Test Report No.:	**PV2212WDG0032-2**
Client	
Name :	**INVT Solar Technology (Shenzhen) Co., Ltd.**
Address :	6th Floor, Block A, INVT Guangming Technology Building, Kejie Fourth Road, Shutianpu Community, Matian Guangming District, 518000 Shenzhen, PEOPLE' S REPUBLIC OF CHINA
Test Item :	**Hybrid inverter**
Identification :	**BD3KTL-LL1, BD4KTL-LL1, BD4.6KTL-LL1, BD5KTL-LL1**
Testing laboratory	
Name :	**Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch**
Address :	No. 96, Guantai Road (Houjie Section), Houjie Town, Dongguan City, Guangdong Province, 523942, People's Republic of China
Test specification	
Standard :	IEC 62040-1:2017 IEC 62477-1:2012+AMD1:2016
Test Result :	**The sample satisfies to the clauses examined.**

Prepared By :

Ryan He
Engineer / Safety Department

2022-12-29
Date

Approved By:

Ken Chan
Manager / Safety Department

2022-12-29
Date

TEST REPORT

IEC 62040-1

Uninterruptible power systems (UPS) – Part 1: General and safety requirements for UPS

Report	
Reference No. ..... :	**PV2212WDG0032-2**
Date of issue..... :	2022-12-29
Total number of pages..... :	124
Testing Laboratory	
Name ..... :	**Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch**
Address ..... :	No. 96, Guantai Road (Houjie Section), Houjie Town, Dongguan City, Guangdong Province, 523942, People's Republic of China
Applicant's	
Name ..... :	**INVT Solar Technology (Shenzhen) Co., Ltd.**
Address ..... :	6th Floor, Block A, INVT Guangming Technology Building, Kejie Fourth Road, Shutianpu Community, Matian Guangming District, 518000 Shenzhen, PEOPLE' S REPUBLIC OF CHINA
Test specification	
Standard ..... :	IEC 62040-1:2017
	IEC 62477-1:2012+AMD1:2016
Non-standard test method ..... :	N/A
Test Report Form No..... :	IEC 62040-1 VER.1
TRF Originator..... :	Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch
Master TRF..... :	Dated 2020-06-11
Test item	
Description ..... :	**Hybrid inverter**
Trademark ..... :	invt
Manufacturer ..... :	**INVT Solar Technology (Shenzhen) Co., Ltd.**
Model and/or type reference ..... :	BD3KTL-LL1, BD4KTL-LL1, BD4.6KTL-LL1, BD5KTL-LL1
Rating(s) ..... :	See below

Ratings ..... :	**BD3KTL-LL1**	**BD4KTL-LL1**	**BD4.6KTL-LL1**	**BD5KTL-LL1**
Input DC voltage range [V]..... :	100-550			
MPPT DC voltage range [V]..... :	120-500			
Input DC current [A] ..... :	2×10	2×11		
Output AC voltage [V]..... :	230Vac, L/N/PE, 50Hz			
Max. Output AC current [A]..... :	15	20	25	25
Output power [W]..... :	3000	4000	4600	5000
Battery operation voltage range [V].. :	40-60			
Max. charge and discharge current [A] ..... :	66			
Max. charge and discharge power [W] ..... :	3600			

Copy of marking plate

invt Hybrid inverter

Model	BD3KTL-LL1
Max.DC voltage	550V
MPPT voltage range	120…500V
Max.DC short current(input A/input B)	12.5A/12.5A
Max.DC current(input A/input B)	10A/10A
Max.DC power	6600W
Nominal AC voltage,Frequency	230V~,50/60Hz
Max.continuous AC current	15A
Nominal AC power(@cosΦ=1)	3000W
Power factor at rated power	1
Adjustable displacement factor range	0.8 leading... 0.8 lagging
AC input nominal voltage,Frequency	230V~,50/60Hz
AC input max.continuous current	15A
AC input nominal power	3000W
Battery type	Lead-acid/Lithium
UPS nominal voltage, Frequency	230V~,50/60Hz
UPS nominal output power	3000W
UPS nominal current	13A
Battery voltage operation voltage	40…60V
Max.charge and discharge current	66A
Max.charge and discharge power	3600W
Operating ambient temperature range	-25…60℃
Ingress protection	IP65(Outdoor use)
Protective class	I
Over voltage category	III
Certificates and approvals	AS4777/VDE-AR-N 4105 VDE0126/G59/G99/CEI 0-21

invt Hybrid inverter

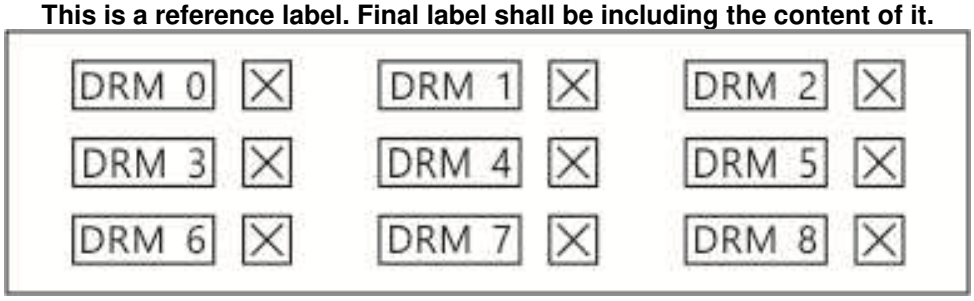
Model	BD4KTL-LL1
Max.DC voltage	550V
MPPT voltage range	120…500V
Max.DC short current(input A/input B)	13.7A/13.7A
Max.DC current(input A/input B)	11A/11A
Max.DC power	7000W
Nominal AC voltage,Frequency	230V~,50/60Hz
Max.continuous AC current	20A
Nominal AC power(@cos =1)	4000W
Power factor at rated power	1
Adjustable displacement factor range	0.8 leading... 0.8 lagging
AC input nominal voltage,Frequency	230V~,50/60Hz
AC input max.continuous current	20A
AC input nominal power	4000W
Battery type	Lead-acid/Lithium
UPS nominal voltage,Frequency	230V~,50/60Hz
UPS nominal output power	3000W
UPS nominal current	13A
Battery voltage operation voltage	40…60V
Max.charge and discharge current	66A
Max.charge and discharge power	3600W
Operating ambient temperature range	-25…60℃
Ingress protection	IP65(Outdoor use)
Protective class	I
Over voltage category	III
Certificates and approvals	AS4777/VDE-AR-N 4105 VDE0126/G59/G99/CEI 0-21

Copy of marking plate

invt	Hybrid inverter
Model	BD4.6KTL-LL1
Max.DC voltage	550V
MPPT voltage range	120···500V
Max.DC short current(input A/input B)	13.7A/13.7A
Max.DC current(input A/input B)	11A/11A
Max.DC power	8000W
Nominal AC voltage,Frequency	230V~,50/60Hz
Max.continuous AC current	25A
Nominal AC power(@cos =1)	4600W
Power factor at rated power	1
Adjustable displacement factor range	0.8 leading... 0.8 lagging
AC input nominal voltage,Frequency	230V~,50/60Hz
AC input max.continuous current	25A
AC input nominal power	4600W
Battery type	Lead-acid/Lithium
UPS nominal voltage, Frequency	230V~,50/60Hz
UPS nominal output power	3000W
UPS nominal current	13A
Battery voltage operation voltage	40···60V
Max.charge and discharge current	66A
Max.charge and discharge power	3600W
Operating ambient temperature range	-25···60℃
Ingress protection	IP65(Outdoor use)
Protective class	I
Over voltage category	III
Certificates and approvals	AS4777/VDE-AR-N 4105 VDE0126/G59/G99/CEI 0-21

invt	Hybrid inverter
Model	BD5KTL-LL1
Max.DC voltage	550V
MPPT voltage range	120···500V
Max.DC short current(input A/input B)	13.7A/13.7A
Max.DC current(input A/input B)	11A/11A
Max.DC power	8000W
Nominal AC voltage,Frequency	230V~,50/60Hz
Max.continuous AC current	25A
Nominal AC power(@cosΦ=1)	5000W
Power factor at rated power	1
Adjustable displacement factor range	0.8 leading... 0.8 lagging
AC input nominal voltage,Frequency	230V~,50/60Hz
AC input max.continuous current	25A
AC input nominal power	5000W
Battery type	Lead-acid/Lithium
UPS nominal voltage, Frequency	230V~,50/60Hz
UPS nominal output power	3000W
UPS nominal current	13A
Battery voltage operation voltage	40···60V
Max.charge and discharge current	66A
Max.charge and discharge power	3600W
Operating ambient temperature range	-25···60 ℃
Ingress protection	IP65(Outdoor use)
Protective class	I
Over voltage category	III
Certificates and approvals	AS4777/VDE-AR-N 4105 VDE0126/G59/G99/CEI 0-21

This is a reference label. Final label shall be including the content of it.



Particulars: test item vs. test requirements	
Classification of installation and use..... :	[] Ordinary Person [x] Instructed Person [] Skilled Person
Equipment mobility ..... :	[] movable [] stationary [x] for building-in
Connection to the mains..... :	[] pluggable equipment [x] permanent connection [] detachable power supply cord [] non-detachable power supply cord [] not directly connected to the mains
Operating condition..... :	[x] continuous [] rated operating / resting time:
Environmental category..... :	[x] indoor [] unconditional [] conditional [] outdoor
Access location ..... :	[x] operator accessible [] restricted access location
Over voltage category (OVC) ..... :	[] OVC I [x] OVC II [] OVC III [] OVC IV [] other:
Mains supply tolerance (%) or absolute mains supply values ..... :	±10%
Tested for IT power systems ..... :	[] Yes [] No
IT testing, phase-phase voltage (V) ..... :	
Class of equipment ..... :	[x] Class I [] Class II [] Class III [] Not classified
Considered current rating (A) ..... :	
Pollution degree (PD) ..... :	[] PD 1 [x] PD 2 [] PD 3
IP protection class ..... :	IP65
Altitude during operation (m) ..... :	2000 m
Altitude of test laboratory (m) ..... :	2000 m
Mass of equipment (kg) ..... :	Approx. 21,0kg

Test case verdicts	
Test case does not apply to the test object :	N/A
Test item does meet the requirement ..... :	P(ass)
Test item does not meet the requirement ... :	F(ail)

Testing	
Date of receipt of test item ..... :	2021-02-19
Date(s) of performance of test ..... :	2021-02-19 till 2021-04-15

General remarks

The test result presented in this report relate only to the object(s) tested.
This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.

"(see Enclosure #)" refers to additional information appended to the report.
"(see appended table)" refers to a table appended to the report.

Throughout this report used as the decimal separator.

Standard IEC 62040-1:2017 is to be used in conjunction with IEC 62477-1: 2012+amd1:2016, which is referred to in this TRF by "RD".

Report history:	
Remark 1	**This is a copy test report, the test results based on the original test report LD170830N034-2.**

Name and address of factory (ies).....:	**Shenzhen Sea Star Industry Co.,LTD** Bao Long 6th Avenue Sea Star Science Park, 6th Floor Long Gang Street, Bao Long Industrial City, Long Gang District, Shenzhen

General product information:

The Solar Inverter converts DC voltage into AC voltage.

The input and output are protected by varistors to Earth. The unit is providing EMC filtering at the PV input and output toward mains. The unit does not provide galvanic separation from input to output (transformerless type). The output is switched off redundantly by the high power switching bridge and two relays. This assures that the opening of the output circuit will also operate in case of a single error.

The internal control is redundant built. It consists of Microcontroller Main DSP (U21) and RCU MCU(U1).

The Main DSP(U21) control the relays by switching signals; measures the PV voltage, PV current, Bus voltage, grid voltage, frequency, AC current with injected DC and the array insulation resistance to ground. In addition it tests the current sensors and the RCMU circuit before each start up.

The RCU MCU (U1) is measures the grid voltage, AC current, grid frequency and residual current, also can switch off the relays independently, and communicate with Main DSP (U21) each other.
The current is measured by a current sensor. The AC current signal and the injected DC current signal are sent to the Main DSP(U21). The Main DSP(U21) tests and calibrates before each start up all current sensors.

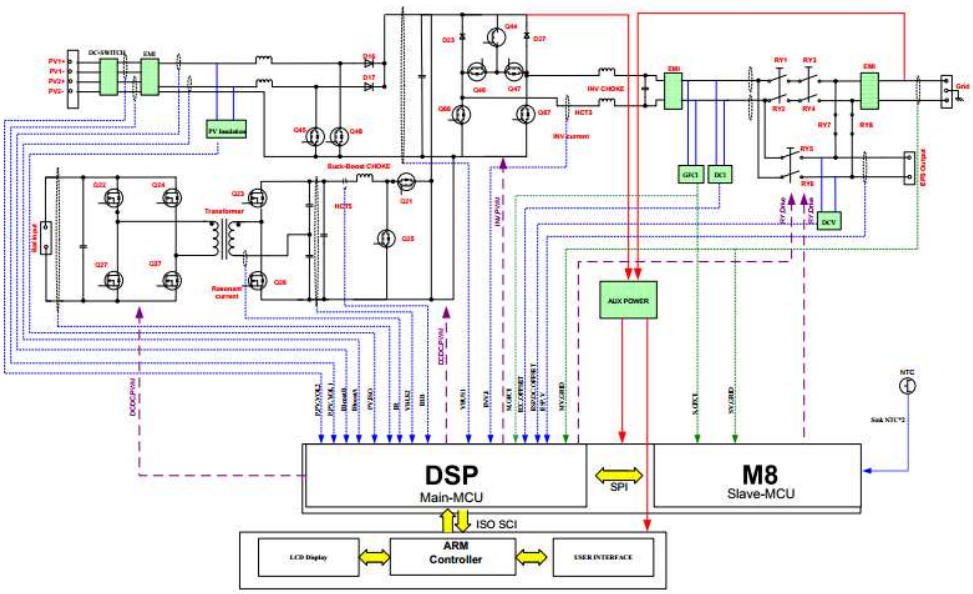


Figure 1 – Block diagram

The unit provides two relays in series in all output conductors. When single fault applied to one relay, alarm an error code in display panel, another redundant relay provides basic insulation maintained between the PV array and the mains. All the relays are tested before each start up.

The product was tested on:
Hardware version: V1.0
Software version: AA1.0

Test condition:

Temperature: 25°C
Relative humidity: 60%
Air pressure: 950 mbar
The test samples were pre-production samples without serial number.

4	Protection against hazards		P
4.1/RD	General	Certified components used Components with IEC and/or national standards certified are used according to their ratings. Components not covered by IEC standards are tested under the conditions present in the equipment.	P
4.2 4.2/RD	Fault and abnormal conditions	(See Table 4.2/RD to 4.3/RD)	P
5.2.4.6/RD	Breakdown of components test (type test)	See below	P
5.2.4.6.1 /RD	Load conditions	The test loading conditions specify by manufacture	P
5.2.4.6.2 /RD	Application of short circuit or open-circuit	The cable and switch has suitable specification model for carrying current.	P
5.2.4.6.3 /RD	Test sequence	Complied	P
4.3	Short-circuit and overload protection	See below	P
4.3.1/RD	General		P
4.3.2/RD	Specification of input short-circuit withstand strength and output short circuit current ability	Provide in the installation manual	P
4.3.2.1/RD	General		P
	The interrupting capability of the overcurrent protective device shall be equal or greater than the prospective short circuit current of the mains supply.	Overcurrent and earthing fault protection devices has specified in installation manual.	P
	For pluggable equipment type A, either the PECS shall be designed so that the byilding installation provides short circuit backup protection, or additional short circuit backup protection shall be provided as part of the equipment.	Overcurrent and earthing fault protection devices has specified in installation manual.	P
	For permanently connected equipment or pluggable equipment type B, it is permitted for short circuit backup protection to be in the byilding installation.	No such equipment	N/A
4.3.2.2/RD	Input ports short-circuit withstand strength	See below	P
	For co-ordination and selection of internal or external protective devices, the PECS manufacturer shall specify: - a maximum allowable prospective short circuit current for each input port of the PECS; and -a minimum required prospective short circuit current in order to ensure proper operation of the protective device.	It has specified in installation manual.	P

	If external protective devices are specified or provided the characteristics of those shall be specified by the manufacturer.	It has specified in installation manual.	P
4.3.2.3/RD	Output short circuit current ability		P
	The output short circuit current ratings apply to a.c. and d.c. power output ports and to other ports for which overcurrent protection is necessary. For all output ports, short circuit evaluation to determine the minimum and maximum output short circuit current shall be performed according to 5.2.4.4/RD and the output short circuit current available from the PECS shall be specified as in 5.2.4.4/RD and 6.2. Internal electronic output short circuit protection is considered acceptable as an output short circuit protection device of the PECS, when compliance is shown by test in 5.2.4.4/RD.	Considered	P
4.3.2.4/RD	Combined input and output ports	See below	P
	For ports which are both input and output ports the applicable requirements of both 4.3.2.1/RD and 4.3.2.3/RD apply.	Combined output ports	P
4.3.3/RD	Short-circuit coordination (backup protection)	See below	P
	Protective devices provided or specified shall have adequate breaking capability to interrupt the maximum prospective short circuit current specified for the port to which they are connected. If internal protection of the PECS is not rated for the prospective short circuit current, the installation instructions shall specify an upstream protective device, rated for this prospective short circuit current of that port, which shall be used to provide backup protection. Analysis shall ensure the protection coordination between the external and internal protective device.	Complied	P
	Compliance shall be checked by inspection and by the tests of 5.2.4.4/RD and 5.2.4.5/RD.	Complied	P
4.3.4/RD	Protection by several devices	See below	P
	Where protective devices that require manual replacement or resetting are used in more than one pole of a supply to a given load, those devices shall be located together. It is permitted to combine two or more protective devices in one component. Compliance shall be checked by inspection.	2 devices : DC Input circuit breaker and AC output breaker	N/A
4.3.101	AC input current		P
4.3.102	Transformer protection	The transformer primary and secondary winding were separated by reinforce insulation	P

4.3.103	AC input short-circuit current		P
4.3.104	Protection of the energy storage device	No any energy hazards in operator access area.	P
4.3.105	Unsynchronized load transfer	No such part	N/A
4.4	Protection against electric shock	See below	P
4.4.1/RD	General		P
4.4.2/RD	Decisive voltage class	See below	P
4.4.2.1/RD	General	Considered	P
4.4.2.2/RD	Determination of decisive voltage class	See appended table 4.4.7.2	P
4.4.2.2.1 /RD	General	See below	P
	For protection against the ventricular fibrillation body reaction, DVC can be selected from Table 2.		P
4.4.2.2.2 4.4.2.2.2 /RD	Selection tables for contact area and skin humidity condition	No access with test finger and test pin to any part with hazards part.	P
4.4.2.2.3 /RD	Limits of the working voltage for the DVC		P
4.4.2.3/RD	Requirements for protection against electric shock	The proper protections are provided on operator access area to prevent cause any hazard.	P
4.4.3/RD	Provision for basic protection		P
4.4.3.1/RD	General	See below	P
4.4.3.2/RD	Protection by means of basic insulation of live parts	Considered	P
	Live parts shall be completely surrounded with insulation if their working voltage is greater than DVC As or if they do not have protective separation from adjacent circuits of DVC C.		P
	Basic insulation may be provided by solid insulation or air clearance.		P
	The insulation shall be rated according to the impulse voltage, temporary overvoltage or working voltage (see 4.4.7.2.1/RD), whichever gives the most severe requirement. It shall not be possible to remove the insulation without the use of a tool or key.		P
4.4.3.3	Openings	No such opening	N/A
4.4.3.4/RD	Protection by means of limitation of touch current and charge		P

	The limitation of touch current and discharge energy shall not exceed: - a value of 3,5 mA a.c. or 10 mA d.c. for the limitation of touch current; and - a value of 50 µC for the limitation of discharge energy.		P
4.4.3.5/RD	Protection by means of limited voltage		P
	The voltage between simultaneously accessible parts shall not be greater than DVC As as determined in 4.4.2.2/RD.		P
4.4.4/RD	Provision for fault protection	See below	P
4.4.4.1/RD	General		P
	Fault protection shall be provided by one or more of the following measures: • Protective equipotential bonding in 4.4.4.2/RD in combinations with the PE conductor in 4.4.4.3/RD; • Automatic disconnection of supply in 4.4.4.4/RD; • Supplementary insulation in 4.4.4.5/RD; • Simple separation between circuits in 4.4.4.6/RD; • Electrically protective screening in 4.4.4.7/RD. Fault protection shall be independent and additional to those for basic protection.	Complied	P
4.4.4.2/RD	Protective equipotential bonding	See below	P
4.4.4.2.1 /RD	General		P
	Protective equipotential bonding shall be provided between accessible conductive parts of the equipment and the means of connection for the PC conductor, except: a) accessible conductive parts that are protected by one of the measures in 4.4.6.4/RD; or b) when accessible conductive parts are separated from live parts using double or reinforced insulation.		P
	Electrical contact to the means of connection of the PE conductor shall be achieved by one or more of the following means: • through direct metallic contact; • through other accessible conductive parts or other metallic components which are not removed when the PECS is used as intended; • through a dedicated protective equipotential bonding conductor.		P

4.4.4.2.2 /RD	Rating of protective equipotential bonding		P
	Protective equipotential bonding shall either be: a) sized in accordance with the requirements for the PE conductor in 4.4.4.3/RD and the means of connection for the PE conductor in 4.4.4.3.2/RD to ensure no voltage drop exceeding the values from 4.4.2.2.3/RD during a fault; or b) sized • to withstand the highest stresses that can occur to the PECS item(s) concerned when they are subjected to a fault connecting to accessible conductive parts; and • to remain effective for as long as a fault to the accessible conductive parts persists or until an upstream protective device removes power from the part; and • to ensure no voltage drop exceeding the values from 4.4.2.2.3/RD during normal operation and during a fault. Compliance shall be checked with the type tests in 5.2.3.11/RD		P
4.4.4.3/RD	PE conductor	See below	P
4.4.4.3.1 /RD	General		P
	A PE conductor shall be connected at all times when power is supplied to the PECS, unless the PECS complies with the requirements of protective class II (see 4.4.6.3/RD) or protective class III. Unless local wiring regulations state otherwise, the PE conductor cross-sectional area shall be determined from Table 7 or by calculation according to 543.1 of IEC 60364-5-54:2011.	Complied	P
	If the PE conductor is routed through a plug and socket, or similar means of disconnection, it shall not be possible to disconnect it unless power is simultaneously removed from the part to be protected.	No such disconnection means.	N/A
	The cross-sectional area of every PE conductor that does not form part of the supply cable or cable enclosure shall, in any case, be not less than: • 2,5 mm^2 if mechanical protection is provided; or • 4 mm^2 if mechanical protection is not provided.		P

	Provisions within cord-connected equipment shall be made so that the PE conductor in the cord shall, in the case of failure of the strain-relief mechanism, be the last conductor to be interrupted. For special system topologies, the PECS designer shall verify the PE conductor cross-section required.		P
4.4.4.3.2 /RD	Means of connection for the PE conductor		P
	PECS shall have a means of connection for the PE conductor, located near the terminals for the respective live conductors. The means of connection shall be corrosion-resistant and shall be suitable for the connection of conductors according to Table 7 and of cables in accordance with the wiring rules applicable at the installation. The means of connection for the PE conductor shall not be used as a part of the mechanical assembly of the equipment or for other connections. Connection and bonding points shall be designed so that their current-carrying capacity is not impaired by mechanical, chemical, or electrochemical influences. Where enclosures and/or conductors of aluminium or aluminium alloys are used, particular attention should be given to the problems of electrolytic corrosion. Compliance shall be checked by inspection.		P
4.4.4.3.3 /RD	Touch current in case of failure of PE conductor		P
	For all other PECS, one or more of the following measures shall be applied, unless the touch current can be shown to be less than the limits specified in 4.4.3.4: a) Use of a fixed connection and • a cross-section of the PE conductor of at least 10 mm^2 Cu or 16 mm^2 Al; or • automatic disconnection of the supply in case of discontinuity of the PE conductor; or • provision of an additional terminal for a second PE conductor of the same cross-sectional area as the original PE conductor; or b) Use of a pluggable type B connection with a minimum PE conductor cross-section of 2,5 mm^2 as part of a multi-conductor power cable. Adequate strain relief shall be provided.		P
	Compliance is checked by inspection and by test of 5.2.3.7/RD.		P
4.4.4.4/RD	Automatic disconnection of supply		P

	For automatic disconnection of supply: • a protective equipotential bonding system shall be provided; and • a protective device operated by the fault current shall disconnect one or more of the line conductors supplying the equipment, system or installation, in case of a failure of basic insulation. The protective device shall interrupt the fault current within a time as specified in Figure 1, Figure 2 or Figure 3 in 4.4.2.2.3/RD.		P
4.4.4.5/RD	Supplementary insulation		P
4.4.4.6/RD	Simple separation between circuits		P
	If any component is connected between the separated circuits, that component shall withstand the electric stresses specified for the insulation which it bridges. If any component is connected between a circuit and a circuit connected to earth, its impedance shall limit the current flow through the component to the steady-state touch current values indicated in 4.4.3.4/RD.		P
4.4.4.7/RD	Electrically protection		P
	Electrically protective screening interposed between hazardous live parts of a PECS, shall consist of a conductive screen connected to the protective equipotential bonding of the PECS whereby the screen is separated from live parts by at least simple separation. The protective screen and the connection to the protective equipotential bonding system of the PECS and that interconnection shall comply with the requirements of 4.4.4.2/RD.		P
4.4.5/RD	Enhanced protection	See below	P
4.4.5.1/RD	General		P
	Enhanced protection shall provide both basic and fault protection and can be achieved by means of: • Reinforced insulation in 4.4.5.2/RD; • Protective separation between circuits in 4.4.5.3/RD; • Protection by means of in 4.4.5.4/RD.		P
4.4.5.2/RD	Reinforced insulation		P
	Reinforced insulation shall be so designed as to be able to withstand electric, thermal, mechanical and environmental stresses with the same reliability of protection as provided by double insulation. (basic insulation and supplementary insulation, see 4.4.3.2/RD and 4.4.4.5/RD)		P

4.4.5.3/RD	Protective separation between circuits		P
	Protective separation between a circuit and other circuits shall be achieved by one of the following means: • double insulation (basic insulation and supplementary insulation in 4.4.3.2/RD and 4.4.4.5/RD); • reinforced insulation in 4.4.5.2/RD; • electrically protective screening in 4.4.4.7/RD; • a combination of these provisions.		P
	If conductors of the separated circuit are contained together with conductors of other circuits in a multi-conductor cable or in another grouping of conductors, they shall be insulated, individually or collectively, for the highest voltage present, so that double insulation is achieved. If any component is connected between the separated circuits, that component shall comply with the requirements for protective impedance devices (see 4.4.5.4/RD)		P
4.4.5.4/RD	Protection by means of protective impedance		P
	Protective impedance shall be arranged so that under both normal and single fault conditions the current and discharge energy available shall be limited according to 4.4.3.4/RD.		P
	The protective impedances shall be designed and tested to withstand the impulse voltages and temporary overvoltages for the circuits to which they are connected. See 5.2.3.2/RD and 5.2.3.4/RD for tests.		P
	Compliance with the requirement for the limitation of touch current is checked by test of 5.2.3.6/RD.		P
	Compliance with the requirement for the discharge energy shall be checked by performing calculations and/or measurements to determine the voltage and capacitance. NOTE A protective impedance designed according to this subclause is not considered to be a galvanic connection.		P
4.4.6/RD	Protective measures	See below	P
4.4.6.1/RD	General		P
4.4.6.2/RD	Protective measures for protective class I equipment	P	P
	Protective class I equipment shall meet the requirements for: • basic protection in 4.4.3/RD; and • fault protection in 4.4.4.2/RD and 4.4.4.3/RD with respect to equipotential bonding and PE conductor.		P

4.4.6.3/RD	Protective measures for protective class II equipment	Class I equipment	N/A
	Protective class II equipment shall meet the requirements for enhanced protection according to 4.4.5/RD and the enclosure shall meet the requirement for basic protection in 4.4.3/RD with respect to accessibility to hazardous live parts. Protective class II equipment shall not have means of connection for the PE conductor. This does not apply if a PE conductor is passed through the equipment to equipment series-connected beyond it. In the latter case the PE conductor and its means for connection shall be separated from: · accessible surface of the equipment; and · circuits which employ protective separation with at least simple separation according to the requirement in 4.4.4.6/RD. The simple separation shall be designed according to the rated voltage of the series-connected equipment. Equipment of protective class II may have provision for the connection of an earthing conductor for functional reasons or for the damping of overvoltages. In this case, the functional earthing conductor shall be separated from: · accessible surface of the equipment; and · circuits which employ protective separation according to 4.4.5.3/RD with at least protective separation according to the requirement in 4.4.5.3/RD. Equipment of protective class II shall be marked according to 6.3.7.3.3/RD. Compliance is checked by inspection.		N/A
4.4.6.4/RD	Protective measures for protective class III equipment or circuits	Class I equipment	N/A
4.4.6.4.1 /RD	General		N/A

	Protective measures shall be achieved by protective separation by one of the following means: • basic insulation and supplementary insulation (double insulation) according to 4.4.3.2/RD and 4.4.4.5/RD; • reinforced insulation according to 4.4.5.2/RD; • electrically protective screening and simple separation according to 4.4.4.7/RD; or • a combination of these provisions; used in combination with one of the following means: • protective impedance according to 4.4.5.4/RD comprising limitation of discharge energy and of current; or • limitation of voltage according to 4.4.3.5/RD.		N/A
	The protective separation shall be fully and effectively maintained under all conditions of intended use of the PECS.		N/A
4.4.6.4.2 /RD	Connection to PELV and SELV circuits	No such port	N/A

	If a port is intended for connection of an external PELV or SELV circuit with a higher voltage than DVC As: • measures to limit the voltage to that of DVC As shall be taken (see Annex A); or • basic protection shall be provided. For connectors containing pins with very small contact area (< 1 mm²), the next higher voltage level for DVC As, of Table 5, is permitted. Example: if DVC A1 is DVC As, then DVC A2 is permitted at pins of signal connectors. The connection of external PELV or SELV circuits to an internal circuit is permitted with the following consideration: • without measures: only if the DVC of the PELV and SELV voltage are lower than or equal to the DVC selected from Table 5 for the internal circuit under consideration; and • with measures: if the DVC of the PELV and SELV voltage are higher than the DVC selected from Table 5 for the internal circuit under consideration. The possibility of an addition of the voltages of the circuits under consideration to a higher level under fault conditions shall be considered. For marking, see 6.3.7.1/RD. Consideration needs to be given to factors such as whether the circuits involved are earthed or not, what the voltages involved are, whether or not direct contact with live parts is possible, single faults in either equipment or the interconnections, etc.		N/A
4.4.7/RD	Insulation		P
4.4.7.1/RD	General		P
4.4.7.1.1 4.4.7.1.1 /RD	Influencing factors		P
	This subclause gives minimum requirements for insulation, based on the principles of IEC 60664.		P
	Insulation shall be selected after consideration of the following influences: - pollution degree; - overvoltage category; - supply system earthing; - impulse withstand voltage, temporary overvoltage and working voltage; - location of insulation; - type of insulation.	Cosidered	P

	Verification of insulation shall be made according to 5.2.2.1/RD, 5.2.3.2/RD, 5.2.3.4/RD and 5.2.3.5/RD. The working voltage can also be measured in accordance with Annex A.		P
4.4.7.1.2 4.4.7.1.2 /RD	Pollution degree	PD2	P
	Insulation, especially when provided by clearances and creepage distances, is affected by pollution which occurs during the expected lifetime of the PECS. The micro-environmental conditions for insulation shall be applied according to Table 8.		P
	The pollution degree shall be determined according to the environmental condition for which the product is specified. See Table 18 for selection of pollution degree according to environmental classification of the installation.		P
	The insulation may be determined according to pollution degree 2 if one of the following applies: a) instructions are provided with the PECS indicating that it shall be installed in a pollution degree 2 environment; or b) the specific installation application of the PECS is known to be a pollution degree 2 environment; or c) the PECS enclosure or coatings applied within the PECS according to 4.4.7.8.4.2/RD or 4.4.7.8.6/RD provide adequate protection against what is expected in pollution degree 3 and 4 (conductive pollution and condensation).		P
	The PECS manufacturer shall state in the documentation the pollution degree for which the PECS has been designed.		P
	If operation in a pollution degree 4 environment is required, protection against conductive pollution shall be provided by means of a suitable enclosure.		N/A
	Unless otherwise specified by the UPS manufacturer, the UPS shall be suitable for installation in environments in which the pollution degree is 2 (PD2), see IEC 62477-1: 2012, Table 8.	Considered	P
4.4.7.1.3 4.4.7.1.3 /RD	Overvoltage category (OVC)	See below	P

	Four categories are considered. • Equipment of overvoltage category IV (OVC IV) is for use at the origin of the installation. • Equipment of overvoltage category III (OVC III) is equipment in fixed installations and for cases where the reliability and the availability of the equipment are subject to special requirements. • Equipment of overvoltage category II (OVC II) is energy-consuming equipment to be supplied from the fixed installation. • Equipment of overvoltage category I (OVC I) is equipment for connection to circuits in which measures are taken to limit transient overvoltages to an appropriately low level.	Equipment of overvoltage category II (OVC II) is energy-consuming equipment to be supplied from the fixed installation	P
	The measures for reduction of the impulse voltage shall ensure that the temporary overvoltages that could occur are sufficiently limited so that their peak value does not exceed the relevant rated impulse voltage of Table 9 and shall meet the requirement of 4.4.7.2.2/RD, 4.4.7.2.3/RD and 4.4.7.3/RD as applicable.		P
	As a minimum, the UPS shall be suitable for installation in environments presenting overvoltage categories listed in Table 102. For UPS units designed to be part of a parallel configuration, the current to be considered in Table 102 is that provided by the parallel configuration.		P
	If measures are provided to reduce impulses of overvoltage category III to values of category II, or values of category II to values of category I, appropriate insulation may be designed to the reduced values, provided that following a single failure, e.g. of the reduction measure, at least the basic insulation requirements for the original overvoltage category shall be fulfilled.		P
4.4.7.1.4 /RD	Supply system earthing		P

	The following three basic types of system earthing are described in IEC 60364-1. • TN system: has one point directly earthed, the accessible conductive parts of the installation being connected to that point by protective conductors. Three types of TN system, TN-C, TN-S and TN-C-S, are defined according to the arrangement of the neutral and protective conductors. • TT system: has one point directly earthed, the accessible conductive parts of the installation being connected to earth electrodes electrically independent of the earth electrodes of the power system. • IT system: has all live parts isolated from earth or one point connected to earth through an impedance, the accessible conductive parts of the installation being earthed independently or collectively to the system earthing.		P
4.4.7.1.5 /RD	Determination of impulse withstand voltage and temporary overvoltage		P
	Table 9 uses the system voltage (see 4.4.7.1.6/RD) and overvoltage category of the circuit under consideration to determine the impulse withstand voltage. The system voltage is also used to determine the temporary overvoltage. A PECS having more than one input or output shall be evaluated according to the input or output which gives the most severe requirements.		P
4.4.7.1.6 /RD	Determination of the system voltage		P
4.4.7.1.6.1 /RD	For mains supply		P
4.4.7.1.6.2 /RD	For non-mains supply		P
	For PSCS supplied by non-mains a.c. or d.c., the system voltage is the r.m.s. value of the supply voltage between phases.		P
4.4.7.1.7 4.4.7.1.7 /RD	Components bridging insulation		P
	Components bridging insulation shall comply with the requirements of the level of insulation (e.g. basic, reinforced, double) they are bridging.		P

	A capacitor connected between two line conductors in a primary circuit, or between one line conductor and the neutral conductor or between the primary circuit and protective earth shall comply with one of the subclasses of IEC 60384-14 or with the requirement of 4.4.7.1.7 of IEC 62477-1: 2012 and shall be used in accordance with its rating for voltage and current		P
	For equipment to be connected to IT power distribytion systems components connected between line and earth shall be rated for the line-to-line voltage. However, capacitors rated for the applicable line-to-neutral voltage are permitted in such applications if they comply with subclass Y1, Y2 or Y4 of IEC 60384-14		P
4.4.7.2/RD	Insulation to the surroundings		P
4.4.7.2.1 /RD	General		P
4.4.7.2.2 4.4.7.2.2 /RD	Circuits connected to mains supply		P
	Insulation between the surroundings and circuits which are connected directly to the mains supply shall be designed according to the impulse withstand voltage, temporary overvoltage, or working voltage, whichever gives the most severe requirement.		P
4.4.7.2.3 /RD	Circuits connected to non-mains supply		P
	Insulation between the surroundings and circuits supplied from a non-mains supply shall be designed according to: • the impulse withstand voltage determined from Table 9 using the system voltage; • the working voltage; • the temporary overvoltage if known to exist due to the nature of the supply; whichever gives the more severe requirement.		P
	Temporary overvoltage on a non-mains supply shall be determined as follows: • Without detailed knowledge of the temporary overvoltage, it shall be according to Table 9. • If the temporary overvoltage is known this value shall be used.		P

	By the determination of temporary overvoltages on non-mains supply, following situations should be considered: • loss of the neutral in a non-mains low-voltage system; • accidental earthing of a non-mains low voltage IT system; and • short circuit in the non-mains low voltage installation.		P
4.4.7.2.4 /RD	Insulation between circuits		P
	Insulation between two circuits shall be designed according to the circuit having the more severe requirement. For the design of simple and protective separation between circuits the insulation shall be designed according to: • the circuit having the more severe requirement; or • the working voltage between the circuits; whichever gives the most severe requirement.		P
4.4.7.3/RD	Functional insulation		P
	If the failure of functional insulation does not produce a hazard (electrical, thermal, fire), no specific requirements apply for the dimensioning of functional insulation. In other cases the following requirements apply. Testing is not required, except where the circuit analysis required by 4.2/RD shows that failure of the insulation could result in a hazard. For parts or circuits that are significantly affected by external transients, functional insulation shall be designed according to the impulse withstand voltage of overvoltage category II, except that overvoltage category III shall be used when the PECS is connected at the origin of the installation. Where measures are provided that reduce transient overvoltages within the circuit from category III to values of category II, or values of category II to values of category I, functional insulation may be designed for the reduced values. Where the circuit characteristics can be shown by testing (see 5.2.3.2/RD) to reduce impulse voltages, functional insulation may be designed for the highest impulse voltage occurring in the circuit during the tests. For parts or circuits that are not significantly affected by external transients, functional insulation shall be designed according to the working voltage across the insulation.		P

4.4.7.4/RD	Clearance distance		P
4.4.7.4.1 /RD	Determination		P
	Clearances for functional, basic and supplementary insulation shall be dimensioned according to Table 10 (see Annex D for examples of the evaluation of clearance distances). Interpolation is permitted, when clearance is determined from temporary overvoltage or working voltage. Clearances for reinforced insulation shall be dimensioned to withstand an impulse voltage one step higher than the impulse withstand voltage, or 1,6 times the peak temporary overvoltage or peak working voltage, required for basic insulation. Clearance distances for use in altitudes between 2 000 m and 20 000 m shall be calculated using a correction factor according to Table A.2 of IEC 60664-1:2007, which is reproduced as Table E.1. A correction factor selected from Table F.2 is also used for determination of clearance distances for approximately homogenous fields when frequencies are greater than 30 kHz, as given in Annex F.		P
	Compliance shall be checked by visual inspection (see 5.2.2.1/RD) or by performing the impulse voltage test of 5.2.3.2/RD and the a.c. or d.c. voltage test of 5.2.3.4/RD.		P
4.4.7.4.2 /RD	Electric field homogeneity		P
	The dimensions in Table 10 correspond to the requirements of an inhomogeneous electric field distribytion across the clearance, which are the conditions normally experienced in practice. If a homogeneous electric field distribytion is known to exist, the clearance distance for basic or supplementary insulation may be reduced to not less than that required by Table F.2 (Case B) of IEC 60664-1:2007. In this case, however, the impulse voltage test of 5.2.3.2/RD shall be performed across the considered clearance. If the withstand against steady state voltages, recurring peak or temporary overvoltages according to Table 10 is decisive for the dimensioning of clearance and if these clearances are smaller than the values of Table 10 then an a.c. or d.c. voltage test according to 5.2.3.4/RD is required. Clearance distances for reinforced insulation shall not be reduced for homogeneous fields.		P
4.4.7.4.3 /RD	Clearance to conductive enclosure		P

	The clearance between any non-insulated live part and the walls of a metal enclosure shall be in accordance with 4.4.7.4.1/RD during and following the deflection tests of 5.2.2.4.2/RD.		P
	Compliance is checked by inspection and by test of 5.2.2.4.2/RD.		P
	If the design clearance distance is at least 12,7 mm and the clearance distance required by 4.4.7.4.1/RD does not exceed 8 mm, the deflection tests may be omitted.		P
4.4.7.5/RD	Creepage distances		P
4.4.7.5.1 /RD	Insulating material groups		P
	Creepage distance requirements for PWBs exposed to pollution degree 3 environmental conditions shall be determined based on Table 11 pollution degree 3 under “Other insulators”.		P
	For inorganic insulating materials, for example glass or ceramic, which do not track, the creepage distance may equal the associated clearance distance, as determined from Table 10.		P
4.4.7.5.2 /RD	Determination		P
	Creepage distances for functional, basic and supplementary insulation shall be dimensioned according to Table 11. Interpolation is permitted. Creepage distances for reinforced insulation shall be twice the distances required for basic insulation.		P
	When the creepage distance requirement determined from Table 11 is less than the clearance distance required by 4.4.7.4.1/RD or the clearance distance determined by impulse testing (see 5.2.3.2/RD), then the creepage distance shall be increased to the clearance distance.		P
	Compliance of creepage distances shall be checked by measurement or inspection (see 5.2.2.1/RD) (see Annex D for examples of the evaluation of creepage distances).		P
4.4.7.6/RD	Coating	See below	N/A
	A coating may be used to provide insulation, to protect a surface against pollution, and to allow a reduction in creepage and clearance distances (see 4.4.7.8.4.2/RD and 4.4.7.8.6/RD)	No such coating	N/A
4.4.7.7 4.4.7.7/RD	PWB spacings for functional insulation		P
	Spacings for functional insulation shall comply with the requirement of 4.4.7.4/RD and 4.4.7.5/RD.		P

	Decreased spacing for components mounted on PWB or decreased spacing on PWB are permitted when all the following are satisfied: • the PWB has flammability rating of V-0 (see IEC 60695-11-10); • the PWB base material has a minimum CTI of 100; • the equipment complies with the PWB short circuit test (see 5.2.4.7/RD). Decreased spacings for components assembled on PWB are permitted when used in: • pollution degree 1 or 2 environment; and • not more than overvoltage category I. In this case the manufacture specification may be used. Compliance is checked by inspection and by test of 5.2.4.7/RD if applicable.		P
4.4.7.8/RD	Solid insulation	See below	N/A
4.4.7.8.1 /RD	General	No such solid insulation used	N/A
	Materials selected for solid insulation shall be able to withstand the stresses occurring. These include mechanical, electrical, thermal, climatic and chemical stresses which are to be expected in normal use. Insulation materials shall also be resistant to ageing during the expected lifetime of the PECS. Tests shall be performed on components and sub-assemblies using solid insulation, in order to ensure that the insulation performance has not been compromised by the design or manufacturing process.	No such solid insulation used	N/A
4.4.7.8.2 /RD	Material requirements	No such solid insulation used	N/A
	The insulating material shall have a CTI of 100 or greater. The insulating material shall be suitable for the maximum temperature it attains as determined by the temperature rise test of 5.2.3.10/RD. Consideration shall be given as to whether or not the insulating material additionally provides mechanical strength and whether or not the part can be subject to impact during use.	No such solid insulation used	N/A

	The insulating material in contact with live parts higher than DVC As shall comply with: • the glow-wire test described in 5.2.5.3/RD at a test temperature of 850 °C; or • the glow-wire test described in 5.2.5.3/RD, at a lower test temperature, byt not less than 550 °C, depending on the classification of the use of the PECS, according to Table A.1 of IEC 60695-2-11:2011; or • the alternative hot wire ignition test of 5.2.5.4/RD	No such solid insulation used	N/A
	Thermoplastic insulating materials used in contact with live parts higher than DVC As or used as part of the enclosure shall comply with the ball pressure test as abnormal heat test according to IEC 60695-10-2.	No such solid insulation used	N/A
	Where an insulating material is used in a PECS that incorporates switching contacts, and is within 12,7 mm of the contacts, it shall comply with the high current arcing ignition test of 5.2.5.2/RD.	No such solid insulation used	N/A
	In case the manufacturer of the insulating material provides data to demonstrate compliance with the above requirements no further testing is required. No further evaluation is required when generic materials are used according to Table 12.	No such solid insulation used	N/A
	Compliance is checked by inspection and by test of 5.2.3.10/RD and 5.2.5.3/RD or 5.2.5.2/RD.	No such solid insulation used	N/A
4.4.7.8.3 /RD	Thin sheet or tape material	See below	P
4.4.7.8.3.1 /RD	General		P
	4.4.7.8.3/RD applies to the use of thin sheet or tape materials in assemblies such as wound components and bys-bars. Insulation consisting of thin (less than 0,75 mm) sheet or tape materials is permitted, provided that it is protected from damage and is not subject to mechanical stress under normal use. Where more than one layer of insulation is used, there is no requirement for all layers to be of the same material. NOTE 1 One layer of insulation tape wound with more than 50 % overlap is considered to constitute two layers. NOTE 2 Basic, supplementary and double insulation can be applied as a pre-assembled system of thin materials.		P
4.4.7.8.3.2 /RD	Material thickness equal to or more than 0,2 mm		P

	Basic or supplementary insulation shall consist of at least one layer of material, which will meet the requirements of 4.4.7.8.1/RD and 4.4.7.10.1/RD.		P
	Double insulation shall consist of at least two layers of material, each of which will meet the requirements of 4.4.7.8.1/RD, 4.4.7.10.1/RD, and the partial discharge requirements of 4.4.7.10.2/RD, and both layers together will meet the impulse and a.c. or d.c. voltage requirements of 4.4.7.10.2/RD.		P
	Reinforced insulation shall consist of a single layer of material, which will meet the requirements of 4.4.7.8.1/RD and 4.4.7.10.2/RD.		P
	NOTE The requirements of this subclause indicate that double insulation can be at least 0,4 mm thick, while reinforced insulation is permitted to be 0,2 mm thick.		P
4.4.7.8.3.3 /RD	Material thickness less than 0,2 mm		P
	Basic or supplementary insulation shall consist of at least two layers of material, which will meet the requirements of 4.4.7.8.1/RD and 4.4.7.10.1/RD.		P
	Double insulation shall consist of at least three layers of material. Each layer shall meet the requirements of 4.4.7.8.1/RD and 4.4.7.10.1/RD, and any two layers together shall meet the requirements of 4.4.7.10.2/RD.		P
	Reinforced insulation consisting of a single layer of material is not permitted.		P
4.4.7.8.3.4 /RD	Compliance		P
	Compliance shall be checked by the tests described in 5.2.3.1/RD to 5.2.3.5/RD. When a component or sub-assembly makes use of thin sheet insulating materials, it is permitted to perform the tests on the component rather than on the material.		P
4.4.7.8.4 /RD	Printed wiring boards (PWBs)		P
4.4.7.8.4.1 /RD	General		P

	Insulation between conductor layers in double-sided single-layer PWBs, multi-layer PWBs and metal core PWBs, shall meet the requirements of 4.4.7.8.1/RD. Basic, supplementary, double and reinforced insulation shall meet the appropriate requirements of 4.4.7.10.1/RD or 4.4.7.10.2/RD. Functional insulation in PWBs shall meet the requirements of 4.4.7.7/RD. For the inner layers of multi-layer PWBs, the insulation between adjacent tracks on the same layer shall be treated as either: • a creepage distance for pollution degree 1 and a clearance as in air (see Example D.14); or • solid insulation, in which case it shall meet the requirements of 4.4.7.8.1/RD and 4.4.7.10/RD.		P
4.4.7.8.4.2 /RD	Use of coating materials	No such coating materials used	N/A
	A coating material used to provide functional, basic, supplementary and reinforced insulation shall meet the requirement as specified below.		N/A
	Type 1 protection (as defined in IEC 60664-3) improves the microenvironment of the parts under protection. The clearance and creepage distance of Table 10 and Table 11 for pollution degree 1 apply under the protection. Between two conductive parts, it is a requirement that one or both conductive parts, together with all the spacing between them, are covered by the protection.		N/A
	Type 2 protection is considered to be similar to solid insulation. Under the protection, the requirements for solid insulation specified in 4.4.7.8/RD are applicable, including the coating material itself, and spacings shall not be less than those specified in Table 1 of IEC 60664-3:2003. The requirements for clearance and creepage in Table 10 and Table 11 do not apply. Between two conductive parts, it is a requirement that both conductive parts, together with the spacing between them, are covered by the protection so that no air gap exists between the protective material, the conductive parts and the printed boards.		N/A
	The coating material used to provide Type 1 and Type 2 protection shall be designed to withstand the stresses anticipated to occur during the expected lifetime of the PECS. A type test on representative PWBs shall be conducted according to Clause 5 of IEC 60664-3:2003. For the cold test (5.7.1 of IEC 60664-3:2003), a temperature of -25 °C shall be used, and for the rapid change of temperature test (5.7.3 of IEC 60664-3:2003): -25 °C to +125 °C. No routine test is required.		N/A

4.4.7.8.5 /RD	Wound components	No such components	N/A
	Varnish or enamel insulation of wires shall not be used for basic, supplementary, double or reinforced insulation. Wound components shall meet the requirements of 4.4.7.8.1/RD and 4.4.7.10/RD. The component itself shall pass the requirements given in 4.4.7.8.1/RD and 4.4.7.10.2/RD. If the component has reinforced or double insulation, the a.c. or d.c. voltage test of 5.2.3.4/RD shall be performed as a routine test.		N/A
4.4.7.8.6 /RD	Potting materials	No potting materials used	N/A
	A potting material may be used to provide solid insulation or to act as a coating to protect against pollution.		N/A
	If used as solid insulation, it shall comply with the requirements of 4.4.7.8.1/RD and 4.4.7.10/RD.		N/A
	If used to protect against pollution, the requirements for Type 1 protection in 4.4.7.8.4.2/RD apply.		N/A
4.4.7.9/RD	Connection of parts of solid insulation (cemented joints)	No such construction	N/A
	The creepage and clearance path in the presence of a cemented joint between two insulating parts, are determined as follows. • Type 1 or type 2 protection as described in 4.4.7.8.4.2/RD apply. • A cemented joint that is not evaluated as providing protection of type 1 or type 2, is neither considered solid insulation nor to reduce pollution degree. The clearance and creepage distances of Table 10 and Table 11 apply for the pollution degree of the environment around the joint. See 5.2.5.7/RD for test.		N/A
4.4.7.10 /RD	Requirements for electrical withstand capability	See below	P
4.4.7.10.1 /RD	Basic or supplementary insulation	See Table 4.4.7.10/RD	P
	Test with impulse withstand voltage according to 5.2.3.1/RD		P
	Test with a.c. or d.c. voltage according to 5.2.3.4/RD		P
4.4.7.10.2 /RD	Double or reinforced insulation	See Table 4.4.7.10/RD	P

	Double or reinforced insulation shall be tested as follows: • Test with impulse withstand voltage according to 5.2.3.2/RD; and • Test with a.c. or d.c. voltage according to 5.2.3.4/RD.		P
	For solid insulation, the partial discharge test according to 5.2.3.5/RD shall be performed in addition to the above tests, if the recurring peak working voltage across the insulation is greater than 750 V and the voltage stress on the insulation is greater than 1 kV/mm. The partial discharge test shall be performed as a type test on all components, sub-assemblies and PWB. In addition, a sample test shall be performed if the insulation consists of a single layer of material.		N/A
	Double insulation shall be designed so that failure of the basic insulation or of the supplementary insulation will not result in reduction of the insulation capability of the remaining part of the insulation.		P
4.4.7.11 /RD	Insulation requirements above 30kHz	Up to 30kHz	P
4.4.8/RD	Compatibility with residual current-operated protective devices (RCD)	the RCD is built-in the PCE	P
	To ensure the intended work of an RCD provided by the installation PECS shall satisfy one of the following conditions. a) A Pluggable Type A single-phase PECS, shall be designed so that, under normal and fault conditions any resulting d.c. component of the current in the PE conductor does not exceed the d.c. current withstand requirements in IEC 60755 for RCD of type A. b) For PECS that are Pluggable Type B or intended for permanent connection, d.c. current in the PE conductor is not limited if the information and marking requirements of 6.3.7.4/RD are complied with.		P
	Compliance with RCD provided by the installation shall be checked by simulation or calculation of current in the PE conductor under normal and single fault conditions according to the guideline provided in Annex H/RD.		P
4.4.9 4.4.9/RD	Capacitor discharge		P

	For protection against shock hazard, capacitors within a PECS shall be discharged to a voltage less than DVC As, or to a residual charge less than 50 µC, after the removal of power from the PECS: • for pluggable UPS type A, the discharge time shall not exceed 1 s or the hazardous live parts shall be protected against direct contact by at least IPXXB (see 4.4.3.3); • for pluggable UPS type B, the discharge time shall not exceed 5 s or the hazardous live parts shall be protected against direct contact by at least IPXXB (see 4.4.3.3); • for permanently connected UPS, the discharge time shall not exceed 15 s. For pluggable PECS type A and B and permanently connected PECS, which do not meet the above requirements, access shall only be possible by means of a tool or key and the information and marking requirements of 6.5.2/RD apply. Compliance is checked by test of 5.2.3.8/RD.	The symbol "⚡" of Annex C and "5min" were provided on the label.	P
4.5	Protection against electrical energy hazards	See below	P
4.5.1/RD	Operator access areas		P
4.5.1.1/RD	General		P
	Equipment shall be so designed that there is no risk of electrical energy hazard in operator access areas from accessible circuits by fulfilling requirement of 4.2/RD. A risk of injury due to an electrical energy hazard exists if it is likely that two or more bare parts (one of which may be earthed) between which a hazardous energy level exists, will be bridged by a metallic object. The likelihood of bridging the parts under consideration is determined by means of the test finger of Figure 1 of IEC 60529:1989, in a straight position. If it is possible to bridge the parts with this test finger, a hazardous energy level shall not exist. Barriers, guards, and similar means preventing unintentional contact may be provided as an alternative to limiting the energy.	The proper protections are provided on operator access area to prevent cause any hazard.	P
	Compliance is checked by inspection or test of 5.2.2.2/RD.		P
4.5.1.2/RD	Determination of hazardous electrical energy level		P

	A hazardous electrical energy level is considered to exist if: • the voltage is 2 V or more; and • power available exceeds 240 VA after 60 s; or • the energy exceeds 20 J. Compliance shall be checked with the test in 5.2.3.9/RD or by calculation.		P
4.5.2 4.5.2/RD	Service access areas	See below	P
	Capacitors within a PECS shall be discharged to an energy level less than 20 J, as in 4.5.1.2, within 5 s after the removal of power from the PECS. If this requirement is not achievable for functional or other reasons, the information and marking requirements of 6.5.2/RD apply.	It has specified in insutruction manual	P
	This requirement does not apply to terminals covered by 4.4.9. In a service access area, the following requirements apply. Bare parts at hazardous voltage shall be located or guarded so that unintentional contact with such parts is unlikely during service operations involving other parts of the equipment. Bare parts at hazardous voltage shall be located or guarded so that accidental shorting to parts at non-hazardous potentials (for example, by tools or test probes used by a service person) is unlikely.	It has specified in insutruction manual	P
	If the capacitor discharge time cannot be accurately calculated, the discharge time shall be measured.	It has specified in insutruction manual	P
4.6	Protection against fire and thermal hazards	See below	P
4.6.1/RD	Circuits representing a fire hazard	See below	P
	The following types of circuits are considered a fire hazard: - circuits directly connected to the mains - circuits that are not directly connected to the mains byt exceed the limits for limited power sources in 4.6.5/RD - components having unenclosed arcing parts	Used of material with the required flammability class, and select the components for simulation of fault with acceptable results.	P
4.6.2/RD	Components representing a fire hazard	All conponent around on inside of metallic fire enclosure used	P
4.6.2.1/RD	General		P
	Compliance with 4.6.2/RD and 4.6.3/RD shall be confirmed by inspection of component and material data sheets and, where necessary, by test.	Temperature rise of electrical components did not exceed the limit.	P

4.6.2.2 4.6.2.2/RD	Components within a circuit representing a fire hazard	See below	P
	Inside fire enclosures, materials for components and other parts and all materials in contact with such parts shall comply with flammability class V-2 as classified in IEC 60695-11-10 or flammability class HF-2 as classified in ISO 9772 or better.	Metallic fire enclosure used	P
	The above requirement does not apply to any of the following: • electrical components which do not present a fire hazard under abnormal operating conditions when tested according to 5.2.4.6/RD; • materials and components within an enclosure of 0,06 m3 or less, consisting totally of metal and having no ventilation openings, or within a sealed unit containing an inert gas; • electronic components, such as integrated circuit packages, opto-coupler packages, capacitors and other small parts that are mounted on material of flammability class V-1 or better; • wiring, cables and connectors insulated with PVC, TFE, PTFE, FEP, neoprene or polyimide; • the following parts, provided that they are separated from electrical parts (other than insulated wires and cables) which under fault conditions are likely to produce a temperature that could cause ignition, by at least 13 mm of air or by a solid barrier of material of flammability class V-1 or better: – other small parts which would contribyte negligible fuel to a fire, including, labels, mounting feet, key caps, knobs and the like; – tubing for air or any fluid systems, containers for powders or liquids and foamed plastic parts, provided that they are of flammability class HB.		N/A
	Batteries shall have a flammability class HB or better.		P
4.6.2.3/RD	Components within a circuit not representing a fire hazard		P
	For components within a circuit not representing a fire hazard 4.6.2/RD does not apply.		P
4.6.3/RD	Fire enclosure		P
4.6.3.1 4.6.3.1/RD	General	Fire enclosure is required	P

	Fire enclosures are used to reduce the risk of fire to the environment, independent of the location where they are installed. A fire enclosure shall be provided for all UPS unless: • circuits inside of an enclosure are within the limits of limited power sources in 4.6.5 of this document; or • there is an agreement between the user and the manufacturer; or • the UPS is intended to be used only in areas without combystible materials and is marked according to 6.3.5/RD.		P
4.6.3.2/RD	Flammability of enclosure materials	See below	P
	Materials used for fire enclosures of PECS shall meet the flammability test requirements of 5.2.5.5/RD, except for those portions of the enclosure that enclose only circuits not representing a fire hazard.	Metallic fire enclosure used	P
	Materials are considered to comply without test if, in the minimum thickness used, the material is of flammability class 5VA or better, according to IEC 60695-11-20.		P
	Metals, ceramic materials, and glass which is heat-resistant tempered, wired or laminated, are considered to comply without test.	Considered	P
	Materials for components that fill an opening in a fire enclosure shall: • be of at least V-1 class material and no larger than 100 mm in any dimension; or • be of at least V-2 class material and either – not larger than 25 mm in any dimension; or – not larger than 100 mm in any dimension and located at least 100mm from any part that is a source of fire hazard; or • be of at least V-2 class material and there is a barrier or device(s) that forms a barrier made of a V-0 class material between the part and a source of fire hazard; or • comply with a relevant IEC component standard that includes flammability requirements for components that are intended to form part of, or fill openings in, a fire enclosure.	No such opening	N/A
	Polymeric materials that serve as the outer enclosure and have surface area greater than 1 m^2 or a single dimension larger than 2 m, shall have a maximum flame spread index of 100 as determined by ASTM E162 or ANSI/ASTM E84.	No such part	N/A

	The manufacturer may provide data from the fire enclosure material supplier to demonstrate compliance with the above requirements. In this case, no further testing is required.		P
	Compliance shall be checked by visual inspection and, where necessary, by test.....		P
4.6.3.3/RD	Openings in fire enclosure	No such opening	N/A
4.6.3.3.1 /RD	General		N/A
4.6.3.3.2 4.6.3.3.2 /RD	Openings in the top and side if fire enclosures		N/A
	Openings in the top surfaces of fire enclosures shall be designed to prevent an external object falling vertically or at up to 5° from vertically from entering the enclosure in an area that could lead to a fire hazard. This requirement applies to all sides of moveable equipment with no defined top and bottom, unless top and bottom surfaces can be suitably demonstrated in the installation instructions. The test requirements are found in 5.2.2.2 of this document.		N/A
	Openings in the top surfaces of fire enclosures not located vertically above or within 5° from vertical of a circuit representing a fire hazard as defined in 4.6.1/RD are not subject to the test of 5.2.2.2/RD and can be of any construction if the construction prevents access to parts greater than DVC As with the IP2X probe as detailed in 4.4.3.3/RD. Where a portion of the side of a fire enclosure falls within the area traced out by the 5° angle in Figure 6, the limitations in 4.6.3.3.3/RD regarding openings in bottoms of fire enclosures also apply to this portion of the side. Compliance shall be checked by visual inspection.		N/A
4.6.3.3.3 /RD	Openings in the bottom of a fire enclosure		N/A
	Compliance is checked by inspection or with the hot flaming oil test in 5.2.5.6/RD, in case the fire enclosure is designed differently than as described in this subclause.		N/A
4.6.3.3.4 /RD	Doors or covers in fire enclosures		N/A

	If part of a fire enclosure consists of a door or a cover leading to an operator access area, it shall comply with one of the following requirements: • the door or cover shall be provided with a safety interlock; or • a door or cover, intended to be routinely opened by the user, shall comply with both of the following conditions: – it shall not be removable from other parts of the fire enclosure by the user; and – it shall be provided with a means to keep it closed during normal operation. A door or cover intended only for occasional use by an installer, such as for the installation of accessories, is permitted to be removable provided that the equipment instructions include directions for correct removal and reinstallation of the door or cover. Compliance is checked by inspection.		N/A
4.6.4/RD	Temperature	See below	P
4.6.4.1 4.6.4.1/RD	Internal parts	See table 4.6.4/RD	P
	Equipment and its component parts shall not attain temperatures in excess of those in Table 14 when tested in normal mode in accordance with the ratings of the equipment. Magnetic components shall not attain temperatures in excess of those in Table 103 when tested in stored energy mode in accordance with the ratings of the equipment. Compliance is checked by test of 5.2.3.10/RD.		P
4.6.4.2/RD	Accessible parts		P
	When surface temperatures of the PECS, close to mounting surfaces, exceed the limit of Table 15, a warning according to 6.3.5/RD shall be provided.		P
4.6.5 4.6.5/RD	Limited power sources		N/A
	Where a limited power source is required, the source shall comply with Table 16 or Table 17 as applicable. Compliance to both the maximum allowed current and maximum apparent power available from the power source is required.		N/A

	A limited power source shall comply with one of the following requirements: a) the output is inherently limited in compliance with Table 16; or b) a linear or non-linear impedance limits the output in compliance with Table 16. If a positive temperature coefficient device (PTC) is used, it shall pass the tests specified in IEC 60730-1, Clauses 15, 17, J.15 and J.17; or c) a regulating network limits the output in compliance with Table 16, both with and without a single fault in the regulating network; or d) an overcurrent protective device is used and the output is limited in compliance with Table 17.		N/A
	Compliance to determine the maximum available power is checked by test of 5.2.3.9/RD.	See appended tabel 4.6.5/RD	N/A
4.7	Protection against mechanical hazards	See below	P
4.7.1/RD	General		P
	Failure of any component within the PECS shall not release sufficient energy to lead to a hazard, for example, expulsion of material into an area occupied by personnel.	Considered	P
4.7.2/RD	Specific requirements for liquid cooled PECS	No liquid cooled PSCS.	N/A
4.7.2.1/RD	General		N/A
4.7.2.2/RD	Coolant	No coolant	N/A
	Coolant temperature in operation shall not exceed the limit specified in Table 14.		N/A
	Compliance is checked by inspection and test of 5.2.3.10/RD.		N/A
4.7.2.3/RD	Design requirements		N/A
4.7.2.3.1 /RD	General		N/A
	The liquid containment system components shall be compatible with the liquid to be used. Equipment using liquids shall be so constructed that it is unlikely that either a dangerous concentration of these materials or a hazard in the meaning of this standard will be created by condensation, vaporization, leakage, spillage or corrosion during normal operation, storage, filling or emptying. Compliance is checked by inspection. The flexible hoses should be made of material free of conductive contaminants such as carbon.		N/A
4.7.2.3.2 /RD	Corrosion resistance		N/A

	All cooling system components shall be suitable for use with the specified coolant. They shall be corrosion resistant and shall not corrode as a result of prolonged exposure to the coolant and/or air. Compliance is checked by inspection.		N/A
4.7.2.3.3 /RD	Tubing, joints and seals		N/A
	Cooling system tubing, joints and seals shall be designed to prevent leakage during excursions of pressure over the life of the equipment. The entire cooling system including tubing shall satisfy the requirements of the hydrostatic pressure test of 5.2.7/RD.		N/A
4.7.2.3.4 /RD	Provision for condensation	No such device	N/A
	Where internal condensation occurs during normal operation or maintenance, measures shall be taken to prevent degradation of insulation. In those areas where such condensation is expected, clearance and creepage distances of Table 10 and Table 11 shall be evaluated at least for a pollution degree 3 environment (see Table 8), and provision shall be made to prevent accumulation of water (for example by providing a drain). Compliance is checked by inspection.		N/A
4.7.2.3.5 /RD	Leakage of coolant	No such device	N/A
	During a leakage measures has to ensure that coolant will not result in wetting of live parts or electrical insulation.		N/A
4.7.2.3.6 /RD	Loss of coolant	No such device	N/A
	Loss of coolant form the cooling system shall not result in thermal hazards, explosion, or shock hazard. The requirements of the Loss of coolant test of 5.4.3.9.4/RD shall be satisfied.		N/A
4.7.2.3.7 /RD	Conductivity of coolant	No such device	N/A
	When the coolant is intentionally in contact with live parts (for example non-earthed heatsinks), the conductivity of the coolant shall be continuously monitored and controlled, in order to avoid hazardous current flow through the coolant.		N/A
4.7.2.3.8 /RD	Insulation requirements for coolant hoses	No such device	N/A

	When the coolant is intentionally in contact with live parts (for example non-earthed heatsinks), the coolant hoses form a part of the insulation system. Depending on the location of the hoses, the requirements of 4.4.7/RD for functional or simple or protective separation shall be applied where relevant.		N/A
4.7.101	Protection in service access area		P
4.8	Equipment with multiple sources of supply	No multiple sources of supply	N/A
4.8.101	General		N/A
4.8.102	Backfeed protection		N/A
4.9 4.9/RD	Protection against environmental stresses	See below	P
	The manufacturer has to specify the following conditions for operation, storage and transportation according to IEC 60721: - Coolant temperature (min/max); - Ambient temperature (min/max); - Humidity (min/max) - Pollution degree; - Vibration; - U.V. resistance; - Over voltage category (OVC); - Altitude for thermal consideration, if rated for operation above 1000 m; - Altitude for insulation coordination considerations, if rated for operation above 2000 m.	Considered	P
	The manufacturer shall state the environmental service condition for the PECS according to Table 18. The UPS, as a minimum, shall comply with the following indoor conditions: climatic, pollution degree, and humidity condition of the skin as part of the environmental service condition 3K2 of Table 18 of IEC 62477-1:2012. The manufacturer may elect to comply with environmental service conditions more onerous than 3K2 subject to the UPS being marked accordingly (see 6.2).		P
4.10	Protection against sonic pressure hazards	No sonic pressure hazards	N/A
4.11	Wiring and connections	See below	P
4.11.1/RD	General		P

	The wiring and connections between parts of the equipment and within each part shall be protected from mechanical damage during installation. The insulation, conductors and routing of all wires of the equipment shall be suitable for the electrical, mechanical, thermal and environmental conditions of use. Conductors which are able to contact each other shall be provided with insulation rated for the DVC requirements of the relevant circuits. The compliance with 4.11.2/RD to 4.11.8/RD shall be checked by inspection (see 5.2.1/RD) of the overall construction and datasheets if applicable.	Considered	P
4.11.2/RD	Routing	See below	P
	A hole through which insulated wires pass in a sheet metal wall within the enclosure of the equipment shall be provided with a smooth, well-rounded byshing or grommet or shall have smooth, well-rounded surfaces upon which the wires bear to reduce the risk of abrasion of the insulation.	Wire ways are smooth and free from edges. Wire are adequately fixed to prevent excessive stain on wire.	P
	Wires shall be routed away from sharp edges, screw threads, byrrs, fins, moving parts, drawers, and similar parts, which abrade the wire insulation. The minimum bend radius specified by the wire manufacturer shall not be violated.	Wire ways are smooth and free from edges. Wire are adequately fixed to prevent excessive stain on wire.	P
	Clamps and guides, either metallic or non-metallic, used for routing stationary internal wiring shall be provided with smooth, well-rounded edges. The camping action and bearing surface shall be such that abrasion or deformation of the insulation does not occur. If a metal clamp is used for conductors having thermoplastic insulation less than 0,8 mm thick, non-conduction mechanical protection shall be provided.	Wire ways are smooth and free from edges. Wire are adequately fixed to prevent excessive stain on wire.	P
4.11.3/RD	Colour coding		P
	Insulated conductors, other than those which are integral of ribbon cable or multi-cord signal cable, identified by the colour green with or without one or more yellow stripes shall only be used for protective bonding.		P
4.11.4/RD	Splices and connections		P

	All splices and connections shall be mechanically secured and shall provide electrical continuity. Electrical connections shall be soldered, welded, crimped, or otherwise securely connected. A soldered joint, other than a component on a PWB, shall additionally be mechanically secured. NOTE Stranded wire should not be consolidated with solder where secured in a terminal that relies on pressure for contact or equivalent When stranded internal wiring is connected to a wire-binding screw, the construction shall be such that loose strands of wire do not contact: • other uninsulated live parts not always of the same potential as the wire; • de-energized metal parts. When screw terminal connections are used, the resulting connections may require routine maintenance (tightening). Appropriate reference shall be made in the maintenance manual (see 6.5.1/RD).		P
4.11.5/RD	Accessible connections	No such parts	P
	In addition to measures given in 4.4.6.4/RD it shall be ensured that neither insertion error nor polarity reversal of connectors can lead to a voltage on an accessible connection higher than the maximum of DVC As. This applies for example to plug-in sub-assemblies or other plug-in devices which can be plugged in without the use of a tool or key or which are accessible without the use of a tool or key. This does not apply to equipment intended to be installed in restricted access areas. If relevant, non-interchangeability and protection against polarity reversal of connectors, plugs and socket outlets shall be confirmed by inspection and trial insertion.	The input& output is special terminals can not be disconnected without the use of a tool or key. Its can prevent the polarity reversal of connectors	P
4.11.6/RD	Interconnection between parts of the PECS		P

	In addition to complying with the requirements given in 4.11.1/RD to 4.11.5/RD, the means provided for the interconnection between parts of the PECS shall comply with the following requirements or those of 4.11.7/RD. Cable assemblies and flexible cords provided for interconnection between sections of equipment or between units of a system shall be suitable for the service or use involved. Cables shall be protected from physical damage as they leave the enclosure and shall be provided with mechanical strain relief. Misalignment of male and female connectors, insertion of a multipin male connector in a female connector other than the one intended to receive it, and other manipulations of parts which are accessible to the operator shall not result in mechanical damage or a risk of thermal hazards, electric shock, or injury to persons. When external interconnecting cables terminate in a plug which mates with a receptacle on the external surface of an enclosure, no risk of electric shock shall exist at accessible contacts of either the plug or receptacle when disconnected. NOTE An interlock circuit in the cable to de-energize the accessible contacts whenever an end of the cable is disconnected meets the intent of these requirements.		P
4.11.7/RD	Supply connections	See below	P
	The connection points provided shall be of appropriate construction to preclude the possibility of loose strands reducing the spacing between conductors when careful attention is paid to installation.	The customized terminals and it can be prevent looseness of joints	P
4.11.8/RD	Terminals	See below	P
4.11.8.1 /RD	Construction requirements	Considered	P

	All parts of terminals which maintain contact and carry current shall be of metal having adequate mechanical strength. Terminal connections shall be such that the conductors can be connected by means of screws, springs or other equivalent means so as to ensure that the necessary contact pressure is maintained. Terminals shall be so constructed that the conductors can be clamped between suitable surfaces without any significant damage either to conductors or terminals. Terminals shall not allow the conductors to be displaced or be displaced themselves in a manner detrimental to the operation of equipment and the insulation shall not be reduced below the rated values. The requirements of this subclause are met by using terminals complying with IEC 60947-7-1 or IEC 60947-7-2, as appropriate.		P
4.11.8.2 4.11.8.2 /RD	Connecting capacity		P
	Terminals shall be provided which accommodate the conductors specified in the installation and maintenance manuals (see 6.3.6.4/RD) and cables in accordance with the wiring rules applicable at the installation. The terminals shall meet the temperature rise test of 5.2.3.10/RD.		P
	Information regarding the permitted wire sizes shall be given in the installation manual.		P
	The UPS manufacturer shall indicate whether the terminals are suitable for connection of copper or aluminium conductors, or both. The terminals shall be such that the external conductors may be connected by a means (screws, connectors, etc.) which ensures that the necessary contact pressure corresponding to the current rating, the short-circuit strength of the apparatus and the circuit are maintained.		P
	In the absence of a special agreement between the UPS manufacturer and the purchaser, terminals shall be capable of accommodating copper conductors from the smallest to the largest cross-sectional areas corresponding to the appropriate rated current (see Annex AA). Compliance is checked by inspection, by measurement and by fitting at least the smallest and largest cross-sectional areas of the appropriate range in Annex AA.	The connections wiring has adequate cross-sectional area for the carrying current.	P
4.11.8.3 /RD	Connection		P

	Terminals for connection to external conductors shall be readily accessible during installation. Sets of terminals for connection to the same input or output shall be grouped together and shall be located in proximity to each other and to the main protective earthing terminal, if any. If the installation instructions provide detail on the proper earthing of the system, the protective earthing terminal need not be placed in proximity to the terminals. Clamping screws and nuts shall not serve to fix any other component although they may hold the terminals in place or prevent them from turning.		P
4.11.8.4 /RD	Wire bending space for wires 10 mm^2 and greater		P
	The distance between a terminal for connection to the main supply, or between major parts of the PECS (for example a transformer), and an obstruction toward which the wire is directed upon leaving the terminal shall be at least that specified in Table 19.		P
4.11.101	Non-detachable cords		N/A
4.11.101.1	Cord guard		N/A
4.11.101.2	Cord anchorages and strain relief		N/A
4.12/RD	Enclosures	See below	P
4.12.1/RD	General		P
4.12.2/RD	Handle and manual controls		N/A
	Handles, knobs, grips, levers and the like shall be reliably fixed so that they will not work loose in normal use, if this could result in a hazard. Sealing compounds and the like, other than self-hardening resins, shall not be used to prevent loosening. If handles, knobs and the like are used to indicate the position of switches or similar components, it shall not be possible to fix them in a wrong position if this could result in a hazard.		N/A
4.12.3/RD	Cast metal	No case metal	N/A

	Die-cast metal, except at threaded holes for conduit, where a minimum of 6,4 mm thickness is required, shall be: • not less than 2,0 mm thick for an area larger than 155 cm^2 or having any dimension larger than 150 mm; • not less than 1,2 mm thick for an area of 155 cm^2 or less and having no dimension larger than 150 mm. The area under evaluation may be bounded by reinforcing ribs subdividing a larger area. Malleable iron or permanent-mould cast aluminium, brass, bronze, or zinc, except at threaded holes for conduit, where a minimum of 6,4 mm thickness is required, shall be: • at least 2,4 mm thick for an area greater than 155 cm^2 or having any dimension more than 150 mm; • at least 1,5 mm thick for an area of 155 cm^2 or less having no dimension more than 150 mm. A sand-cast metal enclosure shall be a minimum of 3,0 mm thick except at locations for threaded holes for conduit, where a minimum of 6,4 mm is required.		N/A
4.12.4/RD	Sheet metal	See below	P
4.12.5/RD	Stability test for enclosure		P
	Under conditions of normal use, units and equipment shall not become physically unstable to the degree that they could become a hazard to an operator or to a service person. If units are designed to be fixed together on site and not used individually, the stability of each individual unit is exempt from the requirements of 4.12.5/RD. The requirements of 4.12.5/RD are not applicable if the installation instructions for a unit specify that the equipment is to be secured to the byilding structure before operation. Under conditions of operator use, a stabilizing means, if needed, shall be automatic in operation when drawers, doors, etc., are opened. During operations performed by a service person, the stabilizing means, if needed, shall either be automatic in operation, or a marking shall be provided to instruct the service person to deploy the stabilizing means. Compliance is checked by test of 5.2.2.5/RD.	The apparatus has adequate stability and no overturn during testing applied force of 250N for a period of 5s.	P
4.101	UPS isolation and disconnect device	No such device	N/A
4.101.1	Emergency switching (disconnect) device		N/A

4.101.2	Normal disconnect devices	Adequate AC and DC breaker used	P
4.102	Stored energy source	See below	P
4.102.1	General		P
4.102.2	Accessibility and maintainability	Provided in the installation manual	P
4.102.3	Distance between battery cells	Provided in the installation manual	P
4.102.4	Case insulation	Provided in the installation manual	P
4.102.5	Electrolyte spillage	The sealed metal enclosure of battery used as container	P
4.102.6	Ventilation and hydrogen concentration		N/A
4.102.7	Charging voltages	Full charging voltage 52.5Vdc	P
4.102.8	Battery circuit protection	See below	P
4.102.8.1	Overcurrent and earth fault protection	The overcurrent protection device by BMS protection circuit of batteries.	P
4.102.8.2	Location of protective device	The overcurrent protection device by BMS protection circuit of batteries.	P
4.102.8.3	Rating of protective devices	Provided in the installation manual	P
4.103	UPS connection to telecommunication lines	No connection to telecommunication lines	N/A

5	Test requirements		P
5.1/RD	General	See below	P
5.1.1/RD	Test objectives and classification		P
5.1.2/RD	Selection of test samples		P
5.1.3/RD	Sequence of tests		P
5.1.4/RD	Earthing conditions		P
5.1.5/RD	General conditions for tests		P
5.1.5.1/RD	Application of tests		P
	Unless otherwise stated, upon conclusion of the tests, the equipment need not be operational.		P
5.1.5.2/RD	Test samples		P
5.1.5.3 5.1.5.3/RD	Operating parameters for tests		P
5.1.6/RD	Compliance		P

5.1.7	Test overview		P
5.1.101	UPS test overview	Not USP	N/A
5.2	Test specification		P
5.2.1/RD	Visual inspections (type test, sample test and routine test)		P
	Before type testing, a check shall be made that the PECS delivered for the test is as expected with respect to supply voltage, input and output ranges, etc.		P
5.2.2/RD	Mechanical tests		P
5.2.2.1/RD	Clearance and creepage distance test (type test)	See below	P
	It shall be verified by measurement or visual inspection that the clearance and creepage distances comply with 4.4.7.4/RD and 4.4.7.5/RD.	See appende table	P
	Where this verification is impossible to perform, an impulse voltage test (see 5.2.3.2/RD) shall be performed between the considered circuits.	See appende table	P
5.2.2.2	Non-accessibility test (type test)	See below	N/A
5.2.2.3/RD	Ingress protection test (IP rating)(type test)	IP20	P
	The claimed IP rating of the enclosure shall be verified. This test shall be performed as a type test of the enclosure of a PSCS as specified in IEC 60529 for the enclosure classification.	The portion had evaluated and testing according IEC 60529:2013.	P
5.2.2.4/RD	Enclosure integrity test (type test)	See below	P
5.2.2.4.1 /RD	General		P
	The integrity tests apply to PSCS, and also where PSCS are intended for operation without a further enclosure in restricted access areas. After completion of the integrity test, the PSCS shall pass the tests of 5.2.3.2/RD and 5.2.3.4/RD and shall be inspected to confirm that:		P
	- no degradation of any safety-relevant component of the PSCS has occurred.		P
	- live parts have not become accessible (see 4.4.3.3/RD).		P
	- enclosures show no cracks or openings which could cause a hazard.		P
	- clearances are not less than their minimum permitted values and other insulation is undamaged.		P
	- barriers have not been damaged or loosened.	No such part	N/A
	- no moving parts which could cause a hazard are exposed.	No such part	N/A

	The integrity tests shall be performed at the worst case point on representative accessible face(s) of the enclosure.		P
	The PSCS is not required to be operational after testing and the enclosure may be deformed to such an extent that its original IP rating is not maintained.		N/A
5.2.2.4.2 /RD	Deflection test (type test)		P
5.2.2.4.2.1 /RD	General		P
5.2.2.4.2.2 /RD	Stead force test, 30N	Applied force of 30N for a period of 5s After testing, no hazardous, no damage.	P
5.2.2.4.2.3 /RD	Stead force test, 250N	Applied force of 250N for a period of 5s After testing, no hazardous, no damage.	P
5.2.2.4.3 /RD	Impact test (type test)	A mass 500g of steel ball fall freely from rest through a vertical distance (H) of 1.3m. After testing, no hazardous, no damage.	P
5.2.2.4.4	Drop test		N/A
5.2.2.4.5 /RD	Stress relief test	Metallic enclosure used	N/A
5.2.2.5/RD	Stability test	Not overturn	P
5.2.2.6	Wall, ceiling or rack mounted equipment test	No such construction	N/A
5.2.2.6.101	Wall and ceiling mounted equipment test		N/A
5.2.2.6.102	Rack mounted equipment test		N/A
5.2.2.7/RD	Handle and manual controls securement test		N/A
5.2.2.101	Cord guard test		N/A
5.2.3/RD	Electrical tests	See appended table 4.3.101, 5.2.3.102	P
5.2.3.1/RD	General		P
	The electrical tests described in 5.2.3.2/RD to 5.2.3.5/RD are applicable to basic, supplementary and reinforced insulation. Before performing these tests, preconditioning according to 5.2.6.3.1/RD and 5.2.6.3.2/RD is required.	Complied	P

	When performing electrical and preconditioning tests, the preferred procedure is to test the entire equipment; however it is acceptable to test the components or sub-assemblies providing the basic and reinforced insulation. When components or sub-assemblies are tested, test conditions shall simulate the least favourable conditions occurring inside the equipment at the place of installation.	According to standard	P
5.2.3.2/RD	Impulse voltage test (type test and sample test)		P
5.2.3.3/RD	Alternative to impulse voltage test (type test and sample test)		N/A
	An a.c. or d.c. voltage test according to 5.2.3.4/RD may be used as an alternative method to the impulse voltage test of 5.2.3.2/RD.		N/A
	For an a.c. voltage test the peak value of the a.c. test voltage shall be equal to the impulse test of Table 25 and applied for three cycles of the a.c. test voltage.		N/A
	For a d.c. voltage test the average value of the d.c. test voltage shall be equal to the impulse test voltage of Table 25 and applied three times for 10 ms in each polarity.		N/A
	See IEC60664-1 clause 6.1.2.2.2/RD for further information.		N/A
5.2.3.4/RD	Ac or d.c. voltage test (type test and routine test)	The EUT does not directly connnented to mains	N/A
5.2.3.4.1 /RD	Purpose of test		N/A
	The test is used to verify that the clearances and solid insulation of components and of assembled PSCS has adequate dielectric strength to resist temporary overvoltage conditions.		N/A
5.2.3.4.2 /RD	Value and type of test voltage		N/A
	The values of the test voltage for circuits connected to mains supply are determined from column 2 or 3 of Table 26. The voltage test shall be performed with a sinusoidal voltage at 50 Hz or 60 Hz. If the circuit contains capacitors the test may be performed with a d.c. voltage of a value equal to the peak value of the specified a.c. voltage.		N/A
5.2.3.4.3 /RD	Performing the voltage test		P

	a) Test (1) between accessible conductive part 8 connected to earth) and each circuit sequentially (except DVC As circuits). Test voltage according to Table 26, or Table 27, column 2, corresponding to voltage of considered circuit under test. Test (2) between accessible surface (nonconductive or conductive byt not connected to earth9 and each circuit sequentially (except DVC As circuits). Test voltage according to Table 26 or Table 27, column 3 (for type test) or column 2 (for routine test), corresponding to voltage of considered circuit under test.		P
	b) Test between each considered circuit sequentially and the other adjacent circuits connected together. Test voltage according to Table 26 or Table 27, column 2, corresponding to voltage of considered circuit under test.		P
	c) Test between DVC As circuit and each adjacent circuit sequentially. Test voltage according to Table 26 or Table 27, column 3 (for type test) or column 2 (for routine test), corresponding to the circuit with the higher voltage. Either the adjacent circuit or the DVC As circuit may be earthed for this test. It is necessary to test functional insulation between PELV and SELV circuits, byt it is not necessary to test functional insulation between adjacent PELV or adjacent SELV circuits.		P
5.2.3.4.4 /RD	Duration of the a.c. or d.c. voltage test		P
	The duration of the test shall be at least 60 s for the type test and 1 s for the routine test. The test voltage may be applied with increasing and/or decreasing ramp voltage byt the full voltage shall be maintained for 60 s and 1 s respectively for type and routine tests.		P
5.2.3.4.5 /RD	Verification of the a.c. or d.c. voltage test		P
	The test is successfully passed if no electrical breakdown occurs during the test.		P
5.2.3.5/RD	Partial discharge test (type test, sample test)		N/A
	The partial discharge test shall confirm that the solid insulation (see 4.4.7.8/RD) used in components and subassemblies for protective separation of electrical circuits remains partial-discharge-free within the specified voltage range (see Table 28).		N/A

	This test shall be performed as a type test and a sample test. It may be omitted for insulating materials which are not degraded by partial discharge, for example ceramics. The partial discharge inception and extinction voltage are influenced by climatic factors (e.g. temperature and moisture), equipment self-heating, and manufacturing tolerance. These influencing variables can be significant under certain conditions and shall therefore be taken into account during type testing.		N/A
5.2.3.6/RD	Protective impedance test (type test and routine test)	See below	P
	A type test shall be performed to verify that the current through a protective impedance under normal operating or single-fault conditions does not exceed the values given in 4.4.3.4/RD. The test shall be performed using the circuit of IEC 60990:1999, Figure 4. NOTE IEC 60990 states that the use of a single network for the measurement of a.c. combined with d.c. has not been investigated, byt no suggestion is made for measurement in such cases. The value of the protective impedance shall be verified as a routine test.	Complied	P
5.2.3.7/RD	Touch current measurement test (type test)	See below	P
	The touch current shall be measured to determine if the measures of protection need not be taken (see 4.4.4.3.3/RD). The PECS shall be set up in an insulated state without any connection to the earth and shall be operated at rated voltage. Under these conditions, the touch current shall be measured between the means of connection for the PE conductor and the PE conductor itself with the test circuit of Figure 4 of IEC 60990:1999.	The metallic enclosure was considered reliably connected to earthing	P
	• For a PSCS to be connected to an earthed neutral system, the neutral of the mains of the test site shall be directly connected to the protective earthing conductor.	No sunch construction	N/A
	• For a PSCS to be connected to an earthed neutral system, the neutral shall be connected through a resistance of 1 kΩ to the protective earthing conductor which shall be connected to each input phase in turn. The highest value will be taken as the definitive result.	No sunch construction	N/A
	• For a PSCS to be connected to a corner earthed system, the protective earthing conductor shall be connected to each input phase in turn. The highest value will be taken as the definitive result.	No sunch construction	N/A
	• For a PSCS with a particular earthing system, this system shall operate as intended during the test.	No sunch construction	N/A

	• If a PSCS is intended to be connected to more than one system network, each of these different system networks (or the worst-case, if that can be determined) shall be used to make the touch current measurement.	No sunch construction	N/A
5.2.3.8/RD	Capacitor discharge test (type test)	No such capacitor used	N/A
	The capacitor discharge time as required by 4.4.3.4/RD may be verified by a type test and/or by calculation taking into account the relevant tolerances.		N/A
5.2.3.9	Limited power source test (type test)	See appended table 4.6.5/RD	P
5.2.3.10 5.2.3.10 /RD	Temperature rise test (type test)	See appended table 4.6.4/RD	P
	If possible the PECS must operate in the worst conditions of the rated power and the output current.		P
	Equipment, in which the heating or cooling quantity depends on the temperature, the temperature measurement must be carried out under the most unfavourable conditions of ambient temperature within the range specified by the manufacturer.	No such device	N/A
	The PECS shall be tested with at least 1,2 m of wire attached to each field wiring terminal. The wire shall be of the smallest size intended to be connected to the PECS as specified by the manufacturer for installation. When there is only provision for the connection of bys-bars to the PECS, they shall be of the minimum size intended to be connected to the PECS as specified by the manufacturer, and they shall be at least 1,2 m in length.	considered	P
	The test shall be maintained until thermal stabilization has been reached. That is, when three successive readings, taken at intervals of 10 % of the previously elapsed duration of the test and not less than 10 min. intervals, indicate no change in temperature, defined as ± 1 °C between any of the three successive readings, with respect to the ambient temperature.		P
	The temperature of an electrical insulation (other than that of windings) is measured on the surface of the insulation at a point close to the heat source, if a failure of this insulation could cause a hazard. If temperatures of windings are measured by the thermocouple method, the thermocouple shall be located on the surface of the winding assuming the hottest part due to surrounding heat emitting components. See also notes in Table 14.	No such construction	N/A
	The maximum temperature attained shall be corrected to the rated ambient temperature of the PSCS by adding the difference between the ambient temperature during the test and the maximum rated ambient temperature.	Considered	P

	No corrected temperature of the material or component shall exceed the temperature in Table 14 in IEC 62477-1: 2012 or Table 103 as applicable.	Considered	P
	During the test, thermal cut-out, overload detection functions and devices shall not operate.		P
5.2.3.11 /RD	Protective equipotential bonding tests (type tests and routine test)		N/A
5.2.3.11.1 /RD	General		N/A
	Each conductive accessible part under consideration shall be tested separately, to determine if the protective equipotential bonding path for that part is adequate to withstand the test current that the bonding path may be subjected to under fault conditions. The circuit under consideration shall be selected from amongst those circuits adjacent to the accessible part under consideration and separated from it by only basic or functional insulation. All of these selected circuits have to be analysed regarding prospective short circuit current and the associated protective element(s): - If the circuit under consideration exceeds the 5 s disconnection time requirement of IEC 60364-4-41, the protective equipotential bonding impedance test of 5.2.3.11.2/RD and the protective equipotential bonding short circuit test of 5.2.3.11.3/RD have to be performed. - If the circuit under consideration meets the 5 s disconnection time requirement of IEC 60364-4-41, the protective equipotential bonding short circuit test of 5.2.3.11.3/RD has to be performed. - If the circuit under consideration meets the disconnection time requirement of IEC 60364-4-41:2005, Table 41.1, as applicable, depending on the earthing system of the installation, no type test is required.		N/A
	For pluggable equipment type A only the protective equipotential bonding impedance test of 5.2.3.11.2/RD have to be performed.		N/A
5.2.3.11.2 /RD	Protective equipotential bonding impedance test		N/A
5.2.3.11.2. 1/RD	Test conditions		N/A

	Where required by 4.4.4.2.2/RD and 5.2.3.11.2.1/RD, the impedance of protective equipotential bonding means shall be checked by passing a test current through the bond for a period of time. The test current is based on the rating of the overcurrent protection for the equipment or part of the equipment under consideration, as follows: • for pluggable equipment type A, the overcurrent protective device is that provided external to the equipment (for example, in the byilding wiring, in the mains plug or in an equipment rack); • for pluggable equipment type B and permanently connected equipment, the maximum rating of the overcurrent protective device specified in the equipment installation instructions to be provided external to the equipment; • the rating of the provided overcurrent device for a circuit or part of the equipment for which an overcurrent protective device is provided as part of the equipment.		N/A
5.2.3.11.2.2/RD	Test current, duration and acceptance criteria		N/A
	a) For PECS with an overcurrent protective device rating of 16 A or less, this test may be omitted, if an impedance not exceeding 0,1 Ω can be demonstrated.		N/A
	b) As an alternative to Table 29, where the time-current characteristic of the overcurrent protective device that limits the fault current in the protective equipotential bonding means is known because the device is either provided in the equipment or fully specified in the installation instructions, the test duration may be based on that specific device's time-current characteristic. The tests are conducted for a duration corresponding to the 200 % current value on the time-current characteristic.		N/A
	c) For PECS with an overcurrent protective device rating of more than 460 A, calculations or simulations according to IEC 60949 shall be used to show the ability of the prospective short circuit current to fulfil the requirements. The protective equipotential bonding continuity routine test of 5.2.3.11.4/RD shall be performed to show that the impedance of the protective equipotential bonding means during and at the end of the test shall not exceed the expected value.		N/A

	Acceptance criteria: The test current is 200 % of the overcurrent protective device rating and the duration of the test is as shown in Table 29. The voltage drop in the protective equipotential bonding means, during and at the end of the test, shall not exceed DVC As, as determined from Table 2 and Table 5 with respect to the accessible surface of the enclosure.		N/A
	After the tests, visual inspection shall show no damage to the protective equipotential bonding means.		N/A
5.2.3.11.3 /RD	Protective equipotential bonding short circuit withstand test (type test)	No such construction	N/A
	As required by 5.2.3.11.2.1/RD, the short circuit test in 5.2.4.3/RD shall be performed to ensure that protective bonding has the ability to withstand the prospective short circuit current that it may be subjected to under fault conditions.		N/A
	The testing shall include an individual test of the protective bonding path for each conductive accessible part unless analysis shows that the short circuit withstand capability of the path is adequate, or that the results of one combination are representative of the anticipated results of another combination.		N/A
5.2.3.11.4 /RD	Protective equipotential bonding continuity test (routine test)		N/A
5.2.3.101	Backfeed protection test (type test)	No such parts	N/A
5.2.3.101.1	General		N/A
5.2.3.101.2	Test for pluggable UPS		N/A
5.2.3.101.3	Test for permanently connected UPS		N/A
5.2.3.101.4	Method to simulate the load-induced change of reference potential for pluggable UPS		N/A
5.2.3.101.5	Solid-state backfeed protection		N/A
5.2.3.102	Input current test	See appended table 5.2.3.102	P
5.2.3.103	Short-time withstand current test (type test)		N/A
5.2.3.103.1	General procedure		N/A
5.2.3.103.2	Input port rated conditional short-circuit current		N/A
5.2.3.103.3	Input port short-time withstand current rating		N/A
5.2.3.103.4	Exemption from testing	Not application	N/A
5.2.3.104	Transformer protection test	The transformer primary and secondary winding were separated by reinforce insulation	P
5.2.3.105	Unsynchronized load transfer test	No such load used	N/A
5.2.3.105.1	General		N/A

5.2.3.105.2	Phase displacement		N/A
5.2.4/RD	Abnormal operation and simulated fault tests	See below	P
5.2.4.1 5.2.4.1/RD	General	See appended table 4.2/RD and 4.3/RD	P
5.2.4.2/RD	Pass criteria		P
	As a result of the abnormal operation tests, the PSCS shall comply with the following: - there shall be no emission of flame, burning particles or molten metal; - the surgical cotton indicator shall not have ignited; - the earth connection and protective bonding of the PSCS shall not have opened; - doors and cover shall remain in place; - during and after the test, accessible DVC As, SELV and PELV circuits and accessible conductive parts shall not exhibit voltages greater than the time dependent voltages of Figure 1, Figure 2 or Figure 3, as appropriate and shall be separated from live parts at voltages greater than DVC As with at least basic insulation. Compliance shall be checked by the a.c./d.c. insulation test of 5.2.3.4/RD for basic insulation; - during and after the test, live parts at voltages greater than DVC As shall not become accessible.	After testing, no emission of flame, burning particles or molten metal and the surgical cotton indicator shall not have ignited	P
	The PSCS is not required to be operational after testing and it is possible that the enclosure can become deformed. Overcurrent protection integral to the PECS, or required to be used with the PECS, is allowed to open.	The overcurrent protection is integral part of the EUT	P
5.2.4.3/RD	Protective equipotential bonding short circuit withstand test (type test)	No such construction	N/A
5.2.4.3.1 /RD	General		N/A
	When required by 5.2.3.11.2.1/RD, a protective bonding path shall be subjected to the following short-circuit withstand test.		N/A
5.2.4.3.2 /RD	Test conditions		N/A
	The equipment under test shall be supplied with power and the output port shall be operating as intended in 5.2.4.1/RD prior to closing the switching means that applied will be more severe.		N/A

	The protective bonding short circuit test shall be performed with the PSCS working with light load, unless analysis shows that higher short circuit currents are available under higher loading conditions.		N/A
	A new sample may be used for each short-circuit test.		N/A
5.2.4.3.3 /RD	Protective equipotential bonding short circuit test method		N/A
5.2.4.3.4 /RD	Pass criteria		N/A
5.2.4.4/RD	Output short-circuit test (type test)	See below	P
5.2.4.4.1 /RD	Load condition	Normal load condition	P
	The short circuit test shall be performed with the PSCS at full load or light load whichever creates the more severe condition.	The EUT at full load condition creates the more severe condition.	P
5.2.4.4.2 /RD	Short-circuit test method		N/A
	In addition to determining compliance with the criteria of 5.2.4.2/RD, this test is used to determine the output short circuit current rating of the port under consideration, in accordance with 4.3.2.3/RD. An oscilloscope or other suitable instrument shall be used to measure the peak current during the test, and to measure or calculate the r.m.s. value of the current.		N/A
	The value(s) to be recorded and to be provided with the PECS instructions, in accordance with 6.2, are the peak current, and the highest of the r.m.s. current values measured or calculated over a time period as follows: a) for a.c. signals, three cycles of the nominal a.c. frequency for the port under consideration, in which case the value is to be stated as the 3-cycle r.m.s. value; b) for all signals, the duration of the short circuit from the time the short circuit is applied, until the time the short circuit current is interrupted by a protective device or other mechanism, in which case the value stated is to include the r.m.s. value and the time period in seconds; c) for short circuit tests that result in a continuous non-zero value, the steady-state r.m.s. value, in which case the value is to be stated as a continuous r.m.s value. For PECS with internal short circuit protection according to 4.3.2.3/RD, which protects the output port within some few µs, the requirements in a), b) and c) are not applicable.		N/A

5.2.4.5/RD	Output overload test (type test)	See appended table 4.2/RD and 4.3/RD	P
5.2.4.6/RD	Breakdown of components test (type test)		P
5.2.4.6.1 /RD	Load conditions		P
	The breakdown of a component, identified as a result of the circuit analysis of 4.2/RD, shall be tested with the PSCS at full load or light load whichever creates the more severe condition.	Considered	P
5.2.4.6.2 /RD	Application of short circuit or open-circuit		P
	The short circuit shall be applied with cable of a cross-section appropriate for the current that normally flows through the component, byt no less than 2.5 mm^2. The length of the loop shall be as short as practical to perform the test. Short circuits and open circuits are applied using an appropriate switching device.	Considered	P
	Each identified component shall be subjected to only one breakdown of components test unless both open- and short-circuit failure modes are likely in that component.	Considered	P
5.2.4.6.3 /RD	Test sequence		P
	For the Breakdown of components test, identified components shall be short-circuited or open-circuited, whichever creates the worst hazard, one at a time.	Considered	P
5.2.4.7/RD	PWB short circuit test (type test)		P
	On PWBs, functional insulation provided by spacings which are less than those specified in Table 10 and Table 11 (see 4.4.7.7/RD) shall be type tested as described below.		P
	The decreased spacings shall be short-circuited one at a time, on representative samples, and the short-circuit shall be maintained until no further damage occurs.		P
5.2.4.8/RD	Loss of phase test (type test)	The EUT does not directly connected to mains	N/A
	A multi-phase PSCS shall be operated with each line (including neutral, if used) disconnected in turn at the input. The test shall be performed by disconnecting one line with the power conversion equipment operating at its maximum normal load and shall be repeated by initially energizing the device with on lead disconnected.		N/A
	The test shall continue until terminated by a protective mechanism, a component failure occurs, or the temperature stabilizes.		N/A

	This particular requirement may be simulated for PSCS with rated input current greater than 500 A.		N/A
5.2.4.9/RD	Cooling failure tests (type tests)	No such device	N/A
5.2.4.9.1 /RD	General and pass criteria		N/A
	For PSCS having a combination of cooling mechanisms, all relevant tests shall be performed. It is not necessary to perform the tests simultaneously. The test shall continue, - until the temperature stabilizes, in which case the temperature limits of 4.6.4.2/RD apply; or - until terminated by a protective mechanism or a component failure occurs, in which case the temperature limits of 4.6.4.2/RD may be exceeded by not more than 5°C. If this is not possible a warning statement shall be provided in the user documentation.		N/A
	NOTE The temperature increase of 5 °C with regard to the steady state limits reflect the spread of the byrn threshold given in IEC Guide 117.		N/A
5.2.4.9.2 /RD	Inoperative blower motor test	No motor used	N/A
	A PSCS having forced ventilation shall be operated at rated load with fan or blower motor or motors made inoperative, singly or in combination from a single fault, by physically preventing their rotation.		N/A
5.2.4.9.3 /RD	Clogged filter test	No clogged filter	N/A
	Enclosed PSCS having filtered ventilation openings shall be operated with the openings blocked to represent clogged filters. The test shall be performed initially with the ventilation openings blocked 50 %. The test shall be repeated under full blocked condition.		N/A
5.2.4.9.4 /RD	Loss of coolant test	No coolant used	N/A
	A liquid cooled PSCS shall be operated at rated load. Loss of coolant shall be simulated by draining the coolant, blocking the flow or disabling the system coolant pump.		N/A
	If the PSCS is shut down due to the operation of a thermal device located inside the coolant, then the test shall be repeated with the coolant drained out of the system.		N/A
	NOTE: It is presumed that the thermal device will be inoperative if not surrounded by coolant liquid.		N/A
5.2.5/RD	Material tests	See below	P
5.2.5.1/RD	General		P

	When requested by 4.4.7.8.2/RD, the manufacturer shall test the flammability properties of the materials used for insulating purposes, as defined in 5.2.5.2/RD, 5.2.5.3/RD and 5.2.5.4/RD. When requested by 4.6.3.2/RD the manufacturer shall test the flammability properties of the materials used for fire enclosure, as defined in 5.2.5.5/RD	Metallic fire enclosure used	P
5.2.5.2/RD	High current arcing ignition test (type test)		N/A
5.2.5.3/RD	Glow-wire test (type test)		N/A
	The glow-wire test shall be made under the conditions specified in 4.4.7.8.2/RD according to IEC 60695-2-10 and IEC 60695-2-13.		N/A
5.2.5.4/RD	Hot wire ignition test (type test – alternative to glow-wire test)		N/A
5.2.5.5/RD	Flammability test (type test)		N/A
5.2.5.6/RD	Flaming oil test (type test)		N/A
5.2.5.7/RD	Cemented joints test (type test)		N/A
	When required by 4.4.7.9/RD representative samples of cemented joints providing protection of type 1 or type 2 as defined in IEC 60664-3:2003 shall be tested as a type test as follows. The samples shall be subjected to the conditioning procedure specified in 5.7 of IEC 60664-3:2003, using the following parameters: for the cold test (5.7.1/RD), a temperature of -25 °C shall be used, and for the rapid change of temperature test (5.7.3/RD): –25 °C to +125 °C. After the conditioning the samples shall pass the following tests in the prescribed order: a) The mechanical strength of the joint shall be evaluated by loading the joint using the forces anticipated to be present under normal conditions. There shall be no separation of the parts. b) The insulation resistance between the conductive parts separated by the joint shall be measured according to 5.8.3 of IEC 60664-3:2003. c) Cemented joints shall be treated as to be thin sheet material and shall be tested according 4.4.7.8.3/RD d) The sectioning of the joint shall not show any cracks, voids or separation.		N/A
5.2.6 5.2.6/RD	Environmental tests (type tests)	See below	P
5.2.6.1/RD	General		P

	Compliance is shown by conducting test of 5.2.6.3/RD, 5.2.6.4/RD, 5.2.6.5/RD and 5.2.6.6/RD according to Table 30 as applicable for the environmental conditions specified by the manufacture.	Mentioned in the user manual	P
5.2.6.2/RD	Acceptance criteria		P
	The following acceptance criteria shall be satisfied: - no degradation of any safety-relevant component of the PSCS; - no potentially hazardous behaviour of the PSCS during the test; - no sign of component overheating; - no live part shall become accessible; - no cracks in the enclosure and no damaged or loose insulators; - pass routine a.c. or d.c. voltage test 5.2.3.4/RD; - pass protective bonding test 5.2.3.11.2/RD; - no potentially hazardous behaviour when the PSCS is operated following the test.	No any safety relevant hazardous and damage occurred during the testing.	P
5.2.6.3/RD	Climatic tests		P
5.2.6.3.1 /RD	Dry heat test (steady state)		P
	To prove the ability of components and equipment to be operated, transported or stored at high temperatures the dry heat (steady state) test shall be performed according to the conditions specified in Table 31.	No any safety relevant hazardous and damage occurred during the testing.	P
5.2.6.3.2 /RD	Damp heat test (steady state)		P
	To prove the resistance to humidity, the PSCS shall be subjected to a Damp heat test (steady state) according to Table 32.	No any safety relevant hazardous and damage occurred during the testing.	P
5.2.6.4	Vibration test (type test)	No any safety relevant hazardous and damage occurred during the testing.	P
5.2.6.5	Salt mist test (type test)	Indoor equipment, not application	N/A
5.2.6.6	Dust and sand test (type test)	Indoor equipment, not application	N/A
5.2.7/RD	Hydrostatic pressure test (type test and routine test)	No cooling system	N/A

	For type tests, the pressure inside the cooling system of a liquid cooled PSCS (see 4.7.2.3.3/RD) shall be increased at a gradual rate until a pressure relief mechanism (if provided) operates, or until a pressure of twice the operating value or 1,5 times the maximum pressure rating of the system is achieved, whichever is the greater. NOTE: for the purpose of this test the coolant pump may be disabled. For routine tests, the pressure shall be increased to the maximum pressure rating of the system. The pressure shall be maintained for at least one minute. There shall be no thermal, shock, or other hazard resulting from the test. There shall be no significant leakage of coolant or loss of pressure during the test, other than from a pressure relief mechanism during a type test. After the hydrostatic pressure type test the PSCS shall pass the a.c. or d.c. voltage test 5.2.3.4/RD.		N/A

6	Information and marking requirements		P
6.1	General		P
6.1.101	Durability	The label was subjected to the test for permanence of marking. The label was rubbed with cloth 15s. And the rubbed by the cloth soaked with Naphtha for 30s. After this test there was no damage to the label. The label marking on the label did not fade. There was neither curling nor lifting on the label edge.	P
6.1.102	Removable parts	No removable part	P
6.2	Information for selection	The EUT function, electrical characteristics, and intended environment shall be specified by manufacture.	P
6.3	Information for installation and commissioning	See below	P
6.3.1/RD	General		P
6.3.2/RD	Mechanical considerations	Mentioned in the manual	P
	The following drawings shall be prepared by the manufacturer: - Dimensional drawing, including mass information - Mounting drawing		P

6.3.3/RD	Environment	Provided in the installation manual	P
	In accordance with 4.9/RD the following environmental conditions shall be specified, for operation, transportation and storage:		P
	Climatic (temperature, humidity, altitude, pollution, ultra-violet light, etc.)		P
	Mechanical (vibration, shock, drop, topple, etc.)		P
	Electrical (overvoltage category)		P
6.3.4/RD	Handling and mounting	No such part	N/A
	In order to prevent injury or damage, the installation documents shall include warnings of any hazards which can be experienced during installation. Where necessary, instructions shall be provided for: - packing and unpacking; - moving; - lifting; - strength and rigidity of mounting surface; - fastening; - provision of adequate access for operation, adjustment and maintenance.		N/A
6.3.5/RD	Enclosure temperature		P
	When surface temperatures of the PECS, close to mounting surfaces, exceed the limit of 4.6.4.2/RD, the installation manual shall contain a warning to consider the combystibility of the mounting surface.		P
	Where required by 4.6.3.1/RD, the following marking shall appear on the PECS and in the installation instructions: “suitable for mounting on concrete or other non-combystible surfaces only”.		P
6.3.6/RD	Connections	See below	P
6.3.6.1/RD	General		P
	Information shall be provided to enable the installer to make safe electrical connection to the PSCS. This shall include information for protection against hazards (for example, electric shock or availability of energy) that may be encountered during installation, operation or maintenance.	Provided in the installation manual	P
6.3.6.2/RD	Interconnection and wiring diagrams		N/A
	The installation and maintenance manuals shall include details of all necessary connections, together with a suggested interconnection diagram.	No such Interconnection and wiring diagrams	N/A
6.3.6.3/RD	Conductor (cable)selection	See below	P

	The Installation manual shall define the voltage and current levels for all connections to the PSCS, together with cable insulation requirements. These shall be worst-case values, taking into account overcurrent and overload conditions and the possible effects of non-sinusoidal currents.	Provided in the installation manual	P
6.3.6.4/RD	Terminal capacity and identification	See below	P
	The installation and maintenance manuals shall indicate the range of acceptable conductor sizes and types (solid or stranded) for all terminals, and also the maximum number of conductors which can simultaneously be connected.	Provided in the installation manual	P
	For field wiring terminals, the manuals shall specify the requirements for tightening torque values and also the insulation temperature rating requirements for the conductor or cable.	No such part	N/A
	The identification of all field wiring terminals shall be marked on the PSCS, either directly or by label attached close to the terminals.	No such part	N/A
	The installation and maintenance manuals shall identify all external terminals relating to circuits protected by one of the methods of 4.4.6.4/RD.	Provided in the installation manual	P
6.3.7/RD	Protection requirements	See below	P
6.3.7.1/RD	Accessible parts and circuits		P
	The installation, users and maintenance manuals shall identify any accessible parts at voltages greater than DVC As, and shall describe the insulation and separation provisions required for protection.	Class III equipment, not application	N/A
	The manuals shall also indicate the precautions to be taken to ensure that the safety of DVC As connections maintained during installation.	Class III equipment, not application	N/A
	Where a hazard is present after the removal of a cover, a warning label shall be placed on the equipment. The label shall be visible before the cover is removed.	Class III equipment, not application	N/A
	The manual of a PSCS shall state the maximum voltage allowed to be connected to each port.	Mentioned in the manual	P
	The manuals shall provide instructions for the use of PELF circuits within a zone of equipotential bonding.	Class III equipment, not application	N/A
6.3.7.2/RD	Type of electrical supply system	Class III equipment, not application	N/A
	The installation manual or the PECS shall specify requirements for safe earthing including the permitted earthing system of the installation (see 4.4.7.1.4/RD)	Class III equipment, not application	N/A

	The unacceptable earthing systems shall be indicated as: - not permitted; or - with modification of values and/or safety levels which shall be quantified through type test.	Class III equipment, not application	N/A
6.3.7.3/RD	Protective class	See below	P
6.3.7.3.1 /RD	General		
	The installation manual of the PECS shall declare the protective class specified for the PECS and the product shall be marked according to the requirement of 6.3.7.3.2/RD, 6.3.7.3.3/RD, and 6.3.7.3.4/RD		P
6.3.7.3.2 /RD	Protective class I equipment	See below	P
	Terminals for connection of the PE conductor shall be clearly and indelibly marked with one or more of the following:		P
	The symbol IEC 60417-5019 (2011-01)		P
	With the letters PE		P
	The colour coding green or green-yellow	Green-yellow wiring used	P
6.3.7.3.3 /RD	Protective class II equipment	Class I equipment, not application	N/A
	Equipment of protective class II shall be marked with symbol IEC 60417-5172 (2011-01) (see Annex C). Where such equipment has provision for the connection of an earthing conductor for functional reasons (see 4.4.6.3/RD) it shall be marked with symbol IEC 60417-5018 (2011-01) (see Annex C).	Class I equipment, not application	N/A
6.3.7.3.4 /RD	Protective class III equipment	Class I equipment, not application	N/A
	No marking is required on the product.	Class I equipment, not application	N/A
6.3.7.4/RD	Touch current marking	See below	P
	Where the touch current in the PE conductor exceeds the limits given in 4.4.4.3.3/RD, this shall be stated in the installation and maintenance manuals. In addition, a warning symbol ISO 7010- W001 (2011-06) (see Annex C) shall be placed on the product, and a notice shall be provided in the installation manual to instruct the user that the minimum size of the PE conductor shall comply with the local safety regulations for high PE conductor current equipment.	Complied	P
6.3.7.5/RD	Compatibility with RCD marking	See below	N/A

	The installation and maintenance manuals shall indicate compatibility with RCDs (see 4.4.8/RD). When 4.4.8/RD b) applies, a caution notice and the symbol ISO 7010-W001 (2011-06) (see Annex C) shall be provided in the user manual, and the symbol shall be placed on the product. The caution notice shall be the following or equivalent: "This product can cause a d.c. current in the PE conductor. Where a residual current-operated protective device (RCD) is used for protection against electrical shock, only an RCD of Type B is allowed on the supply side of this product." (See 6.4.3/RD for general requirements for labels, signs and signals.)	No such device	N/A
6.3.7.6/RD	Cable and connection	No such cable	N/A
	Any particular cable and connection requirements shall be identified in the installation and maintenance manuals.		N/A
6.3.7.7/RD	External protection devices	No such device	N/A
	Where external devices are necessary to protect against hazards, the installation manual shall specify the required characteristics (see also 5.2.4/RD and 4.3.2.1/RD)		N/A
6.3.8/RD	Commissioning	See below	P
	If commissioning tests are necessary to ensure the electrical and thermal safety of a PSCS, information to support these tests shall be provided for each part of the PSCS. This information can depend on the specific installation, and close cooperation between manufacturer, installer, and user can be required. Commissioning information shall include references to hazards that might be encountered during commissioning, for example those mentioned in 6.4/RD and 6.5/RD.	Mentioned in the manual	P
6.3.101	Guidance on UPS installation		N/A
6.4	Information for use		P
6.4.1/RD	General		P
	The user's manual shall include all information regarding the safe operation of the PSCS. In particular, it shall identify any hazardous materials and risks of electrical shock, overheating, misuse of the PSCS.	Mentioned in the manual	P
	The manual should also indicate any hazards which can result from reasonably foreseeable misuse of the PSCS.	Mentioned in the manual	P
6.4.2/RD	Adjustment	No such part	N/A

	The user's manual shall give details of all safety-relevant adjustments intended for the user. The identification or function of each control or indicating device and fuse shall be marked adjacent to the item. Where it is not possible to do this on the product, the information shall be provided pictorially in the manual.		N/A
	Maintenance adjustments may also be described in this manual, byt shall be made clear that they should only be made by qualified personnel.		N/A
	Clear warnings shall be provided where excessive adjustment could lead to a hazardous state of the PSCS.		N/A
	Any special equipment necessary for making adjustments shall be specified and described.		N/A
6.4.3 6.4.3/RD	Labels, signs and signals	See below	P
6.4.3.1/RD	General		P
	Labelling shall be in accordance with good ergonomic principles so that notices, controls, indications, test facilities, fuses, etc., are sensibly placed and logically grouped to facilitate correct and unambiguous identification. All safety related equipment labels shall be located so as to be visible after installation or readily visible by opening a door or removing a cover. Where a symbol is used, the information provided with the PSCS shall contain an explanation of the symbol and its meaning.	Marking plate was provided on the side of apparatus, it was comprehensible and easily discernible.	P
	Labels shall: • wherever possible, use international symbols as given by ISO 3864-1, ISO 7000 or IEC 60417; • if no international symbol is available, be worded in an appropriate language or in a language associated with a particular technical field; • be concise and unambiguous; • be conspicuous, legible and durable; • state the hazards involved and give ways in which risks can be reduced.	Complied	P

	When instructing the person(s) concerned as to • what to avoid: the wording should include “no”, “do not”, or “prohibited”; • what to do: the wording should include “shall”, or “must”; • the nature of the hazard: the wording should include “caution”, “warning”, or “danger”, as appropriate; • the nature of safe conditions: the wording should include the noun appropriate to the safety device.	Considered	P
	Safety signs shall comply with ISO 3864-1.		P
	The signal words indicated hereinafter shall be used and the following hierarchy respected: • DANGER to call attention to a high risk, for example: “High voltage”. • WARNING to call attention to a medium risk, for example: “This surface can be hot.” • CAUTION to call attention to a low risk, for example: “Some of the tests specified in this standard involve the use of processes imposing risks on persons concerned.” Danger, warning and caution markings on the PECS shall be prefixed with the word “DANGER”, “WARNING”, or “CAUTION” as appropriate in letters not less than 3,2 mm high. The remaining letters of such markings shall be not less than 1,6 mm high.		P
6.4.3.2/RD	Isolators	No isolators used	N/A
	Where an isolating device is not intended to interrupt load current, a warning shall state: DO NOT OPEN UNDER LOAD.		N/A
	The following requirements apply to any supply isolating device which does not disconnect all sources of power to the PSCS.		N/A
	If the isolating device is mounted in an equipment enclosure with the operating handle externally operable, a warning label shall be provided adjacent to the operating handle starting that it does not disconnect all power to the PSCS.		N/A
	Where a control circuit disconnector can be confused with power circuit disconnectors due to size or location, a warning label shall be provided adjacent to the operating handle of the control disconnector stating that it does not disconnect all power to the PSCS.		N/A
6.4.3.3/RD	Visual and audible signals		P

	Visual signals such as flashing lights, and addible signals such as sirens, may be used to warn of an impending hazardous event such as the driven equipment start-up and shall be identified. It is essential that these signals: - are unambiguous; - can be clearly perceived and differentiated from all other signals used; - can be clearly recognized by the user; - are emitted before the occurrence of the hazardous event. It is recommended that higher frequency flashing lights be used for information. Note: IEC 60073 provides guidance on recommended flashing rates and on/off ratios.		P
6.4.3.4/RD	Hot surfaces	No hot surface	N/A
	Where required by 4.6.4.2/RD the warning symbol W017 of ISO 7010 shall be marked on or adjacent to parts exceeding the touch temperature limits of Table 15.		N/A
6.4.3.5/RD	Control and device marking	No such device	N/A
	The Identification of each control or indicating device and fuse shall be marked adjacent to the item. Replaceable fuses shall be marked with their rating and time characteristics. Where it is not possible to do this on the product, the information shall be provided pictorially in the manual. Appropriate identification shall be marked on or adjacent to each movable connector. Test points shall be individually marked with the circuit diagram reference. The polarity of any polarized devices shall be marked adjacent to the device. The diagram reference and if possible the function shall be marked adjacent to each pre-set control in a position where it is clearly visible while the adjustment is being made.		N/A
6.4.3.101	Distribution-related backfeed	Mention in installation manual	P
6.4.3.102	Protection in building installation		P
6.4.3.102.1	General		P
6.4.3.102.2	Rated conditional short-circuit current (Icc)		P
6.4.3.102.3	Prospective short-circuit current (Icp)		P
6.4.3.102.4	Requirement for byilding installation		P
6.4.3.103	Batteries installed within the UPS enclosure		N/A

6.5	Information for maintenance	See below	P
6.5.1/RD	General	Mention in installation manual	P
	The PECS shall be marked with the date code, or serial number from which the date of manufacture can be determined.	Mention in installation manual	P
	Safety information shall be provided in the installation and maintenance manuals including appropriate, the following:	Mention in installation manual	P
	• Preventive maintenance procedures and schedules	Mention in installation manual	P
	• Safety precautions during maintenance	Mention in installation manual	P
	• Location of live parts that can be accessible during maintenance (for example, when covers are removed)	Mention in installation manual	P
	• Adjustment procedures		N/A
	• Subassembly and component repair and replacement procedures		P
	• Any other relevant information		P
6.5.2/RD	Capacitor discharge	No such capacitor used	N/A
	When the requirements 4.4.9/RD are not met, the warning symbol W012 of ISO 7010 and an indication of the discharge time (for example, 45 s, 5 min) shall be placed in a clearly visible position on the enclosure, the capacitor protective barrier, or at a point close to the capacitor(s) concerned (depending on the construction). The symbol shall be explained and the time required for the capacitors to discharge after the removal or the power from the PSCS shall be stated in the installation and maintenance manuals.		N/A
6.5.3/RD	Auto restart/bypass connection	No such configured	N/A
	If a PSCS can be configured to provide automatic restart or bypass connection, the installation, user and maintenance manuals shall contain appropriate warning statements.		N/A
	A PSCS which is set to provide automatic restart or bypass connection, after the removal of power, shall be clearly identified at the installation.		N/A
6.5.4/RD	Other hazards	Mention in installation manual	P
	The manufacturer shall identify any components and materials of a PSCS which require special procedures to prevent hazards.	Mention in installation manual	P
6.5.5/RD	Equipment with multiple sources of supply	No such equipment	N/A

	In accordance with 4.8/RD, where there is more than one source of supply energizing the PSCS, information shall be provided to indicate which disconnect device or devices are required to be operated in order to completely isolate the equipment.		N/A
6.5.101	Battery information for maintenance	See below	P
6.5.101.1	Labelling on battery		P
6.5.101.2	Information in instruction manual(s)	Mentioned in the instruction manual	P
6.5.101.2.1	General		P
6.5.101.2.2	Instructions for battery replacement	Mentioned in the instruction manual	P

Annex A	Addition information for protection against electric shock		P
A.1/RD	General		P
A.2/RD	Protection by means of DVC As		P
A.3/RD	Protection by means of protective impedance		P
A.4/RD	Protection by using limited voltages		P
A.5/RD	Evaluation of working voltage and selection of DVC for touch voltage, PELV and SELV circuits		P
A.5.1/RD	General		P
A.5.2/RD	Selection of DVC for touch voltage sets to protect against ventricular fibrillation		P
A.5.3/RD	Selection of DVC for touch voltage sets to protect against muscular reaction		P
A.5.4/RD	Selection of DVC for touch voltage sets to protect against startle reaction		P
A.5.5/RD	Determination of voltage limits for touch voltage under fault condition depending on protective equipotential bonding impedance		P
A.5.6/RD	Touch time- d.c. voltage zones of ventricular fibrillation		P
A.5.7/RD	Touch time- d.c. voltage zones of muscular reaction (inability to let go reaction)		P
A.5.8/RD	Touch time- d.c. voltage zones of saltwater-wet skin condition		P
A.5.9/RD	Touch time- a.c. voltage zones of ventricular fibrillation		P
A.5.10/RD	Touch time- a.c. voltage zones of muscular reaction (inability to let go reaction)		P
A.5.11/RD	Touch time- a.c. voltage zones for startle reaction		P

A.6/RD	Evaluation of the working voltage of circuits		P
A.6.1/RD	General		P
A.6.2/RD	AC working voltage		P
A.6.3/RD	DC working voltage		P
A.6.4/RD	Pulsating working voltage		N/A
A.7/RD	Examples of the use of elements of protective measures		P
A.101	Comparison of limits of working voltage		P

Annex D	Evaluation of clearance and creepage distances		P
D.1/RD	Measurement		P
D.2/RD	Relationship of measurement to pollution degree		P
D.3/RD	Examples		P

Annex F	Clearance and creepage distance determination for frequencies greater than 30kHz		N/A
F.1/RD	General influence of the frequency on the withstand characteristics		N/A
F.2/RD	Clearance		N/A
F.2.1/RD	General		N/A
F.2.2/RD	Clearance for inhomogeneous fields		N/A
F.2.3/RD	Clearance for approximately homogenous fields		N/A
F.3/RD	Creepage distance		N/A
F.4/RD	Solid insulation		N/A
F4.1/RD	General		N/A
F4.2/RD	Approximately uniform field distribytion without air gaps or voids		N/A
F4.3/RD	Other cases		N/A

Annex BB	Reference loads		N/A
BB.1	General		N/A
BB.2	Reference resistive load		N/A
BB.3	Reference inductive-resistive loads		N/A
BB.4	Reference capacitive-resistive loads		N/A
BB.5	Reference non-linear load		N/A

BB.5.1	General		N/A
BB.5.2	Test method		N/A

Annex CC	Ventilation of lead-acid battery compartments		N/A
CC.1	General		N/A
CC.2	Normal conditions		N/A
CC.3	Blocked conditions		N/A
CC.4	Overcharge conditions		N/A

Annex GG	Requirements for the mounting means of rack-mounted equipment		N/A
GG.1	General		N/A
GG.2	Mechanical strength test, variable force		N/A
GG.3	Mechanical strength test, 250N force, including end stops		N/A
GG.4	Compliance		N/A

4.2/RD to 4.3/RD	TABLE: fault condition tests		P
	ambient temperature (°C)..... :	25.0	--

component No.	fault	test condition		test time	fuse No.	fault condition		result
		AC	DC			AC	DC	
L to N	reversed	230V 0.1A	480V 0.2A	5Min.	--	230V 0.1A	480V 0.2A	Error message"E023" Do not connect to AC mains, can reset by remove fault condition. No damaged.No hazard.
PV+ to PV-	reversed	230V 0.1A	480V 0.2A	5Min.	--	230V 0.1A	480V 0.2A	Auxiliary power was power off. No damaged.No hazard.
BAT+ to BAT-	reversed	230V 0.1A	480V 0.2A	5Min.	--	230V 0.1A	480V 0.2A	The fuse between inverter nad battery is break. Inveter no damaged and no hazard.
Heat sink	Blanket wrapped	230V 21.7A	480V 10.7A	4.5hrs		230V 13.4A	300V 10.7A	Inverter operated normally. AC output power derate to 3.0kW. No damaged.No hazard.
L-N Load	Overload	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	Inverter disconnected from grid immediately. Error message"E022" No damaged.No hazard.
RY 1	Short circuit before energized	230V 0.1A	480V 0.2A	5Min.	--	230V 0.1A	480V 0.2A	Indicate Relay fault, error code "E016" Do not connect to AC mains, can reset by remove fault condition. No damage, no hazards.
RY 1	Open circuit before energized	230V 0.1A	480V 0.2A	5Min.	--	230V 0.1A	480V 0.2A	Indicate Relay fault, error code "E016" Do not connect to AC mains, can reset by remove fault condition. No damage, no hazards.
RY 2	Short circuit before energized	230V 0.1A	480V 0.2A	5Min.	--	230V 0.1A	480V 0.2A	Indicate Relay fault, error code "E016" Do not connect to AC mains, can reset by remove fault condition. No damage, no hazards.
RY 2	Open circuit before energized	230V 0.1A	480V 0.2A	5Min.	--	230V 0.1A	480V 0.2A	Indicate Relay fault, error code "E016" Do not connect to AC mains, can reset by remove fault condition. No damage, no hazards.

RY 3	Short circuit before energized	230V 0.1A	480V 0.2A	5Min.	--	230V 0.1A	480V 0.2A	Indicate Relay fault, error code “E016” Do not connect to AC mains, can reset by remove fault condition. No damage, no hazards.
RY 3	Open circuit before energized	230V 0.1A	480V 0.2A	5Min.	--	230V 0.1A	480V 0.2A	Indicate Relay fault, error code “E016” Do not connect to AC mains, can reset by remove fault condition. No damage, no hazards.
RY 4	Short circuit before energized	230V 0.1A	480V 0.2A	5Min.	--	230V 0.1A	480V 0.2A	Indicate Relay fault, error code “E016” Do not connect to AC mains, can reset by remove fault condition. No damage, no hazards.
RY 4	Open circuit before energized	230V 0.1A	480V 0.2A	5Min.	--	230V 0.1A	480V 0.2A	Indicate Relay fault, error code “E016” Do not connect to AC mains, can reset by remove fault condition. No damage, no hazards.
R82	Short circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 21.7A	480V 10.7A	Operating as normal. No damage. No hazards.
R83	Open circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 21.7A	480V 10.7A	Operating as normal. No damage. No hazards.
R98	Short circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 21.7A	480V 10.7A	Operating as normal. No damage. No hazards.
R99	Open circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 21.7A	480V 10.7A	Operating as normal. No damage. No hazards.
R81	Short circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 21.7A	480V 10.7A	Operating as normal. No damage. No hazards.
R80	Open circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 21.7A	480V 10.7A	Operating as normal. No damage. No hazards.
R93	Short circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 21.7A	480V 10.7A	Operating as normal. No damage. No hazards.
R96	Open circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 21.7A	480V 10.7A	Operating as normal. No damage. No hazards.
R136	Short circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 21.7A	480V 10.7A	Operating as normal. No damage. No hazards.
R137	Open circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	Output a.c. relays operated, disconnected with grid and turn into off-grid mode. No damage. No hazards.
R147	Short circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 21.7A	480V 10.7A	Operating as normal. No damage. No hazards.
R154	Open circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	Output a.c. relays operated, disconnected with grid and turn into off-grid mode. No damage. No hazards.
XL2 (crystal oscillator)	Short circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, error code “E000”. No damage. No hazards.

+3.3VD (DSP Vcc)	Open circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, error code "E000". No damage. No hazards.
U21 PIN 108 (communication between main and slave DSP)	Open circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, error code "E000". No damage. No hazards.
U21 PIN 109 (communication between main and slave DSP)	Open circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, error code "E000". No damage. No hazards.
R61	Open circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 21.7A	480V 10.7A	Operating as normal. No damage. No hazards.
R55	Open circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	Output a.c. relays operated, disconnected with grid and turn into off-grid mode. No damage. No hazards.
R154	Open circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, error code "W026". No damage. No hazards.
R172	Open circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, error code "W026". No damage. No hazards.
U13 PIN5 and PIN6	Short circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, error code "W026". No damage. No hazards.
R244	Open circuit before energized	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	Indicate insulation fault, error code "W020" Do not connect to AC mains, can reset by remove fault condition. No damage, no hazards.
R239	Open circuit before energized	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	Indicate insulation fault, error code "W020" Do not connect to AC mains, can reset by remove fault condition. No damage, no hazards.
R231	Open circuit before energized	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	Indicate insulation fault, error code "W020" Do not connect to AC mains, can reset by remove fault condition. No damage, no hazards.
R240	Short circuit before energized	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	Indicate insulation fault, error code "W020" Do not connect to AC mains, can reset by remove fault condition. No damage, no hazards.
R232	Short circuit before energized	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	Indicate insulation fault, error code "W020" Do not connect to AC mains, can reset by remove fault condition. No damage, no hazards.

R245	Open circuit before energized	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	Indicate insulation fault, error code "W020" Do not connect to AC mains, can reset by remove fault condition. No damage, no hazards.
R208	Open circuit before energized	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	Indicate insulation fault, error code "W020" Do not connect to AC mains, can reset by remove fault condition. No damage, no hazards.
R234	Short circuit before energized	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	Indicate insulation fault, error code "W020" Do not connect to AC mains, can reset by remove fault condition. No damage, no hazards.
R211	Open circuit before energized	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	Indicate insulation fault, error code "W020" Do not connect to AC mains, can reset by remove fault condition. No damage, no hazards.
R236	Short circuit before energized	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	Indicate insulation fault, error code "W020" Do not connect to AC mains, can reset by remove fault condition. No damage, no hazards.
U1 PIN5 and PIN6	Short circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	Output a.c. relays operated, disconnected with grid and turn into off-grid mode. No damage. No hazards.
R21	Short circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	Output a.c. relays operated, disconnected with grid and turn into off-grid mode. No damage. No hazards.
R27	Open circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	Output a.c. relays operated, disconnected with grid and turn into off-grid mode. No damage. No hazards.
U2 PIN9 and PIN10	Short circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	Output a.c. relays operated, disconnected with grid and turn into off-grid mode. No damage. No hazards.
R7	Open circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	Output a.c. relays operated, disconnected with grid and turn into off-grid mode. No damage. No hazards.
R28	Open circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	Output a.c. relays operated, disconnected with grid and turn into off-grid mode. No damage. No hazards.
U37 PIN12 and PIN13	Short circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, indicate BUS fault, error code "E020". No damage, no hazards.
R62	Open circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, indicate BUS fault, error code "E020". No damage, no hazards.

U5 PIN2 and PIN3	Short circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, indicate BUS fault, error code “E020”. No damage, no hazards.
R64	Open circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, indicate BUS fault, error code “E020”. No damage, no hazards.
U37 PIN5 and PIN6	Short circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, indicate BUS fault, error code “E020”. No damage, no hazards.
R100	Open circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, indicate over current fault, error code “E022”. No damage, no hazards.
U37 PIN2 and PIN3	Short circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, indicate BUS fault, error code “E020”. No damage, no hazards.
R99	Open circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, indicate over current fault, error code “E022”. No damage, no hazards.
U37 PIN9 and PIN10	Short circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, indicate over current fault, error code “E022”. No damage, no hazards.
R102	Open circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, indicate over current fault, error code “E022”. No damage, no hazards.
R79	Open circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, indicate over current fault, error code “E022”. No damage, no hazards.
U21 PIN5 and PIN6	Short circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, indicate over current fault, error code “E021”. No damage, no hazards.
R110	Open circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, indicate over current fault, error code “E021”. No damage, no hazards.
R111	Open circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, indicate over current fault, error code “E021”. No damage, no hazards.

R132	Open circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, indicate over current fault, error code "E021". No damage, no hazards.
R135	Open circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, indicate over current fault, error code "E021". No damage, no hazards.
TX1 PIN1 and Pin2	Short circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, output a.c. relays operated, disconnected with grid. No damage. No hazards.
TX1 PIN3 and Pin4	Short circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, output a.c. relays operated, disconnected with grid. No damage. No hazards.
TX1 PIN5 and Pin7	Short circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, output a.c. relays operated, disconnected with grid. No damage. No hazards.
TX1 PIN8 and Pin9	Short circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, output a.c. relays operated, disconnected with grid. No damage. No hazards.
TX1 PIN12 and Pin13	Short circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, output a.c. relays operated, disconnected with grid. No damage. No hazards.
TX1 PIN15 and Pin16	Short circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, output a.c. relays operated, disconnected with grid. No damage. No hazards.
TX1 PIN17 and Pin19	Short circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, output a.c. relays operated, disconnected with grid. No damage. No hazards.
TX1 PIN21 and Pin22	Short circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, output a.c. relays operated, disconnected with grid. No damage. No hazards.
TX1 PIN24 and Pin25	Short circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, output a.c. relays operated, disconnected with grid. No damage. No hazards.

TX1 PIN30 and Pin31	Short circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, output a.c. relays operated, disconnected with grid. No damage. No hazards.
C256	Short circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, indicate BUS fault, error code “E020”. No damage, no hazards.
Q23 PIN1 and PIN3	Short circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, indicate over current fault, error code “E022”. No damage, no hazards.
Q23 PIN2 and PIN3	Short circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, indicate over current fault, error code “E022”. No damage, no hazards.
Q23 PIN1 and PIN2	Short circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, indicate over current fault, error code “E022”. Q23, D46 damage, no hazards.
Q27 PIN1 and PIN3	Short circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, indicate over current fault, error code “E022”. No damage, no hazards.
Q27 PIN2 and PIN3	Short circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, indicate over current fault, error code “E022”. No damage, no hazards.
Q27 PIN1 and PIN2	Short circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, indicate over current fault, error code “E022”. Q27, D46 damage, no hazards.
Q45 PIN1 and PIN2	Short circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, indicate over current fault, error code “E022”. No damage, no hazards.
Q45 PIN2 and PIN4	Short circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 21.7A	480V 10.7A	Operating as normal. No damage. No hazards.
Q45 PIN1 and PIN4	Short circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, indicate over current fault, error code “E022”. Q45, D46 damage, no hazards.
C202	Short circuit	230V 21.7A	480V 10.7A	5Min.	--	230V 0.1A	480V 0.2A	The EUT shut down immediately, indicate BUS fault, error code “E020”. No damage, no hazards.
See technical documentation.								

4.6.4/RD	TABLE: Abnormal heating temperature rise measurements		P
	Test voltage (V) ..... :	K: 480Vdc/17A (Blanketing)	—
	t1 (°C)..... :	See below	—
	t2 (°C) ..... :	See below	—

Temperature T of part/at:	Measured T (°C)	Limit T (°C)
	K	
Ambient	60.9	--
SPS Board_Q1	102.1	130
IO Board_RCM1	73.9	130
IO Board_L2	82.2	130
IO Board_L1	72.2	130
Main Board_C258	77.2	105
Main Board_Q22	93.9	130
Main Board_Q24	95.3	130
PV Side Switch	67.6	85
Main Board_Q26	87.7	130
Main Board_Q27	88.4	130
Main_Board_C356	87.7	105
Main Board_Q52	92.9	130
IO Board_C48	73.3	110
Main Board_TX4 coil	86.6	130
Main Board_C352	79.5	110
Main Board_TX1 coil	88.5	130
IO Board_C36	72.5	105
Main Board_Q23	98.6	130
Main Board_Q45	88.8	130
IO Board_RY1 Coil	74.5	130
IO Board_RY4 enclosure	72.4	120
IO Board_RY5 enclosure	96.1	120
IO Board_L1	70.1	130
Main Board_PCB	79.4	130
Main Board_Q44	77.9	130
Main Boardd_Q66	78.3	130
Main Board_D23	77.5	130
Main Board_Q47	76.8	130
Main Board_Q46	77.5	130
Main Board_D16	79.7	130
Main Board_D27	76.3	130
Main Board_D17	80.1	130
Main Board_Q45	80.3	130
Main Board_Q67	76.2	130
Main Board_Q48	80.9	130
Main Board_Q21	90.2	130
LLC TX coil	88.7	130
LLC TX core	88.9	130
BUCK-BOOST Inductor	86.2	130
BOOST Inductor	74.4	130
INV Inductor _L1	72.4	130
INV Inductor _L2	73.9	130
Main Board_C204	76.8	105
CTRL Board_U21	88.3	105
SPS Board_TX1 coil	90.4	130
Main Board_U27	79.8	100

M3 Board_U1	78.8	105
Covers	66.1	70
PV Terminals	62.0	85
Mounting surface	88.1	90
supplementary information Test model: BD5KTL-LL1		

4.3.101, 5.2.3.102	TABLE: Electrical Data (in normal conditions)	P

Type	U (V)	I (A) DC	P (W) DC	U (V)	I (A) AC	P (W) AC
PV Input mode						
BD3KTL-LL1	120Vdc	23.50	2820	230V/50Hz	12.00	2763
BD3KTL-LL1	250Vdc	12.20	3050	230V/50Hz	13.00	2990
BD3KTL-LL1	360Vdc	8.50	3062	230V/50Hz	13.04	3000
BD3KTL-LL1	450Vdc	6.76	3045	230V/50Hz	12.97	2984
BD3KTL-LL1	550Vdc	/	/	230V/50Hz	/	/
Type	U (V)	I (A) DC	P (W) DC	U (V)	I (A) DC	P (W) DC
PV charging mode						
BD3KTL-LL1	120Vdc	22.40	2688	40Vdc	65.89	2635
BD3KTL-LL1	250Vdc	10.73	2683	40Vdc	65.90	2636
BD3KTL-LL1	360Vdc	7.76	2793	40Vdc	66.00	2640
BD3KTL-LL1	450Vdc	6.18	2783	40Vdc	65.75	2630
BD3KTL-LL1	550Vdc	/	/	40Vdc	/	/
BD3KTL-LL1	120Vdc	23.65	2838	48Vdc	57.94	2781
BD3KTL-LL1	250Vdc	12.63	3158	48Vdc	62.18	2985
BD3KTL-LL1	360Vdc	8.61	3100	48Vdc	61.00	2930
BD3KTL-LL1	450Vdc	6.93	3120	48Vdc	61.40	2950
BD3KTL-LL1	550Vdc	/	/	48Vdc	/	/
BD3KTL-LL1	120Vdc	/	/	60Vdc	/	/
BD3KTL-LL1	250Vdc	/	/	60Vdc	/	/
BD3KTL-LL1	360Vdc	/	/	60Vdc	/	/
BD3KTL-LL1	450Vdc	/	/	60Vdc	/	/
BD3KTL-LL1	550Vdc	/	/	60Vdc	/	/
Type	U (V)	I (A) AC	P (W) AC	U (V)	I (A) DC	P (W) DC
AC charging mode						
BD3KTL-LL1	207Vac	14.20	2940	42Vdc	65.80	2763
BD3KTL-LL1	230Vac	12.76	2935	42Vdc	65.68	2758
BD3KTL-LL1	253Vac	11.66	2950	42Vdc	66.00	2773
BD3KTL-LL1	207Vac	14.40	2995	48Vdc	58.65	2815
BD3KTL-LL1	230Vac	12.99	2989	48Vdc	58.53	2809
BD3KTL-LL1	253Vac	11.84	2997	48Vdc	58.69	2817
BD3KTL-LL1	207Vac	/	/	60Vdc	/	/
BD3KTL-LL1	230Vac	/	/	60Vdc	/	/
BD3KTL-LL1	253Vac	/	/	60Vdc	/	/
Type	U (V)	I (A) DC	P (W) DC	U (V)	I (A) AC	P (W) AC
Battery discharging mode						
BD3KTL-LL1	42Vdc	65.98	2771	207Vac	12.58	2605
BD3KTL-LL1	42Vdc	65.72	2760	230Vac	11.28	2595
BD3KTL-LL1	42Vdc	63.88	2683	253Vac	9.96	2522
BD3KTL-LL1	48Vdc	64.53	3097	207Vac	14.00	2912
BD3KTL-LL1	48Vdc	64.45	3093	230Vac	12.64	2908
BD3KTL-LL1	48Vdc	55.74	2675	253Vac	9.94	2515
BD3KTL-LL1	60Vdc	/	/	207Vac	/	/
BD3KTL-LL1	60Vdc	/	/	230Vac	/	/

BD3KTL-LL1	60Vdc	/	/	253Vac	/	/
Type	U (V)	I (A) DC	P (W) DC	U (V)	I (A)	P (W)
PV input for battery charging and AC output mode						
BD3KTL-LL1	120Vdc	23.95	2874	230Vac	0.04	9
BD3KTL-LL1				42Vdc	65.30	2742
BD3KTL-LL1	250Vdc	23.82	5955	230Vac	12.75	2938
BD3KTL-LL1				42Vdc	65.80	2763
BD3KTL-LL1	360Vdc	16.83	6048	230Vac	13.17	3030
BD3KTL-LL1				42Vdc	65.97	2770
BD3KTL-LL1	450Vdc	13.51	6079	230Vac	13.26	3050
BD3KTL-LL1				42Vdc	65.96	2770
BD3KTL-LL1	550Vdc	/	/	230Vac	/	/
BD3KTL-LL1				42Vdc	/	/
BD3KTL-LL1	120Vdc	23.92	2870	230Vac	0.08	18
BD3KTL-LL1				48Vdc	56.87	2729
BD3KTL-LL1	250Vdc	23.89	5973	230Vac	11.73	2699
BD3KTL-LL1				48Vdc	62.89	3018
BD3KTL-LL1	360Vdc	17.49	6296	230Vac	13.11	3015
BD3KTL-LL1				48Vdc	62.78	3013
BD3KTL-LL1	450Vdc	13.98	6291	230Vac	13.12	3018
BD3KTL-LL1				48Vdc	62.61	3005
BD3KTL-LL1	550Vdc	/	/	230Vac	/	/
BD3KTL-LL1				48Vdc	/	/
BD3KTL-LL1	120Vdc	23.57	2828	230Vac	11.99	2757
BD3KTL-LL1				60Vdc	/	/
BD3KTL-LL1	250Vdc	12.28	3070	230Vac	13.01	2993
BD3KTL-LL1				60Vdc	/	/
BD3KTL-LL1	360Vdc	8.52	3067	230Vac	13.00	2990
BD3KTL-LL1				60Vdc	/	/
BD3KTL-LL1	450Vdc	6.83	3073	230Vac	13.02	2996
BD3KTL-LL1				60Vdc	/	/
BD3KTL-LL1	550Vdc	/	/	230Vac	/	/
BD3KTL-LL1				60Vdc	/	/
supplementary information						

4.3.101, 5.2.3.102	TABLE: Electrical Data (in normal conditions)					P
Type	U (V)	I (A) DC	P (W) DC	U (V)	I (A) AC	P (W) AC
PV Input mode						
BD4KTL-LL1	120Vdc	23.52	2822	230V/50Hz	11.96	2751
BD4KTL-LL1	250Vdc	16.38	4095	230V/50Hz	17.35	3992
BD4KTL-LL1	360Vdc	11.39	4100	230V/50Hz	17.38	3997
BD4KTL-LL1	450Vdc	9.12	4104	230V/50Hz	17.39	4001
BD4KTL-LL1	550Vdc	/	/	230V/50Hz	/	/
Type	U (V)	I (A) DC	P (W) DC	U (V)	I (A) DC	P (W) DC
PV charging mode						
BD4KTL-LL1	120Vdc	23.25	2790	40Vdc	65.56	2622
BD4KTL-LL1	250Vdc	11.18	2795	40Vdc	65.68	2627
BD4KTL-LL1	360Vdc	7.78	2801	40Vdc	65.82	2632
BD4KTL-LL1	450Vdc	6.23	2805	40Vdc	65.91	2636
BD4KTL-LL1	550Vdc	/	/	40Vdc	/	/
BD4KTL-LL1	120Vdc	23.51	2985	48Vdc	58.45	2805
BD4KTL-LL1	250Vdc	12.80	3201	48Vdc	62.68	3008
BD4KTL-LL1	360Vdc	8.84	3185	48Vdc	62.37	2993
BD4KTL-LL1	450Vdc	7.14	3213	48Vdc	62.92	3020
BD4KTL-LL1	550Vdc	/	/	48Vdc	/	/
BD4KTL-LL1	120Vdc	/	/	60Vdc	/	/
BD4KTL-LL1	250Vdc	/	/	60Vdc	/	/
BD4KTL-LL1	360Vdc	/	/	60Vdc	/	/
BD4KTL-LL1	450Vdc	/	/	60Vdc	/	/
BD4KTL-LL1	550Vdc	/	/	60Vdc	/	/
Type	U (V)	I (A) AC	P (W) AC	U (V)	I (A) DC	P (W) DC
AC charging mode						
BD4KTL-LL1	207Vac	14.20	2940	42Vdc	65.80	2763
BD4KTL-LL1	230Vac	12.80	2945	42Vdc	65.91	2768
BD4KTL-LL1	253Vac	11.61	2938	42Vdc	65.75	2761
BD4KTL-LL1	207Vac	15.50	3210	48Vdc	62.86	3017
BD4KTL-LL1	230Vac	13.97	3215	48Vdc	62.96	3022
BD4KTL-LL1	253Vac	12.67	3208	48Vdc	62.82	3015
BD4KTL-LL1	207Vac	/	/	60Vdc	/	/
BD4KTL-LL1	230Vac	/	/	60Vdc	/	/
BD4KTL-LL1	253Vac	/	/	60Vdc	/	/
Type	U (V)	I (A) DC	P (W) DC	U (V)	I (A) AC	P (W) AC
Battery discharging mode						
BD4KTL-LL1	42Vdc	65.83	2764	207Vac	12.55	2599
BD4KTL-LL1	42Vdc	65.57	2754	230Vac	11.25	2589
BD4KTL-LL1	42Vdc	65.72	2760	253Vac	10.25	2595
BD4KTL-LL1	48Vdc	65.55	3146	207Vac	14.28	2958
BD4KTL-LL1	48Vdc	65.75	3156	230Vac	12.90	2967
BD4KTL-LL1	48Vdc	65.86	3161	253Vac	11.74	2972
BD4KTL-LL1	60Vdc	/	/	207Vac	/	/
BD4KTL-LL1	60Vdc	/	/	230Vac	/	/
BD4KTL-LL1	60Vdc	/	/	253Vac	/	/
Type	U (V)	I (A) DC	P (W) DC	U (V)	I (A)	P (W)
PV input for battery charging and AC output mode						
BD4KTL-LL1	120Vdc	23.88	2865	230Vac	0.08	18
BD4KTL-LL1				42Vdc	64.89	2725
BD4KTL-LL1	250Vdc	23.92	5980	230Vac	12.85	2957

BD4KTL-LL1				40Vdc	65.91	2768
BD4KTL-LL1	360Vdc	19.72	7099	230Vac	17.50	4027
BD4KTL-LL1				42Vdc	65.96	2770
BD4KTL-LL1	450Vdc	15.74	7083	230Vac	17.44	4011
BD4KTL-LL1				42Vdc	65.96	2770
BD4KTL-LL1	550Vdc	/	/	230Vac	/	/
BD4KTL-LL1				42Vdc	/	/
BD4KTL-LL1	120Vdc	23.97	2876	230Vac	0.07	17
BD4KTL-LL1				48Vdc	57.02	2736
BD4KTL-LL1	250Vdc	23.92	5980	230Vac	11.84	2717
BD4KTL-LL1				48Vdc	62.68	3008
BD4KTL-LL1	360Vdc	20.37	7333	230Vac	17.44	4012
BD4KTL-LL1				48Vdc	62.68	3008
BD4KTL-LL1	450Vdc	16.28	7326	230Vac	17.42	4008
BD4KTL-LL1				48Vdc	62.63	3006
BD4KTL-LL1	550Vdc	/	/	230Vac	/	/
BD4KTL-LL1				48Vdc	/	/
BD4KTL-LL1	120Vdc	23.92	2870	230Vac	12.16	2798
BD4KTL-LL1				60Vdc	/	/
BD4KTL-LL1	250Vdc	16.42	4105	230Vac	17.40	4002
BD4KTL-LL1				60Vdc	/	/
BD4KTL-LL1	360Vdc	11.45	4122	230Vac	17.47	4018
BD4KTL-LL1				60Vdc	/	/
BD4KTL-LL1	450Vdc	9.12	4104	230Vac	17.39	4004
BD4KTL-LL1				60Vdc	/	/
BD4KTL-LL1	550Vdc	/	/	230Vac	/	/
BD4KTL-LL1				60Vdc	/	/
supplementary information						

4.3.101, 5.2.3.102	TABLE: Electrical Data (in normal conditions)					P
Type	U (V)	I (A) DC	P (W) DC	U (V)	I (A) AC	P (W) AC
PV Input mode						
BD4.6KTL-LL1	120Vdc	23.87	2864	230V/50Hz	12.14	2792
BD4.6KTL-LL1	250Vdc	18.86	4715	230V/50Hz	19.98	4597
BD4.6KTL-LL1	360Vdc	13.09	4712	230V/50Hz	19.97	4594
BD4.6KTL-LL1	450Vdc	10.35	4657	230V/50Hz	19.74	4541
BD4.6KTL-LL1	550Vdc	/	/	230V/50Hz	/	/
Type	U (V)	I (A) DC	P (W) DC	U (V)	I (A) DC	P (W) DC
PV charging mode						
BD4.6KTL-LL1	120Vdc	23.25	2790	40Vdc	65.56	2622
BD4.6KTL-LL1	250Vdc	11.13	2783	40Vdc	65.40	2616
BD4.6KTL-LL1	360Vdc	7.78	2802	40Vdc	65.84	2633
BD4.6KTL-LL1	450Vdc	6.21	2797	40Vdc	65.72	2629
BD4.6KTL-LL1	550Vdc	/	/	40Vdc	/	/
BD4.6KTL-LL1	120Vdc	23.91	2870	48Vdc	56.20	2697
BD4.6KTL-LL1	250Vdc	12.82	3205	48Vdc	62.76	3012
BD4.6KTL-LL1	360Vdc	8.87	3195	48Vdc	62.56	3003
BD4.6KTL-LL1	450Vdc	7.11	3201	48Vdc	62.68	3008
BD4.6KTL-LL1	550Vdc	/	/	48Vdc	/	/
BD4.6KTL-LL1	120Vdc	/	/	60Vdc	/	/
BD4.6KTL-LL1	250Vdc	/	/	60Vdc	/	/
BD4.6KTL-LL1	360Vdc	/	/	60Vdc	/	/

BD4.6KTL-LL1	450Vdc	/	/	60Vdc	/	/
BD4.6KTL-LL1	550Vdc	/	/	60Vdc	/	/
Type	U (V)	I (A) AC	P (W) AC	U (V)	I (A) DC	P (W) DC
AC charging mode						
BD4.6KTL-LL1	207Vac	14.19	2938	42Vdc	65.75	2761
BD4.6KTL-LL1	230Vac	12.78	2941	42Vdc	65.82	2764
BD4.6KTL-LL1	253Vac	11.60	2936	42Vdc	65.71	2759
BD4.6KTL-LL1	207Vac	15.54	3218	48Vdc	63.01	3024
BD4.6KTL-LL1	230Vac	13.97	3214	48Vdc	62.94	3021
BD4.6KTL-LL1	253Vac	12.68	3210	48Vdc	62.86	3017
BD4.6KTL-LL1	207Vac	/	/	60Vdc	/	/
BD4.6KTL-LL1	230Vac	/	/	60Vdc	/	/
BD4.6KTL-LL1	253Vac	/	/	60Vdc	/	/
Type	U (V)	I (A) DC	P (W) DC	U (V)	I (A) AC	P (W) AC
Battery discharging mode						
BD4.6KTL-LL1	42Vdc	65.98	2771	207Vac	12.58	2605
BD4.6KTL-LL1	42Vdc	65.72	2760	230Vac	11.28	2595
BD4.6KTL-LL1	42Vdc	65.67	2758	253Vac	10.24	2593
BD4.6KTL-LL1	48Vdc	65.71	3154	207Vac	14.32	2965
BD4.6KTL-LL1	48Vdc	65.84	3160	230Vac	12.91	2971
BD4.6KTL-LL1	48Vdc	65.95	3165	253Vac	11.76	2976
BD4.6KTL-LL1	60Vdc	/	/	207Vac	/	/
BD4.6KTL-LL1	60Vdc	/	/	230Vac	/	/
BD4.6KTL-LL1	60Vdc	/	/	253Vac	/	/
Type	U (V)	I (A) DC	P (W) DC	U (V)	I (A)	P (W)
PV input for battery charging and AC output mode						
BD4.6KTL-LL1	120Vdc	23.95	2874	230Vac	0.10	24
BD4.6KTL-LL1				42Vdc	64.93	2727
BD4.6KTL-LL1	250Vdc	23.94	5985	230Vac	12.84	2960
BD4.6KTL-LL1				42Vdc	65.96	2770
BD4.6KTL-LL1	360Vdc	21.36	7689	230Vac	19.96	4592
BD4.6KTL-LL1				42Vdc	65.95	2769
BD4.6KTL-LL1	450Vdc	17.09	7690	230Vac	19.96	4592
BD4.6KTL-LL1				42Vdc	65.97	2770
BD4.6KTL-LL1	550Vdc	/	/	230Vac	/	/
BD4.6KTL-LL1				42Vdc	/	/
BD4.6KTL-LL1	120Vdc	23.95	2874	230Vac	0.05	12
BD4.6KTL-LL1				48Vdc	57.08	2735
BD4.6KTL-LL1	250Vdc	23.97	5992	230Vac	11.86	2729
BD4.6KTL-LL1				48Vdc	62.67	3008
BD4.6KTL-LL1	360Vdc	22.05	7938	230Vac	19.96	4591
BD4.6KTL-LL1				48Vdc	62.69	3009
BD4.6KTL-LL1	450Vdc	17.63	7933	230Vac	19.95	589
BD4.6KTL-LL1				48Vdc	62.65	3007
BD4.6KTL-LL1	550Vdc	/	/	230Vac	/	/
BD4.6KTL-LL1				48Vdc	/	/
BD4.6KTL-LL1	120Vdc	23.95	2874	230Vac	12.18	2802
BD4.6KTL-LL1				60Vdc	/	/
BD4.6KTL-LL1	250Vdc	18.83	4707	230Vac	19.95	589
BD4.6KTL-LL1				60Vdc	/	/
BD4.6KTL-LL1	360Vdc	13.09	4712	230Vac	19.97	4594
BD4.6KTL-LL1				60Vdc	/	/
BD4.6KTL-LL1	450Vdc	10.47	4711	230Vac	19.97	4593
BD4.6KTL-LL1				60Vdc	/	/

BD4.6KTL-LL1	550Vdc	/	/	230Vac	/	/
BD4.6KTL-LL1				60Vdc	/	/
supplementary information						

4.3.101, 5.2.3.102	TABLE: Electrical Data (in normal conditions)					P
Type	U (V)	I (A) DC	P (W) DC	U (V)	I (A) AC	P (W) AC
PV Input only for AC output mode						
BD5KTL-LL1	120Vdc	23.92	2870	230V/50Hz	12.16	2798
BD5KTL-LL1	250Vdc	20.49	5122	230V/50Hz	21.71	4994
BD5KTL-LL1	360Vdc	14.22	5119	230V/50Hz	21.70	4991
BD5KTL-LL1	450Vdc	11.38	5121	230V/50Hz	21.70	4992
BD5KTL-LL1	550Vdc	/	/	230V/50Hz	/	/
Type	U (V)	I (A) DC	P (W) DC	U (V)	I (A) DC	P (W) DC
PV charging mode						
BD5KTL-LL1	120Vdc	23.31	2798	40Vdc	65.753	2630
BD5KTL-LL1	250Vdc	11.16	2790	40Vdc	65.565	2622
BD5KTL-LL1	360Vdc	7.76	2794	40Vdc	65.659	2626
BD5KTL-LL1	450Vdc	6.23	2804	40Vdc	65.894	2635
BD5KTL-LL1	550Vdc	/	/	40Vdc	/	/
BD5KTL-LL1	120Vdc	23.93	2872	48Vdc	56.24	2699
BD5KTL-LL1	250Vdc	12.83	3208	48Vdc	62.82	3015
BD5KTL-LL1	360Vdc	8.86	3192	48Vdc	62.51	3000
BD5KTL-LL1	450Vdc	7.13	3211	48Vdc	62.88	3018
BD5KTL-LL1	550Vdc	/	/	48Vdc	/	/
BD5KTL-LL1	120Vdc	/	/	60Vdc	/	/
BD5KTL-LL1	250Vdc	/	/	60Vdc	/	/
BD5KTL-LL1	360Vdc	/	/	60Vdc	/	/
BD5KTL-LL1	450Vdc	/	/	60Vdc	/	/
BD5KTL-LL1	550Vdc	/	/	60Vdc	/	/
Type	U (V)	I (A) AC	P (W) AC	U (V)	I (A) DC	P (W) DC
AC charging mode						
BD5KTL-LL1	207Vac	14.22	2945	42Vdc	65.91	2768
BD5KTL-LL1	230Vac	12.77	2939	42Vdc	65.77	2762
BD5KTL-LL1	253Vac	11.62	2942	42Vdc	65.84	2765
BD5KTL-LL1	207Vac	15.54	3218	48Vdc	63.01	3024
BD5KTL-LL1	230Vac	14.00	3220	48Vdc	63.05	3026
BD5KTL-LL1	253Vac	12.70	3215	48Vdc	62.96	3022
BD5KTL-LL1	207Vac	/	/	60Vdc	/	/
BD5KTL-LL1	230Vac	/	/	60Vdc	/	/
BD5KTL-LL1	253Vac	/	/	60Vdc	/	/
Type	U (V)	I (A) DC	P (W) DC	U (V)	I (A) AC	P (W) AC
Battery discharging mode						
BD5KTL-LL1	42Vdc	65.93	2769	207Vac	12.57	2603
BD5KTL-LL1	42Vdc	65.80	2763	230Vac	11.29	2598
BD5KTL-LL1	42Vdc	65.98	2771	253Vac	10.29	2605
BD5KTL-LL1	48Vdc	65.93	3164	207Vac	14.37	2975
BD5KTL-LL1	48Vdc	65.80	3158	230Vac	12.90	2969
BD5KTL-LL1	48Vdc	65.89	3162	253Vac	11.75	2973
BD5KTL-LL1	60Vdc	/	/	207Vac	/	/
BD5KTL-LL1	60Vdc	/	/	230Vac	/	/
BD5KTL-LL1	60Vdc	/	/	253Vac	/	/
Type	U (V)	I (A) DC	P (W) DC	U (V)	I (A)	P (W)

PV input for battery charging and AC output mode						
BD5KTL-LL1	120Vdc	23.94	2872	230Vac	0.05	11
BD5KTL-LL1				42Vdc	65.21	2738
BD5KTL-LL1	250Vdc	23.98	5995	230Vac	12.91	2970
BD5KTL-LL1				42Vdc	65.95	2769
BD5KTL-LL1	360Vdc	22.51	8103	230Vac	21.69	4990
BD5KTL-LL1				42Vdc	65.93	2769
BD5KTL-LL1	450Vdc	18.02	8109	230Vac	21.70	4993
BD5KTL-LL1				42Vdc	65.98	2771
BD5KTL-LL1	550Vdc	/	/	230Vac	/	/
BD5KTL-LL1				42Vdc	/	/
BD5KTL-LL1	120Vdc	23.97	2876	230Vac	0.05	12
BD5KTL-LL1				48Vdc	57.11	2741
BD5KTL-LL1	250Vdc	23.96	5990	230Vac	11.85	2726
BD5KTL-LL1				48Vdc	62.68	3008
BD5KTL-LL1	360Vdc	23.21	8355	230Vac	21.69	4990
BD5KTL-LL1				48Vdc	62.71	3010
BD5KTL-LL1	450Vdc	18.58	8361	230Vac	21.71	4994
BD5KTL-LL1				48Vdc	62.74	3011
BD5KTL-LL1	550Vdc	/	/	230Vac	/	/
BD5KTL-LL1				48Vdc	/	/
BD5KTL-LL1	120Vdc	23.98	2877	230Vac	12.19	2805
BD5KTL-LL1				60Vdc	/	/
BD5KTL-LL1	250Vdc	20.49	5122	230Vac	21.71	4994
BD5KTL-LL1				60Vdc	/	/
BD5KTL-LL1	360Vdc	14.22	5119	230Vac	21.70	4991
BD5KTL-LL1				60Vdc	/	/
BD5KTL-LL1	450Vdc	11.38	5121	230Vac	21.70	4992
BD5KTL-LL1				60Vdc	/	/
BD5KTL-LL1	550Vdc	/	/	230Vac	/	/
BD5KTL-LL1				60Vdc	/	/
supplementary information						

4.4.4.3.3 /RD	TABLE: Touch current measurement			P
Measured between:		**Measured (mA)**	**Limit (mA)**	**Comments/ conditions**
Living part and com. Port:		3.21	3.5	--
Live part and metal enclosure		2.08	3.5	--
Supplementary information:				

4.4.7/RD	TABLE: Transformers						P
Loc.	Tested insulation	Working voltage peak / V	Working voltage rms / V	Required electric strength	Required clearance / mm	Required creepage distance / mm	Required distance thr. insul.
--	--	--	550Vdc	2454Vdc	--	--	--
Loc.	Tested insulation			Test voltage/ V	Measured clearance / mm	Measured creepage dist./ mm	Measured distance thr. insul. / mm; number of layers
--	--	--	--	--	--	--	--
Supplementary information:							

4.4.7/RD	TABLE: Transformers	N/A
N/A		

4.4.7.4/RD to 4.4.7.5/RD	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)
Y cap (C11,C10) to earthing on PCB) (IO board) (BI)	550	--	3.0	5.1	3.0	5.1
Y cap (C14,C15) to earthing on PCB) (IO board) (BI)	550	--	3.0	5.1	3.0	5.1
Y cap (C60, C61,C59) to earthing on PCB(IO board) (BI)	550	--	3.0	5.1	3.0	5.1
Gas discarher tube (CGAS1, GAS2) to earthing on PCB (IO board) (BI)	550	--	3.0	5.1	3.0	5.1
Relay (RY1, RY5, RY6, RY7) two polarity on PCB (IO board) (BI)	550	--	3.0	5.1	3.0	5.1
Y cap (C70,C72) to earthing on PCB (main board) (BI)	550	--	3.0	5.1	3.0	5.1
Y cap (C71,C73) to earthing on PCB (Main board) (BI)	550	--	3.0	5.1	3.0	5.1
Primary circuits to earthing on PCB (Main board) (BI)	550	--	3.0	5.1	3.0	5.1
Q44, Q45, D21 to earthing on PCB (Main board) (BI)	550	--	3.0	5.1	3.0	5.1
Primary circuits to earthing on PCB (Main board) (BI)	550	--	3.0	5.1	3.0	5.1
Transformer (TX1) pri. Pin to sec. pin (Main board) (BI)	550	--	3.0	6.5	3.0	6.5
Opocoupler (U16, U15,U45,U44,U51, U39) Primary pin to Secondary pin on (main board Communication circuit) (RI)	550	--	3.0	7.0	3.0	7.0
Transformer (TX1) pri. Pin to sec. pin (SPS board) (SI)	550	--	3.0	6.5	3.0	6.5

Transformer (TX2) pri. Pin to sec. pin (SPS board) (SI)	550	--	3.0	6.5	3.0	6.5
Opocoupler (U1, U2, U4-U7) Primary pin to Secondary pin on PCB (SPS board) (SI)	550	--	5.5	7.0	5.5	7.0
Y cap (C4, C3) to earthing on PCB (SPS board) (BI)	550	--	3.0	5.1	3.0	5,1
Opocoupler (U2, U6,U4) Primary pin to Secondary pin on (SPS board) (SI)	550	--	3.0	7.0	3.0	7.0
Primary circuits to Secondarycircuits on PCB(SPS board) (RI)	550	--	5.5	7.2	5.5	7.2
Supplementary information: RI: Reinforced insulation, DI: double insulation, BI: basic insulation, SI: supplementary insulation The double side PCB layout is considered and evaluated.						

4.4.7.8.2 /RD	**TABLE: Ball Pressure Test of Thermoplastics**		**P**
Allowed impression diameter (mm) ..... :			—
Object/ Part No./ Material	Manufacturer/ trademark	Test temperature (°C)	Impression diameter (mm)
PCB	--	125	--
AC Input and output terminal Block	ENT Tech Shenzhen Co., Ltd./ E06-18-3P	125	--
Battery terminal	ENT Tech Shenzhen Co., Ltd./ EPT2-1P-C25-KM6	125	--
Plastic enclosure of LCD panel	--	125	--
Supplementary information:			

4.4.7.8.2 /RD	TABLE: Resistance to heat and fire - Glow wire tests	P

Object/ Part No./ Material	Manufacturer / trademark	Glow wire test (GWT); (°C)						Verdict
		550	650		750		850	
			te	ti	te	ti		
Plastic enclosure panel	--	550	0	0	--	--	--	

Object/ Part No./ Material	Manufacturer / trademark	Glow-wire flammability index (GWFI), °C				GW ignition temp. (GWIT), °C		Verdict
		550	650	750	850	675	775	
--	--	--	--	--	--	--	--	--

The test specimen passed the glow wire test (GWT) with no ignition [(te – ti) ≤ 2s] (Yes/No) :	--
If no, then surrounding parts passed the needle-flame test of annex E (Yes/No) .....:	--
The test specimen passed the test by virtue of most of the flaming material being withdrawn with the glow-wire (Yes/No)?.....:	--
Ignition of the specified layer placed underneath the test specimen (Yes/No).....:	--
Supplementary information: 550 °C GWT not relevant (or applicable) to parts of material classified at least HB40 or if relevant HBF The GWIT pre-selection option, the 850 °C GWFI pre-selection option, and the 850 °C GWT are not relevant (or applicable) for attended appliances.	

4.4.7.8.3.2 /RD to 4.4.7.9/RD	TABLE: Distance Through Insulation Measurements	N/A

Distance through insulation di at/of:	U r.m.s. (V)	Test voltage (V)	Required di (mm)	di (mm)
Insulation sheet	550	5090	--	0.23
Photo coupler (certified)*	550	5090	0.2	0.4
Supplementary information: "*"Approved components.				

4.4.7.10 /RD, 5.2.3/RD	TABLE: electric strength measurements, impulse voltage test and partial discharge test	P

test voltage applied between:	test voltage (V)	impulse withstand voltage (V)	partial discharge extinction voltage (V)	Breakdown / flashover (Yes/No)
DC input terminal to earthed enclosure	2545	4000	—	Pass
AC Output terminal to communication port	4240	6000	—	Pass
DC input terminal to communication port	5090	6000	—	Pass
Battery terminal to earthed enclosure	2545	4000	—	Pass
Battery terminal to communication port	5090	6000	—	Pass
Insulation sheet	2545	4000	—	Pass
Main board Transformer (TX1) Pri. to Sec.	2545	4000	—	Pass
Main board Transformer (TX1) Pri. to core	2545	4000	—	Pass
Main board Transformer (TX1) Sec. to Core	2545	4000	—	Pass
SPS board Transformer (TX2) Pri. to Sec.	2545	4000	—	Pass

SPS board Transformer (TX2) Pri. to core	2545	4000	—	Pass
SPS board Transformer (TX2) Sec. to Core	2545	4000	—	Pass
One layer of insulation tape	5090	6000	—	Pass
Relay pin 3 to pin 4	2545	4000	—	Pass
Supplementary information:				

4.4.9/RD	TABLE: Capacitor discharge			N/A
Condition	**τ calculated (s)**	**τ measured (s)**	**t u→ 0V (s)**	**Comments**
--	--	--	--	--
Supplementary information:				

4.6.3/RD	TABLE: Resistance to fire				P
Part	**Manufacturer of material**	**Type of material**	**Thickness (mm)**	**Flammability class**	**Evidence**
Enclosure	--	metallic	--	--	--
Plastic enclosure of LCD panel	--	Plastic	--	--	--

4.6.3.3.3 /RD	TABLE: Needle- flame test (NFT)				N/A
Object/ Part No./ Material	Manufacturer/ trademark	Duration of application of test flame (ta); (s)	Ignition of specified layer Yes/No	Duration of byrning (tb) (s)	Verdict
--	--	--	--	--	--
Supplementary information: NFT not relevant (or applicable) for Parts of material classified as V-0 or V-1 NFT not relevant (or applicable) for Base material of PCBs classified as V-0 or if relevant VTM-0					

4.6.4/RD	TABLE: Heating Test (PV input only for AC output mode)		P
	Test voltage (V) ..... :	A: 250Vdc/12.9A B: 480Vdc/6.5A C: 250Vdc/20.5A D: 480Vdc/10.7A	—
	t1 (°C) ..... :	See below	—
	t2 (°C) ..... :	See below	—

Temperature T of part/at:	Measured T (°C)				Limit T (°C)
	A	B	C	D	
Ambient	60.3	60.2	45.8	45.4	--
SPS Board_Q1	92.5	99.0	95.4	87.2	130
IO Board_RCM1	85.1	86.9	79.3	73.1	130
IO Board_L2	70.2	69.0	58.7	53.8	130
IO Board_L1	79.0	75.1	71.3	58.8	130
Main Board_C258	81.9	79.4	72.3	64.1	105
Main Board_Q22	73.0	70.5	60.5	54.8	130
Main Board_Q24	92.8	91.0	58.9	55.8	130
PV Side Switch	72.4	71.1	61.6	55.2	85
Main Board_Q26	70.3	68.4	56.8	52.3	130
Main Board_Q27	70.5	68.7	57.4	52.8	130
Main_Board_C356	72.6	71.0	61.3	56.4	105
Main Board_Q52	74.0	72.8	62.5	57.4	130
IO Board_C48	81.7	77.9	75.6	62.7	110
Main Board_TX4 coil	72.8	72.0	63.0	57.4	130
Main Board_C352	74.3	73.0	63.7	58.6	110
Main Board_TX1 coil	86.4	85.5	77.0	71.4	130
IO Board_C36	79.2	75.8	72.7	61.0	105
Main Board_Q23	71.2	69.1	58.1	52.9	130
Main Board_Q45	74.9	71.7	62.7	55.9	130
IO Board_RY1 Coil	95.4	98.3	87.4	82.8	130
IO Board_RY4 enclosure	91.4	94.1	84.2	79.7	120
IO Board_RY5 enclosure	70.1	68.2	56.6	52.0	120
IO Board_L1	80.2	81.2	71.2	66.8	130
Main Board_PCB	93.4	95.8	85.6	82.0	130
Main Board_Q44	92.4	92.7	83.9	79.5	130
Main Boardd_Q66	89.0	88.1	78.3	72.5	130
Main Board_D23	81.9	81.1	71.6	66.2	130
Main Board_Q47	92.7	94.7	83.4	80.6	130
Main Board_Q46	91.4	92.2	83.2	78.8	130
Main Board_D16	84.6	80.5	83.4	79.8	130
Main Board_D27	82.7	83.3	72.3	68.3	130
Main Board_D17	83.5	79.0	72.8	63.4	130
Main Board_Q45	90.4	76.9	79.0	60.9	130
Main Board_Q67	88.6	90.0	77.2	73.5	130
Main Board_Q48	84.4	74.9	72.9	59.1	130
Main Board_Q21	77.4	73.2	65.8	57.4	130
LLC TX coil	71.5	70.0	60.5	55.0	130
LLC TX core	72.4	70.7	61.7	55.9	130
BUCK-BOOST Inductor	77.2	74.4	68.6	59.9	130
BOOST Inductor	95.7	88.8	93.2	73.6	130
INV Inductor _L1	95.9	102.4	94.5	90.9	130
INV Inductor _L2	98.4	102.3	98.1	90.5	130
Main Board_C204	84.5	84.1	77.2	68.8	105

CTRL Board_U21	92.9	93.8	85.8	80.7	105
SPS Board_TX1 coil	93.1	93.8	76.8	72.4	130
Main Board_U27	89.3	90.2	81.9	76.7	100
M3 Board_U1	84.6	85.3	74.8	70.4	105
Covers	66.4	66.1	53.2	50.5	70
PV Terminals	63.1	62.8	48.6	46.4	85
Mounting surface	81.2	81.4	70.2	76.3	90
supplementary information Test model: BD5KTL-LL1					

4.6.4/RD	**TABLE: Heating Test** **(PV input for battery charging and AC output mode)**		**P**
	Test voltage (V) .....:	E: 250Vdc/24.0A F: 480Vdc/12.9A G: 250Vdc/24.0A H: 480Vdc/17.4A	—
	t1 (°C) .....:	See below	—
	t2 (°C) .....:	See below	—

Temperature T of part/at:	Measured T (°C)				Limit T (°C)
	E	F	G	H	
Ambient	60.5	60.4	45.9	45.7	--
SPS Board_Q1	94.1	95.6	100.9	95.0	130
IO Board_RCM1	85.1	85.6	82.5	80.2	130
IO Board_L2	90.9	92.1	90.9	87.8	130
IO Board_L1	77.9	76.9	72.8	68.3	130
Main Board_C258	82.2	81.0	77.1	73.5	105
Main Board_Q22	95.2	95.2	87.7	85.4	130
Main Board_Q24	99.2	99.1	83.0	81.6	130
PV Side Switch	71.6	71.2	62.7	60.5	85
Main Board_Q26	84.7	84.9	77.8	77.3	130
Main Board_Q27	87.7	88.1	83.5	81.7	130
Main_Board_C356	95.8	97.2	96.4	97.0	105
Main Board_Q52	97.4	98.2	94.2	92.9	130
IO Board_C48	79.6	78.4	75.1	70.5	110
Main Board_TX4 coil	89.7	91.0	89.4	89.1	130
Main Board_C352	82.4	82.9	79.5	77.7	110
Main Board_TX1 coil	92.4	92.7	88.9	85.9	130
IO Board_C36	78.9	77.6	74.1	69.7	105
Main Board_Q23	84.4	84.4	76.9	75.8	130
Main Board_Q45	90.8	92.9	82.8	84.1	130
IO Board_RY1 Coil	95.7	94.8	93.9	91.8	130
IO Board_RY4 enclosure	89.1	90.7	87.4	87.5	120
IO Board_RY5 enclosure	83.3	83.4	76.7	76.7	120
IO Board_L1	79.0	79.4	73.9	72.5	130
Main Board_PCB	92.0	93.2	89.2	88.1	130
Main Board_Q44	91.4	90.7	87.2	83.7	130
Main Boardd_Q66	88.4	88.3	82.4	80.2	130
Main Board_D23	81.6	81.3	75.2	72.9	130
Main Board_Q47	91.2	92.8	86.1	85.3	130
Main Board_Q46	90.3	91.3	83.1	83.6	130
Main Board_D16	82.5	80.8	84.7	84.5	130
Main Board_D27	82.2	82.4	75.5	74.1	130
Main Board_D17	81.9	80.0	75.4	71.4	130
Main Board_Q45	85.3	79.8	79.8	70.8	130
Main Board_Q67	87.6	88.6	80.3	80.2	130

Main Board_Q48	83.1	79.2	76.3	70.4	130
Main Board_Q21	86.6	85.0	79.7	76.1	130
LLC TX coil	95.5	96.8	96.4	92.8	130
LLC TX core	95.3	96.4	96.3	92.2	130
BUCK-BOOST Inductor	95.7	98.0	99.5	96.7	130
BOOST Inductor	88.3	84.0	88.5	80.3	130
INV Inductor _L1	91.3	93.3	95.9	95.2	130
INV Inductor _L2	93.2	94.0	98.4	95.6	130
Main Board_C204	82.6	80.9	79.5	74.4	105
CTRL Board_U21	93.1	93.3	89.1	87.1	105
SPS Board_TX1 coil	95.5	95.2	80.8	88.5	130
Main Board_U27	88.1	87.8	84.8	81.7	100
M3 Board_U1	84.5	84.6	78.2	76.2	105
Covers	67.3	67.2	55.8	54.9	70
PV Terminals	63.7	63.6	50.4	50.3	85
Mounting surface	81.0	81.9	79.7	79.8	90
supplementary information Test model: BD5KTL-LL1					

4.6.4/RD	TABLE: Heating Test (AC input for charging battery mode)		P
	Test voltage (V) .....:	I: 230Vac /13.8A	—
	t1 (°C) .....:	See below	—
	t2 (°C) .....:	See below	—

Temperature T of part/at:	Measured T (°C)	Limit T (°C)
	I	
Ambient	45.7	--
SPS Board_Q1	94.8	130
IO Board_RCM1	69.1	130
IO Board_L2	86.0	130
IO Board_L1	62.9	130
Main Board_C258	68.6	105
Main Board_Q22	86.0	130
Main Board_Q24	83.5	130
PV Side Switch	56.5	85
Main Board_Q26	80.5	130
Main Board_Q27	84.1	130
Main_Board_C356	95.8	105
Main Board_Q52	91.5	130
IO Board_C48	64.3	110
Main Board_TX4 coil	89.8	130
Main Board_C352	77.3	110
Main Board_TX1 coil	80.4	130
IO Board_C36	63.5	105
Main Board_Q23	89.4	130
Main Board_Q45	77.6	130
IO Board_RY1 Coil	76.0	130
IO Board_RY4 enclosure	71.3	120
IO Board_RY5 enclosure	92.8	120
IO Board_L1	63.3	130
Main Board_PCB	74.6	130
Main Board_Q44	65.5	130
Main Boardd_Q66	69.5	130
Main Board_D23	67.7	130

Main Board_Q47	71.1	130
Main Board_Q46	70.8	130
Main Board_D16	71.0	130
Main Board_D27	66.5	130
Main Board_D17	66.9	130
Main Board_Q45	67.3	130
Main Board_Q67	67.4	130
Main Board_Q48	68.1	130
Main Board_Q21	78.0	130
LLC TX coil	90.1	130
LLC TX core	88.9	130
BUCK-BOOST Inductor	87.3	130
BOOST Inductor	67.2	130
INV Inductor _L1	71.3	130
INV Inductor _L2	72.4	130
Main Board_C204	69.5	105
CTRL Board_U21	79.3	105
SPS Board_TX1 coil	82.2	130
Main Board_U27	71.5	100
M3 Board_U1	69.9	105
Covers	53.3	70
PV Terminals	49.5	85
Mounting surface	70.1	90
supplementary information Test model: BD5KTL-LL1		

4.6.4/RD	TABLE: Heating Test (Battery discharging mode)		P
	Test voltage (V) .....:	J: 48Vdc /65.8A	—
	t1 (°C) .....:	See below	—
	t2 (°C) .....:	See below	—

Temperature T of part/at:	Measured T (°C)	Limit T (°C)
	J	
Ambient	61.0	--
SPS Board_Q1	102.3	130
IO Board_RCM1	83.4	130
IO Board_L2	107.4	130
IO Board_L1	79.4	130
Main Board_C258	82.9	105
Main Board_Q22	103.2	130
Main Board_Q24	101.4	130
PV Side Switch	71.5	85
Main Board_Q26	90.3	130
Main Board_Q27	95.5	130
Main_Board_C356	103.9	105
Main Board_Q52	107.3	130
IO Board_C48	80.0	110
Main Board_TX4 coil	107.0	130
Main Board_C352	91.6	110
Main Board_TX1 coil	94.9	130
IO Board_C36	79.3	105
Main Board_Q23	89.0	130
Main Board_Q45	96.0	130
IO Board_RY1 Coil	82.9	130
IO Board_RY4 enclosure	80.3	120
IO Board_RY5 enclosure	87.8	120
IO Board_L1	85.0	130
Main Board_PCB	88.0	130
Main Board_Q44	86.9	130
Main Boardd_Q66	85.5	130
Main Board_D23	81.2	130
Main Board_Q47	86.2	130
Main Board_Q46	86.2	130
Main Board_D16	81.7	130
Main Board_D27	81.0	130
Main Board_D17	81.3	130
Main Board_Q45	82.3	130
Main Board_Q67	84.1	130
Main Board_Q48	81.7	130
Main Board_Q21	90.3	130
LLC TX coil	113.2	130
LLC TX core	111.9	130
BUCK-BOOST Inductor	112.6	130
BOOST Inductor	83.7	130
INV Inductor _L1	85.7	130
INV Inductor _L2	87.5	130
Main Board_C204	83.8	105
CTRL Board_U21	93.5	105
SPS Board_TX1 coil	81.3	130

Main Board_U27	86.5	100
M3 Board_U1	84.4	105
Covers	68.4	70
PV Terminals	63.4	85
Mounting surface	82.3	90
supplementary information Test model: BD5KTL-LL1		

4.6.4/RD	TABLE: Heating test, resistance method		N/A
	Test voltage (V)..... :	--	—
	Ambient, t_1 (°C) ..... :	--	—
	Ambient, t_2 (°C) ..... :	--	—

Temperature rise of winding	R_1 (Ω)	R_2 (Ω)	ΔT (K)	Max. dT (K)	Insulation class
--	--	--	--	--	--
Supplementary information:					

4.6.5/RD	TABLE: Limited power sources						N/A
Components	Test condition (Single fault)	Uoc (V)	Isc (A)		VA		
			Meas.	Limit	Meas.	Limit	
--	--	--	--	--	--	--	
Supplementary information: Sc=Short circuit, Oc=Open circuit							

4.12.1/RD, 5.2.2.4.3 /RD	TABLE: Impact Resistance		P
Impacts per surface	Surface tested	Impact energy (Nm)	Comments
Enclosure surface (Top, Side, Bottom)	Top, Side, Bottom	1300 mm	After testing, no hazard, no damaged
Supplementary information:			

Annex CC	TABLE: Ventilation of lead-acid battery compartments	N/A
The required dimension for the ventilation openings will be calculated with the following formula:		
$A \geq Q/360$ [m^2]		
with $Q = 0.054 * n * I * C$		
where: Q : airflow in m^3/h n : number of battery cells I : constant factor (0,2A/100Ah for valve regulated lead acid batteries) C : is the battery nominal capacity in Ah at the 10h discharge rate		
With the specific data for the UPS the following dimension for the ventilation openings is required:		
n : ? C : ?		
$A \geq (0.054 * n * 0.2\ A/100\ Ah * C)/360$		
$A \geq ?\ m^2$		
Verdict		
The size of ventilation openings in battery cabinet exceeds the required airflow by far (as well as the UPS).		
Supplementary information:		

	TABLE: Critical components information				P
Object / part No.	**Manufacturer/ trademark**	**Type / model**	**Technical data**	**Standard**	**Mark(s) of conformity[1)]**
Enclosure	ALL	ALL accepted	Metal, Thickness: 1.5mm min	IEC62109	Tested with Appliance
Heat-sink (the rear side of enclosure)	ALL	ALL accepted	Metal, overall measured: L: 403mm W:265mm H:88mm	IEC62109	Tested with Appliance
DC breaker DC switch	Santon	XB3310/2	Ie=25A,Ue=650V	EN60947-1&3:2009	2199573.01
-alternative	Projoy	PEDS150-HM32-3	600V/32A Max. 85°C , IP66	EN60947-1&3:2009	E489584
PV connector	Dongguan Zerun Electronics Technology Co.,Ltd	Z4S- CH3A2	1000Vdc, 32A, Max. 85°C	EN50521	TUV R 50363877
Battery terminal	ENT Tech Shenzhen Co., Ltd.	EPT2-1P-C25-KM6	AC600V, 120A, Max. 125°C	EN50521	R50428248 001
Internal wiring (DC-input)	ALL	ALL accepted	Min. 10AWG,600V, 105°C,VW-1	UL 1015	UL E341104
Internal wiring (AC-input)	ALL	ALL accepted	Min. 10AWG,600V, 150°C,VW-1	UL 1015	UL E341104
Internal wiring (EPS-output)	ALL	ALL accepted	Min. 10AWG,600V, 105°C,VW-1	UL 1015	UL E341104
Earthing wire	ALL	ALL accepted	Min. 12AWG,600V, 105°C,VW-1	UL 1015	UL E341104
AC Grid terminal	Vaconn power	VPAC07EW-3S	300V, 35A, -40°C ~90°C	EN61984	TUV R50235418
AC Grid terminal	ENT Tech Shenzhen Co., Ltd.	E06-18-3P	500V, 33A, -40°C ~100°C	EN61984	TUV R50223009
EPS output terminal	ENT Tech Shenzhen Co., Ltd.	E06-18-3P	500V, 33A, -40°C ~100°C	EN61984	TUV R50223009
All PCB	All	All accepted	Min. 130°C Min. V-0, CTI. V-	UL 796	UL E345887
Tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE	PF-	180°C,0.45mm	UL510	UL E165111
		WF	130°C, 0.42mm		
TUBE	SHENZHENWOER HEAT-SHRINKABLE	600V RSFR	125°C	UL224	UL E203950

	TABLE: Critical components information				P
Object / part No.	**Manufacturer/ trademark**	**Type / model**	**Technical data**	**Standard**	**Mark(s) of conformity[1)]**
	MATERIALCO., LTD				
-Tube	SHENZHEN WAHCHANGWEI INDUSTRIAL CO.,LTD	SGS-25	200°C	UL224	UL E233804
Inductor (Boost1)	HUIZHOU BAOHUI ELECTRONICS TECHNOLOGY CO.,LTD	NPF185060*2	1.24mH±10%(min) 2.0mm*1P*85Ts 1.24mH	IEC62109	Tested with Appliance
Inductor (Boost1)	SHENZHEN JIALIANG ELECTRONICS TECHNOLOGY CO.,LTD	NPF185060*2	1.24mH±10%(min) 2.0mm*1P*85Ts 1.24mH	IEC62109	Tested with Appliance
Inductor (Boost2)	HUIZHOU BAOHUI ELECTRONICS TECHNOLOGY CO.,LTD	NPF185060*2	1.24mH±10%(min) 2.0mm*1P*85Ts 1.24mH	IEC62109	Tested with Appliance
Inductor (Boost2)	SHENZHEN JIALIANG ELECTRONICS TECHNOLOGY CO.,LTD	NPF185060*2	2.0mm*1P*85Ts 1.24mH±10%	IEC62109	Tested with Appliance
Inductor (Inv1)	HUIZHOU BAOHUI ELECTRONICS TECHNOLOGY CO.,LTD	NPH185060*3	1.8mm*2P*50Ts 645uH±10%	IEC62109	Tested with Appliance
Inductor (Inv1)	SHENZHEN JIALIANG ELECTRONICS TECHNOLOGY CO.,LTD	NPH185060*3	1.8mm*2P*50Ts 645uH±10%	IEC62109	Tested with Appliance
Inductor (Inv2)	HUIZHOU BAOHUI ELECTRONICS TECHNOLOGY CO.,LTD	NPH185060*3	1.8mm*2P*50Ts 645uH±10%	IEC62109	Tested with Appliance
Inductor (Inv2)	SHENZHEN JIALIANG ELECTRONICS	NPH185060*3	1.8mm*2P*50Ts 645uH±10%	IEC62109	Tested with Appliance

	TABLE: Critical components information				P
Object / part No.	**Manufacturer/ trademark**	**Type / model**	**Technical data**	**Standard**	**Mark(s) of conformity[1)]**
	TECHNOLOGY CO.,LTD				
Inductor (BB)	HUIZHOU BAOHUI ELECTRONICS TECHNOLOGY CO.,LTD	NPF185060*2	2.0mm*1P*85Ts 1.24mH±10%	IEC62109	Tested with Appliance
Inductor (BB)	SHENZHEN JIALIANG ELECTRONICS TECHNOLOGY CO.,LTD	NPF185060*2	2.0mm*1P*85Ts 1.24mH±10%	IEC62109	Tested with Appliance
Transformer (TX)	HUIZHOU BAOHUI ELECTRONICS TECHNOLOGY CO.,LTD	EE55A*2	EE55A N1:N2:N3= 3:2:3 0.58mH, ClassB	IEC 62040-1	Tested with Appliance
-alternative	ThreeLayer Scientific-Technics Co.,Ltd	EE55A*2	EE55A N1:N2:N3= 3:2:3 0.58mH, ClassB	IEC 62040-1	Tested with Appliance
- Winding	SHANGHAI ASIA PACIFIC ELECTRIC CO LTD	EIW EI/AIW	180°C	UL 758	UL E214423
-- alternative	Guangdong jingda Rea Special Enamelled Wire Co.,Ltd.	QZY-2/ QZY/XY-2	180°C	UL 758	UL E223994
-Lead wire	3Q WIRE & CABLE CO LTD	ALL accepted	Min. 10AWG, 600V, 30A, Max.105°C, VW-1	UL 1015	UL E341104
-- alternative	LTK WIRING CO LTD OR EQ	ALL accepted	Min. 10AWG, 600V, 30A, Max.105°C, VW-1	UL 1015	UL E148000
-WINDING TAPE	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE	PF-	180°C	UL 510	UL E165111
-MARGIN TAPE	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE	WF-	180°C	UL 510	UL E165111
-UL TUBE	SHENZHEN WOER HEAT-SHRINKABLE	600V RSFR-H	125°C	UL 224	UL E203950

	TABLE: Critical components information				P
Object / part No.	**Manufacturer/ trademark**	**Type / model**	**Technical data**	**Standard**	**Mark(s) of conformity[1)]**
	MATERIAL CO.,LTD				
-Epoxy	DONGGUAN EATTO ELECTRONIC MATERIAL CO LTD	3300A-1/3300B-1	V-0, 130°C	UL 746	UL E218090
M3 board					
MCU (U1)	STMicroelectronics	STM32F107VCT	-40 to +105°C	IEC 62040-1	Tested with Appliance
-- alternative	GigaDevice	GD32F305Vx	-40 to +85°C	IEC 62040-1	Tested with Appliance
Crystal oscillator (XL1)	SHEN ZHEN CRYSTAL TECHNOLOGY INDUSTRIAL CO.,LTD	SJK-7U-16M-9-10-60-B-10	16MHz/±10PPM/9PF SMD	IEC62109	Tested with Appliance
Crystal oscillator (XL2)	SHEN ZHEN CRYSTAL TECHNOLOGY INDUSTRIAL CO.,LTD	SJK	/32.768KHz/-40°-85°/3.2*1.5mm	IEC62109	Tested with Appliance
LCD panel	SHENZHEN HUAYUAN DISPLAY CO.,LTD.	HYC160227C-YF62L-VA/3.3V	3.3V, -30-80°C	IEC62109	Tested with Appliance
Insulation sheet	Renata batteries	SMTU2032-LF	28.5*20*5.4 mm MIN300°C	UL 746C	UL E218732
Control board (DSP board)					
DSP (U21)	Texas Instruments	TMS320F28075PTPT	-40 to +125°C	IEC62109	Tested with Appliance
Crystal oscillator (XL1)	SHEN ZHEN CRYSTAL TECHNOLOGY INDUSTRIAL CO.,LTD	SJK-7U-16M-9-10-60-B-10	16MHz/±10PPM/9PF SMD	IEC62109	Tested with Appliance
Crystal oscillator (XL2)	SHEN ZHEN CRYSTAL TECHNOLOGY INDUSTRIAL CO.,LTD	SJK7U0200000212LJP	20MHZ/±10ppm/-40°C to +105°C /3225/SMD	IEC62109	Tested with Appliance
IO board					
Electrolytic capacitor (C41)	Rubycon	AL 100UF/25V/YXJ	105°C / 5*11mm/2mm	IEC62109	Tested with Appliance
Electrolytic capacitor (C22, C24, C25, C32, C39)	Rubycon	AL 220UF/25V/YXF	105°C / 6.3*11.5mm/2.5mm	IEC62109	Tested with Appliance
X capacitor (C18A,C6)	Xiamen Faratronic Co.Ltd.	MKP62	X2/1uF/275Vac/26.5*10*18.5mm/22.5mm/K	EN60384-14：2013	400000358

	TABLE: Critical components information				P
Object / part No.	**Manufacturer/ trademark**	**Type / model**	**Technical data**	**Standard**	**Mark(s) of conformity[1)]**
Y capacitor (C2, C10, C11, C14, C15, C16, C23, C27, C52, C53, C54, C55, C56, C57, C58, C59, C60, C61)	Xiamen Faratronic Co.Ltd.	MKP63	Y2/4.7nF/1000Vdc/13*6*11mm/10 mm/K	EN60384-14 : 2013	SE/0366-2C
Film Capacitor (C43A, C47A, C48, C49, C51)	Xiamen Faratronic Co.Ltd. or SHENZHEN CRC NEW ENERGY CO.,LTD	MKP21	0.33uF/630V/26.5*10.5*16.5mm/22.5mm/K	EN60384-14 : 2013	SE/0366-2C
Film Capacitor (C9,C44B)	Xiamen Faratronic Co.Ltd. or SHENZHEN CRC NEW ENERGY CO.,LTD	MKP62	2.2uF/310VAC/31*26*18mm/27.5mm/K	EN60384-14 : 2013	400000358
Film Capacitor (C17)	Xiamen Faratronic Co.Ltd. or SHENZHEN CRC NEW ENERGY CO.,LTD	MKP-AC	3.3uF/300VAC/37.5mm/J	EN60384-14 : 2013	400000358
Electrolytic capacitor (C36, C37)	NICHICON	LGN2L101MELENH	AL 100uF/550V/25.4X40, AL	IEC62109	Tested with Appliance
-alternative	Nantong Jianghai Capacitor Co.,Ltd	ECS2YKC101MLA 250035E	AL 100uF/550V/25.4X40, AL	IEC62109	Tested with Appliance
Y capacitor (C1, C8)	Xiamen Faratronic Co.Ltd.	MKP63	Y2 33nF/300VAC/17.5*13.5*7.5/P=15mm	EN60384-14 : 2013	SE/0366-2C
Relay (RY1,RY2,RY2, RY4, RY5, RY6)	Panasonic	ALFG2PF12/31A/12VDC	31A, 250Vac, 12Vdc, 85°C, Creepage Min. 9.5mm, Clearance Min. 8mm Gap:1.8mm	IEC 61810-1	VDE 40023067
-alternative	Panasonic	ALFG2PF121/33A/12VDC	33A, 250Vac, 12Vdc, 85°C, Creepage Min. 9.5mm, Clearance Min. 8mm Gap:1.8mm	IEC 61810-1	VDE 40023067
-alternative	Xiamen	HF161F-W/12-	33A, 250Vac,	IEC 61810-1	VDE 40031410

	TABLE: Critical components information				P
Object / part No.	**Manufacturer/ trademark**	**Type / model**	**Technical data**	**Standard**	**Mark(s) of conformity[1)]**
	HongFa Electric Power Controls CO.,LTD	HT477	12Vdc, 85°C, Gap: 1.8mm, Creepage Min. 8mm, Clearance Min. 6.4mm		
-alternative	Xiamen HongFa Electric Power Controls CO.,LTD	HF161F-W/12-HT	31A, 250Vac, 12Vdc, 85°C, Gap: 1.8mm, Creepage Min. 8mm, Clearance Min. 6.4mm	IEC 61810-1	VDE 40031410
Relay (RY7,RY8)	SONG CHUAN	832HA-1A-F	40A, 277VAC, 12Vdc, Gap: 0.8mm Max.70°C	EN 61810-1	VDE 006615 UL E88991
-alternative	SONG CHUAN	832HA-1C-F	40A,277VAC, 12Vdc, Gap: 0.8mm Max. 70°C	EN 61810-1	VDE 006615 UL E88991
Filtering inductance (L1)	HUIZHOU BAOHUI ELECTRONICS TECHNOLOGY CO.,LTD	T42-26-18C(R5K)	230uH(min)	IEC62109	Tested with Appliance
Filtering inductance (L1)	SHENZHEN JIALIANG ELECTRONICS TECHNOLOGY CO.,LTD	T42-26-18C(R5K)	230uH(min)	IEC62109	Tested with Appliance
Filtering inductance (L2)	HUIZHOU BAOHUI ELECTRONICS TECHNOLOGY CO.,LTD	T42-26-18C(R10K)	150uH/-18C(R10K)LEC	IEC62109	Tested with Appliance
Filtering inductance (L2)	SHENZHEN JIALIANG ELECTRONICS TECHNOLOGY CO.,LTD	T42-26-18C(R10K)	150uH/-18C(R10K)G E	IEC62109	Tested with Appliance
Filtering inductance (L6)	HUIZHOU BAOHUI ELECTRONICS TECHNOLOGY CO.,LTD	T38-22-16C	1.3mH/4P	IEC62109	Tested with Appliance
Filtering inductance (L6)	SHENZHEN JIALIANG ELECTRONICS	T38-22-16C	1.3mH/4P	IEC62109	Tested with Appliance

	TABLE: Critical components information				P
Object / part No.	**Manufacturer/ trademark**	**Type / model**	**Technical data**	**Standard**	**Mark(s) of conformity[1)]**
	TECHNOLOGY CO.,LTD				
Gas Discharge Tube(GAS1, GAS2)	BRIGHTKING (SHENZHEN) CO LTD	2RP600-8	600VDC, 20kA 125°C	UL 479	UL E244458
Current sensor (TX3,TX4)	HUIZHOU BAOHUI ELECTRONICS TECHNOLOGY CO.,LTD	218-17-008C	5.28H MIN/8.2ΩMAX	IEC62040-1	Tested with Appliance
Main Board					
Opto-coupler (U23, U24, U25, U26, U27, U28, U29, U30, U31, U22, U32, U33, U34, U35, U36)	Fairchild/ON	FOD3120SD	Di≧ 0.4mm, Internal di≧ 4.0mm, External di≧ 8.0mm, AC 6000V, 100°C	EN 60747-5-5/A1	VDE 40018398
-alternative	Fairchild/ ON	FOD3150SD	Di≧ 0.4mm, Internal di≧ 4.0mm, External di≧ 8.0mm, AC 6000V, 100°C	EN 60747-5-5/A1	VDE 40018398
-alternative	ISOCOM	ICPL3120	Di≧ 0.4mm, Internal di≧ 4.0mm, External di≧ 8.0mm, AC 6000V, 105°C	UL 60384-14	UL E91231
-alternative	Fairchild	FOD3182	Di≧ 0.4mm, Internal di≧ 4.0mm, External di≧ 8.0mm, AC 6000V, 110°C	EN 60747-5-5/A1	VDE 40018398
-alternative	LITE-ON	LTV-3120	Di≧ 0.4mm, Internal di≧ 4.0mm, External di≧ 8.0mm, AC 6000V, 100°C	EN 60747-5-5/A1	VDE 40027788
-alternative	LITE-ON	LTV-3150	Di≧ 0.4mm, Internal di≧ 4.0mm, External di≧ 8.0mm, AC 6000V, 105°C	EN 60747-5-5/A1	VDE 40027788

	TABLE: Critical components information				P
Object / part No.	**Manufacturer/ trademark**	**Type / model**	**Technical data**	**Standard**	**Mark(s) of conformity[1)]**
-alternative	TOSHIBA	TLP352	Output peak current:eak23; Operating temperature: -40°C to 125°C; Supply current:3.0mA (max); Supply voltage:15 to 30V	UL1577 VDE	UL E67349 EN60747-5-5
Current Mode Controller (U43)	ON Semiconductor	UC2845BD1R2G	8PIN/85°C /SOIC-8(Pb-Free)	IEC62109	Tested with Appliance
-alternative	ST	UC2845BD1	8PIN/150°C /SO8	IEC62109	Tested with Appliance
Opto-coupler (U39,U40,U42, U44,U45,U49,U51)	LITE-ON TECHNOLOGY CORPORATION	LTV-817S-TA-B	CTR:MIN.50% at IF=5mA, VCE=5V; Viso=5000Vrms	UL1577	UL E113898
-alternative	AVAGO	HCPL-817-56BE	CTR：min.50% at IF=5mA ,VCE=5V	EN60747-5-2 VDE 0884	VDE 40016429
Opto-coupler (U14,U15,U16)	AVAGO TECHNOLOGIES PTE LTD.	ACPL-C87H	8P/105°C /SMD	IEC60747-5-5	TUV R50036077
MOS(Q1, Q2)	ON Semiconductor	MOS MGSF1N03LT1	1.5A/30V/150°C /N/SOT-23	IEC62109	Tested with Appliance
MOS(Q30)	Infineon	IPD90R1K2C3	5.1A/900V/150°C /N/PG-TO252	IEC62109	Tested with Appliance
MOS(Q52)	Infineon	IPD530N15N3G	21A/150V/175°C /N/PG-TO252	IEC62109	Tested with Appliance
Electrolytic capacitor (C77, C123,C278,C379)	Rubycon	AL 100UF/25V/YXJ	105°C /5*11mm/2mm	IEC62109	Tested with Appliance
Film capacitor (C257,C258)	Xiamen Faratronic Co.Ltd. or SHENZHEN CRC NEW ENERGY CO.,LTD	MKP-RS	1.5uf/1200V DC/42*25*38mm/K	IEC62109	Tested with Appliance
Electrolytic capacitor (C354, C355,C356, C357,C358, C359,C360, C361,C362, C363,C364, C366)	Rubycon	AL/ ZLH	1800uF/63V /105°C /18*40mm/7.5mm	IEC62109	Tested with Appliance
Y capacitor (C199, C200, C221, C222, C225, C416)	Xiamen Faratronic Co.Ltd	MKP63	Y2 4.7nF/1000Vdc/13*6*11mm/10mm/K	EN60384-14：2013	SE/0366-2C

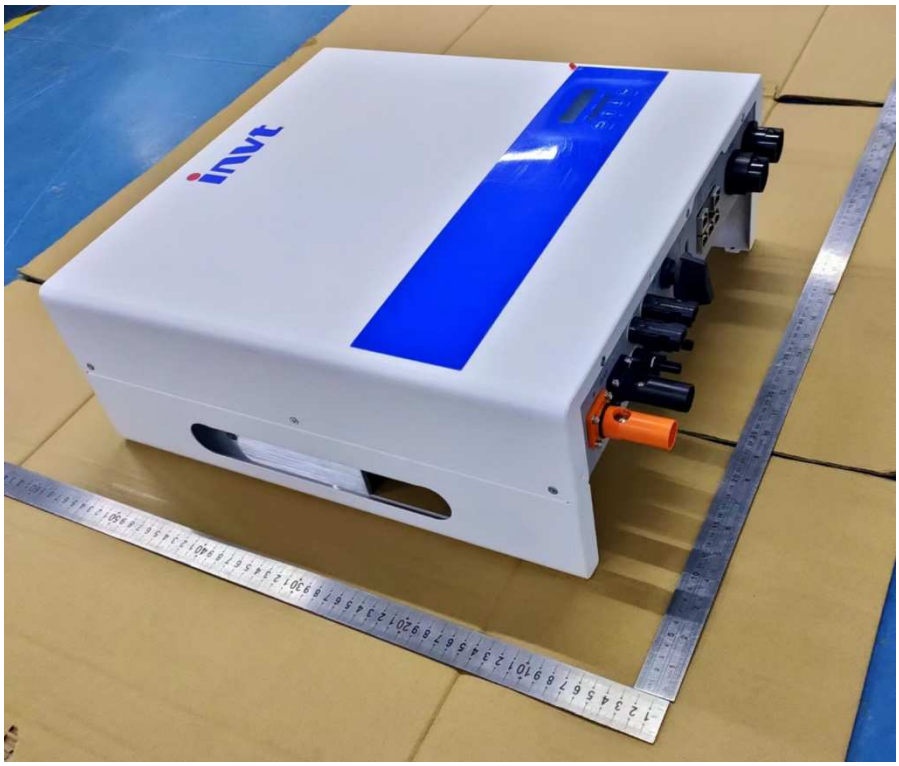
	TABLE: Critical components information				P
Object / part No.	**Manufacturer/ trademark**	**Type / model**	**Technical data**	**Standard**	**Mark(s) of conformity[1)]**
Film Capacitor(C196, C197, C209, C210, C245, C256, C393)	Xiamen Faratronic Co.Ltd. or SHENZHEN CRC NEW ENERGY CO.,LTD	MKP21	0.33uF/630V/26.5 *10.5*16.5mm/22. 5mm/K	EN60384-14 : 2013	SE/0366-2C
Electrolytic capacitor (C202, C203, C204, C205, C206)	Nichicon	LGN2L471MEL ANH	AL 550V/470UF/LGN /105°C /60*35mm/10mm 3000H	IEC62109	Tested with Appliance
-alternative	Nantong Jianghai Capacitor Co.,Ltd	ECS2YKC471M LA 350060E	AL 550V/470UF/ 105°C/60*35mm/1 0mm 3000H	IEC62109	Tested with Appliance
-alternative	Nippon Chemi-Con Corporation	EKMS551VSN4 71MA60S	AL 550V/470UF/ 105°C /60*35mm/ 10mm 3000H	IEC62109	Tested with Appliance
Film capacitor (C242)	SHENZHEN CRC NEW ENERGY CO.,LTD	MKP-FC	50uF/900V/58*35* 50mm/52.5*20.3 mm/K	IEC62109	Tested with Appliance
IGBT(Q44)	Infineon	IGZ75N65H5	650V/75A/175°C /TO247-4	IEC62109	Tested with Appliance
MOS (Q23, Q26)	Infineon	IPW65R080CF D	80mohm/650V/17 5℃/N/TO-247	IEC62109	Tested with Appliance
IGBT(Q21,Q25, Q45,Q46,Q47, Q48,Q66,Q67)	Fairchild	75T65SHD-4L	/	IEC62109	Tested with Appliance
MOS(Q22, Q24, Q27, Q37)	Infineon	MOS IRFP4468	290A/100V/N/ 175°C /TO-247	IEC62109	Tested with Appliance
Diode (D16,D17,D23,D 27)	Fairchild	RHRG5060	50A,600V, Max.175°C	IEC62109	Tested with Appliance
-alternative	Microsemi	APT60D60BG	600V, 60A, Max.175°C	IEC62109	Tested with Appliance
Current sensor HCT3	LEM Electronics Co.,Ltd	CKSR 25-NP	IPN=25A, VC=5V, 85°C	EN61000-6	UL E189713
-alternative	Sinomags Technololgy Co., Ltd	STB-25CAS/K	IPN=25A, VC=5V, 85°C	EN61000-6	VIC160825-CZX-1285
Current sensor (HCT1,HCT2,H CT5)	LEM Electronics Co.,Ltd	HLSR-16P	IPN=16A, VC=5V, 85°C	EN61000-6	UL E189713
-alternative	LEM Electronics Co.,Ltd	HLSR-20P	IPN=20A, VC=5V, 85°C	EN61000-6	UL E189713
-alternative	Sinomags Technololgy Co., Ltd	STK-20PL	IPN=20A, VC=5V, 85°C	EN61000-6	VIC161031-CZX-1386

	TABLE: Critical components information				P
Object / part No.	**Manufacturer/ trademark**	**Type / model**	**Technical data**	**Standard**	**Mark(s) of conformity[1)]**
Relay(RY1, RY2)	Omron	G5Q-14 DC12	DC12/ -40°C ~105°C	UL	**E41515**
Transformer (TX1)	HUIZHOU BAOHUI ELECTRONICS TECHNOLOGY CO.,LTD	TXEI33/34Pin	N1+N18: N2:N3:N4:N5:N6: N7:N8:N9:N10: N11:N12:N13:N14 :N15:N16:N17= 12:4:5:4:5:5:2:2:2: 2:7:7:7:7:7:7:7 38μH, 130°C	IEC62109	Tested with Appliance
--Bobin	SUMITOMO BAKELITE CO LTD	PM-9820 PM-9630	150°C	UL94	UL E41429
--Wire	SHENZHEN JIAZHENGXIN INDUSTRIAL CO LTD	xUEW@/130 xUEW@/155	130°C	UL 758	UL E334005
--Margin tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE	WF	155°C	UL 510A	UL E165111
--Tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	CT	130°C	UL 510	UL E165111
SPS Board					
Opto-coupler (U2, U4, U6)	LITE-ON TECHNOLOGY CORPORATION	LTV-817S-TA-B	CTR:MIN.50% at IF=5mA, VCE=5V Viso=5000Vrms	UL1577	UL E113898
- Interchangeable	AVAGO	HCPL-817-56BE	CTR：min.50% at IF=5mA ,VCE=5V	EN60747-5-2 VDE 0884	VDE 40016429
MOS(Q16, Q17)	Infineon	IPD90R1K2C3	5.1A/900V/150°C /N/PG-TO252	IEC62109	Tested with Appliance
Y capacitor (C3, C4, C5, C6)	KEMET ELECTRONICS CORPORATION	MKP63	Y2 4.7nF/1000Vdc/13 *6*11mm/10mm/K	ENEC IEC 60384-14	UL E85238
Film Capacitor (C43A, C47A, C48, C49, C51)	Xiamen Faratronic Co.Ltd. or SHENZHEN CRC NEW ENERGY CO.,LTD	MKP21	0.33uF/630V/26.5 *10.5*16.5mm/22. 5mm/K	EN60384-14：2013	SE/0366-2C
Electrolytic capacitor (C78)	Rubycon	AL /BXC	33UF/450V/BXC/ 16*25mm/7.5mm	IEC62109	Tested with Appliance
Electrolytic capacitor (C85,	Rubycon	AL/YXJ	100uF/63V/105°C /10*12.5MM	IEC62109	Tested with Appliance

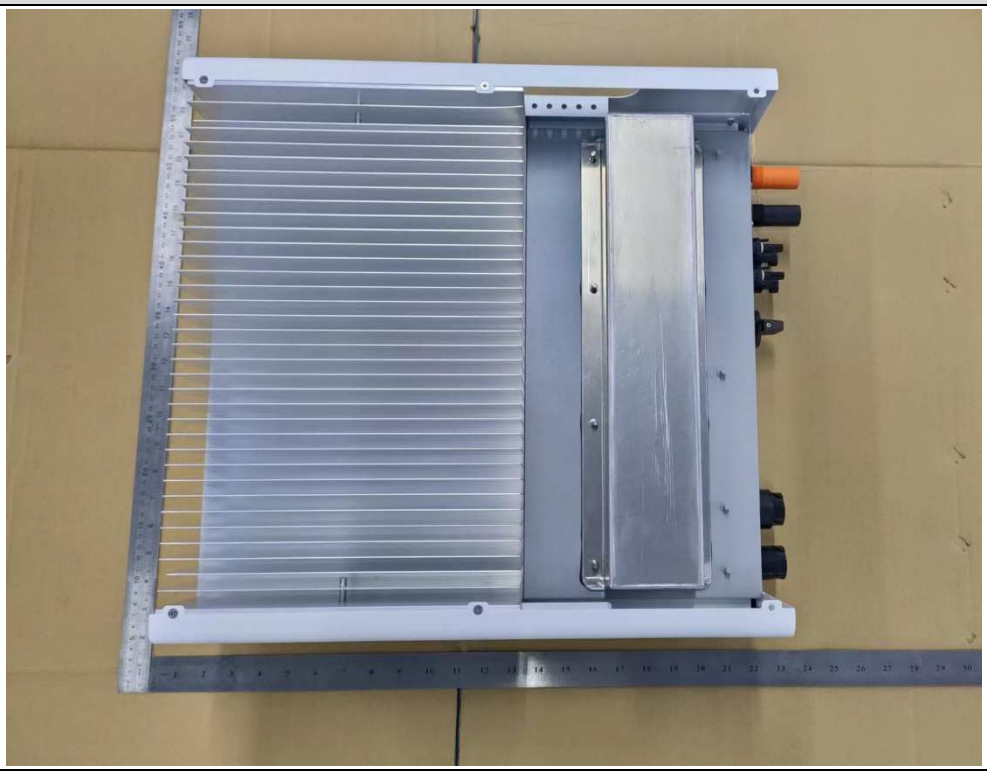
	TABLE: Critical components information				P
Object / part No.	**Manufacturer/ trademark**	**Type / model**	**Technical data**	**Standard**	**Mark(s) of conformity[1)]**
C102)					
NTC1	Thinking Electronic industrial Co., Ltd.	SCK101001MSY	Imax=1A, 100ohm at 25°C, MAX 125°C	EN 60730-1 EN 60539-1	TUV R 50050155
Transformer (TX1,TX2)	HUIZHOU BAOHUI ELECTRONICS TECHNOLOGY CO.,LTD	ERL28A	ERL28A N1:N2:N3:N4:N5 = 40:49:40:12:12 680μH,130°C	IEC62109	Tested with Appliance
--Wire	SHANGHAI ASIA PACIFIC ELECTRIC CO LTD	UEW-U UEW/NY	130°C/155°C	UL 758	UL E214423
-- alternative	DONG GUAN YIDA INDUSTRIAL CO LTD	UEW/130 UEW/155	130°C/155°C	UL 758	ULE344055
-- alternative	PACIFIC ELECTRIC WIRE & CABLE (SHENZHEN) CO LTD	UEW/U UEWN/U	130°C/155°C	UL 758	ULE201757
-Tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	CT	130°C	UL 510	UL E165111
-Tube	SHENZHEN WOER HEAT-SHRINKABLE MATERIAL CO.,LTD	PTFE	200°C	UL 224	E203950
-Bobbin	SUMITOMO BAKELITE CO LTD	PM-9820 PM9630	150°C	UL 94	UL E41429
[1)] an asterisk indicates a mark which assures the agreed level of surveillance					

Photos of EUT

General view - 1

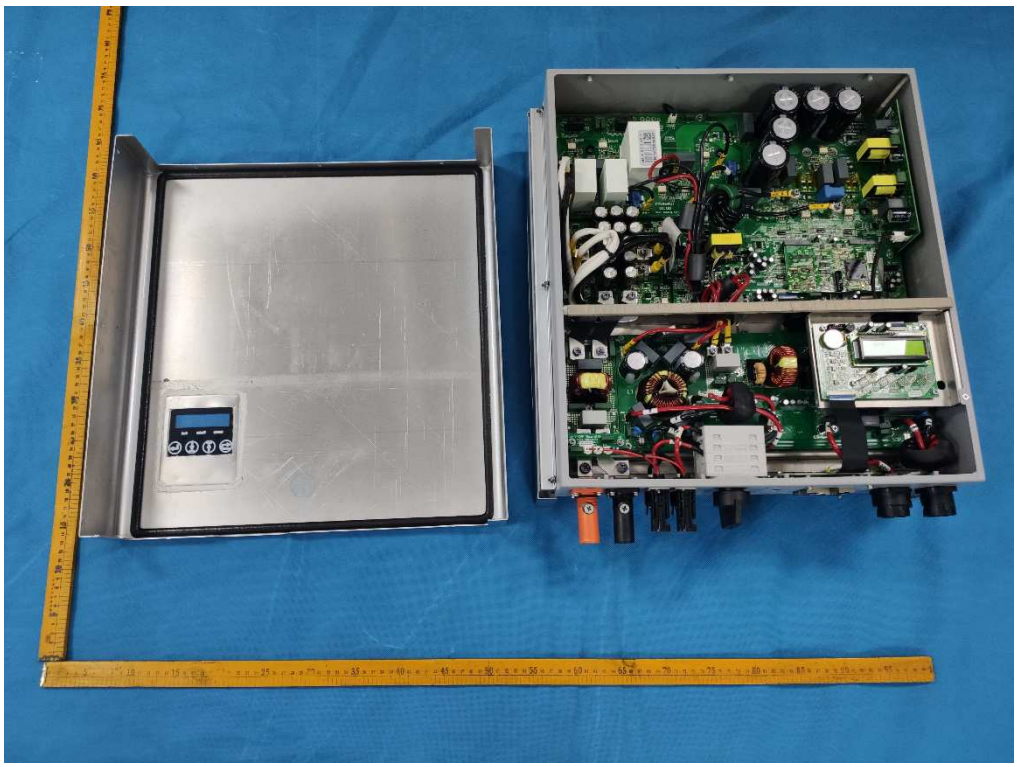


Enclosure front view



Enclosure terminal view

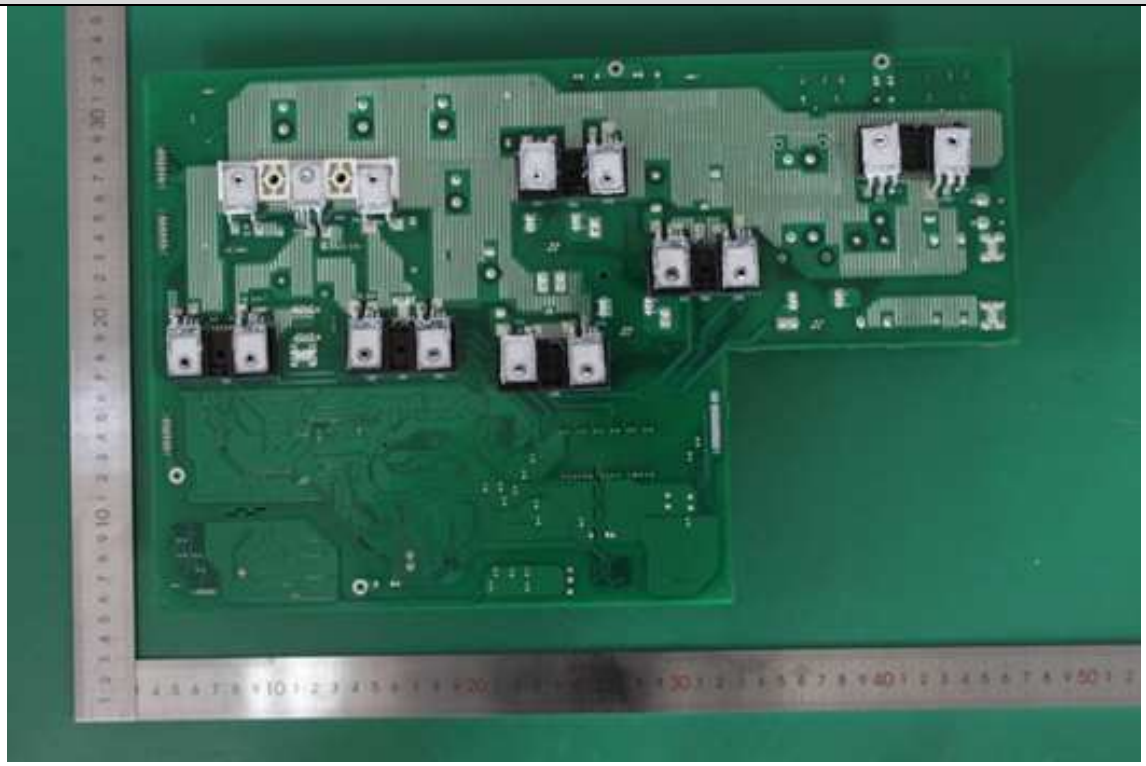
Internal view-1



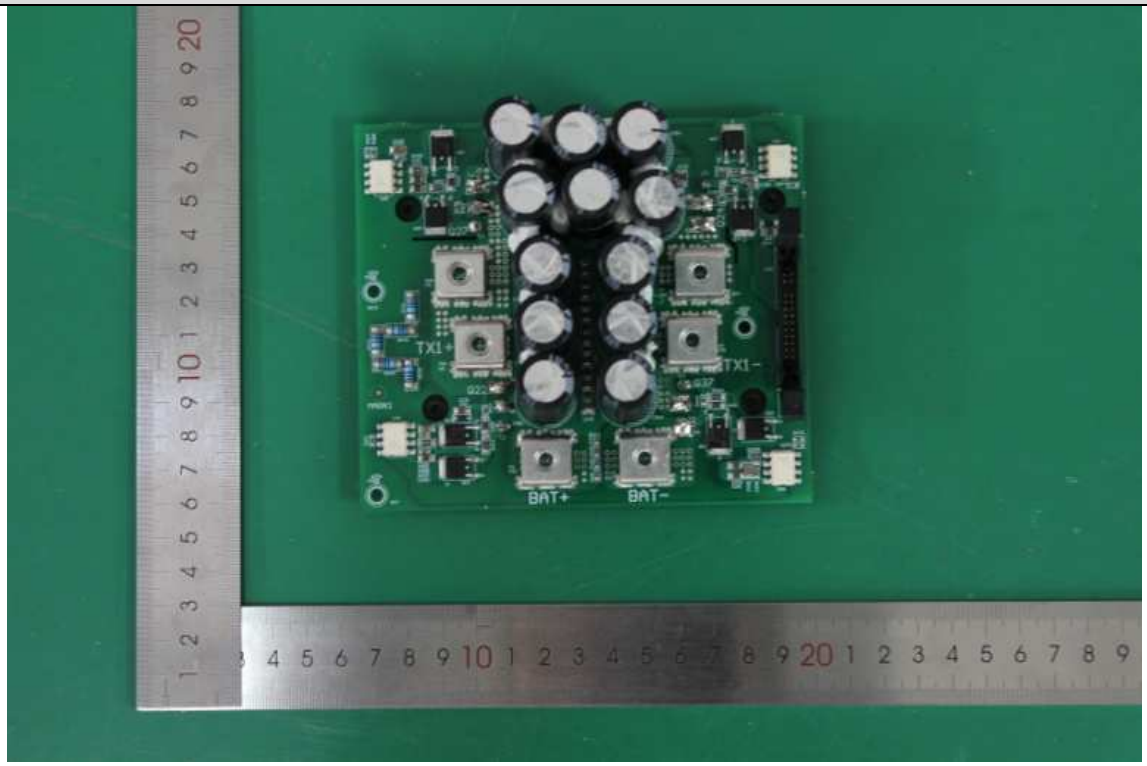
Internal view-2

Main Board-Component side

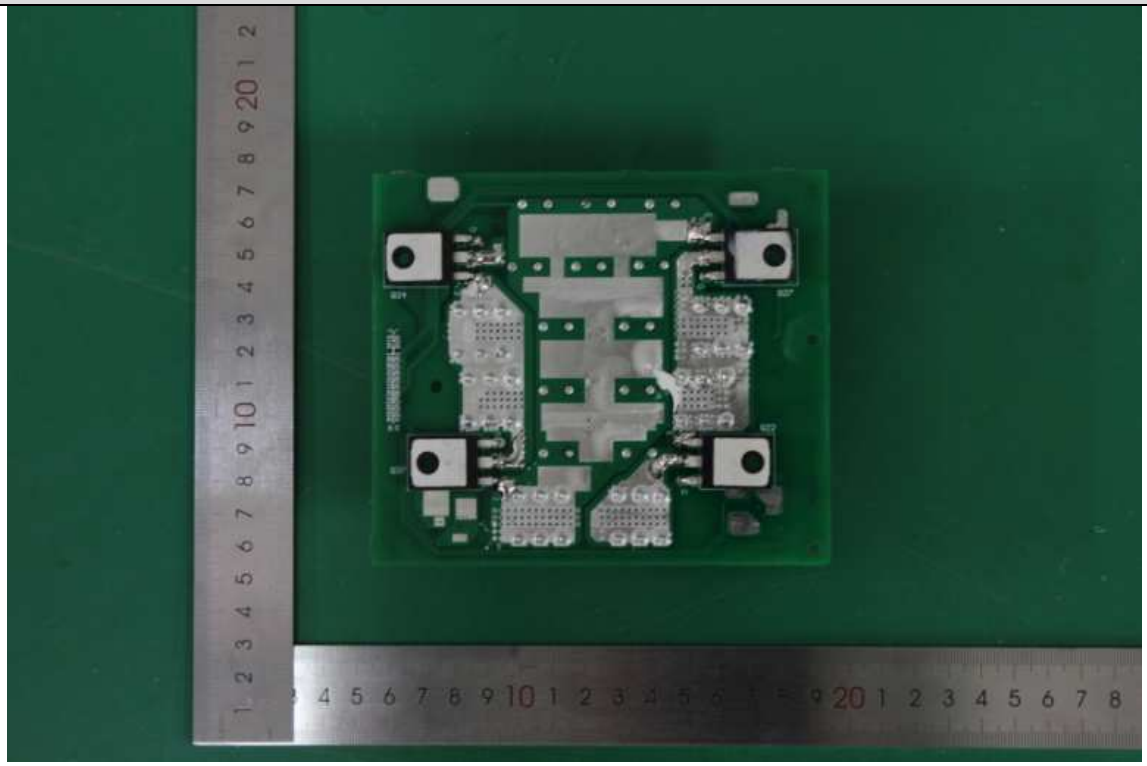
Main board-solder side view



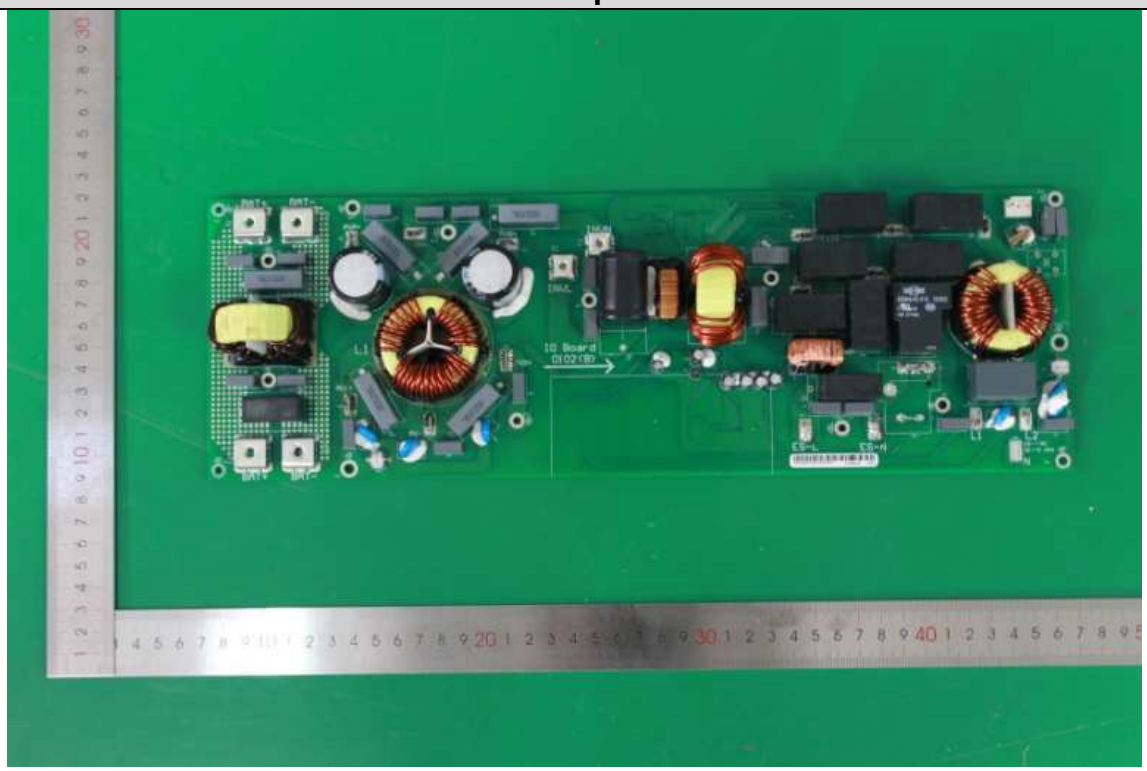
DC/DC Board-Component side



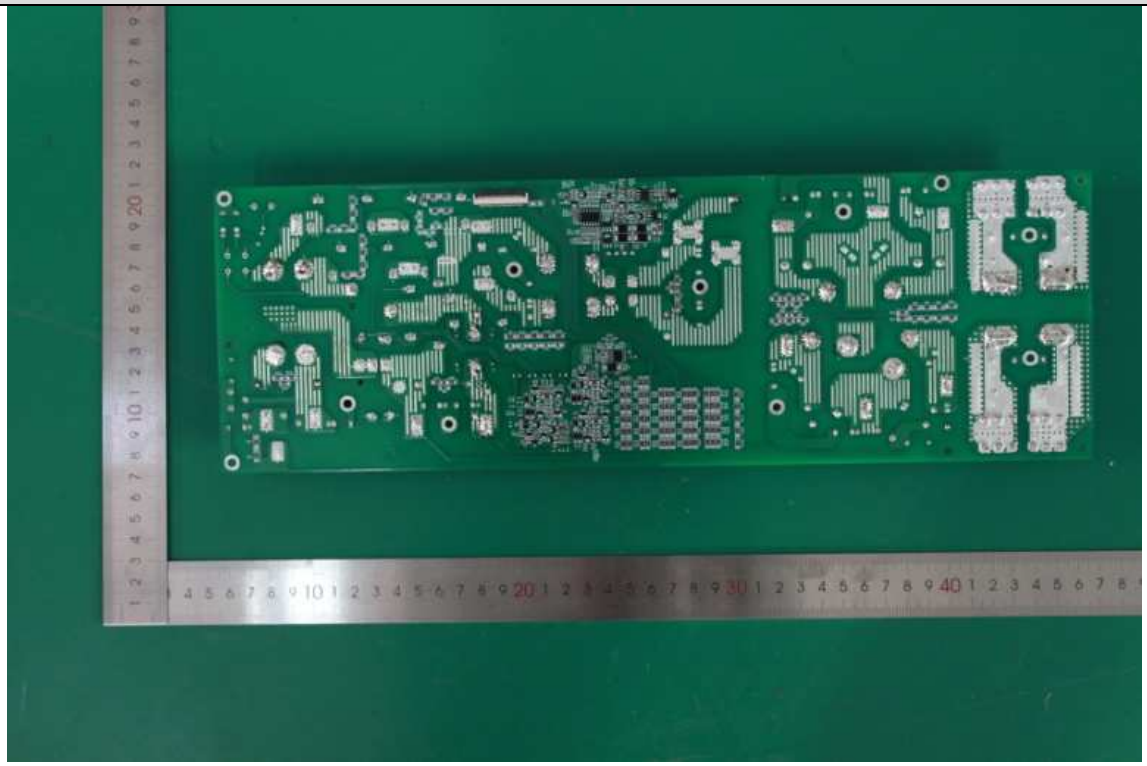
DC-DC power board-solder side view



IO Board-Component side

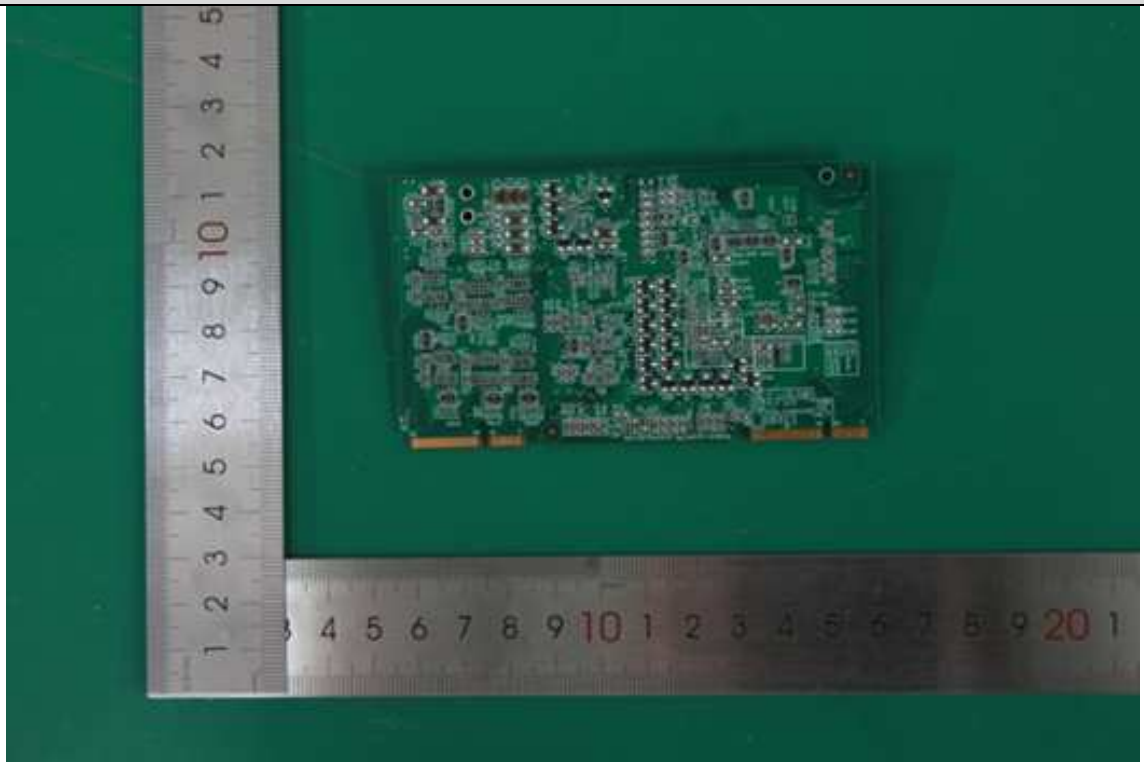


IO Board- Reverse side

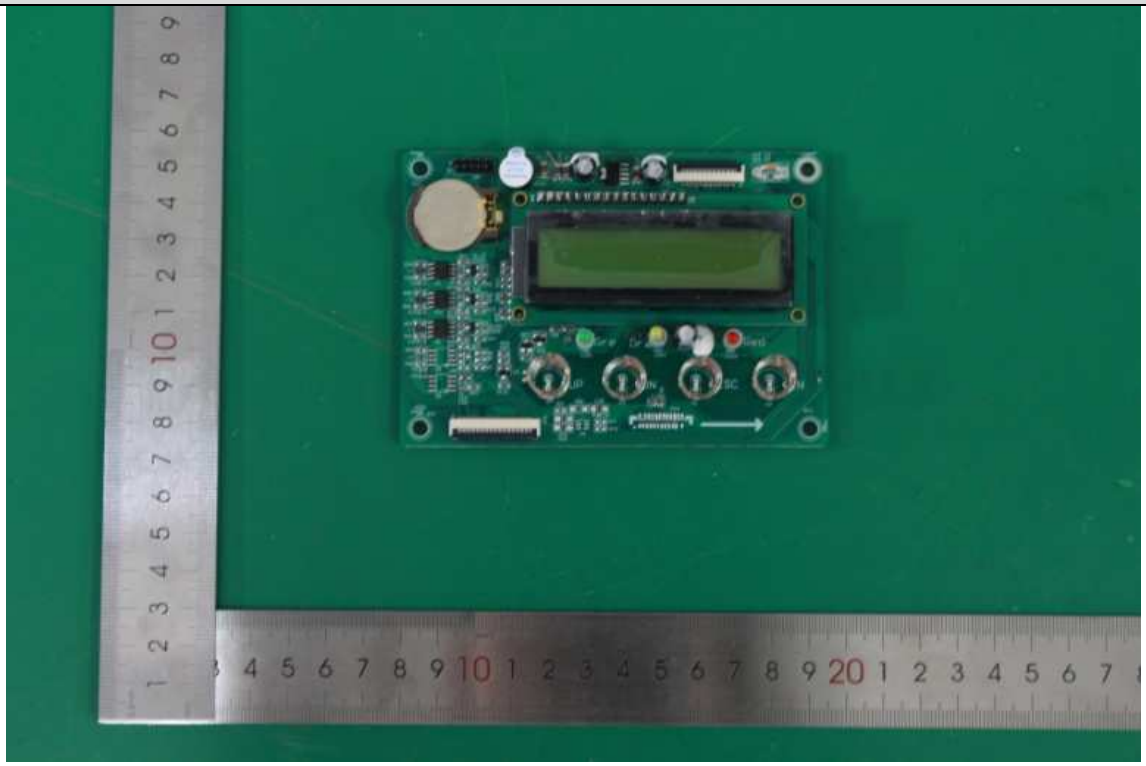


Control Board-Component side

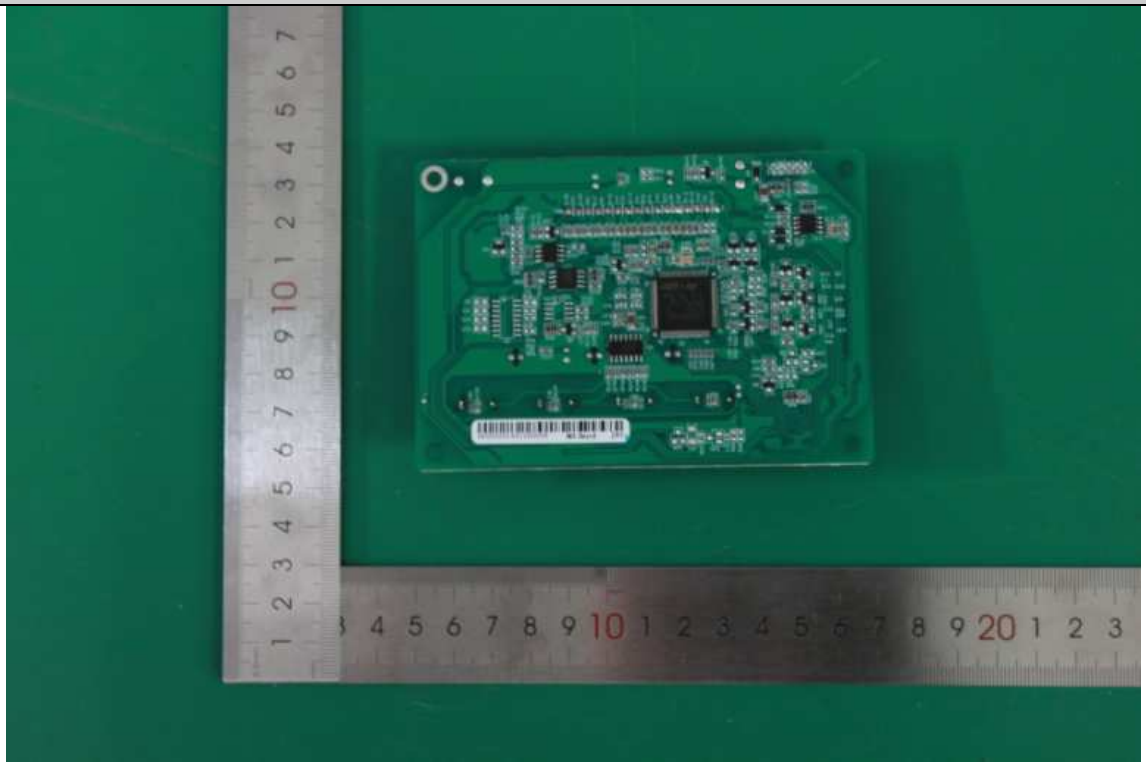
Control Board- Reverse side



Communication Board-Component side

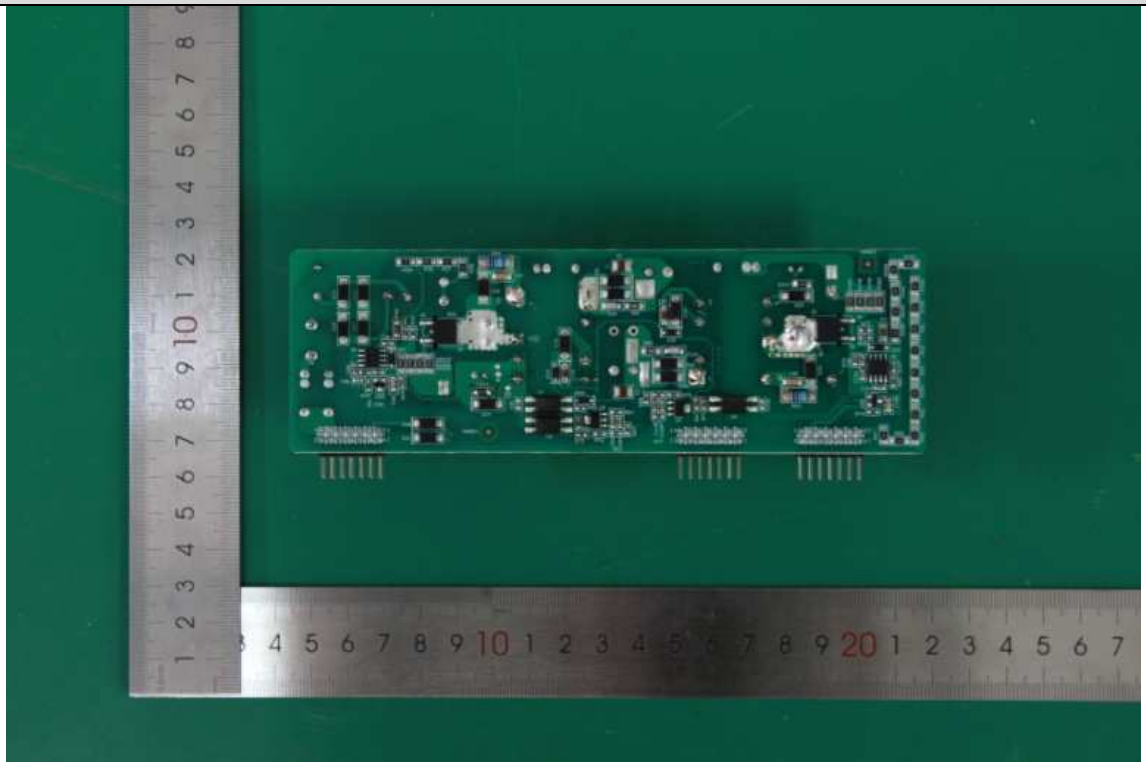


Communication Board - Reverse side

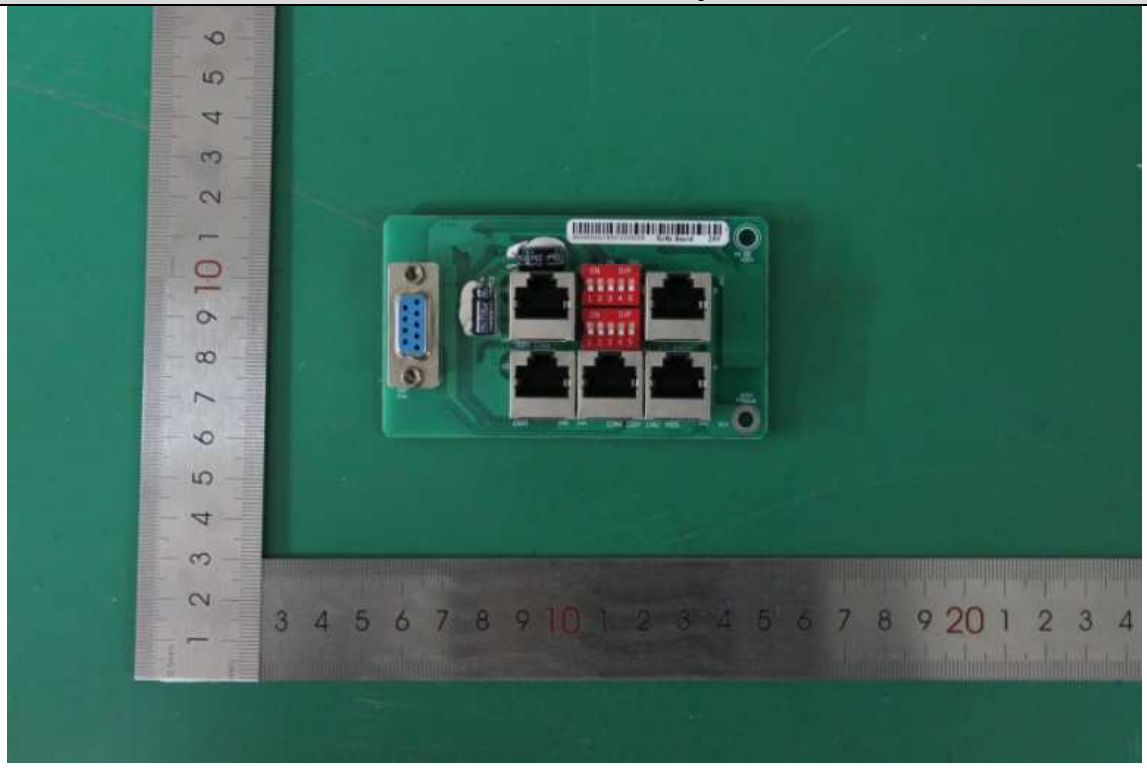


SPS Board-Component side

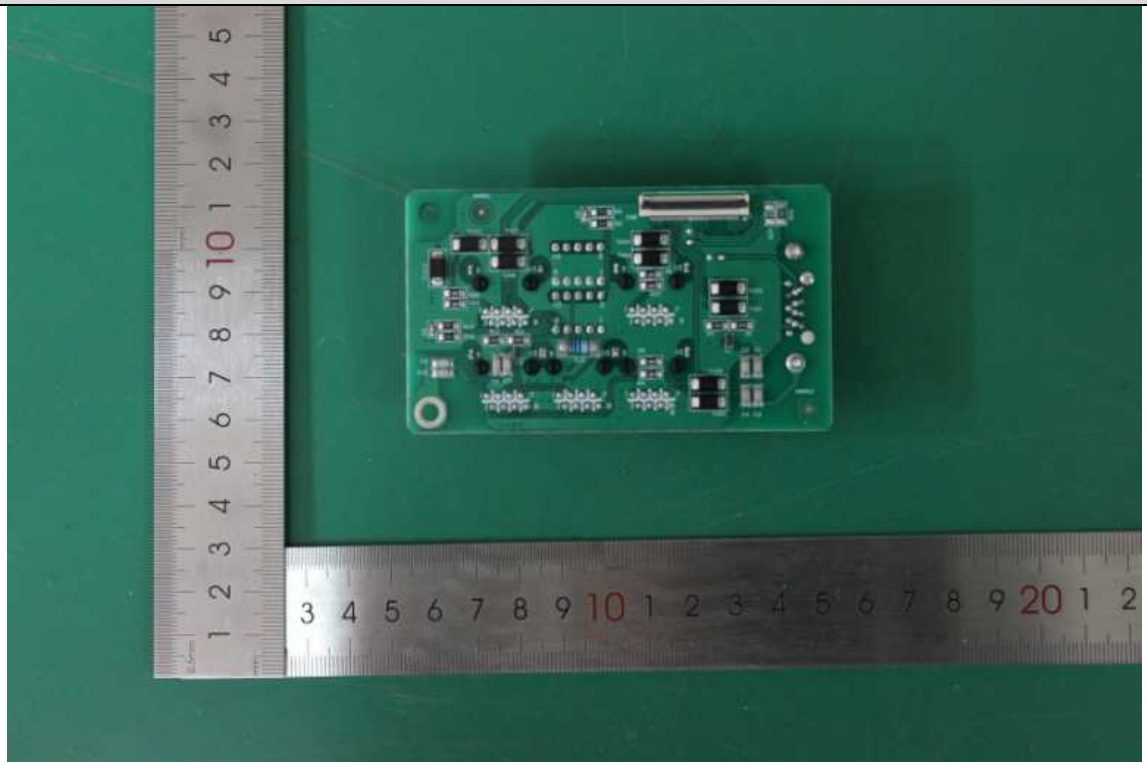
SPS Board- Reverse side



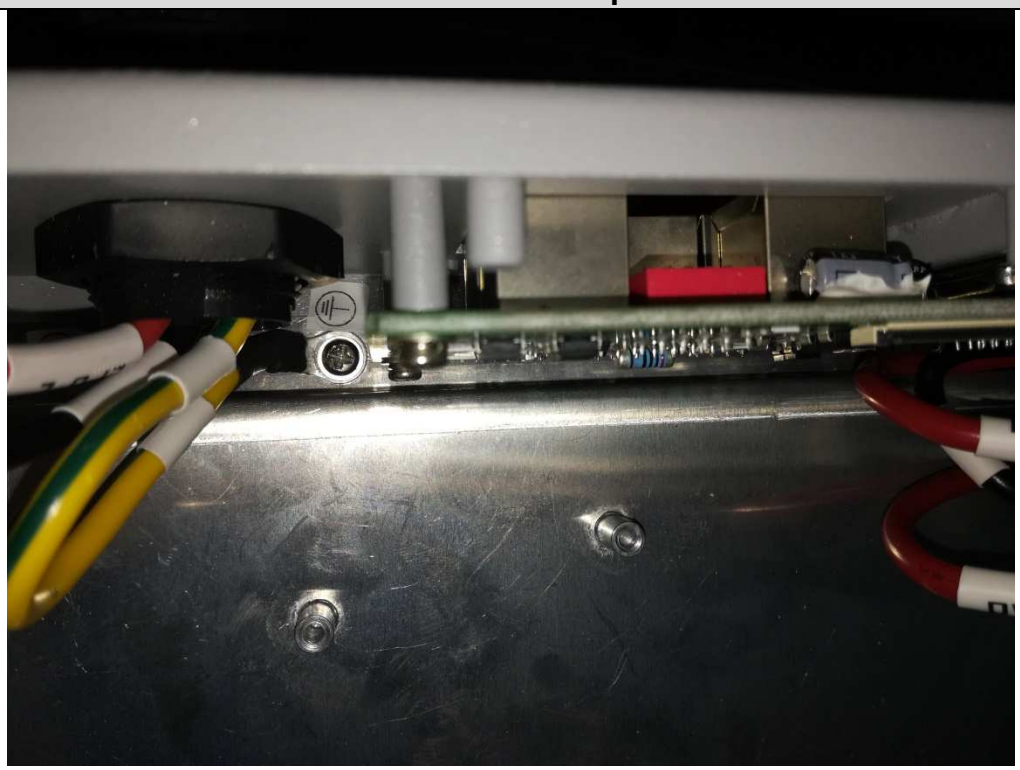
RJ45 connector Board-Component side



RJ45 connector Board - Reverse side



The earth terminal photo



The earth connection on the enclosure photo


--End of Test Report--