

## 1000W, High Reliability, Convection Cooled, Railway Quality DC/DC Converter BHR 65X2R-4U2NF Series (Opto-less)

- No optocouplers, low component count
- Rugged, railway quality
- Cooling by convection only (no fans or forced air)
- Rugged construction
- Conformal coating
- High input/output isolation
- Full electronic protection
- Customized versions available



This rugged, railway quality DC/DC converter is designed for a long operating life. By eliminating optocouplers in the feedback loop, the MTBF of the unit is greatly improved over conventional designs. The converter is built with two BHR 65R modules connected redundant parallel. Each internal module generates 500W. This modular construction provides inherent redundancy; the failure of one internal module would cause a 50% drop in output power while the unit remains functional at 500W. Therefore, this design can also be used as a 500W redundant power supply. A +/- dual output configuration is also possible. The mechanical construction has no internal wiring, which increases vibration-withstand capacity and contributes to long-term reliability. In addition, the internal boards are conformal coated for immunity to humidity and contamination. All heat generating components are installed on aluminum heat-sink blocks which are thermally coupled to the heatsink fins and cooled by natural convection. Heatsink fins are installed on the side of the unit and internally for efficient cooling. The input and output are filtered for low noise. Full electronic protection eliminates failure due to abnormal operating conditions, including application errors. Large design headroom and the use of components with established reliability also contribute to the long operating life of the unit. The converter meets the requirements of EN50155 for electronic equipment used on railway rolling stock. It is manufactured at our plant under strict quality control. An industrial quality version of this design, the BHR 65X2-4U2NF, is also available.

### SPECIFICATIONS

#### Input Voltage

72Vdc (43 – 101V),  
96Vdc (58 – 135V),  
110Vdc (66 – 154V)  
For other input voltages,  
please consult factory.

#### Input Protection

Inrush current limiting  
Varistor  
Reverse polarity protection  
Internal safety fuse  
Lower voltage than the specified  
minimum input will not damage  
the unit

#### Isolation

Corresponding to input/output  
voltage:  
Min. 1500Vdc input to chassis  
Min. 3000Vdc input to output  
Min. 1500VDC output to chassis

#### Standards

Designed to meet EN 60950-1  
and EN50155

#### Immunity

Meets criteria as requested in  
EN50155 and EN50121-3-2  
according to the following  
standards:  
EN61000-4-2 (ESD)  
EN61000-4-3 (RF Immunity)  
EN61000-4-4 (Fast Transients)  
EN 50155 (Surge)  
EN 61000-4-6 (Conduction  
Immunity)  
EN50155 (Voltage Variations)

#### EMI

EN50121-3-2

#### Switching Frequency

55kHz  $\pm$ 3kHz

#### Output Voltages

24V, 48V, 110V or 125Vdc  
1000W continuous  
12Vdc at 800W continuous  
Output is floating; either terminal  
can be grounded  
Consult factory for other  
voltages

#### Redundancy diode

Internal boards are connected  
parallel via redundancy diode

#### Line/Load Regulation

$\pm$  2% combined from 5% load  
to full load

#### Dynamic Response

Max 5% voltage deviation for 10%  
to 50% load step, with better than  
1msec recovery time

#### Output Ripple/Noise

Better than 1% of output voltage  
peak to peak or 0.2% Vrms  
(20MHz BW)

#### Output Overload Protection

Rectangular current limiting with  
short-circuit protection  
Thermal shutdown in case of  
insufficient cooling (self-resetting)

#### Output Overvoltage Protection

Second control loop

#### Efficiency

Typically 80-90% at full load  
depending on input/output  
combination

#### Operating Temperature Range

-25 °C to 55 °C for full specification  
Extended temperature ranges  
available on request

#### Temperature Drift

0.03% per °C, over operating  
temperature range

#### Cooling

By natural air convection

#### Environmental Protection

Ruggedizing  
Conformal coating

#### Shock/Vibration

IEC 61373 Cat 1 A&B

#### Humidity

5 - 95% non-condensing

#### MTBF

175,000 hours at 45 °C  
Demonstrated MTBF is  
significantly higher

#### Indicators

Green 'Output ON LED' visible  
through cooling slots

#### Control Input

Optional

#### Alarm Output

None on standard version  
Output fail alarm Form C contacts  
installed on request

#### Package/Dimensions (H x W x D)

4U2NF: 191 x 191 x 305 mm  
(7.5 x 7.5 x 12")  
Dimensions include heatsink fins  
and flanges, exclude connectors.  
Mounting holes are clear

#### Weight

6.8 kg (15 lb)

#### Connections

Barrier type terminal blocks or  
threaded studs

#### RoHS Compliance

Compliant

#### Warranty

Two years subject to application  
within good engineering practice



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