

## DC-DC CONVERTER HEBC60

RAILWAY CONVERTER.

### STANDARD EURO-RACK SIZE 19"



### HIGHLIGHTS

- + Output Power up to 60 Watts\*
- + Ultra Wide Input Range
- + Wide Temperature Range
- + Hold-up-time > 10ms
- + RoHS compliance
- + According to EN50155

### INPUT

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

### OUTPUT

Output Voltage	5,1 V / 12 V and 24 V
Initial Set Accuracy	< 1 % (no load)
Minimum Load	No minimum load
Short circuit	Continuous short circuit proof
Line Regulation	< 0,5 %
Load Regulation	< 1 % (0% - 100% load)***
Ripple & Noise	< 1 % pk-pk, 20 MHz bandwidth (+25°C)
Start Time	< 260 ms
Max. Output Capacitance	500 $\mu$ F x $I_{out, nom}$
Temperature Coefficient	< 0.01 %/°C

### FEATURES

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

\* Derating from 70 to 85°C 1,65 W/K

\*\* 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

### PROTECTION

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

### GENERAL

Product Standard	EN 50155:2007
Isolation	2200 VDC Input to Output 1500 VDC Input to Earth (PE) 710 VDC Output to Earth (PE)
Switching Frequency	130/135/450 kHz****
Dimensions [mm]	164 x 40 x 111
Weight	approx. 770 g
MTBF	1.800.000 h acc. to MIL-HDBK-217F (GB, 25°C) 140.000 h acc. to MIL-HDBK-217F (GM, 40°C)
Fire & Smoke	UNI CEI 11170-3 Ed.2005 + FA 2007, LRA NF F 16-101:1988, F1

### ENVIRONMENTAL

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

### EMC & SAFETY

EMC Standard	EN 50121-3-2:2006
Conducted Emissions	EN 55011:2007+A2:2007, Class A**
ESD Immunity	EN 61000-4-2:2009 level 3 (6kV/8kV), Criteria A
Burst	EN 61000-4-4:2004, level 3 (2kV), Criteria A
Surge	EN 50121-3-2:2006, line to line $\pm$ 1kV, 42R, and line to case $\pm$ 2kV, 42R, Criteria B
Conducted Immunity	EN 61000-4-6:2007+A1:2001, level 3 (10V), Criteria A
Safety	EN 60950-1:2006+A11:2009+A1:2010+A12:2012

# TECHNICAL DATA

For  $T_{amb} = 25^{\circ}\text{C}$ ,  $V_{in\ nom}$ ,  $I_{out\ nom}$ , 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 25 % / 75 % Load Step Recovery Time < 1 ms	mV	±60			±30	

## SPECIFICATION Input 14,4 - 154 VDC

TYPE		HEBC60-W					
ORDER NUMBER		87 41 24 0112 3					
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	3,0	2,0	1,5	1,0	0,65
	Input Current @ No Load	A	0,15	0,10	0,07	0,05	0,03
	Input Current disabled mode	mA	11	8	7	6	5
OUTPUT	Output Voltage Nominal	V	24				
	Output Current Nominal	A	2,5				
	Output Power	W	60				
	Efficiency @ Full Load (typical)	%	85	86	87	88	90
	Output Current limit	A	3,0...4,0				
	Short Circuit Current (typical)	A	14 (pulse approx. 3Hz)***				
	Transient Response 25 % / 75 % Load Step Recovery Time < 1 ms	mV	±120				

\* Power Distribution with  $V_{out1}$

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

\*\*\* Peak current pulsating

# TECHNICAL DATA

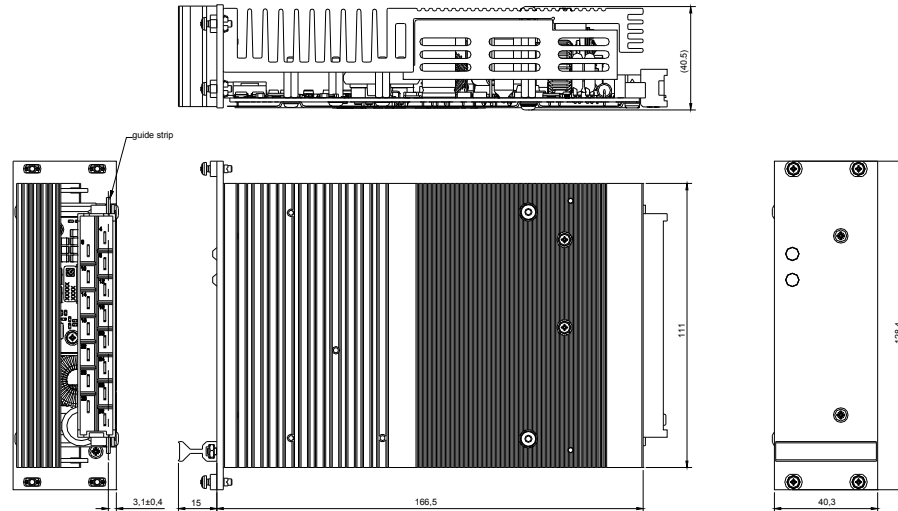
For  $T_{amb} = 25^{\circ}\text{C}$ ,  $V_{in\ nom}$ ,  $I_{out\ nom}$ , unless otherwise specified

## MECHANICAL DETAILS

1. Dimensions in mm

Coating: Lackwerke Peters ELPEGUARD SL 1307-FLZ/2

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	+ $V_{out1}$ (at HEBC60-W + $V_{out1}$ )
8	+Power Good (PG)
10	-Power Good (PG)
12	+ $V_{out2}$ (at HEBC60-W internal connected)
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

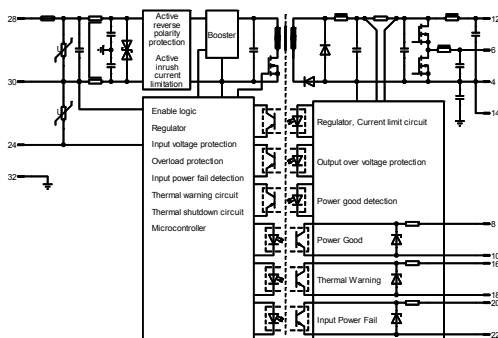
Installation instructions:

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

HEBC60-2DW:

The output power of the converter is limited to about 55 W. The power is distributed to 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 8 A. If 12 V switches-off 5.1 V goes down, too.

HEBC60-W:

The output power of the converter is limited to about 70 W. At overload and current limit the voltage decreases down to 17 V, then the converter switches-off and tries to restart after 330 ms.

## 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 fails, or Power Good is not present, or Thermal Warning is active. The LED blinks in case of Overtemperature Shutdown.