



## DC-DC CONVERTER HEC 120-5W

RAILWAY CONVERTER FOR COMPACT PCI®.

### STANDARD EURO-RACK SIZE 19"



### HIGHLIGHTS

- + Output Power up to 120 Watts
- + Efficiency up to 91 %
- + High power density
- + Ultra Wide Input Range
- + Wide Temperature Range
- + Hold-up-time > 10ms
- + Redundant Operation
- + RoHS compliance
- + According to EN50155

### 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 sec.)
Standby Input Power	Max. 3 W

### OUTPUT

Output Voltage	5 V / 3,3 V / 12 V / -12 V / 5 V stby**
Initial Set Accuracy	±0,5% (V <sub>out 1r 2r 3r</sub> ), ±2% (V <sub>out 4r 5r</sub> ) no load
Minimum Load	No minimum load
Short Circuit	Continuous short circuit proof
Line Regulation	< 0,5 %
Load Regulation	< 1 % (V <sub>out 1r 3r</sub> ), < 3 % (V <sub>out 2r 4r 5r</sub> )**** (0% - 100% load)
Ripple & Noise	Output 1, 2, 3: <2% pk-pk, 20 MHz bandwidth. Output 4, 5: <4% pk-pk, 20 MHz bandwidth
Start Time	< 900ms
Max. Output Capacitance	10.000 µF (V <sub>out 1r 2r 3r</sub> ), 500 µF/A (V <sub>out 4r 5r</sub> )
Temperature Coefficient	< 0.01 %/°C (V <sub>out 1r 2r 3r</sub> ), 0.03%/°C (V <sub>out 4r 5r</sub> )

### FEATURES

Active Reverse Polarity Protection	Max. 160 V
Active Inrush Current Limitation	Max.15 A (at t > 100µs) 0,4 A²sec
Input Voltage Detection	See page 4
Hold-Up-Time	> 10 ms at full load
Green LED	See page 4
Enable Signal Secondary	See page 4
Inhibit Signal Secondary	OFF: INH connected to GND
Supply Fail Signal	Open-collector output
Derating Signal	Open-collector output
Sense +/-	See page 4
Standby Voltage	5 V / 0,5 A (for 10sec, 0,3A continuous)
Redundant Operation	See page 4

\* Derating > +70°C continuously, +85°C max.10 min.

\*\*3,3 V adjusted to 3,4 V and 5 V adjusted to 5,1 V

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

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

\*\*\*\*\* Converter / Step-down V<sub>out 1r</sub>

### PROTECTION

Over Voltage Protection (OVP)	110...120% (V <sub>out 1r 2r 3r 4r</sub> )
Over Current Protection (OCP)	See table 2
Over Temperature Warning (OTW)	DEG = low at +105°C...110°C PCB-temp. with 5°C hysteresis and auto recovery.
Over Temperature Protection (OTP)	Shutdown at +110°C...115°C PCB-temp. with 5°C hysteresis and auto recovery.

### GENERAL

Product Standard	EN 50155:2007
Isolation	2200 VDC Input to Output 2200 VDC Input to Earth (PE) 710 VDC Output to Earth (PE)
Switching Frequency	Typ. 100 / 375 kHz*****
Dimensions [mm]	166,5 x 30,1 x 107, (6TE)
Weight	600g
MTBF	TBD
Fire & Smoke	TBD

### ENVIRONMENTAL

Operating Ambient Temp.	-40°C to +85°C (Class TX)*
Storage Temperature	-40°C to +85°C
Vibration / Shock / Bump	EN 61373:2010, Cat. 1B

### EMC

EMC Standard	EN 50121-3-2:2015
Emissions	EN 55011:2009+A1:2010, Class A***
ESD	EN 61000-4-2:2009, level 3 (6kV/8kV), Criteria A
Burst	EN 61000-4-4:2012, level 3 (2kV), Criteria A
Surge	EN 50121-3-2:2015, line to line ±1kV, 42R, and line to case ±2kV, 42R, Criteria A EN61000-4-5:2014, line to line ±0,5kV and line to PE ±1kV Criteria A
Conducted Immunity	EN 61000-4-6:2014, level 3 (10V), Criteria A
Radiated Immunity	EN 61000-4-3:2006+A1:2008+A2:2010, 20V/m, Criteria A
Safety	EN 62368-1



## TECHNICAL DATA

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

### SPECIFICATION Input 14,4 - 154 VDC

		HEC120-5W / HEC120-5W						
		System slot left			System slot right			
ORDER NUMBER		87 83 89 0122 6 / 87 84 89 0122 2						
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		<15,0...16,5 depends on position of S101 (see page 4)					
	Under Voltage Turn-off	V	<12,0...14 depends on position of S101 (see page 4)					
	Input Current @ 120W Load	A	5,75	3,83	2,87	1,92	1,44	1,25
	Input Current @ No Load	A	0,15	0,11	0,08	0,05	0,05	0,04
	Input Current disabled mode*	mA	0,05	0,03	0,025	0,02	0,02	0,02
	Internal Fuse	A	16 T					
OUTPUT			Output 1	Output 2	Output 3	Output 4	Output 5	
	Output Voltage Nominal	V	5,0**	3,3**	12	-12	5	
	Output Current Nominal	A	20	14	10	0,5	0,5***	
	Output Power	W	100	47	120	6	2,5	
	Output Power Max.	W	120****					
	Efficiency @ Full Load Out 1	%	86	87	86	86	86	
	Efficiency @ Full Load Out 3	%	90	91	91	91	90	
	Output Current limit	A	21 ... 27	14,5 ... 17	12 ... 14	0,55 ... 0,9	0,55 ... 0,9	
	Short Circuit Current (typical)	A	44A (pulse)	22A (pulse)	30A (pulse)	1,3A(continuous)	2A (continuous)	
	Transient Response 25 % / 75 % Load Step	mV	±100	±100	±200	±200	±100	

\* Enable signal open or Inhibit signal low

\*\*3,3 V adjusted to 3,4 V and 5 V adjusted to 5,1 V

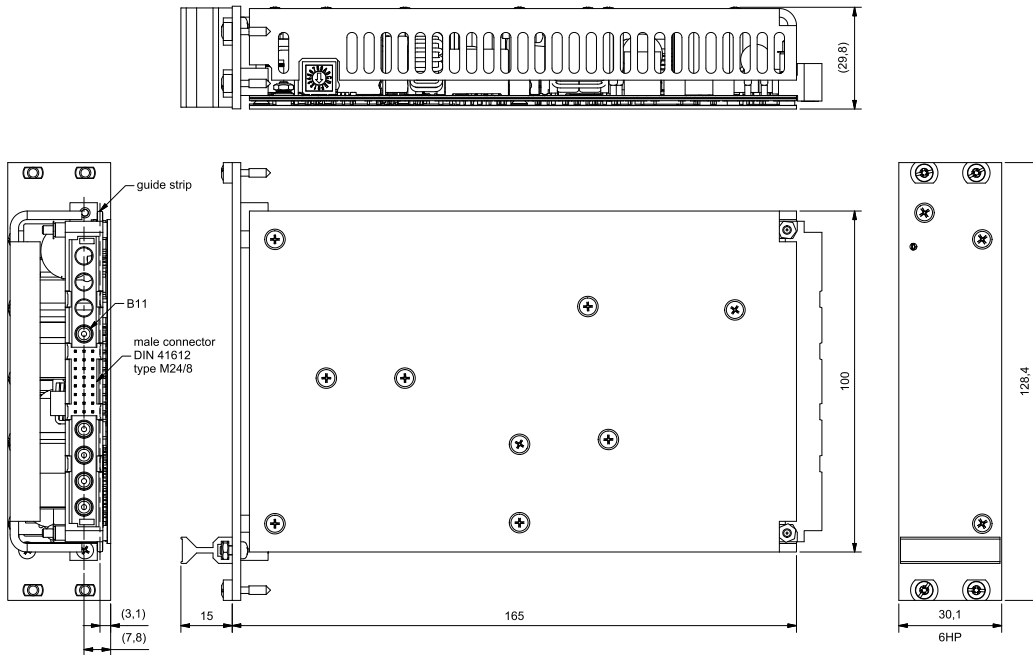
\*\*\* for <10sec, maximum continuous current is 0,3A

\*\*\*\* for output 3 only, for loading the outputs 1 or 2 with more than 20%, the maximum power is 100W

### MECHANICAL DETAILS

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

Coating: Lackwerke Peters ELPEGUARD SL 1307-FLZ/2



Production acc. to IPC-A-610 (exception bonding)



# TECHNICAL DATA

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

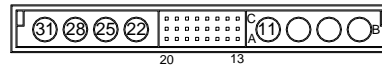
## PINNING

Pin	Function	Pin	Function		
A13	$V_{out5}$	+5 $V_{aux}$	B17	$V_{out2}$	+3,3V Output Voltage
A14	INH	Inhibit Signal	B18	$V_{out2}$	+3,3V Output Voltage
A15	NC	Not connected	B19	$V_{out3}$	+12V Output Voltage
A16	S return	Sense return	B20	$V_{out4}$	-12V Output Voltage
A17	S+5V	Sense $V_{out1}$	B22	$V_{out1}$	+5V Output Voltage
A18	S+3,3V	Sense $V_{out2}$	B25	GND	Ground
A19	$V_{out3}$	+12V Output Voltage	B28	$V_{in+}$	+Input Voltage
A20	$V_{out4}$	-12V Output Voltage	B31	$V_{in-}$	-Input Voltage
B2	NC	Not connected	C13	En	Enable Signal
B5	NC	Not connected	C14	DEG	Derate Signal
B8	NC	Not connected	C15	FAL	Supply Fail Signal
B11		Chassis Ground	C16	$V_{out2}$	+3,3V Output Voltage
B13	$V_{out2}$	+3,3V Output Voltage	C17	$V_{out2}$	+3,3V Output Voltage
B14	$V_{out2}$	+3,3V Output Voltage	C18	$V_{out2}$	+3,3V Output Voltage
B15	$V_{out2}$	+3,3V Output Voltage	C19	$V_{out3}$	+12V Output Voltage
B16	$V_{out2}$	+3,3V Output Voltage	C20	$V_{out4}$	-12V Output Voltage

## CONNECTION

Connector DIN M24/8

## TOP VIEW CONNECTOR



## NOTES

Installation instructions:

The converters have to be installed according to the guidelines currently in force, like other open electronic component assemblies. Plug in not under voltage. Attention must be paid to sufficient ventilation, carry off heat, fastening and protection against accidental contact.

The pin B11, Case/PE : (), has to be properly connected in order to assure operation.

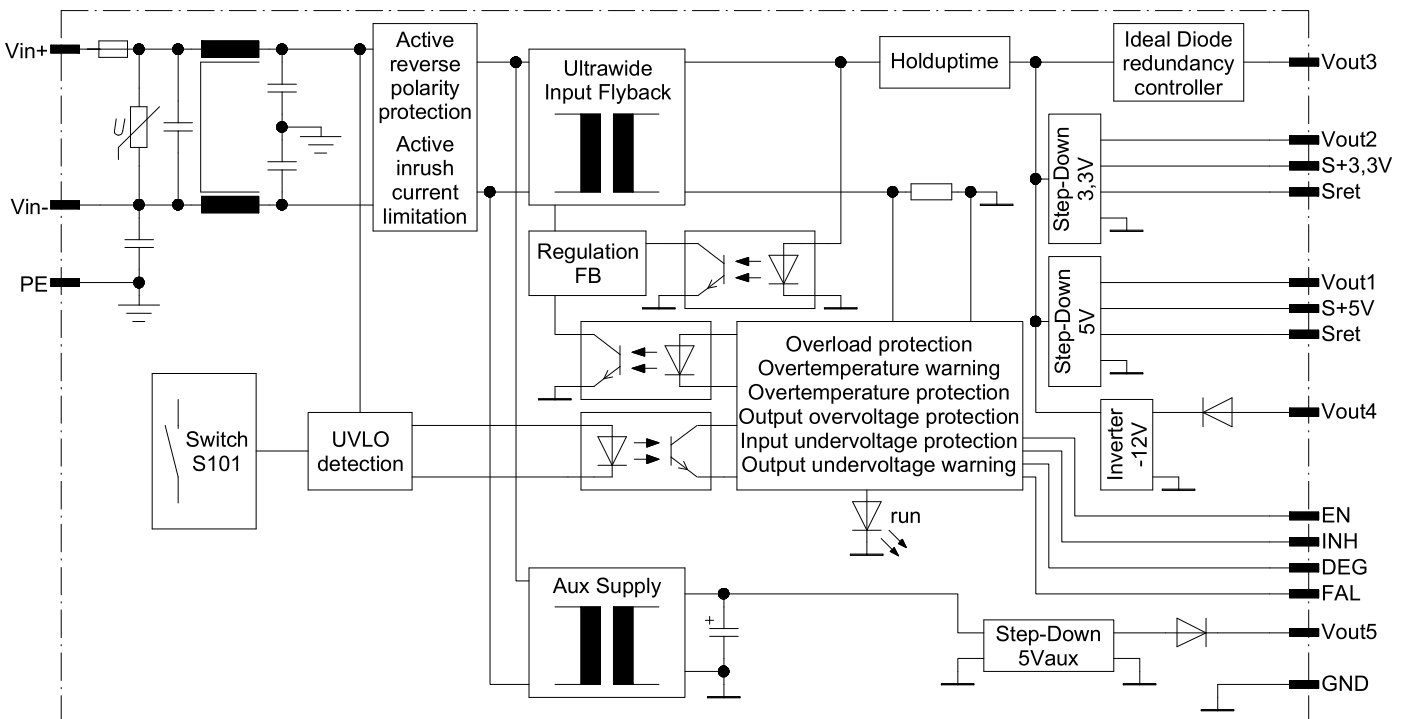
**Attention!** At  $P_{out\ max}$  (for time > 1 min) a warming up of the front plate up to 15°C over the ambient temperature is possible.

Fault protection:

The converters are equipped with a soldered-in time-lag fuse corresponding to IEC 60127-2 for input protection.

In case of fault the supplying current source must be capable to blow the fuse. In some applications 2 fuses would be necessary, one in each input line.

## BLOCK DIAGRAM





## DESCRIPTION OF FEATURES

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

### INPUT VOLTAGE DETECTION

With this rotating switch S101 the undervoltage levels can be set.

Switch position	0	1	2	3	4	5
$V_{in\ nominal}$ (V)	24	36	48	72	96	110
Under voltage turn-off (V)	12...14	20...21	25...28	40...42	52...56	60...64

At all other positions, the UVLO level is 12V...14V

### ENABLE SIGNAL / INHIBIT SIGNAL

Inputs	Reference to GND	Low-Level: 0V...0,8V	High-Level 8V...9V or open (Logic see table)		
INH		Low	Low	High	High
EN		Low	High	Low	High
Power Status		"Off"	"Off"	"On"	"Off"

The pin sources about 170  $\mu\text{A}$  at low level.

### SUPPLY FAIL SIGNAL

The Supply Fail Signal is an open-collector output, emitter grounded (npn-Transistor). Active level: low.

Maximum current = 20 mA, maximum voltage = 9 V, saturation voltage < 0,5 V.

FAL switches Low, if one of the outputs 1-4 is out of tolerance of  $\pm 10\%$  or if  $V_{in}$  breaks down. If  $V_{in}$  breaks down, it remains 5 ms between the edge of the FAL-Signal and the break down of  $V_{out}$ .

### DERATE SIGNAL

The Derate Signal is an open-collector output, emitter grounded (npn-Transistor). Active level: low.

Maximum current = 20 mA, maximum voltage = 9 V, saturation voltage < 0,5 V.

### SENSE

Sense connection is not required. If it is accomplished, the voltage at the load is reduced by ca. 100 mV. This feature provides compensation of voltage drops (max. 0,2 V each line) at  $V_{out1}$  and  $V_{out2}$  between power supply and load. The pins Sense return, Sense +5 V and Sense +3,3 V must be connected with the load. The sense signal should not be longer than 0,4m.

### OVER CURRENT PROTECTION

If  $V_{out1}$  is shut down due to overload,  $V_{out2}$  will also be switched-off too.

### LED

Blinking LED indicates:

- $V_{in}$  is lower than adjusted under voltage turn-off value
- One of the output voltages 1-4 is not in specified range
- Converter is in standby mode

Lightning LED indicates:

- Converter is in normal operating mode

### REDUNDANT OPERATION

The outputs 3-5 are build for redundant operation with one other converter in parallel. The connected wires between the converters should be as short as possible. Output voltages 1 and 2 are not prepared for redundant operation.