

# DINergy™ MD960-24-3C

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



## FEATURES

- 3 PHASE AC INPUT VOLTAGE
- SELV COMPONENTS DESIGN
- SHORT CIRCUIT PROTECTION
- INTERNAL INPUT FILTER
- OVER TEMPERATURE PROTECTION
- 3 YEARS WARRANTY



## SELECTION CHART

**MD 960**

**24**

Wattage

24 : 24V OUT     48 : 48V OUT

## MODEL LIST

MODEL NO.	INPUT VOLTAGE	OUTPUT WATTAGE	OUTPUT VOLTAGE	OUTPUT CURRENT	EFF. (min.)	EFF. (typ.)
<b>Single Output Models</b>						
MD960-24-3C	3 $\phi$ 340~575 VAC	960 WATTS	+ 24 VDC	40 A	90%	92%

## 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	3,000 / 4,242			VAC / VDC
	Input-FG	1,500 / 2,121			VAC / VDC
	Output-FG	500 / 710			VAC / VDC
Isolation resistance	Input-Output, @ 500VDC	100			M $\Omega$
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		355,000		Hours
Altitude during operation	EN 60950-1			5,000	m
Dimension	Screw terminal type		L125.9 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			I $\phi$ or 3 $\phi$ 380 / 480 VAC		
Rated input voltage	Io nom	400		500	VAC
Absolute input max. range	Ta min ... Ta max, AC in	340		575	VAC
	Io nom, DC in	480		820	VDC
Input current	Vi : 400 / 500 VAC, Io nom		1.72 / 1.5		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
Rated input current	Vi : 340 VAC, Io nom			2.4	A
Line frequency	Vi nom, Io nom	47		63	Hz
Inrush current	Vi nom, Io nom		30	35	A
Power dissipation	Vi : 400 VAC, Io nom		98		W
Leakage current	Input-Output			0.25	mA
	Input-FG			3.5	mA
Power factor (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			± 1	%
		single mode		± 5	%
Voltage trim range	Vi nom, 0.8 Io nom	22.5		28.5	VDC
Rated continuous loading	Vi nom		40 A @ 24Vdc / 33.5 A @ 28.5Vdc		
Hold up time	Vi nom, Io nom	15			ms
Turn on time	Vi nom, Io nom			1,000	ms
	Vi nom, Io nom → with 7000 µF CAP			1,500	ms
Rise time	Vi nom, Io nom			150	ms
	Vi nom, Io nom → with 7000 µF CAP			500	ms
Fall time				150	ms
Transient recovery time	Vi nom, I ~0.5 Io nom			2	ms
Ripple & noise	Vi nom, Io nom, BW = 20MHz			80	mV
Power back immunity	Vi nom, Io nom	35			VDC
					VDC
Capacitor load	Vi nom, Io nom			7,000	µF
DC ON indicator threshold at start up (Green LED)	Vi nom, Io nom	17.6		19.4	VDC
				43	VDC
DC LOW indicator threshold after start up (Red LED)	Vi nom, Io nom	17.6		19.4	VDC
				43	VDC
Parallel operation *2	0.1 Io min ~ 0.9 Io max			3	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)	110		135	%
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, 0.8 Io nom (Shut-down)	30		33	VDC
				66	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.

## SPECIFICATION

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

### APPROVALS AND STANDARDS

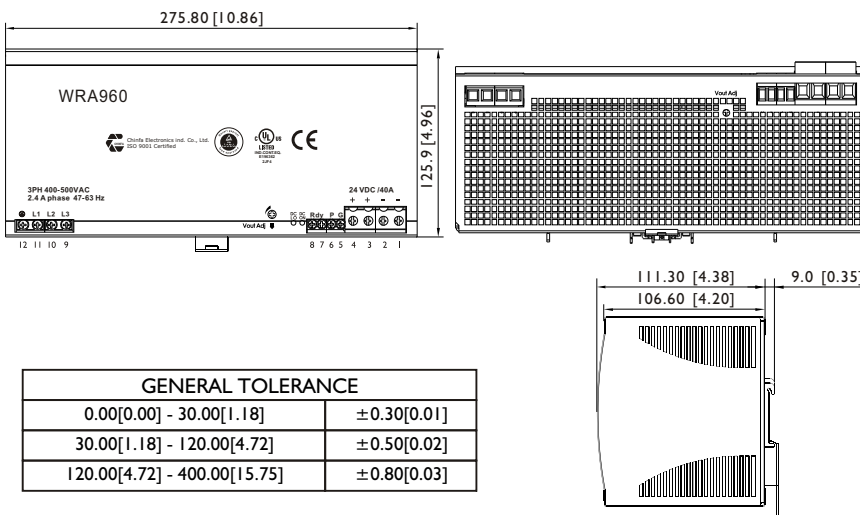
UL / cUL	UL 508 Listed UL 60950-1 Recognized ISA 12.12.01(Class I, Division 2, Groups A, B, C and D)
TUV	EN 60950-1 EN 61558-1, EN 61558-2-16 (meet EN 60204-1)
CE	EN 61000-6-3, EN 55032 Class B, EN 61000-3-2, EN 61000-3-3 EN 61000-6-2, EN 55024, EN 61000-4-2 Level 4, EN 61000-4-3 Level 3 EN 61000-4-4 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
CQC	GB4943.1, GB9254, GB17625.1
Vibration resistance	meet IEC 60068-2-6 (Mounting on 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 125.9 x 275.8 x 118.8 mm (4.96 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]



#### 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

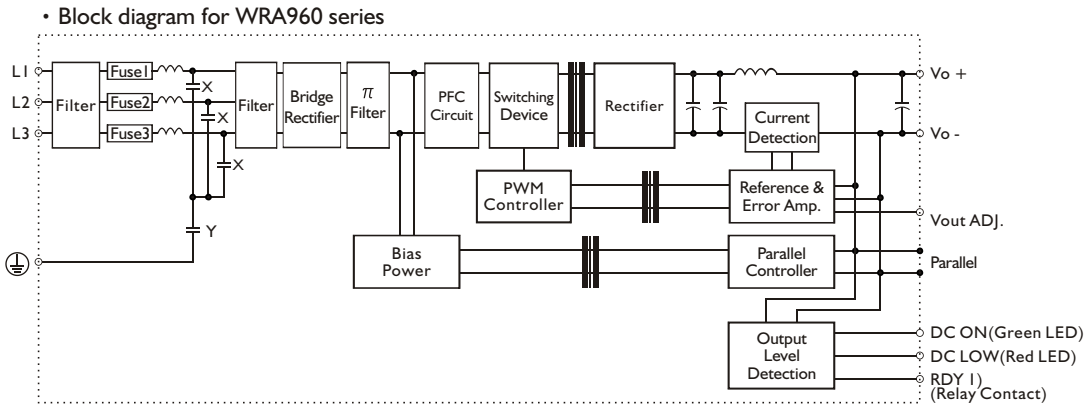
Connector size range  
Input and Rdy, P, G Control : AWG24 - 10 (0.2~4mm<sup>2</sup>), flexible / solid cable  
Output : AWG20 - 6 (0.5~10mm<sup>2</sup>), flexible / solid cable  
- Input connector can withstand torque at maximum 9 pound-inches  
Rdy, P, G control connector can withstand torque at maximum 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

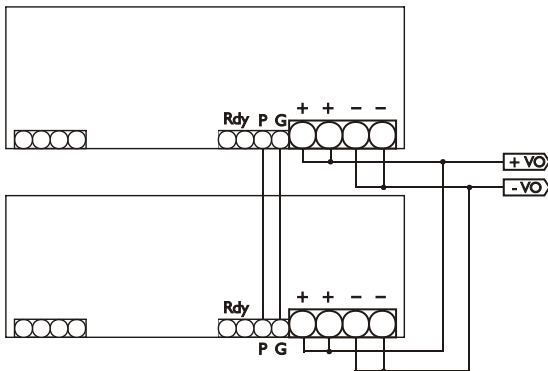
PIN NO.	Designation	Description
1, 2	V -	Negative output terminal
3, 4	V +	Positive output terminal
5	G	Parallel GND PIN for current share
6	P	Parallel PIN for current share
7	RDY	A normal open relay contact for DC ON level control
8		(Never connect except 24V model)
9	L3	Input terminals
10	L2	Input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

\* WRA960-24L without PIN5~ PIN8

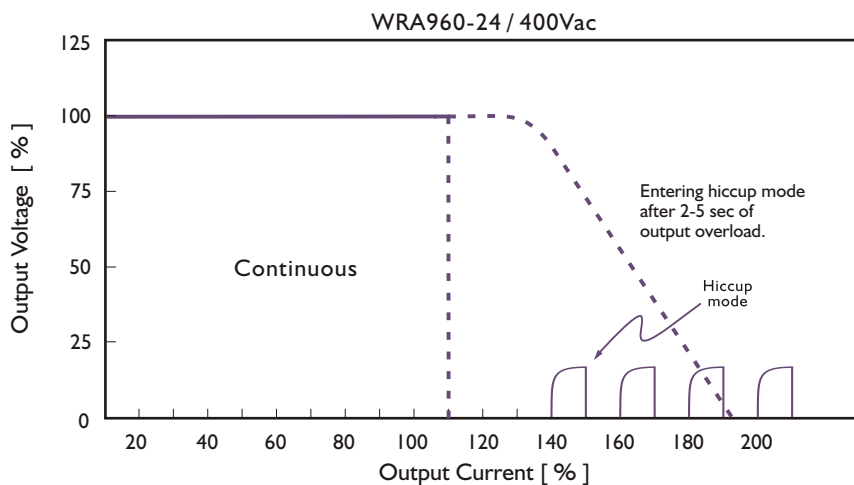
## CIRCUIT SCHEMATIC



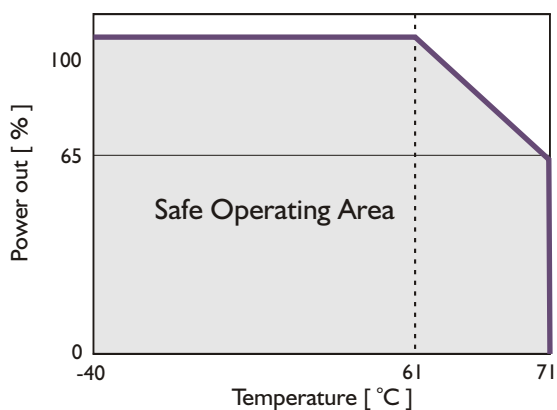
• Parallel connection



## TYP. CURRENT LIMITED CURVE



## DERATING CURVE



## TYP. EFFICIENCY CURVE

