*DIN*ergy™ MD960-XX-3C SERIES

3PH AC - DC DIN RAIL MOUNTABLE POWER SUPPLY
INDUSTRIAL CONTROL EQUIPMENT

FEATURES

- 3 PHASE AC INPUT VOLTAGE
- COMPACT DESIGN
- PARALLEL FUNCTION
- UNIVERSAL INPUT VOLTAGE
- 3 YEARS WARRANTY

c UL us LISTED IND. CONT. EQ. UL 508 | c US Class I, Div 2 | c US UL 60950-1 | CE

SELECTION CHART

MD960-XX-3C

- **Wattage**
- **Output Volts (DC)** — **24Vdc/48Vdc**
- **Three-Phase**

INPUT VOLTAGE	OUTPUT WATTAGE	OUTPUT VOLTAGE	OUTPUT CURRENT	EFF. (min.)	EFF. (typ.)
Single Output Models					
3ø 340~575 VAC	960 WATTS	+ 24 VDC	40 A	90%	92%
3ø 340~575 VAC	960 WATTS	+ 48 VDC	20 A	91%	93%

SPECIFICATION

All Specifications Typical At Nominal Line, Full Load, 25°C Unless Otherwise Noticed

GENERAL

Characteristics	Conditions		min.	typ.	max.	unit
Switching frequency	Vi nom, Io nom			52		KHz
Isolation voltage	Input-Output		3000 / 4242			VAC / VDC
	Input-FG		1500 / 2121			VAC / VDC
	Output-FG		500 / 710			VAC / VDC
Isolation resistance	Input-Output, @ 500VDC		100			MΩ
Ambient temperature	Operating at Vi nom		-40		+ 71	°C
Derating (see derating curve)	Vi nom, from +61 to +71°C				3.5	% / °C
Storage temperature	Non operational		-40		+ 85	°C
Relative humidity	Vi nom, Io nom		20		95	% RH
Temperature coefficient	Vi nom, Io min				± 0.03	% / °C
MTBF	Bellcore Issue 6 @40°C, GB	24V model		352000		Hours
		24L model		381000		Hours
		48V model		390000		Hours
Altitude during operation	IEC 60068-2-13				4850	m
Dimension	Screw terminal type		L126.2 x W275.8 x D118.8			mm
Cooling	Free air convection					
Installation position	Vertical (other direction may derating using)					
Pollution degree				2		

INPUT SPECIFICATIONS

Characteristics	Conditions		min.	typ.	max.	unit
Nominal voltage *1				Iø or 3ø 380 / 480 VAC		
Rated input voltage	Io nom		400		500	VAC
Absolute input max. range	Ta min ... Ta max, Io nom	AC in	340		575	VAC
		DC in	480		820	VDC
Input current	Vi : 400 / 500 VAC, Io nom			1.72 / 1.5		A
Rated input current	Vi : 340 VAC, Io nom				2.4	A

*1. Single phase input is permissible, but output load is derated to 75%

SPECIFICATION

All Specifications Typical At Nominal Line, Full Load, 25°C Unless Otherwise Noticed

INPUT SPECIFICATIONS

Characteristics	Conditions		min.	typ.	max.	unit
Line frequency	Vi nom, Io nom		47		63	Hz
Inrush current	Vi nom, Io nom cold start	24V, 48V models		30	35	A
		24L model		50	60	A
Power dissipation	Vi : 400 VAC, Io nom	24V model		98		W
		48V model		90		W
Leakage current	Input-Output				0.25	mA
	Input-FG				3.5	mA
P.F.C. (Passive)	Vi nom, Io nom			0.8		

OUTPUT SPECIFICATIONS

Characteristics	Conditions		min.	typ.	max.	unit
Output voltage accuracy (Adjusted before shipment)	Vi nom, Io max		0		± 1	%
Minimum load	Vi nom		0			%
Line regulation	Io nom, Vi min ...Vi max				± 1	%
Load regulation	Vi nom, Io min ...Io nom	single mode			± 1	%
		parallel mode			± 5	%
Voltage trim range	Vi nom, 0.8 Io nom	24V model	22.5		28.5	VDC
		48V model	47		56	VDC
Rated continuous loading	Vi nom	24V model	40 A @ 24Vdc / 33.5 A @ 28.5Vdc			
		48V model	20 A @ 48Vdc / 17 A @ 56Vdc			
Hold up time	Vi nom , Io nom		15			ms
Turn on time	Vi nom, Io nom				1000	ms
	Vi nom, Io nom → with 7000 μF CAP				1500	ms
Rise time	Vi nom, Io nom				150	ms
	Vi nom, Io nom → with 7000 μF CAP				500	ms
Fall time	Vi nom, Io nom				150	ms
Transient recovery time	Vi nom, 1 ~0.5 Io nom				2	ms
Ripple & noise	Vi nom, Io nom, BW = 20MHz				80	mV
Power back immunity	Vi nom, Io nom	24V model	35			VDC
		48V model	63			VDC
Capacitor load	Vi nom, Io nom				7000	μF
DC ON indicator threshold at start up (Green LED)	Vi nom, Io nom	24V model	17.6		19.4	VDC
		48V model	37		43	VDC
DC LOW indicator threshold after start up (Red LED)	Vi nom, Io nom	24V model	17.6		19.4	VDC
		48V model	37		43	VDC
Parallel operation	0.1 Io min ~ 0.9 Io max				2	unit
Efficiency	Vi nom, Io nom, Po / Pi		Up to 93%, See model list and typ efficiency curve			

CONTROL AND PROTECTION

Characteristics	Conditions		min.	typ.	max.	unit
Input fuse			T5 A / 500 VAC internal / phase			
Internal surge voltage protection	IEC 61000-4-5		Varistor			
Rated over load protection	Vi nom(see typ current limited curve)		120		140	%
Power Rdy *2 (for WRA960-24 model only)	Threshold voltage of contact closed(at start up)		17.6		19.4	VDC
	Electrical isolation		500			VDC
	Contact rating at 60VDC				0.3	A
Over voltage protection	Vi nom, Io nom (Auto Recovery)	24V model	30		33	VDC
		48V model	60		68	VDC
Output short circuit			Hiccup mode			
Over temperature	Detect on heat sink, shut down O/P voltage, recovers automatically after temperature goes down.		100		110	°C
Degree of protection			IP20			

*2. This function is not on 24L model.

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APPROVALS AND STANDARDS

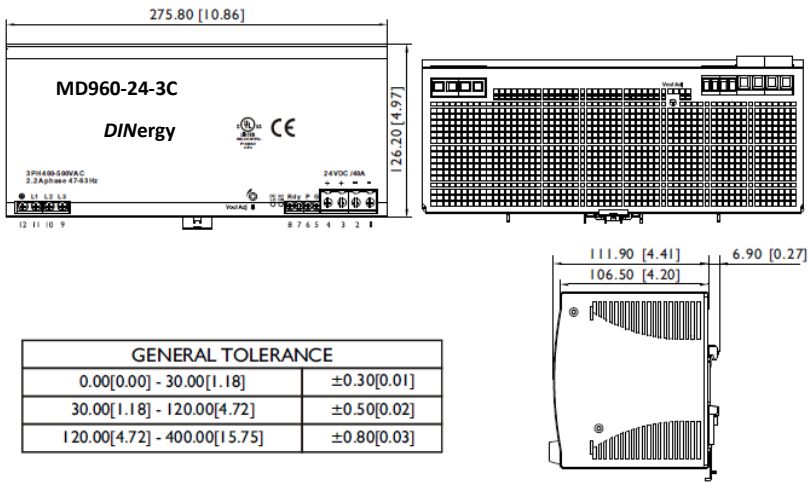
UL / cUL	UL 508 Listed UL 60950-1 Recognized ISA 12.12.01(Class I, Division 2, Groups A, B, C and D)
CE	EN 61000-6-3, EN 55022 Class B, EN 61000-3-2, EN 61000-3-3 EN 61000-6-2, EN 55024, EN 61000-4-2 Level 4, EN 61000-4-3 Level 3 EN 61000-4-4 Level 4, EN 61000-4-5 L-N Level 3, L / N-FG Level 4 EN 61000-4-6 Level 3, EN 61000-4-8 Level 4, EN 61000-4-11 ENV 50204 Level 2, EN 61204-3
Vibration resistance	meet IEC 60068-2-6 (Mounting by rail : 10-500 Hz, 2G, along X, Y, Z each Axis, 60 min for each Axis)
Shock resistance	meet IEC 60068-2-27 (15G, 11ms, 3 Axis, 6 Faces, 3 times for each Face)

PHYSICAL CHARACTERISTICS

Case size	Screw terminal type 126.2 x 275.8 x 118.8 mm (4.97 x 10.86 x 4.68 inches)
Case material	Metal
Weight	3400g
Packing	3.68kg ; 6 pcs / 23kg / 2.41CUFT

MECHANISM & PIN CONFIGURATION

mm [inch]



GENERAL TOLERANCE	
0.00[0.00] - 30.00[1.18]	±0.30[0.01]
30.00[1.18] - 120.00[4.72]	±0.50[0.02]
120.00[4.72] - 400.00[15.75]	±0.80[0.03]

CONSTRUCTION

Easy snap-on mounting onto the DIN-Rail (TS35/7.5 or TS35/15), unit sits safely and firmly on the rail.

INSTALLATION

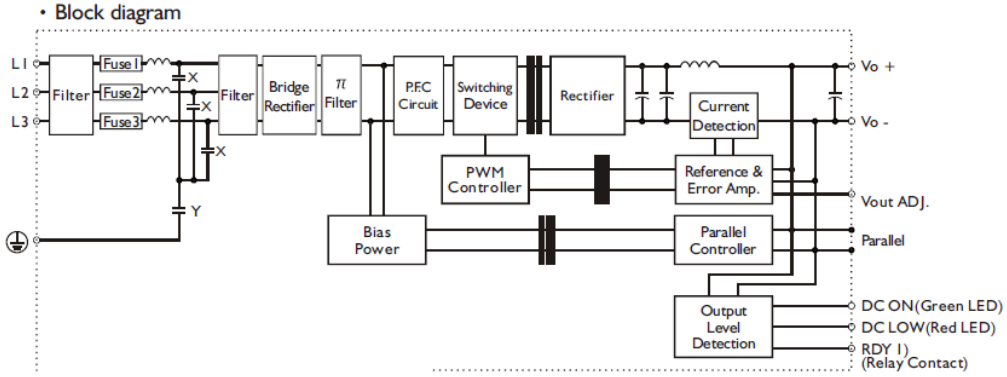
Ventilation / Cooling
Normal convection
All sides 25mm free space
For cooling recommended
Connector size range
Input and Rdy, P, G Control : AWG24 - 10 (0.2~4mm^2), flexible / solid cable
Output : AWG20 - 6 (0.5~10mm^2), flexible / solid cable
- Input connector can withstand torque at maximum 9 pound-inches
Rdy, P, G control connector can withstand torque at maximum 5.5 pound-inches
8m/m stripping at cable end recommends
- Output connector can withstand torque at maximum 15.6 pound-inches
10m/m stripping at cable end recommends
Use copper conductors only, 60 / 75°C

PIN ASSIGNMENT

PIN NO.	Designation		Description
1, 2	OUT	V -	Negative output terminal
3, 4		V +	Positive output terminal
5		G	Parallel GND PIN for current share
6		P	Parallel PIN for current share
7		RDY	A normal open relay contact for DC ON level control
8			(Never connect except 24V model)
9	IN	L3	Input terminals
10		L2	Input terminals
11		L1	Input terminals
12		⏚	Ground this terminal to minimize high-frequency emissions
	OTHER	DC ON	Operation indicator LED
		DC LO	DC LOW voltage indicator LED
		Vout ADJ.	Trimmer-potentiometer for Vout adjustment

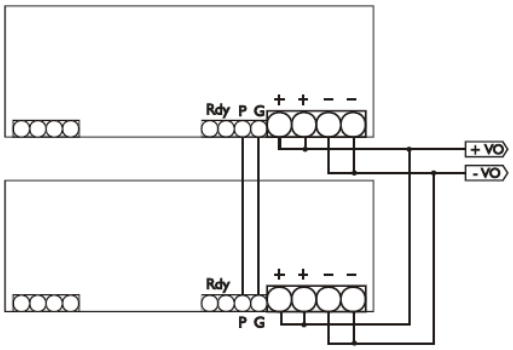
CIRCUIT SCHEMATIC

• Block diagram



Note:1) For MD960-24 Model Only

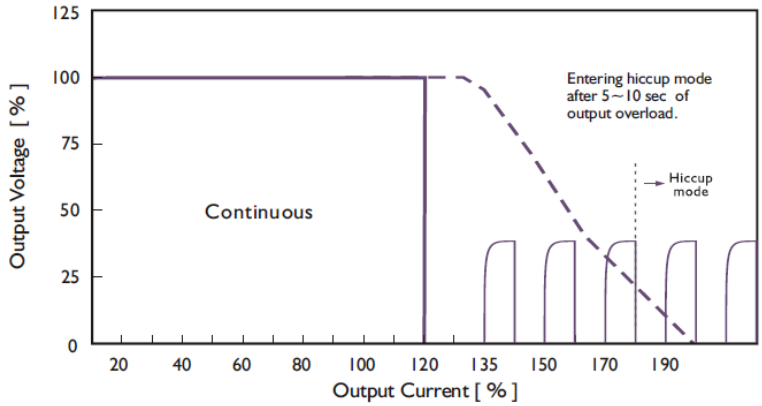
• Parallel connection



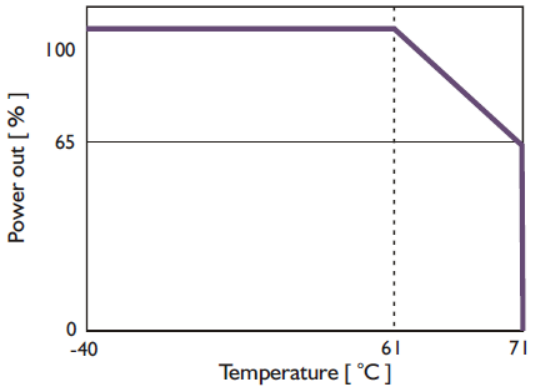
"P" Terminal:

When operating in parallel mode for increased current, it is advisable to interconnect both supply's control loops via the "P" terminal as this will allow for even current balancing between the two supplies.

TYP. CURRENT LIMITED CURVE



DERATING CURVE



TYP. EFFICIENCY CURVE