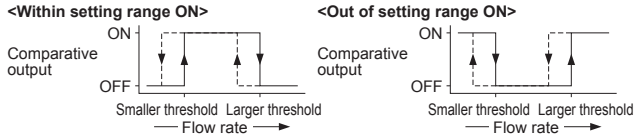


Window comparator mode

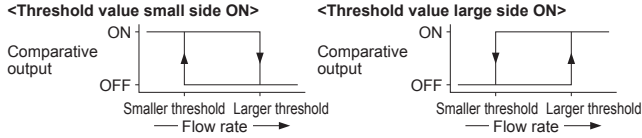
- In this mode, the ON / OFF state of the comparative output is controlled with a flow rate in the set range.



Note: Hysteresis of the window comparator mode is approx. 1% F.S. (factory setting). The hysteresis can be changed in the range of approx. 1 to 8% F.S. For details, refer to "Hysteresis setting" in "PRO MODE."

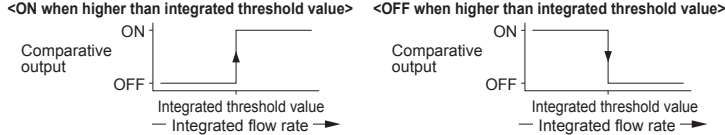
Hysteresis mode

- The comparative output ON / OFF state can be controlled with randomly set hysteresis in this mode.



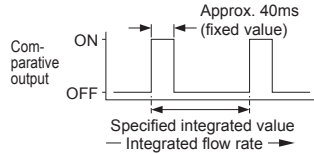
Integrated output mode

- The comparative output ON / OFF state can be controlled with randomly set integrated threshold value in this mode.



Integrated pulse output mode

- In this mode, pulse can be outputted with each specified integrated value.
- For the specified integrated value, refer to "SPECIFICATIONS."
- Take care that if fluid flows in the direction opposite to the set flow direction, the integrated pulse is outputted as well.



7 RUN MODE

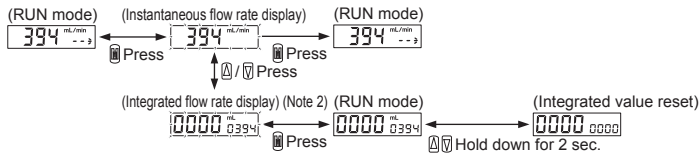
- In this mode, flow rate display mode, confirmation of the set value, peak / bottom hold function and key lock function are available.

In the flow rate display mode, color of the digital display changes in green or red in conjunction with the comparative output. The color of the main display can be changed in conjunction with the comparative output 1, while the color of the sub display can be changed in conjunction with the comparative output 2.

For setting color of the digital display, refer to "Display color setting" in "PRO MODE."

Flow rate display mode

- Either instantaneous flow rate or integrated flow rate can be indicated on the digital display.
- The integrated value can be reset by key operation or external input while the integrated flow rate is indicated. (Note 1)
- At the instantaneous flow rate display, 4-digit instantaneous flow rate value is indicated on the main display, while the flow direction is indicated on the sub display.
- When setting flow direction to bi-direction or one-side forward direction, if fluid flows in the direction opposite to the forward direction display on the main body, the flow rate value is indicated negatively. In case of one-side reverse direction, if the fluid flows in the same direction to the forward direction display, the flow rate value is indicated negatively.
- At the integrated flow rate display, 7-digit integrated flow rate value is indicated on the main display and the sub display.
- When setting flow direction to bi-direction, if fluid flows in the direction to the forward direction display on the main body, the integrated value will be counted up. While if fluid flows in the opposite direction, the integrated value will be counted down. Further, in case of one-side forward direction and one-side reverse direction, if fluid flows in the direction opposite to the set flow direction by mistake, the integrated value will be counted down.

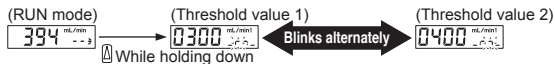


Notes: 1) When resetting the integrated value, first set to the integrated value reset input function, then conduct key operation or input an external signal. For setting the integrated value reset input function, refer to "CH2 setting" in "PRO MODE."
2) The integrated value will be reset when the power is supplied again at the integrated flow rate display.

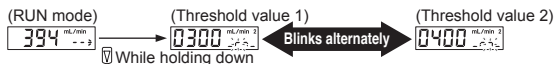
Confirmation of the set value

- The threshold value of the comparative output 1 and the output mode can be checked while holding down UP key when the flow rate is indicated. Meanwhile, the threshold value of the comparative output 2, the output mode and the integrated value reset input function can be checked while holding down DOWN key when the flow rate is indicated.

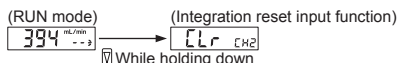
<Display for the set value of comparative output 1>



<Display for the set value of comparative output 2>



<When CH2 is set to the integrated value reset input function>

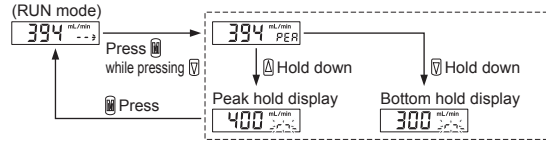


Notes: 1) When CH2 is set to the teaching function, the set value cannot be checked.

2) For details of the output mode, refer to "Output mode and threshold value setting mode" in "MENU SETTING MODE."

Peak / bottom hold function

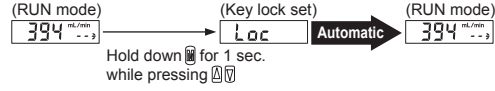
- The peak / bottom hold function displays the peak value and bottom value of the fluctuating flow rate.



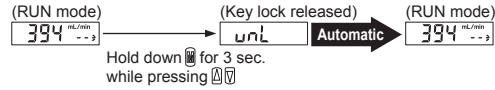
Key lock function

- The key lock function prevents key operations so that the conditions set in each setting mode are not inadvertently changed.
- After setting the key lock, "Loc" will be displayed on the digital display.

<How to set>

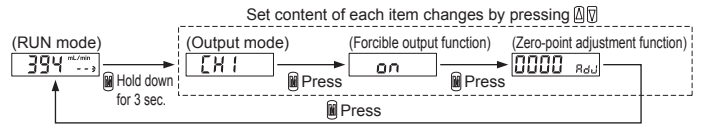


<How to release>



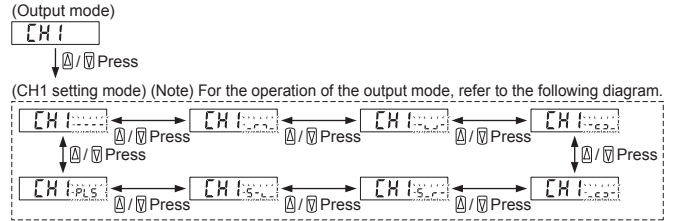
8 MENU SETTING MODE

- In this mode, the output mode (threshold value setting mode), forcible output function and zero-point adjustment function can be set.



Output mode and threshold value setting mode

- Output mode and threshold value can be set.



(Threshold value1 setting mode)

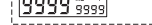
<When output mode is set to the window comparator mode or hysteresis mode>

(Smaller threshold) (Larger threshold)



<When output mode is set to the integrated output>

(Smaller threshold)

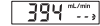


Threshold value changes by pressing UP / DOWN

(CH2 setting mode) Conduct same operation with "CH1 setting mode."

(Threshold value 2 setting mode) Conduct same operation with "threshold value 1 setting mode."

(RUN mode)



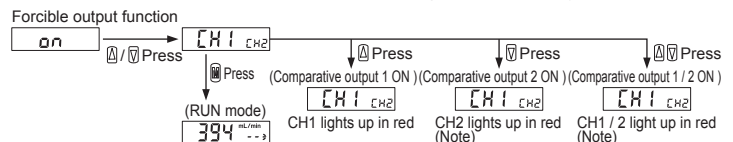
Note: If the teaching function is selected at CH2 setting in PRO mode, jumps to the "Selection of method for loading input value" at "CH2 setting" under PRO mode.

<Output mode operation>

Sub display	Output mode	Operation
- - -	Output OFF mode (Factory setting)	Output OFF
- r -	Window comparator mode	Within setting range ON
- l -		Out of setting range ON
- c -	Hysteresis mode	Smaller threshold value side ON
- C -		Larger threshold value side ON
5 - -	Integrated output mode	ON when higher than integrated threshold value
5 - l		OFF when higher than integrated threshold value
PLS	Integrated pulse output mode	Pulse output

Forcible output function

- The forcible output function is used to turn ON the comparative output forcibly regardless of output mode or threshold value.
- The comparative output turns ON while pressing UP / DOWN key.



Note: When CH2 is set to the external input, the comparative output 2 does not operate. For the setting method of CH2, refer to "CH2 setting" in "PRO MODE."

Zero-point adjustment function

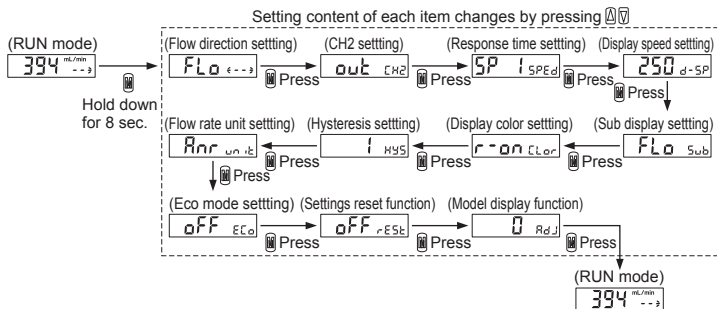
- The zero-point adjustment function is used to adjust the gap of the zero-point between the display and the analogue voltage output.



9 PRO MODE

- In this mode, each detailed function can be set.

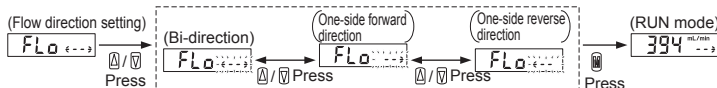
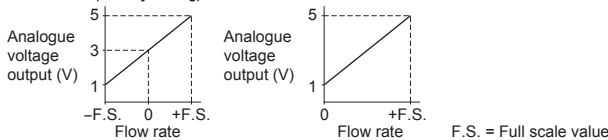
When pressing the MODE key after changing the set content of each item, the set content is confirmed and returns to RUN mode.



Flow direction setting

- Sets the flow direction of fluid. Either bi-direction, one-side forward direction or one-side reverse direction can be set. (Factory setting: bi-direction)
- When setting flow direction to bi-direction or one-side forward direction, if fluid flows in the direction opposite to the forward direction display on the main body, the flow rate value is indicated negatively. In case of one-side reverse direction, if the fluid flows in the same direction to the forward direction display, the flow rate value is indicated negatively.
- Zero-point and the span of the analogue voltage output change as follows depending on the set flow direction.

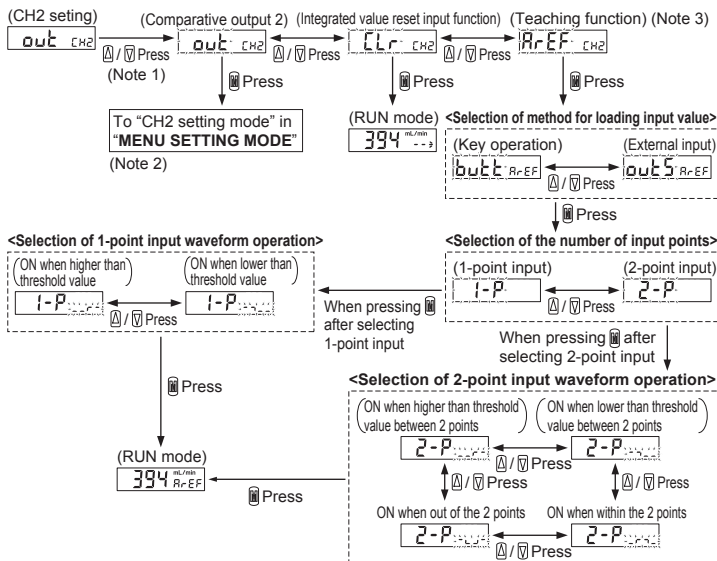
<Bi-direction (Factory setting)> <One-side forward / one-side reverse direction>



Note: If changing the flow direction setting, output mode (CH1 / CH2), threshold value (CH1 / CH2), zero-point adjustment value, integrated flow rate value and CH2 setting are all cleared, then returns to the factory setting.

CH2 setting

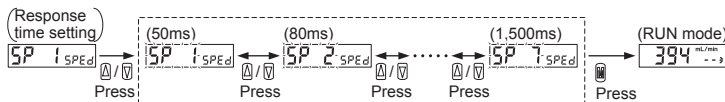
- Select whether CH2 is used as comparative output 2, integrated value reset input function or teaching function. (Factory setting: comparative output 2)
- When setting CH2 to the teaching function, select method for loading input value, the number of input points and input waveform operation.



Notes: 1) When setting CH2, the threshold value of the comparative output 1 may be reset. Therefore, confirm the threshold value of the comparative output 1 after setting CH2.
2) For CH2 setting mode, refer to "Output mode" in "MENU SETTING MODE."
3) For teaching function, refer to "TEACHING FUNCTION."

Response time setting

- Sets response time. The response time can be selected from seven levels: 50 to 1,500ms. Chattering and malfunction due to rapid change in the flow rate can be prevented. (Factory setting: 50ms)

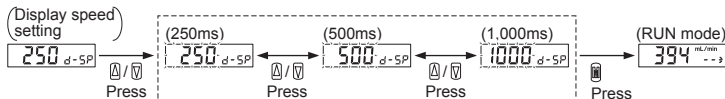


Display	SP 1	SP 2	SP 3	SP 4	SP 5	SP 6	SP 7
Response time	50ms	80ms	120ms	200ms	400ms	800ms	1,500ms

Note: The response time is applied to the sensor itself. Take care that the response time changes depending on piping.

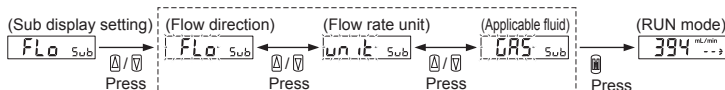
Display speed setting

- Updating cycle of the digital display can be selected from three levels: 250ms, 500ms or 1,000ms. (Factory setting: 250ms)



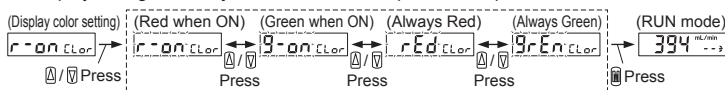
Sub display setting

- Flow direction, flow rate unit and applicable fluid can be indicated on the sub display. (Factory setting: flow direction)



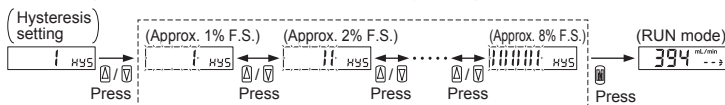
Display color setting

- Display color of the digital display can be set either: red when comparative output is ON, green when comparative output is ON, always red, or always green. (Factory setting: red when comparative output is ON)
- When setting either red when ON or green when ON, the color of the main display changes in conjunction with the comparative output 1, while the color of the sub display changes in conjunction with the comparative output 2.



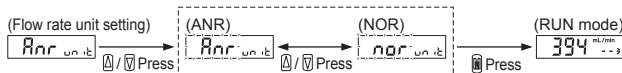
Hysteresis setting

- Sets hysteresis of the window comparator mode. The hysteresis can be selected from eight levels: approx. 1 to 8% F.S. (Factory setting: approx. 1% F.S.)



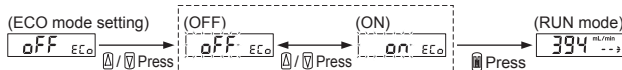
Flow rate unit setting

- Display unit can be set either ANR or NOR. (Factory setting: ANR)
ANR: Flow rate that is converted to +20°C, 1 atmosphere (101kPa) volume
NOR: Flow rate that is converted to 0°C, 1 atmosphere (101kPa) volume



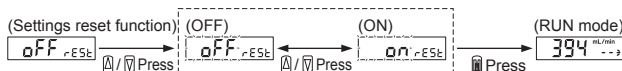
ECO mode setting

- If not operating the key for approx. 1 min. after setting ECO mode, the digital display turns OFF (only "L" is displayed) and the current consumption can be reduced. (Factory setting: OFF)
- Press any key to temporarily show the normal indication.



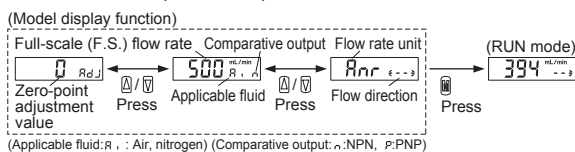
Settings reset function

- Returns to the factory settings. (Factory setting: OFF)



Model display function

- Displays the model. Zero-point adjustment value, full-scale (F.S.) flow rate, applicable fluid, comparative output, flow rate unit and flow direction can be checked.

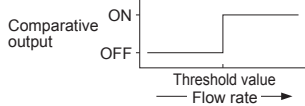


(Applicable fluid: R : Air, NPN, P: PNP) (Comparative output: n: NPN, P: PNP)

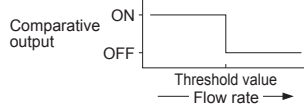
10 TEACHING FUNCTION

- In this function, sets the threshold value of the comparative output 1 based on the instantaneous flow rate value at the time of key operation or inputting external signal. For setting the teaching function, refer to "CH2 setting" in "9 PRO MODE."

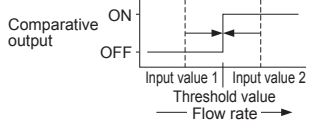
<1-point input, ON when higher than threshold value>



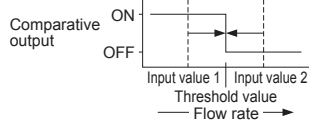
<1-point input, ON when lower than threshold value>



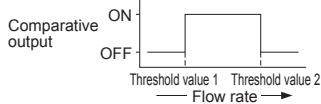
<2-point input, ON when higher than threshold value>



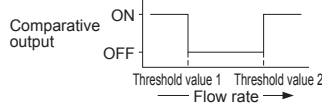
<2-point input, ON when lower than threshold value>



<2-point input, ON when within the 2 points>



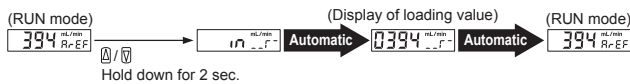
<2-point input, ON when out of the 2 points>



Note: The hysteresis of approx. 1% F.S. (factory setting) is set to the smaller threshold value side. The hysteresis can be changed in the range of approx. 1 to 8% F.S. For details, refer to "Hysteresis setting" in "9 PRO MODE."

[How to load the reference instantaneous flow rate value]

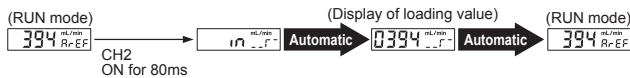
In case of key operation



In case of 1-point input: Hold down DOWN key for 2 sec. to load instantaneous flow rate value and set threshold value.

In case of 2-point input: Hold down UP key and DOWN key for 2 sec. to load the input values of 2 points. The threshold value is set automatically by discriminating the magnitude relation of the input values between 2 points.

In case of external input



In case of 1-point input: Turn ON the external input for 80ms to load instantaneous flow rate value and set threshold value.

In case of 2-point input: Turn ON the external input for 80ms to load the first input value. When turning ON the external input again for 80ms, loads the second input value. The threshold value is set automatically by discriminating the magnitude relation between the first point and the second point. When inputting the third point and the fourth point successively, the latest input value will be valid and the threshold value is set. The default loading value is 0.

Notes: 1) The threshold value set at the teaching function will be reset when turning ON the power again.
2) Loads the instantaneous flow rate value to the comparative output 1 by teaching. After the load is complete, ON / OFF pulses (approx. 40ms) are outputted after approx. 6 sec. at 1-point input, approx. 10 sec. at 2-point input.

11 ERROR INDICATION

Error indication	Cause	Remedy
E 02	Fluid flows during zero-point adjustment.	Make sure to check that fluid does not flow and conduct zero-point adjustment again.
E 03	Internal process error	Turn ON the power supply again. If not restoring normally, contact Panasonic Industrial Devices SUNX.
E 04		
H 1	Flow rate is exceeding upper limit of the display range.	The instantaneous flow rate should be brought within the display flow rate range.
L 0	Flow rate is exceeding lower limit of the display range.	
Operation indicator is blinking	Load is short-circuited causing an over-current to flow.	Turn OFF the power and check the load.

12 CAUTIONS

- This product has been developed / produced for industrial use only.
- This product is for use in air and nitrogen only. Do not use the product for other fluids since the sensing accuracy cannot be guaranteed.
- Take care that if foreign materials are mixed in the sensing part, the product may break.
- Do not use this product for commercial purposes since the product does not comply with International System of Units (SI).
- Do not apply pressure that is exceeding resistant-pressure.
- Make sure that the power supply is OFF while wiring.
- Take care that short-circuit of the load or wrong wiring may burn or damage the product.
- Take care that if applying voltage exceeding the rated range or connecting to AC power supply, the product may break or burn.
- If power is supplied from a commercial switching regulator, ensure that the frame ground (F.G.) terminal of the power supply is connected to an actual ground.
- In case noise generating equipment (switching regulator, inverter motor, etc.) is used in the vicinity of this product, connect the frame ground (F.G.) terminal of the equipment to an actual ground.
- Do not use during the initial transient time (approx. 5 sec.) after the power supply is switched ON.
- Do not run the wires together with high-voltage lines or power lines or put them in the same raceway. This can cause malfunction due to induction.
- The specification may not be satisfied in a strong magnetic field.
- Accuracy of the display and the analogue voltage output is influenced by self-heating by applying current other than the temperature characteristics. Standby time (5 min. or more after applying current) should be taken when using the product.

- Extension up to total 10m is possible with 0.3mm² or more, cable.
- Make sure that stress by forcible bend or pulling is not applied directly to the sensor cable joint.
- This product is suitable for indoor use only.
- Do not use this product in places having excessive vapor, dust, etc., or where it may come in contact with corrosive gas, etc.
- Take care that the product does not come in contact with water, oil, grease, or organic solvents such as thinner, etc., strong acid or alkaline.
- Do not drop the product or apply hard shock. This can cause product breakage.
- In the case multiple units are installed next to each other, do not allow them to contact each other. If the units are in contact, the heat generated by the products can cause a change in product characteristics or degradation of the material. Be sure to keep a distance of at least 10mm between the products when installing multiple units.
- This product adopts EEPROM. Settings cannot be done 100 thousand times or more because of the EEPROM's lifetime.

13 SPECIFICATIONS

<Model-wise specifications>

Type	Resin body type					
Model No.	FM-252-4(-P)	FM-213-4(-P)	FM-253-4(-P)	FM-214-4(-P)	FM-254-8(-P)	FM-215-8(-P)
Full scale (F.S.) flow rate (Note 1)	500m ³ /min	1,000m ³ /min	5t/min	10t/min	50t/min	100t/min
Display flow rate range (Note 2)	-550 to +550m ³ /min	-1,100 to +1,100m ³ /min	-5.5 to +5.5m ³ /min	-11 to +11t/min	-55 to +55m ³ /min	-110 to +110t/min
Display resolution	1m ³ /min		0.01t/min		0.1t/min	
Integrated flow rate range	±9999999m ³					
Specified integrated value	5m ³	10m ³	0.05t	0.1t	0.5t	1t
Port size	ø4 push-in			ø8 push-in		
Weight	Approx. 50g			Approx. 70g		

Type	Aluminum body type			
Model No.	FM-255-AR2(-P)	FM-255-AG2-P	FM-216-AR2(-P)	FM-216-AG2-P
Full scale (F.S.) flow rate (Note 1)	500m ³ /min		1,000m ³ /min	
Display flow rate range (Note 2)	-550 to +550m ³ /min		-1,100 to +1,100m ³ /min	
Display resolution	1m ³ /min			
Integrated flow rate range	±9999999m ³			
Specified integrated value	0.5t		1t	
Port size	Rc½	G½	Rc½	G½
Weight	Approx. 155g			

<Common specifications>

Type	NPN output type		PNP output type	
Model No.	FM-□		FM-□-P	
Accuracy assurance range (Note 3)	Bi-direction: -100 to -3% F.S., +3 to +100% F.S. One-side direction: +3 to +100% F.S.			
Rated pressure range	-0.09 to +0.7MPa			
Residual pressure	1MPa			
Applicable fluid	Clean air, compressed air and nitrogen gas (Note 4)			
Sensing element	Semiconductor type			
Supply voltage	12 to 24V DC±10% Ripple P-P10% or less			
Current consumption	Normal mode: 60mA or less, ECO mode: 40mA or less			
Comparative output (Comparative output 1 / 2)	NPN open-collector transistor • Maximum sink current: 50mA or less • Applied voltage: 26.4V DC or less (between comparative output and 0V) • Residual voltage: 2.4V or less (at 50mA sink current)		PNP open-collector transistor • Maximum source current: 50mA or less • Applied voltage: 26.4V DC or less (between comparative output and +V) • Residual voltage: 2.4V or less (at 50mA source current)	
Output mode	Output OFF mode, window comparator mode, hysteresis mode, integrated output mode and integrated pulse output mode			
Short-circuit protection	Incorporated			
Hysteresis	Window comparator mode: Variable at approx. 1 to 8% F.S. Hysteresis mode: Variable			
Analogue voltage output	Output voltage: 1 to 5V, Output impedance: Approx. 1kΩ			
Repeatability	Within ±1% F.S.			
External input	• ON voltage: 0 to +0.4V • OFF voltage: +5 to +V or Open • Input time: 80ms or more		• ON voltage: +5 to +V • OFF voltage: 0 to +0.6V or Open • Input time: 80ms or more	
Linearity	Within ±3% F.S. (+25°C, secondary atmospheric criteria)			
Temperature characteristics	Within ±0.2% F.S. / °C (+15 to +35°C, +25°C criteria)			
Pressure characteristics	Within ±5% F.S. (-0.09 to +0.7MPa, +25°C, secondary atmospheric criteria)			
Protection	IP40 (IEC)			
Ambient temperature	0 to +50°C (no dew condensation allowed), Storage: -10 to +60°C			
Ambient humidity	35 to 90% RH or less, Storage: 35 to 90% RH or less			
Material	Enclosure: ABS, Body: Polyamide (Aluminum body type: Aluminum) Switch: EPDM, Display: Acrylic, Mounting screw part (Resin body type): Brass Current plate / port filter: Stainless steel (used for the gas contact area) Sensor tip: Silicone, Gasket: Fluorine rubber			
Grounding method	Floating (Note 5)			
Accessory	CN-F15-C1 (Cable with connector, 1m long): 1 pc.			

- Notes: 1) Converted to volumetric flow at +20°C and 1 atmospheric pressure (101kPa).
2) The display flow rate range is the case when setting to bi-direction at the flow direction setting. When the flow direction is set to one-side forward direction or one-side reverse direction, the negative side of the display flow rate range shows up to 10% of the full-scale (F.S.).
3) Take care that if fluid flows in the vicinity of zero-point which is out of the accuracy assurance range, the instantaneous flow rate value may forcibly display "zero", or the integrated value may not be counted, or the integrated pulse output may not be outputted.
4) The clean air complies with JIS B 8392-1.1.1 to 5.6.2 and the compressed air complies with JIS B 8392-1.1.1 to 1.6.2.
5) As a variable resistor (clamping voltage: approx. 40V) is connected to the aluminum body type, do not apply voltage higher than the rated voltage of the sensor.

14 INTENDED PRODUCTS FOR CE MARKING

- The models listed under "13 SPECIFICATIONS" come with CE Marking. As for all other models, please contact our office.



Panasonic Industrial Devices SUNX Co., Ltd.

http://panasonic.net/id/pidsx/global

Overseas Sales Division (Head Office)

2431-1 Ushiyama-cho, Kasugai-shi, Aichi, 486-0901, Japan
Phone: +81-568-33-7861 FAX: +81-568-33-8591

For sales network, please visit our website.

PRINTED IN JAPAN

© Panasonic Industrial Devices SUNX Co., Ltd. 2016