



**BUREAU
VERITAS**

Certificate of compliance

Applicant: KACO new energy GmbH
Carl-Zeiss-Str. 1
74172 Neckarsulm
Germany

Product: Interface protection device

Model: Powador-protect

Use in accordance with regulations:

Interface protection device with three-phase mains surveillance in accordance with Engineering Recommendation G59/3 for generating systems with a three-phase parallel coupling via an inverter in the public mains supply.

Applied rules and standards:

Engineering Recommendation G59/3:2013; G59/3-1:2014; G59/3-2:2015

Recommendation for the Connection of Generating Plant to the Distribution Systems of licensed Distribution Network Operators.

DIN V VDE V 0126-1-1:2006-02 (Functional safety)

Automatic disconnection device between a generator and the public low-voltage grid

At the time of issue of this certificate the safety concept of an aforementioned representative product corresponds to the valid safety specifications for the specified use in accordance with regulations.

The aforementioned product does not provide direct current injection monitoring and residual current monitoring. Therefore these protection functions need to be installed externally if required.

Report number: 16TH0109-G59/3

Certificate number: U16-0226

Date of issue: 2016-04-29

Certification body



Dieter Zitzmann



Deutsche
Akkreditierungsstelle
D-ZE-12024-01-00

Certification body of Bureau Veritas Consumer Products Services Germany GmbH
Accredited according to DIN EN ISO/IEC 17065

Appendix 13.1 Type Testing a Generating Unit

Extract from test report according the Engineering Recommendation G59/3

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Type Approval and declaration of compliance with the requirements of Engineering Recommendation G59/3.

Manufacturer / applicant:	KACO new energy GmbH Carl-Zeiss-Str. 1 74172 Neckarsulm Germany
Generating Unit technology	Interface protection device
Rated values	Powador-protect
Rated voltage [V]	230
Supply voltage range [V]	100 - 264
Monitoring voltage range [V]	0 – 290
Monitoring frequency range [Hz]	40 – 70
Firmware version	SW 2.06 / CFG 1.12 / Boot 4.01
* The tests were performed with Firmware version SW 2.06. Changes in the Firmware version on position SW 2.0x has no effect on the required electrical properties. x = could be any number or sign	
Measurement period:	2016-04-01 to 2016-04-28

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Description of the structure of the power generation unit (Figure 1):

The Powador-protect is an interface protection relay. It is combination of different protection relay functions which operates the interface switch of a generating unit or plant and prevents its closure, whichever is appropriate in case of the presence of voltage and frequency values outside the configured values

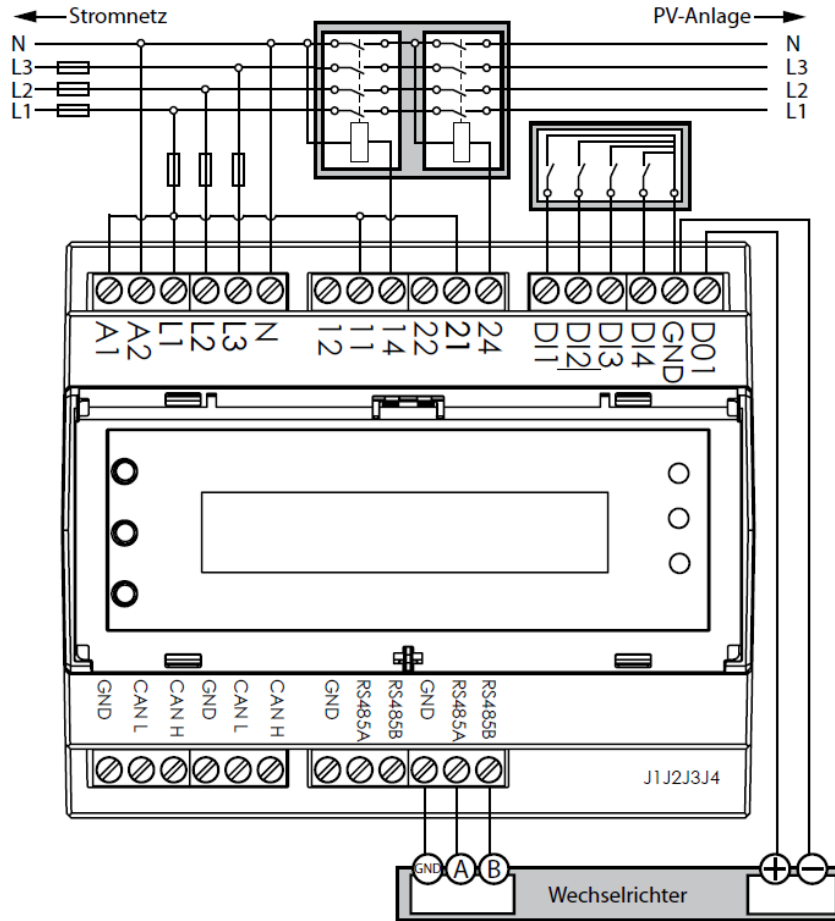


Figure 1 – Schematic structure of the power generation unit

The above stated protection device is tested according the requirements in the Engineering Recommendation G59/3. Any modification that affects the stated tests must be named by the manufacturer/supplier of the product to ensure that the product meets all requirements of the Engineering Recommendation G59/3.

Appendix 13.1 Type Testing a Generating Unit

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Protection. Voltage tests (grid voltage 230V).						
Phase 1						
Function	Setting		Trip test		No trip test	
	Voltage	Time delay	Voltage	Time delay	Voltage / time	Confirm no trip
U/V stage 1	200,1V	2,5s	199,7V	2,593s	204,1V / 3,5s	No trip
U/V stage 2	184V	0,5s	183,6V	0,594s	188V / 2,48s	No trip
					180V / 0,48s	No trip
O/V stage 1	262,2V	1,0s	262,4	1,035s	258,2V 2,0s	No trip
O/V stage 2	273,7V	0,5s	270,6	0,538s	269,7V 0,98s	No trip
					277,7V 0,48s	No trip

Protection. Voltage tests (grid voltage 230V).						
Phase 2						
Function	Setting		Trip test		No trip test	
	Voltage	Time delay	Voltage	Time delay	Voltage / time	Confirm no trip
U/V stage 1	200,1V	2,5s	200,0V	2,595s	204,1V / 3,5s	No trip
U/V stage 2	184V	0,5s	183,9V	0,596s	188V / 2,48s	No trip
					180V / 0,48s	No trip
O/V stage 1	262,2V	1,0s	262,5V	1,056	258,2V 2,0s	No trip
O/V stage 2	273,7V	0,5s	273,9V	0,565s	269,7V 0,98s	No trip
					277,7V 0,48s	No trip

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Protection. Voltage tests (grid voltage 230V).						
Phase 3						
Function	Setting		Trip test		No trip test	
	Voltage	Time delay	Voltage	Time delay	Voltage / time	Confirm no trip
U/V stage 1	200,1V	2,5s	200,2V	2,591s	204,1V / 3,5s	No trip
U/V stage 2	184V	0,5s	184,2V	0,590s	188V / 2,48s	No trip
					180V / 0,48s	No trip
O/V stage 1	262,2V	1,0s	262,8V	1,052s	258,2V 2,0s	No trip
O/V stage 2	273,7V	0,5s	274,2V	0,569s	269,7V 0,98s	No trip
					277,7V 0,48s	No trip
<p>Note. For Voltage tests the Voltage required to trip is the setting $\pm 3,45V$. The time delay can be measured at a larger deviation than the minimum required to operate the protection. The No trip tests need to be carried out at the setting $\pm 4V$ and for the relevant times as shown in the table above to ensure that the protection will not trip in error.</p>						

Appendix 13.1 Type Testing a Generating Unit

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Protection. Voltage tests (grid voltage 240V).						
Phase 1						
Function	Setting		Trip test		No trip test	
	Voltage	Time delay	Voltage	Time delay	Voltage / time	Confirm no trip
U/V stage 1	208,8V	2,5s	208,4V	2,536s	212,8V / 3,5s	No trip
U/V stage 2	192V	0,5s	191,6V	0,537s	196V / 2,48s	No trip
					188V / 0,48s	No trip
O/V stage 1	273,8V	1,0s	274,1V	1,015s	269,6V 2,0s	No trip
O/V stage 2	285,6V	0,5s	286,2V	0,518s	281,6V 0,98s	No trip
					289,2V 0,48s	No trip

Protection. Voltage tests (grid voltage 240V).						
Phase 2						
Function	Setting		Trip test		No trip test	
	Voltage	Time delay	Voltage	Time delay	Voltage / time	Confirm no trip
U/V stage 1	208,8V	2,5s	208,6V	2,537s	212,8V / 3,5s	No trip
U/V stage 2	192V	0,5s	192,1V	0,538s	196V / 2,48s	No trip
					180V / 0,48s	No trip
O/V stage 1	273,8V	1,0s	274,1V	1,014s	269,6V 2,0s	No trip
O/V stage 2	285,6V	0,5s	286,1V	0,518s	281,6V 0,98s	No trip
					277,7V 0,48s	No trip

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Protection. Voltage tests (grid voltage 240V).						
Phase 3						
Function	Setting		Trip test		No trip test	
	Voltage	Time delay	Voltage	Time delay	Voltage / time	Confirm no trip
U/V stage 1	208,8V	2,5s	208,7V	2,531s	212,8V / 3,5s	No trip
U/V stage 2	192V	0,5s	192,2V	0,535s	196V / 2,48s	No trip
					180V / 0,48s	No trip
O/V stage 1	273,8V	1,0s	274,3V	1,031s	269,6V 2,0s	No trip
O/V stage 2	285,6V	0,5s	286,2V	0,513s	281,6V 0,98s	No trip
					277,7V 0,48s	No trip

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Protection. Frequency tests.						
Function	Setting		Trip test		No trip test	
	Frequency	Time delay	Frequency	Time delay	Frequency / time	Confirm no trip
U/F stage 1	47,5Hz	20s	47,45Hz	20,078s	47,7Hz / 25s	No trip
U/F stage 2	47Hz	0,5s	46,98Hz	0,573s	47,2Hz / 19,98s	No trip
					46,8Hz / 0,48s	No trip
O/F stage 1	51,5Hz	90s	51,56Hz	90,000s	51,3Hz / 95s	No trip
O/F stage 2	52Hz	0,5s	52,00Hz	0,568s	51,8Hz / 89,98s	No trip
					52,2Hz / 0,48s	No trip
<p>Note. For Frequency Trip tests the Frequency required to trip is the setting $\pm 0,1$Hz. In order to measure the time delay a larger deviation than the minimum required to operate the protection can be used. The "No-trip tests" need to be carried out at the setting $\pm 0,2$Hz and for the relevant times as shown in the table above to ensure that the protection will not trip in error.</p>						

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Protection. Re-connection timer.				
Test should prove that the reconnection sequence starts in no less than 20 seconds for restoration of voltage and frequency to within the stage 1 settings of table 10.5.7.1.				
Voltage				
Time delay setting		Measured delay		
20s		21,053s		
Frequency				
Time delay setting		Measured delay		
20s		21,180s		
Grid voltage 230 V				
	Checks on no reconnection when voltage or frequency is brought to just outside stage 1 limits of table 1.			
	At 266,2V	At 196,1V	At 47,4Hz	At 51,6Hz
Confirmation that the Generating Unit does not re-connect.	No reconnection	No reconnection	No reconnection	No reconnection
Grid voltage 240 V				
	At 277,7V	At 204,6V	At 47,4Hz	At 51,6Hz
Confirmation that the Generating Unit does not re-connect.	No reconnection	No reconnection	No reconnection	No reconnection

Protection. Frequency change, Stability test.				
	Start Frequency	Change	End Frequency	Confirm no trip
Positive Vector Shift	49,5Hz	+9 degrees		No trip
Negative Vector Shift	50,5Hz	- 9 degrees		No trip
Positive Frequency drift	49,5Hz	+0,19Hz/sec	51,5Hz	No trip
Negative Frequency drift	50,5Hz	-0,19Hz/sec	47,5Hz	No trip