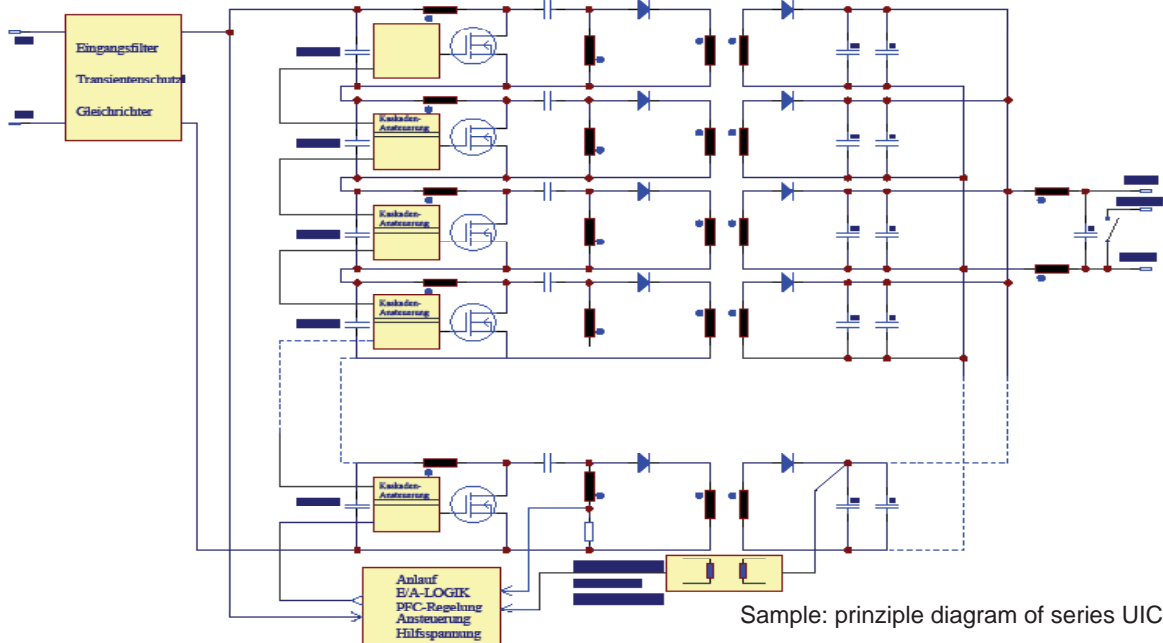


Combination brings functionality!

- **Patented voltage cascaded Regenerator-topology**
- **Traction line-, intermediate-, UIC-voltages, high voltage batteries**
- **220V / 450V_{DC}-fuel cell**
- **600V / 750V_{DC} // 1200 / 2400V_{DC}-traction line**
- **1000V_{AC} / 1500V_{DC/AC} / 3000V_{DC} UIC-voltages**
- **System supply, battery charging, start-up/dead battery start operation**



Sample: prinziple diagram of series UIC06

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Converter-family	P _{out}	U _{out}	Source voltage	Special features: System supply with:
	W	V		
ABS-USV	40	12-48	Traction lines, intermediate circuits, fuel cells	Intelligent battery charging = f(T _{Bat})
ABS04	50/75	12-48	Traction lines, intermediate circuits, fuel cells	Switch over to charging end voltage
ABS05	75/100	12-48	Traction lines, intermediate circuits, fuel cells	Switch over to charging end voltage
ABS02	100	60-110	Traction lines, intermediate circuits, fuel cells	Switch over to charging end voltage
ABS01	150/200	12-48	Traction lines, intermediate circuits, fuel cells	Switch over to charging end voltage
ABS06	500	12-48	Traction lines, intermediate circuits, fuel cells	Switch over to charging end voltage
ABS07	1500	24-110	Traction lines, UIC-voltage, fuel cells	Switch over to charging end voltage
BSZ.U	480	12-24	intermediate circuits, fuel cells	Transient proof acc. to Stanag/Germ.Lloyd
UIC01	110	24-110	UIC-voltage 1kV/16,3Hz or 1,5kV DC	UIC-start-up capable (ESP2)*, with PFC
UIC02	220	24-110	UIC-voltage 1kV/16,3Hz or 1,5kV DC	UIC-start-up capable (ESP0)*, with PFC
UIC03	275	24-110	UIC-voltage 1kV/16,3Hz and 1,5kV DC/50Hz	UIC-start-up capable (ESP1)*, with PFC
UIC06	600	24-110	UIC-voltage multiple voltage	UIC-start-up capable (MSP)*, with PFC, Battery charging
HVC	800	24-110	transient limited traction cable, intermediate circuits, fuel cells	battery charging = f(T _{Bat}) Current sharing with LMB, optionally water cooling
VHO.U	1000/1700	12-110	transient limited traction line, intermediate circuits, fuel cells	Compact dimensions Front-end
BLG.M	1000/1500	12-110	transient limited traction line, intermediate circuits, fuel cells	Cascadable, battery charging = f(T _{Bat}) Current sharing with LMB, optionally water cooling
HBL.M	n x 5000	24-110	transient limited traction line, intermediate circuits, fuel cells	Cascadable, battery charging = f(T _{Bat}) Current sharing with LMB, optionally water cooling
HBL.H	n x 5000	24-110	600V/750V-traction line acc. EN50163 1200V-traction line	Cascadable, battery charging = f(T _{Bat}) Current sharing with LMB, optionally water cooling
FE.UIC	3000 / 4000	370	Zwischenkreis, UIC-Spannungen	Project specific cascaded power block Front end supply for output connected devices like 1ph/3ph-inverters, battery chargers

* over Schaltbau GmbH Munich

Stand: 07/15

In general:

SYKO defines power supplies as high voltage converters when the supplying source voltages is 220V/450V fuel cell battery, 600 / 750 V and 1200 / 2400 V traction line voltage, 660 V intermediate circuits and UIC voltages 1000 V AC / 16,3 Hz, 1500 V AC / 50 Hz 1500 V DC and 3000 V DC.

Highest priority is the PCB's isolation-coordination according to EN 50 124-1 (VDE 0115 part 107-1) Okt. 2001 for the pollution level PD 3. The PCB is build up in accordance to EN50178 (VDE 0160) 1997 based on the solder masking paint with additional coating according to isolation material level 1 (CTI>600) and glued components according to pollution level PD 2. But the calculation of air and creepage distances is based on isolation material level 2. A single or increased or double isolation (or a solid body isolation is accepted) is depending, if the output voltage is goundet or not grounded.

Overview input voltages:

Nominal voltage	Energy source	U _{in min} / V	U _{in min} / V	U _{in max} / V	U _{in max} / V	U _{in max} / V	
U _{nom} / V		10 minutes	static	static	5 minutes	short term ¹⁾²⁾	
		U _{in min2}	U _{in min1}	U _{in max1}	U _{in max2}	U _{in max2.1}	
220	Fuel cells	150	170	285	330	550	10ms
450	Fuel cells	300	337	562	660	1065	10ms
660	Intermediate circuits, rectified	390	460	850	920	1050	10s
1000	UIC-high voltage bus	700	800	1150	1200	1250/1280*	10s
1500	UIC-high voltage bus	1050	1140	1650	1740	1860	10s
1500	UIC-high voltage bus	900	1000	1800/2000*	1950/2050	2050/2500*	10s
3000	UIC-high voltage bus	1800	2000	3600/4000	3900/4300	4050/5000*	10s
600/750	Traction line	390	460	950	1050	1950	10ms
1200	Traction line	720	860	1440	1560	1640	10s
2400	Traction line	1440	1600	2880	3120	3280	10s

1) If converter switches off, on request

2) Additional transients can be berücksichtigt

The given values are design/development regulations and need the project specific confirmation in written form or specification requirements from the customer side. The voltage can drop under the minimum voltage limit, when a functional guarantee of the supplied electronic must not be given for this time or approx. 10s. The customer must announce the input voltage with the harmonic content and the curve form (sinus, trapeze, failure). SYKO gives extra information about verification with standard confirmation / type tests / EG-conformity / build-in and build-in manual.

The shown and described devices are part of high power systems and developed for special applications. They are designed and tested in accordance to the state of the art technology and adapted in analogy to existing components. In general those electrical devices can cause heavy health and material damage by improper use, mistakes in operating, insufficient service or improper changes.

General explanations:

Traction line converter

Loads, which are directly connected to the public 600/750V DC networks or on 1200/2400V DC networks, have to work with operational characteristics under special conditions. **Funkenbildung** and transients caused by **icing** or switching operations, current free, surge disturbances etc. are processed unproblematically with according topologies and our long market experience.

UIC-high voltage converters

Energy supply equipment of modern railway vehicles converts the input sided high voltage in accordance to the UIC 550 standard into the needed voltage form. These standard UIC nominal voltages are 1000V AC 162/3Hz, 1500V AC 50Hz, 1500V DC and 3000V DC.

According to the UIC 555 standard very high transients in the range of milliseconds are possible. Special requirements of basis or increased isolation according to EN 50124-1 or EN 50178 are given to the values of test voltages, partial discharging voltages and air/creepage distances.

Start-up / dead battery supplies

Railway control systems cannot be supplied directly out of the high voltage level. For the run-up these control systems need the working vehicles battery. In reality the vehicle's battery can be discharged or defect caused by operational situations. In this case the control systems/auxiliary supplies cannot be set in operation.

The solution for a failure free operation is a start-up power supply (dead battery start converter). This converter supplies the control system and the run-up relays for 3 x 3 minutes out of the UIC-voltage level. Within this time the control system / auxiliary supply starts and supplies the vehicles systems and can charge the flat battery.

The standard compliant UIC-start-up converters are exclusively offered by company Schaltbau GmbH/ Munich in the versions ESP0, ESP1 and MSP. (www.schaltbau.de)

Traction line converters and system supplies are directly offered from SYKO.

Low power - energy supply equipment

Electronic must be supplied in mobile applications (railway, utility vehicles, ships etc.) with innovative high voltage concepts for static operation even there, where normally low voltage solutions have been used. Those solutions today work as intelligent battery chargers supplied out of all existing on-board networks e.g. on railway passenger cars, on rolling stock for freight transport or on the track. Furthermore system voltages are processed or 1ph/3ph inverters are supplied. The combination of isolated/non isolated power electronic with different outputs like konstant voltages, battery charging and sine wave inverters are professionally offered by SYKO.

This market is new and a general standard is occurred yet. SYKO offers a wide variety of power electronics as standard products and will extend this variety in the power range of/up to 5kW.