





Test Report issued under the responsibility of:



www.nemko.com

TEST REPORT IEC 62040-1 Uninterruptible power systems (UPS) – Part 1: General and safety requirements for UPS	
Report Number.....	453512
Date of issue.....	31 March, 2022
Total number of pages	114 pages and refer to page 4
Name of Testing Laboratory preparing the Report	Nemko Taiwan 5 Fl., No. 409, Sec.2, Tiding Blvd., Neihu, Taipei 114, Taiwan
Applicant's name	American Power Conversion Holdings Inc., Taiwan Branch
Address.....	5F., No.189, Sec. 2, Jiuzong Rd., Neihu District, Taipei City 11494, Taiwan
Test specification:	
Standard	IEC 62040-1:2017, IEC 62040-1:2017/AMD1:2021
Test procedure	CB Scheme
Non-standard test method	N/A
TRF template used.....	IECEE OD-2020-F1:2021, Ed.1.4
Test Report Form No.	IEC62040_1F
Test Report Form(s) Originator	TÜV Rheinland Japan Ltd.
Master TRF	Dated 2021-08-27
Copyright © 2021 IEC System of Conformity Assessment Schemes for Electrotechnical Equipment and Components (IECEE System). All rights reserved. This publication may be reproduced in whole or in part for non-commercial purposes as long as the IECEE is acknowledged as copyright owner and source of the material. IECEE takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context. If this Test Report Form is used by non-IECEE members, the IECEE/IEC logo and the reference to the CB Scheme procedure shall be removed. This report is not valid as a CB Test Report unless signed by an approved IECEE Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.	
General disclaimer: The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of the Issuing NCB. The authenticity of this Test Report and its contents can be verified by contacting the NCB, responsible for this Test Report.	

Test item description..... :	Uninterruptible Power Supply	
Trade Mark..... :		
Manufacturer	Same as applicant	
Model/Type reference	SX31K1CI; SX31K1CIy; SX3800CI; SX3800CIy (The "y" in the model name can be -AR, -CN, -GR, -RS, -FR, -AZ or nil for marketing use.)	
Ratings	SX31K1CI; SX31K1CIy: Input: 5.5A 220-240Vac 50/60Hz 1Ø Icc: 1kA Cl. I Output: 4.8A 220-240Vac 50/60Hz 660W 1100VA 1Ø SX3800CI; SX3800CIy: Input: 4.0A 220-240Vac 50/60Hz 1Ø Icc: 1kA Cl. I Output: 3.5A 220-240Vac 50/60Hz 480W 800VA 1Ø	
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
<input checked="" type="checkbox"/>	CB Testing Laboratory:	Nemko Taiwan
Testing location/ address..... :		5 Fl., No. 409, Sec.2, Tiding Blvd., Neihu, Taipei 114, Chinese Taipei
Tested by (name, function, signature)..... :		Ryan Chen (Project Handler) 
Approved by (name, function, signature).... :		Roy Chou (Verifier) 
<input type="checkbox"/>	Testing procedure: CTF Stage 1:	
Testing location/ address..... :		
Tested by (name, function, signature)..... :		
Approved by (name, function, signature).... :		
<input type="checkbox"/>	Testing procedure: CTF Stage 2:	
Testing location/ address..... :		
Tested by (name + signature)		
Witnessed by (name, function, signature) . :		
Approved by (name, function, signature).... :		
<input type="checkbox"/>	Testing procedure: CTF Stage 3:	
<input type="checkbox"/>	Testing procedure: CTF Stage 4:	
Testing location/ address..... :		

Tested by (name, function, signature).....:		
Witnessed by (name, function, signature) .:		
Approved by (name, function, signature)...:		
Supervised by (name, function, signature) :		

List of Attachments (including a total number of pages in each attachment): <ol style="list-style-type: none"> 1. Photos (17 pages) 2. PCB layout (1 page) 3. Australian National Differences (2 pages) 	
Summary of testing:	
Tests performed (name of test and test clause): 4.2/RD to 4.3/RD fault condition tests 4.3.101, 5.2.3.102 Electrical Data (in normal conditions)(AC input current) 4.4.4.3.3 /RD Touch current measurement 4.3.102, 5.2.3.104 Transformer protection 4.4.7.2/RD Working Voltage Measurement 4.4.7.4/RD to 4.4.7.5/RD Clearance and Creepage Distance Measurements 4.4.7.8.2 /RD Ball Pressure Test of Thermoplastics 4.4.7.8.3.2 /RD to 4.4.7.9/RD Distance Through Insulation Measurements 4.4.7.10 /RD, 5.2.3/RD Electric strength measurements, impulse voltage test and partial discharge test 4.4.9/RD Capacitor discharge 4.6.3/RD Resistance to fire 4.6.4/RD Heating Test 4.8.102, 5.2.3.101 Backfeed protection 4.12.1/RD, 5.2.2.4.3 /RD Impact Resistance 5.2.2.2 Non-accessibility test 5.2.6 Environmental tests Annex CC Ventilation of lead-acid battery compartments <u>Operating condition:</u> Loaded to rating load.	Testing location: See page 2.

Summary of compliance with National Differences (List of countries addressed):

The sample(s) tested compliance with the requirements of IEC 62040-1:2017/AMD1:2021

List of countries addressed: Australian National Differences

☒ **The product fulfils the requirements of IEC 62040-1:2017, IEC 62040-1:2017/AMD1:2021 and EN IEC 62040-1:2019**

Use of uncertainty of measurement for decisions on conformity (decision rule) :

☒ No decision rule is specified by the IEC standard, when comparing the measurement result with the applicable limit according to the specification in that standard. The decisions on conformity are made without applying the measurement uncertainty ("simple acceptance" decision rule, previously known as "accuracy method").

Information on uncertainty of measurement:

The uncertainties of measurement are calculated by the laboratory based on application of criteria given by OD-5014 for test equipment and application of test methods, decision sheets and operational procedures of IECEE.

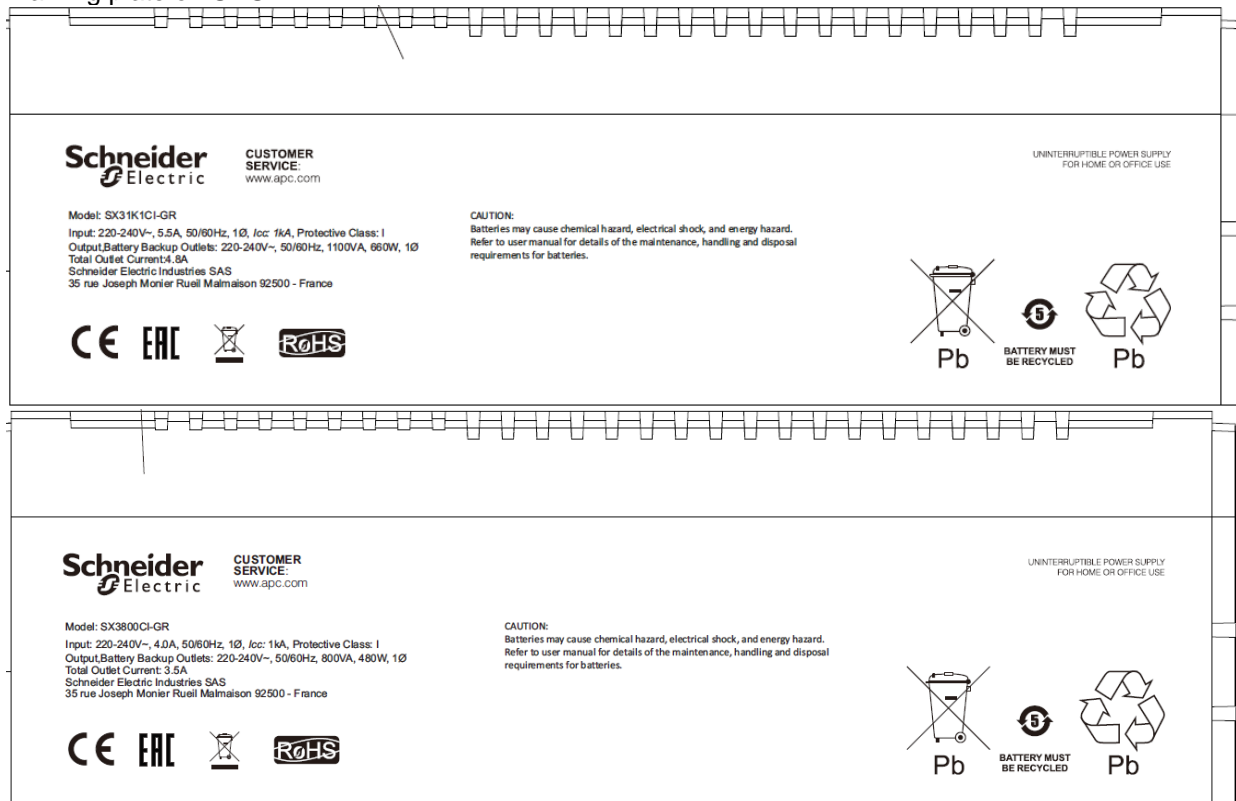
IEC Guide 115 provides guidance on the application of measurement uncertainty principles and applying the decision rule when reporting test results within IECEE scheme, noting that the reporting of the measurement uncertainty for measurements is not necessary unless required by the test standard or customer.

Calculations leading to the reported values are on file with the NCB and testing laboratory that conducted the testing.

Copy of marking plate:

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.

Marking plate on UPS:



Above labels for representative used for model SX31K1CIy; SX3800CIy, models label is identical except model name designation and different power cord used, see General product information for details.

Warning label for marketing to Finland, Norway, Denmark and Sweden:

In **Finland**: "Laite on liitettävä suojakoskettimilla varustettuun pistorasiaan"

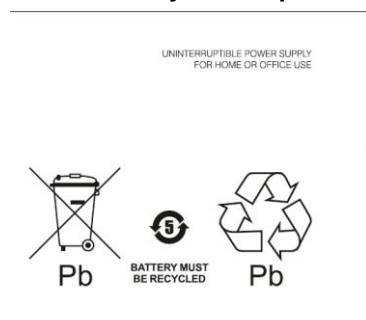
In **Norway**: "Apparatet må tilkoples jordet stikkontakt"

In **Sweden**: "Apparaten skall anslutas till jordat uttag"

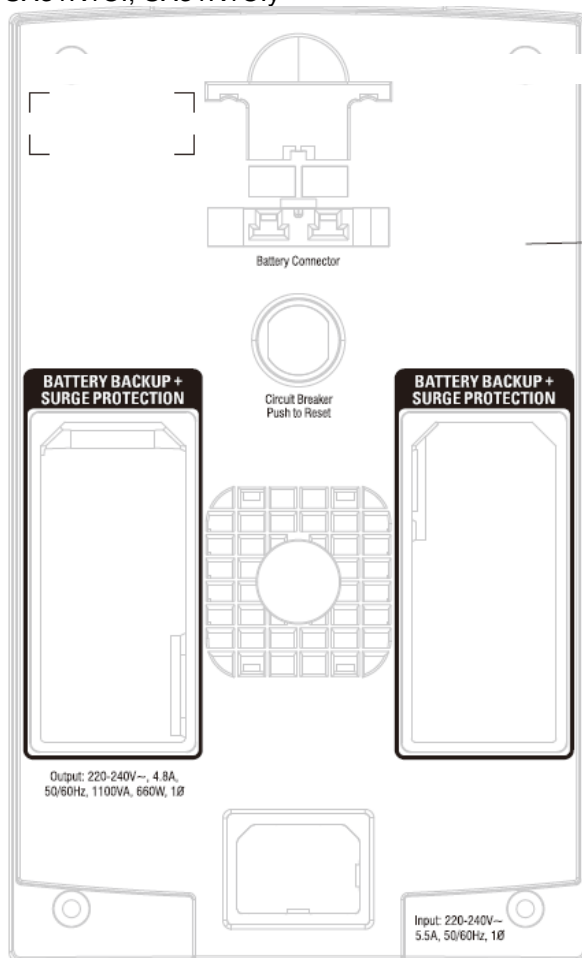
In **Denmark**: "Apparatets stikprop skal tilsluttes en stikkontakt med jord, som giver forbindelse til stikproppens jord."

Copy of marking plate:

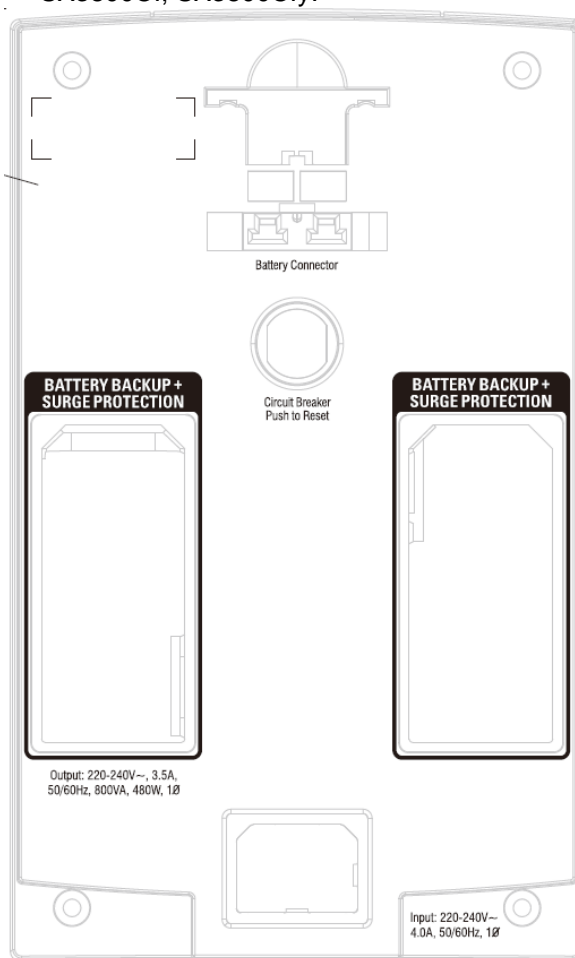
The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.



SX31K1CI; SX31K1CIy



SX3800CI; SX3800CIy.



Test item particulars.....:	
Classification of installation and use.....:	<input checked="" type="checkbox"/> Ordinary Person <input type="checkbox"/> Instructed Person <input type="checkbox"/> Skilled Person
Supply Connection	<input checked="" type="checkbox"/> pluggable equipment <input checked="" type="checkbox"/> type A <input type="checkbox"/> type B <input type="checkbox"/> permanent connection <input checked="" type="checkbox"/> detachable power supply cord For models SX31K1CI; SX3800CI <input checked="" type="checkbox"/> non-detachable power supply cord For models SX31K1CIy; SX3800CIy
Environmental category	<input checked="" type="checkbox"/> indoor <input type="checkbox"/> unconditional <input type="checkbox"/> conditional <input type="checkbox"/> outdoor
Equipment mobility	<input checked="" type="checkbox"/> movable <input type="checkbox"/> stationary <input type="checkbox"/> for building-in <input type="checkbox"/> fixed
Access location.....:	<input checked="" type="checkbox"/> ordinary person accessible <input type="checkbox"/> restricted access location
Over voltage category.....:	<input type="checkbox"/> OVC I <input checked="" type="checkbox"/> OVC II <input type="checkbox"/> OVC III <input type="checkbox"/> OVC IV
Mains supply tolerance (%).....:	±10%
Tested for power systems	TN and IT - 230V _{L-L} for Norway
IT testing, phase-phase voltage (V).....	230
Class of equipment.....	<input checked="" type="checkbox"/> Class I <input type="checkbox"/> Class II <input type="checkbox"/> Class III
Considered current rating of protective device as part of the building installation (A).....	16A
Pollution degree (PD)	<input type="checkbox"/> PD1 <input checked="" type="checkbox"/> PD2 <input type="checkbox"/> PD3
IP protection class.....	IP20
Elevation during operation (m)	Up to 3000m
Elevation of test laboratory (m)	Up to 1000m
Mass of equipment (kg)	8.0kg (SX3800CI; SX3800CIy) 12.0kg (SX31K1CI; SX31K1CIy) Dimension (W x H x D): 131mm by 216mm by 335mm (H x W x D)
Possible test case verdicts:	
- test case does not apply to the test object.....: N/A	
- test object does meet the requirement.....: P (Pass)	
- test object does not meet the requirement.....: F (Fail)	
Testing.....:	
Date of receipt of test item	21 October, 2021
Date (s) of performance of tests	21 October to 31 March, 2022

General remarks:	
<p>"(See Enclosure #)" refers to additional information appended to the report.</p> <p>"(See appended table)" refers to a table appended to the report.</p> <p>Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator.</p>	
Manufacturer's Declaration per sub-clause 4.2.5 of IEC60335-1:	
<p>The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided</p>	<p><input checked="" type="checkbox"/> Yes</p> <p><input type="checkbox"/> Not applicable</p>
When differences exist; they shall be identified in the General product information section.	
<p>Name and address of factory (ies)</p> <ol style="list-style-type: none"> 1. DANAM PHILIPPINES INC. Philippines Economic Zone Authority (PEZA), Lot 1-A, Block 15, Phase III, Rosario, Cavite 4106, Philippines 2. International Precision Assemblies, Inc. (Plant 2) Blk 17, Lot 2, Phase 4, CEPZA 4106, Rosario, Cavite, Philippines 	

General product information and other remarks:

The equipment under tests is Class I off-line Uninterruptible Power Supply for general office use.

The EUT has the following features:

- This is standard upgrade project, which is based on report no.: 366594
- The EUT is not allowed the user replacing the battery. There is a plastic housing on output (+ and -) terminal of battery pack to prevent output (+ to -) terminals short circuited.
- The EUT is provided with plastic enclosure.
- For model difference, see below model difference table for details.

Model difference table:

Model differences table:		
Model	SX31K1CI; SX31K1Cly	SX3800CI; SX3800Cly
Input	5.5A 220-240Vac 50/60Hz 1Ø, I _{cc} : 1kA	4.0A 220-240Vac 50/60Hz 1Ø, I _{cc} : 1kA
Output	4.8A 220-240Vac 50/60Hz 660W 1100VA 1Ø	3.5A 220-240Vac 50/60Hz 480W 800VA 1Ø
Battery	Two batteries in series (7.2Ah * 2)	One battery (9Ah * 1)
DC Fan	One provided	None
Power cord	Detachable power supply cord For models SX31K1CI; SX3800CI; Non-detachable power supply cord For models SX31K1Cly; SX3800Cly	
SX31K1CI; SX31K1Cly (1100VA) and SX3800CI; SX3800Cly (800VA) have similar construction except following non-critical components: R77, R63, R10, R17, R109, R110, R65, R66, IC4, R84, R64, R55, RY1, RY4, RY3, R43, R48, R51, R203, R86, D30, Q13, Q15, Q16, Q17, Q18, Q19, R176, R188, R189, Q36, R85, R88, C33, D24, D25, R12, R31, R6, R74, R9.		

Unless otherwise specified, tests performed on model SX31K1CI; SX31K1Cly which represents the worst condition.

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
4	Protection against hazards		P
4.1/RD	General	See below,	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	Tested with the PECS at full load to represent the more severe condition.	P
5.2.4.6.2 /RD	Application of short circuit or open-circuit	Test with cable of a cross-section areas not less than 2.5mm ² , see Table 4.2/RD to 4.3/RD	P
5.2.4.6.3 /RD	Test sequence	Test one at a time, see Table 4.2/RD to 4.3/RD	P
4.3	Short-circuit and overload protection	See Table 4.2/RD to 4.3/RD	P
4.3.1/RD	General	See below,	P
4.3.2/RD	Specification of input short-circuit withstand strength and output short circuit current ability	Icc: 1kA, see copy of marking plate.	P
4.3.2.1/RD	General	See below,	P
	The interrupting capability of the overcurrent protective device shall be equal or greater than the prospective short circuit current of the mains supply.	Equipment provided Interrupting capability of the overcurrent protective device (Circuit breaker 10A, 240V for mode SX31K1CI and SX31K1Cly Circuit breaker 7A, 250V for model SX3800CI and SX3800Cly).	P
	For pluggable equipment type A, either the PECS shall be designed so that the building installation provides short circuit backup protection, or additional short circuit backup protection shall be provided as part of the equipment.	Equipment provided to use breakers for short circuit protection.	P
	For permanently connected equipment or pluggable equipment type B, it is permitted for short circuit backup protection to be in the building installation.	The equipment is pluggable equipment type A, not for permanently connection.	N/A
4.3.2.2/RD	Input ports short-circuit withstand strength	See below,	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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.	The manufacturer has declared - a maximum allowable prospective short circuit current ($I_{cc} \leq 1 \text{ kA}$) for each input port of the PECS; - a minimum required prospective short circuit current $I_{cp} \leq 10 \text{ kA}$.	P
	If external protective devices are specified or provided the characteristics of those shall be specified by the manufacturer.	Not used external protective devices.	N/A
4.3.2.3/RD	Output short circuit current ability	See below.	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.	See Table 4.2/RD to 4.3/RD	P
4.3.2.4/RD	Combined input and output ports	No such port used.	N/A
	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.		N/A
4.3.3/RD	Short-circuit coordination (backup protection)	Adequate protective device.	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.	Equipment provided Interrupting capability of the overcurrent protective device Circuit breaker 10A, 240V for mode SX31K1CI and SX31K1CIy Circuit breaker 7A, 250V for model SX3800CI and SX3800CIy, refer to table of critical components list.	P
	Compliance shall be checked by inspection and by the tests of 5.2.4.4/RD and 5.2.4.5/RD.	See Clause 5.2.4.4/RD and 5.2.4.5/RD.	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
4.3.4/RD	Protection by several devices	No such part used.	N/A
	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.		N/A
4.3.101	AC input current	Refer to table 4.3.101, 5.2.3.102.	P
4.3.102	Transformer protection	Only AVR transformer functional used, no insulation required on it.	N/A
4.3.103	AC input short-circuit current	I _{cc} :1kA.	P
4.3.104	Protection of the energy storage device	Equipment configures DC fuse for battery: F2, F3: 40A/32Vdc	P
4.3.105	Unsynchronized load transfer	No applicable.	N/A
4.4	Protection against electric shock	There is adequate protection against operator contact with bare parts at ELV or hazardous voltage, or parts separated from these with reinforce insulation (except protective earth).	P
4.4.1/RD	General	Equipment under normal conditions is provided by basic protection, and protection under single fault conditions is provided by fault protection. Enhanced protection provides protection under both conditions.	P
4.4.2/RD	Decisive voltage class	See below.	P
4.4.2.1/RD	General	Equipment operated in dry condition only.	P
4.4.2.2/RD	Determination of decisive voltage class	See below.	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.	Body parts: DVC A2 Hand: DVC A Fingertip: DVC B	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
4.4.2.2.2 4.4.2.2.2 /RD	Selection tables for contact area and skin humidity condition	Contact area of accessible parts: hand (cm ²): 1 < accessible parts < 80 Humidity condition of the skin: Dry	P
4.4.2.2.3 /RD	Limits of the working voltage for the DVC	All user accessible area voltage under DVC A (30Vrms, 42.4Vpeak, 60Vdc)	P
4.4.2.3/RD	Requirements for protection against electric shock	There is adequate protection against operator contact with bare parts at DVC C or hazardous voltage or parts separated from these with enhanced protection.	P
4.4.3/RD	Provision for basic protection	See below.	P
4.4.3.1/RD	General	See below.	P
4.4.3.2/RD	Protection by means of basic insulation of live parts	See below.	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.	Equipment protected by enclosure, rated V-0, refer to table critical component information.	P
	Basic insulation may be provided by solid insulation or air clearance.	Considered, see table 4.4.7.4/RD to 4.4.7.5/RD.	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.	Considered, see Cl. 4.4.7.2.1.	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
4.4.3.3	Openings	<p>No front, rear and bottom openings,</p> <p>Top side: Numerous louver shape openings each 1.6mm x 38.5mm, covering an area of 81.0mm x 38.5mm</p> <p>Left side: Numerous shutter openings each 1.5mm x 133.0mm, covering an area of 151.0mm x 81.0mm</p> <p>Right side: Numerous louver shape shutter openings each 1.5mm x 133.0mm, covering an area of 151.0mm x 81.0mm.</p> <p>Openings are not located within 5° projection of fire hazardous components. Checked by test finger and test pin openings comply with IP2X.</p>	P
4.4.3.4/RD	Protection by means of limitation of touch current and charge	See table 4.4.4.3.3/RD.	P
	<p>The limitation of touch current and discharge energy shall not exceed:</p> <ul style="list-style-type: none"> - 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>- Touch current not exceed 3.5mA.</p> <p>- Value of 50 µC for the limitation of discharge energy.</p> <p>$V_{in} \times Y_{Cap.} = (C_{82} + C_{83} = 4700pF.)$ $264V \times (4700pF + 4700pF) = 2.48\mu C.$</p>	P
4.4.3.5/RD	Protection by means of limited voltage	See below,	P
	The voltage between simultaneously accessible parts shall not be greater than DVC As as determined in 4.4.2.2/RD.	No any energy hazards in operator access area.	P
4.4.4/RD	Provision for fault protection	See below	P
4.4.4.1/RD	General	See below	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>Fault protection shall be provided by one or more of the following measures:</p> <ul style="list-style-type: none"> • 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. <p>Fault protection shall be independent and additional to those for basic protection.</p>	Refer to Cl. 4.4.4.2/RD, 4.4.4.3/RD, 4.4.4.4/RD, 4.4.4.5/RD, 4.4.4.6/RD and 4.4.4.7/RD.	P
4.4.4.2/RD	Protective equipotential bonding	See below.	P
4.4.4.2.1 /RD	General	See below.	P
	<p>Protective equipotential bonding shall be provided between accessible conductive parts of the equipment and the means of connection for the PC conductor, except:</p> <ul style="list-style-type: none"> 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. 	Accessible conductive parts are separated from live parts using double or reinforced insulation.	P
	<p>Electrical contact to the means of connection of the PE conductor shall be achieved by one or more of the following means:</p> <ul style="list-style-type: none"> • 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. 	Electrical contact to the means of connection of the PE conductor by following means: through other accessible conductive parts or other metallic components which are not removed when the PECS is used as intended.	P
4.4.4.2.2 /RD	Rating of protective equipotential bonding	See below.	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>Protective equipotential bonding shall either be:</p> <p>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</p> <p>b) sized</p> <ul style="list-style-type: none"> • 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. <p>Compliance shall be checked with the type tests in 5.2.3.11/RD</p>	<p>- GND wire: 18AWG</p> <p>- Appliance inlet GND pin to Busbar: 32A/2 min., voltage drop to 0.16V.</p>	P
4.4.4.3/RD	PE conductor	See below.	P
4.4.4.3.1/RD	General	See below.	P
	<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.</p>	<p>A PE conductor connected at all time when power is supplied to PECS, equipment, Cl. I. equipment. GND wire: 18AWG.</p>	P
	<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.</p>	<p>PE conductor routed through a plug or inlet, its not possible to disconnected power unless removed power plug.</p>	P
	<p>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:</p> <ul style="list-style-type: none"> • 2,5 mm² if mechanical protection is provided; or • 4 mm² if mechanical protection is not provided. 	No such parts.	N/A

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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.	No such parts.	N/A
4.4.4.3.2 /RD	Means of connection for the PE conductor	See below.	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.	The earthing pin in the appliance inlet or plug is regarded as the main protective earthing terminals. Protective bonding conductor(green/yellow wire) is hooked-in and soldered) to the earth pin of approved appliance inlet or with non-detachable plug and fixed to earth pin of outlets by hook-in and soldered, then contact to Main board and Ethernet protection board by reliable quick connector.	P
4.4.4.3.3 /RD	Touch current in case of failure of PE conductor	See below.	N/A
	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 <ul style="list-style-type: none"> a cross-section of the PE conductor of at least 10 mm² Cu or 16 mm² 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.	Touch current less than (3.5mA a.c.) the limits specified in 4.4.3.4.	N/A

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Compliance is checked by inspection and by test of 5.2.3.7/RD.	Not applicable.	N/A
4.4.4.4/RD	Automatic disconnection of supply	No such parts.	N/A
	<p>For automatic disconnection of supply:</p> <ul style="list-style-type: none"> • 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. <p>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>		N/A
4.4.4.5/RD	Supplementary insulation	Considered, see table 4.4.7.10 /RD, 5.2.3/RD.	P
4.4.4.6/RD	Simple separation between circuits	See below.	P
	<p>If any component is connected between the separated circuits, that component shall withstand the electric stresses specified for the insulation which it bridges.</p> <p>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>	Opto-coupler bridge primary and secondary circuit and pass the electric strength withstand. Refer to table of 4.4.7.10 /RD, 5.2.3/RD and table 4.4.4.3.3/RD for test results.	P
4.4.4.7/RD	Electrically protection	See below.	N/A
	<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.</p> <p>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>	No used.	N/A
4.4.5/RD	Enhanced protection	See below.	P
4.4.5.1/RD	General	See below.	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Enhanced protection shall provide both basic and fault protection and can be achieved by means of: <ul style="list-style-type: none"> • 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. 	See table of 4.2/RD to 4.3/RD fault condition tests, equipment after fault condition tests remains insulation effective.	P
4.4.5.2/RD	Reinforced insulation	See below.	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)	Electric strength withstand test conducted after thermal, mechanical and environmental stresses tests.	P
4.4.5.3/RD	Protective separation between circuits	See below.	P
	Protective separation between a circuit and other circuits shall be achieved by one of the following means: <ul style="list-style-type: none"> • 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. 	Equipment provide following: Double / reinforced insulation: Opto-coupler.	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)	No such conductors separated circuit are contained together.	N/A
4.4.5.4/RD	Protection by means of protective impedance	See below.	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.	See table 4.4.4.3.3/RD, not exceed 3,5 mA a.c.	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.	See table 4.4.7.10 /RD, 5.2.3/RD	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Compliance with the requirement for the limitation of touch current is checked by test of 5.2.3.6/RD.	See table 4.4.4.3.3/RD, not exceed 3,5 mA a.c.	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.	Considered, see table 4.4.9/RD.	P
4.4.6/RD	Protective measures	See below	P
4.4.6.1/RD	General	See below	P
4.4.6.2/RD	Protective measures for protective class I equipment	Cl. I equipment.	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.	Equipment meets the requirements: • 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	Cl. I equipment.	N/A

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>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.</p> <p>In the latter case the PE conductor and its means for connection shall be separated from:</p> <ul style="list-style-type: none"> · 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. <p>The simple separation shall be designed according to the rated voltage of the series-connected equipment.</p> <p>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:</p> <ul style="list-style-type: none"> · accessible surface of the equipment; and · circuits which employ protective separation according to 4.4.5.3/RD <p>with at least protective separation according to the requirement in 4.4.5.3/RD.</p> <p>Equipment of protective class II shall be marked according to 6.3.7.3.3/RD.</p> <p>Compliance is checked by inspection.</p>	Cl. I equipment.	N/A
4.4.6.4/RD	Protective measures for protective class III equipment or circuits	Cl. I equipment.	N/A
4.4.6.4.1/RD	General		N/A

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>Protective measures shall be achieved by protective separation by one of the following means:</p> <ul style="list-style-type: none"> • 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; <p>used in combination with one of the following means:</p> <ul style="list-style-type: none"> • 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		N/A

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>If a port is intended for connection of an external PELV or SELV circuit with a higher voltage than DVC As:</p> <ul style="list-style-type: none"> • measures to limit the voltage to that of DVC As shall be taken (see Annex A); or • basic protection shall be provided. <p>For connectors containing pins with very small contact area ($< 1 \text{ mm}^2$), 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.</p> <p>The connection of external PELV or SELV circuits to an internal circuit is permitted with the following consideration:</p> <ul style="list-style-type: none"> • 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. <p>The possibility of an addition of the voltages of the circuits under consideration to a higher level under fault conditions shall be considered.</p> <p>For marking, see 6.3.7.1/RD.</p> <p>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.</p>		N/A
4.4.7/RD	Insulation	See below	P
4.4.7.1/RD	General	See below	P
4.4.7.1.1 4.4.7.1.1 /RD	Influencing factors	This equipment is intended to be operated under altitude up to 3000m, so the clearance is multiplied by the altitude correction factor (1.14), specified in table A.2 of IEC 60664-1.	P
	This subclause gives minimum requirements for insulation, based on the principles of IEC 60664.	Considered, refer to below.	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Insulation shall be selected after consideration of the following influences: <ul style="list-style-type: none"> - pollution degree; - overvoltage category; - supply system earthing; - impulse withstand voltage, temporary overvoltage and working voltage; - location of insulation; - type of insulation. 	Consider, equipment is under altitude up to 3000m, clearance is multiplied by the altitude correction factor (1.14), specified in table A.2 of IEC 60664-1, .	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.	Tests performed and passed. Results see below. After tests, unit complied with the requirements of 5.2.2.1/RD, 5.2.3.2/RD, 5.2.3.4/RD and 5.2.3.5/RD.	P
4.4.7.1.2 4.4.7.1.2/RD	Pollution degree	See below.	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.	Equipment considered as PD2, based on 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.	Equipment considered indoor conditioned as PD2, based on table 18.	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).	The information which is intended to operating environment provided in the user manual.	P
	The PECS manufacturer shall state in the documentation the pollution degree for which the PECS has been designed.	See above.	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	If operation in a pollution degree 4 environment is required, protection against conductive pollution shall be provided by means of a suitable enclosure.	Not applicable.	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.	Equipment considered as PD2.	P
4.4.7.1.3 4.4.7.1.3 /RD	Overvoltage category (OVC)	See below	P
	Four categories are considered. <ul style="list-style-type: none"> • 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 considered as Overvoltage category II.	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.	Not applicable.	N/A
	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.	Equipment considered as Overvoltage category II, based on Table 102.	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.		N/A

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
4.4.7.1.4 /RD	Supply system earthing	See below.	P
	<p>The following three basic types of system earthing are described in IEC 60364-1.</p> <ul style="list-style-type: none"> • 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. 	Tested for connection to IT and TN distribution system.	P
4.4.7.1.5 /RD	Determination of impulse withstand voltage and temporary overvoltage	See below.	P
	<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.</p> <p>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>	Equipment considered as Overvoltage category II, impulse under 300Vac and 2500V peak.	P
4.4.7.1.6 /RD	Determination of the system voltage	Equipment supply by single-phase TN and IT systems.	P
4.4.7.1.6.1 /RD	For mains supply	Equipment supply AC mains.	P
4.4.7.1.6.2 /RD	For non-mains supply	Not applicable.	N/A
	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.		N/A
4.4.7.1.7 /RD	Components bridging insulation	See below.	P
	Components bridging insulation shall comply with the requirements of the level of insulation (e.g. basic, reinforced, double) they are bridging.	Considered, refer to TABLE of Critical components information.	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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	Certified X, Y capacitors between one line conductor and the neutral conductor in primary circuit, refer to TABLE of Critical components information.	P
	For equipment to be connected to IT power distribution 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	Certified Y capacitors. between Primary and PE with basic insulation, refer to TABLE of Critical components information.	P
4.4.7.2/RD	Insulation to the surroundings	See below.	P
4.4.7.2.1 /RD	General	See below.	P
4.4.7.2.2 4.4.7.2.2 /RD	Circuits connected to mains supply	Equipment connected to AC mains.	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.	Equipment insulation between the surroundings and circuits which are connected directly to the mains supply according to the impulse withstand voltage 2500V _{peak} , and working voltage, refer to table 4.4.7.2/RD Working Voltage Measurement.	P
4.4.7.2.3 /RD	Circuits connected to non-mains supply	Not applicable.	N/A
	Insulation between the surroundings and circuits supplied from a non-mains supply shall be designed according to: <ul style="list-style-type: none"> 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.		N/A

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>Temporary overvoltage on a non-mains supply shall be determined as follows:</p> <ul style="list-style-type: none"> • 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. 		N/A
	<p>By the determination of temporary overvoltages on non-mains supply, following situations should be considered:</p> <ul style="list-style-type: none"> • 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. 		N/A
4.4.7.2.4 /RD	Insulation between circuits	See below.	P
	<p>Insulation between two circuits shall be designed according to the circuit having the more severe requirement.</p> <p>For the design of simple and protective separation between circuits the insulation shall be designed according to:</p> <ul style="list-style-type: none"> • the circuit having the more severe requirement; or • the working voltage between the circuits; <p>whichever gives the most severe requirement.</p>	Equipment insulation between Primary and secondary circuits designed according to working voltage.	P
4.4.7.3/RD	Functional insulation	See below.	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	<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.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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>	The failure of functional insulation not produce hazards, refer to TABLE 4.2/RD to 4.3/RD fault condition tests.	P
4.4.7.4/RD	Clearance distance	See below.	P
4.4.7.4.1/RD	Determination	See Table 4.4.7.4/RD	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	<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.</p> <p>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.</p> <p>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.</p> <p>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>	Equipment clearances for functional, basic and supplementary insulation, refer to table 4.4.7.4/RD, 4.4.7.5/RD.	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.	Considered, compliance checked 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	No such parts, frequency less than 30 KHz.	N/A
	<p>The dimensions in Table 10 correspond to the requirements of an inhomogeneous electric field distribution across the clearance, which are the conditions normally experienced in practice. If a homogeneous electric field distribution 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.</p> <p>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>		N/A
4.4.7.4.3 /RD	Clearance to conductive enclosure	No such parts.	N/A

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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.		N/A
	Compliance is checked by inspection and by test of 5.2.2.4.2/RD.		N/A
	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.		N/A
4.4.7.5/RD	Creepage distances	See below.	P
4.4.7.5.1/RD	Insulating material groups	EUT installed in a pollution degree 2 environment, measurement not relevant.	N/A
	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".	Not applicable.	N/A
	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.	No such parts.	N/A
4.4.7.5.2/RD	Determination	See below.	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.	See Table 4.4.7.4/RD, 4.4.7.5/RD	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.	See table 4.4.7.4/RD, 4.4.7.5/RD	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).	Considered, see Table 4.4.7.4/RD, 4.4.7.5/RD	P
4.4.7.6/RD	Coating	No coating used.	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)		N/A

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
4.4.7.7 4.4.7.7/RD	PWB spacings for functional insulation	See below.	P
	Spacings for functional insulation shall comply with the requirement of 4.4.7.4/RD and 4.4.7.5/RD.	Considered, see Table 4.4.7.4/RD, 4.4.7.5/RD	P
	<p>Decreased spacing for components mounted on PWB or decreased spacing on PWB are permitted when all the following are satisfied:</p> <ul style="list-style-type: none"> • 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). <p>Decreased spacings for components assembled on PWB are permitted when used in:</p> <ul style="list-style-type: none"> • pollution degree 1 or 2 environment; and • not more than overvoltage category I. <p>In this case the manufacture specification may be used.</p> <p>Compliance is checked by inspection and by test of 5.2.4.7/RD if applicable.</p>	No such parts.	N/A
4.4.7.8/RD	Solid insulation	See below.	P
4.4.7.8.1 /RD	General	See below.	P
	<p>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.</p> <p>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.</p>	Approved opto-couplers, see TABLE critical components information.	P
4.4.7.8.2 /RD	Material requirements	See below.	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>The insulating material shall have a CTI of 100 or greater.</p> <p>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.</p> <p>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.</p>	The insulating material suitable for the maximum temperature.	P
	<p>The insulating material in contact with live parts higher than DVC As shall comply with:</p> <ul style="list-style-type: none"> • 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, but 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 	Certified insulating sheet 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.	See appended table 4.4.7.8.2/RD	P
	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 part used.	N/A
	<p>In case the manufacturer of the insulating material provides data to demonstrate compliance with the above requirements no further testing is required.</p> <p>No further evaluation is required when generic materials are used according to Table 12.</p>		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.	Compliance checked 5.2.3.10/RD.	P
4.4.7.8.3 /RD	Thin sheet or tape material	See below.	P
4.4.7.8.3.1 /RD	General	See Table 4.4.7.8.3.2/RD, 4.4.7.9/RD	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>4.4.7.8.3/RD applies to the use of thin sheet or tape materials in assemblies such as wound components and bus-bars.</p> <p>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.</p> <p>Where more than one layer of insulation is used, there is no requirement for all layers to be of the same material.</p> <p>NOTE 1 One layer of insulation tape wound with more than 50 % overlap is considered to constitute two layers.</p> <p>NOTE 2 Basic, supplementary and double insulation can be applied as a pre-assembled system of thin materials.</p>	See Table 4.4.7.8.3.2/RD, 4.4.7.9/RD	P
4.4.7.8.3.2/RD	Material thickness equal to or more than 0,2 mm	See below.	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.		N/A
	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.		N/A
	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.	(See table 4.4.7.8.3.2/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.	(See table 4.4.7.8.3.2/RD)	P
4.4.7.8.3.3/RD	Material thickness less than 0,2 mm	Not applicable.	N/A
	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.		N/A
	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.		N/A

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Reinforced insulation consisting of a single layer of material is not permitted.		N/A
4.4.7.8.3.4 /RD	Compliance	See below.	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.	Compliance checked, see table 4.4.7.8.3.2/RD, 4.4.7.9/RD.	P
4.4.7.8.4 /RD	Printed wiring boards (PWBs)	See below.	P
4.4.7.8.4.1 /RD	General	See below.	N/A
	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.	See appended table 4.4.7.4/RD and 4.4.7.5/RD.	P
4.4.7.8.4.2 /RD	Use of coating materials	No coating 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

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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	See below.	P
	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.	See appended table 4.4.7.10/RD.	P
4.4.7.8.6 /RD	Potting materials	No such parts.	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)	See below.	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>The creepage and clearance path in the presence of a cemented joint between two insulating parts, are determined as follows.</p> <ul style="list-style-type: none"> • 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. 	Approved optocouplers, see appended critical components information.	P
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	The recurring peak working voltage is less than 750V, refer to table 4.4.7.2/RD.	P
	Test with a.c. or d.c. voltage according to 5.2.3.4/RD	See Table 4.4.7.10/RD	P
4.4.7.10.2 /RD	Double or reinforced insulation	See below.	P
	<p>Double or reinforced insulation shall be tested as follows:</p> <ul style="list-style-type: none"> • 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. 	Test with a.c. or d.c. voltage according to 5.2.3.4/RD, see table 4.4.7.10/RD, table working voltage measurement.	P
	<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.</p> <p>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.</p>	The recurring peak working voltage is less than 750V, refer to table 4.4.7.2/RD.	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.	Test with a.c. or d.c. voltage according to 5.2.3.4/RD, see Table 4.4.7.10/RD	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
4.4.7.11/RD	Insulation requirements above 30kHz	Voltages across insulation frequencies is 26.88 kHz, refer to table 4.4.7.2/RD, TABLE working voltage measurement.	N/A
4.4.8/RD	Compatibility with residual current-operated protective devices (RCD)	No residual current-operated protective devices (RCD) used.	N/A
	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.		N/A
	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.		N/A
4.4.9 4.4.9/RD	Capacitor discharge	See below.	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	<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:</p> <ul style="list-style-type: none"> • 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. <p>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.</p> <p>Compliance is checked by test of 5.2.3.8/RD.</p>	Considered, refer to 4.4.9/RD	P
4.5	Protection against electrical energy hazards	See below.	P
4.5.1/RD	Operator access areas	No electrical energy hazards in operator access areas.	P
4.5.1.1/RD	General	See below.	P
	<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.</p> <p>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.</p> <p>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.</p> <p>Barriers, guards, and similar means preventing unintentional contact may be provided as an alternative to limiting the energy.</p>	No energy hazard in operator access area.	P
	Compliance is checked by inspection or test of 5.2.2.2/RD.	No energy hazard in operator access area.	P
4.5.1.2/RD	Determination of hazardous electrical energy level	See below.	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>A hazardous electrical energy level is considered to exist if:</p> <ul style="list-style-type: none"> • the voltage is 2 V or more; <p>and</p> <ul style="list-style-type: none"> • power available exceeds 240 VA after 60 s; or • the energy exceeds 20 J. <p>Compliance shall be checked with the test in 5.2.3.9/RD or by calculation.</p>	No energy hazard in operator access area.	P
4.5.2 4.5.2/RD	Service access areas	See below.	P
	<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.</p>	No energy hazard.	P
	<p>This requirement does not apply to terminals covered by 4.4.9.</p> <p>In a service access area, the following requirements apply.</p> <p>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.</p>	Checked by inspection, unintentional contact is unlikely during service operations.	N/A
	If the capacitor discharge time cannot be accurately calculated, the discharge time shall be measured.	Not applicable.	N/A
4.6	Protection against fire and thermal hazards	See below.	P
4.6.1/RD	Circuits representing a fire hazard	See below.	P
	<p>The following types of circuits are considered a fire hazard:</p> <ul style="list-style-type: none"> - circuits directly connected to the mains - circuits that are not directly connected to the mains but exceed the limits for limited power sources in 4.6.5/RD - components having unenclosed arcing parts 	Equipment circuits directly connected to the mains and with fire enclosure rated V-0 min.	P
4.6.2/RD	Components representing a fire hazard	See below.	P
4.6.2.1/RD	General	See below.	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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.	Considered, see table 4.6.4/RD.	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.	Considered, see table of critical components information.	P
	<p>The above requirement does not apply to any of the following:</p> <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> – other small parts which would contribute 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. 	Considered, see table of critical components information.	P
	Batteries shall have a flammability class HB or better.	Certified battery used, see table of critical components information.	P
4.6.2.3/RD	Components within a circuit not representing a fire hazard	See Cl. 4.6.2/RD.	N/A
	For components within a circuit not representing a fire hazard 4.6.2/RD does not apply.		N/A
4.6.3/RD	Fire enclosure	See below.	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
4.6.3.1 4.6.3.1/RD	General	Equipment with fire enclosure rated V-0 min, see table of critical components information.	P
	<p>Fire enclosures are used to reduce the risk of fire to the environment, independent of the location where they are installed.</p> <p>A fire enclosure shall be provided for all UPS unless:</p> <ul style="list-style-type: none"> • 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 combustible materials and is marked according to 6.3.5/RD. 	Equipment provided with total enclosed fire enclosure.	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.	Equipment with fire enclosure rated V-0 min, see table of critical components information.	P
	Materials are considered to comply without test if, in the minimum thickness used, the materials are of flammability class 5VB or better, according to IEC 60695-11-20.	Not applicable.	N/A
	For movable UPS having a total mass not exceeding 18 kg, materials are considered to comply without test if, in the minimum thickness used, the materials are of flammability class of V-1 or better, according to IEC 60695-11-10.	The equipment is movable and the mass not exceeding 18kg, with V-0 fire enclosure.	P
	Metals, ceramic materials, and glass which is heat-resistant tempered, wired or laminated, are considered to comply without test.	No used, not applicable.	N/A

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>Materials for components that fill an opening in a fire enclosure shall:</p> <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> – 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. 	Equipment with fire enclosure rated V-0 min.	P
	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.	Not applicable.	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.	Equipment with fire enclosure rated V-0 min, see table of critical components information.	P
	Compliance shall be checked by visual inspection and, where necessary, by test.	See above, enclosure comply requirement.	P
4.6.3.3/RD	Openings in fire enclosure	See below.	P
4.6.3.3.1 /RD	General	See below.	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
4.6.3.3.2 4.6.3.3.2 /RD	Openings in the top and side of fire enclosures	<p>Openings dimension: Top side: Numerous vertical openings each 1.6mm x 38.5mm, covering an area of 81.0mm x 38.5mm Left side: numerous vertical openings each 1.5mm x 133.0mm, covering an area of 151.0mm x 81.0mm Right side: numerous vertical openings each 1.5mm x 133.0mm, covering an area of 151.0mm x 81.0mm Bottom, front and rear side: no opening.</p> <p>Openings at side do not allow foreign objects entering the equipment to fall on bare parts at hazardous voltage. Checked by test finger and test pin. Fire enclosure construction is considered to comply with the requirements.</p>	P
	<p>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.</p> <p>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.</p> <p>The test requirements are found in 5.2.2.2 of this document.</p>	<p>Openings at side do not allow foreign objects entering the equipment to fall on bare parts at hazardous voltage. Also, openings are not located within 5° projections of fire hazardous components.</p>	P
	<p>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.</p> <p>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.</p> <p>Compliance shall be checked by visual inspection.</p>	<p>Top openings are not located within 5° projections of fire hazardous components.</p>	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
4.6.3.3.3/RD	Openings in the bottom of a fire enclosure	No bottom openings.	P
	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	No doors or cover in fire enclosure leading to an operator access area.	N/A
	<p>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:</p> <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> – 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. <p>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.</p> <p>Compliance is checked by inspection.</p>		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
	<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.</p> <p>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.</p> <p>Compliance is checked by test of 5.2.3.10/RD.</p>	Considered. See table 4.6.4/RD.	P
4.6.4.2/RD	Accessible parts	See below.	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.	See table 4.6.4/RD	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
4.6.5 4.6.5/RD	Limited power sources	No 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.		N/A
4.7	Protection against mechanical hazards	See below.	P
4.7.1/RD	General	See below.	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.	Fault condition test did not lead to any hazards. No fire or molten metal occurred and no deformation of enclosure during the tests. No reduction of clearance and creepage distances.	P
4.7.2/RD	Specific requirements for liquid cooled PECS	No liquid cooled in equipment.	N/A
4.7.2.1/RD	General		N/A
4.7.2.2/RD	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	No liquids used in equipment.	N/A

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
4.7.2.3.1 /RD	General		N/A
	<p>The liquid containment system components shall be compatible with the liquid to be used.</p> <p>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.</p> <p>Compliance is checked by inspection.</p> <p>The flexible hoses should be made of material free of conductive contaminants such as carbon.</p>		N/A
4.7.2.3.2 /RD	Corrosion resistance	No risk of corrosion.	N/A
	<p>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.</p> <p>Compliance is checked by inspection.</p>		N/A
4.7.2.3.3 /RD	Tubing, joints and seals	No such cooling system used.	N/A
	<p>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.</p>		N/A
4.7.2.3.4 /RD	Provision for condensation		N/A
	<p>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).</p> <p>Compliance is checked by inspection.</p>		N/A
4.7.2.3.5 /RD	Leakage of coolant		N/A
	<p>During a leakage measures has to ensure that coolant will not result in wetting of live parts or electrical insulation.</p>		N/A

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
4.7.2.3.6 /RD	Loss of coolant	No such parts.	N/A
	Loss of coolant from 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 parts.	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 parts.	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	Equipment provided with a DC fan, checked by inspection, unintentional contact is unlikely during service operations.	P
4.8	Equipment with multiple sources of supply	The UPS only provide one phase connector (one AC inlet).	N/A
4.8.101	General	See below:	P
4.8.102	Backfeed protection	Backfeed relay provided even in case of a single fault.	P
4.9 4.9/RD	Protection against environmental stresses	See below.	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>The manufacturer has to specify the following conditions for operation, storage and transportation according to IEC 60721:</p> <ul style="list-style-type: none"> - 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. 	<p>Manufacturer declare below:</p> <ul style="list-style-type: none"> - No used coolant. - 25°C min., 40°C max. - 50% min., 95% max. - PD2 - No Vibration rated. - No U.V. resistance rated. - OVC II - under 3000m. - under 3000m. 	P
	<p>The manufacturer shall state the environmental service condition for the PECS according to Table 18.</p> <p>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>	<p>Manufacturer declare below:</p> <p>comply with the following Indoor used only, tropical climatic, pollution degree 2, humidity condition: 50% min., 95% max.</p>	P
4.10	Protection against sonic pressure hazards	No such parts produce noise and sound.	N/A
4.11	Wiring and connections	See below.	P
4.11.1/RD	General	See below.	P
	<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.</p> <p>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.</p>	Wireways are smooth and free from edges. Wires are adequately fixed to prevent excessive strain on wire and terminals and avoiding damage to the insulation of the conductors.	P
4.11.2/RD	Routing		

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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 bushing or grommet or shall have smooth, well-rounded surfaces upon which the wires bear to reduce the risk of abrasion of the insulation.	No insulated wires pass the hole.	N/A
	Wires shall be routed away from sharp edges, screw threads, burrs, 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.	Wireways are smooth and away from sharp edges. Wires are adequately fixed to prevent excessive strain on wire and terminals and avoiding damage to the insulation wires.	P
	Clamps and guides, either metallic or non-metallic, used for routing stationary internal wiring shall be provided with smooth, well-rounded edges. The clamping 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.		P
4.11.3/RD	Colour coding	See below.	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.	The insulated protective earth conductors are used colored green and yellow.	P
4.11.4/RD	Splices and connections	See below.	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>All splices and connections shall be mechanically secured and shall provide electrical continuity.</p> <p>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.</p> <p>NOTE Stranded wire should not be consolidated with solder where secured in a terminal that relies on pressure for contact or equivalent</p> <p>When stranded internal wiring is connected to a wire-binding screw, the construction shall be such that loose strands of wire do not contact:</p> <ul style="list-style-type: none"> • other uninsulated live parts not always of the same potential as the wire; • de-energized metal parts. <p>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>	All electrical connection in proper secured with mechanical or soldered.	P
4.11.5/RD	Accessible connections	See below.	P
	<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.</p> <p>If relevant, non-interchangeability and protection against polarity reversal of connectors, plugs and socket outlets shall be confirmed by inspection and trial insertion.</p>	Considered, no hazards voltage present when either insertion error nor polarity reversal of connectors.	P
4.11.6/RD	Interconnection between parts of the PECS	See below.	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	<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.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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>	Internal wire min. 18AWG, VW-1, see table critical components information for details.	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.	All electrical connection in proper secured with mechanical or soldered.	P
4.11.8/RD	Terminals	Cl. 4.11.8.1 to Cl. 4.11.8.4: No such terminal used.	N/A
4.11.8.1/RD	Construction requirements		N/A

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>All parts of terminals which maintain contact and carry current shall be of metal having adequate mechanical strength.</p> <p>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.</p> <p>Terminals shall be so constructed that the conductors can be clamped between suitable surfaces without any significant damage either to conductors or terminals.</p> <p>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.</p> <p>The requirements of this subclause are met by using terminals complying with IEC 60947-7-1 or IEC 60947-7-2, as appropriate.</p>		N/A
4.11.8.2 4.11.8.2 /RD	Connecting capacity		N/A
	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.		N/A
	Information regarding the permitted wire sizes shall be given in the installation manual.		N/A
	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.		N/A

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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.		N/A
4.11.8.3 /RD	Connection		N/A
	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.		N/A
4.11.8.4 /RD	Wire bending space for wires 10 mm ² and greater		N/A
	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.		N/A
4.11.101	Non-detachable cords	Equipment provided with a non-detachable power cord with strain relief, see table of critical components information.	P
4.11.101.1	Cord guard	Considered, see table of critical components information.	P
4.11.101.2	Cord anchorages and strain relief	The unit has a mass over 4kg, tested 100N/1 sec (25 times).	P
4.12/RD	Enclosures	Considered, see table of critical components information.	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
4.12.1/RD	General	See below.	P
4.12.2/RD	Handle and manual controls	No 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.	No such parts.	N/A
4.12.3/RD	Cast metal	No use case metal.	N/A
	<p>Die-cast metal, except at threaded holes for conduit, where a minimum of 6,4 mm thickness is required, shall be:</p> <ul style="list-style-type: none"> • not less than 2,0 mm thick for an area larger than 155 cm² or having any dimension larger than 150 mm; • not less than 1,2 mm thick for an area of 155 cm² or less and having no dimension larger than 150 mm. <p>The area under evaluation may be bounded by reinforcing ribs subdividing a larger area.</p> <p>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:</p> <ul style="list-style-type: none"> • at least 2,4 mm thick for an area greater than 155 cm² or having any dimension more than 150 mm; • at least 1,5 mm thick for an area of 155 cm² or less having no dimension more than 150 mm. <p>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.</p>		N/A
4.12.4/RD	Sheet metal	No such parts.	N/A
4.12.5/RD	Stability test for enclosure	See below.	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	<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.</p> <p>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.</p> <p>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 building structure before operation.</p> <p>Under conditions of operator use, a stabilizing means, if needed, shall be automatic in operation when drawers, doors, etc., are opened.</p> <p>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.</p> <p>Compliance is checked by test of 5.2.2.5/RD.</p>	Units do not overbalance under normal use.	P
4.101	UPS isolation and disconnect device	Appliance coupler will be provided as disconnect device.	P
4.101.1	Emergency switching (disconnect) device	Pluggable equipment type A, certified appliance inlet used.	N/A
4.101.2	Normal disconnect devices	<p>For models SX31K1Cly;; SX3800Cly is provided with a non-detachable power supply cord and plug used as disconnect device.</p> <p>For models SX31K1CI; SX3800CI, the equipment is provided with appliance inlet.</p>	
4.102	Stored energy source	See below.	P
4.102.1	General	See below.	P
4.102.2	Accessibility and maintainability	Maintenance battery, the batteries are connected through quick connector.	P
4.102.3	Distance between battery cells	The batteries are connected through quick connector to prevented from coming into undesirable contact with terminals of adjacent cells, or with metal parts of the battery compartment	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
4.102.4	Case insulation	No cell with conductive casing.	N/A
4.102.5	Electrolyte spillage	Lead-acid batteries used.	N/A
4.102.6	Ventilation and hydrogen concentration	Considered, see Table Annex CC.	P
4.102.7	Charging voltages	The battery charging voltage is max. 28.1Vdc.	P
4.102.8	Battery circuit protection	See below.	P
4.102.8.1	Overcurrent and earth fault protection	See below.	P
4.102.8.2	Location of protective device	The fuses are directly located behind the supply wire from the battery. The charger located in the battery circuit before the fuses. For the charger circuit there is no hazardous condition under any simulated fault conditions.	P
4.102.8.3	Rating of protective devices	Refer to TABLE: Critical components information	P
4.103	UPS connection to telecommunication lines	Considered, see Annex A.101	P

5	Test requirements		P
5.1/RD	General	See below.	P
5.1.1/RD	Test objectives and classification	Type tests.	P
5.1.2/RD	Selection of test samples	Representative sample with the objective can be meet the requirements.	P
5.1.3/RD	Sequence of tests	Sequence of tests meet the requirements.	P
5.1.4/RD	Earthing conditions	System earthing: neutral to earth.	P
5.1.5/RD	General conditions for tests	See below.	P
5.1.5.1/RD	Application of tests	See below.	P
	Unless otherwise stated, upon conclusion of the tests, the equipment need not be operational.	Considered, refer to 4.2/RD to 4.3/RD.	P
5.1.5.2/RD	Test samples	Representative sample with the objective is actual equipment ready for shipment to the user.	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
5.1.5.3 5.1.5.3/RD	Operating parameters for tests	Testing conducted under the most unfavourable combination within the manufacturer's specifications.	P
5.1.6/RD	Compliance	Considered, all relevant tests have been passed.	P
5.1.7	Test overview	Type test conducted with relevant tests.	P
5.1.101	UPS test overview	Type test conducted with relevant tests.	P
5.2	Test specification	See below.	P
5.2.1/RD	Visual inspections (type test, sample test and routine test)	See below.	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.	Relevant supply voltage, input and out ranges has been checked to meet the requirements.	
5.2.2/RD	Mechanical tests	See below.	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 table: Clearance and Creepage Distance Measurements.	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.		N/A
5.2.2.2	Non-accessibility test (type test)	No energy hazard in operator access area. The equipment complies with IP20.	P
5.2.2.3/RD	Ingress protection test (IP rating)(type test)	IP 20.	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.		P
5.2.2.4/RD	Enclosure integrity test (type test)	See below	P
5.2.2.4.1 /RD	General	See below	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:	Considered, after test with following no degradation of any safety-relevant component of the PECS has occurred.	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	- no degradation of any safety-relevant component of the PSCS has occurred.	No degradation any component.	N/A
	- live parts have not become accessible (see 4.4.3.3/RD).	Hazardous live parts have not become accessible.	P
	- enclosures show no cracks or openings which could cause a hazard.	No cracks or openings no cause hazards.	P
	- clearances are not less than their minimum permitted values and other insulation is undamaged.	Clearances are not less minimum requirement values and insulation is no damaged.	P
	- barriers have not been damaged or loosened.	Barriers have not been damaged or loosened.	P
	- no moving parts which could cause a hazard are exposed.	No moving parts which could cause a hazard are exposed.	P
	The integrity tests shall be performed at the worst case point on representative accessible face(s) of the enclosure.	Considered, equipment tests performed on the worst case 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.	After test the equipment still operation with no deformed on enclosure.	P
5.2.2.4.2 /RD	Deflection test (type test)	See below.	P
5.2.2.4.2.1 /RD	General	See below.	P
5.2.2.4.2.2 /RD	Stead force test, 30N	No internal enclosure.	N/A
5.2.2.4.2.3 /RD	Stead force test, 250N	No hazard. The test is performed on all sides of enclosure, no safety relevant damage.	P
5.2.2.4.3 /RD	Impact test (type test)	No hazard as result from the steel sphere fall test.	P
5.2.2.4.4	Drop test	No safety relevant damage.	P
5.2.2.4.5 /RD	Stress relief test	After 7h at 70 degree and cooling down to room temperature, no shrinkage, distortion or losing of enclosure parts was noticeable on the equipment.	P
5.2.2.5/RD	Stability test	Equipment do not overbalance at 10°.	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
5.2.2.6	Wall, ceiling or rack mounted equipment test	No wall or ceiling mounted equipment.	N/A
5.2.2.6.101	Wall and ceiling mounted equipment test		N/A
5.2.2.6.102	Rack mounted equipment test	Not rack mounted equipment.	N/A
5.2.2.7/RD	Handle and manual controls securement test	No handle and manual controls in equipment.	N/A
5.2.2.101	Cord guard test		N/A
5.2.3/RD	Electrical tests	See below.	P
5.2.3.1/RD	General	See below.	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.	See test in table 5.2.3/RD.	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.	Test performed in whole equipment and insulation transformer, see test in table 5.2.3/RD.	P
5.2.3.2/RD	Impulse voltage test (type test and sample test)	(See appended table 4.4.7.10/RD)	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)	See below.	P
5.2.3.4.1/RD	Purpose of test	See below.	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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.	See test in table 5.2.3/RD.	P
5.2.3.4.2 /RD	Value and type of test voltage	See below.	P
	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.	See test in table 5.2.3/RD.	P
5.2.3.4.3 /RD	Performing the voltage test	See below.	P
	a) Test (1) between accessible conductive part 8connected 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 but 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.	See test in table 5.2.3/RD.	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.	Test conducted, see test in table 5.2.3/RD.	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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, but it is not necessary to test functional insulation between adjacent PELV or adjacent SELV circuits.	Test conducted, see test in table 5.2.3/RD.	P
5.2.3.4.4 /RD	Duration of the a.c. or d.c. voltage test	See below.	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 but the full voltage shall be maintained for 60 s and 1 s respectively for type and routine tests.	60 s for type test.	P
5.2.3.4.5 /RD	Verification of the a.c. or d.c. voltage test	See below.	P
	The test is successfully passed if no electrical breakdown occurs during the test.	Test passed, no electrical breakdown occurs, see test in table 5.2.3/RD.	P
5.2.3.5/RD	Partial discharge test (type test, sample test)	Not applicable.	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).	Not applicable.	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.	Not applicable.	N/A
5.2.3.6/RD	Protective impedance test (type test and routine test)	See below.	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	<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.</p> <p>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, but no suggestion is made for measurement in such cases.</p> <p>The value of the protective impedance shall be verified as a routine test.</p>	See table in 4.4.3.4/RD.	P
5.2.3.7/RD	Touch current measurement test (type test)	See below.	P
	<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.</p>	See table in 4.4.3.4/RD.	P
	<ul style="list-style-type: none"> 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. 	Considered, the earthed neutral system, the neutral of the mains of the test site shall be directly connected to the protective earthing.	P
	<ul style="list-style-type: none"> 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. 		P
	<ul style="list-style-type: none"> 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. 	Not applicable.	N/A
	<ul style="list-style-type: none"> For a PSCS with a particular earthing system, this system shall operate as intended during the test. 	Not applicable.	N/A
	<ul style="list-style-type: none"> 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. 	Not applicable.	N/A
5.2.3.8/RD	Capacitor discharge test (type test)	See below.	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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.	See test in table 4.4.9/RD.	P
5.2.3.9	Limited power source test (type test)	No limited power source test.	N/A
5.2.3.10 5.2.3.10 /RD	Temperature rise test (type test)	Considered, see below.	P
	If possible the PECS must operate in the worst conditions of the rated power and the output current.	Equipment operate in worst condition on rated maximum load.	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.	See table 4.6.4 /RD.	P
	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 bus-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.	Equipment no use field wiring terminal.	N/A
	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.	Heating test performed to reached thermal stabilization requirement.	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.	Heating test performed with thermocouple method; thermocouple measured on the closest to the heat source.	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, see table 4.6.4 /RD	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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, see table 4.6.4 /RD	P
	During the test, thermal cut-out, overload detection functions and devices shall not operate.	When heating test performed, no operation overload detection devices and no operate thermal protection detected. No thermal cut-out	P
5.2.3.11 /RD	Protective equipotential bonding tests (type tests and routine test)	See below.	P
5.2.3.11.1 /RD	General	See below.	P
	<p>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.</p> <p>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.</p> <p>All of these selected circuits have to be analysed regarding prospective short circuit current and the associated protective element(s):</p> <ul style="list-style-type: none"> - 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. 	See test in 5.2.3.11.2/RD.	P
	For pluggable equipment type A only the protective equipotential bonding impedance test of 5.2.3.11.2/RD have to be performed.	See test in 5.2.3.11.2/RD.	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
5.2.3.11.2 /RD	Protective equipotential bonding impedance test	See below.	P
5.2.3.11.2.1/RD	Test conditions	<p>Considered, test below</p> <ul style="list-style-type: none"> - From the GND pin of plug to GND trace on board (TNV): 54 mΩ, 32A for 2 minutes, voltage drop: 1.73V - From the GND pin of plug to GND trace on main board 58 mΩ 32A for 2 minutes, voltage drop: 1.86V - From the GND pin of plug to Busbar 53 mΩ 32A for 2 minutes, voltage drop: 1.70V - From the Inlet GND terminal to GND trace on main board 14 mΩ 32A for 2 minutes, voltage drop: 0.45V - From the Inlet GND terminal to Busbar 5 mΩ 32A for 2 minutes, voltage drop: 0.16V 	P
	<p>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:</p> <ul style="list-style-type: none"> • for pluggable equipment type A, the overcurrent protective device is that provided external to the equipment (for example, in the building 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. 	Test pass, see above.	P
5.2.3.11.2.2/RD	Test current, duration and acceptance criteria	See cl. 5.2.3.11.2.1/RD.	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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.	Test performed, see cl. 5.2.3.11.2.1/RD.	P
	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.	Not use alternative method.	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.	Not applicable.	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.	Considered, test performed, see cl. 5.2.3.11.2.1/RD.	P
	After the tests, visual inspection shall show no damage to the protective equipotential bonding means.	After the tests, no damage of the protective equipotential bonding means.	P
5.2.3.11.3 /RD	Protective equipotential bonding short circuit withstand test (type test)	Not applicable, no relevant path of short circuit can cause higher current.	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

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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)	Not applicable.	N/A
5.2.3.101	Backfeed protection test (type test)	See below.	P
5.2.3.101.1	General	See below.	P
5.2.3.101.2	Test for pluggable UPS	Test conducted on stored energy mode in no load condition, measured on AC input terminal (L/N pin): 0V.	P
5.2.3.101.3	Test for permanently connected UPS	Not permanently connected.	N/A
5.2.3.101.4	Method to simulate the load-induced change of reference potential for pluggable UPS	Method not used.	N/A
5.2.3.101.5	Solid-state backfeed protection	No such parts.	N/A
5.2.3.102	Input current test	See table 4.3.101.	P
5.2.3.103	Short-time withstand current test (type test)	The manufacturer has declared rated conditional short circuit current ($I_{cc} \leq 1\text{ kA}$ and $ICP \leq 10\text{ kA}$).	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	The manufacturer has declared rated conditional short circuit current ($I_{cc} \leq 1\text{ kA}$ and $ICP \leq 10\text{ kA}$).	P
5.2.3.104	Transformer protection test	Considered, see table 4.4.7/RD.	P
5.2.3.105	Unsynchronized load transfer test	Not applicable.	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 table 4.2/RD and 4.3/RD	P
5.2.4.2/RD	Pass criteria	See below.	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>As a result of the abnormal operation tests, the PSCS shall comply with the following:</p> <ul style="list-style-type: none"> - 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. 	No fire or molten occurred, no ignition in surgical cotton, cover remain in place, accessible parts not present hazards voltage and no deformation of enclosure during the tests.	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.	No deformation of enclosure, no reduction of clearance and creepage distances. Electric strength test is made on basic, supplementary and reinforced insulation, see table 4.2/RD and 4.3/RD.	P
5.2.4.3/RD	Protective equipotential bonding short circuit withstand test (type test)	Not applicable, no relevant path of short circuit can cause higher current.	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

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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 table 4.2/RD and 4.3/RD	P
5.2.4.4.1 /RD	Load condition	Loaded to rating load.	P
	The short circuit test shall be performed with the PSCS at full load or light load whichever creates the more severe condition.	See table 4.2/RD and 4.3/RD	P
5.2.4.4.2 /RD	Short-circuit test method	See below	P
	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.	See table 4.2/RD and 4.3/RD	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>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:</p> <p>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;</p> <p>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;</p> <p>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.</p> <p>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.</p>	See table 4.2/RD and 4.3/RD	P
5.2.4.5/RD	Output overload test (type test)	See table 4.2/RD and 4.3/RD	P
5.2.4.6/RD	Breakdown of components test (type test)	See table 4.2/RD and 4.3/RD	P
5.2.4.6.1 /RD	Load conditions	See below.	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.	Rated full load are considered.	P
5.2.4.6.2 /RD	Application of short circuit or open-circuit	See below.	P
	The short circuit shall be applied with cable of a cross-section appropriate for the current that normally flows through the component, but 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.	See table 4.2/RD and 4.3/RD	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.	See table 4.2/RD and 4.3/RD	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
5.2.4.6.3 /RD	Test sequence	See below.	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.	See table 4.2/RD and 4.3/RD	P
5.2.4.7/RD	PWB short circuit test (type test)	See below	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.	See table 4.2/RD and 4.3/RD	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.	See table 4.2/RD and 4.3/RD	P
5.2.4.8/RD	Loss of phase test (type test)	No multi-phase PSCS, not applicable.	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)	See below.	P
5.2.4.9.1 /RD	General and pass criteria	See below.	P
	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.	Considered, see table 4.2/RD and 4.3/RD	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	NOTE The temperature increase of 5 °C with regard to the steady state limits reflect the spread of the burn threshold given in IEC Guide 117.	Considered, see table 4.2/RD and 4.3/RD	P
5.2.4.9.2 /RD	Inoperative blower motor test	See below.	P
	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.	Considered, see table 4.2/RD and 4.3/RD	P
5.2.4.9.3 /RD	Clogged filter test	No such parts.	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 such parts.	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	All materials have suitable flame class, no testing required.	N/A
5.2.5.1/RD	General		N/A
	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		N/A
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

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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)	Not applicable.	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)	No cemented joint.	N/A
	<p>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.</p> <p>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.</p> <p>After the conditioning the samples shall pass the following tests in the prescribed order:</p> <ul style="list-style-type: none"> 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	See below.	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.	See cl. 5.2.6.3/RD, 5.2.6.4/RD, 5.2.6.5/RD and 5.2.6.6/RD	P
5.2.6.2/RD	Acceptance criteria	See below.	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>The following acceptance criteria shall be satisfied:</p> <ul style="list-style-type: none"> - 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 hazards after test performed.	P
5.2.6.3/RD	Climatic tests	See below.	P
5.2.6.3.1 /RD	Dry heat test (steady state)	See below.	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.	Test performed and no deformation of equipment, no hazards.	P
5.2.6.3.2 /RD	Damp heat test (steady state)	See below.	P
	To prove the resistance to humidity, the PSCS shall be subjected to a Damp heat test (steady state) according to Table 32.	Humidity treatment performed 95%, 40°C. for 120hrs. (per client request).	P
5.2.6.4	Vibration test (type test)	Not applicable.	N/A
5.2.6.5	Salt mist test (type test)	Not applicable.	N/A
5.2.6.6	Dust and sand test (type test)	Not applicable.	N/A
5.2.7/RD	Hydrostatic pressure test (type test and routine test)	Not applicable.	N/A

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>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.</p> <p>NOTE: for the purpose of this test the coolant pump may be disabled.</p> <p>For routine tests, the pressure shall be increased to the maximum pressure rating of the system.</p> <p>The pressure shall be maintained for at least one minute.</p> <p>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.</p> <p>After the hydrostatic pressure type test the PSCS shall pass the a.c. or d.c. voltage test 5.2.3.4/RD.</p>	No such parts.	N/A

6	Information and marking requirements		P
6.1	General	See below.	P
6.1.101	Durability	The marking withstands required tests.	P
6.1.102	Removable parts	No removeable parts.	N/A
6.2	Information for selection	Refer to marketing plate.	P
6.3	Information for installation and commissioning	See below.	P
6.3.1/RD	General	See below.	P
6.3.2/RD	Mechanical considerations	See below.	P
	<p>The following drawings shall be prepared by the manufacturer:</p> <ul style="list-style-type: none"> - Dimensional drawing, including mass information - Mounting drawing 	<p>Dimensional and mass in manual.</p> <p>No mounting means.</p>	P
6.3.3/RD	Environment	See below.	P
	In accordance with 4.9/RD the following environmental conditions shall be specified, for operation, transportation and storage:	See below.	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Climatic (temperature, humidity, altitude, pollution, ultra-violet light, etc.)	temperature 40°C, humidity: 95%, altitude: 3000m, pollution: PD2, No ultra-violet light.	P
	Mechanical (vibration, shock, drop, topple, etc.)	Not applicable.	N/A
	Electrical (overvoltage category)	OVC II	P
6.3.4/RD	Handling and mounting	See below.	P
	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: <ul style="list-style-type: none"> - packing and unpacking; - moving; - lifting; - strength and rigidity of mounting surface; - fastening; - provision of adequate access for operation, adjustment and maintenance. 	Installation instruction provided.	P
6.3.5/RD	Enclosure temperature	See below.	N/A
	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 combustibility of the mounting surface.	Enclosure temperature not exceeded.	N/A
	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-combustible surfaces only".		N/A
6.3.6/RD	Connections	See below.	P
6.3.6.1/RD	General	See below.	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.	Information for outlet provide in user manual. Certified outlet used, no electric shock or availability of energy.	P
6.3.6.2/RD	Interconnection and wiring diagrams	See below.	P
	The installation and maintenance manuals shall include details of all necessary connections, together with a suggested interconnection diagram.	Information for outlet provide in user manual.	P
6.3.6.3/RD	Conductor (cable)selection	See below.	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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.	The Installation manual list voltage rated current, power for AC mains input and output backup power.	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.	The Installation manual list range of voltage, current, power for AC input and output backup power, other connections are secondary low voltage, see cl. 6.3.6.2/RD.	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 field wiring terminal.	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.		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.	No such parts.	N/A
6.3.7/RD	Protection requirements	See below.	P
6.3.7.1/RD	Accessible parts and circuits	See below.	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.	The manual list range of voltage, current, power for AC input and output backup power..	P
	The manuals shall also indicate the precautions to be taken to ensure that the safety of DVC As connections maintained during installation.	The manual list voltage, current, power for output backup power No hazards voltage in other output connection,	P
	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.	Caution label located inside of top cover, see copy of marketing plate.	P
	The manual of a PSCS shall state the maximum voltage allowed to be connected to each port.	Considered, see copy of marketing plate.	P
	The manuals shall provide instructions for the use of PELF circuits within a zone of equipotential bonding.	No such parts.	N/A

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
6.3.7.2/RD	Type of electrical supply system	See below.	P
	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)	IT and TN system.	P
	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.	Not applicable.	N/A
6.3.7.3/RD	Protective class	See below.	P
6.3.7.3.1/RD	General	See below.	P
	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	The installation instruction specifies safe earthing including the earthing system installation.	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:	Certified AC inlet used for model: SX31K1CI; SX3800CI; Non-detachable power supply cord for model: SX31K1CIy; SX3800CIy, refer to critical component list.	P
	The symbol IEC 60417-5019 (2011-01)	Earthing conductor is marked with standard earth symbol (IEC 60417 No. 5019)	P
	With the letters PE		N/A
	The colour coding green or green-yellow	Insulated protective earth conductors are colored green with yellow.	P
6.3.7.3.3/RD	Protective class II equipment	Class I equipment.	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).		N/A
6.3.7.3.4/RD	Protective class III equipment	Class I equipment.	N/A

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	No marking is required on the product.		N/A
6.3.7.4/RD	Touch current marking	See below.	N/A
	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.	Touch current not exceeds the limits in 4.4.4.3.3/RD.	N/A
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 RCD used, refer to cl. 4.4.8 /RD.	N/A
6.3.7.6/RD	Cable and connection	See below.	P
	Any particular cable and connection requirements shall be identified in the installation and maintenance manuals.	Relevant information for cable used list in installation manual.	P
6.3.7.7/RD	External protection devices	No external protection.	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	Not applicable.	N/A

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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.		N/A
6.3.101	Guidance on UPS installation	Installation manual provided.	P
6.4	Information for use	See below.	P
6.4.1/RD	General	See below.	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.	Relevant caution on label, refer to copy of marketing plate and user manual.	P
	The manual should also indicate any hazards which can result from reasonably foreseeable misuse of the PSCS.	Relevant caution on label, refer to copy of marketing plate and manual.	P
6.4.2/RD	Adjustment	The explanations are provided in the manual.	P
	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.		P
	Maintenance adjustments may also be described in this manual, but shall be made clear that they should only be made by qualified personnel.		P
	Clear warnings shall be provided where excessive adjustment could lead to a hazardous state of the PSCS.		P
	Any special equipment necessary for making adjustments shall be specified and described.		P
6.4.3 6.4.3/RD	Labels, signs and signals	See below.	P
6.4.3.1/RD	General	See below.	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	<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.</p> <p>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.</p> <p>Where a symbol is used, the information provided with the PSCS shall contain an explanation of the symbol and its meaning.</p>	Relevant caution on label, refer to copy of marketing plate and manual.	P
	<p>Labels shall:</p> <ul style="list-style-type: none"> • 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. 	Refer to copy of marketing plate.	P
	<p>When instructing the person(s) concerned as to</p> <ul style="list-style-type: none"> • 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. 		P
	Safety signs shall comply with ISO 3864-1.	Refer to copy of marketing plate and manual.	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>The signal words indicated hereinafter shall be used and the following hierarchy respected:</p> <ul style="list-style-type: none"> • 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." <p>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>	Refer to copy of marketing plate and manual.	P
6.4.3.2/RD	Isolators	No such parts.	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 stating that it does not disconnect all power to the PSCS.	Not applicable.	N/A
	Where a control circuit disconnecter 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 disconnecter stating that it does not disconnect all power to the PSCS.	Not applicable.	N/A
6.4.3.3/RD	Visual and audible signals	No such parts.	N/A

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>Visual signals such as flashing lights, and audible 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.</p> <p>It is essential that these signals:</p> <ul style="list-style-type: none"> - 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. <p>It is recommended that higher frequency flashing lights be used for information.</p> <p>Note: IEC 60073 provides guidance on recommended flashing rates and on/off ratios.</p>		N/A
6.4.3.4/RD	Hot surfaces	No such parts.	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 controls.	N/A
	<p>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.</p> <p>Appropriate identification shall be marked on or adjacent to each movable connector.</p> <p>Test points shall be individually marked with the circuit diagram reference.</p> <p>The polarity of any polarized devices shall be marked adjacent to the device.</p> <p>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.</p>		N/A
6.4.3.101	Distribution-related backfeed		N/A
6.4.3.102	Protection in building installation	See below.	P
6.4.3.102.1	General	See below.	P
6.4.3.102.2	Rated conditional short-circuit current (I _{cc})	See copy of marketing plate.	P
6.4.3.102.3	Prospective short-circuit current (I _{cp})	See copy of marketing plate.	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
6.4.3.102.4	Requirement for building installation	Not for permanently.	N/A
6.4.3.103	Batteries installed within the UPS enclosure	The explanations are provided in the manual.	P
6.5	Information for maintenance	See below.	P
6.5.1/RD	General	See below.	P
	The PECS shall be marked with the date code, or serial number from which the date of manufacture can be determined.	Date code, or serial number from which the date of manufacture on marketing plate.	P
	Safety information shall be provided in the installation and maintenance manuals including appropriate, the following:	Relevant caution in label, see copy of marketing plate and manual.	P
	• Preventive maintenance procedures and schedules	Preventive maintenance procedures and schedules in service manual.	P
	• Safety precautions during maintenance	Relevant caution in label, see copy of marketing plate.	P
	• Location of live parts that can be accessible during maintenance (for example, when covers are removed.	See manual.	P
	• Adjustment procedures	No adjustments.	N/A
	• Subassembly and component repair and replacement procedures	No such parts.	N/A
	• Any other relevant information	Relevant information in manual.	P
6.5.2/RD	Capacitor discharge	See below.	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.	Cl. 4.4.9 requirements are met.	N/A
6.5.3/RD	Auto restart/bypass connection	No such parts.	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

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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	No other hazards.	N/A
	The manufacturer shall identify any components and materials of a PSCS which require special procedures to prevent hazards.		N/A
6.5.5/RD	Equipment with multiple sources of supply	Single supply connection.	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	Battery information in label, see copy of marketing plate.	P
6.5.101.1	Labelling on battery	See copy of marketing plate.	P
6.5.101.2	Information in instruction manual(s)	Battery information provided in instruction manual.	P
6.5.101.2.1	General	See below.	P
6.5.101.2.2	Instructions for battery replacement	Information provided in instruction manual.	P

Annex A	Addition information for protection against electric shock		P
A.1/RD	General	See below.	P
A.2/RD	Protection by means of DVC As	Maximum safe voltage values to be touchable under DVC A3	P
A.3/RD	Protection by means of protective impedance	Not applicable.	N/A
A.4/RD	Protection by using limited voltages	See table of Touch voltage under DVC A1.	P
A.5/RD	Evaluation of working voltage and selection of DVC for touch voltage, PELV and SELV circuits	See below.	P
A.5.1/RD	General	Complied, see appended table 4.4.4.3.3/RD.	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

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
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	See table 4.4.7.2/RD	P
A.6.1/RD	General		P
A.6.2/RD	AC working voltage		P
A.6.3/RD	DC working voltage	Not applicable.	N/A
A.6.4/RD	Pulsating working voltage	Not applicable.	N/A
A.7/RD	Examples of the use of elements of protective measures		N/A
A.101	Comparison of limits of working voltage	See table 4.4.7.2/RD	P

Annex D	Evaluation of clearance and creepage distances		P
D.1/RD	Measurement	See table 4.4.7.4/RD to 4.4.7.5/RD	P
D.2/RD	Relationship of measurement to pollution degree	PD 2	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	Voltages across insulation frequencies is 26.88 KHz, see table 4.4.7.2/RD, table working voltage measurement.	N/A
F.2/RD	Clearance		N/A
F.2.1/RD	General		N/A

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
F.2.2/RD	Clearance for inhomogeneous fields	See F.1/RD	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 distribution without air gaps or voids		N/A
F4.3/RD	Other cases		N/A

Annex BB	Reference loads		P
BB.1	General	UPS loaded according to the manufacturer's rated load.	P
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		P
CC.1	General	See table Annex CC	P
CC.2	Normal conditions		P
CC.3	Blocked conditions		P
CC.4	Overcharge conditions		P

Annex GG	Requirements for the mounting means of rack-mounted equipment		N/A
GG.1	General	Equipment not for mounting means of rack-mounted.	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

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict

4.2/RD to 4.3/RD		TABLE: fault condition tests					P
		Ambient temperature (°C).....: 25					—
No.	component No.	fault	test voltage (V)	test time	fuse No.	fuse current (A)	result
Model SX31K1Cl; SX31K1Clly							
1.	Ventilation openings	Blocked	264	2 h	Circuit breaker	4.58	Normal operation. Max temperature measured on: Main transformer coil 56.2°C, Main transformer core 60.7°C, Battery 33.1°C, Ambient 25.8°C No damage, no hazard.
2.	D12	s-c	240	10 min	Circuit breaker	4.46	F4 trace link open, output normal operation. No hazard. Test repeated 3 times with the same result.
3.	D18	s-c	240	10 min	Circuit breaker	4.46	F4 trace link open, output normal operation. No hazard. Test repeated 3 times with the same result.
4.	U1 pin1-2	s-c	240	10 min	Circuit breaker	4.58	Input voltage sense function fault. Output normal operation. No damage, no hazard.
5.	U1 pin3-4	s-c	240	10 min	Circuit breaker	4.58	Normal operation. No damage, no hazard.
6.	C62	s-c	240	10 min	Circuit breaker	--	Circuit breaker tripped. Unit transfer to back up mode. No damage, no hazard.
7.	CT1 pin1-3	s-c	240	10 min	Circuit breaker	4.58	Normal operation. No damage, no hazard.
8.	R21	s-c	240	10 min	Circuit breaker	4.58	Normal operation. No damage, no hazard.

IEC 62040-1							
Clause	Requirement + Test				Result - Remark		Verdict
9.	Q27 G-S	s-c	240	10 min	Circuit breaker	4.46	Charge circuit fault, output normal operation. No damage, no hazard.
10.	Q27 D-S	s-c	240	10 min	Circuit breaker	4.46	F4 trace link open, output normal operation. No hazard. Test repeated 3 times with the same result.
11.	Q27 G-D	s-c	240	10 min	Circuit breaker	4.46	F4 trace link open, output normal operation. No hazard. Test repeated 3 times with the same result.
12.	R121	s-c	240	10 min	Circuit breaker	--	Unit transfer to back up mode, output normal operation. No damage, no hazard.
13.	Output	s-c	240	10 min	Circuit breaker	--	Circuit breaker tripped. No damage, no hazard.
14.	Output	o-l	240	8 h	Circuit breaker	13.71	Output loaded to 13.62A, 3200VA. Further increase of load caused circuit breaker trip. Buzzer operated after output exceed 1160VA. Max temperature measured on: Main transformer coil 71.6°C, Main transformer core 76.0°C, Battery 40.2°C, Ambient 25.8°C No damage, no hazard.
15.	IC300 pin1-2	s-c	240	10 min	Circuit breaker	4.58	Unit normal operation. Connection through USB port fault. No damage, no hazard.
16.	IC300 pin3-4	s-c	240	10 min	Circuit breaker	4.58	Unit normal operation. Connection through USB port fault. No damage, no hazard.

IEC 62040-1							
Clause	Requirement + Test				Result - Remark		Verdict
17.	Ventilation openings	Blocked	Back up mode	5 min	F1, F2, F3	--	Normal operation. Max temperature measured on: Main transformer coil 89.3°C, Main transformer core 67.8°C, Battery 32.1°C, Ambient 25.7°C No damage, no hazard.
18.	Main transformer, J4-J3	s-c	Back up mode	10 min	F1, F2, F3	--	Output shut down, buzzer operated. No damage, no hazard.
19.	Q18 G-S	s-c	Back up mode	10 min	F1, F2, F3	--	Output shut down, buzzer operated. No damage, no hazard.
20.	Q18 D-S	s-c	Back up mode	10 min	F1, F2, F3	--	Output shut down, buzzer operated. No damage, no hazard.
21.	Q18 G-D	s-c	Back up mode	10 min	F1, F2, F3	--	Output shut down, buzzer operated. No damage, no hazard.
22.	Q6 D-S	s-c	Back up mode	10 min	F1, F2, F3	--	Output shut down, buzzer operated. No damage, no hazard.
23.	Output	s-c	Back up mode	10 min	F1, F2, F3	--	Output shut down, buzzer operated. No damage, no hazard.
Model SX3800CI; SX3800Cly							
24.	Ventilation openings	Blocked	264	2 h	Circuit breaker	3.56	Normal operation. Max temperature measured on: Main transformer coil 58.2°C, Main transformer core 61.1°C, Battery 36.6°C, Ambient 25.7°C No damage, no hazard.
25.	Output	s-c	240	10 min	Circuit breaker	--	Circuit breaker tripped. No damage, no hazard.

IEC 62040-1							
Clause	Requirement + Test					Result - Remark	Verdict
26.	Output	o-l	240	5 h	Circuit breaker	10.37	Output loaded to 10.29A, 2370VA. Further increase of load caused circuit breaker trip. Buzzer operated after output exceed 980VA. Max temperature measured on: Main transformer coil 56.4°C, Main transformer core 60.4°C, Battery 36.5°C, Ambient 25.8°C No damage, no hazard.
27.	Ventilation openings	Blocked	Back up mode	5 min	F1, F2, F3	--	Normal operation. Max temperature measured on: Main transformer coil 89.5°C, Main transformer core 66.9°C, Battery 45.3°C, Ambient 26.5°C No damage, no hazard.
28.	Output	s-c	Back up mode	10 min	F1, F2, F3	--	Output shut down, buzzer operated. No damage, no hazard.
Supplementary information:							

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict

4.3.101, 5.2.3.102		TABLE: Electrical Data (in normal conditions)					P
fuse #	I rated (A)	U (V)	P (W)	I (A)	I fuse (A)	condition/status	
Model: SX31K1CI; SX31K1Cly							
Circuit breaker	--	198, 50Hz	698W, 1134VA	5.58	5.58	Normal mode and rated output load	
Circuit breaker	--	198, 60Hz	684W, 1127VA	5.54	5.54	Normal mode and rated output load	
Circuit breaker	5.5	220, 50Hz	694W, 1123VA	5.13	5.13	Normal mode and rated output load	
Circuit breaker	5.5	220, 60Hz	689W, 1130VA	5.12	5.12	Normal mode and rated output load	
Circuit breaker	5.5	240, 50Hz	674W, 1119VA	4.58	4.58	Normal mode and rated output load	
Circuit breaker	5.5	240, 60Hz	687W, 1130VA	4.71	4.71	Normal mode and rated output load	
Circuit breaker	--	254, 50Hz	697W, 1134VA	4.32	4.32	Normal mode and rated output load	
Circuit breaker	--	254, 60Hz	699W, 1138VA	4.33	4.33	Normal mode and rated output load	
Model SX3800CI; SX3800Cly							
Circuit breaker	--	198, 50Hz	525W, 833VA	4.13	4.13	Normal mode and rated output load	
Circuit breaker	--	198, 60Hz	526W, 831VA	4.09	4.09	Normal mode and rated output load	
Circuit breaker	4.0	220, 50Hz	514W, 821VA	3.70	3.70	Normal mode and rated output load	
Circuit breaker	4.0	220, 60Hz	517W, 827VA	3.68	3.68	Normal mode and rated output load	
Circuit breaker	4.0	240, 50Hz	522W, 830VA	3.56	3.56	Normal mode and rated output load	
Circuit breaker	4.0	240, 60Hz	520W, 830VA	3.47	3.47	Normal mode and rated output load	
Circuit breaker	--	254, 50Hz	527W, 835VA	3.28	3.28	Normal mode and rated output load	
Circuit breaker	--	254, 60Hz	531W, 828VA	3.14	3.14	Normal mode and rated output load	
Supplementary information:							

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict

4.4.4.3.3 /RD	TABLE: Touch current measurement			P
Measured between:	Measured (mA)	Limit (mA)	Comments/conditions	
Line – protective earthing	1.43	3.5	Power ON	
Neutral – protective earthing	1.43	3.5	Power ON	
L / N – Plastic enclosure with foil	0.02	0.25	Power ON	
L / N – USB port	0.03	0.25	Power ON	
L / N – TNV port	0.02	0.25	Power ON	
Supplementary information:				

4.4.7/RD		TABLE: Transformers						N/A
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.	
Loc.	Tested insulation			Test voltage/ V	Measured clearance / mm	Measured creepage dist./ mm	Measured distance thr. insul. / mm; number of layers	
Supplementary information:								

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict

4.4.7.2/RD	TABLE: Working Voltage Measurement			P
Location		RMS voltage (V)	Peak voltage (V)	Comments
Phase – Phase		240	340	--
Primary – SELV		240	340	--
Primary – TNV		240	340	--
CT1, pin 1 - 5		240	339	
CT1, pin 3 - 6		240	339	--
AVR transformer, pin white – BLK		255.9	465.0	Frequency: 26.88 KHz
AVR transformer, pin white – RED		228.9	445.7	--
AVR transformer, pin white – YEL		240.5	439.2	--
Supplementary information:				

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict

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)
Functional: Live – Neutral before circuit breaker	340	240	1.8 1)	12.0	2.5	12.0
Basic: C82 – GND	340	240	1.8 1)	3.0	2.5	3.0
Basic: C83 – GND	340	240	1.8 1)	3.1	2.5	3.1
Basic: Pri. – GND	340	240	1.8 1)	3.0	2.5	3.0
Basic: RY2, I/P – O/P 2)	340	240	1.8 1)	5.0 *)	2.5	5.0 **)
Basic: RY2, I/P – O/P 3)	340	240	1.8 1)	3.0 *)	2.5	3.0 **)
Reinforced: Pri. – Enclosure	340	240	3.5 1)	5.8	5.0	5.8
Reinforced: Pri. – Enclosure	340	240	3.5 1)	10.0	5.0	10.0
Basic: TNV – Enclosure	120	120	1.8 1)	8.0	1.8 4)	8.0
Reinforced: TNV – SELV	120	120	1.8 1)	> 20.0	1.8 4)	> 20.0
Reinforced: TNV – Primary	340	240	3.5 1)	16.0	5.0	16.0
Reinforced: IC300, IC301 Pri. – Sec.	340	240	3.5 1)	5.3	5.0	5.3
Supplementary information: 1) The equipment used at elevations ≤ 3000m. Required clearance is 1.14 times under IEC60664-1 considering sea level 3000m. 2) Measured on soldering side of PCB. 3) Measured on internal distance. 4) Creepage distance increased to the clearance distance, since creepage distance requirement is less than the clearance distance required. *) Measured total clearance from RY2 I/P (Line port) to RY2 O/P (Line port) plus RY2 I/P (Neutral port) to RY2 O/P (Neutral port). **) Measured total creepage distance from RY2 I/P (Line port) to RY2 O/P (Line port) plus RY2 I/P (Neutral port) to RY2 O/P (Neutral port).						

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)	
Bobbin of AVR transformer	EI Dupont / 101L	125	0.9	
Supplementary information:				

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict

4.4.7.8.2 /RD	TABLE: Resistance to heat and fire - Glow wire tests							N/A
Object/ Part No./ Material	Manufacturer / trademark	Glow wire test (GWT); (°C)						Verdict
		550	650		750		850	
			te	ti	te	ti		
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				P
Distance through insulation di at/of:		U r.m.s. (V)	Test voltage (V)	Required di (mm)	di (mm)
IC300, IC301 Prim. – Sec.		240	3000 AC	0.4	*)
Enclosure		240	3000 AC	2.7	*)
Heatsink tube on internal wire		240	3000 AC	0.4	*)
Supplementary information: *) See appended Table: Critical components information					

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict

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)	
Input L/N – Protective earthing	2120 DC	--	--	No	
Output L/N – Protective earthing	2120 DC	--	--	No	
Primary – Enclosure	4240 DC	--	--	No	
Primary – SELV	4240 DC	--	--	No	
Primary – TNV	4240 DC	--	--	No	
TNV – Enclosure 1)	2120 DC	--	--	No	
TNV – Protective earthing 1) 2)	2120 DC	--	--	No	
TNV – SELV 1)	2120 DC	--	--	No	
TNV – Protective earthing	--	1500 DC	--	No	
TNV – SELV	--	1500 DC	--	No	
Supplementary information: 1) 1.5kV tested to cover Australian deviation. 2) MV211 and MV212 disconnected during the test.					

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict

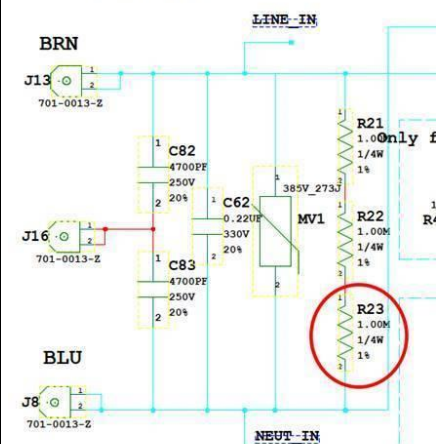
4.4.9/RD	TABLE: Capacitor discharge			P
Condition	τ calculated (s)	τ measured (s)	t u→ 0V (s)	Comments
Line to Neutral	--	386ms	--	Switch off
Line to Neutral	--	996.9ms	--	Switch off, R23 open circuit

Supplementary information:

Vin=264V, no load, circuit breaker in.

All X-cap are rated max according to List of critical components.

EMI SURGE



IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict

4.6.3/RD	TABLE: Resistance to fire					P
Part	Manufacturer of material	Type of material	Thickness (mm)	Flammability class	Evidence	
Plastic enclosure	LG	AF-312, AF312A	Min 2.7mm thick	flame class V-0	UL	
Plastic enclosure	Chi Mei	PA-765A(+)	Min 2.7mm thick	flame class V-0	UL	
Plastic enclosure	Sabic	Lexan 945	Min 2.7mm thick	flame class V-0	UL	
Supplementary information:						

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 burning (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						

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict

4.6.4/RD	TABLE: Heating Test				P
	Test voltage (V)	198	264	Back up mode	—
	Ambient (°C)	25			—
Thermocouple Locations		Max. temperature measured, (°C)			Max. temperature limit, (°C)
Model: SX31K1CI; SX31K1Cly					
C82		51.4	55.6	52.7	110.3
C62		51.7	55.4	52.4	105.3
RY2 coil		67.3	69.6	67.2	95.3
RY3 coil		53.4	58.7	59.9	95.3
RY4 coil		63.2	66.1	63.0	95.3
CT1 coil		56.5	62.0	58.1	105.3
CT1 core		54.3	59.8	56.5	105.3
RY1 coil		60.0	67.1	64.6	95.3
HS1		67.4	75.9	92.1	--
HS5		83.8	92.0	59.4	--
L1 coil		83.6	90.8	58.7	--
F2 body		50.8	57.4	78.8	--
C57		54.3	58.1	55.7	70.3
Circuit breaker body		43.1	45.0	42.5	--
Main transformer coil		53.7	63.8	94.0	105.3 127.3 *)
Main transformer core		56.4	67.1	70.3	105.3 127.3 *)
Outlet		33.7	34.9	34.2	--
Battery body		40.6	47.9	46.6	--
Enclosure insde near main transformer		42.5	48.5	49.6	--
Enclosure outsied above main board		45.9	50.0	49.2	80.3
C40		81.7	82.1	71.7	90.3
PCB near Q18		73.7	74.5	112.8	135.3
Ambient		25.5	27.1	25.3	--

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
Supplementary information: Maximum ambient temperature of 40°C. the maximum temperatures are calculated based upon a (minimum) test temperature of 25.3°C. Temperature limits include less 10K for thermocouple measurement method. *) Max. allow temperature for back up mode			

4.6.4/RD	TABLE: Heating Test (continued)				P
	Test voltage (V)	198	264	Back up mode	—
	Ambient (°C)	25			—
Thermocouple Locations		Max. temperature measured, (°C)			Max. temperature limit, (°C)
Model: SX3800CI; SX3800CIy					
C82		49.3	49.2	54.7	108.9
C62		50.7	50.2	55.7	103.9
RY2 coil		59.2	56.4	57.0	93.9
RY3 coil		67.2	56.6	58.3	93.9
RY4 coil		63.7	62.3	64.7	93.9
CT1 coil		59.6	55.1	55.1	103.9
CT1 core		55.6	53.6	54.3	103.9
RY1 coil		66.4	62.5	65.5	93.9
HS1		63.0	62.8	81.7	--
HS5		84.7	91.0	52.9	--
L1 coil		88.2	94.2	56.0	--
F2 body		51.5	53.2	102.0	--
C57		52.8	56.7	59.1	68.9
Circuit breaker body		45.8	44.6	51.6	--
Main transformer coil		65.3	64.5	87.3	103.9 125.9 *)
Main transformer core		70.0	70.5	71.3	103.9 125.9 *)
Outlet		31.8	33.2	32.3	--
Battery body		32.1	33.9	39.1	--
Enclosure insde near main transformer		45.8	40.7	51.3	--

IEC 62040-1				
Clause	Requirement + Test		Result - Remark	Verdict
Enclosure outsided above main board	41.3	40.9	49.6	78.9
C40	76.5	77.2	63.1	88.9
PCB near Q18	70.2	67.7	125.2	133.9
Ambient	26.8	23.9	24.0	--
Supplementary information: Maximum ambient temperature of 40°C. the maximum temperatures are calculated based upon a (minimum) test temperature of 23.9°C. Temperature limits include less 10K for thermocouple measurement method. *) Max. allow temperature for back up mode				

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:						

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict

4.8.102, 5.2.3.101	TABLE: Backfeed protection				P
Condition		Voltage measured (V)			Comments
	L-N	L-PE	N-PE		
Normal condition					
No load	10	12	0	At 1 sec	
Full load	8	8	0	At 1 sec	
Load-induced change	10	10	0	At 1 sec	
Fault condition					
No load	11	10	0	At 1 sec Q6 Pin 2-3 short	
Full load	7	6	0	At 1 sec Q6 Pin 2-3 short	
Load-induced change	6	7	0	At 1 sec Q6 Pin 2-3 short	
Supplementary information:					

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict

4.12.1/RD, 5.2.2.4.3 /RD	TABLE: Impact Resistance			
	Impacts per surface	Surface tested	Impact energy (Nm)	Comments
	Top side on enclosure	Fall test	Steel ball freely fall from rest through a vertical distance High of 1,3 m onto the equipment	No deformation, no damaged, no hazards of equipment.
	Left side on enclosure	Swing test	Steel ball is suspended by a cord and swung as a pendulum to apply a horizontal impact, dropping through a vertical distance (Hight) 1,3 m onto the equipment	No deformation, no damaged, no hazards of equipment.
	Right side on enclosure	Swing test	Steel ball is suspended by a cord and swung as a pendulum to apply a horizontal impact, dropping through a vertical distance (Hight) 1,3 m onto the equipment	No deformation, no damaged, no hazards of equipment.
Supplementary information:				

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict

Annex CC	TABLE: Ventilation of lead-acid battery compartments	P
The required dimension for the ventilation openings will be calculated with the following formula:		
$A \geq Q/360 \text{ [m}^2\text{]}$		
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 : 12 (6 cells/per battery, max 2 battery provided)		
C : Max 8.5Ah		
$A \geq (0.054 * n * 0.2 \text{ A/100 Ah} * C)/360$		
$A > 28 \text{ h} * \text{cm}^2/\text{m}^3 * (0.054 \text{ m}^3/\text{Ah}) * n * 0.2 \text{ A/100 Ah} * C$ $A > 0.308 \text{ cm}^2$		
Verdict		
The size of ventilation openings in battery cabinet exceeds the required airflow by far (as well as the UPS).		
Supplementary information:		

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict

TABLE: Critical components information						P
Object / part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity ¹⁾	
- Description: Model SX31K1Cly; SX3800Cly						
Plug	Well Shin I-Sheng	WS-015F SP-852	10A, 250V	IRAM 2073	IRAM IRAM	
Plug	I-Sheng Wellshin	SP-506A WS-015D-6	10A, 250V	GB2099.1-1996, GB1002-1996, GB/T1002-2008; GB/T2099.1- 2008	CCC CCC	
Plug	Well Shin	WS-010	16A, 250V	DIN VDE 0620-1	VDE	
Power cord	Well Shin	H05VV-F	3x0.75mm ² (4.1*6.5±0.2mm)	DIN EN 50525- 2-11:2012-01; EN 50525-2- 11:2011	VDE	
Plug	I-Sheng	SP-023	16A, 250V	DIN VDE 0620-1	VDE	
Power cord	I-Sheng	H05VV-F	3x0.75mm ² (4.1*6.5±0.2mm)	DIN EN 50525- 2-11:2012-01; EN 50525-2- 11:2011	VDE	
Strain relief bushing (for primary cord with C14 Receptacles)	Kang Yang Hardware Enterprises Co Ltd	5N-4	13.5mm x 10.9mm x 4.2mm (Fit cables: SVT, 6.4-7.4mm, round type)	UL 635	UL (E127489)	
- Description: TNV board (optional used) for all model						
PTC (TH201, TH202)	Littelfuse	PSR-25105	3Ω @25°C, 250V	EN 60738-1	TUV	
Alt.	Littelfuse	250R170-C	3Ω @25°C, 250V	EN 60738-1	TUV	
Surge suppressors (MV213), Connected between tip and ring circuit.	Ceramate	GNR10D271K YCR	175Vac	IEC 61051-2, UL 1449	VDE, UL	

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict

Object / part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity ¹⁾
Surge suppressors (MV211, MV212), Connected between TNV to GND.	Maida	D61ZOV321R X45T1N	Max continuous voltage 420Vdc, varistor voltage min 453Vdc, max clamping voltage 850V	IEC 61051-2, UL 1449	VDE, UL
Alt.	Panasonic	V10511U	Max continuous voltage 410Vdc, voltage at reference current min 459Vdc	IEC 61051-2	VDE
Alt.	Littelfuse	LA series V320LA10P	Max continuous voltage 420Vdc, varistor voltage min 462Vdc, max clamping voltage 850V	IEC 61051-2, UL 1449, evaluated in equipment	VDE, UL
- Description:		USB board for all model			
Opto-coupler (IC300, IC301)	FAIRCHILD	H11A817B	Dti=1mm Ext. dcr=7.0mm 100°C (Thermal cycling test)	EN 60747-5-5	VDE
Alt.	Everlight	EL816	Dti=0.6mm Int. dcr=4.6mm Ext. dcr=7.4mm 100°C	EN 60747-5-5	VDE
Alt.	Isocom	ISP817X	Dti=0.6mm Int. dcr=4.1mm Ext. dcr=9.0mm 100°C	EN 60747-5-5	VDE
Alt.	Vishay	SFH 6156-4T	Dti=0.5mm Int. dcr=4.9mm Ext. dcr=8.2mm 100°C	EN 60747-5-5	VDE
Alt.	LITE-ON	LTV-817	Dti=0.4mm Int. dcr=4.0mm Ext. dcr=8.0mm 100°C	EN 60747-5-5	VDE
Alt.	Broadcom	HCPL-817	Dti=0.4mm Int. dcr=5.4mm Ext. dcr=9.0mm 110°C	EN 60747-5-5	VDE
- Description:		For model: SX31K1CI; SX3800CI			

IEC 62040-1					
Clause	Requirement + Test		Result - Remark		Verdict
Object / part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity ¹⁾
Appliance inlet	Elcom	EMI-14-T5	10A, 250V	IEC 60320-1	VDE
Alt.	Rich Bay	R-301SN	10A, 250V	IEC 60320-1	VDE
Alt.	Qualtek	701W	10A, 250V	IEC 60320-1	VDE
- Description: For model: SX31K1CI; SX31K1Cly					
DC Fan	Yen Sun	FD244020MB-H	24Vdc, 0.07A, 7.2 CFM	EN 62368-1	TUV
- Description: For all model					
Appliance outlet (Argentina)	APC	-- (Customer Part No. 876-0478, 876-0481-001)	--	IEC 60884-1	Nemko test report No. 187179
Appliance outlet (European Schuko)	APC	-- (Customer Part No. 876-0504, 876-0499)	--	IEC 60884-1	Nemko test report No. 187175
Appliance outlet (French)	APC	-- (Customer Part No. 876-1880,)	--	IEC 60884-1	UL CB report No. DK-18434
Appliance outlet (Australia)	APC	-- (Customer Part No. 876-0485,)	--	AS/NZS 3112	Test by A-plus Report no: A05001-14 (SAA recognition laboratory no.:RECLAB 40004)
Appliance outlet (IEC)	Rong Feng	742W-3P	10A, 250V	IEC 60320-1	TUV
Enclosure	LG	AF-312, AF312A	Min 2.7mm thick, flame class V-0	UL 94	UL
Alt.	Chi Mei	PA-765A (+)	Min 2.7mm thick, flame class V-0	UL 94	UL
Alt.	Sabic	Lexan 945	Min 2.7mm thick, flame class V-0	UL 94	UL
Wire between input circuit and main PCB	Interchangeable	Interchangeable	Min 18AWG, 105°C, VW-1, 300V	UL 758	UL

IEC 62040-1					
Clause	Requirement + Test		Result - Remark		Verdict
Object / part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity ¹⁾
Wire between main PCB and outlet	Interchangeable	Interchangeable	Min 18AWG, 105°C, VW-1, 300V	UL 758	UL
Wire between main PCB and battery	Interchangeable	1015	10AWG, 105°C, VW-1, 600V	UL 758	UL
Heatsink tube on internal wire	Interchangeable	Interchangeable	Min 0.4mm thick, 300V, 105°C, VW-1	UL 224	UL
Circuit breaker for 800VA	Rong Feng	RFMB	7A, 250V	IEC/EN 60934	TUV
Circuit breaker for models of 1100VA	Snap Action	MB1	10A, 240V	EN 60934	TUV
Alt.	Rong Feng	RFMB	10A, 250V	IEC/EN 60934	TUV
Alt.	Kuoyuh	88 series	10A, 250V	IEC/EN 60934	VDE
- Description:	Main board for all model,				
Y cap (C82, C83)	Apex	DA2GYE472M U823 (Type NU)	4700pF, 250V, 125°C, Y2	IEC 60384-14 2ed	VDE
Alt.	Vishay	VY2472M49Y 5US6TK5	4700pF, 300V, 125°C, min Y2	IEC 60384-14 2ed	VDE
Alt.	Jya-Nay	JY	4700pF, 250V, 125°C, min Y2	EN/IEC 60384-14 3rd	TUV
X cap (C62)	EPCOS	B3291#	Max 0.22uF, 330V, 110°C, X2	EN/IEC 60384-14	VDE
Alt.	Cheng Tung	CTX	Max 0.22uF, 300V, 100°C, X1	EN/IEC 60384-14 3rd	VDE
VDR (MV1), Located after circuit breaker, not connected between primary and GND	EPCOS	S20K385	385V, 40/85/56	IEC 61051-2	VDE
Alt.	CERAMATE	GNR20D621K	385V, 273J, 40/85/56	IEC 61051-2	VDE
Alt.	Thinking	TVR20621K	385V, 40/85/56	IEC 61051-2	VDE

IEC 62040-1					
Clause	Requirement + Test		Result - Remark		Verdict
Object / part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity ¹⁾
Bleeder Resistors (R21, R22, R23)	Interchangeable	Interchangeable	1M Ohm, 1/4W (Three resistors in series located after circuit breaker)	IEC 62040-1	Tested in equipment
Backfeed Relay (RY2)	Omron	G2RG-2A4	8A, 250V, class F	IEC/EN 61810-1:2015	VDE
Alt.	O/E/N India Ltd	68-12-2AE	8A, 250V, class F	IEC/EN 61810-1:2015, UL508	VDE, UL
Alt.	American Zettler	AZ733W-2A-12DE	8A, 250V, class F	IEC/EN 61810-1:2015, UL508	TUV, UL
Alt.	Song Chuan	894H-2AH1-F-S	8A, 250V, class F	IEC/EN 61810-1:2015, UL508	TUV, UL
Boost Relay (RY3), Trim Relay (RY1), Output Relay (RY4) For SX31K1CI; SX31K1CIy	Song Chuan	845HN-1C-B-C	12A, 250V, class B	IEC/EN 61810-1:2015, UL508	TUV, UL
Boost Relay (RY3), Trim Relay (RY1), Output Relay (RY4) For SX3800CI; SX3800CIy	Song Chuan	845HN-1C-C	12A, 250V, class B	IEC/EN 61810-1:2015, UL508	TUV, UL
Alt.	Good Sky	MI-SS-112L	10A, 250V, class B	IEC/EN 61810-1:2015, UL508	TUV, UL
Primary Choke (CT1) Bobbin	Leader	460-0102C-Z	130°C	IEC 62040-1	Tested in equipment
	Chang Chun Plastics	T375J	Phenolic, V-0, 150°C	UL 94	UL
	Sumitomo	PM9820, PM9630	Phenolic, V-0, 150°C	UL 94	UL 94
Alt. Primary Choke (CT1) Bobbin	Falco	460-0102C-Z	130°C	IEC 62040-1	Tested in equipment
	Chang Chun Plastics	T375J	Phenolic, V-0, 150°C	UL 94	UL

IEC 62040-1					
Clause	Requirement + Test		Result - Remark		Verdict
Object / part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity ¹⁾
X capacitor (C57)	Pilkor	PCX2 337	Max 0.1uF, min 250V, min. 85°C	IEC 60384-14	ENEC14
Alt.	Illinois	MKP	Max 0.1uF, min 250V, min. 85°C	IEC 60384-14	VDE
Alt.	Europtronic	MPX2	Max 0.1uF, min 250V, min. 85°C	IEC 60384-14	VDE
Fuse (F1, F4)	Littelfuse	251005.NRT1 L	5A, 125Vac	UL 248	UL
Alt.	Bel Fuse	MQ5 T&R	5A, 125Vac	UL 248	UL, CSA
Alt.	Cooper Bussmann	MCR W 5A	5A, 125Vac	UL 248	UL, CSA
DC fuse (F2, F3)	Littelfuse	257040.PXAP C	40A, 32Vdc	UL 275	UL
Alt.	Protectron	PTF 200-40A-SN	40A, 32Vdc	UL 248	UL
AVR transformer (for models of 1100VA) Bobbin	Chuan Shun / Qingdao Yunlu	430-0823	130°C	IEC 62040-1	Tested in equipment
	E I Dupont	101L	V-2, 130°C, Polyamide	UL 94	UL
AVR transformer (for models of 800VA) Bobbin	Chuan Shun / Qingdao Yunlu	430-0824	130°C	IEC 62040-1	Tested in equipment
	E I Dupont	101L	V-2, 130°C, Polyamide	UL 94	UL
PCB	Interchangeable	Interchangeable	V-0, 130°C	UL 796	UL
Battery for models of 800VA (RBC17)	GS YUASA	UP-RW1245P1	7.8Ah, 12Vdc	UL 1989	UL
Alt.	CSB	HR 1234W F2	8.5Ah, 12Vdc	UL 1989	UL
Alt.	B&B	HR1234W	4.25Ah, 12Vdc	UL 1989	UL
Alt.	Kung Long	WP1234W	8.0Ah, 12Vdc	UL 1989	UL

IEC 62040-1					
Clause	Requirement + Test		Result - Remark		Verdict
Object / part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity ¹⁾
Battery for models of 1100VA (APCRBC113)	B&B	SH1228W	3.5Ah, 12Vdc	UL 1989	UL
Alt.	Kung Long	WP7-12(28W)	7.0Ah, 12Vdc	UL 1989	UL
Alt.	LEOCH	LP12-7.0	7.0Ah, 12Vdc	UL 1989	UL
Alt.	CSB	GP 1272 F2 12V 28W	28W/Cell, 12Vdc	UL 1989	UL
NTC for all model	Thinking	NTSA0103FZ 729	10Kohm @ 25°C	IEC 62040-1	Tested in equipment
Supplementary information:					
1) Provided evidence ensures the agreed level of compliance. See OD-CB2039.					

- End of test report -



Photos

Report No. 453512

For model SX31K1CI; SX31K1CIy





Photos

Report No. 453512

(Socket outlet, type 876-0504)



Bottom side

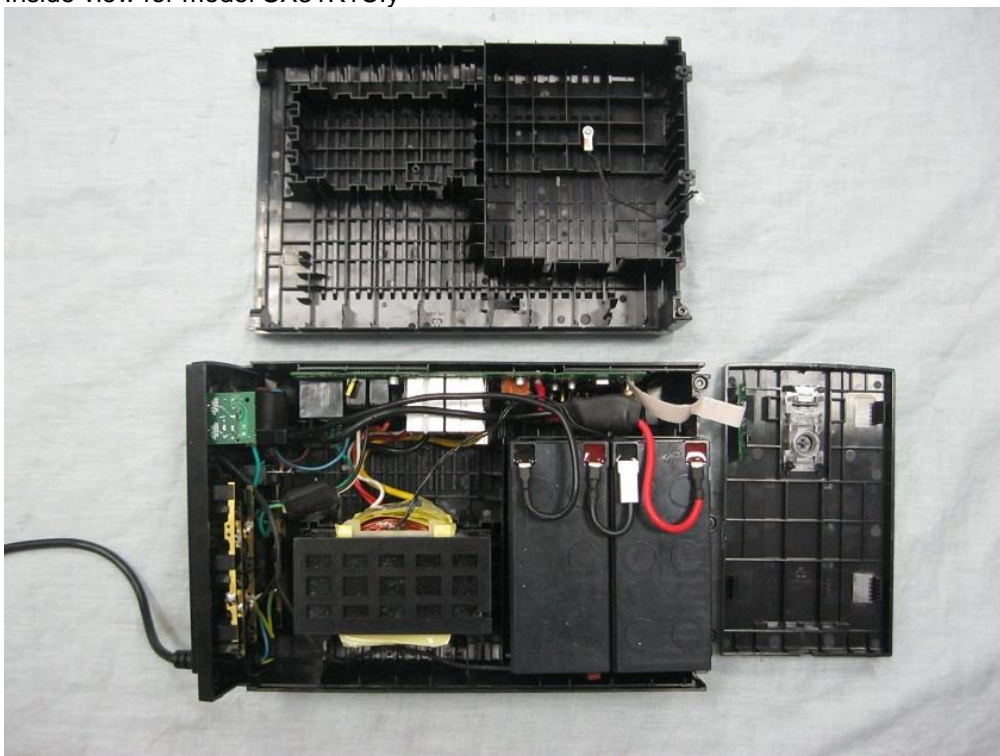




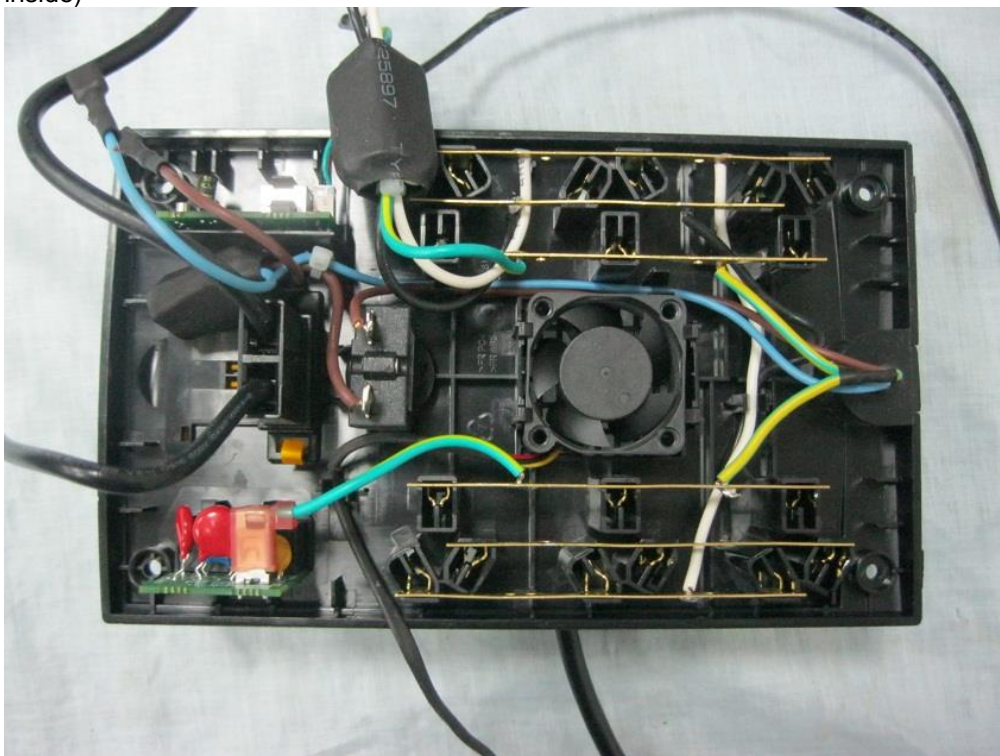
Photos

Report No. 453512

Inside view for model SX31K1Cly



Inside of rear enclosure (Socket outlet type 876-0478, USB board and TNV board inside)

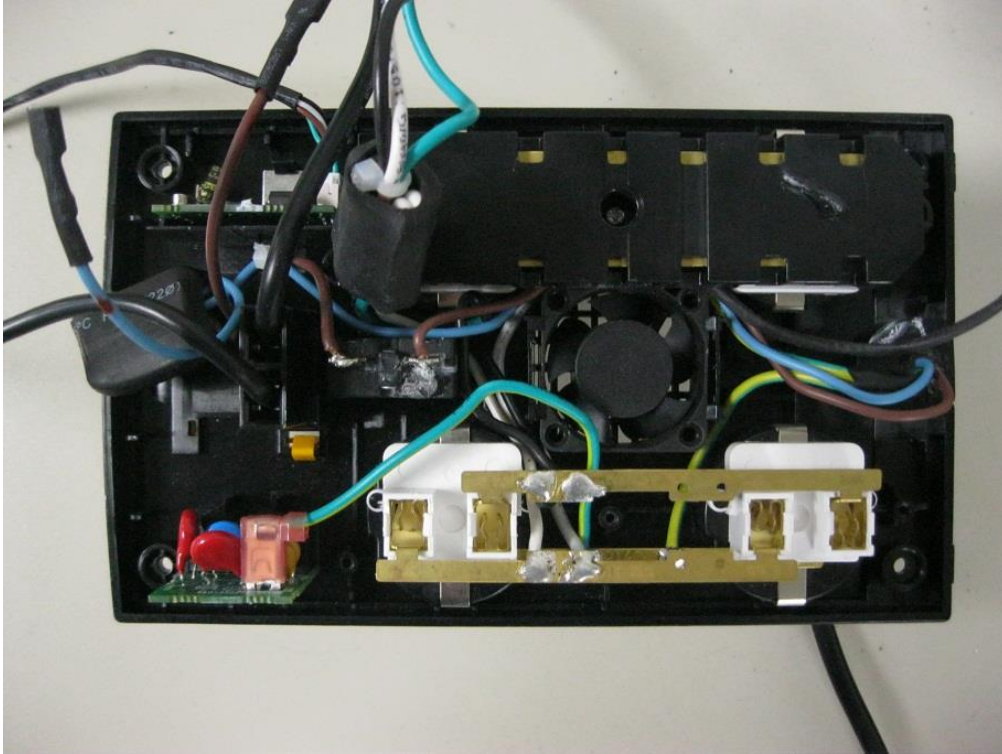




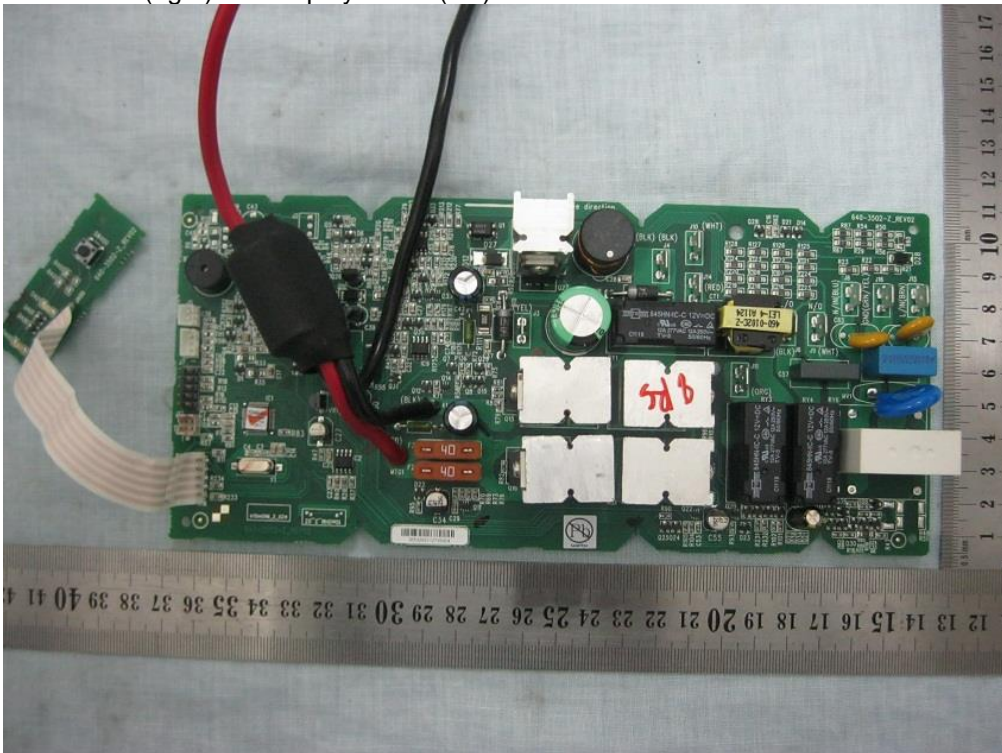
Photos

Report No. 453512

For model SX31K1CI; SX31K1CIy
(Socket outlet type 876-0504; Plastic cover of the lower socket outlet removed)



Main board (right) and display board (left)

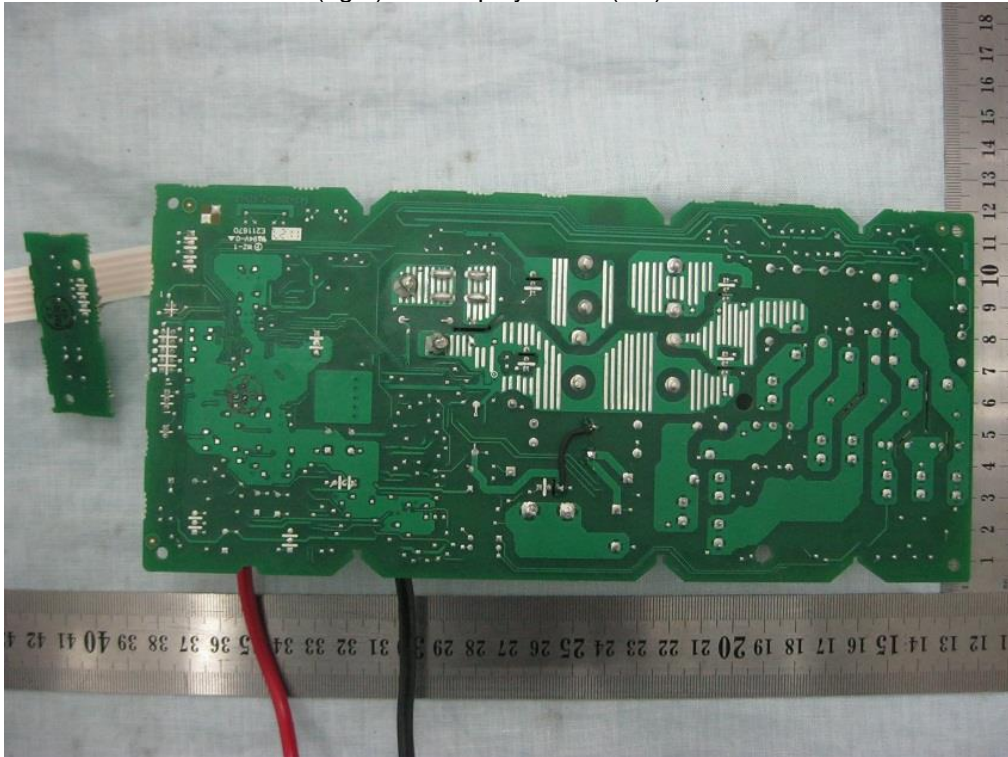




Photos

Report No. 453512

Solder side of Main board (right) and display board (left)



For model SX31K1CI; SX31K1CIy USB board (left) and TNV board (right)

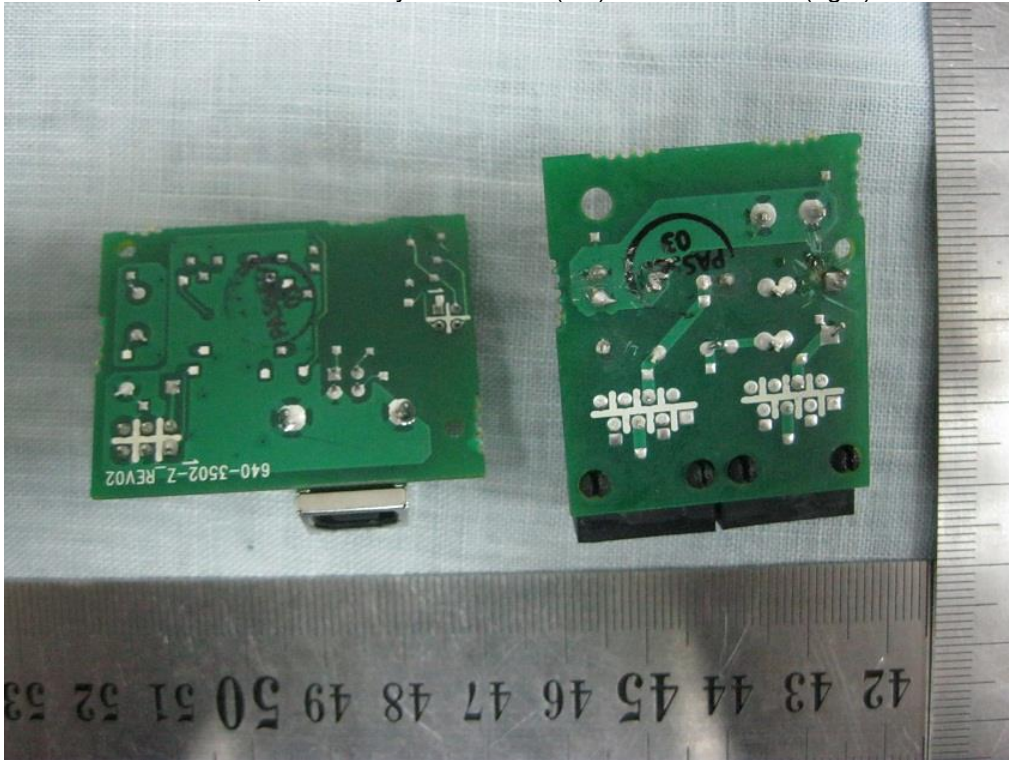




Photos

Report No. 453512

For model SX31K1CI; SX31K1CIy USB board (left) and TNV board (right)



For model SX31K1CI

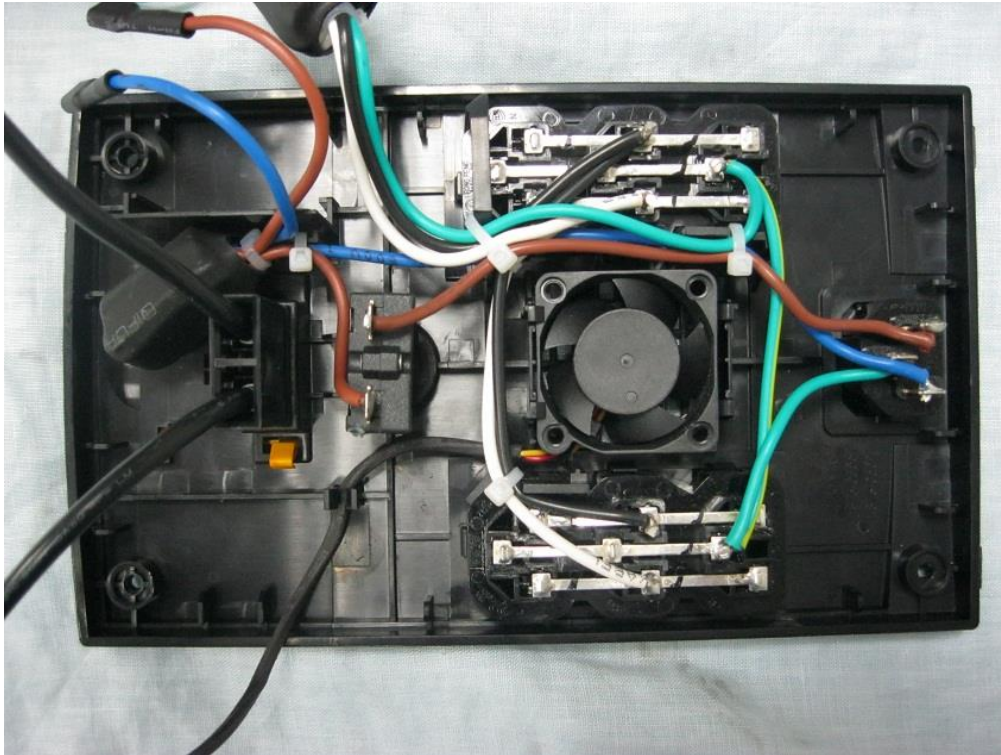




Photos

Report No. 453512

Inside of rear enclosure



For model SX3800Cly

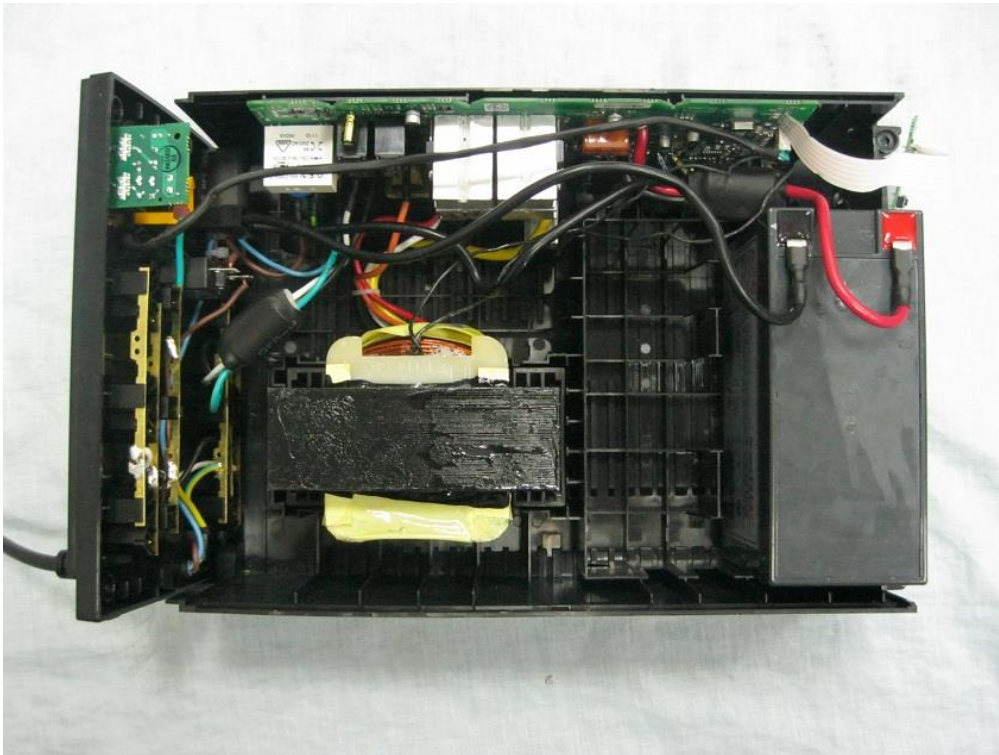




Photos

Report No. 453512

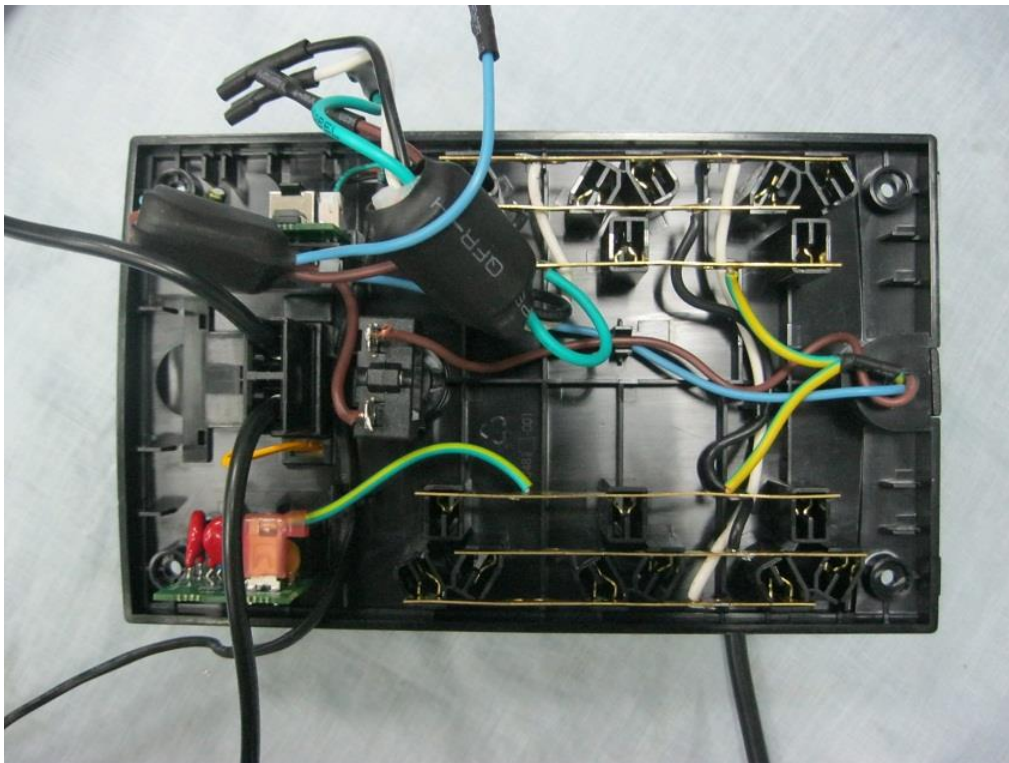
For model SX3800Cly





Photos

Report No. 453512



For model SX3800CI

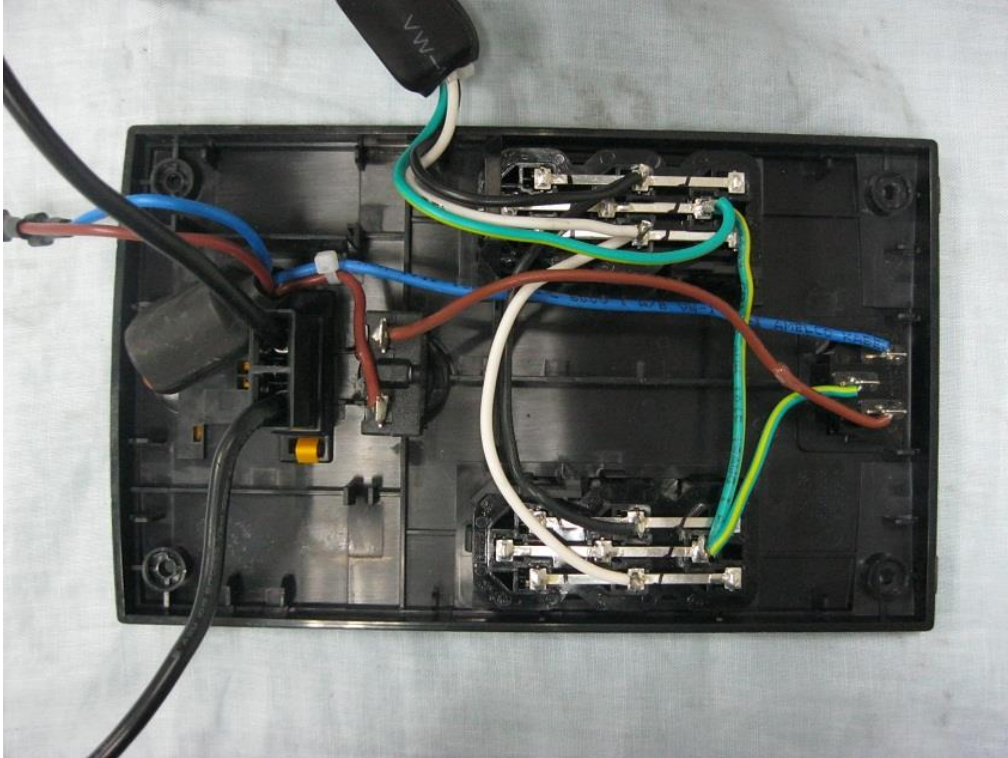




Photos

Report No. 453512

Inside of rear enclosure



For models: SX31K1CI





Photos

Report No. 453512

For models: SX31K1CI



For model SX31K1CI-FR (rear view)





Photos

Report No. 453512

For model SX31K1CI-GR (rear view)



Model SX31K1CI-FR (rear view)





Photos

Report No. 453512

For model SX31K1CI-GR (rear view)



For model SX31K1CI-AZ (rear view)





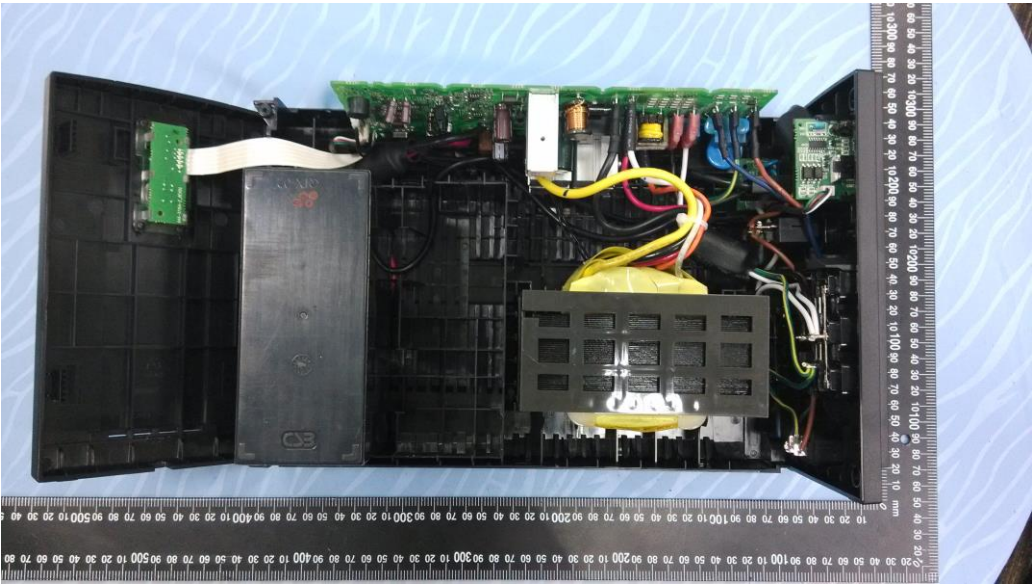
Photos

Report No. 453512

For model SX31K1CI-AZ (rear view)



Inside of model SX31K1CI

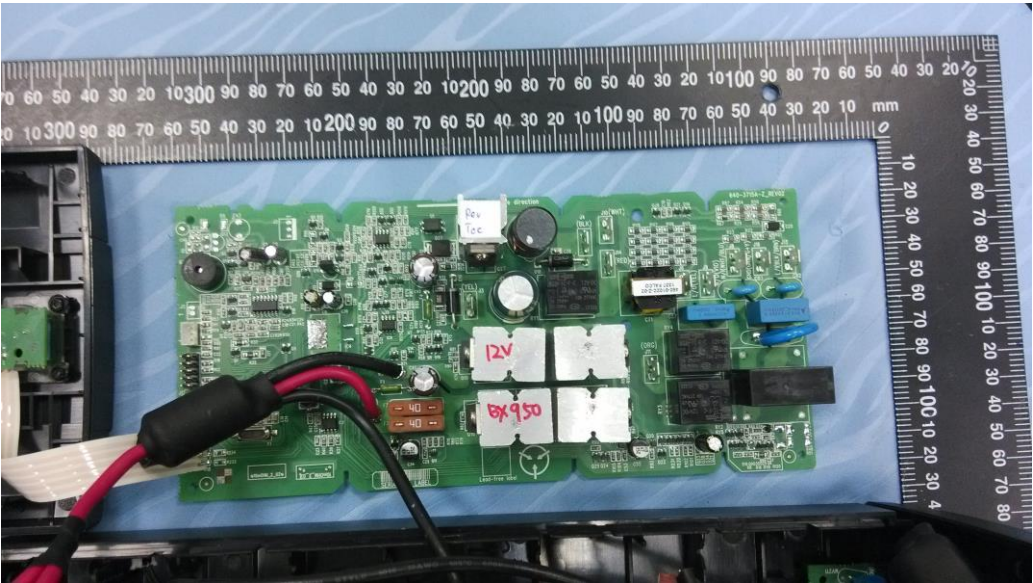




Photos

Report No. 453512

Main board

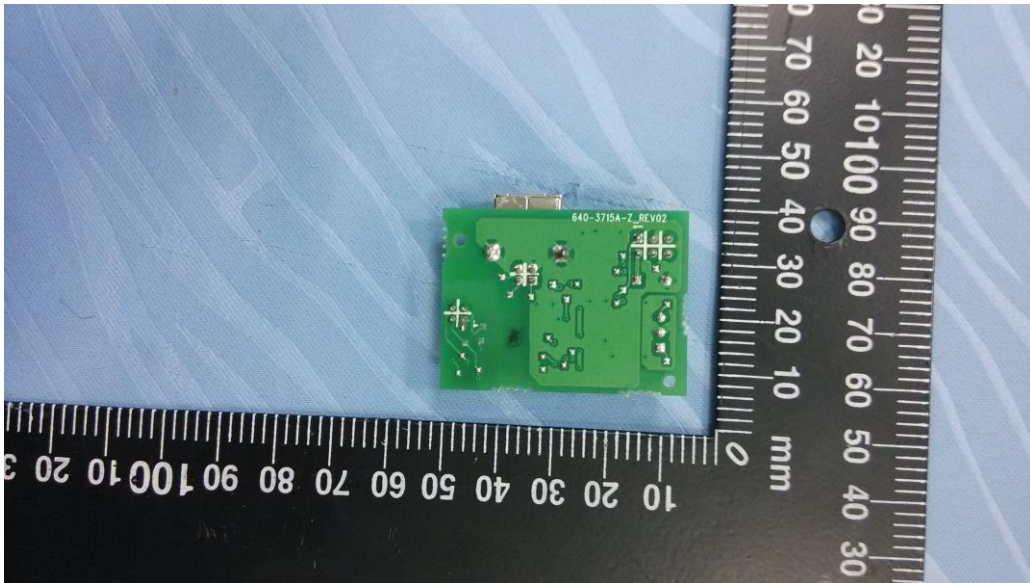
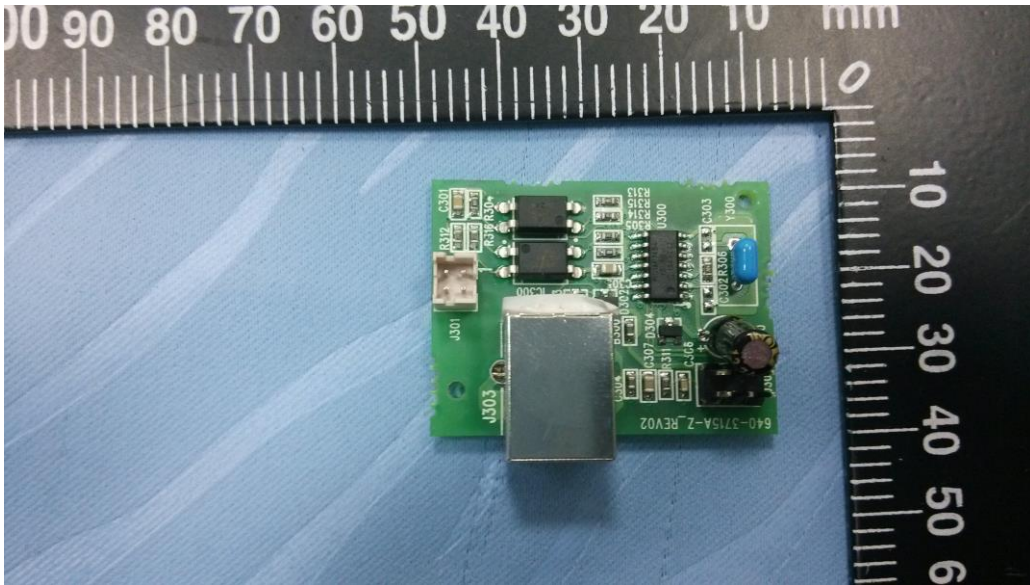




Photos

Report No. 453512

USB board

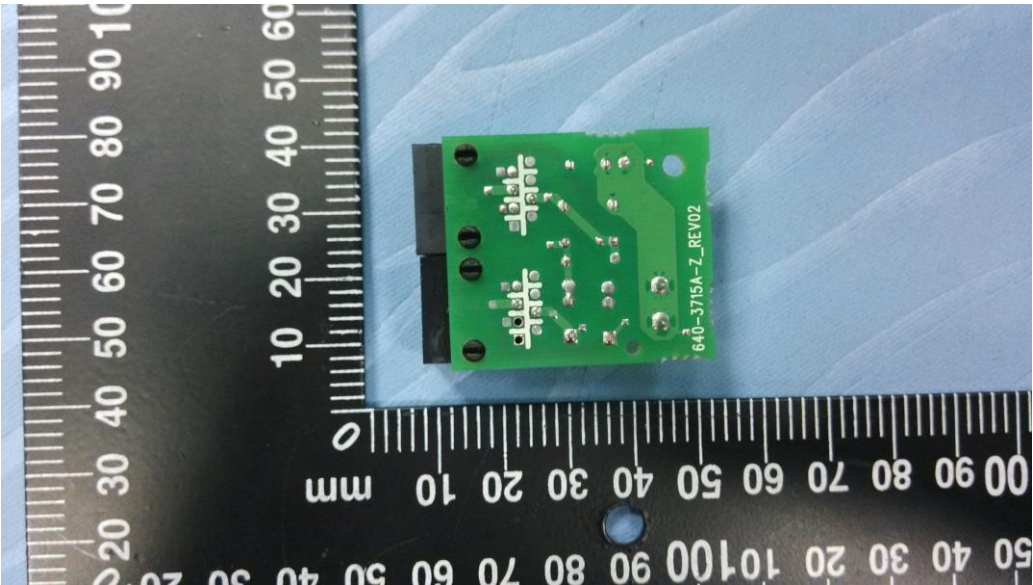
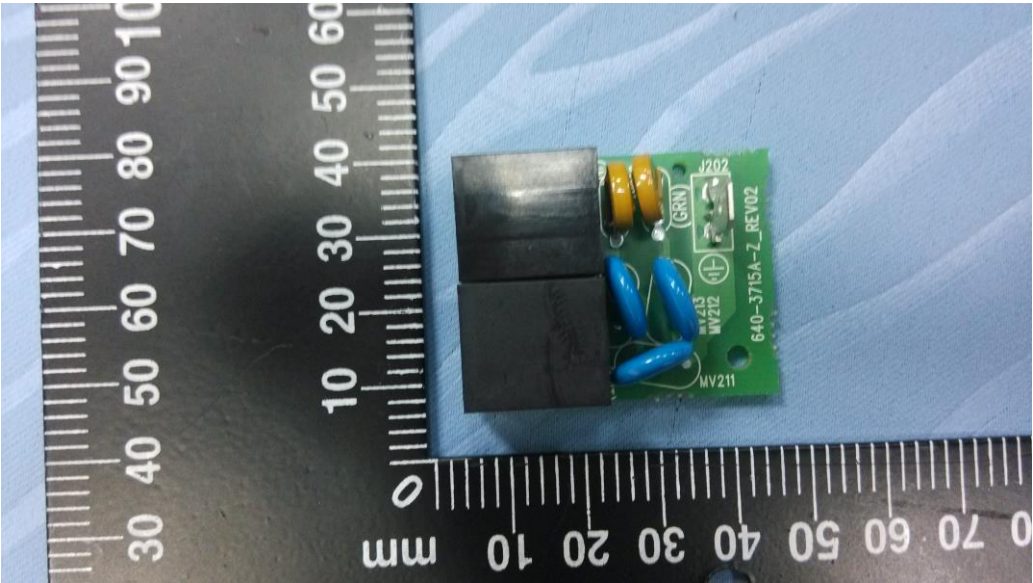




Photos

Report No. 453512

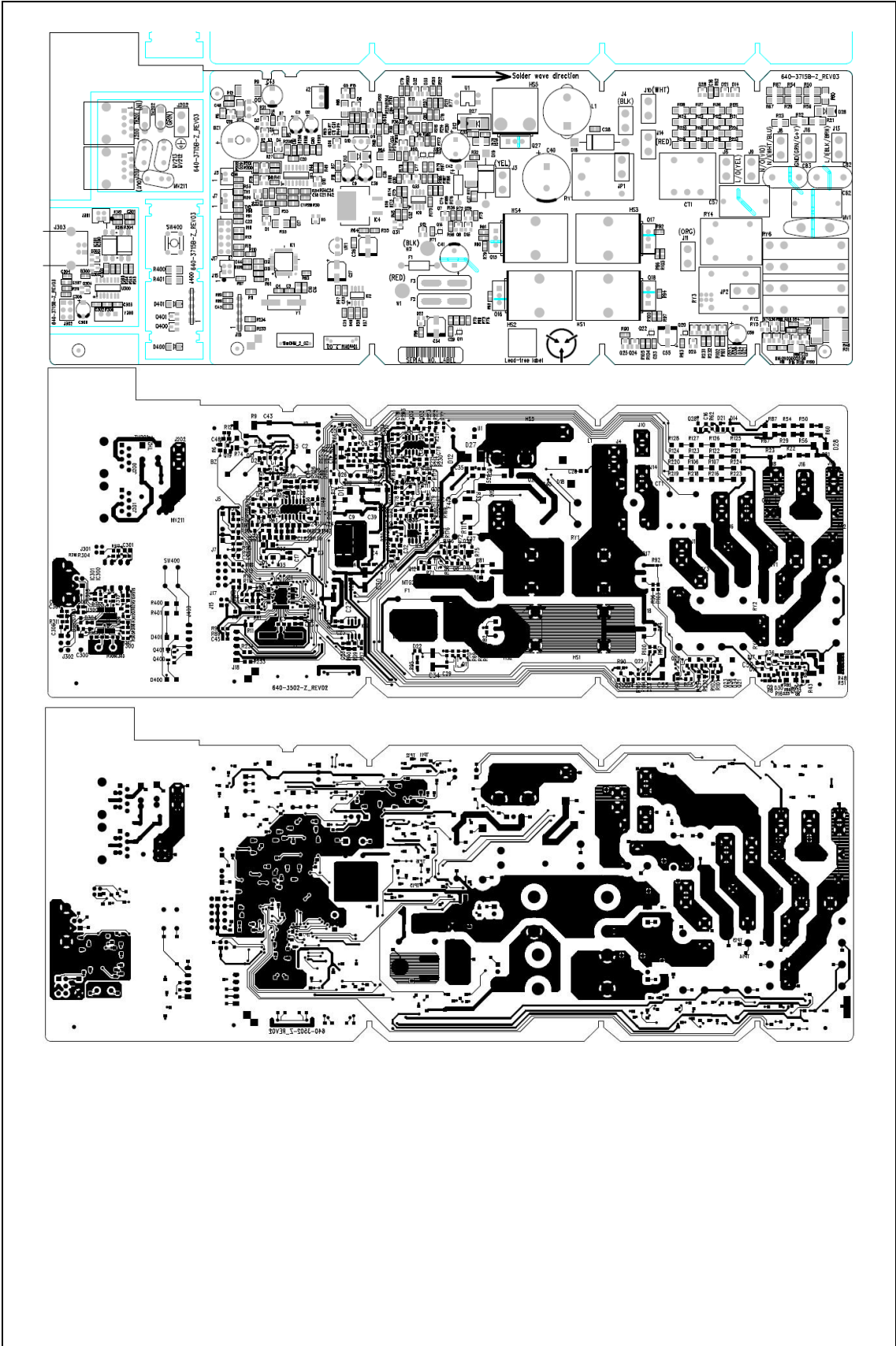
TNV board (optional)





PCB layout

Report No. 453512



IEC62040_1E - Attachment			
Clause	Requirement + Test	Result - Remark	Verdict
ATTACHMENT TO TEST REPORT IEC 62040_1E AUSTRALIAN NATIONAL DIFFERENCES Uninterruptible power systems (UPS) Part 1: Safety requirements			
Differences according to : AS 62040.1:2019			
TRF template used:..... : IEC EE OD-2020-F3, Ed. 1.1			
Attachment Form No. : AU_ND_IEC62040_1E			
Attachment Originator : JAS-ANZ			
Master Attachment..... : 2021-03-21			
Copyright © 2021 IEC System for Conformity Testing and Certification of Electrical Equipment (IECEE), Geneva, Switzerland. All rights reserved.			
	National Differences		
Appendix ZA	Variations to IEC 62040-1:2017 for Australia (Normative)		P
ZA.1	This appendix lists the normative variations to IEC 62040-1:2017		P
ZA.2	Variations		P
2	1. After the first paragraph, <i>add</i> the following: The Australian or Australian/New Zealand Standards listed below are modified adoptions of, or not equivalent to, IEC normative references and are required for the application of this Standard. All references in the source text to those IEC normative references shall be replaced by references to the corresponding Australian or Australian/New Zealand Standards. Australian or Australian/New Zealand Standards that are identical adoptions of international normative references may be used interchangeably.		P
	2. Delete "IEC 60950-1:2005, Information technology equipment — Safety — Part 1: General requirements" and replace with the following: AS/NZS 60950.1:2015, Information technology equipment — Safety, Part 1: General requirements (IEC 60950-1, Ed. 2.2 (2013), MOD) or AS/NZS 62368.1:2018 Audio/video, information and communication technology equipment Part 1: Safety requirements (IEC 62368-1:2014 (ED. 2.0) MOD)		P
	Is AS/NZS 60950.1:2015 or AS/NZS 62368.1:2018 applicable to this product		P
	If Yes, is a test report supplied and reviewed with this report		P
	3. Delete "IEC 61008-1, Residual current operated circuit-breakers without integral overcurrent protection for household and similar uses (RCCBs) — Part 1: General rules" and replace with the following: AS/NZS 61008.1, Residual current operated circuit-breakers without integral overcurrent protection for household and similar uses (RCCBs), Part 1: General rules (IEC 61008-1, Ed. 3.2 (2013) MOD)		N/A
	Is AS/NZS 61008.1 applicable to this product		N/A

IEC62040_1E - Attachment			
Clause	Requirement + Test	Result - Remark	Verdict
	If Yes, is a test report supplied and reviewed with this report.		N/A
	4. After "IEC 61009-1, Residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBOs) — Part 1: General rules" add the following: AS/NZS 61009.1, Residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBOs), Part 1: General rules (IEC 61009-1, Ed. 3.2 (2013) MOD)		N/A
	Is AS/NZS 61008.1 applicable to this product		N/A
	If Yes, is a test report supplied and reviewed with this report.		N/A
	Special national conditions (if any)		
	NIL		