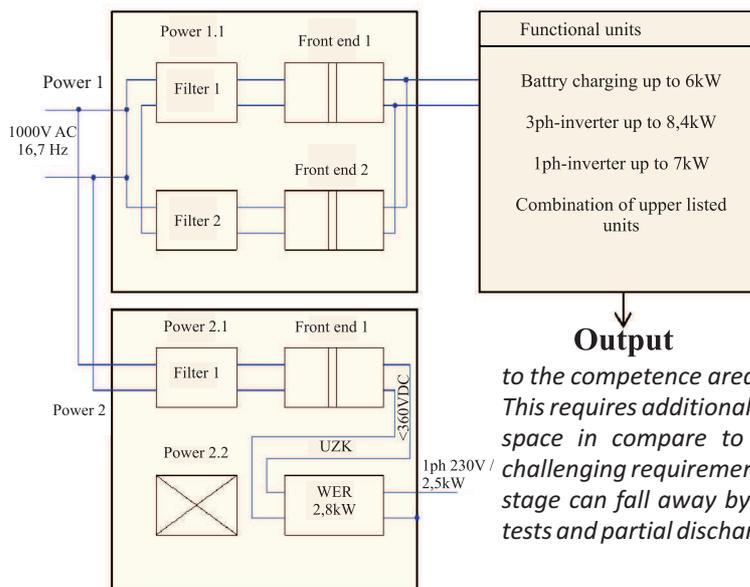


# Functional operation on high voltage bus 1000 V/16,7 Hz

With the DRR 1000 series (see also report „Operation on 1 kV/16,7 Hz UIC-high voltage bus“) SYKO placed the cornerstone for the competence area of 1000 V AC.

The power range starts from 2,8 kW over 5,6 kW up to >11,2 kW (kVA). Input strings process the input voltage range 700-1280V/16,7Hz. The isolated front-end unit generates intermediate levels from 350 V and 650 V DC with power factor regulation and filter unit. On this output now the following items can be supplied:

- Isolated battery chargers up to  $U_{out} > 750 V$   
BLG.M ( $n \times 2 kW$ )  
HBL.M ( $n \times 6,5 kW$ )
- 3ph inverter stages series DR, non-isolating with f/U-Control, which with the run-up power can be limited to max. double nominal power
- Single phase inverter series WR 115 V/60 Hz or 230V/50 Hz
- The combination of both before described functional units



Functionality and isolation coordination defines the character of these power modules. Higher power from 1000 VAC is realised with parallel connection of further strings. Power increase of the three phase bridge or double phase bridge with string currents up to 30Arms (3ph 20kW / 2ph 7kW) and including synthetic sine wave output are unproblematic for SYKO e.g. according to the characteristic function (components). New is the achievement to generate sine wave characteristic of currents and voltage for power of different topology versions with processor technology to realise DC to AC and AC to DC with PFC. But we also work on concepts for field regulation with space phasor. The modification to the competence area of 1500VDC and 1500VAC is started for power solutions up to 5kW. This requires additional power stages for the balanced voltage cascading and there for more space in compare to the 1000 V-technology. Voltage and current cascading was a challenging requirement and SYKO gained field experience. Partially the additional cascaded stage can fall away by using according PCB-materials. Transformers with according type tests and partial discharge voltage protection are under control.

## Operational voltages: input voltages acc. 550, version 01.01.97 and additional DB AG\* requirements

Minimum voltage up to 10 minutes	Minimum voltage continuous	Nominal range	Maximum voltage continuous	Maximum voltage up to 5 minutes	Maximum voltage up to 10 s	Maximum voltage up to 30ms	Maximum voltage up to 1ms	Existing system converters series		
$U_{min 2} (V)$	$U_{min 1} (V)$	$U_N (V), f_N (Hz)$	$U_{max 1} (V)$	$U_{max 2} (V)$	$U_{max 2A} (V)$	$U_{max 3} (V)$	$U_{max 4} (V)$	ESP0	ESP1	MSP
700	800	1000, 16 2/3	1150	1200	1250 / 1280*	1620	10kV			
1050	1140	1500, 50	1650	1740	1860	2320	12kV			
900	1000	1500 (DC)	1800 / 2000*	1950 / 2050*	2050 / 2500*	2538	12kV			
1800	2000	3000 (DC)	3600 / 4000*	3900 / 4300*	4050 / 5000*	5075	14kV			

The compressor's run-up at discharges air pressure system and f/U-Control is possible with 1,6 ... double power, when without these actions the run-up power normally would be at sixfold short term power. Single phase inverters run-up with constant frequency. To prevent re-feeding of electrical or mechanical energy, the turn-of procedure is realised with the use of sufficient capacitors or braking chopper or switched resistors. If the double frequency is required to optimise inductive and capacitive components or to improve the efficiency an considerable improvement of today's semiconductors must be involved.

**NEW:** SYKO now designed a buck-boost converter for the operation on 400...750 V DC-link with an output power of >3 kW and efficiency of 97,6- 98,6 %, which generates no-load to full-load stable output tolerance of  $\pm 1,5\%$  without regulation. SYKO - focus your power visions!

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