

# DC-DC CONVERTER HEBC60

RAILWAY CONVERTER.

## STANDARD EURO-RACK SIZE 19"



## HIGHLIGHTS

- + Output Power up to 55 Watts\*
- + Ultra Wide Input Range
- + Wide Temperature Range
- + Hold-up-time > 10ms
- + RoHS compliance
- + According to EN50155

## INPUT

|                                |                                |
|--------------------------------|--------------------------------|
| <b>Input Voltage Nominal</b>   | 24, 36, 48, 72 and 110 VDC     |
| <b>Input Voltage Operating</b> | 16,8-137,5 VDC                 |
| <b>Input Voltage Range</b>     | 14,4-154 VDC ( $\pm 1,0$ sec.) |
| <b>No Load Input Current</b>   | See table page 2               |
| <b>Internal Fusing</b>         | 5 AT                           |

## OUTPUT

|                                |   |
|--------------------------------|---|
| <b>Output Voltage</b>          | 5,1 V / 12 V                              |
| <b>Initial Set Accuracy</b>    | < 1 % (no load)                           |
| <b>Minimum Load</b>            | No minimum load                           |
| <b>Short circuit</b>           | Continuous short circuit proof            |
| <b>Line Regulation</b>         | < 0,5 %                                   |
| <b>Load Regulation</b>         | < 1 % (0% - 100% load)***                 |
| <b>Ripple &amp; Noise</b>      | < 1 % pk-pk, 20 MHz bandwidth (+25°C)     |
| <b>Start Time</b>              | < 260 ms                                  |
| <b>Max. Output Capacitance</b> | 500 $\mu$ F x $I_{out, nom}$              |
| <b>Temperature Coefficient</b> | < 0.01 %/°C ( $V_{out1}$ and $V_{out2}$ ) |

## FEATURES

|   |  |
|---|--|
| <b>Enable Signal Primary</b>              | EN connected to $V_{in+}$ : ON;<br>EN open or connected to $V_{in-}$ : OFF.            |
| <b>Active Reverse Polarity Protection</b> | Max. 160 V   |
| <b>Inrush Current Limitation</b>          | Max. 6,5 A   |
| <b>Hold-up-time</b>                       | > 10 ms at full load   |
| <b>Input Power Fail Signal</b>            | Isolated Open-Collector Output. Active Level: Low                                      |
| <b>Thermal Warning Signal</b>             | Isolated Open-Collector Output. Active level: Low<br>T=75-80°C PCB with 5°C hysteresis |
| <b>Power Good Signal</b>                  | Isolated Open-Collector Output. Active Level: Low                                      |

## PROTECTION

|   |  |
|---|--|
| <b>Output Over Voltage Protection (OVP)</b> | 110-130 % $V_{out, nom}$ (output 2 latched, reset through EN or power off)             |
| <b>Over Current Protection (OCP)</b>        | See table page 2   |
| <b>Over Temperature Protection (OTP)</b>    | Shutdown at +100-105°C (inside temp.) PCB-temp. with 5°C hysteresis and auto recovery. |

## GENERAL

|                            |  |
|----------------------------|--|
| <b>Product Standard</b>    | EN 50155:2007  |
| <b>Isolation</b>           | 2200 VDC Input to Output<br>1500 VDC Input to Earth (PE)<br>710 VDC Output to Earth (PE) |
| <b>Switching Frequency</b> | 130/135/450 kHz****  |
| <b>Dimensions [mm]</b>     | 164 x 40 x 111   |
| <b>Weight</b>              | approx. 770 g  |
| <b>MTBF</b>                | TBD  |

## ENVIRONMENTAL

|                                 |                        |
|---------------------------------|------------------------|
| <b>Operating Ambient Temp.</b>  | -40°C to +85°C*        |
| <b>Storage Temperature</b>      | -40°C to +85°C         |
| <b>Vibration / Shock / Bump</b> | EN 61373:1999, Cat. 1B |

## EMC

|                            |   |
|----------------------------|---|
| <b>EMC Standard</b>        | EN 50121-3-2:2006   |
| <b>Conducted Emissions</b> | EN 55011:2007+A2:2007, Class A**  |
| <b>ESD Immunity</b>        | EN 61000-4-2:2009 level 3 (6kV/8kV), Criteria A   |
| <b>Burst</b>               | EN 61000-4-4:2004, level 3 (2kV), Criteria A  |
| <b>Surge</b>               | EN 50121-3-2:2006, line to line $\pm 1$ kV, 42R, and line to case $\pm 2$ kV, 42R, Criteria B |
| <b>Conducted Immunity</b>  | EN 61000-4-6:2007+A1:2001, level 3 (10V), Criteria A  |

\* Derating > +70°C: TBD %/°C

\*\* With mounted front plate. In built-in condition the devices may show different EMC properties.

\*\*\* Value could be higher, depending on the voltage drop of the connector.

\*\*\*\* Booster / Converter / Step-down

# TECHNICAL DATA

For  $T_{amb} = 25^{\circ}C, V_{in nom}, I_{out nom}$ , unless otherwise specified

## SPECIFICATION Input 14,4 - 154 VDC

| TYPE  |                             | HEBC60-2DW      |   |           |                          |            |          |
|---|-----------------------------|-----------------|---|-----------|--------------------------|------------|----------|
| ORDER NUMBER  |                             | 87 51 65 0112 7 |   |           |                          |            |          |
| CHARACTERISTIC  |                             | Unit            |   |           |                          |            |          |
| INPUT   | Input Voltage Nominal       | V               | 24  | 36        | 48                       | 72         | 110      |
|   | Input Voltage Range         | V               | 14,4...36                                 | 21,6...51 | 28,8...67,2              | 43,2...101 | 66...154 |
|   | Under Voltage Turn-on       | V               | <16,8                                     |           |                          |            |          |
|   | Under Voltage Turn-off      | V               | <14,4 (14,4V < Vin < 16,8V at t > 1 sec.) |           |                          |            |          |
|   | Input Current @ Full Load   | A               | 2,8                                       | 2         | 1,4                      | 0,9        | 0,6      |
|   | Input Current @ No Load     | A               | 0,17                                      | 0,11      | 0,09                     | 0,06       | 0,04     |
|   | Input Current disabled mode | mA              | 11  | 8         | 7                        | 6          | 5        |
|   | OUTPUT                      |                 |   | Output 1  |                          | Output 2   |          |
| Output Voltage Nominal  |                             | V               | 5,1                                       |           | 12                       |            |          |
| Output Current  |                             | A               | 0...6                                     |           | 0...4,5*                 |            |          |
| Output Power  |                             | W               | 30  |           | 55*                      |            |          |
| Efficiency @ Full Load** (typical)                                  |                             | %               | 84  | 86        | 86                       | 87         | 89       |
| Output Current limit  |                             | A               | 7,5-9,5                                   |           | 2,2...6,0*               |            |          |
| Short Circuit Current (typical)                                     |                             | A               | 13 (pulse approx. 13 Hz)***               |           | 13 (pulse approx. 10 Hz) |            |          |
| Transient Response<br>25 % / 75 % Load Step<br>Recovery Time < 1 ms |                             | mV              | ±60                                       |           | ±30                      |            |          |

\* Power Distribution with  $V_{out1}$

\*\*  $I_{out1} = 6 A, I_{out2} = 2 A$

\*\*\* Peak current pulsating

# TECHNICAL DATA

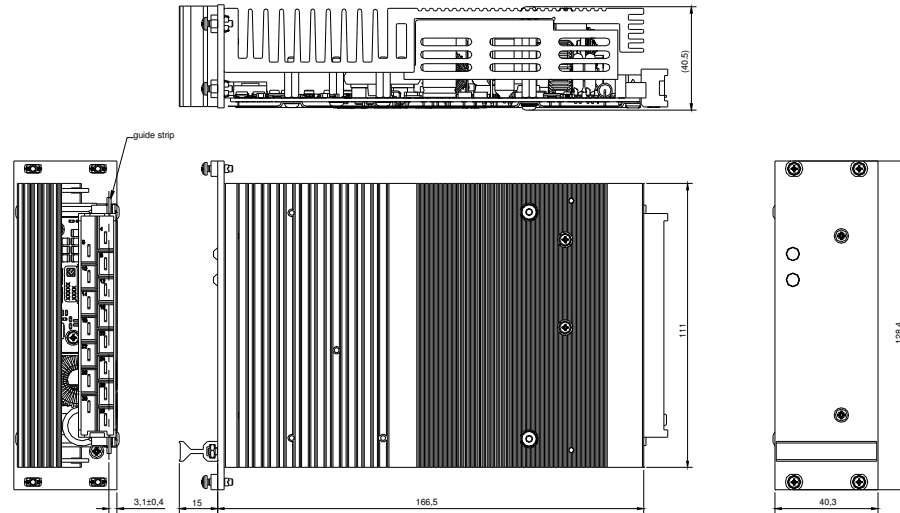
For  $T_{amb} = 25^{\circ}\text{C}$ ,  $V_{in\ nom}$ ,  $I_{out\ nom}$ , unless otherwise specified

## MECHANICAL DETAILS

1. Dimensions in mm

Coating: Lackwerke Peters ELPEGUARD SL 1307-FLZ/342

2. Unless otherwise specified, general tolerances  $\pm 0,5$  are for values in brackets (XX). Values not in brackets are according to ISO-2768-1m



## PINNING

| Pin | Function              |
|-----|-----------------------|
| 4   | GND                   |
| 6   | + $V_{out1}$ (+5, 1V) |
| 8   | +Power Good (PG)      |
| 10  | -Power Good (PG)      |
| 12  | + $V_{out2}$ (+12V)   |
| 14  | GND                   |
| 16  | +Thermal Warning      |
| 18  | -Thermal Warning      |
| 20  | +Input Power Fail     |
| 22  | -Input Power Fail     |
| 24  | Enable Primary (EN)   |
| 26  | n.c.                  |
| 28  | + $V_{in}$            |
| 30  | - $V_{in}$            |
| 32  | Case (PE)             |

## NOTES

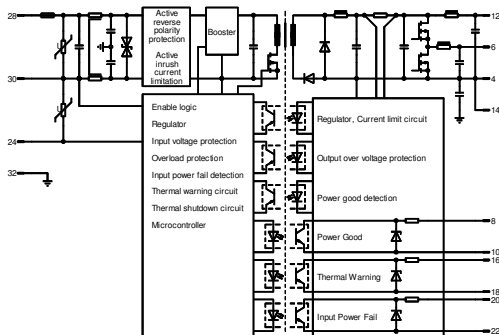
Installation instructions:

The converters have to be installed according to the guidelines currently in force, like other open electronic component assemblies. Attention must be paid to sufficient ventilation, carry off heat, fastening and protection against accidental contact. Plug in not under voltage if converter connected parallel or in series. A front plate must be mounted on the converter.

Fault protection:

The converters are equipped with a soldered-in-time-lag fuse corresponding to IEC 60127-2 for input protection. In case at fault the supplying current source must be capable to blow the fuse.

## BLOCK DIAGRAM



## DESCRIPTION OF FEATURES

For  $T_{amb} = 25^{\circ}\text{C}$ ,  $V_{in\ nom}$ ,  $I_{out\ nom}$ , unless otherwise specified

### ENABLE SIGNAL PRIMARY

If the Enable Signal is activated, the converter starts operating.

Enable Primary (Pin24) is activated by a voltage between 10 VDC and 160 VDC referenced to  $V_{in-}$  (Pin30).

Typically it is directly switched to  $V_{in+}$  to enable the converter. The pin sinks about 1,7 mA.

### INPUT POWER FAIL SIGNAL

The Input Power Fail is a potential-free Open-Collector Output realized by an optocoupler. Current < 5 mA, Voltage < 35 V, saturation voltage < 1,2 V.

The signal becomes active (LOW) when  $V_{in} < 16,8\text{ V}$ . The signal could be used, to inform the system about power loss and for a safe shutdown while the hold-up-time is running.

### THERMAL WARNING SIGNAL

The Thermal Warning is a potential-free Open-Collector Output realized by an optocoupler. Current < 5 mA, Voltage < 35 V, saturation voltage < 1,2 V.

The signal becomes active (LOW) when the temperature of the PCB rises above typ.  $80^{\circ}\text{C}$ , with a hysteresis of about  $5^{\circ}\text{C}$ .

### POWER GOOD SIGNAL

The Power Good is a potential free Open-Collector Output realized by an optocoupler. Current < 5 mA, Voltage < 35 V, saturation voltage < 1,2 V.

The signal becomes active when the output voltages are above 95 % of  $V_{out\ nom}$ .

### OVER CURRENT PROTECTION

The output power of the converter is limited to about 55 W. The power is distributed to the both output voltages, 12 V and 5,1 V.

The main output is 12 V and can carry up to 4,5 A continuously. At overload and current limit, the voltage decreases down to 8,5 V, then the converter switches-off and tries to restart after 100 ms. Out of the 12 V, the 5,1 V Output is made. It has a nominal current of 6 A and current limit 8A. If 12 V switches-off, 5,1 V goes down, too.

### LED Power Good (yellow):

The LED indicates that  $V_{out1}$  and  $V_{out2}$  are higher then 95% of nom. voltage (on: > 97%, off: < 95%).

### LED Error (red):

The LED indicates that Input Power failes, or Power Good is not present, or Thermal Warning is active. The LED blinks in case of Overtemperature Shutdown.