

TEST REPORT

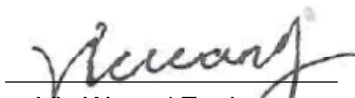
Applicant : TommaTech UG
Address : Angerlweg 14 85748 Garching HRB Nummer 213239 Amtsgericht
München, Germany
Manufacturer : TommaTech UG
Address : Angerlweg 14 85748 Garching HRB Nummer 213239 Amtsgericht
München, Germany
Product Name : INVERTER
Trade Mark : TOMMATECH

Model No. : Tommatech 5K+PLUS
Ratings : See the copy of marking plate on page 3
Standard : Information technology equipment – Safety –
Part 1: General requirements
IEC 60950-1:2005+A1:2009+A2:2013
EN 60950-1:2006+A11:2009+A1:2010+A12:2011+A2:2013

Date of Receiver : February 24, 2018
Date of Test : February 25, 2018 to March 09, 2018
Date of Issue : March 09, 2018
Test Report Form No : NTCS-IEC60950-1-A1-E/I
Test Result : Pass *

This Test Report is Issued Under the Authority of :

Compiled by


Vic Wang / Engineer

Approved by

Han Song / Manager

*Remarks:

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of Dongguan Nore Testing Center Co., Ltd. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

Revision History of This Test Report

[illegible]

Copy of marking plate:

INVERTER

Model Name: Tommatech 5K+ PLUS
Brand name: Tommatech
Color: Blue and Black
Operating Temperature Range: 0~ 55°C



92931210100001

Inverter Mode:

Rated Power: 5000W
DC Input: 48VDC, 117A
AC Output: 230VAC, 50Hz, 22A, 1Φ

AC Mode:



AC Input: 230VAC, 50Hz, 35A, 1Φ
DC Output: 54VDC,
Max. 60A, Default 30A
AC Output: 230VAC, 50Hz, 22A, 1Φ

Solar Mode:

Rated Current: 50A
System Voltage: 48VDC
Min. Solar Voltage: 36VDC
Max. Solar Voltage (VOC): 105VDC



Note: - The trade mark or Manufacturer should be marked on the label or on the enclosure surface

- Symbol  (hight at least 5.0mm) and symbol  (hight at least 7.0mm)

Summary of testing:

The submitted samples were found to comply with the above standard.

- Tests performed on the bench.
- Maximum ambient temperature: +55°C
- Tested for moderate conditions.

Test item particulars..... :

Equipment mobility..... : ☐ movable ☐ hand-held ☐ transportable
☒ stationary ☐ for building-in ☐ direct plug-in

Connection to the mains..... : ☐ pluggable equipment ☒ type A ☐ type B
☒ permanent connection
☐ detachable power supply cord
☐ non-detachable power supply cord
☐ not directly connected to the mains

Operating condition..... : ☒ continuous
☐ rated operating / resting time:

Access location : ☒ operator accessible
☐ restricted access location

Over voltage category (OVC) : ☐ OVC I ☒ OVC II ☐ OVC III ☐ OVC IV
☐ other:

Mains supply tolerance (%) or absolute mains supply values : -10% to 10%

Tested for IT power systems : ☐ Yes (only for Norway) ☒ No

IT testing, phase-phase voltage (V) : N/A

Class of equipment : ☒ Class I ☐ Class II ☐ Class III
☐ Not classified

Considered current rating of protective device as part of the building installation (A) : --

Pollution degree (PD) : ☐ PD 1 ☒ PD 2 ☐ PD 3

IP protection class : IP20

Altitude during operation (m) : Up to 2000m

Altitude of test laboratory (m) : below 2000m

Mass of equipment (kg) : 9.47 kg

Possible test case verdicts:

- test case does not apply to the test object..... : N (N/A)

- test object does meet the requirement..... : P (Pass)

- test object does not meet the requirement..... : F (Fail)

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 is used as the decimal separator.

General product information:

1. The equipment was general designed for using with information technology equipment.
2. Between the charger and battery there has to be a 48VDC/100A circuit breaker.
3. Battery is not provided by manufacturer and is not checked in this report. A battery is only used as tool for test.
4. Double/reinforced insulation provided between primary circuits and SELV circuits by safety isolation transformer, optocoupler and sufficient clearances and creepage distances within the unit.

Factory: TommaTech UG

Address: Angerlweg 14 85748 Garching HRB Nummer 213239 Amtsgericht München, Germany

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
1	GENERAL		P
1.5	Components		P
1.5.1	General	See below	P
	Comply with IEC 60950-1 or relevant component standard	(See appended table 1.5.1).	P
1.5.2	Evaluation and testing of components	<p>Certified components are used in accordance with their ratings, certifications and they comply with applicable parts of this standard.</p> <p>Components not certified are used in accordance with their ratings and they comply with applicable parts of IEC 60950-1 and the relevant component standard.</p> <p>Components, for which no relevant IEC-standard exists, have been tested under the conditions occurring in the equipment, using applicable parts of IEC 60950-1.</p>	P
1.5.3	Thermal controls	Thermal controls used.	P
1.5.4	Transformers	Transformers used were suitable for their intended application and comply with the relevant requirements of the standard.	P
1.5.5	Interconnecting cables	No interconnecting cables	N
1.5.6	Capacitors bridging insulation	X2 type capacitors provided Y2 type capacitors provided.	P
1.5.7	Resistors bridging insulation	See below.	P
1.5.7.1	Resistors bridging functional, basic or supplementary insulation		N
1.5.7.2	Resistors bridging double or reinforced insulation between a.c. mains and other circuits	Bridging resistors bridging reinforced insulation.	P
1.5.7.3	Resistors bridging double or reinforced insulation between a.c. mains and antenna or coaxial cable	No such resistors.	N
1.5.8	Components in equipment for IT power systems	TN power system.	N
1.5.9	Surge suppressors		P
1.5.9.1	General	See Annex Q (see appended table 1.5.1)	P
1.5.9.2	Protection of VDRs		N

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
1.5.9.3	Bridging of functional insulation by a VDR		P
1.5.9.4	Bridging of basic insulation by a VDR	(see appended table 2.10.3 and 2.10.4)	P
1.5.9.5	Bridging of supplementary, double or reinforced insulation by a VDR		N

1.6	Power interface		P
1.6.1	AC power distribution systems	For connection to TN power system.	P
1.6.2	Input current	(see appended table 1.6.2)	P
1.6.3	Voltage limit of hand-held equipment	This appliance is not a hand-held equipment	N
1.6.4	Neutral conductor	Neutral conductor is basic insulated from earth and body of the equipment.	P

1.7	Marking and instructions		P
1.7.1	Power rating and identification markings	See the copy of marking plate or below for detail	P
1.7.1.1	Power rating marking	See the copy of marking plate	P
	Multiple mains supply connections.....:		P
	Rated voltage(s) or voltage range(s) (V) :	See the copy of marking plate	P
	Symbol for nature of supply, for d.c. only:		P
	Rated frequency or rated frequency range (Hz) :	See the copy of marking plate	P
	Rated current (mA or A) :	See the copy of marking plate	P
1.7.1.2	Identification markings	See below	P
	Manufacturer's name or trade-mark or identification mark :	See the copy of marking plate	P
	Model identification or type reference :	See the copy of marking plate	P
	Symbol for Class II equipment only :	Class I equipment	N
	Other markings and symbols :	Additional symbols or marking do not give rise to misunderstanding.	P
1.7.1.3	Use of graphical symbols		P
1.7.2	Safety instructions and marking	Considered.	P
1.7.2.1	General	The user manual contains information for operation, installation, servicing transport, storage and technical data.	P

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
1.7.2.2	Disconnect devices	AC input connector used, Should be considered in the final system.	N
1.7.2.3	Overcurrent protective device	Building installation circuit- breaker and Input breaker	P
1.7.2.4	IT power distribution systems	TN power distribution systems	N
1.7.2.5	Operator access with a tool	All areas containing hazard(s) are inaccessible to the operator.	P
1.7.2.6	Ozone	The equipment does not produce Ozone.	N
1.7.3	Short duty cycles	The equipment is intended for continuous operation.	N
1.7.4	Supply voltage adjustment :	No voltage selector.	N
	Methods and means of adjustment; reference to installation instructions :		N
1.7.5	Power outlets on the equipment :	AC output connector	P
1.7.6	Fuse identification (marking, special fusing characteristics, cross-reference) :	Marking required	P
1.7.7	Wiring terminals	See below	P
1.7.7.1	Protective earthing and bonding terminals :	The earth terminal is marked with the standard earth symbol near the terminal	P
1.7.7.2	Terminals for a.c. mains supply conductors	Power plug used.	N
1.7.7.3	Terminals for d.c. mains supply conductors		P
1.7.8	Controls and indicators	LCD indicated the working condition, detail specified in the instruction.	P
1.7.8.1	Identification, location and marking :	LCD provided to indicate the working condition. A corresponding statement was provided in the User's Manual.	P
1.7.8.2	Colours :	Colors are acceptable due to only used for information (no safety involved even if disregarded).	P
1.7.8.3	Symbols according to IEC 60417:		N
1.7.8.4	Markings using figures :		N
1.7.9	Isolation of multiple power sources :	Provided in the user manual.	N
1.7.10	Thermostats and other regulating devices :	No thermostats or other regulating devices.	N

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
1.7.11	Durability	The marking withstands required tests.	P
1.7.12	Removable parts	No required markings placed on removable parts.	P
1.7.13	Replaceable batteries :	No replaceable batteries in the equipment.	N
	Language(s) :		--
1.7.14	Equipment for restricted access locations:	Operator is not instructed to use a tool in order to gain access to operator access area.	N

2	PROTECTION FROM HAZARDS		P
2.1	Protection from electric shock and energy hazards		P
2.1.1	Protection in operator access areas	See below.	P
2.1.1.1	Access to energized parts	Checked by test finger, test probe and test pin. No accessible hazard energized parts.	P
	Test by inspection :	Not accessible	P
	Test with test finger (Figure 2A) :	Not accessible	P
	Test with test pin (Figure 2B) :	Not accessible	P
	Test with test probe (Figure 2C) :	Not TNV circuit	N
2.1.1.2	Battery compartments	No Interner battery	N
2.1.1.3	Access to ELV wiring	No ELV wiring in operator accessible area.	P
	Working voltage (V _{peak} or V _{rms}); minimum distance through insulation (mm)		--
2.1.1.4	Access to hazardous voltage circuit wiring	Insulation of internal wiring not operator accessible.	P
2.1.1.5	Energy hazards :	No energy hazard in equipment.	P
2.1.1.6	Manual controls	No conductive controls or handles or alike provided.	N
2.1.1.7	Discharge of capacitors in equipment	No risk of electric shock.	P
	Measured voltage (V); time-constant (s):	(see appended table 2.1.1.7)	--
2.1.1.8	Energy hazards – d.c. mains supply	Not connected to DC mains supply.	N
	a) Capacitor connected to the d.c. mains supply ...:		N
	b) Internal battery connected to the d.c. mains supply :		N

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Clause	Requirement + Test	Result - Remark	Verdict
2.1.1.9	Audio amplifiers :	No Audio amplifiers	N
2.1.2	Protection in service access areas		N
2.1.3	Protection in restricted access locations	Equipment not intended for installation in RAL.	N
2.2	SELV circuits		P
2.2.1	General requirements	The secondary circuits were tested as SELV.	P
2.2.2	Voltages under normal conditions (V) :	Not exceed 42.4V peak or 60Vdc in SELV circuit under normal operation.	P
2.2.3	Voltages under fault conditions (V) :	Single fault cause did not excessive voltage in accessible SELV circuits. (see appended table 2.2.2 and 5.3)	P
2.2.4	Connection of SELV circuits to other circuits :		N
2.3	TNV circuits		N
2.3.1	Limits	No TNV circuit	N
	Type of TNV circuits:		—
2.3.2	Separation from other circuits and from accessible parts		N
2.3.2.1	General requirements		N
2.3.2.2	Protection by basic insulation		N
2.3.2.3	Protection by earthing		N
2.3.2.4	Protection by other constructions :		N
2.3.3	Separation from hazardous voltages		N
	Insulation employed:		—
2.3.4	Connection of TNV circuits to other circuits		N
	Insulation employed:		—
2.3.5	Test for operating voltages generated externally		N
2.4	Limited current circuits		P
2.4.1	General requirements		P
2.4.2	Limit values	(See appended table 2.4.2)	P
	Frequency (Hz):		—
	Measured current (mA):		—
	Measured voltage (V):		—

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Clause	Requirement + Test	Result - Remark	Verdict
	Measured circuit capacitance (nF or μ F):		—
2.4.3	Connection of limited current circuits to other circuits	Protective earthing as limited current circuit connected to primary via bridging components	P
2.5	Limited power sources		N
	a) Inherently limited output	No such circuit	N
	b) Impedance limited output		N
	c) Regulating network limited output under normal operating and single fault condition		N
	d) Overcurrent protective device limited output		N
	Max. output voltage (V), max. output current (A), max. apparent power (VA):		—
	Current rating of overcurrent protective device (A) .:		—
	Use of integrated circuit (IC) current limiters		N
2.6	Provisions for earthing and bonding		P
2.6.1	Protective earthing	Reliable connection of relevant conductive parts to the PE terminal via green/yellow insulated wires.	P
2.6.2	Functional earthing	See below	P
2.6.3	Protective earthing and protective bonding conductors	Protective bonding conductors have sufficient current-carrying capacity.	P
2.6.3.1	General	Compliance checked. Protective bonding conductors have sufficient current-carrying capacity.	P
2.6.3.2	Size of protective earthing conductors	See sub-clause 2.6.3.4	P
	Rated current (A), cross-sectional area (mm^2), AWG:		--
2.6.3.3	Size of protective bonding conductors	Evaluation by test of sub-clause 2.6.3.4,	P
	Rated current (A), cross-sectional area (mm^2), AWG:	Comply with 2.6.3.4	--
	Protective current rating (A), cross-sectional area (mm^2), AWG:	Comply with 2.6.3.4	--
2.6.3.4	Resistance of earthing conductors and their terminations; resistance (Ω), voltage drop (V), test current (A), duration (min):	$<0.1\Omega$, (See appended table 2.6.3.4)	P

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Clause	Requirement + Test	Result - Remark	Verdict
2.6.3.5	Colour of insulation:	Yellow-and-Green	P
2.6.4	Terminals		P
2.6.4.1	General	AC Connector as protective earth terminal.	P
2.6.4.2	Protective earthing and bonding terminals	Adequate protective earth connection, see also Subclause 2.6.3.4 and 3.3.	P
	Rated current (A), type, nominal thread diameter (mm):	Comply with 2.6.3.4	--
2.6.4.3	Separation of the protective earthing conductor from protective bonding conductors	Separate PE and protective bonding by conductor.	P
2.6.5	Integrity of protective earthing	See below.	P
2.6.5.1	Interconnection of equipment	This unit has it's own earthing connection. PE terminals of outlets reliably connected to PE terminal of unit. (AC Connector). Green wire terminal of outlet connector to metal chassis by weld.	P
2.6.5.2	Components in protective earthing conductors and protective bonding conductors	There are no switches or overcurrent protective devices in the protective earthing/bonding conductors.	P
2.6.5.3	Disconnection of protective earth		P
2.6.5.4	Parts that can be removed by an operator	AC Connector, earthing connected before and disconnected after hazardous voltage. No other operator removable parts.	P
2.6.5.5	Parts removed during servicing	Protective earthed parts cannot be removed in a way which impairs safety.	P
2.6.5.6	Corrosion resistance	No risk of corrosion.	P
2.6.5.7	Screws for protective bonding	Protective bonding conductors connected to metal chassis via ring-type lugs fixed to metal by weld.	P
2.6.5.8	Reliance on telecommunication network or cable distribution system	Protective earthing is not rely on telecommunication network or cable distribution system.	N
2.7	Overcurrent and earth fault protection in primary circuits		P

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Clause	Requirement + Test	Result - Remark	Verdict
2.7.1	Basic requirements	Protective device is integrated in the equipment, see also sub-clause 5.3.	P
	Instructions when protection relies on building installation	Protective device is integrated in the equipment, see also sub-clause 5.3.	P
2.7.2	Faults not simulated in 5.3.7	The building installation is considered as providing short-circuit backup protection.	P
2.7.3	Short-circuit backup protection	Building installation and Input breaker is considered as providing short-circuit backup protection.	P
2.7.4	Number and location of protective devices :	Over current protection by one built-in circuit-breaker.	P
2.7.5	Protection by several devices	Only one protective device. See sub-clause 2.7.4.	N
2.7.6	Warning to service personnel:	Stated in the user's manual	P

2.8	Safety interlocks		N
2.8.1	General principles	No safety interlock	N
2.8.2	Protection requirements		N
2.8.3	Inadvertent reactivation		N
2.8.4	Fail-safe operation		N
	Protection against extreme hazard		N
2.8.5	Moving parts		N
2.8.6	Overriding		N
2.8.7	Switches, relays and their related circuits		N
2.8.7.1	Separation distances for contact gaps and their related circuits (mm) :		N
2.8.7.2	Overload test		N
2.8.7.3	Endurance test		N
2.8.7.4	Electric strength test		N
2.8.8	Mechanical actuators		N

2.9	Electrical insulation		P
2.9.1	Properties of insulating materials	Suitable material according to their thermal electrical and mechanical properties.	P
2.9.2	Humidity conditioning	Humidity treatment performed for 48 hrs.	P

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Relative humidity (%), temperature (°C) :	25°C, 93%	--
2.9.3	Grade of insulation	The adequate levels of safety insulation is provided and maintained to comply with the requirements of this standard.	P
2.9.4	Separation from hazardous voltages	See below	P
	Method(s) used :	Method 1 and 2	--

2.10	Clearances, creepage distances and distances through insulation		P
2.10.1	General		P
2.10.1.1	Frequency :	Considered	P
2.10.1.2	Pollution degrees :	Pollution degree 2.	P
2.10.1.3	Reduced values for functional insulation	The functional insulation complied with clause 5.3.4	P
2.10.1.4	Intervening unconnected conductive parts	Considered.	P
2.10.1.5	Insulation with varying dimensions	No reduction of distances considered.	N
2.10.1.6	Special separation requirements	Not special separation requirements.	N
2.10.1.7	Insulation in circuits generating starting pulses	No such circuit generating starting pulses.	N
2.10.2	Determination of working voltage	(see appended table 2.10.2)	P
2.10.2.1	General		P
2.10.2.2	RMS working voltage	(see appended table 2.10.2)	P
2.10.2.3	Peak working voltage	(see appended table 2.10.2)	P
2.10.3	Clearances	(see appended table 2.10.3 and 2.10.4)	P
2.10.3.1	General		P
2.10.3.2	Mains transient voltages	Normal transient voltage considered.	P
	a) AC mains supply :	2500V _{peak}	P
	b) Earthed d.c. mains supplies :	Not intended for d.c. mains supplies	N
	c) Unearthed d.c. mains supplies :	Not intended for d.c. mains supplies	N
	d) Battery operation :	External battery considered.	N
2.10.3.3	Clearances in primary circuits	(see appended table 2.10.3 and 2.10.4)	P

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Clause	Requirement + Test	Result - Remark	Verdict
2.10.3.4	Clearances in secondary circuits	(see appended table 2.10.3 and 2.10.4)	P
2.10.3.5	Clearances in circuits having starting pulses	The circuit will not generating starting pulse.	N
2.10.3.6	Transients from a.c. mains supply :	Considered.	P
2.10.3.7	Transients from d.c. mains supply :	Not connected to d.c. mains supply.	N
2.10.3.8	Transients from telecommunication networks and cable distribution systems :	Not connected to telecommunication networks and cable distribution systems	N
2.10.3.9	Measurement of transient voltage levels	Normal transient voltage considered.	N
	a) Transients from a mains supply		N
	For an a.c. mains supply :		N
	For a d.c. mains supply :		N
	b) Transients from a telecommunication network :		N
2.10.4	Creepage distances	(see appended table 2.10.3 and 2.10.4)	P
2.10.4.1	General	Considered.	P
2.10.4.2	Material group and comparative tracking index		P
	CTI tests:	Material group IIIb is assumed to be used.	--
2.10.4.3	Minimum creepage distances	(see appended table 2.10.3 and 2.10.4)	P
2.10.5	Solid insulation	Solid or laminated insulating material having adequate thickness is provided.	P
2.10.5.1	General	Considered.	P
2.10.5.2	Distances through insulation	(see appended table 2.10.5)	P
2.10.5.3	Insulating compound as solid insulation	No such construction used.	N
2.10.5.4	Semiconductor devices	No such component used.	N
2.10.5.5.	Cemented joints	No cemented joint.	N
2.10.5.6	Thin sheet material – General	Thin sheet material in form of polyester tape used in transformer.	P
2.10.5.7	Separable thin sheet material	Tapes used in transformers.	P
	Number of layers (pcs):	3 layers	--
2.10.5.8	Non-separable thin sheet material	Not used.	N
2.10.5.9	Thin sheet material – standard test procedure	Not used.	N

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Clause	Requirement + Test	Result - Remark	Verdict
	Electric strength test		--
2.10.5.10	Thin sheet material – alternative test procedure		P
	Electric strength test	(see appended table 2.10.5)	--
2.10.5.11	Insulation in wound components	No such components.	N
2.10.5.12	Wire in wound components	No such components.	N
	Working voltage :		N
	a) Basic insulation not under stress :		N
	b) Basic, supplementary, reinforced insulation:		N
	c) Compliance with Annex U :		N
	Two wires in contact inside wound component; angle between 45° and 90° :		N
2.10.5.13	Wire with solvent-based enamel in wound components	No wire with solvent-based enamel in wound components.	N
	Electric strength test		--
	Routine test		N
2.10.5.14	Additional insulation in wound components	No additional insulation used.	N
	Working voltage :		N
	- Basic insulation not under stress :		N
	- Supplementary, reinforced insulation :		N
2.10.6	Construction of printed boards	See below.	P
2.10.6.1	Uncoated printed boards	Uncoated printed boards used.	P
2.10.6.2	Coated printed boards	No such boards used.	N
2.10.6.3	Insulation between conductors on the same inner surface of a printed board	No such boards used.	N
2.10.6.4	Insulation between conductors on different layers of a printed board	No such boards used.	N
	Distance through insulation		N
	Number of insulation layers (pcs):		N
2.10.7	Component external terminations	No such construction.	N
2.10.8	Tests on coated printed boards and coated components	No coated printed boards and components.	N
2.10.8.1	Sample preparation and preliminary inspection		N
2.10.8.2	Thermal conditioning		N
2.10.8.3	Electric strength test		N
2.10.8.4	Abrasion resistance test		N

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
2.10.9	Thermal cycling	No special insulation in order to reduce distance.	N
2.10.10	Test for Pollution Degree 1 environment and insulating compound		N
2.10.11	Tests for semiconductor devices and cemented joints	Approved opto-couplers provided. No other parts to be tested. (see appended table 1.5.1)	P
2.10.12	Enclosed and sealed parts	For relay, see appended table 1.5.1	P

3	WIRING, CONNECTIONS AND SUPPLY		P
3.1	General		P
3.1.1	Current rating and overcurrent protection	Adequate cross sectional areas on internal wiring.	P
3.1.2	Protection against mechanical damage	Wireways are smooth and free from edges. Wires are adequately fixed to prevent excessive strain on wire and terminals and avoiding damage to the insulation of the conductors.	P
3.1.3	Securing of internal wiring	Internal wiring is secured against excessive strain, loosening of terminals and damage to the conductor insulation.	P
3.1.4	Insulation of conductors	Insulation on internal conductors is considered to be of adequate quality and suitable for the application and the working voltage involved.	P
3.1.5	Beads and ceramic insulators	No beads or similar ceramic insulators on conductors.	N
3.1.6	Screws for electrical contact pressure	No screws of insulating material used for electrical connection.	P
3.1.7	Insulating materials in electrical connections	All current carrying and safety earthing connections are metal to metal	P
3.1.8	Self-tapping and spaced thread screws	No self-tapping and spaced thread screws used.	N

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
3.1.9	Termination of conductors	Terminations can not become displaced so that clearances and creepage distances can be reduced.	P
	10 N pull test	Break away or pivot on its terminal is unlikely	P
3.1.10	Sleeving on wiring	Sleeves are used as supplementary insulation.	P

3.2	Connection to a mains supply		P
3.2.1	Means of connection	Refer below:	P
3.2.1.1	Connection to an a.c. mains supply	The equipment is provided with an ac connector.	P
3.2.1.2	Connection to a d.c. mains supply	Not connected to a d.c. mains supply	N
3.2.2	Multiple supply connections	AC mains supply and dc supply	P
3.2.3	Permanently connected equipment	Permanently connected equipment.	P
	Number of conductors, diameter of cable and conduits (mm) :		--
3.2.4	Appliance inlets	AC input connector provided. Should be considered in the final system.	N
3.2.5	Power supply cords		P
3.2.5.1	AC power supply cords	Power supply cord is not provided with the equipment, refer to summary of testing.	P
	Type :	See appended table	--
	Rated current (A), cross-sectional area (mm ²), AWG :		--
3.2.5.2	DC power supply cords		N
3.2.6	Cord anchorages and strain relief	Equipment provided with an ac input connector and dc input connector	N
	Mass of equipment (kg), pull (N) :		--
	Longitudinal displacement (mm) :		--
3.2.7	Protection against mechanical damage	Enclosure without sharp edges.	P
3.2.8	Cord guards		N

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Clause	Requirement + Test	Result - Remark	Verdict
	Diameter or minor dimension D (mm); test mass (g) :		--
	Radius of curvature of cord (mm):		--
3.2.9	Supply wiring space		N

3.3	Wiring terminals for connection of external conductors		N
3.3.1	Wiring terminals	Should be considered in the final system.	N
3.3.2	Connection of non-detachable power supply cords		N
3.3.3	Screw terminals		N
3.3.4	Conductor sizes to be connected		N
	Rated current (A), cord/cable type, cross-sectional area (mm ²):		—
3.3.5	Wiring terminal sizes		N
	Rated current (A), type, nominal thread diameter (mm) :		—
3.3.6	Wiring terminal design		N
3.3.7	Grouping of wiring terminals		N
3.3.8	Stranded wire		N

3.4	Disconnection from the mains supply		P
3.4.1	General requirement	See sub-clause 3.4.2	N
3.4.2	Disconnect devices	Should be considered in the final system.	N
3.4.3	Permanently connected equipment		N
3.4.4	Parts which remain energized		P
3.4.5	Switches in flexible cords	No switch.	N
3.4.6	Number of poles - single-phase and d.c. equipment		N
3.4.7	Number of poles - three-phase equipment		N
3.4.8	Switches as disconnect devices		N
3.4.9	Plugs as disconnect devices		N
3.4.10	Interconnected equipment		N
3.4.11	Multiple power sources		N

3.5	Interconnection of equipment		N
3.5.1	General requirements		N
3.5.2	Types of interconnection circuits :		N

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Clause	Requirement + Test	Result - Remark	Verdict
3.5.3	ELV circuits as interconnection circuits		N
3.5.4	Data ports for additional equipment		N
4	PHYSICAL REQUIREMENTS		P
4.1	Stability		N
	Angle of 10°		N
	Test force (N) :		N
4.2	Mechanical strength		P
4.2.1	General	Tests performed and passed. Results see below. After the tests, unit complied with the requirements of sub-clauses 2.1.1, 2.6.1, 2.10 and 4.4.1.	P
	Rack-mounted equipment.		N
4.2.2	Steady force test, 10 N	10 N applied to all components	P
4.2.3	Steady force test, 30 N	No such compartments.	N
4.2.4	Steady force test, 250 N	250N applied to outer enclosure. No energy or other hazards.	P
4.2.5	Impact test	No hazard as a result from steel ball impact test.	P
	Fall test	No hazard as a result from steel ball impact test.	P
	Swing test	No hazard as a result from steel sphere ball swung test.	P
4.2.6	Drop test; height (mm) :	No required for this equipment.	N
4.2.7	Stress relief test	Metal enclosure	N
4.2.8	Cathode ray tubes	No cathode ray tube.	N
	Picture tube separately certified :		N
4.2.9	High pressure lamps	No high pressure lamp provided.	N
4.2.10	Wall or ceiling mounted equipment; force (N) :	The force applied 279N to products, there is no damaged	P
4.3	Design and construction		P

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Clause	Requirement + Test	Result - Remark	Verdict
4.3.1	Edges and corners	All edges and corners are rounded and/or smoothed.	P
4.3.2	Handles and manual controls; force (N).....:	No Handles, knobs, grips, levers and the like	N
4.3.3	Adjustable controls	No hazardous adjustable controls.	N
4.3.4	Securing of parts	Mechanical fixings in such a way designed that they will withstand mechanical stress occurring in normal use.	P
4.3.5	Connection by plugs and sockets	No mismatch of connectors.	P
4.3.6	Direct plug-in equipment	No direct plug-in equipment.	N
	Torque :		--
	Compliance with the relevant mains plug standard :		N
4.3.7	Heating elements in earthed equipment	No heating elements provided.	N
4.3.8	Batteries	No batteries provided	N
	- Overcharging of a rechargeable battery		N
	- Unintentional charging of a non-rechargeable battery		N
	- Reverse charging of a rechargeable battery		N
	- Excessive discharging rate for any battery		N
4.3.9	Oil and grease	Insulation in intended use not considered to be exposed to oil or grease.	N
4.3.10	Dust, powders, liquids and gases	The equipment does not produce dust or use powders, liquids and gases in the equipment.	N
4.3.11	Containers for liquids or gases	No container for liquids or gases used	N
4.3.12	Flammable liquids :	The equipment does not contain flammable liquid	N
	Quantity of liquid (l) :		N
	Flash point (°C) :		N
4.3.13	Radiation	See below:	P
4.3.13.1	General		P
4.3.13.2	Ionizing radiation	The equipment does not generate ionizing radiation.	N
	Measured radiation (pA/kg):		--
	Measured high-voltage (kV) :		--
	Measured focus voltage (kV) :		--

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Clause	Requirement + Test	Result - Remark	Verdict
	CRT markings :		--
4.3.13.3	Effect of ultraviolet (UV) radiation on materials	The equipment does not produce significant UV radiation.	N
	Part, property, retention after test, flammability classification :		N
4.3.13.4	Human exposure to ultraviolet (UV) radiation :	The equipment does not produce significant UV radiation.	N
4.3.13.5	Lasers (including laser diodes) and LEDs	Non-lasing LEDs provided for indicating only.	N
4.3.13.5.1	Lasers (including laser diodes)		N
	Laser class :	Class I	--
4.3.13.5.2	Light emitting diodes (LEDs)		--
4.3.13.6	Other types :	The equipment does not generate other types of radiation.	N

4.4	Protection against hazardous moving parts		P
4.4.1	General	No hazardous moving parts within the equipment	N
4.4.2	Protection in operator access areas :	No service access areas	P
	Household and home/office document/media shredders		N
4.4.3	Protection in restricted access locations:	No service access areas	P
4.4.4	Protection in service access areas	No service access areas	P
4.4.5	Protection against moving fan blades	No service access areas	P
4.4.5.1	General		N
	Not considered to cause pain or injury. a).....:		N
	Is considered to cause pain, not injury. b)		N
	Considered to cause injury. c)		N
4.4.5.2	Protection for users	Protection against by metal enclosure	P
	Use of symbol or warning		N
4.4.5.3	Protection for service persons	Protection against by metal enclosure	P
	Use of symbol or warning		N

4.5	Thermal requirements		P
4.5.1	General	(see appended table 4.5)	P

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Clause	Requirement + Test	Result - Remark	Verdict
4.5.2	Temperature tests	(see appended table 4.5)	P
	Normal load condition per Annex L	See Annex L	--
4.5.3	Temperature limits for materials	(see appended table 4.5)	P
4.5.4	Touch temperature limits	(see appended table 4.5)	P
4.5.5	Resistance to abnormal heat	(see appended table 4.5.5)	P
4.6	Openings in enclosures		P
4.6.1	Top and side openings	(see appended table 4.6)	P
	Dimensions (mm)		--
4.6.2	Bottoms of fire enclosures	Installed in not burning parts	P
	Construction of the bottom, dimensions (mm) ...		--
4.6.3	Doors or covers in fire enclosures	No doors or covers in fire enclosure.	N
4.6.4	Openings in transportable equipment	Not transportable equipment.	N
4.6.4.1	Constructional design measures		N
	Dimensions (mm)		--
4.6.4.2	Evaluation measures for larger openings		N
4.6.4.3	Use of metallized parts		N
4.6.5	Adhesives for constructional purposes	No adhesive used for constructional purposes.	N
	Conditioning temperature (°C), time (weeks).....		--
4.7	Resistance to fire		P
4.7.1	Reducing the risk of ignition and spread of flame	See below.	P
	Method 1, selection and application of components wiring and materials	Use of materials with the required flammability classes. (see appended table 4.7)	P
	Method 2, application of all of simulated fault condition tests		N
4.7.2	Conditions for a fire enclosure	See below.	P
4.7.2.1	Parts requiring a fire enclosure	Internal components required a fire enclosure.	P
4.7.2.2	Parts not requiring a fire enclosure	The fire enclosure is required to cover all parts.	N
4.7.3	Materials		P
4.7.3.1	General	Components and materials have adequate flammability classification.	P

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Clause	Requirement + Test	Result - Remark	Verdict
4.7.3.2	Materials for fire enclosures	Metal enclosure	P
4.7.3.3	Materials for components and other parts outside fire enclosures	No parts outside the fire enclosure.	N
4.7.3.4	Materials for components and other parts inside fire enclosures	Internal components except small parts are minimum V-2 material.	P
4.7.3.5	Materials for air filter assemblies	No air filters in the equipment.	N
4.7.3.6	Materials used in high-voltage components	No parts exceeding 4kV.	N

5	ELECTRICAL REQUIREMENTS AND SIMULATED ABNORMAL CONDITIONS		P
5.1	Touch current and protective conductor current		P
5.1.1	General	Test conducted in accordance with 5.1.2 to 5.1.7	P
5.1.2	Configuration of equipment under test (EUT)		P
5.1.2.1	Single connection to an a.c. mains supply	Only one connection to mains.	P
5.1.2.2	Redundant multiple connections to an a.c. mains supply	No multiple power sources.	N
5.1.2.3	Simultaneous multiple connections to an a.c. mains supply	No multiple power sources.	N
5.1.3	Test circuit	Using figure 5A	P
5.1.4	Application of measuring instrument	Measuring instrument D1 is used.	P
5.1.5	Test procedure	The touch current was measured from primary to enclosure.	P
5.1.6	Test measurements	(see appended table 5.1)	P
	Supply voltage (V)		--
	Measured touch current (mA)		--
	Max. allowed touch current (mA)		--
	Measured protective conductor current (mA)		--
	Max. allowed protective conductor current (mA)...		--
5.1.7	Equipment with touch current exceeding 3,5 mA	The touch current does not exceed 3.5mA.	N
5.1.7.1	General		N
5.1.7.2	Simultaneous multiple connections to the supply		N
5.1.8	Touch currents to telecommunication networks and cable distribution systems and from telecommunication networks		N

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Clause	Requirement + Test	Result - Remark	Verdict
5.1.8.1	Limitation of the touch current to a telecommunication network or to a cable distribution system	No test necessary.	N
	Supply voltage (V)		—
	Measured touch current (mA)		—
	Max. allowed touch current (mA)		—
5.1.8.2	Summation of touch currents from telecommunication networks		N
	a) EUT with earthed telecommunication ports		N
	b) EUT whose telecommunication ports have no reference to protective earth		N
5.2	Electric strength		P
5.2.1	General	(see appended table 5.2)	P
5.2.2	Test procedure	(see appended table 5.2)	P
5.3	Abnormal operating and fault conditions		P
5.3.1	Protection against overload and abnormal operation	(see appended table 5.3)	P
5.3.2	Motors	Only fan motor	P
5.3.3	Transformers	(see appended Annex C)	P
5.3.4	Functional insulation.....	By short-circuit	P
5.3.5	Electromechanical components	No electromechanical components.	N
5.3.6	Audio amplifiers in ITE	No audio amplifier in equipment.	N
5.3.7	Simulation of faults	(see appended table 5.3)	P
5.3.8	Unattended equipment		N
5.3.9	Compliance criteria for abnormal operating and fault conditions	See below.	P
5.3.9.1	During the tests	No fire or molten metal occurred and no deformation of enclosure during the tests.	P
5.3.9.2	After the tests	No reduction of clearance and creepage distances. Electric strength test is made on functional, basic and reinforced insulation.	P
6	CONNECTION TO TELECOMMUNICATION NETWORKS		N

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Clause	Requirement + Test	Result - Remark	Verdict
6.1	Protection of telecommunication network service persons, and users of other equipment connected to the network, from hazards in the equipment		N
6.1.1	Protection from hazardous voltages		N
6.1.2	Separation of the telecommunication network from earth		N
6.1.2.1	Requirements	No telecommunication network circuits	N
	Supply voltage (V)		—
	Current in the test circuit (mA)		—
6.1.2.2	Exclusions		N
6.2	Protection of equipment users from overvoltages on telecommunication networks		N
6.2.1	Separation requirements		N
6.2.2	Electric strength test procedure		N
6.2.2.1	Impulse test		N
6.2.2.2	Steady-state test		N
6.2.2.3	Compliance criteria		N
6.3	Protection of the telecommunication wiring system from overheating		N
	Max. output current (A)		—
	Current limiting method		—
7	CONNECTION TO CABLE DISTRIBUTION SYSTEMS		N
7.1	General	Not connected to Cable Distribution System.	N
7.2	Protection of cable distribution system service persons, and users of other equipment connected to the system, from hazardous voltages in the equipment		N
7.3	Protection of equipment users from overvoltages on the cable distribution system		N
7.4	Insulation between primary circuits and cable distribution systems		N
7.4.1	General		N
7.4.2	Voltage surge test		N
7.4.3	Impulse test		N
A	ANNEX A, TESTS FOR RESISTANCE TO HEAT AND FIRE		N

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Clause	Requirement + Test	Result - Remark	Verdict
A.1	Flammability test for fire enclosures of movable equipment having a total mass exceeding 18 kg, and of stationary equipment (see 4.7.3.2)		N
A.1.1	Samples.....:		—
	Wall thickness (mm).....:		—
A.1.2	Conditioning of samples; temperature (°C):		N
A.1.3	Mounting of samples:		N
A.1.4	Test flame (see IEC 60695-11-3)		N
	Flame A, B, C or D:		—
A.1.5	Test procedure		N
A.1.6	Compliance criteria		N
	Sample 1 burning time (s).....:		—
	Sample 2 burning time (s).....:		—
	Sample 3 burning time (s).....:		—
A.2	Flammability test for fire enclosures of movable equipment having a total mass not exceeding 18 kg, and for material and components located inside fire enclosures (see 4.7.3.2 and 4.7.3.4)		N
A.2.1	Samples, material.....:		—
	Wall thickness (mm).....:		—
A.2.2	Conditioning of samples; temperature (°C):		N
A.2.3	Mounting of samples:		N
A.2.4	Test flame (see IEC 60695-11-4)		N
	Flame A, B or C:		—
A.2.5	Test procedure		N
A.2.6	Compliance criteria		N
	Sample 1 burning time (s).....:		—
	Sample 2 burning time (s).....:		—
	Sample 3 burning time (s).....:		—
A.2.7	Alternative test acc. to IEC 60695-11-5, cl. 5 and 9		N
	Sample 1 burning time (s).....:		—
	Sample 2 burning time (s).....:		—
	Sample 3 burning time (s).....:		—
A.3	Hot flaming oil test (see 4.6.2)		N
A.3.1	Mounting of samples		N
A.3.2	Test procedure		N
A.3.3	Compliance criterion		N

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Clause	Requirement + Test	Result - Remark	Verdict
B	ANNEX B, MOTOR TESTS UNDER ABNORMAL CONDITIONS (see 4.7.2.2 and 5.3.2)		P
B.1	General requirements	Only fan motor	P
	Position	(see appended Annex 1.5.1)	--
	Manufacturer		--
	Type		--
	Rated values		--
B.2	Test conditions		N
B.3	Maximum temperatures		N
B.4	Running overload test		N
B.5	Locked-rotor overload test		P
	Test duration (days)		—
	Electric strength test: test voltage (V)		—
B.6	Running overload test for d.c. motors in secondary circuits		N
B.6.1	General		N
B.6.2	Test procedure		N
B.6.3	Alternative test procedure		N
B.6.4	Electric strength test; test voltage (V)		N
B.7	Locked-rotor overload test for d.c. motors in secondary circuits		N
B.7.1	General		N
B.7.2	Test procedure		N
B.7.3	Alternative test procedure		N
B.7.4	Electric strength test; test voltage (V)		N
B.8	Test for motors with capacitors		N
B.9	Test for three-phase motors		N
B.10	Test for series motors		N
	Operating voltage (V)		—

C	ANNEX C, TRANSFORMERS (see 1.5.4 and 5.3.3)		P
	Position	See table 1.5.1	—
	Manufacturer		—
	Type		—
	Rated values		—
	Method of protection.....		—
C.1	Overload test	See appended table 5.3	P

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Clause	Requirement + Test	Result - Remark	Verdict
C.2	Insulation	See appended table 5.2	P
	Protection from displacement of windings.....:	See appended table C.2	P
D	ANNEX D, MEASURING INSTRUMENTS FOR TOUCH-CURRENT TESTS (see 5.1.4)		P
D.1	Measuring instrument	As in figure D1 used.	P
D.2	Alternative measuring instrument		N
E	ANNEX E, TEMPERATURE RISE OF A WINDING (see 1.4.13)		P
F	ANNEX F, MEASUREMENT OF CLEARANCES AND CREEPAGE DISTANCES (see 2.10 and Annex G)		P
G	ANNEX G, ALTERNATIVE METHOD FOR DETERMINING MINIMUM CLEARANCES		N
G.1	Clearances		N
G.1.1	General		N
G.1.2	Summary of the procedure for determining minimum clearances		N
G.2	Determination of mains transient voltage (V)		N
G.2.1	AC mains supply		N
G.2.2	Earthed d.c. mains supplies		N
G.2.3	Unearthed d.c. mains supplies		N
G.2.4	Battery operation		N
G.3	Determination of telecommunication network transient voltage (V)		N
G.4	Determination of required withstand voltage (V)		N
G.4.1	Mains transients and internal repetitive peaks		N
G.4.2	Transients from telecommunication networks		N
G.4.3	Combination of transients		N
G.4.4	Transients from cable distribution systems		N
G.5	Measurement of transient voltages (V)		N
	a) Transients from a mains supply		N
	For an a.c. mains supply		N
	For a d.c. mains supply		N
	b) Transients from a telecommunication network		N
G.6	Determination of minimum clearances		N

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Clause	Requirement + Test	Result - Remark	Verdict
H	ANNEX H, IONIZING RADIATION (see 4.3.13)		N
J	ANNEX J, TABLE OF ELECTROCHEMICAL POTENTIALS (see 2.6.5.6)		P
	Metal(s) used	Considered	--
K	ANNEX K, THERMAL CONTROLS (see 1.5.3 and 5.3.8)		N
K.1	Making and breaking capacity		N
K.2	Thermostat reliability; operating voltage (V)		N
K.3	Thermostat endurance test; operating voltage (V)		N
K.4	Temperature limiter endurance; operating voltage (V)		N
K.5	Thermal cut-out reliability		N
K.6	Stability of operation		N
L	ANNEX L, NORMAL LOAD CONDITIONS FOR SOME TYPES OF ELECTRICAL BUSINESS EQUIPMENT (see 1.2.2.1 and 4.5.2)		P
L.1	Typewriters		N
L.2	Adding machines and cash registers		N
L.3	Erasers		N
L.4	Pencil sharpeners		N
L.5	Duplicators and copy machines		N
L.6	Motor-operated files		N
L.7	Other business equipment	Worst case power factors as specified by the manufacturer maintained during the relevant tests.	P
M	ANNEX M, CRITERIA FOR TELEPHONE RINGING SIGNALS (see 2.3.1)		N
M.1	Introduction		N
M.2	Method A		N
M.3	Method B		N
M.3.1	Ringling signal		N
M.3.1.1	Frequency (Hz)		--
M.3.1.2	Voltage (V)		--
M.3.1.3	Cadence; time (s), voltage (V)		--
M.3.1.4	Single fault current (mA)		--
M.3.2	Tripping device and monitoring voltage		N

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Clause	Requirement + Test	Result - Remark	Verdict
M.3.2.1	Conditions for use of a tripping device or a monitoring voltage		N
M.3.2.2	Tripping device		N
M.3.2.3	Monitoring voltage (V)		N
N	ANNEX N, IMPULSE TEST GENERATORS (see 1.5.7.2, 1.5.7.3, 2.10.3.9, 6.2.2.1, 7.3.2, 7.4.3 and Clause G.5)		N
N.1	ITU-T impulse test generators		N
N.2	IEC 60065 impulse test generator		N
P	ANNEX P, NORMATIVE REFERENCES		--
Q	ANNEX Q, Voltage dependent resistors (VDRs) (see 1.5.9.1)		P
	a) Preferred climatic categories	Max. 85°C	P
	b) Maximum continuous voltage	Min. AC300V	P
	c) Combination pulse current	See appended table 1.5.1	P
	Body of the VDR Test according to IEC60695-11-5.....		P
	Body of the VDR. Flammability class of material (min V-1).....		P
R	ANNEX R, EXAMPLES OF REQUIREMENTS FOR QUALITY CONTROL PROGRAMMES		N
R.1	Minimum separation distances for unpopulated coated printed boards (see 2.10.6.2)		N
R.2	Reduced clearances (see 2.10.3)		N
S	ANNEX S, PROCEDURE FOR IMPULSE TESTING (see 6.2.2.3)		N
S.1	Test equipment		N
S.2	Test procedure		N
S.3	Examples of waveforms during impulse testing		N
T	ANNEX T, GUIDANCE ON PROTECTION AGAINST INGRESS OF WATER (see 1.1.2)		N
U	ANNEX U, INSULATED WINDING WIRES FOR USE WITHOUT INTERLEAVED INSULATION (see 2.10.5.4)		N
		No TIW	—

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Clause	Requirement + Test	Result - Remark	Verdict
V	ANNEX V, AC POWER DISTRIBUTION SYSTEMS (see 1.6.1)		P
V.1	Introduction		P
V.2	TN power distribution systems		P
W	ANNEX W, SUMMATION OF TOUCH CURRENTS		N
W.1	Touch current from electronic circuits		N
W.1.1	Floating circuits		N
W.1.2	Earthed circuits		N
W.2	Interconnection of several equipments		N
W.2.1	Isolation		N
W.2.2	Common return, isolated from earth		N
W.2.3	Common return, connected to protective earth		N
X	ANNEX X, MAXIMUM HEATING EFFECT IN TRANSFORMER TESTS (see clause C.1)		P
X.1	Determination of maximum input current		P
X.2	Overload test procedure		P
Y	ANNEX Y, ULTRAVIOLET LIGHT CONDITIONING TEST (see 4.3.13.3)		N
Y.1	Test apparatus		N
Y.2	Mounting of test samples		N
Y.3	Carbon-arc light-exposure apparatus		N
Y.4	Xenon-arc light exposure apparatus		N
Z	ANNEX Z, OVERVOLTAGE CATEGORIES (see 2.10.3.2 and Clause G.2)		N
AA	ANNEX AA, MANDREL TEST (see 2.10.5.8)		N
BB	ANNEX BB, CHANGES IN THE SECOND EDITION		--
CC	ANNEX CC, Evaluation of integrated circuit (IC) current limiters		N
CC.1	General		N
CC.2	Test program 1.....		N
CC.3	Test program 2.....		N
CC.4	Test program 3.....		N
CC.5	Compliance.....		N

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Clause	Requirement + Test	Result - Remark	Verdict
DD	ANNEX DD, Requirements for the mounting means of rack-mounted equipment		N
DD.1	General		N
DD.2	Mechanical strength test, variable N.....:		N
DD.3	Mechanical strength test, 250N, including end stops.....:		N
DD.4	Compliance.....:		N

EE	ANNEX EE, Household and home/office document/media shredders		N
EE.1	General		N
EE.2	Markings and instructions		N
	Use of markings or symbols.....:		N
	Information of user instructions, maintenance and/or servicing instructions.....:		N
EE.3	Inadvertent reactivation test.....:		N
EE.4	Disconnection of power to hazardous moving parts:		N
	Use of markings or symbols.....:		N
EE.5	Protection against hazardous moving parts		N
	Test with test finger (Figure 2A)		N
	Test with wedge probe (Figure EE1 and EE2) ...:		N

ATTACHMENT TO TEST REPORT IEC 60950-1
EUROPEAN GROUP DIFFERENCES AND NATIONAL DIFFERENCES
Information technology equipment – Safety –
Part 1: General requirements

Differences according to.....: EN 60950-1:2006/A11:2009/A1:2010/A12:2011/A2:2013

EN 60950-1:2006/A11:2009/A1:2010/A12:2011/A2:2013 – CENELEC COMMON MODIFICATIONS

IEC 60950-1, GROUP DIFFERENCES (CENELEC common modifications EN)			
Clause	Requirement + Test	Result - Remark	Verdict
Contents	Add the following annexes: Annex ZA (normative) Normative references to international publications with their corresponding European publications Annex ZB (normative) Special national conditions Annex ZD (informative) IEC and CENELEC code designations for flexible cords		P

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
IEC 60950-1, GROUP DIFFERENCES (CENELEC common modifications EN)			
Clause	Requirement + Test	Result - Remark	Verdict
General	<p>Delete all the "country" notes in the reference document (IEC 60950-1:2005) according to the following list:</p> <p>1.4.8 Note 2 1.5.1 Note 2 & 3 1.5.7.1 Note 1.5.8 Note 2 1.5.9.4 Note 1.7.2.1 Note 4, 5 & 6 2.2.3 Note 2.2.4 Note 2.3.2 Note 2.3.2.1 Note 2 2.3.4 Note 2 2.6.3.3 Note 2 & 3 2.7.1 Note 2.10.3.2 Note 2 2.10.5.13 Note 3 3.2.1.1 Note 3.2.4 Note 3 2.5.1 Note 2 4.3.6 Note 1 & 2 4.7 Note 4 4.7.2.2 Note 4.7.3.1 Note 2 5.1.7.1 Note 3 & 4 5.3.7 Note 1 6 Note 2 & 5 6.1.2.1 Note 2 6.1.2.2 Note 6.2.2 Note 6.2.2.1 Note 2 6.2.2.2 Note 7.1 Note 3 7.2 Note 7.3 Note 1 & 2 G.2.1 Note 2 Annex H Note 2</p>		P
General (A1:2010)	<p>Delete all the "country" notes in the reference document (IEC 60950-1:2005/A1:2010) according to the following list:</p> <p>1.5.7.1 Note 6.1.2.1 Note 2 6.2.2.1 Note 2 EE.3 Note</p>		P
General (A2:2013)	<p>Delete all the "country" notes in the reference document (IEC 60950-1:2005/A1:2010) according to the following list:</p> <p>2.7.1 Note * 2.10.3.1 Note 2 6.2.2 Note</p> <p>* Note of secretary: Text of Common Modification remains unchanged.</p>		P
1.3.Z1	<p>Add the following subclause:</p> <p>1.3.Z1 Exposure to excessive sound pressure</p> <p>The apparatus shall be so designed and constructed as to present no danger when used for its intended purpose, either in normal operating conditions or under fault conditions, particularly providing protection against exposure to excessive sound pressures from headphones or earphones.</p> <p>NOTE Z1 A new method of measurement is described in EN 50332-1, Sound system equipment: Headphones and earphones associated with portable audio equipment - Maximum sound pressure level measurement methodology and limit considerations - Part 1: General method for "one package equipment", and in EN 50332-2, Sound system equipment: Headphones and earphones associated with portable audio equipment - Maximum sound pressure level measurement methodology and limit considerations - Part 2: Guidelines to associate sets with headphones coming from different manufacturers.</p>	No audio output.	N
(A12:2011)	<p>In EN 60950-1:2006/A12:2011</p> <p>Delete the addition of 1.3.Z1 / EN 60950-1:2006</p> <p>Delete the definition 1.2.3.Z1 / EN 60950-1:2006 /A1:2010</p>		N

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict

IEC 60950-1, GROUP DIFFERENCES (CENELEC common modifications EN)			
Clause	Requirement + Test	Result - Remark	Verdict
1.5.1	Add the following NOTE: NOTE Z1 The use of certain substances in electrical and electronic equipment is restricted within the EU: see Directive 2002/95/EC		N
1.7.2.1 (A1:2010)	In addition, for a PORTABLE SOUND SYSTEM, the instructions shall include a warning that excessive sound pressure from earphones and headphones can cause hearing loss.	Not a portable sound system.	N
1.7.2.1 (A12:2011)	In EN 60950-1:2006/A12:2011 Delete NOTE Z1 and the addition for Portable Sound System. Add the following clause and annex to the existing standard and amendments.	Not a portable sound system.	N
	Zx Protection against excessive sound pressure from personal music players		N
	Zx.1 General This sub-clause specifies requirements for protection against excessive sound pressure from personal music players that are closely coupled to the ear. It also specifies requirements for earphones and headphones intended for use with personal music players. A personal music player is a portable equipment for personal use, that: is designed to allow the user to listen to recorded or broadcast sound or video; and primarily uses headphones or earphones that can be worn in or on or around the ears; and allows the user to walk around while in use. NOTE 1 Examples are hand-held or body-worn portable CD players, MP3 audio players, mobile phones with MP3 type features, PDA's or similar equipment. A personal music player and earphones or headphones intended to be used with personal music players shall comply with the requirements of this sub-clause. The requirements in this sub-clause are valid for music or video mode only. The requirements do not apply: while the personal music player is connected to an external amplifier; or while the headphones or earphones are not used. NOTE 2 An external amplifier is an amplifier which is not part of the personal music player or the listening device, but which is intended to play the music as a standalone music player. The requirements do not apply to: hearing aid equipment and professional equipment; NOTE 3 Professional equipment is equipment sold through special sales channels. All products sold through normal		N

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
IEC 60950-1, GROUP DIFFERENCES (CENELEC common modifications EN)			
Clause	Requirement + Test	Result - Remark	Verdict
	electronics stores are considered not to be professional equipment.		
	<p>analogue personal music players (personal music players without any kind of digital processing of the sound signal) that are brought to the market before the end of 2015.</p> <p>NOTE 4 This exemption has been allowed because this technology is falling out of use and it is expected that within a few years it will no longer exist. This exemption will not be extended to other technologies.</p> <p>For equipment which is clearly designed or intended for use by young children, the limits of EN 71-1 apply.</p>		N
	<p>Zx.2 Equipment requirements</p> <p>No safety provision is required for equipment that complies with the following:</p> <p>equipment provided as a package (personal music player with its listening device), where the acoustic output $L_{Aeq,TIS} \leq 85$ dBA measured while playing the fixed "programme simulation noise" as described in EN 50332-1; and</p> <p>a personal music player provided with an analogue electrical output socket for a listening device, where the electrical output is ≤ 27 mV measured as described in EN 50332-2, while playing the fixed "programme simulation noise" as described in EN 50332-1.</p> <p>NOTE 1 Wherever the term acoustic output is used in this clause, the 30 s A-weighted equivalent sound pressure level $L_{Aeq,TIS}$ meant. See also Zx.5 and Annex Zx.</p> <p>All other equipment shall:</p> <p>a) protect the user from unintentional acoustic outputs exceeding those mentioned above; and</p> <p>b) have a standard acoustic output level not exceeding those mentioned above, and automatically return to an output level not exceeding those mentioned above when the power is switched off; and</p>		N
	<p>c) provide a means to actively inform the user of the increased sound pressure when the equipment is operated with an acoustic output exceeding those mentioned above. Any means used shall be acknowledged by the user before activating a mode of operation which allows for an acoustic output exceeding those mentioned above. The acknowledgement does not need to be repeated more than once every 20 h of cumulative listening time; and</p> <p>NOTE 2 Examples of means include visual or audible signals. Action from the user is always required.</p>		N

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
IEC 60950-1, GROUP DIFFERENCES (CENELEC common modifications EN)			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>NOTE 3 The 20 h listening time is the accumulative listening time, independent how often and how long the personal music player has been switched off.</p> <p>d) have a warning as specified in Zx.3; and</p> <p>e) not exceed the following:</p> <p>1) equipment provided as a package (player with its listening device), the acoustic output shall be ≤ 100 dBA measured while playing the fixed "programme simulation noise" described in EN 50332-1; and</p> <p>2) a personal music player provided with an analogue electrical output socket for a listening device, the electrical output shall be ≤ 150 mV measured as described in EN 50332-2, while playing the fixed "programme simulation noise" described in EN 50332-1.</p> <p>For music where the average sound pressure (long term $L_{Aeq,T}$) measured over the duration of the song is lower than the average produced by the programme simulation noise, the warning does not need to be given as long as the average sound pressure of the song is below the basic limit of 85 dBA. In this case T becomes the duration of the song.</p> <p>NOTE 4 Classical music typically has an average sound pressure (long term $L_{Aeq,T}$) which is much lower than the average programme simulation noise. Therefore, if the player is capable to analyse the song and compare it with the programme simulation noise, the warning does not need to be given as long as the average sound pressure of the song is below the basic limit of 85 dBA.</p> <p>For example, if the player is set with the programme simulation noise to 85 dBA, but the average music level of the song is only 65 dBA, there is no need to give a warning or ask an acknowledgement as long as the average sound level of the song is not above the basic limit of 85 dBA.</p>		
	<p>Zx.3 Warning</p> <p>The warning shall be placed on the equipment, or on the packaging, or in the instruction manual and shall consist of the following:</p> <p>the symbol of Figure 1 with a minimum height of 5 mm; and</p> <p>the following wording, or similar:</p> <p>"To prevent possible hearing damage, do not listen at high volume levels for long periods."</p> <div data-bbox="512 1780 724 1989" data-label="Image"> </div> <p>Figure 1 – Warning label (IEC 60417-6044)</p>		N

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
IEC 60950-1, GROUP DIFFERENCES (CENELEC common modifications EN)			
Clause	Requirement + Test	Result - Remark	Verdict
	Alternatively, the entire warning may be given through the equipment display during use, when the user is asked to acknowledge activation of the higher level.		
	Zx.4 Requirements for listening devices (headphones and earphones)		N
	Zx.4.1 Wired listening devices with analogue input With 94 dBA sound pressure output $L_{Aeq,T}$, the input voltage of the fixed "programme simulation noise" described in EN 50332-2 shall be ≥ 75 mV. This requirement is applicable in any mode where the headphones can operate (active or passive), including any available setting (for example built-in volume level control). NOTE The values of 94 dBA – 75 mV correspond with 85dBA – 27 mV and 100 dBA – 150 mV.		N
	Zx.4.2 Wired listening devices with digital input With any playing device playing the fixed "programme simulation noise" described in EN 50332-1 (and respecting the digital interface standards, where a digital interface standard exists that specifies the equivalent acoustic level), the acoustic output $L_{Aeq,T}$ of the listening device shall be ≤ 100 dBA. This requirement is applicable in any mode where the headphones can operate, including any available setting (for example built-in volume level control, additional sound feature like equalization, etc.). NOTE An example of a wired listening device with digital input is a USB headphone.		N

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
IEC 60950-1, GROUP DIFFERENCES (CENELEC common modifications EN)			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>Zx.4.3 Wireless listening devices In wireless mode: with any playing and transmitting device playing the fixed programme simulation noise described in EN 50332-1; and respecting the wireless transmission standards, where an air interface standard exists that specifies the equivalent acoustic level; and with volume and sound settings in the listening device (for example built-in volume level control, additional sound feature like equalization, etc.) set to the combination of positions that maximize the measured acoustic output for the abovementioned programme simulation noise, the acoustic output $L_{Aeq,T}$ of the listening device shall be ≤ 100 dBA.</p> <p>NOTE An example of a wireless listening device is a Bluetooth headphone.</p>		N
	<p>Zx.5 Measurement methods Measurements shall be made in accordance with EN 50332-1 or EN 50332-2 as applicable. Unless stated otherwise, the time interval T shall be 30 s.</p> <p>NOTE Test method for wireless equipment provided without listening device should be defined.</p>		N
2.7.1	<p>Replace the subclause as follows: Basic requirements To protect against excessive current, short-circuits and earth faults in PRIMARY CIRCUITS, protective devices shall be included either as integral parts of the equipment or as parts of the building installation, subject to the following, a), b) and c): a) except as detailed in b) and c), protective devices necessary to comply with the requirements of 5.3 shall be included as parts of the equipment; b) for components in series with the mains input to the equipment such as the supply cord, appliance coupler, r.f.i. filter and switch, short-circuit and earth fault protection may be provided by protective devices in the building installation;</p>		N

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
IEC 60950-1, GROUP DIFFERENCES (CENELEC common modifications EN)			
Clause	Requirement + Test	Result - Remark	Verdict
	c) it is permitted for PLUGGABLE EQUIPMENT TYPE B or PERMANENTLY CONNECTED EQUIPMENT, to rely on dedicated overcurrent and short-circuit protection in the building installation, provided that the means of protection, e.g. fuses or circuit breakers, is fully specified in the installation instructions. If reliance is placed on protection in the building installation, the installation instructions shall so state, except that for PLUGGABLE EQUIPMENT TYPE A the building installation shall be regarded as providing protection in accordance with the rating of the wall socket outlet.		N
2.7.2	This subclause has been declared 'void'.		N
3.2.3	Delete the NOTE in Table 3A, and delete also in this table the conduit sizes in parentheses.		N
3.2.5.1	Replace "60245 IEC 53" by "H05 RR-F"; "60227 IEC 52" by "H03 VV-F or H03 VVH2-F"; "60227 IEC 53" by "H05 VV-F or H05 VVH2-F2". In Table 3B, replace the first four lines by the following: Up to and including 6 0,75 ^{a)} Over 6 up to and including 10 (0,75) ^{b)} 1,0 Over 10 up to and including 16 (1,0) ^{c)} 1,5 In the conditions applicable to Table 3B delete the words "in some countries" in condition ^{a)} . In NOTE 1, applicable to Table 3B, delete the second sentence.		N
3.2.5.1 (A2:2013)	NOTE Z1 The harmonised code designations corresponding to the IEC cord types are given in Annex ZD		N
3.3.4	In Table 3D, delete the fourth line: conductor sizes for 10 to 13 A, and replace with the following: Over 10 up to and including 16 1,5 to 2,5 1,5 to 4 Delete the fifth line: conductor sizes for 13 to 16 A		N
4.3.13.6 (A1:2010)	Replace the existing NOTE by the following: NOTE Z1 Attention is drawn to: 1999/519/EC: Council Recommendation on the limitation of exposure of the general public to electromagnetic fields 0 Hz to 300 GHz, and 2006/25/EC: Directive on the minimum health and safety requirements regarding the exposure of workers to risks arising from physical agents (artificial optical radiation).		N

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict

IEC 60950-1, GROUP DIFFERENCES (CENELEC common modifications EN)			
Clause	Requirement + Test	Result - Remark	Verdict
	Standards taking into account mentioned Recommendation and Directive which demonstrate compliance with the applicable EU Directive are indicated in the OJEC.		N
Annex H	Replace the last paragraph of this annex by: At any point 10 cm from the surface of the OPERATOR ACCESS AREA, the dose rate shall not exceed 1 µSv/h (0,1 mR/h) (see NOTE). Account is taken of the background level. Replace the notes as follows: NOTE These values appear in Directive 96/29/Euratom. Delete NOTE 2.	The unit does not emit X-ray radiation.	N
Bibliography	Additional EN standards.		—

ZA	NORMATIVE REFERENCES TO INTERNATIONAL PUBLICATIONS WITH THEIR CORRESPONDING EUROPEAN PUBLICATIONS		—
ZB ANNEX (normative) SPECIAL NATIONAL CONDITIONS (EN)			
Clause	Requirement + Test	Result - Remark	Verdict
1.2.4.1	In Denmark , certain types of Class I appliances (see 3.2.1.1) may be provided with a plug not establishing earthing conditions when inserted into Danish socket-outlets.		N
1.2.13.14	In Norway and Sweden , for requirements see 1.7.2.1 and 7.3 of this annex.		N
1.5.7.1	In Finland, Norway and Sweden , resistors bridging BASIC INSULATION in CLASS I PLUGGABLE EQUIPMENT TYPE A must comply with the requirements in 1.5.7.1. In addition when a single resistor is used, the resistor must withstand the resistor test in 1.5.7.2.		N
1.5.8	In Norway , due to the IT power system used (see annex V, Figure V.7), capacitors are required to be rated for the applicable line-to-line voltage (230 V).		N
1.5.9.4	In Finland, Norway and Sweden , the third dashed sentence is applicable only to equipment as defined in 6.1.2.2 of this annex.		N
1.7.2.1	In Finland, Norway and Sweden , CLASS I PLUGGABLE EQUIPMENT TYPE A intended for connection to other equipment or a network shall, if safety relies on connection to protective earth or if surge suppressors are connected between the network terminals and accessible parts, have a marking stating that the equipment must be connected to an earthed mains socket-outlet. The marking text in the applicable countries shall be as follows:		N

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict

IEC 60950-1, GROUP DIFFERENCES (CENELEC common modifications EN)			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>In Finland: "Laite on liitettävä suojakoskettimilla varustettuun pistorasiaan"</p> <p>In Norway: "Apparatet må tilkoples jordet stikkontakt"</p> <p>In Sweden: "Apparaten skall anslutas till jordat uttag"</p> <p>In Norway and Sweden, the screen of the cable distribution system is normally not earthed at the entrance of the building and there is normally no equipotential bonding system within the building. Therefore the protective earthing of the building installation need to be isolated from the screen of a cable distribution system.</p> <p>It is however accepted to provide the insulation external to the equipment by an adapter or an interconnection cable with galvanic isolator, which may be provided by e.g. a retailer.</p> <p>The user manual shall then have the following or similar information in Norwegian and Swedish language respectively, depending on in what country the equipment is intended to be used in:</p> <p>"Equipment connected to the protective earthing of the building installation through the mains connection or through other equipment with a connection to protective earthing – and to a cable distribution system using coaxial cable, may in some circumstances create a fire hazard. Connection to a cable distribution system has therefore to be provided through a device providing electrical isolation below a certain frequency range (galvanic isolator, see EN 60728-11)."</p>		

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
IEC 60950-1, GROUP DIFFERENCES (CENELEC common modifications EN)			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>NOTE In Norway, due to regulation for installations of cable distribution systems, and in Sweden, a galvanic isolator shall provide electrical insulation below 5 MHz. The insulation shall withstand a dielectric strength of 1,5 kV r.m.s., 50 Hz or 60 Hz, for 1 min.</p> <p>Translation to Norwegian (the Swedish text will also be accepted in Norway):</p> <p>“Utstyrsmorkoplettilbeskyttelsesjord via nettpluggog/eller via annetjordtilkoplet utstyr – ogertilkoplet et kabel-TV nett, kanforårsakebrannfare. For å unngådetteskaldetvedtilkoplingavutstyrtilkabel-TV nettetinstalleres en galvanisk isolator mellomutstyretogkabel- TV nettet.”</p> <p>Translation to Swedish:</p> <p>”Utrustningsomärkopplad till skyddsjord via jordatvägguttagoch/eller via annan utrustningochsamtidigtärkopplad till kabel-TV nätkanivissa fall medföra risk för brand. Förattundvikadettaskall vid anslutningavutrustningen till kabel-TV nät galvanisk isolator finnas mellanutrustningen ochkabel-TV nätet.”</p>		N
1.7.2.1 (A2:2013)	<p>In Denmark, CLASS I PLUGGABLE EQUIPMENT TYPE A intended for connection to other equipment or a network shall, if safety relies on connection to protective earth or if surge suppressors are connected between the network terminals and accessible parts, have a marking stating that the equipment must be connected to an earthed mains socket-outlet.</p> <p>The marking text in Denmark shall be as follows: In Denmark: “Apparatets stikprop skal tilsluttes en stikkontakt med jord, som giver forbindelse til stikproppens jord.”</p>		N
1.7.5 1.7.5 (A11:2009)	<p>In Denmark, socket-outlets for providing power to other equipment shall be in accordance with the Heavy Current Regulations, Section 107-2-D1, Standard Sheet DK 1-3a, DK 1-5a or DK 1-7a, when used on Class I equipment. For STATIONARY EQUIPMENT the socket-outlet shall be in accordance with Standard Sheet DK 1-1b or DK 1-5a.</p> <p>For CLASS II EQUIPMENT the socket outlet shall be in accordance with Standard Sheet DKA 1-4a.</p>		N

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
IEC 60950-1, GROUP DIFFERENCES (CENELEC common modifications EN)			
Clause	Requirement + Test	Result - Remark	Verdict
1.7.5 (A2:2013)	In Denmark , socket-outlets for providing power to other equipment shall be in accordance with the DS 60884-2-D1:2011. For class I equipment the following Standard Sheets are applicable: DK 1-3a, DK 1-1c, DK 1-1d, DK 1-5a or DK 1-7a, with the exception for STATIONARY EQUIPMENT where the socket-outlets shall be in accordance with Standard Sheet DK 1-1b, DK 1-1c, DK 1-1d or DK 1-5a. Socket outlets intended for providing power to Class II apparatus with a rated current of 2,5 A shall be in accordance with DS 60884-2-D1 standard sheet DKA 1-4a. Other current rating socket outlets shall be in compliance with by DS 60884-2-D1 Standard Sheet DKA 1-3a or DKA 1-3b. Justification the Heavy Current Regulations, 6c		N
2.2.4	In Norway , for requirements see 1.7.2.1, 6.1.2.1 and 6.1.2.2 of this annex.	No TNV circuits within the equipment	N
2.3.2	In Finland, Norway and Sweden there are additional requirements for the insulation. See 6.1.2.1 and 6.1.2.2 of this annex.	No TNV circuits within the equipment	N
2.3.4	In Norway , for requirements see 1.7.2.1, 6.1.2.1 and 6.1.2.2 of this annex.	No TNV circuits within the equipment	N
2.6.3.3	In the United Kingdom , the current rating of the circuit shall be taken as 13 A, not 16 A.		N
2.7.1	In the United Kingdom , to protect against excessive currents and short-circuits in the PRIMARY CIRCUIT of DIRECT PLUG-IN EQUIPMENT, tests according to 5.3 shall be conducted, using an external protective device rated 30 A or 32 A. If these tests fail, suitable protective devices shall be included as integral parts of the DIRECT PLUG-IN EQUIPMENT, so that the requirements of 5.3 are met.		N
2.10.5.13	In Finland, Norway and Sweden , there are additional requirements for the insulation, see 6.1.2.1 and 6.1.2.2 of this annex.		N

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
IEC 60950-1, GROUP DIFFERENCES (CENELEC common modifications EN)			
Clause	Requirement + Test	Result - Remark	Verdict
3.2.1.1	<p>In Switzerland, supply cords of equipment having a RATED CURRENT not exceeding 10 A shall be provided with a plug complying with SEV 1011 or IEC 60884-1 and one of the following dimension sheets:</p> <p>SEV 6532-2.1991 Plug Type 15 3P+N+PE 250/400 V, 10 A</p> <p>SEV 6533-2.1991 Plug Type 11 L+N 250 V, 10 A</p> <p>SEV 6534-2.1991 Plug Type 12 L+N+PE 250 V, 10 A</p> <p>In general, EN 60309 applies for plugs for currents exceeding 10 A. However, a 16 A plug and socket-outlet system is being introduced in Switzerland, the plugs of which are according to the following dimension sheets, published in February 1998:</p> <p>SEV 5932-2.1998: Plug Type 25 , 3L+N+PE 230/400 V, 16 A</p> <p>SEV 5933-2.1998: Plug Type 21, L+N, 250 V, 16A</p> <p>SEV 5934-2.1998: Plug Type 23, L+N+PE 250 V, 16 A</p>		N
3.2.1.1	<p>In Denmark, supply cords of single-phase equipment having a rated current not exceeding 13 A shall be provided with a plug according to the Heavy Current Regulations, Section 107-2-D1.</p> <p>CLASS I EQUIPMENT provided with socket-outlets with earth contacts or which are intended to be used in locations where protection against indirect contact is required according to the wiring rules shall be provided with a plug in accordance with standard sheet DK 2-1a or DK 2-5a.</p> <p>If poly-phase equipment and single-phase equipment having a RATED CURRENT exceeding 13 A is provided with a supply cord with a plug, this plug shall be in accordance with the Heavy Current Regulations, Section 107-2-D1 or EN 60309-2.</p>		N

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
IEC 60950-1, GROUP DIFFERENCES (CENELEC common modifications EN)			
Clause	Requirement + Test	Result - Remark	Verdict
3.2.1.1 (A2:2013)	<p>In Denmark, supply cords of single-phase equipment having a rated current not exceeding 13 A shall be provided with a plug according to DS 60884-2-D1.</p> <p>CLASS I EQUIPMENT provided with socket-outlets with earth contacts or which are intended to be used in locations where protection against indirect contact is required according to the wiring rules shall be provided with a plug in accordance with standard sheet DK 2-1a or DK 2-5a.</p> <p>If a single-phase equipment having a RATED CURRENT exceeding 13 A or if a poly-phase equipment is provided with a supply cord with a plug, this plug shall be in accordance with the standard sheets DK 6-1a in DS 60884-2-D1 or EN 60309-2.</p> <p>Justification the Heavy Current Regulations, 6c</p>		N
3.2.1.1	<p>In Spain, supply cords of single-phase equipment having a rated current not exceeding 10 A shall be provided with a plug according to UNE 20315:1994.</p> <p>Supply cords of single-phase equipment having a rated current not exceeding 2,5 A shall be provided with a plug according to UNE-EN 50075:1993.</p> <p>CLASS I EQUIPMENT provided with socket-outlets with earth contacts or which are intended to be used in locations where protection against indirect contact is required according to the wiring rules, shall be provided with a plug in accordance with standard UNE 20315:1994.</p> <p>If poly-phase equipment is provided with a supply cord with a plug, this plug shall be in accordance with UNE-EN 60309-2.</p>		N
3.2.1.1	<p>In the United Kingdom, apparatus which is fitted with a flexible cable or cord and is designed to be connected to a mains socket conforming to BS 1363 by means of that flexible cable or cord and plug, shall be fitted with a 'standard plug' in accordance with Statutory Instrument 1768:1994 - The Plugs and Sockets etc. (Safety) Regulations 1994, unless exempted by those regulations.</p> <p>NOTE 'Standard plug' is defined in SI 1768:1994 and essentially means an approved plug conforming to BS 1363 or an approved conversion plug.</p>		N
3.2.1.1	<p>In Ireland, apparatus which is fitted with a flexible cable or cord and is designed to be connected to a mains socket conforming to I.S. 411 by means of that flexible cable or cord and plug, shall be fitted with a 13 A plug in accordance with Statutory Instrument 525:1997 - National Standards Authority of Ireland (section 28) (13 A Plugs and Conversion Adaptors for Domestic Use) Regulations 1997.</p>		N

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
IEC 60950-1, GROUP DIFFERENCES (CENELEC common modifications EN)			
Clause	Requirement + Test	Result - Remark	Verdict
3.2.4	In Switzerland, for requirements see 3.2.1.1 of this annex.		N
3.2.5.1	In the United Kingdom, a power supply cord with conductor of 1,25 mm ² is allowed for equipment with a rated current over 10 A and up to and including 13 A.		N
3.3.4	In the United Kingdom, the range of conductor sizes of flexible cords to be accepted by terminals for equipment with a RATED CURRENT of over 10 A up to and including 13 A is: 1,25 mm ² to 1,5 mm ² nominal cross-sectional area.		N
4.3.6	In the United Kingdom, the torque test is performed using a socket outlet complying with BS 1363 part 1:1995, including Amendment 1:1997 and Amendment 2:2003 and the plug part of DIRECT PLUG-IN EQUIPMENT shall be assessed to BS 1363: Part 1, 12.1, 12.2, 12.3, 12.9, 12.11, 12.12, 12.13, 12.16 and 12.17, except that the test of 12.17 is performed at not less than 125 °C. Where the metal earth pin is replaced by an Insulated Shutter Opening Device (ISOD), the requirements of clauses 22.2 and 23 also apply.		N
4.3.6	In Ireland, DIRECT PLUG-IN EQUIPMENT is known as plug similar devices. Such devices shall comply with Statutory Instrument 526:1997 - National Standards Authority of Ireland (Section 28) (Electrical plugs, plug similar devices and sockets for domestic use) Regulations, 1997.		N
5.1.7.1	In Finland, Norway and Sweden TOUCH CURRENT measurement results exceeding 3,5 mA r.m.s. are permitted only for the following equipment: <ul style="list-style-type: none"> • STATIONARY PLUGGABLE EQUIPMENT TYPE A that is intended to be used in a RESTRICTED ACCESS LOCATION where equipotential bonding has been applied, for example, in a telecommunication centre; and has provision for a permanently connected PROTECTIVE EARTHING CONDUCTOR; and is provided with instructions for the installation of that conductor by a SERVICE PERSON; • STATIONARY PLUGGABLE EQUIPMENT TYPE B; • STATIONARY PERMANENTLY CONNECTED EQUIPMENT. 		N

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
IEC 60950-1, GROUP DIFFERENCES (CENELEC common modifications EN)			
Clause	Requirement + Test	Result - Remark	Verdict
6.1.2.1 (A1:2010)	<p>In Finland, Norway and Sweden, add the following text between the first and second paragraph of the compliance clause:</p> <p>If this insulation is solid, including insulation forming part of a component, it shall at least consist of either</p> <ul style="list-style-type: none"> - two layers of thin sheet material, each of which shall pass the electric strength test below, or - one layer having a distance through insulation of at least 0,4 mm, which shall pass the electric strength test below. <p>Alternatively for components, there is no distance through insulation requirements for the insulation consisting of an insulating compound completely filling the casing, so that CLEARANCES and CREEPAGE DISTANCES do not exist, if the component passes the electric strength test in accordance with the compliance clause below and in addition</p> <ul style="list-style-type: none"> - passes the tests and inspection criteria of 2.10.11 with an electric strength test of 1,5 kV multiplied by 1,6 (the electric strength test of 2.10.10 shall be performed using 1,5 kV), and - is subject to ROUTINE TESTING for electric strength during manufacturing, using a test voltage of 1,5 kV. <p>It is permitted to bridge this insulation with an optocoupler complying with 2.10.5.4 b).</p> <p>It is permitted to bridge this insulation with a capacitor complying with EN 60384-14:2005, subclass Y2.</p> <p>A capacitor classified Y3 according to EN 60384-14:2005, may bridge this insulation under the following conditions:</p> <ul style="list-style-type: none"> - the insulation requirements are satisfied by having a capacitor classified Y3 as defined by EN 60384-14, which in addition to the Y3 testing, is tested with an impulse test of 2,5 kV defined in EN 60950-1:2006, 6.2.2.1; - the additional testing shall be performed on all the test specimens as described in EN 60384-14: - the impulse test of 2,5 kV is to be performed before the endurance test in EN 60384-14, in the sequence of tests as described in EN 60384-14. 	No TNV circuits	N

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict

IEC 60950-1, GROUP DIFFERENCES (CENELEC common modifications EN)			
Clause	Requirement + Test	Result - Remark	Verdict
6.1.2.2	In Finland, Norway and Sweden , the exclusions are applicable for PERMANENTLY CONNECTED EQUIPMENT, PLUGGABLE EQUIPMENT TYPE B and equipment intended to be used in a RESTRICTED ACCESS LOCATION where equipotential bonding has been applied, e.g. in a telecommunication centre, and which has provision for a permanently connected PROTECTIVE EARTHING CONDUCTOR and is provided with instructions for the installation of that conductor by a SERVICE PERSON.	No TNV circuits	N
7.2	In Finland, Norway and Sweden , for requirements see 6.1.2.1 and 6.1.2.2 of this annex. The term TELECOMMUNICATION NETWORK in 6.1.2 being replaced by the term CABLE DISTRIBUTION SYSTEM.		N
7.3	In Norway and Sweden , for requirements see 1.2.13.14 and 1.7.2.1 of this annex.		N
7.3	In Norway , for installation conditions see EN 60728-11:2005.		N

1.5.1 TABLE: list of critical components					P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity ¹⁾
-Description: Whole unit					
Metal enclosure	Various	Various	min. thickness: 1.5mm	IEC/EN 60950-1	Test in appliance
AC terminal blocks	SHENZHEN SUCCEED ELECTRONICS TECHNOLOGY CO., LTD.	TR-6N-01-3P-BK	600V, 50A	UL 1059	UL E332956
DC terminal blocks	SHENZHEN SUCCEED ELECTRONICS TECHNOLOGY CO., LTD.	TR-6N-01-2P-BK	600V, 50A	UL 1059	UL E332956
Power Switch	Rong Feng Industrial Co., Ltd	RF-1033	250Vac, 6A	EN 61058-1	VDE 40021707, UL E94138
Circuit breaker	TOPSTONE CORP	L1	125/250Vac, 40A	EN 60934:2001	TUV R50046704 UL E244552
DC Fan	ADDA CORPORATION	AD0812XB-A7BGP	DC12V, 0.55A	UL 507	UL E132139
Mylar	SHIN-ETSU CHEMICAL CO LTD	TC-(xxxx)TCI	V-0, 0.2mm, 150°C	UL 94	UL E48923
Internal wiring	VEGA TECHNOLOGIES INDUSTRIAL (AUSTRIA) CO	1015	10AWG, 105°C	UL758	UL E189529
Alternate	YONG HAO ELECTRICAL INDUSTRY CO LTD	1015	10AWG, 105°C	UL758	UL E240426
Alternate	Various	Various	Min. 10AWG, 105°C	UL758	UL
Heat shrink tube	CHANGYUAN ELECTRONICS (SHENZHEN) CO LTD	CB-HFT	600V, 125°C	UL224	UL E180908
Alternate	Various	Various	Min. 600V, 125°C	UL224	UL
- Description: For main board (16-500242-00G)					
Varistor (MOV1)	BRIGHTKING (SHENZHEN) CO., LTD	471KN20	300Vac, 385Vdc	EN 61051-1, IEC61051-2/A1, UL 1449	VDE UL E327997
Y-Cap (C59, C60)	JUHONG ELE CO	JA	1000pF, min. 250Vac, min. 85°C	IEC 60384-14	VDE UL E253194
Alternate	Various	Various	1000pF, min. 250Vac, min. 85°C	IEC 60384-14	VDE UL

Y-Cap (C119, C120, C121, C122, C52, C53, C70, C71)	JUHONG ELE CO	JA	Max. 10000pF, min. 250Vac, min. 85°C	IEC 60384-14	VDE UL E253194
Alternate	Various	Various	Max. 10000pF, min. 250Vac, min. 85°C	IEC 60384-14	VDE UL
X-Cap(C87)	FARAD ELECTRONICS CO., LTD	PXK	Max. 0.22uF, min. 250Vac, min. 100°C	IEC 60384-14	VDE UL E247953
Alternate	Various	Various	Max. 0.22uF, min. 250Vac, min. 100°C	IEC 60384-14	VDE UL E247953
X-Cap(C49)	FARAD ELECTRONICS CO., LTD	PXK	Max. 0.47uF, min. 250Vac, min. 100°C	IEC 60384-14	VDE UL E247953
Alternate	Various	Various	Max. 0.47uF, min. 250Vac, min. 100°C	IEC 60384-14	VDE UL E247953
Relay (RY1, RY2, RY3, RY4)	SONG CHUAN PRECISION CO., LTD	832HA-1A-F-C	277Vac, 40A	EN 60255-23, EN 61810-1, EN 61810-5, UL508.	UL E88991
E-Cap(C40, C41)	--	--	470uF, 500Vac, 105°C	--	--
IGBT(QB2, QD2, QA1, QC1, Q28, Q27, Q29, Q30, Q31, Q32,)	--	--	45A, 600V	--	--
Mosfet (Q19, Q13, Q18, Q23, Q24, Q11, Q17, Q20, Q38, Q21, Q22, Q12, Q40, Q26, Q25, Q14)	--	--	120A, 75V	--	--
Thermistor (NTCCN4-HS3, NTCCN8-HS1)	Lattron Co., Ltd	LNTA153@W*	15Kohm at 25°C	UL 1434	UL E306546
Chock(L2)	CLICK	41-110111-00G	130°C	IEC/EN 60950-1	Test in appliance
Chock(L4)	Voltronic Power	SP36123B-00SS	130°C	IEC/EN 60950-1	Test in appliance
Chock(L1)	Voltronic Power	41-110103-00G	130°C	IEC/EN 60950-1	Test in appliance
Current transformer (CT1)	Voltronic Power	41-020027-00G	130°C	IEC/EN 60950-1	Test in appliance
Current transformer (HCT1)	Voltronic Power	41-025003-00G	130°C	IEC/EN 60950-1	Test in appliance

Opto coupler (U8, U13, U11, U17, U18)	COSMO ELECTRONICS CORP	K1010	Int. CR / Ext. CR / Dti. $\geq 6,5$ mm / $\geq 6,5$ mm / $> 0,4$ mm, 55/115/21	IEC 60747-5-2: 1997 + A1: 2002	VDE 101347 UL E169586
Transformer (TX1)	CLICK	41-070187-00G	155°C	IEC/EN 60950-1	Test in appliance
Transformer (TX10, TX11)	CLICK	41-070183-00G	Class B	IEC/EN 60950-1	Test in appliance
Transformer (TX5, TX8)	Rong Chyuan Technology Corporation	EE16	Class B	IEC/EN 60950-1	Test in appliance
-Triple insulated wire	FURUKAWA ELECTRIC CO., LTD	TEX-E	130°C	UL 2353	UL E206440
Transformer (TX7)	CLICK	41-070184-00G	Class B	IEC/EN 60950-1	Test in appliance
Transformer (TX6)	CLICK	41-070185-00G	Class B	IEC/EN 60950-1	Test in appliance
Transformer (TX2)	CLICK	41-070186-00G	Class B	IEC/EN 60950-1	Test in appliance
Transformer (TX9)	CLICK	41-070194-00G	Class B	IEC/EN 60950-1	Test in appliance
DC fuse (F1, F2, F3, F4, F5)	COOPER BUSSMANN L L C	ABC-30-R	30A, 125Vdc	UL 248-1 UL 248-14	UL E19180
PCB	KINGBOARD LAMINATES HOLDINGS LTD	KB6160	V-0, 130°C	UL94	UL E123995
- Description: For Charge board(16-500244-00C)					
Opto coupler (U6, U8)	COSMO ELECTRONICS CORP	K1010	Int. CR / Ext. CR / Dti. $\geq 6,5$ mm / $\geq 6,5$ mm / $> 0,4$ mm, 55/115/21	IEC 60747-5-2: 1997 + A1: 2002	VDE 101347 UL E169586
Relay (RY1)	SONG CHUAN PRECISION CO., LTD	897P1-1AH-C	14Vac, 70A	IEC/EN 60950-1	Test in appliance
X-Cap(C5)	FARAD ELECTRONICS CO., LTD	PXK	Max. 0.1uF, min. 250Vac, min. 100°C	IEC 60384-14	VDE UL E247953
Alternate	Various	Various	Max. 0.1uF, min. 250Vac, min. 100°C	IEC 60384-14	VDE UL E247953
PCB	KINGBOARD LAMINATES HOLDINGS LTD	KB6160	V-0, 130°C	UL94	UL E123995
- Description: For Mini board(16-500237-00G)					
Transformer (TX1)	Rong Chyuan Technology Corporation	41-070193-00G	Class B	IEC/EN 60950-1	Test in appliance
-Triple insulated wire	FURUKAWA ELECTRIC CO., LTD	TEX-E	130°C	UL 2353	UL E206440

Opto coupler (U1, U2)	COSMO ELECTRONICS CORP	K1010	Int. CR / Ext. CR / Dti. ≥6,5 mm / ≥6,5 mm / >0,4 mm, 55/115/21	IEC 60747-5- 2: 1997 + A1: 2002	VDE(101347) UL(E169586)
PCB	KINGBOARD LAMINATES HOLDINGS LTD	KB5150	V-0, 130°C	UL94	UL E123995
Supplementary information: 1) Provided evidence ensures the agreed level of compliance.					

1.6.2	TABLE: Electrical data (in normal conditions)						P
U (V)	I (A)	I _{rated} (A)	P (kW)	Fuse #	I _{fuse} (A)	Condition/status	
For AC Charger mode:							
207Vac /50Hz	31.30	--	5.87	Circuit breaker	31.30	Rated output load	
230Vac /50Hz	28.43	35	5.90	Circuit breaker	28.43	Rated output load	
253Vac /50Hz	25.68	--	5.80	Circuit breaker	25.68	Rated output load	
For Inverter mode:							
48Vdc	94.8	117	4.55	DC fuse	--	Rated output load	
Supplementary information:							

2.1.1.5 c1)	TABLE: max. V, A, VA test (Energy hazardous measurement)				N
Voltage (rated) (V)	Current (rated) (A)	Voltage (max.) (V)	Current (max.) (A)	VA (max.) (VA)	
--	--	--	--	--	
--	--	--	--	--	
Supplementary information:					

2.1.1.5 c2)	TABLE: stored energy (Energy hazardous measurement)			N
Capacitance C (μF)	Voltage U (V)	Energy E (J)		
--	--	--		
--	--	--		
Supplementary information:				

2.1.1.7	TABLE: capacitance discharge test				P
Condition	t _{calculated} (s)	t _{measured} (ms)	Tu @ 0V (s)	Comments	
L-N	---	248ms	--	V _p =384V, 37% of V _p =142V	

Supplementary information:

2.2	TABLE: evaluation of voltage limiting components in SELV circuits			P
Component (measured between)		Maximum voltage (V) (normal operation)		Voltage limiting components
		Vpeak	Vd.c.	
TX1(for mini board) Pin 8 to 7		38.8	--	
TX1(for mini board) Pin 6 to 7		38.4	--	
Fault test performed on voltage limiting components		Voltage measured (V) in SELV circuits (Vpeak or Vd.c.)		
Supplementary information: s-c=short circuit.				

2.4.2	TABLE: limited current circuit measurement					P
Condition	Voltage (V)	Current (mA)	Freq. (Hz)	Limit (mA)	Comments	
Inverter mode						
L-N	0.67	0.34	50	0.7	Normal	
L-GND	0.87	0.44	50	0.7	Normal	
N-GND	0.84	0.42	50	0.7	Normal	
L-N	1.02	0.51	50	0.7	Short-circuited R185	
L-GND	1.09	0.55	50	0.7	Short-circuited R185	
N-GND	1.14	0.57	50	0.7	Short-circuited R185	
L-N	1.01	0.51	50	0.7	Short-circuited R184	
L-GND	1.21	0.61	50	0.7	Short-circuited R184	
N-GND	1.08	0.51	50	0.7	Short-circuited R184	
AC Charge mode						
PV+ - PV-	0.42	0.21	50	0.7	Using the measuring instrument of Annex D and test used 228 meter	
Supplementary information:						

2.5	TABLE: limited power sources	N
Circuit output tested:		
Note: Measured Uoc (V) with all load circuits disconnected:		

Components	Sample No.	Uoc (V)	I _{sc} (A)		VA	
			Meas.	Limit	Meas.	Limit
--	--	--	--	--	--	--
--	--	--	--	--	--	--

supplementary information:

2.6.3.4	TABLE: ground continue test				P
Location		Resistance measured (mΩ)	Voltage measured (V)	Current applied (A)	Duration (min)
PE pole to Metal enclosure		10.3	--	32	2
PE pole to Metal enclosure		9.7	--	40	2

Supplementary information:

2.10.2	TABLE: determination of operating voltage measurement			P
Location		Peak votage (Vac)	RMS voltage (Vac)	Comments
For main board				
TX1 Pin 1 to Pin 3		430	240	--
TX1 Pin 1 to Pin 4		444	286	Max. Peak for TX1
TX1 Pin 2 to Pin 3		435	287	Max. RMS for TX1
TX1 Pin 2 to Pin 4		444	254	--
TX5 Pin 1 to Pin 5		93.0	11.7	--
TX5 Pin 1 to Pin 6		79.0	7.9	--
TX5 Pin 1 to Pin 7		44.0	28.0	--
TX5 Pin 1 to Pin 8		10.0	36.1	--
TX5 Pin 4 to Pin 5		97.0	40.3	Max. Peak and RMS for TX5
TX5 Pin 4 to Pin 6		84.0	30.7	--
TX5 Pin 4 to Pin 7		33.0	7.8	--
TX5 Pin 4 to Pin 8		47.0	13.3	--
TX8 Pin 1 to Pin 5		87.0	35.4	--
TX8 Pin 1 to Pin 6		74.0	26.7	--
TX8 Pin 1 to Pin 7		40.0	8.9	--
TX8 Pin 1 to Pin 8		30.0	9.8	--
TX8 Pin 4 to Pin 5		93.0	40.3	Max. Peak and RMS for TX8
TX8 Pin 4 to Pin 6		78.0	28.9	--
TX8 Pin 4 to Pin 7		34.0	8.9	--
TX8 Pin 4 to Pin 8		49.0	13.3	--

TX2 Pin 7 to 4	521	300	Max. Peak and RMS for TX2
TX2 Pin 9 to 4	514	300	--
TX2 Pin 7 to 2	14.5	8.3	--
TX2 Pin 9 to 2	28.0	9.6	--
TX9 Pin 1 to Pin 5	36.0	13.2	--
TX9 Pin 1 to Pin 6	28.0	8.9	--
TX9 Pin 1 to Pin 8	132	45.9	--
TX9 Pin 1 to Pin 11	120	44.5	--
TX9 Pin 1 to Pin 9	133	45.2	--
TX9 Pin 1 to Pin 12	132	46.1	--
TX9 Pin 3 to Pin 5	108	48.0	--
TX9 Pin 3 to Pin 6	132	55.0	--
TX9 Pin 3 to Pin 8	132	48.9	--
TX9 Pin 3 to Pin 11	145	54.6	--
TX9 Pin 3 to Pin 9	140	50.6	--
TX9 Pin 3 to Pin 12	160	65.3	Max. Peak and RMS for TX9
TX6 Pin 1 to Pin 5	60.0	44.2	--
TX6 Pin 1 to Pin 6	61.0	44.7	--
TX6 Pin 1 to Pin 8	164	89.7	--
TX6 Pin 1 to Pin 11	164	89.1	--
TX6 Pin 3 to Pin 5	60.0	43.2	--
TX6 Pin 3 to Pin 6	60.0	43.5	--
TX6 Pin 3 to Pin 8	164	89.2	--
TX6 Pin 3 to Pin 11	164	90.1	Max. Peak and RMS for TX6
U8 Primary to Secondary	50.3	9.2	--
U13 Primary to Secondary	64.0	9.3	--
U11 Primary to Secondary	56.3	22.1	--
U17 Primary to Secondary	70.3	12.0	--
U18 Primary to Secondary	57.0	15.6	--
Supplementary information:			

2.10.3 and 2.10.4	TABLE: clearance and creepage distance measurements						P
clearance cl and creepage distance dcr at/of/between:	U peak (V)	U r.m.s. (V)	Required cl (mm)	Cl (mm)	Required dcr (mm)	Cr (mm)	
Primary circuits to PE through:	420	250	2.0	See below	2.5	See below	
-under C52, C53, C59, C60, C70, C71				3.3		3.3	
-under C122, C119				3.8		3.8	
-under C120				3.7		3.7	
-under C121				4.0		4.0	
Primary circuits to SELV circuits through PCB on main board	420	250	4.0	See below	5.0	See below	
-under U8, U11, U13, U17				5.4		5.4	
-under U18				5.5		5.5	
-under TX9	420	250	4.0	>10	5.0	>10	
-under TX6	420	250	4.0	5.2	5.0	5.2	
-under TX2	521	300	4.8	>6.0	6.0	>6.0	
-under TX1	444	287	4.6	>10	5.8	>10	
-under TX5, TX8	420	250	4.0	7.6	5.0	7.6	
Primary circuits to SELV circuits through PCB on mini board	420	250	4.0	See below	5.0	See below	
-under U1, U2				4.7		>5.4	
-under TX1	420	250	4.0	5.7	5.0	5.7	
Supplementary information:							
1. See appended table C.2 for internal distances of transformer.							
2. 10N test performed component and internal wire.							

2.10.5	TABLE: distance through insulation measurement					P
Distance through insulation (DTI) at/of:	Upeak (V)	U rms (V)	Test voltage (V)	Required DTI (mm)	DTI (mm)	
Opto-coupler (U8, U13, U11, U17, U18, U6, U8, U1, U2)	<420	<250	3000	0.4	≥0.4 ¹⁾	
Supplementary information:						
For detail refer to table 1.5.1.						

4.3.8	TABLE: Batteries								N
The tests of 4.3.8 are applicable only when appropriate battery data is not available									N
Is it possible to install the battery in a reverse polarity position?									N
	Non-rechargeable batteries			Rechargeable batteries					
	Discharging		Un-intentional charging	Charging		Discharging		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:					--				Verdict
- Chemical leaks					--				N
- Explosion of the battery					--				N
- Emission of flame or expulsion of molten metal					--				N
- Electric strength tests of equipment after completion of tests					--				N
Supplementary information:									

4.5	TABLE: temperature rise measurements					P
	test voltage (V)	A : 207V AC charger mode B : 253V AC charger mode C : 48V Inverter mode D : Battery discharger mode				
	Ambient T _{min} (°C)	--	--	--	--	
	Ambient T _{max} (°C)	--	--	--	--	
Maximum temperature T of part/at:		T (°C)				Allowed T _{max} (°C)
		A	B	C	D	
For main board						
Varistor MOV3 body		63.8	63.9	69.7	72.0	85
Cx135 body		64.6	64.4	69.8	72.1	100
Cy121 body		77.2	72.8	74.8	76.9	85
Relay RY1 coil		74.3	71.0	70.7	72.9	110
Relay RY3 coil		76.6	73.0	69.8	72.1	110

Relay RY2 coil	79.3	75.0	82.4	84.4	110
Relay RY4 coil	73.0	70.6	83.1	84.7	110
Cx58 body	64.3	64.7	72.7	73.4	100
C16 body near HS3	63.0	66.5	77.8	79.5	105
CT1 coil	84.8	75.9	86.2	87.1	105
L2 coil	62.7	65.9	84.1	85.5	105
C33 body	61.3	65.6	68.5	69.6	100
HCT1 coil	64.0	65.5	68.6	68.6	105
L4 coil	91.2	86.4	96.6	93.7	105
TX7 coil	63.8	63.7	65.9	65.9	110
PCB under Q32	63.9	66.2	84.0	84.5	130
PCB near W12	61.9	64.8	82.2	82.9	130
L3 coil	64.1	64.9	69.9	72.0	105
TX10 coil	65.8	66.2	74.0	76.0	105
TX11 coil	66.2	66.7	75.4	77.4	105
PCB under F4	60.8	65.6	94.6	109.8	130
Cx73 body near HS2	58.4	64.4	78.4	87.3	100
C13 body near HS1	59.0	66.1	83.3	93.2	105
TX1 coil	85.7	86.8	107.0	116.5	130
Cx150 body near TX1	58.5	62.5	67.0	70.5	100
C8 body near HS1	58.8	66.3	78.8	85.6	105
L1 coil	59.2	64.4	73.1	77.7	105
C41 body near HS3	62.0	64.9	58.8	60.5	105
PCB under Q37	58.4	65.4	72.1	72.6	130
U17 body	59.3	61.6	61.5	61.9	100
TX6 coil	62.0	65.0	58.9	60.5	110
TX9 coil	66.3	68.9	66.9	67.7	110
PCB under Q36	65.2	67.6	64.3	65.2	130
TX2 coil	56.9	59.3	57.6	58.4	110
PCB near TX2 and HS1	58.0	61.3	64.3	68.4	130
PCB under Q21	59.5	66.3	94.7	111.1	130
PCB under HS1 and HS2	58.5	65.8	91.2	107.2	130
TX8 coil	61.2	66.2	78.5	86.2	110
TX5 coil	61.8	66.9	81.9	89.9	110
Charge board					
Cx5 body	58.4	61.1	63.7	65.6	100

RY1 coil	57.7	61.4	64.8	67.1	105
PCB under Q5	58.1	60.2	62.9	63.9	130
L1 coil	58.1	59.8	60.9	62.2	105
U8 body	57.4	58.7	61.9	62.5	100
Switch body	57.7	62.2	69.4	73.7	85
Mini board					
U1 body	55.3	63.9	72.4	74.5	100
TX1 coil	61.2	63.5	71.5	73.7	110
TX1 core	60.6	61.5	66.7	68.6	110
Unit					
Input Connector near "L"	59.8	57.1	59.1	58.7	115
Cx1 body	61.5	62.5	68.6	70.5	100
Input wire inside	63.1	63.7	69.1	71.1	105
Input breaker	63.3	64.1	70.5	72.8	100
DC Connector near "+"	58.6	62.2	70.8	75.4	115
AC Output Connector near "L"	61.3	63.0	70.7	72.9	115
AC Output wire inside	63.2	63.9	72.1	74.3	105
Enclosure top outside near Main board	56.3	58.0	60.1	61.7	70
Ambient(°C)	55.0	55.0	55.0	55.0	--
Temperature rise ΔT of winding:	R1 (Ω)	R2 (Ω)	ΔT (K)	allowed ΔT (K)	insulation class
--	--	--	--	--	--
--	--	--	--	--	--
Supplementary information:					
1) T shall not exceed ($T_{max} + T_{amb} - T_{ma}$), see clause 1.4.12					
T: is the temperature of the given part measured under the prescribed test condition;					
T _{max} : is the maximum temperature specified for compliance with the test;					
T _{amb} : is the ambient temperature during test;					
T _{ma} : is the maximum ambient temperature during permitted by the manufacturer's specification, see below					
2) The maximum ambient temperature is 55°C					

4.5.5	TABLE: ball pressure test of thermoplastics			P
	required impression diameter (mm): ≤ 2 mm			—
Part		Test temperature (°C)	Impression diameter (mm)	
Plastic material of connector		125	1.5	
Transformer Bobbin		125	1.1	

Supplementary information:

4.6.1 and 4.6.2	TABLE: openings		P
Location	Size (mm)	Comments	
Top	---	No openings	
Side	Φ=3.4mm	Circularity openings provided, no hazardous live parts exposed to the openings	
Bottom	30mmX1.8mm	Rectangle openings provided, no hazardous live parts exposed to the openings	
Front	---	No openings	
Back	Φ=3.4mm	Circularity openings provided, no hazardous live parts exposed to the openings	
Supplementary information:			

4.7	TABLE: resistance to fire					N
Part	Manufacturer of material	Type of material	Thickness (mm)	Flammability class	Evidence	
Supplementary information: see appended table 1.5.1						

5.1.6	TABLE: touch current measurement			P
Measured between:	Measured (mA)	Limit (mA)	Comments/conditions	
L/N	1.98	3.5	To metal enclosure	
L/N	0.02	0.25	To output terminals	
Supplementary information:				

5.2	TABLE: electric strength tests, impulse tests and voltage surge tests			P
Test voltage applied between:	Voltage shape (AC, DC, impulse, surge)	Test voltage (V)	Breakdown Yes/No	
L and N of input (without fuse)	AC	1500	No	
Primary circuits to COM circuits	AC	3000	No	
Primary and enclosure	AC	1500	No	
TX1 primary and secondary(Main board)	AC	3000	No	
TX1 primary and core(Main board)	AC	1500	No	
TX1 secondary and core(Main board)	AC	1500	No	
TX2 primary and secondary(Main board)	AC	3000	No	
TX2 primary and core(Main board)	AC	1500	No	

TX2 secondary and core(Main board)	AC	1500	No
TX5 primary and secondary(Main board)	AC	3000	No
TX5 secondary and core(Main board)	AC	3000	No
TX6 primary and secondary(Main board)	AC	3000	No
TX6 primary and core(Main board)	AC	1500	No
TX6 secondary and core(Main board)	AC	1500	No
TX9 primary and secondary(Main board)	AC	3000	No
TX9 primary and core(Main board)	AC	1500	No
TX9 secondary and core(Main board)	AC	1500	No
TX1 primary and secondary(Mini board)	AC	3000	No
TX1 secondary and core(Mini board)	AC	3000	No
Mylar	AC	3000	No

Supplementary information: Test after humidity treatment, heating test, and each fault condition test of 5.3.

5.3 TABLE: fault condition tests							P
Ambient temperature (°C)					25, if not specify		—
Power source for EUT: Manufacturer, model/type, output rating					--		—
Component No.	Fault	Supply voltage (V)	Test time	Fuse #	Fuse current (A)	Observation	
Ventilation	Block	230	1.5h	--	28.43	Unit temperature sable, no hazards, no damaged. The Max. temperature of main board: CT1 coil: 69.0°C, TX1 coil: 80.2 °C, TX2 coil: 45.9 °C, TX5 coil: 51.1°C, TX6 coil: 53.6°C, TX8 coil: 49.9°C, TX9 coil: 53.8°C, Min. board: TX1 coil: 50.7°C, TX 1core: 50.1°C, Ambient: 29.0°C.	
Fan 1	Lock	230	30min	--	28.43	Unit temperature sable, no hazards, no damaged. The Max. temperature of main board: CT1 coil: 74.1°C, TX1 coil: 74.0 °C, TX2 coil: 33.5 °C, TX5 coil: 45.5°C, TX6 coil: 53.6°C, TX8 coil: 44.7°C, TX9 coil: 53.8°C, Min. board: TX1 coil: 41.0°C, TX 1core: 40.3°C, Ambient: 29.1°C.	
Fan 2	Lock	230	30min	--	28.43	Unit temperature sable, no hazards, no damaged. The Max. temperature of main board: CT1 coil: 70.8°C, TX1 coil: 71.7 °C, TX2 coil: 34.5°C, TX5 coil: 49.4°C, TX6 coil: 44.5°C, TX8 coil: 47.8°C, TX9 coil: 47.8°C, Min. board: TX1 coil: 41.6°C, TX 1core: 39.7°C, Ambient: 28.8°C.	

AC Output (AC Charge mode)	S-C	230	10min	--	0.13	Unit shutdown immediately, the AC input circuit breaker open, no damaged, no hazards.
DC Output (AC Charge mode)	S-C	230	10min	--	0.02	Unit shutdown immediately, the DC fuse is open, no damaged, no hazards.
AC output (Inverter mode)	S-C	48Vdc	10min	--	0.03	Unit shutdown immediately, no damaged, no hazards.
Q33 Pin 2-3	S-C	230	10min	--	28.43	Normal operation, no hazards, no damaged.
Q33 Pin 2-3	S-C	48Vdc	10min	--	0.03	Unit shutdown immediately, Recoverable, no hazards, no damaged.
Q34 Pin 2-3	S-C	230	10min	--	28.43	Normal operation, no hazards, no damaged.
Q34 Pin 2-3	S-C	48Vdc	10min	--	94.8	Normal operation, no hazards, no damaged.
<p>Supplementary information:</p> <p>S-C = short circuit; O-C = open circuit; O-L= over load</p> <p>After all fault condition test, the samples passed the dielectric voltage test.</p>						

C.2	Table: Transformers						P
Location	Tested insulation	Working Voltage peak/V(2.10.2)	Working voltage rms / V (2.10.2)	Required Electric strength (5.2)	Required clearance / mm (2.10.3)	Required creepage distance / mm (2.10.4)	Required distance thr. insul. (2.10.5)
TX1	Reinforced (Pri. - Sec.)	444	287	3000Vac	4.6	5.8	*)
TX1	Basic (Core - Sec.)	444	287	1500Vac	2.3	2.9	*)
TX1	Basic (Core - Pri.)	444	287	1500Vac	2.3	2.9	*)
Location	Tested insulation			Test voltage/ V	Measured clearance / mm	Measured creepage dist./ mm	Measured distance thr. insul. / mm; number of layers
TX1	Reinforced (Pri. - Sec.)			3000Vac	>6.0mm	>6.0mm	*)
TX1	Basic (Core - Sec.)			1500Vac	>3.0mm	>3.0mm	*)
TX1	Basic (Core - Pri.)			1500Vac	>3.0mm	>3.0mm	*)
supplementary information: Transformer TX1 (see table 1.5.1)							

C.2 Table: Transformers							P
Location	Tested insulation	Working Voltage peak/V(2.10.2)	Working voltage rms / V (2.10.2)	Required Electric strength (5.2)	Required clearance / mm (2.10.3)	Required creepage distance / mm (2.10.4)	Required distance thr. insul. (2.10.5)

TX2	Reinforced (Pri. - Sec.)	521	300	3000Vac	4.8	6.0	*)
TX2	Basic (Core - Sec.)	521	300	1500Vac	2.4	3.0	*)
TX2	Basic (Core - Pri.)	521	300	1500Vac	2.4	3.0	*)
Location	Tested insulation			Test voltage/ V	Measured clearance / mm	Measured creepage dist./ mm	Measured distance thr. insul. / mm; number of layers
TX2	Reinforced (Pri. - Sec.)			3000Vac	>6.0mm	>6.0mm	*)
TX2	Basic (Core - Sec.)			1500Vac	>3.0mm	>3.0mm	*)
TX2	Basic (Core - Pri.)			1500Vac	>3.0mm	>3.0mm	*)
supplementary information: Transformer TX2 (see table 1.5.1)							

C.2	Table: Transformers						P
Location	Tested insulation	Working Voltage peak/V (2.10.2)	Working voltage rms / V (2.10.2)	Required Electric strength (5.2)	Required clearance / mm (2.10.3)	Required creepage distance / mm (2.10.4)	Required distance thr. insul. (2.10.5)
TX5/TX8	Reinforced (Pri. - Sec.)	420	250	3000Vac	4.0	5.0	*)
TX5/TX8	Reinforced (Core - Sec.)	420	250	3000Vac	4.0	5.0	*)
Location	Tested insulation			Test voltage/ V	Measured clearance / mm	Measured creepage dist./ mm	Measured distance thr. insul. / mm; number of layers
TX5/TX8	Reinforced (Pri. - Sec.)			3000Vac	Triple insulated wire	>5.0mm	*)
TX5/TX8	Reinforced (Core - Sec.)			3000Vac	Triple insulated wire	>5.0mm	*)
supplementary information: Transformer TX5/TX8 (see table 1.5.1)							

C.2	Table: Transformers						P
Location	Tested insulation	Working Voltage peak/V(2.10.2)	Working voltage rms / V (2.10.2)	Required Electric strength (5.2)	Required clearance / mm (2.10.3)	Required creepage distance / mm (2.10.4)	Required distance thr. insul. (2.10.5)
TX6	Reinforced (Pri. - Sec.)	420	250	3000Vac	4.0	5.0	*)
TX6	Basic (Core - Sec.)	420	250	1500Vac	2.0	2.5	*)

TX6	Basic (Core - Pri.)	420	250	1500Vac	2.0	2.5	*)
Location	Tested insulation			Test voltage/ V	Measured clearance / mm	Measured creepage dist./ mm	Measured distance thr. insul. / mm; number of layers
TX6	Reinforced (Pri. - Sec.)			3000Vac	>6.0mm	>6.0mm	*)
TX6	Basic (Core - Sec.)			1500Vac	>3.0mm	>3.0mm	*)
TX6	Basic (Core - Pri.)			1500Vac	>3.0mm	>3.0mm	*)
supplementary information: Transformer TX6 (see table 1.5.1)							

C.2	Table: Transformers							P
Location	Tested insulation	Working Voltage peak/V(2.10.2)	Working voltage rms / V (2.10.2)	Required Electric strength (5.2)	Required clearance / mm (2.10.3)	Required creepage distance / mm (2.10.4)	Required distance thr. insul. (2.10.5)	
TX9	Reinforced (Pri. - Sec.)	420	250	3000Vac	4.0	5.0	*)	
TX9	Basic (Core - Sec.)	420	250	1500Vac	2.0	2.5	*)	
TX9	Basic (Core - Pri.)	420	250	1500Vac	2.0	2.5	*)	
Location	Tested insulation			Test voltage/ V	Measured clearance / mm	Measured creepage dist./ mm	Measured distance thr. insul. / mm; number of layers	
TX9	Reinforced (Pri. - Sec.)			3000Vac	>6.0mm	>6.0mm	*)	
TX9	Basic (Core - Sec.)			1500Vac	>3.0mm	>3.0mm	*)	
TX9	Basic (Core - Pri.)			1500Vac	>3.0mm	>3.0mm	*)	
supplementary information: Transformer TX9 (see table 1.5.1)								

C.2	Table: Transformers						P
Location	Tested insulation	Working Voltage peak/V (2.10.2)	Working voltage rms / V (2.10.2)	Required Electric strength (5.2)	Required clearance / mm (2.10.3)	Required creepage distance / mm (2.10.4)	Required distance thr. insul. (2.10.5)
TX1	Reinforced (Pri. - Sec.)	420	250	3000Vac	4.0	5.0	*)
TX1	Reinforced (Core - Sec.)	420	250	3000Vac	4.0	5.0	*)

Location	Tested insulation	Test voltage/ V	Measured clearance / mm	Measured creepage dist./ mm	Measured distance thr. insul. / mm; number of layers
TX1	Reinforced (Pri. - Sec.)	3000Vac	Triple insulated wire	>5.0mm	*)
TX1	Reinforced (Core - Sec.)	3000Vac	Triple insulated wire	>5.0mm	*)
supplementary information: Transformer TX1 (see table 1.5.1)					

Photo documentation

Photo 1



Photo 2



Photo 3



Photo 4

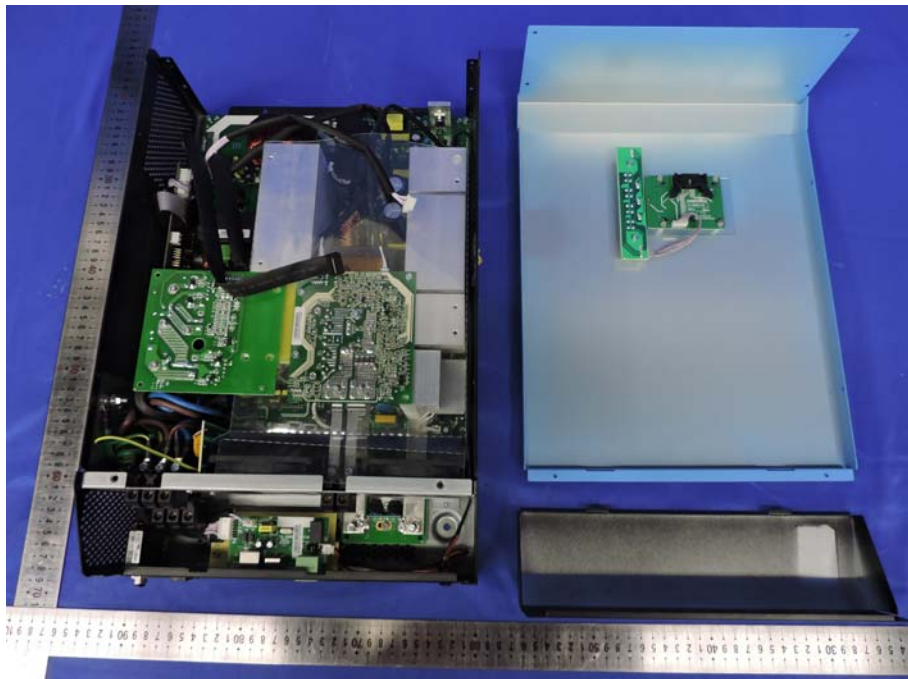


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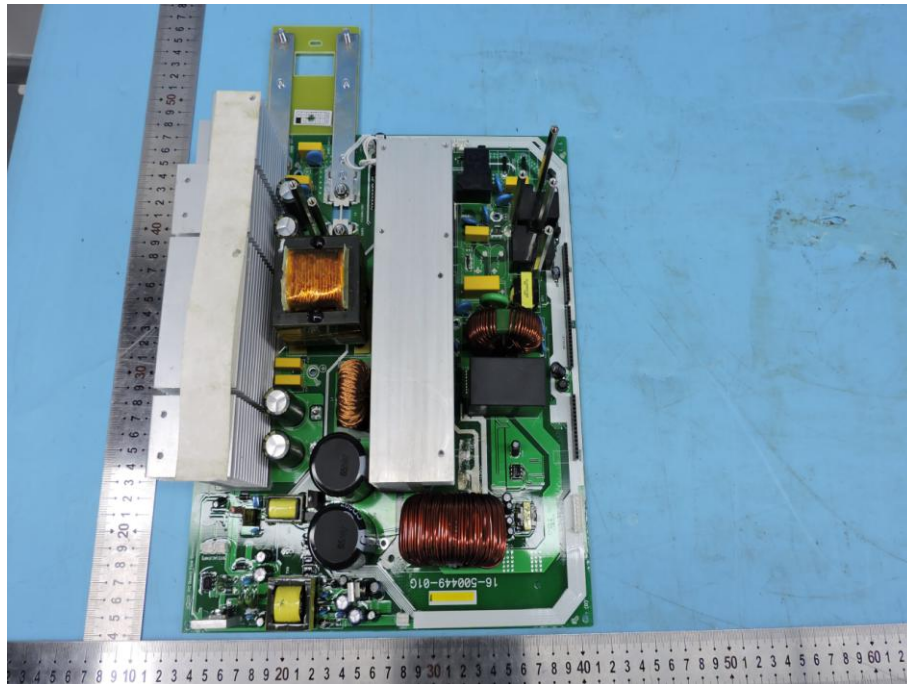


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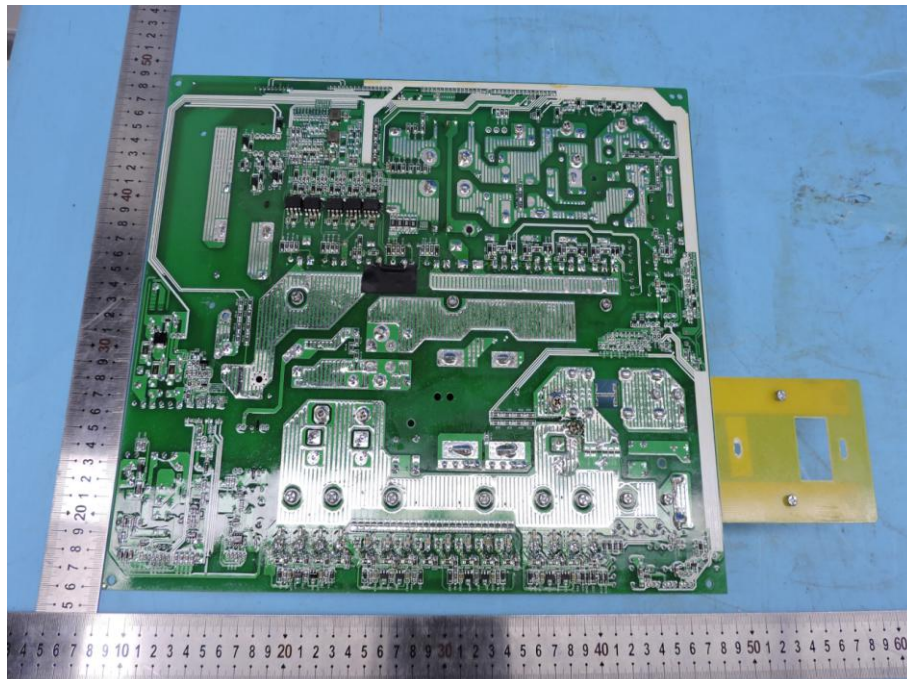


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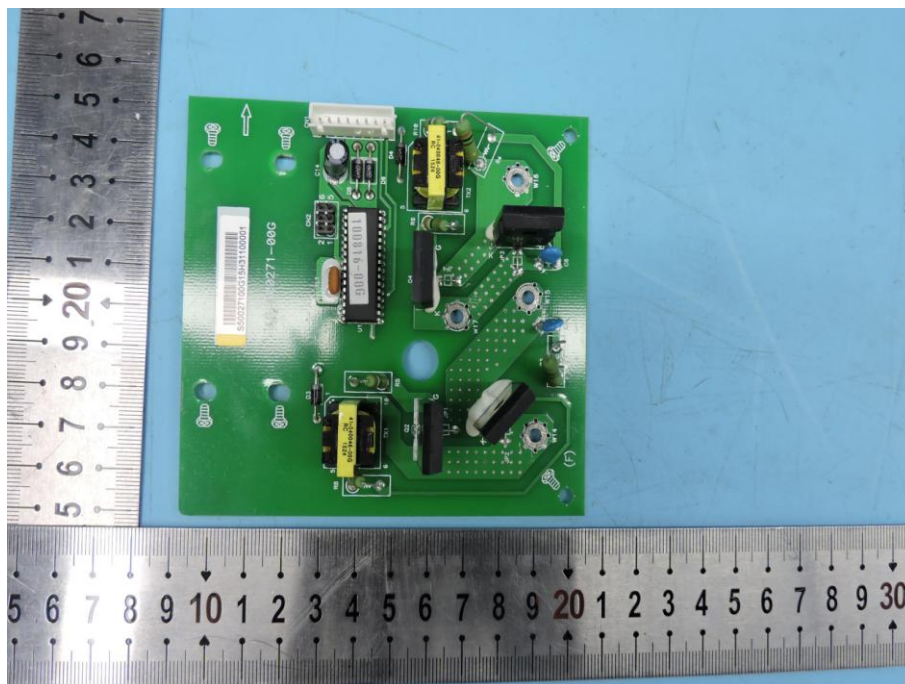


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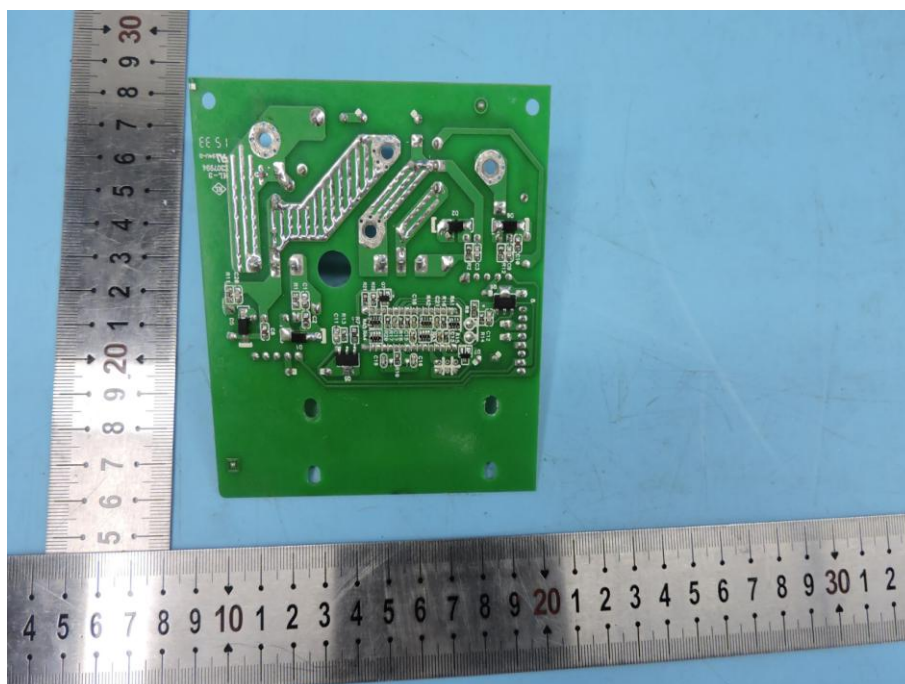


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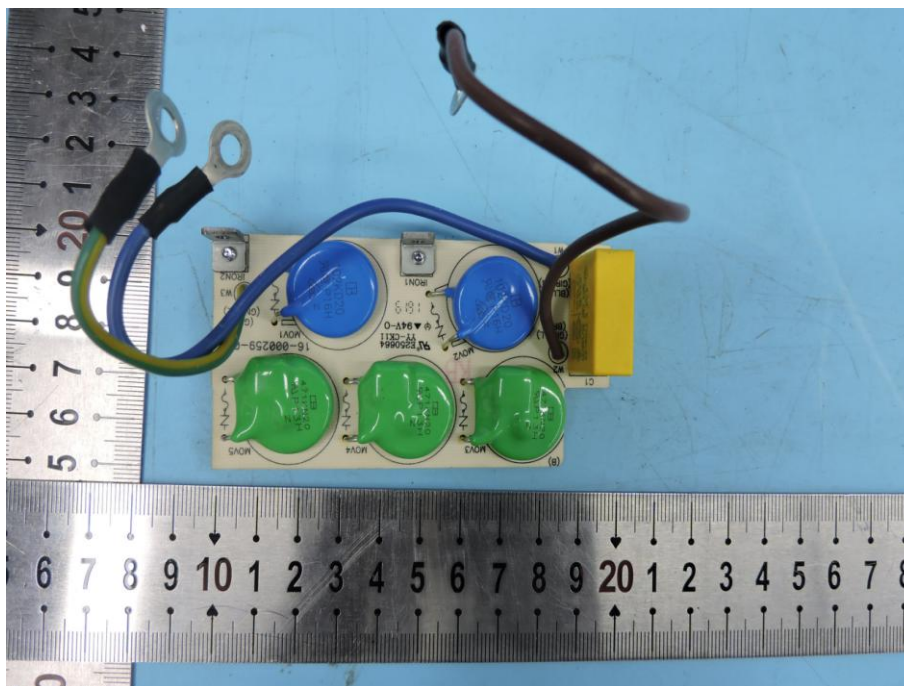


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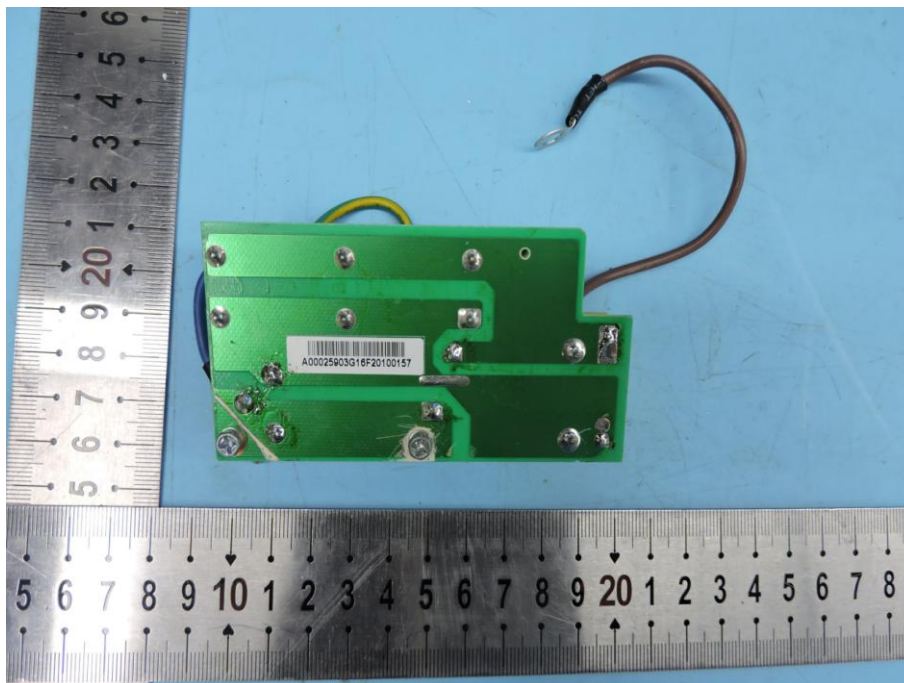


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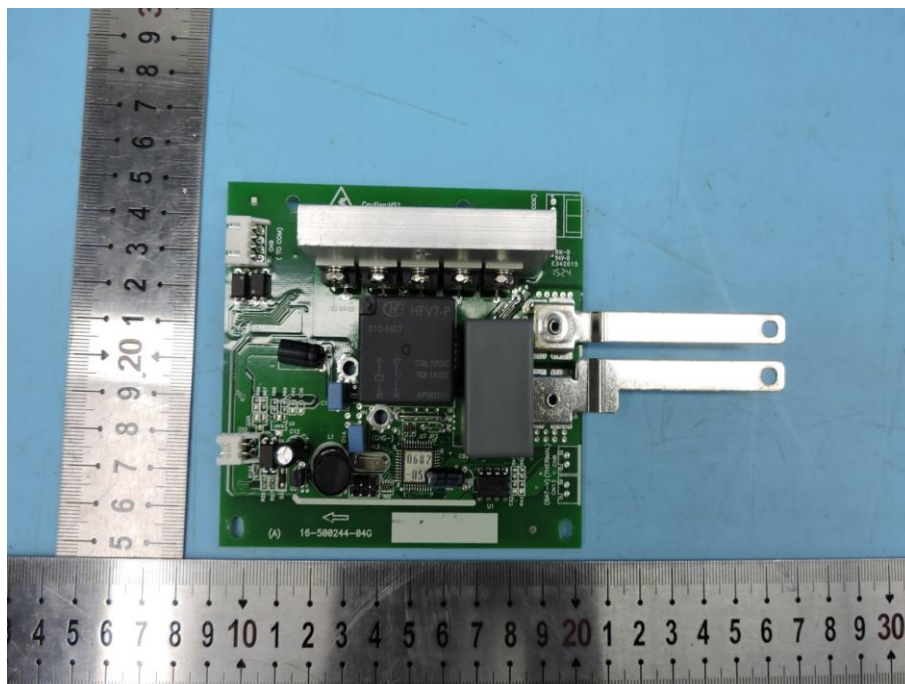


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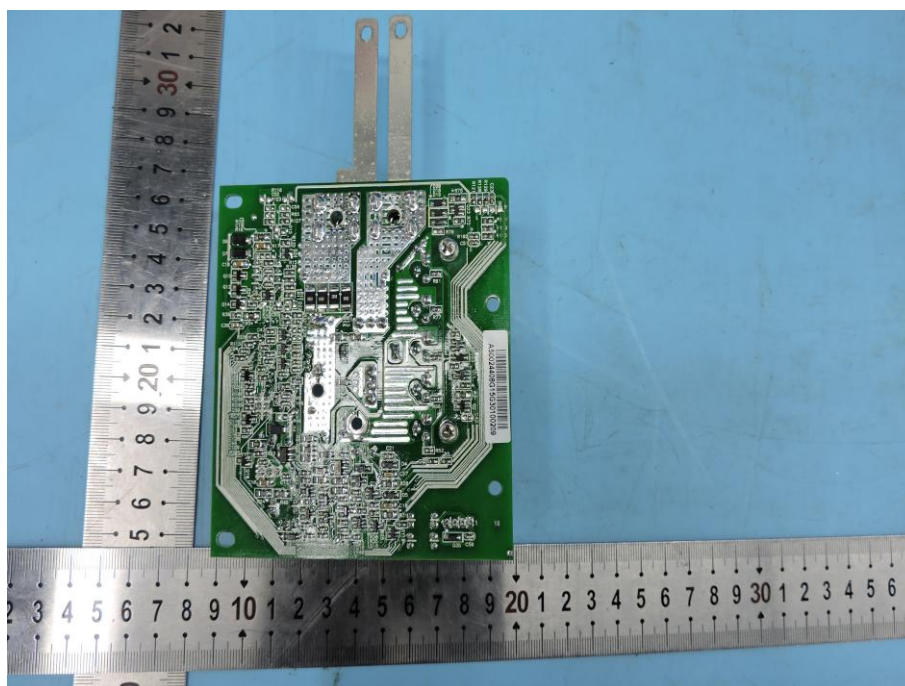


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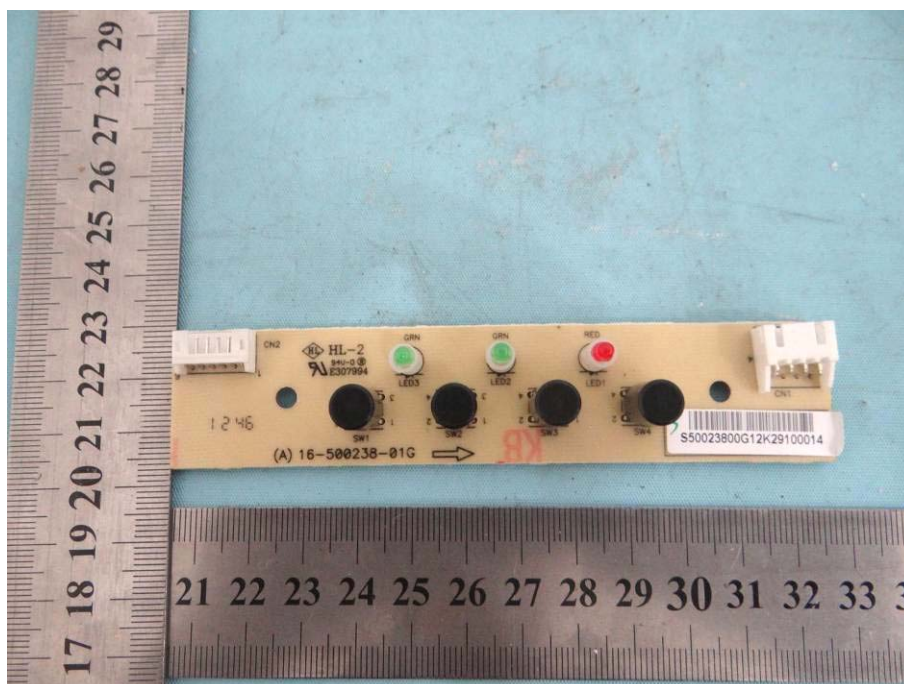


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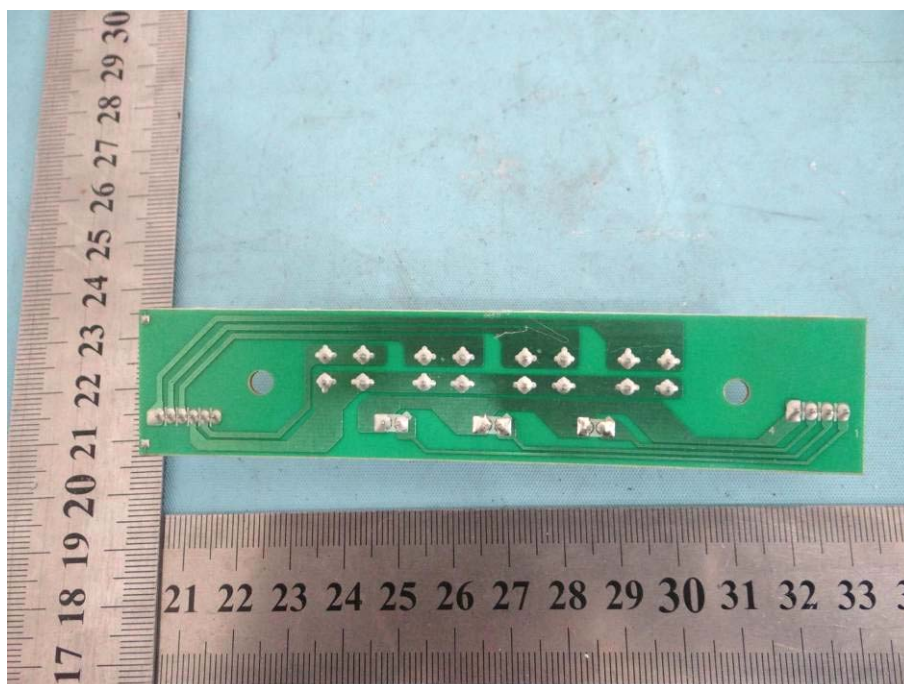


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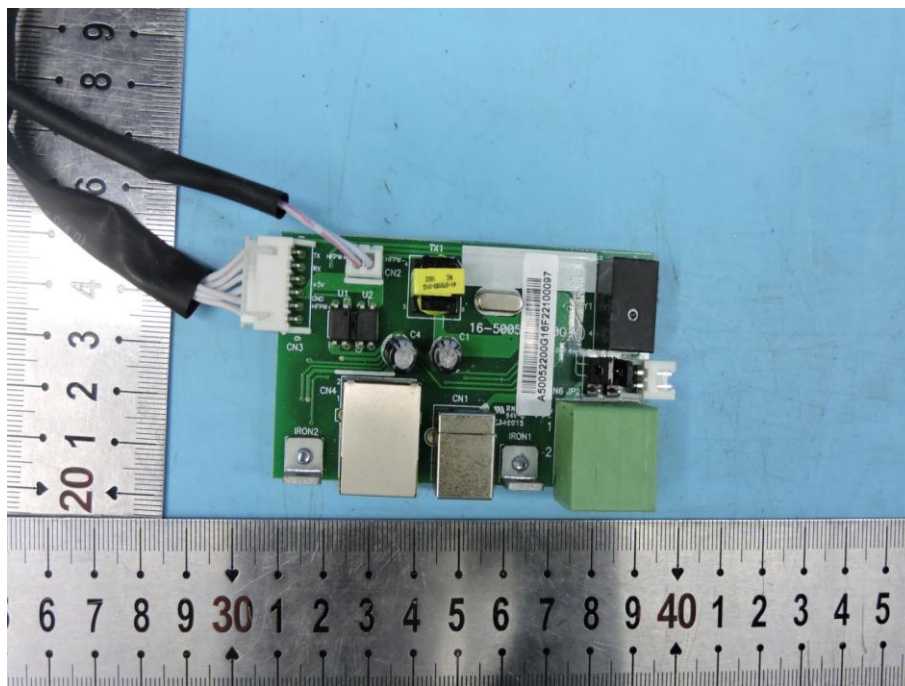


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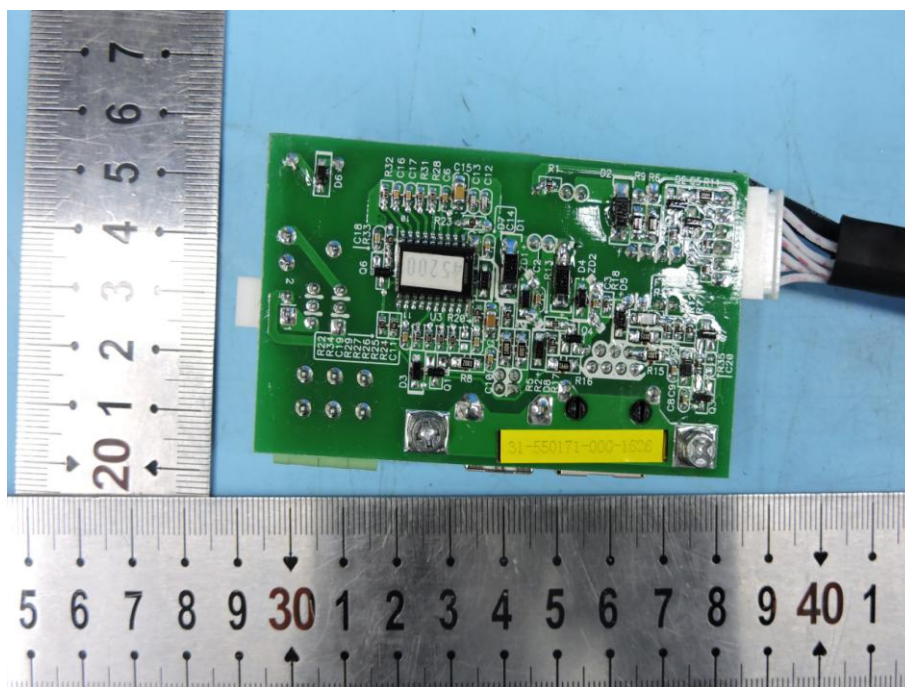


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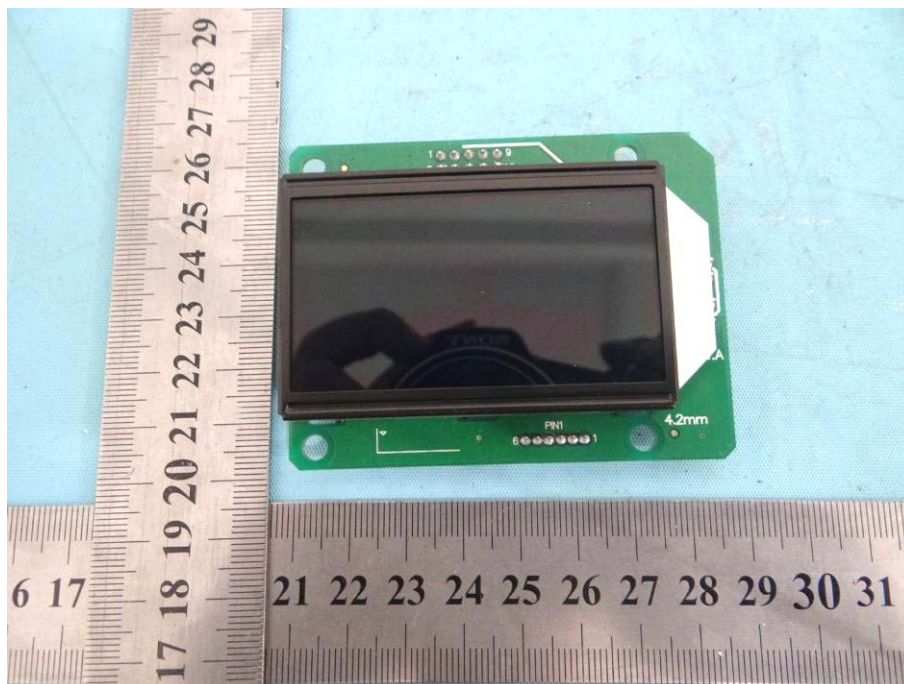


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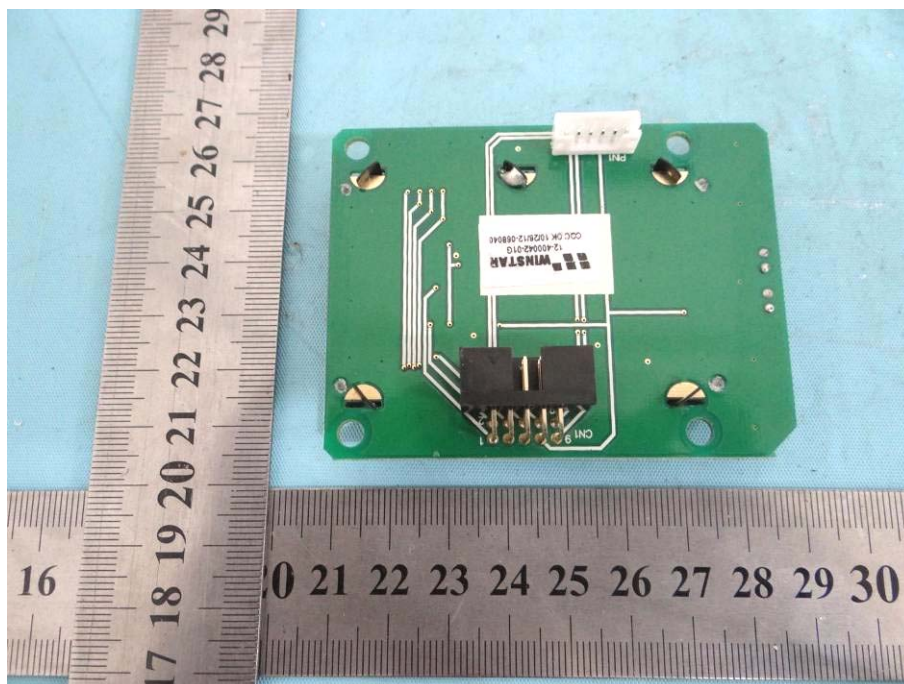


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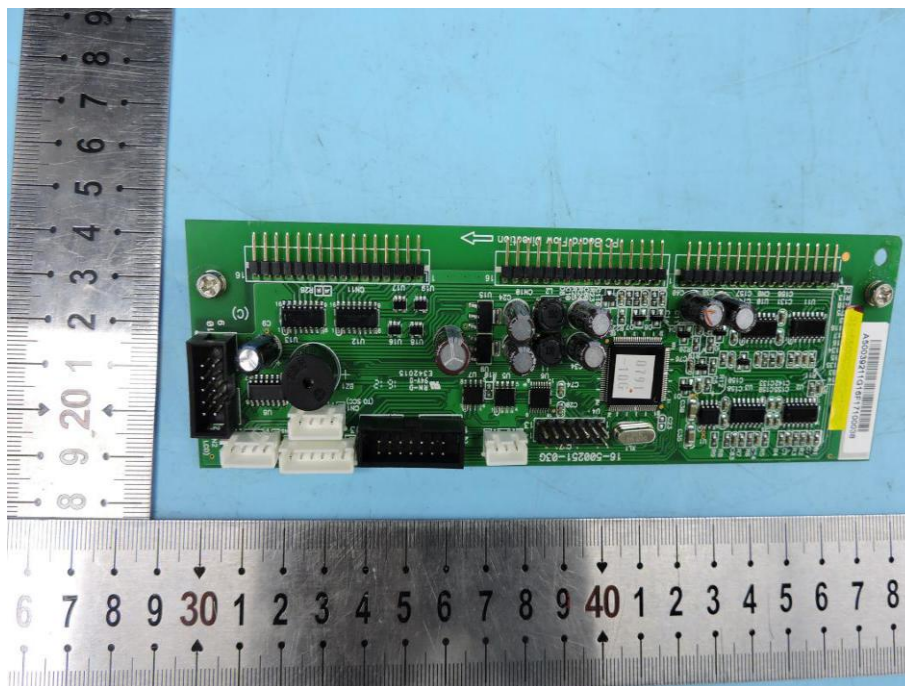


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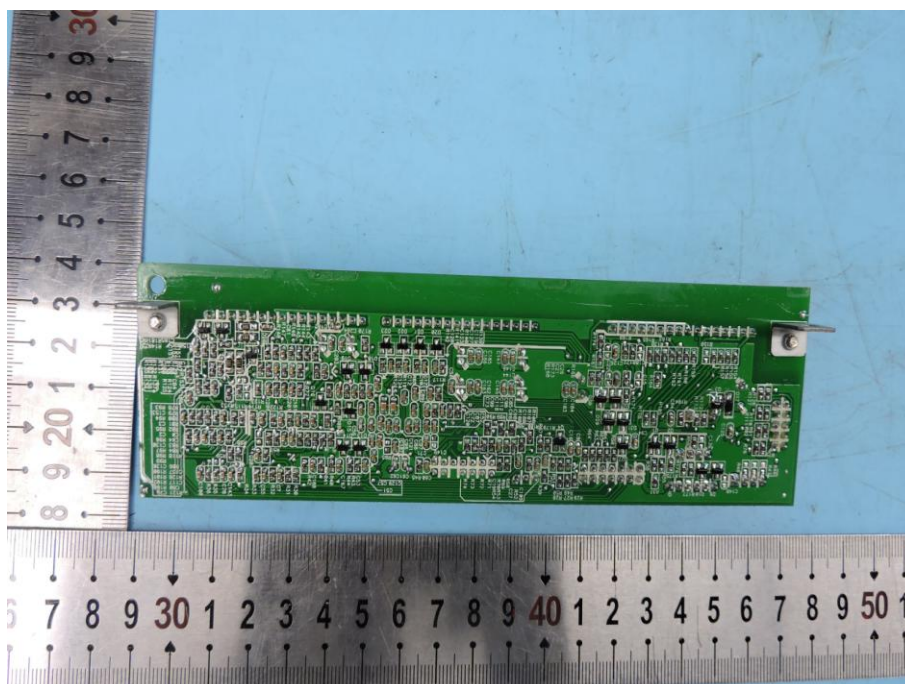


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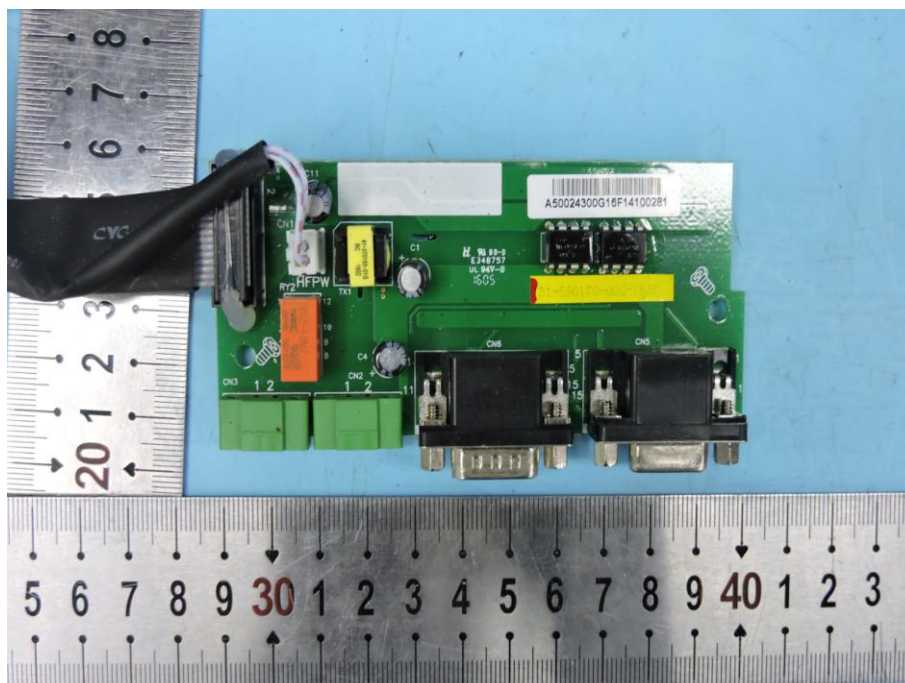
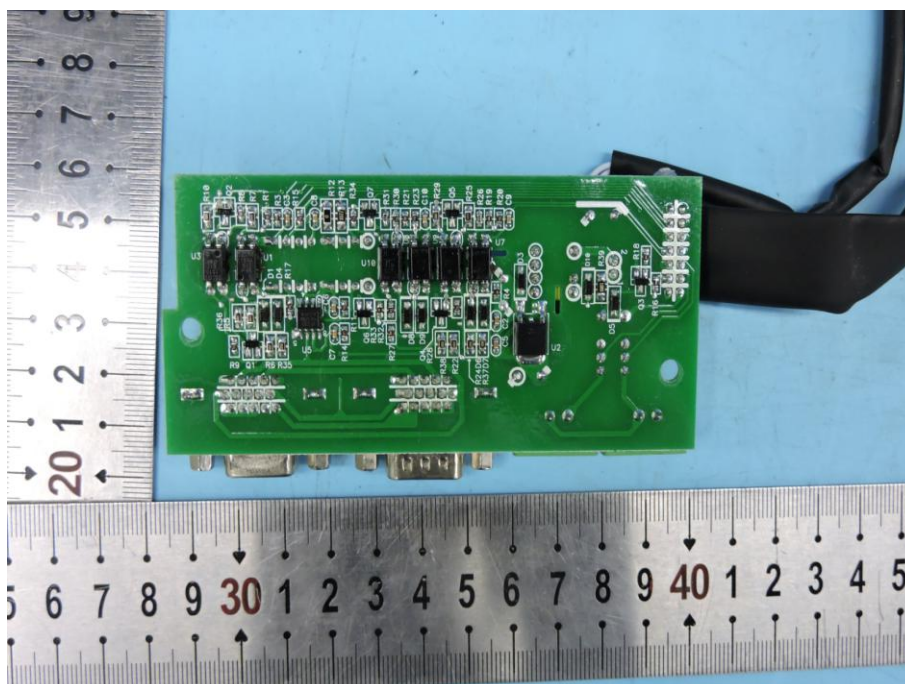


Photo 22



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