AC/DC 400W Open Frame Power Supply

LOF400-20BxxR2 Series

MORNSUN®

CE Report EN62368-1 | UKCA Report BS EN62368-1 | RoHS | 3 years Warranty

FEATURES

- Input voltage range:80 - 264VAC/110 - 370VDC
- Compact size: 5" x 3"
- Operating ambient temperature range:-40℃ to +85℃
- Active PFC
- High I/O isolation test voltage up to 4000VAC
- Operating altitude up to 5000m
- Very low leakage current ＜0.1mA
- Stand-by power consumption 0.5W Typ.
- 150% peak load output for 3 second
- The base plate with conformal coating
- Output short circuit, over-current, over-voltage, over-temperature protection
- Design to meet medical approvals and be suitable for BF type applications
- 3 years warranty
- Installing in system of Safety Class I/II is available
- Design refer to IEC/EN/UL62368-1,GB4943.1, IEC/EN60335-1, IEC/EN61558-1, IEC/EN/ES60601-1

LOF400-20BxxR2 series is one of Mornsun's AC-DC miniaturize open frame power supply and suitable for all kinds of BF type (be accessible to patients) medical system equipment. It features universal AC input and at the same time accepts DC input voltage, cost-effective, high efficiency, high reliability and double or reinforced insulation. These converters offer excellent EMC and safety performance, which meet IEC/EN/UL/BS EN62368、GB4943、IEC/EN60335、IEC/EN61558、IEC/EN/ES60601、IEC60950 standards and they are widely used in areas of industrial, LED, street light control, security, telecommunications, smart home, medical, etc.

Selection Guide

Certification	Part No.	Cool Mode	Output Power (W)*	Nominal Output Voltage and Current (Vo/Io)	Output Voltage Adjustable Range (V)*	Instantaneous power (W) /Duration (s)	Peak current (A)	Efficiency at 230VAC (%) Typ.*	Max. Capacitive Load (μF)
EN/ BS EN	LOF400-20B12R2	Air cooling	249.6	12V/20.8A	11.4-12.6	600/3	50	94.0	3000
		23CFM	399.6	12V/33.3A					
	LOF400-20B24R2	Air cooling	252.0	24V/10.5A	22.8-25.2		25	94.5	1600
		23CFM	400.8	24V/16.7A					
	LOF400-20B48R2	Air cooling	254.4	48V/5.3A	45.6-50.4		12.5	95.0	1200
		23CFM	403.2	48V/8.4A					

Note:
1.*Under any conditions, the total power of the product should not exceed the rated power. When the output voltage is increased, the total output power cannot exceed the rated output power, when the output voltage is decreased, the output current cannot exceed the rated output current;
2.*When measuring the full load efficiency, the fan should be connected to an external power supply, fan loss is not included in the input power;

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Voltage Range	Rated input (Certified voltage)	100	--	240	VAC
	AC input	80	--	264	
	DC input	110	--	370	VDC
Input Voltage Frequency	Rated input (Certified voltage)	50	--	60	Hz
	AC input	47	--	63	
Input Current	Rated input (Certified voltage)	--	--	5.0	A
	115VAC	--	--	5.0	
	230VAC	--	--	2.5	

Inrush Current	115VAC	Cold start	--	40	--	
	230VAC		--	80	--	
Power Factor	115VAC		--	0.98	--	--
	230VAC		--	0.95	--	
Input Fuse	Built-in fuse		--	8	--	A
Hot Plug			Unavailable			

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Output Voltage Accuracy*	Full load range		--	±3.0	--	%
Line Regulation	Rated load		--	±0.5	--	
Load Regulation	0% - 100% load		--	±1.0	--	
Minimum Load			0	--	--	
Stand-by Power Consumption	At room temperature, 230VAC input (when PS_ON is at high potential) Vdd voltage: 3.3-15V, Vdd supply current requirement: 5mA.When PS_ON is at a high level to SGND, the power output is turned off		--	--	0.5	W
Ripple & Noise*	20MHz bandwidth (peak-peak value)	12V	--	--	120	mV
		24V	--	--	200	
		48V	--	--	250	
Temperature Coefficient			--	±0.03	--	%/℃
Hold-up Time	230VAC, rated load, 25℃	Air cooling (250W Load)	--	30	--	ms
		23CFM (400W Load)	--	16	--	
Short Circuit Protection	Recovery time <3s after the short circuit disappear.		Hiccup, continuous, self-recover			
Over-current Protection	100-240VAC, rated load	Normal temperature, high temperature	⩾105% Io, hiccup, self-recover			
		Low temperature	⩾105% full load after derating, hiccup, self-recover			
Over-voltage Protection	12V		⩽16.0VDC (Hiccup, self-recover)			
	24V		⩽33VDC (Hiccup, self-recover)			
	48V		⩽60VDC (Hiccup, self-recover)			
Over-temperature Protection*	115VAC, 100% load Recommended external wind environment: 23CFM	Over-temperature protection start	65	--	90	℃
		Over-temperature protection release	50	--	75	
Fan power	12V		Provide 12V/0.5A output for the fan, with voltage accuracy of-15% to +15% under the premise that the main output is greater than 20% of the rated load			

Notes: 1. *Output voltage accuracy: including the setting error, line regulation, load regulation.
2. *The "Tip and barrel method" is used for ripple and noise test, output parallel 10uF electrolytic capacitor and 0.1uF ceramic capacitor, please refer to AC-DC Converter Application Notes for specific information.
3. *Over-temperature Protection：Hiccup, self-recover.
4. *For all the above test items, please refer to our company standard "AC-DC Black Box Test Specification" for specific test specifications and methods.

General Specifications

Item		Operating Conditions	Min.	Typ.	Max.	Unit
Isolation Test	Input - output	Electric strength test for 1min., leakage current <5mA	4000	--	--	VAC
	Input - ⏚		2000	--	--	
	Output - ⏚		1500	--	--	
Insulation Resistance	Input - ⏚	Ambient temperature: 25 ± 5℃ Relative humidity: < 95%RH, no condensation Test voltage: 500VDC	100	--	--	MΩ
	Input - output		100	--	--	
	Output - ⏚		100	--	--	

Operating Temperature					-40	--	85	℃
Storage Temperature					-40	--	85	
Storage Humidity	No condensation				10	--	95	%RH
Operating Humidity					20	--	90	
Power Derating	Operating temperature derating	23CFM rated power 400W		-40℃ to +50℃	0	--	--	%/℃
				+50℃ to +70℃	1.87	--	--	
		Air cooling rated power 250W	230VAC	+70℃ to +85℃	3.0	--	--	
				-40℃ to +45℃	0	--	--	
				+45℃ to +60℃	1.5	--	--	
			115VAC	+60℃ to +70℃	1.0	--	--	
				-40℃ to +40℃	0	--	--	
				+40℃ to +70℃	1.42	--	--	
	Input voltage derating			80VAC-115VAC	1.142	--	--	%/VAC
				115VAC-264VAC	0	--	--	
Leakage Current	240VAC, 60Hz	Touch current			<0.1mA			
		Earth leakage current			<0.5mA			
Safety Standard	BS EN62368-1, EN62368-1(Report) Design refer to IEC/UL62368-1, GB4943.1, IEC/EN60335-1, IEC/EN61558-1, IEC/EN/ES60601-1							
Safety Class	CLASS I (with PE and must be connected)/ CLASS II (without PE)							
MTBF	MIL-HDBK-217F@25℃				≥200,000 h			
Warranty	Ambient temperature: <25℃				3 years			

Functional Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
PS_ON Input Signal	External power supply	Vdd voltage	3.3	--	15	V
	Power off	PS_ON low	0	--	0.6	
	Power on	PS_ON high	3.3	--	24	
PG Signal	High level	High	2	--	5	
	Low level	Low	0	--	1	
	Power on	The PG signal goes high with 10ms to 500ms delay after power set up	10	--	500	ms
	Power off/Power fail	The TTL signal goes low at least 1ms before output below 90% of rated value	1	--	--	
Remote compensation	The total compensation voltage value when Vs+ and Vs- (pins S1 and S2 of CN2) are respectively short-circuited to the output load terminals (RS+ short-circuited to +Vo, RS- short-circuited to -VO)		--	--	0.5	V
LED Signal	Main output status indication	Normal output	Green on			
		Power off (AC without Input)	Light off			
Remote Sense	When RS+ and RS- are connected to the system, with function of remote voltage compensation, if not needed, left RS+ and RS- open					

Environmental Characteristics

Item	Operating Conditions	Standard
High and Low Temperature Working	+85℃, -40℃	GB2423.1, IEC60068-2-1
Sinusoidal Vibration	10 - 500Hz, 2g, three directions of X, Y, Z axis	GB2423.10, IEC60068-2-6
Alternating Hot and Humid	+25℃, 95%RH - +60℃, 95%RH	GB2423.4, IEC60068-2-30
Low Temperature Storage	-40℃	GB2423.1, IEC60068-2-1
High Temperature Storage	+85℃	GB2423.2, IEC60068-2-2
High Temperature Aging	+50℃ (23CFM, Full load)	GB2423.2, IEC60068-2-2
Normal Temperature Aging	+25℃ (23CFM, Full load)	GB2423.1, IEC60068-2-1
Temperature Shock	-40℃ to +85℃	GB2423.22, IEC60068-2-14
Temperature Cycle	-25℃ to +50℃	GB2423.22, IEC60068-2-14
Hot and Humid	+85℃, 85%RH	GB2423.50, IEC60068-2-67
High Temperature Elevation	+60℃, 54KPa	GB2423.26, IEC60068-2-41
Low Temperature Elevation	-25℃, 54KPa	GB2423.25, IEC60068-2-40
Constant Humid and Hot	+40℃, 95%RH	GB2423.3, IEC60068-2-78
Sinusoidal Vibration Response	10 - 150Hz, 1g, three directions of X, Y, Z axis	GB/T 11287-2000, IEC60255-21-1
Sinusoidal Vibration Endurance Test		
Sinusoidal Impulse Response	15g, pulse duration 11ms, three times in each direction of X, Y, Z axis	GB/T 114537-1993, IEC60255-21-2
Sinusoidal Impact Endurance Test		
Packaging Drop	1m, one corner, three edges and six sides	GB2423.8, IEC68-2-32

Mechanical Specifications

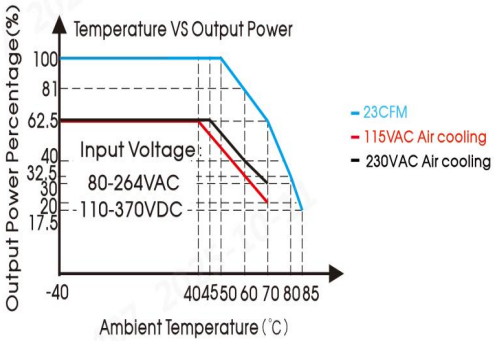
Case Material	Open frame
Dimension	127.00mm x 76.20mm x 27.50mm
Weight	410g (Typ.)
Cooling Method*	Air cooling (250W) / 23CFM (400W)

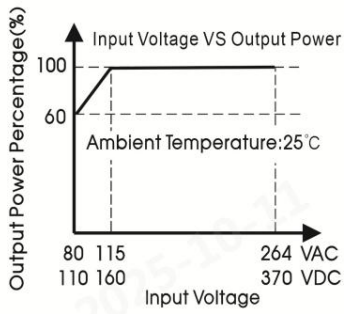
Electromagnetic Compatibility (EMC)

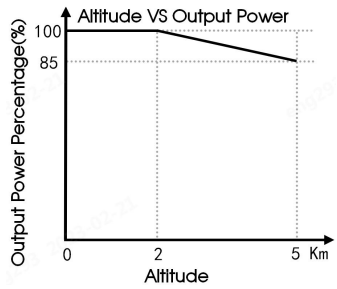
Emissions*	CE	CISPR32/EN55032 (CLASS I equipment, CLASS B; CLASS II equipment, CLASS A)	
	RE	CISPR32/EN55032 (CLASS I equipment, CLASS B; CLASS II equipment, CLASS A)	
	Harmonic current	IEC/EN61000-3-2 CLASS A and CLASS D	
Immunity	ESD	IEC/EN 61000-4-2 Contact ±8KV/Air ±15KV	perf. Criteria A
	RS	IEC/EN 61000-4-3 10V/m	perf. Criteria A
	EFT	IEC/EN 61000-4-4 ±2KV	perf. Criteria A
	Surge	IEC/EN 61000-4-5 ±2KV/±4KV	perf. Criteria A
	CS	IEC/EN61000-4-6 10 Vr.m.s	perf. Criteria A
	Voltage drop	IEC/EN61000-4-11 70% 240 ,25/30 Period(50/60Hz) 40% 240 ,10/12 Period(50/60Hz) 0% 240 ,1 Period (Un is the maximum input nominal voltage)	perf. Criteria B
	Voltage interruption	IEC/EN61000-4-11 0% 240 ,250/300 periods (50/60Hz) (Un is the maximum input nominal voltage)	perf. Criteria C
	Power frequency magnetic field immunity	IEC/EN61000-4-8 30A/m	perf. Criteria A

Note: 1. *perf. Criteria:
A: The equipment shall continue to operate as intended without operator intervention;
B: After the test, the equipment shall continue to operate as intended without operator intervention;
C: Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions.
2.*The power supply should be considered as a part of the components in the system. All EMC performance are been tested on a metal plate with a thickness of 1mm and a length of 360mm x 360mm. The power supply must be combined with the terminal equipment for electromagnetic compatibility confirmation;
3.*Category I products with PE (which must be connected), category II products without PE;

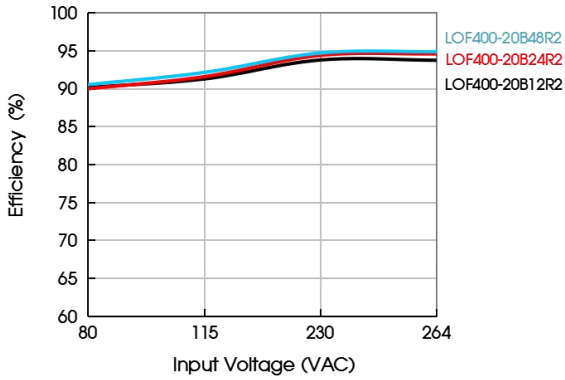
Product Characteristic Curve



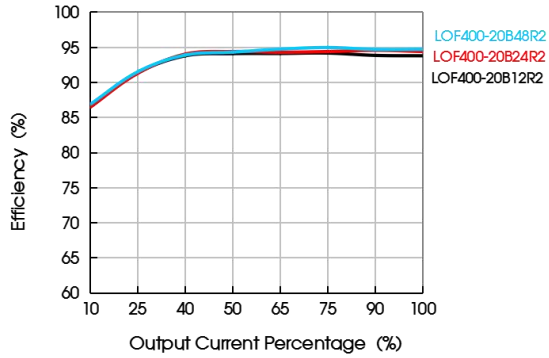




Efficiency Vs Input Voltage (Full Load)



Efficiency Vs Output Load (Vin=230VAC)

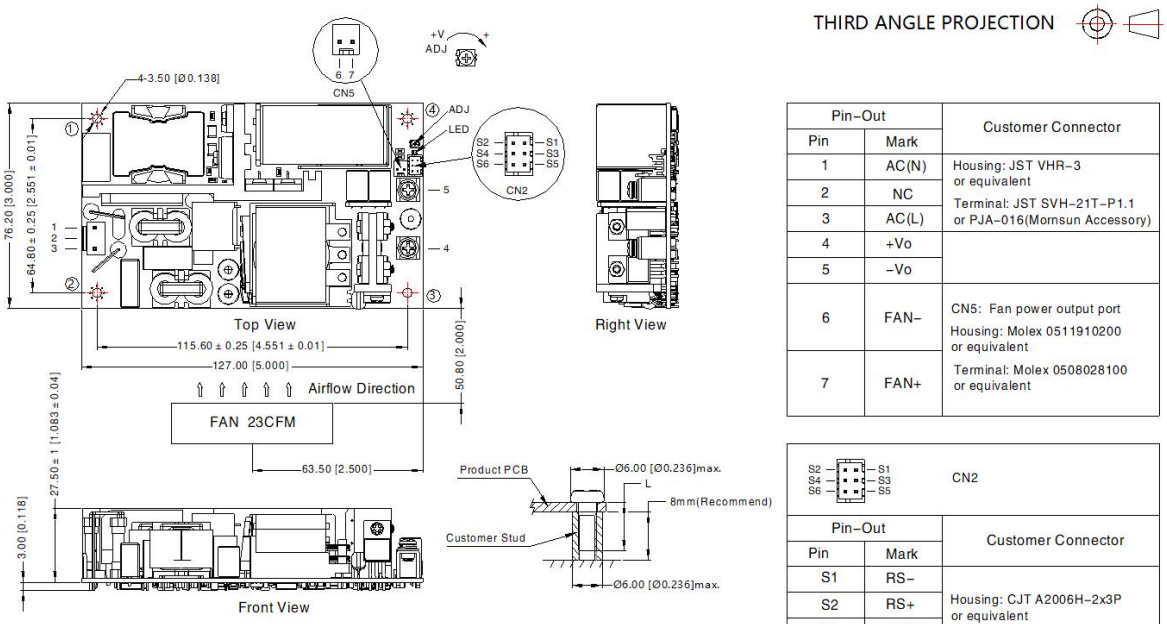


Note: 1. With an AC input voltage between 80 -115VAC and a DC input between 110-160VDC the output power must be derated as per the temperature derating curves.

2. This product is suitable for applications using natural air cooling; for applications in closed environment please consult Mornsun FAE.

Dimensions and Recommended Layout

THIRD ANGLE PROJECTION



Pin-Out		Customer Connector
Pin	Mark	
1	AC(N)	Housing: JST VHR-3 or equivalent Terminal: JST SVH-21T-P1.1 or PJA-016(Mornsun Accessory)
2	NC	
3	AC(L)	
4	+Vo	
5	-Vo	
6	FAN-	CN5: Fan power output port Housing: Molex 0511910200 or equivalent Terminal: Molex 0508028100 or equivalent
7	FAN+	

CN2

Pin-Out		Customer Connector
Pin	Mark	
S1	RS-	Housing: CJT A2006H-2x3P or equivalent Terminal: CJT A2006-T or equivalent
S2	RS+	
S3	SGND	
S4	PG	
S5	PS_ON	
S6	Vdd	

Pro. No	Output connector	Output connector Pic.
12V, 24V, 48V	10AWG	5.20 [0.205] 8.30 [0.327] 4.30 [0.169] XIMENKANG SNB S 5.5-4 or equivalent
Screw/torque	M4.0, 0.9N · m ± 10%	

Position	Screw Spec.	L(Recommend)	Torque
①-④	M3	6mm	0.6N · m ± 10%

Note:
1. Unit: mm[inch]
2. ADJ: Output adjustable resistor
3. General tolerances: ± 1.00[± 0.039]
4. Do not use fan power to power other devices
5. The layout of the device is for reference only, please refer to the actual product
6. Reserved safety distance between PCB edge and customer components, recommended 10mm
7. Class Ⅰ system ①, ②, ④ positions must be connected to the earth(⏚)
8. Class Ⅱ system ①, ②, ④ positions must be connected together

Note: The PJA-XXX series is the accessories of products, quotation is available.

Note:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58220181;
2. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25℃, humidity <75%RH with nominal input voltage and rated output load;
3. All index testing methods in this datasheet are based on our company corporate standards;
4. In order to improve the efficiency at high input voltage, there will be audible noise generated, but it does not affect product performance and reliability;
5. We can provide product customization service, please contact our technicians directly for specific information;
6. Products are related to laws and regulations: see "Features" and "EMC";
7. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units;
8. The output voltage can be adjusted by the ADJ, clockwise to decrease;
9. CAUTION: Double pole, neutral fusing. Disconnect mains before servicing."/"ATTENTION: Double pôle/fusible sur le neutre. Débrancher lalimentation avant lentretien;
10. The power supply is considered a component which will be installed into a terminal equipment. All EMC tests should be confirmed with the final equipment. Please consult our FAE for EMC test operation instructions.
11. When the output voltage is adjusted via the ADJ exceeds the upper adjustable limit specified in the manual, the product may trigger over-power protection. It will automatically recover after being adjusted back within the specified range.
12. The surface of product should keep a safe distance from the customer system (recommended ≥3mm), if not, please consult Mornsun FAE.

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