



ELECTRICAL SAFETY TEST REPORT

HPE BATTERY CHARGE SYSTEM

for the purpose of Electrical safety



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1. INTRODUCTION

1.1 PURPOSE OF THE REPORT

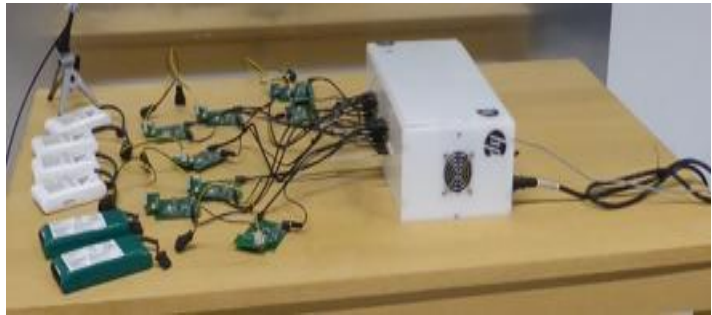
Certification Company was commissioned by **DHL Supply Chain (Netherlands) B.V.** (hereinafter referred to as the 'Client' and/or 'Manufacturer') to perform a conformity assessment procedure for the purpose of CE Certification on the **HPE Battery charge system device** (referred to as 'the Equipment').

The Certification company carried out the necessary testing on behalf of the applicant, in accordance with the Low voltage directive harmonised standards. This report specifically includes the test results for compliance with the applicable Low voltage directive standards, providing an overview of the Equipment's performance in relation to these requirements.

This chapter deals with identification ([§ 1.2](#)) and legal classification ([§ 1.3](#)) of the Product, the legal classification of the Applicant as an economic operator ([§ 1.4](#)) and provides an overview of compliance documentation submitted by the Applicant ([§ 1.5](#)).

1.2 PRODUCT IDENTIFICATION

For the purpose of this investigation the following Product has been taken into account:

#	PRODUCT NAME	INTENDED USE	PHOTOGRAPHIC EXAMPLE
1	HPE	Battery charger	

Remark: -

1.3 PRODUCT CLASSIFICATION

The Product is primarily classified as an **electrical equipment** in accordance with the European Low Voltage Directive. According to article 1 of the European Low Voltage Directive electrical equipment means:

“a product which has been designed for use with a voltage rating of between 50 and 1 000 V for alternating current and between 75 and 1 500 V for direct current”

- **Justification:** The product is designed for alternating current between 50 and 1000 V. Therefore, the Product is considered as electrical equipment and falls within the scope of the above mentioned applicable European Legislation

Remark: Besides the Low Voltage Directive, the Product also falls under the scope of the EMC and RoHS Directives, which means the Product has to conform to the relevant standards of those Directives as well.

1.4 ECONOMIC OPERATOR CLASSIFICATION

According to article 2, paragraph 7 of the Low Voltage Directive, there are four economic operators: the manufacturer, the authorized representative, the importer and the distributor.

The Applicant is classified as the **Manufacturer** in accordance with the European Low Voltage Directive. According to article 2, paragraph 3 of the Low Voltage Directive, a manufacturer means:

“any natural or legal person who manufactures electrical equipment or has electrical equipment designed or manufactured, and markets that equipment under his name or trade mark”

- **Justification:** The Applicant is a legal person who has the electrical equipment designed and/or manufactured and wants to market that equipment under his name or trade mark. Therefore, the Applicant must be considered as the manufacturer of the electrical equipment within the scope of Low Voltage Directive.

1.5 OVERVIEW COMPLIANCE DOCUMENTATION

The Applicant provided the following compliance documentation as part of the EMC measuring assessment.

#	DOCUMENT NAME	DOCUMENT TYPE	INTERNAL REFERENCE NUMBER
1	TeraSci HPE Battery Process Work Instruction	User Manual	TD-03-03
2	HPE. pdf	Schematics	TD-02-02
3	10637. pdf	Datasheet	TD-01-01
4	AP7361C. pdf	Datasheet	TD-01-02
5	bq24725 .pdf	Datasheet	TD-01-03
6	CDRH125. pdf	Datasheet	TD-01-04
7	efm8bb3-datasheet .pdf	Datasheet	TD-01-05
8	KEM_R7002_EC2_EE2 .pdf	Datasheet	TD-01-06
9	pj-002a .pdf	Datasheet	TD-01-07
10	rcae3 .pdf	Datasheet	TD-01-08
11	RoHS-statement. pdf	Statement	TD-01-09
12	scls117e .pdf	Datasheet	TD-01-10
13	si4178dy .pdf	Datasheet	TD-01-11
14	sn74hc125. pdf	Datasheet	TD-01-12
15	sn74ls06 .pdf	Datasheet	TD-01-13
16	TAJ .pdf	Datasheet	TD-01-14
17	THJ .pdf	Datasheet	TD-01-15
18	si4178dy.pdf	Datasheet	TD-01-16
19	Battery_BoM.xlsx	BoM	TD-01-17

Remark: the documentation made available and the results and / or conclusions resulting therefrom are assumed to be authentic. The internal reference numbers mentioned above will be used throughout this report as part of compliance evidence.

2 ASSESSMENT OF ESSENTIAL REQUIREMENTS (LVD)

LVD ESSENTIAL REQUIREMENTS CHECKLIST (In accordance with article 6(1) and Annex I of the LVD Directive)		
REQUIREMENTS	LEGAL BASIS	ASSESSMENT
1) Electrical equipment shall be constructed in accordance with good engineering practice in safety matters, shall not endanger the health and safety of persons and domestic animals, or property, when properly installed and maintained and used in applications for which it was designed.	Article 6(1)	IN COMPLIANCE
	~ Annex I	Please refer to Electrical Safety Report for detailed test results with respect to essential safety requirements as set out in Low voltage Directive 2014/35/EU.

3 ELECTRICAL SAFETY TEST REPORT

1 INTRODUCTION

The electrical safety evaluation is carried out in order to find out whether the product complies with the harmonised electric safety standards under the low voltage directive 2014/35/EU.

In this report, the product tested will be referred to as Equipment Under Test (EUT).

All relevant tests and measurements as described in the applicable standard(s), listed in 1.1, are carried out, unless specified in this report.

The test results presented in this report relate only to the product which is tested.

1.1 STANDARD(S)

The EUT is tested against the following standard(s):

- EN62368-1:2014 – Audio/Video, information and communication technology equipment – Part 1: Safety requirements

1.2 Abbreviations

Abbr.	Description
EUT	Equipment Under Test
LPS	Limited Power Source
SFC	Single Fault Condition
SELV	Safety Extra Low Voltage

2 Test item particulars

Classification of use by	<input type="checkbox"/> Ordinary person <input checked="" type="checkbox"/> Instructed person <input type="checkbox"/> Skilled person (Installation) <input type="checkbox"/> Children likely to be present
Supply Connection	<input checked="" type="checkbox"/> AC Mains <input type="checkbox"/> DC Mains <input type="checkbox"/> External Circuit - not Mains connected - <input type="checkbox"/> ES1 <input type="checkbox"/> ES2 <input type="checkbox"/> ES3
Supply % Tolerance	<input checked="" type="checkbox"/> +10%/-10% <input type="checkbox"/> +20%/-15% <input type="checkbox"/> +___%/ -___% <input type="checkbox"/> None
Supply Connection – Type	<input checked="" type="checkbox"/> pluggable equipment type A - <input type="checkbox"/> non-detachable supply cord <input checked="" type="checkbox"/> appliance coupler <input type="checkbox"/> direct plug-in <input type="checkbox"/> mating connector <input type="checkbox"/> pluggable equipment type B - <input type="checkbox"/> non-detachable supply cord <input type="checkbox"/> appliance coupler <input type="checkbox"/> permanent connection <input type="checkbox"/> mating connector <input type="checkbox"/> other:
Considered current rating of protective device as part of building or equipment installation.....	16A; Installation location: <input checked="" type="checkbox"/> building; <input type="checkbox"/> equipment
Equipment mobility	<input checked="" type="checkbox"/> movable <input type="checkbox"/> hand-held <input type="checkbox"/> transportable <input type="checkbox"/> stationary <input type="checkbox"/> for building-in <input type="checkbox"/> direct plug-in <input type="checkbox"/> rack-mounting <input type="checkbox"/> wall-mounted
Over voltage category (OVC)	<input type="checkbox"/> OVC I <input checked="" type="checkbox"/> OVC II <input type="checkbox"/> OVC III <input type="checkbox"/> OVC IV <input type="checkbox"/> other: _____
Class of equipment	<input checked="" type="checkbox"/> Class I <input type="checkbox"/> Class II <input type="checkbox"/> Class III
Access location	<input type="checkbox"/> restricted access location <input checked="" type="checkbox"/> N/A
Pollution degree (PD)	<input type="checkbox"/> PD 1 <input checked="" type="checkbox"/> PD 2 <input type="checkbox"/> PD 3
Manufacturer's specified maximum operating ambient.....	+40°C
IP protection class	<input type="checkbox"/> IPX0 <input type="checkbox"/> IP65
Power Systems	<input type="checkbox"/> TN <input type="checkbox"/> TT <input type="checkbox"/> IT - ___ V _{L-L}

Altitude during operation (m)	<input checked="" type="checkbox"/> 2000 m or less <input type="checkbox"/> _____ m
Altitude of test laboratory (m)	<input checked="" type="checkbox"/> 2000 m or less <input type="checkbox"/> _____ m
Mass of equipment (kg)	<input checked="" type="checkbox"/> 3.3

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.

This Test Report covers test results for IEC 62368-1: 2014 (Second Edition), and additional results for IEC 60065: 2014 (Eighth Edition) and/or IEC 60950-1: 2005 (Second Edition) + Am 1: 2009 + Am 2: 2013.

Where a requirement in IEC 62368-1 addresses the same requirement/principle in IEC 60065 and/or IEC 60950-1, compliance with the IEC 62368-1 requirements covers compliance with the same requirement/principle in IEC 60065 and/or IEC 6095-1, as indicated.

The complete background/rationale behind the considerations in this TRF is outlined in **108/575/INF**, *IEC TC 108 position related to TRFs associated with the transition of IEC 60065 and IEC 60950-1 to IEC 62368-1*. Use of this TRF is intended to allow for a smooth transition from the legacy standards, IEC 60065 and IEC 60950-1, to the state-of-art requirements for safety of audio/video, information and communication technology equipment, IEC 62368-1.

GENERAL PRODUCT INFORMATION:

Product Description:

The EUT can charge up to 8 batteries, it is connected to 230Vac mains and a PC.
 On the PC the charge is activated and can be monitored.

Model Differences:
 -

Additional application considerations – (Considerations used to test a component or sub-assembly) –
 See chapter 4.1, conditions of use.

Applicant's name.....:	
Address.....:	

3 CONCLUSION

The performed tests according the applicable standard(s) mentioned in chapter 1.1 were passed under conditions of use (chapter 4.1).

This means that the tested EUT is in compliance with the harmonized standard as mentioned in chapter 1.1 under the low voltage directive 2014/35/EU.

The test results presented in this report are valid for the tested/assessed sample(s) only since product reproducibility is not within the scope.

This report can be used as a reference for the declaration of conformity for low-voltage directive 2014/35/EU.

At request of the costumer Single Fault Conditions (SFC) are not performed to reduce the risk of malfunctions / defects of the EUT

3.1 NON-CONFORMITIES PREVIOUS REPORT

F.3.2.1	No marking on EUT, manufacturer identification, the manufacturer or responsible vendor shall be identified by means of a marking on the equipment and missing the electrical ratings.	Solved, Marking on back of EUT
F.3.5	The position of the disconnect switch shall be identified (on/off marking)	Solved, new mains switch do have on/off marking
4.1.3	Equipment design and construction (see comments at cl. 4.1.3)	Solved, all internal PS3 circuits are provided with a metal fire enclosure
6.4	Max. output current in case of an overload or other SFC on each output is 19A _{dc} , the connector and cable are not suitable for this high currents. Each output shall be provided with a fused	Solved, each output is provided with a fuse, rated 5A

3.2 Observations

- A lot of dust / pollution is founded in the EUT. The EUT is evaluated for pollution degree 2. If the environment is pollution degree 3 the openings in the EUT shall be protected with filter material (FAN inlet / outlet)

4 EVALUATION CONDITIONS

4.1 Conditions of use

- The product is evaluated for a maximum ambient temperature of 40°C
- IP tests are not part of this investigation
- External PC is not part of this evaluation
- External batteries are not part of this evaluation (only used for load conditions)
- Internal power supplies provide double or reinforced insulation, are already certified and not part of this evaluation

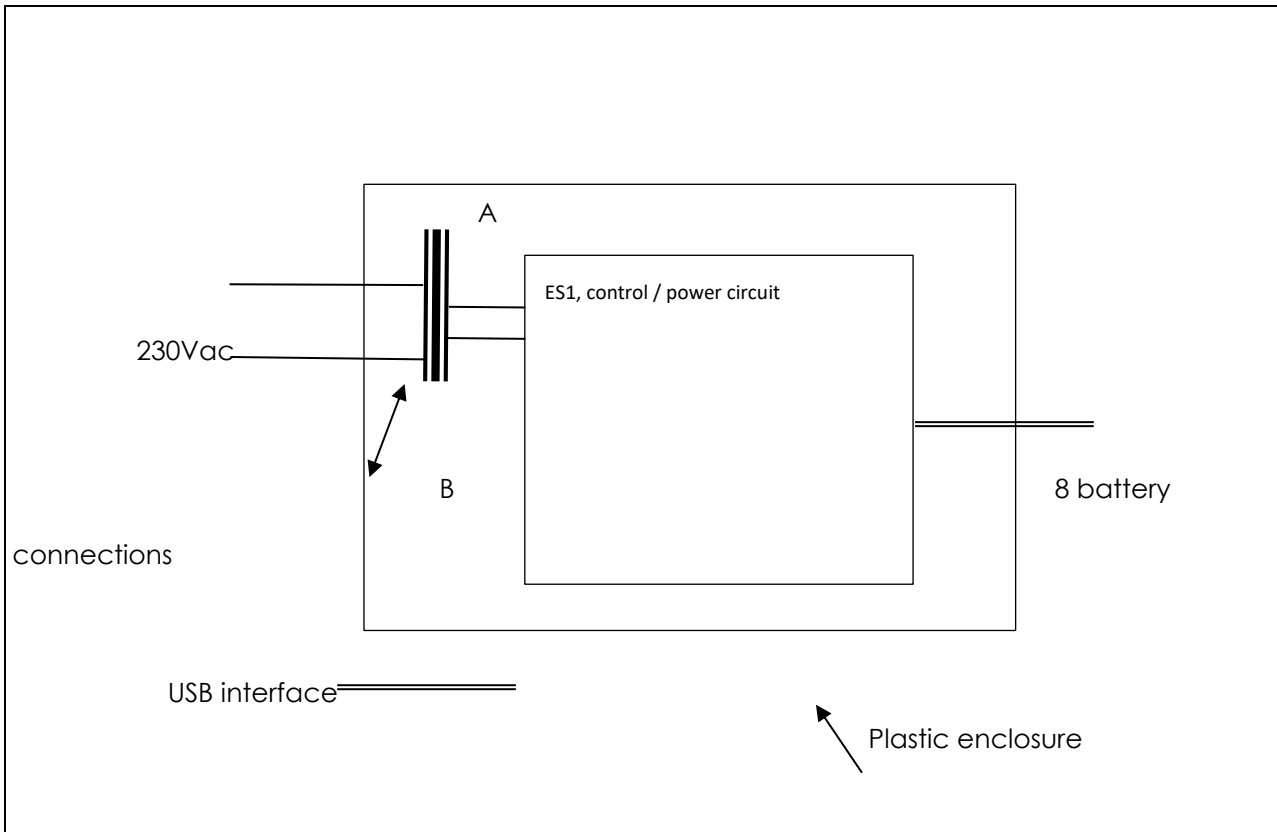
4.2 Environmental test conditions

- Ambient temperature: 23°C (+/- 5°C)
- Relative humidity : 45% (+/- 15%)

Test setup

EUT powered with 230Vac, 6 batteries connected and charged

5 Energy / Isolation Diagram



Location or description	Insulation type (NOTE 1)	Maximum working voltage (NOTE 2)	
A	DI/RI	230	Insulation by certified power supplies (2x)
B	DI/RI	230	Isolation by enclosure

NOTE 1 – Type of insulation: BI = BASIC INSULATION DI = DOUBLE INSULATION PI = PROTECTIVE IMPEDANCE RI = Reinforced INSULATION SI = Supplementary INSULATION	NOTE 2 - Types of voltage Peak impulse test voltage (pulse) r.m.s. d.c. peak	NOTE 3 - INSTALLATION CATEGORIES (OVERVOLTAGE CATEGORIES) or POLLUTION DEGREES which differ from these should be shown under "Comments".
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Supplementary Information:

6 Energy sources identification table

Electrically-caused injury (Clause 5): (Note: Identify type of source, list sub-assembly or circuit designation and corresponding energy source classification) Example: +5 V dc input ES1	
Source of electrical energy	Corresponding classification (ES)
Input voltage: 230Vac	ES3
Control circuit: 15Vdc and 5Vdc	ES1
Electrically-caused fire (Clause 6): (Note: List sub-assembly or circuit designation and corresponding energy source classification) Example: Battery pack (maximum 85 watts): PS2	
Source of power or PIS	Corresponding classification (PS)
Mains input circuit	PS3
Control circuit (behind transformer, 15Vdc)	PS3
Control circuit (behind transformer, 5Vdc)	PS2
Injury caused by hazardous substances (Clause 7) (Note: Specify hazardous chemicals, whether produces ozone or other chemical construction not addressed as part of the component evaluation.) Example: Liquid in filled component Glycol	
Source of hazardous substances	Corresponding chemical
None	N/A
Mechanically-caused injury (Clause 8) (Note: List moving part(s), fan, special installations, etc. & corresponding MS classification based on Table 35.) Example: Wall mount unit MS2	
Source of kinetic/mechanical energy	Corresponding classification (MS)
No sharp edges	MS1
Weight	MS1
Thermal burn injury (Clause 9) (Note: Identify the surface or support, and corresponding energy source classification based on type of part, location, operating temperature and contact time in Table 38.) Example: Hand-held scanner – thermoplastic enclosure TS1	
Source of thermal energy	Corresponding classification (TS)
Enclosure	TS1

Radiation (Clause 10)

(Note: List the types of radiation present in the product and the corresponding energy source classification.)

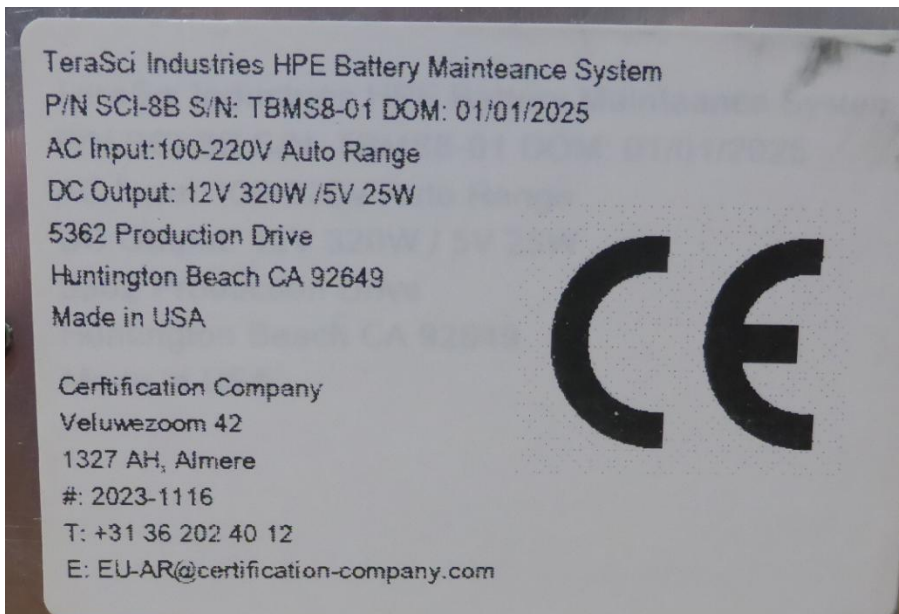
Example: DVD – Class 1 Laser Product

RS1

Type of radiation	Corresponding classification (RS)
LED (indication LED)	RS1

7 Marking and documentation
7.1 Equipment identification

Test item description	HPE Maintenance System
Trade mark	
Manufacturer.....	
Model/type reference.....	SCI-8B
Ratings	110-220Vac, 50-60Hz, 320W

7.2 Sample of marking plate


Summation of requirements

Test case verdicts	
Test case does not apply to the test object	N/A
Test item does meet the requirement ...	P(ass)
Test item does not meet the requirement	F(ail)
Testing	
Date of receipt of test item	13 June 2022
Date(s) of performance of test	14 June – 16 June 2022 / April 2025

IEC 62368-1 (ed.2) & IEC 60065 (ed.8) & IEC 60950-1 (ed.2), am1; am2			
Clause	Requirement + Test	Result - Remark	Verdict

4	GENERAL REQUIREMENTS		P
4.1.1	Acceptance of materials, components and subassemblies (IEC 60065, 3.4) & (IEC 60950-1, 1.5.1)		P
4.1.2	Use of components (IEC 60065, 3.4, 14.1) & (IEC 60950-1, 1.5.2)	For safety, certified components are used according with their ratings and certifications. (see table 1)	-
4.1.3	Equipment design and construction (IEC 60065, 3.1) & (IEC 60950-1, 1.3.2)	External battery connector board(s) are protected by a fuse of 5A. All internal PS3 circuits are in a metal fire enclosure	P
4.4.4	Safeguard robustness	(See Annex T.3, T.4, T.5, T.6, T.7, T.8, T.9) only on main enclosure	P
4.5	Explosion		N/A
4.6	Fixing of conductors (IEC 60065, 8.14) & (IEC 60950-1, 3.1.9)		P
4.7	Equipment for direct insertion into mains socket – outlets (IEC 60065, 15.4) & (IEC 60950-1, 4.3.6)		N/A

4.8	Products containing coin/button cell batteries (IEC 60065, 12.7)		N/A
4.9	Likelihood of fire or shock due to entry of conductive object..... : (IEC 60065, 9.1.3, 20.3.2) & (IEC 60950-1, 4.6.1)		—

5	ELECTRICALLY-CAUSED INJURY		P
5.2.1	Electrical energy source classifications :	(See appended table 5.2)	—
5.2.2	ES1, ES2 and ES3 limits	ES1 and ES3 circuits	P
5.3	Protection against electrical energy sources (IEC 60065, 9.1.1) & (IEC 60950-1, 2.1)	All ES3 circuits in enclosure	P
5.3.1	General Requirements for accessible parts to ordinary, instructed and skilled persons (IEC 60065, 9.1.1) & (IEC 60950-1, 2.1)	No ES3 bare parts could be touched without the need of a tool	P
5.4	Insulation materials and requirements		P
5.4.2	Clearances (IEC 60065, 13.3, Annex J) & (IEC 60950-1, 2.10.3, Annex G)	Between ES3 and ES1 circuits	P
5.4.3	Creepage distances..... : (IEC 60065, 13.4) & (IEC 60950-1, 2.10.4)	Between ES3 and ES1 circuits	—
5.4.4	Solid insulation (IEC 60065, 8.8) & (IEC 60950-1, 2.10.5)	Part of certified power supplies	P
5.4.5	Antenna terminal insulation (IEC 60065, 10.2) & (IEC 60950-1, 7.4)		N/A
5.4.6	Insulation of internal wire as part of supplementary safeguard : (IEC 60065, 8.9) & (IEC 60950-1, 2.1.1.3)		—
5.4.7	Tests for semiconductor components and for cemented joints (IEC 60065, 13.6, 13.7, 13.8) & (IEC 60950-1, 2.10.11)		N/A
5.4.8	Humidity conditioning		N/A
5.4.9	Electric strength test : (IEC 60065, 10.4) & (IEC 60950-1, 5.2)		—

5.4.10	Protection against transient voltages between external circuit (IEC 60065, Annex B) & (IEC 60950-1, 6.2)		N/A
5.4.11	Insulation between external circuits and earthed circuitry.....: (IEC 60065, Annex B) & (IEC 60950-1, 6.1)		—
5.5	Components as safeguards		P
5.5.1	General		P
5.5.2	Capacitors and RC units (IEC 60065, 14.3)		N/A
5.5.3	Transformers (IEC 60065, 14.4) & (IEC 60950-1, 1.5.4, Annex C)	Two internal certified power supplies	P
5.5.4	Optocouplers (IEC 60065, 14.12) & (IEC 60950-1, 2.10.5.3, 2.10.5.4)		N/A
5.5.5	Relays		N/A
5.5.6	Resistors (IEC 60065, 14.2) & (IEC 60950-1, 1.5.7)		N/A
5.5.7	SPD's (IEC 60065, 14.13) & (IEC 60950-1, 1.5.9)		N/A
5.5.8	Insulation between the mains and external circuit consisting of a coaxial cable.....: (IEC 60065, 10.2) & (IEC 60950-1, 1.5.7.3, 7.4)		—
5.6	Protective conductor		P
5.6.2	Requirement for protective conductors (IEC 60065, 15.2) & (IEC 60950-1, 2.6.3, 2.6.5)	PE only for connection to the internal power supplies. enclosure is non-conductive and not connected to PE	P
5.6.3	Requirement for protective earthing conductors (IEC 60065, 15.2) & (IEC 60950-1, 2.6.3.2)		P
	Protective earthing conductor size (mm ²):		—
5.6.4	Requirement for protective bonding conductors		N/A
5.6.5	Terminals for protective conductors		N/A
5.6.6	Resistance of the protective system (IEC 60065, 15.2) & (IEC 60950-1, 2.6.3.4)		N/A

5.6.7	Reliable earthing (IEC 60065, 14.13) & (IEC 60950-1, 1.5.9.4, 5.1.7.1)		N/A
5.7	Prospective touch voltage, touch current and protective conductor current		P
5.7.2	Measuring devices and networks		P
5.7.2.1	Measurement of touch current: (IEC 60065, 9.1.1.2) & (IEC 60950-1, 5.1.4)		—
5.7.4	Earthed conductive accessible parts: (IEC 60065, 9.1.1.2) & (IEC 60950-1, 5.1.6)		N/A
5.7.5	Protective conductor current (IEC 60950-1, 5.1.7)		P
5.7.6	Prospective touch voltage and touch current due to external circuits (IEC 60950-1, 5.1.8)		N/A
5.7.7	Summation of touch currents from external circuits (IEC 60950-1, 5.1.8.2)		N/A

6	ELECTRICALLY- CAUSED FIRE		P
6.2	Classification of power sources (PS) and potential ignition sources (PIS)		P
6.2.2	Power source circuit classifications	(See appended table 6.2.2)	P
6.3	Safeguards against fire under normal operating and abnormal operating conditions		P
6.4	Safeguards against fire under single fault conditions		P
6.4.1	Safeguard method	Reduce the likelihood of ignition method is used	P
6.4.3.2	Reduce the likelihood of ignition	Max. output current in case of an overload or other SFC on each output is 5A _{dc} max. (each output is protected by a fuse)	P
6.4.4	Control of fire spread in PS1 circuits		P
6.4.5	Control of fire spread in PS2 circuits		N/A

6.4.6	Control of fire spread in PS3 circuits	SFC not performed to protect the EUT All components are mounted on UL94V-1 or better All internal PS3 circuits are within a metal fire enclosure	P
6.4.7	Separation of combustible materials from a PIS (IEC 60065, 20.2.5) & (IEC 60950-1, 4.7.3.4)		N/A
6.5	Internal and external wiring		P
6.6	Safeguards against fire due to connection to additional equipment (IEC 60950-1, 3.5.4)		N/A
	External port limited to PS2 or complies with Clause Q.1		N/A

7	INJURY CAUSED BY HAZARDOUS SUBSTANCES		N/A
7.2	Reduction of exposure to hazardous substances		N/A
7.3	Ozone exposure (IEC 60950-1, 1.7.2.6)		N/A
7.4	Use of personal safeguards (PPE)		N/A
	Personal safeguards and instructions		—
7.5	Use of instructional safeguards and instructions		N/A
	Instructional safeguard (ISO 7010)		—
7.6	Batteries..... (IEC 60065, 14.10) & (IEC 60950-1, 4.3.8)		N/A

8	MECHANICALLY-CAUSED INJURY		P
8.1	General		P
8.2	Mechanical energy source classifications	MS1, EUT -> 3.3kg	P
8.3	Safeguards against mechanical energy sources	MS1, no additional safeguards required	N/A

8.4	Safeguards against parts with sharp edges and corners (IEC 60065, 19.5) & (IEC 60950-1, 4.3.1)	No such	N/A
8.5	Safeguards against moving parts	Finger guard mounted for fan blades	P
8.6	Stability (IEC 60065, 19) & (IEC 60950-1, 4.1)		P
8.7	Equipment mounted to wall or ceiling (IEC 60065, 19.7) & (IEC 60950-1, 4.2.10)	No such	N/A
8.8	Handles strength	No such	N/A
8.9	Wheels or casters attachment requirements	No such	N/A
8.10	Carts, stands and similar carriers	No such	N/A
8.11	Mounting means for rack mounted equipment (IEC 60950-1, Annex DD)	No such	N/A
8.12	Telescoping or rod antennas.....: (IEC 60065, 12.6)	No such	—
	Button/Ball diameter (mm)		—

9	THERMAL BURN INJURY		P
9.2	Thermal energy source classifications (IEC 60065, 7.1, 11.2) & (IEC 60950-1, 4.5.4)	Enclosure TS1	P
9.3	Safeguard against thermal energy sources (IEC 60065, 7.1, 11.2) & (IEC 60950-1, 4.5.4)		N/A
9.4	Requirements for safeguards		N/A

10	RADIATION		P
10.2	Radiation energy source classification	RS1, signalling LED only	P
10.3	Protection against laser radiation (IEC 60065, 6.2) & (IEC 60950-1, 4.3.13.5.1)		N/A
10.4	Protection against visible, infrared, and UV radiation (IEC 60065, 6.3) & (IEC 60950-1, 4.3.13.4, 4.3.13.5.2)		N/A
10.5	Protection against x-radiation (IEC 60065, 6.1) & (IEC 60950-1, 4.3.13.2)		N/A

10.6	Protection against acoustic energy sources		N/A
------	--	--	-----

B	NORMAL OPERATING CONDITION TESTS, ABNORMAL OPERATING CONDITION TESTS AND SINGLE FAULT CONDITION TESTS		P
B.2	Normal Operating Conditions	(See appended table B.2.5)	P
B.3	Simulated abnormal operating conditions		P
B.4	Simulated single fault conditions (IEC 60065, 4.3) & (IEC 60950-1, 1.4.14)	Bridging functional insulation will not result in a hazard. Only schematics reviewed, not tested	P

C	UV RADIATION		N/A
C.1	Protection of materials in equipment from UV radiation (IEC 60950-1, 4.3.13.3)		N/A

D	TEST GENERATORS		N/A
D.1	Impulse test generators (IEC 60065, Annex K) & (IEC 60950-1, N.1)		N/A
D.2	Antenna interface test generator (IEC 60950-1, N.2)		N/A
D.3	Electronic pulse generator		N/A

E	TEST CONDITIONS FOR EQUIPMENT CONTAINING AUDIO AMPLIFIERS		N/A
E.1	Audio amplifier normal operating conditions (IEC 60065, 4.2.5) & (IEC 60950-1, 4.5.1)		N/A
E.2	Audio amplifier abnormal operating conditions (IEC 60065, 4.3.6) & (IEC 60950-1, 5.3.6)		N/A

F	EQUIPMENT MARKINGS, INSTRUCTIONS, AND INSTRUCTIONAL SAFEGUARDS		P
F.1	General requirements (IEC 60065, 5.1, 5.2, 5.3) & (IEC 60950-1, 1.7.2.1)		P
	Instructions – Language	English instructions reviewed	—

F.2	Letter symbols and graphical symbols (IEC 60065, 5.1)		P
F.3	Equipment markings		P
F.3.1	Equipment marking locations (IEC 60065, 5.1) & (IEC 60950-1, 1.7.1.2)		P
F.3.2	Equipment identification markings (IEC 60065, 5.2) & (IEC 60950-1, 1.7.1.2)	Marking on back of EUT	P
F.3.3	Equipment rating markings (IEC 60065, 5.2) & (IEC 60950-1, 1.7.1.1)		P
F.3.4	Voltage setting device (IEC 60065, 5.2 e) & (IEC 60950-1, 1.7.4)		N/A
F.3.5	Terminals and operating devices		P
F.3.6	Equipment markings related to equipment classification		N/A
F.3.7	Equipment IP rating marking: (IEC 60065, A.5)		—
F.3.8	External power supply output marking (IEC 60065, 5.3 c))		N/A
F.3.9	Durability, legibility and permanence of marking (IEC 60065, 5.1) & (IEC 60950-1, 1.7.11)		N/T
F.3.10	Test for permanence of markings (IEC 60065, 5.1) & (IEC 60950-1, 1.7.11)		N/T
F.4	Instructions (IEC 60065, 5.4, 5.5.2) & (IEC 60950-1, 1.7.2.1, 1.7.14, 5.1.7, 3.4.3)		P
F.5	Instructional safeguards (IEC 60065, 5.4, 5.5)		N/A

G	COMPONENTS		P
G.1	Switches (IEC 60950-1, 2.8.7)		N/A
G.2	Relays (IEC 60065, 14.4.3) & (IEC 60950-1, 2.8.7)		N/A
G.3	Protection Devices		N/A
G.4	Connectors		N/A
G.5	Wound Components		N/A
G.5.4	Motors		N/A

G.6	Wire Insulation	N/A
G.7	Mains supply cords	P
G.8	Varistors	N/A
G.9	Integrated Circuit (IC) Current Limiters (IEC 60950-1, Annex CC)	N/A
G.10	Resistors (IEC 60065, 14.2) & (IEC 60950-1, 1.5.7)	N/A
G.11	Capacitor and RC units (IEC 60065, 14.3) & (IEC 60950-1, 1.5.6)	N/A
G.12	Optocouplers	N/A
G.13	Printed boards (IEC 60065, 13.5) & (IEC 60950-1, 2.10.6)	P
G.14	Coating on components terminals	N/A
G.15	Liquid filled components	N/A
G.16	IC including capacitor discharge function (ICX)	N/A

H	CRITERIA FOR TELEPHONE RINGING SIGNALS		N/A
H.1	General (IEC 60950-1, M.1)		N/A

J	INSULATED WINDING WIRES FOR USE WITHOUT INTERLEAVED INSULATION		N/A
	General requirements (IEC 60065, Annex H) & (IEC 60950-1, Annex U)		N/A

K	SAFETY INTERLOCKS		N/A
K.1	General requirements (IEC 60065, 14.8) & (IEC 60950-1, 2.8.1, 2.8.2)		N/A

L	DISCONNECT DEVICES		P
L.1	General requirements (IEC 60065, 5.5.3) & (IEC 60950-1, 3.4.1, 3.4.2)	Power switch act as disconnecting device	P

M	EQUIPMENT CONTAINING BATTERIES AND THEIR PROTECTION CIRCUITS		N/A
M.1	General requirements (IEC 60065, 5.5.2 c)) & (IEC 60950-1, 1.7.13)		N/A
M.2	Safety of batteries and their cells (IEC 60065, 14.11.1) & (IEC 60950-1, 4.3.8)		N/A
M.3	Protection circuits (IEC 60950-1, 4.3.8)		N/A
M.4	Additional safeguards for equipment containing secondary lithium battery		N/A
M.4.1	General		N/A
M.4.2	Charging safeguards		N/A
M.4.3	Fire Enclosure		N/A
M.4.4	Endurance of equipment containing a secondary lithium battery		N/A
M.5	Risk of burn due to short circuit during carrying		N/A
M.6	Prevention of short circuits and protection from other effects of electric current		N/A
M.7	Risk of explosion from lead acid and NiCd batteries		N/A
M.8	Protection against internal ignition from external spark sources of lead acid batteries		N/A
M.9	Preventing electrolyte spillage		N/A
M.10	Instructions to prevent reasonably foreseeable misuse (Determination of compliance: inspection, data review; or abnormal testing) : (IEC 60065, 5.5.1)		N/A

N	ELECTROCHEMICAL POTENTIALS		P
	Metal(s) used..... : (IEC 60065, Annex F) & (IEC 60950-1, Annex J)		—

O	MEASUREMENT OF CREEPAGE DISTANCES AND CLEARANCES		P
	Figures O.1 to O.20 of this Annex applied : (IEC 60065, Annex E) & (IEC 60950-1, Annex F)		—

P	SAFEGUARDS AGAINST ENTRY OF FOREIGN OBJECTS AND SPILLAGE OF INTERNAL LIQUIDS		P
P.1	General requirements		P
P.2.2	Safeguards against entry of foreign object (IEC 60065, 9.1.3) & (IEC 60950-1, 4.6.1)		P
P.2.3	Safeguard against the consequences of entry of foreign object		N/A
P.2.3.1	Safeguards against the entry of a foreign object (IEC 60950-1, 4.6.1, 4.6.4.3)		N/A
P.3	Safeguards against spillage of internal liquids		N/A
P.4	Metallized coatings and adhesive securing parts		N/A

Q	CIRCUITS INTENDED FOR INTERCONNECTION WITH BUILDING WIRING		N/A
Q.1	Limited power sources (IEC 60950-1, 2.5)		N/A
Q.2	Test for external circuits – paired conductor cable (IEC 60950-1, 6.3)		N/A

R	LIMITED SHORT CIRCUIT TEST		N/A
R.1	General requirements		N/A
R.2	Determination of the overcurrent protective device and circuit		N/A
R.3	Test method Supply voltage (V) and short-circuit current (A).		—

S	TESTS FOR RESISTANCE TO HEAT AND FIRE		N/A
S.1	Flammability test for fire enclosures and fire barrier materials of equipment where the steady state power does not exceed 4 000 W		N/A
S.2	Flammability test for fire enclosure and fire barrier integrity		N/A

S.3	Flammability test for the bottom of a fire enclosure (IEC 60950-1, A.3)		N/A
S.4	Flammability classification of materials		N/A
S.5	Flammability test for fire enclosures and fire barrier materials of equipment where the steady state power does not exceed 4 000 W		N/A

T	MECHANICAL STRENGTH TESTS		P
T.1	General requirements		P
T.2	Steady force test, 10 N: (IEC 60065, 13.3.1) & (IEC 60950-1, 4.2.2)		P
T.3	Steady force test, 30 N: (IEC 60065, 13.3.1) & (IEC 60950-1, 4.2.3)		P
T.4	Steady force test, 100 N: (IEC 60065, 9.1.7)		P
T.5	Steady force test, 250 N: (IEC 60065, 9.1.7) & (IEC 60950-1, 4.2.4)		P
T.6	Enclosure impact test (IEC 60065, 12.1.4) & (IEC 60950-1, 4.2.5)		P
T.7	Drop test: (IEC 60065, 12.1.5) & (IEC 60950-1, 4.2.6)		N/A
T.8	Stress relief test: (IEC 60065, 12.1.6) & (IEC 60950-1, 4.2.7)		N/A
T.9	Impact Test (glass) (IEC 60065, 19.6.1) & (IEC 60950-1, 4.2.5)		N/A
T.10	Glass fragmentation test.....: (IEC 60065, 19.6.2)		N/A
T.11	Test for telescoping or rod antennas (IEC 60065, 12.6)		N/A

U	MECHANICAL STRENGTH OF CATHODE RAY TUBES (CRT) AND PROTECTION AGAINST THE EFFECTS OF IMPLOSION		N/A
U.1	General requirements (IEC 60065, 18.1) & (IEC 60950-1, 4.2.8)		N/A

V	DETERMINATION OF ACCESSIBLE PARTS (FINGERS, PROBES AND WEDGES)		N/A
V.1	Accessible parts of equipment (IEC 60065, 9.1.1.3, 9.1.3, 9.1.4) & (IEC 60950-1, 1.7.2.5, 2.1.1.1, EE.5)		N/A

9 Measurements

9.1 Critical components

4.1.2	TABLE: List of critical components					--
Object / part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity ¹	
PCB	Various	--	UL94V-0	UL94	UL, #	
Appliance inlet	Various		250V, 10A	-	#	
Power supply 1	Morsun	LM50-23B05	85...305Vac, 47...63Hz, 0.8A output: 5Vdc, 10A, -30...+70°C	EN62368-1 EN60335-1	UR, CE, #	
Power supply 2	Mean Well	RSP-320-12	100...240Vac, 47...63Hz, 2.5A output: 12Vdc, 26A, -30...+70°C	EN62368-1	UR, #	
Battery power connector					#	
Internal wiring primary	Various				#	
Internal wiring secondary	Various				#	
N1CD Battery charge board	TeraSci Inc.	Rev. C2	-	-	#	
N1-MH battery pack connection board	TeraSci Inc.	Rev. B1	-	-	#	
Enclosure			420x220x130mm	-	#	
Supplementary information: ¹) Provided evidence ensures the agreed level of compliance. See OD-CB2039. An # indicates the component is tested as part of the appliance						

9.2 Batteries

Annex M	TABLE: Batteries								N/A	
The tests of Annex M are applicable only when appropriate battery data is not available									N/A	
Is it possible to install the battery in a reverse polarity position?							-		N/A	
	Non-rechargeable batteries			Rechargeable batteries						
	Discharging		Un-intentional charging	Charging (mA)		Discharging (mA)		Reversed charging		
	Meas. current	Manuf. Specs.		Meas. current	Manuf. Specs.	Meas. current	Manuf. Specs.	Meas. current	Manuf. Specs.	
Max. current during normal condition	-	-	-	-	-	-	-	-	-	
Max. current during fault condition	-	-	-	-	-	-	-	-	-	
Test results:										
- Chemical leaks									Verdict	
- Explosion of the battery									N/A	
- Emission of flame or expulsion of molten metal									N/A	
- Electric strength tests of equipment after completion of tests									N/A	
Supplementary information:										

9.3 Electrical energy sources

5.2	TABLE: Classification of electrical energy sources						P
5.2.2.2 – Steady State Voltage and Current conditions							
No.	Supply Voltage	Location (e.g. circuit designation)	Test conditions	Parameters: touch voltage and touch current			ES Class
				U (Vrms or Vpk)	I (mA _{pk} or mA _{rms})	Hz	
1	230Vac	Input power	Normal	-	-	-	ES3
			Abnormal	-	-	-	
			Single fault – SC/OC	-	-	-	
2	15Vdc / 5Vdc	Electronic circuit behind power supplies	Normal	15.0	0.036	-	ES1
			Abnormal	15.0	0.036	-	
			Single fault – SC/OC	15.0	0.036	-	
Supplementary information:							

9.4 Temperature measurements

5.4.1.4, 6.3.2, 9.0, B.2.6	TABLE: Temperature measurements					P
	Supply voltage (V)	230Vac ¹	230Vac ²		*	—
	Ambient T _{max} (°C)	40.0	40.0			—
	T _{ma} (°C)	40.0	40.0			—
Maximum measured temperature T of part/at:	T (°C)				Allowed T _{max} (°C)	
Mains appliance inlet	23.6	23.9		40.2	-	
Mains switch	23.6	25.0		40.2	-	
DC output cable	23.6	23.7		40.2	-	
Internal temperature	23.8	27.4		40.4	50.0#	
Case battery	23.2	23.3		39.8	-	
Enclosure, case top	23.8	25.1		40.4	94.0	
Enclosure, case bottom	25.2	26.5		41.8	94.0	
Enclosure, case front	23.9	24.7		40.5	94.0	
Enclosure, case back	26.7	28.1		43.3	94.0	
Ambient	23.4	22.8		-	--	
Supplementary information: *) measured temperature extrapolated to 40°C 1) 6 batteries connected and in charge mode 2) 6 batteries connected and in charge mode but FAN stalled (SFC) #) based on the max. ambient temperature of the internal power supplies						

9.5 Clearance and creepage

5.4.2.2, 5.4.2.4 and 5.4.3	TABLE: Minimum Clearances/Creepage distance							P
Clearance (cl) and creepage distance (cr) at/of/between:	Up (V)	U r.m.s. (V)	Frequency (kHz) ¹	Required cl (mm)	cl (mm) ²	Required ³ cr (mm)	cr (mm)	
<i>Basic insulation:</i>								
L/N -> PE, internal wiring	-	230	-	1.5	>5.0	2.3	>5.0	
<i>Reinforced:</i>								
L/N -> ES1 circuit	-	230	-	3.0	>5.0	4.6	>5.0	
Part of certified power supplies								
Supplementary information: Short circuit the functional insulation complies with B4.4 Note 1: Only for frequency above 30 kHz Note 2: See table 5.4.2.4 if this is based on electric strength test Note 3: Based on material Group IIIb								

9.6 Electric strength

5.4.9	TABLE: Electric strength tests			P
Test voltage applied between:	Voltage shape (AC, DC)	Test voltage (V)	Breakdown Yes / No	
<i>Basic/supplementary:</i>				
L+N -> PE	AC	1500	No	
<i>Reinforced:</i>				
L+N -> Battery power circuit	DC	4000	No	
L+N -> USB, battery communication	DC	4000	No	
L+N -> USB, PC connection	DC	4000	No	
Supplementary information:				

9.7 Protective conductors

5.6.6.2	TABLE: Resistance of protective conductors and terminations				N/A
Accessible part	Test current (A)	Duration (min)	Voltage drop (V)	Resistance (mΩ)	
Supplementary information: PE only for connection towards internal power supplies, no conductive surfaces available					

9.8 Touch current

5.7		TABLE: access to energized parts		P
Item	Description	Determination method (note 5)	Comments	
1	Enclosure	V		
2	Battery power interfaces	V,J		
3	USB interface to PC	V,J		
<p>Note 1 – test fingers and pins are to be applied without force unless a force is specified</p> <p>Note 2 – special consideration should be given to inadequate insulation and high voltage parts</p> <p>Note 3 – parts are considered to be ACCESSIBLE if they could be touched in the absence of any covering which is not considered to provide suitable insulation</p> <p>Note 4 – capacitor test may be required</p> <p>Note 5 – the determination methods are: v = visual; r = rigid test finger; j = jointed test finger; p3 = pin 3 mm diameter; p4 = pin 4 mm diameter.</p>				
<p>Supplementary information: Class III device, ES1</p>				

5.7.2.2, 5.7.4		TABLE: (Earthed) accessible (conductive) parts			P
Item (see previous table)	Current				Comments
	U2 (mV)	mA (r.m.s.)	mA (r.m.s.) PE-open		
1	0	0	0		
2	18	0.036	0.72		
3	18	0.036	0.72		
<p>Supplementary information:</p>					

9.9 Electrical power sources and ignition sources

6.2.2		TABLE: Electrical power sources (PS) measurements for classification				P
Source	Description	Measurement	Max Power after 3 s	Max Power after 5 s*)	PS Classification	
A	230Vac input power	Power (W) ... :	-	-	PS3	
		VA (V) :	-	-		
		IA (A)..... :	-	-		
B	All electronics behind transformer 1	Power (W) ... :	-	175.0	PS3	
		VA (V) :	-	10.8		
		IA (A)..... :	-	16.2		
C	All electronics behind transformer 2	Power (W) ... :	-	63.4	PS2	
		VA (V) :	-	4.8		
		IA (A)..... :	-	13.2		
Supplementary Information:						

6.2.3.1		TABLE: Determination of Potential Ignition Sources (Arcing PIS)			P
Location	Open circuit voltage After 3 s (V _p)	Measured r.m.s current (I _{rms})	Calculated value (V _p x I _{rms})	Arcing PIS? Yes / No	
Supplementary information:					
Mains circuit is evaluated as a arcing PIS					
An Arcing PIS requires a minimum of 50 V (peak) a.c. or d.c. An Arcing PIS is established when the product of the open circuit voltage (V _p) and normal operating condition rms current (I _{rms}) is greater than 15.					

6.2.3.2	TABLE: Determination of Potential Ignition Sources (Resistive PIS)					P
Circuit Location (x-y)	Operating Condition (Normal / Describe Single Fault)	Measured wattage or VA During first 30 s (W / VA)	Measured wattage or VA After 30 s (W / VA)	Protective Circuit, Regulator, or PTC Operated? Yes / No (Comment)	Resistive PIS? Yes/No	

Supplementary Information:

Mains circuit and 15Vdc circuit is evaluated as resistive PIS

A combination of voltmeter, VA and ammeter IA may be used instead of a wattmeter.

If a separate voltmeter and ammeter are used, the product of (VA x IA) is used to determine Resistive PIS classification.

A Resistive PIS: (a) dissipates more than 15 W, measured after 30 s of normal operation, or (b) under single fault conditions has either a power exceeding 100 W measured immediately after the introduction of the fault if electronic circuits, regulators or PTC devices are used, or has an available power exceeding 15 W measured 30 s after introduction of the fault.

9.10 Equipment ratings

B.2.5	TABLE: Input test							-
U (V)	I (mA)	I rated (A)	P (W)	P rated (W)	Fuse No	I fuse (A)	Condition/status	
230	530	-	70	-	-	-	Active, 6 batteries in charge mode	
230	140	-	15	-	-	-	standby	

Supplementary information:

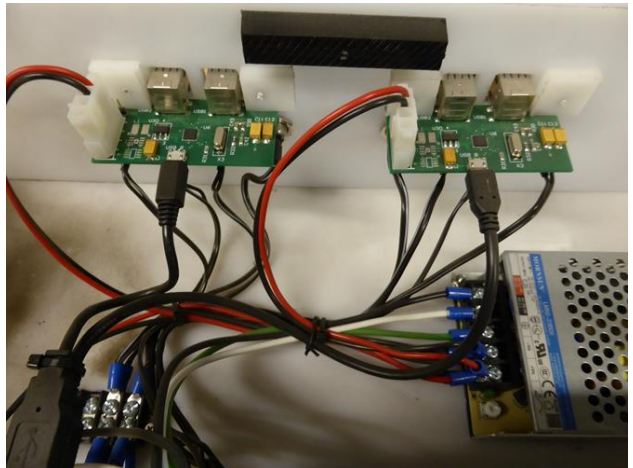
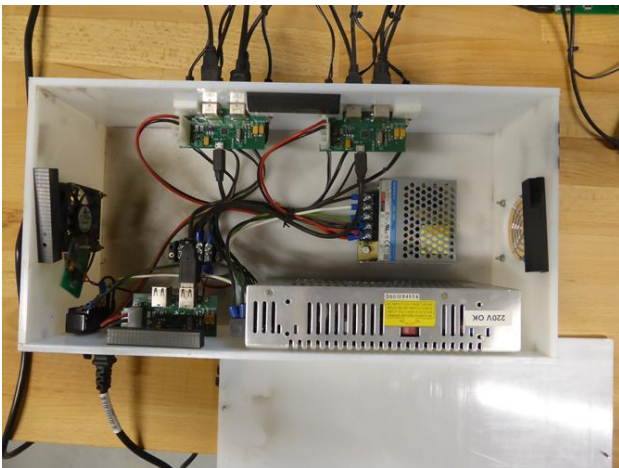
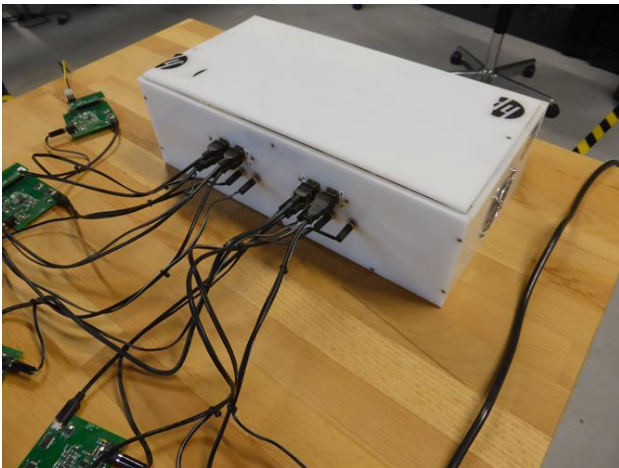
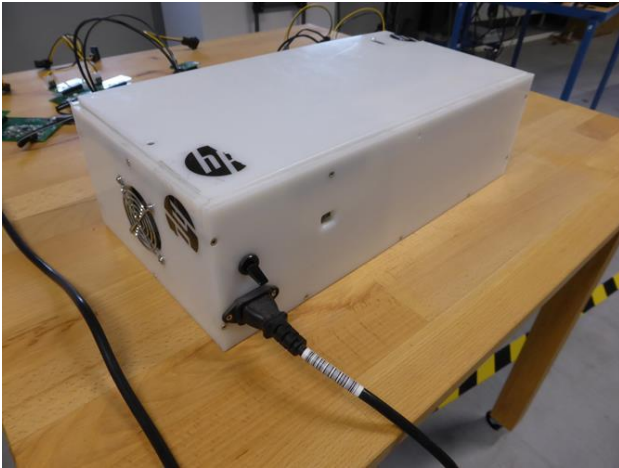
9.11 Fault conditions

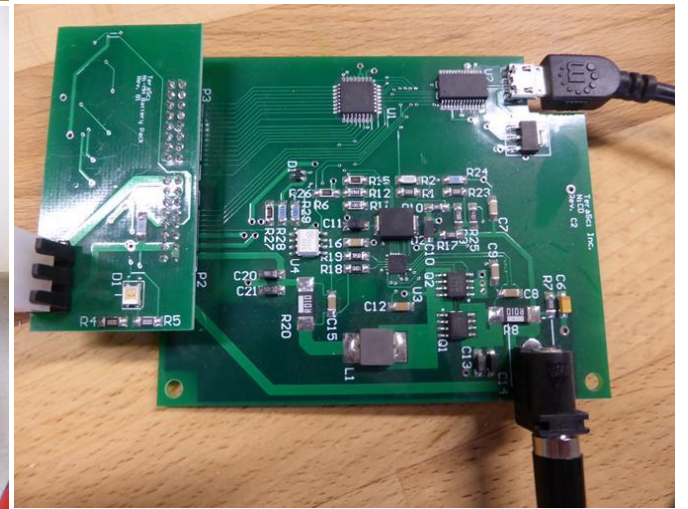
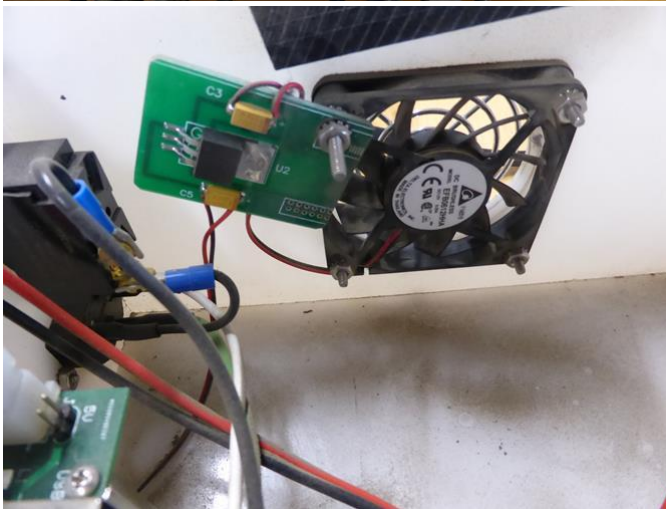
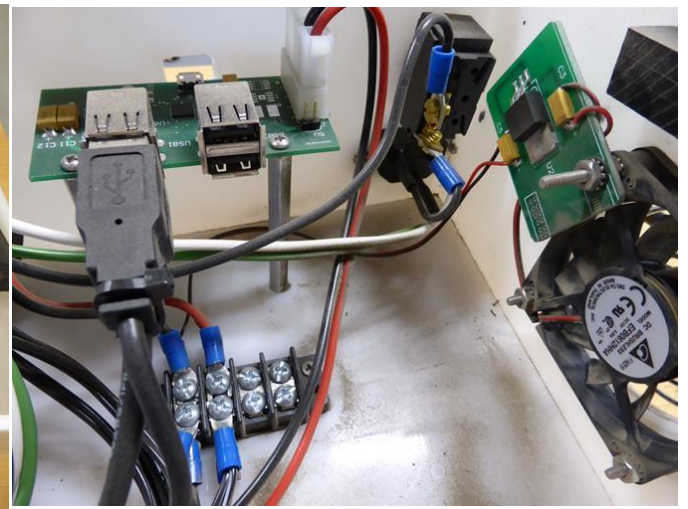
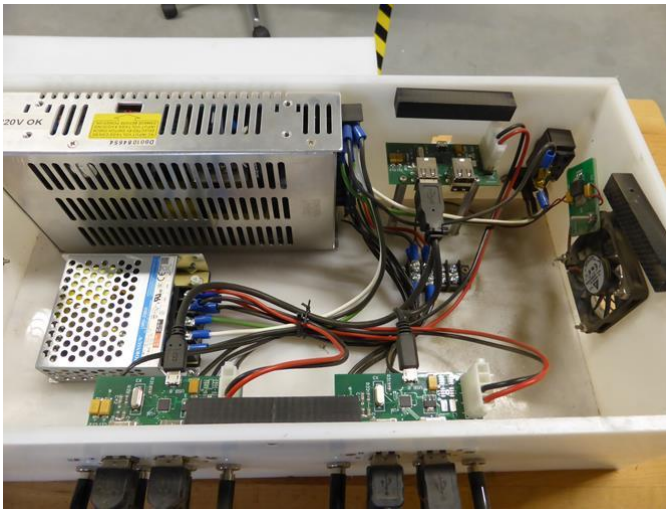
B.3, B.4		TABLE: Abnormal operating and Fault condition tests					N/T
Ambient temperature (°C)		22.0					—
Power source for EUT: Manufacturer, model/type, output rating		--					—
Component No.	Abnormal / Fault Condition	Supply voltage, (V)	Test time (min.)	Fuse no.	current, (mA)	Observation	
Supplementary information:							
s.c. -> short circuit, o.l. -> overload test							

9.12 Interconnections

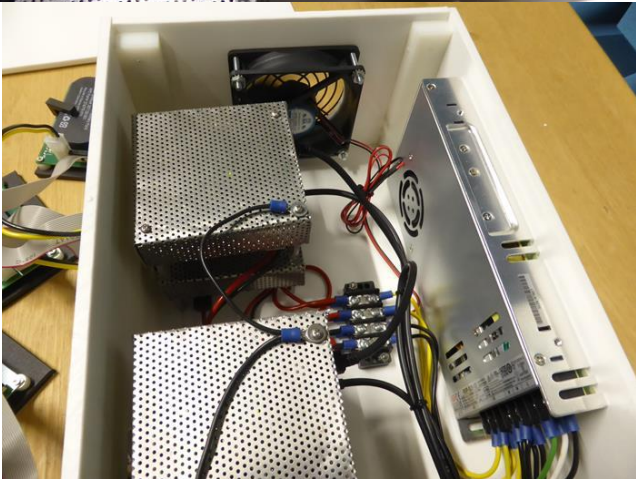
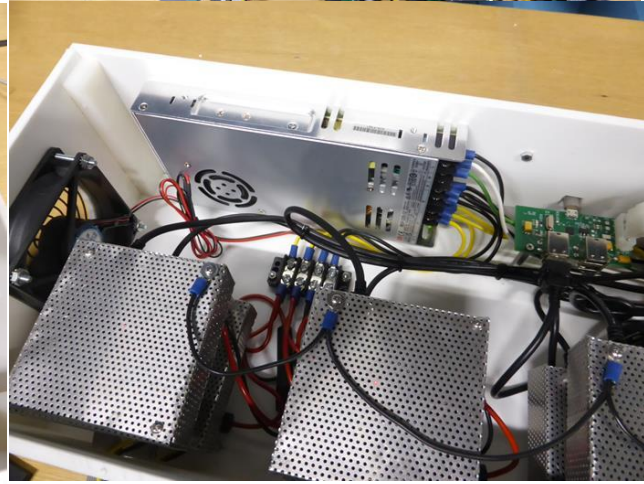
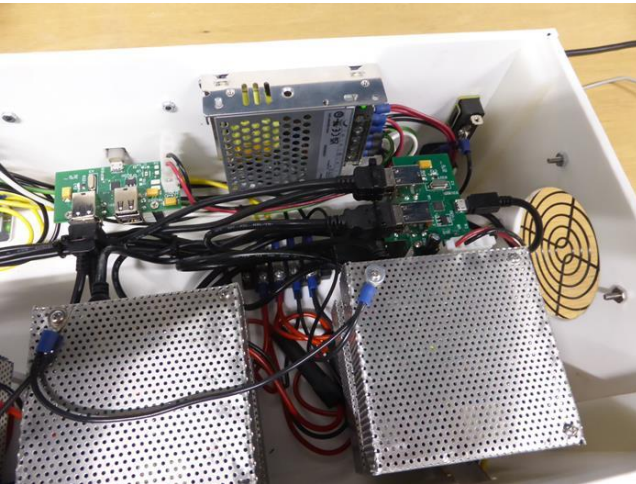
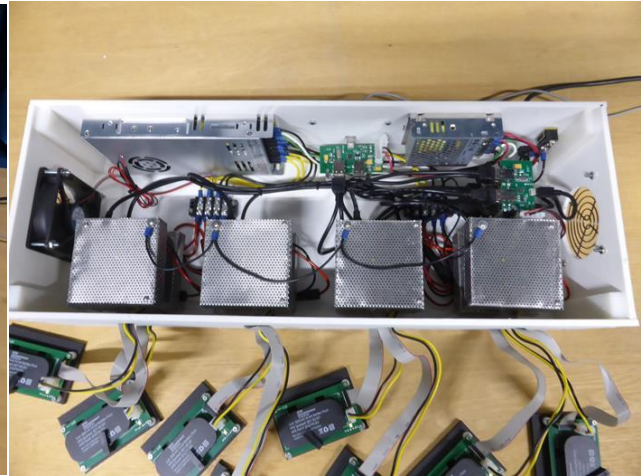
Annex Q.1		TABLE: Circuits intended for interconnection with building wiring (LPS)				N/A	
Note: Measured UOC (V) with all load circuits disconnected:							
Output Circuit	Components	U _{oc} (V)	I _{sc} (A)		S (VA)		
			Meas.	Limit	Meas.	Limit	
				<8.0		<100	
Supplementary Information:							
SC=Short circuit, OC=Open circuit							

10 Pictures





Updated sample:



11 Used equipment

Description	Type	Brand
Multimeter	185, true RMS multimeter	Fluke
Multimeter	179, true RMS multimeter	Fluke
Temperature logger	34970A + 34901A	Agilent
AC adjustable power supply	BL1350	Behlman
Power meter	WT200	Yokogawa
Hi-pot tester	GPT9804	GWInstek
True RMS clamp meter	325	Fluke
Oscilloscope	DS1104	Rigol Technologies
Electrical load	6050A system	Hewlett Packard
Calliper	500-184-30	Mitutoyo
Test finger	MP-100.04A	Stahl
500gr. Steel ball	MP-100.04L	Stahl

Almere, The Netherlands

27th of May 2025

CERTIFICATION COMPANY B.V.

***** END REPORT *****