



INNOTRANS BERLIN
2026

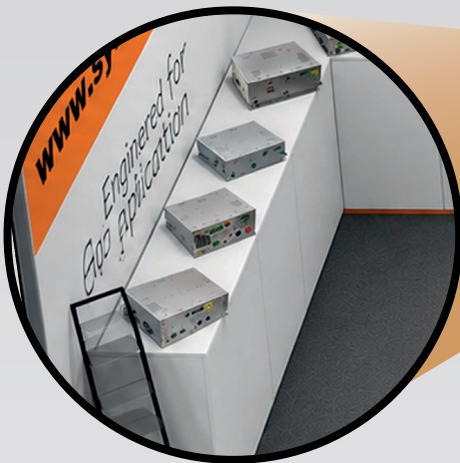
BATTERY CHARGERS FROM OVERHEAD LINE, 1PH/3PH MAINS VOLTAGE

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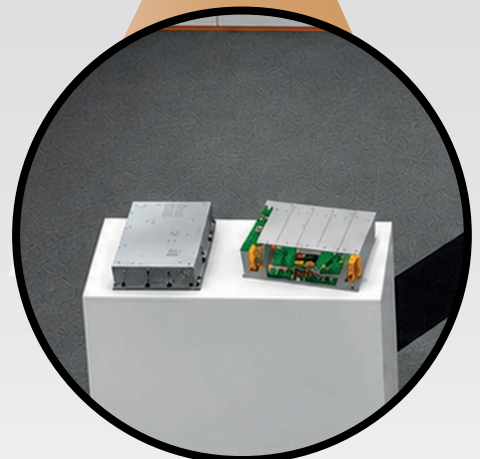
INVERTERS / THREE- PHASE INVERTERS FROM OVERHEAD LINE AND ONBOARD BATTERY

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SYSTEM COMPONENTS PROJECT FUR AND FE.H6D

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WWW.SYKO.DE



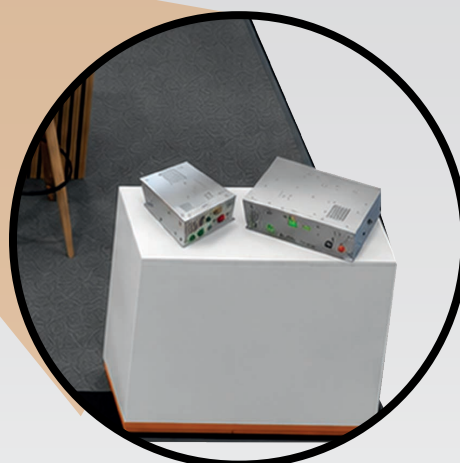
UIC HIGH-VOLTAGE FRONTEND

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MULTI-VOLTAGE SYSTEM CONVERTERS

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SYSTEM COMPONENTS PROJECT

BLG.2P/BLG.3P AND WER.H6D

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SYSTEM-COMPONENTS-PROJECT

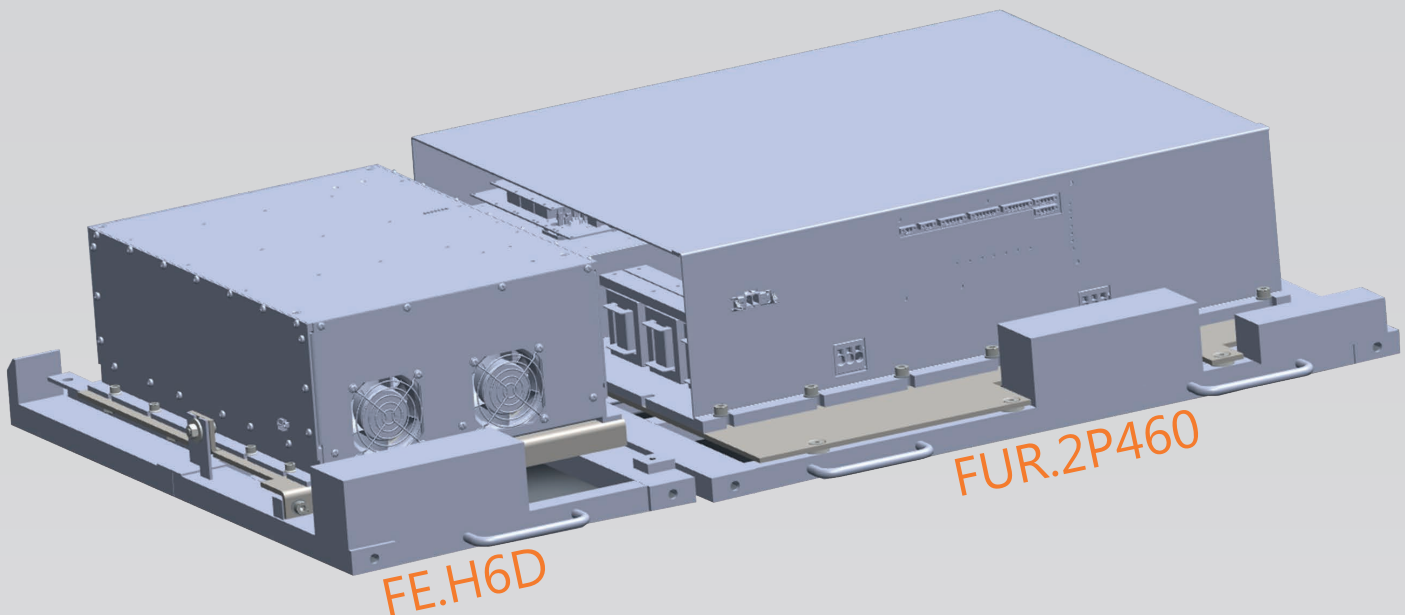
ICE 1 Galley

The 2-phase frequency converter (FUR) converts an input voltage of 320 Vrms to 575 Vrms / 16 2/3 Hz into a output voltage of 3Ph~ 230 Vrms / 50 Hz. The output voltage is used to supply the electrical 230 Vrms kitchen equipment / loads in the ICE 1 galley.

In addition, the units feature an emergency power supply from the 110 VDC onboard power supply to ensure the required emergency supply in the event of a failure of the regular input voltage.

This is ensured by the FE.H6D, which provides a continuous output power of 3.3 kW and a dynamic output power of 4.2 kW.

The output power of the FUR is 9 kW static and up to 14 kW dynamic.

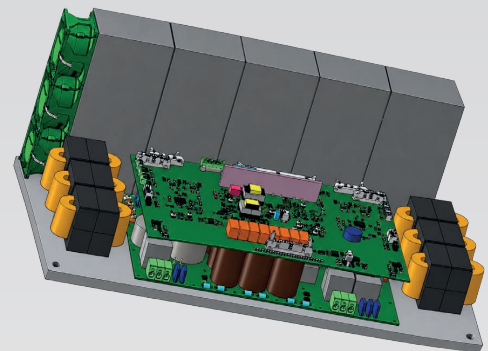


FUR.2P460.3P220.09/14

U_{in} : 322 VAC to 575 VAC 16²/₃ Hz

U_{out} : 3Ph/230V_{eff}/50Hz

P_{out} : 9kW_{stat} / 14KW_{dyn}



FE.H6D.110.450.070.090

U_{in} : onboard power supply (66-154)VDC

U_{out} : 450 VDC

P_{out} : 3,3kW_{stat} / 4,2kW_{dyn}



To increase efficiency, 1200 V / 16 mΩ SiC technology was used in the 3-level transistor topology with flying capacitor.

SYSTEM - COMPONENTS - PROJECT

DB Measurement Train

State of the art sensor platforms and computer workstations are used in a DB measurement train. Two different power supply networks are available for their supply: 1Ph / 230 Vrms / 60 Hz or 3Ph / 460 Vrms / 60 Hz.

In 2026, SYKO presented a newly developed system concept using the AC system components BLG.2P and BLG.3P battery chargers for 1-phase and 3-phase supply, with power-factor-corrected input and temperature-dependent end-of-charge voltage with separately programmable charging current.

The units can each be connected in regulated parallel operation to increase the output power. On the output side, the 110 V onboard power supply (optionally 24 V) is supplied with galvanic isolation and dynamic/static short-circuit protection.

From the onboard supply voltage, the WER.H6D onboard inverters each generate a galvanically isolated 230 Vrms / 50 Hz voltage with dynamic/static power limitation to supply the sensor and computer platforms.

BLG 2P.230.137.035

U_{In} : 230 VAC/60Hz

U_{out} : 137 VDC = $f(T_{BAT})$

P_{out} : 4,8kW regulated parallel operation



BLG 3P.460.137.035

U_{In} : 460 VAC/60Hz

U_{out} : 137 VDC = $f(T_{BAT})$

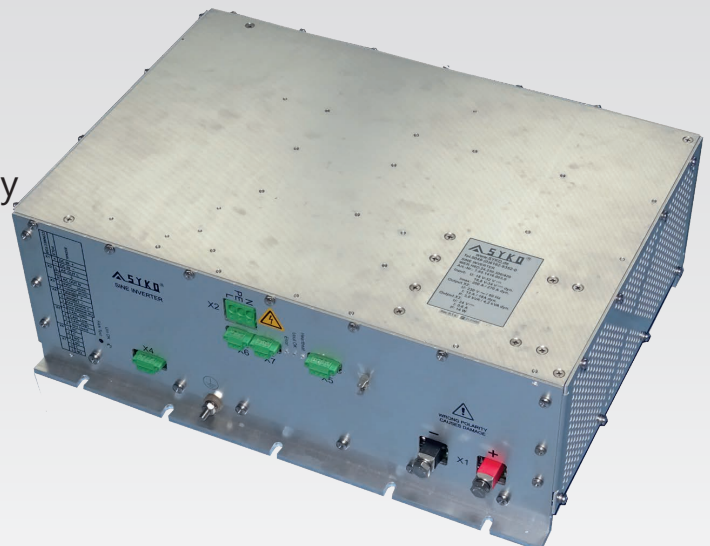
P_{out} : 4,8kW regulated parallel operation

WER.H6D.110.230.330/420

U_{In} : 66 to 157V onboard power supply

U_{out} : 230 VAC 50Hz

P_{out} : 3,3kW_{stat} / 4,2kW_{dyn}



SYSTEM-COMPONENTS-PROJECT

Redundancy Concept: DC and AC Onboard Power Supply

The SYKO system concept enables the supply of modern rail vehicles directly from overhead line voltages of 600/750 VDC. The DC system components provide the galvanically isolated supply of the 24 V onboard power supply and can be connected in regulated parallel operation to increase the output power. For supplying three-phase loads, the DRR.H750 three-phase inverters are supplied directly from the overhead line and generate a galvanically isolated, regulated 3-phase AC output voltage. This allows various AC loads such as compressors, fans or service sockets to be supplied according to demand.

Overhead line 600/750 VDC AVENIO MUNICH

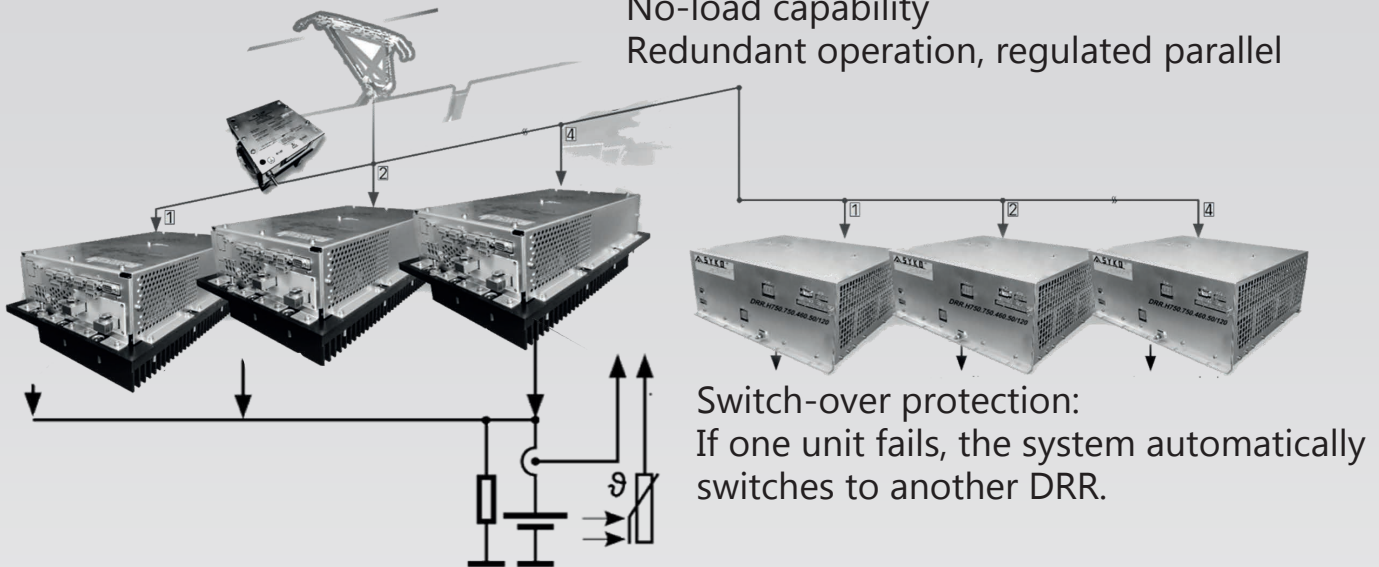
420-1000VDC
1270VDC/1Sek.
1700V_s/100ms
3000V/1ms

Low voltage 24 V / 110 V (>600 V) / $n \times 6$ kW

$n \times 200$ A = 800 A / $n \times 6$ kW

No-load capability

Redundant operation, regulated parallel



3-phase 460 V / 60 Hz

Functional parallel connection

Compressors, fans and service sockets

6 kW continuous / 8 kW – 20 sec. / 10 kW – 4 sec. / f-U control

SYKO operates in voltage ranges up to >5000 V for all UIC voltages, current ranges up to 1500 A and power ratings up to 15 kW.

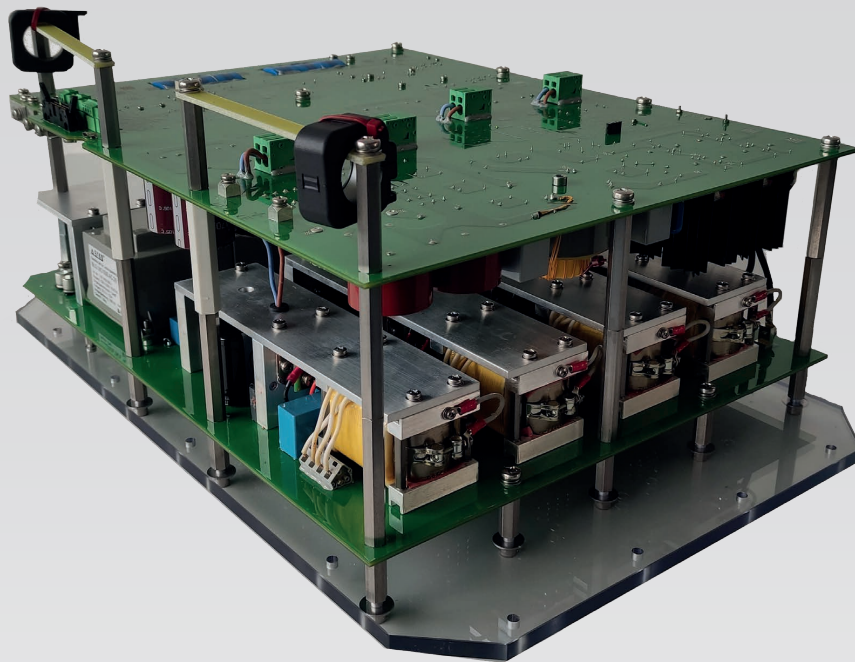
UIC HIGH-VOLTAGE FRONTEND

BLG.UIC

The compact BLG.UIC is an intelligent 4 kW battery charger for standards-compliant operation according to UIC 550 at 1000 V / 16 2/3 Hz up to 1500 VAC / 50 Hz and 1500 VDC.

The regulated voltage-cascadable multi-stage circuit concept provides high overvoltage resistance and consistently high efficiency across the input voltage range. Inrush and connection currents are actively limited. Up to four units can be operated in cascade, ensuring dynamic and static current sharing.

The robust design, standards-compliant insulation and creepage distances as well as direct heat dissipation enable reliable operation under increased requirements due to temperature, shock and vibration. An internal housekeeper supplies all functional levels before power activation. An emergency start with a deeply discharged battery is optionally available. CAN communication enables commissioning and the transmission of operating parameters via an optional GUI.



U_{In} : 1000V/16²/₃Hz - 1200VDC/1500 VDC / 1500V 50Hz

U_{out} : 28/42/84/126/137 VDC

P_{out} : 3,3kW_{stat} / 4kW_{dyn}

BATTERY CHARGERS

FROM OVERHEAD LINE, 1PH/3PH MAINS VOLTAGE

BLG.H750

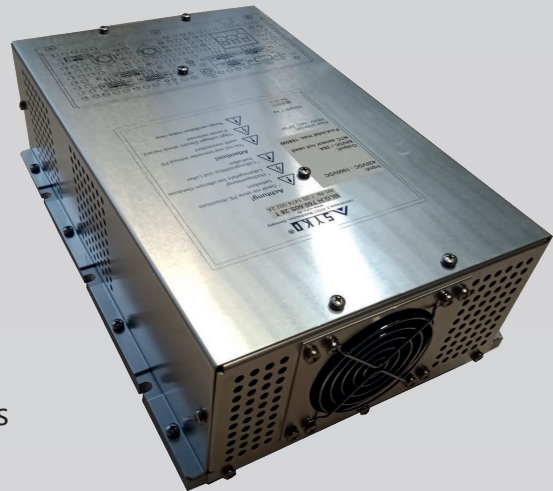
This intelligent 1.8 kW rail-certified battery charger operates directly from the overhead line within an input voltage range of 380 to 1,000 VDC and is designed for short-term overvoltages of 1,270 V for 1 s, 1,700 V for 100 ms and 3,000 V for 1 ms.

The galvanically isolated output voltage is regulated depending on the battery temperature. At the same time, the charging current into the battery is regulated and split (current splitting), ensuring reliable and battery friendly charging.

U_{in} : 380-1000V/1270Vdyn 1700V-100ms / 3000V-1ms

U_{out} : 24/48/72/110

Temperature-compensated end-of-charge voltage



HBL.H750

This intelligent, cascable $n \times 6$ kW multi-master battery charging system for low- and high-voltage batteries operates from (420–1270) VDC or from rectified 3Ph / 400/480 VAC 50/60 Hz.

Parallel operation of the onboard power supply and battery with temperature-dependent end-of-charge voltage $UBAT = f(TBAT)$ operates using the current-splitting method. Optionally available for MIL

U_{in} : 420-1270V (Fahrdracht) oder

U_{in} : 3Ph 400-480V AC 47-65Hz

U_{out} : 24/48/72/110

Temperature compensated end-of-charge voltage

BLG.3P/BLG.2P

The rail-certified AC battery chargers operate from a 460 Vrms / 3Ph or 230 Vrms / 1Ph mains supply. With an output power of 5 kW, they generate a galvanically isolated output voltage whose end-of-charge voltage is regulated depending on the battery temperature. Thanks to regulated current sharing, up to four units can be cascaded. An active power factor of >0.98 and an efficiency of 93%.

U_{in} : 3Ph 325-560V_{eff} / 16 2/3 50 60Hz

U_{out} : 24/48/72/110

Programmable battery current



SYKO develops according to EN 50155 – safety, fire protection, EMC and environmental requirements.

INVERTERS / THREE-PHASE INVERTERS FROM OVERHEAD LINE AND ONBOARD BATTERY

DRR.H750

This 3-phase sine-wave inverter is supplied directly from the 600/750 VDC overhead line voltage and generates a galvanically isolated 3-phase sine-wave voltage of 400/460 VAC at 50/60 Hz with f/U control.

The output power is 6 kW static and 8/10 kW dynamic. The output ramps up using f/U control or the setpoint is specified with galvanic isolated voltage. The external interfaces operate via CAN bus. The entire system is digitally processor-controlled / regulated.

U_{In} : 600V/750VDC (overhead line)

U_{out} : 3Ph sine-wave voltage 400/460VAC 50Hz

P_{out} : 6kW_{stat} / 8/10kW_{dyn}



WER.HXD

This standard battery inverter is designed for onboard power supply voltages from 24 V to 110 VDC.

A regulated string-current cascade initially generates a galvanically isolated DC-link voltage of 400 VDC. From this, a galvanically isolated synthetic sine-wave voltage of 230 VAC at 50 Hz is generated.

The inverters are available in various power ratings and are specifically designed for railway applications.

U_{In} : 24/36/72/110 VDC onboard power supply voltage

U_{ZK} : 400VDC DC-link voltage

U_{out} : 230V_{eff} optional 115V_{eff}



DRR.HXD

This standardized battery three-phase inverter is designed for onboard power supply voltages from 24 V to 110 VDC with a tolerance range of -30/+40%.

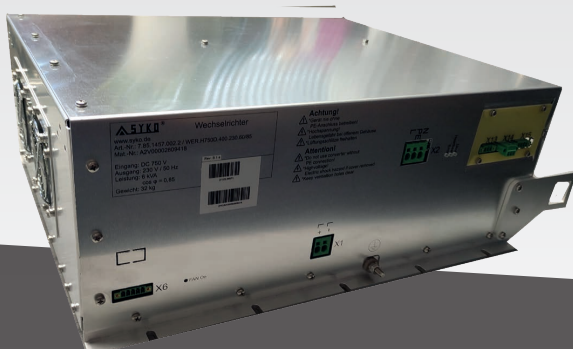
A regulated string-current cascade initially generates a galvanically isolated DC-link voltage of 750 VDC. From this, a galvanically isolated synthetic 3-phase sine-wave voltage of 400/460 VAC at 50/60 Hz is generated.

The three-phase inverter is available in various power ratings of 500, 1,000, 2,000 and 3,000 W and dynamically provides 1.4 times the rated output power for 4 seconds (I²t). Communication is via CAN bus.

U_{In} : 24/36/72/110 VDC onboard power supply voltage

U_{out} : 3Ph sine-wave voltage 400/460VAC 50Hz

P_{out} : 0,5/1/2/3kW dyn 1,4xP_{out}



WER.H750/M750

These 1-phase sine-wave inverters are supplied directly from the 600/750 VDC overhead line voltage and generate a galvanically isolated 230 VAC sine-wave voltage.

The outputs are statically/dynamically short-circuit-proof and protected against overload via I²t.

U_{In} : 600V/750VDC (overhead line)

U_{out} : 230VAC at 50Hz optional 115V_{eff}

P_{out} : 6kW_{stat} / 8,5kW_{dyn}

MULTI-VOLTAGE SYSTEM CONVERTERS

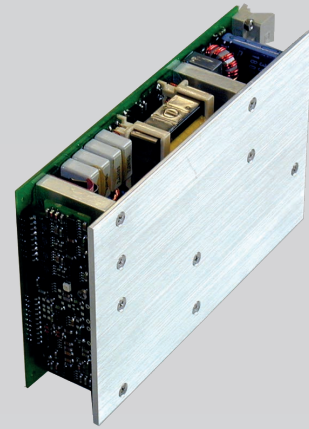
HL 16.B

DC/DC system converter, galvanically isolated
Unipolar / bipolar up to 150 W stat. / 240 W dyn

U_{in} : 42 to 154V

U_{out} : $\pm 5V/6,6A$ / $3,4A$ / $\Sigma 13A_{max}$

Input/output voltage according to customer



BOM 02/03

DC/DC system converter, galvanically isolated

U_{in} : 16,8 to 143V_{stat} / 14,4 to 154V_{dyn}

U_{out} : 5,1V/1,8A / 5,1V/1,2A / -15V/0,1A / +15V/0,15A / +15/3,5A



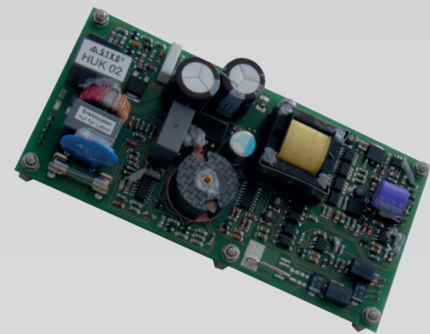
HUK 02.2

Regenerator with push-pull converter

U_{in} : 16,8V to 34V

U_{out} : 1 3,9V/0,27A / 2 5V/1,2A / 3 5V/0,15A / 4 12V/0,5A

Input/output voltage according to customer requirements



HC 16

Bipolar / unipolar chassis mounting

U_{in} : 16.8-34V_{stat} / 30-154V_{dyn}

U_{out} : $\pm 24V/10,5A$ to $36V/4,2A$ / $72V/2A$ / $110V/1,4A$ / $12V/12A$



MC 500

Regenerator with push-pull converter

U_{in} : 18V - 34V / 100V_{dyn}

U_{out} : 1 5,1V/3A / +15V/2A / -15V/2A



SYKO applies advanced GaN and SiC semiconductor technologies in its system components

MULTI-VOLTAGE SYSTEM CONVERTERS

Development of Multi-Voltage System Converters with GaN Technology

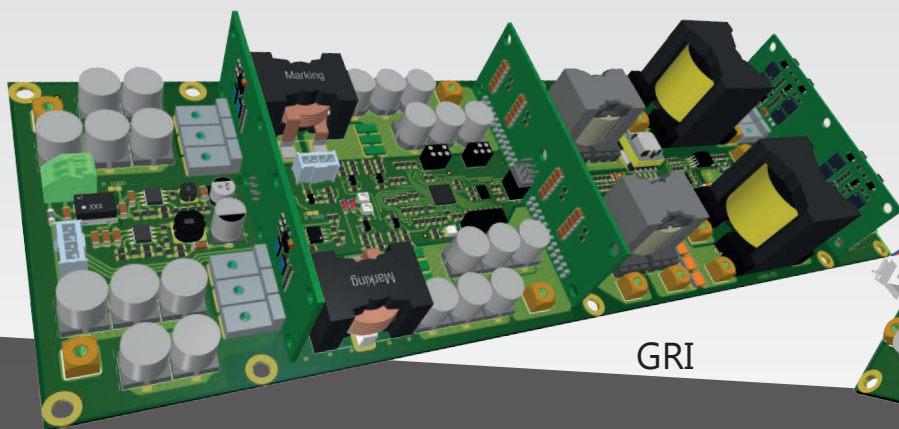
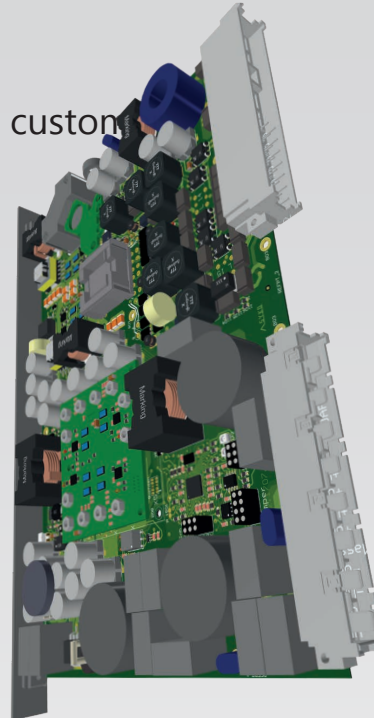
The supply of electronic systems from low-voltage onboard power supplies today requires the use of GaN semiconductor technology. Switching frequencies up to >400 kHz, chip resistances <1 mΩ, processor-controlled and regulated functions allow power supplies to become smaller, more efficient and more controlled / durable.
This new power supply system was researched using these modules.

	GSR	GRI	
Configuration	galvanically isolated regenerative	galvanically isolated regenerative	97% regeneration efficiency
Onboard power supply	15-36V	15-36V	98% step-down
Short-term	9-15V	optional	98% system converter
Overtolerance	50V/50-280ms	50V/50-280ms	
Overtolerance	70V/2ms	70V/2ms	
DC-Link		24V	
Output voltage	24V	24V	
Output continuous current	30A	25A	
Short-term	40A	33A	
Switching frequency	400kHz	400kHz	

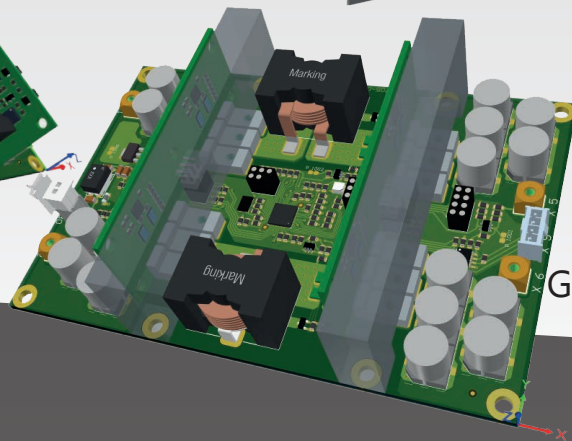
MULTI-VOLTAGE

With the know-how gained, it became possible to modify a first custom specific multi-voltage system converter.

Configuration	EMC regenerator, LLC push-pull stages with fixed frequency, linear and switched post-regulation
DC link	24 V for GT stages and external sensor supplies Σ 400Watt
Outputs	5,1V /30A (very low-impedance outputs) 12 low-power outputs 3,3 to 40V output power from 3W to 30W each.



GRI



GSR

BATTERY CHARGERS ON DIESEL/ELECTRIC LOCOMOTIVES

LGP3001N2

The LGP3001N2 is a proven, long-established galvanically isolated charging rectifier with active PFC for charging lead-acid and lead-gel batteries. The microprocessor-controlled charging voltage is adjusted depending on temperature via PT100; sense connections compensate for voltage drops to the battery.

A display and status LED enable operation and quick diagnostics. Optional battery monitoring in the absence of AC mains and a galvanically isolated CANopen interface according to CiA-301 are available.

Unit settings and communication are parameterized according to customer requirements.

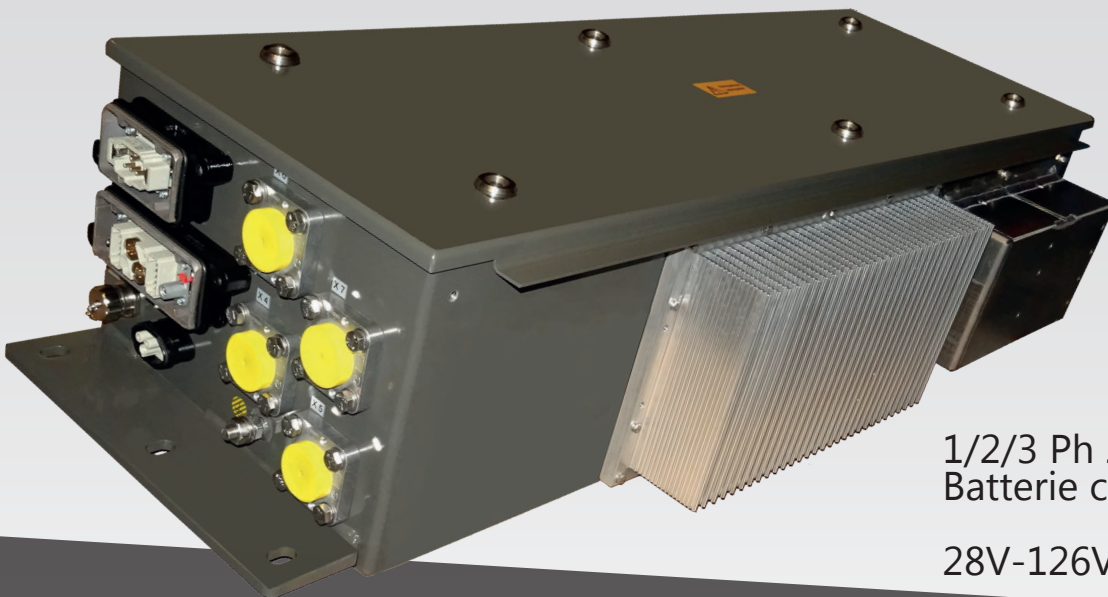
230VAC -> Battery charger
28V / 3,3kW



LGI 6501

The LGI 6501 is a battery charger for use on rail vehicles to supply the 24 V onboard power supply and to charge the starter and onboard batteries.

In 3Ph HBU operation, the AC input current is optionally limited to 11 A per phase and the DC output current to 240 A. In 3Ph shore connection operation, the input current is limited to 7 A per phase and can be adjusted via CAN. In addition, in the event of a phase failure, the system enables charging operation at 50% to supply the onboard power supply and charge the batteries.



1/2/3 Ph 230V 400VAC
Batterie charger 28V/240A

28V-126V / >6kW

SYKO implements complex system integrations.

POWER AND DATA TRANSMISSION

RPS.M / RPS.R



The system enables safe separation of stuff from the hazardous area and transmits <4 kW DC power over distances of up to 4 km with an overall efficiency of 94%.

Integrated residual-current protection on the 1500 VDC DC-link voltage and insulation monitoring of the 230 VAC output voltage are provided. The remote side ensures safe operation.

In addition, data can be transmitted via optical fibre with galvanic isolation and without affecting the electrical RPS.M power transmission.

RPS.M

230VAC 1500VDC

28VDC optional

up to 4km
4kW
1mm² copper conductor



RPS.R

1500VDC 230VAC

optional optional 28V Batterie charging
3Ph/400VAC

Originally developed for military applications, this technology also offers great potential for the railway industry. The combination of efficient power transmission over long distances and interference-free high-speed data communication via optical fibre enables the safe supply and networking of decentralized sensor, measurement and computer systems in combination with power electronics.

Modification and production by SYKO – Sales by SOLIFOS / Switzerland

POWER BRIDGE SUPPLY

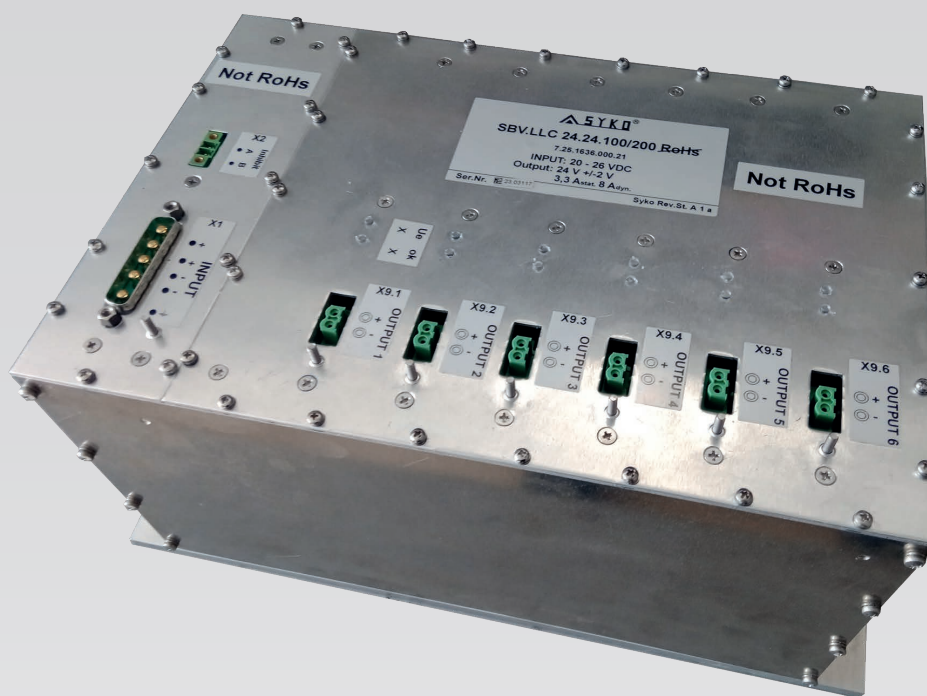
24 VDC to 6 × 24 VDC System Converter for High-Side Supply

This system converter provides six independent 24 V / 3.3 A outputs with 8 A dynamic capability and reinforced insulation between each output. The outputs themselves are also provided with reinforced insulation.

The outputs are isolated from each other with a rated voltage of $U_{nm} = 1000\text{ V}$ with OV3 and $U_{ni} = 8\text{ kV}$ and are therefore suitable for the high-side and low-side supply voltages of a three-phase motor controller.

The very low coupling capacitance between the outputs also reduces dU/dt interference between the outputs and towards the primary side. The input is protected against inrush current by an active filter and ensures high EMC compatibility.

The topology behind the DC/DC converters is a processor-controlled LLC converter with synchronous rectification and an overall efficiency of $>88\%$.



Input: 18V – 36 VDC

Total output power:

$$\begin{aligned} 6 \times 24\text{V} \times 3,3\text{A} &= 475\text{W}_{\text{stat}} \\ 6 \times 24 \times 8\text{A} &= 1152\text{W}_{\text{dyn}} \end{aligned}$$

SYKO® INNOVATIVE POWER ELECTRONICS SINCE 1973

For more than 50 years, SYKO has been developing, modifying and manufacturing power electronics at its Mainhausen site, providing reliable power-electronic solutions for demanding applications on land, at sea and in the air.

Our portfolio includes standardized DC/DC converters, AC/DC power supplies, inverters, frequency converters, battery chargers as well as customer-specific and project-based system solutions.

The focus is on high efficiency, robustness and reliable operation even under extreme operating conditions.

From the initial idea through development or modification and prototyping to series production and market maturity, our customers receive everything from a single source.

DEVELOPED, MANUFACTURED AND TESTED IN GERMANY

- More than 50 years of experience in mobile power electronics
- Development & manufacturing Made in Germany
- Customized and standardized solutions for demanding applications (individual components and system projects)
- High power density, efficiency and reliability
- Solutions according to international industrial, railway and defence standards
- Personal support and technical assistance

SYKO Power Electronics engineered for application



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