








Test Report issued under the responsibility of:



TEST REPORT IEC 62040-1 Uninterruptible power systems (UPS) – Part 1: General and safety requirements for UPS	
Report Number. :	291902-TL4-1 CB DE1-66759
Date of issue..... :	2022-09-02
Total number of pages	107
Name of Testing Laboratory preparing the Report	VDE Prüf- und Zertifizierungsinstitut GmbH VDE Testing and Certification Institute
Applicant's name..... :	APC by Schneider Electric
Address..... :	Boston ONE Campus; 800 Federal Street; Andover MA 01810-1067; USA
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	
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Test item description..... :	Uninterruptible power supply Uninterruptible power supply			
Trade Mark..... :	 or  or 			
Manufacturer..... :	APC by Schneider Electric Boston ONE Campus; 800 Federal Street; Andover MA 01810-1067; USA			
Model/Type reference..... :	SMT1500RMI1U			
Ratings..... :	See table below			
Model/Type reference:		Rating(s):		
SMT1500RMI1U		Input:	220-240V AC, 50/60 Hz, 7.25 A, 1P+N+PE	
		Output:	220-240V AC, 50/60 Hz, 1.5 kVA, 1.0 kW, 6.8 A max.	
		Ambient:	40 °C	Class: I

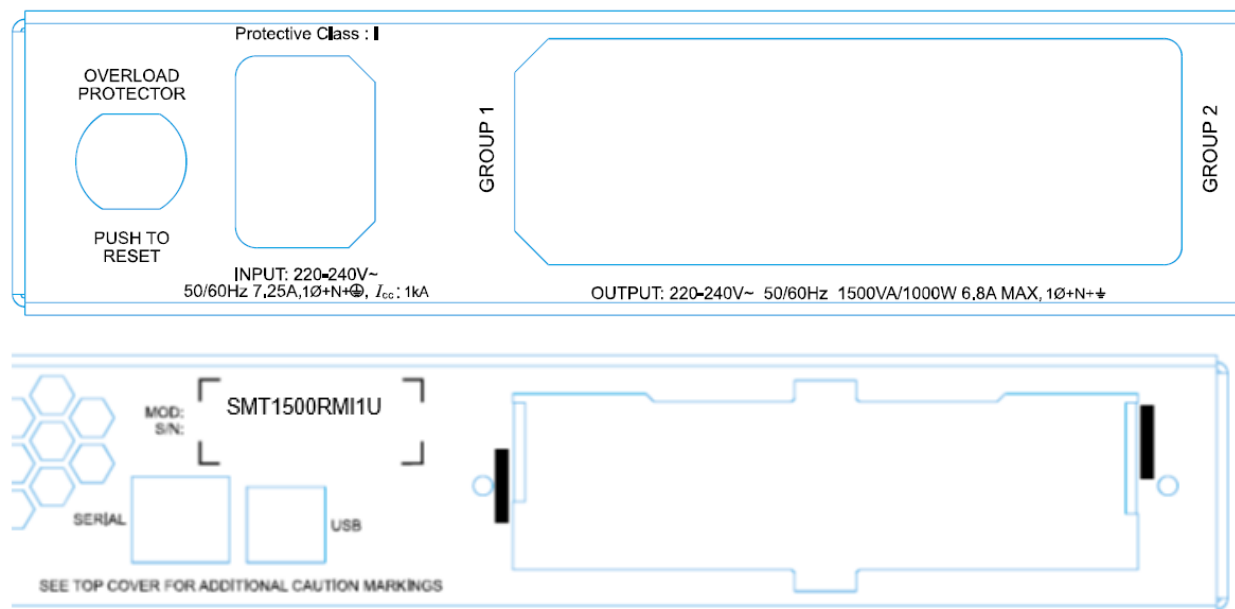
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
<input checked="" type="checkbox"/>	CB Testing Laboratory:	VDE Prüf- und Zertifizierungsinstitut GmbH <i>VDE Testing and Certification Institute</i>
Testing location/ address		Merianstraße 28, 63069 Offenbach, Germany
<input type="checkbox"/>	Associated CB Testing Laboratory:	
Testing location/ address		
Tested by (name, function, signature)		H. Kreuzer (Authorization of test report) Testing engineer 
Approved by (name, function, signature) ..		J. Bärwinkel Technical Certification Officer 
<input type="checkbox"/>	Testing procedure: CTF Stage 1:	
Testing location/ address		
Tested by (name, function, signature)		(Authorization of test report) Testing engineer
Approved by (name, function, signature) ..		Technical Certification Officer
<input type="checkbox"/>	Testing procedure: CTF Stage 2:	
Testing location/ address		
Tested by (name + signature)		Testing engineer
Witnessed by (name, function, signature) ..		(Authorization of test report) Witnessed
Approved by (name, function, signature) ..		Technical Certification Officer
<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):		
Appendix No.	Description	Page(s)
1	Photographs	2
Summary of testing: <p>For the standards update, the construction of the present appliances and the associated component list were examined and compared with the existing documents.</p> <p>It was found that there is compliance with the requirements of DIN EN IEC 62040-1 (VDE 0558-510):2020 and DIN EN IEC 62040-1/A11 (VDE 0558-510/A11):2021 and therefore no additional tests, except for Impulse Voltage Test of 5.2.3.2. are necessary.</p>		
Tests performed (name of test and test clause): <p>Alternative for Impulse Voltage Test an a.c. voltage test according to 5.2.3.3 was performed.</p> <p>All other applicable tests were performed by previous investigation under VDE file: 1924400-3335-0063.</p>		Testing location: <p>VDE Testing and Certification Institute Merianstraße 28, 63069 Offenbach, Germany</p> <p>Refer to previous test reports under VDE file: 1924400-3335-0063 (see Test Report History)</p>
Summary of compliance with National Differences (List of countries addressed): <p><input checked="" type="checkbox"/> The product fulfils the requirements of DIN EN IEC 62040-1 (VDE 0558-510):2020 EN IEC 62040-1:2019 DIN EN IEC 62040-1/A11 (VDE 0558-510/A11):2021 EN IEC 62040-1:2019/A11:2021</p> <p>DIN EN 62040-1 (VDE 0558-510):2013-11 EN 62040-1:2008 + A1 May2013 IEC 62040-1:2008 (First Edition) + Am 1:2013</p> <p><input checked="" type="checkbox"/> The product fulfils the requirements of EN IEC 62040-1:2017 + AMD 2021</p>		

Test Report History:			
This report may consist of more than one report and is valid only with additional or previous issued reports: VDE license: 40036317, VDE file ref. No. 1924400-3335-0063			
Date:	CB-Ref No.:	Test Report Number	Modifications:
2022-09-02	DE1-66759	291902-TL4-1	Upgrade test (this) report to IEC 62040-1:2017, IEC 62040-1:2017/AMD1:2021 DIN EN IEC 62040-1(VDE 0558-510):2020 EN IEC 62040-1:2019 DIN EN IEC 62040-1/A11(VDE 0558-510/A11):2021 EN IEC 62040-1:2019/A11:2021
2017-10-20	DE1-50794/A2	243303-CI3-1	Additional test report. Update of the critical component list. No safety relevant changings. Cancel factory location: AMERICAN POWER CONVERSION CORPORATION (A.P.C.) B.V. 2nd Street, PEZA, Cavite Economic Zone 4106 ROSARIO, CAVITE PHILIPPINES
2015-11-10	DE1-50794/A1	215749-CI3-1	Additional test report Upgrade Test Report Uninterruptible Power Supply (UPS) upgrade to DIN EN 62040-1 (VDE 0558-510):2013-11 EN 62040-1:2008 + A1 May2013 IEC 62040-1:2008 (First Edition) + Am1:2013
2012-11-29	DE1-50794/A1	1924400-3335-0063/172100	Test Report (original report) Uninterruptible Power Supply (UPS) tested to DIN EN 62040-1 (VDE 0558-510):2009-06 EN 62040-1:2008 IEC 62040-1:2008 (1st Edition)

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.

**APC™**

UNINTERRUPTIBLE POWER SUPPLY



CONTAINS SEALED NON SPILLABLE LEAD-ACID BATTERIES.

MUST BE RECYCLED



WARNING: This is a category C2 UPS product. In a residential environment, this product may cause radio interference, in which case the user may be required to take additional measures.

CAUTION: Batteries may cause chemical hazard, electrical shock, and energy hazard. Refer to user manual for details of the maintenance, handling and disposal requirements for batteries.

For use in a controlled environment.

Refer to manual for environmental conditions.

UK
CA

EAC

CE



Schneider Electric Industries SAS
35 rue Joseph Monier Rueil Malmaison - 92500, France

885-6339C

Test item particulars	
Classification of installation and use.....	<input type="checkbox"/> Ordinary Person <input checked="" 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 <input type="checkbox"/> non-detachable power supply cord
Environmental category.....	<input checked="" type="checkbox"/> indoor <input type="checkbox"/> unconditional <input type="checkbox"/> conditional <input type="checkbox"/> outdoor
Equipment mobility.....	<input type="checkbox"/> movable <input checked="" 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 / +6 %
Tested for power systems	No
IT testing, phase-phase voltage (V)	--
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)	16 A
Pollution degree (PD).....	<input type="checkbox"/> PD1 <input checked="" type="checkbox"/> PD2 <input type="checkbox"/> PD3
IP protection class	IP20
Elevation during operation (m)	≤ 3000 m
Elevation of test laboratory (m)	≤ 2000 meter
Mass of equipment (kg)	>18 Kg
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.....	: 2022-05-11
Date (s) of performance of tests	: 2022-08-29

General remarks:

"(See Enclosure #)" refers to additional information appended to the report.

"(See appended table)" refers to a table appended to the report.

Throughout this report a ☐ comma / ☒ point is used as the decimal separator.

Conformity statement:

☒ Conformity statement is decided in accordance with IEC Guide 115, Procedure 2 (Accuracy method).

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").

☐ Other: (to be specified, for example when required by the standard or client, or if national accreditation requirements apply)

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.

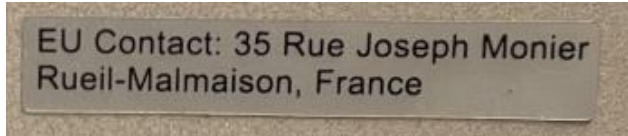
Calculations leading to the reported values are on file with the NCB and testing laboratory that conducted the testing.

Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:

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.....:

☒ **Yes**
☐ **Not applicable**

When differences exist; they shall be identified in the General product information section.

Name and address of factory (ies)..... :	AMERICAN POWER CONVERSION; CORPORATION (A.P.C.) B.V.; Lot 3, Block 14, Phase III, PEZA; 4106 ROSARIO, CAVITE; Philippines / Reference 30006747 Danam Philippines, Inc; Lot 1-A Block 15, Phase III; 4106 PEZA, Rosario, Cavite; Philippines / Reference 30017547 AMERICAN POWER CONVERSION; CORPORATION (A.P.C.) B.V.; Lot 10, Block 16, Phase IV,; 4106 PEZA, ROSARIO, CAVITE; Philippines / Reference 30006759 International Precision; Assemblies, Inc.; Blk 17, Lot 2 Phase IV, CEPZA Rosario; 4106 Cavite; Philippines / Reference 30020614
In accordance with " § 6 of the German Product Safety Act (ProdSG) ", the manufacturers have to indicate their name and contact address on the consumer product or, where that is not possible, on its packaging. If the manufacturer is not domiciled in the European Economic Area (EEA), the name and the contact address of the authorised person(s) within the EEA or importer must be indicated.	<div> <input checked="" type="checkbox"/> Pass (see picture) <input type="checkbox"/> Fail <input type="checkbox"/> Not applicable </div> <div>  </div>

General product information and other remarks:

The units are suitable for a maximum manufacturer's recommended ambient operating temperature (Tma) of 40 °C.

Unit is designed and approved for use in installation category II.

Unit intended for continuous operation while charging.

Unit could be used as rack mounted version.

Creepage and Clearance are evaluated as per altitude level $\leq 3000\text{m}$.

VDE approved appliance inlets and outlets are used.

Conditions of Installation: The UPS is Class 1 and designed for Pollution Degree 2 and intended to use TN power system.

1. Main PCB used

Functional board	Identification number	Layout
Main Power Board	640-1318x	Primary + Earthing + DVC A

2. Components cross insulation

Functional board	Isolation components	Required Insulation
Main Power Board	IC426, IC423, T400	Reinforced insulation

3. Classification of interfaces

Serial port and USB Type B are accessible and classified as DVC A circuit. No TNV circuits existed in the unit.

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
4	Protection against hazards		P
4.1/RD	General		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 Table 4.2/RD to 4.3/RD	P
5.2.4.6.1 /RD	Load conditions		P
5.2.4.6.2 /RD	Application of short circuit or open-circuit		P
5.2.4.6.3 /RD	Test sequence		P
4.3	Short-circuit and overload protection	See Table 4.2/RD to 4.3/RD	P
4.3.1/RD	General	Protective devices provided and stated in manual have sufficient quantity and location to detect and interrupt fault current.	P
4.3.2/RD	Specification of input short-circuit withstand strength and output short circuit current ability	Specified in User manual	P
4.3.2.1/RD	General		P
	The interrupting capability of the overcurrent protective device shall be equal or greater than the prospective short circuit current of the mains supply.	Rated 16A circuit breaker.	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.	Short circuit backup protection provided.	P
	For permanently connected equipment or pluggable equipment type B, it is permitted for short circuit backup protection to be in the building installation.		N/A
4.3.2.2/RD	Input ports short-circuit withstand strength		P
	For co-ordination and selection of internal or external protective devices, the PECS manufacturer shall specify: - a maximum allowable prospective short circuit current for each input port of the PECS; and -a minimum required prospective short circuit current in order to ensure proper operation of the protective device.		P
	If external protective devices are specified or provided the characteristics of those shall be specified by the manufacturer.		P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
4.3.2.3/RD	Output short circuit current ability	Refer below	P
	<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.</p> <p>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.</p> <p>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.</p>	<p>Internal electronic output short circuit protection provided.</p> <p>See Table 4.2/RD to 4.3/RD</p>	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)		N/A
	<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.</p> <p>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.</p>		N/A
	Compliance shall be checked by inspection and by the tests of 5.2.4.4/RD and 5.2.4.5/RD.		N/A
4.3.4/RD	Protection by several devices		N/A
	<p>Where protective devices that require manual replacement or resetting are used in more than one pole of a supply to a given load, those devices shall be located together. It is permitted to combine two or more protective devices in one component.</p> <p>Compliance shall be checked by inspection.</p>		N/A
4.3.101	AC input current	The input current to the UPS shall not exceed that declared by the UPS manufacturer.	P
4.3.102	Transformer protection	See Table 4.2/RD to 4.3/RD	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
4.3.103	AC input short-circuit current	Single input port provided and have specify the lcc rating by manufacturer.	P
4.3.104	Protection of the energy storage device	No such protective device provided to Internal battery and external battery cabinet	N/A
4.3.105	Unsynchronized load transfer	No such load used	N/A
4.4	Protection against electric shock		P
4.4.1/RD	General		P
4.4.2/RD	Decisive voltage class		P
4.4.2.1/RD	General		P
4.4.2.2/RD	Determination of decisive voltage class	DVC A considered	P
4.4.2.2.1/RD	General		P
	For protection against the ventricular fibrillation body reaction, DVC can be selected from Table 2.	DVC A considered	P
4.4.2.2.2 4.4.2.2.2/RD	Selection tables for contact area and skin humidity condition	Hand and Dry	P
4.4.2.2.3/RD	Limits of the working voltage for the DVC	30V RMS, 42.4Vpeak or 60V DC	P
4.4.2.3/RD	Requirements for protection against electric shock		P
4.4.3/RD	Provision for basic protection		P
4.4.3.1/RD	General		P
4.4.3.2/RD	Protection by means of basic insulation of live parts		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.	Live parts surrounded by mylar sheet	P
	Basic insulation may be provided by solid insulation or air clearance.	See table 4.4.7.4/RD to 4.4.7.5/RD for details.	P
	The insulation shall be rated according to the impulse voltage, temporary overvoltage or working voltage (see 4.4.7.2.1/RD), whichever gives the most severe requirement. It shall not be possible to remove the insulation without the use of a tool or key.		P
4.4.3.3	Openings	Top/bottom: no openings Rear & Front: many hexagon opening, no hazards exited inwards 5° projections. Left/right: No openings	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
4.4.3.4/RD	Protection by means of limitation of touch current and charge	No such protection	N/A
	The limitation of touch current and discharge energy shall not exceed: <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. 		N/A
4.4.3.5/RD	Protection by means of limited voltage		N/A
	The voltage between simultaneously accessible parts shall not be greater than DVC As as determined in 4.4.2.2/RD.		N/A
4.4.4/RD	Provision for fault protection		P
4.4.4.1/RD	General		P
	Fault protection shall be provided by one or more of the following measures: <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. Fault protection shall be independent and additional to those for basic protection.	See sub-clauses for details	P
4.4.4.2/RD	Protective equipotential bonding		P
4.4.4.2.1 /RD	General	Metal enclosure used	P
	Protective equipotential bonding shall be provided between accessible conductive parts of the equipment and the means of connection for the PC conductor, except: <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 metal chassis connected to PE conductor	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Electrical contact to the means of connection of the PE conductor shall be achieved by one or more of the following means: <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. 	All means considered	P
4.4.4.2.2 /RD	Rating of protective equipotential bonding		P
	Protective equipotential bonding shall either be: <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>	considered and comply	P
4.4.4.3/RD	PE conductor		P
4.4.4.3.1 /RD	General		P
	A PE conductor shall be connected at all times when power is supplied to the PECS, unless the PECS complies with the requirements of protective class II (see 4.4.6.3/RD) or protective class III. Unless local wiring regulations state otherwise, the PE conductor cross-sectional area shall be determined from Table 7 or by calculation according to 543.1 of IEC 60364-5-54:2011.	Class I equipment. PE conductor is included in the Power supply.	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.	PE conductor is the last connection removed during the disconnection.	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	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: <ul style="list-style-type: none"> • 2,5 mm² if mechanical protection is provided; or • 4 mm² if mechanical protection is not provided. 	PE conductor formed part of the supply cable.	N/A
	Provisions within cord-connected equipment shall be made so that the PE conductor in the cord shall, in the case of failure of the strain-relief mechanism, be the last conductor to be interrupted. For special system topologies, the PECS designer shall verify the PE conductor cross-section required.		P
4.4.4.3.2 /RD	Means of connection for the PE conductor	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.	Power coated sheet metal is used for metal chassis.	P
4.4.4.3.3 /RD	Touch current in case of failure of PE conductor	See below	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>For all other PECS, one or more of the following measures shall be applied, unless the touch current can be shown to be less than the limits specified in 4.4.3.4:</p> <p>a) Use of a fixed connection and</p> <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; <p>or</p> <p>b) Use of a pluggable type B connection with a minimum PE conductor cross-section of 2,5 mm² as part of a multi-conductor power cable. Adequate strain relief shall be provided.</p>	The measured values are within the limits specified in 4.4.3.4/RD	P
	Compliance is checked by inspection and by test of 5.2.3.7/RD.	See table 4.4.4.3.3/RD for details	P
4.4.4.4/RD	Automatic disconnection of supply		P
	<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>	Wall circuit breaker considered as automatic disconnection of supply.	P
4.4.4.5/RD	Supplementary insulation	Considered	N/A
4.4.4.6/RD	Simple separation between circuits	Suitable insulation provided	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>		P
4.4.4.7/RD	Electrically protection	No such protection provided	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Electrically protective screening interposed between hazardous live parts of a PECS, shall consist of a conductive screen connected to the protective equipotential bonding of the PECS whereby the screen is separated from live parts by at least simple separation. The protective screen and the connection to the protective equipotential bonding system of the PECS and that interconnection shall comply with the requirements of 4.4.4.2/RD.		N/A
4.4.5/RD	Enhanced protection		P
4.4.5.1/RD	General		P
	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 sub-clauses for details	P
4.4.5.2/RD	Reinforced insulation		P
	Reinforced insulation shall be so designed as to be able to withstand electric, thermal, mechanical and environmental stresses with the same reliability of protection as provided by double insulation. (basic insulation and supplementary insulation, see 4.4.3.2/RD and 4.4.4.5/RD)	See table 4.4.7.4/RD to 4.4.7.5/RD for details	P
4.4.5.3/RD	Protective separation between circuits	Same as above	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. 	Same as above	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)	Opto-couplers and isolation transformers provided	P
4.4.5.4/RD	Protection by means of protective impedance	No such construction used	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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.		N/A
	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.		N/A
	Compliance with the requirement for the limitation of touch current is checked by test of 5.2.3.6/RD.		N/A
	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.		N/A
4.4.6/RD	Protective measures	See below	P
4.4.6.1/RD	General		P
4.4.6.2/RD	Protective measures for protective class I equipment	Protective class 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.		P
4.4.6.3/RD	Protective measures for protective class II equipment	Protective class I equipment	N/A

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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>		N/A
4.4.6.4/RD	Protective measures for protective class III equipment or circuits	Protective class I equipment	N/A
4.4.6.4.1 /RD	General		N/A

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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	PELV/SELV ports only connected to PELV/SELV ports with equal or lower voltage than DVC As which consider without additional evaluation.	P

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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>	Same as above	P
4.4.7/RD	Insulation		P
4.4.7.1/RD	General		P
4.4.7.1.1 4.4.7.1.1 /RD	Influencing factors		P
	This subclause gives minimum requirements for insulation, based on the principles of IEC 60664.		P
	<p>Insulation shall be selected after consideration of the following influences:</p> <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. 	See sub-clauses 4.4.7.1.2 to 4.4.7.1.7 for details.	P

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

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Clause	Requirement + Test	Result - Remark	Verdict
	<p>Four categories are considered.</p> <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. 	OVC II considered.	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.	No reduction considered.	N/A
	<p>As a minimum, the UPS shall be suitable for installation in environments presenting overvoltage categories listed in Table 102.</p> <p>For UPS units designed to be part of a parallel configuration, the current to be considered in Table 102 is that provided by the parallel configuration.</p>	OVC II considered.	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.	No reduction considered.	N/A
4.4.7.1.4 /RD	Supply system earthing		P

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Clause	Requirement + Test	Result - Remark	Verdict
	<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. 	TN or TT system considered.	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>	2500V considered.	P
4.4.7.1.6 /RD	Determination of the system voltage		P
4.4.7.1.6.1 /RD	For mains supply	220-240 V	P
4.4.7.1.6.2 /RD	For non-mains supply		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 4.4.7.1.7 /RD	Components bridging insulation		P
	Components bridging insulation shall comply with the requirements of the level of insulation (e.g., basic, reinforced, double) they are bridging.	Complied	P

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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	X and Y capacitors complied with IEC 60384-14	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	TN or TT power distribution system	N/A
4.4.7.2/RD	Insulation to the surroundings		P
4.4.7.2.1 /RD	General		P
4.4.7.2.2 4.4.7.2.2 /RD	Circuits connected to mains supply		P
	Insulation between the surroundings and circuits which are connected directly to the mains supply shall be designed according to the impulse withstand voltage, temporary overvoltage, or working voltage, whichever gives the most severe requirement.		P
4.4.7.2.3 /RD	Circuits connected to non-mains supply	AC mains supply considered	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.	Same as above	N/A
	Temporary overvoltage on a non-mains supply shall be determined as follows: <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. 	Same as above	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	<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. 	Same as above	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>	Refer table 4.4.7	P
4.4.7.3/RD	Functional insulation	Same as above	P

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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>		P
4.4.7.4/RD	Clearance distance	Refer table 4.4.7.4	P
4.4.7.4.1 /RD	Determination	See Table 4.4.7.4/RD	P
	<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>	See Table 4.4.7.4/RD	P

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Clause	Requirement + Test	Result - Remark	Verdict
	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.	Same as above	P
4.4.7.4.2 /RD	Electric field homogeneity	No such field used	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>	Same as above	N/A
4.4.7.4.3 /RD	Clearance to conductive enclosure	See Table 4.4.7.4/RD	P
	The clearance between any non-insulated live part and the walls of a metal enclosure shall be in accordance with 4.4.7.4.1/RD during and following the deflection tests of 5.2.2.4.2/RD.	Same as above	P
	Compliance is checked by inspection and by test of 5.2.2.4.2/RD.	Same as above	P
	If the design clearance distance is at least 12,7 mm and the clearance distance required by 4.4.7.4.1/RD does not exceed 8 mm, the deflection tests may be omitted.	5.2.2.4.2/RD considered.	N/A
4.4.7.5/RD	Creepage distances	Refer table 4.4.7.4	P
4.4.7.5.1 /RD	Insulating material groups	Same as above	P
	Creepage distance requirements for PWBs exposed to pollution degree 3 environmental conditions shall be determined based on Table 11 pollution degree 3 under "Other insulators".	Pollution degree II used	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 material used	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
4.4.7.5.2 /RD	Determination	See Table 4.4.7.5/RD	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.	Same as above	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.	Same as above	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).	Same as above	P
4.4.7.6/RD	Coating	Coating not 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)	Same as above	N/A
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	P
	Decreased spacing for components mounted on PWB or decreased spacing on PWB are permitted when all the following are satisfied: <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). Decreased spacings for components assembled on PWB are permitted when used in: <ul style="list-style-type: none"> • pollution degree 1 or 2 environment; and • not more than overvoltage category I. In this case the manufacture specification may be used. Compliance is checked by inspection and by test of 5.2.4.7/RD if applicable.	Decreasing spacing not used.	N/A
4.4.7.8/RD	Solid insulation	See below	P
4.4.7.8.1 /RD	General	See below	P

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Clause	Requirement + Test	Result - Remark	Verdict
	Materials selected for solid insulation shall be able to withstand the stresses occurring. These include mechanical, electrical, thermal, climatic and chemical stresses which are to be expected in normal use. Insulation materials shall also be resistant to ageing during the expected lifetime of the PECS. Tests shall be performed on components and sub-assemblies using solid insulation, in order to ensure that the insulation performance has not been compromised by the design or manufacturing process.	Certified opto-coupler with min 0.4mm thickness used	P
4.4.7.8.2 /RD	Material requirements	Same as above	P
	The insulating material shall have a CTI of 100 or greater. The insulating material shall be suitable for the maximum temperature it attains as determined by the temperature rise test of 5.2.3.10/RD. Consideration shall be given as to whether or not the insulating material additionally provides mechanical strength and whether or not the part can be subject to impact during use.	Complied	P
	The insulating material in contact with live parts higher than DVC As shall comply with: • the glow-wire test described in 5.2.5.3/RD at a test temperature of 850 °C; or • the glow-wire test described in 5.2.5.3/RD, at a lower test temperature, 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 plastic material 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.	Certified plastic material used	N/A
	Where an insulating material is used in a PECS that incorporates switching contacts, and is within 12,7 mm of the contacts, it shall comply with the high current arcing ignition test of 5.2.5.2/RD.		N/A
	In case the manufacturer of the insulating material provides data to demonstrate compliance with the above requirements no further testing is required. No further evaluation is required when generic materials are used according to Table 12.	See critical component list for details.	P

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Clause	Requirement + Test	Result - Remark	Verdict
	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.	Same as above	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	P
	<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>	Same as above	P
4.4.7.8.3.2 /RD	Material thickness equal to or more than 0,2 mm	3 layer tape used	N/A
	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.	Same as above	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.	Same as above	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.	Same as above	N/A
	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.	Same as above	N/A
4.4.7.8.3.3 /RD	Material thickness less than 0,2 mm	See table 4.4.7/RD for details	P
	Basic or supplementary insulation shall consist of at least two layers of material, which will meet the requirements of 4.4.7.8.1/RD and 4.4.7.10.1/RD.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Double insulation shall consist of at least three layers of material. Each layer shall meet the requirements of 4.4.7.8.1/RD and 4.4.7.10.1/RD, and any two layers together shall meet the requirements of 4.4.7.10.2/RD.		P
	Reinforced insulation consisting of a single layer of material is not permitted.		P
4.4.7.8.3.4 /RD	Compliance		P
	Compliance shall be checked by the tests described in 5.2.3.1/RD to 5.2.3.5/RD. When a component or sub-assembly makes use of thin sheet insulating materials, it is permitted to perform the tests on the component rather than on the material.		P
4.4.7.8.4 /RD	Printed wiring boards (PWBs)		P
4.4.7.8.4.1 /RD	General		P
	Insulation between conductor layers in double-sided single-layer PWBs, multi-layer PWBs and metal core PWBs, shall meet the requirements of 4.4.7.8.1/RD. Basic, supplementary, double and reinforced insulation shall meet the appropriate requirements of 4.4.7.10.1/RD or 4.4.7.10.2/RD. Functional insulation in PWBs shall meet the requirements of 4.4.7.7/RD. For the inner layers of multi-layer PWBs, the insulation between adjacent tracks on the same layer shall be treated as either: <ul style="list-style-type: none"> • a creepage distance for pollution degree 1 and a clearance as in air (see Example D.14); or • solid insulation, in which case it shall meet the requirements of 4.4.7.8.1/RD and 4.4.7.10/RD. 		P
4.4.7.8.4.2 /RD	Use of coating materials	Coating not used	N/A
	A coating material used to provide functional, basic, supplementary and reinforced insulation shall meet the requirement as specified below.	Same as above	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.	Same as above	N/A

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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.	Same as above	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.	Same as above	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.	Refer critical component list	P
4.4.7.8.6 /RD	Potting materials	No such material used	N/A
	A potting material may be used to provide solid insulation or to act as a coating to protect against pollution.	Same as above	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.	Same as above	N/A
	If used to protect against pollution, the requirements for Type 1 protection in 4.4.7.8.4.2/RD apply.	Same as above	N/A
4.4.7.9/RD	Connection of parts of solid insulation (cemented joints)	No such cemented joints used	N/A

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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. 	Same as above	N/A
4.4.7.10 /RD	Requirements for electrical withstand capability	See below	P
4.4.7.10.1 /RD	Basic or supplementary insulation	See Table 4.4.7.10/RD	P
	Test with impulse withstand voltage according to 5.2.3.1/RD	Same as above	P
	Test with a.c. or d.c. voltage according to 5.2.3.4/RD	Same as above	P
4.4.7.10.2 /RD	Double or reinforced insulation	See Table 4.4.7.10/RD	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. 	Same as above	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>	Solid insulation not used for PCB	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.	See Table 4.4.7.10/RD	P
4.4.7.11 /RD	Insulation requirements above 30kHz	No such insulation used	N/A
4.4.8/RD	Compatibility with residual current-operated protective devices (RCD)	RCD not used	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	<p>To ensure the intended work of an RCD provided by the installation PECS shall satisfy one of the following conditions.</p> <p>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.</p> <p>b) For PECS that are Pluggable Type B or intended for permanent connection, d.c. current in the PE conductor is not limited if the information and marking requirements of 6.3.7.4/RD are complied with.</p>	Same as above	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.	Same as above	N/A
4.4.9 4.4.9/RD	Capacitor discharge	See below	P
	<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>	Pluggable UPS Type A used limit value 1 s considered.	P
4.5	Protection against electrical energy hazards	Detailed information regarding external interfaces, Serial Port, USB and connection of supply and loads provided in the user's manual.	P
4.5.1/RD	Operator access areas		P
4.5.1.1/RD	General	See below	P

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Clause	Requirement + Test	Result - Remark	Verdict
	<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>	IP20 considered	P
	Compliance is checked by inspection or test of 5.2.2.2/RD.		N/A
4.5.1.2/RD	Determination of hazardous electrical energy level		P
	<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>		P
4.5.2 4.5.2/RD	Service access areas	See below	P
	Capacitors within a PECS shall be discharged to an energy level less than 20 J, as in 4.5.1.2, within 5 s after the removal of power from the PECS. If this requirement is not achievable for functional or other reasons, the information and marking requirements of 6.5.2/RD apply.		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>		P

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Clause	Requirement + Test	Result - Remark	Verdict
	If the capacitor discharge time cannot be accurately calculated, the discharge time shall be measured.		P
4.6	Protection against fire and thermal hazards		P
4.6.1/RD	Circuits representing a fire hazard		P
	The following types of circuits are considered a fire hazard: - circuits directly connected to the mains - circuits that are not directly connected to the mains but exceed the limits for limited power sources in 4.6.5/RD - components having unenclosed arcing parts		P
4.6.2/RD	Components representing a fire hazard		P
4.6.2.1/RD	General		P
	Compliance with 4.6.2/RD and 4.6.3/RD shall be confirmed by inspection of component and material data sheets and, where necessary, by test.		P
4.6.2.2 4.6.2.2/RD	Components within a circuit representing a fire hazard		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.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	<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. 		P
	Batteries shall have a flammability class HB or better.	HB flammability class provided	P
4.6.2.3/RD	Components within a circuit not representing a fire hazard	Metal enclosure provided	P
	For components within a circuit not representing a fire hazard 4.6.2/RD does not apply.		P
4.6.3/RD	Fire enclosure	Metal enclosure provided	P
4.6.3.1 4.6.3.1/RD	General		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. 		P

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Clause	Requirement + Test	Result - Remark	Verdict
4.6.3.2/RD	Flammability of enclosure materials	Metal enclosure provided	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.		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.		P
	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.	Mass >18kg	N/A
	Metals, ceramic materials, and glass which is heat-resistant tempered, wired or laminated, are considered to comply without test.	Metal enclosure provided	P
	Materials for components that fill an opening in a fire enclosure shall: <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. 	V-1 or better material used to fill the openings of the fire enclosure.	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.		P
	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.	See critical component list for details.	P
	Compliance shall be checked by visual inspection and, where necessary, by test.....		P

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Clause	Requirement + Test	Result - Remark	Verdict
4.6.3.3/RD	Openings in fire enclosure	Comply with protection degree IP20	P
4.6.3.3.1/RD	General		P
4.6.3.3.2 4.6.3.3.2/RD	Openings in the top and side of fire enclosures	No opening in the top or bottom side enclosure.	N/A
	<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>		N/A
	<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>		N/A
4.6.3.3.3/RD	Openings in the bottom of a fire enclosure	No opening in the top or bottom side enclosure.	N/A
	Compliance is checked by inspection or with the hot flaming oil test in 5.2.5.6/RD, in case the fire enclosure is designed differently than as described in this subclause.		N/A
4.6.3.3.4/RD	Doors or covers in fire enclosures	No such doors and cover provided in fire enclosure	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	<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		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>		P
4.6.4.2/RD	Accessible parts	See table 4.6.4/RD	P
	When surface temperatures of the PECS, close to mounting surfaces, exceed the limit of Table 15, a warning according to 6.3.5/RD shall be provided.		P
4.6.5 4.6.5/RD	Limited power sources	No limited power sources	N/A
	<p>Where a limited power source is required, the source shall comply with Table 16 or Table 17 as applicable.</p> <p>Compliance to both the maximum allowed current and maximum apparent power available from the power source is required.</p>		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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	Wires do not touch sharp edges and heat sinks that could damage the insulation and cause hazard.	P
4.7.1/RD	General		P
	Failure of any component within the PECS shall not release sufficient energy to lead to a hazard, for example, expulsion of material into an area occupied by personnel.		P
4.7.2/RD	Specific requirements for liquid cooled PECS	No such system used	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		N/A
4.7.2.3.1 /RD	General		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	<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		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		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
4.7.2.3.6 /RD	Loss of coolant		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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		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		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	Fan guard is provided for DC fan	P
4.8	Equipment with multiple sources of supply		P
4.8.101	General	Different type of connector and identification provided near to the connector	P
4.8.102	Backfeed protection	Backfeed protection provided by relay RY402, RY407 corresponding control circuit. The relay provides a contact gap of 0.6mm minimum between each contact. The Backfeed protection circuit works reliably in normal and single-fault condition.	P
4.9 4.9/RD	Protection against environmental stresses		P

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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. 	Information provided in user manual.	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>	Information provided in user manual.	P
4.10	Protection against sonic pressure hazards	No such hazard used	N/A
4.11	Wiring and connections		P
4.11.1/RD	General		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>	Wires are adequately fixed to prevent excessive strain or damage of the conductors' insulation.	P
4.11.2/RD	Routing	Wires do not touch sharp edges and heat sinks that could damage the insulation and cause hazard.	P

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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 such construction used	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.	Wires do not touch sharp edges and heat sinks that could damage the insulation and cause hazard.	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		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.	PE wire is provided with Green/Yellow colour	P
4.11.4/RD	Splices and connections		P
	<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>	<p>Electrical and earthing connections engage at least two complete threads into metal.</p> <p>Screws with star/spring washers are used for the connection between ground trace (PWB) and chassis.</p> <p>Conductors are suitable terminated, creepage and clearances maintained, second securing for soldered terminations provided.</p>	P
4.11.5/RD	Accessible connections		P

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Clause	Requirement + Test	Result - Remark	Verdict
	<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>		P
4.11.6/RD	Interconnection between parts of the PECS	Complies	P
	<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>		P
4.11.7/RD	Supply connections	Certified appliance inlet used, refer critical component list table.	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.		P

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Clause	Requirement + Test	Result - Remark	Verdict
4.11.8/RD	Terminals	Certified appliance inlet used	N/A
4.11.8.1/RD	Construction requirements	Refer above	N/A
	<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>	Refer above	N/A
4.11.8.2 4.11.8.2/RD	Connecting capacity	Refer above	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

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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	Refer above	P
	Terminals for connection to external conductors shall be readily accessible during installation. Sets of terminals for connection to the same input or output shall be grouped together and shall be located in proximity to each other and to the main protective earthing terminal, if any. If the installation instructions provide detail on the proper earthing of the system, the protective earthing terminal need not be placed in proximity to the terminals. Clamping screws and nuts shall not serve to fix any other component although they may hold the terminals in place or prevent them from turning.		P
4.11.8.4 /RD	Wire bending space for wires 10 mm ² and greater	Less than 10 mm ² wire size is used	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	Detachable power cord used	N/A
4.11.101.1	Cord guard		N/A
4.11.101.2	Cord anchorages and strain relief		N/A
4.12/RD	Enclosures		P
4.12.1/RD	General		P
4.12.2/RD	Handle and manual controls	No handles and manual controls used	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Handles, knobs, grips, levers and the like shall be reliably fixed so that they will not work loose in normal use, if this could result in a hazard. Sealing compounds and the like, other than self-hardening resins, shall not be used to prevent loosening. If handles, knobs and the like are used to indicate the position of switches or similar components, it shall not be possible to fix them in a wrong position if this could result in a hazard.		N/A
4.12.3/RD	Cast metal	Cast metal not used	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	More than 1.25 mm supported sheet metal used	P
4.12.5/RD	Stability test for enclosure		P

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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>		P
4.101	UPS isolation and disconnect device		P
4.101.1	Emergency switching (disconnect) device		N/A
4.101.2	Normal disconnect devices	Certified appliance inlet used	P
4.102	Stored energy source	Internal Lead Acid battery used with 36Vdc	P
4.102.1	General		P
4.102.2	Accessibility and maintainability	Maintenance-free VRLA lead acid battery used.	P
4.102.3	Distance between battery cells	UL certified Lead acid battery used	P
4.102.4	Case insulation	Insulated battery used	P
4.102.5	Electrolyte spillage	Sealed maintenance free batteries provided with an unlikely emission of electrolyte (VRLA type).	P
4.102.6	Ventilation and hydrogen concentration	Sufficient openings are provided in such a way that a local concentration of hydrogen and oxygen is not possible. No requirement regarding the separation of operational arcing parts from battery vents/valves.	N/A
4.102.7	Charging voltages	Refer above clause 4.102	P
4.102.8	Battery circuit protection		P

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Clause	Requirement + Test	Result - Remark	Verdict
4.102.8.1	Overcurrent and earth fault protection	Fuse provided in UPS	P
4.102.8.2	Location of protective device	The fuse is directly located behind the supply wire of the batteries inside the UPS. There are no hazardous conditions under any simulated fault conditions.	P
4.102.8.3	Rating of protective devices	Refer clause 4.102.8.1	P
4.103	UPS connection to telecommunication lines	No such connection used	N/A

5	Test requirements		P
5.1/RD	General	Complies	P
5.1.1/RD	Test objectives and classification		P
5.1.2/RD	Selection of test samples		P
5.1.3/RD	Sequence of tests		P
5.1.4/RD	Earthing conditions	Neutral to Earth	P
5.1.5/RD	General conditions for tests		P
5.1.5.1/RD	Application of tests		P
	Unless otherwise stated, upon conclusion of the tests, the equipment need not be operational.		P
5.1.5.2/RD	Test samples		P
5.1.5.3 5.1.5.3/RD	Operating parameters for tests		P
5.1.6/RD	Compliance		P
5.1.7	Test overview		P
5.1.101	UPS test overview		P
5.2	Test specification	Complies	P
5.2.1/RD	Visual inspections (type test, sample test and routine test)		P
	Before type testing, a check shall be made that the PECS delivered for the test is as expected with respect to supply voltage, input and output ranges, etc.		P
5.2.2/RD	Mechanical tests		P
5.2.2.1/RD	Clearance and creepage distance test (type test)	See table 4.4.7.4/RD to 4.4.7.5/RD	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.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Where this verification is impossible to perform, an impulse voltage test (see 5.2.3.2/RD) shall be performed between the considered circuits.		P
5.2.2.2	Non-accessibility test (type test)	Live parts are not accessible	P
5.2.2.3/RD	Ingress protection test (IP rating)(type test)		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.	IP20	P
5.2.2.4/RD	Enclosure integrity test (type test)	Complies	P
5.2.2.4.1 /RD	General	Refer Clause 5.2.2.4.2	P
	The integrity tests apply to PSCS, and also where PSCS are intended for operation without a further enclosure in restricted access areas. After completion of the integrity test, the PSCS shall pass the tests of 5.2.3.2/RD and 5.2.3.4/RD and shall be inspected to confirm that:		P
	- no degradation of any safety-relevant component of the PSCS has occurred.		P
	- live parts have not become accessible (see 4.4.3.3/RD).		P
	- enclosures show no cracks or openings which could cause a hazard.		P
	- clearances are not less than their minimum permitted values and other insulation is undamaged.		P
	- barriers have not been damaged or loosened.		P
	- 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.		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.		P
5.2.2.4.2 /RD	Deflection test (type test)	Complies	P
5.2.2.4.2.1 /RD	General		P
5.2.2.4.2.2 /RD	Stead force test, 30N	Applied to relevant parts. No hazard.	P
5.2.2.4.2.3 /RD	Stead force test, 250N	Applied to relevant parts. No hazard.	P

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Clause	Requirement + Test	Result - Remark	Verdict
5.2.2.4.3/RD	Impact test (type test)	Test performed on the top, bottom and on the side of the unit. No hazard.	P
5.2.2.4.4	Drop test	The equipment mass is more than 18kg	N/A
5.2.2.4.5/RD	Stress relief test	Metal enclosure used	N/A
5.2.2.5/RD	Stability test	10° tilt all unfavourable position, 250N for any direction except upward. 800N for downward force.	P
5.2.2.6	Wall, ceiling or rack mounted equipment test	Unit will not be extended away from the rack for installation.	N/A
5.2.2.6.101	Wall and ceiling mounted equipment test	Unit is not intended for wall or ceiling mounting	N/A
5.2.2.6.102	Rack mounted equipment test	Not a slide rails mounted	P
5.2.2.7/RD	Handle and manual controls securement test	No Handle and manual controls are used	N/A
5.2.2.101	Cord guard test	Detachable power supply cord used	N/A
5.2.3/RD	Electrical tests	Compliance	P
5.2.3.1/RD	General		P
	The electrical tests described in 5.2.3.2/RD to 5.2.3.5/RD are applicable to basic, supplementary and reinforced insulation. Before performing these tests, preconditioning according to 5.2.6.3.1/RD and 5.2.6.3.2/RD is required.		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.		P
5.2.3.2/RD	Impulse voltage test (type test and sample test)	Alternative test conducted	N/A
5.2.3.3/RD	Alternative to impulse voltage test (type test and sample test)	Alternative test applied.	P
	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.		P
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	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.	Primary circuit to PE:2500Vdc Primary circuit to DVC A circuit:4000Vdc (tested 3 times for 10 ms in each polarity).	P
	See IEC60664-1 clause 6.1.2.2/RD for further information.	Considered	P
5.2.3.4/RD	Ac or d.c. voltage test (type test and routine test)	See Table 4.4.7.10/RD, 5.2.3/RD	P
5.2.3.4.1 /RD	Purpose of test		P
	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.		P
5.2.3.4.2 /RD	Value and type of test voltage		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.		P
5.2.3.4.3 /RD	Performing the voltage test		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.		P
	b) Test between each considered circuit sequentially and the other adjacent circuits connected together. Test voltage according to Table 26 or Table 27, column 2, corresponding to voltage of considered circuit under test.		P

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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.		P
5.2.3.4.4 /RD	Duration of the a.c. or d.c. voltage test	60s for type test 1s for routine test	P
	The duration of the test shall be at least 60 s for the type test and 1 s for the routine test. The test voltage may be applied with increasing and/or decreasing ramp voltage but the full voltage shall be maintained for 60 s and 1 s respectively for type and routine tests.	See above	P
5.2.3.4.5 /RD	Verification of the a.c. or d.c. voltage test	No electrical breakdown occurred	P
	The test is successfully passed if no electrical breakdown occurs during the test.		P
5.2.3.5/RD	Partial discharge test (type test, sample test)		N/A
	The partial discharge test shall confirm that the solid insulation (see 4.4.7.8/RD) used in components and subassemblies for protective separation of electrical circuits remains partial-discharge-free within the specified voltage range (see Table 28).		N/A
	This test shall be performed as a type test and a sample test. It may be omitted for insulating materials which are not degraded by partial discharge, for example ceramics. The partial discharge inception and extinction voltage are influenced by climatic factors (e.g. temperature and moisture), equipment self-heating, and manufacturing tolerance. These influencing variables can be significant under certain conditions and shall therefore be taken into account during type testing.		N/A
5.2.3.6/RD	Protective impedance test (type test and routine test)		N/A

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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>		N/A
5.2.3.7/RD	Touch current measurement test (type test)	See table 4.4.4.3.3 /RD	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
	<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. 		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. 		N/A
	<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. 		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. 		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. 		N/A
5.2.3.8/RD	Capacitor discharge test (type test)	See below	P
	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.	Pluggable equipment type A is used.	P

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Clause	Requirement + Test	Result - Remark	Verdict
5.2.3.9	Limited power source test (type test)		N/A
5.2.3.10 5.2.3.10 /RD	Temperature rise test (type test)	See Table 4.6.4/RD	P
	If possible the PECS must operate in the worst conditions of the rated power and the output current.		P
	Equipment, in which the heating or cooling quantity depends on the temperature, the temperature measurement must be carried out under the most unfavourable conditions of ambient temperature within the range specified by the manufacturer.		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.		P
	The test shall be maintained until thermal stabilization has been reached. That is, when three successive readings, taken at intervals of 10 % of the previously elapsed duration of the test and not less than 10 min. intervals, indicate no change in temperature, defined as $\pm 1^{\circ}\text{C}$ between any of the three successive readings, with respect to the ambient temperature.		P
	The temperature of an electrical insulation (other than that of windings) is measured on the surface of the insulation at a point close to the heat source, if a failure of this insulation could cause a hazard. If temperatures of windings are measured by the thermocouple method, the thermocouple shall be located on the surface of the winding assuming the hottest part due to surrounding heat emitting components. See also notes in Table 14.		P
	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.		P
	No corrected temperature of the material or component shall exceed the temperature in Table 14 in IEC 62477-1: 2012 or Table 103 as applicable.		P
	During the test, thermal cut-out, overload detection functions and devices shall not operate.		P

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Clause	Requirement + Test	Result - Remark	Verdict
5.2.3.11 /RD	Protective equipotential bonding tests (type tests and routine test)		P
5.2.3.11.1 /RD	General		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. 		P
	For pluggable equipment type A only the protective equipotential bonding impedance test of 5.2.3.11.2/RD have to be performed.		P
5.2.3.11.2 /RD	Protective equipotential bonding impedance test	See 5.2.3.11.2.2/RD	P
5.2.3.11.2.1/RD	Test conditions		P

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Clause	Requirement + Test	Result - Remark	Verdict
	<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. 		P
5.2.3.11.2.2/RD	Test current, duration and acceptance criteria	See 5.2.3.11.2.2/RD	P
	a) For PECS with an overcurrent protective device rating of 16 A or less, this test may be omitted, if an impedance not exceeding 0,1 Ω can be demonstrated.		N/A
	b) As an alternative to Table 29, where the time-current characteristic of the overcurrent protective device that limits the fault current in the protective equipotential bonding means is known because the device is either provided in the equipment or fully specified in the installation instructions, the test duration may be based on that specific device's time-current characteristic. The tests are conducted for a duration corresponding to the 200 % current value on the time-current characteristic.	See 5.2.3.11.2.2/RD	P
	c) For PECS with an overcurrent protective device rating of more than 460 A, calculations or simulations according to IEC 60949 shall be used to show the ability of the prospective short circuit current to fulfil the requirements. The protective equipotential bonding continuity routine test of 5.2.3.11.4/RD shall be performed to show that the impedance of the protective equipotential bonding means during and at the end of the test shall not exceed the expected value.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Acceptance criteria: The test current is 200 % of the overcurrent protective device rating and the duration of the test is as shown in Table 29. The voltage drop in the protective equipotential bonding means, during and at the end of the test, shall not exceed DVC As, as determined from Table 2 and Table 5 with respect to the accessible surface of the enclosure.		N/A
	After the tests, visual inspection shall show no damage to the protective equipotential bonding means.	After test, no damage to the protective equipotential bonding.	P
5.2.3.11.3 /RD	Protective equipotential bonding short circuit withstand test (type test)		N/A
	As required by 5.2.3.11.2.1/RD, the short circuit test in 5.2.4.3/RD shall be performed to ensure that protective bonding has the ability to withstand the prospective short circuit current that it may be subjected to under fault conditions.		N/A
	The testing shall include an individual test of the protective bonding path for each conductive accessible part unless analysis shows that the short circuit withstand capability of the path is adequate, or that the results of one combination are representative of the anticipated results of another combination.		N/A
5.2.3.11.4 /RD	Protective equipotential bonding continuity test (routine test)	See 5.2.3.11.2.2/RD	P
5.2.3.101	Backfeed protection test (type test)		P
5.2.3.101.1	General		P
5.2.3.101.2	Test for pluggable UPS	Pluggable UPS type A considered. Safety relay provided. Even in case of a single fault the protection circuit acts within 1s and open-circuit voltage was measured. See appended table 4.8.102.	N/A
5.2.3.101.3	Test for permanently connected UPS		P
5.2.3.101.4	Method to simulate the load-induced change of reference potential for pluggable UPS		P
5.2.3.101.5	Solid-state backfeed protection	No such device used	N/A
5.2.3.102	Input current test	See table 4.3.101, 5.2.3.102	P
5.2.3.103	Short-time withstand current test (type test)	Rated I _{cw} and I _{cc} rated less than 10 kA.	N/A
5.2.3.103.1	General procedure		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
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		N/A
5.2.3.104	Transformer protection test	See table 4.2/RD to 4.3/RD	P
5.2.3.105	Unsynchronized load transfer test		N/A
5.2.3.105.1	General		N/A
5.2.3.105.2	Phase displacement	Single phase UPS	N/A
5.2.4/RD	Abnormal operation and simulated fault tests	See table 4.2/RD and 4.3/RD	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		P
	<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. 		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.		P
5.2.4.3/RD	Protective equipotential bonding short circuit withstand test (type test)		N/A
5.2.4.3.1 /RD	General		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	When required by 5.2.3.11.2.1/RD, a protective bonding path shall be subjected to the following short-circuit withstand test.		N/A
5.2.4.3.2 /RD	Test conditions		N/A
	The equipment under test shall be supplied with power and the output port shall be operating as intended in 5.2.4.1/RD prior to closing the switching means that applied will be more severe.		N/A
	The protective bonding short circuit test shall be performed with the PSCS working with light load, unless analysis shows that higher short circuit currents are available under higher loading conditions.		N/A
	A new sample may be used for each short-circuit test.		N/A
5.2.4.3.3 /RD	Protective equipotential bonding short circuit test method		N/A
5.2.4.3.4 /RD	Pass criteria		N/A
5.2.4.4/RD	Output short-circuit test (type test)	See table 4.2/RD to 4.3/RD	P
5.2.4.4.1 /RD	Load condition		P
	The short circuit test shall be performed with the PSCS at full load or light load whichever creates the more severe condition.		P
5.2.4.4.2 /RD	Short-circuit test method		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.		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>		P
5.2.4.5/RD	Output overload test (type test)	See table 4.2/RD to 4.3/RD	P
5.2.4.6/RD	Breakdown of components test (type test)		P
5.2.4.6.1 /RD	Load conditions	See table 4.2/RD and 4.3/RD	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.		P
5.2.4.6.2 /RD	Application of short circuit or open-circuit		P
	The short circuit shall be applied with cable of a cross-section appropriate for the current that normally flows through the component, 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.		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.		P
5.2.4.6.3 /RD	Test sequence		P

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Clause	Requirement + Test	Result - Remark	Verdict
	For the Breakdown of components test, identified components shall be short-circuited or open-circuited, whichever creates the worst hazard, one at a time.		P
5.2.4.7/RD	PWB short circuit test (type test)	Reduced spacing not used	N/A
	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.		N/A
	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.		N/A
5.2.4.8/RD	Loss of phase test (type test)	Single phase UPS	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 table 4.2/RD and 4.3/RD	P
5.2.4.9.1/RD	General and pass criteria		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.		P
	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.		P
5.2.4.9.2/RD	Inoperative blower motor test		P

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Clause	Requirement + Test	Result - Remark	Verdict
	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.		P
5.2.4.9.3 /RD	Clogged filter test	Clogged filter not used	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	Liquid coolant not used	N/A
	A liquid cooled PSCS shall be operated at rated load. Loss of coolant shall be simulated by draining the coolant, blocking the flow or disabling the system coolant pump.		N/A
	If the PSCS is shut down due to the operation of a thermal device located inside the coolant, then the test shall be repeated with the coolant drained out of the system.		N/A
	NOTE: It is presumed that the thermal device will be inoperative if not surrounded by coolant liquid.		N/A
5.2.5/RD	Material tests	See critical component list for details.	P
5.2.5.1/RD	General		P
	When requested by 4.4.7.8.2/RD, the manufacturer shall test the flammability properties of the materials used for insulating purposes, as defined in 5.2.5.2/RD, 5.2.5.3/RD and 5.2.5.4/RD. When requested by 4.6.3.2/RD the manufacturer shall test the flammability properties of the materials used for fire enclosure, as defined in 5.2.5.5/RD		P
5.2.5.2/RD	High current arcing ignition test (type test)		N/A
5.2.5.3/RD	Glow-wire test (type test)	Considered during component certification.	P
	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.		P
5.2.5.4/RD	Hot wire ignition test (type test – alternative to glow-wire test)	Alternate test not considered	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 joints used	N/A

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
	<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)		P
5.2.6.1/RD	General		P
	Compliance is shown by conducting test of 5.2.6.3/RD, 5.2.6.4/RD, 5.2.6.5/RD and 5.2.6.6/RD according to Table 30 as applicable for the environmental conditions specified by the manufacture.		P
5.2.6.2/RD	Acceptance criteria		P

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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. 		P
5.2.6.3/RD	Climatic tests		P
5.2.6.3.1 /RD	Dry heat test (steady state)	40°C for 16hr	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.		P
5.2.6.3.2 /RD	Damp heat test (steady state)	40°C with 93%Rh for 4days	P
	To prove the resistance to humidity, the PSCS shall be subjected to a Damp heat test (steady state) according to Table 32.		P
5.2.6.4	Vibration test (type test)	Considered default environmental conditions	N/A
5.2.6.5	Salt mist test (type test)	Considered default environmental conditions	N/A
5.2.6.6	Dust and sand test (type test)	Considered default environmental conditions	N/A
5.2.7/RD	Hydrostatic pressure test (type test and routine test)	liquid cooling system not used	N/A

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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>		N/A

6	Information and marking requirements		P
6.1	General		P
6.1.101	Durability	Test is conducted 15 s with a piece of cloth soaked with water and 30 s with a piece of cloth soaked with petroleum spirit	P
6.1.102	Removable parts	marking not provided on removable parts	P
6.2	Information for selection		P
6.3	Information for installation and commissioning		P
6.3.1/RD	General		P
6.3.2/RD	Mechanical considerations		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 	Information provided in manual.	P
6.3.3/RD	Environment	Same as above	P
	In accordance with 4.9/RD the following environmental conditions shall be specified, for operation, transportation and storage:	Same as above	P
	Climatic (temperature, humidity, altitude, pollution, ultra-violet light, etc.)	Same as above	P

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Clause	Requirement + Test	Result - Remark	Verdict
	Mechanical (vibration, shock, drop, topple, etc.)	Same as above	P
	Electrical (overvoltage category)	Same as above	P
6.3.4/RD	Handling and mounting	Same as above	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. 		P
6.3.5/RD	Enclosure temperature	Limit not exceeded	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.		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	Information provided in manual.	P
6.3.6.1/RD	General		P
	Information shall be provided to enable the installer to make safe electrical connection to the PSCS. This shall include information for protection against hazards (for example, electric shock or availability of energy) that may be encountered during installation, operation or maintenance.		P
6.3.6.2/RD	Interconnection and wiring diagrams	No interconnection and wire used	N/A
	The installation and maintenance manuals shall include details of all necessary connections, together with a suggested interconnection diagram.		N/A
6.3.6.3/RD	Conductor (cable)selection	Information provided in manual.	P
	The Installation manual shall define the voltage and current levels for all connections to the PSCS, together with cable insulation requirements. These shall be worst-case values, taking into account overcurrent and overload conditions and the possible effects of non-sinusoidal currents.		P

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Clause	Requirement + Test	Result - Remark	Verdict
6.3.6.4/RD	Terminal capacity and identification	Detachable power cord used	N/A
	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.		N/A
	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.		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.		N/A
6.3.7/RD	Protection requirements		P
6.3.7.1/RD	Accessible parts and circuits	Information provided in manual. DVC A port is only accessible.	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.		P
	The manuals shall also indicate the precautions to be taken to ensure that the safety of DVC As connections maintained during installation.		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.		P
	The manual of a PSCS shall state the maximum voltage allowed to be connected to each port.		P
	The manuals shall provide instructions for the use of PELF circuits within a zone of equipotential bonding.		P
6.3.7.2/RD	Type of electrical supply system	Information provided in manual.	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)	TN or TT system used	P

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Clause	Requirement + Test	Result - Remark	Verdict
	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.		P
6.3.7.3/RD	Protective class	Protective class I equipment	P
6.3.7.3.1/RD	General	Same as above	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	Same as above	P
6.3.7.3.2/RD	Protective class I equipment	Protective class I equipment	P
	Terminals for connection of the PE conductor shall be clearly and indelibly marked with one or more of the following:	Same as above	P
	The symbol IEC 60417-5019 (2011-01)	Symbol provided	P
	With the letters PE	Same as above	P
	The colour coding green or green-yellow	Ground wire is provided with green-yellow colour	P
6.3.7.3.3/RD	Protective class II equipment	Protective 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).	Same as above	N/A
6.3.7.3.4/RD	Protective class III equipment	Protective class I equipment	N/A
	No marking is required on the product.	Same as above	N/A
6.3.7.4/RD	Touch current marking	Limit not exceeded	N/A
	Where the touch current in the PE conductor exceeds the limits given in 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.		N/A
6.3.7.5/RD	Compatibility with RCD marking	RCD not used	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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.)	Same as above	N/A
6.3.7.6/RD	Cable and connection	Information provided in manual.	P
	Any particular cable and connection requirements shall be identified in the installation and maintenance manuals.	Same as above	P
6.3.7.7/RD	External protection devices	Wall CB details provided in manual. See installation instructions	P
	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)	Same as above	P
6.3.8/RD	Commissioning	Information provided in manual.	P
	If commissioning tests are necessary to ensure the electrical and thermal safety of a PSCS, information to support these tests shall be provided for each part of the PSCS. This information can depend on the specific installation, and close cooperation between manufacturer, installer, and user can be required. Commissioning information shall include references to hazards that might be encountered during commissioning, for example those mentioned in 6.4/RD and 6.5/RD.	Same as above	P
6.3.101	Guidance on UPS installation	Same as above	P
6.4	Information for use	Same as above	P
6.4.1/RD	General	Same as above	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.	Same as above	P

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Clause	Requirement + Test	Result - Remark	Verdict
	The manual should also indicate any hazards which can result from reasonably foreseeable misuse of the PSCS.	Same as above	P
6.4.2/RD	Adjustment	Adjustment not required for UPS	N/A
	The user's manual shall give details of all safety-relevant adjustments intended for the user. The identification or function of each control or indicating device and fuse shall be marked adjacent to the item. Where it is not possible to do this on the product, the information shall be provided pictorially in the manual.	Same as above	N/A
	Maintenance adjustments may also be described in this manual, but shall be made clear that they should only be made by qualified personnel.	Same as above	N/A
	Clear warnings shall be provided where excessive adjustment could lead to a hazardous state of the PSCS.	Same as above	N/A
	Any special equipment necessary for making adjustments shall be specified and described.	Same as above	N/A
6.4.3 6.4.3/RD	Labels, signs and signals	All safety related labels are located outside and visible after installation.	P
6.4.3.1/RD	General		P
	<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>		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. 		P

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Clause	Requirement + Test	Result - Remark	Verdict
	When instructing the person(s) concerned as to <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.		P
	The signal words indicated hereinafter shall be used and the following hierarchy respected: <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.” Danger, warning and caution markings on the PECS shall be prefixed with the word “DANGER”, “WARNING”, or “CAUTION” as appropriate in letters not less than 3,2 mm high. The remaining letters of such markings shall be not less than 1,6 mm high.		P
6.4.3.2/RD	Isolators	Isolators not used	N/A
	Where an isolating device is not intended to interrupt load current, a warning shall state: DO NOT OPEN UNDER LOAD.		N/A
	The following requirements apply to any supply isolating device which does not disconnect all sources of power to the PSCS.		N/A
	If the isolating device is mounted in an equipment enclosure with the operating handle externally operable, a warning label shall be provided adjacent to the operating handle stating that it does not disconnect all power to the PSCS.		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.		N/A
6.4.3.3/RD	Visual and audible signals	No such signals used	N/A

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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 hot surfaces	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	See below	P
	<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>	Relevant marking provided and no field serviceable part inside the UPS.	P
6.4.3.101	Distribution-related backfeed	In-build Backfeed protection provided in UPS	N/A
6.4.3.102	Protection in building installation		P
6.4.3.102.1	General		P
6.4.3.102.2	Rated conditional short-circuit current (Icc)	The Icw and Icc rated less than 10 kA.	N/A
6.4.3.102.3	Prospective short-circuit current (Icp)	Same as above	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
6.4.3.102.4	Requirement for building installation	Instruction provided in installation manual	P
6.4.3.103	Batteries installed within the UPS enclosure	Same as above	P
6.5	Information for maintenance	Instruction provided in installation manual	P
6.5.1/RD	General	Same as above	P
	The PECS shall be marked with the date code, or serial number from which the date of manufacture can be determined.	Same as above	P
	Safety information shall be provided in the installation and maintenance manuals including appropriate, the following:	Same as above	P
	• Preventive maintenance procedures and schedules	Same as above	P
	• Safety precautions during maintenance	Same as above	P
	• Location of live parts that can be accessible during maintenance (for example, when covers are removed)	Same as above	P
	• Adjustment procedures	Same as above	N/A
	• Subassembly and component repair and replacement procedures	Same as above	N/A
	• Any other relevant information	Instruction provided in installation manual	P
6.5.2/RD	Capacitor discharge	Refer 4.4.9	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 of the power from the PSCS shall be stated in the installation and maintenance manuals.		N/A
6.5.3/RD	Auto restart/bypass connection	Instruction provided in installation manual	P
	If a PSCS can be configured to provide automatic restart or bypass connection, the installation, user and maintenance manuals shall contain appropriate warning statements.	Same as above	P
	A PSCS which is set to provide automatic restart or bypass connection, after the removal of power, shall be clearly identified at the installation.	Same as above	P

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
6.5.4/RD	Other hazards	No other hazard provided	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		N/A
	In accordance with 4.8/RD, where there is more than one source of supply energizing the PSCS, information shall be provided to indicate which disconnect device or devices are required to be operated in order to completely isolate the equipment.		N/A
6.5.101	Battery information for maintenance	See below	P
6.5.101.1	Labelling on battery	Label provided on internal Battery	P
6.5.101.2	Information in instruction manual(s)	Instruction provided in user manual	P
6.5.101.2.1	General	See below	P
6.5.101.2.2	Instructions for battery replacement	Battery replacement Instruction provided for internal mounted battery in user manual	P

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

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
A.5.7/RD	Touch time- d.c. voltage zones of muscular reaction (inability to let go reaction)		N/A
A.5.8/RD	Touch time- d.c. voltage zones of saltwater-wet skin condition		N/A
A.5.9/RD	Touch time- a.c. voltage zones of ventricular fibrillation		P
A.5.10/RD	Touch time- a.c. voltage zones of muscular reaction (inability to let go reaction)		P
A.5.11/RD	Touch time- a.c. voltage zones for startle reaction		P
A.6/RD	Evaluation of the working voltage of circuits		P
A.6.1/RD	General		P
A.6.2/RD	AC working voltage		P
A.6.3/RD	DC working voltage		N/A
A.6.4/RD	Pulsating working voltage		N/A
A.7/RD	Examples of the use of elements of protective measures		P
A.101	Comparison of limits of working voltage		P

Annex D	Evaluation of clearance and creepage distances		P
D.1/RD	Measurement	Refer 5.2.2.1/RD	P
D.2/RD	Relationship of measurement to pollution degree		P
D.3/RD	Examples		P

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

IEC 62040-1			
Clause	Requirement + Test	Result - Remark	Verdict
Annex BB	Reference loads		N/A
BB.1	General		N/A
BB.2	Reference resistive load		N/A
BB.3	Reference inductive-resistive loads		N/A
BB.4	Reference capacitive-resistive loads		N/A
BB.5	Reference non-linear load		N/A
BB.5.1	General		N/A
BB.5.2	Test method		N/A

Annex CC	Ventilation of lead-acid battery compartments		P
CC.1	General	Sufficient openings are provided in such a way that a local concentration of hydrogen and oxygen is not possible. No requirement regarding the separation of operational arcing parts from battery vents/valves.	P
CC.2	Normal conditions	See appended table Annex CC	P
CC.3	Blocked conditions	See appended table 4.2/RD to 4.3/RD	P
CC.4	Overcharge conditions	See appended table Annex CC	P

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

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
1.	Output	s-c	230	1 sec	--	N/A	IEC 16A circuit breaker tripped
2.	Output	s-c	Battery	1 sec	--	N/A	Unit shut down on inverter fault
3.	C411 P1 to 2	s-c	230	1 sec	--	N/A	Unit shut down to a loss of battery charger causing a loss of logic power. Temperature was monitored for 30 min, and the temp of T400 reached 39.5 0C
4.	C419 P1 to 2	s-c	230	1 sec	--	N/A	Unit shut down. Temperature was monitored for 2 hours and 30 min, and the temp of T400 reached 37.9 0C
5.	Q406 P2 to 3	s-c	230	1 sec	--	N/A	Unit shut down. Q406 and Q414 failed.
6.	D439 P1 to 2	s-c	230	2 minutes and 33 seconds	--	N/A	Unit Shut down. Temperature was monitored for 1 hour, and the temperature of T401 reached 105.8°C
Supplementary information: Test results taken from previous investigation under VDE file 1924400-3335-0063 (172100) CB / DE1-50794 for reference. No tests performed by this upgrade.							

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 (mA)	condition/status	
--	6.71	230	1020	6.64	--	Charge	
--	7.21	230	1100	6.84	--	Recharge	
Supplementary information: Test results taken from previous investigation under VDE file 1924400-3335-0063 (172100) CB / DE1-50794 for reference. No tests performed by this upgrade.							

4.4.4.3.3 /RD	TABLE: Touch current measurement					P
Measured between:	Measured (mA)	Limit (mA)	Comments/conditions			
Input to Chassis	1.266	3.5	EUT Power Switch ON Normal, No Load, Switch (e) Open			
Input to Chassis	1.266	3.5	EUT Power Switch ON Reverse, No Load, Switch (e) Open			

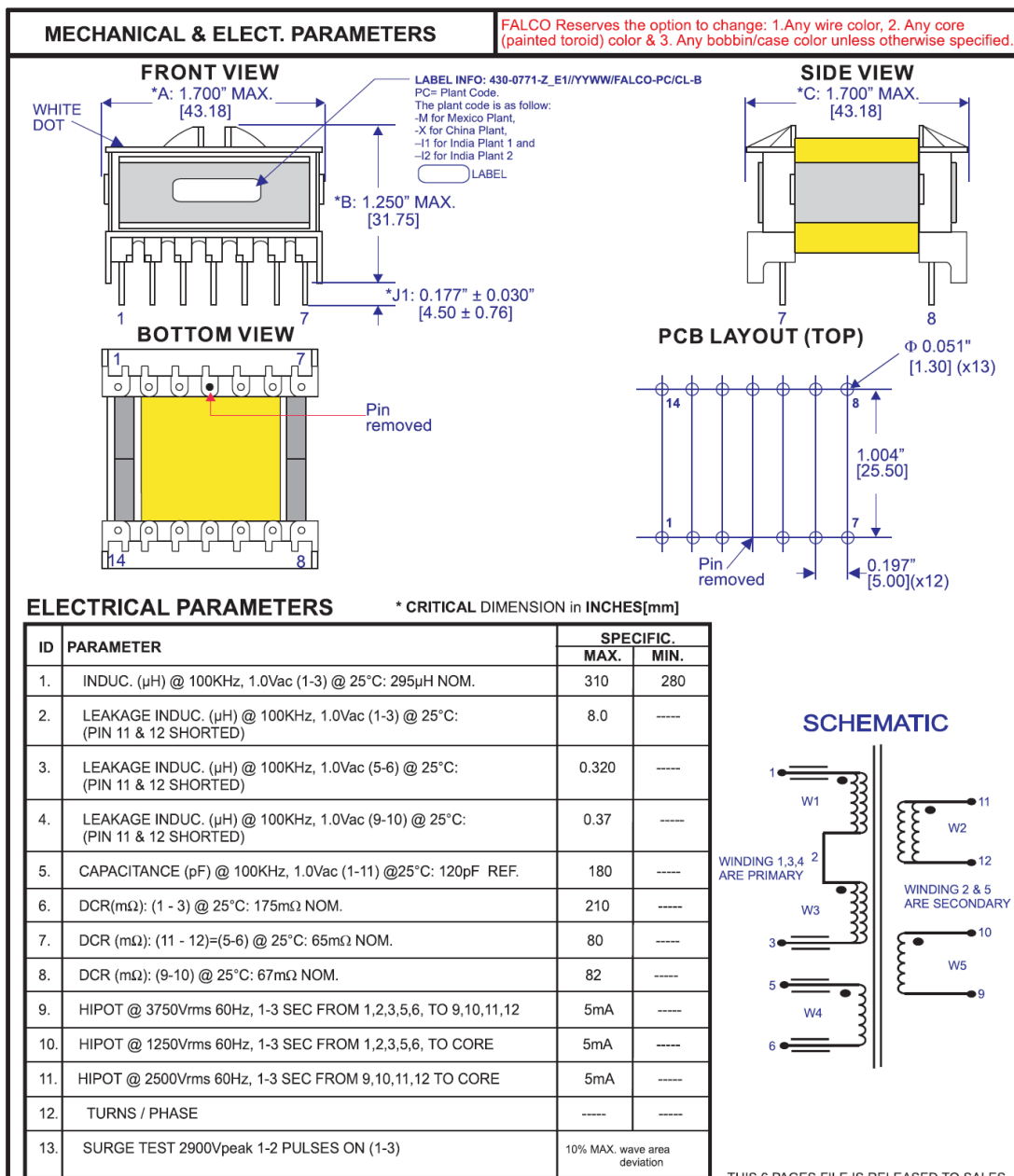
IEC 62040-1			
Clause	Requirement + Test		Result - Remark
Input to Chassis	1.238	3.5	EUT Power Switch OFF Normal, No Load, Switch (e) Open
Input to Chassis	1.238	3.5	EUT Power Switch OFF Reverse, No Load, Switch (e) Open
Input to Chassis	0.972	3.5	EUT Power Switch ON Normal, No Load, Switch (e) Closed
Input to Chassis	1.140	3.5	EUT Power Switch ON Reverse, No Load, Switch (e) Closed
Input to Chassis	0.614	3.5	EUT Power Switch OFF Normal, No Load, Switch (e) Closed
Input to Chassis	0.648	3.5	EUT Power Switch OFF Reverse, No Load, Switch (e) Closed
Supplementary information: Test results taken from previous investigation under VDE file 1924400-3335-0063 (172100) CB / DE1-50794 for reference. No tests performed by this upgrade.			

4.4.7/RD		TABLE: Transformers					P
Loc.	Tested insulation	Working voltage peak / V	Working voltage rms / V	Required electric strength	Required clearance / mm	Required creepage distance / mm	Required distance thr. insul.
T400	Reinforced	353.5	250	4242	3.42	5.0	--
Loc.	Tested insulation			Test voltage/ V	Measured clearance / mm	Measured creepage dist./ mm	Measured distance thr. insul. / mm; number of layers
T400	Reinforced	4242	31.75	31.75	--	T400	Reinforced
Supplementary information: Test results taken from previous investigation under VDE file 1924400-3335-0063 (172100) CB / DE1-50794 for reference. No tests performed by this upgrade.							

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

4.4.7/RD	TABLE: Transformers	P
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T400 – 430-0771-Z



THIS 6 PAGES FILE IS RELEASED TO SALES.
APRIL. 24.2012. CESAR PEREZ

DESC: ED34 FLYBACK TRANSFORMER 90W

ECN #:

PEAK VOLTAGE FROM PIN 1 TO PIN 3 : 598Vpk

Falco
electronics



FPN: ED3436 REV: A50 DATE: 04/24/12 CPN: 430-0771-Z REV: E1

ROHS LEVEL: I J PB FREE: e2 UL EIS: CL-B, Table V

CREEPAGE PRI. to SEC.: 5.3mm CLEARANCE PRI. To SEC.: 4.5mm

REPRODUCTION IN WHOLE OR IN PART IS NOT
PERMITTED WITHOUT FALCO ELECTRONICS MEXICO'S EXPLICIT CONSENT

ORIGINATOR: CESARP APPROVED BY: SHEET 1

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

SCHEMATIC & WINDING CHART										
WINDING CHART										
WINDING ORDER	PIN NOS ST FIN	WIRE (FPN) (MWR)	TURNS EXACT	TURNS/ LAYER	LAYERS	WRAP INSULATION	INTERLAYER INSULATION	MARGIN TAPE	SLEEVE	NOTE
ORDEN ENROLLADO	PINES INI. FIN	ALAMBRE NUM PARTE	VUeltas EXACTAS	VUeltas/ CAPA	CAPAS	ENVOLTURA DE ENROLLADO	ASLAMIENTO ENTRE CAPAS	CINTA DE MARGEN	POPOTE	NOTA
1	1 - 2	2x #27AWG HVY	20	20	1	2x Mylar tape	-----	1.5mm	#20	1,2,3,4,5,6
2	11 - 12	2x0.37mm TILW-B	15	15	1	2x Mylar tape	-----	-----	-----	10,2,6,12
3	2 - 3	2x #27AWG HVY	20	20	1	2x Mylar tape	-----	1.5mm	#20	2,6,7,11,13
4	5 - 6	1x0.37mm TILW-B	6	6	1	2x Mylar tape	-----	-----	#20	3,9,7,6,13
5	10 - 9	1x0.37mm TILW-B	6	6	1	2x Mylar tape	-----	-----	-----	12,9,7,6

WINDING DETAIL

● START OF WINDING

— SLEEVED WIRE

⊠ MARGIN TAPE OF 1.5mm

NOTES:

- 1.- PLACE THE BOBBIN WITH PIN #1 POINTING INSIDE OF THE MANDREL.
- 2.- BIFILAR WINDING.
- 3.- ADD SLEEVE ON THE START OF THE WINDING.
- 4.- PLACE ANCHOR TAPE ON THE START AND FINISH OF THE WINDING.
- 5.- PLACE RISER TAPE ON THE FINISH OF THE WINDING ON PIN 1-2 AFTER WRAPPING TAPE.
- 6.- PLACE CROSS TAPE ON THE FINISH OF THE WINDING AND USE THE SAME TAPE TO WRAP THE WINDING.
- 7.- PLACE ANCHOR TAPE ON THE FINISH OF THE WINDING.
- 8.- PLACE RISER TAPE ON THE FINISH OF THE WINDING ON PIN 1-3 AFTER WRAPPING TAPE.
- 9.- SPREAD THE WINDING ACROSS BOBBIN WIDTH.
- 10.- CONNECT THE WIRE PROVISIONALLY ON PIN #3 AND START THE WINDING ON PINs 1-7 SIDE, THEN CROSS THE START WIRE TO THE FINISH WIRE AND CONNECT IT ON PIN #11.
- 11.- PLACE RISER TAPE ON THE FINISH OF THE WINDING ON PIN 2-3 BEFORE WRAPPING TAPE.
- 12.- PLACE ANCHOR TAPE ON THE START OF THE WINDING.
- 13.- ADD SLEEVE ON THE FINISH OF THE WINDING, SLEEVING MUST BE INSIDE THE WINDING AT 2-3mm MINIMUM.
- 14.- SECURE THE CORES WITH GLUE.
- 15.- GAP ONE CENTER LEG CORE TO MEET THE NOMINAL INDUCTANCE.
- 16.- WHITE DOT ON PIN #1.
- 17.- PLACE LABEL.
- 18.- REMOVE PIN #4 FROM THE BOBBIN.
- 19.- MARKING TO INCLUDE MANUFACTURER'S ID (FALCO), DATE CODE (YEAR AND WEEK OF THE MANUFACTURE) AND APC P/N (430-0771-Z).
- 20.- PART USES UL LISTED CLASS B INSULATION SYSTEM DESIGNATED CL-B, E147168.
- 21.- CORE: ETD34/17/11-3C90 FERROXCUBE OR EQUIVALENT ETD34/17/11 $\mu=2300$
- 22.- As per DIRECTIVE 2002/95/EC of the EU with the following levels:
Cadmium (Cd) < 100ppm & Lead (Pb), Mercury (Hg), Chromium VI (Cr VI),
Poly-brominated Biphenyls (PBBs) and Poly-brominated Diphenyl Ethers (PBDEs) < 1000ppm

		FPN: ED3436 REV: A50 DATE: 04/24/12 CPN: 430-0771-Z REV: E1
		CREEPAGE: PRI. TO CORE: 2.0mm SEC. TO CORE: 3.3mm
		CLEARANCE: PRI. TO CORE: 1.5mm SEC. TO CORE: 3.0mm
		Number of Layers: NONE FILE: S:\DCI\ML\ED3436A50.cdr SHEET 2

REPRODUCTION IN WHOLE OR IN PART IS NOT PERMITTED WITHOUT FALCO ELECTRONICS MEXICO'S EXPLICIT CONSENT

AVR Transformer – 430-10013B

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

顾 客:
CUSTOMER SA013

FILE NO: RDDBT0UI8545B2Q
文件编号: (RDJ4010854521Q)

H 版



请 承 认 书

SPECIFICATION FOR APPROVAL

产品名称 UI96 TRANSFORMER 型 号 DB-UI96-8545B
DESCRIPTION MODEL NO.

顾 客 部 品 号 430-10013B
CUSTOMER'S PART NO.

制 造 商 料 号 日期 2015-09-24
MANUFACTURE'S P/N. DBT0UI8545B2(J4010854521) DATE

确认签字、盖章后请寄回此承认书一份
PLEASE RETURN TO US ONE COPY OF "SPECIFICATION
FOR APPROVAL "WITH YOUR APPROVED SIGNATURES

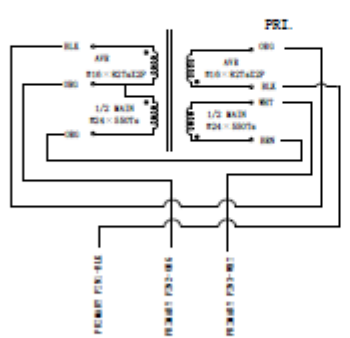
	"√"	顾客签名 CUSTOMER'S SIGNATURE	备注 NOTE
完全承认 FULL APPROVED			
有条件承认 CONDITION APPROVED			
不予承认 REJECTED			

MAKER SIGNATURE/供方确认

DRAWING 制图	SAMPLE 制样	CHECKED 审核	QC CHECKED 品质审核	APPROVED 批准
石杰烽	王主柏	康宏文	袁志军	谢光元

深圳市京泉华科技股份有限公司
SHEN ZHEN JING QUAN HUA ELECTRONICS CO.,LTD
深圳市观澜镇库坑京泉华工业园
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E-mail:evemise@evemise.net

IEC 62040-1																																														
Clause	Requirement + Test	Result - Remark	Verdict																																											
顾 客 CUSTOMER	SA013	产品名称 DESCRIPTION	UI96 TRANSFORMER																																											
部 品 号 PART NO.	430-10013B	型 号 MODEL	DB-UI96-8545B	H 版																																										
<p>1. 外观图示(单位: mm)/DIMENSION (UNIT:mm)</p> <div style="display: flex; justify-content: space-between;"> <div style="width: 60%;"> <p style="text-align: center;">扎带</p> </div> <div style="width: 35%;"> <p>标签/LABEL:</p> <div style="border: 1px solid black; padding: 5px; margin: 5px;"> <p>CLASS 130(B) NER-882 APC 430-10013B Shenzhen Jingguoshun Electronics Co., Ltd DB-UI96-8545B E208707</p> <p style="text-align: right; font-weight: bold;">230V</p> <p>CAUTION Transformer core is not grounded— It may present risk of electric shock Test before touching.</p> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="text-align: center;"> <p>绕线 治具</p> <p>ORG-ORG-BRN</p> </div> <div style="text-align: center;"> <p>绕线 治具</p> <p>BLK-ORG-BRN-WHT</p> </div> </div> </div> </div> <div style="margin-top: 10px;"> <p>DATE CODE:</p> <div style="display: flex; align-items: center;"> <div style="text-align: center; margin-right: 10px;"> <p>XX X XX</p> <p>日/DATE (1, 01; 2, 02...)</p> <p>月/MONTH (1, A; 2, B...)</p> <p>年/YEAR (2012, 12; 2013, 13...)</p> </div> </div> </div> <div style="margin-top: 10px;"> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>BOTTOM VIEW</p> <p>BLACK COATING</p> </div> <div style="text-align: center;"> <p>TOP VIEW</p> </div> </div> </div>																																														
<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th>A</th> <th>B</th> <th>C</th> <th>D</th> <th>E</th> <th>F</th> <th>G</th> <th>H</th> <th>I</th> <th>J</th> <th>K</th> <th>L</th> <th>M</th> <th>N</th> </tr> </thead> <tbody> <tr> <td>76.2</td> <td>96.0</td> <td>139.7</td> <td>158.8</td> <td>32.0</td> <td>94.7</td> <td>21.6</td> <td>40.9</td> <td>9.7</td> <td>139</td> <td>63.0</td> <td>21.5</td> <td>120.0</td> <td>04.4</td> </tr> <tr> <td>±1.5</td> <td>±2.0</td> <td>±1.5</td> <td>±2.0</td> <td>±1.0</td> <td>±1.0</td> <td>±1.5</td> <td>MAX</td> <td>REF</td> <td>MAX</td> <td>REF</td> <td>REF</td> <td>±10.0</td> <td>±0.13</td> </tr> </tbody> </table>					A	B	C	D	E	F	G	H	I	J	K	L	M	N	76.2	96.0	139.7	158.8	32.0	94.7	21.6	40.9	9.7	139	63.0	21.5	120.0	04.4	±1.5	±2.0	±1.5	±2.0	±1.0	±1.0	±1.5	MAX	REF	MAX	REF	REF	±10.0	±0.13
A	B	C	D	E	F	G	H	I	J	K	L	M	N																																	
76.2	96.0	139.7	158.8	32.0	94.7	21.6	40.9	9.7	139	63.0	21.5	120.0	04.4																																	
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料 号 MATERIAL NO. DBT0UI8545B2 (J4010854521)		制 图 DRAWING 石杰烽	制 样 SAMPLE 王主柏	审 核 CHECKED 康宏文	QC 审 核 QC CHECKED 袁志军	批 准 APPROVED 谢光元	日 期 DATE 2015-09-24																																							

IEC 62040-1						
Clause	Requirement + Test	Result - Remark	Verdict			
顾 客 CUSTOMER	SA013	产品名称 DESCRIPTION	UI96 TRANSFORMER			
部 品 号 PART NO.	430-10013B	型 号 MODEL	DB-UI96-8545B	H 版		
绕组 WINDING	颜色 COLOUR	规格 TYPE	外壳 HOUSING	端子 TERMINAL	备注 NOTE	
PRI.	BLK-ORG-WHT (1)-(2)-(3)	UL 1015 16AWG 600V 105°C (WHT)	1-480700-0	350536-3	-----	
2. 特性/CHARACTERISTIC						
2.1	初级输入电压 Pri. Rating Input	317VAC 47Hz [WHT(3)-BLK(1)]				
2.2	初级空载电流 Primary Exciting Current	0.6A MAX(AT 317VAC 47Hz INPUT) [WHT(3)-BLK(1)]				
2.3	铁损 Core Loss	15.0W MAX(AT 317VAC 47Hz INPUT) [WHT(3)-BLK(1)]				
2.4	AVR直流电阻 AVR DC Resistance (@ 25°C)	0.2Ω MAX [BLK(1)-ORG(2)]				
2.4	初级直流电阻 PRI. DC Resistance(@ 25°C)	14Ω MAX [ORG(2)-WHT(3)]				
2.5	初级次级电压 Pri. & Sec. Voltage	测试点 Measure Point BLK(1)-ORG(2)	空载电压 No Load Voltage 41.12VAC±5%	测试条件 Testing Condition Pri. Input 317VAC 47Hz, across WHT(3)-BLK(1)		
2.6	承受电压 Dielectric Withstand	COIL-CORE: AC 1.5KV 50Hz 3mA FOR 60S				
2.8	绝缘电阻 Insulation Resistance	COIL-CORE:100MΩ Min(DC 500V)				
2.9	端子强度 Lead Strength	Leads should withstand pull force equal to weight of transformer and neither less than 3 lbs nor more 10 lbs for 60 seconds, no damage occurred.				
2.10	温湿实验 Humidity Test	In an ambient temperature of 40±2°C and 90-95% R H for 48 hours, after 10 minutes out of the oven, the unit should meet item 2.7 requirements, and insulation resistance shall be 10 M ohms minimum.				
2.11	倍频倍压测试 Voltage&frequency -multiplying test	Sec. winding open, Input 460V 400Hz for 15 seconds shall withstand without breakdown				
2.12	绝缘等级 Insulation System	Class B(130°C)				
3. 电气原理/CIRCUIT DIAGRAM						
						
<p>“●” : POLARITY/极性</p> <p>绕组顺序/WINDING ORDER:</p> <p>MAIN, AVR/MAIN, AVR</p>						
料 号 MATERIAL NO. DBTOUI8545B2 (J4010854521)	制 图 DRAWING 石杰烽	制 样 SAMPLE 王主柏	审 核 CHECKED 康宏文	QC 审 核 QC CHECKED 袁志军	批 准 APPROVED 谢光元	日 期 DATE 2015-09-24

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

顾 客 CUSTOMER	SA013	产品名称 DESCRIPTION	UI96 TRANSFORMER			
部 品 号 PART NO.	430-10013B	型 号 MODEL	DB-UI96-8545B	H 版		

4. 解剖图/CONSTRUCTION DIAGRAM

料 号 MATERIAL NO. DBTOUI8545B2 (J4010854521)	制 图 DRAWING 石杰烽	制 样 SAMPLE 王主柏	审 核 CHECKED 康宏文	QC 审 核 QC CHECKED 袁志军	批 准 APPROVED 谢光元	日 期 DATE 2015-09-24
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IEC 62040-1																				
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5. 材料清单/MATERIAL LIST																				
序号 NO.	项 目 ITEM	规格 TYPE	制造商 MANUFACTURE	认证号 UL NO.																
1	骨架 BOBBIN	TYPE: UI96 MATERIAL: Eptel 101L	E I DUPONT DE NEMOURS & CO INC	E41938																
2	铁芯 CORE	TYPE: UI96 50H400 0.3/t MATERIAL: SILICON STEEL	New Nippon Steel Corp. SHENZHEN CHUNYUAN STEEL INDUSTRY CO., LTD																	
3	(MAIN) 绕组 WINDING (MAIN)	Polyurethane TYPE: UBW(#24) THERMAL RATING: MW75/130°C	XIN LONG MAGNET WIRE CO LTD TAI-I ELECTRIC WIRE & CABLE CO LTD	E171082 E85640																
4	(AVR) 绕组 WINDING (AVR)	Polyurethane TYPE: UBW(#16) THERMAL RATING: MW75/130°C	XIN LONG MAGNET WIRE CO LTD TAI-I ELECTRIC WIRE & CABLE CO LTD	E171082 E85640																
5	铁芯绝缘 INSULATION FOR CORE	ADHESIVE POLYESTER TAPE TYPE NO.: 1PS01 0.05/t THERMAL RATING: 130°C COLOUR: YELLOW 2 LAYERS	P LEO & CO (B C) LTD	E126174																
6	漏电流保护 CREEPAGE INS.	ADHESIVE POLYESTER TAPE TYPE NO.: 1PS01 0.05/t THERMAL RATING: 130°C COLOUR: YELLOW 3 LAYERS	P LEO & CO (B C) LTD	E126174																
7	焊接绝缘 INSULATION FOR SOLDER	Aramid Insulating Paper TYPE: Nomex 410 THERMAL RATING: 220°C THICKNESS: 0.25mm/t 1 LAYER	E I DUPONT DE NEMOURS & CO INC	E34739																
8	绝缘纸片 INSULATION PAPER	Aramid Insulating Paper TYPE: Nomex 410 THERMAL RATING: 220°C THICKNESS: 0.25mm/t 1 LAYERS	E I DUPONT DE NEMOURS & CO INC	E34739																
9	外部纸片 OUTER WRAPPER	ADHESIVE POLYESTER TAPE TYPE NO.: 1PS01 0.05/t THERMAL RATING: 130°C COLOUR: YELLOW 2 TURNS	P LEO & CO (B C) LTD	E126174																
10	外部纸片 OUTER WRAPPER	ADHESIVE POLYESTER TAPE TYPE NO.: 1PS01 0.05/t THERMAL RATING: 130°C COLOUR: YELLOW 1 TURN	P LEO & CO (B C) LTD	E126174																
11	连接引线 CONNECT LEAD	TYPE: UL 1015 16AWG 600V 105°C MATERIAL: PVC EST	DONGGUAN SHIPAI LICHENG ELECTRONICS CO LTD SHENZHEN CITY CHENGWEI INDUSTRY CO LTD XINYA ELECTRONIC CO LTD	E205038 E225317 E170689																
12	PIN 1. 电子线 PIN 1. LEAD WIRE	TYPE: UL 1015 16AWG 600V 105°C MATERIAL: PVC EST	DONGGUAN SHIPAI LICHENG ELECTRONICS CO LTD SHENZHEN CITY CHENGWEI INDUSTRY CO LTD XINYA ELECTRONIC CO LTD	E205038 E225317 E170689																
13	PIN 2. 电子线 PIN 2. LEAD WIRE																			
14	PIN 3. 电子线 PIN 3. LEAD WIRE	TYPE: UL 1015 16AWG 600V 105°C MATERIAL: PVC EST	DONGGUAN SHIPAI LICHENG ELECTRONICS CO LTD SHENZHEN CITY CHENGWEI INDUSTRY CO LTD XINYA ELECTRONIC CO LTD	E205038 E225317 E170689																
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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	
T400 (Pri - SELV)	250	353.5	--	
Line – Earth	250	353.5	--	
Neutral – Earth	250	353.5	--	
Supplementary information: Test results taken from previous investigation under VDE file 1924400-3335-0063 (172100) CB / DE1-50794 for reference. No tests performed by this upgrade.				

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)
T400	353.5	250	3.42	31.75	5.0	31.75
Line – Earth (PCB)	353.5	250	1.71	5.5	2.5	5.5
Neutral – Earth (PCB)	353.5	250	1.71	5.5	2.5	5.5
Line – Earth	353.5	250	1.71	3.2	2.5	3.2
Neutral – Earth	353.5	250	1.71	3.2	2.5	3.2
Supplementary information: Test results taken from previous investigation under VDE file 1924400-3335-0063 (172100) CB / DE1-50794 for reference. No tests performed by this upgrade.						

4.4.7.8.2 /RD	TABLE: Ball Pressure Test of Thermoplastics			N/A
Allowed impression diameter (mm) :				—
Object/ Part No./ Material	Manufacturer/ trademark	Test temperature (°C)	Impression diameter (mm)	
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)	
Model: ALL UNITS					
Opto-isolator Primary to SELV	250	5000	>0.4	>0.4	
Shrink tubing on wires	250	3000	>0.4	Shrink tubing on wires	
Insulation sheets (Basic insulation)	250	1500	0.6	Insulation sheet and tested with 1500VAC	
Insulation on Display Panel cable	250	3000	3 Layers	Insulator and tested with 3000VAC	
T400	250	3000	3 Layers	3 Layers, two been tested with 3000VAC	
T402	250	3000	3 Layers	Triple insulated wire	
Supplementary information: Test results taken from previous investigation under VDE file 1924400-3335-0063 (172100) CB / DE1-50794 for reference. No tests performed by this upgrade.					

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)	
Model: SMT1500RMI1U					
Unit Primary to Ground	DC 2121	--		No	
Unit Primary to Chassis	DC 2121	--	--	No	
Unit Primary to SELV	DC 4242	--	--	No	
Hazardous Battery Voltage to Ground	AC 1500	--	--	No	
PWB Primary to Ground	AC 1500	--	--	No	
PWB Primary to SELV	AC 3000	--	--	No	
Supplementary information: Test results taken from previous investigation under VDE file 1924400-3335-0063 (172100) CB / DE1-50794 for reference. No tests performed by this upgrade.					

4.4.9/RD	TABLE: Capacitor discharge				P
Condition	τ calculated (s)	τ measured (s)	t u→ 0V (s)	Comments	
Phase to Neutral	--	< 1	0	Vo: 357.8 Vpk, 37%Vo: 132.4 Vpk, Vtc: 8 Vpk	
Phase to Neutral	--	< 1	0	Vo: 357.8 Vpk, 37%Vo: 132.4 Vpk, Vtc: -4 Vpk	
Phase to Neutral	--	< 1	0	Vo: 357.8 Vpk, 37%Vo: 132.4 Vpk, Vtc: 12 Vpk	
Phase to Neutral	--	< 1	0	Vo: 357.8 Vpk, 37%Vo: 132.4 Vpk, Vtc: -14 Vpk	
Supplementary information: Test results taken from previous investigation under VDE file 1924400-3335-0063 (172100) CB / DE1-50794 for reference. No tests performed by this upgrade.					

4.6.3/RD	TABLE: Resistance to fire					N/A
Part	Manufacturer of material	Type of material	Thickness (mm)	Flammability class	Evidence	
Supplementary information: See Critical component List						

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

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) :	230 VAC		—
	Ambient (°C)..... :	24.0		—
Thermocouple Locations		Max. temperature measured, (°C)		Max. temperature limit, (°C)
Model: SMT1500RM11U				
Modes of operation	Normal	Discharge	Charge	--
L400	28.9	50.2	31.8	120
L401	35.5	38.6	37.6	130
L403	31.4	51.6	34.3	130
L407	39.0	38.8	40.6	155
C419	32.7	39.1	35.3	105
C421	28.5	44.3	30.8	85
C422	36.5	36.8	40.9	85
C441	35.6	56.9	38.1	85
C408A	31.4	41.0	33.4	85
T400	40.5	40.4	62.1	120
T401	31.0	78.9	34.1	140
T402	41.9	42.0	43.7	120
AVR Transformer Primary	32.9	29.2	29.7	120
AVR Transformer Secondary	32.1	30.3	29.2	120
RY402	39.6	41.9	42.1	85
RY405	30.8	40.2	32.1	85
RY407	45.5	45.5	46.7	85
Phase Trace (Near J420)	34.5	34.7	36.7	130
Between Batteries	25.5	35.7	31.5	50
Top of Battery	25.5	37.0	31.6	50
Power cord Line	33.2	33.9	34.9	105
Power cord Neutral	31.8	32.9	34.6	105
Battery wire, Red	27.3	41.9	29.7	105
Top Cover (Over AVR Transformer)	30.3	32.3	31.3	70
Top Cover (Over Bridge)	28.2	31.0	28.4	70
Supplementary information: Test results taken from previous investigation under VDE file 1924400-3335-0063 (172100) CB / DE1-50794 for reference. No tests performed by this upgrade.				

IEC 62040-1					
Clause	Requirement + Test		Result - Remark	Verdict	
4.6.4/RD	TABLE: Heating Test			P	
	Test voltage (V) :	253 VAC		—	
	Ambient (°C)..... :	23.2		—	
Thermocouple Locations		Max. temperature measured, (°C)		Max. temperature limit, (°C)	
Model: SMT1500RMI1U					
Modes of operation		Normal	Discharge	Charge	--
L400		29.6	47.6	30.2	120
L401		33.8	33.9	33.9	130
L403		31.5	47.3	29.9	130
L407		37.6	33.3	37.9	155
C419		34.8	35.4	33.4	105
C421		25.6	42.0	28.2	85
C422		37.4	32.7	40.9	85
C441		31.1	52.9	28.2	85
C408A		31.3	37.1	28.9	85
T400		39.9	33.8	62.8	120
T401		30.1	75.2	30.1	140
T402		40.5	37.2	36.0	120
AVR Transformer Primary		57.0	56.8	59.0	120
AVR Transformer Secondary		52.8	52.8	54.8	120
RY402		35.2	38.0	32.5	85
RY405		29.3	37.1	29.4	85
RY407		37.6	38.6	35.7	85
Phase Trace (Near J420)		35.6	32.3	37.4	130
Between Batteries		25.8	35.0	30.7	50
Top of Battery		25.9	36.4	30.0	50
Power cord Line		33.4	32.0	35.9	105
Power cord Neutral		32.6	31.2	35.8	105
Battery wire, Red		25.1	39.8	28.0	105
Top Cover (Over AVR Transformer)		28.5	29.5	27.5	70
Top Cover (Over Bridge)		31.1	32.9	33.5	70
Supplementary information: Test results taken from previous investigation under VDE file 1924400-3335-0063 (172100) CB / DE1-50794 for reference. No tests performed by this upgrade.					

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

4.6.4/RD	TABLE: Heating Test			P
	Test voltage (V) :	207 VAC		—
	Ambient (°C)..... :	23.6		—
Thermocouple Locations		Max. temperature measured, (°C)		Max. temperature limit, (°C)
Model: SMT1500RMI1U				
Modes of operation	Normal	Discharge	Charge	--
L400	25.9	48.3	27.6	120
L401	30.0	34.6	33.5	130
L403	26.6	48.4	27.3	130
L407	34.8	34.0	39.2	155
C419	30.0	35.8	33.0	105
C421	24.5	43.0	25.0	85
C422	33.0	33.1	40.4	85
C441	27.0	54.1	26.6	85
C408A	27.0	37.8	27.6	85
T400	37.1	33.7	61.6	120
T401	26.1	77.3	26.8	140
T402	35.4	37.8	35.7	120
AVR Transformer Primary	61.3	61.3	63.1	120
AVR Transformer Secondary	56.4	56.4	58.1	120
RY402	32.3	34.0	33.1	85
RY405	27.3	37.7	26.9	85
RY407	34.7	39.4	36.1	85
Phase Trace (Near J420)	33.6	33.0	38.2	130
Between Batteries	25.7	35.9	29.2	50
Top of Battery	25.7	37.4	28.9	50
Power cord Line	32.9	32.5	36.8	105
Power cord Neutral	32.6	31.8	36.3	105
Battery wire, Red	24.9	41.0	25.3	105
Top Cover (Over AVR Transformer)	27.1	30.1	27.2	70
Top Cover (Over Bridge)	32.8	33.7	33.9	70
Supplementary information: Test results taken from previous investigation under VDE file 1924400-3335-0063 (172100) CB / DE1-50794 for reference. No tests performed by this upgrade.				

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

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:						

4.8.102, 5.2.3.101	TABLE: Backfeed protection				P
Condition		Voltage measured (V)			Comments
		L-N	L-PE	N-PE	
No load		4.0	10.0	16.0	No Fault
Full load with 22nF caps		10.0	-22.0	8.0	No Fault
No load		10.0	0	-4.0	Q431 (Pin 2 & 3)
Full load with 22nF caps		-14.0	2.0	-4.0	Q431 (Pin 2 & 3)
Supplementary information: Test results taken from previous investigation under VDE file 1924400-3335-0063 (172100) CB / DE1-50794 for reference. No tests performed by this upgrade.					

4.12.1/RD, 5.2.2.4.3 /RD	TABLE: Impact Resistance			N/A
Impacts per surface	Surface tested	Impact energy (Nm)	Comments	
Supplementary information:				

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

Annex CC	TABLE: Ventilation of lead-acid battery compartments	N/A
The required dimension for the ventilation openings will be calculated with the following formula:		
$A \geq Q/360 \text{ [m}^2\text{]}$		
with $Q = 0.054 * n * I * C$		
where:		
Q : airflow in m³/h		
n : number of battery cells		
I : constant factor (0,2A/100Ah for valve regulated lead acid batteries)		
C : is the battery nominal capacity in Ah at the 10h discharge rate		
With the specific data for the UPS the following dimension for the ventilation openings is required:		
n : ?		
C : ?		
$A \geq (0.054 * n * 0.2 \text{ A/100 Ah} * C)/360$		
$A \geq ? \text{ m}^2$		
Verdict		
The size of ventilation openings in battery cabinet exceeds the required airflow by far (as well as the UPS).		
Supplementary information:		

5.2.3.11/R D	TABLE: Protective equipotential bonding tests				P
	Test current (A)			Refer below	—
Points of application		Resistance (mΩ)	Voltage (mV)	Test time (s)	Result
Model: SMT1500RMI1U					
Test current (A)		32 A			
AC Inlet Ground Pin to Battery Front Plate		9.398	300.7	120	Pass
AC Inlet Ground Pin to Rare Panel		6.802	217.7	120	Pass
AC Inlet Ground Pin to Network Management Card		9.486	303.6	120	Pass
Supplementary Information: Test results taken from previous investigation under VDE file 1924400-3335-0063 (172100) CB / DE1-50794 for reference. No tests performed by this upgrade.					

TABLE: Critical components information					P
Object / part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity ¹⁾
Metal enclosure	Interchangeable	Interchangeable	Sheet metal, Min 1.25mm thick	IEC/EN 62040-1 (2021)	Tested with appliance
Fan (490-0196x) 490-0196	Sunon	X1X2 Series MB40202VX- 0000-A99	24 Vdc, 64mA- 74mA, CFM 10.8	EN IEC 62368- 1:2020+A11 EN 62368-1:2014 UL 507	TUV R 50003871 UL GPWV2.E77551
	Interchangeable	Interchangeable			VDE, UL or equivalent
Appliance Inlet 770-0012A	Qualtek Electronics	(701W) SS-120-1.5-4.0	250V, 10A	IEC 60320-1:2015 DIN EN 60320-1 (VDE 0625-1):2016- 04; EN 60320- 1:2015 + AC:2016 UL 498 CSA-C22.2 No. 60320-1:19	VDE 40030552 UL AXUT2.E139592, CSA 065612
	Schurter	6100-Serie(s) (6100.4115)			VDE 40015595 UL AXUT2.E96454
	Elcom	EMI-10			VDE 40005064
Supplementary thermal protector for Input (530-0034x-700) 530-0034A-700	Mechanical Product Co	1600 (1600-254-100)	250 V, 10 A, 1P	EN IEC 60934:2019 ANSI/UL 1077, CSA C22.2 No. 235	VDE 40003670 UL QVNU2.E66224 CSA 027156
	Teknic	TR11 (TR11WY6310A)			VDE 128558 UL QVNU2.E209569 CSA 110904
AC Outlet - group of 4 (1 no.) 770-0271B	ELCOM	EMO-14	250V, 10A	IEC 60320-1:2015, IEC 60320-1:2015/ AMD1:2018, DIN EN 60320-1 (VDE 0625-1):2016-04; EN 60320- 1:2015+AC: 2016	VDE 40005067
AVR Transformer (mounted on chassis) (430-10013x) 430-10013B	HK Jing Quan Hua	NER-B82	Class B (130°C)	UL1446	UL OBJY2.E208707
Bobbin of AVR Trx	E I Dupont De Nemours & Co INC.	Zytel 101L	UL 94V-0	ANSI/UL 94	UL QMFZ2.41429
All insulators 850-1654x, 850-1587x, 850-1581x, 850-1586x	ITW Materials Technology (Shanghai) Co., Ltd	FORMEX GK- (a)(b)(f2)	VTM-0, Min thick 0.25mm, 115°C	UL 94, UL 746	UL QMFZ2/8.E256266
	Interchangeable	Interchangeable			UL
Battery Connector for APCRBC88 - 726-0141	Anderson Power Products	Series PP45	600V 45A	UL 1977	UL ECBT2/8.E26226

TABLE: Critical components information					P
Object / part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity ¹⁾
All PCB	Huizhou Welgao Electronics Co Ltd	W-2	Min. V-1, min. 130°C	UL94 UL 796	UL ZPMV2/8.E310226
	Interchangeable	Interchangeable			UL
Optocoupler (IC401, IC402, IC423, IC424, IC426) (349-0100x-Z- 003) 349-0100-Z- 003	Fairchild Semiconductor Pte Ltd)	H11A817B (H11A817B-3S)	5kVrms, DTI>0.4mm	IEC 60747-5- 5:2007 IEC 60747-5- 5:2007/AMD1:2013 DIN EN 60747-5-5 (VDE 0884-5):2015- 11; EN 60747-5- 5:2011+A1:2015 CSA E65, and CSA 950-95 ANSI/UL 1577	VDE 40026857 UL FPQU2.E90700
	Vishay	SFH6156 series (SFH6156-4T)			VDE 091888 FIMKO FI/40820, UL FPQU2.E52744 CSA 093751_0_000
	Isocom Components 2004 Ltd.	ISP817X- 77SMT+R			VDE 40028086 UL FPQU2.E91231
	Broadcom Limited	HCPL-817 (HCPL-817-56B or HCPL-817- 56BE) (lead free)			VDE 40016429 UL FPQU2.E55361
	LITEON ELECTRONICS	LTV-817 (LTV 817S-C)			VDE 40015248 UL FPQU2.E113898
	Everlight Electronics Co. Ltd.	EL816S1 (EL816S1KTA- G)			VDE 132249 NEMKO P11214765/A5 SEMKO 1406059, UL FPQU2.E214129
Fuse – F401 (513-0022x-Z) 513-0022-Z	BEL Fuse	MRT (MRT4)	250V, 4A slow	EN 60127-3 (VDE 0820-3):2015-11; EN 60127-3:2015 IEC 60127-1:2006 IEC 60127- 1:2006/AMD1:2011 IEC 60127- 1:2006/AMD2:2015 IEC 60127-3:2015 DIN EN 60127-1 (VDE 0820-1):2015- 12; EN 60127- 1:2006+A1:2011+A 2:2015, ANSI/UL 248-1	VDE 40001000, UL JDYX2.E20624 CSA 039772
	Schurter AG	MST 250 (0034.6821)			VDE 40002080 UL JDYX2.E41599
	Littlefuse	372 (3721400 0001)			VDE 116448 UL JDYX2.E67006
Fuse (charger circuit) – F400, F402 (519-0013x-Z) 519-0013-Z	BEL Fuse	SST5 /1K Type: SST	125Vdc, 5A slow	UL 248-1 UL 248- 14 CSA C22.2 No. 248.1	UL JDYX2.E20624 CSA R39772
	Conquer Electronics	SET 5A 125V			UL JDYX2.E82636 CSA 174222

TABLE: Critical components information					P
Object / part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity ¹⁾
Capacitor (C564, C570) (232-7105x-Z) 232-7105-Z	Arcotronics	R.46 (R46KN410045 N2M)	250V, X2, 1uF 125°C	EN 60384- 14:2013+A1:2016; IEC 60384- 14:2013+A1:2016, UL 60384-14	ENEC DAT97000141 UL FOWX2.E97797
	Interchangeable	Interchangeable			VDE, UL or equivalent
Capacitor Y2 - (C400, C402, C568, C569) (221-0001x-Z) 221-0001-Z	Jya Nay Co Ltd	JY series (JY12E472MD5 R1)	250 V, Y2, 4700pF, 125°C	IEC 60384- 14:2013+A1, EN 60384- 14:2013+ A1, UL 60384-14	TUV R50232061 UL FOWX2.E201384
	Interchangeable	Interchangeable			VDE, UL or equivalent
Varistors (MV402, MV408A,MV409A) (380-0001x-Z) 380-0001-Z	Epcos(TDK)	S20* (S20K300S5M4 -8 B72220S0301K 101)	20 mm, 300 V 173J	IEC 61051-1:2018 IEC 61051-2:1991 IEC 61051- 2:1991/AMD1:2009 DIN EN 61051- 1:2009 EN IEC 62368- 1:2018 Annex G.8.1 ANSI/UL 1449 CSA-C22.2 No. 60065	VDE 40027582 UL VZCA2.E321126
	Wujin Thinking	TVR20471 (TVR20471KOC 4F29Y)			VDE 005944 UL VZCA2.E314979 CSA 97495 CQC GB/T10193- 1997 CQC GB/T10194- 1997
	Panasonic Ceramic Products	V20471U (ERZV20D471)			VDE 005912, UL VZCA2.E321499 CSA 092226
	Ceramate Technical Co., Ltd	20D471K (GNR20D471K C4)			VDE 40031745 UL VZCA2.E315429
Varistor (MV405) (380-0009x-Z- 001) 380-0009-Z- 001	Ceramate Technical Co., Ltd	GNR 20D561K (GNR20D561K +C4)	360 V, 382J	IEC 61051-1:2007, IEC 61051-2:1991, IEC 61051-2:1991/ AMD1:2009, IEC 61051-2-2:1991, DIN EN 61051- 1:2009, UL 1449	VDE 005938 UL VZCA2.E315429
	MAIDA	D65 Series (D6544ZOV36 1RA160)			VDE 40043376 UL VZCA2.E321173
Transformer (T400) - (430-0771x-Z) 430-0771-Z	Falco	CL-B	Class B (130°C)	UL1446	UL OBJY2.E147168

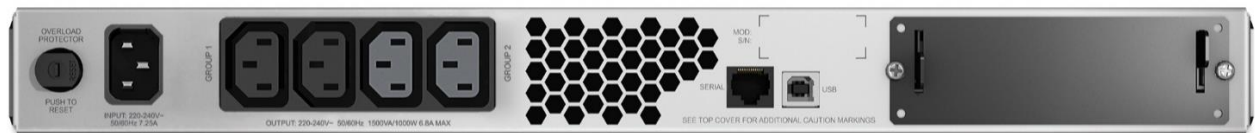
TABLE: Critical components information					P
Object / part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity ¹⁾
Bobbin of T400	Sumitomo	PM-9820	V-0, 150°C	UL 94, UL 746	UL QMFZ2.E41429
Transformer (T401) - (433-0080x-Z) 433-0080-Z	Falco	CL-F	Class F (155°C)	UL1446	UL OBJY2.E147168
Bobbin of T401	Sumitomo	PM-9820	V-0, 150°C	UL 94, UL 746	UL QMFZ2.E41429
Transformer (T402) - (430-0569x-Z) 430-0569-Z	Falco	CL-B	Class B (130°C)	UL1446	UL OBJY2.E147168
	Cormex Electronics Ind. Co., Ltd.	SBI4.2			UL OBJT2. E151908
Bobbin of T402	Sumitomo	PM-9820	V-0, 150°C	UL 94, UL 746	UL QMFZ2.41429
	Chang Chun Plastics Co Ltd	T375J(G5)(G6)			UL QMFZ2.E59481
Internal battery assembly – Replaceable Battery Cartage (RBC) – APCRBC88					
Metal - Battery Tray	Interchangeable	Interchangeable	Sheet metal, Min 1.25mm thick	IEC/EN 62040-1 (2021)	Tested with appliance
Battery Connector for APCRBC88 726-0141	Anderson Power Products	Series PP45	600V 45A	UL 1977	UL ECBT2/8.E26226
Battery (910-0634 * 6 no.) (APCRBC88 *1no.) (911-0070 * 1 no.)	CSB Battery	HRL634WF2	6Vdc, 34W	UL 1989	UL BAZR2.MH14533
Insulator 850-1653C	ITW Materials Technology (Shanghai) Co., Ltd	FORMEX GK- (a)(b)(f2)	VTM-0, Min thick 0.25mm, 115°C	UL 94, UL 746	UL QMFZ2/8.E256266
	Interchangeable	Interchangeable			UL
Battery Pack Fuse (517- 0060x-Z) 517-0060-Z	Littlefuse	299060	60 A, 36 Vdc	ANSI/UL 248-1	UL JFHR2.E71611
Supplementary information: Provided evidence ensures the agreed level of compliance. See OD-CB2039. UL approved components are additionally evaluated in the appliance and accepted according to the product standard. Component certificates as well as data sheets are available upon request.					

List of test equipment used:

A completed list of used test equipment shall be provided in the Test Reports when a Customer's Testing Facility according to CTF stage 1 or CTF stage 2 procedure has been used.

Note: This page may be removed when CTF stage 1 or CTF stage 2 are not used. See also clause 4.8 in OD 2020 for more details.

Clause	Measurement / testing	Testing / measuring equipment / material used, (Equipment ID)	Range used	Last Calibration date	Calibration due date
5.2.3.3/ RD	Alternate to Impulse voltage test	High Voltage tester Elabo, type 90-1F, inv.no. 1500151	Up to 5KVac, 20mA, Up to 6KVdc, 5mA	2022-07-19	2023-07-19

Appendix 1: Photographs**UPS - SMT1500RMI1U****Front View****Rear View****Front view with top cover and bezel open**

Main PCB board**Replacement Battery Cartridge - APCRBC88 (Internal Battery Module)**