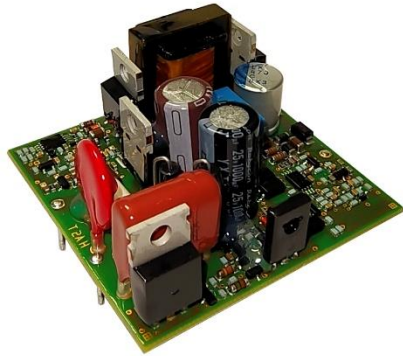


DC-DC CONVERTER HPC10-W/O

RAILWAY CONVERTER.

FOR PCB MOUNTING



HIGHLIGHTS

- + Output Power up to 10 Watts*
- + Efficiency up to 85 %
- + Ultra Wide Input Range
- + Wide Temperature Range
- + Hold-up-time > 10 ms
- + RoHS compliance
- + According to EN50155
- + Pins compatible to Quarter Brick

INPUT

| | |
|--------------------------------|------------------------------------|
| Input Voltage Nominal | 12, 24, 36, 48, 72, 96 and 110 VDC |
| Input Voltage Operating | 9-137,5 VDC |
| Input Voltage Range | 9-154 VDC (Class 1C) |
| No Load Input Current | See table page 2, 3, 4 |
| Internal Fusing | 2,0 AT*** |

OUTPUT

| | |
|--------------------------------|--|
| Output Voltage | 5, 12, 15, 24 V (other outputs on request) |
| Initial Set Accuracy | <2 % |
| 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 |
| Start Time | <400 ms (@ Vin 12 V) <100 ms (@ Vin 24 V - 110 V) |
| Max. Output Capacitance | 500 uF/A |
| Temperature Coefficient | <0.01 %/°C |

FEATURES

| | |
|---|---|
| Active Reverse Polarity Protection | Max.160 V |
| Inrush Current | <1,5 A ² s |
| Hold-up-time | >10 ms at full load (Class S2 @ Vin 24 V-110 V) |

PROTECTION

| | |
|--|---|
| Over Voltage Protection (OVP) | 110-125 % V _{out nom.} |
| 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 +107 – 112 °C PCB-temp. with about 10 °C hysteresis and auto recovery. |

GENERAL

| | |
|---------------------------------|----------------------------------|
| Product Standard | EN 50155:2017 |
| Isolation | 2200 VDC Input to Output |
| Pollution Degree | PD2 according to EN 50124-1:2017 |
| Switching Frequency | Typ. 125 kHz |
| Dimensions [mm] | 55,2 X 54 X 25 |
| Weight | 50 g |
| MTBF / Useful Life Class | TBD / Class L4 (20 years) |
| Fire & Smoke | EN 45545-2:2016-02 HL3 (R25) |

ENVIRONMENTAL

| | |
|------------------------------------|---|
| Operating Ambient Temp. | -40 °C to +70 °C* (Class OT4) and Class ST1, ST2: +15 °C (@ Vin 24 V - 110 V) |
| Storage Temperature | -40 °C to +85 °C |
| Rapid Temperature Variation | Class H1 |
| Altitude | up to 2000 m |
| Vibration / Shock / Bump | EN 61373:2010, Cat. 1B |

EMC & SAFETY

| | |
|---------------------------|---|
| EMC Standard | EN 50121-3-2:2016 |
| Emissions | EN 55011: 2018, Class A** |
| Burst | EN 61000-4-4:2012, level 3 (2 kV), Criteria A |
| Surge | EN 50121-3-2:2016, line to line ±1kV, 42R, Criteria A EN 61000-4-5:2014, line to line ± 0,5 kV, Criteria A |
| Conducted Immunity | EN 61000-4-6:2014, level 3 (10 V), Criteria A |
| Radiated Immunity | EN 61000-4-3:2006+A1:2008+A2:2010, 20 V/m, Criteria A |
| Safety | Designed to meet IEC 62368-1:2014 +AC:2015 |

* Derating by Input Voltage 9 V...12 V see page 6

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

*** Except Version 87 61 12 0052 7

TECHNICAL DATA

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

SPECIFICATION Input 9 - 154 VDC

| TYPE | | HPC10-W/O | | | | | | | |
|----------------|---|------------------|-------------------------------|-----------|-----------|-------------|------------|--------------|----------|
| ORDER NUMBER | | 87 61 05 0042 9* | | | | | | | |
| CHARACTERISTIC | | Unit | | | | | | | |
| INPUT | Input Voltage Nominal | V | 12V | 24 | 36 | 48 | 72 | 96 | 110 |
| | Input Voltage Range | V | 9...20 | 14,4...36 | 21,6...51 | 28,8...67,2 | 43,2...101 | 57,6...134,4 | 66...154 |
| | Under Voltage Turn-on | | <9,0 | | | | | | |
| | Under Voltage Turn-off | V | <8,0 | | | | | | |
| | Input Current @ Full Load | A | 1,17 | 0,51 | 0,33 | 0,25 | 0,17 | 0,13 | 0,11 |
| | Input Current @ No Load | A | 0,025 | 0,015 | 0,015 | 0,01 | 0,01 | 0,01 | 0,01 |
| | Internal Fuse | A | 2,0 | | | | | | |
| | | | | Output | | | | | |
| OUTPUT | Output Voltage Nominal | V | 5 | | | | | | |
| | Output Current Nominal | A | 2 | | | | | | |
| | Output Power | W | 10 | | | | | | |
| | Efficiency @ 6W Load (typical) | % | 76 | 83 | 84 | 84 | 83 | 83 | 83 |
| | Efficiency @ 10W Load (typical) | % | 72 | 82 | 83 | 83 | 84 | 83 | 82 |
| | Output Current limit | A | 2,1...2,6 | | | | | | |
| | Short Circuit Current (typical) | A | 6...10 (pulse approx. 2 Hz)** | | | | | | |
| | Transient Response 25 % / 75 % Load Step Recovery Time < 1 ms | mV | ±200 | | | | | | |

SPECIFICATION Input 9 - 154 VDC

| TYPE | | HPC10-W/O | | | | | | | |
|----------------|---|-----------------|------------------------------|-----------|-----------|-------------|------------|--------------|----------|
| ORDER NUMBER | | 87 61 12 0042 4 | | | | | | | |
| CHARACTERISTIC | | Unit | | | | | | | |
| INPUT | Input Voltage Nominal | V | 12V | 24 | 36 | 48 | 72 | 96 | 110 |
| | Input Voltage Range | V | 9...20 | 14,4...36 | 21,6...51 | 28,8...67,2 | 43,2...101 | 57,6...134,4 | 66...154 |
| | Under Voltage Turn-on | | <9,0 | | | | | | |
| | Under Voltage Turn-off | V | <8,0 | | | | | | |
| | Input Current @ Full Load | A | 1,17 | 0,51 | 0,33 | 0,25 | 0,17 | 0,13 | 0,11 |
| | Input Current @ No Load | A | 0,025 | 0,015 | 0,015 | 0,01 | 0,01 | 0,01 | 0,01 |
| | Internal Fuse | A | 2,0 | | | | | | |
| | | | | Output | | | | | |
| OUTPUT | Output Voltage Nominal | V | 12 | | | | | | |
| | Output Current Nominal | A | 0,85 | | | | | | |
| | Output Power | W | 10,2 | | | | | | |
| | Efficiency @ 6W Load (typical) | % | 75 | 82 | 83 | 83 | 83 | 80 | 79 |
| | Efficiency @ 10W Load (typical) | % | 70 | 80 | 83 | 83 | 84 | 83 | 82 |
| | Output Current limit | A | 0,93...1,10 | | | | | | |
| | Short Circuit Current (typical) | A | 4...8 (pulse approx. 2 Hz)** | | | | | | |
| | Transient Response 25 % / 75 % Load Step Recovery Time < 1 ms | mV | ±200 | | | | | | |

* preliminary

** Pulsating current time duration 50 ms

TECHNICAL DATA

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

SPECIFICATION Input 9 - 154 VDC

| TYPE | | HPC10-W/O | | | | | | | |
|----------------|---|-----------------|-----------------------------|-----------|-----------|-------------|------------|--------------|----------|
| ORDER NUMBER | | 87 61 12 0052 7 | | | | | | | |
| CHARACTERISTIC | | Unit | | | | | | | |
| INPUT | Input Voltage Nominal | V | 12V | 24 | 36 | 48 | 72 | 96 | 110 |
| | Input Voltage Range | V | 9...20 | 14,4...36 | 21,6...51 | 28,8...67,2 | 43,2...101 | 57,6...134,4 | 66...154 |
| | Under Voltage Turn-on | | <9,0 | | | | | | |
| | Under Voltage Turn-off | V | <8,0 | | | | | | |
| | Input Current @ Full Load | A | 1,17 | 0,51 | 0,33 | 0,25 | 0,17 | 0,13 | 0,11 |
| | Input Current @ No Load | A | 0,025 | 0,015 | 0,015 | 0,01 | 0,01 | 0,01 | 0,01 |
| | Internal Fuse** | A | no Fuse | | | | | | |
| OUTPUT | | | Output | | | | | | |
| | Output Voltage Nominal | V | 12 | | | | | | |
| | Output Current Nominal | A | 0,85 | | | | | | |
| | Output Power | W | 10,2 | | | | | | |
| | Efficiency @ 6W Load (typical) | % | 75 | 82 | 83 | 83 | 83 | 80 | 79 |
| | Efficiency @ 10W Load (typical) | % | 70 | 80 | 83 | 83 | 84 | 83 | 82 |
| | Output Current limit | A | 0,93...1,10 | | | | | | |
| | Short Circuit Current (typical) | A | 4...8 (pulse approx. 2 Hz)* | | | | | | |
| | Transient Response 25 % / 75 % Load Step Recovery Time < 1 ms | mV | ±200 | | | | | | |

SPECIFICATION Input 9 - 154 VDC

| TYPE | | HPC10-W/O | | | | | | | |
|---|---------------------------------|-----------------|-----------------------------|-----------|-----------|-------------|------------|--------------|----------|
| ORDER NUMBER | | 87 61 15 0042 1 | | | | | | | |
| CHARACTERISTIC | | Unit | | | | | | | |
| INPUT | Input Voltage Nominal | V | 12V | 24 | 36 | 48 | 72 | 96 | 110 |
| | Input Voltage Range | V | 9...20 | 14,4...36 | 21,6...51 | 28,8...67,2 | 43,2...101 | 57,6...134,4 | 66...154 |
| | Under Voltage Turn-on | | <9,0 | | | | | | |
| | Under Voltage Turn-off | V | <8,0 | | | | | | |
| | Input Current @ Full Load | A | 1,17 | 0,51 | 0,33 | 0,25 | 0,17 | 0,13 | 0,11 |
| | Input Current @ No Load | A | 0,025 | 0,015 | 0,015 | 0,01 | 0,01 | 0,01 | 0,01 |
| | Internal Fuse | A | 2,0 | | | | | | |
| OUTPUT | | | Output | | | | | | |
| | Output Voltage Nominal | V | 15 | | | | | | |
| | Output Current Nominal | A | 0,67 | | | | | | |
| | Output Power | W | 10 | | | | | | |
| | Efficiency @ 6W Load (typical) | % | 76 | 83 | 84 | 84 | 83 | 80 | 79 |
| | Efficiency @ 10W Load (typical) | % | 72 | 83 | 85 | 85 | 85 | 83 | 82 |
| | Output Current limit | A | 0,73...0,85 | | | | | | |
| | Short Circuit Current (typical) | A | 4...8 (pulse approx. 2 Hz)* | | | | | | |
| Transient Response 25 % / 75 % Load Step Recovery Time < 1 ms | mV | ±200 | | | | | | | |

* Pulsating current time duration 50 ms

** external Fuse 2ATH necessary

TECHNICAL DATA

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

SPECIFICATION Input 9 - 154 VDC

| TYPE | | HPC10-W/O | | | | | | | |
|---|---------------------------------|------------------|------------------------------|-----------|-----------|-------------|------------|--------------|----------|
| ORDER NUMBER | | 87 61 24 0042 9* | | | | | | | |
| CHARACTERISTIC | | Unit | | | | | | | |
| INPUT | Input Voltage Nominal | V | 12V | 24 | 36 | 48 | 72 | 96 | 110 |
| | Input Voltage Range | V | 9...20 | 14,4...36 | 21,6...51 | 28,8...67,2 | 43,2...101 | 57,6...134,4 | 66...154 |
| | Under Voltage Turn-on | | <9,0 | | | | | | |
| | Under Voltage Turn-off | V | <8,0 | | | | | | |
| | Input Current @ Full Load | A | 1,17 | 0,51 | 0,33 | 0,25 | 0,17 | 0,13 | 0,11 |
| | Input Current @ No Load | A | 0,025 | 0,015 | 0,015 | 0,01 | 0,01 | 0,01 | 0,01 |
| | Internal Fuse | A | 2,0 | | | | | | |
| OUTPUT | | | Output | | | | | | |
| | Output Voltage Nominal | V | 24 | | | | | | |
| | Output Current Nominal | A | 0,42 | | | | | | |
| | Output Power | W | 10 | | | | | | |
| | Efficiency @ 6W Load (typical) | % | 76 | 83 | 84 | 84 | 83 | 83 | 83 |
| | Efficiency @ 10W Load (typical) | % | 72 | 82 | 83 | 83 | 84 | 83 | 82 |
| | Output Current limit | A | 0,46...0,55 | | | | | | |
| | Short Circuit Current (typical) | A | 4...8 (pulse approx. 2 Hz)** | | | | | | |
| Transient Response 25 % / 75 % Load Step Recovery Time < 1 ms | mV | ±200 | | | | | | | |

* preliminary

** Pulsating current time duration 50 ms

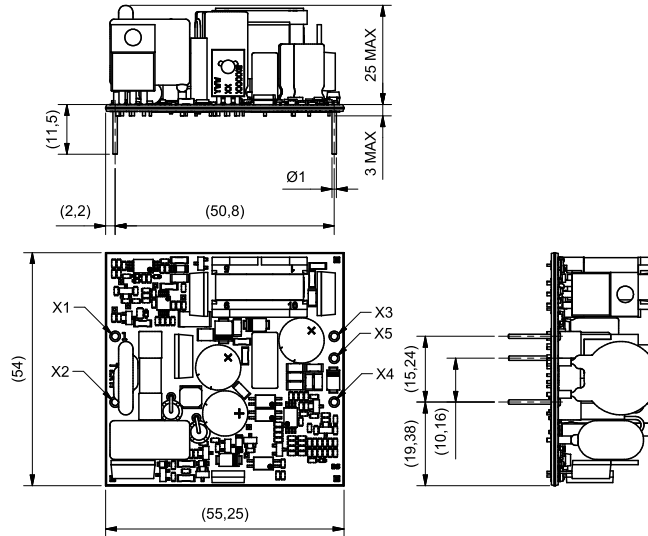
TECHNICAL DATA

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-2768-1m.

Coating Class PC2: Lackwerke Peters ELPEGUARD SL 1307-FLZ/2
Protection Degree: IP00



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

PINNING

| Pin | Function | |
|-----|----------|-------------------------|
| X1 | +Vin | Positive Input Voltage |
| X2 | -Vin | Negative Input Voltage |
| X3 | +Vout | Positive Output Voltage |
| X4 | -Vout | Negative Output Voltage |
| X5 | n.c. | Not connected |

NOTES

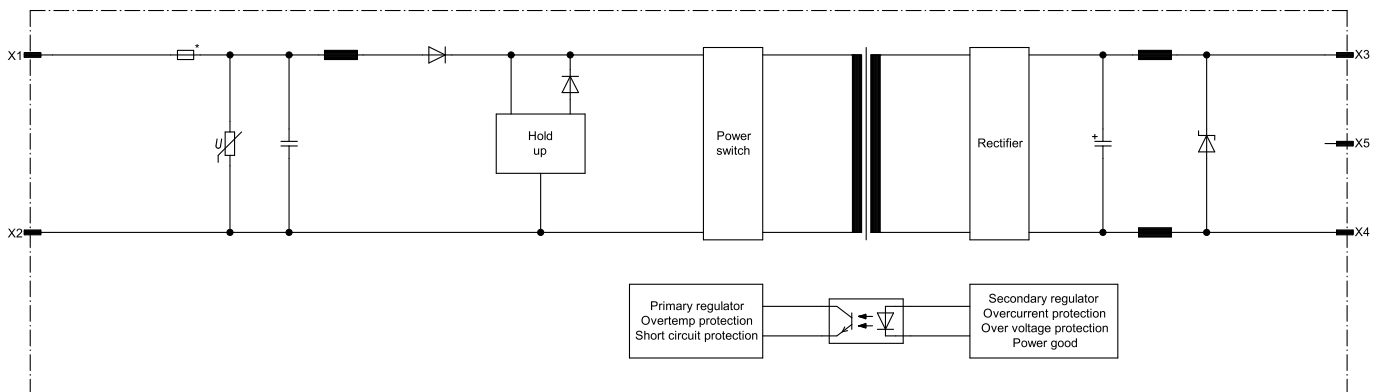
Installation instructions:

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. Fault protection: The converters are equipped with a soldered-in-time-lag fuse corresponding to IEC 60127-2 for input protection, except version 87 61 12 0052 7. In case at fault the supplying current source must be capable to blow the fuse.

Caution

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

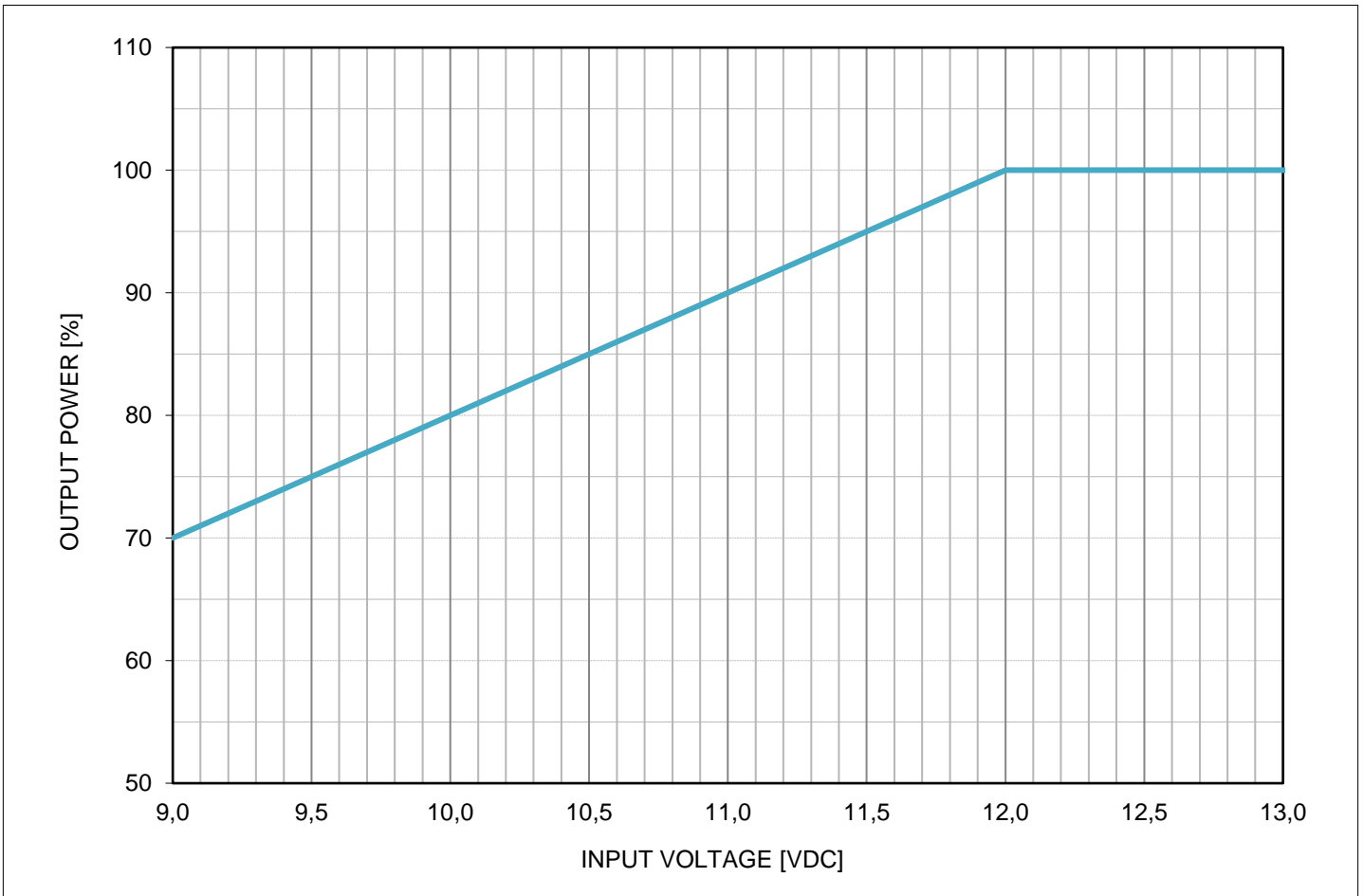
BLOCK DIAGRAM



* not for Version 87 61 12 0052 7

DESCRIPTION OF FEATURES

Output Power Derating



CHANGE HISTORY

| Revision | Date | Author | Modification |
|----------|------------|-------------|---------------|
| a00 | 2020-10-13 | A. Ehrhardt | First edition |
| | | | |
| | | | |