

# WRA960 SERIES

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

# WRA 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> |                |                |                |                |             |             |
| WRA960-24                   | 3ø 340~575 VAC | 960 WATTS      | + 24 VDC       | 40 A           | 90%         | 92%         |
| WRA960-24L                  | 3ø 340~575 VAC | 960 WATTS      | + 24 VDC       | 40 A           | 90%         | 92%         |
| WRA960-48                   | 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                                    | 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                      |         |        | 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                      | 355,000 |        | Hours     |
|                               |                                                 | 24L                      | 380,000 |        | Hours     |
|                               |                                                 | 48V                      | 396,000 |        | 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        |                            |      | Iø or 3ø 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%



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### INPUT SPECIFICATIONS

| Characteristics        | Conditions                 | min.     | typ. | max. | unit |
|------------------------|----------------------------|----------|------|------|------|
| Rated input current    | $V_i$ : 340 VAC, $I_o$ nom |          |      | 2.4  | A    |
| Line frequency         | $V_i$ nom, $I_o$ nom       | 47       |      | 63   | Hz   |
| Inrush current         | $V_i$ nom, $I_o$ nom       |          | 30   | 35   | A    |
| Power dissipation      | $V_i$ : 400 VAC, $I_o$ nom | 24V, 48V |      |      |      |
|                        |                            | 24V      | 98   |      | W    |
|                        |                            | 48V      | 90   |      | W    |
| Leakage current        | Input-Output               |          |      | 0.25 | mA   |
|                        | Input-FG                   |          |      | 3.5  | mA   |
| Power factor (Passive) | $V_i$ nom, $I_o$ nom       |          | 0.8  |      |      |

### OUTPUT SPECIFICATIONS

| Characteristics                                     | Conditions                                   | min.                                               | typ.                            | max.  | unit    |
|-----------------------------------------------------|----------------------------------------------|----------------------------------------------------|---------------------------------|-------|---------|
| Output voltage accuracy (Adjusted before shipment)  | $V_i$ nom, $I_o$ max                         | 0                                                  |                                 | + 1   | %       |
| Minimum load                                        | $V_i$ nom                                    | 0                                                  |                                 |       | %       |
| Line regulation                                     | $I_o$ nom, $V_i$ min ... $V_i$ max           |                                                    |                                 | ± 1   | %       |
| Load regulation                                     | $V_i$ nom, $I_o$ min ... $I_o$ nom           | single mode                                        |                                 | ± 1   | %       |
|                                                     |                                              | parallel mode                                      |                                 | ± 5   | %       |
| Voltage trim range                                  | $V_i$ nom, 0.8 $I_o$ nom                     | 24V                                                | 22.5                            | 28.5  | VDC     |
|                                                     |                                              | 48V                                                | 47                              | 56    | VDC     |
| Rated continuous loading                            | $V_i$ nom                                    | 24V                                                | 40 A @ 24Vdc / 33.5 A @ 28.5Vdc |       |         |
|                                                     |                                              | 48V                                                | 20 A @ 48Vdc / 17 A @ 56Vdc     |       |         |
| Hold up time                                        | $V_i$ nom, $I_o$ nom                         | 15                                                 |                                 |       | ms      |
| Turn on time                                        | $V_i$ nom, $I_o$ nom                         |                                                    |                                 | 1,000 | ms      |
|                                                     | $V_i$ nom, $I_o$ nom → with 7000 $\mu$ F CAP |                                                    |                                 | 1,500 | ms      |
| Rise time                                           | $V_i$ nom, $I_o$ nom                         |                                                    |                                 | 150   | ms      |
|                                                     | $V_i$ nom, $I_o$ nom → with 7000 $\mu$ F CAP |                                                    |                                 | 500   | ms      |
| Fall time                                           |                                              |                                                    |                                 | 150   | ms      |
| Transient recovery time                             | $V_i$ nom, $I \sim 0.5 I_o$ nom              |                                                    |                                 | 2     | ms      |
| Ripple & noise                                      | $V_i$ nom, $I_o$ nom, BW = 20MHz             |                                                    |                                 | 80    | mV      |
| Power back immunity                                 | $V_i$ nom, $I_o$ nom                         | 24V                                                | 35                              |       | VDC     |
|                                                     |                                              | 48V                                                | 63                              |       | VDC     |
| Capacitor load                                      | $V_i$ nom, $I_o$ nom                         |                                                    |                                 | 7,000 | $\mu$ F |
| DC ON indicator threshold at start up (Green LED)   | $V_i$ nom, $I_o$ nom                         | 24V                                                | 17.6                            | 19.4  | VDC     |
|                                                     |                                              | 48V                                                | 37                              | 43    | VDC     |
| DC LOW indicator threshold after start up (Red LED) | $V_i$ nom, $I_o$ nom                         | 24V                                                | 17.6                            | 19.4  | VDC     |
|                                                     |                                              | 48V                                                | 37                              | 43    | VDC     |
| Parallel operation *2                               | 0.1 $I_o$ min ~ 0.9 $I_o$ max                |                                                    |                                 | 3     | unit    |
| Efficiency                                          | $V_i$ nom, $I_o$ nom, $P_o / P_i$            | 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              | $V_i$ 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                 | $V_i$ nom, 0.8 $I_o$ nom (Shut-down)                                                            | 24V                             | 30   | 33   | VDC  |
|                                         |                                                                                                 | 48V                             | 60   | 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.

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## SPECIFICATION

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## APPROVALS AND STANDARDS

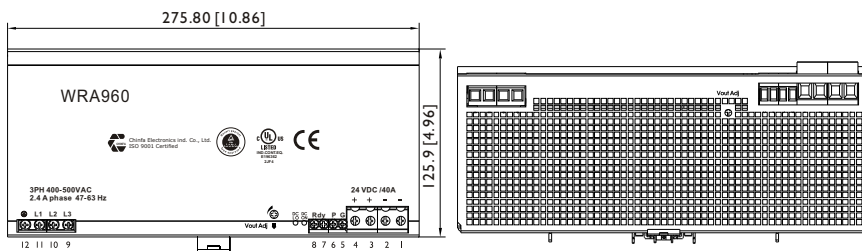
|                      |                                                                                                                                                                                                                                                                                                    |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| UL / cUL             | UL 508 Listed<br>UL 60950-1 Recognized<br>ISA 12.12.01(Class I, Division 2, Groups A, B, C and D)                                                                                                                                                                                                  |
| TUV                  | EN 60950-1<br>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<br>EN 61000-6-2, EN 55024, EN 61000-4-2 Level 4, EN 61000-4-3 Level 3<br>EN 61000-4-4 Level 4, EN 61000-4-5 L-N Level 3, L / N-FG Level 4<br>EN 61000-4-6 Level 3, EN 61000-4-8 Level 4, EN 61000-4-11<br>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

### 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] |

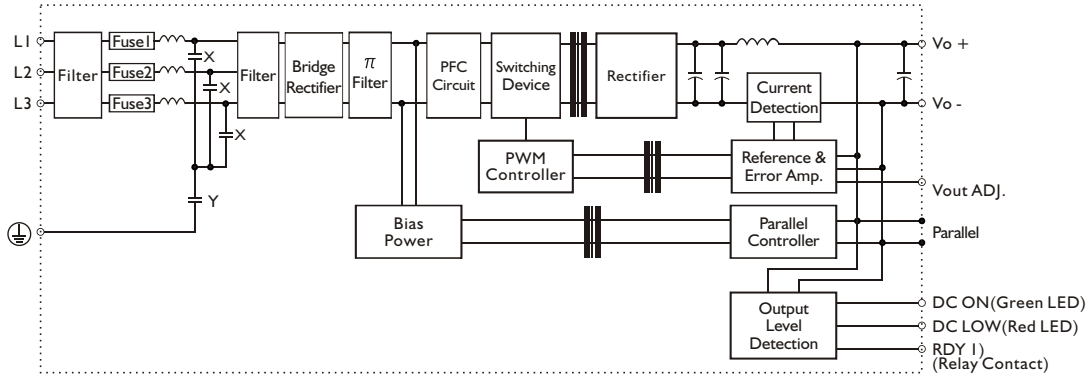
## PIN ASSIGNMENT

| 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 circuit of PhotoMOS Relay (24V model only)  |
| 8       | IN          | L3        | Input terminals                                           |
| 9       |             | L2        | Input terminals                                           |
| 10      |             | L1        | Input terminals                                           |
| 11      |             | ⊕         | Ground this terminal to minimize high-frequency emissions |
| 12      | OTHER       | DC ON     | Operation indicator LED                                   |
|         |             | DC LO     | DC LOW voltage indicator LED                              |
|         |             | Vout ADJ. | Trimmer-potentiometer for Vout adjustment                 |

\* WRA960-24L without PIN5~PIN8

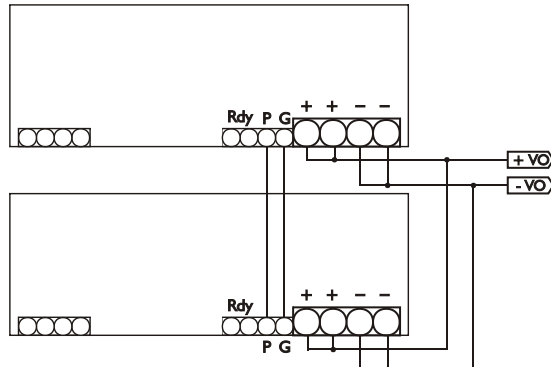
## CIRCUIT SCHEMATIC

- Block diagram for WRA960 series

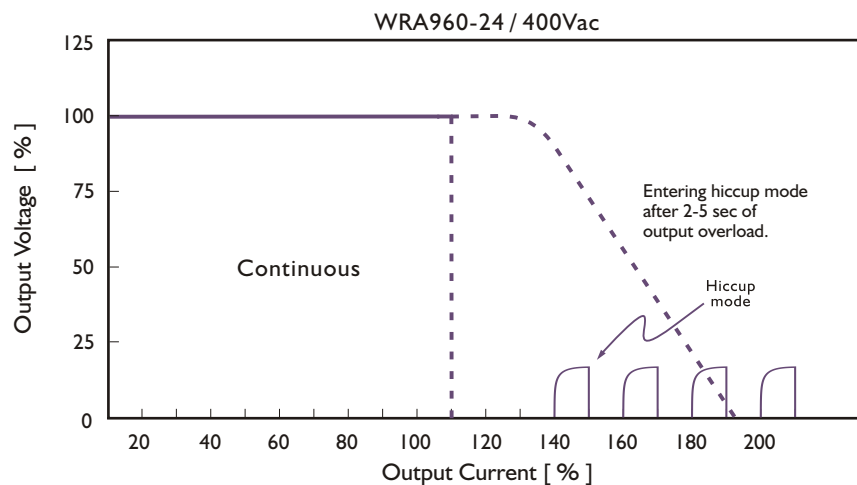


Note: 1) For WRA960-24 Model Only

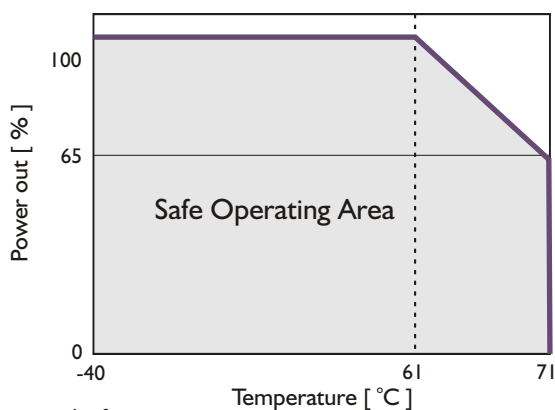
- Parallel connection



### TYP. CURRENT LIMITED CURVE



## DERATING CURVE



### TYP. EFFICIENCY CURVE

