

Test report for integrated grid and system protection in accordance with VDE-AR-N 4105, F.4

Manufacturer's name and address	KACO new energy GmbH Carl-Zeiss-Str. 1 74172 Neckarsulm, Germany	130311
Type of grid and system protection	Internal grid and system protection	
Software version from	ARM: 4.76 / DSP: 4.70 / Config: 7.17	
Allocated to generator unit type	Powador 2002, 3002, 4202, 5002, 6002	

Protective function	Setting value U_{Set}	Trigger value	Shutdown time
Voltage drop protector $U <$	$0.80 \cdot U_n$	$U_{Set} - 0.13 \% \cdot U_n$	191.5 ms

Protective function	Setting value U_{Set}	Trigger value	Shutdown time
Voltage increase protector $U >$ as 10 min average <small>Measured in accordance with VDE 0124-100 5.4.5.3.2a. Shutdown must take place within 600 s.</small>	$1.10 \cdot U_n$	----	298 sec

Protective function	Setting value U_{Set}	Trigger value	Shutdown time
Voltage increase protector $U >>$	$1.15 \cdot U_n$	$U_{Set} \pm 0.00 \% \cdot U_n$	191.5 ms

Protective function	Setting value F_{Set}	Trigger value	Shutdown time
Frequency drop protector $f <$	47.5 Hz	$F_{Set} + 0.01 \text{ Hz}$	170 ms

Protective function	Setting value F_{Set}	Trigger value	Shutdown time
Frequency increase protector $f >$	51.5 Hz	$F_{Set} \pm 0.00 \text{ Hz}$	186 ms

Islanding detection, active process	Shutdown limit	Shutdown time, max.
	5 s	1.227 s

Circuit-breaker	
Integrated circuit-breaker	Control unit type 1 Power relay Control unit type 2 Power relay
Actuation of circuit-breaker	by internal grid and system protection
including inherent delay of circuit-breaker	10 ms

Shutdown time (grid and system protection trigger time plus inherent delay of circuit-breaker) must not exceed 200 ms. Checking of the overall functional chain "grid and system protection - circuit-breaker" led to a successful shutdown.