

## UFE / UFR Series

### Up to 6000 Watts

**Total Power:** Up to 6000 W  
**Input Voltage:** 85 - 264 Vac  
**# of Outputs:** Single + Aux  
**Output:** 24 V & 48 V



### Special Features

- Rack mounted chassis (1U, 19")
- 3 hot pluggable rectifiers per 1U chassis, up to 4 kW redundant or 6 kW available power (180 - 264 Vac input)
- Up to 2.6 kW redundant or 3.9 kW available per shelf at 90 - 132 Vac input
- Stackable to 6U high to provide up to 36 kW available power
- Class B conducted EMI EN55022 (See Note 1)
- Automatic fan speed control with fault reporting
- Auxiliary standby output, 11 V at approximately 2.8 W
- High density up to 22 W/in<sup>3</sup>
- High efficiency up to 91%
- Floating as well as isolated main output voltage allows positive or negative polarity operation
- EU directive 2002/95/EC compliant for RoHS
- 2 year warranty
- PMBus compliant

### Safety

- VDE EN/IEC60950-1
- UL/cUL60950-1

## Electrical Specifications

| Output                                          |                                                      |                                                                                                    |
|-------------------------------------------------|------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| Output Power:                                   | Main output<br>Auxiliary output                      | See Table 1<br>11 V ±15%, 2.875 W                                                                  |
| Line regulation:                                | Low line to high line                                | ±0.15% max.                                                                                        |
| Load regulation (active share mode):            | Full load to min. load                               | ±0.15% max.                                                                                        |
| Turn-on delay:                                  | (See Note 4)                                         | 5.0 s max.                                                                                         |
| Ambient temp. coefficient:                      | At full load, min. Vin                               | ± 0.005%/°C                                                                                        |
| Voltage adjustability:                          | 48 Vout<br>24 Vout                                   | 42-57 Vdc<br>21-28.5 Vdc                                                                           |
| Adjustable PMBus command<br>(See Note 6)        |                                                      |                                                                                                    |
| Output setpoint accuracy:                       |                                                      | ± 0.5%                                                                                             |
| Default output voltage:<br>setting 25 °C        | 48 Vout (active default)<br>24 Vout (active default) | 48 V ± 0.5% @ 41 A<br>27 V ± 0.5% @ 48 A                                                           |
| Voltage droop:<br>(operation set PMBus command) | 24 Vout<br>48 Vout                                   | 40.3 mV/A ± 3.0% from<br>10 A up to power limit<br>80.6 mV/A ± 3.0% from<br>10 A up to power limit |
| Total error band:                               | -40 °C to +70 °C, FL range                           | ±1.0% max.                                                                                         |
| Overshoot/undershoot:                           | Main output @ turn-on/off                            | 0%/0%                                                                                              |
| Ripple and noise (20 MHz):                      | Main output, -5 °C and above<br>Auxiliary output     | 500 mV pk-pk, 150 mV rms<br>400 mV pk-pk, 150 mV rms                                               |
| Dynamic regulation (except droop mode):         | Peak dev., 25% load step Recovery<br>time            | 2.5% max.<br>1 ms max.                                                                             |
| Current sharing (See Note 3):                   | (I1-I2) / I LIMIT x 100                              | 15% max.                                                                                           |

All specifications are typical at nominal input, full load at 25 °C ambient unless otherwise stated.

| Input                                 |                                    |                                                                                    |
|---------------------------------------|------------------------------------|------------------------------------------------------------------------------------|
| Input voltage range:<br>(See note 2)  |                                    | 88 - 264 Vac<br>176 - 264 Vac                                                      |
| Input frequency range:                |                                    | 47 - 63 Hz                                                                         |
| Input current:                        |                                    | 15 A max.                                                                          |
| Ground leakage current:               | AC to safety ground                | 2 mA max.                                                                          |
| Input fuse (internal)                 | Both lines fused                   | 30 A                                                                               |
| Power factor:                         | 50 to 100% load                    | 0.98                                                                               |
| Undervoltage lockout:<br>(power up)   | High line range<br>Wide line range | 176 Vac max.<br>88 Vac. max                                                        |
| Undervoltage lockout:<br>(power down) | High line range<br>Wide line range | 162 Vac min.<br>LED warning @ 176 V max.<br>76 Vac min.<br>LED warning @ 88 V max. |

| General Specifications   |                                                                |                                            |
|--------------------------|----------------------------------------------------------------|--------------------------------------------|
| Electrical insulation:   | Input/output<br>Input/chassis                                  | 3000 Vac / 4242 Vdc<br>1500 Vac / 2121 Vdc |
| Switching frequency:     | Fixed                                                          | 450 kHz                                    |
| Approvals and standards: |                                                                | VDE EN/IEC60950-1<br>UL/CUL60950-1         |
| Weight:                  |                                                                | 5.5 lbs                                    |
| Hold-up time:            | 48 Vout at rated output power<br>24 Vout at rated output power | 20 ms min.<br>20 ms min.                   |
| MTBF (@25 °C):           | Telcordia SR-332 Issue 1                                       | 279,069 hours                              |
| Acoustical noise:        | Over all conditions<br>25 °C ambient at rated output power     | 71 dB max.<br>58 dB typ.                   |

| EMC                  |                      |                                    |
|----------------------|----------------------|------------------------------------|
| Conducted emissions: | EN55022, FCC part 15 | Class B (when installed in system) |
| Immunity:            |                      |                                    |
| Harmonic current:    | EN61000-3-2          | Compliant                          |
| ESD air/contact:     | EN61000-4-2          | Level 3                            |
| Surge:               | EN61000-4-5          |                                    |
| Fast transients:     | EN61000-4-4          | Level 3                            |
| Flicker:             | EN61000-3-3          | Compliant                          |
| Magnetic field:      | EN61000-4-8          | Compliant                          |
| Radiated immunity:   | EN61000-4-3          | Level 3                            |
| Conducted immunity:  | EN61000-4-6          | Level 3                            |

#### Notes

- Final EMI performance is system/shelf dependent.
- Auto ranging sets power limit based on input voltage at turn on.
- The difference in output current among any two rectifiers operating in parallel does not exceed a value equal to 15% of the rated current limit. This specification applies for operation with any output current from no load to 110% of maximum.
- Maximum 15 minute warm up time at light loads below -15 °C. See Application Note 212 for cold start timing data.
- For operation above 1,524 m (5,000 ft), maximum operation temperature is derated by 2 °C per 305 m (1,000 ft).
- Output voltage can be modified on the fly between 21-28.5 V (24 V model) or 42-57 V (48 V model) PMBus command.
- PM BUs communication. Pin names in parenthesis refer to the PMBus version names. UFE2000-96S48PJ and UFE130096S24PJ use PMBus.

#### Ordering Information

| Rated Output Power | Output Voltage Vout |        | Output Current (Min) | Power Limit +15% / -0% Vout (min) | Line Range at Turn On (Auto Ranging) | Operating Line Range | Current Limit (Vout) < Vout (min) | Model Numbers (7) | Order Number |
|--------------------|---------------------|--------|----------------------|-----------------------------------|--------------------------------------|----------------------|-----------------------------------|-------------------|--------------|
|                    | Min                 | Max    |                      |                                   |                                      |                      |                                   |                   |              |
| 24 Vout Models     |                     |        |                      |                                   |                                      |                      |                                   |                   |              |
| 1300 W             | 21 v                | 28.5 V | 0 A                  | 1300 W                            | 90-264 Vac                           | 65 A                 | 65 A                              | UFE1300-96S24C1J  | UFE1300-5    |
| 48 Vout Models     |                     |        |                      |                                   |                                      |                      |                                   |                   |              |
| 1300 W             | 42 V                | 57 V   | 0 A                  | 1300 W                            | 90-264 Vac                           | 33 A                 | 33 A                              | UFE2000-96S48PJ   | UFE2000-9    |
| 2000 W             | 42 V                | 57 V   | 0 A                  | 2000 W                            | 180-264 Vac                          | 52 A                 | 52 A                              |                   |              |
| 1300 W             | 42 V                | 57 V   | 0 A                  | 1300 W                            | 90-264 Vac                           | 33 A                 | 33 A                              | UFE2000-96S48PDJ  | UFE2000-9-D  |
| 2000 W             | 42 V                | 57 V   | 0 A                  | 2000 W                            | 180-264 Vac                          | 52 A                 | 52 A                              |                   |              |
| 1300 W             | 42 V                | 57 V   | 0 A                  | 1300 W                            | 90-264 Vac                           | 33 A                 | 33 A                              | UFE2000-96S48PHDJ | UFE2000-9-HD |
| 2000 W             | 42 V                | 57 V   | 0 A                  | 2000 W                            | 180-264 Vac                          | 52 A                 | 52 A                              |                   |              |

#### Rack Ordering Information

| Rack Model Number | Hot Plug Interface | Number of Power Modules per Pack |
|-------------------|--------------------|----------------------------------|
| UFR6000-00J       | Yes                | 3                                |
| UFR6000-01J       | Yes                | 2 + 1 (Split Rack)               |
| UFR6000PJ         | Blank Panel        | 3                                |

## Environmental Specifications

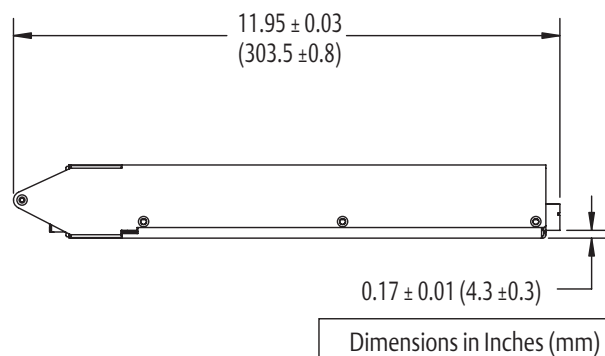
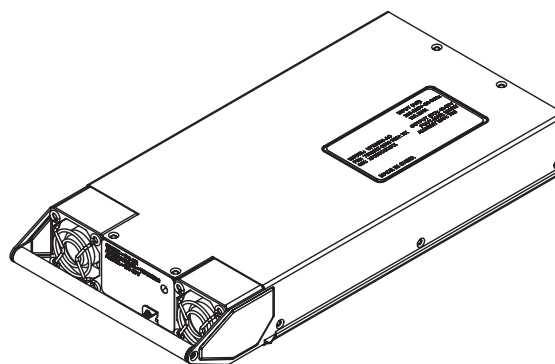
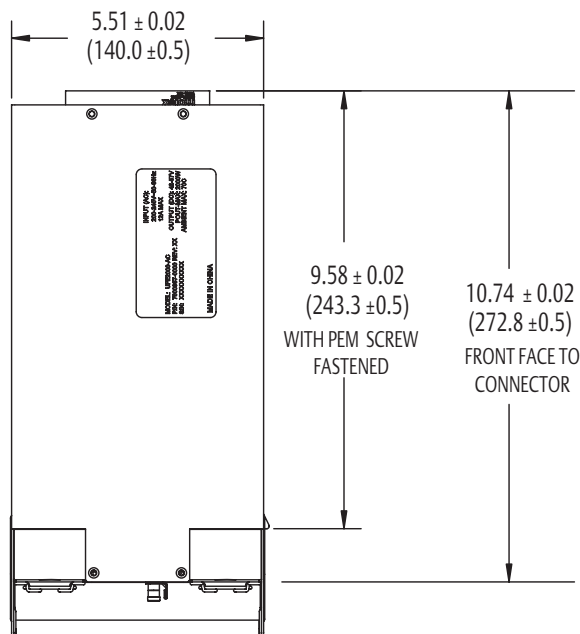
|                                                           |                                                        |                                                 |
|-----------------------------------------------------------|--------------------------------------------------------|-------------------------------------------------|
| Thermal performance:<br>(See Notes 4 and derating curves) | Operating<br>Non-operating<br>Cold Start               | -33 °C to +70 °C<br>-40 °C to +100 °C<br>-40 °C |
| Relative humidity:<br>non-condensing                      | Operating<br>Non-operating                             | Up to 80%<br>Up to 95%                          |
| Altitude:<br>(See Note 5)                                 | Operating<br>Non-operating                             | 10,000 feet max.<br>35,000 feet max.            |
| Vibration:                                                | Operating<br>Non-operating                             | 1.0 G peak<br>1.5 G peak                        |
| Shock:                                                    | Operating<br>Non-operating                             | 10 G peak / 11 ms<br>40 G peak / 11 ms          |
| <b>Protection</b>                                         |                                                        |                                                 |
| Power limit:<br>Vo > Vout min                             |                                                        | ± Rated power +15%/-0%                          |
| Current limit:                                            | Constant current limiting - brickwall<br>Vo > Vout min | ± limit, ± 8%                                   |
| Short-circuit:                                            | Hiccup mode at<br>Vo < 40 Vdc<br>Vo < 20 Vdc           | 200 ms on / 1/8 s off                           |
| Overvoltage:                                              | Output shutdown<br>Latching after 1 retry              | 60 V max.<br>32 V max.                          |
| Thermal:                                                  | Self protecting                                        | Non-latching                                    |
| OR-ing fault<br>(See Note 7)                              | Tested via I <sup>2</sup> C or PMBus                   | LED alarm (by read) in case of OR-ing fault     |
| <b>Communication Monitoring Readout Accuracy</b>          |                                                        |                                                 |
| Current:                                                  | Valid from 15% to max. load                            | ± 15%                                           |
| Voltage:                                                  | Measured before output OR-ing                          | ± 5%                                            |
| Temperature:                                              | Measured Internal output OR-ing                        | ± 5 °C                                          |
| Hours counter:                                            |                                                        | ± 36 s/hours approx.                            |

## Part Number System with Options

| Product Family            | Rated Output Power                     | Input Range                  | Standard Compliance      | Type of Output | Output Voltage         | Communications Type                                                          | Option Code                                                         | Special Modification | RoHS Compliance <sup>(9)</sup>   |
|---------------------------|----------------------------------------|------------------------------|--------------------------|----------------|------------------------|------------------------------------------------------------------------------|---------------------------------------------------------------------|----------------------|----------------------------------|
| <b>UFE</b>                | <b>2000</b>                            | <b>9</b>                     | <b>6</b>                 | <b>S</b>       | <b>48</b>              | <b>P</b>                                                                     | <b>D</b>                                                            | <b>XX</b>            | <b>J</b>                         |
| UFE = Universal Front-End | 1300 = 1300 Watts<br>2000 = 2000 Watts | 9 = Universal Input with PFC | 6 = UL/CSA/VDE Class A/B | S = Single     | 48 = 48 V<br>24 = 24 V | C1 = I <sup>2</sup> C serial communication<br>P = PMBus serial communication | None = Active Ishare<br>D = Droop Ishare<br>HD = PS Enable HI/Droop |                      | J = Pb free (RoHS 6/6 compliant) |

## Mechanical Drawing

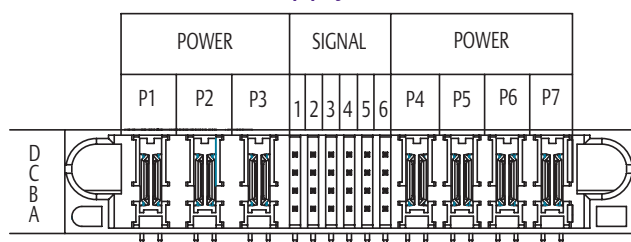
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| Power Supply Connector | Mating Connector    |
|------------------------|---------------------|
| Molex: 87663-4006      | Molex: 87664-2004   |
| Tyco: 2-1450330-8      | Tyco: 1450370-5     |
| FCI Berg: 51939-180    | FCI Berg: 51915-070 |

| Power Supply Connector Pinout |           |        |  |         |                                      |
|-------------------------------|-----------|--------|--|---------|--------------------------------------|
| Pin                           | D         | C      |  | B       | A                                    |
| P1                            | L1        |        |  |         |                                      |
| P2                            | L2        |        |  |         |                                      |
| P3                            | PEG       |        |  |         |                                      |
| 1                             | Sense-    | Sense+ |  | GND     | Shortpin                             |
| 2                             | Present-L | GND    |  | PS-ID0  | GND                                  |
| 3                             | PS-ID3    | PS-ID2 |  | GND     | 12V-AUX                              |
| 4                             | GND       | SCL    |  | PS-ID1  | GND                                  |
| 5                             | SDA       | GND    |  | GND     | I <sup>2</sup> C-En-H<br>(Comm-En-H) |
| 6                             | SMBALERT# | Ishare |  | DC-OK-L | PS-EN (Control)                      |
| P4                            | DC_N      |        |  |         |                                      |
| P5                            | DC_N      |        |  |         |                                      |
| P6                            | DC_P      |        |  |         |                                      |
| P7                            | DC_P      |        |  |         |                                      |

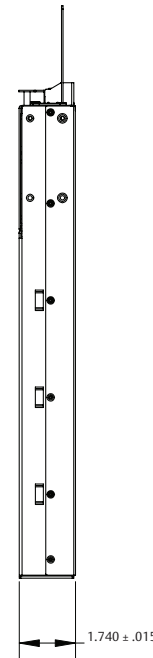
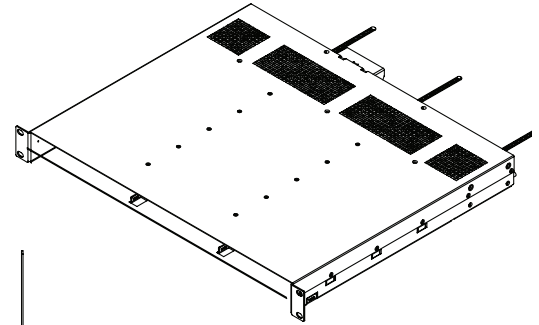
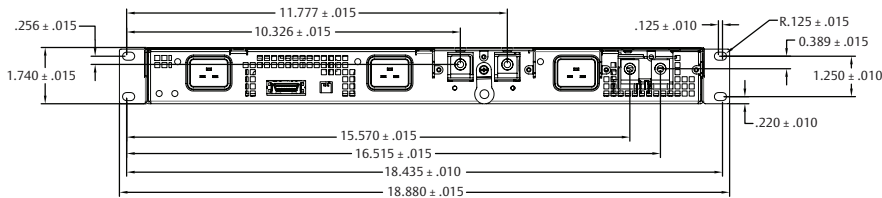
### Power Supply Connector



Power Connections Layout  
(Looking into Connector Side of UFE Power Supply)

# Rack Specifications

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| Rack Signal Connector Pinout |                                     |         |                |
|------------------------------|-------------------------------------|---------|----------------|
| Pin No.                      | Function                            | Pin No. | Function       |
| 1                            | 48V Sense+                          | 14      | 48V Ishare     |
| 2                            | Ground                              | 15      | Unit 1 Present |
| 3                            | 48V Sense-                          | 16      | Ground         |
| 4                            | Ground                              | 17      | Unit 2 Present |
| 5                            | PS-EN (Control)                     | 18      | Ground         |
| 6                            | DC1-OK0-L                           | 19      | Unit 3 Present |
| 7                            | DC2-OK-L                            | 20      | Ground         |
| 8                            | DC3-OK-L                            | 21      | SCL            |
| 9                            | I <sup>2</sup> C-En-H-1 (Comm-En-H) | 22      | Ground         |
| 10                           | I <sup>2</sup> C-En-H-2 (Comm-En-H) | 23      | SDA            |
| 11                           | I <sup>2</sup> C-En-H-3 (Comm-En-H) | 24      | Ground         |
| 12                           | Ground                              | 25      | SMBALERT#      |
| 13                           | 12V-Aux                             | 26      | N/C            |

| Signal Connector (1 per shelf) |                   |
|--------------------------------|-------------------|
| Shelf Connector                | Mating Connector  |
| Molex: 52986-2679              | Molex: 52316-2619 |
| Tyco: 2-178238-4               | Tyco: 2-5175677-4 |

| AC Input Connector (3 per shelf) |                                  |
|----------------------------------|----------------------------------|
| Shelf Connector                  | Mating Connector                 |
| IEC320 C20 Socket                | IEC320 C20 Plug (Straight Entry) |

| Shelf DIP Switch Table |            |            |
|------------------------|------------|------------|
| Shelf Number           | DIP Switch | DIP Switch |
| 1                      | Up         | Up         |
| 2                      | Up         | Down       |
| 3                      | Down       | Up         |
| 4                      | Down       | Down       |

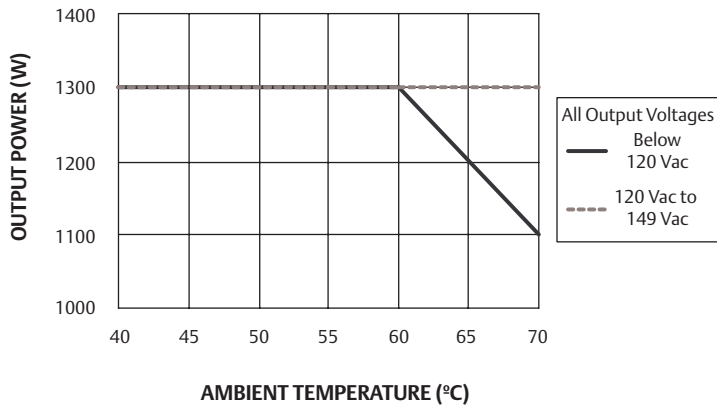


Figure 1 - Thermal Derating Curve for UFE2000-96S48J Model  
Low Line Input Voltage

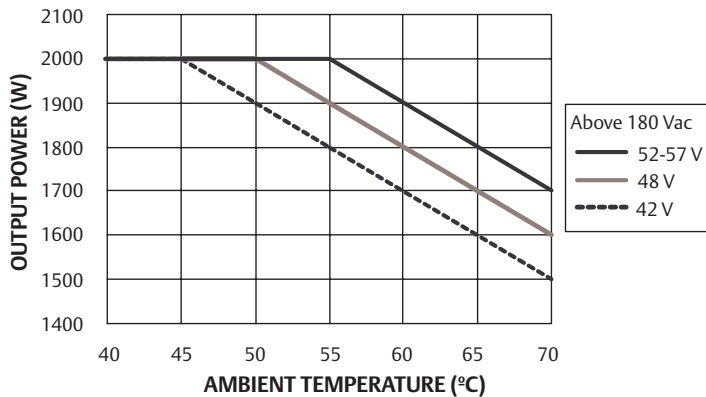


Figure 2 - Thermal Derating Curve for UFE2000-96S48J Model  
High Line Input Voltage

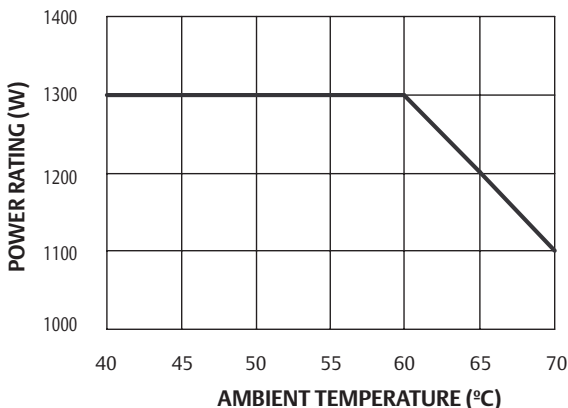


Figure 3 - Thermal Derating Curve for UFE1300-96S24J Model  
All Conditions

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