



# CFM500M SERIES 500 WATT MEDICAL AC-DC POWER SUPPLY WITH PFC

## Features

- Universal Input Range 80~264V<sub>ac</sub>
- High Efficiency up to 94.5%
- 3"x 5" Compact Size
- Class I
- No Load Power Consumption<0.5W
- Approval IEC/EN/UL 60601-1 2 MOPP
- Approval EN 55011, 47 CFR FCC Part 18
- Active PFC Meets EN 61000-3-2
- Meets IEC/EN 60335-1
- Operating Altitude 5000m
- High Power Density up to 21.64W/Inch<sup>3</sup>
- 390W Natural, 470 ~ 500W Conduction Convection
- Over Temperature Protection
- PS On/Off Remote Control
- Power Good & Power Fail Signal
- +5V Stand-by, 12V Fan Output
- Low Inrush Current



MODEL NUMBER	OUTPUT VOLTAGE	OUTPUT CURRENT			VOLTAGE ACCURACY NOTE2	RIPPLE & NOISE NOTE3	VOLTAGE ADJ. RANGE	LINE REGULATION NOTE4	LOAD REGULATION NOTE5	%EFF. (Typ.)	
		NOTE1		COVER							OPEN
		With FAN									
CFM500M120	12 V	41.67A	27.5A	25A	±1%	120mV	11.4~12.6 V	±0.5%	±1%	92.5%	
CFM500M180	18 V	27.78A	18.33A	16.67A	±1%	150mV	17.1~18.9 V	±0.5%	±1%	93.5%	
CFM500M240	24 V	20.83A	17.08A	15.83A	±1%	150mV	22.8~25.2 V	±0.5%	±1%	94.5%	
CFM500M360	36 V	13.89A	11.39A	10.56A	±1%	200mV	34.2~37.8 V	±0.5%	±1%	94.5%	
CFM500M480	48 V	10.42A	8.54A	7.92A	±1%	250mV	45.6~50.4 V	±0.5%	±1%	94.5%	
<b>Stand-by Output Voltage</b>											
All	+5V	1A			±3%	100mV	---	±1%	±5%	---	
<b>Fan Output Voltage</b>											
All	+12V	0.5A (NOTE 6)			---	---	---	---	---	---	

Note:

1. Forced air convection with 21CFM Fan.
2. Voltage accuracy is set at 100% full load and 25°C Ta.
3. Add a 0.1uF ceramic capacitor and a 10uF E.L. capacitor to output for ripple & noise measuring @20MHz BW.
4. Line regulation is measured from high line to low line with 100% full load.
5. Load regulation is measured from 10% to 100% full load.
6. Fan output can only operate normal when the stand-by output is above 0.5A.

## PART NUMBER

Series	Number of Outputs	Nominal Output Voltage	Type	Output Terminal
CFM500	X	XXX	X (Option)	-X(Option)
CFM500	M : Medical	120 : 12V 180 : 18V 240 : 24V 360 : 36V 480 : 48V	None : With Baseplate C : With Cover	None : Vertical R : Horizontal

Part Number Example:

- CFM500M120:** With Baseplate, 500W, 12Vdc Output, Vertical Type Terminal
- CFM500M120C:** With Cover, 500W, 12Vdc Output, Vertical Type Terminal
- CFM500M120-R:** With Baseplate, 500W, 12Vdc Output, Horizontal Type Terminal
- CFM500M120C-R:** With Cover, 500W, 12Vdc Output, Horizontal Type Terminal



# CFM500M Series

## TECHNICAL SPECIFICATIONS

(All specifications are typical at nominal input, full load at 25°C unless otherwise noted.)

### ABSOLUTE MAXIMUM RATINGS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Input Voltage	Safety approvals only to the AC input	All	80		264	V <sub>ac</sub>
Operating Case Temperature	See Derating Curve	All	-40		85	°C
Storage Temperature		All	-40		85	°C
Operating Altitude		All			5000	m

### INPUT CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Operating Voltage Range		All	100		240	V <sub>ac</sub>
Input Frequency Range		All	47		63	Hz
Maximum Input Current	100% Full Load, V <sub>in</sub> =100V <sub>ac</sub>	All			6	A
Power Factor	V <sub>in</sub> =230V <sub>ac</sub>	All		0.97		
Leakage Current		All			0.3	mA
Inrush Current	V <sub>in</sub> =240V <sub>ac</sub> , Cold start at 25°C	All		8.5		A

### OUTPUT CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Output Voltage Set Point	V <sub>in</sub> =Nominal V <sub>in</sub> , I <sub>o</sub> =I <sub>o</sub> max., T <sub>c</sub> =25°C.	CFM500M120	11.88	12	12.12	V <sub>dc</sub>
		CFM500M180	17.82	18	18.18	
		CFM500M240	23.76	24	24.24	
		CFM500M360	35.64	36	36.36	
		CFM500M480	47.52	48	48.48	
Operating Output Current Range	V <sub>in</sub> =80V <sub>ac</sub> ~264V <sub>ac</sub> , See Derating Curve	CFM500M120			41.67	A
		CFM500M180			27.78	
		CFM500M240			20.83	
		CFM500M360			13.89	
		CFM500M480			10.42	
Holdup Time	V <sub>in</sub> =115V <sub>ac</sub>	All		16		ms
Output Voltage Regulation						
Load Regulation	10% to 100% full load	All			±1.0	%
Line Regulation	V <sub>in</sub> =High line to low line	All			±0.5	%
Over Voltage Protection	Latch off (AC recycle to reset)	CFM500M120			16	V <sub>dc</sub>
		CFM500M180			30	
		CFM500M240			35	
		CFM500M360			50	
		CFM500M480			63	
Over Current Protection	Auto recovery	All	120		190	%
Short Circuit Protection	Auto recovery	All				
Over Temperature Protection	Auto recovery	All				
Output Ripple and Noise	1. Add a 0.1uF ceramic capacitor and a 10uF aluminum electrolytic capacitor to output 2. Oscilloscope is 20MHz bandwidth 3. Ambient temperature=25°C	CFM500M120			120	mV
		CFM500M180			150	
		CFM500M240			150	
		CFM500M360			200	
		CFM500M480			250	



# CFM500M Series

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Load Capacitance	1. $V_{in}=115V_{ac}$ and $230V_{ac}$ 2. Output is 100% full load 3. Ambient temperature= $25^{\circ}C$	CFM500M120			42900	uF
		CFM500M180			28600	
		CFM500M240			20800	
		CFM500M360			14000	
		CFM500M480			10800	
Efficiency	1. $V_{in}=230V_{ac}$ 2. Output is 100% full load 3. Ambient temperature= $25^{\circ}C$	CFM500M120		92.5		%
		CFM500M180		93.5		
		CFM500M240		94.5		
		CFM500M360		94.5		
		CFM500M480		94.5		
PS-On Signal	Power on	All	0		2	$V_{dc}$
	Power off (PS-ON and GND open)			4		
	Power on (PS-ON and GND short)			10		mA
	Power-off (PS-ON and GND open)			0		
Power Good (PG)	1. $V_{in}=80V_{ac}\sim 264V_{ac}$ 2. Output is 100% full load 3. The TTL goes high after power set up	All	100		500	ms
Power Fail (PF)	1. $V_{in}=80V_{ac}\sim 264V_{ac}$ 2. Output is 100% full load 3. The TTL goes low before $V_o$ below 90% rated value	All	1	10		ms

## ISOLATION CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Input to Output	1 minute	All			4000	$V_{ac}$
Isolation Resistance	Input to output	All	100			M $\Omega$

## FEATURE CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Switching Frequency	Pout=max. rated power	All		65		kHz
Output Voltage adjustment		All	-5		+5	%

## GENERAL SPECIFICATIONS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
MTBF	$I_o=100\%$ ; $T_a=25^{\circ}C$ per MIL-HDBK-217F	All		200		k hours
Humidity	Non-condensing	All			93	% RH
Shock	Meet MIL-STD-810F Table 516.5, Table 516.5-I 10ms, each axis 3 times( $\pm X$ 、 $\pm Y$ 、 $\pm Z$ axis)	All		75		g
Vibration	Meet MIL-STD-810F Table 514.5C-VIII, 15~2000Hz, X、Y、Z axis, 1 hour (each axis),. Total 3 hrs.	All		4		g
Weight	Baseplate versions	All		515		g
	Covered versions			635		
Dimensions	With baseplate	All	5.000x3.000x1.540 Inches (127.00x76.20x39.10 mm)			
	C (with cover)		5.354x3.425x1.673 Inches (136.00x87.00x42.50 mm)			
Safety	Class I, IEC 60601-1:2005, COR1:2006, COR2:2007, AMD1:2012 EN 60601-1:2006+A11+A1+A12 ANSI/AAMI ES60601-1 (2005/(R)2012+A1:2012, C1:2009/(R)2012+A2:2010/(R)2012)				Ed 3.1	
EMC Emission	EN 55011:2009+A1:2010, CISPR 11:2009+A1:2010, Class B, IEC 61000-3-2:2014, IEC 61000-3-3:2013, 47 CFR FCC Part 18					
Conducted Disturbance	EN 55011:2009+A1:2010, CISPR 11:2009+A1:2010, 47 CFR FCC Part 18				Class B	
Radiated Disturbance	EN 55011:2009+A1:2010, CISPR 11:2009+A1:2010, 47 CFR FCC Part 18				Class B	
Harmonic Current Emissions	IEC 61000-3-2:2014				Class A, C, D	



# CFM500M Series

## GENERAL SPECIFICATIONS

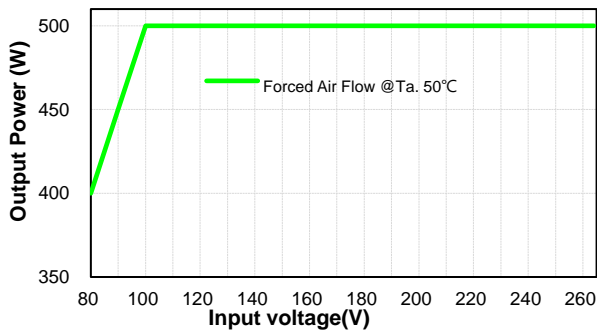
Voltage Fluctuations & Flicker	IEC 61000-3-3:2013	
<b>EMC Immunity</b>	EN 60601-1-2:2015, IEC 61000-4-2,3,4,5,6,8,11	Ed 4.0
Electrostatic Discharge (ESD)	IEC 61000-4-2:2008, Air Discharge: $\pm 15\text{kV}$ , Contact Discharge: $\pm 8\text{kV}$	
Radio-Frequency, Continuous Radiated Disturbance	IEC 61000-4-3:2006+A1:2007+A2:2010	
Electrical Fast Transient (EFT)	IEC 61000-4-4:2012, $\pm 2\text{kV}$	
Surge	IEC 61000-4-5:2014+A1:2017, L-N: $\pm 0.5\text{kV}$ , $\pm 1\text{kV}$ , L-E(Ground): $\pm 0.5\text{kV}$ , $\pm 1\text{kV}$ , $\pm 2\text{kV}$	
Conducted Disturbances, Induced by RF Fields	IEC 61000-4-6:2013+COR1:2015	
Power Frequency Magnetic Field	IEC 61000-4-8:2009	
Voltage Dips	IEC 61000-4-11:2004+A1:2017, Dip: 30% Reduction, Dip >95% Reduction	
Voltage Interruptions	IEC 61000-4-11:2004+A1:2017, >95% Reduction	
Application Note Link	<a href="#">CFM500M Series App Notes</a>	

## CHARACTERISTIC CURVE

### Power Derating Curve

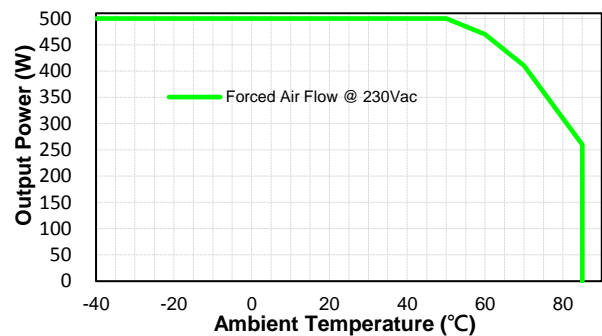
#### Forced Air Flow

Output power & Input voltage



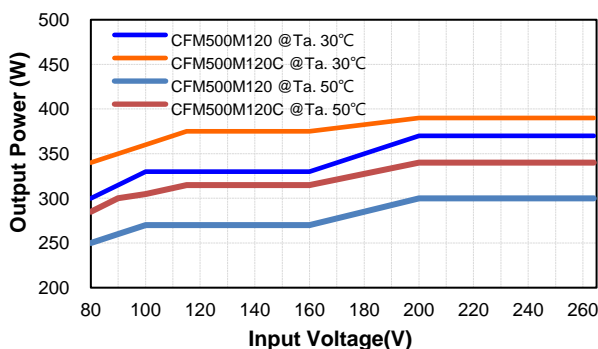
#### Forced Air Flow

Output power vs Ambient Temperature



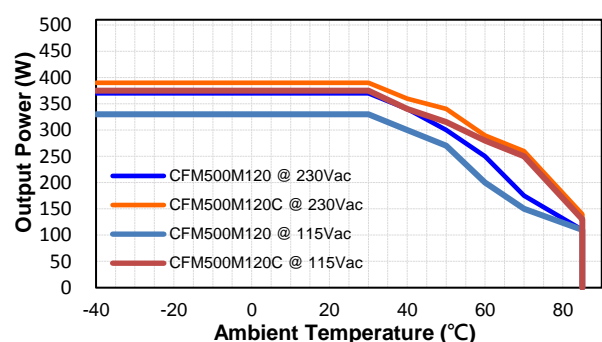
#### Natural Convection

Output power & Input Voltage



#### Natural Convection

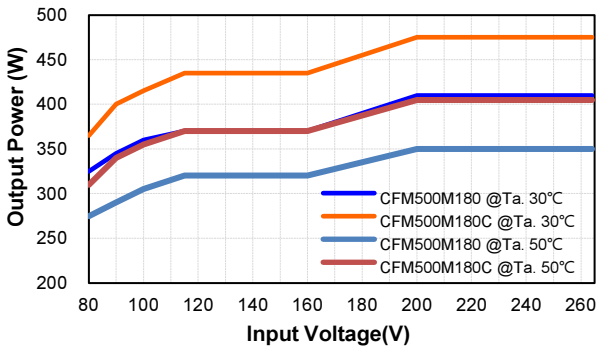
Output power vs Ambient Temperature



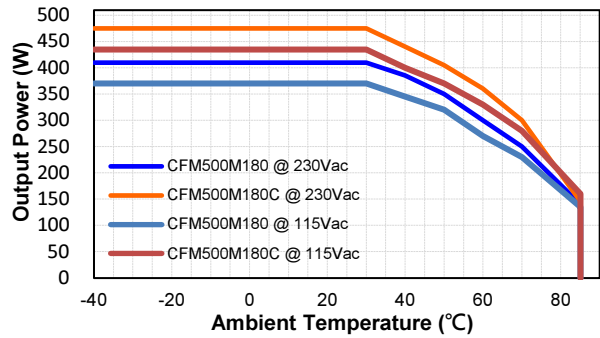


# CFM500M Series

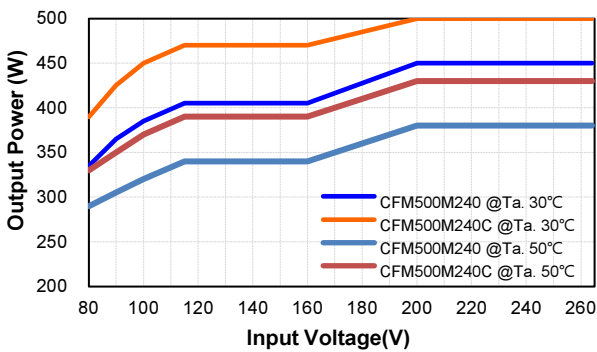
Output power & Input Voltage



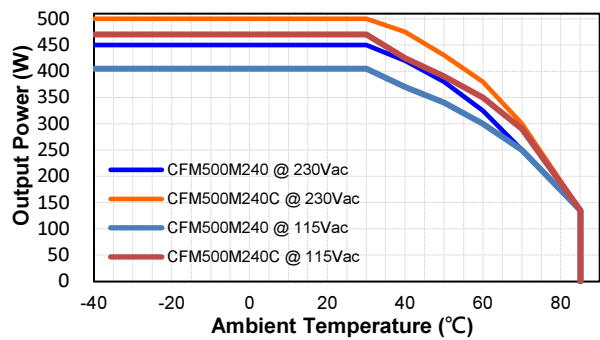
Output power vs Ambient Temperature



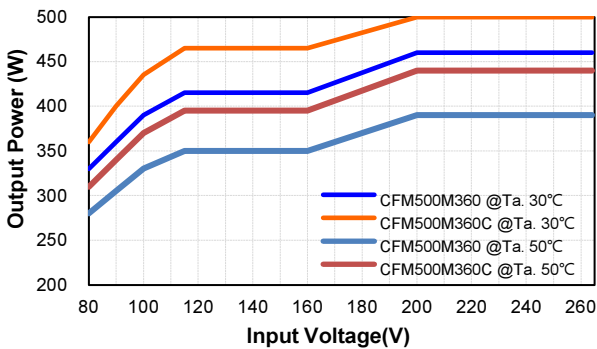
Output power & Input Voltage



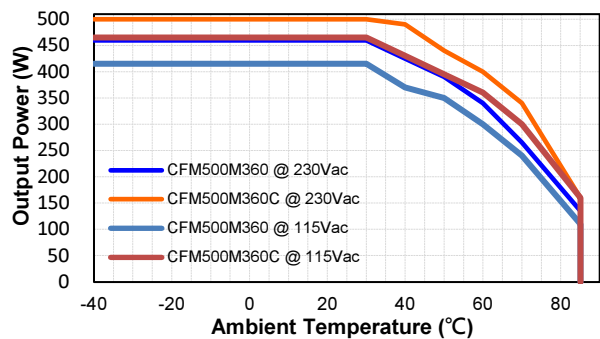
Output power vs Ambient Temperature



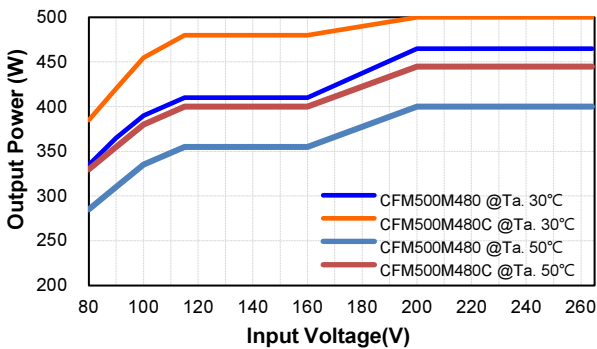
Output power & Input Voltage



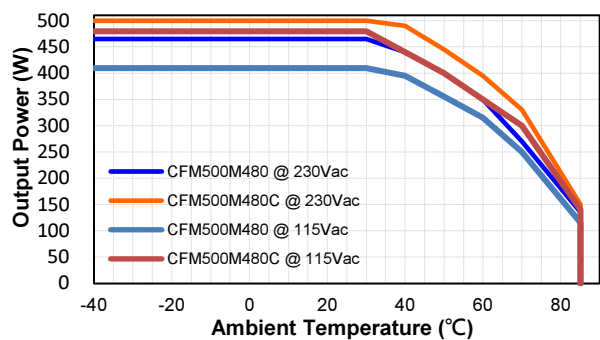
Output power vs Ambient Temperature



Output power & Input Voltage



Output power vs Ambient Temperature



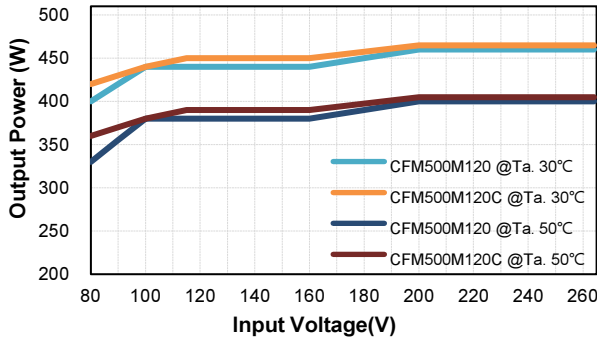


**Conduction Convection with External Baseplate  
(48x24.8x0.12cm)**

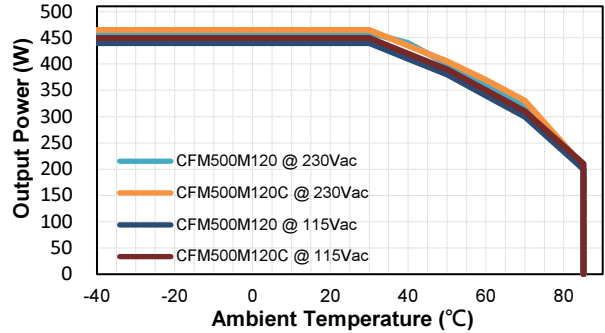
**CFM500M Series**

**Conduction Convection with External Baseplate  
(48x24.8x0.12cm)**

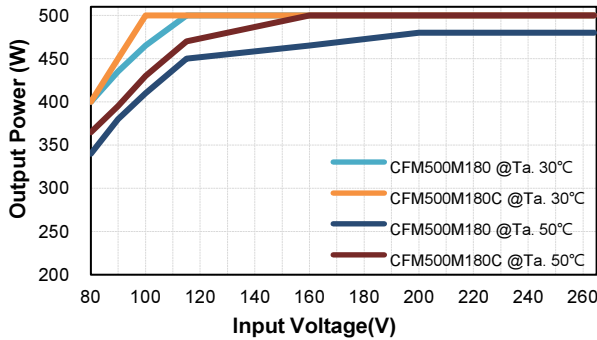
**Output power & Input Voltage**



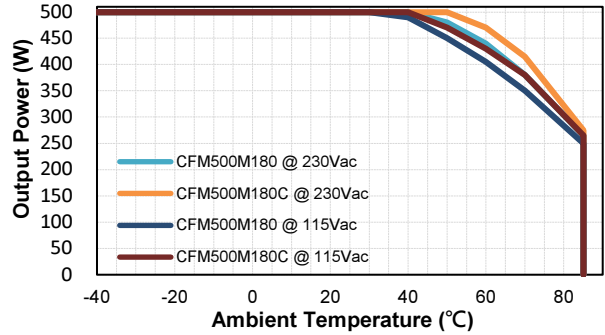
**Output power vs Ambient Temperature**



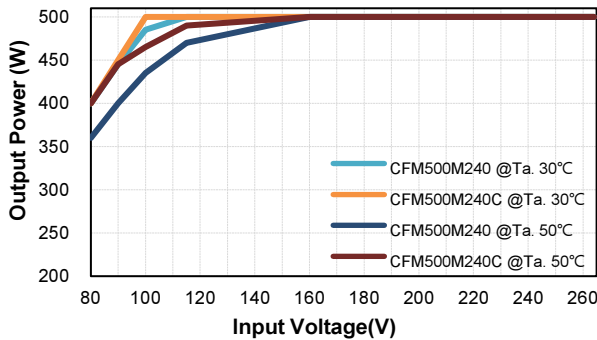
**Output power & Input Voltage**



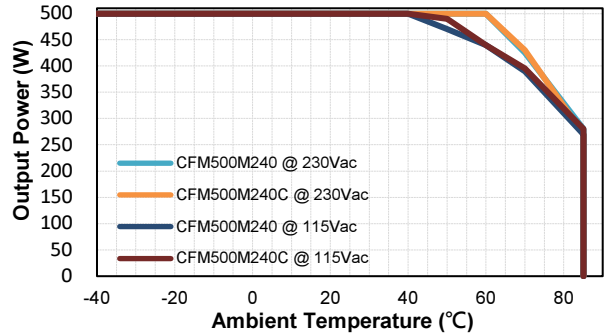
**Output power vs Ambient Temperature**



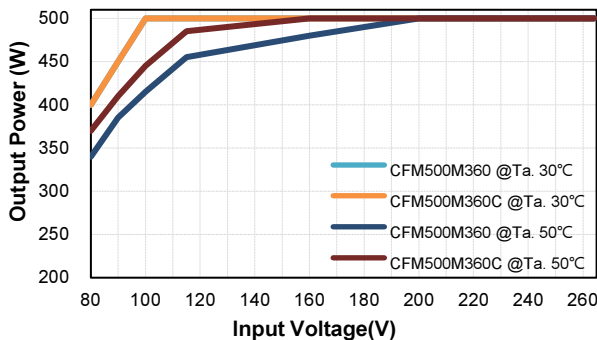
**Output power & Input Voltage**



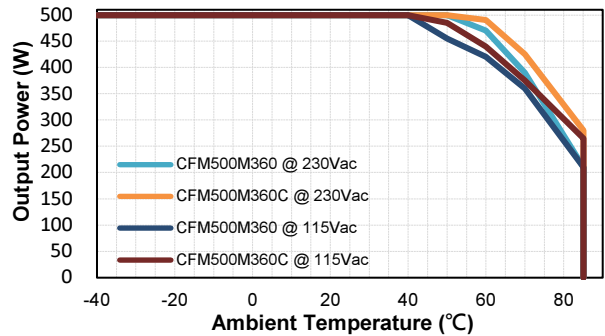
**Output power vs Ambient Temperature**



**Output power & Input Voltage**



**Output power vs Ambient Temperature**

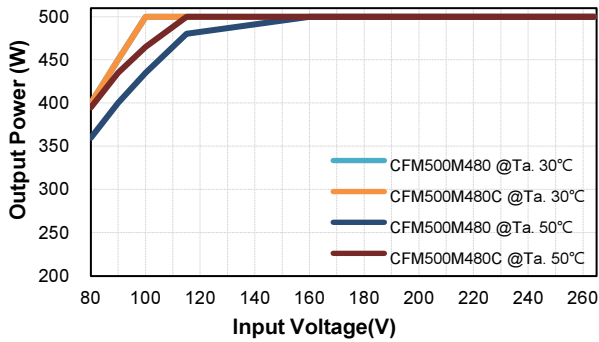




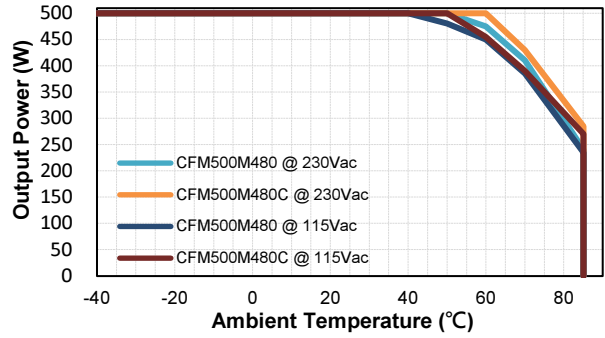


# CFM500M Series

Output power & Input Voltage

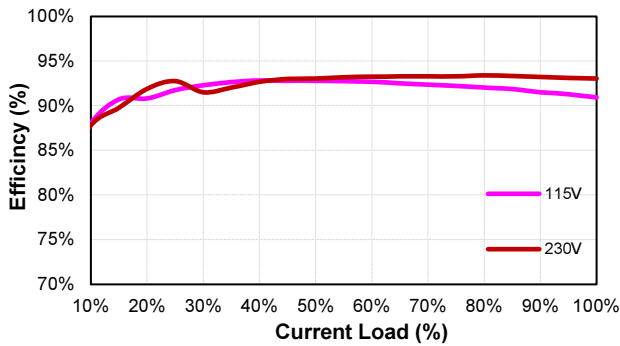


Output power vs Ambient Temperature

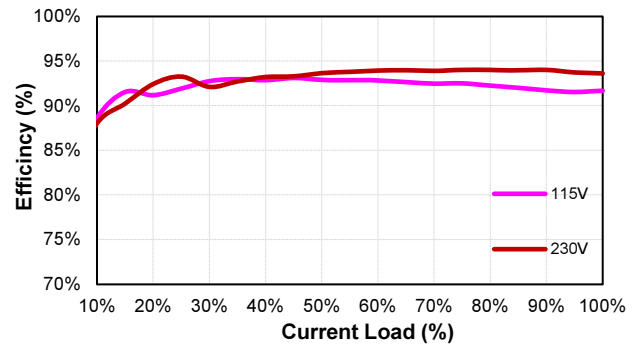


## Performance Data

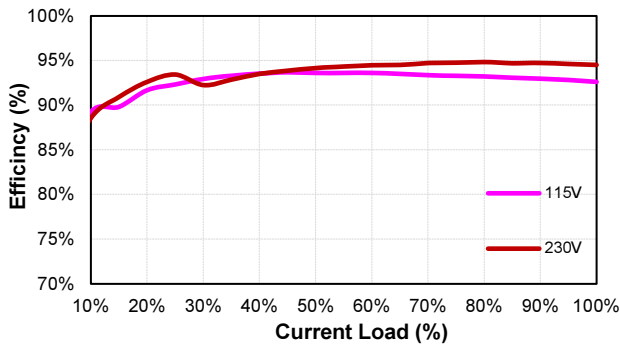
CFM500M120 (Eff Vs Io)



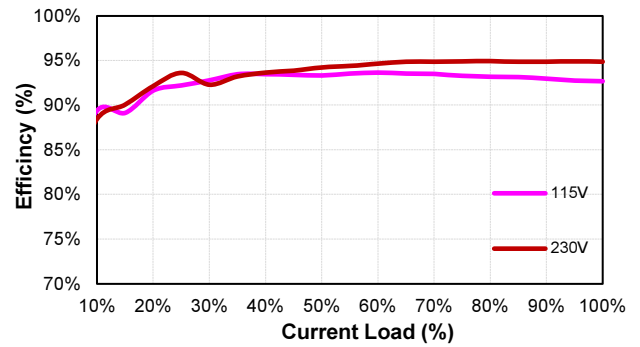
CFM500M180 (Eff Vs Io)



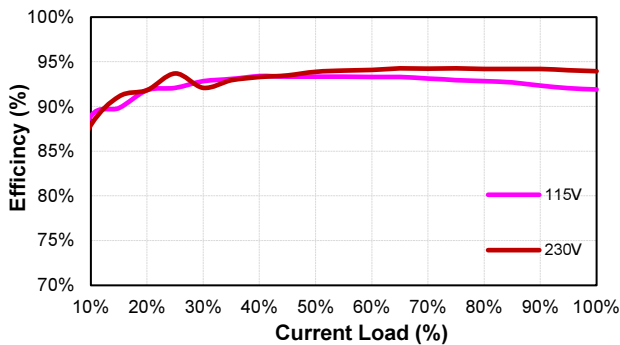
CFM500M240 (Eff Vs Io)



CFM500M360 (Eff Vs Io)



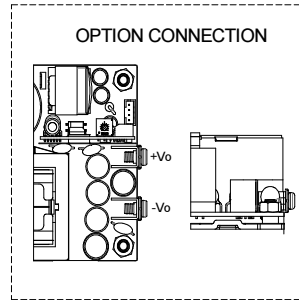
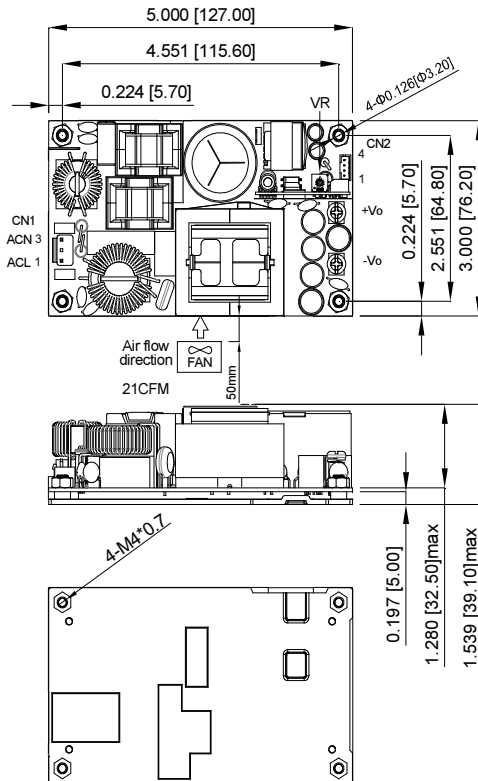
CFM500M480 (Eff Vs Io)





# CFM500M Series

## MECHANICAL SPECIFICATION



CN1:  
PIN CONNECTION

Pin	Function
1	ACL
2	-
3	ACN

CN2:  
PIN CONNECTION

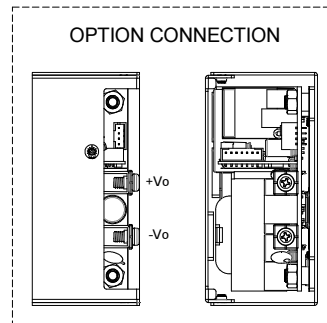
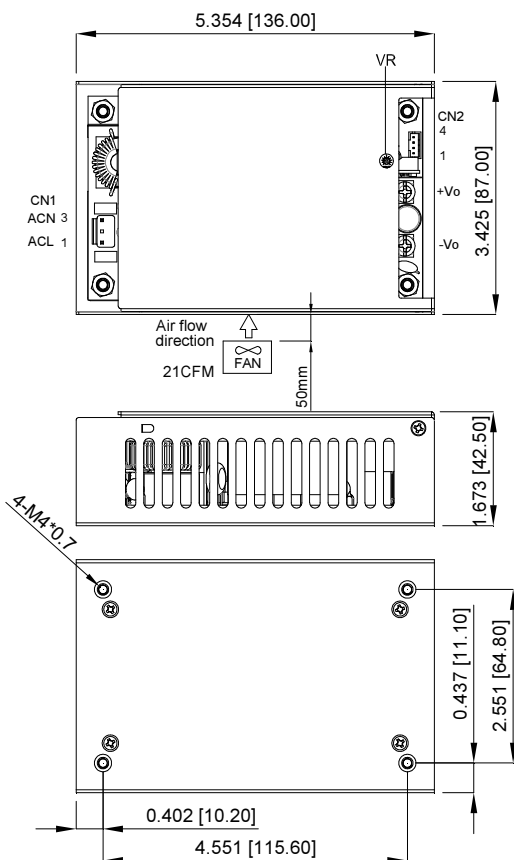
Pin	Function
1	GND
2	+5VSB
3	GND
4	+12V-FAN

CN3:  
PIN CONNECTION

Pin	Function
1	GND
2	PF
3	FAN-EN
4	PS-ON
5	-Sense
6	+Sense
7	OPTION

All Dimensions In Inches[mm]  
Tolerance Inches:x.xxx= ± 0.02  
Millimeters: x.xx = ± 0.5

### CFM500MXXX



CN1:  
PIN CONNECTION

Pin	Function
1	ACL
2	-
3	ACN

CN2:  
PIN CONNECTION

Pin	Function
1	GND
2	+5VSB
3	GND
4	+12V-FAN

CN3:  
PIN CONNECTION

Pin	Function
1	GND
2	PF
3	FAN-EN
4	PS-ON
5	-Sense
6	+Sense
7	OPTION

All Dimensions In Inches[mm]  
Tolerance Inches:x.xxx= ± 0.02  
Millimeters: x.xx = ± 0.5

### CFM500MXXXC

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