Commissioning | EN

Inverter

Inverter i550 Cabinet 0.25 ... 90 kW

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1 General information

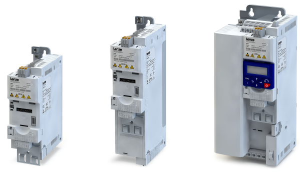
1.1 Read first, then start

⚠WARNING!

Read this documentation thoroughly before carrying out the installation and commissioning.

▶ Please observe the safety instructions!

Information and tools with regard to the Lenze products can be found on the Internet:
http://www.lenze.com → Download



2 Safety instructions

2.1 Basic safety measures

Disregarding the following basic safety measures may lead to severe personal injury and damage to material assets!

The product
- must only be used as directed.
- must never be commissioned if they display signs of damage.
- must never be technically modified.
- must never be commissioned if they are not fully mounted.
- must never be operated without required covers.

Connect/disconnect all pluggable terminals only in deenergised condition.

Only remove the product from the installation in the deenergised state.

Insulation resistance tests between 24V control potential and PE: According to EN 61800−5−1, the maximum test voltage must not exceed 110 V DC.

Observe all specifications of the corresponding documentation supplied. This is the precondition for safe and trouble-free operation and for obtaining the product features specified.

The procedural notes and circuit details described in this document are only proposals. It is up to the user to check whether they can be adapted to the particular applications. Lenze does not take any responsibility for the suitability of the procedures and circuit proposals described.

The product must only be used by qualified personnel. IEC 60364 or CENELEC HD 384 define the skills of these persons:
- They are familiar with installing, mounting, commissioning, and operating the product.
- They have the corresponding qualifications for their work.
- They know and can apply all regulations for the prevention of accidents, directives, and laws applicable at the place of use.

Please observe the specific notes in the other chapters!
Notes used:

⚠ DANGER!

This note refers to an imminent danger which, if not avoided, may result in death or serious injury.

⚠ WARNING!

This note refers to a danger which, if not avoided, may result in death or serious injury.

⚠ CAUTION!

This note refers to a danger which, if not avoided, may result in minor or moderate injury.

NOTICE

This note refers to a danger which, if not avoided, may result in damage to property.

2.2 Residual hazards

The user must take the residual hazards mentioned into consideration in the risk assessment for his/her machine/system.

If the above is disregarded, this can lead to severe injuries to persons and damage to material assets!

Product
Observe the warning labels on the product!

Icon	Description
	Electrostatic sensitive devices: Before working on the product, the staff must ensure to be free of electrostatic charge!
	Dangerous electrical voltage Before working on the product, check if no voltage is applied to the power terminals! After mains disconnection, the power terminals carry the hazardous electrical voltage given on the product!
	High leakage current: Carry out fixed installation and PE connection in compliance with EN 61800−5−1 or EN 60204−1!
	Hot surface: Use personal protective equipment or wait until devices have cooled down!

Motor
If there is a short circuit of two power transistors, a residual movement of up to 180°/number of pole pairs can occur at the motor! (For 4-pole motor: residual movement max. 180°/2 = 90°).

2.3 Application as directed

- The product must only be operated under the operating conditions prescribed in this documentation.
- The product meets the protection requirements of 2014/35/EU: Low-Voltage Directive.
- The product is not a machine in terms of 2006/42/EC: Machinery Directive.
- Commissioning or starting the operation as directed of a machine with the product is not permitted until it has been ensured that the machine meets the regulations of the EC Directive 2006/42/EC: Machinery Directive; observe EN 60204−1.
- Commissioning or starting the operation as directed is only allowed when there is compliance with the EMC Directive 2014/30/EU.
- The harmonised standard EN 61800−5−1 is used for the inverters.
- The product is not a household appliance, but is only designed as component for commercial or professional use in terms of EN 61000−3−2.
- The product can be used according to the technical data if drive systems have to comply with categories according to EN 61800−3.

  In residential areas, the product may cause EMC interferences. The operator is responsible for taking interference suppression measures.

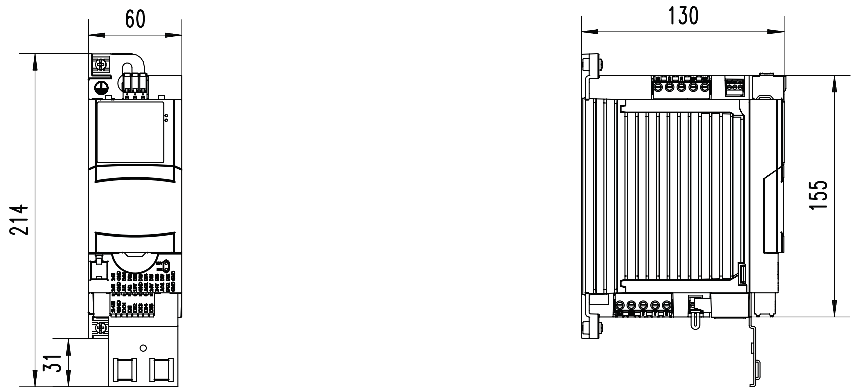
3 Mechanical installation

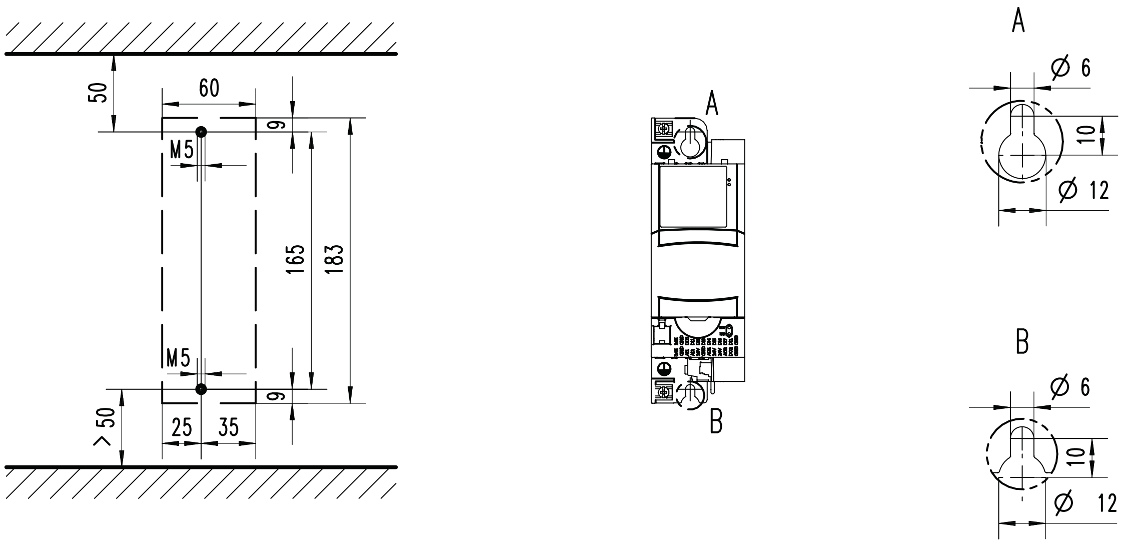
3.1 Dimensions

0.25 kW ... 0.37 kW

The dimensions in mm apply to:

0.25 kW	I55AE125B	I55AE125D	
0.37 kW	I55AE137B	I55AE137D	I55AE137F





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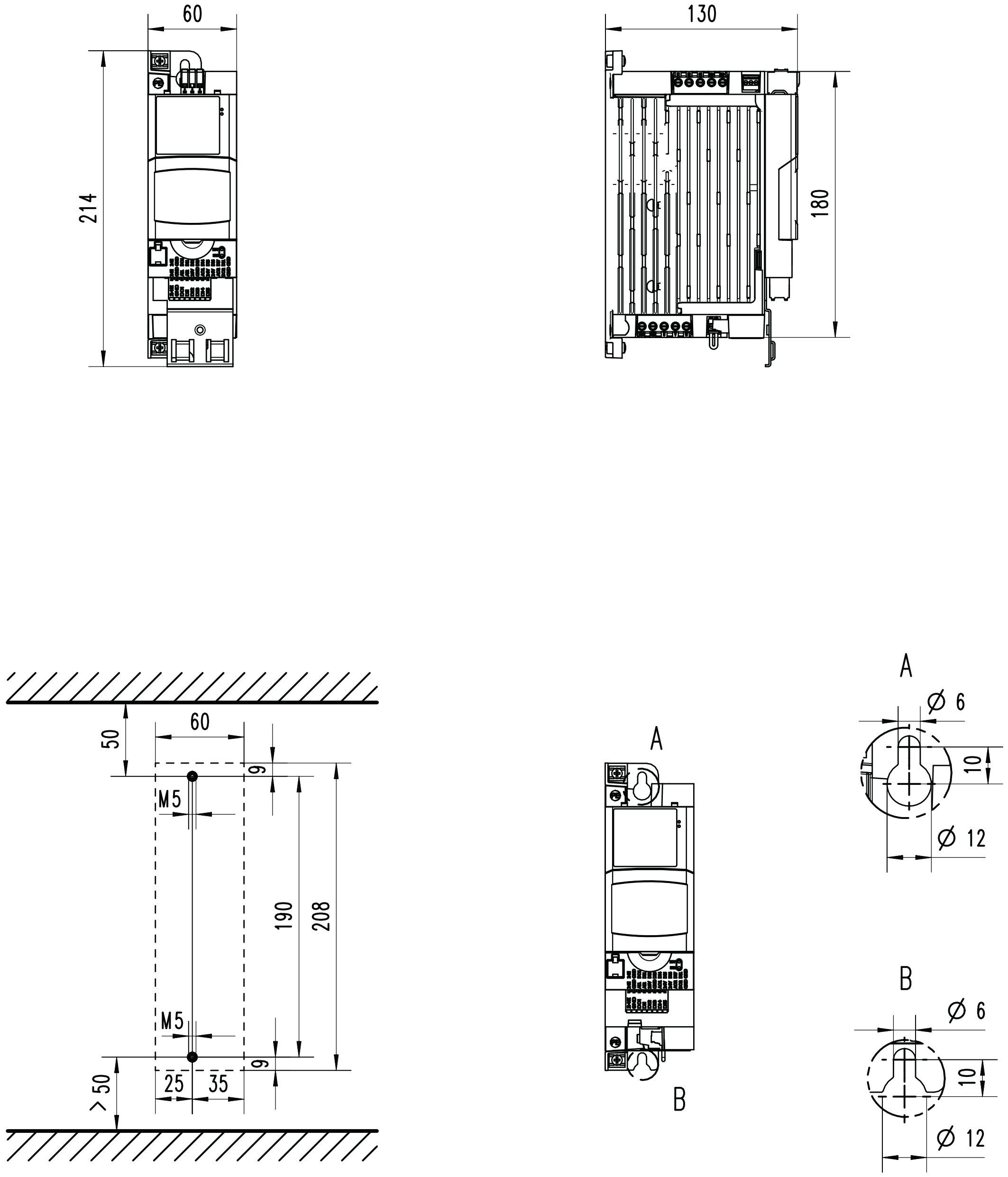
0.25 kW ... 0.37 kW

The dimensions in mm apply to:

0.25 kW	I55AE125A
0.37 kW	I55AE137A



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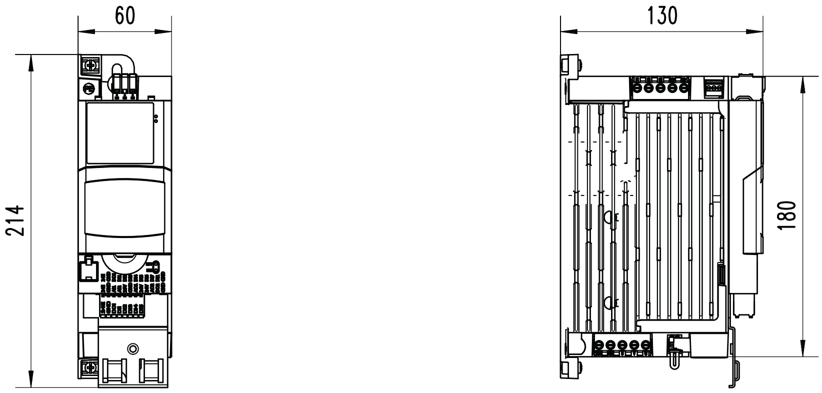
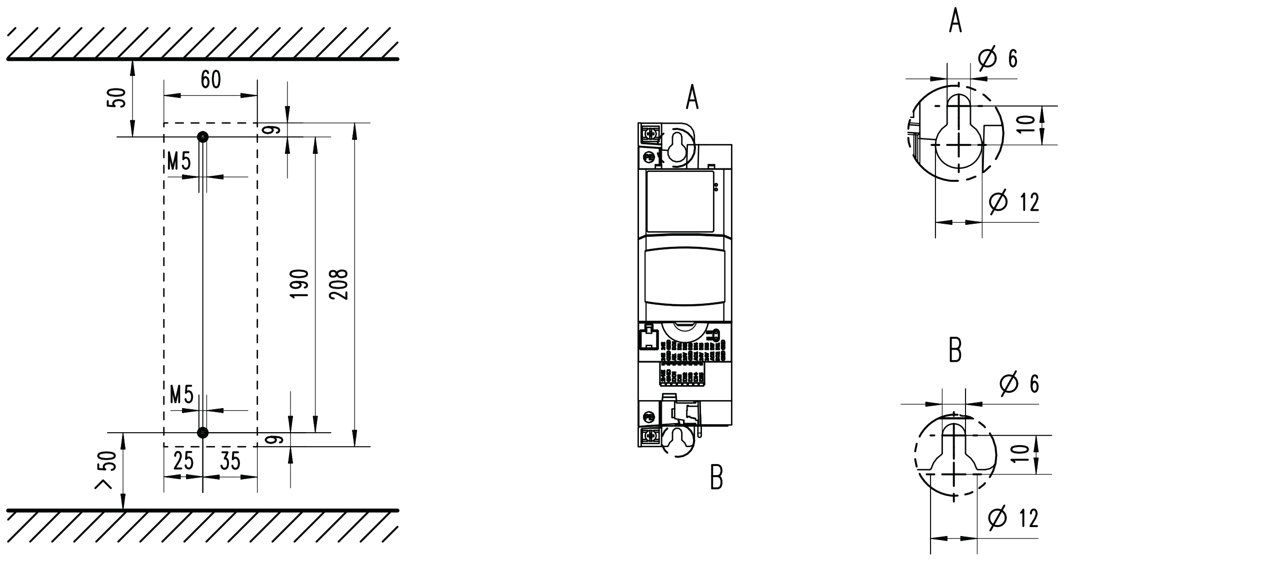
0.55 kW ... 0.75 kW

The dimensions in mm apply to:

0.55 kW	I55AE155B	I55AE155D	I55AE155F
0.75 kW	I55AE175B	I55AE175D	I55AE175F

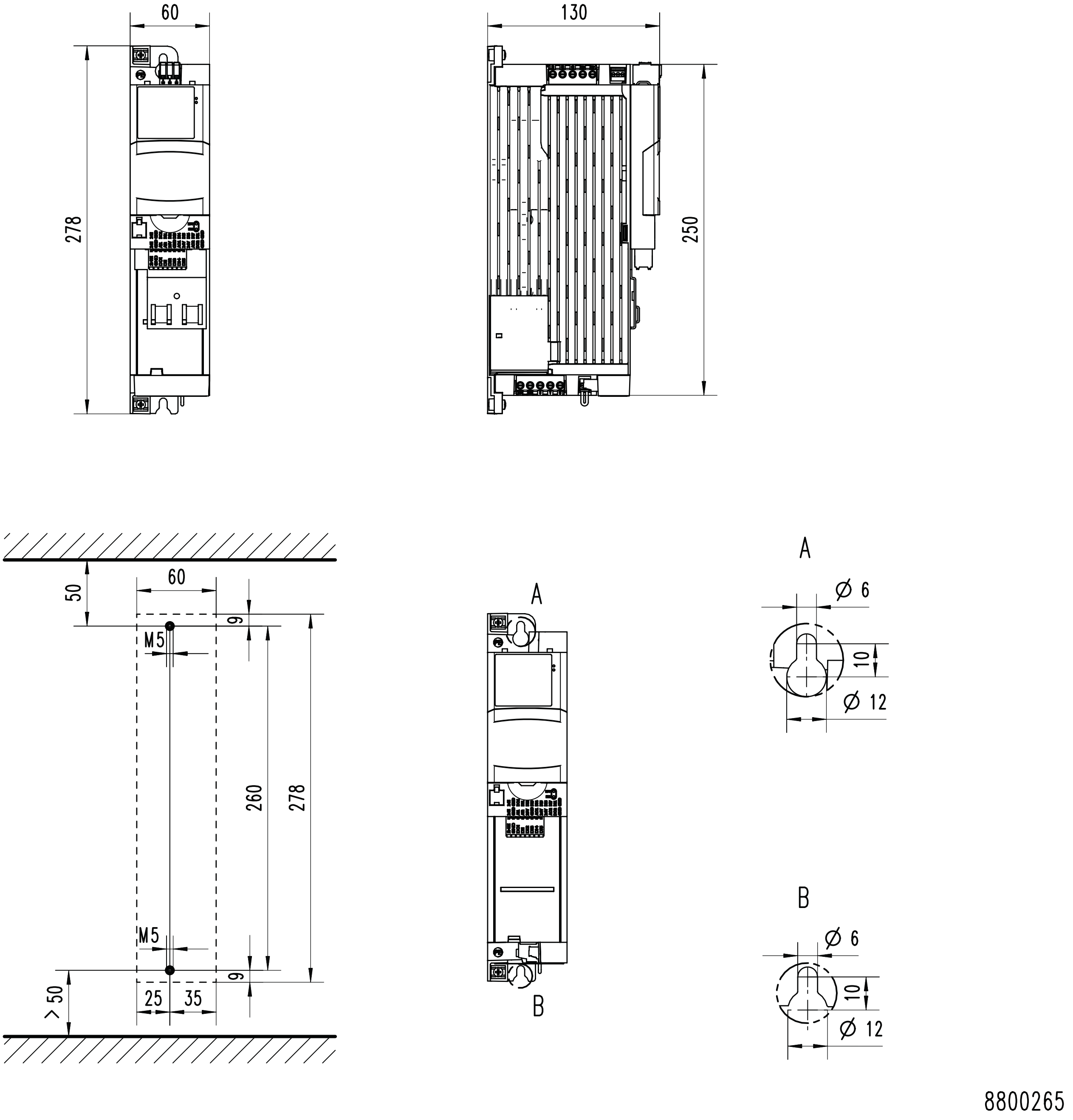




0.75 kW ... 1.1 kW

The dimensions in mm apply to:

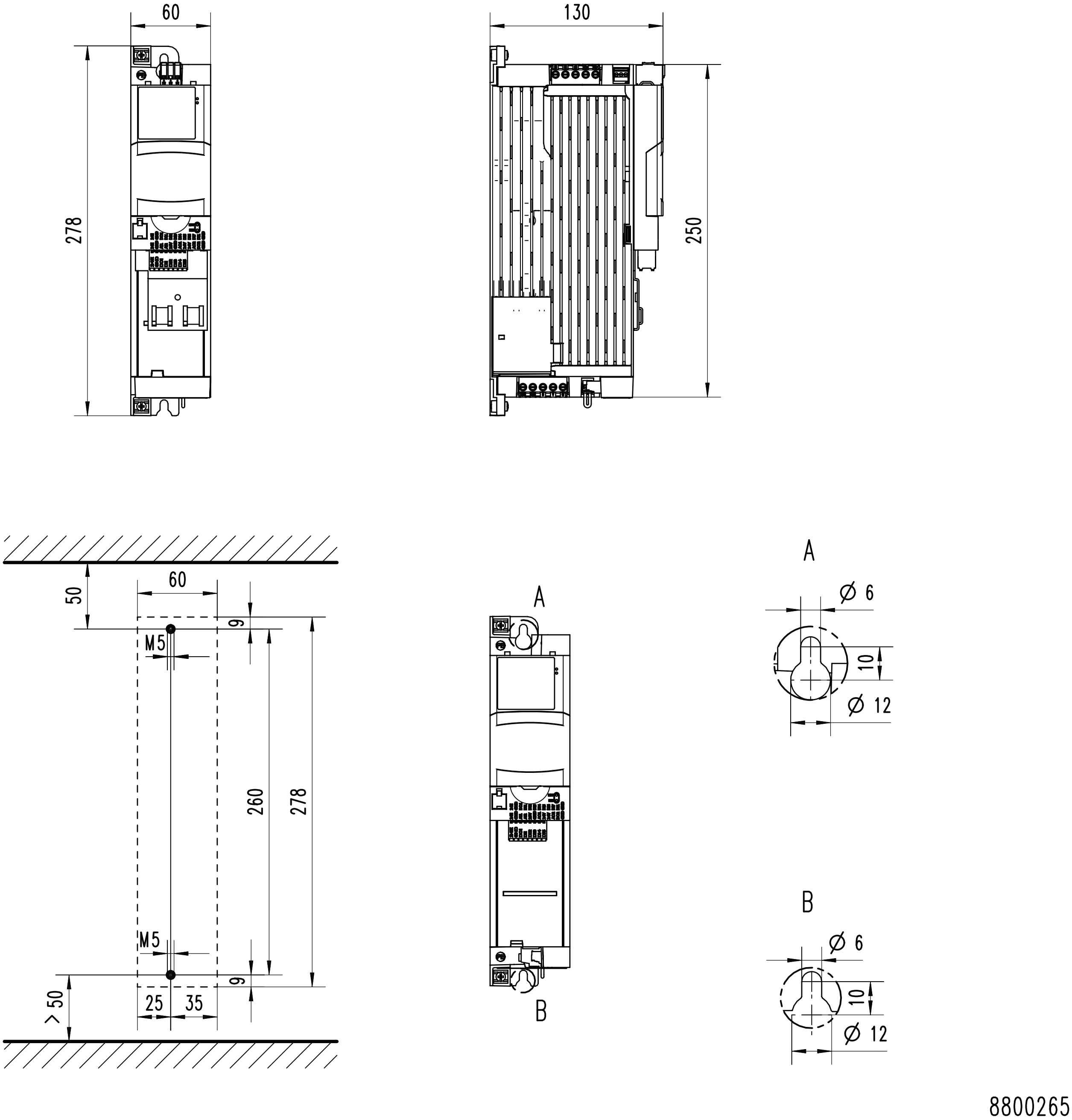
0.75 kW	I55AE175A
1.1 kW	I55AE211A



1.1 kW ... 2.2 kW

The dimensions in mm apply to:

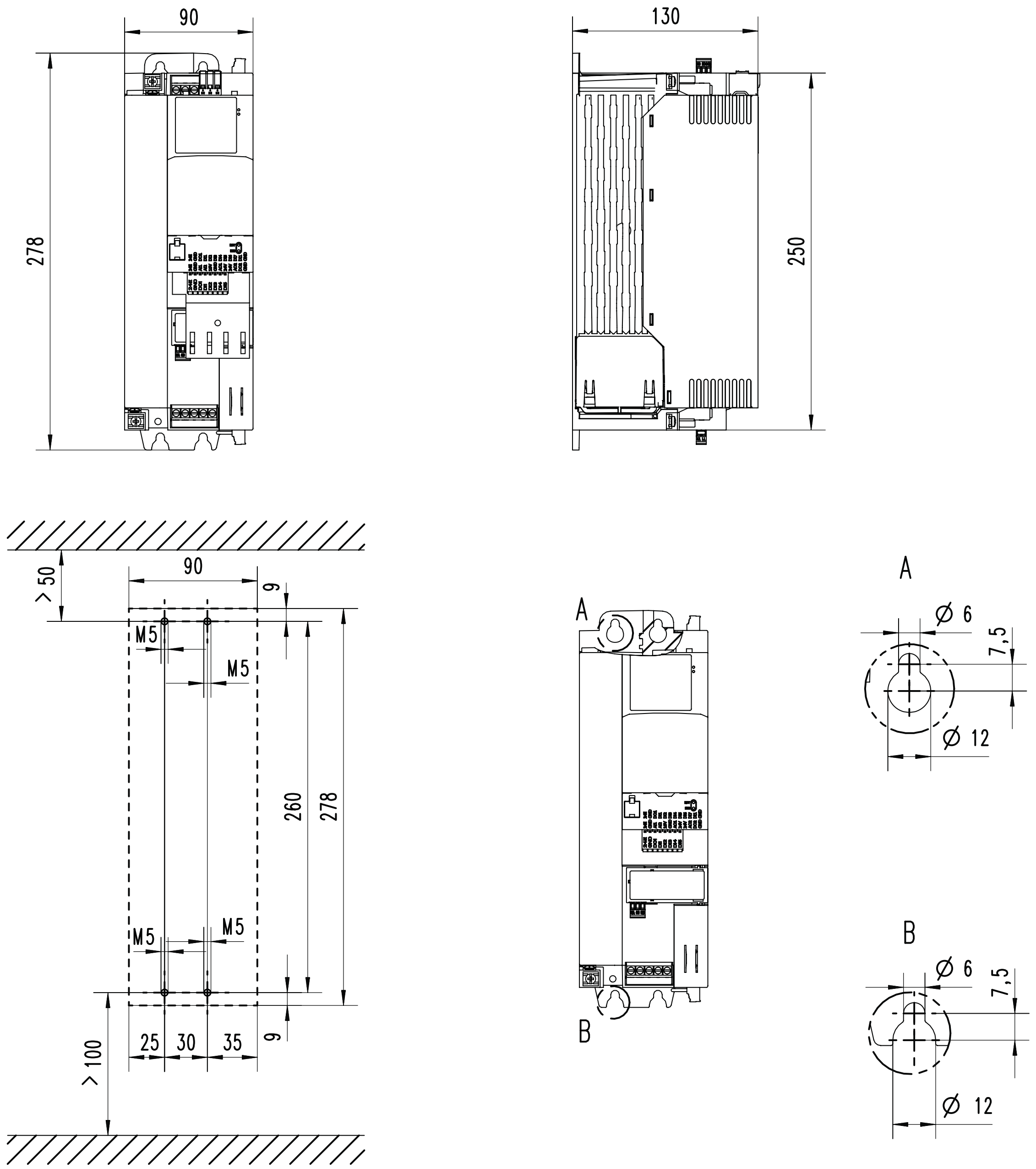
1.1 kW	I55AE211B	I55AE211D	I55AE211F
1.5 kW	I55AE215B	I55AE215D	I55AE215F
2.2 kW	I55AE222B	I55AE222D	I55AE222F



3 kW ... 5.5 kW

The dimensions in mm apply to:

3 kW		I55AE230F
4 kW	I55AE240C	I55AE240F
5.5 kW	I55AE255C	I55AE255F



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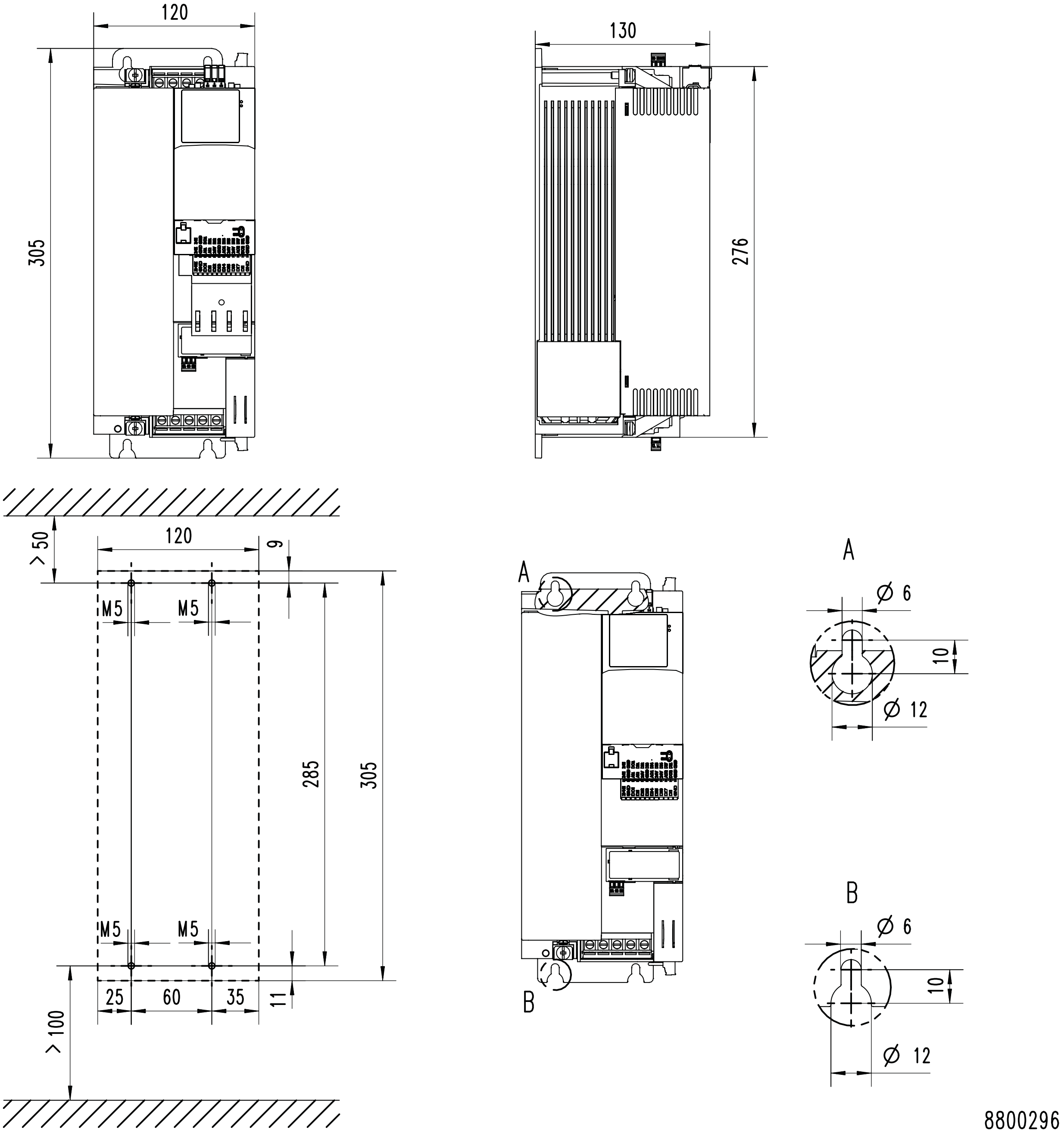
7.5 kW ... 11 kW

The dimensions in mm apply to:

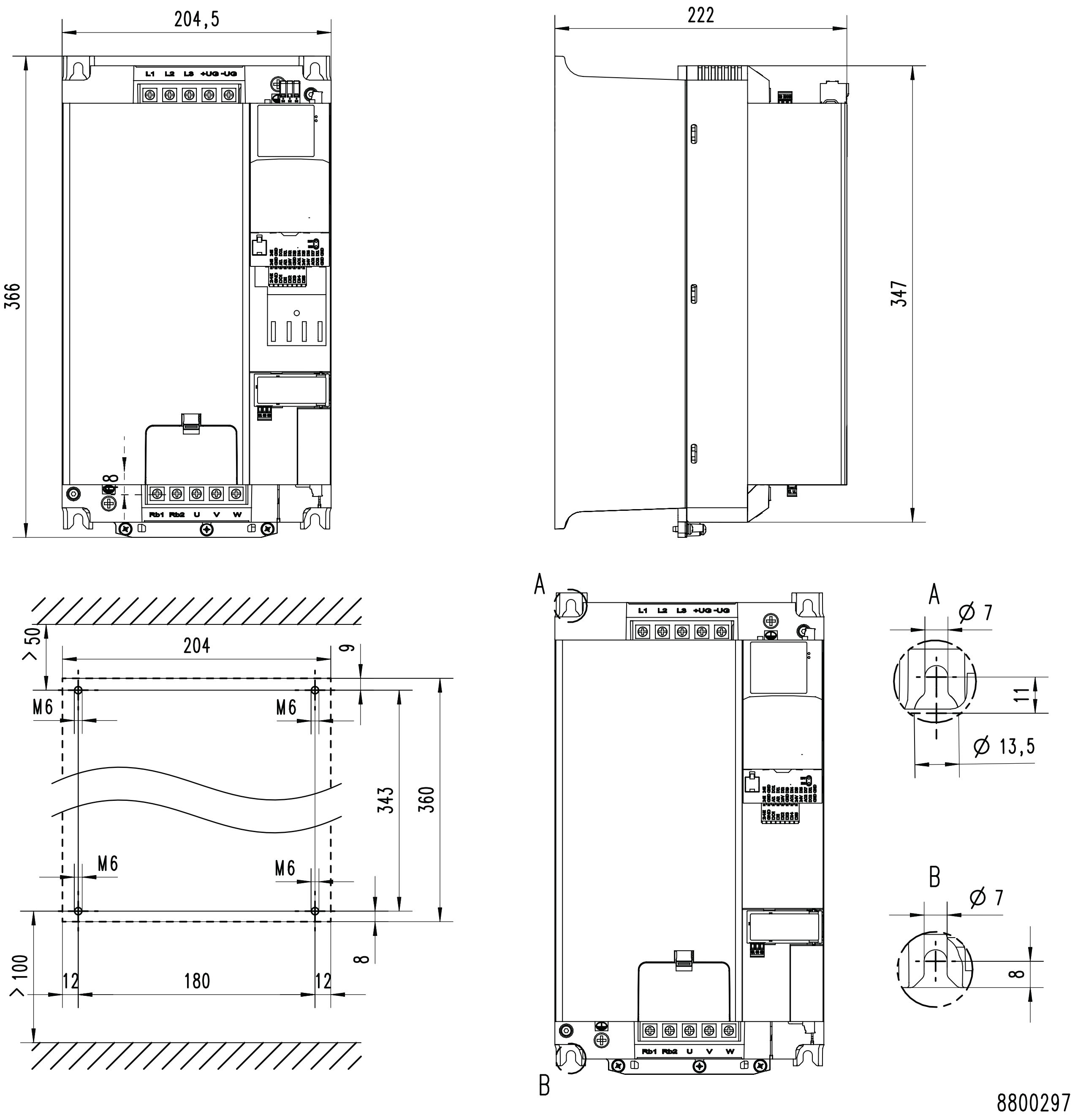
7.5 kW	I55AE275F
11 kW	I55AE311F



15 kW ... 22 kW

The dimensions in mm apply to:

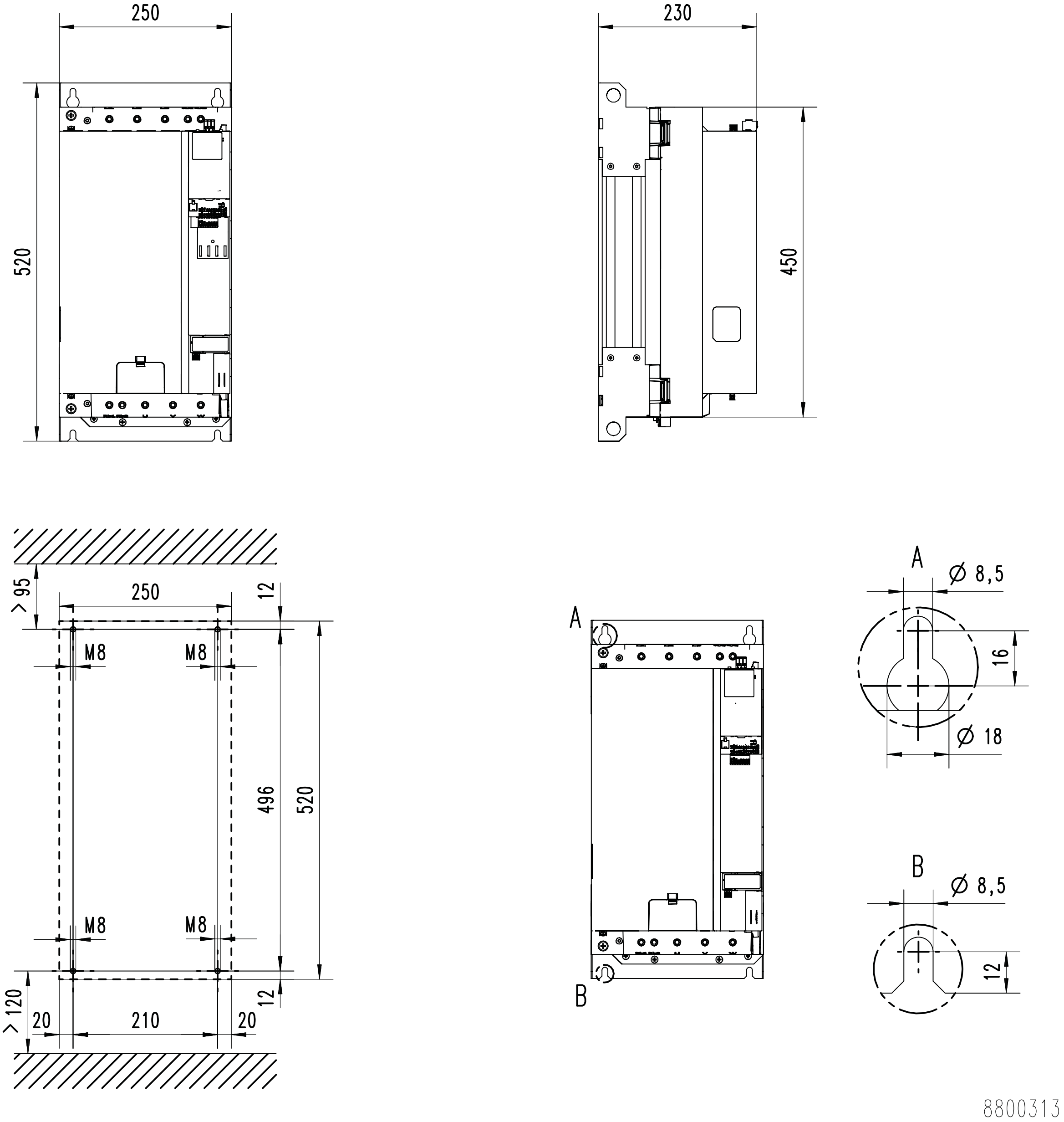
15 kW	I55AE315F
18.5 kW	I55AE318F
22 kW	I55AE322F



30 kW ... 45 kW

The dimensions in mm apply to:

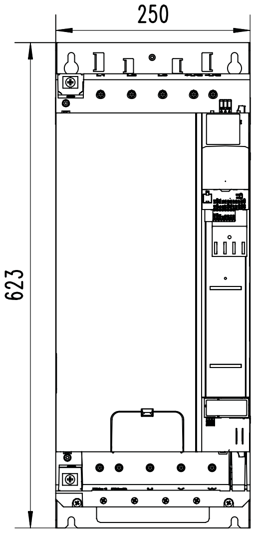
30 kW	I55AE330F
37 kW	I55AE337F
45 kW	I55AE345F

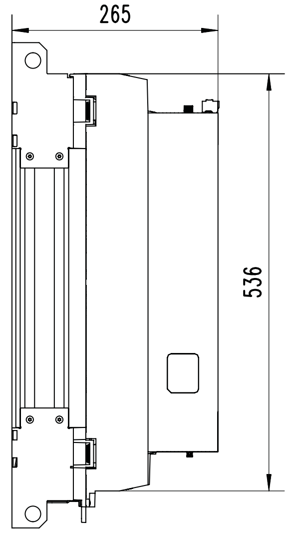


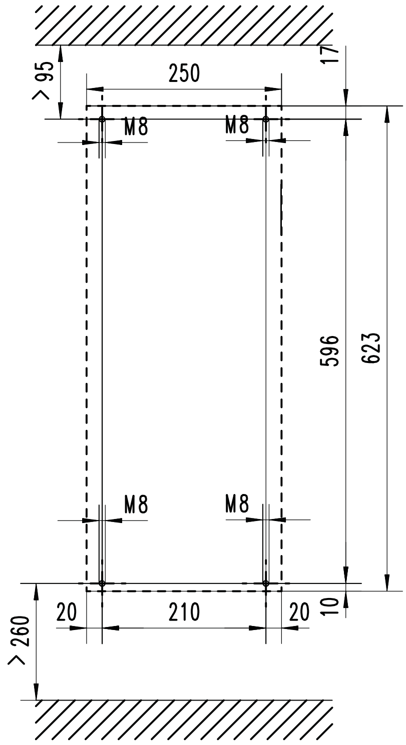
55 kW ... 75 kW

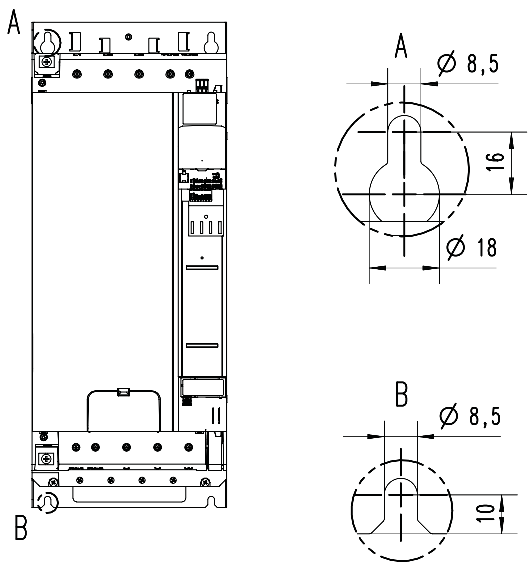
The dimensions in mm apply to:

55 kW	I55AE355F
75 kW	I55AE375F









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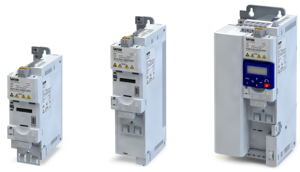


4 Electrical installation

4.1 Important notes

⚠ DANGER!

Dangerous electrical voltage

Possible consequence: death or severe injuries

- All work on the inverter must only be carried out in the deenergised state.
- After switching off the mains voltage, wait for at least 3 minutes before you start working.

4.2 Mains connection

4.2.1 1-phase mains connection 120 V

4.2.1.1 Connection plan

The connection plan is valid for the inverters I55AExxx**A**.

Inverters I55AExxx**A** do not have an integrated RFI filter in the AC mains supply.

In order to meet the EMC requirements according to EN 61800−3, an external EMC filter according to IEC EN 60939 must be used.

The user must verify that the conformity with EN 61800−3 is fulfilled.

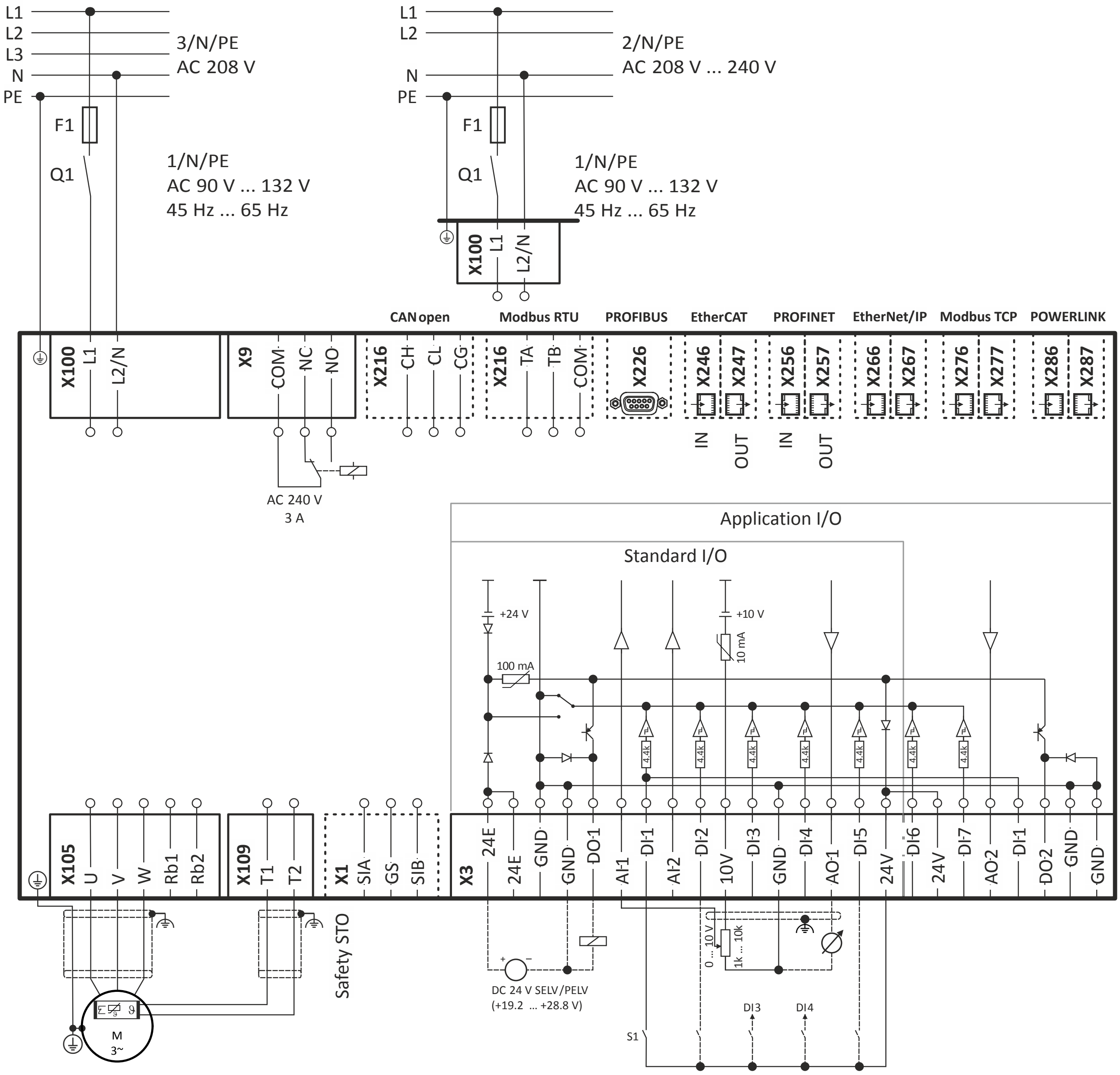


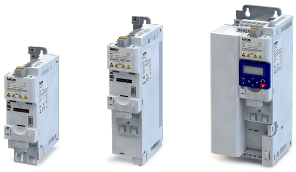
Fig. 1: Wiring example

S1	Start/Stop	Q1	Mains contactor
Fx	Fuses	---	Dashed line = options

4.2.1.2 Fusing and terminal data

Fuse data			
Inverter		**I55AE125A** **I55AE137A**	**I55AE175A** **I55AE211A**
Cable installation in compliance with		EN 60204-1	
Installation method		B2	
operation		without mains choke	
Fuse			
Characteristics		gG/gL or gRL	
Max. rated current	A	16	25
Circuit breaker			
Characteristics		B	
Max. rated current	A	16	25
operation		with mains choke	
Fuse			
Characteristics		gG/gL or gRL	
Max. rated current	A	16	25
Circuit breaker			
Characteristics		B	
Max. rated current	A	16	25
Earth-leakage circuit breaker			
1-phase mains connection		≥ 30 mA, type A or B	

Fuse data			
Inverter		**I55AE125A** **I55AE137A**	**I55AE175A** **I55AE211A**
Cable installation in compliance with		US National Electrical Code NFPA 70 / Canadian Electrical Code C22.1	
operation		without mains choke	
Fuse			
Characteristics		all acc. to UL 248 / Class CC	
Max. rated current	A	15	30
Circuit breaker			
Characteristics		-	
Max. rated current	A	15	30
operation		with mains choke	
Fuse			
Characteristics		all acc. to UL 248 / Class CC	
Max. rated current	A	15	30
Circuit breaker			
Characteristics		-	
Max. rated current	A	15	30
Earth-leakage circuit breaker			
1-phase mains connection		≥ 30 mA, type A or B	



Mains connection			
Inverter		**I55AE125A I55AE137A**	**I55AE175A I55AE211A**
Connection		X100	
Connection type		pluggable screw terminal	
Min. cable cross-section	mm²	1	
Min. cable cross-section	AWG	18	
Max. cable cross-section	mm²	2.5	6
Max. cable cross-section	AWG	12	10
Stripping length	mm	8	
Stripping length	inch	0.32	
Tightening torque	Nm	0.5	0.7
Tightening torque	lb-in	4.4	6.2
Required tool		0.5 x 3.0	0.6 x 3.5

PE connection		
Inverter		**I55AE125A I55AE137A I55AE175A I55AE211A**
Connection		PE
Connection type		PE screw
Min. cable cross-section	mm²	1.5
Min. cable cross-section	AWG	14
Max. cable cross-section	mm²	6
Max. cable cross-section	AWG	10
Stripping length	mm	10
Stripping length	inch	0.39
Tightening torque	Nm	2
Tightening torque	lb-in	18
Required tool		TORX TX20

Motor connection		
Inverter		**I55AE125A I55AE137A I55AE175A I55AE211A**
Connection		X105
Connection type		pluggable screw terminal
Min. cable cross-section	mm²	1
Min. cable cross-section	AWG	18
Max. cable cross-section	mm²	2.5
Max. cable cross-section	AWG	12
Stripping length	mm	8
Stripping length	inch	0.32
Tightening torque	Nm	0.5
Tightening torque	lb-in	4.4
Required tool		0.5 x 3.0

4.2.2 1-phase mains connection 230/240 V

4.2.2.1 Connection plan

The connection plan is valid for the inverters I55AExxx**B**.

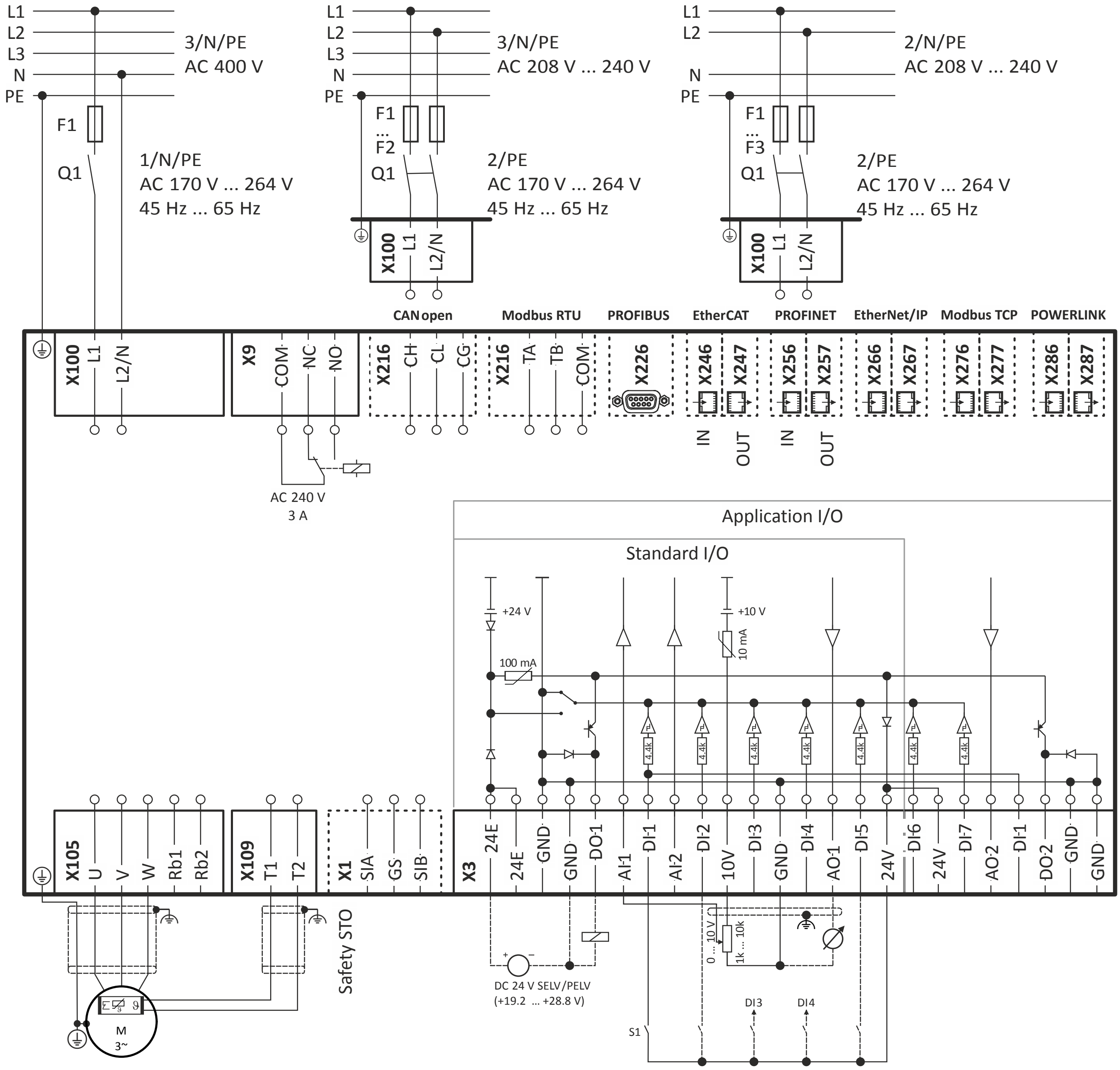
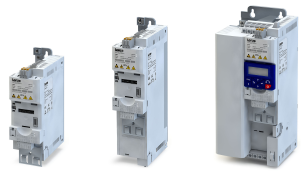


Fig. 2: Wiring example

S1	Start/Stop	Q1	Mains contactor
Fx	Fuses	---	Dashed line = options



The connection plan is valid for the inverters I55AExxx**D**.

Inverters I55AExxx**D** do not have an integrated RFI filter in the AC mains supply.

In order to meet the EMC requirements according to EN 61800−3, an external EMC filter according to IEC EN 60939 must be used.

The user must verify that the conformity with EN 61800−3 is fulfilled.

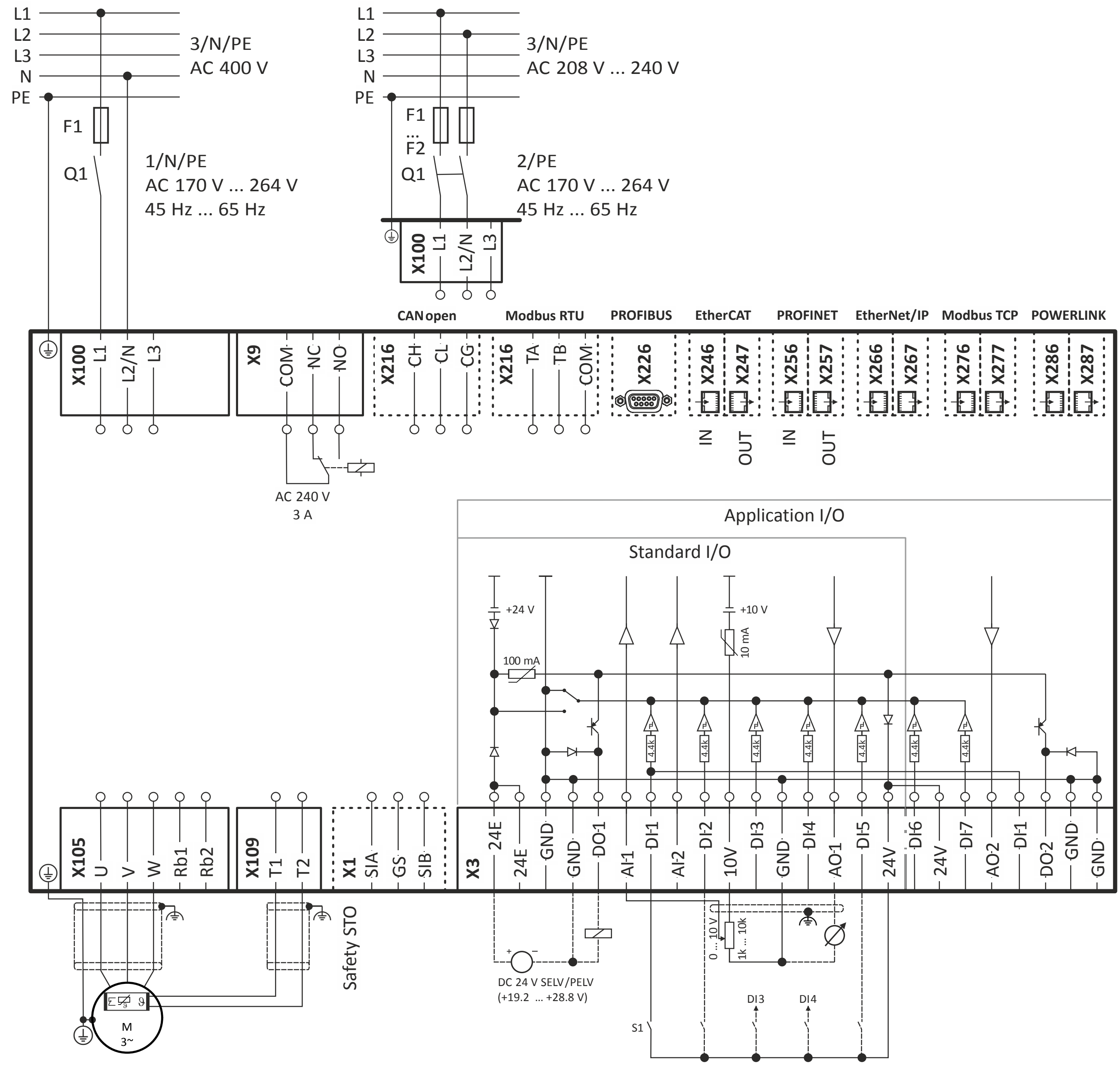
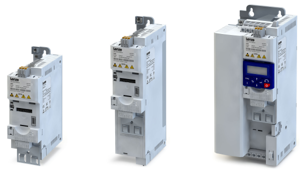


Fig. 3: Wiring example

S1	Start/Stop	Q1	Mains contactor
Fx	Fuses	---	Dashed line = options



4.2.2.2 Fusing and terminal data

Fuse data					
Inverter		**I55AE125B** **I55AE137B**	**I55AE125D** **I55AE137D**	**I55AE155B** **I55AE175B**	**I55AE155D** **I55AE175D**
Cable installation in compliance with		EN 60204-1			
Installation method		B2			
operation		without mains choke			
Fuse					
Characteristics		gG/gL or gRL			
Max. rated current	A	10	10	16	16
Circuit breaker					
Characteristics		B			
Max. rated current	A	10	10	16	16
operation		with mains choke			
Fuse					
Characteristics		gG/gL or gRL			
Max. rated current	A	10	10	16	16
Circuit breaker					
Characteristics		B			
Max. rated current	A	10	10	16	16
Earth-leakage circuit breaker					
1-phase mains connection		≥ 30 mA, type A or B			
3-phase mains connection		-	≥ 30 mA, type B	-	≥ 30 mA, type B

Fuse data			
Inverter		**I55AE211B** **I55AE215B** **I55AE222B**	**I55AE211D** **I55AE215D** **I55AE222D**
Cable installation in compliance with		EN 60204-1	
Installation method		B2	
operation		without mains choke	
Fuse			
Characteristics		gG/gL or gRL	
Max. rated current	A	25	25
Circuit breaker			
Characteristics		B	
Max. rated current	A	25	25
operation		with mains choke	
Fuse			
Characteristics		gG/gL or gRL	
Max. rated current	A	25	25
Circuit breaker			
Characteristics		B	
Max. rated current	A	25	25
Earth-leakage circuit breaker			
1-phase mains connection		≥ 30 mA, type A or B	
3-phase mains connection		-	≥ 30 mA, type B

Fuse data					
Inverter		**I55AE125B I55AE137B I55AE155B I55AE175B**	**I55AE125D I55AE137D I55AE155D I55AE175D**	**I55AE211B I55AE215B I55AE222B**	**I55AE211D I55AE215D I55AE222D**
Cable installation in compliance with		US National Electrical Code NFPA 70 / Canadian Electrical Code C22.1			
operation		without mains choke			
Fuse					
Characteristics		all acc. to UL 248 / Class CC			
Max. rated current	A	15	15	30	30
Circuit breaker					
Characteristics		-			
Max. rated current	A	15	15	30	30
operation		with mains choke			
Fuse					
Characteristics		all acc. to UL 248 / Class CC			
Max. rated current	A	15	15	30	30
Circuit breaker					
Characteristics		-			
Max. rated current	A	15	15	30	30
Earth-leakage circuit breaker					
1-phase mains connection		≥ 30 mA, type A or B			
3-phase mains connection		-	≥ 30 mA, type B	-	≥ 30 mA, type B

Mains connection			
Inverter		**I55AE125B I55AE125D I55AE137B I55AE137D I55AE155B I55AE155D I55AE175B I55AE175D**	**I55AE211B I55AE211D I55AE215B I55AE215D I55AE222B I55AE222D**
Connection		X100	
Connection type		pluggable screw terminal	
Min. cable cross-section	mm²	1	
Min. cable cross-section	AWG	18	
Max. cable cross-section	mm²	2.5	6
Max. cable cross-section	AWG	12	10
Stripping length	mm	8	
Stripping length	inch	0.32	
Tightening torque	Nm	0.5	0.7
Tightening torque	lb-in	4.4	6.2
Required tool		0.5 x 3.0	0.6 x 3.5

PE connection		
Inverter		**I55AE125B** **I55AE125D** **I55AE137B** **I55AE137D** **I55AE155B** **I55AE155D** **I55AE175B** **I55AE175D** **I55AE211B** **I55AE211D** **I55AE215B** **I55AE215D** **I55AE222B** **I55AE222D**
Connection		PE
Connection type		PE screw
Min. cable cross-section	mm²	1.5
Min. cable cross-section	AWG	14
Max. cable cross-section	mm²	6
Max. cable cross-section	AWG	-
Stripping length	mm	10
Stripping length	inch	0.39
Tightening torque	Nm	2
Tightening torque	lb-in	18
Required tool		TORX TX20

Motor connection		
Inverter		**I55AE125B** **I55AE125D** **I55AE137B** **I55AE137D** **I55AE155B** **I55AE155D** **I55AE175B** **I55AE175D** **I55AE211B** **I55AE211D** **I55AE215B** **I55AE215D** **I55AE222B** **I55AE222D**
Connection		X105
Connection type		pluggable screw terminal
Min. cable cross-section	mm²	1
Min. cable cross-section	AWG	18
Max. cable cross-section	mm²	2.5
Max. cable cross-section	AWG	12
Stripping length	mm	8
Stripping length	inch	0.32
Tightening torque	Nm	0.5
Tightening torque	lb-in	4.4
Required tool		0.5 x 3.0

4.2.3 3-phase mains connection 230/240 V

4.2.3.1 Connection plan

The connection plan is valid for the inverters I55AExxx**C**.

Inverters I55AExxx**C** do not have an integrated RFI filter in the AC mains supply.

In order to meet the EMC requirements according to EN 61800−3, an external EMC filter according to IEC EN 60939 must be used.

The user must verify that the conformity with EN 61800−3 is fulfilled.

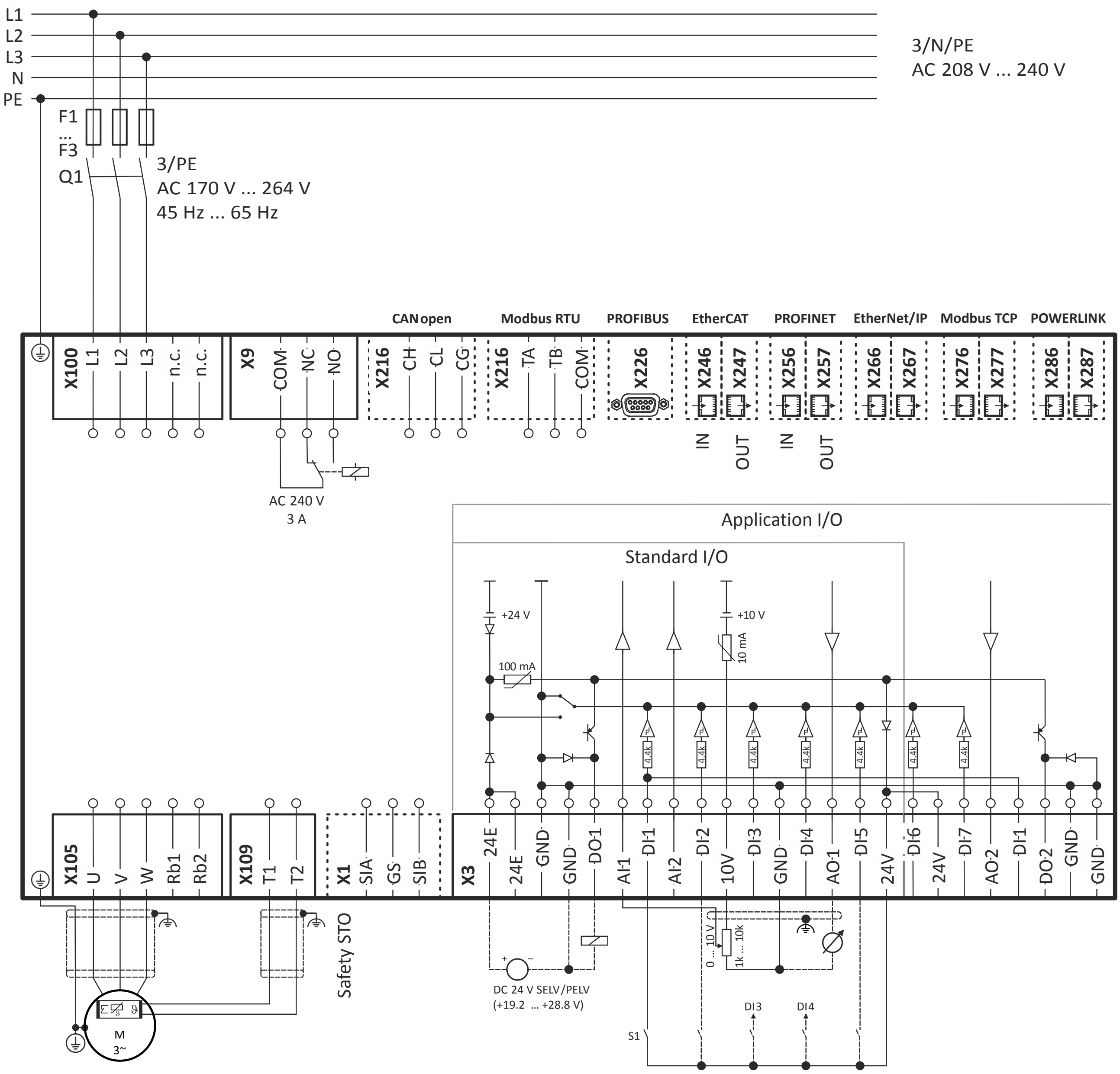


Fig. 4: Wiring example

S1	Start/Stop	Q1	Mains contactor
Fx	Fuses	---	Dashed line = options

The connection plan is valid for the inverters I55AExxx**D**.

Inverters I55AExxx**D** do not have an integrated RFI filter in the AC mains supply.

In order to meet the EMC requirements according to EN 61800−3, an external EMC filter according to IEC EN 60939 must be used.

The user must verify that the conformity with EN 61800−3 is fulfilled.

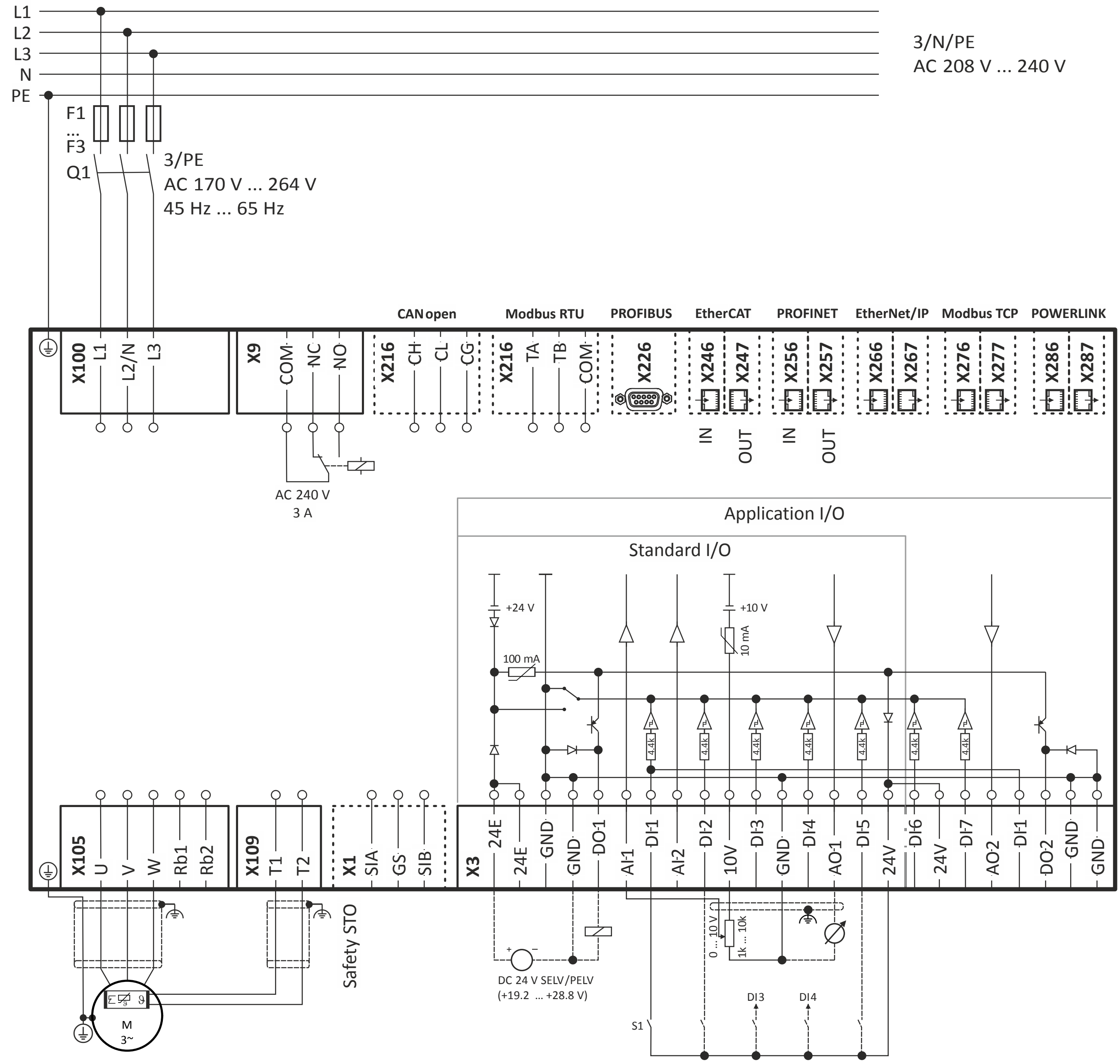


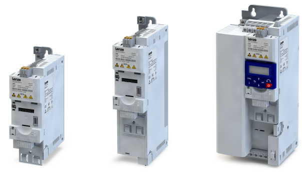
Fig. 5: Wiring example

S1	Start/Stop	Q1	Mains contactor
Fx	Fuses	---	Dashed line = options

4.2.3.2 Fusing and terminal data

Fuse data					
Inverter		**I55AE125D I55AE137D**	**I55AE155D I55AE175D**	**I55AE211D I55AE215D I55AE222D**	**I55AE240C I55AE255C**
Cable installation in compliance with		EN 60204-1			
Installation method		B2			C
operation		without mains choke			
Fuse					
Characteristics		gG/gL or gRL			
Max. rated current	A	10	16	25	32
Circuit breaker					
Characteristics		B			
Max. rated current	A	10	16	25	32
operation		with mains choke			
Fuse					
Characteristics		gG/gL or gRL			
Max. rated current	A	10	16	25	32
Circuit breaker					
Characteristics		B			
Max. rated current	A	10	16	25	32
Earth-leakage circuit breaker					
1-phase mains connection		≥ 30 mA, type A or B			-
3-phase mains connection		≥ 30 mA, type B			≥ 300 mA, type B

Fuse data				
Inverter		**I55AE125D I55AE137D I55AE155D I55AE175D**	**I55AE211D I55AE215D I55AE222D**	**I55AE240C I55AE255C**
Cable installation in compliance with		US National Electrical Code NFPA 70 / Canadian Electrical Code C22.1		
operation		without mains choke		
Fuse				
Characteristics		all acc. to UL 248 / Class CC		all acc. to UL 248 / Class J, T, R
Max. rated current	A	15	30	40
Circuit breaker				
Characteristics		-		
Max. rated current	A	15	30	-
operation		with mains choke		
Fuse				
Characteristics		all acc. to UL 248 / Class CC		all acc. to UL 248 / Class J, T, R
Max. rated current	A	15	30	40
Circuit breaker				
Characteristics		-		
Max. rated current	A	15	30	-
Earth-leakage circuit breaker				
1-phase mains connection		≥ 30 mA, type A or B		-
3-phase mains connection		≥ 30 mA, type B		≥ 300 mA, type B



Mains connection				
Inverter		**I55AE125D I55AE137D I55AE155D I55AE175D**	**I55AE211D I55AE215D I55AE222D**	**I55AE240C I55AE255C**
Connection		X100		
Connection type		pluggable screw terminal		Screw terminal
Min. cable cross-section	mm²	1		1.5
Min. cable cross-section	AWG	18		16
Max. cable cross-section	mm²	2.5	6	
Max. cable cross-section	AWG	12	10	8
Stripping length	mm	8		9
Stripping length	inch	0.32		0.35
Tightening torque	Nm	0.5	0.7	0.5
Tightening torque	lb-in	4.4	6.2	4.4
Required tool		0.5 x 3.0	0.6 x 3.5	

PE connection		
Inverter		**I55AE125D I55AE137D I55AE155D I55AE175D I55AE211D I55AE215D I55AE222D I55AE240C I55AE255C**
Connection		PE
Connection type		PE screw
Min. cable cross-section	mm²	1.5
Min. cable cross-section	AWG	14
Max. cable cross-section	mm²	6
Max. cable cross-section	AWG	-
Stripping length	mm	10
Stripping length	inch	0.39
Tightening torque	Nm	2
Tightening torque	lb-in	18
Required tool		TORX TX20

Motor connection			
Inverter		**I55AE125D I55AE137D I55AE155D I55AE175D I55AE211D I55AE215D I55AE222D**	**I55AE240C I55AE255C**
Connection		X105	
Connection type		pluggable screw terminal	Screw terminal
Min. cable cross-section	mm²	1	1.5
Min. cable cross-section	AWG	18	16
Max. cable cross-section	mm²	2.5	6
Max. cable cross-section	AWG	12	8
Stripping length	mm	8	9
Stripping length	inch	0.32	0.35
Tightening torque	Nm	0.5	
Tightening torque	lb-in	4.4	
Required tool		0.5 x 3.0	0.6 x 3.5

4.2.4 3-phase mains connection 400 V

4.2.4.1 Connection plan

The connection plan is valid for the inverters I55AExxx**F**.

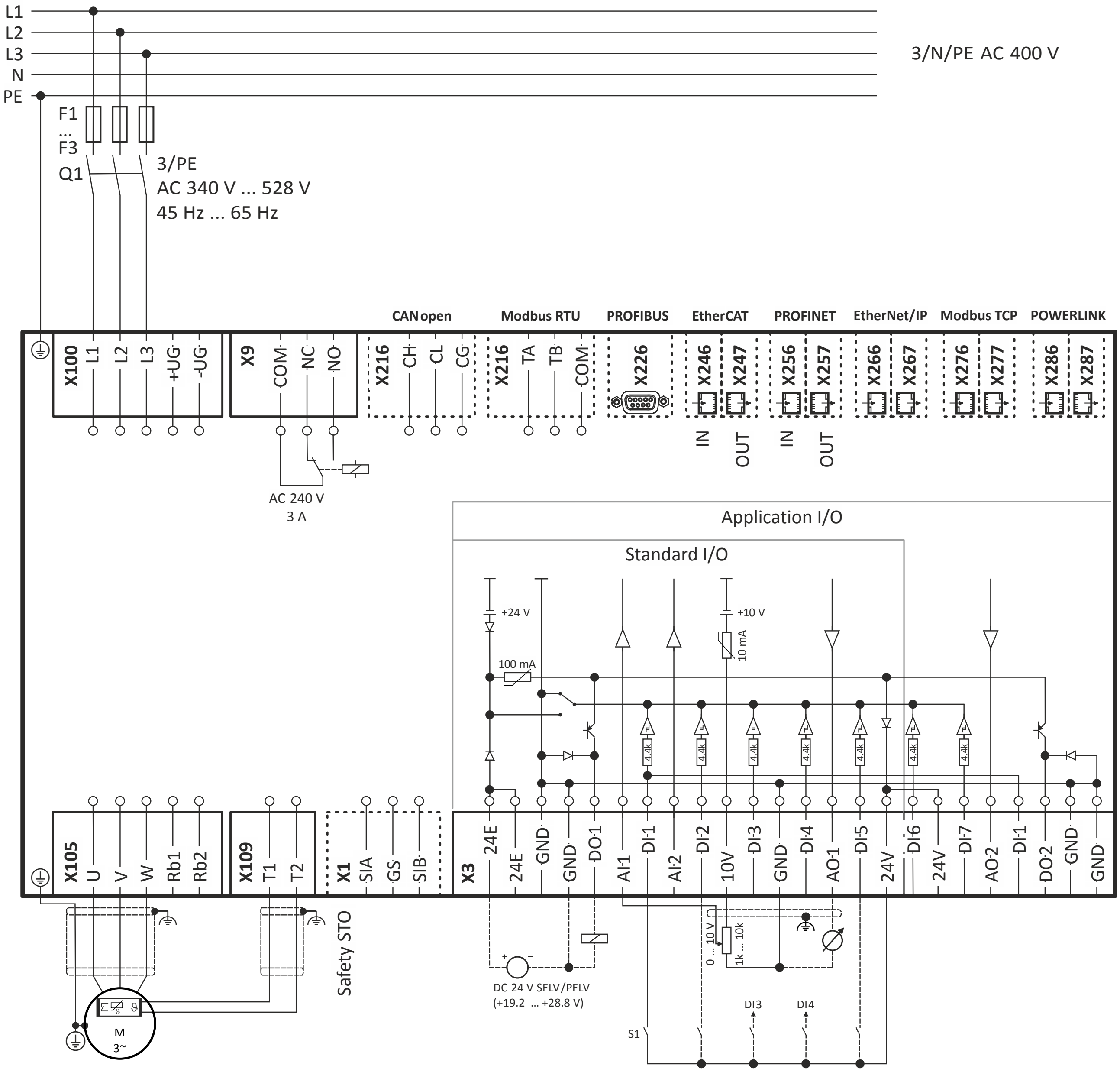


Fig. 6: Wiring example

S1	Start/Stop	Q1	Mains contactor
Fx	Fuses	---	Dashed line = options

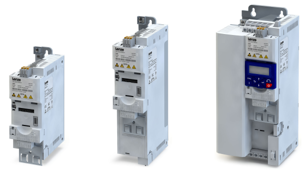
4.2.4.2 Fusing and terminal data

Fuse data					
Inverter		**I55AE137F I55AE155F I55AE175F**	**I55AE211F I55AE215F I55AE222F**	**I55AE230F I55AE240F I55AE255F**	**I55AE275F I55AE311F**
Cable installation in compliance with		EN 60204-1			
Installation method		B2			
operation		without mains choke			
Fuse					
Characteristics		gG/gL or gRL			
Max. rated current	A	10	16	25	32
Circuit breaker					
Characteristics		B			
Max. rated current	A	10	16	25	32
operation		with mains choke			
Fuse					
Characteristics		gG/gL or gRL			
Max. rated current	A	10	16	25	32
Circuit breaker					
Characteristics		B			
Max. rated current	A	10	16	25	32
Earth-leakage circuit breaker					
3-phase mains connection		≥ 30 mA, type B		≥ 300 mA, type B	

Fuse data					
Inverter		**I55AE315F I55AE318F**	**I55AE322F**	**I55AE330F**	**I55AE337F**
Cable installation in compliance with		EN 60204-1			
Installation method		B2		C	
operation		without mains choke			
Fuse					
Characteristics		gG/gL or gRL	-		
Max. rated current	A	63	-	-	-
Circuit breaker					
Characteristics		B	-		
Max. rated current	A	63	-	-	-
operation		with mains choke			
Fuse					
Characteristics		gG/gL or gRL			
Max. rated current	A	63	63	80	100
Circuit breaker					
Characteristics		B			
Max. rated current	A	63	63	80	100
Earth-leakage circuit breaker					
3-phase mains connection		≥ 300 mA, type B			

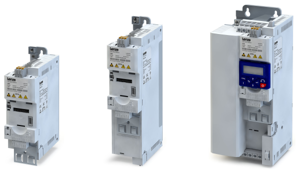
Fuse data			
Inverter		**I55AE345F**	**I55AE355F I55AE375F**
Cable installation in compliance with		EN 60204-1	
Installation method		C	F
operation			
Fuse			
Characteristics		-	
Max. rated current	A	-	-
Circuit breaker			
Characteristics		-	
Max. rated current	A	-	-
operation		with mains choke	
Fuse			
Characteristics		gG/gL or gRL	gR
Max. rated current	A	125	160
Circuit breaker			
Characteristics		B	-
Max. rated current	A	125	-
Earth-leakage circuit breaker			
3-phase mains connection		≥ 300 mA, type B	

Fuse data					
Inverter		**I55AE137F I55AE155F I55AE175F I55AE211F I55AE215F I55AE222F**	**I55AE230F I55AE240F I55AE255F**	**I55AE275F**	**I55AE311F**
Cable installation in compliance with		US National Electrical Code NFPA 70 / Canadian Electrical Code C22.1			
operation		without mains choke			
Fuse					
Characteristics		all acc. to UL 248 / Class CC		all acc. to UL 248 / Class J, T, R	
Max. rated current	A	15	25	40	40
Circuit breaker					
Characteristics		-			
Max. rated current	A	-	25	35	-
operation		with mains choke			
Fuse					
Characteristics		all acc. to UL 248 / Class CC		all acc. to UL 248 / Class J, T, R	
Max. rated current	A	15	25	40	40
Circuit breaker					
Characteristics		-			
Max. rated current	A	-	25	35	-
Earth-leakage circuit breaker					
3-phase mains connection		≥ 30 mA, type B	≥ 300 mA, type B		



Fuse data					
Inverter		**I55AE315F I55AE318F**	**I55AE322F**	**I55AE330F**	**I55AE337F**
Cable installation in compliance with		US National Electrical Code NFPA 70 / Canadian Electrical Code C22.1			
operation		without mains choke			
Fuse					
Characteristics		all acc. to UL 248 / Class J, T, R	-		
Max. rated current	A	70	-	-	-
Circuit breaker					
Characteristics		-	-	-	-
Max. rated current	A	-	-	-	-
operation		with mains choke			
Fuse					
Characteristics		all acc. to UL 248 / Class J, T, R			
Max. rated current	A	70	70	80	100
Circuit breaker					
Characteristics		-	-	-	-
Max. rated current	A	-	-	-	-
Earth-leakage circuit breaker					
3-phase mains connection		≥ 300 mA, type B			

Fuse data			
Inverter		**I55AE345F**	**I55AE355F I55AE375F**
Cable installation in compliance with		US National Electrical Code NFPA 70 / Canadian Electrical Code C22.1	
operation			
Fuse			
Characteristics		-	
Max. rated current	A	-	-
Circuit breaker			
Characteristics		-	-
Max. rated current	A	-	-
operation		with mains choke	
Fuse			
Characteristics		all acc. to UL 248 / Class J, T, R	acc. to UL 248 / Class J (recommended: HSJ by Mersen)
Max. rated current	A	125	200
Circuit breaker			
Characteristics		-	-
Max. rated current	A	-	-
Earth-leakage circuit breaker			
3-phase mains connection		≥ 300 mA, type B	



Mains connection							
Inverter		**I55AE137F I55AE155F I55AE175F I55AE211F I55AE215F I55AE222F**	**I55AE230F I55AE240F I55AE255F**	**I55AE275F I55AE311F**	**I55AE315F I55AE318F I55AE322F**	**I55AE330F I55AE337F I55AE345F**	**I55AE355F I55AE375F**
Connection		X100					
Connection type		pluggable screw terminal	Screw terminal				
Min. cable cross-section	mm²	1	1.5			10	25
Min. cable cross-section	AWG	18	16			6	2
Max. cable cross-section	mm²	2.5	6	16	35	50	95
Max. cable cross-section	AWG	12	10	6	2	1/0	4/0
Stripping length	mm	8	9	11	18	19	22
Stripping length	inch	0.32	0.35	0.43	0.7	0.75	0.87
Tightening torque	Nm	0.5		1.2	3.8	4	10
Tightening torque	lb-in	4.4		11	34	35	89
Required tool		0.5 x 3.0	0.6 x 3.5	0.8 x 4.0	0.8 x 5.5	Allen key 4.0	Allen key 6.0

PE connection				
Inverter		**I55AE137F I55AE155F I55AE175F I55AE211F I55AE215F I55AE222F I55AE230F I55AE240F I55AE255F**	**I55AE275F I55AE311F**	**I55AE315F I55AE318F I55AE322F I55AE330F I55AE337F I55AE345F I55AE355F I55AE375F**
Connection		PE		
Connection type		PE screw		
Min. cable cross-section	mm²	1.5	2.5	4
Min. cable cross-section	AWG	14	12	
Max. cable cross-section	mm²	6	16	25
Max. cable cross-section	AWG	-		
Stripping length	mm	10	11	16
Stripping length	inch	0.39	0.43	0.63
Tightening torque	Nm	2	3.4	4
Tightening torque	lb-in	18	30	35
Required tool		TORX TX20	PZ2	

Motor connection							
Inverter		**I55AE137F I55AE155F I55AE175F I55AE211F I55AE215F I55AE222F**	**I55AE230F I55AE240F I55AE255F**	**I55AE275F I55AE311F**	**I55AE315F I55AE318F I55AE322F**	**I55AE330F I55AE337F I55AE345F**	**I55AE355F I55AE375F**
Connection		X105					
Connection type		pluggable screw terminal	Screw terminal				
Min. cable cross-section	mm²	1	1.5			10	25
Min. cable cross-section	AWG	18	16			6	2
Max. cable cross-section	mm²	2.5	6	16	35	50	95
Max. cable cross-section	AWG	12	10	6	2	1/0	4/0
Stripping length	mm	8	9	11	18	19	22
Stripping length	inch	0.32	0.35	0.43	0.7	0.75	0.87
Tightening torque	Nm	0.5		1.2	3.8	4	10
Tightening torque	lb-in	4.4		11	34	35	89
Required tool		0.5 x 3.0	0.6 x 3.5	0.8 x 4.0	0.8 x 5.5	Allen key 4.0	Allen key 6.0

4.2.5 3-phase mains connection 400 V "light duty"

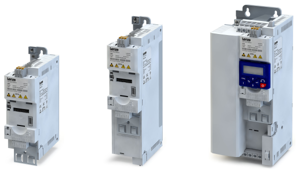
4.2.5.1 Connection plan

See chapter "3-phase mains connection 400 V". 41

4.2.5.2 Fusing and terminal data

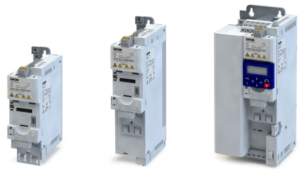
Fuse data					
Inverter		**I55AE230F I55AE240F I55AE255F**	**I55AE275F**	**I55AE311F**	**I55AE315F**
Cable installation in compliance with		EN 60204-1			
Installation method		B2			
operation		without mains choke			without mains choke
Fuse					
Characteristics		gG/gL or gRL		-	gG/gL or gRL
Max. rated current	A	25	32	-	63
Circuit breaker					
Characteristics		B		-	B
Max. rated current	A	25	32	-	63
operation		with mains choke			
Fuse					
Characteristics		gG/gL or gRL			
Max. rated current	A	25	32	32	63
Circuit breaker					
Characteristics		B			
Max. rated current	A	25	32	32	63
Earth-leakage circuit breaker					
3-phase mains connection		≥ 300 mA, type B			

Fuse data					
Inverter		**I55AE318F I55AE322F**	**I55AE330F**	**I55AE337F**	**I55AE345F**
Cable installation in compliance with		EN 60204-1			
Installation method		B2	C		
operation					
Fuse					
Characteristics		-			
Max. rated current	A	-	-	-	-
Circuit breaker					
Characteristics		-			
Max. rated current	A	-	-	-	-
operation		with mains choke			
Fuse					
Characteristics		gG/gL or gRL			
Max. rated current	A	63	80	100	125
Circuit breaker					
Characteristics		B			
Max. rated current	A	63	80	100	125
Earth-leakage circuit breaker					
3-phase mains connection		≥ 300 mA, type B			



Fuse data			
Inverter		**I55AE355F I55AE375F**	**I55AE390F**
Cable installation in compliance with		EN 60204-1	
Installation method		F	
operation			
Fuse			
Characteristics		-	
Max. rated current	A	-	-
Circuit breaker			
Characteristics		-	-
Max. rated current	A	-	-
operation		with mains choke	
Fuse			
Characteristics		gR	
Max. rated current	A	160	300
Circuit breaker			
Characteristics		-	-
Max. rated current	A	-	-
Earth-leakage circuit breaker			
3-phase mains connection		≥ 300 mA, type B	

Fuse data					
Inverter		**I55AE230F I55AE240F I55AE255F**	**I55AE275F**	**I55AE311F**	**I55AE315F**
Cable installation in compliance with		US National Electrical Code NFPA 70 / Canadian Electrical Code C22.1			
operation		without mains choke			without mains choke
Fuse					
Characteristics		all acc. to UL 248 / Class CC	all acc. to UL 248 / Class J, T, R	-	all acc. to UL 248 / Class J, T, R
Max. rated current	A	25	40	-	70
Circuit breaker					
Characteristics		-			
Max. rated current	A	25	35	-	-
operation		with mains choke			
Fuse					
Characteristics		all acc. to UL 248 / Class CC	all acc. to UL 248 / Class J, T, R		
Max. rated current	A	25	40	40	70
Circuit breaker					
Characteristics		-			
Max. rated current	A	25	35	-	-
Earth-leakage circuit breaker					
3-phase mains connection		≥ 300 mA, type B			

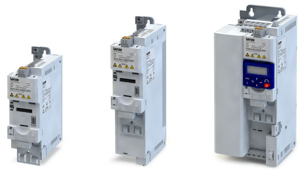


Fuse data					
Inverter		**I55AE318F I55AE322F**	**I55AE330F**	**I55AE337F**	**I55AE345F**
Cable installation in compliance with		US National Electrical Code NFPA 70 / Canadian Electrical Code C22.1			
operation					
Fuse					
Characteristics		-			
Max. rated current	A	-	-	-	-
Circuit breaker					
Characteristics		-	-	-	-
Max. rated current	A	-	-	-	-
operation		with mains choke			
Fuse					
Characteristics		all acc. to UL 248 / Class J, T, R			
Max. rated current	A	70	80	100	125
Circuit breaker					
Characteristics		-	-	-	-
Max. rated current	A	-	-	-	-
Earth-leakage circuit breaker					
3-phase mains connection		≥ 300 mA, type B			

Fuse data			
Inverter		**I55AE355F I55AE375F**	**I55AE390F**
Cable installation in compliance with		US National Electrical Code NFPA 70 / Canadian Electrical Code C22.1	
operation			
Fuse			
Characteristics		-	
Max. rated current	A	-	-
Circuit breaker			
Characteristics		-	-
Max. rated current	A	-	-
operation		with mains choke	
Fuse			
Characteristics		acc. to UL 248 / Class J (recommended: HSJ by Mersen)	all acc. to UL 248 / Class J, T, R
Max. rated current	A	200	300
Circuit breaker			
Characteristics		-	-
Max. rated current	A	-	-
Earth-leakage circuit breaker			
3-phase mains connection		≥ 300 mA, type B	

Mains connection							
Inverter		**I55AE230F I55AE240F I55AE255F**	**I55AE275F I55AE311F**	**I55AE315F I55AE318F I55AE322F**	**I55AE330F I55AE337F I55AE345F**	**I55AE355F I55AE375F**	**I55AE390F**
Connection		X100					
Connection type		Screw terminal					
Min. cable cross-section	mm²	1.5			10	25	35
Min. cable cross-section	AWG	16			6	2	1
Max. cable cross-section	mm²	6	16	35	50	95	150
Max. cable cross-section	AWG	10	6	2	1/0	4/0	-
Stripping length	mm	9	11	18	19	22	28
Stripping length	inch	0.35	0.43	0.7	0.75	0.87	1.1
Tightening torque	Nm	0.5	1.2	3.8	4	10	18
Tightening torque	lb-in	4.4	11	34	35	89	160
Required tool		0.6 x 3.5	0.8 x 4.0	0.8 x 5.5	Allen key 4.0	Allen key 6.0	Allen key 8.0

Motor connection							
Inverter		**I55AE230F I55AE240F I55AE255F**	**I55AE275F I55AE311F**	**I55AE315F I55AE318F I55AE322F**	**I55AE330F I55AE337F I55AE345F**	**I55AE355F I55AE375F**	**I55AE390F**
Connection		X105					
Connection type		Screw terminal					
Min. cable cross-section	mm²	1.5			10	25	35
Min. cable cross-section	AWG	16			6	2	1
Max. cable cross-section	mm²	6	16	35	50	95	150
Max. cable cross-section	AWG	-					
Stripping length	mm	9	11	18	19	22	28
Stripping length	inch	0.35	0.43	0.7	0.75	0.87	1.1
Tightening torque	Nm	0.5	1.2	3.8	4	10	18
Tightening torque	lb-in	4.4	11	34	35	89	160
Required tool		0.6 x 3.5	0.8 x 4.0	0.8 x 5.5	Allen key 4.0	Allen key 6.0	Allen key 8.0



4.2.6 3-phase mains connection 480 V

4.2.6.1 Connection plan

The connection plan is valid for the inverters I55AExxx**F**.

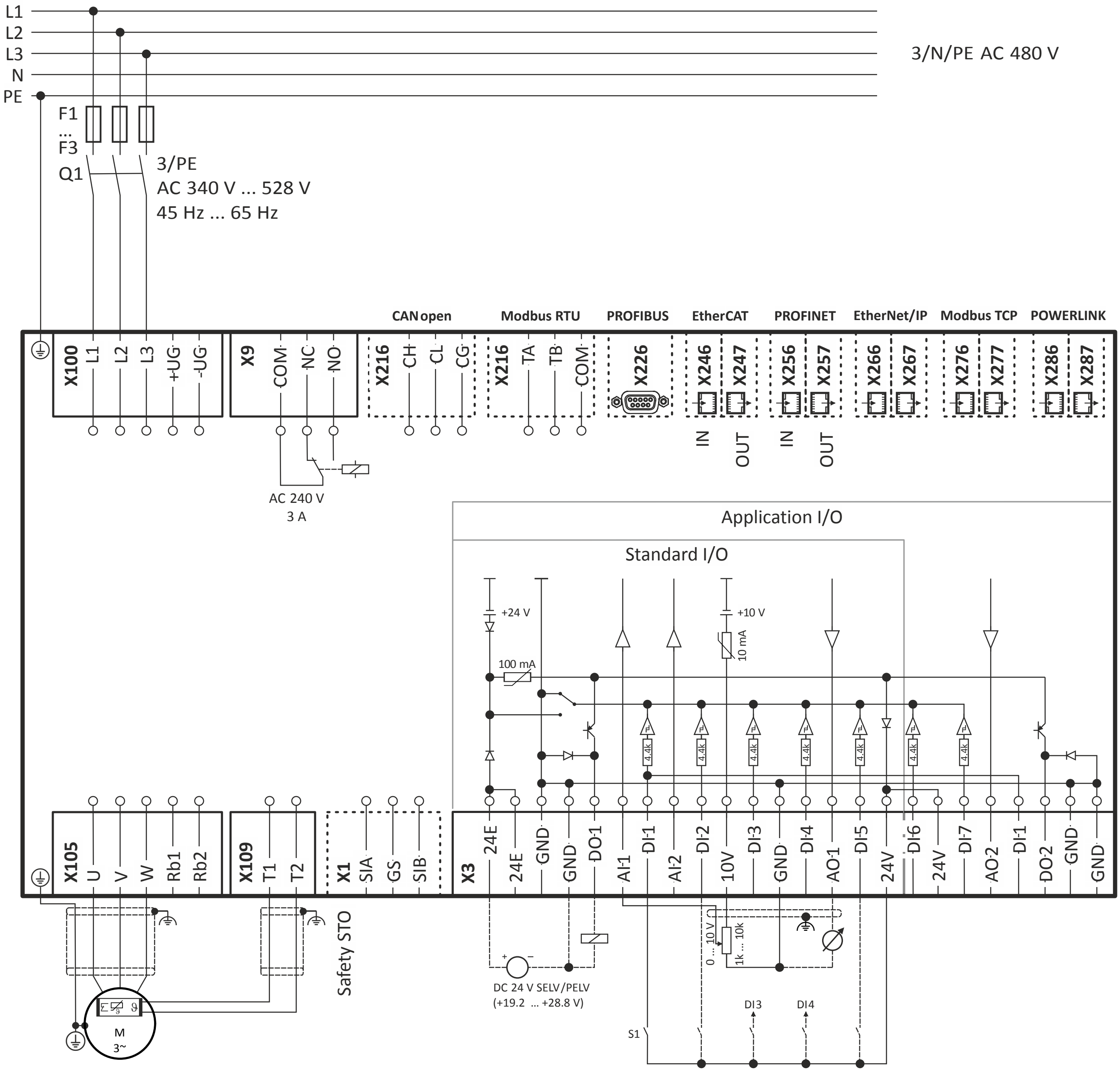


Fig. 7: Wiring example

S1	Start/Stop	Q1	Mains contactor
Fx	Fuses	---	Dashed line = options

4.2.6.2 Fusing and terminal data

Fuse data					
Inverter		**I55AE137F I55AE155F I55AE175F**	**I55AE211F I55AE215F I55AE222F**	**I55AE230F I55AE240F I55AE255F**	**I55AE275F I55AE311F**
Cable installation in compliance with		EN 60204-1			
Installation method		B2			
operation		without mains choke			
Fuse					
Characteristics		gG/gL or gRL			
Max. rated current	A	10	16	25	32
Circuit breaker					
Characteristics		B			
Max. rated current	A	10	16	25	32
operation		with mains choke			
Fuse					
Characteristics		gG/gL or gRL			
Max. rated current	A	10	16	25	32
Circuit breaker					
Characteristics		B			
Max. rated current	A	10	16	25	32
Earth-leakage circuit breaker					
3-phase mains connection		≥ 30 mA, type B		≥ 300 mA, type B	

Fuse data					
Inverter		**I55AE315F I55AE318F I55AE322F**	**I55AE330F**	**I55AE337F**	**I55AE345F**
Cable installation in compliance with		EN 60204-1			
Installation method		B2	C		
operation		without mains choke			
Fuse					
Characteristics		gG/gL or gRL	-		
Max. rated current	A	63	-	-	-
Circuit breaker					
Characteristics		B	-		
Max. rated current	A	63	-	-	-
operation		with mains choke			
Fuse					
Characteristics		gG/gL or gRL			
Max. rated current	A	63	80	100	125
Circuit breaker					
Characteristics		B			
Max. rated current	A	63	80	100	125
Earth-leakage circuit breaker					
3-phase mains connection		≥ 300 mA, type B			

Fuse data		
Inverter		**I55AE355F I55AE375F**
Cable installation in compliance with		EN 60204-1
Installation method		F
operation		
Fuse		
Characteristics		-
Max. rated current	A	-
Circuit breaker		
Characteristics		-
Max. rated current	A	-
operation		with mains choke
Fuse		
Characteristics		gR
Max. rated current	A	160
Circuit breaker		
Characteristics		-
Max. rated current	A	-
Earth-leakage circuit breaker		
3-phase mains connection		≥ 300 mA, type B

Fuse data					
Inverter		**I55AE137F I55AE155F I55AE175F I55AE211F I55AE215F I55AE222F**	**I55AE230F I55AE240F I55AE255F**	**I55AE275F**	**I55AE311F**
Cable installation in compliance with		US National Electrical Code NFPA 70 / Canadian Electrical Code C22.1			
operation		without mains choke			
Fuse					
Characteristics		all acc. to UL 248 / Class CC		all acc. to UL 248 / Class J, T, R	
Max. rated current	A	15	25	40	40
Circuit breaker					
Characteristics		-			
Max. rated current	A	-	25	35	-
operation		with mains choke			
Fuse					
Characteristics		all acc. to UL 248 / Class CC		all acc. to UL 248 / Class J, T, R	
Max. rated current	A	15	25	40	40
Circuit breaker					
Characteristics		-			
Max. rated current	A	-	25	35	-
Earth-leakage circuit breaker					
3-phase mains connection		≥ 30 mA, type B	≥ 300 mA, type B		

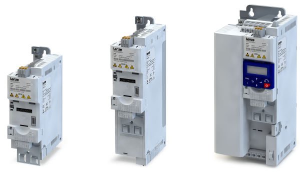
Fuse data					
Inverter		**I55AE315F I55AE318F I55AE322F**	**I55AE330F**	**I55AE337F**	**I55AE345F**
Cable installation in compliance with		US National Electrical Code NFPA 70 / Canadian Electrical Code C22.1			
operation		without mains choke			
Fuse					
Characteristics		all acc. to UL 248 / Class J, T, R	-		
Max. rated current	A	70	-	-	-
Circuit breaker					
Characteristics		-	-	-	-
Max. rated current	A	-	-	-	-
operation		with mains choke			
Fuse					
Characteristics		all acc. to UL 248 / Class J, T, R			
Max. rated current	A	70	80	100	125
Circuit breaker					
Characteristics		-	-	-	-
Max. rated current	A	-	-	-	-
Earth-leakage circuit breaker					
3-phase mains connection		≥ 300 mA, type B			

Fuse data		
Inverter		**I55AE355F I55AE375F**
Cable installation in compliance with		US National Electrical Code NFPA 70 / Canadian Electrical Code C22.1
operation		
Fuse		
Characteristics		-
Max. rated current	A	-
Circuit breaker		
Characteristics		-
Max. rated current	A	-
operation		with mains choke
Fuse		
Characteristics		acc. to UL 248 / Class J (recommended: HSJ by Mersen)
Max. rated current	A	200
Circuit breaker		
Characteristics		-
Max. rated current	A	-
Earth-leakage circuit breaker		
3-phase mains connection		≥ 300 mA, type B

<table>
<tr><th colspan="8">Mains connection</th></tr>
<tr><th>Inverter</th><th></th><th>I55AE137F
I55AE155F
I55AE175F
I55AE211F
I55AE215F
I55AE222F</th><th>I55AE230F
I55AE240F
I55AE255F</th><th>I55AE275F
I55AE311F</th><th>I55AE315F
I55AE318F
I55AE322F</th><th>I55AE330F
I55AE337F
I55AE345F</th><th>I55AE355F
I55AE375F</th></tr>
<tr><td>Connection</td><td></td><td colspan="6">X100</td></tr>
<tr><td>Connection type</td><td></td><td>pluggable screw terminal</td><td colspan="5">Screw terminal</td></tr>
<tr><td>Min. cable cross-section</td><td>mm²</td><td>1</td><td colspan="3">1.5</td><td>10</td><td>25</td></tr>
<tr><td>Min. cable cross-section</td><td>AWG</td><td>18</td><td colspan="3">16</td><td>6</td><td>2</td></tr>
<tr><td>Max. cable cross-section</td><td>mm²</td><td>2.5</td><td>6</td><td>16</td><td>35</td><td>50</td><td>95</td></tr>
<tr><td>Max. cable cross-section</td><td>AWG</td><td>12</td><td>10</td><td>6</td><td>2</td><td>1/0</td><td>4/0</td></tr>
<tr><td>Stripping length</td><td>mm</td><td>8</td><td>9</td><td>11</td><td>18</td><td>19</td><td>22</td></tr>
<tr><td>Stripping length</td><td>inch</td><td>0.32</td><td>0.35</td><td>0.43</td><td>0.7</td><td>0.75</td><td>0.87</td></tr>
<tr><td>Tightening torque</td><td>Nm</td><td colspan="2">0.5</td><td>1.2</td><td>3.8</td><td>4</td><td>10</td></tr>
<tr><td>Tightening torque</td><td>lb-in</td><td colspan="2">4.4</td><td>11</td><td>34</td><td>35</td><td>89</td></tr>
<tr><td>Required tool</td><td></td><td>0.5 x 3.0</td><td>0.6 x 3.5</td><td>0.8 x 4.0</td><td>0.8 x 5.5</td><td>Allen key 4.0</td><td>Allen key 6.0</td></tr>
</table>

<table>
<tr><th colspan="5">PE connection</th></tr>
<tr><th>Inverter</th><th></th><th>I55AE137F
I55AE155F
I55AE175F
I55AE211F
I55AE215F
I55AE222F
I55AE230F
I55AE240F
I55AE255F</th><th>I55AE275F
I55AE311F</th><th>I55AE315F
I55AE318F
I55AE322F
I55AE330F
I55AE337F
I55AE345F
I55AE355F
I55AE375F</th></tr>
<tr><td>Connection</td><td></td><td colspan="3">PE</td></tr>
<tr><td>Connection type</td><td></td><td colspan="3">PE screw</td></tr>
<tr><td>Min. cable cross-section</td><td>mm²</td><td>1.5</td><td>2.5</td><td>4</td></tr>
<tr><td>Min. cable cross-section</td><td>AWG</td><td>14</td><td colspan="2">12</td></tr>
<tr><td>Max. cable cross-section</td><td>mm²</td><td>6</td><td>16</td><td>25</td></tr>
<tr><td>Max. cable cross-section</td><td>AWG</td><td>10</td><td>6</td><td>2</td></tr>
<tr><td>Stripping length</td><td>mm</td><td>10</td><td>11</td><td>16</td></tr>
<tr><td>Stripping length</td><td>inch</td><td>0.39</td><td>0.43</td><td>0.63</td></tr>
<tr><td>Tightening torque</td><td>Nm</td><td>2</td><td>3.4</td><td>4</td></tr>
<tr><td>Tightening torque</td><td>lb-in</td><td>18</td><td>30</td><td>35</td></tr>
<tr><td>Required tool</td><td></td><td>TORX TX20</td><td colspan="2">PZ2</td></tr>
</table>

Motor connection							
Inverter		**I55AE137F I55AE155F I55AE175F I55AE211F I55AE215F I55AE222F**	**I55AE230F I55AE240F I55AE255F**	**I55AE275F I55AE311F**	**I55AE315F I55AE318F I55AE322F**	**I55AE330F I55AE337F I55AE345F**	**I55AE355F I55AE375F**
Connection		X105					
Connection type		pluggable screw terminal	Screw terminal				
Min. cable cross-section	mm²	1	1.5			10	25
Min. cable cross-section	AWG	18	16			6	2
Max. cable cross-section	mm²	2.5	6	16	35	50	95
Max. cable cross-section	AWG	-					
Stripping length	mm	8	9	11	18	19	22
Stripping length	inch	0.32	0.35	0.43	0.7	0.75	0.87
Tightening torque	Nm	0.5		1.2	3.8	4	10
Tightening torque	lb-in	4.4		11	34	35	89
Required tool		0.5 x 3.0	0.6 x 3.5	0.8 x 4.0	0.8 x 5.5	Allen key 4.0	Allen key 6.0



4.2.7 3-phase mains connection 480 V "Light Duty"

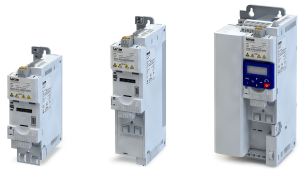
4.2.7.1 Connection plan

See chapter "3-phase mains connection 480 V". 52

4.2.7.2 Fusing and terminal data

Fuse data					
Inverter		**I55AE230F I55AE240F I55AE255F**	**I55AE275F**	**I55AE311F**	**I55AE315F**
Cable installation in compliance with		EN 60204-1			
Installation method		B2			
operation		without mains choke			without mains choke
Fuse					
Characteristics		gG/gL or gRL		-	gG/gL or gRL
Max. rated current	A	25	32	-	63
Circuit breaker					
Characteristics		B		-	B
Max. rated current	A	25	32	-	63
operation		with mains choke			
Fuse					
Characteristics		gG/gL or gRL			
Max. rated current	A	25	32	32	63
Circuit breaker					
Characteristics		B			
Max. rated current	A	25	32	32	63
Earth-leakage circuit breaker					
3-phase mains connection		≥ 300 mA, type B			

Fuse data					
Inverter		**I55AE318F I55AE322F**	**I55AE330F**	**I55AE337F**	**I55AE345F**
Cable installation in compliance with		EN 60204-1			
Installation method		B2	C		
operation					
Fuse					
Characteristics		-			
Max. rated current	A	-	-	-	-
Circuit breaker					
Characteristics		-			
Max. rated current	A	-	-	-	-
operation		with mains choke			
Fuse					
Characteristics		gG/gL or gRL			
Max. rated current	A	63	80	100	125
Circuit breaker					
Characteristics		B			
Max. rated current	A	63	80	100	125
Earth-leakage circuit breaker					
3-phase mains connection		≥ 300 mA, type B			



Fuse data			
Inverter		**I55AE355F** **I55AE375F**	**I55AE390F**
Cable installation in compliance with		EN 60204-1	
Installation method		F	
operation			
Fuse			
Characteristics		-	
Max. rated current	A	-	-
Circuit breaker			
Characteristics		-	-
Max. rated current	A	-	-
operation		with mains choke	
Fuse			
Characteristics		gR	
Max. rated current	A	160	300
Circuit breaker			
Characteristics		-	-
Max. rated current	A	-	-
Earth-leakage circuit breaker			
3-phase mains connection		≥ 300 mA, type B	

Fuse data					
Inverter		**I55AE230F** **I55AE240F** **I55AE255F**	**I55AE275F**	**I55AE311F**	**I55AE315F**
Cable installation in compliance with		US National Electrical Code NFPA 70 / Canadian Electrical Code C22.1			
operation		without mains choke			without mains choke
Fuse					
Characteristics		all acc. to UL 248 / Class CC	all acc. to UL 248 / Class J, T, R	-	all acc. to UL 248 / Class J, T, R
Max. rated current	A	25	40	-	70
Circuit breaker					
Characteristics		-			
Max. rated current	A	25	35	-	-
operation		with mains choke			
Fuse					
Characteristics		all acc. to UL 248 / Class CC	all acc. to UL 248 / Class J, T, R		
Max. rated current	A	25	40	40	70
Circuit breaker					
Characteristics		-			
Max. rated current	A	25	35	-	-
Earth-leakage circuit breaker					
3-phase mains connection		≥ 300 mA, type B			

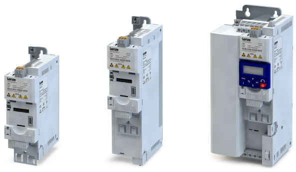
Fuse data					
Inverter		**I55AE318F** **I55AE322F**	**I55AE330F**	**I55AE337F**	**I55AE345F**
Cable installation in compliance with		US National Electrical Code NFPA 70 / Canadian Electrical Code C22.1			
operation					
Fuse					
Characteristics		-			
Max. rated current	A	-	-	-	-
Circuit breaker					
Characteristics		-	-	-	-
Max. rated current	A	-	-	-	-
operation		with mains choke			
Fuse					
Characteristics		all acc. to UL 248 / Class J, T, R			
Max. rated current	A	70	80	100	125
Circuit breaker					
Characteristics		-	-	-	-
Max. rated current	A	-	-	-	-
Earth-leakage circuit breaker					
3-phase mains connection		≥ 300 mA, type B			

Fuse data			
Inverter		**I55AE355F** **I55AE375F**	**I55AE390F**
Cable installation in compliance with		US National Electrical Code NFPA 70 / Canadian Electrical Code C22.1	
operation			
Fuse			
Characteristics		-	
Max. rated current	A	-	-
Circuit breaker			
Characteristics		-	-
Max. rated current	A	-	-
operation		with mains choke	
Fuse			
Characteristics		acc. to UL 248 / Class J (recommended: HSJ by Mersen)	all acc. to UL 248 / Class J, T, R
Max. rated current	A	200	300
Circuit breaker			
Characteristics		-	-
Max. rated current	A	-	-
Earth-leakage circuit breaker			
3-phase mains connection		≥ 300 mA, type B	

Mains connection							
Inverter		**I55AE230F I55AE240F I55AE255F**	**I55AE275F I55AE311F**	**I55AE315F I55AE318F I55AE322F**	**I55AE330F I55AE337F I55AE345F**	**I55AE355F I55AE375F**	**I55AE390F**
Connection		X100					
Connection type		Screw terminal					
Min. cable cross-section	mm²	1.5			10	25	35
Min. cable cross-section	AWG	16			6	2	1
Max. cable cross-section	mm²	6	16	35	50	95	150
Max. cable cross-section	AWG	10	6	2	1/0	4/0	-
Stripping length	mm	9	11	18	19	22	28
Stripping length	inch	0.35	0.43	0.7	0.75	0.87	1.1
Tightening torque	Nm	0.5	1.2	3.8	4	10	18
Tightening torque	lb-in	4.4	11	34	35	89	160
Required tool		0.6 x 3.5	0.8 x 4.0	0.8 x 5.5	Allen key 4.0	Allen key 6.0	Allen key 8.0

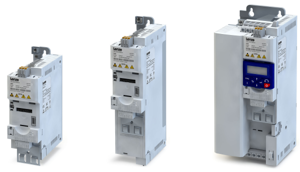
PE connection					
Inverter		**I55AE230F I55AE240F I55AE255F**	**I55AE275F I55AE311F**	**I55AE315F I55AE318F I55AE322F I55AE330F I55AE337F I55AE345F I55AE355F I55AE375F**	**I55AE390F**
Connection		PE			
Connection type		PE screw			PE bolt
Min. cable cross-section	mm²	1.5	2.5	4	
Min. cable cross-section	AWG	14	12		
Max. cable cross-section	mm²	6	16	25	150
Max. cable cross-section	AWG	-			
Stripping length	mm	10	11	16	-
Stripping length	inch	0.39	0.43	0.63	-
Tightening torque	Nm	2	3.4	4	10
Tightening torque	lb-in	18	30	35	89
Required tool		TORX TX20	PZ2		Width across flats 13

Motor connection							
Inverter		**I55AE230F I55AE240F I55AE255F**	**I55AE275F I55AE311F**	**I55AE315F I55AE318F I55AE322F**	**I55AE330F I55AE337F I55AE345F**	**I55AE355F I55AE375F**	**I55AE390F**
Connection		X105					
Connection type		Screw terminal					
Min. cable cross-section	mm²	1.5			10	25	35
Min. cable cross-section	AWG	16			6	2	1
Max. cable cross-section	mm²	6	16	35	50	95	150
Max. cable cross-section	AWG	-					
Stripping length	mm	9	11	18	19	22	28
Stripping length	inch	0.35	0.43	0.7	0.75	0.87	1.1
Tightening torque	Nm	0.5	1.2	3.8	4	10	18
Tightening torque	lb-in	4.4	11	34	35	89	160
Required tool		0.6 x 3.5	0.8 x 4.0	0.8 x 5.5	Allen key 4.0	Allen key 6.0	Allen key 8.0



4.3 Control connections

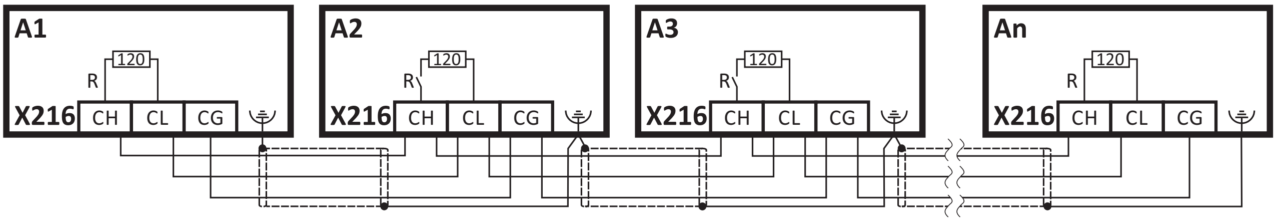
Terminal description		Relay output	PTC input	Control terminals
Connection		X9	X109	X3
Connection type		pluggable screw terminal	pluggable screw terminal	pluggable spring terminal
Min. cable cross-section	mm²	0.5	0.5	0.5
Min. cable cross-section	AWG	22	22	22
Max. cable cross-section	mm²	1.5	1.5	1.5
Max. cable cross-section	AWG	14	14	16
Stripping length	mm	6	6	9
Stripping length	inch	0.24	0.24	0.35
Tightening torque	Nm	0.2	0.2	-
Tightening torque	lb-in	1.8	1.8	-
Required tool		0.4 x 2.5	0.4 x 2.5	0.4 x 2.5



4.4 Networks

4.4.1 CANopen

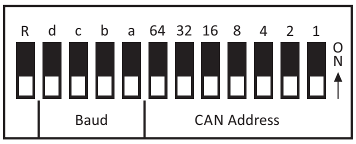
Typical topologies



Terminal description		CANopen
Connection		X216
Connection type		pluggable spring terminal
Min. cable cross-section	mm²	0.5
Min. cable cross-section	AWG	22
Max. cable cross-section	mm²	2.5
Max. cable cross-section	AWG	12
Stripping length	mm	10
Stripping length	inch	0.39
Tightening torque	Nm	-
Tightening torque	lb-in	-
Required tool		0.4 x 2.5

Basic network settings

Use the DIP switch to set the node address and baud rate and to activate the integrated bus terminating resistor.

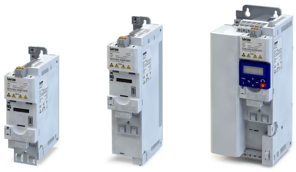


Bus termination	Baud rate					CAN node address						
R	d	c	b	a		64	32	16	8	4	2	1
OFF	OFF	ON	OFF	ON	20 kbps	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**
Inactive	OFF	OFF	ON	ON	50 kbps	Value from parameter						
ON	OFF	OFF	ON	OFF	125 kbps	Node address - example:						
Active	OFF	OFF	OFF	ON	250 kbps	OFF	OFF	ON	OFF	ON	ON	ON
	OFF	**OFF**	**OFF**	**OFF**	Value from parameter (**500 kbps**)	Node address = 16 + 4 + 2 + 1 = 23						
	OFF	ON	OFF	OFF	1 Mbps							
	All other combinations				Value from parameter (**500 kbps**)							

Bold print = default setting

The network must be terminated with a 120 Ω resistor at the physically first and last node.

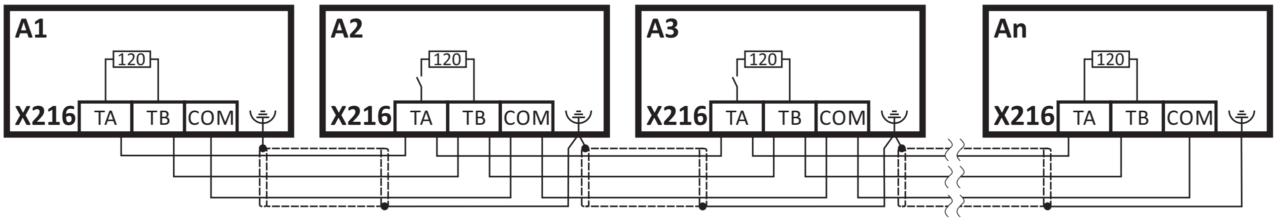
Set the "R" switch to ON at these nodes.



4.4.2 Modbus RTU

Typical topologies

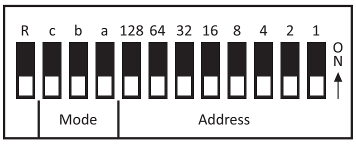
Line



Terminal description		Modbus RTU
Connection		X216
Connection type		pluggable spring terminal
Min. cable cross-section	mm²	0.5
Min. cable cross-section	AWG	22
Max. cable cross-section	mm²	2.5
Max. cable cross-section	AWG	12
Stripping length	mm	10
Stripping length	inch	0.39
Tightening torque	Nm	-
Tightening torque	lb-in	-
Required tool		0.4 x 2.5

Basic network settings

Use the DIP switch to set the node address and baud rate and to activate the integrated bus terminating resistor.

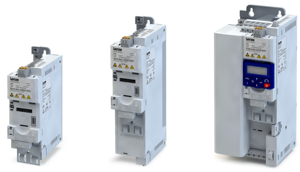


Bus termination		Baud rate	Parity	Modbus node address							
R	**c**	**b**	**a**	**128**	**64**	**32**	**16**	**8**	**4**	**2**	**1**
OFF	n.c.	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**
Inactive		Automatic detection	Automatic detection	Value from parameter							
ON		ON	ON	Node address - example:							
Active		Value from parameter	Value from parameter	OFF	OFF	OFF	ON	OFF	ON	ON	ON
				Node address = 16 + 4 + 2 + 1 = 23							
				Node address > 247: value from parameter							

Bold print = default setting

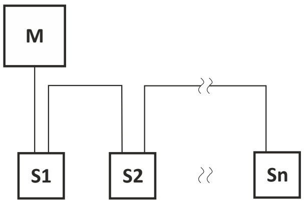
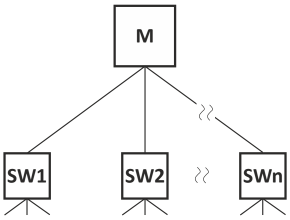
The network must be terminated with a 120 Ω resistor at the physically first and last node.

Set the "R" switch to ON at these nodes.



4.4.3 Modbus TCP

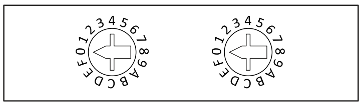
Typical topologies

Line	Tree
	

M	Master	SW	Switch
S	Slave		

Basic network settings

The rotary encoder switch allows you to set the last byteof the IP address.



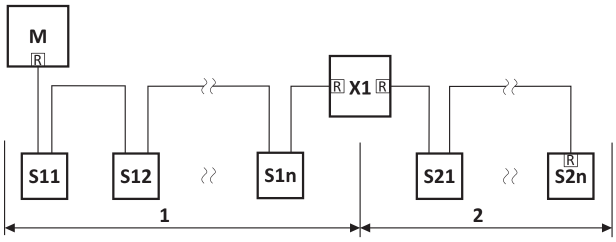
x16 x1

Setting	Value of last byte	Resulting IP address
0x00	Value from parameter	Value from parameter
0x01 ... 0xFE	Switch position	192.168.124.<switch position>
0xFF	Default setting	192.168.124.16

4.4.4 PROFIBUS

Typical topologies

Line with repeater



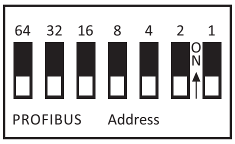
M	Master	X	Repeater
S	Slave	R	Activated bus terminating resistor

Terminal description		PROFIBUS
Connection		X226
Connection type		Sub-D 9p
Min. cable cross-section	mm²	-
Min. cable cross-section	AWG	-
Max. cable cross-section	mm²	-
Max. cable cross-section	AWG	-
Stripping length	mm	-
Stripping length	inch	-
Tightening torque	Nm	-
Tightening torque	lb-in	-
Required tool		-

Basic network settings

Use the DIP switch to set the station address.

The baud rate is detected automatically.

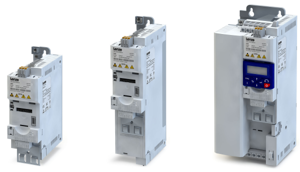


PROFIBUS station address						
64	**32**	**16**	**8**	**4**	**2**	**1**
OFF	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**	**OFF**
Value from parameter						
Station address - example:						
OFF	OFF	ON	OFF	ON	ON	ON
Station address = 16 + 4 + 2 + 1 = 23						
Do not set station address = 126 and station address = 127. These station addresses are invalid.						

Bold print = default setting

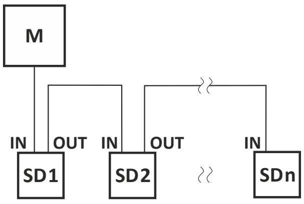
The network must be terminated with a resistor at the physically first and last node.

Activate the bus terminating resistor at these nodes in the bus connection plug.



4.4.5 EtherCAT

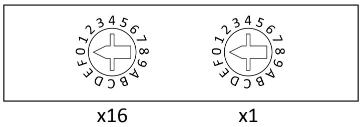
Typical topologies

Line


M	Master
SD	Slave Device

Basic network settings

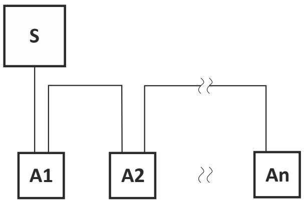
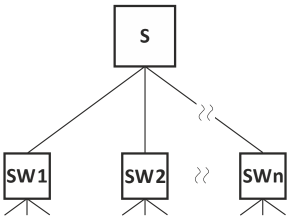
The rotary encoder switch allows you to set an EtherCAT identifier.

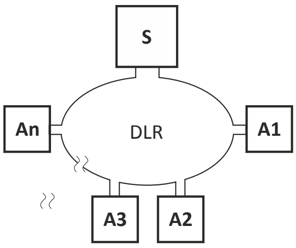


Setting	Identifier
0x00	Value from parameter
0x01 ... 0xFF	Switch position

4.4.6 EtherNet/IP

Typical topologies

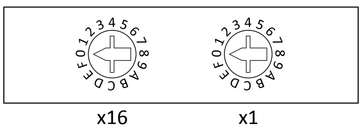
Line	Tree
	

Ring


S	Scanner	SW	Switch
A	Adapter		

Basic network settings

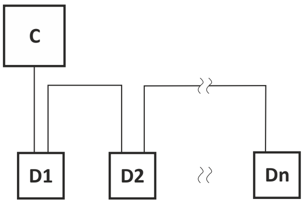
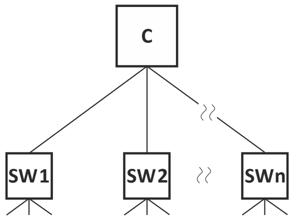
The rotary encoder switch allows you to set the last byteof the IP address.

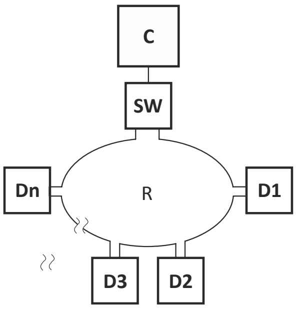


Setting	Value of last byte	Resulting IP address
0x00	Value from parameter	Value from parameter
0x01 ... 0xFE	Switch position	192.168.124.<switch position>
0xFF	Default setting	192.168.124.16

4.4.7 PROFINET

Typical topologies

Line	Tree
	

Ring


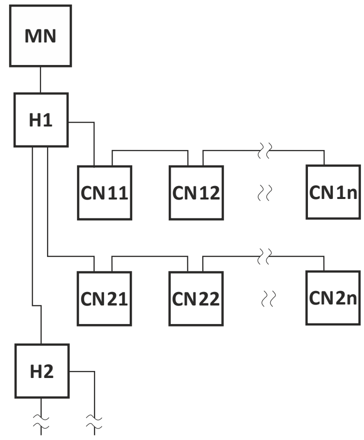
C	IO controller	SW	Switch SCALANCE (MRP capable)
D	IO device	R	Redundant domain

The rotary encoder switch has no function.

4.4.8 POWERLINK

Typical topologies

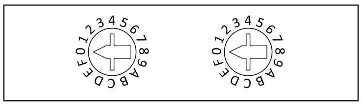
Line



Mrated	Managing Node	H	Hub
CN	Controlled Node		

Basic network settings

The rotary encoder switch allows you to set the node address (last byte of the IP address).



x16 x1

Setting	Node address	Resulting IP address
0x00	Value from parameter	192.168.100.<parameter value>
0x01 ... 0xEF	Switch position	192.168.100.<switch position>

4.5 Connection of the safety module

⚠ DANGER!

Automatic restart if the request of the safety function is deactivated.

Possible consequences: Death or severe injuries

▶ You must provide external measures according to EN ISO 13849−1 which ensure that the drive only restarts after a confirmation.

Terminal description		Safety STO
Connection		X1
Connection type		pluggable spring terminal
Min. cable cross-section	mm²	0.5
Min. cable cross-section	AWG	22
Max. cable cross-section	mm²	1.5
Max. cable cross-section	AWG	16
Stripping length	mm	9
Stripping length	inch	0.35
Tightening torque	Nm	-
Tightening torque	lb-in	-
Required tool		0.4 x 2.5

5 Commissioning

5.1 Important notes

⚠WARNING!

Incorrect wiring can cause unexpected states during the commissioning phase.

Possible consequence: death, severe injuries or damage to property

Check the following before switching on the mains voltage:

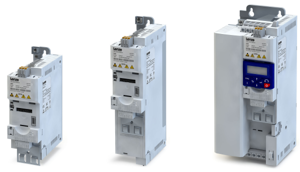
- Is the wiring complete and correct?
- Are there no short circuits and earth faults?
- Is the motor circuit configuration (star/delta) adapted to the output voltage of the inverter?
- Is the motor connected in-phase (direction of rotation)?
- Does the "emergency stop" function of the entire plant operate correctly?

⚠WARNING!

Incorrect settings during commissioning may cause unexpected and dangerous motor and system movements.

Possible consequence: death, severe injuries or damage to property

- Clear hazardous area.
- Observe safety instructions and safety clearances.



5.2 Operating interfaces

Commissioning the inverter requires an operator-process interface.

5.2.1 Keypad

The keypad is an easy means for the local operation, parameterisation, and diagnostics of the inverter.

- The keypad is simply connected to the diagnostic interface on the front of the inverter.
- The keypad can also be connected and removed during operation.

Detailed information on the keypad can be found in the appendix:

▸ Operate and parameterise the inverter with keypad 📖 631

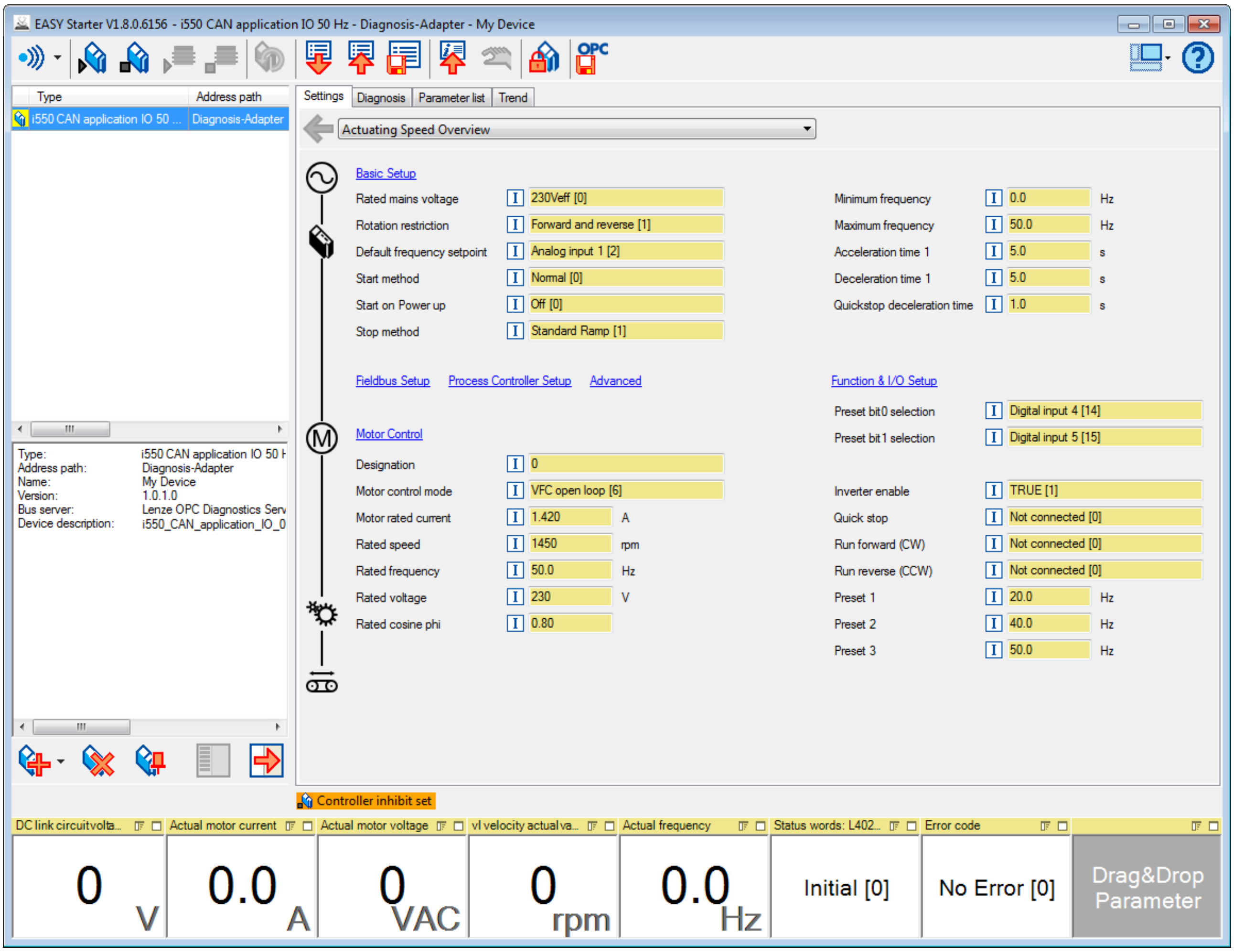
5.2.2 Engineering tool »EASY Starter«

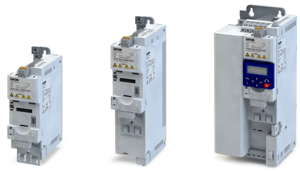
The »EASY Starter« is a PC software that is especially designed for the commissioning and maintenance of the inverter.

The »EASY Starter« PC software can be found on the Internet:

http://www.lenze.com → Download → Software Downloads

Sample screenshot:





5.2.2.1 Generate a connection between inverter and »EASY Starter«

For commissioning the inverter with the »EASY Starter«, a communication link with the inverter is required. This can be established in a wired or wireless manner via WLAN.

Preconditions

- For the wired communication with the inverter, the USB module and a USB 2.0 cable (A plug on Micro-B plug) are required.

- For the wireless communication with the inverter, the WLAN module is required. Moreover, the PC on which the »EASY Starter« is installed must be wireless-enabled.

Details

The following instructions describe the connection establishment via the USB module.

- Parameterising without motor operation does not require a mains voltage: If you connect the inverter directly to the PC without a hub, The USB interface of the PC is sufficient for the voltage supply.
- Instructions for the connection establishment via the WLAN module can be found in the chapter "Wireless LAN (WLAN)". 📖 426

How to establish a communication to the inverter via USB:

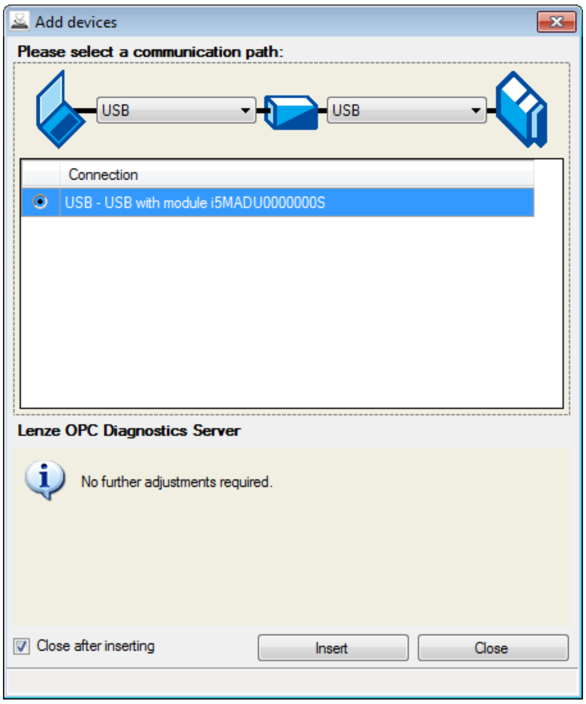
Preconditions for commissioning:

- The functional test described in the mounting and switch-on instructions has been completed successfully (without any errors or faults).
- The inverter is ready for operation (mains voltage is switched on).

Accessories required for commissioning:

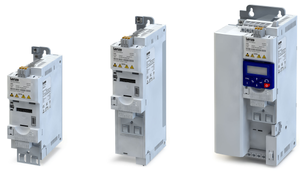
- USB module
- USB 2.0 cable (A-plug on micro B-plug)
- PC with installed »EASY Starter« software

1. Plug the USB module onto the front of the inverter (interface X16).
2. Use a USB cable to connect the inverter to the PC on which »EASY Starter« is installed:
   a) Plug the micro B plug of the USB cable into the socket of the USB module.
   b) Plug the other end into a free USB type A-socket of the PC.
3. Start »EASY Starter«.
   The "Add devices" dialog is shown.
4. Select the "USB - USB via adapter i5MADU0000000S" connection:



5. Click the **Insert** button.

»EASY Starter« searches for connected devices via the communication path selected. When the connection has been established successfully, the inverter is displayed in the device list of »EASY Starter«. The inverter parameters can now be accessed via the tabs of »EASY Starter«.



5.3 Parameter setting

As a part of a machine with a speed-variable drive system, the inverter must be adapted to its drive task. The adaptation process of the inverter is carried out by changing parameters. Optionally these parameters can be accessed by means of the keypad or »EASY Starter«. If the inverter is provided with a network option, access can also be effected by a higher-level Controller via the corresponding network.

Certain device commands or settings which might cause a critical state of the drive behaviour can only be carried our when the inverter is inhibited.

5.3.1 General notes on parameters

Each parameter features a 16-bit index as address. Under this address, the parameter is stored in the object directory of the inverter.

- Parameters that belong together functionally are combined in a data set. These parameters are additionally provided with an 8-bit subindex.
- The colon is used as a separator between the index and subindex Example: "0x2540:001"
- There are parameters the setting of which can be changed, and (diagnostic) parameters which can only be read.

Parameterisation using the keypad

- All parameters which can be accessed by means of the keypad are provided with a "Display code", the first digit of the display code specifying the group in which the parameter can be found on the keypad.
- In the documentation, the display code — if available — is specified in brackets behind the address. Example: "0x2915 (P210.00)".

▶ Keypad parameterisation mode 🕮 635

Structure of the parameter descriptions in this documentation

- The parameter descriptions in this documentation are structured in table form.
- The representation distinguishes parameters with a setting range, text, selection list, and bit-coded display.
- The default setting of parameters with a write access feature is shown in **bold**.
- The display code as well as the short keypad designation of the parameter which is limited to 16 characters, are — if available — shown in brackets.

Example: parameters with a setting range

Parameter	Name / value range / [default setting]	Info
Index:Subindex (display code)	Parameter designation (abbreviated keypad designation) Minimum value ... [**default setting**] ... maximum value • Optional information with regard to the parameter.	Explanations & notes with regard to the parameter.

Example: parameters with a selection list

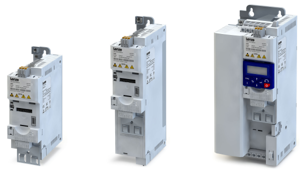
Parameter	Name / value range / [default setting]		Info
Index:Subindex (display code)	Parameter designation (abbreviated keypad designation) • Optional information with regard to the parameter.		Explanations & notes with regard to the parameter. **Note:** The corresponding selection number (here 0, 1, or 2) must be set. Other values are not permissible.
	0	**Designation of selection 0**	Optionally: Explanations & notes with regard to the corresponding selection. The default selection is shown in **bold**.
	1	Designation of selection 1	
	2	Designation of selection 2	

Example: parameters with a bit-coded display

Parameter	Name / value range / [default setting]		Info
Index:Subindex (display code)	Parameter designation (abbreviated keypad designation) • Optional information with regard to the parameter.		Explanations & notes with regard to the parameter.
	Bit 0	Designation of bit 0	Optionally: Explanations & notes with regard to the corresponding bit.
	Bit 1	Designation of bit 1	
	Bit 2	Designation of bit 2	
	...	...	
	Bit 15	Designation of bit 15	

Parameter overview lists in this documentation

- Keypad parameter list: for the parameterisation using the keypad, contains a list of all parameters which can also be accessed by means of the keypad. 🕮 85
- Parameter attribute list: contains a list of all inverter parameters. This list in particular includes some information that is relevant for the reading and writing of parameters via the network. 🕮 659

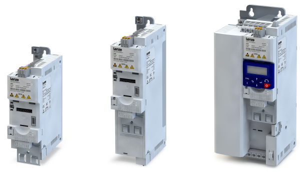


5.3.2 Basic inverter settings

Check the following basic settings of the inverter and adapt them, if required.

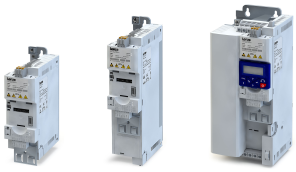
Parameter	Name / value range / [default setting]		Info
0x2540:001 (P208.01)	Mains settings: Rated mains voltage (Mains settings: Mains voltage) • Setting can only be changed if the inverter is inhibited.		Selection of the mains voltage for actuating the inverter.
	0	**230 Veff**	
	1	400 Veff	
	2	480 Veff	
	3	120 Veff	
	10	230 Veff/reduced LU level	
0x2838:001 (P203.01)	Start/stop configuration: Start method (Start/stop confg: Start method) • Setting can only be changed if the inverter is inhibited.		Behaviour after start command.
	0	**Normal**	After start command, the standard ramps are active. • Acceleration time 1 can be set in 0x2917 (P220.00). • Deceleration time 1 can be set in 0x2918 (P221.00).
	1	DC braking	After start command, the "DC braking" function is active for the time set in 0x2B84:002 (P704.02). ▸ DC braking 📖 437
	2	Flying restart circuit	After the start command, the flying restart circuit is active. The flying restart function makes it possible to restart a coasting motor during operation without speed feedback. Synchronicity between the inverter and motor is coordinated so that the transition to the rotating motor is effected without jerk at the time of connection. ▸ Flying restart circuit 📖 481
	3	Start with magnetisation	
0x2838:002 (P203.02)	Start/stop configuration: Start at power-up (Start/stop confg: Start at powerup)		Starting performance after switching on the mains voltage.
	0	**Off**	No automatic start after switching on mains voltage. In addition to the inverter enable, a renewed start command is always required to start the motor.
	1	On	Automatic start of the motor after switching on the mains voltage if the inverter is enabled and a start command exists.
0x2838:003 (P203.03)	Start/stop configuration: Stop method (Start/stop confg: Stop method)		Behaviour after the "Stop" command.
	0	Coasting	The motor becomes torqueless (coasts down to standstill).
	1	**Standard ramp**	The motor is brought to a standstill with deceleration time 1 (or deceleration time 2, if activated). • Deceleration time 1 can be set in 0x2918 (P221.00). • Deceleration time 2 can be set in 0x291A (P223.00). ▸ Frequency limits and ramp times 📖 156
	2	Quick stop ramp	The motor is brought to a standstill with the deceleration time set for the "Quick stop" function. • Deceleration time for quick stop can be set in 0x291C (P225.00). • The "quick stop" function can also be activated manually, for instance via a digital input. ▸ Quick stop 📖 159
0x283A (P304.00)	Limitation of rotation (Limit. rotation)		Optional restriction of the rotating direction.
	0	Only clockwise (CW)	The motor can only be rotated clockwise (CW). The transfer of negative frequency and PID setpoints to the motor control is prevented. • This function takes effect after the "Reverse rotational direction" function (0x2631:013 (P400.13)). • Since this function only prevents negative setpoints, counter-clockwise rotation (CCW) is possible if the motor has been wired for this rotating direction.
	1	**Both rotational directions**	Both directions of motor rotation are enabled.

Parameter	Name / value range / [default setting]		Info
0x2860:001 (P201.01)	Frequency control: Default setpoint source (Stnd. setpoints: Freq. setp. src.)		Selection of the standard setpoint source for operating mode "MS: Velocity mode". • The selected standard setpoint source is always active in the operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]" when no setpoint change-over to another setpoint source via corresponding triggers/functions is active. ▸ Setpoint change-over 📖 546
	1	Keypad	The setpoint is specified locally by the keypad. • Default setting: 0x2601:001 (P202.01) • Use the ↑ and ↓ navigation keys to change the keypad setpoint (also during running operation).
	2	**Analog input 1**	The setpoint is defined as analog signal via the analog input 1. ▸ Analog input 1 📖 597
	3	Analog input 2	The setpoint is defined as analog signal via the analog input 2. ▸ Analog input 2 📖 601
	4	HTL input (from version 04.00)	The digital inputs DI3 and DI4 can be configured as HTL input to use an HTL encoder as setpoint encoder or define the setpoint as a reference frequency ("pulse train"). ▸ HTL input setpoint source 📖 565
	5	Network	The setpoint is defined as process data object via the network. ▸ Configuring the network 📖 226
	11	Frequency preset 1	For the setpoint selection, preset values can be parameterised and selected. ▸ Setpoint source of preset setpoints 📖 554
	12	Frequency preset 2	
	13	Frequency preset 3	
	14	Frequency preset 4	
	15	Frequency preset 5	
	16	Frequency preset 6	
	17	Frequency preset 7	
	18	Frequency preset 8	
	19	Frequency preset 9	
	20	Frequency preset 10	
	21	Frequency preset 11	
	22	Frequency preset 12	
	23	Frequency preset 13	
	24	Frequency preset 14	
	25	Frequency preset 15	
	31	Segment preset 1 (from version 03.00)	For the setpoint selection, the segment presets parameterised for the "sequencer" function can be selected as well. ▸ Sequencer 📖 504
	32	Segment preset 2 (from version 03.00)	
	33	Segment preset 3 (from version 03.00)	
	34	Segment preset 4 (from version 03.00)	
	35	Segment preset 5 (from version 03.00)	
	36	Segment preset 6 (from version 03.00)	
	37	Segment preset 7 (from version 03.00)	
	38	Segment preset 8 (from version 03.00)	
	50	Motor potentiometer	The setpoint is generated by the "motor potentiometer" function. This function can be used as an alternative setpoint control which is controlled via two signals: "MOP setpoint up" and "MOP setpoint down". ▸ Motor potentiometer setpoint source (MOP) 📖 559
	201	Internal value (from version 05.00)	Internal values of the manufacturer.
	202	Internal value (from version 05.00)	
	203	Internal value (from version 05.00)	
	204	Internal value (from version 05.00)	
	205	Internal value (from version 05.00)	
	206	Internal value (from version 05.00)	



Parameter	Name / value range / [default setting]	Info
0x2911:001 (P450.01)	Frequency setpoint presets: Preset 1 (Freq. presets: Freq. preset 1) 0.0 ... [**20.0**] ... 599.0 Hz	Parameterisable frequency setpoints (presets) for operating mode "MS: Velocity mode".
0x2911:002 (P450.02)	Frequency setpoint presets: Preset 2 (Freq. presets: Freq. preset 2) 0.0 ... [**40.0**] ... 599.0 Hz	
0x2911:003 (P450.03)	Frequency setpoint presets: Preset 3 (Freq. presets: Freq. preset 3) Device for 50-Hz mains: 0.0 ... [**50.0**] ... 599.0 Hz Device for 60-Hz mains: 0.0 ... [**60.0**] ... 599.0 Hz	
0x2915 (P210.00)	Minimum frequency (Min. frequency) 0.0 ... [**0.0**] ... 599.0 Hz	Lower limit value for all frequency setpoints.
0x2916 (P211.00)	Maximum frequency (Max. frequency) Device for 50-Hz mains: 0.0 ... [**50.0**] ... 599.0 Hz Device for 60-Hz mains: 0.0 ... [**60.0**] ... 599.0 Hz	Upper limit value for all frequency setpoints.
0x2917 (P220.00)	Acceleration time 1 (Accelerat.time 1) 0.0 ... [**5.0**] ... 3600.0 s	Acceleration time 1 for the operating mode "MS: Velocity mode". • The acceleration time set refers to the acceleration from standstill to the maximum frequency set. In the case of a lower setpoint selection, the actual acceleration time is reduced accordingly. • Setting is not effective in the operating mode 0x6060 (P301.00) = "CiA: Velocity mode [2]". ▶ Device profile CiA 402 📖 469
0x2918 (P221.00)	Deceleration time 1 (Decelerat.time 1) 0.0 ... [**5.0**] ... 3600.0 s	Deceleration time 1 for the operating mode "MS: Velocity mode". • The deceleration time set refers to the deceleration from the maximum frequency set to standstill. In the case of a lower actual frequency, the actual deceleration time is reduced accordingly. • Setting is not effective in the operating mode 0x6060 (P301.00) = "CiA: Velocity mode [2]". ▶ Device profile CiA 402 📖 469
0x291C (P225.00)	Quick stop deceleration time (QSP dec. time) 0.0 ... [**1.0**] ... 3600.0 s	Quick stop deceleration time for the operating mode "MS: Velocity mode". • If the "Quick stop" function is activated, the motor is brought to a standstill within the deceleration time set here. • The deceleration time set refers to the deceleration from the maximum frequency set to standstill. In the case of a lower actual frequency, the actual deceleration time is reduced accordingly. • Setting is not effective in the operating mode 0x6060 (P301.00) = "CiA: Velocity mode [2]". ▶ Device profile CiA 402 📖 469

All possible basic settings are described in the "Basic setting" chapter. 📖 143



5.3.3 Basic motor settings

Check the following default settings for the motor and motor control and adapt them, if required.

Drive behaviour by default

By default, the V/f characteristic control with a linear characteristic is preset as motor control for asynchronous motors. The V/f characteristic control is a motor control for conventional frequency inverter applications. It is based on a simple and robust control mode for the operation of asynchronous motors with a linear or square-law load torque characteristic (e.g. fan). Because of the minimal parameterisation effort, such applications can be commissioned easily and quickly.

The default settings of the parameters ensure that the inverter is ready for operation immediately and the motor works adequately without further parameterisation if an inverter and an asynchronous motor* Hz asynchronous machine with matching performances are assigned to each other.

* Depending on the device/mains frequency either 50-Hz asynchronous motor or 60-Hz asynchronous motor.

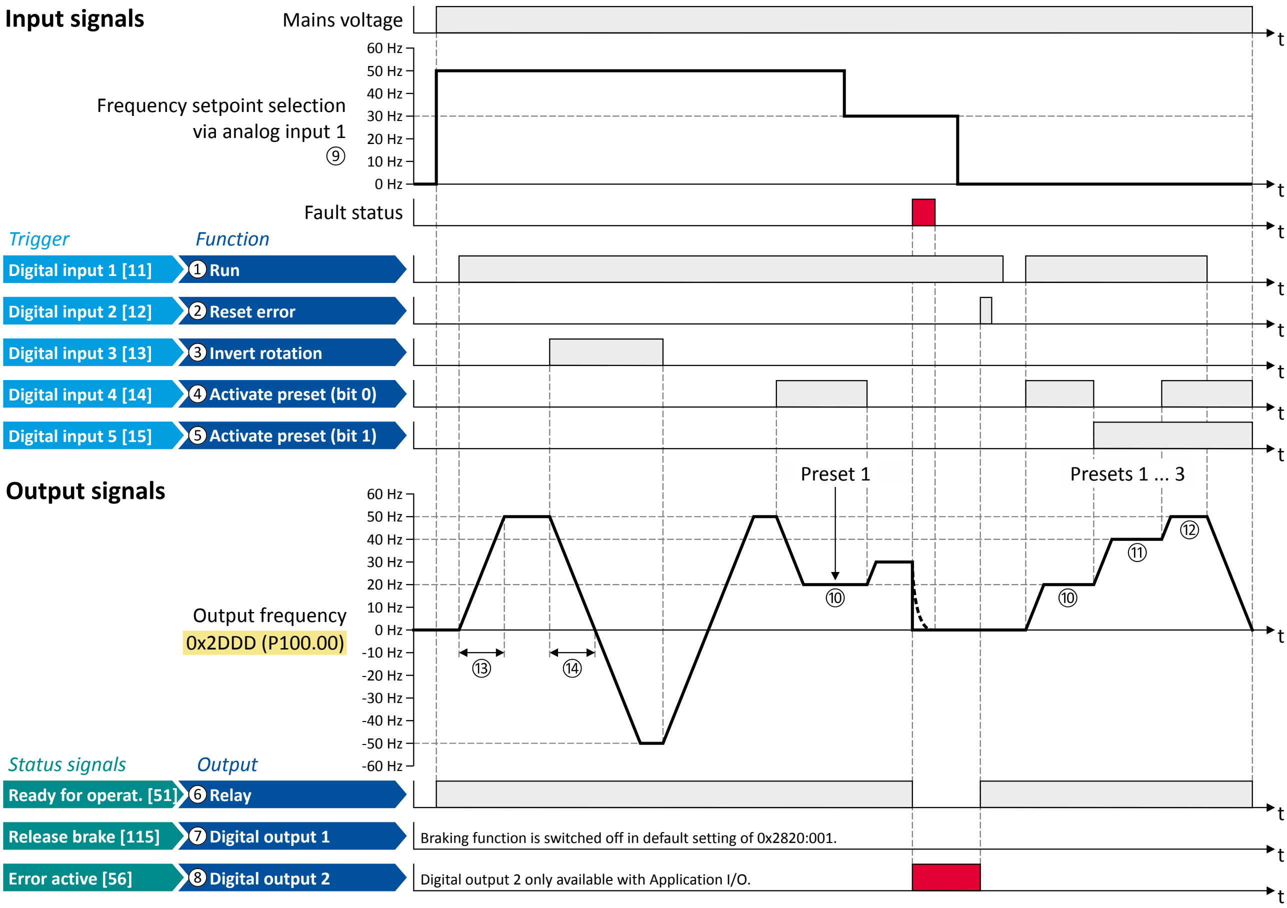
Parameter	Name / value range / [default setting]	Info
0x2B01:001 (P303.01)	V/f shape data: Base voltage (V/f shape data: Base voltage) 0 ... **[230]*** ... 5000 V * Default setting depending on the size.	Base voltage and base frequency define the V/f ratio and thus the gradient of the V/f characteristic. • The V/f base voltage is usually set to the rated motor voltage 0x2C01:007 (P320.07). • The V/f base frequency is usually set to the rated motor frequency 0x2C01:005 (P320.05).
0x2B01:002 (P303.02)	V/f shape data: Base frequency (V/f shape data: Base frequency) Device for 50-Hz mains: 0 ... **[50]*** ... 1500 Hz Device for 60-Hz mains: 0 ... **[60]*** ... 1500 Hz * Default setting depending on the size.	
0x2C00 (P300.00)	Motor control mode (Motor ctrl mode) • Setting can only be changed if the inverter is inhibited.	Selection of the motor control type.
	2 Servo control (SC ASM) (from version 02.00)	This control mode is used for servo control of an asynchronous motor. ▶ Servo control for asynchronous motors (SC-ASM) 🕮 176
	3 Sensorless control (SL PSM) (from version 02.00)	This control type is used for the sensorless control of a synchronous motor. • Control mode is possible up to a rated power of maximally 22 kW. ▶ Sensorless control for synchronous motors (SL-PSM) 🕮 178
	4 Sensorless vector control (SLVC)	This control type is used for sensorless vector control of an asynchronous motor. ▶ Sensorless vector control (SLVC) 🕮 173
	6 V/f characteristic control (VFC open loop)	This control mode is used for the speed control of an asynchronous motor via a V/f characteristic and is the simplest control mode. ▶ V/f characteristic control (VFC) 🕮 166
	7 V/f characteristic control (VFC closed loop) (from version 04.00)	The control mode is used for speed control of an asynchronous motor via a V/f characteristic with speed feedback. A motor encoder must be connected to the inverter and set as feedback system for the motor control. ▶ V/f characteristic control (VFC closed loop) 🕮 172
0x2C01:010	Motor parameters: Motor name	The name (e.g. " 1") can be freely selected by the user. If the motor in the engineering tool has been selected from the "motor catalog", the respective motor name is automatically entered here (example: "MDSKA080-22, 70").
0x6075 (P323.00)	Motor rated current (Motor current) 0.001 ... **[1.700]*** ... 500.000 A * Default setting depending on the size. • Setting can only be changed if the inverter is inhibited.	The rated motor current to be set here serves as a reference value for different parameters with a setting/display of a current value in percent. Example: • Motor rated current = 1.7 A • Max current 0x6073 (P324.00) = 200 % Motor rated current = 3.4 A

All possible settings with regard to the motor and motor control are described in the "Motor control" chapter. 🕮 163

5.3.4 Function assignment of the inputs and outputs

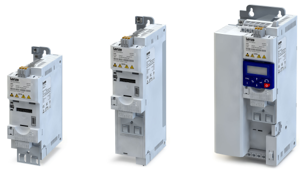
The inverter control can be adapted individually to the respective application. This is basically effected by assigning digital control sources ("triggers") to functions of the inverter.

By default, the inverter can be controlled via the I/O terminals as follows:



Parameter			Name	Default setting
Control functions				
①	0x2631:002	(P400.02)	Run	Digital input 1 [11]
②	0x2631:004	(P400.04)	Reset fault	Digital input 2 [12]
③	0x2631:013	(P400.13)	Reverse rotational direction	Digital input 3 [13]
④	0x2631:018	(P400.18)	Activate preset (bit 0)	Digital input 4 [14]
⑤	0x2631:019	(P400.19)	Activate preset (bit 1)	Digital input 5 [15]
Configuration of digital outputs				
⑥	0x2634:001	(P420.01)	Relay	Ready for operation [51]
⑦	0x2634:002	(P420.02)	Digital output 1	Release holding brake [115]
⑧	0x2634:003	(P420.03)	Digital output 2 (only for application I/O)	Error active [56]
Settings for the frequency setpoint				
⑨	0x2860:001	(P201.01)	Frequency control: Default setpoint source	Analog input 1 [2]
⑩	0x2911:001	(P450.01)	Frequency setpoint presets: Preset 1	20 Hz
⑪	0x2911:002	(P450.02)	Frequency setpoint presets: Preset 2	40 Hz
⑫	0x2911:003	(P450.03)	Frequency setpoint presets: Preset 3	50 Hz
⑬	0x2917	(P220.00)	Acceleration time 1	5.0 s
⑭	0x2918	(P221.00)	Deceleration time 1	5.0 s

Parameter	Name / value range / [default setting]	Info
0x2631:002 (P400.02)	Function list: Run (Function list: Run) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532	Assignment of a trigger to the "Run" function. **Function 1: Start / stop motor (default setting)** Function 1 is active if no further start commands (start forward/start reverse) have been connected to triggers, no keypad control is active and no network control is active. Trigger = TRUE: Let motor rotate forward (CW). Trigger = FALSE: Stop motor. Notes to function 1: • If "Enable inverter" 0x2631:001 (P400.01) = "Constant TRUE [1]", only a digital input is permissible as trigger for this function in order that the motor can be stopped again any time. Exception: If the "Safe torque off (STO)" safety function is available, both functions "Enable inverter" and "Run" can be set to "Constant TRUE [1]". The inverter is then controlled via the STO signal unless no other start commands (start-forward/start-backward) have been connected to triggers. • The stop method can be selected in 0x2838:003 (P203.03). • The function also serves to realise an automatic start after switch-on. ▶ Starting performance 📖 153 **Function 2: Start enable/stop motor** Function 2 is active if further start commands have been connected to triggers, keypad control is active or network control is active. Trigger = TRUE: Start commands of the active control source are enabled. Trigger = FALSE: Stop motor. Notes to function 2: • If no separate start enable is required for the application, the trigger "Constant TRUE [1]" must be set. • The stop method can be selected in 0x2838:003 (P203.03).
	11 **Digital input 1**	
0x2631:004 (P400.04)	Function list: Reset fault (Function list: Reset fault) • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532	Assignment of a trigger for the "Reset fault" function. Trigger = FALSE↗TRUE (edge): Active error is reset (acknowledged) if the error condition is not active anymore and the error is resettable. Trigger = FALSE: no action.
	12 **Digital input 2**	
0x2631:013 (P400.13)	Function list: Reverse rotational direction (Function list: Reverse rot.dir.) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532	Assignment of a trigger for the "Reverse rotational direction" function. Trigger = TRUE: the setpoint specified is inverted (i. e. the sign is inverted). Trigger = FALSE: no action / deactivate function again.
	13 **Digital input 3**	
0x2631:018 (P400.18)	Function list: Activate preset (bit 0) (Function list: Setp: Preset b0) • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532	Assignment of a trigger for the "Activate preset (bit 0)" function. Selection bit with the valency 20 for the bit-coded selection and activation of a parameterised setpoint (preset value). Trigger = FALSE: selection bit = "0". Trigger = TRUE: selection bit = "1".
	14 **Digital input 4**	
0x2631:019 (P400.19)	Function list: Activate preset (bit 1) (Function list: Setp: Preset b1) • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532	Assignment of a trigger for the "Activate preset (bit 1)" function. Selection bit with the valency 21 for the bit-coded selection and activation of a parameterised setpoint (preset value). Trigger = FALSE: selection bit = "0". Trigger = TRUE: selection bit = "1".
	15 **Digital input 5**	
0x2634:001 (P420.01)	Digital outputs function: Relay (Dig.out.function: Relay function) • For further possible settings, see parameter 0x2634:001 (P420.01). 📖 603	Assignment of a trigger to the relay. Trigger = FALSE: X9/NO-COM open and NC-COM closed. Trigger = TRUE: X9/NO-COM closed and NC-COM open. Notes: • An inversion set in 0x2635:001 (P421.01)is taken into consideration here.
	51 **Ready for operation**	TRUE if inverter is ready for operation (no error active, no STO active and DC-bus voltage ok). Otherwise FALSE.



Parameter	Name / value range / [default setting]		Info
0x2634:002 (P420.02)	Digital outputs function: Digital output 1 (Dig.out.function: DO1 function) • For further possible settings, see parameter 0x2634:001 (P420.01). 📖 603		Assignment of a trigger to digital output 1. Trigger = FALSE: X3/DO1 set to LOW level. Trigger = TRUE: X3/DO1 set to HIGH level. Notes: • An inversion set in 0x2635:002 (P421.02) is taken into consideration here.
	115	**Release holding brake**	
	100	Sequencer controlled (from version 03.00)	The control is executed via the sequencer (according to the configuration of the digital outputs for the current segment). ▶ Segment configuration 📖 506
0x2634:003 (P420.03)	Digital outputs function: Digital output 2 (Dig.out.function: DO2 function) • Only available for application I/O. • For further possible settings, see parameter 0x2634:001 (P420.01). 📖 603		Assignment of a trigger to digital output 2. Trigger = FALSE: X3/DO2 set to LOW level. Trigger = TRUE: X3/DO2 set to HIGH level. Notes: • An inversion set in 0x2635:003 (P421.03) is taken into consideration here.
	56	**Error active**	
	100	Sequencer controlled (from version 03.00)	The control is executed via the sequencer (according to the configuration of the digital outputs for the current segment). ▶ Segment configuration 📖 506

All functional possible settings for controlling the inverter are described in the "Flexible I/O configuration" chapter. 📖 525

5.4 Keypad parameter list

For commissioning or diagnostics using the keypad, all parameters of the inverter that can also be accessed by means of the keypad are listed in the following "Keypad parameter list".

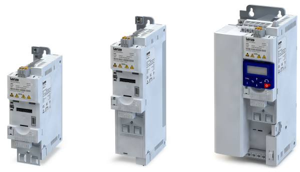
- The keypad parameter list is sorted in ascending order in compliance with the "display code" (Pxxx).
- In order to provide for quick access, all parameters of the inverter are divided into different groups according to their function.
- Group 0 contains the configurable "Favorites". In the default setting these are the most common parameters for the solution of typical applications. ▶ Favorites 📖 459
- Based on the hundreds digit of the display code (P**x**xx) you can quickly see in which group the parameter is to be found on the keypad:

Parameter	Group - name	Description
P**1**xx	Group 1 - Diagnostics	Diagnostic/display parameters for displaying device-internal process factors, current actual values, and status messages. ▶ Diagnostics parameter 📖 109
P**2**xx	Group 2 - Basic setting	Setting of the mains voltage, selection of the control and setpoint source, starting and stopping performance, frequency limits and ramp times. ▶ Basic setting 📖 143
P**3**xx	Group 3 - Motor control	Configuration of the motor and motor control ▶ Motor control 📖 163
P**4**xx	Group 4 - I/O setting	Function assignment and configuration of the inputs and outputs ▶ Flexible I/O configuration 📖 525
P**5**xx	Group 5 - Network setting	Configuration of the network (if available) ▶ Configuring the network 📖 226
P**6**xx	Group 6 - Process controller	Configuration of the process controller ▶ Configuring the process controller 📖 407
P**7**xx	Group 7 - Additional functions	Parameterisable additional functions ▶ Additional functions 📖 417
P**8**xx	Group 8 - Sequencer	The "sequencer" function serves to define a programmed sequence of speed setpoints, PID setpoints or torque setpoints for the motor control. Switching to the next setpoint can be executed in a time-based or event-based manner. ▶ Sequencer 📖 504

A complete overview of all parameter indexes can be found in the annex in the Parameter attribute list. 📖 659

Frequently used abbreviations in the short keypad designations of the parameters:

Abbreviation	Meaning
AI	Analog input
AO	Analog output
B0, B1, ...	Bit 0, bit 1, ...
CU	Control unit
DI	Digital input
DO	Digital output
LU	Undervoltage
MOP	Motor potentiometer
NET	Network
OU	overvoltage
PID	Process controller
PU	Power unit
QSP	Quick stop
Setp	Setpoint
WD	Watchdog



How to read the keypad parameter list:

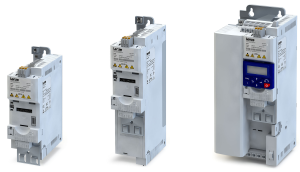
Column	Meaning
Display code	Parameter number on the keypad. Format: Number.Subindex
Short designation	Short keypad designation limited to 16 characters.
Default setting	Default setting of the parameter.
Setting range	Possible setting range for the parameter. Format: minimum value ... maximum value [unit]
Address	Address of the parameter in the object directory. Format: Index:Subindex
Category	Functional assignment of the parameter, for example "motor control" or "CANopen".

Keypad parameter list (short overview of all parameters with display code)

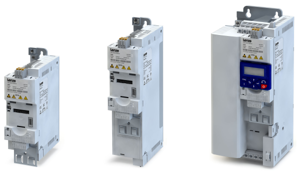
Display code	Short designation	Default setting	Setting range	Address	Category
P100.00	Output frequency	x.x Hz	- (Read only)	0x2DDD	general
P101.00	Scaled act value	x Units	- (Read only)	0x400D	general
P102.00	Freq. setpoint	x.x Hz	- (Read only)	0x2B0E	general
P103.00	Current actual	x.x %	- (Read only)	0x6078	general
P104.00	Motor current	x.x A	- (Read only)	0x2D88	general
P105.00	DC-bus voltage	x V	- (Read only)	0x2D87	general
P106.00	Motor voltage	x VAC	- (Read only)	0x2D89	general
P107.00	Torque actual	x.x %	- (Read only)	0x6077	general
P108.xx	Output power				
└ P108.01	Effective power	x.xxx kW	- (Read only)	0x2DA2:001	general
└ P108.02	Apparent power	x.xxx kVA	- (Read only)	0x2DA2:002	general
P109.xx	Output energy				
└ P109.01	Motor	x.xx kWh	- (Read only)	0x2DA3:001	general
└ P109.02	Generator	x.xx kWh	- (Read only)	0x2DA3:002	general
P110.xx	AI1 diagnostics				
└ P110.01	AI1 terminal %	x.x %	- (Read only)	0x2DA4:001	general
└ P110.02	AI1 scaled freq.	x.x Hz	- (Read only)	0x2DA4:002	general
└ P110.03	AI1 scaled PID	x.xx PID unit	- (Read only)	0x2DA4:003	general
└ P110.04	AI1 scaled torq.	x.x %	- (Read only)	0x2DA4:004	general
└ P110.16	AI1 status	-	- (Read only)	0x2DA4:016	general
P111.xx	AI2 diagnostics				
└ P111.01	AI2 terminal %	x.x %	- (Read only)	0x2DA5:001	general
└ P111.02	AI2 scaled freq.	x.x Hz	- (Read only)	0x2DA5:002	general
└ P111.03	AI2 scaled PID	x.xx PID unit	- (Read only)	0x2DA5:003	general
└ P111.04	AI2 scaled torq.	x.x %	- (Read only)	0x2DA5:004	general
└ P111.16	AI2 status	-	- (Read only)	0x2DA5:016	general
P112.xx	AO1 diagnostics				
└ P112.01	AO1 Voltage	x.xx V	- (Read only)	0x2DAA:001	general
└ P112.02	AO1 Current	x.xx mA	- (Read only)	0x2DAA:002	general
P113.xx	AO2 diagnostics				
└ P113.01	AO2 Current	x.xx V	- (Read only)	0x2DAB:001	Appl. I/O
└ P113.02	AO2 Voltage	x.xx mA	- (Read only)	0x2DAB:002	Appl. I/O
P114.xx	DO actual freq.				
└ P114.01	Digital output 1	x.x Hz	- (Read only)	0x2646:001	general
└ P114.02	Digital output 2	x.x Hz	- (Read only)	0x2646:002	general
P115.00	Actual sw. freq.	-	- (Read only)	0x293A	general
P115.xx	HTL inp. diag.				
└ P115.01	Input frequency	x.x Hz	- (Read only)	0x2642:001	general
└ P115.02	Freq. setpoint	x.x Hz	- (Read only)	0x2642:002	general
└ P115.03	PID setpoint	x.xx PID unit	- (Read only)	0x2642:003	general
└ P115.04	Torque setpoint	x.x %	- (Read only)	0x2642:004	general
P117.xx	Heatsink temp.				

* Default setting depending on the size. Firmware version 05.00.00.00

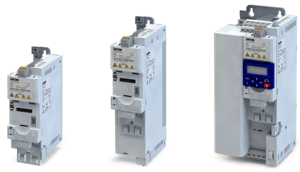
Display code	Short designation	Default setting	Setting range	Address	Category
└ P117.01	Heatsink temp.	x.x °C	- (Read only)	0x2D84:001	general
P118.00	Digital inputs	-	- (Read only)	0x60FD	general
P119.00	Keypad status	-	- (Read only)	0x2DAC	general
P120.00	Int. HW states	-	- (Read only)	0x2DAD	general
P121.xx					
└ P121.01	PID setpoint	x.xx PID unit	- (Read only)	0x401F:001	general
└ P121.02	PID process var.	x.xx PID unit	- (Read only)	0x401F:002	general
└ P121.03	PID status	-	- (Read only)	0x401F:003	general
P123.00	Mot. i2t utilis.	x %	- (Read only)	0x2D4F	general
P125.xx	Inverter diag.				
└ P125.01	Active control	-	- (Read only)	0x282B:001	general
└ P125.02	Active setpoint	-	- (Read only)	0x282B:002	general
└ P125.03	Keypad LCD stat.	-	- (Read only)	0x282B:003	general
└ P125.04	Drive mode	-	- (Read only)	0x282B:004	general
└ P125.05	Netw. contr.reg.	-	- (Read only)	0x282B:005	general
└ P125.06	Netw. setp.reg.	-	- (Read only)	0x282B:006	general
P126.xx	Status words				
└ P126.01	Cause of disable	-	- (Read only)	0x282A:001	general
└ P126.02	Cause of QSP	-	- (Read only)	0x282A:002	general
└ P126.03	Cause of stop	-	- (Read only)	0x282A:003	general
└ P126.05	Device status	-	- (Read only)	0x282A:005	general
P135.xx	Device utilisat.				
└ P135.04	ixt utilisation	x %	- (Read only)	0x2D40:004	general
└ P135.05	Error response	**Fault [3]**	Selection list	0x2D40:005	general
P140.xx	Sequencer diag				
└ P140.01	Active Step	-	- (Read only)	0x2DAE:001	general
└ P140.02	StepTime elapsed	x.x s	- (Read only)	0x2DAE:002	general
└ P140.03	StepTime remain	x.x s	- (Read only)	0x2DAE:003	general
└ P140.04	Steps complete	-	- (Read only)	0x2DAE:004	general
└ P140.05	Steps remain	-	- (Read only)	0x2DAE:005	general
└ P140.06	Active sequence	-	- (Read only)	0x2DAE:006	general
└ P140.07	Active segment	-	- (Read only)	0x2DAE:007	general
└ P140.08	SeqTime remain %	x %	- (Read only)	0x2DAE:008	general
└ P140.09	SeqTime remain	x.x s	- (Read only)	0x2DAE:009	general
P150.00	Error code	-	- (Read only)	0x603F	general
P151.xx	Life-diagnosis				
└ P151.01	Operating time	x s	- (Read only)	0x2D81:001	general
└ P151.02	Power-on time	x s	- (Read only)	0x2D81:002	general
└ P151.03	CU oper. time	x ns	- (Read only)	0x2D81:003	general
└ P151.04	Switching cycles	-	- (Read only)	0x2D81:004	general
└ P151.05	Relay cycles	-	- (Read only)	0x2D81:005	general
└ P151.06	Short-circ.count	-	- (Read only)	0x2D81:006	general
└ P151.07	Earthfault count	-	- (Read only)	0x2D81:007	general
└ P151.08	Clamp active	-	- (Read only)	0x2D81:008	general
└ P151.09	Fan oper. time	x s	- (Read only)	0x2D81:009	general
P155.xx	Fault memory				
└ P155.00	Error memory	-	- (Read only)	0x2006:000	general
P190.xx	Device data				
└ P190.01	Product code	-	- (Read only)	0x2000:001	general
└ P190.02	Serial number	-	- (Read only)	0x2000:002	general
└ P190.04	CU firmware ver.	-	- (Read only)	0x2000:004	general
└ P190.05	CU firmware type	-	- (Read only)	0x2000:005	general
└ P190.06	CU bootlder ver.	-	- (Read only)	0x2000:006	general
└ P190.07	CU bootlder type	-	- (Read only)	0x2000:007	general
* Default setting depending on the size.					Firmware version 05.00.00.00



Display code	Short designation	Default setting	Setting range	Address	Category
└ P190.08	OBD version	-	- (Read only)	0x2000:008	general
└ P190.10	PU firmware ver.	-	- (Read only)	0x2000:010	general
└ P190.11	PU firmware type	-	- (Read only)	0x2000:011	general
└ P190.12	PU bootlder ver.	-	- (Read only)	0x2000:012	general
└ P190.13	PU bootlder type	-	- (Read only)	0x2000:013	general
└ P190.14	Mod. firmware	-	- (Read only)	0x2000:014	general
└ P190.15	FW revision nr.	-	- (Read only)	0x2000:015	general
└ P190.16	Bootloader revNo	-	- (Read only)	0x2000:016	general
P191.00	Device name	**My Device**	Text	0x2001	general
P192.xx	Device module				
└ P192.04	CU type code	-	- (Read only)	0x2002:004	general
└ P192.05	PU type code	-	- (Read only)	0x2002:005	general
└ P192.06	CU serial number	-	- (Read only)	0x2002:006	general
└ P192.07	PU serial number	-	- (Read only)	0x2002:007	general
P197.00	Protect. status	-	- (Read only)	0x2040	general
P198.00	Status load. par	-	- (Read only)	0x2827	general
P200.00	Control select.	**Flexible I/O [0]**	Selection list	0x2824	general
P201.xx	Stnd. setpoints				
└ P201.01	Freq. setp. src.	**Analog input 1 [2]**	Selection list	0x2860:001	general
└ P201.02	PID setp. src.	**Keypad [1]**	Selection list	0x2860:002	general
└ P201.03	Torque setp.src.	**Analog input 1 [2]**	Selection list	0x2860:003	general
P202.xx	Keypad setpoints				
└ P202.01	KP freq.setpoint	**20.0 Hz**	0.0 ... 599.0 Hz	0x2601:001	general
└ P202.02	KP PID setpoint	**0.00 PID unit**	-300.00 ... 300.00 PID unit	0x2601:002	general
└ P202.03	KP torq.setpoint	**100.0 %**	-400.0 ... 400.0 %	0x2601:003	general
P203.xx	Start/stop confg				
└ P203.01	Start method	**Normal [0]**	Selection list	0x2838:001	general
└ P203.02	Start at powerup	**Off [0]**	Selection list	0x2838:002	general
└ P203.03	Stop method	**Standard ramp [1]**	Selection list	0x2838:003	general
P208.xx	Mains settings				
└ P208.01	Mains voltage	**230 Veff [0]**	Selection list	0x2540:001	general
└ P208.02	LU warn. thresh.	**0 V** *	0 ... 800 V	0x2540:002	general
└ P208.03	LU error thresh.	x V	- (Read only)	0x2540:003	general
└ P208.04	LU reset thresh.	x V	- (Read only)	0x2540:004	general
└ P208.05	OU warn. thresh.	**0 V** *	0 ... 800 V	0x2540:005	general
└ P208.06	OU error thresh.	x V	- (Read only)	0x2540:006	general
└ P208.07	OU reset thresh.	x V	- (Read only)	0x2540:007	general
P210.00	Min. frequency	**0.0 Hz**	0.0 ... 599.0 Hz	0x2915	general
P211.00	Max. frequency	Device for 50-Hz mains: **50.0 Hz** Device for 60-Hz mains: **60.0 Hz**	0.0 ... 599.0 Hz	0x2916	general
P220.00	Accelerat.time 1	**5.0 s**	0.0 ... 3600.0 s	0x2917	general
P221.00	Decelerat.time 1	**5.0 s**	0.0 ... 3600.0 s	0x2918	general
P222.00	Accelerat.time 2	**5.0 s**	0.0 ... 3600.0 s	0x2919	general
P223.00	Decelerat.time 2	**5.0 s**	0.0 ... 3600.0 s	0x291A	general
P224.00	Ramp 2 thresh.	**0.0 Hz**	0.0 ... 599.0 Hz	0x291B	general
P225.00	QSP dec. time	**1.0 s**	0.0 ... 3600.0 s	0x291C	general
P226.xx	S-ramp char.				
└ P226.01	Smoothing factor	**0.0 %**	0.0 ... 100.0 %	0x291E:001	general
P230.xx	Optical tracking				
└ P230.01	Start detection	**Stop [0]**	Selection list	0x2021:001	general
└ P230.02	Blink. duration	**5 s**	0 ... 3600 s	0x2021:002	general
P300.00	Motor ctrl mode	**VFC open loop [6]**	Selection list	0x2C00	general
* Default setting depending on the size.					Firmware version 05.00.00.00



Display code	Short designation	Default setting	Setting range	Address	Category
P301.00	Modes of op.	**MS: Velocitymode [-2]**	Selection list	0x6060	general
P302.00	V/f charac.shape	**Linear [0]**	Selection list	0x2B00	general
P303.xx	V/f shape data				
└ P303.01	Base voltage	**230 V** *	0 ... 5000 V	0x2B01:001	MCTRL
└ P303.02	Base frequency	Device for 50-Hz mains: **50 Hz** Device for 60-Hz mains: **60 Hz** *	0 ... 1500 Hz	0x2B01:002	MCTRL
└ P303.03	Midpoint voltage	**0 V**	0 ... 5000 V	0x2B01:003	MCTRL
└ P303.04	Midpoint freq	**0 Hz**	0 ... 1500 Hz	0x2B01:004	MCTRL
P304.00	Limit. rotation	**Both rot. direct [1]**	Selection list	0x283A	general
P305.00	Switching freq.	**0** *	Selection list	0x2939	general
P306.xx	Inv. load char.				
└ P306.01	Duty selection	**Heavy Duty [0]**	Selection list	0x2D43:001	general
P308.xx	Motor overload				
└ P308.01	Max.load.for 60s	**150 %**	30 ... 200 %	0x2D4B:001	general
└ P308.02	Speed comp.	**On [0]**	Selection list	0x2D4B:002	general
└ P308.03	Response	**Fault [3]**	Selection list	0x2D4B:003	general
P309.xx	Mot.temp.monit.				
└ P309.02	Response	**Fault [3]**	Selection list	0x2D49:002	general
P310.xx	Mot.phase.fail.				
└ P310.01	Response	**No response [0]**	Selection list	0x2D45:001	general
└ P310.02	Current thresh.	**5.0 %**	1.0 ... 25.0 %	0x2D45:002	general
└ P310.03	Voltage thresh.	**10.0 V**	0.0 ... 100.0 V	0x2D45:003	general
P315.xx	Slip compens.				
└ P315.01	Slip: gain	**100.00 %**	-200.00 ... 200.00 %	0x2B09:001	general
└ P315.02	Filter time	**100 ms**	1 ... 6000 ms	0x2B09:002	general
P316.xx	V/f boosts				
└ P316.01	Fixed V/f boost	**2.5 %** *	0.0 ... 20.0 %	0x2B12:001	MCTRL
└ P316.02	Dynam. V/f boost	**0.0 %**	0.0 ... 20.0 %	0x2B12:002	general
P317.xx	Skip frequencies				
└ P317.01	Skip frequency 1	**0.0 Hz**	0.0 ... 599.0 Hz	0x291F:001	general
└ P317.02	Skip bandwidth 1	**0.0 Hz**	0.0 ... 10.0 Hz	0x291F:002	general
└ P317.03	Skip frequency 2	**0.0 Hz**	0.0 ... 599.0 Hz	0x291F:003	general
└ P317.04	Skip bandwidth 2	**0.0 Hz**	0.0 ... 10.0 Hz	0x291F:004	general
└ P317.05	Skip frequency 3	**0.0 Hz**	0.0 ... 599.0 Hz	0x291F:005	general
└ P317.06	Skip bandwidth 3	**0.0 Hz**	0.0 ... 10.0 Hz	0x291F:006	general
P318.xx	Oscillat. damp.				
└ P318.01	Gain	**150 %**	-400 ... 400 %	0x2B0A:001	MCTRL
└ P318.02	Filter time	**30 ms**	1 ... 600 ms	0x2B0A:002	MCTRL
P319.00	Field weak thold	**0.0 Hz**	-599.0 ... 599.0 Hz	0x2B0C	general
P320.xx	Motor parameters				
└ P320.04	Rated speed	Device for 50-Hz mains: **1450 rpm** Device for 60-Hz mains: **1750 rpm**	50 ... 50000 rpm	0x2C01:004	MCTRL
└ P320.05	Rated frequency	Device for 50-Hz mains: **50.0 Hz** Device for 60-Hz mains: **60.0 Hz**	1.0 ... 1000.0 Hz	0x2C01:005	MCTRL
└ P320.06	Rated power	**0.25 kW** *	0.00 ... 655.35 kW	0x2C01:006	MCTRL
└ P320.07	Rated voltage	**230 V** *	0 ... 65535 V	0x2C01:007	MCTRL
└ P320.08	Cosine phi	**0.80**	0.00 ... 1.00	0x2C01:008	MCTRL
P322.00	Max motor speed	**6075 rpm**	0 ... 480000 rpm	0x6080	general
P323.00	Motor current	**1.700 A** *	0.001 ... 500.000 A	0x6075	MCTRL
* Default setting depending on the size.					Firmware version 05.00.00.00

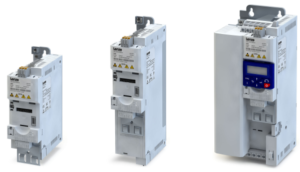


Display code	Short designation	Default setting	Setting range	Address	Category
P324.00	Max current	**200.0 %**	0.0 ... 3000.0 %	0x6073	general
P325.00	Motor torque	**1.650 Nm** *	0.001 ... 4294967.295 Nm	0x6076	MCTRL
P326.00	Max torque	**250.0 %**	0.0 ... 3000.0 %	0x6072	general
P327.xx	Axis commands				
└ P327.04	Identify mot.	**0**	0 ... 1	0x2822:004	general
└ P327.05	Calibrate mot.	**0**	0 ... 1	0x2822:005	general
P329.xx	MaxTrq.Monitor				
└ P329.01	Response	**No response [0]**	Selection list	0x2D67:001	MCTRL
└ P329.02	Triggering delay	**0.000 s**	0.000 ... 10.000 s	0x2D67:002	MCTRL
P330.xx	VFC-ECO				
└ P330.01	Min. voltage	**20 %**	20 ... 100 %	0x2B0D:001	MCTRL
└ P330.06	Cos Phi actual	-	- (Read only)	0x2B0D:006	general
P332.xx	Speed controller				
└ P332.01	Gain	**0.00193 Nm/rpm** *	0.00000 ... 20000.00000 Nm/rpm	0x2900:001	MCTRL
└ P332.02	Reset time	**80.0 ms** *	1.0 ... 6000.0 ms	0x2900:002	MCTRL
P333.xx	V/f Imax contr.				
└ P333.01	Gain	**0.284 Hz/A** *	0.000 ... 1000.000 Hz/A	0x2B08:001	MCTRL
└ P333.02	Reset time	**2.3 ms** *	1.0 ... 2000.0 ms	0x2B08:002	MCTRL
P334.xx	Current contr.				
└ P334.01	Gain	**42.55 V/A** *	0.00 ... 750.00 V/A	0x2942:001	MCTRL
└ P334.02	Reset time	**4.50 ms** *	0.01 ... 2000.00 ms	0x2942:002	MCTRL
P335.xx	Moment of inert.				
└ P335.01	Motor inertia	**3.70 kg cm^2** *	0.00 ... 20000000.00 kg cm^2	0x2910:001	MCTRL
└ P335.02	Load inertia	**3.70 kg cm^2** *	0.00 ... 20000000.00 kg cm^2	0x2910:002	MCTRL
└ P336.02	Ramp time	**1.0 s**	0.0 ... 60.0 s	0x2948:002	general
P337.xx					
└ P337.01	Pos. torqlim src	**Max torque [0]**	Selection list	0x2949:001	general
└ P337.02	Neg. torqlim src	**(-) Max torque [0]**	Selection list	0x2949:002	general
└ P337.03	Act postorqlim	x.x %	- (Read only)	0x2949:003	general
└ P337.04	Act negtorqlim	x.x %	- (Read only)	0x2949:004	general
P340.xx	Speed limitation				
└ P340.01	Upper limit	**0 vel. unit**	-480000 ... 480000 vel. unit	0x2946:001	general
└ P340.02	Lower limit	**0 vel. unit**	-480000 ... 480000 vel. unit	0x2946:002	general
└ P340.03	Uppspeed lim src	**Max. frequency [0]**	Selection list	0x2946:003	general
└ P340.04	Lowspeed lim src	**(-) Max. freq. [0]**	Selection list	0x2946:004	general
└ P340.05	Upper freq.limit	Device for 50-Hz mains: **50.0 Hz** Device for 60-Hz mains: **60.0 Hz**	-1000.0 ... 1000.0 Hz	0x2946:005	general
└ P340.06	Lower freq.limit	Device for 50-Hz mains: **-50.0 Hz** Device for 60-Hz mains: **-60.0 Hz**	-1000.0 ... 1000.0 Hz	0x2946:006	general
└ P340.07	Act uppspeed lim	x.x Hz	- (Read only)	0x2946:007	general
└ P340.08	Act lowspeed lim	x.x Hz	- (Read only)	0x2946:008	general
P341.xx	Encoder settings				
└ P341.01	Enc. Inc/Rev	**128**	1 ... 16384	0x2C42:001	general
P342.00	Enc.error resp.	**Warning [1]**	Selection list	0x2C45	general
P350.xx	Overspeed monit.				
└ P350.01	Threshold	**8000 rpm**	50 ... 50000 rpm	0x2D44:001	general
└ P350.02	Response	**Fault [3]**	Selection list	0x2D44:002	general
P351.xx	ASM motor par.				
└ P351.01	Rotor resistance	**8.8944 Ω** *	0.0000 ... 200.0000 Ω	0x2C02:001	MCTRL
└ P351.02	Mutual induct.	**381.9 mH** *	0.0 ... 50000.0 mH	0x2C02:002	MCTRL

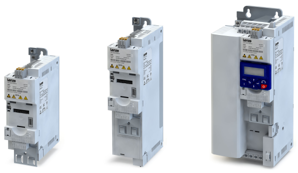
* Default setting depending on the size. Firmware version 05.00.00.00

Display code	Short designation	Default setting	Setting range	Address	Category
└ P351.03	Magn. current	**0.96 A** *	0.00 ... 500.00 A	0x2C02:003	MCTRL
└ P351.04	Slip frequency	x.x Hz	- (Read only)	0x2C02:004	general
P352.xx	PSM motor par.				
└ P352.01	BEMF constant	**41.8 V/1000rpm**	0.0 ... 100000.0 V/1000rpm	0x2C03:001	MCTRL
P353.xx	Overcurr. monit.				
└ P353.01	Threshold	**6.8 A** *	0.0 ... 1000.0 A	0x2D46:001	general
└ P353.02	Response	**Fault [3]**	Selection list	0x2D46:002	general
P354.00	Voltage reserve	**5 %**	1 ... 20 %	0x29E4	general
P400.xx	Function list				
└ P400.01	Enable inverter	**TRUE [1]**	Selection list	0x2631:001	general
└ P400.02	Run	**Digital input 1 [11]**	Selection list	0x2631:002	general
└ P400.03	Quick stop	**Not connected [0]**	Selection list	0x2631:003	general
└ P400.04	Reset fault	**Digital input 2 [12]**	Selection list	0x2631:004	general
└ P400.05	DC braking	**Not connected [0]**	Selection list	0x2631:005	general
└ P400.06	Start forward	**Not connected [0]**	Selection list	0x2631:006	general
└ P400.07	Start reverse	**Not connected [0]**	Selection list	0x2631:007	general
└ P400.08	Run forward	**Not connected [0]**	Selection list	0x2631:008	general
└ P400.09	Run reverse	**Not connected [0]**	Selection list	0x2631:009	general
└ P400.10	Jog foward	**Not connected [0]**	Selection list	0x2631:010	general
└ P400.11	Jog reverse	**Not connected [0]**	Selection list	0x2631:011	general
└ P400.12	Keypad control	**Not connected [0]**	Selection list	0x2631:012	general
└ P400.13	Reverse rot.dir.	**Digital input 3 [13]**	Selection list	0x2631:013	general
└ P400.14	Setp: AI1	**Not connected [0]**	Selection list	0x2631:014	general
└ P400.15	Setp: AI2	**Not connected [0]**	Selection list	0x2631:015	general
└ P400.16	Setp: Keypad	**Not connected [0]**	Selection list	0x2631:016	general
└ P400.17	Setp: Network	**Not connected [0]**	Selection list	0x2631:017	general
└ P400.18	Setp: Preset b0	**Digital input 4 [14]**	Selection list	0x2631:018	general
└ P400.19	Setp: Preset b1	**Digital input 5 [15]**	Selection list	0x2631:019	general
└ P400.20	Setp: Preset b2	**Not connected [0]**	Selection list	0x2631:020	general
└ P400.21	Setp: Preset b3	**Not connected [0]**	Selection list	0x2631:021	general
└ P400.22	Setp: HTL input	**Not connected [0]**	Selection list	0x2631:022	general
└ P400.23	MOP up	**Not connected [0]**	Selection list	0x2631:023	general
└ P400.24	MOP down	**Not connected [0]**	Selection list	0x2631:024	general
└ P400.25	Setp: MOP	**Not connected [0]**	Selection list	0x2631:025	general
└ P400.26	Setp: Segment b0	**Not connected [0]**	Selection list	0x2631:026	general
└ P400.27	Setp: Segment b1	**Not connected [0]**	Selection list	0x2631:027	general
└ P400.28	Setp: Segment b2	**Not connected [0]**	Selection list	0x2631:028	general
└ P400.29	Setp: Segment b3	**Not connected [0]**	Selection list	0x2631:029	general
└ P400.30	Seq: Run/abort	**Not connected [0]**	Selection list	0x2631:030	general
└ P400.31	Seq: Start	**Not connected [0]**	Selection list	0x2631:031	general
└ P400.32	Seq: Next step	**Not connected [0]**	Selection list	0x2631:032	general
└ P400.33	Seq: Pause	**Not connected [0]**	Selection list	0x2631:033	general
└ P400.34	Seq: Suspense	**Not connected [0]**	Selection list	0x2631:034	general
└ P400.35	Seq: Stop	**Not connected [0]**	Selection list	0x2631:035	general
└ P400.36	Seq: Abort	**Not connected [0]**	Selection list	0x2631:036	general
└ P400.37	Network control	**Not connected [0]**	Selection list	0x2631:037	general
└ P400.39	Activ. ramp 2	**Not connected [0]**	Selection list	0x2631:039	general
└ P400.40	Load param.set	**Not connected [0]**	Selection list	0x2631:040	general
└ P400.41	Sel. paramset b0	**Not connected [0]**	Selection list	0x2631:041	general
└ P400.42	Sel. paramset b1	**Not connected [0]**	Selection list	0x2631:042	general
└ P400.43	Fault 1	**Not connected [0]**	Selection list	0x2631:043	general
└ P400.44	Fault 2	**Not connected [0]**	Selection list	0x2631:044	general
└ P400.45	PID off	**Not connected [0]**	Selection list	0x2631:045	general
└ P400.46	PID output=0	**Not connected [0]**	Selection list	0x2631:046	general

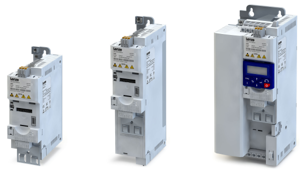
* Default setting depending on the size. Firmware version 05.00.00.00



Display code	Short designation	Default setting	Setting range	Address	Category
└ P400.47	PID-I inhibited	**Not connected [0]**	Selection list	0x2631:047	general
└ P400.48	PID-Inf ramp on	**TRUE [1]**	Selection list	0x2631:048	general
└ P400.49	Release brake	**Not connected [0]**	Selection list	0x2631:049	general
└ P400.50	Seq: Select. b0	**Not connected [0]**	Selection list	0x2631:050	general
└ P400.51	Seq: Select. b1	**Not connected [0]**	Selection list	0x2631:051	general
└ P400.52	Seq: Select. b2	**Not connected [0]**	Selection list	0x2631:052	general
└ P400.53	Seq: Select. b3	**Not connected [0]**	Selection list	0x2631:053	general
└ P400.54	PosCounter reset	**Not connected [0]**	Selection list	0x2631:054	general
└ P400.55	Activ. UPS oper.	**Not connected [0]**	Selection list	0x2631:055	general
P410.xx	DI settings				
└ P410.01	Assertion level	**HIGH active [1]**	Selection list	0x2630:001	general
└ P410.02	Input function	**Digital Input [0]**	Selection list	0x2630:002	general
P411.xx	DI inversion				
└ P411.01	DI1 inversion	**Not inverted [0]**	Selection list	0x2632:001	general
└ P411.02	DI2 inversion	**Not inverted [0]**	Selection list	0x2632:002	general
└ P411.03	DI3 inversion	**Not inverted [0]**	Selection list	0x2632:003	general
└ P411.04	DI4 inversion	**Not inverted [0]**	Selection list	0x2632:004	general
└ P411.05	DI5 inversion	**Not inverted [0]**	Selection list	0x2632:005	general
└ P411.06	DI6 inversion	**Not inverted [0]**	Selection list	0x2632:006	Appl. I/O
└ P411.07	DI7 inversion	**Not inverted [0]**	Selection list	0x2632:007	Appl. I/O
P412.00	Freq. threshold	**0.0 Hz**	0.0 ... 599.0 Hz	0x4005	general
P413.00	MOP startmode	**Last value [0]**	Selection list	0x4003	general
P414.xx	MOP start value				
└ P414.01	Frequency	**0.0 Hz**	0.0 ... 599.0 Hz	0x4004:001	general
└ P414.02	PID value	**0.00 PID unit**	-300.00 ... 300.00 PID unit	0x4004:002	general
└ P414.03	Torque	**0.0 %**	0.0 ... 1000.0 %	0x4004:003	general
P415.xx	HTL inp. setting				
└ P415.01	Min.frequency	**0.0 Hz**	-100000.0 ... 100000.0 Hz	0x2640:001	general
└ P415.02	Max. frequency	**0.0 Hz**	-100000.0 ... 100000.0 Hz	0x2640:002	general
└ P415.03	Min.motor.freq	**0.0 Hz**	-1000.0 ... 1000.0 Hz	0x2640:003	general
└ P415.04	Max.motor.freq	Device for 50-Hz mains: **50.0 Hz** Device for 60-Hz mains: **60.0 Hz**	-1000.0 ... 1000.0 Hz	0x2640:004	general
└ P415.05	Min.PID setpoint	**0.00 PID unit**	-300.00 ... 300.00 PID unit	0x2640:005	general
└ P415.06	Max.PID setpoint	**100.00 PID unit**	-300.00 ... 300.00 PID unit	0x2640:006	general
└ P415.07	Min.torque setp.	**0.0 %**	-400.0 ... 400.0 %	0x2640:007	general
└ P415.08	Max.torque setp	**100.0 %**	-400.0 ... 400.0 %	0x2640:008	general
└ P415.09	Filter time	**10 ms**	0 ... 10000 ms	0x2640:009	general
P416.xx	HTL inp. monit.				
└ P416.01	Min.freq.thresh.	**0.0 Hz**	-214748364.8 ... 214748364.7 Hz	0x2641:001	general
└ P416.02	Min.delay thres.	**5.0 s**	0.0 ... 300.0 s	0x2641:002	general
└ P416.03	Max.freq.thresh.	**0.0 Hz**	-214748364.8 ... 214748364.7 Hz	0x2641:003	general
└ P416.04	Max.delay thres.	**5.0 s**	0.0 ... 300.0 s	0x2641:004	general
└ P416.05	Monit. condition	**< min. frequency [1]**	Selection list	0x2641:005	general
└ P416.06	Error response	**No response [0]**	Selection list	0x2641:006	general
P420.xx	Dig.out.function				
└ P420.01	Relay function	**Rdy for operat. [51]**	Selection list	0x2634:001	general
└ P420.02	DO1 function	**Release brake [115]**	Selection list	0x2634:002	general
└ P420.03	DO2 function	**Error [56]**	Selection list	0x2634:003	Appl. I/O
└ P420.10	NetWordOUT1.00	**Rdy for operat. [51]**	Selection list	0x2634:010	general
└ P420.11	NetWordOUT1.01	**Not connected [0]**	Selection list	0x2634:011	general
└ P420.12	NetWordOUT1.02	**Operat. enabled [52]**	Selection list	0x2634:012	general
* Default setting depending on the size.					Firmware version 05.00.00.00



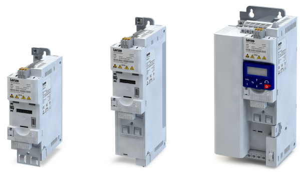
Display code	Short designation	Default setting	Setting range	Address	Category
└ P420.13	NetWordOUT1.03	**Error [56]**	Selection list	0x2634:013	general
└ P420.14	NetWordOUT1.04	**Not connected [0]**	Selection list	0x2634:014	general
└ P420.15	NetWordOUT1.05	**Quick stop [54]**	Selection list	0x2634:015	general
└ P420.16	NetWordOUT1.06	**Running [50]**	Selection list	0x2634:016	general
└ P420.17	NetWordOUT1.07	**Device warning [58]**	Selection list	0x2634:017	general
└ P420.18	NetWordOUT1.08	**Not connected [0]**	Selection list	0x2634:018	general
└ P420.19	NetWordOUT1.09	**Not connected [0]**	Selection list	0x2634:019	general
└ P420.20	NetWordOUT1.10	**Speed - setp=act [72]**	Selection list	0x2634:020	general
└ P420.21	NetWordOUT1.11	**At current limit [78]**	Selection list	0x2634:021	general
└ P420.22	NetWordOUT1.12	**Actual speed=0 [71]**	Selection list	0x2634:022	general
└ P420.23	NetWordOUT1.13	**Rot.dir.reversed [69]**	Selection list	0x2634:023	general
└ P420.24	NetWordOUT1.14	**Release brake [115]**	Selection list	0x2634:024	general
└ P420.25	NetWordOUT1.15	**Safe Torque Off [55]**	Selection list	0x2634:025	general
P421.xx	DO inversion				
└ P421.01	Relay inverted	**Not inverted [0]**	Selection list	0x2635:001	general
└ P421.02	DO1 inversion	**Not inverted [0]**	Selection list	0x2635:002	general
└ P421.03	DO2 inversion	**Not inverted [0]**	Selection list	0x2635:003	Appl. I/O
P423.xx	DO1 freq. setup				
└ P423.01	Min. frequency	**0.0 Hz**	0.0 ... 10000.0 Hz	0x2644:001	general
└ P423.02	Max. frequency	**10000.0 Hz**	0.0 ... 10000.0 Hz	0x2644:002	general
└ P423.03	Function	**Not connected [0]**	Selection list	0x2644:003	general
└ P423.04	Min. signal	**0**	-2147483648 ... 2147483647	0x2644:004	general
└ P423.05	Max. signal	**1000**	-2147483648 ... 2147483647	0x2644:005	general
P424.xx	DO2 freq. setup				
└ P424.01	Min. frequency	**0.0 Hz**	0.0 ... 10000.0 Hz	0x2645:001	general
└ P424.02	Max. frequency	**10000.0 Hz**	0.0 ... 10000.0 Hz	0x2645:002	general
└ P424.03	Function	**Not connected [0]**	Selection list	0x2645:003	general
└ P424.04	Min. signal	**0**	-2147483648 ... 2147483647	0x2645:004	general
└ P424.05	Max. signal	**1000**	-2147483648 ... 2147483647	0x2645:005	general
P430.xx	Analog input 1				
└ P430.01	AI1 input range	**0 ... 10 VDC [0]**	Selection list	0x2636:001	general
└ P430.02	AI1 freq @ min	**0.0 Hz**	-1000.0 ... 1000.0 Hz	0x2636:002	general
└ P430.03	AI1 freq @ max	Device for 50-Hz mains: **50.0 Hz** Device for 60-Hz mains: **60.0 Hz**	-1000.0 ... 1000.0 Hz	0x2636:003	general
└ P430.04	AI1 PID @ min	**0.00 PID unit**	-300.00 ... 300.00 PID unit	0x2636:004	general
└ P430.05	AI1 PID @ max	**100.00 PID unit**	-300.00 ... 300.00 PID unit	0x2636:005	general
└ P430.06	AI1 filter time	**10 ms**	0 ... 10000 ms	0x2636:006	general
└ P430.07	AI1 dead band	**0.0 %**	0.0 ... 100.0 %	0x2636:007	general
└ P430.08	AI1 monit.level	**0.0 %**	-100.0 ... 100.0 %	0x2636:008	general
└ P430.09	AI1 monit.cond.	**IN < threshold [0]**	Selection list	0x2636:009	general
└ P430.10	AI1 error resp.	**Fault [3]**	Selection list	0x2636:010	general
└ P430.11	Min. torque	**0.0 %**	-400.0 ... 400.0 %	0x2636:011	general
└ P430.12	Max. torque	**100.0 %**	-400.0 ... 400.0 %	0x2636:012	general
P431.xx	Analog input 2				
└ P431.01	AI2 input range	**0 ... 10 VDC [0]**	Selection list	0x2637:001	general
└ P431.02	AI2 freq @ min	**0.0 Hz**	-1000.0 ... 1000.0 Hz	0x2637:002	general
└ P431.03	AI2 freq @ max	Device for 50-Hz mains: **50.0 Hz** Device for 60-Hz mains: **60.0 Hz**	-1000.0 ... 1000.0 Hz	0x2637:003	general
└ P431.04	AI2 PID @ min	**0.00 PID unit**	-300.00 ... 300.00 PID unit	0x2637:004	general
└ P431.05	AI2 PID @ max	**100.00 PID unit**	-300.00 ... 300.00 PID unit	0x2637:005	general
└ P431.06	AI2 filter time	**10 ms**	0 ... 10000 ms	0x2637:006	general
* Default setting depending on the size.					Firmware version 05.00.00.00



Display code	Short designation	Default setting	Setting range	Address	Category
└ P431.07	AI2 dead band	**0.0 %**	0.0 ... 100.0 %	0x2637:007	general
└ P431.08	AI2 monit.level	**0.0 %**	-100.0 ... 100.0 %	0x2637:008	general
└ P431.09	AI2 error resp.	**IN < threshold [0]**	Selection list	0x2637:009	general
└ P431.10	AI2 error resp.	**Fault [3]**	Selection list	0x2637:010	general
└ P431.11	Min. torque	**0.0 %**	-400.0 ... 400.0 %	0x2637:011	general
└ P431.12	Max. torque	**100.0 %**	-400.0 ... 400.0 %	0x2637:012	general
P440.xx	Analog output 1				
└ P440.01	AO1 outp. range	**0 ... 10 VDC [1]**	Selection list	0x2639:001	general
└ P440.02	AO1 function	**Outp. frequency [1]**	Selection list	0x2639:002	general
└ P440.03	AO1 min. signal	**0**	-2147483648 ... 2147483647	0x2639:003	general
└ P440.04	AO1 max. signal	**1000**	-2147483648 ... 2147483647	0x2639:004	general
P441.xx	Analog output 2				
└ P441.01	AO2 outp. range	**0 ... 10 VDC [1]**	Selection list	0x263A:001	Appl. I/O
└ P441.02	AO2 function	**Motor current [5]**	Selection list	0x263A:002	Appl. I/O
└ P441.03	AO2 min. signal	**0**	-2147483648 ... 2147483647	0x263A:003	Appl. I/O
└ P441.04	AO2 max. signal	**1000**	-2147483648 ... 2147483647	0x263A:004	Appl. I/O
P450.xx	Freq. presets				
└ P450.01	Freq. preset 1	**20.0 Hz**	0.0 ... 599.0 Hz	0x2911:001	general
└ P450.02	Freq. preset 2	**40.0 Hz**	0.0 ... 599.0 Hz	0x2911:002	general
└ P450.03	Freq. preset 3	Device for 50-Hz mains: **50.0 Hz** Device for 60-Hz mains: **60.0 Hz**	0.0 ... 599.0 Hz	0x2911:003	general
└ P450.04	Freq. preset 4	**0.0 Hz**	0.0 ... 599.0 Hz	0x2911:004	general
└ P450.05	Freq. preset 5	**0.0 Hz**	0.0 ... 599.0 Hz	0x2911:005	general
└ P450.06	Freq. preset 6	**0.0 Hz**	0.0 ... 599.0 Hz	0x2911:006	general
└ P450.07	Freq. preset 7	**0.0 Hz**	0.0 ... 599.0 Hz	0x2911:007	general
└ P450.08	Freq. preset 8	**0.0 Hz**	0.0 ... 599.0 Hz	0x2911:008	general
└ P450.09	Freq. preset 9	**0.0 Hz**	0.0 ... 599.0 Hz	0x2911:009	general
└ P450.10	Freq. preset 10	**0.0 Hz**	0.0 ... 599.0 Hz	0x2911:010	general
└ P450.11	Freq. preset 11	**0.0 Hz**	0.0 ... 599.0 Hz	0x2911:011	general
└ P450.12	Freq. preset 12	**0.0 Hz**	0.0 ... 599.0 Hz	0x2911:012	general
└ P450.13	Freq. preset 13	**0.0 Hz**	0.0 ... 599.0 Hz	0x2911:013	general
└ P450.14	Freq. preset 14	**0.0 Hz**	0.0 ... 599.0 Hz	0x2911:014	general
└ P450.15	Freq. preset 15	**0.0 Hz**	0.0 ... 599.0 Hz	0x2911:015	general
P451.xx	PID presets				
└ P451.01	PID preset 1	**0.00 PID unit**	-300.00 ... 300.00 PID unit	0x4022:001	general
└ P451.02	PID preset 2	**0.00 PID unit**	-300.00 ... 300.00 PID unit	0x4022:002	general
└ P451.03	PID preset 3	**0.00 PID unit**	-300.00 ... 300.00 PID unit	0x4022:003	general
└ P451.04	PID preset 4	**0.00 PID unit**	-300.00 ... 300.00 PID unit	0x4022:004	general
└ P451.05	PID preset 5	**0.00 PID unit**	-300.00 ... 300.00 PID unit	0x4022:005	general
└ P451.06	PID preset 6	**0.00 PID unit**	-300.00 ... 300.00 PID unit	0x4022:006	general
└ P451.07	PID preset 7	**0.00 PID unit**	-300.00 ... 300.00 PID unit	0x4022:007	general
└ P451.08	PID preset 8	**0.00 PID unit**	-300.00 ... 300.00 PID unit	0x4022:008	general
P452.xx	Torque presets				
└ P452.01	Torque preset 1	**100.0 %**	-400.0 ... 400.0 %	0x2912:001	general
└ P452.02	Torque preset 2	**100.0 %**	-400.0 ... 400.0 %	0x2912:002	general
└ P452.03	Torque preset 3	**100.0 %**	-400.0 ... 400.0 %	0x2912:003	general
└ P452.04	Torque preset 4	**100.0 %**	-400.0 ... 400.0 %	0x2912:004	general
└ P452.05	Torque preset 5	**100.0 %**	-400.0 ... 400.0 %	0x2912:005	general
└ P452.06	Torque preset 6	**100.0 %**	-400.0 ... 400.0 %	0x2912:006	general
└ P452.07	Torque preset 7	**100.0 %**	-400.0 ... 400.0 %	0x2912:007	general
└ P452.08	Torque preset 8	**100.0 %**	-400.0 ... 400.0 %	0x2912:008	general
P500.xx	Module ID				
* Default setting depending on the size.					Firmware version 05.00.00.00

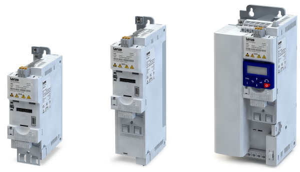
Display code	Short designation	Default setting	Setting range	Address	Category
└ P500.01	Active module ID	-	- (Read only)	0x231F:001	general
└ P500.02	Module ID conn.	-	- (Read only)	0x231F:002	general
P505.xx	NetWordIN1 fct.				
└ P505.01	NetWordIN1.00	**Not active [0]**	Selection list	0x400E:001	general
└ P505.02	NetWordIN1.01	**Not active [0]**	Selection list	0x400E:002	general
└ P505.03	NetWordIN1.02	**Quick stop [3]**	Selection list	0x400E:003	general
└ P505.04	NetWordIN1.03	**Not active [0]**	Selection list	0x400E:004	general
└ P505.05	NetWordIN1.04	**Run forward [8]**	Selection list	0x400E:005	general
└ P505.06	NetWordIN1.05	**Setp: Preset b0 [18]**	Selection list	0x400E:006	general
└ P505.07	NetWordIN1.06	**Setp: Preset b1 [19]**	Selection list	0x400E:007	general
└ P505.08	NetWordIN1.07	**Reset error [4]**	Selection list	0x400E:008	general
└ P505.09	NetWordIN1.08	**Not active [0]**	Selection list	0x400E:009	general
└ P505.10	NetWordIN1.09	**DC braking [5]**	Selection list	0x400E:010	general
└ P505.11	NetWordIN1.10	**Not active [0]**	Selection list	0x400E:011	general
└ P505.12	NetWordIN1.11	**Not active [0]**	Selection list	0x400E:012	general
└ P505.13	NetWordIN1.12	**Reverse rot.dir. [13]**	Selection list	0x400E:013	general
└ P505.14	NetWordIN1.13	**Not active [0]**	Selection list	0x400E:014	general
└ P505.15	NetWordIN1.14	**Not active [0]**	Selection list	0x400E:015	general
└ P505.16	NetWordIN1.15	**Not active [0]**	Selection list	0x400E:016	general
P508.00	CANopen comm.	**No action [0]**	Selection list	0x2300	CANopen
P508.00	EtherCAT comm.	**No action [0]**	Selection list	0x2360	EtherCAT
P508.00	EtherN/IP comm.	**No action [0]**	Selection list	0x23A0	EtherNet/IP
P508.00	Modbus comm.	**No action [0]**	Selection list	0x2320	Modbus RTU
P508.00	MBTCP comm.	**No action [0]**	Selection list	0x23B0	Modbus TCP
P508.00	PROFINET comm.	**No action [0]**	Selection list	0x2380	PROFINET
P509.00	CANopen switch	-	- (Read only)	0x2303	CANopen
P509.00	EtherC. switch	-	- (Read only)	0x2363	EtherCAT
P509.00	EtherN. switch	-	- (Read only)	0x23A3	EtherNet/IP
P509.00	Modbus switch	-	- (Read only)	0x2323	Modbus RTU
P509.00	Switch position	-	- (Read only)	0x23B3	Modbus TCP
P509.00	PROFIBUS switch	-	- (Read only)	0x2343	PROFIBUS
P510.xx	CANopen sett.				
└ P510.01	Node ID	**1**	1 ... 127	0x2301:001	CANopen
└ P510.02	Baud rate	**500 kbps [5]**	Selection list	0x2301:002	CANopen
└ P510.03	Slave/Master	**Slave [0]**	Selection list	0x2301:003	CANopen
└ P510.04	Start rem. delay	**3000 ms**	0 ... 65535 ms	0x2301:004	CANopen
└ P510.05	SDO2 channel	**Not active [0]**	Selection list	0x2301:005	CANopen
└ P510.06	COB-ID Config	**Base + node-ID [0]**	Selection list	0x2301:006	CANopen
P510.xx	EtherCAT sett.				
└ P510.04	Device ident.	**0**	0 ... 65535	0x2361:004	EtherCAT
P510.xx	EtherN/IP sett.				
└ P510.01	IP address	**276605120**	0 ... 4294967295	0x23A1:001	EtherNet/IP
└ P510.02	Subnet	**16777215**	0 ... 4294967295	0x23A1:002	EtherNet/IP
└ P510.03	Gateway	**0**	0 ... 4294967295	0x23A1:003	EtherNet/IP
└ P510.04	Host name		Text	0x23A1:004	EtherNet/IP
└ P510.05	IP configuration	**BOOTP [1]**	Selection list	0x23A1:005	EtherNet/IP
└ P510.06	Multicast TTL	**1**	1 ... 255	0x23A1:006	EtherNet/IP
└ P510.07	Mcast allocation	**Default alloc. [0]**	Selection list	0x23A1:007	EtherNet/IP
└ P510.08	Mcast IP addr.	**3221373167**	0 ... 4294967295	0x23A1:008	EtherNet/IP
└ P510.09	Multicast number	**1**	1 ... 8	0x23A1:009	EtherNet/IP
└ P510.10	Timeout	**10000 ms**	500 ... 65535 ms	0x23A1:010	EtherNet/IP
P510.xx	Modbus sett.				
└ P510.01	Node ID	**1**	1 ... 247	0x2321:001	Modbus RTU
└ P510.02	Baud rate	**Automatic [0]**	Selection list	0x2321:002	Modbus RTU

* Default setting depending on the size. Firmware version 05.00.00.00



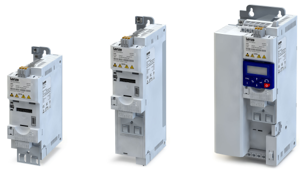
Display code	Short designation	Default setting	Setting range	Address	Category
└ P510.03	Data format	**Automatic [0]**	Selection list	0x2321:003	Modbus RTU
└ P510.04	Min. resp. time	**0 ms**	0 ... 1000 ms	0x2321:004	Modbus RTU
P510.xx	MBTCP settings				
└ P510.01	IP address	**276605120**	0 ... 4294967295	0x23B1:001	Modbus TCP
└ P510.02	Subnet	**16777215**	0 ... 4294967295	0x23B1:002	Modbus TCP
└ P510.03	Gateway	**0**	0 ... 4294967295	0x23B1:003	Modbus TCP
└ P510.05	IP configuration	**Stored IP [0]**	Selection list	0x23B1:005	Modbus TCP
└ P510.06	TTL value	**32**	1 ... 255	0x23B1:006	Modbus TCP
└ P510.10	Ethernet timeout	**10 s**	0 ... 65535 s	0x23B1:010	Modbus TCP
└ P510.11	Secondary port	**502**	0 ... 65535	0x23B1:011	Modbus TCP
P510.xx	PROFIBUS sett.				
└ P510.01	Station address	**3**	1 ... 125	0x2341:001	PROFIBUS
P510.xx	PROFINET sett.				
└ P510.01	IP address	**0**	0 ... 4294967295	0x2381:001	PROFINET
└ P510.02	Subnet	**0**	0 ... 4294967295	0x2381:002	PROFINET
└ P510.03	Gateway	**0**	0 ... 4294967295	0x2381:003	PROFINET
└ P510.04	Station name		Text	0x2381:004	PROFINET
P511.xx	CANopen diag.				
└ P511.01	Active node ID	-	- (Read only)	0x2302:001	CANopen
└ P511.02	Active baud rate	-	- (Read only)	0x2302:002	CANopen
P511.xx	EtherCAT diag.				
└ P511.04	Device ident.	-	- (Read only)	0x2362:004	EtherCAT
└ P511.06	Station address	-	- (Read only)	0x2362:006	EtherCAT
└ P511.07	Tx length	-	- (Read only)	0x2362:007	EtherCAT
└ P511.08	Rx length	-	- (Read only)	0x2362:008	EtherCAT
P511.xx	EtherN/IP diag.				
└ P511.01	IP address	-	- (Read only)	0x23A2:001	EtherNet/IP
└ P511.02	Subnet	-	- (Read only)	0x23A2:002	EtherNet/IP
└ P511.03	Gateway	-	- (Read only)	0x23A2:003	EtherNet/IP
└ P511.05	MAC address	-	- (Read only)	0x23A2:005	EtherNet/IP
└ P511.06	Mcast address	-	- (Read only)	0x23A2:006	EtherNet/IP
P511.xx	Modbus diag.				
└ P511.01	Active node ID	-	- (Read only)	0x2322:001	Modbus RTU
└ P511.02	Active baud rate	-	- (Read only)	0x2322:002	Modbus RTU
└ P511.03	Data format	-	- (Read only)	0x2322:003	Modbus RTU
P511.xx	Act. MBTCP sett.				
└ P511.01	Act. IP address	-	- (Read only)	0x23B2:001	Modbus TCP
└ P511.02	Act. subnet	-	- (Read only)	0x23B2:002	Modbus TCP
└ P511.03	Act. gateway	-	- (Read only)	0x23B2:003	Modbus TCP
└ P511.05	MAC address	-	- (Read only)	0x23B2:005	Modbus TCP
P511.xx	PROFIBUS diag.				
└ P511.01	Act.station addr	-	- (Read only)	0x2342:001	PROFIBUS
└ P511.02	Active baud rate	-	- (Read only)	0x2342:002	PROFIBUS
└ P511.03	Watchdog time	-	- (Read only)	0x2342:003	PROFIBUS
P511.xx	PROFINET diag.				
└ P511.01	IP address	-	- (Read only)	0x2382:001	PROFINET
└ P511.02	Subnet	-	- (Read only)	0x2382:002	PROFINET
└ P511.03	Gateway	-	- (Read only)	0x2382:003	PROFINET
└ P511.04	Station name	-	- (Read only)	0x2382:004	PROFINET
└ P511.05	MAC Address	-	- (Read only)	0x2382:005	PROFINET
P512.xx	Port settings				
└ P512.01	Port 1	**Auto-Negotiation [0]**	Selection list	0x23A4:001	EtherNet/IP
└ P512.02	Port 2	**Auto-Negotiation [0]**	Selection list	0x23A4:002	EtherNet/IP
P512.xx	Port settings				
* Default setting depending on the size.					Firmware version 05.00.00.00

Display code	Short designation	Default setting	Setting range	Address	Category
└ P512.01	Port 1	**Auto-Negotiation [0]**	Selection list	0x23B4:001	Modbus TCP
└ P512.02	Port 2	**Auto-Negotiation [0]**	Selection list	0x23B4:002	Modbus TCP
P512.xx	PROFIBUS Config.				
└ P512.01	Ext. diag. bit	**Delete [0]**	Selection list	0x2344:001	PROFIBUS
P513.00	QualityOfService	-	- (Read only)	0x23A6	EtherNet/IP
P513.xx	Act. port sett.				
└ P513.01	Port 1	-	- (Read only)	0x23B5:001	Modbus TCP
└ P513.02	Port 2	-	- (Read only)	0x23B5:002	Modbus TCP
P514.00	AddrConflctDetec	**Enabled [1]**	Selection list	0x23A7	EtherNet/IP
P514.xx	MBTCP t-out mon				
└ P514.01	Time-out time	**2.0 s**	0.0 ... 300.0 s	0x23B6:001	Modbus TCP
└ P514.02	Keep al t-out	**2.0 s**	0.0 ... 300.0 s	0x23B6:002	Modbus TCP
└ P514.05	Keep al register	**0**	0 ... 65535	0x23B6:005	Modbus TCP
P515.00	Time-out status	-	- (Read only)	0x2307	CANopen
P515.xx	EtherCAT monit.				
└ P515.01	WD elapsed	**Trouble [2]**	Selection list	0x2859:001	EtherCAT
└ P515.03	Invalid config	**Trouble [2]**	Selection list	0x2859:003	EtherCAT
└ P515.04	Init. error	**Trouble [2]**	Selection list	0x2859:004	EtherCAT
└ P515.05	Inval. proc.data	**Trouble [2]**	Selection list	0x2859:005	EtherCAT
P515.xx	EtherN/IP monit.				
└ P515.01	WD elapsed	**Trouble [2]**	Selection list	0x2859:001	EtherNet/IP
└ P515.03	Invalid config	**Trouble [2]**	Selection list	0x2859:003	EtherNet/IP
└ P515.04	Init. error	**Trouble [2]**	Selection list	0x2859:004	EtherNet/IP
└ P515.05	Inval. proc.data	**Trouble [2]**	Selection list	0x2859:005	EtherNet/IP
└ P515.06	Timeout ExplMsg	**Warning [1]**	Selection list	0x2859:006	EtherNet/IP
└ P515.07	Timeout Comm.	**Warning [1]**	Selection list	0x2859:007	EtherNet/IP
P515.xx	Modbus monit.				
└ P515.01	Resp. Time-out	**Fault [3]**	Selection list	0x2858:001	Modbus RTU
└ P515.02	Time-out time	**2.0 s**	0.0 ... 300.0 s	0x2858:002	Modbus RTU
P515.xx	MBTCP monitoring				
└ P515.03	Config error	**Trouble [2]**	Selection list	0x2859:003	Modbus TCP
└ P515.04	Init error	**Trouble [2]**	Selection list	0x2859:004	Modbus TCP
└ P515.07	React t-out netw	**Warning [1]**	Selection list	0x2859:007	Modbus TCP
└ P515.08	React t-out mast	**Fault [3]**	Selection list	0x2859:008	Modbus TCP
└ P515.09	Reac t-out kp-al	**Fault [3]**	Selection list	0x2859:009	Modbus TCP
P515.xx	PROFIBUS monit.				
└ P515.01	WD elapsed	**Trouble [2]**	Selection list	0x2859:001	PROFIBUS
└ P515.02	Data exch.exited	**No response [0]**	Selection list	0x2859:002	PROFIBUS
└ P515.03	Invalid config	**Trouble [2]**	Selection list	0x2859:003	PROFIBUS
└ P515.04	Init. error	**Trouble [2]**	Selection list	0x2859:004	PROFIBUS
└ P515.05	Inval. proc.data	**Trouble [2]**	Selection list	0x2859:005	PROFIBUS
P515.xx	PROFINET monit.				
└ P515.01	WD elapsed	**Trouble [2]**	Selection list	0x2859:001	PROFINET
└ P515.02	Data exch.exited	**No response [0]**	Selection list	0x2859:002	PROFINET
└ P515.03	Invalid config	**Trouble [2]**	Selection list	0x2859:003	PROFINET
└ P515.04	Init. error	**Trouble [2]**	Selection list	0x2859:004	PROFINET
└ P515.05	Inval. proc.data	**Trouble [2]**	Selection list	0x2859:005	PROFINET
P516.00	CANopen status	-	- (Read only)	0x2308	CANopen
P516.00	EtherCAT status	-	- (Read only)	0x2368	EtherCAT
P516.00	CIP module stat.	-	- (Read only)	0x23A8	EtherNet/IP
P516.00	MBTCP modul. stat	-	- (Read only)	0x23B8	Modbus TCP
P516.xx	PROFIBUS Status				
└ P516.01	Bus status	-	- (Read only)	0x2348:001	PROFIBUS
└ P516.02	Watchdog status	-	- (Read only)	0x2348:002	PROFIBUS
* Default setting depending on the size.					Firmware version 05.00.00.00



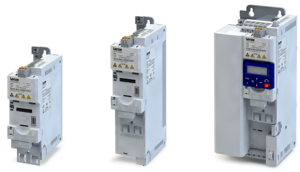
Display code	Short designation	Default setting	Setting range	Address	Category
P516.00	PROFINET status	-	- (Read only)	0x2388	PROFINET
P517.00	CAN contr.status	-	- (Read only)	0x2309	CANopen
P517.00	EtherCAT error	-	- (Read only)	0x2369	EtherCAT
P517.00	EtherN/IP status	-	- (Read only)	0x23A9	EtherNet/IP
P517.00	MBTCP netw stat	-	- (Read only)	0x23B9	Modbus TCP
P517.00	PROFIBUS error	-	- (Read only)	0x2349	PROFIBUS
P517.xx	PROFINET error				
└ P517.01	Error 1	-	- (Read only)	0x2389:001	PROFINET
└ P517.02	Error2	-	- (Read only)	0x2389:002	PROFINET
P518.00	CAN errorcounter	-	- (Read only)	0x230B	CANopen
P519.xx	Port diagnostics				
└ P519.01	Port 1	-	- (Read only)	0x23A5:001	EtherNet/IP
└ P519.02	Port 2	-	- (Read only)	0x23A5:002	EtherNet/IP
P520.xx	Cons. heartbeat				
└ P520.00	Highest subindex	-	- (Read only)	0x1016:000	CANopen
└ P520.01	Cons. heartbeat1	**0x00000000**	0x00000000 ... 0x00FFFFFF	0x1016:001	CANopen
└ P520.02	Cons. heartbeat2	**0x00000000**	0x00000000 ... 0x00FFFFFF	0x1016:002	CANopen
└ P520.03	Cons. heartbeat3	**0x00000000**	0x00000000 ... 0x00FFFFFF	0x1016:003	CANopen
└ P520.04	Cons. heartbeat4	**0x00000000**	0x00000000 ... 0x00FFFFFF	0x1016:004	CANopen
P522.00	Prod. heartbeat	**0 ms**	0 ... 65535 ms	0x1017	CANopen
P530.xx	Para. mapping				
└ P530.01 ... 24	Parameter 1 ... Parameter 24	**0x00000000**	0x00000000 ... 0xFFFFFF00	0x232B:001 ... 0x232B:024	Modbus RTU
P530.xx	MBTCP param.mapp				
└ P530.01 ... 24	Parameter 1 ... Parameter 24	**0x00000000**	0x00000000 ... 0xFFFFFFFF	0x23BB:001 ... 0x23BB:024	Modbus TCP
P531.xx	Reg. assigned				
└ P531.01 ... 24	Register 1 ... Register 24	-	- (Read only)	0x232C:001 ... 0x232C:024	Modbus RTU
P531.xx	Register assignm				
└ P531.01 ... 24	Register 1 ... Register 24	-	- (Read only)	0x23BC:001 ... 0x23BC:024	Modbus TCP
P532.00	Verificationcode	-	- (Read only)	0x232D	Modbus RTU
P532.00	Verificat. code	-	- (Read only)	0x23BD	Modbus TCP
P540.xx	RPDO1 config.				
└ P540.01	COB-ID	**0x00000200**	0x00000000 ... 0xFFFFFFFF	0x1400:001	CANopen
└ P540.02	Transm. type	**255**	0 ... 255	0x1400:002	CANopen
└ P540.05	Event timer	**100 ms**	0 ... 65535 ms	0x1400:005	CANopen
P541.xx	RPDO2 config.				
└ P541.01	COB-ID	**0x80000300**	0x00000000 ... 0xFFFFFFFF	0x1401:001	CANopen
└ P541.02	Transm. type	**255**	0 ... 255	0x1401:002	CANopen
└ P541.05	Event timer	**100 ms**	0 ... 65535 ms	0x1401:005	CANopen
P542.xx	RPDO3 config.				
└ P542.01	COB-ID	**0x80000400**	0x00000000 ... 0xFFFFFFFF	0x1402:001	CANopen
└ P542.02	Transm. type	**255**	0 ... 255	0x1402:002	CANopen
└ P542.05	Event timer	**100 ms**	0 ... 65535 ms	0x1402:005	CANopen
P550.xx	TPDO1 config.				
└ P550.01	COB-ID	**0x40000180**	0x00000001 ... 0xFFFFFFFF	0x1800:001	CANopen
└ P550.02	Transm. type	**255**	0 ... 255	0x1800:002	CANopen
└ P550.03	Inhibit time	**0.0 ms**	0.0 ... 6553.5 ms	0x1800:003	CANopen
└ P550.05	Event timer	**20 ms**	0 ... 65535 ms	0x1800:005	CANopen
└ P550.05	NetWordIN5	**0.0 %**	-100.0 ... 100.0 %	0x4008:005	general
P551.xx	TPDO2 config.				
└ P551.01	COB-ID	**0xC0000280**	0x00000001 ... 0xFFFFFFFF	0x1801:001	CANopen
* Default setting depending on the size.					Firmware version 05.00.00.00

Display code	Short designation	Default setting	Setting range	Address	Category
└ P551.02	Transm. type	**255**	0 ... 255	0x1801:002	CANopen
└ P551.03	Inhibit time	**0.0 ms**	0.0 ... 6553.5 ms	0x1801:003	CANopen
└ P551.05	Event timer	**0 ms**	0 ... 65535 ms	0x1801:005	CANopen
P552.xx	TPDO3 config.				
└ P552.01	COB-ID	**0xC0000380**	0x00000001 ... 0xFFFFFFFF	0x1802:001	CANopen
└ P552.02	Transm. type	**255**	0 ... 255	0x1802:002	CANopen
└ P552.03	Inhibit time	**0.0 ms**	0.0 ... 6553.5 ms	0x1802:003	CANopen
└ P552.05	Event timer	**0 ms**	0 ... 65535 ms	0x1802:005	CANopen
P580.xx	CAN statistics				
└ P580.01	PDO1 received	-	- (Read only)	0x230A:001	CANopen
└ P580.02	PDO2 received	-	- (Read only)	0x230A:002	CANopen
└ P580.03	PDO3 received	-	- (Read only)	0x230A:003	CANopen
└ P580.05	PDO1 transmitted	-	- (Read only)	0x230A:005	CANopen
└ P580.06	PDO2 transmitted	-	- (Read only)	0x230A:006	CANopen
└ P580.07	PDO3 transmitted	-	- (Read only)	0x230A:007	CANopen
└ P580.09	SDO1 counter	-	- (Read only)	0x230A:009	CANopen
└ P580.10	SDO2 counter	-	- (Read only)	0x230A:010	CANopen
P580.xx	Modbus statistic				
└ P580.01	Mess. received	-	- (Read only)	0x232A:001	Modbus RTU
└ P580.02	Val. mess. rec.	-	- (Read only)	0x232A:002	Modbus RTU
└ P580.03	Mess. w. exc.	-	- (Read only)	0x232A:003	Modbus RTU
└ P580.04	Mess. w. errors	-	- (Read only)	0x232A:004	Modbus RTU
└ P580.05	Messages sent	-	- (Read only)	0x232A:005	Modbus RTU
P580.xx	MBTCP statistics				
└ P580.01	Rx messages	-	- (Read only)	0x23BA:001	Modbus TCP
└ P580.02	Valid Rx messag.	-	- (Read only)	0x23BA:002	Modbus TCP
└ P580.03	Mess. w. except	-	- (Read only)	0x23BA:003	Modbus TCP
└ P580.05	Tx messages	-	- (Read only)	0x23BA:005	Modbus TCP
P580.xx	PROFIBUS counter				
└ P580.01	Data cycles/sec.	-	- (Read only)	0x234A:001	PROFIBUS
└ P580.02	PRM events	-	- (Read only)	0x234A:002	PROFIBUS
└ P580.03	CFG events	-	- (Read only)	0x234A:003	PROFIBUS
└ P580.04	DIAG events	-	- (Read only)	0x234A:004	PROFIBUS
└ P580.05	C1 messages	-	- (Read only)	0x234A:005	PROFIBUS
└ P580.06	C2 messages	-	- (Read only)	0x234A:006	PROFIBUS
└ P580.07	WD events	-	- (Read only)	0x234A:007	PROFIBUS
└ P580.08	DataEx.event	-	- (Read only)	0x234A:008	PROFIBUS
└ P580.09	Tot. data cycles	-	- (Read only)	0x234A:009	PROFIBUS
P583.xx	Rx data diagn.				
└ P583.01	Rx data offset	**0**	0 ... 240	0x232E:001	Modbus RTU
└ P583.02	Last RxD byte0	-	- (Read only)	0x232E:002	Modbus RTU
└ P583.03	Last RxD byte1	-	- (Read only)	0x232E:003	Modbus RTU
└ P583.04	Last RxD byte2	-	- (Read only)	0x232E:004	Modbus RTU
└ P583.05	Last RxD byte3	-	- (Read only)	0x232E:005	Modbus RTU
└ P583.06	Last RxD byte4	-	- (Read only)	0x232E:006	Modbus RTU
└ P583.07	Letzt RxD-Byte5	-	- (Read only)	0x232E:007	Modbus RTU
└ P583.08	Last RxD byte6	-	- (Read only)	0x232E:008	Modbus RTU
└ P583.09	Last RxD byte7	-	- (Read only)	0x232E:009	Modbus RTU
└ P583.10	Last RxD byte8	-	- (Read only)	0x232E:010	Modbus RTU
└ P583.11	Last RxD byte9	-	- (Read only)	0x232E:011	Modbus RTU
└ P583.12	Last RxD byte10	-	- (Read only)	0x232E:012	Modbus RTU
└ P583.13	Last RxD byte11	-	- (Read only)	0x232E:013	Modbus RTU
└ P583.14	Last RxD byte12	-	- (Read only)	0x232E:014	Modbus RTU
└ P583.15	Last RxD byte13	-	- (Read only)	0x232E:015	Modbus RTU
* Default setting depending on the size.					Firmware version 05.00.00.00



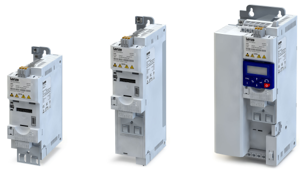
Display code	Short designation	Default setting	Setting range	Address	Category
└ P583.16	Last RxD byte14	-	- (Read only)	0x232E:016	Modbus RTU
└ P583.17	Last RxD byte15	-	- (Read only)	0x232E:017	Modbus RTU
P585.xx	Tx data diagn.				
└ P585.01	Tx data offset	**0**	0 ... 240	0x232F:001	Modbus RTU
└ P585.02	Last TxD byte0	-	- (Read only)	0x232F:002	Modbus RTU
└ P585.03	Last TxD Byte1	-	- (Read only)	0x232F:003	Modbus RTU
└ P585.04	Last TxD byte2	-	- (Read only)	0x232F:004	Modbus RTU
└ P585.05	Last TxD byte3	-	- (Read only)	0x232F:005	Modbus RTU
└ P585.06	Last TxD byte4	-	- (Read only)	0x232F:006	Modbus RTU
└ P585.07	Last TxD byte5	-	- (Read only)	0x232F:007	Modbus RTU
└ P585.08	Last TxD byte6	-	- (Read only)	0x232F:008	Modbus RTU
└ P585.09	Last TxD byte7	-	- (Read only)	0x232F:009	Modbus RTU
└ P585.10	Last TxD byte8	-	- (Read only)	0x232F:010	Modbus RTU
└ P585.11	Last TxD byte9	-	- (Read only)	0x232F:011	Modbus RTU
└ P585.12	Last TxD byte10	-	- (Read only)	0x232F:012	Modbus RTU
└ P585.13	Last TxD byte11	-	- (Read only)	0x232F:013	Modbus RTU
└ P585.14	Last TxD byte12	-	- (Read only)	0x232F:014	Modbus RTU
└ P585.15	Last TxD byte13	-	- (Read only)	0x232F:015	Modbus RTU
└ P585.16	Last TxD byte14	-	- (Read only)	0x232F:016	Modbus RTU
└ P585.17	Last TxD byte15	-	- (Read only)	0x232F:017	Modbus RTU
P585.xx	MBTCP Tx/Rx diag				
└ P585.01	Rx offset	**0**	0 ... 240	0x23BE:001	Modbus TCP
└ P585.02	Last Rx message	-	- (Read only)	0x23BE:002	Modbus TCP
└ P585.03	Tx offset	**0**	0 ... 240	0x23BE:003	Modbus TCP
└ P585.04	Last Tx message	-	- (Read only)	0x23BE:004	Modbus TCP
P590.xx	NetWordINx				
└ P590.01	NetWordIN1	**0x0000**	0x0000 ... 0xFFFF	0x4008:001	general
└ P590.02	NetWordIN2	**0x0000**	0x0000 ... 0xFFFF	0x4008:002	general
└ P590.03	NetWordIN3	**0.0 %**	0.0 ... 100.0 %	0x4008:003	general
└ P590.04	NetWordIN4	**0.0 %**	0.0 ... 100.0 %	0x4008:004	general
P591.xx	NetWordOUTx				
└ P591.01	NetWordOUT1	-	- (Read only)	0x400A:001	general
└ P591.02	NetWordOUT2	-	- (Read only)	0x400A:002	general
P592.xx	Process data IN				
└ P592.01	AC control word	**0x0000**	0x0000 ... 0xFFFF	0x400B:001	general
└ P592.02	LECOM ctrl word	**0x0000**	0x0000 ... 0xFFFF	0x400B:002	general
└ P592.03	Net.freq. 0.1	**0.0 Hz**	0.0 ... 599.0 Hz	0x400B:003	general
└ P592.04	Net.setp. speed	**0 rpm**	0 ... 50000 rpm	0x400B:004	general
└ P592.05	Net.freq. 0.01	**0.00 Hz**	0.00 ... 599.00 Hz	0x400B:005	general
└ P592.06	Veloc. mode setp	**0.0 Hz**	-599.0 ... 599.0 Hz	0x400B:006	general
└ P592.07	PID setpoint	**0.00 PID unit**	-300.00 ... 300.00 PID unit	0x400B:007	general
└ P592.08	Torque mode setp	**0 Nm**	-32768 ... 32767 Nm	0x400B:008	general
└ P592.09	Torque scaling	**0**	-128 ... 127	0x400B:009	general
└ P592.11	PID feedback	**0.00 PID unit**	-300.00 ... 300.00 PID unit	0x400B:011	general
└ P592.12	NetSetfreq0.02Hz	**0 Hz**	-29950 ... 29950 Hz	0x400B:012	general
└ P592.13	N.FrqSet+/-16384	**0**	-32768 ... 32767	0x400B:013	general
P593.xx	Process data OUT				
└ P593.01	AC status word	-	- (Read only)	0x400C:001	general
└ P593.02	LECOM stat. word	-	- (Read only)	0x400C:002	general
└ P593.03	Frequency (0.1)	x.x Hz	- (Read only)	0x400C:003	general
└ P593.04	Motor speed	x rpm	- (Read only)	0x400C:004	general
└ P593.05	Drive status	-	- (Read only)	0x400C:005	general
└ P593.06	Frequency 0.01	x.xx Hz	- (Read only)	0x400C:006	general
└ P593.07	Torque scaled	-	- (Read only)	0x400C:007	general
* Default setting depending on the size.					Firmware version 05.00.00.00

Display code	Short designation	Default setting	Setting range	Address	Category
└ P593.08	Frequency 0.02Hz	Hz	- (Read only)	0x400C:008	general
└ P593.09	Freq. [+/-16384]	-	- (Read only)	0x400C:009	general
P595.xx	PAM monitoring				
└ P595.02	Keep alive reg.	**0**	0 ... 65535	0x2552:002	general
└ P595.03	Time-out time	**10.0 s**	0.0 ... 6553.5 s	0x2552:003	general
└ P595.04	Reaction	**No response [0]**	Selection list	0x2552:004	general
└ P595.05	Action	**No action [0]**	Selection list	0x2552:005	general
└ P595.06	PAM status	-	- (Read only)	0x2552:006	general
└ P595.07	WLAN reset t.out	**0 s**	0 ... 65535 s	0x2552:007	general
P600.xx	PID setup				
└ P600.01	Operating mode	**Inhibited [0]**	Selection list	0x4020:001	general
└ P600.02	PID process var.	**Analog input 1 [1]**	Selection list	0x4020:002	general
└ P600.03	PID speed range	**100 %**	0 ... 100 %	0x4020:003	general
└ P600.04	PID line speed	**w/o speed.add. [0]**	Selection list	0x4020:004	general
└ P600.05	Min speed lim	**-100.0 %**	-100.0 ... 100.0 %	0x4020:005	general
└ P600.06	Max speed lim	**100.0 %**	-100.0 ... 100.0 %	0x4020:006	general
P601.00	PID P-component	**5.0 %**	0.0 ... 1000.0 %	0x4048	general
P602.00	PID I- component	**400 ms**	10 ... 6000 ms	0x4049	general
P603.00	PID D-component	**0.0 s**	0.0 ... 20.0 s	0x404A	general
P604.00	PID setp.ramp	**20.0 s**	0.0 ... 100.0 s	0x404B	general
P605.xx	PID setp. limit				
└ P605.01	Minimum setpoint	**-300.00 PID unit**	-300.00 ... 300.00 PID unit	0x404E:001	general
└ P605.02	Maximum setpoint	**300.00 PID unit**	-300.00 ... 300.00 PID unit	0x404E:002	general
P606.xx	PID speed op.				
└ P606.01	Accel. time	**1.0 s**	0.0 ... 3600.0 s	0x4021:001	general
└ P606.02	Decel. time	**1.0 s**	0.0 ... 3600.0 s	0x4021:002	general
P607.xx	PID influence				
└ P607.01	Activation time	**5.0 s**	0.0 ... 999.9 s	0x404C:001	general
└ P607.02	Mask out time	**5.0 s**	0.0 ... 999.9 s	0x404C:002	general
P608.xx	PID alarms				
└ P608.01	MIN alarm thrsh.	**0.00 PID unit**	-300.00 ... 300.00 PID unit	0x404D:001	general
└ P608.02	MAX alarm thrsh.	**100.00 PID unit**	-300.00 ... 300.00 PID unit	0x404D:002	general
└ P608.03	Bandw. feedback	**2.00 %**	0.00 ... 100.00 %	0x404D:003	general
P610.xx	PID sleep mode				
└ P610.01	Activation	**Disabled [0]**	Selection list	0x4023:001	general
└ P610.02	Stop method	**Coasting [0]**	Selection list	0x4023:002	general
└ P610.03	Freq. thresh.	**0.0 Hz**	0.0 ... 599.0 Hz	0x4023:003	general
└ P610.04	Feedback thresh.	**0.00 PID unit**	-300.00 ... 300.00 PID unit	0x4023:004	general
└ P610.05	Delay time	**0.0 s**	0.0 ... 300.0 s	0x4023:005	general
└ P610.06	Recovery	**Setp. > P610.3 [0]**	Selection list	0x4023:006	general
└ P610.07	Bandwidth	**0.00 PID unit**	0.00 ... 300.00 PID unit	0x4023:007	general
└ P610.08	Recovery thresh.	**0.00 PID unit**	-300.00 ... 300.00 PID unit	0x4023:008	general
P615.xx	Auto-rinsing				
└ P615.01	Rinsing in idle	**Inhibited [0]**	Selection list	0x4024:001	general
└ P615.02	Rinse interval	**30.0 min**	0.0 ... 6000.0 min	0x4024:002	general
└ P615.03	Rinse speed	**0.0 Hz**	-599.0 ... 599.0 Hz	0x4024:003	general
└ P615.04	Rinse period	**0.0 s**	0.0 ... 6000.0 s	0x4024:004	general
P700.xx	Device commands				
└ P700.01	Load def. sett.	**Off / ready [0]**	Selection list	0x2022:001	general
└ P700.03	Save user data	**Off / ready [0]**	Selection list	0x2022:003	general
└ P700.04	Load user data	**Off / ready [0]**	Selection list	0x2022:004	general
└ P700.05	Load OEM data	**Off / ready [0]**	Selection list	0x2022:005	general
└ P700.06	Save OEM data	**Off / ready [0]**	Selection list	0x2022:006	general
└ P700.07	Load par. set 1	**Off / ready [0]**	Selection list	0x2022:007	general
* Default setting depending on the size.					Firmware version 05.00.00.00

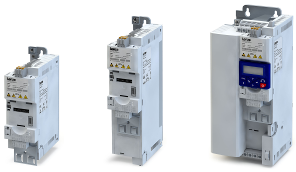


Display code	Short designation	Default setting	Setting range	Address	Category
└ P700.08	Load par. set 2	**Off / ready [0]**	Selection list	0x2022:008	general
└ P700.09	Load par. set 3	**Off / ready [0]**	Selection list	0x2022:009	general
└ P700.10	Load par. set 4	**Off / ready [0]**	Selection list	0x2022:010	general
└ P700.11	Save par. set 1	**Off / ready [0]**	Selection list	0x2022:011	general
└ P700.12	Save par. set 2	**Off / ready [0]**	Selection list	0x2022:012	general
└ P700.13	Save par. set 3	**Off / ready [0]**	Selection list	0x2022:013	general
└ P700.14	Save par. set 4	**Off / ready [0]**	Selection list	0x2022:014	general
└ P700.15	Delete logbook	**Off / ready [0]**	Selection list	0x2022:015	general
P701.00	KP setp. incr.	**1**	1 ... 100	0x2862	general
P702.00	Scal.speed fact.	**0.00**	0.00 ... 650.00	0x4002	general
P703.00	KP status displ.	**0x00000000**	0x00000000 ... 0xFFFFFF00	0x2864	general
P704.xx	DC braking				
└ P704.01	Current	**0.0 %**	0.0 ... 200.0 %	0x2B84:001	general
└ P704.02	Hold time autom.	**0.0 s**	0.0 ... 1000.0 s	0x2B84:002	general
└ P704.03	Threshold autom.	**0.0 Hz**	0.0 ... 599.0 Hz	0x2B84:003	general
└ P704.04	Demagnet. time	**100 %**	0 ... 150 %	0x2B84:004	general
└ P704.05	Def. demag. time	x ms	- (Read only)	0x2B84:005	general
└ P704.06	DCbrk/inv.disab	**0**	0 ... 1	0x2B84:006	general
P705.00	KP language	**English [1]**	Selection list	0x2863	general
P706.xx	Brake management				
└ P706.01	Operating mode	**Rfg stop (RFGS) [1]**	Selection list	0x2541:001	general
└ P706.02	Active threshold	x V	- (Read only)	0x2541:002	general
└ P706.03	Red. threshold	**0 V**	0 ... 100 V	0x2541:003	general
└ P706.04	Add.frequency	**0.0 Hz**	0.0 ... 10.0 Hz	0x2541:004	general
└ P706.05	Del.overr.time	**2.0 s**	0.0 ... 60.0 s	0x2541:005	general
└ P706.06	Brk. res. behav	**Off:disabl+error [0]**	Selection list	0x2541:006	general
P707.xx	Brake resistor				
└ P707.02	Resistance value	**180.0 Ω** *	0.0 ... 500.0 Ω	0x2550:002	general
└ P707.03	Rated power	**50 W** *	0 ... 800000 W	0x2550:003	general
└ P707.04	Maximum heat	**8.0 kWs** *	0.0 ... 100000.0 kWs	0x2550:004	general
└ P707.07	Thermal load	x.x %	- (Read only)	0x2550:007	general
└ P707.08	Warning thresh.	**90.0 %**	50.0 ... 150.0 %	0x2550:008	general
└ P707.09	Error thresh.	**100.0 %**	50.0 ... 150.0 %	0x2550:009	general
└ P707.10	Warning resp.	**Warning [1]**	Selection list	0x2550:010	general
└ P707.11	Error response	**Fault [3]**	Selection list	0x2550:011	general
P708.xx	Keypad setup				
└ P708.01	CTRL&F/R keys	**CTRL&F/R Enable [1]**	Selection list	0x2602:001	general
└ P708.02	Select rot.dir.	**Forward [0]**	Selection list	0x2602:002	general
└ P708.03	Keypad Full Ctrl	**Off [0]**	Selection list	0x2602:003	general
P710.xx	Load loss detect				
└ P710.01	Threshold	**0.0 %**	0.0 ... 200.0 %	0x4006:001	general
└ P710.02	Deceleration	**0.0 s**	0.0 ... 300.0 s	0x4006:002	general
P711.xx	Position counter				
└ P711.01	Signal source	**Disbled [0]**	Selection list	0x2C49:001	general
└ P711.02	Reset mode	**Rising edge [0]**	Selection list	0x2C49:002	general
└ P711.03	Actual position	-	- (Read only)	0x2C49:003	general
P712.xx	Brake control				
└ P712.01	Brake mode	**Off [2]**	Selection list	0x2820:001	general
└ P712.02	Closing time	**100 ms**	0 ... 10000 ms	0x2820:002	general
└ P712.03	Opening time	**100 ms**	0 ... 10000 ms	0x2820:003	general
└ P712.07	Closing thresh.	**0.2 Hz**	0.0 ... 599.0 Hz	0x2820:007	general
└ P712.08	Holding load	**0.0 %**	-500.0 ... 500.0 %	0x2820:008	general
└ P712.12	ClosingThr delay	**0 ms**	0 ... 10000 ms	0x2820:012	general
└ P712.13	HoldLoad ramptim	**0 ms**	0 ... 100 ms	0x2820:013	general
* Default setting depending on the size.					Firmware version 05.00.00.00

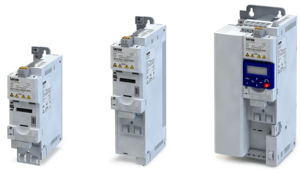
Display code	Short designation	Default setting	Setting range	Address	Category
└ P712.15	Brake status	-	- (Read only)	0x2820:015	general
P718.xx	Flying restart				
└ P718.01	Current	**30 %**	0 ... 100 %	0x2BA1:001	MCTRL
└ P718.02	Start frequency	**20.0 Hz**	-599.0 ... 599.0 Hz	0x2BA1:002	MCTRL
└ P718.03	Restart time	**5911 ms** *	1 ... 60000 ms	0x2BA1:003	MCTRL
└ P718.08	Fl.res.frequency	x.x Hz	- (Read only)	0x2BA1:008	MCTRL
P721.xx	Mains fail. ctrl				
└ P721.01	Enable function	**Disabled [0]**	Selection list	0x2D66:001	general
└ P721.02	DC-bus act.level	**0 %** *	60 ... 90 %	0x2D66:002	general
└ P721.03	Gain V-ctrl	**0.01000 Hz/V**	0.00001 ... 0.50000 Hz/V	0x2D66:003	general
└ P721.04	Res. time V-ctrl	**20 ms**	5 ... 2000 ms	0x2D66:004	general
└ P721.05	DC voltage setp.	**100 %**	80 ... 110 %	0x2D66:005	general
└ P721.06	Setp. ramp	**20 ms**	1 ... 16000 ms	0x2D66:006	general
└ P721.07	Clear time	**20 ms**	1 ... 60000 ms	0x2D66:007	general
└ P721.08	Restart level	**0.0 Hz**	0.0 ... 599.0 Hz	0x2D66:008	general
└ P721.09	RERT:Status	-	- (Read only)	0x2D66:009	general
P730.00	PIN1 protection	**0**	-1 ... 9999	0x203D	general
P731.00	PIN2 protection	**0**	-1 ... 9999	0x203E	general
P732.00	Auto-Save EPM	**Inhibit [0]**	Selection list	0x2829	general
P740.xx	Favorites sett.				
└ P740.01	Parameter 1	**0x2DDD0000**	0x00000000 ... 0xFFFFFF00	0x261C:001	general
└ P740.02	Parameter 2	**0x60780000**	0x00000000 ... 0xFFFFFF00	0x261C:002	general
└ P740.03	Parameter 3	**0x2D890000**	0x00000000 ... 0xFFFFFF00	0x261C:003	general
└ P740.04	Parameter 4	**0x603F0000**	0x00000000 ... 0xFFFFFF00	0x261C:004	general
└ P740.05	Parameter 5	**0x28240000**	0x00000000 ... 0xFFFFFF00	0x261C:005	general
└ P740.06	Parameter 6	**0x28600100**	0x00000000 ... 0xFFFFFF00	0x261C:006	general
└ P740.07	Parameter 7	**0x28380100**	0x00000000 ... 0xFFFFFF00	0x261C:007	general
└ P740.08	Parameter 8	**0x28380300**	0x00000000 ... 0xFFFFFF00	0x261C:008	general
└ P740.09	Parameter 9	**0x25400100**	0x00000000 ... 0xFFFFFF00	0x261C:009	general
└ P740.10	Parameter 10	**0x29150000**	0x00000000 ... 0xFFFFFF00	0x261C:010	general
└ P740.11	Parameter 11	**0x29160000**	0x00000000 ... 0xFFFFFF00	0x261C:011	general
└ P740.12	Parameter 12	**0x29170000**	0x00000000 ... 0xFFFFFF00	0x261C:012	general
└ P740.13	Parameter 13	**0x29180000**	0x00000000 ... 0xFFFFFF00	0x261C:013	general
└ P740.14	Parameter 14	**0x2C000000**	0x00000000 ... 0xFFFFFF00	0x261C:014	general
└ P740.15	Parameter 15	**0x2B000000**	0x00000000 ... 0xFFFFFF00	0x261C:015	general
└ P740.16	Parameter 16	**0x2B010100**	0x00000000 ... 0xFFFFFF00	0x261C:016	general
└ P740.17	Parameter 17	**0x2B010200**	0x00000000 ... 0xFFFFFF00	0x261C:017	general
└ P740.18	Parameter 18	**0x283A0000**	0x00000000 ... 0xFFFFFF00	0x261C:018	general
└ P740.19	Parameter 19	**0x29390000**	0x00000000 ... 0xFFFFFF00	0x261C:019	general
└ P740.20	Parameter 20	**0x2D430100**	0x00000000 ... 0xFFFFFF00	0x261C:020	general
└ P740.21	Parameter 21	**0x2D4B0100**	0x00000000 ... 0xFFFFFF00	0x261C:021	general
└ P740.22	Parameter 22	**0x2B120100**	0x00000000 ... 0xFFFFFF00	0x261C:022	general
└ P740.23	Parameter 23	**0x60750000**	0x00000000 ... 0xFFFFFF00	0x261C:023	general
└ P740.24	Parameter 24	**0x60730000**	0x00000000 ... 0xFFFFFF00	0x261C:024	general
└ P740.25	Parameter 25	**0x26310100**	0x00000000 ... 0xFFFFFF00	0x261C:025	general
└ P740.26	Parameter 26	**0x26310200**	0x00000000 ... 0xFFFFFF00	0x261C:026	general
└ P740.27	Parameter 27	**0x26310300**	0x00000000 ... 0xFFFFFF00	0x261C:027	general
└ P740.28	Parameter 28	**0x26310400**	0x00000000 ... 0xFFFFFF00	0x261C:028	general
└ P740.29	Parameter 29	**0x26310500**	0x00000000 ... 0xFFFFFF00	0x261C:029	general
└ P740.30	Parameter 30	**0x26310600**	0x00000000 ... 0xFFFFFF00	0x261C:030	general
└ P740.31	Parameter 31	**0x26310700**	0x00000000 ... 0xFFFFFF00	0x261C:031	general
└ P740.32	Parameter 32	**0x26310800**	0x00000000 ... 0xFFFFFF00	0x261C:032	general
└ P740.33	Parameter 33	**0x26310900**	0x00000000 ... 0xFFFFFF00	0x261C:033	general
└ P740.34	Parameter 34	**0x26310D00**	0x00000000 ... 0xFFFFFF00	0x261C:034	general
* Default setting depending on the size.					Firmware version 05.00.00.00



Display code	Short designation	Default setting	Setting range	Address	Category
└ P740.35	Parameter 35	**0x26311200**	0x00000000 ... 0xFFFFFF00	0x261C:035	general
└ P740.36	Parameter 36	**0x26311300**	0x00000000 ... 0xFFFFFF00	0x261C:036	general
└ P740.37	Parameter 37	**0x26311400**	0x00000000 ... 0xFFFFFF00	0x261C:037	general
└ P740.38	Parameter 38	**0x26340100**	0x00000000 ... 0xFFFFFF00	0x261C:038	general
└ P740.39	Parameter 39	**0x26340200**	0x00000000 ... 0xFFFFFF00	0x261C:039	general
└ P740.40	Parameter 40	**0x26360100**	0x00000000 ... 0xFFFFFF00	0x261C:040	general
└ P740.41	Parameter 41	**0x26360200**	0x00000000 ... 0xFFFFFF00	0x261C:041	general
└ P740.42	Parameter 42	**0x26360300**	0x00000000 ... 0xFFFFFF00	0x261C:042	general
└ P740.43	Parameter 43	**0x26390100**	0x00000000 ... 0xFFFFFF00	0x261C:043	general
└ P740.44	Parameter 44	**0x26390200**	0x00000000 ... 0xFFFFFF00	0x261C:044	general
└ P740.45	Parameter 45	**0x26390300**	0x00000000 ... 0xFFFFFF00	0x261C:045	general
└ P740.46	Parameter 46	**0x26390400**	0x00000000 ... 0xFFFFFF00	0x261C:046	general
└ P740.47	Parameter 47	**0x29110100**	0x00000000 ... 0xFFFFFF00	0x261C:047	general
└ P740.48	Parameter 48	**0x29110200**	0x00000000 ... 0xFFFFFF00	0x261C:048	general
└ P740.49	Parameter 49	**0x29110300**	0x00000000 ... 0xFFFFFF00	0x261C:049	general
└ P740.50	Parameter 50	**0x29110400**	0x00000000 ... 0xFFFFFF00	0x261C:050	general
P750.xx	Param.set setup				
└ P750.01 ... 32	Parameter 1 ... Parameter 32	**0x00000000**	0x00000000 ... 0xFFFFFF00	0x4041:001 ... 0x4041:032	general
P751.xx	Par. value set 1				
└ P751.01 ... 32	Set 1 - Value 1 ... Set 1 - Value 32	**0**	-2147483648 ... 2147483647	0x4042:001 ... 0x4042:032	general
P752.xx	Par. value set 2				
└ P752.01 ... 32	Set 2 - Value 1 ... Set 2 - Value 32	**0**	-2147483648 ... 2147483647	0x4043:001 ... 0x4043:032	general
P753.xx	Par. value set 3				
└ P753.01 ... 32	Set 3 - Value 1 ... Set 3 - Value 32	**0**	-2147483648 ... 2147483647	0x4044:001 ... 0x4044:032	general
P754.xx	Par. value set 4				
└ P754.01 ... 32	Set 4 - Value 1 ... Set 4 - Value 32	**0**	-2147483648 ... 2147483647	0x4045:001 ... 0x4045:032	general
P755.00	PSet activation	**On op. disabled [0]**	Selection list	0x4046	general
P756.xx	PSet error msg.				
└ P756.01	Status	-	- (Read only)	0x4047:001	general
└ P756.02	List entry	-	- (Read only)	0x4047:002	general
P760.xx	Fault config.				
└ P760.02	Restart delay	**3.0 s**	0.0 ... 1000.0 s	0x2839:002	general
└ P760.03	Restart counter	**5**	0 ... 255	0x2839:003	general
└ P760.04	Tro.count r.time	**40.0 s**	0.1 ... 3600.0 s	0x2839:004	general
└ P760.05	Trouble counter	-	- (Read only)	0x2839:005	general
P780.00	CiA: Statusword	-	- (Read only)	0x6041	general
P781.00	Target velocity	**0 rpm**	-32768 ... 32767 rpm	0x6042	general
P782.00	Velocity demand	x rpm	- (Read only)	0x6043	general
P783.00	Velocity actual	x rpm	- (Read only)	0x6044	general
P784.xx	Vel. min max				
└ P784.01	Vel. min amount	**0 rpm**	0 ... 480000 rpm	0x6046:001	general
└ P784.02	Vel. max amount	**2147483647 rpm**	0 ... 2147483647 rpm	0x6046:002	general
P785.xx	Vel.acceleration				
└ P785.01	Delta speed	**3000 rpm**	0 ... 2147483647 rpm	0x6048:001	general
└ P785.02	Delta time	**10 s**	0 ... 65535 s	0x6048:002	general
P786.xx	Vel.deceleration				
└ P786.01	Delta speed	**3000 rpm**	0 ... 2147483647 rpm	0x6049:001	general
└ P786.02	Delta time	**10 s**	0 ... 65535 s	0x6049:002	general
P788.00	Modes of op. dis	-	- (Read only)	0x6061	general
P789.00	Supported modes	-	- (Read only)	0x6502	general
* Default setting depending on the size.					Firmware version 05.00.00.00



Display code	Short designation	Default setting	Setting range	Address	Category
P790.00	Quick stop dec.	**546000 pos. unit/s²**	0 ... 2147483647 pos. unit/s²	0x6085	general
P791.00	Fault reaction	**Coasting [0]**	Selection list	0x605E	general
P800.00	Sequencer mode	**Disabled [0]**	Selection list	0x4025	general
P801.xx	Segment 1				
└ P801.01	Frequency setp.	**0.0 Hz**	-599.0 ... 599.0 Hz	0x4026:001	general
└ P801.02	Accel./decel.	**5.0 s**	0.0 ... 3600.0 s	0x4026:002	general
└ P801.03	Time	**0.0 s**	0.0 ... 100000.0 s	0x4026:003	general
└ P801.04	Digital outp.	**0**	0 ... 255	0x4026:004	general
└ P801.05	Analog outp.	**0.00 VDC**	0.00 ... 10.00 VDC	0x4026:005	general
└ P801.06	PID setp.	**0.00 PID unit**	-300.00 ... 300.00 PID unit	0x4026:006	general
└ P801.07	Torque setp.	**100.0 %**	-400.0 ... 400.0 %	0x4026:007	general
P802.xx	Segment 2				
└ P802.01	Frequency setp.	**0.0 Hz**	-599.0 ... 599.0 Hz	0x4027:001	general
└ P802.02	Accel./decel.	**5.0 s**	0.0 ... 3600.0 s	0x4027:002	general
└ P802.03	Time	**0.0 s**	0.0 ... 100000.0 s	0x4027:003	general
└ P802.04	Digital outp.	**0**	0 ... 255	0x4027:004	general
└ P802.05	Analog outp.	**0.00 VDC**	0.00 ... 10.00 VDC	0x4027:005	general
└ P802.06	PID setp.	**0.00 PID unit**	-300.00 ... 300.00 PID unit	0x4027:006	general
└ P802.07	Torque setp.	**100.0 %**	-400.0 ... 400.0 %	0x4027:007	general
P803.xx	Segment 3				
└ P803.01	Frequency setp.	**0.0 Hz**	-599.0 ... 599.0 Hz	0x4028:001	general
└ P803.02	Accel./decel.	**5.0 s**	0.0 ... 3600.0 s	0x4028:002	general
└ P803.03	Time	**0.0 s**	0.0 ... 100000.0 s	0x4028:003	general
└ P803.04	Digital outp.	**0**	0 ... 255	0x4028:004	general
└ P803.05	Analog outp.	**0.00 VDC**	0.00 ... 10.00 VDC	0x4028:005	general
└ P803.06	PID setp.	**0.00 PID unit**	-300.00 ... 300.00 PID unit	0x4028:006	general
└ P803.07	Torque setp.	**100.0 %**	-400.0 ... 400.0 %	0x4028:007	general
P804.xx	Segment 4				
└ P804.01	Frequency setp.	**0.0 Hz**	-599.0 ... 599.0 Hz	0x4029:001	general
└ P804.02	Accel./decel.	**5.0 s**	0.0 ... 3600.0 s	0x4029:002	general
└ P804.03	Time	**0.0 s**	0.0 ... 100000.0 s	0x4029:003	general
└ P804.04	Digital outp.	**0**	0 ... 255	0x4029:004	general
└ P804.05	Analog outp.	**0.00 VDC**	0.00 ... 10.00 VDC	0x4029:005	general
└ P804.06	PID setp.	**0.00 PID unit**	-300.00 ... 300.00 PID unit	0x4029:006	general
└ P804.07	Torque setp.	**100.0 %**	-400.0 ... 400.0 %	0x4029:007	general
P805.xx	Segment 5				
└ P805.01	Frequency setp.	**0.0 Hz**	-599.0 ... 599.0 Hz	0x402A:001	general
└ P805.02	Accel./decel.	**5.0 s**	0.0 ... 3600.0 s	0x402A:002	general
└ P805.03	Time	**0.0 s**	0.0 ... 100000.0 s	0x402A:003	general
└ P805.04	Digital outp.	**0**	0 ... 255	0x402A:004	general
└ P805.05	Analog outp.	**0.00 VDC**	0.00 ... 10.00 VDC	0x402A:005	general
└ P805.06	PID setp.	**0.00 PID unit**	-300.00 ... 300.00 PID unit	0x402A:006	general
└ P805.07	Torque setp.	**100.0 %**	-400.0 ... 400.0 %	0x402A:007	general
P806.xx	Segment 6				
└ P806.01	Frequency setp.	**0.0 Hz**	-599.0 ... 599.0 Hz	0x402B:001	general
└ P806.02	Accel./decel.	**5.0 s**	0.0 ... 3600.0 s	0x402B:002	general
└ P806.03	Time	**0.0 s**	0.0 ... 100000.0 s	0x402B:003	general
└ P806.04	Digital outp.	**0**	0 ... 255	0x402B:004	general
└ P806.05	Analog outp.	**0.00 VDC**	0.00 ... 10.00 VDC	0x402B:005	general
└ P806.06	PID setp.	**0.00 PID unit**	-300.00 ... 300.00 PID unit	0x402B:006	general
└ P806.07	Torque setp.	**100.0 %**	-400.0 ... 400.0 %	0x402B:007	general
P807.xx	Segment 7				
└ P807.01	Frequency setp.	**0.0 Hz**	-599.0 ... 599.0 Hz	0x402C:001	general
└ P807.02	Accel./decel.	**5.0 s**	0.0 ... 3600.0 s	0x402C:002	general
* Default setting depending on the size.					Firmware version 05.00.00.00



Display code	Short designation	Default setting	Setting range	Address	Category
└ P807.03	Time	**0.0 s**	0.0 ... 100000.0 s	0x402C:003	general
└ P807.04	Digital outp.	**0**	0 ... 255	0x402C:004	general
└ P807.05	Analog outp.	**0.00 VDC**	0.00 ... 10.00 VDC	0x402C:005	general
└ P807.06	PID setp.	**0.00 PID unit**	-300.00 ... 300.00 PID unit	0x402C:006	general
└ P807.07	Torque setp.	**100.0 %**	-400.0 ... 400.0 %	0x402C:007	general
P808.xx	Segment 8				
└ P808.01	Frequency setp.	**0.0 Hz**	-599.0 ... 599.0 Hz	0x402D:001	general
└ P808.02	Accel./decel.	**5.0 s**	0.0 ... 3600.0 s	0x402D:002	general
└ P808.03	Time	**0.0 s**	0.0 ... 100000.0 s	0x402D:003	general
└ P808.04	Digital outp.	**0**	0 ... 255	0x402D:004	general
└ P808.05	Analog outp.	**0.00 VDC**	0.00 ... 10.00 VDC	0x402D:005	general
└ P808.06	PID setp.	**0.00 PID unit**	-300.00 ... 300.00 PID unit	0x402D:006	general
└ P808.07	Torque setp.	**100.0 %**	-400.0 ... 400.0 %	0x402D:007	general
P820.00	StartOfSeq. mode	**Restart sequencr [0]**	Selection list	0x4040	general
P822.xx	End segment				
└ P822.01	Frequency setp.	**0.0 Hz**	-599.0 ... 599.0 Hz	0x402E:001	general
└ P822.02	Accel./decel.	**5.0 s**	0.0 ... 3600.0 s	0x402E:002	general
└ P822.03	Time	**0.0 s**	0.0 ... 100000.0 s	0x402E:003	general
└ P822.04	Digital outp.	**0**	0 ... 255	0x402E:004	general
└ P822.05	Analog outp.	**0.00 VDC**	0.00 ... 10.00 VDC	0x402E:005	general
└ P822.06	PID setp.	**0.00 PID unit**	-300.00 ... 300.00 PID unit	0x402E:006	general
└ P822.07	Torque setp.	**100.0 %**	-400.0 ... 400.0 %	0x402E:007	general
P824.00	End of seq. mode	**Keep running [0]**	Selection list	0x402F	general
P830.xx	Sequence 1				
└ P830.01 ... 16	Step 1 ... Step 16	**Skip step [0]**	Selection list	0x4030:001 ... 0x4030:016	general
P831.00	Cycl. sequence 1	**1**	1 ... 65535	0x4031	general
P835.xx	Sequence 2				
└ P835.01 ... 16	Step 1 ... Step 16	**Skip step [0]**	Selection list	0x4032:001 ... 0x4032:016	general
P836.00	Cycl. sequence 2	**1**	1 ... 65535	0x4033	general
P840.xx	Sequence 3				
└ P840.01 ... 16	Step 1 ... Step 16	**Skip step [0]**	Selection list	0x4034:001 ... 0x4034:016	general
P841.00	Cycl. sequence 3	**1**	1 ... 65535	0x4035	general
P845.xx	Sequence 4				
└ P845.01 ... 16	Step 1 ... Step 16	**Skip step [0]**	Selection list	0x4036:001 ... 0x4036:016	general
P846.00	Cycl. sequence 4	**1**	1 ... 65535	0x4037	general
P850.xx	Sequence 5				
└ P850.01 ... 16	Step 1 ... Step 16	**Skip step [0]**	Selection list	0x4038:001 ... 0x4038:016	general
P851.00	Cycl. sequence 5	**1**	1 ... 65535	0x4039	general
P855.xx	Sequence 6				
└ P855.01 ... 16	Step 1 ... Step 16	**Skip step [0]**	Selection list	0x403A:001 ... 0x403A:016	general
P856.00	Cycl. sequence 6	**1**	1 ... 65535	0x403B	general
P860.xx	Sequence 7				
└ P860.01 ... 16	Step 1 ... Step 16	**Skip step [0]**	Selection list	0x403C:001 ... 0x403C:016	general
P861.00	Cycl. sequence 7	**1**	1 ... 65535	0x403D	general
P865.xx	Sequence 8				
└ P865.01 ... 16	Step 1 ... Step 16	**Skip step [0]**	Selection list	0x403E:001 ... 0x403E:016	general
P866.00	Cycl. sequence 8	**1**	1 ... 65535	0x403F	general

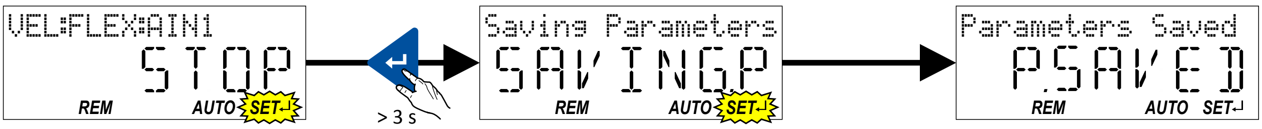
* Default setting depending on the size. Firmware version 05.00.00.00

5.5 Save parameter settings in the memory module

5.5.1 Save parameter settings with keypad

If one parameter setting has been changed with the keypad but has not been saved in the memory module with mains failure protection, the SET display is blinking.

In order to save parameter settings in the user memory of the memory module, press the keypad enter key longer than 3 s.

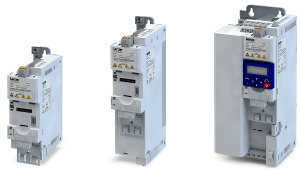


5.5.2 Save parameter settings with »EASY Starter«

If a parameter setting has been changed with the »EASY Starter« but not yet saved in the memory module with mains failure protection, the status line of the »EASY Starter« displays the note "The parameter set was changed".

In order to save parameter settings in the user memory of the memory module,

- click the button in the toolbar of the »EASY Starter« or
- press the function key **<F6>** or
- execute the device command "Save user data": 0x2022:003 (P700.03) = "On / start [1]".



6 Diagnostics and fault elimination

6.1 LED status display

The "RDY" and "ERR" LED status displays on the front of the inverter provide some quick information about certain operating states.

"RDY" LED (blue)	"ERR" LED (red)	Status/meaning
off	off	No supply voltage.
on	on	Initialisation (inverter is started.)
blinking (1 Hz)	off	Safe torque off (STO) active. ▸ Safe torque off (STO) 523
	blinking fast (4 Hz)	Safe torque off (STO) active, warning active.
blinking (2 Hz)	off	Inverter inhibited.
	blinking fast (4 Hz)	Inverter disabled, warning active. ▸ Error handling 139
	on	Inverter disabled, error active. ▸ Error handling 139
	lit every 1.5 s for a short time	Inverter inhibited, no DC-bus voltage.
	on for a short time every 1 s	USB module is connected, 5-V supply voltage for the USB module is available.
on	off	Inverter enabled. **The motor rotates according to the specified setpoint or quick stop active.**
	blinking fast (4 Hz)	Inverter enabled, warning active. **The motor rotates according to the specified setpoint or quick stop active.**
	blinking (1 Hz)	Inverter enabled, quick stop as response to fault active. ▸ Error handling 139
Both LEDs are blinking in a rapidly alternating mode		Firmware update active. ▸ Firmware download 501
Both LEDs are blinking in a very rapidly synchronous mode		"Visual tracking" function is active. ▸ Optical device identification 162

6.2 Diagnostics parameter

The inverter provides many diagnostic parameters which are helpful for operation, maintenance, error diagnosis, error correction, etc.

- In the following overview the most common diagnostic parameters are listed. For the keypad you can find these diagnostic parameters in group 1.
- Further parameters for more specific diagnostic purposes are described in the following subchapters.
- The diagnostic parameters can only be read and cannot be written to.

Parameter	Name / value range / [default setting]	Info
0x2030	CRC parameter set • Read only	Display of the 32-bit hash sum for the integrity check of the parameter set.
0x2B0B	Frequency setpoint • Read only: x.x Hz • From version 03.00	Display of the actual frequency setpoint that is internally transferred to the motor control (after scaling and ramp generator).
0x2B0E (P102.00)	Frequency setpoint (Freq. setpoint) • Read only: x.x Hz	Display of the frequency setpoint currently assigned. • Depending on the present operating conditions, this value may differ from the current output frequency 0x2DDD (P100.00).
0x2B0F	VFC output frequency • Read only: x.x Hz	Display of the current output frequency at V/f operation.
0x2D4F (P123.00)	Motor utilisation (i^2*t) (Mot. i2t utilis.) • Read only: x %	Display of the current thermal motor utilisation.
0x2D87 (P105.00)	DC-bus voltage (DC-bus voltage) • Read only: x V	Display of the current DC-bus voltage.
0x2D88 (P104.00)	Motor current (Motor current) • Read only: x.x A	Display des present current-r.m.s. value.
0x2D89 (P106.00)	Motor voltage (Motor voltage) • Read only: x VAC	Display of the current motor voltage.
0x2DA2:001 (P108.01)	Output power: Effective power (Output power: Effective power) • Read only: x.xxx kW	Display of the active output power for an energy analysis in the respective application.
0x2DA2:002 (P108.02)	Output power: Apparent power (Output power: Apparent power) • Read only: x.xxx kVA	Display of the apparent output power for an energy analysis in the respective application.
0x2DA3:001 (P109.01)	Output energy: Motor (Output energy: Motor) • Read only: x.xx kWh	Display of the output power in motor mode for an energy analysis in the respective application.
0x2DA3:002 (P109.02)	Output energy: Generator (Output energy: Generator) • Read only: x.xx kWh	Display of the output power in generator mode for an energy analysis in the respective application.
0x2DDD (P100.00)	Output frequency (Output frequency) • Read only: x.x Hz	Display of the current output frequency for diagnostics of the control.
0x400D (P101.00)	Scaled actual value (Scaled act value) • Read only: x Units	Display of the current speed in application units.
0x6077 (P107.00)	Torque actual value (Torque actual) • Read only: x.x %	Display of the current torque. • 100 % ≡ Motor rated torque 0x6076 (P325.00)
0x6078 (P103.00)	Current actual value (Current actual) • Read only: x.x %	Display of the present motor current. • 100 % ≡ Motor rated current 0x6075 (P323.00)

6.2.1 Logbook

For diagnostic purposes, the logbook contains the last 32 error messages and warning signals of the inverter, which have occurred during operation.

Preconditions

The logbook can only be accessed

- via the user interface of »EASY Starter« ("Diagnostics" tab) or
- via network.

Details

In contrast to the error history buffer, the logbook additionally protocols the following events:

- Fault messages
- Change-over from normal to setup mode (and vice versa)
- Execution of device commands
- Avoidance of safety functions

The logbook entries are saved persistently in the inverter. If all 32 memory units are occupied, the oldest entry is deleted for a new entry. By means of the "Delete logbook" device command, all logbook entries can be deleted.

Accessing the logbook with »EASY Starter«

1. Select the inverter on the left side in the »EASY Starter« device list.
2. Change to the "Diagnostics" tab.
3. Click the icon to open the logbook.

Observe that the logbook only presents a snapshot at the time the data are read out. If a new event occurs, the logbook must be read out again so that the new event becomes visible.

Accessing the logbook via network

The logbook can also be accessed via network from a higher-level controller or a visualisation. The structure of the diagnostic messages complies with the "ETG.1020" standard of the EtherCAT Technology Group (ETG).

See chapter 13.3 of document "ETG.1020 Protocol Enhancements" provided by the EtherCAT Technology Group (ETG) for detailed information on the structure of the diagnostic messages.

Parameter	Name / value range / [default setting]		Info
0x2022:015 (P700.15)	Device commands: Delete logbook (Device commands: Delete logbook) • Setting can only be changed if the inverter is inhibited.		1 = delete all entries in the logbook.
	0	**Off / ready**	
	1	On / start	

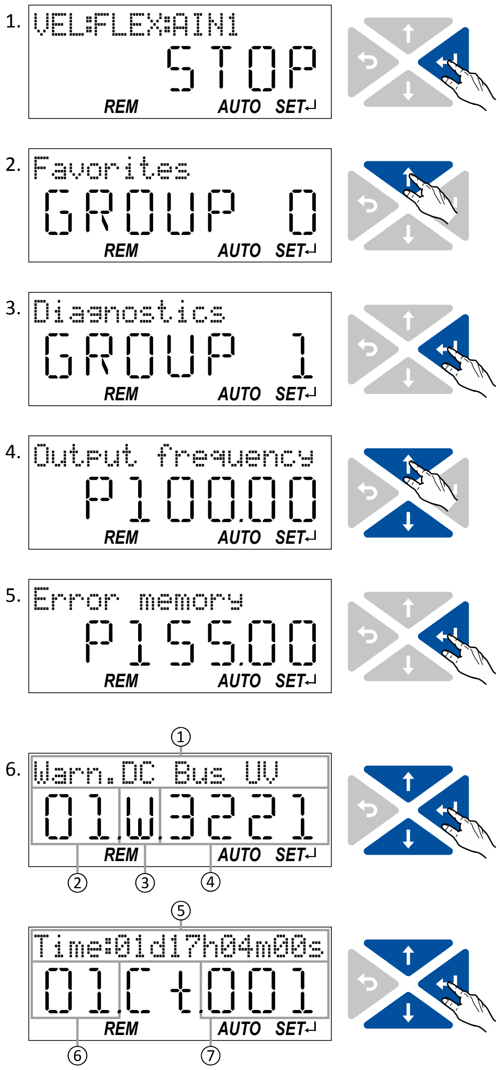
6.2.2 Error history buffer

For purposes of diagnostics, the error history buffer contains the last 32 error and warning messages of the inverter, which have occurred during operation. The error history buffer can be read out using the keypad via P155.00 and provides a limited view on the logbook.

Details

- For each event that is recorded, the error history buffer contains the message text, the error code, the time of occurrence as well as a counter for successive, identical events. If an event that has already been recorded occurs repeatedly, only the counter is incremented.
- The error history buffer can be reset by the user. In order to prevent the buffer from being reset by the user, this function can be protected by means of a password.
- Observe that the error history buffer only presents a snapshot at the time the data are read out. If a new event occurs, the error history buffer must be read out again via P155.00 so that the new event becomes visible.

Accessing the error history buffer with the keypad



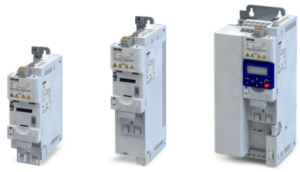
1. Use the ↵ key in the operating mode to navigate to the parameterisation mode one level below.
   You are now in the group level. All parameters of the inverter are divided into different groups according to their function.
   Note: By using the ↶ key you can navigate one level upwards again anytime.
2. Use the ↑ navigation key to select group 1 ("Diagnostics").
3. Use the ↵ key to navigate to one level below.
   You are now in the parameter level of the group selected.
4. Use the ↑ and ↓ select the P155.00 parameter.
5. Use the ↵ key to navigate to one level below.
   You are now in the error history buffer.
6. Use the ↑ and ↓ navigation keys you can now scroll through the error history buffer entries.
   Use the ↵ key, you can switch over the display.

Information displayed (page 1):
① Message text
② No. of the entry (01 = latest event)
③ Response (W = warning, T = trouble, F = fault)
④ Error code

Information displayed (page 2):
⑤ Time of occurrence
⑥ No. of the entry (01 = latest event)
⑦ Counter for successive, identical events

Note: By using the ↶ key you can exit the error history buffer again.

Parameter	Name / value range / [default setting]	Info
0x2006:000 (P155.00)	Error history buffer: Keypad display (Fault memory: Error memory) • Read only	Display of the error history buffer on the keypad.
0x2006:001	Error history buffer: Maximum number of messages • Read only	Display of the maximum number of messages which can be stored in the history buffer (from subindex 6).



Parameter	Name / value range / [default setting]	Info
0x2006:002	Error history buffer: Latest message • Read only	Display of the subindex of the most recent message.
0x2006:003	Error history buffer: Latest acknowledgement message 0 ... [**0**] ... 37	0 = delete all entries in the error history buffer.
0x2006:004	Error history buffer: New message • Read only	Reserved for future extensions.
0x2006:005	Error history buffer: Buffer overflow 0 ... [**1**] ... 65535	Bit 0 ... bit 4 = 0. Bit 5 = 1 ≡ overflow (after recording the 33rd event in the error history buffer.
	Bit 0 Send emergency message	
	Bit 1 Disable info message	
	Bit 2 Disable warning message	
	Bit 3 Disable error message	
	Bit 4 Mode selection	
	Bit 5 Message overwritten	
0x2006:006	Error history buffer: Message 0 • Read only	Error history buffer entry 01 (latest event)
0x2006:007	Error history buffer: Message 1 • Read only	Error history buffer entry 02
0x2006:008	Error history buffer: Message 2 • Read only	Error history buffer entry 03
0x2006:009	Error history buffer: Message 3 • Read only	Error history buffer entry 04
0x2006:010	Error history buffer: Message 4 • Read only	Error history buffer entry 05
0x2006:011	Error history buffer: Message 5 • Read only	Error history buffer entry 06
0x2006:012	Error history buffer: Message 6 • Read only	Error history buffer entry 07
0x2006:013	Error history buffer: Message 7 • Read only	Error history buffer entry 08
0x2006:014	Error history buffer: Message 8 • Read only	Error history buffer entry 09
0x2006:015	Error history buffer: Message 9 • Read only	Error history buffer entry 10
0x2006:016	Error history buffer: Message 10 • Read only	Error history buffer entry 11
0x2006:017	Error history buffer: Message 11 • Read only	Error history buffer entry 12
0x2006:018	Error history buffer: Message 12 • Read only	Error history buffer entry 13
0x2006:019	Error history buffer: Message 13 • Read only	Error history buffer entry 14
0x2006:020	Error history buffer: Message 14 • Read only	Error history buffer entry 15
0x2006:021	Error history buffer: Message 15 • Read only	Error history buffer entry 16
0x2006:022	Error history buffer: Message 16 • Read only	Error history buffer entry 17
0x2006:023	Error history buffer: Message 17 • Read only	Error history buffer entry 18
0x2006:024	Error history buffer: Message 18 • Read only	Error history buffer entry 19
0x2006:025	Error history buffer: Message 19 • Read only	Error history buffer entry 20
0x2006:026	Error history buffer: Message 20 • Read only	Error history buffer entry 21
0x2006:027	Error history buffer: Message 21 • Read only	Error history buffer entry 22

Parameter	Name / value range / [default setting]	Info
0x2006:028	Error history buffer: Message 22 • Read only	Error history buffer entry 23
0x2006:029	Error history buffer: Message 23 • Read only	Error history buffer entry 24
0x2006:030	Error history buffer: Message 24 • Read only	Error history buffer entry 25
0x2006:031	Error history buffer: Message 25 • Read only	Error history buffer entry 26
0x2006:032	Error history buffer: Message 26 • Read only	Error history buffer entry 27
0x2006:033	Error history buffer: Message 27 • Read only	Error history buffer entry 28
0x2006:034	Error history buffer: Message 28 • Read only	Error history buffer entry 29
0x2006:035	Error history buffer: Message 29 • Read only	Error history buffer entry 30
0x2006:036	Error history buffer: Message 30 • Read only	Error history buffer entry 31
0x2006:037	Error history buffer: Message 31 • Read only	Error history buffer entry 32

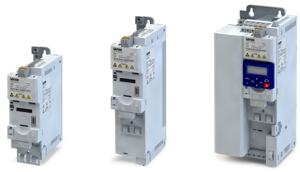
Structure of the messages

The following example shows the detailed structure of one of the following messages (parameter 0x2006:006 ... 0x2006:037):

Message:	00E01043120199000052OB0473FC0100050001					
	00E01043	1201	9900	00520B0473FC0100	0500	01
Meaning:	Diag code	Message type	Text ID	Time stamp in [ns]	Flag param. 1	Parameter 1
Data type:	U32	U16	U16	U64	U16	U8
Hex value:	0x4310 E000	0x0112	0x0099	0x0001 FC73 040B 5200	0x0005	0x01

Notes:

- The upper 16 bits of the "Diag Code" contain the error code (in the example "0x4310").
- Bit 0 ... 3 of the message type contain the error type (0: Info, 1: Warning, 2: Trouble, 3: Fault).
- Convert time stamp: 0x0001 FC73 040B 5200 = 559045896000000 ns = 6 days, 11 hours, 17 minutes, 25 seconds
- The flag for parameter 1 has no meaning for decoding the message.
- The parameter 1 contains the counter for successive, identical events.



6.2.3 Inverter diagnostics

The following parameters supply some information about the current operating status of the inverter.

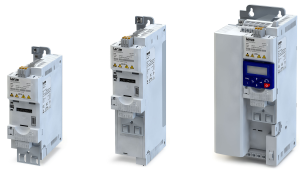
This includes the following information:
- Active access protection after log-in by means of PIN1/PIN2
- Currently loaded parameter settings
- Cause(s) for disable, quick stop and stop.
- Active control source and active setpoint source
- Active operating mode
- Keypad status
- Status of the internal motor control

Some of the following parameters contain bit-coded status words. Each single bit has a certain meaning.

▸ Display of status words on keypad 638

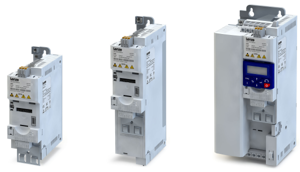
Parameter	Name / value range / [default setting]		Info
0x2040 (P197.00)	Access protection status (Protect. status) • Read only		Bit-coded display of the active access protection after login by PIN1/PIN2.
	Bit 0	No write access	
	Bit 1	Only favorites changeable	
0x2827 (P198.00)	Currently loaded parameter settings (Status load. par) • Read only		Display of the parameter settings currently loaded. ▸ Data handling 141 ▸ Saving/loading the parameter settings 419
	0	User settings	User parameter settings of the memory module
	1	Reset 60 Hz setting	Delivery status (default setting) for 50-Hz device
	2	Reset 50 Hz setting	Delivery status (default setting) for 60-Hz device
	3	OEM default settings	OEM parameter settings of the memory module
0x282A:001 (P126.01)	Status words: Cause of disable (Status words: Cause of disable) • Read only		Bit-coded display of the cause(s) for disabled inverter.
	Bit 0	Flexible I/O configuration	1 ≡ the inverter was disabled by the trigger set in 0x2631:001 (P400.01).
	Bit 1	Network	1 ≡ the inverter was disabled via network.
	Bit 2	Axis command	1 ≡ the inverter was disabled via axis command .
	Bit 6	Fault DC-bus	1 ≡ the inverter was inhibited due to a DC-bus error.
	Bit 7	Drive not ready	1 ≡ the inverter was disabled internally since the drive was not ready for operation. Possible causes: • Under/overvoltage in the DC bus • Defect device hardware
	Bit 8	Quick stop active	1 ≡ the inverter has been disabled by the "Quick stop" function.
	Bit 9	Motor data identification	1 ≡ the inverter was disabled by the "Automatic identification of the motor data" function.
	Bit 10	Automatic holding brake control	1 ≡ the inverter was disabled by the "Holding brake control" function.
	Bit 11	DC braking	-
	Bit 12	CiA402 Inverter disabled	1 ≡ the inverter was disabled by the internal state machine. The bit is only set if • operating mode 0x6060 (P301.00) = "CiA: Velocity mode [2]" and • state machine in the "Switch on disabled" state and • the state change has not been carried out via the "Disable operation" command.
	Bit 13	CiA402 Quick stop option code 2	1 ≡ the inverter has been disabled by the "Quick stop" function.
	Bit 14	Safe torque off (STO)	1 ≡ the inverter has been disabled by the integrated safety system.
	Bit 15	CiA402 operation mode 0	1 ≡ the inverter has been disabled because the selection "No mode change/no mode assigned [0]" is set in 0x6060 (P301.00).

Parameter	Name / value range / [default setting]	Info
0x282A:002 (P126.02)	Status words: Cause of quick stop (Status words: Cause of QSP) • Read only	Bit coded display of the cause(s) of quick stop.
	Bit 0 Flexible I/O configuration	1 ≡ quick stop was activated by the trigger set in 0x2631:003 (P400.03).
	Bit 1 Network	1 ≡ quick stop was activated via network.
	Bit 2 Axis command	1 ≡ quick stop was activated via axis command .
	Bit 6 Error response	1 ≡ quick stop has been activated as a response to an error.
0x282A:003 (P126.03)	Status words: Cause of stop (Status words: Cause of stop) • Read only	Bit coded display of the cause(s) of stop.
	Bit 0 Flexible I/O: Start disabled	1 ≡ stop was activated by the trigger set in 0x2631:002 (P400.02).
	Bit 1 Flexible I/O: Run forward	1 ≡ stop has been activated due to cancellation of the command "Run forward (CW)".
	Bit 2 Flexible I/O: Run reverse	1 ≡ stop has been activated due to cancellation of the command "Run reverse (CCW)".
	Bit 3 Flexible I/O: Jog forward	1 ≡ stop has been activated due to cancellation of the command "Jog foward (CW)".
	Bit 4 Flexible I/O: Jog reverse	1 ≡ stop has been activated due to cancellation of the command "Jog reverse (CCW)".
	Bit 5 Network	1 ≡ stop was activated via network.
	Bit 6 Keypad	1 ≡ stop was activated via keypad.
	Bit 7 Control mode transition	1 ≡ stop has been activated due to a change of the operating mode.
	Bit 8 End of sequence	1 ≡ stop was activated by the "sequencer" function since the sequence is completed. • The bit is only set after the sequence is completed if End of sequence mode0x402F (P824.00) is set ="Stop [1]" or "Stop and abort [2]".
	Bit 15 Waiting for start	1 ≡ Stop is active as a start command is not yet available (e.g. after enabling the inverter).
0x282A:004	Status words: Extended status word • Read only	Bit-coded status word.
	Bit 8 Reverse rotational direction	1 ≡ reversal active.
	Bit 10 Safe torque off (STO) active	1 ≡ "Safe torque off (STO)" function has been triggered by the integrated safety system.
	Bit 11 Both STO channels not active	1 ≡ safe inputs SIA and SIB = LOW (simultaneously).
0x282A:005 (P126.05)	Status words: Device status (Status words: Device status) • Read only	Display of the current inverter device state.
	0 Initialisation	
	2 Not ready to switch on	
	3 Switch on disabled	
	4 Ready to switch on	
	5 Switched on	
	6 Operation enabled	
	7 Disable operation	
	8 Shut down	
	9 Quick stop active	
	10 Fault reaction active	
	11 Fault	
0x282B:001 (P125.01)	Inverter diagnostics: Active control source (Inverter diag.: Active control) • Read only	Display of the control source that is currently active.
	0 Flexible I/O configuration	
	1 Network	
	2 Keypad	
	8 Keypad full control	



Parameter	Name / value range / [default setting]		Info
0x282B:002 (P125.02)	Inverter diagnostics: Active setpoint source (Inverter diag.: Active setpoint) • Read only		Display of the setpoint source that is currently active.
	0	Not selected	
	1	Analog input 1	
	2	Analog input 2	
	3	Keypad Setpoint	
	4	HTL input	
	5	Network Setpoint	
	11	Setpoint preset 1	
	12	Setpoint preset 2	
	13	Setpoint preset 3	
	14	Setpoint preset 4	
	15	Setpoint preset 5	
	16	Setpoint preset 6	
	17	Setpoint preset 7	
	18	Setpoint preset 8	
	19	Setpoint preset 9	
	20	Setpoint preset 10	
	21	Setpoint preset 11	
	22	Setpoint preset 12	
	23	Setpoint preset 13	
	24	Setpoint preset 14	
	25	Setpoint preset 15	
	31	Segment preset 1	
	32	Segment preset 2	
	33	Segment preset 3	
	34	Segment preset 4	
	35	Segment preset 5	
	36	Segment preset 6	
	37	Segment preset 7	
	38	Segment preset 8	
	39	Last segment	
	50	Motor potentiometer	
	51	PID setpoint (from version 04.00)	
	201	Internal value (from version 05.00)	
	202	Internal value (from version 05.00)	
	203	Internal value (from version 05.00)	
	204	Internal value (from version 05.00)	
	205	Internal value (from version 05.00)	
	206	Internal value (from version 05.00)	
0x282B:003 (P125.03)	Inverter diagnostics: Keypad LCD status (Inverter diag.: Keypad LCD stat.) • Read only		Bit-coded state of the keypad status displays.
	Bit 0	LOC	1 ≡ local keypad control active.
	Bit 1	REM	1 ≡ remote control via terminals, network, etc. active.
	Bit 2	MAN	1 ≡ manual setpoint selection via keypad active.
	Bit 3	Auto	1 ≡ automatic setpoint selection via terminals, network, etc. active.
	Bit 4	Set	1 ≡ a parameter setting has been changed but not been saved yet in the memory module with mains failure protection.

Parameter	Name / value range / [default setting]		Info
0x282B:004 (P125.04)	Inverter diagnostics: Active drive mode (Inverter diag.: Drive mode) • Read only		Display of the active drive mode.
	0	Velocity mode	"Velocity mode" active.
	1	PID control	PID control active.
	2	Torque mode (from version 03.00)	"Torque mode" active.
	4	Jog operation	"Jog foward (CW)" or "Jog reverse (CCW)" function active.
0x2831	Inverter status word • Read only		Bit-coded status word of the internal motor control.
	Bit 1	Speed 1 limited	1 ≡ input of speed controller 1 in limitation.
	Bit 2	Speed limited	1 ≡ output of speed controller 1 in limitation.
	Bit 3	Torque limited	1 ≡ setpoint torque in limitation.
	Bit 4	Current limited	1 ≡ setpoint current in limitation.
	Bit 5	Speed 2 limited	1 ≡ input of the speed controller 2 in "torque mode" in limitation.
	Bit 6	Upper speed limit active	1 ≡ in "torque mode", the speed is limited to upper speed limit 0x2946:001 (P340.01).
	Bit 7	Lower speed limit active	1 ≡ in "torque mode", the speed is limited to lower speed limit0x2946:002 (P340.02).
	Bit 10	Output frequency limited	1 ≡ setpoint frequency with V/f operation in limitation.
	Bit 11	Magnetisation completed	1 ≡ during V/f operation, the factor 7 rotor time constant has passed (calculated from the time at which the inverter was enabled without restart on the fly and with a total motor current of 20 % rated motor current for the first time). Otherwise 0.
	Bit 12	Motor phase error	1 ≡ motor phase failure detection active.
	Bit 14	Error reset blocking time active	1 ≡ the fault can only be reset when the blocking time has elapsed.
0x2833	Inverter status word 2 • Read only		Bit-coded status word 2 of the inverter.
	Bit 1	Manual test mode active	1 ≡ manual test mode active.
	Bit 2	Manual control active	1 ≡ manual control active.
	Bit 6	DC braking active	1 ≡ DC braking active.
	Bit 15	UPS operation active	1 ≡ UPS operation active.
0x293A (P115.00)	Actual switching frequency (Actual sw. freq.) • Read only		Display of the currently active switching frequency of the inverter. Example: • "16 kHz variable / drive-optimised / 4 kHz min. [22]" is selected as switching frequency in 0x2939 (P305.00). • An increase of the ambient temperature and/or the load have caused a decrease of the switching frequency to 8 kHz. In this case, this parameter indicates the selection "8 kHz power loss-optimised [7]".
	1	2 kHz drive-optimised	
	2	4 kHz drive-optimised	
	3	8 kHz drive-optimised	
	4	16 kHz drive-optimised	
	5	2 kHz power loss-optimised	
	6	4 kHz power loss-optimised	
	7	8 kHz power loss-optimised	
	8	16 kHz power loss-optimised	
0x2DAC (P119.00)	Keypad status (Keypad status) • Read only		Bit-coded display of the keypad status.
	Bit 0	Start Key	1 ≡ keypad start key I pressed.
	Bit 1	Stop Key	1 ≡ keypad stop key O pressed.
	Bit 2	Up arrow	1 ≡ keypad up-arrow key ↑ pressed.
	Bit 3	Down arrow	1 ≡ keypad down-arrow key ↓ pressed.
	Bit 4	Enter Key	1 ≡ keypad enter key ↵ pressed.
	Bit 5	Back key	1 ≡ keypad back key ↶ pressed.



Parameter	Name / value range / [default setting]	Info
0x2DAD (P120.00)	Internal hardware states (Int. HW states) • Read only	Bit-coded display of internal hardware states.
	Bit 0 | Relay	0 ≡ X9/NO-COM open and NC-COM closed. 1 ≡ X9/NO-COM closed and NC-COM open.
	Bit 1 | Digital output 1	0 ≡ LOW level, 1 ≡ HIGH level.
	Bit 2 | Digital output 2	
	Bit 10 | Charge Relay	1 ≡ precharging of the DC bus via charge relay is active.
0x603F (P150.00)	Error code (Error code) • Read only	Error message

6.2.4 Network diagnostics

The following parameters show some general information with regard to the network option available and the network.

Further fieldbus-specific diagnostic parameters are described in the following subchapters.

Parameter	Name / value range / [default setting]	Info
0x282B:005 (P125.05)	Inverter diagnostics: Most recently used control register (Inverter diag.: Netw. contr.reg.) • Read only	Display of the network register for the control that was accessed last (e. g. 0x6040 or 0x400B:1). • Format: 0xiiiiss00 (iiii = hexadecimal index, ss = hexadecimal subindex) • The lowest byte is always 0x00.
0x282B:006 (P125.06)	Inverter diagnostics: Most recently used setpoint register (Inverter diag.: Netw. setp.reg.) • Read only	Display of the network register for setpoint selection that was accessed last (e. g. 0x6042 or 0x400B:3). • Format: 0xiiiiss00 (iiii = hexadecimal index, ss = hexadecimal subindex) • The lowest byte is always 0x00.
0x400B:006 (P592.06)	Process input data: Velocity mode setpoint (Process data IN: Veloc. mode setp) -599.0 ... [**0.0**] ... 599.0 Hz	Mappable parameter for defining the setpoint for operating mode "MS: Velocity mode" via network. • If this parameter is to be used as standard setpoint source, the selection "Network [5]" must be set in 0x2860:001 (P201.01). • If this bipolar setpoint is used, the direction of rotation cannot be controlled via the network control word. The direction of rotation is determined by the sign of the setpoint.
0x400B:007 (P592.07)	Process input data: PID setpoint (Process data IN: PID setpoint) -300.00 ... [**0.00**] ... 300.00 PID unit	Mappable parameter for defining the setpoint for the PID control via network. • If this parameter is to be used as standard setpoint source, the selection "Network [5]" must be set in 0x2860:002 (P201.02).
0x400B:008 (P592.08)	Process input data: Torque mode setpoint (Process data IN: Torque mode setp) -32768 ... [**0**] ... 32767 Nm	Mappable parameter for defining the setpoint for operating mode "MS: Torque mode" via network. • If this parameter is to be used as standard setpoint source, the selection "Network [5]" must be set in 0x2860:003 (P201.03). • The scaling factor can be set in 0x400B:009 (P592.09). • Scaled torque setpoint = torque setpoint (0x400B:008) / $2^{\text{scaling factor}}$ Example: • Torque setpoint (0x400B:008) = 345 [Nm] • Scaling factor (0x400B:009) = 3 • Scaled torque setpoint = 345 [Nm] / 2^3 = 43.125 [Nm]

Parameter	Name / value range / [default setting]		Info
0x231F:001 (P500.01)	Module ID: Active module ID (Module ID: Active module ID) • Read only		Display of the network options currently configured in the inverter. • With the help of this module ID, the keypad only shows the communication parameters relevant to the respective network. Note! When switched on, the inverter checks whether the parameter settings saved in the memory module match the inverter hardware and firmware. In case of an incompatibility, a corresponding error message is output. For details see chapter "Data handling" (section "Hardware and firmware updates/downgrades"). 📖 141
	48	No network	
	67	CANopen	
	71	EtherNet/IP (from version 02.00)	
	78	POWERLINK (from version 05.00)	
	80	PROFIBUS	Display of the network options currently configured in the inverter. • With the help of this module ID, the keypad only shows the communication parameters relevant to the respective network. Note! When switched on, the inverter checks whether the parameter settings saved in the memory module match the inverter hardware and firmware. In case of an incompatibility, a corresponding error message is output. For details see chapter "Data handling" (section "Hardware and firmware updates/downgrades"). 📖 141
	82	PROFINET (from version 02.00)	
	84	EtherCAT (from version 02.00)	
	86	Modbus TCP/IP	
	87	Modbus	
0x231F:002 (P500.02)	Module ID: Module ID connected (Module ID: Module ID conn.) • Read only • For the meaning of the display see parameter 0x231F:001 (P500.01). 📖 229		Display of the network option currently available in the inverter. Note! When switched on, the inverter checks whether the parameter settings saved in the memory module match the inverter hardware and firmware. In case of an incompatibility, a corresponding error message is output. For details see chapter "Data handling" (section "Hardware and firmware updates/downgrades"). 📖 141
0x400B:009 (P592.09)	Process input data: Torque scaling (Process data IN: Torque scaling) -128 ... [**0**] ... 127 • From version 02.00		Scaling factor for torque setpoint 0x400B:008 (P592.08) and actual torque value 0x400C:007 (P593.07) via network. • With the setting 0, no scaling takes place.

Related topics

▶ Configuring the network 📖 226

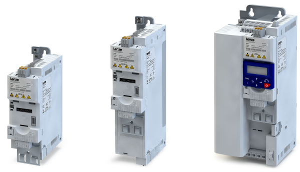
6.2.4.1 CANopen diagnostics

The following parameters serve to diagnose the CANopen interface and communication via CANopen.

Preconditions

Control unit (CU) of the inverter is provided with CANopen.

Parameter	Name / value range / [default setting]	Info
0x1000	Device type • Read only	CANopen device profile according CANopen specification CiA 301/CiA 402. Specifies the axis type: • 0x01010192 ≡ single axis • 0x02010192 ≡ double axis • 0x01020192 ≡ servo single axis • 0x02020192 ≡ servo double axis • 0x01030192 ≡ stepper single axis • 0x02030192 ≡ stepper double axis
0x1001	Error register • Read only	Bit-coded error status. • Bit 0 is set if an error is active. The other bits signalise which group the active error belongs to: • Bit 1: Current error • Bit 2: Voltage error • Bit 3: Temperature error • Bit 4: Communication error • Bit 5: Device profile-specific error • Bit 6: Reserved (always 0) • Bit 7: Manufacturer-specific error

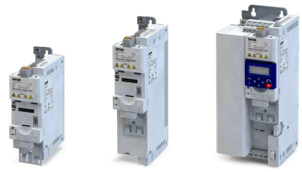


Parameter	Name / value range / [default setting]		Info
0x1008	Manufacturer device name • Read only		Display of the manufacturer device name.
0x1009	Manufacturer hardware version • Read only		Display of the manufacturer hardware version.
0x100A	Manufacturer software version • Read only		Display of the manufacturer software version.
0x1018:001	Identity object: Vendor ID • Read only		Display of the manufacturer's identification number. • The identification number allocated to Lenze by the organisation "CAN in Automation e. V." is "0x0000003B".
0x1018:002	Identity object: Product ID • Read only		Display of the product code of the inverter.
0x1018:003	Identity object: Revision number • Read only		Display of the main and subversion of the firmware.
0x1018:004	Identity object: Serial number • Read only		Display of the serial number of the inverter.
0x2302:001 (P511.01)	Active CANopen settings: Active node ID (CANopen diag.: Active node ID) • Read only		Display of the active node address.
0x2302:002 (P511.02)	Active CANopen settings: Active baud rate (CANopen diag.: Active baud rate) • Read only		Display of the active baud rate.
	0	Automatic (from version 03.00)	
	1	20 kbps	
	2	50 kbps	
	3	125 kbps	
	4	250 kbps	
	5	500 kbps	
	6	800 kbps	
	7	1 Mbps	
0x2307 (P515.00)	CANopen time-out status (Time-out status) • Read only		Bit-coded status display of the CAN time monitoring functions.
	Bit 0	RPDO1-Timeout	1 ≡ RPDO1 was not received within the monitoring time or not with the sync configured. • Status is reset automatically after the RPDO has been received again. • Setting of monitoring time for RPDO1 in 0x1400:005 (P540.05).
	Bit 1	RPDO2-Timeout	1 ≡ RPDO2 was not received within the monitoring time or not with the sync configured. • Status is reset automatically after the RPDO has been received again. • Setting of monitoring time for RPDO2 in 0x1401:005 (P541.05).
	Bit 2	RPDO3-Timeout	1 ≡ RPDO3 was not received within the monitoring time or not with the sync configured. • Status is reset automatically after the RPDO has been received again. • Setting of monitoring time for RPDO3 in 0x1402:005 (P542.05).
	Bit 8	Heartbeat-Timeout Consumer 1	1 ≡ within the "Heartbeat Consumer Time", no heartbeat telegram was received from node 1 to be monitored. • Status can only be reset by mains switching or error reset. • "Heartbeat Consumer Time" setting in 0x1016:001 (P520.01).
	Bit 9	Heartbeat-Timeout Consumer 2	1 ≡ within the "Heartbeat Consumer Time", no heartbeat telegram was received from node 2 to be monitored. • Status can only be reset by mains switching or error reset. • "Heartbeat Consumer Time" setting in 0x1016:002 (P520.02).
	Bit 10	Heartbeat-Timeout Consumer 3	1 ≡ within the "Heartbeat Consumer Time", no heartbeat telegram was received from node 3 to be monitored. • Status can only be reset by mains switching or error reset. • "Heartbeat Consumer Time" setting in 0x1016:003 (P520.03).
	Bit 11	Heartbeat-Timeout Consumer 4	1 ≡ within the "Heartbeat Consumer Time", no heartbeat telegram was received from node 4 to be monitored. • Status can only be reset by mains switching or error reset. • "Heartbeat Consumer Time" setting in 0x1016:004 (P520.04).

Parameter	Name / value range / [default setting]	Info
0x2308 (P516.00)	CANopen status (CANopen status) • Read only	Display of the current fieldbus state
	0 Initialisation	Fieldbus initialisation active. • The initialisation is started automatically at mains connection. During this phase, the inverter us not involved in the data exchange process on the CAN bus. • All CAN-relevant parameters are initialised with the saved settings. • When the initialisation process has been completed, the inverter automatically adopts the "Pre-Operational" state.
	1 Reset node	"Reset Node" NMT command active. • All parameters are initialised with the saved settings (not only the CAN-relevant parameters).
	2 Reset communication	"Reset Communication" NMT command active. • Initialisation of all CAN-relevant parameters with the values stored.
	4 Stopped	Only network management telegrams can be received.
	5 Operational	Parameter data and process data can be received. If defined, process data is sent as well.
	127 Pre-Operational	Parameter data can be received, process data are ignored.
0x2309 (P517.00)	CANopen controller status (CAN contr.status) • Read only	Status display of the internal CANopen controller.
	1 Error active	The inverter is a fully-fledged communication node at the CANopen network. It is able to transmit and receive data and to report faults.
	2 Error passive	The inverter can only passively indicate faulty reception via the ACK field.
	3 Bus off	The inverter is electrically separated from the CANopen network. In order to exit this state, the CANopen interface must be reset. An automatic restart is implemented.
0x230A:001 (P580.01)	CANopen statistics: PDO1 received (CAN statistics: PDO1 received) • Read only	Display of the number of PDO1 telegrams received.
0x230A:002 (P580.02)	CANopen statistics: PDO2 received (CAN statistics: PDO2 received) • Read only	Display of the number of PDO2 telegrams received.
0x230A:003 (P580.03)	CANopen statistics: PDO3 received (CAN statistics: PDO3 received) • Read only	Display of the number of PDO3 telegrams received.
0x230A:005 (P580.05)	CANopen statistics: PDO1 transmitted (CAN statistics: PDO1 transmitted) • Read only	Display of the number of PDO1 telegrams sent.
0x230A:006 (P580.06)	CANopen statistics: PDO2 transmitted (CAN statistics: PDO2 transmitted) • Read only	Display of the number of PDO2 telegrams sent.
0x230A:007 (P580.07)	CANopen statistics: PDO3 transmitted (CAN statistics: PDO3 transmitted) • Read only	Display of the number of PDO3 telegrams sent.
0x230A:009 (P580.09)	CANopen statistics: SDO1 telegrams (CAN statistics: SDO1 counter) • Read only	Display of the number of SDO1 telegrams.
0x230A:010 (P580.10)	CANopen statistics: SDO2 telegrams (CAN statistics: SDO2 counter) • Read only	Display of the number of SDO2 telegrams.
0x230B (P518.00)	CANopen error counter (CAN errorcounter) • Read only	Display of the total number of CAN faults that have occurred.

Related topics

▶ CANopen 🕮 259



6.2.4.2 Modbus diagnostics

The following parameters serve to diagnose the Modbus interface and communication via Modbus.

Preconditions

Control unit (CU) of the inverter is provided with Modbus.

Parameter	Name / value range / [default setting]	Info
0x2322:001 (P511.01)	Active Modbus settings: Active node ID (Modbus diag.: Active node ID) • Read only	Display of the active node address.
0x2322:002 (P511.02)	Active Modbus settings: Active baud rate (Modbus diag.: Active baud rate) • Read only • For the meaning of the display see parameter 0x2321:002 (P510.02). 283	Display of the active baud rate.
0x2322:003 (P511.03)	Active Modbus settings: Data format (Modbus diag.: Data format) • Read only • For the meaning of the display see parameter 0x2321:003 (P510.03). 283	Display of the active data format.
0x232A:001 (P580.01)	Modbus statistics: Messages received (Modbus statistic: Mess. received) • Read only	Display of the total number of messages received. • This counter counts both valid and invalid messages. • After the maximum value has been reached, the counter starts again "0".
0x232A:002 (P580.02)	Modbus statistics: Valid messages received (Modbus statistic: Val. mess. rec.) • Read only	Display of the number of valid messages received. • After the maximum value has been reached, the counter starts again "0".
0x232A:003 (P580.03)	Modbus statistics: Messages with exceptions (Modbus statistic: Mess. w. exc.) • Read only	Display of the number of messages with exceptions that have been received. • After the maximum value has been reached, the counter starts again "0".
0x232A:004 (P580.04)	Modbus statistics: Messages with errors (Modbus statistic: Mess. w. errors) • Read only	Display of the number of messages received with a faulty data integrity (parity, CRC). • After the maximum value has been reached, the counter starts again "0".
0x232A:005 (P580.05)	Modbus statistics: Messages sent (Modbus statistic: Messages sent) • Read only	Display of the total number of messages sent. • After the maximum value has been reached, the counter starts again "0".

Related topics

▶ Modbus RTU 282

6.2.4.3 PROFIBUS diagnostics

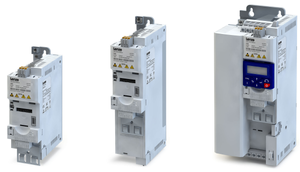
The following parameters serve to diagnose the PROFIBUS interface and communication via PROFIBUS.

Preconditions

Control unit (CU) of the inverter is provided with PROFIBUS.

Parameter	Name / value range / [default setting]	Info
0x2342:001 (P511.01)	Active PROFIBUS settings: Active station address (PROFIBUS diag.: Act.station addr) • Read only	Display of the active station address.

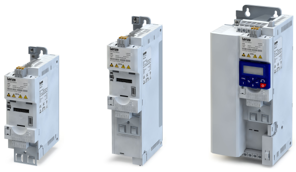
Parameter	Name / value range / [default setting]		Info
0x2342:002 (P511.02)	Active PROFIBUS settings: Active baud rate (PROFIBUS diag.: Active baud rate) • Read only		Display of the active baud rate.
	0	12 Mbps	
	1	6 Mbps	
	2	3 Mbps	
	3	1.5 Mbps	
	4	500 kbps	
	5	187.5 kbps	
	6	93.75 kbps	
	7	45.45 kbps	
	8	19.2 kbps	
	9	9.6 kbps	
	15	Search	Automatic baud rate detection active.
0x2342:003 (P511.03)	Active PROFIBUS settings: Watchdog time (PROFIBUS diag.: Watchdog time) • Read only		Display of the watchdog monitoring time specified by the master. • Monitoring starts with the arrival of the first telegram. • When a value of "0" is displayed, the monitoring function is deactivated. • A change in the watchdog monitoring time in the master is effective immediately.
0x2348:001 (P516.01)	PROFIBUS Status: Bus status (PROFIBUS Status: Bus status) • Read only		Display of the current DP state machine state (DP-STATE).
	0	WAIT_PRM	After the run-up, the inverter (slave) is waiting for parameter data (CHK_PRM) from the master. All other frame types are not processed. Exchanging user data with the master is not possible yet.
	1	WAIT_CFG	The inverter (slave) is waiting for configuration data (CHK_CFG) from the master that define the structure of the cyclic frames.
	2	DATA_EXCH	Parameter and configuration data have been received and accepted by the inverter (slave). The inverter is in the "Data Exchange" state. It is now possible to exchange user data with the master.
0x2348:002 (P516.02)	PROFIBUS Status: Watchdog status (PROFIBUS Status: Watchdog status) • Read only		Display of the current state of the watchdog state machine (WD-STATE).
	0	BAUD_SEARCH	The inverter (slave) is able to detect the baud rate automatically.
	1	BAUD_CONTROL	After detecting the correct baud rate, the inverter (slave) status changes to BAUD_CONTROL, and the baud rate is monitored.
	2	DP_CONTROL	The DP_CONTROL state serves to the response monitoring of the master.



Parameter	Name / value range / [default setting]	Info
0x2349 (P517.00)	PROFIBUS error (PROFIBUS error) • Read only	Bit-coded display of PROFIBUS errors.
	Bit 0 Watchdog elapsed	Communication with the PROFIBUS master is continuously interrupted, e. g. by cable break or failure of the PROFIBUS master. • No process data are sent to the inverter (slave) in the "Data Exchange" state. • When the watchdog monitoring time specified by the master has elapsed, the response set in 0x2859:001 (P515.01) is triggered in the inverter. Preconditions for a response by the inverter (slave): • The slave is in the "Data Exchange" state. • The watchdog monitoring time is configured correctly in the master (1 ... 65535 ms). If one of these preconditions is not met, the response to the absence of cyclic process data telegrams from the master is not executed.
	Bit 1 Data exchange completed	Data exchange via PROFIBUS has been terminated. • The inverter (slave) can be instructed by the master to exit the "Data Exchange" state. • If this state change is to be treated as an error in the inverter, the desired response can be set in 0x2859:002 (P515.02).
	Bit 2 Incorrect configuration data	The inverter (slave) has received invalid configuration data from the master. • The response set in 0x2859:003 (P515.03) is effected.
	Bit 3 Initialisation error	An error has occurred during the initialisation of the PROFIBUS interface. • The response set in 0x2859:004 (P515.04) is effected.
	Bit 4 Invalid process data	The inverter (slave) has received invalid process data from the master, e.g. no process data or deleted process data are sent by the "Stop" operating status in the master. • The response set in 0x2859:005 (P515.05) is effected.
0x234A:001 (P580.01)	PROFIBUS statistics: Data cycles per second (PROFIBUS counter: Data cycles/sec.) • Read only	Display of the data cycles per second.
0x234A:002 (P580.02)	PROFIBUS statistics: Parameterization events (PROFIBUS counter: PRM events) • Read only	Display of the number of parameterisation events.
0x234A:003 (P580.03)	PROFIBUS statistics: Configuration events (PROFIBUS counter: CFG events) • Read only	Display of the number of configuration events.
0x234A:004 (P580.04)	PROFIBUS statistics: Diagnostics events (PROFIBUS counter: DIAG events) • Read only	Display of the number of diagnostic telegrams sent.
0x234A:005 (P580.05)	PROFIBUS statistics: C1 messages (PROFIBUS counter: C1 messages) • Read only	Display of the number of requests by the class 1 DPV1 master.
0x234A:006 (P580.06)	PROFIBUS statistics: C2 messages (PROFIBUS counter: C2 messages) • Read only	Display of the number of requests by the class 2 DPV1 master.
0x234A:007 (P580.07)	PROFIBUS statistics: Watchdog events (PROFIBUS counter: WD events) • Read only	Display of the number of watchdog events.
0x234A:008 (P580.08)	PROFIBUS statistics: Data exchange aborts (PROFIBUS counter: DataEx.event) • Read only	Display of the number of "Data Exchange exited" events.
0x234A:009 (P580.09)	PROFIBUS statistics: Total data cycles (PROFIBUS counter: Tot. data cycles) • Read only	Display of the number of cyclic process data received.

Related topics

▶ PROFIBUS 📖 294



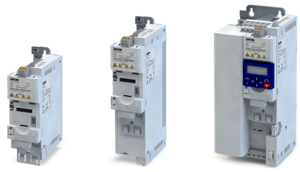
6.2.4.4 EtherNet/IP diagnostics

The following parameters serve to diagnose the EtherNet/IP interface and the communication via EtherNet/IP.

Preconditions

Control unit (CU) of the inverter is provided with EtherNet/IP.

Parameter	Name / value range / [default setting]	Info
0x23A2:001 (P511.01)	Active EtherNet/IP settings: IP address (EtherN/IP diag.: IP address) • Read only • From version 02.00	Display of the active IP address. The default setting 276605120 corresponds to the IP address 192.168.124.16. • 276605120 = 0x107CA8C0 → 0xC0.0xA8.0x7C.0x10 = 192.168.124.16
0x23A2:002 (P511.02)	Active EtherNet/IP settings: Subnet (EtherN/IP diag.: Subnet) • Read only • From version 02.00	Display of the active subnet mask. The default setting 16777215 corresponds to the subnet mask 255.255.255.0. • 16777215 = 0xFFFFFF → 0xFF.0xFF.0xFF.0x00 = 255.255.255.0
0x23A2:003 (P511.03)	Active EtherNet/IP settings: Gateway (EtherN/IP diag.: Gateway) • Read only • From version 02.00	Display of the active gateway address. Example: The setting 276344004 corresponds to the gateway address 196.172.120.16. • 276344004 = 0x1078ACC4 → 0xC4.0xAC.0x78.0x10 = 196.172.120.16
0x23A2:005 (P511.05)	Active EtherNet/IP settings: MAC address (EtherN/IP diag.: MAC address) • Read only • From version 02.00	Display of the active MAC address.
0x23A2:006 (P511.06)	Active EtherNet/IP settings: Multicast address (EtherN/IP diag.: Mcast address) • Read only • From version 02.00	Display of the active Multicast IP address. The default setting 3221373167 corresponds to the Multicast IP address 239.64.2.192. • 3221373167 = 0xC00240EF → 0xEF.0x40.0x02.0xC0 = 239.64.2.192
0x23A3 (P509.00)	EtherNet/IP switch position (EtherN. switch) • Read only • From version 02.00	Display of the rotary encoder switch settings at the last mains power-on.
0x23A5:001 (P519.01)	Active port settings: Port 1 (Port diagnostics: Port 1) • Read only • From version 02.00	Display of the active baud rate for Ethernet port 1.
	0 Not connected	
	1 10 Mbps/Half Duplex	
	2 10 Mbps/Full Duplex	
	3 100 Mbps/Half Duplex	
	4 100 Mbps/Full Duplex	
0x23A5:002 (P519.02)	Active port settings: Port 2 (Port diagnostics: Port 2) • Read only • From version 02.00	Display of the active baud rate for Ethernet port 2.
	0 Not connected	
	1 10 Mbps/Half Duplex	
	2 10 Mbps/Full Duplex	
	3 100 Mbps/Half Duplex	
	4 100 Mbps/Full Duplex	
	5 Reserved	
	6 Reserved	
0x23A6 (P513.00)	Quality of service (QualityOfService) • Read only • From version 02.00	Display if the QoS tag for prioritising the data packages to be transmitted is used.
	0 802.1Q Tag disable	
	1 802.1Q Tag enable	
0x23A8 (P516.00)	CIP module status (CIP module stat.) • Read only • From version 02.00	Display of the active CIP module status.



Parameter	Name / value range / [default setting]	Info
0x23A9 (P517.00)	EtherNet/IP status (EtherN/IP status) • Read only • From version 02.00	Display of the active network status.

Related topics

▶ EtherNet/IP 📖 316

6.2.4.5 PROFINET diagnostics

The following parameters serve to diagnose the PROFINET interface and the communication via PROFINET.

Preconditions

Control unit (CU) of the inverter is provided with PROFINET.

Parameter	Name / value range / [default setting]		Info
0x2382:001 (P511.01)	Active PROFINET settings: IP address (PROFINET diag.: IP address) • Read only • From version 02.00		Display of the active IP address.
0x2382:002 (P511.02)	Active PROFINET settings: Subnet (PROFINET diag.: Subnet) • Read only • From version 02.00		Display of the active subnet mask.
0x2382:003 (P511.03)	Active PROFINET settings: Gateway (PROFINET diag.: Gateway) • Read only • From version 02.00		Display of the gateway address.
0x2382:004 (P511.04)	Active PROFINET settings: Station name (PROFINET diag.: Station name) • Read only • From version 02.00		Display of the active station name.
0x2382:005 (P511.05)	Active PROFINET settings: MAC Address (PROFINET diag.: MAC Address) • Read only • From version 02.00		Display of the active MAC address.
0x2388 (P516.00)	PROFINET status (PROFINET status) • Read only • From version 02.00		Bit coded display of the current Bus status.
	Bit 0	Initialized	After initialisation, the network component waits for a communication partner and the system power-up.
	Bit 1	Online	
	Bit 2	Connected	
	Bit 3	IP address error	The IP address is invalid. Valid IP addresses are defined according to RFC 3330.
	Bit 4	Hardware fault	
	Bit 6	Watchdog elapsed	PROFINET communication is continuously interrupted in the "Data_Exchange" state, e.g. by cable break or failure of the IO Controller. • PROFINET communication changes to the "No_Data_Exchange" state. When the watchdog monitoring time specified by the IO Controller has elapsed, the response set in 0x2859:001 (P515.01) is triggered in the inverter.
	Bit 7	Protocol error	
	Bit 8	PROFINET stack ok	
	Bit 9	PROFINET stack not configured	
	Bit 10	Ethernet controller fault	
	Bit 11	UDP stack fault	

Parameter	Name / value range / [default setting]		Info
0x2389:001 (P517.01)	PROFINET error: Error 1 (PROFINET error: Error 1) • Read only • From version 02.00		The parameter currently contains the error detected on the network. • The error values may occur in combination with the error values from parameter 0x2389:002 (P517.02).
	0	No error	
	1	Reserved	
	2	Unit ID unknown	
	3	Max. units exceeded	
	4	Invalid size	
	5	Unit type unknown	
	6	Runtime plug error	
	7	Invalid argument	
	8	Service pending	
	9	Stack not ready	
	10	Command unknown	
	11	Invalid address descriptor	
0x2389:002 (P517.02)	PROFINET error: Error 2 (PROFINET error: Error2) • Read only • From version 02.00		The parameter currently contains the error detected on the network. • The error values may occur in combination with the error values from parameter 0x2389:001 (P517.01).
	Bit 7	IP address error	The IP address is invalid. Valid IP addresses are defined according to RFC 3330.
	Bit 8	Station name problem	The station name must be assigned according to the PROFINET specification.
	Bit 9	DataExch left	
	Bit 10	Stack boot error	
	Bit 11	Stack online error	
	Bit 12	Stack state error	
	Bit 13	Stack revision error	
	Bit 14	Initialization problem	
	Bit 15	Stack init error	The stack cannot be initiated with the user specifications. A reason might be, e. g., a station name that does not correspond to the PROFINET specification.

Related topics

▶ PROFINET 📖 365

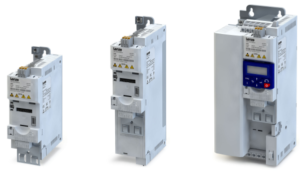
6.2.4.6 EtherCAT diagnostics

The following parameters serve to diagnose the EtherCAT interface and the communication via EtherCAT.

Preconditions

The control unit (CU) of the inverter is provided with EtherCAT (from firmware 02.00).

Parameter	Name / value range / [default setting]	Info
0x1000	Device type • Read only • From version 02.00	CANopen device profile according CANopen specification CiA 301/ CiA 402.
0x1008	Manufacturer device name • Read only • From version 02.00	Display of the manufacturer device name.
0x1009	Manufacturer hardware version • Read only • From version 02.00	Display of the manufacturer hardware version.
0x100A	Manufacturer software version • Read only • From version 02.00	Display of the manufacturer software version.
0x1018:001	Identity object: Vendor ID • Read only • From version 02.00	Display of the manufacturer's identification number.



Parameter	Name / value range / [default setting]	Info
0x1018:002	Identity object: Product ID • Read only • From version 02.00	Display of the product code of the inverter.
0x1018:003	Identity object: Revision number • Read only • From version 02.00	Display of the main and subversion of the firmware.
0x1018:004	Identity object: Serial number • Read only • From version 02.00	Display of the serial number of the inverter.
0x2362:004 (P511.04)	Active EtherCAT settings: Device identifier (EtherCAT diag.: Device ident.) • Read only • From version 02.00	Display of the clear device address in the network which is defined via rotary encoder switch or object 0x2361:004 (P510.04).
0x2362:006 (P511.06)	Active EtherCAT settings: Station address (EtherCAT diag.: Station address) • Read only • From version 02.00	Display of the active station address.
0x2362:007 (P511.07)	Active EtherCAT settings: Tx length (EtherCAT diag.: Tx length) • Read only • From version 02.00	Display of the length of the transmitted cyclic data in bytes.
0x2362:008 (P511.08)	Active EtherCAT settings: Rx length (EtherCAT diag.: Rx length) • Read only • From version 02.00	Display of the length of the received cyclic data in bytes.
0x2368 (P516.00)	EtherCAT status (EtherCAT status) • Read only • From version 02.00	Display of the current network status.
	1 Initialisation	Network initialisation is active. • No PDO/SDO transmission. • Device identification is possible by network scan.
	2 Pre-Operational	The network is active. • SDO transmission (CoE communication via mailbox) is possible. • No PDO transmission.
	3 Bootstrap	Firmware update active. • For the firmware update, the FoE protocol is used. • No PDO transmission.
	4 Safe-Operational	SDO transmission (CoE communication via mailbox) is possible. PDO transmission: • The input data in the process image are updated. • The output data from the process image are not transmitted.
	8 Operational	Normal operation • PDO/SDO transmission is possible. • Network synchronisation is successful (if used).
0x2369 (P517.00)	EtherCAT error (EtherCAT error) • Read only • From version 02.00	Bit coded display of EtherCAT errors.

Related topics

▶ EtherCAT 📖 383

6.2.4.7 POWERLINK diagnostics

The following parameters serve to diagnose the POWERLINK interface and the communication via POWERLINK.

Preconditions

Control unit (CU) of the inverter is provided with POWERLINK.

Parameter	Name / value range / [default setting]	Info
0x1000	NMT_DeviceType_U32 • Read only	CANopen device profile according CANopen specification CiA 301/ CiA 402.

Parameter	Name / value range / [default setting]	Info
0x1008	NMT_ManufactDevName_VS • Read only	Display of the manufacturer device name.
0x1009	NMT_ManufactHwVers_VS • Read only	Display of the manufacturer hardware version.
0x100A	NMT_ManufactSwVers_VS • Read only	Display of the manufacturer software version.
0x1018:001	NMT_IdentityObject_REC: VendorId_U32 • Read only	Display of the manufacturer's identification number.
0x23C2:001	Active POWERLINK settings: IP address • Read only	Display of the active IP address.
0x23C2:002	Active POWERLINK settings: Subnet • Read only	Display of the active subnet mask.
0x23C2:003	Active POWERLINK settings: Gateway • Read only	Display of the IP address of the router that connects the POWERLINK segment to the higher-level network.
0x23C2:004	Active POWERLINK settings: Node ID • Read only	Display of the active node address (node ID) in the network.
0x23C2:005	Active POWERLINK settings: MAC Address • Read only	Display of the active MAC address.
0x23C2:007	Active POWERLINK settings: Tx length • Read only	Display of the length of the transmitted cyclic data in bytes.
0x23C2:008	Active POWERLINK settings: Rx length • Read only	Display of the length of the received cyclic data in bytes.
0x23C3	POWERLINK switch position • Read only	Display of the rotary encoder switch setting at the last mains power-on.
0x23C8:001	POWERLINK status: Network management • Read only	Display of the current bus status.
0x23C9:001	POWERLINK error: Error • Read only	Bit coded display of the bus error state reported by the LED "BE" (Bus Error). • Bit 0 = 0 (0x0000) ≡ no bus error • Bit 0 = 1 (0x0001) ≡ active bus error

Related topics

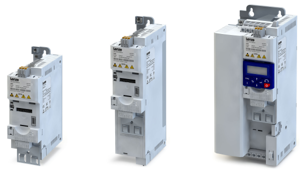
▶ POWERLINK 📖 396

6.2.5 Diagnostics of the inputs and outputs

6.2.5.1 Digital inputs and outputs

The following parameters serve to diagnose the digital inputs and outputs of the inverter.

Parameter	Name / value range / [default setting]		Info
0x60FD (P118.00)	Digital inputs (Digital inputs) • Read only		Bit coded display of the current state of the digital inputs
	Bit 16	Level from digital input 1	0 ≡ LOW level, 1 ≡ HIGH level. Digital input 6 and digital input 7 are only available with application I/O.
	Bit 17	Level from digital input 2	
	Bit 18	Level from digital input 3	
	Bit 19	Level from digital input 4	
	Bit 20	Level from digital input 5	
	Bit 21	Level from digital input 6	
	Bit 22	Level from digital input 7	
	Bit 25	Internal interconnection of digital inputs	0 ≡ digital input terminals are set to HIGH level via pull-up resistors. 1 ≡ digital input terminals are set to LOW level via pull-down resistors.
0x2DAD (P120.00)	Internal hardware states (Int. HW states) • Read only		Bit-coded display of internal hardware states.
	Bit 0	Relay	0 ≡ X9/NO-COM open and NC-COM closed. 1 ≡ X9/NO-COM closed and NC-COM open.
	Bit 1	Digital output 1	0 ≡ LOW level, 1 ≡ HIGH level.
	Bit 2	Digital output 2	
	Bit 10	Charge Relay	1 ≡ precharging of the DC bus via charge relay is active.



Parameter	Name / value range / [default setting]	Info
0x4016:005	Digital output 1: Terminal state • Read only 0 FALSE 1 TRUE	Display of the logic state of output terminal X3/DO1.
0x4016:006	Digital output 1: Trigger signal state • Read only 0 FALSE 1 TRUE	Display of the logic state of the trigger signal for digital output 1 (without taking a ON/OFF delay set and inversion into consideration).
0x4017:005	Digital output 2: Terminal state • Read only • Only available for application I/O. 0 FALSE 1 TRUE	Display of the logic state of output terminal X3/DO2.
0x4017:006	Digital output 2: Trigger signal state • Read only • Only available for application I/O. 0 FALSE 1 TRUE	Display of the logic state of the trigger signal for digital output 2 (without taking a ON/OFF delay set and inversion into consideration).
0x4018:005	Relay: Relay state • Read only 0 FALSE 1 TRUE	Display of the logic state of the relay.
0x4018:006	Relay: Trigger signal state • Read only 0 FALSE 1 TRUE	Display of the logic state of the trigger signal for the relay (without taking a ON/OFF delay set and inversion into consideration).

Related topics

▸ Configuration of digital inputs 📖 594

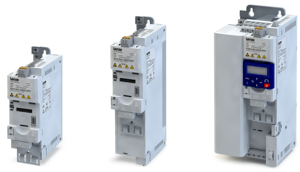
▸ Configuration of digital outputs 📖 603

6.2.5.2 Analog inputs and outputs

The following parameters serve to diagnose the analog inputs and outputs of the inverter.

Parameter	Name / value range / [default setting]	Info
0x2DA4:001 (P110.01)	Diagnostics of analog input 1: Value in percent (AI1 diagnostics: AI1 terminal %) • Read only: x.x %	Display of the current input value at X3/AI1 scaled as value in percent. • 100 % ≡ 10 V or 20 mA or 5 V
0x2DA4:002 (P110.02)	Diagnostics of analog input 1: Frequency value (AI1 diagnostics: AI1 scaled freq.) • Read only: x.x Hz	Display of the current input value at X3/AI1 scaled as a frequency value. • The standard setpoint source for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]" is selected in 0x2860:001 (P201.01).
0x2DA4:003 (P110.03)	Diagnostics of analog input 1: Process controller value (AI1 diagnostics: AI1 scaled PID) • Read only: x.xx PID unit	Display of the current input value at X3/AI1 scaled as a process controller value. • The standard setpoint source for the reference value of PID control is selected in 0x2860:002 (P201.02).
0x2DA4:004 (P110.04)	Diagnostics of analog input 1: Torque value (AI1 diagnostics: AI1 scaled torq.) • Read only: x.x %	Display of the current input value at X3/AI1 scaled as a percentage torque value. • 100 % ≡ permissible maximum torque 0x6072 (P326.00) • The standard setpoint source for operating mode 0x6060 (P301.00) = "MS: Torque mode [-1]" is selected in 0x2860:003 (P201.03).

Parameter	Name / value range / [default setting]	Info
0x2DA4:016 (P110.16)	Diagnostics of analog input 1: Status (AI1 diagnostics: AI1 status) • Read only • From version 04.00	Bit-coded display of the status of analog input 1 (X3/AI1).
	Bit 0 Mode 0: 0 ... 10 VDC active	
	Bit 1 Mode 1: 0 ... 5 VDC active	
	Bit 2 Mode 2: 2 ... 10 VDC active	
	Bit 3 Mode 3: -10 ... 10 VDC active	
	Bit 4 Mode 4: 4 ... 20 mA active	
	Bit 5 Mode 5: 0 ... 20 mA active	
	Bit 6 24 V supply OK	
	Bit 7 Calibration successful	
	Bit 8 Monitoring threshold exceeded/not reached	
	Bit 9 Input current too low (mode 4)	
	Bit 10 Input voltage too low (mode 2)	
	Bit 11 Input voltage too high (mode 4)	
0x2DA5:001 (P111.01)	Diagnostics of analog input 2: Value in percent (AI2 diagnostics: AI2 terminal %) • Read only: x.x %	Display of the current input value at X3/AI2 scaled as a value in percent. • 100 % ≡ 10 V or 20 mA or 5 V
0x2DA5:002 (P111.02)	Diagnostics of analog input 2: Frequency value (AI2 diagnostics: AI2 scaled freq.) • Read only: x.x Hz	Display of the current input value at X3/AI2 scaled as a frequency value. • The standard setpoint source for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]" is selected in 0x2860:001 (P201.01).
0x2DA5:003 (P111.03)	Diagnostics of analog input 2: Process controller value (AI2 diagnostics: AI2 scaled PID) • Read only: x.xx PID unit	Display of the current input value at X3/AI2 scaled as a process controller value. • The standard setpoint source for the reference value of PID control is selected in 0x2860:002 (P201.02).
0x2DA5:004 (P111.04)	Diagnostics of analog input 2: Torque value (AI2 diagnostics: AI2 scaled torq.) • Read only: x.x %	Display of the current input value at X3/AI2 scaled as a percentage torque value. • 100 % ≡ permissible maximum torque 0x6072 (P326.00)
0x2DA5:016 (P111.16)	Diagnostics of analog input 2: Status (AI2 diagnostics: AI2 status) • Read only • From version 04.00	Bit-coded display of the status of analog input 2 (X3/AI2).
	Bit 0 Mode 0: 0 ... 10 VDC active	
	Bit 1 Mode 1: 0 ... 5 VDC active	
	Bit 2 Mode 2: 2 ... 10 VDC active	
	Bit 3 Mode 3: -10 ... 10 VDC active	
	Bit 4 Mode 4: 4 ... 20 mA active	
	Bit 5 Mode 5: 0 ... 20 mA active	
	Bit 6 24 V supply OK	
	Bit 7 Calibration successful	
	Bit 8 Monitoring threshold exceeded/not reached	
	Bit 9 Input current too low	
	Bit 10 Input voltage too low	
	Bit 11 Input voltage too high	
0x2DAA:001 (P112.01)	Diagnostics of analog output 1: Voltage (AO1 diagnostics: AO1 Voltage) • Read only: x.xx V	Display of the current output voltage at X3/AO1.
0x2DAA:002 (P112.02)	Diagnostics of analog output 1: Current (AO1 diagnostics: AO1 Current) • Read only: x.xx mA	Display of the present output current at X3/AO1.
0x2DAB:001 (P113.01)	Diagnostics of analog output 2: Voltage (AO2 diagnostics: AO2 Current) • Read only: x.xx V • Only available for application I/O.	Display of the current output voltage at X3/AO2.
0x2DAB:002 (P113.02)	Diagnostics of analog output 2: Current (AO2 diagnostics: AO2 Voltage) • Read only: x.xx mA • Only available for application I/O.	Display of the present output current at X3/AO2.



Related topics

▸ Configuration of analog inputs 📖 597

▸ Configuration of analog outputs 📖 617

6.2.6 Wireless-LAN diagnostics

The following parameters serve to diagnose the WLAN module and the WLAN communication.

Preconditions

WLAN module has been plugged onto the interface X16 on the front of the inverter.

Parameter	Name / value range / [default setting]		Info
0x2442:001	Active WLAN settings: Active IP address • Read only • From version 02.00		Display of the active IP address. • If DHCP is activated, the active IP address usually derives from the configured static IP address of the device.
0x2442:002	Active WLAN settings: Active netmask • Read only • From version 02.00		Display of the active netmask.
0x2442:003	Active WLAN settings: Active gateway • Read only • From version 02.00		Display of the active gateway IP address.
0x2442:004	Active WLAN settings: Active module mode • Read only • From version 02.00		Display of the active data source for the WLAN settings. • This parameter indicates whether the settings used come from the inverter or from the WLAN module.
	0	Inverter	The WLAN settings saved in the inverter are used.
	1	Standalone	The WLAN settings saved in the WLAN module are used.
0x2442:005	Active WLAN settings: MAC address • Read only • From version 02.00		Display of the MAC address of the WLAN module.
0x2448:001	WLAN status: Connection time • Read only • From version 02.00		Display of the connection time in [s] since the current connection was established.
0x2448:002	WLAN status: Number of connections • Read only • From version 02.00		In access point mode: Display of the number of currently connected clients. In client mode: 0 ≡ not connected; 1 ≡ connected with external WLAN network.
0x2448:003	WLAN status: Rx frame counter • Read only • From version 02.00		Display of the number of request received via WLAN.
0x2448:004	WLAN status: Error statistics • Read only • From version 02.00		Display of the quality of the WLAN connection. A display value > 0 indicates communication problemsn.
0x2449	WLAN error • Read only • From version 02.00		Bit coded display of WLAN errors.
	Bit 2	WLAN error	
	Bit 3	Memory problem	
	Bit 4	WLAN connection problem	
	Bit 7	WLAN off	
	Bit 9	Client mode off	
	Bit 12	TCP/IP configuration error	
	Bit 13	Password length	
	Bit 14	Access denied	

Related topics

▸ Wireless LAN (WLAN) 📖 426

6.2.7 Setpoint diagnostic

The following parameters show the current setpoints of different setpoint sources.

Parameter	Name / value range / [default setting]	Info
0x282B:007	Inverter diagnostics: Default frequency setpoint • Read only: x.x Hz • From version 03.00	Display of the frequency setpoint of the standard setpoint source set in 0x2860:001 (P201.01).
0x282B:008	Inverter diagnostics: Preset frequency setpoint • Read only: x.x Hz • From version 03.00	Display of the preset frequency setpoint selected via the four functions "Activate preset (bit 0)" ... " Activate preset (bit 3)". ▶ Setpoint source of preset setpoints 554
0x282B:009	Inverter diagnostics: Actual frequency setpoint • Read only: x.x Hz • From version 03.00	Display of the currently selected frequency setpoint that is internally transferred to the motor control.
0x282B:010	Inverter diagnostics: Default PID setpoint • Read only: x.xx PID unit • From version 03.00	Display of the PID control value of the standard setpoint source set in 0x2860:002 (P201.02).
0x282B:011	Inverter diagnostics: Preset PID setpoint • Read only: x.xx PID unit • From version 03.00	Display of the preset PID setpoint selected via the four functions "Activate preset (bit 0)" ... " Activate preset (bit 3)". ▶ Setpoint source of preset setpoints 554
0x282B:012	Inverter diagnostics: Default torque setpoint • Read only: x.x % • From version 03.00	Display of the torque setpoint of the standard setpoint source set in 0x2860:003 (P201.03). • 100 % ≡ Motor rated torque 0x6076 (P325.00)
0x282B:013	Inverter diagnostics: Preset torque setpoint • Read only: x.x % • From version 03.00	Display of the preset torque setpoint selected via the four functions "Activate preset (bit 0)" ... " Activate preset (bit 3)". ▶ Setpoint source of preset setpoints 554
0x2948:001	Actual torque setpoint • Read only: x.x % • From version 03.00	Display of the currently selected torque setpoint that is internally transferred to the motor control. • 100 % ≡ Motor rated torque 0x6076 (P325.00)
0x2DAE:010	Sequencer diagnostics: Frequency setpoint • Read only: x.x Hz • From version 03.00	Display of the current frequency setpoint of the "sequencer" function. ▶ Sequencer 504
0x2DAE:011	Sequencer diagnostics: PID setpoint • Read only: x.xx PID unit • From version 03.00	Display of the current PID control value of the "sequencer" function. ▶ Sequencer 504
0x2DAE:012	Sequencer diagnostics: Torque setpoint • Read only: x.x % • From version 03.00	Display of the current torque setpoint of the "sequencer" function. • 100 % ≡ Motor rated torque 0x6076 (P325.00) ▶ Sequencer 504
0x4009:004	MOP values saved: Frequency setpoint • Read only: x.x Hz	Display of the last MOP value saved internally for the operating mode "MS: Velocity mode".
0x4009:005	MOP values saved: PID setpoint • Read only: x.xx PID unit	Display of the last MOP value saved internally for the reference value of the PID control.
0x4009:006	MOP values saved: Torque setpoint • Read only: x.x %	Display of the last MOP value saved internally for the operating mode "MS: Torque mode".

Related topics

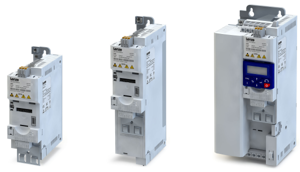
▶ Selection of setpoint source 148

▶ Setpoint change-over 546

6.2.8 Process controller status

The following parameters serve to diagnose the process controller.

Parameter	Name / value range / [default setting]	Info
0x401F:001 (P121.01)	Current setpoint (PID setpoint) • Read only: x.xx PID unit	Display of the current reference value (setpoint) for the process controller.
0x401F:002 (P121.02)	Current process variable (PID process var.) • Read only: x.xx PID unit	Display of the current controlled variable (actual value) fed back for the process controller.



Parameter	Name / value range / [default setting]	Info
0x401F:003 (P121.03)	Status (PID status) • Read only	Bit-coded status display of the process controller.
	Bit 0 Process controller off	
	Bit 1 PID output set to 0	
	Bit 2 PID I-component inhibited	
	Bit 3 PID influence active	
	Bit 4 Setpoint = actual value	
	Bit 5 Idle state active	
	Bit 6 Max. alarm	
	Bit 7 Min. alarm	
0x401F:004	PID control value • Read only: x.x Hz • From version 03.00	Display of the output frequency after the PID controller, but without any influencing factor.
0x401F:005	PID Feedforward value • Read only: x.x Hz • From version 03.00	Display of the feedforward control value for the process controller.
0x401F:006	PID output value • Read only: x.x Hz • From version 03.00	Display of the current process controller setpoint that is internally transferred to the motor control (considering the feedforward control value).
0x401F:007	PID error value • Read only: x.xx PID unit • From version 03.00	Display of the difference between reference value (setpoint) and fed back variable (actual value) of the process controller.

Related topics

▸ Configuring the process controller 📖 407

6.2.9 Sequencer diagnostics

The following parameters serve to diagnose the "sequencer" function.

Parameter	Name / value range / [default setting]	Info
0x2DAE:001 (P140.01)	Sequencer diagnostics: Active step (Sequencer diag: Active Step) • Read only • From version 03.00	Display of the active step. • 0 ≡ no sequence active.
0x2DAE:002 (P140.02)	Sequencer diagnostics: Step time elapsed (Sequencer diag: StepTime elapsed) • Read only: x.x s • From version 03.00	Display of the time that has passed since the start of the current step.
0x2DAE:003 (P140.03)	Sequencer diagnostics: Step time remaining (Sequencer diag: StepTime remain) • Read only: x.x s • From version 03.00	Display of the residual time for the current step.
0x2DAE:004 (P140.04)	Sequencer diagnostics: Steps complete (Sequencer diag: Steps complete) • Read only • From version 03.00	Display of the number of steps that have been made since the start of the sequence.
0x2DAE:005 (P140.05)	Sequencer diagnostics: Steps remaining (Sequencer diag: Steps remain) • Read only • From version 03.00	Display of the residual number of steps until the current sequence is completed. This includes the current step.
0x2DAE:006 (P140.06)	Sequencer diagnostics: Active sequence (Sequencer diag: Active sequence) • Read only • From version 03.00	Display of the active sequence. • 0 ≡ no sequence active.
0x2DAE:007 (P140.07)	Sequencer diagnostics: Active segment (Sequencer diag: Active segment) • Read only • From version 03.00	Display of the active segment. • 0 ≡ no sequence active. • 255 ≡ final sequence active.

Parameter	Name / value range / [default setting]	Info
0x2DAE:008 (P140.08)	Sequencer diagnostics: Relative sequence time remaining (Sequencer diag: SeqTime remain %) • Read only: x % • From version 03.00	Display of the residual time of the sequence in [%].
0x2DAE:009 (P140.09)	Sequencer diagnostics: Absolute sequence time remaining (Sequencer diag: SeqTime remain) • Read only: x.x s • From version 03.00	Display of the residual time of the sequence in [s].

Related topics

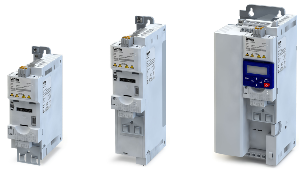
▶ Sequencer 504

▶ Sequencer control functions 588

6.2.10 Device identification

The following parameters show some general information about the inverter.

Parameter	Name / value range / [default setting]	Info
0x2000:001 (P190.01)	Device data: Product code (Device data: Product code) • Read only	Product code of the complete device. Example: "I55AE155D10V10017S" • If control unit and power unit were ordered separately, the product code "XXXXXXXXXXXXXXXXXXX" is displayed.
0x2000:002 (P190.02)	Device data: Serial number (Device data: Serial number) • Read only	Serial number of the complete device. Example: "0000000000000000XYZXYZ" • If control unit and power unit were ordered separately, the serial number "XXXXXXXXXXXXXXXXXXX" is displayed.
0x2000:004 (P190.04)	Device data: CU firmware version (Device data: CU firmware ver.) • Read only	Firmware version of the control unit. Example: "01.00.01.00"
0x2000:005 (P190.05)	Device data: CU firmware type (Device data: CU firmware type) • Read only	Firmware type of the control unit. Example: "IOFW51AC10"
0x2000:006 (P190.06)	Device data: CU bootloader version (Device data: CU bootlder ver.) • Read only	Bootloader version of the control unit. Example: "00.00.00.13"
0x2000:007 (P190.07)	Device data: CU bootloader type (Device data: CU bootlder type) • Read only	Bootloader type of the control unit. Example: "IOBL51AOnn"
0x2000:008 (P190.08)	Device data: Object directory version (Device data: OBD version) • Read only	Example: "108478"
0x2000:010 (P190.10)	Device data: PU firmware version (Device data: PU firmware ver.) • Read only	Firmware version of the power unit. Example: "00202"
0x2000:011 (P190.11)	Device data: PU firmware type (Device data: PU firmware type) • Read only	Firmware type of the power unit. Example: "IDFW5AA"
0x2000:012 (P190.12)	Device data: PU bootloader version (Device data: PU bootlder ver.) • Read only	Bootloader version of the power unit.
0x2000:013 (P190.13)	Device data: PU bootloader type (Device data: PU bootlder type) • Read only	Bootloader type of the power unit.
0x2000:014 (P190.14)	Device data: Module - firmware version (Device data: Mod. firmware) • Read only	Firmware version of the plugged-in module (e. g. WLAN module).
0x2000:015 (P190.15)	Device data: Firmware revision number (Device data: FW revision nr.) • Read only	Firmware version of the network option.



Parameter	Name / value range / [default setting]	Info
0x2000:016 (P190.16)	Device data: Bootloader revision number (Device data: Bootloader revNo) • Read only	Bootloader version of the network option.
0x2001 (P191.00)	Device name (Device name) ["**My Device**"]	Any device name (e.g. "Wheel drive") can be set in this object for the purpose of device identification.
0x2002:004 (P192.04)	Device module: CU type code (Device module: CU type code) • Read only	Type code of the control unit.
0x2002:005 (P192.05)	Device module: PU type code (Device module: PU type code) • Read only	Type code of the power unit.
0x2002:006 (P192.06)	Device module: CU serial number (Device module: CU serial number) • Read only	Serial number of the control unit.
0x2002:007 (P192.07)	Device module: PU serial number (Device module: PU serial number) • Read only	Serial number of the power unit.

6.2.11 Device overload monitoring (i*t)

The inverter calculates the i*t utilisation in order to protect itself against thermal overload. In simple terms: a higher current or an overcurrent that continues for a longer time causes a higher i*t utilisation.

⚠ DANGER!

Uncontrolled motor movements by pulse inhibit.

When the device overload monitoring function is activated, pulse inhibit is set and the motor becomes torqueless. A load that is connected to motors without a holding brake may therefore cause uncontrolled movements! Without a load, the motor will coast.

► Only operate the inverter under permissible load conditions.

Details

The device overload monitoring function primarily offers protection to the power section. Indirectly, also other components such as filter chokes, circuit-board conductors, and terminals are protected against overheating. Short-time overload currents followed by recovery periods (times of smaller current utilisation) are permissible. The monitoring function during operation checks whether these conditions are met, taking into consideration that higher switching frequencies and lower stator frequencies as well as higher DC voltages cause a greater device utilisation.

- If the device utilisation exceeds the warning threshold set in 0x2D40:002 (default setting: 95 %), the inverter outputs a warning.
- If the device utilisation exceeds the permanent error threshold 100 %, the inverter is disabled immediately and any further operation is stopped.
- Device overload monitoring depends on the inverter load characteristic 0x2D43:001 (P306.01).
- The device overload can be obtained from the configuration document.

Parameter	Name / value range / [default setting]	Info
0x2D40:002	Device utilisation (i*t): Warning threshold 0 ... [**95**] ... 101 %	If the device utilisation exceeds the threshold set, the inverter outputs a warning. • With the setting 0 % or ≥ 100 %, the warning is deactivated.
0x2D40:004 (P135.04)	Device utilisation (i*t) (Device utilisat.: ixt utilisation) • Read only: x %	Display of the current device utilisation.

Parameter	Name / value range / [default setting]		Info
0x2D40:005 (P135.05)	Device utilisation (i*t): Error response (Device utilisat.: Error response)		Selection of the response to be executed when the device overload monitoring function is triggered. Associated error code: • 9090 | 0x2382 - I*t error
	2	Trouble	▸ Error types 📖 139
	3	**Fault**	
0x2DDF:001	Axis information: Rated current • Read only: x.xx A		Display of the rated current of the axis.

6.2.12 Heatsink Temperature Monitoring

Parameter	Name / value range / [default setting]	Info
0x2D84:001 (P117.01)	Heatsink temperature (Heatsink temp.: Heatsink temp.) • Read only: x.x °C	Display of the current heatsink temperature.
0x2D84:002	Heatsink temperature: Warning threshold 50.0 ... [**80.0**]* ... 100.0 °C * Default setting depending on the size.	Warning threshold for temperature monitoring. • If the heatsink temperature exceeds the threshold set here, the inverter outputs a warning. • The warning is reset with a hysteresis of approx. 5 °C. • If the heatsink temperature increases further and exceeds the non-adjustable error threshold (100 °C), the inverter changes to the "Fault" device status. The inverter is disabled and thus any further operation is stopped.

6.2.13 Life-diagnosis

The following parameters provide some information about the use of the inverter.

This includes the following information:

- Operating and power-on time of the inverter/control unit
- Operating time of the internal fan
- Number of switching cycles of the mains voltage
- Number of switching cycles of the relay
- Number of short-circuits and earth faults that have occurred
- Display of the number of "Imax: Clamp responded too often" errors that have occurred.

Parameter	Name / value range / [default setting]	Info
0x2D81:001 (P151.01)	Life-diagnosis: Operating time (Life-diagnosis: Operating time) • Read only: x s	Display showing for how long the inverter has been running so far "Operation enabled" device state).
0x2D81:002 (P151.02)	Life-diagnosis: Power-on time (Life-diagnosis: Power-on time) • Read only: x s	Display showing for how long the inverter has been supplied with mains voltage so far.
0x2D81:003 (P151.03)	Life-diagnosis: Control unit operating time (Life-diagnosis: CU oper. time) • Read only: x ns	Display showing for how long the control unit has been supplied with voltage so far. This includes the external 24-V supply and voltage supply via USB module. • This also includes the time within which the control unit has only been supplied with an external 24 V voltage.
0x2D81:004 (P151.04)	Life-diagnosis: Main switching cycles (Life-diagnosis: Switching cycles) • Read only	Display of the number of switching cycles of the mains voltage.
0x2D81:005 (P151.05)	Life-diagnosis: Relay switching cycles (Life-diagnosis: Relay cycles) • Read only	Display of the number of switching cycles of the relay.
0x2D81:006 (P151.06)	Life-diagnosis: Short-circuit counter (Life-diagnosis: Short-circ.count) • Read only	Display of the number of short circuits that have occurred.
0x2D81:007 (P151.07)	Life-diagnosis: Earth fault counter (Life-diagnosis: Earthfault count) • Read only	Display of the number of earth faults that have occurred.

Parameter	Name / value range / [default setting]	Info
0x2D81:008 (P151.08)	Life-diagnosis: Clamp active (Life-diagnosis: Clamp active) • Read only	Display of the number of "Imax: Clamp responded too often" errors that have occurred. • "Clamp" = short-time inhibit of the inverter in V/f operation when the current limit shown in 0x2DDF:002 is reached.
0x2D81:009 (P151.09)	Life-diagnosis: Fan operating time (Life-diagnosis: Fan oper. time) • Read only: x s	Display showing for how long the internal fan has been running so far.

6.3 Error handling

Many functions integrated in the inverter can

- detect errors and thus protect inverter and motor from damages,
- detect an operating error of the user,
- output a warning or information if desired.

6.3.1 Error types

In the event of an error, the inverter response is determined by the error type defined for the error.

In the following, the different error types are described.

Error type "No response"

The error is completely ignored (does not affect the running process).

Error type "Warning"

A warning does not severely affect the process and may be also ignored in consideration of safety aspects.

Error type "Fault"

The motor is brought to a standstill with the quick stop ramp.

- The inverter will only be disabled after the quick stop is executed (motor at standstill) or after the time-out time set in 0x2826 has been elapsed. ▶ Timeout für fault reaction 📖 483
- **Exception:** In case of a serious fault, the inverter is disabled immediately. The motor becomes torqueless (coasts). For details see the table "Error codes". 📖 639

Error type "Trouble"

Just like "Fault", but the error state will be left automatically if the error condition is not active anymore.

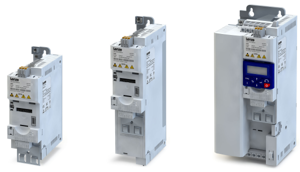
- **Exception:** In case of a severe trouble, the inverter is disabled immediately. The motor becomes torqueless (coasts). For details see the table "Error codes". 📖 639
- The restart behaviour after trouble can be configured. ▶ Automatic restart 📖 484

In the operating mode 0x6060 (P301.00) = "CiA: Velocity mode [2]", the behaviour in case of "Trouble" is just like in case of "Fault"!

Comparison of the error types

The following table compares the main differences of the error types:

Error type	Logging in the Error history buffer / Logbook	Display in the CiA 402 status word 0x6041 (P780.00)	Inverter disable	Motor stop	Error reset is required	"ERR" LED (red)
No response	No	No	No	No	No	off
Warning	Yes	yes, bit 7	No	No	No	blinking fast (4 Hz)
Trouble	Yes	yes, bit 3	after quick stop or immediately.	quick stop ramp or coasting.	No	blinking (1 Hz)
Error	Yes	yes, bit 3	For details see table "Error codes". 📖 639		Yes	on



6.3.2 Error configuration

The errors can be divided into two types:

- Errors with predefined error type
- Errors with configurable error type

Especially critical errors are permanently set to the "Fault" error type in order to protect inverter and motor from damages.

In case of errors with configurable error type, the default setting can be changed in consideration of safety aspects and the operational performance. The selection "No response [0]" is, however, only available for minor errors.

The "Error codes" table lists the error type for each error. If the error type can be configured by the user, the "adjustable in" column displays the corresponding parameter. 639

6.3.3 Error reset

If the error condition is not active anymore, there are several options to reset an active error and thus leave the error state again:

- Via the keypad key . ▶ Error reset with keypad 634
- Via the trigger assigned to the Reset fault" function. ▶ Reset error 570
- Via the button in the »EASY Starter« ("Diagnostics" tab).
- In the default setting of 0x400E:008 (P505.08) via bit 7 in the mappable data word NetWordIN1 0x4008:001 (P590.01).
- Via bit 7 in the mappable CiA 402 control word 0x6040.
- Via bit 2 in the mappable AC Drive control word 0x400B:001 (P592.01).
- Via bit 11 in the mappable LECOM control word 0x400B:002 (P592.02).

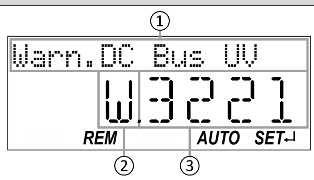
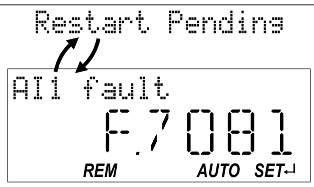
Notes:

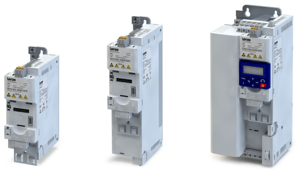
- Certain errors can only be reset by mains switching.
- Certain errors (e. g. earth fault or short circuit of the motor phases) may cause a blocking time. In this case, the error can be reset only after the blocking time has elapsed. An active blocking time is displayed via bit 14 in the inverter status word 0x2831.

The "Error codes" table gives the blocking time (if available) for each error. This table also shows whether mains switching is required for the error reset. 639

6.3.4 Keypad error messages

If an error is pending, the keypad shows the following information:

Keypad display	Meaning
 • Faults (F) and trouble (T) are displayed continuously. • Warnings (W) are only displayed every 2 seconds for a short time.	① Error text ② Error type: F — Fault T — Trouble W — Warning ③ Error code (hexadecimal) ▶ Error codes 639 ▶ Error reset with keypad 634
	After a disturbance, a restart is possible if the error condition is not active anymore. The keypad shows this by the "Restart Pending" note. The note is displayed in a 1-second interval alternating with the error text. ▶ Timeout für fault reaction 483



6.4 Data handling

In the following, the behaviour of the inverter is described if the data on the memory module do not match the inverter hardware or firmware, for whatever reason.

The following points are described in detail here:

- Automatic loading of the parameter settings when the inverter is switched on
- Manual loading of the user data via device command
- Manual loading of the OEM data via device command
- Manual saving of the parameter settings via device command
- Hardware and firmware updates/downgrades

Automatic loading of the parameter settings when the inverter is switched on

Process when the inverter is switched on:

1. The default setting saved in the inverter firmware is loaded.
2. If a memory module with valid data is available, the data is loaded from the user memory.

   Otherwise a corresponding error message is output:

Error message	Info
0x7681: No memory module	The default setting saved in the inverter firmware is loaded. The error cannot be reset by the user. Remedy: 1. Switch off inverter. 2. Plug the memory module into the inverter. 3. Switch the inverter on again. Note: The memory module cannot be replaced during ongoing operation!
0x7682: Memory module: invalid user data	The user parameter settings in the memory module are invalid. Thus, the user parameter settings get lost. The default setting is loaded automatically. Remedy: 1. Execute user parameter settings again. 2. Execute device command "Save user data" 0x2022:003 (P700.03).
0x7684: Data not completely saved before switch-off	Saving the parameter settings was interrupted by an unexpected disconnection. The user parameter settings were not saved completely. When the inverter is switched on the next time, the backup data is copied to the user memory. Remedy: 1. Check user parameter settings. (The loaded backup is an older version.) 2. If required, repeat the changes made last. 3. Execute device command "Save user data" 0x2022:003 (P700.03).
0x7689: Memory module: invalid OEM data	The OEM memory contains invalid parameter settings or is empty. The user parameter settings are loaded automatically. Remedy: • Execute device command "Save OEM data" 0x2022:006 (P700.06). • Thus, the user parameter settings get lost!

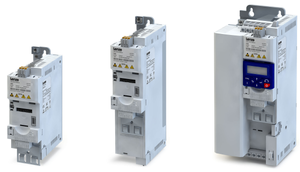
Notes:

- If the memory module contains invalid data, the device commands "Load user data" 0x2022:004 (P700.04) and "Load OEM data" 0x2022:005 (P700.05) are not executed. The status feedback "Action cancelled" takes place.
- If the memory module is empty, the default setting saved in the inverter firmware is loaded. No access is required by the user. The memory module remains empty until the device command "Save user data" 0x2022:003 (P700.03) or "Save OEM data" 0x2022:006 (P700.06) is executed.
- Irrespective of the data on the memory module, the device command "Load default settings" 0x2022:001 (P700.01) is always enabled.

Manual loading of the user data via device command

Device command: "Load user data" 0x2022:004 (P700.04)

- If the user memory contains invalid parameter settings, the default setting saved in the inverter firmware is automatically loaded.
- For possible error messages, see the table above.



Manual loading of the OEM data via device command

Device command: "Load OEM data" 0x2022:005 (P700.05)

- If the OEM memory contains invalid parameter settings, the user parameter settings are loaded automatically.
- If the OEM memory is empty, the status feedback "Action cancelled" takes place. The current parameter settings remain unchanged.

Manual saving of the parameter settings via device command

Device command: "Save user data" 0x2022:003 (P700.03)

- It may happen that the parameter settings cannot be saved because the user memory is full. In this case, the following error message appears:

Error message	Info
0x7680: Memory module is full	The memory module contains too many parameter settings. The parameter settings were not saved in the memory module. Remedy: Execute device command "Save user data" 0x2022:003 (P700.03) again. This reinitialises the user memory with the current parameter settings. By this means, parameter settings no longer required are deleted automatically.

Hardware and firmware upgrades/downgrades

By "taking along" the memory module, all parameter settings of a device can be transferred to another device, for instance, in case of a device replacement. When switched on, the inverter checks whether the parameter settings saved in the memory module match the inverter hardware and firmware. In case of an incompatibility, a corresponding error message is output.

The following table contains details on different scenarios:

Prio	Compatibility check User data ←→ device	Error message	Info
1	Device has a newer firmware Example: Version 2.x → version 3.x	-	The "firmware upgrade" is recognised. • The user parameter settings are loaded without an action being required by the user. • If the parameter settings are saved afterwards, the user memory is reinitialised with the current parameter settings. By this means, parameter settings no longer required are deleted automatically.
	Device has an older firmware Example: Version 4.x → version 3.x	0x7690: EPM firmware version incompatible	The data is loaded into the RAM memory but are incompatible. Remedy: 1. Execute device command "Load default settings" 0x2022:001 (P700.01). 2. Execute "Save user data" 0x2022:003 (P700.03) or "Save OEM data" 0x2022:006 (P700.06) device command.
2	Firmware type is different	0x7691: EPM data: firmware type incompatible	
	Power unit is different (and incompatible with saved data)	0x7693: EPM data: PU size incompatible	
	Country code is different Example: EU → USA	0x7691: EPM data: firmware type incompatible	
	Device has less functionality Examples: i550 → i510 Application I/O → Standard I/O		
3	Network option is different Example: CANopen → PROFIBUS	0x7692: EPM data: new firmware type detected	The data is loaded into the RAM memory and is compatible. However, the settings must be accepted by the user: 1. Check parameter settings. 2. Reset error. 3. Execute "Save user data" 0x2022:003 (P700.03) or "Save OEM data" 0x2022:006 (P700.06) device command.
4	Device has more functionality Examples: i510 → i550 Standard I/O → application I/O	-	The "hardware upgrade" is recognised. • The user parameter settings are loaded without an action being required by the user. • If the parameter settings are saved afterwards, the user memory is reinitialised with the current parameter settings. By this means, parameter settings no longer required are deleted automatically.
5	Power unit is different (but compatible with saved data) Example: 230 V/0.75 kW → 400 V/5.5 kW	0x7694: EPM data: new PU size detected	The data is loaded into the RAM memory and is compatible. However, the settings must be accepted by the user: 1. Check parameter settings. 2. Reset error. 3. Execute "Save user data" 0x2022:003 (P700.03) or "Save OEM data" 0x2022:006 (P700.06) device command.

7 Basic setting

This chapter contains the most frequently used functions and settings to adapt the inverter to a simple application based on the default setting.

7.1 Mains voltage

The rated mains voltage set for the inverter has an impact on the operating range of the inverter.

Details

By default, the rated mains voltage in 0x2540:001 (P208.01) is set according to the product code of the inverter.

Check the setting of the rated mains voltage in 0x2540:001 (P208.01). Ensure that it matches the actual mains voltage applied!

Region	Inverter	Product code 0x2000:001 (P190.01)	Rated mains voltage	
			Default setting	Possible settings
EU	i500, 230 V, 1-phase	i5xAExxxBxxxx0xxxx	230 Veff [0]	230 Veff [0]
US	i500, 230 V, 1-phase	i5xAExxxBxxxx1xxxx	230 Veff [0]	230 Veff [0]
EU	i500, 230 V, 1/3-phase	i5xAExxxDxxxx0xxxx	230 Veff [0]	230 Veff [0]
US	i500, 230 V, 1/3-phase	i5xAExxxDxxxx1xxxx	230 Veff [0]	230 Veff [0]
EU	i500, 400 V, 3-phase	i5xAExxxFxxxx0xxxx	400 Veff [1]	400 Veff [1], 480 Veff [2]
US	i500, 480 V, 3-phase	i5xAExxxFxxxx1xxxx	480 Veff [2]	400 Veff [1], 480 Veff [2]
EU	i500, 120 V, 1-phase	i5xAExxxAxxxx0xxxx	120 Veff [3]	120 Veff [3]
US	i500, 120 V, 1-phase	i5xAExxxAxxxx1xxxx	120 Veff [3]	120 Veff [3]

Notes regarding the table:

- The inverter types 400/480 V can be used with different mains voltages. For setting the internal limit values, the rated mains voltage can be set in 0x2540:001 (P208.01) by the user.
- The inverter types 120 V are designed for a 1-phase 120-V mains voltage and 3-phase 230-V three-phase AC motors. These inverters have an internal DC bus similar to the 230-V inverters. The voltage thresholds correspond to the ones of the 230-V inverters.
- If the inverter is reset to the delivery status, the rated mains voltage is also reset to the default setting listed in the table according to the product code.

The following results from the rated mains voltage set:

- the error threshold for monitoring the DC-bus voltage and
- the voltage threshold for braking operation ("brake chopper threshold").

Monitoring of the DC-bus voltage

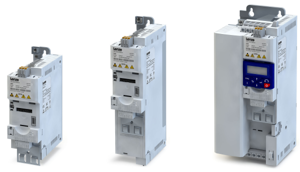
- The warning thresholds for monitoring are adjustable.
- The error thresholds and reset thresholds for monitoring result from the rated mains voltage set:

Rated mains voltage	Undervoltage thresholds			Overvoltage thresholds		
	Warning threshold	Error threshold	Reset threshold	Warning threshold	Error threshold	Reset threshold
Setting in 0x2540:001 (P208.01)	Setting in 0x2540:002 (P208.02)	Display in 0x2540:003 (P208.03)	Display in 0x2540:004 (P208.04)	Setting in 0x2540:005 (P208.05)	Display in 0x2540:006 (P208.06)	Display in 0x2540:007 (P208.07)

- If the DC-bus voltage of the inverter falls below the undervoltage error threshold, the "Trouble" response is triggered.
  - Without external 24-V supply: Motor behaves according to 0x2838:002 (P203.02).
  - With external 24-V supply: At undervoltage, motor behaves according to disturbance response.
- If the DC-bus voltage of the inverter exceeds the overvoltage error threshold, the "Fault" response is triggered.

The motor does not restart automatically after the overvoltage monitoring function has been activated.

Parameter	Name / value range / [default setting]	Info
0x2540:001 (P208.01)	Mains settings: Rated mains voltage (Mains settings: Mains voltage) • Setting can only be changed if the inverter is inhibited.	Selection of the mains voltage for actuating the inverter.
	0 **230 Veff**	
	1 400 Veff	
	2 480 Veff	
	3 120 Veff	
	10 230 Veff/reduced LU level	
0x2540:002 (P208.02)	Mains settings: Undervoltage warning threshold (Mains settings: LU warn. thresh.) 0 ... [**0**]* ... 800 V * Default setting depending on the size.	Setting of the warning threshold for monitoring DC bus undervoltage. • If the DC bus voltage falls below the threshold set, the inverter outputs a warning. • The warning is reset with a hysteresis of 10 V.
0x2540:003 (P208.03)	Mains settings: Undervoltage error threshold (Mains settings: LU error thresh.) • Read only: x V	Display of the fixed error threshold for monitoring DC bus undervoltage. • If the DC-bus voltage falls below the threshold displayed, the "Fault" response is triggered.
0x2540:004 (P208.04)	Mains settings: Undervoltage reset threshold (Mains settings: LU reset thresh.) • Read only: x V	Display of the fixed reset threshold for monitoring DC bus undervoltage.
0x2540:005 (P208.05)	Mains settings: Overvoltage warning threshold (Mains settings: OU warn. thresh.) 0 ... [**0**]* ... 800 V * Default setting depending on the size.	Setting of the warning threshold for monitoring DC bus overvoltage. • If the DC bus voltage exceeds the threshold set, the inverter outputs a warning. • The warning is reset with a hysteresis of 10 V.
0x2540:006 (P208.06)	Mains settings: Overvoltage error threshold (Mains settings: OU error thresh.) • Read only: x V	Display of the fixed error threshold for monitoring the DC bus overvoltage. • If the DC-bus voltage exceeds the threshold displayed, the "Fault" response is triggered.
0x2540:007 (P208.07)	Mains settings: Overvoltage reset threshold (Mains settings: OU reset thresh.) • Read only: x V	Display of the fixed reset threshold for monitoring DC bus overvoltage.



7.2 Inverter load characteristic

The inverter has two different load characteristics: "Light Duty" and "Heavy Duty". The load characteristic "Light Duty" enables a higher output current with restrictions regarding overload capacity, ambient temperature and switching frequency. This enables the motor required for the application to be driven by a less powerful inverter. The selected load characteristic depends on the application.

NOTICE

Load characteristic "Light Duty"

In order to prevent irreversible damage of the inverter/motor:

- Based on the configuration document, check whether the inverter can be operated with the load characteristic "Light Duty".
- Comply with all data in the configuration document for this load characteristic and the corresponding mains voltage range. Among other things, this includes information on the type of installation and required fuses, cable cross-sections, mains chokes and filters.
- Set parameters only in accordance with the following specifications.

Details

The following table compares the two load characteristics:

	Duty selection 0x2D43:001 (P306.01)	
	"Heavy Duty [0]"	**"Light Duty [1]"**
Characteristics	High dynamic requirements	Low dynamic requirements
Typical applications	Main tool drives, travelling drives, hoist drives, winders, forming drives, and conveyors.	Pumps, fans, general horizontal materials handling technology and line drives.
Overload capacity	3 s/200 %, 60 s/150 % For details see configuration document	Reduced overload For details see configuration document

If the inverter is reset to the default setting, the load characteristic is set to "Heavy Duty [0]".

Parameter	**Name / value range / [default setting]**		**Info**
0x2D43:001 (P306.01)	Inverter load characteristic: Duty selection (Inv. load char.: Duty selection) • Setting can only be changed if the inverter is inhibited.		Selection of the load characteristic. Further required settings: • Set the motor data according to the motor. • Set further parameters (e. g. current limits) according to the application.
	0	**Heavy Duty**	Load characteristic for high dynamic requirements.
	1	Light Duty	Load characteristic for low dynamic requirements. • The device overload monitoring (i*t) is adapted. CAUTION! Observe the information in the configuration document for this load characteristic.

Related topics

- Motor data 164
- Current limits 220

7.3 Control source selection

The selected "control source" serves to provide the inverter with its start, stop, and reversal commands.

Possible control sources are:

- Digital inputs
- Keypad
- Network

> Irrespective of the control source selection, stop commands are always active from each source connected! If, for instance, the network control is active and a keypad is connected for diagnostic purposes, the motor is also stopped if the keypad key is pressed.
> **Exception:** In the jog operation, a stop command has no impact.

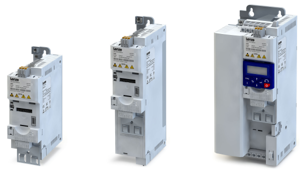
Details

- The default setting "Flexible I/O configuration [0]" in 0x2824 (P200.00) enables a flexible control of the inverter via digital inputs, network and keypad. The control of the inverter via the digital inputs is preconfigured. For details see the chapter "Function assignment of the inputs and outputs". 📖 82
- If the keypad is to be used as the sole control source for the application, selection "Keypad [1]" is to be set in 0x2824 (P200.00).
- The control source that is currently active is displayed in 0x282B:001 (P125.01).

Parameter	Name / value range / [default setting]		Info
0x2824 (P200.00)	Control selection (Control select.)		Selection of the type of inverter control.
	0	**Flexible I/O configuration**	This selection enables a flexible assignment of the start, stop, and rotating direction commands with digital signal sources. • Digital signal sources can be digital inputs, network and keypad. • The I/O configuration is made via the parameters 0x2631:xx (P400.xx).
	1	Keypad	This selection enables the motor to be started exclusively via the start key of the keypad. Other signal sources for starting the motor are ignored. Start motor Stop motor Note! • The functions "Enable inverter" 0x2631:001 (P400.01) and "Run" 0x2631:002 (P400.02) must be set to TRUE to start the motor. • If jog operation is active, the motor cannot be stopped via the keypad key.
0x282B:001 (P125.01)	Inverter diagnostics: Active control source (Inverter diag.: Active control) • Read only		Display of the control source that is currently active.
	0	Flexible I/O configuration	
	1	Network	
	2	Keypad	
	8	Keypad full control	

Related topics

- The preset I/O configuration can be individually adapted to the respective application. For details see the chapter "Flexible I/O configuration". 📖 525
- For details of the network control of the inverter, see the chapter "General network settings". 📖 227



7.4 Selection of setpoint source

The selected "setpoint source" serves to provide the inverter with its setpoint. The setpoint source can be selected individually for each operating mode.

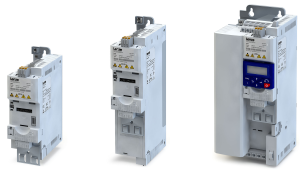
Possible setpoint sources are:
- Analog inputs
- Keypad
- Network
- Parameterisable setpoints (presets)
- Digital inputs (configured as HTL input for pulse train or HTL encoder)
- "Motor potentiometer" function
- "Sequencer" function

Details

- For applications only requiring one setpoint it is sufficient to define the standard setpoint source in the following parameters.
- For applications requiring a change-over of the setpoint source during operation, the functions for setpoint change-over have to be configured accordingly. ▶ Setpoint change-over 📖 546

Parameter	Name / value range / [default setting]		Info
0x2860:001 (P201.01)	Frequency control: Default setpoint source (Stnd. setpoints: Freq. setp. src.)		Selection of the standard setpoint source for operating mode "MS: Velocity mode". • The selected standard setpoint source is always active in the operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]" when no setpoint change-over to another setpoint source via corresponding triggers/functions is active. ▶ Setpoint change-over 📖 546
	1	Keypad	The setpoint is specified locally by the keypad. • Default setting: 0x2601:001 (P202.01) • Use the ↑ and ↓ navigation keys to change the keypad setpoint (also during running operation).
	2	**Analog input 1**	The setpoint is defined as analog signal via the analog input 1. ▶ Analog input 1 📖 597
	3	Analog input 2	The setpoint is defined as analog signal via the analog input 2. ▶ Analog input 2 📖 601
	4	HTL input (from version 04.00)	The digital inputs DI3 and DI4 can be configured as HTL input to use an HTL encoder as setpoint encoder or define the setpoint as a reference frequency ("pulse train"). ▶ HTL input setpoint source 📖 565
	5	Network	The setpoint is defined as process data object via the network. ▶ Configuring the network 📖 226
	11	Frequency preset 1	For the setpoint selection, preset values can be parameterised and selected. ▶ Setpoint source of preset setpoints 📖 554
	12	Frequency preset 2	
	13	Frequency preset 3	
	14	Frequency preset 4	
	15	Frequency preset 5	
	16	Frequency preset 6	
	17	Frequency preset 7	
	18	Frequency preset 8	
	19	Frequency preset 9	
	20	Frequency preset 10	
	21	Frequency preset 11	
	22	Frequency preset 12	
	23	Frequency preset 13	
	24	Frequency preset 14	
	25	Frequency preset 15	

Parameter	Name / value range / [default setting]		Info
	31	Segment preset 1 (from version 03.00)	For the setpoint selection, the segment presets parameterised for the "sequencer" function can be selected as well. ▶ Sequencer 📖 504
	32	Segment preset 2 (from version 03.00)	
	33	Segment preset 3 (from version 03.00)	
	34	Segment preset 4 (from version 03.00)	
	35	Segment preset 5 (from version 03.00)	
	36	Segment preset 6 (from version 03.00)	
	37	Segment preset 7 (from version 03.00)	
	38	Segment preset 8 (from version 03.00)	
	50	Motor potentiometer	The setpoint is generated by the "motor potentiometer" function. This function can be used as an alternative setpoint control which is controlled via two signals: "MOP setpoint up" and "MOP setpoint down". ▶ Motor potentiometer setpoint source (MOP) 📖 559
	201	Internal value (from version 05.00)	Internal values of the manufacturer.
	202	Internal value (from version 05.00)	
	203	Internal value (from version 05.00)	
	204	Internal value (from version 05.00)	
	205	Internal value (from version 05.00)	
	206	Internal value (from version 05.00)	



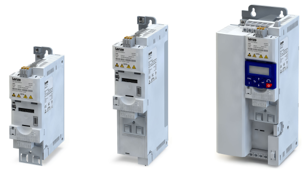
Parameter	Name / value range / [default setting]		Info
0x2860:002 (P201.02)	PID control: Default setpoint source (Stnd. setpoints: PID setp. src.)		Selection of the standard setpoint source for the reference value of the PID control. • The selected standard setpoint source is always active with an activated PID control when no setpoint change-over to another setpoint source via corresponding triggers/functions is active.
	1	**Keypad**	The setpoint is specified locally by the keypad. • Default setting: 0x2601:002 (P202.02) • Use the ↑ and ↓ navigation keys to change the keypad setpoint (also during running operation).
	2	Analog input 1	The setpoint is defined as analog signal via the analog input 1. ▸ Analog input 1 📖 597
	3	Analog input 2	The setpoint is defined as analog signal via the analog input 2. ▸ Analog input 2 📖 601
	4	HTL input (from version 04.00)	The digital inputs DI3 and DI4 can be configured as HTL input to use an HTL encoder as setpoint encoder or define the setpoint as a reference frequency ("pulse train"). ▸ HTL input setpoint source 📖 565
	5	Network	The setpoint is defined as process data object via the network. ▸ Configuring the network 📖 226
	11	PID preset 1	For the setpoint selection, preset values can be parameterised and selected. ▸ Setpoint source of preset setpoints 📖 554
	12	PID preset 2	
	13	PID preset 3	
	14	PID preset 4	
	15	PID preset 5	
	16	PID preset 6	
	17	PID preset 7	
	18	PID preset 8	
	31	Segment preset 1 (from version 03.00)	For the setpoint selection, the segment presets parameterised for the "sequencer" function can be selected as well. ▸ Sequencer 📖 504
	32	Segment preset 2 (from version 03.00)	
	33	Segment preset 3 (from version 03.00)	
	34	Segment preset 4 (from version 03.00)	
	35	Segment preset 5 (from version 03.00)	
	36	Segment preset 6 (from version 03.00)	
	37	Segment preset 7 (from version 03.00)	
	38	Segment preset 8 (from version 03.00)	
	50	Motor potentiometer	The setpoint is generated by the "motor potentiometer" function. This function can be used as an alternative setpoint control which is controlled via two signals: "MOP setpoint up" and "MOP setpoint down". ▸ Motor potentiometer setpoint source (MOP) 📖 559
	201	Internal value (from version 05.00)	Internal values of the manufacturer.
	202	Internal value (from version 05.00)	
	203	Internal value (from version 05.00)	
	204	Internal value (from version 05.00)	
	205	Internal value (from version 05.00)	
	206	Internal value (from version 05.00)	

Parameter	Name / value range / [default setting]	Info
0x2860:003 (P201.03)	Torque control: Default setpoint source (Stnd. setpoints: Torque setp.src.) • From version 03.00	Selection of the standard setpoint source for operating mode "MS: Torque mode". • The selected standard setpoint source is always active in the operating mode 0x6060 (P301.00) = "MS: Torque mode [-1]" when no setpoint change-over to another setpoint source via corresponding triggers/functions is active.
	1 Keypad	The setpoint is specified locally by the keypad. • Default setting: 0x2601:003 (P202.03) • Use the ↑ and ↓ navigation keys to change the keypad setpoint (also during running operation).
	2 Analog input 1	The setpoint is defined as analog signal via the analog input 1. ▸ Analog input 1 📖 597
	3 Analog input 2	The setpoint is defined as analog signal via the analog input 2. ▸ Analog input 2 📖 601
	4 HTL input (from version 04.00)	The digital inputs DI3 and DI4 can be configured as HTL input to use an HTL encoder as setpoint encoder or define the setpoint as a reference frequency ("pulse train"). ▸ HTL input setpoint source 📖 565
	5 Network	The setpoint is defined as process data object via the network. ▸ Configuring the network 📖 226
	11 Torque preset 1	For the setpoint selection, preset values can be parameterised and selected. ▸ Setpoint source of preset setpoints 📖 554
	12 Torque preset 2	
	13 Torque preset 3	
	14 Torque preset 4	
	15 Torque preset 5	
	16 Torque preset 6	
	17 Torque preset 7	
	18 Torque preset 8	
	31 Segment preset 1	For the setpoint selection, the segment presets parameterised for the "sequencer" function can be selected as well. ▸ Sequencer 📖 504
	32 Segment preset 2	
	33 Segment preset 3	
	34 Segment preset 4	
	35 Segment preset 5	
	36 Segment preset 6	
	37 Segment preset 7	
	38 Segment preset 8	
	50 Motor potentiometer	The setpoint is generated by the "motor potentiometer" function. This function can be used as an alternative setpoint control which is controlled via two signals: "MOP setpoint up" and "MOP setpoint down". ▸ Motor potentiometer setpoint source (MOP) 📖 559
	201 Internal value (from version 05.00)	Internal values of the manufacturer.
	202 Internal value (from version 05.00)	
	203 Internal value (from version 05.00)	
	204 Internal value (from version 05.00)	
	205 Internal value (from version 05.00)	
	206 Internal value (from version 05.00)	

7.4.1 Keypad setpoint default setting

For the manual setpoint selection via keypad the following default settings are used.

Parameter	Name / value range / [default setting]	Info
0x2601:001 (P202.01)	Keypad setpoints: Frequency setpoint (Keypad setpoints: KP freq.setpoint) 0.0 ... [**20.0**] ... 599.0 Hz	Default setting of the keypad setpoint for the operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]".
0x2601:002 (P202.02)	Keypad setpoints: Process controller setpoint (Keypad setpoints: KP PID setpoint) -300.00 ... [**0.00**] ... 300.00 PID unit	Default setting of the keypad setpoint for the reference value of the PID control.



Parameter	Name / value range / [default setting]	Info
0x2601:003 (P202.03)	Keypad setpoints: Torque setpoint (Keypad setpoints: KP torq.setpoint) -400.0 ... [**100.0**] ... 400.0 % • From version 03.00	Default setting of the keypad setpoint for the operating mode 0x6060 (P301.00) = "MS: Torque mode [-1]". • 100 % ≡ Motor rated torque 0x6076 (P325.00)

The increment for keypad setpoints can be adapted in 0x2862 (P701.00) by pressing a keypad arrow key once.

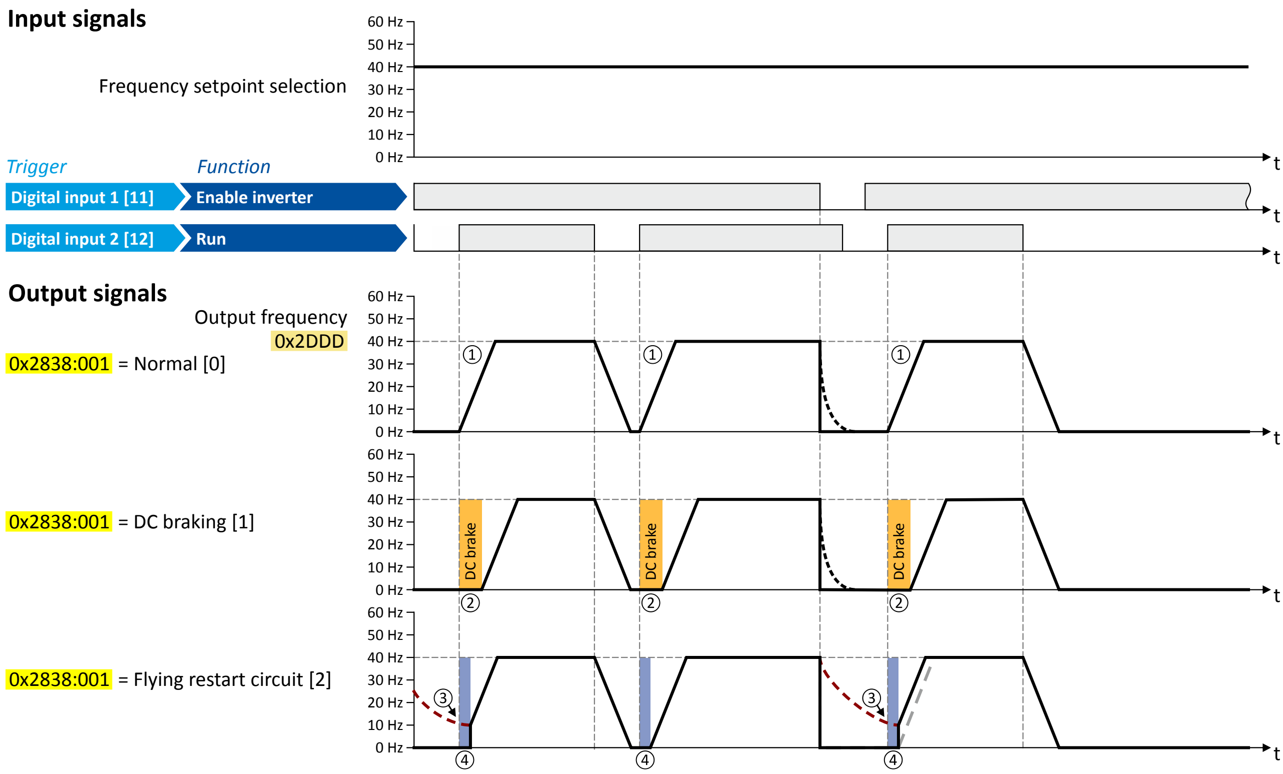
7.5 Starting/stopping performance

7.5.1 Starting performance

The start can be optionally made with DC braking or flying restart circuit. Moreover, an automatic start can be activated after switch-on.

Details

The start method can be selected in 0x2838:001 (P203.01). The following diagram demonstrates the different start methods:



① Start method = "Normal [0]": After the start command, the motor is accelerated to the setpoint with the set acceleration time.

② Start method = "DC braking [1]": After the start command, the "DC braking" function is active. Only after the hold time set in 0x2B84:002 (P704.02) has elapsed, the motor is accelerated to the setpoint with the set acceleration time.
▶ DC braking 📖 437

③ For demonstrating the flying restart circuit: At the time of the start command, the motor is not at standstill (for instance by loads with high inertia such as fans or flywheels).

④ Start method = "Flying restart circuit [2]": After the start command, the flying restart circuit is active. The flying restart circuit serves to restart a coasting motor on the fly during operation without speed feedback. The synchronicity between inverter and motor is coordinated so that the transition to the rotating motor is effected without jerk at the time of connection.
▶ Flying restart circuit 📖 481

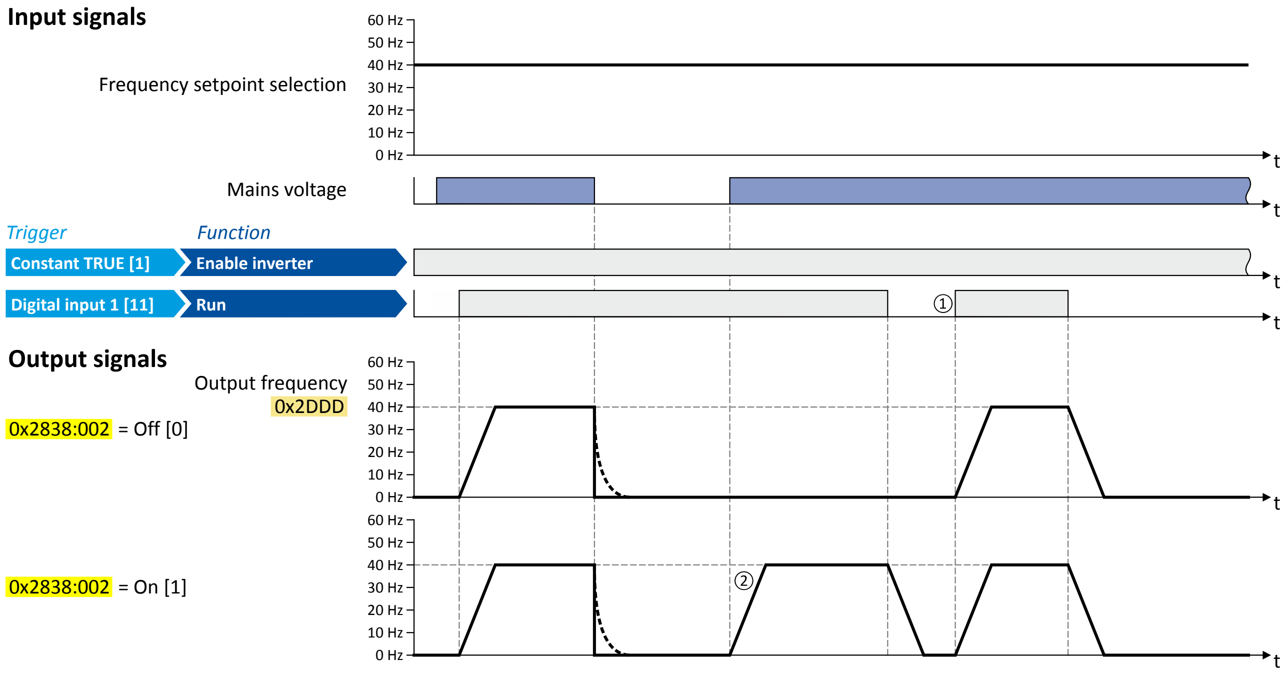
Automatic start after switching on the mains voltage

The automatic start can be activated in 0x2838:002 (P203.02).

Preconditions for the automatic start:

- Flexible I/O configuration is selected: 0x2824 (P200.00) = "Flexible I/O configuration [0]"
- For the start command, a digital input has been configured. (In case of keypad or activated network control, an automatic start is not possible.)

The following diagram demonstrates the function:



① Start at power-up = "Off [0]": After switching on the mains voltage, a renewed start command is required to start the motor.

② Start at power-up = "On [1]": After switching on the mains voltage, the motor starts automatically if a start command is active.

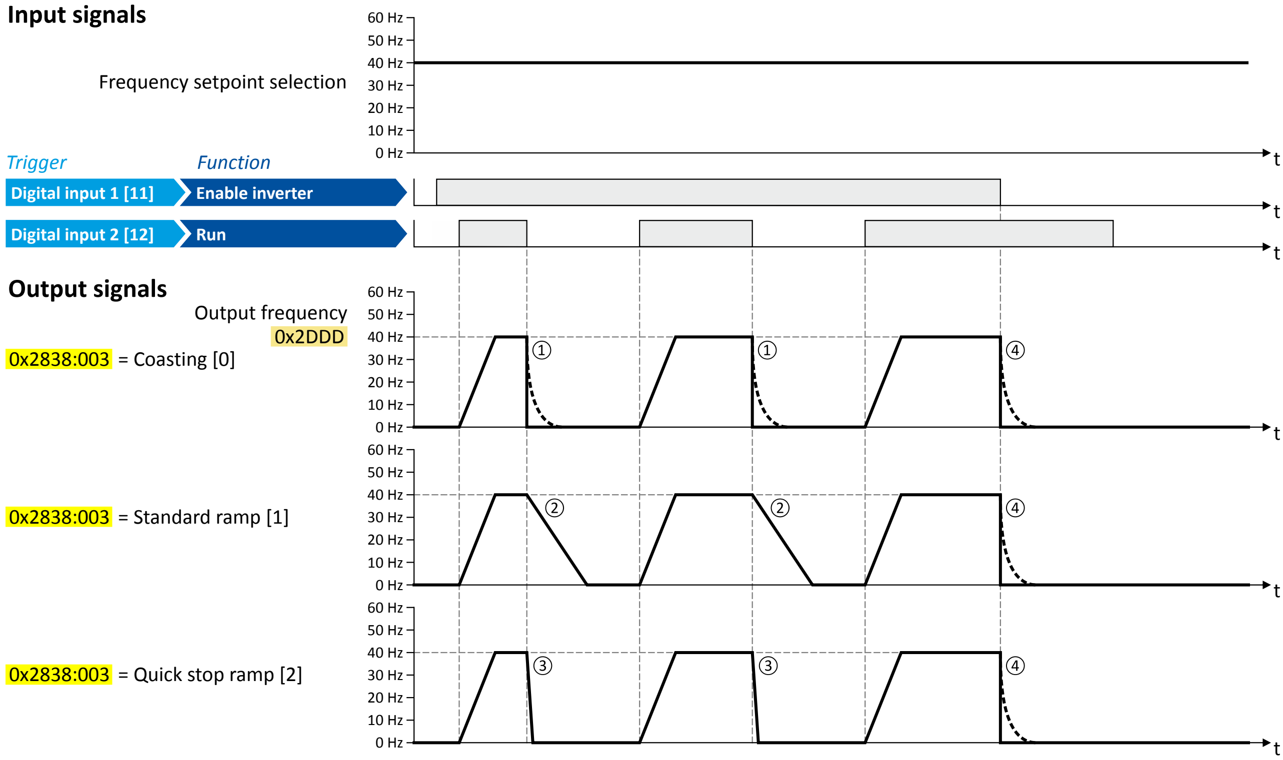
Parameter	Name / value range / [default setting]	Info
0x2838:001 (P203.01)	Start/stop configuration: Start method (Start/stop confg: Start method) • Setting can only be changed if the inverter is inhibited.	Behaviour after start command.
	0 **Normal**	After start command, the standard ramps are active. • Acceleration time 1 can be set in 0x2917 (P220.00). • Deceleration time 1 can be set in 0x2918 (P221.00).
	1 DC braking	After start command, the "DC braking" function is active for the time set in 0x2B84:002 (P704.02). ▸ DC braking 📖 437
	2 Flying restart circuit	After the start command, the flying restart circuit is active. The flying restart function makes it possible to restart a coasting motor during operation without speed feedback. Synchronicity between the inverter and motor is coordinated so that the transition to the rotating motor is effected without jerk at the time of connection. ▸ Flying restart circuit 📖 481
	3 Start with magnetisation	
0x2838:002 (P203.02)	Start/stop configuration: Start at power-up (Start/stop confg: Start at powerup)	Starting performance after switching on the mains voltage.
	0 **Off**	No automatic start after switching on mains voltage. In addition to the inverter enable, a renewed start command is always required to start the motor.
	1 On	Automatic start of the motor after switching on the mains voltage if the inverter is enabled and a start command exists.

7.5.2 Stopping performance

In the default setting, the motor is brought to a standstill after a stop command with standard ramp. Alternatively, coasting or ramping down with quick stop ramp can be selected.

Details

The stop method can be selected in 0x2838:003 (P203.03). The following diagram demonstrates the different stop methods:



① Stop method = "Coasting [0]": The motor is coasting.

② Stop method = "Standard ramp [1]": The motor is brought to standstill with a deceleration time 1 (here: 10 s).

③ Stop method = "Quick stop ramp [2]": The motor is brought to a standstill with the deceleration time for quick stop (here: 1 s).

④ If "Enable inverter" is set to FALSE, the inverter is disabled. The motor becomes torqueless and coasts to standstill depending on the mass inertia of the machine (irrespective of the set stop method).

Parameter	Name / value range / [default setting]		Info
0x2838:003 (P203.03)	Start/stop configuration: Stop method (Start/stop confg: Stop method)		Behaviour after the "Stop" command.
	0	Coasting	The motor becomes torqueless (coasts down to standstill).
	1	**Standard ramp**	The motor is brought to a standstill with deceleration time 1 (or deceleration time 2, if activated). • Deceleration time 1 can be set in 0x2918 (P221.00). • Deceleration time 2 can be set in 0x291A (P223.00). ▸ Frequency limits and ramp times 📖 156
	2	Quick stop ramp	The motor is brought to a standstill with the deceleration time set for the "Quick stop" function. • Deceleration time for quick stop can be set in 0x291C (P225.00). • The "quick stop" function can also be activated manually, for instance via a digital input. ▸ Quick stop 📖 159

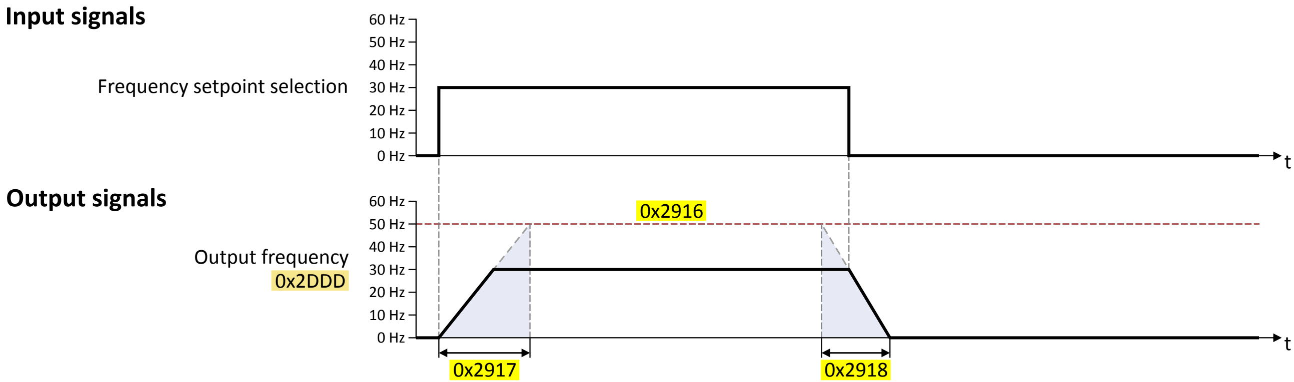
7.6 Frequency limits and ramp times

The frequency range can be limited by setting a minimum and maximum frequency. For the frequency setpoint, two different ramps can be parameterised. Change-over to ramp 2 can be carried out manually or automatically.

Details

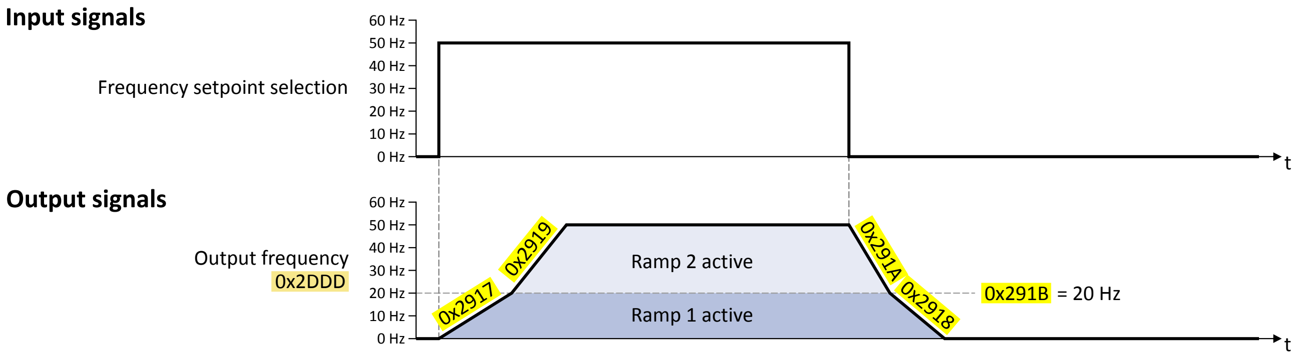
The frequency setpoint is internally led via a ramp generator.

- The acceleration time set in 0x2917 (P220.00) refers to an acceleration from standstill to the maximum frequency set in 0x2916 (P211.00). At a low setpoint selection, the real acceleration time decreases accordingly.
- The deceleration time set in 0x2918 (P221.00) refers to the deceleration of the set maximum frequency to standstill. In case of a lower actual frequency, the actual deceleration time is reduced accordingly.



Automatic/manual change-over to ramp 2

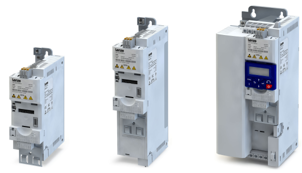
- For ramp 2, the acceleration time 2 set in 0x2919 (P222.00) and the deceleration time 2 set in 0x291A (P223.00) apply.
- The change-over to ramp 2 is effected automatically if the frequency setpoint (absolute value) ≥ auto-changeover threshold 0x291B (P224.00).



- The "Activate ramp 2" function serves to manually activate the acceleration time 2 and the deceleration time 2. ▶ Activating ramp 2 manually 📖 576

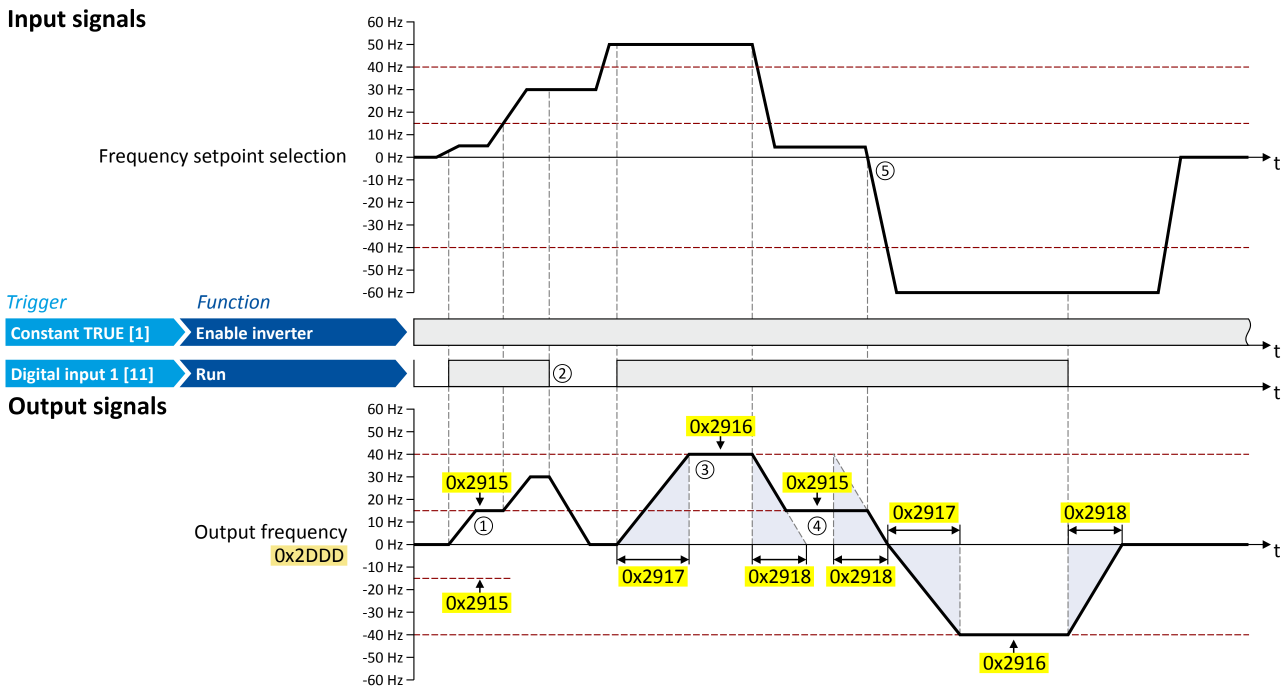
Parameter	Name / value range / [default setting]	Info
0x2915 (P210.00)	Minimum frequency (Min. frequency) 0.0 ... [**0.0**] ... 599.0 Hz	Lower limit value for all frequency setpoints.
0x2916 (P211.00)	Maximum frequency (Max. frequency) Device for 50-Hz mains: 0.0 ... [**50.0**] ... 599.0 Hz Device for 60-Hz mains: 0.0 ... [**60.0**] ... 599.0 Hz	Upper limit value for all frequency setpoints.

Parameter	Name / value range / [default setting]	Info
0x2917 (P220.00)	Acceleration time 1 (Accelerat.time 1) 0.0 ... [**5.0**] ... 3600.0 s	Acceleration time 1 for the operating mode "MS: Velocity mode". • The acceleration time set refers to the acceleration from standstill to the maximum frequency set. In the case of a lower setpoint selection, the actual acceleration time is reduced accordingly. • Setting is not effective in the operating mode 0x6060 (P301.00) = "CiA: Velocity mode [2]". ▸ Device profile CiA 402 📖 469
0x2918 (P221.00)	Deceleration time 1 (Decelerat.time 1) 0.0 ... [**5.0**] ... 3600.0 s	Deceleration time 1 for the operating mode "MS: Velocity mode". • The deceleration time set refers to the deceleration from the maximum frequency set to standstill. In the case of a lower actual frequency, the actual deceleration time is reduced accordingly. • Setting is not effective in the operating mode 0x6060 (P301.00) = "CiA: Velocity mode [2]". ▸ Device profile CiA 402 📖 469
0x2919 (P222.00)	Acceleration time 2 (Accelerat.time 2) 0.0 ... [**5.0**] ... 3600.0 s	Acceleration time 2 for the operating mode "MS: Velocity mode". • The acceleration time set refers to the acceleration from standstill to the maximum frequency set. In the case of a lower setpoint selection, the actual acceleration time is reduced accordingly. • The acceleration time 2 is active if the frequency setpoint (absolute value) ≥ auto switching threshold 0x291B (P224.00) or the trigger assigned to the function "Activate ramp 2" in 0x2631:039 (P400.39) = TRUE. • The acceleration time 2 is also used for changing the MOP setpoint generated by the "motor potentiometer" function. • Setting is not effective in the operating mode 0x6060 (P301.00) = "CiA: Velocity mode [2]". ▸ Device profile CiA 402 📖 469
0x291A (P223.00)	Deceleration time 2 (Decelerat.time 2) 0.0 ... [**5.0**] ... 3600.0 s	Deceleration time 2 for the operating mode "MS: Velocity mode". • The deceleration time set refers to the deceleration from the maximum frequency set to standstill. In the case of a lower actual frequency, the actual deceleration time is reduced accordingly. • The deceleration time 2 is active if the frequency setpoint (absolute value) ≥ auto change-over threshold 0x291B (P224.00) or the trigger assigned to the function "Activate ramp 2" in 0x2631:039 (P400.39) = TRUE. • The deceleration time 2 is also used for changing the MOP setpoint generated by the "motor potentiometer" function. • Setting is not effective in the operating mode 0x6060 (P301.00) = "CiA: Velocity mode [2]". ▸ Device profile CiA 402 📖 469
0x291B (P224.00)	Auto-changeover threshold of ramp 2 (Ramp 2 thresh.) 0.0 ... [**0.0**] ... 599.0 Hz	Threshold for the automatic change-over to acceleration time 2 and deceleration time 2. • The change-over is effected if the frequency setpoint (absolute value) ≥ auto change-over threshold. • With the setting 0, the automatic change-over function is deactivated.



Example for operating mode

Parameter	Name	Setting for this example
0x2631:001 (P400.01)	Enable inverter	Constant TRUE [1]
0x2631:002 (P400.02)	Run	Digital input 1 [11]
0x2915 (P210.00)	Minimum frequency	15 Hz
0x2916 (P211.00)	Maximum frequency	40 Hz
0x2917 (P220.00)	Acceleration time 1	4 s
0x2918 (P221.00)	Deceleration time 1	3 s



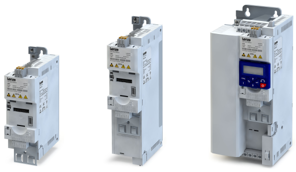
① After a start command, the motor is accelerated to the minimum frequency. This is also the case if the setpoint selection is = 0 Hz. If the setpoint exceeds the minimum frequency, the ramp generator follows the setpoint.

② If the start command is deactivated again, the motor is stopped with the stop method set in 0x2838:003 (P203.03) (here: Standard ramp).

③ The motor is accelerated to the set maximum frequency.

④ If the setpoint falls below the minimum frequency, it is decelerated up to the minimum frequency.

⑤ In case of a sign reversal of the setpoint, a change of direction of rotation takes place, minimum and maximum frequency, however, continue to apply.



7.7 Quick stop

The "quick stop" function is an alternative stop method if the motor has to be stopped faster than normal.

> Cancelling the quick stop causes a restart of the motor if the start command is still active and the inverter is enabled!

Details

- Possible triggers to be selected for the "quick stop" function are available for example in 0x2631:003 (P400.03) the digital inputs and internal status signals of the inverter.
- An activation via network is possible via the mappable NetWordIN1 data word or one of the predefined process data words. ▶ General network settings 📖 227

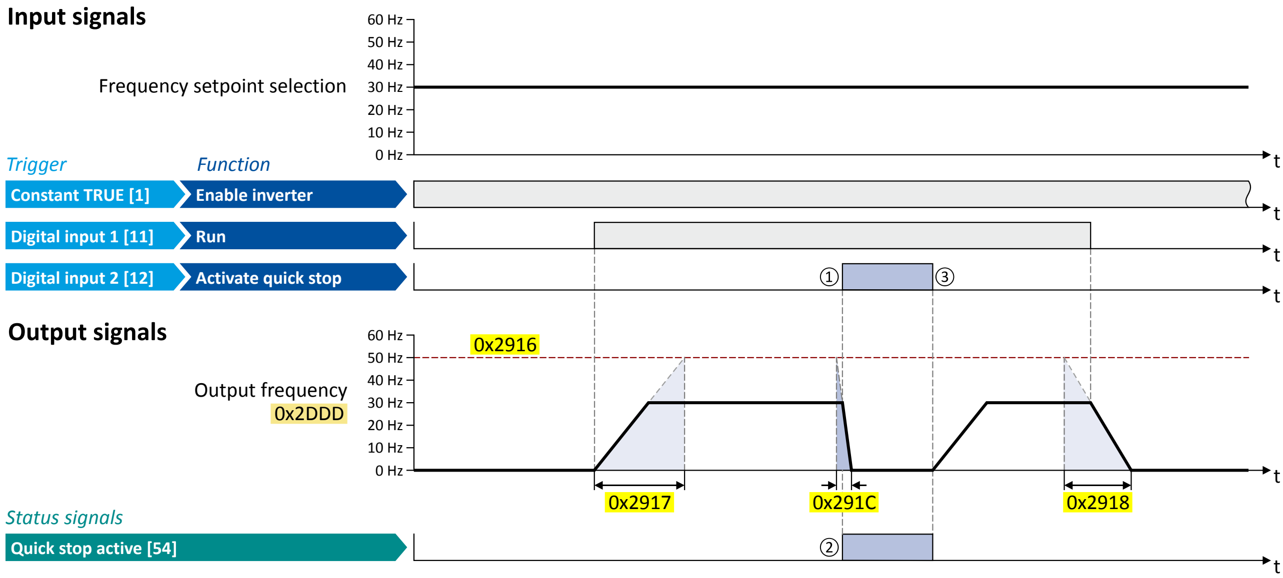
Diagnostic parameters:

- 0x282A:002 (P126.02) displays the cause of quick stop bit-coded.

Parameter	Name / value range / [default setting]	Info
0x291C (P225.00)	Quick stop deceleration time (QSP dec. time) 0.0 ... [**1.0**] ... 3600.0 s	Quick stop deceleration time for the operating mode "MS: Velocity mode". • If the "Quick stop" function is activated, the motor is brought to a standstill within the deceleration time set here. • The deceleration time set refers to the deceleration from the maximum frequency set to standstill. In the case of a lower actual frequency, the actual deceleration time is reduced accordingly. • Setting is not effective in the operating mode 0x6060 (P301.00) = "CiA: Velocity mode [2]". ▶ Device profile CiA 402 📖 469
0x2631:003 (P400.03)	Function list: Activate quick stop (Function list: Quick stop) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532	Assignment of a trigger for the "Activate quick stop" function. Trigger = TRUE: Activate quick stop. Trigger = FALSE: Deactivate quick stop. Notes: • The "Quick stop" function brings the motor to a standstill within the deceleration time set in 0x291C (P225.00).
	0 | **Not connected**	

Example for operating mode

Parameter	Name	Setting for this example
0x2631:001 (P400.01)	Enable inverter	Constant TRUE [1]
0x2631:002 (P400.02)	Run	Digital input 1 [11]
0x2631:003 (P400.03)	Activate quick stop	Digital input 2 [12]
0x2838:003 (P203.03)	Stop method	Standard ramp [1]
0x2916 (P211.00)	Maximum frequency	50 Hz
0x2917 (P220.00)	Acceleration time 1	4 s
0x2918 (P221.00)	Deceleration time 1	3 s
0x291C (P225.00)	Quick stop deceleration time	1 s



① Quick stop is activated: The motor is brought to a standstill within the deceleration time set in 0x291C (P225.00).

② If quick stop is active, the status signal "Quick stop active [54]" is set to TRUE. This status signal can be assigned via the Flexible I/O configuration of a function or a digital output.

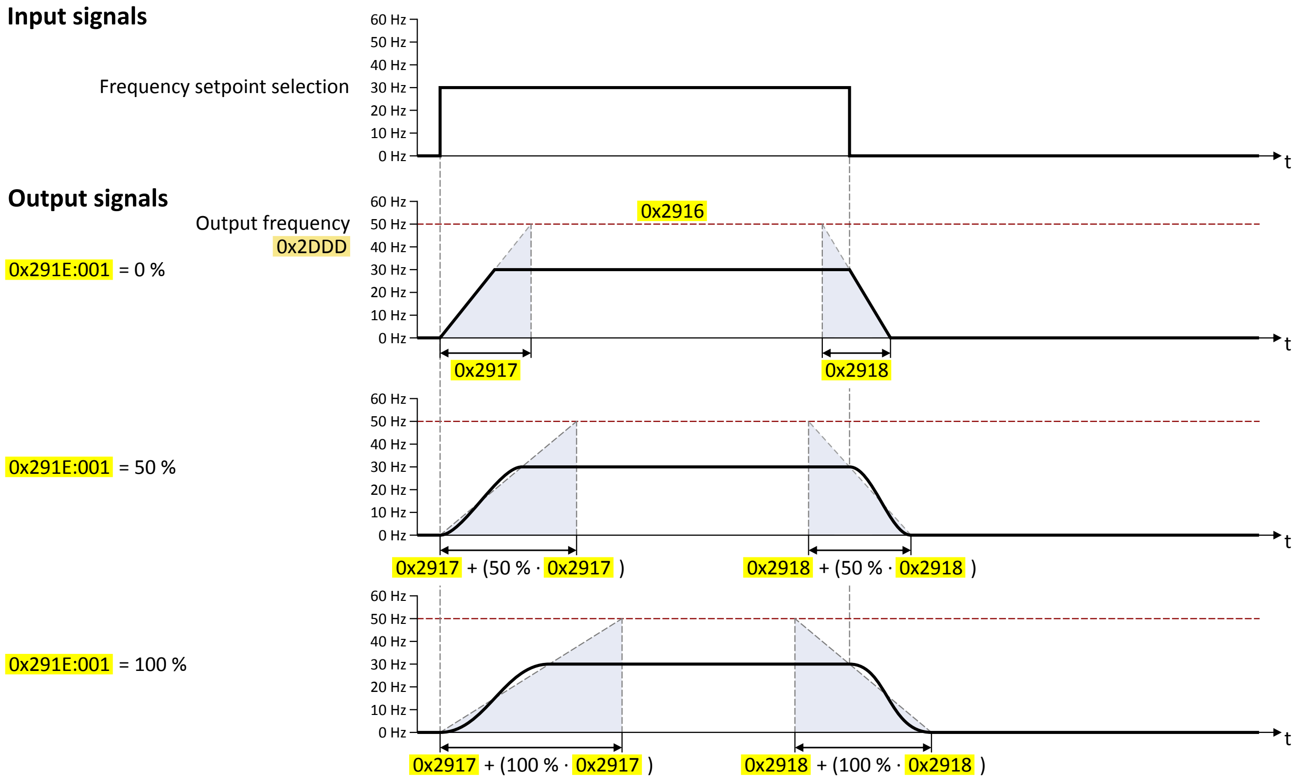
③ Quick stop is deactivated again: The motor accelerates again to the setpoint since the start command is still active.

7.8 S-shaped ramps

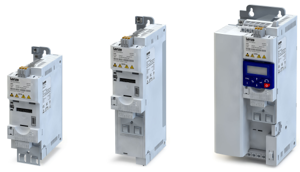
In order to reduce the jerk and to therefore prevent the drive components from damage, a smoothing factor can be set for the acceleration/deceleration ramps.

Details

In the default setting, the motor is accelerated and decelerated with linear ramps since this is the most used configuration. The setting of a smoothing factor causes S-shaped ramps. This leads to a smoother starting and braking behaviour which, for instance, is used for sensitive machine parts with backlash. It has to be observed here that the setting of a smoothing factor causes longer acceleration and delay times (see the following diagrams).



Parameter	Name / value range / [default setting]	Info
0x291E:001 (P226.01)	S-Ramp characteristic: Smoothing factor (S-ramp char.: Smoothing factor) 0.0 ... [**0.0**] ... 100.0 %	Factor for S-rounding of the acceleration/deceleration ramps. • With the setting "0.0", the S-rounding is deactivated and acceleration/deceleration with linear ramps is carried out.



7.9 Optical device identification

For applications including several interconnected inverters it may be difficult to locate a device that has been connected online. The "Optical device identification" function serves to locate the inverter by means of blinking LEDs.

Details

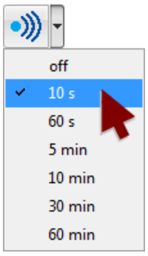
In order to start the visual tracking,

- click the button in the toolbar of the »EASY Starter« or
- set 0x2021:001 (P230.01) = "Start [1]".

After the start, both LEDs "RDY" and "ERR" on the front of the inverter synchronously blink very fast.

"RDY" LED (blue)	"ERR" LED (red)	Status/meaning
Both LEDs are blinking in a very rapidly synchronous mode		"Visual tracking" function is active.

The blinking duration can be set in 0x2021:002 (P230.02) or selected in the »EASY Starter« in the dropdown list field:



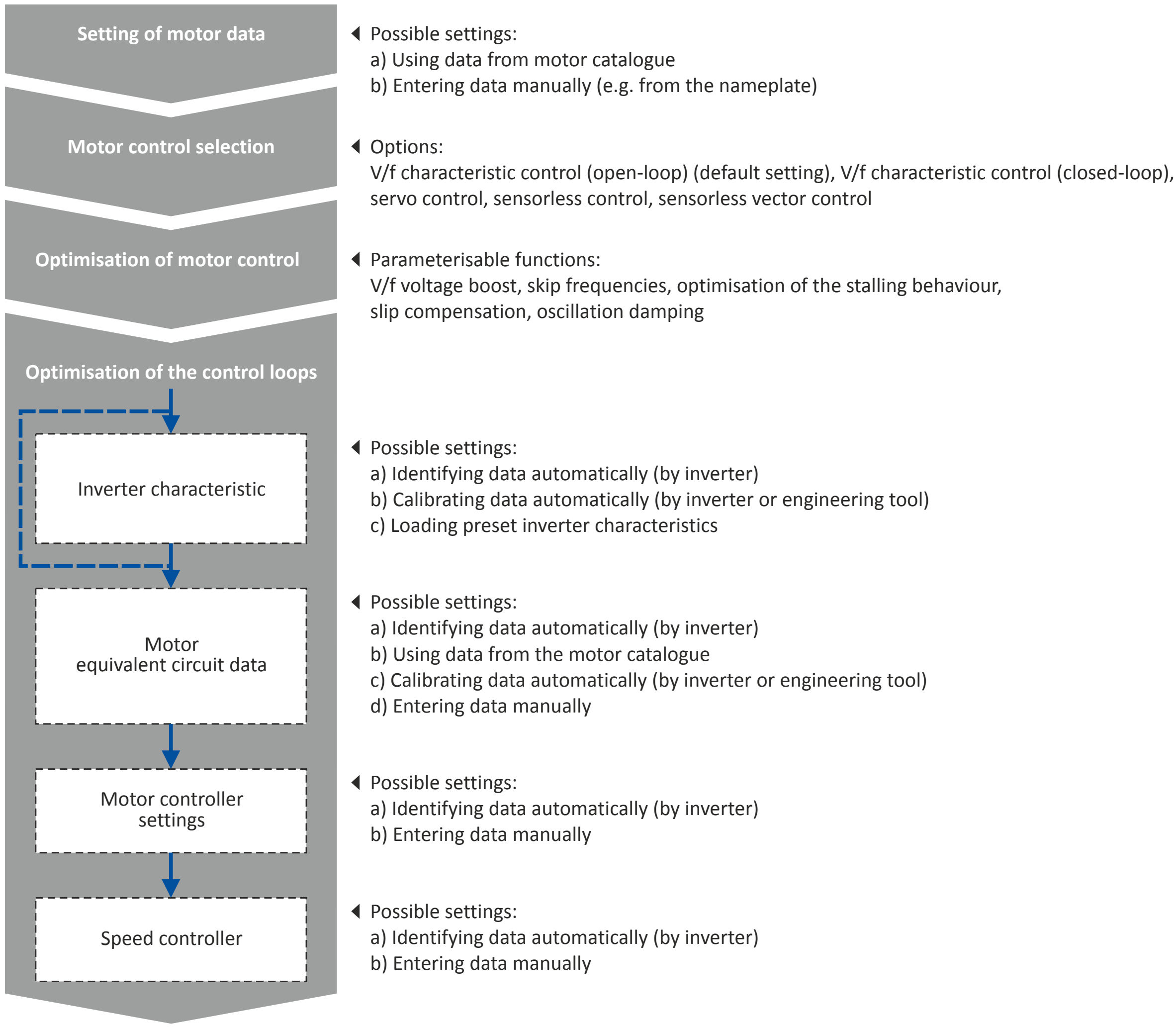
Parameter	Name / value range / [default setting]		Info
0x2021:001 (P230.01)	Optical tracking: Start detection (Optical tracking: Start detection)		1 = start optical device identification. • After the start, the two LEDs "RDY" and "ERR" on the front of the inverter are blinking with a blinking frequency of 20 Hz for the blinking duration set in 0x2021:002 (P230.02). The setting is then automatically reset to "0" again. • If the function is reactivated within the blinking time set, the time is extended correspondingly. • A manual reset to "0" makes it possible to stop the function prematurely.
	0	**Stop**	
	1	Start	
0x2021:002 (P230.02)	Optical tracking: Blinking duration (Optical tracking: Blink. duration) 0 ... [**5**] ... 3600 s		

8 Motor control

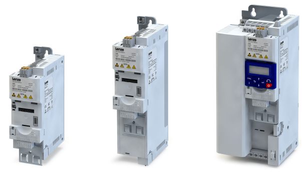
This chapter contains all functions and settings relevant for the motor control.

Basic procedure of commissioning the motor control
In the first step, the rated data of the motor must be set. The other steps depend on the respective application case.

There are several options for setting the motor data and optimising the control loops. Basically, you can select between a manual and an automatic process. Whether a setting can be applied or not depends on the motor (Lenze motor yes/no) and the application. If possible, always use the possible setting listed first in the following diagram since this one leads to the most accurate results.



- Motor data 📖 164
- Motor control selection 📖 165
- Optimisation of motor control 📖 182
- Optimisation of the control loops 📖 193
- Motor rotating direction 📖 212
- Switching frequency changeover 📖 213
- Motor protection 📖 214



8.1 Motor data

Setting of motor data | Motor control selection | Optimisation of motor control | Optimisation of the control loops

The term "motor data" comprises all parameters only depending on the motor and only characterising the electrical behaviour of the machine. Motor data are independent of the application in which the inverter and the motor are used.

Preconditions

When you enter the motor nameplate data, take into account the phase connection implemented for the motor (star or delta connection). Only enter the data applying to the connection type selected.

Possible settings

If a Lenze motor is connected to the inverter, you can simply select the used motor in the engineering tool from the "motor catalog".

- For details see chapter "Motor selection from motor catalogue". 📖 197

Otherwise the motor data has to be set manually (see the following subchapter).

8.1.1 Manual setting of the motor data

If an external motor is connected to the inverter, the motor data must be set manually in the following parameters according to the manufacturer information/motor data sheet.

Parameter	Name / value range / [default setting]	Info
0x2C01:001	Motor parameters: Number of pole pairs • Read only	Display of the number of pole pairs calculated from the rated speed and rated frequency.
0x2C01:004 (P320.04)	Motor parameters: Rated speed (Motor parameters: Rated speed) Device for 50-Hz mains: 50 ... [**1450**] ... 50000 rpm Device for 60-Hz mains: 50 ... [**1750**] ... 50000 rpm	General motor data. Carry out settings as specified by motor nameplate data. Note! When you enter the motor nameplate data, take into account the phase connection implemented for the motor (star or delta connection). Only enter the data applying to the connection type selected.
0x2C01:005 (P320.05)	Motor parameters: Rated frequency (Motor parameters: Rated frequency) Device for 50-Hz mains: 1.0 ... [**50.0**] ... 1000.0 Hz Device for 60-Hz mains: 1.0 ... [**60.0**] ... 1000.0 Hz	
0x2C01:006 (P320.06)	Motor parameters: Rated power (Motor parameters: Rated power) 0.00 ... [**0.25**]* ... 655.35 kW * Default setting depending on the size.	
0x2C01:007 (P320.07)	Motor parameters: Rated voltage (Motor parameters: Rated voltage) 0 ... [**230**]* ... 65535 V * Default setting depending on the size.	
0x2C01:008 (P320.08)	Motor parameters: Cosine phi (Motor parameters: Cosine phi) 0.00 ... [**0.80**] ... 1.00	
0x6075 (P323.00)	Motor rated current (Motor current) 0.001 ... [**1.700**]* ... 500.000 A * Default setting depending on the size. • Setting can only be changed if the inverter is inhibited.	The rated motor current to be set here serves as a reference value for different parameters with a setting/display of a current value in percent. Example: • Motor rated current = 1.7 A • Max current 0x6073 (P324.00) = 200 % Motor rated current = 3.4 A
0x6076 (P325.00)	Motor rated torque (Motor torque) 0.001 ... [**1.650**]* ... 4294967.295 Nm * Default setting depending on the size. • Setting can only be changed if the inverter is inhibited.	The rated motor torque to be set here serves as a reference value for different parameters with a setting/display of a torque value in percent. Example: • Motor rated torque = 1.65 Nm • Max torque 0x6072 (P326.00) = 250 % Motor rated torque = 4.125 Nm
0x6080 (P322.00)	Max motor speed (Max motor speed) 0 ... [**6075**] ... 480000 rpm	Limitation of the maximum motor speed.

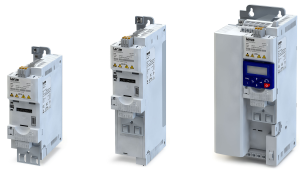
8.2 Motor control selection

Setting of motor data | **Motor control selection** | Optimisation of motor control | Optimisation of the control loops

The inverter supports different modes for closed-loop/open-loop motor control.

Parameter	Name / value range / [default setting]		Info
0x2C00 (P300.00)	Motor control mode (Motor ctrl mode) • Setting can only be changed if the inverter is inhibited.		Selection of the motor control type.
	2	Servo control (SC ASM) (from version 02.00)	This control mode is used for servo control of an asynchronous motor. ▸ Servo control for asynchronous motors (SC-ASM) 📖 176
	3	Sensorless control (SL PSM) (from version 02.00)	This control type is used for the sensorless control of a synchronous motor. • Control mode is possible up to a rated power of maximally 22 kW. ▸ Sensorless control for synchronous motors (SL-PSM) 📖 178
	4	Sensorless vector control (SLVC)	This control type is used for sensorless vector control of an asynchronous motor. ▸ Sensorless vector control (SLVC) 📖 173
	6	**V/f characteristic control (VFC open loop)**	This control mode is used for the speed control of an asynchronous motor via a V/f characteristic and is the simplest control mode. ▸ V/f characteristic control (VFC) 📖 166
	7	V/f characteristic control (VFC closed loop) (from version 04.00)	The control mode is used for speed control of an asynchronous motor via a V/f characteristic with speed feedback. A motor encoder must be connected to the inverter and set as feedback system for the motor control. ▸ V/f characteristic control (VFC closed loop) 📖 172

In the following subchapters, each motor control is described in detail.



8.2.1 V/f characteristic control (VFC)

The V/f characteristic control is a motor control for conventional frequency inverter applications. It is based on a simple and robust control mode for the operation of asynchronous motors with a linear or square-law load torque characteristic (e.g. fan). Because of the minimal parameterisation effort, such applications can be commissioned easily and quickly.

Preconditions

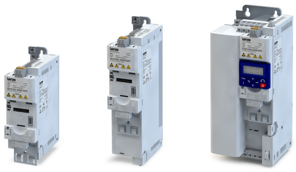
- The V/f characteristic control is only suitable for asynchronous motors.
- If you want to actuate a drive with a square-law V/f characteristic: please always check whether the corresponding drive is suitable for operation with a square-law V/f characteristic!
- From the motor nameplate data, at least the rated speed and rated frequency must be entered, so that the inverter can calculate the correct number of pole pairs. ▶ Motor data 📖 164
- The motor must only be actuated above the rated motor frequency/rated voltage if this is expressly approved by the motor manufacturer!

Details

This motor control type is activated by setting 0x2C00 (P300.00) = " V/f characteristic control (VFC open loop) [6]".

- 0x2B00 (P302.00) provides different characteristic shapes which are described in detail in the following subchapters.
- Limiting factors for the V/f characteristic are rated mains voltage 0x2540:001 (P208.01), minimum frequency 0x2915 (P210.00) and maximum frequency 0x2916 (P211.00).

Parameter	Name / value range / [default setting]		Info
0x2B00 (P302.00)	V/f characteristic shape (V/f charac.shape) • Setting can only be changed if the inverter is inhibited.		Selection of the V/f characteristic shape for the adaptation to different load profiles.
	0	**Linear**	Linear characteristic for drives with constant load torque over the speed. ▶ Linear V/f characteristic 📖 167
	1	Quadratic	Square-law characteristic for drives with a linear or square-law load torque over the speed. • Square-law V/f characteristics are preferably used for centrifugal pumps and fan drives. • Please always check whether the corresponding drive is suitable for operation with a square-law V/f characteristic! • If your pump drive or fan drive is not suitable for operation with a square-law V/f characteristic, use the linear V/f characteristic instead. ▶ Square-law V/f characteristic 📖 168
	2	Multipoint (from version 03.00)	Linear characteristics with an additional centre characteristic point for the purpose of adaptation to specific load profiles. ▶ User-definable V/f characteristic 📖 169
	3	Eco (from version 02.00)	Linear characteristic with energy optimisation in the partial load operational range. ▶ V/f characteristic control - energy-saving (VFC Eco) 📖 170
0x2B01:001 (P303.01)	V/f shape data: Base voltage (V/f shape data: Base voltage) 0 ... [**230**]* ... 5000 V * Default setting depending on the size.		Base voltage and base frequency define the V/f ratio and thus the gradient of the V/f characteristic. • The V/f base voltage is usually set to the rated motor voltage 0x2C01:007 (P320.07). • The V/f base frequency is usually set to the rated motor frequency 0x2C01:005 (P320.05).
0x2B01:002 (P303.02)	V/f shape data: Base frequency (V/f shape data: Base frequency) Device for 50-Hz mains: 0 ... [**50**]* ... 1500 Hz Device for 60-Hz mains: 0 ... [**60**]* ... 1500 Hz * Default setting depending on the size.		



8.2.1.1 Linear V/f characteristic

The linear V/f characteristic is the most used characteristic shape for general applications since they cause a torque that is largely constant.

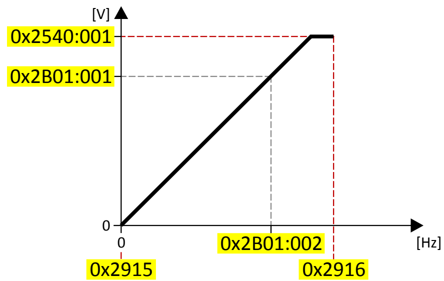
Details

Select V/f characteristic control with linear characteristic:

1. Motor control mode 0x2C00 (P300.00) = "V/f characteristic control (VFC open loop) [6]"
2. V/f characteristic shape 0x2B00 (P302.00) = "Linear [0]"

Setting of the V/f characteristic:

- Limiting factors for the V/f characteristic are rated mains voltage 0x2540:001 (P208.01), minimum frequency 0x2915 (P210.00) and maximum frequency 0x2916 (P211.00).
- The base voltage 0x2B01:001 (P303.01) is usually set to the rated motor voltage (motor nameplate data). The base voltage is preset to the rated mains voltage. This again is preset according to the product key of the inverter. ▶ Mains voltage 📖 144
- The base frequency 0x2B01:002 (P303.02) is usually set to the rated motor frequency (motor nameplate data).

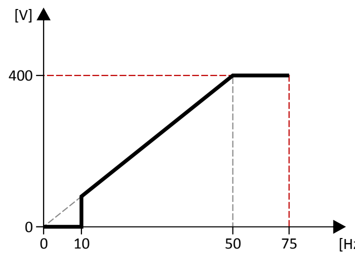


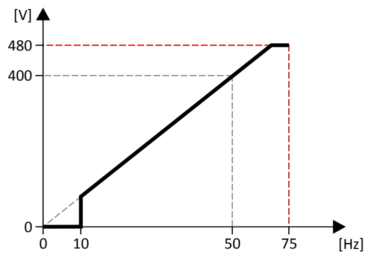
The current output frequency can exceed the set maximum frequency if the gain for the slip compensation in 0x2B09:001 (P315.01) is set to a value higher than 0.

Example

In this example, a 400 V/50 Hz motor is connected to the inverter which is to be operated with maximally 75 Hz. The minimum frequency is set to 10 Hz.

- V/f characteristic on the left: The inverter is operated with a rated mains voltage of 400 V.
- V/f characteristic on the right: The inverter is operated with a rated mains voltage of 480 V. This causes the output voltage to further increase above 50 Hz.

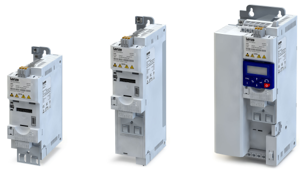




Parameter	Name	Setting for this example
0x2540:001 (P208.01)	Rated mains voltage	400 Veff [1] (on the left) / 480 Veff [2] (on the right)
0x2915 (P210.00)	Minimum frequency	10 Hz
0x2916 (P211.00)	Maximum frequency	75 Hz
0x2B01:001 (P303.01)	Base voltage	400 V
0x2B01:002 (P303.02)	Base frequency	50 Hz

Next steps

- The inverter provides different functions by means of which the drive behaviour can be further optimised. ▶ Optimisation of motor control 📖 182
- An optimisation of the control loops is not mandatory for this motor control type but may lead to a better control mode. ▶ Optimisation of the control loops 📖 193



8.2.1.2 Square-law V/f characteristic

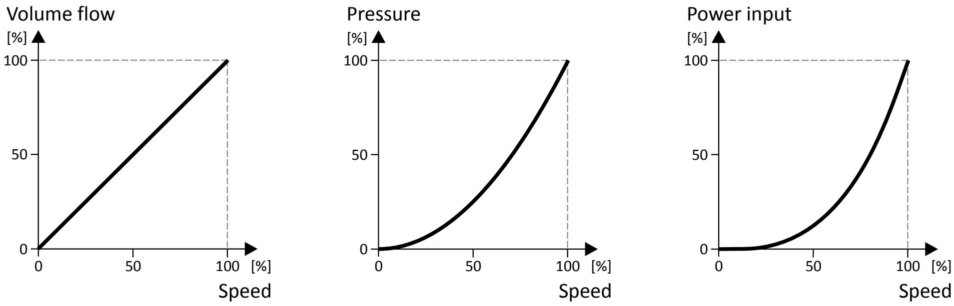
The square-law V/f characteristic is typically used in heating, ventilation and climate applications to control the speed of fans and pumps.

Details

Each application that is provided with the features according to the affinity laws may possibly benefit from a square-law V/f characteristic.

The affinity laws describe the relation between the speed and other variables:

- The volume flow increases proportionately to the speed.
- The required pressure behaves proportionately to the square of the speed.
- The power input is proportionately to the cube of the speed. This means that already a minimal reduction of the speed may lead to substantial savings in energy consumption.



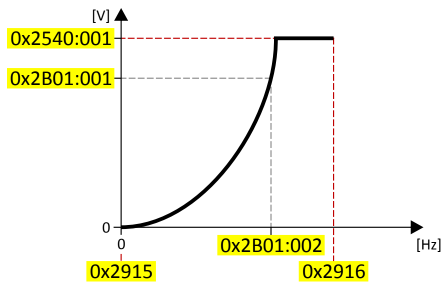
By approximation, the square-law V/f characteristic corresponds to the curve for power input shown above. At low frequencies, the voltage is reduced since due to the type of load a lower voltage is sufficient to generate the required power. All in all, this results in an energy-efficient system.

Select V/f characteristic control with square-law characteristic:

1. Motor control mode 0x2C00 (P300.00) = "V/f characteristic control (VFC open loop) [6]"
2. V/f characteristic shape 0x2B00 (P302.00) = "Quadratic [1]"

Setting of the V/f characteristic:

- Limiting factors for the V/f characteristic are rated mains voltage 0x2540:001 (P208.01), minimum frequency 0x2915 (P210.00) and maximum frequency 0x2916 (P211.00).
- The base voltage 0x2B01:001 (P303.01) is usually set to the rated motor voltage (motor nameplate data). The base voltage is preset to the rated mains voltage. This again is preset according to the product key of the inverter. ▸ Mains voltage 📖 144
- The base frequency 0x2B01:002 (P303.02) is usually set to the rated motor frequency (motor nameplate data).



The current output frequency can exceed the set maximum frequency if the gain for the slip compensation in 0x2B09:001 (P315.01) is set to a value higher than 0.

Next steps

- The inverter provides different functions by means of which the drive behaviour can be further optimised. ▸ Optimisation of motor control 📖 182
- An optimisation of the control loops is not mandatory for this motor control type but may lead to a better control mode. ▸ Optimisation of the control loops 📖 193

8.2.1.3 User-definable V/f characteristic

The user-definable V/f characteristic is based on the linear V/f characteristic. An additional medium characteristic point, however, enables the adaptation to applications with special torque properties.

Details

An application case for this characteristic shape are applications that require a higher torque at lower speeds. The additional medium characteristic point can be then configured in such a way that more voltage is provided in the lower frequency range of the characteristic. Otherwise, the same limits apply for the adaptive characteristic as for the linear characteristic.

Select V/f characteristic control with adaptive characteristic:

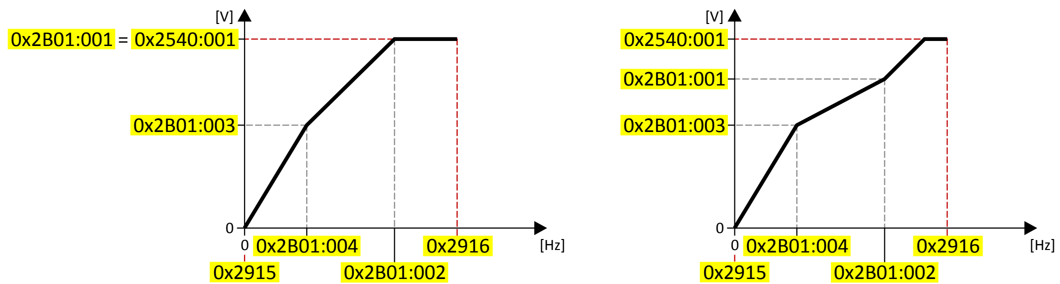
1. Motor control mode 0x2C00 (P300.00) = "V/f characteristic control (VFC open loop) [6]"
2. V/f characteristic shape 0x2B00 (P302.00)= "Multipoint [2]"

Setting of the V/f characteristic:

- Limiting factors for the V/f characteristic are rated mains voltage 0x2540:001 (P208.01), minimum frequency 0x2915 (P210.00) and maximum frequency 0x2916 (P211.00).
- The base voltage 0x2B01:001 (P303.01) is usually set to the rated motor voltage (motor nameplate data). The base voltage is preset to the rated mains voltage. This again is preset according to the product key of the inverter. ▶ Mains voltage 📖 144
- The base frequency 0x2B01:002 (P303.02) is usually set to the rated motor frequency (motor nameplate data).
- The additional medium characteristic point is defined based on the parameters 0x2B01:003 (P303.03) and 0x2B01:004 (P303.04).

Characteristic examples:

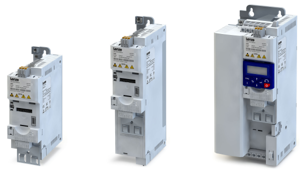
- Example on the left: Base voltage is set equal to rated mains voltage
- Example on the right: Base voltage s set lower than rated mains voltage



Parameter	Name / value range / [default setting]	Info
0x2B01:003 (P303.03)	V/f shape data: Midpoint voltage (V/f shape data: Midpoint voltage) 0 ... **[0]** ... 5000 V • From version 03.00	Definition of the medium characteristic point for user-definable V/f characteristic. • Only relevant if V/f characteristic shape 0x2B00 (P302.00) is set = "Multipoint [2]".
0x2B01:004 (P303.04)	V/f shape data: Midpoint frequency (V/f shape data: Midpoint freq) 0 ... **[0]** ... 1500 Hz • From version 03.00	

Next steps

- The inverter provides different functions by means of which the drive behaviour can be further optimised. ▶ Optimisation of motor control 📖 182
- An optimisation of the control loops is not mandatory for this motor control type but may lead to a better control mode. ▶ Optimisation of the control loops 📖 193



8.2.1.4 V/f characteristic control - energy-saving (VFC Eco)

In case of the energy-saving V/f characteristic control (VFCplusEco). the motor voltage of the inverter is detected by means of a linear characteristic as a function of the rotating field frequency or motor speed to be generated. Moreover, the motor is always driven in the optimal efficiency range via a cosφ control and the resulting voltage reduction (reduced copper losses in the asynchronous motor).

Details

Select energy-saving V/f characteristic control with linear characteristic:

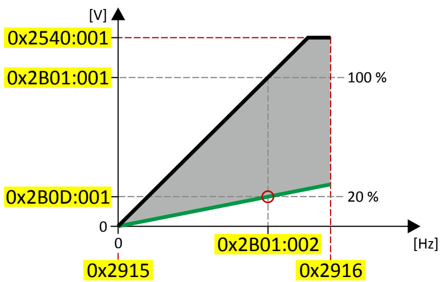
1. Motor control mode 0x2C00 (P300.00) = "V/f characteristic control (VFC open loop) [6]"
2. V/f characteristic shape 0x2B00 (P302.00)= "Eco [3]"

Setting of the V/f characteristic:

- Limiting factors for the V/f characteristic are rated mains voltage 0x2540:001 (P208.01), minimum frequency 0x2915 (P210.00) and maximum frequency 0x2916 (P211.00).
- The base voltage 0x2B01:001 (P303.01) is usually set to the rated motor voltage (motor nameplate data). The base voltage is preset to the rated mains voltage. This again is preset according to the product key of the inverter. ▸ Mains voltage 📖 144
- The base frequency 0x2B01:002 (P303.02) is usually set to the rated motor frequency (motor nameplate data).

Eco efficiency range:

- The Eco efficiency range (grey) is between the V/f-standard characteristic (black) and the V/f Eco characteristic (green).
- The V/f Eco characteristic (green) is defined by the operating point that results from the minimum voltage 0x2B0D:001 (P330.01) and the base frequency 0x2B01:002 (P303.02).
- The minimum voltage 0x2B0D:001 (P330.01) has to be set in percent with reference to the base voltage 0x2B01:001 (P303.01).



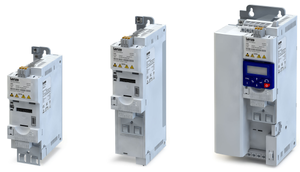
> The current output frequency can exceed the set maximum frequency if the gain for the slip compensation in 0x2B09:001 (P315.01) is set to a value higher than 0.

Parameter	Name / value range / [default setting]	Info
0x2B0D:001 (P330.01)	VFC-ECO: Minimum voltage (VFC-ECO: Min. voltage) 20 ... **[20]** ... 100 % • From version 02.00	Defining the operating point of the V/f eco characteristic. The V/f eco characteristic defines the lower limit of the eco efficiency range. • 100 % ≡ Base voltage 0x2B01:001 (P303.01)
0x2B0D:006 (P330.06)	Cos phi actual value (Cos Phi actual) • Read only • From version 02.00	
0x2822:004 (P327.04)	Axis commands: Identify motor data (energized) (Axis commands: Identify mot.) 0 ... **[0]** ... 1	1 = start automatic identification of the motor data. • Inverter characteristics, motor equivalent circuit diagram data and controller settings are identified and set automatically. • During the procedure, the motor is energised!
0x2822:005 (P327.05)	Axis commands: Calibrate motor data (non-energized) (Axis commands: Calibrate mot.) 0 ... **[0]** ... 1	1 = start automatic calibration of the motor data. • A default inverter characteristic is loaded. • the motor equivalent circuit diagram data and controller settings are calculated on the basis of the currently set rated motor data. • The motor is not energised.

Parameter	Name / value range / [default setting]	Info
0x2B00 (P302.00)	V/f characteristic shape (V/f charac.shape) • Setting can only be changed if the inverter is inhibited.	Selection of the V/f characteristic shape for the adaptation to different load profiles.
	0 Linear	Linear characteristic for drives with constant load torque over the speed. ▶ Linear V/f characteristic 📖 167
	1 Quadratic	Square-law characteristic for drives with a linear or square-law load torque over the speed. • Square-law V/f characteristics are preferably used for centrifugal pumps and fan drives. • Please always check whether the corresponding drive is suitable for operation with a square-law V/f characteristic! • If your pump drive or fan drive is not suitable for operation with a square-law V/f characteristic, use the linear V/f characteristic instead. ▶ Square-law V/f characteristic 📖 168
	2 Multipoint (from version 03.00)	Linear characteristics with an additional centre characteristic point for the purpose of adaptation to specific load profiles. ▶ User-definable V/f characteristic 📖 169
	3 Eco (from version 02.00)	Linear characteristic with energy optimisation in the partial load operational range. ▶ V/f characteristic control - energy-saving (VFC Eco) 📖 170
0x2B01:001 (P303.01)	V/f shape data: Base voltage (V/f shape data: Base voltage) 0 ... [**230**]* ... 5000 V * Default setting depending on the size.	Base voltage and base frequency define the V/f ratio and thus the gradient of the V/f characteristic. • The V/f base voltage is usually set to the rated motor voltage 0x2C01:007 (P320.07). • The V/f base frequency is usually set to the rated motor frequency 0x2C01:005 (P320.05).
0x2B01:002 (P303.02)	V/f shape data: Base frequency (V/f shape data: Base frequency) Device for 50-Hz mains: 0 ... [**50**]* ... 1500 Hz Device for 60-Hz mains: 0 ... [**60**]* ... 1500 Hz * Default setting depending on the size.	
0x2C00 (P300.00)	Motor control mode (Motor ctrl mode) • Setting can only be changed if the inverter is inhibited.	Selection of the motor control type.
	2 Servo control (SC ASM) (from version 02.00)	This control mode is used for servo control of an asynchronous motor. ▶ Servo control for asynchronous motors (SC-ASM) 📖 176
	3 Sensorless control (SL PSM) (from version 02.00)	This control type is used for the sensorless control of a synchronous motor. • Control mode is possible up to a rated power of maximally 22 kW. ▶ Sensorless control for synchronous motors (SL-PSM) 📖 178
	4 Sensorless vector control (SLVC)	This control type is used for sensorless vector control of an asynchronous motor. ▶ Sensorless vector control (SLVC) 📖 173
	6 V/f characteristic control (VFC open loop)	This control mode is used for the speed control of an asynchronous motor via a V/f characteristic and is the simplest control mode. ▶ V/f characteristic control (VFC) 📖 166
	7 V/f characteristic control (VFC closed loop) (from version 04.00)	The control mode is used for speed control of an asynchronous motor via a V/f characteristic with speed feedback. A motor encoder must be connected to the inverter and set as feedback system for the motor control. ▶ V/f characteristic control (VFC closed loop) 📖 172

Next steps

- The inverter provides different functions by means of which the drive behaviour can be further optimised. ▶ Optimisation of motor control 📖 182
- An optimisation of the control loops is not mandatory for this motor control type but may lead to a better control mode. ▶ Optimisation of the control loops 📖 193



8.2.2 V/f characteristic control (VFC closed loop)

The V/f characteristic control with feedback (VFC closed loop) can be used if an asynchronous motor with motor encoder is connected to the inverter.

The speed feedback leads to the following advantages:

- Stationary speed accuracy
- Improved dynamics compared to the V/f characteristic control without feedback (VFC open loop) or to the encoderless vector control (SLVC)
- Suitability for group drives

Preconditions

- The V/f characteristic control (VFC closed loop) is only suitable for asynchronous motors.
- The V/f characteristic control (VFC closed loop) requires a feedback of the speed. A motor encoder must be connected to the inverter and set as feedback system for the motor control.
    - This setting is not made automatically if a motor is selected from the motor catalog.
    - For required settings see chapter "HTL encoder". 496
- If you want to actuate a drive with a square-law V/f characteristic: please always check whether the corresponding drive is suitable for operation with a square-law V/f characteristic!
- From the motor nameplate data, at least the rated speed and rated frequency must be entered, so that the inverter can calculate the correct number of pole pairs. ▶ Motor data 164
- The motor must only be actuated above the rated motor frequency/rated voltage if this is expressly approved by the motor manufacturer!

Details

This motor control type is activated by setting 0x2C00 (P300.00) = " V/f characteristic control (VFC closed loop) [7]".

- 0x2B00 (P302.00) provides different characteristic shapes.
- Limiting factors for the V/f characteristic are rated mains voltage 0x2540:001 (P208.01), minimum frequency 0x2915 (P210.00) and maximum frequency 0x2916 (P211.00).
- The slip compensation is deactivated in this motor control type. In case of V/f characteristic control with feedback, the slip is calculated and injected by the slip regulator. ▶ Slip controller 210

Next steps

- The inverter provides different functions by means of which the drive behaviour can be further optimised. ▶ Optimisation of motor control 182
- An optimisation of the control loops is not mandatory for this motor control type but may lead to a better control mode. ▶ Optimisation of the control loops 193

8.2.3 Sensorless vector control (SLVC)

Sensorless (field-oriented) vector control for asynchronous motors is based on a decoupled, separate control for the torque-producing and the field-producing current component. In addition, the actual speed is reconstructed by means of a motor model so that a speed sensor is not required.

Preconditions

- Sensorless vector control (SLVC) is only suitable for asynchronous motors.
- The operation of the sensorless vector control (SLVC) is only permitted for a single drive, i. e., only one motor may be connected to the inverter.
- Operation of the sensorless vector control (SLVC) is **not** permissible for hoists!

Supported operating modes 0x6060 (P301.00):

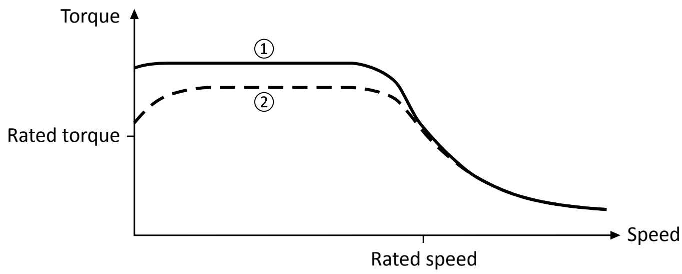
- "MS: Velocity mode [-2]"
- "MS: Torque mode [-1]"
- "CiA: Velocity mode [2]"

Details

This motor control type is activated by setting 0x2C00 (P300.00) = "Sensorless vector control (SLVC) [4]".

Compared to the V/f characteristics, the sensorless vector control (SLVC) serves to achieve improved drive characteristics thanks to:

- higher torque throughout the entire speed range
- higher speed accuracy and higher concentricity factor
- higher efficiency



① Sensorless vector control (SLVC)
② V/f characteristic control (VFC) 166

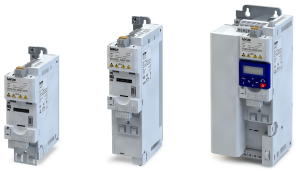
For a speed control with torque limitation in operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]":

1. Select the source in 0x2949:001 (P337.01) for the positive torque limit source and set it accordingly.
2. Select the source in 0x2949:002 (P337.02) for the negative torque limit source and set it accordingly.

Alternatively, the inverter can be configured in this motor control type in such a way that it controls a motor torque within a defined frequency range. For details, see chapter "Torque control w/ freq. limit". 206

Parameter	Name / value range / [default setting]	Info
0x2B40:003	Q-Feedforward 0.00 ... [**0.00**] ... 10000.00 • From version 03.00	Feedforward control for the SLVC Q controller.
0x2B40:004	D-Feedforward 0.00 ... [**0.00**] ... 10000.00 • From version 03.00	Feedforward control of the SLVC-D controller.

Parameter	Name / value range / [default setting]		Info
0x2949:001 (P337.01)	Positive torque limit source (Pos. torqlim src) • From version 03.00		Selection of the source for the positive torque limit source.
	0	**Max torque**	Positive torque limit source = Max torque 0x6072 (P326.00).
	1	Fixed Limit 0.0 %	Positive torque limit source = 0.0 %.
	2	Analog Input 1	The positive torque limit source is defined as analog signal via the analog input 1. ▶ Analog input 1 📖 597
	3	Analog Input 2	The positive torque limit source is defined as analog signal via the analog input 2. ▶ Analog input 2 📖 601
	4	Positive torque limit	Positive torque limit source = Positive torque limit 0x60E0.
	5	Network target torque	The positive torque limit source is defined as process data object via network. ▶ Configuring the network 📖 226
0x2949:002 (P337.02)	Negative torque limit source (Neg. torqlim src) • From version 03.00		Selection of the source for the negative torque limit source.
	0	**(-) Max torque**	Negative torque limit source = (-) Max torque 0x6072 (P326.00).
	1	Fixed Limit 0.0 %	Negative torque limit source = 0.0 %.
	2	Analog Input 1	The negative torque limit source is defined as analog signal via the analog input 1. ▶ Analog input 1 📖 597
	3	Analog Input 2	The negative torque limit source is defined as analog signal via the analog input 2. ▶ Analog input 2 📖 601
	4	Negative torque limit	Negative torque limit source = Negative torque limit 0x60E1.
	5	Network target torque	The negative torque limit source is defined as process data object via network. ▶ Configuring the network 📖 226
0x2C00 (P300.00)	Motor control mode (Motor ctrl mode) • Setting can only be changed if the inverter is inhibited.		Selection of the motor control type.
	2	Servo control (SC ASM) (from version 02.00)	This control mode is used for servo control of an asynchronous motor. ▶ Servo control for asynchronous motors (SC-ASM) 📖 176
	3	Sensorless control (SL PSM) (from version 02.00)	This control type is used for the sensorless control of a synchronous motor. • Control mode is possible up to a rated power of maximally 22 kW. ▶ Sensorless control for synchronous motors (SL-PSM) 📖 178
	4	Sensorless vector control (SLVC)	This control type is used for sensorless vector control of an asynchronous motor. ▶ Sensorless vector control (SLVC) 📖 173
	6	**V/f characteristic control (VFC open loop)**	This control mode is used for the speed control of an asynchronous motor via a V/f characteristic and is the simplest control mode. ▶ V/f characteristic control (VFC) 📖 166
	7	V/f characteristic control (VFC closed loop) (from version 04.00)	The control mode is used for speed control of an asynchronous motor via a V/f characteristic with speed feedback. A motor encoder must be connected to the inverter and set as feedback system for the motor control. ▶ V/f characteristic control (VFC closed loop) 📖 172



Parameter	Name / value range / [default setting]		Info
0x6060 (P301.00)	Modes of operation (Modes of op.) • Setting can only be changed if the inverter is inhibited.		Selection of the operating mode.
	-2	**MS: Velocity mode**	Vendor specific velocity mode
	-1	MS: Torque mode (from version 03.00)	Vendor specific torque mode • Only possible in motor control type 0x2C00 (P300.00) = "Sensorless vector control (SLVC) [4]" or "Servo control (SC ASM) [2]". ▸ Torque control w/ freq. limit 📖 206
	0	No mode change/no mode assigned	No operating mode (standstill)
	2	CiA: Velocity mode	CiA 402 velocity mode

Next steps

- The inverter provides different functions by means of which the drive behaviour can be further optimised. ▸ Optimisation of motor control 📖 182
- The default setting enables the operation of a power-adapted motor. **An optimum operation of this motor control type requires an optimisation of the control loops!** ▸ Optimisation of the control loops 📖 193
- If the inverter is to control a motor torque within a defined frequency range, the torque control must be configured accordingly after the control loops are optimised. ▸ Torque control w/ freq. limit 📖 206

8.2.4 Servo control for asynchronous motors (SC-ASM)

The field-oriented servo control is based on a decoupled, separated control of the torque-producing and field-producing current share. The motor control is based on a feedback, field-oriented and cascaded controller structure and enables a dynamic and stable operation in all four quadrants.

Preconditions

- The servo control (SC ASM) is only suitable for asynchronous motors.
- The servo control (SC-ASM) requires a feedback of the speed. A motor encoder must be connected to the inverter and set as feedback system for the motor control.
  - This setting is not made automatically if a motor is selected from the motor catalog.
  - For required settings see chapter "HTL encoder". 📖 496

Details

This motor control type is activated by setting 0x2C00 (P300.00) = "Servo control (SC ASM) [2]".

Basically, the servo control has the same advantages as the sensorless vector control (SLVC). Compared to the V/f characteristic control without feedback, the following can be achieved by means of the servo control:

- A higher maximum torque throughout the entire speed range
- A higher speed accuracy
- A higher concentricity factor
- A higher level of efficiency
- The implementation of torque-actuated operation with speed limitation
- The limitation of the maximum torque in motor and generator mode for speed-actuated operation

For a speed control with torque limitation in operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]":

1. Select the source in 0x2949:001 (P337.01) for the positive torque limit source and set it accordingly.
2. Select the source in 0x2949:002 (P337.02) for the negative torque limit source and set it accordingly.

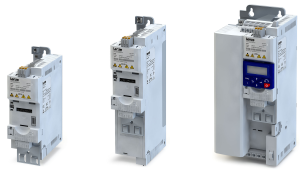
Alternatively, the inverter can be configured in this motor control type in such a way that it controls a motor torque within a defined frequency range. For details, see chapter "Torque control w/ freq. limit". 📖 206

Parameter	Name / value range / [default setting]		Info
0x2901	Speed controller gain adaption 0.00 ... [**100.00**] ... 200.00 % • From version 04.00		Mappable parameter for adaptive adjustment of the speed controller gain via network.
0x2949:001 (P337.01)	Positive torque limit source (Pos. torqlim src) • From version 03.00		Selection of the source for the positive torque limit source.
	0	**Max torque**	Positive torque limit source = Max torque 0x6072 (P326.00).
	1	Fixed Limit 0.0 %	Positive torque limit source = 0.0 %.
	2	Analog Input 1	The positive torque limit source is defined as analog signal via the analog input 1. ▸ Analog input 1 📖 597
	3	Analog Input 2	The positive torque limit source is defined as analog signal via the analog input 2. ▸ Analog input 2 📖 601
	4	Positive torque limit	Positive torque limit source = Positive torque limit 0x60E0.
	5	Network target torque	The positive torque limit source is defined as process data object via network. ▸ Configuring the network 📖 226

Parameter	Name / value range / [default setting]	Info
0x2949:002 (P337.02)	Negative torque limit source (Neg. torqlim src) • From version 03.00	Selection of the source for the negative torque limit source.
	0 (-) Max torque	Negative torque limit source = (-) Max torque 0x6072 (P326.00).
	1 Fixed Limit 0.0 %	Negative torque limit source = 0.0 %.
	2 Analog Input 1	The negative torque limit source is defined as analog signal via the analog input 1. ▶ Analog input 1 📖 597
	3 Analog Input 2	The negative torque limit source is defined as analog signal via the analog input 2. ▶ Analog input 2 📖 601
	4 Negative torque limit	Negative torque limit source = Negative torque limit 0x60E1.
	5 Network target torque	The negative torque limit source is defined as process data object via network. ▶ Configuring the network 📖 226
0x2C00 (P300.00)	Motor control mode (Motor ctrl mode) • Setting can only be changed if the inverter is inhibited.	Selection of the motor control type.
	2 Servo control (SC ASM) (from version 02.00)	This control mode is used for servo control of an asynchronous motor. ▶ Servo control for asynchronous motors (SC-ASM) 📖 176
	3 Sensorless control (SL PSM) (from version 02.00)	This control type is used for the sensorless control of a synchronous motor. • Control mode is possible up to a rated power of maximally 22 kW. ▶ Sensorless control for synchronous motors (SL-PSM) 📖 178
	4 Sensorless vector control (SLVC)	This control type is used for sensorless vector control of an asynchronous motor. ▶ Sensorless vector control (SLVC) 📖 173
	6 V/f characteristic control (VFC open loop)	This control mode is used for the speed control of an asynchronous motor via a V/f characteristic and is the simplest control mode. ▶ V/f characteristic control (VFC) 📖 166
	7 V/f characteristic control (VFC closed loop) (from version 04.00)	The control mode is used for speed control of an asynchronous motor via a V/f characteristic with speed feedback. A motor encoder must be connected to the inverter and set as feedback system for the motor control. ▶ V/f characteristic control (VFC closed loop) 📖 172
0x2C01:010	Motor parameters: Motor name	The name (e.g. " 1") can be freely selected by the user. If the motor in the engineering tool has been selected from the "motor catalog", the respective motor name is automatically entered here (example: "MDSKA080-22, 70").

Next steps

- The inverter provides different functions by means of which the drive behaviour can be further optimised. ▶ Optimisation of motor control 📖 182
- The default setting enables the operation of a power-adapted motor. **An optimum operation of this motor control type requires an optimisation of the control loops!** ▶ Optimisation of the control loops 📖 193



8.2.5 Sensorless control for synchronous motors (SL-PSM)

The sensorless control for synchronous motors is based on a decoupled, separated control of the torque-producing current and the current in field direction. In contrast to the servo control, the actual speed value and rotor position are reconstructed via a motor model.

NOTICE

In case of this motor control type, an adjustable, constant current is injected in the lower speed range. If this current is higher than the rated motor current, the motor may heat up in the lower speed range. This effect increases if the motor is operated in the lower speed range for a longer period of time.

Possible consequence: Destruction of the motor by overheating

- Do not operate the motor for a longer period of time in the lower speed range.
- For detecting and monitoring the motor temperature, we recommend a temperature feedback via PTC thermistor or thermal contact. ▶ Motor temperature monitoring 🕮 219

Preconditions

The sensorless control for synchronous motors (SL-PSM) is possible up to a rated power of maximally 22 kW.

Details

This motor control type is activated by setting 0x2C00 (P300.00) = "Sensorless control (SL PSM) [3]".

The motor model-based speed observer requires a rotating machine. Thus, as a matter of principle, the operational performance of the sensorless control for synchronous motors is divided into two ranges:

1. Low speed range (|setpoint speed| < lower limit 0x2C11:001)
    - In the range of low speed, the speed of a synchronous motor cannot be observed. In this "Low speed range", an open-loop controlled operation takes place: For acceleration processes, the current set in 0x2C12:001 is injected and for processes without acceleration (for instance standstill or constant setpoint speed) the current set in 0x2C12:002 is injected.
2. High speed range (|setpoint speed| > lower limit 0x2C11:001)
    - In this area, the rotor flux position and the speed are reconstructed by means of an observer. The control is executed in a field-oriented way. Only the current required for generating the necessary torque is injected.

Pole position identification (PLI)

- For controlling a permanent-magnet synchronous motor, the pole position - the angle between the motor phase U and the field axis of the rotor - must be known.
- In case of a drive at standstill, the inverter enable is directly followed by the "pole position identification (PLI)" which identifies the initial pole position.

Flying restart circuit

- From firmware version 4 onwards, a flying restart circuit for the synchronous motor up to speeds lower than half the rated speed is supported.
- If the flying restart circuit shall be used, set the start method "Flying restart circuit [2]" in 0x2838:001 (P203.01). More settings are not required for the flying restart circuit at sensorless control of a synchronous motor.

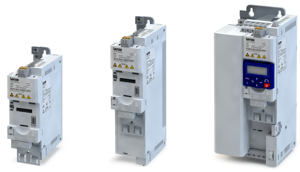
For a speed control with torque limitation in operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]":

1. Select the source in 0x2949:001 (P337.01) for the positive torque limit source and set it accordingly.
2. Select the source in 0x2949:002 (P337.02) for the negative torque limit source and set it accordingly.

SL-PSM parameters

The parameters for this motor control type are calculated and set automatically while optimising the control loops. ▶ Optimisation of the control loops 🕮 193

Parameter	Name / value range / [default setting]	Info
0x2C03:001 (P352.01)	Back EMF constant (BEMF constant) 0.0 ... [**41.8**] ... 100000.0 V/1000rpm • From version 02.00	Voltage induced by the motor (rotor voltage / 1000 rpm).
0x2C11:001	High speed range: Lower limit 5 ... [**30**] ... 100 % • From version 02.00	Definition of the lower limit of the high speed range. • The lower limit has a permanent hysteresis of 5 %.
0x2C11:002	High speed range: Tracking controller gain 0 ... [**200**] ... 65535 % • From version 02.00	Gain factor for tracking the rotor position in the motor model.
0x2C11:003	High speed range: Tracking controller reset time 0.00 ... [**6.00**] ... 655.35 ms • From version 02.00	Reset time for tracking the rotor position in the motor model.
0x2C11:004	High speed range: Tracking controller decouple time 0.0 ... [**200.0**] ... 6553.5 ms • From version 02.00	Temporal hysteresis for the switching back and forth from the open-loop controlled to the closed-loop controlled operation.
0x2C12:001	SM low speed range: Acceleration current 5 ... [**70**] ... 400 % • From version 02.00	R.m.s. current value for acceleration processes in the lower velocity range. • 100 % ≡ rated motor current 0x6075 (P323.00) • In the lower speed range and during the acceleration phase, the current setpoints of 0x2C12:001 and 0x2C12:002 are added and injected to the motor.
0x2C12:002	SM low speed range: Standstill current 5 ... [**30**] ... 400 % • From version 02.00	R.m.s. current value for processes without acceleration (for instance standstill or constant setpoint speed) in the lower velocity range. • 100 % ≡ rated motor current 0x6075 (P323.00) • In the lower speed range and during the acceleration phase, the current setpoints of 0x2C12:001 and 0x2C12:002 are added and injected to the motor. Note! In case of a "100 %" setting and at standstill, a motor current flows, the r.m.s. value of which is square root of 2 higher than the rated motor current. The reason for this is that at standstill a DC current is injected into the synchronous motor and not an AC current. But as soon as the motor rotates, the correct rated motor current flows.
0x2949:001 (P337.01)	Positive torque limit source (Pos. torqlim src) • From version 03.00	Selection of the source for the positive torque limit source.
	0 **Max torque**	Positive torque limit source = Max torque 0x6072 (P326.00).
	1 Fixed Limit 0.0 %	Positive torque limit source = 0.0 %.
	2 Analog Input 1	The positive torque limit source is defined as analog signal via the analog input 1. ▶ Analog input 1 🕮 597
	3 Analog Input 2	The positive torque limit source is defined as analog signal via the analog input 2. ▶ Analog input 2 🕮 601
	4 Positive torque limit	Positive torque limit source = Positive torque limit 0x60E0.
	5 Network target torque	The positive torque limit source is defined as process data object via network. ▶ Configuring the network 🕮 226



Parameter	Name / value range / [default setting]	Info
0x2949:002 (P337.02)	Negative torque limit source (Neg. torqlim src) • From version 03.00	Selection of the source for the negative torque limit source.
	0 **(-) Max torque**	Negative torque limit source = (-) Max torque 0x6072 (P326.00).
	1 Fixed Limit 0.0 %	Negative torque limit source = 0.0 %.
	2 Analog Input 1	The negative torque limit source is defined as analog signal via the analog input 1. ▶ Analog input 1 📖 597
	3 Analog Input 2	The negative torque limit source is defined as analog signal via the analog input 2. ▶ Analog input 2 📖 601
	4 Negative torque limit	Negative torque limit source = Negative torque limit 0x60E1.
	5 Network target torque	The negative torque limit source is defined as process data object via network. ▶ Configuring the network 📖 226
0x2C00 (P300.00)	Motor control mode (Motor ctrl mode) • Setting can only be changed if the inverter is inhibited.	Selection of the motor control type.
	2 Servo control (SC ASM) (from version 02.00)	This control mode is used for servo control of an asynchronous motor. ▶ Servo control for asynchronous motors (SC-ASM) 📖 176
	3 Sensorless control (SL PSM) (from version 02.00)	This control type is used for the sensorless control of a synchronous motor. • Control mode is possible up to a rated power of maximally 22 kW. ▶ Sensorless control for synchronous motors (SL-PSM) 📖 178
	4 Sensorless vector control (SLVC)	This control type is used for sensorless vector control of an asynchronous motor. ▶ Sensorless vector control (SLVC) 📖 173
	6 **V/f characteristic control (VFC open loop)**	This control mode is used for the speed control of an asynchronous motor via a V/f characteristic and is the simplest control mode. ▶ V/f characteristic control (VFC) 📖 166
	7 V/f characteristic control (VFC closed loop) (from version 04.00)	The control mode is used for speed control of an asynchronous motor via a V/f characteristic with speed feedback. A motor encoder must be connected to the inverter and set as feedback system for the motor control. ▶ V/f characteristic control (VFC closed loop) 📖 172
0x60E0	Positive torque limit 0.0 ... [**250.0**] ... 3276.7 % • From version 02.00	Positive torque limit source for speed control with torque limitation. • 100 % ≡ Motor rated torque 0x6076 (P325.00)
0x60E1	Negative torque limit 0.0 ... [**250.0**] ... 3276.7 % • From version 02.00	Negative torque limit source for speed control with torque limitation. • 100 % ≡ Motor rated torque 0x6076 (P325.00)

Next steps

- The inverter provides different functions by means of which the drive behaviour can be further optimised. ▶ Optimisation of motor control 📖 182
- The default setting enables the operation of a power-adapted motor. **An optimum operation of this motor control type requires an optimisation of the control loops!** ▶ Optimisation of the control loops 📖 193

8.2.5.1 Stall monitoring

The stalling monitoring for the sensorless control for synchronous motors (SL-PSM) switches off the drive if the motor is about to "stall". A possible cause may be an overload of the motor.

Preconditions

The stalling monitoring only works in the controlled area and if the motor is not operated in the field weakening range.

Details

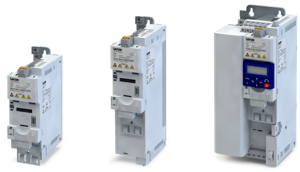
In order to detect the motor stalling, the cosine phi is used.

Example:

- For the cosine phi, the value "0.9" is set in 0x2C01:008 (P320.08) according to the data given on the motor nameplate.
- The limit value for stalling monitoring is set in 0x2C11:006 to "80 %".
- Stalling monitoring is triggered if the current cosine phi is lower than 0.72 (80 % of 0.9).

> If stalling monitoring is triggered, the "Trouble" error response takes place. If the operating mode "MS: Velocity mode [-2]" is set in 0x6060 (P301.00), the motor automatically restarts if the trouble does not exist anymore.

Parameter	Name / value range / [default setting]		Info
0x2C11:006	High speed range: Stall monitoring limit 0 ... **[50]** ... 65535 % • From version 04.00		The stall monitoring limit refers to the cosine phi of the motor in percent.
0x6060 (P301.00)	Modes of operation (Modes of op.) • Setting can only be changed if the inverter is inhibited.		Selection of the operating mode.
	-2	**MS: Velocity mode**	Vendor specific velocity mode
	-1	MS: Torque mode (from version 03.00)	Vendor specific torque mode • Only possible in motor control type 0x2C00 (P300.00) = "Sensorless vector control (SLVC) [4]" or "Servo control (SC ASM) [2]". ▶ Torque control w/ freq. limit 📖 206
	0	No mode change/no mode assigned	No operating mode (standstill)
	2	CiA: Velocity mode	CiA 402 velocity mode



8.3 Optimisation of motor control

The inverter provides different functions by means of which the drive behaviour can be further optimised.

Function	Motor control type				
	VFC open loop	VFC closed loop	SC-ASM	SL-PSM	SLVC
V/f voltage boost 📖 183 The parameterisable voltage boost makes it possible to improve the starting performance for applications requiring a high starting torque.	●	●			
Skip frequencies 📖 184 By means of the three parameterisable skip frequencies, critical frequencies can be suppressed which lead to mechanical resonances in the system.	●	●	●	●	●
Optimising the stalling behaviour 📖 186 For special motors which enable an operation in the field weakening range, the behaviour in the field weakening range can be adapted to the motor.	●	●			
Slip compensation 📖 188 In case of a load, the speed of an asynchronous motor decreases. This load-dependent speed drop is called slip. The slip compensation serves to counteract the load-dependent speed loss.	●				
Oscillation damping 📖 190 The oscillation damping serves to reduce the oscillations during no-load operation which are caused by energy oscillating between the mechanical system (mass inertia) and the electrical system (DC bus).	●	●			
For controlling a permanent-magnet synchronous motor, the pole position - the angle between the motor phase U and the field axis of the rotor - must be known. This function serves to detect the pole position for the currently activated motor encoder.				●	

VFC open loop = V/f characteristic control
VFC closed loop = V/f characteristic control with speed feedback
SC-ASM = servo control for asynchronous motor
SL-PSM = sensorless control for synchronous motor
SLVC = sensorless vector control

8.3.1 V/f voltage boost

The parameterisable voltage boost makes it possible to improve the starting performance for applications requiring a high starting torque.

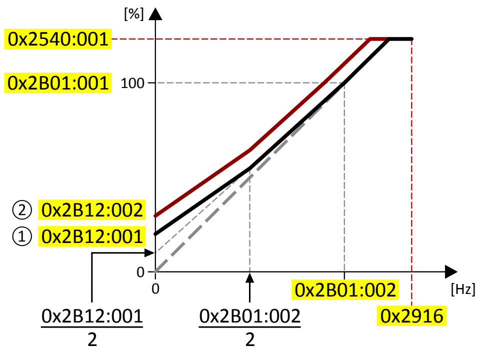
Preconditions

The function is only effective in the following motor control types:

- V/f characteristic control (VFC open loop)
- V/f characteristic control (VFC closed loop)

Details

- In 0x2B12:001 (P316.01), a permanent voltage boost can be set. ①
- In 0x2B12:002 (P316.02), an additional voltage boost can be set for acceleration processes only. ②
- Reference for the percentage setting of the voltage boost is the base voltage 0x2B01:001 (P303.01).



Parameter	Name / value range / [default setting]	Info
0x2B12:001 (P316.01)	Fixed boost (Fixed V/f boost) 0.0 ... [**2.5**]* ... 20.0 % * Default setting depending on the size.	Fixed (constant) voltage boost for V/f characteristic control without feedback. • 100 % ≡ V/f base voltage 0x2B01:001 (P303.01) • For the purpose of optimising the starting performance for applications requiring a high starting torque.
0x2B12:002 (P316.02)	V/f voltage boost: Boost at acceleration (V/f boosts: Dynam. V/f boost) 0.0 ... [**0.0**] ... 20.0 %	Additional voltage boost for V/f characteristic control without feedback. • 100 % ≡ V/f base voltage 0x2B01:001 (P303.01) • This voltage boost is only active while the motor is accelerated. It then acts in addition to the fixed voltage boost set in 0x2B12:001 (P316.01).
0x2B01:001 (P303.01)	V/f shape data: Base voltage (V/f shape data: Base voltage) 0 ... [**230**]* ... 5000 V * Default setting depending on the size.	Base voltage and base frequency define the V/f ratio and thus the gradient of the V/f characteristic. • The V/f base voltage is usually set to the rated motor voltage 0x2C01:007 (P320.07). • The V/f base frequency is usually set to the rated motor frequency 0x2C01:005 (P320.05).
0x2B01:002 (P303.02)	V/f shape data: Base frequency (V/f shape data: Base frequency) Device for 50-Hz mains: 0 ... [**50**]* ... 1500 Hz Device for 60-Hz mains: 0 ... [**60**]* ... 1500 Hz * Default setting depending on the size.	

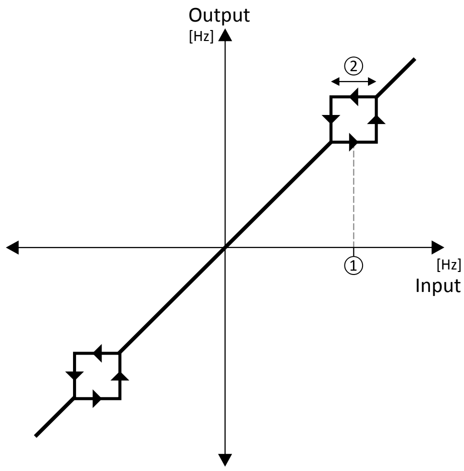
8.3.2 Skip frequencies

By means of the three parameterisable skip frequencies, critical frequencies can be suppressed which lead to mechanical resonances in the system.

Details

A blocking zone is active as soon as the frequency for this blocking zone is set to value unequal to "0 Hz".

- The set frequency defines the centre of the range to be masked out. ①
- The set bandwidth defines its total size. ②



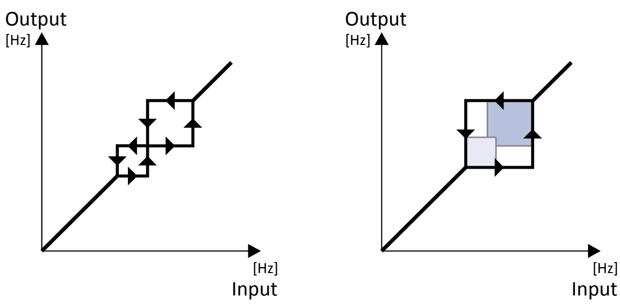
Example: For a blocking zone, the frequency is set to 20 Hz and the bandwidth to 10 Hz. These settings mask out the range from 15 Hz to 25 Hz.

Notes:

- Skip frequencies are absolute values. With the setting "20 Hz", at the same time also the skip frequency "-20 Hz" is defined.
- The inverter accelerates/decelerates the motor by the range to be masked out. A continuous operation within this range is not possible.
- A blocking zone is not active if its bandwidth is set to "0 Hz".

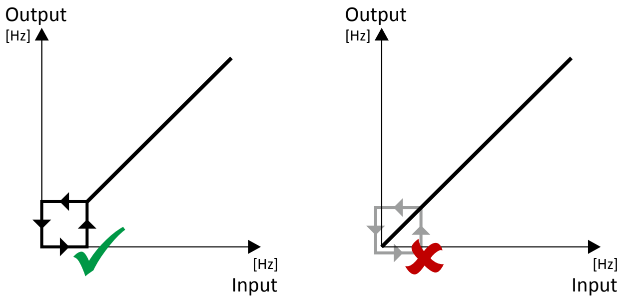
Adjacent and overlapping ranges:

- Example on the left: If the ranges are closely spaced, the ranges are passed through as shown.
- Example on the right: If the ranges overlap, the lowest and highest value form a new range. In the status display 0x291F:016, both ranges are shown as active.

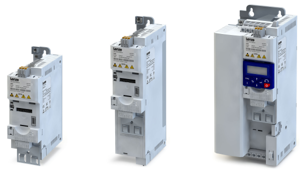


Valid and invalid ranges:

- Example on the left: Skip frequency = 5 Hz, bandwidth = 10 Hz
  → Valid range (starts at ≥ 0)
- Example on the right: Skip frequency = 4 Hz, bandwidth = 10 Hz
  → Invalid range (starts at < 0); is thus ignored.



Parameter	Name / value range / [default setting]	Info
0x291F:001 (P317.01)	Skip frequencies: Skip frequency 1 (Skip frequencies: Skip frequency 1) 0.0 ... **[0.0]** ... 599.0 Hz	Centre of frequency range 1 which is to be skipped.
0x291F:002 (P317.02)	Skip frequencies: Skip bandwidth 1 (Skip frequencies: Skip bandwidth 1) 0.0 ... **[0.0]** ... 10.0 Hz	Size of frequency range 1 which is to be skipped.
0x291F:003 (P317.03)	Skip frequencies: Skip frequency 2 (Skip frequencies: Skip frequency 2) 0.0 ... **[0.0]** ... 599.0 Hz	Centre of frequency range 2 which is to be skipped.
0x291F:004 (P317.04)	Skip frequencies: Skip bandwidth 2 (Skip frequencies: Skip bandwidth 2) 0.0 ... **[0.0]** ... 10.0 Hz	Size of frequency range 2 which is to be skipped.
0x291F:005 (P317.05)	Skip frequencies: Skip frequency 3 (Skip frequencies: Skip frequency 3) 0.0 ... **[0.0]** ... 599.0 Hz	Centre of frequency range 3 which is to be skipped.
0x291F:006 (P317.06)	Skip frequencies: Skip bandwidth 3 (Skip frequencies: Skip bandwidth 3) 0.0 ... **[0.0]** ... 10.0 Hz	Size of frequency range 3 which is to be skipped.
0x291F:016	Skip frequencies: Status • Read only	Bit-coded status display of the skip frequencies.
	Bit 0 Blocking zone 1 active	
	Bit 1 Blocking zone 2 active	
	Bit 2 Blocking zone 3 active	
	Bit 4 Frequency above blocking zone 1	
	Bit 5 Frequency above blocking zone 2	
	Bit 6 Frequency above blocking zone 3	
	Bit 8 Blocking zone 1 invalid	
	Bit 9 Blocking zone 2 invalid	
	Bit 10 Blocking zone 3 invalid	
0x291F:032	Skip frequencies: Input frequency • Read only: x.xx Hz	Display of the skip filter input frequency.
0x291F:033	Skip frequencies: Output frequency • Read only: x.xx Hz	Display of the skip filter output frequency.



8.3.3 Optimising the stalling behaviour

If the motor is driven with frequencies above the rated motor frequency, the operating point is shifted to the "field weakening range". In this range, the motor voltage does not increase proportionately to the output frequency anymore. As a consequence, the inverter automatically reduces the maximum current since the full torque is not available anymore at these frequencies.

For special motors which enable an operation in the field weakening range, the behaviour in the field weakening range can be adapted to the motor with 0x2B0C (P319.00).

⚠ DANGER!

Danger by incorrect parameterisation.

Possible consequences: damage to material assets and injury to persons

- Only change the default setting (0 Hz) in 0x2B0C (P319.00) after consulting the motor manufacturer!
- Recommendation: Maintain default setting (0 Hz).

Preconditions

The function is only effective in the following motor control types:

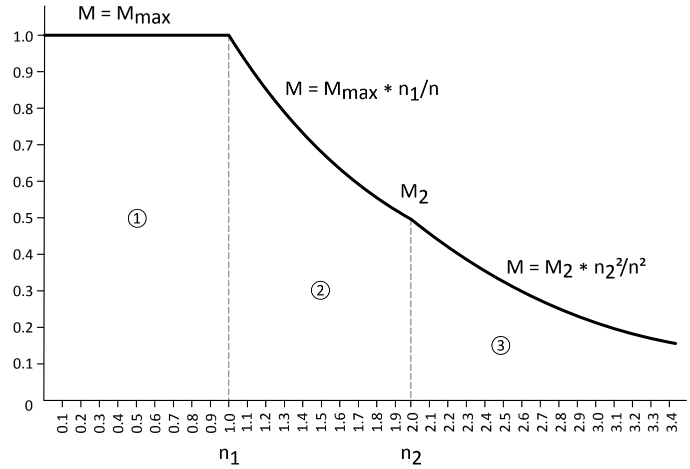
- V/f characteristic control (VFC open loop)
- V/f characteristic control (VFC closed loop)

Details

The operating range of an asynchronous motor consists of the voltage range ① and the field weakening range. The field weakening range again is divided into two ranges:

- In the first range ②, the power can be kept constant without the motor stalling.
- The second field weakening range ③ is characterised by the fact that the maximum permissible stator current is decreased to prevent the motor from stalling .

Speed/torque curve of the asynchronous motor with two field weakening ranges



The override point (n_2, M_2) can be influenced with 0x2B0C (P319.00).

0x2B0C (P319.00) > 0 Hz:

- The maximum current characteristic is shifted to higher field frequencies by the frequency entered.
- The maximum permissible current and the maximum torque increase in the field weakening range.
- The risk of motor stalling increases.

0x2B0C (P319.00) < 0 Hz:

- The maximum current characteristic is shifted to lower field frequencies by the frequency entered.
- The maximum permissible current and the maximum torque are reduced in the field weakening range.
- The risk of motor stalling is reduced.

Parameter	Name / value range / [default setting]	Info
0x2B0C (P319.00)	Override field weakening (Field weak thold) -599.0 ... [**0.0**] ... 599.0 Hz	Offset of the override point for field weakening.
0x2B01:002 (P303.02)	V/f shape data: Base frequency (V/f shape data: Base frequency) Device for 50-Hz mains: 0 ... [**50**]* ... 1500 Hz Device for 60-Hz mains: 0 ... [**60**]* ... 1500 Hz * Default setting depending on the size.	Base voltage and base frequency define the V/f ratio and thus the gradient of the V/f characteristic. • The V/f base voltage is usually set to the rated motor voltage 0x2C01:007 (P320.07). • The V/f base frequency is usually set to the rated motor frequency 0x2C01:005 (P320.05).

8.3.4 Slip compensation

In case of a load, the speed of an asynchronous motor decreases. This load-dependent speed drop is called slip. The slip compensation serves to counteract the load-dependent speed loss.

Preconditions

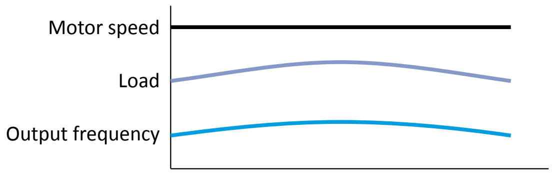
The function is only effective in the motor control type "V/f characteristic control (VFC open loop)".

In order that the function can determine the rated slip correctly, the following parameters must be set correctly:

- Rated speed
- Rated frequency
- Number of pole pairs (Automatically calculated from Rated speed and Rated frequency)

Details

The slip compensation increases or decreases the output frequency as a response to a load change. Thus, the slip is counteracted and the speed is kept precisely.



The rated slip required for the slip compensation is calculated by the inverter according to the following formula:

Rated slip [%] = (1 - (rated motor speed [rpm] / (120 * rated motor frequency [Hz] / number of poles))) * 100

Calculation example:

- Rated motor speed = 1750 rpm
- Rated motor frequency = 60 Hz
- Number of poles = 2 * Number of pole pairs = 2 * 2 = 4
- Rated slip = (1 - (1750 / (120 * 60 / 4))) * 100 = 2.77 %

The rated slip represents the reduction of the motor speed due to the motor load. At full speed and full load, the motor given in the example would rotate with 1750 rpm, which means 2.77 % below its synchronous speed of 1800 rpm. In order to compensate this speed loss, the inverter increases the output frequency by the rated slip multiplied by the rated motor frequency. In the example 2.77 % * 60 Hz = 1.66 Hz increase at full load.

In order to consider load changes, the influence of the rated slip on output frequency can be adapted in 0x2B09:001 (P315.01). A setting of 100 % corresponds to the rated slip of the machine in the nominal operating point.

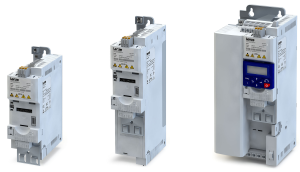
With reference to the example above and a setpoint frequency of 60 Hz:

- If 0x2B09:001 (P315.01) = 100 %, the output frequency is = 61.66 Hz
  (60 Hz + 100 % * 1.66 Hz).
- If 0x2B09:001 (P315.01) = 50 %, the output frequency is = 60.83 Hz
  (60 Hz + 50 % * 1.66 Hz).

Additionally, the filter time for the slip compensation can be adapted in 0x2B09:002 (P315.02) if required. The preset filter time is adapted to typical motors. If full load or nearly full load oscillations or instabilities occur, we recommend an increase of the filter time.

Parameter	Name / value range / [default setting]	Info
0x2B09:001 (P315.01)	Slip compensation: Gain (Slip compens.: Slip: gain) -200.00 ... [**100.00**] ... 200.00 %	Adjustment in percent of the slip calculated. • For instance required for deviations of the real motor data from the nameplate data. • A setting of 100 % corresponds to the rated slip of the machine in the nominal operating point.
0x2B09:002 (P315.02)	Slip compensation: Filter time (Slip compens.: Filter time) 1 ... [**100**] ... 6000 ms	Filter time for the slip compensation. • The preset filter time is adapted to typical motors.

Parameter	Name / value range / [default setting]	Info
0x2C02:004 (P351.04)	Slip frequency (Slip frequency) • Read only: x.x Hz	Display of the rated slip determined.
0x2C01:001	Motor parameters: Number of pole pairs • Read only	Display of the number of pole pairs calculated from the rated speed and rated frequency.
0x2C01:004 (P320.04)	Motor parameters: Rated speed (Motor parameters: Rated speed) Device for 50-Hz mains: 50 ... [**1450**] ... 50000 rpm Device for 60-Hz mains: 50 ... [**1750**] ... 50000 rpm	General motor data. Carry out settings as specified by motor nameplate data. Note! When you enter the motor nameplate data, take into account the phase connection implemented for the motor (star or delta connection). Only enter the data applying to the connection type selected.
0x2C01:005 (P320.05)	Motor parameters: Rated frequency (Motor parameters: Rated frequency) Device for 50-Hz mains: 1.0 ... [**50.0**] ... 1000.0 Hz Device for 60-Hz mains: 1.0 ... [**60.0**] ... 1000.0 Hz	



8.3.5 Oscillation damping

The oscillation damping serves to reduce the oscillations during no-load operation which are caused by energy oscillating between the mechanical system (mass inertia) and the electrical system (DC bus). Furthermore, the oscillation damping can also be used to compensate for resonances.

Preconditions

The function is only effective in the following motor control types:
- V/f characteristic control (VFC open loop)
- V/f characteristic control (VFC closed loop)

Restrictions

Observe the following restrictions:
- Damping is possible only for constant oscillations at a steady-state operating point.
- Oscillations occurring sporadically cannot be damped.
- Oscillation damping is not suitable for oscillations occurring during dynamic processes (e.g. accelerations or load changes).
- Oscillation damping is only active if the setpoint speed is greater than 10 rpm and the DC-bus voltage exceeds a value of 100 V.

Details

The determination of the oscillation is based on the active current. In order to obtain the alternating component of the active current, this current is differentiated. This signal is then passed through a PT1 filter.

Identification of the oscillation

Before the oscillation damping function can be parameterised, the oscillation has to be identified. One way to do this is to examine the motor current while oscillation damping is switched off (gain = 0 %). At steady-state operation, a constant current flows. If the drive oscillates, these oscillations are also visible on the motor current. It is therefore possible to determine the frequency and the amplitude of the oscillation from the alternating component of the motor current. In the following, this alternating component is referred to as "current oscillation".

Parameter setting

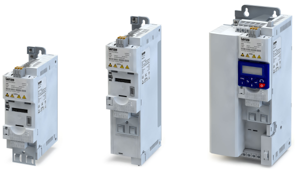
The gain of the oscillation signal is to be set according to the following equation:

0x2B0A:001 (P318.01) = current amplitude * 100 % / (√2 * maximum device current)

The default time constant of the PT1 filter should be sufficient for most applications. If required, it is only possible to adapt the time constant via »EASY Starter«. Generally, the time constant must be set so that the oscillation can be dampened, but that higher-frequency components are filtered from the signal. The time constant is determined from the reciprocal value of the double current oscillation frequency:

0x2B0A:002 (P318.02) = 1 / (2 * oscillation frequency)

Parameter	Name / value range / [default setting]	Info
0x2B0A:001 (P318.01)	Gain (Gain) -400 ... [**150**] ... 400 %	Gain of the oscillation signal. • With the setting 0, oscillation damping is deactivated.
0x2B0A:002 (P318.02)	Filter time (Filter time) 1 ... [**30**] ... 600 ms	Time constant of the PT1 filter.
0x2DDF:002	Axis information: Maximum current • Read only: x.xx A	Display of the maximum current of the axis.
0x2D88 (P104.00)	Motor current (Motor current) • Read only: x.x A	Display des present current-r.m.s. value.



8.3.6 Pole position identification without movement

If a permanent-magnet synchronous motor is driven by the inverter, a "pole position identification (PLI)" is required for an optimum and jerk-free starting torque. In the default setting, a pole position identification is executed after each inverter enable. If the pole position identification is deactivated, the motor may briefly rotate backwards before starting or stall if the starting torque is too high.

NOTICE

With an incorrect parameter setting and dimensioning of the inverter, the maximum permissible motor current may be exceeded during the pole position identification.

Possible consequence: irreversible damage of the motor.

- Set the motor data correctly. ▶ Motor data 📖 164
- Only use an inverter that is performance-matched to the motor.

Preconditions

- The wiring of the three motor phases and the motor encoder must be carried out according to the specifications from the mounting instructions.
- The inverter is ready for operation (no fault active).
- For the pole position identification (PPI) without movement, the motor must be at standstill. In order that the pole position identification is only executed at standstill, set the start method "Flying restart circuit [2]" in 0x2838:001 (P203.01).

Details

This function was developed for a wide range of motor characteristics. In case of some motor types, the identified pole position may differ considerably from the real pole position, so that a considerable loss in torque and greater motor losses may occur.

The pole position identification can be executed automatically after every inverter enable if "After each enable [2]" is selected in 0x2C63:001. Further settings are not required for this function.

Process of the pole position identification:

1. After inverter enable, a defined pulse pattern is output that provides currents up to approx. maximum motor current. The respective currents are measured. Based on these currents, the field distribution can be detected so that the pole position can be calculated. This process lasts maximally 1.8 seconds.
2. After the pole position identification has been carried out successfully, the motor follows the setpoint selection.

During the pole position identification:

- The current test pulses cause audible engine noises that may be increased by the machine mechanics depending on the mechanical coupling!
- The function can be aborted by the inverter disable any time without changing the settings. In this case, you have to carry out the pole position identification again.
- If the function is aborted by itself, the motor features may not be suitable for this function.

If an error occurs during the pole position identification,

- the procedure is stopped without the settings being changed.
- the response set in 0x2C60 is effected.

Parameter	Name / value range / [default setting]		Info
0x2C60	PPI monitoring: Reaction • From version 04.00 • For further possible settings, see parameter 0x2D45:001 (P310.01). 📖 223		Selection of the response triggered by the occurrence of an error during the pole position identification (PLI). Associated error code: • 28961 | 0x7121 - Pole position identification fault
	3	**Fault**	

Parameter	Name / value range / [default setting]		Info
0x2C63:001	PPI without movement: Execution • Setting can only be changed if the inverter is inhibited. • From version 04.00		Starting performance (without or with pole position identification before the start).
	0	Deactivated	Do not execute a pole position identification.
	2	**After each enable**	Execute a pole position identification after every inverter enable.

8.4 Optimisation of the control loops

Setting of motor data > Motor control selection > Optimisation of motor control > **Optimisation of the control loops**

If there is a need to improve the total power of the system, different options are available:

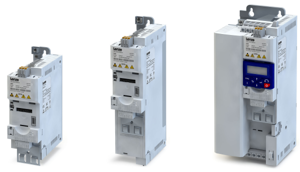
a) Select motor from motor catalogue
b) Tuning of the motor and the speed controller
c) Automatic motor identification (energized)
d) Automatic motor calibration (non-energized)

Simply select an option that best suits your environment and requirements!

Before the different options are described in detail, first make the decision which operator interface you want to use to execute the optimisation:

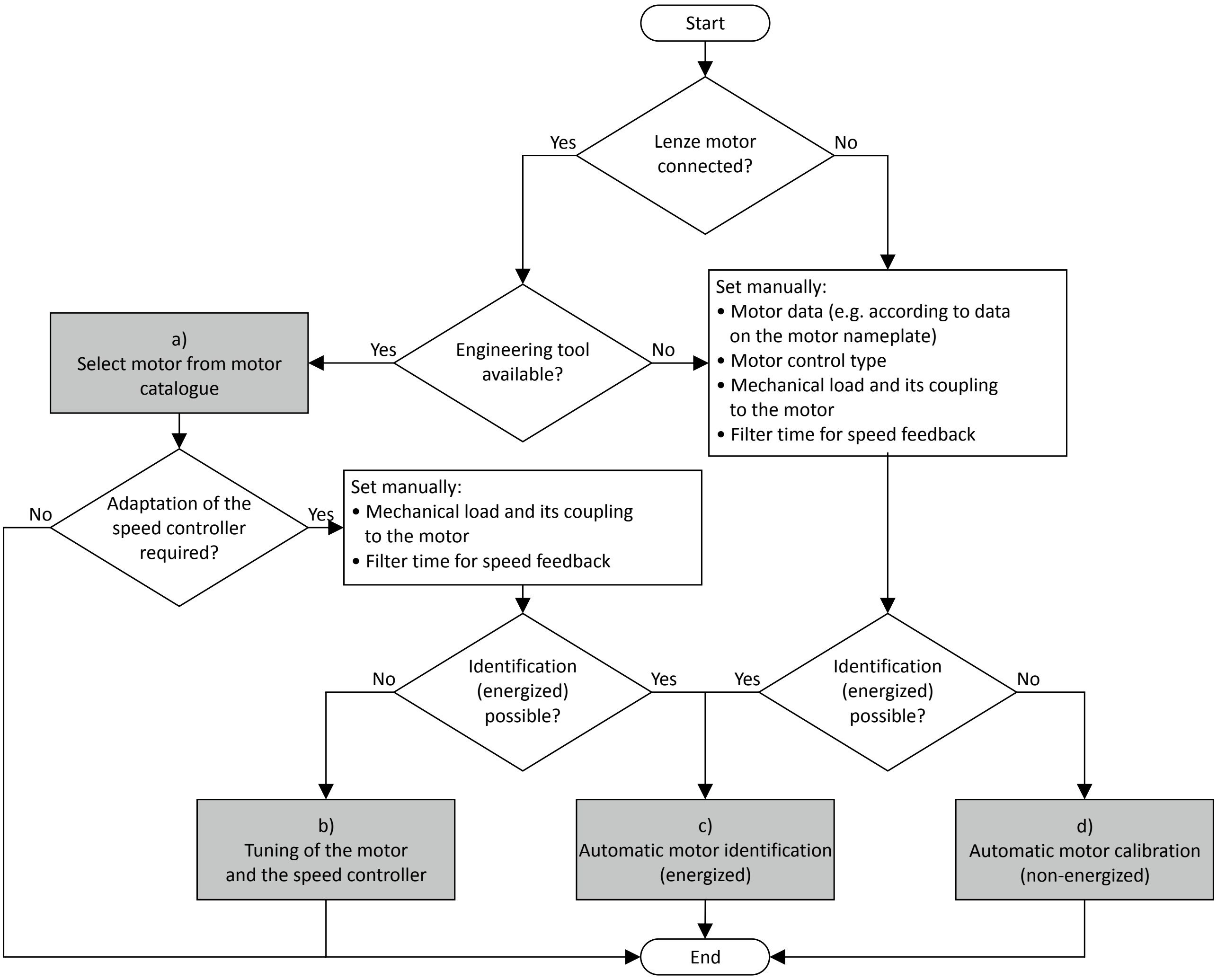
Option 1: Performing optimisation with engineering tool 🕮 194

Option 2: Performing optimisation with keypad 🕮 195



Performing optimisation with engineering tool

The following flow diagram shows the optimisation process with an engineering tool (e. g. »EASY Starter«):



a) No matter which option suits you best, first the relevant motor data must be set. By selecting the motor from the motor catalogue, you benefit from very accurate Motor equivalent circuit diagram data.
▸ Motor selection from motor catalogue 197

b) If you already have an optimised system, but the load adjustment has changed, it makes sense to just re-initialise the speed controller.
▸ Tuning of the motor and the speed controller 198

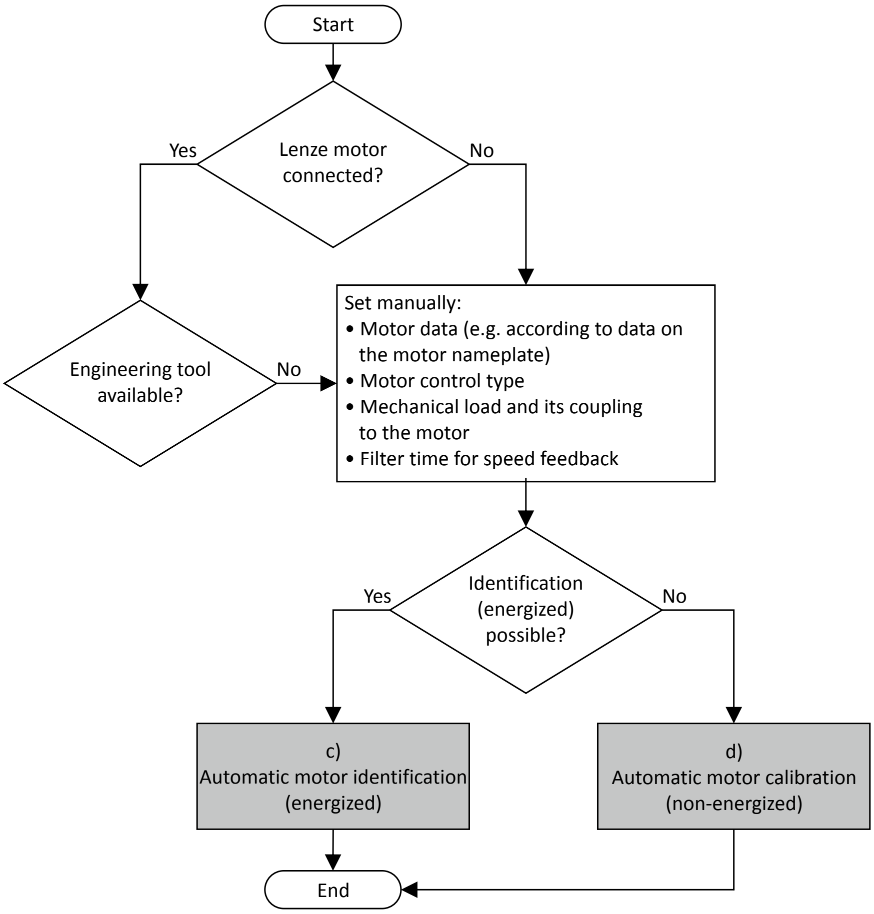
c) If the application enables you to energise the system during the optimisation procedure, carry out an automatic identification. This procedure results in the best possible parameter settings.
▸ Automatic motor identification (energized) 199

d) If the application does **not** enable you to energise the system during the optimisation procedure, carry out an automatic calibration.
▸ Automatic motor calibration (non-energized) 200

Performing optimisation with keypad

Since there is no access with the keypad to the motor catalogue, first the motor data must be set manually with the keypad according to the manufacturer data/motor data sheet. ▶ Manual setting of the motor data 📖 164

The following flow diagram shows the optimisation process with the keypad:



c) If the application enables you to energise the system during the optimisation procedure, carry out an automatic identification. This procedure results in the best possible parameter settings.
▶ Automatic motor identification (energized) 📖 199

d) If the application does **not** enable you to energise the system during the optimisation procedure, carry out an automatic calibration.
▶ Automatic motor calibration (non-energized) 📖 200

8.4.1 Options for optimized motor tuning

The option to be selected depends on the respective application. Depending on the selected option, different procedures become active and thus different parameter groups are influenced:

- Rated motor data
- Inverter characteristic
- Motor equivalent circuit diagram data
- Motor controller settings
- Speed controller settings

For further details, see the following subchapters:

- Motor selection from motor catalogue 🕮 197
- Tuning of the motor and the speed controller 🕮 198
- Automatic motor identification (energized) 🕮 199
- Automatic motor calibration (non-energized) 🕮 200

8.4.1.1 Motor selection from motor catalogue

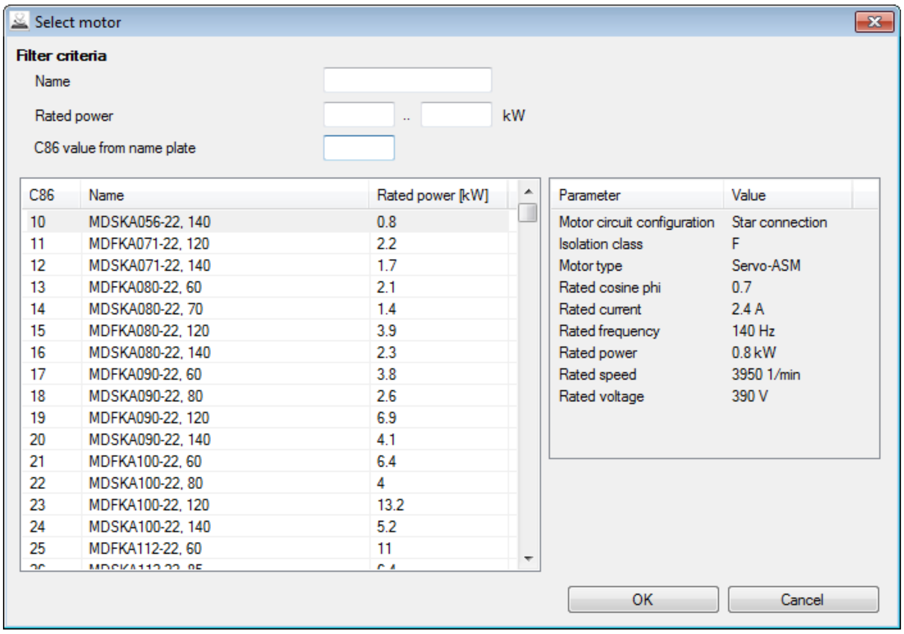
The following describes how to optimise your drive system by selecting a Lenze motor from the motor catalogue. Several steps are started invisibly in the background to load/calculate the settings for the relevant parameters.

Preconditions

- Access to a Lenze engineering tool (e. g. »EASY Starter«).
- Optimisation is possible online or offline (with or without connected motor).

Required steps

1. Open the Lenze engineering tool that provides for the functionality of a "Lenze motor catalogue".
2. Click the **Select motor...** button. In case of the »EASY Starter«, you find the **Select motor...** button on the "settings". tab.
3. Select the used motor in the "Select motor" dialog:



- By entering filter criteria, you can restrict the selection.
- Name (e. g. "MDSKxxx"), rated power and C86 value can be found on the motor nameplate.

4. Click the **OK** button to start the optimisation.

Optimisation process

As soon as the optimisation has been started, the following steps are initiated by the engineering tool:

1. The rated motor data are loaded from the motor catalogue.
2. The motor equivalent circuit diagram data are loaded from the motor catalogue.
3. The motor controller settings are calculated based on the previously loaded data.
4. The speed controller settings are automatically calculated based on the previously loaded data.

Notes:

- The data involved in this optimisation are provided be the motor catalogue alone. Further user data is not required.
- The inverter characteristic is not changed by this optimisation.

Parameter	Name / value range / [default setting]	Info
0x2C01:010	Motor parameters: Motor name	The name (e.g. " 1") can be freely selected by the user. If the motor in the engineering tool has been selected from the "motor catalog", the respective motor name is automatically entered here (example: "MDSKA080-22, 70").

8.4.1.2 Tuning of the motor and the speed controller

The following describes in general how to optimise the speed controller. This may be required if some parameters have on the load side of the drive system have changed or have not been set yet, such as:

- Motor moment of inertia
- Load moment of inertia
- Type of coupling between moment of inertia of the motor and that of the load

Preconditions

- All rated motor data are known and set in the inverter, either by selecting the motor from the motor catalogue or manually.
  ▸ Motor selection from motor catalogue 📖 197
  ▸ Manual setting of the motor data 📖 164
- All further options for optimisation have been executed before if possible.
  ▸ Automatic motor identification (energized) 📖 199
  ▸ Automatic motor calibration (non-energized) 📖 200
- Optimisation is possible online or offline (with or without connected motor).

Required steps

Adapt the following parameters to your drive system using the engineering tool. Since this only changes load-dependent data, the other parameter groups must not be calculated again.

Parameter	Name / value range / [default setting]		Info
0x2910:001 (P335.01)	Motor moment of inertia (Motor inertia) 0.00 ... [**3.70**]* ... 20000000.00 kg cm² * Default setting depending on the size.		Setting of the moment of inertia of the motor.
0x2910:002 (P335.02)	Load moment of inertia (Load inertia) 0.00 ... [**3.70**]* ... 20000000.00 kg cm² * Default setting depending on the size.		Setting of the moment of inertia of the load. • Always adjust the setting to the current load, otherwise the optimisation process cannot be executed successfully.
0x2910:003	Coupling		Selection of the type of coupling between the moment of inertia of the motor and that of the load.
	0	Stiff	
	1	Elastic	
	2	**With backlash**	
0x2904	Actual speed filter time 0.0 ... [**2.0**] ... 50.0 ms		Filter time for the actual speed value.

For further details on the speed controller, see chapter "Speed controller". 📖 211

8.4.1.3 Automatic motor identification (energized)

The automatic identification of the motor results in the best possible parameter settings. If the application enables you to energise the system during the optimisation, carry out this optimisation.

Preconditions

- All rated motor data are known and set in the inverter, either by selecting the motor from the motor catalogue or manually.
  ▸ Motor selection from motor catalogue 📖 197
  ▸ Manual setting of the motor data 📖 164
- In 0x2C00 (P300.00), the motor control type required and suitable for the motor is selected.
- In 0x6060 (P301.00), the operating mode "MS: Velocity mode [-2]" or "CiA: Velocity mode [2]" is set.
- DC-bus voltage is available.
- The inverter is error-free and in the "Ready to switch on" or "Switched on" device state.
- The motor is stopped (no start enable).
- No inverter disable is active.
- No quick stop is active.
- No other axis command is active anymore.

General information on the identification

- The automatic identification can take from some seconds to minutes.
- The procedure can be aborted any time by inverter disable or cancellation of the start enable without settings being changed.
- During and after the procedure, the LED "RDY" (blue) is permanently on.
- After completing, a renewed start command is required to start the motor.

Required steps

Optimisation with engineering tool (e. g. »EASY Starter«):

1. Go to the "Settings" tab and navigate to the parameterisation dialog "Advanced motor setting".
2. Click the **Energized** button under "motor calibration".
3. Follow the instructions of the engineering tool.

Optimisation with keypad:

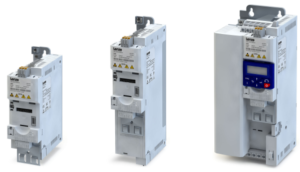
1. Request automatic identification: Set 0x2822:004 (P327.04) = "1".
2. Issue the start command to start the procedure.

Parameter	Name / value range / [default setting]	Info
0x2822:004 (P327.04)	Axis commands: Identify motor data (energized) (Axis commands: Identify mot.) 0 ... [**0**] ... 1	1 = start automatic identification of the motor data. • Inverter characteristics, motor equivalent circuit diagram data and controller settings are identified and set automatically. • During the procedure, the motor is energised!

Optimisation process

As soon as the process has been started, the following steps are initiated:

1. The inverter characteristic is automatically identified by the inverter.
2. The motor equivalent circuit diagram data are automatically identified by the inverter.
3. The motor controller settings are automatically calculated.
4. The speed controller settings are automatically calculated.



8.4.1.4 Automatic motor calibration (non-energized)

If the application does not enable you to energise the system during the optimisation, carry out this optimisation.

Preconditions

- All rated motor data are known and set in the inverter, either by selecting the motor from the motor catalogue or manually.
  ▸ Motor selection from motor catalogue 📖 197
  ▸ Manual setting of the motor data 📖 164
- In 0x2C00 (P300.00), the motor control type required and suitable for the motor is selected.
- The inverter is error-free and in the "Ready to switch on" or "Switched on" device state.
- The inverter is disabled or the motor is stopped (no start enable).
- No other axis command is active anymore.

Required steps

Optimisation with engineering tool (e. g. »EASY Starter«):

1. Go to the "Settings" tab and navigate to the parameterisation dialog "Advanced motor setting".
2. Click the **Non-energized** button under "motor calibration".
3. Follow the instructions of the engineering tool.

Optimisation with keypad:

- 0x2822:005 (P327.05) Set = "1" to start the process.

Parameter	Name / value range / [default setting]	Info
0x2822:005 (P327.05)	Axis commands: Calibrate motor data (non-energized) (Axis commands: Calibrate mot.) 0 ... [**0**] ... 1	1 = start automatic calibration of the motor data. • A default inverter characteristic is loaded. • the motor equivalent circuit diagram data and controller settings are calculated on the basis of the currently set rated motor data. • The motor is not energised.

Optimisation process

As soon as the process has been started, the following steps are initiated:

1. A default inverter characteristic is loaded.
2. The motor equivalent circuit diagram data is calculated based on the currently set rated motor data.
3. The motor controller settings are automatically calculated.
4. The speed controller settings are automatically calculated.

8.4.2 Inverter Characteristics

The inverter characteristic is automatically set if one of the following optimisations is carried out:

▸ Automatic motor identification (energized) 📖 199

▸ Automatic motor calibration (non-energized) 📖 200

The settings made can be seen if required, but should not be changed. A wrong setting may influence the control negatively!

Parameter	Name / value range / [default setting]	Info
0x2947:001 ... 0x2947:017	Inverter characteristic: Value y1 ... Value y17 0.00 ... [**0.00**]* ... 20.00 V * Default setting depending on the size.	The inverter characteristic (consisting of 17 values) is calculated and set during the automatic identification of the motor data. If only an automatic calibration of the motor data is carried out, a default inverter characteristic is loaded instead. Note! Changing these values is not recommended by the manufacturer.

8.4.3 Motor equivalent circuit diagram data

The motor equivalent circuit diagram data are automatically set if one of the following optimisations is carried out:

- Motor selection from motor catalogue 197
- Automatic motor identification (energized) 199
- Automatic motor calibration (non-energized) 200

Parameter	Name / value range / [default setting]	Info
0x2C01:002	Motor parameters: Stator resistance 0.0000 ... [**10.1565**]* ... 125.0000 Ω * Default setting depending on the size.	General motor data. Carry out settings as specified by manufacturer data/motor data sheet.
0x2C01:003	Motor parameters: Stator leakage inductance 0.000 ... [**23.566**]* ... 500.000 mH * Default setting depending on the size.	
0x2C02:001 (P351.01)	Motor parameter (ASM): Rotor resistance (ASM motor par.: Rotor resistance) 0.0000 ... [**8.8944**]* ... 200.0000 Ω * Default setting depending on the size.	Equivalent circuit data of the motor required for the motor model.
0x2C02:002 (P351.02)	Motor parameter (ASM): Mutual inductance (ASM motor par.: Mutual induct.) 0.0 ... [**381.9**]* ... 50000.0 mH * Default setting depending on the size.	
0x2C02:003 (P351.03)	Motor parameter (ASM): Magnetising current (ASM motor par.: Magn. current) 0.00 ... [**0.96**]* ... 500.00 A * Default setting depending on the size.	

8.4.4 Motor controller settings

After the motor settings have been made, the different control loops must be set. For a quick commissioning, the calculations and settings are made automatically if one of the following optimisations is carried out:

▶ Motor selection from motor catalogue 📖 197

▶ Automatic motor identification (energized) 📖 199

▶ Automatic motor calibration (non-energized) 📖 200

Details

The following controllers have an influence in the respective motor control type:

Controller	Motor control type				
	VFC open loop	VFC closed loop	SC-ASM	SL-PSM	SLVC
Current controller 📖 202	●	●	●	●	●
Field controller 📖 203			●		●
Field weakening controller 📖 203			●		●
Imax controller 📖 204	●	●			
Flying restart controller 📖 205	●			●	●
SLVC controller 📖 205					●
Slip controller 📖 210		●			

VFC open loop = V/f characteristic control
VFC closed loop = V/f characteristic control with speed feedback
SC-ASM = servo control for asynchronous motor
SL-PSM = sensorless control for synchronous motor
SLVC = sensorless vector control

8.4.4.1 Current controller

For a quick commissioning, the calculations and settings are made automatically during the optimisation.

For typical applications, a manual adaptation of the parameters of the current controller is not recommended. A wrong setting may have a negative effect on the control. For special applications, contact the manufacturer before adapting the parameters.

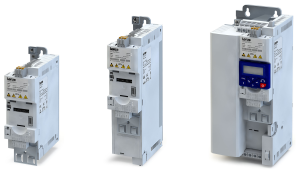
Preconditions

The current controller parameters are calculated based on the stator resistance and leakage inductance. Thus, the following parameters must be set correctly, either via optimisation or manually (according to manufacturer-data/motor data sheet):

- 0x2C01:002: Stator resistance
- 0x2C01:003: Stator leakage inductance

▶ Motor equivalent circuit diagram data 📖 201

Parameter	Name / value range / [default setting]	Info
0x2942:001 (P334.01)	Current controller parameters: Gain (Current contr.: Gain) 0.00 ... [**42.55**]* ... 750.00 V/A * Default setting depending on the size.	Gain factor Vp of the current controller.
0x2942:002 (P334.02)	Current controller parameters: Reset time (Current contr.: Reset time) 0.01 ... [**4.50**]* ... 2000.00 ms * Default setting depending on the size.	Reset time Ti of the current controller.



8.4.4.2 Field controller

For a quick commissioning, the calculations and settings are made automatically during the optimisation.

Preconditions

The field controller is only effective in the following motor control types:
- Servo control (SC ASM)
- Sensorless vector control (SLVC)

Parameter	Name / value range / [default setting]	Info
0x29C0:001	Gain 0.00 ... [**59.68**]* ... 50000.00 A/Vs * Default setting depending on the size.	Gain factor Vp of the field controller.
0x29C0:002	Reset time 1.0 ... [**45.5**]* ... 6000.0 ms * Default setting depending on the size.	Reset time Tn of the field controller.

8.4.4.3 Field weakening controller

For a quick commissioning, the calculations and settings are made automatically during the optimisation.

Preconditions

The field weakening controller is only effective in the following motor control types:
- Servo control (SC ASM)
- Sensorless vector control (SLVC)

Parameter	Name / value range / [default setting]	Info
0x29E0:001	Field weakening controller settings: Gain 0.000 ... [**0.000**]* ... 2000000.000 Vs/V * Default setting depending on the size.	Gain factor Vp of the field weakening controller.
0x29E0:002	Field weakening controller settings: Reset time 1.0 ... [**1478.3**]* ... 240000.0 ms * Default setting depending on the size.	Reset time Tn of the field weakening controller.
0x29E1	Field weakening controller Field limitation 5.00 ... [**100.00**] ... 100.00 % • From version 04.00	Field limitation of the field weakening controller.

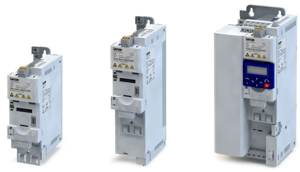
8.4.4.4 Field weakening controller (advanced)

For a quick commissioning, the calculations and settings are made automatically during the optimisation.

Preconditions

The field weakening controller is only effective in the following motor control types:
- Servo control (SC ASM)
- Sensorless vector control (SLVC)

Parameter	Name / value range / [default setting]	Info
0x29E2	DC-bus filter time 1.0 ... [**25.0**] ... 1000.0 ms	Filter time for the current DC-bus voltage.
0x29E3	Motor voltage filter time 1.0 ... [**25.0**] ... 1000.0 ms	Filter time for the current motor voltage.
0x29E4 (P354.00)	Voltage reserve range (Voltage reserve) 1 ... [**5**] ... 20 %	Voltage reserve range at the transition point to the field weakening. • Only relevant if 0x2C00 (P300.00) is set = "Servo control (SC ASM) [2]".



8.4.4.5 Imax controller

For a quick commissioning, the calculations and settings are made automatically during the optimisation.

For typical applications, a manual adaptation of the parameters of the Imax controller is not recommended. A wrong setting may have a negative effect on the control. For special applications, contact the manufacturer before adapting the parameters.

Preconditions

The Imax controller is only effective in the following motor control types:
- V/f characteristic control (VFC open loop)
- V/f characteristic control (VFC closed loop)

Details

The Imax controller becomes active in the V/f operation if the actual motor current exceeds the maximum overload current "Max current". The Imax controller changes the output frequency to counteract the exceedance.

The maximum overload current "Max current" is defined in 0x6073 (P324.00) in percent with regard to the rated motor current "Motor rated current" 0x6075 (P323.00).

If the maximum overload current is exceeded:
- During operation in motor mode, the Imax controller reduces the output frequency.
- During operation in generator mode, the Imax controller increases the output frequency.

Setting notes

If oscillations occur at the current limit during operation:
- Reduce gain of the Imax controller in 0x2B08:001 (P333.01).
- Increase reset time of the Imax controller in 0x2B08:002 (P333.02).
- Carry out the changes in small steps only (by 2 ... 3 % of the set value) until the oscillations do not exist anymore.

If the Imax controller does not respond fast enough after the maximum current has been exceeded:
- Increase gain of the Imax controller in 0x2B08:001 (P333.01).
- Reduce reset time of the Imax controller in 0x2B08:002 (P333.02).
- Carry out the changes in small steps only (by 2 ... 3 % of the set value) until the response time is acceptable.

Parameter	Name / value range / [default setting]	Info
0x2822:019	Axis commands: Calculate Imax controller parameter 0 ... [**0**] ... 1	1 = start automatic calculation of the Imax controller parameters. • Gain 0x2B08:001 (P333.01) and reset time 0x2B08:002 (P333.02) of the Imax controller are recalculated and set.
0x2B08:001 (P333.01)	V/f Imax controller: Gain (V/f Imax contr.: Gain) 0.000 ... [**0.284**]* ... 1000.000 Hz/A * Default setting depending on the size.	Gain factor Vp of the Imax controller.
0x2B08:002 (P333.02)	V/f Imax controller: Reset time (V/f Imax contr.: Reset time) 1.0 ... [**2.3**]* ... 2000.0 ms * Default setting depending on the size.	Reset time Ti of the Imax controller.

8.4.4.6 Flying restart controller

For a quick commissioning, the calculations and settings are made automatically during the optimisation.

Preconditions

The flying restart controller is only effective in the following motor control types:
- V/f characteristic control (VFC open loop)
- Sensorless control (SL PSM)
- Sensorless vector control (SLVC)

Details

The following parameter is only relevant for the flying restart circuit if an asynchronous motor is controlled. In case of a sensorless control of a synchronous motor (SL-PSM) the parameter has no meaning.

Parameter	Name / value range / [default setting]	Info
0x2BA1:003 (P718.03)	Flying restart circuit: Restart time (Flying restart: Restart time) 1 ... [**5911**]* ... 60000 ms * Default setting depending on the size.	Integration time for controlling the flying restart circuit.

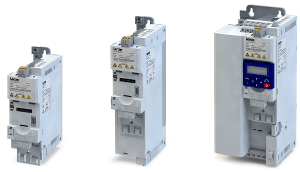
8.4.4.7 SLVC controller

For a quick commissioning, the calculations and settings are made automatically during the optimisation.

Preconditions

The SLVC controller is only effective in the motor control type "Sensorless vector control (SLVC)".

Parameter	Name / value range / [default setting]	Info
0x2B40:001	Gain 0.0000 ... [**0.2686**]* ... 1000.0000 Hz/A * Default setting depending on the size.	Gain of the SLVC-Q controller.
0x2B40:002	Reset time 1.0 ... [**2.3**]* ... 2000.0 ms * Default setting depending on the size.	Reset time of the SLVC-Q controller.



8.4.4.8 Torque control w/ freq. limit

In general, the inverter is operated in a mode that controls the motor frequency. Alternatively, the inverter can be configured in such a way that it controls a motor torque within a defined frequency range.

Typical applications for such a torque control with frequency limitation are winders and packaging machines.

Preconditions

A torque control is only possible in the motor control type 0x2C00 (P300.00) = "Sensorless vector control (SLVC) [4]" or "Servo control (SC ASM) [2]". Thus, first this motor control type must be configured. For details see the following chapter:

▶ Sensorless vector control (SLVC) 📖 173

▶ Servo control for asynchronous motors (SC-ASM) 📖 176

After configuring the sensorless vector control (SLVC), one of the following optimisations must be carried out for a torque control as precise as possible:

▶ Automatic motor identification (energized) 📖 199

▶ Automatic motor calibration (non-energized) 📖 200

Details

Setpoint selection:

- Instead of a frequency setpoint in [Hz], a torque setpoint has to be defined for the torque control. This can be either a value in percent with reference to the rated motor torque set in 0x6076 (P325.00) or a value in [Nm] if defined via the network.
- The standard setpoint source for the torque control can be selected in 0x2860:003 (P201.03) (default setting: Analog input 1).
- Corresponding functions make it possible to change over to other setpoint sources during operation. ▶ Setpoint change-over 📖 546

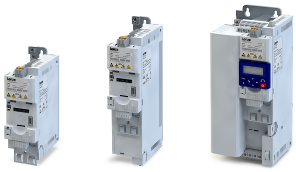
Limitation of the torque range:

- The positive and negative torque limit can be set independently of each other.

Frequency limitation / speed limitation:

- The adjustable speed limits serve to protect against very high speeds. High speeds can occur if a pure torque is selected without a counter torque being available (load-free machine).
- The torque control controls the assigned torque setpoint within the set speed limits. The actual speed results from the load conditions of the application. If the actual speed reaches the set speed limits, it is kept on the respective limit value. This protective function is also called "speed limitation".
- The lower and upper speed limit for speed limitation can be set independently of each other. They can also be defined via analog inputs or network.

In the following, the steps required for configuring the torque control with frequency limitation are described.



Parameterisation required

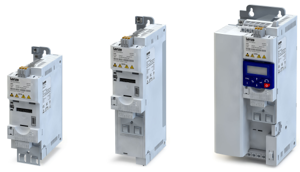
1. Set the operating mode "MS: Torque mode [-1]" in 0x6060 (P301.00).
2. Set the rated motor torque in 0x6076 (P325.00).
3. Set the permissible maximum torque in 0x6072 (P326.00).
   - The setting is made in percent with reference to the rated motor torque set in 0x6076 (P325.00).
4. Select the source for the positive torque limit in 0x2949:001 (P337.01).
   - Default setting: Maximum torque 0x6072 (P326.00)
   - In case of selection "Analog Input 1 [2]": Set setting range in 0x2636:011 (P430.11) and 0x2636:012 (P430.12).
   - In case of selection "Analog Input 2 [3]": Set setting range in 0x2637:011 (P431.11) and 0x2637:012 (P431.12).
   - In case of selection "Positive torque limit [4]": Set the positive torque limit in 0x60E0.
5. Select the source for the negative torque limit in 0x2949:002 (P337.02).
   - Default setting: (-) Maximum torque 0x6072 (P326.00)
   - In case of selection "Analog Input 1 [2]": Set setting range in 0x2636:011 (P430.11) and 0x2636:012 (P430.12).
   - In case of selection "Analog Input 2 [3]": Set setting range in 0x2637:011 (P431.11) and 0x2637:012 (P431.12).
   - In case of selection "Negative torque limit [4]": Set the negative torque limit in 0x60E1.
6. Select the source for the upper speed limit in 0x2946:003 (P340.03).
   - Default setting: Maximum frequency 0x2916 (P211.00)
   - In case of selection "Analog input 1 [2]": Set setting range in 0x2636:002 (P430.02) and 0x2636:003 (P430.03).
   - In case of selection "Analog input 2 [3]": Set setting range in 0x2637:002 (P431.02) and 0x2637:003 (P431.03).
   - In case of selection "Upper frequency limit [4]": Set the upper speed limit in [Hz] in 0x2946:005 (P340.05).
   - In case of selection "Upper speed limit [5]": Set the upper speed limit in [vel. unit in 0x2946:001 (P340.01).
7. Select the source for the lower speed limit in 0x2946:004 (P340.04).
   - Default setting: (-) Maximum frequency 0x2916 (P211.00)
   - In case of selection "Analog input 1 [2]": Set setting range in 0x2636:002 (P430.02) and 0x2636:003 (P430.03).
   - In case of selection "Analog input 2 [3]": Set setting range in 0x2637:002 (P431.02) and 0x2637:003 (P431.03).
   - In case of selection "Lower frequency limit [4]": Set the lower speed limit in [Hz] in 0x2946:006 (P340.06).
   - In case of selection "Lower speed limit [5]": Set the lower speed limit in [vel. unit in 0x2946:002 (P340.02).
8. Select the standard setpoint source for the torque control in 0x2860:003 (P201.03).
   - Default setting: Analog input 1. In case of this selection, set the setting range in 0x2636:011 (P430.11) and 0x2636:012 (P430.12).
   - In case of selection "Analog input 2 [3]": Set setting range in 0x2637:011 (P431.11) and 0x2637:012 (P431.12).
   - Except for the network, the torque setpoint must be given in percent with regard to the 0x6076 (P325.00) rated motor torque.
   - Via the network the torque setpoint is selected via the mappable parameter 0x400B:008 (P592.08) in [Nm / $2^{\text{scaling factor}}$]. The scaling factor can be set in 0x400B:009 (P592.09).
9. Optionally: For a "smooth" change-over between different setpoint sources, adapt the ramp time for the torque setpoint in 0x2948:002 (P336.02).

The torque control with frequency limitation is now active and the inverter responds to the torque setpoint given by the selected setpoint source.

Diagnostic parameters:
- 0x2DD5: Torque setpoint
- 0x2949:003 (P337.03): Actual positive torque limit
- 0x2949:004 (P337.04): Actual negative torque limit
- 0x2946:007 (P340.07): Speed limitation: Actual upper speed limit
- 0x2946:008 (P340.08): Speed limitation: Actual lower speed limit

Parameter	Name / value range / [default setting]	Info
0x2912:001 (P452.01)	Torque setpoint presets: Preset 1 (Torque presets: Torque preset 1) -400.0 ... [**100.0**] ... 400.0 %	Parameterisable torque setpoints (presets) for operating mode "MS: Torque mode". • 100 % ≡ Motor rated torque 0x6076 (P325.00)
0x2912:002 (P452.02)	Torque setpoint presets: Preset 2 (Torque presets: Torque preset 2) -400.0 ... [**100.0**] ... 400.0 %	
0x2912:003 (P452.03)	Torque setpoint presets: Preset 3 (Torque presets: Torque preset 3) -400.0 ... [**100.0**] ... 400.0 %	
0x2912:004 (P452.04)	Torque setpoint presets: Preset 4 (Torque presets: Torque preset 4) -400.0 ... [**100.0**] ... 400.0 %	
0x2912:005 (P452.05)	Torque setpoint presets: Preset 5 (Torque presets: Torque preset 5) -400.0 ... [**100.0**] ... 400.0 %	
0x2912:006 (P452.06)	Torque setpoint presets: Preset 6 (Torque presets: Torque preset 6) -400.0 ... [**100.0**] ... 400.0 %	
0x2912:007 (P452.07)	Torque setpoint presets: Preset 7 (Torque presets: Torque preset 7) -400.0 ... [**100.0**] ... 400.0 %	
0x2912:008 (P452.08)	Torque setpoint presets: Preset 8 (Torque presets: Torque preset 8) -400.0 ... [**100.0**] ... 400.0 %	
0x2946:001 (P340.01)	Speed limitation: Upper speed limit (Speed limitation: Upper limit) -480000 ... [**0**] ... 480000 vel. unit • From version 03.00	Upper limit for the speed limitation. • Setting is only effective with the selection "Upper speed limit [5]" in 0x2946:003 (P340.03).
0x2946:002 (P340.02)	Speed limitation: Lower speed limit (Speed limitation: Lower limit) -480000 ... [**0**] ... 480000 vel. unit • From version 03.00	Lower limit for speed limitation. • Setting is only effective with the selection "Lower speed limit [5]" in 0x2946:004 (P340.04).
0x2946:003 (P340.03)	Speed limitation: Upper speed limit source (Speed limitation: Uppspeed lim src) • From version 03.00	Selection of the source for the upper speed limit.
	0 **Maximum frequency**	Upper speed limit = Maximum frequency 0x2916 (P211.00).
	1 Fixed Limit 0.0 Hz	Upper speed limit = 0.0 Hz.
	2 Analog input 1	The upper speed limit is defined as analog signal via the analog input 1. ▸ Analog input 1 📖 597
	3 Analog input 2	The upper speed limit is defined as analog signal via the analog input 2. ▸ Analog input 2 📖 601
	4 Upper frequency limit	Upper speed limit = setting in 0x2946:005 (P340.05) in [Hz].
	5 Upper speed limit	Upper speed limit = setting in 0x2946:001 (P340.01) in [vel. unit].
	6 Network target velocity	The upper speed limit is defined as process data object via network. ▸ Configuring the network 📖 226

Parameter	Name / value range / [default setting]	Info
0x2946:004 (P340.04)	Speed limitation: Lower speed limit source (Speed limitation: Lowspeed lim src) • From version 03.00	Selection of the source for the lower speed limit.
	0 (-) Maximum frequency	Lower speed limit = (-) Maximum frequency 0x2916 (P211.00).
	1 Fixed Limit 0.0 Hz	Lower speed limit = 0.0 Hz.
	2 Analog input 1	The lower speed limit is defined as analog signal via the analog input 1. ▸ Analog input 1 🕮 597
	3 Analog input 2	The lower speed limit is defined as analog signal via the analog input 2. ▸ Analog input 2 🕮 601
	4 Lower frequency limit	Lower speed limit = setting in 0x2946:006 (P340.06) in [Hz].
	5 Lower speed limit	Lower speed limit = setting in 0x2946:002 (P340.02) in [vel. unit].
	6 Network target velocity	The lower speed limit is defined as process data object via network. ▸ Configuring the network 🕮 226
0x2946:005 (P340.05)	Speed limitation: Upper frequency limit (Speed limitation: Upper freq.limit) Device for 50-Hz mains: -1000.0 ... [**50.0**] ... 1000.0 Hz Device for 60-Hz mains: -1000.0 ... [**60.0**] ... 1000.0 Hz • From version 03.00	Upper limit for the speed limitation. • Setting is only effective with the selection "Lower frequency limit [4]" in 0x2946:004 (P340.04).
0x2946:006 (P340.06)	Speed limitation: Lower frequency limit (Speed limitation: Lower freq.limit) Device for 50-Hz mains: -1000.0 ... [**-50.0**] ... 1000.0 Hz Device for 60-Hz mains: -1000.0 ... [**-60.0**] ... 1000.0 Hz • From version 03.00	Lower limit for speed limitation. • Setting is only effective with the selection "Lower frequency limit [4]" in 0x2946:004 (P340.04).
0x2946:007 (P340.07)	Speed limitation: Actual upper speed limit (Speed limitation: Act uppspeed lim) • Read only: x.x Hz • From version 03.00	Display of the current upper limit for speed limitation.
0x2946:008 (P340.08)	Speed limitation: Actual lower speed limit (Speed limitation: Act lowspeed lim) • Read only: x.x Hz • From version 03.00	Display of the current lower limit for speed limitation.
0x2948:002 (P336.02)	ramp time (Ramp time) 0.0 ... [**1.0**] ... 60.0 s • From version 03.00	Ramp time for operating mode "MS: Torque mode". • The torque setpoint is led via a ramp generator. This provides for a "smooth" switch-over between different setpoint sources. • The set ramp time refers to the ramping up/down of 0 ... 100 % rated motor torque 0x6076 (P325.00). At a lower setpoint selection, the ramp time is reduced accordingly.
0x2949:001 (P337.01)	Positive torque limit source (Pos. torqlim src) • From version 03.00	Selection of the source for the positive torque limit source.
	0 Max torque	Positive torque limit source = Max torque 0x6072 (P326.00).
	1 Fixed Limit 0.0 %	Positive torque limit source = 0.0 %.
	2 Analog Input 1	The positive torque limit source is defined as analog signal via the analog input 1. ▸ Analog input 1 🕮 597
	3 Analog Input 2	The positive torque limit source is defined as analog signal via the analog input 2. ▸ Analog input 2 🕮 601
	4 Positive torque limit	Positive torque limit source = Positive torque limit 0x60E0.
	5 Network target torque	The positive torque limit source is defined as process data object via network. ▸ Configuring the network 🕮 226



Parameter	Name / value range / [default setting]	Info
0x2949:002 (P337.02)	Negative torque limit source (Neg. torqlim src) • From version 03.00	Selection of the source for the negative torque limit source.
	0 (-) Max torque	Negative torque limit source = (-) Max torque 0x6072 (P326.00).
	1 Fixed Limit 0.0 %	Negative torque limit source = 0.0 %.
	2 Analog Input 1	The negative torque limit source is defined as analog signal via the analog input 1. ▸ Analog input 1 📖 597
	3 Analog Input 2	The negative torque limit source is defined as analog signal via the analog input 2. ▸ Analog input 2 📖 601
	4 Negative torque limit	Negative torque limit source = Negative torque limit 0x60E1.
	5 Network target torque	The negative torque limit source is defined as process data object via network. ▸ Configuring the network 📖 226
0x2949:003 (P337.03)	Actual positive torque limit (Act postorqlim) • Read only: x.x % • From version 03.00	Display of the current positive torque limit. • 100 % ≡ Motor rated torque 0x6076 (P325.00)
0x2949:004 (P337.04)	Actual negative torque limit (Act negtorqlim) • Read only: x.x % • From version 03.00	Display of the current negative torque limit. • 100 % ≡ Motor rated torque 0x6076 (P325.00)
0x2DD5	Torque setpoint • Read only: x.xx Nm • From version 03.00	Display of the current torque setpoint.

8.4.4.9 Slip controller

In case of V/f characteristic control with feedback (VFC closed loop), the slip is calculated and injected by the slip controller. The default setting of the slip controller provides robustness and moderate dynamics.

Preconditions

In 0x2C00 (P300.00), the motor control type "V/f characteristic control (VFC closed loop) [7]" is selected and configured. For details, see chapter "V/f characteristic control (VFC closed loop)". 📖 172

Details

- The slip controller is designed as PI controller.
- In order to improve the response to setpoint changes, the setpoint speed of setpoint frequency is added as feedforward control value to the output (correcting variable) of the slip controller.
- With the setting 0x2B14:003 = 0 Hz, the slip controller is deactivated.

Parameter	Name / value range / [default setting]	Info
0x2B14:001	Gain 0.000 ... [**0.100**] ... 65.535	Gain of the slip controller.
0x2B14:002	Reset time 0.0 ... [**100.0**] ... 6553.5 ms	Reset time of the slip controller.
0x2B14:003	Frequency limitation 0.00 ... [**10.00**] ... 100.00 Hz	Frequency limitation of the slip controller. • With the setting of 0 Hz, the slip controller is deactivated.

8.4.5 Speed controller

The speed controller is automatically set if one of the following optimisations is carried out:

▶ Motor selection from motor catalogue 📖 197

▶ Automatic motor identification (energized) 📖 199

▶ Automatic motor calibration (non-energized) 📖 200

For typical applications, a manual adaptation of the parameters of the speed controller is not recommended. A wrong setting may have a negative effect on the control. For special applications, contact the manufacturer before adapting the parameters.

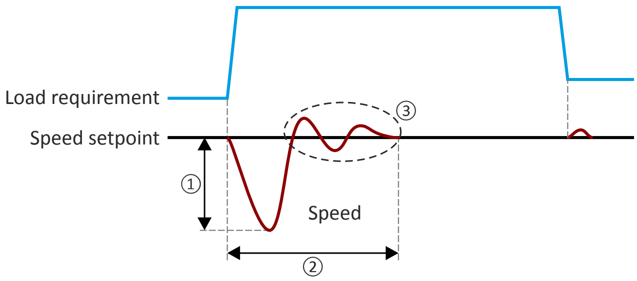
Details

The speed controller has an influence in the following motor control types:

- Servo control (SC ASM)
- Sensorless control (SL PSM)
- Sensorless vector control (SLVC)

The automatically calculated settings for the speed controller enable an optimal control behaviour for typical load requirements:

- Minimum speed loss ①
- Minimum settling time ②
- Minimum overshoot ③



Setting notes

If oscillations occur during operation after high load requirements:

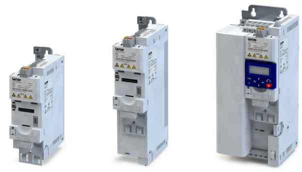
- Reduce gain of the speed controller in 0x2900:001 (P332.01).
- Increase reset time of the speed controller in 0x2900:002 (P332.02).

If the speed loss is too high or the settling time too long during operation with high load requirements:

- Increase gain of the speed controller in 0x2900:001 (P332.01).

If the gain is set too high or the reset time too low, the speed control loop can become unstable!

Parameter	Name / value range / [default setting]	Info
0x2900:001 (P332.01)	Speed controller settings: Gain (Speed controller: Gain) 0.00000 ... [**0.00193**]* ... 20000.00000 Nm/rpm * Default setting depending on the size.	Gain factor Vp of the speed controller.
0x2900:002 (P332.02)	Speed controller settings: Reset time (Speed controller: Reset time) 1.0 ... [**80.0**]* ... 6000.0 ms * Default setting depending on the size.	Reset time Ti of the speed controller.
0x2904	Actual speed filter time 0.0 ... [**2.0**] ... 50.0 ms	Filter time for the actual speed value.



8.5 Motor rotating direction

In the default setting, both directions of motor rotation are enabled. Optionally, the direction of rotation can be restricted so that only a clockwise rotation (CW) of the motor is possible.

Preconditions

Wiring of the motor phases must be carried out correctly with regard to the direction of motor rotation.

In the documentation and the parameter selection texts, the following terms are used for the direction of rotation:

- Forward = clockwise direction of rotation (CW)
- Reverse = counter-clockwise direction of rotation (CCW)

Details

The direction of rotation of the motor can be controlled in various ways:

- Via the function "Reverse rotational direction". Possible triggers to be selected for the function "Reverse rotational direction" are available for example in 0x2631:013 (P400.13) the digital inputs and internal status signals of the inverter.
- Via network. The definition of the direction of rotation is possible via the mappable Net-WordIN1 data word or one of the predefined process data words.
- By specifying a bipolar setpoint value via analog input. Either via bipolar input range (-10 ... +10 V) or configuration of a bipolar setting range.

If a reversal is not required, the direction of rotation can be restricted in 0x283A (P304.00) to "Only clockwise (CW) [0]".

Parameter	Name / value range / [default setting]		Info
0x283A (P304.00)	Limitation of rotation (Limit. rotation)		Optional restriction of the rotating direction.
	0	Only clockwise (CW)	The motor can only be rotated clockwise (CW). The transfer of negative frequency and PID setpoints to the motor control is prevented. • This function takes effect after the "Reverse rotational direction" function (0x2631:013 (P400.13)). • Since this function only prevents negative setpoints, counter-clockwise rotation (CCW) is possible if the motor has been wired for this rotating direction.
	1	**Both rotational directions**	Both directions of motor rotation are enabled.
0x2631:013 (P400.13)	Function list: Reverse rotational direction (Function list: Reverse rot.dir.) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x2631:001 (P400.01). 532		Assignment of a trigger for the "Reverse rotational direction" function. Trigger = TRUE: the setpoint specified is inverted (i. e. the sign is inverted). Trigger = FALSE: no action / deactivate function again.
	13	**Digital input 3**	

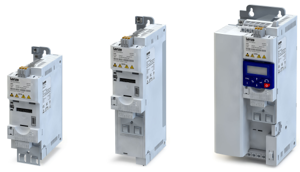
8.6 Switching frequency changeover

The output voltage of the inverter is a DC voltage with sine-coded pulse width modulation (PWM). This corresponds by approximation to a AC voltage with variable frequency. The frequency of the PWM pulses is adjustable and is called "switching frequency".

Details

The switching frequency has an impact on the smooth running performance and the noise generation in the motor connected as well as on the power loss in the inverter. The lower the switching frequency, the better the concentricity factor, the smaller the power loss and the higher the noise generation.

Parameter	Name / value range / [default setting]		Info
0x2939 (P305.00)	Switching frequency (Switching freq.) * Default setting depending on the size.		Selection of the inverter switching frequency. Abbreviations used: • "Variable": adaptation of the switching frequency as a function of the current • "Drive-opt.": drive-optimised modulation ("sine/delta modulation") • "Fixed": fixed switching frequency • "Min. Pv": additional reduction of power loss
	1	4 kHz variable / drive-optimised	
	2	8 kHz variable / drive-optimised	
	3	16 kHz variable / drive-optimised	
	5	2 kHz fixed / drive-optimised	
	6	4 kHz fixed / drive-optimised	
	7	8 kHz fixed / drive-optimised	
	8	16 kHz fixed / drive-optimised	
	11	4 kHz variable / min. Pv	
	12	8 kHz variable / min. Pv	
	13	16 kHz variable / min. Pv	
	15	2 kHz constant/min. Pv	
	16	4 kHz constant/min. Pv	
	17	8 kHz constant/min. Pv	
	18	16 kHz constant/min. Pv	
	21	8 kHz variable / drive-optimised / 4 kHz min.	
	22	16 kHz variable / drive-optimised / 4 kHz min.	
	23	16 kHz variable / drive-optimised / 8 kHz min.	
	31	8 kHz variable /min. Pv / 4 kHz min.	
	32	16 kHz variable /min. Pv / 4 kHz min.	
	33	16 kHz variable /min. Pv / 8 kHz min.	
0x293A (P115.00)	Actual switching frequency (Actual sw. freq.) • Read only		Display of the currently active switching frequency of the inverter. Example: • "16 kHz variable / drive-optimised / 4 kHz min. [22]" is selected as switching frequency in 0x2939 (P305.00). • An increase of the ambient temperature and/or the load have caused a decrease of the switching frequency to 8 kHz. In this case, this parameter indicates the selection "8 kHz power loss-optimised [7]".
	1	2 kHz drive-optimised	
	2	4 kHz drive-optimised	
	3	8 kHz drive-optimised	
	4	16 kHz drive-optimised	
	5	2 kHz power loss-optimised	
	6	4 kHz power loss-optimised	
	7	8 kHz power loss-optimised	
	8	16 kHz power loss-optimised	



8.7 Motor protection

Many monitoring functions integrated in the inverter can detect errors and thus protect the device or motor from being destroyed or overloaded.

8.7.1 Motor overload monitoring (i²*t)

This function monitors the thermal utilisation of the motor, taking the motor currents recorded and a mathematical model as a basis.

⚠ DANGER!

Fire hazard by overheating of the motor.

Possible consequences: Death or severe injuries

- ▶ To achieve full motor protection, an additional temperature monitoring function with a separate evaluation must be installed.
- ▶ When actuating motors that are equipped with PTC thermistors or thermal contacts, always activate the PTC input.

Details

This function only serves to functionally protect the motor. It is not suitable for the safety-relevant protection against energy-induced hazards, since the implementation is not fail-safe.

- When the thermal motor utilisation calculated reaches the threshold set in 0x2D4B:001 (P308.01), the response set in 0x2D4B:003 (P308.03) is triggered.
- With the setting 0x2D4B:003 (P308.03) = "No response [0]", the monitoring function is deactivated.

For a UL-compliant operation with motor overload protection, 0x2D4B:002 (P308.02) and 0x2D4B:003 (P308.03) must be left on the default setting! This setting serves to save the calculated thermal motor utilisation internally when the inverter is switched off and reloaded when it is switched on.

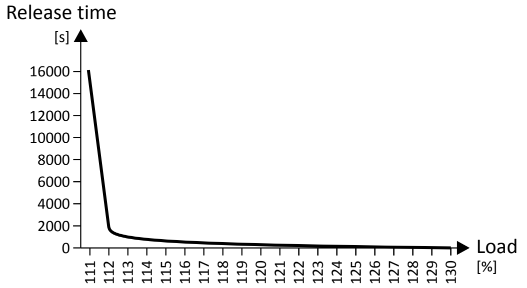
If monitoring is deactivated by the setting 0x2D4B:003 (P308.03) = "No response [0]", no motor overload protection is active. In this case, an external motor overload protection can be provided by the user for a UL-compliant operation.

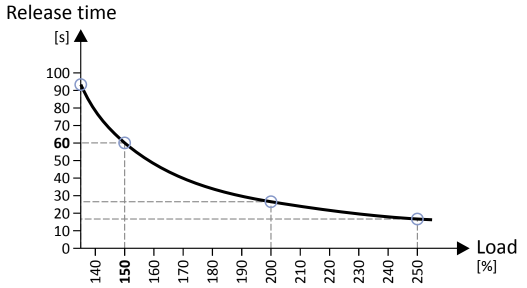
If a suitable motor temperature sensor is connected to the terminals X109/T1 and X109/T2 and the response to the triggering of the motor temperature monitoring in 0x2D49:002 (P309.02) is set to "Fault [3]", the response of the motor overload monitoring may be set other than "Fault [3]" " in 0x2D4B:003 (P308.03).

▶ Motor temperature monitoring 📖 219

The following two diagrams show the relation between the motor load and release time of the monitoring under the following conditions:

- Maximum utilisation 0x2D4B:001 (P308.01) = 150 %
- Speed compensation 0x2D4B:002 (P308.02) = "Off [1]" or output frequency ≥ 40 Hz





Load * Load ratio	Release time
110 %	Indefinite
135 %	93 s
150 %	**60 s**
200 %	26 s
250 %	17 s

Depending on the setting in 0x2D4B:001 (P308.01), the release time from the diagrams can be derived as follows:

- Calculation of the load ratio:
  Load ratio = 150 % / maximum utilisation 0x2D4B:001 (P308.01)
  (example: 0x2D4B:001 (P308.01) = 75 % → load ratio = 150 % / 75 % = 2)
- Calculation of the release time of the monitoring:
  Release time = actual load * load ratio
  (example: actual load = 75 % → release time = 75 % * 2 = 150 %)
- Looking up the release time from the above table based on load * load ratio.
  (example: Load * load ratio = 150 % → release time = 60 s)

Speed compensation for protecting motors at low speed

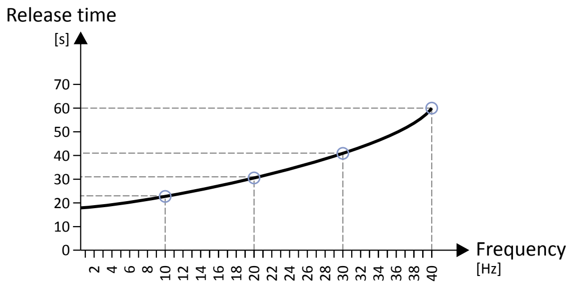
The inverter comes with an implemented compensation for low speed. If the motor is driven with frequencies lower than 40 Hz, the speed compensation in 0x2D4B:002 (P308.02)should be set to "On [0]" (default setting). This setting serves to reduce the release time of the monitoring at low speed to consider the reduced natural ventilation at AC motors. The speed compensation for UL-compliant operation in 0x2D4B:002 (P308.02) must be set to "On [0]" as well.

If the speed compensation is activated, the release time is reduced as follows:

- With an output frequency < 40 Hz: Reduced release time to 62.5 % + 37.5 % * output frequency [Hz] / 40 [Hz]
- With an output frequency ≥ 40 Hz: No reduced release time

The following diagram shows the reduced release time with activated speed compensation.

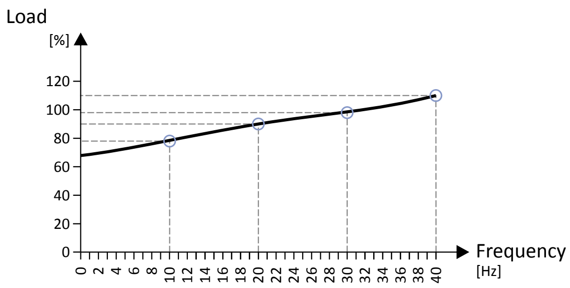
- Maximum utilisation 0x2D4B:001 (P308.01) = 150 %
- Speed compensation 0x2D4B:002 (P308.02) = "On [0]"



Output frequency	Release time
40 Hz	60 s
30 Hz	≈ 41 s
20 Hz	≈ 31 s
10 Hz	≈ 23 s

The following diagram shows the possible permanent load with activated speed compensation without the monitoring being triggered.

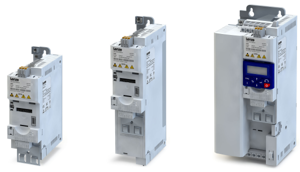
- Maximum utilisation 0x2D4B:001 (P308.01) = 150 %
- Speed compensation 0x2D4B:002 (P308.02) = "On [0]"



Output frequency	Possible permanent load
40 Hz	110 %
30 Hz	99 %
20 Hz	90 %
10 Hz	79 %

In case of 0 Hz, only a load of 62.7 % (≈ 62.5 %) with regard to the load at 40 Hz or above is possible (69 / 110 * 100 % = 62.7 %). In case of a deviating setting in 0x2D4B:001 (P308.01), the maximum possible motor load changes proportionately.

Parameter	Name / value range / [default setting]	Info
0x2D4B:001 (P308.01)	Motor overload monitoring (i^2*t): Maximum utilisation [60 s] (Motor overload: Max.load.for 60s) 30 ... **[150]** ... 200 %	Maximum permissible thermal motor utilisation (max. permissible motor current for 60 seconds). • 100 % ≡ rated motor current 0x6075 (P323.00) • If the motor is actuated with the current set here for 60 seconds, the maximum permissible thermal motor utilisation is reached and the response set in 0x2D4B:003 (P308.03) is executed. • If the motor is actuated with a different current, the time period until the motor overload monitoring function is activated is different. Generally the following applies: the lower the current, the lower the thermal utilisation and the later the monitoring function is triggered.



Parameter	Name / value range / [default setting]	Info
0x2D4B:002 (P308.02)	Motor overload monitoring (i²*t): Speed compensation (Motor overload: Speed comp.)	Use this function to protect motors that are actuated at a speed below 40 Hz. • UL-compliant operation with motor overload protection requires the setting "On [0]"!
	0 **On**	Release time for motor overload monitoring is reduced in order to compensate for the reduced cooling of naturally ventilated AC induction motors during operation at low speed.
	1 Off	Function deactivated, no reduction of the motor overload monitoring release time. May require an external motor overload protection for the UL-compliant operation.
0x2D4B:003 (P308.03)	Motor overload monitoring (i²*t): Response (Motor overload: Response) • For further possible settings, see parameter 0x2D45:001 (P310.01). 223	Selection of the response to the triggering of motor overload monitoring. • UL-compliant operation with motor overload protection requires the setting "error [3]"! • If monitoring is deactivated by the setting 0x2D4B:003 (P308.03) = "No response [0]", no motor overload protection is active. In this case, an external motor overload protection can be provided by the user for a UL-compliant operation. Associated error code: • 9040 | 0x2350 - CiA: i²*t overload (thermal state)
	3 **Fault**	
0x2D4B:005	Motor overload monitoring (i²*t): Thermal load • Read only	Display of the value of the internal i²*t integrator. • 37500 ≡ 100 % thermal load • When power is switched off, this value is saved in the internal EEPROM. • When power is switched on, the saved value is reloaded into the i²*t integrator. • The internal i²*t integrator detects the thermal load based on the load conditions even if the motor overload monitoring is deactivated.

8.7.2 Motor temperature monitoring

In order to record and monitor the motor temperature, a PTC thermistor (single sensor according to DIN 44081 or triple sensor according to DIN 44082) or thermal contact (normally-closed contact) can be connected to the terminals T1 and T2. This measure helps to prevent the motor from being destroyed by overheating.

Preconditions

- The inverter can only evaluate one PTC thermistor! Do not connect several PTC thermistors in series or parallel.
- If several motors are actuated on one inverter, thermal contacts (NC contacts) connected in series are to be used.
- To achieve full motor protection, an additional temperature monitoring function with a separate evaluation must be installed.
- By default, a wire jumper is installed between terminals X109/T1 and X109/T2, which must be removed when the PTC thermistor or thermal contact is connected.

Details

If 1.6 kΩ < R < 4 kΩ at terminals X109/T1 and X109/T2, the monitoring function will be activated; see functional test below.

- If the monitoring function is activated, the response set in 0x2D49:002 (P309.02) will be effected.
- The setting 0x2D49:002 (P309.02) = 0 deactivates the monitoring function.

If a suitable motor temperature sensor is connected to the terminals X109/T1 and X109/T2 and the response in 0x2D49:002 (P309.02) is set to "Fault [3]", the response of the motor overload monitoring may be set other than "Fault [3]" in 0x2D4B:003 (P308.03).

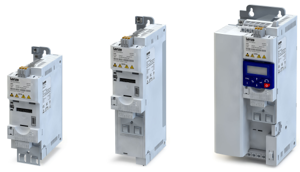
▶ Motor overload monitoring (i^2*t) 📖 215

Functional test

Connect a fixed resistor to the PTC input:

- R > 4 kΩ : the monitoring function must be activated.
- R < 1 kΩ : the monitoring function must not be activated.

Parameter	Name / value range / [default setting]		Info
0x2D49:002 (P309.02)	Motor temperature monitoring: Response (Mot.temp.monit.: Response) • For further possible settings, see parameter 0x2D45:001 (P310.01). 📖 223		Selection of the response to the triggering of the motor temperature monitoring. Associated error code: • 17168 | 0x4310 - Motor overtemperature error
	3	**Fault**	



8.7.3 Current limits

For the purpose of current limitation, a maximum overload current can be set for the inverter. If the current consumption of the motor exceeds this current limit, the inverter changes its dynamic behaviour, in order to counteract this exceedance.

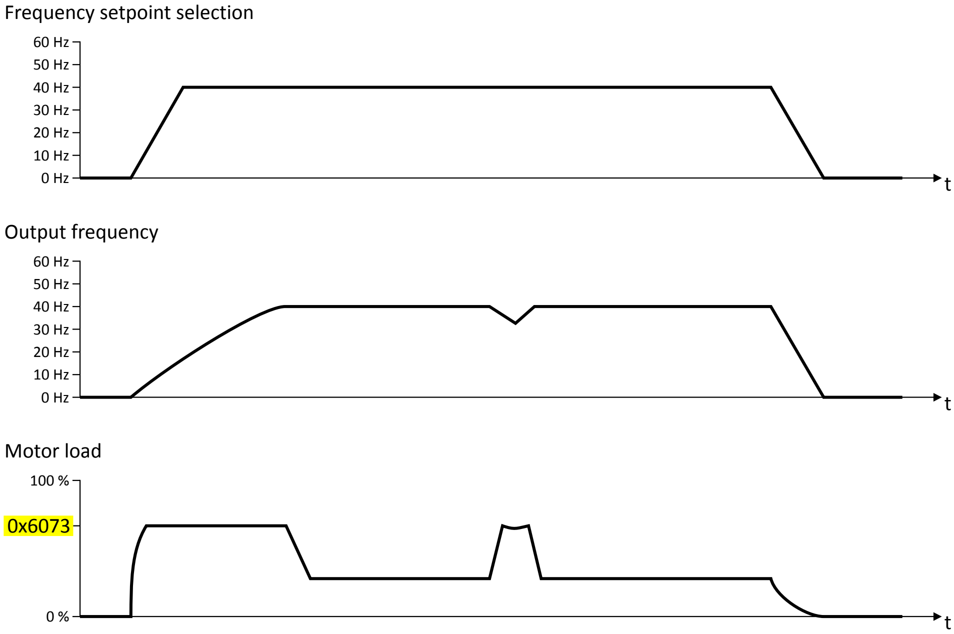
Details

- The maximum overload current of the inverter can be set in 0x6073 (P324.00).
- Reference for the percentage setting of the maximum overload current is the rated motor current set in 0x6075 (P323.00).
- The actual motor current is displayed in 0x2D88 (P104.00).

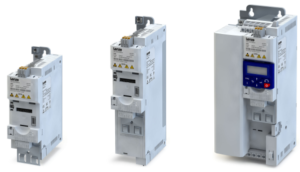
If the change in the dynamic behaviour carried out by the inverter does not result in exiting the overcurrent state, the inverter outputs an error.

Load behaviour	Impact
Overload during acceleration in motor mode	A longer time than is required for reaching the frequency setpoint is set.
Overload during deceleration in generator mode	A longer time than is required for reaching standstill is set.
Increasing load at constant frequency	If the motor current limit value is reached: • The inverter reduces the effective speed setpoint until a stable working is set or an effective speed setpoint of 0 rpm is reached. • If the load is reduced, the inverter increases the effective speed setpoint until the setpoint speed is reached or the load reaches the current limit value again.
	When the generator current limit value is reached: • The inverter increases the effective speed setpoint until a stable working point is reached or up to the maximum permissible output frequency 0x2916 (P211.00). • If the load is reduced, the inverter reduces the effective speed setpoint until the setpoint speed is reached or the load reaches the current limit value again.
	If an abrupt load is building at the motor shaft (e.g. drive is blocked), the overcurrent switch-off function may respond.

Example: Overcurrent switch-off in case of a sudden load at the motor shaft



Parameter	Name / value range / [default setting]	Info
0x6073 (P324.00)	Max current (Max current) 0.0 ... [**200.0**] ... 3000.0 %	Maximum overload current of the inverter. • 100 % ≡ Motor rated current 0x6075 (P323.00) • If the current consumption of the motor exceeds this current limit, the inverter changes its dynamic behaviour, in order to counteract this exceedance. • If the change in the dynamic behaviour carried out by the inverter does not result in exiting the overcurrent state, the inverter outputs an error. Note! This parameter is not identical to the so-called ultimate motor current I_{ULT} ! • The ultimate motor current set in 0x2D46:001 (P353.01) is a limit value for synchronous motors that serves to protect their magnets. • The value to be set here should always be considerably below the ultimate motor current!
0x2D88 (P104.00)	Motor current (Motor current) • Read only: x.x A	Display des present current-r.m.s. value.
0x6078 (P103.00)	Current actual value (Current actual) • Read only: x.x %	Display of the present motor current. • 100 % ≡ Motor rated current 0x6075 (P323.00)



8.7.4 Overcurrent monitoring

This function monitors the instantaneous value of the motor current and serves as motor protection.

NOTICE

With an incorrect parameterisation, the maximum permissible motor current may be exceeded in the process.

Possible consequence: irreversible damage of the motor.

- ▶ The setting of the threshold for the overcurrent monitoring in 0x2D46:001 (P353.01) must be adapted to the connected motor.
- ▶ Set the maximum output current of the inverter in 0x6073 (P324.00) much lower than the threshold for overcurrent monitoring.

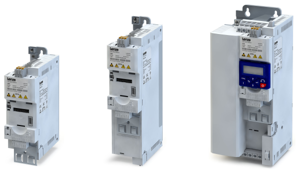
Details

The inverter monitors its output current. This monitoring takes place irrespective of the settings for the current limiting function. ▶ Current limits 📖 220

- If the instantaneous value of the motor current exceeds the threshold set in 0x2D46:001 (P353.01), the response set in 0x2D46:002 (P353.02) takes place.
- With the setting 0x2D46:002 (P353.02) = "No response [0]", the monitoring function is deactivated.

The threshold for the overcurrent monitoring is preset to four times the rated motor current. This presetting is overwritten in case a motor in the engineering tool is selected from the "motor catalog" or the automatic identification or calibration of the motor data is carried out. For a suitable protection, the automatically adapted setting should be used. If disturbances occur during operation, the value can be increased.

Parameter	Name / value range / [default setting]	Info
0x2D46:001 (P353.01)	Overcurrent monitoring: Threshold (Overcurr. monit.: Threshold) 0.0 ... [**6.8**]* ... 1000.0 A * Default setting depending on the size. • From version 02.00	Warning/error threshold for motor current monitoring. • If the instantaneous value of the motor current exceeds the threshold set, the response set in 0x2D46:002 (P353.02) is effected for the purpose of motor protection. • The parameter is calculated and set in the course of the automatic identification of the motor. • The parameter can also be set and thus overwritten by selecting a motor in the engineering tool from the "motor catalog" or calibrating the motor. ▶ Optimisation of the control loops 📖 193
0x2D46:002 (P353.02)	Overcurrent monitoring: Response (Overcurr. monit.: Response) • For further possible settings, see parameter 0x2D45:001 (P310.01). 📖 223 **3** | **Fault**	Selection of the response to the triggering of motor current monitoring. Associated error code: • 29056 | 0x7180 - Motor overcurrent



8.7.5 Motor phase failure detection

The motor phase failure detection function can be activated for both synchronous and asynchronous motors.

Preconditions

Phase failure detection during operation is basically only suitable for applications which are operated with a constant load and speed. In other cases, transient processes or unfavourable operating points can cause maloperation.

Details

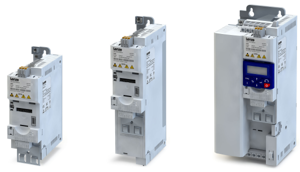
If a current-carrying motor phase (U, V, W) fails during operation, the response selected in 0x2D45:001 (P310.01) is tripped. In case of setting "No response [0]", only an entry is made in the logbook.

A motor phase failure can only be detected if

1. the rated motor current is higher than 10 % of the rated inverter current and
2. the output frequency is not lower than 0.1 Hz (standstill).

The lower the output frequency the longer the detection of the motor phase failure.

Parameter	Name / value range / [default setting]	Info
0x2D45:001 (P310.01)	Motor phase failure detection: Response (Mot.phase.fail.: Response)	Selection of the response following the detection of a motor phase failure. Associated error codes: • 65289 | 0xFF09 - Motor phase missing • 65290 | 0xFF0A - Phase U motor phase failure • 65291 | 0xFF0B - Motor phase failure phase V • 65292 | 0xFF0C - Motor phase failure phase W
	0 **No response**	▸ Error types 📖 139
	1 Warning	
	2 Trouble	
	3 Fault	
0x2D45:002 (P310.02)	Motor phase failure detection: Current threshold (Mot.phase.fail.: Current thresh.) 1.0 ... [**5.0**] ... 25.0 %	Current threshold for the activation of the motor phase failure detection function. • 100 % ≡ Maximum current 0x2DDF:002 • Background: in order to be able to reliably detect the failure of a motor phase, first a certain must flow for the current sensor system. The detection function is therefore only activated if the actual value of the motor current has exceeded the current threshold set here. • Display of the present motor current in 0x2D88 (P104.00).
0x2D45:003 (P310.03)	Motor phase failure detection: Voltage threshold (Mot.phase.fail.: Voltage thresh.) 0.0 ... [**10.0**] ... 100.0 V	Voltage threshold for motor phase monitoring. • The monitoring function is triggered if the level of the motor current is lower than the device-dependent threshold for longer than 20 ms. • In case of V/f characteristic control, the voltage threshold is considered additionally for the motor phase failure detection. If the motor voltage is higher than the voltage threshold, monitoring is combined with the motor current.



8.7.6 Motor speed monitoring

This function monitors the motor speed during operation.

Preconditions

- In order to detect the current motor speed, the inverter must be enabled and the motor must rotate.
- For an exact monitoring, rated motor speed 0x2C01:004 (P320.04) and rated motor frequency 0x2C01:005 (P320.05) must be set correctly.

Details

- If the motor speed reaches the threshold set in 0x2D44:001 (P350.01), the response set in 0x2D44:002 (P350.02) takes place.
- With the setting 0x2D44:002 (P350.02) = "No response [0]", the monitoring function is deactivated.

Parameter	Name / value range / [default setting]		Info
0x2D44:001 (P350.01)	Overspeed monitoring: Threshold (Overspeed monit.: Threshold) 50 ... [**8000**] ... 50000 rpm		Warning/error threshold for motor speed monitoring. • If the motor speed reaches the threshold set, the response selected in 0x2D44:002 (P350.02) is effected. • The parameter is calculated and set in the course of the automatic identification of the motor. • The parameter can also be set and thus overwritten by selecting a motor in the engineering tool from the "motor catalog" or calibrating the motor. ▸ Optimisation of the control loops 🕮 193
0x2D44:002 (P350.02)	Overspeed monitoring: Response (Overspeed monit.: Response) • For further possible settings, see parameter 0x2D45:001 (P310.01). 🕮 223		Selection of the response to the triggering of motor speed monitoring. Associated error code: • 65286 | 0xFF06 - Motor overspeed
	3	**Fault**	

8.7.7 Motor torque monitoring

This function monitors the motor torque during operation.

Preconditions

The motor torque monitoring can only be used for the following motor control types with speed controller:

- Servo control (SC ASM)
- Sensorless control (SL PSM)
- Sensorless vector control (SLVC)

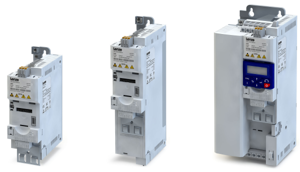
Details

This function sets the internal status signal "Torque limit reached [79]" = TRUE if the maximum possible torque has been reached.

- The status signal is set irrespective of the response 0x2D67:001 (P329.01) and delay time 0x2D67:002 (P329.02) set for this monitoring.
- The user can use the status signal to activate certain functions. ▸ Flexible I/O configuration 🕮 525
- The status signal also serves to set a digital output or a bit of the NetWordOUT1 status word. ▸ Configuration of digital outputs 🕮 603

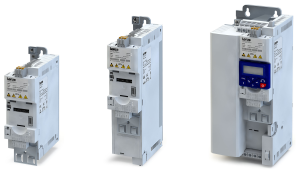
Parameter	Name / value range / [default setting]		Info
0x2D67:001 (P329.01)	Maximum torque monitoring: Response (MaxTrq.Monitor: Response) • From version 02.00 • For further possible settings, see parameter 0x2D45:001 (P310.01). 🕮 223		Selection of response to reaching the maximum possible torque. • The selected response takes place if the status signal "Torque limit reached [79]" = TRUE and the deceleration time set in 0x2D67:002 (P329.02) has elapsed. Associated error code: • 33553 | 0x8311 - Torque limit reached
	0	**No response**	

Parameter	Name / value range / [default setting]	Info
0x2D67:002 (P329.02)	Maximum torque monitoring: Triggering delay (MaxTrq.Monitor: Triggering delay) 0.000 ... [**0.000**] ... 10.000 s • From version 02.00	Optional setting of a deceleration for triggering the response selected in 0x2D67:001 (P329.01). Typical application: • The motor should be driven at the torque limit for a short time without triggering the selected response. • Only after a longer operation (> set deceleration) at the torque limit, the selected response is to take place.
0x6072 (P326.00)	Max torque (Max torque) 0.0 ... [**250.0**] ... 3000.0 % • From version 02.00	Symmetrical selection of the maximum permissible torque. • 100 % ≡ Motor rated torque 0x6076 (P325.00) • This parameter serves to implement a statically and bipolarly acting torque limitation. This can be used, for instance, as overload protection of the mechanical transmission path/elements starting at the motor shaft. • This limitation acts irrespective of the torque limitations acting in unipolar mode that are set in 0x60E0 and 0x60E1.
0x60E0	Positive torque limit 0.0 ... [**250.0**] ... 3276.7 % • From version 02.00	Positive torque limit source for speed control with torque limitation. • 100 % ≡ Motor rated torque 0x6076 (P325.00)
0x60E1	Negative torque limit 0.0 ... [**250.0**] ... 3276.7 % • From version 02.00	Negative torque limit source for speed control with torque limitation. • 100 % ≡ Motor rated torque 0x6076 (P325.00)



9 Configuring the network

The inverter is available as variants with different network options.



9.1 General network settings

Activate network control

In order to be able to control the inverter via network, a trigger must be first assigned in 0x2631:037 (P400.37) to the "Activate network control" function.

- This trigger can for instance be the constant value "TRUE" or a digital input.
- If the assigned trigger is = TRUE, the motor can only be started via the network control word (exception: Jog operation; see chapter "Start / stop motor" 531).

In case of an activated network control, the following functions are still active:

- 0x2631:001 (P400.01): Enable inverter
- 0x2631:002 (P400.02): Run
- 0x2631:003 (P400.03): Activate quick stop
- 0x2631:004 (P400.04): Reset fault
- 0x2631:005 (P400.05): Activate DC braking
- 0x2631:010 (P400.10): Jog foward (CW)
- 0x2631:011 (P400.11): Jog reverse (CCW)
- 0x2631:012 (P400.12): Activate keypad control
- 0x2631:037 (P400.37): Activate network control
- 0x2631:043 (P400.43): Activate fault 1
- 0x2631:044 (P400.44): Activate fault 2
- 0x2631:054 (P400.54): Position counter reset

All other functions configurable via 0x2631:xx (P400.xx) are deactivated in case of network control. ▶ Flexible I/O configuration 525

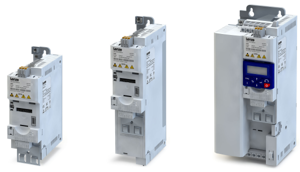
Network control word and status word

For establishing a simple network connection, the inverter provides predefined control and status words for device profile CiA 402, AC drive profile as well as in LECOM format. For implementing your own formats, the data words NetWordIN1 and NetWordOUT1 are available. By means of data mapping to a network register, each of these words can be transferred as process date via network.

Designation	Parameter	Associated mapping entry *	Further information
CiA: Controlword	0x6040	0x60400010	▶ Device profile CiA 402 247
CiA: Statusword	0x6041 (P780.00)	0x60410010	
AC Drive control word	0x400B:001 (P592.01)	0x400B0110	▶ AC Drive Profile 248
AC Drive status word	0x400C:001 (P593.01)	0x400C0110	
LECOM control word	0x400B:002 (P592.02)	0x400B0210	▶ Lenze LECOM profile 249
LECOM status word	0x400C:002 (P593.02)	0x400C0210	
NetWordIN1	0x4008:001 (P590.01)	0x40080110	For implementing an individual control word format. The functions that are to be triggered via bits 0 ... 15 of the NetWordIN1 data word are defined in 0x400E:001 (P505.01) ... 0x400E:016 (P505.16).
NetWordOUT1	0x400A:001 (P591.01)	0x400A0110	For implementing an individual status word format. The triggers for bits 0 ... 15 of the NetWordOUT1 data word are defined in 0x2634:010 (P420.10) ... 0x2634:025 (P420.25).

* A mapping entry consists of index, subindex and data length in bits of the parameter to be mapped.

General information about the process of data mapping can be found in the chapter of the same name for the corresponding network.



Network setpoint

It must be observed that the network setpoint must be selected explicitly. There are various options to select/change-over to the network setpoint. See the following examples.

Example 1: The AC drive control word shall enable a change-over from the standard setpoint source to the network setpoint (bit 6).

1. Set a standard setpoint source different than Network" [5]" in 0x2860:001 (P201.01).
2. Set the selection Network setpoint active " [116]" in 0x2631:017 (P400.17).

Example 2: Independent of the used network, a change-over from the standard setpoint source to the network setpoint shall be possible via a digital trigger (e. g. digital input).

1. Set a standard setpoint source different than Network" [5]" in 0x2860:001 (P201.01).
2. Set the desired digital trigger (e. g. digital input) in 0x2631:017 (P400.17) via which the change-over to the network setpoint is to take place.

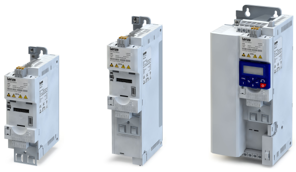
Example 3: The setpoint is to be defined exclusively via network.

1. As standard setpoint source, set the selection "Network [5]" in 0x2860:001 (P201.01).

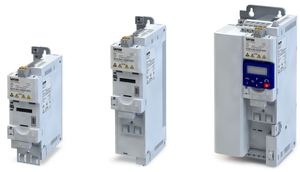
The following table describes the change-over to the network setpoint via the different network control words in detail:

<table>
<tr><th>Network control word</th><th colspan="3">Change-over to network setpoint</th></tr>
<tr><td rowspan="4">NetWordIN1 data word
0x4008:001 (P590.01)</td><td colspan="3">Assign the functionActivate network setpoint [17]" to the bit that is to be used for activating the network setpoint.
• The functions that are to be triggered via bits 0 ... 15 of the NetWordIN1 data word are defined in 0x400E:001 (P505.01) ... 0x400E:016 (P505.16).</td></tr>
<tr><td colspan="2">Bit x</td><td>Selection:</td></tr>
<tr><td colspan="2">0</td><td>Standard setpoint source selected in 0x2860:001 (P201.01).</td></tr>
<tr><td colspan="2">1</td><td>Network setpoint</td></tr>
<tr><td rowspan="5">AC drive control word
0x400B:001 (P592.01)</td><td colspan="3">The network setpoint is activated via bit 6 of the AC Drive control word:</td></tr>
<tr><td colspan="2">Bit 6</td><td>Selection:</td></tr>
<tr><td colspan="2">0</td><td>Standard setpoint source selected in 0x2860:001 (P201.01).</td></tr>
<tr><td colspan="2">1</td><td>Network setpoint</td></tr>
<tr><td colspan="3">Note!
In order that the activation via bit 6 works, the selection "Network setpoint active [116]" must be set in 0x2631:017 (P400.17).</td></tr>
<tr><td rowspan="6">LECOM control word
0x400B:002 (P592.02)</td><td colspan="3">The setpoint is selected via bit 0 and bit 1 of the LECOM control word:</td></tr>
<tr><td>Bit 1</td><td>Bit 0</td><td>Selection:</td></tr>
<tr><td>0</td><td>0</td><td>Standard setpoint source selected in 0x2860:001 (P201.01).</td></tr>
<tr><td>0</td><td>1</td><td>Frequency setpoint preset 1 0x2911:001 (P450.01)</td></tr>
<tr><td>1</td><td>0</td><td>Frequency setpoint preset 2 0x2911:002 (P450.02)</td></tr>
<tr><td>1</td><td>1</td><td>Frequency setpoint preset 3 0x2911:003 (P450.03)</td></tr>
<tr><td>CiA 402 Controlword
0x6040</td><td colspan="3">In case of control via device profile CiA 402:
• In the operating mode "CiA: Velocity mode [2]", the setpoint speed defined via the "Target velocity" 0x6042 (P781.00) parameter is used. ▶ Device profile CiA 402 📖 469
• A change-over to an alternative setpoint source via the CiA 402 Controlword is not possible.</td></tr>
</table>

If a bipolar network setpoint is specified for the operating mode "MS: Velocity mode" (e. g. via the mappable parameter 0x400B:006 (P592.06)), the direction of rotation cannot be controlled via the network control word. The direction of rotation is determined by the sign of the setpoint.

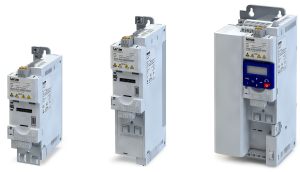


Parameter	Name / value range / [default setting]	Info
0x231F:001 (P500.01)	Module ID: Active module ID (Module ID: Active module ID) • Read only	Display of the network options currently configured in the inverter. • With the help of this module ID, the keypad only shows the communication parameters relevant to the respective network. Note! When switched on, the inverter checks whether the parameter settings saved in the memory module match the inverter hardware and firmware. In case of an incompatibility, a corresponding error message is output. For details see chapter "Data handling" (section "Hardware and firmware updates/downgrades"). 🕮 141
	48 No network	
	67 CANopen	
	71 EtherNet/IP (from version 02.00)	
	78 POWERLINK (from version 05.00)	
	80 PROFIBUS	Display of the network options currently configured in the inverter. • With the help of this module ID, the keypad only shows the communication parameters relevant to the respective network. Note! When switched on, the inverter checks whether the parameter settings saved in the memory module match the inverter hardware and firmware. In case of an incompatibility, a corresponding error message is output. For details see chapter "Data handling" (section "Hardware and firmware updates/downgrades"). 🕮 141
	82 PROFINET (from version 02.00)	
	84 EtherCAT (from version 02.00)	
	86 Modbus TCP/IP	
	87 Modbus	
0x231F:002 (P500.02)	Module ID: Module ID connected (Module ID: Module ID conn.) • Read only • For the meaning of the display see parameter 0x231F:001 (P500.01). 🕮 229	Display of the network option currently available in the inverter. Note! When switched on, the inverter checks whether the parameter settings saved in the memory module match the inverter hardware and firmware. In case of an incompatibility, a corresponding error message is output. For details see chapter "Data handling" (section "Hardware and firmware updates/downgrades"). 🕮 141
0x400E:001 (P505.01)	NetWordIN1 function: Bit 0 (NetWordIN1 fct.: NetWordIN1.00) • Setting can only be changed if the inverter is inhibited.	Definition of the function that is to be triggered via bit 0 of the mappable NetWordIN1 data word.
	0 Not active	Trigger bit without any function.
	1 Disable inverter	Trigger bit = 0-1 edge: The inverter is disabled. Trigger bit = 0: The inverter is enabled (unless there is another cause for inverter disable). Notes: • In all device states, a 0-1 edge causes an immediate change to the inhibited state with one exception: If the inverter is in the error status and the error condition still exists, the inverter remains in the error status. • Changing to the disabled state causes an immediate stop of the motor, regardless of the stop method set in 0x2838:003 (P203.03). The motor coasts down as a function of the mass inertia of the machine. • In the disabled state, the motor cannot be started. • After the inverter disable is deactivated, a renewed start command is required to restart the motor. • The cause(s) that are active for the disabled state are shown in 0x282A:001 (P126.01).
	2 Stopping	Trigger bit = 1: Motor is stopped. Trigger bit = 0: No action / Deactivate stop again. Notes: • The stop method can be selected in 0x2838:003 (P203.03).
	3 Activate quick stop	Trigger bit = 1: "Quick stop" function activated. Trigger bit = 0: no action / deactivate function again. Notes: • The "Quick stop" function brings the motor to a standstill within the deceleration time set in 0x291C (P225.00). • The "Quick stop" function has a higher priority than the "Run" function.



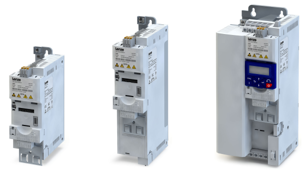
Parameter	Name / value range / [default setting]		Info
	4	Reset error	Trigger bit = 0-1 edge: Active error is reset (acknowledged) if the error condition is not active anymore and the error is resettable. Trigger bit = 0: No action. Notes: • After resetting the error, a new enable/start command is required to restart the motor. ▸ Error handling 🕮 139
	5	Activate DC braking	Trigger bit = 1: "DC braking" function activated. Trigger bit = 0: no action / deactivate function again. ▸ DC braking 🕮 437
	8	Run forward (CW)	Trigger bit = 0-1 edge: Motor is started in forward rotating direction (CW). Trigger bit = 1-0 edge: Motor is stopped again. Notes: • The stop method can be selected in 0x2838:003 (P203.03). • In the case of a bipolar setpoint selection (e.g ±10 V), the function is executed irrespective of the rotating direction. The rotating direction is determined by the sign of the setpoint. • The function also serves to realise an automatic start after switch-on. ▸ Starting performance 🕮 153 • The "Reverse rotational direction [13]" function can be used in connection with this function.
	9	Run reverse (CCW)	Trigger bit = 0-1 edge: Motor is started in backward rotating direction (CCW). Trigger bit = 1-0 edge: Motor is stopped again. Notes: • The stop method can be selected in 0x2838:003 (P203.03). • In the case of a bipolar setpoint selection (e.g ±10 V), the function is executed irrespective of the rotating direction. The rotating direction is determined by the sign of the setpoint. • The function also serves to realise an automatic start after switch-on. ▸ Starting performance 🕮 153 • The "Reverse rotational direction [13]" function can be used in connection with this function.
	13	Reverse rotational direction	Trigger bit = 1: the setpoint specified is inverted (i. e. the sign is inverted). Trigger bit = 0: no action / deactivate function again.
	14	Activate AI1 setpoint	Trigger bit = 1: analog input 1 is used as setpoint source (if the trigger bit assigned has the highest setpoint priority). Trigger bit = 0: no action / deactivate function again. ▸ Analog input 1 🕮 597
	15	Activate AI2 setpoint	Trigger bit = 1: analog input 2 is used as setpoint source (if the trigger bit assigned has the highest setpoint priority). Trigger bit = 0: no action / deactivate function again. ▸ Analog input 2 🕮 601
	17	Activate network setpoint	Trigger bit = 1: the network is used as setpoint source (if the trigger bit assigned has the highest setpoint priority). Trigger bit = 0: no action / deactivate function again.
	18	Activate preset (bit 0)	Selection bits for bit coded selection and activation of a parameterised setpoint (preset). ▸ Setpoint source of preset setpoints 🕮 554
	19	Activate preset (bit 1)	
	20	Activate preset (bit 2)	
	21	Activate preset (bit 3)	
	26	Activate segment 1 setpoint (from version 03.00)	Selection bits for bit coded selection and activation of a parameterised segment setpoint. Notes: • During normal operation (no active sequence), this function serves to activate the setpoint of a segment (instead of an entire sequence in the sequencer operation). • This function is not intended for the use in the sequencer operation. ▸ Setpoint source segment setpoints 🕮 563
	27	Activate segment 2 setpoint (from version 03.00)	
	28	Activate segment 3 setpoint (from version 03.00)	
	29	Activate segment 4 setpoint (from version 03.00)	

Parameter	Name / value range / [default setting]	Info
	30 Run/abort sequence (from version 03.00)	Trigger bit = 1: Start selected sequence. Trigger bit = 0: Abort sequence. Notes: • The assigned trigger bit must remain set to "1" for the duration of the sequence. • If the trigger bit is reset to "0", the sequence is aborted. In this case, the standard setpoint or the setpoint source selected via setpoint change-over is active again. • A sequence is selected in a binary-coded fashion via the trigger bits assigned to the four functions "Select sequence (bit 0) [50]" ... "Select sequence (bit 3) [53]". ▸ Sequencer 📖 504
	32 Next sequence step (from version 03.00)	Trigger bit = 0↗1 (edge): Next sequence step. Trigger bit = 1↘0 (edge): No action. Notes: • The execution of the current step is completed even if the time parameterised for the segment has not elapsed yet. • The function is only relevant for Sequencer mode 0x4025 (P800.00) = "Step operation [2]" or "Time & step operation [3]". • A jump to the next sequence step is not possible if the sequence pauses, the sequence is suspended or the final segment is executed. ▸ Sequencer 📖 504
	33 Pause sequence (from version 03.00)	Trigger bit = 1: Pause sequence. Trigger bit = 0: Continue sequence. Notes: • During the pause, the sequence stops in the current step. The expiration of the time set for the segment is stopped. • The sequencer setpoint continues to remain active. ▸ Sequencer 📖 504
	34 Suspend sequence (from version 03.00)	Trigger bit = 1: Suspend sequence. Trigger bit = 0: Continue sequence. Notes: • This function serves to temporarily change over to the standard setpoint or the setpoint source selected via setpoint change-over. • The sequence is continued at the point where it was suspended. ▸ Sequencer 📖 504
	35 Stop sequence (from version 03.00)	Trigger bit = 0↗1 (edge): Stop sequence. Trigger bit = 1↘0 (edge): No action. Notes: • If the sequence is stopped, it is jumped to the final segment. • The further execution depends on the selected End of sequence mode 0x402F (P824.00). ▸ Sequencer 📖 504
	36 Abort sequence (from version 03.00)	Trigger bit = 0↗1 (edge): Abort sequence. Trigger bit = 1↘0 (edge): No action. Notes: • This function serves to directly stop the sequence without the final segment being executed. In this case, the standard setpoint or the setpoint source selected via setpoint change-over is active again. ▸ Sequencer 📖 504
	39 Activate ramp 2	Trigger bit = 1: activate acceleration time 2 and deceleration time 2 manually. Trigger bit = 0: no action / deactivate function again. ▸ Frequency limits and ramp times 📖 156
	40 Load parameter set	Trigger bit = 0-1 edge: parameter change-over to the value set selected via "Select parameter set (bit 0)" and "Select parameter set (bit 1)". Trigger bit = 0: no action. Notes: • The activation method for the "Parameter change-over" function can be selected in 0x4046 (P755.00). ▸ Parameter change-over 📖 464



Parameter	Name / value range / [default setting]		Info
	41	Select parameter set (bit 0)	Selection bits for the "Parameter change-over" function. ▸ Parameter change-over 📖 464
	42	Select parameter set (bit 1)	
	43	Activate fault 1	Trigger bit = 1: Trigger user-defined error 1. Trigger bit = 0: no action. Notes: • After the error is triggered, the motor is brought to a standstill with the quick stop ramp. The inverter is then disabled. Associated error code: • 25249 | 0x62A1 - Network: user fault 1
	44	Activate fault 2	Trigger bit = 1: Trigger user-defined error 2. Trigger bit = 0: no action. Notes: • After the error is triggered, the motor is brought to a standstill with the quick stop ramp. The inverter is then disabled. Associated error code: • 25250 | 0x62A2 - Network: user fault 2
	45	Deactivate PID controlling	Trigger bit = 1: If PID control is activated, ignore PID control and drive the motor in speed-controlled manner. Trigger bit = 0: If PID control is activated, drive the motor with PID control. Notes: • The PID control can be activated in 0x4020:001 (P600.01). ▸ Configuring the process controller 📖 407
	46	Set PID output to 0	Trigger bit = 1: If PID control is activated, I component and the output of the PID controller are set to 0 and the internal control algorithm is stopped. The PID control remains active. Trigger bit = 0: No action / deactivate function again. ▸ Configuring the process controller 📖 407
	47	Inhibit PID I-component	Trigger bit = 1: If the PID control is activated, the I component of the PID controller is set to 0 and the integration process is stopped. Trigger bit = 0: No action / deactivate function again. ▸ Configuring the process controller 📖 407
	48	Activate PID influence ramp	Trigger bit = 1: the influence of the process controller is shown by means of a ramp. Trigger bit = 0 or not connected: the influence of the process controller is shown by means of a ramp. Notes: • The influence of the process controller is always active (not only when PID control is activated). • Acceleration time for showing the influence of the process controller can be set in 0x404C:001 (P607.01). • Deceleration time for hiding the influence of the process controller can be set in 0x404C:002 (P607.02). ▸ Configuring the process controller 📖 407
	49	Release holding brake	Trigger bit = 1: Release holding brake manually. Trigger bit = 0: No action. Notes: • The manually triggered "Release holding brake" command has a direct impact on the "Release holding brake [115]" trigger. Thus, the holding brake can be manually released if the power section is switched off. • The responsibility for a manual release of the holding brake has the external trigger source for the "Release holding brake" command. ▸ Holding brake control 📖 472
	50	Select sequence (bit 0)	Selection bits for bit coded selection of a sequence. Notes: • The selected sequence is not started automatically. • For a status-controlled start, the function "Run/abort sequence [30]" is available. ▸ Sequencer control functions 📖 588
	51	Select sequence (bit 1)	
	52	Select sequence (bit 2)	
	53	Select sequence (bit 3)	

Parameter	Name / value range / [default setting]	Info
	54 Position counter reset	Trigger bit = 1: Reset position counter manually. Trigger bit = 0: No action. ▸ Position counter 📖 493
	55 Activate UPS operation	Trigger bit = 1: Activate UPS operation. Trigger bit = 0: No action / deactivate function again. ▸ UPS operation 📖 490
0x400E:002 (P505.02)	NetWordIN1 function: Bit 1 (NetWordIN1 fct.: NetWordIN1.01) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x400E:001 (P505.01). 📖 229	Definition of the function that is to be triggered via bit 1 of the mappable NetWordIN1 data word.
	0 Not active	
0x400E:003 (P505.03)	NetWordIN1 function: Bit 2 (NetWordIN1 fct.: NetWordIN1.02) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x400E:001 (P505.01). 📖 229	Definition of the function that is to be triggered via bit 2 of the mappable NetWordIN1 data word.
	3 Activate quick stop	
0x400E:004 (P505.04)	NetWordIN1 function: Bit 3 (NetWordIN1 fct.: NetWordIN1.03) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x400E:001 (P505.01). 📖 229	Definition of the function that is to be triggered via bit 3 of the mappable NetWordIN1 data word.
	0 Not active	
0x400E:005 (P505.05)	NetWordIN1 function: Bit 4 (NetWordIN1 fct.: NetWordIN1.04) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x400E:001 (P505.01). 📖 229	Definition of the function that is to be triggered via bit 4 of the mappable NetWordIN1 data word.
	8 Run forward (CW)	
0x400E:006 (P505.06)	NetWordIN1 function: Bit 5 (NetWordIN1 fct.: NetWordIN1.05) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x400E:001 (P505.01). 📖 229	Definition of the function that is to be triggered via bit 5 of the mappable NetWordIN1 data word.
	18 Activate preset (bit 0)	
0x400E:007 (P505.07)	NetWordIN1 function: Bit 6 (NetWordIN1 fct.: NetWordIN1.06) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x400E:001 (P505.01). 📖 229	Definition of the function that is to be triggered via bit 6 of the mappable NetWordIN1 data word.
	19 Activate preset (bit 1)	
0x400E:008 (P505.08)	NetWordIN1 function: Bit 7 (NetWordIN1 fct.: NetWordIN1.07) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x400E:001 (P505.01). 📖 229	Definition of the function that is to be triggered via bit 7 of the mappable NetWordIN1 data word.
	4 Reset error	
0x400E:009 (P505.09)	NetWordIN1 function: Bit 8 (NetWordIN1 fct.: NetWordIN1.08) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x400E:001 (P505.01). 📖 229	Definition of the function that is to be triggered via bit 8 of the mappable NetWordIN1 data word.
	0 Not active	

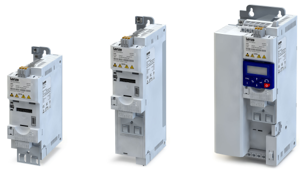


Parameter	Name / value range / [default setting]	Info
0x400E:010 (P505.10)	NetWordIN1 function: Bit 9 (NetWordIN1 fct.: NetWordIN1.09) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x400E:001 (P505.01). 229	Definition of the function that is to be triggered via bit 9 of the mappable NetWordIN1 data word.
	5 Activate DC braking	
0x400E:011 (P505.11)	NetWordIN1 function: Bit 10 (NetWordIN1 fct.: NetWordIN1.10) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x400E:001 (P505.01). 229	Definition of the function that is to be triggered via bit 10 of the mappable NetWordIN1 data word.
	0 Not active	
0x400E:012 (P505.12)	NetWordIN1 function: Bit 11 (NetWordIN1 fct.: NetWordIN1.11) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x400E:001 (P505.01). 229	Definition of the function that is to be triggered via bit 11 of the mappable NetWordIN1 data word.
	0 Not active	
0x400E:013 (P505.13)	NetWordIN1 function: Bit 12 (NetWordIN1 fct.: NetWordIN1.12) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x400E:001 (P505.01). 229	Definition of the function that is to be triggered via bit 12 of the mappable NetWordIN1 data word.
	13 Reverse rotational direction	
0x400E:014 (P505.14)	NetWordIN1 function: Bit 13 (NetWordIN1 fct.: NetWordIN1.13) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x400E:001 (P505.01). 229	Definition of the function that is to be triggered via bit 13 of the mappable NetWordIN1 data word.
	0 Not active	
0x400E:015 (P505.15)	NetWordIN1 function: Bit 14 (NetWordIN1 fct.: NetWordIN1.14) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x400E:001 (P505.01). 229	Definition of the function that is to be triggered via bit 14 of the mappable NetWordIN1 data word.
	0 Not active	
0x400E:016 (P505.16)	NetWordIN1 function: Bit 15 (NetWordIN1 fct.: NetWordIN1.15) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x400E:001 (P505.01). 229	Definition of the function that is to be triggered via bit 15 of the mappable NetWordIN1 data word.
	0 Not active	
0x2631:001 (P400.01)	Function list: Enable inverter (Function list: Enable inverter) • Setting can only be changed if the inverter is inhibited.	Assignment of a trigger for the "Enable inverter" function. Trigger = TRUE: The inverter is enabled (unless there is another cause for inverter disable). Trigger = FALSE: The inverter is disabled. Notes: • This function must be set to TRUE to start the motor. Either via an assigned digital input or by default setting "Constant TRUE [1]". • Changing to the inhibited state causes an immediate stop of the motor, regardless of the stop method set in 0x2838:003 (P203.03). The motor becomes torqueless and coasts down as a function of the mass inertia of the machine. • The cause(s) that are active for the disabled state are shown in 0x282A:001 (P126.01).
	0 Not connected	No trigger assigned (trigger is constantly FALSE).

Parameter	Name / value range / [default setting]		Info
	1	**Constant TRUE**	Trigger is constantly TRUE.
	11	Digital input 1	State of X3/DI1, taking an inversion set in 0x2632:001 (P411.01) into consideration.
	12	Digital input 2	State of X3/DI2, taking an inversion set in 0x2632:002 (P411.02) into consideration.
	13	Digital input 3	State of X3/DI3, taking an inversion set in 0x2632:003 (P411.03) into consideration.
	14	Digital input 4	State of X3/DI4, taking an inversion set in 0x2632:004 (P411.04) into consideration.
	15	Digital input 5	State of X3/DI5, taking an inversion set in 0x2632:005 (P411.05) into consideration.
	16	Digital input 6	State of X3/DI6, taking an inversion set in 0x2632:006 (P411.06) into consideration. Digital input 6 is only available in the Control Unit (CU) with application I/O.
	17	Digital input 7	State of X3/DI7, taking an inversion set in 0x2632:007 (P411.07) into consideration. Digital input 7 is only available in the Control Unit (CU) with application I/O.
	50	Running	TRUE if inverter and start are enabled and output frequency > 0.2 Hz. Otherwise FALSE.
	51	Ready for operation	TRUE if inverter is ready for operation (no error active, no STO active and DC-bus voltage ok). Otherwise FALSE.
	53	Stop active	TRUE if inverter is enabled and motor is not started and output frequency = 0.
	54	Quick stop active	TRUE if quick stop is active. Otherwise FALSE.
	58	Device warning active	TRUE if warning is active. Otherwise FALSE. • A warning has no impact on the operating status of the inverter. • A warning is reset automatically if the cause has been eliminated.
	59	Device fault active	TRUE if a fault is active. Otherwise FALSE. • In the event of a fault, the motor is brought to a standstill with the quick stop ramp. The inverter is then disabled. • Exception: In case of a serious fault, the inverter is disabled immediately. The motor becomes torqueless (coasts). • The error state will be left automatically if the error condition is not active anymore. • The restart behaviour after trouble can be configured. ▸ Automatic restart 484
	60	Heatsink temperature warning active	TRUE if current heatsink temperature > warning threshold for temperature monitoring. Otherwise FALSE. • Display of the current heatsink temperature in 0x2D84:001 (P117.01). • Setting of the warning threshold in 0x2D84:002.
	69	Rotational direction reversed	TRUE if output frequency is negative. Otherwise FALSE.
	70	Frequency threshold exceeded	TRUE if current output frequency > frequency threshold. Otherwise FALSE. • Display of the current output frequency in 0x2DDD (P100.00). • Setting Frequency thresholdin 0x4005 (P412.00). ▸ Frequency threshold for "Frequency threshold exceeded" trigger 593
	71	Actual speed = 0	TRUE if current output frequency = 0 Hz (± 0.01 Hz), irrespective of the operating mode. Otherwise FALSE. • Display of the current output frequency in 0x2DDD (P100.00).
	78	Current limit reached	TRUE if current motor current ≥ maximum current. Otherwise FALSE. • Display of the present motor current in 0x2D88 (P104.00). • Setting for the maximum current in 0x6073 (P324.00).
	79	Torque limit reached (from version 02.00)	TRUE if torque limit has been reached or exceeded. Otherwise FALSE. • Setting "Positive torque limit" in 0x60E0. • Setting "Negative torque limit" in 0x60E1.

Parameter	Name / value range / [default setting]		Info
	81	Error of analog input 1 active	TRUE if the monitoring of the input signal at the analog input 1 has responded. Otherwise FALSE. This trigger is set as a function of the following settings: • Monitoring threshold 0x2636:008 (P430.08) • Monitoring condition 0x2636:009 (P430.09) The setting of the Error response in 0x2636:010 (P430.10) has no effect on this trigger. ▸ Analog input 1 📖 597
	82	Error of analog input 2 active	TRUE if the monitoring of the input signal at the analog input 2 has responded. Otherwise FALSE. This trigger is set as a function of the following settings: • Monitoring threshold 0x2637:008 (P431.08) • Monitoring condition 0x2637:009 (P431.09) The setting of the Error response in 0x2637:010 (P431.10) has no effect on this trigger. ▸ Analog input 2 📖 601
	83	Load loss detected	TRUE if actual motor current < threshold for load loss detection after delay time of the load loss detection has elapsed. Otherwise FALSE. • Display of the present motor current in 0x6078 (P103.00). • Setting Threshold in 0x4006:001 (P710.01). • Setting Decelerationin 0x4006:002 (P710.02). ▸ Load loss detection 📖 449
	102	Sequence suspended (from version 03.00)	Status signal of the "sequencer" function: TRUE if the sequence is currently suspended. ▸ Sequencer 📖 504
	103	Sequence done (from version 03.00)	Status signal of the "sequencer" function: TRUE if the sequence is completed (final segment has been passed through). ▸ Sequencer 📖 504
	104	Local control active	TRUE if local keypad control ("LOC") active. Otherwise FALSE.
	105	Remote control active	TRUE if remote control ("REM") via terminals, network, etc. active. Otherwise FALSE.
	106	Manual setpoint selection active	TRUE if manual setpoint selection ("MAN") via keypad active. Otherwise FALSE. • Selection of the trigger for the "Activate keypad setpoint" function in 0x2631:016 (P400.16).
	107	Automatic setpoint selection active	TRUE if automatic setpoint selection ("AUTO") via terminals, network, etc. active. Otherwise FALSE.
	201	Internal value (from version 05.00)	Internal values of the manufacturer.
	202	Internal value (from version 05.00)	
	203	Internal value (from version 05.00)	
	204	Internal value (from version 05.00)	
	205	Internal value (from version 05.00)	
	206	Internal value (from version 05.00)	

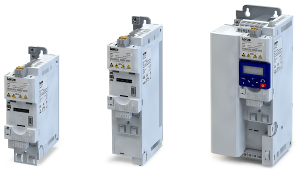
Parameter	Name / value range / [default setting]	Info
0x2631:002 (P400.02)	Function list: Run (Function list: Run) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532 **11** **Digital input 1**	Assignment of a trigger to the "Run" function. **Function 1: Start / stop motor (default setting)** Function 1 is active if no further start commands (start forward/start reverse) have been connected to triggers, no keypad control is active and no network control is active. Trigger = TRUE: Let motor rotate forward (CW). Trigger = FALSE: Stop motor. Notes to function 1: • If "Enable inverter" 0x2631:001 (P400.01) = "Constant TRUE [1]", only a digital input is permissible as trigger for this function in order that the motor can be stopped again any time. Exception: If the "Safe torque off (STO)" safety function is available, both functions "Enable inverter" and "Run" can be set to "Constant TRUE [1]". The inverter is then controlled via the STO signal unless no other start commands (start-forward/start-backward) have been connected to triggers. • The stop method can be selected in 0x2838:003 (P203.03). • The function also serves to realise an automatic start after switch-on. ▸ Starting performance 📖 153 **Function 2: Start enable/stop motor** Function 2 is active if further start commands have been connected to triggers, keypad control is active or network control is active. Trigger = TRUE: Start commands of the active control source are enabled. Trigger = FALSE: Stop motor. Notes to function 2: • If no separate start enable is required for the application, the trigger "Constant TRUE [1]" must be set. • The stop method can be selected in 0x2838:003 (P203.03).
0x2631:003 (P400.03)	Function list: Activate quick stop (Function list: Quick stop) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532 **0** **Not connected**	Assignment of a trigger for the "Activate quick stop" function. Trigger = TRUE: Activate quick stop. Trigger = FALSE: Deactivate quick stop. Notes: • The "Quick stop" function brings the motor to a standstill within the deceleration time set in 0x291C (P225.00).
0x2631:004 (P400.04)	Function list: Reset fault (Function list: Reset fault) • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532 **12** **Digital input 2**	Assignment of a trigger for the "Reset fault" function. Trigger = FALSE↗TRUE (edge): Active error is reset (acknowledged) if the error condition is not active anymore and the error is resettable. Trigger = FALSE: no action.
0x2631:005 (P400.05)	Function list: Activate DC braking (Function list: DC braking) • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532 **0** **Not connected**	Assignment of a trigger for the "Activate DC braking" function. Trigger = TRUE: Activate DC braking. Trigger = FALSE: Deactivate DC braking. ⚠ CAUTION! DC braking remains active as long as the trigger is set to TRUE. ▸ DC braking 📖 437



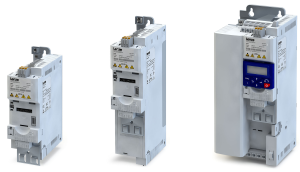
Parameter	Name / value range / [default setting]	Info
0x2631:010 (P400.10)	Function list: Jog foward (CW) (Function list: Jog foward) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x2631:001 (P400.01). 532	Assignment of a trigger for the "Jog foward (CW)" function. Trigger = TRUE: Let motor rotate forward with preset 5. Trigger = FALSE: Stop motor. CAUTION! The jog operation has a higher priority than the "Run" function, all other start commands and the keypad key . • If jog operation is active, the motor cannot be stopped with the previously mentioned functions! • However, jog operation can be interrupted by the "Quick stop" function. Notes: • The preset value 5 can be set in 0x2911:005 (P450.05). • The stop method can be selected in 0x2838:003 (P203.03). • If "Jog foward (CW)" and "Jog reverse (CCW)" are activated at the same time, the motor is stopped using the stop method and jog operation must be triggered again. • Jog operation cannot be started automatically. The "Start at power-up" option in 0x2838:002 (P203.02) does not apply to jog operation.
	0 **Not connected**	
0x2631:011 (P400.11)	Function list: Jog reverse (CCW) (Function list: Jog reverse) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x2631:001 (P400.01). 532	Assignment of a trigger for the "Jog reverse (CCW)" function. Trigger = TRUE: Let motor rotate backward with preset 6. Trigger = FALSE: Stop motor. CAUTION! The jog operation has a higher priority than the "Run" function, all other start commands and the keypad key . • If jog operation is active, the motor cannot be stopped with the previously mentioned functions! • However, jog operation can be interrupted by the "Quick stop" function. Notes: • The preset value 6 can be set in 0x2911:006 (P450.06). • The stop method can be selected in 0x2838:003 (P203.03). • If "Jog foward (CW)" and "Jog reverse (CCW)" are activated at the same time, the motor is stopped using the stop method and jog operation must be triggered again. • Jog operation cannot be started automatically. The "Start at power-up" option in 0x2838:002 (P203.02) does not apply to jog operation.
	0 **Not connected**	
0x2631:012 (P400.12)	Function list: Activate keypad control (Function list: Keypad control) • For further possible settings, see parameter 0x2631:001 (P400.01). 532	Assignment of a trigger for the "Activate keypad control" function. Trigger = TRUE: activate keypad as control source. Trigger = FALSE: no action / deactivate keypad as control source again.
	0 **Not connected**	
0x2631:017 (P400.17)	Function list: Activate network setpoint (Function list: Setp: Network) • From version 02.01 • For further possible settings, see parameter 0x2631:001 (P400.01). 532	Assignment of a trigger for the "Activate network setpoint" function. Trigger = TRUE: the network is used as setpoint source (if the trigger assigned has the highest setpoint priority). Trigger = FALSE: no action / deactivate function again.
	0 **Not connected**	
	116 Network setpoint active (from version 02.00)	TRUE if a change-over to network setpoint is requested via bit 6 of the AC drive control word0x400B:001 (P592.01). Otherwise FALSE. Notes: • Set this selection if the network setpoint is to be activated via bit 6 of the AC drive control word. • The AC drive control word can be used with any communication protocol. ▸ AC Drive Profile 248

Parameter	Name / value range / [default setting]	Info
0x2631:037 (P400.37)	Function list: Activate network control (Function list: Network control) • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532	Assignment of a trigger for the "Activate network control" function. Trigger = TRUE: Activate network control. Trigger = FALSE: No action / deactivate network control again.
	0 **Not connected**	
	114 Network control active (from version 02.00)	TRUE if the network control is requested via bit 5 of the AC drive control word 0x400B:001 (P592.01). Otherwise FALSE. Notes: • Set this selection if the network control is to be activated via bit 5 of the AC drive control word. • The AC drive control word can be used with any communication protocol. ▸ AC Drive Profile 📖 248
0x2631:043 (P400.43)	Function list: Activate fault 1 (Function list: Fault 1) • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532	Assignment of a trigger for the "Activate fault 1" function. Trigger = TRUE: Trigger user-defined error 1. Trigger = FALSE: no action. Notes: • After the error is triggered, the motor is brought to a standstill with the quick stop ramp. The inverter is then disabled. Associated error code: • 25217 | 0x6281 - User-defined fault 1
	0 **Not connected**	
0x2631:044 (P400.44)	Function list: Activate fault 2 (Function list: Fault 2) • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532	Assignment of a trigger for the "Activate fault 2" function. Trigger = TRUE: Trigger user-defined error 2. Trigger = FALSE: no action. Notes: • After the error is triggered, the motor is brought to a standstill with the quick stop ramp. The inverter is then disabled. Associated error code: • 25218 | 0x6282 - User-defined fault 2
	0 **Not connected**	
0x2634:010 (P420.10)	Digital outputs function: NetWordOUT1 - bit 0 (Dig.out.function: NetWordOUT1.00) • For further possible settings, see parameter 0x2634:001 (P420.01). 📖 603	Assignment of a trigger to bit 0 of NetWordOUT1. Trigger = FALSE: bit set to 0. Trigger = TRUE: bit set to 1.
	51 **Ready for operation**	
0x2634:011 (P420.11)	Digital outputs function: NetWordOUT1 - bit 1 (Dig.out.function: NetWordOUT1.01) • For further possible settings, see parameter 0x2634:001 (P420.01). 📖 603	Assignment of a trigger to bit 1 of NetWordOUT1. Trigger = FALSE: bit set to 0. Trigger = TRUE: bit set to 1.
	0 **Not connected**	
0x2634:012 (P420.12)	Digital outputs function: NetWordOUT1 - bit 2 (Dig.out.function: NetWordOUT1.02) • For further possible settings, see parameter 0x2634:001 (P420.01). 📖 603	Assignment of a trigger to bit 2 of NetWordOUT1. Trigger = FALSE: bit set to 0. Trigger = TRUE: bit set to 1.
	52 **Operation enabled**	
0x2634:013 (P420.13)	Digital outputs function: NetWordOUT1 - bit 3 (Dig.out.function: NetWordOUT1.03) • For further possible settings, see parameter 0x2634:001 (P420.01). 📖 603	Assignment of a trigger to bit 3 of NetWordOUT1. Trigger = FALSE: bit set to 0. Trigger = TRUE: bit set to 1.
	56 **Error active**	
0x2634:014 (P420.14)	Digital outputs function: NetWordOUT1 - bit 4 (Dig.out.function: NetWordOUT1.04) • For further possible settings, see parameter 0x2634:001 (P420.01). 📖 603	Assignment of a trigger to bit 4 of NetWordOUT1. Trigger = FALSE: bit set to 0. Trigger = TRUE: bit set to 1.
	0 **Not connected**	
0x2634:015 (P420.15)	Digital outputs function: NetWordOUT1 - bit 5 (Dig.out.function: NetWordOUT1.05) • For further possible settings, see parameter 0x2634:001 (P420.01). 📖 603	Assignment of a trigger to bit 5 of NetWordOUT1. Trigger = FALSE: bit set to 0. Trigger = TRUE: bit set to 1.
	54 **Quick stop active**	

Parameter	Name / value range / [default setting]	Info
0x2634:016 (P420.16)	Digital outputs function: NetWordOUT1 - bit 6 (Dig.out.function: NetWordOUT1.06) • For further possible settings, see parameter 0x2634:001 (P420.01). 603	Assignment of a trigger to bit 6 of NetWordOUT1. Trigger = FALSE: bit set to 0. Trigger = TRUE: bit set to 1.
	50 **Running**	
0x2634:017 (P420.17)	Digital outputs function: NetWordOUT1 - bit 7 (Dig.out.function: NetWordOUT1.07) • For further possible settings, see parameter 0x2634:001 (P420.01). 603	Assignment of a trigger to bit 7 of NetWordOUT1. Trigger = FALSE: bit set to 0. Trigger = TRUE: bit set to 1.
	58 **Device warning active**	
0x2634:018 (P420.18)	Digital outputs function: NetWordOUT1 - bit 8 (Dig.out.function: NetWordOUT1.08) • For further possible settings, see parameter 0x2634:001 (P420.01). 603	Assignment of a trigger to bit 8 of NetWordOUT1. Trigger = FALSE: bit set to 0. Trigger = TRUE: bit set to 1.
	0 **Not connected**	
0x2634:019 (P420.19)	Digital outputs function: NetWordOUT1 - bit 9 (Dig.out.function: NetWordOUT1.09) • For further possible settings, see parameter 0x2634:001 (P420.01). 603	Assignment of a trigger to bit 9 of NetWordOUT1. Trigger = FALSE: bit set to 0. Trigger = TRUE: bit set to 1.
	0 **Not connected**	
0x2634:020 (P420.20)	Digital outputs function: NetWordOUT1 - bit 10 (Dig.out.function: NetWordOUT1.10) • For further possible settings, see parameter 0x2634:001 (P420.01). 603	Assignment of a trigger to bit 10 of NetWordOUT1. Trigger = FALSE: bit set to 0. Trigger = TRUE: bit set to 1.
	72 **Setpoint speed reached**	
0x2634:021 (P420.21)	Digital outputs function: NetWordOUT1 - bit 11 (Dig.out.function: NetWordOUT1.11) • For further possible settings, see parameter 0x2634:001 (P420.01). 603	Assignment of a trigger to bit 11 of NetWordOUT1. Trigger = FALSE: bit set to 0. Trigger = TRUE: bit set to 1.
	78 **Current limit reached**	
0x2634:022 (P420.22)	Digital outputs function: NetWordOUT1 - bit 12 (Dig.out.function: NetWordOUT1.12) • For further possible settings, see parameter 0x2634:001 (P420.01). 603	Assignment of a trigger to bit 12 of NetWordOUT1. Trigger = FALSE: bit set to 0. Trigger = TRUE: bit set to 1.
	71 **Actual speed = 0**	
0x2634:023 (P420.23)	Digital outputs function: NetWordOUT1 - bit 13 (Dig.out.function: NetWordOUT1.13) • For further possible settings, see parameter 0x2634:001 (P420.01). 603	Assignment of a trigger to bit 13 of NetWordOUT1. Trigger = FALSE: bit set to 0. Trigger = TRUE: bit set to 1.
	69 **Rotational direction reversed**	
0x2634:024 (P420.24)	Digital outputs function: NetWordOUT1 - bit 14 (Dig.out.function: NetWordOUT1.14) • For further possible settings, see parameter 0x2634:001 (P420.01). 603	Assignment of a trigger to bit 14 of NetWordOUT1. Trigger = FALSE: bit set to 0. Trigger = TRUE: bit set to 1.
	115 **Release holding brake**	
0x2634:025 (P420.25)	Digital outputs function: NetWordOUT1 - bit 15 (Dig.out.function: NetWordOUT1.15) • For further possible settings, see parameter 0x2634:001 (P420.01). 603	Assignment of a trigger to bit 15 of NetWordOUT1. Trigger = FALSE: bit set to 0. Trigger = TRUE: bit set to 1.
	55 **Safe torque off (STO) active**	
0x2860:001 (P201.01)	Frequency control: Default setpoint source (Stnd. setpoints: Freq. setp. src.)	Selection of the standard setpoint source for operating mode "MS: Velocity mode". • The selected standard setpoint source is always active in the operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]" when no setpoint change-over to another setpoint source via corresponding triggers/functions is active. ▶ Setpoint change-over 546
	1 Keypad	The setpoint is specified locally by the keypad. • Default setting: 0x2601:001 (P202.01) • Use the ↑ and ↓ navigation keys to change the keypad setpoint (also during running operation).

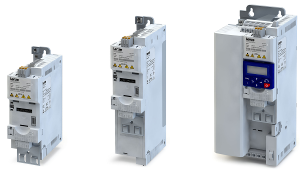


Parameter	Name / value range / [default setting]		Info
	2	**Analog input 1**	The setpoint is defined as analog signal via the analog input 1. ▸ Analog input 1 📖 597
	3	Analog input 2	The setpoint is defined as analog signal via the analog input 2. ▸ Analog input 2 📖 601
	4	HTL input (from version 04.00)	The digital inputs DI3 and DI4 can be configured as HTL input to use an HTL encoder as setpoint encoder or define the setpoint as a reference frequency ("pulse train"). ▸ HTL input setpoint source 📖 565
	5	Network	The setpoint is defined as process data object via the network. ▸ Configuring the network 📖 226
	11	Frequency preset 1	For the setpoint selection, preset values can be parameterised and selected. ▸ Setpoint source of preset setpoints 📖 554
	12	Frequency preset 2	
	13	Frequency preset 3	
	14	Frequency preset 4	
	15	Frequency preset 5	
	16	Frequency preset 6	
	17	Frequency preset 7	
	18	Frequency preset 8	
	19	Frequency preset 9	
	20	Frequency preset 10	
	21	Frequency preset 11	
	22	Frequency preset 12	
	23	Frequency preset 13	
	24	Frequency preset 14	
	25	Frequency preset 15	
	31	Segment preset 1 (from version 03.00)	For the setpoint selection, the segment presets parameterised for the "sequencer" function can be selected as well. ▸ Sequencer 📖 504
	32	Segment preset 2 (from version 03.00)	
	33	Segment preset 3 (from version 03.00)	
	34	Segment preset 4 (from version 03.00)	
	35	Segment preset 5 (from version 03.00)	
	36	Segment preset 6 (from version 03.00)	
	37	Segment preset 7 (from version 03.00)	
	38	Segment preset 8 (from version 03.00)	
	50	Motor potentiometer	The setpoint is generated by the "motor potentiometer" function. This function can be used as an alternative setpoint control which is controlled via two signals: "MOP setpoint up" and "MOP setpoint down". ▸ Motor potentiometer setpoint source (MOP) 📖 559
	201	Internal value (from version 05.00)	Internal values of the manufacturer.
	202	Internal value (from version 05.00)	
	203	Internal value (from version 05.00)	
	204	Internal value (from version 05.00)	
	205	Internal value (from version 05.00)	
	206	Internal value (from version 05.00)	



Parameter	Name / value range / [default setting]		Info
0x2860:002 (P201.02)	PID control: Default setpoint source (Stnd. setpoints: PID setp. src.)		Selection of the standard setpoint source for the reference value of the PID control. • The selected standard setpoint source is always active with an activated PID control when no setpoint change-over to another setpoint source via corresponding triggers/functions is active.
	1	**Keypad**	The setpoint is specified locally by the keypad. • Default setting: 0x2601:002 (P202.02) • Use the ↑ and ↓ navigation keys to change the keypad setpoint (also during running operation).
	2	Analog input 1	The setpoint is defined as analog signal via the analog input 1. ▸ Analog input 1 📖 597
	3	Analog input 2	The setpoint is defined as analog signal via the analog input 2. ▸ Analog input 2 📖 601
	4	HTL input (from version 04.00)	The digital inputs DI3 and DI4 can be configured as HTL input to use an HTL encoder as setpoint encoder or define the setpoint as a reference frequency ("pulse train"). ▸ HTL input setpoint source 📖 565
	5	Network	The setpoint is defined as process data object via the network. ▸ Configuring the network 📖 226
	11	PID preset 1	For the setpoint selection, preset values can be parameterised and selected. ▸ Setpoint source of preset setpoints 📖 554
	12	PID preset 2	
	13	PID preset 3	
	14	PID preset 4	
	15	PID preset 5	
	16	PID preset 6	
	17	PID preset 7	
	18	PID preset 8	
	31	Segment preset 1 (from version 03.00)	For the setpoint selection, the segment presets parameterised for the "sequencer" function can be selected as well. ▸ Sequencer 📖 504
	32	Segment preset 2 (from version 03.00)	
	33	Segment preset 3 (from version 03.00)	
	34	Segment preset 4 (from version 03.00)	
	35	Segment preset 5 (from version 03.00)	
	36	Segment preset 6 (from version 03.00)	
	37	Segment preset 7 (from version 03.00)	
	38	Segment preset 8 (from version 03.00)	
	50	Motor potentiometer	The setpoint is generated by the "motor potentiometer" function. This function can be used as an alternative setpoint control which is controlled via two signals: "MOP setpoint up" and "MOP setpoint down". ▸ Motor potentiometer setpoint source (MOP) 📖 559
	201	Internal value (from version 05.00)	Internal values of the manufacturer.
	202	Internal value (from version 05.00)	
	203	Internal value (from version 05.00)	
	204	Internal value (from version 05.00)	
	205	Internal value (from version 05.00)	
	206	Internal value (from version 05.00)	

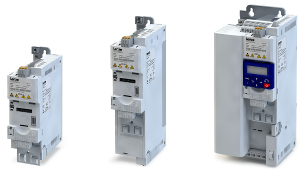
Parameter	Name / value range / [default setting]		Info
0x4008:001 (P590.01)	Process input words: NetWordIN1 (NetWordINx: NetWordIN1) 0x0000 ... [**0x0000**] ... 0xFFFF		Mappable data word for flexible control of the inverter via network.
	Bit 0	Mapping bit 0	Assignment of the function: 0x400E:001 (P505.01)
	Bit 1	Mapping bit 1	Assignment of the function: 0x400E:002 (P505.02)
	Bit 2	Mapping bit 2	Assignment of the function: 0x400E:003 (P505.03)
	Bit 3	Mapping bit 3	Assignment of the function: 0x400E:004 (P505.04)
	Bit 4	Mapping bit 4	Assignment of the function: 0x400E:005 (P505.05)
	Bit 5	Mapping bit 5	Assignment of the function: 0x400E:006 (P505.06)
	Bit 6	Mapping bit 6	Assignment of the function: 0x400E:007 (P505.07)
	Bit 7	Mapping bit 7	Assignment of the function: 0x400E:008 (P505.08)
	Bit 8	Mapping bit 8	Assignment of the function: 0x400E:009 (P505.09)
	Bit 9	Mapping bit 9	Assignment of the function: 0x400E:010 (P505.10)
	Bit 10	Mapping bit 10	Assignment of the function: 0x400E:011 (P505.11)
	Bit 11	Mapping bit 11	Assignment of the function: 0x400E:012 (P505.12)
	Bit 12	Mapping bit 12	Assignment of the function: 0x400E:013 (P505.13) Alternatively, this mapping bit can be used for controlling the digital outputs. Assignment of the digital outputs: • Relay: 0x2634:001 (P420.01) / selection [30] • Digital output 1: 0x2634:002 (P420.02) / selection [30] • Digital output 2: 0x2634:003 (P420.03) / selection [30] Note! Do not assign the mapping bit to a function and a digital output at the same time. A double assignment can cause an unpredictable drive behaviour!
	Bit 13	Mapping bit 13	Assignment of the function: 0x400E:014 (P505.14) Alternatively, this mapping bit can be used for controlling the digital outputs. Assignment of the digital outputs: • Relay: 0x2634:001 (P420.01) / selection [31] • Digital output 1: 0x2634:002 (P420.02) / selection [31] • Digital output 2: 0x2634:003 (P420.03) / selection [31] Note! Do not assign the mapping bit to a function and a digital output at the same time. A double assignment can cause an unpredictable drive behaviour!
	Bit 14	Mapping bit 14	Assignment of the function: 0x400E:015 (P505.15) Alternatively, this mapping bit can be used for controlling the digital outputs. Assignment of the digital outputs: • Relay: 0x2634:001 (P420.01) / selection [32] • Digital output 1: 0x2634:002 (P420.02) / selection [32] • Digital output 2: 0x2634:003 (P420.03) / selection [32] Note! Do not assign the mapping bit to a function and a digital output at the same time. A double assignment can cause an unpredictable drive behaviour!
	Bit 15	Mapping bit 15	Assignment of the function: 0x400E:016 (P505.16) Alternatively, this mapping bit can be used for controlling the digital outputs. Assignment of the digital outputs: • Relay: 0x2634:001 (P420.01) / selection [33] • Digital output 1: 0x2634:002 (P420.02) / selection [33] • Digital output 2: 0x2634:003 (P420.03) / selection [33] Note! Do not assign the mapping bit to a function and a digital output at the same time. A double assignment can cause an unpredictable drive behaviour!



Parameter	Name / value range / [default setting]		Info
0x400A:001 (P591.01)	Process output words: NetWordOUT1 (NetWordOUTx: NetWordOUT1) • Read only		Mappable data word for the output of status messages of the inverter via network.
	Bit 0	Mapping bit 0	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:010 (P420.10)
	Bit 1	Mapping bit 1	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:011 (P420.11)
	Bit 2	Mapping bit 2	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:012 (P420.12)
	Bit 3	Mapping bit 3	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:013 (P420.13)
	Bit 4	Mapping bit 4	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:014 (P420.14)
	Bit 5	Mapping bit 5	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:015 (P420.15)
	Bit 6	Mapping bit 6	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:016 (P420.16)
	Bit 7	Mapping bit 7	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:017 (P420.17)
	Bit 8	Mapping bit 8	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:018 (P420.18)
	Bit 9	Mapping bit 9	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:019 (P420.19)
	Bit 10	Mapping bit 10	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:020 (P420.20)
	Bit 11	Mapping bit 11	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:021 (P420.21)
	Bit 12	Mapping bit 12	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:022 (P420.22)
	Bit 13	Mapping bit 13	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:023 (P420.23)
	Bit 14	Mapping bit 14	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:024 (P420.24)
	Bit 15	Mapping bit 15	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:025 (P420.25)

<table>
<tr><th>Parameter</th><th colspan="2">Name / value range / [default setting]</th><th>Info</th></tr>
<tr><td rowspan="17">0x400A:002
(P591.02)</td><td colspan="2">Process output words: NetWordOUT2
(NetWordOUTx: NetWordOUT2)
• Read only</td><td rowspan="17">Mappable data word for the output of messages of the "Sequencer" function via network.

Configuration of the messages:
• 0x4026:008: NetWordOUT2 value for sequencer segment 1
• 0x4027:008: NetWordOUT2 value for sequencer segment 2
• 0x4028:008: NetWordOUT2 value for sequencer segment 3
• 0x4029:008: NetWordOUT2 value for sequencer segment 4
• 0x402A:008: NetWordOUT2 value for sequencer segment 5
• 0x402B:008: NetWordOUT2 value for sequencer segment 6
• 0x402C:008: NetWordOUT2 value for sequencer segment 7
• 0x402D:008: NetWordOUT2 value for sequencer segment 8
• 0x402E:008: NetWordOUT2 value for final segment</td></tr>
<tr><td>Bit 0</td><td>Mapping bit 0</td></tr>
<tr><td>Bit 1</td><td>Mapping bit 1</td></tr>
<tr><td>Bit 2</td><td>Mapping bit 2</td></tr>
<tr><td>Bit 3</td><td>Mapping bit 3</td></tr>
<tr><td>Bit 4</td><td>Mapping bit 4</td></tr>
<tr><td>Bit 5</td><td>Mapping bit 5</td></tr>
<tr><td>Bit 6</td><td>Mapping bit 6</td></tr>
<tr><td>Bit 7</td><td>Mapping bit 7</td></tr>
<tr><td>Bit 8</td><td>Mapping bit 8</td></tr>
<tr><td>Bit 9</td><td>Mapping bit 9</td></tr>
<tr><td>Bit 10</td><td>Mapping bit 10</td></tr>
<tr><td>Bit 11</td><td>Mapping bit 11</td></tr>
<tr><td>Bit 12</td><td>Mapping bit 12</td></tr>
<tr><td>Bit 13</td><td>Mapping bit 13</td></tr>
<tr><td>Bit 14</td><td>Mapping bit 14</td></tr>
<tr><td>Bit 15</td><td>Mapping bit 15</td></tr>
</table>



9.2 Predefined process data words

Process data are exchanged via cyclic data exchange between the network master and the inverter.

Details

For the cyclic data exchange, the inverter is provided with 24 network registers.

- 12 network registers are provided as input registers for data words from the network master to the inverter.
- 12 network registers are provided as output registers for data words from the inverter to the network master.
- Each network register is provided with a corresponding code that defines which parameters (or other data codes) are mapped to the network register.
- The input and output registers are divided into three blocks (A, B, C) in each case, featuring 4 successive data words, respectively:

Network register	
Input register	**Output register**
Network IN A0 Network IN A1 Network IN A2 Network IN A3	Network OUT A0 Network OUT A1 Network OUT A2 Network OUT A3
Network IN B0 Network IN B1 Network IN B2 Network IN B3	Network OUT B0 Network OUT B1 Network OUT B2 Network OUT B3
Network IN C0 Network IN C1 Network IN C2 Network IN C3	Network OUT C0 Network OUT C1 Network OUT C2 Network OUT C3

The terms "input" and "output" refer to the point of view of the inverter:

- Input data are transmitted by the network master and received by the inverter.
- Output data are transmitted by the inverter and received by the network master.

The exact assignment of the network registers and the number of data words that can be transmitted cyclically varies according to the network/communication protocol. You can find some detailed information in the documentation for the respective communication protocol.

Data mapping

For establishing a simple network connection, the inverter provides predefined control and status words for device profile CiA 402, AC drive profile as well as in LECOM format. By means of data mapping to a network register, each of these words can be transferred as process date via network. Additionally, further mappable data words are provided to individually control the inverter. The mappable data words are described in detail in the following subchapters.

Data mapping cannot be applied to all parameters. The mappable parameters are marked correspondingly in the parameter attribute list.

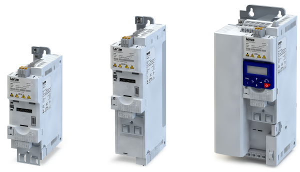
9.2.1 Device profile CiA 402

For control via device profile CiA 402, the parameters listed in the following can be mapped to network register.

Details

- The mapping entry for the CiA 402 control word is 0x60400010.
- The mapping entry for the CiA 402 status word is 0x60410010.
- General information about the process of data mapping can be found in the chapter of the same name for the corresponding network.
- For further CiA 402 parameters, see chapter "Device profile CiA 402". 469

Parameter	Name / value range / [default setting]		Info
0x6040	CiA: Controlword 0 ... [**0**] ... 65535		Mappable CiA 402 control word with bit assignment according to device profile CiA 402.
	Bit 0	Switch on	1 = switch-on
	Bit 1	Enable voltage	1 = DC bus: Establish readiness for operation
	Bit 2	Quick stop	0 = activate quick stop
	Bit 3	Enable operation	1 = enable operation
	Bit 4	Operation mode specific	Bits are not supported.
	Bit 5	Operation mode specific	
	Bit 6	Operation mode specific	
	Bit 7	Fault reset	0-1 edge = reset error
	Bit 8	Halt (from version 04.00)	1 = stop motor (ramping down to frequency setpoint 0 Hz)
	Bit 9	Operation mode specific	Operating mode dependent
	Bit 14	Release holding brake	1 = releasing holding brake manually CAUTION! • The manually triggered "Release holding brake" command has a direct impact on the "Release holding brake [115]" trigger. Thus, the holding brake can be manually released if the power section is switched off. • The responsibility for a manual release of the holding brake has the external trigger source for the "Release holding brake" command. ▸ Holding brake control 472
0x6041 (P780.00)	CiA: Statusword (CiA: Statusword) • Read only		Mappable CiA 402 status word with bit assignment according to device profile CiA 402.
	Bit 0	Ready to switch on	1 ≡ drive ready to start
	Bit 1	Switched on	1 ≡ drive switched-on
	Bit 2	Operation enabled	1 ≡ operation enabled
	Bit 3	Fault	1 ≡ fault or trouble active
	Bit 4	Voltage enabled	1 ≡ DC bus ready for operation
	Bit 5	Quick stop	0 ≡ quick stop active
	Bit 6	Switch on disabled	1 ≡ operation inhibited
	Bit 7	Warning	1 ≡ warning active
	Bit 8	RPDOs deactivated	1 ≡ cyclic PDOs have been deactivated.
	Bit 9	Remote	1 ≡ inverter can receive commands via network. • Bit is not set in the operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]".
	Bit 10	Target reached	1 ≡ the actual position is in the window.
	Bit 11	Internal limit active	1 ≡ internal limitation of a setpoint active.
	Bit 14	Holding brake released	1 ≡ holding brake released
	Bit 15	Safe torque off (STO) not active	0 ≡ STO active 1 ≡ STO not active



9.2.2 AC Drive Profile

For control via AC drive profile, the parameters listed in the following can be mapped to network registers.

Details

- The mapping entry for the AC Drive control word is 0x400B0110.
- The mapping entry for the AC Drive status word is 0x400C0110.
- Detailed information on the data mapping can be found in the chapter of the corresponding network.

AC drive control word

The AC Drive control word 0x400B:001 (P592.01) will only be processed if the network control in 0x2631:037 (P400.37) has been activated and the network is also active as control source.
▶ Control source change-over 📖 526

- Moreover, some bits in the AC drive control word are ignored if the bit 5 ("Activate network control") is not set. For details see the parameter description for 0x400B:001 (P592.01).
- The following logic applies to bit 0 "Run forward (CW)" and bit 1 "Run reverse (CCW)":

Bit 0 "Run forward (CW)"	Bit 1 "Run reverse (CCW)"	Action
0	0	Stopping with stop method set in 0x2838:003 (P203.03).
0↗1 (edge)	0	Run forward (CW)
0	0↗1 (edge)	Run reverse (CCW)
0↗1 (edge)	0↗1 (edge)	No action / last action is continued to be executed.
1	1	
1	0	
0	1	
1↘0 (edge)	1	Run reverse (CCW)
1	1↘0 (edge)	Run forward (CW)

For further details on the single bits, see the following parameter descriptions:

Parameter	Name / value range / [default setting]		Info
0x400B:001 (P592.01)	Process input data: AC Drive control word (Process data IN: AC control word) 0x0000 ... [**0x0000**] ... 0xFFFF		Mappable control word with bit assignment in compliance with EtherNet/IP™ AC drive profile.
	Bit 0	Run forward (CW)	Bits are only evaluated if bit 5 = "1". For the exact logic, see the above truth table.
	Bit 1	Run reverse (CCW)	
	Bit 2	Reset error (0-1 edge)	
	Bit 5	Activate network control	If bit 5 = "1" and 0x2631:037 (P400.37) = "Network control active [114]": All bits of the AC drive control word are evaluated. If bit 5 = "0" or 0x2631:037 (P400.37) = "Not connected [0]": • Bit 0, 1, 12, 13, 14, 15 of the AC drive control word are not evaluated (ignored). • Active control source is the "Flexible I/O configuration". ▶ Control source change-over 📖 526
	Bit 6	Activate network setpoint	0 = the standard setpoint source selected in 0x2860:001 (P201.01) is used. 1 = network setpoint is used.
	Bit 12	Disable inverter	Bits are only evaluated if bit 5 = "1".
	Bit 13	Activate quick stop	
	Bit 14	Deactivate PID controlling	
	Bit 15	Activate DC braking	

Parameter	Name / value range / [default setting]		Info
0x400C:001 (P593.01)	Process output data: AC Drive status word (Process data OUT: AC status word) • Read only		Mappable status word with bit assignment in compliance with EtherNet/IP™ AC drive profile.
	Bit 0	Fault/Trip active	
	Bit 1	Warning active	
	Bit 2	Running forward	
	Bit 3	Running reverse	
	Bit 4	Ready	
	Bit 5	Network control active	
	Bit 6	Network setpoint active	
	Bit 7	At Reference	
	Bit 8	Profile-State bit 0	The drive status is coded as follows: 0: Manufacturer-specific (reserved) 1: Startup (Drive initialisation) 2: Not_Ready (Mains voltage switched off) 3: Ready (Mains voltage switched on) 4: Enabled (Drive has received run command) 5: Stopping (Drive has received stop command and is stopped) 6: Fault_Stop (Drive is stopped due to a fault) 7: Faulted (Faults have occurred)
	Bit 9	Profile-State bit 1	
	Bit 10	Profile-State bit 2	
	Bit 11	Profile-State bit 3	
	Bit 12	Process controller active	
	Bit 13	Torque mode active	
	Bit 14	Current limit reached	
	Bit 15	DC braking active	
0x6402	Motor type • From version 02.00		AC motor type • Motor Data Object (0x28) - instance attribute 3
	3	PM synchronous	
	7	**Squirrel cage induction**	

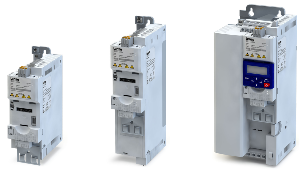
9.2.3 Lenze LECOM profile

For connection to Lenze inverters with a LECOM control word (C135) and LECOM status word (C150), the parameters listed in the following can be mapped to network registers.

Details

- The mapping entry for the LECOM control word is 0x400B0210.
- The mapping entry for the LECOM status word is 0x400C0210.
- General information about the process of data mapping can be found in the chapter of the same name for the corresponding network.

Parameter	Name / value range / [default setting]		Info
0x400B:002 (P592.02)	Process input data: LECOM control word (Process data IN: LECOM ctrl word) 0x0000 ... [**0x0000**] ... 0xFFFF		Mappable control word with bit assignment in compliance with code C135 of the 8200 Lenze inverter.
	Bit 0	Activate preset (bit 0)	
	Bit 1	Activate preset (bit 1)	
	Bit 2	Reverse rotational direction	
	Bit 3	Activate quick stop	
	Bit 9	Disable inverter	
	Bit 10	Activate user fault	
	Bit 11	Reset error (0-1 edge)	
	Bit 14	Activate DC braking	



Parameter	Name / value range / [default setting]		Info
0x400C:002 (P593.02)	Process output data: LECOM status word (Process data OUT: LECOM stat. word) • Read only		Mappable status word with bit assignment in compliance with code C150 of the 8200 Lenze inverter.
	Bit 0	Active parameter set (0 = set 1 or 3; 1 = set 2 or 4)	
	Bit 1	Power section inhibited	
	Bit 2	Current or Torque limit reached	
	Bit 3	Frequency setpoint reached	
	Bit 4	Ramp generator (input = output)	
	Bit 5	Frequency < frequency threshold	
	Bit 6	Actual frequency = 0	
	Bit 7	Inverter disabled	
	Bit 8	Coded status bit 0	
	Bit 9	Coded status bit 1	
	Bit 10	Coded status bit 2	
	Bit 11	Coded status bit 3	
	Bit 12	Overtemperature warning	
	Bit 13	DC-bus overvoltage	
	Bit 14	Rotational direction reversed	
	Bit 15	Ready for Operation	

9.2.4 Further process data

The parameters listed in the following can also be mapped to network registers, in order to transmit control and status information as well as setpoints and actual values as process data.

Details

- The following parameters are always available irrespective of the network option.
- The use of these parameters for the transmission of process data is optional. It is also possible to only use a part of the parameters. For the transmission of the frequency setpoint and actual value, for instance, several parameters with a different resolution can be selected.
- Via the parameters, at the same time the general network activity can be diagnosed.

NetWordIN1 ... NetWordIN5

These mappable data words are provided to individually control the inverter:

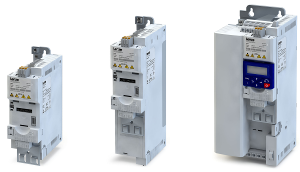
Data word	Parameter	Intended use
NetWordIN1	0x4008:001 (P590.01)	For implementing an individual control word format. ▸ General network settings 📖 227
NetWordIN2	0x4008:002 (P590.02)	For controlling the digital outputs via network. ▸ Configuration of digital outputs 📖 603
NetWordIN3	0x4008:003 (P590.03)	For controlling the analog outputs via network. ▸ Configuration of analog outputs 📖 617
NetWordIN4	0x4008:004 (P590.04)	
NetWordIN5	0x4008:005 (P550.05)	For defining an additive voltage impression via network. ▸ Additive voltage impression 📖 502

NetWordOUT1 and NetWordOUT2

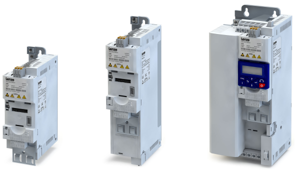
These mappable data words are provided to output status messages to the network master:

Data word	Parameter	Intended use
NetWordOUT1	0x400A:001 (P591.01)	For implementing an individual status word format. ▸ NetWordOUT1 status word 📖 609
NetWordOUT2	0x400A:002 (P591.02)	For the output of messages of the "sequencer" function. ▸ Segment configuration 📖 506

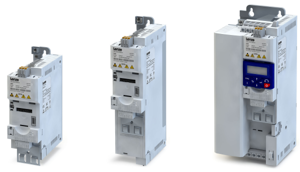
The following describes all further process data.



Parameter	Name / value range / [default setting]	Info
0x4008:001 (P590.01)	Process input words: NetWordIN1 (NetWordINx: NetWordIN1) 0x0000 ... [**0x0000**] ... 0xFFFF	Mappable data word for flexible control of the inverter via network.
	Bit 0 Mapping bit 0	Assignment of the function: 0x400E:001 (P505.01)
	Bit 1 Mapping bit 1	Assignment of the function: 0x400E:002 (P505.02)
	Bit 2 Mapping bit 2	Assignment of the function: 0x400E:003 (P505.03)
	Bit 3 Mapping bit 3	Assignment of the function: 0x400E:004 (P505.04)
	Bit 4 Mapping bit 4	Assignment of the function: 0x400E:005 (P505.05)
	Bit 5 Mapping bit 5	Assignment of the function: 0x400E:006 (P505.06)
	Bit 6 Mapping bit 6	Assignment of the function: 0x400E:007 (P505.07)
	Bit 7 Mapping bit 7	Assignment of the function: 0x400E:008 (P505.08)
	Bit 8 Mapping bit 8	Assignment of the function: 0x400E:009 (P505.09)
	Bit 9 Mapping bit 9	Assignment of the function: 0x400E:010 (P505.10)
	Bit 10 Mapping bit 10	Assignment of the function: 0x400E:011 (P505.11)
	Bit 11 Mapping bit 11	Assignment of the function: 0x400E:012 (P505.12)
	Bit 12 Mapping bit 12	Assignment of the function: 0x400E:013 (P505.13) Alternatively, this mapping bit can be used for controlling the digital outputs. Assignment of the digital outputs: • Relay: 0x2634:001 (P420.01) / selection [30] • Digital output 1: 0x2634:002 (P420.02) / selection [30] • Digital output 2: 0x2634:003 (P420.03) / selection [30] Note! Do not assign the mapping bit to a function and a digital output at the same time. A double assignment can cause an unpredictable drive behaviour!
	Bit 13 Mapping bit 13	Assignment of the function: 0x400E:014 (P505.14) Alternatively, this mapping bit can be used for controlling the digital outputs. Assignment of the digital outputs: • Relay: 0x2634:001 (P420.01) / selection [31] • Digital output 1: 0x2634:002 (P420.02) / selection [31] • Digital output 2: 0x2634:003 (P420.03) / selection [31] Note! Do not assign the mapping bit to a function and a digital output at the same time. A double assignment can cause an unpredictable drive behaviour!
	Bit 14 Mapping bit 14	Assignment of the function: 0x400E:015 (P505.15) Alternatively, this mapping bit can be used for controlling the digital outputs. Assignment of the digital outputs: • Relay: 0x2634:001 (P420.01) / selection [32] • Digital output 1: 0x2634:002 (P420.02) / selection [32] • Digital output 2: 0x2634:003 (P420.03) / selection [32] Note! Do not assign the mapping bit to a function and a digital output at the same time. A double assignment can cause an unpredictable drive behaviour!
	Bit 15 Mapping bit 15	Assignment of the function: 0x400E:016 (P505.16) Alternatively, this mapping bit can be used for controlling the digital outputs. Assignment of the digital outputs: • Relay: 0x2634:001 (P420.01) / selection [33] • Digital output 1: 0x2634:002 (P420.02) / selection [33] • Digital output 2: 0x2634:003 (P420.03) / selection [33] Note! Do not assign the mapping bit to a function and a digital output at the same time. A double assignment can cause an unpredictable drive behaviour!

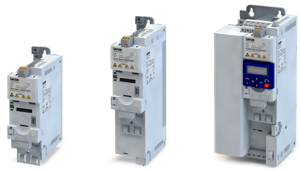


Parameter	Name / value range / [default setting]	Info
0x4008:002 (P590.02)	Process input words: NetWordIN2 (NetWordINx: NetWordIN2) 0x0000 ... [**0x0000**] ... 0xFFFF	Mappable data word for optional control of the digital outputs via net-work. Assignment of the digital outputs: • Relay: 0x2634:001 (P420.01) / selection [34] ... [49] • Digital output 1: 0x2634:002 (P420.02) / selection [34] ... [49] • Digital output 2: 0x2634:003 (P420.03) / selection [34] ... [49]
	Bit 0 Mapping bit 0	
	Bit 1 Mapping bit 1	
	Bit 2 Mapping bit 2	
	Bit 3 Mapping bit 3	
	Bit 4 Mapping bit 4	
	Bit 5 Mapping bit 5	
	Bit 6 Mapping bit 6	
	Bit 7 Mapping bit 7	
	Bit 8 Mapping bit 8	
	Bit 9 Mapping bit 9	
	Bit 10 Mapping bit 10	
	Bit 11 Mapping bit 11	
	Bit 12 Mapping bit 12	
	Bit 13 Mapping bit 13	
	Bit 14 Mapping bit 14	
	Bit 15 Mapping bit 15	
0x4008:003 (P590.03)	Process input words: NetWordIN3 (NetWordINx: NetWordIN3) 0.0 ... [**0.0**] ... 100.0 %	Mappable data word for optional control of an analog output via net-work. Assignment of the analog outputs: • Analog output 1: 0x2639:002 (P440.02) = "NetWordIN3 [20]" • Analog output 2: 0x263A:002 (P441.02) = "NetWordIN3 [20]"
0x4008:004 (P590.04)	Process input words: NetWordIN4 (NetWordINx: NetWordIN4) 0.0 ... [**0.0**] ... 100.0 %	Mappable data word for optional control of an analog output via net-work. Assignment of the analog outputs: • Analog output 1: 0x2639:002 (P440.02) = "NetWordIN4 [21]" • Analog output 2: 0x263A:002 (P441.02) = "NetWordIN4 [21]"
0x4008:005 (P550.05)	Process input words: NetWordIN5 (NetWordINx: NetWordIN5) -100.0 ... [**0.0**] ... 100.0 %	Mappable data word for optionally specifying an additive voltage set-point via network. • 100 % ≡ Rated voltage 0x2C01:007 (P320.07) • This value is used if "Network [3]" is selected in 0x2B13:002.



Parameter	Name / value range / [default setting]		Info
0x400A:001 (P591.01)	Process output words: NetWordOUT1 (NetWordOUTx: NetWordOUT1) • Read only		Mappable data word for the output of status messages of the inverter via network.
	Bit 0	Mapping bit 0	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:010 (P420.10)
	Bit 1	Mapping bit 1	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:011 (P420.11)
	Bit 2	Mapping bit 2	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:012 (P420.12)
	Bit 3	Mapping bit 3	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:013 (P420.13)
	Bit 4	Mapping bit 4	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:014 (P420.14)
	Bit 5	Mapping bit 5	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:015 (P420.15)
	Bit 6	Mapping bit 6	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:016 (P420.16)
	Bit 7	Mapping bit 7	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:017 (P420.17)
	Bit 8	Mapping bit 8	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:018 (P420.18)
	Bit 9	Mapping bit 9	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:019 (P420.19)
	Bit 10	Mapping bit 10	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:020 (P420.20)
	Bit 11	Mapping bit 11	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:021 (P420.21)
	Bit 12	Mapping bit 12	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:022 (P420.22)
	Bit 13	Mapping bit 13	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:023 (P420.23)
	Bit 14	Mapping bit 14	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:024 (P420.24)
	Bit 15	Mapping bit 15	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:025 (P420.25)

Parameter	Name / value range / [default setting]	Info
0x400A:002 (P591.02)	Process output words: NetWordOUT2 (NetWordOUTx: NetWordOUT2) • Read only Bit 0 | Mapping bit 0 Bit 1 | Mapping bit 1 Bit 2 | Mapping bit 2 Bit 3 | Mapping bit 3 Bit 4 | Mapping bit 4 Bit 5 | Mapping bit 5 Bit 6 | Mapping bit 6 Bit 7 | Mapping bit 7 Bit 8 | Mapping bit 8 Bit 9 | Mapping bit 9 Bit 10 | Mapping bit 10 Bit 11 | Mapping bit 11 Bit 12 | Mapping bit 12 Bit 13 | Mapping bit 13 Bit 14 | Mapping bit 14 Bit 15 | Mapping bit 15	Mappable data word for the output of messages of the "Sequencer" function via network. Configuration of the messages: • 0x4026:008: NetWordOUT2 value for sequencer segment 1 • 0x4027:008: NetWordOUT2 value for sequencer segment 2 • 0x4028:008: NetWordOUT2 value for sequencer segment 3 • 0x4029:008: NetWordOUT2 value for sequencer segment 4 • 0x402A:008: NetWordOUT2 value for sequencer segment 5 • 0x402B:008: NetWordOUT2 value for sequencer segment 6 • 0x402C:008: NetWordOUT2 value for sequencer segment 7 • 0x402D:008: NetWordOUT2 value for sequencer segment 8 • 0x402E:008: NetWordOUT2 value for final segment
0x400B:003 (P592.03)	Process input data: Network setpoint frequency (0.1) (Process data IN: Net.freq. 0.1) 0.0 ... [**0.0**] ... 599.0 Hz	Mappable parameter for specifying the frequency setpoint in [0.1 Hz] via network. • The specification is made without sign (irrespective of the rotating direction). • The rotating direction is specified via the control word. • Example: 456 ≡ 45.6 Hz
0x400B:004 (P592.04)	Process input data: Network setpoint speed (Process data IN: Net.setp. speed) 0 ... [**0**] ... 50000 rpm	Mappable parameter for specifying the setpoint as speed in [rpm] via network. • The specification is made without sign (irrespective of the rotating direction). • The rotating direction is specified via the control word. • Example: 456 ≡ 456 rpm
0x400B:005 (P592.05)	Process input data: Network setpoint frequency (0.01) (Process data IN: Net.freq. 0.01) 0.00 ... [**0.00**] ... 599.00 Hz	Mappable parameter for specifying the frequency setpoint in [0.01 Hz] via network. • The specification is made without sign (irrespective of the rotating direction). • The rotating direction is specified via the control word. • Example: 456 ≡ 4.56 Hz
0x400B:009 (P592.09)	Process input data: Torque scaling (Process data IN: Torque scaling) -128 ... [**0**] ... 127 • From version 02.00	Scaling factor for torque setpoint 0x400B:008 (P592.08) and actual torque value 0x400C:007 (P593.07) via network. • With the setting 0, no scaling takes place.
0x400B:012 (P592.12)	Process input data: Network setpoint frequency [0.02Hz] (Process data IN: NetSetfreq0.02Hz) -29950 ... [**0**] ... 29950 Hz • From version 04.00	Mappable parameter for specifying the frequency setpoint in [0.02 Hz] via network. • The specification is made without sign (irrespective of the rotating direction). • The rotating direction is specified via the control word. • Examples: 50 ≡ 1 Hz, 100 ≡ 2 Hz
0x400B:013 (P592.13)	Process input data: Network frequency setpoint [+/-16384] (Process data IN: N.FrqSet+/-16384) -32768 ... [**0**] ... 32767 • From version 05.00	Mappable parameter for specifying the frequency setpoint via network. • ±16384 ≡ ±100 % Maximum frequency 0x2916 (P211.00)
0x400C:003 (P593.03)	Process output data: Frequency (0.1) (Process data OUT: Frequency (0.1)) • Read only: x.x Hz	Mappable parameter for the output of the actual frequency value in [0.1 Hz] via network. • The output is effected without sign (irrespective of the rotating direction). • The rotating direction is specified via the status word. • Example: 456 ≡ 45.6 Hz



Parameter	Name / value range / [default setting]	Info
0x400C:004 (P593.04)	Process output data: Motor speed (Process data OUT: Motor speed) • Read only: x rpm	Mappable parameter for the output of the actual value as speed in [rpm] via network. • The output is effected without sign (irrespective of the rotating direction). • The rotating direction is specified via the status word. • Example: 456 ≡ 456 rpm
0x400C:005 (P593.05)	Process output data: Drive status (Process data OUT: Drive status) • Read only	Mappable status word (Modbus Legacy Register 2003).
	0 Error (non-resettable) active	
	1 Error active	
	2 Waiting for start	
	3 Identification not executed	
	4 Inverter disabled	
	5 Stop active	
	7 Identification active	
	8 Running	
	9 Acceleration active	
	10 Deceleration active	
	11 Deceleration override active	
	12 DC braking active	
	13 Flying start active	
	14 Current limit reached	
	16 Process controller idle state	
0x400C:006 (P593.06)	Process output data: Frequency (0.01) (Process data OUT: Frequency 0.01) • Read only: x.xx Hz	Mappable parameter for the output of the actual frequency value in [0.01 Hz] via network. • The output is effected without sign (irrespective of the rotating direction). • The rotating direction is specified via the status word. • Example: 456 ≡ 4.56 Hz
0x400C:007 (P593.07)	Process output data: Torque scaled (Process data OUT: Torque scaled) • Read only • From version 02.00	Mappable parameter for the output of the actual torque value in [Nm / $2^{\text{scaling factor}}$] via network. • The scaling factor can be set in 0x400B:009 (P592.09). • Actual torque value = scaled actual torque value (0x400C:007) / $2^{\text{scaling factor}}$ Example: • Scaled actual torque value (0x400C:007) = 345 [Nm] • Scaling factor (0x400B:009) = 3 • Actual torque value = 345 [Nm] / 2^3 = 43.125 [Nm]
0x400C:008 (P593.08)	Process output data: Frequency [0.02 Hz] (Process data OUT: Frequency 0.02Hz) • Read only: Hz • From version 04.00	Mappable parameter for the output of the actual frequency value in [0.02 Hz] via network. • The output is effected without sign (irrespective of the rotating direction). • The rotating direction is specified via the status word. • Examples: 50 ≡ 1 Hz, 100 ≡ 2 Hz
0x400C:009 (P593.09)	Process output data: Frequency [+/-16384] (Process data OUT: Freq. [+/-16384]) • Read only • From version 05.00	Mappable parameter for the output of the actual frequency value via network. • ±16384 ≡ ±100 % Maximum frequency 0x2916 (P211.00)

9.2.5 Parameter access monitoring (PAM)

The parameter access monitoring can be used as basic protection against a control loss of the inverter. Monitoring is triggered if a parameter write access to a certain index does not take place at regular intervals via the established communication connection.

Preconditions

This monitoring only works when the network control is activated.

Except for the keypad, the monitoring can be used for all communication connections, for instance:

- PC/Engineering Tool <--> inverter with USB module
- PC/Engineering Tool <--> inverter with WLAN module
- Controller <--> network <--> inverter with network option

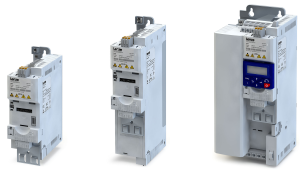
Details

For monitoring purposes, a non-zero value must be written into the "Keep-alive register" 0x2552:002 (P595.02) at regular intervals. The first write access with a non-zero value activates monitoring. The intervals between the write accesses must not be higher than the time-out time set in 0x2552:003 (P595.03). If no parameter write access takes place within the time-out time, monitoring is triggered: The response selected in 0x2552:005 (P595.05) takes place and the action selected in 0x2552:005 (P595.05). In addition, the status bit 1 in 0x2552:006 (P595.06) is set to "1".

The error status can be left by a normal "error reset". Since monitoring continues to be active and the time-out time is not reset by the error reset, the inverter immediately changes again to the error status. In order to prevent his, you have the following options:

a) Restore communication exchange.
b) Set the monitoring response in 0x2552:004 (P595.04) to "No response [0]" or "Warning [1]".
c) Change over to local or flexible control.

Parameter	Name / value range / [default setting]	Info
0x2552:002 (P595.02)	Parameter access monitoring: Keep alive register (PAM monitoring: Keep alive reg.) 0 ... [**0**] ... 65535 • From version 04.00	Register for cyclic parameter write accesses for monitoring the communication link. • If the setting is non-zero, the monitoring is active. • In order that the monitoring is not tripped, a non-zero value has to be entered into this index at regular intervals. The temporal distances of the write accesses must not be higher than the time-out time set in 0x2552:003 (P595.03).
0x2552:003 (P595.03)	Parameter access monitoring: Time-out time (PAM monitoring: Time-out time) 0.0 ... [**10.0**] ... 6553.5 s • From version 04.00	Maximum permitted time between two write accesses to the "keep-alive-register". In case of a time-out • the error response selected in 0x2552:004 (P595.04) is effected, • the action selected in 0x2552:005 (P595.05) is effected, • the status bit 1 in 0x2552:006 (P595.06) is set to "1".
0x2552:004 (P595.04)	Parameter access monitoring: Reaction (PAM monitoring: Reaction) • From version 04.00 • For further possible settings, see parameter 0x2D45:001 (P310.01). 223	Selection of the response to the triggering of the parameter access monitoring. Associated error code: • 33045 | 0x8115 - Time-out (PZÜ)
	0 **No response**	
0x2552:005 (P595.05)	Parameter access monitoring: Action (PAM monitoring: Action) • From version 04.00	Selection of the action to be executed if the parameter access monitoring is triggered.
	0 **No action**	
	1 Reserved	



Parameter	Name / value range / [default setting]		Info
0x2552:006 (P595.06)	Parameter access monitoring: Parameter Access Monitoring-Status (PAM monitoring: PAM status) • Read only • From version 04.00		Bit coded display of the status of parameter access monitoring.
	Bit 0	Monitoring activated	1 ≡ parameter access monitoring is active.
	Bit 1	Timeout	1 ≡ within the time-out time set in 0x2552:003 (P595.03), no successful parameter write access to the "keep-alive register" 0x2552:002 (P595.02) was made.
0x2552:007 (P595.07)	Parameter access monitoring: WLAN reset time-out time (PAM monitoring: WLAN reset t.out) 0 ... [**0**] ... 65535 s • From version 05.00		Time after which the WLAN network with the current settings of the WLAN parameters is restarted if no "keep alive" messages are received. • 0 s = function deactivated (no WLAN restart). • With a setting > 0 s and a time-out, the control units sets 0x2440 = "Restart with current values [1]".

9.2.6 Process data handling in case of error

If the inverter receives invalid process data, the inverter uses the process data received last (valid). You can optionally set that the contents of the process data in the inverter are set to the value "0" after invalid process data has been received.

> **i** The setting in 0x24E5:001 is independent of the response selected in 0x2859:005 if invalid process data has been received!
>
> If the application requires that the drive keeps moving with the last valid process data when receiving invalid process data, set the response "No response" or "Warning" in 0x2859:005. Moreover, the selection "Clear data [1]" must not be set in 0x24E5:001. Deleting the process data would stop the motor.

Parameter	Name / value range / [default setting]		Info
0x24E5:001	Process data handling in case of error: Procedure		Selection which process data the inverter is to use after receiving invalid process data.
	0	**Keep last data**	The last valid process data of the master are used.
	1	Clear data	The contents of the process data in the inverter is set to the value "0".

9.3 Acyclic data exchange

The acyclic data exchange is normally used for transmitting parameter data the transmission of which is not time-critical. Such parameter data are for example operating parameters, motor data, and diagnostic information.

Details

- The acyclic data exchange enables access to all parameters of the inverter.
- For all communication protocols except Modbus, the parameter is addressed directly via the index and subindex.
- The parameter attribute list contains a list of all inverter parameters. This list in particular includes some information that is relevant to the reading and writing of parameters via the network.

9.4 CANopen

CANopen® is an internationally approved communication protocol which is designed for commercial and industrial automation applications. High data transfer rates in connection with efficient data formatting provide for the coordination of motion control devices in multi-axis applications.

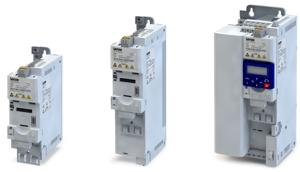
- Detailed information on CANopen can be found on the web page of the CAN in Automation (CiA) user organisation: http://www.can-cia.org
- Information about the dimensioning of a CANopen network can be found in the configuration document for the inverter.
- CANopen® is a registered community trademark of the CAN in Automation e. V user organisation.

Preconditions

- Control unit (CU) of the inverter is provided with CANopen.
- The DIP switches for node address, baud rate and bus terminating resistors are set correctly. See "Basic network settings" in the section ▶ CANopen 📖 64.
- The network is terminated by one bus terminating resistor each at the first and last node. See "Typical topologies" in the section ▶ CANopen 📖 64.
- The required EDS device description files for the inverters to be operated are loaded in the master.
    - Download of EDS files

9.4.1 Introduction

- The implementation of the CANopen communication profile (CiA DS301, version 4.02) enables baud rates of 20 kbps to 1 Mbps.
- For establishing a simple network connection, the inverter provides predefined control and status words for device profile CiA 402, AC-drive profile and in LECOMformat. Additionally, further mappable data words are provided to individually control the inverter.
- The inverter control is preconfigured via a CiA 402-compliant control word.



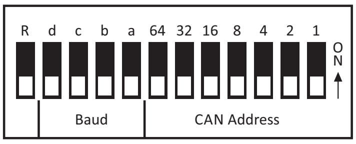
9.4.2 Node address setting

Each network node must be provided with a unique node address.

Details

- The node address of the inverter can be optionally set in 0x2301:001 (P510.01) or using the DIP switches on the device labelled with "1" ... "64".
- The setting that is active when the inverter is switched on is the effective setting.
- The labelling of the DIP switches corresponds to the values of the individual DIP switches for determining the node address (see the following example).
- The active node address is displayed in 0x2302:001 (P511.01).

View of the DIP switch



Example of how the node address is set via the DIP switches

DIP switch	64	32	16	8	4	2	1
Setting	OFF	OFF	**ON**	OFF	**ON**	**ON**	**ON**
Value	0	0	**16**	0	**4**	**2**	**1**
Node address	= sum of all values = 16 + 4 + 2 + 1 = **23**						

The parameters for addressing the device are described below.

Parameter	Name / value range / [default setting]	Info
0x2301:001 (P510.01)	CANopen settings: Node ID (CANopen sett.: Node ID) 1 ... [**1**] ... 127	Optionally setting of the node address (instead of setting via DIP switches 1 ... 64). • The node address set here only becomes effective if DIP switches 1 ... 64 have been set to OFF before mains switching. • A change in the node address will not be effective until a CAN Reset Node is performed.
0x2302:001 (P511.01)	Active CANopen settings: Active node ID (CANopen diag.: Active node ID) • Read only	Display of the active node address.
0x2303 (P509.00)	CANopen switch position (CANopen switch) • Read only	Display of the DIP switch setting at the last mains power-on.

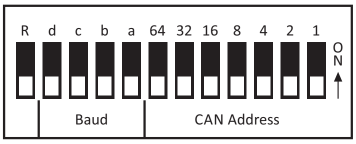
9.4.3 Baud rate setting

All network nodes must be set to the same baud rate.

Details

- The baud rate can be optionally set in 0x2301:002 (P510.02) or using the DIP switches on the device labelled with "a" ... "d" (see the following table).
- The setting that is active when the inverter is switched on is the effective setting.
- The active baud rate is displayed in 0x2302:002 (P511.02).

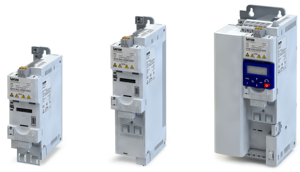
View of the DIP switch



d	c	b	a	Baud rate
OFF	ON	OFF	ON	20 kbps
OFF	OFF	ON	ON	50 kbps
OFF	OFF	ON	OFF	125 kbps
OFF	OFF	OFF	ON	250 kbps
OFF	**OFF**	**OFF**	**OFF**	**500 kbps**
OFF	ON	OFF	OFF	1 Mbps
When a combination is set that is not in the list, the baud rate is set to 500 kbps.				

The parameters for the baud rate of the device are described below.

Parameter	Name / value range / [default setting]		Info
0x2301:002 (P510.02)	CANopen settings: Baud rate (CANopen sett.: Baud rate)		Optionally, setting of the baud rate (instead of setting via DIP switches a ... d). • The parameterised baud rate is only effective if DIP switches a ... d and 1 ... 64 were set to before mains switching. • A change in the baud rate will not be effective until a CAN reset node is performed.
	0	Automatic (from version 03.00)	
	1	20 kbps	
	2	50 kbps	
	3	125 kbps	
	4	250 kbps	
	5	**500 kbps**	
	6	800 kbps	
	7	1 Mbps	
0x2302:002 (P511.02)	Active CANopen settings: Active baud rate (CANopen diag.: Active baud rate) • Read only		Display of the active baud rate.
	0	Automatic (from version 03.00)	
	1	20 kbps	
	2	50 kbps	
	3	125 kbps	
	4	250 kbps	
	5	500 kbps	
	6	800 kbps	
	7	1 Mbps	



9.4.4 Configure device as mini master

If the initialisation of the CANopen network and the associated status change from "Pre-Operational" to "Operational" is not effected by a higher-level host system, the inverter can instead be defined as a "mini" master to execute this task.

Details

The inverter is configured as mini master in 0x2301:003 (P510.03).

- In the default setting, the inverter is configured as slave and waits for the NMT telegram "Start Remote Node" from the master/host system after being switched on.
- Configured as mini master, the inverter changes to the "Operational" state after being switched on and sets all nodes connected to the CAN bus (broadcast telegram) to the "Operational" communication state using the "Start Remote Node" NMT telegram after the deceleration time set in 0x2301:004 (P510.04) has elapsed. Only this communication status enables data exchange via the process data objects.

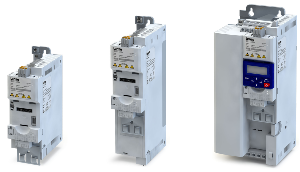
The change of the master/slave operation only becomes effective by renewed mains switching of the inverter or by sending the NMT telegram "Reset Node" or "Reset Communication" to the inverter. Alternatively, the CAN communication can be restarted via 0x2300 (P508.00). ▶ Restart communication 📖 278

Parameter	Name / value range / [default setting]		Info
0x2301:003 (P510.03)	CANopen settings: Slave/Master (CANopen sett.: Slave/Master)		1 = after mains switching, inverter starts as mini-master.
	0	**Slave**	
	1	Mini-master	
0x2301:004 (P510.04)	CANopen settings: Start remote delay (CANopen sett.: Start rem. delay) 0 ... [**3000**] ... 65535 ms		If the inverter has been defined as mini-master, a delay time can be set here, which has to elapse after mains switching before the inverter deposits the "Start Remote Node" NMT telegram on the CAN bus.

9.4.5 Diagnostics

For the purpose of diagnostics, the inverter provides several status words via which the CAN bus status, the CAN bus controller status, and the status of different time monitoring functions can be queried.

Parameter	Name / value range / [default setting]		Info
0x2307 (P515.00)	CANopen time-out status (Time-out status) • Read only		Bit-coded status display of the CAN time monitoring functions.
	Bit 0	RPDO1-Timeout	1 ≡ RPDO1 was not received within the monitoring time or not with the sync configured. • Status is reset automatically after the RPDO has been received again. • Setting of monitoring time for RPDO1 in 0x1400:005 (P540.05).
	Bit 1	RPDO2-Timeout	1 ≡ RPDO2 was not received within the monitoring time or not with the sync configured. • Status is reset automatically after the RPDO has been received again. • Setting of monitoring time for RPDO2 in 0x1401:005 (P541.05).
	Bit 2	RPDO3-Timeout	1 ≡ RPDO3 was not received within the monitoring time or not with the sync configured. • Status is reset automatically after the RPDO has been received again. • Setting of monitoring time for RPDO3 in 0x1402:005 (P542.05).
	Bit 8	Heartbeat-Timeout Consumer 1	1 ≡ within the "Heartbeat Consumer Time", no heartbeat telegram was received from node 1 to be monitored. • Status can only be reset by mains switching or error reset. • "Heartbeat Consumer Time" setting in 0x1016:001 (P520.01).
	Bit 9	Heartbeat-Timeout Consumer 2	1 ≡ within the "Heartbeat Consumer Time", no heartbeat telegram was received from node 2 to be monitored. • Status can only be reset by mains switching or error reset. • "Heartbeat Consumer Time" setting in 0x1016:002 (P520.02).
	Bit 10	Heartbeat-Timeout Consumer 3	1 ≡ within the "Heartbeat Consumer Time", no heartbeat telegram was received from node 3 to be monitored. • Status can only be reset by mains switching or error reset. • "Heartbeat Consumer Time" setting in 0x1016:003 (P520.03).
	Bit 11	Heartbeat-Timeout Consumer 4	1 ≡ within the "Heartbeat Consumer Time", no heartbeat telegram was received from node 4 to be monitored. • Status can only be reset by mains switching or error reset. • "Heartbeat Consumer Time" setting in 0x1016:004 (P520.04).
0x2308 (P516.00)	CANopen status (CANopen status) • Read only		Display of the current fieldbus state
	0	Initialisation	Fieldbus initialisation active. • The initialisation is started automatically at mains connection. During this phase, the inverter us not involved in the data exchange process on the CAN bus. • All CAN-relevant parameters are initialised with the saved settings. • When the initialisation process has been completed, the inverter automatically adopts the "Pre-Operational" state.
	1	Reset node	"Reset Node" NMT command active. • All parameters are initialised with the saved settings (not only the CAN-relevant parameters).
	2	Reset communication	"Reset Communication" NMT command active. • Initialisation of all CAN-relevant parameters with the values stored.
	4	Stopped	Only network management telegrams can be received.
	5	Operational	Parameter data and process data can be received. If defined, process data is sent as well.
	127	Pre-Operational	Parameter data can be received, process data are ignored.



Parameter	Name / value range / [default setting]		Info
0x2309 (P517.00)	CANopen controller status (CAN contr.status) • Read only		Status display of the internal CANopen controller.
	1	Error active	The inverter is a fully-fledged communication node at the CANopen network. It is able to transmit and receive data and to report faults.
	2	Error passive	The inverter can only passively indicate faulty reception via the ACK field.
	3	Bus off	The inverter is electrically separated from the CANopen network. In order to exit this state, the CANopen interface must be reset. An automatic restart is implemented.

9.4.6 Emergency telegram

If the error status changes when an internal device error occurs or is remedied, an emergency telegram is sent to the NMT master once.

Details

- The identifier for the emergency telegram is fixedly defined and is shown in 0x1014.
- In 0x1015, a blocking time can be set, in order to limit the bus load in the case of emergency telegrams following quickly in succession.

Parameter	Name / value range / [default setting]	Info
0x1014	COB-ID EMCY • Read only	Display of the identifier for emergency telegrams.
0x1015	Inhibit time EMCY 0.0 ... [**0.0**] ... 6553.5 ms	Blocking time which can be set in order to limit the bus load in the case of emergency telegrams following quickly in succession.

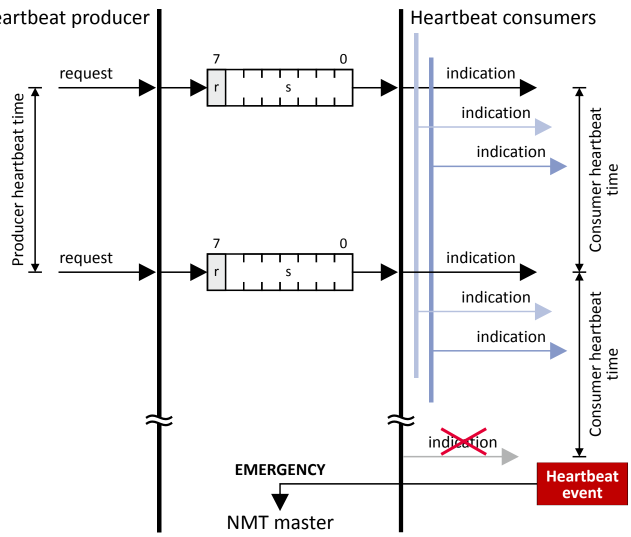
9.4.7 Heartbeat protocol

The heartbeat protocol can be used for node monitoring purposes within a CAN network.

Details

Basic procedure:

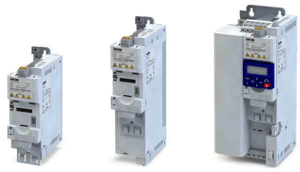
1. A heartbeat producer cyclically sends a heartbeat telegram to one or several receivers (consumers).
2. The consumer(s) monitor(s) the heartbeat telegram for arrival on a regular basis.



The inverter can be configured as producer or as consumer to monitor up to four other nodes.

Parameter	Name / value range / [default setting]	Info
0x1016:000 (P520.00)	Consumer heartbeat time: Highest sub-index supported (Cons. heartbeat: Highest subindex) • Read only	Highest subindex, permanently set to 4. Corresponds at the same time to the maximum possible number of nodes to be monitored.

Parameter	Name / value range / [default setting]	Info
0x1016:001 (P520.01)	Consumer heartbeat time: Consumer heartbeat time 1 (Cons. heartbeat: Cons. heartbeat1) 0x00000000 ... [**0x00000000**] ... 0x00FFFFFF	Node ID and heartbeat time of node 1 which is to be monitored. • Format: 0x00nnhhhh (nn = node ID, hhhh = heartbeat time in [ms])
0x1016:002 (P520.02)	Consumer heartbeat time: Consumer heartbeat time 2 (Cons. heartbeat: Cons. heartbeat2) 0x00000000 ... [**0x00000000**] ... 0x00FFFFFF	Node ID and heartbeat time of node 2 which is to be monitored. • Format: 0x00nnhhhh (nn = node ID, hhhh = heartbeat time in [ms])
0x1016:003 (P520.03)	Consumer heartbeat time: Consumer heartbeat time 3 (Cons. heartbeat: Cons. heartbeat3) 0x00000000 ... [**0x00000000**] ... 0x00FFFFFF	Node ID and heartbeat time of node 3 which is to be monitored. • Format: 0x00nnhhhh (nn = node ID, hhhh = heartbeat time in [ms])
0x1016:004 (P520.04)	Consumer heartbeat time: Consumer heartbeat time 4 (Cons. heartbeat: Cons. heartbeat4) 0x00000000 ... [**0x00000000**] ... 0x00FFFFFF	Node ID and heartbeat time of node 4 which is to be monitored. • Format: 0x00nnhhhh (nn = node ID, hhhh = heartbeat time in [ms])
0x1017 (P522.00)	Producer heartbeat time (Prod. heartbeat) 0 ... [**0**] ... 65535 ms	Time interval for the transmission of the heartbeat telegram to the consumer(s). • The heartbeat telegram is sent automatically as soon as a time > 0 ms is set. • The set time is internally rounded up to the next multiple of 10 ms.



9.4.8 Process data objects

Process data objects (PDOs) are used for the cyclic transmission of (process) data via CAN-open. PDOs only contain data and an identifier. They do not contain any information about the sender or receiver and are therefore very efficient.

Details

- Process data objects which the inverter receives via the network are referred to as "Receive PDOs" (RPDOs).
- Process data objects which the inverter sends via the network are referred to as "Transmit PDOs" (TPDOs).
- The maximum length of a PDO is 8 bytes (4 data words).
- Each PDO requires a unique identifier ("COB-ID") for the purpose of identification within the network.
- Communication parameters such as the transmission type and cycle time for each PDO can be set freely and independently of the settings of other PDOs

Transmission type

Process data objects can be transmitted in an event-controlled or time-controlled manner. The below table shows that it is possible to combine the different methods by means of logic operations (AND, OR):

- Event-controlled: The PDO is sent if a special device-internal event has occurred, for instance, if the data contents of the TPDO have changed or if a transmission cycle time has elapsed.
- Synchronous transmission: Transmission of a TPDOs or reception of an RPDO is effected after the inverter has received a sync telegram (COB-ID 0x80).
- Cyclic transmission: The cyclic transmission of PDOs is effected when the transmission cycle time has elapsed.
- Polled via RTR: Transmission of a TPDO is carried out on request by another device via data request frame (RTR remote transmit request). For this, the data requester (e.g. master) sends the data request frame with the COB-ID of the TPDO that is to be requested to transmit. The receiver recognises the RTR and carries out the transmission.

Transmission type	PDO transmission			Logic combination of different transmission types
	cyclic	synchronous	event-controlled	
0		●	●	AND
1 ... 240		●		-
254, 255	●		●	OR

Transmission type	Description
0	Synchronous and acyclic • The PDO is transmitted on an event-controlled basis with every sync (e.g. when a bit change occurs in the PDO).
1 ... 240	Synchronous and cyclic (sync-controlled with a response) • Selection n = 1: The PDO is transmitted with every sync. • Selection 1 < n ≤ 240: The PDO is transmitted with every n-th sync.
241 ... 251	Reserved
252	Synchronous - RTR only
253	Asynchronous - RTR only
254, 255	Asynchronous - manufacturer-specific / device profile-specific • If one of these values is entered, the PDO is transferred in an event-controlled or cyclic manner. (The values "254" and "255" are equivalent). • For a cyclic transmission, a cycle time must be entered for the respective PDO. In this case, cyclic transmission takes place in addition to event-controlled transmission.

Synchronisation of PDOs via sync telegram

During cyclic transmission, one or more PDOs are transmitted/received in fixed time intervals. An additional specific telegram, the so-called sync telegram, is used for synchronising cyclic process data.

- The sync telegram is the trigger point for the transmission of process data from the slaves to the master and for the acceptance of process data from the master in the slaves.
- For sync-controlled process data processing, the sync telegram must be generated accordingly.
- The response to a sync telegram is determined by the transmission type selected.

Generating the sync telegram:

- 0x1005 can be used to activate the generation of sync telegrams and to write the identifier value.
- Sync telegrams are created when bit 30 (see below) is set to "1".
- The interval between sync telegrams is to be set in 0x1006.

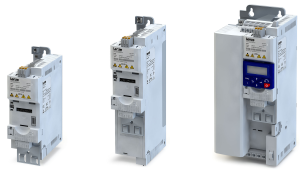
Writing identifiers:

- To receive sync telegrams, the value 0x80 must be entered in the 11-bit identifier in the default setting (and in compliance with the CANopen specification). This means that all inverters are set to the same sync telegram by default.
- If sync telegrams are only to be received by specific nodes, their identifiers can be entered with a value of up to and including 0x07FF.
- The identifier can only be changed if the inverter does not send any sync telegrams (0x1005, Bit 30 = "0").

Data telegram assignment

<table>
<tr><th colspan="3">8th byte (data 4)</th><th>7th byte (data 3)</th><th colspan="2">6th byte (data 2)</th><th>5th byte (data 1)</th></tr>
<tr><td>Bit 31</td><td>Bit 30</td><td colspan="3">Bit 29 ... bit 11</td><td colspan="2">Bit 10 ... bit 0</td></tr>
<tr><td>x</td><td>0/1</td><td colspan="3">Extended identifier*</td><td colspan="2">11-bit identifier</td></tr>
<tr><td colspan="7">* The extended identifier is not supported. Bit 11 ... bit 29 must be set to "0".</td></tr>
</table>

Parameter	Name / value range / [default setting]	Info
0x1005	COB-ID SYNC 0x00000000 ... [**0x00000080**] ... 0xFFFFFFFF	Identifier for sync telegram. How to change the identifier: 1. Deactivate Sync: Set bit 30 to "0". 2. Change identifier. 3. Activate Sync: Set bit 30 to "1".
0x1006	Communication cyclic period 0 ... [**0**] ... 65535000 us	Cycle time for sync telegrams. • With the setting "0", no sync telegrams are generated. • The set time is internally rounded up to the next multiple of 10 ms. The shortest possible cycle time thus is 10 ms.
0x1400:000	RPDO1 communication parameter: Highest sub-index supported • Read only	
0x1400:001 (P540.01)	RPDO1 communication parameter: COB-ID (RPDO1 config.: COB-ID) 0x00000000 ... [**0x00000200**] ... 0xFFFFFFFF	RPDO1: identifier How to change the identifier: 1. Set PDO to "invalid": Set bit 31 to "1". 2. Change identifier and reset PDO to "valid" (bit 31 = "0").
	Bit 0 — COB-ID bit 0	
	Bit 1 — COB-ID bit 1	
	Bit 2 — COB-ID bit 2	
	Bit 3 — COB-ID bit 3	
	Bit 4 — COB-ID bit 4	
	Bit 5 — COB-ID bit 5	
	Bit 6 — COB-ID bit 6	
	Bit 7 — COB-ID bit 7	
	Bit 8 — COB-ID bit 8	
	Bit 9 — COB-ID bit 9	
	Bit 10 — COB-ID bit 10	
	Bit 31 — PDO invalid	



Parameter	Name / value range / [default setting]	Info
0x1400:002 (P540.02)	RPDO1 communication parameter: Transmission type (RPDO1 config.: Transm. type) 0 ... **[255]** ... 255	RPDO1: transmission type in compliance with DS301 V4.02
0x1400:005 (P540.05)	RPDO1 communication parameter: Event timer (RPDO1 config.: Event timer) 0 ... **[100]** ... 65535 ms	RPDO1: time-out for the monitoring of data reception.
0x1401:001 (P541.01)	RPDO2 communication parameter: COB-ID (RPDO2 config.: COB-ID) 0x00000000 ... **[0x80000300]** ... 0xFFFFFFFF	RPDO2: identifier How to change the identifier: 1. Set PDO to "invalid": Set bit 31 to "1". 2. Change identifier and reset PDO to "valid" (bit 31 = "0").
	Bit 0 COB-ID bit 0	
	Bit 1 COB-ID bit 1	
	Bit 2 COB-ID bit 2	
	Bit 3 COB-ID bit 3	
	Bit 4 COB-ID bit 4	
	Bit 5 COB-ID bit 5	
	Bit 6 COB-ID bit 6	
	Bit 7 COB-ID bit 7	
	Bit 8 COB-ID bit 8	
	Bit 9 COB-ID bit 9	
	Bit 10 COB-ID bit 10	
	Bit 31 PDO invalid	
0x1401:002 (P541.02)	RPDO2 communication parameter: Transmission type (RPDO2 config.: Transm. type) 0 ... **[255]** ... 255	RPDO2: transmission type in compliance with DS301 V4.02
0x1401:005 (P541.05)	RPDO2 communication parameter: Event timer (RPDO2 config.: Event timer) 0 ... **[100]** ... 65535 ms	RPDO2: time-out for the monitoring of data reception.
0x1402:001 (P542.01)	RPDO3 communication parameter: COB-ID (RPDO3 config.: COB-ID) 0x00000000 ... **[0x80000400]** ... 0xFFFFFFFF	RPDO3: identifier How to change the identifier: 1. Set PDO to "invalid": Set bit 31 to "1". 2. Change identifier and reset PDO to "valid" (bit 31 = "0").
	Bit 0 COB-ID bit 0	
	Bit 1 COB-ID bit 1	
	Bit 2 COB-ID bit 2	
	Bit 3 COB-ID bit 3	
	Bit 4 COB-ID bit 4	
	Bit 5 COB-ID bit 5	
	Bit 6 COB-ID bit 6	
	Bit 7 COB-ID bit 7	
	Bit 8 COB-ID bit 8	
	Bit 9 COB-ID bit 9	
	Bit 10 COB-ID bit 10	
	Bit 31 PDO invalid	
0x1402:002 (P542.02)	RPDO3 communication parameter: Transmission type (RPDO3 config.: Transm. type) 0 ... **[255]** ... 255	RPDO3: transmission type in compliance with DS301 V4.02
0x1402:005 (P542.05)	RPDO3 communication parameter: Event timer (RPDO3 config.: Event timer) 0 ... **[100]** ... 65535 ms	RPDO3: time-out for the monitoring of data reception.
0x1800:000	TPDO1 communication parameter: Highest sub-index supported • Read only	The value "5" is permanently set.

Parameter	Name / value range / [default setting]	Info
0x1800:001 (P550.01)	TPDO1 communication parameter: COB-ID (TPDO1 config.: COB-ID) 0x00000001 ... [**0x40000180**] ... 0xFFFFFFFF	TPDO1: identifier How to change the identifier: 1. Set PDO to "invalid": Set bit 31 to "1". 2. Change identifier and reset PDO to "valid" (bit 31 = "0").
	Bit 0 COB-ID bit 0	
	Bit 1 COB-ID bit 1	
	Bit 2 COB-ID bit 2	
	Bit 3 COB-ID bit 3	
	Bit 4 COB-ID bit 4	
	Bit 5 COB-ID bit 5	
	Bit 6 COB-ID bit 6	
	Bit 7 COB-ID bit 7	
	Bit 8 COB-ID bit 8	
	Bit 9 COB-ID bit 9	
	Bit 10 COB-ID bit 10	
	Bit 30 RTR not allowed	
	Bit 31 PDO invalid	
0x1800:002 (P550.02)	TPDO1 communication parameter: Transmission type (TPDO1 config.: Transm. type) 0 ... [**255**] ... 255	TPDO1: transmission type in compliance with DS301 V4.02
0x1800:003 (P550.03)	TPDO1 communication parameter: Inhibit time (TPDO1 config.: Inhibit time) 0.0 ... [**0.0**] ... 6553.5 ms	TPDO1: minimum time between the transmission of two identical PDOs (see DS301 V4.02).
0x1800:005 (P550.05)	TPDO1 communication parameter: Event timer (TPDO1 config.: Event timer) 0 ... [**20**] ... 65535 ms	TPDO1: Cycle time for PDO transmission with transmission type "254" or "255". • The set time is internally rounded up to the next multiple of 10 ms.
0x1801:000	TPDO2 communication parameter: Highest sub-index supported • Read only	The value "5" is permanently set.
0x1801:001 (P551.01)	TPDO2 communication parameter: COB-ID (TPDO2 config.: COB-ID) 0x00000001 ... [**0xC0000280**] ... 0xFFFFFFFF	TPDO2: identifier How to change the identifier: 1. Set PDO to "invalid": Set bit 31 to "1". 2. Change identifier and reset PDO to "valid" (bit 31 = "0").
	Bit 0 COB-ID bit 0	
	Bit 1 COB-ID bit 1	
	Bit 2 COB-ID bit 2	
	Bit 3 COB-ID bit 3	
	Bit 4 COB-ID bit 4	
	Bit 5 COB-ID bit 5	
	Bit 6 COB-ID bit 6	
	Bit 7 COB-ID bit 7	
	Bit 8 COB-ID bit 8	
	Bit 9 COB-ID bit 9	
	Bit 10 COB-ID bit 10	
	Bit 30 RTR not allowed	
	Bit 31 PDO invalid	
0x1801:002 (P551.02)	TPDO2 communication parameter: Transmission type (TPDO2 config.: Transm. type) 0 ... [**255**] ... 255	TPDO2: transmission type in compliance with DS301 V4.02
0x1801:003 (P551.03)	TPDO2 communication parameter: Inhibit time (TPDO2 config.: Inhibit time) 0.0 ... [**0.0**] ... 6553.5 ms	TPDO2: minimum time between the transmission of two identical PDOs (see DS301 V4.02).
0x1801:005 (P551.05)	TPDO2 communication parameter: Event timer (TPDO2 config.: Event timer) 0 ... [**0**] ... 65535 ms	TPDO2: Cycle time for PDO transmission with transmission type "254" or "255". • The set time is internally rounded up to the next multiple of 10 ms.
0x1802:000	TPDO3 communication parameter: Highest sub-index supported • Read only	The value "5" is permanently set.

Parameter	Name / value range / [default setting]		Info
0x1802:001 (P552.01)	TPDO3 communication parameter: COB-ID (TPDO3 config.: COB-ID) 0x00000001 ... [**0xC0000380**] ... 0xFFFFFFFF		TPDO3: identifier How to change the identifier: 1. Set PDO to "invalid": Set bit 31 to "1". 2. Change identifier and reset PDO to "valid" (bit 31 = "0").
	Bit 0	COB-ID bit 0	
	Bit 1	COB-ID bit 1	
	Bit 2	COB-ID bit 2	
	Bit 3	COB-ID bit 3	
	Bit 4	COB-ID bit 4	
	Bit 5	COB-ID bit 5	
	Bit 6	COB-ID bit 6	
	Bit 7	COB-ID bit 7	
	Bit 8	COB-ID bit 8	
	Bit 9	COB-ID bit 9	
	Bit 10	COB-ID bit 10	
	Bit 30	RTR not allowed	
	Bit 31	PDO invalid	
0x1802:002 (P552.02)	TPDO3 communication parameter: Transmission type (TPDO3 config.: Transm. type) 0 ... [**255**] ... 255		TPDO3: transmission type in compliance with DS301 V4.02
0x1802:003 (P552.03)	TPDO3 communication parameter: Inhibit time (TPDO3 config.: Inhibit time) 0.0 ... [**0.0**] ... 6553.5 ms		TPDO3: minimum time between the transmission of two identical PDOs (see DS301 V4.02).
0x1802:005 (P552.05)	TPDO3 communication parameter: Event timer (TPDO3 config.: Event timer) 0 ... [**0**] ... 65535 ms		TPDO3: Cycle time for PDO transmission with transmission type "254" or "255". • The set time is internally rounded up to the next multiple of 10 ms.
0x2301:006 (P510.06)	CANopen settings: COB-ID Configuration (CANopen sett.: COB-ID Config) • From version 03.00		Selection of the process for assigning the identifiers. Irrespective of this selection, these are the following bits of the identifiers: • Bit 30: "RTR not allowed" (only in case of TPDO) • Bit 31: "PDO invalid"
	0	**Base + node-ID**	Identifier = set (basic) identifiers + set node address
	1	Freely configurable	Identifier = set identifiers

9.4.9 Data mapping

Data mapping serves to define which process data are transmitted cyclically via the process data channels.

Details

Data mapping (in the case of CANopen also referred to as "PDO mapping") is preconfigured for control of the inverter via the device profile CiA 402:

- RPDO1 = CiA 402 control word 0x6040 and Target velocity 0x6042 (P781.00).
- TPDO1 = CiA 402 status word 0x6041 (P780.00) and Velocity actual value 0x6044 (P783.00).

Variable PDO mapping

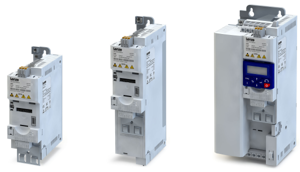
For individual drive solutions, the inverter supports "variable PDO mapping", providing 8 mapping entries in each case to assign 8-bit, 16-bit, and 32-bit parameters to a PDO in an optional order. The total length of the parameters mapped, however, must not exceed 8 bytes.

The process of PDO mapping cannot be applied to all parameters. The mappable parameters are marked correspondingly in the parameter attribute list.

The process of variable PDO mapping only allows the following procedure:

1. Set PDO to "invalid": set bit 31 in the corresponding identifier (0x1400:1 ... 0x1402:1 or 0x1800:1 ... 0x1802:1) to "1".
2. Set PDO mapping to "invalid": Set subindex 0 in the mapping parameter (0x1600 ... 0x1602 or 0x1A00 ... 0x1A02) to "0".
3. Set desired PDO mapping via the corresponding mapping entries.
   format: 0xiiiissll (iiii = hexadecimal index, ss = hexadecimal subindex, ll = hexadecimal data length)
4. Set subindex 0 in the mapping parameter (0x1600 ... 0x1602 or 0x1A00 ... 0x1A02) to a valid value (number of parameters mapped).
5. Reset PDO to "valid": set bit 31 in the corresponding identifier (0x1400:1 ... 0x1402:1 or 0x1800:1 ... 0x1802:1) to "0".

Parameter	Name / value range / [default setting]	Info
0x1600:000	RPDO1 mapping parameter: Number of mapped application objects in PDO 0 ... [**2**] ... 8	Number of objects mapped in RPDO1.
0x1600:001	RPDO1 mapping parameter: Application object 1 0x00000000 ... [**0x60400010**] ... 0xFFFFFFFF	Mapping entry 1 for RPDO1.
0x1600:002	RPDO1 mapping parameter: Application object 2 0x00000000 ... [**0x60420010**] ... 0xFFFFFFFF	Mapping entry 2 for RPDO1.
0x1600:003	RPDO1 mapping parameter: Application object 3 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 3 for RPDO1.
0x1600:004	RPDO1 mapping parameter: Application object 4 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 4 for RPDO1.
0x1600:005	RPDO1 mapping parameter: Application object 5 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 5 for RPDO1.
0x1600:006	RPDO1 mapping parameter: Application object 6 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 6 for RPDO1.
0x1600:007	RPDO1 mapping parameter: Application object 7 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 7 for RPDO1.
0x1600:008	RPDO1 mapping parameter: Application object 8 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 8 for RPDO1.
0x1601:000	RPDO2 mapping parameter: Number of mapped application objects in PDO 0 ... [**0**] ... 8	Number of objects mapped in RPDO2.
0x1601:001	RPDO2 mapping parameter: Application object 1 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 1 for RPDO2.
0x1601:002	RPDO2 mapping parameter: Application object 2 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 2 for RPDO2.



Parameter	Name / value range / [default setting]	Info
0x1601:003	RPDO2 mapping parameter: Application object 3 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 3 for RPDO2.
0x1601:004	RPDO2 mapping parameter: Application object 4 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 4 for RPDO2.
0x1601:005	RPDO2 mapping parameter: Application object 5 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 5 for RPDO2.
0x1601:006	RPDO2 mapping parameter: Application object 6 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 6 for RPDO2.
0x1601:007	RPDO2 mapping parameter: Application object 7 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 7 for RPDO2.
0x1601:008	RPDO2 mapping parameter: Application object 8 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 8 for RPDO2.
0x1602:000	RPDO3 mapping parameter: Number of mapped application objects in PDO 0 ... [**0**] ... 8	Number of objects mapped in RPDO3.
0x1602:001	RPDO3 mapping parameter: Application object 1 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 1 for RPDO3.
0x1602:002	RPDO3 mapping parameter: Application object 2 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 2 for RPDO3.
0x1602:003	RPDO3 mapping parameter: Application object 3 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 3 for RPDO3.
0x1602:004	RPDO3 mapping parameter: Application object 4 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 4 for RPDO3.
0x1602:005	RPDO3 mapping parameter: Application object 5 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 5 for RPDO3.
0x1602:006	RPDO3 mapping parameter: Application object 6 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 6 for RPDO3.
0x1602:007	RPDO3 mapping parameter: Application object 7 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 7 for RPDO3.
0x1602:008	RPDO3 mapping parameter: Application object 8 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 8 for RPDO3.
0x1A00:000	TPDO1 mapping parameter: Number of mapped application objects in TPDO 0 ... [**2**] ... 8	Number of objects mapped in TPDO1.
0x1A00:001	TPDO1 mapping parameter: Application object 1 0x00000000 ... [**0x60410010**] ... 0xFFFFFFFF	Mapping entry 1 for TPDO1.
0x1A00:002	TPDO1 mapping parameter: Application object 2 0x00000000 ... [**0x60440010**] ... 0xFFFFFFFF	Mapping entry 2 for TPDO1.
0x1A00:003	TPDO1 mapping parameter: Application object 3 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 3 for TPDO1.
0x1A00:004	TPDO1 mapping parameter: Application object 4 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 4 for TPDO1.
0x1A00:005	TPDO1 mapping parameter: Application object 5 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 5 for TPDO1.
0x1A00:006	TPDO1 mapping parameter: Application object 6 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 6 for TPDO1.
0x1A00:007	TPDO1 mapping parameter: Application object 7 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 7 for TPDO1.
0x1A00:008	TPDO1 mapping parameter: Application object 8 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 8 for TPDO1.
0x1A01:000	TPDO2 mapping parameter: Number of mapped application objects in TPDO 0 ... [**0**] ... 8	Number of objects mapped in TPDO2.
0x1A01:001	TPDO2 mapping parameter: Application object 1 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 1 for TPDO2.
0x1A01:002	TPDO2 mapping parameter: Application object 2 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 2 for TPDO2.
0x1A01:003	TPDO2 mapping parameter: Application object 3 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 3 for TPDO2.
0x1A01:004	TPDO2 mapping parameter: Application object 4 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 4 for TPDO2.

Parameter	Name / value range / [default setting]	Info
0x1A01:005	TPDO2 mapping parameter: Application object 5 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 5 for TPDO2.
0x1A01:006	TPDO2 mapping parameter: Application object 6 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 6 for TPDO2.
0x1A01:007	TPDO2 mapping parameter: Application object 7 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 7 for TPDO2.
0x1A01:008	TPDO2 mapping parameter: Application object 8 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 8 for TPDO2.
0x1A02:000	TPDO3 mapping parameter: Number of mapped application objects in TPDO 0 ... [**0**] ... 8	Number of objects mapped in TPDO3.
0x1A02:001	TPDO3 mapping parameter: Application object 1 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 1 for TPDO3.
0x1A02:002	TPDO3 mapping parameter: Application object 2 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 2 for TPDO3.
0x1A02:003	TPDO3 mapping parameter: Application object 3 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 3 for TPDO3.
0x1A02:004	TPDO3 mapping parameter: Application object 4 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 4 for TPDO3.
0x1A02:005	TPDO3 mapping parameter: Application object 5 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 5 for TPDO3.
0x1A02:006	TPDO3 mapping parameter: Application object 6 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 6 for TPDO3.
0x1A02:007	TPDO3 mapping parameter: Application object 7 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 7 for TPDO3.
0x1A02:008	TPDO3 mapping parameter: Application object 8 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entry 8 for TPDO3.

9.4.10 Service data objects

Service data objects (SDOs) make it possible to read and write all parameters of the inverter via CANopen.

Details

- Two independent SDO channels are provided at the same time. SDO channel 1 is always active. SDO channel 2 can be activated via 0x2301:005 (P510.05).
- An SDO is always transmitted with confirmation, i. e. the reception of an SDO frame is acknowledged by the receiver.
- The identifiers for SDO1 and SDO2 are generated from the basic identifier (in compliance with the "Predefined Connection Set") and the node address set:

Object	Direction		Identifier
	to the device	from the device	
SDO1	●		Basic identifier 0x600 + node address
		●	Basic identifier 0x580 + node address
SDO2	●		Basic identifier 0x640 + node address
		●	Basic identifier 0x5C0 + node address

Structure of the SDO frame user data

The user data are shown in Motorola format:

1st byte	2nd byte	3rd byte	4th byte	5th byte	6th byte	7th byte	8th byte
Command	Index		Subindex	Data 1	Data 2	Data 3	Data 4
See table below.	LOW byte	HIGH byte		LOW word		HIGH word	
	Address of the parameter to be read or written.			LOW byte	HIGH byte	LOW byte	HIGH byte

The following commands can be transmitted or received for writing and reading the parameters:

Command	1st byte		Data length	Info
	hex	dec		
Write request	0x23	35	4 bytes	Writing of a parameter to the inverter.
	0x2B	43	2 bytes	
	0x2F	47	1 byte	
	0x21	33	Block	
Write response	0x60	96	4 bytes	Inverter acknowledges a write request.
Read request	0x40	64	4 bytes	Reading of a parameter from the inverter.
Read response	0x43	67	4 bytes	Inverter response to a read request with the current parameter value.
	0x4B	75	2 bytes	
	0x4F	79	1 byte	
	0x41	65	Block	
Error response	0x80	128	4 bytes	Inverter response to the incorrect execution of the read/write request.

More precisely, the command byte comprises the following information:

Command	1st byte							
	Command specifier (cs)			Toggle (t)	Length*		e	s
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Write request	0	0	1	0	0/1	0/1	1	1
Write response	0	1	1	0	0	0	0	0
Read request	0	1	0	0	0	0	0	0
Read response	0	1	0	0	0/1	0/1	1	1
Error response	1	0	0	0	0	0	0	0

*Bit coding of the length: 00 = 4 bytes, 01 = 3 bytes, 10 = 2 bytes, 11 = 1 byte
e: expedited (shortened block service)
s: segmented (normal block service)

More commands are defined in the DS301 V4.02 CANopen specification (e. g. segmented transfer).

Maximally 4 bytes are available for parameter value entries. Depending on the data format, they are assigned as follows:

<table>
<tr><th>5th byte</th><th>6th byte</th><th>7th byte</th><th>8th byte</th></tr>
<tr><td>Parameter value (1 byte)</td><td>0x00</td><td>0x00</td><td>0x00</td></tr>
<tr><td colspan="2">Parameter value (2 bytes)</td><td rowspan="2">0x00</td><td rowspan="2">0x00</td></tr>
<tr><td>LOW byte</td><td>HIGH byte</td></tr>
<tr><td colspan="4">Parameter value (4 bytes)</td></tr>
<tr><td colspan="2">LOW word</td><td colspan="2">HIGH word</td></tr>
<tr><td>LOW byte</td><td>HIGH byte</td><td>LOW byte</td><td>HIGH byte</td></tr>
</table>

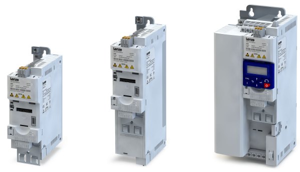
The parameter attribute list in the annex also specifies a scaling factor. The scaling factor is relevant to the transmission of parameter values which are represented with one or several decimal positions in the parameter list. If the scaling factor is > 1, before the transmission, the value must be multiplied with the scaling factor specified, so that the value can be transferred completely (as an integer value). On the SDO-client side, the integer value must then be divided by the scaling factor again, in order to receive the original value with decimal positions.

Parameter	Name / value range / [default setting]	Info
0x1200:000	SDO1 server parameter: Highest sub-index supported • Read only	
0x1200:001	SDO1 server parameter: COB-ID client -> server (rx) • Read only	Display of the receive identifier for SDO server channel 1 (basic SDO channel). • According to DS301 V4.02, the basic SDO channel can neither be changed nor deactivated.
0x1200:002	SDO1 server parameter: COB-ID server -> client (tx) • Read only	Display of the transmit identifier for SDO server channel 1 (basic SDO channel). • According to DS301 V4.02, the basic SDO channel can neither be changed nor deactivated.
0x1201:000	SDO2 server parameter: Highest sub-index supported • Read only	
0x1201:001	SDO2 server parameter: COB-ID client -> server (rx) 0x00000000 ... [**0x80000640**] ... 0xFFFFFFFF	Specification of the receive identifier for SDO server channel 2. • If SDO server channel 2 is activated via 0x2301:005 (P510.05), this parameter is set to the value "node address + 0x640". This default setting can be changed.
0x1201:002	SDO2 server parameter: COB-ID server -> client (tx) 0x00000000 ... [**0x800005C0**] ... 0xFFFFFFFF	Specification of the transmit identifier for SDO server channel 2. • If SDO server channel 2 is activated via 0x2301:005 (P510.05), this parameter is set to the value "node address + 0x5C0". This default setting can be changed.
0x1201:003	SDO2 server parameter: Node-ID of the SDO client 1 ... [**0**] ... 127	Specification of the node address for the SDO client.
0x2301:005 (P510.05)	CANopen settings: Activate SDO2 channel (CANopen sett.: SDO2 channel) **0** **Not active** 1 Active	1 = activate SDO server channel 2.

9.4.11 Error responses

The response to CANopen errors such as missing PDOs or heartbeat frames can be configured via the following parameters.

Parameter	Name / value range / [default setting]	Info
0x1029:000	Error behavior: Highest sub-index supported • Read only	



Parameter	Name / value range / [default setting]	Info
0x1029:001	Error behavior: Communication error	Selection of the NMT state to which the inverter is to change automatically if a failure of a CANopen node or an internal error is detected in the "Operational" state. These also include the following communication errors: • Change-over of the CAN interface to the "Bus-off" state. • Occurrence of a "Heartbeat Event".
	0 **Status -> Pre-operational**	In the "Pre-operational" state, network management, sync, and emergency telegrams as well as parameter data can be received; process data, however, are ignored.
	1 No status change	
	2 Status -> Stopped	In the "Stopped" state, only network management telegrams can be received.
0x2857:001	CANopen monitoring: RPDO1-Timeout • For further possible settings, see parameter 0x2D45:001 (P310.01). 223 3 **Fault**	Selection of the response to triggering the RPDO1 time monitoring. Associated error code: • 33425 | 0x8291 - CAN: RPDO1 time-out
0x2857:002	CANopen monitoring: RPDO2-Timeout • For further possible settings, see parameter 0x2D45:001 (P310.01). 223 3 **Fault**	Selection of the response to triggering the RPDO2 time monitoring. Associated error code: • 33426 | 0x8292 - CAN: RPDO2 time-out
0x2857:003	CANopen monitoring: RPDO3-Timeout • For further possible settings, see parameter 0x2D45:001 (P310.01). 223 3 **Fault**	Selection of the response to triggering the RPDO3 time monitoring. Associated error code: • 33427 | 0x8293 - CAN: RPDO3 time-out
0x2857:005	CANopen monitoring: Heartbeat-Timeout Consumer 1 • For further possible settings, see parameter 0x2D45:001 (P310.01). 223 3 **Fault**	Selection of the response with "Heartbeat Event" in consumer 1. Associated error code: • 33156 | 0x8184 - CAN: heartbeat time-out consumer 1
0x2857:006	CANopen monitoring: Heartbeat-Timeout Consumer 2 • For further possible settings, see parameter 0x2D45:001 (P310.01). 223 3 **Fault**	Selection of the response with "Heartbeat Event" in consumer 2. Associated error code: • 33157 | 0x8185 - CAN: heartbeat time-out consumer 2
0x2857:007	CANopen monitoring: Heartbeat-Timeout Consumer 3 • For further possible settings, see parameter 0x2D45:001 (P310.01). 223 3 **Fault**	Selection of the response with "Heartbeat Event" in consumer 3. Associated error code: • 33158 | 0x8186 - CAN: heartbeat time-out consumer 3
0x2857:008	CANopen monitoring: Heartbeat-Timeout Consumer 4 • For further possible settings, see parameter 0x2D45:001 (P310.01). 223 3 **Fault**	Selection of the response with "Heartbeat Event" in consumer 4. Associated error code: • 33159 | 0x8187 - CAN: heartbeat time-out consumer 4
0x2857:010	CANopen monitoring: "Bus-off" state change • For further possible settings, see parameter 0x2D45:001 (P310.01). 223 2 **Trouble**	Selection of the response to changing to the "Bus off" state. Associated error code: • 33154 | 0x8182 - CAN: bus off
0x2857:011	CANopen monitoring: Warning • For further possible settings, see parameter 0x2D45:001 (P310.01). 223 1 **Warning**	Selection of the response that is executed in the case of too many incorrectly sent or received CAN telegrams (> 96). Associated error code: • 33155 | 0x8183 - CAN: warning

9.4.12 Diagnostic counter

The following parameters serve to diagnose the communication activities between the inverter and the CANopen network. The counters are free-running, i. e. when the maximum value has been reached, the respective counter starts at 0 again.

Parameter	Name / value range / [default setting]	Info
0x230A:000	CANopen statistics: Highest subindex • Read only	Number of frame and error counters.
0x230A:001 (P580.01)	CANopen statistics: PDO1 received (CAN statistics: PDO1 received) • Read only	Display of the number of PDO1 telegrams received.

Parameter	Name / value range / [default setting]	Info
0x230A:002 (P580.02)	CANopen statistics: PDO2 received (CAN statistics: PDO2 received) • Read only	Display of the number of PDO2 telegrams received.
0x230A:003 (P580.03)	CANopen statistics: PDO3 received (CAN statistics: PDO3 received) • Read only	Display of the number of PDO3 telegrams received.
0x230A:005 (P580.05)	CANopen statistics: PDO1 transmitted (CAN statistics: PDO1 transmitted) • Read only	Display of the number of PDO1 telegrams sent.
0x230A:006 (P580.06)	CANopen statistics: PDO2 transmitted (CAN statistics: PDO2 transmitted) • Read only	Display of the number of PDO2 telegrams sent.
0x230A:007 (P580.07)	CANopen statistics: PDO3 transmitted (CAN statistics: PDO3 transmitted) • Read only	Display of the number of PDO3 telegrams sent.
0x230A:009 (P580.09)	CANopen statistics: SDO1 telegrams (CAN statistics: SDO1 counter) • Read only	Display of the number of SDO1 telegrams.
0x230A:010 (P580.10)	CANopen statistics: SDO2 telegrams (CAN statistics: SDO2 counter) • Read only	Display of the number of SDO2 telegrams.
0x230B (P518.00)	CANopen error counter (CAN errorcounter) • Read only	Display of the total number of CAN faults that have occurred.

9.4.13 LED status displays

Information about the CAN bus status can be obtained quickly via the "CAN-RUN" and "CAN-ERR" LED displays on the front of the inverter.

The meaning can be seen from the tables below.

Inverter not active on the CAN bus (yet)

LED "CAN-RUN"	LED "CAN-ERR"	Meaning
off	off	Inverter is not active on the CAN bus.
	on	"Bus Off" state.
Both LEDs are flickering alternately		Automatic baud rate detection active.

Inverter active on the CAN bus

The green "CAN-RUN" LED indicates the CANopen state:

LED "CAN-RUN"	CANopen state
blinking fast (5 Hz)	Pre-Operational
on	Operational
blinking 1x, then goes off for 1 s	Stopped

The red "CAN-ERR" LED indicates a CANopen error:

LED "CAN-ERR"	CANopen error
blinking 1x, then goes off for 1 s	Warning Limit reached
blinking 2x, then goes off for 1 s	Heartbeat Event
blinking 3x, then goes off for 1 s	Sync message error (only possible in the "Operational" state)

9.4.14 Restart communication

The following parameter can be used to restart or stop communication. Optionally it is also possible to reset all communication parameters to the default status.

Details

A restart of communication is required after changes of the interface configuration (e. g. node address and baud rate) in order that the changed settings become effective.

For restarting communication, there are two options:

a) Switch inverter off and on again.

b) Set the selection = "Restart with current values [1]" in 0x2300 (P508.00).

Parameter	Name / value range / [default setting]		Info
0x2300 (P508.00)	CANopen communication (CANopen comm.) • Setting can only be changed if the inverter is inhibited.		Restart / stop communication. • After successful execution, the value 0 is shown.
	0	**No action/no error**	Only status feedback
	1	Restart with current values	Restart communication with the current values.
	2	Restart with default values	Restart communication with the standard values of the CAN parameters (0x1000 ... 0x1FFF and 0x2301).
	5	Stop network communication	Stop communication. • The "Stop Remote Node" NMT command is executed. After successful execution of this command, only the reception of network management frames is possible.
	10	In progress	Only status feedback
	11	Action cancelled	
	12	Error	

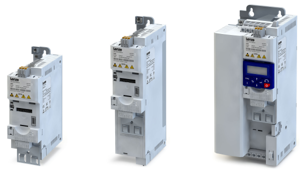
9.4.15 Short setup

In the following, the steps required for controlling the inverter via CANopen are described.

Parameterisation required

1. Set the CANopen node address.
    - Each network node must be provided with a unique node address.
    - Details: ▶ Node address setting 📖 260
2. Set the CANopen baud rate.
    - Default setting: 500 kbps
    - Details: ▶ Baud rate setting 📖 261
3. Optional: Configure inverter as "mini master".
    - Required if the initialisation of the CANopen network and the associated status change from "Pre-Operational" to "Operational" is not effected by a higher-level host system.
    - Details: ▶ Configure device as mini master 📖 262
4. Optional: Change the response of the inverter to the triggering of the RPDO time monitoring.
    - Default setting: In case of missing RPDOs, an error is triggered.
    - Details: ▶ Error responses 📖 275
5. Save parameter settings: 0x2022:003 (P700.03) = "On / start [1]".
6. Switch the inverter off and then on again in order that the changed communication settings can get effective.
7. Program the master so that the following SDO messages are sent to the inverter:
    1. 0x2631:037 (P400.37) = 1 (activate network control)
    2. 0x2860:001 (P201.01) = 5 (set network as standard setpoint source)
    3. PDO mapping and configuration of the process data objects RPDO1 and TPDO1 (see the sections "RPDO1 mapping" and "TPDO1 mapping").
8. Control inverter via RPDO1 (and evaluate the current status via TPDO1).
    - For assignment of the control word and setpoint selection, see section "RPDO1 mapping".
    - For assignment of the status word and actual value output, see section "TPDO1 mapping".
    - Acceleration 0x2917 (P220.00) and deceleration 0x2918 (P221.00) can be set/changed via SDO messages.

In the default setting, the digital input DI1 is assigned with the "Run" function. If the network control is activated, this function serves as "start enable" for start commands via network. Hence, the digital input DI1 must be set to HIGH level in order that the motor can be started via network. ▶ Start / stop motor 📖 531



RPDO1 mapping

The RPDO1 is used to control the inverter.

Changing the identifier (COB-ID) and the PDO mapping only allows the following procedure:

1. Set RPDO1 to "invalid": Set bit 31 in the identifier 0x1400:001 (P540.01) to "1".
2. Set RPDO1 mapping to "invalid": 0x1600:000 = set 0.
3. Map NetWordIN1 data word0x4008:001 (P590.01) to RPDO1:
   0x1600:001 = set 0x40080110.
4. MapNetwork setpoint frequency (0.1) 0x400B:003 (P592.03) to RPDO1:
   0x1600:002 = set 0x400B0310.
5. Set RPDO1 mapping to "valid" again: 0x1600:000 = set 2 (number of mapped parameters).
6. Optional: Set time-out time for monitoring the data reception in 0x1400:005 (P540.05) in [ms].
   - Default setting: 100 ms
7. Change identifier for RPDO1 (optional) and set RPDO1 to "valid" again: Write the new identifier into 0x1400:001 (P540.01) and simultaneously set bit 31 to "0".
   - Default setting: 0x200 + node address (hex)
   - Example: Node address = 10 (0xA) and basic identifier = default setting:

     Identifier to be written into 0x1400:001 (P540.01) = 0x200 + 0xA = 0x20A (0b0011 0000 1010)

Function assignment of the NetWordIN1 data word (byte 1+2 of the RPDO1)

Bit	Default setting	For details and configuration, see
0	Not active (reserve)	0x400E:001 (P505.01)
1	Not active (reserve)	0x400E:002 (P505.02)
2	Activate quick stop	0x400E:003 (P505.03)
3	Not active (reserve)	0x400E:004 (P505.04)
4	Run forward (CW)	0x400E:005 (P505.05)
5	Activate preset (bit 0)	0x400E:006 (P505.06)
6	Activate preset (bit 1)	0x400E:007 (P505.07)
7	Reset error	0x400E:008 (P505.08)
8	Not active (reserve)	0x400E:009 (P505.09)
9	Activate DC braking	0x400E:010 (P505.10)
10	Not active (reserve)	0x400E:011 (P505.11)
11	Not active (reserve)	0x400E:012 (P505.12)
12	Reverse rotational direction	0x400E:013 (P505.13)
13	Not active (reserve)	0x400E:014 (P505.14)
14	Not active (reserve)	0x400E:015 (P505.15)
15	Not active (reserve)	0x400E:016 (P505.16)

Specifying the frequency setpoint (byte 3+4 of the RPDO1)

- The specification is made unsigned (independent of the direction of rotation) as integer in the resolution [0.1 Hz].
- The direction of rotation is defined in the default setting via bit 12 of the NetWordIN1 data word.
- Example: 456 ≡ 45.6 Hz

TPDO1 mapping

The TPDO1 is used for the output of status information and the actual frequency value.

Changing the identifier (COB-ID) and the PDO mapping only allows the following procedure:

1. Set TPDO1 to "invalid": Set bit 31 in the identifier 0x1800:001 (P550.01) to "1".
2. Set TPDO1 mapping to "invalid": 0x1A00:000 = set 0.
3. Map NetWordOUT1 data word 0x400A:001 (P591.01)to TPDO1:
   0x1A00:001 = set 0x400A0110.
4. MapFrequency (0.1) 0x400B:003 (P592.03) to TPDO1:
   0x1A00:002 = set 0x400C0310.
5. Set TPDO1 mapping to "valid" again: 0x1A00:000 = set 2 (number of mapped parameters).
6. Optional: Set Transmission type in 0x1800:002 (P550.02) and Event timer in 0x1800:005 (P550.05).
   - Default setting: Cyclic transmission every 20 ms.
7. Change identifier for TPDO1 (optional) and set TPDO1 to "valid" again: Write the new identifier into 0x1800:001 (P550.01) and simultaneously set bit 31 to "0".
   - Default setting: 0x40000180 + node address (hex)
   - Example: Node address = 10 (0xA) and TPDO1 basic identifier = default setting:

     Identifier to be written into 0x1800:001 (P550.01) = 0x40000180 + 0xA = 0x4000018A
     (0b0100 0000 0000 0000 0000 0001 1000 1010)

Status assignment of the NetWordOUT1 data word (byte 1+2 of the TPDO1)

Bit	Default setting	For details and configuration, see
0	Ready for operation	0x2634:010 (P420.10)
1	Not connected	0x2634:011 (P420.11)
2	Operation enabled	0x2634:012 (P420.12)
3	Error active	0x2634:013 (P420.13)
4	Not connected	0x2634:014 (P420.14)
5	Quick stop active	0x2634:015 (P420.15)
6	Running	0x2634:016 (P420.16)
7	Device warning active	0x2634:017 (P420.17)
8	Not connected	0x2634:018 (P420.18)
9	Not connected	0x2634:019 (P420.19)
10	Setpoint speed reached	0x2634:020 (P420.20)
11	Current limit reached	0x2634:021 (P420.21)
12	Actual speed = 0	0x2634:022 (P420.22)
13	Rotational direction reversed	0x2634:023 (P420.23)
14	Release holding brake	0x2634:024 (P420.24)
15	Safe torque off (STO) active	0x2634:025 (P420.25)

Output of the actual frequency value (byte 3+4 of the TPDO1)

- The output is made unsigned (independent of the direction of rotation) as integer in the resolution [0.1 Hz].
- An active reversal is displayed via bit 13 of the NetWordOUT1 data word.
- Example: 456 ≡ 45.6 Hz

9.5 Modbus RTU

Modbus is an internationally approved, asynchronous, serial communication protocol, designed for commercial and industrial automation applications.

- Detailed information on the Modbus can be found on the web page of the international Modbus Organization, USA, who also further develop the Modbus protocol: http://www.modbus.org
- Information about the dimensioning of a Modbus network can be found in the configuration document for the inverter.

Preconditions

Control unit (CU) of the inverter is provided with Modbus.

9.5.1 Introduction

- The process of data transmission distinguishes between three different operating modes: Modbus ASCII, Modbus RTU, and Modbus TCP. This chapter describes the Modbus RTU operating mode ("Remote Terminal Unit").
- The Modbus protocol is based on a master/slave architecture where the inverter always works as slave.
- The Modbus network only permits one master sending commands and requests. The master is also the sole instance to be allowed to initiate Modbus communication. No direct communication takes place between the slaves.
- The physical interface corresponds to TIA/EIA-485-A which is very common and suitable for the industrial environment. This interface enables baud rates from 2400 to 115200 kbps.
- The inverter supports Modbus function codes 3, 6, 16 (0x10) and 23 (0x17).

9.5.2 Node address setting

Each network node must be provided with a unique node address.

The parameters for the baud rate of the device are described below.

The parameters for addressing the device are described below.

Details

- The node address of the inverter can be optionally set in 0x2321:001 (P510.01) or using the DIP switches on the device labelled with "1" ... "128".
- The setting that is active when the inverter is switched on is the effective setting.
- The labelling of the DIP switches corresponds to the values of the individual DIP switches for determining the node address (see the following example).
- The node address 0 is reserved for messages to all nodes ("Broadcast") .
- The active node address is shown in 0x2322:001 (P511.01).

Example of how the node address is set via the DIP switches

DIP switch	128	64	32	16	8	4	2	1
Setting	OFF	OFF	OFF	**ON**	OFF	**ON**	**ON**	**ON**
Value	0	0	0	**16**	0	**4**	**2**	**1**
Node address	= sum of all values = 16 + 4 + 2 + 1 = **23**							

Parameter	Name / value range / [default setting]	Info
0x2321:001 (P510.01)	Modbus settings: Node ID (Modbus sett.: Node ID) 1 ... [**1**] ... 247	Optionally setting of the node address (instead of setting via DIP switches 1 ... 128). • The node address set here only becomes effective if DIP switches 1 ... 128 have been set to OFF before mains switching. • A change in the node address only becomes effective after a restart of Modbus communication.

Parameter	Name / value range / [default setting]		Info
0x2323 (P509.00)	Modbus switch position (Modbus switch) • Read only		Display of the DIP switch setting at the last mains power-on. • The value displayed corresponds to the sum of all DIP switch values (except for DIP switches for terminating resistor).

9.5.3 Baud rate setting

All network nodes must be set to the same baud rate.

Details

- If the DIP switch labelled with "b" is in the OFF position at switch-on, the automatic baud rate detection function is active. If it is in the ON position, the setting in 0x2321:002 (P510.02)applies instead.
- If the automatic baud rate detection function is activated, the first 5 ... 10 messages are lost after switch-on.
- The active baud rate is displayed in 0x2322:002 (P511.02).

Parameter	Name / value range / [default setting]		Info
0x2321:002 (P510.02)	Modbus settings: Baud rate (Modbus sett.: Baud rate)		Optionally setting of the baud rate (instead of setting via DIP switch b). • The baud rate set here is only effective if DIP switch b was set to ON before mains switching. Otherwise automatic baud rate detection is active. • A change in the baud rate only becomes effective after a restart of Modbus communication. • If the automatic baud rate detection function is activated, the first 5 ... 10 messages are lost after switch-on.
	0	**Automatic**	
	1	2400 bps	
	2	4800 bps	
	3	9600 bps	
	4	19200 bps	
	5	38400 bps	
	6	57600 bps	
	7	115200 bps	
0x2323 (P509.00)	Modbus switch position (Modbus switch) • Read only		Display of the DIP switch setting at the last mains power-on. • The value displayed corresponds to the sum of all DIP switch values (except for DIP switches for terminating resistor).

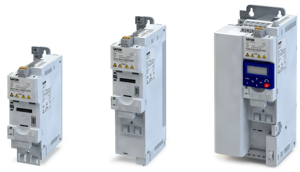
9.5.4 Data format setting

All network nodes must be set to the same data format.

Details

- If the DIP switch labelled with "a" is in the OFF position at switch-on, the automatic data format detection function is active. If it is in the ON position, the setting in 0x2321:003 (P510.03)applies instead.
- If the automatic data format detection function is activated, the first 5 ... 10 messages are lost after switch-on.
- The active data format is displayed in 0x2322:003 (P511.03).

Parameter	Name / value range / [default setting]		Info
0x2321:003 (P510.03)	Modbus settings: Data format (Modbus sett.: Data format)		Definition of the parity and stop bits.
	0	**Automatic**	Automatic data format detection. • With this setting, the first 5 ... 10 messages are lost after switch-on.
	1	8, E, 1	8 data bits, even parity, 1 stop bit
	2	8, O, 1	8 data bits, odd parity, 1 stop bit
	3	8, N, 2	8 data bits, no parity bit, 2 stop bits
	4	8, N, 1	8 data bits, no parity bit, 1 stop bit
0x2323 (P509.00)	Modbus switch position (Modbus switch) • Read only		Display of the DIP switch setting at the last mains power-on. • The value displayed corresponds to the sum of all DIP switch values (except for DIP switches for terminating resistor).



9.5.5 Time-out monitoring

The response to the missing Modbus messages can be configured via the following parameters.

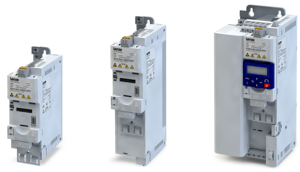
Parameter	Name / value range / [default setting]	Info
0x2858:001 (P515.01)	Modbus monitoring: Response to time-out (Modbus monit.: Resp. Time-out) • For further possible settings, see parameter 0x2D45:001 (P310.01). 📖 223	Selection of the response executed if no valid messages have been received via the Modbus for a longer time than the time-out period set in 0x2858:002 (P515.02). Associated error code: • 33185 | 0x81A1 - Modbus: network time-out
	3 **Fault**	
0x2858:002 (P515.02)	Modbus monitoring: Time-out time (Modbus monit.: Time-out time) 0.0 ... [**2.0**] ... 300.0 s	Time-out period for monitoring the message reception via Modbus.

9.5.6 Diagnostics

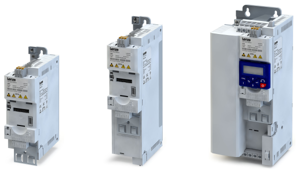
The following parameters serve to diagnose the communication activities between the inverter and the Modbus network.

Parameter	Name / value range / [default setting]	Info
0x2322:001 (P511.01)	Active Modbus settings: Active node ID (Modbus diag.: Active node ID) • Read only	Display of the active node address.
0x2322:002 (P511.02)	Active Modbus settings: Active baud rate (Modbus diag.: Active baud rate) • Read only • For the meaning of the display see parameter 0x2321:002 (P510.02). 📖 283	Display of the active baud rate.
0x2322:003 (P511.03)	Active Modbus settings: Data format (Modbus diag.: Data format) • Read only • For the meaning of the display see parameter 0x2321:003 (P510.03). 📖 283	Display of the active data format.
0x232A:001 (P580.01)	Modbus statistics: Messages received (Modbus statistic: Mess. received) • Read only	Display of the total number of messages received. • This counter counts both valid and invalid messages. • After the maximum value has been reached, the counter starts again "0".
0x232A:002 (P580.02)	Modbus statistics: Valid messages received (Modbus statistic: Val. mess. rec.) • Read only	Display of the number of valid messages received. • After the maximum value has been reached, the counter starts again "0".
0x232A:003 (P580.03)	Modbus statistics: Messages with exceptions (Modbus statistic: Mess. w. exc.) • Read only	Display of the number of messages with exceptions that have been received. • After the maximum value has been reached, the counter starts again "0".
0x232A:004 (P580.04)	Modbus statistics: Messages with errors (Modbus statistic: Mess. w. errors) • Read only	Display of the number of messages received with a faulty data integrity (parity, CRC). • After the maximum value has been reached, the counter starts again "0".
0x232A:005 (P580.05)	Modbus statistics: Messages sent (Modbus statistic: Messages sent) • Read only	Display of the total number of messages sent. • After the maximum value has been reached, the counter starts again "0".
0x232E:001 (P583.01)	Modbus diagnostics of last Rx data: Offset (Rx data diagn.: Rx data offset) 0 ... [**0**] ... 240	For purposes of diagnostics, the last message received (max. 16 bytes) is shown in 0x232E:002 (P583.02)...0x232E:017 (P583.17). For longer messages, an offset can be specified here, indicating from which byte of the message the display of the 16 bytes is to start.

Parameter	Name / value range / [default setting]	Info
0x232E:002 (P583.02)	Modbus diagnostics of last Rx data: Data byte 0 (Rx data diagn.: Last RxD byte0) • Read only	Display of the message received last.
0x232E:003 (P583.03)	Modbus diagnostics of last Rx data: Data byte 1 (Rx data diagn.: Last RxD byte1) • Read only	
0x232E:004 (P583.04)	Modbus diagnostics of last Rx data: Data byte 2 (Rx data diagn.: Last RxD byte2) • Read only	
0x232E:005 (P583.05)	Modbus diagnostics of last Rx data: Data byte 3 (Rx data diagn.: Last RxD byte3) • Read only	
0x232E:006 (P583.06)	Modbus diagnostics of last Rx data: Data byte 4 (Rx data diagn.: Last RxD byte4) • Read only	
0x232E:007 (P583.07)	Modbus diagnostics of last Rx data: Data byte 5 (Rx data diagn.: Letzt RxD-Byte5) • Read only	
0x232E:008 (P583.08)	Modbus diagnostics of last Rx data: Data byte 6 (Rx data diagn.: Last RxD byte6) • Read only	
0x232E:009 (P583.09)	Modbus diagnostics of last Rx data: Data byte 7 (Rx data diagn.: Last RxD byte7) • Read only	
0x232E:010 (P583.10)	Modbus diagnostics of last Rx data: Data byte 8 (Rx data diagn.: Last RxD byte8) • Read only	
0x232E:011 (P583.11)	Modbus diagnostics of last Rx data: Data byte 9 (Rx data diagn.: Last RxD byte9) • Read only	
0x232E:012 (P583.12)	Modbus diagnostics of last Rx data: Data byte 10 (Rx data diagn.: Last RxD byte10) • Read only	
0x232E:013 (P583.13)	Modbus diagnostics of last Rx data: Data byte 11 (Rx data diagn.: Last RxD byte11) • Read only	
0x232E:014 (P583.14)	Modbus diagnostics of last Rx data: Data byte 12 (Rx data diagn.: Last RxD byte12) • Read only	
0x232E:015 (P583.15)	Modbus diagnostics of last Rx data: Data byte 13 (Rx data diagn.: Last RxD byte13) • Read only	
0x232E:016 (P583.16)	Modbus diagnostics of last Rx data: Data byte 14 (Rx data diagn.: Last RxD byte14) • Read only	
0x232E:017 (P583.17)	Modbus diagnostics of last Rx data: Data byte 15 (Rx data diagn.: Last RxD byte15) • Read only	
0x232F:001 (P585.01)	Modbus diagnostics of last Tx data: Offset (Tx data diagn.: Tx data offset) 0 ... [**0**] ... 240	For purposes of diagnostics, the last message sent (max. 16 bytes) is shown in 0x232F:002 (P585.02)...0x232F:017 (P585.17). For longer messages, an offset can be specified here, indicating from which byte of the message the display of the 16 bytes is to start.



Parameter	Name / value range / [default setting]	Info
0x232F:002 (P585.02)	Modbus diagnostics of last Tx data: Data byte 0 (Tx data diagn.: Last TxD byte0) • Read only	Display of the message sent last.
0x232F:003 (P585.03)	Modbus diagnostics of last Tx data: Data byte 1 (Tx data diagn.: Last TxD Byte1) • Read only	
0x232F:004 (P585.04)	Modbus diagnostics of last Tx data: Data byte 2 (Tx data diagn.: Last TxD byte2) • Read only	
0x232F:005 (P585.05)	Modbus diagnostics of last Tx data: Data byte 3 (Tx data diagn.: Last TxD byte3) • Read only	
0x232F:006 (P585.06)	Modbus diagnostics of last Tx data: Data byte 4 (Tx data diagn.: Last TxD byte4) • Read only	
0x232F:007 (P585.07)	Modbus diagnostics of last Tx data: Data byte 5 (Tx data diagn.: Last TxD byte5) • Read only	
0x232F:008 (P585.08)	Modbus diagnostics of last Tx data: Data byte 6 (Tx data diagn.: Last TxD byte6) • Read only	
0x232F:009 (P585.09)	Modbus diagnostics of last Tx data: Data byte 7 (Tx data diagn.: Last TxD byte7) • Read only	
0x232F:010 (P585.10)	Modbus diagnostics of last Tx data: Data byte 8 (Tx data diagn.: Last TxD byte8) • Read only	
0x232F:011 (P585.11)	Modbus diagnostics of last Tx data: Data byte 9 (Tx data diagn.: Last TxD byte9) • Read only	
0x232F:012 (P585.12)	Modbus diagnostics of last Tx data: Data byte 10 (Tx data diagn.: Last TxD byte10) • Read only	
0x232F:013 (P585.13)	Modbus diagnostics of last Tx data: Data byte 11 (Tx data diagn.: Last TxD byte11) • Read only	
0x232F:014 (P585.14)	Modbus diagnostics of last Tx data: Data byte 12 (Tx data diagn.: Last TxD byte12) • Read only	
0x232F:015 (P585.15)	Modbus diagnostics of last Tx data: Data byte 13 (Tx data diagn.: Last TxD byte13) • Read only	
0x232F:016 (P585.16)	Modbus diagnostics of last Tx data: Data byte 14 (Tx data diagn.: Last TxD byte14) • Read only	
0x232F:017 (P585.17)	Modbus diagnostics of last Tx data: Data byte 15 (Tx data diagn.: Last TxD byte15) • Read only	



9.5.7 Function codes

The mode of access to inverter data (parameters) is controlled via function codes.

Details

The inverter supports the following function codes:

Function code		Function name	Description
3	0x03	Read Holding Registers	Read one or more 16-bit data words.
6	0x06	Preset Single Register	Write a 16-bit data word.
16	0x10	Preset Multiple Registers	Write one or more 16-bit data words.
23	0x17	Read/Write 4X Registers	Within a transaction • write into a group of connected 4X holding registers. • read from a group of connected 4X holding registers.

Addressing

- The function codes listed above exclusively refer to 4X registers in Modbus addressing.
- All data in the inverter can only be accessed via 4X registers, i.e. via register addresses from 40001.
- The 4xxxx reference is implicit, i. e. given by the function code used. In the frame therefore the leading 4 is omitted in the addressing process.
- Lenze supports the basic 1 addressing of Modbus, i.e. the numbering of the registers starts with 1 whereas addressing starts with 0. For example, the address 0 is used in the frame when register 40001 is read.

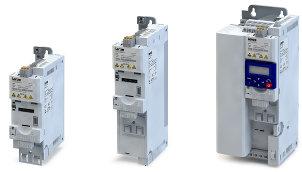
Frame structure

Communication is established on the basis of the central medium access method. Communication is always started by a master request. The inverter (slave) then either gives a valid response or outputs an error code (provided that the request has been received and evaluated as a valid Modbus frame). Error causes can be invalid CRC checksums, function codes that are not supported, or impermissible data access.

All Modbus frames have the following basic structure:

- A "frame" consists of a PDU (Protocol Data Unit) and an ADU (Application Data Unit).
- The PDU contains the function code and the data belonging to the function code.
- The ADU serves the purposes of addressing and error detection.
- The data are represented in Big Endian format (most significant byte first).

<table>
<tr><th colspan="4">ADU (Application Data Unit)</th></tr>
<tr><td rowspan="2">Slave address</td><td>Function code</td><td>Data</td><td rowspan="2">Checksum (CRC)</td></tr>
<tr><td colspan="2">PDU (Protocol Data Unit)</td></tr>
</table>

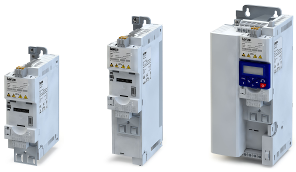


Error codes

In the event of an error, the node responds with a function code associated to the message:

Function code	Associated function code in the event of an error	Supported error codes
0x03	0x83	0x01, 0x02, 0x03, 0x04
0x06	0x86	0x01, 0x02, 0x03, 0x04
0x10	0x90	0x01, 0x02, 0x03, 0x04
0x17	0x97	0x01, 0x02, 0x03, 0x04

Error code	Designation	Cause(s)
0x01	Invalid function code	The function code is not supported by the inverter, or the inverter is in a state in which the request is not permissible or in which it cannot be processed.
0x02	Invalid data address	The combination of a start address and the length of the data to be transmitted is invalid. Example: If you have a slave with 100 registers, the first register has the address 0 and the last register has the address 99. If there is a request of four registers now, from the start address 96, the request can be processed successfully (for registers 96, 97, 98, and 99). If, however, five registers from the start address 96 are queried, this error code is returned, since the slave has no register with the address 100.
0x03	Invalid data value	Error in the reset structure of a complex request, e. g. because the data length that has resulted implicitly is not correct. The cause, however, is not that a (parameter) value is written outside the valid setting range. As a matter of principle, the Modbus protocol has no information on valid setting ranges of single registers or their meaning.
0x04	Slave device failure	A non-correctable error has occurred while the request was processed in the inverter.



9.5.8 Data mapping

The process of data mapping is used for defining which Modbus registers read or write to which inverter parameters.

Details

- There are fixedly defined Modbus registers for common control and status words, which are located in consecutive blocks, in order to facilitate communication with OPC servers and other Modbus masters. In order to access all relevant data of the inverter, only a minimum number of commands is required.
- In addition, 24 registers are provided for variable mapping, i. e. free assignment to inverter parameters.

Predefined Modbus control registers

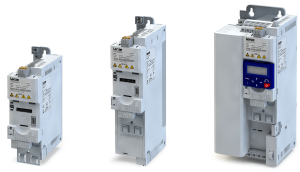
- These registers are provided with write and read access.
- The cross-reference in column 2 leads to the detailed parameter description.

Modbus registers	Permanently assigned parameter	
	Address	**Name**
42101	0x400B:001 (P592.01)	AC Drive control word
42102	0x400B:005 (P592.05)	Network setpoint frequency (0.01)
42103	0x4008:002 (P590.02)	NetWordIN2
42104	0x4008:003 (P590.03)	NetWordIN3
42105	0x400B:007 (P592.07)	PID setpoint
42106	0x6071	Target torque
42107	0x4008:001 (P590.01)	NetWordIN1
42108	0x4008:004 (P590.04)	NetWordIN4
42109 ... 42121	-	Reserved

Predefined Modbus status registers

- These registers are only provided with read access.
- The cross-reference in column 2 leads to the detailed parameter description.

Modbus registers	Permanently assigned parameter	
	Address	**Name**
42001	0x400C:001 (P593.01)	AC Drive status word
42002	0x400C:006 (P593.06)	Frequency (0.01)
42003	0x603F (P150.00)	Error code
42004	0x400C:005 (P593.05)	Drive status
42005	0x2D89 (P106.00)	Motor voltage
42006	0x2D88 (P104.00)	Motor current
42007	0x6078 (P103.00)	Current actual value
42008	0x2DA2:002 (P108.02)	Apparent power (42008 = High Word, 42009 = Low Word)
42009		
42010	0x2D84:001 (P117.01)	Heatsink temperature
42011	0x2D87 (P105.00)	DC-bus voltage
42012	0x60FD (P118.00)	Digital inputs (only bit 16 ... bit 31)
42013	0x6077 (P107.00)	Torque actual value
42014 ... 42021	-	Reserved



Variable mapping

- Via 0x232B:001 ... 0x232B:024 (P530.01 ... 24), 24 registers can be mapped to parameters of the inverter.
  Format: 0xiiiiss00 (iiii = index hexadecimal, ss = subindex hexadecimal)
- The display of the internal Modbus register numbers in 0x232C:001 ... 0x232C:024 (P531.01 ... 24) is generated automatically. Since 32-bit parameters require two registers, there is no 1:1 assignment.
- For the mappable registers, a CRC (Cyclic Redundancy Check) is executed. The checksum determined is displayed in 0x232D (P532.00). The user can read this "validation code" and use it for comparison in the Modbus master. In this way it can be checked whether the inverter currently queried is configured correctly for the respective application.

Parameter	Name / value range / [default setting]	Info
0x232B:001 ... 0x232B:024 (P530.01 ... 24)	Modbus parameter mapping: Parameter 1 ... Parameter 24 (Para. mapping: Parameter 1 ... Parameter 24) 0x00000000 ... [**0x00000000**] ... 0xFFFFFF00	Mapping entries for Modbus register 40103 ... 40149. • Format: 0xiiiiss00 (iiii = index, ss = subindex)
0x232C:001 ... 0x232C:024 (P531.01 ... 24)	Modbus register assignment: Register 1 ... Register 24 (Reg. assigned: Register 1 ... Register 24) • Read only	Display of the internal Modbus register number starting from which the parameter mapped in 0x232B:001 ... 0x232B:024 (P530.01 ... 24) is stored. • For the first parameter mapped, always 2500. • From the second parameter mapped, 2500 + offset. The offset results from the data types of the previously mapped parameters.
0x232D (P532.00)	Modbus verification code (Verificationcode) • Read only	

9.5.9 LED status displays

Information about the Modbus status can be obtained quickly via the "MOD-RUN" and "MOD-ERR" LED displays on the front of the inverter.

The meaning can be seen from the tables below.

Inverter not active on the Modbus bus (yet)

LED "MOD-RUN"	LED "MOD-ERR"	Meaning
off	on	Internal error
Both LEDs are flickering alternately		Automatic detection of baud rate and data format active.

Inverter active on the Modbus

The green "MOD-RUN" LED indicates the communication status:

LED "MOD-RUN"	Communication status
off	No reception / no transmission
on	Reception / transmission active

The red "MOD-ERR" LED indicates an error:

LED "MOD-ERR"	Error
off	No fault
Blinking	Communication error

9.5.10 Restart communication

The following parameter can be used to restart communication.

Details

A restart of communication is required after changes of the interface configuration (e. g. node address and baud rate) in order that the changed settings become effective.

For restarting communication, there are two options:

a) Switch inverter off and on again.

b) Set the selection = "Restart with current values [1]" in 0x2320 (P508.00).

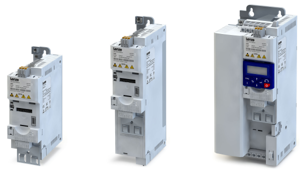
Parameter	Name / value range / [default setting]		Info
0x2320 (P508.00)	Modbus communication (Modbus comm.)		1 = restart communication in order that changed settings of the interface configuration become effective.
	0	**No action/no error**	
	1	Restart with current values	

9.5.11 Response time setting

Define a minimum time delay between the reception of a valid Modbus message and the response of the inverter.

Especially at higher baud rates, defining a minimum time delay ensures the data exchange between transmitter (Modbus master) and receiver (e. g. inverter).

Parameter	Name / value range / [default setting]	Info
0x2321:004 (P510.04)	Modbus settings: Minimum response time (Modbus sett.: Min. resp. time) 0 ... [**0**] ... 1000 ms	



9.5.12 Short setup

In the following, the steps required for controlling the inverter via Modbus are described.

Parameterisation required

1. Activate network control: 0x2631:037 (P400.37) = "TRUE [1]"
2. Set network as standard setpoint source: 0x2860:001 (P201.01) = "Network [5]"
3. Set Modbus node address.
   - Each network node must be provided with a unique node address.
   - Details: ▸ Node address setting 📖 282
4. Set Modbus baud rate.
   - Default setting: Automatic detection.
   - If the automatic baud rate detection function is activated, the first 5 ... 10 messages are lost after switch-on.
   - Details: ▸ Baud rate setting 📖 283
5. Set Modbus data format.
   - Default setting: Automatic detection.
   - If the automatic data format detection function is activated, the first 5 ... 10 messages are lost after switch-on.
   - Details: ▸ Data format setting 📖 283
6. Save parameter settings: 0x2022:003 (P700.03) = "on / start [1]".
7. Switch the inverter off and then on again in order that the changed communication settings can get effective.

In the default setting, the digital input DI1 is assigned with the "Run" function. If the network control is activated, this function serves as "start enable" for start commands via network. Hence, the digital input DI1 must be set to HIGH level in order that the motor can be started via network. ▸ Start / stop motor 📖 531

Starting/stopping the drive via Modbus

For starting/stopping the drive, Modbus register 42101 can be used.

- Modbus register 42101 is permanently assigned to the AC Drive control word 0x400B:001 (P592.01).
- In the frame, the leading 4 is omitted in the addressing process. The numbering of the registers starts with 1; addressing, however starts with 0. Therefore the address 2100 (0x0834) is used in the frame when register 42101 is written.

Bits set in the AC drive control word:

- Bit 0 ≡ Run forward (CW)
- Bit 5 ≡ Activate network control
- Bit 6 ≡ Activate network setpoint

Example of an inverter with the node address 1:

Request frame by the master							
Slave address	Function code	Data				Checksum (CRC)	
		Register address		AC Drive control word			
0x01	0x06	0x08	0x34	0x00	0x61	0x0B	0x8C

If digital input DI1 ("Start enable") is set to HIGH level, the drive should start and the inverter should respond with the same frame as confirmation:

Response message from the inverter							
Slave address	Function code	Data				Checksum (CRC)	
		Register address		AC Drive control word			
0x01	0x06	0x08	0x34	0x00	0x61	0x0B	0x8C

Write the speed of the drive via Modbus

The drive speed can be changed via the Modbus register 42102, see Data mapping.

Example of an inverter with the node address 1:

Request frame by the master							
Slave address	Function code	Data				Checksum (CRC)	
		Register address		Network setpoint frequency (0.01)			
0x01	0x06	0x08	0x35	0x04	0xD2	0x19	0x39

Response message from the inverter							
Slave address	Function code	Data				Checksum (CRC)	
		Register address		Network setpoint frequency (0.01)			
0x01	0x06	0x08	0x35	0x04	0xD2	0x19	0x39

The drive now rotates with a frequency of 12.34 Hz.

Read the drive speed via Modbus

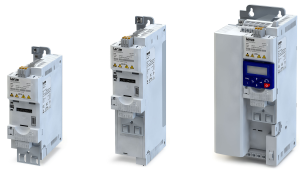
The drive speed can be read out via the Modbus register 42002, see Data mapping. For reading a single register or several connected register blocks, the function code 3 is used, see Function codes.

Example of an inverter with the node address 1:

Request frame by the master							
Slave address	Function code	Data				Checksum (CRC)	
		Register address		Number of words			
0x01	0x03	0x07	0xD1	0x00	0x01	0xD5	0x47

Response message from the inverter						
Slave address	Function code	Data			Checksum (CRC)	
		Read bytes	Frequency (0.01)			
0x01	0x03	0x02	0x04	0xD1	0x7A	0xD8

The drive rotates with a frequency of 12.33 Hz.



9.6 PROFIBUS

PROFIBUS® (Process Field Bus) is a widely-used fieldbus system for the automation of machines and production plants.

- Detailed information on PROFIBUS can be found on the web page of the PROFIBUS & PROFINET International (PI) user organisation: http://www.profibus.com
- Information about the dimensioning of a PROFIBUS network can be found in the configuration document for the inverter.
- PROFIBUS® is a registered trademark and patented technology licensed by the PROFIBUS & PROFINET International (PI) user organisation.

Preconditions

- Control unit (CU) of the inverter is provided with PROFIBUS.
- The DIP switch for the node address is set correctly. See "Basic network settings" in the section ▶ PROFIBUS 📖 67.
- The GSD file is imported into the hardware configurator of the control.
  - Download of the GSD file

9.6.1 Introduction

The inverter is integrated into a PROFIBUS-DP network as slave. Therefore it is only allowed to receive and acknowledge messages and to respond to requests by a master. The master is also referred to as an active node. Two different types are distinguished:

- Class 1 DP master: central control (PLC or PC) which cyclically exchanges process data with the slave. Acyclic data exchange via a separate transmission channel is also possible.
- Class 2 DP master: engineering, configuration, or operator device (HMI) which only exchanges data with the slave acyclically, e.g. for the purposes of configuration, maintenance, or diagnostics.

9.6.2 Communication time setting

The communication time is the time between the start of a request and the arrival of the corresponding response.

The communication times in the PROFIBUS network depend on the ...

- processing time in the inverter
- Telegram runtime (baud rate/telegram length),
- nesting depth of the network.

In the case of the inverter, the processing time for process data is approx. 2 ... 3 ms, and for parameter data (DPV1) it is approx. 10 ms. There are no interdependencies between parameter data and process data.

9.6.3 Station address setting

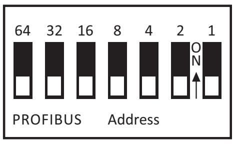
Each network node must be provided with a unique station address.

The parameters for addressing the device are described below.

Details

- The station address of the inverter can be optionally set via the DIP switches on the device labelled with "1" ... "64" or in 0x2341:001 (P510.01). (The DIP switches have priority.)
- The setting that is active when the inverter is switched on is the effective setting.
- The labelling of the DIP switches corresponds to the values of the individual DIP switches for determining the station address (see the following example).
- The active station address is shown in 0x2342:001 (P511.01).

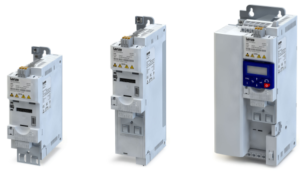
View of the DIP switch



Example of how the station address is set via the DIP switches

DIP switch	64	32	16	8	4	2	1
Setting	OFF	OFF	**ON**	OFF	**ON**	**ON**	**ON**
Value	0	0	**16**	0	**4**	**2**	**1**
Station address	= sum of all values = 16 + 4 + 2 + 1 = **23**						

Parameter	Name / value range / [default setting]	Info
0x2341:001 (P510.01)	PROFIBUS settings: Station address (PROFIBUS sett.: Station address) 1 ... [**3**] ... 125	Optional setting of the station address (instead of setting via DIP switches 1 ... 64). • The station address set here only becomes effective if DIP switches 1 ... 64 have been set to OFF before mains switching. • A change in the station address only becomes effective after a restart of PROFIBUS communication.
0x2342:001 (P511.01)	Active PROFIBUS settings: Active station address (PROFIBUS diag.: Act.station addr) • Read only	Display of the active station address.
0x2343 (P509.00)	PROFIBUS switch position (PROFIBUS switch) • Read only	Display of the DIP switch setting at the last mains power-on. • The displayed value corresponds to the sum of the individual DIP switch values 1 ... 64.



9.6.4 Baud rate setting

At the class 1 DP master, the desired baud rate is set. All masters at the bus must be set to the same baud rate.

The parameters for the baud rate of the device are described below.

Details

- The inverter detects the baud rate automatically.
- The active baud rate is displayed in 0x2342:002 (P511.02).
- The status of automatic detection is displayed in 0x2348:002 (P516.02).

Parameter	Name / value range / [default setting]		Info
0x2342:002 (P511.02)	Active PROFIBUS settings: Active baud rate (PROFIBUS diag.: Active baud rate) • Read only		Display of the active baud rate.
	0	12 Mbps	
	1	6 Mbps	
	2	3 Mbps	
	3	1.5 Mbps	
	4	500 kbps	
	5	187.5 kbps	
	6	93.75 kbps	
	7	45.45 kbps	
	8	19.2 kbps	
	9	9.6 kbps	
	15	Search	Automatic baud rate detection active.
0x2348:002 (P516.02)	PROFIBUS Status: Watchdog status (PROFIBUS Status: Watchdog status) • Read only		Display of the current state of the watchdog state machine (WD-STATE).
	0	BAUD_SEARCH	The inverter (slave) is able to detect the baud rate automatically.
	1	BAUD_CONTROL	After detecting the correct baud rate, the inverter (slave) status changes to BAUD_CONTROL, and the baud rate is monitored.
	2	DP_CONTROL	The DP_CONTROL state serves to the response monitoring of the master.

9.6.5 Monitoring

The inverter can give a parameterisable response to various PROFIBUS errors.

The parameters for setting network monitoring functions are described below.

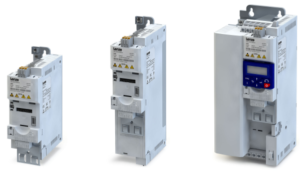
Details

The following table lists the PROFIBUS errors that can be set for a response.

Event	Display in	Response can be set in	Default setting
Communication to the PROFIBUS master is continuously interrupted.	0x2349 (P517.00), Bit 0	0x2859:001 (P515.01)	Error
Data exchange via PROFIBUS has been terminated.	0x2349 (P517.00), Bit 1	0x2859:002 (P515.02)	No response
The inverter has received invalid configuration data from the master.	0x2349 (P517.00), Bit 2	0x2859:003 (P515.03)	Error
An error has occurred during the initialisation of the PROFIBUS interface.	0x2349 (P517.00), Bit 3	0x2859:004 (P515.04)	Error
The process data received are invalid.	0x2349 (P517.00), Bit 4	0x2859:005 (P515.05)	Trouble

Parameter	Name / value range / [default setting]	Info
0x2342:003 (P511.03)	Active PROFIBUS settings: Watchdog time (PROFIBUS diag.: Watchdog time) • Read only	Display of the watchdog monitoring time specified by the master. • Monitoring starts with the arrival of the first telegram. • When a value of "0" is displayed, the monitoring function is deactiva-ted. • A change in the watchdog monitoring time in the master is effective immediately.

Parameter	Name / value range / [default setting]	Info
0x2348:002 (P516.02)	PROFIBUS Status: Watchdog status (PROFIBUS Status: Watchdog status) • Read only	Display of the current state of the watchdog state machine (WD-STATE).
	0 BAUD_SEARCH	The inverter (slave) is able to detect the baud rate automatically.
	1 BAUD_CONTROL	After detecting the correct baud rate, the inverter (slave) status changes to BAUD_CONTROL, and the baud rate is monitored.
	2 DP_CONTROL	The DP_CONTROL state serves to the response monitoring of the master.
0x2349 (P517.00)	PROFIBUS error (PROFIBUS error) • Read only	Bit-coded display of PROFIBUS errors.
	Bit 0 Watchdog elapsed	Communication with the PROFIBUS master is continuously interrupted, e. g. by cable break or failure of the PROFIBUS master. • No process data are sent to the inverter (slave) in the "Data Exchange" state. • When the watchdog monitoring time specified by the master has elapsed, the response set in 0x2859:001 (P515.01) is triggered in the inverter. Preconditions for a response by the inverter (slave): • The slave is in the "Data Exchange" state. • The watchdog monitoring time is configured correctly in the master (1 ... 65535 ms). If one of these preconditions is not met, the response to the absence of cyclic process data telegrams from the master is not executed.
	Bit 1 Data exchange completed	Data exchange via PROFIBUS has been terminated. • The inverter (slave) can be instructed by the master to exit the "Data Exchange" state. • If this state change is to be treated as an error in the inverter, the desired response can be set in 0x2859:002 (P515.02).
	Bit 2 Incorrect configuration data	The inverter (slave) has received invalid configuration data from the master. • The response set in 0x2859:003 (P515.03) is effected.
	Bit 3 Initialisation error	An error has occurred during the initialisation of the PROFIBUS interface. • The response set in 0x2859:004 (P515.04) is effected.
	Bit 4 Invalid process data	The inverter (slave) has received invalid process data from the master, e.g. no process data or deleted process data are sent by the "Stop" operating status in the master. • The response set in 0x2859:005 (P515.05) is effected.
0x2859:001 (P515.01)	PROFIBUS monitoring: Watchdog elapsed (PROFIBUS monit.: WD elapsed) • For further possible settings, see parameter 0x2D45:001 (P310.01). 🕮 223 **2 Trouble**	Selection of the response to the continuous interruption of communication to the PROFIBUS master, e. g. by cable break or failure of the PROFIBUS master. Associated error code: • 33168 | 0x8190 - Network: watchdog timeout
0x2859:002 (P515.02)	PROFIBUS monitoring: Data exchange exited (PROFIBUS monit.: Data exch.exited) • For further possible settings, see parameter 0x2D45:001 (P310.01). 🕮 223 **0 No response**	Selection of the response to exiting the "Data Exchange" state. Associated error code: • 33169 | 0x8191 - Network: disruption of cyclic data exchange
0x2859:003 (P515.03)	PROFIBUS monitoring: Invalid configuration (PROFIBUS monit.: Invalid config) • For further possible settings, see parameter 0x2D45:001 (P310.01). 🕮 223 **2 Trouble**	Selection of the response triggered by the reception of invalid configuration data. Associated error code: • 33414 | 0x8286 - Network: PDO mapping error
0x2859:004 (P515.04)	PROFIBUS monitoring: Initialisation error (PROFIBUS monit.: Init. error) • For further possible settings, see parameter 0x2D45:001 (P310.01). 🕮 223 **2 Trouble**	Selection of the response triggered by the occurrence of an error during the initialisation of the PROFIBUS module. Associated error code: • 33170 | 0x8192 - Network: initialisation error



Parameter	Name / value range / [default setting]	Info
0x2859:005 (P515.05)	PROFIBUS monitoring: Invalid process data (PROFIBUS monit.: Inval. proc.data) • For further possible settings, see parameter 0x2D45:001 (P310.01). 📖 223	Selection of the response triggered by the reception of invalid process data. • If the master changes to the "Stop" state, no cyclic process data are sent to the inverter (slave) anymore; the length of the process data then is 0. Associated error code: • 33171 | 0x8193 - Network: invalid cyclic process data
	2 **Trouble**	

9.6.6 LED status displays

Information about the PROFIBUS status can be obtained quickly via the "NS" and "NE" LED displays on the front of the inverter.

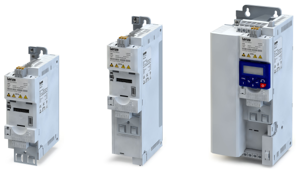
The meaning can be seen from the table below.

LED "NS" (green)	LED "NE" (red)	Status/meaning
off	off	No supply voltage available, network deactivated, not initialised, or firmware download active.
on		Connected with master, control running, "Data Exchange" state active.
Blinking		Not connected, control stopped, or no data exchange.
Blinking	Blinking	Watchdog monitoring time elapsed.
Any	Flashing	PROFIBUS parameterisation error.
	Flashing 2 x	PROFIBUS configuration error.
off	on	Invalid station address set or non-correctable error.

9.6.7 Diagnostics

The following parameters serve to diagnose the communication activities between the inverter and the PROFIBUS network.

Parameter	Name / value range / [default setting]	Info
0x2344:001 (P512.01)	PROFIBUS Configuration: Extended diagnostic bit (PROFIBUS Config.: Ext. diag. bit)	1 = set external diagnostic bit ("Diag Bit"). • The diagnostic bit is sent to the master where it is evaluated separately.
	0 **Delete**	
	1 Set	
0x2348:001 (P516.01)	PROFIBUS Status: Bus status (PROFIBUS Status: Bus status) • Read only	Display of the current DP state machine state (DP-STATE).
	0 WAIT_PRM	After the run-up, the inverter (slave) is waiting for parameter data (CHK_PRM) from the master. All other frame types are not processed. Exchanging user data with the master is not possible yet.
	1 WAIT_CFG	The inverter (slave) is waiting for configuration data (CHK_CFG) from the master that define the structure of the cyclic frames.
	2 DATA_EXCH	Parameter and configuration data have been received and accepted by the inverter (slave). The inverter is in the "Data Exchange" state. It is now possible to exchange user data with the master.
0x234A:001 (P580.01)	PROFIBUS statistics: Data cycles per second (PROFIBUS counter: Data cycles/sec.) • Read only	Display of the data cycles per second.
0x234A:002 (P580.02)	PROFIBUS statistics: Parameterization events (PROFIBUS counter: PRM events) • Read only	Display of the number of parameterisation events.
0x234A:003 (P580.03)	PROFIBUS statistics: Configuration events (PROFIBUS counter: CFG events) • Read only	Display of the number of configuration events.
0x234A:004 (P580.04)	PROFIBUS statistics: Diagnostics events (PROFIBUS counter: DIAG events) • Read only	Display of the number of diagnostic telegrams sent.



Parameter	Name / value range / [default setting]	Info
0x234A:005 (P580.05)	PROFIBUS statistics: C1 messages (PROFIBUS counter: C1 messages) • Read only	Display of the number of requests by the class 1 DPV1 master.
0x234A:006 (P580.06)	PROFIBUS statistics: C2 messages (PROFIBUS counter: C2 messages) • Read only	Display of the number of requests by the class 2 DPV1 master.
0x234A:007 (P580.07)	PROFIBUS statistics: Watchdog events (PROFIBUS counter: WD events) • Read only	Display of the number of watchdog events.
0x234A:008 (P580.08)	PROFIBUS statistics: Data exchange aborts (PROFIBUS counter: DataEx.event) • Read only	Display of the number of "Data Exchange exited" events.
0x234A:009 (P580.09)	PROFIBUS statistics: Total data cycles (PROFIBUS counter: Tot. data cycles) • Read only	Display of the number of cyclic process data received.
0x2348:002 (P516.02)	PROFIBUS Status: Watchdog status (PROFIBUS Status: Watchdog status) • Read only	Display of the current state of the watchdog state machine (WD-STATE).
	0 BAUD_SEARCH	The inverter (slave) is able to detect the baud rate automatically.
	1 BAUD_CONTROL	After detecting the correct baud rate, the inverter (slave) status changes to BAUD_CONTROL, and the baud rate is monitored.
	2 DP_CONTROL	The DP_CONTROL state serves to the response monitoring of the master.

9.6.8 Functions

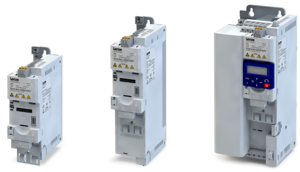
The inverter supports PROFIBUS DP-V0 (DRIVECOM profile) and PROFIBUS DP-V1 (PROFIdrive profile). PROFIBUS DP-V2 is not supported.

Details

The PROFIBUS DP communication protocol is provided with the following functions:
- DP-V0: cyclic data exchange, diagnostics (all devices).
- DP-V1: acyclic data exchange, process alarm processing (process automation). Note: The inverter does not support any alarm diagnostics.
- DP-V2: cycle synchronisation and time stamp, slave-to-slave communication.

A class 1 DP master connection (DPV1 C1) between a cyclic master and slave is established automatically when the "Data Exchange" state has been established. In byte 7 of the parameterisation frame, the "DPV1_Enable" bit must be set. Furthermore, a class 2 DP master connection (DPV1 C2) with the slave can be defined by another master connected. This connection must be established via the "MSAC2_Initiate" service.

The inverter supports the following acyclic DPV1 services:
- MSAC1_Read/Write: C1 read/write request for a data block.
- MSAC2_Initiate/Abort: connection or disconnection for acyclic data exchange between a class 2 DP master and the slave.
- MSAC2_Read/Write: C2 read/write request for a data block.



9.6.9 Data mapping

Data mapping is used to define which process data are exchanged cyclically between the master and slave. Data mapping is defined in the hardware configurator. The configuration of the process data is automatically sent to the inverter. The same applies to the bit configuration of the data words NetWordIN1 and NetWordOUT1.

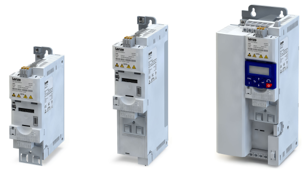
Details

External tools are only described as required for the corresponding network.

- The already imported GSD file serves to select the required data for the application to add the node to the PROFIBUS network configuration.
- After the start-up, the master communicates the structure of the cyclic frames to the inverter (slave) via the configuration frame (CHK_CFG).
- The inverter checks the configuration. If the configuration is accepted, the inverter changes from the "Wait Configuration" state to the "Data Exchange" state. It is now possible to exchange user data with the master.
- The internal mapping of the cyclic data is set in 0x24E0:xxx (master → inverter direction) and 0x24E1:xxx (inverter → master direction).
  Format: 0xiiiissll (iiii = index hexadecimal, ss = subindex hexadecimal, ll = data length hexadecimal)

Parameter	Name / value range / [default setting]	Info
0x24E0:000	Generic RPDO mapping: Highest subindex 0 ... [**2**] ... 16 • From version 02.00	Number of mapping entries for RPDO.
0x24E0:001	Generic RPDO mapping: Entry 1 0x00000000 ... [**0x60400010**] ... 0xFFFFFFFF • From version 02.00	Mapping entry 1 for RPDO.
0x24E0:002	Generic RPDO mapping: Entry 2 0x00000000 ... [**0x60420010**] ... 0xFFFFFFFF • From version 02.00	Mapping entry 2 for RPDO.
0x24E0:003	Generic RPDO mapping: Entry 3 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF • From version 02.00	Mapping entry 3 for RPDO.
0x24E0:004	Generic RPDO mapping: Entry 4 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF • From version 02.00	Mapping entry 4 for RPDO.
0x24E0:005	Generic RPDO mapping: Entry 5 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF • From version 02.00	Mapping entry 5 for RPDO.
0x24E0:006	Generic RPDO mapping: Entry 6 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF • From version 02.00	Mapping entry 6 for RPDO.
0x24E0:007	Generic RPDO mapping: Entry 7 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF • From version 02.00	Mapping entry 7 for RPDO.
0x24E0:008	Generic RPDO mapping: Entry 8 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF • From version 02.00	Mapping entry 8 for RPDO.
0x24E0:009	Generic RPDO mapping: Entry 9 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF • From version 02.00	Mapping entry 9 for RPDO.
0x24E0:010	Generic RPDO mapping: Entry 10 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF • From version 02.00	Mapping entry 10 for RPDO.
0x24E0:011	Generic RPDO mapping: Entry 11 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF • From version 02.00	Mapping entry 11 for RPDO.

Parameter	Name / value range / [default setting]	Info
0x24E0:012	Generic RPDO mapping: Entry 12 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF • From version 02.00	Mapping entry 12 for RPDO.
0x24E0:013	Generic RPDO mapping: Entry 13 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF • From version 02.00	Mapping entry 13 for RPDO.
0x24E0:014	Generic RPDO mapping: Entry 14 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF • From version 02.00	Mapping entry 14 for RPDO.
0x24E0:015	Generic RPDO mapping: Entry 15 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF • From version 02.00	Mapping entry 15 for RPDO.
0x24E0:016	Generic RPDO mapping: Entry 16 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF • From version 02.00	Mapping entry 16 for RPDO.
0x24E1:000	Generic TPDO mapping: Highest subindex 0 ... [**3**] ... 16 • From version 02.00	Number of mapping entries for TPDO.
0x24E1:001	Generic TPDO mapping: Entry 1 0x00000000 ... [**0x60410010**] ... 0xFFFFFFFF • From version 02.00	Mapping entry 1 for TPDO.
0x24E1:002	Generic TPDO mapping: Entry 2 0x00000000 ... [**0x60440010**] ... 0xFFFFFFFF • From version 02.00	Mapping entry 2 for TPDO.
0x24E1:003	Generic TPDO mapping: Entry 3 0x00000000 ... [**0x603F0010**] ... 0xFFFFFFFF • From version 02.00	Mapping entry 3 for TPDO.
0x24E1:004	Generic TPDO mapping: Entry 4 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF • From version 02.00	Mapping entry 4 for TPDO.
0x24E1:005	Generic TPDO mapping: Entry 5 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF • From version 02.00	Mapping entry 5 for TPDO.
0x24E1:006	Generic TPDO mapping: Entry 6 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF • From version 02.00	Mapping entry 6 for TPDO.
0x24E1:007	Generic TPDO mapping: Entry 7 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF • From version 02.00	Mapping entry 7 for TPDO.
0x24E1:008	Generic TPDO mapping: Entry 8 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF • From version 02.00	Mapping entry 8 for TPDO.
0x24E1:009	Generic TPDO mapping: Entry 9 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF • From version 02.00	Mapping entry 9 for TPDO.
0x24E1:010	Generic TPDO mapping: Entry 10 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF • From version 02.00	Mapping entry 10 for TPDO.
0x24E1:011	Generic TPDO mapping: Entry 11 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF • From version 02.00	Mapping entry 11 for TPDO.
0x24E1:012	Generic TPDO mapping: Entry 12 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF • From version 02.00	Mapping entry 12 for TPDO.
0x24E1:013	Generic TPDO mapping: Entry 13 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF • From version 02.00	Mapping entry 13 for TPDO.
0x24E1:014	Generic TPDO mapping: Entry 14 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF • From version 02.00	Mapping entry 14 for TPDO.
0x24E1:015	Generic TPDO mapping: Entry 15 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF • From version 02.00	Mapping entry 15 for TPDO.



Parameter	Name / value range / [default setting]	Info
0x24E1:016	Generic TPDO mapping: Entry 16 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF • From version 02.00	Mapping entry 16 for TPDO.

9.6.10 Parameter data transfer

Data communication with PROFIBUS DP-V0 is characterised by cyclic diagnostics and cyclic process data transfer. An optional service expansion is the acyclic parameter data transfer of PROFIBUS DP-V1. This service does not impair the functionality of the standard services under PROFIBUS DP-V0.

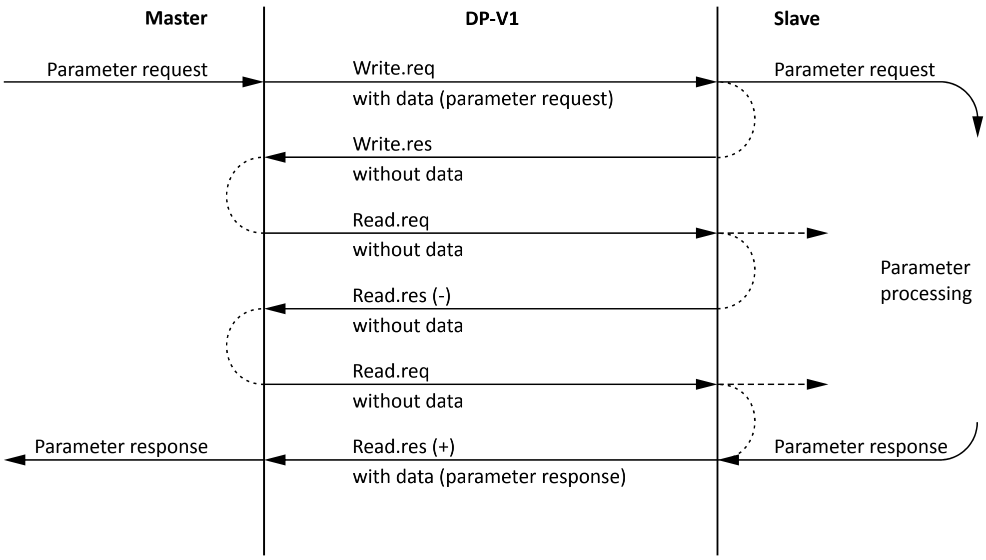
Details

- PROFIBUS DP-V0 and PROFIBUS DP-V1 can be operated simultaneously in the same network. This enables the step-by-step expansion or modification of a system.
- The services of PROFIBUS DP-V1 can be used by the class 1 master (PLC) and the class 2 DP master (diagnostics master, etc.).
- Integration of the acyclic service into the fixed bus cycle depends on the corresponding configuration of the class 1 master:
  - With configuration, a time slot is reserved.
  - Without configuration, the acyclic service is appended when a class 2 DP master acyclically accesses a DP-V1 slave.

Product features

- 16 bits each for addressing the parameter index and subindex.
- Several parameter requests can be combined to one request (multi-parameter requests).
- Only one request is processed at a time (no pipelining).
- A request or response must fit into one data block (max. 240 bytes). Requests or responses cannot be split into several data blocks.
- No spontaneous messages are transferred.
- There are only acyclic parameter requests.
- Profile-specific parameters can be read independently of the slave state.
- A class 1 DP master can always request parameters from a slave if the slave is in the "Data Exchange" state.
- In addition to a class 1 DP master, a class 2 DP master can establish communication with a slave:

Transmission directions for acyclic data transfer



Procedure:

1. A "Write.req" is used to pass the data set (DB47) to the slave in the form of a parameter request.
2. With "Write.res" the master receives the confirmation for the receipt of the message.
3. The master requests the response of the slave with "Read.req".
4. The slave responds with "Read.res (-)" if processing has not been completed yet.
5. After parameter processing, the parameter request is completed by transmitting the parameter response to the master with "Read.res (+)".

Telegram structure

SD	LE	LEr	SD	DA	SA	FC	DSAP	SSAP	**Data Unit (DU)**	FCS	ED

The Data Unit (DU) contains the DP-V1 header and the parameter request or the parameter response. The DP V1 header consists of the function detection, slot number, data set, and the length of the user data. More information about the DP-V1 header can be found in the corresponding PROFIBUS specification. A detailed description of the parameter request and parameter response can be found in the following subchapters.

Assignment of the user data depending on the data type

Depending on the data type used, the user data are assigned as follows:

Data type	Length	User data assignment				
		Byte 1	**Byte 2**	**Byte 3**	**Byte 4**	**Byte ...**
String	x bytes	*Data* (x bytes)				
U8	1 byte	*Data*	0x00			
U16	2 bytes	HIGH byte	LOW byte			
		Data	*Data*			
U32	4 bytes	HIGH word		LOW word		
		HIGH byte	LOW byte	HIGH byte	LOW byte	
		Data	*Data*	*Data*	*Data*	

9.6.11 Read parameter data

This section describes the request and response for the acyclic reading of a parameter.

Details

- When a read request is processed, no parameter value is written to the slave.
- When a read request is transmitted by multi-parameters, the parameter attribute, index and subindex are repeated.
- A read request must not exceed the maximum data length of 240 bytes.

Request header

Byte 1	Byte 2	Byte 3	Byte 4
Request reference	Request identification	Axis	Number of indices

Field	Data type	Values
Request reference	U8	This value is defined by the master.
Request identification	U8	0x01: Request parameters for reading.
Axis	U8	0x00 or 0x01
Number of indices	U8	0x"n" (n = number of parameters requested)

Parameter attribute

Byte 5	Byte 6	
Attribute	Number of subindices	

Field	Data type	Values
Attribute	U8	0x10: Value
Number of subindices	U8	0x00

Index and subindex

Byte 7	Byte 8	Byte 9	Byte 10
Index		Subindex	
HIGH byte	LOW byte	HIGH byte	LOW byte

Field	Data type	Values
Index	U16	0x0001 ... 0xFFFF (1 ... 65535)
Subindex	U16	0x0000 ... 0x00FF (0 ... 255)

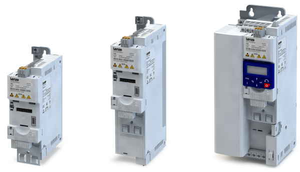
Response to a correctly executed read request

Responses to a read request do not contain parameter attributes, indices and subindices.

Response header

Byte 1	Byte 2	Byte 3	Byte 4
Request reference (mirrored)	Response identification	Axis (mirrored)	Number of indices

Field	Data type	Values
Request reference	U8	Mirrored value of the parameter request.
Response identification	U8	0x01: Parameter has been read.
Axis	U8	0x00 or 0x01
Number of indices	U8	0x"n" (n = number of parameters requested)



Parameter format

Byte 5	Byte 6	
Format	Number of values	

Field	Data type	Values
Format	U8	0x02: integer8 (1 byte with sign) 0x03: Integer16 (2 bytes with sign) 0x04: Integer32 (4 bytes with sign) 0x05: Unsigned8 (1 byte without sign) 0x06: Unsigned16 (2 bytes without sign) 0x07: Unsigned32 (4 bytes without sign) 0x09: Visible String (with n characters) 0x0A: Octet String (with n characters) 0x40: Zero 0x41: Byte 0x42: Word 0x43: Double word
Number of values	U8	0x01 or number of characters (n) for string parameters.

Parameter value

Byte 7	Byte 8	Byte 9	Byte 10
Value (Integer8 / Unsigned8 / byte)			
Value (Integer16 / Unsigned16 / word)			
Value (Integer32 / Unsigned32 / double word)			

Byte 7	Byte 8	Byte 9	Byte ...
String (Visible String / octet string with an optional length)			

Field	Data type	Values
Value	U8/U16/U32	Value range/length depends on the parameter format (see table above).
String	U8	Visible string / octet string with an optional length (n characters = n bytes)

Response to a read error

In the case of a multi-parameter request, correct and possible faulty messages are summarised in one telegram. They have the following data contents:

Correct message

- Format: data type of the value requested
- Number of values: as described above.
- Parameter value: value requested

Faulty message

- Format: 0x44
- Number of values: 0x01 or 0x02
- Error code without additional information (for number of values = 0x01) or error code with additional information (for number of values = 0x02)

A faulty access to a parameter "n" is indicated at the nth position in the response telegram of a multi-parameter request.

Response header

Byte 1	Byte 2	Byte 3	Byte 4
Request reference (mirrored)	Response identification	Axis (mirrored)	Number of indices

Field	Data type	Values
Request reference	U8	Mirrored value of the parameter request.
Response identification	U8	0x81: Parameter has not been read. The data in bytes 7 + 8 must be interpreted as an error code.
Axis	U8	0x00 or 0x01
Number of indices	U8	0x"n" (n = number of parameters requested)

Parameter format

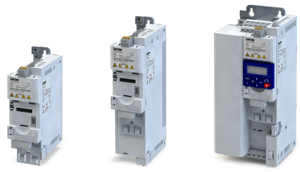
Byte 5	Byte 6	
Format	Number of values	

Field	Data type	Values
Format	U8	0x44: Error
Number of values	U8	0x01: Error code without additional information. 0x02: Error code with additional information.

Error code

Byte 7	Byte 8	Byte 9	Byte 10
Error code		Additional information (if available)	
HIGH byte	LOW byte	HIGH byte	LOW byte

Field	Data type	Values
Error code	U16	0x0000 ... 0xFFFF Error codes for parameter data transfer 📖 311
Additional information (if available)	U16	



9.6.12 Write parameter data

This section describes the request and response for the acyclic writing of a parameter.

Details

- When a multi-parameter write request is transmitted, the parameter attribute, index and subindex and then the parameter format and parameter value are repeated "n" times, "n" being the number of parameters addressed.
- A write request must not exceed the maximum data length of 240 bytes.

Request header

Byte 1	Byte 2	Byte 3	Byte 4
Request reference	Request identification	Axis	Number of indices

Field	Data type	Values
Request reference	U8	This value is defined by the master.
Request identification	U8	0x02: Write parameters.
Axis	U8	0x00 or 0x01
Number of indices	U8	0x"n" (n = number of parameters addressed)

Parameter attribute

Byte 5	Byte 6	
Attribute	Number of subindices	

Field	Data type	Values
Attribute	U8	0x10: Value
Number of subindices	U8	0x00

Index and subindex

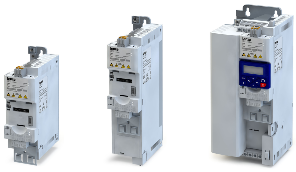
Byte 7	Byte 8	Byte 9	Byte 10
Index		Subindex	
HIGH byte	LOW byte	HIGH byte	LOW byte

Field	Data type	Values
Index	U16	0x0001 ... 0xFFFF (1 ... 65535)
Subindex	U16	0x0000 ... 0x00FF (0 ... 255)

Parameter format

Byte 11	Byte 12	
Format	Number of values	

Field	Data type	Values
Format	U8	0x02: integer8 (1 byte with sign) 0x03: Integer16 (2 bytes with sign) 0x04: Integer32 (4 bytes with sign) 0x05: Unsigned8 (1 byte without sign) 0x06: Unsigned16 (2 bytes without sign) 0x07: Unsigned32 (4 bytes without sign) 0x09: Visible String (with n characters) 0x0A: Octet String (with n characters) 0x40: Zero 0x41: Byte 0x42: Word 0x43: Double word
Number of values	U8	0x01 or number of characters (n) for string parameters.



Parameter value

Byte 13	Byte 14	Byte 15	Byte 16
Value (Integer8 / Unsigned8 / byte)			
Value (Integer16 / Unsigned16 / word)			
Value (Integer32 / Unsigned32 / double word)			

Byte 13	Byte 14	Byte 15	Byte ...
String (Visible string / octet string with an optional length)			

Field	Data type	Values
Value	U8/U16/U32	Value range/length depends on the parameter format (see table above).
String	U8	Visible string / octet string with an optional length (n characters = n bytes)

Response to a correctly executed write request

With an error-free multi-parameter request, only the response header is transmitted, and the complete data area is omitted.

Response header

Byte 1	Byte 2	Byte 3	Byte 4
Request reference (mirrored)	Response identification	Axis (mirrored)	Number of indices

Field	Data type	Values
Request reference	U8	Mirrored value of the parameter request.
Response identification	U8	0x02: Parameter has been written.
Axis	U8	0x00 or 0x01
Number of indices	U8	0x"n" (n = number of parameters addressed)

Response to a write error

In the case of a multi-parameter request, correct and possible faulty messages are summarised in one telegram. They have the following data contents:

Correct message
- Format: 0x40
- Number of values: 0x00

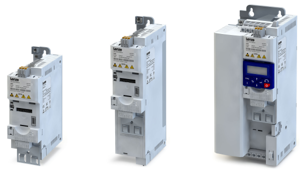
Faulty message
- Format: 0x44
- Number of values: 0x01 or 0x02
- Error code without additional information (for number of values = 0x01) or error code with additional information (for number of values = 0x02)

A faulty access to a parameter "n" is indicated at the nth position in the response telegram of a multi-parameter request.

Response header

Byte 1	Byte 2	Byte 3	Byte 4
Request reference (mirrored)	Response identification	Axis (mirrored)	Number of indices

Field	Data type	Values
Request reference	U8	Mirrored value of the parameter request.
Response identification	U8	0x82: Parameter has not been written. The data in bytes 7 + 8 must be interpreted as an error code.
Axis	U8	0x00 or 0x01
Number of indices	U8	0x"n" (n = number of parameters addressed)



Parameter format

Byte 5	Byte 6	
Format	Number of values	

Field	Data type	Values
Format	U8	0x44: Error
Number of values	U8	0x01: Error code without additional information. 0x02: Error code with additional information.

Error code

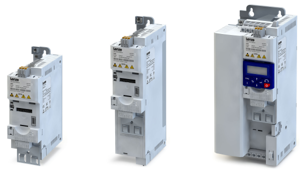
Byte 7	Byte 8	Byte 9	Byte 10
Error code		Additional information (if available)	
HIGH byte	LOW byte	HIGH byte	LOW byte

Field	Data type	Values
Error code	U16	0x0000 ... 0xFFFF Error codes for parameter data transfer 311
Additional information (if available)	U16	

9.6.13 Error codes for parameter data transfer

The following table lists all possible error codes for the acyclic data exchange:

Error code	Description	Explanation	Additional information
0x0000	Parameter number impermissible	Access to non-available parameter.	-
0x0001	Parameter value cannot be changed	Change access to a parameter value that cannot be changed.	Subindex
0x0002	Lower or upper value limit exceeded	Change access with value beyond the value limits.	Subindex
0x0003	Subindex impermissible	Access to non-available subindex.	Subindex
0x0004	No array	Access with subindex to non-indicated parameter.	-
0x0005	Incorrect data type	Change access with value that does not match the data type of the parameter.	-
0x0006	No setting permitted (only resettable)	Change access with a non-zero value where it is not permitted.	Subindex
0x0007	Description element cannot be changed	Change access to a description element that cannot be changed.	Subindex
0x0008	Reserved	(PROFIdrive profile V2: PPO-Write requested in IR is not available.)	-
0x0009	Description data not available	Access to non-available description (parameter value is available).	-
0x000A	Reserved	(PROFIdrive profile V2: Wrong access group.)	-
0x000B	No parameter change rights	Change access with missing parameter change rights.	-
0x000C	Reserved	(PROFIdrive profile V2: Wrong password.)	-
0x000D	Reserved	(PROFIdrive profile V2: Text cannot be read in cyclic data transfer.)	-
0x000E	Reserved	(PROFIdrive profile V2: Name cannot be read in cyclic data transfer.)	-
0x000F	No text array available	Access to non-available text array (parameter value is available).	-
0x0010	Reserved	(PROFIdrive profile V2: No PPO-Write.)	-
0x0011	Request cannot be executed due to the operating state	Access is not possible for temporary reasons that are not specified in detail.	-
0x0012	Reserved	(PROFIdrive profile V2: Other error.)	-
0x0013	Reserved	(PROFIdrive profile V2: Date cannot be read in cyclic data transfer.)	-
0x0014	Value impermissible	Change access with the value that is within the value limits but that is impermissible for other permanent reasons (parameters with defined individual values).	Subindex
0x0015	Response too long	The length of the current response exceeds the maximum length transferrable.	-
0x0016	Parameter address impermissible	Impermissible value or value which is not supported for the attribute, number of subindexes, parameter number, or subindex, or a combination.	-
0x0017	Format impermissible	Write request: Impermissible or non-supported format of parameter data.	-
0x0018	Number of values not consistent	Write request: Number of parameter data values does not match the number of subindexes in the parameter address.	-
0x0019	Axis impermissible	Access to non-available axis. For double axis, only 0x00 or 0x01 permitted.	-
0x001A ... 0x00FF	Reserved	-	-



9.6.14 Restart communication

The following parameter can be used to restart or stop communication. Optionally it is also possible to reset all communication parameters to the default status.

Details

A restart of communication is required after changes of the interface configuration (e. g. station address and baud rate) in order that the changed settings become effective.

For restarting communication, there are two options:

a) Switch inverter off and on again.

b) Set the selection = "Restart with current values [1]" in 0x2340.

Parameter	Name / value range / [default setting]		Info
0x2340	PROFIBUS communication • From version 03.00		Restart / stop communication.
	0	**No action/no error**	Only status feedback
	1	Restart with current values	Restart communication with the current values.
	2	Restart with default values	Restart communication with the standard values of the communication parameters.
	5	Stop network communication	Stop communication.
	10	In progress	Only status feedback
	11	Action cancelled	
	12	Error	

9.6.15 Short setup

In the following, the steps required for controlling the inverter via PROFIBUS are described.

Parameterisation required

1. Activate network control: 0x2631:037 (P400.37) = "TRUE [1]"
2. Set network as standard setpoint source: 0x2860:001 (P201.01) = "Network [5]"
3. Set PROFIBUS station address.
   - Each network node must be provided with a unique station address.
   - Details: ▶ Station address setting 📖 295
4. Optional: Change the response of the inverter if the communication to the PROFIBUS master is interrupted.
   - Default setting: If communication is interrupted, an error is triggered.
   - Details: ▶ Monitoring 📖 296
5. Save parameter settings: 0x2022:003 (P700.03) = "On / start [1]".
6. Switch the inverter off and then on again in order that the changed communication settings can get effective.
7. Configure the host system (master) in order to enable communication with the inverter. See section "Configuring the host system (master)".
8. Control inverter via RPDO (and evaluate in the current status via TPDO).
   - For assignment of the control word and setpoint selection, see section "RPDO mapping".
   - For assignment of the status word and actual value output, see section "TPDO mapping".
   - Acceleration 0x2917 (P220.00) and deceleration 0x2918 (P221.00) can be set/changed via the acyclic parameter data transfer.

In the default setting, the digital input DI1 is assigned with the "Run" function. If the network control is activated, this function serves as "start enable" for start commands via network. Hence, the digital input DI1 must be set to HIGH level in order that the motor can be started via network. ▶ Start / stop motor 📖 531

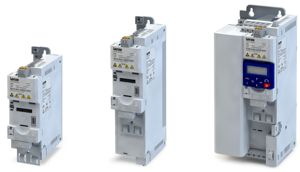
Configuring the host system (master)

Configure the host system (master) as follows in order to enable communication with the inverter.

1. Import the device description file of the inverter into the master.

   The device description file for the inverter can be found in the Internet:
   http://www.lenze.com → Download

   The following language versions of the device description file can be used:
   - LENZE[product type].GSE (source file, English), e.g. LENZE550.GSE for i550
   - LENZE[product type].GSG (German), e.g. LENZE550.GSG for i550
   - LENZE[product type].GSE (English), e.g. LENZE550.GSE for i550
2. Define the user data length.
   - The user data length is defined during the initialisation phase of the master.
   - The inverter supports the configuration of maximally 16 process data words (maximally 32 bytes).
   - The user data length for process input data and process output data is the same.
3. Execute data mapping in the hardware configurator.
   - For preconfigured PDO mapping, see the sections "RPDO mapping" and "TPDO mapping".
   - Details: ▶ Data mapping 📖 300



RPDO mapping

For the process data from the master to the inverter, the following data mapping is preset in the device description file:

1. NetWordIN1 data word0x4008:001 (P590.01)
2. Network setpoint frequency (0.01) 0x400B:005 (P592.05)
3. 16 bit selectable output data, mapped to Keypad setpoints: Process controller setpoint 0x2601:002 (P202.02)

Function assignment of the NetWordIN1 data word

Bit	Default setting	For details and configuration, see
0	Not active (reserve)	0x400E:001 (P505.01)
1	Not active (reserve)	0x400E:002 (P505.02)
2	Activate quick stop	0x400E:003 (P505.03)
3	Not active (reserve)	0x400E:004 (P505.04)
4	Run forward (CW)	0x400E:005 (P505.05)
5	Activate preset (bit 0)	0x400E:006 (P505.06)
6	Activate preset (bit 1)	0x400E:007 (P505.07)
7	Reset error	0x400E:008 (P505.08)
8	Not active (reserve)	0x400E:009 (P505.09)
9	Activate DC braking	0x400E:010 (P505.10)
10	Not active (reserve)	0x400E:011 (P505.11)
11	Not active (reserve)	0x400E:012 (P505.12)
12	Reverse rotational direction	0x400E:013 (P505.13)
13	Not active (reserve)	0x400E:014 (P505.14)
14	Not active (reserve)	0x400E:015 (P505.15)
15	Not active (reserve)	0x400E:016 (P505.16)

Specifying the frequency setpoint

- The specification is made unsigned (independent of the direction of rotation) as integer in the resolution [0.01 Hz].
- The direction of rotation is defined in the default setting via bit 12 of the NetWordIN1 data word.
- Example: 4560 ≡ 45.60 Hz

TPDO mapping

For the process data from the inverter to the master, the following data mapping is preset in the device description file:

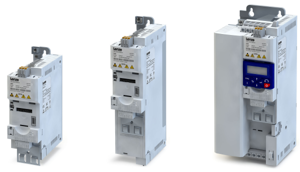
1. NetWordOUT1 data word 0x400A:001 (P591.01)
2. Network setpoint frequency (0.01) 0x400B:005 (P592.05)
3. Motor current 0x2D88 (P104.00)

Status assignment of the NetWordOUT1 data word

Bit	Default setting	For details and configuration, see
0	Ready for operation	0x2634:010 (P420.10)
1	Not connected	0x2634:011 (P420.11)
2	Operation enabled	0x2634:012 (P420.12)
3	Error active	0x2634:013 (P420.13)
4	Not connected	0x2634:014 (P420.14)
5	Quick stop active	0x2634:015 (P420.15)
6	Running	0x2634:016 (P420.16)
7	Device warning active	0x2634:017 (P420.17)
8	Not connected	0x2634:018 (P420.18)
9	Not connected	0x2634:019 (P420.19)
10	Setpoint speed reached	0x2634:020 (P420.20)
11	Current limit reached	0x2634:021 (P420.21)
12	Actual speed = 0	0x2634:022 (P420.22)
13	Rotational direction reversed	0x2634:023 (P420.23)
14	Release holding brake	0x2634:024 (P420.24)
15	Safe torque off (STO) active	0x2634:025 (P420.25)

Output of the actual frequency value

- The output is made unsigned (independent of the direction of rotation) as integer in the resolution [0.01 Hz].
- An active reversal is displayed via bit 13 of the NetWordOUT1 data word.
- Example: 4560 ≡ 45.60 Hz



9.7 EtherNet/IP

EtherNet/IP™ (EtherNet Industrial Protocol) is a fieldbus based on Ethernet which uses the Common Industrial Protocol™ (CIP™) for data exchange.

- EtherNet/IP™ andCommon Industrial Protocol™ (CIP™) are trademarks and patented technologies, licensed by the user organisation ODVA (Open DeviceNet Vendor Assoziation), USA.
- Detailed information on EtherNet/IP can be found on the web page of the user organisation: http://www.odva.org
- Information on the dimensioning of a EtherNet/IP network can be found in the configuration document for the product.

The inverter can be controlled by every CIP Generic Master that either uses "Class 1 Messaging" or "Class 3 Messaging".

For this purpose, the inverter must be configured as AC drive Adapter with the programming software »RSLogix™ 5000« from the Rockwell Automation® Corporation.

Registered trademarks used or trademarks of the Rockwell Automation® Corporation, USA:

- »RSLogix™«, »RSLogix™ 5000«
- »Allen-Bradley®«
- »CompactLogix™«, »ControlLogix®«, »SoftLogix™«

Conditions for commissioning

- The control unit (CU) of the inverter is provided with EtherNet/IP (from firmware 02.01).
- The device is networked as EtherNet/IPAdapter with an EtherNet/IP Scanner and, if necessary, further EtherNet/IP nodes, see "Typical topologies" in the section ▶ EtherNet/IP 📖 68.
- An Engineering PC with the programming software »RSLogix™ 5000« (from version 20) is connected to the Scanner.
- Current device description files for EtherNet/IP are available.
  - EDS files for Lenze devices: Download
  - The files are installed via the "EDS Hardware Installation Tool" of the »RSLogix™ 5000«.
  - Allen-Bradley control systems do not need any EDS files to add devices to their configuration.
- An »RSLogix™ 5000« project has been created and is in the offline state.
- The CPU and Ethernet adapter of the PLC (Scanner) have been configured.
- All EtherNet/IP nodes are supplied with voltage and are switched on.

Commissioning with »RSLogix™ 5000« (from version 20)

The basic commissioning steps can be found under:

▶ Short setup 📖 346

9.7.1 Basic settings

IP basic settings

The basic IP settings are required to let the engineering software access the network nodes (PLC, inverter) directly via Ethernet.

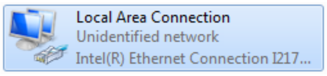
The PC with the engineering software must be in the same network as the devices to be configured.

First, configure the PC so that this condition is fulfilled.

The required steps are described by the example of the operating system Microsoft® Windows® 7.

How to define the IP basic settings:

1. Call the "Network and sharing center" under "Control panel".
2. Select "Change adapter settings" (observe administrator rights!).
3. Select the network to be configured (double-click), e. g.:



The network nodes (PLC, inverter) must be connected to the network.

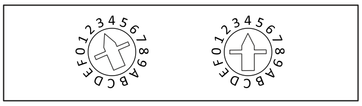
The status dialog box of the network is opened.

4. Click "Properties".
   The properties dialog box of the network is opened.
5. Select "Internet protocol version 4 (TCP/IPv4)" and click "Properties".
   The properties dialog box of the "Internet protocol version 4 (TCP/IPv4)" is opened.
6. Enter the IP address, the subnet mask and, if required, the gateway address under "Use the following addresses".
7. Click "OK".

The IP basic settings are now completed.

Set IP address

The rotary encoder switches at the front of the device serve to set the IP address in terms of hardware.

Setting	Addressing
0x00	IP address via parameter 0x23A1:001 (P510.01).
0x01 ... 0xFE	Setting of the 4th byte of the IP address via the rotary encoder switch. 192.168.124.[setting] **Example:** Setting for the value 52 (3 × 16) + (4 × 1) = 52  x16 x1

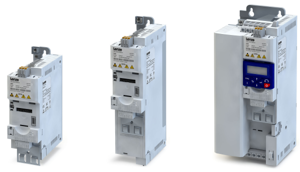
The value set via the rotary encoder switches is used when the mains is switched on or after a network restart with 0x23A0 (P508.00) = 1 or 2 . A changed value during operation will only become valid after the network has been restarted.

- 0x23A3 (P509.00) shows the switch setting at the last mains connection.
- 0x23A2:001 (P511.01) shows the active IP address.

Set subnet mask

The desired subnet mask is set via 0x23A1:002 (P510.02).

0x23A2:002 (P511.02) shows the active subnet mask.



Set gateway address

If a gateway is used, set the gateway address via 0x23A1:003 (P510.03).

0x23A2:003 (P511.03) shows the active gateway address.

Set host name

Set the desired host name (max. 64 characters) via 0x23A1:004 (P510.04).

Since DNS is not supported, the host name only serves to identify the device.

IP configuration

As an alternative to the manual setting of the IP addresses, a DHCP or BOOTP server can also be used to assign the IP addresses to each single network node.

0x23A1:005 (P510.05) serves to define whether the currently saved IP addresses are used or the IP addresses are assigned by means of DHCP or BOOTP.

Multicast settings

We recommend you to keep the default settings in order to ensure a safe multicast transmission.

Multicast enables the transfer of data packages to several nodes or to a closed node group at the same time. For this purpose, the scanner automatically generates a multicast IP address for the device.

The preset **multicast TTL value** is 1, which means that the multicast data packages are only transferred via the local subnetwork. Contact your IT department for the correct setting of the respective network installation.

The multicast settings can also be made manually via the following parameters:

- 0x23A1:008 (P510.08): Multicast IP address
- 0x23A1:007 (P510.07): Multicast allocation
- 0x23A1:006 (P510.06): Multicast TTL
- 0x23A1:009 (P510.09): Multicast number

Set the baud rate for the Ethernet ports manually

By default, the device automatically recognises the baud rate of the connected Ethernet network.

For the Ethernet ports of the device, you can also set the baud rate explicitly and define whether the communication is to be half duplex or full duplex:

- 0x23A4:001 (P512.01): Setting of the baud rate for Ethernet port 1
- 0x23A4:002 (P512.02): Setting of the baud rate for Ethernet port 2
- 0x23A5:001 (P519.01): Display of the active baud rate for Ethernet port 1
- 0x23A5:002 (P519.02): Display of the active baud rate for Ethernet port 2

Address conflict detection (ACD)

0x23A7 (P514.00) serves to switch off the Address conflict detection.

In the default setting, the Address conflict detection is activated.

A change of the setting only gets effective after the device has been reset ("power off/on" or "type 0 reset").

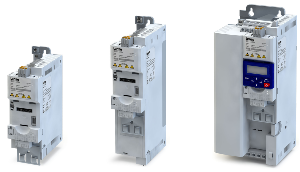
Quality of service (QoS)

0x23A6 (P513.00) indicates if the EtherNet/IP-specific QoS tag (802.1Q) for prioritising the data packages to be transmitted is used.

In the presetting, the QoS tag is not used.

The parameters for configuring the network of the device are described below.

Parameter	Name / value range / [default setting]	Info
0x23A1:001 (P510.01)	EtherNet/IP settings: IP address (EtherN/IP sett.: IP address) 0 ... [**276605120**] ... 4294967295 • From version 02.00	Set IP address. The default setting 276605120 corresponds to the IP address 192.168.124.16. • 276605120 = 0x107CA8C0 → 0xC0.0xA8.0x7C.0x10 = 192.168.124.16
0x23A1:002 (P510.02)	EtherNet/IP settings: Subnet (EtherN/IP sett.: Subnet) 0 ... [**16777215**] ... 4294967295 • From version 02.00	Set subnet mask. The default setting 16777215 corresponds to the subnet mask 255.255.255.0. • 16777215 = 0xFFFFFF → 0xFF.0xFF.0xFF.0x00 = 255.255.255.0
0x23A1:003 (P510.03)	EtherNet/IP settings: Gateway (EtherN/IP sett.: Gateway) 0 ... [**0**] ... 4294967295 • From version 02.00	Set gateway address. Example: The setting 276344004 corresponds to the gateway address 196.172.120.16. • 276344004 = 0x1078ACC4 → 0xC4.0xAC.0x78.0x10 = 196.172.120.16
0x23A1:004 (P510.04)	EtherNet/IP settings: Host name (EtherN/IP sett.: Host name) • From version 02.00	Set host name. • String with up to 64 characters.
0x23A1:005 (P510.05)	EtherNet/IP settings: IP configuration (EtherN/IP sett.: IP configuration) • From version 02.00	Set IP configuration.
	0 Stored IP	The currently saved IP configuration is used.
	1 BOOTP	The IP configuration is assigned by the Scanner via BOOTP.
	2 DHCP	The IP configuration is assigned by the Scanner via DHCP. The assignment of a gateway address that is not in the same subnetwork as the IP address, is denied.
0x23A1:006 (P510.06)	EtherNet/IP settings: Multicast TTL (EtherN/IP sett.: Multicast TTL) 1 ... [**1**] ... 255 • From version 02.00	Setting of the multicast TTL value for the validity of data packages in the network.
0x23A1:007 (P510.07)	EtherNet/IP settings: Multicast allocation (EtherN/IP sett.: Mcast allocation) • From version 02.00	Selection for multicast-IP addressing.
	0 Default allocation	
	1 Multicast number/start address	
0x23A1:008 (P510.08)	EtherNet/IP settings: Multicast IP address (EtherN/IP sett.: Mcast IP addr.) 0 ... [**3221373167**] ... 4294967295 • From version 02.00	Set multicast IP address. The default setting 3221373167 corresponds to the Multicast IP address 239.64.2.192. • 3221373167 = 0xC00240EF → 0xEF.0x40.0x02.0xC0 = 239.64.2.192
0x23A1:009 (P510.09)	EtherNet/IP settings: Multicast number (EtherN/IP sett.: Multicast number) 1 ... [**1**] ... 8 • From version 02.00	Set multicast number.
0x23A4:001 (P512.01)	Port settings: Port 1 (Port settings: Port 1) • From version 02.00	Set baud rate for Ethernet port 1.
	0 Auto-Negotiation	
	1 10 Mbps	
	2 100 Mbps	
	3 Reserved	
	4 Reserved	
	5 10 Mbps/Half Duplex	
	6 10 Mbps/Full Duplex	
	7 100 Mbps/Half Duplex	
	8 100 Mbps/Full Duplex	
	9 Reserved	
	10 Reserved	
	11 Reserved	
	12 Reserved	



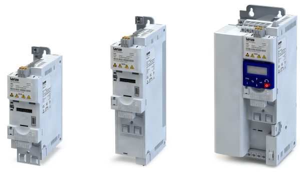
Parameter	Name / value range / [default setting]	Info
0x23A4:002 (P512.02)	Port settings: Port 2 (Port settings: Port 2) • From version 02.00	Set baud rate for Ethernet port 2.
	0 **Auto-Negotiation**	
	1 10 Mbps	
	2 100 Mbps	
	3 Reserved	
	4 Reserved	
	5 10 Mbps/Half Duplex	
	6 10 Mbps/Full Duplex	
	7 100 Mbps/Half Duplex	
	8 100 Mbps/Full Duplex	
	9 Reserved	
	10 Reserved	
	11 Reserved	
	12 Reserved	
0x23A7 (P514.00)	Address conflict detection (AddrConflctDetec) • From version 02.00	Activate address conflict detection (ACD) (enable). • If this value is changed, the device must be reset ("Power off/on" or "Type 0 Reset").
	0 Disabled	
	1 **Enabled**	
0x23A3 (P509.00)	EtherNet/IP switch position (EtherN. switch) • Read only • From version 02.00	Display of the rotary encoder switch settings at the last mains power-on.
0x23A6 (P513.00)	Quality of service (QualityOfService) • Read only • From version 02.00	Display if the QoS tag for prioritising the data packages to be transmitted is used.
	0 802.1Q Tag disable	
	1 802.1Q Tag enable	

9.7.2 Monitoring

The parameters for setting network monitoring functions are described below.

Parameter	Name / value range / [default setting]	Info
0x23A1:010 (P510.10)	EtherNet/IP settings: Timeout (EtherN/IP sett.: Timeout) 500 ... [**10000**] ... 65535 ms • From version 02.00	Setting of the maximum permissible time-out for the CIP communication. When the specified monitoring time has elapsed, the response set in 0x2859:007 (P515.07) is triggered in the inverter.
0x2859:001 (P515.01)	EtherNet/IP monitoring: Watchdog elapsed (EtherN/IP monit.: WD elapsed) • From version 02.00 • For further possible settings, see parameter 0x2D45:001 (P310.01). 🕮 223	Selection of the response to a permanent interruption of the communication to the Scanner, e. g. by cable break or failure of the Scanner. Associated error code: • 33168 | 0x8190 - Network: watchdog timeout
	2 **Trouble**	
0x2859:003 (P515.03)	EtherNet/IP monitoring: Invalid configuration (EtherN/IP monit.: Invalid config) • From version 02.00 • For further possible settings, see parameter 0x2D45:001 (P310.01). 🕮 223	Selection of the response triggered by the reception of invalid configuration data. Associated error code: • 33414 | 0x8286 - Network: PDO mapping error
	2 **Trouble**	
0x2859:004 (P515.04)	EtherNet/IP monitoring: Initialisation error (EtherN/IP monit.: Init. error) • From version 02.00 • For further possible settings, see parameter 0x2D45:001 (P310.01). 🕮 223	Selection of the response triggered by the occurrence of an error during the initialisation of the network component. Associated error code: • 33170 | 0x8192 - Network: initialisation error
	2 **Trouble**	

Parameter	Name / value range / [default setting]	Info
0x2859:005 (P515.05)	EtherNet/IP monitoring: Invalid process data (EtherN/IP monit.: Inval. proc.data) • From version 02.00 • For further possible settings, see parameter 0x2D45:001 (P310.01). 📖 223	Selection of the response triggered by the reception of invalid process data. Associated error code: • 33171 | 0x8193 - Network: invalid cyclic process data
	2 **Trouble**	
0x2859:006 (P515.06)	EtherNet/IP monitoring: Timeout explicit message (EtherN/IP monit.: Timeout ExplMsg) • From version 02.00 • For further possible settings, see parameter 0x2D45:001 (P310.01). 📖 223	Selection of the response to time-outs during the transfer of Explicit Messages. Associated error code: • 33042 | 0x8112 - Network: timeout explicit message
	1 **Warning**	
0x2859:007 (P515.07)	EtherNet/IP monitoring: Timeout communication (EtherN/IP monit.: Timeout Comm.) • From version 02.00 • For further possible settings, see parameter 0x2D45:001 (P310.01). 📖 223	Selection of the response to the time-out during the CIP communication. Selection of the response to the time-out during the CIP communication. The monitoring time for the CIP communication is defined in 0x23A1:010 (P510.10). Associated error code: • 33044 | 0x8114 - Network: overall communication timeout
	1 **Warning**	



9.7.3 LED status displays

Information on the CIP status can be obtained quickly via the "MS" and "NS" LED displays on the front of the inverter. In addition, the LEDs at the RJ45 sockets indicate the Ethernet connection status.

The meaning of the "MS" and "NS" LEDs can be obtained from the following two tables.

LED "MS" (green/red)	CIP module status	Status/meaning
off	Nonexistent	The network option is not supplied with voltage.
On (green)	Operational	The network option works correctly.
Blinking green	Standby	The network option is not configured completely or the configuration is incorrect.
Blinking red	Major recoverable fault	The network option contains a correctable error.
on (red)	Major unrecoverable fault	The network option contains a non-correctable error.
Blinking green/red	Device self testing	The network option executes a self-test.

LED "NS" (green/red)	CIP network status	Status/meaning
off	No IP address	The network option is not supplied with voltage or has not received an IP address yet.
On (green)	Connected	The network option works correctly an has established a connection to the scanner.
Blinking green	No connections	The network option • works correctly, • has been assigned to an IP address, • has not been implemented into the network yet by the scanner.
Blinking red	Connection timeout	A time-out has occurred.
on (red)	Duplicate IP	The network option cannot access the network (IP address conflict).
Blinking green/red	Device self testing	The network option executes a self-test.

Status displays at the RJ45 sockets

The LEDs at the RJ45 sockets indicate the connection status to the network:

LED "Link" (green)	Status/meaning
off	No connection to the network.
on	A physical connection to the network is available.

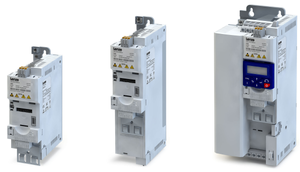
LED "Activity" (yellow)	Status/meaning
off	No data transfer.
on or flickers	Data is exchanged via the network.

9.7.4 Diagnostics

The parameters for diagnosing the network are described below.

Parameter	Name / value range / [default setting]	Info
0x23A2:001 (P511.01)	Active EtherNet/IP settings: IP address (EtherN/IP diag.: IP address) • Read only • From version 02.00	Display of the active IP address. The default setting 276605120 corresponds to the IP address 192.168.124.16. • 276605120 = 0x107CA8C0 → 0xC0.0xA8.0x7C.0x10 = 192.168.124.16
0x23A2:002 (P511.02)	Active EtherNet/IP settings: Subnet (EtherN/IP diag.: Subnet) • Read only • From version 02.00	Display of the active subnet mask. The default setting 16777215 corresponds to the subnet mask 255.255.255.0. • 16777215 = 0xFFFFFF → 0xFF.0xFF.0xFF.0x00 = 255.255.255.0

Parameter	Name / value range / [default setting]	Info
0x23A2:003 (P511.03)	Active EtherNet/IP settings: Gateway (EtherN/IP diag.: Gateway) • Read only • From version 02.00	Display of the active gateway address. Example: The setting 276344004 corresponds to the gateway address 196.172.120.16. • 276344004 = 0x1078ACC4 → 0xC4.0xAC.0x78.0x10 = 196.172.120.16
0x23A2:005 (P511.05)	Active EtherNet/IP settings: MAC address (EtherN/IP diag.: MAC address) • Read only • From version 02.00	Display of the active MAC address.
0x23A2:006 (P511.06)	Active EtherNet/IP settings: Multicast address (EtherN/IP diag.: Mcast address) • Read only • From version 02.00	Display of the active Multicast IP address. The default setting 3221373167 corresponds to the Multicast IP address 239.64.2.192. • 3221373167 = 0xC00240EF → 0xEF.0x40.0x02.0xC0 = 239.64.2.192
0x23A5:001 (P519.01)	Active port settings: Port 1 (Port diagnostics: Port 1) • Read only • From version 02.00	Display of the active baud rate for Ethernet port 1.
	0 Not connected	
	1 10 Mbps/Half Duplex	
	2 10 Mbps/Full Duplex	
	3 100 Mbps/Half Duplex	
	4 100 Mbps/Full Duplex	
0x23A5:002 (P519.02)	Active port settings: Port 2 (Port diagnostics: Port 2) • Read only • From version 02.00	Display of the active baud rate for Ethernet port 2.
	0 Not connected	
	1 10 Mbps/Half Duplex	
	2 10 Mbps/Full Duplex	
	3 100 Mbps/Half Duplex	
	4 100 Mbps/Full Duplex	
	5 Reserved	
	6 Reserved	
0x23A8 (P516.00)	CIP module status (CIP module stat.) • Read only • From version 02.00	Display of the active CIP module status.
0x23A9 (P517.00)	EtherNet/IP status (EtherN/IP status) • Read only • From version 02.00	Display of the active network status.



9.7.5 Objects

An EtherNet/IP node is a collection of objects. A single object is described by its class, their instances and attributes. Various services such as read or write services can be applied to these objects.

> This chapter only describes the CIP objects implemented by Lenze and their supported features (attributes).
>
> Not all object features as described in the "Common Industrial Protocol Specification" of the ODVA are supported.

Class Attribute Services

These "Class Attribute Services" are supported:

Service ID	Name	Data type
1	Get Revision	UNIT
2	Get Max. Instance	
3	Get Number of Instances	
4	Get Number Attributes	
5	Get Optional Attributes	
6	Get Max. ID Number Class Attributes	
7	Get Max. ID Number Instance Attributes	

Instance Attribute Services

These "Instance Attribute Services" are supported:

Service ID	Name	Data type
1	Get No. of Member in List	UNIT
2	Get Member List	
3	Get/Set Data	
4	Get Size	

0x01: Identity Object

The "Identity Object" provides the identification and the general information on the device.

Attribute (Instance ID)	Name	Info
1	Vendor ID	Lenze
2	Device Type	2 (AC Drive)
3	Product Code	550
4	Revision	e.g. "1.5"
5	Status	
6	Serial Number	
7	Product Name	IOFW51AGXX
8	State	

0x04: Assembly Object

The inverter contains EtherNet/IP assembly object instances which refer to the following »RSLogix™ 5000« connection parameters:

- Inputs (actual value such as actual speed, actual position, etc.)
- Outputs (enable and reference value for the drive)
- Configuration

The inputs and outputs refer to the view of the Scanner (PLC).

Output data/assemblies are created by the Scanner (PLC) and transmitted to the Adapter (inverter).

Input data/assemblies are created by the Adapter (inverter) and transmitted to the Scanner (PLC).

The assembly object instances can be accessed via "Class 1 Messaging" (Implicit Messaging) and "Class 3 Messaging" (Explicit Messaging).

Customer specific configurations with the assembly object instances 110 and 111 are only possible with PLCs (Scanner) that support "Class 1 Messaging".

See also:

▶ Process data transfer 📖 332 (Implicit Messaging)

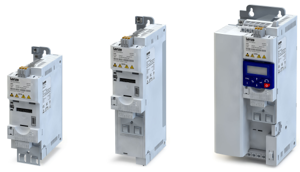
▶ Parameter data transfer 📖 342 (Explicit Messaging)

The Ethernet connection object offers the following common services for accessing the assembly object instances:

- 0x0E: Get_Attribute_Single (read parameter/assembly data)
- 0x10: Set_Attribute_Single (write parameter/assembly data)

The following predefined assembly object instances can be used according to the "CIP™ Network Library":

Attribute (Instance ID)	Name	Info / parameter
Assembly output object instances according to AC Drive profile		
20	Basic Speed Control Output	LSB of the AC Drive control word 0x400B:001 (P592.01) (some bits are masked) ▶ 0x400B:004 (P592.04) Network setpoint speed
21	Extended Speed Control Output	LSB of the AC Drive control word 0x400B:001 (P592.01) ▶ 0x400B:004 (P592.04) Network setpoint speed
22	Speed and Torque Control Output	LSB of the AC Drive control word 0x400B:001 (P592.01) (some bits are masked) ▶ 0x400B:004 (P592.04) Network setpoint speed ▶ 0x400B:008 (P592.08) Torque mode setpoint
23	Extended Speed and Torque Control Output	LSB of the AC Drive control word 0x400B:001 (P592.01) ▶ 0x400B:004 (P592.04) Network setpoint speed ▶ 0x400B:008 (P592.08) Torque mode setpoint
Assembly input object instances according to the AC Drive profile		
70	Basic Speed Control Input	LSB of the AC Drive status word 0x400C:001 (P593.01) (some bits are masked) ▶ 0x400C:004 (P593.04) Motor speed
71	Extended Speed Control Input	LSB of the AC Drive status word 0x400C:001 (P593.01) ▶ 0x400C:004 (P593.04) Motor speed
72	Speed and Torque Control Input	LSB of the AC Drive status word 0x400C:001 (P593.01) ▶ 0x400C:004 (P593.04) Motor speed ▶ 0x400C:007 (P593.07) Torque scaled
73	Extended Speed and Torque Control Input	LSB of the AC Drive status word 0x400C:001 (P593.01) MSB Drive State of the AC Drive status word (mask bits 12 ... 15) ▶ 0x400C:004 (P593.04) Motor speed ▶ 0x400C:007 (P593.07) Torque scaled
Assembly object instances for customer specific configurations		
110	Custom Output	Customised The inverter must be registered with an EDS device description file in »RSLogix™ 5000« to be able to assign data to these assembly object instances.
111	Custom Input	



Assembly output objects (outputs)

Assembly output objects are usually used to enable the inverter (Adapter) and define a speed or torque setpoint.

Depending on the data length defined by the PLC (Scanner) the memory map of the I/O data may vary in size.

In case of assembly output objects, a 32-bit-run/idle header is assumed. When the assemblies are mapped, this header is inserted automatically into the data flow by most of the Allen-Bradley PLC/SLC devices. For this purpose, no adaptations are required.

If your PLC does not support the 32-bit run/idle header, complement the output image by a leading 32-bit header. Set the data in the header to 0.

Bit 0 of the header can be defined in the process image of your PLC:

- State 0: Idle mode
- State 1: Run mode

Structure of the output objects

<table>
<tr><th>Attribute (Instance ID)</th><th>Byte</th><th>Bit 7</th><th>Bit 6</th><th>Bit 5</th><th>Bit 4</th><th>Bit 3</th><th>Bit 2</th><th>Bit 1</th><th>Bit 0</th></tr>
<tr><td rowspan="4">20 (0x14)</td><td>0</td><td></td><td></td><td></td><td></td><td></td><td>FaultRst</td><td></td><td>RunFwd (CW)</td></tr>
<tr><td>1</td><td colspan="8"></td></tr>
<tr><td>2</td><td colspan="8">Speed Reference (low byte)</td></tr>
<tr><td>3</td><td colspan="8">Speed Reference (high byte)</td></tr>
<tr><td rowspan="4">21 (0x15)</td><td>0</td><td></td><td>NetRef</td><td>NetCtrl</td><td></td><td></td><td>FaultRst</td><td>RunRev (CCW)</td><td>RunFwd (CW)</td></tr>
<tr><td>1</td><td colspan="8"></td></tr>
<tr><td>2</td><td colspan="8">Speed Reference (low byte)</td></tr>
<tr><td>3</td><td colspan="8">Speed Reference (high byte)</td></tr>
<tr><td rowspan="6">22 (0x16)</td><td>0</td><td></td><td></td><td></td><td></td><td></td><td>FaultRst</td><td></td><td>RunFwd (CW)</td></tr>
<tr><td>1</td><td colspan="8"></td></tr>
<tr><td>2</td><td colspan="8">Speed Reference (low byte)</td></tr>
<tr><td>3</td><td colspan="8">Speed Reference (high byte)</td></tr>
<tr><td>4</td><td colspan="8">Torque Reference (low byte)</td></tr>
<tr><td>5</td><td colspan="8">Torque Reference (high byte)</td></tr>
<tr><td rowspan="6">23 (0x17)</td><td>0</td><td></td><td>NetRef</td><td>NetCtrl</td><td></td><td></td><td>FaultRst</td><td>RunRev (CCW)</td><td>RunFwd (CW)</td></tr>
<tr><td>1</td><td colspan="8"></td></tr>
<tr><td>2</td><td colspan="8">Speed Reference (low byte)</td></tr>
<tr><td>3</td><td colspan="8">Speed Reference (high byte)</td></tr>
<tr><td>4</td><td colspan="8">Torque Reference (low byte)</td></tr>
<tr><td>5</td><td colspan="8">Torque Reference (high byte)</td></tr>
<tr><td>110 (0x6E)</td><td>0
...
31</td><td colspan="8">Custom Output</td></tr>
</table>

Assembly input objects (inputs)

Assembly input objects are usually used to monitor the status of the inverter (Adapter) and request current actual values (e. g. the current speed).

The input objects are mapped in the Adaptermemory from byte 0 and transmitted "mode-less".

The inverter does not use a 32-bit header for the real time status. Thus, the start address in the assembly memory map is the real start of the first assembly data element.

When the assembly input objects are mapped to the control memory, observe the real assembly lengths.

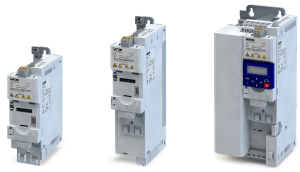
Structure of the input objects

Attribute (Instance ID)	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
70 (0x46)	0						Running1 (Fwd, CW)		Faulted
	1								
	2	Speed Actual (low byte)							
	3	Speed Actual (high byte)							
71 (0x47)	0	AtReference	RefFromNet	CtrlFromNet	Ready	Running2 (Rev, CCW)	Running1 (Fwd, CW)	Warning	Faulted
	1	Drive State							
	2	Speed Actual (low byte)							
	3	Speed Actual (high byte)							
72 (0x48)	0						Running1 (Fwd, CW)		Faulted
	1								
	2	Speed Actual (low byte)							
	3	Speed Actual (high byte)							
	4	Torque Actual (low byte)							
	5	Torque Actual (high byte)							
73 (0x49)	0	AtReference	RefFromNet	CtrlFromNet	Ready	Running2 (Rev, CCW)	Running1 (Fwd, CW)	Warning	Faulted
	1	Drive State							
	2	Speed Actual (low byte)							
	3	Speed Actual (high byte)							
	4	Torque Actual (low byte)							
	5	Torque Actual (high byte)							
111 (0x6F)	0 ... 31	Custom Input							

0x28: Motor Data Object

The "Motor Data Object" provides a data basis for motor parameters.

Attribute (Instance ID)	Name	Info / parameter
3	Motor Type	▸ 0x6402 Motor type Default setting: Squirrel cage induction
6	Rated Current [mA]	▸ 0x6075 (P323.00) Motor rated current
7	Rated Voltage [V]	▸ 0x2C01:007 (P320.07) Rated voltage



0x29: Control Supervisor Object

The "Control Supervisor Object" describes all management functions of the device for the motor control.

Attribute (Instance ID)	Name	Info / parameter
3	Run1	AC Drive control word 0x400B:001 (P592.01): Bit 0 (run forward, CW)
4	Run2	AC Drive control word 0x400B:001 (P592.01): Bit 1 (run backward, CCW)
5	NetCtrl	AC Drive control word 0x400B:001 (P592.01): Bit 5 (activate network control: 0x2631:037 (P400.37) = 114)
6	State	AC Drive status word 0x400C:001 (P593.01): Bits 8 ... 11 (profile status/Drive State) Bits 12 ... 15 masked
7	Running1	AC Drive status word 0x400C:001 (P593.01): Bit 2 (run forward active, CW)
8	Running2	AC Drive status word 0x400C:001 (P593.01): Bit 3 (run backward active, CCW)
9	Ready	AC Drive status word 0x400C:001 (P593.01): Bit 4 (ready)
10	Faulted	AC Drive status word 0x400C:001 (P593.01): Bit 0 (fault/trouble active)
11	Warning	AC Drive status word 0x400C:001 (P593.01): Bit 1 (warning active)
12	FaultRst	AC Drive control word 0x400B:001 (P592.01): Bit 2 (fault reset)
13	FaultCode	▸ 0x603F (P150.00) Error code
15	CtrlFromNet	AC Drive status word 0x400C:001 (P593.01): Bit 5 (network control active)

Assignment of "CiA 402 plus States" to "AC Drive Profile Drive States"

CiA 402 plus States	AC Drive Profile Drive States
INIT (0, 1)	0: Manufacturer-specific
NOT_READY_TO_SWITCH_ON (2)	1: Startup (drive initialisation)
SWITCH_ON_DISABLED (3)	2: Not_Ready (mains voltage switched off)
READY_TO_SWITCH_ON (4)	3: Ready (mains voltage switched on)
SWITCHED_ON (5)	
OPERATION_ENABLED (6)	4: Enabled (drive has received run command)
DISABLE_OPERATION (7)	5: Stopping (drive has received stop command and is stopped)
SHUT_DOWN (8)	
QUICK_STOP (9)	
FAULT_REACTION_ACTIVE (10)	6: Fault_Stop (drive is stopped due to a fault)
FAULT (11)	7: Faulted (faults have occurred)

0x2A: AC Drive Object

The "AC Drive Object" describes the device-specific functions of the inverter, e. g. speed ramps, torque control etc.

Attribute (Instance ID)	Name	Info / parameter
3	AtReference	AC Drive status word 0x400C:001 (P593.01): Bit 7 (At Reference)
4	NetRef	AC Drive control word 0x400B:001 (P592.01): Bit 6 (Network Setpoint Source) Activate network setpoint: 0x2631:017 (P400.17) = 116
6	DriveMode	0x400B:010 AC Drive mode
7	SpeedActual [rpm / $2^{SpeedScale}$]	0x400C:004 (P593.04) Current motor speed A speed scale parameter is not supported.
8	SpeedRef [rpm / $2^{SpeedScale}$]	0x400B:004 (P592.04) Setpoint speed A speed scale parameter is not supported.
11	TorqueActual [Nm / $2^{TorqueScale}$]	0x400C:007 (P593.07) Actual torque (scaled)
12	TorqueRef [Nm / $2^{TorqueScale}$]	0x400B:008 (P592.08) Torque setpoint The scaling factor can be set with 0x400B:009 (P592.09). Example: • Torque setpoint (0x400B:008) = 345 [Nm] • Scaling factor (0x400B:009) = 3 • Scaled torque setpoint = 345 [Nm] / 2^3 = 43.125 [Nm]
22	SpeedScale	Not implemented. Use the value "0" for SpeedScale.
24	TorqueScale	0x400B:009 (P592.09) Torque scaling of TorqueRef (0x400B:008 (P592.08)) and TorqueActual (0x400C:007 (P593.07))
29	RefFromNet	AC Drive status word 0x400C:001 (P593.01): Bit 6 (Reference from Network)

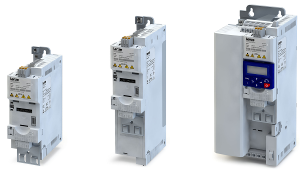
The following table shows the negative influence of an AC Drive mode on the mode selection parameters.

Impacts of the AC Drive mode on the mode selection parameters of the inverter

0x400B:010 **AC Drive mode** **0x2A: AC Drive Object** **Attribute 6: Drive Mode**	0x6402 **Motor type**	0x6060 (P301.00) **Modes of operation**	0x2C00 (P300.00) **Motor control mode**	0x4020:001 (P600.01) **Operating mode**
0: Vendor specific	Unchanged	Unchanged	Unchanged	Unchanged
1: Speed control (open loop)	7: Squirrel cage induction	2: MS: Velocity mode	6: V/f characteristic control (VFC open loop)	0: Inhibited
2: Speed control (closed loop)	7: Squirrel cage induction	2: MS: Velocity mode	2: Servo control (SC ASM)	0: Inhibited
3: Torque control	7: Squirrel cage induction	1: MS: Torque mode	Unchanged	0: Inhibited

The parameters for the implemented EtherNet/IP objects are described below.

Parameter	Name / value range / [default setting]		Info
0x400B:010	AC Drive mode		Selection of the AC drive mode.
	0	Vendor specific	
	1	**Speed control (open loop)**	
	2	Speed control (closed loop)	
	3	Torque control (from version 03.00)	



Parameter	Name / value range / [default setting]	Info
0x2631:017 (P400.17)	Function list: Activate network setpoint (Function list: Setp: Network) • From version 02.01 • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532	Assignment of a trigger for the "Activate network setpoint" function. Trigger = TRUE: the network is used as setpoint source (if the trigger assigned has the highest setpoint priority). Trigger = FALSE: no action / deactivate function again.
	0 **Not connected**	
	116 Network setpoint active (from version 02.00)	TRUE if a change-over to network setpoint is requested via bit 6 of the AC drive control word0x400B:001 (P592.01). Otherwise FALSE. Notes: • Set this selection if the network setpoint is to be activated via bit 6 of the AC drive control word. • The AC drive control word can be used with any communication protocol. ▶ AC Drive Profile 📖 248
0x6402	Motor type • From version 02.00	AC motor type • Motor Data Object (0x28) - instance attribute 3
	3 PM synchronous	
	7 **Squirrel cage induction**	

9.7.6 Restart communication

In order that the inverter can be controlled via the network, activate the network control:
0x2631:037 (P400.37) = "Network control active [114]"

Select "Network [5]" in 0x2860:001 (P201.01)to use the network generally as a standard setpoint source. If another standard setpoint source is set, a change-over to the network setpoint via the AC Drive control word 0x400B:001 (P592.01) is possible in case the network control is activated:

Change-over to network setpoint	
The network setpoint is activated via bit 6 (NetRef) of the AC Drive control word:	
Bit 6	Selection:
0	Standard setpoint source selected in 0x2860:001 (P201.01).
1	Network setpoint
Note! In order that the activation via bit 6 works, the selection "Network setpoint active [116]" must be set in 0x2631:017 (P400.17).	

Optionally, a change-over from the standard setpoint source to the network setpoint is also possible via a digital input:

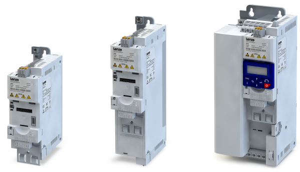
- Set a standard setpoint source different than Network" [5]" in 0x2860:001 (P201.01).
- Set the desired digital input in 0x2631:017 (P400.17) via which the change-over to the network setpoint is to take place.

Bits 5 (NetCtrl) and 6 (NetRef) of byte 0 in the assembly output objects 21 and 23 must be transmitted to the inverter in order that control and speed reference commands are accepted by the network.

If the network control is active (0x400B:001 (P592.01)/bit 5 = 1 and 0x2631:037 (P400.37) = 114), all bits of the AC drive control word (0x400B:001 (P592.01)) are processed.

If the network control is not active (0x400B:001 (P592.01)/bit 5 = 0 or 0x2631:037 (P400.37) = 0), the control bits 0, 1, 12, 13, 14, 15 are *not* processed. Their states are ignored and the drive is in local control.

Parameter	Name / value range / [default setting]		Info
0x23A0 (P508.00)	EtherNet/IP communication (EtherN/IP comm.) • From version 02.00		Restart / stop communication. • When the device command has been executed successfully, the value 0 is shown. • A communication restart has nothing to do with the acceptance of the described operating modes. For this purpose, a restart of the device is required!
	0	**No action/no error**	Only status feedback
	1	Restart with current values	Restart communication with the current values.
	2	Restart with default values	Restart communication with the standard values.
	5	Stop network communication	Stop communication.
	10	In process	Only status feedback
	11	Action cancelled	
	12	Fault	

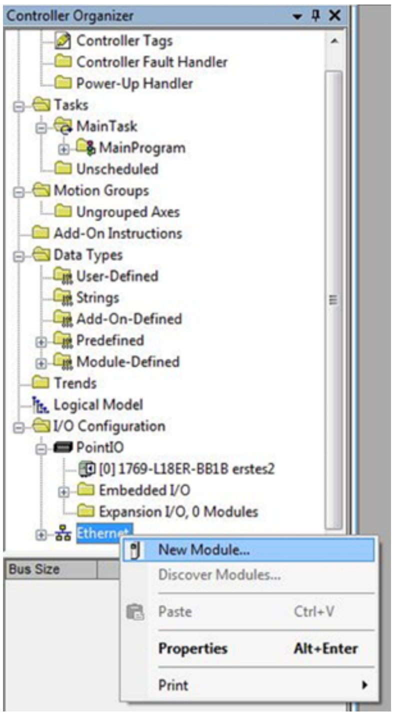


9.7.7 Process data transfer

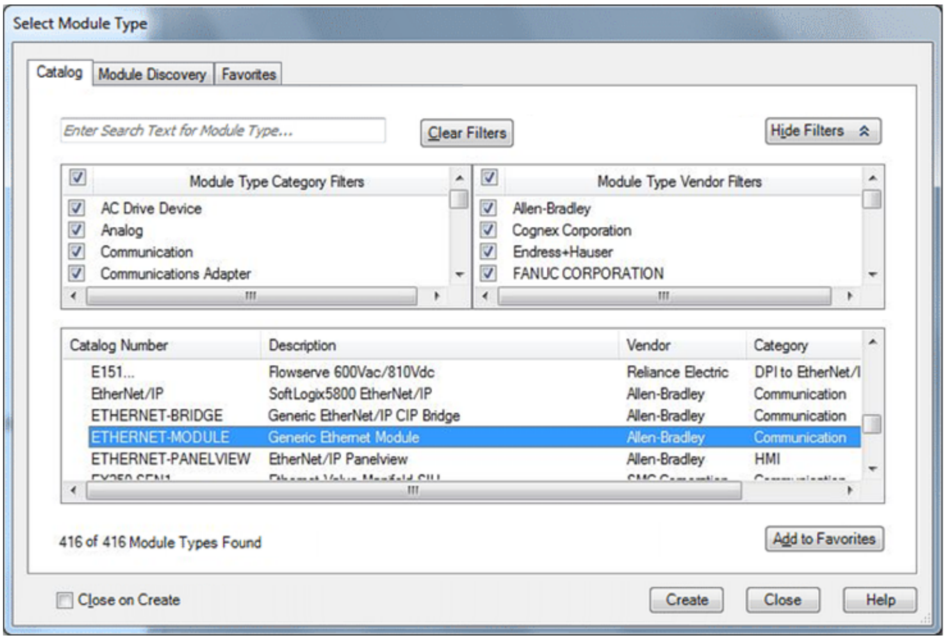
Implicit Messaging

Configure the cyclic data transfer (Implicit Messaging) in »RSLogix™ 5000« (from version 20):

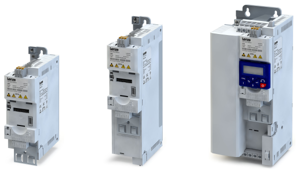
1. **Network configuration of the inverter.**
   1. Go to the navigation tree ("Controller Organizer") under "I/O Configuration → Ethernet" and execute the context menu command "New Module" with a right-click.

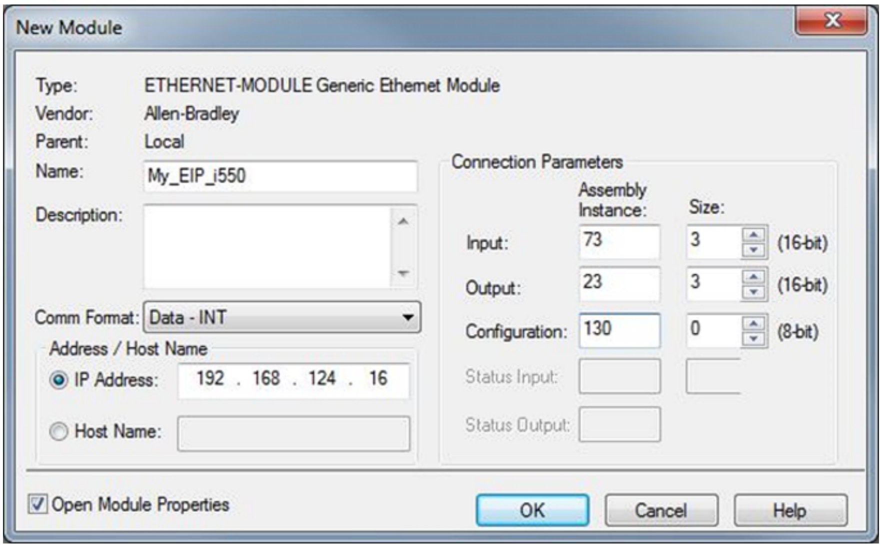


   2. Select the "ETHERNET MODULE Generic Ethernet Module" module type in the appearing dialog box.



   3. Click "Create".
      The "New Module" dialog box is opened.
   4. Fill in input fields.





In the example, the assembly input object 73 is used for reading status information of the inverter and the assembly output object 23 is used for controlling the inverter.

The assembly objects 73 (Extended Speed and Torque Control Input) and 23 (Extended Speed and Torque Control Output) can be used for most of the applications.

Information on the assembly objects: ▶ Objects 📖 324

Further entries:

a) The name to be entered should refer to the process or the device.
b) When entering the IP address, make sure that the inverter (adapter) is in the same network as the PLC (scanner). The subnetwork corresponds to the first three bytes of the IP address.

   See also: ▶ Basic settings 📖 317
c) Select "Data-INT" for the "Comm Format" since the data in the assembly objects 73 and 23 are given in 16-bit-integer words.
d) The required size "0" is entered for the configuration assembly 130.
e) Size "3" is entered for the assembly input object 73.
f) Size "3" is entered for the assembly output object 23.

The inverter (adapter) must be in the same subnetwork as the PLC (scanner). The subnetwork corresponds to the first three bytes of the IP address.

The size of the assembly input and output objects must comply with the number of words that are actually used.

Bits 5 (NetCtrl) and 6 (NetRef) of byte 0 in the assembly output object 23 must be transmitted for the inverter in order that the control and speed reference commands are accepted by the network.

If the network control is active (0x400B:001 (P592.01)/bit 5 = 1 and 0x2631:037 (P400.37) = 114), all bits of the AC drive control word (0x400B:001 (P592.01)) are processed.

If the network control is not active (0x400B:001 (P592.01)/bit 5 = 0 or 0x2631:037 (P400.37) = 0), the control bits 0, 1, 12, 13, 14, 15 are *not* processed. Their states are ignored and the drive is in local control.

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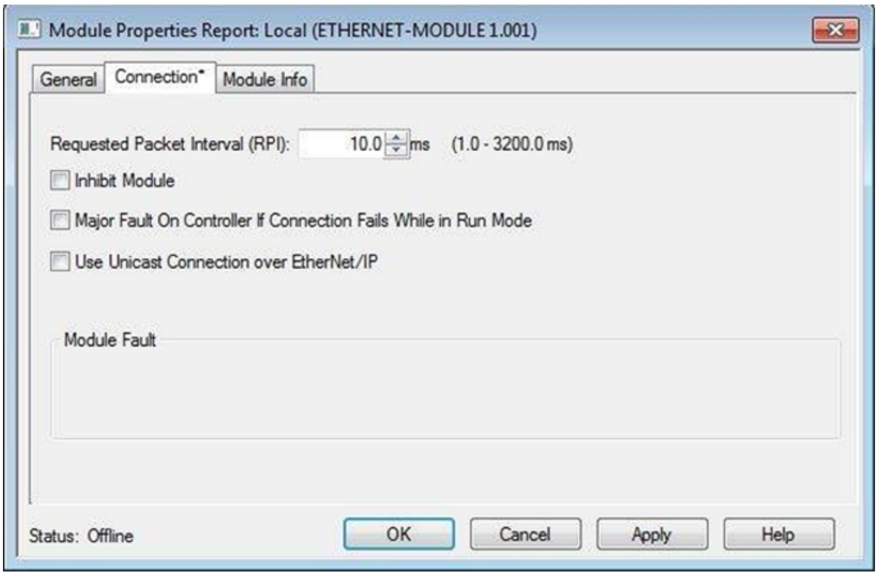
5. Click "OK".
   The "Module Properties Report: ..." dialog box is opened.



6. Set the RPI rate.

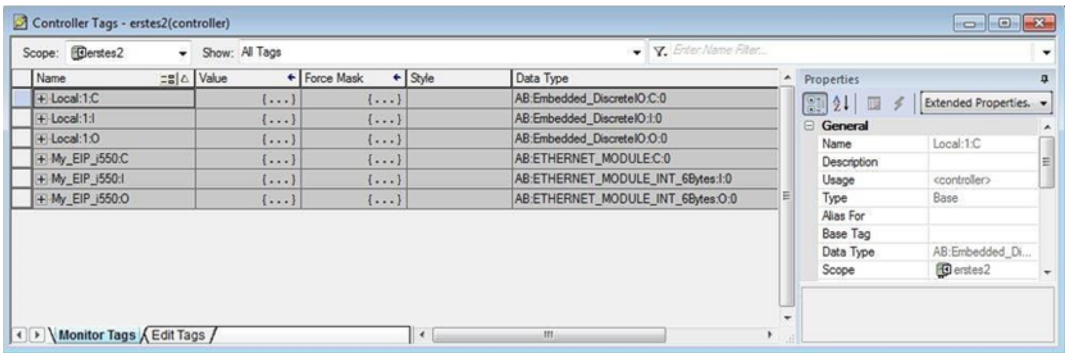
   The example shows the default setting of the RPI rate with "10.0" ms. This means that the inverter is queried every 10 milliseconds by the scanner. For the most inverter applications, it is not required to query the inverter more frequently.

   The minimum value for inverters of the i series is 4.0 ms.
7. Activate/deactivate "Use Unicast Connection over EtherNet/IP".

   The inverter supports "Unicast Connection over EtherNet/IP". The activation of this function causes a faster overall network power. The use of this function, however, can make the error correction for managed switches more complicated.
8. Make optional settings.
   a) Activating "Inhibit Module" inhibits the inverter.
   b) Activating "Major Fault On Controller If Connection Fails While in Run Mode" switches the inverter to "error" if the EtherNet/IP connection to the inverter gets lost during operation.
9. Click "OK".

   The network configuration of the inverter is now completed.

   In the navigation tree ("Controller Organizer") under "Controller → Controller Tags", assembly tags are generated.



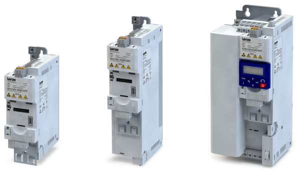
In the sample configuration with the "My_EIP_i550" inverter, these three assembly tags are generated:

"My_EIP_i550:C" for the configuration assembly

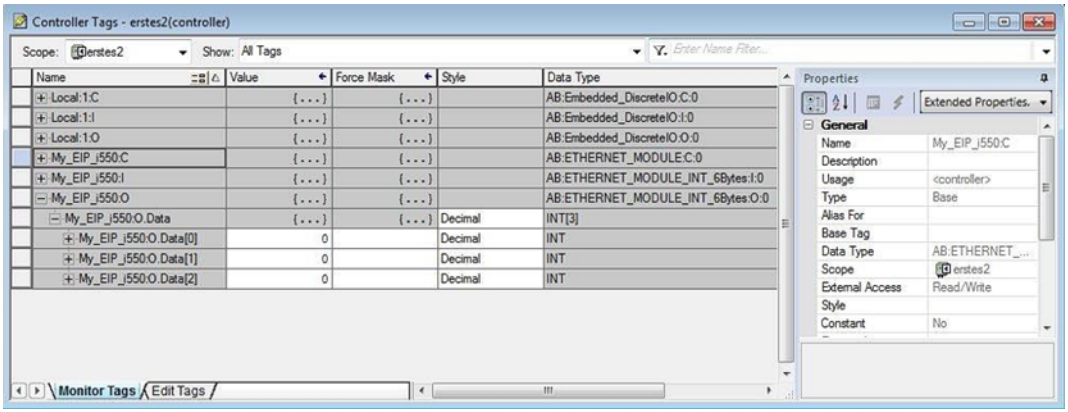
"My_EIP_i550:I" for the input assembly

"My_EIP_i550:O" for the output assembly

By clicking [+] in front of the assembly names, the display of the assemblies is extended.

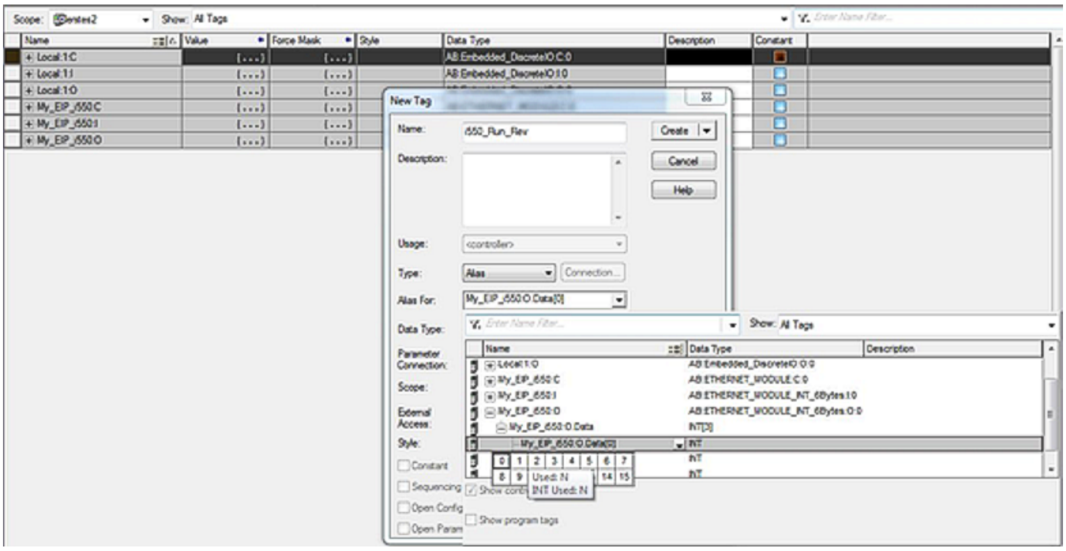


Here, for instance, the four words are displayed, the output assembly "My_EIP_i550:O" consists of:



2. **Creating alias tags for individual bits of the assemblies.**
   1. In the navigation tree (Controller Organizer) under "Controller", open the "Controller Tags".
   2. Right-click any tag to execute the "New Tag" context menu command.

      The "New Tag" dialog box is opened.



   3. Fill in input fields.

      In the example ...

      a) the name "i550_Run_Rev" is entered.

      b) the "Alias" type is selected.

      c) in the output assembly word "My_EIP_i550:O.Data[0]", bit 1 is assigned to "Run_Rev".
   4. Click "Create".

      The new alias tag is added to the database.

The configuration is now completed.

Save the »RSLogix™« project and load the configuration into the PLC (scanner):

1. »RSLogix™«project must be saved.

   Click "File" in the upper toolbar and execute the "Save" menu command.

   If the project is saved for the first time, the "Save as" dialog box appears. Here, navigate to a folder and click "Save".
   The configuration is saved in a file on your PC.
2. Load configuration into the scanner.
   a) Click "Communications" in the upper toolbar and execute the "Download" menu command.
      The "Download" dialog box is opened.
   b) Click "Download".
      The configuration is loaded into the scanner.

      If the download has been completed successfully, »RSLogix™« changes to the online mode and the I/O-OK field in the upper left area of the screen is green.

9.7.7.1 Customer specific configurations

In addition to the defined AC Drive Profile, the inverter supports customer specific configurations.

Customer specific configurations with the assembly object instances 110 and 111 are only possible with PLCs (Scanner) that support "Class 1 Messaging".

Preconditions

For a customer specific configuration, the inverter must be registered with an EDS device description file in »RSLogix™ 5000«.

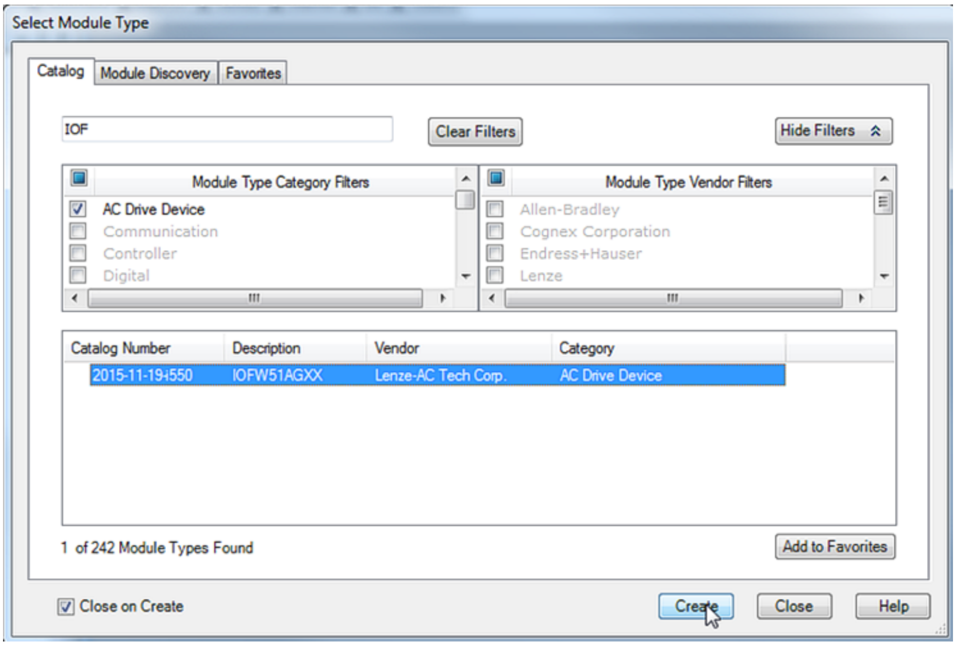
- EDS files for Lenze devices: Download

Afterwards, I/O data can be freely assigned in the assembly objects 110 (Custom Output) and 111 (Custom Input).

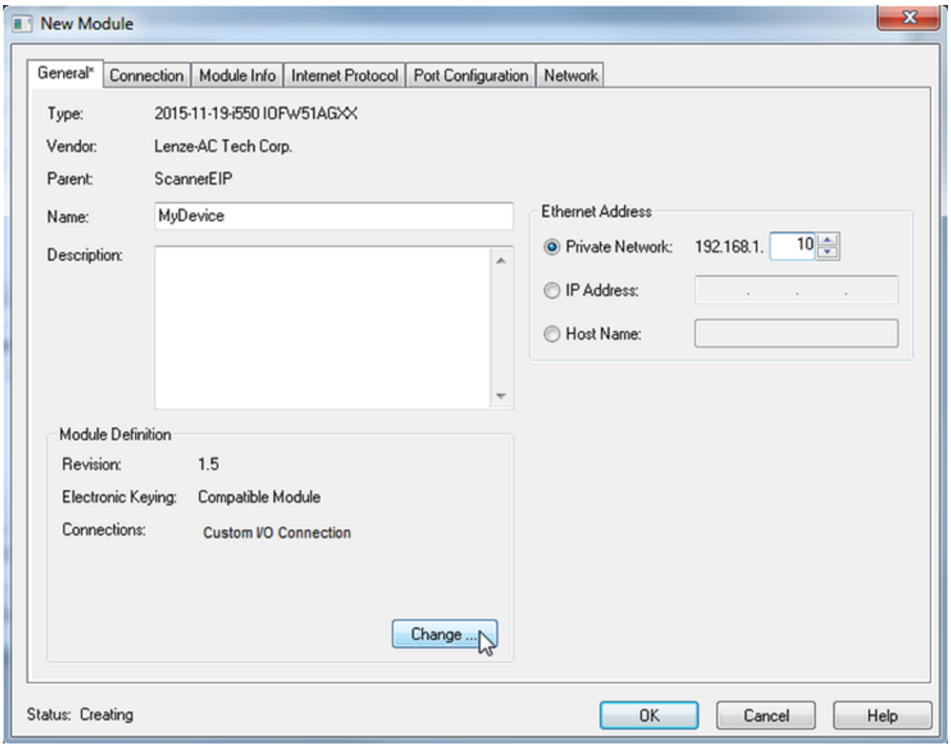
Information on the assembly objects: ▸ Objects 📖 324

Execute a customer specific configuration in »RSLogix™ 5000« (from version 20):

1. Open the dialog "Select Module Type".



2. Go to the "Catalog" tab ...
   a) and select the "AC Drive Device" type category.
   b) select the "IOFW51AGXX" catalog.
3. Click "Create".
   The "New Module" dialog box is opened.

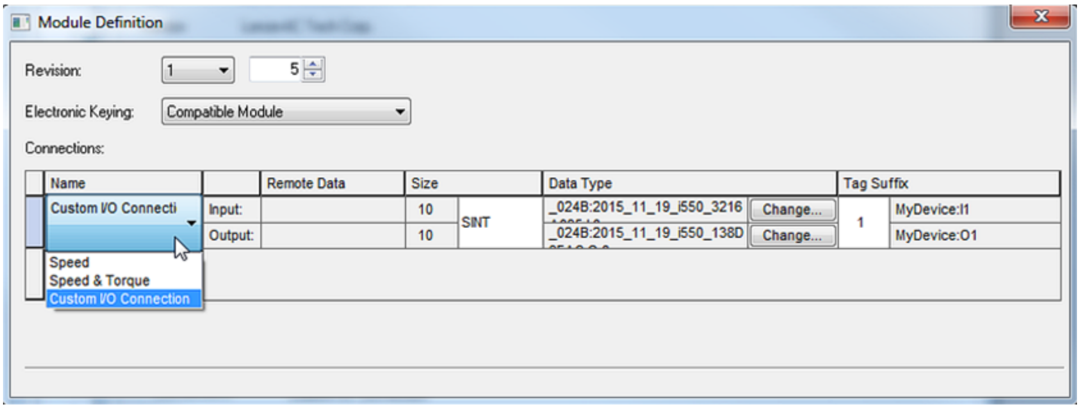


4. Go to the "General" tab ...
   a) assign a name for the inverter.
   b) assign an *unambiguous* IP address.

DNS is not supported.

The host name only describes the device.

5. Click "Change".
6. Open the "Module Definition" dialog box.



7. Here the access to the I/O data for the technology applications "Speed" and "Torque" or a freely definable I/O process data set is defined.
   a) Select connection "Speed", "Speed & Torque" or "Custom I/O Connection".

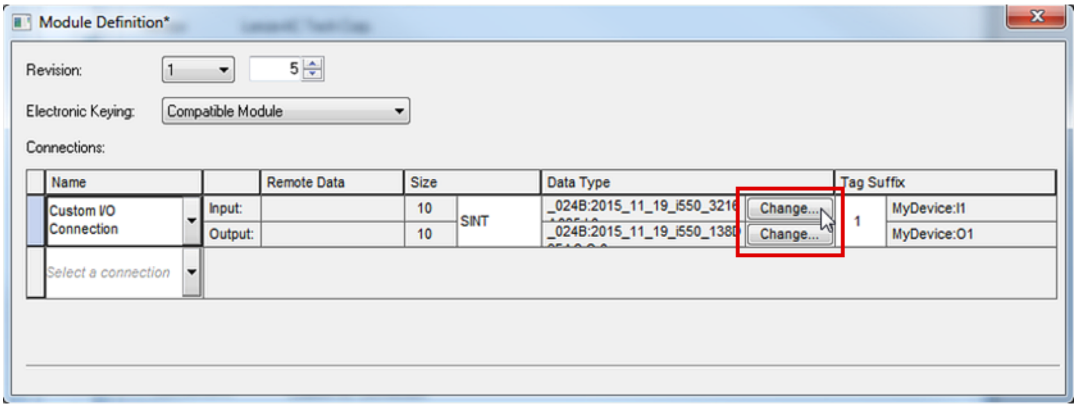
      "Speed" and "Torque" correspond to the ODVA "AC Drive Speed/Torque" profile.

      "Custom I/O Connection" provides a freely definable I/O process data set.
   b) Set data type to the corresponding value (SINT, INT, DINT).

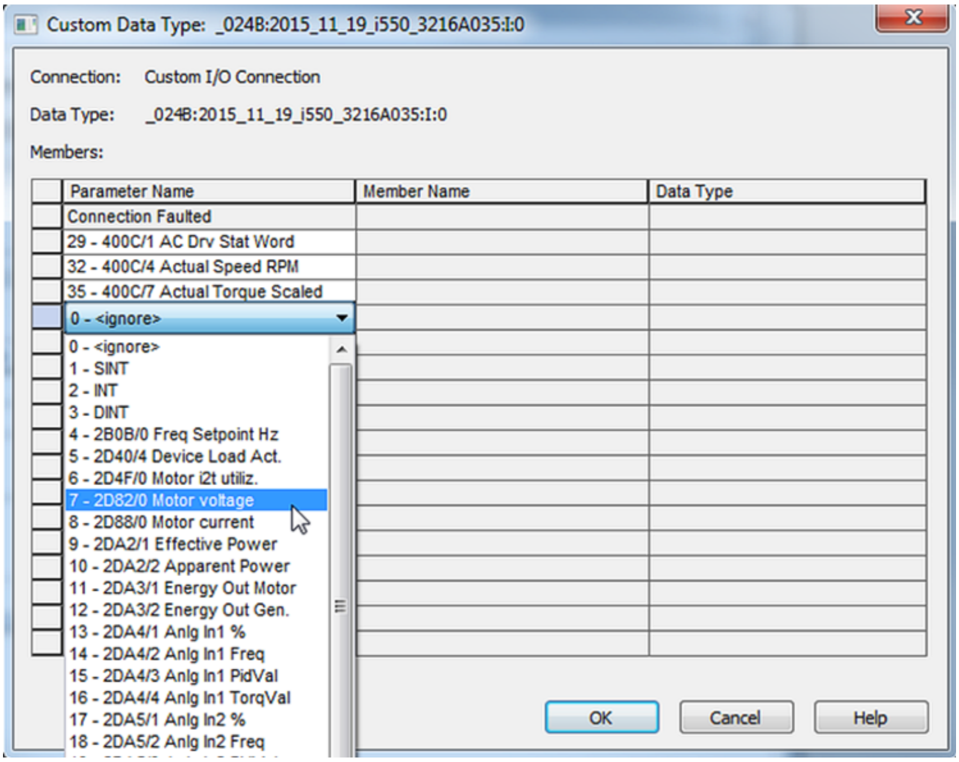
      The real data length of each object that is mapped in the I/O data is determined by the inverter OBD object.

      INT and SINT prevent an uneven data length.

      DINT prevent an uneven number of data words.
8. Click "Change" in the line "Input" or "Output" to adapt the corresponding mapping individually.



This example shows a mapping selection for inputs:



9. Group the process data according to their data length to prevent gaps.

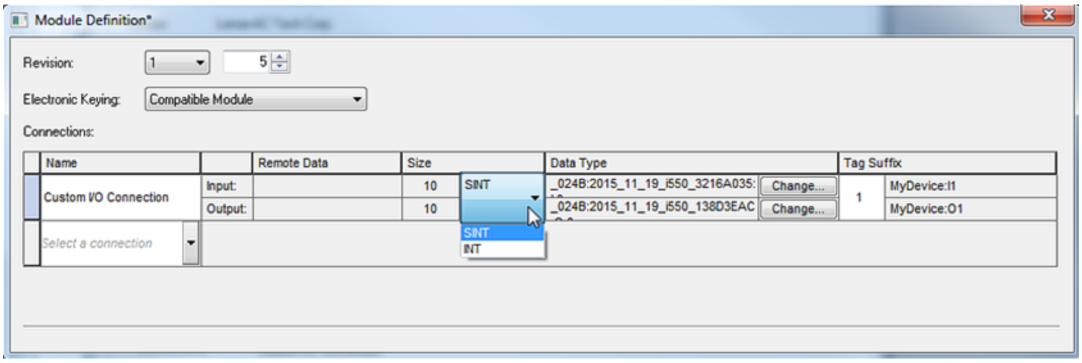
   Example:

   1. All required DINT data
   2. All required INT data
   3. All required SINT data

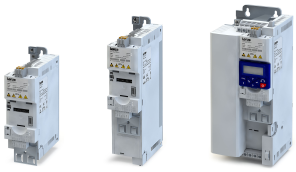
   At the end, a DINT value is automatically added to prevent tool zero-length problems.

   Data types are provided according to the input or output data length.

   Thus, e. g., no DINT type is provided at 10 bytes of input data:



The customer specific configuration is now completed.



Save the »RSLogix™« project and load the configuration into the PLC (scanner):

1. »RSLogix™«project must be saved.

   Click "File" in the upper toolbar and execute the "Save" menu command.

   If the project is saved for the first time, the "Save as" dialog box appears. Here, navigate to a folder and click "Save".
   The configuration is saved in a file on your PC.
2. Load configuration into the scanner.
   a) Click "Communications" in the upper toolbar and execute the "Download" menu command.
      The "Download" dialog box is opened.
   b) Click "Download".
      The configuration is loaded into the scanner.

      If the download has been completed successfully, »RSLogix™« changes to the online mode and the I/O-OK field in the upper left area of the screen is green.

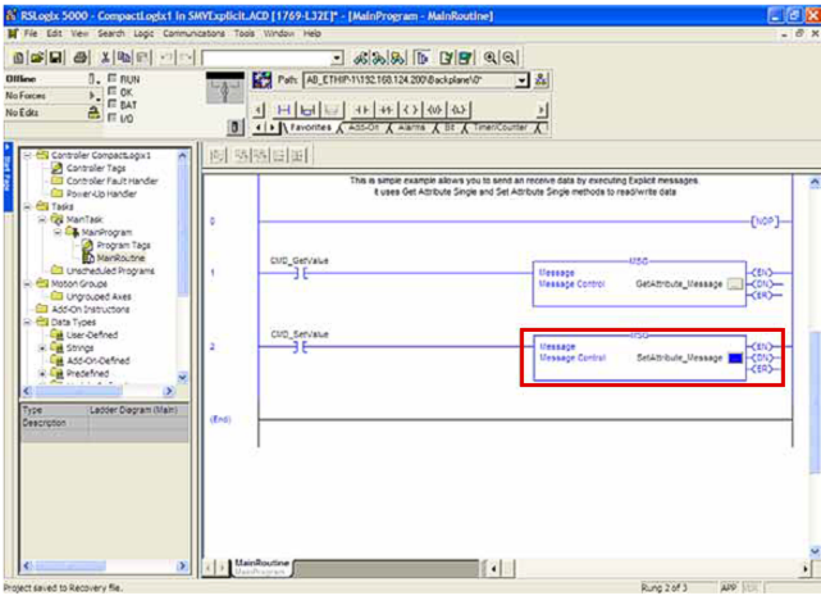
9.7.8 Parameter data transfer

- The acyclic/non-cyclic data access (service access) provides a procedure for the PLC (scanner) to access any drive or device parameter.
- This type of parameter access is typically used for ...
  - monitoring or the not time-controlled parameter access with low priority;
  - writing parameter data (assembly data) for controlling the inverter (adapter).
- For this purpose, the device supports several methods.

Explicit Messaging

An explicit message is a logic instruction in the PLC program for the message transfer. It can be used to read or write a parameter setting or the data of an EtherNet/IP node (assembly data).

If the Allen-Bradley control systems»CompactLogix™«, »ControlLogix®« and »SoftLogix™« are used, the "Explicit Message" instruction provides the functionalities described in the following sections. Further PLC types can be found in the programming documentation of the PLC.



General drive variables (parameters and subindices) are contained in class "0x6E". The instance is the index number of the parameter and the attribute is the subindex number. If no subindex is available, the attribute must be set to "0". The attribute value "1" is only supported for those clients that do not support the attribute value "0".

All these variables have the data type SINT (8 bit, 1-byte objects), INT (16 bit, 2-byte objects) or DINT (32 bit, 4-byte objects).

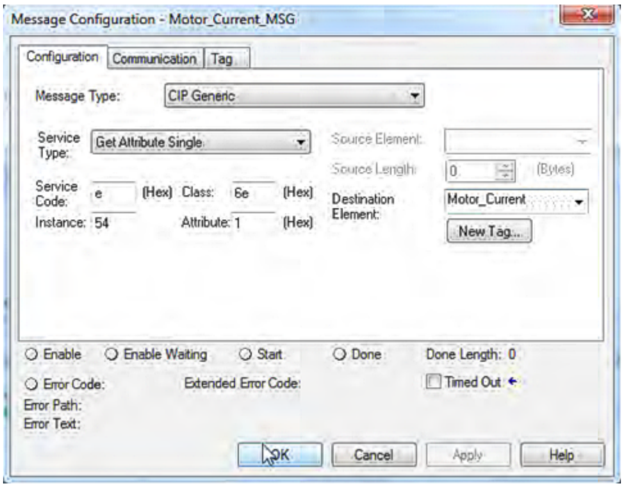
The device parameters and the PLC program variables must have the same data lengths!

Read parameter value

Definitions to read a parameter value (Adapter → Scanner):

- Message Type = CIP Generic
- Service Code = 0x0E (read parameter, Get_Attribute_Single)
- Class= 0x6E (hex)
- Instance= index number of the parameter
- Attribute= parameter subindex number (or 0x01 in case of no subindex)
- Destination Element= target variable in the PLC (scanner) for the parameter data to be read.

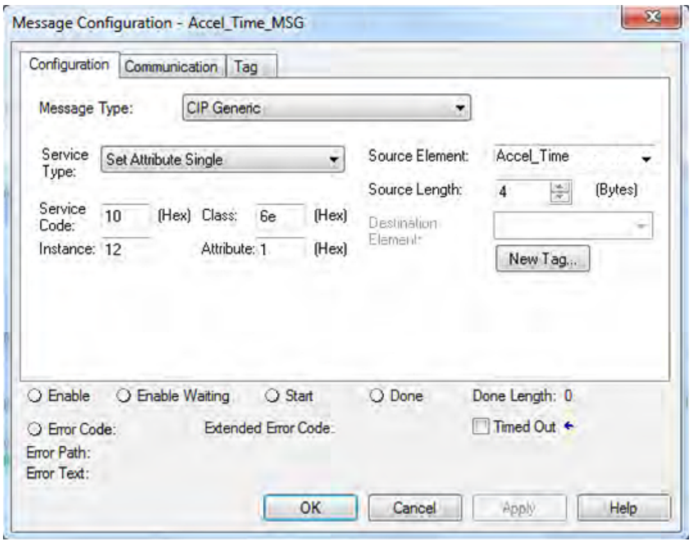
  The variable must have the same format and data length as the parameter!

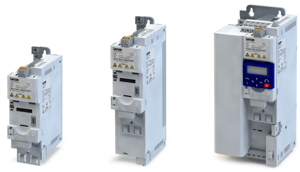


Write parameter value

Definitions to write a parameter value (Scanner → Adapter):

- Message Type = CIP Generic
- Service Code = 0x10 (write parameter, Set_Attribute_Single)
- Class= 0x6E
- Instance= index number of the parameter
- Attribute= parameter subindex number (or 0x01 in case of no subindex)
- Source Element= variable in the PLC (scanner) which is used as source of the parameter data to be written.
- Source Length= data length (bytes) of the data to be written





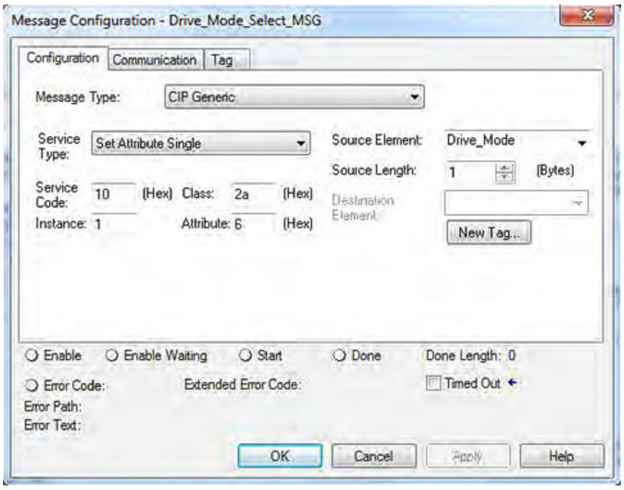
Write variables "TorqueScale" and "Drive_Mode"

The variables "TorqueScale" and "Drive_Mode" are AC Drive profile objects

They are defined in the CIP library:

Variable	Class	Instance	Attribute	Data type	Size
Drive_Mode	2a	1	6	SINT	1 byte
TorqueScale	2a	1	18	SINT	1 byte

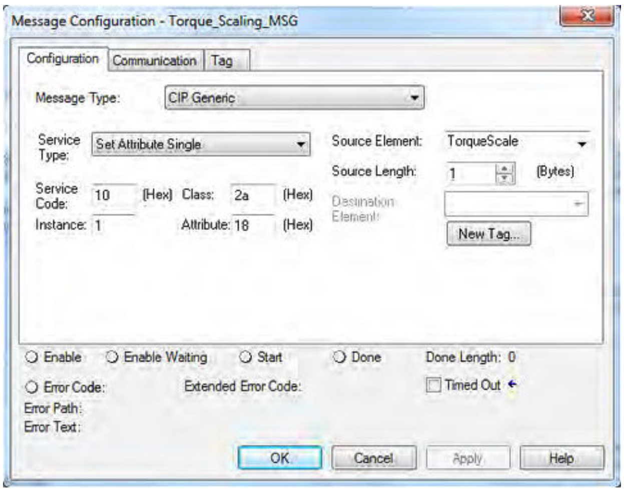
- Drive_Mode



The variable "Drive_Mode" only has two valid settings:

- 1: Velocity Mode
- 3: Torque Mode

- TorqueScale



The variable "TorqueScale" refers to the real torque command by the following equation:

Torque reference in TorqueScale = Nm * 2TorqueScale

Due to the setting of TorqueScale = 0, the torque reference (assembly output object 23, bytes 4/5) is the real torque (= Nm * 20 = Nm * 1 = Nm).

Loading the value "2" as torque reference determines a torque limit of the drive of 2 Nm.

CIP Generic Master(read/write assembly data)

For "CIP Generic Master" that do not support the Implicit Messaging (class 1), the assembly data can be read or written via Explicit Messaging (class 3).

Definitions to read assembly data (Adapter → Scanner):

- Message Type = CIP Generic
- Service Code = 0x0E (read assembly data, Get_Attribute_Single)
- Class= 0x04
- Instance= assembly number in the desired device (e. g. 73 for assembly "73")
- Attribute= 0x03
- Destination Element= target array in the PLC (scanner) for the assembly data to be read.

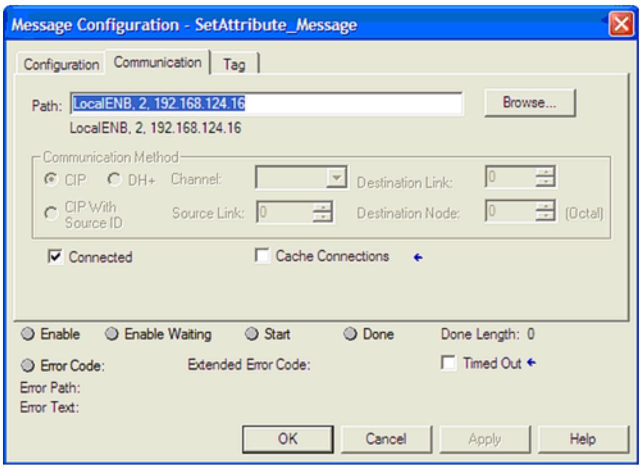
  The array must have the INT format and the same data length as the desired assembly!

Definitions to write assembly data (Scanner → Adapter):

- Message Type = CIP Generic
- Service Code = 0x10 (write assembly data, Set_Attribute_Single)
- Class= 0x04 (hex)
- Instance= assembly number in the desired device (e. g. 23 for assembly "23")
- Attribute= 0x03
- Source Element= INT array in the PLC (scanner) that is used as source of the assembly data to be written.
- Source Length= data length (bytes) of the INT array to be written (the assembly "23" contains e. g. 3 words which corresponds to 6 bytes.)

Explicit Message Path

For each explicit message, the path must be specified in order to forward the message from the Ethernet port of the PLC (scanner) to the IP address of the inverter (adapter). This path depends on the used PLC. If required, contact the PLC manufacturer to find out how the path is specified.

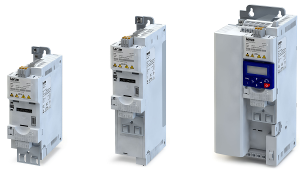


Explicit Messaging Timeout

In order to prevent that the inverter runs continuously, a time-out error state can be set.

For this purpose, set these parameters:

- 0x23A1:010 (P510.10): Timeout
- 0x2859:007 (P515.07): Timeout communication



9.7.9 Short setup

Typically, an EtherNet/IP network consists of segments that contain point-to-point connections in a star configuration (see "Typical topologies" in the section ▶ EtherNet/IP 68).

In the following, the required steps are described to control the device as EtherNet/IP adapter.

Conditions for commissioning

- The control unit (CU) of the inverter is provided with EtherNet/IP (from firmware 02.01).
- The device is networked as EtherNet/IPAdapter with an EtherNet/IP Scanner and, if necessary, further EtherNet/IP nodes, see "Typical topologies" in the section ▶ EtherNet/IP 68.
- An Engineering PC with the programming software »RSLogix™ 5000« (from version 20) is connected to the Scanner.
- Current device description files for EtherNet/IP are available.
  - EDS files for Lenze devices: Download
  - The files are installed via the "EDS Hardware Installation Tool" of the »RSLogix™ 5000«.
  - Allen-Bradley control systems do not need any EDS files to add devices to their configuration.
- An »RSLogix™ 5000« project has been created and is in the offline state.
- The CPU and Ethernet adapter of the PLC (Scanner) have been configured.
- All EtherNet/IP nodes are supplied with voltage and are switched on.

How to configure the network:

1. **Configure IP communication.**
   1. Make IP basic settings at the Engineering PC.

      The PC with the programming tool »RSLogix™ 5000« must be in the same network as the devices to be configured.
   2. Set IP address of the inverter (adapter) via rotary encoder switch and parameter 0x23A1:001 (P510.01).
   3. Set subnet mask: 0x23A1:002 (P510.02)
   4. Set gateway address: 0x23A1:003 (P510.03)

      ▶ Basic settings 317

      The configuration of the IP communication is now completed.
2. **Activate network control in the inverter.**
   1. Activate network control: 0x2631:037 (P400.37) = "Network control active [114]"
   2. Set network as standard setpoint source: 0x2860:001 (P201.01) = "Network [5]"

      If a different standard setpoint source is set and the network control is activated, a change-over to the network setpoint is possible via the AC Drive control word 0x400B:001 (P592.01).

      ▶ Restart communication 331

      ▶ General network settings 332

      The network control is now activated.
   3. Save parameter settings: 0x2022:003 (P700.03) = "On / start [1]"
3. **Execute I/O configuration with »RSLogix™ 5000« (version 20).**
   1. Start the »RSLogix™ 5000«.
   2. Open or recreate a »RSLogix™« project.
   3. Configure the cyclic data transfer (Implicit Messaging).

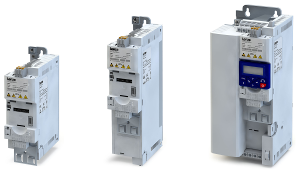
      ▶ Process data transfer 332

      ▶ Customer specific configurations 337
   4. Configure the acyclic data transfer (Explicit Messaging).

      ▶ Parameter data transfer 342

      The I/O configuration is now completed.

The configuration of the network is now completed.



Save the »RSLogix™« project and load the configuration into the PLC (scanner):

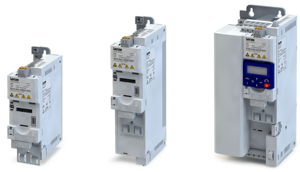
1. »RSLogix™«project must be saved.

   Click "File" in the upper toolbar and execute the "Save" menu command.

   If the project is saved for the first time, the "Save as" dialog box appears. Here, navigate to a folder and click "Save".

   The configuration is saved in a file on your PC.
2. Load configuration into the scanner.
   a) Click "Communications" in the upper toolbar and execute the "Download" menu command.
      The "Download" dialog box is opened.
   b) Click "Download".
      The configuration is loaded into the scanner.

      If the download has been completed successfully, »RSLogix™« changes to the online mode and the I/O-OK field in the upper left area of the screen is green.



9.8 Modbus TCP

Modbus is an internationally approved, asynchronous, serial communication protocol, designed for commercial and industrial automation applications.

- Detailed information on the Modbus can be found on the web page of the international Modbus Organization, USA, who also further develop the Modbus protocol: http://www.modbus.org
- Information about the dimensioning of a Modbus network can be found in the configuration document for the inverter.

Preconditions

Control unit (CU) of the inverter is equipped with Modbus TCP.

9.8.1 Introduction

- The process of data transmission distinguishes between three different operating modes: Modbus ASCII, Modbus RTU and Modbus TCP/IP. This chapter describes the Modbus TCP/IP operating mode.
- The Modbus protocol is based on a master/slave architecture where the inverter always works as slave.
- In the Modbus TCP/IP network, a master can only address one slave at a time. However, several masters can be available in the network.
- Only a master can initiate the Modbus communication.
- No direct communication takes place between the slaves.
- The network option supports the baud rates 10 Mbps (10 BaseT) and 100 Mbps (100 BaseT). The baud rate in the network is automatically detected.
- The inverter supports the function codes 3, 6, 16 (0x10) and 23 (0x17).

9.8.2 Basic settings

IP basic settings

The basic IP settings are required to let the engineering software access the network nodes (PLC, inverter) directly via Ethernet.

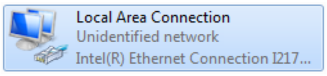
The PC with the engineering software must be in the same network as the devices to be configured.

First, configure the PC so that this condition is fulfilled.

The required steps are described by the example of the operating system Microsoft® Windows® 7.

How to define the IP basic settings:

1. Call the "Network and sharing center" under "Control panel".
2. Select "Change adapter settings" (observe administrator rights!).
3. Select the network to be configured (double-click), e. g.:



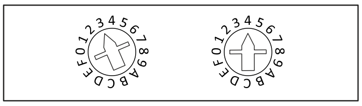
The network nodes (PLC, inverter) must be connected to the network.

   The status dialog box of the network is opened.
4. Click "Properties".
   The properties dialog box of the network is opened.
5. Select "Internet protocol version 4 (TCP/IPv4)" and click "Properties".
   The properties dialog box of the "Internet protocol version 4 (TCP/IPv4)" is opened.
6. Enter the IP address, the subnet mask and, if required, the gateway address under "Use the following addresses".
7. Click "OK".

The IP basic settings are now completed.

Set IP address

The two rotary encoder switches at the front of the device serve to set the IP address in terms of hardware.

Setting	Addressing
0x00	IP address via the parameter 0x23B1:001 (P510.01).
0x01 ... 0xFF	Setting of the 4th byte of the IP address via the rotary encoder switch. 192.168.124.[setting] **Example:** Setting for the value 52 (3 × 16) + (4 × 1) = 52  x16 x1

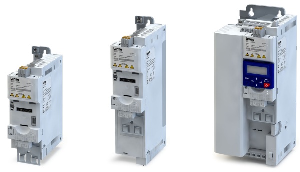
The value set via the rotary encoder switches is used when the mains is switched on or after a network restart with 0x23B0 (P508.00) = 1. A changed value during operation will only become valid after the network has been restarted.

- 0x23B3 (P509.00) shows the switch setting at the last mains connection.
- 0x23B2:001 (P511.01) shows the active IP address.

Time-To-Live (TTL)

The TTL value (8-bit value) limits the number of routers a sent package passes on the way to its target.

- 0x23A1:006 (P510.06): Time-to-live value (TTL)



The parameters for configuring the network of the device are described below.

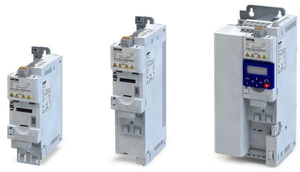
Parameter	Name / value range / [default setting]	Info
0x23B1:001 (P510.01)	Modbus -TCP/IP settings: IP address (MBTCP settings: IP address) 0 ... [**276605120**] ... 4294967295 • From version 04.00	Set IP address. The default setting 276605120 corresponds to the IP address 192.168.124.16. • 276605120 = 0x107CA8C0 → 0xC0.0xA8.0x7C.0x10 = 192.168.124.16
0x23B1:002 (P510.02)	Modbus -TCP/IP settings: Subnet (MBTCP settings: Subnet) 0 ... [**16777215**] ... 4294967295 • From version 04.00	Set subnet mask. The default setting 16777215 corresponds to the subnet mask 255.255.255.0. • 16777215 = 0xFFFFFF → 0xFF.0xFF.0xFF.0x00 = 255.255.255.0
0x23B1:003 (P510.03)	Modbus -TCP/IP settings: Gateway (MBTCP settings: Gateway) 0 ... [**0**] ... 4294967295 • From version 04.00	Set gateway address. Example The setting 276344004 corresponds to the gateway address 196.172.120.16. • 276344004 = 0x1078ACC4 → 0xC4.0xAC.0x78.0x10 = 196.172.120.16
0x23B1:005 (P510.05)	Modbus -TCP/IP settings: IP configuration (MBTCP settings: IP configuration) • From version 04.00	Set IP configuration.
	0 **Stored IP**	The currently saved IP configuration is used.
	1 BOOTP	The IP configuration is assigned by the master via BOOTP.
	2 DHCP	The IP configuration is assigned by the Master via DHCP. The assignment of a gateway address that is not in the same subnetwork as the IP address, is denied.
0x23B1:006 (P510.06)	Modbus -TCP/IP settings: Time-to-live value (TTL) (MBTCP settings: TTL value) 1 ... [**32**] ... 255 • From version 04.00	Setting of the TTL value for the validity of data packages in the network.
0x23B1:011 (P510.11)	Modbus -TCP/IP settings: Secondary port (MBTCP settings: Secondary port) 0 ... [**502**] ... 65535 • From version 04.00	Set port number for a second port.
0x23B4:001 (P512.01)	Port settings: Port 1 (Port settings: Port 1) • From version 04.00	Set baud rate for the port 1.
	0 **Auto-Negotiation**	
	1 10 Mbps	
	2 100 Mbps	
	5 10 Mbps/Half Duplex	
	6 10 Mbps/Full Duplex	
	7 100 Mbps/Half Duplex	
	8 100 Mbps/Full Duplex	
0x23B4:002 (P512.02)	Port settings: Port 2 (Port settings: Port 2) • From version 04.00	Set baud rate for the port 2.
	0 **Auto-Negotiation**	
	1 10 Mbps	
	2 100 Mbps	
	5 10 Mbps/Half Duplex	
	6 10 Mbps/Full Duplex	
	7 100 Mbps/Half Duplex	
	8 100 Mbps/Full Duplex	

Parameter	Name / value range / [default setting]		Info
0x23B0 (P508.00)	Modbus TCP communication (MBTCP comm.) • From version 04.00		Restart / stop communication
	0	**No action/no error**	Only status feedback.
	1	Restart with current values	Restart communication in order that changed settings of the interface configuration become effective.
	2	Restart with default values	Restart communication with the standard values.
	5	Stop network communication	Stop communication.
	10	In progress	Only status feedback
	11	Action cancelled	
	12	Error	
0x23B3 (P509.00)	Switch position (Switch position) • Read only • From version 04.00		Display of the rotary encoder switch setting at the last mains power-on.

9.8.3 Time-out behaviour

The response to the missing Modbus messages can be configured via the following parameters.

Parameter	Name / value range / [default setting]		Info
0x23B1:010 (P510.10)	Modbus -TCP/IP settings: Ethernet time-out (MBTCP settings: Ethernet timeout) 0 ... [**10**] ... 65535 s • From version 04.00		Setting of the maximum permissible time-out of the TCP communication. When the specified monitoring time has elapsed, the response set in 0x2859:007 (P515.07) is triggered in the inverter.
0x23B6:001 (P514.01)	Time-out monitoring: Time-out time (MBTCP t-out mon: Time-out time) 0.0 ... [**2.0**] ... 300.0 s • From version 04.00		Monitoring is active if the first valid write command arrives at the Modbus master. Each further valid write/read message resets the watchdog timer. Monitoring responds if within the time set here no valid message has been received by the Modbus master.
0x23B6:002 (P514.02)	Time-out monitoring: Keep alive time-out time (MBTCP t-out mon: Keep al t-out) 0.0 ... [**2.0**] ... 300.0 s • From version 04.00		Monitoring is active after a valid value is written into the keep alive register 0x23B6:005 (P514.05) via the Modbus for the first time. Keep alive monitoring responds if no value (range 1 ... 65535) has been written into the keep alive register within the time set here.
0x23B6:005 (P514.05)	Time-out monitoring: Keep alive register (MBTCP t-out mon: Keep al register) 0 ... [**0**] ... 65535 • From version 04.00		Time-out monitoring of the keep alive register is active after a value has been written into the keep alive register for the first time. In order to prevent that time-out monitoring for the keep alive register responds, the keep alive register must be written as follows: • With a value of 1 ... 65535 **and** • an interval that is shorter than the time set in 0x23B6:002 (P514.02).
0x2859:003 (P515.03)	Modbus TCP/IP monitoring: Configuration error (MBTCP monitoring: Config error) • From version 04.00 • For further possible settings, see parameter 0x2D45:001 (P310.01). 📖 223		Selection of the response triggered by the reception of invalid configuration data. Associated error code: • 33414 | 0x8286 - Network: PDO mapping error
	2	**Trouble**	
0x2859:004 (P515.04)	Modbus TCP/IP monitoring: Initialisation error (MBTCP monitoring: Init error) • From version 04.00 • For further possible settings, see parameter 0x2D45:001 (P310.01). 📖 223		Selection of the response triggered by the occurrence of an error during the initialisation of the network component. Associated error code: • 33170 | 0x8192 - Network: initialisation error
	2	**Trouble**	
0x2859:007 (P515.07)	Modbus TCP/IP monitoring: Fault reaction by time-out Network (MBTCP monitoring: React t-out netw) • From version 04.00 • For further possible settings, see parameter 0x2D45:001 (P310.01). 📖 223		If monitoring detects a time-out of the TCP communication with an existing TCP connection, the error response to be selected with this parameter occurs. The maximum permissible time-out of the TCP communication is defined in 0x23B1:010 (P510.10). Associated error code: • 33044 | 0x8114 - Network: overall communication timeout
	1	**Warning**	



Parameter	Name / value range / [default setting]	Info
0x2859:008 (P515.08)	Modbus TCP/IP monitoring: Fault reaction by time-out Master (MBTCP monitoring: React t-out mast) • From version 04.00 • For further possible settings, see parameter 0x2D45:001 (P310.01). 📖 223	Selection of the response if within the time set in 0x23B6:001 (P514.01) no valid message has arrived at the Modbus master. Associated error code: • 33046 | 0x8116 - Modbus TCP master time-out
	3 Fault	
0x2859:009 (P515.09)	Modbus TCP/IP monitoring: Fault reaction by time-out Keep alive (MBTCP monitoring: Reac t-out kp-al) • From version 04.00 • For further possible settings, see parameter 0x2D45:001 (P310.01). 📖 223	Selection of the response if within the time set in 0x23B6:002 (P514.02)no valid message has been written into the keep alive register. Associated error code: • 33047 | 0x8117 - Modbus TCP Keep Alive time-out
	3 Fault	

9.8.4 LED status displays

Information on the CIP status can be obtained quickly via the "MS" and "NS" LED displays on the front of the inverter. In addition, the LEDs at the RJ45 sockets indicate the Ethernet connection status.

The meaning of the "MS" and "NS" LEDs can be obtained from the following two tables.

LED "MS" (green/red)	Module status	Status/meaning
off	Nonexistent	The network option is not supplied with voltage.
On (green)	Operational	The network option works correctly.
Blinking green	Standby	The network option is not configured completely or the configuration is incorrect.
Blinking red	Major recoverable fault	The network option contains a correctable error.
on (red)	Major unrecoverable fault	The network option contains a non-correctable error.
Blinking green/red	Device self testing	The network option executes a self-test.

LED "NS" (green/red)	Network status	Status/meaning
off	No IP address	The network option is not supplied with voltage or has not received an IP address yet.
On (green)	Connected	The network option works correctly an has established a connection to the master.
Blinking green	No connections	The network option • works correctly, • has been assigned to an IP address, • has not been implemented into the network yet by the master.
Blinking red	Connection timeout	A time-out has occurred.
on (red)	Duplicate IP	The network option cannot access the network (IP address conflict).
Blinking green/red	Device self testing	The network option executes a self-test.

Status displays at the RJ45 sockets

The LEDs at the RJ45 sockets indicate the connection status to the network:

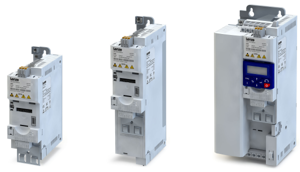
LED "Link" (green)	Status/meaning
off	No connection to the network.
on	A physical connection to the network is available.

LED "Activity" (yellow)	Status/meaning
off	No data transfer.
on or flickers	Data is exchanged via the network.

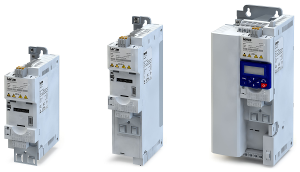
9.8.5 Diagnostics

The parameters for diagnosing the network are described below.

Parameter	Name / value range / [default setting]	Info
0x23B2:001 (P511.01)	Active Modbus TCP settings: Active IP address (Act. MBTCP sett.: Act. IP address) • Read only • From version 04.00	Display of the active IP address.
0x23B2:002 (P511.02)	Active Modbus TCP settings: Active subnet (Act. MBTCP sett.: Act. subnet) • Read only • From version 04.00	Display of the active subnet mask.
0x23B2:003 (P511.03)	Active Modbus TCP settings: Active gateway (Act. MBTCP sett.: Act. gateway) • Read only • From version 04.00	Display of the active gateway address. Example The setting 276344004 corresponds to the gateway address 196.172.120.16. • 276344004 = 0x1078ACC4 → 0xC4.0xAC.0x78.0x10 = 196.172.120.16
0x23B2:005 (P511.05)	Active Modbus TCP settings: MAC address (Act. MBTCP sett.: MAC address) • Read only • From version 04.00	Display of the active MAC address.
0x23B3 (P509.00)	Switch position (Switch position) • Read only • From version 04.00	Display of the rotary encoder switch setting at the last mains power-on.
0x23B5:001 (P513.01)	Active port settings: Port 1 (Act. port sett.: Port 1) • Read only • From version 04.00	Display of the baud rate set for the port 1 in parameter 0x23B4:001 (P512.01).
	0 Not connected	
	1 10 Mbps/Half Duplex	
	2 10 Mbps/Full Duplex	
	3 100 Mbps/Half Duplex	
	4 100 Mbps/Full Duplex	
0x23B5:002 (P513.02)	Active port settings: Port 2 (Act. port sett.: Port 2) • Read only • From version 04.00	Display of the baud rate set for the port 2 in parameter 0x23B4:002 (P512.02).
	0 Not connected	
	1 10 Mbps/Half Duplex	
	2 10 Mbps/Full Duplex	
	3 100 Mbps/Half Duplex	
	4 100 Mbps/Full Duplex	
0x23B8 (P516.00)	Modbus TCP module status (MBTCP modul. stat) • Read only • From version 04.00	Display of the TCP module state.
	0 Power off	
	1 Initialization	
	2 Warning	
	3 Fault	
	4 No configuration	
	5 Operational	



Parameter	Name / value range / [default setting]	Info
0x23B9 (P517.00)	Modbus TCP/IP network status (MBTCP netw stat) • Read only • From version 04.00	Display of the active network status.
	0: No configuration	
	1: Initialization	
	2: Connection time-out	
	3: Configuration error	
	4: Not connected	
	5: Connection established	
0x23BA:001 (P580.01)	Modbus TCP statistics: Messages received (MBTCP statistics: Rx messages) • Read only • From version 04.00	Display of the total number of messages received. • This counter counts both valid and invalid messages. • After the maximum value has been reached, the counter starts again "0".
0x23BA:002 (P580.02)	Modbus TCP statistics: Valid messages received (MBTCP statistics: Valid Rx messag.) • Read only • From version 04.00	Display of the number of valid messages received. • After the maximum value has been reached, the counter starts again "0".
0x23BA:003 (P580.03)	Modbus TCP statistics: Messages with exceptions (MBTCP statistics: Mess. w. except) • Read only • From version 04.00	Display of the number of messages with exceptions that have been received. • After the maximum value has been reached, the counter starts again "0".
0x23BA:005 (P580.05)	Modbus TCP statistics: Messages sent (MBTCP statistics: Tx messages) • Read only • From version 04.00	Display of the total number of messages sent. • After the maximum value has been reached, the counter starts again "0".
0x23BE:001 (P585.01)	Modbus TCP/IP diagnostics of last Rx/Tx data: Receive offset (MBTCP Tx/Rx diag: Rx offset) 0 ... [**0**] ... 240 • From version 04.00	For diagnostic purposes, the last received message (max. 16 bytes) is displayed in 0x23BE:002 (P585.02). For longer messages, an offset can be specified here, indicating from which byte of the message the display of the 16 bytes is to start.
0x23BE:002 (P585.02)	Modbus TCP/IP diagnostics of last Rx/Tx data: Last Rx message (MBTCP Tx/Rx diag: Last Rx message) • Read only • From version 04.00	Display of the message received last.
0x23BE:003 (P585.03)	Modbus TCP/IP diagnostics of last Rx/Tx data: Transmit offset (MBTCP Tx/Rx diag: Tx offset) 0 ... [**0**] ... 240 • From version 04.00	For diagnostic purposes, the last sent message (max. 16 bytes) is displayed in 0x23BE:004 (P585.04). For longer messages, an offset can be specified here, indicating from which byte of the message the display of the 16 bytes is to start.
0x23BE:004 (P585.04)	Modbus TCP/IP diagnostics of last Rx/Tx data: Last Tx message (MBTCP Tx/Rx diag: Last Tx message) • Read only • From version 04.00	Display of the message sent last.
0x23B1:005 (P510.05)	Modbus -TCP/IP settings: IP configuration (MBTCP settings: IP configuration) • From version 04.00	Set IP configuration.
	0: Stored IP	The currently saved IP configuration is used.
	1: BOOTP	The IP configuration is assigned by the master via BOOTP.
	2: DHCP	The IP configuration is assigned by the Master via DHCP. The assignment of a gateway address that is not in the same subnetwork as the IP address, is denied.



9.8.6 Function codes

The mode of access to inverter data (parameters) is controlled via function codes.

Frame structure

Modbus Application Header (MBAP)				Protocol Data Unit (PDU)		CRC
Transaction number	Protocol characters (always 0x0000)	Number of the bytes still to follow	Slave address	Function code	Data / error code	Checksum
2 bytes	2 bytes	2 bytes	1 byte	1 byte	n byte	2 bytes

Tab. 1: ADU (Application Data Unit)

Communication is established on the basis of the master/slave mode. Communication is always started by a master request.

The inverter (slave) then either gives a valid response or outputs an error code (provided that the request has been received and evaluated as valid message).

In case of a valid answer, the function code is returned. In the event of an error, a function code assigned to the request is returned.

Error causes can be invalid CRC checksums, non-supported function codes or impermissible data accesses.

Elements of the ADU:

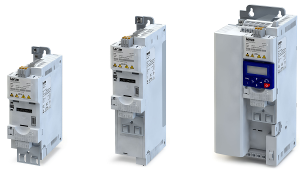
- MBAP (7 bytes)
  - Number of the bytes still to follow in the message.
  - Address of the inverter Basic settings 📖 349.
  - The other bytes of the header are not described here.
- Function code
  - The function codes exclusively refer to "4X registers", i. e. registers from the address 4000.
  - All data in the inverter can only be accessed via these 4X registers, see Data mapping 📖 360.
  - The 4xxxx reference is implicit, i. e. given by the function code used. In the frame therefore the leading 4 is omitted in the addressing process.
  - Lenze supports the basic 1 addressing of Modbus, i.e. the numbering of the registers starts with 1 whereas addressing starts with 0. For example, the address 0 is used in the frame when register 40001 is read.
- Data or error code
- Checksum

All ADU contents are represented in the Big Endian format (most significant byte first).

Function codes

Function code	Function code in the event of an error	Supported error codes
0x03	0x83	0x01, 0x02, 0x03, 0x04
0x06	0x86	0x01, 0x02, 0x03, 0x04
0x10	0x90	0x01, 0x02, 0x03, 0x04
0x17	0x97	0x01, 0x02, 0x03, 0x04

Function code		Function name	Info
3	0x03	Read Holding Registers	Reading of a single register or a group of several interconnected registers.
6	0x06	Preset Single Register	Writing of a single register.
16	0x10	Preset Multiple Registers	Writing of a single register or a group of several interconnected registers.
23	0x17	Read/Write 4X Registers	Reading and writing within a transaction: • Writing of a data block into a group of several interconnected registers. • Reading from a block of interconnected registers.



Error codes

Error code	Designation	Cause(s)
0x01	Invalid function code	The function code is not supported by the inverter, or the inverter is in a state in which the request is not permissible or in which it cannot be processed.
0x02	Invalid data address	The combination of a start address and the length of the data to be transmitted is invalid. Example: If you have a slave with 100 registers, the first register has the address 0 and the last register has the address 99. If there is a request of four registers now, from the start address 96, the request can be processed successfully (for registers 96, 97, 98, and 99). If, however, five registers from the start address 96 are queried, this error code is returned, since the slave has no register with the address 100.
0x03	Invalid data value	Error in the reset structure of a complex request, e. g. because the data length that has resulted implicitly is not correct. The cause, however, is not that a (parameter) value is written outside the valid setting range. As a matter of principle, the Modbus protocol has no information on valid setting ranges of single registers or their meaning.
0x04	Slave device failure	A non-correctable error has occurred while the request was processed in the inverter.

Data transfer with function code 3

Request	
Function code	0x03
Start address	0x0000 ... 0xFFFF
Number of registers (n)	0x01 ... 0x7D (1 ... 125)

Response	
Function code	0x03
Number of bytes	2 x (number of registers)
Register value	Data in (n) register of 2 bytes each

Error message	
Function code in the event of an error	0x83
Error code	01 ... 04

Example for data transfer with function code 3

The data from the registers 40108 to 40110 are to be read.

Request		Info
Function code	0x03	Function code 3
Start address (High)	0x00	Start address 107 (0x006B)
Start address (Low)	0x6B	
Number of registers (High)	0x00	Number of registers = 3 (0x0003)
Number of registers (Low)	0x03	

Response		Info
Function code	0x03	Function code 3
Number of bytes	0x06	6 bytes are read.
Value in registers 40108 (High)	0x02	Data in register 40108: 0x022B (555).
Value in registers 40108 (Low)	0x2B	
Value in registers 40109 (High)	0x00	Data in register 40109: 0x0000 (0).
Value in registers 40109 (Low)	0x00	
Value in registers 40110 (High)	0x00	Data in register 40110: 0x0064 (100).
Value in registers 40110 (Low)	0x64	

Data transfer with function code 6

Request	
Function code	0x06
Register address	0x0000 ... 0xFFFF
Register value	0x0000 ... 0xFFFF

Response	
Function code	0x06
Register address	0x0000 ... 0xFFFF
Register value	0x0000 ... 0xFFFF

Error message	
Function code in the event of an error	**0x86**
Error code	01 ... 04

Example for data transfer with function code 6

The value "3" (0x0003) is to be written into the register 40002.

Request		**Info**
Function code	0x06	Function code 6
Register address (High)	0x00	Register address for register 40002: 1 (0x0001)
Register address (Low)	0x01	
Register value (High)	0x00	Value to be written into the register: 3 (0x0003)
Register value (Low)	0x03	

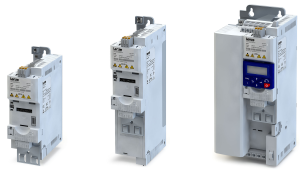
Response		**Info**
Function code	0x06	Function code 6
Register address (High)	0x00	Register address: 1 (0x0001)
Register address (Low)	0x01	
Register value (High)	0x00	Register value: 3 (0x0003)
Register value (Low)	0x03	

Data transfer with function code 16

Request	
Function code	0x10
Start address	0x0000 ... 0xFFFF
Number of registers (n)	0x0001 ... 0x7D (0d125)
Number of bytes	2 x (number of registers)
Register value	Data in (n) register of 2 bytes each

Response	
Function code	0x10
Number of bytes	2 x (number of registers)
Register values	Data in (n) register of 2 bytes each

Error message	
Function code in the event of an error	**0x90**
Error code	01 ... 04



Example for data transfer with function code 16

In a transaction, the value "10" is to be written into the register 40002 and the value "258" is to be written into the adjacent register 40003.

Request		Info
Function code	0x10	Function code 16
Start address (High)	0x00	Start address is the register 40002: 1 (0x0001)
Start address (Low)	0x01	
Number of registers (High)	0x00	Number of registers: 2 (0x0002)
Number of registers (Low)	0x02	
Number of bytes	0x04	4 bytes (0x0004) are to be written.
Register value (High)	0x00	The value "10" (0x000A) is written into the register with the start address 1 (= register 40002).
Register value (Low)	0x0A	
Register value (High)	0x01	The value "258" (0x0102) is written into the following register (= register 40003).
Register value (Low)	0x02	

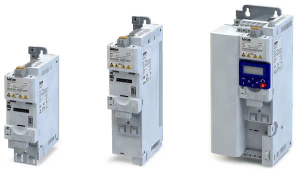
Response		Info
Function code	0x10	Function code 16
Start address (High)	0x00	Start address: 1 (0x0001)
Start address (Low)	0x01	
Number of registers (High)	0x00	Number of registers: 2 (0x0002)
Number of registers (Low)	0x02	

Data transfer with function code 23

Request	
Function code	**0x17**
Start address for reading (High)	0x0000 ... 0xFFFF
Start address for reading (Low)	0x0000 ... 0xFFFF
Number of registers for reading (High)	0x00 ... 0xFF
Number of registers for reading (Low)	0x00 ... 0xFF
Start address for writing (High)	0x0000 ... 0xFFFF
Start address for writing (Low)	0x0000 ... 0xFFFF
Number of registers for writing (High)	0x00 ... 0xFF
Number of registers for writing (Low)	0x00 ... 0xFF
Number of bytes for writing	2 x (number of registers)
Written value 1 (High)	0x00 ... 0xFF
Written value 1 (Low)	0x00 ... 0xFF
....	...
Written value n (High)	0x00 ... 0xFF
Written value n (Low)	0x00 ... 0xFF

Response	
Function code	**0x17**
Number of bytes for reading	2 x (number of registers)
Read value 1 (High)	0x00 ... 0xFF
Read value 1 (Low)	0x00 ... 0xFF
...	...
Read value x (High)	0x00 ... 0xFF
Read value x (Low)	0x00 ... 0xFF

Error message	
Function code in the event of an error	**0x97**
Error code	02 ... 04



Example for data transfer with function code 23

The following tasks are to be executed with a transaction:

- The values from six connected registers, starting with register 40005, are to be read.
- The value "255" is to be written into each of three connected registers, starting with register 40016.

Request		Info
Function code	0x17	Function code 23
Start address for reading (High)	0x00	Start address for reading is the register 40005: 4 (0x0004)
Start address for reading (Low)	0x04	
Number of registers for reading (High)	0x00	Number of registers for reading: 6 (0x0006))
Number of registers for reading (Low)	0x06	
Start address for writing (High)	0x00	Start address for writing is the register 40016: 15 (0x000F)
Start address for writing (Low)	0x0F	
Number of registers for writing (High)	0x00	Number of registers for writing: 3 (0x0003)
Number of registers for writing (Low)	0x03	
Number of bytes for writing	0x06	6 bytes (0x06) must be provided in 3 registers.
Written value 1 (High)	0x00	Data: 255 (0x00FF)
Written value 1 (Low)	0xFF	
Written value 2 (High)	0x00	Data: 255 (0x00FF)
Written value 2 (Low)	0xFF	
Written value 3 (High)	0x00	Data: 255 (0x00FF)
Written value 3 (Low)	0xFF	

Response		Info
Function code	0x17	Function code 23
Number of bytes for reading	0x0C	12 bytes (0x0C) from 6 registers are read.
Read value 1 (High)	0x00	1. written value Data: 254 (0x00FE)
Read value 1 (Low)	0xFE	
Written value 2 (High)	0x0A	2. written value Data: 2765 (0x0ACD)
Read value 2 (Low)	0xCD	
Read value 3 (High)	0x00	3. read value Data: 1 (0x0001)
Read value 3 (Low)	0x01	
Read value 4 (High)	0x00	4. read value Data: 3 (0x0003)
Read value 4 (Low)	0x03	
Read value 5 (High)	0x00	5. read value Data: 13 (0x000D)
Read value 5 (Low)	0x0D	
Read value 6 (High)	0x00	6. read value Data: 255 (0x00FF)
Read value 6 (Low)	0xFF	

9.8.7 Data mapping

The process of data mapping is used for defining which Modbus registers read or write to which inverter parameters.

Overview

The following table provides an overview of the Modbus register with variable and permanent assignment:

Register	Register address	Info
40103	0102	Variable mapping 0x23BB:001 ... 0x23BB:024 (P530.01 ... 24) serves to map these 24 registers to parameters of the inverter.
40104	0103	
...	...	
40149	0148	
42001 ... 42021	2000 ... 2020	Predefined Modbus status registers For details see the following section "Predefined Modbus status registers".
42101 ... 42121	2100 ... 2120	Predefined Modbus control registers For details see the following section "Predefined Modbus control registers".

Details

- There are fixedly defined Modbus registers for common control and status words, which are located in consecutive blocks, in order to facilitate communication with OPC servers and other Modbus masters. In order to access all relevant data of the inverter, only a minimum number of commands is required.
- In addition, 24 registers are provided for variable mapping, i. e. free assignment to inverter parameters.

Predefined Modbus control registers

- These registers are provided with write and read access.
- The cross-reference in column 2 leads to the detailed parameter description.

Modbus registers	Permanently assigned parameter	
	Address	Name
42101	0x400B:001 (P592.01)	AC Drive control word
42102	0x400B:005 (P592.05)	Network setpoint frequency (0.01)
42103	0x4008:002 (P590.02)	NetWordIN2
42104	0x4008:003 (P590.03)	NetWordIN3
42105	0x400B:007 (P592.07)	PID setpoint
42106	0x6071	Target torque
42107	0x4008:001 (P590.01)	NetWordIN1
42108	0x4008:004 (P590.04)	NetWordIN4
42109 ... 42121	-	Reserved

Predefined Modbus status registers

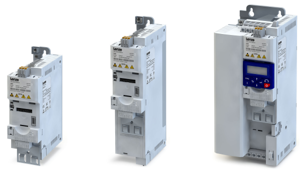
- These registers are only provided with read access.
- The cross-reference in column 2 leads to the detailed parameter description.

Modbus registers	Permanently assigned parameter	
	Address	Name
42001	0x400C:001 (P593.01)	AC Drive status word
42002	0x400C:006 (P593.06)	Frequency (0.01)
42003	0x603F (P150.00)	Error code
42004	0x400C:005 (P593.05)	Drive status
42005	0x2D89 (P106.00)	Motor voltage
42006	0x2D88 (P104.00)	Motor current
42007	0x6078 (P103.00)	Current actual value
42008	0x2DA2:002 (P108.02)	Apparent power (42008 = High Word, 42009 = Low Word)
42009		
42010	0x2D84:001 (P117.01)	Heatsink temperature
42011	0x2D87 (P105.00)	DC-bus voltage
42012	0x60FD (P118.00)	Digital inputs (only bit 16 ... bit 31)
42013	0x6077 (P107.00)	Torque actual value
42014 ... 42021	-	Reserved

Variable mapping

- Via 0x23BB:001 ... 0x23BB:024 (P530.01 ... 24), 24 registers can be mapped to parameters of the inverter.
  Format: 0xiiiiss00 (iiii = index, ss = subindex)
- The display of the internal Modbus register numbers in 0x23BC:001 ... 0x23BC:024 (P531.01 ... 24) is generated automatically. Since 32-bit parameters require two registers, there is no 1:1 assignment.
- For the mappable registers, a CRC (Cyclic Redundancy Check) is executed. The checksum determined is displayed in 0x23BD (P532.00). The user can read this "validation code" and use it for comparison in the Modbus master. In this way it can be checked whether the inverter currently queried is configured correctly for the respective application.

Parameter	Name / value range / [default setting]	Info
0x23BB:001 ... 0x23BB:024 (P530.01 ... 24)	Modbus TCP/IP parameter mapping: Parameter 1 ... Parameter 24 (MBTCP param.mapp: Parameter 1 ... Parameter 24) 0x00000000 ... [**0x00000000**] ... 0xFFFFFFFF	Mapping entries for Modbus register 40103 ... 40149. • Format: 0xiiiiss00 (iiii = index, ss = subindex)
0x23BC:001 ... 0x23BC:024 (P531.01 ... 24)	Register assignment: Register 1 ... Register 24 (Register assignm: Register 1 ... Register 24) • Read only	Display of the internal Modbus register number starting from which the parameter mapped in 0x23BB:001 ... 0x23BB:024 (P530.01 ... 24) is stored. • For the first parameter mapped, always 2500. • From the second parameter mapped, 2500 + offset. The offset results from the data types of the previously mapped parameters.
0x23BD (P532.00)	Verification code (Verificat. code) • Read only • From version 04.00	



9.8.8 Short setup

In the following, the steps required for controlling the inverter via Modbus are described.

Parameterisation required

1. Activate network control: 0x2631:037 (P400.37) = "TRUE [1]"
2. Set network as standard setpoint source: 0x2860:001 (P201.01) = "Network [5]"
3. Set IP address of the inverter (slave), see section Data mapping. 360
4. Save parameter settings: 0x2022:003 (P700.03) = "on / start [1]".
5. In order that the changed communication settings become effective, there is the option to
   - switch the inverter off and on again or
   - restart the communication, see 0x23B0 (P508.00).

In the default setting, the digital input DI1 is assigned with the "Run" function. If the network control is activated, this function serves as "start enable" for start commands via network. Hence, the digital input DI1 must be set to HIGH level in order that the motor can be started via network. ▶ Start / stop motor 531

Starting/stopping the drive via Modbus

For starting/stopping the drive, Modbus register 42101 can be used.

- Modbus register 42101 is permanently assigned to the AC Drive control word 0x400B:001 (P592.01).
- In the frame, the leading 4 is omitted in the addressing process. The numbering of the registers starts with 1; addressing, however starts with 0. Therefore the address 2100 (0x0834) is used in the frame when register 42101 is written.

Bits set in the AC drive control word:

- Bit 0 ≡ Run forward (CW)
- Bit 5 ≡ Activate network control
- Bit 6 ≡ Activate network setpoint
- Function code 6, i. e. writing into a single register.

Example of an inverter with the node address 1:

Request frame by the master							
Slave address	Function code	Register address		AC Drive control word Data: 0b1100001 ≡ 0x0061		Checksum (CRC)	
0x01	0x06	0x08	0x34	0x00	0x61	0x0B	0x8C

If digital input DI1 ("Start enable") is set to HIGH level, the drive should start and the inverter should respond with the same frame as confirmation:

Response message from the inverter							
Slave address	Function code	Register address		AC Drive control word Data: 0b1100001 ≡ 0x0061		Checksum (CRC)	
0x01	0x06	0x08	0x34	0x00	0x61	0x0B	0x8C

Write the speed of the drive via Modbus

The drive speed can be changed via the Modbus register 42102, see Data mapping.

Example of an inverter with the node address 1:

Request frame by the master							
Slave address	Function code	Data				Checksum (CRC)	
		Register address		Network setpoint frequency (0.01)			
0x01	0x06	0x08	0x35	0x04	0xD2	0x19	0x39

Response message from the inverter							
Slave address	Function code	Data				Checksum (CRC)	
		Register address		Network setpoint frequency (0.01)			
0x01	0x06	0x08	0x35	0x04	0xD2	0x19	0x39

The drive now rotates with a frequency of 12.34 Hz.

Read the drive speed via Modbus

The drive speed can be read out via the Modbus register 42002, see Data mapping. For reading a single register or several connected register blocks, the function code 3 is used, see Function codes.

Example of an inverter with the node address 1:

Request frame by the master							
Slave address	Function code	Data				Checksum (CRC)	
		Register address		Number of words			
0x01	0x03	0x07	0xD1	0x00	0x01	0xD5	0x47

Response message from the inverter						
Slave address	Function code	Data			Checksum (CRC)	
		Read bytes	Frequency (0.01)			
0x01	0x03	0x02	0x04	0xD1	0x7A	0xD8

The drive rotates with a frequency of 12.33 Hz.

Parameter	Name / value range / [default setting]		Info
0x2631:037 (P400.37)	Function list: Activate network control (Function list: Network control) • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532		Assignment of a trigger for the "Activate network control" function. Trigger = TRUE: Activate network control. Trigger = FALSE: No action / deactivate network control again.
	0	**Not connected**	
	114	Network control active (from version 02.00)	TRUE if the network control is requested via bit 5 of the AC drive control word 0x400B:001 (P592.01). Otherwise FALSE. Notes: • Set this selection if the network control is to be activated via bit 5 of the AC drive control word. • The AC drive control word can be used with any communication protocol. ▸ AC Drive Profile 📖 248

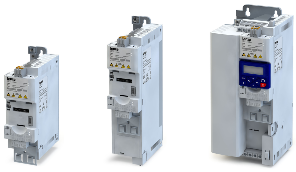
9.8.9 Restart communication

Parameter	Name / value range / [default setting]		Info
0x23B0 (P508.00)	Modbus TCP communication (MBTCP comm.) • From version 04.00		Restart / stop communication
	0	**No action/no error**	Only status feedback.
	1	Restart with current values	Restart communication in order that changed settings of the interface configuration become effective.
	2	Restart with default values	Restart communication with the standard values.
	5	Stop network communication	Stop communication.
	10	In progress	Only status feedback
	11	Action cancelled	
	12	Error	

9.8.10 Baud rate setting

Parameter	Name / value range / [default setting]		Info
0x23B4:001 (P512.01)	Port settings: Port 1 (Port settings: Port 1) • From version 04.00		Set baud rate for the port 1.
	0	**Auto-Negotiation**	
	1	10 Mbps	
	2	100 Mbps	
	5	10 Mbps/Half Duplex	
	6	10 Mbps/Full Duplex	
	7	100 Mbps/Half Duplex	
	8	100 Mbps/Full Duplex	

Parameter	Name / value range / [default setting]		Info
0x23B4:002 (P512.02)	Port settings: Port 2 (Port settings: Port 2) • From version 04.00		Set baud rate for the port 2.
	0	**Auto-Negotiation**	
	1	10 Mbps	
	2	100 Mbps	
	5	10 Mbps/Half Duplex	
	6	10 Mbps/Full Duplex	
	7	100 Mbps/Half Duplex	
	8	100 Mbps/Full Duplex	
0x23B5:001 (P513.01)	Active port settings: Port 1 (Act. port sett.: Port 1) • Read only • From version 04.00		Display of the baud rate set for the port 1 in parameter 0x23B4:001 (P512.01).
	0	Not connected	
	1	10 Mbps/Half Duplex	
	2	10 Mbps/Full Duplex	
	3	100 Mbps/Half Duplex	
	4	100 Mbps/Full Duplex	
0x23B5:002 (P513.02)	Active port settings: Port 2 (Act. port sett.: Port 2) • Read only • From version 04.00		Display of the baud rate set for the port 2 in parameter 0x23B4:002 (P512.02).
	0	Not connected	
	1	10 Mbps/Half Duplex	
	2	10 Mbps/Full Duplex	
	3	100 Mbps/Half Duplex	
	4	100 Mbps/Full Duplex	



9.9 PROFINET

PROFINET® (Process Field Network) is a real-time capable fieldbus system based on Ethernet.

- Detailed information on PROFINET can be found on the web page of the PROFIBUS & PROFINET International (PI) user organisation: http://www.profibus.com
- Information about the dimensioning of a PROFINET network can be found in the configuration document for the inverter.
- PROFINET® is a registered trademark and patented technology licensed by the PROFIBUS & PROFINET International (PI) user organisation.

Preconditions

- Control unit (CU) of the inverter is provided with PROFINET.
- The required GSDML device description files for PROFINET are installed in the engineering tool for configuring the network.
    - Download of GSDML files

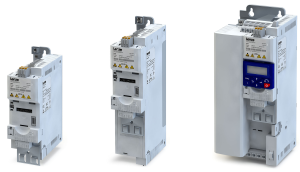
9.9.1 Introduction

The inverter is implemented as IO-Device into a PROFINET network. PROFINET transmits parameter data, configuration data, diagnostic data, alarm messages and process data between the IO-Devices and the IO-Controller (in the following, this term is used instead of "PLC" or "host system").

The data is transmitted as a function of its time-critical behaviour via corresponding communication channels.

Supported services

Features	Inverter
Conformance	Class CCB
Option according to conformance class	Media Redundancy Protocol
Device class	IO device
According to PN specification	V2.2
Safety channel support	-
Shared device	-
Device access	TCI, I&M0 ... 4
Device profile support	-
Conductor access	OK
The second inverter	Yes
Fast startup	No. (typical starting times, approx. 11 seconds)
Topology support	LLDP MIB, station alias
PN blinking function	OK
Alarm type	User
Acyclic services	OK
Additional Ethernet channel	TCP/IP channel
Lenze GCI support	OK
Lenze ESDCP support	OK
Power over Ethernet PoE	-
External 24V current supply	X3 24E / GND
Optical fiber support	-



9.9.2 Basic settings

For communicating with the inverter, the IO controller must be configured.

The configuration of the IO controller comprises

- the loading of the device description file into the IO controller,
- the assignment of a station name for the inverter and
- the assignment of an IP address for the inverter.

The station name and the IP address are assigned by the IO controller. The assignment can also be made by the Lenze engineering tool.

Preconditions

- The entire wiring of the inverter has already been checked for completeness, short circuit and earth fault.
- The GSDML device description file for PROFINET must be downloaded from http://www.lenze.com/application-knowledge-base/artikel/200804173/0/ . Please observe the required system requirements an the notes regarding the inverter.

Device description file

The current device description file is installed in the engineering tool used for configuring the network. Thus, an unambiguous station name is assigned to the inverter which makes it possible for the IO controller to identify the device in the network and manage the data exchange with the other network nodes.

The designation of the device description file is as follows:

"GSDML-V<x>.<z>-Lenze-i<NNN>PN<Version>-<yyyy><mm><dd>.xml".

The information in the wildcards (angle brackets) are explained in the following:

Wildcard	Info
x	Major version of the used GSDML scheme
z	Minor version of the used GSDML scheme
NNN	Specifying the inverter designation, e.g. i<550>
Version	First software version that can be used with this GSDML. This data must not be changed.
yyyy	Year of publication
mm	Month of publication
dd	Day of publication

Tab. 2: Explanation of the wildcards in the designation of the device description file

Station name

The station name is required for the clear addressing of the inverter by the IO controller.

The station name of the inverter must be entered into the 0x2381:004 (P510.04) parameter with permissible characters according to the PROFINET specification. The characters permissible for the name allocation are given in the specification.

The station name is read out with 0x2382:004 (P511.04).

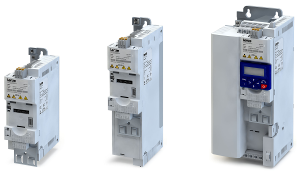
IP address

The IP address makes it possible to access the inverter in the entire network.

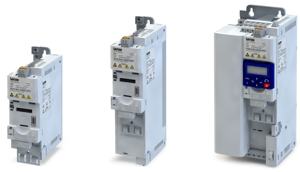
For configuring the IP address, the subnet mask and gateway address must also be assigned:

- 0x2381:001 (P510.01): IP address
- 0x2381:002 (P510.02): Subnet mask
- 0x2381:003 (P510.03): Gateway address

All three settings are read out with the parameters 0x2382:001 (P511.01) ... 0x2382:003 (P511.03).



Parameter	Name / value range / [default setting]	Info
0x2380 (P508.00)	PROFINET communication (PROFINET comm.) • From version 02.00	Restart / stop communication • When the device command has been executed successfully, the value 0 is shown.
	0 **No action/no error**	Only status feedback
	1 Restart with current values	Restart communication with the current values.
	2 Restart with default values	Restart communication with the standard values of the PROFINET parameters (0x2381:001 ... 0x2381:009).
	5 Stop network communication	Stop communication
	10 In process	Only status feedback
	11 Action cancelled	
	12 Fault	
0x2381:001 (P510.01)	PROFINET settings: IP address (PROFINET sett.: IP address) 0 ... [**0**] ... 4294967295 • From version 02.00	Set IP address • The change of this parameter becomes only effective after a restart.
0x2381:002 (P510.02)	PROFINET settings: Subnet (PROFINET sett.: Subnet) 0 ... [**0**] ... 4294967295 • From version 02.00	Set subnet mask • The change of this parameter becomes only effective after a restart.
0x2381:003 (P510.03)	PROFINET settings: Gateway (PROFINET sett.: Gateway) 0 ... [**0**] ... 4294967295 • From version 02.00	Set gateway address • The gateway address is valid if the network address of the IP address is identical to the gateway address. In this case, no gateway functionality is used. • DHCP is not supported. • The change of this parameter becomes only effective after a restart.
0x2381:004 (P510.04)	PROFINET settings: Station name (PROFINET sett.: Station name) • From version 02.00	Set station name • The change of this parameter becomes only effective after a restart.
0x2381:005	PROFINET settings: I&M1 System designation • From version 02.00	Input/output of the I&M1 system designation • The default setting is an empty string.
0x2381:006	PROFINET settings: I&M1 Installation site • From version 02.00	Input/output of the I&M1 location identification code • The default setting is an empty string.
0x2381:007	PROFINET settings: I&M2 Installation date • From version 02.00	Input/output of the I&M1 date of installation • The default setting is an empty string.
0x2381:008	PROFINET settings: I&M3 additional information • From version 02.00	Input/output of the I&M1 additional information • The default setting is an empty string.
0x2381:009	PROFINET settings: I&M4 signature code • From version 02.00	Input/output of the I&M1 signature • The default setting is an empty string.



9.9.3 LED status displays

Information on the network status can be obtained quickly via the "BUS RDY" and "BUS ERR" LED displays on the front of the inverter. In addition, the LEDs at the RJ45 sockets indicate the PROFINET connection status.

The meaning of the "BUS RDY" and "BUS ERR" LEDs can be obtained from the following two tables.

LED "BUS RDY" (green)	Status/meaning
off	No connection to the master
blinking	PLC in STOP
on	PLC in RUN (DATA_EXCHANGE)

LED "BUS ERR" (red)	Status/meaning
off	No fault
flickers	The PROFINET function "Node flashing test" is triggered by the IO controller. The flickering LED serves to identify (locate) accessible IO devices
blinking	Impermissible settings: Stack, station name or IP parameters are invalid.
on (red)	Communication error (e.g. Ethernet cable removed)

Status displays at the RJ45 sockets

The LEDs at the RJ45 sockets indicate the connection status to the network:

LED "Link" (green)	Status/meaning
off	No connection to the network.
on	A physical connection to the network is available.

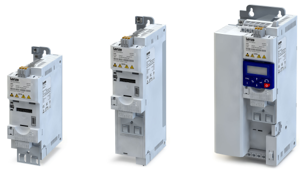
LED "Activity" (yellow)	Status/meaning
off	No data transfer.
on or flickers	Data is exchanged via the network.

9.9.4 Diagnostics

The parameters for diagnosing the network are described below.

Parameter	Name / value range / [default setting]	Info
0x2382:001 (P511.01)	Active PROFINET settings: IP address (PROFINET diag.: IP address) • Read only • From version 02.00	Display of the active IP address.
0x2382:002 (P511.02)	Active PROFINET settings: Subnet (PROFINET diag.: Subnet) • Read only • From version 02.00	Display of the active subnet mask.
0x2382:003 (P511.03)	Active PROFINET settings: Gateway (PROFINET diag.: Gateway) • Read only • From version 02.00	Display of the gateway address.
0x2382:004 (P511.04)	Active PROFINET settings: Station name (PROFINET diag.: Station name) • Read only • From version 02.00	Display of the active station name.
0x2382:005 (P511.05)	Active PROFINET settings: MAC Address (PROFINET diag.: MAC Address) • Read only • From version 02.00	Display of the active MAC address.

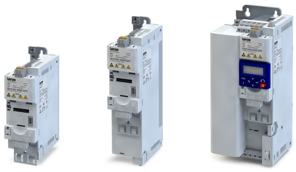
Parameter	Name / value range / [default setting]		Info
0x2388 (P516.00)	PROFINET status (PROFINET status) • Read only • From version 02.00		Bit coded display of the current Bus status.
	Bit 0	Initialized	After initialisation, the network component waits for a communication partner and the system power-up.
	Bit 1	Online	
	Bit 2	Connected	
	Bit 3	IP address error	The IP address is invalid. Valid IP addresses are defined according to RFC 3330.
	Bit 4	Hardware fault	
	Bit 6	Watchdog elapsed	PROFINET communication is continuously interrupted in the "Data_Exchange" state, e.g. by cable break or failure of the IO Controller. • PROFINET communication changes to the "No_Data_Exchange" state. When the watchdog monitoring time specified by the IO Controller has elapsed, the response set in 0x2859:001 (P515.01) is triggered in the inverter.
	Bit 7	Protocol error	
	Bit 8	PROFINET stack ok	
	Bit 9	PROFINET stack not configured	
	Bit 10	Ethernet controller fault	
	Bit 11	UDP stack fault	
0x2389:001 (P517.01)	PROFINET error: Error 1 (PROFINET error: Error 1) • Read only • From version 02.00		The parameter currently contains the error detected on the network. • The error values may occur in combination with the error values from parameter 0x2389:002 (P517.02).
	0	No error	
	1	Reserved	
	2	Unit ID unknown	
	3	Max. units exceeded	
	4	Invalid size	
	5	Unit type unknown	
	6	Runtime plug error	
	7	Invalid argument	
	8	Service pending	
	9	Stack not ready	
	10	Command unknown	
	11	Invalid address descriptor	
0x2389:002 (P517.02)	PROFINET error: Error 2 (PROFINET error: Error2) • Read only • From version 02.00		The parameter currently contains the error detected on the network. • The error values may occur in combination with the error values from parameter 0x2389:001 (P517.01).
	Bit 7	IP address error	The IP address is invalid. Valid IP addresses are defined according to RFC 3330.
	Bit 8	Station name problem	The station name must be assigned according to the PROFINET specifica-tion.
	Bit 9	DataExch left	
	Bit 10	Stack boot error	
	Bit 11	Stack online error	
	Bit 12	Stack state error	
	Bit 13	Stack revision error	
	Bit 14	Initialization problem	
	Bit 15	Stack init error	The stack cannot be initiated with the user specifications. A reason might be, e. g., a station name that does not correspond to the PROFI-NET specification.



9.9.5 Monitoring

The parameters for setting network monitoring functions are described below.

Parameter	Name / value range / [default setting]	Info
0x2859:001 (P515.01)	PROFINET monitoring: Watchdog elapsed (PROFINET monit.: WD elapsed) • From version 02.00 • For further possible settings, see parameter 0x2D45:001 (P310.01). 223	Selection of the response to a permanent interruption of the communication to the IO controller. Associated error code: • 33168 | 0x8190 - Network: watchdog timeout
	2 **Trouble**	
0x2859:002 (P515.02)	PROFINET monitoring: Data exchange exited (PROFINET monit.: Data exch.exited) • For further possible settings, see parameter 0x2D45:001 (P310.01). 223	
	0 **No response**	
0x2859:003 (P515.03)	PROFINET monitoring: Invalid configuration (PROFINET monit.: Invalid config) • From version 02.00 • For further possible settings, see parameter 0x2D45:001 (P310.01). 223	Selection of the response triggered by the reception of invalid configuration data. Associated error code: • 33414 | 0x8286 - Network: PDO mapping error
	2 **Trouble**	
0x2859:004 (P515.04)	PROFINET monitoring: Initialisation error (PROFINET monit.: Init. error) • From version 02.00 • For further possible settings, see parameter 0x2D45:001 (P310.01). 223	Selection of the response triggered by the occurrence of an error during the initialisation of the network component. Associated error code: • 33170 | 0x8192 - Network: initialisation error
	2 **Trouble**	
0x2859:005 (P515.05)	PROFINET monitoring: Invalid process data (PROFINET monit.: Inval. proc.data) • From version 02.00 • For further possible settings, see parameter 0x2D45:001 (P310.01). 223	Selection of the response triggered by the reception of invalid process data. Process data marked as invalid (IOPS is "BAD") are received by the IO Controller. Typically in case of • a PLC in STOP state, • alarms, • acyclic demand data. Associated error code: • 33171 | 0x8193 - Network: invalid cyclic process data
	2 **Trouble**	



9.9.6 Data mapping

The process data are used to control the inverter.

The process data is transmitted cyclically between the IO-Controller and the IO-Devices participating at the PROFINET:

- The available 27 network registers ("slots") serve to maximally exchange 16 process data words (data types 8-bit or 16-bit) or 8 process data double words (data type 32-bit) for each direction.
- Output data direction: From IO-Controller to IO-Device.
- Input data direction: From IO-Device to IO-Controller.

Data mapping is used to define which process data are exchanged cyclically between IO-Controller andIO-Device.

Details

- If the inverter is known in the PROFINET network as node and the IO-Controller connects to the IO-Device for the first time, the mapping objects are automatically transferred to the IO device, i. e. to the inverter.
- Internal mapping of the process output data is set in 0x24E0:001 ... 0x24E0:016.
- Internal mapping of the process input data is set in 0x24E1:001 ... 0x24E1:016.

All subsequent changes in the objects 0x24E1 and 0x24E1 can cause PROFINET alarms according to the deviation of the automatically set configurations.

RPDO mapping

The assignment of different bits with the same function is not permissible.

For the process data from the master to the inverter, the following data mapping is preset in the device description file:

1. NetWordIN1 data word 0x4008:001 (P590.01)
2. Network setpoint frequency (0.01) 0x400B:005 (P592.05)
3. 16 bit selectable output data, mapped to Keypad setpoints: Process controller setpoint 0x2601:002 (P202.02)

Function assignment of the NetWordIN1 data word

Bit	Default setting	For details and configuration, see
0	Not active (reserve)	0x400E:001 (P505.01)
1	Not active (reserve)	0x400E:002 (P505.02)
2	Activate quick stop	0x400E:003 (P505.03)
3	Not active (reserve)	0x400E:004 (P505.04)
4	Run forward (CW)	0x400E:005 (P505.05)
5	Activate preset (bit 0)	0x400E:006 (P505.06)
6	Activate preset (bit 1)	0x400E:007 (P505.07)
7	Reset error	0x400E:008 (P505.08)
8	Not active (reserve)	0x400E:009 (P505.09)
9	Activate DC braking	0x400E:010 (P505.10)
10	Not active (reserve)	0x400E:011 (P505.11)
11	Not active (reserve)	0x400E:012 (P505.12)
12	Reverse rotational direction	0x400E:013 (P505.13)
13	Not active (reserve)	0x400E:014 (P505.14)
14	Not active (reserve)	0x400E:015 (P505.15)
15	Not active (reserve)	0x400E:016 (P505.16)

Specifying the frequency setpoint

- The specification is made unsigned (independent of the direction of rotation) as integer in the resolution [0.01 Hz].
- The direction of rotation is defined in the default setting via bit 12 of the NetWordIN1 data word.
- Example: 4560 ≡ 45.60 Hz

TPDO mapping

The assignment of different bits with the same function is not permissible.

For the process data from the inverter to the master, the following data mapping is preset in the device description file:

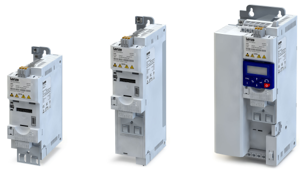
1. NetWordOUT1 data word 0x400A:001 (P591.01)
2. Frequency (0.01) 0x400C:006 (P593.06)
3. Motor current 0x2D88 (P104.00)

Status assignment of the NetWordOUT1 data word

Bit	Default setting	For details and configuration, see
0	Ready for operation	0x2634:010 (P420.10)
1	Not connected	0x2634:011 (P420.11)
2	Operation enabled	0x2634:012 (P420.12)
3	Error active	0x2634:013 (P420.13)
4	Not connected	0x2634:014 (P420.14)
5	Quick stop active	0x2634:015 (P420.15)
6	Running	0x2634:016 (P420.16)
7	Device warning active	0x2634:017 (P420.17)
8	Not connected	0x2634:018 (P420.18)
9	Not connected	0x2634:019 (P420.19)
10	Setpoint speed reached	0x2634:020 (P420.20)
11	Current limit reached	0x2634:021 (P420.21)
12	Actual speed = 0	0x2634:022 (P420.22)
13	Rotational direction reversed	0x2634:023 (P420.23)
14	Release holding brake	0x2634:024 (P420.24)
15	Safe torque off (STO) active	0x2634:025 (P420.25)

Output of the actual frequency value

- The output is made unsigned (independent of the direction of rotation) as integer in the resolution [0.01 Hz].
- An active reversal is displayed via bit 13 of the NetWordOUT1 data word.
- Example: 4560 ≡ 45.60 Hz



Example for changing a pre-assigned mapping

The assignment of the third output word is to be changed. Due to the device description file, this output word (designation "16 bit selectable OUT-data_1") has already been assigned with the keypad setpoint.

The keypad setpoint (0x2601:002 (P202.02)) is to be replaced by the acceleration ramp (0x2917 (P220.00)).

Proceeding

1. Mark the 3rd output word in the "Device view".
2. Select the "Module parameter" dialog in "Properties".
   a) Display in "Index": 9729 (decimal form of the index 0x2601)
   b) Display in "Subindex": 2
3. Replace keypad setpoint 0x2601:002 (P202.02) by acceleration ramp 0x2917 (P220.00)
   a) Use the Parameter attribute list to check whether mapping is permitted for the current parameter to be mapped and the data type is complied with. 659
   b) Entry in "Index": 10519 (decimal form of the index 0x2917)
   c) Entry in "Subindex": 0

The acceleration time must be defined later, e.g. at the FB LCB_ActuatorSpeed, input wFreeCtrl, with the factor 10 (10 s ≡ 100).

9.9.7 Parameter data transfer

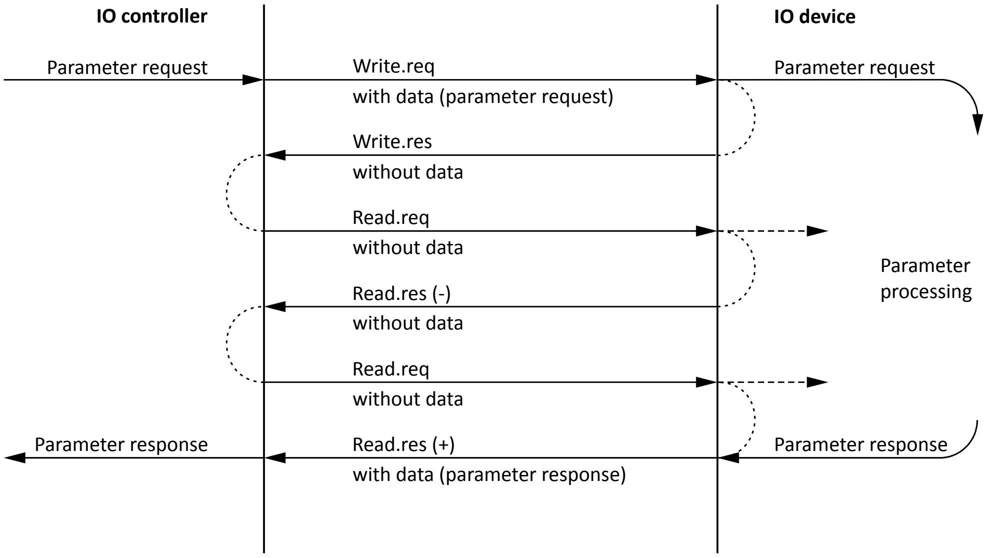
Data communication with PROFINET is characterised by the simultaneous operation of cyclic and acyclic services in the network. As an optional extension, the parameter data transfer belongs to the acyclic services.

Details

- Only one parameter request is processed at a time (no pipelining).
- No spontaneous messages are transferred.
- There are only acyclic parameter requests.
- Profile-specific parameters can be independently of the states of the IO-Device.

An IO-Controller can always request parameters from the IO-Device if the IO-Device is in the DATA_EXCHANGE state.

Transmission directions for acyclic data transfer

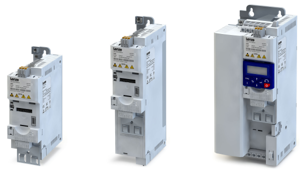


1. A "Write.req" is used to transmit the data set (DB47) to the IO-Device in the form of a parameter request.
2. With "Write.res", the IO-Controller receives the confirmation for the receipt of the mes-sage.
3. The IO-Controller requests the response of the IO-Device with "Read-req".
4. The IO-Device responds with a "Read.res (-)" if processing has not been completed yet.
5. After parameter processing, the parameter request is completed by transmitting the parameter response to the IO-Controller with "Read.res (+).

Telegram structure

Destr	ScrAddr	VLAN	Type 0x0800	RPC	NDR	**Read/Write Block**	**Data**	FCS
6 bytes	6 bytes	4 bytes	4 bytes	80 bytes	64 bytes	64 bytes	0 .... 240 bytes	4 bytes

In the **Read / Write Block** field, the initiator specifies the access to the "DB47" data set. The data that is written on this index or read by it, contain a header and the parameter request or the parameter response. The read data or the data to be written are contained in the **Data** field.



Assignment of the user data depending on the data type

Depending on the data type used, the user data are assigned as follows:

<table>
<tr><th rowspan="2">Data type</th><th rowspan="2">Length</th><th colspan="5">User data assignment</th></tr>
<tr><th>Byte 1</th><th>Byte 2</th><th>Byte 3</th><th>Byte 4</th><th>Byte ...</th></tr>
<tr><td>String</td><td>x bytes</td><td colspan="5">Data (x bytes)</td></tr>
<tr><td colspan="7"></td></tr>
<tr><td>U8</td><td>1 byte</td><td>Data</td><td>0x00</td><td colspan="3"></td></tr>
<tr><td colspan="7"></td></tr>
<tr><td rowspan="2">U16</td><td rowspan="2">2 bytes</td><td>HIGH byte</td><td>LOW byte</td><td rowspan="2" colspan="3"></td></tr>
<tr><td>Data</td><td>Data</td></tr>
<tr><td colspan="7"></td></tr>
<tr><td rowspan="3">U32</td><td rowspan="3">4 bytes</td><td colspan="2">HIGH word</td><td colspan="2">LOW word</td><td rowspan="3"></td></tr>
<tr><td>HIGH byte</td><td>LOW byte</td><td>HIGH byte</td><td>LOW byte</td></tr>
<tr><td>Data</td><td>Data</td><td>Data</td><td>Data</td></tr>
</table>

9.9.8 Short setup

In the following, the steps required for controlling the inverter via PROFINET are described.

Parameterisation required

On the control side, all commissioning steps are carried out with the engineering tool of an original equipment manufacturer (e.g. »Siemens TIA Portal«). Please note that in the standard setting of the used engineering tool, changes of network parameters carried out by a Lenze engineering tool (e.g. »EASY Starter«) may be overwritten.

1. Go to the device configuration and open the "net view" to drag the inverter from the catalog to the net view of the PROFINET.

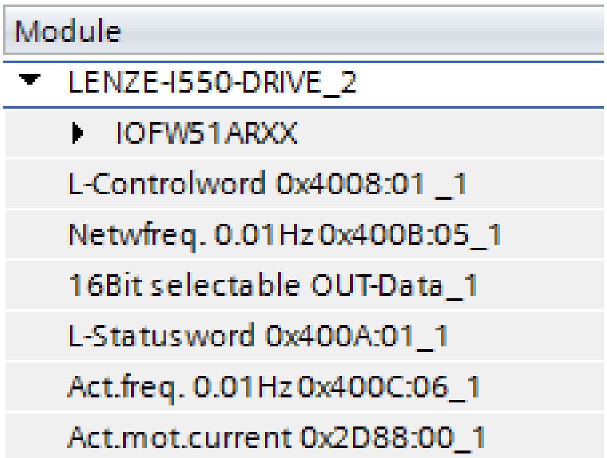
   Condition: The device description file has been installed before, see Basic settings.
2. Assign the inverter to the associated IO controller.
3. Mark the inverter and change to the "device view".
4. Set the IP address and the station name ("PROFINET device name") in "Properties".

   For setting of the IP address and the station name, see Basic settings.

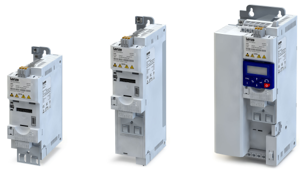
In order that the inverter can be identified via Ethernet when the IO controller is switched off, it is necessary that the IP address is saved in the inverter with mains failure protection via the separate entry with the »EASY Starter«.

Please observe the notes in the section Save parameter settings in the memory module and use the 0x2022:003 (P700.03) parameter for saving the settings.

5. Activate network control: 0x2631:037 (P400.37) = "TRUE [1]"
6. Set network as standard setpoint source: 0x2860:001 (P201.01) = "Network [5]"
7. Below the module name and the name of the device description file, the device view shows the pre-assignment of three output and input process data objects (TPDO / RPDO) each:



   - In the device view. further process data words can be added or preassigned PDOs can be changed. Please make sure that all addresses of the input and output data words follow each other without any gaps.
   - Please observe the description for data mapping, see Data mapping and the subsequent "example for changing a pre-assigned mapping".
8. Save configuration in the engineering tool.
9. Load project into the IO controller.
10. Get the IO controller to "RUN", e.g. by setting bit 4 in the control word NetWordIN1 0x400E:005 (P505.05).
    - The startup causes the current configuration to be transferred to the inverter.
    - If required, save mapping and all other parameters in the inverter with mains failure protection, see Save parameter settings in the memory module.



Restart or stop communication

The following parameter can be used to restart or stop communication. Optionally it is also possible to reset all communication parameters to the default status.

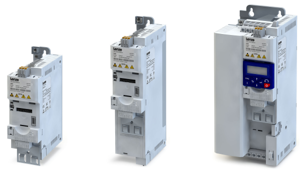
A restart of communication is required after changes of the interface configuration (e. g. station address and baud rate) in order that the changed settings become effective.

For restarting communication, there are two options:

1. Switch inverter off and on again.
2. Set the selection = "Restart with current values [1]" in 0x2380 (P508.00).

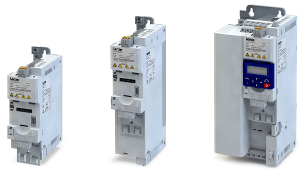
Parameter	Name / value range / [default setting]		Info
0x2022:003 (P700.03)	Device commands: Save user data (Device commands: Save user data) • For further possible settings, see parameter 0x2022:001 (P700.01). 📖 418		1 = save current parameter settings in the main memory of the memory module with mains failure protection. • It may take some seconds to execute the task. When the task has been executed successfully, the value 0 is shown. • Do not switch off the supply voltage during the saving process and do not unplug the memory module from the inverter! • When the inverter is switched on, all parameters are automatically loaded from the main memory of the memory module to the RAM memory of the inverter.
	0	**Off / ready**	
0x2381:004 (P510.04)	PROFINET settings: Station name (PROFINET sett.: Station name) • From version 02.00		Set station name • The change of this parameter becomes only effective after a restart.
0x2382:001 (P511.01)	Active PROFINET settings: IP address (PROFINET diag.: IP address) • Read only • From version 02.00		Display of the active IP address.
0x2382:004 (P511.04)	Active PROFINET settings: Station name (PROFINET diag.: Station name) • Read only • From version 02.00		Display of the active station name.
0x2388 (P516.00)	PROFINET status (PROFINET status) • Read only • From version 02.00		Bit coded display of the current Bus status.
	Bit 0	Initialized	After initialisation, the network component waits for a communication partner and the system power-up.
	Bit 1	Online	
	Bit 2	Connected	
	Bit 3	IP address error	The IP address is invalid. Valid IP addresses are defined according to RFC 3330.
	Bit 4	Hardware fault	
	Bit 6	Watchdog elapsed	PROFINET communication is continuously interrupted in the "Data_Exchange" state, e.g. by cable break or failure of the IO Controller. • PROFINET communication changes to the "No_Data_Exchange" state. When the watchdog monitoring time specified by the IO Controller has elapsed, the response set in 0x2859:001 (P515.01) is triggered in the inverter.
	Bit 7	Protocol error	
	Bit 8	PROFINET stack ok	
	Bit 9	PROFINET stack not configured	
	Bit 10	Ethernet controller fault	
	Bit 11	UDP stack fault	

Parameter	Name / value range / [default setting]		Info
0x2631:002 (P400.02)	Function list: Run (Function list: Run) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532		Assignment of a trigger to the "Run" function.
	11	**Digital input 1**	**Function 1: Start / stop motor (default setting)** Function 1 is active if no further start commands (start forward/start reverse) have been connected to triggers, no keypad control is active and no network control is active. Trigger = TRUE: Let motor rotate forward (CW). Trigger = FALSE: Stop motor. Notes to function 1: • If "Enable inverter" 0x2631:001 (P400.01) = "Constant TRUE [1]", only a digital input is permissible as trigger for this function in order that the motor can be stopped again any time. Exception: If the "Safe torque off (STO)" safety function is available, both functions "Enable inverter" and "Run" can be set to "Constant TRUE [1]". The inverter is then controlled via the STO signal unless no other start commands (start-forward/start-backward) have been connected to triggers. • The stop method can be selected in 0x2838:003 (P203.03). • The function also serves to realise an automatic start after switch-on. ▸ Starting performance 📖 153 **Function 2: Start enable/stop motor** Function 2 is active if further start commands have been connected to triggers, keypad control is active or network control is active. Trigger = TRUE: Start commands of the active control source are enabled. Trigger = FALSE: Stop motor. Notes to function 2: • If no separate start enable is required for the application, the trigger "Constant TRUE [1]" must be set. • The stop method can be selected in 0x2838:003 (P203.03).
0x2631:037 (P400.37)	Function list: Activate network control (Function list: Network control) • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532		Assignment of a trigger for the "Activate network control" function. Trigger = TRUE: Activate network control. Trigger = FALSE: No action / deactivate network control again.
	0	**Not connected**	
	114	Network control active (from version 02.00)	TRUE if the network control is requested via bit 5 of the AC drive control word 0x400B:001 (P592.01). Otherwise FALSE. Notes: • Set this selection if the network control is to be activated via bit 5 of the AC drive control word. • The AC drive control word can be used with any communication protocol. ▸ AC Drive Profile 📖 248
0x2859:001 (P515.01)	PROFINET monitoring: Watchdog elapsed (PROFINET monit.: WD elapsed) • From version 02.00 • For further possible settings, see parameter 0x2D45:001 (P310.01). 📖 223		Selection of the response to a permanent interruption of the communication to the IO controller. Associated error code: • 33168 | 0x8190 - Network: watchdog timeout
	2	**Trouble**	
0x2860:001 (P201.01)	Frequency control: Default setpoint source (Stnd. setpoints: Freq. setp. src.)		Selection of the standard setpoint source for operating mode "MS: Velocity mode". • The selected standard setpoint source is always active in the operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]" when no setpoint change-over to another setpoint source via corresponding triggers/functions is active. ▸ Setpoint change-over 📖 546
	1	Keypad	The setpoint is specified locally by the keypad. • Default setting: 0x2601:001 (P202.01) • Use the ↑ and ↓ navigation keys to change the keypad setpoint (also during running operation).
	2	**Analog input 1**	The setpoint is defined as analog signal via the analog input 1. ▸ Analog input 1 📖 597

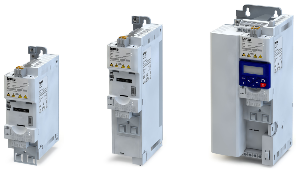


Parameter	Name / value range / [default setting]		Info
	3	Analog input 2	The setpoint is defined as analog signal via the analog input 2. ▸ Analog input 2 📖 601
	4	HTL input (from version 04.00)	The digital inputs DI3 and DI4 can be configured as HTL input to use an HTL encoder as setpoint encoder or define the setpoint as a reference frequency ("pulse train"). ▸ HTL input setpoint source 📖 565
	5	Network	The setpoint is defined as process data object via the network. ▸ Configuring the network 📖 226
	11	Frequency preset 1	For the setpoint selection, preset values can be parameterised and selected. ▸ Setpoint source of preset setpoints 📖 554
	12	Frequency preset 2	
	13	Frequency preset 3	
	14	Frequency preset 4	
	15	Frequency preset 5	
	16	Frequency preset 6	
	17	Frequency preset 7	
	18	Frequency preset 8	
	19	Frequency preset 9	
	20	Frequency preset 10	
	21	Frequency preset 11	
	22	Frequency preset 12	
	23	Frequency preset 13	
	24	Frequency preset 14	
	25	Frequency preset 15	
	31	Segment preset 1 (from version 03.00)	For the setpoint selection, the segment presets parameterised for the "sequencer" function can be selected as well. ▸ Sequencer 📖 504
	32	Segment preset 2 (from version 03.00)	
	33	Segment preset 3 (from version 03.00)	
	34	Segment preset 4 (from version 03.00)	
	35	Segment preset 5 (from version 03.00)	
	36	Segment preset 6 (from version 03.00)	
	37	Segment preset 7 (from version 03.00)	
	38	Segment preset 8 (from version 03.00)	
	50	Motor potentiometer	The setpoint is generated by the "motor potentiometer" function. This function can be used as an alternative setpoint control which is controlled via two signals: "MOP setpoint up" and "MOP setpoint down". ▸ Motor potentiometer setpoint source (MOP) 📖 559
	201	Internal value (from version 05.00)	Internal values of the manufacturer.
	202	Internal value (from version 05.00)	
	203	Internal value (from version 05.00)	
	204	Internal value (from version 05.00)	
	205	Internal value (from version 05.00)	
	206	Internal value (from version 05.00)	
0x2D88 (P104.00)	Motor current (Motor current) • Read only: x.x A		Display des present current-r.m.s. value.

Parameter	Name / value range / [default setting]		Info
0x4008:001 (P590.01)	Process input words: NetWordIN1 (NetWordINx: NetWordIN1) 0x0000 ... **[0x0000]** ... 0xFFFF		Mappable data word for flexible control of the inverter via network.
	Bit 0	Mapping bit 0	Assignment of the function: 0x400E:001 (P505.01)
	Bit 1	Mapping bit 1	Assignment of the function: 0x400E:002 (P505.02)
	Bit 2	Mapping bit 2	Assignment of the function: 0x400E:003 (P505.03)
	Bit 3	Mapping bit 3	Assignment of the function: 0x400E:004 (P505.04)
	Bit 4	Mapping bit 4	Assignment of the function: 0x400E:005 (P505.05)
	Bit 5	Mapping bit 5	Assignment of the function: 0x400E:006 (P505.06)
	Bit 6	Mapping bit 6	Assignment of the function: 0x400E:007 (P505.07)
	Bit 7	Mapping bit 7	Assignment of the function: 0x400E:008 (P505.08)
	Bit 8	Mapping bit 8	Assignment of the function: 0x400E:009 (P505.09)
	Bit 9	Mapping bit 9	Assignment of the function: 0x400E:010 (P505.10)
	Bit 10	Mapping bit 10	Assignment of the function: 0x400E:011 (P505.11)
	Bit 11	Mapping bit 11	Assignment of the function: 0x400E:012 (P505.12)
	Bit 12	Mapping bit 12	Assignment of the function: 0x400E:013 (P505.13) Alternatively, this mapping bit can be used for controlling the digital outputs. Assignment of the digital outputs: • Relay: 0x2634:001 (P420.01) / selection [30] • Digital output 1: 0x2634:002 (P420.02) / selection [30] • Digital output 2: 0x2634:003 (P420.03) / selection [30] Note! Do not assign the mapping bit to a function and a digital output at the same time. A double assignment can cause an unpredictable drive behaviour!
	Bit 13	Mapping bit 13	Assignment of the function: 0x400E:014 (P505.14) Alternatively, this mapping bit can be used for controlling the digital outputs. Assignment of the digital outputs: • Relay: 0x2634:001 (P420.01) / selection [31] • Digital output 1: 0x2634:002 (P420.02) / selection [31] • Digital output 2: 0x2634:003 (P420.03) / selection [31] Note! Do not assign the mapping bit to a function and a digital output at the same time. A double assignment can cause an unpredictable drive behaviour!
	Bit 14	Mapping bit 14	Assignment of the function: 0x400E:015 (P505.15) Alternatively, this mapping bit can be used for controlling the digital outputs. Assignment of the digital outputs: • Relay: 0x2634:001 (P420.01) / selection [32] • Digital output 1: 0x2634:002 (P420.02) / selection [32] • Digital output 2: 0x2634:003 (P420.03) / selection [32] Note! Do not assign the mapping bit to a function and a digital output at the same time. A double assignment can cause an unpredictable drive behaviour!
	Bit 15	Mapping bit 15	Assignment of the function: 0x400E:016 (P505.16) Alternatively, this mapping bit can be used for controlling the digital outputs. Assignment of the digital outputs: • Relay: 0x2634:001 (P420.01) / selection [33] • Digital output 1: 0x2634:002 (P420.02) / selection [33] • Digital output 2: 0x2634:003 (P420.03) / selection [33] Note! Do not assign the mapping bit to a function and a digital output at the same time. A double assignment can cause an unpredictable drive behaviour!



Parameter	Name / value range / [default setting]		Info
0x400A:001 (P591.01)	Process output words: NetWordOUT1 (NetWordOUTx: NetWordOUT1) • Read only		Mappable data word for the output of status messages of the inverter via network.
	Bit 0	Mapping bit 0	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:010 (P420.10)
	Bit 1	Mapping bit 1	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:011 (P420.11)
	Bit 2	Mapping bit 2	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:012 (P420.12)
	Bit 3	Mapping bit 3	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:013 (P420.13)
	Bit 4	Mapping bit 4	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:014 (P420.14)
	Bit 5	Mapping bit 5	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:015 (P420.15)
	Bit 6	Mapping bit 6	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:016 (P420.16)
	Bit 7	Mapping bit 7	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:017 (P420.17)
	Bit 8	Mapping bit 8	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:018 (P420.18)
	Bit 9	Mapping bit 9	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:019 (P420.19)
	Bit 10	Mapping bit 10	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:020 (P420.20)
	Bit 11	Mapping bit 11	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:021 (P420.21)
	Bit 12	Mapping bit 12	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:022 (P420.22)
	Bit 13	Mapping bit 13	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:023 (P420.23)
	Bit 14	Mapping bit 14	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:024 (P420.24)
	Bit 15	Mapping bit 15	Mappable data word for the output of status messages of the inverter via network. Assignment of the status message: 0x2634:025 (P420.25)
0x400B:005 (P592.05)	Process input data: Network setpoint frequency (0.01) (Process data IN: Net.freq. 0.01) 0.00 ... [**0.00**] ... 599.00 Hz		Mappable parameter for specifying the frequency setpoint in [0.01 Hz] via network. • The specification is made without sign (irrespective of the rotating direction). • The rotating direction is specified via the control word. • Example: 456 ≡ 4.56 Hz
0x400C:006 (P593.06)	Process output data: Frequency (0.01) (Process data OUT: Frequency 0.01) • Read only: x.xx Hz		Mappable parameter for the output of the actual frequency value in [0.01 Hz] via network. • The output is effected without sign (irrespective of the rotating direction). • The rotating direction is specified via the status word. • Example: 456 ≡ 4.56 Hz



9.10 EtherCAT

EtherCAT® (Ethernet for Controller and Automation Technology)is an Ethernet-based fieldbus system which fulfils the application profile for industrial realtime systems.

- EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.
- Detailed information on EtherCAT can be found on the web page of EtherCAT Technology Group (ETG): http://www.ethercat.org
- Information about the dimensioning of an EtherCAT network can be found in the configuration document for the inverter.

Preconditions

- The control unit (CU) of the inverter is provided with EtherCAT (from firmware 02.00).
- For commissioning, the »PLC Designer« and current device description files for EtherCAT are available:
  - Download »PLC Designer«
  - Download XML/ESI files for Lenze devices

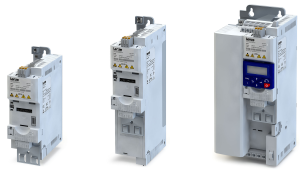
Properties and supported services

Properties / supported services	
CoE (CANopen over EtherCAT)	✓
FSoE (Fail Safety over EtherCAT)	-
Operating modes	• Free run • Config • Run
Access	• Logical write (W) • Logical read/write (RW)
Maximum process data length per direction (Rx/Tx)	32 bytes
FMMU (Fieldbus Memory Management Units)	3*
SM (Sync-Managers)	4
DC synchronisation	-
Topology addressing	✓
Second slave address	Only via EEPROM
Explicit Device Identification Mode	✓
✓ Is supported. - Is not supported. * Available for data mapping.	

Restart of the network communication

The network communication is restarted with 0x2360 (P508.00) = 1.

Parameter	Name / value range / [default setting]		Info
0x2360 (P508.00)	EtherCAT communication (EtherCAT comm.) • From version 02.00		Restart communication. • When the device command has been executed successfully, the value 0 is shown.
	0	**No action/no error**	Only status feedback
	1	Restart with current values	Restart communication with the current values.
	10	In process	Only status feedback
	11	Action cancelled	
	12	Fault	



9.10.1 Device identification

The EtherCAT objects for identifying the devices are described below.

The objects can only be accessed via the EtherCAT network.

Parameter	Name / value range / [default setting]	Info
0x1000	Device type • Read only • From version 02.00	CANopen device profile according CANopen specification CiA 301/ CiA 402.
0x1008	Manufacturer device name • Read only • From version 02.00	Display of the manufacturer device name.
0x1009	Manufacturer hardware version • Read only • From version 02.00	Display of the manufacturer hardware version.
0x100A	Manufacturer software version • Read only • From version 02.00	Display of the manufacturer software version.
0x1018:001	Identity object: Vendor ID • Read only • From version 02.00	Display of the manufacturer's identification number.
0x1018:002	Identity object: Product ID • Read only • From version 02.00	Display of the product code of the inverter.
0x1018:003	Identity object: Revision number • Read only • From version 02.00	Display of the main and subversion of the firmware.
0x1018:004	Identity object: Serial number • Read only • From version 02.00	Display of the serial number of the inverter.

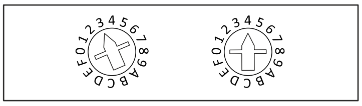
9.10.2 EtherCAT configuration

Addressing the EtherCAT devices

The EtherCAT devices are normally addressed via a permanent 16-bit address defined by the master. At the start, this address is assigned automatically to each node by the master, depending on the physical order in the network. The address is not saved and gets lost when the device is switched off.

"Explicit Device Identification" via rotary encoder switch or parameter

The "Explicit Device Identification" is required if the device is part of a "Hot Connect" group or the device is operated within a modular Lenze machine application. Each slave receives an *unambiguous* identifier for being identified by the master.

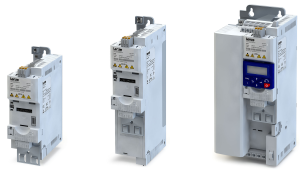
Setting	Assignment of the identifier
0x00	Identifier via the parameter 0x2361:004 (P510.04).
0x01 ... 0xFF	Identifier via the rotary encoder switches. **Example:** Setting for the value 52 (3 × 16) + (4 × 1) = 52  x16 x1

The value set via the rotary encoder switches is used once when the mains is switched on or after a network restart with 0x2360 (P508.00) = 1. A changed value during operation will only become valid after the network has been restarted.

As an alternative, a master can also use station alias addresses of the slaves that are configured and *unambiguous* in the network. For this purpose, a station alias address must be saved in the EEPROM of the device by setting the corresponding register.

The parameters for addressing the device are described below.

Parameter	Name / value range / [default setting]	Info
0x2361:004 (P510.04)	EtherCAT settings: Device identifier (EtherCAT sett.: Device ident.) 0 ... [**0**] ... 65535 • From version 02.00	Setting of the identifier *unambiguous* in the network (Explicit Device Identification). This setting is only valid for rotary encoder switch setting 0 (0x00).
0x2363 (P509.00)	EtherCAT switch position (EtherC. switch) • Read only • From version 02.00	Display of the current rotary encoder switch settings.



9.10.3 LED status displays

Information on the network status can be obtained quickly via the "BUS RDY" and "BUS ERR" LED displays on the front of the inverter. In addition, the LEDs at the RJ45 sockets indicate the EtherCAT connection status.

The meaning of the "BUS RDY" and "BUS ERR" LEDs can be obtained from the following two tables.

LED "BUS RDY" (green)	EtherCAT status	Status/meaning
off	off / Init	The network option is not active at the network or is in the "Init" status.
blinking	Pre-Operational	Access to parameters and objects possible. No process data exchange.
	Safe-Operational	The data is not active yet in the standard device.
on	Operational	The network option works correctly.
flickers	Bootstrap	Firmware update of the network option active.

LED "BUS ERR" (red)	Status/meaning
off	No fault
flickers	Local error. The network option changes automatically to the "Safe-Operational" status.
on (red)	A "Sync Manager Watchdog Timeout" has occurred.
blinking	The configuration is invalid/incorrect.

The LED "L/A" at the RJ45 sockets show the connection status to the network:

LED "L/A" (green)	Status/meaning
off	No connection to the network.
flickers	Data is exchanged via the network.
on	A physical connection to the network is available.

9.10.4 Diagnostics

The parameters for diagnosing the network are described below.

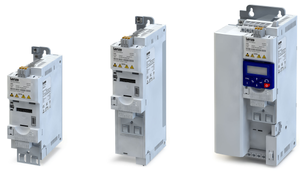
Parameter	Name / value range / [default setting]	Info
0x2362:004 (P511.04)	Active EtherCAT settings: Device identifier (EtherCAT diag.: Device ident.) • Read only • From version 02.00	Display of the clear device address in the network which is defined via rotary encoder switch or object 0x2361:004 (P510.04).
0x2362:006 (P511.06)	Active EtherCAT settings: Station address (EtherCAT diag.: Station address) • Read only • From version 02.00	Display of the active station address.
0x2362:007 (P511.07)	Active EtherCAT settings: Tx length (EtherCAT diag.: Tx length) • Read only • From version 02.00	Display of the length of the transmitted cyclic data in bytes.
0x2362:008 (P511.08)	Active EtherCAT settings: Rx length (EtherCAT diag.: Rx length) • Read only • From version 02.00	Display of the length of the received cyclic data in bytes.

Parameter	Name / value range / [default setting]	Info
0x2368 (P516.00)	EtherCAT status (EtherCAT status) • Read only • From version 02.00	Display of the current network status.
	1 Initialisation	Network initialisation is active. • No PDO/SDO transmission. • Device identification is possible by network scan.
	2 Pre-Operational	The network is active. • SDO transmission (CoE communication via mailbox) is possible. • No PDO transmission.
	3 Bootstrap	Firmware update active. • For the firmware update, the FoE protocol is used. • No PDO transmission.
	4 Safe-Operational	SDO transmission (CoE communication via mailbox) is possible. PDO transmission: • The input data in the process image are updated. • The output data from the process image are not transmitted.
	8 Operational	Normal operation • PDO/SDO transmission is possible. • Network synchronisation is successful (if used).
0x2369 (P517.00)	EtherCAT error (EtherCAT error) • Read only • From version 02.00	Bit coded display of EtherCAT errors.

9.10.5 Monitoring

The parameters for setting network monitoring functions are described below.

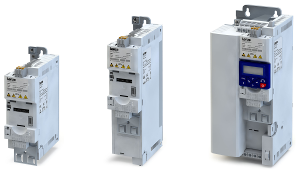
Parameter	Name / value range / [default setting]	Info
0x2859:001 (P515.01)	EtherCAT monitoring: Watchdog elapsed (EtherCAT monit.: WD elapsed) • From version 02.00 • For further possible settings, see parameter 0x2D45:001 (P310.01). 📖 223 **2 Trouble**	Selection of the response to the continuous interruption of communication to the EtherCAT master, e. g. by cable break or failure of the EtherCAT master. Associated error code: • 33168 | 0x8190 - Network: watchdog timeout
0x2859:003 (P515.03)	EtherCAT monitoring: Invalid configuration (EtherCAT monit.: Invalid config) • From version 02.00 • For further possible settings, see parameter 0x2D45:001 (P310.01). 📖 223 **2 Trouble**	Selection of the response triggered by the reception of invalid configuration data. Associated error code: • 33414 | 0x8286 - Network: PDO mapping error
0x2859:004 (P515.04)	EtherCAT monitoring: Initialisation error (EtherCAT monit.: Init. error) • From version 02.00 • For further possible settings, see parameter 0x2D45:001 (P310.01). 📖 223 **2 Trouble**	Selection of the response triggered by the occurrence of an error during the initialisation of the network component. Associated error code: • 33170 | 0x8192 - Network: initialisation error
0x2859:005 (P515.05)	EtherCAT monitoring: Invalid process data (EtherCAT monit.: Inval. proc.data) • From version 02.00 • For further possible settings, see parameter 0x2D45:001 (P310.01). 📖 223 **2 Trouble**	Selection of the response triggered by the reception of invalid process data. Associated error code: • 33171 | 0x8193 - Network: invalid cyclic process data



9.10.6 Objects

The parameters for the implemented EtherCAT objects are described below.

Parameter	Name / value range / [default setting]	Info
0x2360 (P508.00)	EtherCAT communication (EtherCAT comm.) • From version 02.00	Restart communication. • When the device command has been executed successfully, the value 0 is shown.
	0 No action/no error	Only status feedback
	1 Restart with current values	Restart communication with the current values.
	10 In process	Only status feedback
	11 Action cancelled	
	12 Fault	
0x2361:004 (P510.04)	EtherCAT settings: Device identifier (EtherCAT sett.: Device ident.) 0 ... [**0**] ... 65535 • From version 02.00	Setting of the identifier *unambiguous* in the network (Explicit Device Identification). This setting is only valid for rotary encoder switch setting 0 (0x00).
0x2362:004 (P511.04)	Active EtherCAT settings: Device identifier (EtherCAT diag.: Device ident.) • Read only • From version 02.00	Display of the clear device address in the network which is defined via rotary encoder switch or object 0x2361:004 (P510.04).
0x2362:006 (P511.06)	Active EtherCAT settings: Station address (EtherCAT diag.: Station address) • Read only • From version 02.00	Display of the active station address.
0x2362:007 (P511.07)	Active EtherCAT settings: Tx length (EtherCAT diag.: Tx length) • Read only • From version 02.00	Display of the length of the transmitted cyclic data in bytes.
0x2362:008 (P511.08)	Active EtherCAT settings: Rx length (EtherCAT diag.: Rx length) • Read only • From version 02.00	Display of the length of the received cyclic data in bytes.
0x2363 (P509.00)	EtherCAT switch position (EtherC. switch) • Read only • From version 02.00	Display of the current rotary encoder switch settings.
0x2368 (P516.00)	EtherCAT status (EtherCAT status) • Read only • From version 02.00	Display of the current network status.
	1 Initialisation	Network initialisation is active. • No PDO/SDO transmission. • Device identification is possible by network scan.
	2 Pre-Operational	The network is active. • SDO transmission (CoE communication via mailbox) is possible. • No PDO transmission.
	3 Bootstrap	Firmware update active. • For the firmware update, the FoE protocol is used. • No PDO transmission.
	4 Safe-Operational	SDO transmission (CoE communication via mailbox) is possible. PDO transmission: • The input data in the process image are updated. • The output data from the process image are not transmitted.
	8 Operational	Normal operation • PDO/SDO transmission is possible. • Network synchronisation is successful (if used).
0x2369 (P517.00)	EtherCAT error (EtherCAT error) • Read only • From version 02.00	Bit coded display of EtherCAT errors.



9.10.7 Process data transfer

- Process data are cyclically transferred between the EtherCAT master and the slaves (permanent exchange of current input and output data).
- The transfer of process data is time-critical.
- The process data serve to control the EtherCAT slaves.
- The process data can be directly accessed by the master. The data in the PLC, for instance, are directly stored in the I/O area.
- The contents of the process data are defined via I/O Data mapping (definition of the EtherCAT objects that are to be transmitted cyclically).
- Process data are not saved in the device.
- Process data are, e. g. setpoints, actual values, control and status words.

Configuration

- The available objects can be mapped in the CiA 402 operating mode "CiA: Velocity mode" (0x6060 (P301.00) = 2) and as dynamic (free) configuration. The contents can be selected from all mappable objects.
  - Mapping objects for the CiA 402 operating mode "CiA: Velocity mode": 0x1603:001 and 0x1603:002 (RPDOs), 0x1A03:001 ... 0x1A03:003 (TPDOs)
  - Mapping objects for a dynamic (free) assignment: 0x1605:001 ... 0x1605:016 (RPDOs), 0x1A05:001 ... 0x1A05:016 (TPDOs)
- The freely configurable mapping objects contain an 8 bit dummy entry (0x00050008). This ensures that each object is transferred cyclically with 16 bits.
- Mapping is executed in the master configuration and automatically transferred to the slave.
- The data format is 0xAAAABBCC (AAAA = index, BB = subindex, CC = length).

Standard mapping of the RPDOs in the CiA 402 operating mode "CiA: Velocity mode"

Master → slave	
0x1603:001 RPDO mapping entry 1 (CiA: Velocity mode)	CiA: Controlword (0x6040)
0x1603:002 RPDO mapping entry 2 (CiA: Velocity mode)	CiA 402 parameter "Target velocity" (0x6042 (P781.00))
0x1605:001 RPDO mapping Entry 1 (freely configurable)	Not assigned.

Standard mapping of the TPDOs in the CiA 402 operating mode "CiA: Velocity mode"

Slave → master	
0x1A03:001 TPDO mapping entry 1 (CiA: Velocity mode)	CiA: Statusword (0x6041 (P780.00))
0x1A03:002 TPDO mapping entry 2 (CiA: Velocity mode)	CiA 402 parameter "Velocity actual value" (0x6044 (P783.00))
0x1A03:003 TPDO mapping entry 3 (CiA: Velocity mode)	Error code (0x603F (P150.00))
0x1A05:001 TPDO mapping entry 1 (freely configurable)	Digital inputs

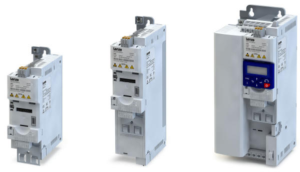
Expert settings

- The sync managers are configured for the cyclic data transfer an the mailbox communication (display in 0x1C00:001 ... 0x1C00:004).
- For the communication, the I/O data mapping must be configured via 0x1C12:000 ... 0x1C12:002 (for RPDOs) and 0x1C13:000 ... 0x1C13:002 (for TPDOs).
- The basic settings for the sync managers are made via 0x1C32:001 ... 0x1C32:005 and 0x1C33:001 ... 0x1C33:005.

In the following, the EtherCAT objects are described (Mapping-Objekt-Index), that can be assigned to process data.

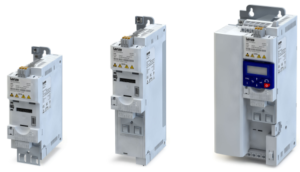
The objects can only be accessed via the EtherCAT network.

Parameter	Name / value range / [default setting]	Info
0x1603:001	RPDO4 mapping parameter: Application object 1 • Read only • From version 02.00	Predefined mapping entry of CiA: Controlword (0x6040) for the CiA 402 operating mode "CiA: Velocity mode" (0x60400010).
0x1603:002	RPDO4 mapping parameter: Application object 2 • Read only • From version 02.00	Predefined mapping entry of "CiA: Target velocity" für den "Velocity Mode" (0x60420010).



Parameter	Name / value range / [default setting]	Info
0x1605:001	RPDO6 mapping parameter: Application object 1 • Read only • From version 02.00	Mapping entry for the selection of an object to be received.
0x1605:002	RPDO6 mapping parameter: Application object 2 • Read only • From version 02.00	
0x1605:003	RPDO6 mapping parameter: Application object 3 • Read only • From version 02.00	
0x1605:004	RPDO6 mapping parameter: Application object 4 • Read only • From version 02.00	
0x1605:005	RPDO6 mapping parameter: Application object 5 • Read only • From version 02.00	
0x1605:006	RPDO6 mapping parameter: Application object 6 • Read only • From version 02.00	
0x1605:007	RPDO6 mapping parameter: Application object 7 • Read only • From version 02.00	
0x1605:008	RPDO6 mapping parameter: Application object 8 • Read only • From version 02.00	
0x1605:009	RPDO6 mapping parameter: Application object 9 • Read only • From version 02.00	
0x1605:010	RPDO6 mapping parameter: Application object 10 • Read only • From version 02.00	
0x1605:011	RPDO6 mapping parameter: Application object 11 • Read only • From version 02.00	
0x1605:012	RPDO6 mapping parameter: Application object 12 • Read only • From version 02.00	
0x1605:013	RPDO6 mapping parameter: Application object 13 • Read only • From version 02.00	
0x1605:014	RPDO6 mapping parameter: Application object 14 • Read only • From version 02.00	
0x1605:015	RPDO6 mapping parameter: Application object 15 • Read only • From version 02.00	
0x1605:016	RPDO6 mapping parameter: Application object 16 • Read only • From version 02.00	
0x1A03:001	TPDO4 mapping parameter: Application object 1 • Read only • From version 02.00	Predefined mapping entry of CiA: Statusword (0x6041 (P780.00)) for the CiA 402 operating mode "CiA: Velocity mode" (0x60410010).
0x1A03:002	TPDO4 mapping parameter: Application object 2 • Read only • From version 02.00	Predefined mapping entry of "CiA: Velocity actual value" für den "Velocity Mode" (0x60440010).
0x1A03:003	TPDO4 mapping parameter: Application object 3 • Read only • From version 02.00	Predefined mapping entry of "CiA: Error code" für den "Velocity Mode" (0x603F0010).

Parameter	Name / value range / [default setting]	Info
0x1A05:001	TPDO6 mapping parameter: Application object 1 • Read only • From version 02.00	Mapping entry for the selection of an object to be sent.
0x1A05:002	TPDO6 mapping parameter: Application object 2 • Read only • From version 02.00	
0x1A05:003	TPDO6 mapping parameter: Application object 3 • Read only • From version 02.00	
0x1A05:004	TPDO6 mapping parameter: Application object 4 • Read only • From version 02.00	
0x1A05:005	TPDO6 mapping parameter: Application object 5 • Read only • From version 02.00	
0x1A05:006	TPDO6 mapping parameter: Application object 6 • Read only • From version 02.00	
0x1A05:007	TPDO6 mapping parameter: Application object 7 • Read only • From version 02.00	
0x1A05:008	TPDO6 mapping parameter: Application object 8 • Read only • From version 02.00	
0x1A05:009	TPDO6 mapping parameter: Application object 9 • Read only • From version 02.00	
0x1A05:010	TPDO6 mapping parameter: Application object 10 • Read only • From version 02.00	
0x1A05:011	TPDO6 mapping parameter: Application object 11 • Read only • From version 02.00	
0x1A05:012	TPDO6 mapping parameter: Application object 12 • Read only • From version 02.00	
0x1A05:013	TPDO6 mapping parameter: Application object 13 • Read only • From version 02.00	
0x1A05:014	TPDO6 mapping parameter: Application object 14 • Read only • From version 02.00	
0x1A05:015	TPDO6 mapping parameter: Application object 15 • Read only • From version 02.00	
0x1A05:016	TPDO6 mapping parameter: Application object 16 • Read only • From version 02.00	
0x1C00:001	Sync Manager communication type: SM1 communication type • Read only • From version 02.00	The communication type SM1 is used for the mailbox input (MbxIn).
	0 Reserved	
	1 Receive mailbox	
	2 Transmit mailbox	
	3 Transmit process data	
	4 Receive process data	
0x1C00:002	Sync Manager communication type: SM2 communication type • Read only • From version 02.00	The communication type SM2 is used for the mailbox output (MbxOut).



Parameter	Name / value range / [default setting]	Info
0x1C00:003	Sync Manager communication type: SM3 communication type • Read only • From version 02.00	The communication type SM3 is used for the input process data (RPDOs).
0x1C00:004	Sync Manager communication type: SM4 communication type • Read only • From version 02.00	The communication type SM4 is used for the output process data (TPDOs).
0x1C12:000	Number of assigned PDOs • Read only • From version 02.00	Number of selected RPDOs. These values are written by the master according to the selected settings in the master.
0x1C12:001	PDO mapping object index of 1. assigned RPDO • Read only • From version 02.00	Indication of the 1st mapping object index.
0x1C12:002	PDO mapping object index of 2. assigned RPDO • Read only • From version 02.00	Indication of the 2nd mapping object index.
0x1C13:000	Number of assigned PDOs • Read only • From version 02.00	Number of selected TPDOs. These values are written by the master according to the selected settings in the master.
0x1C13:001	PDO mapping object index of 1. assigned TPDO • Read only • From version 02.00	Display of the 1st mapping object index.
0x1C13:002	PDO mapping object index of 2. assigned TPDO • Read only • From version 02.00	Display of the 2nd mapping object index.
0x1C32:001	Sync Manager 2: Synchronization type • From version 02.00	Settings of the synchronisation method for the mailbox communication.
	0 **Free run**	The slave application runs independently of the EtherCAT cycle time.
0x1C32:002	Sync Manager 2: Cycle time • Read only: x ns • From version 02.00	Display of the cycle time for the mailbox communication.
0x1C32:003	Sync Manager 2: Shift time • Read only: x ns • From version 02.00	Display of the time shift for the mailbox communication.
0x1C32:004	Sync Manager 2: Synchronization types supported • Read only • From version 02.00	Display of the available synchronisation method for the mailbox communication. • Bit 0 (free run)
0x1C32:005	Sync Manager 2: Minimum cycle time • Read only: x ns • From version 02.00	Display of the minimum cycle time for the mailbox communication.
0x1C33:001	Sync Manager 3: Synchronization type 0 ... [**0**] ... 65535 • From version 02.00	Setting of the synchronisation method for the input process data (RPDO).
0x1C33:002	Sync Manager 3: Cycle time • Read only: x ns • From version 02.00	Display of the cycle time for the input process data (RPDO).
0x1C33:003	Sync Manager 3: Shift time • Read only: x ns • From version 02.00	Display of the time shift for the input process data (RPDO).
0x1C33:004	Sync Manager 3: Synchronization types supported • Read only • From version 02.00	Display of the available synchronisation method for the input process data (RPDO). • Bit 0 (free run)
0x1C33:005	Sync Manager 3: Minimum cycle time • Read only: x ns • From version 02.00	Display of the minimum cycle time for the input process data (RPDO).

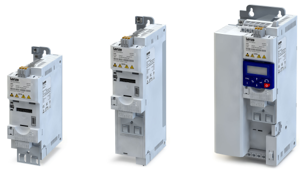
9.10.8 Parameter data transfer

- For configuring and diagnosing the EtherCAT devices, the parameters are accessed by means of acyclic communication.
- Parameter data are transferred as SDOs (Service Data Objects).
- The SDO services enable the writing and reading access to parameters, EtherCAT objects and CiA 402 objects.
  - Objects 388
  - Device profile CiA 402 469
- The transfer of parameter data is usually not time-critical.
- Parameter data are, for instance, operating parameters, motor data and diagnostic information.

SDO return values

If an SDO request is evaluated negatively, a corresponding error code is output:

Index	Description
0x00000000	No fault.
0x05030000	The state of the toggle bit has not changed.
0x05040000	SDO protocol time-out.
0x05040001	Invalid or unknown specification symbol for the client/server command.
0x05040005	The space in the main memory is not sufficient.
0x06010000	Unsupported access to an object.
0x06010001	Read access to a write-only object.
0x06010002	Write access to a read-only object.
0x06020000	An object is not available in the object directory.
0x06040041	An object cannot be mapped into the PDO.
0x06040042	The number and/or length of the mapped objects would exceed the PDO length.
0x06040043	General parameter incompatibility.
0x06040047	General internal incompatibility in the device.
0x06060000	The access has failed due to errors in the hardware.
0x06070010	The data type or the parameter length do not match.
0x06070012	Wrong data type: The parameter length is too big.
0x06070013	Wrong data type: The parameter length is too small.
0x06090011	A subindex is not available.
0x06090030	The value range for parameters is too big (only in case of write access).
0x06090031	The parameter value is too high.
0x06090032	The parameter value is too low.
0x06090036	The maximum value is smaller than the minimum value.
0x08000000	General fault.
0x08000020	Data cannot be transferred to the application or saved in the application.
0x08000021	Due to local control, the data cannot be transferred to the application or saved in the application.
0x08000022	Due to the current device state, the data cannot be transferred to the application or saved in the application.
0x08000023	The dynamic object directory generation has failed or no object directory is available.



9.10.9 Short setup

During commissioning, the EtherCAT master operates as gateway to access from the Engineering PC to the slaves.

In the following, the required steps are described to control the device as EtherCAT slave.

Preconditions

- The device is networked as EtherCAT slave with an EtherCAT master and, if necessary, further EtherCAT devices (see "Typical topologies" in the section ▶ EtherCAT 📖 68).
- An Engineering PC with installed »PLC Designer« from V3.12 is connected to the master.
  - Download »PLC Designer«
- A »PLC Designer« project with current device description files for EtherCAT is available.
  - Download XML/ESI files for Lenze devices
  - The files are installed via the device repository of the »PLC Designer« (menu command "Tools → Device repository").
- All EtherCAT devices are supplied with voltage and are switched on.

Short setup

- With the »PLC Designer« from V3.12, the CiA 402 operating mode "CiA: Velocity mode" is automatically activated.
- In the operating mode "CiA: Velocity mode", the setpoint speed defined via the "Target velocity" 0x6042 (P781.00) parameter is used.
- A changeover to an alternative setpoint source via CiA: Controlword (0x6040) is not possible.
- CiA: Controlword (0x6040) serves to start/stop the EtherCAT device.
- Standard configuration of the PDOs in the CiA 402 operating mode "CiA: Velocity mode": ▶ Process data transfer 📖 389
- CiA 402 objects: ▶ Device profile CiA 402 📖 469

How to configure the network:

1. **Activate network control in the inverter.**
   1. Activate network control: 0x2631:037 (P400.37) = "TRUE [1]"
   2. Set network as standard setpoint source: 0x2860:001 (P201.01) = "Network [5]"
      The network control is now activated.

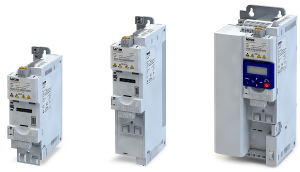
      Further information on this: ▶ General network settings 📖 332
   3. Save parameter settings: 0x2022:003 (P700.03) = "On / start [1]"
2. **Configure the master for the gateway function.**
   1. Start the »PLC Designer«.
   2. On»PLC Designer«project.
   3. Open the "Communication settings" tab of the master.
   4. Click "Add gateway".

      Do the following in the appearing dialog window:
      a) Enter the IP address of the master.
      b) Confirm the entry with "OK".
   5. Click "Search network".
   6. Select the corresponding master for the previously entered IP address.
   7. Click "Set active path".
   8. Log into the master using the "Online → Log in" menu command or with <Alt>+<F8>.
      Now you can access the slaves from the Engineering PC via the EtherCAT master as gateway.
3. **Carry out network scan.**
   1. Execute the "Start Search" command in the context menu of the master.
      The appearing dialog box lists all available EtherCAT devices according to the physical order in the network.
   2. Click "Copy all devices into the project".
      The physical network structure is reproduced in the »PLC Designer«project.

> **i** A proper operation requires that the network topology generated in the project corresponds to the physical order of the EtherCAT nodes in the network. Otherwise, an error message displays which slave (product code) is to be expected at which position.

4. **Optionally: Adapt EtherCAT device to the application.**
   1. Adapt parameter values under the "Settings" and "Parameter list" tabs.
   2. Set the PDO mapping under the "Process data" tab.
   3. Assign variable names under the "EtherCAT I/O image" by double-clicking the variable fields.
   4. Create PLC program.
5. **Load the network configuration into the master.**
   1. Log off: Menu command "Online → Log off" or <Ctrl>+<F8>.
   2. Compiling: Menu command "Build → Build" or <F11>.
   3. Log in: Menu command "Online → Log in" or <Alt>+<F8>.
      The configuration, the parameter settings and the PLC program are loaded into the master. Afterwards, all EtherCAT slaves are Initialised.

> **i** These steps must be carried out after every change within the »PLC Designer«project. An already available configuration and an available PLC program in the master will be then overwritten.



9.11 POWERLINK

POWERLINK is a real-time capable fieldbus system based on Ethernet.

- Detailed information on POWERLINK can be found on the web page of the Ethernet POWERLINK Standardization Group (EPSG): http://www.ethernet-powerlink.org
- Information about the dimensioning of a POWERLINK network can be found in the configuration document for the inverter.

Preconditions

- Control unit (CU) of the inverter is provided with POWERLINK.

9.11.1 Introduction

The inverter is implemented as a controlled node (CN) into a POWERLINK network. Thus, it only may respond to poll-request messages of a managing node (MN). For typical topologies see the section "POWERLINK" in the "Electrical installation" chapter. 70

Features

- The network option can both be supplied internally by the standard device and externally by a separate voltage source.
- Real time Ethernet with the Ethernet POWERLINK V2 communication profile for Motion and general applications
- A line topology can be set up by the integrated 2-port hub.
- Supported functionalities: POWERLINK CN
- Very short CN response times for optimum network performance
- Access to all inverter parameters

The following is not supported:

- Firmware download via POWERLINK
- PDO crosslinks for the managing node or the controlled node for setting up systems with "distributed intelligence"

9.11.2 Basic settings

Each network node must be provided with a unique node address (node ID).

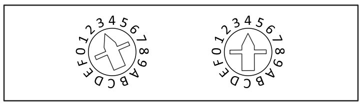
Setting the node address

The node address can be set in 0x23C1:004 or via the two rotary encoder switches on the front of the inverter.

- If both rotary encoder switches are set to "0", the value set in 0x23C1:004 is used as node address.
- The setting that is active when the inverter is switched on is the effective setting.
- A value changed during operation only gets valid when the device is restarted.
- Valid node addresses for controlled nodes: 1 ... 239
- The resulting IP address is "192.168.100.[node address]".

Example: Setting of the node address 52 via the rotary encoder switches

- 52 = **3** x 16 + **4** x 1



x16 x1

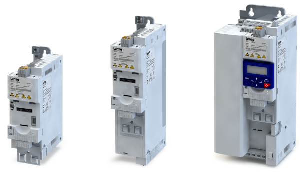
- The resulting IP address is "192.168.100.52".

Note: If the value set via the rotary encoder switches is higher than 239, the node address is set to 239.

Diagnostic parameters:

- 0x23C2:004 displays the active node address.
- 0x23C3 displays the switch setting at the last mains switching.

Parameter	Name / value range / [default setting]	Info
0x23C1:004	POWERLINK settings: Node ID 0 ... [**0**] ... 255	Setting of the unique node address (node ID) in the network. • The node address set here is only effective if both rotary encoder switches are set to "0". • In the default setting "0", the rotary encoder switch setting is used. • The resulting IP address is "192.168.100.[node address]". • A changed node address only becomes effective after a restart of the device.
0x23C2:004	Active POWERLINK settings: Node ID • Read only	Display of the active node address (node ID) in the network.
0x23C3	POWERLINK switch position • Read only	Display of the rotary encoder switch setting at the last mains power-on.



9.11.3 LED status displays

Information on the network status can be obtained quickly via the "BS" and "BE" LED displays on the front of the inverter. In addition, the LEDs at the RJ45 sockets indicate the POWERLINK connection status.

The meaning can be seen from the table below.

LED "BS" (green)	NMT communication status	Meaning
off	-	The network option is not supplied with voltage, is not active at the network or is in the INIT state.
Flashing	NMT_CS_PREOPERATIONAL_1	The POWERLINK network is in the initialisation phase.
Flashing 2 x	NMT_CS_PREOPERATIONAL_2	The POWERLINK network is in the initialisation phase with cyclic traffic.
Flashing 3 x	NMT_CS_READY_TO_OPERATE	The network option waits for the start signal.
flickers	NMT_CS_BASIC_ETHERNET	The network option has not found a managing node and is in the "Basic Ethernet Mode".
blinking	NMT_CS_STOPPED	The network option is in the "Stopped" state (waiting for switch-off).
on	NMT_CS_OPERATIONAL	The network option is in the operating phase.

LED "BE" (red)	Status/meaning
on	POWERLINK network error

Status displays at the RJ45 sockets

The LEDs at the RJ45 sockets display the POWERLINK connection status:

LED "A" (green)	Status/meaning
off	No POWERLINK connection.
on	A physical POWERLINK connection is available.
flickers	Data is exchanged via POWERLINK.

LED "B" (red)	Status/meaning
on	POWERLINK collision

Status displays at the RJ45 sockets

The LEDs at the RJ45 sockets indicate the connection status to the network:

LED "A" (green)	Status/meaning
off	No connection to the network.
on	A physical connection to the network is available.
flickers	Data is exchanged via the network.

LED "B" (red)	Status/meaning
on	POWERLINK collision

9.11.4 Diagnostics

The controlled node indicates applied diagnostic data by an emergency message to the managing node.

Details

- The XXXX parameter serves to suppress the transmission of emergency messages to the managing node. Thus, errors of a certain type can be suppressed in a targeted way.
- Errors and warnings of the inverter and the network option are sent as extended diagnostic messages to the managing node:

Bytes	Meaning	Value [hex]
1 ... 6	Diagnostic block header	0x0010 001C 0100
7 ... 8	Alarm type	0x0001 (diagnostics)
9 ... 12	API (Application Programming Interface)	0x0000 0000
13, 14	Slot number	0x0001 / 0x0002
15, 16	Subslot number	0x0001
17 ... 20	Module ID	ID according to module
21 ... 24	Submodule number	ID according to module
25, 26	Alarm specification	0xB000
27, 28	User structure ID	0x0001
29 ... 32	Error code	▸ Error codes 639

9.11.5 Process data transfer

POWERLINK transfers process data, parameter data, configuration data and diagnostic data between the managing node and the involved controlled nodes. Depending on their time-critical behaviour, the data is transmitted via corresponding communication channels.

Details

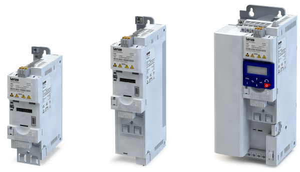
- Process data is transmitted cyclically between the managing node and the controlled node (permanent exchange of current input and output data).
- The transfer of process data is time-critical.
- The process data serves to control the POWERLINK nodes.
- The process data can be directly accessed by the managin node. The data in the PLC, for instance, are directly stored in the I/O area.
- The contents of the process data are defined via I/O data mapping.
- Process data are not saved in the device.

Process data (RxPDO):

- 0x4008:001 (P590.01) (NetWordIN1)
- 0x400B:013 (P592.13) (Network frequency setpoint [+/-16384])

Process data (TxPDO):

- 0x400A:001 (P591.01) (NetWordOUT1)
- 0x400C:009 (P593.09) (Frequency [+/-16384])
- 0x2D88 (P104.00) (Motor current)
- 0x4050:002 (internal parameters)



9.11.6 Monitoring

In the "Operational" state, the controlled node detects an interruption of the POWERLINK communication, e. g. by cable breakage or failure of the managing node.

The response to the interrupted communication is controlled by the following settings:

1. The watchdog monitoring time defined in the managing node is transferred to the controlled node when the POWERLINK communication is initialised.
2. If the controlled node does not receive any valid process data in the "Operational" state, the process data are handled in a general (not fieldbus-specific) object according to the setting. Thus, the data sent last by the managing node can be used or the process data is set to zero.
3. 'After the communication has failed...
   - the controlled node changes to the "Pre-Operational" state.
   - the red "BE" LED on the front of the inverter is permanently on. ▶ LED status displays 🕮 398
   - the error response set in 0x2859:001 is effected (default setting: "Trouble").

Parameter	Name / value range / [default setting]	Info
0x2859:001	POWERLINK monitoring: Watchdog elapsed • For further possible settings, see parameter 0x2D45:001 (P310.01). 🕮 223 2 Trouble	Selection of the error response when the "Operational" communication status (watchdog elapsed) has been left.
0x2859:010	POWERLINK monitoring: CRC error • For further possible settings, see parameter 0x2D45:001 (P310.01). 🕮 223 2 Trouble	Selection of the error response in case of CRC error.
0x2859:011	POWERLINK monitoring: Loss of SoC • For further possible settings, see parameter 0x2D45:001 (P310.01). 🕮 223 2 Trouble	Selection of the error response in case of SoC loss.

9.11.7 Error response

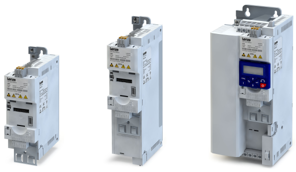
The response to POWERLINK errors such as the lack of PDOs can be configured via the following parameters.

Parameter	Name / value range / [default setting]	Info
0x2859:001	POWERLINK monitoring: Watchdog elapsed • For further possible settings, see parameter 0x2D45:001 (P310.01). 🕮 223 2 Trouble	Selection of the error response when the "Operational" communication status (watchdog elapsed) has been left.
0x2859:010	POWERLINK monitoring: CRC error • For further possible settings, see parameter 0x2D45:001 (P310.01). 🕮 223 2 Trouble	Selection of the error response in case of CRC error.
0x2859:011	POWERLINK monitoring: Loss of SoC • For further possible settings, see parameter 0x2D45:001 (P310.01). 🕮 223 2 Trouble	Selection of the error response in case of SoC loss.

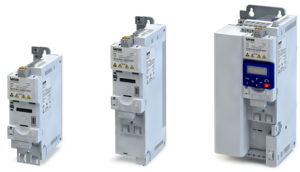
9.11.8 Supported objects

In the following, all supported objects of the Ethernet POWERLINK communication profile (DS 301) are listed. The objects can only be accessed by the managing node via the network.

Parameter	Name / value range / [default setting]	Info
0x1001	ERR_ErrorRegister_U8 • Read only	Error register

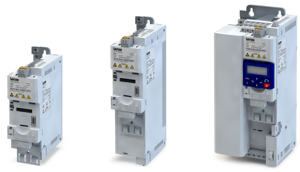


Parameter	Name / value range / [default setting]	Info
0x1003:001	ERR_History_ADOM: ErrorEntry_DOM 1 • Read only	Error memory • Further information on the error memory can be found in the current Ethernet POWERLINK specification.
0x1003:002	ERR_History_ADOM: ErrorEntry_DOM 2 • Read only	
0x1003:003	ERR_History_ADOM: ErrorEntry_DOM 3 • Read only	
0x1003:004	ERR_History_ADOM: ErrorEntry_DOM 4 • Read only	
0x1003:005	ERR_History_ADOM: ErrorEntry_DOM 5 • Read only	
0x1003:006	ERR_History_ADOM: ErrorEntry_DOM 6 • Read only	
0x1003:007	ERR_History_ADOM: ErrorEntry_DOM 7 • Read only	
0x1003:008	ERR_History_ADOM: ErrorEntry_DOM 8 • Read only	
0x1003:009	ERR_History_ADOM: ErrorEntry_DOM 9 • Read only	
0x1003:010	ERR_History_ADOM: ErrorEntry_DOM 10 • Read only	
0x1006	NMT_CycleLen_U32 0 ... [**0**] ... 4294967295	Length of the POWERLINK cycle in µs. • The selected value must correspond to the real bus cycle time in order that the internal monitoring modes operate correctly. • In the configured state, all POWERLINK nodes must be set to an identical value.
0x1016:001	NMT_ConsumerHeartbeatTime: HeartbeatDescription 0 ... [**0**] ... 4294967295 ms	Node ID and heartbeat time of node 1 which is to be monitored. • Format: 0x00nnhhhh (nn = node ID, hhhh = heartbeat time in [ms])
0x1016:002	NMT_ConsumerHeartbeatTime: HeartbeatDescription 0 ... [**0**] ... 4294967295 ms	Node ID and heartbeat time of node 2 which is to be monitored. • Format: 0x00nnhhhh (nn = node ID, hhhh = heartbeat time in [ms])
0x1016:003	NMT_ConsumerHeartbeatTime: HeartbeatDescription 0 ... [**0**] ... 4294967295 ms	Node ID and heartbeat time of node 3 which is to be monitored. • Format: 0x00nnhhhh (nn = node ID, hhhh = heartbeat time in [ms])
0x1016:004	NMT_ConsumerHeartbeatTime: HeartbeatDescription 0 ... [**0**] ... 4294967295 ms	Node ID and heartbeat time of node 4 which is to be monitored. • Format: 0x00nnhhhh (nn = node ID, hhhh = heartbeat time in [ms])
0x1030:001	NMT_InterfaceGroup_0h_REC: InterfaceIndex_U16 • Read only	Display of the interface number of the Ethernet interface.
0x1030:002	NMT_InterfaceGroup_0h_REC: InterfaceDescription_VSTR • Read only	Display of the description of the Ethernet interface.
0x1030:003	NMT_InterfaceGroup_0h_REC: InterfaceType_U8 • Read only	Display of the interface type.
0x1030:004	NMT_InterfaceGroup_0h_REC: InterfaceMtu_U32 • Read only	Display of the maximum frame size.
0x1030:005	NMT_InterfaceGroup_0h_REC: InterfacePhysAddress_OSTR • Read only	Display of the MAC address of the Ethernet interface.
0x1030:006	NMT_InterfaceGroup_0h_REC: InterfaceName_VSTR ["**ETH0**"]	Symbolic name of the Ethernet interface.
0x1030:007	NMT_InterfaceGroup_0h_REC: InterfaceOperState_U8 • Read only	Display of the operation status of the Ethernet interface.
0x1030:008	NMT_InterfaceGroup_0h_REC: InterfaceAdminState_U8 0 ... [**0**] ... 255	Administration status of the Ethernet interface.
0x1030:009	NMT_InterfaceGroup_0h_REC: Valid_BOOL 0 ... [**0**] ... 255	Release of the interface description.
0x1300	SDO_SequLayerTimeout_U32 0 ... [**30000**] ... 4294967295 ms	Time-out time for detecting an aborted connection of an SDO transfer.
0x1301	SDO_CmdLayerTimeout_U32 0 ... [**30000**] ... 4294967295 ms	Time-out time for detecting an aborted connection in the SDO command layer.
0x1400:001	PDO_RxCommParam_00h_REC: NodeID_U8 0 ... [**0**] ... 255	Setting of the node ID for RPDO1.



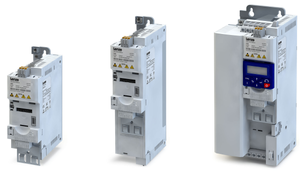
Parameter	Name / value range / [default setting]	Info
0x1400:002	PDO_RxCommParam_00h_REC: MappingVersion_U8 • Read only	Display of the version of the RPDO1 mapping.
0x1600:001 ... 0x1600:016	PDO_RxMappParam_00h_REC: ObjectMapping_U64 1 ... ObjectMapping_U64 16 0 ... [**0**] ... 18446744073709552000	Mapping entries 1 ... 16 for RPDO1.
0x1800:001	PDO_TxCommParam_00h_REC: NodeID_U8 • Read only	Display of the node ID of the TPDO1 receiver.
0x1800:002	PDO_TxCommParam_00h_REC: MappingVersion_U8 • Read only	Display of the TPDO1 mapping version.
0x1A00:001 ... 0x1A00:016	PDO_TxMappParam_00h_REC: ObjectMapping_U64 1 ... ObjectMapping_U64 16 0 ... [**0**] ... 18446744073709552000	Mapping entries 1 ... 16 for TPDO1.
0x1C0A:001	DLL_CNCollision_REC: CumulativeCnt_U32 • Read only	Display of the number of "collision" errors detected by the controlled node. • The counter content is increased each time by 1 if the controlled node has detected a "collision" error.
0x1C0B:001	DLL_CNLossSoC_REC: CumulativeCnt_U32 • Read only	Display of the number of SoC losses detected by the controlled node. • The counter content is increased each time by 1 if the controlled node has detected an SoC loss.
0x1C0B:002	DLL_CNLossSoC_REC: ThresholdCnt_U32 • Read only	Display of the network quality with regard to SoC losses. • The counter content is increased each time by 8 if the controlled node has detected an SoC loss and decreased by 1 at every error-free cycle.
0x1C0B:003	DLL_CNLossSoC_REC: Threshold_U32 0 ... [**0**] ... 4294967295	Error threshold for monitoring SoC losses. • If the counter content displayed in 0x1C0B:002 reaches the set threshold, the error response selected in 0x2859:011 is effected. • If the setting is "0", this monitoring is not active.
0x1C0F:001	DLL_CNCRCError_REC: CumulativeCnt_U32 • Read only	Display of the number of CRC errors detected by the controlled node. • The counter content is increased each time by 1 if the controlled node has detected a "CRC" error.
0x1C0F:002	DLL_CNCRCError_REC: ThresholdCnt_U32 • Read only	Display of the network quality with regard to CRC errors. • The counter content is increased each time by 8 if the controlled node has detected a CRC error and decreased by 1 at every error-free cycle.
0x1C0F:003	DLL_CNCRCError_REC: Threshold_U32 0 ... [**0**] ... 4294967295	Error threshold for monitoring CRC errors. • If the counter content displayed in 0x1C0F:002 reaches the set threshold, the error response selected in 0x2859:010 is effected. • If the setting is "0", this monitoring is not active.
0x1C10	DLL_CNLossOfLinkCum_U32 • Read only	Display of the number of connection losses detected by the controlled node. • The counter content is increased each time by 1 if the controlled node has detected a connection loss. • A connection loss may occur if the connection is interrupted, for instance due to a cable break/unplugging the network cable or a defect hub/switch in the POWERLINK network.
0x1E40:001	NWL_IpAddrTable_0h_REC: IfIndex_U16 • Read only	Display of the LF index which clearly identifies the Ethernet interface.
0x1E40:002	NWL_IpAddrTable_0h_REC: Addr IPAD • Read only	Display of the IP address of the Ethernet interface.
0x1E40:003	NWL_IpAddrTable_0h_REC: NetMask_IPAD • Read only	Display of the network mask of the Ethernet interface.
0x1E40:004	NWL_IpAddrTable_0h_REC: ReasmMaxSize_U16 • Read only	Display of the maximum frame size which can be reconstructed by frames that arrive in a fragmented way.
0x1E40:005	NWL_IpAddrTable_0h_REC: DefaultGateway_IPAD 0 ... [**0**] ... 4294967295	Display of the IP address of the router that connects the POWERLINK segment to the higher-level network.
0x1E4A:001	NWL_IpGroup_REC: Forwarding_BOOL • Read only	Display whether the IP router function ("Forwarding") is supported or not.
0x1E4A:002	NWL_IpGroup_REC: DefaultTTL_U16 0 ... [**64**] ... 65535	Time-to-live value which is entered into the IP header of frames to be sent. • If the frame passes a router or a gateway, the time-to-live value in the IP header is reduced by 1. As soon as the value is set to 0, the frame is not valid anymore and is discarded.

Parameter	Name / value range / [default setting]	Info
0x1E4A:003	NWL_IpGroup_REC: ForwardingDatagrams_U32 • Read only	Display of the number of frames received that were determined for a different IP address. • As the device does not support the IP router function, this value is always 0.
0x1F81:001 ... 0x1F81:254	NMT_NodeAssignment: Node assignment 1 ... Node assignment 254 0 ... [**0**] ... 4294967295	Bit coded declaration of the controlled nodes, routers, managing nodes and their properties. Subindex ≡ node address: • 1 ... 239 = controlled nodes with address 1 ... 239 • 240 = managing node with standard address 240 • 254 = router (type 1) with standard address 254 The single bits have the following meaning: • Bit 0 = 1 ≡ isochronous access • Bit 1 = 1 ≡ SDO via UDP/IP • Bit 2 = 1 ≡ SDO via EPL "ASnd" • Bit 3 = 1 ≡ SDO integrated in PDO • Bit 4 = 1 ≡ support of "NMT Info Services" • Bit 5 = 1 ≡ support of extended "NMT State Commands" • Bit 6 = 1 ≡ support of the dynamic PDO mapping • Bit 7 = reserved (no function) • Bit 8 = 1 ≡ configuration manager function • Bit 9 = 1 ≡ isochronous multiplexed access possible • Bit 10 = 1 ≡ address assignment via software • Bit 11 = reserved (no function) • Bit 12 = 1 ≡ device is router (type 1) • Bit 13 = 1 ≡ device is router (type 2) • Bit 14 ... 31 = reserved (no function)
0x1F82	NMT_FeatureFlags_U32 • Read only	Bit coded display of the POWERLINK functions implemented by the POWERLINK nodes. The single bits have the following meaning: • Bit 0 = 1 ≡ node with this ID exists. • Bit 1 = 1 ≡ node with this ID is a controlled node. • Bit 2 = 1 ≡ If a booting controlled node is detected, this is reported to the application and the controlled node is started. • Bit 3 = 1 ≡ controlled node is mandatory. • Bit 4 = 1 ≡ managing node must not send any reset commands. • Bit 5 = 1 ≡ software version verification of the controlled node required. • Bit 6 = 1 ≡ automatic software update of the application permitted. • Bit 7 = reserved (no function) • Bit 8 = 1 ≡ controlled node is addressed asynchronously. • Bit 9 = 1 ≡ controlled node is addressed in a multiplexed way. • Bit 10 = 1 ≡ device is router (type 1) • Bit 11 = 1 ≡ device is router (type 2) • Bit 12 = 1 ≡ managing node sends PRes frames. • Bit 13 ... 30 = reserved (no function) • Bit 31 = 1 ≡ bits 0 ... 30 are enabled.
0x1F83	NMT_EPLVers_U8 • Read only	Display of the POWERLINK version.
0x1F8C	NMT_CurrState_U8 • Read only	Display of the current NMT state of the POWERLINK node (according to the Ethernet POWERLINK specification).
0x1F8D:001 ... 0x1F8D:254	NMT_MNPResPayloadList: PResPayload 1 ... PResPayload 254 0 ... [**0**] ... 65535	Setting of the reserved user data length of the PRes frames for controlled nodes. • This object contains a list of the expected PRes user data slot size in octets for each configured node that is accessed isochronously (for example via PReq/PRes frames). • The user data slot size is a measure for the configured size of the PRes frame. Up to this limit, the data slot can be filled by PDO data. Subindex ≡ node address: • 1 ... 239 = controlled nodes with address 1 ... 239 • 240 = managing node with standard address 240 • 254 = router (type 1) with standard address 254
0x1F93:001	NMT_EPLNodeID_REC: NodeID_U8 • Read only	Display of the currently valid node address (node ID).



Parameter	Name / value range / [default setting]	Info
0x1F93:002	NMT_EPLNodeID_REC: NodeIDByHW_BOOL • Read only	Display whether the node address (node ID) has been set via rotary encoder switch or via software.
0x1F93:003	NMT_EPLNodeID_REC: SWNodeID_U8 0 ... [**0**] ... 255	Setting of the unique node address (node ID) in the network. • This address setting is only valid for rotary encoder switch setting 0 (0x00).
0x1F98:001	NMT_CycleTiming_REC: IsochrTxMaxPayload_ U16 • Read only	Display of the size of the isochronous transmit memory.
0x1F98:002	NMT_CycleTiming_REC: IsochrRxMaxPayload_ U16 • Read only	Display of the size of the isochronous receive memory.
0x1F98:003	NMT_CycleTiming_REC: PResMaxLatency_U32 • Read only: x ns	Display of the isochronous response delay.
0x1F98:004	NMT_CycleTiming_REC: PReqActPayload_U16 0 ... [**0**] ... 65535	Setting of the data size to be maximally received by the controlled node via PReq for the current network configuration. • The set value is an upper limit value for the total size of the PDO mapping for the PReq frame. • In the configured state, the value must be identical to the entry valid for the POWERLINK node for a response.
0x1F98:005	NMT_CycleTiming_REC: PResActPayload_U16 0 ... [**0**] ... 65535	Setting of the PDO data size to be maximally sent by the POWERLINK node for the current network configuration. • The PDO mapping may assign data with a total size higher/equal to the value set here. • In the configured state, the value must be identical to the entry valid for the POWERLINK node in 0x1F8D:xxx.
0x1F98:006	NMT_CycleTiming_REC: ASndMaxLatency_U32 • Read only: x ns	Display of the asynchronous response delay.
0x1F98:007	NMT_CycleTiming_REC: MultipleCycleCnt_U8 0 ... [**0**] ... 255	Setting of the maximum number of multiplexed cycles. • In case of the setting "3", the multiplexed cycle is repeated every 3 cycles. • Within one multiplexed cycle, the nodes are queried according to the values in 0x1F9B:xxx. If, for instance, the value "2" is entered for a node in 0x1F9B:xxx, it is always only queried in the 2nd of 3 multiplexed cycles.
0x1F98:008	NMT_CycleTiming_REC: AsyncMTUSize_U16 0 ... [**0**] ... 65535	Setting of the maximum user data size for asynchronous frames. • Protocol-specific headers for POWERLINK, UDP/IP and others as well as service-specified headers can be seen as part of the user data. • In the configured state, all POWERLINK nodes must be set to an identical value.
0x1F98:009	NMT_CycleTiming_REC: Prescaler_U16 0 ... [**0**] ... 65535 ns	Configuration of the switching rate of the SoC-PS flag.
0x1F99	NMT_CNBasicEthernetTimeout_u32 0 ... [**0**] ... 4294967295	Setting of the maximum time the booting controlled node waits for the managing node. • If the controlled node detects a managing node within the time, the controlled node changes to the "NMT_CS_PREOPERATIONAL_1" state. Otherwise, the controlled node changes to the "Basic Ethernet Mode" state.
0x1F9A	NMT_HostName_VSTR	Setting of a DNS-compatible device name. • The length is limited to 20 characters. • The device name must be clear within the network domain. • The device name starts with a letter ends with a letter or a number. Permitted characters: • Letter (A ... Z, a ... z) • Numbers (0 ... 9) • Hyphen (-)
0x1F9B:001 ... 0x1F9B:100	NMT_MultiplCycleAssign_AU8: NMT_MultiplCycleAssign_AU8 1 ... NMT_MultiplCycleAssign_AU8 100 • Read only	Display in which multiplexed cycle the respective controlled node is queried. • Subindex 1 ... 100 ≡ node address 1 ... 100 • The value must not exceed the setting in 0x1F98:007. Example: • 0x1F98:007 = "3": The multiplexed cycle is repeated every three cycles. • If the value "2" is now entered in 0x1F9B:xxx for a node, it is always only queried in the 2nd of 3 multiplexed cycles.

Parameter	Name / value range / [default setting]	Info
0x1F9E	NMT_ResetCmd_U8 • Read only	This object enables the managing node to execute a reset command in the controlled node. Note! A reset command at a single POWERLINK node in the network can cause cycle and monitoring errors.
0x23C0	POWERLINK communication	Restart / stop communication. • When the device command has been executed successfully, the value 0 is shown.
	0 No action/no error	Only status feedback
	1 Restart with current values	Restart communication with the current values.
	2 Restart with default values	Restart communication with the standard values.
	5 Stop network communication	Stop communication.
	10 In progress	Only status feedback
	11 Action cancelled	
	12 Error	
0x23C1:004	POWERLINK settings: Node ID 0 ... [**0**] ... 255	Setting of the unique node address (node ID) in the network. • The node address set here is only effective if both rotary encoder switches are set to "0". • In the default setting "0", the rotary encoder switch setting is used. • The resulting IP address is "192.168.100.[node address]". • A changed node address only becomes effective after a restart of the device.
0x1000	NMT_DeviceType_U32 • Read only	CANopen device profile according CANopen specification CiA 301/ CiA 402.
0x1008	NMT_ManufactDevName_VS • Read only	Display of the manufacturer device name.
0x1009	NMT_ManufactHwVers_VS • Read only	Display of the manufacturer hardware version.
0x100A	NMT_ManufactSwVers_VS • Read only	Display of the manufacturer software version.
0x1018:001	NMT_IdentityObject_REC: VendorId_U32 • Read only	Display of the manufacturer's identification number.
0x23C2:001	Active POWERLINK settings: IP address • Read only	Display of the active IP address.
0x23C2:002	Active POWERLINK settings: Subnet • Read only	Display of the active subnet mask.
0x23C2:003	Active POWERLINK settings: Gateway • Read only	Display of the IP address of the router that connects the POWERLINK segment to the higher-level network.
0x23C2:004	Active POWERLINK settings: Node ID • Read only	Display of the active node address (node ID) in the network.
0x23C2:005	Active POWERLINK settings: MAC Address • Read only	Display of the active MAC address.
0x23C2:007	Active POWERLINK settings: Tx length • Read only	Display of the length of the transmitted cyclic data in bytes.
0x23C2:008	Active POWERLINK settings: Rx length • Read only	Display of the length of the received cyclic data in bytes.
0x23C3	POWERLINK switch position • Read only	Display of the rotary encoder switch setting at the last mains power-on.
0x23C8:001	POWERLINK status: Network management • Read only	Display of the current bus status.
0x23C9:001	POWERLINK error: Error • Read only	Bit coded display of the bus error state reported by the LED "BE" (Bus Error). • Bit 0 = 0 (0x0000) ≡ no bus error • Bit 0 = 1 (0x0001) ≡ active bus error



9.11.9 Short setup

In the following, the steps required for controlling the inverter via POWERLINK are described.

Parameterisation required

1. Activate network control: 0x2631:037 (P400.37) = "TRUE [1]"
2. Set network as standard setpoint source: 0x2860:001 (P201.01) = "Network [5]"
3. Set the node address.
   - Each network node must be provided with a unique node address (node ID).
   - Details: ▶ Basic settings 📖 397
4. Save parameter settings: 0x2022:003 (P700.03) = "On / start [1]".
5. Switch the inverter off and then on again in order that the changed communication settings can get effective.
6. Check the readiness for operation of the inverter by means of the LED status displays.
   - The red LEDs must be off, otherwise an error has occurred.
   - The green LED at the RJ45 socket is on if a physical POWERLINK connection is available.
   - Details: ▶ LED status displays 📖 398

> **i** In the default setting, the digital input DI1 is assigned with the "Run" function. If the network control is activated, this function serves as "start enable" for start commands via network. Hence, the digital input DI1 must be set to HIGH level in order that the motor can be started via network. ▶ Start / stop motor 📖 531

Start network

The network is automatically started if you first set all controlled nodes (as described above) and then the managing node.

Otherwise, there are the following two options:

a) Switch all network nodes off and then on again or

b) make a fault reset at the managing node (node ID 240).

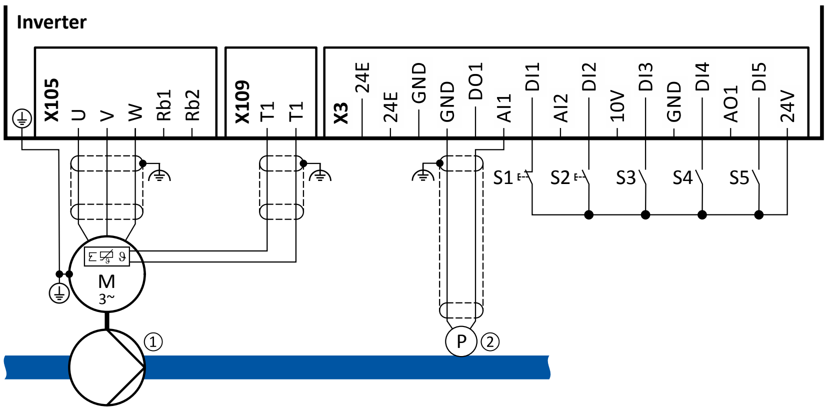
10 Configuring the process controller

By means of the process controller, a process variable can be regulated, for instance the pressure of a pump. The process controller is also referred to as "PID controller" (PID controller = proportional, integral and differential controller).

The process controller is part of a closed control loop. The variable to be influenced (controlled variable) is measured continuously by means of a sensor and supplied to the inverter as an analog signal (actual value) which, in the inverter, is then compared to the reference value (setpoint). The system deviation resulting therefrom is supplied to the process controller which, on this basis, decelerates or accelerates the motor speed according to the desired dynamic performance of the control loop, so that, for instance, a pump always generates the desired pressure.

Connection plan (example)

The following sample connection plan shows the control of a pump ①. The feedback of the variable (here: pressure) takes place via a pressure transducer ② connected to the analog input 1.



The digital inputs can be used to activate functions of the process controller. The specific assignment of the digital inputs and type of the contacts (switches or buttons, normally-closed contacts or normally-open contacts) depends on the application.

General information on the setting

- The basic setting of the process controller is described in the following subchapter.
  ▸ Basic process controller settings 🕮 408
- Optionally, the motor can be put into an energy-saving idle state if no power is required.
  ▸ Process controller idle state 🕮 414
- The rinsing function which can be activated in addition accelerates the motor in idle state to a defined speed at regular intervals. The rinsing of a pipe system with a pump that has been in an inactive state for a longer period is a typical application. ▸ Process controller rinse function 🕮 416

10.1 Basic process controller settings

The process controller is set in two steps:

1. Basic settings
2. Fine adjustment of the PID controller for an optimum control mode

Basic settings

Based on the default setting, we recommend the following proceeding:

1. Activate PID control: Set the desired operating mode (normal or reverse operation) in 0x4020:001 (P600.01).
2. If the feedback of the variable is to take place via analog input 2 instead of analog input 1: Set 0x4020:002 (P600.02) = "analog input 2 [2]".
3. Configure used analog input:
   - Configure input range.
   - Configure setting range for the PID control.
   - Adapt filter time to minimise impacts of the noise on the variable.
   - Set monitoring response to "No response [0]".
     ▶ Configuration of analog inputs 597
4. If a (temporary) change-over to a speed-controlled operation is to be possible via a digital input:
   - Assign a free digital input to the control function "Deactivate PID controller" in 0x2631:045 (P400.45). As long as the digital input provides a TRUE signal, the PID control is ignored and the motor is driven in a speed-controlled way.
   - Set acceleration time 0x4021:001 (P606.01) and deceleration time 0x4021:002 (P606.02) for speed-controlled drive control.
5. Select the standard setpoint source for the reference value in 0x2860:002 (P201.02).
   - Functions for setpoint change-over can be used as well. ▶ Setpoint change-over 546
   - The keypad setpoint can be preset in 0x2601:002 (P202.02).
   - If process controller presets are used, they have to be set in 0x4022:001 (P451.01) ... 0x4022:008 (P451.08).
   - If the analog input is used as setpoint source, it must be configured accordingly. ▶ Configuration of analog inputs 597
   - If the motor potentiometer is used as setpoint source, this function must be configured accordingly. ▶ Motor potentiometer setpoint source (MOP) 559
6. Set the speed range to be controlled in 0x4020:003 (P600.03).
7. If the output value of the process controller is to be limited, adapt the following parameters:
   - 0x4020:005 (P600.05): Min speed limit
   - 0x4020:006 (P600.06): Max speed limit
8. Try out the following parameters with the default setting and only adapt them if required:
   - 0x404B (P604.00): Setpoint ramp
   - 0x404C:001 (P607.01): Acceleration time for showing the process controller influence
   - 0x404C:002 (P607.02): Deceleration for hiding the process controller influence
9. Diagnostics: Check current reference value and feedback of the variable:
   - The current reference value (setpoint) is displayed in 0x401F:001 (P121.01).
   - The current variable (actual value) is displayed in 0x401F:002 (P121.02).

After the basic setting of the process controller has been carried out, a fine adjustment of the PID controller must be executed for an optimum control mode (see the following section).

Fine adjustment of the PID controller

The dynamics of the PID controller is parameterised based on the gain of the P component 0x4048 (P601.00), the reset time for the I component 0x4049 (P602.00) and the gain of the D component 0x404A (P603.00). In the default setting, the process controller operates as PI controller, the D component is deactivated.

Basics

- If only the P component is used and the system operates in a steady-state status (reference value is constant and process variable is controlled to a fixed value), a certain system deviation always continues to exist. This remaining system deviation is also called "stationary deviation".
- The I component prevents a permanent fluctuation around the setpoint. Here, the reset time 0x4049 (P602.00) determines how much the duration of the control deviation influences the control. A high reset time means a lower influence of the I component and vice versa.
- The D component does not respond to the height of the system deviation but to their rate of change only. The D component acts as a "damper" for overshoots. Overshoots may occur if the control tries to respond quickly to changes in the system deviation or the reference value. Thus, the D component reduces the risk of instabilities due to overshoots.

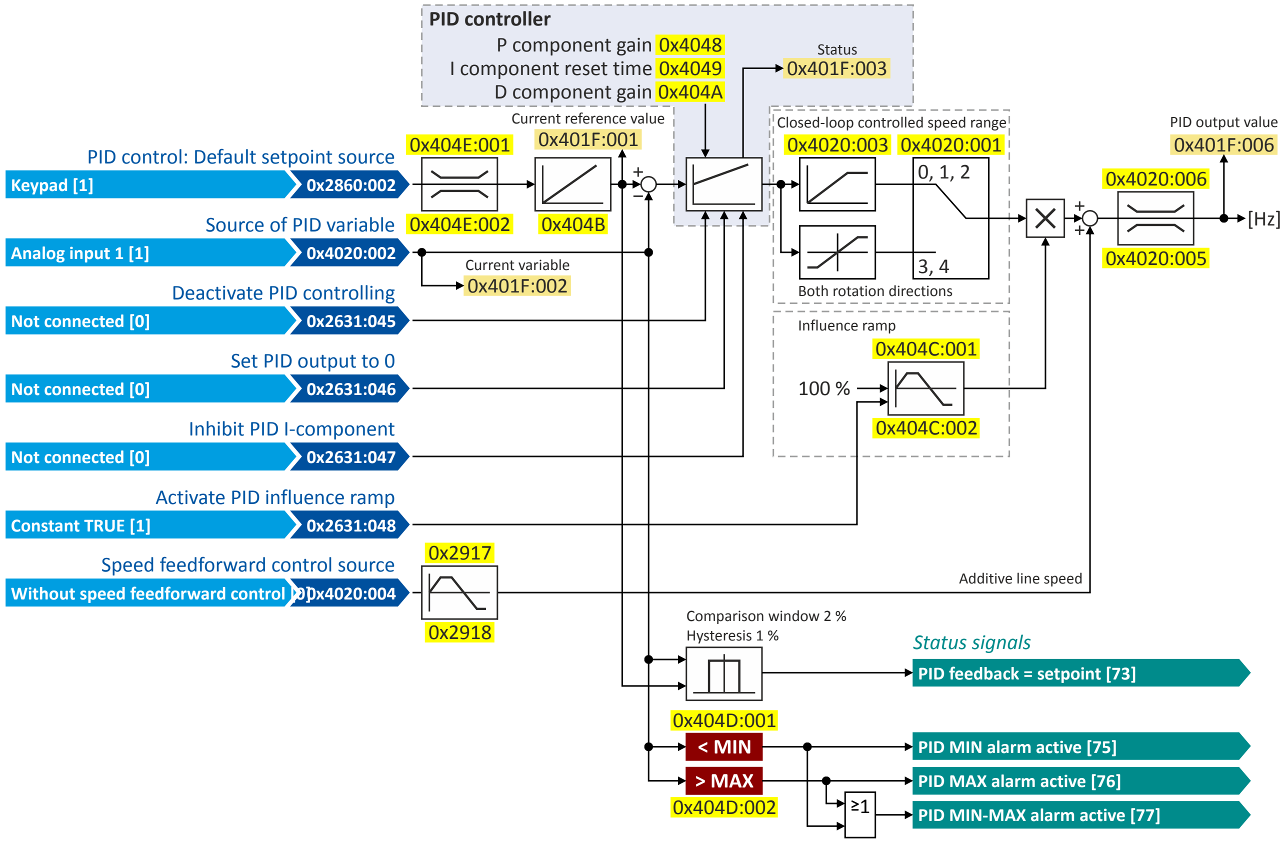
For most applications, the setting of the gain of the P component and the reset time for the I component is sufficient for the fine adjustment. The setting of the gain of the D component may by required for a further stabilisation of the system especially if a quick response to system deviations is to take place.

Execute fine adjustment:

1. Set the reset time for the I component to 6000 ms in 0x4049 (P602.00) to deactivate the I component.
    - With this setting and the default setting of 0x404A (P603.00), the process controller operates as P controller.
2. Increase gain of the P component step by step in 0x4048 (P601.00) unit the system gets instable.
3. Reduce gain again until the system is stable again.
4. Reduce gain by another 15 %.
5. Set reset time for the I component in 0x4049 (P602.00).
    - With this setting it should be noted that a too low reset time may cause overshoots, especially in case of high steps of the system deviation.
6. Set optional gain of D component in 0x404A (P603.00).
    - With this setting it should be noted that the D component responds very sensitively to electrical disturbance on the feedback as well as digitisation errors.

Internal signal flow

The following illustration shows the internal signal flow of the process controller (without the additional functions "idle state" and "rinsing function"):



Control functions

The flexible I/O configuration serves to configure different control functions for the process controller:

- 0x2631:045 (P400.45): Deactivate PID controller
- 0x2631:046 (P400.46): Set process controller output to 0
- 0x2631:047 (P400.47): Inhibit process controller I-component
- 0x2631:048 (P400.48): Activate PID influence ramp

For details see chapter "Process controller function selection". 585

Status signals for configurable outputs

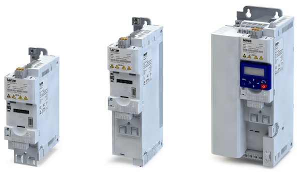
The process controller provides different internal status signals. These status signals can be assigned to the relay, the digital outputs or the NetWordOUT1 status word.

For details see chapter "Configuration of digital outputs". 603

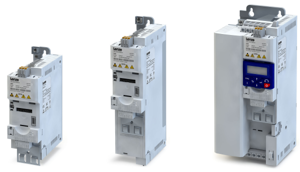
Parameter	Name / value range / [default setting]	Info
0x400B:011 (P592.11)	Process input data: PID feedback (Process data IN: PID feedback) -300.00 ... [**0.00**] ... 300.00 PID unit • From version 03.00	Mappable parameter for the feedback of the variable (actual value) via network. • Only effective with the selection "Network[5]" in 0x4020:002 (P600.02).

Parameter	Name / value range / [default setting]	Info
0x4020:001 (P600.01)	Process controller setup (PID): Operating mode (PID setup: Operating mode)	Selection of the process controller operating mode.
	0 Inhibited	Process controller deactivated.
	1 Normal operation	The setpoint is higher than the fed back variable (actual value). If the system deviation increases, the motor speed is increased. Example: pressure-controlled booster pumps (increase in the motor speed produces an increase in pressure.)
	2 Reverse operation	The setpoint is lower than the fed back variable (actual value). If the system deviation increases, the motor speed is increased. Example: temperature-controlled cooling water pump (increase in motor speed produces decrease in temperature.)
	3 Normal bi-directional	The direction of rotation corresponds to the sign of the system deviation. If the system deviation increases, the motor speed is increased.
	4 Reverse bi-directional	A negative system deviation causes a positive direction of rotation. If the system deviation increases, the motor speed is increased.
0x4020:002 (P600.02)	Process controller setup (PID): PID process variable (PID setup: PID process var.)	Selection of the source via which the feedback of the controlled variable (actual value) for the process controller is effected.
	1 Analog input 1	
	2 Analog input 2	
	3 DC-bus voltage (from version 02.00)	
	4 Motor Current (from version 02.00)	
	5 Network (from version 02.00)	
	6 HTL input (from version 04.00)	
0x4020:003 (P600.03)	Process controller setup (PID): Closed-loop controlled speed range (PID setup: PID speed range) 0 ... [**100**] ... 100 %	Setting of the maximum output frequency up to which the process controller carries out regulation. • 100 % ≡ Maximum frequency 0x2916 (P211.00).
0x4020:004 (P600.04)	Process controller setup (PID): Speed feedforward control source (PID setup: PID line speed)	Optional selection of a speed feedforward control source for the process controller. • Is advisable, for instance, for dancer position controls if the motor speed must not fall below line speed (process controller output value = line speed + controlled motor speed). • Standard applications usually do not require a speed feedforward control; therefore it is deactivated in the default setting.
	0 Without speed addition	
	1 Keypad frequency setpoint	
	2 Analog input 1	
	3 Analog input 2	
	4 Frequency preset 1	
	5 Frequency preset 2	
	6 Frequency preset 3	
	7 Frequency preset 4	
	8 Network	
	9 HTL input	
0x4020:005 (P600.05)	Process controller setup (PID): Min speed limit (PID setup: Min speed lim) -100.0 ... [**-100.0**] ... 100.0 % • From version 03.00	Configuration of the process controller • 100 % ≡ Maximum frequency 0x2916 (P211.00). • The limitation becomes effective after the line speed has been added. • The value set here also limits the I component of the PID controller (Integrator-Anti-Windup).
0x4020:006 (P600.06)	Process controller setup (PID): Max speed limit (PID setup: Max speed lim) -100.0 ... [**100.0**] ... 100.0 % • From version 03.00	Maximum output value of the process controller. • 100 % ≡ Maximum frequency 0x2916 (P211.00). • The limitation becomes effective after the line speed has been added. • The value set here also limits the I component of the PID controller (Integrator-Anti-Windup).
0x4021:001 (P606.01)	PID speed operation: Acceleration time (PID speed op.: Accel. time) 0.0 ... [**1.0**] ... 3600.0 s	Acceleration time for (temporary) speed-controlled drive control in process controller mode. • The acceleration time takes effect at the output of the process controller.
0x4021:002 (P606.02)	PID speed operation: Deceleration time (PID speed op.: Decel. time) 0.0 ... [**1.0**] ... 3600.0 s	Deceleration time for (temporary) speed-controlled drive control in process controller mode. • The deceleration time takes effect at the output of the process controller. • **Exception:** In case of quick stop, the quick stop delay time is effective.

Parameter	Name / value range / [default setting]	Info
0x4048 (P601.00)	PID P-component (PID P-component) 0.0 ... [**5.0**] ... 1000.0 %	Output frequency of the process controller per 1 % system deviation. • 100 % ≡ maximum frequency 0x2916 (P211.00).
0x4049 (P602.00)	PID I- component (PID I- component) 10 ... [**400**] ... 6000 ms	Reset time for system deviation. • With the setting "6000 ms", the I component is deactivated. • The I component can also be deactivated via the "Inhibit process controller I-component" 0x2631:047 (P400.47) function.
0x404A (P603.00)	PID D-component (PID D-component) 0.0 ... [**0.0**] ... 20.0 s	D component, does not respond to the rate of the system deviation, but only to its rate of change.
0x404B (P604.00)	PID setpoint ramp (PID setp.ramp) 0.0 ... [**20.0**] ... 100.0 s	Acceleration time and deceleration time for the process controller setpoint, relating to the entire setting range of the process controller.
0x404C:001 (P607.01)	PID influence: Acceleration time for activation (PID influence: Activation time) 0.0 ... [**5.0**] ... 999.9 s	If the trigger assigned in 0x2631:048 (P400.48) of the "Activate PID influence ramp" function is TRUE, the influence of the process controller is shown by means of a ramp with the acceleration time set here.
0x404C:002 (P607.02)	PID influence: Deceleration time for masking out (PID influence: Mask out time) 0.0 ... [**5.0**] ... 999.9 s	If the trigger assigned in 0x2631:048 (P400.48) of the "Activate PID influence ramp" function is FALSE, the influence of the process controller is hidden via a ramp with the deceleration time set here.
0x404D:001 (P608.01)	PID alarms: MIN alarm threshold (PID alarms: MIN alarm thrsh.) -300.00 ... [**0.00**] ... 300.00 PID unit	Trigger threshold for the status signal "PID MIN alarm active [75]". • The "PID MIN alarm active [75]" status signal is TRUE if the fed back variable (with activated PID control) is lower than the threshold set here. • The status signal can be assigned to the relay, a digital output of the NetWordOUT1 status word. ▸ Configuration of digital outputs 603
0x404D:002 (P608.02)	PID alarms: MAX alarm threshold (PID alarms: MAX alarm thrsh.) -300.00 ... [**100.00**] ... 300.00 PID unit	Trigger threshold for the status signal "PID MAX alarm active [76]". • The "PID MAX alarm active [76]" status signal is TRUE if the fed back variable (with activated PID control) is higher than the threshold set here. • The status signal can be assigned to the relay, a digital output of the NetWordOUT1 status word. ▸ Configuration of digital outputs 603
0x404D:003 (P608.03)	PID alarms: Monitoring bandwidth PID feedback signal (PID alarms: Bandw. feedback) 0.00 ... [**2.00**] ... 100.00 % • From version 04.00	Hysteresis for status signal "PID feedback = setpoint [73]". • 100 % ≡ configured variable input range • Example: Variable input range 0 ... 10 V: 2 % ≡ 0.2 V • The status signal "PID feedback = setpoint [73]" is TRUE if the controlled variable fed back = process controller setpoint (± hysteresis set here). • The status signal can be assigned to the relay, a digital output of the NetWordOUT1 status word. ▸ Configuration of digital outputs 603
0x404E:001 (P605.01)	PID setpoint limits: Minimum setpoint (PID setp. limit: Minimum setpoint) -300.00 ... [**-300.00**] ... 300.00 PID unit	Minimum value of the process controller setpoint.
0x404E:002 (P605.02)	PID setpoint limits: Maximum setpoint (PID setp. limit: Maximum setpoint) -300.00 ... [**300.00**] ... 300.00 PID unit	Maximum value of the process controller setpoint.



Parameter	Name / value range / [default setting]	Info
0x2860:002 (P201.02)	PID control: Default setpoint source (Stnd. setpoints: PID setp. src.)	Selection of the standard setpoint source for the reference value of the PID control. • The selected standard setpoint source is always active with an activated PID control when no setpoint change-over to another setpoint source via corresponding triggers/functions is active.
	1 **Keypad**	The setpoint is specified locally by the keypad. • Default setting: 0x2601:002 (P202.02) • Use the ↑ and ↓ navigation keys to change the keypad setpoint (also during running operation).
	2 Analog input 1	The setpoint is defined as analog signal via the analog input 1. ▸ Analog input 1 📖 597
	3 Analog input 2	The setpoint is defined as analog signal via the analog input 2. ▸ Analog input 2 📖 601
	4 HTL input (from version 04.00)	The digital inputs DI3 and DI4 can be configured as HTL input to use an HTL encoder as setpoint encoder or define the setpoint as a reference frequency ("pulse train"). ▸ HTL input setpoint source 📖 565
	5 Network	The setpoint is defined as process data object via the network. ▸ Configuring the network 📖 226
	11 PID preset 1	For the setpoint selection, preset values can be parameterised and selected. ▸ Setpoint source of preset setpoints 📖 554
	12 PID preset 2	
	13 PID preset 3	
	14 PID preset 4	
	15 PID preset 5	
	16 PID preset 6	
	17 PID preset 7	
	18 PID preset 8	
	31 Segment preset 1 (from version 03.00)	For the setpoint selection, the segment presets parameterised for the "sequencer" function can be selected as well. ▸ Sequencer 📖 504
	32 Segment preset 2 (from version 03.00)	
	33 Segment preset 3 (from version 03.00)	
	34 Segment preset 4 (from version 03.00)	
	35 Segment preset 5 (from version 03.00)	
	36 Segment preset 6 (from version 03.00)	
	37 Segment preset 7 (from version 03.00)	
	38 Segment preset 8 (from version 03.00)	
	50 Motor potentiometer	The setpoint is generated by the "motor potentiometer" function. This function can be used as an alternative setpoint control which is controlled via two signals: "MOP setpoint up" and "MOP setpoint down". ▸ Motor potentiometer setpoint source (MOP) 📖 559
	201 Internal value (from version 05.00)	Internal values of the manufacturer.
	202 Internal value (from version 05.00)	
	203 Internal value (from version 05.00)	
	204 Internal value (from version 05.00)	
	205 Internal value (from version 05.00)	
	206 Internal value (from version 05.00)	
0x401F:003 (P121.03)	Status (PID status) • Read only	Bit-coded status display of the process controller.
	Bit 0 Process controller off	
	Bit 1 PID output set to 0	
	Bit 2 PID I-component inhibited	
	Bit 3 PID influence active	
	Bit 4 Setpoint = actual value	
	Bit 5 Idle state active	
	Bit 6 Max. alarm	
	Bit 7 Min. alarm	



10.2 Process controller - idle state and rinse function

10.2.1 Process controller idle state

If the PID control is activated, this function sets the drive in process controller mode to an energy-saving idle state when no power is required.

Details

A typical application for this function is a booster pump for water in a high-rise building. If no tenant opens the water tap or uses the shower for a longer period of time, the pump changes to the energy-saving idle state. This usually happens at night. The idle state automatically ends as soon as a tenant opens the tap again. The pumps operates normally again until the condition for the idle state is pending again.

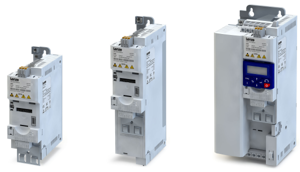
The conditions for activating and terminating the idle state can be set independently of one another in 0x4023:001 (P610.01) and 0x4023:006 (P610.06) (see the following tables).

In 0x4023:005 (P610.05), a delay time can be set for the activation. This is the minimum time the values must fall below or exceed the respective threshold before the idle state is activated.

0x4023:001 (P610.01)	**Condition for activating the idle state**					
0	Idle state deactivated.					
1	Frequency setpoint 0x2B0E (P102.00)	<	Frequency threshold 0x4023:003 (P610.03)	(+	Delay time 0x4023:005 (P610.05)	)
2	Frequency setpoint 0x2B0E (P102.00)	<	Frequency threshold 0x4023:003 (P610.03)	(+	Delay time 0x4023:005 (P610.05)	)
		OR				
	Current process variable 0x401F:002 (P121.02)	>	Feedback threshold 0x4023:004 (P610.04)	(+	Delay time 0x4023:005 (P610.05)	)
3	Frequency setpoint 0x2B0E (P102.00)	<	Frequency threshold 0x4023:003 (P610.03)	(+	Delay time 0x4023:005 (P610.05)	)
		OR				
	Current process variable 0x401F:002 (P121.02)	<	Feedback threshold 0x4023:004 (P610.04)	(+	Delay time 0x4023:005 (P610.05)	)

0x4023:006 (P610.06)	**Condition for terminating the idle state**					
0	Frequency setpoint 0x2B0E (P102.00)	>	Frequency threshold 0x4023:003 (P610.03)	(+	2 Hz hysteresis	)
		OR				
	PID error value 0x401F:007	>	Bandwidth 0x4023:007 (P610.07)			
1	Current process variable 0x401F:002 (P121.02)	<	Recovery threshold 0x4023:008 (P610.08)			
2	Current process variable 0x401F:002 (P121.02)	>	Recovery threshold 0x4023:008 (P610.08)			

Parameter	Name / value range / [default setting]	Info
0x4023:001 (P610.01)	PID sleep mode: Activation (PID sleep mode: Activation)	Condition for activating the idle state.
	0 **Disabled**	Idle state deactivated.
	1 Output frequency < threshold	0x2B0E (P102.00)<0x4023:003 (P610.03) (+ Delay time 0x4023:005 (P610.05))
	2 Output frequency < threshold OR process variable > feedback threshold	0x2B0E (P102.00)<0x4023:003 (P610.03) (+ Delay time 0x4023:005 (P610.05)) OR 0x401F:002 (P121.02)>0x4023:004 (P610.04) (+ Delay time 0x4023:005 (P610.05))
	3 Output frequency < threshold OR process variable < feedback threshold	0x2B0E (P102.00)<0x4023:003 (P610.03) (+ Delay time 0x4023:005 (P610.05)) OR 0x401F:002 (P121.02)<0x4023:004 (P610.04) (+ Delay time 0x4023:005 (P610.05))
0x4023:002 (P610.02)	PID sleep mode: Stop method (PID sleep mode: Stop method)	Selection of the stop method after activation of the idle state.
	0 **Coasting**	The motor becomes torqueless (coasts down to standstill).
	1 Deceleration to standstill	The motor is brought to a standstill with deceleration time 1 (or deceleration time 2, if activated). • Deceleration time 1 can be set in 0x2918 (P221.00). • Deceleration time 2 can be set in 0x291A (P223.00). ▶ Frequency limits and ramp times 📖 156
	2 Stop method set	The stop method set in 0x2838:003 (P203.03) is used.
0x4023:003 (P610.03)	PID sleep mode: Frequency threshold (PID sleep mode: Freq. thresh.) 0.0 ... [**0.0**] ... 599.0 Hz	Frequency threshold for the activation of the idle state. • For comparing "output frequency < threshold" in case of selection 1 ... 3 in 0x4023:001 (P610.01).
0x4023:004 (P610.04)	PID sleep mode: Feedback threshold (PID sleep mode: Feedback thresh.) -300.00 ... [**0.00**] ... 300.00 PID unit	Feedback threshold for the activation of the idle state. • For comparing "variable > feedback threshold" in case of selection 2 in 0x4023:001 (P610.01). • For comparing "variable < feedback threshold" in case of selection 3 in 0x4023:001 (P610.01).
0x4023:005 (P610.05)	PID sleep mode: Delay time (PID sleep mode: Delay time) 0.0 ... [**0.0**] ... 300.0 s	Minimum time for which the respective threshold must be underrun or exceeded before the idle state is activated.
0x4023:006 (P610.06)	PID sleep mode: Recovery (PID sleep mode: Recovery)	Condition for terminating the idle state.
	0 **Setpoint > threshold OR system deviation > bandwidth**	0x2B0E (P102.00) > 0x4023:003 (P610.03) (+ 2 Hz hysteresis) OR 0x401F:007>0x4023:007 (P610.07)
	1 Process variable < recovery threshold	0x401F:002 (P121.02) < 0x4023:008 (P610.08)
	2 Process variable > recovery threshold	0x401F:002 (P121.02)>0x4023:008 (P610.08)
0x4023:007 (P610.07)	PID sleep mode: Bandwidth (PID sleep mode: Bandwidth) 0.00 ... [**0.00**] ... 300.00 PID unit	Range around the process controller setpoint for terminating the idle state. • 0.00 = bandwidth deactivated.
0x4023:008 (P610.08)	PID sleep mode: Recovery threshold (PID sleep mode: Recovery thresh.) -300.00 ... [**0.00**] ... 300.00 PID unit	Termination threshold for idle state.



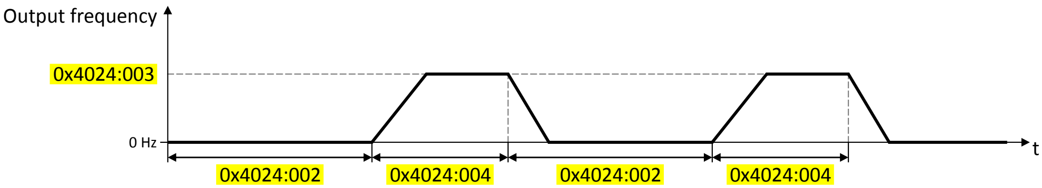
10.2.2 Process controller rinse function

This function accelerates the motor in idle state of the process controller at regular intervals to a defined speed.

Details

A typical application for this function is the rinsing of a pipe system with a pump that has been in an inactive state for a longer period to prevent deposits.

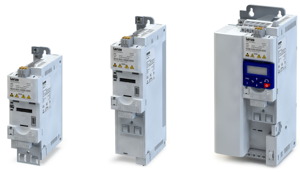
- In order to activate the rinsing function, set the selection "Enabled [1]" in 0x4024:001 (P615.01).
- The following diagram demonstrates the function:



- The rinsing function uses the ramp times set for the "MS: Velocity mode". ▶ Frequency limits and ramp times 156

Parameter	Name / value range / [default setting]		Info
0x4024:001 (P615.01)	Automatic rinsing: Rinsing in idle state (Auto-rinsing: Rinsing in idle)		1 = activate automatic rinsing in idle state.
	0	**Inhibited**	
	1	Enabled	
0x4024:002 (P615.02)	Automatic rinsing: Rinse interval (Auto-rinsing: Rinse interval) 0.0 ... [**30.0**] ... 6000.0 min		Time interval between two rinsing processes.
0x4024:003 (P615.03)	Automatic rinsing: Rinse speed (Auto-rinsing: Rinse speed) -599.0 ... [**0.0**] ... 599.0 Hz		Speed setpoint for rinse function.
0x4024:004 (P615.04)	Automatic rinsing: Rinse period (Auto-rinsing: Rinse period) 0.0 ... [**0.0**] ... 6000.0 s		Duration of a rinsing process.

11 Additional functions



11.1 Device Commands

Device commands are commands for calling organisational functions of the inverter, e.g. saving and loading of parameter settings, or restoring the default setting.

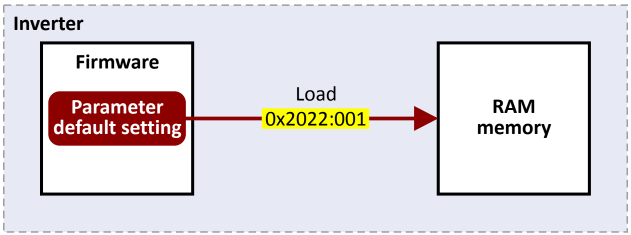
11.1.1 Reset parameters to default

With the "Load default settings" device command, all parameters can be reset to the default setting.

By executing this device command, all parameter settings made by the user are lost!

Details

- All parameters in the RAM memory of the inverter are set to the default setting stored in the firmware of the inverter. (The persistent parameters in the memory module remain unaffected by this measure.)



- Afterwards the inverter can be parameterised again on the basis of this initial state.
- Typical application: incorrect or unknown parameter settings.
- The device command only has an effect on the RAM. For a permanent acceptance of the changes made, the data must be saved in the memory module. ▸ Saving/loading the parameter settings 📖 419

Parameter	Name / value range / [default setting]		Info
0x2022:001 (P700.01)	Device commands: Load default settings (Device commands: Load def. sett.) • Setting can only be changed if the inverter is inhibited.		1 ≡ reset all parameters in the RAM memory of the inverter to the default setting that is stored in the inverter firmware. • All parameter changes made by the user are lost during this process! • It may take some seconds to execute the task. When the task has been executed successfully, the value 0 is shown. • Loading parameters has a direct effect on the cyclic communication: The data exchange for control is interrupted and a communication error is generated.
	0	**Off / ready**	Only status feedback
	1	On / start	Execute device command
	2	In progress	Only status feedback
	3	Action cancelled	
	4	No access	
	5	No access (Inverter disabled)	

11.1.2 Saving/loading the parameter settings

If parameter settings of the inverter are changed, these changes at first are only made in the RAM memory of the inverter. In order to save the parameter settings with mains failure protection, the inverter is provided with a pluggable memory module and corresponding device commands.

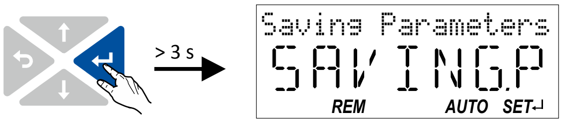
Details

The memory module is provided with two memories, the user memory and the OEM memory.

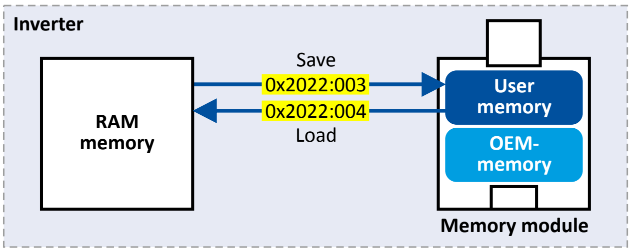
User memory

The user memory is used as power-failure-proof storage of parameter settings made by the user during commissioning/operation.

- The SET display is blinking on the keypad if a parameter setting has been changed but has not been saved in the memory module with mains failure protection. In order to save parameter settings in the user memory of the memory module, press the keypad "Enter" key > 3 s.



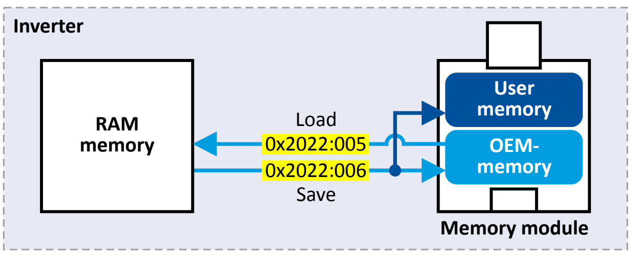
- Parameter settings carried out with »EASY Starter« or via the network must be explicitly saved in the user memory by means of the "Save user data" device command, so that the changes carried out are not lost when the mains of the inverter are switched.
- Saving can also be made in the »EASY Starter« via the button or the **<F6>** function key.
- The device command "Load user data" serves to reload the data from the user memory into the RAM.

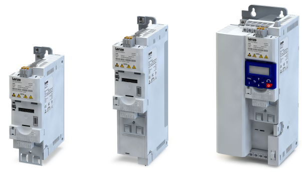


OEM memory

The OEM memory is provided for the storage of customised parameter settings by the OEM/mechanical engineer. If the user carries out parameter settings with the keypad, they are always saved in the user memory if the keypad Enter key is clicked longer than 3 s. The OEM memory remains unaffected by these changes.

- With the "Load OEM data" device command, the parameter settings preconfigured by the OEM/mechanical engineer can be reloaded to the RAM memory of the inverter anytime, if required.
- For saving parameter settings in the OEM memory, the "Save OEM data" device command must be executed explicitly. The parameter settings are simultaneously saved in the user memory.





Response after initial switch-on of the inverter

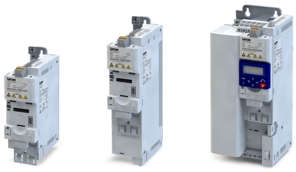
After switch-on, the inverter first tries to load the parameter settings stored in the user memory. If the user memory is empty or damaged, an error message is output and the user must intervene:

- Option 1 = user memory empty: → default setting is loaded automatically from the firmware → data are saved automatically in the user memory of the memory module.
- Option 2 = user- memory damaged: → Error message → default setting is loaded automatically → data are saved automatically in the user memory of the memory module.
- Option 3 = OEM memory empty/damaged: → error message → data are loaded automatically from the user memory of the memory module.

Parameter	Name / value range / [default setting]		Info
0x2022:003 (P700.03)	Device commands: Save user data (Device commands: Save user data) • For further possible settings, see parameter 0x2022:001 (P700.01). 🕮 418		1 = save current parameter settings in the main memory of the memory module with mains failure protection. • It may take some seconds to execute the task. When the task has been executed successfully, the value 0 is shown. • Do not switch off the supply voltage during the saving process and do not unplug the memory module from the inverter! • When the inverter is switched on, all parameters are automatically loaded from the main memory of the memory module to the RAM memory of the inverter.
	0	**Off / ready**	
0x2022:004 (P700.04)	Device commands: Load user data (Device commands: Load user data) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x2022:001 (P700.01). 🕮 418		1 = load data from the main memory of the memory module to the RAM memory of the inverter. • When the device command has been executed successfully, the value 0 is shown. • Loading parameters has a direct effect on the cyclic communication: The data exchange for control is interrupted and a communication error is generated.
	0	**Off / ready**	
0x2022:005 (P700.05)	Device commands: Load OEM data (Device commands: Load OEM data) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x2022:001 (P700.01). 🕮 418		1 = load data from the OEM memory of the memory module to the RAM memory of the inverter. • When the device command has been executed successfully, the value 0 is shown. • Loading parameters has a direct effect on the cyclic communication: The data exchange for control is interrupted and a communication error is generated.
	0	**Off / ready**	
0x2022:006 (P700.06)	Device commands: Save OEM data (Device commands: Save OEM data) • For further possible settings, see parameter 0x2022:001 (P700.01). 🕮 418		1 = save current parameter settings in the OEM memory of the memory module with mains failure protection. • At the same time, the parameter settings are saved in the main memory of the memory module. • After successful execution, the value 0 is shown.
	0	**Off / ready**	
0x2829 (P732.00)	Automatic storage in the memory module (Auto-Save EPM)		1 = activate automatic saving of parameters in the memory module. • With the setting 0, the "Save user data" 0x2022:003 (P700.03) device command must be explicitly executed, or the "Enter" keypad key must be pressed for longer than 3 s to save the current parameter settings in the memory module of the inverter with mains failure protection.
	0	**Inhibit**	
	1	Enable	

Related topics

▸ Data handling 🕮 141



11.1.3 Device commands for parameter change-over

The inverter supports several parameter sets. The parameter set can be selected by means of the device commands "Load parameter set 1" ... "Load parameter set 4".

⚠ DANGER!

Changed parameter settings can become effective immediately depending on the activating method set in 0x4046 (P755.00).

The possible consequence is an unexpected response of the motor shaft while the inverter is enabled.

- ▶ If possible, only carry out parameter changes while the inverter is disabled.
- ▶ Certain device commands or settings which might cause a critical state of the drive behaviour can generally only be carried our when the inverter is inhibited.

Details

The "parameter change-over" function provides a change-over between four sets with different parameter values for up to 32 freely selectable parameters. For details on the compilation of the parameters and setting of the value sets, see the chapter "Parameter change-over". 📖 464

The change-over via the device commands depends on the activation method set in 0x4046 (P755.00):

- Activation method = 1 or 3: Change-over takes place immediately.
- Activation method = 0 or 2: The respective device command is only executed if the inverter is disabled.

Parameter	Name / value range / [default setting]		Info
0x2022:007 (P700.07)	Device commands: Load parameter set 1 (Device commands: Load par. set 1) • For further possible settings, see parameter 0x2022:001 (P700.01). 📖 418		1 = load value set 1 of the "Parameter change-over" function. • The parameters specified in 0x4041/1...32 are set to the values set in 0x4042/1...32. • After successful execution, the value 0 is shown. ▶ Parameter change-over 📖 464
	0	**Off / ready**	
0x2022:008 (P700.08)	Device commands: Load parameter set 2 (Device commands: Load par. set 2) • For further possible settings, see parameter 0x2022:001 (P700.01). 📖 418		1 = load value set 2 of the "Parameter change-over" function. • The parameters specified in 0x4041/1...32 are set to the values set in 0x4043/1...32. • After successful execution, the value 0 is shown. ▶ Parameter change-over 📖 464
	0	**Off / ready**	
0x2022:009 (P700.09)	Device commands: Load parameter set 3 (Device commands: Load par. set 3) • For further possible settings, see parameter 0x2022:001 (P700.01). 📖 418		1 = load value set 3 of the "Parameter change-over" function. • The parameters specified in 0x4041/1...32 are set to the values set in 0x4044/1...32. • After successful execution, the value 0 is shown. ▶ Parameter change-over 📖 464
	0	**Off / ready**	
0x2022:010 (P700.10)	Device commands: Load parameter set 4 (Device commands: Load par. set 4) • For further possible settings, see parameter 0x2022:001 (P700.01). 📖 418		1 = load value set 4 of the "Parameter change-over" function. • The parameters specified in 0x4041/1...32 are set to the values set in 0x4045/1...32. • After successful execution, the value 0 is shown. ▶ Parameter change-over 📖 464
	0	**Off / ready**	

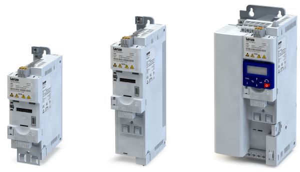
11.1.4 Delete logbook

By means of the "Delete logbook" device command, all logbook entries can be deleted.

Parameter	Name / value range / [default setting]		Info
0x2022:015 (P700.15)	Device commands: Delete logbook (Device commands: Delete logbook) • Setting can only be changed if the inverter is inhibited.		1 = delete all entries in the logbook.
	0	**Off / ready**	
	1	On / start	

Related topics

▶ Logbook 📖 110



11.2 Keypad

For the keypad various settings can be made, which are described in detail in the following subchapters.

11.2.1 Keypad language selection

Parameter	Name / value range / [default setting]		Info
0x2863 (P705.00)	Keypad language selection (KP language)		Language selection for the keypad display.
	0	No language selected	
	1	**English**	
	2	German	

11.2.2 Keypad setpoint increment

Parameter	Name / value range / [default setting]	Info
0x2862 (P701.00)	Keypad setpoint increment (KP setp. incr.) 1 ... [**1**] ... 100	Adaptation of the increment for keypad setpoints when a keypad arrow key is pressed once. The value set serves as a multiplier for the preset increments. Preset increments: • 0.1 Hz for frequency setpoint 0x2601:001 (P202.01). • 0.01 PUnit for process controller setpoint 0x2601:002 (P202.02). • 1 % for torque setpoint 0x2601:003 (P202.03). Notes: • With a setting > 1, the option of repeatedly changing the setpoint by pressing the key for a longer time is deactivated. • The setting only has an impact on the keypad setpoints. Example: with the setting "5", the keypad frequency setpoint is increased/decreased by 0.5 Hz every time the key is pressed.

11.2.3 Keypad scaling of speed display

Parameter	Name / value range / [default setting]	Info
0x4002 (P702.00)	Speed display scaling (Scal.speed fact.) 0.00 ... [**0.00**] ... 650.00	Factor for the scaling of the speed display in 0x400D (P101.00). • With the setting "0.00", no scaling takes place. • Example: with the "16.50" and the actual frequency = 50 Hz, 0x400D (P101.00) shows the speed "825 rpm".
0x400D (P101.00)	Scaled actual value (Scaled act value) • Read only: x Units	Display of the current speed in application units.

11.2.4 Keypad status display

During operation, the keypad displays the output frequency of the inverter, or with an active PID control it shows the process controller setpoint. Alternatively, an optional diagnostic parameter can be displayed during operation.

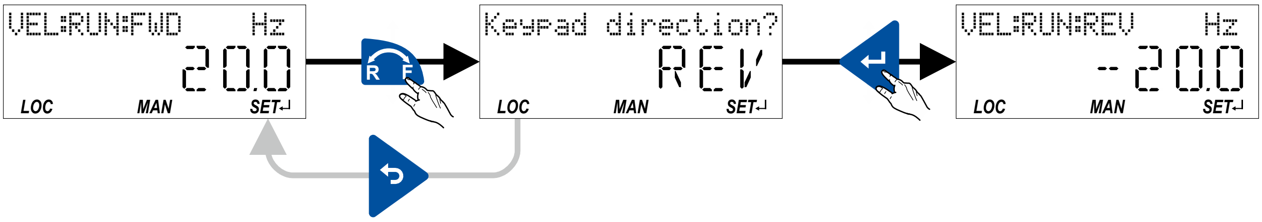
Parameter	Name / value range / [default setting]	Info
0x2864 (P703.00)	Keypad status display (KP status displ.) 0x00000000 ... [**0x00000000**] ... 0xFFFFFF00	0 = normal display depending on the operating mode • In case of an active frequency control, the keypad displays the output frequency of the inverter. • In case of active PID control, the keypad displays the current Process controller setpoint in [P-Unit]. As an alternative, an optional diagnostic parameter can be set here, which is to be shown on the keypad during operation. • Format: 0xiiiiss00 (iiii = hexadecimal index, ss = hexadecimal subindex) • The lowest byte is always 0x00. • The keypad can be used to select the desired diagnostics parameter from a list.

11.2.5 Keypad - Configuration of R/F and CTRL buttons

Keypad rotation setup

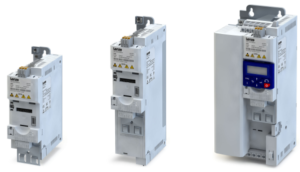
Use the keypad to reverse the rotation direction at local keypad control.

- After the key has been pressed, the reversal of rotation direction must be confirmed with the key. (The key serves to cancel the action.)



The keypad key

- directly changes the keypad rotation setup in 0x2602:002 (P708.02).
- has no function in case of a bipolar setpoint selection (e. g. ±10 V). In this case, the direction of rotation is determined by the sign of the setpoint.
- has no function if the rotation limitation "Only clockwise (CW) [0]" is set in 0x283A (P304.00).
- has no function in the operating mode 0x6060 (P301.00) = "MS: Torque mode [-1]".
- has no function if the PID control is activated.
- can be deactivated in 0x2602:001 (P708.01).



Keypad Full Control

Use the **CTRL** keypad key to activate the "Keypad Full Control" control mode. Both the control and the setpoint selection are then made via the keypad. This special control mode can be, for instance, used during the commissioning phase if external control and setpoint sources are not ready to use yet.

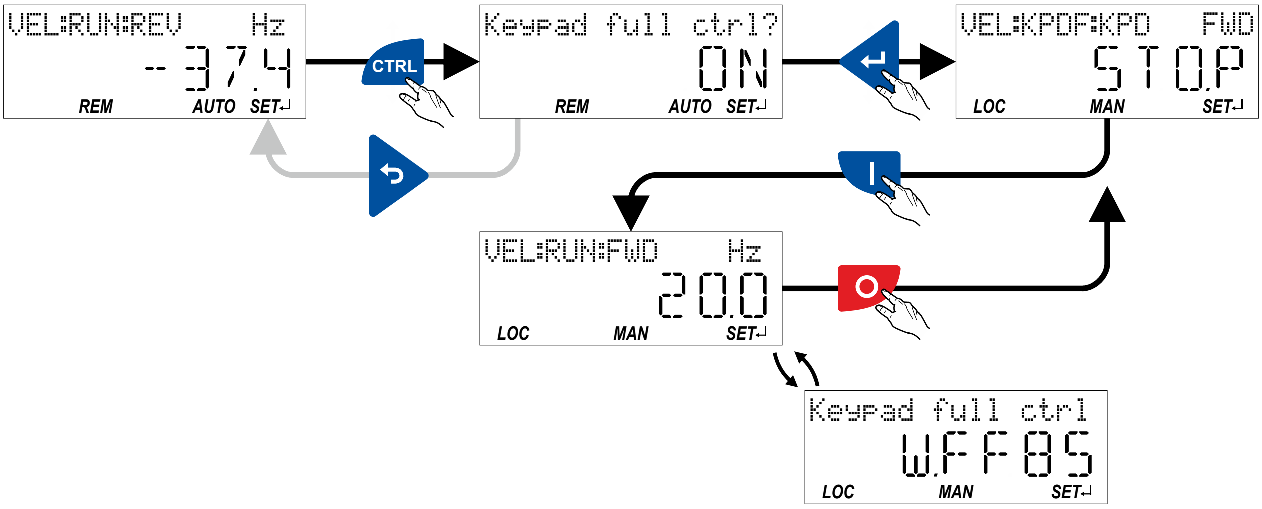
NOTICE

If the "Keypad Full Control" control mode is active, the "Run" 0x2631:002 (P400.02) function is internally set to TRUE.

In this case, the motor cannot be stopped via this function.

▶ For stopping the motor, use the O keypad key, deactivate the inverter enable or activate the "quick stop" function.

- After the **CTRL** key has been pressed, the activation of the control mode must be confirmed with the ↵ key. (The ↶ key serves to cancel the action.)
- When the control mode is changed over, the motor is first stopped and the "Forward" direction of rotation is set. Then, the motor can be started and stopped via the keypad.



If the "Keypad Full Control" control mode is active,

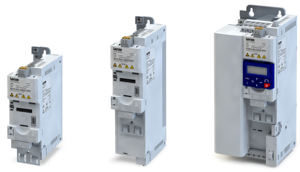
- the keypad shows the "Keypad full ctrl" warning alternately with the status display.
- the set standard setpoint sources are ignored.
- a change-over to other setpoint sources is not possible.
- a change-over to network control is not possible.
- the following functions continue to be active:
  - 0x2631:001 (P400.01): Enable inverter
  - 0x2631:003 (P400.03): Activate quick stop
  - 0x2631:005 (P400.05): Activate DC braking
  - 0x2631:010 (P400.10): Jog foward (CW)
  - 0x2631:011 (P400.11): Jog reverse (CCW)
  - 0x2631:013 (P400.13): Reverse rotational direction
  - 0x2631:043 (P400.43): Activate fault 1
  - 0x2631:044 (P400.44): Activate fault 2

Clicking the **CTRL** keypad key stops the control mode again.

The keypad key **CTRL**

- directly changes the setting in 0x2602:003 (P708.03).
- can be deactivated in 0x2602:001 (P708.01).

Parameter	Name / value range / [default setting]	Info
0x2602:001 (P708.01)	Keypad setup: CTRL & F/R key setup (Keypad setup: CTRL&F/R keys) • From version 03.00	Disable/enable CTRL and F/R key of the keypad.
	0 CTRL & F/R Disable	
	1 CTRL & F/R Enable	
	2 CTRL Enable F/R Disable	
	3 CTRL Disable F/R Enable	
0x2602:002 (P708.02)	Keypad setup: Select rotational direction (Keypad setup: Select rot.dir.) • From version 03.00	Instructed direction of rotation if local keypad control is active. • If the local keypad control is active, this setting can be directly changed via the keypad key R F if the key in 0x2602:001 (P708.01) has not been disabled. • When the remote control is changed over to local keypad control and vice versa, this parameter is set to "Forward [0]".
	0 Forward	
	1 Reverse	
0x2602:003 (P708.03)	Keypad setup: Keypad Full Control (Keypad setup: Keypad Full Ctrl) • From version 03.00	Activate/deactivate full keypad control. • This setting can be changed directly via the keypad key **CTRL** if the key in 0x2602:001 (P708.01) has not been disabled. • When the control mode is changed over, the motor is stopped and the "Forward" direction of rotation is set.
	0 Off	
	1 On	

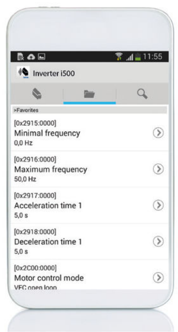


11.3 Wireless LAN (WLAN)

The pluggable WLAN module enables
- an easy access to inverters that are installed in difficult access areas,
- an easy parameter setting without cable and instead of the keypad,
- a comfortable monitoring and adaptation of the machine.

The inverter can be accessed via WLAN with the following devices:
- Engineering PC (with WLAN functionality) and the »EASY Starter« engineering tool.
- Android smartphone with Lenze Smart Keypad App.

The Lenze Smart Keypad App is recommended for the adaptation of simple applications. The Lenze Smart Keypad App can be found in the Google Play Store.



11.3.1 WLAN LED status displays

Information on the WLAN module status can be obtained quickly via the LED displays "Power", "TX/RX" and "WLAN" on the front of the WLAN module.

The meaning can be seen from the table below.

LED "Power" (green)	LED "TX/RX" (yellow)	LED "WLAN" (green)	Status/meaning
off	off	off	No supply voltage.
on	on	on	Self-test (duration approx. 1 s)
	off	off	Ready for operation — no active WLAN connection.
	Flashing	on	Communication active.
	off	blinking	Client mode — waiting for connection.
blinking	off	off	Trouble

After being plugged in, the WLAN module needs approx. 20 seconds until it is ready for operation.

11.3.2 WLAN basic settings

The WLAN functionality can be configured via the following parameters.

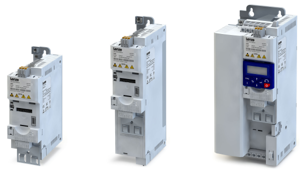
Preconditions

WLAN module has been plugged onto the interface X16 on the front of the inverter.

Details

- The WLAN module can be connected and removed during operation.
- The WLAN module can either create an own WLAN network (access point mode, default setting) or implement itself as a WLAN client in an already existing WLAN network. For details see the following subchapters.
- The WLAN connection is encrypted. The WLAN encryption can be selected in 0x2441:009.
- 0x2441:012 can be used to set that the name of the WLAN network, called SSID, is not visible for other WLAN devices. As a result, the number of WLAN networks displayed on smartphone or PC can be reduced.
- Two data sources are possible for the WLAN settings: Inverter and WLAN module.
  - Data source - inverter: The WLAN settings saved in the inverter are used. Each inverter has its own WLAN settings.
  - Data source - WLAN module: The WLAN settings saved in the WLAN module are used. In this "stand-alone" mode, the WLAN module can be plugged onto another inverter and then be used with the same settings (irrespective of the WLAN settings of the inverter).
  - The data source is activated with 0x2440.
  - The currently active data source is displayed in 0x2442:004.

Parameter	Name / value range / [default setting]		Info
0x2440	Initiate WLAN • From version 02.00		Restart WLAN network with default setting or current settings.
	0	**No action/no error**	Only status display.
	1	Restart with current values (from version 04.00)	Restart WLAN network with current settings of the WLAN parameters. • The WLAN settings of the active data source (inverter or WLAN module) are used. • The active data source is displayed in 0x2442:004. • The data source is not changed by this selection. Note! This selection is currently not supported by the WLAN module V1.0.
	2	Restart with default values	Restart WLAN network with default setting of the WLAN parameters. • The WLAN settings saved in the WLAN module are deleted. • Active data source for the WLAN settings is now the inverter.
	11	Save settings in WLAN module	Restart WLAN network with current settings of the WLAN parameters. • The current settings are saved in the WLAN module. • Active data source for the WLAN settings is now the WLAN module.
0x2441:004	WLAN settings: DHCP • From version 02.00		1 = Dynamic Host Configuration Protocol (DHCP) is enabled. • In the access point mode, the DHCP server of the WLAN module is activated. • In the client mode, the DHCP-client function is activated.
	0	Disabled	
	1	**Enabled**	
0x2441:005	WLAN settings: DHCP start address 0 ... [**0**] ... 4294967295 • From version 02.00		Definition of the start address when the Dynamic Host Configuration Protocol (DHCP) is used. • Only relevant for access point mode. • When 0 is set, the active IP address + 1 is used as start address.
0x2441:006	WLAN settings: WLAN operation mode • From version 02.00		Definition of the operating mode of the WLAN module.
	0	**Access point mode**	For a direct connection to another WLAN device, the WLAN module creates an own WLAN network. ▸ WLAN access point mode 📖 430
	1	Client mode	The WLAN module can be integrated as WLAN client into an already existing WLAN network. ▸ WLAN client mode 📖 435



Parameter	Name / value range / [default setting]	Info
0x2441:007	WLAN settings: WLAN SSID ["**i5**"] • From version 02.00	Name (Service Set Identifier, SSID) of the WLAN network. • The preset name consists of the device name (iXXX) and the first 10 digits of the serial number. • Example: "i550_0123456789" • The serial number is displayed in 0x2000:002 (P190.02).
0x2441:008	WLAN settings: WLAN password ["**password**"] • From version 02.00	Password (WLAN network key) of the WLAN network. • This password serves to secure the WLAN connections. • The password must have a minimum length of 8 characters. Although shorter passwords are accepted and saved, the WLAN module cannot be operated with such a password. • The character "*" is not allowed. Note! If the WLAN module is to be plugged onto the inverter for a longer period of time, it is important to select a safe password. Otherwise, a potential attacker might connect to the WLAN access point and attack the device and other connected devices or networks. Currently (status: 2016), a WLAN is considered as safe if the password • consists of more than 20 characters, • contains capital and small letters, numbers and special characters and • cannot be found in any dictionary.
0x2441:009	WLAN settings: WLAN security • From version 02.00	Selection of the WLAN encryption.
	0 WPA	
	1 WPA2	
0x2441:010	WLAN settings: WLAN access • From version 02.00	Switch on/off WLAN.
	0 Disabled (WLAN off)	
	1 Enabled (WLAN on)	
0x2441:011	WLAN settings: WLAN channel • From version 02.00	Selection of the WLAN channel.
	1 Channel 1	
	2 Channel 2	
	3 Channel 3	
	4 Channel 4	
	5 Channel 5	
	6 Channel 6	
	7 Channel 7	
	8 Channel 8	
	9 Channel 9	
	10 Channel 10	
	11 Channel 11	
0x2441:012	WLAN settings: WLAN SSID broadcast • From version 02.00	1 = the name of the WLAN network, called SSID, is not visible for other WLAN devices.
	0 Activated	
	1 Deactivated	
0x2442:004	Active WLAN settings: Active module mode • Read only • From version 02.00	Display of the active data source for the WLAN settings. • This parameter indicates whether the settings used come from the inverter or from the WLAN module.
	0 Inverter	The WLAN settings saved in the inverter are used.
	1 Standalone	The WLAN settings saved in the WLAN module are used.
0x2442:005	Active WLAN settings: MAC address • Read only • From version 02.00	Display of the MAC address of the WLAN module.

Parameter	Name / value range / [default setting]		Info
0x2449	WLAN error • Read only • From version 02.00		Bit coded display of WLAN errors.
	Bit 2	WLAN error	
	Bit 3	Memory problem	
	Bit 4	WLAN connection problem	
	Bit 7	WLAN off	
	Bit 9	Client mode off	
	Bit 12	TCP/IP configuration error	
	Bit 13	Password length	
	Bit 14	Access denied	

11.3.2.1 Resetting WLAN settings to default setting

Possible reasons:

- Password is not known anymore.
- WLAN SSID is not visible and not known anymore.
- WLAN module mode "stand-alone" shall be deactivated.

0x2440 serves to reset all WLAN settings to the default setting. For this purpose, the inverter must be connected to the »EASY Starter« via the USB module or an existing network.

Option 1: Reset via USB module

How to reset the WLAN settings to default setting by means of the USB module:

Requirements:

- The inverter is ready for operation (supplied with voltage).

Required accessories:

- USB module
- USB 2.0 cable (A-plug on micro B-plug)
- PC with installed »EASY Starter« software

1. Remove the WLAN module from the inverter and plug on the USB module instead.
2. Establish a connection between inverter and »EASY Starter« via the USB module.
3. Set the parameter 0x2440 to "Restart with default values [2]".
4. Remove the USB module from the inverter and plug on the WLAN module instead again.

The default setting is loaded.

Option 2: Reset via network

How to reset the WLAN settings to default setting via network:

Requirements:

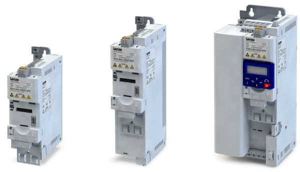
- The inverter is ready for operation (supplied with voltage).
- The inverter is connected to a functioning network.

Required accessories:

- PC with installed »EASY Starter«. Moreover, the PC must be connected to the network which also implements the inverter.

1. Establish a connection between the inverter and »EASY Starter« via the used network.
2. Set the parameter 0x2440 to "Restart with default values [2]".

The default setting is loaded.



11.3.3 WLAN access point mode

In the presetting, the WLAN module is configured as WLAN access point because this is the most frequent application. In this operating mode, the WLAN module creates its own WLAN network for a direct connection to other WLAN devices.

The supported WLAN devices are:

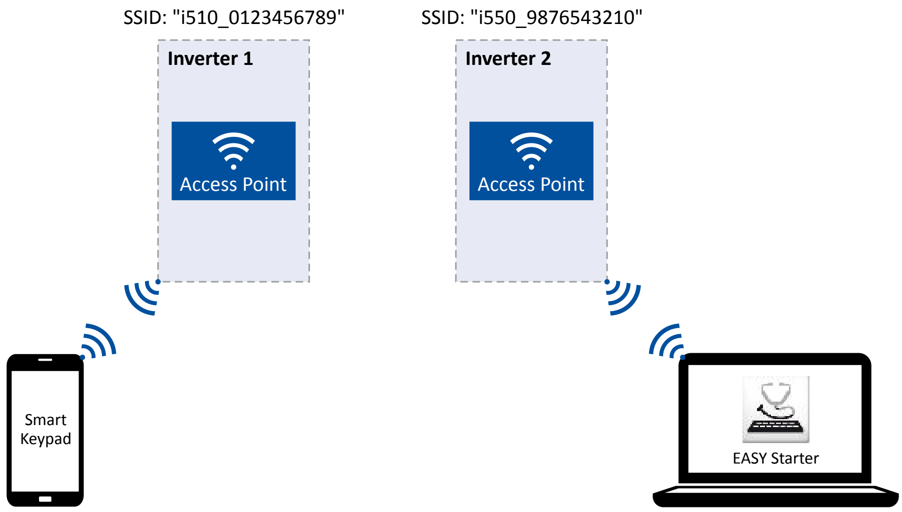
- Android smartphone with Lenze Smart Keypad App.
- Engineering PC (with WLAN functionality) and the »EASY Starter« engineering tool.

Details

- In default setting, every inverter with WLAN functionality comes with an individual network name, called SSID.
- The preset network name consists of the device name (iXXX) and the first 10 digits of the serial number (example: "i550_0123456789").
- In the default setting, the password for the WLAN network is called "password" and can be changed in 0x2441:008.

If the WLAN module is to be plugged onto the inverter for a longer period of time, it is important to select a safe password. Otherwise, a potential attacker might connect to the WLAN access point and attack the device and other connected devices or networks. Currently (status: 2016), a WLAN is considered as safe if the password consists of more than 20 characters, contains capital and small letters, numbers and special characters and cannot be found in any dictionary.

The following illustration displays the SSIDs as examples only:



For establishing a WLAN connection, only a few settings are required. The respective setting is described in the following subchapters:

- Establishing a direct WLAN connection between smartphone and inverter 📖 431
- Using the smartphone as "Smart Keypad" 📖 432
- Establishing a direct WLAN connection between Engineering PC and inverter 📖 433

11.3.3.1 Establishing a direct WLAN connection between smartphone and inverter

How to establish a direct WLAN connection to the inverter on the smartphone:

Requirements:

- The functional test described in the mounting and switch-on instructions has been completed successfully (without any errors or faults).
- The inverter is ready for operation (supplied with voltage).

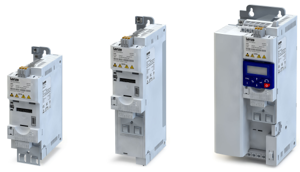
Required accessories:

- WLAN module
- Android smartphone
- Lenze Smart Keypad App (available free of charge in the Google Play Store)

1. Plug the WLAN module onto the front of the inverter (interface X16).
2. Unless already activated, activate the WLAN function on the smartphone under "Settings" → "WLAN".
   The WLAN networks available in your range are now displayed.
3. Select the WLAN network established by the inverter.
4. Enter the password for the WLAN network (default setting "password") and click "Connect".
   The connection to the WLAN network of the inverter is now established.
5. Start the Lenze Smart Keypad App on the Android smartphone.

If a WLAN connection to the inverter has been established, the Lenze Smart Keypad App serves to

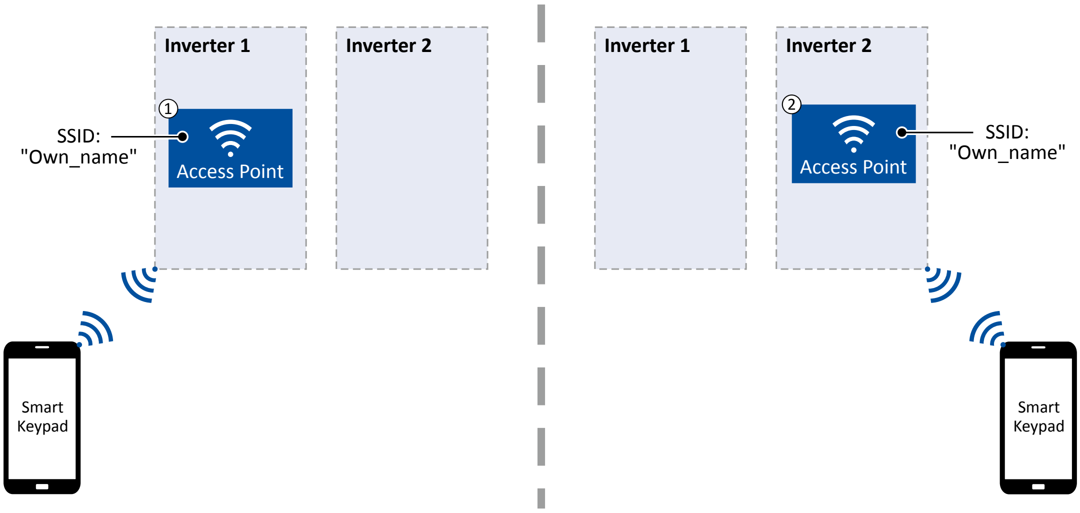
- read out diagnostics parameters of the inverter,
- change parameter settings of the inverter and
- transmit parameter sets.



11.3.3.2 Using the smartphone as "Smart Keypad"

In the default setting, the WLAN settings of the inverters are used. If the WLAN module is plugged onto another inverter, the WLAN connection must be set up again because the replugging causes a change of the network name.

For using the smartphone as "Smart Keypad", the WLAN module can be configured such that the WLAN settings are saved locally in the WLAN module and only these settings are used. In this "standalone" mode, the WLAN module remains permanently coupled to the smartphone because after replugging onto another inverter, the login data for the WLAN network (SSID and password) is the same:



① WLAN module is plugged onto the inverter 1. After the connection to the smartphone has been established, the inverter 1 can be diagnosed or parameterised with the Lenze Smart Keypad App.

② WLAN module is plugged onto the inverter 2. After the WLAN network is restarted, a connection is established again to the smartphone because the WLAN settings are identical. Now, the inverter 2 can be diagnosed or parameterised with the Lenze Smart Keypad App.

How to configure the WLAN module for a "Smart Keypad" use:

Requirements:
- The WLAN settings of the inverter can be accessed via the Lenze Smart Keypad App or »EASY Starter«.

1. Define your own network name (SSID) in 0x2441:007.
2. Define your own password in 0x2441:008.
3. Set the selection "Save settings in WLAN module [11]" in 0x2440.

The defined network name and the password are saved locally in the WLAN module. The WLAN network is restarted with the current settings.

If the WLAN module is then plugged onto another inverter, the settings that are locally saved in the WLAN module are used (irrespective of the WLAN settings of the inverter).
- The active mode ("Inverter" or "Standalone") is displayed in 0x2442:004.
- In order to return to the standard mode "Inverter", the selection "Restart with default values [2]" must be set in 0x2440.

11.3.3.3 Establishing a direct WLAN connection between Engineering PC and inverter

How to establish a direct WLAN connection to the inverter on the Engineering PC:

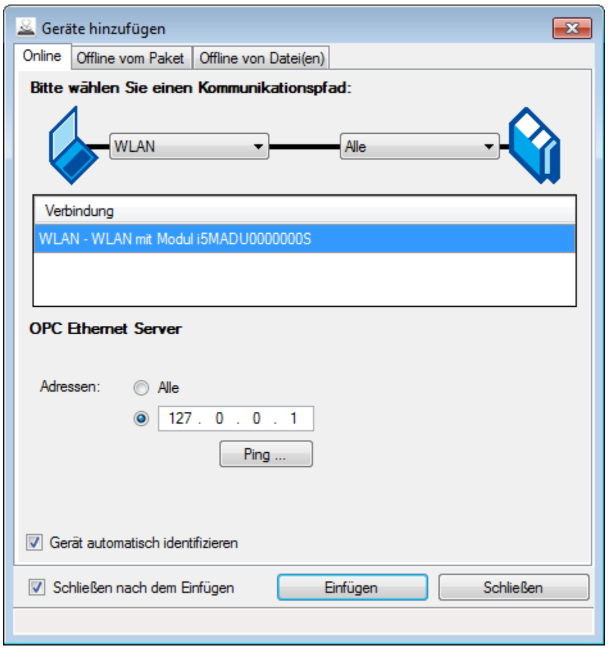
Requirements:

- The functional test described in the mounting and switch-on instructions has been completed successfully (without any errors or faults).
- The inverter is ready for operation (supplied with voltage).

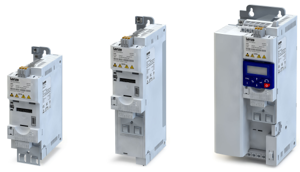
Required accessories:

- WLAN module
- PC (with WLAN functionality) and installed »EASY Starter«

1. Plug the WLAN module onto the front of the inverter (interface X16).
2. Open the network settings on the Engineering PC: "Control panel" → "Network and sharing center".
3. Select the "Set up a new connection or network" option under "Change your network settings".
   The "Set Up a Connection or Network" dialog box is displayed.
4. Select the "Manually connect to a wireless network" connection option and click the "Next" button.
   The "Manually connect to a wireless network" dialog box is displayed.
5. Enter the SSID of the inverter as network name.
6. Select "WPA2-Personal" as safety type.
7. Select "AES" as encryption type.
8. Enter the password as safety key for the WLAN network (default setting "password").
9. Tick "Start this connection automatically".
10. Click "Next".
    A note indicates that the connection has been added successfully.
11. Click "Close".
12. Start »EASY Starter«.
    The "Add devices" dialog is shown.
13. Select connection "WLAN - WLAN with module i5MADU0000000S":



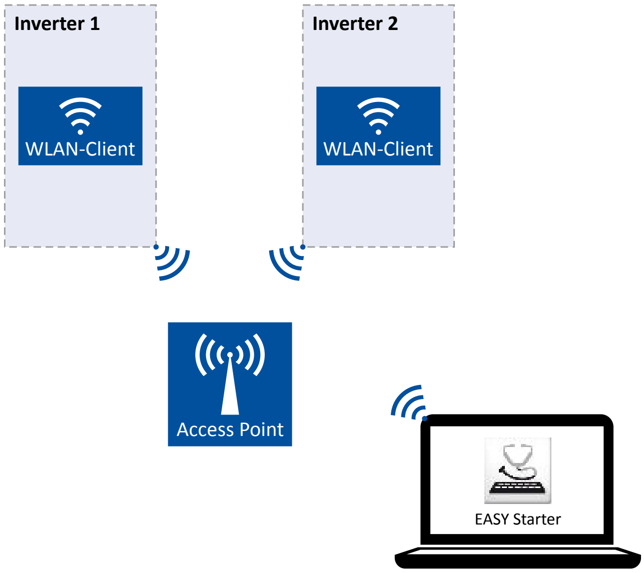
14. Click the **Insert** button.
    »EASY Starter« searches for connected devices via the communication path selected. When the connection has been established successfully, the inverter is displayed in the device list of »EASY Starter«. The inverter parameters can now be accessed via the tabs of »EASY Starter«.



Recommendation: Click the button in the toolbar of the »EASY Starter« to start visual tracking. This function serves to quickly check whether the connection to the correct device has been established. ▶ Optical device identification 📖 162

11.3.4 WLAN client mode

The WLAN module can be optionally configured as a WLAN client. In this operating mode, the WLAN module can be implemented into an already existing WLAN network.



How to configure the WLAN module as WLAN client:

Requirements:

- The WLAN settings of the inverter can be accessed via »EASY Starter«.
- Name (SSID) and password of the external WLAN network are known.

1. Set the selection "Client mode [1]" in 0x2441:006.
2. Set the name (SSID) of the external WLAN network in 0x2441:007.
3. Set the password of the external WLAN network in 0x2441:008.
4. Save parameter settings in the memory module. 📖 107

Before activating the changed WLAN settings in the next step: Make sure that the name (SSID) and the password of the external WLAN network are set correctly. The restart of the WLAN module in the client mode causes a termination of an existing WLAN connection in the access point mode!

5. Restart the inverter or remove and replug the WLAN module to activate the changed WLAN settings.

The WLAN module now tries as a client to establish a connection to the set external WLAN network.

Notes:

- In the default setting, the WLAN client is configured as DHCP client in 0x2441:004.
  - Settings as IP address, subnetwork mask and gateway are automatically made by the DHCP server of the external WLAN network.
  - The active settings are displayed in 0x2442:001, 0x2442:002 and 0x2442:003.
- A static IP configuration can be made via the parameters 0x2441:001, 0x2441:002 and 0x2441:003.

Parameter	Name / value range / [default setting]	Info
0x2441:001	WLAN settings: IP address 0 ... **[28485824]** ... 4294967295 • From version 02.00	Definition of the IP address for the WLAN access point. • In the client mode, a static IP address can be set here for the WLAN client. In order that the static configuration becomes effective, DHCP must be disabled in 0x2441:004. • Byte order is "Big-Endian": 192.168.178.01 ≡ 0x01B2A8C0 (= 28485824)

Parameter	Name / value range / [default setting]	Info
0x2441:002	WLAN settings: Netmask 0 ... [**16777215**] ... 4294967295 • From version 02.00	Definition of the network mask for the WLAN access point. • In the client mode, a static network mask can be set here for the WLAN client. In order that the static configuration becomes effective, DHCP must be disabled in 0x2441:004. • Byte order is "Big-Endian": 255.255.255.0 ≡ 0x00FFFFFF (= 16777215)
0x2441:003	WLAN settings: Gateway 0 ... [**28485824**] ... 4294967295 • From version 02.00	Definition of the gateway for the WLAN access point. • In the client mode, a static gateway can be set here for the WLAN client. In order that the static configuration becomes effective, DHCP must be disabled in 0x2441:004. • Byte order is "Big-Endian": 192.168.178.1 ≡ 0x01B2A8C0 (= 28485824)
0x2442:001	Active WLAN settings: Active IP address • Read only • From version 02.00	Display of the active IP address. • If DHCP is activated, the active IP address usually derives from the configured static IP address of the device.
0x2442:002	Active WLAN settings: Active netmask • Read only • From version 02.00	Display of the active netmask.
0x2442:003	Active WLAN settings: Active gateway • Read only • From version 02.00	Display of the active gateway IP address.
0x2448:001	WLAN status: Connection time • Read only • From version 02.00	Display of the connection time in [s] since the current connection was established.
0x2448:002	WLAN status: Number of connections • Read only • From version 02.00	In access point mode: Display of the number of currently connected clients. In client mode: 0 ≡ not connected; 1 ≡ connected with external WLAN network.
0x2448:003	WLAN status: Rx frame counter • Read only • From version 02.00	Display of the number of request received via WLAN.
0x2448:004	WLAN status: Error statistics • Read only • From version 02.00	Display of the quality of the WLAN connection. A display value > 0 indicates communication problemsn.

11.4 DC braking

The "DC braking" function generates a braking torque by injecting a DC current into the motor. The function can be used to shorten the braking of a load with high mass inertia. Another application is holding the motor shaft either before starting or while stopping.

NOTICE

Avoid long-time activation of the "DC braking" function with a high braking current or a high braking voltage!

Possible consequence: thermal motor overload.

- Only use the "DC braking" function in applications in which the load is only exceptionally stopped.
- Do not activate the "DC braking" function longer than necessary.

Preconditions

The "DC braking" function is only possible if the inverter is enabled.

Details

The function can be used as follows:

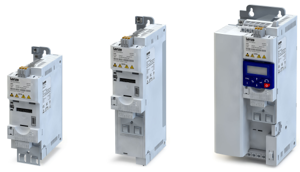
1. Automatically when the motor is started.
2. Automatically when the motor is stopped.
3. Manually (via the flexible I/O configuration).

The three options can also be combined, for instance automatic DC braking when starting and stopping the motor.

For further details and configuration examples, see the following chapter:

- Example 1: Automatic DC braking when the motor is started 439
- Example 2: Automatic DC braking when the motor is stopped 440
- Migration of Lenze Inverter Drives 8200/8400 442
- Activating DC braking manually 572

Parameter	Name / value range / [default setting]	Info
0x2B84:001 (P704.01)	DC braking: Current (DC braking: Current) 0.0 ... **[0.0]** ... 200.0 %	Braking current for DC braking. • 100 % ≡ rated motor current 0x6075 (P323.00)
0x2B84:002 (P704.02)	DC braking: Automatic hold time (DC braking: Hold time autom.) 0.0 ... **[0.0]** ... 1000.0 s	Hold time for automatic DC braking. • The "Automatic DC braking" function is active for the time set here. • 1000.0 = infinite Note! Do not set this parameter to the value "1000.0" (infinite) if the DC braking is used during the start. The "Infinite" setting can be used to lock the rotor for an indefinite time while a stop is active. However, ensure here that the longer DC braking does not cause a thermal overload of the motor!
0x2B84:003 (P704.03)	DC braking: Automatic operating threshold (DC braking: Threshold autom.) 0.0 ... **[0.0]** ... 599.0 Hz	Operating threshold for automatic DC braking. • With the setting 0, the "Automatic DC braking" function is deactivated.
0x2B84:004 (P704.04)	DC braking: Demagnetization time (DC braking: Demagnet. time) 0 ... **[100]** ... 150 % • From version 04.00	In the default setting, the DC braking is activated after the standard demagnetising time has elapsed. This parameter can be used to adapt the time. • 100 % ≡ Default demagnetization time 0x2B84:005 (P704.05) Note! A too short demagnetising time can cause an overcurrent error!
0x2B84:005 (P704.05)	DC braking: Default demagnetization time (DC braking: Def. demag. time) • Read only: x ms • From version 04.00	Display of the standard demagnetising time as a setting help for the user. • This time is calculated by the inverter: Demagnetising time = 7 * rotor time constant



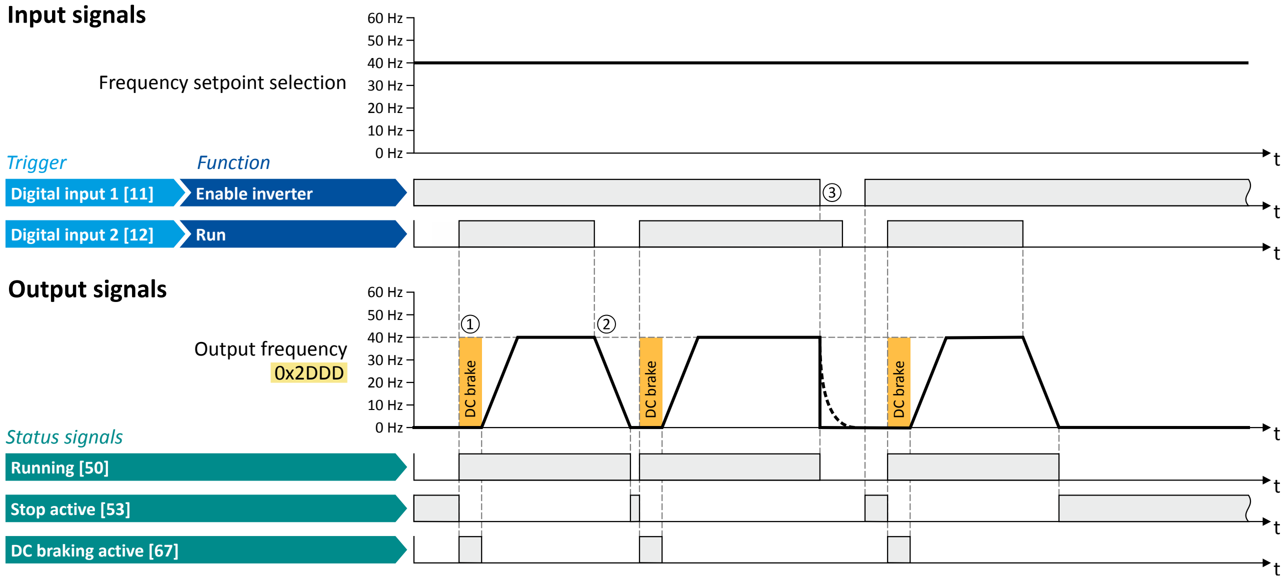
Parameter	Name / value range / [default setting]	Info
0x2B84:006 (P704.06)	DC braking: DC brake with inverter disable (DC braking: DCbrk/inv.disab) 0 ... [**0**] ... 1	1 = behaviour in case of automatic DC braking as with the Lenze Inverter Drives 8200/8400. The behaviour of the Lenze Inverter Drives 8200/8400 in case of automatic DC braking is different: In case of these inverters, after the auto DCB hold time has elapsed, the motor is deenergised (by means of pulse inhibit) until the setpoint exceeds th auto DCB operating threshold. In order to make a migration to the i500 inverter series easier, the setting "1" serves to activate the same behaviour in the i500.
0x2631:005 (P400.05)	Function list: Activate DC braking (Function list: DC braking) • For further possible settings, see parameter 0x2631:001 (P400.01). 532	Assignment of a trigger for the "Activate DC braking" function. Trigger = TRUE: Activate DC braking. Trigger = FALSE: Deactivate DC braking. ⚠ CAUTION!
	0 **Not connected**	DC braking remains active as long as the trigger is set to TRUE. ▶ DC braking 437
0x2838:001 (P203.01)	Start/stop configuration: Start method (Start/stop confg: Start method) • Setting can only be changed if the inverter is inhibited.	Behaviour after start command.
	0 **Normal**	After start command, the standard ramps are active. • Acceleration time 1 can be set in 0x2917 (P220.00). • Deceleration time 1 can be set in 0x2918 (P221.00).
	1 DC braking	After start command, the "DC braking" function is active for the time set in 0x2B84:002 (P704.02). ▶ DC braking 437
	2 Flying restart circuit	After the start command, the flying restart circuit is active. The flying restart function makes it possible to restart a coasting motor during operation without speed feedback. Synchronicity between the inverter and motor is coordinated so that the transition to the rotating motor is effected without jerk at the time of connection. ▶ Flying restart circuit 481
	3 Start with magnetisation	
0x2838:003 (P203.03)	Start/stop configuration: Stop method (Start/stop confg: Stop method)	Behaviour after the "Stop" command.
	0 Coasting	The motor becomes torqueless (coasts down to standstill).
	1 **Standard ramp**	The motor is brought to a standstill with deceleration time 1 (or deceleration time 2, if activated). • Deceleration time 1 can be set in 0x2918 (P221.00). • Deceleration time 2 can be set in 0x291A (P223.00). ▶ Frequency limits and ramp times 156
	2 Quick stop ramp	The motor is brought to a standstill with the deceleration time set for the "Quick stop" function. • Deceleration time for quick stop can be set in 0x291C (P225.00). • The "quick stop" function can also be activated manually, for instance via a digital input. ▶ Quick stop 159

11.4.1 Example 1: Automatic DC braking when the motor is started

In order that the DC braking is automatically active when the motor is started, the start method "DC braking [1]" must be set in 0x2838:001 (P203.01).

- The DC braking is carried out with the braking current set in 0x2B84:001 (P704.01).
- Only after the hold time 0x2B84:002 (P704.02) has elapsed, the motor is accelerated to the setpoint.

Parameter	Name	Setting for this example
0x2631:001 (P400.01)	Enable inverter	Digital input 1 [11]
0x2631:002 (P400.02)	Run	Digital input 2 [12]
0x2631:004 (P400.04)	Reset fault	Not connected [0]
0x2838:001 (P203.01)	Start method	DC braking [1]
0x2860:001 (P201.01)	Frequency control: Default setpoint source	Frequency preset 1 [11]
0x2911:001 (P450.01)	Frequency setpoint presets: Preset 1	40 Hz
0x2B84:001 (P704.01)	Current	50 %
0x2B84:002 (P704.02)	Automatic hold time	10 s

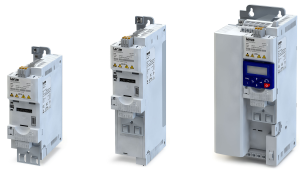


The status signals can be assigned to digital outputs. ▶ Configuration of digital outputs 📖 603

① After the start command, the DC braking is active. Only after the hold time 0x2B84:002 (P704.02) has elapsed, the motor is accelerated to the setpoint.

② The motor is stopped with the stop method set in 0x2838:003 (P203.03). In the example: Stop with standard ramp.

③ If the inverter is disabled, the motor coasts.



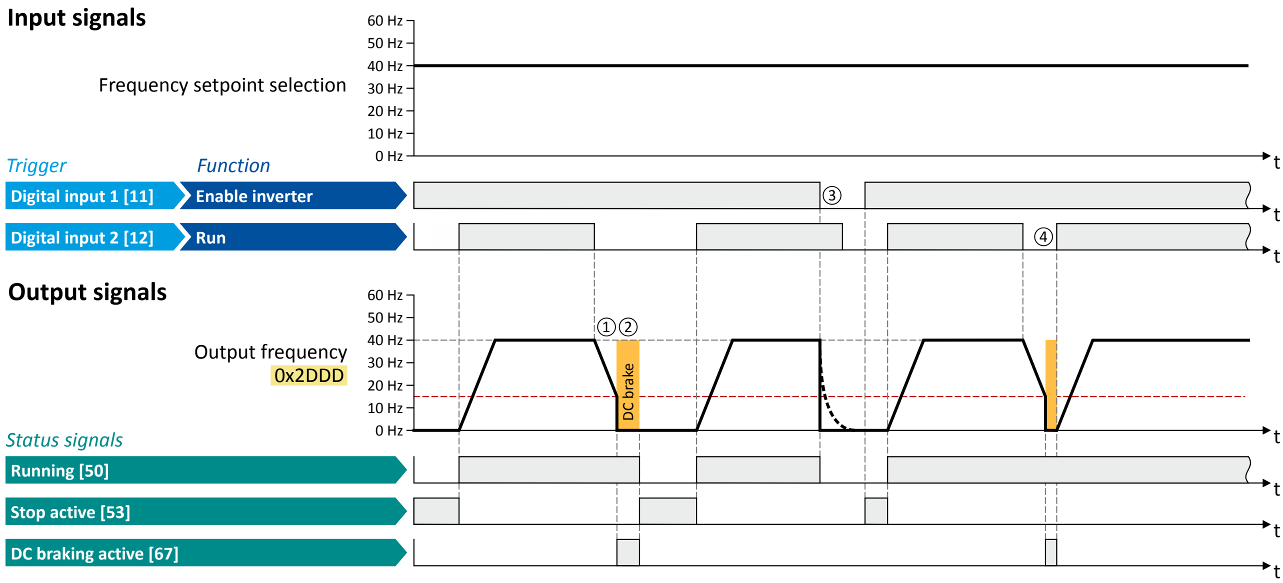
11.4.2 Example 2: Automatic DC braking when the motor is stopped

In order that the DC braking is automatically active when the motor is stopped, the corresponding operating threshold must be set in 0x2B84:003 (P704.03).

- After a stop command, the motor is first decelerated as set. Only if the output frequency falls below the set operating threshold, the inverter stops the deceleration and activates DC braking.
- DC braking is carried out with the braking current set in 0x2B84:001 (P704.01) for the hold time set in 0x2B84:002 (P704.02).
- The exact behaviour depends on the stop method set in 0x2838:003 (P203.03).

Stop method = "Standard ramp [1]"

Parameter	Name	Setting for this example
0x2631:001 (P400.01)	Enable inverter	Digital input 1 [11]
0x2631:002 (P400.02)	Run	Digital input 2 [12]
0x2631:004 (P400.04)	Reset fault	Not connected [0]
0x2838:003 (P203.03)	Stop method	Standard ramp [1]
0x2860:001 (P201.01)	Frequency control: Default setpoint source	Frequency preset 1 [11]
0x2911:001 (P450.01)	Frequency setpoint presets: Preset 1	40 Hz
0x2B84:001 (P704.01)	Current	50 %
0x2B84:002 (P704.02)	Automatic hold time	10 s
0x2B84:003 (P704.03)	Automatic operating threshold	15 Hz



The status signals can be assigned to digital outputs. ▶ Configuration of digital outputs 603

① With the stop method "Standard ramp [1]", the motor is first decelerated normally until the value falls below the operating threshold set in 0x2B84:003 (P704.03).

② The DC braking becomes active for the hold time set in 0x2B84:002 (P704.02).

③ If the inverter is disabled, the motor coasts. (DC braking is only possible if the inverter is enabled.)

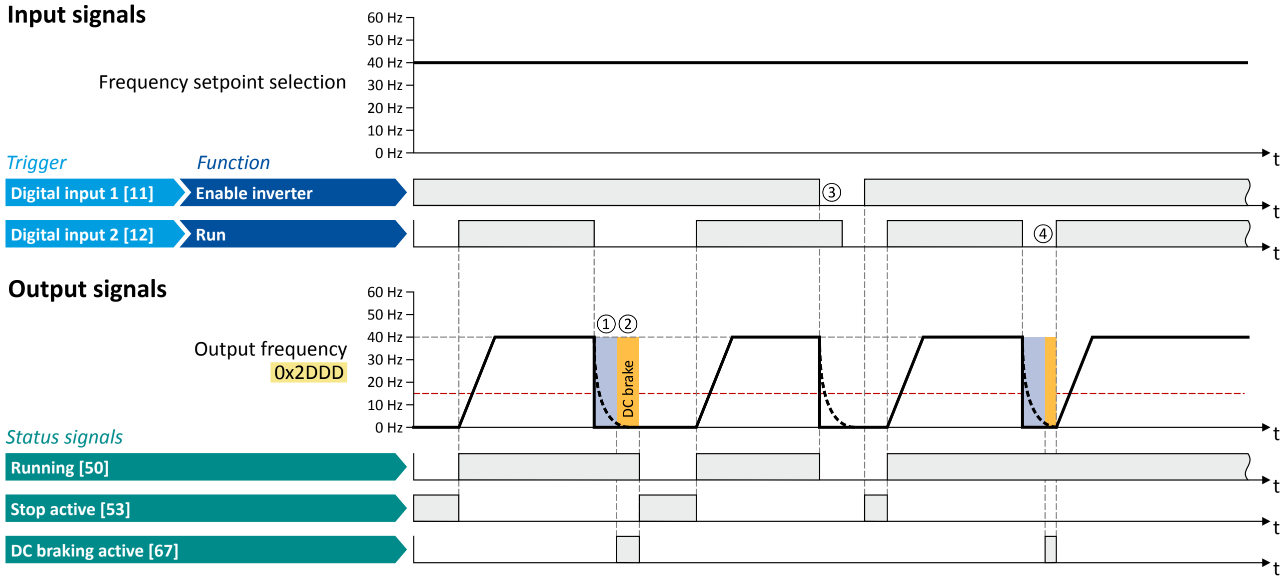
④ If there is a new start command within the hold time, the DC braking is cancelled. The motor is accelerated to the setpoint again.

Stop method = "Quick stop ramp [2]"

Same behaviour as with the stop method "Standard ramp [1]", except that the motor is decelerated with the quick stop ramp instead of the standard ramp.

Stop method = "Coasting [0]"

Parameter	Name	Setting for this example
0x2631:001 (P400.01)	Enable inverter	Digital input 1 [11]
0x2631:002 (P400.02)	Run	Digital input 2 [12]
0x2838:003 (P203.03)	Stop method	Coasting [0]
0x2860:001 (P201.01)	Frequency control: Default setpoint source	Frequency preset 1 [11]
0x2911:001 (P450.01)	Frequency setpoint presets: Preset 1	40 Hz
0x2B84:001 (P704.01)	Current	50 %
0x2B84:002 (P704.02)	Automatic hold time	10 s
0x2B84:003 (P704.03)	Automatic operating threshold	15 Hz



The status signals can be assigned to digital outputs. ▶ Configuration of digital outputs 📖 603

① With the stop method "Coasting [0]", the motor first coasts for a specified time. This "demagnetising time" serves to reduce the induced voltage.

② The DC braking becomes active for the hold time set in 0x2B84:002 (P704.02).

③ If the inverter is disabled, the motor coasts. (DC braking is only possible if the inverter is enabled.)

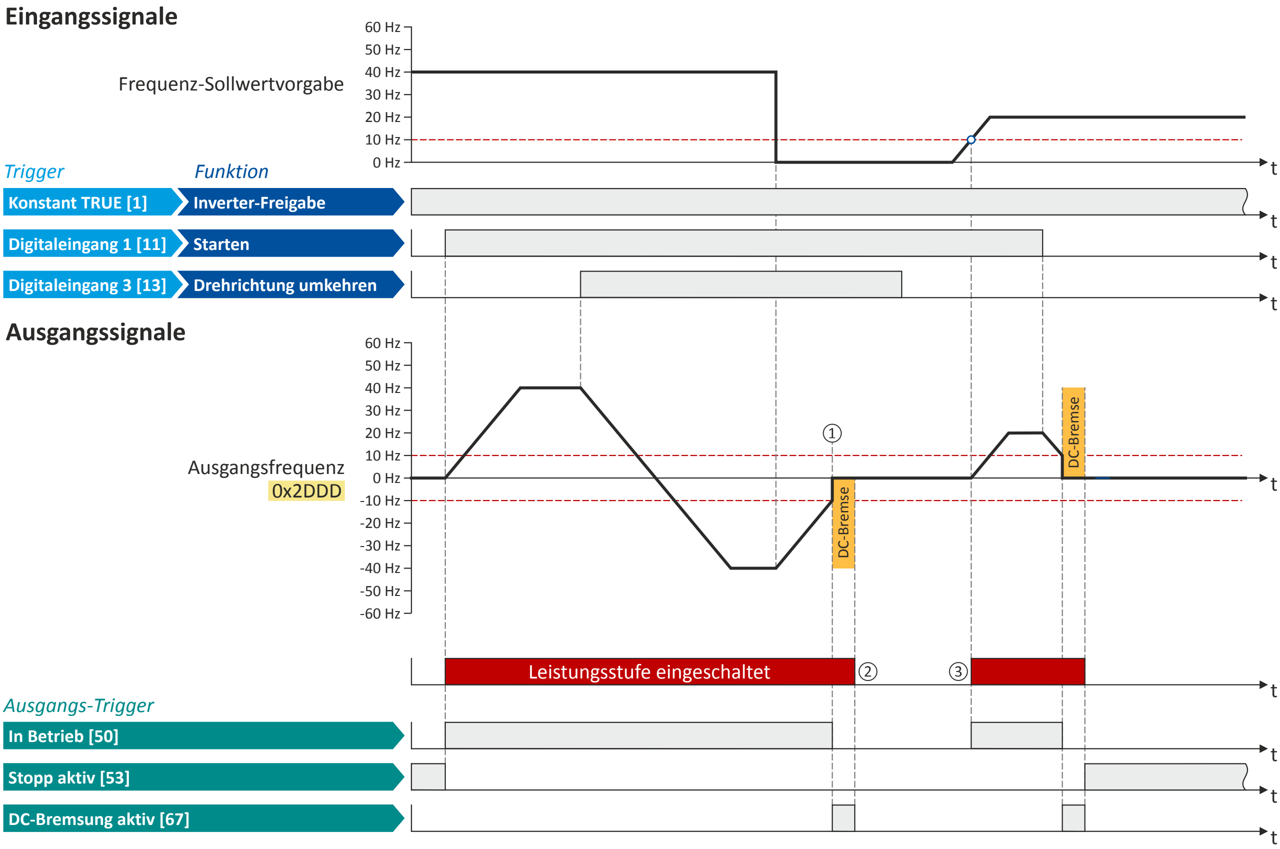
④ If there is a new start command within the hold time, the DC braking is cancelled. The motor is accelerated to the setpoint again.

11.4.3 Migration of Lenze Inverter Drives 8200/8400

The behaviour of the Lenze Inverter Drives 8200/8400 in case of automatic DC braking is different: In case of these inverters, after the auto DCB hold time has elapsed, the motor is deenergised (by means of pulse inhibit) until the setpoint exceeds the auto DCB operating threshold. In order to make a migration to the i500 inverter series easier, the setting 0x2B84:006 (P704.06) = "1" serves to activate the same behaviour in the i500.

The following example illustrates the behaviour of the function if 0x2B84:006 (P704.06) = "1".

Parameter	Designation	Setting for this example
0x2631:001 (P400.01)	Enable inverter	Constant TRUE [1]
0x2631:002 (P400.02)	Run	Digital input 1 [11]
0x2631:013 (P400.13)	Reverse rotational direction	Digital input 3 [13]
0x2838:003 (P203.03)	Stop method	Standard ramp [1]
0x2B84:001 (P704.01)	Current	50 %
0x2B84:002 (P704.02)	Automatic hold time	10 s
0x2B84:003 (P704.03)	Automatic operating threshold	10 Hz
0x2B84:006 (P704.06)	DC brake with inverter disable	1



The status signals can be assigned to digital outputs. ▶ Configuration of digital outputs 📖 603

① If the setpoint falls below the operating threshold set in 0x2B84:003 (P704.03), the DC braking gets active for the hold time set in 0x2B84:002 (P704.02).

② After the hold time has elapsed, the power section is switched off.

③ If the setpoint exceeds the operating threshold again, the power section is switched on again. The motor is accelerated to the setpoint again.

11.5 Brake energy management

When braking electrical motors, the kinetic energy of the drive train is fed back regeneratively to the DC bus. This energy causes a DC-bus voltage boost. If the energy fed back is too high, the inverter reports an error.

Several different strategies can serve to avoid DC-bus overvoltage:

- Use of a brake resistor
- Stopping the deceleration ramp function generator when the active voltage threshold for the brake operation is exceeded
- Use of the "Inverter motor brake" function
- Combination of the above named options
- DC-bus connection

Details

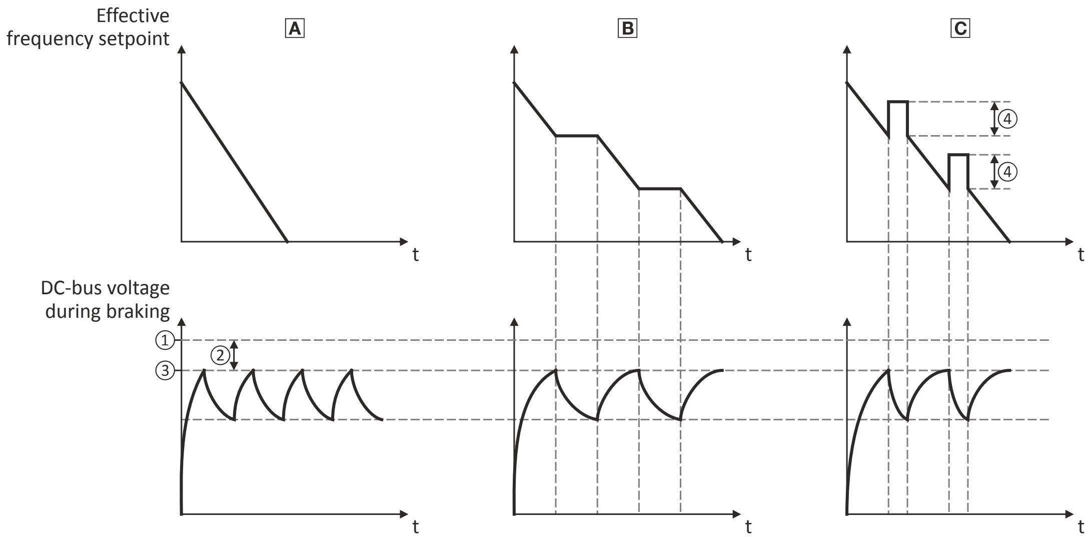
The voltage threshold for braking operation results on the basis of the rated mains voltage set:

Rated mains voltage	Voltage thresholds for braking operation	
	Braking operation on	Braking operation off
230 V	DC 390 V	DC 380 V
400 V	DC 725 V	DC 710 V
480 V	DC 780 V	DC 765 V

The voltage threshold for braking operation can be reduced by 0 ... 100 V. The reduction required must be set in 0x2541:003 (P706.03). However, the reduction must be made to such an extent that the reduced voltage threshold is still above the normal stationary DC-bus voltage.The active voltage threshold for the braking operation is displayed in 0x2541:002 (P706.02).

If the DC-bus voltage exceeds the voltage threshold for braking operation, the braking method selected in 0x2541:001 (P706.01) is applied.

- Optimum following of the actual frequency value to the frequency setpoint (e. g. quick stop of the motor) can always be achieved by the use of a brake resistor.
- Stopping the deceleration ramp function generator enables smoother deceleration with lower torque oscillation.
- The "Inverter motor brake" function allows for quick braking without using a brake resistor. For process-related reasons, torque oscillations may occur.



①	Voltage threshold for braking operation	A	Use of a brake resistor 445
②	Reduced threshold 0x2541:003 (P706.03)	B	Stopping the deceleration ramp function generator 447
③	Active threshold 0x2541:002 (P706.02)	C	Inverter motor brake 448
④	Additional frequency 0x2541:004 (P706.04)		

Parameter	Name / value range / [default setting]		Info
0x2541:001 (P706.01)	Brake energy management: Operating mode (Brake management: Operating mode)		Selection of the braking method. • The braking method(s) selected is/are activated if the DC-bus voltage exceeds the voltage threshold for the braking operation shown in 0x2541:002 (P706.02).
	0	Brake resistor	The integrated brake chopper (brake transistor) is used. ▸ Use of a brake resistor 📖 445
	1	**Ramp function generator stop (RFGS)**	The deceleration ramp function generator is stopped. ▸ Stopping the deceleration ramp function generator 📖 447
	2	Brake resistor + RFGS	The brake resistor is supplied with current and the deceleration ramp function generator is stopped.
	3	Inverter motor brake (IMB) + RFGS	Braking with the "Inverter motor brake" braking method in connection with "Deceleration ramp function generator stop" is executed. ▸ Inverter motor brake 📖 448
	4	Brake resistor + IMB + RFGS	Braking is performed by combining all three braking procedures.
0x2541:002 (P706.02)	Brake energy management: Active threshold (Brake management: Active threshold) • Read only: x V		Display of the active voltage threshold for the braking operation. • The voltage threshold shown depends on the mains voltage selected in 0x2540:001 (P208.01) and the voltage value set in 0x2541:003 (P706.03). • The voltage threshold must be higher than the stationary DC voltage in the DC bus.
0x2541:003 (P706.03)	Brake energy management: Reduced threshold (Brake management: Red. threshold) 0 ... [**0**] ... 100 V		The voltage threshold for the braking operation is reduced by the voltage value set here.
0x2541:005 (P706.05)	Brake energy management: Deceleration override time (Brake management: Del.overr.time) 0.0 ... [**2.0**] ... 60.0 s		Maximum permissible time for the deceleration override by means of the braking method selected in 0x2541:001 (P706.01). • If the DC-bus voltage does not fall below the voltage threshold for braking operation shown in 0x2541:002 (P706.02) within this time, the motor is decelerated further. • The time is only reset if the voltage threshold shown in 0x2541:002 (P706.02) is not reached.
0x2540:001 (P208.01)	Mains settings: Rated mains voltage (Mains settings: Mains voltage) • Setting can only be changed if the inverter is inhibited.		Selection of the mains voltage for actuating the inverter.
	0	**230 Veff**	
	1	400 Veff	
	2	480 Veff	
	3	120 Veff	
	10	230 Veff/reduced LU level	

11.5.1 Use of a brake resistor

For braking operation, optionally the brake chopper integrated in the inverter (brake transistor) can be used.

NOTICE

Incorrect dimensioning of the brake resistor may result in the destruction of the integrated brake chopper (brake transistor).

- Only connect a brake resistor complying in terms of performance to terminals R_{B1} and R_{B2} of the inverter.
- Avoiding thermal overload of the brake resistor.

Preconditions

In order that the integrated brake chopper is activated in the braking operation, one of the following braking methods must be set in 0x2541:001 (P706.01):

- "Brake resistor [0]"
- "Brake resistor + RFGS [2]"
- "Brake resistor + IMB + RFGS [4]"

In the default setting of 0x2541:001 (P706.01), the integrated brake chopper is not activated in the brake operation!

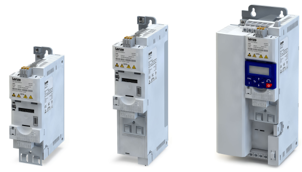
Details

- The brake resistor required is to be connected to terminals R_{B1} and R_{B2} of the inverter.
- In 0x2541:001 (P706.01), additionally the stopping function for the deceleration ramp function generator can be set when the brake resistor is controlled, in order to avoid overvoltage disconnection in the case of lower deceleration times.
- In the default setting and with a disabled inverter and an error status ("Error active"), the brake chopper is switched off. This behaviour can be changed in 0x2541:006 (P706.06). Example: In a DC-bus connection with several inverters, only one brake resistor is used. It is connected to the most powerful inverter in the DC-bus connection. This inverter then serves to change the behaviour so that inverter disable and/or an error does not cause a switch-off of the brake chopper.

Internal protective function

The following protective function prevents the brake chopper from being switched on permanently, e.g. due to too high voltages or wrong settings:

- The brake chopper is switched off if it was switched on over a period of 4 s.
- If the DC-bus voltage again falls below the voltage threshold for braking operation, the brake chopper can again be switched on for maximally 4 s without interruption.



Brake resistor monitoring

The inverter calculates and monitors the thermal load of the brake resistor to ensure that the brake resistor will not be overloaded.

A correct calculation required the following settings according to the data on the nameplate of the brake resistor:

- 0x2550:002 (P707.02): Resistance value
- 0x2550:003 (P707.03): Rated power
- 0x2550:004 (P707.04): Maximum thermal load

The calculated thermal load is not displayed in 0x2550:007 (P707.07).

The brake resistor monitoring is designed with two stages:

- If the calculated thermal load exceeds the warning threshold set in 0x2550:008 (P707.08) (default setting: 90 %), the response set in 0x2550:010 (P707.10) takes place (default setting: "Warning"). The warning status will be reset if the thermal load falls below the warning threshold - 20 %.
- If the calculated thermal load exceeds the warning threshold set in 0x2550:009 (P707.09) (default setting: 100 %), the response set in 0x2550:011 (P707.11) takes place (default setting: "Fault"). The error status will be reset if the thermal load falls below the error threshold - 20 %.

Parameter	Name / value range / [default setting]		Info
0x2541:006 (P706.06)	Brake energy management: Brake resistor response (Brake management: Brk. res. behav) • Setting can only be changed if the inverter is inhibited.		Behaviour of the integrated brake chopper if the inverter is disabled and if the error status is active.
	0	**Off: disable and error**	If the inverter is disabled and the error status is active, the brake chopper is switched off.
	1	On: disable / off: error	Brake chopper is switched off if the error status is active, but not if the inverter is disabled.
	2	Off: disable / on: error	Brake chopper is switched off if the inverter is disabled but not if the error status is active.
	3	On: disable and error	Brake chopper is not switched off if the inverter disabled and the error status is active.
0x2550:002 (P707.02)	Brake resistor: Resistance value (Brake resistor: Resistance value) 0.0 ... [**180.0**]* ... 500.0 Ω * Default setting depending on the size.		Resistance value of the brake resistor connected. • The value to be entered can be obtained from the brake resistor nameplate.
0x2550:003 (P707.03)	Brake resistor: Rated power (Brake resistor: Rated power) 0 ... [**50**]* ... 800000 W * Default setting depending on the size.		Rated power of the brake resistor connected. • The value to be entered can be obtained from the brake resistor nameplate.
0x2550:004 (P707.04)	Brake resistor: Maximum thermal load (Brake resistor: Maximum heat) 0.0 ... [**8.0**]* ... 100000.0 kWs * Default setting depending on the size.		Thermal capacity of the brake resistor connected. • The value to be entered can be obtained from the brake resistor nameplate.
0x2550:007 (P707.07)	Brake resistor: Thermal load (Brake resistor: Thermal load) • Read only: x.x %		Display of the utilisation of the brake resistor connected.
0x2550:008 (P707.08)	Brake resistor: Warning threshold (Brake resistor: Warning thresh.) 50.0 ... [**90.0**] ... 150.0 %		Warning threshold for brake resistor monitoring. • If the utilisation shown in 0x2541:004 (P706.04) reaches the threshold set, the response selected in 0x2550:010 (P707.10) is effected. • The warning is reset with a hysteresis of 20 %.
0x2550:009 (P707.09)	Brake resistor: Error threshold (Brake resistor: Error thresh.) 50.0 ... [**100.0**] ... 150.0 %		Error threshold for brake resistor monitoring. • If the utilisation shown in 0x2541:004 (P706.04) reaches the threshold set, the response selected in 0x2550:011 (P707.11) is effected. • Resetting the error is only possible if the hysteresis is lower than 20 %.
0x2550:010 (P707.10)	Brake resistor: Response to warning (Brake resistor: Warning resp.) • For further possible settings, see parameter 0x2D45:001 (P310.01). 📖 223		Selection of the response that is executed when the warning threshold for brake resistor monitoring is reached. Associated error code: • 65334 | 0xFF36 - Brake resistor: overload warning
	1	**Warning**	

Parameter	Name / value range / [default setting]		Info
0x2550:011 (P707.11)	Brake resistor: Response to error (Brake resistor: Error response) • For further possible settings, see parameter 0x2D45:001 (P310.01). 📖 223		Selection of the response to be executed when the error threshold for brake resistor monitoring is reached. Associated error code: • 65282 | 0xFF02 - Brake resistor: overload warning
	3	**Fault**	

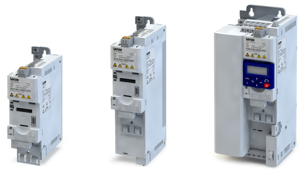
11.5.2 Stopping the deceleration ramp function generator

The deceleration ramp function generator is stopped for a short time if the voltage threshold for braking operation is exceeded.

Details

When this braking method is selected, the maximum permissible time for the deceleration override has to be set in 0x2541:005 (P706.05).

- If the DC-bus voltage does not fall below the voltage threshold for braking operation shown in 0x2541:002 (P706.02) within this time, the motor is decelerated further.
- The time is only reset if the voltage threshold shown in 0x2541:002 (P706.02) is not reached.



11.5.3 Inverter motor brake

With this braking method, which can be selected in 0x2541:001 (P706.01), the regenerative energy in the motor is converted as a result of dynamic acceleration/deceleration with down-ramping of the ramp function generator.

NOTICE

Too frequent braking may cause thermal overload of the motor.

- Avoid activating the "Inverter motor brake" function over a longer time!
- In applications with a high mass inertia and long braking times (> 2 s), use the "DC braking" function.

Preconditions

- The "Inverter motor brake" braking method must not be used with vertical conveyors (hoists) or with active loads!
- The "inverter motor brake" braking method only works in operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]".
- When this braking method is used, the motor overload monitoring is not adapted. A too frequent use of the inverter motor brake may cause an incorrect operation of the motor overload monitoring. ▶ Motor overload monitoring (i²*t) 215

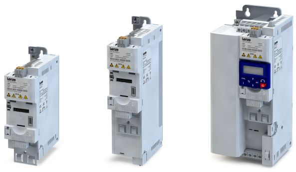
Details

During the deceleration process, the ramp function generator is stopped. The frequency set in 0x2541:004 (P706.04) is added to the frequency setpoint, taking the sign of the current actual frequency into consideration. Furthermore the ramp function generator is stopped in a state of overvoltage. If the DC-bus voltage falls below a defined DC-bus voltage potential, the additional frequency connected is reduced again and the ramp function generator is re-activated. By the alternating acceleration and deceleration resulting from this circuit, the energy is converted thermally in the motor. For process-related reasons, torque oscillations may occur.

Setting instructions

Generally, the smallest value possible required by the application for being able to still traverse the load to be moved in a controlled fashion should be set as additional frequency. Greater mass inertia values require an increase in the rated motor frequency set. Increasing the rated motor frequency, however, causes greater torque oscillations. A possible consequence is the reduced service life of mechanical components. Furthermore an increase in the rated motor frequency also increases the energy converted into heat in the motor. A possible consequence is the reduced service life of the motor.

Parameter	Name / value range / [default setting]	Info
0x2541:004 (P706.04)	Brake energy management: Additional frequency (Brake management: Add.frequency) 0.0 ... [**0.0**] ... 10.0 Hz	Frequency deviation which is connected to the deceleration ramp in a pulsative fashion when the "Inverter motor brake" braking method is used.
0x2C01:005 (P320.05)	Motor parameters: Rated frequency (Motor parameters: Rated frequency) Device for 50-Hz mains: 1.0 ... [**50.0**] ... 1000.0 Hz Device for 60-Hz mains: 1.0 ... [**60.0**] ... 1000.0 Hz	General motor data. Carry out settings as specified by motor nameplate data. Note! When you enter the motor nameplate data, take into account the phase connection implemented for the motor (star or delta connection). Only enter the data applying to the connection type selected.



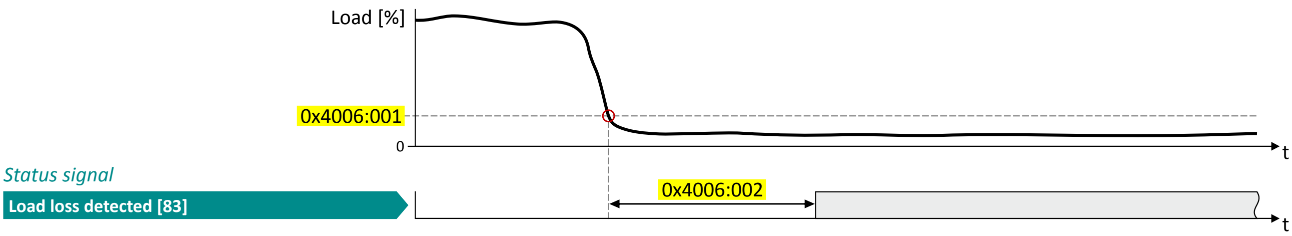
Parameter	Name / value range / [default setting]	Info
0x6060 (P301.00)	Modes of operation (Modes of op.) • Setting can only be changed if the inverter is inhibited.	Selection of the operating mode.
	-2 **MS: Velocity mode**	Vendor specific velocity mode
	-1 MS: Torque mode (from version 03.00)	Vendor specific torque mode • Only possible in motor control type 0x2C00 (P300.00) = "Sensorless vector control (SLVC) [4]" or "Servo control (SC ASM) [2]". ▶ Torque control w/ freq. limit 📖 206
	0 No mode change/no mode assigned	No operating mode (standstill)
	2 CiA: Velocity mode	CiA 402 velocity mode

11.6 Load loss detection

This function serves to detect a load loss during operation and to then activate a specific function, for instance the switching of the relay.

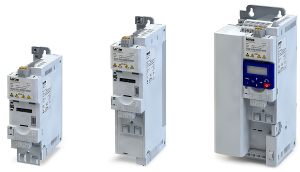
Details

If, during operation, the current motor current falls below the threshold set in 0x4006:001 (P710.01) for at least the time set in 0x4006:002 (P710.02), the internal status signal "Load loss detected [83]" is set to TRUE:



- The threshold is set in percent with reference to the rated motor current "Motor rated current" 0x6075 (P323.00).
- The status signal "Load loss detected [83]" can be assigned, for instance, to a digital output or the relay via the flexible I/O configuration. ▶ Configuration of digital outputs 📖 603
- The load loss detection is not active with active DC braking.

Parameter	Name / value range / [default setting]	Info
0x4006:001 (P710.01)	Load loss detection: Threshold (Load loss detect: Threshold) 0.0 ... [**0.0**] ... 200.0 %	Threshold for load loss detection. • 100 % ≡ rated motor current 0x6075 (P323.00)
0x4006:002 (P710.02)	Load loss detection: Deceleration (Load loss detect: Deceleration) 0.0 ... [**0.0**] ... 300.0 s	Tripping delay for load loss detection.
0x6075 (P323.00)	Motor rated current (Motor current) 0.001 ... [**1.700**]* ... 500.000 A * Default setting depending on the size. • Setting can only be changed if the inverter is inhibited.	The rated motor current to be set here serves as a reference value for different parameters with a setting/display of a current value in percent. Example: • Motor rated current = 1.7 A • Max current 0x6073 (P324.00) = 200 % Motor rated current = 3.4 A
0x6078 (P103.00)	Current actual value (Current actual) • Read only: x.x %	Display of the present motor current. • 100 % ≡ Motor rated current 0x6075 (P323.00)



11.7 Access protection

11.7.1 Write access protection

Optionally a write access protection can be installed for the inverter parameters.

> Write access protection only restricts parameterisation via keypad and »EASY Starter«. Write access protection via network is not restricted. Irrespective of the write access protection that is currently set, a higher-level controller, OPC-UA server, or any other communication partner connected to the inverter is always provided with full read/write access to all parameters of the inverter.

> After activating the write access protection, you have to enter a valid PIN to remove the write access protection. Note down the defined PIN(s) and keep this information in a safe place! If you lose the PIN(s), the inverter can only be disabled by resetting it to the delivery status. This means, all parameter settings made by the user get lost! ▶ Reset parameters to default 📖 418

Details

Usually the write access protection function is implemented by the mechanical engineer/ OEM , for example to protect the inverter against incorrect parameterisation by non-authorised persons. For diagnostic purposes, a read access to all parameters is always possible.

The write access protection allows for the following configurations:

- Full write access
- Write access only to favorites or (when knowing PIN1) to all parameters
- No write access or (when knowing PIN2) full write access
- No write access or (when knowing PIN1) write access only to favorites or (when knowing PIN2) to all parameters

The following table compares the four possible configurations:

PIN1 setting	PIN2 setting	Log-in	Status display after log-in	Active write access protection (via keypad/»EASY Starter«)
0x203D (P730.00)	0x203E (P731.00)	0x203F	0x2040 (P197.00)	
0	0	-	0	No access protection configured.
		Access →		Diagnostics (read access) / Favorites / All parameters
> 0	0	0 or wrong PIN	2	Write access only possible to favorites.
		Correct PIN1	0	Write access to all parameters possible.
		Access →		Diagnostics (read access) / Favorites / PIN1 / All parameters
0	> 0	0 or wrong PIN	1	No write access.
		Correct PIN2	0	Write access to all parameters possible.
		Access →		Diagnostics (read access) / PIN2 / Favorites / All parameters
> 0	> 0	0 or wrong PIN	1	No write access.
		Correct PIN1	2	Write access only possible to favorites.
		Correct PIN2	0	Write access to all parameters possible.
		Access →		Diagnostics (read access) / PIN1 / Favorites / PIN2 / All parameters
		If PIN1 and PIN2 are set identically, a write access to all parameters is possible after the PIN has been entered correctly.		

Notes:

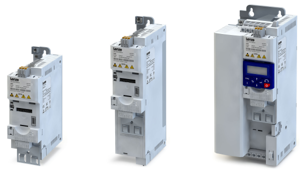
- The firmware of the inverter does only support the protection status.
- The access protection is realised by the keypad and engineering tools as "clients" themselves based on the current protection status 0x2040 (P197.00).

More details on how to configure the write access protection with the respective client can be found in the following subchapters:

▶ Write access protection in the »EASY Starter« 📖 452

▶ Write access protection in the keypad 📖 455

Parameter	Name / value range / [default setting]	Info
0x203D (P730.00)	PIN1 access protection (PIN1 protection) -1 ... [**0**] ... 9999	PIN definition for write access protection. • 1 ... 9999 = set/change PIN. • 0 = delete PIN (deactivate access protection). • When the PIN has been set successfully, the value -1 is shown; otherwise 0. • Setting/changing the PIN via keypad/»EASY Starter« only possible if no write access protection is active. • Settings/changes via »EASY Starter« become effective immediately; via keypad they only become effective when the parameter group has been exited.
0x203E (P731.00)	PIN2 access protection (PIN2 protection) -1 ... [**0**] ... 9999	
0x203F	PIN1/PIN2 log-in -32768 ... [**0**] ... 32767	Parameter for PIN entry for the purpose of deactivating an active access protection temporarily. • 1 ... 9999 = log-in (deactivate access protection temporarily). • 0 = log-out (reactivate access protection). • After having logged in successfully, the value 0 is shown; otherwise -1. • After 10 invalid entries, the log-in function is inhibited. In order to remove the log-in inhibit, the inverter must be switched off and on again.
0x2040 (P197.00)	Access protection status (Protect. status) • Read only Bit 0 – No write access Bit 1 – Only favorites changeable	Bit-coded display of the active access protection after login by PIN1/PIN2.



11.7.1.1 Write access protection in the »EASY Starter«

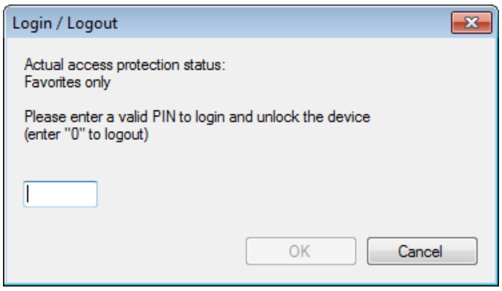
If a write access protection is active for the online connected inverter, it is displayed in the status bar of the »EASY Starter«:

Display	Representation of the parameters in the »EASY Starter«
No write access	All parameters in all dialogs are displayed as read-only parameters.
Only favorites	Except for the favorites, all parameters in all dialogs are displayed as read-only parameters.

An active write access protection can be removed when the PIN is known.

How to remove an active write access protection temporarily:

1. Click the symbol in the toolbar.
   The "Log in / Log off" dialog box is displayed:



2. Enter the valid PIN and confirm with **OK**.

After 10 invalid entries, the log-in function is inhibited. In order to remove the log-in inhibit, the inverter must be switched off and on again.

The write access protection gets active again:

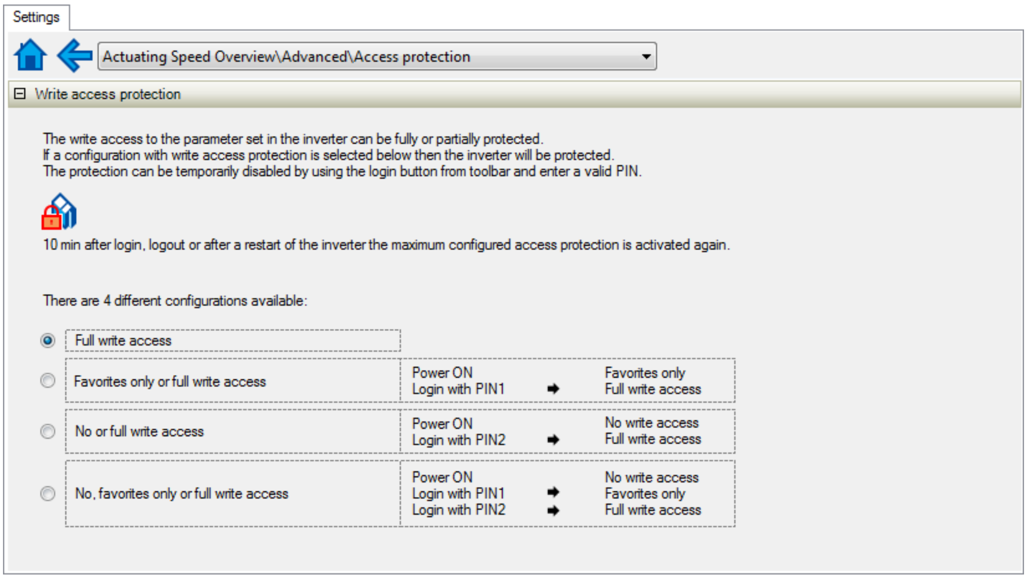
- Automatically 10 minutes after the last log-in.
- Automatically after the mains voltage is switched on again.
- Manually by entering a "0" in the dialog box "Log in / Log off" (see above).

Configuring the write access protection with »EASY Starter«

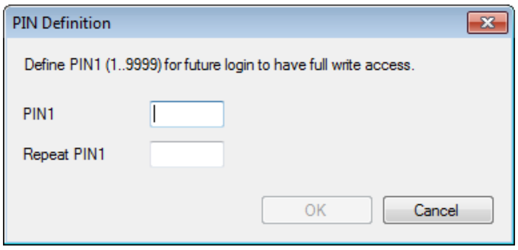
The write access protection is activated by specifying PIN1 and/or PIN2 (depending on the desired configuration of the write access protection).

How to activate the write access protection:

1. Go to the "Settings" tab and navigate to the "Access protection" parameterisation dialog:



2. Select the desired configuration of the write access protection.
   The "PIN definition" dialog box is displayed. The possible entries depend on the selected configuration.



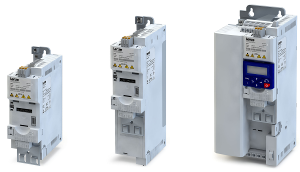
3. Enter the desired PIN(s) and confirm with **OK**.
   After successful execution, the write access protection is immediately effective and is displayed in the »EASY Starter« status bar.
4. For a permanent acceptance of the configuration: Save parameter settings in the device.

How to change already defined PIN(s):

1. Remove the active write access protection temporarily (see above).
2. Select the "Full write access" configuration in the "Access protection" parameterisation dialog.
3. Select again the desired configuration of the write access protection.
4. Enter new PIN(s) and confirm with **OK**.
5. Save parameter settings in the device.

How to remove a configured write access protection permanently:

1. Remove the active write access protection temporarily (see above).
2. Select the "Full write access" configuration in the "Access protection" parameterisation dialog.
3. Save parameter settings in the device.



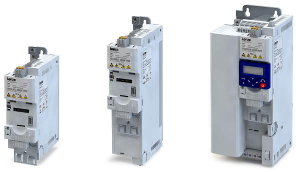
Impact of the write access protection on EASY Starter« functions

The following »EASY Starter« functions are not supported when write access protection is active:

- Parameter set download
- Definition of the "Favorites" parameters.
- Definition of the parameters for the "Parameter change-over" function

The following »EASY Starter« functions are supported irrespective of whether write access protection is active:

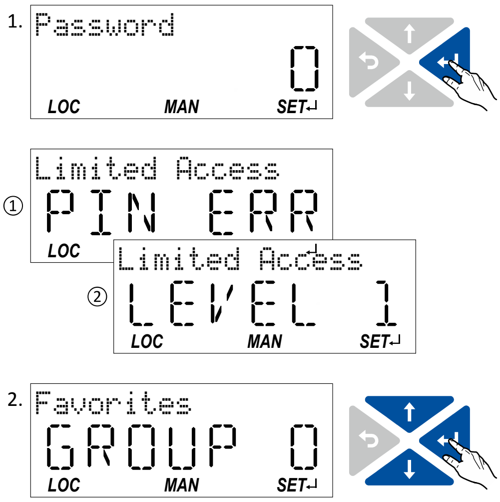
- Optical device identification 0x2021:001 (P230.01)
- Enable/inhibit inverter
- Reset parameters to default 0x2022:001 (P700.01)
- Save parameter set 0x2022:003 (P700.03)
- Load user parameter 0x2022:004 (P700.04)
- Load OEM parameter 0x2022:005 (P700.05)
- Reset error 0x2631:004 (P400.04)



11.7.1.2 Write access protection in the keypad

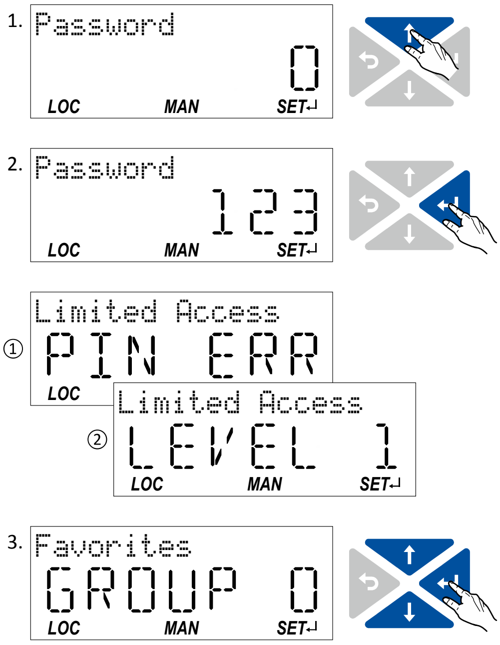
If a write access protection is active for the inverter, the keypad automatically displays a log-in when changing to the parameterisation mode. You can either skip the log-in and thus keep the access protection active or remove it temporarily by entering a valid PIN.

Option 1 - skip log-in and keep access protection active



1. Use the ↵ key to skip the log-in.
   The configured access protection remains active and is briefly displayed:
   ① PIN ERR: No write access
   ② LEVEL 1: Write access only to favorites
   You are now in the group level.
2. You can now use the navigation keys ↑ and ↓ to select the desired group and with key ↵ navigate one level lower to the parameter level.
   Note: By using the ↶ key you can navigate one level upwards again anytime.

Option 2 - remove access protection temporarily by entering a valid PIN

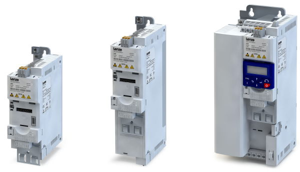


1. Use the ↑ key to enter the defined PIN.
2. Use the ↵ key to accept the changed setting.
   If the access remains restricted, it is briefly displayed:
   ① PIN ERR: No write access
   ② LEVEL 1: Write access only to favorites
   You are now in the group level.
3. You can now use the navigation keys ↑ and ↓ to select the desired group and with key ↵ navigate one level lower to the parameter level.
   Note: By using the ↶ key you can navigate one level upwards again anytime.

> After 10 invalid entries, the log-in function is inhibited. In order to remove the log-in inhibit, the inverter must be switched off and on again.

The write access protection gets active again:

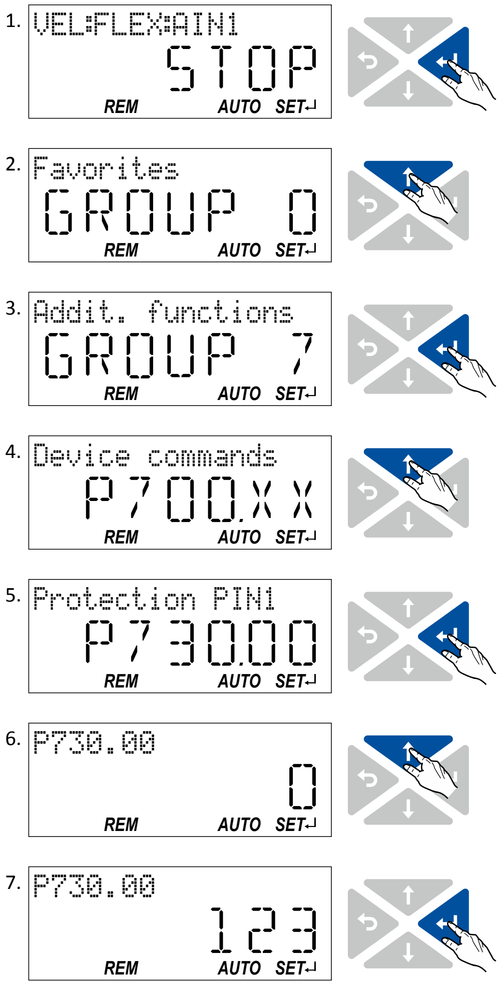
- Automatically 10 minutes after the last log-in or the last keypad entry.
- Automatically after the mains voltage is switched on again.



Configuring the write access protection with the keypad

The write access protection is activated by defining PIN1 in P730.00 and/or PIN2 in P731.00 (depending on the desired configuration of the write access protection).

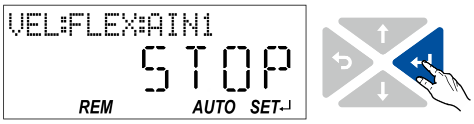
In the following example, the write access protection is configured in such a way that a write access to the favorites only is possible or (when knowing PIN) to all parameters. This configuration only requires the definition of PIN1 (here: "123").

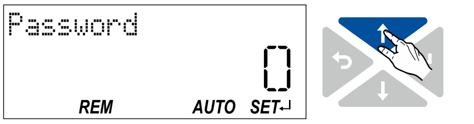


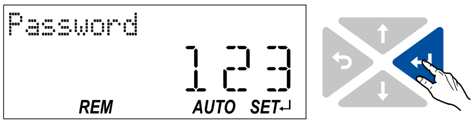
Defining PIN1:

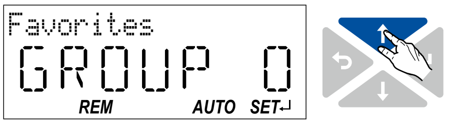
1. Use the ↵ key in the operating mode to navigate to the parameterisation mode one level below.
   You are now in the group level.
   Note: By using the ↶ key you can navigate one level upwards again anytime.
2. Use the ↑ navigation key to select group 7.
3. Use the ↵ key to navigate to one level below.
   You are now in the parameter level of the group selected.
4. Use the ↑ navigation key to select the P730.00 parameter.
5. Use the ↵ key to navigate to one level below.
   You are now in the editing mode.
6. Use the ↑ navigation key to set PIN1 to the value "123".
7. Use the ↵ key to accept the changed setting.
   The editing mode is exited.
   Note: The configured access protection only gets effective after the parameter group is quit.

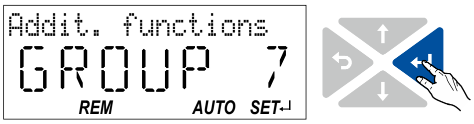
In the following example, PIN1 is changed from "123" to "456". For this purpose, the defined PIN must first be deleted by the setting "0".

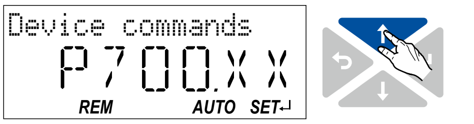
1.


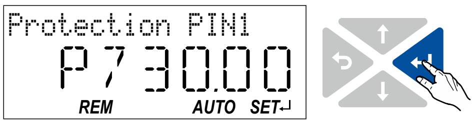
2.


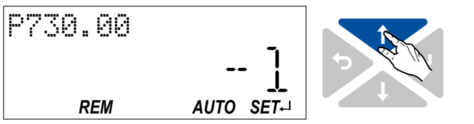
3.


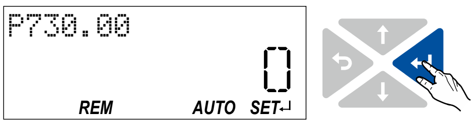
4.


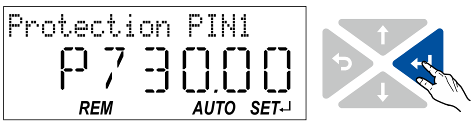
5.


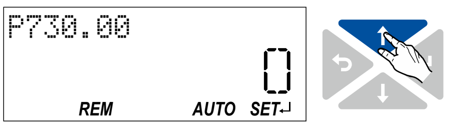
6.


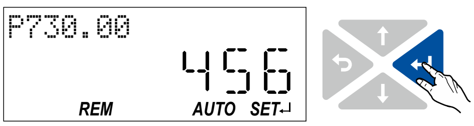
7.


8.


9.


10.


11.


12.


Change defined PIN1:

1. Use the ↵ key in the operating mode to navigate to the parameterisation mode one level below.
   Since the access protection is active, the input dialog for the PIN is displayed.
2. Use the ↑ navigation key to set PIN "123" to remove the access protection temporarily.
3. Use the ↵ key to accept the entered PIN.
   You are now in the group level.
4. Use the ↑ to select group 7.
5. Use the ↵ key to navigate to one level below.
   You are now in the parameter level of the group selected.
6. Use the ↑ to select the P730.00 parameter.
7. Use the ↵ key to navigate to one level below.
   You are now in the editing mode.
8. Use the ↑ key to set PIN1 to the value "0". This setting first deletes PIN1.
9. Use the ↵ key to accept the changed setting.
   The editing mode is exited.
10. Use the ↵ key to navigate again one level below to the editing mode.
11. Use the ↑ navigation key t set the previously deleted PIN1 to the new value "456".
12. Use the ↵ key to accept the changed setting.
    The editing mode is exited.
    Note: The configured access protection only gets effective after the parameter group is quit.

How to remove a configured write access protection permanently:

1. Remove the active write access protection temporarily (see above).
2. Set PIN1 (P730.00) and PIN2 (P731.00) to the value "0" (see instructions for changing the PIN).

Impact of the write access protection to the keypad functions

The following keypad functions are supported irrespective of the active write access protection:

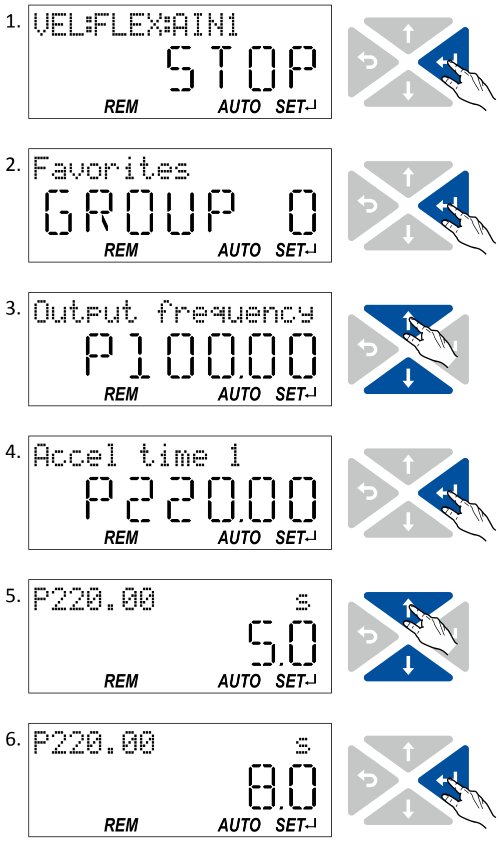
- Optical device identification 0x2021:001 (P230.01)
- Reset parameters to default 0x2022:001 (P700.01)
- Load user parameter 0x2022:004 (P700.04)
- Load OEM parameter 0x2022:005 (P700.05)

11.8 Favorites

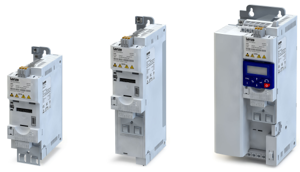
In order to gain quick access using »EASY Starter« or the keypad, frequently used parameters of the inverter can be defined as "Favorites".

- »EASY Starter« provides quick access to the "Favorites" via the *Favorites* tab.
- On the keypad, the "Favorites" can be found in group 0.

11.8.1 Accessing the "Favorites" with the keypad



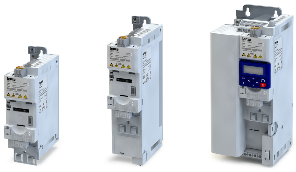
1. Use the ↵ key in the operating mode to navigate to the parameterisation mode one level below.
   You are now in the group level. All parameters of the inverter are divided into different groups according to their function.
   Group 0 contains the "Favorites".
   Note: By using the ↶ key you can navigate one level upwards again anytime.
2. Use the ↵ key to navigate to one level below.
   You are now in the parameter level of the group selected.
3. Use the ↑ and ↓ navigation keys to select the desired parameter.
4. Use the ↵ key to navigate to one level below.
   You are now in the editing mode.
5. Set the desired value using the ↑ and ↓ navigation keys.
6. Use the ↵ key to accept the changed setting.
   The editing mode is exited.
   Note: By using the ↶ key you can exit the editing mode without accepting the new setting (abort).



11.8.2 Favorites parameter list (default setting)

In the default setting, the most common parameters for the solution of typical applications are defined as "Favorites":

No.	Display code	Designation	Default setting	Setting range	Info
1	P100.00	Output frequency	x.x Hz	- (Read only)	0x2DDD (P100.00)
2	P103.00	Current actual	x.x %	- (Read only)	0x6078 (P103.00)
3	P106.00	Motor voltage	x VAC	- (Read only)	0x2D89 (P106.00)
4	P150.00	Error code	-	- (Read only)	0x603F (P150.00)
5	P200.00	Control select.	**Flexible I/O [0]**	Selection list	0x2824 (P200.00)
6	P201.01	Freq. setp. src.	**Analog input 1 [2]**	Selection list	0x2860:001 (P201.01)
7	P203.01	Start method	**Normal [0]**	Selection list	0x2838:001 (P203.01)
8	P203.03	Stop method	**Standard ramp [1]**	Selection list	0x2838:003 (P203.03)
9	P208.01	Mains voltage	**230 Veff [0]**	Selection list	0x2540:001 (P208.01)
10	P210.00	Min. frequency	**0.0 Hz**	0.0 ... 599.0 Hz	0x2915 (P210.00)
11	P211.00	Max. frequency	**50.0 Hz* | 60.0 Hz****	0.0 ... 599.0 Hz	0x2916 (P211.00)
12	P220.00	Accelerat.time 1	**5.0 s**	0.0 ... 3600.0 s	0x2917 (P220.00)
13	P221.00	Decelerat.time 1	**5.0 s**	0.0 ... 3600.0 s	0x2918 (P221.00)
14	P300.00	Motor ctrl mode	**VFC open loop [6]**	Selection list	0x2C00 (P300.00)
15	P302.00	V/f charac.shape	**Linear [0]**	Selection list	0x2B00 (P302.00)
16	P303.01	Base voltage	**230 V**	0 ... 5000 V	0x2B01:001 (P303.01)
17	P303.02	Base frequency	**50 Hz* | 60 Hz****	0 ... 1500 Hz	0x2B01:002 (P303.02)
18	P304.00	Limit. rotation	**Both rot. direct [1]**	Selection list	0x283A (P304.00)
19	P305.00	Switching freq.	**0**	Selection list	0x2939 (P305.00)
20	P306.01	Duty selection	**Heavy Duty [0]**	Selection list	0x2D43:001 (P306.01)
21	P308.01	Max.load.for 60s	**150 %**	30 ... 200 %	0x2D4B:001 (P308.01)
22	P316.01	Fixed V/f boost	**2.5 %**	0.0 ... 20.0 %	0x2B12:001 (P316.01)
23	P323.00	Motor current	**1.700 A**	0.001 ... 500.000 A	0x6075 (P323.00)
24	P324.00	Max current	**200.0 %**	0.0 ... 3000.0 %	0x6073 (P324.00)
25	P400.01	Enable inverter	**TRUE [1]**	Selection list	0x2631:001 (P400.01)
26	P400.02	Run	**Digital input 1 [11]**	Selection list	0x2631:002 (P400.02)
27	P400.03	Quick stop	**Not connected [0]**	Selection list	0x2631:003 (P400.03)
28	P400.04	Reset fault	**Digital input 2 [12]**	Selection list	0x2631:004 (P400.04)
29	P400.05	DC braking	**Not connected [0]**	Selection list	0x2631:005 (P400.05)
30	P400.06	Start forward	**Not connected [0]**	Selection list	0x2631:006 (P400.06)
31	P400.07	Start reverse	**Not connected [0]**	Selection list	0x2631:007 (P400.07)
32	P400.08	Run forward	**Not connected [0]**	Selection list	0x2631:008 (P400.08)
33	P400.09	Run reverse	**Not connected [0]**	Selection list	0x2631:009 (P400.09)
34	P400.13	Reverse rot.dir.	**Digital input 3 [13]**	Selection list	0x2631:013 (P400.13)
35	P400.18	Setp: Preset b0	**Digital input 4 [14]**	Selection list	0x2631:018 (P400.18)
36	P400.19	Setp: Preset b1	**Digital input 5 [15]**	Selection list	0x2631:019 (P400.19)
37	P400.20	Setp: Preset b2	**Not connected [0]**	Selection list	0x2631:020 (P400.20)
38	P420.01	Relay function	**Rdy for operat. [51]**	Selection list	0x2634:001 (P420.01)
39	P420.02	DO1 function	**Release brake [115]**	Selection list	0x2634:002 (P420.02)
40	P430.01	AI1 input range	**0 ... 10 VDC [0]**	Selection list	0x2636:001 (P430.01)
41	P430.02	AI1 freq @ min	**0.0 Hz**	-1000.0 ... 1000.0 Hz	0x2636:002 (P430.02)
42	P430.03	AI1 freq @ max	**50.0 Hz* | 60.0 Hz****	-1000.0 ... 1000.0 Hz	0x2636:003 (P430.03)
43	P440.01	AO1 outp. range	**0 ... 10 VDC [1]**	Selection list	0x2639:001 (P440.01)
44	P440.02	AO1 function	**Outp. frequency [1]**	Selection list	0x2639:002 (P440.02)
45	P440.03	AO1 min. signal	**0**	-2147483648 ... 2147483647	0x2639:003 (P440.03)
46	P440.04	AO1 max. signal	**1000**	-2147483648 ... 2147483647	0x2639:004 (P440.04)
47	P450.01	Freq. preset 1	**20.0 Hz**	0.0 ... 599.0 Hz	0x2911:001 (P450.01)
48	P450.02	Freq. preset 2	**40.0 Hz**	0.0 ... 599.0 Hz	0x2911:002 (P450.02)
49	P450.03	Freq. preset 3	**50.0 Hz* | 60.0 Hz****	0.0 ... 599.0 Hz	0x2911:003 (P450.03)
50	P450.04	Freq. preset 4	**0.0 Hz**	0.0 ... 599.0 Hz	0x2911:004 (P450.04)
* Device for 50-Hz mains ** Device for 60-Hz mains					Firmware version 05.00.00.00



11.8.3 Configuring the "Favorites"

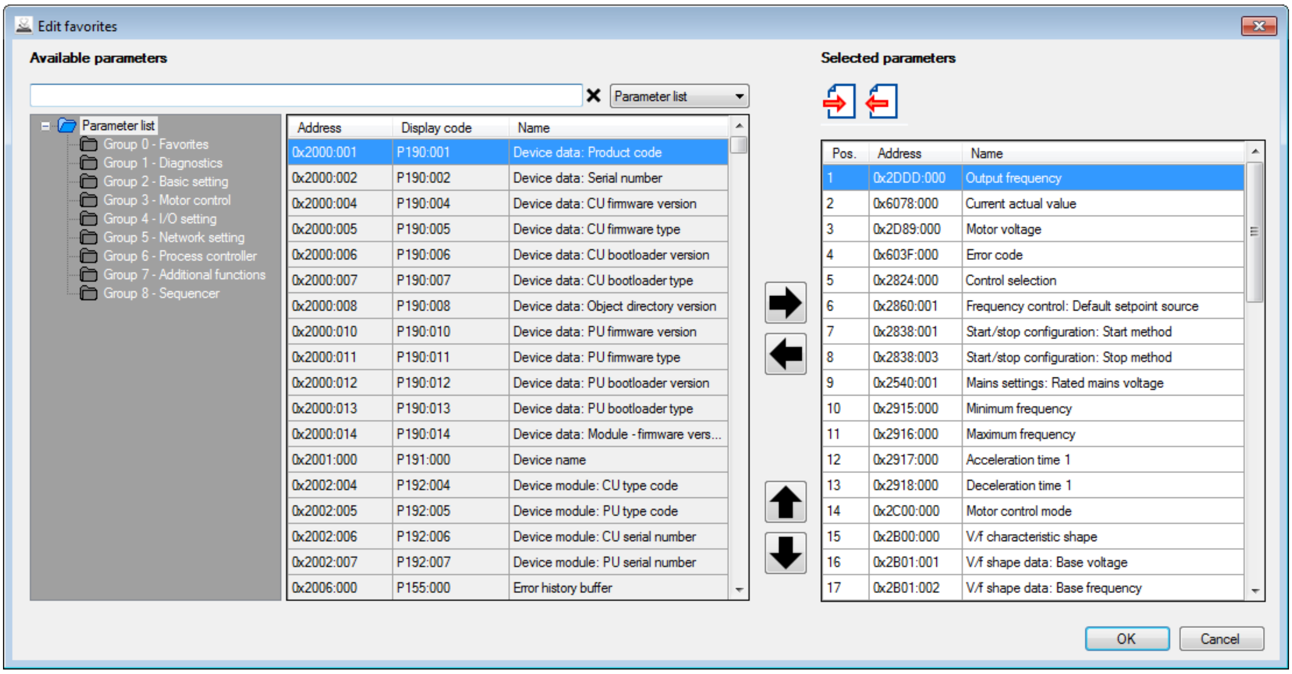
The "Favorites" can be configured by the user.

Details

A maximum number of 50 parameters can be defined as "Favorites".

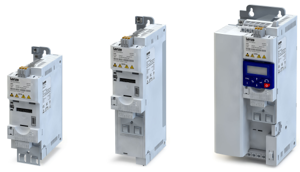
The easiest way to process the selection of the favorites is via the parameterisation dialog in the »EASY Starter«:

1. Change to the "Parameter list" tab.
2. Select group 0 - Favorites.
3. Click the button.
4. Process favorites:



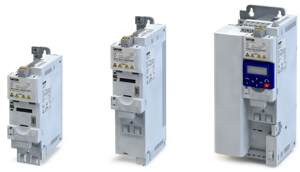
Default favorites can be changed with the keypad or via network via the following parameters:

Parameter	Name / value range / [default setting]	Info
0x261C:001 (P740.01)	Favorites settings: Parameter 1 (Favorites sett.: Parameter 1) 0x00000000 ... [**0x2DDD0000**] ... 0xFFFFFF00	Definition of the "Favorites" parameters. • Format: 0xiiiiss00 (iiii = hexadecimal index, ss = hexadecimal subindex) • The lowest byte is always 0x00. • The keypad can be used to select the desired parameter from a list.
0x261C:002 (P740.02)	Favorites settings: Parameter 2 (Favorites sett.: Parameter 2) 0x00000000 ... [**0x60780000**] ... 0xFFFFFF00	
0x261C:003 (P740.03)	Favorites settings: Parameter 3 (Favorites sett.: Parameter 3) 0x00000000 ... [**0x2D890000**] ... 0xFFFFFF00	
0x261C:004 (P740.04)	Favorites settings: Parameter 4 (Favorites sett.: Parameter 4) 0x00000000 ... [**0x603F0000**] ... 0xFFFFFF00	
0x261C:005 (P740.05)	Favorites settings: Parameter 5 (Favorites sett.: Parameter 5) 0x00000000 ... [**0x28240000**] ... 0xFFFFFF00	
0x261C:006 (P740.06)	Favorites settings: Parameter 6 (Favorites sett.: Parameter 6) 0x00000000 ... [**0x28600100**] ... 0xFFFFFF00	
0x261C:007 (P740.07)	Favorites settings: Parameter 7 (Favorites sett.: Parameter 7) 0x00000000 ... [**0x28380100**] ... 0xFFFFFF00	
0x261C:008 (P740.08)	Favorites settings: Parameter 8 (Favorites sett.: Parameter 8) 0x00000000 ... [**0x28380300**] ... 0xFFFFFF00	



Parameter	Name / value range / [default setting]	Info
0x261C:009 (P740.09)	Favorites settings: Parameter 9 (Favorites sett.: Parameter 9) 0x00000000 ... [**0x25400100**] ... 0xFFFFFF00	
0x261C:010 (P740.10)	Favorites settings: Parameter 10 (Favorites sett.: Parameter 10) 0x00000000 ... [**0x29150000**] ... 0xFFFFFF00	
0x261C:011 (P740.11)	Favorites settings: Parameter 11 (Favorites sett.: Parameter 11) 0x00000000 ... [**0x29160000**] ... 0xFFFFFF00	
0x261C:012 (P740.12)	Favorites settings: Parameter 12 (Favorites sett.: Parameter 12) 0x00000000 ... [**0x29170000**] ... 0xFFFFFF00	
0x261C:013 (P740.13)	Favorites settings: Parameter 13 (Favorites sett.: Parameter 13) 0x00000000 ... [**0x29180000**] ... 0xFFFFFF00	
0x261C:014 (P740.14)	Favorites settings: Parameter 14 (Favorites sett.: Parameter 14) 0x00000000 ... [**0x2C000000**] ... 0xFFFFFF00	
0x261C:015 (P740.15)	Favorites settings: Parameter 15 (Favorites sett.: Parameter 15) 0x00000000 ... [**0x2B000000**] ... 0xFFFFFF00	
0x261C:016 (P740.16)	Favorites settings: Parameter 16 (Favorites sett.: Parameter 16) 0x00000000 ... [**0x2B010100**] ... 0xFFFFFF00	
0x261C:017 (P740.17)	Favorites settings: Parameter 17 (Favorites sett.: Parameter 17) 0x00000000 ... [**0x2B010200**] ... 0xFFFFFF00	
0x261C:018 (P740.18)	Favorites settings: Parameter 18 (Favorites sett.: Parameter 18) 0x00000000 ... [**0x283A0000**] ... 0xFFFFFF00	
0x261C:019 (P740.19)	Favorites settings: Parameter 19 (Favorites sett.: Parameter 19) 0x00000000 ... [**0x29390000**] ... 0xFFFFFF00	
0x261C:020 (P740.20)	Favorites settings: Parameter 20 (Favorites sett.: Parameter 20) 0x00000000 ... [**0x2D430100**] ... 0xFFFFFF00	
0x261C:021 (P740.21)	Favorites settings: Parameter 21 (Favorites sett.: Parameter 21) 0x00000000 ... [**0x2D4B0100**] ... 0xFFFFFF00	
0x261C:022 (P740.22)	Favorites settings: Parameter 22 (Favorites sett.: Parameter 22) 0x00000000 ... [**0x2B120100**] ... 0xFFFFFF00	
0x261C:023 (P740.23)	Favorites settings: Parameter 23 (Favorites sett.: Parameter 23) 0x00000000 ... [**0x60750000**] ... 0xFFFFFF00	
0x261C:024 (P740.24)	Favorites settings: Parameter 24 (Favorites sett.: Parameter 24) 0x00000000 ... [**0x60730000**] ... 0xFFFFFF00	
0x261C:025 (P740.25)	Favorites settings: Parameter 25 (Favorites sett.: Parameter 25) 0x00000000 ... [**0x26310100**] ... 0xFFFFFF00	
0x261C:026 (P740.26)	Favorites settings: Parameter 26 (Favorites sett.: Parameter 26) 0x00000000 ... [**0x26310200**] ... 0xFFFFFF00	
0x261C:027 (P740.27)	Favorites settings: Parameter 27 (Favorites sett.: Parameter 27) 0x00000000 ... [**0x26310300**] ... 0xFFFFFF00	
0x261C:028 (P740.28)	Favorites settings: Parameter 28 (Favorites sett.: Parameter 28) 0x00000000 ... [**0x26310400**] ... 0xFFFFFF00	
0x261C:029 (P740.29)	Favorites settings: Parameter 29 (Favorites sett.: Parameter 29) 0x00000000 ... [**0x26310500**] ... 0xFFFFFF00	

Parameter	Name / value range / [default setting]	Info
0x261C:030 (P740.30)	Favorites settings: Parameter 30 (Favorites sett.: Parameter 30) 0x00000000 ... [**0x26310600**] ... 0xFFFFFF00	
0x261C:031 (P740.31)	Favorites settings: Parameter 31 (Favorites sett.: Parameter 31) 0x00000000 ... [**0x26310700**] ... 0xFFFFFF00	
0x261C:032 (P740.32)	Favorites settings: Parameter 32 (Favorites sett.: Parameter 32) 0x00000000 ... [**0x26310800**] ... 0xFFFFFF00	
0x261C:033 (P740.33)	Favorites settings: Parameter 33 (Favorites sett.: Parameter 33) 0x00000000 ... [**0x26310900**] ... 0xFFFFFF00	
0x261C:034 (P740.34)	Favorites settings: Parameter 34 (Favorites sett.: Parameter 34) 0x00000000 ... [**0x26310D00**] ... 0xFFFFFF00	
0x261C:035 (P740.35)	Favorites settings: Parameter 35 (Favorites sett.: Parameter 35) 0x00000000 ... [**0x26311200**] ... 0xFFFFFF00	
0x261C:036 (P740.36)	Favorites settings: Parameter 36 (Favorites sett.: Parameter 36) 0x00000000 ... [**0x26311300**] ... 0xFFFFFF00	
0x261C:037 (P740.37)	Favorites settings: Parameter 37 (Favorites sett.: Parameter 37) 0x00000000 ... [**0x26311400**] ... 0xFFFFFF00	
0x261C:038 (P740.38)	Favorites settings: Parameter 38 (Favorites sett.: Parameter 38) 0x00000000 ... [**0x26340100**] ... 0xFFFFFF00	
0x261C:039 (P740.39)	Favorites settings: Parameter 39 (Favorites sett.: Parameter 39) 0x00000000 ... [**0x26340200**] ... 0xFFFFFF00	
0x261C:040 (P740.40)	Favorites settings: Parameter 40 (Favorites sett.: Parameter 40) 0x00000000 ... [**0x26360100**] ... 0xFFFFFF00	
0x261C:041 (P740.41)	Favorites settings: Parameter 41 (Favorites sett.: Parameter 41) 0x00000000 ... [**0x26360200**] ... 0xFFFFFF00	
0x261C:042 (P740.42)	Favorites settings: Parameter 42 (Favorites sett.: Parameter 42) 0x00000000 ... [**0x26360300**] ... 0xFFFFFF00	
0x261C:043 (P740.43)	Favorites settings: Parameter 43 (Favorites sett.: Parameter 43) 0x00000000 ... [**0x26390100**] ... 0xFFFFFF00	
0x261C:044 (P740.44)	Favorites settings: Parameter 44 (Favorites sett.: Parameter 44) 0x00000000 ... [**0x26390200**] ... 0xFFFFFF00	
0x261C:045 (P740.45)	Favorites settings: Parameter 45 (Favorites sett.: Parameter 45) 0x00000000 ... [**0x26390300**] ... 0xFFFFFF00	
0x261C:046 (P740.46)	Favorites settings: Parameter 46 (Favorites sett.: Parameter 46) 0x00000000 ... [**0x26390400**] ... 0xFFFFFF00	
0x261C:047 (P740.47)	Favorites settings: Parameter 47 (Favorites sett.: Parameter 47) 0x00000000 ... [**0x29110100**] ... 0xFFFFFF00	
0x261C:048 (P740.48)	Favorites settings: Parameter 48 (Favorites sett.: Parameter 48) 0x00000000 ... [**0x29110200**] ... 0xFFFFFF00	
0x261C:049 (P740.49)	Favorites settings: Parameter 49 (Favorites sett.: Parameter 49) 0x00000000 ... [**0x29110300**] ... 0xFFFFFF00	
0x261C:050 (P740.50)	Favorites settings: Parameter 50 (Favorites sett.: Parameter 50) 0x00000000 ... [**0x29110400**] ... 0xFFFFFF00	



11.9 Parameter change-over

For up to 32 freely selectable parameters, this function provides a change-over between four sets with different parameter values.

⚠ DANGER!

Changed parameter settings are effective immediately.

The possible consequence is an unexpected response of the motor shaft while the inverter is enabled.

- ▶ If possible, only carry out parameter changes while the inverter is disabled.
- ▶ Certain device commands or settings which might cause a critical state of the drive behaviour can generally only be carried our when the inverter is inhibited.

Details

The parameter list is compiled in the same way as that of the "Favorites" via configuration. »EASY Starter« provides a user-friendly parameterisation dialog for this purpose.

Change-over to another value set can optionally be effected via corresponding device commands and/or special functions/triggers:

▶ Device commands for parameter change-over 📖 421

▶ Functions for parameter change-over 📖 579

Parameter	Name / value range / [default setting]	Info
0x2022:011 (P700.11)	Device commands: Save parameter set 1 (Device commands: Save par. set 1) • For further possible settings, see parameter 0x2022:001 (P700.01). 📖 418 **0** **Off / ready**	1 = save value set 1 of the "Parameter change-over" function. • When the device command has been executed successfully, the value 0 is shown.
0x2022:012 (P700.12)	Device commands: Save parameter set 2 (Device commands: Save par. set 2) • For further possible settings, see parameter 0x2022:001 (P700.01). 📖 418 **0** **Off / ready**	1 = save value set 2 of the "Parameter change-over" function. • When the device command has been executed successfully, the value 0 is shown.
0x2022:013 (P700.13)	Device commands: Save parameter set 3 (Device commands: Save par. set 3) • For further possible settings, see parameter 0x2022:001 (P700.01). 📖 418 **0** **Off / ready**	1 = save value set 3 of the "Parameter change-over" function. • When the device command has been executed successfully, the value 0 is shown.
0x2022:014 (P700.14)	Device commands: Save parameter set 4 (Device commands: Save par. set 4) • For further possible settings, see parameter 0x2022:001 (P700.01). 📖 418 **0** **Off / ready**	
0x4041:001 ... 0x4041:032 (P750.01 ... 32)	Parameter change-over: Parameter 1 ... Parameter 32 (Param.set setup: Parameter 1 ... Parameter 32) 0x00000000 ... [**0x00000000**] ... 0xFFFFFF00	Definition of the parameter list for the "Parameter change-over" function. • Format: 0xiiiiss00 (iiii = hexadecimal index, ss = hexadecimal subindex) • The lowest byte is always 0x00.
0x4042:001 ... 0x4042:032 (P751.01 ... 32)	Parameter value set 1: Value of parameter 1 ... Value of parameter 32 (Par. value set 1: Set 1 - Value 1 ... Set 1 - Value 32) -2147483648 ... [**0**] ... 2147483647	Value set 1 for the parameter list defined in 0x4041:001 ... 0x4041:032 (P750.01 ... 32).
0x4043:001 ... 0x4043:032 (P752.01 ... 32)	Parameter value set 2: Value of parameter 1 ... Value of parameter 32 (Par. value set 2: Set 2 - Value 1 ... Set 2 - Value 32) -2147483648 ... [**0**] ... 2147483647	Value set 2 for the parameter list defined in 0x4041:001 ... 0x4041:032 (P750.01 ... 32).
0x4044:001 ... 0x4044:032 (P753.01 ... 32)	Parameter value set 3: Value of parameter 1 ... Value of parameter 32 (Par. value set 3: Set 3 - Value 1 ... Set 3 - Value 32) -2147483648 ... [**0**] ... 2147483647	Value set 3 for the parameter list defined in 0x4041:001 ... 0x4041:032 (P750.01 ... 32).

Parameter	Name / value range / [default setting]		Info
0x4045:001 ... 0x4045:032 (P754.01 ... 32)	Parameter value set 4: Value of parameter 1 ... Value of parameter 32 (Par. value set 4: Set 4 - Value 1 ... Set 4 - Value 32) -2147483648 ... [**0**] ... 2147483647		Value set 4 for the parameter list defined in 0x4041:001 ... 0x4041:032 (P750.01 ... 32).
0x4046 (P755.00)	Activation of parameter set (PSet activation)		Selection of the activation method for the parameter change-over. • If the selection is changed from "Via command... [0]/[1]" to "If the selection is changed...[2]/[3]" after switch-on, the parameter set selected via the functions "Select parameter set (bit 0)" and "Select parameter set (bit 1)" is activated immediately. In case of selection [2], however, this only takes place if the inverter is disabled, the motor is stopped or an error is active.
	0	**Via command (disable required)**	The parameter set selected via the functions "Select parameter set (bit 0)" and "Select parameter set (bit 1)" is activated if the trigger assigned to the "Load parameter set" function in 0x2631:040 (P400.40) provides a FALSE-TRUE edge AND the inverter is inhibited, the motor is stopped or an error is active.
	1	Via command (immediately)	The parameter set selected via the functions "Select parameter set (bit 0)" and "Select parameter set (bit 1)" is immediately activated if the trigger assigned to the "Load parameter set" function in 0x2631:040 (P400.40) provides a FALSE-TRUE edge.
	2	If the selection is changed (disable required)	The parameter set selected via the functions "Select parameter set (bit 0)" and "Select parameter set (bit 1)" is activated if the state of these selection bits changes AND the inverter is inhibited, the motor is stopped or an error is active.
	3	If the selection is changed (immediately)	The parameter set selected via the functions "Select parameter set (bit 0)" and "Select parameter set (bit 1)" is activated immediately if the state of these selection bits is changed.
0x4047:001 (P756.01)	Parameter change-over error message: Status (PSet error msg.: Status) • Read only		Error message for the "parameter change-over" function. • In the event of an error, an error status is shown here, and in 0x4047:002 (P756.02) the number of the list entry in which the error has occurred is displayed (in connection with the value set selected). • If several errors occur at the same time, only the first incorrect list entry will be displayed. Hence, after elimination of the displayed error and repeated activation, more errors may be displayed. • The parameter list will always be processed from beginning to end, even if errors occur in the meantime.
	0	No fault	
	33803	Invalid data type	
	33804	Range violation	
	33806	Invalid index	
	33813	No element selected	
	33815	Writing impermissible	
	33816	Device not inhibited	
	33829	Invalid subindex	
	33837	Access impermissible	
	33860	Parameter not mappable	
	33865	No subindexes	
	33876	Parameter not changeable	
0x4047:002 (P756.02)	Parameter change-over error message: List entry (PSet error msg.: List entry) • Read only		Error message for the "Parameter set changeover" function. • In the event of an error, the number of the list entry for which the error displayed in 0x4047:001 (P756.01) has occurred is shown here.
0x2631:040 (P400.40)	Function list: Load parameter set (Function list: Load param.set) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532		Assignment of a trigger for the "Load parameter set" function. Trigger = FALSE-TRUE edge: parameter change-over to the value set selected via "Select parameter set (bit 0)" and "Select parameter set (bit 1)". Trigger = FALSE: no action. Notes: • The activation method for the "Parameter change-over" function can be selected in 0x4046 (P755.00).
	0	**Not connected**	
0x2631:041 (P400.41)	Function list: Select parameter set (bit 0) (Function list: Sel. paramset b0) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532		Assignment of a trigger for the "Select parameter set (bit 0)" function. Selection bit with the valency 2^0 for "Parameter change-over" function. Trigger = FALSE: selection bit = "0". Trigger = TRUE: selection bit = "1".
	0	**Not connected**	

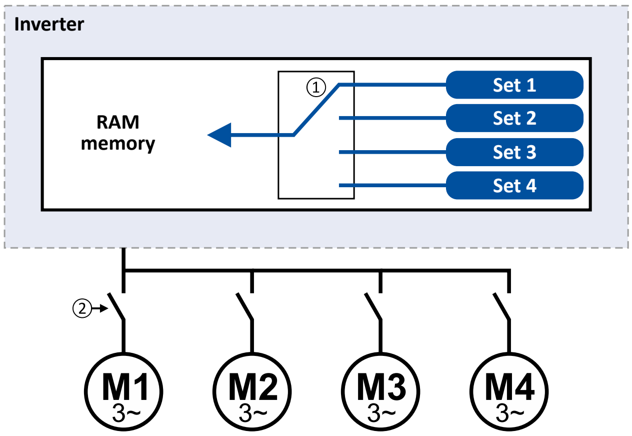
Parameter	Name / value range / [default setting]	Info
0x2631:042 (P400.42)	Function list: Select parameter set (bit 1) (Function list: Sel. paramset b1) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x2631:001 (P400.01). 532	Assignment of a trigger for the "Select parameter set (bit 1)" function. Selection bit with the valency 2^1 for "Parameter change-over" function. Trigger = FALSE: selection bit = "0". Trigger = TRUE: selection bit = "1".
	0 **Not connected**	

11.9.1 Example: Selective control of several motors with one inverter

A typical application for the parameter change-over is an application/machine in which several axes must be triggered successively but a simultaneous operation of several motors is not required. In this case, one and the same inverter can trigger the motors in succession. Advantages of this solution are the reduced amount of components (inverters) and thus a reduced energy consumption.

Principle:

- The motor to be currently controlled is connected to the inverter via motor contactors. (The contactor system can, for instance, be controlled via the digital outputs of the inverter.)
- At the same time, the motor and control settings suitable for motor are activated in the inverter by means of parameter change-over. ▶ Functions for parameter change-over 579

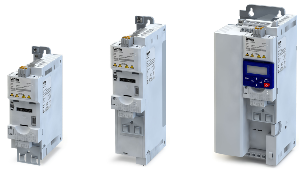


① Motor data change-over (via the "parameter change-over" function)

② Motor change-over (e.g. via motor contactors)

The following table lists all parameters that require different settings for the four motors:

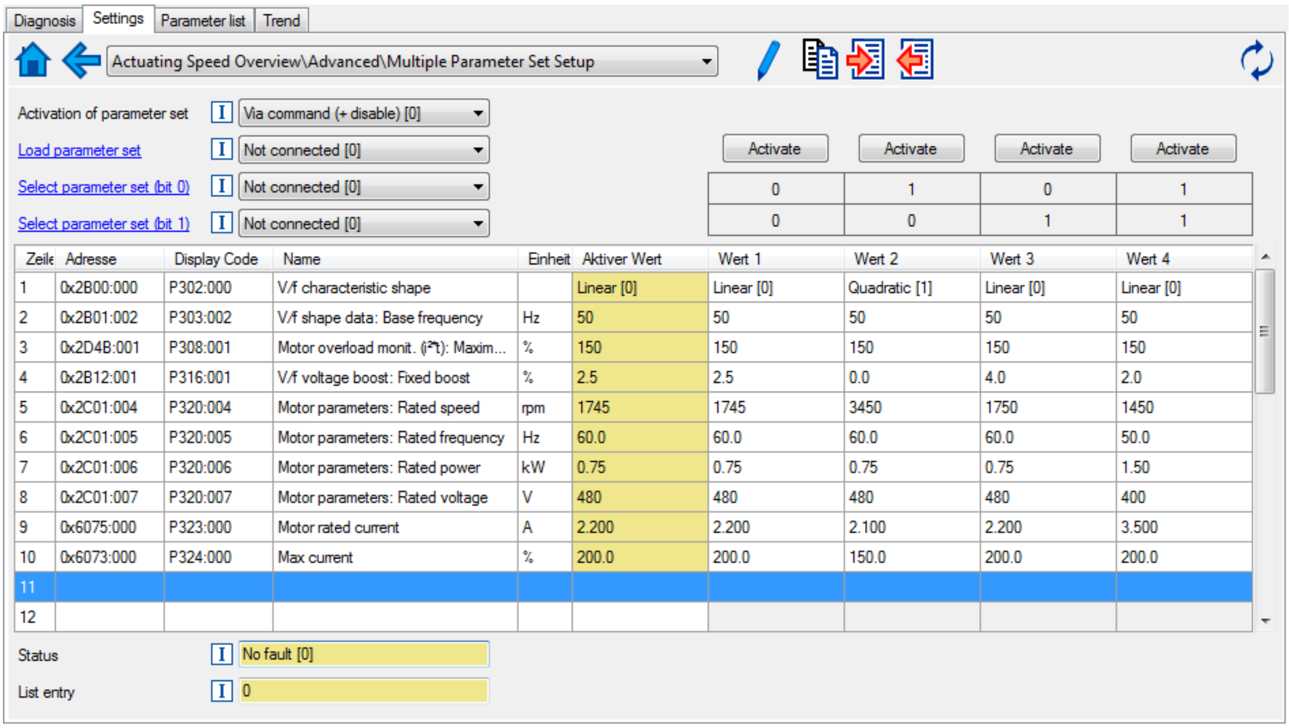
#	Parameter	Name	Setting			
			M1	M2	M3	M4
1	0x2B00 (P302.00)	V/f characteristic shape	Linear [0]	Square-law [1]	Linear [0]	Linear [0]
2	0x2B01:002 (P303.02)	Base frequency	60 Hz	60 Hz	60 Hz	50 Hz
3	0x2D4B:001 (P308.01)	Maximum utilisation [60 s]	150 %	120 %	150 %	150 %
4	0x2B12:001 (P316.01)	Fixed boost	2.5 %	0.0 %	4.0 %	2.0 %
5	0x2C01:004 (P320.04)	Rated speed	1745	3450	1750	1450
6	0x2C01:005 (P320.05)	Rated frequency	60.0 Hz	60.0 Hz	60.0 Hz	50.0 Hz
7	0x2C01:006 (P320.06)	Rated power	0.75 kW	0.75 kW	0.75 kW	1.50 kW
8	0x2C01:007 (P320.07)	Rated voltage	480 V	480 V	480 V	400 V
9	0x6075 (P323.00)	Motor rated current	2,200 A	2,100 A	2,200 A	3,500 A
10	0x6073 (P324.00)	Max current	200.0 %	150.0 %	200.0 %	200.0 %



Settings required for the "parameter change-over" function

The easiest way to make the required settings is via the parameterisation dialog in the »EASY Starter«:

1. Click the button to first select the 10 relevant parameters.
2. Set values for motor M1 ... M4 in the corresponding fields:



In case of a direct setting in the parameters of the "parameter change-over" function:

- The addresses must be set with the following format: 0xiiiiss00 (iiii = index hexadecimal, ss = subindex hexadecimal). The keypad serves to select the desired parameter from a list.
- The values for the motors must be set as integer values. The integer value results from the multiplication of the actual setting value by the factor of the respective parameter. In the , the factor for each parameter must be given.

The following table shows the required settings:

#	Address 0x4041:x (PAR 750/x)		Name	Value 1 0x4042:x (PAR 752/x)	Value 2 0x4043:x (PAR 753/x)	Value 3 0x4044:x (PAR 754/x)	Value 4 0x4045:x (PAR 755/x)
	hex	decimal					
1	0x2B000000	721420288	V/f characteristic shape	0	1	0	0
2	0x2B010200	721486336	Base frequency	60	60	60	50
3	0x2D4B0100	759890176	Maximum utilisation [60 s]	150	120	150	150
4	0x2B120100	722600192	Fixed boost	25	0	40	20
5	0x2C010400	738264064	Rated speed	1745	3450	1750	1450
6	0x2C010500	738264320	Rated frequency	600	600	600	500
7	0x2C010600	738264576	Rated power	75	75	75	150
8	0x2C010700	738264832	Rated voltage	480	480	480	400
9	0x60750000	1618280448	Motor rated current	2200	2100	2200	3500
10	0x60730000	1618149376	Max current	2000	1500	2000	2000

11.10 Device profile CiA 402

The CiA® 402 device profile defines the functional behaviour of stepping motors, servo drives, and frequency inverters. In order to be able to describe the different drive types, various operating modes and device parameters are specified in the device profile. Each operating mode provides objects (e.g. for the setpoint speed, acceleration and deceleration) to generate the desired drive behaviour.

Details

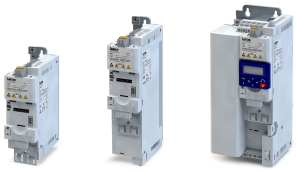
The CiA 402 operating mode "CiA: Velocity mode" is activated by the setting 0x6060 (P301.00) = "CiA: Velocity mode [2]".

More details can be found in the CiA 402 specification (CANopen device profile for drives and Motion Control) of the CAN in Automation (CiA) user organisation.
http://www.can-cia.org

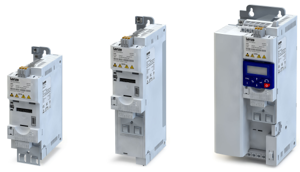
CiA® is a registered community trademark of the CAN in Automation e. V user organisation.

Parameter	Name / value range / [default setting]	Info
0x6042 (P781.00)	Target velocity (Target velocity) -32768 ... [**0**] ... 32767 rpm	Setpoint speed (velocity mode).
0x6043 (P782.00)	Velocity demand (Velocity demand) • Read only: x rpm	Display of the setpoint velocity (velocity mode).
0x6044 (P783.00)	Velocity actual value (Velocity actual) • Read only: x rpm	Display of the actual speed (velocity mode).
0x6046:001 (P784.01)	Velocity min max amount: Velocity min amount (Vel. min max: Vel. min amount) 0 ... [**0**] ... 480000 rpm	Minimum speed (velocity mode).
0x6046:002 (P784.02)	Velocity min max amount: Velocity max amount (Vel. min max: Vel. max amount) 0 ... [**2147483647**] ... 2147483647 rpm	Maximum speed (velocity mode).
0x6048:001 (P785.01)	Velocity acceleration: Delta speed (Vel.acceleration: Delta speed) 0 ... [**3000**] ... 2147483647 rpm	Acceleration: speed interval
0x6048:002 (P785.02)	Velocity acceleration: Delta time (Vel.acceleration: Delta time) 0 ... [**10**] ... 65535 s	Acceleration: time interval
0x6049:001 (P786.01)	Velocity deceleration: Delta speed (Vel.deceleration: Delta speed) 0 ... [**3000**] ... 2147483647 rpm	Deceleration: speed interval
0x6049:002 (P786.02)	Velocity deceleration: Delta time (Vel.deceleration: Delta time) 0 ... [**10**] ... 65535 s	Deceleration: time interval
0x605A	Quick stop option code	Device status after exiting the quick stop ramp. • Setting is only effective in the operating mode 0x6060 (P301.00) = "CiA: Velocity mode [2]".
	2 **Quick stop ramp -> switch-on inhibited**	Automatic change to the "Switch-on inhibited" device state. • The "Quick stop active [54]" status is reset to FALSE after ramp-down to standstill.
	6 Quick stop ramp -> quick stop active	The inverter remains in the "Quick stop active" device state. • The "Quick stop active [54]" status remains TRUE until the "Quick stop" function is activated.

Parameter	Name / value range / [default setting]		Info
0x605E (P791.00)	Fault reaction option code (Fault reaction)		Selection of the response to faults.
	-2	DC braking	The motor is brought to a standstill by means of the "DC braking" function. ▸ DC braking 📖 437
	0	**Coasting**	The motor becomes torqueless (coasts down to standstill).
	2	Quick stop	The motor is brought to a standstill with the "quick stop" function. • In the operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]", the deceleration time set in 0x291C (P225.00) is effective. • In the operating mode 0x6060 (P301.00) = "CiA: Velocity mode [2]", the speed change set in 0x6085 (P790.00) is effective.
0x6060 (P301.00)	Modes of operation (Modes of op.) • Setting can only be changed if the inverter is inhibited.		Selection of the operating mode.
	-2	**MS: Velocity mode**	Vendor specific velocity mode
	-1	MS: Torque mode (from version 03.00)	Vendor specific torque mode • Only possible in motor control type 0x2C00 (P300.00) = "Sensorless vector control (SLVC) [4]" or "Servo control (SC ASM) [2]". ▸ Torque control w/ freq. limit 📖 206
	0	No mode change/no mode assigned	No operating mode (standstill)
	2	CiA: Velocity mode	CiA 402 velocity mode
0x6061 (P788.00)	Modes of operation display (Modes of op. dis) • Read only		Display of the current operating mode.
	-2	MS: Velocity mode	Vendor specific velocity mode
	-1	MS: Torque mode (from version 03.00)	Vendor specific torque mode
	0	No mode change/no mode assigned	No operating mode (standstill)
	2	CiA: Velocity mode	CiA 402 velocity mode
0x6071	Target torque -3276.8 ... [**0.0**] ... 3276.7 %		Setpoint torque for the "MS: Torque mode" operating mode. • 100 % ≡ Motor rated torque 0x6076 (P325.00)
0x6074	Torque demand value • Read only: x.x % • From version 02.00		Display of the setpoint torque in the "MS: Torque mode" operating mode. • 100 % ≡ Motor rated torque 0x6076 (P325.00)
0x6079	DC link circuit voltage • Read only: x.xxx V • From version 02.00		Display of the current DC-bus voltage.
0x6085 (P790.00)	Quick stop deceleration (Quick stop dec.) 0 ... [**546000**] ... 2147483647 pos. unit/s²		Change in velocity used for deceleration to a standstill if quick stop is activated. • Setting is only effective in the operating mode 0x6060 (P301.00) = "CiA: Velocity mode [2]". • In operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]", the deceleration time set in 0x291C (P225.00) is effective. 0x6085 = ((initial speed of the motor [rpm]) / (duration of the ramp until standstill [s])) * 1092
0x6502 (P789.00)	Supported drive modes (Supported modes) • Read only		Bit-coded display of the operating modes supported.
	Bit 0	Reserved	-
	Bit 1	CiA: Velocity mode	1 ≡ CiA 402 velocity mode is supported.
	Bit 2	Reserved	-
	Bit 3	Reserved	
	Bit 5	Reserved	
	Bit 6	Reserved	
	Bit 7	Cyclic sync position mode	Always 0 (not supported).
	Bit 8	Cyclic sync velocity mode	
	Bit 9	Cyclic sync torque mode	
	Bit 17	MS: Velocity mode	1 ≡ vendor specific velocity mode is supported.



Parameter	Name / value range / [default setting]		Info
0x6040	CiA: Controlword 0 ... [**0**] ... 65535		Mappable CiA 402 control word with bit assignment according to device profile CiA 402.
	Bit 0	Switch on	1 = switch-on
	Bit 1	Enable voltage	1 = DC bus: Establish readiness for operation
	Bit 2	Quick stop	0 = activate quick stop
	Bit 3	Enable operation	1 = enable operation
	Bit 4	Operation mode specific	Bits are not supported.
	Bit 5	Operation mode specific	
	Bit 6	Operation mode specific	
	Bit 7	Fault reset	0-1 edge = reset error
	Bit 8	Halt (from version 04.00)	1 = stop motor (ramping down to frequency setpoint 0 Hz)
	Bit 9	Operation mode specific	Operating mode dependent
	Bit 14	Release holding brake	1 = releasing holding brake manually ⚠ CAUTION! • The manually triggered "Release holding brake" command has a direct impact on the "Release holding brake [115]" trigger. Thus, the holding brake can be manually released if the power section is switched off. • The responsibility for a manual release of the holding brake has the external trigger source for the "Release holding brake" command. ▸ Holding brake control 📖 472
0x6041 (P780.00)	CiA: Statusword (CiA: Statusword) • Read only		Mappable CiA 402 status word with bit assignment according to device profile CiA 402.
	Bit 0	Ready to switch on	1 ≡ drive ready to start
	Bit 1	Switched on	1 ≡ drive switched-on
	Bit 2	Operation enabled	1 ≡ operation enabled
	Bit 3	Fault	1 ≡ fault or trouble active
	Bit 4	Voltage enabled	1 ≡ DC bus ready for operation
	Bit 5	Quick stop	0 ≡ quick stop active
	Bit 6	Switch on disabled	1 ≡ operation inhibited
	Bit 7	Warning	1 ≡ warning active
	Bit 8	RPDOs deactivated	1 ≡ cyclic PDOs have been deactivated.
	Bit 9	Remote	1 ≡ inverter can receive commands via network. • Bit is not set in the operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]".
	Bit 10	Target reached	1 ≡ the actual position is in the window.
	Bit 11	Internal limit active	1 ≡ internal limitation of a setpoint active.
	Bit 14	Holding brake released	1 ≡ holding brake released
	Bit 15	Safe torque off (STO) not active	0 ≡ STO active 1 ≡ STO not active



11.11 Holding brake control

This function serves as a low-wear control of a holding brake. The holding is usually mounted to the motor as an option. The holding brake can be automatically released via the start command for the inverter or manually via an external control signal, for instance, by a higher-level Controller. The interaction of higher-level Controller and holding brake is especially important for vertical applications. Horizontal applications need a less demanding holding brake control.

Preconditions

- Observe that the holding brake is an important element of the machine's safety concept as a whole. Therefore be sure to carry out commissioning of this system part with particular care!
- Holding brakes are not intended for braking during operation. The increased wear caused by braking during operation may destroy the holding brake prematurely!
- The holding brake control itself only outputs a digital trigger for releasing the holding brake. This trigger "Release holding brake [115]" must be assigned to a digital output or, in the simplest case, to the relay when then switches the brake supply. ▸ Configuration of digital outputs 🕮 603
- If the holding brake is to be controlled via a digital output, the use of an additional relay or power contactor is required. The digital output is not suited for direct control of a holding brake.
- If, instead of an electrically releasing (self-holding) holding brake, an electrically holding (self-releasing) holding brake is to be controlled, a signal inversion for the digital output used or for the relay is to be set! ▸ Configuration of digital outputs 🕮 603

Parameter	Name / value range / [default setting]	Info
0x2634:001 (P420.01)	Digital outputs function: Relay (Dig.out.function: Relay function) • For further possible settings, see parameter 0x2634:001 (P420.01). 🕮 603	Assignment of a trigger to the relay. Trigger = FALSE: X9/NO-COM open and NC-COM closed. Trigger = TRUE: X9/NO-COM closed and NC-COM open. Notes: • An inversion set in 0x2635:001 (P421.01)is taken into consideration here.
	51 **Ready for operation**	TRUE if inverter is ready for operation (no error active, no STO active and DC-bus voltage ok). Otherwise FALSE.

11.11.1 Basic setting

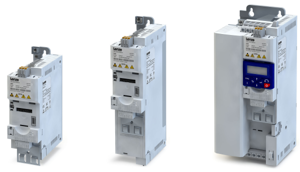
The following parameters must be set for the activation and basic setting of the holding brake control.

When a power contactor is used, the response time and release time of the contactor are added to the brake application and release time. Both times must also be taken into consideration for parameterising the brake application time and brake opening time!

Parameter	Name / value range / [default setting]		Info
0x2820:001 (P712.01)	Holding brake control: Brake mode (Brake control: Brake mode)		Selecting how the "Release holding brake" command is to be triggered.
	0	Automatically (via device state)	"Automatic operation": The "Release holding brake" command is automatically carried out as a function of the device state and further conditions. ⚠ CAUTION! Also in the automatic operation, a manual release of the holding brake is possible! For details see the following information for selection "Manually [1]".
	1	Manually	The "Release holding brake" command can also be initiated by the following external triggers: • Via the trigger assigned to the "Release holding brake" function in 0x2631:049 (P400.49) if the network control is not active. • Via bit 14 in the CiA 402 control word 0x6040 if the network control is active. ⚠ CAUTION! • The manually triggered "Release holding brake" command has a direct impact on the "Release holding brake [115]" trigger. Thus, the holding brake can be manually released if the power section is switched off! • The responsibility for a manual release of the holding brake has the external trigger source for the "Release holding brake" command!
	2	**Off**	The holding brake is deactivated.
0x2820:002 (P712.02)	Holding brake control: Brake closing time (Brake control: Closing time) 0 ... [**100**] ... 10000 ms		Application time (engagement time) of the holding brake. • Only effective in automatic operation.
0x2820:003 (P712.03)	Holding brake control: Brake opening time (Brake control: Opening time) 0 ... [**100**] ... 10000 ms		Release time (disengagement time) of the holding brake. • Only effective in automatic operation.
0x2820:015 (P712.15)	Holding brake control: Brake status (Brake control: Brake status) • Read only		Display of the holding brake status. • The status is also displayed via bit 14 in the CiA: Statusword 0x6041 (P780.00).
	0	Active	Holding brake is applied.
	1	Brake released	Holding brake is released.

For examples and details on more possible settings, see the following subchapter:

- "Automatic" brake mode (automatic operation) 📖 474
- Brake holding load 📖 476
- Brake closing level 📖 478
- Manual release of the holding brake 📖 480



11.11.2 "Automatic" brake mode (automatic operation)

In automatic operation, the inverter automatically released the holding brake when the motor is started. In the stopped state, the holding brake is closed.

⚠ DANGER!

Manual release of the holding brake

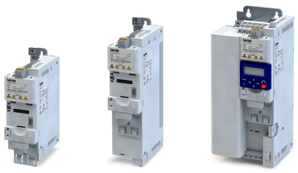
Also in automatic operation, a manual release of the holding brake is possible. The manually triggered "Release holding brake" command has a direct impact on the "Release holding brake [115]" trigger. Thus, the holding brake can be manually released if the power section is switched off.

- ▶ The responsibility for a manual release of the holding brake has the external trigger source for the "Release holding brake" command!

Preconditions

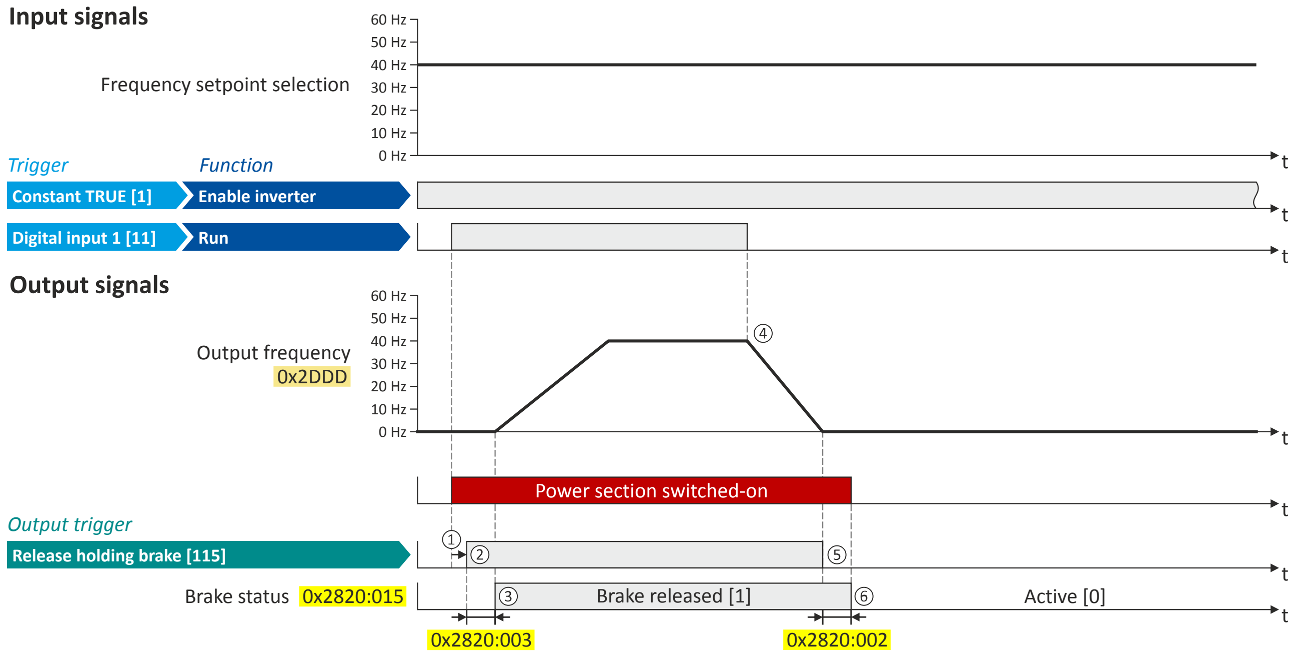
Automatic operation is only available if the operating mode "MS: Velocity mode [-2]" or "MS: Torque mode [-1]" is set in 0x6060 (P301.00).

Parameter	Name / value range / [default setting]		Info
0x6060 (P301.00)	Modes of operation (Modes of op.) • Setting can only be changed if the inverter is inhibited.		Selection of the operating mode.
	-2	**MS: Velocity mode**	Vendor specific velocity mode
	-1	MS: Torque mode (from version 03.00)	Vendor specific torque mode • Only possible in motor control type 0x2C00 (P300.00) = "Sensorless vector control (SLVC) [4]" or "Servo control (SC ASM) [2]". ▶ Torque control w/ freq. limit 📖 206
	0	No mode change/no mode assigned	No operating mode (standstill)
	2	CiA: Velocity mode	CiA 402 velocity mode



General mode of operation

The following diagram demonstrates the general functioning of the automatic operation:



① If the inverter is enabled and no error is active, the motor can be started with the "Run" function in forward rotating direction. The power section is switched on and the motor is magnetised first.

② The holding brake is released. For this purpose, the output trigger "Release holding brake [115]" is set to TRUE. This trigger must be assigned to a digital output or, in the simplest case, to the relay which then switches the brake supply.

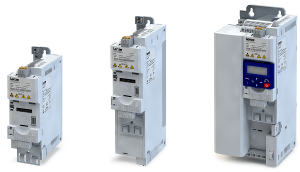
③ After the release time 0x2820:003 (P712.03) has elapsed, the motor is accelerated to the setpoint. The brake status "Brake released [1]" is displayed in 0x2820:015 (P712.15).

④ If "Run" is set to FALSE, the motor is stopped with the stop method set in 0x2838:003 (P203.03). In the example: Stop with standard ramp.

⑤ Then the holding brake is closed again.

⑥ After the closing time 0x2820:002 (P712.02) has elapsed, the brake status "Active [0]" is displayed in 0x2820:015 (P712.15).

ℹ If the power section is disabled, the holding brake is closed. Reasons for this can be an error, a fault, or the activation of the "Safe torque off (STO)" safety function.



11.11.3 Brake holding load

Depending on the application, a torque at the motor may be required at speed "0" of the motor shaft:

- In order to hold loads in vertical applications and prevent "sagging".
- In order to prevent a position loss in horizontal applications.

For this purpose, a brake holding load can be set. The brake holding load can be optionally generated via a ramp to reduce a vibration stimulation that may be caused by the brake holding load.

Preconditions

Ensure that the inverter builds up a sufficient torque in the motor when releasing and applying the holding, in order to hold the load.

- For this purpose, a V/f voltage boost can be set for the V/f characteristic control. ▸ V/f voltage boost 📖 183
- The parameters for the V/f voltage boost are automatically set when you carry out an automatic identification of the motor.

Details

Relevant parameters:

- 0x2820:008 (P712.08): Brake holding load
- 0x2820:013 (P712.13): Holding load ramptime

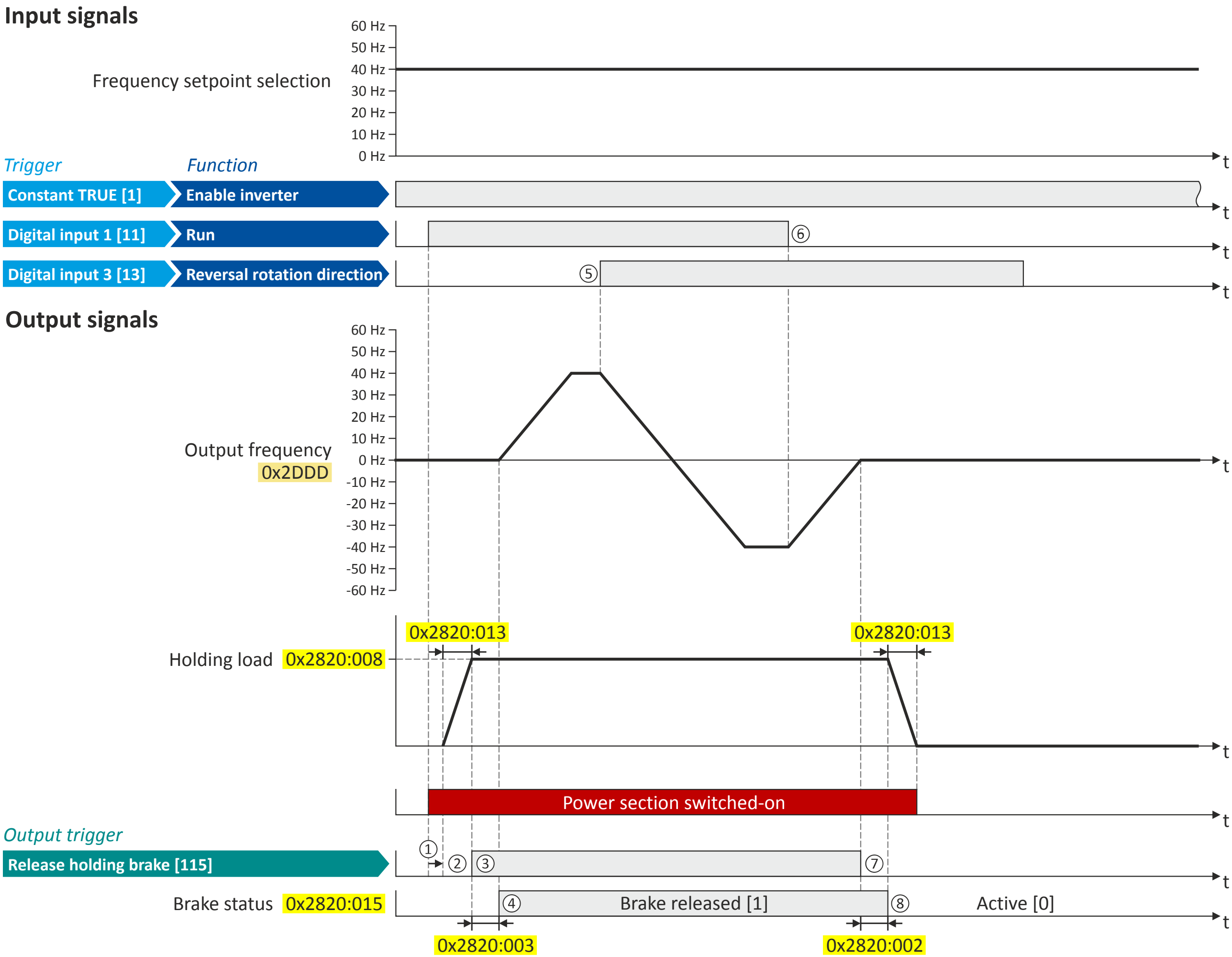
Setting notes:

- In case of applications with constant load, a constant value is suitable for the brake holding load.
- If the load constantly changes, a approximate value for the brake holding load has to be considered.
- Start with the setting "0 %" if you do not know the correct direction, otherwise with, for instance, "30 %". Afterwards change the setting upwards or downwards in 10-% steps.

Parameter	Name / value range / [default setting]	Info
0x2820:008 (P712.08)	Holding brake control: Brake holding load (Brake control: Holding load) -500.0 ... [**0.0**] ... 500.0 %	By setting a holding load, the load can be held against the force of gravity in case of vertical applications, and a position loss can be prevented in case of horizontal applications. • The setting of "100 %" approximately corresponds to rated motor torque and slip frequency. Note! The torque for creating the holding load depends on the selected motor control type and its settings. Before using this function, make sure that you have set the motor control type correctly.
0x2820:013 (P712.13)	Holding brake control: Holding load ramptime (Brake control: HoldLoad ramptim) 0 ... [**0**] ... 100 ms • From version 03.00	By setting a ramp time, a vibration stimulation can be reduced that might be caused by the brake holding load 0x2820:008 (P712.08).

General mode of operation

The following diagram demonstrates the general functioning in automatic operation:



① If the inverter is enabled and no error is active, the motor can be started with the "Run" function in forward rotating direction. The power section is switched on and the motor is magnetised first.

② The brake holding load set in 0x2820:008 (P712.08) is build up via the ramp set in 0x2820:013 (P712.13).

③ The holding brake is released. For this purpose, the output trigger "Release holding brake [115]" is set to TRUE. This trigger must be assigned to a digital output or, in the simplest case, to the relay which then switches the brake supply.

④ After the release time 0x2820:003 (P712.03) has elapsed, the motor is accelerated to the setpoint. The brake status "Brake released [1]" is displayed in 0x2820:015 (P712.15).

⑤ In case the direction of rotation reverses, the holding brake remains released.

⑥ If "Run" is set to FALSE, the motor is stopped with the stop method set in 0x2838:003 (P203.03). In the example: Stop with standard ramp.

⑦ Then the holding brake is closed again.

⑧ After the closing time 0x2820:002 (P712.02) has elapsed, the brake status "Active [0]" is displayed in 0x2820:015 (P712.15). The brake holding load is reduced again via the ramp.

11.11.4 Brake closing level

In some cases, a low speed does not make any sense from the application point of view. This includes applications with unfavorable load features, such as static friction. In such applications and depending on the type of control, a low speed may cause an unwanted behaviour. In order to prevent such an operating situation, a closing threshold can be set. The power section will only be switched on and the holding brake is opened if the setpoint is higher than the closing threshold. In order to prevent the holding brake from being closed if the setpoint only shortly falls below the closing threshold during operation, a delay time can be set in addition.

Preconditions

If the holding brake is controlled manually via an external control signal: It must be ensured that the motor does not move while the motor control is deactivated by this function.

Details

The function is part of the holding brake control and does not have an independent functionality.

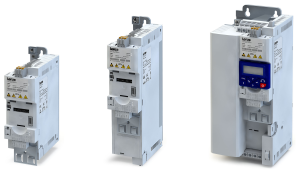
Relevant parameters:

- 0x2820:007 (P712.07): Brake closing threshold
- 0x2820:012 (P712.12): Closing threshold delay

Setting notes:

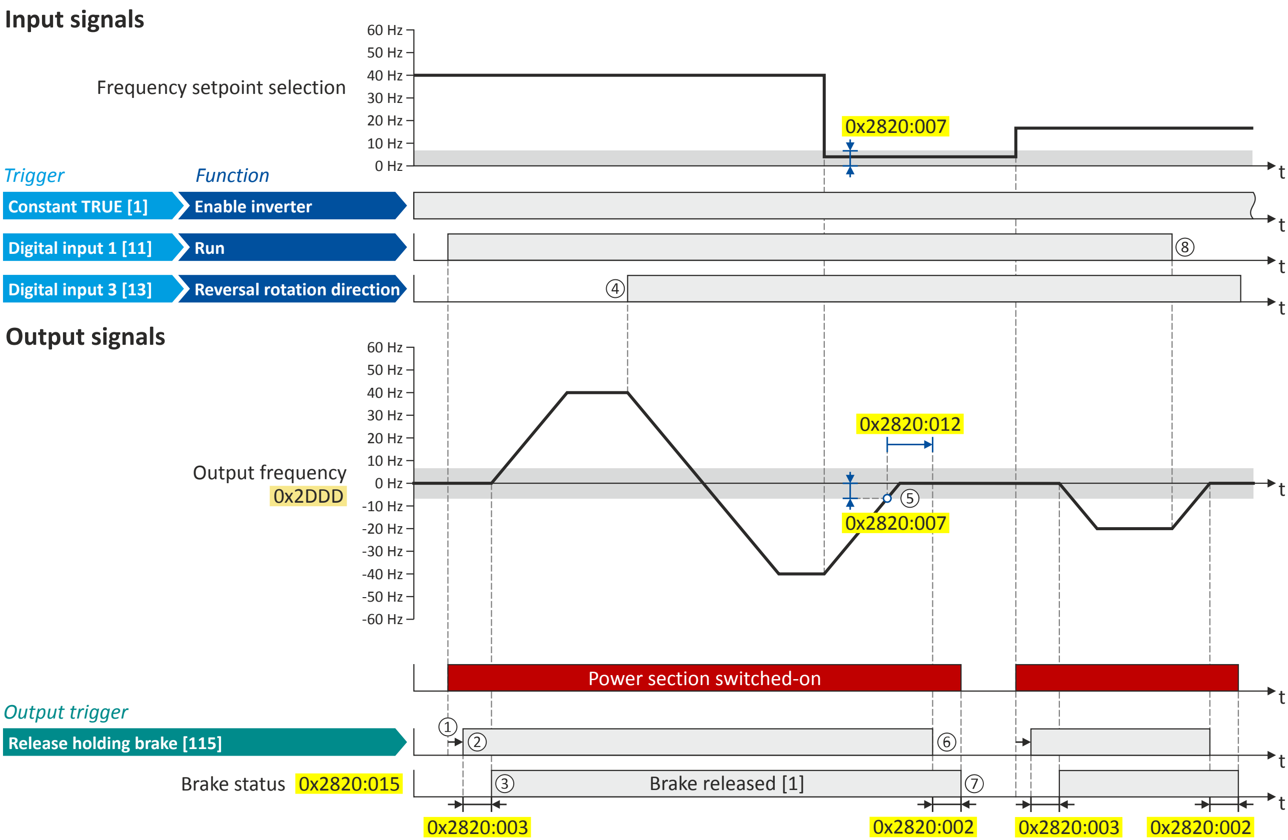
- The function is active if the brake closing threshold is higher than 0 Hz.
- In order that the brake can work correctly, the brake closing threshold must be set to a value that is greater than or equals the minimum frequency 0x2915 (P210.00).
- The brake closing threshold has a permanent hysteresis of 1 Hz in order to prevent an unwanted change-over. Exception: If the brake closing threshold is set to 0 Hz, the hysteresis is also 0 Hz.
- If the brake closing threshold is set to 0 Hz, a start command is only required to release the holding brake during automatic operation.
- This function can be combined with the setting of a holding load.

Parameter	Name / value range / [default setting]	Info
0x2820:007 (P712.07)	Holding brake control: Brake closing threshold (Brake control: Closing thresh.) 0.0 ... [**0.2**] ... 599.0 Hz	Threshold for closing the holding brake. • The power section will only be switched on and the holding brake will be opened if the setpoint is higher than the threshold set here. • In order that the brake can work correctly, the brake closing threshold must be set to a value that is greater than or equals the minimum frequency 0x2915 (P210.00). • The brake closing threshold has a permanent hysteresis of 1 Hz in order to prevent an unwanted change-over. Exception: If the brake closing threshold is set to 0 Hz, the hysteresis is also 0 Hz. • In case of a setting of "0 Hz", only a start command is required to release the holding break during automatic operation.
0x2820:012 (P712.12)	Holding brake control: Closing threshold delay (Brake control: ClosingThr delay) 0 ... [**0**] ... 10000 ms • From version 03.00	By setting a deceleration, a closing of the holding brake can be prevented if the frequency only temporarily falls below the brake closing threshold 0x2820:007 (P712.07).



General mode of operation

The following diagram demonstrates the general functioning in automatic operation:



① If the inverter is enabled and no error is active, the motor can be started with the "Run" function in forward rotating direction. The power section is switched on and the motor is magnetised first.

② The holding brake is released. For this purpose, the output trigger "Release holding brake [115]" is set to TRUE. This trigger must be assigned to a digital output or, in the simplest case, to the relay which then switches the brake supply.

③ After the release time 0x2820:003 (P712.03) has elapsed, the motor is accelerated to the setpoint. The brake status "Brake released [1]" is displayed in 0x2820:015 (P712.15).

④ If the direction of rotation reverses, the holding brake remains released (even if the closing threshold delay is running.)

⑤ If the setpoint selection and the internal setpoint for the motor control fall below the brake closing threshold set in 0x2820:007 (P712.07), the output frequency is ramped down to "0 Hz".
At the same time the closing threshold delay set in 0x2820:012 (P712.12) starts to run

⑥ If the values fall below the closing threshold longer than the closing threshold delay, the holding brake is closed again.

⑦ After the closing time 0x2820:002 (P712.02) has elapsed, the brake status "Active [0]" is displayed in 0x2820:015 (P712.15).

⑧ If "Run" is set to FALSE, the motor is stopped with the stop method set in 0x2838:003 (P203.03). In the example: Stop with standard ramp. In this case, closing threshold and closing threshold delay are not effective anymore.

11.11.5 Manual release of the holding brake

A manual release of the holding brake is possible in the modes "Automatic [0]" and "Manual [1]" via the following external triggers:

- Via bit 14 in the CiA 402 Controlword 0x6040.
- Via the trigger assigned in 0x2631:049 (P400.49) of the "Release holding brake" function.

▸ Example for operating mode 📖 574

Parameter	Name / value range / [default setting]		Info
0x2631:049 (P400.49)	Function list: Release holding brake (Function list: Release brake) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532		Assignment of a trigger for the "Release holding brake" function. Trigger = TRUE: Release holding brake (immediately). Trigger = FALSE: no action. Notes: • Function is only executed if the brake mode 0x2820:001 (P712.01) is set to "Automatic [0]" or "Manual [1]". ⚠ CAUTION! • The manually triggered "Release holding brake" command has a direct impact on the "Release holding brake [115]" trigger. Thus, the holding brake can be manually released if the power section is switched off! • The responsibility for a manual release of the holding brake has the external trigger source for the "Release holding brake" command!
	0	**Not connected**	
0x6040	CiA: Controlword 0 ... [**0**] ... 65535		Mappable CiA 402 control word with bit assignment according to device profile CiA 402.
	Bit 0	Switch on	1 = switch-on
	Bit 1	Enable voltage	1 = DC bus: Establish readiness for operation
	Bit 2	Quick stop	0 = activate quick stop
	Bit 3	Enable operation	1 = enable operation
	Bit 4	Operation mode specific	Bits are not supported.
	Bit 5	Operation mode specific	
	Bit 6	Operation mode specific	
	Bit 7	Fault reset	0-1 edge = reset error
	Bit 8	Halt (from version 04.00)	1 = stop motor (ramping down to frequency setpoint 0 Hz)
	Bit 9	Operation mode specific	Operating mode dependent
	Bit 14	Release holding brake	1 = releasing holding brake manually ⚠ CAUTION! • The manually triggered "Release holding brake" command has a direct impact on the "Release holding brake [115]" trigger. Thus, the holding brake can be manually released if the power section is switched off. • The responsibility for a manual release of the holding brake has the external trigger source for the "Release holding brake" command. ▸ Holding brake control 📖 472

11.12 Flying restart circuit

The flying restart function makes it possible to restart a coasting motor on the fly during operation without speed feedback. Synchronicity between the inverter and the motor is coordinated so that the transition to the rotating drive is effected without jerk at the time of connection.

> The following description and the listed parameters are valid for the flying restart circuit of an asynchronous motor.
>
> For information on a flying restart circuit in case of a sensorless control of a synchronous motor, see chapter "Sensorless control for synchronous motors (SL-PSM)". 178

Preconditions

- Drive systems with speed feedback do not need a flying restart circuit because there is always a jerk-free synchronisation to the feedback speed.
- The flying restart circuit operates safely and reliably in case of drives with high centrifugal masses. If several motors with different centrifugal masses are connected to the inverter, the flying restart circuit must not be used.
- The flying restart circuit serves to identify rotating field frequencies of up to maximally ±200 Hz.
- Especially at high power, very high mass inertias and mains voltages higher than 440 V, a temporary overvoltage in the DC bus may occur. The use of a brake resistor can prevent this behaviour. ▶ Use of a brake resistor 445

Required settings before the flying restart circuit is used:

1. The motor data must be set correctly. ▶ Motor data 164
2. The settings for the current controller and the flying restart controller must be adapted to the motor. The settings are made automatically if one of the following optimisations is carried out:

▶ Motor selection from motor catalogue 197

▶ Automatic motor identification (energized) 199

▶ Automatic motor calibration (non-energized) 200

Details

The inverter determines synchronicity by identifying the synchronous rotating field frequency. The "search" starts in positive direction.

Duration:

- The flying restart process is determined within approx. 0.5 ... 1.5 seconds.
- The duration is influenced by the start frequency 0x2BA1:001 (P718.01).

Setting the function:

1. As starting performance, set the selection "Flying restart circuit [2]" in 0x2838:001 (P203.01).
   - Thus, every inverter enable causes a synchronisation to the rotating or standing drive.
   - After the inverter has been enabled, the motor can temporarily start or reverse if drives with low friction and low mass inertia are used.
   - If the inverter is operated with the default settings, no further settings are required for most applications.
2. If required, adapt the current 0x2BA1:001 (P718.01) and the start frequency 0x2BA1:002 (P718.02) for the flying restart circuit.
   - Setting notes can be found in the "Info" column for the respective parameter.

For diagnostic purposes, the frequency detected when the motor has been restarted on the fly is displayed in 0x2BA1:008 (P718.08).

Parameter	Name / value range / [default setting]	Info
0x2BA1:001 (P718.01)	Flying restart circuit: Current (Flying restart: Current) 0 ... [**30**] ... 100 %	The current set here is injected into the motor during the flying restart process for the identification of the rotating field frequency. • 100 % ≡ Motor rated current 0x6075 (P323.00) • Reducing the current causes a reduction of the motor torque during the flying restart process. A short-time starting action or reversing of the motor is prevented with low flying restart currents. • If the current is set too low, the rotating field frequency cannot be identified correctly. • If the current is increased, this improves the robustness of the flying restart circuit. • In case of high mass inertias and high speeds, the flying restart circuit may cause an overvoltage in the DC bus if no brake resistor is connected. In this case, the current must be reduced.
0x2BA1:002 (P718.02)	Flying restart circuit: Start frequency (Flying restart: Start frequency) -599.0 ... [**20.0**] ... 599.0 Hz	The frequency set here defines the starting point for the flying restart process. • The search starts in positive direction. • The default setting is adjusted to standard asynchronous motors. • In case of systems with a known search speed (e.g. torque-controlled drive systems that are to synchronise to a defined speed), the start frequency can be adapted for reducing the flying restart time.
0x2BA1:008 (P718.08)	Flying restart circuit: Flying restart frequency (Flying restart: Fl.res.frequency) • Read only: x.x Hz	Display of the found frequency at which the motor has been successfully restarted on the fly.

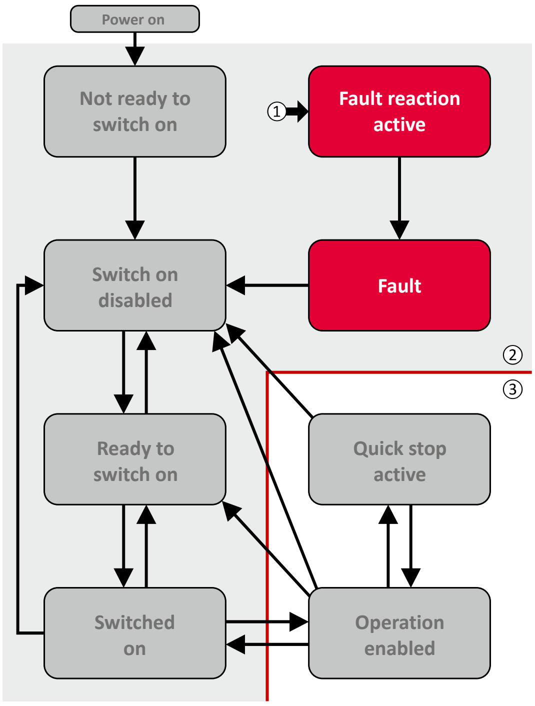
11.13 Timeout für fault reaction

If an error occurs that does not immediately cause a switch-off, the "Fault reaction active" device status becomes initially active. The motor is brought to a standstill with quick stop ramp. The change to the device status "Fault" is only made after the quick stop (motor at standstill) has been executed or after an adjustable timeout time has expired.

Details

In the device status "Fault reaction active"

- only the parameters of the inverter can be changed that do not require an inverter disable.
- a holding brake in brake mode 0x2820:001 (P712.01) = "Automatically (via device state) [0]" is triggered for closing.
- the motor control continues to be operable.



① From all states
② Power section inhibited (pulse inhibit)
③ Power section enabled

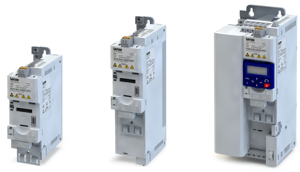
Diagnostic parameters:

- 0x282A:005 (P126.05) displays the current device status of the inverter

Parameter	Name / value range / [default setting]	Info
0x2826	Time-out for error response 0.0 ... [**6.0**] ... 100.0 s	This timer is started when a change-over to the "Fault reaction active" device status takes place. If the motor is still rotating after the time-out time has elapsed, a change-over to the "Fault" device status takes place. • In case of a serious error, an immediate change-over to the "Fault" device status takes place. ⚠ CAUTION! Changing this parameter may cause a longer ramptime in the event of an error. This must be considered when changing this parameter.

Related topics

▸ Error handling 📖 139
▸ Automatic restart 📖 484



11.14 Automatic restart

Configuration of the restart behaviour after a fault.

The settings have no impact on errors and warnings of the inverter.

Parameter	Name / value range / [default setting]	Info
0x2839:002 (P760.02)	Fault configuration: Restart delay (Fault config.: Restart delay) 0.0 ... [**3.0**] ... 1000.0 s	If a fault occurs, a restart is possible at the earliest after the time set here has elapsed.
0x2839:003 (P760.03)	Fault configuration: Number of restart attempts (Fault config.: Restart counter) 0 ... [**5**] ... 255	Number of restart attempts after a fault. • 255 = unlimited number of restart attempts.
0x2839:004 (P760.04)	Fault configuration: Trouble counter reset time (Fault config.: Tro.count r.time) 0.1 ... [**40.0**] ... 3600.0 s	Time of trouble-free operation after the expiry of which the fault counter is decreased by 1.
0x2839:005 (P760.05)	Fault configuration: Trouble counter (Fault config.: Trouble counter) • Read only	Display of the current fault counter content. • The counter content is increased by 1 after each restart attempt.

Related topics

▸ Error handling 📖 139

▸ Timeout für fault reaction 📖 483

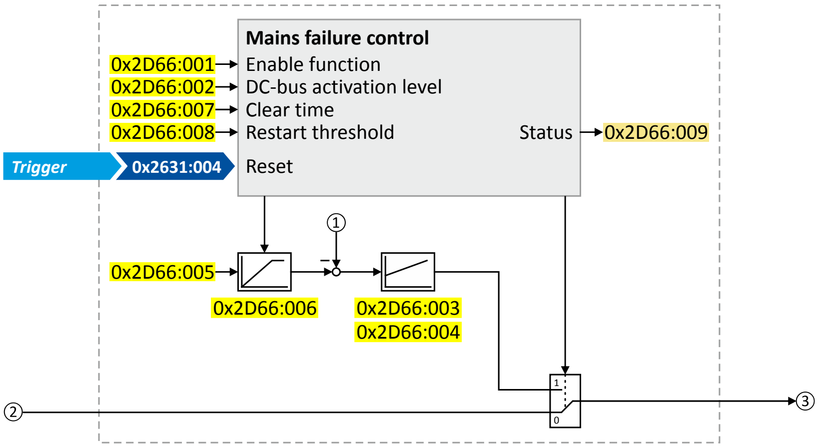
11.15 Mains failure control

In case of power failure, this function can decelerate the motor and use its rotational energy to maintain the DC-bus voltage for a certain period of time. This makes it possible to continue to let the motor run during a short-term failure of the mains voltage. After mains recovery, the operating status that was active before the failure is adopted again.

Details

A failure of the mains voltage causes a continuous DC-bus voltage drop. If the mains failure control is enabled in 0x2D66:001 (P721.01), it will get active if the DC-bus voltage falls below the activation threshold set in 0x2D66:002 (P721.02).

As soon as the mains failure control is active, the motor is decelerated. Now the rotational energy of the motor is used to maintain the DC-bus voltage above the error threshold for undervoltage until the motor is decelerated to standstill in a controlled way. This process is controlled by the DC-bus voltage controller.



① Current DC-bus voltage
② Frequency setpoint (internal input signal)
③ Frequency setpoint (internal output signal for motor control)

The activation and commissioning of the mains failure control are described in detail in the following subchapters.

Parameter	Name / value range / [default setting]	Info
0x2D66:001 (P721.01)	Mains failure control: Enable function (Mains fail. ctrl: Enable function) • From version 02.00	1 = enable mains failure control.
	0 **Disabled**	
	1 Enabled	
0x2D66:002 (P721.02)	Mains failure control: DC-bus activation level (Mains fail. ctrl: DC-bus act.level) 60 ... [**0**]* ... 90 % * Default setting depending on the size. • From version 02.00	Threshold below which the mains failure control is activated if it is enabled (0x2D66:001 (P721.01) = 1). • 100 % ≡ nominal DC-bus voltage Recommended setting: • In general: 5 ... 10 % above the error threshold for undervoltage (display in 0x2540:003 (P208.03)). • 230-V devices: 72 % • 400/480-V devices: 82 %
0x2D66:003 (P721.03)	Mains failure control: Gain V-controller (Mains fail. ctrl: Gain V-ctrl) 0.00001 ... [**0.01000**] ... 0.50000 Hz/V • From version 02.00	Proportional gain of the DC-bus voltage controller.
0x2D66:004 (P721.04)	Mains failure control: Reset time V-controller (Mains fail. ctrl: Res. time V-ctrl) 5 ... [**20**] ... 2000 ms • From version 02.00	Reset time of the DC-bus voltage controller.

Parameter	Name / value range / [default setting]	Info
0x2D66:005 (P721.05)	Mains failure control: DC voltage setpoint (Mains fail. ctrl: DC voltage setp.) 80 ... [**100**] ... 110 % • From version 02.00	Voltage setpoint onto which the DC-bus voltage is to maintained. • 100 % ≡ nominal DC-bus voltage
0x2D66:006 (P721.06)	Mains failure control: Setpoint ramp (Mains fail. ctrl: Setp. ramp) 1 ... [**20**] ... 16000 ms • From version 02.00	Acceleration time for the voltage setpoint set in 0x2D66:005 (P721.05). • The set acceleration time refers to the acceleration from 0 to 100 % of the nominal DC-bus voltage.
0x2D66:007 (P721.07)	Mains failure control: Clear time (Mains fail. ctrl: Clear time) 1 ... [**20**] ... 60000 ms • From version 02.00	After the DC-bus voltage has exceeded the activation threshold 0x2D66:002 (P721.02) (+hysteresis) again, the time set here must be elapsed before the mains failure control is deactivated again if the restart protection is not activated (default setting).
0x2D66:008 (P721.08)	Mains failure control: Restart threshold (Mains fail. ctrl: Restart level) 0.0 ... [**0.0**] ... 599.0 Hz • From version 02.00	Threshold for restart protection. Below the threshold set here no restart takes place after mains recovery.
0x2D66:009 (P721.09)	Mains failure control: Status mains failure control (Mains fail. ctrl: RERT:Status) • Read only • From version 02.00	Bit coded display of the mains failure control status.
	Bit 0 | Control active	1 ≡ mains failure control active. • The DC-bus voltage has fallen below the activation threshold 0x2D66:002 (P721.02). • The bit is reset to 0 after the DC-bus voltage has exceeded the activation threshold (+hysteresis) again and the clear time set in 0x2D66:007 (P721.07) has elapsed.
	Bit 1 | I-Reset active	1 ≡ I component of the speed controller of the motor control is reset. • Bit is set to 1 if bit 0 is set to 1 (mains failure control active). • Bit is reset to 0 if the frequency setpoint falls below 0.1 Hz.
0x2B01:002 (P303.02)	V/f shape data: Base frequency (V/f shape data: Base frequency) Device for 50-Hz mains: 0 ... [**50**]* ... 1500 Hz Device for 60-Hz mains: 0 ... [**60**]* ... 1500 Hz * Default setting depending on the size.	Base voltage and base frequency define the V/f ratio and thus the gradient of the V/f characteristic. • The V/f base voltage is usually set to the rated motor voltage 0x2C01:007 (P320.07). • The V/f base frequency is usually set to the rated motor frequency 0x2C01:005 (P320.05).

11.15.1 Activating the mains failure control

1. Set the selection "Enabled [1]" in 0x2D66:001 (P721.01).
2. Set the activation threshold in [%] with reference to the nominal DC-bus voltage in 0x2D66:002 (P721.02).
   - Recommended setting: 5 ... 10 % above the error threshold for undervoltage (display in 0x2540:003 (P208.03)).
3. Set the voltage setpoint onto which the DC-bus voltage is to be maintained in 0x2D66:005 (P721.05).
   - Recommended setting: 95 ... 100 % (of the nominal DC-bus voltage).

The mains failure control gets active with these settings if the DC-bus voltage falls below the activation threshold. The DC-bus voltage controller now generates the required operational energy from the rotational energy of the motor. The motor is decelerated by the mains failure control. Thus, the deceleration ramp is shorter than the one of a non-guided system (coasting drive).

After the mains failure control has been activated:

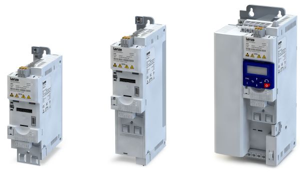
1. The DC-bus voltage is controlled with the acceleration time set in 0x2D66:006 (P721.06) to the setpoint set in 0x2D66:005 (P721.05).
2. An internally generated frequency setpoint is transferred to the motor control which enables the motor (via the frequency setpoint) to be decelerated to a frequency close to "0 Hz".
   - Starting value for the guided deceleration is the current output frequency.
   - The deceleration ramp (and hence the braking torque) results from the moment of inertia of the load machine(s), the power loss of the drive (system) and the set parameterisation.

Behaviour after mains recovery

If, after mains recovery, the DC-bus voltage has exceeded the activation threshold (+hysteresis) again, an internal timing element is started. After the time period set in 0x2D66:007 (P721.07) has elapsed, the mains failure control is stopped if the restart protection is not activated (default setting).

▸ Restart protection 📖 488

▸ Fast mains recovery 📖 488



11.15.2 Restart protection

The integrated restart protection is to prevent a restart in the lower frequency range if the mains voltage was only interrupted briefly (mains recovery before the motor stands still).

- In the default setting 0x2D66:008 (P721.08) = 0 Hz, the restart protection is deactivated.
- In order to activate the restart protection, set the restart threshold in [Hz] in 0x2D66:008 (P721.08) below which no automatic start shall take place after mains recovery.
- If, in case of mains recovery, the output frequency is below the restart threshold, the restart protection gets active:
    - If the current DC-bus voltage is lower than the voltage setpoint 0x2D66:005 (P721.05), the motor is continued to be decelerated (until frequency 0 Hz).
    - If the current DC-bus voltage is higher than the voltage setpoint 0x2D66:005 (P721.05), the motor is accelerated in a controlled way until the output frequency exceeds the restart threshold.
- If, in case of mains recovery, the output frequency is above the restart threshold, the motor is accelerated again to the frequency setpoint. ▶ Fast mains recovery 📖 488

Diagnostic parameters:

- An active restart protection is displayed via the status bit 0 in 0x2D66:009 (P721.09) if the mains failure control is not active.

Terminating the active restart protection

If, after mains recovery, the restart protection is active, it can be terminated by the following actions:

- Error reset via the trigger set in 0x2631:004 (P400.04).
- Short-time inverter disable via the trigger set in 0x2631:001 (P400.01).
- Restart via the trigger set in 0x2631:002 (P400.02).

11.15.3 Fast mains recovery

A fast mains recovery is caused by a short interruption at the energy supply company (for instance due to a thunderstorm) and by faulty components in the supply cables (for instance slip rings).

The fast mains recovery causes a restart of the motor

- if the restart protection is deactivated (0x2D66:008 (P721.08) = 0 Hz, default setting) or
- the restart protection does not get active (output frequency > 0x2D66:008 (P721.08)).

If this behaviour is not desired, you can decelerate the restart by setting a switch-off time in 0x2D66:007 (P721.07) or prevent it in connection with the restart protection. ▶ Restart protection 📖 488

11.15.4 Commissioning the mains failure control

Commissioning should be executed with motors without load:

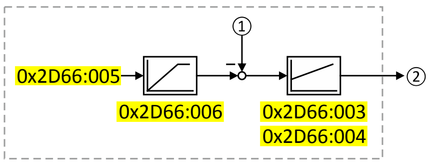
1. Let the motor rotate with a rated frequency of 100 %.
2. Disable the inverter and measure the time until the motor has reached standstill.
   - The time can be measured with a stop watch or similar.
   - If a motor encoder is connected to the inverter and set as feedback system for the motor control, this signal can be output at the analog output and measured with an oscilloscope.
3. Set the acceleration time for the voltage setpoint in 0x2D66:006 (P721.06) to approx. 1/10 of the time measured before.
4. Set the switch-off time n 0x2D66:007 (P721.07) to the time measured before.

Fine adjustment of the mains failure control

For the fine adjustment, you must repeat the following points several times:

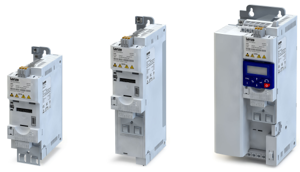
1. An end frequency as low as possible should be reached before the inverter reaches the error threshold for undervoltage:
   - Increase the proportional gain of the DC-bus voltage controller in 0x2D66:003 (P721.03).
   - Reduce the reset time of the DC-bus voltage controller in 0x2D66:004 (P721.04).
2. If, during the mains failure control, monitoring for overvoltage in the DC bus is triggered:
   - Increase the reset time again in 0x2D66:004 (P721.04) until monitoring is not triggered anymore.
   - If required, additionally reduce the voltage setpoint in 0x2D66:005 (P721.05) onto which the DC-bus voltage is to be controlled.
3. Increasing the delay time or reducing the braking torque is only possible to a limited extent:
   - Increasing the acceleration time in 0x2D66:006 (P721.06) reduces the initial braking torque and simultaneously increases the deceleration time.
   - Increasing the reset time of the DC-bus voltage controller in 0x2D66:004 (P721.04) reduces the braking torque and simultaneously increases the deceleration time. If the reset time is too high, the inverter reaches the error threshold for undervoltage before standstill is reached. From this point on, the motor is not guided anymore.

Signal flow - DC-bus voltage controller



① Current DC-bus voltage

② Internally generated frequency setpoint that is transferred to the motor control in case of an active mains failure control.



11.16 UPS operation

This function enables the operation of a 3x400-V inverter with an uninterruptible 1x230-V power supply (UPD) to be able to operate the motor with reduced load for a certain period in the event of a power failure.

NOTICE

UPS operation is not suitable for a continuous operation.

Possible consequence: Device overload

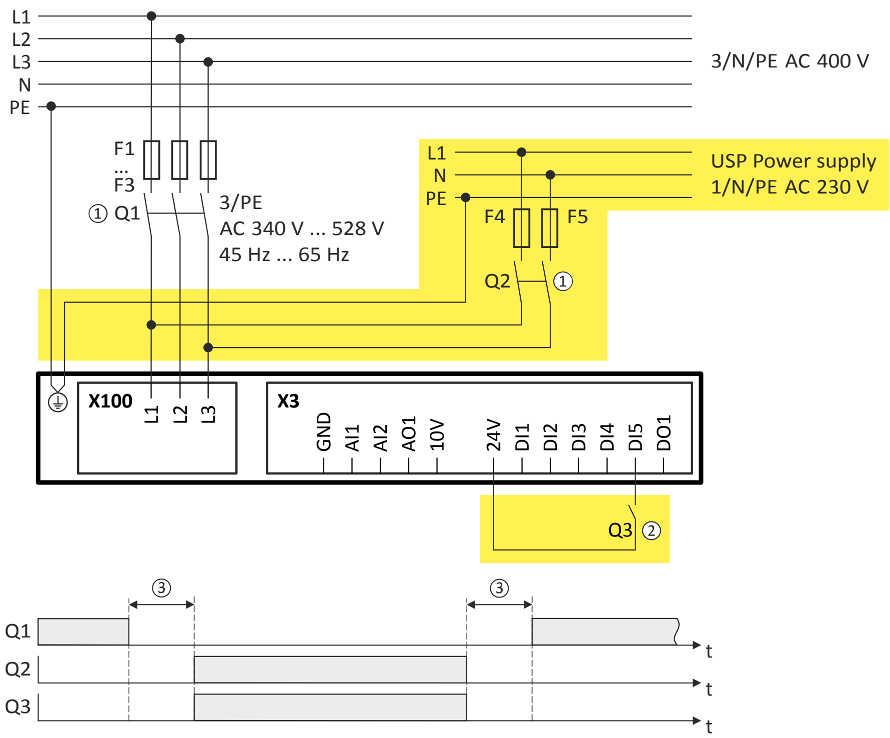
▶ Prevent a too frequent use of this function.

Restrictions

- UPS operation is only available for 3x400-V devices up to 11 kW.
- For UPS operation, one reduced output current and one reduced overload are available only:
  - Output current: 60 % of the 400-V rated current
  - Overload: 80 %/5 min, 120 %/3 s of the 400-V rated current
- In order to change over to UPS operation, a minimum delay of 10 s is required.

Details

The following figure shows the principal connection of the UPS to the inverter. For further technical details, please contact the inverter manufacturer.

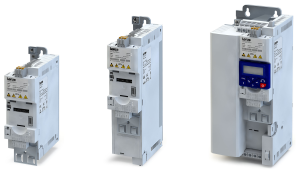


① A mutual locking is required for the contactors Q1 and Q2.

② In this example, the digital input DI5 is used to activate the UPS operation. For this purpose, the function "Activate UPS operation" 0x2631:055 (P400.55) must be assigned to trigger "Digital input 5 [15]".

③ In order to change over to UPS operation, a minimum delay of 10 s is required.

The UPS operation can be alternatively activated via network. In this case, a bit of the mappable data word NetWordIN1 0x4008:001 (P590.01) must be assigned to the "Activate UPS operation [55]" function.



If the UPS operation is active,

- the device overload monitoring (i*t) is adapted accordingly.
- the DC limit values are reduced.
- the phase failure detection is switched off.
- the warning "Operation at UPS active" (error code 12672 | 0x3180) is output.
- trigger "UPS operation active [118]" is set to TRUE. The trigger can be assigned to a digital output.
- bit 15 ("UPS operation active") in the inverter status word 2 0x2833 is set to "1".

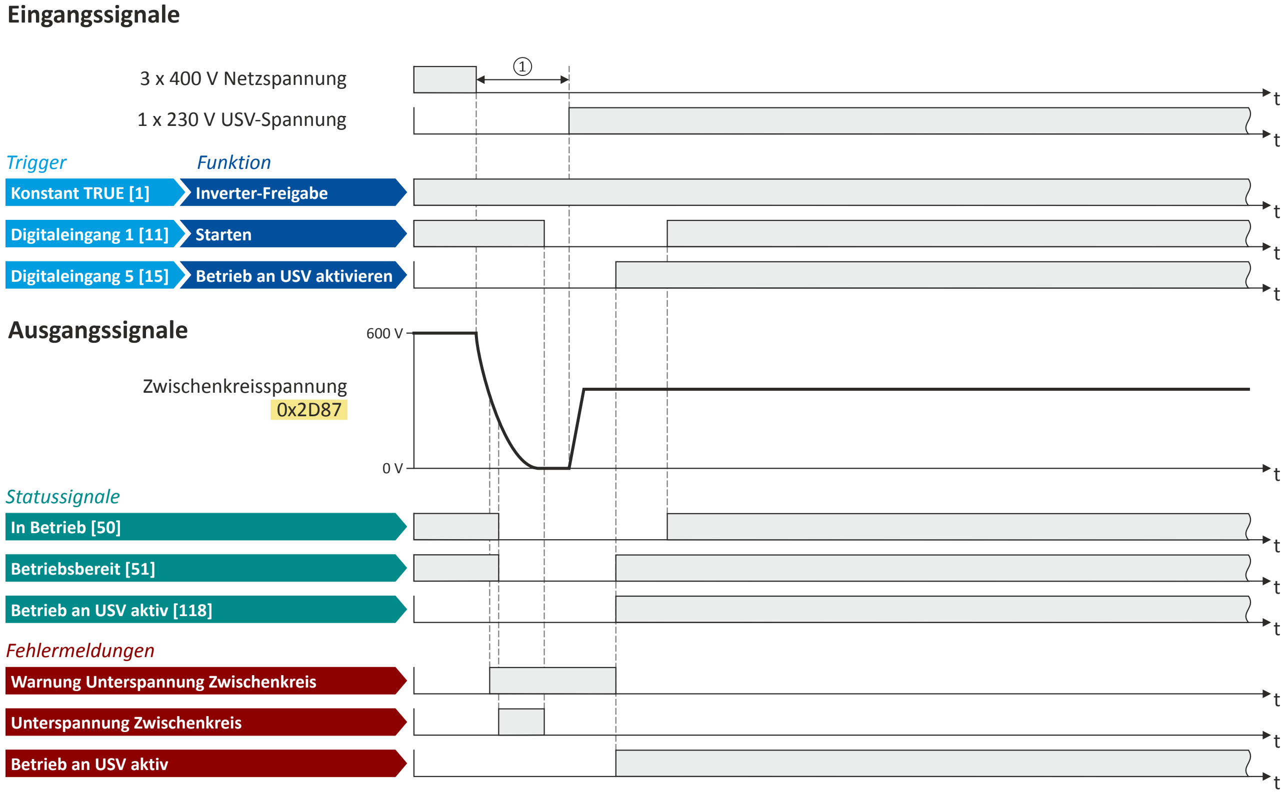
Notes:

- An additional limitation of speed, current, etc. can be realised with the "parameter change-over". ▶ Parameter change-over 📖 464

Parameter	Name / value range / [default setting]		Info
0x2631:055 (P400.55)	Function list: Activate UPS operation (Function list: Activ. UPS oper.) • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532		Assignment of a trigger to the "Activate UPS operation" function. Trigger = TRUE: Activate UPS operation. Trigger = FALSE: no action / deactivate function again.
	0	**Not connected**	
0x2833	Inverter status word 2 • Read only		Bit-coded status word 2 of the inverter.
	Bit 1	Manual test mode active	1 ≡ manual test mode active.
	Bit 2	Manual control active	1 ≡ manual control active.
	Bit 6	DC braking active	1 ≡ DC braking active.
	Bit 15	UPS operation active	1 ≡ UPS operation active.

Example for operating mode

Parameter	Designation	Setting for this example
0x2631:001 (P400.01)	Enable inverter	Constant TRUE [1]
0x2631:002 (P400.02)	Run	Digital input 1 [11]
0x2631:055 (P400.55)	Activate UPS operation	Digital input 5 [15]



The status signals can be assigned to digital outputs. ▶ Configuration of digital outputs 📖 603

① In order to change over to UPS operation, a minimum delay is required.

11.17 Process data

This chapter describes additional functions that provide process data for a higher-level Controller.

11.17.1 Position counter

This function counts the number of motor revolutions. The current counter content (actual position) can be output as process data value via network to implement a simple position control in a higher-level Controller.

Preconditions

- An HTL encoder must be connected to and set at the digital inputs DI3/DI4. ▶ HTL encoder 📖 496
- As an alternative, the number of motor revolutions from the motor model can be reconstructed. For this purpose, the motor control type "Sensorless control (SL PSM) [3]" must be selected and set in 0x2C00 (P300.00). ▶ Sensorless control for synchronous motors (SL-PSM) 📖 178
- The position control must be implemented in the Controller.

Details

The signal source for the position counter is selected in 0x2C49:001 (P711.01). The position counter can count forwards and backwards. The current counter content (actual position) is displayed in 0x2C49:003 (P711.03). After the maximum or minimum value has been reached, an overflow takes place.

Reset position counter:

- The position counter is reset when the supply voltage is switched on.
- The position counter can be set manually via the "Position counter reset" 0x2631:054 (P400.54) function or the NetWordIN1 0x4008:001 (P590.01) data word. For a reset via NetWordIN1, the "Position counter reset [54]" function must be assigned to a bit of the data word. Depending on the selection in 0x2C49:002 (P711.02), the reset can be made either edge-controlled or status-controlled.

Parameter	Name / value range / [default setting]		Info
0x2631:054 (P400.54)	Function list: Position counter reset (Function list: PosCounter reset) • From version 03.00 • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532		Assignment of a trigger for the "Position counter reset" function. Trigger = FALSE-TRUE edge: Reset position counter manually. Trigger = FALSE: no action. Notes: • In 0x2C49:002 (P711.02) it can be selected whether the reset is to be effected edge-controlled (default setting) or status-controlled.
	0	**Not connected**	
0x2C49:001 (P711.01)	Position counter: Signal source (Position counter: Signal source) • From version 03.00		Selection of the signal source for the position counter.
	0	**Disbled**	Position counter is deactivated.
	1	Feedback 1 (DI3/DI4)	The motor revolutions are counted that are provided by an HTL encoder connected to the digital inputs DI3/DI4. • A motor revolution always equals to the increments/revolution set in 0x2C42:001 (P341.01) for the HTL encoder. This applies to all types of HTL encoders that can be set in 0x2630:002 (P410.02): "HTL encoder (AB) [1]", "Pulse train [2]" and "Pulse train/direction [3]". • The counter content will be updated as well if the power section is switched off. • If an HTL encoder is used without detecting the direction of rotation, it is only counted forwards.
	5	Internal motor model	The motor revolutions reconstructed from the internal motor model of the sensorless control (SL PSM) are counted. • The counter content will not be updated if the power section is switched off. • After restarting the power section, the counting of the last counter content is continued.

Parameter	Name / value range / [default setting]	Info
0x2C49:002 (P711.02)	Position counter: Reset mode (Position counter: Reset mode) • From version 03.00	Selection if the manual reset of the position counter is to be effected edge-controlled or status-controlled.
	0 **Reset by rising edge**	
	1 Reset by signal state true	
0x2C49:003 (P711.03)	Position counter: Actual position (Position counter: Actual position) • Read only • From version 03.00	Mappable parameter for providing the current counter content (actual position) via network. Scaling (applies to every measuring method or encoder resolution): • Upper 16 bits: Counted revolutions (0 ... 65535, overflow possible) • Lower 16 bits: Current position within the revolution (0 ... 65535)

11.18 Encoder settings

In general, an encoder is a measuring system which serves to detect the velocity/speed and possibly the position of a kinematics or motor.

- The Inverter i550 exclusively supports HTL encoders.
- For details see the following subchapter.

11.18.1 HTL encoder

In case of the inverter i550, the digital inputs DI3 and DI4 can be configured as HTL input to evaluate the signal of a cost-effective HTL encoder or a reference frequency ("pulse train").

An HTL encoder can be used at the Inverter i550 for the following tasks:

- As motor encoder for a motor speed feedback for speed control as precise as possible.
- As setpoint encoder for defining a frequency setpoint.
- As setpoint encoder for defining the reference value for the process controller.
- As setpoint encoder for defining a torque setpoint.
- As actual value encoder for the process controller.
- As actual value encoder for the "position counter" function.

Preconditions

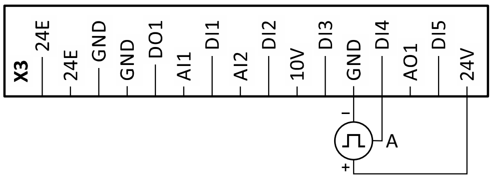
- Single-track or two-track HTL encoder.
  - A single-track HTL encoder (track A) cannot be used for motor speed feedback.
  - A two-track HTL encoder (track A and B) must have a phase offset of exactly 90° between track A and B (error ≤ ±10°). Inverted tracks are not required.
- Encoder increments: ≤ 16384 increments per revolution
- For supplying the encoder, the maximum supply current of the inverter must be considered. If necessary, an external 24-V voltage supply for the encoder is required.

Restrictions

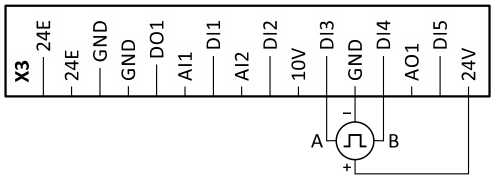
- When the digital inputs DI3 and DI4 are configured as HTL input, these two digital inputs are no longer available for other control functions.
- The HTL input can be either used for detecting an HTL encoder signal or a pulse train. They cannot be used at the same time.
- The maximum input frequency of the digital inputs is 100 kHz. If this frequency is exceeded, an error is triggered.

Connection

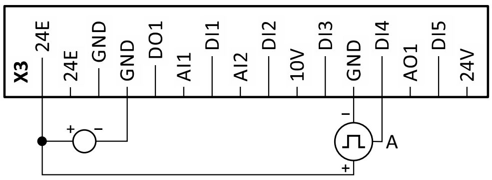
Connection of single-track HTL encoder (without external 24-V voltage supply)



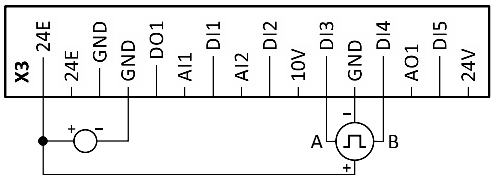
Connection of two-track HTL encoder (without external 24-V voltage supply)



Connection of single-track HTL encoder (with external 24-V voltage supply)



Connection of two-track HTL encoder (with external 24-V voltage supply)



Details

Encoder dimensioning: Calculate maximum number of increments per revolution of the encoder	
Max. encoder increments = f_{max} [Hz] * 60 s / n_{max} [rpm] Max. encoder increment = 100000 [Hz] * 60 s / 1500 [rpm] = 4000 Increments/revolution	
f_{max}	Maximum input frequency of the digital inputs = 100 kHz = 100000 Hz
n_{max}	Maximum encoder speed (in this example: 1500 rpm)
Max. encoder increments	Maximum number of increments per encoder revolution

Select an encoder with a maximum number of increments per revolution which is lower than or equal to the calculated number. The higher the number of increments per revolution, the more stable the system is.

Basic steps for configuring the encoder in the »EASY Starter«:

1. Set the selection "HTL encoder (AB) [1]" in 0x2630:002 (P410.02) to configure the digital inputs DI3 and DI4 as encoder inputs.
2. Set the encoder increment in 0x2C42:001 (P341.01) according to the manufacturer data/ encoder data sheet.

Parameter	Name / value range / [default setting]		Info
0x2C42:001 (P341.01)	Encoder settings: Increments/revolution (Encoder settings: Enc. Inc/Rev) 1 ... **[128]** ... 16384 • Setting can only be changed if the inverter is inhibited. • From version 02.00		Encoder increment. Carry out setting according to manufacturer data/encoder data sheet.
0x2C42:006	Encoder settings: Actual velocity • Read only: x rpm • From version 02.00		Display of the speed currently detected by the encoder.
0x2630:002 (P410.02)	Settings for digital inputs: Input function (DI settings: Input function)		Input function of the digital terminals DI3 and DI4.
	0	**Digital input**	DI3 = digital input DI4 = digital input
	1	HTL encoder (AB) (from version 02.00)	DI3 = HTL input for encoder track B DI4 = HTL input for encoder track A
	2	Pulse train (from version 03.00)	DI3 = digital input DI4 = HTL input for pulse train
	3	Pulse train/direction (from version 03.00)	DI3 = HTL input for direction specification; HIGH level = counter-clockwise (CCW) DI4 = HTL input for pulse train

Related topics

- Selection of setpoint source 📖 148
- Position counter 📖 493
- HTL input setpoint source 📖 565

11.18.2 Encoder monitoring

For monitoring the HTL encoder, two monitoring functions are implemented in the inverter firmware:

a) Encoder signal loss monitoring: Is triggered if a failure of the encoder signal is detected (e. g. due to open circuit or failure of the encoder current supply).
b) Encoder maximum frequency monitoring: Is triggered if the calculated encoder maximum frequency is beyond the permissible frequency range of the digital inputs.

Preconditions

- The encoder signal loss monitoring is only active if the HTL encoder
  - is set as feedback system for the motor control or
  - used as signal source for the "Position counter" function. 493
- For the encoder signal loss monitoring ,the inverter must be enabled and the motor must rotate.
- The encoder maximum frequency monitoring is active as soon as the HTL encoder has been configured.

Restrictions

- The encoder signal loss monitoring does not work anymore if the "DC braking" function is active. 437
- The response time of the encoder signal loss monitoring depends on the setting of the encoder increments/revolution in 0x2C42:001 (P341.01).
- The settings of the speed controller can influence the encoder signal loss monitoring. If the reset time of the speed controller is very low or deactivated, an encoder signal loss cannot be detected at switch-on.
- If the HTL encoder is used as signal source for the "Position counter" function, an encoder signal loss cannot be detected at switch-on.
- Combined with the "Holding brake control" function:
  - In order that the encoder signal loss monitoring is not triggered by mistake, monitoring will only be activated when the holding brake is released.
  - If Brake closing time 0x2820:002 (P712.02) and Brake opening time 0x2820:003 (P712.03) are not set correctly, the encoder signal loss monitoring can be triggered although an encoder signal is available.

▶ Holding brake control 472

Details on encoder signal loss monitoring

The encoder signal loss monitoring distinguishes between the following signal failures:

a) Complete failure (no encoder signals available at all, e. g. in case the encoder current supply has failed)
b) Only one track has failed (track A or track B)

In order to detect a complete failure, the inverter calculates internally two trigger thresholds for monitoring based on the configuration of the HTL encoder:

1. Based on the encoder resolution set in 0x2C42:001 (P341.01), the minimum output frequency is calculated:

   $$\text{Minimum output frequency [Hz]} = \frac{\text{number of motor pole pairs}}{\frac{t_{max}\ [\text{s}]}{\text{edge}} \cdot \frac{\text{encoder increments}}{\text{revolution}}} = \frac{\text{number of motor pole pairs}}{0.001\ [\text{s}] \cdot 4 \cdot \frac{\text{encoder increments}}{\text{revolution}}}$$

   Note: The maximum time (t_{max}) per edge is 0.001 s. In order to prevent a false tripping, this value is multiplied by the factor 4.

   Calculation example:

   - Number of pole pairs = 2
   - Encoder resolution = 128 increments/revolution

   $$\text{minimum output frequency [Hz]} = \frac{2}{0.001\ [\text{s}] \cdot 4 \cdot 128} = 3.9\ [\text{Hz}]$$

2. The maximum permitted time is calculated in which a new signal edge of the encoder must arrive:

   $$\text{time per edge [s]} = \frac{1}{\text{encoder frequency [Hz]} \cdot \frac{\text{encoder increments}}{\text{revolution}}}$$

   If the calculation with the (synchronous) encoder frequency at minimum output frequency (here: 2 * 3.9 Hz) is carried out, the resulting time interval equals the maximum time per edge (here: 0.001 s)

If the real encoder frequency is lower than the calculated minimum output frequency AND if the new signal edge has not arrived within the maximum permitted item, monitoring is triggered. The complete failure is displayed via the status bit 4 in 0x2C42:007.

If only track A or B fails, signals are continued to be detected. In this case, however, the sign of the frequency changes with every new signal edge. In order to detect the failure of only one track, an internal counter is increased by 1 every time the sign between two signal edges changes. If the sign is unchanged in two signal edges in a row, the counter is reset. If the counter reaches the counter content "100", monitoring is triggered. The failure of only one track is displayed via the status bit 5 in 0x2C42:007.

Both in case of a complete failure and in case only one track fails, the error message "Encoder open circuit" (error code 29445 | 0x7305). The error response can be selected in 0x2C45 (P342.00).

Details on encoder maximum frequency monitoring

After the HTL encoder has been configured (or if the encoder settings are changed), the inverter internally calculates the maximum possible number of encoder pulses per second (hereinafter referred to as "encoder maximum frequency"):

$$\text{encoder maximum frequency [Hz]} = \frac{\text{encoder increments}}{\text{revolution}} \cdot \frac{\text{max. motor speed [rpm]}}{60}$$

If the calculated encoder maximum frequency is beyond the permissible frequency range of the digital inputs, monitoring is triggered:

- The status bit 0 in 0x2C42:007 is set to "1".
- The warning "Feedback system: speed limitation" (error code 29573 | 0x7385) is output.

Calculation example 1:

- Maximum input frequency of the digital inputs = 100 kHz
- Encoder resolution 0x2C42:001 (P341.01) = 1024 increments/revolution
- Max motor speed 0x6080 (P322.00) = 3000 rpm

$$\text{encoder maximum frequency [Hz]} = 1024 \frac{\text{encoder increments}}{\text{revolution}} \cdot \frac{3000\text{ [rpm]}}{60} = 51200\text{ [Hz]}$$

Result: The encoder maximum frequency monitoring is not triggered because the encoder maximum frequency is within the permissible frequency range of the digital inputs.

Calculation example 2:

- Maximum input frequency of the digital inputs = 100 kHz
- Encoder resolution 0x2C42:001 (P341.01) = 4096 increments/revolution
- Max motor speed 0x6080 (P322.00) = 3600 rpm

$$\text{encoder maximum frequency [Hz]} = 4096 \frac{\text{encoder increments}}{\text{revolution}} \cdot \frac{3600\text{ [rpm]}}{60} = 245760\text{ [Hz]}$$

Result: The encoder maximum frequency monitoring is triggered because the encoder maximum frequency is beyond the permissible frequency range of the digital inputs.

Parameter	Name / value range / [default setting]		Info
0x2C42:007	Encoder settings: Status 0 ... [**0**] ... 4294967295 • From version 02.00		Bit coded display of the status of encoder monitoring.
	Bit 0	Maximum encoder speed reached	1 ≡ the calculated encoder maximum frequency is beyond the permissible frequency range of the digital inputs.
	Bit 4	No signal detected	1 ≡ a complete failure of the encoder signals has been detected.
	Bit 5	Encoder track A or B missing	1 ≡ a failure of only one track (track A or track B) has been detected.
0x2C45 (P342.00)	Encoder-error response (Enc.error resp.) • From version 03.00		Selection of the response to the triggering of the encoder signal loss monitoring. Associated error code: • 29445 | 0x7305 - Encoder open circuit
	0	No response	▸ Error types 139
	1	**Warning**	
	3	Fault	
0x2C42:001 (P341.01)	Encoder settings: Increments/revolution (Encoder settings: Enc. Inc/Rev) 1 ... [**128**] ... 16384 • Setting can only be changed if the inverter is inhibited. • From version 02.00		Encoder increment. Carry out setting according to manufacturer data/encoder data sheet.
0x2C42:006	Encoder settings: Actual velocity • Read only: x rpm • From version 02.00		Display of the speed currently detected by the encoder.

11.19 Firmware download

The device firmware is continuously improved by the manufacturer. New firmware versions contain error corrections, function extensions and simplify the handling.

A new firmware is always compatible with the older version:
- A device with updated firmware and unchanged parameter settings shows the same behaviour as before.
- Parameter settings must only be adapted if new functions are used.

11.19.1 Firmware download with »EASY Starter (Firmware loader)«

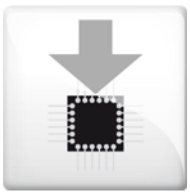
The »EASY Starter (firmware loader)« is a PC software which serves to update the firmware of the inverter.

Preconditions
- For the firmware download, we recommend a direct USB connection to the device. For this purpose, the USB module and a USB 2.0 cable (A plug on Micro-B plug) are required. The voltage supply of the control electronics also takes place via the USB connection.
- The control electronics of the inverter must be supplied with voltage. Either via the USB connection or via the external 24-V voltage supply.
- Voltage supply and communication must not be interrupted during the firmware download.

Details

Together with the »EASY Starter« engineering tool, the following tools are installed as well:

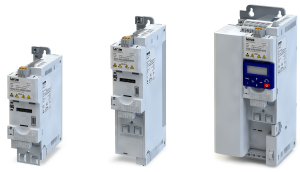
Tool	Brief description
»EASY Navigator«	Helps you to find the right tool for your application.
»EASY Package Manager«	Enables the automatic download and the installation of files for the engineering tools. • For this purpose, the »EASY Package Manager« is provided with current files by the manufacturer and enables the user to install them. • The files also include new firmware versions for inverters.
»EASY Starter (firmware loader)«	Enables the update of the firmware for inverters. • The update can be made by the mechanical engineer or the end user depending on the access protection set for the device.



Carry out the firmware download with the »EASY Starter (firmware loader)«:
1. Start »EASY Navigator« (All programs → Lenze → EASY Navigator).
2. In the »EASY Navigator«, change to the "Ensuring productivity" engineering phase.
3. Click the »EASY Starter (firmware loader)« icon (see on the left).
4. Follow the instructions of the »EASY Starter (firmware loader)«.

Notes:
- The firmware download will not take more than 20 seconds. The progress is shown in the »EASY Starter (firmware loader)«.
- After the firmware download, the connection to the device gets lost for some second and is then restored again automatically.
- Device settings are not changed by the firmware download.
- The brand protection does not get lost by the firmware download.
- The firmware can neither be exported from the device nor be deleted from the device.

If the connection is aborted during the firmware download, this may have the following consequences:
- The device starts with the old firmware. The firmware download can be restarted.
- The firmware in the device is damaged. Consultation with the manufacturer is required.



11.20 Additive voltage impression

This function serves to boost (or lower) the motor voltage from the process via an additive voltage setpoint in order to realise a load adjustment (for instance in case of winder applications).

NOTICE

A too high boost of the motor voltage may cause the motor to heat up strongly due to the resulting current.

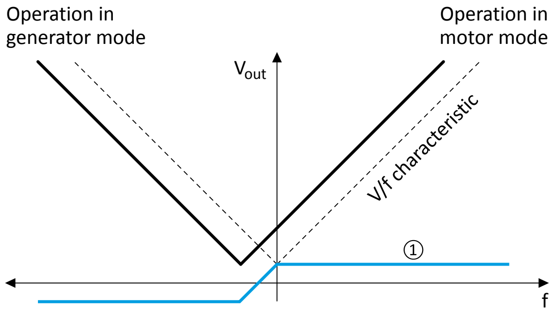
▶ Avoid a too high boost of the motor voltage!

Details

At a constant field frequency, the output voltage of the inverter can be changed within a wide range.

Example: Adaptation of the voltage characteristic in case of V/f characteristic control as a function of the load:

- Clockwise rotation (CW) is operation in motor mode: Boost voltage.
- Counter-clockwise rotation (CCW) is operation in generator mode: Lower voltage.



① Selecting an additive voltage setpoint

A detailed configuration example for this function can be found in the following subchapter.

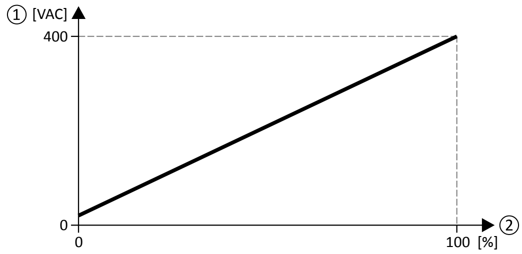
Parameter	Name / value range / [default setting]		Info
0x2B13:001	Additive voltage impression: Enable Function • From version 02.00		1 = enable function.
	0	**Disable**	
	1	Enable	
0x2B13:002	Additive voltage impression: Setpoint source • From version 02.00		Selection of the source for specifying the additive voltage setpoint. • 100 % ≡ Rated voltage 0x2C01:007 (P320.07)
	1	**Analog input 1**	
	2	Analog input 2	
	3	Network	The additive voltage setpoint is defined via the mappable NetWordIN5 0x4008:005 (P550.05)data word.
0x2B13:003	Additive voltage impression: Actual voltage • Read only: x V • From version 02.00		Display of the current (boosted or lowered) voltage.
0x2636:004 (P430.04)	Analog input 1: Min PID value (Analog input 1: AI1 PID @ min) -300.00 ... [**0.00**] ... 300.00 PID unit		Definition of the setting range for PID control. • The standard setpoint source for the reference value of PID control is selected in 0x2860:002 (P201.02).
0x2636:005 (P430.05)	Analog input 1: Max PID value (Analog input 1: AI1 PID @ max) -300.00 ... [**100.00**] ... 300.00 PID unit		
0x2637:004 (P431.04)	Analog input 2: Min PID value (Analog input 2: AI2 PID @ min) -300.00 ... [**0.00**] ... 300.00 PID unit		
0x2637:005 (P431.05)	Analog input 2: Max PID value (Analog input 2: AI2 PID @ max) -300.00 ... [**100.00**] ... 300.00 PID unit		

Parameter	Name / value range / [default setting]	Info
0x4008:005 (P550.05)	Process input words: NetWordIN5 (NetWordINx: NetWordIN5) -100.0 ... [**0.0**] ... 100.0 %	Mappable data word for optionally specifying an additive voltage set-point via network. • 100 % ≡ Rated voltage 0x2C01:007 (P320.07) • This value is used if "Network [3]" is selected in 0x2B13:002.

11.20.1 Example: Using the function with a 400-V inverter

With the settings indicated below, the motor is accelerated after the start to 50 Hz. As the base frequency, however, is set very high (here: 599 Hz), the motor voltage at 50 Hz only amounts to 20 VAC.

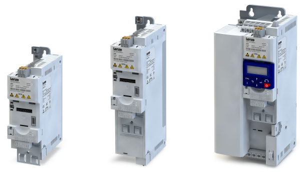
Now, the analog input 1 serves to change the motor voltage at constant frequency within a wide range:



① Motor voltage

② Selection of an additive voltage setpoint in percent via analog input 1
The setting range (here: 0 ... 100 %) can be adapted via the parameters "Min PID value" and "Max PID value".

Parameter	Designation	Setting for this example
0x2636:004 (P430.04)	Analog input 1: Min PID value	0 %
0x2636:005 (P430.05)	Analog input 1: Max PID value	100 %
0x2860:001 (P201.01)	Frequency control: Default setpoint source	Frequency preset 1 [11]
0x2911:001 (P450.01)	Frequency setpoint presets: Preset 1	50 Hz
0x2B01:002 (P303.02)	V/f shape data: Base frequency	599 Hz
0x2B13:001	Additive voltage impression: Enable Function	Enable [1]
0x2B13:002	Additive voltage impression: Setpoint source	Analog input 1 [1]



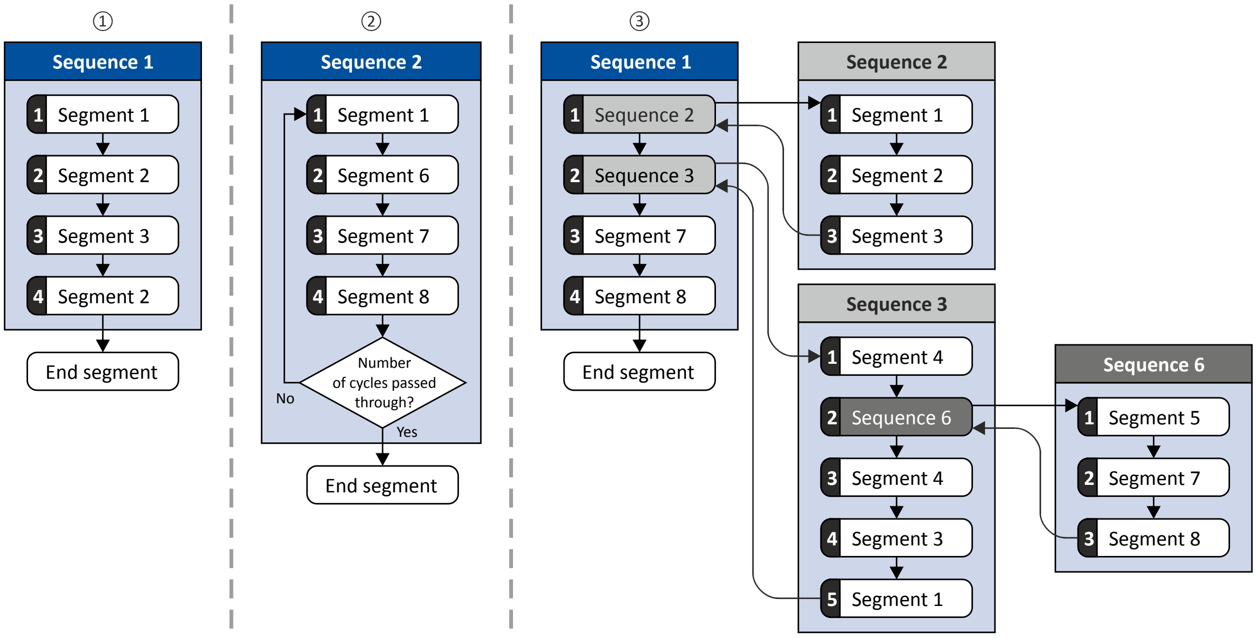
12 Sequencer

The "sequencer" function serves to transfer a programmed sequence of setpoints to the motor control. The switch-over to the next setpoint can be made time-controlled or even-controlled. Optionally, the "sequencer" function can also trigger the digital and analog outputs.

The sequencer only generates setpoints. However, the sequencer does not control the motor operation (does not output any start and stop commands).

Basics: Sequences, steps and segments

- As a total, 8 sequences can be configured (with the numbers 1 to 8).
- Each sequence consists of 16 configurable steps.
- Each step of a sequence can call a "segment".
  - A segment contains, among other things preset setpoints (speed setpoint, PID control value, torque setpoint), a combined acceleration/deceleration for the speed setpoint and optionally a configuration for the digital and analog outputs.
  - 8 different segments and one end segment can be configured.
- Alternatively to calling a single segment, a complete sequence (with a higher number) can also be called from one step. This serves to implement nested sequences or summarise several sequences to one sequence.



① Simple sequence with four steps.

② Simple sequence with four steps that are passed through several times (number of cycles > 1). For each sequence, the number of cycles can be set individually.

③ Nested sequence: Other (sub) sequences are called by one (main) sequence.

Commissioning

For commissioning the sequencer, we recommend the following proceeding:

1. Configure segments (including end segment).

   Details: ▸ Segment configuration 📖 506
2. Configure sequences:
   a) Assign the segments to the single steps of a sequence.
   b) Set the number of cycles for the respective sequence.

   Details: ▸ Sequence configuration 📖 516
3. Make the basic setting of the sequencer:
   a) Set the desired operating mode (time and/or step operation).
   b) Optionally: Adapt end of sequence mode and start of sequence mode.

   Details: ▸ Sequencer basic settings 📖 520
4. Configure the control of the sequencer:
   a) Assign the functions for selecting a sequence to suitable triggers (e. g. digital inputs).
   b) Assign the functions for controlling the sequencer (start, stop, cancel, ...) to suitable triggers.

   Details: ▸ Sequencer control functions 📖 588

Control

The functions listed in the following table serve to control the sequencer. For details, see chapter "Sequencer control functions". 📖 588

Function	Info
Select sequence (bit 0) ... Select sequence (bit 3)	Bit coded selection of the sequence to be started.
Start sequence	The selected sequence is started. The start can take place edge or status-controlled depending on the configuration.
Next sequence step	Immediate jump to the next step irrespective of the time set for the segment.
Pause sequence	The sequencer stops in the current step. The expiration for the time set for the segment is stopped. The sequencer setpoint remains active.
Suspend sequence	There is a temporal return to the normal setpoint control. The sequence is then continued at the point where it was suspended.
Stop sequence	Direct jump to the end segment. The further execution depends on the selected end of sequence mode.
Abort sequence	Immediate return to the normal setpoint control. The end segment is not executed anymore.

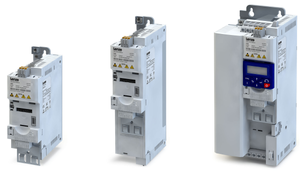
Diagnostics

For diagnosing the sequencer, the diagnostic parameters listed in chapter "Sequencer diagnostics" are available. 📖 134

Internal status signals

The sequencer provides different internal status signals (see the following table). These status signals can be assigned to the relay, the digital outputs or the status word. ▸ Configuration of digital outputs 📖 603

Internal status signal	Info
"Sequencer controlled [100]"	The control is executed via the sequencer (according to the configuration of the digital outputs for the current segment).
"Sequence active [101]"	The sequence is running and is currently not suspended.
"Sequence suspended [102]"	The sequence is currently suspended.
"Sequence done [103]"	The sequence is completed (end segment was passed through).



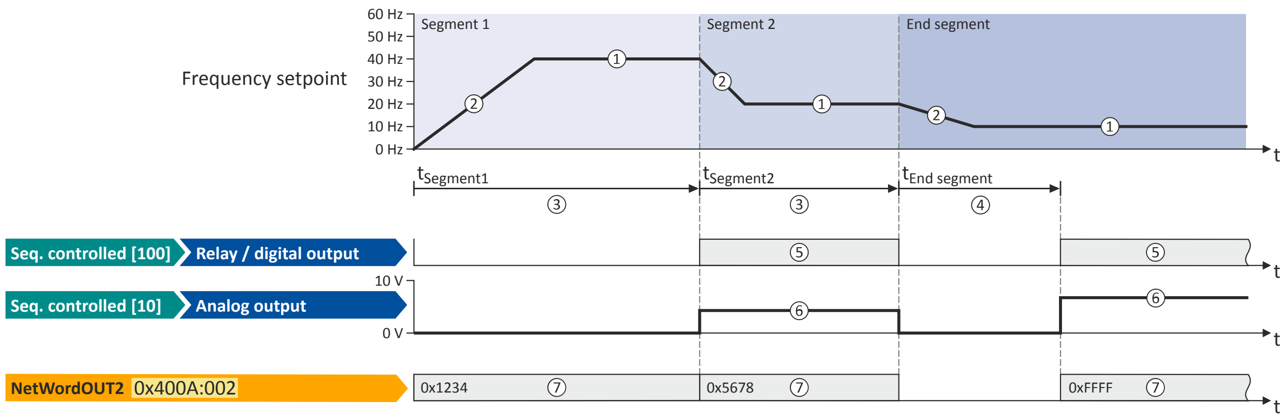
12.1 Segment configuration

Each step of a sequence can call a "segment". A segment contains, among other things preset setpoints (speed setpoint, PID control value, torque setpoint), a combined acceleration/deceleration for the speed setpoint and optionally a configuration for the digital and analog outputs.

Details

As a total, 8 segments and one end segment can be configured.

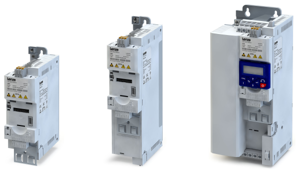
- The settings are only effective if a sequence is active and the respective segment is executed.
- Not all settings are relevant for all operating modes. If, for instance, the PID control is not used at all, no PID setpoint needs to be set for the segment.
- The following figure shows the segment settings relevant for the operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]".
- The table below contains a short overview of the possible settings for each segment.



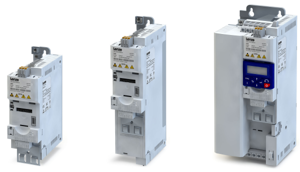
Setting		Info
Frequency setpoint	①	Only relevant for the operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]". direction of rotation according to sign.
Acceleration/deceleration	②	Only relevant for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]". The set time refers to the acceleration from standstill to the set maximum frequency. The deceleration is effected with the same ramp.
Time	③	Meaning for segment 1 ... 8: Runtime for the segment after the expiry of which it is switched over to the next step of the sequence. Only relevant for Sequencer mode 0x4025 (P800.00) = "Time operation [1]" or "Time & step operation [3]".
	④	Meaning for end segment: Delay time for activating the output states configured for the end segment.
Digital outputs	⑤	Optionally: Set digital outputs to a certain level for the execution time of the segment.
Analog outputs	⑥	Optionally: Set analog outputs to an adjustable voltage value for the execution time of the segment.
PID setpoint		Only relevant if the PID control in 0x4020:001 (P600.01) is activated. ▸ Configuring the process controller 📖 407
Torque setpoint		Only relevant for operating mode 0x6060 (P301.00) = "MS: Torque mode [-1]". ▸ Torque control w/ freq. limit 📖 206
NetWordOUT2	⑦	Optionally: Set NetWordOUT2 data word for the execution time of the segment to an adjustable value. The NetWordOUT2 data word 0x400A:002 (P591.02) can be mapped to a network register to transfer the set value as process date. ▸ Further process data 📖 251

In the following, all parameters relevant for the segment configuration are given.

i If the sequencer is active, write accessed to all parameters are blocked that concern the active segment configuration!

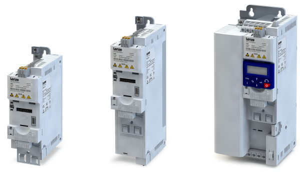


Parameter	Name / value range / [default setting]	Info
0x4026:001 (P801.01)	Sequencer segment 1: Frequency setpoint (Segment 1: Frequency setp.) -599.0 ... [**0.0**] ... 599.0 Hz • From version 03.00	Frequency setpoint for the segment. • Only relevant for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]". • Direction of rotation according to sign.
0x4026:002 (P801.02)	Sequencer segment 1: Acceleration/deceleration (Segment 1: Accel./decel.) 0.0 ... [**5.0**] ... 3600.0 s • From version 03.00	Acceleration/deceleration for the segment. • Only relevant for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]". • The set time refers to the acceleration from standstill to the set maximum frequency. The deceleration is effected with the same ramp.
0x4026:003 (P801.03)	Sequencer segment 1: Time (Segment 1: Time) 0.0 ... [**0.0**] ... 100000.0 s • From version 03.00	Runtime for the segment after the expiry of which it is switched over to the next step of the sequence. • Only relevant for Sequencer mode 0x4025 (P800.00) = "Time operation [1]" or "Time & step operation [3]". • With the setting "0.0", the segment will be skipped.
0x4026:004 (P801.04)	Sequencer segment 1: Digital outputs (Segment 1: Digital outp.) 0 ... [**0**] ... 255 • From version 03.00	Optionally: Set digital outputs to the level set here for the execution time of the segment. Note! In order that the control of a digital output is executed by the sequencer, the following assignment must be made for the respective digital output: • Relay: 0x2634:001 (P420.01) = "Sequencer controlled [100]" • Digital output 1: 0x2634:002 (P420.02) = "Sequencer controlled [100]" • Digital output 2: 0x2634:003 (P420.03) = "Sequencer controlled [100]"
	Bit 0 Relay	0 = X9/NO-COM open and NC-COM closed. 1 = X9/NO-COM closed and NC-COM open. An inversion set in 0x2635:001 (P421.01)is taken into consideration here.
	Bit 1 Digital output 1	0 = set digital output 1 to LOW level. 1 = set digital output 1 to HIGH level. An inversion set in 0x2635:002 (P421.02) is taken into consideration here.
	Bit 2 Digital output 2	0 = set digital output 2 to LOW level. 1 = set digital output 2 to HIGH level. An inversion set in 0x2635:003 (P421.03) is taken into consideration here.
0x4026:005 (P801.05)	Sequencer segment 1: Analog outputs (Segment 1: Analog outp.) 0.00 ... [**0.00**] ... 10.00 VDC • From version 03.00	Optionally: Set analog outputs to the voltage value set here for the execution time of the segment. Note! In order that the control of an analog output is executed by the sequencer, the following assignment must be made for the respective analog output: • Analog output 1: 0x2639:002 (P440.02) = "Sequencer controlled [10]" • Analog output 2: 0x263A:002 (P441.02) = "Sequencer controlled [10]"
0x4026:006 (P801.06)	Sequencer segment 1: PID setpoint (Segment 1: PID setp.) -300.00 ... [**0.00**] ... 300.00 PID unit • From version 03.00	PID control value for the segment. • Only relevant if the PID control in 0x4020:001 (P600.01) is activated.
0x4026:007 (P801.07)	Sequencer segment 1: Torque setpoint (Segment 1: Torque setp.) -400.0 ... [**100.0**] ... 400.0 % • From version 03.00	Torque setpoint for the segment. • Only relevant for operating mode 0x6060 (P301.00) = "MS: Torque mode [-1]".
0x4026:008	Sequencer segment 1: NetWordOUT2 0 ... [**0**] ... 65535 • From version 03.00	Optionally: Set the NetWordOUT2 data word to the value set here for the execution time of the segment. • The NetWordOUT2 data word 0x400A:002 (P591.02) can be mapped to a network register to transfer the set value as process date.
0x4026:009	Sequencer segment 1: Reserved 0 ... [**0**] ... 4294967295 • From version 03.00	
0x4027:001 (P802.01)	Sequencer segment 2: Frequency setpoint (Segment 2: Frequency setp.) -599.0 ... [**0.0**] ... 599.0 Hz • From version 03.00	Frequency setpoint for the segment. • Only relevant for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]". • Direction of rotation according to sign.



Parameter	Name / value range / [default setting]	Info
0x4027:002 (P802.02)	Sequencer segment 2: Acceleration/deceleration (Segment 2: Accel./decel.) 0.0 ... [**5.0**] ... 3600.0 s • From version 03.00	Acceleration/deceleration for the segment. • Only relevant for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]". • The set time refers to the acceleration from standstill to the set maximum frequency. The deceleration is effected with the same ramp.
0x4027:003 (P802.03)	Sequencer segment 2: Time (Segment 2: Time) 0.0 ... [**0.0**] ... 100000.0 s • From version 03.00	Runtime for the segment after the expiry of which it is switched over to the next step of the sequence. • Only relevant for Sequencer mode 0x4025 (P800.00) = "Time operation [1]" or "Time & step operation [3]". • With the setting "0.0", the segment will be skipped.
0x4027:004 (P802.04)	Sequencer segment 2: Digital outputs (Segment 2: Digital outp.) 0 ... [**0**] ... 255 • From version 03.00	Optionally: Set digital outputs to the level set here for the execution time of the segment. Note! In order that the control of a digital output is executed by the sequencer, the following assignment must be made for the respective digital output: • Relay: 0x2634:001 (P420.01) = "Sequencer controlled [100]" • Digital output 1: 0x2634:002 (P420.02) = "Sequencer controlled [100]" • Digital output 2: 0x2634:003 (P420.03) = "Sequencer controlled [100]"
	Bit 0 Relay	0 = X9/NO-COM open and NC-COM closed. 1 = X9/NO-COM closed and NC-COM open. An inversion set in 0x2635:001 (P421.01)is taken into consideration here.
	Bit 1 Digital output 1	0 = set digital output 1 to LOW level. 1 = set digital output 1 to HIGH level. An inversion set in 0x2635:002 (P421.02) is taken into consideration here.
	Bit 2 Digital output 2	0 = set digital output 2 to LOW level. 1 = set digital output 2 to HIGH level. An inversion set in 0x2635:003 (P421.03) is taken into consideration here.
0x4027:005 (P802.05)	Sequencer segment 2: Analog outputs (Segment 2: Analog outp.) 0.00 ... [**0.00**] ... 10.00 VDC • From version 03.00	Optionally: Set analog outputs to the voltage value set here for the execution time of the segment. Note! In order that the control of an analog output is executed by the sequencer, the following assignment must be made for the respective analog output: • Analog output 1: 0x2639:002 (P440.02) = "Sequencer controlled [10]" • Analog output 2: 0x263A:002 (P441.02) = "Sequencer controlled [10]"
0x4027:006 (P802.06)	Sequencer segment 2: PID setpoint (Segment 2: PID setp.) -300.00 ... [**0.00**] ... 300.00 PID unit • From version 03.00	PID control value for the segment. • Only relevant if the PID control in 0x4020:001 (P600.01) is activated.
0x4027:007 (P802.07)	Sequencer segment 2: Torque setpoint (Segment 2: Torque setp.) -400.0 ... [**100.0**] ... 400.0 % • From version 03.00	Torque setpoint for the segment. • Only relevant for operating mode 0x6060 (P301.00) = "MS: Torque mode [-1]".
0x4027:008	Sequencer segment 2: NetWordOUT2 0 ... [**0**] ... 65535 • From version 03.00	Optionally: Set the NetWordOUT2 data word to the value set here for the execution time of the segment. • The NetWordOUT2 data word 0x400A:002 (P591.02) can be mapped to a network register to transfer the set value as process date.
0x4027:009	Sequencer segment 2: Reserved 0 ... [**0**] ... 4294967295 • From version 03.00	
0x4028:001 (P803.01)	Sequencer segment 3: Frequency setpoint (Segment 3: Frequency setp.) -599.0 ... [**0.0**] ... 599.0 Hz • From version 03.00	Frequency setpoint for the segment. • Only relevant for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]". • Direction of rotation according to sign.
0x4028:002 (P803.02)	Sequencer segment 3: Acceleration/deceleration (Segment 3: Accel./decel.) 0.0 ... [**5.0**] ... 3600.0 s • From version 03.00	Acceleration/deceleration for the segment. • Only relevant for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]". • The set time refers to the acceleration from standstill to the set maximum frequency. The deceleration is effected with the same ramp.

Parameter	Name / value range / [default setting]	Info
0x4028:003 (P803.03)	Sequencer segment 3: Time (Segment 3: Time) 0.0 ... [**0.0**] ... 100000.0 s • From version 03.00	Runtime for the segment after the expiry of which it is switched over to the next step of the sequence. • Only relevant for Sequencer mode 0x4025 (P800.00) = "Time operation [1]" or "Time & step operation [3]". • With the setting "0.0", the segment will be skipped.
0x4028:004 (P803.04)	Sequencer segment 3: Digital outputs (Segment 3: Digital outp.) 0 ... [**0**] ... 255 • From version 03.00	Optionally: Set digital outputs to the level set here for the execution time of the segment. Note! In order that the control of a digital output is executed by the sequencer, the following assignment must be made for the respective digital output: • Relay: 0x2634:001 (P420.01) = "Sequencer controlled [100]" • Digital output 1: 0x2634:002 (P420.02) = "Sequencer controlled [100]" • Digital output 2: 0x2634:003 (P420.03) = "Sequencer controlled [100]"
	Bit 0 | Relay	0 = X9/NO-COM open and NC-COM closed. 1 = X9/NO-COM closed and NC-COM open. An inversion set in 0x2635:001 (P421.01)is taken into consideration here.
	Bit 1 | Digital output 1	0 = set digital output 1 to LOW level. 1 = set digital output 1 to HIGH level. An inversion set in 0x2635:002 (P421.02) is taken into consideration here.
	Bit 2 | Digital output 2	0 = set digital output 2 to LOW level. 1 = set digital output 2 to HIGH level. An inversion set in 0x2635:003 (P421.03) is taken into consideration here.
0x4028:005 (P803.05)	Sequencer segment 3: Analog outputs (Segment 3: Analog outp.) 0.00 ... [**0.00**] ... 10.00 VDC • From version 03.00	Optionally: Set analog outputs to the voltage value set here for the execution time of the segment. Note! In order that the control of an analog output is executed by the sequencer, the following assignment must be made for the respective analog output: • Analog output 1: 0x2639:002 (P440.02) = "Sequencer controlled [10]" • Analog output 2: 0x263A:002 (P441.02) = "Sequencer controlled [10]"
0x4028:006 (P803.06)	Sequencer segment 3: PID setpoint (Segment 3: PID setp.) -300.00 ... [**0.00**] ... 300.00 PID unit • From version 03.00	PID control value for the segment. • Only relevant if the PID control in 0x4020:001 (P600.01) is activated.
0x4028:007 (P803.07)	Sequencer segment 3: Torque setpoint (Segment 3: Torque setp.) -400.0 ... [**100.0**] ... 400.0 % • From version 03.00	Torque setpoint for the segment. • Only relevant for operating mode 0x6060 (P301.00) = "MS: Torque mode [-1]".
0x4028:008	Sequencer segment 3: NetWordOUT2 0 ... [**0**] ... 65535 • From version 03.00	Optionally: Set the NetWordOUT2 data word to the value set here for the execution time of the segment. • The NetWordOUT2 data word 0x400A:002 (P591.02) can be mapped to a network register to transfer the set value as process date.
0x4028:009	Sequencer segment 3: Reserved 0 ... [**0**] ... 4294967295 • From version 03.00	
0x4029:001 (P804.01)	Sequencer segment 4: Frequency setpoint (Segment 4: Frequency setp.) -599.0 ... [**0.0**] ... 599.0 Hz • From version 03.00	Frequency setpoint for the segment. • Only relevant for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]". • Direction of rotation according to sign.
0x4029:002 (P804.02)	Sequencer segment 4: Acceleration/deceleration (Segment 4: Accel./decel.) 0.0 ... [**5.0**] ... 3600.0 s • From version 03.00	Acceleration/deceleration for the segment. • Only relevant for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]". • The set time refers to the acceleration from standstill to the set maximum frequency. The deceleration is effected with the same ramp.
0x4029:003 (P804.03)	Sequencer segment 4: Time (Segment 4: Time) 0.0 ... [**0.0**] ... 100000.0 s • From version 03.00	Runtime for the segment after the expiry of which it is switched over to the next step of the sequence. • Only relevant for Sequencer mode 0x4025 (P800.00) = "Time operation [1]" or "Time & step operation [3]". • With the setting "0.0", the segment will be skipped.

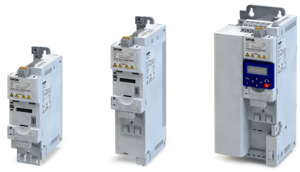


Parameter	Name / value range / [default setting]	Info
0x4029:004 (P804.04)	Sequencer segment 4: Digital outputs (Segment 4: Digital outp.) 0 ... **[0]** ... 255 • From version 03.00	Optionally: Set digital outputs to the level set here for the execution time of the segment. Note! In order that the control of a digital output is executed by the sequencer, the following assignment must be made for the respective digital output: • Relay: 0x2634:001 (P420.01) = "Sequencer controlled [100]" • Digital output 1: 0x2634:002 (P420.02) = "Sequencer controlled [100]" • Digital output 2: 0x2634:003 (P420.03) = "Sequencer controlled [100]"
	Bit 0 Relay	0 = X9/NO-COM open and NC-COM closed. 1 = X9/NO-COM closed and NC-COM open. An inversion set in 0x2635:001 (P421.01)is taken into consideration here.
	Bit 1 Digital output 1	0 = set digital output 1 to LOW level. 1 = set digital output 1 to HIGH level. An inversion set in 0x2635:002 (P421.02) is taken into consideration here.
	Bit 2 Digital output 2	0 = set digital output 2 to LOW level. 1 = set digital output 2 to HIGH level. An inversion set in 0x2635:003 (P421.03) is taken into consideration here.
0x4029:005 (P804.05)	Sequencer segment 4: Analog outputs (Segment 4: Analog outp.) 0.00 ... **[0.00]** ... 10.00 VDC • From version 03.00	Optionally: Set analog outputs to the voltage value set here for the execution time of the segment. Note! In order that the control of an analog output is executed by the sequencer, the following assignment must be made for the respective analog output: • Analog output 1: 0x2639:002 (P440.02) = "Sequencer controlled [10]" • Analog output 2: 0x263A:002 (P441.02) = "Sequencer controlled [10]"
0x4029:006 (P804.06)	Sequencer segment 4: PID setpoint (Segment 4: PID setp.) -300.00 ... **[0.00]** ... 300.00 PID unit • From version 03.00	PID control value for the segment. • Only relevant if the PID control in 0x4020:001 (P600.01) is activated.
0x4029:007 (P804.07)	Sequencer segment 4: Torque setpoint (Segment 4: Torque setp.) -400.0 ... **[100.0]** ... 400.0 % • From version 03.00	Torque setpoint for the segment. • Only relevant for operating mode 0x6060 (P301.00) = "MS: Torque mode [-1]".
0x4029:008	Sequencer segment 4: NetWordOUT2 0 ... **[0]** ... 65535 • From version 03.00	Optionally: Set the NetWordOUT2 data word to the value set here for the execution time of the segment. • The NetWordOUT2 data word 0x400A:002 (P591.02) can be mapped to a network register to transfer the set value as process date.
0x4029:009	Sequencer segment 4: Reserved 0 ... **[0]** ... 4294967295 • From version 03.00	
0x402A:001 (P805.01)	Sequencer segment 5: Frequency setpoint (Segment 5: Frequency setp.) -599.0 ... **[0.0]** ... 599.0 Hz • From version 03.00	Frequency setpoint for the segment. • Only relevant for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]". • Direction of rotation according to sign.
0x402A:002 (P805.02)	Sequencer segment 5: Acceleration/deceleration (Segment 5: Accel./decel.) 0.0 ... **[5.0]** ... 3600.0 s • From version 03.00	Acceleration/deceleration for the segment. • Only relevant for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]". • The set time refers to the acceleration from standstill to the set maximum frequency. The deceleration is effected with the same ramp.
0x402A:003 (P805.03)	Sequencer segment 5: Time (Segment 5: Time) 0.0 ... **[0.0]** ... 100000.0 s • From version 03.00	Runtime for the segment after the expiry of which it is switched over to the next step of the sequence. • Only relevant for Sequencer mode 0x4025 (P800.00) = "Time operation [1]" or "Time & step operation [3]". • With the setting "0.0", the segment will be skipped.

Parameter	Name / value range / [default setting]	Info
0x402A:004 (P805.04)	Sequencer segment 5: Digital outputs (Segment 5: Digital outp.) 0 ... [**0**] ... 255 • From version 03.00	Optionally: Set digital outputs to the level set here for the execution time of the segment. Note! In order that the control of a digital output is executed by the sequencer, the following assignment must be made for the respective digital output: • Relay: 0x2634:001 (P420.01) = "Sequencer controlled [100]" • Digital output 1: 0x2634:002 (P420.02) = "Sequencer controlled [100]" • Digital output 2: 0x2634:003 (P420.03) = "Sequencer controlled [100]"
	Bit 0 Relay	0 = X9/NO-COM open and NC-COM closed. 1 = X9/NO-COM closed and NC-COM open. An inversion set in 0x2635:001 (P421.01)is taken into consideration here.
	Bit 1 Digital output 1	0 = set digital output 1 to LOW level. 1 = set digital output 1 to HIGH level. An inversion set in 0x2635:002 (P421.02) is taken into consideration here.
	Bit 2 Digital output 2	0 = set digital output 2 to LOW level. 1 = set digital output 2 to HIGH level. An inversion set in 0x2635:003 (P421.03) is taken into consideration here.
0x402A:005 (P805.05)	Sequencer segment 5: Analog outputs (Segment 5: Analog outp.) 0.00 ... [**0.00**] ... 10.00 VDC • From version 03.00	Optionally: Set analog outputs to the voltage value set here for the execution time of the segment. Note! In order that the control of an analog output is executed by the sequencer, the following assignment must be made for the respective analog output: • Analog output 1: 0x2639:002 (P440.02) = "Sequencer controlled [10]" • Analog output 2: 0x263A:002 (P441.02) = "Sequencer controlled [10]"
0x402A:006 (P805.06)	Sequencer segment 5: PID setpoint (Segment 5: PID setp.) -300.00 ... [**0.00**] ... 300.00 PID unit • From version 03.00	PID control value for the segment. • Only relevant if the PID control in 0x4020:001 (P600.01) is activated.
0x402A:007 (P805.07)	Sequencer segment 5: Torque setpoint (Segment 5: Torque setp.) -400.0 ... [**100.0**] ... 400.0 % • From version 03.00	Torque setpoint for the segment. • Only relevant for operating mode 0x6060 (P301.00) = "MS: Torque mode [-1]".
0x402A:008	Sequencer segment 5: NetWordOUT2 0 ... [**0**] ... 65535 • From version 03.00	Optionally: Set the NetWordOUT2 data word to the value set here for the execution time of the segment. • The NetWordOUT2 data word 0x400A:002 (P591.02) can be mapped to a network register to transfer the set value as process date.
0x402A:009	Sequencer segment 5: Reserved 0 ... [**0**] ... 4294967295 • From version 03.00	
0x402B:001 (P806.01)	Sequencer segment 6: Frequency setpoint (Segment 6: Frequency setp.) -599.0 ... [**0.0**] ... 599.0 Hz • From version 03.00	Frequency setpoint for the segment. • Only relevant for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]". • Direction of rotation according to sign.
0x402B:002 (P806.02)	Sequencer segment 6: Acceleration/deceleration (Segment 6: Accel./decel.) 0.0 ... [**5.0**] ... 3600.0 s • From version 03.00	Acceleration/deceleration for the segment. • Only relevant for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]". • The set time refers to the acceleration from standstill to the set maximum frequency. The deceleration is effected with the same ramp.
0x402B:003 (P806.03)	Sequencer segment 6: Time (Segment 6: Time) 0.0 ... [**0.0**] ... 100000.0 s • From version 03.00	Runtime for the segment after the expiry of which it is switched over to the next step of the sequence. • Only relevant for Sequencer mode 0x4025 (P800.00) = "Time operation [1]" or "Time & step operation [3]". • With the setting "0.0", the segment will be skipped.

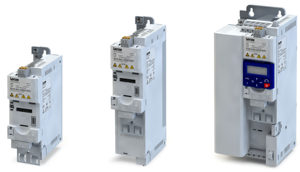
Parameter	Name / value range / [default setting]	Info
0x402B:004 (P806.04)	Sequencer segment 6: Digital outputs (Segment 6: Digital outp.) 0 ... [**0**] ... 255 • From version 03.00	Optionally: Set digital outputs to the level set here for the execution time of the segment. Note! In order that the control of a digital output is executed by the sequencer, the following assignment must be made for the respective digital output: • Relay: 0x2634:001 (P420.01) = "Sequencer controlled [100]" • Digital output 1: 0x2634:002 (P420.02) = "Sequencer controlled [100]" • Digital output 2: 0x2634:003 (P420.03) = "Sequencer controlled [100]"
	Bit 0 Relay	0 = X9/NO-COM open and NC-COM closed. 1 = X9/NO-COM closed and NC-COM open. An inversion set in 0x2635:001 (P421.01)is taken into consideration here.
	Bit 1 Digital output 1	0 = set digital output 1 to LOW level. 1 = set digital output 1 to HIGH level. An inversion set in 0x2635:002 (P421.02) is taken into consideration here.
	Bit 2 Digital output 2	0 = set digital output 2 to LOW level. 1 = set digital output 2 to HIGH level. An inversion set in 0x2635:003 (P421.03) is taken into consideration here.
0x402B:005 (P806.05)	Sequencer segment 6: Analog outputs (Segment 6: Analog outp.) 0.00 ... [**0.00**] ... 10.00 VDC • From version 03.00	Optionally: Set analog outputs to the voltage value set here for the execution time of the segment. Note! In order that the control of an analog output is executed by the sequencer, the following assignment must be made for the respective analog output: • Analog output 1: 0x2639:002 (P440.02) = "Sequencer controlled [10]" • Analog output 2: 0x263A:002 (P441.02) = "Sequencer controlled [10]"
0x402B:006 (P806.06)	Sequencer segment 6: PID setpoint (Segment 6: PID setp.) -300.00 ... [**0.00**] ... 300.00 PID unit • From version 03.00	PID control value for the segment. • Only relevant if the PID control in 0x4020:001 (P600.01) is activated.
0x402B:007 (P806.07)	Sequencer segment 6: Torque setpoint (Segment 6: Torque setp.) -400.0 ... [**100.0**] ... 400.0 % • From version 03.00	Torque setpoint for the segment. • Only relevant for operating mode 0x6060 (P301.00) = "MS: Torque mode [-1]".
0x402B:008	Sequencer segment 6: NetWordOUT2 0 ... [**0**] ... 65535 • From version 03.00	Optionally: Set the NetWordOUT2 data word to the value set here for the execution time of the segment. • The NetWordOUT2 data word 0x400A:002 (P591.02) can be mapped to a network register to transfer the set value as process date.
0x402B:009	Sequencer segment 6: Reserved 0 ... [**0**] ... 4294967295 • From version 03.00	
0x402C:001 (P807.01)	Sequencer segment 7: Frequency setpoint (Segment 7: Frequency setp.) -599.0 ... [**0.0**] ... 599.0 Hz • From version 03.00	Frequency setpoint for the segment. • Only relevant for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]". • Direction of rotation according to sign.
0x402C:002 (P807.02)	Sequencer segment 7: Acceleration/deceleration (Segment 7: Accel./decel.) 0.0 ... [**5.0**] ... 3600.0 s • From version 03.00	Acceleration/deceleration for the segment. • Only relevant for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]". • The set time refers to the acceleration from standstill to the set maximum frequency. The deceleration is effected with the same ramp.
0x402C:003 (P807.03)	Sequencer segment 7: Time (Segment 7: Time) 0.0 ... [**0.0**] ... 100000.0 s • From version 03.00	Runtime for the segment after the expiry of which it is switched over to the next step of the sequence. • Only relevant for Sequencer mode 0x4025 (P800.00) = "Time operation [1]" or "Time & step operation [3]". • With the setting "0.0", the segment will be skipped.

Parameter	Name / value range / [default setting]	Info
0x402C:004 (P807.04)	Sequencer segment 7: Digital outputs (Segment 7: Digital outp.) 0 ... [**0**] ... 255 • From version 03.00	Optionally: Set digital outputs to the level set here for the execution time of the segment. Note! In order that the control of a digital output is executed by the sequencer, the following assignment must be made for the respective digital output: • Relay: 0x2634:001 (P420.01) = "Sequencer controlled [100]" • Digital output 1: 0x2634:002 (P420.02) = "Sequencer controlled [100]" • Digital output 2: 0x2634:003 (P420.03) = "Sequencer controlled [100]"
	Bit 0 Relay	0 = X9/NO-COM open and NC-COM closed. 1 = X9/NO-COM closed and NC-COM open. An inversion set in 0x2635:001 (P421.01)is taken into consideration here.
	Bit 1 Digital output 1	0 = set digital output 1 to LOW level. 1 = set digital output 1 to HIGH level. An inversion set in 0x2635:002 (P421.02) is taken into consideration here.
	Bit 2 Digital output 2	0 = set digital output 2 to LOW level. 1 = set digital output 2 to HIGH level. An inversion set in 0x2635:003 (P421.03) is taken into consideration here.
0x402C:005 (P807.05)	Sequencer segment 7: Analog outputs (Segment 7: Analog outp.) 0.00 ... [**0.00**] ... 10.00 VDC • From version 03.00	Optionally: Set analog outputs to the voltage value set here for the execution time of the segment. Note! In order that the control of an analog output is executed by the sequencer, the following assignment must be made for the respective analog output: • Analog output 1: 0x2639:002 (P440.02) = "Sequencer controlled [10]" • Analog output 2: 0x263A:002 (P441.02) = "Sequencer controlled [10]"
0x402C:006 (P807.06)	Sequencer segment 7: PID setpoint (Segment 7: PID setp.) -300.00 ... [**0.00**] ... 300.00 PID unit • From version 03.00	PID control value for the segment. • Only relevant if the PID control in 0x4020:001 (P600.01) is activated.
0x402C:007 (P807.07)	Sequencer segment 7: Torque setpoint (Segment 7: Torque setp.) -400.0 ... [**100.0**] ... 400.0 % • From version 03.00	Torque setpoint for the segment. • Only relevant for operating mode 0x6060 (P301.00) = "MS: Torque mode [-1]".
0x402C:008	Sequencer segment 7: NetWordOUT2 0 ... [**0**] ... 65535 • From version 03.00	Optionally: Set the NetWordOUT2 data word to the value set here for the execution time of the segment. • The NetWordOUT2 data word 0x400A:002 (P591.02) can be mapped to a network register to transfer the set value as process date.
0x402C:009	Sequencer segment 7: Reserved 0 ... [**0**] ... 4294967295 • From version 03.00	
0x402D:001 (P808.01)	Sequencer segment 8: Frequency setpoint (Segment 8: Frequency setp.) -599.0 ... [**0.0**] ... 599.0 Hz • From version 03.00	Frequency setpoint for the segment. • Only relevant for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]". • Direction of rotation according to sign.
0x402D:002 (P808.02)	Sequencer segment 8: Acceleration/deceleration (Segment 8: Accel./decel.) 0.0 ... [**5.0**] ... 3600.0 s • From version 03.00	Acceleration/deceleration for the segment. • Only relevant for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]". • The set time refers to the acceleration from standstill to the set maximum frequency. The deceleration is effected with the same ramp.
0x402D:003 (P808.03)	Sequencer segment 8: Time (Segment 8: Time) 0.0 ... [**0.0**] ... 100000.0 s • From version 03.00	Runtime for the segment after the expiry of which it is switched over to the next step of the sequence. • Only relevant for Sequencer mode 0x4025 (P800.00) = "Time operation [1]" or "Time & step operation [3]". • With the setting "0.0", the segment will be skipped.



Parameter	Name / value range / [default setting]	Info
0x402D:004 (P808.04)	Sequencer segment 8: Digital outputs (Segment 8: Digital outp.) 0 ... [**0**] ... 255 • From version 03.00	Optionally: Set digital outputs to the level set here for the execution time of the segment. Note! In order that the control of a digital output is executed by the sequencer, the following assignment must be made for the respective digital output: • Relay: 0x2634:001 (P420.01) = "Sequencer controlled [100]" • Digital output 1: 0x2634:002 (P420.02) = "Sequencer controlled [100]" • Digital output 2: 0x2634:003 (P420.03) = "Sequencer controlled [100]"
	Bit 0 Relay	0 = X9/NO-COM open and NC-COM closed. 1 = X9/NO-COM closed and NC-COM open. An inversion set in 0x2635:001 (P421.01)is taken into consideration here.
	Bit 1 Digital output 1	0 = set digital output 1 to LOW level. 1 = set digital output 1 to HIGH level. An inversion set in 0x2635:002 (P421.02) is taken into consideration here.
	Bit 2 Digital output 2	0 = set digital output 2 to LOW level. 1 = set digital output 2 to HIGH level. An inversion set in 0x2635:003 (P421.03) is taken into consideration here.
0x402D:005 (P808.05)	Sequencer segment 8: Analog outputs (Segment 8: Analog outp.) 0.00 ... [**0.00**] ... 10.00 VDC • From version 03.00	Optionally: Set analog outputs to the voltage value set here for the execution time of the segment. Note! In order that the control of an analog output is executed by the sequencer, the following assignment must be made for the respective analog output: • Analog output 1: 0x2639:002 (P440.02) = "Sequencer controlled [10]" • Analog output 2: 0x263A:002 (P441.02) = "Sequencer controlled [10]"
0x402D:006 (P808.06)	Sequencer segment 8: PID setpoint (Segment 8: PID setp.) -300.00 ... [**0.00**] ... 300.00 PID unit • From version 03.00	PID control value for the segment. • Only relevant if the PID control in 0x4020:001 (P600.01) is activated.
0x402D:007 (P808.07)	Sequencer segment 8: Torque setpoint (Segment 8: Torque setp.) -400.0 ... [**100.0**] ... 400.0 % • From version 03.00	Torque setpoint for the segment. • Only relevant for operating mode 0x6060 (P301.00) = "MS: Torque mode [-1]".
0x402D:008	Sequencer segment 8: NetWordOUT2 0 ... [**0**] ... 65535 • From version 03.00	Optionally: Set the NetWordOUT2 data word to the value set here for the execution time of the segment. • The NetWordOUT2 data word 0x400A:002 (P591.02) can be mapped to a network register to transfer the set value as process date.
0x402D:009	Sequencer segment 8: Reserved 0 ... [**0**] ... 4294967295 • From version 03.00	
0x402E:001 (P822.01)	End segment: Frequency setpoint (End segment: Frequency setp.) -599.0 ... [**0.0**] ... 599.0 Hz • From version 03.00	Frequency setpoint after the sequence has been completed, i. e., after the steps configured for the sequence have been passed through with the set numbers of cycles. • Only relevant for the operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]" and if end of sequence mode 0x402F (P824.00) = "Keep running [0]". • Direction of rotation according to sign.
0x402E:002 (P822.02)	End segment: Acceleration/deceleration (End segment: Accel./decel.) 0.0 ... [**5.0**] ... 3600.0 s • From version 03.00	If end of sequence mode = "continuous operation" (default setting): Acceleration/deceleration for reaching the frequency setpoint set for the end segment after the sequence has been processed. If end of sequence mode = "Stop" or "Stop and abort": Deceleration for reaching standstill after the sequence has been processed. • Only relevant for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]". • The set time refers to the acceleration from standstill to the set maximum frequency. The deceleration is effected with the same ramp.

Parameter	Name / value range / [default setting]	Info
0x402E:003 (P822.03)	End segment: Time (End segment: Time) 0.0 ... [**0.0**] ... 100000.0 s • From version 03.00	Delay time for activating the output states configured for the end segment. • This parameter has a different meaning than the time settings for the segments 1 ... 8! • The set deceleration time starts when the end segment is started to be processed. After the deceleration time has elapsed: • The digital outputs are (if configured accordingly) set to the levels set in 0x402E:004 (P822.04). • The analog outputs are (if configured accordingly) set to the voltage value set in 0x402E:005 (P822.05). • The NetWordOUT2 data word is set to the value set in 0x402E:008.
0x402E:004 (P822.04)	End segment: Digital outputs (End segment: Digital outp.) 0 ... [**0**] ... 255 • From version 03.00	Optionally: Set digital outputs to the levels set here after the time set for the end segment.
	Bit 0 Relay	0 = X9/NO-COM open and NC-COM closed. 1 = X9/NO-COM closed and NC-COM open. An inversion set in 0x2635:001 (P421.01)is taken into consideration here.
	Bit 1 Digital output 1	0 = set digital output 1 to LOW level. 1 = set digital output 1 to HIGH level. An inversion set in 0x2635:002 (P421.02) is taken into consideration here.
	Bit 2 Digital output 2	0 = set digital output 2 to LOW level. 1 = set digital output 2 to HIGH level. An inversion set in 0x2635:003 (P421.03) is taken into consideration here.
0x402E:005 (P822.05)	End segment: Analog outputs (End segment: Analog outp.) 0.00 ... [**0.00**] ... 10.00 VDC • From version 03.00	Optionally: Set analog outputs to the voltage value set here after the time set for the end segment. Note! In order that the control of an analog output is executed by the sequencer, the following assignment must be made for the respective analog output: • Analog output 1: 0x2639:002 (P440.02) = "Sequencer controlled [10]" • Analog output 2: 0x263A:002 (P441.02) = "Sequencer controlled [10]"
0x402E:006 (P822.06)	End segment: PID setpoint (End segment: PID setp.) -300.00 ... [**0.00**] ... 300.00 PID unit • From version 03.00	PID control value after the sequence has been completed, i. e., after the steps configured for the sequence have been passed through with the set numbers of cycles. • Only relevant if PID control is activated in 0x4020:001 (P600.01) and end of sequence mode 0x402F (P824.00) = "Keep running [0]".
0x402E:007 (P822.07)	End segment: Torque setpoint (End segment: Torque setp.) -400.0 ... [**100.0**] ... 400.0 % • From version 03.00	Torque setpoint after the sequence has been completed, i. e., after the steps configured for the sequence have been passed through with the set numbers of cycles. • Only relevant for the operating mode 0x6060 (P301.00) = "MS: Torque mode [-1]" and if end of sequence mode 0x402F (P824.00) = "Keep running [0]".
0x402E:008	End segment: NetWordOUT2 0 ... [**0**] ... 65535 • From version 03.00	Optionally: Set NetWordOUT2 data word to the value set here after the time set for the end segment. • The NetWordOUT2 data word 0x400A:002 (P591.02) can be mapped to a network register to transfer the set value as process date.
0x402E:009	End segment: Reserved 0 ... [**0**] ... 4294967295 • From version 03.00	



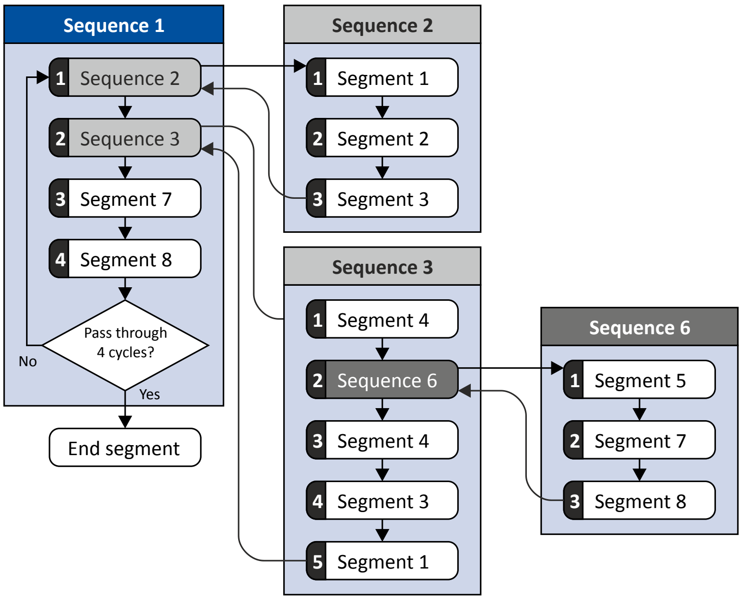
12.2 Sequence configuration

As a total, 8 sequences can be configured (with the numbers 1 to 8). Each sequence consists of 16 configurable steps. Each step of a sequence can call a segment or a complete sequence (with a higher number).

Details

The following example illustrates the configuration based on a nested sequence:

- The sequence 1 is the main sequence which calls further (sub) sequences.
- The main sequence is passed through four times. Afterwards, in the preset "continuous operation" end of sequence mode, the setpoint set for the end segment is continuously transmitted to the motor control until the sequence is aborted.



Resulting segment order												
1	2	3	4	5	7	8	4	3	1	7	8	End segment
4 cycles												

Required parameter setting:

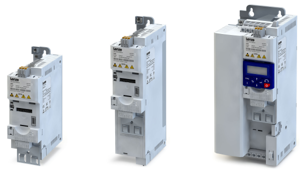
	Sequence 1	Sequence 2
Step 1	0x4030:001 (P830.01) = "Sequence 2 [-2]"	0x4032:001 (P835.01) = "Segment 1 [1]"
Step 2	0x4030:002 (P830.02) = "Sequence 3 [-3]"	0x4032:002 (P835.02) = "Segment 2 [2]"
Step 3	0x4030:003 (P830.03) = "Segment 7 [7]"	0x4032:003 (P835.03) = "Segment 3 [3]"
Step 4	0x4030:004 (P830.04) = "Segment 8 [8]"	0x4032:004 (P835.04) = "Skip step [0]"
Step 5	0x4030:005 (P830.05) = "Skip step [0]"	...
Step ...	...	
Step 16	0x4030:016 (P830.16) = "Skip step [0]"	0x4032:016 (P835.16) = "Skip step [0]"
Number of cycles	0x4031 (P831.00) = 4	0x4033 (P836.00) = 1

	Sequence 3	Sequence 6
Step 1	0x4034:001 (P840.01) = "Segment 4 [4]"	0x403A:001 (P855.01) = "Segment 5 [5]"
Step 2	0x4034:002 (P840.02) = "Sequence 6 [-6]"	0x403A:002 (P855.02) = "Segment 7 [7]"
Step 3	0x4034:003 (P840.03) = "Segment 4 [4]"	0x403A:003 (P855.03) = "Segment 8 [8]"
Step 4	0x4034:004 (P840.04) = "Segment 3 [3]"	0x403A:004 (P855.04) = "Skip step [0]"
Step 5	0x4034:005 (P840.05) = "Segment 1 [1]"	...
Step 6	0x4034:006 (P840.06) = "Skip step [0]"	
Step ...	...	
Step 16	0x4034:016 (P840.16) = "Skip step [0]"	0x403A:016 (P855.16) = "Skip step [0]"
Number of cycles	0x4035 (P841.00) = 1	0x403B (P856.00) = 1

In the following, all parameters relevant for the sequence configuration are given.

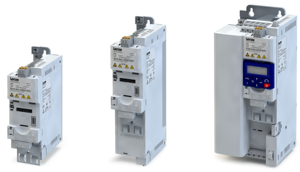
> If the sequencer is active, write accessed to all parameters are blocked that concern the active sequence configuration!

Parameter	Name / value range / [default setting]	Info
0x4030:001 ... 0x4030:016 (P830.01 ... 16)	Sequence 1: Step 1 ... Step 16 (Sequence 1: Step 1 ... Step 16) -8 Sequence 8 -7 Sequence 7 -6 Sequence 6 -5 Sequence 5 -4 Sequence 4 -3 Sequence 3 -2 Sequence 2 **0 Skip step** 1 Segment 1 2 Segment 2 3 Segment 3 4 Segment 4 5 Segment 5 6 Segment 6 7 Segment 7 8 Segment 8	Configuration of the steps 1 ... 16 for sequence 1. • Alternatively to calling a single segment, a complete sequence (with a higher number) can also be called from one step. This, for instance, serves to configure a main sequence from which several subsequences are called successively. • With the setting "0", the respective step is skipped.
0x4031 (P831.00)	Number of cycles sequence 1 (Cycl. sequence 1) 1 ... [**1**] ... 65535 • From version 03.00	Definition of how often the sequence 1 is to be passed through. • 1 = one pass, 2 = two passes, ... • 65535 = infinite number of cycles.
0x4032:001 ... 0x4032:016 (P835.01 ... 16)	Sequence 2: Step 1 ... Step 16 (Sequence 2: Step 1 ... Step 16) -8 Sequence 8 -7 Sequence 7 -6 Sequence 6 -5 Sequence 5 -4 Sequence 4 -3 Sequence 3 **0 Skip step** 1 Segment 1 2 Segment 2 3 Segment 3 4 Segment 4 5 Segment 5 6 Segment 6 7 Segment 7 8 Segment 8	Configuration of the steps 1 ... 16 for sequence 2. • Alternatively to calling a single segment, a complete sequence (with a higher number) can also be called from one step. This, for instance, serves to configure a main sequence from which several subsequences are called successively. • With the setting "0", the respective step is skipped.
0x4033 (P836.00)	Number of cycles sequence 2 (Cycl. sequence 2) 1 ... [**1**] ... 65535 • From version 03.00	Definition of how often the sequence 2 is to be passed through. • 1 = one pass, 2 = two passes, ... • 65535 = infinite number of cycles.



Parameter	Name / value range / [default setting]	Info
0x4034:001 ... 0x4034:016 (P840.01 ... 16)	Sequence 3: Step 1 ... Step 16 (Sequence 3: Step 1 ... Step 16)	Configuration of the steps 1 ... 16 for sequence 3. • Alternatively to calling a single segment, a complete sequence (with a higher number) can also be called from one step. This, for instance, serves to configure a main sequence from which several subsequences are called successively. • With the setting "0", the respective step is skipped.
	-8 Sequence 8	
	-7 Sequence 7	
	-6 Sequence 6	
	-5 Sequence 5	
	-4 Sequence 4	
	0 Skip step	
	1 Segment 1	
	2 Segment 2	
	3 Segment 3	
	4 Segment 4	
	5 Segment 5	
	6 Segment 6	
	7 Segment 7	
	8 Segment 8	
0x4035 (P841.00)	Number of cycles sequence 3 (Cycl. sequence 3) 1 ... [**1**] ... 65535 • From version 03.00	Definition of how often the sequence 3 is to be passed through. • 1 = one pass, 2 = two passes, ... • 65535 = infinite number of cycles.
0x4036:001 ... 0x4036:016 (P845.01 ... 16)	Sequence 4: Step 1 ... Step 16 (Sequence 4: Step 1 ... Step 16)	Configuration of the steps 1 ... 16 for sequence 4. • Alternatively to calling a single segment, a complete sequence (with a higher number) can also be called from one step. This, for instance, serves to configure a main sequence from which several subsequences are called successively. • With the setting "0", the respective step is skipped.
	-8 Sequence 8	
	-7 Sequence 7	
	-6 Sequence 6	
	-5 Sequence 5	
	0 Skip step	
	1 Segment 1	
	2 Segment 2	
	3 Segment 3	
	4 Segment 4	
	5 Segment 5	
	6 Segment 6	
	7 Segment 7	
	8 Segment 8	
0x4037 (P846.00)	Number of cycles sequence 4 (Cycl. sequence 4) 1 ... [**1**] ... 65535 • From version 03.00	Definition of how often the sequence 4 is to be passed through. • 1 = one pass, 2 = two passes, ... • 65535 = infinite number of cycles.
0x4038:001 ... 0x4038:016 (P850.01 ... 16)	Sequence 5: Step 1 ... Step 16 (Sequence 5: Step 1 ... Step 16)	Configuration of the steps 1 ... 16 for sequence 5. • Alternatively to calling a single segment, a complete sequence (with a higher number) can also be called from one step. This, for instance, serves to configure a main sequence from which several subsequences are called successively. • With the setting "0", the respective step is skipped.
	-8 Sequence 8	
	-7 Sequence 7	
	-6 Sequence 6	
	0 Skip step	
	1 Segment 1	
	2 Segment 2	
	3 Segment 3	
	4 Segment 4	
	5 Segment 5	
	6 Segment 6	
	7 Segment 7	
	8 Segment 8	
0x4039 (P851.00)	Number of cycles sequence 5 (Cycl. sequence 5) 1 ... [**1**] ... 65535 • From version 03.00	Definition of how often the sequence 5 is to be passed through. • 1 = one pass, 2 = two passes, ... • 65535 = infinite number of cycles.

Parameter	Name / value range / [default setting]	Info
0x403A:001 ... 0x403A:016 (P855.01 ... 16)	Sequence 6: Step 1 ... Step 16 (Sequence 6: Step 1 ... Step 16) -8 Sequence 8 -7 Sequence 7 **0 Skip step** 1 Segment 1 2 Segment 2 3 Segment 3 4 Segment 4 5 Segment 5 6 Segment 6 7 Segment 7 8 Segment 8	Configuration of the steps 1 ... 16 for sequence 6. • Alternatively to calling a single segment, a complete sequence (with a higher number) can also be called from one step. This, for instance, serves to configure a main sequence from which several subsequences are called successively. • With the setting "0", the respective step is skipped.
0x403B (P856.00)	Number of cycles sequence 6 (Cycl. sequence 6) 1 ... [**1**] ... 65535 • From version 03.00	Definition of how often the sequence 6 is to be passed through. • 1 = one pass, 2 = two passes, ... • 65535 = infinite number of cycles.
0x403C:001 ... 0x403C:016 (P860.01 ... 16)	Sequence 7: Step 1 ... Step 16 (Sequence 7: Step 1 ... Step 16) -8 Sequence 8 **0 Skip step** 1 Segment 1 2 Segment 2 3 Segment 3 4 Segment 4 5 Segment 5 6 Segment 6 7 Segment 7 8 Segment 8	Configuration of the steps 1 ... 16 for sequence 7. • Alternatively to calling a single segment, a complete sequence (with a higher number) can also be called from one step. This, for instance, serves to configure a main sequence from which several subsequences are called successively. • With the setting "0", the respective step is skipped.
0x403D (P861.00)	Number of cycles sequence 7 (Cycl. sequence 7) 1 ... [**1**] ... 65535 • From version 03.00	Definition of how often the sequence 7 is to be passed through. • 1 = one pass, 2 = two passes, ... • 65535 = infinite number of cycles.
0x403E:001 ... 0x403E:016 (P865.01 ... 16)	Sequence 8: Step 1 ... Step 16 (Sequence 8: Step 1 ... Step 16) **0 Skip step** 1 Segment 1 2 Segment 2 3 Segment 3 4 Segment 4 5 Segment 5 6 Segment 6 7 Segment 7 8 Segment 8	Configuration of the steps 1 ... 16 for sequence 8. • With the setting "0", the respective step is skipped.
0x403F (P866.00)	Number of cycles sequence 8 (Cycl. sequence 8) 1 ... [**1**] ... 65535 • From version 03.00	Definition of how often the sequence 8 is to be passed through. • 65535 = infinite number of cycles.



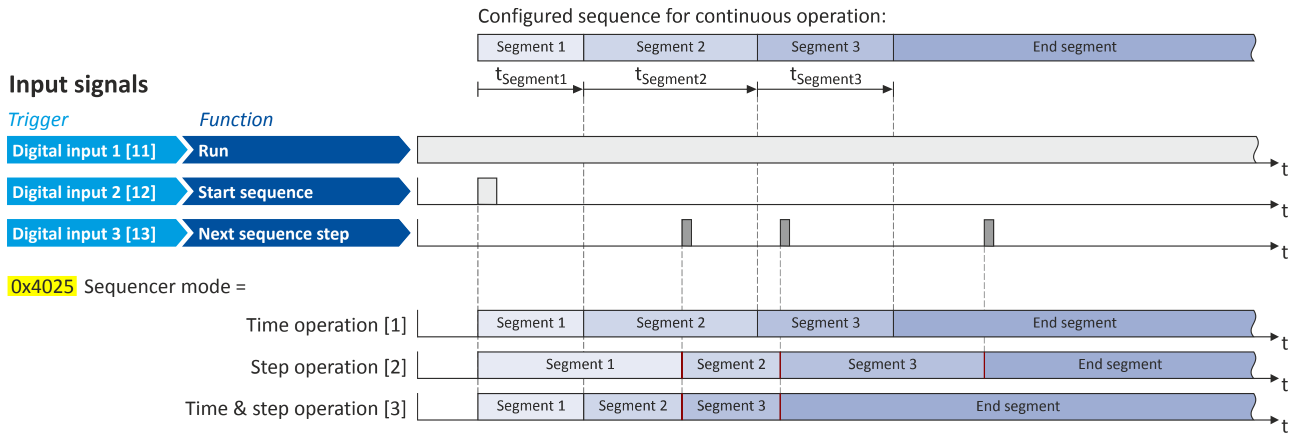
12.3 Sequencer basic settings

In the presetting, the sequencer is disabled. In order to enable the sequencer, the desired sequencer mode (time and/or step operation) must be set. Moreover, different end of sequence modes and start of sequences modes are available.

Details

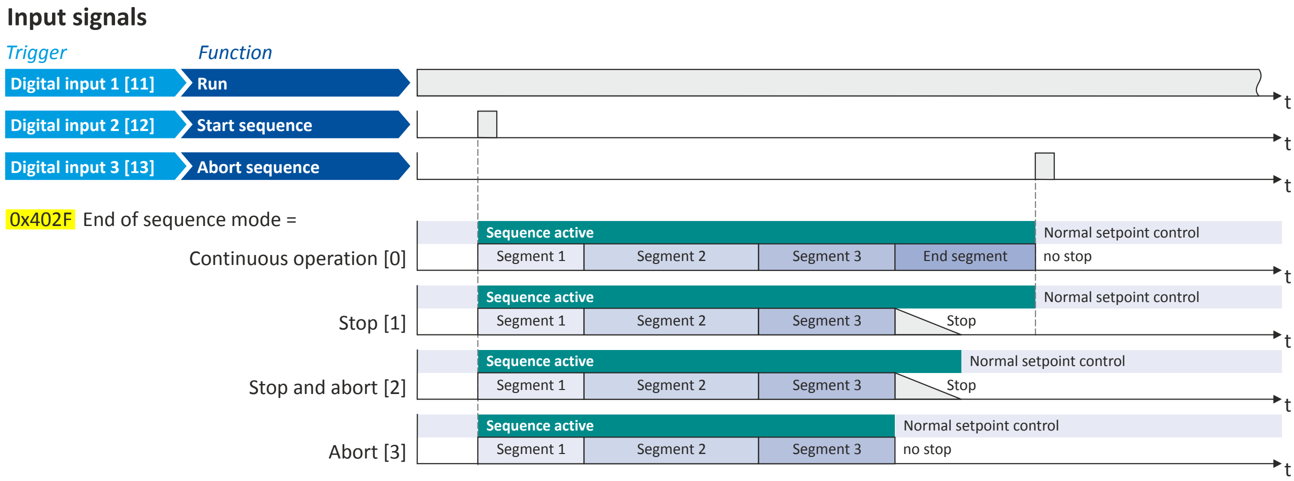
Sequencer mode 0x4025 (P800.00)

- The sequencer can be operated in time and/or step operation.
- The following diagram demonstrates the different sequencer modes:



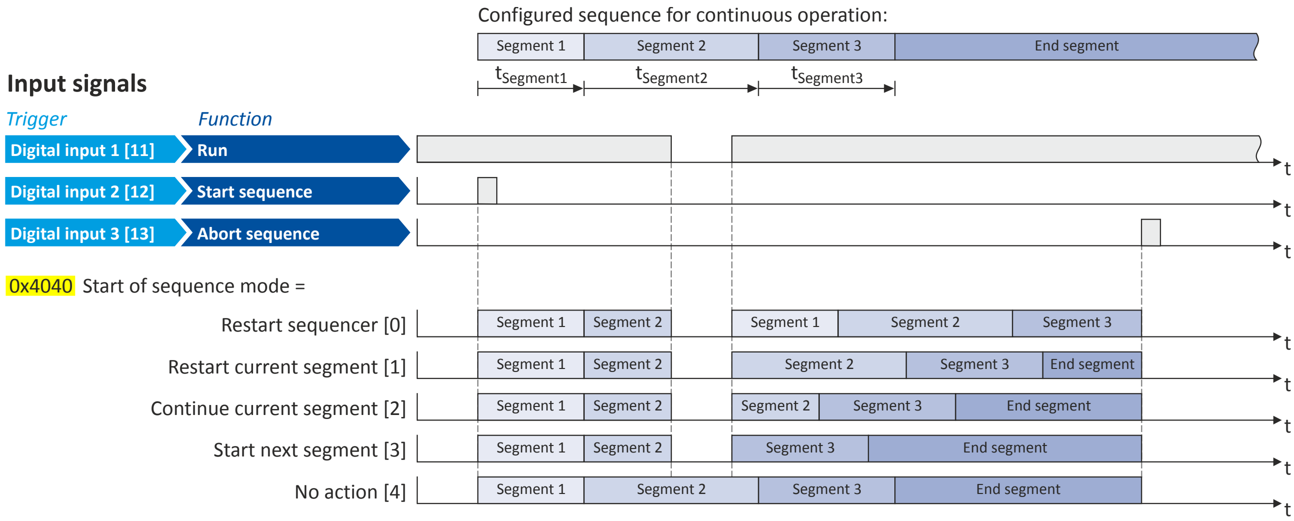
End of sequence mode 0x402F (P824.00)

- The end of sequence mode defines the action after the end of the sequence.
- In the default setting "Keep running [0]", the setpoint set for the end segment is continuously transmitted to the motor control until the sequence is aborted.
- The following diagram demonstrates the different end of sequence modes:

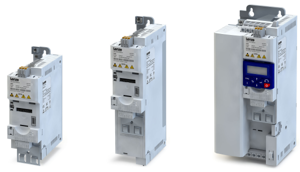


Start of sequence mode 0x4040 (P820.00)

- The start of sequence mode defines the action after the motor is stopped and restarted or after the motor has been restarted after an error occurred.
- In the default setting "Restart sequencer [0]", the currently selected sequence is restarted.
- The following diagram demonstrates the different start of sequence modes:



Parameter	Name / value range / [default setting]	Info
0x4025 (P800.00)	Sequencer mode (Sequencer mode) • From version 02.00	Selection of the sequencer mode.
	0 Disabled	
	1 Time operation (from version 03.00)	The switch-over to the next step of the sequence is made after the time set for the current segment has elapsed.
	2 Step operation (from version 03.00)	The switch-over to the next step of the sequence is made via the trigger assigned in 0x2631:032 (P400.32) to the "Next sequence step" function.
	3 Time & step operation (from version 03.00)	The switch-over to the next step of the sequence is made via the trigger assigned in 0x2631:032 (P400.32) to the "Next sequence step" function, but no later than after the time set for the current segment has elapsed.
0x402F (P824.00)	End of sequence mode (End of seq. mode) • From version 03.00	Selection of the action after the sequence has been completed, i. e., after the steps configured for the sequence have been passed through with the set numbers of cycles.
	0 Keep running	The setpoint set for the end segment is continuously transmitted to the motor control until the sequence is aborted.
	1 Stop	The motor is stopped with the stop method set in 0x2838:003 (P203.03). The setpoint is continued to be controlled by the sequencer. In order to return to the normal setpoint control, the sequence must be aborted. Note! After returning to the normal setpoint control, a start command is required to restart the motor.
	2 Stop and abort	The motor is stopped with the stop method set in 0x2838:003 (P203.03). After standstill is reached, it is automatically returned to the normal set-point control. Note! After returning to the normal setpoint control, a start command is required to restart the motor.
	3 Abort	Return to the normal setpoint control without stopping the motor.



Parameter	Name / value range / [default setting]		Info
0x4040 (P820.00)	Start of sequence mode (StartOfSeq. mode) • From version 03.00		Selection of the action after the motor has been stopped and restarted or after the motor has been restarted after an error occurred.
	0	**Restart sequencer**	The currently selected sequence is restarted.
	1	Restart current segment	The current segment of the selected sequence is restarted.
	2	Continue current segment	The current segment of the selected sequence is continued (just like after a break).
	3	Start next segment	The next segment of the selected sequence is started.
	4	No action	For debugging purposes: The sequence is continued to be processed (including output states) even if the motor is stopped.

Related topics

▶ Sequencer control functions 588

▶ Sequencer diagnostics 134

13 Safety functions

13.1 Safe torque off (STO)

With this safety function, the drive can be switch off safely immediately.

⚠ DANGER!

Automatic restart if the request of the safety function is deactivated.

Possible consequences: Death or severe injuries

- You must provide external measures according to EN ISO 13849−1 which ensure that the drive only restarts after a confirmation.

Preconditions

Inverter with I5MASA000 safety module

Details

Safe disconnection of the drive

1. A safety sensor requests the safety function.
2. The transmission of the pulse width modulation is safely switched off by the safety unit.
3. The power drivers do not generate a rotating field anymore.
4. The "STO is not active" status in the status word changes from 1: HIGH to 0: LOW (object 0x6041, bit 15).

The motor is safely switched to torqueless operation (STO).

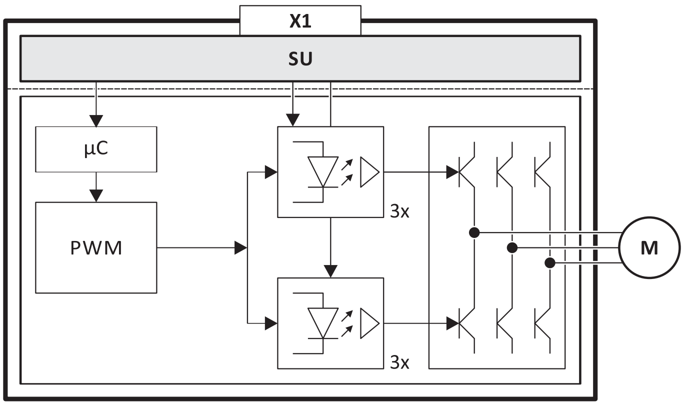


Fig. 8: Operating principle of safety unit

X1	Control terminals of the safety unit	M	Motor
PWM	Pulse width modulation	µC	Microcontroller

Truth table

Safe input / channel		Inverter	
SIA	**SIB**	**Device status**	**Approval**
0	0	STO active	0
0	1		0
1	0		0
1	1	Drive enabled	1

If SIA and SIB are LOW at the same time, the internal status signal "Both STO channels not active [155]" in the inverter is set to TRUE. This status signal can be used to trigger a "non-safe output" (e.g. to the relay).

If the GS connection is interrupted or in case of a short circuit/short circuit of GS to SIA/SIB, STO is active.

Parameter	Name / value range / [default setting]		Info
0x282A:004	Status words: Extended status word • Read only		Bit-coded status word.
	Bit 8	Reverse rotational direction	1 ≡ reversal active.
	Bit 10	Safe torque off (STO) active	1 ≡ "Safe torque off (STO)" function has been triggered by the integrated safety system.
	Bit 11	Both STO channels not active	1 ≡ safe inputs SIA and SIB = LOW (simultaneously).

14 Flexible I/O configuration

Use parameter 0x2631 (P400xx) to individually adapt the inverter control to the respective application. This is basically effected by assigning digital signal sources ("triggers") to functions of the inverter.

NOTICE

A digital signal source can be assigned to several functions.

Possible consequence: unforeseeable behaviour of the drive in case of incorrect assignment

► Carry out assignment of a digital signal source to several functions with greater care.

Details

- Each subcode of 0x2631 (P400) is permanently assigned to a specific function. Functions are for example "Enable inverter", "Activate quick stop" or "Start forward (CW)".
- For a function, exactly one (digital) trigger can be set:

Trigger *Function*

Digital input 1 → Run

- Possible triggers to be selected are for example the digital input and internal status signals of the inverter.
- A list of all triggers available can be found in the description for the parameter 0x2631:001 (P400.01).
- If the trigger condition is met, the corresponding function is executed. More details with regard to the respective trigger conditions can be gathered from the functional descriptions in the following subchapters.

Example: changing the function assignment of a digital input

Task for this example:

1. The preset assignment of the digital input 3 for "Reverse rotational direction" function is to be cancelled.
2. Instead, the digital input 3 is to be assigned to the "Activate DC braking" function.

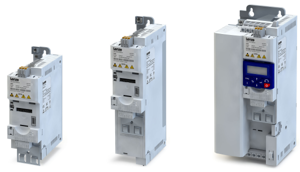
For this purpose, the following two settings are required:

Function *Trigger* *Function*

Default: 0x2631:013 = Digital input 3 [13] → Invert rotation

New: 1. 0x2631:013 = Not connected [0] → Invert rotation

2. 0x2631:005 = Digital input 3 [13] → Activate DC braking



14.1 Control source change-over

The term "control sources" in this connection refers to the digital signal sources from which the inverter receives its start, stop, and reversal commands.

Possible control sources are:

- Digital inputs
- Keypad
- Network

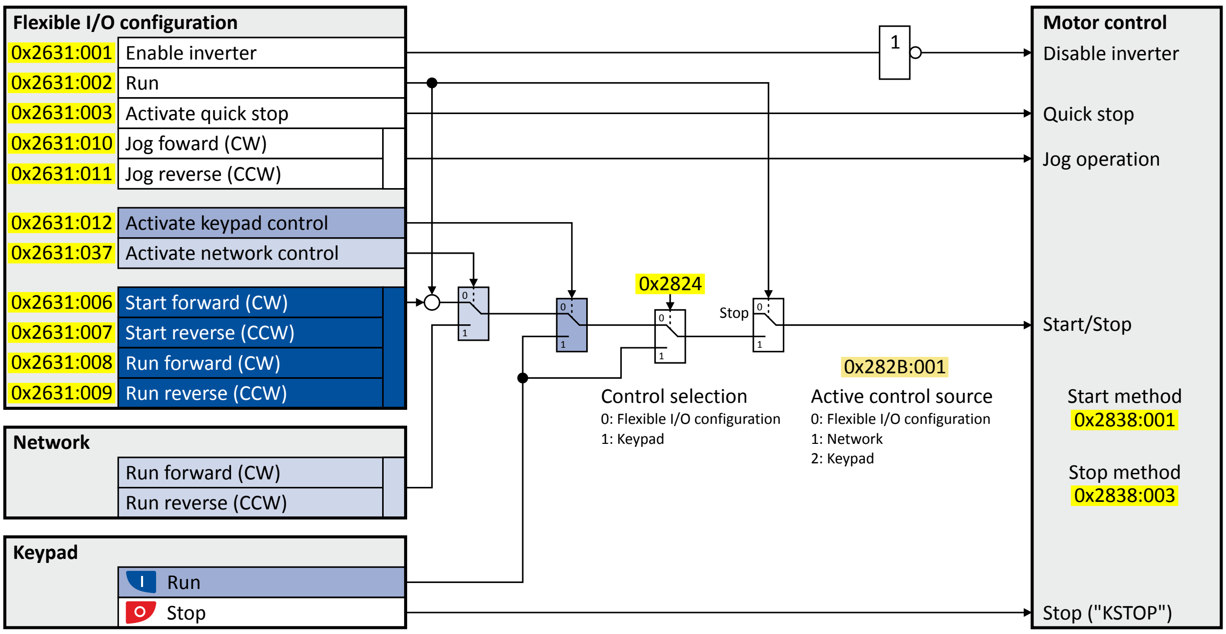
Details

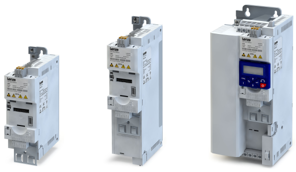
First, select in 0x2824 (P200.00) whether the start of the motor is to be configured flexibly (default setting) or exclusively via the keypad. ▶ Control source selection 📖 147

If "Flexible I/O configuration" is set, a change-over from one control source to another can be effected during operation via the functions listed in the following table. The inverter not only supports such a change-over via its digital inputs, but also as a function of internal inverter states.

Activate keypad control 0x2631:012 (P400.12)	Activate network control 0x2631:037 (P400.37)	Active control source
FALSE / Not connected	FALSE / Not connected	Flexible I/O configuration (default setting) • The motor is controlled via the digital inputs. • For preconfigured assignment of the digital inputs, see chapter "Function assignment of the inputs and outputs". 📖 82 • For description of the basic functions for controlling the motor, see chapter "Start / stop motor". 📖 531
FALSE / Not connected	TRUE	Network • Starting the motor is only possible via the network control word. • Exception: Jog operation; see chapter "Start / stop motor". 📖 531 ▶ Example 2: Change-over from terminal control to network control 📖 530
TRUE	Any	Keypad • Starting the motor is only possible via the I keypad key. • Exception: Jog operation; see chapter "Start / stop motor". 📖 531 ▶ Example 1: Change-over from terminal control to keypad control 📖 529

The following signal flow shows the internal control logics:





The "Enable inverter" 0x2631:001 (P400.01) function must be set to TRUE to start the motor. Either via digital input or by default setting "Constant TRUE [1]". If the function is set to FALSE, the inverter is disabled. The motor becomes torqueless (coasts).

In case of an activated keypad or network control, the "Run" 0x2631:002 (P400.02)function must be additionally set to TRUE to start the motor. Either via digital input or by the "Constant TRUE [1]" setting.

Notes:
- In case of an activated keypad or network control, the following functions are still active:
  - 0x2631:001 (P400.01): Enable inverter
  - 0x2631:002 (P400.02): Run
  - 0x2631:003 (P400.03): Activate quick stop
  - 0x2631:004 (P400.04): Reset fault
  - 0x2631:005 (P400.05): Activate DC braking
  - 0x2631:010 (P400.10): Jog foward (CW)
  - 0x2631:011 (P400.11): Jog reverse (CCW)
  - 0x2631:012 (P400.12): Activate keypad control
  - 0x2631:037 (P400.37): Activate network control
  - 0x2631:043 (P400.43): Activate fault 1
  - 0x2631:044 (P400.44): Activate fault 2
  - 0x2631:054 (P400.54): Position counter reset
- In case of an activated network control, the following additional functions are still active:
  - 0x2631:013 (P400.13): Reverse rotational direction
  - The functions for setpoint change-over. ▶ Setpoint change-over 📖546

  All other functions configurable via 0x2631:xx (P400.xx) are deactivated in case of keypad or network control.

Diagnostic parameters:
- 0x282A:001 (P126.01): Cause of disable
- 0x282A:002 (P126.02): Cause of quick stop
- 0x282A:003 (P126.03): Cause of stop
- 0x282B:001 (P125.01): Active control source

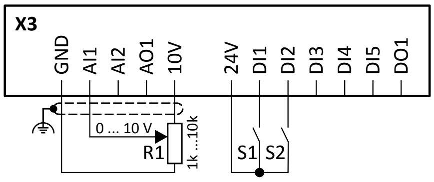
For description of the basic functions for controlling the motor, see chapter "Start / stop motor". 📖531

Parameter	Name / value range / [default setting]		Info
0x2631:012 (P400.12)	Function list: Activate keypad control (Function list: Keypad control) • For further possible settings, see parameter 0x2631:001 (P400.01). 📖532		Assignment of a trigger for the "Activate keypad control" function. Trigger = TRUE: activate keypad as control source. Trigger = FALSE: no action / deactivate keypad as control source again.
	0	**Not connected**	
0x2631:037 (P400.37)	Function list: Activate network control (Function list: Network control) • For further possible settings, see parameter 0x2631:001 (P400.01). 📖532		Assignment of a trigger for the "Activate network control" function. Trigger = TRUE: Activate network control. Trigger = FALSE: No action / deactivate network control again.
	0	**Not connected**	
	114	Network control active (from version 02.00)	TRUE if the network control is requested via bit 5 of the AC drive control word 0x400B:001 (P592.01). Otherwise FALSE. Notes: • Set this selection if the network control is to be activated via bit 5 of the AC drive control word. • The AC drive control word can be used with any communication protocol. ▶ AC Drive Profile 📖248

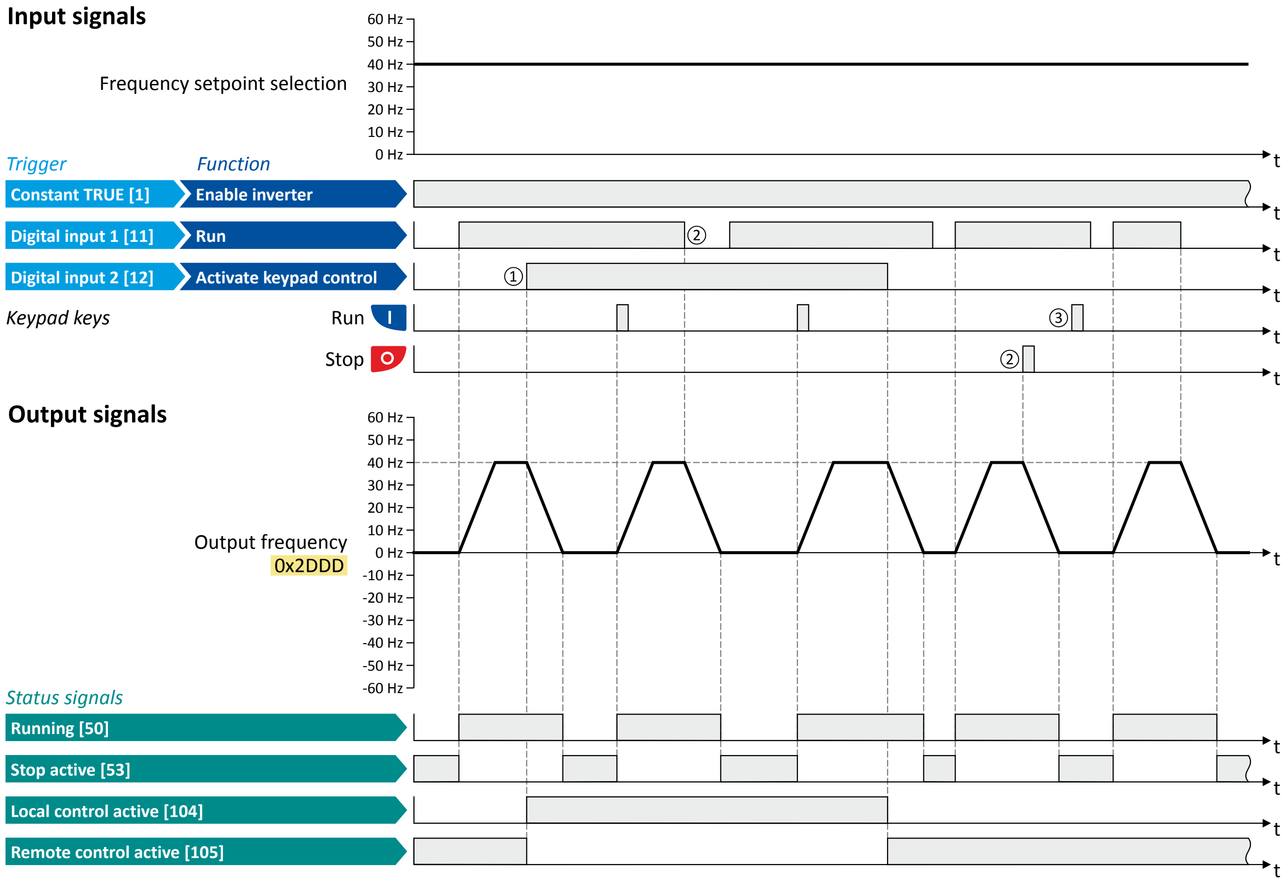
Parameter	Name / value range / [default setting]		Info
0x2824 (P200.00)	Control selection (Control select.)		Selection of the type of inverter control.
	0	**Flexible I/O configuration**	This selection enables a flexible assignment of the start, stop, and rotating direction commands with digital signal sources. • Digital signal sources can be digital inputs, network and keypad. • The I/O configuration is made via the parameters 0x2631:xx (P400.xx).
	1	Keypad	This selection enables the motor to be started exclusively via the start key of the keypad. Other signal sources for starting the motor are ignored. I Start motor O Stop motor Note! • The functions "Enable inverter" 0x2631:001 (P400.01) and "Run" 0x2631:002 (P400.02) must be set to TRUE to start the motor. • If jog operation is active, the motor cannot be stopped via the O keypad key.

14.1.1 Example 1: Change-over from terminal control to keypad control

- The control is executed primarily via the I/O terminals: Switch S1 serves to start and stop the motor.
- Switch S2 serves to optionally change over to local keypad control. In case of activated keypad control, the motor can only be started via the I keypad key. However, the condition is that switch S1 is closed.
- If switch S1 is opened again or the O keypad key is pressed, the motor is stopped (irrespective of the active control source).

Connection plan	function	
	Potentiometer R1	Frequency setpoint selection
	Switch S1	Run
	Switch S2	Activate keypad control

Parameter	Name	Setting for this example
0x2631:001 (P400.01)	Enable inverter	Constant TRUE [1]
0x2631:002 (P400.02)	Run	Digital input 1 [11]
0x2631:004 (P400.04)	Reset fault	Not connected [0]
0x2631:012 (P400.12)	Activate keypad control	Digital input 2 [12]
0x2824 (P200.00)	Control selection	Flexible I/O configuration [0]



The status signals can be assigned to digital outputs. ▸ Configuration of digital outputs 603

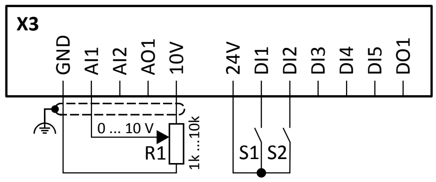
① When changing over to another control source, the motor is first stopped with the stop method set in 0x2838:003 (P203.03).

② The motor will also be stopped if the "Run" function is deactivated or the O keypad key is pressed (irrespective of the active control source).

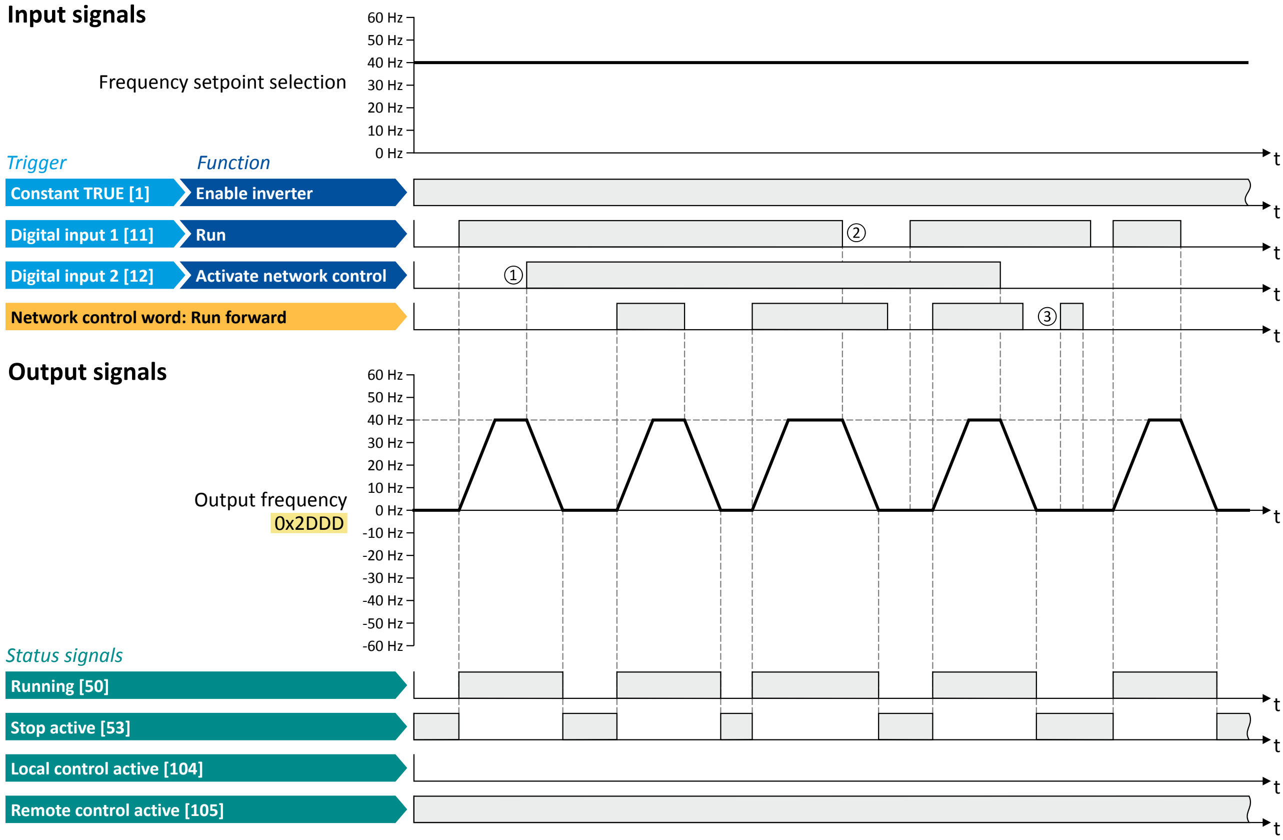
③ After stopping with the O keypad key and before a renewed start command from another control source, the I key on the keypad must be pressed to cancel the keypad stop again ("KSTOP").

14.1.2 Example 2: Change-over from terminal control to network control

- The control is executed primarily via the I/O terminals: Switch S1 serves to start and stop the motor.
- Switch S2 serves to activate the network control. In case of activated keypad control, the motor can only be started via the network control word. However, the condition is that switch S1 is closed.
- If switch S1 is opened again, the motor is stopped (irrespective of the active control source).

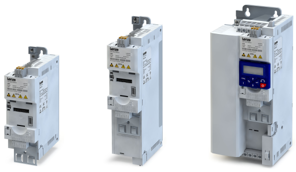
Connection plan	function	
	Potentiometer R1	Frequency setpoint selection
	Switch S1	Run
	Switch S2	Activate network control

Parameter	Name	Setting for this example
0x2631:001 (P400.01)	Enable inverter	Constant TRUE [1]
0x2631:002 (P400.02)	Run	Digital input 1 [11]
0x2631:004 (P400.04)	Reset fault	Not connected [0]
0x2631:037 (P400.37)	Activate network control	Digital input 2 [12]
0x2824 (P200.00)	Control selection	Flexible I/O configuration [0]



The status signals can be assigned to digital outputs. ▸ Configuration of digital outputs 📖 603

① When changing over to another control source, the motor is first stopped with the stop method set in 0x2838:003 (P203.03).
② The motor will also be stopped if the "Run" function is deactivated (irrespective of the active control source).
③ Commands via network are ignored if the network control is not active.



14.2 Start / stop motor

Configuration of the triggers for the basic functions for controlling the motor.

Details

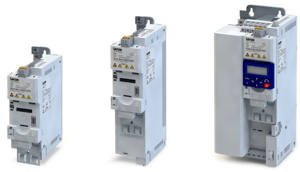
The following table contains a short overview of the basic functions. For more details see the following parameter descriptions.

function	Info
Enable inverter 0x2631:001 (P400.01)	Enable/disable operation. • The function must be set to TRUE to start the motor. Either via digital input or by default setting "Constant TRUE [1]". • If the function is set to FALSE, the inverter is disabled. The motor becomes torqueless (coasts). ▸ Example 6: Enable inverter 545
Run 0x2631:002 (P400.02)	Function 1: Start / stop motor (default setting) • Function 1 is active if no further start commands (start forward/start reverse) have been connected to triggers, no keypad control is active and no network control is active. TRUE: Let motor rotate forward (CW). FALSE: Stop motor. ▸ Example 1: Start/stop (1 signal) and reversal 537
	Function 2: Start enable/stop motor • Function 2 is active if further start commands have been connected to triggers, keypad control is active or network control is active. TRUE: Start commands of the active control source are enabled. FALSE: Stop motor. ▸ Example 2: Start forward/start reverse/stop (edge-controlled) 538 ▸ Example 3: Run forward/Run reverse/stop (status-controlled) 540
Activate quick stop 0x2631:003 (P400.03)	Bring motor to a standstill in best time. ▸ Example 4: Quick stop 542
Start forward (CW) 0x2631:006 (P400.06)	Start motor edge-controlled. • In order to be able to start the motor, the "Run" function must be set to TRUE. • The motor is stopped by resetting the "Run" function to FALSE. • Functions are deactivated in case of keypad or network control. ▸ Example 2: Start forward/start reverse/stop (edge-controlled) 538
Start reverse (CCW) 0x2631:007 (P400.07)	
Run forward (CW) 0x2631:008 (P400.08)	Let the motor rotate in a status-controlled way. • In order to be able to start the motor, the "Run" function must be set to TRUE. • Functions are deactivated in case of keypad or network control. ▸ Example 3: Run forward/Run reverse/stop (status-controlled) 540
Run reverse (CCW) 0x2631:009 (P400.09)	
Jog foward (CW) 0x2631:010 (P400.10)	Jog operation: Let the motor rotate in a status-controlled way with setpoint preset. ⚠ CAUTION! The jog operation has a higher priority than the "Run" function, all other start commands and the keypad key . • If jog operation is active, the motor cannot be stopped with the previously mentioned functions! • However, jog operation can be interrupted by the "Quick stop" function. • Jog operation can always be activated, even in case of keypad or network control. ▸ Example 5: Jog forward/Jog reverse 543
Jog reverse (CCW) 0x2631:011 (P400.11)	
Reverse rotational direction 0x2631:013 (P400.13)	Invert frequency setpoint. • Function can be used in combination with all start commands. • Function is deactivated in case of network control. ▸ Example 1: Start/stop (1 signal) and reversal 537

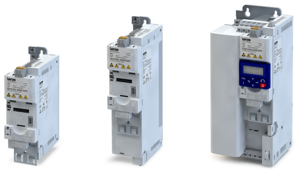
Assignment guidelines

The error message "Trigger/functions connected incorrectly" (error code 25216 | 0x6280) is output if one of the following assignment guidelines is not observed:

- If the "flexible I/O configuration" is active as control source, the "Enable inverter" function or the "Run" function must be connected to a digital input in order that the motor can be stopped again any time!
- In case of keypad or network control, the two functions "Enable inverter" and "Run" can also be set to "Constant TRUE [1]" to start the motor.
- The use of the "Start forward (CW)" and "Start reverse (CCW)" functions excludes the use of the "Run forward (CW)" and "Run reverse (CCW)" and vice versa.



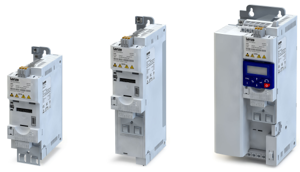
Parameter	Name / value range / [default setting]		Info
0x2631:001 (P400.01)	Function list: Enable inverter (Function list: Enable inverter) • Setting can only be changed if the inverter is inhibited.		Assignment of a trigger for the "Enable inverter" function. Trigger = TRUE: The inverter is enabled (unless there is another cause for inverter disable). Trigger = FALSE: The inverter is disabled. Notes: • This function must be set to TRUE to start the motor. Either via an assigned digital input or by default setting "Constant TRUE [1]". • Changing to the inhibited state causes an immediate stop of the motor, regardless of the stop method set in 0x2838:003 (P203.03). The motor becomes torqueless and coasts down as a function of the mass inertia of the machine. • The cause(s) that are active for the disabled state are shown in 0x282A:001 (P126.01).
	0	Not connected	No trigger assigned (trigger is constantly FALSE).
	1	**Constant TRUE**	Trigger is constantly TRUE.
	11	Digital input 1	State of X3/DI1, taking an inversion set in 0x2632:001 (P411.01) into consideration.
	12	Digital input 2	State of X3/DI2, taking an inversion set in 0x2632:002 (P411.02) into consideration.
	13	Digital input 3	State of X3/DI3, taking an inversion set in 0x2632:003 (P411.03) into consideration.
	14	Digital input 4	State of X3/DI4, taking an inversion set in 0x2632:004 (P411.04) into consideration.
	15	Digital input 5	State of X3/DI5, taking an inversion set in 0x2632:005 (P411.05) into consideration.
	16	Digital input 6	State of X3/DI6, taking an inversion set in 0x2632:006 (P411.06) into consideration. Digital input 6 is only available in the Control Unit (CU) with application I/O.
	17	Digital input 7	State of X3/DI7, taking an inversion set in 0x2632:007 (P411.07) into consideration. Digital input 7 is only available in the Control Unit (CU) with application I/O.
	50	Running	TRUE if inverter and start are enabled and output frequency > 0.2 Hz. Otherwise FALSE.
	51	Ready for operation	TRUE if inverter is ready for operation (no error active, no STO active and DC-bus voltage ok). Otherwise FALSE.
	53	Stop active	TRUE if inverter is enabled and motor is not started and output frequency = 0.
	54	Quick stop active	TRUE if quick stop is active. Otherwise FALSE.
	58	Device warning active	TRUE if warning is active. Otherwise FALSE. • A warning has no impact on the operating status of the inverter. • A warning is reset automatically if the cause has been eliminated.
	59	Device fault active	TRUE if a fault is active. Otherwise FALSE. • In the event of a fault, the motor is brought to a standstill with the quick stop ramp. The inverter is then disabled. • Exception: In case of a serious fault, the inverter is disabled immediately. The motor becomes torqueless (coasts). • The error state will be left automatically if the error condition is not active anymore. • The restart behaviour after trouble can be configured. ▶ Automatic restart 🕮 484
	60	Heatsink temperature warning active	TRUE if current heatsink temperature > warning threshold for temperature monitoring. Otherwise FALSE. • Display of the current heatsink temperature in 0x2D84:001 (P117.01). • Setting of the warning threshold in 0x2D84:002.
	69	Rotational direction reversed	TRUE if output frequency is negative. Otherwise FALSE.
	70	Frequency threshold exceeded	TRUE if current output frequency > frequency threshold. Otherwise FALSE. • Display of the current output frequency in 0x2DDD (P100.00). • Setting Frequency thresholdin 0x4005 (P412.00). ▶ Frequency threshold for "Frequency threshold exceeded" trigger 🕮 593



Parameter	Name / value range / [default setting]		Info
	71	Actual speed = 0	TRUE if current output frequency = 0 Hz (± 0.01 Hz), irrespective of the operating mode. Otherwise FALSE. • Display of the current output frequency in 0x2DDD (P100.00).
	78	Current limit reached	TRUE if current motor current ≥ maximum current. Otherwise FALSE. • Display of the present motor current in 0x2D88 (P104.00). • Setting for the maximum current in 0x6073 (P324.00).
	79	Torque limit reached (from version 02.00)	TRUE if torque limit has been reached or exceeded. Otherwise FALSE. • Setting "Positive torque limit" in 0x60E0. • Setting "Negative torque limit" in 0x60E1.
	81	Error of analog input 1 active	TRUE if the monitoring of the input signal at the analog input 1 has responded. Otherwise FALSE. This trigger is set as a function of the following settings: • Monitoring threshold 0x2636:008 (P430.08) • Monitoring condition 0x2636:009 (P430.09) The setting of the Error response in 0x2636:010 (P430.10) has no effect on this trigger. ▸ Analog input 1 📖 597
	82	Error of analog input 2 active	TRUE if the monitoring of the input signal at the analog input 2 has responded. Otherwise FALSE. This trigger is set as a function of the following settings: • Monitoring threshold 0x2637:008 (P431.08) • Monitoring condition 0x2637:009 (P431.09) The setting of the Error response in 0x2637:010 (P431.10) has no effect on this trigger. ▸ Analog input 2 📖 601
	83	Load loss detected	TRUE if actual motor current < threshold for load loss detection after delay time of the load loss detection has elapsed. Otherwise FALSE. • Display of the present motor current in 0x6078 (P103.00). • Setting Threshold in 0x4006:001 (P710.01). • Setting Decelerationin 0x4006:002 (P710.02). ▸ Load loss detection 📖 449
	102	Sequence suspended (from version 03.00)	Status signal of the "sequencer" function: TRUE if the sequence is currently suspended. ▸ Sequencer 📖 504
	103	Sequence done (from version 03.00)	Status signal of the "sequencer" function: TRUE if the sequence is completed (final segment has been passed through). ▸ Sequencer 📖 504
	104	Local control active	TRUE if local keypad control ("LOC") active. Otherwise FALSE.
	105	Remote control active	TRUE if remote control ("REM") via terminals, network, etc. active. Otherwise FALSE.
	106	Manual setpoint selection active	TRUE if manual setpoint selection ("MAN") via keypad active. Otherwise FALSE. • Selection of the trigger for the "Activate keypad setpoint" function in 0x2631:016 (P400.16).
	107	Automatic setpoint selection active	TRUE if automatic setpoint selection ("AUTO") via terminals, network, etc. active. Otherwise FALSE.
	201	Internal value (from version 05.00)	Internal values of the manufacturer.
	202	Internal value (from version 05.00)	
	203	Internal value (from version 05.00)	
	204	Internal value (from version 05.00)	
	205	Internal value (from version 05.00)	
	206	Internal value (from version 05.00)	

Parameter	Name / value range / [default setting]	Info
0x2631:002 (P400.02)	Function list: Run (Function list: Run) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x2631:001 (P400.01). 532 **11** | **Digital input 1**	Assignment of a trigger to the "Run" function. **Function 1: Start / stop motor (default setting)** Function 1 is active if no further start commands (start forward/start reverse) have been connected to triggers, no keypad control is active and no network control is active. Trigger = TRUE: Let motor rotate forward (CW). Trigger = FALSE: Stop motor. Notes to function 1: • If "Enable inverter" 0x2631:001 (P400.01) = "Constant TRUE [1]", only a digital input is permissible as trigger for this function in order that the motor can be stopped again any time. Exception: If the "Safe torque off (STO)" safety function is available, both functions "Enable inverter" and "Run" can be set to "Constant TRUE [1]". The inverter is then controlled via the STO signal unless no other start commands (start-forward/start-backward) have been connected to triggers. • The stop method can be selected in 0x2838:003 (P203.03). • The function also serves to realise an automatic start after switch-on. ▸ Starting performance 153 **Function 2: Start enable/stop motor** Function 2 is active if further start commands have been connected to triggers, keypad control is active or network control is active. Trigger = TRUE: Start commands of the active control source are enabled. Trigger = FALSE: Stop motor. Notes to function 2: • If no separate start enable is required for the application, the trigger "Constant TRUE [1]" must be set. • The stop method can be selected in 0x2838:003 (P203.03).
0x2631:003 (P400.03)	Function list: Activate quick stop (Function list: Quick stop) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x2631:001 (P400.01). 532 **0** | **Not connected**	Assignment of a trigger for the "Activate quick stop" function. Trigger = TRUE: Activate quick stop. Trigger = FALSE: Deactivate quick stop. Notes: • The "Quick stop" function brings the motor to a standstill within the deceleration time set in 0x291C (P225.00).
0x2631:006 (P400.06)	Function list: Start forward (CW) (Function list: Start forward) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x2631:001 (P400.01). 532 **0** | **Not connected**	Assignment of a trigger for the "Start forward (CW)" function. Trigger = FALSE↗TRUE (edge): Let motor rotate forward. Trigger = TRUE↘FALSE (edge): No action. Notes: • In order to start the motor, "Enable inverter" 0x2631:001 (P400.01) and "Run" 0x2631:002 (P400.02) must be set to TRUE. • After the start, the motor runs until "Run" is set to FALSE, another stop command is given or the inverter is disabled. • In the case of a bipolar setpoint selection (e.g ±10 V), the function is executed irrespective of the rotating direction. The rotating direction is determined by the sign of the setpoint.
0x2631:007 (P400.07)	Function list: Start reverse (CCW) (Function list: Start reverse) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x2631:001 (P400.01). 532 **0** | **Not connected**	Assignment of a trigger for the "Start reverse (CCW)" function Trigger = FALSE↗TRUE (edge): Let motor rotate backward. Trigger = TRUE↘FALSE (edge): No action. Notes: • In order to start the motor, "Enable inverter" 0x2631:001 (P400.01) and "Run" 0x2631:002 (P400.02) must be set to TRUE. • After the start, the motor runs until "Run" is set to FALSE, another stop command is given or the inverter is disabled. • In the case of a bipolar setpoint selection (e.g ±10 V), the function is executed irrespective of the rotating direction. The rotating direction is determined by the sign of the setpoint.

Parameter	Name / value range / [default setting]	Info
0x2631:008 (P400.08)	Function list: Run forward (CW) (Function list: Run forward) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x2631:001 (P400.01). 532 **0** **Not connected**	Assignment of a trigger for the "Run forward (CW)" function. Trigger = TRUE: Let motor rotate forward. Trigger = FALSE: Stop motor. Notes: • In order to start the motor, "Enable inverter" 0x2631:001 (P400.01) and "Run" 0x2631:002 (P400.02) must be set to TRUE. • The inverter always responds to the run command detected last (if start enable is available). • The stop method can be selected in 0x2838:003 (P203.03). • In the case of a bipolar setpoint selection (e.g ±10 V), the function is executed irrespective of the rotating direction. The rotating direction is determined by the sign of the setpoint. • The "Run forward (CW)" function also serves to realise an automatic start after switch-on. ▶ Starting performance 153
0x2631:009 (P400.09)	Function list: Run reverse (CCW) (Function list: Run reverse) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x2631:001 (P400.01). 532 **0** **Not connected**	Assignment of a trigger for the "Run reverse (CCW)" function. Trigger = TRUE: Let motor rotate backward. Trigger = FALSE: Stop motor. Notes: • In order to start the motor, "Enable inverter" 0x2631:001 (P400.01) and "Run" 0x2631:002 (P400.02) must be set to TRUE. • The inverter always responds to the run command detected last (if start enable is available). • The stop method can be selected in 0x2838:003 (P203.03). • In the case of a bipolar setpoint selection (e.g ±10 V), the function is executed irrespective of the rotating direction. The rotating direction is determined by the sign of the setpoint. • The "Run reverse (CCW)" function also serves to realise an automatic start after switch-on. ▶ Starting performance 153
0x2631:010 (P400.10)	Function list: Jog foward (CW) (Function list: Jog foward) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x2631:001 (P400.01). 532 **0** **Not connected**	Assignment of a trigger for the "Jog foward (CW)" function. Trigger = TRUE: Let motor rotate forward with preset 5. Trigger = FALSE: Stop motor. ⚠ CAUTION! The jog operation has a higher priority than the "Run" function, all other start commands and the keypad key . • If jog operation is active, the motor cannot be stopped with the previously mentioned functions! • However, jog operation can be interrupted by the "Quick stop" function. Notes: • The preset value 5 can be set in 0x2911:005 (P450.05). • The stop method can be selected in 0x2838:003 (P203.03). • If "Jog foward (CW)" and "Jog reverse (CCW)" are activated at the same time, the motor is stopped using the stop method and jog operation must be triggered again. • Jog operation cannot be started automatically. The "Start at power-up" option in 0x2838:002 (P203.02) does not apply to jog operation.

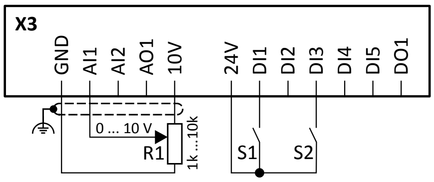


Parameter	Name / value range / [default setting]	Info
0x2631:011 (P400.11)	Function list: Jog reverse (CCW) (Function list: Jog reverse) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x2631:001 (P400.01). 532	Assignment of a trigger for the "Jog reverse (CCW)" function. Trigger = TRUE: Let motor rotate backward with preset 6. Trigger = FALSE: Stop motor. CAUTION! The jog operation has a higher priority than the "Run" function, all other start commands and the keypad key . • If jog operation is active, the motor cannot be stopped with the previously mentioned functions! • However, jog operation can be interrupted by the "Quick stop" function. Notes: • The preset value 6 can be set in 0x2911:006 (P450.06). • The stop method can be selected in 0x2838:003 (P203.03). • If "Jog foward (CW)" and "Jog reverse (CCW)" are activated at the same time, the motor is stopped using the stop method and jog operation must be triggered again. • Jog operation cannot be started automatically. The "Start at power-up" option in 0x2838:002 (P203.02) does not apply to jog operation.
	0 **Not connected**	
0x2631:013 (P400.13)	Function list: Reverse rotational direction (Function list: Reverse rot.dir.) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x2631:001 (P400.01). 532	Assignment of a trigger for the "Reverse rotational direction" function. Trigger = TRUE: the setpoint specified is inverted (i. e. the sign is inverted). Trigger = FALSE: no action / deactivate function again.
	13 **Digital input 3**	

14.2.1 Example 1: Start/stop (1 signal) and reversal

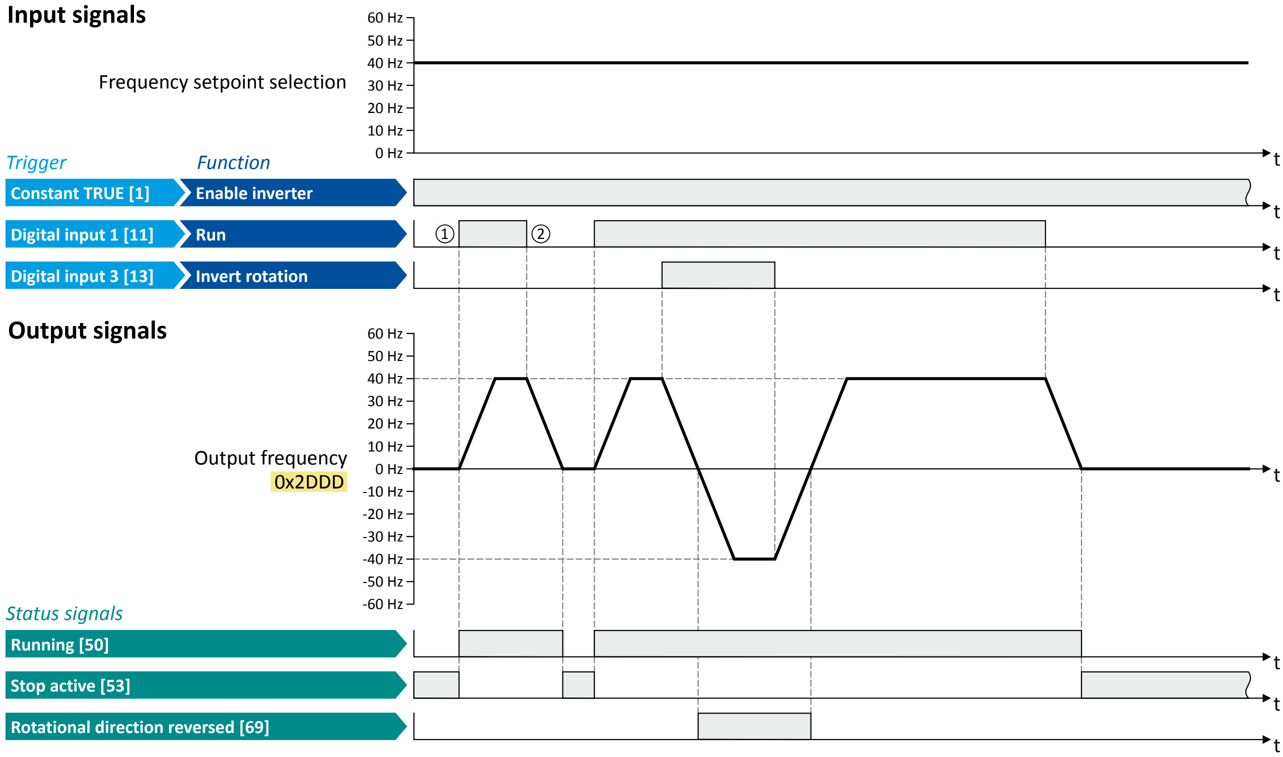
This example shows a simple control option via two switches which should be sufficient for many applications:

- Switch S1 starts the motor in forward direction of rotation. Switch S1 in the initial position stops the motor again.
- Switch S2 switches the direction of rotation.

Connection plan	function	
	Potentiometer R1	Frequency setpoint selection
	Switch S1	Run
	Switch S2	Reverse rotational direction

The example uses the preset I/O configuration of the inverter:

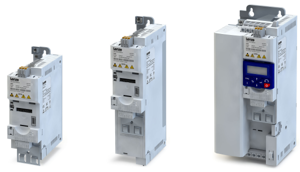
Parameter	Name	Setting for this example (corresponds to default setting)
0x2631:001 (P400.01)	Enable inverter	Constant TRUE [1]
0x2631:002 (P400.02)	Run	Digital input 1 [11]
0x2631:013 (P400.13)	Reverse rotational direction	Digital input 3 [13]



The status signals can be assigned to digital outputs. ▶ Configuration of digital outputs 📖 603

① If the inverter is enabled and no error is active, the motor can be started with the "Run" function in forward rotating direction.

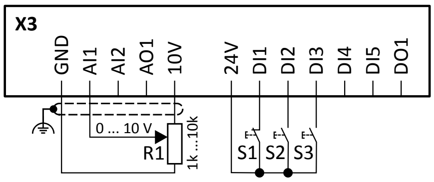
② If "Run" is set to FALSE, the motor is stopped with the stop method set in 0x2838:003 (P203.03). In the example: Stop with standard ramp.



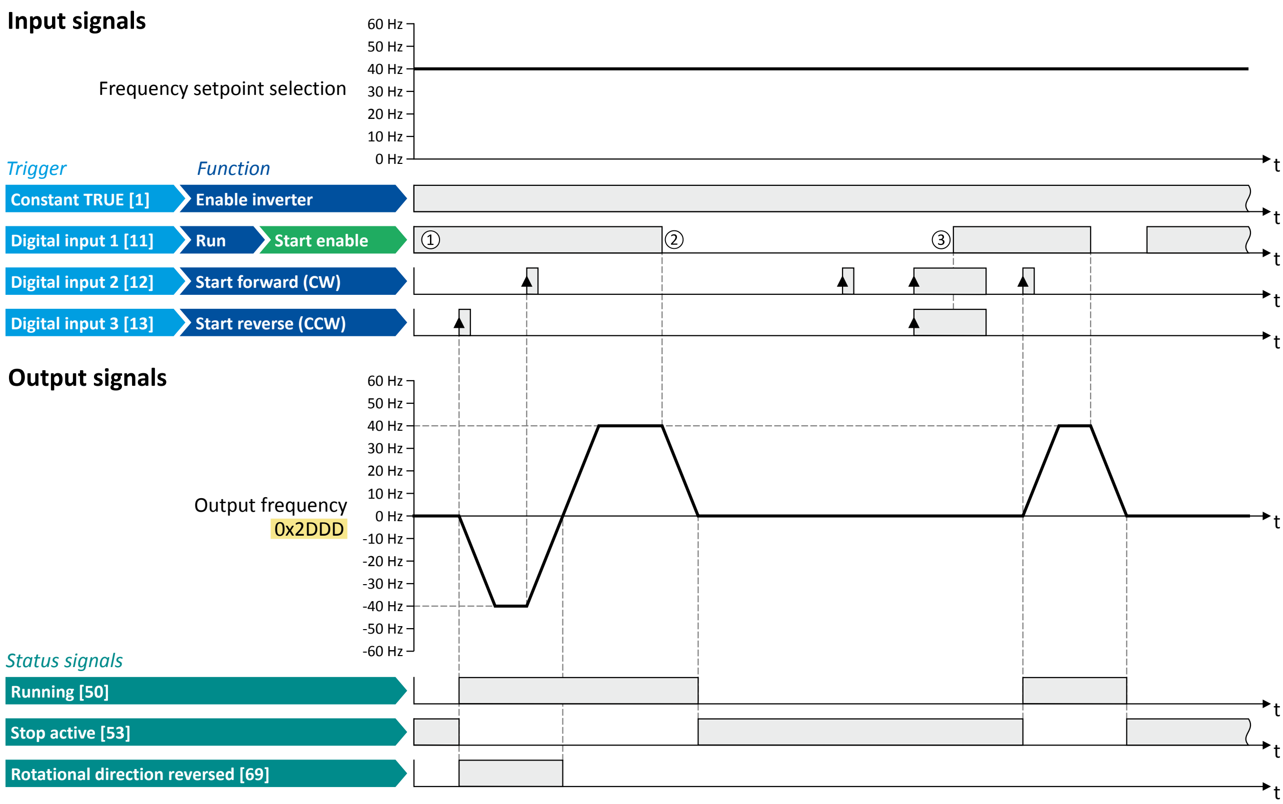
14.2.2 Example 2: Start forward/start reverse/stop (edge-controlled)

The "Run" function automatically becomes a "start enable" if the functions "Start forward (CW)"/ "Start reverse (CCW)" are connected to triggers.

This example shows an edge-controlled start/stop via three buttons:
- In the non-operating state of button S1 (normally-closed contact), there is already a start enable.
- Button S2 starts the motor in forward rotating direction.
- Button S3 starts the motor in backward rotating direction.
- Button S1 (normally-closed contact) stops the motor by (short-time) cancellation of the start command.The inverter then waits for the next start command via button S2/S3.

Connection plan	function	
	Potentiometer R1	Frequency setpoint selection
	Button S1	Stopping
	Button S2	Start forward (CW)
	Button S3	Start reverse (CCW)

Parameter	Name	Setting for this example
0x2631:001 (P400.01)	Enable inverter	Constant TRUE [1]
0x2631:002 (P400.02)	Run	Digital input 1 [11]
0x2631:004 (P400.04)	Reset fault	Not connected [0]
0x2631:006 (P400.06)	Start forward (CW)	Digital input 2 [12]
0x2631:007 (P400.07)	Start reverse (CCW)	Digital input 3 [13]
0x2631:013 (P400.13)	Reverse rotational direction	Not connected [0]

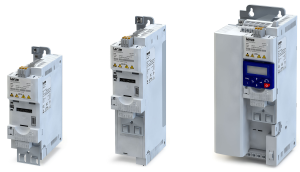


The status signals can be assigned to digital outputs. ▶ Configuration of digital outputs 📖 603

① The "Run" functions serves as start enable for the functions "Start forward (CW)" and "Start reverse (CCW)". Without start enable, the motor cannot be started.

② If the start command is cancelled, the motor is stopped with the stop method set in 0x2838:003 (P203.03). In the example: Stop with standard ramp.

③ If, at start enable, "Start forward (CW)" and "Start reverse (CCW)" are already set to TRUE, the motor remains stopped and the inverter waits for the next valid start edge.

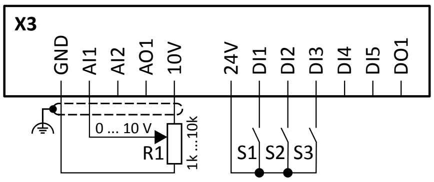


14.2.3 Example 3: Run forward/Run reverse/stop (status-controlled)

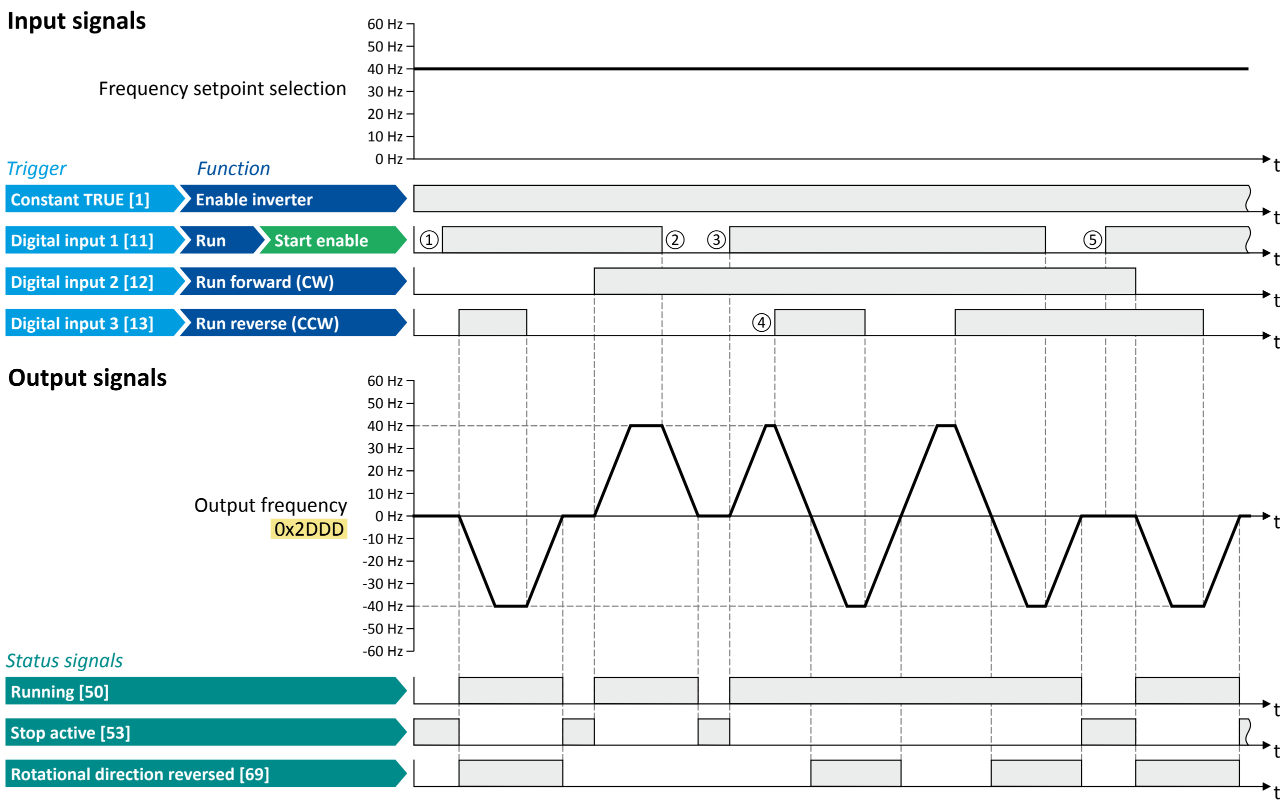
The "Run" function automatically becomes a "start enable" if the functions "Run forward (CW)"/"Run reverse (CCW)" are connected to triggers.

This example shows a status-controlled start/stop via three switches:

- Switch S1 enables the start. Without start enable, the motor cannot be started.
- Switch S2 starts the motor in forward direction of rotation.
- Switch S3 starts the motor in backward direction of rotation.
- The motor is stopped by cancelling the run commands (switches S2 and S3 open) or by cancelling the start enable (switch S1 open).

Connection plan	function	
	Potentiometer R1	Frequency setpoint selection
	Switch S1	Start enable
	Switch S2	Run forward (CW)
	Switch S3	Run reverse (CCW)

Parameter	Name	Setting for this example
0x2631:001 (P400.01)	Enable inverter	Constant TRUE [1]
0x2631:002 (P400.02)	Run	Digital input 1 [11]
0x2631:004 (P400.04)	Reset fault	Not connected [0]
0x2631:008 (P400.08)	Run forward (CW)	Digital input 2 [12]
0x2631:009 (P400.09)	Run reverse (CCW)	Digital input 3 [13]
0x2631:013 (P400.13)	Reverse rotational direction	Not connected [0]



The status signals can be assigned to digital outputs. ▶ Configuration of digital outputs 603

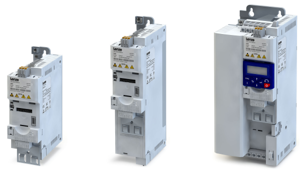
① The "Run" functions serves as start enable for the functions "Run forward (CW)" and "Run reverse (CCW)". Without start enable, the motor cannot be started.

② If the start command is cancelled, the motor is stopped with the stop method set in 0x2838:003 (P203.03). In the example: Stop with standard ramp.
After a renewed start enable, the inverter waits for the next run command.

③ If, at start enable, either "Run forward (CW)" or "Run reverse (CCW)" is set to TRUE, the motor starts into the triggered direction.

④ The inverter always responds to the run command detected last (if start enable is available).
In the example, the "Run reverse (CCW)" command replaces the still active "Run forward (CW)" command.

⑤ If, at start enable, both run commands are set to TRUE, the motor remains stopped until only one valid run command is available.

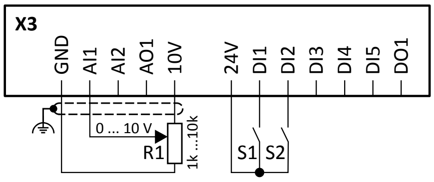


14.2.4 Example 4: Quick stop

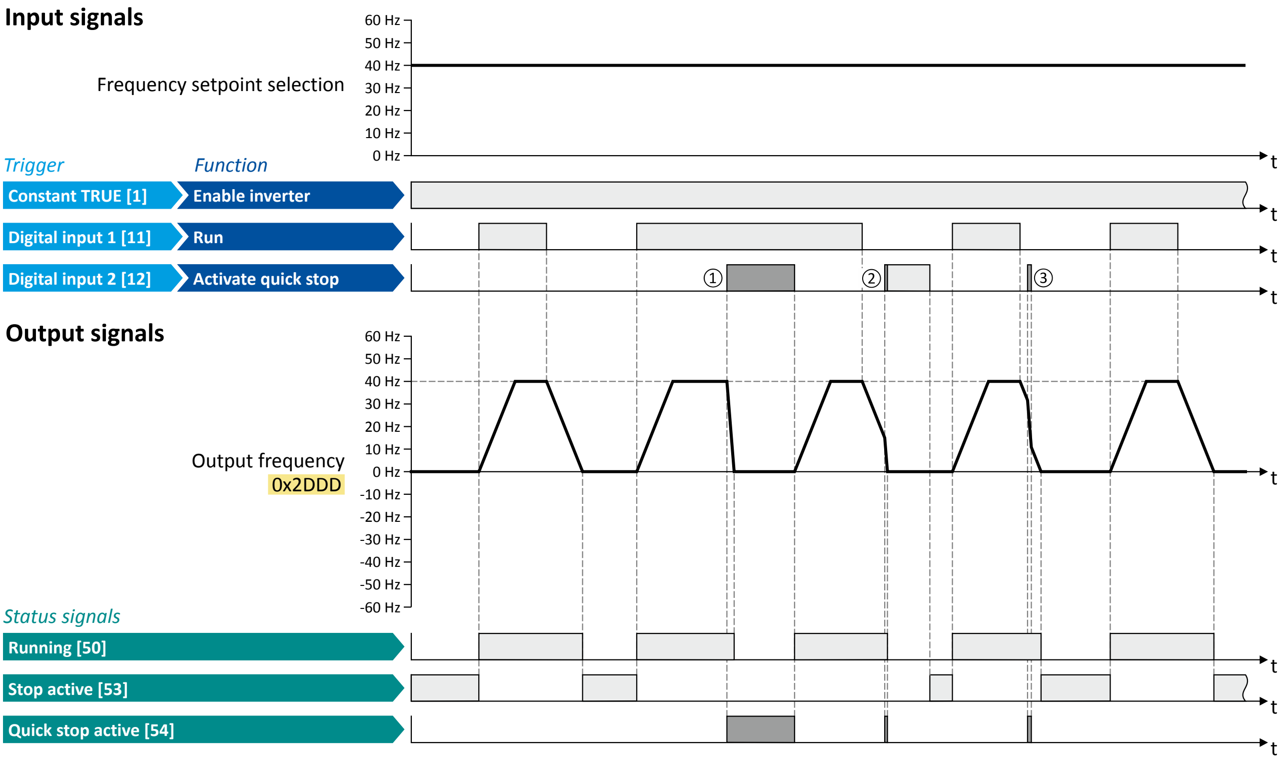
This example illustrates the "quick stop" function. If quick stop is activated, the motor is brought to a standstill within the deceleration time set in 0x291C (P225.00).

- Switch S1 starts the motor in forward direction of rotation. Switch S1 in the initial position stops the motor again.
- Switch S2 activates the "quick stop" function.

Cancelling the quick stop causes a restart of the motor if "Run" is still active (switch S1 closed)!

Connection plan	function	
	Potentiometer R1	Frequency setpoint selection
	Switch S1	Run
	Switch S2	Activate quick stop

Parameter	Name	Setting for this example
0x2631:001 (P400.01)	Enable inverter	Constant TRUE [1]
0x2631:002 (P400.02)	Run	Digital input 1 [11]
0x2631:003 (P400.03)	Activate quick stop	Digital input 2 [12]
0x2631:004 (P400.04)	Reset fault	Not connected [0]
0x2917 (P220.00)	Acceleration time 1	3.0 s
0x2918 (P221.00)	Deceleration time 1	3.0 s
0x291C (P225.00)	Quick stop deceleration time	1.0 s



The status signals can be assigned to digital outputs. ▸ Configuration of digital outputs 603

① If quick stop is activated, the motor is decelerated to the frequency setpoint 0 Hz within a short period of time. The "Quick stop active [54]" status is set as long as quick stop is activated. The "Stop active [53]" status is not set.

② An active stop command is interrupted by a quick stop.

③ If quick stop is cancelled again before standstill is reached, stopping is continued with the stop method set in 0x2838:003 (P203.03). In the example: Stop with standard ramp.

14.2.5 Example 5: Jog forward/Jog reverse

This example illustrates the functions "Jog forward (CW)" and "Jog reverse (CCW)" for Jog operation.

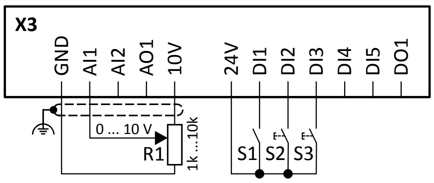
- Switch S1 starts the motor in forward direction of rotation. Switch S1 in the initial position stops the motor again.
- Button S2 starts the motor in forward direction of rotation with frequency preset 5.
- Button S3 starts the motor in backward direction of rotation with frequency preset 6.
- The motor rotates in jog operation as long as the respective button is pressed. If both buttons are pressed at the same time, the motor is stopped.

NOTICE

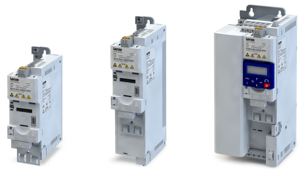
The jog operation has a higher priority than the "Run" function, all other start commands and the keypad key .

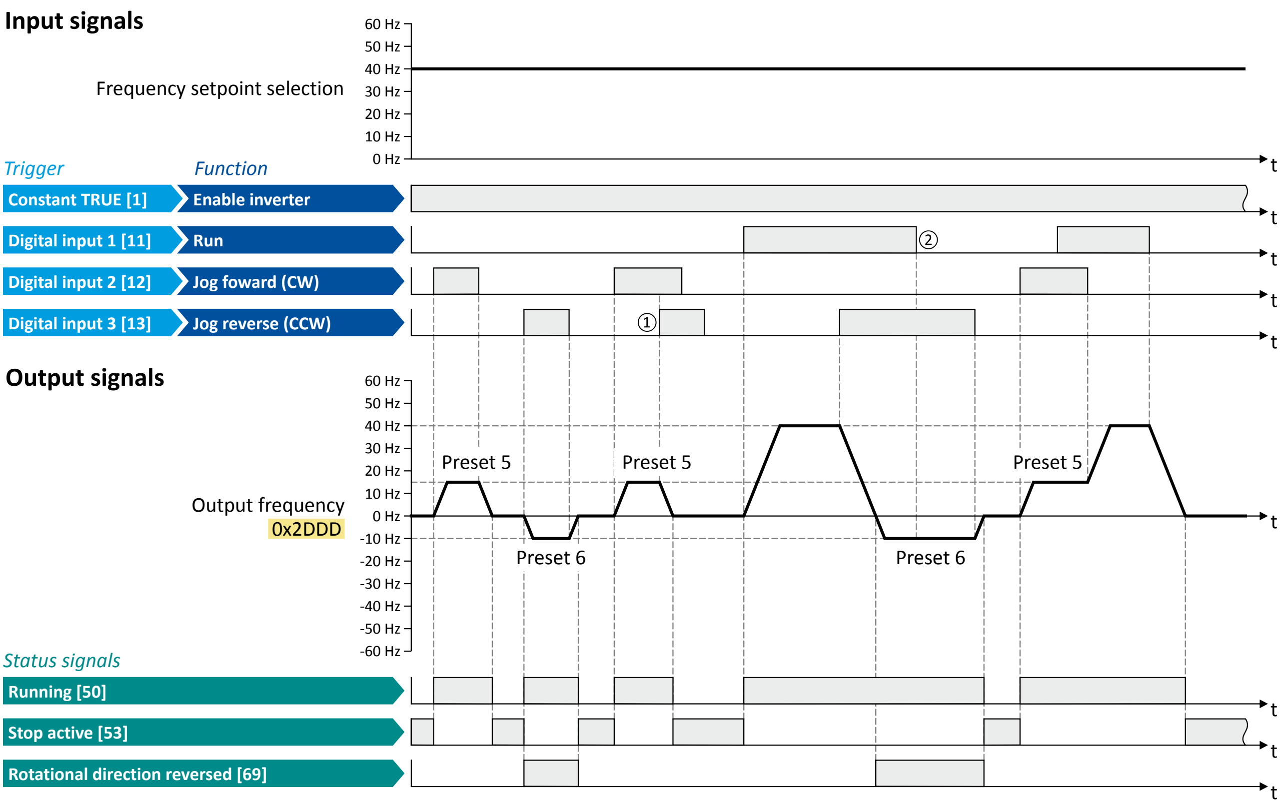
If jog operation is active, the motor cannot be stopped with the previously mentioned functions!

- ▶ The jog operation is stopped by cancelling the functions "Jog foward (CW)"/"Jog reverse (CCW)".
- ▶ The jog operation can be interrupted with the "Activate quick stop" 0x2631:003 (P400.03)function.

Connection plan	function	
	Potentiometer R1	Frequency setpoint selection
	Switch S1	Run
	Button S2	Jog foward (CW)
	Button S3	Jog reverse (CCW)

Parameter	Name	Setting for this example
0x2631:001 (P400.01)	Enable inverter	Constant TRUE [1]
0x2631:002 (P400.02)	Run	Digital input 1 [11]
0x2631:004 (P400.04)	Reset fault	Not connected [0]
0x2631:010 (P400.10)	Jog foward (CW)	Digital input 2 [12]
0x2631:011 (P400.11)	Jog reverse (CCW)	Digital input 3 [13]
0x2631:013 (P400.13)	Reverse rotational direction	Not connected [0]
0x2911:005 (P450.05)	Frequency setpoint presets: Preset 5	15 Hz (is used for jog forward)
0x2911:006 (P450.06)	Frequency setpoint presets: Preset 6	10 Hz (is used for jog reverse)





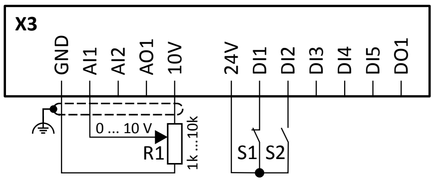
The status signals can be assigned to digital outputs. ▶ Configuration of digital outputs 603

① If "Jog foward (CW)" and "Jog reverse (CCW)" are activated at the same time, the motor is stopped with the stop method set in 0x2838:003 (P203.03) and the jog operation must be triggered again.

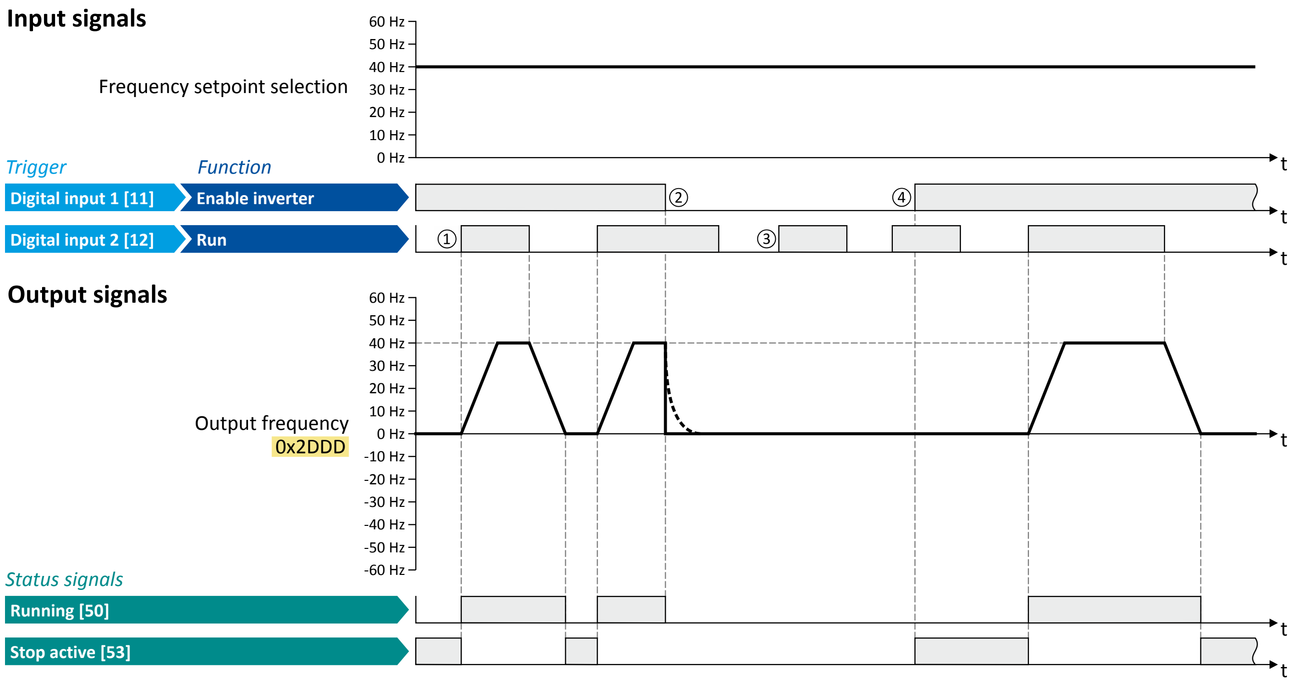
② The jog operation cannot be terminated with the "Run" function but only by cancelling the jog command.

14.2.6 Example 6: Enable inverter

This example shows how to use the "Enable inverter" function for a separate enable input.
- In idle state of switch S1 (normally-closed contact), "Enable inverter" is already available.
- Switch S2 starts the motor in forward rotating direction (if switch S1 is closed). Switch S2 in initial position stops the motor again.
- Switch S1 disables the inverter. The motor becomes torqueless (coasts).

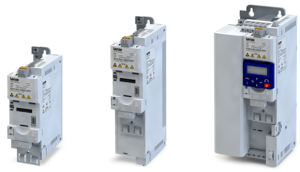
Connection plan	function	
	Potentiometer R1	Frequency setpoint selection
	Switch S1	Disable inverter
	Switch S2	Run

Parameter	Name	Setting for this example
0x2631:001 (P400.01)	Enable inverter	Digital input 1 [11])
0x2631:002 (P400.02)	Run	Digital input 2 [12]
0x2631:004 (P400.04)	Reset fault	Not connected [0]



The status signals can be assigned to digital outputs. ▶ Configuration of digital outputs 📖 603

① If the inverter is enabled and no error is active, the motor can be started with the "Run" function in forward rotating direction.
② If "Enable inverter" is set to FALSE, the inverter is disabled. The motor becomes torqueless and coasts to standstill as a function of the mass inertia of the machine.
③ Without "Enable inverter", the motor cannot be started.
④ In the default setting, the motor does not start if the "Run" function is set to TRUE during "Enable inverter" . After "Enable inverter", must be retriggered to start the motor.
▶ Starting performance 📖 153



14.3 Setpoint change-over

The inverter receives its setpoint from the selected standard setpoint source. Corresponding functions make it possible to change over to other setpoint sources during operation.

Possible setpoint sources are:

- Analog inputs
- Keypad
- Network
- Parameterisable setpoints (presets)
- Digital inputs (configured as HTL input for pulse train or HTL encoder)
- "Motor potentiometer" function
- "Sequencer" function

Details

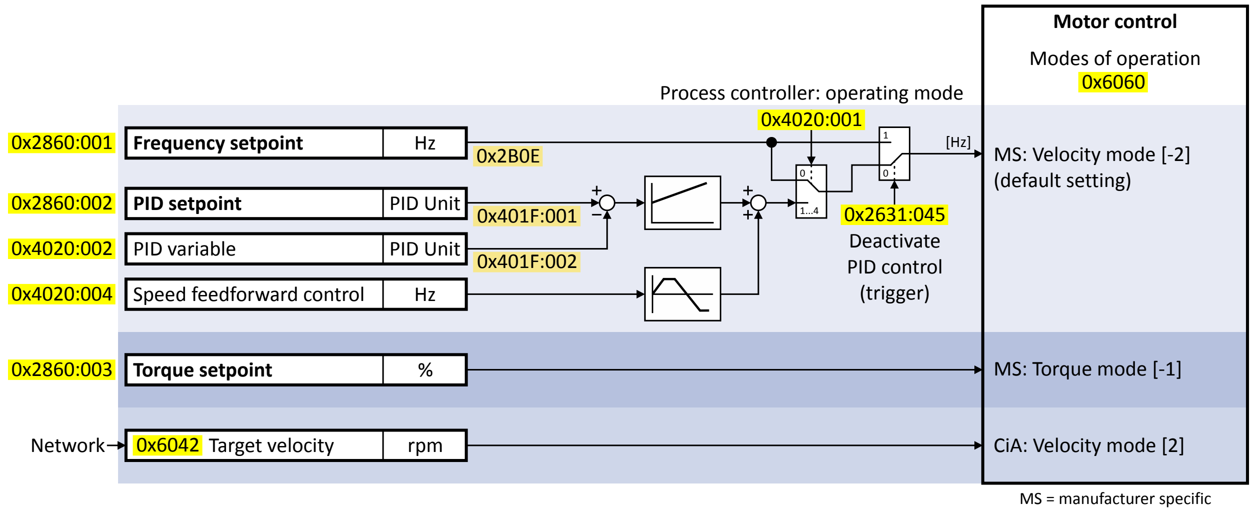
For applications only requiring one setpoint it is sufficient to define the standard setpoint source in the following parameters:

- 0x2860:001 (P201.01): Frequency control: Default setpoint source
- 0x2860:002 (P201.02): PID control: Default setpoint source
- 0x2860:003 (P201.03): Torque control: Default setpoint source

For a setpoint change-over during operation, the following functions must be configured. For details and examples see the following subchapters.

Function	Info
Activate AI1 setpoint 0x2631:014 (P400.14)	Activate analog input 1 / analog input 2 as setpoint source. ▸ Analog input setpoint source 🕮 548
Activate AI2 setpoint 0x2631:002 (P400.02)	
Activate keypad setpoint 0x2631:016 (P400.16)	Activate keypad as setpoint source. • The keypad setpoint can be changed in the operating mode via the navigation keys ↑ and ↓ keypad key. ▸ Keypad setpoint source 🕮 551
Activate network setpoint 0x2631:017 (P400.17)	Activate network as setpoint source. ▸ Network setpoint source 🕮 553
Activate preset (bit 0) 0x2631:018 (P400.18)	Activate parameterisable setpoints (presets) as setpoint source. • 15 frequency setpoints and 8 PID setpoints can be set as presets. • A preset can be selected binary-coded via the four functions "Activate preset (bit 0)" ... "Activate preset (bit 3)". ▸ Setpoint source of preset setpoints 🕮 554
Activate preset (bit 1) 0x2631:019 (P400.19)	
Activate preset (bit 2) 0x2631:020 (P400.20)	
Activate preset (bit 3) 0x2631:021 (P400.21)	
Activate setpoint via HTL input 0x2631:022 (P400.22)	The digital inputs DI3 and DI4 can be configured as HTL input to evaluate the signal of a cost-effective HTL encoder or a reference frequency ("pulse train"). ▸ HTL input setpoint source 🕮 565
Activate MOP setpoint 0x2631:025 (P400.25)	The "Motor potentiometer" function can be used as an alternative setpoint control that is controlled via two functions: "MOP setpoint up" and "MOP setpoint down". ▸ Motor potentiometer setpoint source (MOP) 🕮 559
Activate segment setpoint (bit 0) 0x2631:026 (P400.26)	Activate parameterisable segment setpoints as setpoint source. • The four functions "Activate segment setpoint (bit 0)" ... " Activate segment setpoint´(bit 3)" enable a setpoint change-over to a segment setpoint parameterised for the "sequencer" function during normal operation. ▸ Setpoint source segment setpoints 🕮 563
Activate segment setpoint (bit 1) 0x2631:027 (P400.27)	
Activate segment setpoint (bit 2) 0x2631:028 (P400.28)	
Activate segment setpoint´(bit 3) 0x2631:029 (P400.29)	

The following signal flow shows the internal setpoint logics:

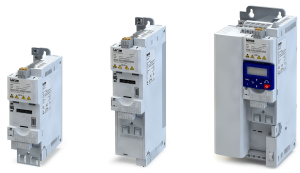


Notes:

- In case of an activated network control, the functions for setpoint change-over are not active! If in case of network control no setpoint is defined via the network control word, the standard setpoint source is active.
- The setpoint used by the motor control depends on the operating mode selected in 0x6060 (P301.00):
  - "MS: Velocity mode [-2]": The active frequency setpoint is used. In addition, the PID control can be activated in 0x4020:001 (P600.01). ▶ Configuring the process controller 📖 407
  - "MS: Torque mode [-1]": The active torque setpoint is used. ▶ Torque control w/ freq. limit 📖 206
  - "CiA: Velocity mode [2]": The setpoint speed defined via the "Target velocity" 0x6042 (P781.00) parameter is used. ▶ Device profile CiA 402 📖 469
- As only one setpoint source can be active at a time, priorities are assigned to the frequency, PID and torque setpoint sources. For details see the following subchapter "Priority of the setpoint sources". 📖 548.

Diagnostic parameters:

- 0x282B:002 (P125.02): Active setpoint source



14.3.1 Priority of the setpoint sources

Since only one setpoint source can be active at a time, the following priorities apply:

Flexible I/O configuration or keypad control active 0x2631:037 (P400.37) **= FALSE**	**Network control active** 0x2631:017 (P400.17) **= FALSE** 0x2631:037 (P400.37) **= TRUE**
Prio 1: Functions for setpoint change-over The priority of the functions results from the assigned triggers (in the order of the selection list): 1. Constant TRUE [1] 2. Digital input 1 [11] 3. Digital input 2 [12] 4. Digital input 3 [13] 5. ...	Prio 1: Setpoint source selected via network control word ▸ General network settings 📖 227
Prio 2: Set standard setpoint source • 0x2860:001 (P201.01): Frequency control: Default setpoint source • 0x2860:002 (P201.02): PID control: Default setpoint source ▸ Selection of setpoint source 📖 148	Prio 2: Set standard setpoint source • 0x2860:001 (P201.01): Frequency control: Default setpoint source • 0x2860:002 (P201.02): PID control: Default setpoint source ▸ Selection of setpoint source 📖 148

Example of allocating priority

Parameter	Name	Setting for this example
0x2631:014 (P400.14)	Activate AI1 setpoint	Digital input 5 [15]
0x2631:016 (P400.16)	Activate keypad setpoint	Digital input 4 [14]

Digital input 4	Digital input 5	Active setpoint source
FALSE	FALSE	Standard setpoint source set in 0x2860:001 (P201.01)
FALSE	TRUE	Analog input 1
TRUE	FALSE	keypad
TRUE	TRUE	Keypad (since "Digital input 4" trigger is higher in the selection list than "Digital input 5" trigger)

14.3.2 Analog input setpoint source

The following functions are used to select analog input 1 or analog input 2 as setpoint source.

Preconditions

A setpoint change-over to the respective analog input is only effected if no setpoint source with a higher priority has been selected. ▸ Priority of the setpoint sources 📖 548

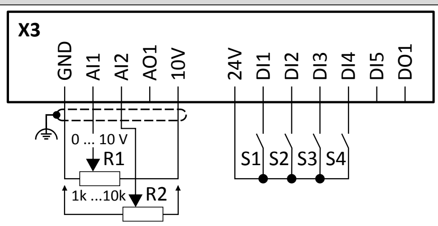
Parameter	Name / value range / [default setting]		Info
0x2631:014 (P400.14)	Function list: Activate AI1 setpoint (Function list: Setp: AI1) • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532		Assignment of a trigger for the "Activate AI1 setpoint" function. Trigger = TRUE: analog input 1 is used as setpoint source (if the trigger assigned has the highest setpoint priority). Trigger = FALSE: no action / deactivate function again. ▸ Analog input 1 📖 597
	0	**Not connected**	

Parameter	Name / value range / [default setting]		Info
0x2631:015 (P400.15)	Function list: Activate AI2 setpoint (Function list: Setp: AI2) • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532		Assignment of a trigger for the "Activate AI2 setpoint" function. Trigger = TRUE: analog input 2 is used as setpoint source (if the trigger assigned has the highest setpoint priority). Trigger = FALSE: no action / deactivate function again. ▸ Analog input 2 📖 601
	0	**Not connected**	

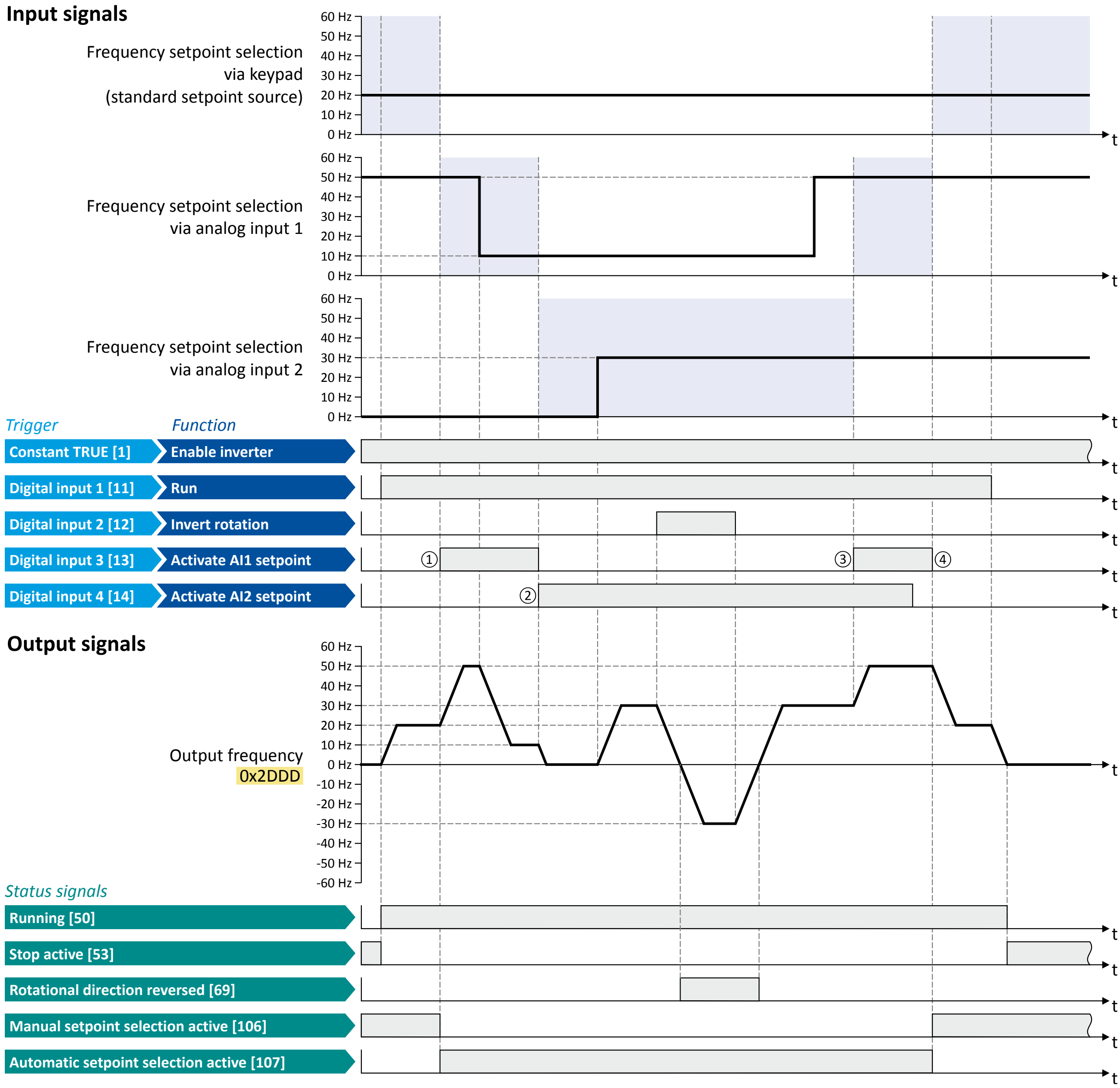
Example for operating mode

- The keypad is set as standard setpoint source.
- Switch S1 starts the motor in forward direction of rotation. Switch S1 in the initial position stops the motor again.
- Switch S2 switches the direction of rotation.
- Switch S3 activates analog input 1 as setpoint source.
- Switch S4 activates analog input 2 as setpoint source.

> **i** If S3 and S4 are operated at the same time, the analog input 1 is active as setpoint source since the digital input 3 assigned to this function has a higher priority than the digital input 4.

Connection plan	function	
	Potentiometer R1	Frequency setpoint selection via AI1
	Potentiometer R2	Frequency setpoint selection via AI2
	Switch S1	Run
	Switch S2	Reverse rotational direction
	Switch S3	Activate AI1 setpoint
	Switch S4	Activate AI2 setpoint

Parameter	Name	Setting for this example
0x2631:001 (P400.01)	Enable inverter	Constant TRUE [1]
0x2631:002 (P400.02)	Run	Digital input 1 [11]
0x2631:004 (P400.04)	Reset fault	Not connected [0]
0x2631:013 (P400.13)	Reverse rotational direction	Digital input 2 [12]
0x2631:014 (P400.14)	Activate AI1 setpoint	Digital input 3 [13]
0x2631:015 (P400.15)	Activate AI2 setpoint	Digital input 4 [14]
0x2631:018 (P400.18)	Activate preset (bit 0)	Not connected [0]
0x2824 (P200.00)	Control selection	Flexible I/O configuration [0]
0x2838:003 (P203.03)	Stop method	Standard ramp [1]
0x2860:001 (P201.01)	Frequency control: Default setpoint source	Keypad [1]



The status signals can be assigned to digital outputs. ▶ Configuration of digital outputs 📖 603

① Change-over from keypad setpoint (standard setpoint source) to AI1 setpoint.

② Change-over from AI1 setpoint to AI2 setpoint.

③ Change-over from AI2 setpoint to AI1 setpoint since the digital input 3 has a higher priority than the digital input 4.

④ Change-over to keypad setpoint (standard setpoint source).

14.3.3 Keypad setpoint source

The following function is used to select the keypad as setpoint source.

Preconditions

A setpoint change-over to the keypad is only effected if no setpoint source with a higher priority has been selected. ▸ Priority of the setpoint sources 548

Parameter	Name / value range / [default setting]		Info
0x2631:016 (P400.16)	Function list: Activate keypad setpoint (Function list: Setp: Keypad) • For further possible settings, see parameter 0x2631:001 (P400.01). 532		Assignment of a trigger for the "Activate keypad setpoint" function. Trigger = TRUE: the keypad is used as setpoint source (if the trigger assigned has the highest setpoint priority). Trigger = FALSE: no action / deactivate function again. Notes: • The default keypad setpoint can be changed in keypad operating mode via the arrow keys of the keypad.
	0	**Not connected**	

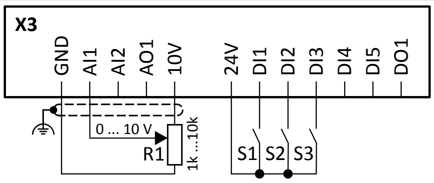
Keypad setpoint default setting

For the manual setpoint selection via keypad the following default settings are used:
- 0x2601:001 (P202.01): Keypad setpoints: Frequency setpoint
- 0x2601:002 (P202.02): Keypad setpoints: Process controller setpoint

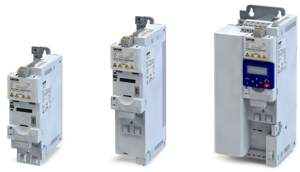
The increment for keypad setpoints can be adapted in 0x2862 (P701.00) by pressing a keypad arrow key once.

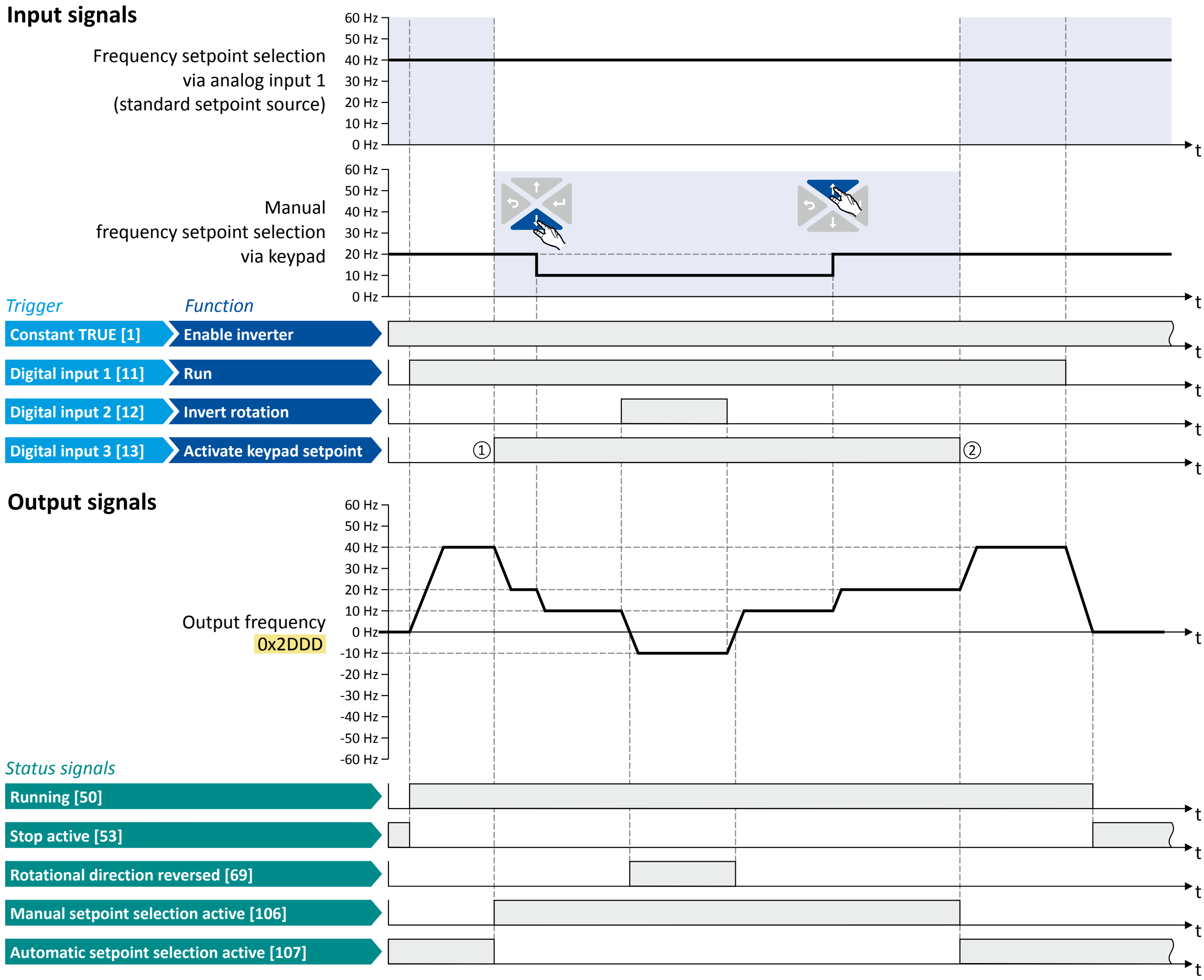
Example for operating mode

- The analog input 1 is set as standard setpoint source.
- Switch S1 starts the motor in forward direction of rotation. Switch S1 in the initial position stops the motor again.
- Switch S2 switches the direction of rotation.
- Switch S3 activates the keypad as setpoint source. The keypad setpoint can be changed in the operating mode via the navigation keys ↑ and ↓ keypad keys.

Connection plan	function	
	Potentiometer R1	Frequency setpoint selection
	Switch S1	Run
	Switch S2	Reverse rotational direction
	Switch S3	Activate keypad setpoint

Parameter	Name	Setting for this example
0x2601:001 (P202.01)	Keypad setpoints: Frequency setpoint	20.0 Hz
0x2631:001 (P400.01)	Enable inverter	Constant TRUE [1]
0x2631:002 (P400.02)	Run	Digital input 1 [11]
0x2631:004 (P400.04)	Reset fault	Not connected [0]
0x2631:013 (P400.13)	Reverse rotational direction	Digital input 2 [12]
0x2631:016 (P400.16)	Activate keypad setpoint	Digital input 3 [13]
0x2824 (P200.00)	Control selection	Flexible I/O configuration [0]
0x2838:003 (P203.03)	Stop method	Standard ramp [1]
0x2860:001 (P201.01)	Frequency control: Default setpoint source	Analog input 1 [2]





The status signals can be assigned to digital outputs. ▶ Configuration of digital outputs 📖 603

① Change-over from analog input 1 (standard setpoint source) to keypad setpoint.

② Change-over from keypad setpoint back to analog input 1 (standard setpoint source).

14.3.4 Network setpoint source

The following function is used to select the network as setpoint source.

Preconditions

The setpoint change-over to the network is only effected if

- no setpoint source with a higher priority has been selected. ▸ Priority of the setpoint sources 548
- no network control is active (0x2631:037 (P400.37) = "FALSE"). If the network control is activated, all functions for setpoint change-over are inactive!

Parameter	Name / value range / [default setting]		Info
0x2631:017 (P400.17)	Function list: Activate network setpoint (Function list: Setp: Network) • From version 02.01 • For further possible settings, see parameter 0x2631:001 (P400.01). 532		Assignment of a trigger for the "Activate network setpoint" function. Trigger = TRUE: the network is used as setpoint source (if the trigger assigned has the highest setpoint priority). Trigger = FALSE: no action / deactivate function again.
	0	**Not connected**	
	116	Network setpoint active (from version 02.00)	TRUE if a change-over to network setpoint is requested via bit 6 of the AC drive control word0x400B:001 (P592.01). Otherwise FALSE. Notes: • Set this selection if the network setpoint is to be activated via bit 6 of the AC drive control word. • The AC drive control word can be used with any communication protocol. ▸ AC Drive Profile 248

Example for different application cases

Example 1: The AC drive control word shall enable a change-over from the standard setpoint source to the network setpoint (bit 6).

1. Set a standard setpoint source different than Network" [5]" in 0x2860:001 (P201.01).
2. Set the selection Network setpoint active " [116]" in 0x2631:017 (P400.17).

Example 2: Independent of the used network, a change-over from the standard setpoint source to the network setpoint shall be possible via a digital trigger (e. g. digital input).

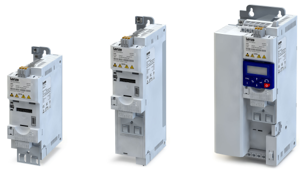
1. Set a standard setpoint source different than Network" [5]" in 0x2860:001 (P201.01).
2. Set the desired digital trigger (e. g. digital input) in 0x2631:017 (P400.17) via which the change-over to the network setpoint is to take place.

Example 3: The setpoint is to be defined exclusively via network.

1. As standard setpoint source, set the selection "Network [5]" in 0x2860:001 (P201.01).

Related topics

▸ General network settings 227



14.3.5 Setpoint source of preset setpoints

The four functions "Activate preset (bit 0)" ... " Activate preset (bit 3)" enable change-over of the setpoint to a parameterisable setpoint (preset value).

Preconditions

A setpoint change-over to the respective preset is only effected if no setpoint source with a higher priority has been selected. ▶ Priority of the setpoint sources 🕮 548

Details

A preset is selected in a binary-coded fashion via the triggers assigned to the four functions "Activate preset (bit 0)" ... " Activate preset (bit 3)" in compliance with the following truth table:

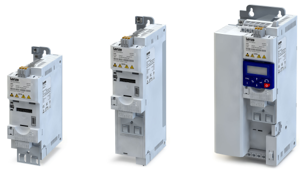
Activate preset				Selection			
Bit 3 0x2631:021 (P400.21)	Bit 2 0x2631:020 (P400.20)	Bit 1 0x2631:019 (P400.19)	Bit 0 0x2631:018 (P400.18)	Preset	Frequency setpoint	PID setpoint	Torque setpoint
FALSE	FALSE	FALSE	FALSE	No preset selected			
FALSE	FALSE	FALSE	TRUE	Preset 1	0x2911:001 (P450.01)	0x4022:001 (P451.01)	0x2912:001 (P452.01)
FALSE	FALSE	TRUE	FALSE	Preset 2	0x2911:002 (P450.02)	0x4022:002 (P451.02)	0x2912:002 (P452.02)
FALSE	FALSE	TRUE	TRUE	Preset 3	0x2911:003 (P450.03)	0x4022:003 (P451.03)	0x2912:003 (P452.03)
FALSE	TRUE	FALSE	FALSE	Preset 4	0x2911:004 (P450.04)	0x4022:004 (P451.04)	0x2912:004 (P452.04)
FALSE	TRUE	FALSE	TRUE	Preset 5	0x2911:005 (P450.05)	0x4022:005 (P451.05)	0x2912:005 (P452.05)
FALSE	TRUE	TRUE	FALSE	Preset 6	0x2911:006 (P450.06)	0x4022:006 (P451.06)	0x2912:006 (P452.06)
FALSE	TRUE	TRUE	TRUE	Preset 7	0x2911:007 (P450.07)	0x4022:007 (P451.07)	0x2912:007 (P452.07)
TRUE	FALSE	FALSE	FALSE	Preset 8	0x2911:008 (P450.08)	0x4022:008 (P451.08)	0x2912:008 (P452.08)
TRUE	FALSE	FALSE	TRUE	Preset 9	0x2911:009 (P450.09)		
...				...	...		
TRUE	TRUE	TRUE	TRUE	Preset 15	0x2911:015 (P450.15)		

Notes:

- The frequency setpoint preset 5 is also used for the "Jog foward (CW)" 0x2631:010 (P400.10) function.
- The frequency setpoint preset 6 is also used for the "Jog reverse (CCW)" 0x2631:011 (P400.11) function.

Parameter	Name / value range / [default setting]	Info
0x2631:018 (P400.18)	Function list: Activate preset (bit 0) (Function list: Setp: Preset b0) • For further possible settings, see parameter 0x2631:001 (P400.01). 🕮 532 **14 Digital input 4**	Assignment of a trigger for the "Activate preset (bit 0)" function. Selection bit with the valency 20 for the bit-coded selection and activation of a parameterised setpoint (preset value). Trigger = FALSE: selection bit = "0". Trigger = TRUE: selection bit = "1".
0x2631:019 (P400.19)	Function list: Activate preset (bit 1) (Function list: Setp: Preset b1) • For further possible settings, see parameter 0x2631:001 (P400.01). 🕮 532 **15 Digital input 5**	Assignment of a trigger for the "Activate preset (bit 1)" function. Selection bit with the valency 21 for the bit-coded selection and activation of a parameterised setpoint (preset value). Trigger = FALSE: selection bit = "0". Trigger = TRUE: selection bit = "1".
0x2631:020 (P400.20)	Function list: Activate preset (bit 2) (Function list: Setp: Preset b2) • For further possible settings, see parameter 0x2631:001 (P400.01). 🕮 532 **0 Not connected**	Assignment of a trigger for the "Activate preset (bit 2)" function. Selection bit with the valency 22 for the bit-coded selection and activation of a parameterised setpoint (preset value). Trigger = FALSE: selection bit = "0". Trigger = TRUE: selection bit = "1".
0x2631:021 (P400.21)	Function list: Activate preset (bit 3) (Function list: Setp: Preset b3) • For further possible settings, see parameter 0x2631:001 (P400.01). 🕮 532 **0 Not connected**	Assignment of a trigger for the "Activate preset (bit 3)" function. Selection bit with the valency 2^3 for the bit-coded selection and activation of a parameterised setpoint (preset value). Trigger = FALSE: selection bit = "0". Trigger = TRUE: selection bit = "1".

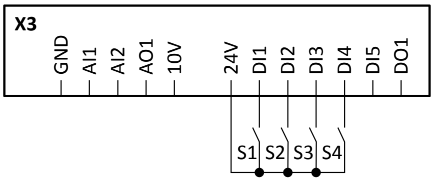
Parameter	Name / value range / [default setting]	Info
0x2911:001 (P450.01)	Frequency setpoint presets: Preset 1 (Freq. presets: Freq. preset 1) 0.0 ... [**20.0**] ... 599.0 Hz	Parameterisable frequency setpoints (presets) for operating mode "MS: Velocity mode".
0x2911:002 (P450.02)	Frequency setpoint presets: Preset 2 (Freq. presets: Freq. preset 2) 0.0 ... [**40.0**] ... 599.0 Hz	
0x2911:003 (P450.03)	Frequency setpoint presets: Preset 3 (Freq. presets: Freq. preset 3) Device for 50-Hz mains: 0.0 ... [**50.0**] ... 599.0 Hz Device for 60-Hz mains: 0.0 ... [**60.0**] ... 599.0 Hz	
0x2911:004 (P450.04)	Frequency setpoint presets: Preset 4 (Freq. presets: Freq. preset 4) 0.0 ... [**0.0**] ... 599.0 Hz	
0x2911:005 (P450.05)	Frequency setpoint presets: Preset 5 (Freq. presets: Freq. preset 5) 0.0 ... [**0.0**] ... 599.0 Hz	
0x2911:006 (P450.06)	Frequency setpoint presets: Preset 6 (Freq. presets: Freq. preset 6) 0.0 ... [**0.0**] ... 599.0 Hz	
0x2911:007 (P450.07)	Frequency setpoint presets: Preset 7 (Freq. presets: Freq. preset 7) 0.0 ... [**0.0**] ... 599.0 Hz	
0x2911:008 (P450.08)	Frequency setpoint presets: Preset 8 (Freq. presets: Freq. preset 8) 0.0 ... [**0.0**] ... 599.0 Hz	
0x2911:009 (P450.09)	Frequency setpoint presets: Preset 9 (Freq. presets: Freq. preset 9) 0.0 ... [**0.0**] ... 599.0 Hz	
0x2911:010 (P450.10)	Frequency setpoint presets: Preset 10 (Freq. presets: Freq. preset 10) 0.0 ... [**0.0**] ... 599.0 Hz	
0x2911:011 (P450.11)	Frequency setpoint presets: Preset 11 (Freq. presets: Freq. preset 11) 0.0 ... [**0.0**] ... 599.0 Hz	
0x2911:012 (P450.12)	Frequency setpoint presets: Preset 12 (Freq. presets: Freq. preset 12) 0.0 ... [**0.0**] ... 599.0 Hz	
0x2911:013 (P450.13)	Frequency setpoint presets: Preset 13 (Freq. presets: Freq. preset 13) 0.0 ... [**0.0**] ... 599.0 Hz	
0x2911:014 (P450.14)	Frequency setpoint presets: Preset 14 (Freq. presets: Freq. preset 14) 0.0 ... [**0.0**] ... 599.0 Hz	
0x2911:015 (P450.15)	Frequency setpoint presets: Preset 15 (Freq. presets: Freq. preset 15) 0.0 ... [**0.0**] ... 599.0 Hz	



Parameter	Name / value range / [default setting]	Info
0x4022:001 (P451.01)	PID setpoint presets: Preset 1 (PID presets: PID preset 1) -300.00 ... [**0.00**] ... 300.00 PID unit	Parameterisable process controller setpoints (presets) for PID control.
0x4022:002 (P451.02)	PID setpoint presets: Preset 2 (PID presets: PID preset 2) -300.00 ... [**0.00**] ... 300.00 PID unit	
0x4022:003 (P451.03)	PID setpoint presets: Preset 3 (PID presets: PID preset 3) -300.00 ... [**0.00**] ... 300.00 PID unit	
0x4022:004 (P451.04)	PID setpoint presets: Preset 4 (PID presets: PID preset 4) -300.00 ... [**0.00**] ... 300.00 PID unit	
0x4022:005 (P451.05)	PID setpoint presets: Preset 5 (PID presets: PID preset 5) -300.00 ... [**0.00**] ... 300.00 PID unit	
0x4022:006 (P451.06)	PID setpoint presets: Preset 6 (PID presets: PID preset 6) -300.00 ... [**0.00**] ... 300.00 PID unit	
0x4022:007 (P451.07)	PID setpoint presets: Preset 7 (PID presets: PID preset 7) -300.00 ... [**0.00**] ... 300.00 PID unit	
0x4022:008 (P451.08)	PID setpoint presets: Preset 8 (PID presets: PID preset 8) -300.00 ... [**0.00**] ... 300.00 PID unit	

Example for operating mode

- The keypad is set as standard setpoint source.
- Switch S1 starts the motor in forward direction of rotation. Switch S1 in the initial position stops the motor again.
- The switches S2 ... S4 serve to switch over to the presets 1 ... 7 (see the following table).

<table>
<tr><th>Connection plan</th><th colspan="5">function</th></tr>
<tr><td rowspan="11">
</td><td>Switch S1</td><td colspan="4">Run</td></tr>
<tr><td rowspan="10">Switches S2 ... S4</td><td colspan="4">Preset selection:</td></tr>
<tr><td>S2</td><td>S3</td><td>S4</td><td></td></tr>
<tr><td>Off</td><td>Off</td><td>Off</td><td>Keypad setpoint</td></tr>
<tr><td>On</td><td>Off</td><td>Off</td><td>Preset value 1</td></tr>
<tr><td>Off</td><td>On</td><td>Off</td><td>Preset value 2</td></tr>
<tr><td>On</td><td>On</td><td>Off</td><td>Preset value 3</td></tr>
<tr><td>Off</td><td>Off</td><td>On</td><td>Preset value 4</td></tr>
<tr><td>On</td><td>Off</td><td>On</td><td>Preset 5</td></tr>
<tr><td>Off</td><td>On</td><td>On</td><td>Preset 6</td></tr>
<tr><td>On</td><td>On</td><td>On</td><td>Preset value 7</td></tr>
</table>

Parameter	Name	Setting for this example
0x2631:001 (P400.01)	Enable inverter	Constant TRUE [1]
0x2631:002 (P400.02)	Run	Digital input 1 [11]
0x2631:004 (P400.04)	Reset fault	Not connected [0]
0x2631:013 (P400.13)	Reverse rotational direction	Not connected [0]
0x2631:018 (P400.18)	Activate preset (bit 0)	Digital input 2 [12]
0x2631:019 (P400.19)	Activate preset (bit 1)	Digital input 3 [13]
0x2631:020 (P400.20)	Activate preset (bit 2)	Digital input 4 [14]
0x2824 (P200.00)	Control selection	Flexible I/O configuration [0]
0x2838:003 (P203.03)	Stop method	Standard ramp [1]
0x2860:001 (P201.01)	Frequency control: Default setpoint source	Keypad [1]
0x2911:001 (P450.01)	Frequency setpoint presets: Preset 1	10 Hz
0x2911:002 (P450.02)	Frequency setpoint presets: Preset 2	15 Hz
0x2911:003 (P450.03)	Frequency setpoint presets: Preset 3	20 Hz
0x2911:004 (P450.04)	Frequency setpoint presets: Preset 4	25 Hz
0x2911:005 (P450.05)	Frequency setpoint presets: Preset 5	30 Hz
0x2911:006 (P450.06)	Frequency setpoint presets: Preset 6	35 Hz
0x2911:007 (P450.07)	Frequency setpoint presets: Preset 7	40 Hz

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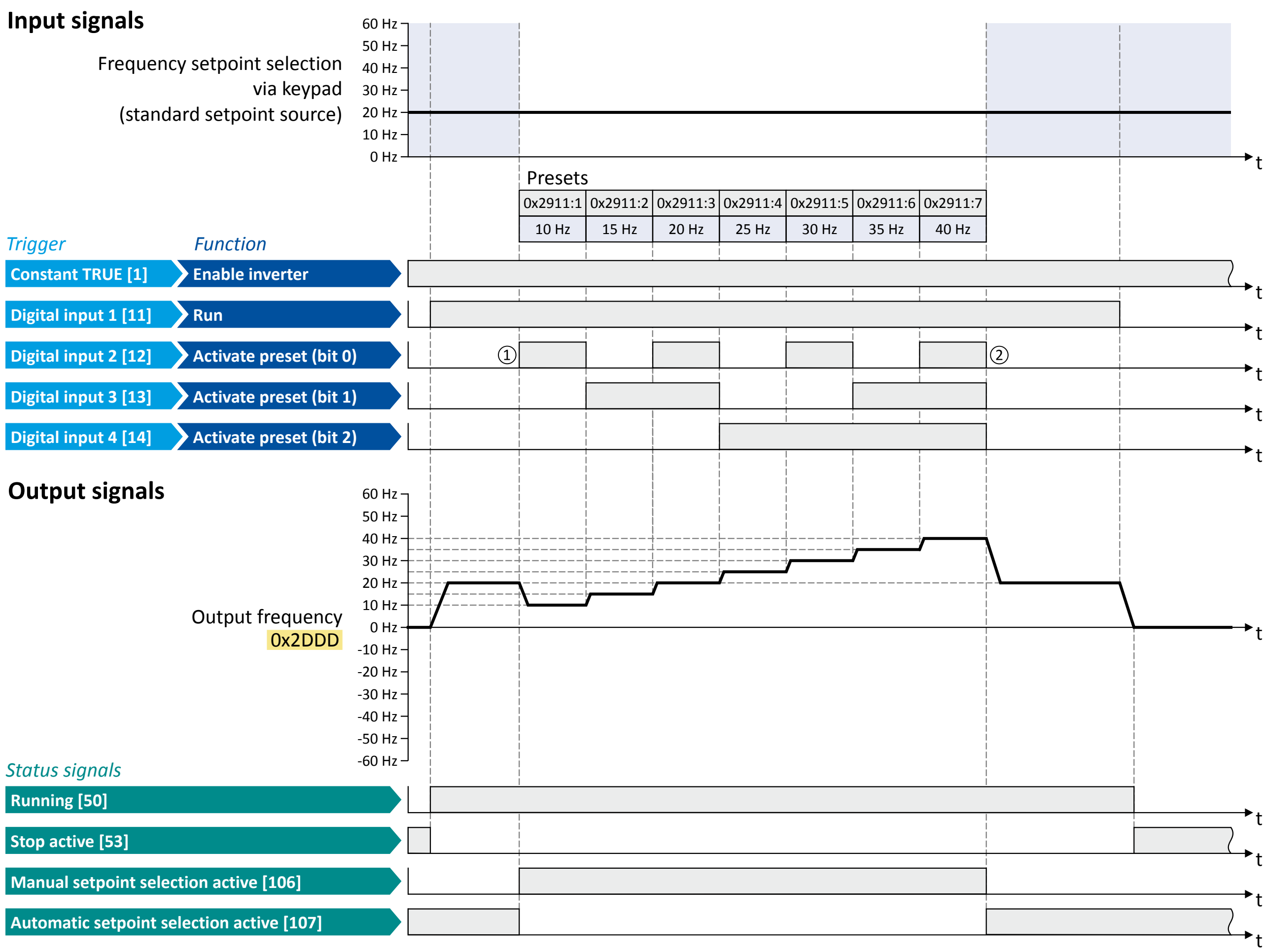
If the frequency presets 8 ... 15 are required as well, the digital input 5 must be additionally assigned to the "Activate preset (bit 3)" function and the terminal DI5 must be interconnected accordingly.



The status signals can be assigned to digital outputs. ▸ Configuration of digital outputs 📖 603

① Change-over from keypad setpoint (standard setpoint source) to presets (first, preset 1 is selected).
② Change-over back to keypad setpoint since no preset is selected anymore (digital inputs 2 ... 4 = FALSE).

14.3.6 Motor potentiometer setpoint source (MOP)

The "Motor potentiometer" function can be used as an alternative setpoint control that is controlled via two functions: "MOP setpoint up" and "MOP setpoint down".

- The "Activate MOP setpoint" function enables a setpoint change-over to the motor potentiometer.
- The motor potentiometer can also be defined as standard setpoint source. ▶ Selection of setpoint source 🕮 148

Preconditions

A setpoint change-over to the motor potentiometer is only effected if

- no setpoint source with a higher priority has been selected. ▶ Priority of the setpoint sources🕮 548
- no jog operation is active ("Jog foward (CW)" and "Jog reverse (CCW)" functions).

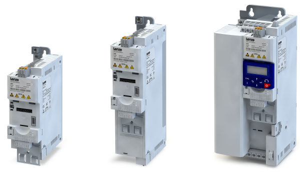
Details

If the motor potentiometer is active as setpoint source, the setpoint generated by this function ("MOP value") can be changed according to the truth table via the triggers assigned to the two "MOP setpoint up" and "MOP setpoint down" functions:

MOP setpoint up 0x2631:023 (P400.23)	MOP setpoint down 0x2631:024 (P400.24)	Response of the function
FALSE	FALSE	Last MOP value is maintained.
TRUE	FALSE	MOP value is increased to a maximum of the upper limit value for the respective operating mode with acceleration time 2. (The motor follows the setpoint change with acceleration time 1.)
FALSE	TRUE	MOP value is increased to a maximum of the lower limit value for the respective operating mode with deceleration time 2. (The motor follows the setpoint change with deceleration time 1.)
TRUE	TRUE	Last MOP value is maintained.

The starting performance can be selected in 0x4003 (P413.00). In the default setting, the last MOP value is used as initial value. The last MOP value is still available after switching off and on again the mains voltage. As an alternative, an adjustable initial value or the minimum value can be used for starting.

Parameter	Name / value range / [default setting]		Info
0x2631:023 (P400.23)	Function list: MOP setpoint up (Function list: MOP up) • For further possible settings, see parameter 0x2631:001 (P400.01). 🕮 532		Assignment of a trigger for the "MOP setpoint up" function. Trigger = TRUE: setpoint generated by the "Motor potentiometer" function ("MOP value") is maximally increased to the upper range limit with acceleration time 2. Trigger = FALSE: last MOP value is maintained. Notes: • If the "MOP setpoint up" and "MOP setpoint down" functions are active at the same time, the last MOP value is maintained. • Acceleration time 2 can be set in 0x2919 (P222.00).
	0	**Not connected**	
0x2631:024 (P400.24)	Function list: MOP setpoint down (Function list: MOP down) • For further possible settings, see parameter 0x2631:001 (P400.01). 🕮 532		Assignment of a trigger for the "MOP setpoint down" function. Trigger = TRUE: setpoint generated by the "Motor potentiometer" function ("MOP value") is maximally decreased to the lower range limit with deceleration time 2. Trigger = FALSE: last MOP value is maintained. Notes: • If the "MOP setpoint up" and "MOP setpoint down" functions are active at the same time, the last MOP value is maintained. • Deceleration time 2 can be set in 0x291A (P223.00).
	0	**Not connected**	
0x2631:025 (P400.25)	Function list: Activate MOP setpoint (Function list: Setp: MOP) • For further possible settings, see parameter 0x2631:001 (P400.01). 🕮 532		Assignment of a trigger for the "Activate MOP setpoint" function. Trigger = TRUE: the "Motor potentiometer" function is used as setpoint source (if the trigger assigned has the highest setpoint priority). Trigger = FALSE: no action / deactivate function again.
	0	**Not connected**	

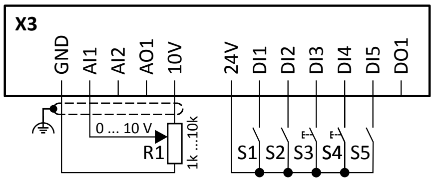


Parameter	Name / value range / [default setting]	Info
0x4003 (P413.00)	MOP starting mode (MOP startmode)	Selection of the initial value which is used after activation of the function.
	0 **Last value**	The last MOP value is used as initial value. It is still provided after the mains voltage has been switched off and on again. Note: The last MOP value is saved in the internal EEPROM of the inverter. If the memory module is transferred to a compatible device, the last MOP value will therefore not be accepted.
	1 Starting value	The starting value of the corresponding operating mode is used as initial value: • 0x4004:001 (P414.01) for the operating mode "MS: Velocity mode" • 0x4004:002 (P414.02) for PID control • 0x4004:003 (P414.03) for the operating mode "MS: Torque mode"
	2 Minimum value	The minimum value of the corresponding operating mode is used as initial value: • 0x2915 (P210.00) for the operating mode "MS: Velocity mode" • 0x404E:001 (P605.01) for PID control
0x4004:001 (P414.01)	MOP starting values: Frequency (MOP start value: Frequency) 0.0 ... [**0.0**] ... 599.0 Hz	Starting value for operating mode "MS: Velocity mode". • This value is used as initial value if "Starting value [1]" is set in 0x4003 (P413.00).
0x4004:002 (P414.02)	MOP starting values: PID value (MOP start value: PID value) -300.00 ... [**0.00**] ... 300.00 PID unit	Starting value for reference value of the PID control. • This value is used as initial value if "Starting value [1]" is set in 0x4003 (P413.00).
0x4004:003 (P414.03)	MOP starting values: Torque (MOP start value: Torque) 0.0 ... [**0.0**] ... 1000.0 %	Starting value for operating mode "MS: Torque mode". • This value is used as initial value if "Starting value [1]" is set in 0x4003 (P413.00).
0x4009:001	MOP values saved: Frequency • Read only: x.x Hz	Display of the last MOP value saved internally for the operating mode "MS: Velocity mode". • This value is used as initial value if "Last value [0]" is set in 0x4003 (P413.00).
0x4009:002	MOP values saved: PID value • Read only: x.xx PID unit	Display of the last MOP value saved internally for the reference value of the PID control. • This value is used as initial value if "Last value [0]" is set in 0x4003 (P413.00).
0x4009:003	MOP values saved: Torque • Read only: x.x %	Display of the last MOP value saved internally for the operating mode "MS: Torque mode". • This value is used as initial value if "Last value [0]" is set in 0x4003 (P413.00).
0x2915 (P210.00)	Minimum frequency (Min. frequency) 0.0 ... [**0.0**] ... 599.0 Hz	Lower limit value for all frequency setpoints.
0x2916 (P211.00)	Maximum frequency (Max. frequency) Device for 50-Hz mains: 0.0 ... [**50.0**] ... 599.0 Hz Device for 60-Hz mains: 0.0 ... [**60.0**] ... 599.0 Hz	Upper limit value for all frequency setpoints.
0x2919 (P222.00)	Acceleration time 2 (Accelerat.time 2) 0.0 ... [**5.0**] ... 3600.0 s	Acceleration time 2 for the operating mode "MS: Velocity mode". • The acceleration time set refers to the acceleration from standstill to the maximum frequency set. In the case of a lower setpoint selection, the actual acceleration time is reduced accordingly. • The acceleration time 2 is active if the frequency setpoint (absolute value) ≥ auto switching threshold 0x291B (P224.00) or the trigger assigned to the function "Activate ramp 2" in 0x2631:039 (P400.39) = TRUE. • The acceleration time 2 is also used for changing the MOP setpoint generated by the "motor potentiometer" function. • Setting is not effective in the operating mode 0x6060 (P301.00) = "CiA: Velocity mode [2]". ▸ Device profile CiA 402 📖 469

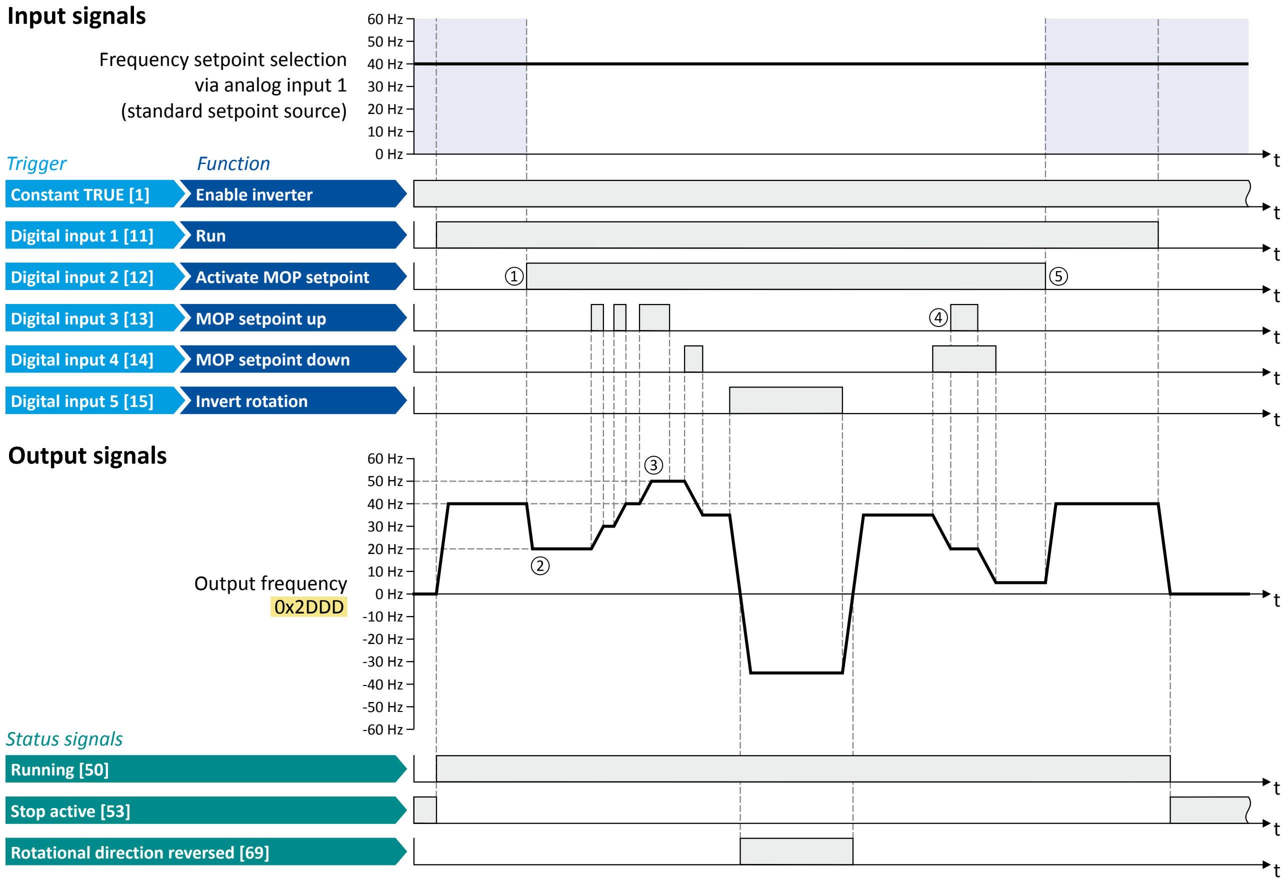
Parameter	Name / value range / [default setting]	Info
0x291A (P223.00)	Deceleration time 2 (Decelerat.time 2) 0.0 ... [**5.0**] ... 3600.0 s	Deceleration time 2 for the operating mode "MS: Velocity mode". • The deceleration time set refers to the deceleration from the maximum frequency set to standstill. In the case of a lower actual frequency, the actual deceleration time is reduced accordingly. • The deceleration time 2 is active if the frequency setpoint (absolute value) ≥ auto change-over threshold 0x291B (P224.00) or the trigger assigned to the function "Activate ramp 2" in 0x2631:039 (P400.39) = TRUE. • The deceleration time 2 is also used for changing the MOP setpoint generated by the "motor potentiometer" function. • Setting is not effective in the operating mode 0x6060 (P301.00) = "CiA: Velocity mode [2]". ▸ Device profile CiA 402 📖 469

Example for operating mode

- The analog input 1 is set as standard setpoint source.
- Switch S1 starts the motor in forward direction of rotation. Switch S1 in the initial position stops the motor again.
- Switch S2 activates the motor potentiometer as setpoint source. The MOP setpoint can then be increased via button S3 and reduced via button S4. If both buttons are pressed at the same time, the MOP setpoint remains unchanged.
- Switch S5 switches the direction of rotation.

Connection plan	function	
	Potentiometer R1	Frequency setpoint selection
	Switch S1	Run
	Switch S2	Activate MOP setpoint
	Button S3	MOP setpoint up
	Button S4	MOP setpoint down
	Switch S5	Reverse rotational direction

Parameter	Name	Setting for this example
0x2631:001 (P400.01)	Enable inverter	Constant TRUE [1]
0x2631:002 (P400.02)	Run	Digital input 1 [11]
0x2631:025 (P400.25)	Activate MOP setpoint	Digital input 2 [12]
0x2631:023 (P400.23)	MOP setpoint up	Digital input 3 [13]
0x2631:024 (P400.24)	MOP setpoint down	Digital input 4 [14]
0x2631:013 (P400.13)	Reverse rotational direction	Digital input 5 [15]
0x2824 (P200.00)	Control selection	Flexible I/O configuration [0]
0x2838:003 (P203.03)	Stop method	Standard ramp [1]
0x2860:001 (P201.01)	Frequency control: Default setpoint source	Analog input 1 [2]
0x2917 (P220.00)	Acceleration time 1	1.0 s
0x2918 (P221.00)	Deceleration time 1	1.0 s
0x2919 (P222.00)	Acceleration time 2	4.0 s (for MOP setpoint change)
0x291A (P223.00)	Deceleration time 2	4.0 s (for MOP setpoint change)
0x4003 (P413.00)	MOP starting mode	Starting value [1]
0x4004:001 (P414.01)	MOP starting values: Frequency	20 Hz



The status signals can be assigned to digital outputs. ▸ Configuration of digital outputs 📖 603

① Change-over from analog input 1 (standard setpoint source) to MOP setpoint.

② The initial value for the motor potentiometer function depends on the setting in 0x4003 (P413.00).
In this example, the "starting value" set in 0x4004:001 (P414.01) is used (here: 20 Hz).

③ The MOP setpoint is maximally increased to the maximum frequency set in 0x2916 (P211.00) (here: 50 Hz).

④ If "MOP setpoint up" and "MOP setpoint down" are requested at the same time, the MOP setpoint remains unchanged.

⑤ Change-over from MOP setpoint back to analog input 1 (standard setpoint source).

14.3.7 Setpoint source segment setpoints

The four functions "Activate segment setpoint (bit 0)" ... " Activate segment setpoint´(bit 3)" enable a setpoint change-over to a segment setpoint parameterised for the "sequencer" function during normal operation.

Preconditions

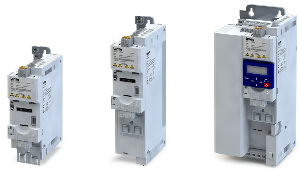
A setpoint change-over to the respective segment setpoint is only effected if no setpoint source with a higher priority has been selected. ▶ Priority of the setpoint sources 📖 548

Details

A segment setpoint is selected in a binary-coded fashion via the triggers assigned to the four functions "Activate segment setpoint (bit 0)" ... " Activate segment setpoint´(bit 3)" in compliance with the following truth table:

Activate segment setpoint				Selection			
Bit 3 0x2631:029 (P400.29)	Bit 2 0x2631:028 (P400.28)	Bit 1 0x2631:027 (P400.27)	Bit 0 0x2631:026 (P400.26)	Segment	Frequency setpoint	PID setpoint	Torque setpoint
FALSE	FALSE	FALSE	FALSE	No segment setpoint selected			
FALSE	FALSE	FALSE	TRUE	1	0x4026:001 (P801.01)	0x4026:006 (P801.06)	0x4026:007 (P801.07)
FALSE	FALSE	TRUE	FALSE	2	0x4027:001 (P802.01)	0x4027:006 (P802.06)	0x4027:007 (P802.07)
FALSE	FALSE	TRUE	TRUE	3	0x4028:001 (P803.01)	0x4028:006 (P803.06)	0x4028:007 (P803.07)
FALSE	TRUE	FALSE	FALSE	4	0x4029:001 (P804.01)	0x4029:006 (P804.06)	0x4029:007 (P804.07)
FALSE	TRUE	FALSE	TRUE	5	0x402A:001 (P805.01)	0x402A:006 (P805.06)	0x402A:007 (P805.07)
FALSE	TRUE	TRUE	FALSE	6	0x402B:001 (P806.01)	0x402B:006 (P806.06)	0x402B:007 (P806.07)
FALSE	TRUE	TRUE	TRUE	7	0x402C:001 (P807.01)	0x402C:006 (P807.06)	0x402C:007 (P807.07)
TRUE	FALSE	FALSE	FALSE	8	0x402D:001 (P808.01)	0x402D:006 (P808.06)	0x402D:007 (P808.07)
TRUE	FALSE	FALSE	TRUE	Invalid selection			
...							
TRUE	TRUE	TRUE	TRUE				

Parameter	Name / value range / [default setting]		Info
0x2631:026 (P400.26)	Function list: Activate segment setpoint (bit 0) (Function list: Setp: Segment b0) • From version 03.00 • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532		Assignment of a trigger for the "Activate segment setpoint (bit 0)" function. Selection bit with the valency 2^0 for the bit-coded selection and activation of a parameterised segment setpoint. Trigger = FALSE: selection bit = "0". Trigger = TRUE: selection bit = "1". Notes: • During normal operation (no active sequence), this function serves to activate the setpoint of a segment (instead of an entire sequence in the sequencer operation). • This function is not intended for the use in the sequencer operation.
	0	**Not connected**	
0x2631:027 (P400.27)	Function list: Activate segment setpoint (bit 1) (Function list: Setp: Segment b1) • From version 03.00 • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532		Assignment of a trigger for the "Activate segment setpoint (bit 1)" function. Selection bit with the valency 2^1 for the bit-coded selection and activation of a parameterised segment setpoint. Trigger = FALSE: selection bit = "0". Trigger = TRUE: selection bit = "1". Notes: • During normal operation (no active sequence), this function serves to activate the setpoint of a segment (instead of an entire sequence in the sequencer operation). • This function is not intended for the use in the sequencer operation.
	0	**Not connected**	



Parameter	Name / value range / [default setting]	Info
0x2631:028 (P400.28)	Function list: Activate segment setpoint (bit 2) (Function list: Setp: Segment b2) • From version 03.00 • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532	Assignment of a trigger for the "Activate segment setpoint (bit 2)" function. Selection bit with the valency 2^2 for the bit coded selection and activation of a parameterised segment setpoint. Trigger = FALSE: selection bit = "0". Trigger = TRUE: selection bit = "1". Notes: • During normal operation (no active sequence), this function serves to activate the setpoint of a segment (instead of an entire sequence in the sequencer operation). • This function is not intended for the use in the sequencer operation.
	0 **Not connected**	
0x2631:029 (P400.29)	Function list: Activate segment setpoint´(bit 3) (Function list: Setp: Segment b3) • From version 03.00 • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532	Assignment of a trigger for the "Activate segment setpoint´(bit 3)" function. Selection bit with the valency 2^3 for the bit coded selection and activation of a parameterised segment setpoint. Trigger = FALSE: selection bit = "0". Trigger = TRUE: selection bit = "1". Notes: • During normal operation (no active sequence), this function serves to activate the setpoint of a segment (instead of an entire sequence in the sequencer operation). • This function is not intended for the use in the sequencer operation.
	0 **Not connected**	

14.3.8 HTL input setpoint source

In case of the inverter i550, the digital inputs DI3 and DI4 can be configured as HTL input to evaluate the signal of a cost-effective HTL encoder or a reference frequency ("pulse train").

Many cost-effective control systems have a pulse-train output as an alternative to a real analog output.

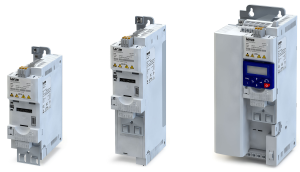
- The HTL input can be defined as standard setpoint source. ▶ Selection of setpoint source 📖 148
- The "Activate setpoint via HTL input" 0x2631:022 (P400.22) function enables a setpoint change-over to the HTL input.

Preconditions

- A setpoint change-over to the HTL input is only effected if no setpoint source with a higher priority has been selected. ▶ Priority of the setpoint sources 📖 548
- For using the digital inputs DI3 and DI4 as HTL input, the corresponding input function must be set in 0x2630:002 (P410.02). ▶ Configuration of digital inputs 📖 594

Restrictions

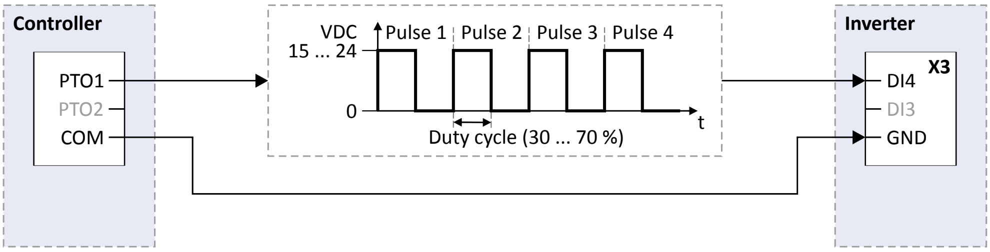
- When the digital inputs DI3 and DI4 are configured as HTL input, these two digital inputs are no longer available for other control functions.
- The HTL input can be either used for detecting an HTL encoder signal or a pulse train. They cannot be used at the same time.
- The maximum input frequency of the digital inputs is 100 kHz. If this frequency is exceeded, an error is triggered.



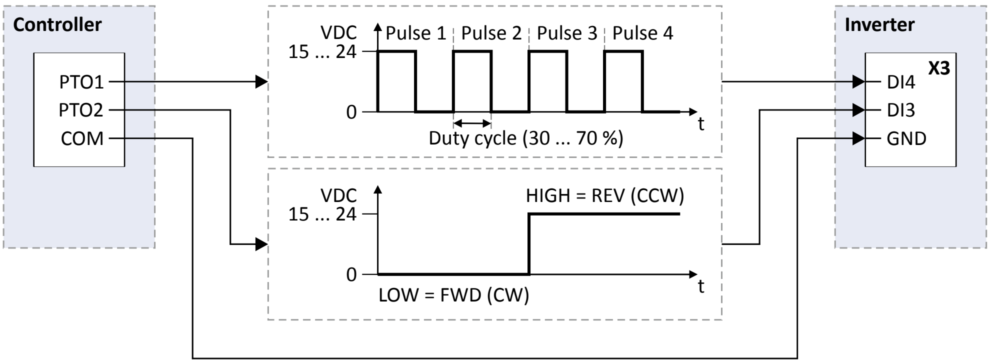
Details

For detecting a pulse train, the following two configurations are supported:

a) input function 0x2630:002 (P410.02) = "Pulse train [2]"
(DI4 = input for pulse train, DI3 = normal digital input)



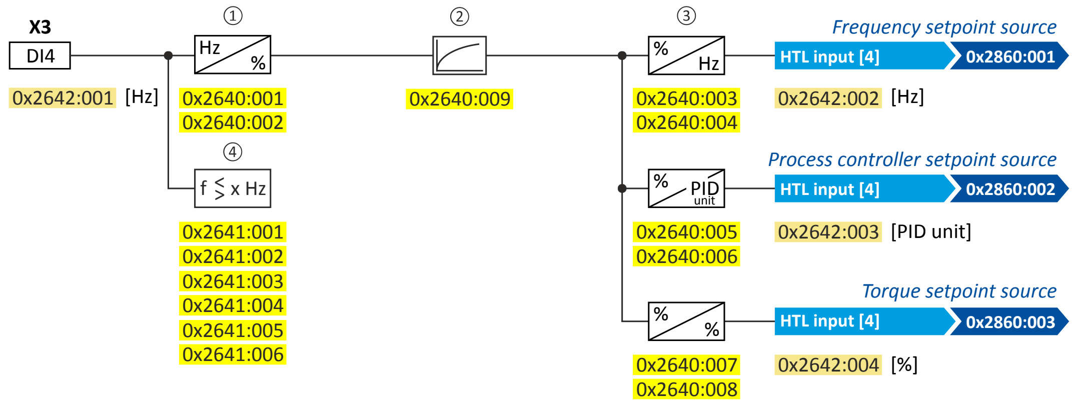
b) input function 0x2630:002 (P410.02) = "Pulse train/direction [3]"
(DI4 = input for pulse train, DI3 = input for specification of direction)



For detecting an HTL encoder AB signal, the input function "HTL encoder (AB) [1]" must be set in 0x2630:002 (P410.02) instead. More details for configuring the HTL encoder can be found in chapter "HTL encoder". 📖 496

The following settings are possible for the HTL input:

- Definition of the input range ①
- Filter time for low-pass filters ②
- Definition of the setting range ③
- Monitoring of the input signal ④



Diagnostic parameters:

- The input frequency is displayed in 0x2642:001 (P115.01).
- The scaled frequency value is displayed in 0x2642:002 (P115.02).
- The scaled process controller value is displayed in 0x2642:003 (P115.03).
- The scaled torque value is displayed in 0x2642:004 (P115.04).

Configuration examples

Detailed configuration examples can be found in the following subchapters:

▸ Example 1: Input range 10 ... 85 kHz ≡ setting range 0 ... 50 Hz 📖 569

▸ Example 2: Input range 10 ... 85 kHz ≡ setting range -50 ... 50 Hz 📖 569

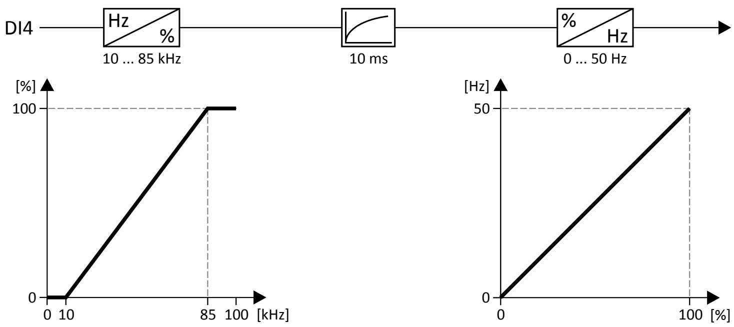
Parameter	Name / value range / [default setting]	Info
0x2631:022 (P400.22)	Function list: Activate setpoint via HTL input (Function list: Setp: HTL input) • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532 **0** **Not connected**	Assignment of a trigger for the "Activate setpoint via HTL input" function. Trigger = TRUE: HTL input is used as setpoint source (if the trigger assigned has the highest setpoint priority). Trigger = FALSE: no action / deactivate function again.
0x2640:001 (P415.01)	HTL input settings: Minimum frequency (HTL inp. setting: Min.frequency) -100000.0 ... [**0.0**] ... 100000.0 Hz • From version 04.00	Definition of the input range of the HTL input.
0x2640:002 (P415.02)	HTL input settings: Maximum frequency (HTL inp. setting: Max. frequency) -100000.0 ... [**0.0**] ... 100000.0 Hz • From version 04.00	
0x2640:003 (P415.03)	HTL input settings: Minimum motor frequency (HTL inp. setting: Min.motor.freq) -1000.0 ... [**0.0**] ... 1000.0 Hz • From version 04.00	Definition of the setting range for operating mode "MS: Velocity mode". • Direction of rotation according to sign. • The standard setpoint source for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]" is selected in 0x2860:001 (P201.01).
0x2640:004 (P415.04)	HTL input settings: Maximum motor frequency (HTL inp. setting: Max.motor.freq) Device for 50-Hz mains: -1000.0 ... [**50.0**] ... 1000.0 Hz Device for 60-Hz mains: -1000.0 ... [**60.0**] ... 1000.0 Hz • From version 04.00	
0x2640:005 (P415.05)	HTL input settings: Minimum PID setpoint (HTL inp. setting: Min.PID setpoint) -300.00 ... [**0.00**] ... 300.00 PID unit • From version 04.00	Definition of the setting range for PID control. • The standard setpoint source for the reference value of PID control is selected in 0x2860:002 (P201.02).
0x2640:006 (P415.06)	HTL input settings: Maximum PID setpoint (HTL inp. setting: Max.PID setpoint) -300.00 ... [**100.00**] ... 300.00 PID unit • From version 04.00	
0x2640:007 (P415.07)	HTL input settings: Minimum torque setpoint (HTL inp. setting: Min.torque setp.) -400.0 ... [**0.0**] ... 400.0 % • From version 04.00	Definition of the setting range for operating mode "MS: Torque mode". • 100 % ≡ Motor rated torque 0x6076 (P325.00) • Direction of rotation according to sign. • The standard setpoint source for operating mode 0x6060 (P301.00) = "MS: Torque mode [-1]" is selected in 0x2860:003 (P201.03). ▸ Torque control w/ freq. limit 📖 206
0x2640:008 (P415.08)	HTL input settings: Maximum torque setpoint (HTL inp. setting: Max.torque setp) -400.0 ... [**100.0**] ... 400.0 % • From version 04.00	
0x2640:009 (P415.09)	HTL input settings: Filter time constant (HTL inp. setting: Filter time) 0 ... [**10**] ... 10000 ms • From version 04.00	PT1 time constant for low-pass filter.
0x2641:001 (P416.01)	HTL input monitoring: Minimum frequency threshold (HTL inp. monit.: Min.freq.thresh.) -214748364.8 ... [**0.0**] ... 214748364.7 Hz • From version 04.00	Settings for monitoring the HTL input.
0x2641:002 (P416.02)	HTL input monitoring: Minimum delay threshold (HTL inp. monit.: Min.delay thres.) 0.0 ... [**5.0**] ... 300.0 s • From version 04.00	
0x2641:003 (P416.03)	HTL input monitoring: Maximum frequency threshold (HTL inp. monit.: Max.freq.thresh.) -214748364.8 ... [**0.0**] ... 214748364.7 Hz • From version 04.00	
0x2641:004 (P416.04)	HTL input monitoring: Maximum delay threshold (HTL inp. monit.: Max.delay thres.) 0.0 ... [**5.0**] ... 300.0 s • From version 04.00	

Parameter	Name / value range / [default setting]	Info
0x2641:005 (P416.05)	HTL input monitoring: Monitoring conditions (HTL inp. monit.: Monit. condition) • From version 04.00	Monitoring condition for HTL input. • If the selected condition is fulfilled, the response set in 0x2641:006 (P416.06) takes place.
	1 Below minimum frequency	Input frequency < minimum frequency threshold 0x2641:001 (P416.01) longer than the deceleration 0x2641:002 (P416.02).
	2 Above maximum frequency	Input frequency > maximum frequency threshold 0x2641:003 (P416.03) longer than the deceleration 0x2641:004 (P416.04).
	3 Below min. or above max. frequency	Input frequency < minimum frequency threshold 0x2641:001 (P416.01) longer than the deceleration 0x2641:002 (P416.02) OR input frequency > maximum frequency threshold 0x2641:003 (P416.03) longer than the deceleration 0x2641:004 (P416.04).
0x2641:006 (P416.06)	HTL input monitoring: Error response (HTL inp. monit.: Error response) • From version 04.00 • For further possible settings, see parameter 0x2D45:001 (P310.01). 📖 223	Selection of the response to the triggering of the HTL input monitoring. Associated error code: • 28803 | 0x7083 - HTL input fault
	0 No response	
0x2642:001 (P115.01)	HTL input diagnostics: Input frequency (HTL inp. diag.: Input frequency) • Read only: x.x Hz • From version 04.00	Display of the current input value at the HTL input.
0x2642:002 (P115.02)	HTL input diagnostics: Frequency setpoint (HTL inp. diag.: Freq. setpoint) • Read only: x.x Hz • From version 04.00	Display of the current input value at the HTL input scaled as frequency value. • The standard setpoint source for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]" is selected in 0x2860:001 (P201.01).
0x2642:003 (P115.03)	HTL input diagnostics: PID setpoint (HTL inp. diag.: PID setpoint) • Read only: x.xx PID unit • From version 04.00	Display of the current input value at the HTL input scaled as process controller value. • The standard setpoint source for the reference value of PID control is selected in 0x2860:002 (P201.02).
0x2642:004 (P115.04)	HTL input diagnostics: Torque setpoint (HTL inp. diag.: Torque setpoint) • Read only: x.x % • From version 04.00	Display of the current input value at the HTL input scaled as torque value in percent. • 100 % ≡ Motor rated torque 0x6076 (P325.00) • The standard setpoint source for operating mode 0x6060 (P301.00) = "MS: Torque mode [-1]" is selected in 0x2860:003 (P201.03).
0x2630:002 (P410.02)	Settings for digital inputs: Input function (DI settings: Input function)	Input function of the digital terminals DI3 and DI4.
	0 Digital input	DI3 = digital input DI4 = digital input
	1 HTL encoder (AB) (from version 02.00)	DI3 = HTL input for encoder track B DI4 = HTL input for encoder track A
	2 Pulse train (from version 03.00)	DI3 = digital input DI4 = HTL input for pulse train
	3 Pulse train/direction (from version 03.00)	DI3 = HTL input for direction specification; HIGH level = counter-clockwise (CCW) DI4 = HTL input for pulse train

14.3.8.1 Example 1: Input range 10 ... 85 kHz ≡ setting range 0 ... 50 Hz

In this configuration, a frequency setpoint between 0 and 50 Hz can be set with an HTL input frequency between 10 and 85 kHz.

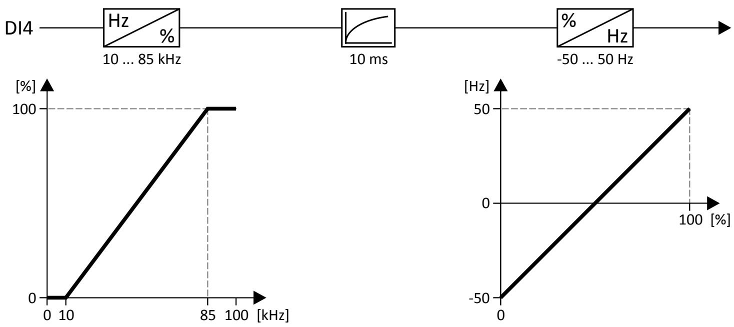
Parameter	Name	Setting for this example
0x2640:001 (P415.01)	HTL input settings: Minimum frequency	10000.0 Hz
0x2640:002 (P415.02)	HTL input settings: Maximum frequency	85000.0 Hz
0x2640:003 (P415.03)	HTL input settings: Minimum motor frequency	0.0 Hz
0x2640:004 (P415.04)	HTL input settings: Maximum motor frequency	50.0 Hz
0x2640:009 (P415.09)	HTL input settings: Filter time constant	10 ms

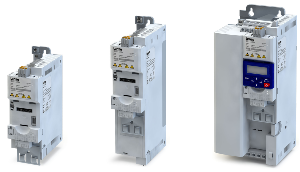


14.3.8.2 Example 2: Input range 10 ... 85 kHz ≡ setting range -50 ... 50 Hz

In this configuration, a frequency setpoint between -50 and 50 Hz can be set with an HTL input frequency between 10 and 85 kHz.

Parameter	Name	Setting for this example
0x2640:001 (P415.01)	HTL input settings: Minimum frequency	10000.0 Hz
0x2640:002 (P415.02)	HTL input settings: Maximum frequency	85000.0 Hz
0x2640:003 (P415.03)	HTL input settings: Minimum motor frequency	-50.0 Hz
0x2640:004 (P415.04)	HTL input settings: Maximum motor frequency	50.0 Hz
0x2640:009 (P415.09)	HTL input settings: Filter time constant	10 ms





14.4 Reset error

By means of the "Reset fault" function, an active error can be reset (acknowledged).

Preconditions

The error can only be reset if the error cause has been eliminated.

Parameter	Name / value range / [default setting]		Info
0x2631:004 (P400.04)	Function list: Reset fault (Function list: Reset fault) • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532		Assignment of a trigger for the "Reset fault" function. Trigger = FALSE↗TRUE (edge): Active error is reset (acknowledged) if the error condition is not active anymore and the error is resettable. Trigger = FALSE: no action.
	12	**Digital input 2**	
0x2839:006	Fault configuration: Fault handling in case of state change		Selection whether a pending error is to be reset via the functions "Enable inverter" 0x2631:001 (P400.01) and "Run" 0x2631:002 (P400.02) as well.
	0	**Reset fault**	
	1	Do not reset fault	

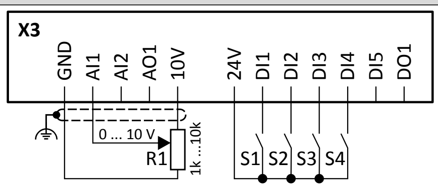
Further options for resetting an error

In addition to the "Reset error" function, there are the following options to reset an error:

function	Required state change to reset an error:
Enable inverter 0x2631:001 (P400.01)	TRUE↘FALSE (edge)
Run 0x2631:002 (P400.02)	TRUE↘FALSE (edge); see the following example
Keypad key O	Keystroke

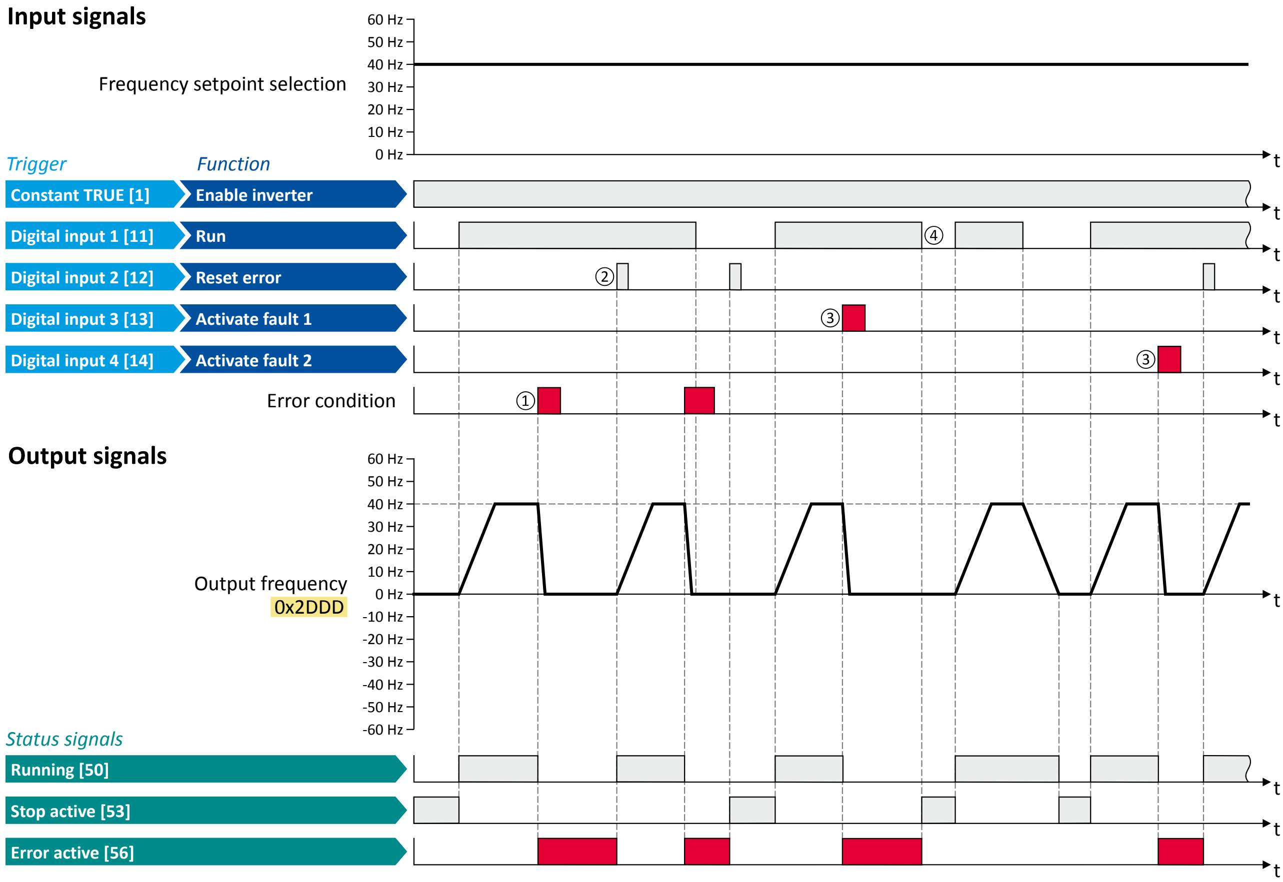
Example for operating mode

- Switch S1 starts the motor in forward direction of rotation. Switch S1 in the initial position stops the motor again.
- Switch S2 resets the current error if the error condition is not active anymore and the error is resettable.
- The switches/sensors S3 and S4 serve to set the inverter from the process to the error status. ▸ Triggering a user-defined fault 📖 578

Connection plan	function	
	Potentiometer R1	Frequency setpoint selection
	Switch S1	Run
	Switch S2	Reset fault
	Switch S3	Activate fault 1
	Switch S4	Activate fault 2

Parameter	Name	Setting for this example
0x2631:001 (P400.01)	Enable inverter	Constant TRUE [1]
0x2631:002 (P400.02)	Run	Digital input 1 [11]
0x2631:004 (P400.04)	Reset fault	Digital input 2 [12]
0x2631:013 (P400.13)	Reverse rotational direction	Not connected [0]
0x2631:018 (P400.18)	Activate preset (bit 0)	Not connected [0]
0x2631:043 (P400.43)	Activate fault 1	Digital input 3 [13]
0x2631:044 (P400.44)	Activate fault 2	Digital input 4 [14]
0x2824 (P200.00)	Control selection	Flexible I/O configuration [0]
0x2838:003 (P203.03)	Stop method	Standard ramp [1]
0x2860:001 (P201.01)	Frequency control: Default setpoint source	Analog input 1 [2]
0x2918 (P221.00)	Deceleration time 1	5.0 s
0x291C (P225.00)	Quick stop deceleration time	1.0 s

The following signal flow illustrates the reset of an error both with the "Reset error" function ② and by cancelling the start command ④:

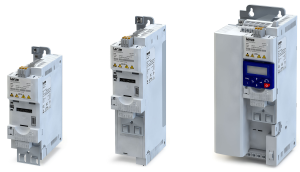


The status signals can be assigned to digital outputs. ▶ Configuration of digital outputs 📖 603

①	If an error condition is active in the inverter, the motor is brought to a standstill with the quick stop ramp. The inverter is then disabled. Exception: In case of a serious error, the inverter is disabled immediately. The motor becomes torqueless (coasts).
②	If the error can be reset, the error state can be left again with the "Reset fault" function (if the error condition no longer exists). The motor accelerates again to the setpoint since the start command is still active.
③	The functions "Activate fault 1" and "Activate fault 2" serve to set the inverter from the process to the error status.
④	If the error can be reset, the cancelled start command results in leaving the error state (if the error condition no longer exists).

Related topics

▶ Error handling 📖 139



14.5 Activating DC braking manually

By means of the "Activate DC braking" function, DC braking can be activated manually.

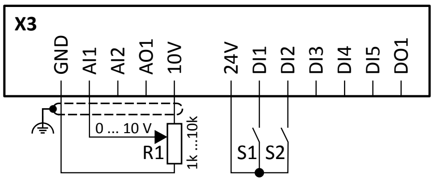
Preconditions

The current for DC braking must be set > 0 % so that the function can be executed.

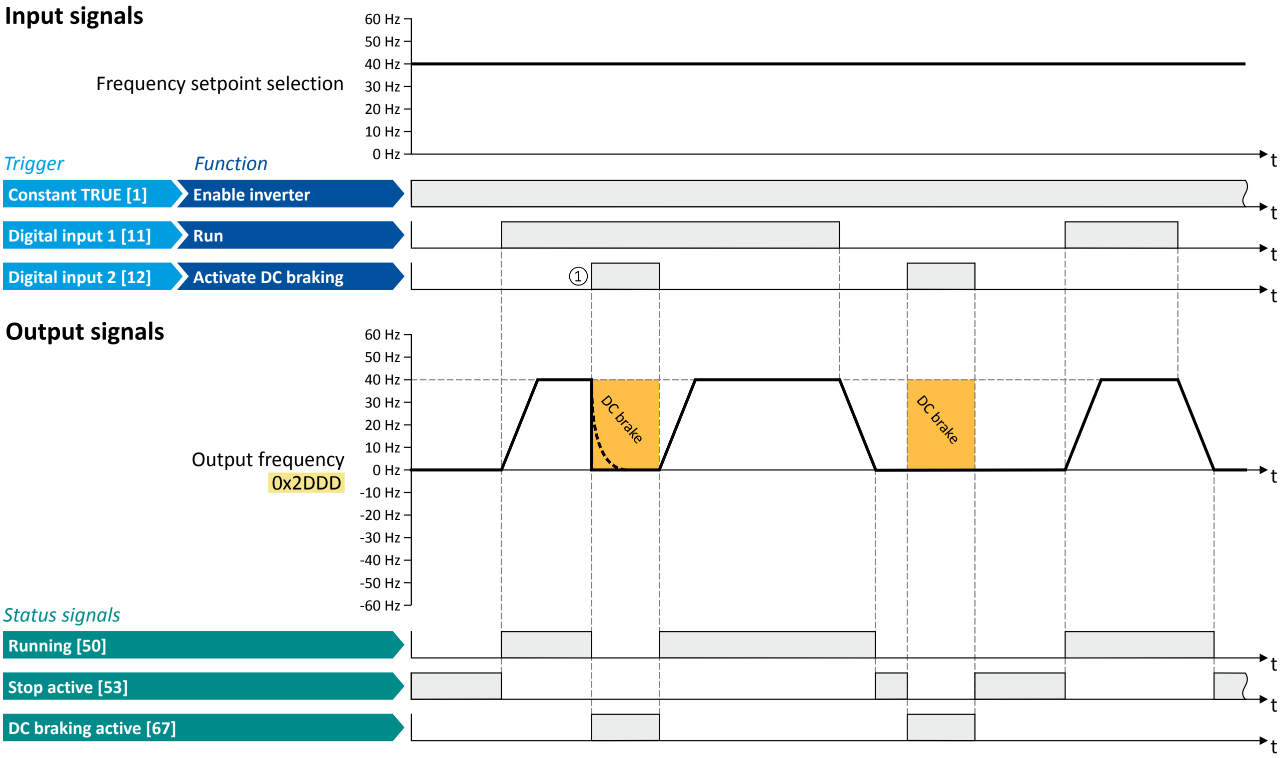
Parameter	Name / value range / [default setting]	Info
0x2631:005 (P400.05)	Function list: Activate DC braking (Function list: DC braking) • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532 **0** **Not connected**	Assignment of a trigger for the "Activate DC braking" function. Trigger = TRUE: Activate DC braking. Trigger = FALSE: Deactivate DC braking. ⚠ CAUTION! DC braking remains active as long as the trigger is set to TRUE. ▸ DC braking 📖 437
0x2B84:001 (P704.01)	DC braking: Current (DC braking: Current) 0.0 ... [**0.0**] ... 200.0 %	Braking current for DC braking. • 100 % ≡ rated motor current 0x6075 (P323.00)

Example for operating mode

- Switch S1 starts the motor in forward direction of rotation. Switch S1 in the initial position stops the motor again.
- Switch S2 activates DC braking.

Connection plan	function	
	Potentiometer R1	Frequency setpoint selection
	Switch S1	Run
	Switch S2	Activate DC braking

Parameter	Name	Setting for this example
0x2631:001 (P400.01)	Enable inverter	Constant TRUE [1]
0x2631:002 (P400.02)	Run	Digital input 1 [11]
0x2631:004 (P400.04)	Reset fault	Not connected [0]
0x2631:005 (P400.05)	Activate DC braking	Digital input 2 [12]
0x2824 (P200.00)	Control selection	Flexible I/O configuration [0]
0x2838:003 (P203.03)	Stop method	Standard ramp [1]
0x2860:001 (P201.01)	Frequency control: Default setpoint source	Analog input 1 [2]
0x2B84:001 (P704.01)	DC braking: Current	10 %



The status signals can be assigned to digital outputs. ▶ Configuration of digital outputs 📖 603

① If DC braking is activated while the motor is running, the output pulses of the inverter are disabled immediately. For stopping the motor, the current set in 0x2B84:001 (P704.01) is injected. The exact drive behaviour depends on the settings for the "DC braking" function and the load properties.

14.6 Releasing holding brake manually

The "Release holding brake" function serves to release the holding brake immediately. Brake application time and brake opening time as well as the conditions for the automatic operation are not effective.

Preconditions

- Observe setting and application notes in the "Holding brake control" chapter! 📖 472
- The brake mode "Automatic [0]" or "Manual [1]" must be set in 0x2820:001 (P712.01).
- The "Release holding brake [115]" trigger has to be assigned to a digital output or, in the simplest case, to the relay which then switches the brake supply.

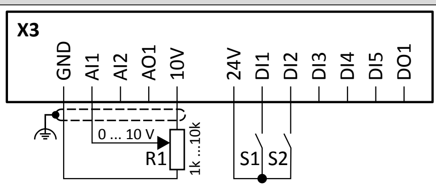
Details

Detailed information about the function and configuration of the holding brake control can be found in the "Holding brake control" chapter. 📖 472

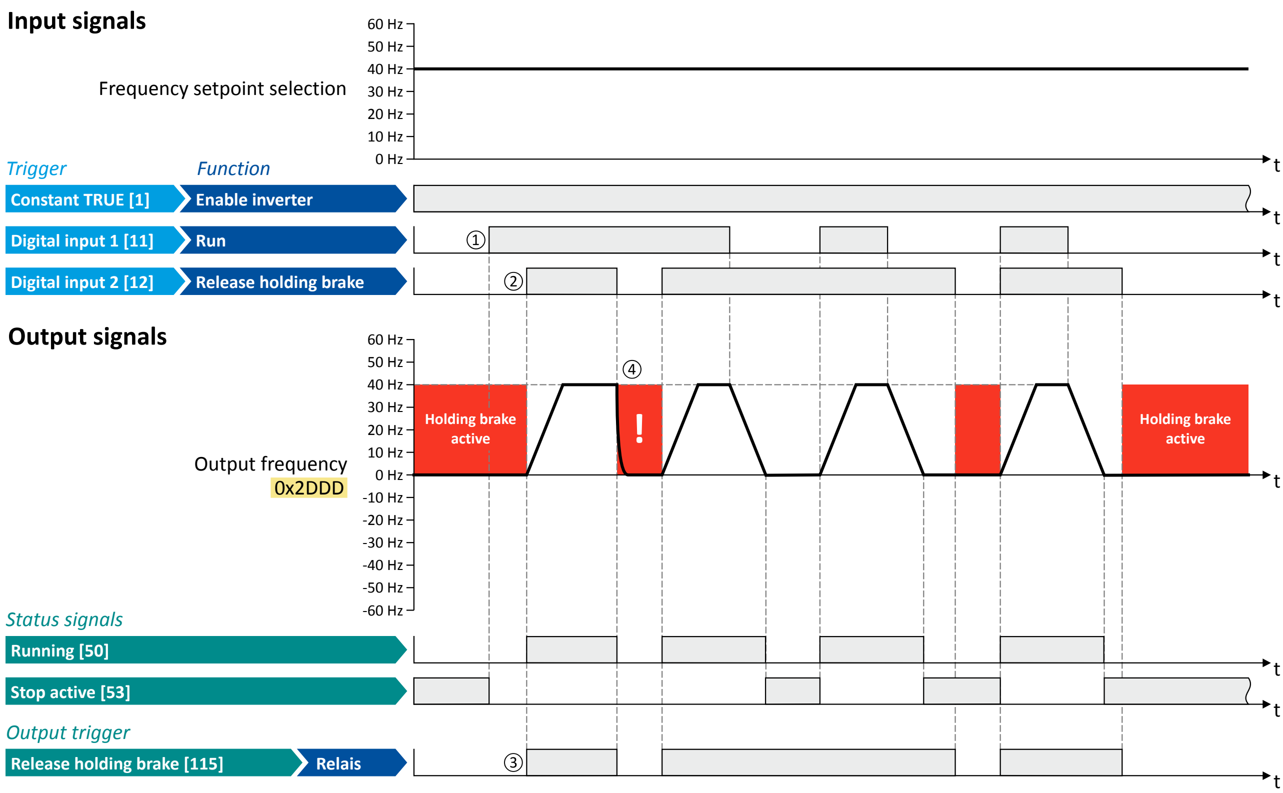
Parameter	Name / value range / [default setting]		Info
0x2631:049 (P400.49)	Function list: Release holding brake (Function list: Release brake) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532		Assignment of a trigger for the "Release holding brake" function. Trigger = TRUE: Release holding brake (immediately). Trigger = FALSE: no action. Notes: • Function is only executed if the brake mode 0x2820:001 (P712.01) is set to "Automatic [0]" or "Manual [1]". ⚠ CAUTION! • The manually triggered "Release holding brake" command has a direct impact on the "Release holding brake [115]" trigger. Thus, the holding brake can be manually released if the power section is switched off! • The responsibility for a manual release of the holding brake has the external trigger source for the "Release holding brake" command!
	0	**Not connected**	

Example for operating mode

- Switch S1 starts the motor in forward direction of rotation. Switch S1 in the initial position stops the motor again.
- Switch S2 releases the holding brake. For this purpose, in this example, trigger "Release holding brake [115]" is assigned to the relay that switches the brake supply.

Connection plan	function	
	Potentiometer R1	Frequency setpoint selection
	Switch S1	Run
	Switch S2	Release holding brake

Parameter	Name	Setting for this example
0x2631:001 (P400.01)	Enable inverter	Constant TRUE [1]
0x2631:002 (P400.02)	Run	Digital input 1 [11]
0x2631:004 (P400.04)	Reset fault	Not connected [0]
0x2631:049 (P400.49)	Release holding brake	Digital input 2 [12]
0x2634:001 (P420.01)	Relay	Release holding brake [115]
0x2824 (P200.00)	Control selection	Flexible I/O configuration [0]
0x2838:003 (P203.03)	Stop method	Standard ramp [1]
0x2860:001 (P201.01)	Frequency control: Default setpoint source	Analog input 1 [2]



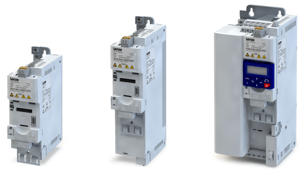
The status signals can be assigned to digital outputs. ▶ Configuration of digital outputs 📖 603

① As the holding brake is active, the motor does not yet start to rotate after the start command.

② The holding brake is released. The motor is led to the setpoint.

③ In this example, the "Release holding brake [115]" trigger is assigned to the relay that switches the brake supply. In idle state, the holding brake is applied. If the relay is energised, the holding brake is released.

④ **Note:** Holding brakes are not intended for braking during operation. The increased wear caused by braking during operation may destroy the holding brakes prematurely!



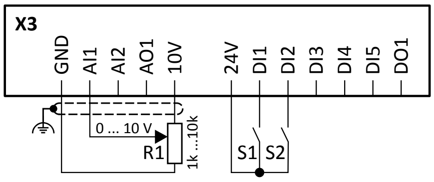
14.7 Activating ramp 2 manually

The "Activate ramp 2" function serves to manually activate acceleration time 2 and deceleration time 2.

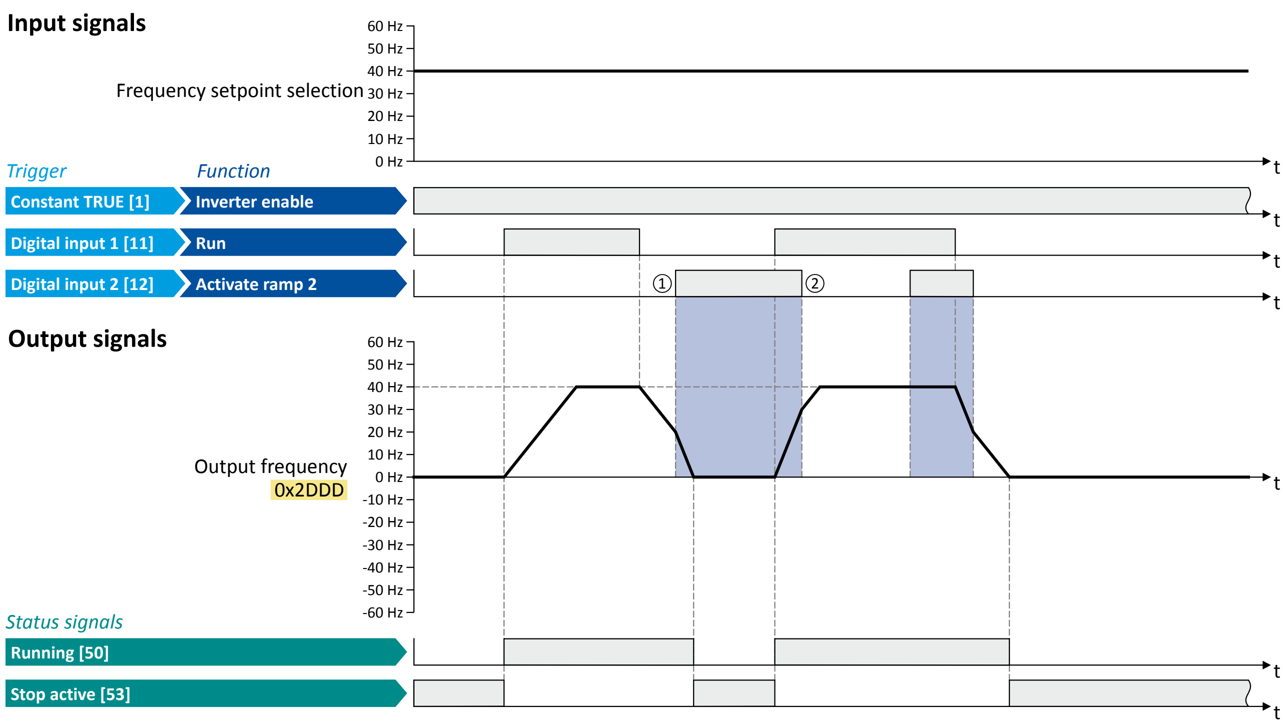
Parameter	Name / value range / [default setting]	Info
0x2631:039 (P400.39)	Function list: Activate ramp 2 (Function list: Activ. ramp 2) • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532 **0** **Not connected**	Assignment of a trigger for the "Activate ramp 2" function. Trigger = TRUE: activate acceleration time 2 and deceleration time 2 manually. Trigger = FALSE: no action / deactivate function again. Notes: • If the function is used and the assigned trigger = TRUE, the auto change-over threshold 0x291B (P224.00) for ramp 2 is deactivated. • Acceleration time 2 can be set in 0x2919 (P222.00). • Deceleration time 2 can be set in 0x291A (P223.00).
0x2917 (P220.00)	Acceleration time 1 (Accelerat.time 1) 0.0 ... [**5.0**] ... 3600.0 s	Acceleration time 1 for the operating mode "MS: Velocity mode". • The acceleration time set refers to the acceleration from standstill to the maximum frequency set. In the case of a lower setpoint selection, the actual acceleration time is reduced accordingly. • Setting is not effective in the operating mode 0x6060 (P301.00) = "CiA: Velocity mode [2]". ▸ Device profile CiA 402 📖 469
0x2918 (P221.00)	Deceleration time 1 (Decelerat.time 1) 0.0 ... [**5.0**] ... 3600.0 s	Deceleration time 1 for the operating mode "MS: Velocity mode". • The deceleration time set refers to the deceleration from the maximum frequency set to standstill. In the case of a lower actual frequency, the actual deceleration time is reduced accordingly. • Setting is not effective in the operating mode 0x6060 (P301.00) = "CiA: Velocity mode [2]". ▸ Device profile CiA 402 📖 469
0x2919 (P222.00)	Acceleration time 2 (Accelerat.time 2) 0.0 ... [**5.0**] ... 3600.0 s	Acceleration time 2 for the operating mode "MS: Velocity mode". • The acceleration time set refers to the acceleration from standstill to the maximum frequency set. In the case of a lower setpoint selection, the actual acceleration time is reduced accordingly. • The acceleration time 2 is active if the frequency setpoint (absolute value) ≥ auto switching threshold 0x291B (P224.00) or the trigger assigned to the function "Activate ramp 2" in 0x2631:039 (P400.39) = TRUE. • The acceleration time 2 is also used for changing the MOP setpoint generated by the "motor potentiometer" function. • Setting is not effective in the operating mode 0x6060 (P301.00) = "CiA: Velocity mode [2]". ▸ Device profile CiA 402 📖 469
0x291A (P223.00)	Deceleration time 2 (Decelerat.time 2) 0.0 ... [**5.0**] ... 3600.0 s	Deceleration time 2 for the operating mode "MS: Velocity mode". • The deceleration time set refers to the deceleration from the maximum frequency set to standstill. In the case of a lower actual frequency, the actual deceleration time is reduced accordingly. • The deceleration time 2 is active if the frequency setpoint (absolute value) ≥ auto change-over threshold 0x291B (P224.00) or the trigger assigned to the function "Activate ramp 2" in 0x2631:039 (P400.39) = TRUE. • The deceleration time 2 is also used for changing the MOP setpoint generated by the "motor potentiometer" function. • Setting is not effective in the operating mode 0x6060 (P301.00) = "CiA: Velocity mode [2]". ▸ Device profile CiA 402 📖 469

Example for operating mode

- Switch S1 starts the motor in forward direction of rotation. Switch S1 in the initial position stops the motor again.
- Switch S2 activates the acceleration time 2 and deceleration time 2.

Connection plan	function	
	Potentiometer R1	Frequency setpoint selection
	Switch S1	Run
	Switch S2	Activate ramp 2

Parameter	Name	Setting for this example
0x2631:001 (P400.01)	Enable inverter	Constant TRUE [1]
0x2631:002 (P400.02)	Run	Digital input 1 [11]
0x2631:004 (P400.04)	Reset fault	Not connected [0]
0x2631:039 (P400.39)	Activate ramp 2	Digital input 2 [12]
0x2824 (P200.00)	Control selection	Flexible I/O configuration [0]
0x2838:003 (P203.03)	Stop method	Standard ramp [1]
0x2860:001 (P201.01)	Frequency control: Default setpoint source	Analog input 1 [2]
0x2917 (P220.00)	Acceleration time 1	10.0 s
0x2918 (P221.00)	Deceleration time 1	10.0 s
0x2919 (P222.00)	Acceleration time 2	5.0 s
0x291A (P223.00)	Deceleration time 2	5.0 s



The status signals can be assigned to digital outputs. ▶ Configuration of digital outputs 🕮 603

① Change-over to deceleration time 2 during the deceleration phase.
② Change-over to acceleration time 1 during the acceleration phase.

14.8 Triggering a user-defined fault

The "Activate fault 1" and "Activate fault 2" functions serve to set the inverter from the process to the error status.

Details

If, for instance, sensors or switches are provided for process monitoring, which are designed to stop the process (and thus the drive) under certain conditions, these sensors/switches can be connected to free digital inputs of the inverter. The digital inputs used for the sensors/switches then have to be assigned to the functions "Activate fault 1" and "Activate fault 2" as triggers.

Parameter	Name / value range / [default setting]		Info
0x2631:043 (P400.43)	Function list: Activate fault 1 (Function list: Fault 1) • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532		Assignment of a trigger for the "Activate fault 1" function. Trigger = TRUE: Trigger user-defined error 1. Trigger = FALSE: no action. Notes: • After the error is triggered, the motor is brought to a standstill with the quick stop ramp. The inverter is then disabled. Associated error code: • 25217 | 0x6281 - User-defined fault 1
	0	**Not connected**	
0x2631:044 (P400.44)	Function list: Activate fault 2 (Function list: Fault 2) • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532		Assignment of a trigger for the "Activate fault 2" function. Trigger = TRUE: Trigger user-defined error 2. Trigger = FALSE: no action. Notes: • After the error is triggered, the motor is brought to a standstill with the quick stop ramp. The inverter is then disabled. Associated error code: • 25218 | 0x6282 - User-defined fault 2
	0	**Not connected**	

Example

An example of the operating mode can be found in the chapter "Reset error". 📖 570

Related topics

▶ Error handling 📖 139

14.9 Functions for parameter change-over

The inverter supports several parameter sets. The parameter set can be selected by means of the "Select parameter set (bit 0)" and "Select parameter set (bit 1)" functions.

⚠ DANGER!

Changed parameter settings can become effective immediately depending on the activating method set in 0x4046 (P755.00).

The possible consequence is an unexpected response of the motor shaft while the inverter is enabled.

- ▶ If possible, only carry out parameter changes while the inverter is disabled.
- ▶ Certain device commands or settings which might cause a critical state of the drive behaviour can generally only be carried our when the inverter is inhibited.

Details

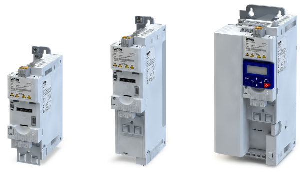
The "parameter change-over" function provides a change-over between four sets with different parameter values for up to 32 freely selectable parameters. For details on the compilation of the parameters and setting of the value sets, see the chapter "Parameter change-over". 📖 464

A value set is selected in a binary-coded fashion via the triggers assigned to the two Select parameter set (bit 0)" and " Select parameter set (bit 1)" functions in compliance with the following truth table:

Select parameter set (bit 1) 0x2631:042 (P400.42)	**Select parameter set (bit 0)** 0x2631:041 (P400.41)	**Selection**
FALSE	FALSE	Value set 1
FALSE	TRUE	Value set 2
TRUE	FALSE	Value set 3
TRUE	TRUE	Value set 4

Change-over is effected depending on the activation method selected in 0x4046 (P755.00) when a state change of the selection inputs takes place or via the trigger assigned to the "Load parameter set" function.

Parameter	**Name / value range / [default setting]**	**Info**
0x2631:040 (P400.40)	Function list: Load parameter set (Function list: Load param.set) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532 **0** **Not connected**	Assignment of a trigger for the "Load parameter set" function. Trigger = FALSE-TRUE edge: parameter change-over to the value set selected via "Select parameter set (bit 0)" and "Select parameter set (bit 1)". Trigger = FALSE: no action. Notes: • The activation method for the "Parameter change-over" function can be selected in 0x4046 (P755.00).
0x2631:041 (P400.41)	Function list: Select parameter set (bit 0) (Function list: Sel. paramset b0) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532 **0** **Not connected**	Assignment of a trigger for the "Select parameter set (bit 0)" function. Selection bit with the valency 2^0 for "Parameter change-over" function. Trigger = FALSE: selection bit = "0". Trigger = TRUE: selection bit = "1".
0x2631:042 (P400.42)	Function list: Select parameter set (bit 1) (Function list: Sel. paramset b1) • Setting can only be changed if the inverter is inhibited. • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532 **0** **Not connected**	Assignment of a trigger for the "Select parameter set (bit 1)" function. Selection bit with the valency 2^1 for "Parameter change-over" function. Trigger = FALSE: selection bit = "0". Trigger = TRUE: selection bit = "1".

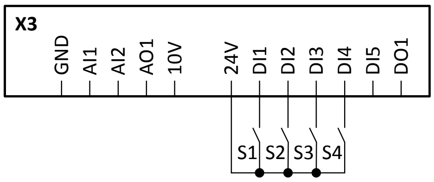


Parameter	Name / value range / [default setting]		Info
0x4046 (P755.00)	Activation of parameter set (PSet activation)		Selection of the activation method for the parameter change-over. • If the selection is changed from "Via command... [0]/[1]" to "If the selection is changed...[2]/[3]" after switch-on, the parameter set selected via the functions "Select parameter set (bit 0)" and "Select parameter set (bit 1)" is activated immediately. In case of selection [2], however, this only takes place if the inverter is disabled, the motor is stopped or an error is active.
	0	**Via command (disable required)**	The parameter set selected via the functions "Select parameter set (bit 0)" and "Select parameter set (bit 1)" is activated if the trigger assigned to the "Load parameter set" function in 0x2631:040 (P400.40) provides a FALSE-TRUE edge AND the inverter is inhibited, the motor is stopped or an error is active.
	1	Via command (immediately)	The parameter set selected via the functions "Select parameter set (bit 0)" and "Select parameter set (bit 1)" is immediately activated if the trigger assigned to the "Load parameter set" function in 0x2631:040 (P400.40) provides a FALSE-TRUE edge.
	2	If the selection is changed (disable required)	The parameter set selected via the functions "Select parameter set (bit 0)" and "Select parameter set (bit 1)" is activated if the state of these selection bits changes AND the inverter is inhibited, the motor is stopped or an error is active.
	3	If the selection is changed (immediately)	The parameter set selected via the functions "Select parameter set (bit 0)" and "Select parameter set (bit 1)" is activated immediately if the state of these selection bits is changed.

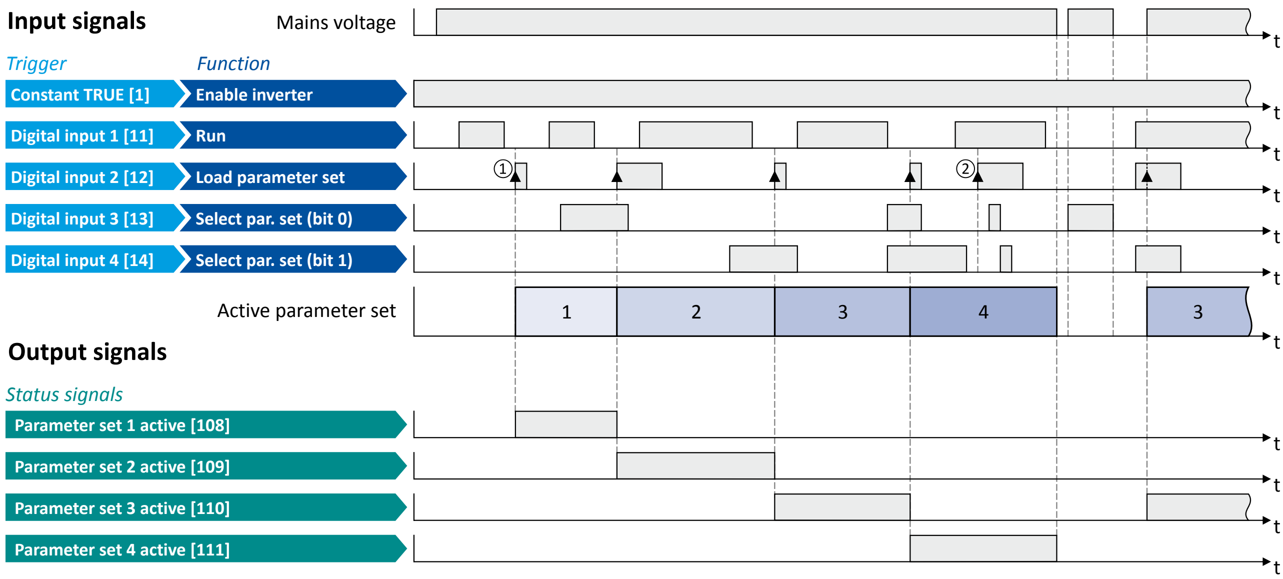
14.9.1 Example 1: Activation via command (only when disabled)

Activation method 0x4046 (P755.00) = "Via command (disable required) [0]":

- Switches S3 and S4 serve to select the parameter set (see the following table).
- Switch S2 activates the change-over. Since the change-over is activated with a rising edge, a button (normally-open contact) can be used instead of a switch.
- Change-over is only possible if the motor is not started (switch S1 open).

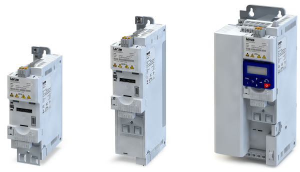
Connection plan	function			
	Switch S1	Run		
	Switch S2	Load parameter set		
	Switches S3 ... S4	Parameter set selection:		
		S3	**S4**	
		Off	Off	Parameter set 1
		On	Off	Parameter set 2
		Off	On	Parameter set 3
		On	On	Parameter set 4

Parameter	Name	Setting for this example
0x2631:001 (P400.01)	Enable inverter	Constant TRUE [1]
0x2631:002 (P400.02)	Run	Digital input 1 [11]
0x2631:004 (P400.04)	Reset fault	Not connected [0]
0x2631:013 (P400.13)	Reverse rotational direction	Not connected [0]
0x2631:018 (P400.18)	Activate preset (bit 0)	Not connected [0]
0x2631:040 (P400.40)	Load parameter set	Digital input 2 [12]
0x2631:041 (P400.41)	Select parameter set (bit 0)	Digital input 3 [13]
0x2631:042 (P400.42)	Select parameter set (bit 1)	Digital input 4 [14]
0x2824 (P200.00)	Control selection	Flexible I/O configuration [0]
0x4046 (P755.00)	Activation of parameter set	Via command (disable required) [0]



The status signals can be assigned to digital outputs. ▸ Configuration of digital outputs 603

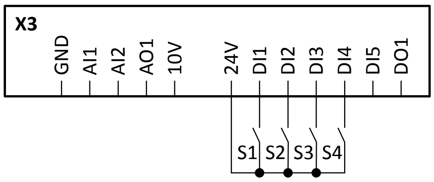
① The change-over is activated with the "Load parameter set" function (FALSE/TRUE edge).
② If the inverter is enabled and the motor is started, a change-over is not possible.



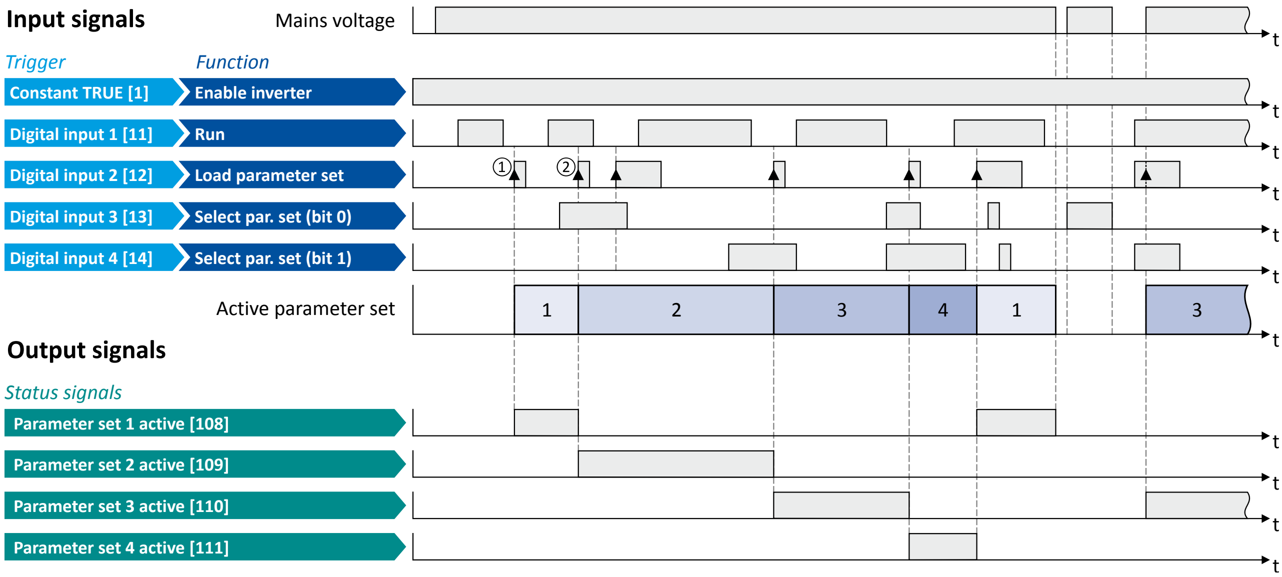
14.9.2 Example 2: Activation via command (immediately)

Activation method 0x4046 (P755.00) = "Via command (immediately) [1]":

- Switches S3 and S4 serve to select the parameter set (see the following table).
- Switch S2 activates the change-over. Since the change-over is activated with a rising edge, a button (normally-open contact) can be used instead of a switch.
- Change-over takes place immediately, even if the motor is started (switch S1 closed).

Connection plan	function			
	Switch S1	Run		
	Switch S2	Load parameter set		
	Switches S3 ... S4	Parameter set selection:		
		S3	**S4**	
		Off	Off	Parameter set 1
		On	Off	Parameter set 2
		Off	On	Parameter set 3
		On	On	Parameter set 4

Parameter	Name	Setting for this example
0x2631:001 (P400.01)	Enable inverter	Constant TRUE [1]
0x2631:002 (P400.02)	Run	Digital input 1 [11]
0x2631:004 (P400.04)	Reset fault	Not connected [0]
0x2631:018 (P400.18)	Activate preset (bit 0)	Not connected [0]
0x2631:040 (P400.40)	Load parameter set	Digital input 2 [12]
0x2631:041 (P400.41)	Select parameter set (bit 0)	Digital input 3 [13]
0x2631:042 (P400.42)	Select parameter set (bit 1)	Digital input 4 [14]
0x2824 (P200.00)	Control selection	Flexible I/O configuration [0]
0x4046 (P755.00)	Activation of parameter set	Via command (immediately) [1]



The status signals can be assigned to digital outputs. ▶ Configuration of digital outputs 603

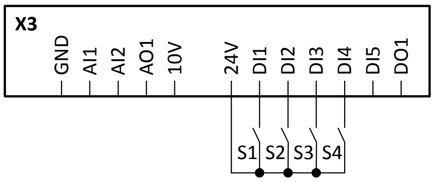
① The change-over is activated with the "Load parameter set" function (FALSE/TRUE edge).
② Change-over is also possible if the inverter is enabled and the motor is started.

14.9.3 Example 3: Activation if the selection is changed (only if the inverter is disabled)

Activation method 0x4046 (P755.00) = "If the selection is changed (disable required) [2]":

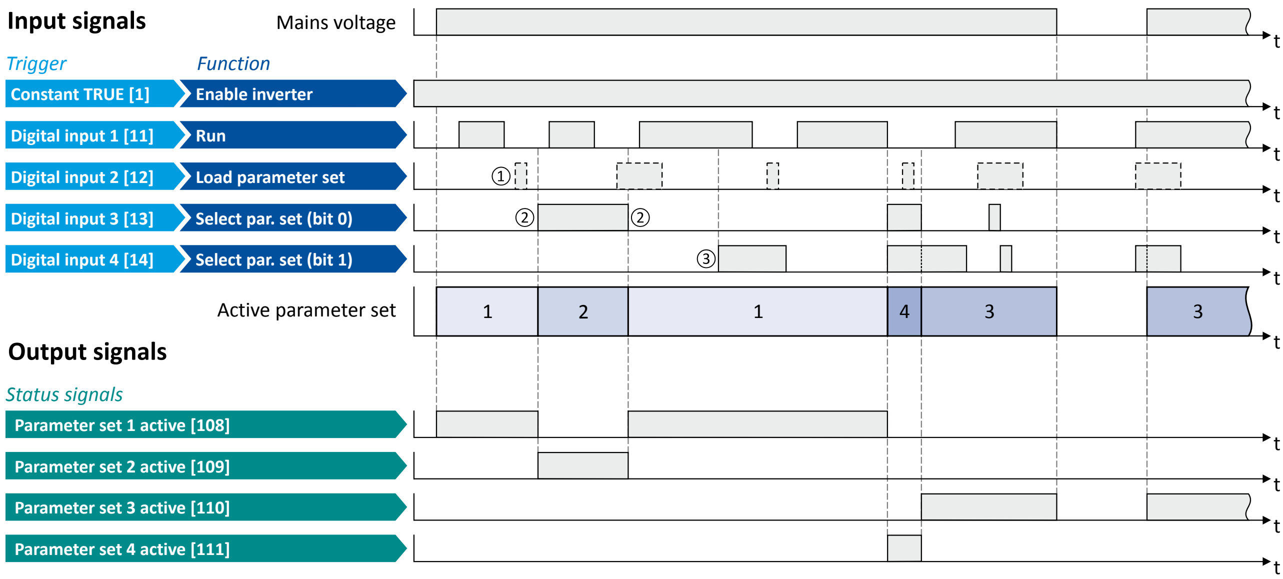
- Switches S3 and S4 serve to select the parameter set (see the following table). At the same time, the change-over is activated by a status change of the selection inputs.
- Change-over is only possible if the motor is not started (switch S1 open).
- Switch S2 ("Load parameter set") is ignored in this configuration.

Connection plan



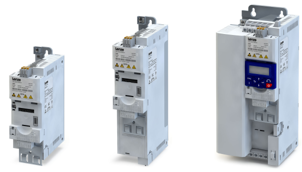
function			
Switch S1	Run		
Switch S2	Load parameter set (is ignored in this configuration)		
Switches S3 ... S4	Parameter set selection and activation at the same time:		
	S3	**S4**	
	Off	Off	Parameter set 1
	On	Off	Parameter set 2
	Off	On	Parameter set 3
	On	On	Parameter set 4

Parameter	Name	Setting for this example
0x2631:001 (P400.01)	Enable inverter	Constant TRUE [1]
0x2631:002 (P400.02)	Run	Digital input 1 [11]
0x2631:004 (P400.04)	Reset fault	Not connected [0]
0x2631:013 (P400.13)	Reverse rotational direction	Not connected [0]
0x2631:018 (P400.18)	Activate preset (bit 0)	Not connected [0]
0x2631:040 (P400.40)	Load parameter set	Digital input 2 [12]
0x2631:041 (P400.41)	Select parameter set (bit 0)	Digital input 3 [13]
0x2631:042 (P400.42)	Select parameter set (bit 1)	Digital input 4 [14]
0x2824 (P200.00)	Control selection	Flexible I/O configuration [0]
0x4046 (P755.00)	Activation of parameter set	If the selection is changed (disable required) [2]



The status signals can be assigned to digital outputs. ▸ Configuration of digital outputs 603

① The "Load parameter set" function is ignored in this configuration.
② Change-over takes place by a status change of the selection inputs.
③ If the inverter is enabled and the motor is started, a change-over is not possible.

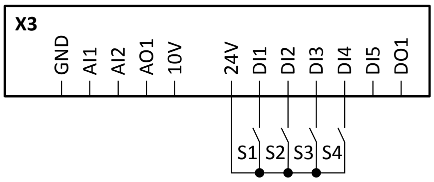


14.9.4 Example 4: Activation if the selection is changed (immediately)

Activation method 0x4046 (P755.00) = "If the selection is changed (immediately) [3]":

- Switches S3 and S4 serve to select the parameter set (see the following table). At the same time, the change-over is activated by a status change of the selection inputs.
- Change-over takes place immediately, even if the motor is started (switch S1 closed).
- Switch S2 ("Load parameter set") is ignored in this configuration.

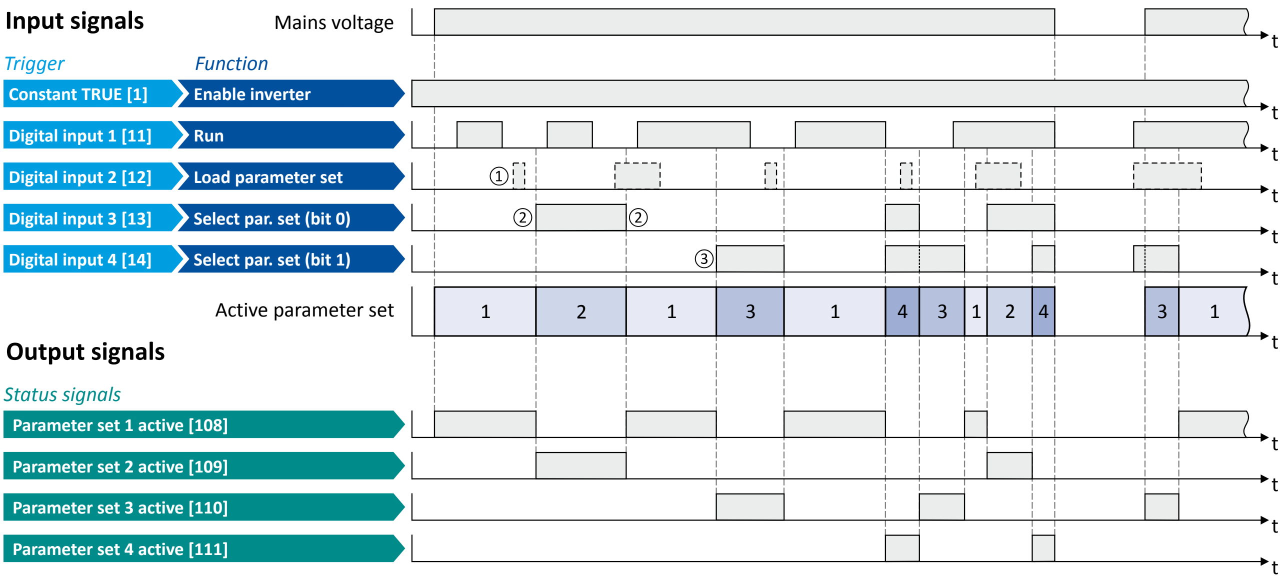
Connection plan



function

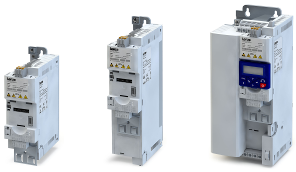
Switch S1	Run		
Switch S2	Load parameter set (is ignored in this configuration)		
Switches S3 ... S4	Parameter set selection and activation at the same time:		
	S3	**S4**	
	Off	Off	Parameter set 1
	On	Off	Parameter set 2
	Off	On	Parameter set 3
	On	On	Parameter set 4

Parameter	Name	Setting for this example
0x2631:001 (P400.01)	Enable inverter	Constant TRUE [1]
0x2631:002 (P400.02)	Run	Digital input 1 [11]
0x2631:004 (P400.04)	Reset fault	Not connected [0]
0x2631:013 (P400.13)	Reverse rotational direction	Not connected [0]
0x2631:018 (P400.18)	Activate preset (bit 0)	Not connected [0]
0x2631:040 (P400.40)	Load parameter set	Digital input 2 [12]
0x2631:041 (P400.41)	Select parameter set (bit 0)	Digital input 3 [13]
0x2631:042 (P400.42)	Select parameter set (bit 1)	Digital input 4 [14]
0x2824 (P200.00)	Control selection	Flexible I/O configuration [0]
0x4046 (P755.00)	Activation of parameter set	If the selection is changed (immediately) [3]



The status signals can be assigned to digital outputs. ▸ Configuration of digital outputs 603

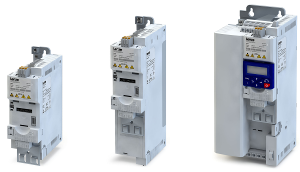
① The "Load parameter set" function is ignored in this configuration.
② Change-over takes place by a status change of the selection inputs.
③ Change-over is also possible if the inverter is enabled and the motor is started.



14.10 Process controller function selection

By means of the following functions, the response of the inverter can be controlled when PID control is activated. ▸ Configuring the process controller 📖 407

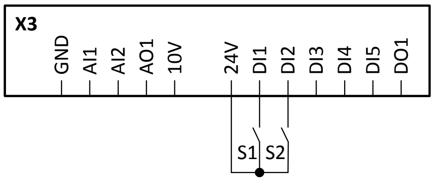
Parameter	Name / value range / [default setting]	Info
0x2631:045 (P400.45)	Function list: Deactivate PID controller (Function list: PID off) • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532 0 **Not connected**	Assignment of a trigger for the "Deactivate PID controller" function. Trigger = TRUE: If PID control is activated, ignore PID control and drive the motor in speed-controlled manner. Trigger = FALSE: If PID control is activated, drive the motor with PID control. Notes: • The PID control mode can be selected in 0x4020:001 (P600.01).
0x2631:046 (P400.46)	Function list: Set process controller output to 0 (Function list: PID output=0) • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532 0 **Not connected**	Assignment of a trigger for the "Set process controller output to 0" function. Trigger = TRUE: If PID control is activated, I component and the output of the PID controller are set to 0 and the internal control algorithm is stopped. The PID control remains active. Trigger = FALSE: no action / deactivate function again.
0x2631:047 (P400.47)	Function list: Inhibit process controller I-component (Function list: PID-I inhibited) • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532 0 **Not connected**	Assignment of a trigger for the "Inhibit process controller I-component" function. Trigger = TRUE: If PID control is activated, the I component of the PID controller is set to 0 and the integration process is stopped. Trigger = FALSE: no action / deactivate function again. Notes: • The reset time can be set in 0x4049 (P602.00).
0x2631:048 (P400.48)	Function list: Activate PID influence ramp (Function list: PID-Inf ramp on) • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532 1 **Constant TRUE**	Assignment of a trigger for the "Activate PID influence ramp" function. Trigger = TRUE: the influence of the process controller is shown via a ramp. Trigger = FALSE or not connected: the influence of the process controller is hidden via ramp. Notes: • The influence of the process controller is always active (not only when PID control is activated). • Acceleration time for showing the influence of the process controller can be set in 0x404C:001 (P607.01). • Deceleration time for hiding the influence of the process controller can be set in 0x404C:002 (P607.02).
0x4020:001 (P600.01)	Process controller setup (PID): Operating mode (PID setup: Operating mode)	Selection of the process controller operating mode.
	0 **Inhibited**	Process controller deactivated.
	1 Normal operation	The setpoint is higher than the fed back variable (actual value). If the system deviation increases, the motor speed is increased. Example: pressure-controlled booster pumps (increase in the motor speed produces an increase in pressure.)
	2 Reverse operation	The setpoint is lower than the fed back variable (actual value). If the system deviation increases, the motor speed is increased. Example: temperature-controlled cooling water pump (increase in motor speed produces decrease in temperature.)
	3 Normal bi-directional	The direction of rotation corresponds to the sign of the system deviation. If the system deviation increases, the motor speed is increased.
	4 Reverse bi-directional	A negative system deviation causes a positive direction of rotation. If the system deviation increases, the motor speed is increased.
0x4049 (P602.00)	PID I- component (PID I- component) 10 ... [**400**] ... 6000 ms	Reset time for system deviation. • With the setting "6000 ms", the I component is deactivated. • The I component can also be deactivated via the "Inhibit process controller I-component" 0x2631:047 (P400.47) function.
0x404C:001 (P607.01)	PID influence: Acceleration time for activation (PID influence: Activation time) 0.0 ... [**5.0**] ... 999.9 s	If the trigger assigned in 0x2631:048 (P400.48) of the "Activate PID influence ramp" function is TRUE, the influence of the process controller is shown by means of a ramp with the acceleration time set here.
0x404C:002 (P607.02)	PID influence: Deceleration time for masking out (PID influence: Mask out time) 0.0 ... [**5.0**] ... 999.9 s	If the trigger assigned in 0x2631:048 (P400.48) of the "Activate PID influence ramp" function is FALSE, the influence of the process controller is hidden via a ramp with the deceleration time set here.



Example for operating mode

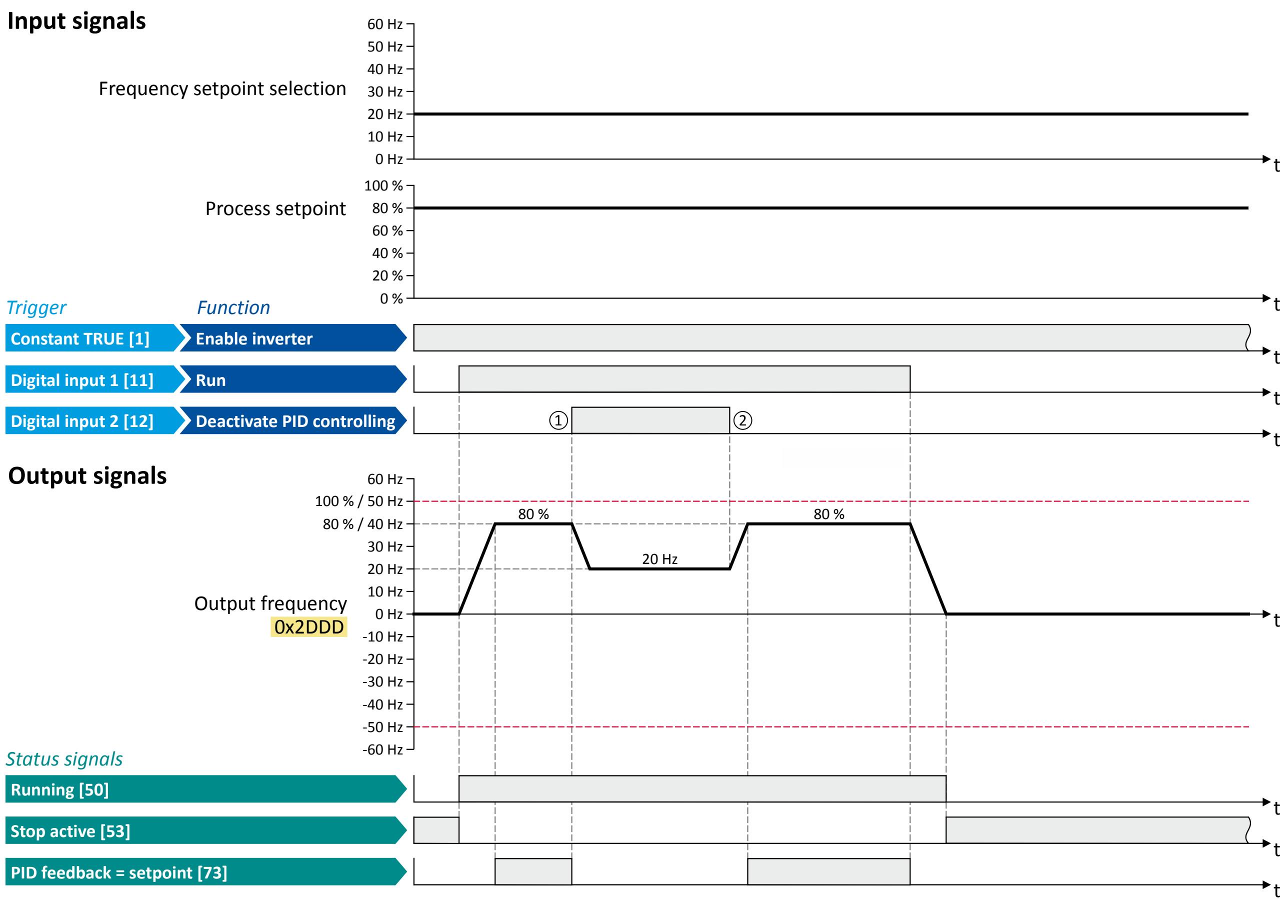
In the following example, the "Deactivate PID controller" function is used to deactivate the PID control temporarily:

- As standard setpoint source, the frequency preset 1 is set to 20 Hz.
- Switch S1 starts the motor in forward direction of rotation. Switch S1 in the initial position stops the motor again.
- Switch S2 deactivates the PID control. The motor is then driven in a speed-controlled way.

Connection plan	function	
	Switch S1	Run
	Switch S2	Deactivate PID controller

Parameter	Name	Setting for this example
0x2631:001 (P400.01)	Enable inverter	Constant TRUE [1]
0x2631:002 (P400.02)	Run	Digital input 1 [11]
0x2631:004 (P400.04)	Reset fault	Not connected [0]
0x2631:045 (P400.45)	Deactivate PID controller	Digital input 2 [12]
0x2824 (P200.00)	Control selection	Flexible I/O configuration [0]
0x2838:003 (P203.03)	Stop method	Standard ramp [1]
0x2860:001 (P201.01)	Frequency control: Default setpoint source	Frequency preset 1 [11]
0x2911:001 (P450.01)	Frequency setpoint presets: Preset 1	20 Hz
0x2916 (P211.00)	Maximum frequency	50 Hz

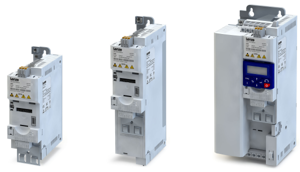
The example assumes that the process controller has been configured accordingly. ▶ Configuring the process controller 🕮 407



The status signals can be assigned to digital outputs. ▸ Configuration of digital outputs 📖 603

① PID control is deactivated: Change-over from the configured PID control to the speed-controlled operation.

② PID control is activated again: Change-over from the speed-controlled operation to the configured PID control.



14.11 Sequencer control functions

The following functions serve to control the sequencer. ▶ Sequencer 📖 504

Select sequence

A sequence is selected in a binary-coded fashion via the triggers assigned to the four functions "Select sequence (bit 0)" ... " Select sequence (bit 3)" in compliance with the following truth table:

Select sequence				Selection
Bit 3 0x2631:053 (P400.53)	**Bit 2** 0x2631:052 (P400.52)	**Bit 1** 0x2631:051 (P400.51)	**Bit 0** 0x2631:050 (P400.50)	
FALSE	FALSE	FALSE	FALSE	No sequence selected
FALSE	FALSE	FALSE	TRUE	Sequence 1
FALSE	FALSE	TRUE	FALSE	Sequence 2
FALSE	FALSE	TRUE	TRUE	Sequence 3
FALSE	TRUE	FALSE	FALSE	Sequence 4
FALSE	TRUE	FALSE	TRUE	Sequence 5
FALSE	TRUE	TRUE	FALSE	Sequence 6
FALSE	TRUE	TRUE	TRUE	Sequence 7
TRUE	FALSE	FALSE	FALSE	Sequence 8
TRUE	FALSE	FALSE	TRUE	Invalid selection
...				
TRUE	TRUE	TRUE	TRUE	

Start sequence

The selected sequence is not started automatically. For starting the sequence, two functions are available:

- 0x2631:030 (P400.30): Run/abort sequence (status-controlled start)
- 0x2631:031 (P400.31): Start sequence (edge-controlled start)

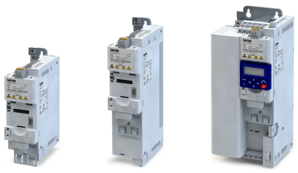
Further control functions

The following functions serve to control the started sequence:

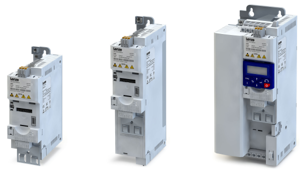
- 0x2631:032 (P400.32): Next sequence step
- 0x2631:033 (P400.33): Pause sequence
- 0x2631:034 (P400.34): Suspend sequence
- 0x2631:035 (P400.35): Stop sequence
- 0x2631:036 (P400.36): Abort sequence

For controlling the sequencer via network, the sequencer control functions can also be assigned to the NetWordIN1 data word 0x4008:001 (P590.01).

Parameter	Name / value range / [default setting]		Info
0x2631:030 (P400.30)	Function list: Run/abort sequence (Function list: Seq: Run/abort) • Setting can only be changed if the inverter is inhibited. • From version 03.00 • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532		Assignment of a trigger for the "Run/abort sequence" function. Trigger = TRUE: Start selected sequence. Trigger = FALSE: Abort sequence. Notes: • The assigned trigger must remain set to TRUE for the duration of the sequence. • If the trigger bit is reset to FALSE, the sequence is aborted. In this case, the standard setpoint or the setpoint source selected via setpoint change-over is active again. • A sequence is selected in a binary-coded fashion via the trigger assigned to the four functions "Select sequence (bit 0)" 0x2631:050 (P400.50) ... "Select sequence (bit 3)" 0x2631:053 (P400.53). • For an edge-controlled start, the function "Start sequence" 0x2631:031 (P400.31) is optionally available.
	0	**Not connected**	



Parameter	Name / value range / [default setting]	Info
0x2631:031 (P400.31)	Function list: Start sequence (Function list: Seq: Start) • Setting can only be changed if the inverter is inhibited. • From version 03.00 • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532 **0** **Not connected**	Assignment of a trigger for the "Start sequence" function. Trigger = FALSE↗TRUE (edge): Start selected sequence. Trigger = TRUE↘FALSE (edge): No action. Notes: • After the start, the sequencer remains activated until the function "Stop sequence" 0x2631:035 (P400.35) or the function "Abort sequence" 0x2631:036 (P400.36) is executed. A normal stop command does not reset the start command for the sequencer. • For a status-controlled start, the function "Run/abort sequence" 0x2631:030 (P400.30) is optionally available.
0x2631:032 (P400.32)	Function list: Next sequence step (Function list: Seq: Next step) • Setting can only be changed if the inverter is inhibited. • From version 03.00 • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532 **0** **Not connected**	Assignment of a trigger for the "Next sequence step" function. Trigger = FALSE↗TRUE (edge): Next sequence step. Trigger = TRUE↘FALSE (edge): No action. Notes: • The execution of the current step is completed even if the time parameterised for the segment has not elapsed yet. • The function is only relevant for Sequencer mode 0x4025 (P800.00) = "Step operation [2]" or "Time & step operation [3]". • A jump to the next sequence step is not possible if the sequence pauses, the sequence is suspended or the final segment is executed.
0x2631:033 (P400.33)	Function list: Pause sequence (Function list: Seq: Pause) • Setting can only be changed if the inverter is inhibited. • From version 03.00 • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532 **0** **Not connected**	Assignment of a trigger for the "Pause sequence" function. Trigger = TRUE: Pause sequence. Trigger = FALSE: Continue sequence. Notes: • During the pause, the sequence stops in the current step. The expiration of the time set for the segment is stopped. • The sequencer setpoint continues to remain active.
0x2631:034 (P400.34)	Function list: Suspend sequence (Function list: Seq: Suspense) • Setting can only be changed if the inverter is inhibited. • From version 03.00 • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532 **0** **Not connected**	Assignment of a trigger for the "Suspend sequence" function. Trigger = TRUE: Suspend sequence. Trigger = FALSE: Continue sequence. Notes: • This function serves to temporarily change over to the standard setpoint or the setpoint source selected via setpoint change-over. • The sequence is continued at the point where it was suspended.
0x2631:035 (P400.35)	Function list: Stop sequence (Function list: Seq: Stop) • Setting can only be changed if the inverter is inhibited. • From version 03.00 • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532 **0** **Not connected**	Assignment of a trigger for the "Stop sequence" function. Trigger = FALSE↗TRUE (edge): Stop sequence. Trigger = TRUE↘FALSE (edge): No action. Notes: • If the sequence is stopped, it is jumped to the final segment. • The further execution depends on the selected End of sequence mode 0x402F (P824.00).
0x2631:036 (P400.36)	Function list: Abort sequence (Function list: Seq: Abort) • Setting can only be changed if the inverter is inhibited. • From version 03.00 • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532 **0** **Not connected**	Assignment of a trigger for the "Abort sequence" function. Trigger = FALSE↗TRUE (edge): Abort sequence. Trigger = TRUE↘FALSE (edge): No action. Notes: • This function serves to directly stop the sequence without the final segment being executed. In this case, the standard setpoint or the setpoint source selected via setpoint change-over is active again.
0x2631:050 (P400.50)	Function list: Select sequence (bit 0) (Function list: Seq: Select. b0) • Setting can only be changed if the inverter is inhibited. • From version 03.00 • For further possible settings, see parameter 0x2631:001 (P400.01). 📖 532 **0** **Not connected**	Assignment of a trigger for the "Select sequence (bit 0)" function. Selection bit with the valency 2^0 for bit coded selection of a sequence. Trigger = FALSE: selection bit = "0". Trigger = TRUE: selection bit = "1". Notes: • The selected sequence is not started automatically. • For a status-controlled start, the function "Run/abort sequence" 0x2631:030 (P400.30) is available. • For an edge-controlled start, the function "Start sequence" 0x2631:031 (P400.31) is available.

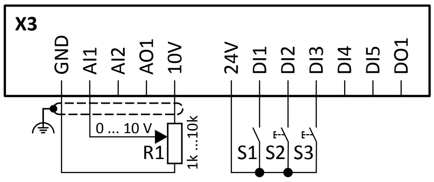


Parameter	Name / value range / [default setting]	Info
0x2631:051 (P400.51)	Function list: Select sequence (bit 1) (Function list: Seq: Select. b1) • Setting can only be changed if the inverter is inhibited. • From version 03.00 • For further possible settings, see parameter 0x2631:001 (P400.01). 532 **0** **Not connected**	Assignment of a trigger for the "Select sequence (bit 1)" function. Selection bit with the valency 2^1 for the bit-coded selection of a sequence. Trigger = FALSE: selection bit = "0". Trigger = TRUE: selection bit = "1". Notes: • The selected sequence is not started automatically. • For a status-controlled start, the function "Run/abort sequence" 0x2631:030 (P400.30) is available. • For an edge-controlled start, the function "Start sequence" 0x2631:031 (P400.31) is available.
0x2631:052 (P400.52)	Function list: Select sequence (bit 2) (Function list: Seq: Select. b2) • Setting can only be changed if the inverter is inhibited. • From version 03.00 • For further possible settings, see parameter 0x2631:001 (P400.01). 532 **0** **Not connected**	Assignment of a trigger for the "Select sequence (bit 2)" function. Selection bit with the valency 2^2 for the bit-coded selection of a sequence. Trigger = FALSE: selection bit = "0". Trigger = TRUE: selection bit = "1". Notes: • The selected sequence is not started automatically. • For a status-controlled start, the function "Run/abort sequence" 0x2631:030 (P400.30) is available. • For an edge-controlled start, the function "Start sequence" 0x2631:031 (P400.31) is available.
0x2631:053 (P400.53)	Function list: Select sequence (bit 3) (Function list: Seq: Select. b3) • Setting can only be changed if the inverter is inhibited. • From version 03.00 • For further possible settings, see parameter 0x2631:001 (P400.01). 532 **0** **Not connected**	Assignment of a trigger for the "Select sequence (bit 3)" function. Selection bit with the valency 2^3 for the bit-coded selection of a sequence. Trigger = FALSE: selection bit = "0". Trigger = TRUE: selection bit = "1". Notes: • The selected sequence is not started automatically. • For a status-controlled start, the function "Run/abort sequence" 0x2631:030 (P400.30) is available. • For an edge-controlled start, the function "Start sequence" 0x2631:031 (P400.31) is available.

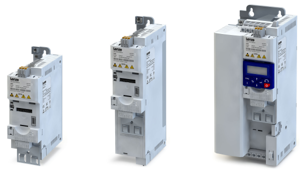
Example for operating mode

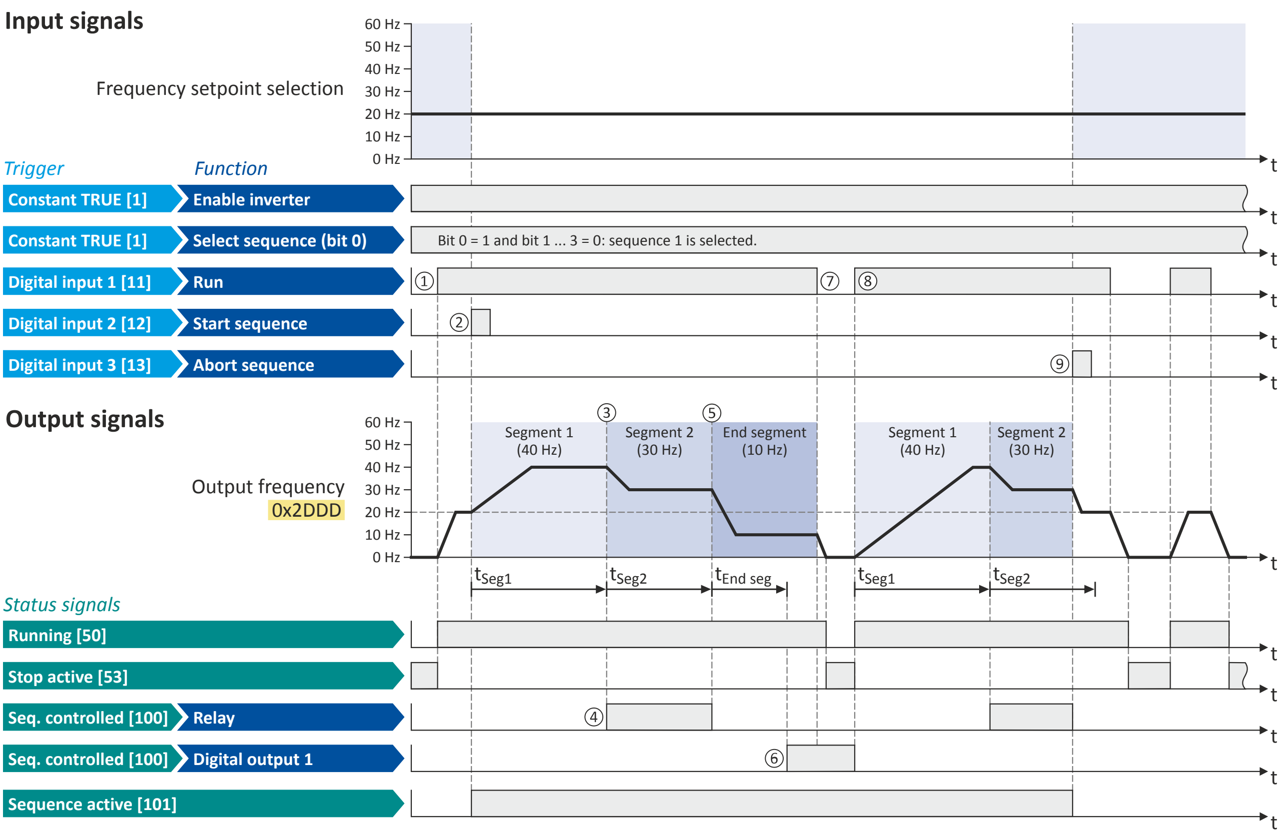
In the following example, the digital inputs 2 and 3 are used for controlling the sequencer.

- The analog input 1 is set as standard setpoint source.
- Switch S1 starts the motor in forward direction of rotation. Switch S1 in the initial position stops the motor again.
- Button S2 starts the sequence, button S3 aborts the sequence. After the abortion, the normal setpoint control is active again.

Connection plan	Function	
	Potentiometer R1	Frequency setpoint selection
	Switch S1	Run
	Button S2	Start sequence
	Button S3	Abort sequence

Parameter	Designation	Setting for this example
0x2631:001 (P400.01)	Enable inverter	Constant TRUE [1]
0x2631:002 (P400.02)	Run	Digital input 1 [11]
0x2631:004 (P400.04)	Reset fault	Not connected [0]
0x2631:013 (P400.13)	Reverse rotational direction	Not connected [0]
0x2631:031 (P400.31)	Start sequence	Digital input 2 [12]
0x2631:036 (P400.36)	Abort sequence	Digital input 3 [13]
0x2631:050 (P400.50)	Select sequence (bit 0)	Constant TRUE [1]
0x2634:001 (P420.01)	Relay	Sequencer controlled [100]
0x2634:002 (P420.02)	Digital output 1	Sequencer controlled [100]
Segment and sequence configuration In this example, only the sequence 1 is used. The sequence consists of two steps (segment 1 and segment 2).		
0x4026:001 (P801.01)	Sequencer segment 1: Frequency setpoint	40 Hz
0x4026:002 (P801.02)	Sequencer segment 1: Acceleration/deceleration	20 s
0x4026:003 (P801.03)	Sequencer segment 1: Time	18 s
0x4026:004 (P801.04)	Sequencer segment 1: Digital outputs	0x00
0x4027:001 (P802.01)	Sequencer segment 2: Frequency setpoint	30 Hz
0x4027:002 (P802.02)	Sequencer segment 2: Acceleration/deceleration	15 s
0x4027:003 (P802.03)	Sequencer segment 2: Time	14 s
0x4027:004 (P802.04)	Sequencer segment 2: Digital outputs	0x02 (only relay)
0x402E:001 (P822.01)	End segment: Frequency setpoint	10 Hz
0x402E:002 (P822.02)	End segment: Acceleration/deceleration	8 s
0x402E:003 (P822.03)	End segment: Time	10 s
0x402E:004 (P822.04)	End segment: Digital outputs	0x04 (only digital output 1)
0x4030:001 ... 0x4030:016 (P830.01 ... 16)	Sequence 1: Step 1	Segment 1 [1]
	Sequence 1: Step 2	Segment 2 [2]
	Sequence 1: Step 3	Skip step [0]
	...	...
	Sequence 1: Step 16	Skip step [0]
Sequencer basic settings		
0x4025 (P800.00)	Sequencer mode	Time operation [1]
0x402F (P824.00)	End of sequence mode	Keep running [0]
0x4040 (P820.00)	Start of sequence mode	Restart sequencer [0]





The status signals can be assigned to digital outputs. ▶ Configuration of digital outputs 📖 603

① If the inverter is enabled and no error is active, the motor can be started with the "Run" function.
As the sequence has not been started yet, first the normal setpoint control is active.

② The "Start sequence" function is used to start the selected sequence in an edge-controlled way.

③ Sequencer mode 0x4025 (P800.00) = "Time operation [1]":
The switch-over to the next step of the sequence is made after the time set for the current segment has elapsed.

④ The segment 2 is configured here in such a way that the relay will be triggered during the time of processing.

⑤ End of sequence mode 0x402F (P824.00) = "Keep running [0]":
After the sequence has been processed, the setpoint set for the end segment is continuously transmitted to the motor control until the sequence is aborted.

⑥ In case of the end segment, the time setting determines the delay after which the configured output states are to become active. Here, the end segment is configured in such a way that the digital output 1 is set after 10 s have expired.

⑦ If the "Run" function is set to FALSE, the motor is stopped with the stop method set in 0x2838:003 (P203.03). The started sequence, however, remains active and the sequencer-controlled outputs keep their state.

⑧ Start of sequence mode 0x4040 (P820.00) = "Restart sequencer [0]":
If the "Run" function is set to TRUE again, the (still active) sequence is restarted.

⑨ The "Abort sequence" function is used to abort the sequence in an edge-controlled way.
In this case, the standard setpoint or the setpoint source selected via setpoint change-over is active again.

14.12 Frequency threshold for "Frequency threshold exceeded" trigger

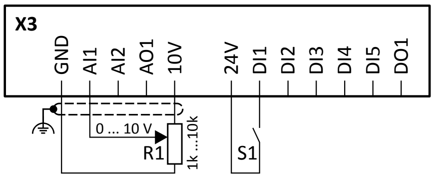
As a function of the current output frequency, the adjustable frequency threshold serves to trigger a certain function or set a digital output.

Parameter	Name / value range / [default setting]	Info
0x4005 (P412.00)	Frequency threshold (Freq. threshold) 0.0 ... [**0.0**] ... 599.0 Hz	Threshold for the "Frequency threshold exceeded [70]" trigger. • The "Frequency threshold exceeded [70]" trigger is TRUE if the current output frequency is higher than the set threshold. • The trigger can be assigned to a function or to a digital output.

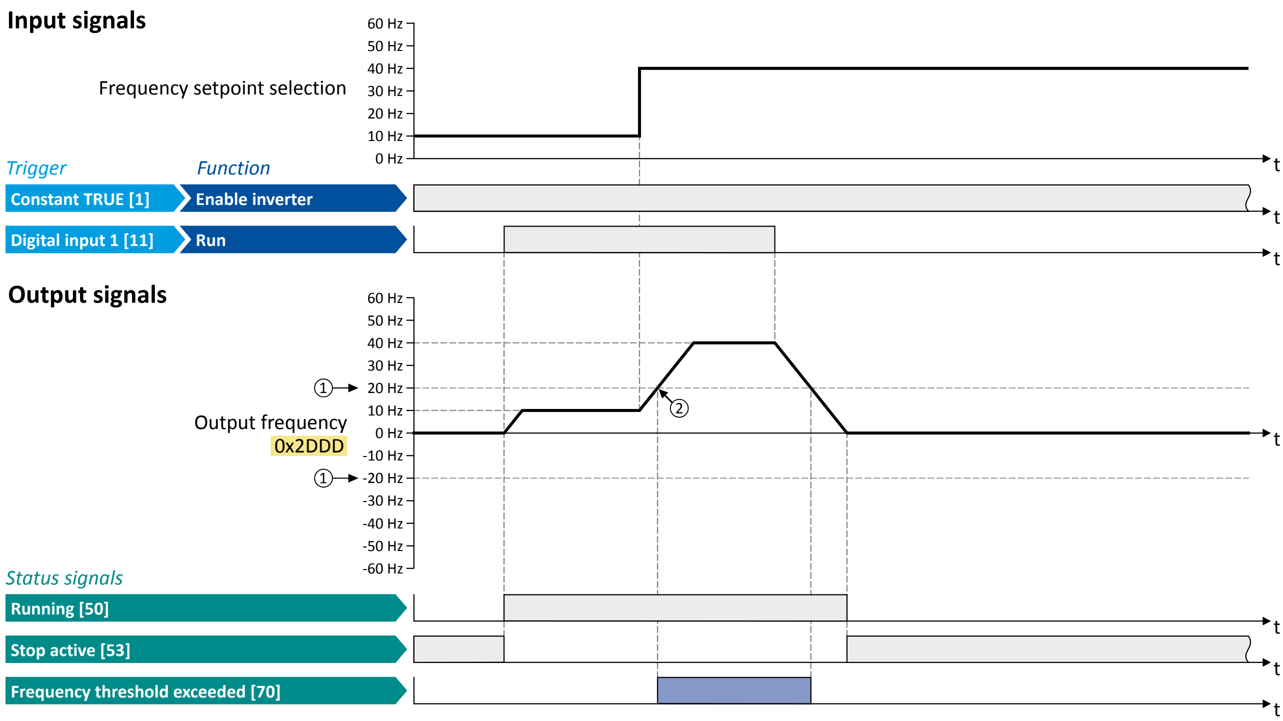
Example for operating mode

In the following example, the digital output 1 is set to TRUE if the output frequency is higher than 20 Hz.

- The analog input 1 is set as standard setpoint source.
- Switch S1 starts the motor in forward direction of rotation. Switch S1 in the initial position stops the motor again.

Connection plan	Function	
	Potentiometer R1	Frequency setpoint selection
	Switch S1	Run

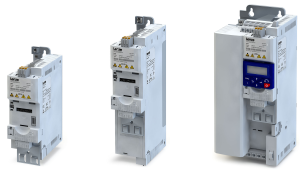
Parameter	Name	Setting for this example
0x2631:001 (P400.01)	Enable inverter	Constant TRUE [1]
0x2631:002 (P400.02)	Run	Digital input 1 [11]
0x2634:002 (P420.02)	Digital outputs function: Digital output 1	Frequency threshold exceeded [70]
0x2824 (P200.00)	Control selection	Flexible I/O configuration [0]
0x2860:001 (P201.01)	Frequency control: Default setpoint source	Analog input 1 [2]
0x4005 (P412.00)	Frequency threshold	20 Hz



The status signals can be assigned to digital outputs. ▸ Configuration of digital outputs 603

① Frequency threshold 0x4005 (P412.00)

② Frequency threshold exceeded: Via trigger "Frequency threshold exceeded [70]", the digital output 1 is set to TRUE.



14.13 Configuration of digital inputs

Settings for digital inputs 1 ... 7.

Preconditions

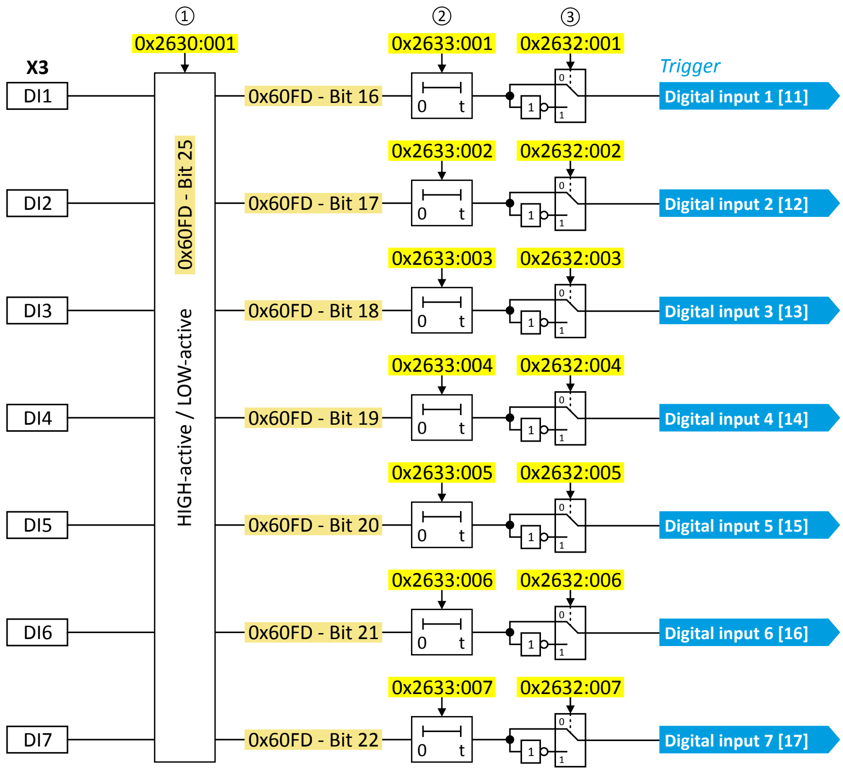
Digital input 6 and digital input 7 are only available for a Control Unit (CU) with application I/O.

Details

The digital inputs are used for control tasks. For this purpose, the digital inputs are available as selectable triggers for functions.

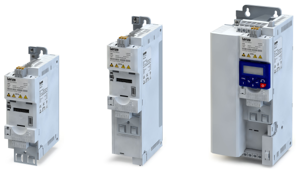
The following settings are possible for the digital inputs:

- Assertion level "HIGH active" or "LOW active" ①
- Debounce time ②
- Inversion ③



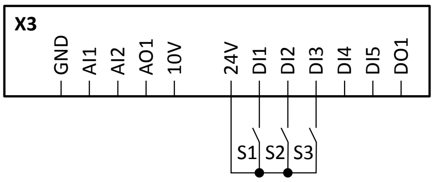
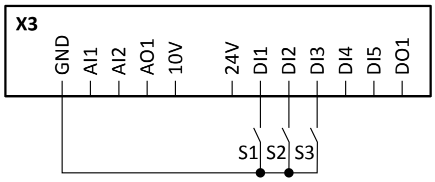
Diagnostic parameters:

- The logic status of the digital inputs is displayed in 0x60FD (P118.00).



Assertion level "HIGH active" or "LOW active"

The digital inputs can be configured in 0x2630:001 (P410.01) HIGH active (default setting) or LOW active:

HIGH active (default setting)	LOW active
• Internally, the digital input terminals are set to LOW level via pull-down resistors. • The current flows from the current supply (e.g. X3/24V) through the contact to the digital input terminal (and internally via the pull-down resistor to GND). • If the contact is closed, the digital input is set to HIGH level and is thus HIGH active.	• Internally, the digital input terminals are set to HIGH level via pull-up resistors. • The current flows from the digital input terminal through the contact to GND. • If the contact is closed, the digital input is set to LOW level and is thus LOW active.
Connection plan (example):  	Connection plan (example): 

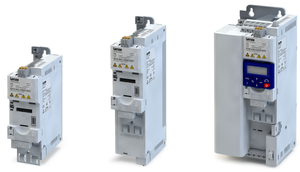
Debounce time

For minimising interference pulses, a debounce time of 1 ms is set for all digital inputs.
Via »EASY Starter« (or network), the debounce time for can be increased individually for each digital input to maximally 50 ms.

Inversion

Each digital input can be configured in such a way that the status pending at the terminal is internally inverted logically. This way, a closed contact, for instance, serves to deactivate an assigned function instead of activating it. Thus, the control of the inverter can be flexibly adapted to the requirements of the actual application.

Parameter	Name / value range / [default setting]		Info
0x2630:001 (P410.01)	Settings for digital inputs: Assertion level (DI settings: Assertion level)		Definition of the internal hardware interconnection of the digital input terminal (X3/DIx).
	0	LOW active	Digital input terminals (X3/DIx) are set to HIGH level via pull-up resistors.
	1	**HIGH active**	Digital input terminals (X3/DIx) are set to LOW level via pull-down resistors.
0x2630:002 (P410.02)	Settings for digital inputs: Input function (DI settings: Input function)		Input function of the digital terminals DI3 and DI4.
	0	**Digital input**	DI3 = digital input DI4 = digital input
	1	HTL encoder (AB) (from version 02.00)	DI3 = HTL input for encoder track B DI4 = HTL input for encoder track A
	2	Pulse train (from version 03.00)	DI3 = digital input DI4 = HTL input for pulse train
	3	Pulse train/direction (from version 03.00)	DI3 = HTL input for direction specification; HIGH level = counter-clockwise (CCW) DI4 = HTL input for pulse train
0x2632:001 (P411.01)	Inversion of digital inputs: Digital input 1 (DI inversion: DI1 inversion)		Inversion of digital input 1
	0	**Not inverted**	
	1	Inverted	
0x2632:002 (P411.02)	Inversion of digital inputs: Digital input 2 (DI inversion: DI2 inversion)		Inversion of digital input 2
	0	**Not inverted**	
	1	Inverted	
0x2632:003 (P411.03)	Inversion of digital inputs: Digital input 3 (DI inversion: DI3 inversion)		Inversion of digital input 3
	0	**Not inverted**	
	1	Inverted	



Parameter	Name / value range / [default setting]	Info
0x2632:004 (P411.04)	Inversion of digital inputs: Digital input 4 (DI inversion: DI4 inversion) **0** **Not inverted** 1 Inverted	Inversion of digital input 4
0x2632:005 (P411.05)	Inversion of digital inputs: Digital input 5 (DI inversion: DI5 inversion) **0** **Not inverted** 1 Inverted	Inversion of digital input 5
0x2632:006 (P411.06)	Inversion of digital inputs: Digital input 6 (DI inversion: DI6 inversion) • Only available for application I/O. **0** **Not inverted** 1 Inverted	Inversion of digital input 6
0x2632:007 (P411.07)	Inversion of digital inputs: Digital input 7 (DI inversion: DI7 inversion) • Only available for application I/O. **0** **Not inverted** 1 Inverted	Inversion of digital input 7
0x2633:001	Digital input debounce time: Digital input 1 1 ... [**1**] ... 50 ms	Debounce time of digital input 1
0x2633:002	Digital input debounce time: Digital input 2 1 ... [**1**] ... 50 ms	Debounce time of digital input 2
0x2633:003	Digital input debounce time: Digital input 3 1 ... [**1**] ... 50 ms	Debounce time of digital input 3
0x2633:004	Digital input debounce time: Digital input 4 1 ... [**1**] ... 50 ms	Debounce time of digital input 4
0x2633:005	Digital input debounce time: Digital input 5 1 ... [**1**] ... 50 ms	Debounce time of digital input 5
0x2633:006	Digital input debounce time: Digital input 6 1 ... [**1**] ... 50 ms • Only available for application I/O.	Debounce time of digital input 6
0x2633:007	Digital input debounce time: Digital input 7 1 ... [**1**] ... 50 ms • Only available for application I/O.	Debounce time of digital input 7

Example: Activating two functions simultaneously via digital input 4

The principle of assigning triggers to functions also enables a digital input to be assigned to several functions. The wiring complexity is reduced since there is no necessity to interconnect several digital inputs.

If, for instance, the frequency preset 1 is to be selected via the digital input 4 and a change-over to the acceleration time 2 and deceleration time 2 is to take place at the same time, this can be easily realised by the following parameter setting:

Parameter	Name	Setting for this example
0x2631:018 (P400.18)	Activate preset (bit 0)	Digital input 4 [14]
0x2631:039 (P400.39)	Activate ramp 2	Digital input 4 [14]

In order to achieve the desired behaviour, the digital input 4 must not be assigned to any further functions!

14.14 Configuration of analog inputs

14.14.1 Analog input 1

Settings for analog input 1.

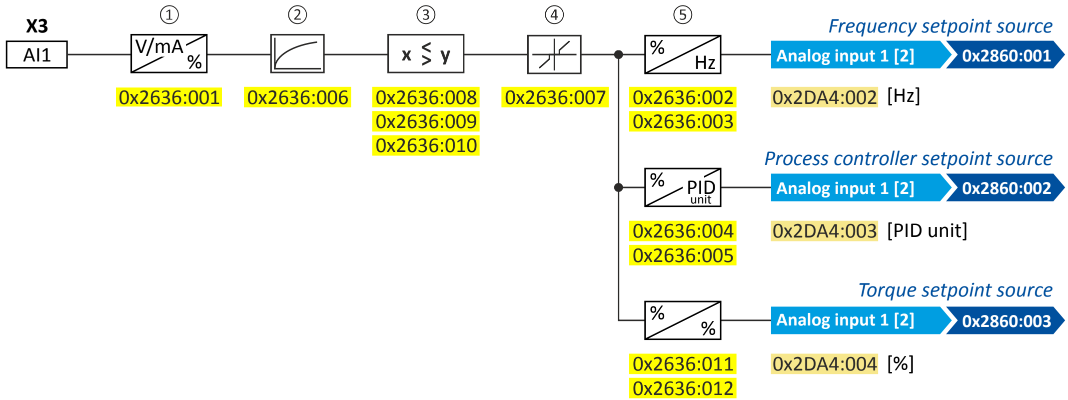
Details

The analog input 1 can be used as setpoint source. ▸ Selection of setpoint source 📖 148

For the process controller, the analog input can be used for the feedback of the variable (actual value) or speed feedforward control. ▸ Basic process controller settings 📖 408

The following settings are possible for the analog input:

- Definition of the input range ①
- Filter time for low-pass filters ②
- Monitoring of the input signal ③
- Dead band for eliminating the smallest signal levels ④
- Definition of the setting range ⑤



Diagnostic parameters:

- The frequency value is displayed in 0x2DA4:002 (P110.02).
- The process controller value is displayed in 0x2DA4:003 (P110.03).
- The torque value is displayed in 0x2DA4:004 (P110.04).

Definition of the input range

The analog input can be configured as voltage or current input. Internally, the signal is always converted to a value in percent.

Definition of the setting range

The setting range results from the set min and max value for the respective mode.

Configuration examples

Detailed configuration examples can be found in the following subchapters:

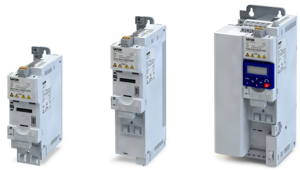
▸ Example 1: Input range 0 ... 10 V ≡ setting range 0 ... 50 Hz 📖 599

▸ Example 2: Input range 0 ... 10 V ≡ setting range -40 ... +40 Hz 📖 599

▸ Example 3: Input range -10 ... +10 V ≡ setting range -40 ... +40 Hz 📖 600

▸ Example 4: Error detection 📖 600

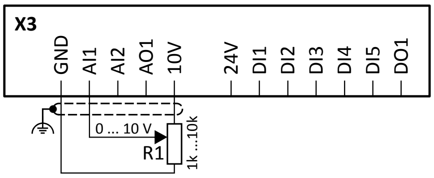
Parameter	Name / value range / [default setting]		Info
0x2636:001 (P430.01)	Analog input 1: Input range (Analog input 1: AI1 input range)		Definition of the input range.
	0	**0 ... 10 VDC**	
	1	0 ... 5 VDC	
	2	2 ... 10 VDC	
	3	-10 ... +10 VDC	
	4	4 ... 20 mA	
	5	0 ... 20 mA	



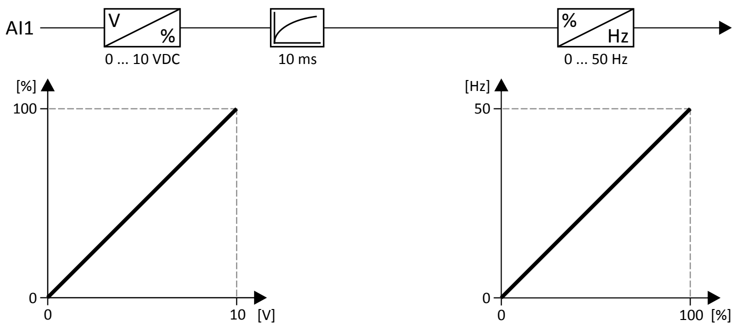
Parameter	Name / value range / [default setting]	Info
0x2636:002 (P430.02)	Analog input 1: Min frequency value (Analog input 1: AI1 freq @ min) -1000.0 ... [**0.0**] ... 1000.0 Hz	Definition of the setting range for operating mode "MS: Velocity mode". • Direction of rotation according to sign. • The standard setpoint source for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]" is selected in 0x2860:001 (P201.01).
0x2636:003 (P430.03)	Analog input 1: Max frequency value (Analog input 1: AI1 freq @ max) Device for 50-Hz mains: -1000.0 ... [**50.0**] ... 1000.0 Hz Device for 60-Hz mains: -1000.0 ... [**60.0**] ... 1000.0 Hz	
0x2636:004 (P430.04)	Analog input 1: Min PID value (Analog input 1: AI1 PID @ min) -300.00 ... [**0.00**] ... 300.00 PID unit	Definition of the setting range for PID control. • The standard setpoint source for the reference value of PID control is selected in 0x2860:002 (P201.02).
0x2636:005 (P430.05)	Analog input 1: Max PID value (Analog input 1: AI1 PID @ max) -300.00 ... [**100.00**] ... 300.00 PID unit	
0x2636:006 (P430.06)	Analog input 1: Filter time (Analog input 1: AI1 filter time) 0 ... [**10**] ... 10000 ms	PT1 time constant for low-pass filter. • By the use of a low-pass filter, the impacts of noise to an analog signal can be minimised. • For an optimum filter effect, first the noise frequency has to be determined. The time constant then has to be set so that it equals the reciprocal value of the double frequency.
0x2636:007 (P430.07)	Analog input 1: Dead band (Analog input 1: AI1 dead band) 0.0 ... [**0.0**] ... 100.0 %	Optional setting of a dead band that is placed symmetrically around the frequency zero point. • The value set defines half the width of the dead band in [%]. • Example: Setting 2 % results in a dead band of 4 %. • If the analog input value is within the dead band, the output value for the motor control is set to "0".
0x2636:008 (P430.08)	Analog input 1: Monitoring threshold (Analog input 1: AI1 monit.level) -100.0 ... [**0.0**] ... 100.0 %	Monitoring threshold for analog input 1. • 100 % ≡ 10 V (with configuration as voltage input) • 100 % ≡ 20 mA (with configuration as current loop)
0x2636:009 (P430.09)	Analog input 1: Monitoring condition (Analog input 1: AI1 monit.cond.) **0** **Input value < trigger threshold** 1 Input value > trigger threshold	Monitoring condition for analog input 1. • If the selected condition is met, the "Error of analog input 1 active [81]" trigger is set to TRUE. The trigger can be assigned to a function or a digital output. • If the selected condition is met for at least 500 ms, the error response set in 0x2636:010 (P430.10) takes place.
0x2636:010 (P430.10)	Analog input 1: Error response (Analog input 1: AI1 error resp.) • For further possible settings, see parameter 0x2D45:001 (P310.01). 📖 223 **3** **Fault**	Error response for analog input 1. • The selected response takes place if the monitoring condition selected in 0x2636:009 (P430.09) is met for at least 500 ms. Associated error code: • 28801 | 0x7081 - Error of analog input 1
0x2636:011 (P430.11)	Analog input 1: Min torque value (Analog input 1: Min. torque) -400.0 ... [**0.0**] ... 400.0 % • From version 03.00	Definition of the setting range for operating mode "MS: Torque mode". • 100 % ≡ permissible maximum torque 0x6072 (P326.00) • Direction of rotation according to sign. • The standard setpoint source for operating mode 0x6060 (P301.00) = "MS: Torque mode [-1]" is selected in 0x2860:003 (P201.03). ▸ Torque control w/ freq. limit 📖 206
0x2636:012 (P430.12)	Analog input 1: Max torque value (Analog input 1: Max. torque) -400.0 ... [**100.0**] ... 400.0 % • From version 03.00	

14.14.1.1 Example 1: Input range 0 ... 10 V ≡ setting range 0 ... 50 Hz

In this configuration, for instance, a frequency setpoint between 0 and 50 Hz can be set with a potentiometer connected to the analog input.

Connection plan	function	
	Potentiometer R1	Frequency setpoint selection (Input voltage 1 V ≡ 5 Hz)

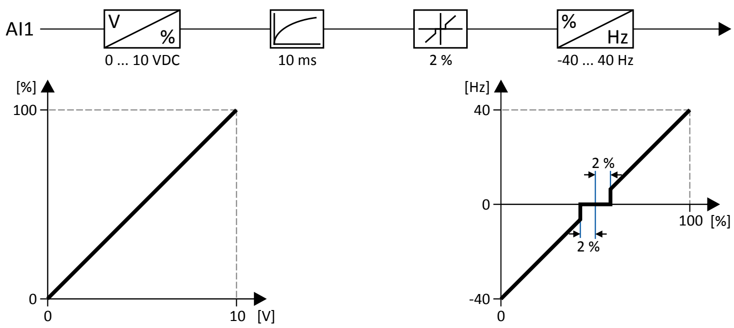
Parameter	Name	Setting for this example
0x2636:001 (P430.01)	Analog input 1: Input range	0 ... 10 VDC [0]
0x2636:002 (P430.02)	Analog input 1: Min frequency value	0.0 Hz
0x2636:003 (P430.03)	Analog input 1: Max frequency value	50.0 Hz
0x2636:006 (P430.06)	Analog input 1: Filter time	10 ms

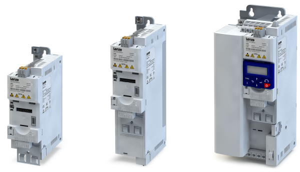


14.14.1.2 Example 2: Input range 0 ... 10 V ≡ setting range -40 ... +40 Hz

In this example, a bipolar setting range and a dead band with 2 % are configured.

Parameter	Name	Setting for this example
0x2636:001 (P430.01)	Analog input 1: Input range	0 ... 10 VDC [0]
0x2636:002 (P430.02)	Analog input 1: Min frequency value	-40.0 Hz
0x2636:003 (P430.03)	Analog input 1: Max frequency value	40.0 Hz
0x2636:006 (P430.06)	Analog input 1: Filter time	10 ms
0x2636:007 (P430.07)	Analog input 1: Dead band	2.0 %

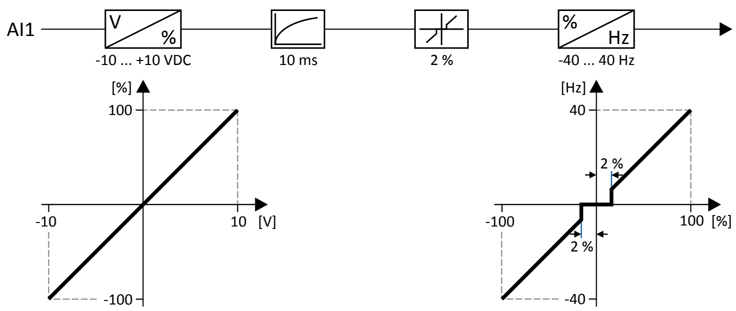




14.14.1.3 Example 3: Input range -10 ... +10 V ≡ setting range -40 ... +40 Hz

In this example, the input range of the analog input is bipolar. For the setting range that is bipolar as well, a dead band with 2 % is configured.

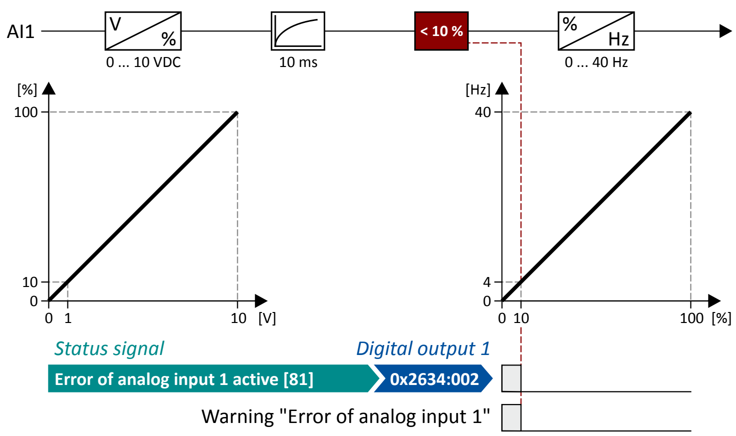
Parameter	Name	Setting for this example
0x2636:001 (P430.01)	Analog input 1: Input range	-10 ... +10 VDC [3]
0x2636:002 (P430.02)	Analog input 1: Min frequency value	-40.0 Hz
0x2636:003 (P430.03)	Analog input 1: Max frequency value	40.0 Hz
0x2636:006 (P430.06)	Analog input 1: Filter time	10 ms
0x2636:007 (P430.07)	Analog input 1: Dead band	2.0 %



14.14.1.4 Example 4: Error detection

In this example, the digital output 1 is set via the trigger "Error of analog input 1 active [81]" if the percentage input value is lower than 10 %. Additionally, a warning is output.

Parameter	Name	Setting for this example
0x2634:002 (P420.02)	Digital outputs function: Digital output 1	Error of analog input 1 active [81]
0x2636:001 (P430.01)	Analog input 1: Input range	0 ... 10 VDC [0]
0x2636:002 (P430.02)	Analog input 1: Min frequency value	0.0 Hz
0x2636:003 (P430.03)	Analog input 1: Max frequency value	40.0 Hz
0x2636:006 (P430.06)	Analog input 1: Filter time	10 ms
0x2636:008 (P430.08)	Analog input 1: Monitoring threshold	10.0 %
0x2636:009 (P430.09)	Analog input 1: Monitoring condition	Input value < trigger threshold [0]
0x2636:010 (P430.10)	Analog input 1: Error response	Warning [1]



14.14.2 Analog input 2

Settings for analog input 2.

Preconditions

Control Unit (CU) with application I/O

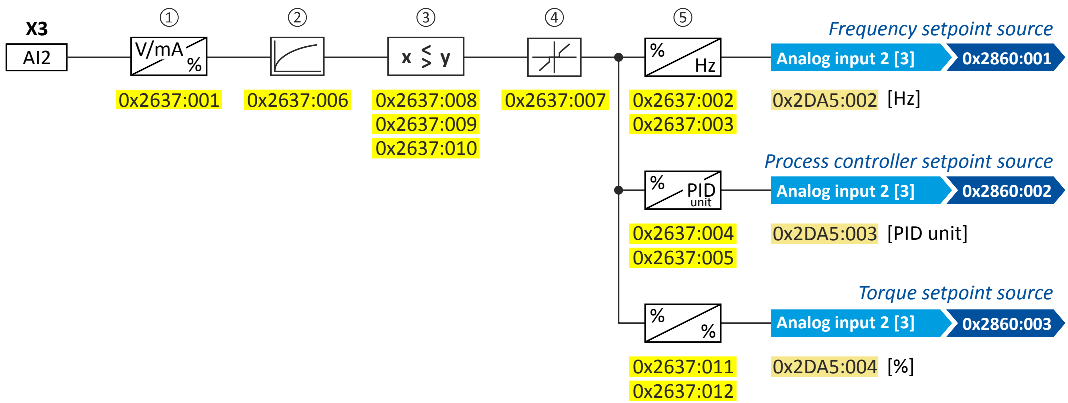
Details

The analog input 2 can be used as setpoint source. ▶ Selection of setpoint source 📖 148

For the process controller, the analog input can be used for the feedback of the variable (actual value) or speed feedforward control. ▶ Basic process controller settings 📖 408

The following settings are possible for the analog input:

- Definition of the input range ①
- Filter time for low-pass filters ②
- Monitoring of the input signal ③
- Dead band for eliminating the smallest signal levels ④
- Definition of the setting range ⑤

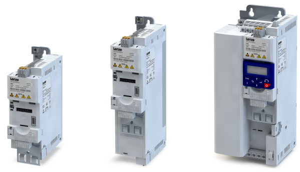


Diagnostic parameters:

- The frequency value is displayed in 0x2DA5:002 (P111.02).
- The process controller value is displayed in 0x2DA5:003 (P111.03).
- The torque value is displayed in 0x2DA5:004 (P111.04).

For further details and configuration examples, see chapter "Analog input 1". 📖 597

Parameter	Name / value range / [default setting]		Info
0x2637:001 (P431.01)	Analog input 2: Input range (Analog input 2: AI2 input range)		Definition of the input range.
	0	**0 ... 10 VDC**	
	1	0 ... 5 VDC	
	2	2 ... 10 VDC	
	3	-10 ... +10 VDC	
	4	4 ... 20 mA	
	5	0 ... 20 mA	
0x2637:002 (P431.02)	Analog input 2: Min frequency value (Analog input 2: AI2 freq @ min) -1000.0 ... [**0.0**] ... 1000.0 Hz		Definition of the setting range for operating mode "MS: Velocity mode". • Direction of rotation according to sign. • The standard setpoint source for operating mode 0x6060 (P301.00) = "MS: Velocity mode [-2]" is selected in 0x2860:001 (P201.01).
0x2637:003 (P431.03)	Analog input 2: Max frequency value (Analog input 2: AI2 freq @ max) Device for 50-Hz mains: -1000.0 ... [**50.0**] ... 1000.0 Hz Device for 60-Hz mains: -1000.0 ... [**60.0**] ... 1000.0 Hz		
0x2637:004 (P431.04)	Analog input 2: Min PID value (Analog input 2: AI2 PID @ min) -300.00 ... [**0.00**] ... 300.00 PID unit		Definition of the setting range for PID control. • The standard setpoint source for the reference value of PID control is selected in 0x2860:002 (P201.02).
0x2637:005 (P431.05)	Analog input 2: Max PID value (Analog input 2: AI2 PID @ max) -300.00 ... [**100.00**] ... 300.00 PID unit		



Parameter	Name / value range / [default setting]	Info
0x2637:006 (P431.06)	Analog input 2: Filter time (Analog input 2: AI2 filter time) 0 ... [**10**] ... 10000 ms	PT1 time constant for low-pass filter. • By the use of a low-pass filter, the impacts of noise to an analog signal can be minimised. • For an optimum filter effect, first the noise frequency has to be determined. The time constant then has to be set so that it equals the reciprocal value of the double frequency.
0x2637:007 (P431.07)	Analog input 2: Dead band (Analog input 2: AI2 dead band) 0.0 ... [**0.0**] ... 100.0 %	Optional setting of a dead band that is placed symmetrically around the frequency zero point. • The value set defines half the width of the dead band in [%]. • Example: Setting 2 % results in a dead band of 4 %. • If the analog input value is within the dead band, the output value for the motor control is set to "0".
0x2637:008 (P431.08)	Analog input 2: Monitoring threshold (Analog input 2: AI2 monit.level) -100.0 ... [**0.0**] ... 100.0 %	Monitoring threshold for analog input 2. Trigger threshold for monitoring the analog input. • 100 % ≡ 10 V (with configuration as voltage input) • 100 % ≡ 20 mA (with configuration as current loop)
0x2637:009 (P431.09)	Analog input 2: Monitoring condition (Analog input 2: AI2 error resp.)	Monitoring condition for analog input 2. Trigger condition for monitoring the analog input. • If the selected condition is met, the "Error of analog input 2 active [82]" trigger is set to TRUE. The trigger can be assigned to a function or a digital output. • If the selected condition is met for at least 500 ms, the error response set in 0x2637:010 (P431.10) takes place. • If the trigger condition is met for at least 500 ms, the response set in subindex 10 is effected.
	0 **Input value < trigger threshold**	Monitoring condition for analog input 2. • If the selected condition is met, the "Error of analog input 2 active [82]" trigger is set to TRUE. The trigger can be assigned to a function or a digital output. • If the selected condition is met for at least 500 ms, the error response set in 0x2637:010 (P431.10) takes place.
	1 Input value > trigger threshold	
0x2637:010 (P431.10)	Analog input 2: Error response (Analog input 2: AI2 error resp.) • For further possible settings, see parameter 0x2D45:001 (P310.01). 📖 223	Error response for analog input 2. • The selected response takes place if the monitoring condition selected in 0x2637:009 (P431.09) is met for at least 500 ms. Associated error code: • 28802 | 0x7082 - Error of analog input 2
	3 **Fault**	
0x2637:011 (P431.11)	Analog input 2: Min torque value (Analog input 2: Min. torque) -400.0 ... [**0.0**] ... 400.0 % • From version 03.00	Definition of the setting range for operating mode "MS: Torque mode". • 100 % ≡ permissible maximum torque 0x6072 (P326.00) • Direction of rotation according to sign. • The standard setpoint source for operating mode 0x6060 (P301.00) = "MS: Torque mode [-1]" is selected in 0x2860:003 (P201.03). ▸ Torque control w/ freq. limit 📖 206
0x2637:012 (P431.12)	Analog input 2: Max torque value (Analog input 2: Max. torque) -400.0 ... [**100.0**] ... 400.0 % • From version 03.00	

14.15 Configuration of digital outputs

Parameter	Name / value range / [default setting]	Info
0x404D:003 (P608.03)	PID alarms: Monitoring bandwidth PID feedback signal (PID alarms: Bandw. feedback) 0.00 ... [**2.00**] ... 100.00 % • From version 04.00	Hysteresis for status signal "PID feedback = setpoint [73]". • 100 % ≡ configured variable input range • Example: Variable input range 0 ... 10 V: 2 % ≡ 0.2 V • The status signal "PID feedback = setpoint [73]" is TRUE if the controlled variable fed back = process controller setpoint (± hysteresis set here). • The status signal can be assigned to the relay, a digital output of the NetWordOUT1 status word. ▶ Configuration of digital outputs 📖 602

14.15.1 Relay

Settings for the relay.

Relay is not suitable for direct switching of a electromechanical holding brake!

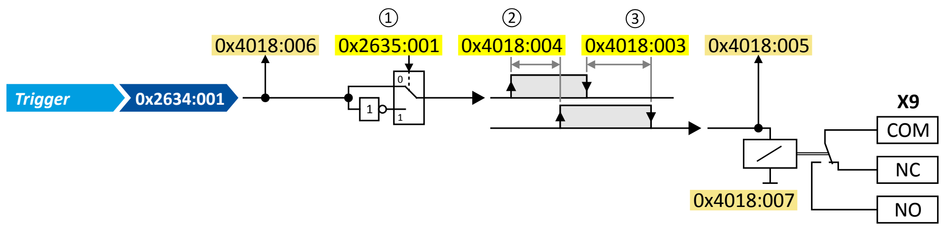
Use a corresponding suppressor circuit in case of an inductive or capacitive load!

Details

The relay is controlled with the trigger selected in 0x2634:001 (P420.01).

The following settings are possible for the relay:

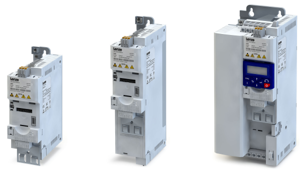
- Inversion ①
- Switch-on delay ②
- Cutout delay ③



Diagnostic parameters:

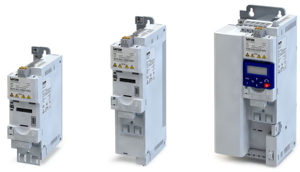
- The logic status of the trigger signal is displayed in 0x4018:006.
- The logic status of the relay is displayed in 0x4018:005.
- The current switching cycles of the relay are shown in 0x4018:007.

Parameter	Name / value range / [default setting]		Info
0x2634:001 (P420.01)	Digital outputs function: Relay (Dig.out.function: Relay function)		Assignment of a trigger to the relay. Trigger = FALSE: X9/NO-COM open and NC-COM closed. Trigger = TRUE: X9/NO-COM closed and NC-COM open. Notes: • An inversion set in 0x2635:001 (P421.01)is taken into consideration here.
	0	Not connected	No trigger assigned (trigger is constantly FALSE).
	1	Constant TRUE	Trigger is constantly TRUE.
	11	Digital input 1	State of X3/DI1, taking an inversion set in 0x2632:001 (P411.01) into consideration.
	12	Digital input 2	State of X3/DI2, taking an inversion set in 0x2632:002 (P411.02) into consideration.
	13	Digital input 3	State of X3/DI3, taking an inversion set in 0x2632:003 (P411.03) into consideration.
	14	Digital input 4	State of X3/DI4, taking an inversion set in 0x2632:004 (P411.04) into consideration.
	15	Digital input 5	State of X3/DI5, taking an inversion set in 0x2632:005 (P411.05) into consideration.
	16	Digital input 6	State of X3/DI6, taking an inversion set in 0x2632:006 (P411.06) into consideration. Digital input 6 is only available in the Control Unit (CU) with application I/O.



Parameter	Name / value range / [default setting]		Info
	17	Digital input 7	State of X3/DI7, taking an inversion set in 0x2632:007 (P411.07) into consideration. Digital input 7 is only available in the Control Unit (CU) with application I/O.
	30	NetWordIN1 - bit 12	State of NetWordIN1/bit 12 ... 15. • Display of NetWordIN1 in 0x4008:001 (P590.01). • For implementing an individual control word format, NetWordIN1 can be mapped to a process data input word.
	31	NetWordIN1 - bit 13	
	32	NetWordIN1 - bit 14	
	33	NetWordIN1 - bit 15	
	34	NetWordIN2 - bit 0	State of NetWordIN2/bit 0 ... bit 15. • Display of NetWordIN2 in 0x4008:002 (P590.02). • For controlling the digital outputs via network, NetWordIN2 can be mapped to a process data input word.
	35	NetWordIN2 - bit 1	
	36	NetWordIN2 - bit 2	
	37	NetWordIN2 - bit 3	
	38	NetWordIN2 - bit 4	
	39	NetWordIN2 - bit 5	
	40	NetWordIN2 - bit 6	
	41	NetWordIN2 - bit 7	
	42	NetWordIN2 - bit 8	
	43	NetWordIN2 - bit 9	
	44	NetWordIN2 - bit 10	
	45	NetWordIN2 - bit 11	
	46	NetWordIN2 - bit 12	
	47	NetWordIN2 - bit 13	
	48	NetWordIN2 - bit 14	
	49	NetWordIN2 - bit 15	
	50	Running	TRUE if inverter and start are enabled and output frequency > 0.2 Hz. Otherwise FALSE.
	51	**Ready for operation**	TRUE if inverter is ready for operation (no error active, no STO active and DC-bus voltage ok). Otherwise FALSE.
	52	Operation enabled	TRUE if inverter and start are enabled. Otherwise FALSE.
	53	Stop active	TRUE if inverter is enabled and motor is not started and output frequency = 0.
	54	Quick stop active	TRUE if quick stop is active. Otherwise FALSE.
	55	Safe torque off (STO) active	TRUE if the integrated safety system has triggered the "Safe torque off (STO)" function. Otherwise FALSE. ▶ Safe torque off (STO) 📖 523
	56	Error active	TRUE if error is active. Otherwise FALSE.
	57	Error (non-resettable) active	TRUE if non-resettable error is active. Otherwise FALSE.
	58	Device warning active	TRUE if warning is active. Otherwise FALSE. • A warning has no impact on the operating status of the inverter. • A warning is reset automatically if the cause has been eliminated.
	59	Device trouble active	TRUE if a fault is active. Otherwise FALSE. • In the event of a fault, the motor is brought to a standstill with the quick stop ramp. The inverter is then disabled. • Exception: In case of a serious fault, the inverter is disabled immediately. The motor becomes torqueless (coasts). • The error state will be left automatically if the error condition is not active anymore. • The restart behaviour after trouble can be configured. ▶ Automatic restart 📖 484
	60	Heatsink temperature warning active	TRUE if current heatsink temperature > warning threshold for temperature monitoring. Otherwise FALSE. • Display of the current heatsink temperature in 0x2D84:001 (P117.01). • Setting of the warning threshold in 0x2D84:002.
	65	Motor PTC error active	TRUE if an error of the motor PTC has been detected. Otherwise FALSE. • The trigger is set irrespective of the response set in 0x2D49:002 (P309.02) when the motor temperature monitoring is triggered. ▶ Motor temperature monitoring 📖 219
	66	Flying restart circuit active	TRUE if flying restart circuit active is active. Otherwise FALSE. ▶ Flying restart circuit 📖 481

Parameter	Name / value range / [default setting]		Info
	67	DC braking active	TRUE if DC braking is active. Otherwise FALSE. ▶ DC braking 📖 437
	69	Rotational direction reversed	TRUE if output frequency is negative. Otherwise FALSE.
	70	Frequency threshold exceeded	TRUE if current output frequency > frequency threshold. Otherwise FALSE. • Display of the current output frequency in 0x2DDD (P100.00). • Setting Frequency thresholdin 0x4005 (P412.00). ▶ Frequency threshold for "Frequency threshold exceeded" trigger 📖 593
	71	Actual speed = 0	TRUE if current output frequency = 0 Hz (± 0.01 Hz), irrespective of the operating mode. Otherwise FALSE. • Display of the current output frequency in 0x2DDD (P100.00).
	72	Setpoint speed reached	TRUE if frequency setpoint reached. Otherwise FALSE.
	73	PID feedback = setpoint	TRUE if the controlled variable fed back = process controller setpoint (± in 0x404D:003 (P608.03) set hysteresis). Otherwise FALSE. ▶ Basic process controller settings 📖 408
	74	PID idle state active	TRUE if the inverter is in "PID idle state". Otherwise FALSE. ▶ Process controller idle state 📖 414
	75	PID MIN alarm active	TRUE if fed back variable (with activated PID control) < MIN alarm threshold. Otherwise FALSE. • Setting of MIN alarm threshold in 0x404D:001 (P608.01). ▶ Basic process controller settings 📖 408
	76	PID MAX alarm active	TRUE if the fed back variable (with activated PID control) > MAX alarm threshold. Otherwise FALSE. • Setting of MAX alarm threshold in 0x404D:002 (P608.02). ▶ Basic process controller settings 📖 408
	77	PID MIN-MAX alarm active	TRUE if no PID alarm is active with activated PID control (MIN alarm threshold < fed back variable < MAX alarm threshold). Otherwise FALSE. • Setting of MIN alarm threshold in 0x404D:001 (P608.01). • Setting of MAX alarm threshold in 0x404D:002 (P608.02). ▶ Basic process controller settings 📖 408
	78	Current limit reached	TRUE if current motor current ≥ maximum current. Otherwise FALSE. • Display of the present motor current in 0x2D88 (P104.00). • Setting for the maximum current in 0x6073 (P324.00).
	79	Torque limit reached	TRUE if torque limit has been reached or exceeded. Otherwise FALSE. • Setting "Positive torque limit" in 0x60E0. • Setting "Negative torque limit" in 0x60E1.
	81	Error of analog input 1 active	TRUE if the monitoring of the input signal at the analog input 1 has responded. Otherwise FALSE. This trigger is set as a function of the following settings: • Monitoring threshold 0x2636:008 (P430.08) • Monitoring condition 0x2636:009 (P430.09) The setting of the Error response in 0x2636:010 (P430.10) has no effect on this trigger. ▶ Analog input 1 📖 597
	82	Error of analog input 2 active	TRUE if the monitoring of the input signal at the analog input 2 has responded. Otherwise FALSE. This trigger is set as a function of the following settings: • Monitoring threshold 0x2637:008 (P431.08) • Monitoring condition 0x2637:009 (P431.09) The setting of the Error response in 0x2637:010 (P431.10) has no effect on this trigger. ▶ Analog input 2 📖 601
	83	Load loss detected	TRUE if actual motor current < threshold for load loss detection after delay time of the load loss detection has elapsed. Otherwise FALSE. • Display of the present motor current in 0x6078 (P103.00). • Setting Threshold in 0x4006:001 (P710.01). • Setting Decelerationin 0x4006:002 (P710.02). ▶ Load loss detection 📖 449
	100	Sequencer controlled (from version 03.00)	The control is executed via the sequencer (according to the configuration of the digital outputs for the current segment). ▶ Segment configuration 📖 506



Parameter	Name / value range / [default setting]		Info
	101	Sequence active (from version 03.00)	Status signal of the "sequencer" function: TRUE if the sequence is running and is currently not suspended. ▶ Sequencer 📖 504
	102	Sequence suspended (from version 03.00)	Status signal of the "sequencer" function: TRUE if the sequence is currently suspended. ▶ Sequencer 📖 504
	103	Sequence done (from version 03.00)	Status signal of the "sequencer" function: TRUE if the sequence is completed (final segment has been passed through). ▶ Sequencer 📖 504
	104	Local control active	TRUE if local keypad control ("LOC") active. Otherwise FALSE.
	105	Remote control active	TRUE if remote control ("REM") via terminals, network, etc. active. Otherwise FALSE.
	106	Manual setpoint selection active	TRUE if manual setpoint selection ("MAN") via keypad active. Otherwise FALSE. • Selection of the trigger for the "Activate keypad setpoint" function in 0x2631:016 (P400.16).
	107	Automatic setpoint selection active	TRUE if automatic setpoint selection ("AUTO") via terminals, network, etc. active. Otherwise FALSE.
	108	Parameter set 1 active	TRUE if parameter set 1 is loaded and active. Otherwise FALSE.
	109	Parameter set 2 active	TRUE if parameter set 2 is loaded and active. Otherwise FALSE.
	110	Parameter set 3 active	TRUE if parameter set 3 is loaded and active. Otherwise FALSE.
	111	Parameter set 4 active	TRUE if parameter set 4 is loaded and active. Otherwise FALSE.
	112	Parameter set load OK	TRUE after any parameter set has been loaded. Otherwise FALSE.
	113	Parameter set load fail	TRUE if any of the parameter sets could not be loaded. Otherwise FALSE.
	115	Release holding brake	Trigger signal for releasing the holding brake (TRUE = release holding brake). Note! If this trigger is assigned to the relay or a digital output, the deceleration times set for the respective output are not effective (are internally set to "0"). Only the deceleration time set in 0x2820:012 (P712.12) for closing the holding brake influences in this case the time-dependent behaviour of the output. ▶ Holding brake control 📖 472
	117	Motor phase failure	TRUE if a motor phase failure has been detected. Otherwise FALSE. ▶ Motor phase failure detection 📖 223
	118	UPS operation active	TRUE if UPS operation is active. Otherwise FALSE. ▶ UPS operation 📖 490
	155	Both STO channels not active	TRUE if safe inputs SIA and SIB = LOW (simultaneously). Otherwise FALSE.
0x2635:001 (P421.01)	Inversion of digital outputs: Relay (DO inversion: Relay inverted)		Relay inversion
	0	**Not inverted**	
	1	Inverted	
0x4018:003	Relay: Switch-off delay 0.000 ... [**0.000**] ... 65.535 s		Switch-off delay for the relay. Note! The set delay time is not effective (internally set to "0") if the relay is assigned to the trigger "Release holding brake [115]". Only the deceleration time set in 0x2820:012 (P712.12)for closing the holding brake influences the time-dependent behaviour of the relay.
0x4018:004	Relay: Switch-on delay 0.000 ... [**0.000**] ... 65.535 s		Switch-on delay for the relay. Note! The set delay time is not effective (internally set to "0") if the relay is assigned to the trigger "Release holding brake [115]". Only the deceleration time set in 0x2820:012 (P712.12)for closing the holding brake influences the time-dependent behaviour of the relay.
0x4018:005	Relay: Relay state • Read only		Display of the logic state of the relay.
	0	FALSE	
	1	TRUE	

Parameter	Name / value range / [default setting]	Info
0x4018:006	Relay: Trigger signal state • Read only	Display of the logic state of the trigger signal for the relay (without taking a ON/OFF delay set and inversion into consideration).
	0 FALSE	
	1 TRUE	
0x4018:007	Relay: Switching cycles • Read only	Display of the previous relay switching cycles.

14.15.2 Digital output 1

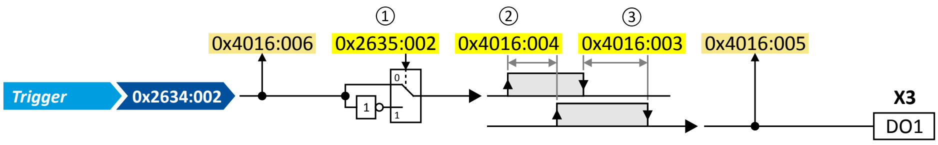
Settings for digital output 1.

Details

The digital output 1 is controlled with the trigger selected in 0x2634:002 (P420.02).

The following settings are possible for the digital output:

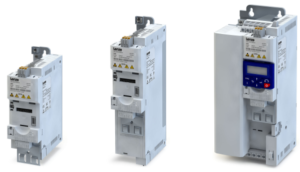
- Inversion ①
- Switch-on delay ②
- Cutout delay ③



Diagnostic parameters:

- The logic status of the trigger signal is displayed in 0x4016:006.
- The logic status of the digital output is displayed in 0x4016:005.

Parameter	Name / value range / [default setting]	Info
0x2634:002 (P420.02)	Digital outputs function: Digital output 1 (Dig.out.function: DO1 function) • For further possible settings, see parameter 0x2634:001 (P420.01). 📖 603	Assignment of a trigger to digital output 1. Trigger = FALSE: X3/DO1 set to LOW level. Trigger = TRUE: X3/DO1 set to HIGH level. Notes: • An inversion set in 0x2635:002 (P421.02) is taken into consideration here.
	115 Release holding brake	
	100 Sequencer controlled (from version 03.00)	The control is executed via the sequencer (according to the configuration of the digital outputs for the current segment). ▸ Segment configuration 📖 506
0x2635:002 (P421.02)	Inversion of digital outputs: Digital output 1 (DO inversion: DO1 inversion)	Inversion of digital output 1
	0 Not inverted	
	1 Inverted	
0x4016:003	Digital output 1: Cutout delay 0.000 ... [**0.000**] ... 65.535 s	Switch-off delay for digital output 1. Note! The set delay time is not effective (internally set to "0") if the relay is assigned to the trigger "Release holding brake [115]". Only the deceleration time set in 0x2820:012 (P712.12)for closing the holding brake influences the time-dependent behaviour of the digital output.
0x4016:004	Digital output 1: Switch-on delay 0.000 ... [**0.000**] ... 65.535 s	Switch-on delay for digital output 1. Note! The set delay time is not effective (internally set to "0") if the relay is assigned to the trigger "Release holding brake [115]". Only the deceleration time set in 0x2820:012 (P712.12)for closing the holding brake influences the time-dependent behaviour of the digital output.
0x4016:005	Digital output 1: Terminal state • Read only	Display of the logic state of output terminal X3/DO1.
	0 FALSE	
	1 TRUE	
0x4016:006	Digital output 1: Trigger signal state • Read only	Display of the logic state of the trigger signal for digital output 1 (without taking a ON/OFF delay set and inversion into consideration).
	0 FALSE	
	1 TRUE	



14.15.3 Digital output 2

Settings for digital output 2.

Preconditions

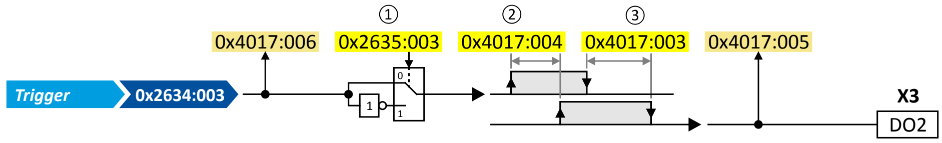
Control Unit (CU) with application I/O

Details

The digital output 2 is controlled with the trigger selected in 0x2634:003 (P420.03).

The following settings are possible for the digital output:

- Inversion ①
- Switch-on delay ②
- Cutout delay ③



Diagnostic parameters:

- The logic status of the trigger signal is displayed in 0x4017:006.
- The logic status of the digital output is displayed in 0x4017:005.

Parameter	Name / value range / [default setting]	Info
0x2634:003 (P420.03)	Digital outputs function: Digital output 2 (Dig.out.function: DO2 function) • Only available for application I/O. • For further possible settings, see parameter 0x2634:001 (P420.01). 📖 603	Assignment of a trigger to digital output 2. Trigger = FALSE: X3/DO2 set to LOW level. Trigger = TRUE: X3/DO2 set to HIGH level. Notes: • An inversion set in 0x2635:003 (P421.03) is taken into consideration here.
	56 | **Error active**	
	100 | Sequencer controlled (from version 03.00)	The control is executed via the sequencer (according to the configuration of the digital outputs for the current segment). ▸ Segment configuration 📖 506
0x2635:003 (P421.03)	Inversion of digital outputs: Digital output 2 (DO inversion: DO2 inversion) • Only available for application I/O.	Inversion of digital output 2
	0 | **Not inverted**	
	1 | Inverted	
0x4017:003	Digital output 2: Cutout delay 0.000 ... [**0.000**] ... 65.535 s • Only available for application I/O.	Switch-off delay for digital output 2. Note! The set delay time is not effective (internally set to "0") if the relay is assigned to the trigger "Release holding brake [115]". Only the deceleration time set in 0x2820:012 (P712.12)for closing the holding brake influences the time-dependent behaviour of the digital output.
0x4017:004	Digital output 2: Switch-on delay 0.000 ... [**0.000**] ... 65.535 s • Only available for application I/O.	Switch-on delay for digital output 2. Note! The set delay time is not effective (internally set to "0") if the relay is assigned to the trigger "Release holding brake [115]". Only the deceleration time set in 0x2820:012 (P712.12)for closing the holding brake influences the time-dependent behaviour of the digital output.
0x4017:005	Digital output 2: Terminal state • Read only • Only available for application I/O.	Display of the logic state of output terminal X3/DO2.
	0 | FALSE	
	1 | TRUE	
0x4017:006	Digital output 2: Trigger signal state • Read only • Only available for application I/O.	Display of the logic state of the trigger signal for digital output 2 (without taking a ON/OFF delay set and inversion into consideration).
	0 | FALSE	
	1 | TRUE	

14.15.4 NetWordOUT1 status word

Assignment of digital triggers to bit 0 ... bit 15 of the NetWordOUT1 status word.

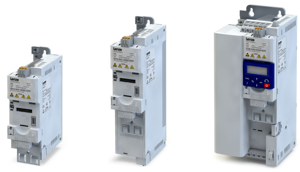
Details

The following table shows the preset status assignment of the NetWordOUT1 data word:

Bit	Default setting	For details and configuration, see
0	Ready for operation	0x2634:010 (P420.10)
1	Not connected	0x2634:011 (P420.11)
2	Operation enabled	0x2634:012 (P420.12)
3	Error active	0x2634:013 (P420.13)
4	Not connected	0x2634:014 (P420.14)
5	Quick stop active	0x2634:015 (P420.15)
6	Running	0x2634:016 (P420.16)
7	Device warning active	0x2634:017 (P420.17)
8	Not connected	0x2634:018 (P420.18)
9	Not connected	0x2634:019 (P420.19)
10	Setpoint speed reached	0x2634:020 (P420.20)
11	Current limit reached	0x2634:021 (P420.21)
12	Actual speed = 0	0x2634:022 (P420.22)
13	Rotational direction reversed	0x2634:023 (P420.23)
14	Release holding brake	0x2634:024 (P420.24)
15	Safe torque off (STO) active	0x2634:025 (P420.25)

The following parameters can be used to change the status assignment of the NetWordOUT1 data word.

Parameter	Name / value range / [default setting]	Info
0x2634:010 (P420.10)	Digital outputs function: NetWordOUT1 - bit 0 (Dig.out.function: NetWordOUT1.00) • For further possible settings, see parameter 0x2634:001 (P420.01). 603 **51 Ready for operation**	Assignment of a trigger to bit 0 of NetWordOUT1. Trigger = FALSE: bit set to 0. Trigger = TRUE: bit set to 1.
0x2634:011 (P420.11)	Digital outputs function: NetWordOUT1 - bit 1 (Dig.out.function: NetWordOUT1.01) • For further possible settings, see parameter 0x2634:001 (P420.01). 603 **0 Not connected**	Assignment of a trigger to bit 1 of NetWordOUT1. Trigger = FALSE: bit set to 0. Trigger = TRUE: bit set to 1.
0x2634:012 (P420.12)	Digital outputs function: NetWordOUT1 - bit 2 (Dig.out.function: NetWordOUT1.02) • For further possible settings, see parameter 0x2634:001 (P420.01). 603 **52 Operation enabled**	Assignment of a trigger to bit 2 of NetWordOUT1. Trigger = FALSE: bit set to 0. Trigger = TRUE: bit set to 1.
0x2634:013 (P420.13)	Digital outputs function: NetWordOUT1 - bit 3 (Dig.out.function: NetWordOUT1.03) • For further possible settings, see parameter 0x2634:001 (P420.01). 603 **56 Error active**	Assignment of a trigger to bit 3 of NetWordOUT1. Trigger = FALSE: bit set to 0. Trigger = TRUE: bit set to 1.
0x2634:014 (P420.14)	Digital outputs function: NetWordOUT1 - bit 4 (Dig.out.function: NetWordOUT1.04) • For further possible settings, see parameter 0x2634:001 (P420.01). 603 **0 Not connected**	Assignment of a trigger to bit 4 of NetWordOUT1. Trigger = FALSE: bit set to 0. Trigger = TRUE: bit set to 1.
0x2634:015 (P420.15)	Digital outputs function: NetWordOUT1 - bit 5 (Dig.out.function: NetWordOUT1.05) • For further possible settings, see parameter 0x2634:001 (P420.01). 603 **54 Quick stop active**	Assignment of a trigger to bit 5 of NetWordOUT1. Trigger = FALSE: bit set to 0. Trigger = TRUE: bit set to 1.



Parameter	Name / value range / [default setting]	Info
0x2634:016 (P420.16)	Digital outputs function: NetWordOUT1 - bit 6 (Dig.out.function: NetWordOUT1.06) • For further possible settings, see parameter 0x2634:001 (P420.01). 603	Assignment of a trigger to bit 6 of NetWordOUT1. Trigger = FALSE: bit set to 0. Trigger = TRUE: bit set to 1.
	50 Running	
0x2634:017 (P420.17)	Digital outputs function: NetWordOUT1 - bit 7 (Dig.out.function: NetWordOUT1.07) • For further possible settings, see parameter 0x2634:001 (P420.01). 603	Assignment of a trigger to bit 7 of NetWordOUT1. Trigger = FALSE: bit set to 0. Trigger = TRUE: bit set to 1.
	58 Device warning active	
0x2634:018 (P420.18)	Digital outputs function: NetWordOUT1 - bit 8 (Dig.out.function: NetWordOUT1.08) • For further possible settings, see parameter 0x2634:001 (P420.01). 603	Assignment of a trigger to bit 8 of NetWordOUT1. Trigger = FALSE: bit set to 0. Trigger = TRUE: bit set to 1.
	0 Not connected	
0x2634:019 (P420.19)	Digital outputs function: NetWordOUT1 - bit 9 (Dig.out.function: NetWordOUT1.09) • For further possible settings, see parameter 0x2634:001 (P420.01). 603	Assignment of a trigger to bit 9 of NetWordOUT1. Trigger = FALSE: bit set to 0. Trigger = TRUE: bit set to 1.
	0 Not connected	
0x2634:020 (P420.20)	Digital outputs function: NetWordOUT1 - bit 10 (Dig.out.function: NetWordOUT1.10) • For further possible settings, see parameter 0x2634:001 (P420.01). 603	Assignment of a trigger to bit 10 of NetWordOUT1. Trigger = FALSE: bit set to 0. Trigger = TRUE: bit set to 1.
	72 Setpoint speed reached	
0x2634:021 (P420.21)	Digital outputs function: NetWordOUT1 - bit 11 (Dig.out.function: NetWordOUT1.11) • For further possible settings, see parameter 0x2634:001 (P420.01). 603	Assignment of a trigger to bit 11 of NetWordOUT1. Trigger = FALSE: bit set to 0. Trigger = TRUE: bit set to 1.
	78 Current limit reached	
0x2634:022 (P420.22)	Digital outputs function: NetWordOUT1 - bit 12 (Dig.out.function: NetWordOUT1.12) • For further possible settings, see parameter 0x2634:001 (P420.01). 603	Assignment of a trigger to bit 12 of NetWordOUT1. Trigger = FALSE: bit set to 0. Trigger = TRUE: bit set to 1.
	71 Actual speed = 0	
0x2634:023 (P420.23)	Digital outputs function: NetWordOUT1 - bit 13 (Dig.out.function: NetWordOUT1.13) • For further possible settings, see parameter 0x2634:001 (P420.01). 603	Assignment of a trigger to bit 13 of NetWordOUT1. Trigger = FALSE: bit set to 0. Trigger = TRUE: bit set to 1.
	69 Rotational direction reversed	
0x2634:024 (P420.24)	Digital outputs function: NetWordOUT1 - bit 14 (Dig.out.function: NetWordOUT1.14) • For further possible settings, see parameter 0x2634:001 (P420.01). 603	Assignment of a trigger to bit 14 of NetWordOUT1. Trigger = FALSE: bit set to 0. Trigger = TRUE: bit set to 1.
	115 Release holding brake	
0x2634:025 (P420.25)	Digital outputs function: NetWordOUT1 - bit 15 (Dig.out.function: NetWordOUT1.15) • For further possible settings, see parameter 0x2634:001 (P420.01). 603	Assignment of a trigger to bit 15 of NetWordOUT1. Trigger = FALSE: bit set to 0. Trigger = TRUE: bit set to 1.
	55 Safe torque off (STO) active	
0x2635:010	Inversion of digital outputs: NetWordOUT1.00	Inversion of bit 0 of NetWordOUT1.
	0 Not inverted	
	1 Inverted	
0x2635:011	Inversion of digital outputs: NetWordOUT1.01	Inversion of bit 1 of NetWordOUT1.
	0 Not inverted	
	1 Inverted	
0x2635:012	Inversion of digital outputs: NetWordOUT1.02	Inversion of bit 2 of NetWordOUT1.
	0 Not inverted	
	1 Inverted	

Parameter	Name / value range / [default setting]	Info
0x2635:013	Inversion of digital outputs: NetWordOUT1.03	Inversion of bit 3 of NetWordOUT1.
	0 Not inverted	
	1 Inverted	
0x2635:014	Inversion of digital outputs: NetWordOUT1.04	Inversion of bit 4 of NetWordOUT1.
	0 Not inverted	
	1 Inverted	
0x2635:015	Inversion of digital outputs: NetWordOUT1.05	Inversion of bit 5 of NetWordOUT1.
	0 Not inverted	
	1 Inverted	
0x2635:016	Inversion of digital outputs: NetWordOUT1.06	Inversion of bit 6 of NetWordOUT1.
	0 Not inverted	
	1 Inverted	
0x2635:017	Inversion of digital outputs: NetWordOUT1.07	Inversion of bit 7 of NetWordOUT1.
	0 Not inverted	
	1 Inverted	
0x2635:018	Inversion of digital outputs: NetWordOUT1.08	Inversion of bit 8 of NetWordOUT1.
	0 Not inverted	
	1 Inverted	
0x2635:019	Inversion of digital outputs: NetWordOUT1.09	Inversion of bit 9 of NetWordOUT1.
	0 Not inverted	
	1 Inverted	
0x2635:020	Inversion of digital outputs: NetWordOUT1.10	Inversion of bit 10 of NetWordOUT1.
	0 Not inverted	
	1 Inverted	
0x2635:021	Inversion of digital outputs: NetWordOUT1.11	Inversion of bit 11 of NetWordOUT1.
	0 Not inverted	
	1 Inverted	
0x2635:022	Inversion of digital outputs: NetWordOUT1.12	Inversion of bit 12 of NetWordOUT1.
	0 Not inverted	
	1 Inverted	
0x2635:023	Inversion of digital outputs: NetWordOUT1.13	Inversion of bit 13 of NetWordOUT1.
	0 Not inverted	
	1 Inverted	
0x2635:024	Inversion of digital outputs: NetWordOUT1.14	Inversion of bit 14 of NetWordOUT1.
	0 Not inverted	
	1 Inverted	
0x2635:025	Inversion of digital outputs: NetWordOUT1.15	Inversion of bit 15 of NetWordOUT1.
	0 Not inverted	
	1 Inverted	

14.15.5 HTL output

The digital output 1 can be configured for the output of a reference frequency ("pulse train") to transfer an internal actual value signal (e. g. current output frequency or current torque) to a higher-level Controller or other inverters.

Preconditions

In order to output an optimum rectangular signal, a "pulldown" resistor of 1 kOhm is recommended at the digital output. The resistor can be directly connected to the terminals DO1 and GND.

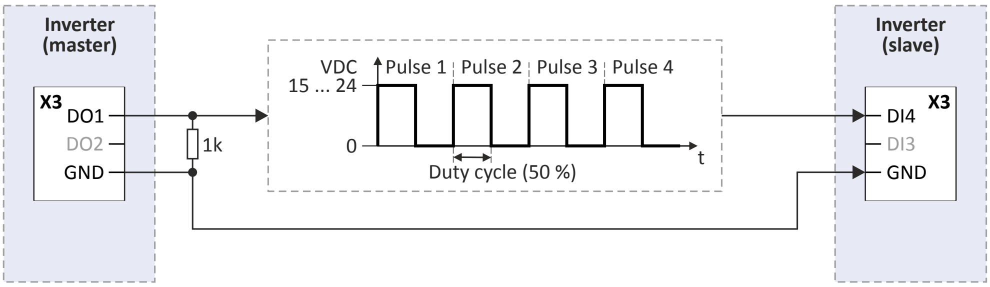
Restrictions

- When the digital output 1 is configured as pulse train output, this digital output is not available anymore for the output of digital status signals.
- The maximum output frequency of the digital output is 10 kHz.

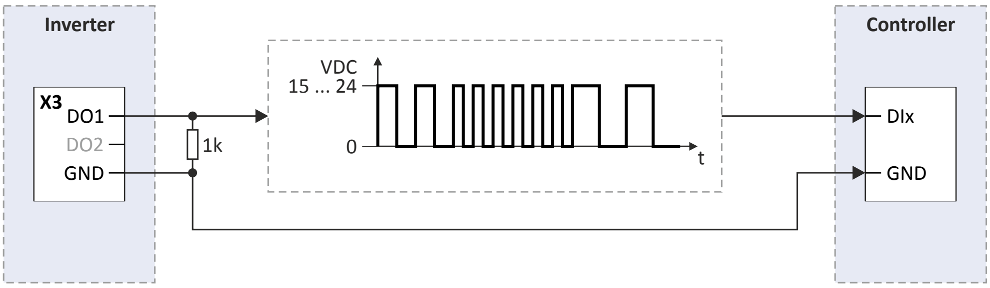
Details

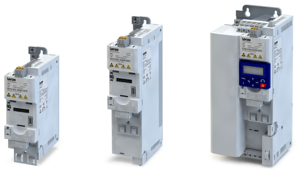
Typical application cases:

a) An inverter acts as a master and transfers its current output frequency in the form of a pulse train signal to one or several other inverters (slaves). The slaves use the pulse train signal with a corresponding scaling as a frequency setpoint.



b) The inverter transfers the current torque or another internal variable as a pulse train signal to a higher-level Controller. Then, the Controller can evaluate the signal accordingly.





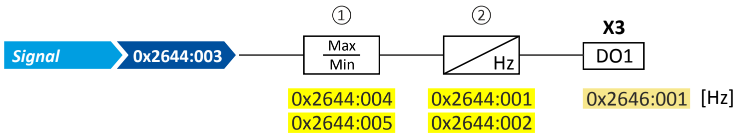
Configure the digital output 1 as pulse train output

In the default setting 0x2644:003 (P423.03) = "Not connected [0]", the digital output 1 is configured as a "normal" digital output: The digital output 1 is controlled with the trigger selected in 0x2634:002 (P420.02).

In order to configure the digital output 1 as pulse train output, the desired signal to be output as pulse train must be selected in 0x2644:003 (P423.03). The trigger assigned to the digital output 1 in 0x2634:002 (P420.02) is then not effective anymore.

The following settings are possible for the pulse train output:

- Definition of the signal range ①
- Definition of the output range ②



Diagnostic parameters:

- The current frequency of the pulse train signal is displayed in 0x2646:001 (P114.01).

Definition of the signal range

The signal range results from the resolution of the selected signal multiplied by the set min and max signal value. Signals outside the signal range are cut off. For examples, see the following table:

Signal 0x2644:003 (P423.03)	Resolution	Minimum signal 0x2644:004 (P423.04)	Maximum signal 0x2644:005 (P423.05)	Signal range
Output frequency	0.1 Hz	0	1000	0 ... 100.0 Hz
Frequency setpoint	0.1 Hz	0	1000	0 ... 100.0 Hz
Analog input 1	0.1 %	0	1000	0 ... 100.0 %
Analog input 2	0.1 %	0	1000	0 ... 100.0 %
Motor current	0.1 A	0	100	0 ... 10.0 A
Output power	0.001 kW	0	250	0 ... 0.250 kW
Torque actual value	0.1 % *	0	1000	0 ... 100.0 % *
NetWordIN3	0.1 %	200	500	20.0 ... 50.0 %
NetWordIN4	0.1 %	0	250	0 ... 25.0 %
* 100 % ≡ Motor rated torque 0x6076 (P325.00)				

Detailed configuration examples can be found in the following subchapters.

Definition of the output range

The frequency output range defined in 0x2644:001 (P423.01) and 0x2644:002 (P423.02) corresponds to the configured signal range.

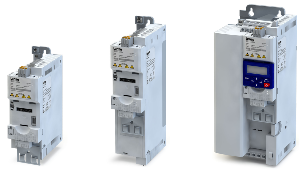
Configuration examples

Detailed configuration examples can be found in the following subchapters:

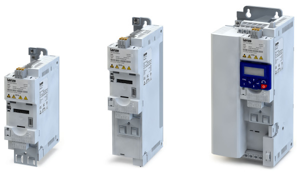
▶ Example 1: Pulse train 0 ... 10 kHz ≡ output frequency 0 ... 100 Hz 📖 615

▶ Example 2: Pulse train 2 ... 10 kHz ≡ output frequency 30 ... 60 Hz 📖 616

Parameter	Name / value range / [default setting]	Info
0x2644:001 (P423.01)	DO1 frequency setup: Minimum frequency (DO1 freq. setup: Min. frequency) 0.0 ... [**0.0**] ... 10000.0 Hz • From version 05.00	Definition of the frequency output range.
0x2644:002 (P423.02)	DO1 frequency setup: Maximum frequency (DO1 freq. setup: Max. frequency) 0.0 ... [**10000.0**] ... 10000.0 Hz • From version 05.00	



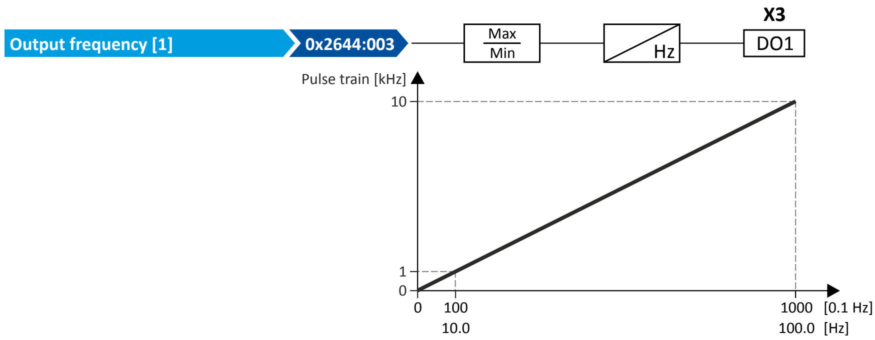
Parameter	Name / value range / [default setting]	Info
0x2644:003 (P423.03)	DO1 frequency setup: Function (DO1 freq. setup: Function) • From version 05.00	Selection of the signal to be provided at the digital output 1 as pulse train.
	0 **Not connected**	No pulse train signal is output at the digital output 1. • The digital output 1 is configured as "normal" digital output. • The digital output 1 is controlled with the trigger selected in 0x2634:002 (P420.02). ▸ Digital output 1 📖 607
	1 Output frequency	Actual output frequency (resolution: 0.1 Hz).
	2 Frequency setpoint	Actual frequency setpoint (resolution: 0.1 Hz).
	3 Analog input 1	Input signal of analog input 1 (resolution: 0.1 %).
	4 Analog input 2	Input signal of analog input 2 (resolution: 0.1 %).
	5 Motor current	Actual motor current (resolution: 0.1 A).
	6 Output power	Actual output power (resolution: 0.001 kW).
	7 Actual torque	Torque actual value (resolution: 0.1 %). • 100 % ≡ permissible maximum torque 0x6072 (P326.00)
	20 NetWordIN3	Actual value of the NetWordIN3 data word (resolution: 0.1 %). ▸ Further process data 📖 251
	21 NetWordIN4	Actual value of the NetWordIN4 data word (resolution: 0.1 %). ▸ Further process data 📖 251
0x2644:004 (P423.04)	DO1 frequency setup: Minimum signal (DO1 freq. setup: Min. signal) -2147483648 ... [**0**] ... 2147483647 • From version 05.00	Definition of the signal value that corresponds to the Minimum frequency at the digital output 1.
0x2644:005 (P423.05)	DO1 frequency setup: Maximum signal (DO1 freq. setup: Max. signal) -2147483648 ... [**1000**] ... 2147483647 • From version 05.00	Definition of the signal value that corresponds to the maximum frequency at the digital output 1.
0x2645:001 (P424.01)	DO2 frequency setup: Minimum frequency (DO2 freq. setup: Min. frequency) 0.0 ... [**0.0**] ... 10000.0 Hz	Parameter not available.
0x2645:002 (P424.02)	DO2 frequency setup: Maximum frequency (DO2 freq. setup: Max. frequency) 0.0 ... [**10000.0**] ... 10000.0 Hz	
0x2645:003 (P424.03)	DO2 frequency setup: Function (DO2 freq. setup: Function)	
	0 **Not connected**	
	1 Output frequency	
	2 Frequency setpoint	
	3 Analog input 1	
	4 Analog input 2	
	5 Motor current	
	6 Output power	
	7 Actual torque	
	20 NetWordIN3	
	21 NetWordIN4	
0x2645:004 (P424.04)	DO2 frequency setup: Minimum signal (DO2 freq. setup: Min. signal) -2147483648 ... [**0**] ... 2147483647	
0x2645:005 (P424.05)	DO2 frequency setup: Maximum signal (DO2 freq. setup: Max. signal) -2147483648 ... [**1000**] ... 2147483647	
0x2646:001 (P114.01)	DO actual frequency: Digital output 1 (DO actual freq.: Digital output 1) • Read only: x.x Hz • From version 05.00	Display of the current frequency of the pulse train signal at the digital output 1.
0x2646:002 (P114.02)	DO actual frequency: Digital output 2 (DO actual freq.: Digital output 2) • Read only: x.x Hz	Parameter not available.



14.15.5.1 Example 1: Pulse train 0 ... 10 kHz ≡ output frequency 0 ... 100 Hz

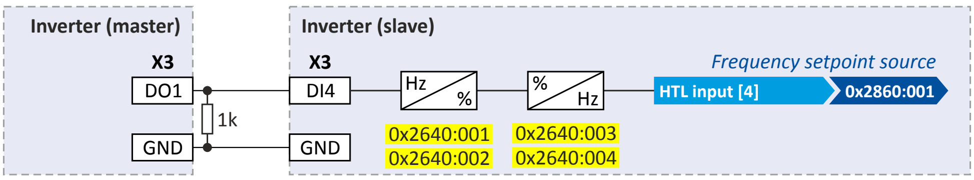
In this configuration, a pulse train is provided at the digital output 1 proportionately to the current output frequency of the inverter (1 kHz pulse train ≡ 10 Hz output frequency, resolution 0.1 Hz).

Parameter	Designation	Setting for this example
0x2644:001 (P423.01)	DO1 frequency setup: Minimum frequency	0.0 Hz
0x2644:002 (P423.02)	DO1 frequency setup: Maximum frequency	10000.0 Hz
0x2644:003 (P423.03)	DO1 frequency setup: Function	Output frequency [1]
0x2644:004 (P423.04)	DO1 frequency setup: Minimum signal	0
0x2644:005 (P423.05)	DO1 frequency setup: Maximum signal	1000



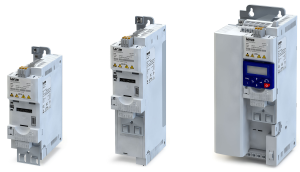
Use pulse train as setpoint source for other inverters (slaves)

The pulse train can be transferred to one or several other i5xx inverters (slaves) and be configured in the respective slave as a frequency setpoint source:



For this purpose, the following settings are required for the i5xx slave:

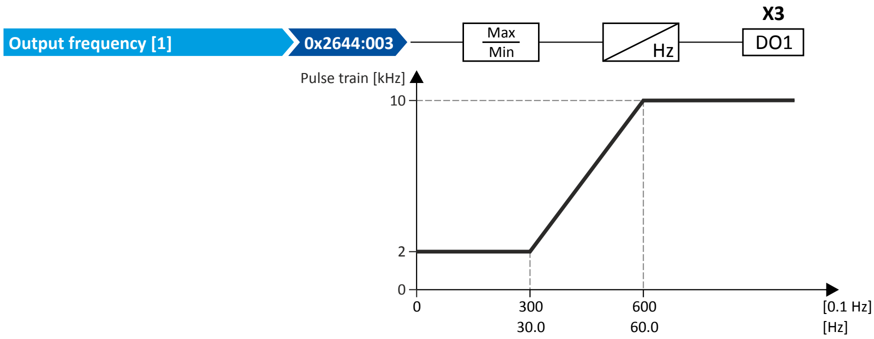
Parameter	Designation	Setting for this example
0x2630:002 (P410.02)	Settings for digital inputs: Input function	Pulse train [2]
0x2640:001 (P415.01)	HTL input settings: Minimum frequency	0.0 Hz
0x2640:002 (P415.02)	HTL input settings: Maximum frequency	10000.0 Hz
0x2640:003 (P415.03)	HTL input settings: Minimum motor frequency	0.0 Hz
0x2640:004 (P415.04)	HTL input settings: Maximum motor frequency	100.0 Hz
0x2860:001 (P201.01)	Frequency control: Default setpoint source	HTL input [4]



14.15.5.2 Example 2: Pulse train 2 ... 10 kHz ≡ output frequency 30 ... 60 Hz

In this configuration, the output range 2 ... 10 kHz is used for the output of the output frequency (resolution: 0.1 Hz). The example shows how the signals outside the signal range (here: 30 ... 60 Hz) are cut off.

Parameter	Designation	Setting for this example
0x2644:001 (P423.01)	DO1 frequency setup: Minimum frequency	2000.0 Hz
0x2644:002 (P423.02)	DO1 frequency setup: Maximum frequency	10000.0 Hz
0x2644:003 (P423.03)	DO1 frequency setup: Function	Output frequency [1]
0x2644:004 (P423.04)	DO1 frequency setup: Minimum signal	300
0x2644:005 (P423.05)	DO1 frequency setup: Maximum signal	600



14.16 Configuration of analog outputs

14.16.1 Analog output 1

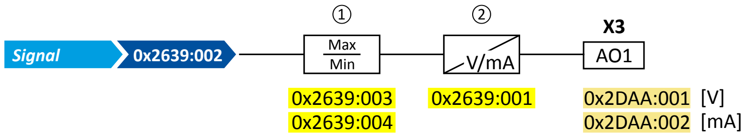
Settings for analog input 1.

Details

The analog output 1 is controlled with the signal selected in 0x2639:002 (P440.02).

The following settings are possible for the analog output:

- Definition of the signal range ①
- Definition of the output range ②



Diagnostic parameters:

- The current output voltage is displayed in 0x2DAA:001 (P112.01).
- The actual output current is displayed in 0x2DAA:002 (P112.02).

Definition of the signal range

The signal range results from the resolution of the selected signal multiplied by the set min and max signal value. Signals outside the signal range are cut off. For examples, see the following table:

Signal 0x2639:002 (P440.02)	Resolution	Min. signal 0x2639:003 (P440.03)	Max. signal 0x2639:004 (P440.04)	Signal range
Output frequency	0.1 Hz	0	1000	0 ... 100.0 Hz
Frequency setpoint	0.1 Hz	0	1000	0 ... 100.0 Hz
Analog input 1	0.1 %	0	1000	0 ... 100.0 %
Analog input 2	0.1 %	0	1000	0 ... 100.0 %
Motor current	0.1 A	0	100	0 ... 10.0 A
Output power	0.001 kW	0	250	0 ... 0.250 kW
Torque actual value	0.1 % *	0	1000	0 ... 100.0 % *
NetWordIN3	0.1 %	200	500	20.0 ... 50.0 %
NetWordIN4	0.1 %	0	250	0 ... 25.0 %
* 100 % ≡ Motor rated torque 0x6076 (P325.00)				

Detailed configuration examples can be found in the following subchapters.

Definition of the output range

The analog output can be configured as voltage or current source. The output range selected in 0x2639:001 (P440.01) then corresponds to the configured signal range.

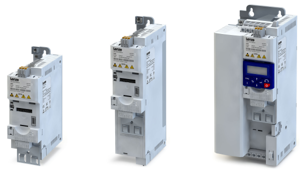
Configuration examples

Detailed configuration examples can be found in the following subchapters:

▸ Example 1: Output voltage 0 ... 10 V ≡ output frequency 0 ... 100 Hz 📖 619

▸ Example 2: Output voltage 2 ... 10 V ≡ output frequency 30 ... 60 Hz 📖 619

Parameter	Name / value range / [default setting]		Info
0x2639:001 (P440.01)	Analog output 1: Output range (Analog output 1: AO1 outp. range)		Definition of the output range.
	0	Inhibited	
	1	**0 ... 10 VDC**	
	2	0 ... 5 VDC	
	3	2 ... 10 VDC	
	4	4 ... 20 mA	
	5	0 ... 20 mA	

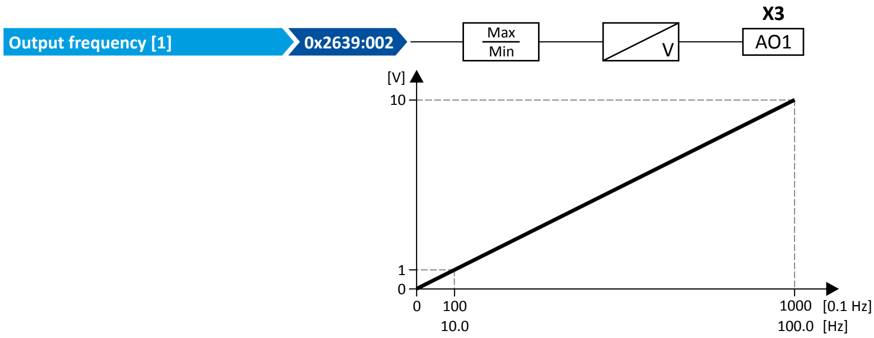


Parameter	Name / value range / [default setting]	Info
0x2639:002 (P440.02)	Analog output 1: Function (Analog output 1: AO1 function)	Selection of the signal to be shown at analog output 1.
	0 Not active	No output signal.
	1 Output frequency	Actual output frequency (resolution: 0.1 Hz).
	2 Frequency setpoint	Actual frequency setpoint (resolution: 0.1 Hz).
	3 Analog input 1	Input signal of analog input 1 (resolution: 0.1 %).
	4 Analog input 2	Input signal of analog input 2 (resolution: 0.1 %).
	5 Motor current	Actual motor current (resolution: 0.1 A).
	6 Output power	Actual output power (resolution: 0.001 kW).
	7 Torque actual value (from version 03.00)	Torque actual value (resolution: 0.1 %). • 100 % ≡ permissible maximum torque 0x6072 (P326.00)
	10 Sequencer controlled (from version 03.00)	Voltage value which has been set for the currently executed sequencer segment (resolution: 0.01 V). ▸ Sequencer 📖 504
	20 NetWordIN3	Actual value of the NetWordIN3 data word (resolution: 0.1 %). ▸ Further process data 📖 251
	21 NetWordIN4	Actual value of the NetWordIN4 data word (resolution: 0.1 %). ▸ Further process data 📖 251
	201 Internal value (from version 05.00)	Internal values of the manufacturer.
	202 Internal value (from version 05.00)	
	203 Internal value (from version 05.00)	
	204 Internal value (from version 05.00)	
	205 Internal value (from version 05.00)	
	206 Internal value (from version 05.00)	
0x2639:003 (P440.03)	Analog output 1: Min. signal (Analog output 1: AO1 min. signal) -2147483648 ... [**0**] ... 2147483647	Definition of the signal value that corresponds to the minimum value at analog output 1. Example: configuration of analog output 1 as a 4 ... 20 mA current loop: output current 4 mA ≡ 0x2639:003
0x2639:004 (P440.04)	Analog output 1: Max. signal (Analog output 1: AO1 max. signal) -2147483648 ... [**1000**] ... 2147483647	Definition of the signal value that corresponds to the maximum value at analog output 1. Example: configuration of analog output 1 as a 4 ... 20 mA current loop: output current 20 mA ≡ 0x2639:004
0x4008:003 (P590.03)	Process input words: NetWordIN3 (NetWordINx: NetWordIN3) 0.0 ... [**0.0**] ... 100.0 %	Mappable data word for optional control of an analog output via network. Assignment of the analog outputs: • Analog output 1: 0x2639:002 (P440.02) = "NetWordIN3 [20]" • Analog output 2: 0x263A:002 (P441.02) = "NetWordIN3 [20]"
0x4008:004 (P590.04)	Process input words: NetWordIN4 (NetWordINx: NetWordIN4) 0.0 ... [**0.0**] ... 100.0 %	Mappable data word for optional control of an analog output via network. Assignment of the analog outputs: • Analog output 1: 0x2639:002 (P440.02) = "NetWordIN4 [21]" • Analog output 2: 0x263A:002 (P441.02) = "NetWordIN4 [21]"

14.16.1.1 Example 1: Output voltage 0 ... 10 V ≡ output frequency 0 ... 100 Hz

In this configuration, a voltage is provided at the analog output proportionately to the current output frequency of the inverter (1 V ≡ 10 Hz, resolution 0.1 Hz).

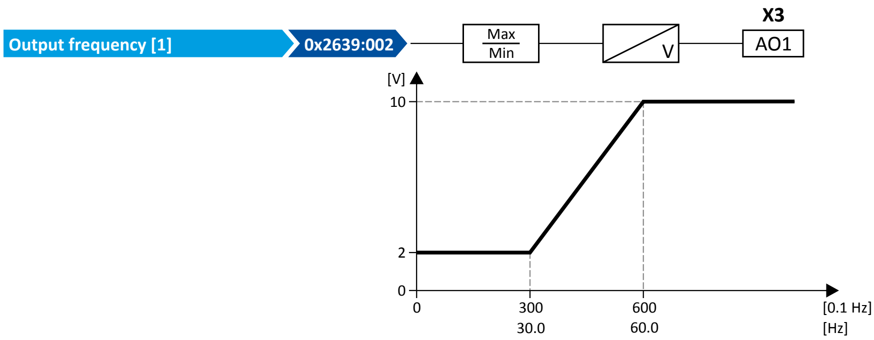
Parameter	Name	Setting for this example
0x2639:001 (P440.01)	Analog output 1: Output range	0 ... 10 VDC [1]
0x2639:002 (P440.02)	Analog output 1: Function	Output frequency [1]
0x2639:003 (P440.03)	Analog output 1: Min. signal	0
0x2639:004 (P440.04)	Analog output 1: Max. signal	1000

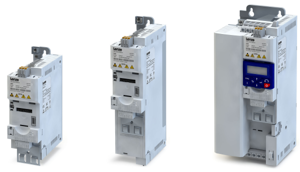


14.16.1.2 Example 2: Output voltage 2 ... 10 V ≡ output frequency 30 ... 60 Hz

In this configuration, the output range 2 ... 10 V is used for the output of the output frequency (resolution: 0.1 Hz). The example shows how the signals outside the signal range (here: 30 ... 60 Hz) are cut off.

Parameter	Name	Setting for this example
0x2639:001 (P440.01)	Analog output 1: Output range	2 ... 10 VDC [3]
0x2639:002 (P440.02)	Analog output 1: Function	Output frequency [1]
0x2639:003 (P440.03)	Analog output 1: Min. signal	300
0x2639:004 (P440.04)	Analog output 1: Max. signal	600





14.16.2 Analog output 2

Settings for analog input 2.

Preconditions

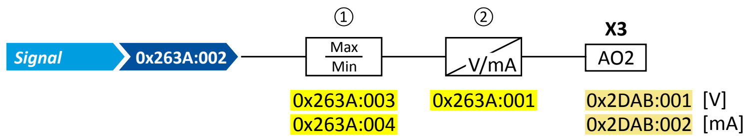
Control Unit (CU) with application I/O

Details

The analog output 2 is controlled with the signal selected in 0x263A:002 (P441.02).

The following settings are possible for the analog output:

- Definition of the signal range ①
- Definition of the output range ②



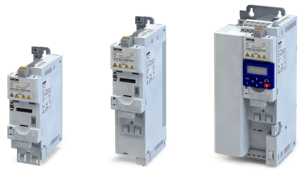
Diagnostic parameters:

- The current output voltage is displayed in 0x2DAB:002 (P113.02).
- The actual output current is displayed in 0x2DAB:001 (P113.01).

For further details and configuration examples, see chapter "Analog output 1". 617

Parameter	Name / value range / [default setting]		Info
0x263A:001 (P441.01)	Analog output 2: Output range (Analog output 2: AO2 outp. range) • Only available for application I/O.		Definition of the output range.
	0	Inhibited	
	1	**0 ... 10 VDC**	
	2	0 ... 5 VDC	
	3	2 ... 10 VDC	
	4	4 ... 20 mA	
	5	0 ... 20 mA	
0x263A:002 (P441.02)	Analog output 2: Function (Analog output 2: AO2 function) • Only available for application I/O.		Selection of the signal to be shown at analog output 2.
	0	Not active	No output signal.
	1	Output frequency	Actual output frequency (resolution: 0.1 Hz).
	2	Frequency setpoint	Actual frequency setpoint (resolution: 0.1 Hz).
	3	Analog input 1	Input signal of analog input 1 (resolution: 0.1 %).
	4	Analog input 2	Input signal of analog input 2 (resolution: 0.1 %).
	5	**Motor current**	Actual motor current (resolution: 0.1 A).
	6	Output power	Actual output power (resolution: 0.001 kW).
	7	Torque actual value	Torque actual value (resolution: 0.1 %). • 100 % ≡ permissible maximum torque 0x6072 (P326.00)
	10	Sequencer controlled (from version 03.00)	Voltage value which has been set for the currently executed sequencer segment (resolution: 0.01 V). ▸ Sequencer 504
	20	NetWordIN3	Actual value of the NetWordIN3 data word (resolution: 0.1 %). ▸ Further process data 251
	21	NetWordIN4	Actual value of the NetWordIN4 data word (resolution: 0.1 %). ▸ Further process data 251
	201	Internal value (from version 05.00)	Internal values of the manufacturer.
	202	Internal value (from version 05.00)	
	203	Internal value (from version 05.00)	
	204	Internal value (from version 05.00)	
	205	Internal value (from version 05.00)	
	206	Internal value (from version 05.00)	

Parameter	Name / value range / [default setting]	Info
0x263A:003 (P441.03)	Analog output 2: Min. signal (Analog output 2: AO2 min. signal) -2147483648 ... [**0**] ... 2147483647 • Only available for application I/O.	Definition of the signal value that corresponds to the minimum value at analog output 2. Example: configuration of analog output 1 as a 4 ... 20 mA current loop: output current 4 mA ≡ 0x263A:003
0x263A:004 (P441.04)	Analog output 2: Max. signal (Analog output 2: AO2 max. signal) -2147483648 ... [**1000**] ... 2147483647 • Only available for application I/O.	Definition of the signal value that corresponds to the maximum value at analog output 2. Example: configuration of analog output 1 as a 4 ... 20 mA current loop: output current 20 mA ≡ 0x263A:004
0x4008:003 (P590.03)	Process input words: NetWordIN3 (NetWordINx: NetWordIN3) 0.0 ... [**0.0**] ... 100.0 %	Mappable data word for optional control of an analog output via network. Assignment of the analog outputs: • Analog output 1: 0x2639:002 (P440.02) = "NetWordIN3 [20]" • Analog output 2: 0x263A:002 (P441.02) = "NetWordIN3 [20]"
0x4008:004 (P590.04)	Process input words: NetWordIN4 (NetWordINx: NetWordIN4) 0.0 ... [**0.0**] ... 100.0 %	Mappable data word for optional control of an analog output via network. Assignment of the analog outputs: • Analog output 1: 0x2639:002 (P440.02) = "NetWordIN4 [21]" • Analog output 2: 0x263A:002 (P441.02) = "NetWordIN4 [21]"



15 Technical data

15.1 Standards and operating conditions

15.1.1 Conformities/approvals

Conformity		
CE	2014/35/EU	Low-Voltage Directive
	2014/30/EU	EMC Directive (reference: CE-typical drive system)
EAC	TR TC 004/2011	Eurasian conformity: safety of low voltage equipment
	TP TC 020/2011	Eurasian conformity: electromagnetic compatibility of technical means
RoHS 2	2011/65/EU	Restrictions for the use of specific hazardous materials in electric and electronic devices
Approval		
UL	UL 61800-5-1	for USA and Canada (requirements of the CSA 22.2 No. 274)
		File No. E132659

15.1.2 Protection of persons and device protection

Enclosure		
IP20	EN 60529	
Type 1	NEMA 250	Protection against contact
Open type		only in UL-approved systems
Insulation resistance		
Overvoltage category III	EN 61800-5-1	0 … 2000 m a.m.s.l.
Overvoltage category II		above 2000 m a.m.s.l.
Control circuit isolation		
Safe mains isolation by double/reinforced insulation	EN 61800-5-1	
Protective measures against		
Short circuit		
earth fault		Earth fault strength depends on the operating status
Overvoltage		
Motor stalling		
Leakage current		
> 3.5 mA AC, > 10 mA DC	EN 61800-5-1	Observe regulations and safety instructions!
Starting current		
≤ 3 x rated mains current		

15.1.3 EMC data

Actuation on public supply systems		
Implement measures to limit the radio interference to be expected:		The machine or plant manufacturer is responsible for compliance with the requirements for the machine/plant!
< 1 kW: with mains choke	EN 61000-3-2	
> 1 kW at mains current ≤ 16 A: without additional measures		
Mains current > 16 A: with mains choke or mains filter, with dimensioning for rated power. Rsce ≥ 120 is to be met.	EN 61000-3-12	RSCE: short-circuit power ratio at the connection point of the machine/plant to the public network.
Noise emission		
Category C1	EN 61800-3	Type-dependent, for motor cable lengths see rated data
Category C2		
Noise immunity		
Meets requirement in compliance with	EN 61800-3	

15.1.4 Motor connection

Requirements to the shielded motor cable		
Capacitance per unit length		
C-core-core/C-core-shield < 75/150 pF/m		≤ 2.5 mm² / AWG 14
C-core-core/C-core-shield < 150/300 pF/m		≥ 4 mm² / AWG 12
Electric strength		
Uo/U = 0.6/1.0 kV		Uo = r.m.s. value external conductor to PE
U ≥ 600 V	UL	U = r.m.s. value external conductor/external conductor

15.1.5 Environmental conditions

Energy efficiency		
Class IE2	EN 50598-2	Reference: Lenze setting (switching frequency 8 kHz variable)
Climate		
1K3 (-25 ... +60 °C)	EN 60721-3-1	Storage
2K3 (-25 ... +70 °C)	EN 60721-3-2	Transport
3K3 (-10 ... +55 °C)	EN 60721-3-3	operation
		Operation at a switching frequency of 2 or 4 kHz: above +45°C, reduce rated output current by 2.5 %/°C
		Operation at a switching frequency of 8 or 16 kHz: above +40°C, reduce rated output current by 2.5 %/°C
Site altitude		
0 … 1000 m a.m.s.l.		
1000 … 4000 m a.m.s.l.		Reduce rated output current by 5 %/1000 m
Pollution		
Degree of pollution 2	EN 61800-5-1	
Vibration resistance		
Transport		
2M2 (sine, shock)	EN 60721-3-2	
operation		
Amplitude 1 mm	Germanischer Lloyd	5 ... 13.2 Hz
Acceleration resistant up to 0.7 g		13.2 ... 100 Hz
Amplitude 0.075 mm	EN 61800-5-1	10 ... 57 Hz
Acceleration resistant up to 1 g		57 ... 150 Hz

15.1.6 Electrical supply conditions

Permissible mains systems		
TT		Voltage against earth: max. 300 V
TN		
IT		Apply the measures described for IT systems!
		IT systems are not relevant for UL-approved systems

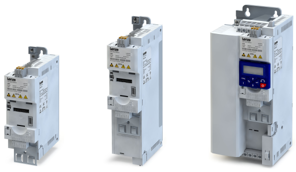
15.2 1-phase mains connection 120 V

15.2.1 Rated data

The output currents apply to these operating conditions:

- At a switching frequency of 2 kHz or 4 kHz: Max. ambient temperature 45°C.
- At a switching frequency of 8 kHz or 16 kHz: Max. ambient temperature 40 °C.

Inverter		**I55AE125A**	**I55AE137A**	**I55AE175A**	**I55AE211A**
Rated power	**kW**	**0.25**	**0.37**	**0.75**	**1.1**
Rated power	**hp**	**0.33**	**0.5**	**1**	**1.5**
Mains voltage range		1/N/PE AC 90 V ... 132 V, 45 Hz ... 65 Hz			
Output voltage		3 AC 0 V ... 240 V			
Rated mains current					
without mains choke	A	6.8	9.6	16.8	22.9
with mains choke	A	6	8.5	14.7	17.1
Apparent output power	kVA	0.6	0.9	1.6	2.2
Output current					
2 kHz	A	1.7	2.4	4.2	6
4 kHz	A	1.7	2.4	4.2	6
8 kHz	A	1.7	2.4	4.2	6
16 kHz	A	1.1	1.6	2.8	4
Weight	kg	1		1.35	
Weight	lb	2.2		3	



15.3 1-phase mains connection 230/240 V

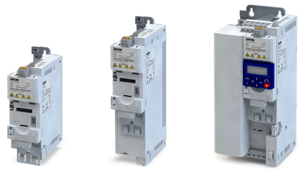
15.3.1 Rated data

The output currents apply to these operating conditions:

- At a switching frequency of 2 kHz or 4 kHz: Max. ambient temperature 45°C.
- At a switching frequency of 8 kHz or 16 kHz: Max. ambient temperature 40 °C.

Inverter		I55AE125B	I55AE125D	I55AE137B	I55AE137D	I55AE155B	I55AE155D	I55AE175B
Rated power	**kW**	**0.25**		**0.37**		**0.55**		**0.75**
Rated power	**hp**	**0.33**		**0.5**		**0.75**		**1**
Mains voltage range		1/N/PE AC 170 V ... 264 V, 45 Hz ... 65 Hz						
Output voltage		3 AC 0 V ... 230 V/240 V						
Rated mains current								
without mains choke	A	4	4	5.7	5.7	7.6	7.6	10
with mains choke	A	3.6	3.6	4.8	4.8	7.1	7.1	8.8
Apparent output power	kVA	0.6		0.9		1.2		1.6
Output current								
2 kHz	A	-	-	-	-	3.2	3.2	4.2
4 kHz	A	1.7	1.7	2.4	2.4	3.2	3.2	4.2
8 kHz	A	1.7	1.7	2.4	2.4	3.2	3.2	4.2
16 kHz	A	1.1	1.1	1.6	1.6	2.1	2.1	2.8
Weight	kg	0.8				1		
Weight	lb	1.8				2.2		

Inverter		I55AE175D	I55AE211B	I55AE211D	I55AE215B	I55AE215D	I55AE222B	I55AE222D
Rated power	**kW**	**0.75**	**1.1**		**1.5**		**2.2**	
Rated power	**hp**	**1**	**1.5**		**2**		**3**	
Mains voltage range		1/N/PE AC 170 V ... 264 V, 45 Hz ... 65 Hz						
Output voltage		3 AC 0 V ... 230 V/240 V						
Rated mains current								
without mains choke	A	10	14.3	14.3	16.7	16.7	22.5	22.5
with mains choke	A	8.8	11.9	11.9	13.9	13.9	16.9	16.9
Apparent output power	kVA	1.6	2.2		2.6		3.6	
Output current								
2 kHz	A	4.2	6	6	7	7	9.6	9.6
4 kHz	A	4.2	6	6	7	7	9.6	9.6
8 kHz	A	4.2	6	6	7	7	9.6	9.6
16 kHz	A	2.8	4	4	4.7	4.7	6.4	6.4
Weight	kg	1	1.35					
Weight	lb	2.2	3					



15.4 3-phase mains connection 230/240 V

15.4.1 Rated data

The output currents apply to these operating conditions:

- At a switching frequency of 2 kHz or 4 kHz: Max. ambient temperature 45°C.
- At a switching frequency of 8 kHz or 16 kHz: Max. ambient temperature 40 °C.

Inverter		**I55AE125D**	**I55AE137D**	**I55AE155D**	**I55AE175D**	**I55AE211D**	**I55AE215D**	**I55AE222D**
Rated power	**kW**	**0.25**	**0.37**	**0.55**	**0.75**	**1.1**	**1.5**	**2.2**
Rated power	**hp**	**0.33**	**0.5**	**0.75**	**1**	**1.5**	**2**	**3**
Mains voltage range		3/PE AC 170 V ... 264 V, 45 Hz ... 65 Hz						
Output voltage		3 AC 0 V ... 230 V/240 V						
Rated mains current								
without mains choke	A	2.6	3.9	4.8	6.4	7.8	9.5	13.6
with mains choke	A	2	3	3.8	5.1	5.6	6.8	9.8
Apparent output power	kVA	0.6	0.9	1.2	1.6	2.2	2.6	3.6
Output current								
2 kHz	A	-	-	3.2	4.2	6	7	9.6
4 kHz	A	1.7	2.4	3.2	4.2	6	7	9.6
8 kHz	A	1.7	2.4	3.2	4.2	6	7	9.6
16 kHz	A	1.1	1.6	2.1	2.8	4	4.7	6.4
Weight	kg	0.8		1		1.35		
Weight	lb	1.8		2.2		3		

Inverter		**I55AE240C**	**I55AE255C**
Rated power	**kW**	**4**	**5.5**
Rated power	**hp**	**5**	**7.5**
Mains voltage range		3/PE AC 170 V ... 264 V, 45 Hz ... 65 Hz	
Output voltage		3 AC 0 V ... 230 V/240 V	
Rated mains current			
without mains choke	A	20.6	28.8
with mains choke	A	15.7	21.9
Apparent output power	kVA	6.4	8.7
Output current			
2 kHz	A	16.5	23
4 kHz	A	16.5	23
8 kHz	A	16.5	23
16 kHz	A	11	15.3
Weight	kg	2.1	
Weight	lb	4.6	

15.5 3-phase mains connection 400 V

15.5.1 Rated data

The output currents apply to these operating conditions:

- At a switching frequency of 2 kHz or 4 kHz: Max. ambient temperature 45°C.
- At a switching frequency of 8 kHz or 16 kHz: Max. ambient temperature 40 °C.

Inverter		**I55AE137F**	**I55AE155F**	**I55AE175F**	**I55AE211F**	**I55AE215F**	**I55AE222F**	**I55AE230F**
Rated power	**kW**	**0.37**	**0.55**	**0.75**	**1.1**	**1.5**	**2.2**	**3**
Rated power	**hp**	**0.5**	**0.75**	**1**	**1.5**	**2**	**3**	**4**
Mains voltage range		3/PE AC 340 V ... 528 V, 45 Hz ... 65 Hz						
Output voltage		3 AC 0 V ... 400 V						
Rated mains current								
without mains choke	A	1.8	2.5	3.3	4.4	5.4	7.8	9.6
with mains choke	A	1.4	2	2.6	3	3.7	5.3	6.9
Apparent output power	kVA	0.9	1.2	1.6	2.2	2.6	3.8	4.9
Output current								
2 kHz	A	-	1.8	2.4	3.2	3.9	5.6	7.3
4 kHz	A	1.3	1.8	2.4	3.2	3.9	5.6	7.3
8 kHz	A	1.3	1.8	2.4	3.2	3.9	5.6	7.3
16 kHz	A	0.9	1.2	1.6	2.1	2.6	3.7	4.9
Weight	kg	0.8	1		1.35			2.3
Weight	lb	1.8	2.2		3			5

Inverter		**I55AE240F**	**I55AE255F**	**I55AE275F**	**I55AE311F**	**I55AE315F**	**I55AE318F**	**I55AE322F**
Rated power	**kW**	**4**	**5.5**	**7.5**	**11**	**15**	**18.5**	**22**
Rated power	**hp**	**5**	**7.5**	**10**	**15**	**20**	**25**	**30**
Mains voltage range		3/PE AC 340 V ... 528 V, 45 Hz ... 65 Hz						
Output voltage		3 AC 0 V ... 400 V						
Rated mains current								
without mains choke	A	12.5	17.2	20	28.4	38.7	48.4	-
with mains choke	A	9	12.4	15.7	22.3	28.8	36	42
Apparent output power	kVA	6.4	8.7	11	16	22	27	32
Output current								
2 kHz	A	9.5	13	16.5	23.5	32	40	47
4 kHz	A	9.5	13	16.5	23.5	32	40	47
8 kHz	A	9.5	13	16.5	23.5	32	40	47
16 kHz	A	6.3	8.7	11	15.7	21.3	26.6	31.3
Weight	kg	2.3		3.7		10.3		
Weight	lb	5		8		23		

Inverter		I55AE330F	I55AE337F	I55AE345F	I55AE355F	I55AE375F
Rated power	**kW**	**30**	**37**	**45**	**55**	**75**
Rated power	**hp**	**40**	**50**	**60**	**75**	**100**
Mains voltage range		3/PE AC 340 V ... 528 V, 45 Hz ... 65 Hz				
Output voltage		3 AC 0 V ... 400 V				
Rated mains current						
without mains choke	A	-	-	-	-	-
with mains choke	A	54.9	68	80	99	135
Apparent output power	kVA	41	51	60	75	100
Output current						
2 kHz	A	61	76	89	110	150
4 kHz	A	61	76	89	110	150
8 kHz	A	61	76	89	110	150
16 kHz	A	40.7	50.7	59.4	73.4	100
Weight	kg	17.2			24	
Weight	lb	38			53	

15.6 3-phase mains connection 400 V "light duty"

15.6.1 Rated data

The output currents apply to these operating conditions:

- At a switching frequency of 2 kHz or 4 kHz: Ambient temperature above 40 °C with a rated output current reduced by 2.5 %/°C.
- If the load characteristic "Light Duty" and the switching frequencies 8 kHz or 16 kHz are selected, only the values of the load characteristic "Heavy Duty" are reached.

Inverter		I55AE230F	I55AE240F	I55AE255F	I55AE275F	I55AE311F	I55AE315F	I55AE318F
Rated power	**kW**	**4**	**5.5**	**7.5**	**11**	**15**	**18.5**	**22**
Rated power	**hp**	**5**	**7.5**	**10**	**15**	**20**	**25**	**30**
Mains voltage range		3/PE AC 340 V ... 528 V, 45 Hz ... 65 Hz						
Output voltage		3 AC 0 V ... 400 V						
Rated mains current								
without mains choke	A	10.3	14	18.3	28	-	48	-
with mains choke	A	8.2	11	14.5	22	27.1	36	43
Apparent output power	kVA	5.9	8	10.5	15	19	26	32
Output current								
2 kHz	A	8.8	11.9	15.6	23	28.2	38.4	48
4 kHz	A	8.8	11.9	15.6	23	28.2	38.4	48
Weight	kg	2.3			3.7		10.3	
Weight	lb	5			8		23	

Inverter		I55AE322F	I55AE330F	I55AE337F	I55AE345F	I55AE355F	I55AE375F
Rated power	**kW**	**30**	**37**	**45**	**55**	**75**	**90**
Rated power	**hp**	**40**	**50**	**60**	**75**	**100**	**125**
Mains voltage range		3/PE AC 340 V ... 528 V, 45 Hz ... 65 Hz					
Output voltage		3 AC 0 V ... 400 V					
Rated mains current							
without mains choke	A	-	-	-	-	-	-
with mains choke	A	55	69	86	100	119	160
Apparent output power	kVA	38	49	61	72	89	121
Output current							
2 kHz	A	56.4	73.2	91.2	107	132	180
4 kHz	A	56.4	73.2	91.2	107	132	180
Weight	kg	10.3	17.2			24	
Weight	lb	23	38			53	

15.7 3-phase mains connection 480 V

15.7.1 Rated data

The output currents apply to these operating conditions:

- At a switching frequency of 2 kHz or 4 kHz: Max. ambient temperature 45°C.
- At a switching frequency of 8 kHz or 16 kHz: Max. ambient temperature 40 °C.

Inverter		**I55AE137F**	**I55AE155F**	**I55AE175F**	**I55AE211F**	**I55AE215F**	**I55AE222F**	**I55AE230F**
Rated power	**kW**	**0.37**	**0.55**	**0.75**	**1.1**	**1.5**	**2.2**	**3**
Rated power	**hp**	**0.5**	**0.75**	**1**	**1.5**	**2**	**3**	**4**
Mains voltage range		3/PE AC 340 V ... 528 V, 45 Hz ... 65 Hz						
Output voltage		3 AC 0 V ... 480 V						
Rated mains current								
without mains choke	A	1.5	2.1	2.8	3.7	4.5	6.5	8
with mains choke	A	1.2	1.7	2.2	2.5	3.1	4.4	5.8
Apparent output power	kVA	0.9	1.2	1.6	2.2	2.6	3.8	4.9
Output current								
2 kHz	A	-	1.6	2.1	3	3.5	4.8	6.3
4 kHz	A	1.1	1.6	2.1	3	3.5	4.8	6.3
8 kHz	A	1.1	1.6	2.1	3	3.5	4.8	6.3
16 kHz	A	0.7	1.1	1.4	2	2.3	3.2	4.2
Weight	kg	0.8	1		1.35			2.3
Weight	lb	1.8	2.2		3			5

Inverter		**I55AE240F**	**I55AE255F**	**I55AE275F**	**I55AE311F**	**I55AE315F**	**I55AE318F**	**I55AE322F**
Rated power	**kW**	**4**	**5.5**	**7.5**	**11**	**15**	**18.5**	**22**
Rated power	**hp**	**5**	**7.5**	**10**	**15**	**20**	**25**	**30**
Mains voltage range		3/PE AC 340 V ... 528 V, 45 Hz ... 65 Hz						
Output voltage		3 AC 0 V ... 480 V						
Rated mains current								
without mains choke	A	10.5	14.3	16.6	23.7	32.3	40.3	47.4
with mains choke	A	7.5	10.3	13.1	18.6	24	30	35.3
Apparent output power	kVA	6.4	8.7	11	16	22	27	32
Output current								
2 kHz	A	8.2	11	14	21	27	34	40.4
4 kHz	A	8.2	11	14	21	27	34	40.4
8 kHz	A	8.2	11	14	21	27	34	40.4
16 kHz	A	5.5	7.3	9.3	14	18	22.6	26.9
Weight	kg	2.3		3.7		10.3		
Weight	lb	5		8		23		

Inverter		I55AE330F	I55AE337F	I55AE345F	I55AE355F	I55AE375F
Rated power	**kW**	**30**	**37**	**45**	**55**	**75**
Rated power	**hp**	**40**	**50**	**60**	**75**	**100**
Mains voltage range		3/PE AC 340 V ... 528 V, 45 Hz ... 65 Hz				
Output voltage		3 AC 0 V ... 480 V				
Rated mains current						
without mains choke	A	-	-	-	-	-
with mains choke	A	45.7	57	66.7	83	113
Apparent output power	kVA	41	51	60	75	100
Output current						
2 kHz	A	52	65	77	96	124
4 kHz	A	52	65	77	96	124
8 kHz	A	52	65	77	96	124
16 kHz	A	34.7	43.4	51.4	64	82.7
Weight	kg	17.2			24	
Weight	lb	38			53	

15.8 3-phase mains connection 480 V "Light Duty"

15.8.1 Rated data

The output currents apply to these operating conditions:

- At a switching frequency of 2 kHz or 4 kHz: Ambient temperature above 40 °C with a rated output current reduced by 2.5 %/°C.
- If the load characteristic "Light Duty" and the switching frequencies 8 kHz or 16 kHz are selected, only the values of the load characteristic "Heavy Duty" are reached.

Inverter		I55AE230F	I55AE240F	I55AE255F	I55AE275F	I55AE311F	I55AE315F	I55AE318F
Rated power	**kW**	**4**	**5.5**	**7.5**	**11**	**15**	**18.5**	**22**
Rated power	**hp**	**5**	**7.5**	**10**	**15**	**20**	**25**	**30**
Mains voltage range		3/PE AC 340 V ... 528 V, 45 Hz ... 65 Hz						
Output voltage		3 AC 0 V ... 480 V						
Rated mains current								
without mains choke	A	8.6	11.2	15.3	22	-	40	-
with mains choke	A	6.8	8.8	12.1	17.2	22.6	30	38
Apparent output power	kVA	5.9	8	10.5	15	19	26	32
Output current								
2 kHz	A	7.6	9.8	13.2	18.3	25.2	32.4	40.8
4 kHz	A	7.6	9.8	13.2	18.3	25.2	32.4	40.8
Weight	kg	2.3			3.7		10.3	
Weight	lb	5			8		23	

Inverter		I55AE322F	I55AE330F	I55AE337F	I55AE345F	I55AE355F	I55AE375F
Rated power	**kW**	**30**	**37**	**45**	**55**	**75**	**90**
Rated power	**hp**	**40**	**50**	**60**	**75**	**100**	**125**
Mains voltage range		3/PE AC 340 V ... 528 V, 45 Hz ... 65 Hz					
Output voltage		3 AC 0 V ... 480 V					
Rated mains current							
without mains choke	A	-	-	-	-	-	-
with mains choke	A	46	59	73	86	105	135
Apparent output power	kVA	38	49	61	72	89	121
Output current							
2 kHz	A	48.5	62.4	78	92.4	115	149
4 kHz	A	48.5	62.4	78	92.4	115	149
Weight	kg	10.3	17.2			24	
Weight	lb	23	38			53	

16 Appendix

16.1 Operate and parameterise the inverter with keypad

The keypad is an easy means for the local operation, parameterisation, and diagnostics of the inverter.

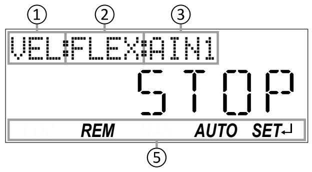
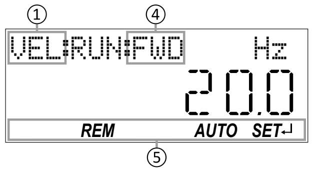
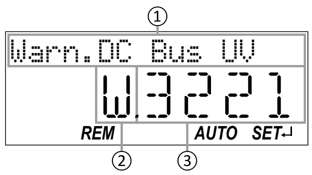
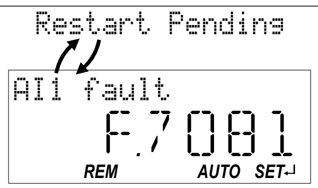
- The keypad is simply connected to the diagnostic interface on the front of the inverter.
- The keypad can also be connected and removed during operation.

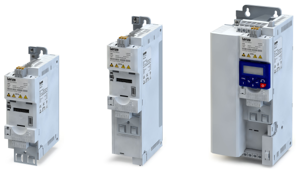
16.1.1 Keypad operating mode

After switching on the inverter, the keypad plugged in is in "Operating mode" after a short initialisation phase.

16.1.1.1 Keypad status display

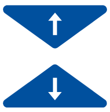
In the operating mode, the keypad displays information on the status of the inverter.

<table>
<tr><th>Keypad display</th><th>Display</th><th>Meaning</th></tr>
<tr><td rowspan="29">If the inverter is inhibited, the keypad shows "STOP":

If the inverter is enabled, the keypad shows the output frequency of the inverter:

• In the process controller mode, instead of the output frequency, the process controller setpoint is displayed.
• The display can be configured in 0x2864 (P703.00).
• The language for the keypad display is preset to "English". The language can be changed in 0x2863 (P705.00).</td><td colspan="2">① Active control mode:</td></tr>
<tr><td>VEL</td><td>Speed mode</td></tr>
<tr><td>PID</td><td>Process controller mode</td></tr>
<tr><td>TRQ</td><td>Torque mode</td></tr>
<tr><td>JOG</td><td>Manual mode</td></tr>
<tr><td colspan="2">② Active control source:</td></tr>
<tr><td>FLEX</td><td>Flexible I/O configuration</td></tr>
<tr><td>KPD</td><td>Keypad</td></tr>
<tr><td>KPDF</td><td>Keypad (complete control via keypad including setpoint selection)</td></tr>
<tr><td>NET</td><td>Network</td></tr>
<tr><td colspan="2">③ Active setpoint source:</td></tr>
<tr><td>AINx</td><td>Analog input x</td></tr>
<tr><td>KPD</td><td>Keypad</td></tr>
<tr><td>NET</td><td>Network</td></tr>
<tr><td>FREQ</td><td>Digital frequency</td></tr>
<tr><td>PRx</td><td>Preset setpoint x</td></tr>
<tr><td>SEGx</td><td>Segment x</td></tr>
<tr><td>MOP</td><td>Motor potentiometer</td></tr>
<tr><td colspan="2">④ Current direction of rotation:</td></tr>
<tr><td>FWD</td><td>Motor is rotating forwards</td></tr>
<tr><td>REV</td><td>Motor is rotating backwards</td></tr>
<tr><td colspan="2">⑤ Lower status line:</td></tr>
<tr><td>LOC</td><td>Local keypad control active.</td></tr>
<tr><td>REM</td><td>Remote control via terminals, network, etc. active.</td></tr>
<tr><td>MAN</td><td>Manual setpoint selection via keypad active.</td></tr>
<tr><td>AUTO</td><td>Automatic setpoint selection via terminals, network, etc. active.</td></tr>
<tr><td>SET</td><td>Blinking if one parameter setting has been changed but has not been saved in the memory module with mains failure protection.
Save settings: Press keypad enter key longer than 3 s.</td></tr>
<tr style="display:none"><td></td><td></td></tr>
<tr style="display:none"><td></td><td></td></tr>
<tr><td rowspan="7">If an error is pending, the keypad shows the following information:

• Faults (F) and trouble (T) are displayed continuously.
• Warnings (W) are only displayed every 2 seconds for a short time.</td><td colspan="2">① Error text</td></tr>
<tr><td colspan="2">② Error type:</td></tr>
<tr><td>F</td><td>Fault</td></tr>
<tr><td>T</td><td>Trouble</td></tr>
<tr><td>W</td><td>Warning</td></tr>
<tr><td colspan="2">③ Error code (hexadecimal)</td></tr>
<tr><td colspan="2">▸ Error codes 639
▸ Error handling 139
▸ Error reset with keypad 634</td></tr>
<tr><td></td><td colspan="2">After a disturbance, a restart is possible if the error condition is not active anymore. The keypad shows this by the "Restart Pending" note. The note is displayed in a 1-second interval alternating with the error text.
▸ Automatic restart 484</td></tr>
</table>



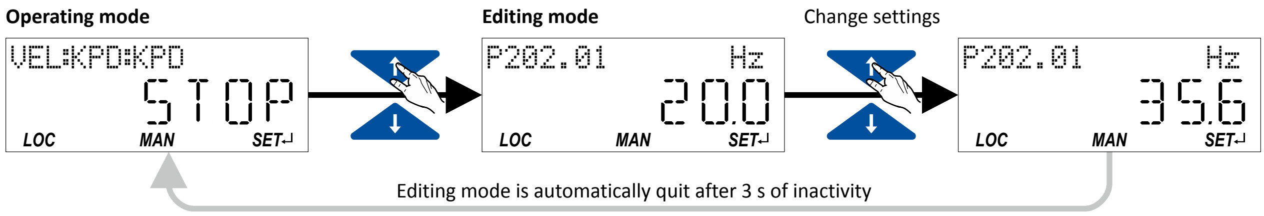
16.1.1.2 Function of keypad keys in operating mode

In the operating mode, the keypad can be used for local control and for manual setpoint selection.

Function of keypad keys in operating mode			
Key	**Actuation**	**Condition**	**Action**
	Shortly	Local keypad control active. Display "LOC"	Run motor.
		Remote control active Display "REM" Display "KSTOP"	Deactivate keypad triggered stop. The motor remains at standstill. Display changes from "KSTOP" to "STOP".
	Shortly	No Jog operation	Stop motor. Display "KSTOP"
	Shortly	Operating mode	Change to parameterisation mode. ▸ Keypad parameterisation mode 📖635
	More than 3 s	None (anytime possible)	Save parameter settings in the user memory of the memory module.
	Shortly	During operation	Scroll through information in the above status line.
	Shortly	Manual setpoint selection via keypad active. Display "MAN"	Change frequency setpoint.
	Shortly	Operating mode	Activate full keypad control Display "ON?" → Confirm with ↵ Control and setpoint selection can now only be carried out via keypad. Renewed clicking: Exit full keypad control. Display "OFF?" → Confirm with ↵ ▸ Keypad - Configuration of R/F and CTRL buttons 📖423
	Shortly	Local keypad control active. Display "LOC"	Reversal of rotation direction. Display "REV?" → Confirm with ↵ ▸ Keypad - Configuration of R/F and CTRL buttons 📖423

Example: Change setpoint

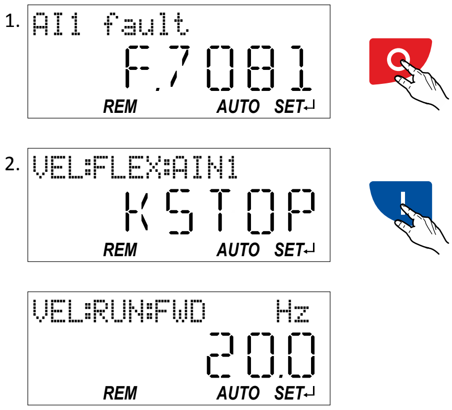
If the setpoints are selected manually via keypad, the frequency setpoint can be changed in the operating mode via the arrow keys (even while the motor is running):



16.1.1.3 Error reset with keypad

Use the keypad key to reset a resettable error if the error condition no longer exists and no blocking time is active.

- The "Error codes" table gives the blocking time (if available) for each error. 639



1. Press keypad key.
   The error is reset. The motor remains stopped via keypad (display "KSTOP").
2. In order to cancel the stop via keypad again: Press keypad key.

16.1.2 Keypad parameterisation mode

In the parameterisation mode of the keypad you can have actual values of the inverter displayed for purposes of diagnostics and change settings of the inverter.

Use the ↵ to change from operating mode to the parameterisation mode.

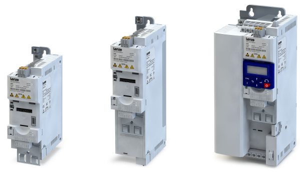
- If a write access protection is active for the inverter, the keypad automatically displays a log-in when changing to the parameterisation mode. You can either skip the log-in and thus keep the access protection active or remove it temporarily by entering a valid PIN.
  ▶ Write access protection 450
- Use the ↩ to return to the operating mode.

16.1.2.1 Parameter groups

In order to provide for quick access, all parameters of the inverter are divided into different groups according to their function.

- Group 0 contains the configurable "Favorites". In the default setting these are the most common parameters for the solution of typical applications. ▶ Favorites 459
- Based on the hundreds digit of the display code (P**x**xx) you can quickly see in which group the parameter is to be found on the keypad:

Parameter	Group/name	Description
P**1**xx	Group 1 - Diagnostics	Diagnostic/display parameters for displaying device-internal process factors, current actual values, and status messages. ▶ Diagnostics parameter 109
P**2**xx	Group 2 - Basic setting	Setting of the mains voltage, selection of the control and setpoint source, starting and stopping performance, frequency limits and ramp times. ▶ Basic setting 143
P**3**xx	Group 3 - Motor control	Configuration of the motor and motor control ▶ Motor control 163
P**4**xx	Group 4 - I/O setting	Function assignment and configuration of the inputs and outputs ▶ Flexible I/O configuration 525
P**5**xx	Group 5 - Network setting	Configuration of the network (if available) ▶ Configuring the network 226
P**6**xx	Group 6 - Process controller	Configuration of the process controller ▶ Configuring the process controller 407
P**7**xx	Group 7 - Additional functions	Parameterisable additional functions ▶ Additional functions 417
P**8**xx	Group 8 - Sequencer	The "sequencer" function serves to define a programmed sequence of speed setpoints, PID setpoints or torque setpoints for the motor control. Switching to the next setpoint can be executed in a time-based or event-based manner. ▶ Sequencer 504

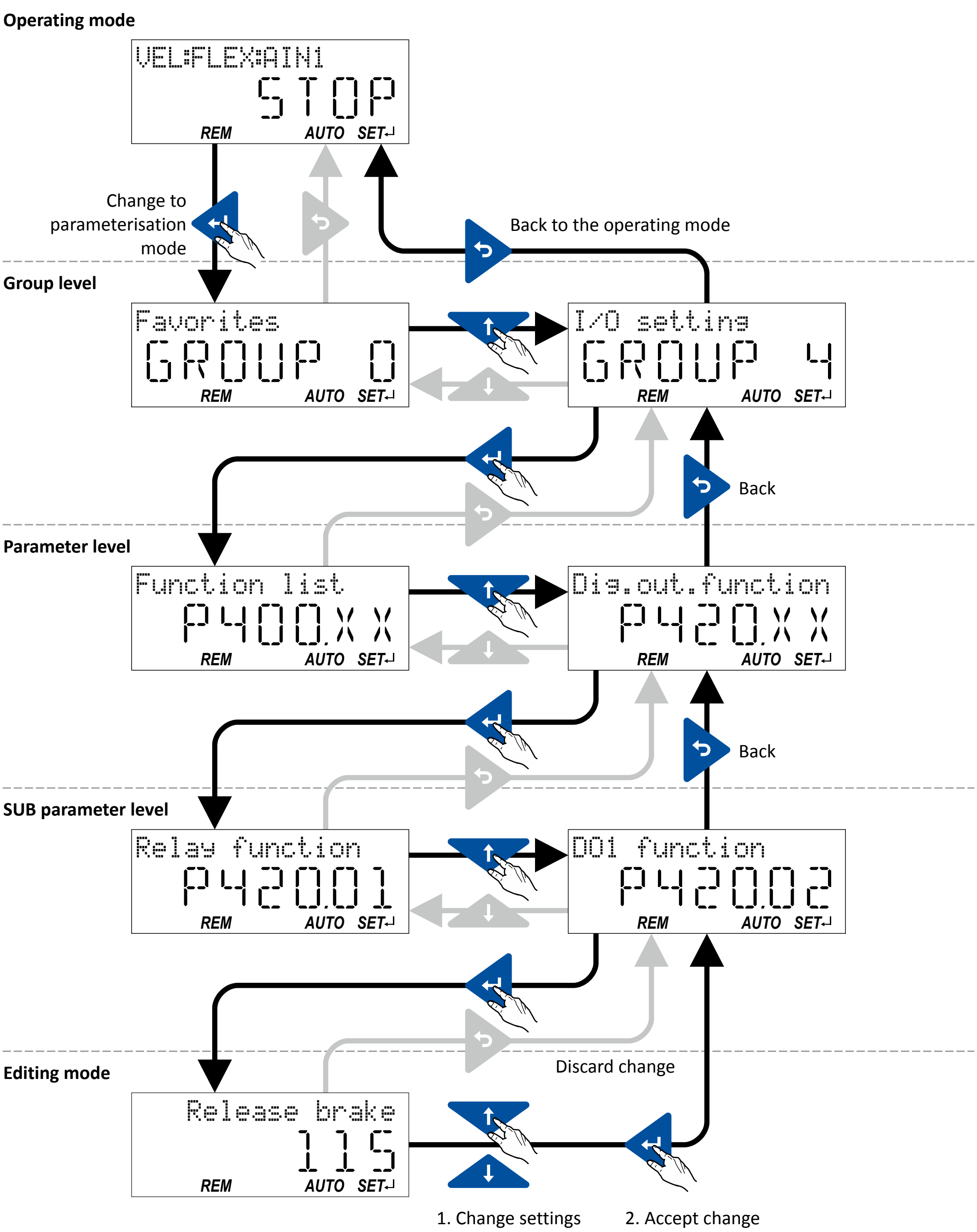


16.1.2.2 Function of the keypad keys in the parameterisation mode

In the parameterisation mode, the arrow keys serve to select and change parameters.

Function of the keypad keys in the parameterisation mode			
Key	**Actuation**	**Condition**	**Action**
	Shortly	Local keypad control active. Display "LOC"	Run motor.
		Remote control active Display "REM" Display "KSTOP"	Deactivate keypad triggered stop. The motor remains at standstill. Display changes from "KSTOP" to "STOP".
	Shortly	No Jog operation	Stop motor. Display "KSTOP"
	Shortly	Parameterisation mode	Navigate to one level below. Group level → Parameter level → [SUB parameter level] → Editing mode
		Editing mode	Exit editing mode and accept new setting.
	More than 3 s	None (anytime possible)	Save parameter settings in the user memory of the memory module.
	Shortly	Parameterisation mode	Navigate to one level above. [SUB parameter level] → Parameter level → Group level → Operating mode
		Editing mode	Abort: Exit editing mode without accepting new setting.
 	Shortly	Group level/Parameter level	Navigate: Select group/parameter.
		Editing mode	Change parameter setting.
			Without function
			Without function

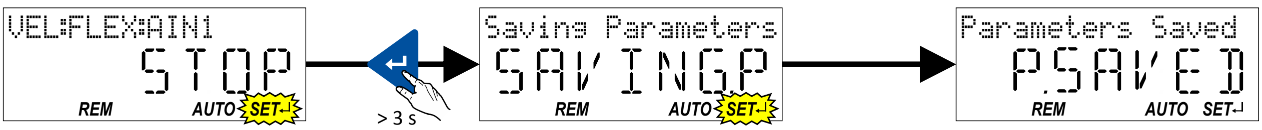
Changing inverter settings by means of the keypad (general operation)



16.1.2.3 Save parameter settings with keypad

If one parameter setting has been changed with the keypad but has not been saved in the memory module with mains failure protection, the SET display is blinking.

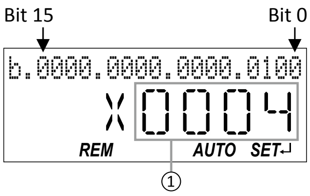
In order to save parameter settings in the user memory of the memory module, press the keypad enter key longer than 3 s.



16.1.2.4 Display of status words on keypad

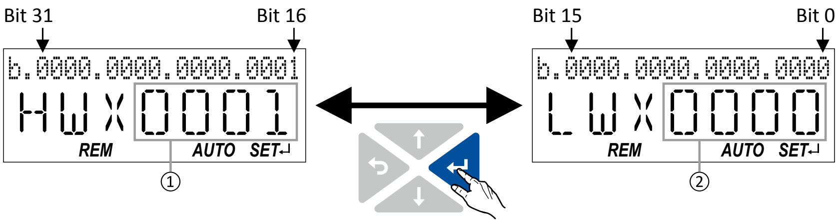
Some diagnostics parameters contain bit-coded status words. Each single bit has a certain meaning.

Display of 16-bit status words on the keypad



① Hexadecimal value

Display of 32-bit status words on the keypad



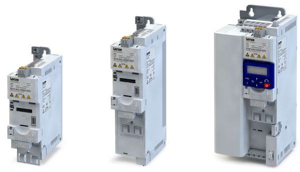
① Hexadecimal value High word (HW)
② Hexadecimal value Low word (LW)

16.2 Error codes

The following table contains the most important error codes of the inverter in ascending order.

- Clicking the error code shows you a detailed description of the error message.
- If the inverter indicates an "internal error" that is not listed here, restart the inverter. If the error persists, make a note of the error code and contact the manufacturer.

Error code		Error message	Error type	Configurable in
8784	0x2250	CiA: continuous overcurrent (inside the device)	Fault	-
8992	0x2320	CiA: Short circuit/earth leakage (internal)	Fault	-
9024	0x2340	CiA: short circuit (inside the device)	Fault	-
9040	0x2350	CiA: i²*t overload (thermal state)	Fault	0x2D4B:003 (P308.03)
9090	0x2382	I*t error	Fault	0x2D40:005 (P135.05)
9091	0x2383	I*t warning	Warning	-
9095	0x2387	Imax: Clamp responded too often	Fault	-
9096	0x2388	SLPSM stall detection active	Trouble	-
12576	0x3120	Mains phase fault	Fault	-
12672	0x3180	Operation at UPS active	Warning	-
12816	0x3210	DC bus overvoltage	Fault	-
12817	0x3211	DC bus overvoltage warning	Warning	-
12832	0x3220	DC bus undervoltage	Trouble	-
12833	0x3221	DC bus undervoltage warning	Warning	-
12834	0x3222	DC-bus voltage too low for switch-on	Warning	-
16912	0x4210	PU: overtemperature fault	Fault	-
17024	0x4280	Thermal sensor heatsink error	Fault	-
17025	0x4281	Heatsink fan warning	Warning	-
17029	0x4285	Power section overtemperature warning	Warning	-
17168	0x4310	Motor overtemperature error	Fault	0x2D49:002 (P309.02)
20754	0x5112	24 V supply critical	Warning	-
20864	0x5180	24-V supply overload	Warning	-
21376	0x5380	OEM hardware incompatible	Fault	-
24970	0x618A	Internal fan warning	Warning	-
25216	0x6280	Trigger/functions connected incorrectly	Trouble	-
25217	0x6281	User-defined fault 1	Fault	-
25218	0x6282	User-defined fault 2	Fault	-
25232	0x6290	Reversal warning	Warning	-
25233	0x6291	Number of maximum permissible faults exceeded	Fault	-
25248	0x62A0	AC Drive: user fault	Fault	-
25249	0x62A1	Network: user fault 1	Fault	-
25250	0x62A2	Network: user fault 2	Fault	-
25265	0x62B1	NetWordIN1 configuration incorrect	Trouble	-
25505	0x63A1	CU: load error ID tag	Fault	-
25506	0x63A2	PU: load error ID tag	Fault	-
25507	0x63A3	Power section unknown	Fault	-
28800	0x7080	Monitoring of connection level (Low/High)	Fault	-
28801	0x7081	Error of analog input 1	Fault	0x2636:010 (P430.10)
28802	0x7082	Error of analog input 2	Fault	0x2637:010 (P431.10)
28803	0x7083	HTL input fault	No response	0x2641:006 (P416.06)
28833	0x70A1	Analog output 1 fault	Warning	-
28834	0x70A2	Analog output 2 fault	Warning	-
28961	0x7121	Pole position identification fault	Fault	0x2C60
29056	0x7180	Motor overcurrent	Fault	0x2D46:002 (P353.02)
29445	0x7305	Encoder open circuit	Warning	0x2C45 (P342.00)
29573	0x7385	Feedback system: speed limitation	Warning	-
30336	0x7680	Memory module is full	Warning	-
30337	0x7681	No memory module	Fault	-



Error code		Error message	Error type	Configurable in
30338	0x7682	Memory module: invalid user data	Fault	-
30340	0x7684	Data not completely saved before switch-off	Warning	-
30342	0x7686	Internal communication error	Fault	-
30345	0x7689	Memory module: invalid OEM data	Warning	-
30346	0x768A	Memory module: wrong type	Fault	-
30352	0x7690	EPM firmware version incompatible	Fault	-
30353	0x7691	EPM data: firmware type incompatible	Fault	-
30354	0x7692	EPM data: new firmware type detected	Fault	-
30355	0x7693	EPM data: PU size incompatible	Fault	-
30356	0x7694	EPM data: new PU size detected	Fault	-
30357	0x7695	Invalid configuration of parameter change-over	Warning	-
30358	0x7696	EPM data: unknown parameter found	Info	-
30359	0x7697	Changed parameters lost	Fault	-
33042	0x8112	Network: timeout explicit message	Warning	0x2859:006 (P515.06)
33044	0x8114	Network: overall communication timeout	Warning	See details for 33044
33045	0x8115	Time-out (PZÜ)	No response	0x2552:004 (P595.04)
33046	0x8116	Modbus TCP master time-out	Fault	0x2859:008 (P515.08)
33047	0x8117	Modbus TCP Keep Alive time-out	Fault	0x2859:009 (P515.09)
33154	0x8182	CAN: bus off	Trouble	0x2857:010
33155	0x8183	CAN: warning	Warning	0x2857:011
33156	0x8184	CAN: heartbeat time-out consumer 1	Fault	0x2857:005
33157	0x8185	CAN: heartbeat time-out consumer 2	Fault	0x2857:006
33158	0x8186	CAN: heartbeat time-out consumer 3	Fault	0x2857:007
33159	0x8187	CAN: heartbeat time-out consumer 4	Fault	0x2857:008
33168	0x8190	Network: watchdog timeout	Trouble	See details for 33168
33169	0x8191	Network: disruption of cyclic data exchange	No response	0x2859:002 (P515.02)
33170	0x8192	Network: initialisation error	Trouble	See details for 33170
33171	0x8193	Network: invalid cyclic process data	Trouble	See details for 33171
33185	0x81A1	Modbus: network time-out	Fault	0x2858:001 (P515.01)
33186	0x81A2	Modbus: incorrect request by master	Warning	-
33200	0x81B0	iCIF connection lost	Fault	-
33414	0x8286	Network: PDO mapping error	Trouble	See details for 33414
33425	0x8291	CAN: RPDO1 time-out	Fault	0x2857:001
33426	0x8292	CAN: RPDO2 time-out	Fault	0x2857:002
33427	0x8293	CAN: RPDO3 time-out	Fault	0x2857:003
33553	0x8311	Torque limit reached	No response	0x2D67:001 (P329.01)
36992	0x9080	Keypad removed	Fault	-
65282	0xFF02	Brake resistor: overload warning	Fault	0x2550:011 (P707.11)
65285	0xFF05	Safe Torque Off error	Fault	-
65286	0xFF06	Motor overspeed	Fault	0x2D44:002 (P350.02)
65289	0xFF09	Motor phase missing	No response	0x2D45:001 (P310.01)
65290	0xFF0A	Phase U motor phase failure	No response	0x2D45:001 (P310.01)
65291	0xFF0B	Motor phase failure phase V	No response	0x2D45:001 (P310.01)
65292	0xFF0C	Motor phase failure phase W	No response	0x2D45:001 (P310.01)
65305	0xFF19	Motor parameter identification error	Fault	-
65334	0xFF36	Brake resistor: overload warning	Warning	0x2550:010 (P707.10)
65335	0xFF37	Automatic start disabled	Fault	-
65366	0xFF56	Maximum motor frequency reached	Warning	-
65413	0xFF85	Keypad full control active	Warning	-

Details regarding the individual error messages

8784 | 0x2250 **CiA: continuous overcurrent (inside the device)** Keypad display: **PU over current**

Cause	Error type/response	Remedy
• Continuous overcurrent on the inverter/ motor side. • Overcurrent at the brake chopper (brake transistor). • DC bus relay has not been closed due to a malfunction.	Fault • The inverter is inhibited immediately. The motor becomes torqueless (coasts). • The error can only be reset after a blocking time of 5 s.	• Check motor and wiring for short circuits. • Check brake resistor and wiring.

8992 | 0x2320 **CiA: Short circuit/earth leakage (internal)** Keypad display: **Earth leak**

Cause	Error type/response	Remedy
• Short circuit/earth fault of motor cable • Capacitive charging current of the motor cable too high.	Fault • The inverter is inhibited immediately. The motor becomes torqueless (coasts). • The error can only be reset after a blocking time of 5 s.	• Check motor cable. • Check length of the motor cable. • Use shorter or lower-capacitance motor cable.

9024 | 0x2340 **CiA: short circuit (inside the device)** Keypad display: **Motor shorted**

Cause	Error type/response	Remedy
Short circuit of motor cable	Fault • The inverter is inhibited immediately. The motor becomes torqueless (coasts). • The error can only be reset after a blocking time of 5 s.	Check motor cable for short circuit.

9040 | 0x2350 **CiA: i²*t overload (thermal state)** Keypad display: **i2t motor**

Cause	Error type/response	Remedy
Motor thermally overloaded, e. g. by an impermissible continuous current or by frequent or too long acceleration processes.	Fault • The error can only be reset after a blocking time of 5 s. • The error type can be configured in 0x2D4B: 003 (P308.03).	• Check drive dimensioning. • Check machine/driven mechanics for excessive load.

Related topics

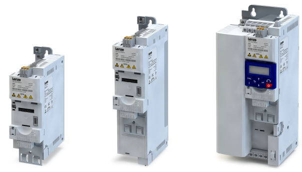
▸ Motor overload monitoring (i²*t) 215

9090 | 0x2382 **I*t error** Keypad display: **Ixt error**

Cause	Error type/response	Remedy
Device utilisation (I*t) too high by frequent and too long acceleration processes.	Fault • The inverter is inhibited immediately. The motor becomes torqueless (coasts). • The error can only be reset after a blocking time of 3 s. • The error type can be configured in 0x2D40:005 (P135.05).	Check drive dimensioning.

Related topics

▸ Device overload monitoring (i*t) 136



9091 | 0x2383 **I*t warning** Keypad display: **Ixt warning**

Cause	Error type/response	Remedy
Device utilisation (I*t) too high by frequent and too long acceleration processes.	Warning	Check drive dimensioning.

Related topics

- Device overload monitoring (i*t) 136

9095 | 0x2387 **Imax: Clamp responded too often** Keypad display: **Clamp timeout**

Cause	Error type/response	Remedy
Maximum current of the axis (display in 0x2DDF:002) has been reached too often in succession.	Fault • The inverter is inhibited immediately. The motor becomes torqueless (coasts).	• Select a flatter speed ramp. • Reduce the load. • Set Imax controller more dynamically.

Related topics

- Imax controller 204

9096 | 0x2388 **SLPSM stall detection active** Keypad display: **SLPSM stall det.**

Cause	Error type/response	Remedy
Overload of the motor with sensorless control for synchronous motors (SL-PSM).	Trouble • The inverter is inhibited immediately. The motor becomes torqueless (coasts).	• Reduce load at the axis. • Check settings of the SL-PSM parameters.

Related topics

- Sensorless control for synchronous motors (SL-PSM) 178

12576 | 0x3120 **Mains phase fault** Keypad display: **Mains Phase fail**

Cause	Error type/response	Remedy
Mains phase failure	Fault • The inverter is inhibited immediately. The motor becomes torqueless (coasts).	• Check wiring of the mains connection. • Check fuses.

12672 | 0x3180 **Operation at UPS active** Keypad display: **UPS oper. active**

Cause	Error type/response	Remedy
Operation on uninterrupted 1x230V current supply (UPS) has been activated: Only a reduced output current is provided.	Warning	Switch back to operation with regular mains voltage.

Related topics

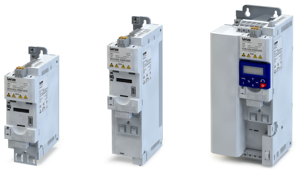
UPS operation 490

12816 | 0x3210 **DC bus overvoltage** Keypad display: **DC Bus OV**

Cause	Error type/response	Remedy
DC-bus voltage has exceeded the error threshold for overvoltage due to a too high braking energy or a too high mains voltage. The error threshold (display in 0x2540:006 (P208.06)) results from the setting of the rated mains voltage in 0x2540:001 (P208.01).	Fault • The inverter is inhibited immediately. The motor becomes torqueless (coasts).	• Reduce dynamic performance of the load profile. • Check mains voltage. • Check settings for the brake energy management. • Connect brake resistor to the power unit and activate the integrated brake chopper.

Related topics

- Mains voltage 144
- Brake energy management 443



12817 | 0x3211 **DC bus overvoltage warning** Keypad display: **Warn.DC Bus OV**

Cause	Error type/response	Remedy
DC-bus voltage has exceeded the warning threshold for overvoltage set in 0x2540:005 (P208.05) due to a too high braking energy or a too high mains voltage.	Warning	• Reduce dynamic performance of the load profile. • Check mains voltage. • Check settings for brake energy management. • Connect brake resistor to the power unit and activate the integrated brake chopper.

Related topics
▶ Mains voltage 📖 144
▶ Brake energy management 📖 443

12832 | 0x3220 **DC bus undervoltage** Keypad display: **DC Bus UV**

Cause	Error type/response	Remedy
DC-bus voltage has fallen below the error threshold for undervoltage. The error threshold (display in 0x2540:003 (P208.03)) results from the setting of the rated mains voltage in 0x2540:001 (P208.01).	Trouble	• Check mains voltage. • Check DC-bus voltage. • Check mains settings.

Related topics
▶ Mains voltage 📖 144

12833 | 0x3221 **DC bus undervoltage warning** Keypad display: **Warn.DC Bus UV**

Cause	Error type/response	Remedy
DC-bus voltage has fallen below the warning threshold for undervoltage set in 0x2540:002 (P208.02).	Warning	• Check mains voltage. • Check DC-bus voltage. • Check mains settings.

Related topics
▶ Mains voltage 📖 144

12834 | 0x3222 **DC-bus voltage too low for switch-on** Keypad display: **DC-bus on-UV**

Cause	Error type/response	Remedy
The input voltage is too low to switch on the inverter.	Warning	• Check mains voltage. • Check mains settings.

Related topics
▶ Mains voltage 📖 144

16912 | 0x4210 **PU: overtemperature fault** Keypad display: **PU Overtemp.**

Cause	Error type/response	Remedy
The heatsink temperature of the power unit (display in 0x2D84:001 (P117.01)) has exceeded the fixed error threshold (100 °C). • Ambient temperature too high. • Fan or ventilation slots are polluted. • Fan is defective.	Fault	• Provide for a sufficient cooling of the device. • Clean fan and ventilation slots. • If required, replace fan. • Reduce switching frequency in .

17024 | 0x4280 **Thermal sensor heatsink error** Keypad display: **Heatsink sensor**

Cause	Error type/response	Remedy
Sensor for the temperature monitoring of the power unit is defective. The failure of the temperature monitoring function poses the risk of overheating!	Fault	Hardware error: it is necessary to contact the manufacturer, since the device must be replaced.

17025 | 0x4281 **Heatsink fan warning** Keypad display: **Heatsink fan**

Cause	Error type/response	Remedy
Warning of the heatsink fan.	Warning	Check/replace the heatsink fan.

17029 | 0x4285 **Power section overtemperature warning** Keypad display: **Warn.PU Overtemp**

Cause	Error type/response	Remedy
The heatsink temperature of the power unit (display in 0x2D84:001 (P117.01)) has exceeded the warning threshold set in 0x2D84:002. • Ambient temperature too high. • Fan or ventilation slots are polluted. • Fan is defective.	Warning	• Provide for a sufficient cooling of the device. • Clean fan and ventilation slots. • If required, replace fan. • Reduce switching frequency in .

Related topics
▸ Heatsink Temperature Monitoring 137

17168 | 0x4310 **Motor overtemperature error** Keypad display: **Overtemp. motor**

Cause	Error type/response	Remedy
The motor temperature sensor connected to terminals X109/T1 and X109/T2 measures a too high motor temperature. • Motor too hot by impermissibly high currents. • Motor too hot by frequent and too long acceleration processes.	Fault • The error can only be reset after a blocking time of 5 s. • The error type can be configured in 0x2D49:002 (P309.02).	• Check drive dimensioning. • Check motor temperature sensor and wiring.

Related topics
▸ Motor temperature monitoring 219

20754 | 0x5112 **24 V supply critical** Keypad display: **24V supply low**

Cause	Error type/response	Remedy
24V voltage failed or too low.	Warning	• Check optional external 24V voltage supply (terminal X3/24E), if connected. • Check mains voltage.

20864 | 0x5180 **24-V supply overload** Keypad display: **Overlaod 24V**

Cause	Error type/response	Remedy
Output current at the 24V output or at the digital outputs too high.	Warning	Check 24V output and digital outputs for earth fault or overload.

21376 | 0x5380 **OEM hardware incompatible** Keypad display: **Incomp. OEM HW**

Cause	Error type/response	Remedy
The control unit (OEM hardware) is not compatible with the power unit (OEM hardware).	Fault • The inverter is inhibited immediately. The motor becomes torqueless (coasts). • The error can only be reset by mains switching.	• Use compatible hardware. • Contact the OEM.

24970 | 0x618A **Internal fan warning** Keypad display: **Internal fan**

Cause	Error type/response	Remedy
Warning of the internal fan.	Warning	Check/replace internal fan.

25216 | 0x6280 **Trigger/functions connected incorrectly** Keypad display: **P400 config err**

Cause	Error type/response	Remedy
The assignment directives have not been observed. • If the "flexible I/O configuration" is active as control source, the "Enable inverter" or "Run" function must be connected to a digital input in order that the motor can be stopped again any time! • The use of the "Start forward (CW)" and "Start reverse (CCW)" functions excludes the use of the "Run forward (CW)" and "Run reverse (CCW)" functions, and vice versa.	Trouble	Check and correct the assignment of the triggers for the functions. • With keypad or network control, the two "Enable inverter" and "Run" functions can also be set to "Constant TRUE [1]" to start the motor.

Related topics
▸ Start / stop motor 531

25217 | 0x6281 **User-defined fault 1** Keypad display: **User fault 1**

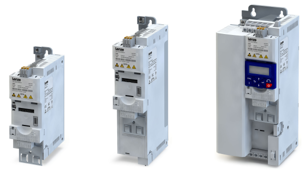
Cause	Error type/response	Remedy
Flexible I/O configuration: the "Activate fault 1" function was activated via the trigger selected in 0x2631:043 (P400.43).	Fault	Eliminate error cause and then reset error.

Related topics
▸ Triggering a user-defined fault 578

25218 | 0x6282 **User-defined fault 2** Keypad display: **User fault 2**

Cause	Error type/response	Remedy
Flexible I/O configuration: the "Activate fault 2" function was activated via the trigger selected in 0x2631:044 (P400.44).	Fault	Eliminate error cause and then reset error.

Related topics
▸ Triggering a user-defined fault 578



25232 | 0x6290 **Reversal warning** Keypad display: **Invert rotation**

Cause	Error type/response	Remedy
• Negative setpoint selection with an active limitation of rotation 0x283A (P304.00). • The "Reverse rotational direction" 0x2631:013 (P400.13) function was requested with an active limitation of rotation 0x283A (P304.00).	Warning • The motor is brought to a standstill, since a reversal of the rotating direction is not permissible.	• Check setpoint selection and trigger. • Check setting in 0x283A (P304.00).

Related topics

▸ Motor rotating direction 212

25233 | 0x6291 **Number of maximum permissible faults exceeded** Keypad display: **Trouble overflow**

Cause	Error type/response	Remedy
The number of permitted restart attempts after a fault set in 0x2839:003 (P760.03) was exceeded. The fault occurred to frequently and could not be reset.	Fault • The motor remains at a standstill, no automatic restart is executed.	Check and the eliminate the fault.

Related topics

▸ Automatic restart 484

25248 | 0x62A0 **AC Drive: user fault** Keypad display: **AC Dr. UserFault**

Cause	Error type/response	Remedy
The "Activate fault" function was triggered via bit 10 of the LECOM control word 0x400B:002 (P592.02).	Fault	Eliminate error cause and then reset error.

25249 | 0x62A1 **Network: user fault 1** Keypad display: **Netw.UserFault 1**

Cause	Error type/response	Remedy
The "Activate fault 1" function was triggered via the NetWordIN1 data word 0x4008:001 (P590.01).	Fault	Eliminate error cause and then reset error.

Related topics

▸ Further process data 251

25250 | 0x62A2 **Network: user fault 2** Keypad display: **Netw.UserFault 2**

Cause	Error type/response	Remedy
The "Activate fault 2" function was triggered via the NetWordIN1 data word 0x4008:001 (P590.01).	Fault	Eliminate error cause and then reset error.

Related topics

▸ Further process data 251

25265 | 0x62B1 **NetWordIN1 configuration incorrect** Keypad display: **NetWordIN1 error**

Cause	Error type/response	Remedy
Two bits of the NetWordIN1 data word 0x4008:001 (P590.01) were assigned to the same function.	Trouble	Check and correct configuration of the NetWordIN1 data word. • The functions that are to be triggered via bits 0 ... 15 of the NetWordIN1 data word are defined in 0x400E:001 (P505.01) ... 0x400E:016 (P505.16).

25505 | 0x63A1 **CU: load error ID tag** Keypad display: **CU ID tag error**

Cause	Error type/response	Remedy
Calibration data of the control unit not compatible or faulty.	Fault • The inverter is inhibited immediately. The motor becomes torqueless (coasts). • The error can only be reset by mains switching.	• Update firmware of the inverter to the most recent version. • If the error persists, the control unit or the device has to be replaced. In this case, please contact the manufacturer.

25506 | 0x63A2 **PU: load error ID tag** Keypad display: **PU ID tag error**

Cause	Error type/response	Remedy
Calibration data of the power unit not compatible or faulty.	Fault • The inverter is inhibited immediately. The motor becomes torqueless (coasts). • The error can only be reset by mains switching.	• Update firmware of the inverter to the most recent version. • If the error persists, the power unit or the device has to be replaced. In this case, please contact the manufacturer.

25507 | 0x63A3 **Power section unknown** Keypad display: **PU unknown**

Cause	Error type/response	Remedy
The power unit installed is not supported by the software.	Fault • The inverter is inhibited immediately. The motor becomes torqueless (coasts). • The error can only be reset by mains switching.	Update firmware of the inverter to the most recent version.

28800 | 0x7080 **Monitoring of connection level (Low/High)** Keypad display: **Assertionlevel**

Cause	Error type/response	Remedy
The last setting of the connection level differs from the saved setting.	Fault	1. Check setting in 0x2630:001 (P410.01). 2. Execute device command "Save user data" 0x2022:003 (P700.03). 3. Switch inverter off and on again.

28801 | 0x7081 **Error of analog input 1** Keypad display: **AI1 fault**

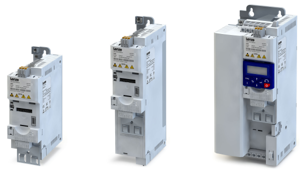
Cause	Error type/response	Remedy
The monitoring function of the input signal configured for analog input 1 in 0x2636:008 (P430.08) and 0x2636:009 (P430.09) has been triggered.	Fault • The error type can be configured in 0x2636:010 (P430.10).	• Check input signal at analog input 1. • Check configuration of the monitoring function.

Related topics
▸ Analog input 1 📖 597

28802 | 0x7082 **Error of analog input 2** Keypad display: **AI2 fault**

Cause	Error type/response	Remedy
The monitoring function of the input signal configured for analog input 2 in 0x2637:008 (P431.08) and 0x2637:009 (P431.09) has been triggered.	Fault • The error type can be configured in 0x2637:010 (P431.10).	• Check input signal at analog input 2. • Check configuration of the monitoring function.

Related topics
▸ Analog input 2 📖 601



28803 | 0x7083 **HTL input fault** Keypad display: **HTL input fault**

Cause	Error type/response	Remedy
The monitoring of the input signal configured for the HTL input has been triggered.	No response • The error type can be configured in 0x2641:006 (P416.06).	• Check input signal at the HTL input. • Check configuration of the monitoring function.

Related topics
- HTL input setpoint source 565

28833 | 0x70A1 **Analog output 1 fault** Keypad display: **AO1 fault**

Cause	Error type/response	Remedy
Open circuit or short circuit at analog output 1.	Warning	• Check wiring of analog output 1. • Check definition of the output range in 0x2639:001 (P440.01).

Related topics
- Analog output 1 617

28834 | 0x70A2 **Analog output 2 fault** Keypad display: **AO2 fault**

Cause	Error type/response	Remedy
Open circuit or short circuit at analog output 2.	Warning	• Check wiring of analog output 2. • Check definition of the output range in 0x263A:001 (P441.01).

Related topics
- Analog output 2 620

28961 | 0x7121 **Pole position identification fault** Keypad display: **Pole pos. error**

Cause	Error type/response	Remedy
• Too many deviations during the pole position identification. • Compared to the inverter, the rated motor current is too high or too low.	Fault • The inverter is inhibited immediately. The motor becomes torqueless (coasts). • The error type can be configured in 0x2C60.	• Check setting of the motor data. • Ensure that the motor is at a standstill during the pole position identification process. • Ensure that the motor and inverter match each other in terms of power.

29056 | 0x7180 **Motor overcurrent** Keypad display: **Mot max current**

Cause	Error type/response	Remedy
The motor current has exceeded the warning/error threshold for the motor current monitoring set in 0x2D46:001 (P353.01).	Fault • The error can only be reset after a blocking time of 1 s. • The error type can be configured in 0x2D46:002 (P353.02).	• Check motor load. • Check drive dimensioning. • Check warning/error threshold set in 0x2D46:001 (P353.01).

Related topics
- Overcurrent monitoring 222

29445 | 0x7305 **Encoder open circuit** Keypad display: **Encoder error**

Cause	Error type/response	Remedy
The encoder signal loss monitoring function has detected a failure of the encoder signal.	Warning • The error type can be configured in 0x2C45 (P342.00).	• Check the encoder connection. • Check encoder cable for wire breakage. • Check encoder current supply.

Related topics
- Encoder monitoring 498

29573 | 0x7385 **Feedback system: speed limitation** Keypad display: **F.fdb spd limit**

Cause	Error type/response	Remedy
The feedback system exceeds the maximum permissible frequency range of the digital inputs.	Warning	Check feedback system.

Related topics
▸ Encoder monitoring 📖 498

30336 | 0x7680 **Memory module is full** Keypad display: **EPM full**

Cause	Error type/response	Remedy
The memory module contains too many parameter settings.	Warning • The parameter settings were not saved in the memory module.	Execute "Save user data" 0x2022:003 (P700.03) device command again. This reinitialises the user memory with the current parameter settings. In this way, parameter settings that are no longer required are automatically deleted.

30337 | 0x7681 **No memory module** Keypad display: **EPM not present**

Cause	Error type/response	Remedy
The inverter memory module was removed.	Fault • The default setting stored in the inverter firmware has been loaded. • The error cannot be reset by the user.	1. Switch off inverter. 2. Plug the memory module into the inverter. 3. Switch the inverter on again. Note: The memory module cannot be replaced during ongoing operation!

30338 | 0x7682 **Memory module: invalid user data** Keypad display: **EPM invalid data**

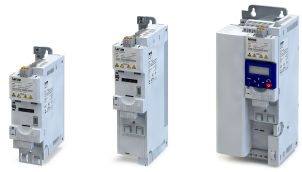
Cause	Error type/response	Remedy
The user parameter settings in the memory module are invalid.	Fault • The inverter is inhibited immediately. The motor becomes torqueless (coasts). • The user parameter settings are lost. • The default settings were automatically loaded.	1. Execute user parameter settings again. 2. Execute device command "Save user data" 0x2022:003 (P700.03).

30340 | 0x7684 **Data not completely saved before switch-off** Keypad display: **Save incomplete**

Cause	Error type/response	Remedy
Saving of the parameter settings was interrupted by an unexpected disconnection.	Warning • The user parameter settings were not fully saved. • At the next switch-on, the data stored are copied to the user memory.	1. Check user parameter settings. (The loaded backup is an older version.) 2. If required, repeat the changes made last. 3. Execute device command "Save user data" 0x2022:003 (P700.03).

30342 | 0x7686 **Internal communication error** Keypad display: **Int. Comm.Err.**

Cause	Error type/response	Remedy
Communication between the power unit and the control unit is faulty.	Fault • The inverter is inhibited immediately. The motor becomes torqueless (coasts).	1. Switch off inverter. 2. Install control unit correctly on power unit. 3. Switch the inverter on again.



30345 | 0x7689 **Memory module: invalid OEM data** Keypad display: **OEM data invalid**

Cause	Error type/response	Remedy
The OEM memory contains invalid parameter settings or is empty.	Warning • The user parameter settings were automatically loaded.	• Execute device command "Save OEM data" 0x2022:006 (P700.06). • Thus, the user parameter settings get lost!

30346 | 0x768A **Memory module: wrong type** Keypad display: **Wrong EPM**

Cause	Error type/response	Remedy
The memory module connected is not supported by the inverter.	Fault • The default setting stored in the inverter firmware has been loaded. • The error cannot be reset by the user.	1. Switch off inverter. 2. Replace plugged-in memory module by a memory module that matches the inverter. 3. Switch the inverter on again.

30352 | 0x7690 **EPM firmware version incompatible** Keypad display: **EPM-FW incomp.**

Cause	Error type/response	Remedy
The parameter settings saved in the memory module are incompatible with the firmware version.	Fault • The data have been loaded into the RAM memory, but they are incompatible.	1. Execute device command "Load default settings" 0x2022:001 (P700.01). 2. Execute "Save user data" 0x2022:003 (P700.03) or "Save OEM data" 0x2022:006 (P700.06) device command.

30353 | 0x7691 **EPM data: firmware type incompatible** Keypad display: **EPM: FW incomp.**

Cause	Error type/response	Remedy
The parameter settings saved in the memory module are incompatible with the firmware type. Example: Memory module of an inverter with an application IO is used in an inverter with a standard IO.	Fault • The data have been loaded into the RAM memory, but they are incompatible.	1. Execute device command "Load default settings" 0x2022:001 (P700.01). 2. Execute "Save user data" 0x2022:003 (P700.03) or "Save OEM data" 0x2022:006 (P700.06) device command.

30354 | 0x7692 **EPM data: new firmware type detected** Keypad display: **UserCU not match**

Cause	Error type/response	Remedy
The parameter settings saved in the memory module do not match the inverter hardware.	Fault • The data have been loaded into the RAM memory without being modified, and they are compatible. • The settings loaded must be accepted by the user (see remedy).	1. Check parameter settings. 2. Reset error. 3. Execute "Save user data" 0x2022:003 (P700.03) or "Save OEM data" 0x2022:006 (P700.06) device command.

30355 | 0x7693 **EPM data: PU size incompatible** Keypad display: **EPM PU size inco**

Cause	Error type/response	Remedy
The parameter settings saved in the memory module are incompatible with the inverter.	Fault • The data have been loaded into the RAM memory, but they are incompatible.	1. Execute device command "Load default settings" 0x2022:001 (P700.01). 2. Execute "Save user data" 0x2022:003 (P700.03) or "Save OEM data" 0x2022:006 (P700.06) device command.

30356 | 0x7694 **EPM data: new PU size detected** Keypad display: **EPM new PU size**

Cause	Error type/response	Remedy
The parameter settings saved in the memory module comply with a different hardware. Example: Memory module of an inverter with a power of 3 kW is used in an inverter with a power of 18.5 kW.	Fault • The data have been loaded into the RAM memory without being modified, and they are compatible. • The settings loaded must be accepted by the user (see remedy).	1. Check parameter settings. 2. Reset error. 3. Execute "Save user data" 0x2022:003 (P700.03) or "Save OEM data" 0x2022:006 (P700.06) device command.

30357 | 0x7695 **Invalid configuration of parameter change-over** Keypad display: **InvalidChgovrCfg**

Cause	Error type/response	Remedy
One or more parameters can no longer be used for the "Parameter change-over" function.	Warning • The parameter change-over function is deactivated.	1. Check error message for parameter change-over in 0x4047:001 (P756.01). 2. Correct the list entry shown in 0x4047:002 (P756.02).

30358 | 0x7696 **EPM data: unknown parameter found** Keypad display: **Unkn. Par in EPM**

Cause	Error type/response	Remedy
The memory module contains parameter settings for one or several parameters that are not known to the inverter.	Info	Execute the "Save user data" 0x2022:003 (P700.03) device command. This reinitialises the user memory with the current parameter settings. In this way, parameter settings that are no longer required are automatically deleted.

30359 | 0x7697 **Changed parameters lost** Keypad display: **Parameter loss**

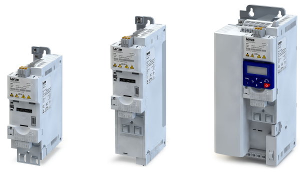
Cause	Error type/response	Remedy
A voltage failure has occurred and changed parameter settings that had not been saved yet were available.	Fault • The inverter is inhibited immediately. The motor becomes torqueless (coasts). • The parameter settings changed have been lost.	1. Execute parameter settings again. 2. Execute device command "Save user data" 0x2022:003 (P700.03).

33042 | 0x8112 **Network: timeout explicit message** Keypad display: **TO expl. msg**

Cause	Error type/response	Remedy
• Within the time-out period for explicit messages, which has been parameterised by the scanner, no "explicit message" was received. • The connection to the scanner has been interrupted. • Failure of an explicit connection.	Warning • The error type can be configured in 0x2859:006 (P515.06).	• Check cables and terminals. • Plug network cables into the Ethernet port. • Check the requested package interval (RPI) of the explicit connection. • Increase time limit for explicit messages in the scanner.

33044 | 0x8114 **Network: overall communication timeout** Keypad display: **TO overall comm**

Cause	Error type/response	Remedy
• EtherNet/IP: the maximum permissible time-out period for the CIP communication set in 0x23A1:010 (P510.10) has been exceeded. • Modbus TCP/IP: the maximum permissible time-out period for the TCP communication set in 0x23B1:010 (P510.10) has been exceeded.	Warning • The error type can be configured in 0x2859:007 (P515.07) (EtherNet/IP), 0x2859:007 (P515.07) (Modbus TCP).	• Check cables and terminals. • Connect network cable.



33045 | 0x8115 **Time-out (PZÜ)** Keypad display: **Time-out (PAM)**

Cause	Error type/response	Remedy
The parameter access monitoring (PAM) function has been activated. For a time longer than the time-out period set in 0x2552:003 (P595.03), no value was entered into the "Keep-alive-Register" 0x2552:002 (P595.02).	No response • The error type can be configured in 0x2552:004 (P595.04).	• Check communication. • Check settings of the parameter access monitoring (PAM) function.

Related topics
- Parameter access monitoring (PAM) 257

33046 | 0x8116 **Modbus TCP master time-out** Keypad display: **MBTCP mast t-out**

Cause	Error type/response	Remedy
No valid messages have been received by the Modbus master for a time longer than the time-out period set in 0x23B6:001 (P514.01).	Fault • The error type can be configured in 0x2859:008 (P515.08).	Check communication with the master.

Related topics
- Time-out behaviour 351

33047 | 0x8117 **Modbus TCP Keep Alive time-out** Keypad display: **MB.Keep Alive TO**

Cause	Error type/response	Remedy
For a time longer than the time-out period set in 0x23B6:002 (P514.02), no value was entered into the Keep alive register 0x23B6:005 (P514.05).	Fault • The error type can be configured in 0x2859:009 (P515.09).	Check communication with the master.

Related topics
- Time-out behaviour 351

33154 | 0x8182 **CAN: bus off** Keypad display: **CAN bus off**

Cause	Error type/response	Remedy
Too many faulty frames have been received. • Defective cable (e. g. loose contact). • Two nodes with the same node address.	Trouble • Change to the "Bus-Off" communication status. • The error type can be configured in 0x2857:010.	• Check wiring of the network. • Check bus terminating resistor. • Set the identical baud rate for each node of the network. • Assign a unique node address to each node of the network. • Eliminate EMC interferences.

33155 | 0x8183 **CAN: warning** Keypad display: **CAN bus warning**

Cause	Error type/response	Remedy
Too many faulty frames have been received. • Defective cable (e. g. loose contact). • Two nodes with the same node address.	Warning • The error type can be configured in 0x2857:011.	• Check wiring of the network. • Check bus terminating resistor. • Set the identical baud rate for each node of the network. • Assign a unique node address to each node of the network. • Eliminate EMC interferences.

33156 | 0x8184 **CAN: heartbeat time-out consumer 1** Keypad display: **CAN heartb. C1**

Cause	Error type/response	Remedy
Within the heartbeat time 0x1016:001 (P520.01), no heartbeat telegram was received by node 1 to be monitored.	Fault • The error type can be configured in 0x2857:005.	• Check communication with the heartbeat producer. • Reactivate heartbeat producer.

Related topics
- Heartbeat protocol 264

33157 | 0x8185 **CAN: heartbeat time-out consumer 2** Keypad display: **CAN heartb. C2**

Cause	Error type/response	Remedy
Within the heartbeat time 0x1016:002 (P520.02), no heartbeat telegram was received by node 2 to be monitored.	Fault • The error type can be configured in 0x2857:006.	• Check communication with the heartbeat producer. • Reactivate heartbeat producer.

Related topics
- Heartbeat protocol 264

33158 | 0x8186 **CAN: heartbeat time-out consumer 3** Keypad display: **CAN heartb. C3**

Cause	Error type/response	Remedy
Within the heartbeat time 0x1016:003 (P520.03), no heartbeat telegram was received by node 3 to be monitored.	Fault • The error type can be configured in 0x2857:007.	• Check communication with the heartbeat producer. • Reactivate heartbeat producer.

Related topics
- Heartbeat protocol 264

33159 | 0x8187 **CAN: heartbeat time-out consumer 4** Keypad display: **CAN heartb. C4**

Cause	Error type/response	Remedy
Within the heartbeat time 0x1016:004 (P520.04), no heartbeat telegram was received by node 4 to be monitored.	Fault • The error type can be configured in 0x2857:008.	• Check communication with the heartbeat producer. • Reactivate heartbeat producer.

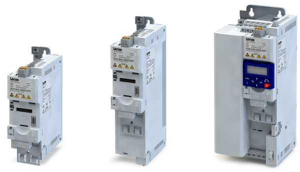
Related topics
- Heartbeat protocol 264

33168 | 0x8190 **Network: watchdog timeout** Keypad display: **Watchdog timeout**

Cause	Error type/response	Remedy
Time-out during cyclic data reception, e.g. due to an interrupted communication link to the master or missing cyclic data.	Trouble • The error type can be configured in 0x2859:001 (P515.01) (PROFIBUS), 0x2859:001 (P515.01) (EtherCAT), 0x2859:001 (P515.01) (EtherNet/IP), 0x2859:001 (P515.01) (PROFINET).	• Check wiring of the network. • Eliminate EMC interferences.

33169 | 0x8191 **Network: disruption of cyclic data exchange** Keypad display: **Cycl data error**

Cause	Error type/response	Remedy
The communication partner has interrupted the cyclic data exchange.	No response • The error type can be configured in 0x2859:002 (P515.02).	• Check wiring of the network. • The slave must receive new parameterisation and configuration files by the master, in order to be able to exchange data again.



33170 | 0x8192 **Network: initialisation error** Keypad display: **Net. Init. error**

Cause	Error type/response	Remedy
The initialisation of the communication stack has been interrupted due to an incorrect address setting or communication configuration.	Trouble • The error type can be configured in 0x2859:004 (P515.04) (PROFIBUS), 0x2859:004 (P515.04) (EtherCAT), 0x2859:004 (P515.04) (EtherNet/IP), 0x2859:004 (P515.04) (PROFINET), 0x2859:004 (P515.04) (Modbus TCP).	Check master/slave configuration and restart the devices.

33171 | 0x8193 **Network: invalid cyclic process data** Keypad display: **Inv. cyclic data**

Cause	Error type/response	Remedy
The cyclic process data received are invalid.	Trouble • The error type can be configured in 0x2859:005 (P515.05) (PROFIBUS), 0x2859:005 (P515.05) (EtherCAT), 0x2859:005 (P515.05) (EtherNet/IP), 0x2859:005 (P515.05) (PROFINET).	Check cyclic process data sent by the master.

33185 | 0x81A1 **Modbus: network time-out** Keypad display: **Modbus time-out**

Cause	Error type/response	Remedy
No valid messages have been received via the Modbus for a longer time than the time-out time set in 0x2858:002 (P515.02).	Fault • The error type can be configured in 0x2858:001 (P515.01).	• Check communication with the master. • Check wiring. • Check bus termination.

33186 | 0x81A2 **Modbus: incorrect request by master** Keypad display: **Modbus request**

Cause	Error type/response	Remedy
The request by the master is invalid, e. g. invalid CRC checksum, non-supported function code, or impermissible data access.	Warning • The inverter (slave) responds to the master with an error code: 0x01 = invalid function code 0x02 = invalid data address 0x03 = invalid data value 0x04 = slave device failure	Check request by the master: • Value in the valid range? • Function code valid? • No impermissible write access? (e. g. with regard to read-only parameters)

33200 | 0x81B0 **iCIF connection lost** Keypad display: **iCIF disconnect.**

Cause	Error type/response	Remedy
In case of the Ethernet communication interface, an internal software error has occurred.	Fault	• Switch inverter off and on again. • In the event of a power failure during a firmware download, it is required to reload the firmware via the USB module and then restart the inverter.

Related topics

▸ Firmware download with »EASY Starter (Firmware loader)« 📖 501

33414 | 0x8286 **Network: PDO mapping error** Keypad display: **PDO map error**

Cause	Error type/response	Remedy
• Invalid PDO assignment by the master. • Internal PDO assignment was changed and does not comply with the configuration available in the master.	Trouble • The error type can be configured in 0x2859:003 (P515.03) (PROFIBUS), 0x2859:003 (P515.03) (EtherCAT), 0x2859:003 (P515.03) (EtherNet/IP), 0x2859:003 (P515.03) (PROFINET), 0x2859:003 (P515.03) (Modbus TCP).	Check data mapping in the master and slave.

33425 | 0x8291 **CAN: RPDO1 time-out** Keypad display: **Timeout RPDO1**

Cause	Error type/response	Remedy
RPDO3 was not received within the time-out period set in 0x1402:005 (P542.05) or with the sync configured.	Fault • The error type can be configured in 0x2857:001.	• Eliminate EMC interferences. • Check bus load.

Related topics
▸ Process data objects 🕮 266

33426 | 0x8292 **CAN: RPDO2 time-out** Keypad display: **Timeout RPDO2**

Cause	Error type/response	Remedy
RPDO2 was not received within the time-out period set in 0x1401:005 (P541.05) or with the sync configured.	Fault • The error type can be configured in 0x2857:002.	• Eliminate EMC interferences. • Check bus load.

Related topics
▸ Process data objects 🕮 266

33427 | 0x8293 **CAN: RPDO3 time-out** Keypad display: **Timeout RPDO3**

Cause	Error type/response	Remedy
RPDO1 was not received within the time-out period set in 0x1400:005 (P540.05) or with the sync configured.	Fault • The error type can be configured in 0x2857:003.	• Eliminate EMC interferences. • Check bus load.

Related topics
▸ Process data objects 🕮 266

33553 | 0x8311 **Torque limit reached** Keypad display: **Torque limit**

Cause	Error type/response	Remedy
Motor has reached the torque limit: • 0x60E0: Positive torque limit • 0x60E1: Negative torque limit • 0x6072 (P326.00): Max torque	No response • The error type can be configured in 0x2D67:001 (P329.01).	• Observe load requirements. • Reduce motor load. • Check set torque limits and sources for the torque limits.

Related topics
▸ Motor torque monitoring 🕮 224

36992 | 0x9080 **Keypad removed** Keypad display: **Keypad removed**

Cause	Error type/response	Remedy
The keypad was removed while the keypad control was activated.	Fault	• Plug on the keypad again or • activate another control source.

Related topics
▸ Control source change-over 🕮 526

65282 | 0xFF02 **Brake resistor: overload warning** Keypad display: **BrkResistor OL.F**

Cause	Error type/response	Remedy
The calculated thermal load of the brake resistor has reached the error threshold set in 0x2550:009 (P707.09). The regenerative energy is too high.	Fault • The inverter is inhibited immediately. The motor becomes torqueless (coasts). • The error can only be reset after a blocking time of 5 s. • The error type can be configured in 0x2550:011 (P707.11).	• Check drive dimensioning. • Check settings for the brake energy management. Note: The error status will be reset if the thermal load falls below the error threshold - 20 %.

Related topics
- Use of a brake resistor 445

65285 | 0xFF05 **Safe Torque Off error** Keypad display: **STO error**

Cause	Error type/response	Remedy
The safety module or safety circuit of the device was detected as being defective.	Fault • The inverter is inhibited immediately. The motor becomes torqueless (coasts). • The error can only be reset by mains switching.	Hardware error: it is necessary to contact the manufacturer since the device must be replaced.

65286 | 0xFF06 **Motor overspeed** Keypad display: **Motor overspeed**

Cause	Error type/response	Remedy
The motor speed has reached the error threshold for overspeed set in 0x2D44:001 (P350.01).	Fault • The error can only be reset after a blocking time of 1 s. • The error type can be configured in 0x2D44:002 (P350.02).	Check application.

Related topics
- Motor speed monitoring 224

65289 | 0xFF09 **Motor phase missing** Keypad display: **Mot.Phase miss.**

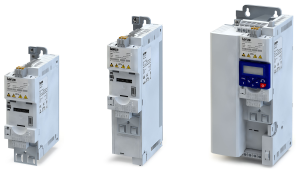
Cause	Error type/response	Remedy
A failure of several motor phases has been detected.	No response • The error can only be reset after a blocking time of 2 s. • The error type can be configured in 0x2D45:001 (P310.01).	• Check wiring between inverter and motor. • In case of a false tripping, adapt the settings for the motor phase failure detection.

Related topics
- Motor phase failure detection 223

65290 | 0xFF0A **Phase U motor phase failure** Keypad display: **Phase U failure**

Cause	Error type/response	Remedy
A failure of the motor phase U has been detected.	No response • The error can only be reset after a blocking time of 2 s. • The error type can be configured in 0x2D45:001 (P310.01).	• Check wiring between inverter and motor. • In case of a false tripping, adapt the settings for the motor phase failure detection.

Related topics
- Motor phase failure detection 223



65291 | 0xFF0B **Motor phase failure phase V** Keypad display: **Phase V failure**

Cause	Error type/response	Remedy
A failure of the motor phase V has been detected.	No response • The error can only be reset after a blocking time of 2 s. • The error type can be configured in 0x2D45:001 (P310.01).	• Check wiring between inverter and motor. • In case of a false tripping, adapt the settings for the motor phase failure detection.

Related topics
▸ Motor phase failure detection 📖 223

65292 | 0xFF0C **Motor phase failure phase W** Keypad display: **Phase W failure**

Cause	Error type/response	Remedy
A failure of the motor phase W has been detected.	No response • The error can only be reset after a blocking time of 2 s. • The error type can be configured in 0x2D45:001 (P310.01).	• Check wiring between inverter and motor. • In case of a false tripping, adapt the settings for the motor phase failure detection.

Related topics
▸ Motor phase failure detection 📖 223

65305 | 0xFF19 **Motor parameter identification error** Keypad display: **Motor ID fault**

Cause	Error type/response	Remedy
During the automatic identification of the motor, an error has occurred.	Fault	• Set motor data so that they comply with the data on the motor nameplate. • Check wiring of the motor.

65334 | 0xFF36 **Brake resistor: overload warning** Keypad display: **BrkResistor OL.W**

Cause	Error type/response	Remedy
The calculated thermal load of the brake resistor has reached the warning threshold set in 0x2550:008 (P707.08). The regenerative energy is too high.	Warning • The error type can be configured in 0x2550:010 (P707.10).	• Check drive dimensioning. • Check settings for the brake energy management. Note: The warning status is reset if the thermal load falls below the warning threshold of - 20 %.

Related topics
▸ Use of a brake resistor 📖 445

65335 | 0xFF37 **Automatic start disabled** Keypad display: **Auto start disab**

Cause	Error type/response	Remedy
At mains connection, a start command was already available and the automatic start at power-up is set in 0x2838:002 (P203.02) to "Off [0]".	Fault	Deactivate start command and reset error.

65366 | 0xFF56 **Maximum motor frequency reached** Keypad display: **Max. motor freq.**

Cause	Error type/response	Remedy
• The maximum motor speed set in 0x6080 (P322.00) is active. • The maximum output frequency of the inverter has been reached.	Warning	Check application.

65413 | 0xFF85 **Keypad full control active** Keypad display: **Keypad full ctrl**

Cause	Error type/response	Remedy
If the "Keypad Full Control" control mode is active.	Warning • Both the activity of controlling and the set-point selection are carried out via the key-pad.	Clicking the **CTRL** keypad key stops the control mode again.

Related topics

▸ Keypad - Configuration of R/F and CTRL buttons 📖 423

16.3 Parameter attribute list

The parameter attribute list in particular contains some information required for reading and writing parameters via network.

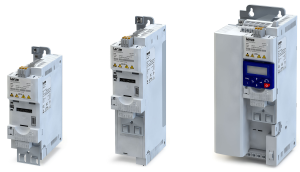
- The parameter attribute list contains all parameters of the inverter.
- The parameter attribute list is sorted by addresses (index:subindex) in ascending order.

How to read the parameter attribute list:

Column	Meaning	
Address	Address of the parameter in the object directory. Format: index:subindex If the parameter can also be accessed via keypad, the "Display Code" is given in addition in brackets.	
Designation	Parameter name	
Default setting	Default setting of the parameter	
Category	Functional assignment of the parameter, for example "motor control" or "CANopen".	
Data type	Data type of the parameter:	
	I8	1 byte, with sign
	I16	2 bytes with sign
	I32	4 bytes with sign
	I64	8 bytes with sign
	U8	1 byte without sign
	U16	2 bytes without sign
	U32	4 bytes without sign
	U64	8 bytes without sign
	REAL32	4 bytes floating point
	STRING[xx]	ASCII string (with character length xx)
	OCTET[xx]	OCTET string (with xx bytes)
	IDX	4 bytes without sign. Is used specially for addressing parameters.
Factor	Factor for data transmission via network, depending on the number of decimal positions:	
	1	No decimal positions
	10	1 decimal position
	100	2 decimal positions
	1000	3 decimal positions
	10000	4 decimal positions
A	Attributes (combinations of several attributes also possible):	
	C	Setting can only be changed if the inverter is inhibited.
	E	Value is displayed as IP address on the keypad.
	H	Value is displayed as hexadecimal value on the keypad.
	I	Parameter is not displayed.
	K	Parameter is only displayed on the keypad.
	O	Parameter can be recorded with the oscilloscope function.
	P	Setting is saved in the memory module.
	X	Parameter is not displayed in the engineering tools.
M	Mapping:	
	r	Receive mapping permissible.
	t	Transmit mapping permissible.
	rt	Receive and transmit mapping permissible.
	-	Mapping not permissible.

Parameter attribute list (short overview of all parameter indexes)

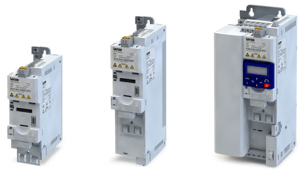
Address	Designation	Default setting	Category	Data type	Factor	A	M
0x1000	Device type	- (Read only)	CANopen	U32	1	H	-
0x1000	Device type	- (Read only)	EtherCAT	U32	1	X	-
0x1000	NMT_DeviceType_U32	- (Read only)	POWERLINK	U32	1	X	-
0x1001	Error register	- (Read only)	CANopen	U8	1	H	t
0x1001	ERR_ErrorRegister_U8	- (Read only)	POWERLINK	U8	1	X	-
0x1003:001	ERR_History_ADOM: ErrorEntry_DOM 1	- (Read only)	POWERLINK	U32	1	X	-
0x1003:002	ERR_History_ADOM: ErrorEntry_DOM 2	- (Read only)	POWERLINK	U32	1	X	-
* Default setting depending on the size.				Firmware version 05.00.00.00			



Address	Designation	Default setting	Category	Data type	Factor	A	M
0x1003:003	ERR_History_ADOM: ErrorEntry_DOM 3	- (Read only)	POWERLINK	U32	1	X	-
0x1003:004	ERR_History_ADOM: ErrorEntry_DOM 4	- (Read only)	POWERLINK	U32	1	X	-
0x1003:005	ERR_History_ADOM: ErrorEntry_DOM 5	- (Read only)	POWERLINK	U32	1	X	-
0x1003:006	ERR_History_ADOM: ErrorEntry_DOM 6	- (Read only)	POWERLINK	U32	1	X	-
0x1003:007	ERR_History_ADOM: ErrorEntry_DOM 7	- (Read only)	POWERLINK	U32	1	X	-
0x1003:008	ERR_History_ADOM: ErrorEntry_DOM 8	- (Read only)	POWERLINK	U32	1	X	-
0x1003:009	ERR_History_ADOM: ErrorEntry_DOM 9	- (Read only)	POWERLINK	U32	1	X	-
0x1003:010	ERR_History_ADOM: ErrorEntry_DOM 10	- (Read only)	POWERLINK	U32	1	X	-
0x1005	COB-ID SYNC	**0x00000080**	CANopen	U32	1	PH	-
0x1006	Communication cyclic period	**0 us**	CANopen	U32	1	P	-
0x1006	NMT_CycleLen_U32	**0**	POWERLINK	U32	1	X	-
0x1008	Manufacturer device name	- (Read only)	CANopen	STRING[50]	1	-	-
0x1008	Manufacturer device name	- (Read only)	EtherCAT	STRING[50]	1	X	-
0x1008	NMT_ManufactDevName_VS	- (Read only)	POWERLINK	STRING[5]	1	X	-
0x1009	Manufacturer hardware version	- (Read only)	CANopen	STRING[50]	1	-	-
0x1009	Manufacturer hardware version	- (Read only)	EtherCAT	STRING[50]	1	X	-
0x1009	NMT_ManufactHwVers_VS	- (Read only)	POWERLINK	STRING[2]	1	X	-
0x100A	Manufacturer software version	- (Read only)	CANopen	STRING[50]	1	-	-
0x100A	Manufacturer software version	- (Read only)	EtherCAT	STRING[50]	1	X	-
0x100A	NMT_ManufactSwVers_VS	- (Read only)	POWERLINK	STRING[6]	1	X	-
0x1014	COB-ID EMCY	- (Read only)	CANopen	U32	1	H	-
0x1015	Inhibit time EMCY	**0.0 ms**	CANopen	U16	10	P	-
0x1016:000 (P520.00)	Consumer heartbeat time: Highest sub-index supported	- (Read only)	CANopen	U8	1	-	-
0x1016:001 (P520.01)	Consumer heartbeat time: Consumer heartbeat time 1	**0x00000000**	CANopen	U32	1	PH	-
0x1016:001	NMT_ConsumerHeartbeatTime: HeartbeatDescription	**0 ms**	POWERLINK	U32	1	X	-
0x1016:002 (P520.02)	Consumer heartbeat time: Consumer heartbeat time 2	**0x00000000**	CANopen	U32	1	PH	-
0x1016:002	NMT_ConsumerHeartbeatTime: HeartbeatDescription	**0 ms**	POWERLINK	U32	1	X	-
0x1016:003 (P520.03)	Consumer heartbeat time: Consumer heartbeat time 3	**0x00000000**	CANopen	U32	1	PH	-
0x1016:003	NMT_ConsumerHeartbeatTime: HeartbeatDescription	**0 ms**	POWERLINK	U32	1	X	-
0x1016:004 (P520.04)	Consumer heartbeat time: Consumer heartbeat time 4	**0x00000000**	CANopen	U32	1	PH	-
0x1016:004	NMT_ConsumerHeartbeatTime: HeartbeatDescription	**0 ms**	POWERLINK	U32	1	X	-
0x1017 (P522.00)	Producer heartbeat time	**0 ms**	CANopen	U16	1	P	-
0x1018:001	Identity object: Vendor ID	- (Read only)	CANopen	U32	1	-	-
0x1018:001	Identity object: Vendor ID	- (Read only)	EtherCAT	U32	1	X	-
0x1018:001	NMT_IdentityObject_REC: VendorId_U32	- (Read only)	POWERLINK	U32	1	X	-
0x1018:002	Identity object: Product ID	- (Read only)	CANopen	U32	1	H	-
0x1018:002	Identity object: Product ID	- (Read only)	EtherCAT	U32	1	X	-
0x1018:003	Identity object: Revision number	- (Read only)	CANopen	U32	1	-	-
0x1018:003	Identity object: Revision number	- (Read only)	EtherCAT	U32	1	X	-
0x1018:004	Identity object: Serial number	- (Read only)	CANopen	U32	1	-	-
0x1018:004	Identity object: Serial number	- (Read only)	EtherCAT	U32	1	X	-
0x1029:000	Error behavior: Highest sub-index supported	- (Read only)	CANopen	U8	1	-	-
0x1029:001	Error behavior: Communication error	**Status -> Pre-operational [0]**	CANopen	U8	1	P	-
0x1030:001	NMT_InterfaceGroup_0h_REC: InterfaceIndex_U16	- (Read only)	POWERLINK	U16	1	X	-
* Default setting depending on the size.							Firmware version 05.00.00.00

Address	Designation	Default setting	Category	Data type	Factor	A	M
0x1030:002	NMT_InterfaceGroup_0h_REC: InterfaceDescrip-tion_VSTR	- (Read only)	POWERLINK	STRING[3]	1	X	-
0x1030:003	NMT_InterfaceGroup_0h_REC: InterfaceType_U8	- (Read only)	POWERLINK	U8	1	X	-
0x1030:004	NMT_InterfaceGroup_0h_REC: InterfaceMtu_U32	- (Read only)	POWERLINK	U32	1	X	-
0x1030:005	NMT_InterfaceGroup_0h_REC: InterfacePhysAd-dress_ OSTR	- (Read only)	POWERLINK	OCTET[6]	1	X	-
0x1030:006	NMT_InterfaceGroup_0h_REC: Interface-Name_VSTR	**ETH0**	POWERLINK	STRING[16]	1	X	-
0x1030:007	NMT_InterfaceGroup_0h_REC: InterfaceOper-State_U8	- (Read only)	POWERLINK	U8	1	X	-
0x1030:008	NMT_InterfaceGroup_0h_REC: InterfaceAdmin-State_U8	**0**	POWERLINK	U8	1	X	-
0x1030:009	NMT_InterfaceGroup_0h_REC: Valid_BOOL	**0**	POWERLINK	U8	1	X	-
0x1200:000	SDO1 server parameter: Highest sub-index suppor-ted	- (Read only)	CANopen	U8	1	-	-
0x1200:001	SDO1 server parameter: COB-ID client -> server (rx)	- (Read only)	CANopen	U32	1	H	-
0x1200:002	SDO1 server parameter: COB-ID server -> client (tx)	- (Read only)	CANopen	U32	1	H	-
0x1201:000	SDO2 server parameter: Highest sub-index suppor-ted	- (Read only)	CANopen	U8	1	-	-
0x1201:001	SDO2 server parameter: COB-ID client -> server (rx)	**0x80000640**	CANopen	U32	1	PH	-
0x1201:002	SDO2 server parameter: COB-ID server -> client (tx)	**0x800005C0**	CANopen	U32	1	PH	-
0x1201:003	SDO2 server parameter: Node-ID of the SDO client	**0**	CANopen	U8	1	P	-
0x1300	SDO_SequLayerTimeout_U32	**30000 ms**	POWERLINK	U32	1	X	-
0x1301	SDO_CmdLayerTimeout_U32	**30000 ms**	POWERLINK	U32	1	X	-
0x1400:000	RPDO1 communication parameter: Highest sub-index supported	- (Read only)	CANopen	U8	1	-	-
0x1400:001 (P540.01)	RPDO1 communication parameter: COB-ID	**0x00000200**	CANopen	U32	1	PH	-
0x1400:001	PDO_RxCommParam_00h_REC: NodeID_U8	**0**	POWERLINK	U8	1	X	-
0x1400:002 (P540.02)	RPDO1 communication parameter: Transmission type	**255**	CANopen	U8	1	P	-
0x1400:002	PDO_RxCommParam_00h_REC: MappingVer-sion_U8	- (Read only)	POWERLINK	U8	1	X	-
0x1400:005 (P540.05)	RPDO1 communication parameter: Event timer	**100 ms**	CANopen	U16	1	P	-
0x1401:001 (P541.01)	RPDO2 communication parameter: COB-ID	**0x80000300**	CANopen	U32	1	PH	-
0x1401:002 (P541.02)	RPDO2 communication parameter: Transmission type	**255**	CANopen	U8	1	P	-
0x1401:005 (P541.05)	RPDO2 communication parameter: Event timer	**100 ms**	CANopen	U16	1	P	-
0x1402:001 (P542.01)	RPDO3 communication parameter: COB-ID	**0x80000400**	CANopen	U32	1	PH	-
0x1402:002 (P542.02)	RPDO3 communication parameter: Transmission type	**255**	CANopen	U8	1	P	-
0x1402:005 (P542.05)	RPDO3 communication parameter: Event timer	**100 ms**	CANopen	U16	1	P	-
0x1600:000	RPDO1 mapping parameter: Number of mapped application objects in PDO	**2**	CANopen	U8	1	P	-
0x1600:001	RPDO1 mapping parameter: Application object 1	**0x60400010**	CANopen	U32	1	PH	-
0x1600:001 ... 0x1600:016	PDO_RxMappParam_00h_REC: ObjectMapping_U64 1 ... ObjectMapping_U64 16	**0**	POWERLINK	U64	1	X	-
0x1600:002	RPDO1 mapping parameter: Application object 2	**0x60420010**	CANopen	U32	1	PH	-
0x1600:003	RPDO1 mapping parameter: Application object 3	**0x00000000**	CANopen	U32	1	PH	-
0x1600:004	RPDO1 mapping parameter: Application object 4	**0x00000000**	CANopen	U32	1	PH	-
0x1600:005	RPDO1 mapping parameter: Application object 5	**0x00000000**	CANopen	U32	1	PH	-
0x1600:006	RPDO1 mapping parameter: Application object 6	**0x00000000**	CANopen	U32	1	PH	-

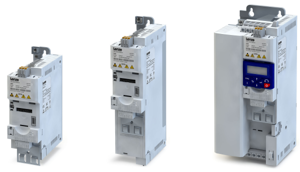
* Default setting depending on the size. Firmware version 05.00.00.00



Address	Designation	Default setting	Category	Data type	Factor	A	M
0x1600:007	RPDO1 mapping parameter: Application object 7	**0x00000000**	CANopen	U32	1	PH	-
0x1600:008	RPDO1 mapping parameter: Application object 8	**0x00000000**	CANopen	U32	1	PH	-
0x1601:000	RPDO2 mapping parameter: Number of mapped application objects in PDO	**0**	CANopen	U8	1	P	-
0x1601:001	RPDO2 mapping parameter: Application object 1	**0x00000000**	CANopen	U32	1	PH	-
0x1601:002	RPDO2 mapping parameter: Application object 2	**0x00000000**	CANopen	U32	1	PH	-
0x1601:003	RPDO2 mapping parameter: Application object 3	**0x00000000**	CANopen	U32	1	PH	-
0x1601:004	RPDO2 mapping parameter: Application object 4	**0x00000000**	CANopen	U32	1	PH	-
0x1601:005	RPDO2 mapping parameter: Application object 5	**0x00000000**	CANopen	U32	1	PH	-
0x1601:006	RPDO2 mapping parameter: Application object 6	**0x00000000**	CANopen	U32	1	PH	-
0x1601:007	RPDO2 mapping parameter: Application object 7	**0x00000000**	CANopen	U32	1	PH	-
0x1601:008	RPDO2 mapping parameter: Application object 8	**0x00000000**	CANopen	U32	1	PH	-
0x1602:000	RPDO3 mapping parameter: Number of mapped application objects in PDO	**0**	CANopen	U8	1	P	-
0x1602:001	RPDO3 mapping parameter: Application object 1	**0x00000000**	CANopen	U32	1	PH	-
0x1602:002	RPDO3 mapping parameter: Application object 2	**0x00000000**	CANopen	U32	1	PH	-
0x1602:003	RPDO3 mapping parameter: Application object 3	**0x00000000**	CANopen	U32	1	PH	-
0x1602:004	RPDO3 mapping parameter: Application object 4	**0x00000000**	CANopen	U32	1	PH	-
0x1602:005	RPDO3 mapping parameter: Application object 5	**0x00000000**	CANopen	U32	1	PH	-
0x1602:006	RPDO3 mapping parameter: Application object 6	**0x00000000**	CANopen	U32	1	PH	-
0x1602:007	RPDO3 mapping parameter: Application object 7	**0x00000000**	CANopen	U32	1	PH	-
0x1602:008	RPDO3 mapping parameter: Application object 8	**0x00000000**	CANopen	U32	1	PH	-
0x1603:001	RPDO4 mapping parameter: Application object 1	- (Read only)	EtherCAT	U32	1	XH	-
0x1603:002	RPDO4 mapping parameter: Application object 2	- (Read only)	EtherCAT	U32	1	XH	-
0x1605:001	RPDO6 mapping parameter: Application object 1	- (Read only)	EtherCAT	U32	1	XH	-
0x1605:002	RPDO6 mapping parameter: Application object 2	- (Read only)	EtherCAT	U32	1	XH	-
0x1605:003	RPDO6 mapping parameter: Application object 3	- (Read only)	EtherCAT	U32	1	XH	-
0x1605:004	RPDO6 mapping parameter: Application object 4	- (Read only)	EtherCAT	U32	1	XH	-
0x1605:005	RPDO6 mapping parameter: Application object 5	- (Read only)	EtherCAT	U32	1	XH	-
0x1605:006	RPDO6 mapping parameter: Application object 6	- (Read only)	EtherCAT	U32	1	XH	-
0x1605:007	RPDO6 mapping parameter: Application object 7	- (Read only)	EtherCAT	U32	1	XH	-
0x1605:008	RPDO6 mapping parameter: Application object 8	- (Read only)	EtherCAT	U32	1	XH	-
0x1605:009	RPDO6 mapping parameter: Application object 9	- (Read only)	EtherCAT	U32	1	XH	-
0x1605:010	RPDO6 mapping parameter: Application object 10	- (Read only)	EtherCAT	U32	1	XH	-
0x1605:011	RPDO6 mapping parameter: Application object 11	- (Read only)	EtherCAT	U32	1	XH	-
0x1605:012	RPDO6 mapping parameter: Application object 12	- (Read only)	EtherCAT	U32	1	XH	-
0x1605:013	RPDO6 mapping parameter: Application object 13	- (Read only)	EtherCAT	U32	1	XH	-
0x1605:014	RPDO6 mapping parameter: Application object 14	- (Read only)	EtherCAT	U32	1	XH	-
0x1605:015	RPDO6 mapping parameter: Application object 15	- (Read only)	EtherCAT	U32	1	XH	-
0x1605:016	RPDO6 mapping parameter: Application object 16	- (Read only)	EtherCAT	U32	1	XH	-
0x1800:000	TPDO1 communication parameter: Highest sub-index supported	- (Read only)	CANopen	U8	1	-	-
0x1800:001 (P550.01)	TPDO1 communication parameter: COB-ID	**0x40000180**	CANopen	U32	1	PH	-
0x1800:001	PDO_TxCommParam_00h_REC: NodeID_U8	- (Read only)	POWERLINK	U8	1	X	-
0x1800:002 (P550.02)	TPDO1 communication parameter: Transmission type	**255**	CANopen	U8	1	P	-
0x1800:002	PDO_TxCommParam_00h_REC: MappingVersion_U8	- (Read only)	POWERLINK	U8	1	X	-
0x1800:003 (P550.03)	TPDO1 communication parameter: Inhibit time	**0.0 ms**	CANopen	U16	10	P	-
0x1800:005 (P550.05)	TPDO1 communication parameter: Event timer	**20 ms**	CANopen	U16	1	P	-
0x1801:000	TPDO2 communication parameter: Highest sub-index supported	- (Read only)	CANopen	U8	1	-	-
* Default setting depending on the size.							Firmware version 05.00.00.00

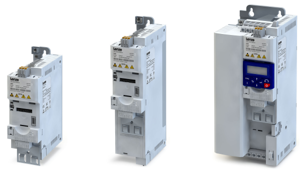
Address	Designation	Default setting	Category	Data type	Factor	A	M
0x1801:001 (P551.01)	TPDO2 communication parameter: COB-ID	**0xC0000280**	CANopen	U32	1	PH	-
0x1801:002 (P551.02)	TPDO2 communication parameter: Transmission type	**255**	CANopen	U8	1	P	-
0x1801:003 (P551.03)	TPDO2 communication parameter: Inhibit time	**0.0 ms**	CANopen	U16	10	P	-
0x1801:005 (P551.05)	TPDO2 communication parameter: Event timer	**0 ms**	CANopen	U16	1	P	-
0x1802:000	TPDO3 communication parameter: Highest sub-index supported	- (Read only)	CANopen	U8	1	-	-
0x1802:001 (P552.01)	TPDO3 communication parameter: COB-ID	**0xC0000380**	CANopen	U32	1	PH	-
0x1802:002 (P552.02)	TPDO3 communication parameter: Transmission type	**255**	CANopen	U8	1	P	-
0x1802:003 (P552.03)	TPDO3 communication parameter: Inhibit time	**0.0 ms**	CANopen	U16	10	P	-
0x1802:005 (P552.05)	TPDO3 communication parameter: Event timer	**0 ms**	CANopen	U16	1	P	-
0x1A00:000	TPDO1 mapping parameter: Number of mapped application objects in TPDO	**2**	CANopen	U8	1	P	-
0x1A00:001	TPDO1 mapping parameter: Application object 1	**0x60410010**	CANopen	U32	1	PH	-
0x1A00:001 ... 0x1A00:016	PDO_TxMappParam_00h_REC: ObjectMapping_U64 1 ... ObjectMapping_U64 16	**0**	POWERLINK	U64	1	X	-
0x1A00:002	TPDO1 mapping parameter: Application object 2	**0x60440010**	CANopen	U32	1	PH	-
0x1A00:003	TPDO1 mapping parameter: Application object 3	**0x00000000**	CANopen	U32	1	PH	-
0x1A00:004	TPDO1 mapping parameter: Application object 4	**0x00000000**	CANopen	U32	1	PH	-
0x1A00:005	TPDO1 mapping parameter: Application object 5	**0x00000000**	CANopen	U32	1	PH	-
0x1A00:006	TPDO1 mapping parameter: Application object 6	**0x00000000**	CANopen	U32	1	PH	-
0x1A00:007	TPDO1 mapping parameter: Application object 7	**0x00000000**	CANopen	U32	1	PH	-
0x1A00:008	TPDO1 mapping parameter: Application object 8	**0x00000000**	CANopen	U32	1	PH	-
0x1A01:000	TPDO2 mapping parameter: Number of mapped application objects in TPDO	**0**	CANopen	U8	1	P	-
0x1A01:001	TPDO2 mapping parameter: Application object 1	**0x00000000**	CANopen	U32	1	PH	-
0x1A01:002	TPDO2 mapping parameter: Application object 2	**0x00000000**	CANopen	U32	1	PH	-
0x1A01:003	TPDO2 mapping parameter: Application object 3	**0x00000000**	CANopen	U32	1	PH	-
0x1A01:004	TPDO2 mapping parameter: Application object 4	**0x00000000**	CANopen	U32	1	PH	-
0x1A01:005	TPDO2 mapping parameter: Application object 5	**0x00000000**	CANopen	U32	1	PH	-
0x1A01:006	TPDO2 mapping parameter: Application object 6	**0x00000000**	CANopen	U32	1	PH	-
0x1A01:007	TPDO2 mapping parameter: Application object 7	**0x00000000**	CANopen	U32	1	PH	-
0x1A01:008	TPDO2 mapping parameter: Application object 8	**0x00000000**	CANopen	U32	1	PH	-
0x1A02:000	TPDO3 mapping parameter: Number of mapped application objects in TPDO	**0**	CANopen	U8	1	P	-
0x1A02:001	TPDO3 mapping parameter: Application object 1	**0x00000000**	CANopen	U32	1	PH	-
0x1A02:002	TPDO3 mapping parameter: Application object 2	**0x00000000**	CANopen	U32	1	PH	-
0x1A02:003	TPDO3 mapping parameter: Application object 3	**0x00000000**	CANopen	U32	1	PH	-
0x1A02:004	TPDO3 mapping parameter: Application object 4	**0x00000000**	CANopen	U32	1	PH	-
0x1A02:005	TPDO3 mapping parameter: Application object 5	**0x00000000**	CANopen	U32	1	PH	-
0x1A02:006	TPDO3 mapping parameter: Application object 6	**0x00000000**	CANopen	U32	1	PH	-
0x1A02:007	TPDO3 mapping parameter: Application object 7	**0x00000000**	CANopen	U32	1	PH	-
0x1A02:008	TPDO3 mapping parameter: Application object 8	**0x00000000**	CANopen	U32	1	PH	-
0x1A03:001	TPDO4 mapping parameter: Application object 1	- (Read only)	EtherCAT	U32	1	XH	-
0x1A03:002	TPDO4 mapping parameter: Application object 2	- (Read only)	EtherCAT	U32	1	XH	-
0x1A03:003	TPDO4 mapping parameter: Application object 3	- (Read only)	EtherCAT	U32	1	XH	-
0x1A05:001	TPDO6 mapping parameter: Application object 1	- (Read only)	EtherCAT	U32	1	XH	-
0x1A05:002	TPDO6 mapping parameter: Application object 2	- (Read only)	EtherCAT	U32	1	XH	-
0x1A05:003	TPDO6 mapping parameter: Application object 3	- (Read only)	EtherCAT	U32	1	XH	-

* Default setting depending on the size. Firmware version 05.00.00.00



Address	Designation	Default setting	Category	Data type	Factor	A	M
0x1A05:004	TPDO6 mapping parameter: Application object 4	- (Read only)	EtherCAT	U32	1	XH	-
0x1A05:005	TPDO6 mapping parameter: Application object 5	- (Read only)	EtherCAT	U32	1	XH	-
0x1A05:006	TPDO6 mapping parameter: Application object 6	- (Read only)	EtherCAT	U32	1	XH	-
0x1A05:007	TPDO6 mapping parameter: Application object 7	- (Read only)	EtherCAT	U32	1	XH	-
0x1A05:008	TPDO6 mapping parameter: Application object 8	- (Read only)	EtherCAT	U32	1	XH	-
0x1A05:009	TPDO6 mapping parameter: Application object 9	- (Read only)	EtherCAT	U32	1	XH	-
0x1A05:010	TPDO6 mapping parameter: Application object 10	- (Read only)	EtherCAT	U32	1	XH	-
0x1A05:011	TPDO6 mapping parameter: Application object 11	- (Read only)	EtherCAT	U32	1	XH	-
0x1A05:012	TPDO6 mapping parameter: Application object 12	- (Read only)	EtherCAT	U32	1	XH	-
0x1A05:013	TPDO6 mapping parameter: Application object 13	- (Read only)	EtherCAT	U32	1	XH	-
0x1A05:014	TPDO6 mapping parameter: Application object 14	- (Read only)	EtherCAT	U32	1	XH	-
0x1A05:015	TPDO6 mapping parameter: Application object 15	- (Read only)	EtherCAT	U32	1	XH	-
0x1A05:016	TPDO6 mapping parameter: Application object 16	- (Read only)	EtherCAT	U32	1	XH	-
0x1C00:001	Sync Manager communication type: SM1 communication type	- (Read only)	EtherCAT	U8	1	X	-
0x1C00:002	Sync Manager communication type: SM2 communication type	- (Read only)	EtherCAT	U8	1	X	-
0x1C00:003	Sync Manager communication type: SM3 communication type	- (Read only)	EtherCAT	U8	1	X	-
0x1C00:004	Sync Manager communication type: SM4 communication type	- (Read only)	EtherCAT	U8	1	X	-
0x1C0A:001	DLL_CNCollision_REC: CumulativeCnt_U32	- (Read only)	POWERLINK	U32	1	X	-
0x1C0B:001	DLL_CNLossSoC_REC: CumulativeCnt_U32	- (Read only)	POWERLINK	U32	1	X	-
0x1C0B:002	DLL_CNLossSoC_REC: ThresholdCnt_U32	- (Read only)	POWERLINK	U32	1	X	-
0x1C0B:003	DLL_CNLossSoC_REC: Threshold_U32	**0**	POWERLINK	U32	1	X	-
0x1C0F:001	DLL_CNCRCError_REC: CumulativeCnt_U32	- (Read only)	POWERLINK	U32	1	X	-
0x1C0F:002	DLL_CNCRCError_REC: ThresholdCnt_U32	- (Read only)	POWERLINK	U32	1	X	-
0x1C0F:003	DLL_CNCRCError_REC: Threshold_U32	**0**	POWERLINK	U32	1	X	-
0x1C10	DLL_CNLossOfLinkCum_U32	- (Read only)	POWERLINK	U32	1	X	-
0x1C12:000	Number of assigned PDOs	- (Read only)	EtherCAT	U8	1	X	-
0x1C12:001	PDO mapping object index of 1. assigned RPDO	- (Read only)	EtherCAT	U16	1	XH	-
0x1C12:002	PDO mapping object index of 2. assigned RPDO	- (Read only)	EtherCAT	U16	1	XH	-
0x1C13:000	Number of assigned PDOs	- (Read only)	EtherCAT	U8	1	X	-
0x1C13:001	PDO mapping object index of 1. assigned TPDO	- (Read only)	EtherCAT	U16	1	XH	-
0x1C13:002	PDO mapping object index of 2. assigned TPDO	- (Read only)	EtherCAT	U16	1	XH	-
0x1C32:001	Sync Manager 2: Synchronization type	**Free run [0]**	EtherCAT	U16	1	X	-
0x1C32:002	Sync Manager 2: Cycle time	x ns (Read only)	EtherCAT	U32	1	X	-
0x1C32:003	Sync Manager 2: Shift time	x ns (Read only)	EtherCAT	U32	1	X	-
0x1C32:004	Sync Manager 2: Synchronization types supported	- (Read only)	EtherCAT	U16	1	X	-
0x1C32:005	Sync Manager 2: Minimum cycle time	x ns (Read only)	EtherCAT	U32	1	X	-
0x1C33:001	Sync Manager 3: Synchronization type	**0**	EtherCAT	U16	1	X	-
0x1C33:002	Sync Manager 3: Cycle time	x ns (Read only)	EtherCAT	U32	1	X	-
0x1C33:003	Sync Manager 3: Shift time	x ns (Read only)	EtherCAT	U32	1	X	-
0x1C33:004	Sync Manager 3: Synchronization types supported	- (Read only)	EtherCAT	U16	1	X	-
0x1C33:005	Sync Manager 3: Minimum cycle time	x ns (Read only)	EtherCAT	U32	1	X	-
0x1E40:001	NWL_IpAddrTable_0h_REC: IfIndex_U16	- (Read only)	POWERLINK	U32	1	X	-
0x1E40:002	NWL_IpAddrTable_0h_REC: Addr IPAD	- (Read only)	POWERLINK	U32	1	X	-
0x1E40:003	NWL_IpAddrTable_0h_REC: NetMask_IPAD	- (Read only)	POWERLINK	U32	1	X	-
0x1E40:004	NWL_IpAddrTable_0h_REC: ReasmMaxSize_U16	- (Read only)	POWERLINK	U32	1	X	-
0x1E40:005	NWL_IpAddrTable_0h_REC: DefaultGateway_IPAD	**0**	POWERLINK	U32	1	X	-
0x1E4A:001	NWL_IpGroup_REC: Forwarding_BOOL	- (Read only)	POWERLINK	U8	1	X	-
0x1E4A:002	NWL_IpGroup_REC: DefaultTTL_U16	**64**	POWERLINK	U16	1	X	-
0x1E4A:003	NWL_IpGroup_REC: ForwardingDatagrams_U32	- (Read only)	POWERLINK	U32	1	X	-
0x1F81:001 ... 0x1F81:254	NMT_NodeAssignment: Node assignment 1 ... Node assignment 254	**0**	POWERLINK	U32	1	X	-
* Default setting depending on the size.					Firmware version 05.00.00.00		

Address	Designation	Default setting	Category	Data type	Factor	A	M
0x1F82	NMT_FeatureFlags_U32	- (Read only)	POWERLINK	U32	1	X	-
0x1F83	NMT_EPLVers_U8	- (Read only)	POWERLINK	U8	1	X	-
0x1F8C	NMT_CurrState_U8	- (Read only)	POWERLINK	U8	1	X	-
0x1F8D:001 ... 0x1F8D:254	NMT_MNPResPayloadList: PResPayload 1 ... PResPayload 254	**0**	POWERLINK	U16	1	X	-
0x1F93:001	NMT_EPLNodeID_REC: NodeID_U8	- (Read only)	POWERLINK	U8	1	X	-
0x1F93:002	NMT_EPLNodeID_REC: NodeIDByHW_BOOL	- (Read only)	POWERLINK	U8	1	X	-
0x1F93:003	NMT_EPLNodeID_REC: SWNodeID_U8	**0**	POWERLINK	U8	1	X	-
0x1F98:001	NMT_CycleTiming_REC: IsochrTxMaxPayload_ U16	- (Read only)	POWERLINK	U16	1	X	-
0x1F98:002	NMT_CycleTiming_REC: IsochrRxMaxPayload_ U16	- (Read only)	POWERLINK	U16	1	X	-
0x1F98:003	NMT_CycleTiming_REC: PResMaxLatency_U32	x ns (Read only)	POWERLINK	U32	1	X	-
0x1F98:004	NMT_CycleTiming_REC: PReqActPayload_U16	**0**	POWERLINK	U16	1	X	-
0x1F98:005	NMT_CycleTiming_REC: PResActPayload_U16	**0**	POWERLINK	U16	1	X	-
0x1F98:006	NMT_CycleTiming_REC: ASndMaxLatency_U32	x ns (Read only)	POWERLINK	U32	1	X	-
0x1F98:007	NMT_CycleTiming_REC: MultipleCycleCnt_U8	**0**	POWERLINK	U8	1	X	-
0x1F98:008	NMT_CycleTiming_REC: AsyncMTUSize_U16	**0**	POWERLINK	U16	1	X	-
0x1F98:009	NMT_CycleTiming_REC: Prescaler_U16	**0 ns**	POWERLINK	U16	1	X	-
0x1F99	NMT_CNBasicEthernetTimeout_u32	**0**	POWERLINK	U32	1	X	-
0x1F9A	NMT_HostName_VSTR		POWERLINK	STRING[32]	1	X	-
0x1F9B:001 ... 0x1F9B:100	NMT_MultiplCycleAssign_AU8: NMT_MultiplCycleAssign_AU8 1 ... NMT_MultiplCycleAssign_AU8 100	- (Read only)	POWERLINK	U8	1	X	-
0x1F9E	NMT_ResetCmd_U8	- (Read only)	POWERLINK	U8	1	X	-
0x2000:001 (P190.01)	Device data: Product code	- (Read only)	general	STRING[18]	1	-	-
0x2000:002 (P190.02)	Device data: Serial number	- (Read only)	general	STRING[50]	1	-	-
0x2000:004 (P190.04)	Device data: CU firmware version	- (Read only)	general	STRING[50]	1	-	-
0x2000:005 (P190.05)	Device data: CU firmware type	- (Read only)	general	STRING[50]	1	-	-
0x2000:006 (P190.06)	Device data: CU bootloader version	- (Read only)	general	STRING[50]	1	-	-
0x2000:007 (P190.07)	Device data: CU bootloader type	- (Read only)	general	STRING[50]	1	-	-
0x2000:008 (P190.08)	Device data: Object directory version	- (Read only)	general	U32	1	-	-
0x2000:010 (P190.10)	Device data: PU firmware version	- (Read only)	general	STRING[50]	1	-	-
0x2000:011 (P190.11)	Device data: PU firmware type	- (Read only)	general	STRING[50]	1	-	-
0x2000:012 (P190.12)	Device data: PU bootloader version	- (Read only)	general	STRING[50]	1	-	-
0x2000:013 (P190.13)	Device data: PU bootloader type	- (Read only)	general	STRING[50]	1	-	-
0x2000:014 (P190.14)	Device data: Module - firmware version	- (Read only)	general	STRING[11]	1	-	-
0x2000:015 (P190.15)	Device data: Firmware revision number	- (Read only)	general	STRING[50]	1	-	-
0x2000:016 (P190.16)	Device data: Bootloader revision number	- (Read only)	general	STRING[50]	1	-	-
0x2001 (P191.00)	Device name	**My Device**	general	STRING[128]	1	PK	-
0x2002:004 (P192.04)	Device module: CU type code	- (Read only)	general	STRING[19]	1	-	-
0x2002:005 (P192.05)	Device module: PU type code	- (Read only)	general	STRING[19]	1	-	-
* Default setting depending on the size.				Firmware version 05.00.00.00			



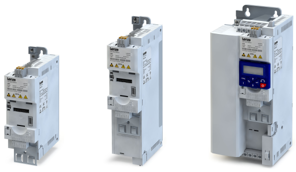
Address	Designation	Default setting	Category	Data type	Factor	A	M
0x2002:006 (P192.06)	Device module: CU serial number	- (Read only)	general	STRING[23]	1	-	-
0x2002:007 (P192.07)	Device module: PU serial number	- (Read only)	general	STRING[23]	1	-	-
0x2006:000 (P155.00)	Error history buffer: Keypad display	- (Read only)	general	U8	1	-	-
0x2006:001	Error history buffer: Maximum number of messages	- (Read only)	general	U8	1	-	-
0x2006:002	Error history buffer: Latest message	- (Read only)	general	U8	1	-	-
0x2006:003	Error history buffer: Latest acknowledgement message	**0**	general	U8	1	-	-
0x2006:004	Error history buffer: New message	- (Read only)	general	U8	1	-	t
0x2006:005	Error history buffer: Buffer overflow	**1**	general	U16	1	-	-
0x2006:006	Error history buffer: Message 0	- (Read only)	general	OCTET[19]	1	-	-
0x2006:007	Error history buffer: Message 1	- (Read only)	general	OCTET[19]	1	-	-
0x2006:008	Error history buffer: Message 2	- (Read only)	general	OCTET[19]	1	-	-
0x2006:009	Error history buffer: Message 3	- (Read only)	general	OCTET[19]	1	-	-
0x2006:010	Error history buffer: Message 4	- (Read only)	general	OCTET[19]	1	-	-
0x2006:011	Error history buffer: Message 5	- (Read only)	general	OCTET[19]	1	-	-
0x2006:012	Error history buffer: Message 6	- (Read only)	general	OCTET[19]	1	-	-
0x2006:013	Error history buffer: Message 7	- (Read only)	general	OCTET[19]	1	-	-
0x2006:014	Error history buffer: Message 8	- (Read only)	general	OCTET[19]	1	-	-
0x2006:015	Error history buffer: Message 9	- (Read only)	general	OCTET[19]	1	-	-
0x2006:016	Error history buffer: Message 10	- (Read only)	general	OCTET[19]	1	-	-
0x2006:017	Error history buffer: Message 11	- (Read only)	general	OCTET[19]	1	-	-
0x2006:018	Error history buffer: Message 12	- (Read only)	general	OCTET[19]	1	-	-
0x2006:019	Error history buffer: Message 13	- (Read only)	general	OCTET[19]	1	-	-
0x2006:020	Error history buffer: Message 14	- (Read only)	general	OCTET[19]	1	-	-
0x2006:021	Error history buffer: Message 15	- (Read only)	general	OCTET[19]	1	-	-
0x2006:022	Error history buffer: Message 16	- (Read only)	general	OCTET[19]	1	-	-
0x2006:023	Error history buffer: Message 17	- (Read only)	general	OCTET[19]	1	-	-
0x2006:024	Error history buffer: Message 18	- (Read only)	general	OCTET[19]	1	-	-
0x2006:025	Error history buffer: Message 19	- (Read only)	general	OCTET[19]	1	-	-
0x2006:026	Error history buffer: Message 20	- (Read only)	general	OCTET[19]	1	-	-
0x2006:027	Error history buffer: Message 21	- (Read only)	general	OCTET[19]	1	-	-
0x2006:028	Error history buffer: Message 22	- (Read only)	general	OCTET[19]	1	-	-
0x2006:029	Error history buffer: Message 23	- (Read only)	general	OCTET[19]	1	-	-
0x2006:030	Error history buffer: Message 24	- (Read only)	general	OCTET[19]	1	-	-
0x2006:031	Error history buffer: Message 25	- (Read only)	general	OCTET[19]	1	-	-
0x2006:032	Error history buffer: Message 26	- (Read only)	general	OCTET[19]	1	-	-
0x2006:033	Error history buffer: Message 27	- (Read only)	general	OCTET[19]	1	-	-
0x2006:034	Error history buffer: Message 28	- (Read only)	general	OCTET[19]	1	-	-
0x2006:035	Error history buffer: Message 29	- (Read only)	general	OCTET[19]	1	-	-
0x2006:036	Error history buffer: Message 30	- (Read only)	general	OCTET[19]	1	-	-
0x2006:037	Error history buffer: Message 31	- (Read only)	general	OCTET[19]	1	-	-
0x2021:001 (P230.01)	Optical tracking: Start detection	**Stop [0]**	general	U8	1	-	-
0x2021:002 (P230.02)	Optical tracking: Blinking duration	**5 s**	general	U16	1	-	-
0x2022:001 (P700.01)	Device commands: Load default settings	**Off / ready [0]**	general	U8	1	C	-
0x2022:003 (P700.03)	Device commands: Save user data	**Off / ready [0]**	general	U8	1	-	-
0x2022:004 (P700.04)	Device commands: Load user data	**Off / ready [0]**	general	U8	1	C	-
0x2022:005 (P700.05)	Device commands: Load OEM data	**Off / ready [0]**	general	U8	1	C	-
* Default setting depending on the size.				Firmware version 05.00.00.00			

Address	Designation	Default setting	Category	Data type	Factor	A	M
0x2022:006 (P700.06)	Device commands: Save OEM data	**Off / ready [0]**	general	U8	1	-	-
0x2022:007 (P700.07)	Device commands: Load parameter set 1	**Off / ready [0]**	general	U8	1	-	-
0x2022:008 (P700.08)	Device commands: Load parameter set 2	**Off / ready [0]**	general	U8	1	-	-
0x2022:009 (P700.09)	Device commands: Load parameter set 3	**Off / ready [0]**	general	U8	1	-	-
0x2022:010 (P700.10)	Device commands: Load parameter set 4	**Off / ready [0]**	general	U8	1	-	-
0x2022:011 (P700.11)	Device commands: Save parameter set 1	**Off / ready [0]**	general	U8	1	-	-
0x2022:012 (P700.12)	Device commands: Save parameter set 2	**Off / ready [0]**	general	U8	1	-	-
0x2022:013 (P700.13)	Device commands: Save parameter set 3	**Off / ready [0]**	general	U8	1	-	-
0x2022:014 (P700.14)	Device commands: Save parameter set 4	**Off / ready [0]**	general	U8	1	-	-
0x2022:015 (P700.15)	Device commands: Delete logbook	**Off / ready [0]**	general	U8	1	C	-
0x2030	CRC parameter set	- (Read only)	general	U32	1	-	-
0x203D (P730.00)	PIN1 access protection	**0**	general	I16	1	-	-
0x203E (P731.00)	PIN2 access protection	**0**	general	I16	1	-	-
0x203F	PIN1/PIN2 log-in	**0**	general	I16	1	-	-
0x2040 (P197.00)	Access protection status	- (Read only)	general	U16	1	-	-
0x2300 (P508.00)	CANopen communication	**No action/no error [0]**	CANopen	U8	1	C	-
0x2301:001 (P510.01)	CANopen settings: Node ID	**1**	CANopen	U8	1	P	-
0x2301:002 (P510.02)	CANopen settings: Baud rate	**500 kbps [5]**	CANopen	U8	1	P	-
0x2301:003 (P510.03)	CANopen settings: Slave/Master	**Slave [0]**	CANopen	U8	1	P	-
0x2301:004 (P510.04)	CANopen settings: Start remote delay	**3000 ms**	CANopen	U16	1	P	-
0x2301:005 (P510.05)	CANopen settings: Activate SDO2 channel	**Not active [0]**	CANopen	U8	1	-	-
0x2301:006 (P510.06)	CANopen settings: COB-ID Configuration	**Base + node-ID [0]**	CANopen	U8	1	P	-
0x2302:001 (P511.01)	Active CANopen settings: Active node ID	- (Read only)	CANopen	U8	1	-	-
0x2302:002 (P511.02)	Active CANopen settings: Active baud rate	- (Read only)	CANopen	U8	1	-	-
0x2303 (P509.00)	CANopen switch position	- (Read only)	CANopen	U16	1	-	-
0x2307 (P515.00)	CANopen time-out status	- (Read only)	CANopen	U32	1	-	-
0x2308 (P516.00)	CANopen status	- (Read only)	CANopen	U16	1	-	-
0x2309 (P517.00)	CANopen controller status	- (Read only)	CANopen	U16	1	-	-
0x230A:000	CANopen statistics: Highest subindex	- (Read only)	CANopen	U8	1	-	-
0x230A:001 (P580.01)	CANopen statistics: PDO1 received	- (Read only)	CANopen	U16	1	-	-
0x230A:002 (P580.02)	CANopen statistics: PDO2 received	- (Read only)	CANopen	U16	1	-	-

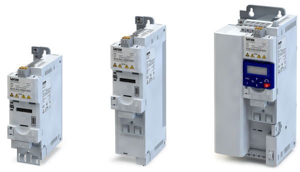
* Default setting depending on the size. Firmware version 05.00.00.00

Address	Designation	Default setting	Category	Data type	Factor	A	M
0x230A:003 (P580.03)	CANopen statistics: PDO3 received	- (Read only)	CANopen	U16	1	-	-
0x230A:005 (P580.05)	CANopen statistics: PDO1 transmitted	- (Read only)	CANopen	U16	1	-	-
0x230A:006 (P580.06)	CANopen statistics: PDO2 transmitted	- (Read only)	CANopen	U16	1	-	-
0x230A:007 (P580.07)	CANopen statistics: PDO3 transmitted	- (Read only)	CANopen	U16	1	-	-
0x230A:009 (P580.09)	CANopen statistics: SDO1 telegrams	- (Read only)	CANopen	U16	1	-	-
0x230A:010 (P580.10)	CANopen statistics: SDO2 telegrams	- (Read only)	CANopen	U16	1	-	-
0x230B (P518.00)	CANopen error counter	- (Read only)	CANopen	U16	1	-	-
0x231F:001 (P500.01)	Module ID: Active module ID	- (Read only)	general	U8	1	P	-
0x231F:002 (P500.02)	Module ID: Module ID connected	- (Read only)	general	U8	1	-	-
0x2320 (P508.00)	Modbus communication	**No action/no error [0]**	Modbus RTU	U8	1	-	-
0x2321:001 (P510.01)	Modbus settings: Node ID	**1**	Modbus RTU	U8	1	P	-
0x2321:002 (P510.02)	Modbus settings: Baud rate	**Automatic [0]**	Modbus RTU	U8	1	P	-
0x2321:003 (P510.03)	Modbus settings: Data format	**Automatic [0]**	Modbus RTU	U8	1	P	-
0x2321:004 (P510.04)	Modbus settings: Minimum response time	**0 ms**	Modbus RTU	U16	1	P	-
0x2322:001 (P511.01)	Active Modbus settings: Active node ID	- (Read only)	Modbus RTU	U8	1	-	-
0x2322:002 (P511.02)	Active Modbus settings: Active baud rate	- (Read only)	Modbus RTU	U8	1	-	-
0x2322:003 (P511.03)	Active Modbus settings: Data format	- (Read only)	Modbus RTU	U8	1	-	-
0x2323 (P509.00)	Modbus switch position	- (Read only)	Modbus RTU	U16	1	-	-
0x232A:001 (P580.01)	Modbus statistics: Messages received	- (Read only)	Modbus RTU	U32	1	-	-
0x232A:002 (P580.02)	Modbus statistics: Valid messages received	- (Read only)	Modbus RTU	U32	1	-	-
0x232A:003 (P580.03)	Modbus statistics: Messages with exceptions	- (Read only)	Modbus RTU	U32	1	-	-
0x232A:004 (P580.04)	Modbus statistics: Messages with errors	- (Read only)	Modbus RTU	U32	1	-	-
0x232A:005 (P580.05)	Modbus statistics: Messages sent	- (Read only)	Modbus RTU	U32	1	-	-
0x232B:001 ... 0x232B:024 (P530.01 ... 24)	Modbus parameter mapping: Parameter 1 ... Parameter 24	**0x00000000**	Modbus RTU	IDX	1	PH	-
0x232C:001 ... 0x232C:024 (P531.01 ... 24)	Modbus register assignment: Register 1 ... Register 24	- (Read only)	Modbus RTU	U16	1	-	-
0x232D (P532.00)	Modbus verification code	- (Read only)	Modbus RTU	U16	1	-	-
0x232E:001 (P583.01)	Modbus diagnostics of last Rx data: Offset	**0**	Modbus RTU	U8	1	-	-
0x232E:002 (P583.02)	Modbus diagnostics of last Rx data: Data byte 0	- (Read only)	Modbus RTU	U8	1	-	-

* Default setting depending on the size. Firmware version 05.00.00.00

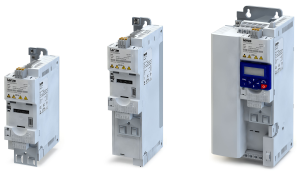


Address	Designation	Default setting	Category	Data type	Factor	A	M
0x232E:003 (P583.03)	Modbus diagnostics of last Rx data: Data byte 1	- (Read only)	Modbus RTU	U8	1	-	-
0x232E:004 (P583.04)	Modbus diagnostics of last Rx data: Data byte 2	- (Read only)	Modbus RTU	U8	1	-	-
0x232E:005 (P583.05)	Modbus diagnostics of last Rx data: Data byte 3	- (Read only)	Modbus RTU	U8	1	-	-
0x232E:006 (P583.06)	Modbus diagnostics of last Rx data: Data byte 4	- (Read only)	Modbus RTU	U8	1	-	-
0x232E:007 (P583.07)	Modbus diagnostics of last Rx data: Data byte 5	- (Read only)	Modbus RTU	U8	1	-	-
0x232E:008 (P583.08)	Modbus diagnostics of last Rx data: Data byte 6	- (Read only)	Modbus RTU	U8	1	-	-
0x232E:009 (P583.09)	Modbus diagnostics of last Rx data: Data byte 7	- (Read only)	Modbus RTU	U8	1	-	-
0x232E:010 (P583.10)	Modbus diagnostics of last Rx data: Data byte 8	- (Read only)	Modbus RTU	U8	1	-	-
0x232E:011 (P583.11)	Modbus diagnostics of last Rx data: Data byte 9	- (Read only)	Modbus RTU	U8	1	-	-
0x232E:012 (P583.12)	Modbus diagnostics of last Rx data: Data byte 10	- (Read only)	Modbus RTU	U8	1	-	-
0x232E:013 (P583.13)	Modbus diagnostics of last Rx data: Data byte 11	- (Read only)	Modbus RTU	U8	1	-	-
0x232E:014 (P583.14)	Modbus diagnostics of last Rx data: Data byte 12	- (Read only)	Modbus RTU	U8	1	-	-
0x232E:015 (P583.15)	Modbus diagnostics of last Rx data: Data byte 13	- (Read only)	Modbus RTU	U8	1	-	-
0x232E:016 (P583.16)	Modbus diagnostics of last Rx data: Data byte 14	- (Read only)	Modbus RTU	U8	1	-	-
0x232E:017 (P583.17)	Modbus diagnostics of last Rx data: Data byte 15	- (Read only)	Modbus RTU	U8	1	-	-
0x232F:001 (P585.01)	Modbus diagnostics of last Tx data: Offset	**0**	Modbus RTU	U8	1	-	-
0x232F:002 (P585.02)	Modbus diagnostics of last Tx data: Data byte 0	- (Read only)	Modbus RTU	U8	1	-	-
0x232F:003 (P585.03)	Modbus diagnostics of last Tx data: Data byte 1	- (Read only)	Modbus RTU	U8	1	-	-
0x232F:004 (P585.04)	Modbus diagnostics of last Tx data: Data byte 2	- (Read only)	Modbus RTU	U8	1	-	-
0x232F:005 (P585.05)	Modbus diagnostics of last Tx data: Data byte 3	- (Read only)	Modbus RTU	U8	1	-	-
0x232F:006 (P585.06)	Modbus diagnostics of last Tx data: Data byte 4	- (Read only)	Modbus RTU	U8	1	-	-
0x232F:007 (P585.07)	Modbus diagnostics of last Tx data: Data byte 5	- (Read only)	Modbus RTU	U8	1	-	-
0x232F:008 (P585.08)	Modbus diagnostics of last Tx data: Data byte 6	- (Read only)	Modbus RTU	U8	1	-	-
0x232F:009 (P585.09)	Modbus diagnostics of last Tx data: Data byte 7	- (Read only)	Modbus RTU	U8	1	-	-
0x232F:010 (P585.10)	Modbus diagnostics of last Tx data: Data byte 8	- (Read only)	Modbus RTU	U8	1	-	-
0x232F:011 (P585.11)	Modbus diagnostics of last Tx data: Data byte 9	- (Read only)	Modbus RTU	U8	1	-	-
0x232F:012 (P585.12)	Modbus diagnostics of last Tx data: Data byte 10	- (Read only)	Modbus RTU	U8	1	-	-
0x232F:013 (P585.13)	Modbus diagnostics of last Tx data: Data byte 11	- (Read only)	Modbus RTU	U8	1	-	-
0x232F:014 (P585.14)	Modbus diagnostics of last Tx data: Data byte 12	- (Read only)	Modbus RTU	U8	1	-	-
* Default setting depending on the size.					Firmware version 05.00.00.00		



Address	Designation	Default setting	Category	Data type	Factor	A	M
0x232F:015 (P585.15)	Modbus diagnostics of last Tx data: Data byte 13	- (Read only)	Modbus RTU	U8	1	-	-
0x232F:016 (P585.16)	Modbus diagnostics of last Tx data: Data byte 14	- (Read only)	Modbus RTU	U8	1	-	-
0x232F:017 (P585.17)	Modbus diagnostics of last Tx data: Data byte 15	- (Read only)	Modbus RTU	U8	1	-	-
0x2340	PROFIBUS communication	**No action/no error [0]**	PROFIBUS	U8	1	-	-
0x2341:001 (P510.01)	PROFIBUS settings: Station address	**3**	PROFIBUS	U8	1	P	-
0x2342:001 (P511.01)	Active PROFIBUS settings: Active station address	- (Read only)	PROFIBUS	U8	1	-	-
0x2342:002 (P511.02)	Active PROFIBUS settings: Active baud rate	- (Read only)	PROFIBUS	U8	1	-	-
0x2342:003 (P511.03)	Active PROFIBUS settings: Watchdog time	- (Read only)	PROFIBUS	U16	1	-	-
0x2343 (P509.00)	PROFIBUS switch position	- (Read only)	PROFIBUS	U16	1	-	-
0x2344:001 (P512.01)	PROFIBUS Configuration: Extended diagnostic bit	**Delete [0]**	PROFIBUS	U8	1	P	-
0x2348:001 (P516.01)	PROFIBUS Status: Bus status	- (Read only)	PROFIBUS	U8	1	-	-
0x2348:002 (P516.02)	PROFIBUS Status: Watchdog status	- (Read only)	PROFIBUS	U8	1	-	-
0x2349 (P517.00)	PROFIBUS error	- (Read only)	PROFIBUS	U32	1	-	-
0x234A:001 (P580.01)	PROFIBUS statistics: Data cycles per second	- (Read only)	PROFIBUS	U32	1	-	-
0x234A:002 (P580.02)	PROFIBUS statistics: Parameterization events	- (Read only)	PROFIBUS	U32	1	-	-
0x234A:003 (P580.03)	PROFIBUS statistics: Configuration events	- (Read only)	PROFIBUS	U32	1	-	-
0x234A:004 (P580.04)	PROFIBUS statistics: Diagnostics events	- (Read only)	PROFIBUS	U32	1	-	-
0x234A:005 (P580.05)	PROFIBUS statistics: C1 messages	- (Read only)	PROFIBUS	U32	1	-	-
0x234A:006 (P580.06)	PROFIBUS statistics: C2 messages	- (Read only)	PROFIBUS	U32	1	-	-
0x234A:007 (P580.07)	PROFIBUS statistics: Watchdog events	- (Read only)	PROFIBUS	U32	1	-	-
0x234A:008 (P580.08)	PROFIBUS statistics: Data exchange aborts	- (Read only)	PROFIBUS	U32	1	-	-
0x234A:009 (P580.09)	PROFIBUS statistics: Total data cycles	- (Read only)	PROFIBUS	U32	1	-	-
0x2360 (P508.00)	EtherCAT communication	**No action/no error [0]**	EtherCAT	U8	1	-	-
0x2361:004 (P510.04)	EtherCAT settings: Device identifier	**0**	EtherCAT	U16	1	P	-
0x2362:004 (P511.04)	Active EtherCAT settings: Device identifier	- (Read only)	EtherCAT	U16	1	-	-
0x2362:006 (P511.06)	Active EtherCAT settings: Station address	- (Read only)	EtherCAT	U16	1	-	-
0x2362:007 (P511.07)	Active EtherCAT settings: Tx length	- (Read only)	EtherCAT	U16	1	-	-
0x2362:008 (P511.08)	Active EtherCAT settings: Rx length	- (Read only)	EtherCAT	U16	1	-	-
0x2363 (P509.00)	EtherCAT switch position	- (Read only)	EtherCAT	U16	1	-	-
0x2368 (P516.00)	EtherCAT status	- (Read only)	EtherCAT	U16	1	-	-

* Default setting depending on the size. Firmware version 05.00.00.00

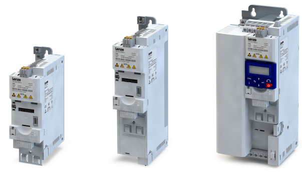


Address	Designation	Default setting	Category	Data type	Factor	A	M
0x2369 (P517.00)	EtherCAT error	- (Read only)	EtherCAT	U16	1	-	-
0x2380 (P508.00)	PROFINET communication	**No action/no error [0]**	PROFINET	U8	1	-	-
0x2381:001 (P510.01)	PROFINET settings: IP address	**0**	PROFINET	U32	1	PE	-
0x2381:002 (P510.02)	PROFINET settings: Subnet	**0**	PROFINET	U32	1	PE	-
0x2381:003 (P510.03)	PROFINET settings: Gateway	**0**	PROFINET	U32	1	PE	-
0x2381:004 (P510.04)	PROFINET settings: Station name		PROFINET	STRING[240]	1	P	-
0x2381:005	PROFINET settings: I&M1 System designation		PROFINET	STRING[32]	1	P	-
0x2381:006	PROFINET settings: I&M1 Installation site		PROFINET	STRING[22]	1	P	-
0x2381:007	PROFINET settings: I&M2 Installation date		PROFINET	STRING[16]	1	P	-
0x2381:008	PROFINET settings: I&M3 additional information		PROFINET	STRING[54]	1	P	-
0x2381:009	PROFINET settings: I&M4 signature code		PROFINET	OCTET[54]	1	P	-
0x2382:001 (P511.01)	Active PROFINET settings: IP address	- (Read only)	PROFINET	U32	1	E	-
0x2382:002 (P511.02)	Active PROFINET settings: Subnet	- (Read only)	PROFINET	U32	1	E	-
0x2382:003 (P511.03)	Active PROFINET settings: Gateway	- (Read only)	PROFINET	U32	1	E	-
0x2382:004 (P511.04)	Active PROFINET settings: Station name	- (Read only)	PROFINET	STRING[240]	1	-	-
0x2382:005 (P511.05)	Active PROFINET settings: MAC Address	- (Read only)	PROFINET	OCTET[6]	1	-	-
0x2388 (P516.00)	PROFINET status	- (Read only)	PROFINET	U16	1	-	-
0x2389:001 (P517.01)	PROFINET error: Error 1	- (Read only)	PROFINET	U16	1	-	-
0x2389:002 (P517.02)	PROFINET error: Error 2	- (Read only)	PROFINET	U16	1	-	-
0x23A0 (P508.00)	EtherNet/IP communication	**No action/no error [0]**	EtherNet/IP	U8	1	-	-
0x23A1:001 (P510.01)	EtherNet/IP settings: IP address	**276605120**	EtherNet/IP	U32	1	PE	-
0x23A1:002 (P510.02)	EtherNet/IP settings: Subnet	**16777215**	EtherNet/IP	U32	1	PE	-
0x23A1:003 (P510.03)	EtherNet/IP settings: Gateway	**0**	EtherNet/IP	U32	1	PE	-
0x23A1:004 (P510.04)	EtherNet/IP settings: Host name		EtherNet/IP	STRING[64]	1	P	-
0x23A1:005 (P510.05)	EtherNet/IP settings: IP configuration	**BOOTP [1]**	EtherNet/IP	U8	1	P	-
0x23A1:006 (P510.06)	EtherNet/IP settings: Multicast TTL	**1**	EtherNet/IP	U8	1	P	-
0x23A1:007 (P510.07)	EtherNet/IP settings: Multicast allocation	**Default allocation [0]**	EtherNet/IP	U8	1	P	-
0x23A1:008 (P510.08)	EtherNet/IP settings: Multicast IP address	**3221373167**	EtherNet/IP	U32	1	PE	-
0x23A1:009 (P510.09)	EtherNet/IP settings: Multicast number	**1**	EtherNet/IP	U8	1	P	-
0x23A1:010 (P510.10)	EtherNet/IP settings: Timeout	**10000 ms**	EtherNet/IP	U16	1	P	-
0x23A2:001 (P511.01)	Active EtherNet/IP settings: IP address	- (Read only)	EtherNet/IP	U32	1	E	-
0x23A2:002 (P511.02)	Active EtherNet/IP settings: Subnet	- (Read only)	EtherNet/IP	U32	1	E	-

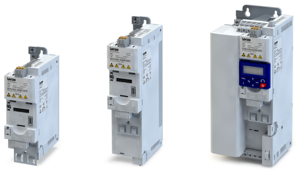
* Default setting depending on the size. Firmware version 05.00.00.00

Address	Designation	Default setting	Category	Data type	Factor	A	M
0x23A2:003 (P511.03)	Active EtherNet/IP settings: Gateway	- (Read only)	EtherNet/IP	U32	1	E	-
0x23A2:005 (P511.05)	Active EtherNet/IP settings: MAC address	- (Read only)	EtherNet/IP	OCTET[6]	1	-	-
0x23A2:006 (P511.06)	Active EtherNet/IP settings: Multicast address	- (Read only)	EtherNet/IP	U32	1	E	-
0x23A3 (P509.00)	EtherNet/IP switch position	- (Read only)	EtherNet/IP	U8	1	-	-
0x23A4:001 (P512.01)	Port settings: Port 1	**Auto-Negotiation [0]**	EtherNet/IP	U16	1	P	-
0x23A4:002 (P512.02)	Port settings: Port 2	**Auto-Negotiation [0]**	EtherNet/IP	U16	1	P	-
0x23A5:001 (P519.01)	Active port settings: Port 1	- (Read only)	EtherNet/IP	U16	1	-	-
0x23A5:002 (P519.02)	Active port settings: Port 2	- (Read only)	EtherNet/IP	U16	1	-	-
0x23A6 (P513.00)	Quality of service	- (Read only)	EtherNet/IP	U8	1	-	-
0x23A7 (P514.00)	Address conflict detection	**Enabled [1]**	EtherNet/IP	U8	1	P	-
0x23A8 (P516.00)	CIP module status	- (Read only)	EtherNet/IP	U16	1	-	-
0x23A9 (P517.00)	EtherNet/IP status	- (Read only)	EtherNet/IP	U16	1	-	-
0x23B0 (P508.00)	Modbus TCP communication	**No action/no error [0]**	Modbus TCP	U8	1	-	-
0x23B1:001 (P510.01)	Modbus -TCP/IP settings: IP address	**276605120**	Modbus TCP	U32	1	PE	-
0x23B1:002 (P510.02)	Modbus -TCP/IP settings: Subnet	**16777215**	Modbus TCP	U32	1	PE	-
0x23B1:003 (P510.03)	Modbus -TCP/IP settings: Gateway	**0**	Modbus TCP	U32	1	PE	-
0x23B1:005 (P510.05)	Modbus -TCP/IP settings: IP configuration	**Stored IP [0]**	Modbus TCP	U8	1	P	-
0x23B1:006 (P510.06)	Modbus -TCP/IP settings: Time-to-live value (TTL)	**32**	Modbus TCP	U8	1	P	-
0x23B1:010 (P510.10)	Modbus -TCP/IP settings: Ethernet time-out	**10 s**	Modbus TCP	U16	1	P	-
0x23B1:011 (P510.11)	Modbus -TCP/IP settings: Secondary port	**502**	Modbus TCP	U16	1	P	-
0x23B2:001 (P511.01)	Active Modbus TCP settings: Active IP address	- (Read only)	Modbus TCP	U32	1	E	-
0x23B2:002 (P511.02)	Active Modbus TCP settings: Active subnet	- (Read only)	Modbus TCP	U32	1	E	-
0x23B2:003 (P511.03)	Active Modbus TCP settings: Active gateway	- (Read only)	Modbus TCP	U32	1	E	-
0x23B2:005 (P511.05)	Active Modbus TCP settings: MAC address	- (Read only)	Modbus TCP	OCTET[6]	1	-	-
0x23B3 (P509.00)	Switch position	- (Read only)	Modbus TCP	U8	1	-	-
0x23B4:001 (P512.01)	Port settings: Port 1	**Auto-Negotiation [0]**	Modbus TCP	U16	1	P	-
0x23B4:002 (P512.02)	Port settings: Port 2	**Auto-Negotiation [0]**	Modbus TCP	U16	1	P	-
0x23B5:001 (P513.01)	Active port settings: Port 1	- (Read only)	Modbus TCP	U16	1	-	-
0x23B5:002 (P513.02)	Active port settings: Port 2	- (Read only)	Modbus TCP	U16	1	-	-
* Default setting depending on the size.					Firmware version 05.00.00.00		

Address	Designation	Default setting	Category	Data type	Factor	A	M
0x23B6:001 (P514.01)	Time-out monitoring: Time-out time	**2.0 s**	Modbus TCP	U16	10	P	-
0x23B6:002 (P514.02)	Time-out monitoring: Keep alive time-out time	**2.0 s**	Modbus TCP	U16	10	P	-
0x23B6:005 (P514.05)	Time-out monitoring: Keep alive register	**0**	Modbus TCP	U16	1	K	r
0x23B8 (P516.00)	Modbus TCP module status	- (Read only)	Modbus TCP	U16	1	-	-
0x23B9 (P517.00)	Modbus TCP/IP network status	- (Read only)	Modbus TCP	U16	1	-	-
0x23BA:001 (P580.01)	Modbus TCP statistics: Messages received	- (Read only)	Modbus TCP	U32	1	-	-
0x23BA:002 (P580.02)	Modbus TCP statistics: Valid messages received	- (Read only)	Modbus TCP	U32	1	-	-
0x23BA:003 (P580.03)	Modbus TCP statistics: Messages with exceptions	- (Read only)	Modbus TCP	U32	1	-	-
0x23BA:005 (P580.05)	Modbus TCP statistics: Messages sent	- (Read only)	Modbus TCP	U32	1	-	-
0x23BB:001 ... 0x23BB:024 (P530.01 ... 24)	Modbus TCP/IP parameter mapping: Parameter 1 ... Parameter 24	**0x00000000**	Modbus TCP	IDX	1	PH	-
0x23BC:001 ... 0x23BC:024 (P531.01 ... 24)	Register assignment: Register 1 ... Register 24	- (Read only)	Modbus TCP	U16	1	-	-
0x23BD (P532.00)	Verification code	- (Read only)	Modbus TCP	U16	1	-	-
0x23BE:001 (P585.01)	Modbus TCP/IP diagnostics of last Rx/Tx data: Receive offset	**0**	Modbus TCP	U8	1	-	-
0x23BE:002 (P585.02)	Modbus TCP/IP diagnostics of last Rx/Tx data: Last Rx message	- (Read only)	Modbus TCP	OCTET[64]	1	-	-
0x23BE:003 (P585.03)	Modbus TCP/IP diagnostics of last Rx/Tx data: Transmit offset	**0**	Modbus TCP	U8	1	-	-
0x23BE:004 (P585.04)	Modbus TCP/IP diagnostics of last Rx/Tx data: Last Tx message	- (Read only)	Modbus TCP	OCTET[64]	1	-	-
0x23C0	POWERLINK communication	**No action/no error [0]**	POWERLINK	U8	1	-	-
0x23C1:004	POWERLINK settings: Node ID	**0**	POWERLINK	U8	1	-	-
0x23C2:001	Active POWERLINK settings: IP address	- (Read only)	POWERLINK	U32	1	E	-
0x23C2:002	Active POWERLINK settings: Subnet	- (Read only)	POWERLINK	U32	1	E	-
0x23C2:003	Active POWERLINK settings: Gateway	- (Read only)	POWERLINK	U32	1	E	-
0x23C2:004	Active POWERLINK settings: Node ID	- (Read only)	POWERLINK	U8	1	-	-
0x23C2:005	Active POWERLINK settings: MAC Address	- (Read only)	POWERLINK	OCTET[6]	1	-	-
0x23C2:007	Active POWERLINK settings: Tx length	- (Read only)	POWERLINK	U16	1	-	-
0x23C2:008	Active POWERLINK settings: Rx length	- (Read only)	POWERLINK	U16	1	-	-
0x23C3	POWERLINK switch position	- (Read only)	POWERLINK	U8	1	-	-
0x23C8:001	POWERLINK status: Network management	- (Read only)	POWERLINK	U16	1	-	-
0x23C9:001	POWERLINK error: Error	- (Read only)	POWERLINK	U16	1	-	-
0x2440	Initiate WLAN	**No action/no error [0]**	WLAN	U8	1	-	-
0x2441:001	WLAN settings: IP address	**28485824**	WLAN	U32	1	PE	-
0x2441:002	WLAN settings: Netmask	**16777215**	WLAN	U32	1	PE	-
0x2441:003	WLAN settings: Gateway	**28485824**	WLAN	U32	1	PE	-
0x2441:004	WLAN settings: DHCP	**Enabled [1]**	WLAN	U8	1	P	-
0x2441:005	WLAN settings: DHCP start address	**0**	WLAN	U32	1	PE	-
0x2441:006	WLAN settings: WLAN operation mode	**Access point mode [0]**	WLAN	U8	1	P	-
0x2441:007	WLAN settings: WLAN SSID	**i5**	WLAN	STRING[32]	1	P	-
0x2441:008	WLAN settings: WLAN password	**password**	WLAN	STRING[64]	1	P	-
0x2441:009	WLAN settings: WLAN security	**WPA2 [1]**	WLAN	U8	1	P	-
0x2441:010	WLAN settings: WLAN access	**Enabled (WLAN on) [1]**	WLAN	U8	1	P	-
* Default setting depending on the size.				Firmware version 05.00.00.00			



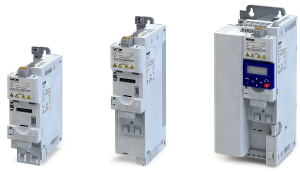
Address	Designation	Default setting	Category	Data type	Factor	A	M
0x2441:011	WLAN settings: WLAN channel	**Channel 1 [1]**	WLAN	U8	1	P	-
0x2441:012	WLAN settings: WLAN SSID broadcast	**Activated [0]**	WLAN	U8	1	P	-
0x2442:001	Active WLAN settings: Active IP address	- (Read only)	WLAN	U32	1	E	-
0x2442:002	Active WLAN settings: Active netmask	- (Read only)	WLAN	U32	1	E	-
0x2442:003	Active WLAN settings: Active gateway	- (Read only)	WLAN	U32	1	E	-
0x2442:004	Active WLAN settings: Active module mode	- (Read only)	WLAN	U8	1	-	-
0x2442:005	Active WLAN settings: MAC address	- (Read only)	WLAN	OCTET[6]	1	-	-
0x2448:001	WLAN status: Connection time	- (Read only)	WLAN	U32	1	-	-
0x2448:002	WLAN status: Number of connections	- (Read only)	WLAN	U16	1	-	-
0x2448:003	WLAN status: Rx frame counter	- (Read only)	WLAN	U16	1	-	-
0x2448:004	WLAN status: Error statistics	- (Read only)	WLAN	U16	1	-	-
0x2449	WLAN error	- (Read only)	WLAN	U16	1	-	-
0x24E0:000	Generic RPDO mapping: Highest subindex	**2**	Mapping	U8	1	PI	-
0x24E0:001	Generic RPDO mapping: Entry 1	**0x60400010**	Mapping	U32	1	PH	-
0x24E0:002	Generic RPDO mapping: Entry 2	**0x60420010**	Mapping	U32	1	PH	-
0x24E0:003	Generic RPDO mapping: Entry 3	**0x00000000**	Mapping	U32	1	PH	-
0x24E0:004	Generic RPDO mapping: Entry 4	**0x00000000**	Mapping	U32	1	PH	-
0x24E0:005	Generic RPDO mapping: Entry 5	**0x00000000**	Mapping	U32	1	PH	-
0x24E0:006	Generic RPDO mapping: Entry 6	**0x00000000**	Mapping	U32	1	PH	-
0x24E0:007	Generic RPDO mapping: Entry 7	**0x00000000**	Mapping	U32	1	PH	-
0x24E0:008	Generic RPDO mapping: Entry 8	**0x00000000**	Mapping	U32	1	PH	-
0x24E0:009	Generic RPDO mapping: Entry 9	**0x00000000**	Mapping	U32	1	PH	-
0x24E0:010	Generic RPDO mapping: Entry 10	**0x00000000**	Mapping	U32	1	PH	-
0x24E0:011	Generic RPDO mapping: Entry 11	**0x00000000**	Mapping	U32	1	PH	-
0x24E0:012	Generic RPDO mapping: Entry 12	**0x00000000**	Mapping	U32	1	PH	-
0x24E0:013	Generic RPDO mapping: Entry 13	**0x00000000**	Mapping	U32	1	PH	-
0x24E0:014	Generic RPDO mapping: Entry 14	**0x00000000**	Mapping	U32	1	PH	-
0x24E0:015	Generic RPDO mapping: Entry 15	**0x00000000**	Mapping	U32	1	PH	-
0x24E0:016	Generic RPDO mapping: Entry 16	**0x00000000**	Mapping	U32	1	PH	-
0x24E1:000	Generic TPDO mapping: Highest subindex	**3**	Mapping	U8	1	PI	-
0x24E1:001	Generic TPDO mapping: Entry 1	**0x60410010**	Mapping	U32	1	PH	-
0x24E1:002	Generic TPDO mapping: Entry 2	**0x60440010**	Mapping	U32	1	PH	-
0x24E1:003	Generic TPDO mapping: Entry 3	**0x603F0010**	Mapping	U32	1	PH	-
0x24E1:004	Generic TPDO mapping: Entry 4	**0x00000000**	Mapping	U32	1	PH	-
0x24E1:005	Generic TPDO mapping: Entry 5	**0x00000000**	Mapping	U32	1	PH	-
0x24E1:006	Generic TPDO mapping: Entry 6	**0x00000000**	Mapping	U32	1	PH	-
0x24E1:007	Generic TPDO mapping: Entry 7	**0x00000000**	Mapping	U32	1	PH	-
0x24E1:008	Generic TPDO mapping: Entry 8	**0x00000000**	Mapping	U32	1	PH	-
0x24E1:009	Generic TPDO mapping: Entry 9	**0x00000000**	Mapping	U32	1	PH	-
0x24E1:010	Generic TPDO mapping: Entry 10	**0x00000000**	Mapping	U32	1	PH	-
0x24E1:011	Generic TPDO mapping: Entry 11	**0x00000000**	Mapping	U32	1	PH	-
0x24E1:012	Generic TPDO mapping: Entry 12	**0x00000000**	Mapping	U32	1	PH	-
0x24E1:013	Generic TPDO mapping: Entry 13	**0x00000000**	Mapping	U32	1	PH	-
0x24E1:014	Generic TPDO mapping: Entry 14	**0x00000000**	Mapping	U32	1	PH	-
0x24E1:015	Generic TPDO mapping: Entry 15	**0x00000000**	Mapping	U32	1	PH	-
0x24E1:016	Generic TPDO mapping: Entry 16	**0x00000000**	Mapping	U32	1	PH	-
0x24E5:001	Process data handling in case of error: Procedure	**Keep last data [0]**	general	U8	1	P	-
0x2540:001 (P208.01)	Mains settings: Rated mains voltage	**230 Veff [0]**	general	U8	1	PC	-
0x2540:002 (P208.02)	Mains settings: Undervoltage warning threshold	**0 V** *	general	U16	1	P	-
0x2540:003 (P208.03)	Mains settings: Undervoltage error threshold	x V (Read only)	general	U16	1	-	-
* Default setting depending on the size.							Firmware version 05.00.00.00



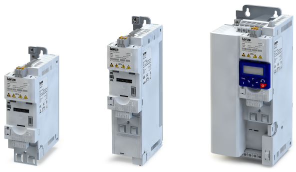
Address	Designation	Default setting	Category	Data type	Factor	A	M
0x2540:004 (P208.04)	Mains settings: Undervoltage reset threshold	x V (Read only)	general	U16	1	-	-
0x2540:005 (P208.05)	Mains settings: Overvoltage warning threshold	**0 V** *	general	U16	1	P	-
0x2540:006 (P208.06)	Mains settings: Overvoltage error threshold	x V (Read only)	general	U16	1	-	-
0x2540:007 (P208.07)	Mains settings: Overvoltage reset threshold	x V (Read only)	general	U16	1	-	-
0x2541:001 (P706.01)	Brake energy management: Operating mode	**Ramp function generator stop (RFGS) [1]**	general	U8	1	P	-
0x2541:002 (P706.02)	Brake energy management: Active threshold	x V (Read only)	general	U16	1	P	-
0x2541:003 (P706.03)	Brake energy management: Reduced threshold	**0 V**	general	U16	1	P	-
0x2541:004 (P706.04)	Brake energy management: Additional frequency	**0.0 Hz**	general	U16	10	P	-
0x2541:005 (P706.05)	Brake energy management: Deceleration override time	**2.0 s**	general	U16	10	P	-
0x2541:006 (P706.06)	Brake energy management: Brake resistor response	**Off: disable and error [0]**	general	U8	1	PC	-
0x2550:002 (P707.02)	Brake resistor: Resistance value	**180.0 Ω** *	general	U16	10	P	-
0x2550:003 (P707.03)	Brake resistor: Rated power	**50 W** *	general	U32	1	P	-
0x2550:004 (P707.04)	Brake resistor: Maximum thermal load	**8.0 kWs** *	general	U32	10	P	-
0x2550:007 (P707.07)	Brake resistor: Thermal load	x.x % (Read only)	general	U16	10	-	-
0x2550:008 (P707.08)	Brake resistor: Warning threshold	**90.0 %**	general	U16	10	P	-
0x2550:009 (P707.09)	Brake resistor: Error threshold	**100.0 %**	general	U16	10	P	-
0x2550:010 (P707.10)	Brake resistor: Response to warning	**Warning [1]**	general	U8	1	P	-
0x2550:011 (P707.11)	Brake resistor: Response to error	**Fault [3]**	general	U8	1	P	-
0x2552:002 (P595.02)	Parameter access monitoring: Keep alive register	**0**	general	U16	1	K	-
0x2552:003 (P595.03)	Parameter access monitoring: Time-out time	**10.0 s**	general	U16	10	P	-
0x2552:004 (P595.04)	Parameter access monitoring: Reaction	**No response [0]**	general	U8	1	P	-
0x2552:005 (P595.05)	Parameter access monitoring: Action	**No action [0]**	general	U8	1	P	-
0x2552:006 (P595.06)	Parameter access monitoring: Parameter Access Monitoring-Status	- (Read only)	general	U16	1	-	-
0x2552:007 (P595.07)	Parameter access monitoring: WLAN reset time-out time	**0 s**	general	U16	1	P	-
0x2601:001 (P202.01)	Keypad setpoints: Frequency setpoint	**20.0 Hz**	general	U16	10	P	r
0x2601:002 (P202.02)	Keypad setpoints: Process controller setpoint	**0.00 PID unit**	general	I16	100	P	r
0x2601:003 (P202.03)	Keypad setpoints: Torque setpoint	**100.0 %**	general	I16	10	P	r
0x2602:001 (P708.01)	Keypad setup: CTRL & F/R key setup	**CTRL & F/R Enable [1]**	general	U8	1	P	-
0x2602:002 (P708.02)	Keypad setup: Select rotational direction	**Forward [0]**	general	U8	1	P	-
* Default setting depending on the size.							Firmware version 05.00.00.00

Address	Designation	Default setting	Category	Data type	Factor	A	M
0x2602:003 (P708.03)	Keypad setup: Keypad Full Control	**Off [0]**	general	U8	1	-	-
0x261C:001 (P740.01)	Favorites settings: Parameter 1	**0x2DDD0000**	general	IDX	1	PH	-
0x261C:002 (P740.02)	Favorites settings: Parameter 2	**0x60780000**	general	IDX	1	PH	-
0x261C:003 (P740.03)	Favorites settings: Parameter 3	**0x2D890000**	general	IDX	1	PH	-
0x261C:004 (P740.04)	Favorites settings: Parameter 4	**0x603F0000**	general	IDX	1	PH	-
0x261C:005 (P740.05)	Favorites settings: Parameter 5	**0x28240000**	general	IDX	1	PH	-
0x261C:006 (P740.06)	Favorites settings: Parameter 6	**0x28600100**	general	IDX	1	PH	-
0x261C:007 (P740.07)	Favorites settings: Parameter 7	**0x28380100**	general	IDX	1	PH	-
0x261C:008 (P740.08)	Favorites settings: Parameter 8	**0x28380300**	general	IDX	1	PH	-
0x261C:009 (P740.09)	Favorites settings: Parameter 9	**0x25400100**	general	IDX	1	PH	-
0x261C:010 (P740.10)	Favorites settings: Parameter 10	**0x29150000**	general	IDX	1	PH	-
0x261C:011 (P740.11)	Favorites settings: Parameter 11	**0x29160000**	general	IDX	1	PH	-
0x261C:012 (P740.12)	Favorites settings: Parameter 12	**0x29170000**	general	IDX	1	PH	-
0x261C:013 (P740.13)	Favorites settings: Parameter 13	**0x29180000**	general	IDX	1	PH	-
0x261C:014 (P740.14)	Favorites settings: Parameter 14	**0x2C000000**	general	IDX	1	PH	-
0x261C:015 (P740.15)	Favorites settings: Parameter 15	**0x2B000000**	general	IDX	1	PH	-
0x261C:016 (P740.16)	Favorites settings: Parameter 16	**0x2B010100**	general	IDX	1	PH	-
0x261C:017 (P740.17)	Favorites settings: Parameter 17	**0x2B010200**	general	IDX	1	PH	-
0x261C:018 (P740.18)	Favorites settings: Parameter 18	**0x283A0000**	general	IDX	1	PH	-
0x261C:019 (P740.19)	Favorites settings: Parameter 19	**0x29390000**	general	IDX	1	PH	-
0x261C:020 (P740.20)	Favorites settings: Parameter 20	**0x2D430100**	general	IDX	1	PH	-
0x261C:021 (P740.21)	Favorites settings: Parameter 21	**0x2D4B0100**	general	IDX	1	PH	-
0x261C:022 (P740.22)	Favorites settings: Parameter 22	**0x2B120100**	general	IDX	1	PH	-
0x261C:023 (P740.23)	Favorites settings: Parameter 23	**0x60750000**	general	IDX	1	PH	-
0x261C:024 (P740.24)	Favorites settings: Parameter 24	**0x60730000**	general	IDX	1	PH	-
0x261C:025 (P740.25)	Favorites settings: Parameter 25	**0x26310100**	general	IDX	1	PH	-
0x261C:026 (P740.26)	Favorites settings: Parameter 26	**0x26310200**	general	IDX	1	PH	-
0x261C:027 (P740.27)	Favorites settings: Parameter 27	**0x26310300**	general	IDX	1	PH	-
0x261C:028 (P740.28)	Favorites settings: Parameter 28	**0x26310400**	general	IDX	1	PH	-
* Default setting depending on the size.				Firmware version 05.00.00.00			

Address	Designation	Default setting	Category	Data type	Factor	A	M
0x261C:029 (P740.29)	Favorites settings: Parameter 29	**0x26310500**	general	IDX	1	PH	-
0x261C:030 (P740.30)	Favorites settings: Parameter 30	**0x26310600**	general	IDX	1	PH	-
0x261C:031 (P740.31)	Favorites settings: Parameter 31	**0x26310700**	general	IDX	1	PH	-
0x261C:032 (P740.32)	Favorites settings: Parameter 32	**0x26310800**	general	IDX	1	PH	-
0x261C:033 (P740.33)	Favorites settings: Parameter 33	**0x26310900**	general	IDX	1	PH	-
0x261C:034 (P740.34)	Favorites settings: Parameter 34	**0x26310D00**	general	IDX	1	PH	-
0x261C:035 (P740.35)	Favorites settings: Parameter 35	**0x26311200**	general	IDX	1	PH	-
0x261C:036 (P740.36)	Favorites settings: Parameter 36	**0x26311300**	general	IDX	1	PH	-
0x261C:037 (P740.37)	Favorites settings: Parameter 37	**0x26311400**	general	IDX	1	PH	-
0x261C:038 (P740.38)	Favorites settings: Parameter 38	**0x26340100**	general	IDX	1	PH	-
0x261C:039 (P740.39)	Favorites settings: Parameter 39	**0x26340200**	general	IDX	1	PH	-
0x261C:040 (P740.40)	Favorites settings: Parameter 40	**0x26360100**	general	IDX	1	PH	-
0x261C:041 (P740.41)	Favorites settings: Parameter 41	**0x26360200**	general	IDX	1	PH	-
0x261C:042 (P740.42)	Favorites settings: Parameter 42	**0x26360300**	general	IDX	1	PH	-
0x261C:043 (P740.43)	Favorites settings: Parameter 43	**0x26390100**	general	IDX	1	PH	-
0x261C:044 (P740.44)	Favorites settings: Parameter 44	**0x26390200**	general	IDX	1	PH	-
0x261C:045 (P740.45)	Favorites settings: Parameter 45	**0x26390300**	general	IDX	1	PH	-
0x261C:046 (P740.46)	Favorites settings: Parameter 46	**0x26390400**	general	IDX	1	PH	-
0x261C:047 (P740.47)	Favorites settings: Parameter 47	**0x29110100**	general	IDX	1	PH	-
0x261C:048 (P740.48)	Favorites settings: Parameter 48	**0x29110200**	general	IDX	1	PH	-
0x261C:049 (P740.49)	Favorites settings: Parameter 49	**0x29110300**	general	IDX	1	PH	-
0x261C:050 (P740.50)	Favorites settings: Parameter 50	**0x29110400**	general	IDX	1	PH	-
0x2630:001 (P410.01)	Settings for digital inputs: Assertion level	**HIGH active [1]**	general	U8	1	P	-
0x2630:002 (P410.02)	Settings for digital inputs: Input function	**Digital input [0]**	general	U8	1	P	-
0x2631:001 (P400.01)	Function list: Enable inverter	**Constant TRUE [1]**	general	U8	1	PC	-
0x2631:002 (P400.02)	Function list: Run	**Digital input 1 [11]**	general	U8	1	PC	-
0x2631:003 (P400.03)	Function list: Activate quick stop	**Not connected [0]**	general	U8	1	PC	-
0x2631:004 (P400.04)	Function list: Reset fault	**Digital input 2 [12]**	general	U8	1	P	-
0x2631:005 (P400.05)	Function list: Activate DC braking	**Not connected [0]**	general	U8	1	P	-
* Default setting depending on the size.							Firmware version 05.00.00.00



Address	Designation	Default setting	Category	Data type	Factor	A	M
0x2631:006 (P400.06)	Function list: Start forward (CW)	**Not connected [0]**	general	U8	1	PC	-
0x2631:007 (P400.07)	Function list: Start reverse (CCW)	**Not connected [0]**	general	U8	1	PC	-
0x2631:008 (P400.08)	Function list: Run forward (CW)	**Not connected [0]**	general	U8	1	PC	-
0x2631:009 (P400.09)	Function list: Run reverse (CCW)	**Not connected [0]**	general	U8	1	PC	-
0x2631:010 (P400.10)	Function list: Jog foward (CW)	**Not connected [0]**	general	U8	1	PC	-
0x2631:011 (P400.11)	Function list: Jog reverse (CCW)	**Not connected [0]**	general	U8	1	PC	-
0x2631:012 (P400.12)	Function list: Activate keypad control	**Not connected [0]**	general	U8	1	P	-
0x2631:013 (P400.13)	Function list: Reverse rotational direction	**Digital input 3 [13]**	general	U8	1	PC	-
0x2631:014 (P400.14)	Function list: Activate AI1 setpoint	**Not connected [0]**	general	U8	1	P	-
0x2631:015 (P400.15)	Function list: Activate AI2 setpoint	**Not connected [0]**	general	U8	1	P	-
0x2631:016 (P400.16)	Function list: Activate keypad setpoint	**Not connected [0]**	general	U8	1	P	-
0x2631:017 (P400.17)	Function list: Activate network setpoint	**Not connected [0]**	general	U8	1	P	-
0x2631:018 (P400.18)	Function list: Activate preset (bit 0)	**Digital input 4 [14]**	general	U8	1	P	-
0x2631:019 (P400.19)	Function list: Activate preset (bit 1)	**Digital input 5 [15]**	general	U8	1	P	-
0x2631:020 (P400.20)	Function list: Activate preset (bit 2)	**Not connected [0]**	general	U8	1	P	-
0x2631:021 (P400.21)	Function list: Activate preset (bit 3)	**Not connected [0]**	general	U8	1	P	-
0x2631:022 (P400.22)	Function list: Activate setpoint via HTL input	**Not connected [0]**	general	U8	1	P	-
0x2631:023 (P400.23)	Function list: MOP setpoint up	**Not connected [0]**	general	U8	1	P	-
0x2631:024 (P400.24)	Function list: MOP setpoint down	**Not connected [0]**	general	U8	1	P	-
0x2631:025 (P400.25)	Function list: Activate MOP setpoint	**Not connected [0]**	general	U8	1	P	-
0x2631:026 (P400.26)	Function list: Activate segment setpoint (bit 0)	**Not connected [0]**	general	U8	1	P	-
0x2631:027 (P400.27)	Function list: Activate segment setpoint (bit 1)	**Not connected [0]**	general	U8	1	P	-
0x2631:028 (P400.28)	Function list: Activate segment setpoint (bit 2)	**Not connected [0]**	general	U8	1	P	-
0x2631:029 (P400.29)	Function list: Activate segment setpoint´(bit 3)	**Not connected [0]**	general	U8	1	P	-
0x2631:030 (P400.30)	Function list: Run/abort sequence	**Not connected [0]**	general	U8	1	PC	-
0x2631:031 (P400.31)	Function list: Start sequence	**Not connected [0]**	general	U8	1	PC	-
0x2631:032 (P400.32)	Function list: Next sequence step	**Not connected [0]**	general	U8	1	PC	-
0x2631:033 (P400.33)	Function list: Pause sequence	**Not connected [0]**	general	U8	1	PC	-
0x2631:034 (P400.34)	Function list: Suspend sequence	**Not connected [0]**	general	U8	1	PC	-
* Default setting depending on the size.							Firmware version 05.00.00.00



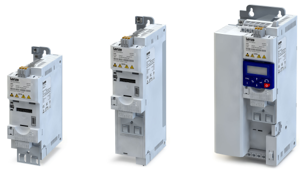
Address	Designation	Default setting	Category	Data type	Factor	A	M
0x2631:035 (P400.35)	Function list: Stop sequence	**Not connected [0]**	general	U8	1	PC	-
0x2631:036 (P400.36)	Function list: Abort sequence	**Not connected [0]**	general	U8	1	PC	-
0x2631:037 (P400.37)	Function list: Activate network control	**Not connected [0]**	general	U8	1	P	-
0x2631:039 (P400.39)	Function list: Activate ramp 2	**Not connected [0]**	general	U8	1	P	-
0x2631:040 (P400.40)	Function list: Load parameter set	**Not connected [0]**	general	U8	1	PC	-
0x2631:041 (P400.41)	Function list: Select parameter set (bit 0)	**Not connected [0]**	general	U8	1	PC	-
0x2631:042 (P400.42)	Function list: Select parameter set (bit 1)	**Not connected [0]**	general	U8	1	PC	-
0x2631:043 (P400.43)	Function list: Activate fault 1	**Not connected [0]**	general	U8	1	P	-
0x2631:044 (P400.44)	Function list: Activate fault 2	**Not connected [0]**	general	U8	1	P	-
0x2631:045 (P400.45)	Function list: Deactivate PID controller	**Not connected [0]**	general	U8	1	P	-
0x2631:046 (P400.46)	Function list: Set process controller output to 0	**Not connected [0]**	general	U8	1	P	-
0x2631:047 (P400.47)	Function list: Inhibit process controller I-component	**Not connected [0]**	general	U8	1	P	-
0x2631:048 (P400.48)	Function list: Activate PID influence ramp	**Constant TRUE [1]**	general	U8	1	P	-
0x2631:049 (P400.49)	Function list: Release holding brake	**Not connected [0]**	general	U8	1	PC	-
0x2631:050 (P400.50)	Function list: Select sequence (bit 0)	**Not connected [0]**	general	U8	1	PC	-
0x2631:051 (P400.51)	Function list: Select sequence (bit 1)	**Not connected [0]**	general	U8	1	PC	-
0x2631:052 (P400.52)	Function list: Select sequence (bit 2)	**Not connected [0]**	general	U8	1	PC	-
0x2631:053 (P400.53)	Function list: Select sequence (bit 3)	**Not connected [0]**	general	U8	1	PC	-
0x2631:054 (P400.54)	Function list: Position counter reset	**Not connected [0]**	general	U8	1	P	-
0x2631:055 (P400.55)	Function list: Activate UPS operation	**Not connected [0]**	general	U8	1	P	-
0x2632:001 (P411.01)	Inversion of digital inputs: Digital input 1	**Not inverted [0]**	general	U8	1	P	-
0x2632:002 (P411.02)	Inversion of digital inputs: Digital input 2	**Not inverted [0]**	general	U8	1	P	-
0x2632:003 (P411.03)	Inversion of digital inputs: Digital input 3	**Not inverted [0]**	general	U8	1	P	-
0x2632:004 (P411.04)	Inversion of digital inputs: Digital input 4	**Not inverted [0]**	general	U8	1	P	-
0x2632:005 (P411.05)	Inversion of digital inputs: Digital input 5	**Not inverted [0]**	general	U8	1	P	-
0x2632:006 (P411.06)	Inversion of digital inputs: Digital input 6	**Not inverted [0]**	Appl. I/O	U8	1	P	-
0x2632:007 (P411.07)	Inversion of digital inputs: Digital input 7	**Not inverted [0]**	Appl. I/O	U8	1	P	-
0x2633:001	Digital input debounce time: Digital input 1	**1 ms**	general	U8	1	P	-
0x2633:002	Digital input debounce time: Digital input 2	**1 ms**	general	U8	1	P	-
0x2633:003	Digital input debounce time: Digital input 3	**1 ms**	general	U8	1	P	-
0x2633:004	Digital input debounce time: Digital input 4	**1 ms**	general	U8	1	P	-
0x2633:005	Digital input debounce time: Digital input 5	**1 ms**	general	U8	1	P	-

* Default setting depending on the size. Firmware version 05.00.00.00

Address	Designation	Default setting	Category	Data type	Factor	A	M
0x2633:006	Digital input debounce time: Digital input 6	**1 ms**	Appl. I/O	U8	1	P	-
0x2633:007	Digital input debounce time: Digital input 7	**1 ms**	Appl. I/O	U8	1	P	-
0x2634:001 (P420.01)	Digital outputs function: Relay	**Ready for operation [51]**	general	U8	1	P	-
0x2634:002 (P420.02)	Digital outputs function: Digital output 1	**Release holding brake [115]**	general	U8	1	P	-
0x2634:003 (P420.03)	Digital outputs function: Digital output 2	**Error active [56]**	Appl. I/O	U8	1	P	-
0x2634:010 (P420.10)	Digital outputs function: NetWordOUT1 - bit 0	**Ready for operation [51]**	general	U8	1	P	-
0x2634:011 (P420.11)	Digital outputs function: NetWordOUT1 - bit 1	**Not connected [0]**	general	U8	1	P	-
0x2634:012 (P420.12)	Digital outputs function: NetWordOUT1 - bit 2	**Operation enabled [52]**	general	U8	1	P	-
0x2634:013 (P420.13)	Digital outputs function: NetWordOUT1 - bit 3	**Error active [56]**	general	U8	1	P	-
0x2634:014 (P420.14)	Digital outputs function: NetWordOUT1 - bit 4	**Not connected [0]**	general	U8	1	P	-
0x2634:015 (P420.15)	Digital outputs function: NetWordOUT1 - bit 5	**Quick stop active [54]**	general	U8	1	P	-
0x2634:016 (P420.16)	Digital outputs function: NetWordOUT1 - bit 6	**Running [50]**	general	U8	1	P	-
0x2634:017 (P420.17)	Digital outputs function: NetWordOUT1 - bit 7	**Device warning active [58]**	general	U8	1	P	-
0x2634:018 (P420.18)	Digital outputs function: NetWordOUT1 - bit 8	**Not connected [0]**	general	U8	1	P	-
0x2634:019 (P420.19)	Digital outputs function: NetWordOUT1 - bit 9	**Not connected [0]**	general	U8	1	P	-
0x2634:020 (P420.20)	Digital outputs function: NetWordOUT1 - bit 10	**Setpoint speed reached [72]**	general	U8	1	P	-
0x2634:021 (P420.21)	Digital outputs function: NetWordOUT1 - bit 11	**Current limit reached [78]**	general	U8	1	P	-
0x2634:022 (P420.22)	Digital outputs function: NetWordOUT1 - bit 12	**Actual speed = 0 [71]**	general	U8	1	P	-
0x2634:023 (P420.23)	Digital outputs function: NetWordOUT1 - bit 13	**Rotational direction reversed [69]**	general	U8	1	P	-
0x2634:024 (P420.24)	Digital outputs function: NetWordOUT1 - bit 14	**Release holding brake [115]**	general	U8	1	P	-
0x2634:025 (P420.25)	Digital outputs function: NetWordOUT1 - bit 15	**Safe torque off (STO) active [55]**	general	U8	1	P	-
0x2635:001 (P421.01)	Inversion of digital outputs: Relay	**Not inverted [0]**	general	U8	1	P	-
0x2635:002 (P421.02)	Inversion of digital outputs: Digital output 1	**Not inverted [0]**	general	U8	1	P	-
0x2635:003 (P421.03)	Inversion of digital outputs: Digital output 2	**Not inverted [0]**	Appl. I/O	U8	1	P	-
0x2635:010	Inversion of digital outputs: NetWordOUT1.00	**Not inverted [0]**	general	U8	1	P	-
0x2635:011	Inversion of digital outputs: NetWordOUT1.01	**Not inverted [0]**	general	U8	1	P	-
0x2635:012	Inversion of digital outputs: NetWordOUT1.02	**Not inverted [0]**	general	U8	1	P	-
0x2635:013	Inversion of digital outputs: NetWordOUT1.03	**Not inverted [0]**	general	U8	1	P	-
0x2635:014	Inversion of digital outputs: NetWordOUT1.04	**Not inverted [0]**	general	U8	1	P	-
0x2635:015	Inversion of digital outputs: NetWordOUT1.05	**Not inverted [0]**	general	U8	1	P	-
0x2635:016	Inversion of digital outputs: NetWordOUT1.06	**Not inverted [0]**	general	U8	1	P	-
0x2635:017	Inversion of digital outputs: NetWordOUT1.07	**Not inverted [0]**	general	U8	1	P	-
0x2635:018	Inversion of digital outputs: NetWordOUT1.08	**Not inverted [0]**	general	U8	1	P	-
0x2635:019	Inversion of digital outputs: NetWordOUT1.09	**Not inverted [0]**	general	U8	1	P	-
0x2635:020	Inversion of digital outputs: NetWordOUT1.10	**Not inverted [0]**	general	U8	1	P	-
0x2635:021	Inversion of digital outputs: NetWordOUT1.11	**Not inverted [0]**	general	U8	1	P	-

* Default setting depending on the size. Firmware version 05.00.00.00

Address	Designation	Default setting	Category	Data type	Factor	A	M
0x2635:022	Inversion of digital outputs: NetWordOUT1.12	**Not inverted [0]**	general	U8	1	P	-
0x2635:023	Inversion of digital outputs: NetWordOUT1.13	**Not inverted [0]**	general	U8	1	P	-
0x2635:024	Inversion of digital outputs: NetWordOUT1.14	**Not inverted [0]**	general	U8	1	P	-
0x2635:025	Inversion of digital outputs: NetWordOUT1.15	**Not inverted [0]**	general	U8	1	P	-
0x2636:001 (P430.01)	Analog input 1: Input range	**0 ... 10 VDC [0]**	general	U8	1	P	-
0x2636:002 (P430.02)	Analog input 1: Min frequency value	**0.0 Hz**	general	I16	10	P	-
0x2636:003 (P430.03)	Analog input 1: Max frequency value	Device for 50-Hz mains: **50.0 Hz** Device for 60-Hz mains: **60.0 Hz**	general	I16	10	P	-
0x2636:004 (P430.04)	Analog input 1: Min PID value	**0.00 PID unit**	general	I16	100	P	-
0x2636:005 (P430.05)	Analog input 1: Max PID value	**100.00 PID unit**	general	I16	100	P	-
0x2636:006 (P430.06)	Analog input 1: Filter time	**10 ms**	general	U16	1	P	-
0x2636:007 (P430.07)	Analog input 1: Dead band	**0.0 %**	general	U16	10	P	-
0x2636:008 (P430.08)	Analog input 1: Monitoring threshold	**0.0 %**	general	I16	10	P	-
0x2636:009 (P430.09)	Analog input 1: Monitoring condition	**Input value < trigger threshold [0]**	general	U8	1	P	-
0x2636:010 (P430.10)	Analog input 1: Error response	**Fault [3]**	general	U8	1	P	-
0x2636:011 (P430.11)	Analog input 1: Min torque value	**0.0 %**	general	I16	10	P	-
0x2636:012 (P430.12)	Analog input 1: Max torque value	**100.0 %**	general	I16	10	P	-
0x2637:001 (P431.01)	Analog input 2: Input range	**0 ... 10 VDC [0]**	general	U8	1	P	-
0x2637:002 (P431.02)	Analog input 2: Min frequency value	**0.0 Hz**	general	I16	10	P	-
0x2637:003 (P431.03)	Analog input 2: Max frequency value	Device for 50-Hz mains: **50.0 Hz** Device for 60-Hz mains: **60.0 Hz**	general	I16	10	P	-
0x2637:004 (P431.04)	Analog input 2: Min PID value	**0.00 PID unit**	general	I16	100	P	-
0x2637:005 (P431.05)	Analog input 2: Max PID value	**100.00 PID unit**	general	I16	100	P	-
0x2637:006 (P431.06)	Analog input 2: Filter time	**10 ms**	general	U16	1	P	-
0x2637:007 (P431.07)	Analog input 2: Dead band	**0.0 %**	general	U16	10	P	-
0x2637:008 (P431.08)	Analog input 2: Monitoring threshold	**0.0 %**	general	I16	10	P	-
0x2637:009 (P431.09)	Analog input 2: Monitoring condition	**Input value < trigger threshold [0]**	general	U8	1	P	-
0x2637:010 (P431.10)	Analog input 2: Error response	**Fault [3]**	general	U8	1	P	-
0x2637:011 (P431.11)	Analog input 2: Min torque value	**0.0 %**	general	I16	10	P	-
0x2637:012 (P431.12)	Analog input 2: Max torque value	**100.0 %**	general	I16	10	P	-
0x2639:001 (P440.01)	Analog output 1: Output range	**0 ... 10 VDC [1]**	general	U8	1	P	-
* Default setting depending on the size.					Firmware version 05.00.00.00		



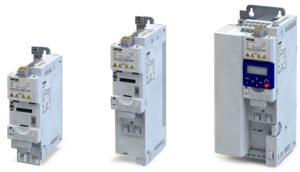
Address	Designation	Default setting	Category	Data type	Factor	A	M
0x2639:002 (P440.02)	Analog output 1: Function	**Output frequency [1]**	general	U8	1	P	-
0x2639:003 (P440.03)	Analog output 1: Min. signal	**0**	general	I32	1	P	-
0x2639:004 (P440.04)	Analog output 1: Max. signal	**1000**	general	I32	1	P	-
0x263A:001 (P441.01)	Analog output 2: Output range	**0 ... 10 VDC [1]**	Appl. I/O	U8	1	P	-
0x263A:002 (P441.02)	Analog output 2: Function	**Motor current [5]**	Appl. I/O	U8	1	P	-
0x263A:003 (P441.03)	Analog output 2: Min. signal	**0**	Appl. I/O	I32	1	P	-
0x263A:004 (P441.04)	Analog output 2: Max. signal	**1000**	Appl. I/O	I32	1	P	-
0x2640:001 (P415.01)	HTL input settings: Minimum frequency	**0.0 Hz**	general	I32	10	P	-
0x2640:002 (P415.02)	HTL input settings: Maximum frequency	**0.0 Hz**	general	I32	10	P	-
0x2640:003 (P415.03)	HTL input settings: Minimum motor frequency	**0.0 Hz**	general	I16	10	P	-
0x2640:004 (P415.04)	HTL input settings: Maximum motor frequency	Device for 50-Hz mains: **50.0 Hz** Device for 60-Hz mains: **60.0 Hz**	general	I16	10	P	-
0x2640:005 (P415.05)	HTL input settings: Minimum PID setpoint	**0.00 PID unit**	general	I16	100	P	-
0x2640:006 (P415.06)	HTL input settings: Maximum PID setpoint	**100.00 PID unit**	general	I16	100	P	-
0x2640:007 (P415.07)	HTL input settings: Minimum torque setpoint	**0.0 %**	general	I16	10	P	-
0x2640:008 (P415.08)	HTL input settings: Maximum torque setpoint	**100.0 %**	general	I16	10	P	-
0x2640:009 (P415.09)	HTL input settings: Filter time constant	**10 ms**	general	U16	1	P	-
0x2641:001 (P416.01)	HTL input monitoring: Minimum frequency threshold	**0.0 Hz**	general	I32	10	P	-
0x2641:002 (P416.02)	HTL input monitoring: Minimum delay threshold	**5.0 s**	general	U16	10	P	-
0x2641:003 (P416.03)	HTL input monitoring: Maximum frequency threshold	**0.0 Hz**	general	I32	10	P	-
0x2641:004 (P416.04)	HTL input monitoring: Maximum delay threshold	**5.0 s**	general	U16	10	P	-
0x2641:005 (P416.05)	HTL input monitoring: Monitoring conditions	**Below minimum frequency [1]**	general	U8	1	P	-
0x2641:006 (P416.06)	HTL input monitoring: Error response	**No response [0]**	general	U8	1	P	-
0x2642:001 (P115.01)	HTL input diagnostics: Input frequency	x.x Hz (Read only)	general	I32	10	-	-
0x2642:002 (P115.02)	HTL input diagnostics: Frequency setpoint	x.x Hz (Read only)	general	I16	10	-	t
0x2642:003 (P115.03)	HTL input diagnostics: PID setpoint	x.xx PID unit (Read only)	general	I16	100	-	t
0x2642:004 (P115.04)	HTL input diagnostics: Torque setpoint	x.x % (Read only)	general	I16	10	-	t
0x2644:001 (P423.01)	DO1 frequency setup: Minimum frequency	**0.0 Hz**	general	I32	10	P	-
0x2644:002 (P423.02)	DO1 frequency setup: Maximum frequency	**10000.0 Hz**	general	I32	10	P	-
* Default setting depending on the size.					Firmware version 05.00.00.00		

Address	Designation	Default setting	Category	Data type	Factor	A	M
0x2644:003 (P423.03)	DO1 frequency setup: Function	**Not connected [0]**	general	U8	1	P	-
0x2644:004 (P423.04)	DO1 frequency setup: Minimum signal	**0**	general	I32	1	P	-
0x2644:005 (P423.05)	DO1 frequency setup: Maximum signal	**1000**	general	I32	1	P	-
0x2645:001 (P424.01)	DO2 frequency setup: Minimum frequency	**0.0 Hz**	general	I32	10	-	
0x2645:002 (P424.02)	DO2 frequency setup: Maximum frequency	**10000.0 Hz**	general	I32	10	-	
0x2645:003 (P424.03)	DO2 frequency setup: Function	**Not connected [0]**	general	U8	1	-	
0x2645:004 (P424.04)	DO2 frequency setup: Minimum signal	**0**	general	I32	1	-	
0x2645:005 (P424.05)	DO2 frequency setup: Maximum signal	**1000**	general	I32	1	-	
0x2646:001 (P114.01)	DO actual frequency: Digital output 1	x.x Hz (Read only)	general	I32	10	-	t
0x2646:002 (P114.02)	DO actual frequency: Digital output 2	x.x Hz (Read only)	general	I32	10	-	t
0x2820:001 (P712.01)	Holding brake control: Brake mode	**Off [2]**	general	U8	1	P	r
0x2820:002 (P712.02)	Holding brake control: Brake closing time	**100 ms**	general	U16	1	P	-
0x2820:003 (P712.03)	Holding brake control: Brake opening time	**100 ms**	general	U16	1	P	-
0x2820:007 (P712.07)	Holding brake control: Brake closing threshold	**0.2 Hz**	general	U16	10	P	-
0x2820:008 (P712.08)	Holding brake control: Brake holding load	**0.0 %**	general	I16	10	P	-
0x2820:012 (P712.12)	Holding brake control: Closing threshold delay	**0 ms**	general	U16	1	P	-
0x2820:013 (P712.13)	Holding brake control: Holding load ramptime	**0 ms**	general	U16	1	P	-
0x2820:015 (P712.15)	Holding brake control: Brake status	- (Read only)	general	U8	1	-	-
0x2822:004 (P327.04)	Axis commands: Identify motor data (energized)	**0**	general	U8	1	-	-
0x2822:005 (P327.05)	Axis commands: Calibrate motor data (non-energized)	**0**	general	U8	1	-	-
0x2822:019	Axis commands: Calculate Imax controller parameter	**0**	general	U8	1	-	-
0x2824 (P200.00)	Control selection	**Flexible I/O configuration [0]**	general	U8	1	P	-
0x2826	Time-out for error response	**6.0 s**	general	U16	10	P	-
0x2827 (P198.00)	Currently loaded parameter settings	- (Read only)	general	U8	1	-	-
0x2829 (P732.00)	Automatic storage in the memory module	**Inhibit [0]**	general	U8	1	P	-
0x282A:001 (P126.01)	Status words: Cause of disable	- (Read only)	general	U32	1	O	-
0x282A:002 (P126.02)	Status words: Cause of quick stop	- (Read only)	general	U16	1	O	-
0x282A:003 (P126.03)	Status words: Cause of stop	- (Read only)	general	U16	1	O	-
0x282A:004	Status words: Extended status word	- (Read only)	general	U16	1	O	t
0x282A:005 (P126.05)	Status words: Device status	- (Read only)	general	U8	1	O	t
* Default setting depending on the size.							Firmware version 05.00.00.00

Address	Designation	Default setting	Category	Data type	Factor	A	M
0x282B:001 (P125.01)	Inverter diagnostics: Active control source	- (Read only)	general	U8	1	O	t
0x282B:002 (P125.02)	Inverter diagnostics: Active setpoint source	- (Read only)	general	U8	1	O	t
0x282B:003 (P125.03)	Inverter diagnostics: Keypad LCD status	- (Read only)	general	U8	1	O	-
0x282B:004 (P125.04)	Inverter diagnostics: Active drive mode	- (Read only)	general	U8	1	O	t
0x282B:005 (P125.05)	Inverter diagnostics: Most recently used control register	- (Read only)	general	U32	1	OH	-
0x282B:006 (P125.06)	Inverter diagnostics: Most recently used setpoint register	- (Read only)	general	U32	1	OH	-
0x282B:007	Inverter diagnostics: Default frequency setpoint	x.x Hz (Read only)	general	I16	10	-	-
0x282B:008	Inverter diagnostics: Preset frequency setpoint	x.x Hz (Read only)	general	I16	10	-	-
0x282B:009	Inverter diagnostics: Actual frequency setpoint	x.x Hz (Read only)	general	I16	10	-	-
0x282B:010	Inverter diagnostics: Default PID setpoint	x.xx PID unit (Read only)	general	I16	100	-	-
0x282B:011	Inverter diagnostics: Preset PID setpoint	x.xx PID unit (Read only)	general	I16	100	-	-
0x282B:012	Inverter diagnostics: Default torque setpoint	x.x % (Read only)	general	I16	10	-	-
0x282B:013	Inverter diagnostics: Preset torque setpoint	x.x % (Read only)	general	I16	10	-	-
0x2831	Inverter status word	- (Read only)	general	U16	1	O	t
0x2833	Inverter status word 2	- (Read only)	general	U16	1	O	t
0x2838:001 (P203.01)	Start/stop configuration: Start method	**Normal [0]**	general	U8	1	PC	-
0x2838:002 (P203.02)	Start/stop configuration: Start at power-up	**Off [0]**	general	U8	1	P	-
0x2838:003 (P203.03)	Start/stop configuration: Stop method	**Standard ramp [1]**	general	U8	1	P	-
0x2839:002 (P760.02)	Fault configuration: Restart delay	**3.0 s**	general	U16	10	P	-
0x2839:003 (P760.03)	Fault configuration: Number of restart attempts	**5**	general	U8	1	P	-
0x2839:004 (P760.04)	Fault configuration: Trouble counter reset time	**40.0 s**	general	U16	10	P	-
0x2839:005 (P760.05)	Fault configuration: Trouble counter	- (Read only)	general	U8	1	-	-
0x2839:006	Fault configuration: Fault handling in case of state change	**Reset fault [0]**	general	U8	1	P	-
0x283A (P304.00)	Limitation of rotation	**Both rotational directions [1]**	general	U8	1	P	-
0x2857:001	CANopen monitoring: RPDO1-Timeout	**Fault [3]**	CANopen	U8	1	P	-
0x2857:002	CANopen monitoring: RPDO2-Timeout	**Fault [3]**	CANopen	U8	1	P	-
0x2857:003	CANopen monitoring: RPDO3-Timeout	**Fault [3]**	CANopen	U8	1	P	-
0x2857:005	CANopen monitoring: Heartbeat-Timeout Consumer 1	**Fault [3]**	CANopen	U8	1	P	-
0x2857:006	CANopen monitoring: Heartbeat-Timeout Consumer 2	**Fault [3]**	CANopen	U8	1	P	-
0x2857:007	CANopen monitoring: Heartbeat-Timeout Consumer 3	**Fault [3]**	CANopen	U8	1	P	-
0x2857:008	CANopen monitoring: Heartbeat-Timeout Consumer 4	**Fault [3]**	CANopen	U8	1	P	-
0x2857:010	CANopen monitoring: "Bus-off" state change	**Trouble [2]**	CANopen	U8	1	P	-
0x2857:011	CANopen monitoring: Warning	**Warning [1]**	CANopen	U8	1	P	-
0x2858:001 (P515.01)	Modbus monitoring: Response to time-out	**Fault [3]**	Modbus RTU	U8	1	P	-
0x2858:002 (P515.02)	Modbus monitoring: Time-out time	**2.0 s**	Modbus RTU	U16	10	P	-
0x2859:001 (P515.01)	PROFIBUS monitoring: Watchdog elapsed	**Trouble [2]**	PROFIBUS	U8	1	P	-
* Default setting depending on the size.				Firmware version 05.00.00.00			

Address	Designation	Default setting	Category	Data type	Factor	A	M
0x2859:001 (P515.01)	EtherNet/IP monitoring: Watchdog elapsed	**Trouble [2]**	EtherNet/IP	U8	1	P	-
0x2859:001 (P515.01)	PROFINET monitoring: Watchdog elapsed	**Trouble [2]**	PROFINET	U8	1	P	-
0x2859:001 (P515.01)	EtherCAT monitoring: Watchdog elapsed	**Trouble [2]**	EtherCAT	U8	1	P	-
0x2859:001	POWERLINK monitoring: Watchdog elapsed	**Trouble [2]**	POWERLINK	U8	1	P	-
0x2859:002 (P515.02)	PROFIBUS monitoring: Data exchange exited	**No response [0]**	PROFIBUS	U8	1	P	-
0x2859:002 (P515.02)	PROFINET monitoring: Data exchange exited	**No response [0]**	PROFINET	U8	1	P	-
0x2859:003 (P515.03)	PROFIBUS monitoring: Invalid configuration	**Trouble [2]**	PROFIBUS	U8	1	P	-
0x2859:003 (P515.03)	EtherNet/IP monitoring: Invalid configuration	**Trouble [2]**	EtherNet/IP	U8	1	P	-
0x2859:003 (P515.03)	Modbus TCP/IP monitoring: Configuration error	**Trouble [2]**	Modbus TCP	U8	1	P	-
0x2859:003 (P515.03)	PROFINET monitoring: Invalid configuration	**Trouble [2]**	PROFINET	U8	1	P	-
0x2859:003 (P515.03)	EtherCAT monitoring: Invalid configuration	**Trouble [2]**	EtherCAT	U8	1	P	-
0x2859:004 (P515.04)	PROFIBUS monitoring: Initialisation error	**Trouble [2]**	PROFIBUS	U8	1	P	-
0x2859:004 (P515.04)	EtherNet/IP monitoring: Initialisation error	**Trouble [2]**	EtherNet/IP	U8	1	P	-
0x2859:004 (P515.04)	Modbus TCP/IP monitoring: Initialisation error	**Trouble [2]**	Modbus TCP	U8	1	P	-
0x2859:004 (P515.04)	PROFINET monitoring: Initialisation error	**Trouble [2]**	PROFINET	U8	1	P	-
0x2859:004 (P515.04)	EtherCAT monitoring: Initialisation error	**Trouble [2]**	EtherCAT	U8	1	P	-
0x2859:005 (P515.05)	PROFIBUS monitoring: Invalid process data	**Trouble [2]**	PROFIBUS	U8	1	P	-
0x2859:005 (P515.05)	EtherNet/IP monitoring: Invalid process data	**Trouble [2]**	EtherNet/IP	U8	1	P	-
0x2859:005 (P515.05)	PROFINET monitoring: Invalid process data	**Trouble [2]**	PROFINET	U8	1	P	-
0x2859:005 (P515.05)	EtherCAT monitoring: Invalid process data	**Trouble [2]**	EtherCAT	U8	1	P	-
0x2859:006 (P515.06)	EtherNet/IP monitoring: Timeout explicit message	**Warning [1]**	EtherNet/IP	U8	1	P	-
0x2859:007 (P515.07)	EtherNet/IP monitoring: Timeout communication	**Warning [1]**	EtherNet/IP	U8	1	P	-
0x2859:007 (P515.07)	Modbus TCP/IP monitoring: Fault reaction by time-out Network	**Warning [1]**	Modbus TCP	U8	1	P	-
0x2859:008 (P515.08)	Modbus TCP/IP monitoring: Fault reaction by time-out Master	**Fault [3]**	Modbus TCP	U8	1	P	-
0x2859:009 (P515.09)	Modbus TCP/IP monitoring: Fault reaction by time-out Keep alive	**Fault [3]**	Modbus TCP	U8	1	P	-
0x2859:010	POWERLINK monitoring: CRC error	**Trouble [2]**	POWERLINK	U8	1	P	-
0x2859:011	POWERLINK monitoring: Loss of SoC	**Trouble [2]**	POWERLINK	U8	1	P	-
0x2860:001 (P201.01)	Frequency control: Default setpoint source	**Analog input 1 [2]**	general	U8	1	P	-
0x2860:002 (P201.02)	PID control: Default setpoint source	**Keypad [1]**	general	U8	1	P	-
0x2860:003 (P201.03)	Torque control: Default setpoint source	**Analog input 1 [2]**	general	U8	1	P	-
0x2862 (P701.00)	Keypad setpoint increment	**1**	general	U16	1	P	-

* Default setting depending on the size. Firmware version 05.00.00.00



Address	Designation	Default setting	Category	Data type	Factor	A	M
0x2863 (P705.00)	Keypad language selection	**English [1]**	general	U8	1	P	-
0x2864 (P703.00)	Keypad status display	**0x00000000**	general	IDX	1	PH	-
0x2900:001 (P332.01)	Speed controller settings: Gain	**0.00193 Nm/rpm** *	MCTRL	U32	100000	P	-
0x2900:002 (P332.02)	Speed controller settings: Reset time	**80.0 ms** *	MCTRL	U16	10	P	-
0x2901	Speed controller gain adaption	**100.00 %**	MCTRL	U16	100	OP	r
0x2904	Actual speed filter time	**2.0 ms**	MCTRL	U16	10	P	-
0x2910:001 (P335.01)	Motor moment of inertia	**3.70 kg cm²** *	MCTRL	U32	100	P	-
0x2910:002 (P335.02)	Load moment of inertia	**3.70 kg cm²** *	MCTRL	U32	100	P	-
0x2910:003	Coupling	**With backlash [2]**	MCTRL	U8	1	P	-
0x2911:001 (P450.01)	Frequency setpoint presets: Preset 1	**20.0 Hz**	general	U16	10	P	-
0x2911:002 (P450.02)	Frequency setpoint presets: Preset 2	**40.0 Hz**	general	U16	10	P	-
0x2911:003 (P450.03)	Frequency setpoint presets: Preset 3	Device for 50-Hz mains: **50.0 Hz** Device for 60-Hz mains: **60.0 Hz**	general	U16	10	P	-
0x2911:004 (P450.04)	Frequency setpoint presets: Preset 4	**0.0 Hz**	general	U16	10	P	-
0x2911:005 (P450.05)	Frequency setpoint presets: Preset 5	**0.0 Hz**	general	U16	10	P	-
0x2911:006 (P450.06)	Frequency setpoint presets: Preset 6	**0.0 Hz**	general	U16	10	P	-
0x2911:007 (P450.07)	Frequency setpoint presets: Preset 7	**0.0 Hz**	general	U16	10	P	-
0x2911:008 (P450.08)	Frequency setpoint presets: Preset 8	**0.0 Hz**	general	U16	10	P	-
0x2911:009 (P450.09)	Frequency setpoint presets: Preset 9	**0.0 Hz**	general	U16	10	P	-
0x2911:010 (P450.10)	Frequency setpoint presets: Preset 10	**0.0 Hz**	general	U16	10	P	-
0x2911:011 (P450.11)	Frequency setpoint presets: Preset 11	**0.0 Hz**	general	U16	10	P	-
0x2911:012 (P450.12)	Frequency setpoint presets: Preset 12	**0.0 Hz**	general	U16	10	P	-
0x2911:013 (P450.13)	Frequency setpoint presets: Preset 13	**0.0 Hz**	general	U16	10	P	-
0x2911:014 (P450.14)	Frequency setpoint presets: Preset 14	**0.0 Hz**	general	U16	10	P	-
0x2911:015 (P450.15)	Frequency setpoint presets: Preset 15	**0.0 Hz**	general	U16	10	P	-
0x2912:001 (P452.01)	Torque setpoint presets: Preset 1	**100.0 %**	general	I16	10	P	-
0x2912:002 (P452.02)	Torque setpoint presets: Preset 2	**100.0 %**	general	I16	10	P	-
0x2912:003 (P452.03)	Torque setpoint presets: Preset 3	**100.0 %**	general	I16	10	P	-
0x2912:004 (P452.04)	Torque setpoint presets: Preset 4	**100.0 %**	general	I16	10	P	-
0x2912:005 (P452.05)	Torque setpoint presets: Preset 5	**100.0 %**	general	I16	10	P	-
0x2912:006 (P452.06)	Torque setpoint presets: Preset 6	**100.0 %**	general	I16	10	P	-

* Default setting depending on the size. Firmware version 05.00.00.00

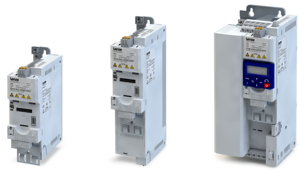
Address	Designation	Default setting	Category	Data type	Factor	A	M
0x2912:007 (P452.07)	Torque setpoint presets: Preset 7	**100.0 %**	general	I16	10	P	-
0x2912:008 (P452.08)	Torque setpoint presets: Preset 8	**100.0 %**	general	I16	10	P	-
0x2915 (P210.00)	Minimum frequency	**0.0 Hz**	general	U16	10	P	-
0x2916 (P211.00)	Maximum frequency	Device for 50-Hz mains: **50.0 Hz** Device for 60-Hz mains: **60.0 Hz**	general	U16	10	P	-
0x2917 (P220.00)	Acceleration time 1	**5.0 s**	general	U16	10	P	rt
0x2918 (P221.00)	Deceleration time 1	**5.0 s**	general	U16	10	P	rt
0x2919 (P222.00)	Acceleration time 2	**5.0 s**	general	U16	10	P	-
0x291A (P223.00)	Deceleration time 2	**5.0 s**	general	U16	10	P	-
0x291B (P224.00)	Auto-changeover threshold of ramp 2	**0.0 Hz**	general	U16	10	P	-
0x291C (P225.00)	Quick stop deceleration time	**1.0 s**	general	U16	10	P	-
0x291E:001 (P226.01)	S-Ramp characteristic: Smoothing factor	**0.0 %**	general	U16	10	P	-
0x291F:001 (P317.01)	Skip frequencies: Skip frequency 1	**0.0 Hz**	general	U16	10	P	-
0x291F:002 (P317.02)	Skip frequencies: Skip bandwidth 1	**0.0 Hz**	general	U8	10	P	-
0x291F:003 (P317.03)	Skip frequencies: Skip frequency 2	**0.0 Hz**	general	U16	10	P	-
0x291F:004 (P317.04)	Skip frequencies: Skip bandwidth 2	**0.0 Hz**	general	U8	10	P	-
0x291F:005 (P317.05)	Skip frequencies: Skip frequency 3	**0.0 Hz**	general	U16	10	P	-
0x291F:006 (P317.06)	Skip frequencies: Skip bandwidth 3	**0.0 Hz**	general	U8	10	P	-
0x291F:016	Skip frequencies: Status	- (Read only)	general	U16	1	-	-
0x291F:032	Skip frequencies: Input frequency	x.xx Hz (Read only)	general	I32	100	-	-
0x291F:033	Skip frequencies: Output frequency	x.xx Hz (Read only)	general	I32	100	-	-
0x2939 (P305.00)	Switching frequency	**0** *	general	U8	1	P	-
0x293A (P115.00)	Actual switching frequency	- (Read only)	general	U8	1	O	t
0x2942:001 (P334.01)	Current controller parameters: Gain	**42.55 V/A** *	MCTRL	U32	100	P	-
0x2942:002 (P334.02)	Current controller parameters: Reset time	**4.50 ms** *	MCTRL	U32	100	P	-
0x2946:001 (P340.01)	Speed limitation: Upper speed limit	**0 vel. unit**	general	I32	480000 /2^{31}	OP	r
0x2946:002 (P340.02)	Speed limitation: Lower speed limit	**0 vel. unit**	general	I32	480000 /2^{31}	OP	r
0x2946:003 (P340.03)	Speed limitation: Upper speed limit source	**Maximum frequency [0]**	general	U8	1	P	-
0x2946:004 (P340.04)	Speed limitation: Lower speed limit source	**(-) Maximum frequency [0]**	general	U8	1	P	-
0x2946:005 (P340.05)	Speed limitation: Upper frequency limit	Device for 50-Hz mains: **50.0 Hz** Device for 60-Hz mains: **60.0 Hz**	general	I16	10	P	-

* Default setting depending on the size. Firmware version 05.00.00.00

Address	Designation	Default setting	Category	Data type	Factor	A	M
0x2946:006 (P340.06)	Speed limitation: Lower frequency limit	Device for 50-Hz mains: **-50.0 Hz** Device for 60-Hz mains: **-60.0 Hz**	general	I16	10	P	-
0x2946:007 (P340.07)	Speed limitation: Actual upper speed limit	x.x Hz (Read only)	general	I16	10	-	-
0x2946:008 (P340.08)	Speed limitation: Actual lower speed limit	x.x Hz (Read only)	general	I16	10	-	-
0x2947:001 ... 0x2947:017	Inverter characteristic: Value y1 ... Value y17	**0.00 V** *	MCTRL	U16	100	P	-
0x2948:001	Actual torque setpoint	x.x % (Read only)	general	I16	10	-	-
0x2948:002 (P336.02)	ramp time	**1.0 s**	general	U16	10	P	-
0x2949:001 (P337.01)	Positive torque limit source	**Max torque [0]**	general	U8	1	P	-
0x2949:002 (P337.02)	Negative torque limit source	**(-) Max torque [0]**	general	U8	1	P	-
0x2949:003 (P337.03)	Actual positive torque limit	x.x % (Read only)	general	I16	10	-	-
0x2949:004 (P337.04)	Actual negative torque limit	x.x % (Read only)	general	I16	10	-	-
0x29C0:001	Gain	**59.68 A/Vs** *	MCTRL	U32	100	P	-
0x29C0:002	Reset time	**45.5 ms** *	MCTRL	U16	10	P	-
0x29E0:001	Field weakening controller settings: Gain	**0.000 Vs/V** *	MCTRL	U32	1000	P	-
0x29E0:002	Field weakening controller settings: Reset time	**1478.3 ms** *	MCTRL	U32	10	P	-
0x29E1	Field weakening controller Field limitation	**100.00 %**	MCTRL	U16	100	OP	r
0x29E2	DC-bus filter time	**25.0 ms**	MCTRL	U16	10	P	-
0x29E3	Motor voltage filter time	**25.0 ms**	MCTRL	U16	10	P	-
0x29E4 (P354.00)	Voltage reserve range	**5 %**	general	U8	1	P	-
0x2B00 (P302.00)	V/f characteristic shape	**Linear [0]**	general	U8	1	PC	-
0x2B01:001 (P303.01)	V/f shape data: Base voltage	**230 V** *	MCTRL	U16	1	P	-
0x2B01:002 (P303.02)	V/f shape data: Base frequency	Device for 50-Hz mains: **50 Hz** Device for 60-Hz mains: **60 Hz** *	MCTRL	U16	1	P	-
0x2B01:003 (P303.03)	V/f shape data: Midpoint voltage	**0 V**	MCTRL	U16	1	P	-
0x2B01:004 (P303.04)	V/f shape data: Midpoint frequency	**0 Hz**	MCTRL	U16	1	P	-
0x2B08:001 (P333.01)	V/f Imax controller: Gain	**0.284 Hz/A** *	MCTRL	U32	1000	P	-
0x2B08:002 (P333.02)	V/f Imax controller: Reset time	**2.3 ms** *	MCTRL	U32	10	P	-
0x2B09:001 (P315.01)	Slip compensation: Gain	**100.00 %**	general	I16	100	P	-
0x2B09:002 (P315.02)	Slip compensation: Filter time	**100 ms**	general	U16	1	P	-
0x2B0A:001 (P318.01)	Gain	**150 %**	MCTRL	I16	1	P	-
0x2B0A:002 (P318.02)	Filter time	**30 ms**	MCTRL	U16	1	P	-
0x2B0B	Frequency setpoint	x.x Hz (Read only)	general	I16	10	O	t
0x2B0C (P319.00)	Override field weakening	**0.0 Hz**	general	I16	10	P	-
0x2B0D:001 (P330.01)	VFC-ECO: Minimum voltage	**20 %**	MCTRL	I16	1	P	-
* Default setting depending on the size.					Firmware version 05.00.00.00		

Address	Designation	Default setting	Category	Data type	Factor	A	M
0x2B0D:006 (P330.06)	Cos phi actual value	- (Read only)	general	I16	100	-	t
0x2B0E (P102.00)	Frequency setpoint	x.x Hz (Read only)	general	I16	10	O	t
0x2B0F	VFC output frequency	x.x Hz (Read only)	MCTRL	I16	10	O	t
0x2B12:001 (P316.01)	Fixed boost	**2.5 %** *	MCTRL	U8	10	P	-
0x2B12:002 (P316.02)	V/f voltage boost: Boost at acceleration	**0.0 %**	general	U8	10	P	-
0x2B13:001	Additive voltage impression: Enable Function	**Disable [0]**	general	U8	1	P	-
0x2B13:002	Additive voltage impression: Setpoint source	**Analog input 1 [1]**	general	U8	1	P	-
0x2B13:003	Additive voltage impression: Actual voltage	x V (Read only)	general	I16	1	-	-
0x2B14:001	Gain	**0.100**	MCTRL	U16	1000	P	-
0x2B14:002	Reset time	**100.0 ms**	MCTRL	U16	10	P	-
0x2B14:003	Frequency limitation	**10.00 Hz**	MCTRL	U16	100	P	-
0x2B40:001	Gain	**0.2686 Hz/A** *	MCTRL	U32	10000	P	-
0x2B40:002	Reset time	**2.3 ms** *	MCTRL	U32	10	P	-
0x2B40:003	Q-Feedforward	**0.00**	MCTRL	U32	100	P	-
0x2B40:004	D-Feedforward	**0.00**	MCTRL	U32	100	P	-
0x2B84:001 (P704.01)	DC braking: Current	**0.0 %**	general	U16	10	P	-
0x2B84:002 (P704.02)	DC braking: Automatic hold time	**0.0 s**	general	U16	10	P	-
0x2B84:003 (P704.03)	DC braking: Automatic operating threshold	**0.0 Hz**	general	U16	10	P	-
0x2B84:004 (P704.04)	DC braking: Demagnetization time	**100 %**	general	U8	1	P	-
0x2B84:005 (P704.05)	DC braking: Default demagnetization time	x ms (Read only)	general	U16	1	-	-
0x2B84:006 (P704.06)	DC braking: DC brake with inverter disable	**0**	general	U8	1	P	-
0x2BA1:001 (P718.01)	Flying restart circuit: Current	**30 %**	MCTRL	U16	1	P	-
0x2BA1:002 (P718.02)	Flying restart circuit: Start frequency	**20.0 Hz**	MCTRL	I16	10	P	-
0x2BA1:003 (P718.03)	Flying restart circuit: Restart time	**5911 ms** *	MCTRL	U16	1	P	-
0x2BA1:008 (P718.08)	Flying restart circuit: Flying restart frequency	x.x Hz (Read only)	MCTRL	I16	10	O	t
0x2C00 (P300.00)	Motor control mode	**V/f characteristic control (VFC open loop) [6]**	general	U8	1	PC	-
0x2C01:001	Motor parameters: Number of pole pairs	- (Read only)	MCTRL	U8	1	-	-
0x2C01:002	Motor parameters: Stator resistance	**10.1565 Ω** *	MCTRL	U32	10000	P	-
0x2C01:003	Motor parameters: Stator leakage inductance	**23.566 mH** *	MCTRL	U32	1000	P	-
0x2C01:004 (P320.04)	Motor parameters: Rated speed	Device for 50-Hz mains: **1450 rpm** Device for 60-Hz mains: **1750 rpm**	MCTRL	U16	1	P	-
0x2C01:005 (P320.05)	Motor parameters: Rated frequency	Device for 50-Hz mains: **50.0 Hz** Device for 60-Hz mains: **60.0 Hz**	MCTRL	U16	10	P	-
0x2C01:006 (P320.06)	Motor parameters: Rated power	**0.25 kW** *	MCTRL	U16	100	P	-
0x2C01:007 (P320.07)	Motor parameters: Rated voltage	**230 V** *	MCTRL	U16	1	P	-
0x2C01:008 (P320.08)	Motor parameters: Cosine phi	**0.80**	MCTRL	U16	100	P	-

* Default setting depending on the size. Firmware version 05.00.00.00



Address	Designation	Default setting	Category	Data type	Factor	A	M
0x2C01:010	Motor parameters: Motor name		MCTRL	STRING[25]	1	P	-
0x2C02:001 (P351.01)	Motor parameter (ASM): Rotor resistance	**8.8944 Ω** *	MCTRL	U32	10000	P	-
0x2C02:002 (P351.02)	Motor parameter (ASM): Mutual inductance	**381.9 mH** *	MCTRL	U32	10	P	-
0x2C02:003 (P351.03)	Motor parameter (ASM): Magnetising current	**0.96 A** *	MCTRL	U16	100	P	-
0x2C02:004 (P351.04)	Slip frequency	x.x Hz (Read only)	general	U16	10	-	-
0x2C03:001 (P352.01)	Back EMF constant	**41.8 V/1000rpm**	MCTRL	U32	10	P	-
0x2C11:001	High speed range: Lower limit	**30 %**	general	U16	1	P	-
0x2C11:002	High speed range: Tracking controller gain	**200 %**	general	U16	1	P	-
0x2C11:003	High speed range: Tracking controller reset time	**6.00 ms**	general	U16	100	P	-
0x2C11:004	High speed range: Tracking controller decouple time	**200.0 ms**	general	U16	10	P	-
0x2C11:006	High speed range: Stall monitoring limit	**50 %**	general	U16	1	P	-
0x2C12:001	SM low speed range: Acceleration current	**70 %**	MCTRL	U16	1	P	-
0x2C12:002	SM low speed range: Standstill current	**30 %**	MCTRL	U16	1	P	-
0x2C42:001 (P341.01)	Encoder settings: Increments/revolution	**128**	general	U32	1	PC	-
0x2C42:006	Encoder settings: Actual velocity	x rpm (Read only)	general	I32	1	O	t
0x2C42:007	Encoder settings: Status	**0**	general	U32	1	X	-
0x2C45 (P342.00)	Encoder-error response	**Warning [1]**	general	U8	1	P	-
0x2C49:001 (P711.01)	Position counter: Signal source	**Disbled [0]**	general	U8	1	P	-
0x2C49:002 (P711.02)	Position counter: Reset mode	**Reset by rising edge [0]**	general	U8	1	P	-
0x2C49:003 (P711.03)	Position counter: Actual position	- (Read only)	general	U32	1	H	t
0x2C60	PPI monitoring: Reaction	**Fault [3]**	general	U8	1	P	-
0x2C63:001	PPI without movement: Execution	**After each enable [2]**	general	U8	1	PC	-
0x2D40:002	Device utilisation (i*t): Warning threshold	**95 %**	general	U16	1	P	-
0x2D40:004 (P135.04)	Device utilisation (i*t)	x % (Read only)	general	U16	1	O	t
0x2D40:005 (P135.05)	Device utilisation (i*t): Error response	**Fault [3]**	general	U8	1	P	-
0x2D43:001 (P306.01)	Inverter load characteristic: Duty selection	**Heavy Duty [0]**	general	U8	1	PC	-
0x2D44:001 (P350.01)	Overspeed monitoring: Threshold	**8000 rpm**	general	U16	1	P	-
0x2D44:002 (P350.02)	Overspeed monitoring: Response	**Fault [3]**	general	U8	1	P	-
0x2D45:001 (P310.01)	Motor phase failure detection: Response	**No response [0]**	general	U8	1	P	-
0x2D45:002 (P310.02)	Motor phase failure detection: Current threshold	**5.0 %**	general	U8	10	P	-
0x2D45:003 (P310.03)	Motor phase failure detection: Voltage threshold	**10.0 V**	general	U16	10	P	-
0x2D46:001 (P353.01)	Overcurrent monitoring: Threshold	**6.8 A** *	general	U16	10	P	-
0x2D46:002 (P353.02)	Overcurrent monitoring: Response	**Fault [3]**	general	U8	1	P	-
0x2D49:002 (P309.02)	Motor temperature monitoring: Response	**Fault [3]**	general	U8	1	P	-
0x2D4B:001 (P308.01)	Motor overload monitoring (i^2*t): Maximum utilisation [60 s]	**150 %**	general	U16	1	P	-
* Default setting depending on the size.					Firmware version 05.00.00.00		

Address	Designation	Default setting	Category	Data type	Factor	A	M
0x2D4B:002 (P308.02)	Motor overload monitoring (i²*t): Speed compensation	**On [0]**	general	U8	1	P	-
0x2D4B:003 (P308.03)	Motor overload monitoring (i²*t): Response	**Fault [3]**	general	U8	1	P	-
0x2D4B:005	Motor overload monitoring (i²*t): Thermal load	- (Read only)	general	U16	1	-	-
0x2D4F (P123.00)	Motor utilisation (i²*t)	x % (Read only)	general	U16	1	O	t
0x2D66:001 (P721.01)	Mains failure control: Enable function	**Disabled [0]**	general	U8	1	P	-
0x2D66:002 (P721.02)	Mains failure control: DC-bus activation level	**0 %** *	general	U8	1	P	-
0x2D66:003 (P721.03)	Mains failure control: Gain V-controller	**0.01000 Hz/V**	general	U16	100000	P	-
0x2D66:004 (P721.04)	Mains failure control: Reset time V-controller	**20 ms**	general	U16	1	P	-
0x2D66:005 (P721.05)	Mains failure control: DC voltage setpoint	**100 %**	general	U8	1	P	-
0x2D66:006 (P721.06)	Mains failure control: Setpoint ramp	**20 ms**	general	U16	1	P	-
0x2D66:007 (P721.07)	Mains failure control: Clear time	**20 ms**	general	U16	1	P	-
0x2D66:008 (P721.08)	Mains failure control: Restart threshold	**0.0 Hz**	general	U16	10	P	-
0x2D66:009 (P721.09)	Mains failure control: Status mains failure control	- (Read only)	general	U8	1	O	t
0x2D67:001 (P329.01)	Maximum torque monitoring: Response	**No response [0]**	MCTRL	U8	1	P	-
0x2D67:002 (P329.02)	Maximum torque monitoring: Triggering delay	**0.000 s**	MCTRL	U16	1000	P	-
0x2D81:001 (P151.01)	Life-diagnosis: Operating time	x s (Read only)	general	U32	1	T	-
0x2D81:002 (P151.02)	Life-diagnosis: Power-on time	x s (Read only)	general	U32	1	T	-
0x2D81:003 (P151.03)	Life-diagnosis: Control unit operating time	x ns (Read only)	general	U64	1	T	-
0x2D81:004 (P151.04)	Life-diagnosis: Main switching cycles	- (Read only)	general	U32	1	-	-
0x2D81:005 (P151.05)	Life-diagnosis: Relay switching cycles	- (Read only)	general	U32	1	-	-
0x2D81:006 (P151.06)	Life-diagnosis: Short-circuit counter	- (Read only)	general	U16	1	-	-
0x2D81:007 (P151.07)	Life-diagnosis: Earth fault counter	- (Read only)	general	U16	1	-	-
0x2D81:008 (P151.08)	Life-diagnosis: Clamp active	- (Read only)	general	U16	1	-	-
0x2D81:009 (P151.09)	Life-diagnosis: Fan operating time	x s (Read only)	general	U32	1	T	-
0x2D84:001 (P117.01)	Heatsink temperature	x.x °C (Read only)	general	I16	10	O	-
0x2D84:002	Heatsink temperature: Warning threshold	**80.0 °C** *	general	I16	10	P	-
0x2D87 (P105.00)	DC-bus voltage	x V (Read only)	general	U16	1	O	t
0x2D88 (P104.00)	Motor current	x.x A (Read only)	general	I16	10	O	t
0x2D89 (P106.00)	Motor voltage	x VAC (Read only)	general	U16	1	O	t
0x2DA2:001 (P108.01)	Output power: Effective power	x.xxx kW (Read only)	general	I32	1000	O	t
* Default setting depending on the size.					Firmware version 05.00.00.00		

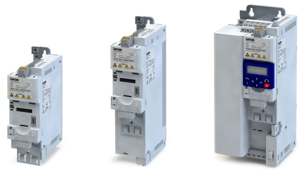
Address	Designation	Default setting	Category	Data type	Factor	A	M
0x2DA2:002 (P108.02)	Output power: Apparent power	x.xxx kVA (Read only)	general	I32	1000	O	t
0x2DA3:001 (P109.01)	Output energy: Motor	x.xx kWh (Read only)	general	I32	100	O	t
0x2DA3:002 (P109.02)	Output energy: Generator	x.xx kWh (Read only)	general	I32	100	O	t
0x2DA4:001 (P110.01)	Diagnostics of analog input 1: Value in percent	x.x % (Read only)	general	I16	10	O	t
0x2DA4:002 (P110.02)	Diagnostics of analog input 1: Frequency value	x.x Hz (Read only)	general	I16	10	O	t
0x2DA4:003 (P110.03)	Diagnostics of analog input 1: Process controller value	x.xx PID unit (Read only)	general	I16	100	O	t
0x2DA4:004 (P110.04)	Diagnostics of analog input 1: Torque value	x.x % (Read only)	general	I16	10	O	t
0x2DA4:016 (P110.16)	Diagnostics of analog input 1: Status	- (Read only)	general	U16	1	O	-
0x2DA5:001 (P111.01)	Diagnostics of analog input 2: Value in percent	x.x % (Read only)	general	I16	10	O	t
0x2DA5:002 (P111.02)	Diagnostics of analog input 2: Frequency value	x.x Hz (Read only)	general	I16	10	O	t
0x2DA5:003 (P111.03)	Diagnostics of analog input 2: Process controller value	x.xx PID unit (Read only)	general	I16	100	O	t
0x2DA5:004 (P111.04)	Diagnostics of analog input 2: Torque value	x.x % (Read only)	general	I16	10	O	t
0x2DA5:016 (P111.16)	Diagnostics of analog input 2: Status	- (Read only)	general	U16	1	O	-
0x2DAA:001 (P112.01)	Diagnostics of analog output 1: Voltage	x.xx V (Read only)	general	U16	100	O	t
0x2DAA:002 (P112.02)	Diagnostics of analog output 1: Current	x.xx mA (Read only)	general	U16	100	O	t
0x2DAB:001 (P113.01)	Diagnostics of analog output 2: Voltage	x.xx V (Read only)	Appl. I/O	U16	100	O	t
0x2DAB:002 (P113.02)	Diagnostics of analog output 2: Current	x.xx mA (Read only)	Appl. I/O	U16	100	O	t
0x2DAC (P119.00)	Keypad status	- (Read only)	general	U16	1	O	t
0x2DAD (P120.00)	Internal hardware states	- (Read only)	general	U16	1	O	-
0x2DAE:001 (P140.01)	Sequencer diagnostics: Active step	- (Read only)	general	U8	1	O	t
0x2DAE:002 (P140.02)	Sequencer diagnostics: Step time elapsed	x.x s (Read only)	general	I32	10	O	t
0x2DAE:003 (P140.03)	Sequencer diagnostics: Step time remaining	x.x s (Read only)	general	I32	10	O	t
0x2DAE:004 (P140.04)	Sequencer diagnostics: Steps complete	- (Read only)	general	I32	1	O	t
0x2DAE:005 (P140.05)	Sequencer diagnostics: Steps remaining	- (Read only)	general	I32	1	O	t
0x2DAE:006 (P140.06)	Sequencer diagnostics: Active sequence	- (Read only)	general	U8	1	O	t
0x2DAE:007 (P140.07)	Sequencer diagnostics: Active segment	- (Read only)	general	U8	1	O	t
0x2DAE:008 (P140.08)	Sequencer diagnostics: Relative sequence time remaining	x % (Read only)	general	U8	1	O	t
0x2DAE:009 (P140.09)	Sequencer diagnostics: Absolute sequence time remaining	x.x s (Read only)	general	I32	10	O	t
0x2DAE:010	Sequencer diagnostics: Frequency setpoint	x.x Hz (Read only)	general	I16	10	-	-
0x2DAE:011	Sequencer diagnostics: PID setpoint	x.xx PID unit (Read only)	general	I16	100	-	-
0x2DAE:012	Sequencer diagnostics: Torque setpoint	x.x % (Read only)	general	I16	10	-	-
* Default setting depending on the size.					Firmware version 05.00.00.00		

Address	Designation	Default setting	Category	Data type	Factor	A	M
0x2DD5	Torque setpoint	x.xx Nm (Read only)	general	I32	100	-	t
0x2DDD (P100.00)	Output frequency	x.x Hz (Read only)	general	I16	10	O	t
0x2DDF:001	Axis information: Rated current	x.xx A (Read only)	general	U16	100	O	t
0x2DDF:002	Axis information: Maximum current	x.xx A (Read only)	general	U16	100	O	t
0x4002 (P702.00)	Speed display scaling	**0.00**	general	U16	100	P	-
0x4003 (P413.00)	MOP starting mode	**Last value [0]**	general	U8	1	P	-
0x4004:001 (P414.01)	MOP starting values: Frequency	**0.0 Hz**	general	U16	10	P	-
0x4004:002 (P414.02)	MOP starting values: PID value	**0.00 PID unit**	general	I16	100	P	-
0x4004:003 (P414.03)	MOP starting values: Torque	**0.0 %**	general	U16	10	P	-
0x4005 (P412.00)	Frequency threshold	**0.0 Hz**	general	U16	10	P	-
0x4006:001 (P710.01)	Load loss detection: Threshold	**0.0 %**	general	U16	10	P	-
0x4006:002 (P710.02)	Load loss detection: Deceleration	**0.0 s**	general	U16	10	P	-
0x4008:001 (P590.01)	Process input words: NetWordIN1	**0x0000**	general	U16	1	HK	r
0x4008:002 (P590.02)	Process input words: NetWordIN2	**0x0000**	general	U16	1	HK	r
0x4008:003 (P590.03)	Process input words: NetWordIN3	**0.0 %**	general	U16	10	K	r
0x4008:004 (P590.04)	Process input words: NetWordIN4	**0.0 %**	general	U16	10	K	r
0x4008:005 (P550.05)	Process input words: NetWordIN5	**0.0 %**	general	I16	10	OK	r
0x4009:001	MOP values saved: Frequency	x.x Hz (Read only)	general	U16	10	-	t
0x4009:002	MOP values saved: PID value	x.xx PID unit (Read only)	general	I16	100	-	t
0x4009:003	MOP values saved: Torque	x.x % (Read only)	general	U16	10	-	t
0x4009:004	MOP values saved: Frequency setpoint	x.x Hz (Read only)	general	I16	10	-	-
0x4009:005	MOP values saved: PID setpoint	x.xx PID unit (Read only)	general	I16	100	-	-
0x4009:006	MOP values saved: Torque setpoint	x.x % (Read only)	general	I16	10	-	-
0x400A:001 (P591.01)	Process output words: NetWordOUT1	- (Read only)	general	U16	1	H	t
0x400A:002 (P591.02)	Process output words: NetWordOUT2	- (Read only)	general	U16	1	-	t
0x400B:001 (P592.01)	Process input data: AC Drive control word	**0x0000**	general	U16	1	OHK	r
0x400B:002 (P592.02)	Process input data: LECOM control word	**0x0000**	general	U16	1	OHK	r
0x400B:003 (P592.03)	Process input data: Network setpoint frequency (0.1)	**0.0 Hz**	general	U16	10	OK	r
0x400B:004 (P592.04)	Process input data: Network setpoint speed	**0 rpm**	general	U16	1	OK	r
0x400B:005 (P592.05)	Process input data: Network setpoint frequency (0.01)	**0.00 Hz**	general	U16	100	OK	r
0x400B:006 (P592.06)	Process input data: Velocity mode setpoint	**0.0 Hz**	general	I16	10	OK	r
0x400B:007 (P592.07)	Process input data: PID setpoint	**0.00 PID unit**	general	I16	100	OK	r
0x400B:008 (P592.08)	Process input data: Torque mode setpoint	**0 Nm**	general	I16	1	OK	r

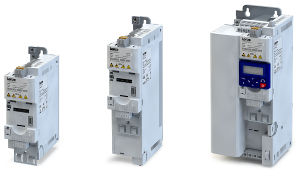
* Default setting depending on the size. Firmware version 05.00.00.00

Address	Designation	Default setting	Category	Data type	Factor	A	M
0x400B:009 (P592.09)	Process input data: Torque scaling	**0**	general	I8	1	OK	-
0x400B:010	AC Drive mode	**Speed control (open loop) [1]**	EtherNet/IP	U8	1	OIK	-
0x400B:011 (P592.11)	Process input data: PID feedback	**0.00 PID unit**	general	I16	100	OK	r
0x400B:012 (P592.12)	Process input data: Network setpoint frequency [0.02Hz]	**0 Hz**	general	I16	50	K	r
0x400B:013 (P592.13)	Process input data: Network frequency setpoint [+/-16384]	**0**	general	I16	1	O	r
0x400C:001 (P593.01)	Process output data: AC Drive status word	- (Read only)	general	U16	1	-	t
0x400C:002 (P593.02)	Process output data: LECOM status word	- (Read only)	general	U16	1	-	t
0x400C:003 (P593.03)	Process output data: Frequency (0.1)	x.x Hz (Read only)	general	U16	10	-	t
0x400C:004 (P593.04)	Process output data: Motor speed	x rpm (Read only)	general	U16	1	-	t
0x400C:005 (P593.05)	Process output data: Drive status	- (Read only)	general	U16	1	-	t
0x400C:006 (P593.06)	Process output data: Frequency (0.01)	x.xx Hz (Read only)	general	U16	100	-	t
0x400C:007 (P593.07)	Process output data: Torque scaled	- (Read only)	general	I16	1	-	t
0x400C:008 (P593.08)	Process output data: Frequency [0.02 Hz]	Hz (Read only)	general	I16	50	-	t
0x400C:009 (P593.09)	Process output data: Frequency [+/-16384]	- (Read only)	general	I16	1	O	t
0x400D (P101.00)	Scaled actual value	x Units (Read only)	general	I16	1	O	t
0x400E:001 (P505.01)	NetWordIN1 function: Bit 0	**Not active [0]**	general	U8	1	PC	-
0x400E:002 (P505.02)	NetWordIN1 function: Bit 1	**Not active [0]**	general	U8	1	PC	-
0x400E:003 (P505.03)	NetWordIN1 function: Bit 2	**Activate quick stop [3]**	general	U8	1	PC	-
0x400E:004 (P505.04)	NetWordIN1 function: Bit 3	**Not active [0]**	general	U8	1	PC	-
0x400E:005 (P505.05)	NetWordIN1 function: Bit 4	**Run forward (CW) [8]**	general	U8	1	PC	-
0x400E:006 (P505.06)	NetWordIN1 function: Bit 5	**Activate preset (bit 0) [18]**	general	U8	1	PC	-
0x400E:007 (P505.07)	NetWordIN1 function: Bit 6	**Activate preset (bit 1) [19]**	general	U8	1	PC	-
0x400E:008 (P505.08)	NetWordIN1 function: Bit 7	**Reset error [4]**	general	U8	1	PC	-
0x400E:009 (P505.09)	NetWordIN1 function: Bit 8	**Not active [0]**	general	U8	1	PC	-
0x400E:010 (P505.10)	NetWordIN1 function: Bit 9	**Activate DC braking [5]**	general	U8	1	PC	-
0x400E:011 (P505.11)	NetWordIN1 function: Bit 10	**Not active [0]**	general	U8	1	PC	-
0x400E:012 (P505.12)	NetWordIN1 function: Bit 11	**Not active [0]**	general	U8	1	PC	-
0x400E:013 (P505.13)	NetWordIN1 function: Bit 12	**Reverse rotational direction [13]**	general	U8	1	PC	-
0x400E:014 (P505.14)	NetWordIN1 function: Bit 13	**Not active [0]**	general	U8	1	PC	-
* Default setting depending on the size.							Firmware version 05.00.00.00

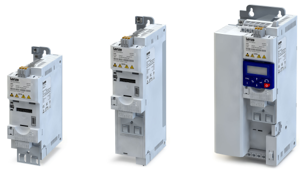
Address	Designation	Default setting	Category	Data type	Factor	A	M
0x400E:015 (P505.15)	NetWordIN1 function: Bit 14	**Not active [0]**	general	U8	1	PC	-
0x400E:016 (P505.16)	NetWordIN1 function: Bit 15	**Not active [0]**	general	U8	1	PC	-
0x4016:003	Digital output 1: Cutout delay	**0.000 s**	general	U16	1000	P	-
0x4016:004	Digital output 1: Switch-on delay	**0.000 s**	general	U16	1000	P	-
0x4016:005	Digital output 1: Terminal state	- (Read only)	general	U8	1	-	-
0x4016:006	Digital output 1: Trigger signal state	- (Read only)	general	U8	1	-	-
0x4017:003	Digital output 2: Cutout delay	**0.000 s**	Appl. I/O	U16	1000	P	-
0x4017:004	Digital output 2: Switch-on delay	**0.000 s**	Appl. I/O	U16	1000	P	-
0x4017:005	Digital output 2: Terminal state	- (Read only)	Appl. I/O	U8	1	-	-
0x4017:006	Digital output 2: Trigger signal state	- (Read only)	Appl. I/O	U8	1	-	-
0x4018:003	Relay: Switch-off delay	**0.000 s**	general	U16	1000	P	-
0x4018:004	Relay: Switch-on delay	**0.000 s**	general	U16	1000	P	-
0x4018:005	Relay: Relay state	- (Read only)	general	U8	1	-	-
0x4018:006	Relay: Trigger signal state	- (Read only)	general	U8	1	-	-
0x4018:007	Relay: Switching cycles	- (Read only)	general	U32	1	-	-
0x401F:001 (P121.01)	Current setpoint	x.xx PID unit (Read only)	general	I16	100	O	t
0x401F:002 (P121.02)	Current process variable	x.xx PID unit (Read only)	general	I16	100	O	t
0x401F:003 (P121.03)	Status	- (Read only)	general	U8	1	O	t
0x401F:004	PID control value	x.x Hz (Read only)	general	I16	10	-	-
0x401F:005	PID Feedforward value	x.x Hz (Read only)	general	I16	10	-	-
0x401F:006	PID output value	x.x Hz (Read only)	general	I16	10	-	-
0x401F:007	PID error value	x.xx PID unit (Read only)	general	I32	100	-	-
0x4020:001 (P600.01)	Process controller setup (PID): Operating mode	**Inhibited [0]**	general	U8	1	P	-
0x4020:002 (P600.02)	Process controller setup (PID): PID process variable	**Analog input 1 [1]**	general	U8	1	P	-
0x4020:003 (P600.03)	Process controller setup (PID): Closed-loop controlled speed range	**100 %**	general	U16	1	P	rt
0x4020:004 (P600.04)	Process controller setup (PID): Speed feedforward control source	**Without speed addition [0]**	general	U8	1	P	-
0x4020:005 (P600.05)	Process controller setup (PID): Min speed limit	**-100.0 %**	general	I16	10	P	-
0x4020:006 (P600.06)	Process controller setup (PID): Max speed limit	**100.0 %**	general	I16	10	P	-
0x4021:001 (P606.01)	PID speed operation: Acceleration time	**1.0 s**	general	U16	10	P	-
0x4021:002 (P606.02)	PID speed operation: Deceleration time	**1.0 s**	general	U16	10	P	-
0x4022:001 (P451.01)	PID setpoint presets: Preset 1	**0.00 PID unit**	general	I16	100	P	-
0x4022:002 (P451.02)	PID setpoint presets: Preset 2	**0.00 PID unit**	general	I16	100	P	-
0x4022:003 (P451.03)	PID setpoint presets: Preset 3	**0.00 PID unit**	general	I16	100	P	-
0x4022:004 (P451.04)	PID setpoint presets: Preset 4	**0.00 PID unit**	general	I16	100	P	-
0x4022:005 (P451.05)	PID setpoint presets: Preset 5	**0.00 PID unit**	general	I16	100	P	-
0x4022:006 (P451.06)	PID setpoint presets: Preset 6	**0.00 PID unit**	general	I16	100	P	-
0x4022:007 (P451.07)	PID setpoint presets: Preset 7	**0.00 PID unit**	general	I16	100	P	-
* Default setting depending on the size.					Firmware version 05.00.00.00		



Address	Designation	Default setting	Category	Data type	Factor	A	M
0x4022:008 (P451.08)	PID setpoint presets: Preset 8	**0.00 PID unit**	general	I16	100	P	-
0x4023:001 (P610.01)	PID sleep mode: Activation	**Disabled [0]**	general	U8	1	P	-
0x4023:002 (P610.02)	PID sleep mode: Stop method	**Coasting [0]**	general	U8	1	P	-
0x4023:003 (P610.03)	PID sleep mode: Frequency threshold	**0.0 Hz**	general	U16	10	P	-
0x4023:004 (P610.04)	PID sleep mode: Feedback threshold	**0.00 PID unit**	general	I16	100	P	-
0x4023:005 (P610.05)	PID sleep mode: Delay time	**0.0 s**	general	U16	10	P	-
0x4023:006 (P610.06)	PID sleep mode: Recovery	**Setpoint > threshold OR system deviation > band-width [0]**	general	U8	1	P	-
0x4023:007 (P610.07)	PID sleep mode: Bandwidth	**0.00 PID unit**	general	U16	100	P	-
0x4023:008 (P610.08)	PID sleep mode: Recovery threshold	**0.00 PID unit**	general	I16	100	P	-
0x4024:001 (P615.01)	Automatic rinsing: Rinsing in idle state	**Inhibited [0]**	general	U8	1	P	-
0x4024:002 (P615.02)	Automatic rinsing: Rinse interval	**30.0 min**	general	U16	10	P	-
0x4024:003 (P615.03)	Automatic rinsing: Rinse speed	**0.0 Hz**	general	I16	10	P	-
0x4024:004 (P615.04)	Automatic rinsing: Rinse period	**0.0 s**	general	U16	10	P	-
0x4025 (P800.00)	Sequencer mode	**Disabled [0]**	general	U8	1	P	-
0x4026:001 (P801.01)	Sequencer segment 1: Frequency setpoint	**0.0 Hz**	general	I16	10	P	-
0x4026:002 (P801.02)	Sequencer segment 1: Acceleration/deceleration	**5.0 s**	general	U16	10	P	-
0x4026:003 (P801.03)	Sequencer segment 1: Time	**0.0 s**	general	U32	10	P	-
0x4026:004 (P801.04)	Sequencer segment 1: Digital outputs	**0**	general	U8	1	P	-
0x4026:005 (P801.05)	Sequencer segment 1: Analog outputs	**0.00 VDC**	general	U16	100	P	-
0x4026:006 (P801.06)	Sequencer segment 1: PID setpoint	**0.00 PID unit**	general	I16	100	P	-
0x4026:007 (P801.07)	Sequencer segment 1: Torque setpoint	**100.0 %**	general	I16	10	P	-
0x4026:008	Sequencer segment 1: NetWordOUT2	**0**	general	U16	1	P	-
0x4026:009	Sequencer segment 1: Reserved	**0**	general	U32	1	P	-
0x4027:001 (P802.01)	Sequencer segment 2: Frequency setpoint	**0.0 Hz**	general	I16	10	P	-
0x4027:002 (P802.02)	Sequencer segment 2: Acceleration/deceleration	**5.0 s**	general	U16	10	P	-
0x4027:003 (P802.03)	Sequencer segment 2: Time	**0.0 s**	general	U32	10	P	-
0x4027:004 (P802.04)	Sequencer segment 2: Digital outputs	**0**	general	U8	1	P	-
0x4027:005 (P802.05)	Sequencer segment 2: Analog outputs	**0.00 VDC**	general	U16	100	P	-
0x4027:006 (P802.06)	Sequencer segment 2: PID setpoint	**0.00 PID unit**	general	I16	100	P	-
0x4027:007 (P802.07)	Sequencer segment 2: Torque setpoint	**100.0 %**	general	I16	10	P	-
* Default setting depending on the size.				Firmware version 05.00.00.00			



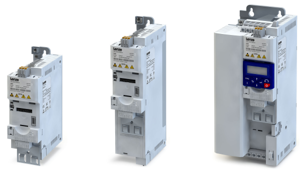
Address	Designation	Default setting	Category	Data type	Factor	A	M
0x4027:008	Sequencer segment 2: NetWordOUT2	**0**	general	U16	1	P	-
0x4027:009	Sequencer segment 2: Reserved	**0**	general	U32	1	P	-
0x4028:001 (P803.01)	Sequencer segment 3: Frequency setpoint	**0.0 Hz**	general	I16	10	P	-
0x4028:002 (P803.02)	Sequencer segment 3: Acceleration/deceleration	**5.0 s**	general	U16	10	P	-
0x4028:003 (P803.03)	Sequencer segment 3: Time	**0.0 s**	general	U32	10	P	-
0x4028:004 (P803.04)	Sequencer segment 3: Digital outputs	**0**	general	U8	1	P	-
0x4028:005 (P803.05)	Sequencer segment 3: Analog outputs	**0.00 VDC**	general	U16	100	P	-
0x4028:006 (P803.06)	Sequencer segment 3: PID setpoint	**0.00 PID unit**	general	I16	100	P	-
0x4028:007 (P803.07)	Sequencer segment 3: Torque setpoint	**100.0 %**	general	I16	10	P	-
0x4028:008	Sequencer segment 3: NetWordOUT2	**0**	general	U16	1	P	-
0x4028:009	Sequencer segment 3: Reserved	**0**	general	U32	1	P	-
0x4029:001 (P804.01)	Sequencer segment 4: Frequency setpoint	**0.0 Hz**	general	I16	10	P	-
0x4029:002 (P804.02)	Sequencer segment 4: Acceleration/deceleration	**5.0 s**	general	U16	10	P	-
0x4029:003 (P804.03)	Sequencer segment 4: Time	**0.0 s**	general	U32	10	P	-
0x4029:004 (P804.04)	Sequencer segment 4: Digital outputs	**0**	general	U8	1	P	-
0x4029:005 (P804.05)	Sequencer segment 4: Analog outputs	**0.00 VDC**	general	U16	100	P	-
0x4029:006 (P804.06)	Sequencer segment 4: PID setpoint	**0.00 PID unit**	general	I16	100	P	-
0x4029:007 (P804.07)	Sequencer segment 4: Torque setpoint	**100.0 %**	general	I16	10	P	-
0x4029:008	Sequencer segment 4: NetWordOUT2	**0**	general	U16	1	P	-
0x4029:009	Sequencer segment 4: Reserved	**0**	general	U32	1	P	-
0x402A:001 (P805.01)	Sequencer segment 5: Frequency setpoint	**0.0 Hz**	general	I16	10	P	-
0x402A:002 (P805.02)	Sequencer segment 5: Acceleration/deceleration	**5.0 s**	general	U16	10	P	-
0x402A:003 (P805.03)	Sequencer segment 5: Time	**0.0 s**	general	U32	10	P	-
0x402A:004 (P805.04)	Sequencer segment 5: Digital outputs	**0**	general	U8	1	P	-
0x402A:005 (P805.05)	Sequencer segment 5: Analog outputs	**0.00 VDC**	general	U16	100	P	-
0x402A:006 (P805.06)	Sequencer segment 5: PID setpoint	**0.00 PID unit**	general	I16	100	P	-
0x402A:007 (P805.07)	Sequencer segment 5: Torque setpoint	**100.0 %**	general	I16	10	P	-
0x402A:008	Sequencer segment 5: NetWordOUT2	**0**	general	U16	1	P	-
0x402A:009	Sequencer segment 5: Reserved	**0**	general	U32	1	P	-
0x402B:001 (P806.01)	Sequencer segment 6: Frequency setpoint	**0.0 Hz**	general	I16	10	P	-
0x402B:002 (P806.02)	Sequencer segment 6: Acceleration/deceleration	**5.0 s**	general	U16	10	P	-
0x402B:003 (P806.03)	Sequencer segment 6: Time	**0.0 s**	general	U32	10	P	-
0x402B:004 (P806.04)	Sequencer segment 6: Digital outputs	**0**	general	U8	1	P	-
* Default setting depending on the size.							Firmware version 05.00.00.00



Address	Designation	Default setting	Category	Data type	Factor	A	M
0x402B:005 (P806.05)	Sequencer segment 6: Analog outputs	**0.00 VDC**	general	U16	100	P	-
0x402B:006 (P806.06)	Sequencer segment 6: PID setpoint	**0.00 PID unit**	general	I16	100	P	-
0x402B:007 (P806.07)	Sequencer segment 6: Torque setpoint	**100.0 %**	general	I16	10	P	-
0x402B:008	Sequencer segment 6: NetWordOUT2	**0**	general	U16	1	P	-
0x402B:009	Sequencer segment 6: Reserved	**0**	general	U32	1	P	-
0x402C:001 (P807.01)	Sequencer segment 7: Frequency setpoint	**0.0 Hz**	general	I16	10	P	-
0x402C:002 (P807.02)	Sequencer segment 7: Acceleration/deceleration	**5.0 s**	general	U16	10	P	-
0x402C:003 (P807.03)	Sequencer segment 7: Time	**0.0 s**	general	U32	10	P	-
0x402C:004 (P807.04)	Sequencer segment 7: Digital outputs	**0**	general	U8	1	P	-
0x402C:005 (P807.05)	Sequencer segment 7: Analog outputs	**0.00 VDC**	general	U16	100	P	-
0x402C:006 (P807.06)	Sequencer segment 7: PID setpoint	**0.00 PID unit**	general	I16	100	P	-
0x402C:007 (P807.07)	Sequencer segment 7: Torque setpoint	**100.0 %**	general	I16	10	P	-
0x402C:008	Sequencer segment 7: NetWordOUT2	**0**	general	U16	1	P	-
0x402C:009	Sequencer segment 7: Reserved	**0**	general	U32	1	P	-
0x402D:001 (P808.01)	Sequencer segment 8: Frequency setpoint	**0.0 Hz**	general	I16	10	P	-
0x402D:002 (P808.02)	Sequencer segment 8: Acceleration/deceleration	**5.0 s**	general	U16	10	P	-
0x402D:003 (P808.03)	Sequencer segment 8: Time	**0.0 s**	general	U32	10	P	-
0x402D:004 (P808.04)	Sequencer segment 8: Digital outputs	**0**	general	U8	1	P	-
0x402D:005 (P808.05)	Sequencer segment 8: Analog outputs	**0.00 VDC**	general	U16	100	P	-
0x402D:006 (P808.06)	Sequencer segment 8: PID setpoint	**0.00 PID unit**	general	I16	100	P	-
0x402D:007 (P808.07)	Sequencer segment 8: Torque setpoint	**100.0 %**	general	I16	10	P	-
0x402D:008	Sequencer segment 8: NetWordOUT2	**0**	general	U16	1	P	-
0x402D:009	Sequencer segment 8: Reserved	**0**	general	U32	1	P	-
0x402E:001 (P822.01)	End segment: Frequency setpoint	**0.0 Hz**	general	I16	10	P	-
0x402E:002 (P822.02)	End segment: Acceleration/deceleration	**5.0 s**	general	U16	10	P	-
0x402E:003 (P822.03)	End segment: Time	**0.0 s**	general	U32	10	P	-
0x402E:004 (P822.04)	End segment: Digital outputs	**0**	general	U8	1	P	-
0x402E:005 (P822.05)	End segment: Analog outputs	**0.00 VDC**	general	U16	100	P	-
0x402E:006 (P822.06)	End segment: PID setpoint	**0.00 PID unit**	general	I16	100	P	-
0x402E:007 (P822.07)	End segment: Torque setpoint	**100.0 %**	general	I16	10	P	-
0x402E:008	End segment: NetWordOUT2	**0**	general	U16	1	P	-
0x402E:009	End segment: Reserved	**0**	general	U32	1	P	-
0x402F (P824.00)	End of sequence mode	**Keep running [0]**	general	U8	1	P	-

* Default setting depending on the size. Firmware version 05.00.00.00

Address	Designation	Default setting	Category	Data type	Factor	A	M
0x4030:001 ... 0x4030:016 (P830.01 ... 16)	Sequence 1: Step 1 ... Step 16	**Skip step [0]**	general	I8	1	P	-
0x4031 (P831.00)	Number of cycles sequence 1	**1**	general	U16	1	P	-
0x4032:001 ... 0x4032:016 (P835.01 ... 16)	Sequence 2: Step 1 ... Step 16	**Skip step [0]**	general	I8	1	P	-
0x4033 (P836.00)	Number of cycles sequence 2	**1**	general	U16	1	P	-
0x4034:001 ... 0x4034:016 (P840.01 ... 16)	Sequence 3: Step 1 ... Step 16	**Skip step [0]**	general	I8	1	P	-
0x4035 (P841.00)	Number of cycles sequence 3	**1**	general	U16	1	P	-
0x4036:001 ... 0x4036:016 (P845.01 ... 16)	Sequence 4: Step 1 ... Step 16	**Skip step [0]**	general	I8	1	P	-
0x4037 (P846.00)	Number of cycles sequence 4	**1**	general	U16	1	P	-
0x4038:001 ... 0x4038:016 (P850.01 ... 16)	Sequence 5: Step 1 ... Step 16	**Skip step [0]**	general	I8	1	P	-
0x4039 (P851.00)	Number of cycles sequence 5	**1**	general	U16	1	P	-
0x403A:001 ... 0x403A:016 (P855.01 ... 16)	Sequence 6: Step 1 ... Step 16	**Skip step [0]**	general	I8	1	P	-
0x403B (P856.00)	Number of cycles sequence 6	**1**	general	U16	1	P	-
0x403C:001 ... 0x403C:016 (P860.01 ... 16)	Sequence 7: Step 1 ... Step 16	**Skip step [0]**	general	I8	1	P	-
0x403D (P861.00)	Number of cycles sequence 7	**1**	general	U16	1	P	-
0x403E:001 ... 0x403E:016 (P865.01 ... 16)	Sequence 8: Step 1 ... Step 16	**Skip step [0]**	general	I8	1	P	-
0x403F (P866.00)	Number of cycles sequence 8	**1**	general	U16	1	P	-
0x4040 (P820.00)	Start of sequence mode	**Restart sequencer [0]**	general	U8	1	P	-
0x4041:001 ... 0x4041:032 (P750.01 ... 32)	Parameter change-over: Parameter 1 ... Parameter 32	**0x00000000**	general	IDX	1	PH	-
0x4042:001 ... 0x4042:032 (P751.01 ... 32)	Parameter value set 1: Value of parameter 1 ... Value of parameter 32	**0**	general	I32	1	P	-
0x4043:001 ... 0x4043:032 (P752.01 ... 32)	Parameter value set 2: Value of parameter 1 ... Value of parameter 32	**0**	general	I32	1	P	-
0x4044:001 ... 0x4044:032 (P753.01 ... 32)	Parameter value set 3: Value of parameter 1 ... Value of parameter 32	**0**	general	I32	1	P	-
0x4045:001 ... 0x4045:032 (P754.01 ... 32)	Parameter value set 4: Value of parameter 1 ... Value of parameter 32	**0**	general	I32	1	P	-
0x4046 (P755.00)	Activation of parameter set	**Via command (disable required) [0]**	general	U8	1	P	-
0x4047:001 (P756.01)	Parameter change-over error message: Status	- (Read only)	general	U16	1	-	-
* Default setting depending on the size.				Firmware version 05.00.00.00			



Address	Designation	Default setting	Category	Data type	Factor	A	M
0x4047:002 (P756.02)	Parameter change-over error message: List entry	- (Read only)	general	U8	1	-	-
0x4048 (P601.00)	PID P-component	**5.0 %**	general	U16	10	P	rt
0x4049 (P602.00)	PID I- component	**400 ms**	general	U16	1	P	rt
0x404A (P603.00)	PID D-component	**0.0 s**	general	U8	10	P	rt
0x404B (P604.00)	PID setpoint ramp	**20.0 s**	general	U16	10	P	-
0x404C:001 (P607.01)	PID influence: Acceleration time for activation	**5.0 s**	general	U16	10	P	-
0x404C:002 (P607.02)	PID influence: Deceleration time for masking out	**5.0 s**	general	U16	10	P	-
0x404D:001 (P608.01)	PID alarms: MIN alarm threshold	**0.00 PID unit**	general	I16	100	P	-
0x404D:002 (P608.02)	PID alarms: MAX alarm threshold	**100.00 PID unit**	general	I16	100	P	-
0x404D:003 (P608.03)	PID alarms: Monitoring bandwidth PID feedback signal	**2.00 %**	general	U16	100	P	-
0x404E:001 (P605.01)	PID setpoint limits: Minimum setpoint	**-300.00 PID unit**	general	I16	100	P	-
0x404E:002 (P605.02)	PID setpoint limits: Maximum setpoint	**300.00 PID unit**	general	I16	100	P	-
0x603F (P150.00)	Error code	- (Read only)	general	U16	1	O	t
0x6040	CiA: Controlword	**0**	general	U16	1	O	r
0x6041 (P780.00)	CiA: Statusword	- (Read only)	general	U16	1	O	t
0x6042 (P781.00)	Target velocity	**0 rpm**	general	I16	1	OK	r
0x6043 (P782.00)	Velocity demand	x rpm (Read only)	general	I16	1	O	t
0x6044 (P783.00)	Velocity actual value	x rpm (Read only)	general	I16	1	O	t
0x6046:001 (P784.01)	Velocity min max amount: Velocity min amount	**0 rpm**	general	U32	1	P	r
0x6046:002 (P784.02)	Velocity min max amount: Velocity max amount	**2147483647 rpm**	general	U32	1	P	r
0x6048:001 (P785.01)	Velocity acceleration: Delta speed	**3000 rpm**	general	U32	1	OP	r
0x6048:002 (P785.02)	Velocity acceleration: Delta time	**10 s**	general	U16	1	OP	r
0x6049:001 (P786.01)	Velocity deceleration: Delta speed	**3000 rpm**	general	U32	1	OP	r
0x6049:002 (P786.02)	Velocity deceleration: Delta time	**10 s**	general	U16	1	OP	r
0x605A	Quick stop option code	**Quick stop ramp -> switch-on inhibited [2]**	general	I16	1	P	-
0x605E (P791.00)	Fault reaction option code	**Coasting [0]**	general	I16	1	-	-
0x6060 (P301.00)	Modes of operation	**MS: Velocity mode [-2]**	general	I8	1	OP C	r
0x6061 (P788.00)	Modes of operation display	- (Read only)	general	I8	1	O	t
0x6071	Target torque	**0.0 %**	general	I16	10	OK	r
0x6072 (P326.00)	Max torque	**250.0 %**	general	U16	10	OP	r
* Default setting depending on the size.							Firmware version 05.00.00.00

Address	Designation	Default setting	Category	Data type	Factor	A	M
0x6073 (P324.00)	Max current	**200.0 %**	general	U16	10	P	r
0x6074	Torque demand value	x.x % (Read only)	MCTRL	I16	10	O	-
0x6075 (P323.00)	Motor rated current	**1.700 A** *	MCTRL	U32	1000	PC	-
0x6076 (P325.00)	Motor rated torque	**1.650 Nm** *	MCTRL	U32	1000	PC	-
0x6077 (P107.00)	Torque actual value	x.x % (Read only)	general	I16	10	O	t
0x6078 (P103.00)	Current actual value	x.x % (Read only)	general	I16	10	O	t
0x6079	DC link circuit voltage	x.xxx V (Read only)	general	U32	1000	O	t
0x6080 (P322.00)	Max motor speed	**6075 rpm**	general	U32	1	OP	r
0x6085 (P790.00)	Quick stop deceleration	**546000 pos. unit/s²**	general	U32	1	P	-
0x60E0	Positive torque limit	**250.0 %**	general	U16	10	P	r
0x60E1	Negative torque limit	**250.0 %**	general	U16	10	P	r
0x60FD (P118.00)	Digital inputs	- (Read only)	general	U32	1	O	t
0x6402	Motor type	**Squirrel cage induction [7]**	MCTRL	U16	1	P	-
0x6502 (P789.00)	Supported drive modes	- (Read only)	general	U32	1	-	-
* Default setting depending on the size.							Firmware version 05.00.00.00

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