

DC-DC CONVERTER HFBC30-W/HFBC50-W

RAILWAY CONVERTER

FOR CHASSIS MOUNTING



HIGHLIGHTS

- + Output Power up to 50 Watts*
- + Efficiency up to 91 %
- + Wide Temperature Range
- + Ultra Wide Input Range
- + Hold-up-time >10 ms
- + RoHS compliance
- + According to EN 50155

INPUT

Input Voltage Nominal	24, 36, 48, 72, 96 and 110 VDC
Input Voltage Operating	16,8 - 137,5 VDC
Input Voltage Range	14,4 - 154 VDC (t ≤1,0 s.) (Class C1)
No Load Input Current	See table page 2

OUTPUT

Output Voltage	12, 24 V, other voltages on request
Initial Set Accuracy	<2 %
Minimum Load	No minimum load
Short circuit	Continuous short circuit proof
Line Regulation	<0,5 %
Load Regulation	<2 % (0 % - 100 % load)
Ripple & Noise	<1 % pk-pk, 20 MHz bandwidth
Start Time	<500 ms
Max. Output Capacitance	500 uF x I _{out nom}
Temperature Coefficient	<0.01 %/°C

FEATURES

Active Reverse Polarity Protection	Max.160 V
Active Inrush Current Limitation	Max. 6 A (for ≥0,2ms) <1 A ² s
Hold-up-time	>10 ms at full load (Class S2)
Parallel operation	A version with parallel operation is available on request
Redundancy operation	A version with built-in ideal diode is available on request

PROTECTION

Over Voltage Protection (OVP)	110-130 % V _{out nom} . The output switches-off and restarts automatically.
Over Current Protection (OCP)	I _{out nom} >105 %. The output switches-off when V _{out nom} <90 % and restarts automatically latest after 500 ms of elimination of the overload.
Over Temperature Protection (OTP)	Shutdown at +100-105 °C PCB-temp with about 5 °C hysteresis and auto recovery.

* Baseplate must not exceed +90 °C

** In built-in condition the devices may show different EMC properties.

GENERAL

Product Standard	EN 50155:2021
Isolation	2200 VDC Input to Output 1500 VDC Input to Earth (PE) 750 VDC Output to Earth (PE)
Pollution Degree	PD2 according to EN 50124-1:2017
Protective Coating	Class PC2
Switching Frequency	Typ. 80 / 110 kHz
Dimensions [mm]	HFBC30-W/O: 90,5 x 54 x 27,5 HFBC50-W/O: 90,5 x 54 x 30,0
Weight	HFBC30-W/O: 103 g HFBC50-W/O: 120 g
MTBF	TBD / Class L4 (20 years)
Fire & Smoke	EN 45545:2020 HL3 / R25

ENVIRONMENTAL

Operating Ambient Temp.	-40 °C to +85 °C* (Class OT6)
Operating PCB Temp.	-40 °C to +100 °C
Storage Temperature	-40 °C to +85 °C
Rapid Temperature Variation	Class H1
Altitude	up to 5000 m
Vibration / Shock / Bump	EN 61373:2010, Cat. 1B

EMC

EMC Standard	EN 50121-3-2:2016
Emissions	EN 55011:2016+A1:2017+A11:2020, +A2:2021 Class A** and meets specification EMV06 rangierfunk 02**
Burst	EN 61000-4-4:2012, level 3 (2 kV), Crit. A
Surge	EN 50121-3-2:2016, line to line ±1kV, 42R, and line to case ±2 kV, 42 R, Criteria A EN 61000-4-5:2019-03, line to line ± 0,5 kV and line to PE ± 1,0 kV, Criteria A
Conducted Immunity	EN 61000-4-6:2014, level 3 (10 V), Crit. A
Radiated Immunity	EN 61000-4-3:2020, 20 V/m, Criteria A
Safety	Designed to meet IEC 62368-1:2018 and EN 50124-1:2017

TECHNICAL DATA

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

SPECIFICATION Input 14,4 - 154 VDC

TYPE		HFBC30-W/O						
ORDER NUMBER		87 63 12 0142 7						
CHARACTERISTIC		Unit						
INPUT	Input Voltage Nominal	V	24	36	48	72	96	110
	Input Voltage Range	V	14,4...36	21,6...51	28,8...67,2	43,2...101	57,6...134,4	66...154
	Under Voltage Turn-on	V	14...16					
	Under Voltage Turn-off	V	12...13,8					
	Input Current @ Full Load	A	1,48	0,98	0,73	0,48	0,36	0,31
	Input Current @ No Load	A	0,049	0,033	0,025	0,015	0,010	0,010
	Internal Fuse	A	3,15 T					
	OUTPUT	V	Output					
Output Voltage Nominal	V	12						
Output Current Nominal	A	2,5						
Output Power	W	30						
Efficiency @ 20 W Load (typical)	%	84	84	85	86	87	87	
Efficiency @ 30 W Load (typical)	%	84	85	86	87	88	88	
Output Current limit	A	2,7...4,1						
Short Circuit Current (typical)	A	8...14 (pulse approx. 2 Hz)*						
Transient Response 25 % / 75 % Load Step Recovery Time <1 ms	mV	±240						

SPECIFICATION Input 14,4 - 154 VDC

TYPE		HFBC50-W/O						
ORDER NUMBER		87 66 12 0142 4						
CHARACTERISTIC		Unit						
INPUT	Input Voltage Nominal	V	24	36	48	72	96	110
	Input Voltage Range	V	14,4...36	21,6...51	28,8...67,2	43,2...101	57,6...134,4	66...154
	Under Voltage Turn-on	V	14...16					
	Under Voltage Turn-off	V	12...13,8					
	Input Current @ Full Load	A	2,45	1,61	1,2	0,79	0,59	0,51
	Input Current @ No Load	A	0,045	0,031	0,023	0,015	0,010	0,010
	Internal Fuse	A	5 T					
	OUTPUT	V	Output					
Output Voltage Nominal	V	12						
Output Current Nominal	A	4,2						
Output Power	W	50,4						
Efficiency @ 30 W Load (typical)	%	85	86	86	87	88	89	
Efficiency @ 50 W Load (typical)	%	86	87	87	88	89	90	
Output Current limit	A	4,6...6,0						
Short Circuit Current (typical)	A	8...14 (pulse approx. 2 Hz)*						
Transient Response 25 % / 75 % Load Step Recovery Time <1 ms	mV	±240						

* Pulsating current time duration 5 ms

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		HFBC30-W/O						
ORDER NUMBER		87 63 24 0142 3						
CHARACTERISTIC		Unit						
INPUT	Input Voltage Nominal	V	24	36	48	72	96	110
	Input Voltage Range	V	14,4...36	21,6...51	28,8...67,2	43,2...101	57,6...134,4	66...154
	Under Voltage Turn-on	V	14...16					
	Under Voltage Turn-off	V	12...13,8					
	Input Current @ Full Load	A	1,47	0,97	0,73	0,48	0,35	0,30
	Input Current @ No Load	A	0,047	0,032	0,024	0,015	0,010	0,010
	Internal Fuse	A	3,15 T					
		V	Output					
OUTPUT	Output Voltage Nominal	V	24					
	Output Current Nominal	A	1,25					
	Output Power	W	30					
	Efficiency @ 20 W Load (typical)	%	84	85	85	86	87	88
	Efficiency @ 30 W Load (typical)	%	86	86	87	88	89	90
	Output Current limit	A	1,4...2,4					
	Short Circuit Current (typical)	A	6...14 (pulse approx. 2 Hz)*					
	Transient Response 25 % / 75 % Load Step Recovery Time <1 ms	mV	±240					

SPECIFICATION Input 14,4 - 154 VDC

TYPE		HFBC50-W/O						
ORDER NUMBER		87 66 24 0142 9						
CHARACTERISTIC		Unit						
INPUT	Input Voltage Nominal	V	24	36	48	72	96	110
	Input Voltage Range	V	14,4...36	21,6...51	28,8...67,2	43,2...101	57,6...134,4	66...154
	Under Voltage Turn-on	V	14...16					
	Under Voltage Turn-off	V	12...13,8					
	Input Current @ Full Load	A	2,42	1,59	1,18	0,78	0,58	0,50
	Input Current @ No Load	A	0,047	0,032	0,024	0,015	0,010	0,010
	Internal Fuse	A	5 T					
		V	Output					
OUTPUT	Output Voltage Nominal	V	24					
	Output Current Nominal	A	2,1					
	Output Power	W	50,4					
	Efficiency @ 20 W Load (typical)	%	86	87	88	88	89	90
	Efficiency @ 30 W Load (typical)	%	87	88	89	90	90	91
	Output Current limit	A	2,4...3,7					
	Short Circuit Current (typical)	A	6...14 (pulse approx. 2 Hz)*					
	Transient Response 25 % / 75 % Load Step Recovery Time <1 ms	mV	±240					

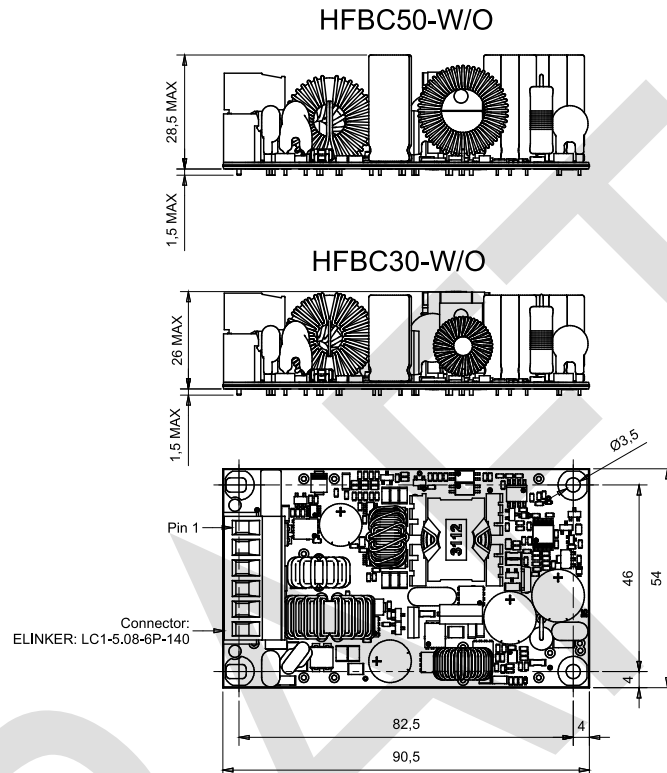
* Pulsating current time duration 5 ms

TECHNICAL DATA

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

MECHANICAL DETAILS

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



Coating: Lackwerke Peters ELPEGUARD SL 1307-FLZ/2

Protection Degree: HFBCx0-W/O - IP00

Production acc. to IPC-A-610 (exception bonding, coating may show differences to requirements)

PINNING

Pin		Function
X10-1	-V _{out}	Negative Output Voltage
X10-2	+V _{out}	Positive Output Voltage
X10-3	TR	Tracking
X10-4	+V _{in}	Positive input Voltage
X10-5	-V _{in}	Negative Input Voltage
X10-6	PE	Potential of the earth

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. Additional thermal conductive pad might be necessary to get a thermal coupling to the mounting-surface. The mounting surface must be flat and able to remove the thermal energy of the PCB (PCB temperature must not exceed $+100^{\circ}\text{C}$). The connection to earth/chassis ground has to be done by the 4 outer mounting holes and the pin 6 PE (∇ / \oplus).

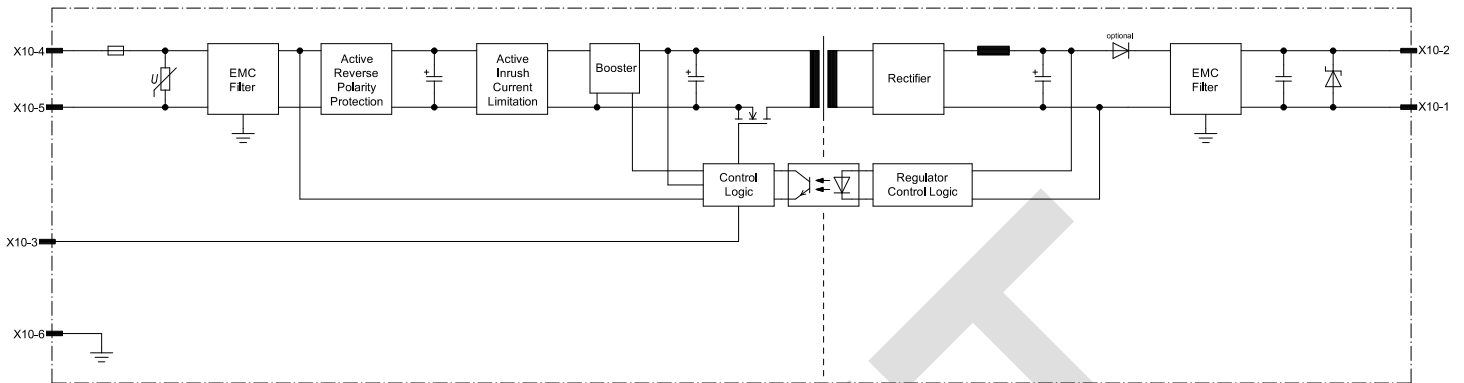
Fault protection: The converters are equipped with a soldered-in time-lag fuse corresponding to IEC 60127-2 for input protection. In case at fault the supplying current source must be capable to blow the fuse.

Caution for HFBCx0-W/O:

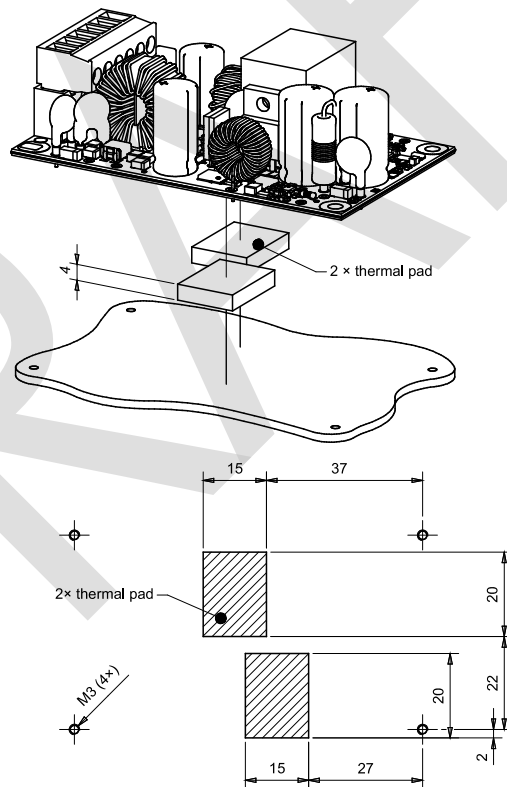
1. No protection against touching, dangerous voltage
2. After power off, wait 10 s before disconnecting or touching

APPLICATION NOTES

BLOCK DIAGRAM



THERMAL PADS

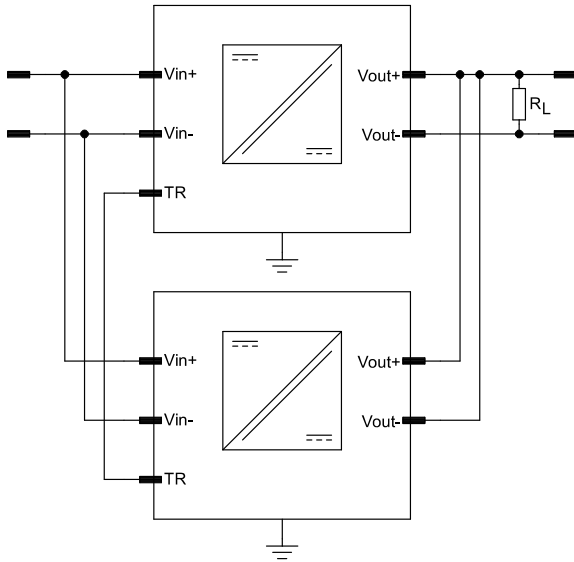


Recommendation: Soft gap-pads with a thermal conductivity of $>2,5$ W/mK, example: HALA TGF-MSS4000-Si or similar

DESCRIPTION OF FEATURES

PARALLEL OPERATION

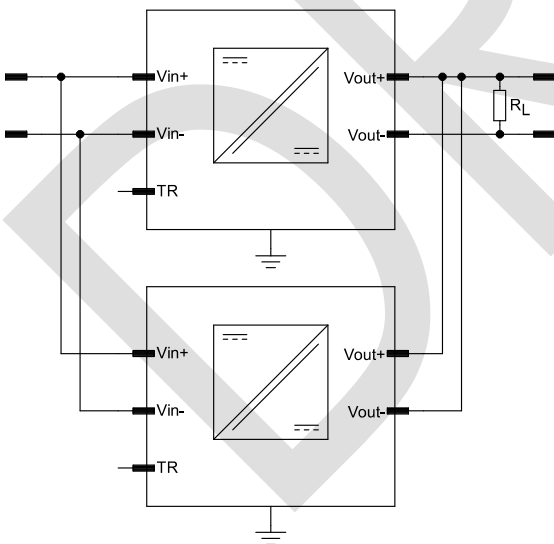
Module of the same output voltage can be connected in parallel operation.



Connection signal TR should be as short as possible (max. 20 cm).
When not use parallel operation, leave Tracking pin not-connected.
A version with parallel operation is available on request.

REDUNDANT OPERATION

Module of the same output voltage can be connected in redundant operation.



By redundant operation Signal TR must be not connected.
A version with redundant operation is available on request.

CHANGE HISTORY

Revision	Date	Author	Modification
a00	2025-09-02	Ehrhardt	First revision

DRAFT