



中国认可
国际互认
检测

TESTING Test Report issued under the responsibility of:
CNAS L6791



Page 1 of 53

TEST REPORT IEC 60255-27 Measuring relays and protection equipment – Part 27: Product safety requirements	
Report Number.....	BL-DG2110533-B01
Date of issue.....	Mar. 26, 2021
Total number of pages	53
Name of Testing Laboratory preparing the Report	Shenzhen BALUN Technology Co., Ltd
Applicant's name	Shenzhen SOFARSOLAR Co., Ltd.
Address.....	401, Building 4, AnTongDa Industrial Park, District 68, XingDong Community, XinAn Street, BaoAn District, Shenzhen, China.
Test specification:	
Standard	IEC 60255-27:2013
Test procedure	Commissioned test
Non-standard test method	N/A
Test item description.....	Hybrid inverter
Trade Mark.....	
Manufacturer	Shenzhen SOFARSOLAR Co., Ltd.
Model/Type reference	HYD 6000-EP, HYD 5500-EP, HYD 5000-EP, HYD 4600-EP, HYD 4000-EP, HYD 3680-EP, HYD 3000-EP
Ratings	See ratings in page 8-9 for details.
Testing Laboratory	Shenzhen BALUN Technology Co., Ltd
Testing location/ address	Room 104, 204, 205, Building 1, No. 6, Industrial South Road, Songshan Lake District, Dongguan, Guangdong, China
Tested by (name, function, signature).....	Colin Chen /Engineer
Approved by (name, function, signature).....	Simon Qi /Chief Engineer
General disclaimer:	
The test results presented in this report relate only to the object tested.	
This report shall not be reproduced, except in full, without the written approval of the Issuing Testing Laboratory. The authenticity of this Test Report and its contents can be verified by contacting the Testing Laboratory, responsible for this Test Report.	
For the report with CNAS mark, the items marked with "☆" are not within the accredited scope.	



<p>List of Attachments (including a total number of pages in each attachment):</p> <p>Tests against:</p> <p>Total test reports contain 1 part and 1 attachments listed in below table:</p>		
Item	Description	pages
Part 1	Test report of IEC 60255-27:2013	53
ATTACHMENT 1	Photo documentation	10
<p>Summary of testing:</p>		
<p>Tests performed (name of test and test clause):</p> <p>10.6.1.1 Dry-heat test – operational. 10.6.1.2 Cold test – operational. 10.6.1.3 Dry heat test at maximum storage temperature. 10.6.1.4 Cold test at minimum storage temperature. 10.6.1.5 Damp-heat test. 10.6.1.6 Cyclic temperature with humidity test. 10.6.2.1 Vibration 10.6.2.2 Shock 10.6.2.3 Bump 10.6.2.4 Seismic ☆ 10.6.2.5 Accessible parts test 10.6.2.6 IP rating 10.6.3 Clearances and creepage distances 10.6.4.2 Impulse voltage 10.6.4.3 AC or d.c. dielectric voltage 10.6.4.4 Insulation resistance 10.6.4.5 Protective bonding resistance 10.6.5.1 Maximum temperature of parts and materials ☆ 10.6.5.5 Single-fault condition 10.6.6 Reverse polarity and slow ramp</p>		<p>Testing location:</p> <p>All tests except clause 10.6.2.6, 10.6.3, 10.6.4.2, 10.6.5.1, 10.6.4.5, 10.6.5.1, 10.6.5.5 and 10.6.6 were performed at address listed on page 1.</p> <p>The tests of clause 10.6.2.6, 10.6.3, 10.6.4.2, 10.6.5.1, 10.6.4.5, 10.6.5.1, 10.6.5.5 and 10.6.6 were performed in: Intertek Testing Services Shenzhen Ltd. Guangzhou Branch. Report No: 201015063GZU-001, Issued by Intertek Testing Services Shenzhen Ltd. Guangzhou Branch.(CNAS L0220), Dated on 23 Nov 2020, total 89 pages.</p>
<p>Summary of compliance with National Differences (List of countries addressed): None.</p> <p><input checked="" type="checkbox"/> The product fulfils the requirements of IEC 60255-27:2013.</p>		

Copy of marking plate:

The artwork below may be only a draft.

SOFAR SOLAR
Hybrid Inverter

Model No: HYD 6000-EP

Max.DC Input Voltage	600V
Operating MPPT Voltage Range	90V~580V
MAX.PV Isc	2x18A
Battery Type	Lead-acid,Lithium-ion
Battery Voltage Range	42-58V
Max.Charging Current	100A
Max.Discharging Current	100A
Max.Charging&Discharging Power	5000W
Nominal Grid Voltage	230Vac
Nominal Output Voltage	230Vac
Max. Output Current	27.3A
Nominal Grid Frequency	50/60Hz
Power Factor	1(adjustable+/-0.8)
Nominal Output Power	6000W
Backup Rated Current	22.7A
Backup Rated Apparent Power	5000VA
Ingress Protection	IP 65
Operating Temperature Range	-30-+60°C
Protective Class	Class I

Manufacturer : Shenzhen SOFARSOLAR Co., Ltd.
Address : 401, Building 4, AnTongDa Industrial Park,
District 68, XingDong Community,XinAn Street,
BaoAn District, Shenzhen, China
VDE0126-1-1,VDE-AR-N4105
G98,AS4777,UTE C15-712-1

SOFAR SOLAR
Hybrid Inverter

Model No: HYD 5500-EP

Max.DC Input Voltage	600V
Operating MPPT Voltage Range	90V~580V
MAX.PV Isc	2x18A
Battery Type	Lead-acid,Lithium-ion
Battery Voltage Range	42-58V
Max.Charging Current	100A
Max.Discharging Current	100A
Max.Charging&Discharging Power	5000W
Nominal Grid Voltage	230Vac
Nominal Output Voltage	230Vac
Max. Output Current	25.0A
Nominal Grid Frequency	50/60Hz
Power Factor	1(adjustable+/-0.8)
Nominal Output Power	5000W
Backup Rated Current	22.7A
Backup Rated Apparent Power	5000VA
Ingress Protection	IP 65
Operating Temperature Range	-30-+60°C
Protective Class	Class I

Manufacturer : Shenzhen SOFARSOLAR Co., Ltd.
Address : 401, Building 4, AnTongDa Industrial Park,
District 68, XingDong Community,XinAn Street,
BaoAn District, Shenzhen, China
VDE0126-1-1,VDE-AR-N4105
G98,AS4777,UTE C15-712-1

SOFAR SOLAR
Hybrid Inverter

Model No: HYD 5000-EP

Max.DC Input Voltage	600V
Operating MPPT Voltage Range	90V~580V
MAX.PV Isc	2x18A
Battery Type	Lead-acid,Lithium-ion
Battery Voltage Range	42-58V
Max.Charging Current	100A
Max.Discharging Current	100A
Max.Charging&Discharging Power	5000W
Nominal Grid Voltage	230Vac
Nominal Output Voltage	230Vac
Max. Output Current	21.7A
Nominal Grid Frequency	50/60Hz
Power Factor	1(adjustable+/-0.8)
Nominal Output Power	5000W
Backup Rated Current	22.7A
Backup Rated Apparent Power	5000VA
Ingress Protection	IP 65
Operating Temperature Range	-30-+60°C
Protective Class	Class I

Manufacturer : Shenzhen SOFARSOLAR Co., Ltd.
Address : 401, Building 4, AnTongDa Industrial Park,
District 68, XingDong Community,XinAn Street,
BaoAn District, Shenzhen, China
VDE0126-1-1,VDE-AR-N4105
G98,AS4777,UTE C15-712-1

SOFAR SOLAR
Hybrid Inverter

Model No: HYD 4600-EP

Max.DC Input Voltage	600V
Operating MPPT Voltage Range	90V~580V
MAX.PV Isc	2x18A
Battery Type	Lead-acid,Lithium-ion
Battery Voltage Range	42-58V
Max.Charging Current	100A
Max.Discharging Current	100A
Max.Charging&Discharging Power	5000W
Nominal Grid Voltage	230Vac
Nominal Output Voltage	230Vac
Max. Output Current	20.9A
Nominal Grid Frequency	50/60Hz
Power Factor	1(adjustable+/-0.8)
Nominal Output Power	4600W
Backup Rated Current	20.9A
Backup Rated Apparent Power	4600VA
Ingress Protection	IP 65
Operating Temperature Range	-30-+60°C
Protective Class	Class I

Manufacturer : Shenzhen SOFARSOLAR Co., Ltd.
Address : 401, Building 4, AnTongDa Industrial Park,
District 68, XingDong Community,XinAn Street,
BaoAn District, Shenzhen, China
VDE0126-1-1,VDE-AR-N4105
G98,AS4777,UTE C15-712-1

 Hybrid Inverter	
Model No:	HYD 4000-EP
Max.DC Input Voltage	600V
Operating MPPT Voltage Range	90V~580V
MAX.PV Isc	2x18A
Battery Type	Lead-acid,Lithium-ion
Battery Voltage Range	42-58V
Max.Charging Current	85A
Max.Discharging Current	85A
Max.Charging&Discharging Power	4250W
Nominal Grid Voltage	230Vac
Nominal Output Voltage	230Vac
Max.Output Current	20.0A
Nominal Grid Frequency	50/60Hz
Power Factor	1(adjustable+/-0.8)
Nominal Output Power	4000W
Backup Rated Current	18.2A
Backup Rated Apparent Power	4000VA
Ingress Protection	IP 65
Operating Temperature Range	-30~+60°C
Protective Class	Class I
Manufacturer : Shenzhen SOFARSOLAR Co., Ltd. Address : 401, Building 4, AnTongDa Industrial Park, District 68, XingDong Community,XinAn Street, BaoAn District, Shenzhen, China VDE0126-1-1,VDE-AR-N4105 G98,AS4777,UTE C15-712-1	

 Hybrid Inverter	
Model No:	HYD 3680-EP
Max.DC Input Voltage	600V
Operating MPPT Voltage Range	90V~580V
MAX.PV Isc	2x18A
Battery Type	Lead-acid,Lithium-ion
Battery Voltage Range	42-58V
Max.Charging Current	80A
Max.Discharging Current	80A
Max.Charging&Discharging Power	4000W
Nominal Grid Voltage	230Vac
Nominal Output Voltage	230Vac
Max.Output Current	16.0A
Nominal Grid Frequency	50/60Hz
Power Factor	1(adjustable+/-0.8)
Nominal Output Power	3680W
Backup Rated Current	16.0A
Backup Rated Apparent Power	3680VA
Ingress Protection	IP 65
Operating Temperature Range	-30~+60°C
Protective Class	Class I
Manufacturer : Shenzhen SOFARSOLAR Co., Ltd. Address : 401, Building 4, AnTongDa Industrial Park, District 68, XingDong Community,XinAn Street, BaoAn District, Shenzhen, China VDE0126-1-1,VDE-AR-N4105 G98,AS4777,UTE C15-712-1	

 Hybrid Inverter	
Model No:	HYD 3000-EP
Max.DC Input Voltage	600V
Operating MPPT Voltage Range	90V~580V
MAX.PV Isc	2x18A
Battery Type	Lead-acid,Lithium-ion
Battery Voltage Range	42-58V
Max.Charging Current	75A
Max.Discharging Current	75A
Max.Charging&Discharging Power	3750W
Nominal Grid Voltage	230Vac
Nominal Output Voltage	230Vac
Max.Output Current	15.0A
Nominal Grid Frequency	50/60Hz
Power Factor	1(adjustable+/-0.8)
Nominal Output Power	3000W
Backup Rated Current	13.6A
Backup Rated Apparent Power	3000VA
Ingress Protection	IP 65
Operating Temperature Range	-30~+60°C
Protective Class	Class I
Manufacturer : Shenzhen SOFARSOLAR Co., Ltd. Address : 401, Building 4, AnTongDa Industrial Park, District 68, XingDong Community,XinAn Street, BaoAn District, Shenzhen, China VDE0126-1-1,VDE-AR-N4105 G98,AS4777,UTE C15-712-1	

Note:

1. The above markings are the minimum requirements required by the safety standard. For the final production samples, the additional markings which do not give rise to misunderstanding may be added.
2. Label is attached on the side surface of enclosure and visible after installation



Test item particulars	
Equipment mobility	<input type="checkbox"/> movable <input type="checkbox"/> hand-held <input type="checkbox"/> stationary <input checked="" type="checkbox"/> fixed <input type="checkbox"/> transportable <input type="checkbox"/> for building-in
Connection to the mains	<input type="checkbox"/> pluggable equipment <input type="checkbox"/> direct plug-in <input checked="" type="checkbox"/> permanent connection <input type="checkbox"/> for building-in
Environmental category	<input checked="" type="checkbox"/> outdoor <input type="checkbox"/> indoor unconditional <input type="checkbox"/> indoor conditional
Over voltage category Mains	<input type="checkbox"/> OVC I <input type="checkbox"/> OVC II <input checked="" type="checkbox"/> OVC III <input type="checkbox"/> OVC IV
Over voltage category PV	<input type="checkbox"/> OVC I <input checked="" type="checkbox"/> OVC II <input type="checkbox"/> OVC III <input type="checkbox"/> OVC IV
Mains supply tolerance (%)	According to the specified supply range.
Tested for power systems	TN
IT testing, phase-phase voltage (V)	N/A
Class of equipment	<input checked="" type="checkbox"/> Class I <input type="checkbox"/> Class II <input type="checkbox"/> Class III <input type="checkbox"/> Not classified
Mass of equipment (kg)	Approx. 25Kg
Pollution degree	PD3(Inside PD2)
IP protection class	IP65
.....	
Possible test case verdicts:	
- test case does not apply to the test object..... :	N/A
- test object does meet the requirement	P (Pass)
- test object was not evaluated for the requirement:	N/E
- test object does not meet the requirement..... :	F (Fail)
Testing	
Date of receipt of test item	Mar. 01, 2020
Date (s) of performance of tests	Mar. 01, 2020 to Mar. 23, 2020



General remarks:	
<p>"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report. The tests results presented in this report relate only to the object tested. This report shall not be reproduced except in full without the written approval of the testing laboratory. List of test equipment must be kept on file and available for review. Additional test data and/or information provided in the attachments to this report. Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator. Determination of the test results includes consideration of measurement uncertainty from the test equipment and methods.</p>	
Manufacturer's Declaration per sub-clause 4.2.5 of IEC60384-14:	
<p>The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided</p>	<p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> Not applicable</p>
When differences exist; they shall be identified in the General product information section.	
<p>Name and address of factory (ies)..... : Dongguan SOFAR SOLAR Co., Ltd. 1F - 6F, Building E, No. 1 JinQi Road, Bihu Industrial Park, Wulian Village, Fenggang Town, Dongguan City.</p>	

General product information:

The unit is a single-phase hybrid inverter, it can convert the high PV voltage and Grid voltage to low DC for charge battery, also convert PV voltage and battery voltage to AC Grid.

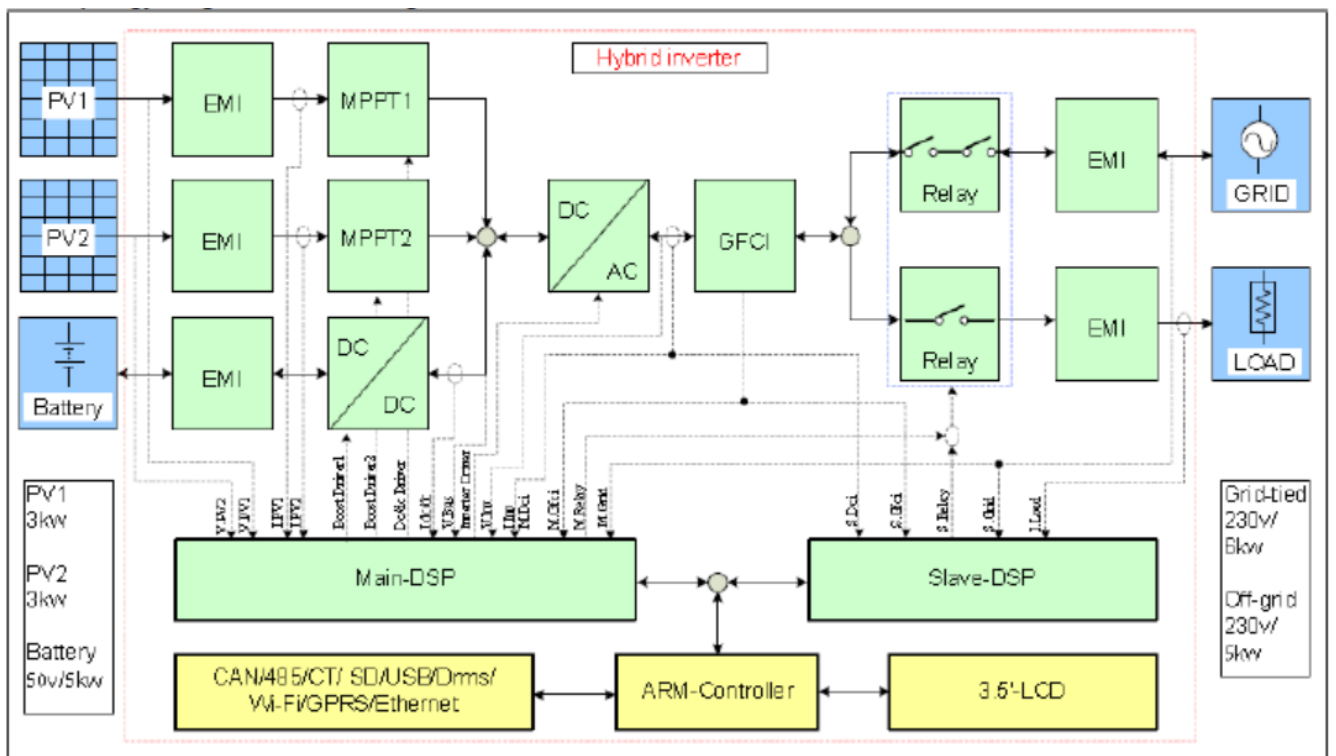
The unit is providing EMI filtering at the PV and battery side. It does provide galvanic separation from PV side to Grid. The battery circuit does provide high frequency isolation to PV side and AC mains.

The unit has two controllers. the master DSP controller monitor the charge or discharge status; measure the PV voltage and current, battery current, bus voltage, AC voltage, current, GFCI and frequency.

The slave DSP controller monitor AC voltage, current, frequency, GFCI and communicate with the master controller

The master DSP and slave DSP are used together to control relay open or close, if the single fault on one DSP, the other one DSP can be capable to open the relay, so that still providing safety means.

The topology diagram as following:



Model differences:

The models HYD 6000-EP, HYD 5500-EP, HYD 5000-EP, HYD 4600-EP, HYD 4000-EP, HYD 3680-EP, HYD 3000-EP are identical and only the output power derating in software. Except for the following table.

Model	HYD 3000-EP	HYD 3680-EP	HYD 4000-EP	HYD 4600-EP	HYD 5000-EP	HYD 5500-EP	HYD 6000-EP
R332, R334, R336	NC, 0Ω, NC			0Ω, NC, 0Ω			
Bus capacitance	6pcs			8pcs			
INV inductor	1.035mH			0.75mH			
R123, R132	499Ω, 499Ω			1.5KΩ, 1.5KΩ			

The product was tested on:

The Software version: V02000;
The Hardware version: V001.

Other than special notes, typical model HYD 6000-EP used as representative for testing in this report.

Rating:

Model	HYD 3000-EP	HYD 3680-EP	HYD 4000-EP	HYD 4600-EP	HYD 5000-EP	HYD 5500-EP	HYD 6000-EP
Max. PV Input Voltage [d.c.V]	600						
MPPT operating voltage range [d.c.V]	90-580						
Number of MPP trackers	2						
Max. input current per MPPT [d.c.A]	13/13						
Max. PV Isc [d.c.A]	2 X 18						
Battery Type	Lead-acid, Lithium-ion						
Battery Voltage Range [d.c.V]	42-58						
Max. Charging Current [d.c.A]	75	80	85	100	100	100	100
Max. Discharging Current [d.c.A]	75	80	85	100	100	100	100
Max. Charging & Discharging Power [W]	3750	4000	4250	5000	5000	5000	5000
Nominal Grid voltage [a.c.V]	230						
Nominal Output Voltage (backup) [a.c.V]	230						
Max. output	15	16	20	20.9	21.7	25	27.3

current [a.c.A]							
Max AC current from utility grid [a.c.A]	27.3	32	36.4	41.8	43.4	43.4	54.6
Nominal Grid Frequency	50/60Hz						
Power Factor	1 (adjustable +/-0.8)						
Nominal AC power [W]	3000	3680	4000	4600	5000	5000	5000
Backup Max.current [a.c.A]	13.6	16.0	18.2	20.9	22.7	22.7	22.7
Backup Max. Apparent Power [VA]	3000	3680	4000	4600	5000	5000	5000
Ingress Protection	IP 65						
Protective Class	Class I						
Operating temperature range	-30 ~ +60°C						

IEC 60255-27			
Clause	Requirement – Test	Result – Remark	Verdict
4	General safety requirements		-
4.1	General		P
4.2	Earthing requirements		P
5	Protection against electric shock		-
5.1	General		-
5.1.1	Introductory remark		P
5.1.2	Protection from contact with hazardous live parts		P
5.1.2.1	General		P
5.1.2.2	Insulation		P
5.1.2.3	Equipment case and barriers	IP65 enclosure and no opening in the case.	-
	Hazardous live parts	Hazardous live parts were separated from the accessible part.	P
	Top surfaces of barriers accessible in normal use ..	No opening of EUT and the cover only can be removed with tool by trained personnel.	P
	Protection in service access areas.....		P
	- with rigid test finger and a force of 10 N		N/A
	- with jointed test finger		N/A
5.1.2.4	Hazardous live terminations using stranded wire		P
5.1.3	Discharge of capacitors		-
	Compliance checked by calculation		P
	Measured voltage (V); time-constant (s)		P
	Residual charge (µC)		P
5.1.4	Protective impedance	No protective impedance used.	-
	Requirements of 5.1.5.3.2 in normal and to level of 5.2.4.1.2 in single fault condition		N/A
	The protective impedance consists of one or more of the following:		N/A
	- appropriate high-integrity single component		N/A
	- combination of components		N/A
	- combination of basic insulation and a current- or voltage-limiting device		N/A
	Voltage test for double/reinforced insulation		N/A

IEC 60255-27			
Clause	Requirement – Test	Result – Remark	Verdict
	Components and associated basic insulation checked after a single-fault condition assessment or test according to 10.6.5.5..... :		N/A
	Clearance, creepage distance between terminations of the impedance meet requirements of double or reinforced insulation of Annex C of this standard and 6.7 of IEC 61010-1:2010 :		N/A
5.1.5	Accessible parts		-
5.1.5.1	General	All accessible metal parts were earthed and separated from live parts by basic insulation. All external accessible circuit were separated from live parts by reinforce insulation.	P
5.1.5.2	Determination of accessible parts		-
5.1.5.2.1	General		P
	Normal operational use, with or without the aid of a too lwhich will increase the accessibility..... :	See 5.1.5.2.2 to 5.1.5.2.4 or test by inspection	P
5.1.5.2.2	General examination	No opening of EUT and the cover only can be removed with tool by trained personnel.	-
	Test with jointed test finger..... :		N/A
	Test with rigid test finger (force of 10 N) :		N/A
5.1.5.2.3	Openings above parts, enclosed by the case, which are hazardous live	No opening of EUT and the cover only can be removed with tool by trained personnel.	-
	Test with test pin (100mm, Ø4mm) :		N/A
5.1.5.2.4	Openings for pre-set controls	No opening of EUT and the cover only can be removed with tool by trained personnel.	-
	Test with test pin (100mm, Ø3mm) :		N/A
5.1.5.2.5	ELV rated or live parts accessible when cover removed		-
	Removing the cover without tools :	No opening of EUT and the cover only can be removed with tool by trained personnel.	N/A
	- Symbol 14 :		N/A
	- Symbol 12 :		N/A
5.1.5.2.6	Wiring terminals		-
	IP1X according to 5.1 of IEC 60529 :		P
	- Symbol 12 :		P
5.1.1.3	Permissible limits for accessible parts		-

IEC 60255-27			
Clause	Requirement – Test	Result – Remark	Verdict
5.1.5.3.1	General..... :		P
	Values of 5.1.5.3.2 in normal operational condition and nor those of 5.2.4.1.2 in single-fault condition.		P
5.1.5.3.2	Values under normal conditions		-
	a) Voltage limits less than 33 V r.m.s. or 70 V d.c. :		P
	for wet locations voltage limits less than 25 V r.m.s. or 37.5V d.c. :	Communication port was accessible conductive part that voltage less than 25 V r.m.s. or 37.5 V d.c.	P
	Voltages are not hazardous live the levels of:	Communication port.	P
	b) Current less than 0,5 mA r.m.s. for sinusoidal, 0,7 mA peak non-sinusoidal or mixed frequencies or 2 mA d.c. when measured with measuring circuit A.1 or A.2 if less than 100 Hz		N/A
	for WET LOCATIONS measuring circuit A.4 used		N/A
	70 mA r.m.s. when measured with circuit A.3 for higher frequencies :		N/A
	c) Levels of capacitive charge or energy less:		N/A
	1) 45 µC for voltages up to 15 kV peak or d.c. or line A of Figure 3 of IEC 61010-1:2010		N/A
	2) 350 mJ stored energy for voltages above 15 kV peak or d.c.		N/A
5.1.6	Bonding to the protective conductor		-
5.1.6.1	Insulation between live parts and accessible conductive parts		P
	Accessible conductive parts :		P
	Unearthed accessible conductive parts:		P
	- separated from by double insulation or reinforced insulation, or..... :		P
	- Equipment of class I protection..... :		P
5.1.6.2	Protective bonding		P
	Accessible conductive parts bonded, or		P
	- EVL circuit protected in case of direct contact of 5.1.5..... :		P
	- magnetic cores are used..... :		P
	- parts of small dimensions separated from hazardous live parts by at least basic insulation :		P
5.1.6.3	Bonding of parts connected to the protective conductor..... :		P

IEC 60255-27			
Clause	Requirement – Test	Result – Remark	Verdict
5.1.6.4	Protection against corrosion..... :		P
5.1.6.5	Interruption of protective bonding..... :	No such protective bonding.	N/A
5.1.7	Protective conductor connection..... :		P
	- means of connection..... :		P
	- suitable for use..... :		P
	- not be used as a part of the mechanical assembly..... :		P
5.1.8	High leakage current..... :	Measured continuous leakage current was 2.05 mA, and the EUT was permanently connected equipment.	N/A
5.1.9	Solid insulation		-
5.1.9.1	General..... :		P
5.1.9.2	Requirements..... :		P
5.1.10	Clearances and creepage distances		-
5.1.10.1	General..... :		P
5.1.10.2	Clearances..... :		P
5.1.10.2.1	General..... :		P
5.1.10.2.2	Clearances for primary circuits..... :	(see appended table 10.6.3)	P
5.1.10.2.3	Clearances for non-primary circuits..... :	(see appended table 10.6.3)	P
5.1.10.2.4	Creepage distances..... :	(see appended table 10.6.3)	P
5.1.11	Functional earthing..... :		P
	Requirements:		P
	- Connection to protective conductor terminal permitted..... :		P
	- separated by a functional insulation..... :		P
	- separated from parts at hazardous voltage by..... :		P
	1) double insulation or reinforced insulation : or		P
	2) a protectively earthed screen or another protectively earthed conductive part, separated from parts at hazardous voltages by at least basic insulation:		P
5.2	Single-fault conditions		-
5.2.1	Testing in single-fault condition	(see appended table 5.2)	P
	not risk of electric shock or fire after a single-fault test..... :		P

IEC 60255-27			
Clause	Requirement – Test	Result – Remark	Verdict
5.2.2	Application of single-fault condition		P
5.2.2.1	General..... :		P
5.2.2.2	Protective impedance..... :		N/A
5.2.2.3	Transformers..... :		P
5.2.2.4	Outputs..... :		P
5.2.2.5	Insulation between circuits and parts..... :		P
5.2.2.6	Primary circuits and hazardous voltage non-primary circuits..... :		P
5.2.2.7	Overloads..... :		P
5.2.2.8	Intermittently rated resistors..... :	No such resistors used.	N/A
5.2.2.9	DC inputs..... :		P
5.2.3	Duration of tests..... :		P
5.2.4	Compliance		-
5.2.4.1	Compliance with requirements for electric shock protection		-
5.2.4.1.1	General..... :		P
5.2.4.1.2	Values in single-fault condition	(see appended table 5.2)	P
	a) Voltage limits less than 55 V r.m.s. or 140 Vd.c. :		P
	- For temporary voltages, limits less than 55 V r.m.s. and 78 V peak or 140 V d.c.		P
	- for wet locations voltage limits less than 33V r.m.s. or 70d.c. :	Communication port was accessible conductive part that voltage less than 33 V r.m.s. or 70 V d.c.	P
	b) Current less than 3,5 mA r.m.s. for sinusoidal, 5 mA peak non-sinusoidal or mixed frequencies or 15 mA d.c. when measured with measuring circuit A.1 or A.2 if less than 100 Hz or 500mA r.m.s (Figure with $R_B = 75 \Omega$ Relates to possible burns in the frequency range 30 kHz to 500 kHz)		N/A
	- for wet locations measuring circuit A.4 used (with $R_S = 375 \Omega$ (instead of 1 500 Ω) :		N/A
	- Current less than 3,5 mA r.m.s. for sinusoidal, 5 mA peak non-sinusoidal or mixed frequencies or 15 mA d.c :		N/A
	c) capacitance level is that defined in Figure 3. curve B in IEC 61010-1:2010 :		N/A

IEC 60255-27			
Clause	Requirement – Test	Result – Remark	Verdict
5.2.4.2	Compliance with requirements for temperature protection..... :		P
5.2.4.3	Compliance with requirements for protection against the spread of fire..... :		P
5.2.4.4	Compliance with requirements for hazardous gases and chemicals..... :		P
5.2.4.5	Compliance with requirements for mechanical protection		P
6	Mechanical aspects		-
6.1	Protection against mechanical hazards		-
6.1.1	Stability..... :		P
6.1.2	Moving parts..... :		P
6.1.3	Edges and corners..... :		P
6.2	Mechanical requirements		P
	Mechanical tests requirements of 10.6.2.1 to 10.6.2.4. :		P
	Higher severity levels..... :		N/A
6.3	Mechanical security of terminations	(see Annex E)	P
7	Flammability and resistance to fire		-
7.1	General		P
	reducing the risk of fire by one of the following means:		-
	- Eliminating or reducing the sources of ignition within the equipment..... :		P
	- Reducing the amount of combustible (or flammable) materials within the equipment..... :		P
	- Containment of a fire within the equipment..... :		P
7.2	Rationale		P
	Risk of fire in normal and single fault condition..... :		P
	In order for a risk of fire within the equipment to exist, all three of the following basic elements shall exist:		P
	- The equipment circuits shall have sufficient power or energy to be an ignition source.. :		P
	- There shall be oxygen present (air is about 21 % oxygen)..... :		P

IEC 60255-27			
Clause	Requirement – Test	Result – Remark	Verdict
	- There shall be combustible materials present to support the combustion process		P
	Conformity is checked by minimum one or a combination of the following (see Figure 1):		P
	- Equipment temperature limits of 7.3.1		P
	- Single Fault test of 7.11 and 10.6.5.5		P
	- Minimization of fire risk and reducing sources of ignition of 7.4 and 7.4.2		P
	- Containment of a fire within equipment of 7.10		P
7.3	General hazards from overheating and fire		-
7.3.1	Equipment temperature limits:		P
	- In normal conditions.....	(See appended table 7.3)	P
	- In single-fault condition (limits of clause 7.11)	(See appended table 5.2)	P
	Symbol 13 of Table 10.....		P
	Symbol 14 of Table 10.....		P
7.3.2	Hazardous gases and chemicals	No gases and chemicals used.	-
	Manufacturer's documentation		N/A
7.4	Minimization of fire risk		-
7.4.1	General:		P
	Critical components of primary circuits and circuits exceeding ELV voltage limits. Compliance with Annex D		P
7.4.2	Eliminating or reducing the sources of ignition within the equipment		P
	a) Either 1) or 2)		P
	1) Limited-energy circuit as specified in 7.12		P
	2) Insulation between parts at different potentials, compliance with clause 7.11		P
	b) circuits designed to produce heat in compliance with clause 5.2.....		N/A
	Circuits not classified as limited-energy circuits. Method i) or ii) below shall be used.		P
	i) Testing in the single-fault conditions in compliance with clause 5.2		P
	ii) Verifying as in 7.11 that if a fire occurs it will be contained within the equipment.....		P

IEC 60255-27			
Clause	Requirement – Test	Result – Remark	Verdict
7.5	Cabling and fusing		P
	Manufacturer's recommendations:		P
	- Connection cables: minimum cross-section and voltage rating		P
	- Protection devices		P
7.6	Flammability of materials and components		-
7.6.1	General		P
	Conformity is checked by inspection		P
	Tests in compliance with IEC 60695-11-10.....		P
7.6.2	Materials for components and other parts inside fire enclosures		P
7.6.3	Materials for fire enclosures		P
7.6.4	Materials for components and other parts outside fire enclosures		P
7.7	Fire ignition sources		P
7.8	Conditions for a fire enclosure	Metal enclosure used.	-
7.8.1	General		P
7.8.2	Parts requiring a fire enclosure		P
7.8.3	Parts not requiring a fire enclosure		P
7.9	Requirements for primary circuits and circuits exceeding ELV limits		P
7.10	Fire enclosures and flame barriers		-
	Enclosure meets following requirements:	No opening in the metal enclosure.	P
	Bottom:		P
	- no openings, or		P
	- to the extent in Figure 3, shall be constructed with baffles as specified in Figure 2, or		N/A
	- be made of metal, perforated as specified in Table 6, or		N/A
	- be a metal screen with a mesh not exceeding 2 mm x 2 mm centre to centre and a wire diameter of at least 0,45 mm ..		N/A
	The sides shall have no openings within the area that is included within the inclined line C in Figure 3 or.....		N/A
	Case and baffle or flame barrier		N/A

IEC 60255-27			
Clause	Requirement – Test	Result – Remark	Verdict
7.11	Assessment of the fire risk due to a single-fault condition		-
7.11.1	Guidelines for maximum acceptable temperatures when subjecting a circuit or component to a single-fault condition		P
7.11.2	Temperature of windings under a normal condition or a single-fault condition	(See appended table 7.3 and 5.2)	P
7.11.3	Compliance of equipment with requirements for protection against the spread of fire		P
7.12	Limited-energy circuit	Not applied.	N/A
	a) Potential not more than 33 r.m.s. or 70 V dc		N/A
	b) Current limited by one of following means:		N/A
	3) Inherently or by impedance (see Table 8); or		N/A
	4) Overcurrent protective device (see Table 9); or		N/A
	5) A regulating network limits also in single fault condition (see Table 8)		N/A
	c) Is separated by at least basic insulation		N/A
	Fuse or a nonadjustable electromechanical device is used		N/A
8	General and fundamental design requirements for safety		-
8.1	Climatic conditions for safety		P
	Environmental ranges declared by the manufacturer:		P
	- temperature, operation and storage..... :		P
	- humidity, non-condensing		P
	- atmospheric pressure		P
8.2	Electrical connections		P
	- electrical terminations and connection points..... :		P
	- protective bonding..... :	(See appended table 10.6.4.5)	P
	- wires and cables		P
	- Conductors		P
	- electrical connections		P
8.3	Components		-
8.3.1	General	(See appended table 8.3)	P
8.3.2	High-integrity part or component		P

IEC 60255-27			
Clause	Requirement – Test	Result – Remark	Verdict
8.4	Connection to telecommunication networks Requirements according to IEC 62151	Not connect to telecommunication networks	N/A
8.5	Connection to other equipment Requirements in accordance with Table A.1		P
8.6	Laser sources Requirements in accordance with IEC 60825-1	No such device.	N/A
8.7	Explosion		-
8.7.1	General		P
8.7.2	Components at risk of explosion		-
8.7.2.1	General	(see clause 5.2.4.5)	P
8.7.2.2	Batteries	No battery used	N/A
	Compliance with Annex F		N/A
	Marking and warning		N/A
	Rechargeable batteries		N/A
	Battery compartment		N/A
	Batteries intended to be replaced by the user		N/A
9	Marking, documentation and packaging		-
9.1	Marking		-
9.1.1	General		P
	Removable parts		P
	Symbols according to table 9.		P
	Rack or panel equipment		P
	Voltages, currents, frequency and their tolerances according to IEC 60255-6		P
9.1.2	Identification		-
	Equipment is identified on the equipment by		P
	a) Manufacturer's or supplier's name or trademark		P
	b) Model or type reference		P
	Manufacturing location identified		P
9.1.3	Auxiliary supplies, VT, CT, I/O9	No such device.	-
9.1.3.1	General requirements for marking		-
	For marking the following should be taken into account:		N/A
	a) a.c. – with symbol 2 of Table 9 and rated frequency or frequency range		N/A
	b) d.c. – with symbol 1 of Table 9		N/A

IEC 60255-27			
Clause	Requirement – Test	Result – Remark	Verdict
	c) symbol 3 of Table 9 on equipment for a.c. and d.c. supply..... :		N/A
	d) symbol 4 of Table 9 on equipment for 3 phase a.c. supply..... :		N/A
	e) a hyphen (-) shall be used to separate the lower and upper nominal voltages, for example, 125 V-230 V..... :		N/A
	f) for measurands either a hyphen (-) or an ellipse (...) shall be used to separate the lower and upper voltages..... :		N/A
	g) for selectable voltage or current markings:		N/A
	- the lower and upper selectable values shall be separated by means of a solidus, i.e. forward slash (/)..... :		N/A
	- voltages or frequencies where switching is automatic then the markings shall be according to symbol 15 of Table 9 or the word "AUTO"..... :		N/A
	- operating voltage achieved using an external, separate device, use +EXT.R. ... :		N/A
	h) the burden in watts (active power) or volt-amperes (apparent power) or the rated input current, with all accessories or plug-in modules connected :		N/A
	The documentation shall specify the burden..... :		N/A
	The measured value shall not exceed the marked value by more than 10 %..... :		N/A
	i) the rated supply voltage(s) or the rated supply voltage range..... :		N/A
	- voltage range more than 20 % of the mean value..... :		N/A
	- different rated supply voltages..... :		N/A
9.1.3.2	Auxiliary supply		-
	The following information shall be provided:		-
	a) on the equipment and in the documentation..... :		N/A
	- a.c. and/or d.c. supply..... :		N/A
	- the rated values..... :		N/A
	b) in the documentation..... :		N/A
	- the burden..... :		N/A
9.1.3.3	Measurands		-
	The following information shall be provided:		N/A

IEC 60255-27			
Clause	Requirement – Test	Result – Remark	Verdict
	a) on the equipment and in the documentation..... :		N/A
	- the nominal values, for example, voltage, current, frequency..... :		N/A
	b) in the documentation..... :		N/A
	- the burden..... :		N/A
	- the overload withstand :		N/A
9.1.3.4	Inputs		-
	The following information shall be provided in the documentation :		N/A
	a) a.c. and/or d.c. supply :		N/A
	b) the rated values..... :		N/A
	c) burden on the supply input..... :		N/A
9.1.3.5	Outputs		-
	The following information shall be provided in the documentation :		N/A
	a) the kind of output, for example, relay, optocoupler etc..... :		N/A
	b) burden on the supply input :		N/A
	c) the switching capability on/off :		N/A
	d) the switching voltage :		N/A
	e) the permissible current, continuous value and short time value for 1 s :		N/A
	f) withstand voltage across open contacts..... :		N/A
9.1.4	Fuses	No such device used.	-
	Operator replaceable fuse marking :		N/A
	Not replaceable by the user :		N/A
9.1.5	Measuring circuit terminals		-
	Marking shall be adjacent to the measuring terminals :		N/A
	If insufficient space, symbol 14 used..... :		N/A
	Symbol 14 and/or 12 of Table 9 :		N/A
	Voltage 33 V a.c. or 70 V d.c. :		N/A
	Exceptions :		N/A
9.1.6	Terminals and operating devices		-
	Safety markings :		P
	AC or d.c. supply :		P
	Operating device markings :		P

IEC 60255-27			
Clause	Requirement – Test	Result – Remark	Verdict
	Functional earth terminals..... :		N/A
	Protective conductor terminals..... :		P
	Marking place :		P
	Plug/socket device..... :		P
	Marking for accessible terminals..... :		P
	Marking for lasers or high-intensity infra-red diodes of class 2 rating or higher :		N/A
9.1.7	Equipment protected by double or reinforced insulation..... :		N/A
9.1.8	Batteries		-
9.1.8.1	Replaceable batteries..... :	No battery used.	N/A
	Battery accessible to the user :		N/A
	Battery not accessible to the user :		N/A
	Polarity of the battery..... :		N/A
9.1.8.2	Charging :		N/A
9.1.9	Test voltage marking :		N/A
9.1.10	Warning markings		-
	Rack- or panel-mounted equipment :	Wall mounted equipment.	P
	Access in normal use :		P
	Equipment documentation :		P
	Batteries..... :		N/A
	Warning markings size :		N/A
9.1.11	Marking durability :		P
9.2	Documentation		-
9.2.1	General :		P
	Explanation of warning symbols :		P
	Protective conductor connections..... :		P
	Equipment ratings, operating instructions and installation instructions :		P
	Information specified in 9.2.2 to 9.2.5..... :		P
	Intended use :		P
9.2.2	Equipment ratings	See rating label	-
9.2.2.1	General		P
	Overvoltage category :	OVC III for MAINS; OVC II for PV	P
	Rated voltage(s) or voltage range(s) (V) :		P

IEC 60255-27			
Clause	Requirement – Test	Result – Remark	Verdict
	Rated frequency or rated frequency range (Hz):		P
	Rated power (W) rated current (mA or A)		P
	Nominal functional value		P
	Input and output connections		P
9.2.2.2	Fuses and external protective devices		-
	Fuse ratings		N/A
	External device	According to user manual the circuit breaker should use in final Installation.	P
9.2.2.3	Environmental requirement		-
	IP rating.....	IP65	P
	Pollution degree	PD2 (Inside); PD3 (Outside)	P
	Insulation class.....	Class I	P
9.2.3	Equipment installation		-
	Safe mounting.....		P
	Protective earthing.....		P
	Ventilation requirements.....		P
	Digital input circuits and output relays		N/A
	Wire.....		P
	External devices		P
9.2.4	Equipment commissioning and maintenance		-
	Fault-finding and repair		P
	Equipment part		P
	Safe methods for changing and disposal of:		-
	Accessible fuses		N/A
	Replaceable batteries.....		N/A
	Re-charging and/or replacement for re-chargeable batteries		N/A
	Fibre-optic output devices		N/A
9.2.5	Equipment operation		-
	Operating instructions:		-
	- CT circuits		N/A
	- Responsibility of the user		P
	- pictures and symbols used		P
9.3	Packaging		P
10	Type tests and routine tests		-

IEC 60255-27			
Clause	Requirement – Test	Result – Remark	Verdict
10.1	General..... :		P
10.2	Safety type tests :		P
10.3	Routine testing or sample testing :		N/A
10.4	Conditions for testing..... :	Considered.	P
10.5	Verification procedure..... :	Considered.	P
10.6	Tests		-
10.6.1	Climatic environmental tests		-
10.6.1.1	Dry-heat test – operational. Tests according to IEC 60255-1 :	Test Bd of IEC60068-2-2 60°C,16h.	P
10.6.1.2	Cold test – operational. Tests according to IEC 60255-1 :	Test Bd of IEC60068-2-1 -30°C, 16h.	P
10.6.1.3	Dry heat test at maximum storage temperature. Tests according to IEC 60255-1 :	Test Bb of IEC60068-2-2 60°C, 16h	P
10.6.1.4	Cold test at minimum storage temperature. Tests according to IEC 60255-1 :	Test Bd of IEC60068-2-1 -30°C, 16h	P
10.6.1.5	Damp-heat test. Tests according to IEC 60255-1 :	Test Cab of IEC60068-2-78 40°C, 93%, 10d	P
10.6.1.6	Cyclic temperature with humidity test. Tests according to IEC 60255-1 :	Test Db: IEC 60068-2-30	P
10.6.2	Mechanical tests		-
10.6.2.1	Vibration Tests according to IEC 60255-21-1..... :	1. Frequency: 10-150Hz; 2. Acceleration:1g; 3. Cycle Time:8 min / axis, total 20 cycles / axis; 4. Direction: X, Y ,Z axis.	P
10.6.2.2	Shock Tests according to IEC 60255-21-2..... :	1. Acceleration: 15g 2. Duration: 11ms; 3. Times: 3 times / direction, total 18 times, 4.Direction: ±X, ±Y , ±Z axis.	P
10.6.2.3	Bump Tests according to IEC 60255-21-2..... :	1. Acceleration: 10g 2. Duration: 16ms; 3. Number: 1000 times / direction. 4. Direction: ±X, ±Y , ±Z axis.	P

IEC 60255-27			
Clause	Requirement – Test	Result – Remark	Verdict
10.6.2.4	Seismic Tests according to IEC 60255-21-3..... :	1.Frequency: 1-35Hz; 2. Cross-over Frequency: 8-9Hz; 3. Horizontal (X, Y): Peak Displacement : 3.5mm; Acceleration: 1.0g; 4. Vertical (Z); 5. Cycle time: 10 min/ axis; 6. Direction: X, Y, Z axis.	P
10.6.2.5	Accessible parts test	(See clause 5.1.5)	P
10.6.2.6	Dust/water ingress protection Tests according to IEC 60529 :	IP 65	P
10.6.3	Clearances and creepage distances		-
	Compliance with Annex C :	(see appended table 10.6.3)	P
	Compliance with clause 5.1.10.2.2..... :	(see appended table 10.6.3)	P
	Transient suppressor used to reduce the overvoltage. Tests according to IEC 60255-26..... :		N/A
10.6.4	Safety-related electrical tests		-
10.6.4.1	General..... :		P
10.6.4.2	Impulse voltage test		-
10.6.4.2.1	General..... :		P
10.6.4.2.2	Test procedures..... :		P
10.6.4.2.3	Waveform and generator characteristics..... :		P
10.6.4.2.4	Selection of impulse test voltage :		P
10.6.4.2.4.1	General..... :		P
	Altitudes(m) :		P
10.6.4.2.4.2	Equipment to tested at 5 kV peak nominal		P
10.6.4.2.4.3	Equipment to tested at 1 kV peak nominal		N/A
	- auxiliary (power supply) circuits :		N/A
	- equipment power supply :		N/A
	- I/O circuits :		N/A
10.6.4.2.5	Performing of tests		P
	test performed between the followings part:	(see appended table 10.6.4.2)	P

IEC 60255-27			
Clause	Requirement – Test	Result – Remark	Verdict
	- between each circuit specified for the same impulse voltage		P
	- between independent circuits		P
	- across the terminals of a given circuit.....		P
	Equipment with an insulated case.....		P
10.6.4.2.6	Test acceptance criteria		-
	During the tests		P
	After the tests		P
10.6.4.2.7	Repetition of the impulse voltage test		P
10.6.4.3	AC or d.c. dielectric voltage test		-
10.6.4.3.1	General.....		P
10.6.4.3.2	Performing the dielectric voltage test	(see appended table 10.6.4.3)	-
10.6.4.3.2.1	Type tests		-
	test performed between the followings part:		P
	- between each circuit and the accessible conductive parts		P
	- between independent circuits		P
	- dielectric voltage withstand, for open metallic contacts.....		P
10.6.4.3.2.2	Routine tests.....		N/A
10.6.4.3.2.3	Routine tests by sampling		N/A
10.6.4.3.3	Value of the dielectric test voltage.....		P
10.6.4.3.4	Test voltage source		P
10.6.4.3.5	Test method.....		P
10.6.4.3.6	Test acceptance criteria		P
10.6.4.3.7	Repetition of the dielectric voltage test.....		P
10.6.4.4	Insulation resistance.....	(See appended table 10.6.4.4)	P
10.6.4.5	Protective bonding tests	(See appended table 10.6.4.5)	P
10.6.5	Electrical environment and flammability		-
10.6.5.1	Maximum temperature of parts and materials.....		P
10.6.5.2	Flammability of insulating materials, components and fire enclosures		N/A
10.6.5.3	Thermal short-time test		-

IEC 60255-27			
Clause	Requirement – Test	Result – Remark	Verdict
	Overvoltage		N/A
	Overcurrent.....		N/A
10.6.5.4	Output relay parameters Parameters in according to IEC 60255-26		N/A
10.6.5.5	Single-fault condition	(See appended table 5.2)	P
10.6.6	Reverse polarity and slow ramp test	(See appended table 5.2)	P
A	ANNEX A, ISOLATION CLASS REQUIREMENTS AND EXAMPLE DIAGRAMS (NORMATIVE) (see 5.1.2; 5.1.6.2; 5.1.10)		P
B	ANNEX B, RATED IMPULSE VOLTAGES (NORMATIVE) (see 5.1.2.2)		P
C	ANNEX C, GUIDANCE FOR THE DETERMINATION OF CLEARANCE, CREEPAGE DISTANCE AND WITHSTAND VOLTAGES (NORMATIVE) (see 5.1.2.2; 5.1.4; 5.1.10; 10.6.3)		P
D	ANNEX D, COMPONENTS (INFORMATIVE) (see 7.4.1; 8.3; 8.7.1)		P
E	ANNEX E, EXTERNAL WIRING TERMINATIONS (NORMATIVE) (see 6.3)		-
E.1	General		P
E.2	Permanently connected equipment		P
	a) a set of terminals; or		P
	b) a non-detachable power supply cable.		N/A
	terminals		P
	screws and nuts		P
	power supply cables:		N/A
	a) two independent fixings.....		N/A
	b) mechanical fixing of the cables		N/A
E.3	Conductors		N/A
	Connection of conductors in compliance with Table E1.		N/A
E.4	Terminals		P
	Contact pressure size in compliance with Table E2.		P
	Terminals contact pressure.....		P
	Slipping of the conductor.....		P

IEC 60255-27			
Clause	Requirement – Test	Result – Remark	Verdict
	Terminals shall be so fixed that when the means of clamping the conductor is tightened or loosened:		P
	a) the terminal itself does not work loose :		P
	b) internal wiring is not subjected to stress..... :		P
	Ordinary non-detachable power supply cables :		N/A
	c) creepage distances and clearances are not reduced below the values specified in Annex C. :		P
F	ANNEX F, EXAMPLES OF BATTERY PROTECTION (INFORMATIVE) (see 8.7.2.2)		N/A

IEC 60255-27

5.2		TABLE: Fault condition tests						P
No.	component No.	fault	test voltage (V)	test time	fuse No.	fuse current (A)	Comments/ Observation	
1	Relay RL4	Short circuit before energized	Input:520V dc Output:230 Vac	10min	--	--	Indicate Relay fault, error code "ID41" (RecoverRelayFail). Do not connect to AC mains. No damage, no hazards.	
2	Relay RL1	Short circuit before energized	Input:520V dc Output:230 Vac	10min	--	--	Indicate Relay fault, error code "ID41" (RecoverRelayFail). Do not connect to AC mains. No damage, no hazards.	
3	Relay RL2	Short circuit before energized	Input:520V dc Output:230 Vac	10min	--	--	Indicate Relay fault, error code "ID41" (RecoverRelayFail). Do not connect to AC mains. No damage, no hazards.	
4	Relay RL5	Short circuit before energized	Input:520V dc Output:230 Vac	10min	--	--	Indicate Relay fault, error code "ID41" (RecoverRelayFail). Do not connect to AC mains. No damage, no hazards.	
5	Rectifier bridge BR1	S/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c. relays operated immediately, disconnected with grid. No damage, no hazards.	
6	Q23 (Pin G-S)	Short circuit before energized	Input:520V dc Output:230 Vac	10min	--	--	Indicate Relay fault, error code "ID41" (RecoverRelayFail). Do not connect to AC mains. No damage, no hazards.	
7	Q17 (Pin G-S)	Short circuit before energized	Input:520V dc Output:230 Vac	10min	--	--	Indicate Relay fault, error code "ID41" (RecoverRelayFail). Do not connect to AC mains. No damage, no hazards.	
8	Q18 (Pin G-S)	Short circuit before energized	Input:520V dc Output:230 Vac	10min	--	--	Indicate Relay fault, error code "ID41" (RecoverRelayFail). Do not connect to AC mains. No damage, no hazards.	
9	Q16 (Pin G-S)	Short circuit before energized	Input:520V dc Output:230 Vac	10min	--	--	Indicate Relay fault, error code "ID41" (RecoverRelayFail). Do not connect to AC mains. No damage, no hazards.	
10	RCM/LP 1 pin GND-Vout	S/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c. relays operated, disconnected with grid, error code "ID05" (GFCI fault). No hazards.	

IEC 60255-27

11	Monitoring voltage defect R203	O/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c. relays operated, disconnected with grid, error code "GridUVP". No damage. No hazards.
12	Monitoring voltage defect R219	O/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c. relays operated, disconnected with grid, error code "GridUVP". No damage. No hazards.
13	U1 pin 485-1TX 485-1RX	S/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c. relays operated, disconnected with grid. 4851 Communication failure. No damage. No hazards.
14	U1 pin 485-2TX 485-2RX	S/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c. relays operated, disconnected with grid. 4852 Communication failure. No damage. No hazards.
15	U1 pin ARMT o DSP ARMF r o m DSP-TX	S/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c. relays operated, disconnected with grid. SCI Communication failure. No damage. No hazards.
16	U1 pin M_CAN _R X M_CAN _T X	S/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c. relays operated, disconnected with grid. CAN Communication failure. No damage. No hazards
17	U1, +3.3V.S	O/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c. relays operated, disconnected with grid. SCI Communication failure. No damage. No hazards
18	PV voltage monitoring R283	S/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c. relays operated, disconnected with grid. No damage. No hazards
19	PV voltage monitoring R277	S/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c. relays operated, disconnected with grid. No damage. No hazards

IEC 60255-27

20	L to N(grid)	Reversed	Input:520V dc Output:230 Vac	10min	--	--	EUT operationed normally. No damage, no hazards.
21	C324	S/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c. relays operated, disconnected with grid. L2, L7 damaged. No hazards.
22	EC2	S/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c. relays operated, disconnected with grid. EC2 damaged. No hazards.
23	EC3	S/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c. relays operated, disconnected with grid. EC3 damaged. No hazards
24	Q61 pin D- S	S/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c. relays operated, disconnected with grid. No damaged. No hazards
25	Q16 pin D- S	S/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c. relays operated, disconnected with grid, error code "ID81" (SwBatOCP). No damage, no hazards.
26	Q17 pin D- S	S/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c. relays operated, disconnected with grid, error code "ID81" (SwBatOCP). No damage, no hazards..
27	Q18 pin D- S	S/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c. relays operated, disconnected with grid, error code "ID81" (SwBatOCP). No damage, no hazards..
28	Q19 pin D- S	S/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c. relays operated, disconnected with grid, error code "ID81" (SwBatOCP). No damage, no hazards..
29	D13	S/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c. relays operated, disconnected with grid, error code "ID69" (PVOVP). No damaged, no hazards..
30	R28	O/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c. relays operated, disconnected with grid, error code "ID69" (PVOVP). No damaged, no hazards.

IEC 60255-27

31	R68	O/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c. relays operated, disconnected with grid, error code "ID71" (LLCBusOVP). No damaged, no hazards.
32	R32	O/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c. relays operated, disconnected with grid, error code "ID71" (LLCBusOVP). No damaged, no hazards.
33	R71	O/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c. relays operated, disconnected with grid, error code "ID71" (LLCBusOVP). No damaged, no hazards.
34	Q27	S/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c. relays operated, disconnected with grid, error code "ID71" (LLCBusOVP). No damaged, no hazards.
35	Q9 G-C	pin S/C	Input:520V dc Output:230 Vac	10min	--	--	The EUT shut down immediately. Q9,Q13 damaged, No hazards.
36	Q8 G-C	pin S/C	Input:520V dc Output:230 Vac	10min	--	--	The EUT shut down immediately. Q8,Q14 damaged, No hazards.
37	Q7 G-C	pin S/C	Input:520V dc Output:230 Vac	10min	--	--	The EUT shut down immediately. Q7 damaged, No hazards.
38	Q12 G-C	pin S/C	Input:520V dc Output:230 Vac	10min	--	--	The EUT shut down immediately. Q12 damaged, no hazards.
39	Q1 G-S	pin S/C	Input:520V dc Output:230 Vac	10min	--	--	The EUT shut down immediately. Q1, Q2, Q3, Q6 damaged, no hazards.
40	Q2 G-S	pin S/C	Input:520V dc Output:230 Vac	10min	--	--	The EUT shut down immediately. Q1, Q2, Q3, Q6 damaged, no hazards.
41	R531	Shorted before start up	Input:520V dc Output:230 Vac	10min	--	--	Indicate ISO fault, error code"ID42 (IsoFault)", No damaged, No hazards

IEC 60255-27

42	R602	Shorted before start up	Input:520V dc Output:230 Vac	10min	--	--	Indicate ISO fault, error code"ID42 (IsoFault)", No damaged, No hazards
43	R611	Shorted before start up	Input:520V dc Output:230 Vac	10min	--	--	Indicate ISO fault, error code"ID42 (IsoFault)", No damaged, No hazards
44	R620	Shorted before start up	Input:520V dc Output:230 Vac	10min	--	--	Indicate ISO fault, error code"ID42 (IsoFault)", No damaged, No hazards
45	EC25	Shorted before start up	Input:520V dc Output:230 Vac	10min	--	--	Indicate ISO fault, error code"ID42 (IsoFault)", No damaged, No hazards
46	EC27	S/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c.relays operated, disconnected with grid. error code"ID17(HwADFaultIGrid) No damaged. No hazards.
47	EC16	S/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c.relays operated, disconnected with grid. error code"ID17(HwADFaultIGrid) No damaged. No hazards.
48	EC17	S/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c.relays operated, disconnected with grid. error code"ID17(HwADFaultIGrid) No damaged. No hazards.
49	EC29	S/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c.relays operated, disconnected with grid. error code"ID17(HwADFaultIGrid) No damaged. No hazards.
50	EC31	S/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c.relays operated, disconnected with grid. error code"ID17(HwADFaultIGrid) No damaged. No hazards.
51	EC18	S/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c.relays operated, disconnected with grid. error code"ID17(HwADFaultIGrid) No damaged. No hazards.

IEC 60255-27

52	EC23	S/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c.relays operated, disconnected with grid. error code"ID17(HwADFaultIGri d) No damaged. No hazards.
53	EC32	S/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c.relays operated, disconnected with grid. SCI Communication failure No damaged. No hazards.
54	U4 pin M_LINR X M_LINT X	S/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c.relays operated, disconnected with grid. M_LINRX Communication failure No damaged. No hazards.
55	INSYN , TX1, INSYN , RX1	S/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c.relays operated, disconnected with grid. error code"ID47(ParallelFault) No damaged. No hazards.
56	C384	S/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c.relays operated, disconnected with grid. error code"ID81(SwBatOCP) No damaged. No hazards.
57	EC6	S/C	Input:520V dc Output:230 Vac	10min	--	--	The EUT shut down immediately. No damaged, no hazards.
58	EC9	S/C	Input:520V dc Output:230 Vac	10min	--	--	The EUT shut down immediately. No damaged, no hazards.
59	EC11	S/C	Input:520V dc Output:230 Vac	10min	--	--	The EUT shut down immediately. No damaged, no hazards.
60	U58	S/C	Input:520V dc Output:230 Vac	10min	--	--	The EUT shut down immediately. No damaged, no hazards.
61	C463	S/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c.relays operated, disconnected with grid. error code"GFCI fault" No damaged. No hazards.
62	C105	S/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c.relays operated, disconnected with grid. error code"CT current fault" No damaged. No hazards.

IEC 60255-27

63	C130	S/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c.relays operated, disconnected with grid. error code" OverTempDerating" No damaged. No hazards.
64	C107	S/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c.relays operated, disconnected with grid. error code" HwLLCBusOCP" No damaged. No hazards.
65	C120	S/C	Input:520V dc Output:230 Vac	10min	--	--	Output a.c.relays operated, disconnected with grid. error code" HwLLCBusOCP" No damaged. No hazards.
66	PV1+ and PV1-	Revers ed	Input:520V dc Output:230 Vac	10min	--	--	PCE did not work, indicate: PV1 HWOCP;PV1 OCP No damaged. No hazards.
67	Bat+ and Bat-	Revers ed	Input:520V dc Output:230 Vac	10min	--	--	PCE did not work, Q16, Q17, Q18, Q19, Q21, Q22, Q23, Q24 damaged. No hazards.
68	Bat+ and Bat-	S/C	Input:520V dc Output:230 Vac	10min	--	--	PCE did not work, Q16, Q17, Q18, Q19, Q21, Q22, Q23, Q24 damaged. No hazards.

Supplementary information:
 S/C: Short circuit, O/C: Open circuit
 During the test:
 Fire do not propagates beyond the PCE;
 Equipment do not emitt molten metal;
 Enclosures do not deform to cause non-compliance with the standard.
 Pass the dielectric test.

Tested on model HYD 6000-EP

7.3	TABLE: Heating Test				P
	test voltage (V) :	See below			—
	t1 (°C) :	See below			—
	t2 (°C) :	See below			—
Thermocouple Locations	Max. temperature measured (°C)				Max. temperature limit (°C)
Test Condition:	PV input for all AC output mode				--
Test voltage	300Vdc,21.0A; 207Vac,29.0A	300Vdc,18.6A; 207Vac,25.7A	300Vdc,21.0A; 253Vac, 23.7A	300Vdc,17.2A; 253Vac,19.4A	--
Ambient	45.0	60.6	45.5	60.4	--
Enclosure, front	58.0	68.1	56.0	68.3	100*

IEC 60255-27

Display panel	51.9	64.5	51.0	64.4	75
Load terminal	49.9	63.0	49.3	63.3	90
DC switch	49.1	62.8	47.5	61.6	85
PV terminal	53.4	65.1	52.2	64.8	90
PCB on display board	65.9	74.3	63.9	74.5	130
Enclosure, side	56.8	68.3	56.2	68.3	100*
Mounting surface	69.8	75.6	71.0	74.5	90
Enclosure, top	63.3	72.3	62.8	73.9	100*
Relay RY1	74.8	81.9	71.0	79.9	85
PCB on the output board	82.5	87.8	75.7	83.5	130
X Cap, C94	69.3	76.7	65.7	76.1	110
Film cap C145	70.0	77.6	68.4	77.6	105
MOV RVP5	69.4	77.0	67.6	77.1	85
Y Cap C138	68.9	76.1	66.6	76.5	125
Capacitor C146	69.1	76.7	66.5	76.6	105
Relay RL9	68.8	75.9	65.0	75.8	85
Hall HL4	68.9	76.3	65.8	76.3	85
DC chock L1	80.7	80.6	79.4	83.9	110
PV power line	75.1	71.9	61.4	72.3	105
DC switch, inside	65.0	72.6	62.5	73.6	85
DC chock L2	84.6	84.2	78.7	85.4	110
DC chock lead wires	68.3	75.1	65.4	76.0	105
INV chock lead wires	71.9	77.9	67.5	77.6	105
INV chock L4	91.3	95.7	85.7	92.6	110
DC chock P8	68.5	74.0	66.1	75.8	110
MCU U1	80.7	79.8	68.5	79.1	Reference
DC Filter L15	71.6	77.5	69.6	78.1	110
Optocoupler U14	90.5	95.8	82.7	90.9	115
Optocoupler U17	76.7	79.6	74.8	83.3	115
Capacitor C172	70.7	77.9	67.1	77.5	100
C13	69.0	76.2	65.6	76.4	105
Relay RL3	66.4	74.6	63.6	74.7	85
Transformer TX1	68.1	76.6	65.7	77.0	110
MCU U4	69.6	78.0	66.8	78.1	Reference
Bus capacitor C8	65.7	73.6	62.6	73.8	105

IEC 60255-27

Inner ambient temperature	66.8	75.3	64.2	75.5	Reference
Bus Cap C10	75.5	76.4	72.8	81.8	105
PCB on power board	65.0	72.8	62.4	73.5	130
Fan	70.4	72.8	68.2	73.8	80
Relay RL1	67.0	75.5	64.7	75.0	85
Hall HL1	67.8	75.1	65.3	76.0	85
X Cap C103	70.3	76.9	66.5	76.9	110
C107	69.1	76.2	65.9	76.4	105
GFCI L10	88.4	93.7	78.6	85.8	110
AC Filter L8	73.8	80.3	69.6	78.7	110
Optocoupler U26	76.7	83.5	71.7	81.1	100
AC Filter L9	82.2	86.6	73.7	82.7	110
Y Cap C114	70.6	78.0	66.5	76.7	125
AC output wires	71.2	79.1	66.9	77.0	105
AC terminal	66.7	74.1	61.6	72.9	90
Battery power line	64.6	71.9	61.9	73.1	105
Battery terminal	62.2	70.6	61.4	71.2	90
IGBT Q5 for PCB	83.1	92.8	78.3	88.0	130
IGBT Q4 for PCB	86.0	97.2	75.9	81.0	130
IGBT Q3 for PCB	88.0	96.8	82.0	91.9	130
Test Condition:	PV input for all AC output mode				--
Test voltage	520Vdc,12.1A; 207Vac,29.0A	520Vdc,9.4A; 207Vac,22.5A	520Vdc,12.1A; 253Vac, 23.7A	520Vdc,10.7A; 253Vac,21.0A	--
Ambient	45.5	60.6	44.9	60.7	--
Enclosure, front	56.4	68.4	53.9	68.0	100*
Display panel	51.6	64.6	52.4	64.4	75
Load terminal	50.2	63.9	52.7	63.4	90
DC switch	49.9	61.5	52.8	61.4	85
PV terminal	51.4	64.4	52.8	64.1	90
PCB on display board	63.8	74.5	60.0	73.5	130
Enclosure, side	56.2	68.2	54.6	67.6	100*
Mounting surface	72.5	61.0	71.9	75.3	90
Enclosure, top	62.3	73.5	59.0	72.5	100*
Relay RY1	74.2	82.9	67.4	80.1	85

IEC 60255-27

PCB on the output board	81.0	89.7	72.0	84.7	130
X Cap, C94	66.4	76.5	62.0	75.3	110
Film cap C145	67.6	77.5	63.3	76.5	105
MOV RVP5	67.3	77.2	63.0	76.2	85
Y Cap C138	65.5	76.0	61.5	74.9	125
Capacitor C146	65.9	76.3	61.7	75.2	105
Relay RL9	65.9	76.2	61.7	74.9	85
Hall HL4	66.0	76.2	61.5	75.1	85
DC chock L1	69.9	79.3	64.8	78.4	110
PV power line	60.8	71.5	57.4	71.3	105
DC switch, inside	62.1	72.6	58.2	72.2	85
DC chock L2	78.1	86.0	69.9	83.8	110
DC chock lead wires	64.8	75.3	60.7	74.7	105
INV chock lead wires	68.3	77.7	62.8	76.7	105
INV chock L4	94.9	101.7	81.0	95.1	110
DC chock P8	62.7	73.6	59.7	73.0	110
MCU U1	69.5	79.5	65.1	78.6	Reference
DC Filter L15	66.8	76.8	62.7	76.2	110
Optocoupler U14	87.2	97.5	78.9	93.2	115
Optocoupler U17	68.8	78.9	64.4	78.2	115
Capacitor C172	68.2	78.0	63.4	77.0	100
C13	66.1	76.3	61.7	75.7	105
Relay RL3	64.0	74.5	60.0	74.0	85
Transformer TX1	66.8	77.3	62.9	76.7	110
MCU U4	67.3	77.9	63.4	77.4	Reference
Bus capacitor C8	63.0	73.5	59.2	73.1	105
Inner ambient temperature	65.0	75.8	61.4	75.1	Reference
Bus Cap C10	65.3	75.5	61.2	75.1	105
PCB on power board	61.9	72.7	58.3	72.2	130
Fan	68.1	78.5	64.5	73.8	80
Relay RL1	65.8	75.6	61.3	74.8	85
Hall HL1	65.0	75.3	60.7	74.5	85
X Cap C103	67.4	77.1	62.5	76.1	110
C107	67.0	76.8	62.1	75.6	105

IEC 60255-27

GFCI L10	89.2	98.8	77.0	90.2	110
AC Filter L8	72.5	80.9	66.0	78.9	110
Optocoupler U26	75.1	84.2	68.4	81.6	100
AC Filter L9	78.7	87.7	70.3	84.2	110
Y Cap C114	69.1	78.1	63.6	76.8	125
AC output wires	70.5	80.0	64.4	77.8	105
AC terminal	64.0	74.5	59.5	73.1	90
Battery power line	61.8	72.6	58.2	72.1	105
Battery terminal	59.6	70.7	56.4	70.4	90
IGBT Q5 for PCB	81.8	93.7	74.7	89.1	130
IGBT Q4 for PCB	87.9	101.1	79.1	89.1	130
IGBT Q3 for PCB	94.5	106.4	81.7	95.7	130
Test Condition:	Battery charging and discharging				--
Test voltage	52Vdc,100.9A; 207Vac,23.3A	52Vdc,79.8A; 207Vac19.1A	52Vdc,102.7A; 253Vac, 19.5A	52Vdc, 80.1A; 253Vac,15.4A	--
Ambient	45.3	60.2	44.8	60.2	--
Enclosure, front	61.7	72.1	60.9	70.3	100*
Display panel	55.2	70.3	54.7	66.2	75
Load terminal	51.3	70.2	50.6	63.8	90
DC switch	50.8	70.2	50.4	62.9	85
PV terminal	55.1	70.7	54.7	65.8	90
PCB on display board	73.6	78.5	72.2	78.0	130
Enclosure, side	59.8	72.6	59.3	69.1	100*
Mounting surface	73.4	78.7	69.9	77.9	90
Enclosure, top	69.2	75.6	67.4	75.1	100*
Relay RY1	79.7	81.9	75.6	80.8	85
PCB on the output board	84.3	83.7	77.6	81.9	130
X Cap, C94	75.0	79.2	72.8	78.7	110
Film cap C145	75.3	80.0	74.1	80.8	105
MOV RVP5	74.8	79.3	72.9	78.8	85
Y Cap C138	75.7	80.0	74.2	79.5	125
Capacitor C146	76.4	80.5	74.9	80.0	105
Relay RL9	76.0	79.8	74.0	79.4	85
Hall HL4	77.9	80.9	75.9	80.4	85
DC chock L1	81.6	84.4	81.9	85.2	110

IEC 60255-27

PV power line	73.1	77.5	72.6	77.6	105
DC switch, inside	73.4	77.6	72.2	77.6	85
DC chock L2	89.3	89.8	90.6	91.7	110
DC chock lead wires	82.0	85.1	81.3	85.1	105
INV chock lead wires	79.1	80.9	76.3	80.6	105
INV chock L4	90.4	86.8	81.4	85.3	110
DC chock P8	99.3	96.1	100.2	96.8	110
MCU U1	77.2	81.8	75.0	81.4	Reference
DC Filter L15	75.5	79.7	73.7	79.5	110
Optocoupler U14	93.1	91.4	84.5	88.9	115
Optocoupler U17	85.5	90.4	86.0	91.0	115
Capacitor C172	83.0	84.4	80.7	83.8	100
C13	82.5	84.1	81.6	84.1	105
Relay RL3	77.3	80.5	75.8	80.4	85
Transformer TX1	76.2	80.8	74.6	80.9	110
MCU U4	77.9	82.3	76.3	82.3	Reference
Bus capacitor C8	81.3	83.9	80.8	84.0	105
Inner ambient temperature	75.0	79.7	73.7	78.8	Reference
Bus Cap C10	76.8	80.6	76.3	80.8	105
PCB on power board	97.5	106.6	98.8	107.4	130
Fan	77.3	75.6	75.4	73.8	80
Relay RL1	74.9	79.1	73.3	78.8	85
Hall HL1	76.8	80.2	75.4	80.0	85
X Cap C103	79.2	81.4	77.1	81.1	110
C107	77.9	80.7	76.0	80.4	105
GFCI L10	89.5	85.0	79.4	83.1	110
AC Filter L8	78.1	80.1	73.9	79.4	110
Optocoupler U26	81.3	82.8	77.1	82.2	100
AC Filter L9	86.7	84.4	80.1	83.1	110
Y Cap C114	75.4	78.6	72.0	78.1	125
AC output wires	76.0	78.3	71.5	77.5	105
AC terminal	69.0	74.4	65.9	73.8	90
Battery power line	75.9	80.2	75.5	80.6	105
Battery terminal	68.8	75.3	68.6	75.1	90

IEC 60255-27

IGBT Q5 for PCB	79.1	82.7	75.1	81.7	130
IGBT Q4 for PCB	87.8	89.4	82.2	90.3	130
IGBT Q3 for PCB	101.5	94.1	85.7	89.9	130
Test Condition:	Stand-alone mode				--
Test voltage	AC output:230V,5kW		AC output power derating to 0W and then restore, cycle		--
Ambient	45.1		60.0		--
Enclosure, front	63.4		72.1		100*
Display panel	55.5		67.5		75
Load terminal	56.9		67.8		90
DC switch	50.0		63.7		85
PV terminal	54.4		66.8		90
PCB on display board	74.1		79.1		130
Enclosure, side	60.0		69.4		100*
Mounting surface	67.8		77.9		90
Enclosure, top	69.4		76.8		100*
Relay RY1	79.1		79.2		85
PCB on the output board	78.5		78.0		130
X Cap, C94	78.0		79.1		110
Film cap C145	78.5		79.8		105
MOV RVP5	77.6		78.6		85
Y Cap C138	79.1		79.5		125
Capacitor C146	80.3		79.8		105
Relay RL9	78.9		81.5		85
Hall HL4	82.0		83.6		85
DC chock L1	87.7		81.7		110
PV power line	77.9		80.5		105
DC switch, inside	77.3		78.8		85
DC chock L2	97.9		90.0		110
DC chock lead wires	88.2		89.4		105
INV chock lead wires	82.0		84.0		105
INV chock L4	89.7		84.9		110
DC chock P8	111.7		97.0		110
MCU U1	81.1		82.9		Reference
DC Filter L15	79.1		79.0		110

IEC 60255-27

Optocoupler U14	93.2	95.7	115
Optocoupler U17	91.2	93.9	115
Capacitor C172	87.6	88.2	100
C13	89.3	86.9	105
Relay RL3	81.5	84.5	85
Transformer TX1	79.1	81.0	110
MCU U4	81.2	84.1	Reference
Bus capacitor C8	88.4	88.2	105
Inner ambient temperature	78.2	78.8	Reference
Bus Cap C10	81.0	83.0	105
PCB on power board	111.8	112.8	130
Fan	75.1	84.8	80
Relay RL1	78.2	81.5	85
Hall HL1	80.6	82.2	85
X Cap C103	83.0	82.9	110
C107	81.4	80.7	105
GFCI L10	89.7	88.0	110
AC Filter L8	76.6	76.3	110
Optocoupler U26	86.1	85.6	100
AC Filter L9	89.1	86.8	110
Y Cap C114	75.7	76.3	125
AC output wires	74.1	76.4	105
AC terminal	69.2	73.8	90
Battery power line	81.6	84.7	105
Battery terminal	72.8	77.9	90
IGBT Q5 for PCB	80.0	85.1	130
IGBT Q4 for PCB	95.6	83.1	130
IGBT Q3 for PCB	86.9	94.3	130

TABLE: Heating test, resistance method

Test voltage (V)..... :		—			
Ambient, t ₁ (°C)		—			
Ambient, t ₂ (°C)		—			
Temperature rise of winding	R₁ (Ω)	R₂ (Ω)	ΔT (K)	Max. dT (K)	Insulation class

IEC 60255-27

Supplementary information: Virtual ground used for the test.

7.6 TABLE: Flammability of materials and components					N/A
Object/ Part No./ Material	Manufacturer/ trademark	Duration of application of test flame (ta); (s)	Ignition of specified layer Yes/No	Duration of burning (tb) (s)	Verdict
--	--	--	--	--	--
Supplementary information:					
Part	Manufacturer of material	Type of material	Thickness (mm)	Flammability class	Evidence
--	--	--	--	--	--
Supplementary information:					

8.3 TABLE: Critical components information					P
Component	Manufacturer/ trademark	Type/model	Technical data	Standard	Mark(s) of conformity
Metal Enclosure	Various	Various	Min. thickness : 1.2mm	IEC/EN 62109-1 IEC/EN 62109-2	Tested with appliance
Heat-sink (the rear side of enclosure)	Various	Various	Metal, overall measured: L: 480mm, W: 343mm, H: 60mm	IEC/EN 62109-1 IEC/EN 62109-2	Tested with appliance
DC breaker	Santon	XBE3310-2-D XBE+3310-2-D	650V dc, 25A dc, Max.70°C	EN 60947-3/A1/C1	DEKRA: 2199573.01
(Alternative)	ProJoy Electric SRL.	PEDS1 50R-HM25-3	25A, 600VDC, Max.75°C	EN 60947-3:2009+A1	TUV R50389807
PV connector	Amphenol Industrial operations	Helios H4 series	1000Vdc, 40A, Max. 90 C, IP 68	DIN V VDE V 0126-3/12.2006	TUV R50157783
Battery terminal	SHENZHEN SUCCEED ELECTRONIC S TECHNOLOGY CO.,LTD	TR100-01-2P	AC600V, 100A, Max. 120 C	UL 1059, UL 486E	UL E332956
Internal wiring (DC-in)	Various	1015	Min.8AWG,600 V,105°C,VW-1	UL 758	UL

IEC 60255-27

8.3		TABLE: Critical components information				P
Component	Manufacturer/ trademark	Type/model	Technical data	Standard	Mark(s) of conformity	
Internal wiring (AC-out)	Various	1015	Min.12AWG,600 V,105°C,VW-1	UL 758	UL	
Earthing wire	Various	1015	Min. 12AWG, 600V, 105°C, VW-1	UL 1015	UL	
Battery wire	Various	1015	Min.8AWG, 600V, 105°C, VW-1	UL 1015	UL	
AC Grid terminal	SHENZHEN SUCCEED ELECTRONIC S TECHNOLOG Y CO.,LTD	TR-6N-01- NP - XX-T(f)	600V, 50A, Max. 105°C	UL 1059, UL 486E	UL E332956	
Plastic sheet for Transistors	BERGQUIST CO	K-10#	150°C, VTM-0, min. 0.13mm thickness	UL 94	UL E59150	
PCB	Various	Various	Min.130°C, min. V-0, CTI≥175	UL 796	UL	
LCD panel	MACDERMID AUTOTYPE LTD	Autotex XE(f2)	105°C, V-0, min. 0.2mm thickness	UL 94 UL 746C	UL E165805	
Boost inductor (L1, L2)	Huizhou Baohui Electronics Technology Co., Ltd	115-18-073E	0.84mH, Class B	IEC/EN 62109- 1 IEC/EN 62109- 2	Tested with appliance	
- Lead wire	Various	Various	10AWG, 600V, 105°C, VW-1	UL 758	UL	
-Winding	All	All accepted	130°C	UL 1446	UL	
- VARNISH	SUZHOU TAIHU ELECTRIC ADVANCED MATERIAL CO LTD	T-4260(a)	130 °C	UL 746 UL94	UL E228349	
- Winding tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE	PF- CT-	Min 130°C	UL 510	UL E165111	

IEC 60255-27

8.3		TABLE: Critical components information				P
Component	Manufacturer/ trademark	Type/model	Technical data	Standard	Mark(s) of conformity	
- Margin tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE	WF-	130 °C	UL 510	UL E165111	
INV Inductor (L4, L5)	Huizhou Baohui Electronics Technology Co., Ltd	SH-T016	840µH, ClassB	IEC/EN 62109- 1 IEC/EN 62109- 2	Tested with appliance	
- Lead wire	Various	Various	10AWG, 600V, 105°C, VW-1	UL 758	UL	
-Winding	All	All accepted	130°C	UL 1446	UL	
- VARNISH	SUZHOU TAIHU ELECTRIC ADVANCED MATERIAL CO LTD	T-4260(a)	130 °C	UL 746 UL94	UL E228349	
- Winding tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE	PF- CT-	Min 130°C	UL 510	UL E165111	
- Margin tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE	WF-	130 °C	UL 510	UL E165111	
-Tube	SHENZHEN WAHCHANGW EI INDUSTRIAL CO LTD	SGS-25	200°C	UL 1441	UL E233804	
SPS transformer (TX1)	Huizhou Baohui Electronics Technology Co., Ltd	SH-T008	Class B	IEC/EN 62109- 1 IEC/EN 62109- 2	Tested with appliance	
-Bobbin	SUMITOMO BAKELITE CO LTD	PM-9820 PM-9630	150°C	UL 94	E41429	
-Winding	Various	Various	130°C	UL 1446	UL	
--Tape	JINGJIANG	CT-	130°C	UL 510	UL E165111	

IEC 60255-27

8.3		TABLE: Critical components information				P
Component	Manufacturer/ trademark	Type/model	Technical data	Standard	Mark(s) of conformity	
	YAHUA PRESSURE SENSITIVE GLUE CO LTD					
- Margin Tape	Jingjiang Yahua Pressure Sensitive Glue Co Ltd	WF-	130°C	UL 510	UL E165111	
-Expoxy	DONGGUAN EATTO ELECTRONI C MATERIAL CO LTD	3300A-1/B-1	V-0, 130 C	UL 746 UL94	UL E218090	
AC Filiter (L14)	Huizhou Baohui Electronics Technology Co., Ltd	2.0D*2/T31* 19* 15C(M12K)	0.5mH, Class B	IEC/EN 62109- 1 IEC/EN 62109- 2	Tested with appliance	
-Magnet Wire	TONGLING JINGDA SPECIAL MAGNET WIRE CO LTD	QZY-2	130°C	UL 1446	UL E223994	
- VARNISH	SUZHOU TAIHU ELECTRIC ADVANCED MATERIAL CO LTD	T-4260(a)	130 °C	UL 746 UL94	UL E228349	
--Tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	CT-	130°C	UL 510	UL E165111	
DC Filiter (L14, L15)	Bo Luo Da Xin Electronic Co., Ltd	2.0D*2/T31* 19*15C(M12 K)	0.5mH, Class B	IEC/EN 62109- 1 IEC/EN 62109- 2	Tested with appliance	
-Magnet Wire	TONGLING JINGDA SPECIAL MAGNET WIRE CO LTD	QZY-2	130°C	UL 1446	UL E223994	

IEC 60255-27

8.3		TABLE: Critical components information				P
Component	Manufacturer/ trademark	Type/model	Technical data	Standard	Mark(s) of conformity	
- VARNISH	SUZHOU TAIHU ELECTRIC ADVANCED MATERIAL CO LTD	T-4260(a)	130 °C	UL 746 UL94	UL E228349	
--Tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	CT-	130°C	UL 510	UL E165111	
BUS Capacitor (C1, C2, C3, C4, C7, C8, C9, C10)	Unielecs Co.,LTD	LLN2F102M 355 0	1000µF, 315V, Max.105°C	IEC/EN 62109- 1 IEC/EN 62109- 2	Tested with appliance	
(Alternative)	Nichicon Co., Ltd.	LGX2F102M EL EZS	1000µF, 315V, Max.105°C	IEC/EN 62109- 1 IEC/EN 62109- 2	Tested with appliance	
(Alternative)	Nantong jianghai Capacitor Co., Ltd.	ECS2FBB10 2M VN350050V	1000µF, 315V, Max.105°C	IEC/EN 62109- 1 IEC/EN 62109- 2	Tested with appliance	
(Alternative)	LELON ELECTRONIC S CORP.	LSK102M2F- - A3550	1000µF, 315V, Max.105°C	IEC/EN 62109- 1 IEC/EN 62109- 2	Tested with appliance	
FAN	Minebea Co.,LTD	06025SA- 12S- AT- 0260*60*2 5	12VDC, 7000r.p.m,1650 0H@80°C	UL94	E98836	
DC-LINK Capacitor (C13)	Xiamen FARA Electroni c Co.,Ltd	C3D2H606K F0 AC00	60µF, 500V, 105°C	EN61071:2007; EN61881 - 1:2011	TUV R50266108	
Y capacitor (C30,C31,C33 7)	Shantou High- New Technology Dev. Zone Songtian Enterprise Co., Ltd	CE	10nF, Y2 250Vac, Max.125°C	EN 60384- 14:2013; IEC 60384-14(ed.4)	VDE 40025748	
Y capacitor (C20,C92,C97,	Shantou High- New	CD	Y1, 4.7nF, 400Vac,	EN 60384-	VDE 40025754	

IEC 60255-27

8.3		TABLE: Critical components information				P
Component	Manufacturer/ trademark	Type/model	Technical data	Standard	Mark(s) of conformity	
C104,C105,C106,C113,C114,C115,C132,C134,C137,C138,C141,C142,C147,C148)	Technology Dev. Zone Songtian Enterprise Co., Ltd		Max.125°C	14:2013; IEC 60384-14(ed.4)		
X2 capacitor (C103,C112)	Shantou High- New Technology Dev. Zone Songtian Enterprise Co., Ltd	MPX	1μF, 275V, Max.110°C	EN 60384-14:2013; IEC 60384-14(ed.4)	VDE 40034679	
Current transducer (HL1)	LEM	CASR 25-NP	IPN: ±25A; Vout: ±5V Max.: 85°C	IEC/EN 62109-1 IEC/EN 62109-2	Tested with appliance	
IGBT (Q1, Q2, Q3, Q4, Q5, Q6, Q7, Q12, Q25, Q26)	Fairchild Semiconductor Corporation	FGA40N65S MD	650V, 40A, 155°C	IEC/EN 62109-1 IEC/EN 62109-2	Tested with appliance	
(Alternative)	ST Microelectronics	STGWT40H 65D FB	650V, 40A, 155°C	IEC/EN 62109-1 IEC/EN 62109-2	Tested with appliance	
(Alternative)	IXYS CORPORATION	IXXH40N65 B4H 1	650V, 40A, 155°C	IEC/EN 62109-1 IEC/EN 62109-2	Tested with appliance	
IGBT (QD1, QD2, QD3, QD4)	Infineon Semiconductor Corporation	IKW40N65H 5	650V, 46A, 155°C	IEC/EN 62109-1 IEC/EN 62109-2	Tested with appliance	
MOSFET (Q16, Q17, Q18, Q19, Q21,Q22, Q23, Q24)	Fairchild Semiconductor Corporation	FDP027N08 B	80V, 120A, 175°C	IEC/EN 62109-1 IEC/EN 62109-2	Tested with appliance	

IEC 60255-27

8.3		TABLE: Critical components information				P
Component	Manufacturer/ trademark	Type/model	Technical data	Standard	Mark(s) of conformity	
(Alternative)	ST Microelectronic s	STP270N8F 7	80V, 180A, 155°C	IEC/EN 62109- 1 IEC/EN 62109- 2	Tested with appliance	
Doide (D13、 D12)	IXYS CORPORATIO N	DSEI30-06A	37A, 600V, , 155°C	IEC/EN 62109- 1 IEC/EN 62109- 2	Tested with appliance	
(Alternative)	MICROSEMI CORPORATI O N	APT30DQ60 BG	30A, 600V, , 155°C	IEC/EN 62109- 1 IEC/EN 62109- 2	Tested with appliance	
Relay (RL1 , RL2 , RL3 , RL4 , RL5 , RL6	Xiamen Hongfa Electroacoustic s Co., Ltd.	HF161F- W/12- HT	31A, 250Vac, 12Vdc, 85°C	IEC/EN 61810- 1	VDE 40031410	
Optocoupler (U14,U15,U16, U17,U19,U20)	Liteon optoelectronics	LTV816	Di≥0.4mm, Internall di≥ 7.0mm, External di≥ 7.62mm, AC 8000V, 115°C	IEC 60747-5-5	VDE 40015248	
Optocoupler (U2, U3, U13, U14, U17, U18, U26, U 27, U31, U32)	TOSHIBA Semiconductor Corporation	TLP350 (D4- TP1.F)	Di≥0.4mm Internal di≥ 7.0mm External di≥ 7.0mm, AC 5000V, reinforced Insulation 100°C	DIN EN 60747- 5-2	VDE 40009302	
(Alternative)	TOSHIBA	TLP352(TP1 ,F)	Di≥0.4mm Internall di≥ 7.0mm External di≥ 7.0mm, 125°C	DIN EN 60747- 5-2	VDE 40009302	
GFCI (L10)	Huizhou	W539	Class B	IEC/EN 62109- 1	Tested with appliance	

IEC 60255-27

8.3		TABLE: Critical components information				P
Component	Manufacturer/ trademark	Type/model	Technical data	Standard	Mark(s) of conformity	
	Baohui Electronics Technology Co., Ltd			IEC/EN 62109- 2		
-Epoxy	DONGGUAN EATTO ELECTRONI C MATERIAL CO LTD	3300A-1/B-1	V-0, 130°C	UL 746 UL94	UL E218090	
(Alternative)	HUI ZHOU QIANG DA ELECTRONIC S INDUSTRY CO LTD	QDJ600(#)	V-0, 130°C	UL 746 UL94	UL E351561	
-Tape	SHENZHEN WOER HEAT- SHRINKABL E MATERIAL CO LTD	WF	200°C	UL224	UL 203950	
Transformer (TX2 in communication board)	Huizhou Baohui Electronics Technology Co., Ltd	SH-T010	Class B	IEC/EN 62109- 1 IEC/EN 62109- 2	Tested with appliance	
-Bobbin	CHANG CHUN PLASTICS CO LTD	PM- 9820 PM- 9830	V-0, min. thickness: 0.75mm, 150 C	UL 94	UL E41429	
-Margin tape	Jingjiang Yahua Pressure Sensitive Glue Co Ltd	WF	130°C	UL 510	UL E165111	
Master MCU	TI	TMS320F28 075 PTP	150M , Max 105°C	IEC/EN 62109- 1 IEC/EN 62109- 2	Tested with appliance	

IEC 60255-27

8.3 TABLE: Critical components information						P
Component	Manufacturer/ trademark	Type/model	Technical data	Standard	Mark(s) of conformity	
Slave MCU	NXP	LPC804M10 1JD H24	60M , Max 105°C	IEC/EN 62109- 1 IEC/EN 62109- 2	Tested with appliance	

10.6.3 TABLE: Clearance and creepage distance measurements							P
clearance cl and creepage distance dcr at / of:	Up (V)	U r.m.s. (V)	required cl (mm)	cl (mm)	required dcr (mm)	dcr (mm)	
PV,AC circuits go through the optocouple U16, U19, U20 to communication circuits and adjacent circuits on output PCB board (RI)	600Vdc	600V 230	5.5	6.54	5.5	6.54	
PV,AC circuits go through the optocouple U56, U53, U63, U46, U51, U52 to communication circuits and adjacent circuits on Power PCB board (RI)	600Vdc	600V 230	5.5	7.01	5.5	7.01	
PV,AC circuits go through the Transformer TX1 to communication circuits and adjacent circuits on Power PCB board (RI)	600Vdc	600V 230	5.5	5.83	5.5	5.83	
Y capacitor (C20, C132, C138, C142,C148,C115,C105,C97,C92,C113,C104,C114) to earthing on output PCB board (BI)	600Vdc	600V 230	3.0	5.02	3.0	5.02	
Relay (RL1,RL2,RL4,RL5 RY6) two polarity on output PCB board (BI)	600Vdc	600V 230	3.0	3.30	3.0	3.30	
PCB board to metal enclosure (BI)	600Vdc	600V 230	3.0	9.23	6.0	9.23	
IGBT go through the insulation sheet to metal screw enclosure (BI)	600Vdc	600V 230	3.0	7.54	6.0	7.54	
Note(s): FI: function insulation BI: Basic insulation SI: Supplementary insulation RI: Reinforced insulation The double side PCB layout is considered and evaluated. Consider the maximum working altitude of the machine is 2000m.							

10.6.4.2/ 10.6.4.3 TABLE: Impulse voltage test/Dielectric Strength					P
test voltage applied between:	test voltage (Vdc)	impulse withstand voltage (V)	partial discharge extinction voltage (V)	result	
DC input terminal to earthed enclosure	3100Vdc	4000	--	P	
AC Output terminal to communication port	5090Vdc	6000	--	P	

IEC 60255-27

DC input terminal to communication port	5090Vdc	6000	--	P
Battery terminal to earthed enclosure	3100Vdc	4000	--	P
Insulation sheet	3100Vdc	4000	--	P
One layer of insulation tape	5090Vdc	6000	--	P
Relay pin 3 to pin 4	3100Vdc	4000	--	P
Supplementary information:				

10.6.4.4	TABLE: insulation resistance measurements			P
Insulation resistance R between:		R (MΩ)	Required R (MΩ)	
In a new condition				
Between mains poles (primary fuse disconnected)		>100	100	
Between parts separated by basic or supplementary insulation		>100	100	
Between parts separated by double or reinforced insulation		>100	100	
After the damp-heat type test				
Between mains poles (primary fuse disconnected)		>100	10	
Between parts separated by basic or supplementary insulation		>100	10	
Between parts separated by double or reinforced insulation		>100	10	
Supplementary information:				

10.6.4.5	TABLE: resistance of bonding conductors and their terminations			P
Accessible conductive part	Test current (A)	Voltage drop (V)	Calculated Resistance (mΩ)	
PE to Enclosure	60	0.65	10.8	
Supplementary information:				

List of test equipment used:

No	Test Equipment	Equipment model	Equipment No.	Calibration due date
1	Simulation of ac power supply	WPLA-330200KVA	BZ-DGD-L204	2021/07/12
2	Solar IV simulator	WPLA-150KW	BZ-DGD-L013	2021/11/17
3	Programmable ac load	ACLT-38160H	BZ-DGD-L003	2021/11/08
4	Power analyser	PW6001-16	BZ-DGD-L025	2022/03/01
5	Oscilloscope	MSO4054B	BZ-DGD-L028	2022/03/02
6	Temperature recorder	LR8400-21	BZ-DGD-L038	2021/12/17
7	Hi-Pot & IR tester	Chroma 19032	BZ-DGD-L066	2022/03/01
8	Noise meter	TES-1357	BZ-DGD-L029	2022/02/24
9	Digital Caliper	LS160	BZ-DGD-L048	2021/07/05
10	Testing Finger B	AUTO-B	BZ-DGD-L082	2021/08/27
11	DC Electronic Load	IT8510	BZ-DGD-L075	2021/09/23
12	Pull and push	2P-1000	BZ-DGD-L080	2021/09/21
13	Electronic Scale	TCS-300	BZ-DGB-L020	2021/07/01
14	Thermostat	16m ³	BZ-DGD-L015	2021/07/01
15	Surge generator	HCWG 70	BZ-DGE-L036	2022/03/17
16	Electromagnetic vibration table	ES-20-321	BZ-DGB-L026-1	2021/09/08
17	Impact table	SY11-50	BZ-DGB-L069	2022/02/28

- End of Test Report -