

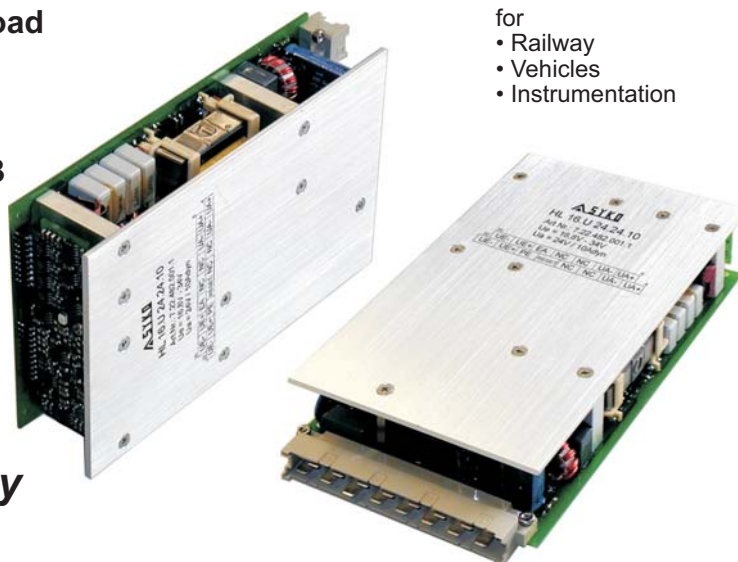
single / double output  
up to 150W stat./240W dyn.

DC/DC system converters  
isolated



- Topology for load steps from zero load
- Euro card 3 U / 10 TE (front panel)
- Wide input voltage range
- Switch on current limitation
- Input noise suppression EN 55011.B
- Input / output spike filter
- Shock/vibration EN 50155
- Over temperature switch off
- Synchronous rectifying<sup>1)</sup>

- for
- Railway
  - Vehicles
  - Instrumentation



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## Series HL16.U/B

### NEW with zero load capability

#### Main points:

#### Output:

- Regulation  $\Sigma (U_{in}+I_{out}+T_U)\pm 3\%$  double-out<sup>2)</sup>
- Max. unsymmetrical load (160/40)%
- Regulation  $\Sigma (U_{in}+I_{out}+T_U)<\pm 1\%$  single-out<sup>2)</sup>
- Accuracy absolute  $\pm 1\%$
- Ripple (over  $T_U$ ):  $<20\text{ mV}_{pp}$
- Spikes  $<50\text{ mV}_{pp}$  (T 1:1/50MHz)
- Response time  $\Delta I=100\% <5\text{ms}$
- Constant current limitation  $<1,2 I_{o,max}$
- Output spike filter (C - L<sup>2</sup> - C)
- No-load, over load, short circuit proof
- 100%-load step / zero load capable
- Simple parallel connection<sup>2)</sup>

#### Input:

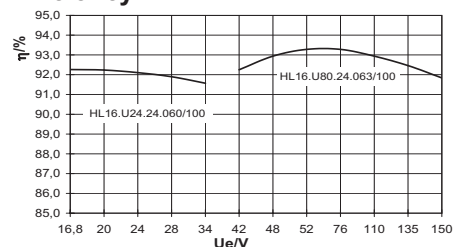
- Burst/Surge railway standard 2kV/42Ω
- No-load current  $<10\text{mA}$  (with inhibit)
- On-Off-application (inhibit) surge proof, up to  $U_{imax}$  (see principle diagram)
- On-Off switch hysteresis at under voltage and delayed auto-restart
- Input filter acc. to EN 55011.B
- Low input capacity
- Emergency fuse (customer)
- Option: long term transient proof

#### In general:

- No electrolytic capacitors in chopping circuits
- LED for  $U_{out} = \text{OK}$
- Connector DIN 41612, style H15
- Buck regulator / push-pull-topology
- Clock frequency 60 kHz/80kHz
- Isolation test voltage 1500V<sub>AC</sub> 1 min
- Ambient temperature  $-25^\circ\text{C} / +70^\circ\text{C}$
- Operation:  $-40^\circ\text{C} / +85^\circ\text{C}$  EN50155 TX
- Derating  $1,5\%/^\circ\text{C} > 60^\circ\text{C}$
- MTBF SN29500/40°C:  $>2,7\text{ mio h}$
- Shock/vibration acc. to EN50155
- Weight approx. 800g
- CE-certificate on request
- Over temperature switch off  $>110^\circ\text{C}$
- Limit temperature on KK-★  $95^\circ\text{C}$
- Front panel acc. to specification (Option)

$U_{in}$ V	$U_{out}$ V	$I_{out}$ A static	$I_{out}$ A dyn. 10s	Model number
16,8 - 34 14,4 dyn. = 85% $U_{out}$ Long term transients 50V/10ms 70V/2ms	5,1 (S)	20,0	30,0	HL16-U24-05-200/300
	12 (S)	11,3	18,7	HL16-U24-12-113/187
	15 (S)	9,0	15	HL16-U24-15-090/150
	24 (D)	5,6	9,4	HL16-U24-24-056/094
	48 (D)	2,8	4,7	HL16-U24-48-028/047
	$\pm 12$ (D)	$\pm 5,6$	$\pm 9,4$	HL16-B24-12-056/094
	$\pm 24$ (D)	$\pm 2,8$	$\pm 4,7$	HL16-B24-24-026/047
	12 (S)	11,3	20	HL16-U30-12-113/200
	15 (S)	9,0	16	HL16-U30-15-090/160
	24 (D)	5,6	10	HL16-U30-24-056/100
surge proof sym. 1kV / 42Ω or unsym. 2kV / 42Ω	48 (D)	2,8	5	HL16-U30-48-028/050
	110 (D)	1,2	2,2	HL16-U30-110-12/022
	$\pm 12$ (D)	$\pm 5,6$	$\pm 10$	HL16-B30-12-056/100
	$\pm 24$ (D)	$\pm 2,8$	$\pm 5,0$	HL16-B30-24-026/050
22 - 80 19 dyn. = 85% $U_{out}$ 110V/10ms	12 (S)	11,3	20	HL16-U50-12-113/200
	15 (S)	9,0	16	HL16-U50-15-090/160
	24 (D)	5,6	10	HL16-U50-24-056/100
	48 (D)	2,8	5	HL16-U50-48-028/050
	110 (D)	1,2	2,2	HL16-U50-110-12/022
	$\pm 12$ (D)	$\pm 5,6$	$\pm 10$	HL16-B50-12-056/100
42 - 154 surge proof sym. 1kV / 42Ω or unsym. 2kV / 42Ω	$\pm 24$ (D)	$\pm 2,8$	$\pm 5,0$	HL16-B50-24-026/050
	12 (S)	11,3	20	HL16-U80-12-113/200
	15 (S)	9,0	16	HL16-U80-15-090/160
	24 (D)	5,6	10	HL16-U80-24-056/100
	48 (D)	2,8	5	HL16-U80-48-028/050
	110 (D)	1,2	2,2	HL16-U80-110-12/022
$\pm 12$ (D)	$\pm 5,6$	$\pm 10$	$\pm 10$	HL16-B80-12-056/100
	$\pm 24$ (D)	$\pm 2,8$	$\pm 5,0$	HL16-B80-24-026/050

#### Efficiency



Version H -40°C up to +85°C additional charge  
 Modification costs of possible changes above values: on request  
 Option 72V-battery with  $U_{in}$ : (43 - 102)V on request

(D) with rectifying diode / (S) with synchronous rectifying<sup>1)</sup>

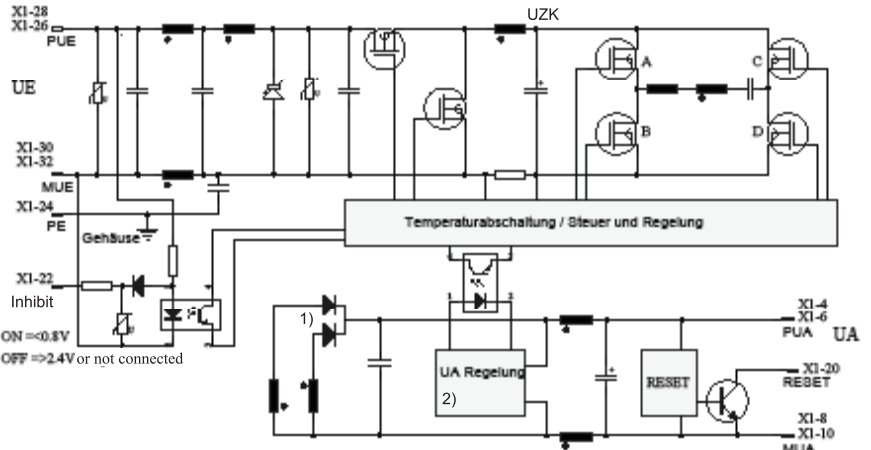
1) Warning: (Synchronous switches)

Output sided energy carriers like batteries must be decoupled with diodes.

The **HL16.U/B** series with an output power up to 150 W and a dynamical load steps from zero to 240W is developed for mobile applications and high operational reliability.

The input works with low input capacity and for the chopping circuit high current capable capacitors are chosen. Wet electrolytic capacitors are not used for the chopping circuit. Input sided surge disturbances are limited to system suitable values.

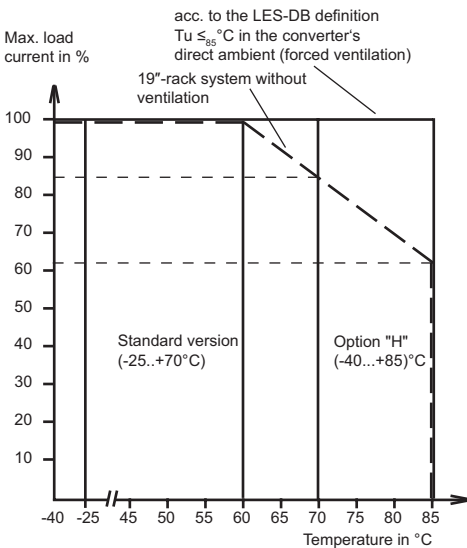
The clever and mechanically stable build up results an ideal heat connection to the face heat sink. The converter is equipped with an under voltage switch off funktion with amplitude and time hysteresis. The integral switch on current limitation is done with an internal power limitation. The functionality is secured in the whole operational range up to limit values based on the chosen components, filters, security circuits, dynamical and statically current limitation, over voltage protection and over temperature protection.



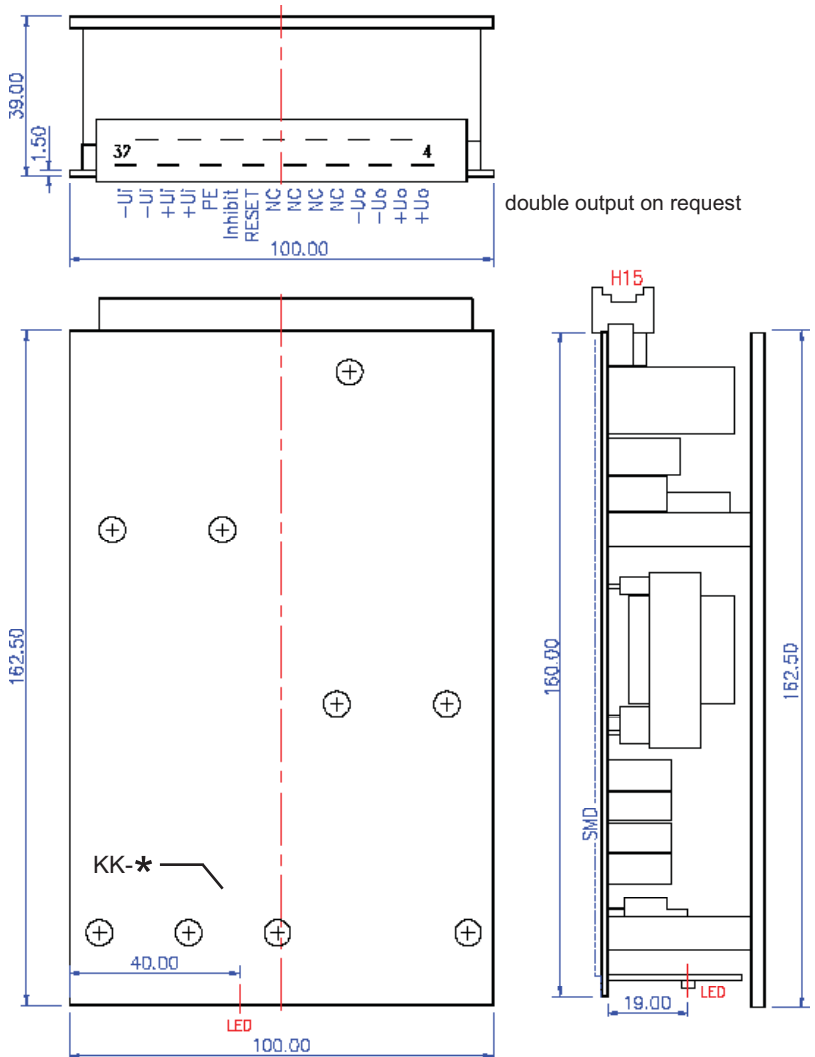
see HC16 datasheet for double output

- 1) For output voltages up to 15V including, the diode 1) is replaced by a synchronous rectifier to result higher efficiencies. The parallel operation without an external decoupling diode is not allowed.
- 2) For output voltages higher than 12V and an amplitude stability of  $\pm 2,5\% = f(U_{in}/I_{out}/T_U)$  the control loop's feed back with optical couplers is not necessary. This results a limited parallel operation and redundancy. The double output version is regulated to  $\pm U_{out}$ . The tracking is max.  $\pm 3\%$  at unsymmetrical loads.

### Derating curve



### 19"-rack version HL16



### Measurement of radio interference

