

# SPSPFE3-0XG

## Power Shelf

SPSPFE3-0XG power-shelf solutions provide rectification, system management, and power distribution, while maintaining high reliability and offering flexibility for future expansion.

The power shelf can be configured with up to six hot-swap capable PFE3000-12-069RA AC/DC-DC power supplies that convert 3-phase AC mains power into a main output of 12 VDC for powering intermediate bus architectures (IBA) in high performance and reliability servers, routers, and network switches.

The shelf is compatible with the Open Compute Rack Design.

The shelf has an optional slot for Network Attached Controller for providing control functions and monitoring through a 10/100 MB base Ethernet port and can be connected directly to the data center management network.

### Key Features & Benefits

- Two 3-Phase inputs, one AC inlet powers 3 power modules.
- Modules are hot-swap capable.
- Modules support I<sup>2</sup>C communication interface for control, programming and monitoring with PMBus® protocol.
- Modules implement the following protections: Overtemperature, output overvoltage and output overcurrent.
- RoHS Compliant.
- Available for OCP V1 and V2 bus-bar style connection.

### Applications

- High Performance Servers
- Routers
- Switches



Disclaimer: PMBus is a registered trademark of SMIF, Inc.

## 1. ORDERING INFORMATION

| MODEL        | INPUT AND OUTPUT CONFIGURATION                                                                                                                                                               |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SPSPFE3-05G  | 3-phase, 200-277 / 346-480 VAC Line to Line input with Neutral line<br>3 sets of output blades for +12 VDC output (each set of blades has max.585 A)                                         |
| SPSPFE3-05CG | 3-phase, 200-277 / 346-480 VAC Line to Line input with Neutral line<br>3 sets of output blades for +12 VDC output (each set of blades has max.585 A)<br>Network Attached Controller included |
| SPSPFE3-06G  | 3-phase, 200-277 / 346-480 VAC Line to Line input with Neutral line<br>1 set of output blade for +12 VDC output                                                                              |
| SPSPFE3-06CG | 3-phase, 200-277 / 346-480 VAC Line to Line input with Neutral line<br>1 set of output blade for +12 VDC output<br>Network Attached Controller included                                      |

## 2. TECHNICAL DATA

| PARAMETER               | DESCRIPTION / CONDITION                                                                                                                                                                                                         |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input                   | 3-phase, 200-277 / 346-480 VAC Line to Line input with Neutral <sup>1</sup>                                                                                                                                                     |
| AC Inlet Configuration  | 3 power modules are powered from one AC inlet                                                                                                                                                                                   |
| Auxiliary AC Outlet     | 3pcs. low power AC outlet providing 230 / 277 VAC output with max. 6A – 10A,<br>Protected by T 10A – F 15 A / 500 VAC Fuse (serviceable)<br>When T <sub>A</sub> : +45 °C to +55 °C, Output load current must be derated to 75%. |
| Redundant Configuration | 3+3 or 5+1 configuration                                                                                                                                                                                                        |
| Rated Power 1           | 8700 W (3+3 configuration) <sup>2</sup>                                                                                                                                                                                         |
| Rated Power 2           | 14400 W (5+1 configuration) <sup>2</sup>                                                                                                                                                                                        |
| Output Connection       | SPSPFE-05G: 3 sets of output blades for +12 VDC output (each set of blades has max.585 A)<br>SPSPFE-06G: 1 set of output blade for +12 VDC output                                                                               |
| Standby Output          | 60 W (Standby output 12 V / 5 A)                                                                                                                                                                                                |
| Communication           | I <sup>2</sup> C PMBus®                                                                                                                                                                                                         |
| NAC1006-01              | Network Attached Controller: Ethernet – SNMPv3 / HTTP                                                                                                                                                                           |

## 3. SAFETY WARNING

The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user indemnifies Bel Power Solutions Inc. from all claims arising from the handling or use of the goods. Persons handling the product(s) must have electronics training and observe good engineering practice standards.

**CAUTION:** Multiple power source. Disconnect all power cords before servicing.

## 4. REFERENCE DOCUMENTS

| DOCUMENT NUMBER | DESCRIPTION                                  |
|-----------------|----------------------------------------------|
| BCD.00297       | PFE3000-12-069RA Datasheet                   |
| BCA.00070       | PFE3000-12-069RA PMBus® Communication Manual |
| BCM.00177       | Installation Instruction PFE3000-12-069RA    |
| BCD.00926       | NAC1006-01 Datasheet                         |
| BCA.00178       | SPSPFE3-0XG Communication Manual             |
| BCM.00444       | Installation Instruction SPSPFE3-0XG         |
| PCA9547PW       | PCA9547PW Datasheet from NXP                 |

<sup>1</sup> Power modules are connected Line to Neutral.

<sup>2</sup> Rated Power is reduced as per current share accuracy characteristic. See PFE3000-12-069RA Datasheet.

## 5. OVERVIEW

The SPSPF3-0XG Power Shelf is a 10U height power shelf. It can be configured with up to six hot-swap capable PFE3000-12-069RA AC/DC power supplies that convert standard AC mains power into a main output of 12 VDC for powering intermediate bus architectures (IBA) in high performance and reliability servers, routers, and network switches.

The I<sup>2</sup>C communication is routed through an I<sup>2</sup>C Multiplexer (NXP PCA9547PW). PSU Modules support I<sup>2</sup>C communication interface for control, programming and monitoring with the PMBus® protocol.

The shelf has a slot for network attached controller (NAC) for providing control functions and monitoring through a 10/100 MB base Ethernet port and can be connected directly to the data center management network. It is hot-pluggable and supplied via the 12 V standby provided by the power supplies in the shelf. The controller can be configured through a web interface; the monitoring and control functions are accessed through SNMPv3.

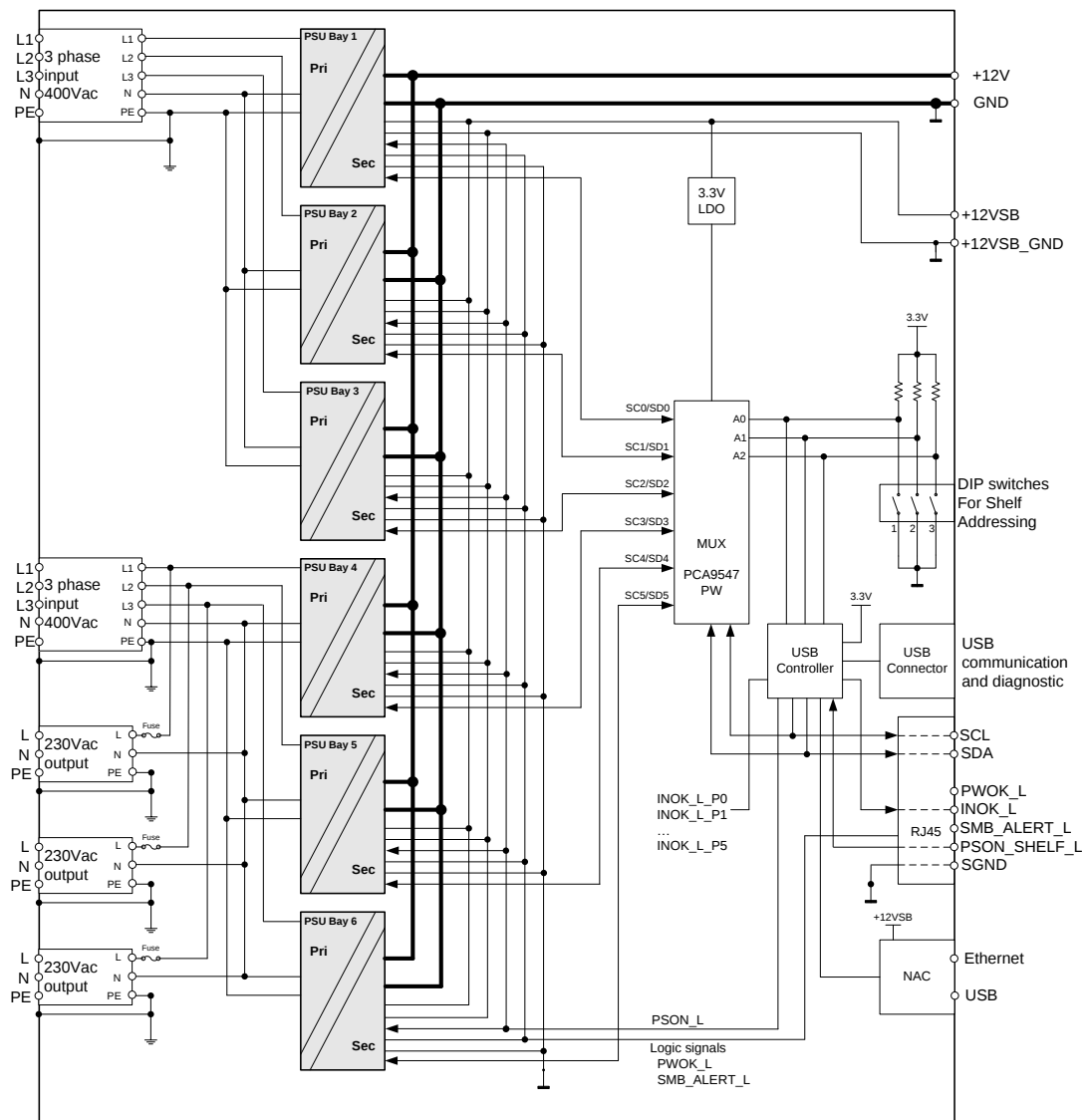


Figure 1. SPSPF3-0XG Block Diagram

## 6. INPUT SPECIFICATIONS

| PARAMETER                           | DESCRIPTION / CONDITION | MIN | NOM       | MAX | UNIT |
|-------------------------------------|-------------------------|-----|-----------|-----|------|
| <i>Input Connector (J106, J107)</i> |                         |     |           |     |      |
| AC Nominal Input Voltage            | Line to Line input      |     | 400 / 480 |     | VAC  |
| AC Input Voltage Ranges             | Line to Neutral input   | 180 |           | 300 | VAC  |
| Max Input Current                   | per line                |     |           | 23  | Arms |
| Input Frequency                     |                         | 47  | 50 / 60   | 63  | Hz   |

## 7. OUTPUT SPECIFICATIONS

| PARAMETER                              | DESCRIPTION / CONDITION                       | MIN | NOM  | MAX   | UNIT       |
|----------------------------------------|-----------------------------------------------|-----|------|-------|------------|
| <i>Main Output V1 (Output Bus Bar)</i> |                                               |     |      |       |            |
| Nominal Output Voltage                 |                                               |     | 12.3 |       | VDC        |
| Voltage Regulation                     |                                               | -5  |      | +5    | % Vout nom |
| Nominal Output Power 1                 | 3+3 configuration, $T_a < 45^\circ\text{C}$   |     |      | 8700  | W          |
| Derated Output Power 1                 | 3+3 configuration, $T_a = 55^\circ\text{C}^3$ |     |      | 6525  | W          |
| Nominal Output Power 2                 | 5+1 configuration, $T_a < 45^\circ\text{C}$   |     |      | 14400 | W          |
| Derated Output Power 2                 | 5+1 configuration, $T_a = 55^\circ\text{C}^3$ |     |      | 10800 | W          |
| Nominal Output Current 1               | 3+3 configuration, $T_a < 45^\circ\text{C}$   |     |      | 707   | ADC        |
| Derated Output Current 1               | 3+3 configuration, $T_a = 55^\circ\text{C}^3$ |     |      | 530   | ADC        |
| Nominal Output Current 2               | 5+1 configuration, $T_a < 45^\circ\text{C}$   |     |      | 1171  | ADC        |
| Derated Output Current 2               | 5+1 configuration, $T_a = 55^\circ\text{C}^3$ |     |      | 878   | ADC        |

|                                 |  |    |    |    |            |
|---------------------------------|--|----|----|----|------------|
| <i>Standby Output VSB (J23)</i> |  |    |    |    |            |
| Output Voltage                  |  |    | 12 |    | VDC        |
| Voltage Regulation              |  | -5 |    | +5 | % Vout nom |
| Output Power                    |  |    |    | 60 | W          |
| Output Current                  |  |    |    | 5  | ADC        |

|                                                   |                                               |  |           |    |      |
|---------------------------------------------------|-----------------------------------------------|--|-----------|----|------|
| <i>Auxiliary AC Outlet (J123, J124, and J125)</i> |                                               |  |           |    |      |
| AC Output Voltage (J123)                          | L1 to Neutral                                 |  | 230 / 277 |    | VAC  |
| AC Output Voltage (J124)                          | L2 to Neutral                                 |  | 230 / 277 |    | VAC  |
| AC Output Voltage (J125)                          | L3 to Neutral                                 |  | 230 / 277 |    | VAC  |
| AC Output Current (J123)                          | L3 to Neutral                                 |  |           | 6  | Arms |
| AC Output Current (J124, J125)                    | L1, L2 to Neutral                             |  |           | 10 | Arms |
| Fuse Protection per Line (F123)                   | Serviceable (10 A / 500 VAC Time Lag fuse)    |  |           |    |      |
| Fuse Protection per Line (F124, F125)             | Serviceable (15 A / 500 VAC Fast-Acting fuse) |  |           |    |      |

Note: When  $T_a$ : +45 °C to +55 °C, Output load current must be derated to 75%.

<sup>3</sup> Linear derating at  $T_a > 45^\circ\text{C}$  is based per module, see PFE3000-12-069RA datasheet

## 7.1 PROTECTION (PER MODULE)

| PARAMETER                                      | DESCRIPTION / CONDITION                                                                                                                   | MIN        | NOM  | MAX                    | UNIT             |
|------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|------------|------|------------------------|------------------|
| Input Fuses (L+N)                              | Not user accessible, quick-acting (F)                                                                                                     |            | 25   |                        | A                |
| OV Threshold $V_I$                             |                                                                                                                                           | 13.6       | 14.2 | 14.8                   | VDC              |
| OV Latch Off Time $V_I$                        |                                                                                                                                           |            |      | 1                      | ms               |
| OV Threshold $V_{SB}$                          |                                                                                                                                           | 13.3       | 13.9 | 14.5                   | VDC              |
| OV Latch Off Time $V_{SB}$                     |                                                                                                                                           |            |      | 1                      | ms               |
| Current Limitation                             | $T_a < 45^\circ\text{C}$<br>$T_a = 55^\circ\text{C}$                                                                                      | 248<br>186 |      | 274<br>212             | A                |
| Current Limit Blanking Time                    | Time to latch off when in over current                                                                                                    | 20         | 22   | 24                     | ms               |
| Current Limit During Short Time Overload $V_I$ | Maximum duration 20ms, per module                                                                                                         | 292        | 300  | 308                    | A                |
| Max Short Circuit Current $V_I$                | $V_I < 3\text{ V}$ , per module                                                                                                           |            |      | 350 <sup>4</sup>       | A                |
| Short Circuit Latch Off Time                   | Time to latch off when in short circuit                                                                                                   |            | 10   |                        | ms               |
| Current Limitation $V_{SB}$                    | Per module                                                                                                                                | 6          |      | 9                      | A                |
| Current Limit Blanking Time                    | Time to hit hiccup when in over current                                                                                                   |            |      | 1                      | ms               |
| Over Temperature on Critical Points            | Inlet Ambient Temperature<br>PFC Primary Heatsink Temperature<br>Secondary Sync Mosfet Temperature<br>Secondary OR-ing Mosfet Temperature |            |      | 60<br>80<br>115<br>125 | $^\circ\text{C}$ |

## 7.2 INTERFACE & CONTROL SIGNALS

The PWOK\_L is an open collector output of all modules and they are interconnected (wired-OR) within the shelf and this signal is fed to the signal connector. PWOK\_L is low when there is at least one module in operation. SMB\_ALERT\_L is also wired-OR already in the shelf. Sink current must not exceed 4 mA on each of these signals.

The internal INOK\_L\_Px signal of each individual module is fed to the backplane microcontroller for modules synchronized AC start-up. This allows the shelf to start up with load > 3000 W during AC application. The microcontroller provides an INOK\_L output signal. INOK\_L is low when there is at least one module supplied with correct input voltage.

PSON\_SHELF\_L signal is an internally pulled-up input signal (3.3 V) to enable / disable the main output V1 of the Shelf. This active-low pin is also used to clear any latched fault condition. This is similar to the PSON\_L on the PSU level. PSON\_SHELF\_L is currently bypassed in ON\_OFF\_CONFIG command.

A pull up resistor of 10k $\Omega$  to 3.3 V within the shelf provides the high level voltage for the PWOK\_L, INOK\_L and SMB\_ALERT\_L signals.

| RJ45 PIN OUTS (J20) | FUNCTION     | DESCRIPTION                         |
|---------------------|--------------|-------------------------------------|
| 1 <sup>5</sup>      | SCL          | I2C clock signal line               |
| 2 <sup>5</sup>      | SDA          | I2C data signal line                |
| 3                   | NC           | NC                                  |
| 4                   | PWOK_L       | Power OK signal output: active-low  |
| 5                   | INOK_L       | Input OK signal: active-low         |
| 6                   | SMB_ALERT_L  | SMB Alert signal output: active-low |
| 7                   | PSON_SHELF_L | Power Shelf on input: active-low    |
| 8                   | SGND         | Signal ground                       |

Table 1. I2C Interface and Signal Connector (RJ45) Pin Out

<sup>4</sup> Limit doesn't include effects of main output capacitive discharge

<sup>5</sup> External Pull-up resistor should be 2 – 5k $\Omega$  to ensure SMBUS compliant signal rise times

### 7.3 I2C COMMUNICATION

The PSU Modules are set to a fixed I2C Address (0x20). PMBus® communication for the PSU Modules are described in more detail in document BCA.00070. The I2C communication to the PSU Modules are routed through an I2C Multiplexer. The I2C MUX Control Register needs to be configured so that the I2C frames are routed to the correct PSU Module. Refer to the I2C MUX datasheet for additional information.

The I2C MUX and backplane controller addresses are configurable via DIP Switches (SW1);

The PSON function of the shelf can also be controlled by a PMBus® command sent to the backplane Controller, see document BCA.00178 for further information and the table below.

| COMMAND |               | ACCESS   | DATA BYTES | COMMENTS                                                         |
|---------|---------------|----------|------------|------------------------------------------------------------------|
| Code    | Name          |          |            |                                                                  |
| 0x01    | OPERATION     | Byte R/W | 1          | Supported Values:<br>0x00 = Unit Off<br>0x80 = Unit On (Default) |
| 0x02    | ON_OFF_CONFIG | Byte R/W | 1          | Supported Values:<br>0x19 (Default)<br>0x01, 0x11, 0x15, 0x1D    |

**NOTE:** A setting in the ON\_OFF\_CONFIGURATION register doesn't survive a power cycle. See also the PMBus® protocol definition.

### 7.4 I2C ADDRESSING (SHELF)

The shelf default MUX address is 0xEE and Controller address is 0x5E. When DIP switch (SW1) is in "ON" position means 0, "OFF" Position means 1.

| POSITION 1 | POSITION 2 | POSITION 3 | MUX ADDRESS (IN HEX) | Controller ADDRESS (IN HEX) |
|------------|------------|------------|----------------------|-----------------------------|
| ON         | ON         | ON         | 0xE0                 | 0x50                        |
| OFF        | ON         | ON         | 0xE2                 | 0x52                        |
| ON         | OFF        | ON         | 0xE4                 | 0x54                        |
| OFF        | OFF        | ON         | 0xE6                 | 0x56                        |
| ON         | ON         | OFF        | 0xE8                 | 0x58                        |
| OFF        | ON         | OFF        | 0xEA                 | 0x5A                        |
| ON         | OFF        | OFF        | 0xEC                 | 0x5C                        |
| OFF        | OFF        | OFF        | 0xEE                 | 0x5E                        |

**NOTE:** Communication Manual of shelf, see document BCA.00178.

Table 2. DIP Switch Setting (SW1)

### 7.5 NETWORK ATTACHED CONTROLLER

The Network Attached Controller (NAC1006-01) is a shelf level controller providing monitoring and control functions through a 10/100 MB base Ethernet port and can be connected directly to the data center management network. It is hot-pluggable and supplied via the 12 V redundant standby provided by the power supplies in the shelf. The controller can be configured through a web interface; the monitoring and control functions are accessed through SNMP.

See BCD.00926 for NAC1006-01 Datasheet.

## 7.6 CONTROL LEDs

Each PSU front-end module has 2 LEDs to indicate status condition. LED number one is green and indicates AC power is on or off, while LED number two is bi-colored: green and yellow and indicates DC power presence or fault situations.

| PARAMETER           | DESCRIPTION / CONDITION                             | LED SIGNALING               |
|---------------------|-----------------------------------------------------|-----------------------------|
| AC LED              | AC Line within range                                | Solid Green                 |
|                     | AC Line UV condition                                | Off                         |
|                     | Normal Operation                                    | Solid Green                 |
|                     | PSON_L High                                         | Blinking Yellow (1:1)       |
| DC LED <sup>6</sup> | $V_I$ or $V_{SB}$ out of regulation                 | Solid Yellow                |
|                     | Over temperature shutdown                           |                             |
|                     | Output over voltage shutdown ( $V_I$ or $V_{SB}$ )  |                             |
|                     | Output under voltage shutdown ( $V_I$ or $V_{SB}$ ) |                             |
|                     | Output over current shutdown ( $V_I$ or $V_{SB}$ )  | Blinking Yellow/Green (2:1) |
|                     | Over temperature warning                            |                             |
|                     | Minor fan regulation error (>5%, <15%)              |                             |
|                     |                                                     |                             |

## 7.7 USB CONNECTOR TYPE B (J3)

This is used for Bel Power Diagnostic thru Bel Power Solutions I<sup>2</sup>C Utility GUI. This connection also provides access to FW boot loading of the PSU Modules.

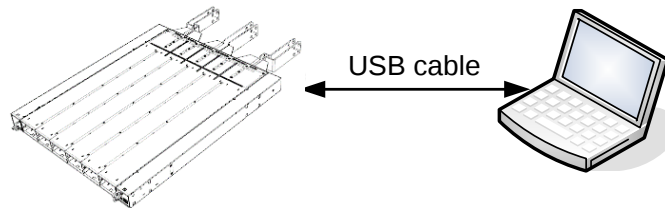


Figure 2. Connection

### WARNING:

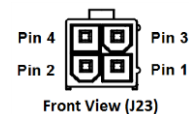


The USB interface is NOT galvanically isolated and referenced to the +12V\_GND / SGND lines. Preferably, use a battery operated laptop to avoid earth loop issues. If a desktop computer is being used, there is a risk of generating earth loop currents, therefore the usage of a USB isolator is highly recommended in such a case.

## 7.8 +12VSB CONNECTOR (J23)

+12VSB output is capable of delivering 5A. The output is protected by a PTC (16R900GF from Littelfuse). Mating Part: Molex 39-01-2045

| PIN OUTS (J23) | FUNCTION | DESCRIPTION   |
|----------------|----------|---------------|
| 1, 3           | VSB_GND  | +12VSB return |
| 2, 4           | VSB      | +12VSB output |



<sup>6</sup> The order of the criteria in the table corresponds to the testing precedence in the controller.

## 7.9 AUXILIARY AC OUTLET

The 3 connectors (J123, J124, and J125) are used to provide AC power to the Network Switch Devices. Each connector is connected to one of the LIVE terminals (L1, L2, and L3) and NEUTRAL from the 3-phase input (J107). These are protected by a 10 A / 500 Vac Time Lag fuse on the LIVE terminal (F123) and 15 A / 500 Vac Fast-Acting fuse on the LIVE terminal (F124 and F125). See Safety Warning when servicing the fuse.

When power shelf is operated at ambient temp of +45 °C to +55 °C, the output load current must be derated to 75%.

## 8. SAFETY, REGULATORY AND EMC SPECIFICATIONS

| PARAMETER                                   | DESCRIPTION / CONDITION                                                                                                                                                                                | CRITERION                                         |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
| Agency Approvals                            | Approved to the latest revisions/amendments of the following standards:<br>UL 60950-1 Second Edition<br>CAN/CSA-C22.2 No. 60950-1-07 Second Edition<br>IEC 60950-1:2005<br>EN 60950-1:2006             | Approved by independent body (see CE Declaration) |
| Insulation                                  | Input (L/N) to case (PE)<br>Input (L/N) to output<br>Output to case (PE)                                                                                                                               | Basic<br>Reinforced<br>Functional                 |
| Creepage / Clearance (dc)                   | Primary (L/N) to protective earth (PE)<br>Primary to secondary                                                                                                                                         |                                                   |
| Electrical Strength Test                    | Input to case<br>Input to output (tested by manufacturer only)                                                                                                                                         | Min. 2121 VDC<br>Min. 4242 VDC                    |
| Max. Leakage Current                        | AC input voltage of TBD VAC, Line to Neutral,<br>AC line frequency of 50 Hz and ambient temperature of 25 °C.                                                                                          | TBD                                               |
| Conducted Emission                          | EN55022 / CISPR 22: 0.15 ... 30 MHz, QP and AVG                                                                                                                                                        | Class A                                           |
| Radiated Emission                           | EN55022 / CISPR 22: 30 MHz ... 1 GHz, QP                                                                                                                                                               | Class A                                           |
| Harmonic Emissions (per module)             | IEC61000-3-2, Vin = 230 VAC, 50 Hz, 100% Load (per module)                                                                                                                                             | Class A                                           |
| Acoustical Noise                            | Sound power statistical declaration (ISO 9296, ISO 7779, IS9295) @ 50% load                                                                                                                            | 60 dBA                                            |
| AC Flicker                                  | IEC / EN 61000-3-3, d <sub>max</sub> < 3.3%                                                                                                                                                            | PASS                                              |
| ESD Contact Discharge                       | IEC / EN 61000-4-2, ±8 kV, 25+25 discharges per test point (metallic case, LEDs, connector body)                                                                                                       | A                                                 |
| ESD Air Discharge                           | IEC / EN 61000-4-2, ±15 kV, 25+25 discharges per test point (non-metallic user accessible surfaces)                                                                                                    | A                                                 |
| Radiated Electromagnetic Field              | IEC / EN 61000-4-3, 10 V/m, 1 kHz/80% Amplitude Modulation, 1 µs Pulse Modulation, 10 kHz...2 GHz                                                                                                      | A                                                 |
| Burst                                       | IEC / EN 61000-4-4, level 3<br>AC port ±2 kV, 1 minute<br>DC port ±1 kV, 1 minute                                                                                                                      | A                                                 |
| Surge                                       | IEC / EN 61000-4-5<br>Line to earth: level 3, ±2 kV<br>Line to line: level 2, ±1 kV                                                                                                                    | A                                                 |
| RF Conducted Immunity                       | IEC/EN 61000-4-6, Level 3, 10 Vrms, CW, 0.1 ... 80 MHz                                                                                                                                                 | A                                                 |
| Voltage Dips and Interruptions (per module) | IEC/EN 61000-4-11 (per module)<br>1: Vi 230 VAC, 100% Load, Dip 100%, Duration 12 ms<br>2: Vi 230 VAC, 100% Load, Dip 100%, Duration < 150 ms<br>3: Vi 230 VAC, 100% Load, Dip 100%, Duration > 150 ms | A<br>V1: B, VSB: A<br>B                           |

## 9. ENVIRONMENTAL SPECIFICATIONS

| PARAMETER                 | DESCRIPTION / CONDITION                                      | MIN | NOM | MAX   | UNIT |
|---------------------------|--------------------------------------------------------------|-----|-----|-------|------|
| Operating Temperature     | @ full load, up to 4000 m:                                   | 0   |     | +35   | °C   |
|                           | @ full load, up to 1800 m:                                   | 0   |     | +45   |      |
|                           | @ 75% load, up to 1800 m:                                    | 0   |     | +55   |      |
| Non-Operating Temperature |                                                              | -40 |     | +70   | °C   |
| Humidity                  | Operating: @ at 40 °C, non-condensing                        | 7   |     | 93    | %RH  |
|                           | Non-Operating: non-condensing                                | 5   |     | 95    |      |
| Altitude                  | Operating:                                                   |     |     | 4000  | m    |
|                           | Non-Operating:                                               |     |     | 13000 |      |
| Shock                     | Operating: 11 ms half-sine shocks in Z axis 10+ve, 10-ve     |     | 5   |       | g    |
|                           | Non-Operating: 11 ms half-sine shocks in Z axis 10+ve, 10-ve |     | 30  |       |      |
| Vibration                 | Operating: 0.2 g <sub>rms</sub> random                       | 5   |     | 500   | Hz   |
|                           | Non-Operating: 1 g <sub>rms</sub> random                     | 2   |     | 200   |      |
| Acoustic Noise Emissions  | @ normal operation, and 50% load sharing                     |     |     | 70    | dBA  |
|                           | Fan speed                                                    |     |     | 7000  |      |
| Cooling                   | When equipped with operating PSUs                            |     |     | 50    | Pa   |

## 10. MECHANICAL SPECIFICATIONS

| PARAMETER                | SPSPFE3-05G                                         |
|--------------------------|-----------------------------------------------------|
| Dimensions (W x H x D)   | 534.5 x 46.5x 650 mm (overall: 535 x 47 x 859.5 mm) |
| Weight (Shelf only)      | 16 kg                                               |
| Weight (6 PSU installed) | 32 kg                                               |

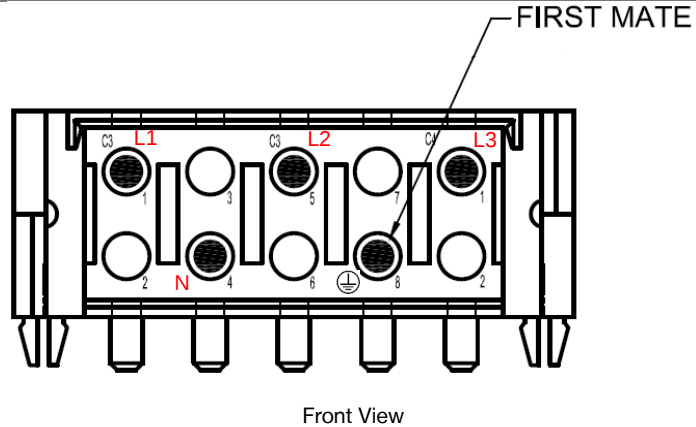
### 10.1 CONNECTORS

| DESCRIPTION                        | REFERENCE DESIGNATOR | TYPE                | MANUFACTURER          | MPN                       |
|------------------------------------|----------------------|---------------------|-----------------------|---------------------------|
| Input Connector                    | J106, J107           | 3-phase input       | Positronic Industries | SP5YYE48M0LN9A1/AA-PA1067 |
| USB I2C Connector                  | J3                   | USB – B type        | Tyco                  | 292304-1                  |
| I2C Interface and Signal Connector | J20                  | RJ45                | FCI Connectors        | 87180-088LF               |
| +12VSB output connector            | J23                  |                     | Molex                 | 39-30-0040                |
| Auxiliary AC Outlet                | J123                 | Single phase output | Molex                 | 172043-0302               |
| Auxiliary AC Outlet                | J124, J125           | Single phase output | Rong Feng             | RF-203P-HP-1.0            |
| Auxiliary AC Outlet Fuse           | F123                 | 5 x 20 mm           | Bel Fuse Inc.         | 0ADKC9100-BE              |
|                                    |                      | Time Lag Fuse       | Eaton                 | BK1-S505H-10-R            |
| Auxiliary AC Outlet Fuse           | F124, F125           | 6.3 x 32 mm         | Bel Fuse Inc.         | 0ADEC9150-BE              |
|                                    |                      | Fast-Acting Fuse    | Littelfuse Inc.       | 0505015.MXP               |

## SHELF

## HIGH VOLTAGE CONNECTOR PIN ASSIGNMENT

3-Phase Input Connector  
(J106, J107)



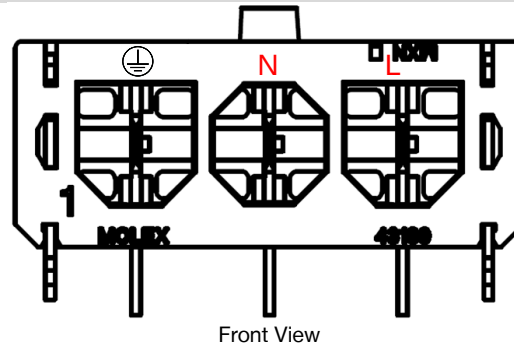
MPN

SP5YYE48M0LN9A1/AA-PA1067

Mating Part

SP5YYE1F0091/AA

Auxiliary AC Outlet  
(J123)



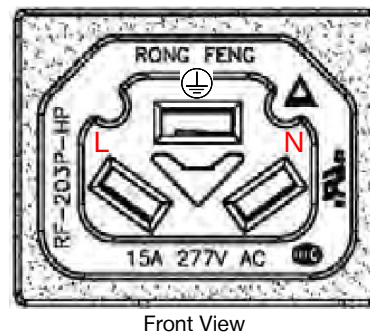
MPN

172043-0302

Mating Part

172672-2003

Auxiliary AC Outlet  
(J124, J125)



MPN

RF-203P-HP-1.0

10.2 SPSPFE3-05G and SPSPFE3-06G MECHANICAL DATA

**NOTE:** finished good may look different from images.

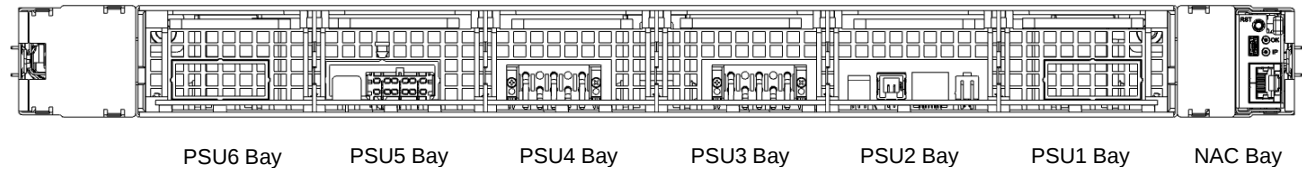


Figure 3. SPSPFE3-05G and SPSPFE3-06G Front View

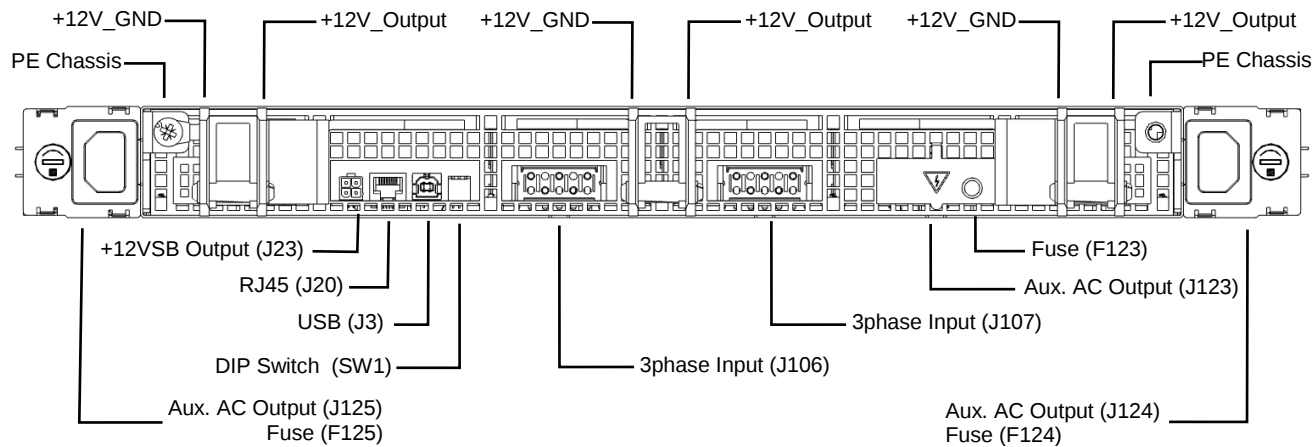


Figure 4. SPSPFE3-05G Rear View

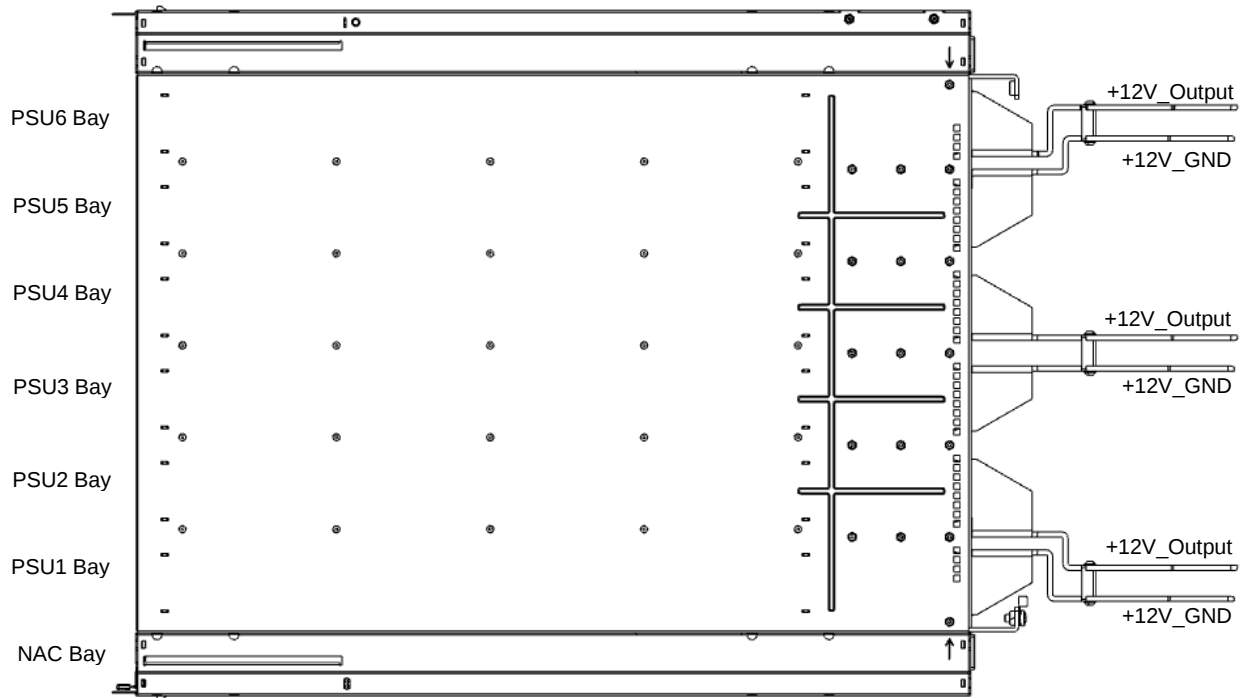


Figure 5. SPSPFE3-05G Top View

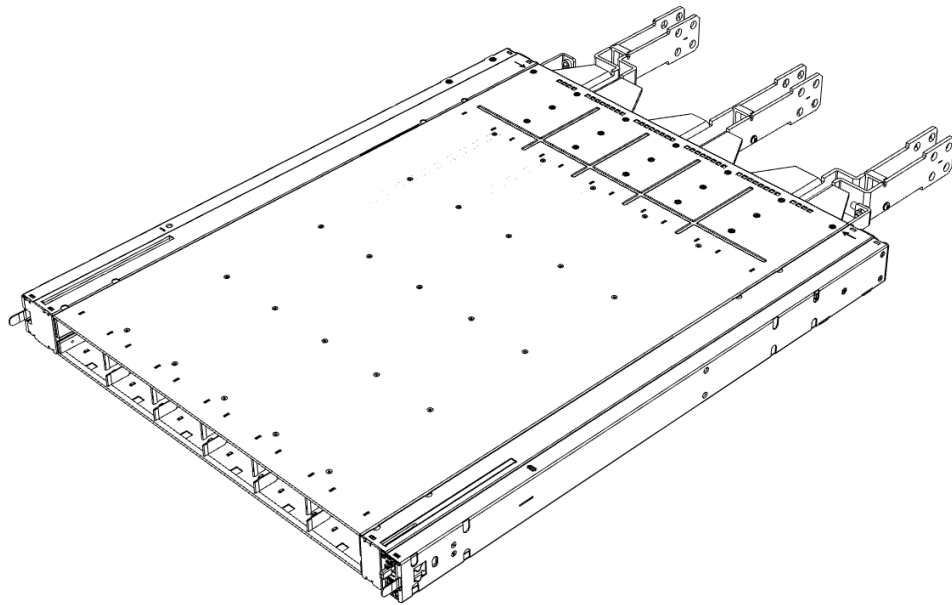


Figure 6. SPSPFE3-05G Isometric View

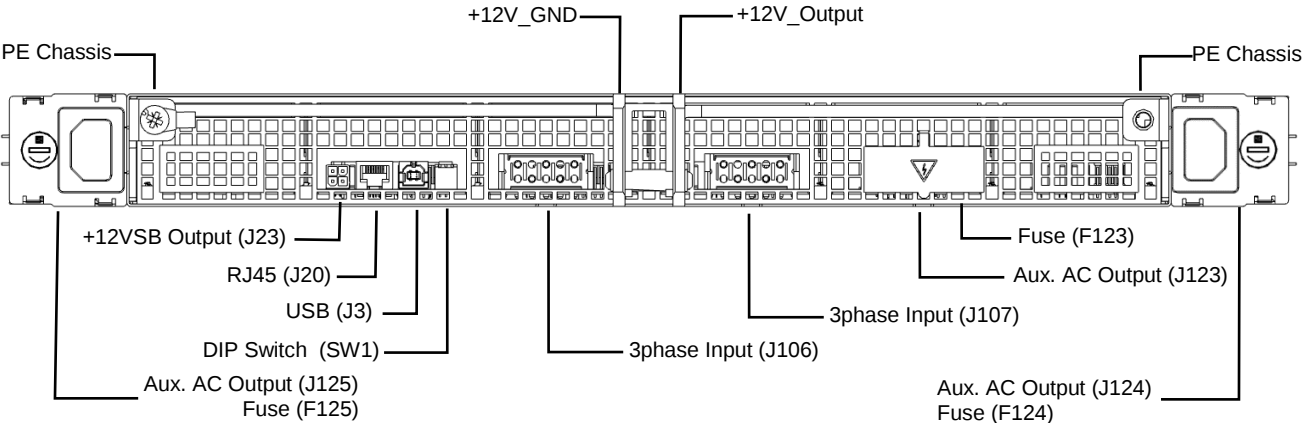


Figure 7. SPSPFE3-06G Rear View

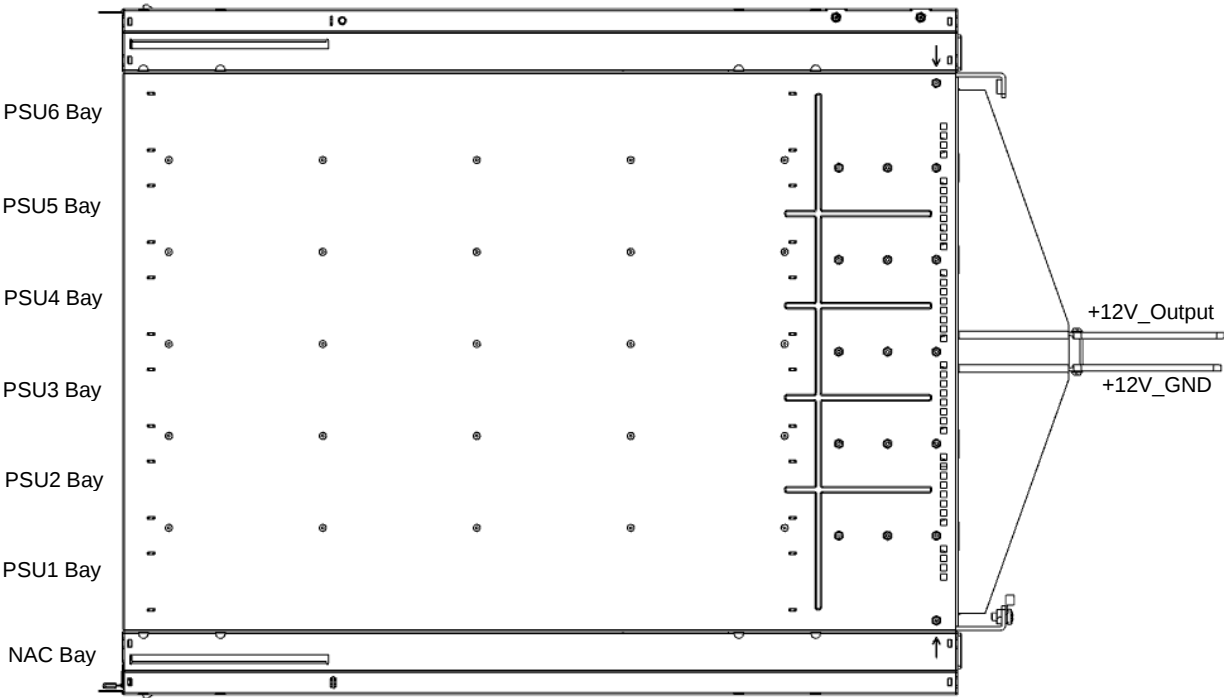


Figure 8. SPSPFE3-06G Top View

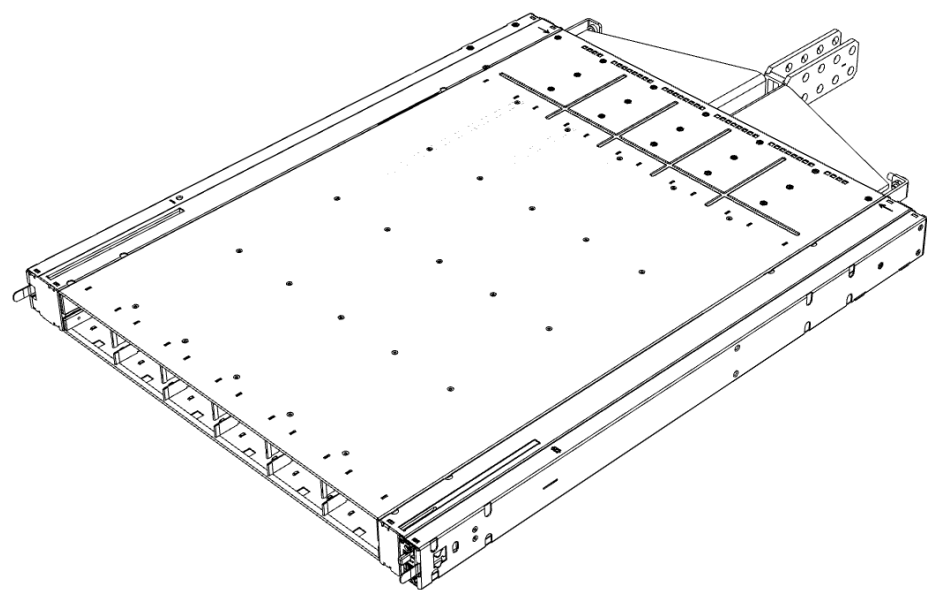
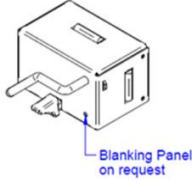


Figure 9. SPSPFE3-06G Isometric View

11. ACCESSORIES

| ITEM                                                                                | DESCRIPTION                                                                                                                                             | ORDERING PN   | SOURCE                                                                       |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------------------------------------------------------------------------|
|  | I <sup>2</sup> C Utility<br>Windows Vista/7/8 compatible<br>GUI to program, control and<br>monitor PFE Front-Ends (and<br>other I <sup>2</sup> C units) | N/A           | <a href="http://belfuse.com/power-solutions">belfuse.com/power-solutions</a> |
|  | Blanking Panel                                                                                                                                          | SPSPFE3-BP01G | <a href="http://belfuse.com/power-solutions">belfuse.com/power-solutions</a> |

## 12. REVISION HISTORY

| REV | DESCRIPTION                                                                                                                                                                                                                                                                                | PRODUCT VERSION | DATE       | AUTHOR |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------|--------|
| 001 | PRELIMINARY: Initial Draft                                                                                                                                                                                                                                                                 | V001            | 11-30-2016 | GS     |
| 002 | PRELIMINARY:<br>Shelf Input Voltage is configured for 277Vac<br>Update Auxiliary AC Outlet to meet 277Vac<br>Update Fuse on Auxiliary AC Outlet<br>Optional PE connection added                                                                                                            | V002            | 08-31-2017 | GS     |
| 003 | Update Datasheet part number for NAC1006-01.<br>Update Mechanical Drawings<br>PMBus™ changed to PMBus®; a disclaimer added to the first page: Disclaimer: PMBus is a registered trademark of SMIF, Inc.<br>Network Attached Controller is set to optional.<br>Update Ordering Information. | V003            | 02-28-2018 | VS     |
| 004 | Update Max Input Current.<br>Add note on AC auxiliary output load current.<br>Removed Pending on Safety Agency Approvals                                                                                                                                                                   | V004            | 04-24-2018 | GS     |

For more information on these products consult: [tech.support@psbel.com](mailto:tech.support@psbel.com)

**NUCLEAR AND MEDICAL APPLICATIONS** - Products are not designed or intended for use as critical components in life support systems, equipment used in hazardous environments, or nuclear control systems.

**TECHNICAL REVISIONS** - The appearance of products, including safety agency certifications pictured on labels, may change depending on the date manufactured. Specifications are subject to change without notice.



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