

Test Report issued under the responsibility of:



**TEST REPORT
IEC 61558-2-16**

**Safety of power transformers, power supplies, reactors and similar
products for supply voltages up to 1100 V**

**Part 2: Particular requirements and tests for switch mode power
supply units and transformers for switch mode power supply units**

Report Number.: 704102301146-01

Date of issue: 2026-08-10

Total number of pages.....: 101

**Name of CB Testing Laboratory
preparing the Report.....: TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai
Branch**

Applicant's name.....: Wandera GmbH

Address: Am Wellenbach 9, 93149 Nittenau, GERMANY

Test specification:

Standard: IEC 61558-2-16:2021 used in conjunction with IEC 61558-1:2017

Test procedure: TUV mark, CE-LVD

Specific program, if applicable: ☐ CCP ☐ ACP

Non-standard test method.....: N/A

TRF template used: IECEE OD-2020-F1:2025, Ed.1.8

Test Report Form No.....: IEC61558_2_16H

Test Report Form(s) Originator: Intertek Testing Services (Singapore) Pte Ltd

Master TRF: Dated 2026-02-13

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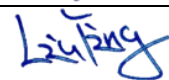
**This report is not valid as a CB Test Report unless signed by an approved IECEE Testing
Laboratory and appended to an IECEE Certificate issued by an NCB in accordance with IECEE 02.**

General disclaimer:

The test results presented in this report relate only to the object tested.

This report shall not be reproduced, except in full, without the written approval of the Issuing NCB. The authenticity of this Test Report and its contents can be verified by contacting the NCB, responsible for this Test Report.

Test item description :	Switch Mode Power Supply Unit Safety light transformer
Trademark(s) :	
Manufacturer :	Same as applicant
Model/Type reference :	999999-017-6
Ratings :	PRI: 230Vac, 50Hz; SEC1:3.5Vdc, 0.766A, 2.681W SEC2:0.5-3.0Vdc, Max.0.7A, 2.1W

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
☒	Testing Laboratory:	TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch No.151 Heng Tong Road 200070, Shanghai P.R. China
Testing location/ address		No. 1999, Duhui Road, Shanghai, 201108, P. R. China
Tested by (name, function, signature)		Gang CHENG /Project Handler
Approved by (name, function, signature) ..		Ying LIU /Designated Reviewer
  		
☐	Testing procedure: CTF Stage 1:	
Testing location/ address		
Tested by (name, function, signature)		
Approved by (name, function, signature) ..		
☐	Testing procedure: CTF Stage 2:	
Testing location/ address		
Tested by (name + signature)		
Witnessed by (name, function, signature) ..		
Approved by (name, function, signature) ..		
☐	Testing procedure: CTF Stage 3:	
☐	Testing procedure: CTF Stage 4:	
Testing location/ address		
Tested by (name, function, signature)		
Witnessed by (name, function, signature) ..		
Approved by (name, function, signature) ..		
Supervised by (name, function, signature) :		

List of Attachments (including a total number of pages in each attachment):

- Attachment 1: Test report of EN 50075:1990 (7pages)
- Attachment 2: Photo documentation (7pages)
- CDF documentation
- Test report EN 61347-2-2:2012 used in conjunction with EN 61347-1:2015/A1:2021, and Test report EN 62493:2015/A1:2022 (Report No.: 704022605251-00)

Summary of testing:

The sample's mentioned in this report is/are submitted/ supplied/ manufactured by client. The laboratory therefore assumes no responsibility for accuracy of information on the brand name, model number, origin of manufacture, consignment or any information supplied.

Tests performed (name of test, test clause and date test performed):

1. Complete tests.
2. Requirements of EN 50075 are also taken into consideration.
3. We conclude that the product presented in this test report comply with the standard according to the test results on the submitted samples.
4. These test results comply with the requirements of EN IEC 61558-1:2019 and EN IEC 61558-2-16: 2025

Testing location: (CBTL, SPTL, CTF, Subcontractor)

TÜV SÜD Certification and Testing (China) Co.,
Ltd. Shanghai Branch
No. 1999, Duhui Road, Shanghai, 201108, P. R.
China

Summary of compliance with National Differences

- IECEE Member countries that are also CENELEC members
Compliance with Group Differences evaluated ☐ yes ☐ No ☒ N/A
- IECEE Member countries with published National Differences which were evaluated and found in compliance: N/A
- IECEE Member countries that declare no National Differences: N/A

To support compliance with published National Differences, attach a compilation of relevant ND and/or GD TRFs to the CB Test Report

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

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

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

Information on uncertainty of measurement:

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

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

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

Copy of marking plate:

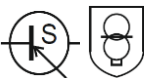
The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.

Refer to CDF.

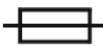
Test item particulars : Switching mode power supply	
Classification of installation and use : Direct plug-in	
Supply Connection : Pluggable equipment	
Possible test case verdicts: - test case does not apply to the test object : N/A - test object does meet the requirement..... : P (Pass) - test object does not meet the requirement..... : F (Fail)	
Testing : Date of receipt of test item : 2023-01-09; 2026-05-26 Date (s) of performance of tests : 2023-01-10 to 2023-02-21; 2026-05-27 to 2026-07-27	
General remarks:	
"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report. Throughout this report a ☐ comma / ☒ point is used as the decimal separator. According to the endorsement notice on relevant standard, the text of international standard IEC 61558-2-16:2021 and IEC 61558-1:2017 was approved by CENELEC as a European standard without any modification. The products comply with EN IEC 61558-1:2019 and EN IEC 61558-2-16:2025. Remark: This report replaces report 704102301146-00 issued on 2023-02-23 due to the modifications mentioned as below: - Update standard EN 61558-2-16:2009/A1:2013 to EN IEC 61558-2-16:2025	
Manufacturer's Declaration per sub-clause 4.2.5 of IEC 02:	
The application for obtaining an IECEE Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided :	☐ Yes ☒ Not applicable
When differences exist; they shall be identified in the General product information section.	
Name and address of factory (ies) : NINGBO KELI POWER CO., LTD Lishan Lucheng Miao Development Zone 315490 Yuyao City, Zhejiang PEOPLE'S REPUBLIC OF CHINA	

General product information and other remarks:

Switch mode power supply, Class II, IP20, used for filament lamp.

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
8	MARKING AND OTHER INFORMATION		-
8.1	Transformers shall be marked with the following (for symbols see Table 1):		P
	a) rated supply voltage(s) or the rated supply voltage range(s) (V)	230V~	P
	b) rated output voltage(s) (V or kV)	Refer to marking plate in CDF	P
	c) rated output (VA, kVA, or W)	Refer to marking plate in CDF	P
	d) rated output current(s) (A or mA)	Refer to marking plate in CDF	P
	e) rated supply frequency(ies) (Hz)	50Hz	P
	f) rated power factor (if not 1)		N/A
	g) symbol AC for alternating current, or DC for direct current-output		P
	h) relevant graphical symbols shown in Table 101 that indicate the kind of transformer in addition with the symbol for SMPS. (IEC 61558-2-16: 2021)	For example: 	P
	i) name or trademark of the manufacturer or responsible vendor		P
	j) model or type reference		P
	k) vector group in accordance with IEC 60076-1 for three phase transformer		N/A
	l) symbol for class II construction		P
	symbol for class III construction		N/A
	m) indication of the protection index IP	IP 20	P
	n) rated maximum ambient temperature t_a , if other than 25 °C		N/A
	o) rated minimum ambient temperature t_{amin} , if lower than +10 °C and if a temperature sensitive device is used		N/A
	p) duty cycle, if any, unless the operating time is limited by the construction of the transformer or corresponds to the operating conditions specified in the relevant part of IEC 61558-2.		N/A
	q) symbol for overvoltage category, if other than OVC II		N/A
	r) transformers used with forced air cooling shall be marked with "AF" in m/s		N/A
	s) Information from the manufacturer to the purchaser (data sheet)		N/A
	- short-circuit voltage (% rated supply voltage) for stationary transformers > 1000 VA		N/A
	- electrical function of the transformer	in the literature	P

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Clause	Requirement + Test	Result - Remark	Verdict
	- All markings except those under i) and j) may be illustrated as QR Code according ISO/IEC 18004.		N/A
	t) symbol indicating the maximum altitude of installation, if higher than 2 000 m		N/A
8.2	Marking for transformers IP00 or for associated transformers: type and trademark, instruction sheets		N/A
8.3	Adjusted voltage easily and clearly discernible	Not adjustable	N/A
8.4	For each tapping or winding: rated output voltage and rated output		N/A
	necessary connections clearly indicated		N/A
8.5	For non-short-circuit proof transformers or non-inherently short-circuit proof transformers designed to be protected by fuses shall be marked:		N/A
	Rated current (A or mA) and symbol for time current characteristics of the fuses for non-inherently short-circuit proof transformer with incorporated fuses and non-short-circuit proof transformer :		N/A
	For non-short-circuit proof transformers or non-inherently short-circuit proof transformers designed to be protected with protective devices other than fuses shall be marked:		N/A
	Manufacturer's models or type reference of the protective device, and/or the ratings of the protective device		N/A
	Instruction sheet for transformers with replaceable protective device (other than fuses) information with information about the replacement.		N/A
8.6	Terminals for neutral: "N"		N/A
	Terminal for protective earth marked with earthing symbol		N/A
	Identification of input terminals:		N/A
	Identification of output terminals:		N/A
	Symbol for any point/terminal in connection with frame or core		N/A
8.7	Indication for correct connection		N/A
8.8	Instruction sheet for type X, Y, Z attachments	Type Z for output wire	P
8.9	Transformer for indoor use shall be marked with the relevant symbol.		P
8.10	Symbol for Class II construction not confused with manufacturer's name or any other identification		P
	Class II transformer with parts to be mounted – delivered with all parts for class II after mounting.		N/A

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	Symbol for class II transformer placed on the part which provides class II.		N/A
8.11	Correct symbols:		P
	Volts	V	P
	Amperes	A (mA)	P
	Volt amperes (or volt-amperes reactive for reactors)	VA or (VAR)	N/A
	Watts	W	P
	Hertz	Hz	P
	Input	PRI	P
	Output	SEC	P
	Direct current	d.c. (DC) or 	P
	Neutral	N	N/A
	Single-phase a.c.		N/A
	Three-phase a.c.	3 	N/A
	Three-phase and neutral a.c.	3N 	N/A
	Power factor	cos φ	N/A
	Class II construction		P
	Class III construction		N/A
	Equipment of overvoltage category I		N/A
	Equipment of overvoltage category II		N/A
	Equipment of overvoltage category III		N/A
	Equipment of overvoltage category IV		N/A
	Fuse		N/A
	Rated max. ambient temperature	t_a	N/A
	Rated minimum ambient temperature	t_{amin}	N/A
	Rated minimum temperature	t_{min}	N/A
	Frame or chassis (or core terminal)		N/A
	Protective earth (ground)		N/A
	IP number	IPXX	P

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Clause	Requirement + Test	Result - Remark	Verdict
	Earth (ground or functional earth)		N/A
	For indoor use only		P
	To indicate that the appliance is intended to be usable up to the maximum altitude 3 000 m.		N/A
	To indicate that the power supply unit shall not be used, if pins of the plug part are damaged.		P
	Additional Symbols (IEC 61558-2-16:2021)		P
	SMPS (Switch mode power supply unit)		P
	SMPS incorporating a Fail-safe separating transformer		N/A
	SMPS incorporating a Non-short-circuit-proof separating transformer		N/A
	SMPS incorporating a Short-circuit-proof separating transformer (inherently or non-inherently)		N/A
	SMPS incorporating a Fail-safe isolating transformer		N/A
	SMPS incorporating a Non-short-circuit-proof isolating transformer		N/A
	SMPS incorporating a Short-circuit-proof isolating transformer (inherently or non-inherently)		N/A
	SMPS incorporating a Fail-safe safety isolating transformer		N/A
	SMPS incorporating a Non-short-circuit-proof safety isolating transformer		N/A
	SMPS incorporating a Short-circuit-proof safety isolating transformer (inherently or non-inherently)		P
	SMPS incorporating a Fail-safe auto-transformer		N/A
	SMPS incorporating a Non-short-circuit proof auto-transformer		N/A
	SMPS incorporating a Short-circuit proof auto-transformer (inherently or non-inherently)		N/A

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
8.12	Number, letters or other visual means for different positions of regulating devices and switches		N/A
	OFF position indicated by number 0		N/A
	Greater output, input etc. indicated by higher number		N/A
8.13	Marking not on screws or other easily removable parts		P
	Marking clearly discernible (transformer ready for use)		P
	Marking for terminals clearly discernible if necessary after removal of the cover		N/A
	Marking for terminals: no confusion between input and output		N/A
	Marking for interchangeable protective devices positioned adjacent to the base		N/A
	Marking for interchangeable protective devices clearly discernible after removal of cover and protective device		N/A
8.14	Visible information (symbols) shall be provided, when it is necessary to take special precautions for installation, transportation or use (in the catalogue, data sheet, instruction sheet or packaging):		N/A
	For non-inherently short-circuit proof transformers with non-self-resetting or non-replaceable devices and non-replaceable intentional weak parts: The device cannot be reset or replaced after a short-circuit or an overload		N/A
	For transformers generating a protective earth conductor current greater than 10 mA and are intended for permanent connection The installation shall be made according to the wiring rules.		N/A
	For stationary transformers exceeding 1000 VA: The short circuit voltage expressed as a percentage of the rated supply voltage		N/A
	The electrical function of the transformer		N/A
	the limiting temperature of the winding under abnormal conditions which shall be respected when the transformer is built into an appliance as information for appliance design;		N/A
	For transformers not designed for series and/or parallel connection with more than one output winding, not for series or parallel connection		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	For IP00-transformers the test of 27.2 is not performed. The result may be affected by the enclosure in the final application.		N/A
8.15	Marking durable and easily legible		P
8.16	Portable transformers with integrated plugs complying with EN 50075 (IEC plug type C), shall use the symbol IEC 60417-6352:2015-10. The instruction sheet of the plug in transformer shall contain the following information, or equivalent: if the pins of the plug parts are damaged, the plug-in power supply shall be scrapped.		P
9	PROTECTION AGAINST ELECTRIC SHOCK		-
9.1	General		P
	Transformers shall be enclosed and provided with adequate protection against contact with hazardous-live-parts and shall have no risk of an electric shock from stored charge on capacitors.		P
9.2	Protection against contact with hazardous-live-parts		P
9.2.1	Determination of hazardous-live-parts		P
9.2.1.1	A live part is not a hazardous-live-part if it is separated from the supply by double or reinforced insulation and the requirements of 9.2.1.2 or 9.2.1.3 are met when the transformer is supplied at rated supply voltage		P
9.2.1.2	The voltage shall not exceed 35 V AC peak or 60 V ripple free DC.		P
9.2.1.3	Where the voltage exceeds 35 V (peak) AC or 60 V ripple free DC, the touch current shall not exceed:		N/A
	- for AC. 0,7 mA (peak)		N/A
	- for DC. 2,0 mA		N/A
	In addition, when a capacitor is connected to live parts:		N/A
9.2.1.3.1	The discharge shall not exceed 45 µC for stored voltages between 60 V and 15 kV, or		N/A
9.2.1.3.2	The energy of discharge shall not exceed 350 mJ for stored voltages exceeding 15 kV.		N/A
9.2.2	Accessibility to hazardous-live-parts		P
	Transformers shall be constructed to provide adequate protection against accessibility to hazardous-live-parts.		P
	Class I and II transformers shall be so constructed and enclosed that there is adequate protection against accidental contact with hazardous-live-parts.		P

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	For class I transformers, accessible parts shall be separated from hazardous-live-parts by at least basic insulation.		N/A
	Class II transformers shall be so constructed and enclosed that there is adequate protection against accessibility to basic insulation and to conductive parts separated from hazardous-live-parts by basic insulation only.		P
	Only parts separated from hazardous-liveparts by double or reinforced insulation may be accessible		P
	Hazardous-live-parts shall not be accessible after removal of detachable parts except for		N/A
	- lamps having caps larger B9 and E10		N/A
	- type D fuse holder		N/A
	IP00 transformers shall comply with the end product standard after incorporation in the end product.		N/A
	The insulating properties of lacquer, enamel, paper, cotton, oxide film on conductive parts and sealing compound shall not be considered as giving the required protection against accidental contact with hazardous-live-parts with the exception of fully insulated winding wire (FIW).		P
	Shafts, handles, operating levers, knobs and the like shall not be hazardous-live-parts.		N/A
	Compliance is checked by inspection and by the relevant tests of IEC 60529.		P
	Class II transformers and Class II parts of Class I construction are tested with the test pin (fig. 3)		P
	Hazardous live parts shall not be touchable by test finger (fig. 4) with the exception of fully insulated winding wire (FIW).		P
	for Class II transformers: conductive parts separated by basic insulation from hazardous live parts not touchable by test finger		P
	hazardous live parts shall not be touchable with the test pin		P
9.2.3	Accessibility of non-hazardous live parts		P
	Non-hazardous live parts of the output circuit isolated from the input circuit by double or reinforced insulation may be accessible under the following conditions:		P
	- for no-load output voltages not exceeding 35 V peak AC or 60 V ripple-free DC, both poles may be accessible;		P

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Clause	Requirement + Test	Result - Remark	Verdict
	- for no-load output voltages exceeding 35 V peak AC or 60 V ripple-free DC and not exceeding 250 V AC, only one of the poles may be accessible.		N/A
9.3	Protection against hazardous electrical discharge		P
	Transformers with primary supply plug: 1 s after the interruption of the supply the voltage between the pins do not exceed 35 V (peak) AC or 60 V ripple free DC		P
	Transformers without a primary supply plug: 5 s after the interruption of the supply the voltage between the input terminals do not exceed 35 V (peak) AC. or 60 V ripple free DC.		N/A
	If the nominal capacitance is $\leq 0,1 \mu\text{F}$ – no test is conducted.		N/A
	- 10 times switch the supply source on and off, or use a special equipment for to switch off at the most unfavourable electrical angle		P
	If the measured voltage is $> 60 \text{ V}$ ripple free DC, the discharge must be $\leq 45 \mu\text{C}$.		N/A
10	CHANGE OF INPUT VOLTAGE SETTING		-
	Transformers with more than one rated supply voltage shall be so constructed that the voltage setting cannot be changed without the aid of a tool.		N/A
	Transformers which can be set to different rated supply voltages:		N/A
	- The indication of voltage for which the transformer is set is discernible on the transformer.		N/A
10.101	A wide range (e.g. 100 V AC to 240 V AC) of supply voltage is allowed (IEC 61558-2-16: 2021)		N/A
	- if the output voltage does not exceed the rated output voltage		N/A
	- if the no-load output voltage does not exceed the limits of the output voltage deviation		N/A
11	OUTPUT VOLTAGE AND OUTPUT CURRENT UNDER LOAD		-
11.1	Difference from rated value (without rectifier; with rectifier):		P
	a) inherently short-circuit proof transformers with one rated output voltage for the output voltage: $\text{AC} \leq 10\%$; $\text{DC} \leq 15\%$		N/A
	b) inherently short-circuit proof transformers with more than one rated output voltage for the highest output voltage: $\text{AC} \leq 10\%$; $\text{DC} \leq 15\%$		N/A
	c) inherently short-circuit proof transformers with more than one rated output voltage for the other output voltages: $\text{AC} \leq 15\%$; $\text{DC} \leq 20\%$		N/A

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	d) other transformers for the output voltages: AC ≤ 5%; DC ≤ 10%	(see appended table 11 & 12)	P
11.2	If a transformer is marked with the rated output, the rated output voltage, the rated output current, and the rated power factor, these values shall be substantially in agreement with each other.		P
	If no rated output current is assigned to the transformer, the rated output current for the purpose of this specification can be calculated from the rated output and the rated output voltage.		N/A
12	NO-LOAD OUTPUT VOLTAGE (IEC 61558-2-16:2021)		-
	Remark: with rectifier measuring on both sides of the rectifier if they are accessible to the user		P
12.101	The no load output voltage shall not exceed :		P
	- For SMPS incorporating separating or auto-transformers: 1000V AC. or 1415 V ripple free DC		N/A
	- For SMPS including isolating transformers: 500 V AC. or 708 V ripple-free DC		N/A
	- For SMPS including safety isolating transformers: 50 V AC. or 120 V ripple-free DC	(see appended table 11 & 12)	P
	For independent SMPS incorporating separating transformers, isolating transformers or auto-transformers: 50 V AC. or 120 V ripple-free DC		N/A
	For independent SMPS, this output voltage limitation applies even when output windings, not for interconnection, are connected in series		N/A
	The requirement for series connection does not apply to associated or IP 00 SMPS		N/A
12.202	The difference between no-load output voltage and the output voltage measured in clause 11 does not exceed the values of table 102	(see appended table 11 & 12)	P
12.103	Unless otherwise specified by the manufacturer, SMPS shall be tested with 20 cm to 200 cm length of wire connected to the output terminals under the most unfavourable conditions. Twisted wires or cables rated in accordance with IEC 60227-5:2011 (type 60227 IEC 53) may be used. The cross sectional area of the conductors shall be determined in accordance with the rated output current of the SMPS, and the current density shall not exceed 5 A/mm ² in normal use.		N/A
13	SHORT-CIRCUIT VOLTAGE		-
	The short-circuit voltage measured shall not deviate by more than 20 % from the value marked.		N/A
14	HEATING		-
14.1	General requirements		P

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
14.1.1	Temperature-rise test		P
	No excessive temperature in normal use		P
	The manufacturer may choose the simulated load methods according to 14.1.2.1 or 14.1.2.2 instead of the direct load method that may be applied.		P
	Room temperature: rated ambient temperature $t_a \pm 5^\circ\text{C}$		P
	Type X, Y, Z attachments: 1 pull (5 N) to the connection windings	Type Z for output wire	P
	Upri (V): 1,1 times rated supply voltage loaded with rated impedance – for independent transformers		P
	Upri (V): 1,1 times rated supply voltage: with I sec (A), measured with rated impedance and 1,0 times of the rated supply voltage for others than independent transformers		N/A
	Max. temperature windings	(see appended table)	P
	- Class A: 100 °C		N/A
	- Class E: 115 °C		N/A
	- Class B: 120 °C		P
	- Class F: 140 °C		N/A
	- Class H: 165 °C		N/A
	- other classes		N/A
	Temperature of external enclosures of stationary transformers:		N/A
	- bare metal: 65 °C		N/A
	- metal covered by lac or varnish: 70 °C		N/A
	- other material: 80 °C		N/A
	Temperature of external enclosure of stationary transformer 85 °C (not touchable with the IEC test finger)		N/A
	Temperature of external enclosures, handles, etc. of portable transformers:		P
	- continuously held parts of metal: 48 °C		N/A
	- continuously held parts of other material: 48 °C		N/A
	- not continuously held parts of metal: 60 °C		N/A
	- not continuously held parts of other material: 80 °C		P
	Temperature of terminals for external conductors and terminals of switches 70 °C		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Temperature of internal and external wiring:		P
	- rubber: 65 °C		N/A
	- PVC: 70 °C		P
	Temperature of parts where safety can be affected:		N/A
	- rubber: 75 °C		N/A
	- phenol-formaldehyde: 105 °C		N/A
	- urea-formaldehyde: 85 °C		N/A
	- impregnated paper and fabric: 85 °C		N/A
	- impregnated wood: 85 °C		N/A
	- PVC, polystyrene and similar thermoplastic material: 65 °C		N/A
	- varnished cambric: 75 °C		N/A
	Temperature rise of supports 85 °C	For reference	P
	Temperature of printed boards:		P
	- bonded with phenol-formaldehyde: 105 °C		P
	- melamine-formaldehyde: 105 °C		N/A
	- phenol-furfural: 105 °C		N/A
	- polyester: 105 °C		N/A
	- bonded with epoxy: 140 °C		N/A
	Electric strength between input and output windings (18.3, 1 min); test voltage (V)	AC 2767V, 1min	P
14.101	Winding temperature measured by thermocouples at the surface of the winding (IEC 61558-2-16: 2021)		P
	- if the internal frequencies is > 500Hz		P
	- the values of Table 2 for windings temperatures are reduced by 10°C		P
14.102	SMPS shall be tested at 0,9 times and 1,1 times the rated supply voltage		P
14.2	Application of 14.1 or 14.3 according to the insulation system		P
14.2.1	Class of insulation system (classified materials according to IEC 60 085 and IEC 60 216)	Class B	P
14.2.2	No classified material, or system but the measured temperature does not exceed the value of Class A		N/A
14.2.3	No classified material or system but the measured temperature exceeds the value for Class A, the live parts of the transformers are submitted to the test of 14.3		N/A
14.3	Accelerated ageing test for undeclared class of insulation system		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
14.3.1	General Cycling test (10 cycles):		N/A
14.3.2	Heat run (temperature in table 4)		N/A
14.3.3	Vibration test: 30 min; amplitude 0,35 mm; frequency range: 10 Hz, 55 Hz, 10 Hz		N/A
14.3.4	Moisture treatment (48 h, 17.2)		N/A
14.3.5	Measurements and tests at the beginning and after each test:		N/A
	- deviation of the no-load input current, measured at the beginning of the test less than 30%		N/A
	- insulation resistance acc. cl.18.1 and 18.2		N/A
	- electric strength, no breakdown (18.3 and 18.4); 2 min; test voltage 35% of specified value		N/A
	- Transformers (50 or 60 Hz version) are tested after the dielectric strength test as follows: under no load; duration: 5 min; Upri(V):1,2 times rated supply voltage; frequency (Hz): 2 times rated frequency		N/A
15	SHORT-CIRCUIT AND OVERLOAD PROTECTION		-
15.1	General requirements		P
15.1.1	Short circuit and overload test method		P
	Tests direct after 14.1 at the same ta and without changing position.	(see appended table)	P
	Supply voltage between 0,9 times and 1,1 times of the rated supply voltage		P
	Transformer with rectifier tests of 15.2 and 15.3 at the input and the output terminals of the rectifier.		P
	Transformers with more than one output winding or tapping, all windings tested with normal load, the winding with the highest temperature is short circuited.		N/A
	Winding protected inherently (15.2)		N/A
	- Max. temperature of winding protected inherently (insulation class): 150°C (A); 165°C (E); 175°C (B); 190°C (F); 210°C (H)		N/A
	Winding protected by protective device:		P
	- Test according 15.3.2 - 15.3.3 – 15.3.4: max. temperature of winding during the time required or the time T given in table 6 (insulation class): 200 °C (A); 215 °C (E); 225 °C (B); 240 °C (F); 260 °C (H)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- Test according 15.3.1: max. temperature of winding during the first hour, peak value (insulation class): 200 °C (A); 215 °C (E); 225 °C (B); 240 °C (F); 260 °C (H)		P
	- Test according 15.3.1: max. temperature of winding after first hour, peak value (insulation class): 175 °C (A); 190 °C (E); 200 °C (B); 215 °C (F); 235 °C (H)		P
	- Test according 15.3.1: max. temperature of winding after first hour, arithmetic mean value (insulation class): 150 °C (A); 165 °C (E); 175 °C (B); 190 °C (F); 210 °C (H)		P
	- Test according 15.3.5: max. temperature of winding (insulation class): 175 °C (A); 190 °C (E); 200 °C (B); 215 °C (F); 235 °C (H)		P
	Max. temperature of external enclosures (accessible by test finger) 105 °C		P
	Max. temperature of insulation of wiring (rubber and PVC) 85 °C		P
	Temperature rise of supports 105 °C		P
15.1.2	Alternative short circuit and overload test method		N/A
	The manufacturer may choose to apply any of the following methods described in 14.1.2.1 and 14.1.2.2. These test procedures are according to IEC 60076-11:2004, 23.2.1 and 23.2.2		N/A
15.2	Inherently short-circuit proof transformers		N/A
	Inherently short-circuit proof transformers are tested by short-circuiting the output windings until steady-state conditions are reached		N/A
15.3	Non-inherently short-circuit proof transformers		P
	Non-inherently short-circuit proof transformers are tested as follows		P
15.3.1	Output terminals short-circuited: protection device operates, test at 0,9 ... 1,1 of the rated supply voltage		P
15.3.2	If protected by a fuse accordance with either IEC 60 269-2 or IEC 60 269-3, or a technical equivalent fuse, the transformer is loaded as in table 6.		N/A
15.3.3	If protected by a fuse accordance with either IEC 60 127(all parts) or ISO 8820(all parts), or a technical equivalent fuse, the transformer is loaded with the current as specified for the longest pre arcing time. If protected by miniature fuses in accordance to IEC 60127(all parts), 1,5 times of the rated fuse, until steady state condition (in addition)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
15.3.4	If protected by a circuit-breaker according to IEC 60 898(all parts) the transformer is loaded with a current equal to 1,45 times the value of the circuit-breaker rated current		N/A
15.3.5	If other overload protection than a fuse (IEC 60 127) or a circuit-breaker (IEC 60 269) test with 0,95 times of operating current	Protected by electronic-circuit	P
	If an internal weak point is used, the test must be repeated with two new samples. The two additional samples works similar to the first sample. Temperatures in the limit of table 5		N/A
15.4	For non-short-circuit proof transformers: temperature rises values in table 5, tests as indicated in 15.3		N/A
15.5	For fail-safe transformers:		N/A
15.5.1	Three additional new specimens are used		N/A
	- Upri (V): 1,1 times rated supply voltage		N/A
	- Isec (A): 1,5 times rated output current		N/A
	- time until steady-state conditions t1 (h)		N/A
	- time until failure t2 (h): t1; 5 h		N/A
15.5.2	During the test:		N/A
	- no flames, molten material, etc.		N/A
	- temperature of enclosure 175 °C		N/A
	- temperature of plywood support 125 °C		N/A
	After the test:		N/A
	- electric strength (Cl. 18, 1 min, test voltage: 35% of specified value); no flashover or break-down for primary-to-secondary only for safety isolating, isolating and separating transformer and for primary-to-body for all kinds of transformer		N/A
	- bare hazardous live parts not accessible by test finger through holes of enclosure		N/A
15.101	Electronic circuits shall be so designed and applied that a fault condition within the SMPS will not cause electric shock, or fire hazard, and unintentional operation of the appliance will not impair safety.	(Details see Annex H)	P
16	MECHANICAL STRENGTH		-
16.1	General		P
	After tests of 16.2, 16.3 and 16.4		P
	- no damage		P

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Clause	Requirement + Test	Result - Remark	Verdict
	- hazardous live parts not accessible by test pin according to 9.2.2		P
	- no damage for insulating barriers		P
	- handles, levers, etc. have not moved on shafts		N/A
16.2	Stationary transformers		N/A
	3 blows, impact energy 0,5 ±0,05 J		N/A
16.3	Portable transformers (except of direct plug in transformers)		N/A
	For portable transformers: 100 falls, 25 mm		N/A
16.4	Portable transformers provided with integral pins for introduction in socket outlets of the fixed wiring		P
16.4.1	General requirements		P
	Portable transformers with integral pins for introduction into fixed socket-outlets shall have adequate mechanical strength.		P
	Plug in power supply units with integral main plug complying with IEC TR 60083, without plugs complying with EN 50075 (IEC plug type C) shall be tested:		N/A
	a) plug-in transformers: tumbling barrel test: 50 times, $x \leq 250$ g; 25 times, $x > 250$ g		N/A
	b) torque test of the plug pins with 0,4 Nm		N/A
	c) pull force according to table 7 for each pin		N/A
16.4.2	Portable transformers provided with integral pins according to EN 50075 (IEC plug type C) for introduction in socket-outlets of the fixed wiring		P
	a) The test is carried in a tumbling barrel as described in IEC 60068-2-31.		P
	- 1000 times: $x \leq 100$ g; 500 times: $100 \text{ g} < x \leq 200$ g; 200 times: $g < 100$ x	1000 times	P
	- pull force according to IEC 60884-1:2002, 24.10 for each pin		P
	b) torque test of the plug pins with 0,4 Nm		P
16.5	Additional requirements for transformers to be used in vehicles and railway applications		N/A
16.5.1	Transformers to be used in vehicles and railway applications		N/A
	An test according IEC 61373 shall be performed with conditions of Table 8 and Table 9 and the frequency values depending on the weight of the specimen are defined in Table 10		N/A
16.5.2	Test requirements for the transportation of transformers		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Shock and vibration testing requirements for transformers subjected to while being transported per IEC 60721-3-2 with conditions according to Table 11 and Figure 8.		N/A
17	PROTECTION AGAINST HARMFUL INGRESS OF WATER AND MOISTURE		-
17.1	Degree of protection (IP code marked on the transformer)		P
17.1.1	General requirements		P
	Test according to 17.1.2 and for other IP ratings test according to IEC 60 529:		P
	- stable operating temperature before starting the test for < IPX8		P
	- the water for the test shall be at a temperature of $15\pm 10^{\circ}\text{C}$		N/A
	- transformer mounted and wired as in normal use		N/A
	- fixed transformer mounted as in normal use by the tests according to 17.1.2 A to J		N/A
	- portable transformers placed in the most unfavourable position and wired as in normal use		P
	- glands tightened with a torque equal to two-thirds of 25.6		N/A
	After the tests:		P
	- dielectric strength test according to 18.3		P
	Inspection:		P
	a) no access with hazardous-live-parts or hazardous moving parts with the relevant test probe according to the test described in 17.1.2, items A 1), B 1) and C 1). The test finger may penetrate but the stop face ($\varnothing 50 \times 20 \text{ mm}$) shall not pass through the openings for the number 2 of the first characteristic numeral		P
	b) no entry into the transformer enclosure by the relevant test probe for solid-object-proof transformers according to test described in 17.1.2, items A 2) and B 2). The protection is satisfactory if the full diameter of the probe does not pass through any openings;		N/A
	c) no deposit of talcum powder in dust-proof transformers		N/A
	d) no deposit of talcum powder inside dust-tight transformers		N/A
	e) no trace of water on live parts except SELV parts below 15 V AC or 25 V DC or insulation if hazard for the user or surroundings no reduction of creepage distances		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	f) no accumulation of water inside the enclosures of drip-proof, spray-proof, splash-proof and jet-proof transformers, which may impair safety		N/A
	g) no trace of water entered in any part of water-tight transformer		N/A
17.1.2	Tests on transformers with enclosure:		P
	A) Solid-object-proof transformers:		P
	- 2 IP2X test finger (IEC 60 529) and test pin (fig. 3)		P
	- rigid sphere		N/A
	B) Solid-object-proof transformers:		N/A
	- IP3X, wire 2,5 mm; force 3 N		N/A
	- IP4X, wire 1 mm; force 1 N		N/A
	C) Dust-proof transformers, IP5X;		N/A
	1) At every possible point with a probe according to test probe D of B 1).		N/A
	2) dust chamber according to IEC 60 529, fig. 2:		N/A
	a) transformer has operating temperature		N/A
	b) transformer, still operating, is placed in the dust chamber		N/A
	c) the door of the dust chamber is closed		N/A
	d) fan/blower is switched on		N/A
	e) after 1 min transformer is switched off for cooling time of 3 h		N/A
	D) Dust-tight transformers (IP6X) test according with C)		N/A
	E) Drip-proof transformers (IPX1) test according to fig. 3 of IEC 60 529 for 10 min		N/A
	F) Rain-proof transformers (IPX2) test according to fig. 3 of IEC 60 529 for 10 min in operation, any angle up to 15°		N/A
	G) Spray proofed transformers (IPX3) test according to fig. 4 of IEC 60 529 for 10 min in operation and 10 min switched off , time for complete oscillation (2 x 120°) is 4 sec.		N/A
	H) Splash-proof transformers (IPX4) test according to fig. 4 of IEC 60 529 (see F) for 10 min in operation and 10 min switched off (the tube shall oscillate $\approx 360^\circ$)		N/A
	I) Jet-proof transformer (IPX5) test according to fig. 6 of IEC 60 529 (nozzle 6,3mm)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	J) Powerful Jet-proof transformer (IPX6) test according to fig. 6 of IEC 60 529 (nozzle 12 mm)		N/A
	K) Watertight transformers (IPX7)		N/A
	L) Pressure watertight transformers (IPX8)		N/A
17.2	After moisture test (48 h for IP20, 168 h for other transformers):	48h	P
	- insulation resistance and electric strength (Cl. 18)		P
18	INSULATION RESISTANCE AND ELECTRIC STRENGTH		-
18.2	Insulation resistance between:	(see appended table 18.2)	P
	- live parts and body for basic insulation $\geq 2 \text{ M}\Omega$		N/A
	- live parts and body for reinforced insulation $\geq 7 \text{ M}\Omega$	$>100 \text{ M}\Omega$	P
	- input circuits and output circuits for basic insulation $\geq 2 \text{ M}\Omega$		N/A
	- input circuits and output circuits for double or reinforced insulation $\geq 5 \text{ M}\Omega$	Between input and output: $>100 \text{ M}\Omega$ Between PRI and SEC of T1: $>100 \text{ M}\Omega$	P
	- each input circuit and all other input circuits connected together $\geq 2 \text{ M}\Omega$		N/A
	- each output circuit and all other output circuits connected together $\geq 2 \text{ M}\Omega$		N/A
	- hazardous live parts and metal parts with basic insulation (Class II transformers) $\geq 2 \text{ M}\Omega$		N/A
	- conductive parts of class II transformers which are separated from hazardous-live parts by basic insulation only, and the body $\geq 5 \text{ M}\Omega$		N/A
	- metal foil in contact with inner and outer surfaces of insulating enclosures $\geq 7 \text{ M}\Omega$	$>100 \text{ M}\Omega$	P
18.3	Electric strength test (1 min): no flashover or breakdown:	(see appended table 18.3)	P
	Overvoltage category	II	P
	1) functional insulation; working voltage (V); test voltage (V)	(see appended table 18.3)	P
	2) basic insulation; working voltage (V); test voltage (V)		N/A
	3) supplementary insulation; working voltage (V); test voltage (V)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	4) double or reinforced insulation.....:	(see appended table 18.3)	P
	5) Functional insulation for windings intended to be connected in series or parallel (test voltage = working voltage + 500 V)		N/A
18.3.1	A partial discharge test according to IEC 60664-1, (see test description below) shall be performed, if FIW wires or TIW wires are used and if the recurring peak working voltage U_t across the insulation is greater than 750 V. The relevant recurring peak voltage is the maximum measured voltage between the input and the output circuit, if the secondary side is earthed. The measuring shall be done at 1,0 of the maximum rated input voltage.		N/A
18.3.1.101	For transformers incorporated in an SMPS in accordance with Annex BB, a partial discharge type test in accordance with Annex AA shall be performed		N/A
18.4	Does not apply (IEC 61558-2-16:2021)		-
18.101	SMPS shall fulfil the impulse dielectric test in accordance with Annex R of IEC 61558-1:2017		P
	After the test of 18.3, the SMPS shall be connected to the impulse test equipment. The impulse dielectric test shall be carried out in accordance with Annex R of IEC 61558-1:2017 between the input and output terminals of the SMPS. The interval between the impulses shall be at least 1 s if the impulses are produced inside the SMPS.		P
	During the test, there shall be no breakdown of the insulation between turns of a winding, between input and output circuits, between adjacent input or output circuits, or between the windings and any conductive core		P
18.5	Touch current and protective earthing conductor current		-
18.5.1	General		P
18.5.2	Touch current		P
	Touch current measured after the clause 14 test (hot) for class I and class II transformers (class II transformers with metal foil at the plastic surface). The test circuit according figure 10. Measuring network according Figure J.1 (Annex J). If the frequency is >30kHz, measuring across the 500 ohm resistor of J.1 (burn effects).		P
	Measurement of the touch current with switch p in both positions and in combination with switches e and n. The measured values are less than the required values of table 15.		P
	switches n and e in on position		P
	switch n: off and switch e: on		P

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Clause	Requirement + Test	Result - Remark	Verdict
	switch n: on and switch e: off		N/A
18.5.3	Protective earthing conductor current		N/A
	The transformer is connected as in clause 14 Impedance of the ammeter < 0,5 ohm, connected between earthing terminal of the transformer and protective earthing conductor		N/A
	The measured values are less than the required values of table 15.		N/A
19	CONSTRUCTION		-
19.1	General construction		P
19.1.1	General		P
19.1.2	Auto-transformers		N/A
19.1.2.1	Plug connected auto-transformers where the rated input voltage is higher than the rated output voltage, shall not have any potential to protective earthing at the output socket higher than the rated output voltage.		N/A
19.1.2.2	Polarised input and output plug and socket-outlet system: an instruction shall be given for not using such a transformer with a nonpolarized plug and socket-outlet system.		N/A
19.1.2.3	A polarity detecting device only energises the output in the case: output potential to earth $\leq$ rated output voltage, also with reversed input plug.		N/A
	- The contact separation of the device is $\geq$ 3mm		N/A
	- A current to earth does not exceed 0,75 mA.		N/A
	- All tests are repeated under fault conditions of H.3.3. The potential to earth does not exceed 1,1 times the max output voltage for more than 5 s.		N/A
	- for class I transformers, the insulation between the input / output winding and the body shall consist of at least basic insulation (rated for the working voltage)		N/A
	- for class II transformers, the insulation between the input / output winding and the body shall consist of double or reinforced insulation (rated for the working voltage).		N/A
19.1.3	Separating transformers		N/A
19.1.3.1	Input and output circuits electrically separated.		N/A
19.1.3.2	The insulation between input and output winding(s) consist of basic insulation		N/A
	Class I transformer		N/A
	- Insulation between input windings and body consist of basic insulation		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- Insulation between output windings and body consist of basic insulation		N/A
	Class II transformer		N/A
	- Insulation between input windings and body consist of double or reinforced insulation		N/A
	- Insulation between output windings and body consist of double or reinforced insulation		N/A
19.1.3.3	The insulation between input windings and intermediate conductive parts and the output windings and intermediate part consist of basic insulation		N/A
	For class I transformer the insulation between input and output windings via the intermediate conductive parts consist of basic insulation		N/A
	For class II transformer the insulation between input winding and the body and between the output windings and the body via the intermediate conductive parts consist of double or reinforced insulation.		N/A
19.1.3.4	Parts of output circuits may be connected to protective earthing		N/A
19.1.3.5	No direct contact between output circuits and the body, unless:		N/A
	- Allowed for associated transformers by the relevant equipment standard		N/A
19.1.4	Isolating transformers and safety isolating transformers		P
19.1.4.1	Input and output circuits electrically separated		P
	No possibility of any connection between these circuits		P
19.1.4.2	The insulation between input and output winding(s) consist of double or reinforced insulation (exception see 19.1.4.4)		P
	Class I transformers not intended for connection to the mains by a plug:		N/A
	- Insulation between input windings and body connected to earth consist of basic insulation (rated for the input voltage)		N/A
	- Insulation between output windings and body, connected to earth consist of basic insulation rated (rated for the output voltage)		N/A
	Class I transformers intended for connection to the mains by a plug:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- Insulation between input windings and body connected to earth consist of basic insulation (rated to the working voltage)		N/A
	- Insulation between output windings and body, connected to earth consist of supplementary insulation (rated for the working voltage)		N/A
	Class II transformers		P
	- Insulation between input windings and body consist of double or reinforced insulation (rated for the input voltage)		P
	- Insulation between output windings and body consist of double or reinforced insulation (rated for the output voltage)		P
19.1.4.3	For transformers with intermediate conductive parts not connected to the body (between input/output):		P
19.1.4.3.1	For class I and class II transformers the insulation between input and output windings, via intermediate conductive parts, consist of double or reinforced insulation (rated for the working voltage)		P
	- For class II transformers the insulation between input winding and the body and between the output windings and the body via the intermediate conductive parts consist of double or reinforced insulation. (rated for the input voltage and output voltage), for SELV circuits only basic insulation is required.		P
	- For transformers, different from independent, the insulation between input and output windings, via intermediate conductive parts, consist of double or reinforced insulation (rated for the working voltage)		N/A
19.1.4.3.2	Class I transformers with earthed core, and not allowed for class II equipment		N/A
	- Insulation between the input winding and the earthed core: basic insulation rated for the input voltage		N/A
	- Insulation between the output winding and the earthed core: basic insulation rated for the output voltage		N/A
19.1.4.3.3	Insulation between: input and intermediate conductive parts, and output and intermediate parts consist of at least basic insulation		P
	- If the insulation from input or output to the intermediate metal part is less than basic insulation, the part is considered to be connected to input or output.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
19.1.4.4	For class I transformers, with protective screen, not connected to the mains by a plug the following conditions comply:		N/A
	- The insulation between input winding and protective screen consist of basic insulation (rated for the input voltage)		N/A
	- The insulation between output winding and protective screen consist of basic insulation (rated for the output voltage)		N/A
	- The protective screen consist of metal foil or a wire wound screen extending the full width of the windings and has no gaps or holes		N/A
	- Where the protective screen does not cover the entire width of the input winding, additional insulation to ensure double insulation in this area, is used.		N/A
	- If the protective screen is made by a foil, the turns are isolated, overlap at least 3 mm		N/A
	- The cross-section of the screen and the lead out wire is at least corresponding to the rated current of the overload protective device		N/A
	- The lead out wire is soldered or fixed to the protective screen.		N/A
	For transformers for connection to the mains by the means of a plug of any type (incorporating or not), the alternative with basic insulation plus protective screening is not allowed.		N/A
19.1.4.5	No connection between output circuit and protective earth, except of associated transformers (allowed by equipment standard) or 19.8 is fulfilled.	Class II equipment	N/A
19.1.4.6	No connection between output circuit and body, except of associated transformers (allowed by equipment standard) or when 19.8 is fulfilled.	No connection between output circuit and body	P
19.1.4.7	The distance between input and output terminals for the connection of external wiring is ≥ 25 mm	No such terminals	N/A
19.1.4.8	Portable transformers having an rated output ≤ 630 VA shall be class II.		P
19.1.4.9	No connection between output circuit and body except of associated transformers (allowed by equipment standard)	No connection between output circuit and body	P
19.1.4.10	Protective screening is not allowed for transformers with plug connection to the mains		N/A
19.2	Flammability of materials		P
	Materials known to be highly flammable, such as celluloid, shall not be used in the construction of transformers.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Cotton, silk, paper and similar fibrous material shall not be used as insulation, unless impregnated.		P
	Wax and similar impregnators shall not be used, unless suitably restrained from migration		P
	Wood, even if impregnated, shall not be used as supplementary or reinforced insulation		N/A
19.3	Short-circuit characteristics of portable transformers		P
	Portable transformer: short-circuit proof or fail-safe	short-circuit proof	P
19.4	Class II transformer contact prevention of accessible conductive parts		N/A
	There shall be provisions to prevent contact between accessible conductive parts and conduits or metal sheaths of supply wiring for class II transformers.	No supply wiring	N/A
19.5	Class II transformer insulation reassembling after service		N/A
	Parts of class II transformers serving as supplementary insulation or reinforced insulation which might be omitted during reassembly after servicing, shall either:		N/A
	- be fixed in such a way that they cannot be removed without being seriously damaged; or		N/A
	- be so designed that they cannot be replaced in an incorrect position and that, if they are omitted, the transformer is rendered inoperable or is manifestly incomplete		N/A
	Sleeving may, however, be used as supplementary insulation on internal wiring, if it is retained in position by positive means.		N/A
19.6	Loosening of wires, screws or similar parts		P
	Class I and II transformers: creepage distances and clearances over supplementary or reinforced insulation if wire, screw, nut, etc. become loose or fall out of position not less than 50% specified values (Cl. 26)		P
19.7	Resistor or capacitor connection with accessible conductive parts		N/A
	Conductive parts connected to accessible metal parts by resistors or capacitors shall be separated from hazardous live parts by double or reinforced insulation		N/A
19.8	Bridging of separated conductive parts by resistors or capacitors		P
	Resistors or capacitors connected between hazardous live parts and the body (accessible metal parts) consist of:		P
	- components according to IEC 60 065, 14.2 or capacitor Y2 according to IEC 60 384-14		N/A
	- at least two separate components		N/A
	- if one component is short-circuited or opened, values specified in Cl. 9 shall not be exceeded		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- if the working voltage is ≤ 250 V, one Y1 capacitor according 60384-14 is allowed		P
	- For a working voltage above 250 V AC and not exceeding 500 V AC and an overvoltage category III, two Y1 capacitors are required.		N/A
19.9	Insulating material separating input and output windings		N/A
	Insulation material input/output and supplementary insulation of rubber resistant to ageing		N/A
	Creepage distances (if cracks) > specified values (Cl. 26)		N/A
19.10	Accidental contact protection against hazardous-live-parts provided by isolating coating		N/A
	Protection against accidental contact by insulating coating:		N/A
	a) ageing test (IEC 60068-2-14), test Na: 168 h; $70 \pm 2^\circ\text{C}$		N/A
	b) impact test (spring-operated impact hammer according to IEC 60 068-2-75; $0,5 \pm 0,05$ J)		N/A
	c) scratch test (hardened steel pin) electric strength test according to Cl. 18.3		N/A
19.11	Insulating material of handles, operating levers, knobs and similar parts		N/A
	Handles, levers, knobs, etc.:	No such parts	N/A
	- insulating material		N/A
	- supplementary insulation covering		N/A
	- separated from shafts or fixing by supplementary insulation		N/A
19.12	Winding construction		P
19.12.1	Undue displacement in all types of transformers not allowed:		P
	- of input or output windings or turns thereof		P
	- of internal wiring or wires for external connection		P
	- of parts of windings or of internal wiring in case of rupture or loosening		P
19.12.2	Serrated tape:	No Serrated tape used.	N/A
	- distance through insulation according to table 22		N/A
	- one additional layer of serrated tape, and		N/A
	- one additional layer without serration		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- in case of cheekless bobbins the end turns of each layer shall be prevented from being displaced		N/A
19.12.3	Insulated winding wires, in an insulation system providing basic, supplementary or reinforced insulation, shall meet the following requirements.	Approved triple insulation wire used.	P
	• Multi-layer extruded or spirally wrapped insulation, passed the tests of annex K		N/A
	• Basic insulation: two wrapped or one extruded wire		N/A
	• Supplementary insulation: two layers, wrapped or extruded		N/A
	• Reinforced insulation: three layers wrapped or extruded		P
	Spirally wrapped insulation:		N/A
	• creepage distances between wrapped layers > cl. 26 _ P1 values		N/A
	• path between wrapped layers sealed, the test voltage of K2 is multiplied with 1,35		N/A
	• test 26.2.4 – Test A, passed for wrapped layers		N/A
	• the finished component pass routine test for the electric strength test according to cl. 18.3		N/A
a)	Insulated winding wire used for basic or supplementary insulation in a wound part:		N/A
	• comply with annex K		N/A
	• two layers for supplementary insulation		N/A
	• one layer for basic insulation		N/A
	• one layer for mechanical separation between the insulated wires of primary and secondary. This layer fulfils the requirement of basic insulation.		N/A
b)	Insulated winding wire used for reinforced insulation in a wound part:		P
	• comply with annex K		P
	• three layers		P
	• relevant dielectric strength test of 18.3		P
	Where the insulated winding wire is wound:		P
	• upon metal or ferrite cores		P
	• upon enamelled wire		P
	• under enamelled wire		P

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Clause	Requirement + Test	Result - Remark	Verdict
	one layer for mechanical separation between the insulated wires and the core or the enamelled wires is required. This layer fulfils the requirement of basic insulation.		P
	both windings shall not touch each other and also not the core.		P
	100 % routine test of Annex K3 is fulfilled		P
	no creepage distances and clearances for insulated winding wires		P
c)	Toroidal cores used with TIW wires for double or reinforced insulation between the primary and secondary circuits shall comply with the following:		N/A
	1) a coating which fulfils the requirements of basic insulation between a winding and the core		N/A
	2) The primary winding consists of TIW wire with 3 layers (reinforced insulation) and the secondary winding consists of enamelled wire. These independent windings shall not be able to contact each other either by mechanical separation or a gap which fulfil the dielectric strength tests for basic insulation.		N/A
	3) For polyfilar windings (primary and secondary windings in contact with each other), the primary winding consists of TIW wire with 3 layers and the secondary winding consists of a TIW wire with 1 layer (requirements for primary and secondary windings can be changed). This construction also is allowed for use with EE-cores or similar.		N/A
d)	Toroidal cores used with FIW wires for double or reinforced insulation between the primary and secondary circuits shall comply with the following:		N/A
	1) a coating, which fulfil the requirements of basic insulation.		N/A
	2) The primary winding consists of FIW wire for reinforced insulation and the secondary winding consist of FIW wire – of basic insulation. These independent windings shall not be able to contact each other either by mechanical separation or a gap which fulfil the dielectric strength test for basic insulation.		N/A
	3) For polyfilar windings (primary and secondary windings in contact with each other), the primary winding and the secondary winding consist of FIW wire for reinforced insulation. This construction also is allowed to use for EE-core or similar.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
e)	Toroidal cores used with TIW in combination with FIW wire, for double or reinforced insulation between the primary and secondary circuits shall comply with the following:		N/A
	1) a coating, which fulfils the requirements of basic insulation.		N/A
	2) The primary winding consists of FIW wire for reinforced insulation, and the secondary winding consists of TIW wire for basic insulation (1 layer). These independent windings shall not be able to contact each other either by mechanical separation or a gap which fulfil the dielectric strength tests for basic insulation.		N/A
	3) For polyfilar windings (primary and secondary windings in contact with each other), the primary winding consists of TIW wire for reinforced insulation (3 layer) and the secondary winding consists of FIW wire for reinforced insulation. This construction also is allowed for use with EE-cores or similar.		N/A
f)	Toroidal cores used with TIW in combination with FIW wire, for basic insulation between the primary and secondary circuits shall comply with the following:		N/A
	1) a coating, which fulfils the requirements of basic insulation		N/A
	2) The primary winding consists of FIW wire for basic insulation, and the secondary winding consists of TIW wire for basic insulation (1 layer). These independent windings shall not be able to contact each other either by mechanical separation or a gap which fulfils the dielectric strength tests for basic insulation.		N/A
	3) For polyfilar windings (primary and secondary windings in contact with each other), the primary winding consists of TIW wire for supplementary insulation (2 layers) and the secondary winding consists of FIW wire for basic insulation. This construction also is allowed for use with EE-cores or similar.		N/A
	4) Further polyfilar constructions with FIW and TIW wires in combination with enamelled wires for basic insulation only: 4.1) Primary winding consists of enamelled wire, secondary winding consists of FIW wire for reinforced insulation 4.2) Primary winding consists of enamelled wire, secondary winding consists of TIW wire for reinforced insulation		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
19.12.3.1	Max. class F for transformers which use FIW-wire		N/A
19.12.3.2	FIW wires comply with IEC 60851-5:2008, IEC 60317-0-7 and IEC 60317-56.		N/A
	other nominal diameter as mentioned in table 24 can be calculated with the Formula (6) in 26.3.5:		N/A
	FIW wire used for basic or supplementary insulation for transformers according 19.1.3:		—
	the test voltage of table 14, based on the working voltage of basic or supplementary insulation, comply with the min. voltage strength of table 24		N/A
	one layer for mechanical separation is located between the insulated wires of primary and secondary. This layer fulfil the requirement of basic insulation		N/A
	between FIW and enamelled wire, no requirements of creepage distances and clearances		N/A
	no touch of FIW and enamelled wires		N/A
	FIW wire used for double or reinforced insulation for transformers according 19.1.4:		N/A
	the test voltage of table 14, based on the working voltage of basic or supplementary insulation, comply with the min. voltage strength of table 24		N/A
	for primary and secondary winding FIW-wire for basic insulation is used		N/A
	one layer for mechanical separation is located between the insulated wires of primary and secondary. This layer fulfil the requirement of basic insulation		N/A
	no touch between the basic insulated PRI and SEC FIW-wires		N/A
	between PRI- and SEC-FIW wires, no requirements of creepage distances and clearances		N/A
	Alternative construction used for reinforced insulation (reinforced insulated FIW wire and enamelled wire)		N/A
	the test voltage of table 14, based on the working voltage reinforced insulation, comply with the min. voltage strength of table 24		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	one layer for mechanical separation is located between the reinforced insulated FIW wire and the enamelled wire. This layer fulfil the requirement of basic insulation		N/A
	no touch between the FIW wire and the enamelled wire		N/A
	between the reinforced FIW wire and any other parts, no requirements of creepage distances and clearances exist		N/A
	Alternative construction with FIW wires, basic or supplementary insulated for transformers with double or reinforced insulation:		N/A
	the test voltage of table 14, based on the working voltage of basic or supplementary insulation, comply with the min. voltage strength of table 24		N/A
	PRI or SEC basic insulated FIW wire and to the other winding (enamelled wire) requirements of supplementary insulation		N/A
	creepage distances and clearances between the basic insulated FIW wire and the enamelled wire for basic or supplementary insulation are required.		N/A
	Where the FIW wire is wound		N/A
	upon metal or ferrite cores		N/A
	one layer for mechanical separation between the insulated wires and the core or the enamelled wires is required. This layer fulfils the requirement of basic insulation.		N/A
	both windings shall not touch each other and also not the core.		N/A
19.13	Fixing of handles, operating levers and similar parts		N/A
	Handles, operating levers and similar parts shall be fixed in a reliable manner so that they will not become loose as a result of heating, vibration, etc. which may occur in normal use.		N/A
19.14	Fixing of covers providing protection against electric shock		P
	Protection against electric shock: covers securely fixed, 2 independent fixing means, one with tool		P
19.15	Strain on fixed socket-outlets caused by pin-transformers connection		P
	Transformer with pins for fixed socket-outlets: no strain on socket-outlet		P
	Additional torque $\leq 0,25$ Nm		P
19.16	Portable transformers for use in irregular or harsh conditions		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Portable transformers for use in irregular or harsh conditions		N/A
	Portable transformers having a weight not exceeding 18 kg shall have a protection index IPX4 or higher.		N/A
19.17	Drain hole of transformers protected against ingress of water		N/A
	Transformers having a protection index from IPX1 up to and including IPX6 shall have an effective drain hole at least 5 mm in diameter or 20 mm ² in area, with a width of at least 3 mm.		N/A
	The drain hole is not required if the transformer, including its windings and core and all uninsulated live parts, are completely embedded in a potting material.		N/A
19.18	Plug connected transformers protected against ingress of water		N/A
	Transformers classified for a protection index higher than IPX1 and having a cord provided with a plug; it shall be a moulded-on plug.		N/A
19.19	Flexible cable or flexible cord connection for class I portable transformers		N/A
	Class I transformers with a non-detachable flexible cable or cord with earth conductor and a plug with earth contact		N/A
19.20	SELV- and PELV-circuit separation of live parts		P
	Live parts of SELV- and PELV-circuits shall be electrically separated from each other and from other circuits		P
	- SELV output circuits separated by double or reinforced insulation from all other than SELV or PELV circuits		P
	- SELV output circuits separated by basic insulation from other SELV or PELV circuits		N/A
19.20.1	SELV circuits and parts not connected to protective earth, to live parts, or protective conductors forming part of other circuits		P
	Nominal voltage (V) > 25 V a.c. or 60 V d.c., the required insulation fulfils the high voltage test according to table 14		N/A
19.20.2	PELV-circuits double or reinforced insulation is necessary		N/A
19.21	Protection against contact for FELV-circuit		N/A
	FELV-circuits: protection against contact fulfils the min. test voltage required for the primary circuit		N/A
19.22	Protective earthing regarding class II transformers		P
	Class II transformers shall not be provided with means for protective earth		P

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Clause	Requirement + Test	Result - Remark	Verdict
	A class II transformer intended for looping-in may have an internal terminal for maintaining the electrical continuity of a protective earthing conductor not terminating in the transformer, provided that the terminal is insulated from the accessible conductive parts by class II insulation.		N/A
19.23	Protective earthing regarding class III transformers		N/A
	Class III transformers shall not be provided with means for protective earth		N/A
20	COMPONENTS		-
20.1	Components such as switches, plugs, fuses, lamp holders, capacitor and flexible cables and cords, comply with relevant IEC standard		P
	Components inside the transformer pass all tests of this standard together with the transformer tests		P
	Testing of components separately to the transformer according the relevant standard:		P
	- Ratings of the component in line with the transformer ratings, including inrush current. Component test according the component standard, based on the component marking (rating).		P
	- Components without markings tested under transformer conditions including inrush current.		P
	- If no IEC standard exists, the component is tested under transformer conditions.		P
20.2	Appliance couplers for main supply shall comply with:		N/A
	- IEC 60 320 for IPX0		N/A
	- IEC 60320-2-3 or IEC 60309 for other		N/A
20.3	Automatic controls shall comply with IEC 60730-1		N/A
20.4	Thermal-links comply with IEC 60691		N/A
20.5	Switches shall comply with annex F		N/A
	Disconnection from the supply:		N/A
	- by a switch, disconnecting all poles of the supply (full disconnection under the relevant overvoltage category)		N/A
	- or a flexible supply cable and cord with plug		N/A
	- or an instruction sheet: disconnection by all-poles switches incorporated in fixed wiring		N/A
20.6	Socket-outlets of the output circuit shall be such that there is no unsafe compatibility to plugs complying with input circuit.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	SELV plug and socket-outlets shall comply with IEC 60 884-2-4 and IEC 60 906-3		N/A
	Plugs and socket-outlets for SELV systems with both a rated current $\leq 3A$ and a rated voltage $\leq 24 VAC$ or $60VDC$ with a power not exceeding $72W$ are allowed to comply only with following:		N/A
	- It is not possible for plugs to enter socket-outlets of other standardised voltage system		N/A
	- Socket outlets do not accommodate plugs of other standardised voltage systems		N/A
	- Socket outlets do not have a protective earth contact		N/A
	PELV plug and socket-outlets shall comply with following:		N/A
	- It is not possible for plugs to enter socket-outlets of other standardised voltage system		N/A
	- Socket outlets do not accommodate plugs of other standardised voltage systems		N/A
	- Socket outlets do not have a protective earth contact		N/A
	FELV plug and socket-outlets shall comply with following:		N/A
	- It is not possible for plugs to enter socket-outlets of other standardised voltage system		N/A
	- Socket outlets do not accommodate plugs of other standardised voltage systems		N/A
20.7	Thermal cut-outs, thermal links, overload relays, fuses and other overload protective devices shall have adequate breaking capacity		N/A
	- Thermal cut outs fulfil the relevant requirements of 20.8 and 20.9		N/A
	- Thermal links fulfil the relevant requirements of 20.9		N/A
	- The breaking capacity is in accordance with the relevant fuse standard		N/A
	For fuses according IEC 60127 and IEC 60269, the fuse current does not exceed 1,1 times of the rated value		N/A
20.8	Thermal cut outs shall meet the requirements of 20.8.1.1 and 20.8.2, or 20.8.1.2 and 20.8.2.		N/A
20.8.1	Requirements according to IEC 60730-1		N/A
20.8.1.1	Thermal cut-out tested as component shall comply with IEC 60 730-1		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	a) Thermal cut outs type 1 or type 2 (see 6.4 of IEC 60730-1:2013)		N/A
	b) Thermal cut outs fulfil the requirements of micro-interruption (type 1.C or 2.C) or micro-disconnection, (type 1.B or 2.B) (see IEC 60730-1:2013)		N/A
	c) Thermal cut outs with manual reset have a trip free mechanism (type 1.E and 2.E) (see IEC 60730-1:2013)		N/A
	d) The number of cycles of automatic action shall be:		N/A
	- 3000 cycles for self-resetting thermal cut-outs		N/A
	- 300 cycles for non-self-resetting thermal cut-outs resetting by hand		N/A
	- 300 cycles for non-self-resetting thermal cut-outs resetting disconnecting		N/A
	- 30 cycles for non-self-resetting thermal cut-outs which are only resettable by a tool		N/A
	e) Thermal cut outs fulfil the electrical stress according 6.14.2 of IEC 60730-1:2013		N/A
	f) Characteristic of thermal cut-outs:		N/A
	- ratings according IEC 60730-1:2013, cl. 5		N/A
	- classification according to:		N/A
	1) nature of supply to IEC 60730-1:2013, cl. 6.1		N/A
	2) type of load controlled to IEC 60730-1:2013, cl. 6.2		N/A
	3) degree of protection IPX0 to IEC 60730-1:2013, cl. 6.5.1		N/A
	4) degree of protection IP0X to IEC 60730-1:2013, cl. 6.5.2		N/A
	5) pollution degree to IEC 60730-1:2013, cl. 6.5.3		N/A
	6) comparative tracking index to IEC 60730-1:2013, cl. 6.13		N/A
	7) max. ambient temperature to IEC 60730-1:2013, cl. 6.7		N/A
20.8.1.2	Thermal cut-out tested as a part of the transformer, test with 3 samples:		N/A
	- at least micro-interruption or micro-disconnection (IEC 60730-1:2013)		N/A
	- 300 h aged at ta (transformer) + 10°C		N/A
	- subjected to a number of cycles for automatic operating according 20.8.1.1		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	During the test no sustaining arcing shall occur, during and after the test no damage at the thermal cut out and the transformer in the sense of this standard		N/A
20.8.2	Thermal cut-outs shall have adequate breaking capacity		N/A
20.8.2.1	The output of the transformer with a non-self-resetting thermal cut out is short circuited at a supply voltage 1, 1 of rated supply voltage. After opening of the cut off, the supply voltage is switched of, until the transformer is cooling down.		N/A
	- 3 cycles at 25° C for transformers without t_{amin}		N/A
	- 3 cycles at t_{amin} for transformers with t_{amin}		N/A
	- after the 3 cycles short circuit of the output at 1,1 of rated supply voltage for 48 h.		N/A
	During the tests no sustaining arcing shall occur After the test: withstand the test of clause 18, show no damage in sense of this standard, and be operational.		N/A
20.8.2.2	The output of the transformer with a self-resetting thermal cut out is short circuited at a supply voltage 1, 1 of rated supply voltage.		N/A
	- 48 h at 25° C for transformers without t_{amin}		N/A
	- 24 h at t_a and 24 h at t_{amin} for transformers with t_{amin}		N/A
	During the tests no sustaining arcing shall occur After the test: withstand the test of clause 18, show no damage in sense of this standard, and be operational.		N/A
20.8.3	Test of a PTC resistor:		N/A
	5 cycles: transformer short-circuited for 48 h by 1,1 times of the input voltage and max. t_a		N/A
	5 cycles: transformer short-circuited for 48 h by 0,9 times of the input voltage and min. t_a (if declared)		N/A
	After the test: withstand the test of clause 18, show no damage in sense of this standard, and be operational.		N/A
20.9	Thermal links shall be tested in one of the following two ways.		N/A
20.9.1	Thermal-links shall comply with IEC 60 691 as a separate component.		N/A
	- electrical conditions to IEC 60691, cl. 6.1		N/A
	- thermal conditions to IEC 60691, cl. 6.2		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- ratings to 8 b) of IEC 60691:2015		N/A
	- suitability of sealing components, impregnating fluids or cleaning solvents 8 c) of IEC 60691:2015		N/A
20.9.2	Thermal-links tested as a part of the transformer:		N/A
	- ageing test 300 h by 35 °C or ta + 10 °C		N/A
	- After transformer fault condition the thermal link operate without sustaining arcing		N/A
	- after opening the thermal-link shall have an insulation resistance of at least 0,2 MΩ		N/A
	- 3 cycles for replaceable thermal-links		N/A
	- 3 new specimens for not replaceable thermal-links		N/A
20.10	Self-resetting devices not used if mechanical, electrical, etc. hazards	No such device	N/A
20.11	Thermal cut-outs intended to be reset by soldering operation shall not be used for overload protection.	No such device	N/A
20.12	Overload protection devices do not operate during test (20 times switched on and off, at no load); U _{pri} (V): 1,1 times rated supply voltage.		P
21	INTERNAL WIRING		-
21.1	Internal wiring and electrical connections protected or enclosed		P
	Wire-ways smooth and free from sharp edges		P
21.2	Openings in sheet metal: edges rounded (radius ≥ 1,5 mm) or bushings of insulating material		N/A
21.3	Uninsulated conductors: distances adequately maintained		P
21.4	When external wires are connected to terminal, internal wiring shall not loosen up		N/A
21.5	Insulation of heat-resistant and non-hygroscopic material for insulated conductors subject to temperature rise > limiting values given in 14.1		N/A
22	SUPPLY CONNECTION AND EXTERNAL FLEXIBLE CABLES AND CORDS		-
22.1	All cables, flexible cords etc. shall have appropriate current and voltage ratings	Type Z attachment for output wire	P
22.2	Input and output wiring inlet and outlet openings for external wiring: separate entries without damage to protective covering of cable or cord		P
	Input and output wiring inlet and outlet openings for flexible cables or cords: insulating material or bushing of insulating material		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Bushings for external wiring: reliably fixed, not of rubber unless part of cord guard		P
22.3	Fixed transformer:		N/A
	- possible to connect after fixing		N/A
	- inside space for wires allow easy introduction and connection of conductors		N/A
	- fitting of cover without damage to conductors		N/A
	- contact between insulation of external supply wires and live parts of different polarity not allowed		N/A
22.4	Length of power supply cord for portable transformers:		N/A
	- not exceed 2 m for cross-sectional area of 0,5 mm ²		N/A
	- exceed 2 m for cross-sectional areas greater than 0,5 mm ² .		N/A
22.5	Power supply cords for transformers IP20 or higher and transformers for "indoor use only" $\geq$ IP20:		N/A
	- for transformers with a mass $\leq$ 3 kg: IEC 60227-5:2011 – type 60227 IEC 52 or ordinary tough rubber sheathed flexible cable or cords according to IEC 60245-4:2011 – type 60245 IEC 53;		N/A
	- for transformers with a mass > 3 kg: IEC 60227-5:2011 – type 60227 IEC 53 or ordinary tough rubber sheathed flexible cable or cords according to IEC 60245-4:2011 – type 60245 IEC 53.		N/A
	Power supply cords for transformers for outdoor use: $\geq$ IPX0: IEC 60245-4:2011 – type 60245 IEC 57		N/A
22.6	Power supply cords for single-phase portable transformers with input current $\leq$ 16A:		N/A
	- cord set fitted with an appliance coupler in accordance with IEC 60320(all parts)		N/A
22.7	Nominal cross-sectional area (mm ²); input current (A) at rated output not less than shown in table 16	Output cable: 20AWG; Max. output current <3A	P
22.8	Class I transformer with power supply flexible cable: green/yellow core connected to earth terminal		N/A
	Plug for single-phase transformer with input current at rated output $\leq$ 16 A shall comply with IEC TR 60083, IEC 60 906-1 or IEC 60 309(all parts)		N/A
22.9	Type X, Y or Z attachments: see relevant part of IEC 61558-2.	Type Z attachment for output wire	P

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Clause	Requirement + Test	Result - Remark	Verdict
22.9.1	For type Z attachment: moulding enclosure and external flexible cable or cord do not affect insulation of cable		P
22.9.2	Inlet openings or inlet bushing: without risk of damage to protective covering of external flexible cable or cord		N/A
	Insulation between conductor and enclosure:		N/A
	- for Class I transformer: insulation of conductor plus separate basic insulation		N/A
	- for Class II transformer: insulation of conductor plus double or reinforced insulation		N/A
	The sheath of an external flexible cable or cord equivalent to at least that of a cord complying with IEC 60227 (all parts) or 60245 (all parts) is regarded as basic insulation.		N/A
	A lining or a bushing of insulating material in a metallic enclosure is only regarded as supplementary insulation		N/A
	An enclosure of insulating material is regarded as reinforced insulation		N/A
22.9.3	Inlet bushings:		N/A
	- no damage to external flexible cable or cord		N/A
	- reliably fixed		N/A
	- not removable without tool		N/A
	- not integral with external flexible cable or cord (for type X attachment)		N/A
	- not of natural rubber except for Class I transformer with type X, Y and Z attachments		N/A
22.9.4	For transformers which are moved while operating:		P
	- cord guards, if any, of insulating material and fixed		P
	Compliance is tested by the oscillating test according to fig. 12:		P
	- loaded force during the test according to fig. 12		P
	- 10 N for a cross-sectional area > 0,75		N/A
	- 5 N for other cords		P
	After the test according to fig. 12:		P
	- no short-circuit between the conductors		P
	- no breakage of more than 10% of strands of any conductor		P
	- no separation of the conductor from the terminal		P

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Clause	Requirement + Test	Result - Remark	Verdict
	- no loosening of any cord guards		P
	- no damage of the cord or cord guard		P
	- no broken strands piercing the insulation and not becoming accessible		P
22.9.5	Cord anchorages for type X attachment:		N/A
	- glands in portable transformers not used unless possibility for clamping all types and sizes of cable		N/A
	- moulded-on designs, tying the cable into a knot and tying the end with string not allowed		N/A
	- labyrinths, if clearly how, permitted		N/A
	- replacement of cable easily possible		N/A
	- protection against strain and twisting clearly how		N/A
	- suitable for different types of cable unless only one type of cable for transformer		N/A
	- the entire flexible cable or cord with covering can be mounted into the cord anchorage		N/A
	- if tightened or loosened no damage		N/A
	- no contact between cable or cord and accessible or electrically connected clamping screws		N/A
	- cord clamped by metal screw not allowed		N/A
	- one part securely fixed to transformer		N/A
	- for Class I transformer: insulating material or insulated from metal parts		N/A
	- for Class II transformers: insulating material or supplementary insulation from metal parts		N/A
	Cord anchorages for type X, Y, Z attachments: cores of power external flexible cable or cord insulated from accessible metal parts by:		N/A
	- basic insulation (Class I transformers), separate insulating barrier/cord anchorage		N/A
	- supplementary insulation (Class II transformers), special lining/cable or cord sheath of cable sheath of cable		N/A
	Cord anchorages for type X and Y attachments:		N/A
	- replacement of external flexible cable or cord does not impair compliance with standard		N/A
	- the entire flexible cable or cord with covering can be mounted into the cord anchorage		N/A
	- if tightened or loosened no damage		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- no contact between cable or cord and accessible or electrically connected clamping screws		N/A
	- cord clamped by metal screws not allowed		N/A
	- knots in cord not used		N/A
	- labyrinths, if clearly how, permitted		N/A
	Tests for type X with special cords, type Y, type Z	Type Z attachment	P
	Test for type X attachments one test with a cord with smallest and one test with a cord with the largest cross-sectional area:		N/A
	- for the test with clamping screws or tightened with torque 2/3 of that specified in table 18		P
	- not possible to push cable into transformer		P
	- 25 pulls of 1 s		P
	- 1 min torque according to table 17		P
	- mass (kg); pull (N); torque (Nm): <1kg; 30N; 0.1Nm		P
	- during test: cable not damaged		P
	- after test: longitudinal displacement ≤ 2 mm for cable or cord and ≤ 1 mm for conductors in terminals		P
	- creepage distances and clearances values specified in Cl. 26		P
22.9.6	Space for external cords or cable for fixed wiring and for type X and Y attachments:		N/A
	- before fitting cover, possibility to check correct connection and position of conductors		N/A
	- cover fitted without damage to supply cords		N/A
	- for portable transformers: contact with accessible metal parts if conductor becomes loose not allowed unless for type X and Y attachments terminations of cords do not slip free of conductor		N/A
	Space for external cords or cable for type X attachment and for connection to fixed wiring, in addition:		N/A
	- conductor easily introduced and connected		N/A
	- possibility of access to terminal for external conductor after removal of covers without special purpose tool		N/A
23	TERMINALS FOR EXTERNAL CONDUCTORS		-

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Clause	Requirement + Test	Result - Remark	Verdict
23.1	Transformer for connection to fixed wiring and transformer without power supply cords with type Y and Z attachments: only connections by screws, nuts or equally effective devices.		N/A
	Terminals are integral part of the transformer:		N/A
	- comply with IEC 60 999-1 under transformer conditions		N/A
	Other terminals:		N/A
	- separately checked according to IEC 60 998-2-1, IEC 60 998-2-2 or IEC 60 947-7-1		N/A
	- used in accordance with their marking		N/A
	- checked according to IEC 60 999-1 under transformer conditions		N/A
	Transformer with type X attachments: soldered connection permitted if reliance not placed upon soldering, crimping or welding alone unless by barriers, creepage distances and clearances between hazardous live parts and other conductive part cannot be reduced to less than 50% of specified value (Cl.26) should conductor break away		N/A
	Transformer with type Y and Z attachments for external conductors: soldered, welded, crimped, etc. connections allowed		N/A
	For Class II transformer: reliance not placed upon soldering, crimping or welding alone unless by barriers, creepage distances and clearances between hazardous live parts and other conductive parts cannot be reduced to less than 50% of specified value (Cl.26) should conductor break away		N/A
23.2	Terminals for type X with special cords Y and Z attachments shall be suitable for their purpose:		N/A
	- test by inspection according to 23.1 and 23.2		N/A
	- pull of 5 N to the connection before test according to 14.1		N/A
23.3	Other terminals than Y and Z attachments shall be so fixed that when the clamping means is tightened or loosened:		N/A
	- terminal does not work loose		N/A
	- internal wiring is not subjected to stress		N/A
	- creepage distances and clearance are not reduced below the values specified in Cl. 26		N/A
23.4	Other terminals than Y and Z attachments shall be so designed that:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- they clamp the conductor between metallic surfaces with sufficient contact pressure		N/A
	- without damage to the conductor		N/A
	- test by inspection according to 23.3 and 23.4		N/A
	- 10 times fastening and loosening a conductor with the largest cross-sectional area with 2/3 of the torque specified in Cl. 25		N/A
23.5	Terminals for fixed wiring and for type X: located near their associated terminals of different polarities and the earth terminal if any		N/A
23.6	Terminal blocks not accessible without the aid of a tool		N/A
23.7	Transformer with type X attachments: stranded conductor test (8 mm removed):		N/A
	- Class I transformers: no connection between live parts and accessible metal parts		N/A
	- free wire of earth terminal: no touching of live parts		N/A
	- Class II transformers: no connection between live parts and accessible metal parts, no connection between live parts and metal parts separated from accessible metal parts by supplementary insulation		N/A
23.8	Terminals for a current > 25 A:		N/A
	- pressure plate, or		N/A
	- two clamping screws		N/A
23.9	When terminal, other than protective earth conductor, screws loosened as far as possible, no contact:		N/A
	- between terminal screws and accessible metal parts		N/A
	- between terminal screws and accessible metal parts separated only by basic or supplementary insulation for Class II transformers		N/A
24	PROVISION FOR PROTECTIVE EARTHING		-
24.1	Class I transformers: accessible conductive parts connected to earth terminal	Class II equipment	N/A
	Class II transformers: no provision for protective earth		P
24.2	Protective earth terminal for connection to fixed wiring and for type X attachment transformers: comply with Cl. 23, adequately locked, not possible to loosen without a tool		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
24.3	No risk of corrosion from contact between metal of earth terminal and other terminal		N/A
	In case of earth terminal body of Al, no risk of corrosion from contact between Cu and Al		N/A
	Body of earth terminal or screws/nuts of brass or other metal resistant to corrosion		N/A
24.4	Resistance of connection between earth terminal and metal parts $\leq 0,1\Omega$ with a min. 25 A or 1,5 times rated input current at 1 min		N/A
24.5	Class I transformers with external flexible cables or cords:		N/A
	- current-carrying conductors becoming touch before the earth conductor		N/A
25	SCREWS AND CONNECTIONS		-
25.1	Screwed connections withstand mechanical stresses	No screws	N/A
	Screws transmitting contact pressure or likely to be tightened by the user or having a diameter < 2,8 mm, shall screw into metal		N/A
	Screws not of metal which is soft or liable to creep (Zn, Al)		N/A
	Screws of insulating material: not used for electrical connection		N/A
	Screws not of insulating material if their replacement by metal screws can impair supplementary or reinforced insulation		N/A
	Screws to be removed (replacement etc. of power supply cord) not of insulating material if their replacement by metal screws can impair basic insulation		N/A
	For a screw in engagement with the threads of insulating material: No damage after torque test: diameter (mm); torque (Nm); ten times		N/A
	For nuts and other screws: No damage after torque test: diameter (mm); torque (Nm); five times		N/A
25.2	Screws in engagement with thread of insulating material:		N/A
	- length of engagement ≥ 3 mm + 1/3 screw diameter or 8 mm whichever is shorter		N/A
	- correct introduction into screw hole		N/A
25.3	Electrical connections: contact pressure not transmitted through insulating material		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
25.4	In case of use of thread-forming (sheet metal) screws for connection of current-carrying parts: clamping and locking means provided		N/A
	Thread-cutting (self-tapping) screws used for the connection of current-carrying parts allowed if they generate a full form machine screw thread and if not operated by the user		N/A
	Thread-cutting screws and thread-forming screws used for earth continuity allowed if at least 2 screws for each connection are used and it is not necessary to disturb the connection in normal use		N/A
25.5	Screws for current-carrying mechanical connections locked against loosening		N/A
	Rivets for current-carrying connections subject to torsion locked against loosening		N/A
25.6	Test of screwed glands with a torque according table 19. After the test no damage at the transformer and the gland.		N/A
26	CREEPAGE DISTANCES, CLEARANCES AND DISTANCES THROUGH INSULATION		-
26.2	Creepage distances and clearances		P
26.2.1	General		P
	The creepage distance and clearance values are shown in Table 20 and Table 21.		P
26.2.2	Windings covered with adhesive tape		N/A
	- all insulating materials are classified according to IEC 60085 and IEC 60216 (all parts);		N/A
	- the impulse voltage dielectric test of 6.1.2.2.1 of IEC 60664-1:2007 is fulfilled; and		N/A
	- test A of 26.2.4 is fulfilled		N/A
26.2.3	Uncemented insulating parts pollution degree P2 or P3	P2	P
	- all isolating material are classified acc. to IEC 60085 and IEC 60216(all parts)		P
	- values of pollution degree 1 are not applicable		P
26.2.4	Cemented insulating parts		N/A
	- all isolating materials are classified acc. to IEC 60085 and IEC 60216(all parts)		N/A
	- values of distance through insulation (dti) are fulfilled		N/A
	- creepage distances and clearances are not required		N/A
	- test A of this sub clause is fulfilled		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Test A		N/A
	- thermal class		N/A
	- working voltage		N/A
	- Test with three specially specimens, with uninsulated wires, without impregnation or potting	(see appended table)	N/A
	Two of the three specimens are subjected to:		N/A
	- the relevant humidity treatment according to 17.2 (48 h)		N/A
	- the relevant dielectric strength test of 18.3 multiplied with factor 1,35		N/A
	- One of the three specimens is subjected to the relevant dielectric strength test of 18.3 multiplied by the factor 1,35 immediately at the end of the last cycle with high temperature		N/A
	Impulse dielectric test according to 6.1.2.2.1 of IEC 60664-1:2007 – see Annex R of IEC 61558-1		N/A
26.2.5	Enclosed parts (e.g. by impregnation or potting)		N/A
26.2.5.1	- The requirements of reduced values as stated for pollution degree 1 (P1) are fulfilled		N/A
	- all isolating materials are classified acc. to IEC 60085 and IEC 60216(all parts)		N/A
	Test B		N/A
	- thermal class		N/A
	- test voltage of 500 V or the working voltage		N/A
	- Test with three specially specimens, potted or impregnated. The dielectric strength test is applied directly to the joint.	(see appended table)	N/A
	Two of the three specimens are subjected to:		N/A
	- the relevant humidity treatment according to 17.2 (48 h)		N/A
	- the relevant dielectric strength test of 18.3 multiplied with factor 1,25		N/A
	- One of the three specimens is subjected to the relevant dielectric strength test of 18.3 multiplied by the factor 1,25 immediately at the end of the last cycle with high temperature		N/A
	The three spacemen pass the Impulse dielectric test according to 6.1.2.2.1 of IEC 60664-1:2007– see Annex R of IEC 61558-1		N/A
26.2.5.2	- The requirements of distance through insulation (dti) are fulfilled. (P1 values are not required)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- all isolating materials are classified acc. to IEC 60085 and IEC 60216(all parts)		N/A
	Test C		N/A
	- thermal class		N/A
	- test voltage of 500 V or the working voltage		N/A
	- Test with three specimens, potted or impregnated. (finished components)	(see appended table)	N/A
	- Neither cracks, nor voids in the insulating compounds		N/A
	Two of the three specimens are subjected to:		N/A
	- the relevant humidity treatment according to 17.2 (48 h)		N/A
	- the relevant dielectric strength test of 18.3 multiplied with factor 1,35		N/A
	- One of the three specimens is subjected to the relevant dielectric strength test of 18.3 multiplied by the factor 1,35 immediately at the end of the last cycle with high temperature		N/A
	The three spacemen pass the Impulse dielectric test according to 6.1.2.2.1 of IEC 60664-1:2007 – see Annex R of IEC 61558-1		N/A
26.3	Distance through insulation		P
26.3.1	For supplementary, double or reinforced insulation, the required values of Tables 22 are fulfilled		P
	The insulation fulfil the material classification according IEC 60085 and 60216(all parts) or the test of 14.3		P
26.3.2	Reduced values of the thickness of insulation for supplementary or reinforced insulation are allowed if the following conditions are fulfilled:		N/A
	- the isolating materials are classified acc. to IEC 60085 and IEC 60216(all parts)		N/A
	- the test of 14.3 is fulfilled		N/A
	- If both requirements are fulfilled, the required values for solid insulation can be multiplied by 0,4		N/A
	- Minimum thickness of reinforced insulation $\geq 0,2$ mm		N/A
	- Minimum thickness of supplementary insulation $\geq 0,1$ mm		N/A
26.3.3	Insulation in thin sheet form		P
	- If the layers are non-separable (glued together):		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The requirement of 3 layers is fulfilled		N/A
	The mandrel test according 26.3.4 is fulfilled with 150 ± 10 N		N/A
	The required values for d.t.i. of thin layers in Tables 22 is fulfilled.		N/A
	- If the layers are separated:		N/A
	The requirement of 2 layers is fulfilled		N/A
	If serrated tape is used, 1 additional layer (serrated) and one additional layer without serration is required		N/A
	The mandrel test according 26.3.4 is fulfilled on each layer with 50 ± 5 N		N/A
	The required values for d.t.i. of thin layers in Tale 22 is fulfilled.		N/A
	- If the layers are separated (alternative):		P
	The requirement of 3 layers is fulfilled		P
	If serrated tape is used, 1 additional layer (serrated) and one additional layer without serration is required		N/A
	The mandrel test according 26.3.4 is fulfilled on 2/3 of the layers with 100 ± 5 N		P
	The required values for d.t.i. of thin layers in Tale 22 is fulfilled.		P
	Test according to 14.3 and if the isolating materials are classified acc. to IEC 60085 and IEC 60216(all parts) no distances through insulation are required for insulation in thin sheet form		N/A
	The values for thin layers are used for insulation in thin sheet form as follows:		P
	- rated output > 100 VA values for thin layers apply		N/A
	- rated output ≥ 25 VA and ≤ 100 VA 2/3 of the values for thin layers apply		N/A
	- rated output < 25 VA 1/3 of the values for thin layers apply		P
26.3.4	Mandrel test of insulation in thin sheet form (specimen of $70 \pm 0,5$ mm width are necessary):		P
	- If the layers are non-separable – at least 3 layers glued together fulfil the test:		N/A
	- pull force of 150 ± 10 N		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- high voltage test of 5,0 kV or the test voltage of 18.3 multiplied by 1,35 whatever is the greater. No flashover, no breakdown.		N/A
	- If the layers are separable and 2/3 of at least 3 layers fulfil the test.		P
	- pull force of 100±5 N		P
	- high voltage test of 5,0 kV or the test voltage of 18.3 multiplied by 1,25 whatever is the greater. No flashover, no breakdowns.		P
	- If the layers are separable 1 of at least 2 layers fulfil the test:		N/A
	- pull force of 50±5 N		N/A
	- high voltage test of 5,0 kV or the test voltage of 18.3 multiplied by 1,25 whatever is the greater. No flashover, no breakdown.		N/A
26.3.5	For transformers with FIW wires		N/A
	- thermal cycles		N/A
	- test voltage of 500 V or the working voltage		N/A
	- Test with three specimens	(see appended table)	N/A
	Two of the three specimens are subjected to:		N/A
	- the relevant humidity treatment according to 17.2 (48 h)		N/A
	- the relevant dielectric strength test of 18.3		N/A
	- One of the three specimens is subjected to the relevant dielectric strength test of 18.3 immediately at the end of the last cycle with high temperature		N/A
	The partial discharge test shall be done at the end of the cycling test at normal room temperature as performed in 18.3.1.		N/A
	The values of allowed voltage strength for other FIW dimensions than defined in Table 24 are calculated		N/A
26.101	Creepage distances and distances through insulation given in Table 21, Table 22 and Table 23 of IEC 61558-1:2017 are generally applicable (IEC 61558-2-16: 2021)	(see appended table)	P
26.102	In compliance with IEC 60664-4:2005, the requirements of 26.103 to 26.106 for creepage distances, clearances and solid insulation are required above 30 kHz and up to the frequency of 3 MHz. For frequencies above 3 MHz, the tests in accordance with 7.4 and 7.5 of IEC 60664-4:2005, high-frequency testing (high-frequency high-voltage test and high-frequency partial discharge test) shall be carried out.		P

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Clause	Requirement + Test	Result - Remark	Verdict
26.103	Clearance (IEC 61558-2-16:2021)		P
	a) Clearance for frequency ≥ 30 kHz according figure 101 two determinations are necessary:		P
	determination based on the rated impulse voltage of the rated supply voltage in accordance with Table 103 and Table 104.		P
	determination based on the measured peak working voltage in accordance with Table 106.		P
	b) Clearance for frequency ≤ 30 kHz according figure 101 two determinations are necessary:		P
	determination based on the rated impulse voltage of the rated supply voltage in accordance with Table 103 and Table 104.		P
	determination based on the measured peak working voltage in accordance with Table 105.		P
26.104	The working voltages of Table 105 and Table 106 for determination of clearances are peak working voltages. (IEC 61558-2-16: 2021)		P
	All peak working voltages including μ s-peaks shall be used to determine clearances in accordance with Table 105 and Table 106.		P
26.105	Creepage distances (IEC 61558-2-16: 2021)		P
	Two determinations of creepage distances are necessary (see Figure 102)		P
	determination based on the measured RMS working voltage in accordance with Table 21 of IEC 61558-1:2017;		P
	determination based on the measured peak working voltage in accordance with Table 107 to Table 112 and the fundamental frequency shall be considered		P
	A high-frequency RMS ripple voltage content not more than 10% can be neglected.		P
	The values in Table 107 to Table 112 do not take into account the effects of tracking phenomena for frequencies above 30 kHz.		P
	The most severe value of the required creepage distances in accordance with Table 107 to Table 112 for frequencies above 30 kHz and the relevant values in Table 21 of IEC 61558-1:2017 shall take precedence.		P
	If the value of the creepage distance is lower than the value of the clearance, the value of the clearance shall be applicable for the creepage distance.		P
	The peak working voltage also includes any DC voltage and any repetitive peak impulse generated by the SMPS (see 26.105). A determination based on RMS values is also required (see 26.104 and Table 112).		P

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Clause	Requirement + Test	Result - Remark	Verdict
26.106	Distance through insulation (IEC 61558-2-16:2021)		N/A
	Instead of partial discharge with high frequency voltage the test of the distance and the calculation of the electric field is applicable under the following conditions:		N/A
	- the max. frequency is < 10 MHz		N/A
	- the field strength approximately comply with Figure 103		N/A
	- no voids or gaps are present in between the solid insulation		N/A
	For thick layers $d1 \geq 0,75$ the peak value of the field strength is ≤ 2 kV/mm		N/A
	For thin layers $d2 \leq 30$ μ m the peak value of the field strength is ≤ 10 kV/mm		N/A
	For $d1 > d > d2$ formula (2) is used for calculation the field strength		N/A
27	RESISTANCE TO HEAT, FIRE AND TRACKING		-
27.1	General		P
27.2	Resistance to heat		P
27.2.1	All insulating parts are resistant to heat		P
	For parts of rubber, which passed the test of 19.9, no additional test is required.		N/A
	The tests are not required for cables and small connectors with a rated current ≤ 3 A, a rated voltage ≤ 24 V AC or 60 V DC and a power ≤ 72 W		P
27.2.2	External accessible parts		P
	The Ball-pressure test: diameter of impression ≤ 2 mm; heating cabinet temperature ($^{\circ}$ C) at 70 ± 2 $^{\circ}$ C or the temperature T of 14.1 ($T + 15 \pm 2$) is fulfilled.		P
27.2.3	Internal parts		P
	For insulating material retaining current carrying parts in position, the ball-pressure test -: diameter of impression ≤ 2 mm; heating cabinet temperature ($^{\circ}$ C) at 125 ± 2 $^{\circ}$ C or the temperature T of 14.1 ($T + 15 \pm 2$) is fulfilled		P
27.3	Resistance to abnormal heat under fault conditions		N/A
27.4	Resistance to fire		P
27.4.1	All isolating parts of the transformer shall be resistant to ignition and spread of fire. The test according to IEC 60695-2-10 is required		P
27.4.2	External accessible parts (glow wire tests)		P

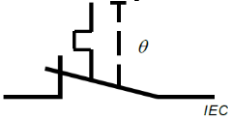
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Clause	Requirement + Test	Result - Remark	Verdict
	- 650°C for enclosures		P
	- 650 °C for parts retaining current carrying parts in position and terminals for external conductors Current $\leq 0,2$ A		N/A
	- 750° C for parts retaining current carrying parts in position and terminals for external conductors with fixed wiring. Current $> 0,2$ A		N/A
	- 850° C for parts retaining current carrying parts in position and terminals for external conductors with non-fixed wiring. Current $> 0,2$ A		P
27.4.3	Internal parts		P
	- 550 °C for internal insulating material – not retaining current carrying parts in position		N/A
	- 650 °C for coil formers (bobbins)		P
	- 650 °C for parts retaining current carrying parts in position and terminals for external conductors. Current $\leq 0,2$ A		N/A
	- 750 °C for parts retaining current carrying parts in position and terminals for external conductors with fixed wiring. Current $> 0,2$ A		N/A
	- 850 °C for parts retaining current carrying parts in position and terminals for external conductors with non-fixed wiring. Current $> 0,2$ A		P
27.5	For IP other than IPX0: If insulating parts retaining current carrying parts in position and under P3 conditions, the material resistance to tracking is at least material of group IIIb		N/A
	Material group IIIb ($100 \leq CTI \leq 175$) is not recommended for application in pollution degree 3 above 630V		N/A
	Test (175 V): no flashover or breakdown before 50 drops		N/A
28	RESISTANCE TO RUSTING		-
	Ferrous parts protected against rusting		P
ANNEX E	GLOW WIRE TEST		-
E.1	The test is required according to IEC 60695-2-10 and IEC 60695-2-11 with the following additions:		P
E.2	The requirements of 8.2, "Test temperatures" of IEC 60695-2-11:2014, apply with the temperature stated in 27.4 of IEC 61558-1		P
E.3	Clause 7, "Conditioning", of IEC 60695-2-11:2014 apply, preconditioning is required		P

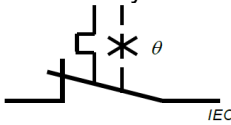
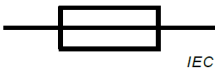
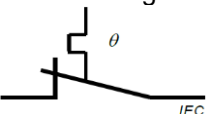
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Clause	Requirement + Test	Result - Remark	Verdict
E.4	Clause 8, "Test procedure", of IEC 60695-2-11:2014 apply, the tip of the glow wire is applied to the flat side of the surface.		P
ANNEX F	REQUIREMENTS FOR MANUALLY OPERATED SWITCHES WHICH ARE PARTS OF THE TRANSFORMER		-
F.2	Manually operated mechanical switches, tested as separate component, shall comply with IEC 61058:2016 under the conditions of F.2.		N/A
F.3	Manually operated mechanical switches tested as part of the transformer shall comply with the conditions specified under F.3		N/A
ANNEX H	ELECTRONIC CIRCUITS		-
H.1	For transformers including electronic circuits, the following requirements apply additionally to Clauses 5, 15, 26. This annex is not required for associated transformers		P
H.2	General notes on tests (addition to clause 5)		P
H.3	SHORT-CIRCUIT AND OVERLOAD PROTECTION (ADDITION TO CLAUSE 15)		P
H.3.1	Circuits designed and applied so that fault conditions do not render the appliance unsafe		P
	During and after each test:		P
	- temperatures do not exceed values specified in table 5		P
	- transformer complies with conditions specified in sub-clause 15.1		P
	If a conductor of a pcb becomes open circuited, the transformer is considered to have withstood the particular test, provided that all six conditions as specified are met		N/A
H.3.2	Fault conditions a) to f) of sub-clause H.3.3 are not tested if the following conditions are met:		N/A
	- electronic circuit is a low-power circuit as specified		N/A
	- safety of the appliance as specified does not rely on correct functioning of the electronic circuit		N/A
H.3.3	Fault conditions tested as specified when relevant:		P
	a) short-circuit of creepage distances and clearances, if less than specified in Cl. 26		P
	b) open circuit at the terminals of any component		P
	c) short-circuit of capacitors, unless they comply with IEC 60 384-14		P
	d) short-circuit of any two terminals of an electronic component as specified		P

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Clause	Requirement + Test	Result - Remark	Verdict
	e) any failure of an integrated circuit as specified		P
	f) low-power circuit: low-power points are connected to the supply source		N/A
	Cl. 15 is repeated with a simulated fault as indicated in a) to e), if the transformer incorporates an electronic circuit to ensure compliance with Cl. 15		P
	Fault condition e) is applied for encapsulated and similar components		P
	PTC's and NTC's are not short-circuited if they are used as specified		N/A
H.3.4	If for a fuse-link complying with IEC 60 127-3 rated fuse current I1 is used, current I2 is measured as specified:		P
	- if $I2 < 2,1 \times I1$ test of 15.8 is repeated with fuse-link short-circuited		N/A
	- if $I2 > 2,75 \times I1$, no other tests are necessary		P
	If $I2 > 2,1 \times I1$ and $I2 < 2,75 \times I1$ test of 15.8 is repeated as specified		N/A
	For fuses other than those complying with IEC 60 127-3, the test is carried out as specified 15.3.2 to 15.3.5		N/A
H.4	CREEPAGE DISTANCES, CLEARANCES AND DISTANCES THROUGH INSULATION (ADDITION TO CLAUSE 26)		N/A
H.4.1	For live parts separated by basic insulation smaller cr and cl as in 26 are allowed, if H.3 is fulfilled.		N/A
	In optocouplers no requirements of cr and cl		N/A
	For coatings annex W applies. Smaller distances as required in IEC 60664-3:2016, clause 4 are applicable,		N/A
	For potted transformers cycling tests according to 26.2. are applicable		N/A
H.4.2	The ma. surface temperature of optocouplers is 50 K		N/A
ANNEX K	INSULATED WINDING WIRES		-
K.1	Wire construction:	Approved triple insulated wire used	N/A
	• insulated winding wire for basic or supplementary insulation (see 19.12.3)		N/A
	• insulated winding wire for reinforced insulation (see 19.12.3)		N/A
	• solid circular winding wires and stranded winding wires with 0,05 to 5,0 mm diameter		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	spirally wrapped insulation – overlapping		N/A
K.2	Type tests		N/A
K.2.1	General Tests between ambient temperature between 15°C and 35°C and at a humidity between 25% and 75 %		N/A
K.2.2	Electric strength test		N/A
K.2.2.1	Solid circular winding wires and stranded winding wires		N/A
	Test samples prepared according to clause 4.4.1 of IEC 60851-5:2008 (twisted pair)		N/A
	Dielectric strength test: 6 kV for reinforced insulation		N/A
	Dielectric strength test: 3 kV for basic or supplementary insulation		N/A
K.2.2.2	Square or rectangular wires.		N/A
	Test samples prepared according to clause 4.7.1 of IEC 60851-5:2008		N/A
	Dielectric strength test: 5,5 kV for reinforced insulation		N/A
	Dielectric strength test: 2,75 kV for basic or supplementary insulation		N/A
K.2.3	Flexibility and adherence		N/A
	Claus 5.1 in Test 8 of IEC 60851-3:2009 shall be used		N/A
	Test samples prepared according to clause 5.1.1.4 of IEC 60851-3:2009		N/A
	Dielectric strength test: 5,5 kV for reinforced insulation		N/A
	Dielectric strength test: 2,75 kV for basic or supplementary insulation		N/A
	Mandrel diameter according table K.1		N/A
	The tension to the wire during winding on mandrel is 118 N/mm ² (118 MPa)		N/A
K.2.4	Heat shock		N/A
	Test samples prepared according to 3.2.1 (in Test 9) of IEC 60851-6:2012		N/A
	high voltage test immediately after this test		N/A
	Dielectric strength test: 5,5 kV for reinforced insulation		N/A
	Dielectric strength test: 2,75 kV for basic or supplementary insulation		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
K.2.5	Retention of dielectric strength after bending (test as specified under test 13 of 4.6.1 c) of IEC 60 851-5)		N/A
	high voltage test immediately after this test		N/A
	Dielectric strength test: 5,5 kV for reinforced insulation		N/A
	Dielectric strength test: 2,75 kV for basic or supplementary insulation		N/A
K.3	Testing during manufacturing		N/A
K.3.1	General Tests as subjected in K.3.2 and K.3.3		N/A
K.3.2	Routine test		N/A
	Dielectric strength test: 4,2 kV for reinforced insulation		N/A
	Dielectric strength test: 2,1 kV for basic or supplementary insulation		N/A
K.3.3	Sampling test		N/A
K.3.3.1	Solid circular winding wires and stranded winding wires		N/A
	Test with a twisted pair, prepared according clause 4.4.1 of IEC 60851-5:2008		N/A
	Dielectric strength test: 6 kV for reinforced insulation		N/A
	Dielectric strength test: 3 kV for basic or supplementary insulation		N/A
K.3.3.2	Square or rectangular wire		N/A
	Samples prepared according to clause 4.7.1 of IEC 60851-5:2008		N/A
	Dielectric strength test: 5,5 kV for reinforced insulation		N/A
	Dielectric strength test: 3 kV for basic or supplementary insulation		N/A

ANNEX V		ANNEX V, SYMBOLS TO BE USED FOR THERMAL CUT-OUTS		-
Figure V.1	Restored by manual operation			N/A
				

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Clause	Requirement + Test	Result - Remark	Verdict
Figure V.2	Restored by disconnection of the supply 		N/A
Figure V.3	Thermal link 		N/A
Figure V.4	Self-resetting thermal cut-out 		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

11 and 12	TABLE: OUTPUT VOLTAGE AND OUTPUT CURRENT UNDER LOAD; NO-LOAD OUTPUT VOLTAGE					P
Clause	11		12			
type/rated output/	rated voltage (V)	sec. voltage (V)	delta Usec (%)	Usec V no-load output	delta Usec no-load output %	further information
999999-017-6 / 3.5Vd.c., 0.766A	230V	3.36V	-4.0	Max. 3.5	+4.2	For Cl. 11 < 10% , For Cl. 12 < 20%
Supplementary information:						

14	TABLE: Heating Test			P
	Test voltage (V)	253	—	
	Ambient (°C)	21.3	—	
Thermocouple Locations		Max. temperature measured, (°C)	Max. temperature limit, (°C)	
Transformer Pri. Winding		55.5	110	
Transformer Sec. Winding		54.9	110	
Bobbin		55.2	120	
Internal wire (primary)		34.3	70	
Output wire (second)		30.5	70	
PCB plate		54.5	130	
Y1 capacitor		46.0	125	
Capacitor C8		47.0	-	
Capacitor C10		46.5	-	
Enclosure (internal)		34.6	80	
Enclosure (External)		30.9	80	
Test corner		35.8	85	
Supplementary information:				

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Clause	Requirement + Test	Result - Remark	Verdict

14	TABLE: Heating Test		P
	Test voltage (V)	207	—
	Ambient (°C)	22.1	—
Thermocouple Locations		Max. temperature measured, (°C)	Max. temperature limit, (°C)
Transformer Pri. Winding		58.3	110
Transformer Sec. Winding		56.9	110
Bobbin		56.5	120
Internal wire (primary)		36.5	70
Output wire (second)		31.3	70
PCB plate		55.0	130
Y1 capacitor		48.5	125
Capacitor C8		48.2	-
Capacitor C10		48.7	-
Enclosure (internal)		34.8	80
Enclosure (External)		33.6	80
Test corner		38.0	85
Supplementary information:			

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Clause	Requirement + Test				Result - Remark		Verdict
14	TABLE: Heating test, resistance method						N/A
	Test voltage (V).....:						—
	Ambient, t ₁ (°C).....:						—
	Ambient, t ₂ (°C).....:						—
Temperature rise of winding		R ₁ (Ω)	R ₂ (Ω)	ΔT (K)	Max. dT (K)	Insulation class	
Supplementary information:							

15	TABLE: SHORT-CIRCUIT AND OVERLOAD PROTECTION						N/A
	ambient temperature (°C)						
type/rated output	r-cold Ω	r-warm Ω	temp. °C	ext. encl. °C	support °C	int. + ext. wire	further information

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Clause	Requirement + Test	Result - Remark	Verdict

15	TABLE: Short circuit and overload protection		P
	Test voltage (V) :	253	—
	Ambient (°C) :	22.9	—
Thermocouple Locations		max. temperature measured, (°C)	max. temperature limit, (°C)
Transformer Pri. Winding		124.3	175
Transformer Sec. Winding		122.5	175
Bobbin		119.7	-
Internal wire (primary)		56.0	85
Output wire (second)		44.6	85
PCB plate		118.6	-
Y1 capacitor		92.4	-
Capacitor C8		89.8	-
Capacitor C10		88.8	-
Enclosure (internal)		61.1	-
Enclosure (External)		50.7	105
Test corner		61.2	105
Supplementary information: When output short-circuited. equipment was protected immediately.			

15	TABLE: Short circuit and overload protection		P
	Test voltage (V) :	207	—
	Ambient (°C) :	23.0	—
Thermocouple Locations		max. temperature measured, (°C)	max. temperature limit, (°C)
Transformer Pri. Winding		127.5	175
Transformer Sec. Winding		125.4	175
Bobbin		120.6	-
Internal wire (primary)		56.4	85
Output wire (second)		46.0	85
PCB plate		123.4	-
Y1 capacitor		97.1	-
Capacitor C8		94.1	-
Capacitor C10		90.7	-
Enclosure (internal)		61.5	-
Enclosure (External)		53.2	105
Test corner		65.8	105
Supplementary information: When output short-circuited. equipment was protected immediately.			

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Clause	Requirement + Test	Result - Remark	Verdict

18.2	TABLE: insulation resistance measurements		P
Insulation resistance R between:		R (MΩ)	Required R (MΩ)
Input and enclosure		>100	7
Input circuit and output circuit		>100	5
PRI and SEC of T1		>100	5
L – N (with FR disconnect)		>100	2
Metal foil in contact with inner and outer surfaces of enclosure		>100	7
Supplementary information:			

18.3	TABLE: Dielectric Strength		P
Test voltage applied between:		Test potential applied (V)	Breakdown / flashover (Yes/No)
L to N (with fuse disconnect)		1384	No
PRI and SEC of Transformer		2767	No
Input circuit and output circuit		2767	No
PRI and enclosure		2767	No
Supplementary information:			

20	TABLE: Critical components information					P
Object / part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity ¹⁾	
Refer to CDF						
- Description:						
- Description:						
- Description:						
Supplementary information:						
1) Provided evidence ensures the agreed level of compliance. See OD-CB2039.						

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Clause	Requirement + Test	Result - Remark	Verdict

25	TABLE: Threaded Part Torque Test				N/A
Threaded part identification		Diameter of thread (mm)	Column number (I, II, or III)	Applied torque (Nm)	
Supplementary information:					

26	TABLE: Clearance And Creepage Distance Measurements					P
clearance cl and creepage distance dcr at/of:	Up (V)	U r.m.s. (V)	Required cl (mm)	cl (mm)	required dcr (mm)	dcr (mm)
L to N before fuse	340	230	1.5	3.5	2.3	3.5
Live part to external Enclosure	340	230	3.0	6.2	4.6	6.2
Transformer: Pri. to Sec.	490	230	3.0	>4.6	4.6	>4.6
Primary circuit to secondary circuit	340	230	3.0	6.0	4.6	7.0
Supplementary information:						

26	TABLE: Distance Through Insulation Measurements				P
Distance through insulation di at/of:		U r.m.s. (V)	Test voltage (V)	Required di (mm)	di (mm)
Between primary circuit and accessible enclosure (through enclosure)		230	--	0.8	>0.8
Between Pri. and Sec. of transformer		230	--	0.2	Certified TIW used
Supplementary information:					

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Clause	Requirement + Test	Result - Remark	Verdict

26.2 TEST A	TABLE: CREEPAGE DISTANCES AND CLEARANCES AND DISTANCES THROUGH INSULATION					N/A
	Test with three special prepared specimens with uninsulated wires, without potting or impregnation					
	cycles with 2 x working voltage between pri / sec	68 h at the temperature acc. Cl. 14 (min. 85 °C)	1 hour 25 °C	2 hour 0 °C	1 hour 25 °C	
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						

26.2 TEST B	TABLE: CREEPAGE DISTANCES AND CLEARANCES AND DISTANCES THROUGH INSULATION					N/A
	Test with three specially prepared specimens with potted – P1 values are required					
	cycles with 2 x working voltage between pri / sec	68 h at the temperature acc. Cl. 14 (min. 85 °C)	1 hour 25 °C	2 hour 0 °C	1 hour 25 °C	
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						

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Clause	Requirement + Test	Result - Remark	Verdict

26.2 TEST C	TABLE: CREEPAGE DISTANCES AND CLEARANCES AND DISTANCES THROUGH INSULATION					N/A
	Test with three specially prepared specimens with potting (only dti is required)					
cycles with 2 x working voltage between pri / sec	68 h at the temperature acc. Cl. 14 (min. 85 °C)	1 hour 25 °C	2 hour 0 °C	1 hour 25 °C		
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						

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Clause	Requirement + Test	Result - Remark	Verdict

26.3.5	TABLE: CREEPAGE DISTANCES AND CLEARANCES AND DISTANCES THROUGH INSULATION					N/A
	Test for transformers, use FIW-wire					
	cycles with 2 x working voltage between pri / sec	68 h at the temperature acc. Cl. 14 (min. 85 °C)	1 hour 25 °C	2 hour 0 °C	1 hour 25 °C	
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						

27.2	TABLE: Ball Pressure Test of Thermoplastics				P
Allowed impression diameter (mm):					—
Object/ Part No./ Material		Manufacturer/ trademark	Test temperature (°C)	Impression diameter (mm)	
Enclosure/plug holder		See CDF	125	1.3	
Bobbin		See CDF	125	1.1	
PCB		See CDF	125	1.0	
Supplementary information:					

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Clause	Requirement + Test	Result - Remark	Verdict

27.4	TABLE: Resistance to heat and fire - Glow wire tests							P
Object/ Part No./ Material	Manufacturer / trademark	Glow wire test (GWT); (°C)						Verdict
		550	650		750		850	
			te	ti	te	ti		
Bobbin	See CDF	-	ni	ni	-	-	-	P
PCB	See CDF	-	-	-	-	-	ni	P
Enclosure / plug holder	See CDF	-	-	-	-	-	ni	P
Ignition of the specified layer placed underneath the test specimen (Yes/No)								No
Supplementary information:								

Annex H	TABLE: short-circuit and overload protection					P
	Power source for EUT: Manufacturer, model/type, output rating				AC mains	—
	Ambient temperature (°C)				25°C	—
Comonent No.	Fault	Supply voltage (V)	Input current (A)	Test time	Observation	
C3	SC	253	0	1s	Fuse opened immediately. No damage, no hazard, no higher temperature.	
C8	SC	253	0.31	30min	EUT shut down immediately. No damage, no hazard, no higher temperature.	
IC1	SC	253	0	1s	Fuse opened immediately. No damage, no hazard, no higher temperature.	
D5	SC	253	0.45	30min	EUT shut down immediately. No damage, no hazard, no higher temperature.	
C10	SC	253	0.11	30min	EUT shut down immediately. No damage, no hazard, no higher temperature.	
D7	SC	253	0.17	30min	EUT shut down immediately. No damage, no hazard, no higher temperature.	
Supplementary information:						

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Clause	Requirement + Test	Result - Remark	Verdict
AA	Annex AA		-
	Partial discharge (PD) test		N/A
			-
BB	Annex BB		-
	Particular requirements for associated transformers for switch mode power supplies with internal frequencies > 500 Hz		N/A
	See separate test report-form for these Annex.		N/A
BB.8	MARKING AND OTHER INFORMATION		N/A
BB.8.2	Marking for transformers IP00 or for associated transformers: type and trademark, instruction sheets		N/A
BB.8.11	Correct symbols:		N/A
	Volts	V	N/A
	Amperes	A (mA)	N/A
	Volt amperes (or volt-amperes reactive for reactors)	VA or (VAR)	N/A
	Watts	W	N/A
	Hertz	Hz	N/A
	Input	PRI	N/A
	Output	SEC	N/A
	Direct current	d.c. (DC) or 	N/A
	Neutral	N	N/A
	Single-phase a.c.		N/A
	Three-phase a.c.	3 	N/A
	Three-phase and neutral a.c.	3N 	N/A
	Power factor	cos φ	N/A
	Class II construction		N/A
	Class III construction		N/A
	Equipment of overvoltage category I		N/A
	Equipment of overvoltage category II		N/A
	Equipment of overvoltage category III		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Equipment of overvoltage category IV		N/A
	Fuse-link		N/A
	Rated max. ambient temperature	t_a	N/A
	Rated minimum ambient temperature	t_{amin}	N/A
	Rated minimum temperature	t_{min}	N/A
	Frame or core terminal		N/A
	Protective earth		N/A
	IP number	IPXX	N/A
	Earth (ground for functional earth)		N/A
	For indoor use only		N/A
	To indicate that the appliance is intended to be usable up to the maximum altitude 3 000 m.		N/A
	To indicate that the power supply unit shall not be used, if pins of the plug part are damaged.		N/A
	Additional Symbols (IEC 61558-2-16:09)		N/A
	SMPS (Switch mode power supply unit)		N/A
	SMPS incorporating a Fail-safe separating transformer		N/A
	SMPS incorporating a Non-short-circuit-proof separating transformer		N/A
	SMPS incorporating a Short-circuit-proof separating transformer (inherently or non-inherently)		N/A
	SMPS incorporating a Fail-safe isolating transformer		N/A
	SMPS incorporating a Non-short-circuit-proof isolating transformer		N/A
	SMPS incorporating a Short-circuit-proof isolating transformer (inherently or non-inherently)		N/A
	SMPS incorporating a Fail-safe safety isolating transformer		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	SMPS incorporating a Non-short-circuit-proof safety isolating transformer		N/A
	SMPS incorporating a Short-circuit-proof safety isolating transformer (inherently or non-inherently)		N/A
	SMPS incorporating a Fail-safe auto-transformer		N/A
	SMPS incorporating a Non-short-circuit proof auto-transformer		N/A
	SMPS incorporating a Short-circuit proof auto-transformer (inherently or non-inherently)		N/A
BB.9	PROTECTION AGAINST ELECTRIC SHOCK		-
BB.10	CHANGE OF INPUT VOLTAGE SETTING		-
BB.11	OUTPUT VOLTAGE AND OUTPUT CURRENT UNDER LOAD		-
BB.12	NO-LOAD OUTPUT VOLTAGE (see supplementary requirements in Part 2)		-
BB.13	SHORT-CIRCUIT VOLTAGE		-
BB.14	HEATING		-
BB.14.2	Application of 14.1 or 14.3 according to the insulation system		N/A
BB.14.2.1	Class of isolating system (classified materials according to IEC 60 085 and IEC 60 216)		N/A
BB.14.2.2	No classified material, or system but the measured temperature does not exceed the value of Class A		N/A
BB.14.2.3	No classified material or system but the measured temperature exceeds the value for Class A, the live parts of the transformers are submitted to the test of 14.3		N/A
BB.14.3	Accelerated ageing test for undeclared class of isolating system		N/A
	Cycling test (10 cycles):		N/A
	– measuring of the no-load input current (mA)		N/A
BB.14.3.2	– heat run (temperature in table 4)		N/A
BB.14.3.3	– vibration test: 30 min; amplitude 0,35 mm; frequency range: 10 Hz, 55 Hz, 10 Hz		N/A
BB.14.3.4	– moisture treatment (48 h, 17.2)		N/A
BB.14.3.5	Measurements and tests at the beginning and after each test:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– deviation of the no-load input current, measured at the beginning of the test less than 30%		N/A
	– insulation resistance acc. Cl.18.1 and 18.2		N/A
	– electric strength, no breakdown (18.3 and 18.4); 2 min; test voltage 35% of specified value		N/A
	– Transformers (50 or 60 Hz version) are tested after the dielectric strength test as follows: under no load; duration: 5 min; Upri(V):1,2 times rated supply voltage; frequency (Hz): 2 times rated frequency		N/A
BB.15	SHORT-CIRCUIT AND OVERLOAD PROTECTION		-
BB.16	MECHANICAL STRENGTH		-
BB.17	PROTECTION AGAINST HARMFUL INGRESS OF WATER AND MOISTURE		-
BB.18	INSULATION RESISTANCE AND ELECTRIC STRENGTH		-
BB.18.2	Insulation resistance between:		-
	– live parts and body for basic insulation $\geq 2 \text{ M}\Omega$		N/A
	– live parts and body for reinforced insulation $\geq 7 \text{ M}\Omega$		N/A
	– input circuits and output circuits for basic insulation $\geq 2 \text{ M}\Omega$		N/A
	– input circuits and output circuits for double or reinforced insulation $\geq 5 \text{ M}\Omega$		N/A
	– each input circuit and all other input circuits connected together $\geq 2 \text{ M}\Omega$		N/A
	– each output circuit and all other output circuits connected together $\geq 2 \text{ M}\Omega$		N/A
	– hazardous live parts and metal parts with basic insulation (Class II transformers) $\geq 2 \text{ M}\Omega$		N/A
	– body and metal parts with basic insulation (Class II transformers) $\geq 5 \text{ M}\Omega$		N/A
	– metal foil in contact with inner and outer surfaces of enclosures $\geq 2 \text{ M}\Omega$		N/A
BB.18.3	Electric strength test (1 min): no flashover or breakdown:		N/A
	1) basic insulation between input circuits and output circuits; working voltage (V); test voltage (V)		N/A
	2) double or reinforced insulation between input circuits and output circuits; working voltage (V); test voltage (V)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	3) basic or supplementary insulation between:		N/A
	4) Reinforced insulation between the body and live parts; working voltage (V); test voltage (V):		N/A
	5) Functional insulation for windings intended to be connected in series or parallel (test voltage = working voltage + 500 V)		N/A
BB.19	CONSTRUCTION		-
BB.19.1	General construction		N/A
BB.19.1.1	General		N/A
BB.19.1.2	Auto-transformers		N/A
BB.19.1.2.1	Plug connected auto-transformers where the rated input voltage is higher than the rated output voltage, shall not have any potential to protective earthing at the output socket higher than the rated output voltage.		N/A
BB.19.1.2.2	Polarised input and output plug and socket-outlet system: an instruction shall be given for not using such a transformer with a nonpolarized plug and socket-outlet system.		N/A
BB.19.1.2.3	A polarity detecting device only energises the output in the case: output potential to earth $\leq$ rated output voltage, also with reversed input plug.		N/A
	– The contact separation of the device is $\geq$ 3mm		N/A
	– A current to earth does not exceed 0,75 Ma.		N/A
	– All tests are repeated under fault conditions of H.3.3 of annex H of part 1. The potential to earth does not exceed the max output voltage for more than 5 s.		N/A
	– for class I transformers, the insulation between the input / output winding and the body shall consist of at least basic insulation (rated for the working voltage)		N/A
	– for class II transformers, the insulation between the input / output winding and the body shall consist of double or reinforced insulation (rated for the working voltage).		N/A
BB.19.1.3	Separating transformers		N/A
BB.19.1.3.1	Input and output circuits electrically separated.		N/A
BB.19.1.3.2	The insulation between input and output winding(s) consist of basic insulation		N/A
	Class I transformer		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– Insulation between input windings and body consist of basic insulation		N/A
	– Insulation between output windings and body consist of basic insulation		N/A
	Class II transformer		N/A
	– Insulation between input windings and body consist of double or reinforced insulation		N/A
	– Insulation between output windings and body consist of double or reinforced insulation		N/A
BB.19.1.3.3	The insulation between input windings and intermediate conductive parts and the output windings and intermediate part consist of basic insulation		N/A
	For class I SMPS the insulation between input and output windings via the intermediate conductive parts consist of basic insulation		N/A
	For class II SMPS the insulation between input winding and the body and between the output windings and the body via the intermediate conductive parts consist of double or reinforced insulation.		N/A
BB.19.1.3.4	Parts of output circuits may be connected to protective earth		N/A
BB.19.1.3.5	No direct contact between output circuits and the body, unless:		N/A
	– Allowed for associated transformers by the equipment standard		N/A
BB.19.1.4	Isolating transformers and safety isolating transformers		N/A
BB.19.1.4.1	Input and output circuits electrically separated		N/A
	No possibility of any connection between these circuits		N/A
BB.19.1.4.2	The insulation between input and output winding(s) consist of double or reinforced insulation (exception see 19.1.4.4)		N/A
	Class I transformers not intended for connection to the mains by a plug:		—
	– Insulation between input windings and body connected to earth consist of basic insulation rated to the input voltage		N/A
	– Insulation between output windings and body, connected to earth consist of basic insulation rated for the output voltage		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Class I transformers intended for connection to the mains by a plug:		N/A
	– Insulation between input windings and body connected to earth consist of basic insulation rated to the working voltage		N/A
	– Insulation between output windings and body, connected to earth consist of supplementary insulation rated for the working voltage		N/A
	Class II transformers		N/A
	– Insulation between input windings and body consist of double or reinforced insulation rated to the input voltage		N/A
	– Insulation between output windings and body consist of double or reinforced insulation, rated to the output voltage		N/A
BB.19.1.4.3	For transformers with intermediate conductive parts not connected to the body (between input/output):		N/A
BB.19.1.4.3.1	For class I and class II transformers the insulation between input and output windings, via intermediate conductive parts, consist of double or reinforced insulation, rated to the working voltage.		N/A
	– For class II transformers the insulation between input winding and the body and between the output windings and the body via the intermediate conductive parts consist of double or reinforced insulation. (rated to the input voltage, for SELV circuits only basic insulation to the body)		N/A
	– For transformers, different from independent, the insulation between input and output windings, via intermediate conductive parts, consist of double or reinforced insulation, rated to the working voltage.		N/A
BB.19.1.4.3.2	Class I transformers with earthed core, and not allowed for class II equipment		N/A
	– Insulation from the input to the earthed core: basic insulation rated for the input voltage		N/A
	– Insulation from the output voltage to the earthed core: basic insulation rated for the output voltage		N/A
BB.19.1.4.3.3	Insulation between: input to intermediate conductive parts and output and intermediate parts consist of at least basic insulation		N/A
	– If the insulation from input or output to the intermediate metal part is less than basic insulation, the part is considered to be connected to input or output.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
BB.19.1.4.4	For class I transformers, with protective screen, not connected to the mains by a plug the following conditions comply:		N/A
	– The insulation between input winding and protective screen consist of basic insulation (rated input voltage)		N/A
	– The insulation between output winding and protective screen consist of basic insulation (rated output voltage)		N/A
	– The protective screen consist of metal foil or a wire wound screen extending the full width of the windings and has no gaps or holes		N/A
	– Where the protective screen does not cover the entire width of the input winding, additional insulation to ensure double insulation in this area, is used.		N/A
	– If the screen is made by a foil, the turns are isolated, overlap at least 3 mm		N/A
	– The cross-section of the screen and the lead out wire is at least corresponding to the rated current of the overload device		N/A
	– The lead out wire is soldered or fixed to the protective screen.		N/A
	For transformers for connection to the mains by the means of a plug of any type (incorporating or not), the alternative with basic insulation plus protective screening is not allowed.		N/A
BB.19.1.4.5	No connection between output circuit and protective earth, except of associated transformers (allowed by equipment standard) or 19.8 is fulfilled.		N/A
BB.19.1.4.6	No connection between output circuit and body, except of associated transformers (allowed by equipment standard)		N/A
BB.19.1.4.7	The distance between input and output terminals for the connection of external wiring is ≥ 25 mm		N/A
BB.19.1.4.8	Portable transformers having an rated output ≤ 630 VA shall be class II.		N/A
BB.19.1.4.9	No connection between output circuit and body except of associated transformers (allowed by equipment standard)		N/A
BB.19.1.4.10	Protective screening is not allowed for transformers with plug connection to the mains		N/A
BB.19.12	Winding construction		N/A
BB.19.12.1	Undue displacement in all types of transformers not allowed:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– of input or output windings or turns thereof		N/A
	– of internal wiring or wires for external connection		N/A
	– of parts of windings or of internal wiring in case of rupture or loosening		N/A
BB.19.12.2	Serrated tape:		N/A
	– distance through insulation according to table 22		N/A
	– one additional layer of serrated tape, and		N/A
	– one additional layer without serration		N/A
	– in case of cheek less bobbins the end turns of each layer shall be prevented from being displaced		N/A
BB.19.12.3	Insulated windings wires providing basic, supplementary or reinforced insulation, meet the following requirements:		N/A
	Multi-layer extruded or spirally wrapped insulation, passed the tests of annex K		N/A
	Basic insulation: two wrapped or one extruded wire		N/A
	Supplementary insulation: two layers, wrapped or extruded		N/A
	Reinforced insulation: three layers wrapped or extruded		N/A
	Spirally wrapped insulation:		N/A
	creepage distances between wrapped layers > cl. 26 _ P1 values		N/A
	path between wrapped layers sealed, the test voltage of K2 is multiplied with 1,35		N/A
	test 26.2.4 – Test A, passed for wrapped layers		N/A
	the finished component pass the electric strength test according to cl. 18.3		N/A
a)	Insulated winding wire used for basic or supplementary insulation in a wound part:		N/A
	comply with annex K		N/A
	two layers for supplementary insulation		N/A
	one layer for basic insulation		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	one layer for mechanical separation between the insulated wires of primary and secondary. This layer fulfils the requirement of basic insulation.		N/A
b)	Insulated winding wire used for reinforced insulation in a wound part:		N/A
	comply with annex K		N/A
	three layers		N/A
	relevant dielectric strength test of 18.3		N/A
	Where the insulated winding wire is wound:		N/A
	upon metal or ferrite cores		N/A
	upon enamelled wire		N/A
	under enamelled wire		N/A
	one layer for mechanical separation between the insulated wires and the core or the enamelled wires is required. This layer fulfils the requirement of basic insulation.		N/A
	both windings shall not touch each other and also not the core.		N/A
	100 % routine test of Annex K3 of part 1 is fulfilled		N/A
	no creepage distances and clearances for insulated winding wires		N/A
c)	Toroidal cores used with TIW wires for double or reinforced insulation between the primary and secondary circuits shall comply with the following:		N/A
	1) a coating which fulfils the requirements of basic insulation between a winding and the core		N/A
	2) The primary winding consists of TIW wire with 3 layers (reinforced insulation) and the secondary winding consists of enamelled wire. These independent windings shall not be able to contact each other either by mechanical separation or a gap which fulfil the dielectric strength tests for basic insulation.		N/A
	3) For polyfilar windings (primary and secondary windings in contact with each other), the primary winding consists of TIW wire with 3 layers and the secondary winding consists of a TIW wire with 1 layer (requirements for primary and secondary windings can be changed). This construction also is allowed for use with EE-cores or similar.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
d)	Toroidal cores used with FIW wires for double or reinforced insulation between the primary and secondary circuits shall comply with the following:		N/A
	1) a coating, which fulfil the requirements of basic insulation.		N/A
	2) The primary winding consists of FIW wire for reinforced insulation and the secondary winding consist of FIW wire – of basic insulation. These independent windings shall not be able to contact each other either by mechanical separation or a gap which fulfil the dielectric strength test for basic insulation.		N/A
	3) For polyfilar windings (primary and secondary windings in contact with each other), the primary winding and the secondary winding consist of FIW wire for reinforced insulation. This construction also is allowed to use for EE-core or similar.		N/A
e)	Toroidal cores used with TIW in combination with FIW wire, for double or reinforced insulation between the primary and secondary circuits shall comply with the following:		N/A
	1) a coating, which fulfils the requirements of basic insulation.		N/A
	2) The primary winding consists of FIW wire for reinforced insulation, and the secondary winding consists of TIW wire for basic insulation (1 layer). These independent windings shall not be able to contact each other either by mechanical separation or a gap which fulfil the dielectric strength tests for basic insulation.		N/A
	3) For polyfilar windings (primary and secondary windings in contact with each other), the primary winding consists of TIW wire for reinforced insulation (3 layer) and the secondary winding consists of FIW wire for reinforced insulation. This construction also is allowed for use with EE-cores or similar.		N/A
f)	Toroidal cores used with TIW in combination with FIW wire, for basic insulation between the primary and secondary circuits shall comply with the following:		N/A
	1) a coating, which fulfils the requirements of basic insulation		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	2) The primary winding consists of FIW wire for basic insulation, and the secondary winding consists of TIW wire for basic insulation (1 layer). These independent windings shall not be able to contact each other either by mechanical separation or a gap which fulfils the dielectric strength tests for basic insulation.		N/A
	3) For polyfilar windings (primary and secondary windings in contact with each other), the primary winding consists of TIW wire for supplementary insulation (2 layers) and the secondary winding consists of FIW wire for basic insulation. This construction also is allowed for use with EE-cores or similar.		N/A
	4) Further polyfilar constructions with FIW and TIW wires in combination with enamelled wires for basic insulation only: 4.1) Primary winding consists of enamelled wire, secondary winding consists of FIW wire for reinforced insulation 4.2) Primary winding consists of enamelled wire, secondary winding consists of TIW wire for reinforced insulation		N/A
BB.19.12.3.1	Max. class F for transformers which use FIW-wire		N/A
BB.19.12.3.2	FIW wires comply with IEC 60851-5:2008, IEC 60317-0-7 and IEC 60317-56.		N/A
	other nominal diameter as mentioned in table 24 can be calculated with the Formula (6) in 26.3.5:		N/A
	FIW wire used for basic or supplementary insulation for transformers according 19.1.3:		N/A
	the test voltage of table 14, based on the working voltage of basic or supplementary insulation, comply with the min. voltage strength of table 24		N/A
	one layer for mechanical separation is located between the insulated wires of primary and secondary. This layer fulfil the requirement of basic insulation		N/A
	between FIW and enamelled wire, no requirements of creepage distances and clearances		N/A
	no touch of FIW and enamelled wires		N/A
	FIW wire used for double or reinforced insulation for transformers according 19.1.4:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	the test voltage of table 14, based on the working voltage of basic or supplementary insulation, comply with the min. voltage strength of table 24		N/A
	for primary and secondary winding FIW-wire for basic insulation is used		N/A
	one layer for mechanical separation is located between the insulated wires of primary and secondary. This layer fulfil the requirement of basic insulation		N/A
	no touch between the basic insulated PRI and SEC FIW-wires		N/A
	between PRI- and SEC-FIW wires, no requirements of creepage distances and clearances		N/A
	Alternative construction used for reinforced insulation (reinforced insulated FIW wire and enamelled wire)		N/A
	the test voltage of table 14, based on the working voltage reinforced insulation, comply with the min. voltage strength of table 24		N/A
	one layer for mechanical separation is located between the reinforced insulated FIW wire and the enamelled wire. This layer fulfil the requirement of basic insulation		N/A
	no touch between the FIW wire and the enamelled wire		N/A
	between the reinforced FIW wire and any other parts, no requirements of creepage distances and clearances exist		N/A
	Alternative construction with FIW wires, basic or supplementary insulated for transformers with double or reinforced insulation:		N/A
	the test voltage of table 14, based on the working voltage of basic or supplementary insulation, comply with the min. voltage strength of table 24		N/A
	PRI or SEC basic insulated FIW wire and to the other winding (enamelled wire) requirements of supplementary insulation		N/A
	creepage distances and clearances between the basic insulated FIW wire and the enamelled wire for basic or supplementary insulation are required.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Where the FIW wire is wound		N/A
	upon metal or ferrite cores		N/A
	one layer for mechanical separation between the insulated wires and the core or the enamelled wires is required. This layer fulfils the requirement of basic insulation.		N/A
	both windings shall not touch each other and also not the core.		N/A
BB.20	COMPONENTS		-
BB.21	INTERNAL WIRING		-
BB.22	SUPPLY CONNECTION AND EXTERNAL FLEXIBLE CABLES AND CORDS		-
BB.23	TERMINALS FOR EXTERNAL CONDUCTORS		-
BB.24	PROVISION FOR PROTECTIVE EARTHING		-
BB.25	SCREWS AND CONNECTIONS		-
BB.26	CREEPAGE DISTANCES AND CLEARANCES		-
BB.26.1	See 26.101		N/A
BB.26.2	Creepage distances (cr) and clearances (cr)		N/A
BB.26.2.1	General		N/A
	The creepage distance and clearance values are shown in Table 20 and Table 21.		N/A
BB.26.2.2	Windings covered with adhesive tape		N/A
	– all insulating materials are classified according to IEC 60085 and IEC 60216 (all parts);		N/A
	– the impulse voltage dielectric test of 6.1.2.2.1 of IEC 60664-1:2007 is fulfilled; and		N/A
	– test A of 26.2.4 is fulfilled		N/A
BB.26.2.3	Uncemented insulating parts pollution degree P2 or P3		N/A
	– all isolating material are classified acc. To IEC 60085 and IEC 60216		N/A
	– values of pollution degree 1 are not applicable		N/A
BB.26.2.4	Cemented insulating parts		N/A
	– all isolating materials are classified acc. To IEC 60085 and IEC 60216		N/A
	– values of distance through insulation (dti) are fulfilled		N/A
	– creepage distances and clearances are not required		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– test A of this sub clause is fulfilled		N/A
	Test A		N/A
	– thermal class		N/A
	– working voltage		N/A
	– Test with three specially specimens, with uninsulated wires, without impregnation or potting	(see appended table)	N/A
	Two of the three specimens are subjected to:		N/A
	– the relevant humidity treatment according to 17.2 (48 h)		N/A
	– the relevant dielectric strength test of 18.3 multiplied with factor 1,35		N/A
	– One of the three specimens is subjected to the relevant dielectric strength test of 18.3 multiplied by the factor 1,35 immediately at the end of the last cycle with high temperature		N/A
	Impulse dielectric test according to 6.1.2.2.1 of IEC 60664-1:2007 – see Annex R of IEC 61558-1		N/A
BB.26.2.5	Enclosed parts, by impregnation or potting		N/A
BB.26.2.5.1	– The requirements of reduced values as stated for pollution degree 1 (P1) are fulfilled		N/A
	– all isolating materials are classified acc. To IEC 60085 and IEC 60216		N/A
	Test B		N/A
	– thermal class		N/A
	– test voltage of 500 V or the working voltage		N/A
	– Test with three specially specimens, potted or impregnated. The dielectric strength test is applied directly to the joint.	(see appended table)	N/A
	Two of the three specimens are subjected to:		N/A
	– the relevant humidity treatment according to 17.2 (48 h)		N/A
	– the relevant dielectric strength test of 18.3 multiplied with factor 1,25		N/A
	– One of the three specimens is subjected to the relevant dielectric strength test of 18.3 multiplied by the factor 1,25 immediately at the end of the last cycle with high temperature		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The three spacemen pass the Impulse dielectric test according to 6.1.2.2.1 of IEC 60664-1:2007– see Annex R of IEC 61558-1		N/A
BB.26.2.5.2	– The requirements of distance through insulation (dti) are fulfilled. (P1 values are not required)		N/A
	– all isolating materials are classified acc. To IEC 60085 and IEC 60216		N/A
	Test C		N/A
	– thermal class		N/A
	– working voltage		N/A
	– Test with three specimens, potted or impregnated. (finished components)	(see appended table)	N/A
	– Neither cracks, nor voids in the insulating compounds		N/A
	Two of the three specimens are subjected to:		N/A
	– the relevant humidity treatment according to 17.2 (48 h)		N/A
	– the relevant dielectric strength test of 18.3 multiplied with factor 1,35		N/A
	– One of the three specimens is subjected to the relevant dielectric strength test of 18.3 multiplied by the factor 1,35 immediately at the end of the last cycle with high temperature		N/A
	The three spacemen pass the Impulse dielectric test according to 4.1.1.2.1 of IEC 60 664-1 (1,2 / 50 s waveform) – see Annex R of IEC 61558-1		N/A
BB.26.3	Distance through insulation		N/A
BB.26.3.1	For supplementary, double or reinforced insulation, the required values of Tables 22 are fulfilled		N/A
	The insulation fulfil the material classification according IEC 60085 and 60216(all parts) or the test of 14.3		N/A
BB.26.3.2	Reduced values of the thickness of insulation for supplementary or reinforced insulation are allowed if the following conditions are fulfilled:		N/A
	– the isolating materials are classified acc. To IEC 60085 and IEC 60216		N/A
	– the test of 14.3 is fulfilled		N/A
	– If both requirements are fulfilled, the required values for solid insulation can be multiplied by 0,4		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– Minimum thickness of reinforced insulation $\geq 0,2$ mm		N/A
	– Minimum thickness of supplementary insulation $\geq 0,1$ mm		N/A
BB.26.3.3	Insulation in thin sheet form		N/A
	– If the layers are non-separable (glued together):		N/A
	– The requirement of 3 layers is fulfilled		N/A
	– The mandrel test according 26.3.4 is fulfilled with 150 N		N/A
	– The required values for d.t.i. of thin layers in Tables 22 is fulfilled.		N/A
	– If the layers are separated:		N/A
	– The requirement of 2 layers is fulfilled		N/A
	– If serrated tape is used, 1 additional layer (serrated) and one additional layer without serration is required		N/A
	– The mandrel test according 26.3.4 is fulfilled on each layer with 50 ± 5 N		N/A
	– The required values for d.t.i. of thin layers in Tale 22 is fulfilled.		N/A
	– If the layers are separated (alternative:		N/A
	– The requirement of 3 layers is fulfilled		N/A
	– If serrated tape is used, 1 additional layer (serrated) and one additional layer without serration is required		N/A
	– The mandrel test according 26.3.4 is fulfilled on 2/3 of the layers with 100 ± 5 N		N/A
	– The required values for d.t.i. of thin layers in Tale 22 is fulfilled.		N/A
	Test according to 14.3 and if the isolating materials are classified acc. To IEC 60085 and IEC 60216 no distances through insulation are required for insulation in thin sheet form		N/A
	The values for thin layers are used for insulation in thin sheet form as follows:		N/A
	– rated output > 100 VA values for thin layers apply		N/A
	– rated output ≥ 25 VA and ≤ 100 VA 2/3 of the values for thin layers apply		N/A
	– rated output < 25 VA 1/3 of the values for thin layers apply		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
BB.26.3.4	Mandrel test of insulation in thin sheet form (specimen of 70±0,5 mm width are necessary):		N/A
	– If the layers are non-separable – at least 3 layers glued together fulfil the test:		N/A
	– pull force of 150 N		N/A
	– high voltage test of 5,0 kV or the test voltage of 18.3 multiplied by 1,25 whatever is the greater. No flashover, no breakdown.		N/A
	– If the layers are separable and 2/3 of at least 3 layers fulfil the test.		N/A
	– pull force of 100 N		N/A
	– high voltage test of 5,0 kV or the test voltage of 18.3 multiplied by 1,25 whatever is the greater. No flashover, no breakdowns.		N/A
	– If the layers are separable 1 of at least 2 layers fulfil the test:		N/A
	– pull force of 50 N		N/A
	– high voltage test of 5,0 kV or the test voltage of 18.3 multiplied by 1,25 whatever is the greater. No flashover, no breakdown.		N/A
BB.26.101	Creepage distances and distances through insulation given in Table 21, Table 22 and Table 23 of IEC 61558-1:2017 are generally applicable (IEC 61558-2-16: 2021)	(see appended table)	N/A
BB.26.102	In compliance with IEC 60664-4:2005, the requirements of 26.103 to 26.106 for creepage distances, clearances and solid insulation are required above 30 kHz and up to the frequency of 3 MHz. For frequencies above 3 MHz, the tests in accordance with 7.4 and 7.5 of IEC 60664-4:2005, high-frequency testing (high-frequency high-voltage test and high-frequency partial discharge test) shall be carried out.		N/A
BB.26.103	Clearance (IEC 61558-2-16:2021)		N/A
	a.) Clearance for frequency ≥ 30 kHz according figure 101 two determinations are necessary:		N/A
	determination based on the rated impulse voltage of the rated supply voltage in accordance with Table 103 and Table 104.		N/A
	determination based on the measured peak working voltage in accordance with Table 106.		N/A
	b.) Clearance for frequency ≤ 30 kHz according figure 101 two determinations are necessary:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– determination based on the rated impulse voltage of the rated supply voltage in accordance with Table 103 and Table 104.		N/A
	– determination based on the measured peak working voltage in accordance with Table 105.		N/A
BB.26.104	The working voltages of Table 105 and Table 106 for determination of clearances are peak working voltages. (IEC 61558-2-16: 2021)		N/A
	All peak working voltages including μ s-peaks shall be used to determine clearances in accordance with Table 105 and Table 106.		N/A
BB.26.105	Creepage distances (IEC 61558-2-16: 2021)		N/A
	Two determinations of creepage distances are necessary (see Figure 102)		N/A
	– determination based on the measured RMS working voltage in accordance with Table 21 of IEC 61558-1:2017;		N/A
	determination based on the measured peak working voltage in accordance with Table 107 to Table 112 and the fundamental frequency shall be considered		N/A
	A high-frequency RMS ripple voltage content not more than 10% can be neglected.		N/A
	The values in Table 107 to Table 112 do not take into account the effects of tracking phenomena for frequencies above 30 kHz.		N/A
	The most severe value of the required creepage distances in accordance with Table 107 to Table 112 for frequencies above 30 kHz and the relevant values in Table 21 of IEC 61558-1:2017 shall take precedence.		N/A
	If the value of the creepage distance is lower than the value of the clearance, the value of the clearance shall be applicable for the creepage distance.		N/A
	The peak working voltage also includes any DC voltage and any repetitive peak impulse generated by the SMPS (see 26.105). A determination based on RMS values is also required (see 26.104 and Table 112).		N/A
BB.26.106	Distance through insulation (IEC 61558-2-16:2021)		N/A
	Instead of partial discharge with high frequency voltage the test of the distance and the calculation of the electric field is applicable under the following conditions:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– the max. frequency is < 10 MHz		N/A
	– the field strength approximately comply with Figure 103		N/A
	– no voids or gaps are present in between the solid insulation		N/A
	For thick layers $d_1 \geq 0,75$ the peak value of the field strength is ≤ 2 kV/mm		N/A
	For thin layers $d_2 \leq 30$ μm the peak value of the field strength is ≤ 10 kV/mm		N/A
	For $d_1 > d > d_2$ formula (2) is used for calculation the field strength		N/A
BB.27	RESISTANCE TO HEAT, FIRE AND TRACKING		-

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Clause	Requirement + Test	Result - Remark	Verdict

IEC 61558-2-16 Annex BB			
Clause	Requirement + Test	Result – Remark	Verdict
BB.E	ANNEX E , GLOW WIRE TEST		-
BB.E.1	The test is required according to IEC 60695-2-10 and IEC 60695-2-11 with the following additions:		N/A
BB.E.2	The requirements of 8.2, “Test temperatures” of IEC 60695-2-11:2014, apply with the temperature stated in 27.4 of IEC 61558-1		N/A
BB.E.3	Clause 7, “Conditioning”, of IEC 60695-2-11:2014 apply, preconditioning is required		N/A
BB.E.4	Clause 8, “Test procedure”, of IEC 60695-2-11:2014 apply, the tip of the glow wire is applied to the flat side of the surface.		N/A
BB.F	ANNEX F, REQUIREMENTS FOR MANUALLY OPERATED SWITCHES WHICH ARE PARTS OF THE TRANSFORMER		-
BB.H	ANNEX H, ELECTRONIC CIRCUITS (IEC 61558-1)		-
BB.K	ANNEX K, INSULATED WINDING WIRES FOR USE AS MULTIPLE LAYER INSULATION		-
BB.K.1	Wire construction:		N/A
	insulated winding wire for basic or supplementary insulation (see 19.12.3)		N/A
	insulated winding wire for reinforced insulation (see 19.12.3)		N/A
	solid circular winding wires and stranded winding wires with 0,05 to 5 mm diameter		N/A
	spirally wrapped insulation – overlapping		N/A
BB.K.2	Type tests		N/A
BB.K.2.1	General Tests between ambient temperature between 15° C and 35° C and at an humidity between 45% and 75 %		N/A
BB K.2.2	Electric strength test		N/A
BB K.2.2.1	Solid circular winding wires and stranded winding wires		N/A
	Test samples prepared according to clause 4.4.1 of IEC 60851-5:2008 (twisted pair)		N/A
	Dielectric strength test: 6 kV for reinforced insulation		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
IEC 61558-2-16 Annex BB			
Clause	Requirement + Test	Result – Remark	Verdict
	Dielectric strength test: 3 kV for basic or supplementary insulation		N/A
BB K.2.2.2	Square or rectangular wires .		N/A
	Test samples prepared according to clause 4.7.1 of IEC 60851-5:2008		N/A
	Dielectric strength test: 5,5 kV for reinforced insulation		N/A
	Dielectric strength test: 2,75 kV for basic or supplementary insulation		N/A
BB K.2.3	Flexibility and adherence		N/A
	Claus 5.1 in Test 8 of IEC 60851-3:2009 shall be used		N/A
	Test samples prepared according to clause 5.1.1.4 of IEC 60851-3:2009		N/A
	Dielectric strength test: 5,5 kV for reinforced insulation		N/A
	Dielectric strength test: 2,75 kV for basic or supplementary insulation		N/A
	Mandrel diameter according table K.1		N/A
	The tension to the wire during winding on mandrel is 118 N/mm ² (118 MPa)		N/A
BB.K.2.4	Heat shock		N/A
	Test samples prepared according to 3.2.1 (in Test 9) of IEC 60851-6:2012		N/A
	• high voltage test immediately after this test		N/A
	• Dielectric strength test: 5,5 kV for reinforced insulation		N/A
	• Dielectric strength test: 2,75 kV for basic or supplementary insulation		N/A
BB.K.2.5	Retention of dielectric strength after bending (test as specified under test 13 of 4.6.1 c) of IEC 60 851-5)		N/A
	• high voltage test immediately after this test		N/A
	• Dielectric strength test: 5,5 kV for reinforced insulation		
	• Dielectric strength test: 2,75 kV for basic or supplementary insulation		
BB.K.3	Testing during manufacturing		N/A

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
IEC 61558-2-16 Annex BB			
Clause	Requirement + Test	Result – Remark	Verdict
BB.K.3.1	General Tests as subjected in K.3.2 and K.3.3		N/A
BB K.3.2	Routine test		N/A
	Dielectric strength test: 4,2 kV for reinforced insulation		N/A
	Dielectric strength test: 2,1 kV for basic or supplementary insulation		N/A
BB K.3.3	Sampling test		N/A
BB K.3.3.1	Solid circular winding wires and stranded winding wires		N/A
	Test with a twisted pair, prepared according clause 4.4.1 of IEC 60851-5:2008		N/A
	Dielectric strength test: 6 kV for reinforced insulation		N/A
	Dielectric strength test: 3 kV for basic or supplementary insulation		N/A
BB K.3.3.2	Square rectangular wire		N/A
	Samples prepared according to clause 4.7.1 of IEC 60851-5:2008		N/A
	Dielectric strength test: 5,5 kV for reinforced insulation		N/A
	Dielectric strength test: 3 kV for basic or supplementary insulation		N/A
BB.U	ANNEX U – INFORMATIVE – OPTIONAL TW – MARKING FOR TRANSFORMERS		-
V	ANNEX V, SYMBOLS TO BE USED FOR THERMAL CUT-OUTS		-

BB.26.2 TEST A	TABLE: CREEPAGE DISTANCES AND CLEARANCES AND DISTANCES THROUGH INSULATION					N/A
	Test with three special prepared specimens with uninsulated wires, without potting or impregnation					
	cycles with 2 x working voltage between pri / sec	68 h at the temperature acc. Cl. 14 (min. 85 °C)	1 hour 25 °C	2 hour 0 °C	1 hour 25 °C	
1.						
2.						
3.						
4.						
5.						

IEC 61558-2-16						
Clause	Requirement + Test			Result - Remark		Verdict
BB.26.2 TEST A	TABLE: CREEPAGE DISTANCES AND CLEARANCES AND DISTANCES THROUGH INSULATION					N/A
	Test with three special prepared specimens with uninsulated wires, without potting or impregnation					
cycles with 2 x working voltage between pri / sec	68 h at the temperature acc. Cl. 14 (min. 85 °C)	1 hour 25 °C	2 hour 0 °C	1 hour 25 °C		
6.						
7.						
8.						
9.						
10.						

BB.26.2 TEST B	TABLE: CREEPAGE DISTANCES AND CLEARANCES AND DISTANCES THROUGH INSULATION					N/A
	Test with three specially prepared specimens with potted – P1 values are required					
	cycles with 2 x working voltage between pri / sec	68 h at the temperature acc. Cl. 14 (min. 85 °C)	1 hour 25 °C	2 hour 0 °C	1 hour 25 °C	
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict

BB.26.2 TEST C	TABLE: CREEPAGE DISTANCES AND CLEARANCES AND DISTANCES THROUGH INSULATION					N/A
	Test with three specially prepared specimens with potting (only dti is required)					
cycles with 2 x working voltage between pri / sec	68 h at the temperature acc. Cl. 14 (min. 85 °C)	1 hour 25 °C	2 hour 0 °C	1 hour 25 °C		
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						

BB.26.3.5	TABLE: CREEPAGE DISTANCES AND CLEARANCES AND DISTANCES THROUGH INSULATION					
	Test for transformers, use FIW-wire					
cycles with 2 x working voltage between pri / sec	68 h at the temperature acc. Cl. 14 (min. 85 °C)	1 hour 25 °C	2 hour 0 °C	1 hour 25 °C		
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict

BB 18.2	TABLE: insulation resistance measurements		N/A
Insulation resistance R between:		R (MΩ)	Required R (MΩ)
Supplementary information:			

BB 18.3	TABLE: Dielectric Strength		N/A
Test voltage applied between:		Test potential applied (V)	Breakdown / flashover (Yes/No)
Supplementary information:			

BB 26	TABLE: Clearance And Creepage Distance Measurements					N/A
clearance cl and creepage distance dcr at/of:	Up (V)	U r.m.s. (V)	Required cl (mm)	cl (mm)	required dcr (mm)	dcr (mm)
Supplementary information:						

BB 26	TABLE: Distance Through Insulation Measurements				N/A
Distance through insulation di at/of:	U r.m.s. (V)	Test voltage (V)	Required di (mm)	di (mm)	
Supplementary information:					

List of test equipment used:

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

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

Clause	Measurement / testing	Testing / measuring equipment / material used, (Equipment ID)	Range used	Last Calibration date	Calibration due date



TEST REPORT EN 50 075

Flat non-rewirable two-pole plugs, 2,5 A 250 V, with cord, for the connection of class II - equipment for household and similar purposes

Report Reference No.: 704102301146-01

Tested by (+ signature): Gang Cheng

Gang Cheng

Approved by (+ signature): Ying Liu

Ying Liu



Date of issue: 2026-08-10

Testing Laboratory: TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch

Address: No.151, Heng Tong Road 200070 Shanghai P.R. China

Testing location / procedure: CCA/ENEC TL ☐ SMT ☐ WMT ☐ TMP ☐

Address: No. 1999, Duhui Road, Shanghai, 201108, P. R. China

Applicant's name: Wandera GmbH

Address: Am Wellenbach 9, D-93149 Nittenau, GERMANY

Test specification:

Standard: EN 50075:1990

Test procedure: TUV product service regulation

Non-standard test method: N/A

Test Report Form No.: EN50075B

TRF originator: OVE

Master TRF: dated 2004-10

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Test item description: Flat non-rewirable two-pole plug integrated in safety light transformer

Trade Mark: N/A

Manufacturer: Same as applicant

Model and/or type reference: N/A

Ratings: 250V~ 50Hz; 2,5A; Class II; IP20

Copy of marking plate

Please see main report.

Summary of testing:

Partly test to comply with end use appliance.

This report should be used in conjunction with report of end use appliance according to EN 61558-2-16.

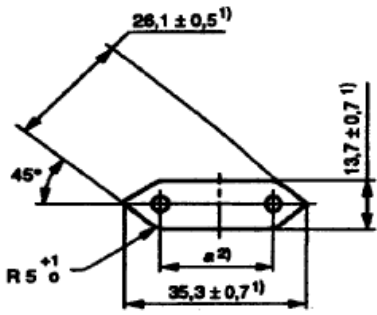
Test item particulars :	
Classification of installation and use	Plug integrated in safety light transformer
Supply Connection.....	Plug in
.....	:
.....	:
Possible test case verdicts:	
- test case does not apply to the test object..... : N/A	
- test object does meet the requirement..... : P(Pass)	
- test object does not meet the requirement : F(Fail)	
Testing :	
Date of receipt of test item : 2023-01-09	
Date (s) of performance of tests : 2023-01-10 to 2023-02-16	
General remarks:	
The present Test Report is not valid as a Test Report according to a Mutual Recognition Agreement (i.e. CCA, ENEC) unless signed by an approved Testing Laboratory and appended to a corresponding Certificate issued by a national Certification Body, signatory to the relevant Scheme.	
The test results presented in this report relate only to the object tested.	
This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.	
"(see Enclosure #)" refers to additional information appended to the report.	
"(see appended table)" refers to a table appended to the report.	
Throughout this report a comma is used as the decimal separator.	
General product information:	
Flat non-rewirable two-pole plug integrated in safety light transformer whose rating is 'input: 230V~ 50Hz; output: SEC1:3,5VDC, 0,766A; SEC2:0,5-3,0VDC, Max.0,7A; Class II; IP20'.	

Clause	Requirement - Test	Result - Remark	Verdict
	First testing set: Sample No. 1, 2 and 3		
5	RATING		
	2,5 A AC 250 V	Tested with appliance	P
6	MARKING		
6.1/2	Rated current: 2,5 A	See end use appliance	N/A
	Rated voltage: 250 V	See end use appliance	N/A
	Nature of supply: AC or DC	~	P
	Name of manufacturer or responsible vendor	See end use appliance	P
	Type reference	See end use appliance	P
6.3	Symbol for Class II construction not allowed		P
6.4	Marking durable		P
	Easily legible		P
	Test: 15 s water and 15 s petroleum spirit		P
7	DIMENSIONS		P
	Compliance with Standard Sheet 1	See attached dimension check datum	P
	Gauges of figures 1 and 2		P
8	PROTECTION AGAINST ELECTRIC SHOCK		P
8.1	Test finger of fig. 3		P
	Ambient temperature	35°C	P
	Force: 75 N		P
8.2	Gauge of fig. 4		P
	Ambient temperature: 35 ± 2 °C	35°C	P
8.3	External parts of insulating material		P
9	CONSTRUCTION		P
9.1	Non-rewirable plug		P
9.2	Switches, fuses and lampholders not incorporated		P
9.3	Pins of plug solid		P
9.4	Pins of plug locked against rotation		P
9.5	Effective permanent connections:		
	- soldered, welded, crimped	soldered	P
	- screwed and snap-on connections not used		P
	- presoldered flexible conductor for crimping not permitted		P
9.6	Gripping operation:		P

Clause	Requirement - Test	Result - Remark	Verdict
	- length $\geq$ 55 mm		P
	- ball test		N/A
10	RESISTANCE TO HUMIDITY		
	No damage after 48 h	Tested with appliance	P
11	INSULATION RESISTANCE AND ELECTRIC STRENGTH		
11.1	Resistance $\geq$ 5 M Ω (500 V, 1 min)	Tested with appliance	P
11.2	Electric strength test (2000 V, 1 min): no flashover or breakdown	Tested with appliance	P
12	FLEXIBLE CORDS AND THEIR CONNECTION		N/A
12.1	Cords in compliance with HD 21.5 or HD 22.4		N/A
13	MECHANICAL STRENGTH		
13.1	Compression test (150 N, 5 min)		P
13.2	Tumbling barrel test: number of falls	Tumbling barrel test performed on sample of switch mode power supply: 1000 times	P
	Torque test on pins (0,4 Nm, 1 min)		P
	Abrasion test (20 000 movements): no damage		P
14	RESISTANCE TO HEAT AND TO AGEING		
14.1.1	Heating test (100 °C, 1 h): no damage	Considered by end use appliance standard	N/A
14.1.2	Pressure test (80°C, 20 N, 1 h): no damage	Considered by end use appliance standard	N/A
15	CURRENT-CARRYING PARTS AND CONNECTIONS		
15.1	Connections withstand the mechanical stresses occurring in normal use		P
15.2	Contact pressure		P
15.3	Material of current-carrying parts	H62	P
16	CREEPAGE DISTANCES, CLEARANCES AND DISTANCES THROUGH INSULATION		
	Creepage distances and clearances between live parts $\geq$ 3 mm	>4 by gauge	P
	Creepage distances and clearances between live parts and accessible external surfaces $\geq$ 3 mm		N/A
	Distance through insulation $\geq$ 1,5 mm	Min. 2,0	P
17	RESISTANCE OF INSULATING MATERIAL TO ABNORMAL HEAT AND TO FIRE		P
	Glow-wire test (750 °C): no visible flame, no sustained glowing or flames and glowing	Considered by end use appliance standard	N/A

Clause	Requirement - Test	Result - Remark	Verdict
	extinguish within 30 s after removal of glow-wire		
	Glow-wire test (650 °C): no visible flame, no sustained glowing or flames and glowing extinguish within 30 s after removal of glow-wire		N/A
	Second testing set: Sample No. 4, 5 and 6		
12.2	Moulded-on plugs		N/A
	Pull test (100 times, 50 N, 1 s)		N/A
	Torque test (1 min):		N/A
	cross-sectional area $\leq 0,5 \text{ mm}^2$, 0,1 Nm: displacement $\leq 2 \text{ mm}$; no break in electrical connections		N/A
	cross-sectional area $\geq 0,75 \text{ mm}^2$, 0,15 Nm: displacement $\leq 2 \text{ mm}$; no break in electrical connections		N/A
13.4	Mechanical strength		P
	Pull test with steel plate on pin (40 N, 70 °C, 1 min): displacement of pin $\leq 1 \text{ mm}$		P
14	Resistance to heat and to ageing		N/A
14.2	Heating test (70 °C, 168 h): no damage, no cracks visible	Considered by end use appliance standard	N/A
	Pressure test (5 N): no traces		N/A
	Third testing set: Sample No. 7, 8 and 9		
12.3	Flexible cords and their connection		N/A
	Flexing test (10 000 flexings, 2,5 A, AC 250 V) - 10 N (cross-sectional area $\leq 0,75 \text{ mm}^2$) - 20 N (cross-sectional area $> 0,75 \text{ mm}^2$) no damage		N/A
	Voltage drop $\leq 10 \text{ mV}$ test current: - 1 A with H03 VH-Y - 2,5 A with other cords		N/A

Attachment: Dimension check of integral power supply plug

Required dim.	Measured dim.	Requirements of EN 50075: 1990
26.1 ± 0.5	26,4	 Top view dimensions: $26,1 \pm 0,5^{1)}$, $13,7 \pm 0,7^{1)}$, 45°, $R 5^{+1}_0$, $a^{2)}$, $35,3 \pm 0,7^{1)}$. Side view dimensions: $\varnothing 3,8 \text{ max. }^{3)}$, 4 min., 10^{+1}_0, $19 \pm 0,5$, $\varnothing 4 \pm 0,06$. Alternative for end of pins: 90° max., $\varnothing 0,7 \text{ to } 1,7$, 2 max.. The edges of the metal parts shall be either chamfered or rounded off. A. Insulating collar B. Metal pin 3) This dimension may be increased to 4mm within a distance of 4mm from the engagement face of the plug.
13.7 ± 0.7	13,5	
35.3 ± 0.7	35,2	
$R 5^{+1}_0$	5	
45°	45°	
$\varnothing 3.8 \text{ Max}$	3,6	
$\varnothing 4 \pm 0.06$	4,0	
19 ± 0.5	19,0	
10^{+1}_0	10,6	
4 Min	18,0	
90° Max	O.K.	
$\varnothing 0.7 \text{ to } 1.7$	O.K.	
2 Max	O.K.	



TEST REPORT
IEC 61347-2-2
Part 2: Particular requirements:
Section 2 – d.c. or a.c. supplied electronic step-down
convertors for filament lamps

Report Number.: 704022605251-00

Date of issue: 2026-08-06

Total number of pages: 29

Name of Testing Laboratory
preparing the Report: TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch

Applicant's name: Wandera GmbH

Address: Am Wellenbach 9
93149 Nittenau
GERMANY

Test specification:

Standard: IEC 61347-2-2:2011 used in conjunction with
IEC 61347-1:2015, AMD1:2017

Test procedure: Without certification

Non-standard test method: N/A

Test Report Form No.: IEC61347_2_2F

Test Report Form(s) Originator: Eurofins Product Service GmbH

Master TRF: 2020-03-06

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General disclaimer:

The test results presented in this report relate only to the object tested.

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Test item description	Electronic transformer (Safety light transformer)		
Trade Mark			
Manufacturer.....	Same as applicant		
Model/Type reference	999999-017-6		
Ratings	Input: 230V~; 50Hz Output 1: 3,5VDC; 766mA. Output 2: 0,5-3,0VDC; Max. 700mA. ta:25°C; tc:40°C; SELV output; Class II; IP20 For other information, please refer to General product information.		
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):			
☒	Testing Laboratory:	TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch No.151 Heng Tong Road. Shanghai 200070 P.R. China	
Testing location/ address		No. 1999, Duhui Road, Shanghai, 201108, P. R. China	
Tested by (name, function, signature)		Jiani WANG Project handler	 
Approved by (name, function, signature)		Xudong ZANG Designated reviewer	
☐	Testing procedure: CTF Stage 1:		
Testing location/ address		N/A	
Tested by (name, function, signature)		N/A	
Approved by (name, function, signature)		N/A	
☐	Testing procedure: CTF Stage 2:		
Testing location/ address		N/A	
Tested by (name + signature)		N/A	
Witnessed by (name, function, signature)...		N/A	
Approved by (name, function, signature)		N/A	
☐	Testing procedure: CTF Stage 3:		
☐	Testing procedure: CTF Stage 4:		
Testing location/ address		N/A	
Tested by (name, function, signature)		N/A	
Witnessed by (name, function, signature)...		N/A	
Approved by (name, function, signature)		N/A	
Supervised by (name, function, signature) :		N/A	

List of Attachments (including a total number of pages in each attachment):

Attachment No. 1: Test for EN IEC 60598-1:2024 + A11:2024 of independent driver (46 Pages)

Attachment No. 2: Test for EN 62493:2015+A1:2022 of EMF (16 Pages)

Attachment No. 3: Photographs (8 Pages)

Summary of testing:

The sample's mentioned in this report is/are submitted/ supplied/ manufactured by client. The laboratory therefore assumes no responsibility for accuracy of information on the brand name, model number, origin of manufacture, consignment or any information supplied.

Tests performed (name of test and test clause):

All applicable tests as described in the compliance checklist were performed at 999999-017-6.

Testing location:

TÜV SÜD Certification and Testing (China) Co., Ltd.
Shanghai Branch

No. 1999, Duhui Road, Shanghai, 201108, P. R.
China

Summary of compliance with National Differences:**List of countries addressed:**

The EUROPEAN GROUP DIFFERENCES between EN 61347-2-2:2012 used in conjunction with EN 61347-1:2015+A1:2021 and IEC 61347-2-2:2011 used in conjunction with IEC 61347-1:2015+A1:2017 is taken into account and found to without modification.

☒ **The product fulfils the requirements of EN 61347-1:2015+A1:2021; EN 61347-2-2:2012; EN 62493:2015+A1:2022**

Statement concerning the uncertainty of the measurement systems used for the tests

(may be required by the product standard or client)

☐ **Internal procedure used for type testing through which traceability of the measuring uncertainty has been established:**

Procedure number, issue date and title:

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

☒ **Statement not required by the standard used for type testing**

(Note: When IEC or ISO standard requires a statement concerning the uncertainty of the measurement systems used for tests, this should be reported above. The informative text in parenthesis should be delete in both cases after selecting the applicable option)

Copy of marking plate

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

Refer to main report 704102301146-01

Test item particulars	Electronic transformer (Safety light transformer)
Classification of installation and use	Independent
Supply Connection	Plug
.....:	
Possible test case verdicts:	
- test case does not apply to the test object.....	N/A
- test object does meet the requirement	P (Pass)
- test object does not meet the requirement.....	F (Fail)
Testing	
Date of receipt of test item	2026-06-01
Date (s) of performance of tests	2026-06-01 to 2026-08-06
General remarks:	
"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report. Throughout this report a ☒ comma / ☐ point is used as the decimal separator. Clause numbers between brackets refer to clauses in IEC 61347-1	
Manufacturer's Declaration per sub-clause 4.2.5 of IEC 61347-1:	
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided:	☐ Yes ☒ Not applicable
When differences exist; they shall be identified in the General product information section.	
Name and address of factory (ies) : NINGBO KELI POWER CO., LTD Lishan Lucheng Miao Development Zone 315490 Yuyao City, Zhejiang PEOPLE'S REPUBLIC OF CHINA	
General product information:	
This test report replaces the previous version 704022300146-00 issued on 2023-03-09 due to Update standard EN IEC 60598-1 and EN 62493 standard	
This independent safety light transformer is used for filament lamps. The product is tested with several 3.5Vd.c. filament lamps which cause maximum output. The lamps for electronic transformer are supplied by manufacturer. This report needs to be used in conjunction with Main report No.: 704102301146-01	

IEC 61347-2-2			
Clause	Requirement + Test	Result - Remark	Verdict
4 (4)	GENERAL REQUIREMENTS		P
- (4)	<u>Insulation materials</u> for double or reinforced insulation according requirements in Annex N of IEC 61347-1	(see Annex N)	N/A
- (4)	Compliance of <u>independent controlgear enclosure</u> with IEC 60 598-1		P
- (4)	<u>Built-in electronic controlgear</u> with double or reinforced insulation comply with Annex O of IEC 61347-1	(see Annex O)	N/A
4 (4)	<u>SELV controlgear</u> comply with Annex I of this part 2 and Annex L of IEC 61347-1	(see Annex L)	P
4 (-)	<u>Auto-wound converters</u> comply with IEC 61558-2-13 and IEC 61558-2-16		N/A
4 (-)	<u>Separating converters</u> comply with IEC 61558-2-1 and IEC 61558-2-16		N/A

6 (6)	CLASSIFICATION		P
	Built-in controlgear	Yes ☐ No ☒	—
	Independent controlgear	Yes ☒ No ☐	—
	Integral controlgear	Yes ☐ No ☒	—
6 (-)	Auto-wound controlgear	Yes ☐ No ☒	—
	Separating controlgear	Yes ☐ No ☒	—
	SELV controlgear	Yes ☒ No ☐	—

7 (7)	MARKING		P
7.1 (7.1)	Mandatory markings		P
	a) mark of origin		P
	b) model number or type reference		P
	c) symbol for independent controlgear, if applicable		P
	d) correlation between interchangeable parts and controlgear marked		N/A
	e) rated supply voltage (V)		P
	supply frequency (Hz)		P
	supply current (A)		P
	f) earthing symbol		N/A
	k) wiring diagram		N/A

IEC 61347-2-2			
Clause	Requirement + Test	Result - Remark	Verdict
	l) value of t_c		P
	m) symbol for declared temperature		N/A
	s) symbol for SELV converter, if applicable		P
	t) LUM earthing symbol		N/A
7.1 (-)	- rated output voltage		P
7.1 (7.2)	Marking durable and legible		P
	Rubbing 15 s water, 15 s petroleum; marking legible		P
7.2 (7.1)	Information to be provided, if applicable		P
	h) declaration of protection against accidental contact		P
	i) cross-section of conductors (mm^2)		N/A
	j) number, type and wattage of lamp(s)		N/A
	s) SELV symbol		P
7.2 (-)	- declaration of mains connected windings		N/A
	- declaration of allowed length of output wire		N/A

8 (10)	PROTECTION AGAINST ACCIDENTAL CONTACT WITH LIVE PARTS		P
- (10.1)	Controlgear protected against accidental contact with live parts		P
- (A2)	Voltage measured with 50 $\text{k}\Omega$	(see Annex A)	N/A
- (A3)	Voltage > 35 V peak or > 60 V d.c. or protective impedance device	(see Annex A)	N/A
- (10.1)	Lacquer or enamel not used for protection or insulation		N/A
	Adequate mechanical strength on parts providing protection		P
- (10.2)	Capacitors > 0,5 μF : voltage after 1 min (V): < 50 V	0,1V	P
- (10.3)	Controlgear providing SELV		P
	Accessible conductive parts are insulated from live parts by double or reinforced insulation in SELV controlgear		N/A
	No connection between output circuit and the body or protective earthing circuit		P
	No possibility of connection between output circuit and the body or protective earthing circuit through other conductive parts		P

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Clause	Requirement + Test	Result - Remark	Verdict
	SELV outputs separated by at least basic insulation		P
	ELV conductive parts insulated as live parts		N/A
	Tests according Annex L of IEC 61347-1	(see Annex L)	P
- (10.4)	Accessible conductive parts in SELV circuits		P
	Output voltage under load ≤ 25 V r.m.s. or ≤ 60 V d.c.		N/A
	If output voltage > 25 V r.m.s. or > 60 V d.c.; No load output ≤ 35 V peak or ≤ 60 V d.c and touch current does not exceed 0,7 mA (peak) or 2 mA d.c.:		N/A
	One conductive part is insulated if output voltage or current exceeding the values above and withstand test voltage 500 V		N/A
	Double or reinforced insulation bridged by appropriate and at least two resistors or two Y2 capacitors or one Y1 capacitor		P
	Y1 or Y2 capacitors comply with IEC 60384-14		P
	Resistors comply with test (a) in 14.1 of IEC 60065		N/A

9 (8)	TERMINALS		N/A
- (8.1)	Integral terminals		N/A
	Screw terminals according section 14 of IEC 60598-1:		N/A
	Separately approved; component list	(see Annex 1)	N/A
	Part of the controlgear	(see Annex 2)	N/A
	Screwless terminals according section 15 of IEC 60598-1:		N/A
	Separately approved; component list	(see Annex 1)	N/A
	Part of the controlgear	(see Annex 3)	N/A
- (8.2)	Terminals other than integral terminals		N/A
	Comply with relevant IEC standard	(see Annex 1)	N/A
	Suit the conditions		N/A
	Satisfy additional relevant requirements of this standard		N/A

10 (9)	PROVISION FOR EARTHING		N/A
- (9.1)	Provisions for protective earthing		N/A
	Terminal complying with clause 8		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Locked against loosening and not possible to loosen by hand		N/A
	Not possible to loosen clamping means unintentionally on screwless terminals		N/A
	All parts of material minimizing the danger of electrolytic corrosion		N/A
	Made of brass or equivalent material		N/A
	Contact surface bare metal		N/A
	Test according 7.2.3 of IEC 60598-1		N/A
- (9.2)	Provision for functional earthing		N/A
	Comply with clause 8 and 9.1		N/A
	Functional earth insulated from live parts by double or reinforced insulation		N/A
- (9.3)	Lamp controlgear with conductors for protective earthing by tracks on printed circuit board		N/A
	Test with a current of 25 A between earthing terminal or earthing contact and each of the accessible metal parts; measured resistance (Ω) at ≥ 10 A according 7.2.3 of IEC 60598-1: $< 0,5 \Omega$		N/A
- (9.4)	Earthing of built-in lamp controlgear		N/A
	Earth by means of fixing to earthed metal of luminaire in compliance of 7.2 of IEC 60598-1		N/A
	Earthing terminal only for earthing the built-in controlgear		N/A
- (9.5)	Earthing via independent controlgear		N/A
- (9.5.1)	Earth connection to other equipment		N/A
	Looping or through connection, conductor min. $1,5 \text{ mm}^2$ and of copper or equivalent		N/A
	Protective earthing wires in line with 5.3.1.1 and clause 7 of IEC 60598-1		N/A
- (9.5.2)	Earthing of the lamp compartments powered via the independent lamp controlgear		N/A
	Test with a current of 25 A between input and output earth terminals; measured resistance (Ω) between earthing terminal or earthing contact and each of the accessible metal parts at ≥ 10 A according 7.2.3 of IEC 60598-1: $< 0,5 \Omega$		N/A
	Output earthing terminal marked as in 7.1 t) of IEC 61347-1		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

11 (11)	MOISTURE RESISTANCE AND INSULATION		P
- (11)	After storage 48 h at 91-95% relative humidity and 20-30 °C measuring of insulation resistance:		P
	For basic insulation $\geq 2 \text{ M}\Omega$		N/A
	For double or reinforced insulation $\geq 4 \text{ M}\Omega$	>199 M Ω	P
	Between primary and secondary circuits in controlgear providing SELV, values in Annex L in IEC 61347-1		P

12 (12)	ELECTRIC STRENGTH		P
- (12)	Immediately after clause 11 electric strength test for 1 min		P
	Basic insulation for SELV, test voltage 500 V		P
	Working voltage $\leq 50 \text{ V}$, test voltage 500 V		N/A
	Working voltage $> 50 \text{ V} \leq 1000 \text{ V}$, test voltage (V):		P
	Basic insulation, $2U + 1000 \text{ V}$		N/A
	Supplementary insulation, $2U + 1000 \text{ V}$		N/A
	Double or reinforced insulation, $4U + 2000 \text{ V}$	2920	P
	No flashover or breakdown		P
	Solid or thin sheet insulation for double or reinforced insulation fulfil the requirements in Annex N in IEC 61347-1		P

14 (14)	FAULT CONDITIONS		P
- (14.1)	When operated under fault conditions the controlgear:		P
	- does not emit flames or molten material		P
	- does not produce flammable gases		P
	- protection against accidental contact not impaired		P
	Thermally protected controlgear does not exceed the marked temperature value		N/A
	Fault conditions: capacitors, resistors or inductors without proof of compliance with relevant specifications have been short-circuited or disconnected	(see appended table)	P
- (14.2)	Short-circuit of creepage distances and clearances if less than specified in clause 16 in Part 1 (after any reduction in 14.2 - 14.5)	(see appended table)	P

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Clause	Requirement + Test	Result - Remark	Verdict
- (14.3)	Short-circuit or interruption of semiconductor devices	(see appended table)	P
- (14.4)	Short-circuit across insulation consisting of lacquer, enamel or textile	(see appended table)	P
- (14.5)	Short-circuit across electrolytic capacitors	(see appended table)	P
	Short-circuit or interruption of SPDs	(see appended table)	N/A
- (14.6)	After the tests has been carried out on three samples:		P
	The insulation resistance $\geq 1 \text{ M}\Omega$	>199 $\text{M}\Omega$	P
	No flammable gases		P
	No accessible parts have become live		P
	During the tests, a five-layer tissue paper, where the test specimen is wrapped, does not ignite		P
- (14.7)	Relevant fault condition tests with high-power a.c. supply and in turn to a d.c. supply		—
14 (-)	Temperature declared thermally protected lamp controlgear fulfil requirements in Annex C		N/A
	The output voltage not exceed 115% of the rated output under fault conditions		P

15 (-)	TRANSFORMER HEATING		P
15.1	General		P
	SELV and separating convertor fulfil requirements in Cl. L.6 and L.7 of IEC 61347-1		P
15.2 (-)	Normal operation		P
	Fulfil requirements in Cl. L.6 of IEC 61347-1		P
	Ambient temperature at t_c if built-in or integral convertor	N/A	—
	Length of output cable	20cm and 200cm	—
15.3 (-)	Abnormal operation		P
	Fulfil requirements in Cl. L.7 of IEC 61347-1	20cm and 200cm	P
	Length of output cable		—
	Double the number of lamps connected in parallel to the output terminals		P
	The output voltage not exceed 115% of the rated output under abnormal conditions		P
	The insulation resistance $\geq 1 \text{ M}\Omega$ after the tests....	>199 $\text{M}\Omega$	P

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Clause	Requirement + Test	Result - Remark	Verdict
	During and at the end of the tests no defect impairing safety, nor any smoke or flammable gases produced		N/A
	The temperature on components in non-totally enclosed convertor do not exceed their rated values		N/A

16 (15)	CONSTRUCTION		P
- (15.1)	Wood, cotton, silk, paper and similar fibrous material		P
	Wood, cotton, silk, paper and similar fibrous material not used as insulation		P
- (15.2)	Printed circuits		P
	Printed circuits used as internal connections complies with clause 14		P
- (15.3)	Plugs and socket-outlets used in SELV or ELV circuits		N/A
	No dangerous compatibility between output socket-outlet and a plug for socket-outlets for input circuit in relation to installation rules, voltages and frequencies		N/A
	Plugs and socket-outlets for SELV comply with IEC 60906-3 and IEC 60884-2-4		N/A
	Plugs and socket-outlets for SELV ≤ 3 A, ≤ 25 V r.m.s. or ≤ 60 V d.c. and ≤ 72 W comply with IEC 60906-3 and IEC 60884-2-4 or:		N/A
	- plugs not able to enter socket-outlets of other standardised system		N/A
	- socket-outlets not admit plugs of other standardised system		N/A
	- socket-outlets without protective earth		N/A
- (15.4)	Insulation between circuits and accessible parts		P
- (15.4.2)	SELV circuits		P
	Source used to supply SELV circuits:		P
	- safety isolating transformer in accordance with relevant part 2 of IEC 61558		N/A
	- controlgear providing SELV in accordance with relevant part 2 of IEC 61347		P
	- another source		N/A
	Voltage in the circuit not higher than ELV		P
	SELV circuits insulated from LV by double or reinforced insulation		P

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Clause	Requirement + Test	Result - Remark	Verdict
	SELV circuits insulated from non SELV circuits by double or reinforced insulation		N/A
	SELV circuits insulated from FELV circuits by supplementary insulation		N/A
	SELV circuits insulated from other SELV circuits by basic insulation		N/A
	SELV circuits insulated from accessible conductive parts according Table 6 in 15.4.5		P
- (15.4.3)	FELV circuits		N/A
	Source used to supply FELV circuits:		N/A
	- separating transformer in accordance with relevant part 2 of IEC 61558		N/A
	- separating controlgear providing basic insulation between input and output circuits in accordance with relevant part 2 of IEC 61347		N/A
	- another source		N/A
	- source in circuits separated by the LV supply by basic insulation		N/A
	Voltage in the circuit not higher than ELV		N/A
	FELV circuits insulated from LV supply by at least basic insulation		N/A
	FELV circuits insulated from other FELV circuits if functional purpose		N/A
	FELV circuits insulated from accessible conductive parts according Table 6 in 15.4.5		N/A
	Plugs and socket-outlets for FELV system comply with:		N/A
	- plugs not able to enter socket-outlets of other voltage systems		N/A
	- socket-outlets not admit plugs of other voltage systems		N/A
	- socket-outlets have a protective conductor contact		N/A
- (15.4.4)	Other circuits		P
	Insulation between circuits other than SELV or FELV and accessible conductive parts in according Table 6 in 15.4.5.		P
- (15.4.5)	Insulation between circuits and accessible conductive parts		P
	Accessible conductive parts insulated from active parts of electric circuits by insulating according Table 6		P

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Clause	Requirement + Test	Result - Remark	Verdict

	Requirements for Class II construction with equipotential bonding for protection against indirect contact with live parts:		N/A
	- all conductive parts are connected together		N/A
	- conductive parts are reliably connected together according test of IEC 60598-1 cl. 7.2.3		N/A
	- conductive parts comply with requirements of Annex A in case of insulation fault		N/A

17 (16)	CREEPAGE DISTANCES AND CLEARANCES		P
- (16.1)	General		P
	Creepage distances and clearances according to 16.2 and 16.3		P
	Controlgears providing SELV comply with additional requirements in Annex L	(see Annex L)	P
	Insulating lining of metallic enclosures		N/A
	Controlgear protected against pollution comply with Annex P	(see Annex P)	N/A
- (16.2)	Creepage distances		P
- (16.2.2)	Minimum creepage distances for working voltages		P
	Creepage distances according to Table 7	(see appended table)	P
- (16.2.3)	Creepage distances for working voltages with frequencies above 30 kHz		N/A
	Creepage distances according to Table 8	(see appended table)	N/A
- (16.3)	Clearances		P
- (16.3.2)	Clearances for working voltages		P
	Clearances distances according to Table 9	(see appended table)	P
- (16.3.3)	Clearances for ignition voltages and working voltages with higher frequencies		N/A
	Clearances distances for basic or supplementary insulation according to Table 10	(see appended table)	N/A
	Clearances distances for reinforced insulation according to Table 11	(see appended table)	N/A

18 (17)	SCREWS, CURRENT-CARRYING PARTS AND CONNECTIONS		P
	Screws, current-carrying parts and connections in compliance with IEC 60598-1 (clause numbers between parentheses refer to IEC 60598-1)		P
(4.11)	Electrical connections		P
(4.11.1)	Contact pressure		P
(4.11.2)	Screws:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- self-tapping screws		N/A
	- thread-cutting screws		N/A
(4.11.3)	Screw locking:		N/A
	- spring washer		N/A
	- rivets		N/A
(4.11.4)	Material of current-carrying parts		P
(4.11.5)	No contact to wood or mounting surface		N/A
(4.11.6)	Electro-mechanical contact systems		N/A
(4.12)	Mechanical connections and glands		P
(4.12.1)	Screws not made of soft metal		N/A
	Screws of insulating material		N/A
	Torque test: torque (Nm); part..... :		N/A
	Torque test: torque (Nm); part..... :		N/A
	Torque test: torque (Nm); part..... :		N/A
(4.12.2)	Screws with diameter < 3 mm screwed into metal		N/A
(4.12.4)	Locked connections:		N/A
	- fixed arms; torque (Nm)..... :		N/A
	- lampholder; torque (Nm) :		N/A
	- push-button switches; torque 0,8 Nm..... :		N/A
(4.12.5)	Screwed glands; force (Nm) :		N/A

19 (18)	RESISTANCE TO HEAT, FIRE AND TRACKING		P
- (18.1)	Ball-pressure test :	See Test Table 19 (18.1)	P
- (18.2)	Test of printed boards :	See Test Table 19 (18.2)	P
- (18.3)	Glow-wire test :	See Test Table 19 (18.3)	P
- (18.4)	Needle flame test :	See Test Table 19 (18.4)	P
- (18.5)	Tracking test :	See Test Table 19 (18.5)	N/A

20 (19)	RESISTANCE TO CORROSION		N/A
	- test according 4.18.1 of IEC 60598-1		N/A
	- adequate varnish on the outer surface		N/A

14	TABLE: tests of fault conditions		
Part	Simulated fault		Hazard

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Clause	Requirement + Test	Result - Remark	Verdict
Output of transformer	Short-circuit, nothing impair safety		NO
D7	Short-circuit, nothing impair safety		NO
C10	Short-circuit, nothing impair safety		NO
D5	Short-circuit, nothing impair safety		NO
C1	Short-circuit, nothing impair safety		NO
D1	Short-circuit, nothing impair safety		NO

17 (16)		TABLE: clearance and creepage distance measurements (mm)						P
Applicable part of IEC 61347-1 Table 7 – 11*								
Distances	Insulation type **	Measured clearance	Required		Measured creepage	Required		
			clearance	*Table		creepage	*Table	
Distance 1:	B	2,8	1,5	9	2,8	2,5	7	
Working voltage (V)					230V~		—	
Frequency if applicable (kHz)					N/A		—	
PTI					< 600 ☒ ≥ 600 ☐		—	
Peak value of the working voltage $\hat{U}_{out}$ if applicable (kV)					N/A		—	
Pulse voltage if applicable (kV)					N/A		—	
Supplementary information: L & N								
Distance 2:	R	6,3	3	9	6,3	5	7	
Working voltage (V)					230V~		—	
Frequency if applicable (kHz)					N/A		—	
PTI					< 600 ☒ ≥ 600 ☐		—	
Peak value of the working voltage $\hat{U}_{out}$ if applicable (kV)					N/A		—	
Pulse voltage if applicable (kV)					N/A		—	
Supplementary information: PRI & SEC								
Distance 3:	R	>6,5	3	9	>6,5	5	7	
Working voltage (V)					230V~		—	
Frequency if applicable (kHz)					N/A		—	
PTI					< 600 ☒ ≥ 600 ☐		—	
Peak value of the working voltage $\hat{U}_{out}$ if applicable (kV)					N/A		—	
Pulse voltage if applicable (kV)					N/A		—	
Supplementary information: Live parts & enclosure								

** Insulation type: B – Basic; S – Supplementary; R – Reinforced

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Clause	Requirement + Test	Result - Remark	Verdict

19 (18.1)	TABLE: Ball Pressure Test			P
Allowed impression diameter (mm)		2		—
Object/ Part No./ Material	Manufacturer/ trademark	Test temperature (°C)	Impression diameter (mm)	
Enclosure	Refer to CDF	75	1,2	
PCB	Refer to CDF	125	1,1	
Bobbin	Refer to CDF	125	0,8	
Supplementary information:				

19 (18.2)	TABLE: Test of printed boards				P
Object/ Part No./ Material	Manufacturer/ trademark	Duration of application of test flame (s)	Ignition of specified layer Yes/No	Duration of burning (s)	Verdict
PCB	Refer to CDF	10s	No	No	P
Supplementary information:					

19 (18.3)	TABLE: Glow-wire test				P
Glow wire temperature..... :		650°C			—
Object/ Part No./ Material	Manufacturer/ trademark		Ignition of specified layer Yes/No	Duration of burning (s)	Verdict
Enclosure	Refer to CDF		No	No burning	P
Lining	Refer to CDF		No	No burning	P
Tape	Refer to CDF		No	No burning	P
Supplementary information:					

19 (18.4)	TABLE: Needle-flame test				P
Object/ Part No./ Material	Manufacturer/ trademark	Duration of application of test flame (s)	Ignition of specified layer Yes/No	Duration of burning (s)	Verdict
Bobbin	See CDF	10	No	No	P
Supplementary information:					

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Clause	Requirement + Test			Result - Remark	Verdict
19 (18.5)	TABLE: Proof tracking test				N/A
Test voltage PTI :			175 V		—
Object/ Part No./ Material	Manufacturer/ trademark	Withstand 50 drops without failure on three places or on three specimens			Verdict
Supplementary information:					

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Clause	Requirement + Test	Result - Remark	Verdict
(A)	ANNEX A - TEST TO ESTABLISH WHETHER A CONDUCTIVE PART IS A LIVE PART WHICH MAY CAUSE AN ELECTRIC SHOCK		N/A
(A.1)	Comply with A.2 or A.3		N/A
(A.2)	Voltage ≤ 35 V peak or ≤ 60 V d.c. :		N/A
(A.3)	If voltage measured according Clause A.2 exceeds the limit value; touch current does not exceed 0,7 mA (peak) or 2 mA d.c. :		N/A
	Comply with Annex G.2 of IEC 60598-1		N/A
(C)	ANNEX C – PARTICULAR REQUIREMENTS FOR ELECTRONIC LAMP CONTROLGEAR WITH MEANS OF PROTECTION AGAINST OVERHEATING		N/A
(C3)	GENERAL REQUIREMENTS		N/A
(C3.1)	Thermal protection means integral with the convertor, protected against mechanical damage		N/A
	Renewable only by means of a tool		N/A
	If function depending on polarity, for cord-connected equipment protection means in both leads		N/A
	Thermal links comply with IEC 60691		N/A
	Electrical controls comply with IEC 60730-2-3		N/A
(C3.2)	No risk of fire by breaking (clause C7)		N/A
(C5)	CLASSIFICATION		N/A
	a) automatic resetting type		—
	b) manual resetting type		—
	c) non-renewable, non-resetting type		—
	d) renewable, non-resetting type		—
	e) other type of thermal protection; description .. :		—
(C6)	MARKING		N/A
(C6.1)	Symbol for temperature declared thermally protected ballasts		N/A
(C6.2)	Declaration of the type of protection provided		N/A
(C7)	LIMITATION OF HEATING		N/A
(C7.1)	Preselection test:		N/A
	Test sample placed for at least 12 h in an oven having temperature ($t_c - 5$) K		N/A
	No operation of the protection device		N/A

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Clause	Requirement + Test	Result - Remark	Verdict

(C7.2)	Functioning of protection means:		N/A
	Normal operation of the sample in a test enclosure according to Annex D at an ambient temperature such that ($t_c +0; -5$) °C is obtained		N/A
	No operation of the protection device		N/A
	Introducing of the most onerous test condition determined during test of clause 14.2 to 14.5		N/A
	Output of windings connected to the mains supply short-circuited, and other part of the controlgear operated under normal conditions		N/A
	Increasing of the current through the windings continuously until operation of the protection means		N/A
	Continuous measuring of the highest surface temperature		N/A
	Ballasts according to C5 a) or C5 e) operated until stable conditions are achieved		N/A
	Automatic-resetting thermal protectors working 3 times		N/A
	Ballasts according to C5 b) working 6 times		N/A
	Ballasts according to C5 c) and C5) d) working once		N/A
	Highest temperature does not exceed the marked value		N/A
	Any overshoot of 10% over the marked value within 15 min		N/A
	After 15 min value not exceed marked value		N/A

(D)	ANNEX D – REQUIREMENTS FOR CARRY OUT THE HEATING TESTS OF THERMALLY PROTECTED LAMP CONTROLGEAR		N/A
	Tests in C7 performed in accordance with Annex D, if applicable		N/A

(F)	ANNEX F – DRAUGHT-PROOF ENCLOSURE		P
	Draught-proof enclosure in accordance with the description		P
	Dimensions of the enclosure		P
	Other design; description		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
(H)	ANNEX H - TESTS		P
	All tests performed in accordance with the advice given in Annex H, if applicable		P
I (L)	ANNEX I IN THIS PART 2 – PARTICULAR ADDITIONAL REQUIREMENTS FOR SELV D.C. OR A.C. SUPPLIED ELECTRONIC STEP-DOWN CONVERTORS FOR FILAMENT LAMPS		P
(L.3)	Classification		P
	Class I	Yes ☐ No ☒	—
	Class II	Yes ☒ No ☐	—
	Class III	Yes ☐ No ☒	—
	non-inherently short circuit proof controlgear	Yes ☐ No ☒	—
	inherently short circuit proof controlgear	Yes ☒ No ☐	—
	fail safe controlgear	Yes ☐ No ☒	—
	non-short-circuit proof controlgear	Yes ☐ No ☒	—
(L.4)	Marking		P
	Adequate symbols are used		P
(L.5)	Protection against electric shock		P
	Comply with clause 9.2 of IEC 61558-1		P
(L.6)	Heating		P
	No excessive temperatures in normal use		P
	Value if capacitor t_c marked	N/A	—
	Winding insulation classified as Class	Class B	—
	Comply with tests of clause 14 of IEC 61558-1 with adjustments		N/A
(L.7)	Short-circuit and overload protection		P
	Comply with tests of clause 15 of IEC 61558-1 with adjustments		P
(L.8)	Insulation resistance and electric strength		P
(L.8.1)	Conditioned 48 h between 91 % and 95 %		P
(L.8.2)	Insulation resistance		P
	Between input- and output circuits not less than 5 M Ω		P
	Between metal parts of class II convertors which are separated from live parts by basic insulation only and the body not less than 5 M Ω		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Between metal foil in contact with the inner and outer surfaces of enclosures of insulating material not less than 2 MΩ		N/A
(L.8.3)	Electric strength		P
	1) Between live parts of input circuits and live parts of output circuits	2920	P
	2) Over basic or supplementary insulation between:		P
	a) live parts having different polarity		N/A
	b) live parts and body if intended to be connected to protective earth		N/A
	c) accessible metal parts and a metal rod of the same diameter as the flexible cable or cord	1460	P
	d) live parts and an intermediate metal part		N/A
	e) intermediate metal parts and the body		N/A
	f) each input circuit and all other input circuits ...		N/A
	3) Over reinforced insulation between the body and live parts	2920	P
(L.9)	Construction		P
(L.9.1)	Transformer comply with 19.12 of IEC 61558-1 and 19 of IEC 61558-2-6		P
	HF transformer comply with 19 of IEC 61558-2-16		P
(L.10)	Components		P
	Protective devices comply with 20.6 – 20.11 of IEC 61558-1		P
(L.11)	Creepage distances, clearances and distances through insulation		P
	Creepage distances and clearances not less than in Clause 16		P
	Distance through insulation according Table L.5 in IEC 61347-1		P
	1) Basic distance through insulation		N/A
	Required distance (mm)		—
	Measured (mm)		N/A
	Supplementary information		—
	2) Supplementary distance through insulation		P
	Required distance (mm)	0,13	—
	Measured (mm)	0,15	P
	Supplementary information		—
	3) Reinforced distance through insulation		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Required distance (mm)	0,8	—
	Measured (mm)	1,0	P
	Supplementary information		—

(N)	ANNEX N: REQUIREMENTS FOR INSULATION MATERIALS USED FOR DOUBLE OR REINFORCED INSULATION		N/A
(N.4)	General requirements		N/A
(N.4.1)	Material comply with IEC 60085 and IEC 60216 series		N/A
(N.4.2)	Solid insulation		N/A
	Electric strength test at least 5 kV or 1,35 x test voltage in Table N.1		N/A
	If not classified according IEC 60085 and IEC 60216 series: Electric strength test increased 10 % of 5,5 kV or 1,5 x test voltage in Table N.1		N/A
(N.4.3)	Thin sheet insulation		N/A
(N.4.3.1)	Thickness and composition of thin sheet insulation		N/A
	- Inside the ballast and not subjected to handling or abrasion during the production and during maintenance		N/A
	- Non-separated layers: Min. 3 layers and fulfil mandrel test of 150N		N/A
	- Separated layers: Min. 2 layers and each layer fulfil mandrel test of 50N		N/A
	- Separated layers (alternative): Min. 3 layers and 2/3 of the layers fulfil mandrel test of 100N		N/A
(N.4.3.2)	Mandrel test (electric strength test during mechanical stress)		N/A
	Electric strength test after mandrel test:		N/A
	- Non-separated layers: min. 5 kV or 1,35 x test voltage in Table N.1		N/A
	- 2/3 of min. 3 separated layers: min. 5 kV or 1,25 x test voltage in Table N.1		N/A
	- one of 2 separated layers: min. 5 kV or 1,25 x test voltage in Table N.1		N/A
	No flashover or breakdown occurred		N/A

(O)	ANNEX O: ADDITIONAL REQUIREMENTS FOR BUILT-IN ELECTRONIC CONTROLGEAR WITH DOUBLE OR REINFORCED INSULATION		N/A
(O.6)	Marking		N/A

IEC 61347-2-2			
Clause	Requirement + Test	Result - Remark	Verdict
	Marking according clause 7 (7)	See clause 7	N/A
	Special symbol		N/A
	Meaning of the special symbol explained in catalogue		N/A
(O.7)	Protection against accidental contact with live parts		N/A
	Requirements of clause 8 (10)	See clause 8	N/A
	Test finger not possible to make contact with basic insulated metal parts		N/A
(O.8)	Terminals		N/A
	Clause 9 (8)	See clause 9	N/A
(O.9)	Provision for earthing		N/A
	Functional earthing terminals comply with clause 9 of part 1		N/A
	No protective earthing terminal		N/A
(O.10)	Moisture resistance and insulation		N/A
	Clause 11 (11)	See clause 11	N/A
(O.11)	Electric strength		N/A
	Clause 12 (12)	See clause 12	N/A
(O.13)	Fault conditions		N/A
	Clause 14 (14)	See clause 14	N/A
	End of test, between live part and accessible metal parts or external parts of insulating material in contact with the supporting surface comply with dielectric strength test according clause 12 reduced to 35 % of values according Table 13 in part 1		N/A
	Insulation resistance according to O.10 between live part and accessible metal parts or external parts of insulating material in contact with the supporting surface not less than 4 MΩ		N/A
(O.14)	Construction		N/A
	Clause 17 (15)	See clause 17	N/A
	Accessible metal parts insulated from live parts by double or reinforced insulation		N/A
	Live part insulated from supporting surface in contact with external faces by double or reinforced insulation		N/A
(O.15)	Creepage distances and clearances		N/A
	Clause 18 (16)	See clause 18	N/A

IEC 61347-2-2			
Clause	Requirement + Test	Result - Remark	Verdict
	Comply with corresponding values for luminaries in IEC 60598-1		N/A
(O.16)	Screws, current-carrying parts and connections		N/A
	Clause 19 (17)	See clause 19	N/A
(O.17)	Resistance to heat and fire		N/A
	Clause 20 (18)	See clause 20	N/A
(O.18)	Resistance to corrosion		N/A
	Clause 21 (19)	See clause 21	N/A

(P)	ANNEX P - Creepage distances and clearances and distance through isolation (DTI) for lamp controlgear which are protected against pollution by the use of coating or potting		N/A
(P.1)	General		N/A
	P.2 applies if creepage distances less than the minimum in Table 7 and 8		N/A
	P.3 applies if clearance less than the minimum in Table 9, 10 and 11		N/A
(P.2)	Creepage distances		N/A
(P.2.2)	Minimum creepage distances for working voltages and rated voltages with frequencies up to 30 kHz (Table P.1)		N/A
	Basic or supplementary insulation:		N/A
	Required creepage		—
	Measured		N/A
	Supplementary information		—
	Reinforced insulation:		N/A
	Required creepage		—
	Measured		N/A
	Supplementary information		—
(P.2.3)	Creepage distances for working voltages with frequencies above 30 kHz (Table P.2)		N/A
	Voltage $\hat{U}_{out}$ kV		—
	Frequency		—
	Required distance		—
	Measured		N/A
	Supplementary information		—
(P.2.4)	Compliance with the required creepage distances		N/A

IEC 61347-2-2			
Clause	Requirement + Test	Result - Remark	Verdict
(P.2.4.1)	Compliance in accordance with 16.3.3 and test according P.2.4.2		N/A
(P.2.4.3)	Electrical tests after conditioning		N/A
(P.2.4.3.1)	Insulation resistance and electric strength according Clause 11 and 12		N/A
(P.3)	Distance through isolation		N/A
(P.3.4)	Electrical tests after conditioning		N/A
(P.3.4.1)	Insulation resistance and electric strength according Clause 11 and 12		N/A
(P.3.4.2)	Impulse voltage dielectrical test		N/A
	Basic or supplementary insulation:		N/A
	Working/rated voltage		—
	Impulse voltage.....		N/A
	Supplementary information		—
	Reinforced insulation:		N/A
	Working/rated voltage		—
	Impulse voltage.....		N/A
	Supplementary information		—

IEC 61347-2-2			
Clause	Requirement + Test	Result - Remark	Verdict

ANNEX 1		TABLE: Critical components information (Refer to main report 704102301146-01)					P
Object / part No.	Code	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity ¹⁾	
Description:							
Description:							
Description:							
Supplementary information: ¹⁾ Provided evidence ensures the agreed level of compliance. See OD-CB2039. The codes above have the following meaning: A - The component is replaceable with another one, also certified, with equivalent characteristics B - The component is replaceable if authorised by the test house C - Integrated component tested together with the appliance D - Alternative component							

IEC 61347-2-2			
Clause	Requirement + Test	Result - Remark	Verdict
ANNEX 2	Screw terminals (part of the controlgear)		N/A
(14)	SCREW TERMINALS(IEC 60598-1)		N/A
(14.2)	Type of terminal		—
	Rated current (A)		—
(14.3.2.1)	One or more conductors		N/A
(14.3.2.2)	Special preparation		N/A
(14.3.2.3)	Terminal size		N/A
	Cross-sectional area (mm ²)		—
(14.3.3)	Conductor space (mm)		N/A
(14.4)	Mechanical tests		N/A
(14.4.1)	Minimum distance		N/A
(14.4.2)	Cannot slip out		N/A
(14.4.3)	Special preparation		N/A
(14.4.4)	Nominal diameter of thread (metric ISO thread).....	M	N/A
	External wiring		N/A
	No soft metal		N/A
(14.4.5)	Corrosion		N/A
(14.4.6)	Nominal diameter of thread (mm)		N/A
	Torque (Nm).....		N/A
(14.4.7)	Between metal surfaces		N/A
	Lug terminal		N/A
	Mantle terminal		N/A
	Pull test; pull (N).....		N/A
(14.4.8)	Without undue damage		N/A

IEC 61347-2-2			
Clause	Requirement + Test	Result - Remark	Verdict
ANNEX 3	Screwless terminals (part of the controlgear)		N/A
(15)	SCREWLESS TERMINALS (IEC 60598-1)		N/A
(15.2)	Type of terminal.....:		—
	Rated current (A).....:		—
(15.3.1)	Material		N/A
(15.3.2)	Clamping		N/A
(15.3.3)	Stop		N/A
(15.3.4)	Unprepared conductors		N/A
(15.3.5)	Pressure on insulating material		N/A
(15.3.6)	Clear connection method		N/A
(15.3.7)	Clamping independently		N/A
(15.3.8)	Fixed in position		N/A
(15.3.10)	Conductor size		N/A
	Type of conductor		N/A
(15.5)	Terminals and connections for internal wiring		N/A
(15.5.1)	Mechanical tests		N/A
(15.5.1.1.1)	Pull test spring-type terminals (4 N, 4 samples)		N/A
(15.5.1.1.2)	Pull test pin or tab terminals (4 N, 4 samples)		N/A
	Insertion force not exceeding 50 N		N/A
(15.5.1.2)	Permanent connections: pull-off test (20 N)		N/A
(15.5.2)	Electrical tests		N/A
	Voltage drop (mV) after 1 h (4 samples).....:		N/A
	Voltage drop of two inseparable joints		N/A
	Number of cycles:		—
	Voltage drop (mV) after 10th alt. 25th cycle (4 samples).....:		N/A
	Voltage drop (mV) after 50th alt. 100th cycle (4 samples).....:		N/A
	After ageing, voltage drop (mV) after 10th alt. 25th cycle (4 samples)		N/A
	After ageing, voltage drop (mV) after 50th alt. 100th cycle (4 samples)		N/A
(15.6)	Terminals and connections for external wiring		N/A
(15.6.1)	Conductors		N/A
	Terminal size and rating		N/A
15.6.2	Mechanical tests		N/A

IEC 61347-2-2			
Clause	Requirement + Test	Result - Remark	Verdict
(15.6.2.1)	Pull test spring-type terminals or welded connections (4 samples); pull (N)		N/A
(15.6.2.2)	Pull test pin or tab terminals (4 samples); pull (N)		N/A
(15.6.3)	Electrical tests		N/A
	Tests according 15.6.3.1 + 15.6.3.2 in IEC 60598-1		N/A

(15.6.3.1) (15.6.3.2)	TABLE: Contact resistance test / Heating tests										N/A
	Voltage drop (mV) after 1 h										—
terminal	1	2	3	4	5	6	7	8	9	10	
voltage drop (mV)											
	Voltage drop of two inseparable joints										
	Voltage drop after 10th alt. 25th cycle										
	Max. allowed voltage drop (mV) :										—
terminal	1	2	3	4	5	6	7	8	9	10	
voltage drop (mV)											
	Voltage drop after 50th alt. 100th cycle										
	Max. allowed voltage drop (mV) :										—
terminal	1	2	3	4	5	6	7	8	9	10	
voltage drop (mV)											
	Continued ageing: voltage drop after 10th alt. 25th cycle										
	Max. allowed voltage drop (mV) :										—
terminal	1	2	3	4	5	6	7	8	9	10	
voltage drop (mV)											
	Continued ageing: voltage drop after 50th alt. 100th cycle										
	Max. allowed voltage drop (mV) :										—
terminal	1	2	3	4	5	6	7	8	9	10	
voltage drop (mV)											
Supplementary information:											



TEST REPORT
IEC 60598-2-1
Luminaires
Part 2-1: Particular requirements –
Fixed general-purpose luminaires

Report Number 704022605251-00 Attachment No. 1

Date of issue 2026-08-06

Total number of pages 46

Name of CB Testing Laboratory preparing the Report TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch

Applicant's name Wandera GmbH

Address Am Wellenbach 9
93149 Nittenau
GERMANY

Test specification:

Standard IEC 60598-2-1:2020 used in conjunction with IEC 60598-1:2024

Test procedure Without certification

Non-standard test method N/A

TRF template used IECEE OD-2020-F1:2024, Ed.1.7

Test Report Form No. IEC60598_2_1K

Test Report Form(s) Originator Intertek Semko AB

Master TRF Dated 2025-08-29

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General disclaimer:

The test results presented in this report relate only to the object tested.

This report shall not be reproduced, except in full, without the written approval of the Issuing NCB. The authenticity of this Test Report and its contents can be verified by contacting the NCB, responsible for this Test Report.

Test item description	Electronic transformer (Safety light transformer)		
Trade Mark(s)			
Manufacturer	Same as applicant		
Model/Type reference	Refer to 704022605251-00		
Ratings	Refer to 704022605251-00		
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):			
☒	Testing Laboratory:	TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch No.151 Heng Tong Road. Shanghai 200070 P.R. China	
Testing location/ address		No.1999, Duhui Road, Shanghai, 201108, P. R. China	
Tested by (name, function, signature)		Jiani WANG Project handler	 
Approved by (name, function, signature) ..		Xudong ZANG Designated reviewer	
☐	Testing procedure: CTF Stage 1:	N/A	
Testing location/ address		N/A	
Tested by (name, function, signature)		N/A	
Approved by (name, function, signature) ..		N/A	
☐	Testing procedure: CTF Stage 2:	N/A	
Testing location/ address		N/A	
Tested by (name + signature)		N/A	
Witnessed by (name, function, signature) .		N/A	
Approved by (name, function, signature) ..		N/A	
☐	Testing procedure: CTF Stage 3:	N/A	
☐	Testing procedure: CTF Stage 4:	N/A	
Testing location/ address		N/A	
Tested by (name, function, signature)		N/A	
Witnessed by (name, function, signature) .		N/A	
Approved by (name, function, signature) ..		N/A	
Supervised by (name, function, signature) :		N/A	

List of Attachments (including a total number of pages in each attachment): N/A	
Summary of testing: All applicable hazards are covered by the harmonized standard. The sample's mentioned in this report is/are submitted/ supplied/ manufactured by client. The laboratory therefore assumes no responsibility for accuracy of information on the brand name, model number, origin of manufacture, consignment or any information supplied.	
Tests performed (name of test and test clause): EN IEC 60598-1:2024 + A11:2024	Testing location: (CBTL, SPTL, CTF, Subcontractor) TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch No. 1999, Duhui Road, Shanghai, 201108, P. R. China
Summary of compliance with National Differences • IECIEE Member countries that are also CENELEC members Compliance with Group Differences evaluated ☒ yes ☐ No ☐ N/A • IECIEE Member countries with published National Differences which were evaluated: European group differences • IECIEE Member countries that did not publish any National Differences: N/A To support compliance with published National Differences, attach a compilation of relevant ND and/or GD TRFs to the CB Test Report	

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

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

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

Information on uncertainty of measurement:

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

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

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

Copy of marking plate:

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

Refer to 704022605251-00

Test item particulars: Electronic transformer (Safety light transformer)	
Classification of installation and use: Independent	
Supply Connection: Plug	
Possible test case verdicts: - test case does not apply to the test object.....: N/A - test object does meet the requirement.....: P (Pass) - test object does not meet the requirement.....: F (Fail)	
Testing: Date of receipt of test item: 2026-06-01 Date (s) of performance of tests: 2026-06-01 to 2026-08-06	
General remarks:	
"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report. Throughout this report a ☒ comma / ☐ point is used as the decimal separator. The manufacturer/ Importer has to ensure the appliance placing on the EU market conforms to the applicable EU directives which provide the affixing of the CE marking, such as LVD, EMC, RoHS, ErP, and so on.	
Manufacturer's Declaration per sub-clause 4.2.5 of IEC60598-2-1K:	
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided:	☐ Yes ☒ Not applicable
When differences exist; they shall be identified in the General product information section.	

Name and address of factory (ies) : NINGBO KELI POWER CO., LTD Lishan Lucheng Miao Development Zone 315490 Yuyao City, Zhejiang PEOPLE'S REPUBLIC OF CHINA
--

General product information and other remarks:

Refer to 704022605251-00

IEC 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
1.4 (4)	GENERAL TEST REQUIREMENTS		P
1.4 (4.1.2)	More parts of IEC 60598-2 series applicable :	Yes ☐ No ☒	—
	Part(s)..... :		
1.4 (4.2)	Batteries or EDLCs operated luminaire	(see ANNEX 5)	N/A
1.4 (4.3)	Components	(see ANNEX 1)	—
1.4 (4.4)	Information for luminaire design in light sources standards		—
1.4 (4.4.2)	Light source and/or controlgear safety standard :		—
	Luminaire design in the light source and/or controlgear safety standard		N/A
1.5 (5)	CLASSIFICATION OF LUMINAIRES		P
1.5 (5.2)	Type of protection :	Class II	P
1.5 (5.3)	Degree of protection..... :	IP 20	—
1.5 (5.4)	Luminaire suitable for direct mounting on normally flammable surfaces :	Yes ☒ No ☐	—
1.5 (5.5)	Luminaire for normal use :	Yes ☒ No ☐	—
	Luminaire for rough service :	Yes ☐ No ☒	—
1.6 (6)	MARKING		P
1.6 (6.1)	Language of instructions		P
1.6 (6.2)	Marking on luminaire		P
	Position of the marking		P
	Format of symbols/text		P
1.6 (6.3)	Information on luminaire		P
1.6 (6.4)	Additional information		N/A
1.6 (6.4.2)	Combination luminaires		N/A
1.6 (6.4.3)	Rated frequency in Hz		N/A
1.6 (6.4.4)	Operating temperature		N/A
1.6 (6.4.5)	Wiring diagram		N/A
1.6 (6.4.6)	Special conditions		N/A
1.6 (6.4.7)	Metal halide lamp luminaire – warning		N/A
1.6 (6.4.8)	Limitation for semi-luminaires		N/A
1.6 (6.4.9)	Power factor and supply current		N/A

IEC 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
1.6 (6.4.10)	Luminaires using remote controlgear		N/A
1.6 (6.4.11)	Clip-mounted luminaire – warning		N/A
1.6 (6.4.12)	Specifications of protective shields		N/A
1.6 (6.4.13)	Rough service luminaire		N/A
1.6 (6.4.14)	Mounting instruction for type Y, type Z and some type X attachments	type Z	P
1.6 (6.4.15)	Non-ordinary luminaires with PVC cable		N/A
1.6 (6.4.16)	Protective conductor current in instruction if applicable		N/A
1.6 (6.4.17)	Provided with information if not intended to be mounted within arm's reach		N/A
1.6 (6.4.18)	Non replaceable and non-user replaceable light sources information provided		N/A
1.6 (6.4.19)	Controllable luminaires, classification of insulation provided		N/A
1.6 (6.4.20)	Luminaires without controlgear provided with necessary information for selection of appropriate component		N/A
1.6 (6.4.21)	If not supplied with terminal block, information on the packaging		N/A
1.6 (6.4.22)	Luminaires employing light sources emitting UV on mains wiring, information provided		N/A
1.6 (6.4.23)	Wall mounted luminaire using external flexible cable or cord longer than 0.3 m, information provided		N/A
1.6 (6.4.24)	Information for replacement or non-replacement of controlgear provided:		N/A
	a) Non-serviceable controlgear		N/A
	b) Non-user serviceable controlgear		N/A
	c) Serviceable controlgear		N/A
1.6 (6.5)	Test of marking		P
	Test with water		P
	Test with hexane		P
	Legible after test		P
	Label attached		P

IEC 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
1.7 (7)	CONSTRUCTION		P
1.7 (7.2)	Components replaceable or serviceable without difficulty		P
1.7 (7.3)	Wireways smooth and free from sharp edges		P
1.7 (7.4)	Lamp holders		N/A
1.7 (7.4.1)	Integral lamp holder		N/A
1.7 (7.4.2)	Wiring connection		N/A
1.7 (7.4.3)	Lamp holder for end-to-end mounting		N/A
1.7 (7.4.4)	Positioning		N/A
	- pressure test (N)		—
	After test the lamp holder comply with relevant standard sheets and show no damage		N/A
	After test on single-capped lamp holder the lamp holder has not moved from its position and show no permanent deformation		N/A
	- bending test (N)		—
	After test the lamp holder has not moved from its position and show no permanent deformation		N/A
1.7 (7.4.5)	Peak pulse voltage		N/A
1.7 (7.4.6)	Centre contact		N/A
1.7 (7.4.7)	Parts in rough service luminaires resistant to tracking		N/A
1.7 (7.4.8)	Lamp connectors		N/A
1.7 (7.4.9)	Caps and bases correctly used		N/A
1.7 (7.4.10)	Light source for lamp holder or connection according to IEC 60061 not connected another way		N/A
1.7 (7.5)	Starter holders		N/A
	Starter holder in luminaires other than class II		N/A
	Starter holder class II construction		N/A
1.7 (7.6)	Terminal blocks		N/A
	Connecting leads (tails)		N/A
	Unsecured blocks		N/A
1.7 (7.7)	Terminals and supply connections		P
1.7 (7.7.1)	Contact to metal parts		N/A
1.7 (7.7.2)	Test 8 mm hazardous live conductor		P

IEC 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Test 8 mm earth conductor		N/A
1.7 (7.7.3)	Terminals for supply conductors		P
1.7 (7.7.4)	Welded method and material		N/A
	- stranded or solid conductor		N/A
	- spot welding		N/A
	- type Y and Z attachment		N/A
	- mechanical test according to 17.5.2		N/A
	- electrical test according to 17.5.3		N/A
	- heat test according to 17.5.3.3.4 and 17.5.3.3.5		N/A
1.7 (7.7.5)	Terminals other than supply connection		P
1.7 (7.7.6)	Heat-resistant wiring/sleeves		N/A
1.7 (7.7.7)	Multi-pole plug		N/A
	- test at 30 N		N/A
1.7 (7.8)	Switches		N/A
	- adequate rating		N/A
	- adequate fixing		N/A
	- polarized supply		N/A
	- compliance with IEC 61058-1-1 or IEC 60669-1 for mechanical switches		N/A
	- compliance with IEC 61058-1-2 or IEC 60669-2-1 for electronic switches		N/A
	- compliance with IEC 61058-2-1 for cord switches		N/A
1.7 (7.9)	Insulating lining and sleeves		N/A
1.7 (7.9.1)	Retainment		N/A
	Method of fixing		N/A
1.7 (7.9.2)	Insulated linings and sleeves:		N/A
	Resistant to a temperature > 20 °C to the wire temperature or		N/A
	a) & c) Insulation resistance and electric strength		N/A
	b) Ageing test. Temperature (°C)		N/A
1.7 (7.10)	Double or reinforced insulation		P
1.7 (7.10.1)	No contact, mounting surface – accessible metal parts –basic insulation		P
	Safe installation fixed luminaires		N/A

IEC 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Capacitors and switches		N/A
1.7 (7.10.2)	Assembly gaps:		N/A
	- not coincidental		N/A
	- no straight access with test probe		N/A
1.7 (7.10.3)	Retainment of insulation:		N/A
	- fixed		N/A
	- unable to be replaced; luminaire inoperative		N/A
	- sleeves retained in position		N/A
	- lining in lamp holder		N/A
1.7 (7.10.4)	Protective impedance device:		N/A
	Basic or supplementary insulation bridged by resistor(s) or appropriate capacitor		N/A
	Double or reinforced insulation bridged by at least two separate resistors in series or appropriate capacitor(s)		N/A
1.7 (7.11)	Electrical connections and current-carrying parts		P
1.7 (7.11.1)	Contact pressure		P
1.7 (7.11.2)	Screws:		N/A
	- self-tapping screws		N/A
	- thread-cutting screws		N/A
1.7 (7.11.3)	Screw locking:		N/A
	- spring washer		N/A
	- rivets		N/A
1.7 (7.11.4)	Material of current-carrying parts		P
	FELV, SELV or PELV supplying circuits:		N/A
	- load less than 15 W		N/A
	- load (including short-circuit) not higher than 2 A		N/A
1.7 (7.11.5)	No contact to wood or mounting surface		P
1.7 (7.11.6)	Electro-mechanical contact systems		N/A
1.7 (7.12)	Screws and connections (mechanical) and glands		N/A
1.7 (7.12.1)	Screws not made of soft metal		N/A
	Screws of insulating material		N/A
	Torque test: torque (Nm); part :		N/A
	Torque test: torque (Nm); part :		N/A
	Torque test: torque (Nm); part :		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
1.7 (7.12.2)	Screws with diameter < 3 mm screwed into metal		N/A
1.7 (7.12.3)	Locked connections:		N/A
	- fixed arms; torque (Nm)		N/A
	- lamp holder; torque (Nm)		N/A
	- push-button switches; torque 0,8 Nm		N/A
1.7 (7.12.4)	Screwed glands; force (Nm)		N/A
1.7 (7.13)	Mechanical strength		P
1.7 (7.13.1)	Impact tests:		P
	- fragile parts; energy (Nm)		N/A
	- other parts; energy (Nm)	0,5Nm	P
	1) live parts		P
	2) linings		N/A
	3) protection		P
	4) covers		P
1.7 (7.13.2)	Metal parts have adequate mechanical strength		N/A
1.7 (7.13.3)	Test with straight unjointed test finger		N/A
1.7 (7.13.4)	Tumbling barrel		P
1.7 (7.14)	Suspensions, fixings and means of adjusting		N/A
1.7 (7.14.1)	Mechanical load:		N/A
	A) four times the weight		N/A
	B) torque 2,5 Nm		N/A
	C) bracket arm; bending moment (Nm)		N/A
	D) load track-mounted luminaires		N/A
	E) clip-mounted luminaires, glass-shelve. Thickness (mm)		N/A
	Metal rod. diameter (mm)		N/A
	Fixed luminaire or independent controlgear without fixing devices		N/A
	Magnets not used as the primary fixing		N/A
1.7 (7.14.2)	Load to flexible cables:		N/A
	Mass (kg)		—
	Stress in conductors (N/mm ²)		N/A
	Special cable or cord, force applied (N)		N/A
	Mass (kg) of semi-luminaire		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Bending moment (Nm) of semi-luminaire		N/A
1.7 (7.14.3)	Adjusting devices:		N/A
	- flexing test; number of cycles		N/A
	- strands broken		N/A
	- insulation resistance and electric strength tests afterwards		N/A
1.7 (7.14.4)	Telescopic tubes: cords not fixed to tube; no strain on conductors		N/A
1.7 (7.14.5)	Guide pulleys		N/A
1.7 (7.14.6)	Strain on socket-outlets		N/A
1.7 (7.15)	Flammable materials		P
	- glow-wire test 650°C	See Test Table 1.16 (15.3.3)	P
	- spacing ≥ 30 mm		N/A
	- screen withstanding test of 15.3.2		N/A
	- screen dimensions		N/A
	- no fiercely burning material		P
	- thermal protection		N/A
	- electronic circuits exempted		N/A
1.7 (7.15.2)	Luminaires made of thermoplastic material with controlgear:		N/A
	a) construction		N/A
	b) temperature sensing control		N/A
	c) surface temperature		N/A
1.7 (7.16)	Luminaires for mounting on normally flammable surfaces		P
1.7 (7.16.1)	No controlgear	(compliance with Clause 14)	P
	Provided with adaptor for a track meet the requirements for direct mounting on normally flammable surfaces		N/A
1.7 (7.16.2)	Controlgear spacing:		N/A
	- spacing 35 mm		N/A
	- spacing 10 mm		N/A
1.7 (7.16.3)	Thermal protection:		N/A
	- in controlgear		N/A
	- external		N/A
	- fixed position		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- temperature marked controlgear		N/A
1.7 (7.16.4)	Design to satisfy the test of 14.6	(see 14.6)	N/A
1.7 (7.17)	Drain holes		N/A
	Clearance at least 5 mm		N/A
1.7 (7.18)	Resistance to corrosion		N/A
1.7 (7.18.1)	- rust-resistance		N/A
1.7 (7.18.2)	- season cracking in copper		N/A
1.7 (7.18.3)	- corrosion of aluminium		N/A
1.7 (7.19)	Igniters compatible with ballast		N/A
1.7 (7.20)	Rough service luminaires		N/A
1.7 (7.20.1)	Resistance to vibrations		N/A
1.7 (7.20.2)	IP54 or higher		N/A
	a) fixed		N/A
	b) hand-held		N/A
	c) delivered with a stand		N/A
	d) for temporary installations and suitable for mounting on a stand		N/A
1.7 (7.21)	Protective shield		N/A
1.7 (7.21.1)	Shield fitted if tungsten halogen lamps or metal halide lamps		N/A
	Shield of glass if tungsten halogen lamps		N/A
1.7 (7.21.2)	Particles from a shattering lamp not impair safety		N/A
1.7 (7.21.3)	No direct path		N/A
1.7 (7.21.4)	Impact test on shield		N/A
	Glow-wire test on lamp compartment :	See Test Table 1.16 (15.3.3)	N/A
1.7 (7.22)	Attachments to lamps		N/A
	Attachments to lamps do not cause overheating or damage		N/A
1.7 (7.23)	Semi-luminaires		N/A
	Semi-luminaires comply Class II		N/A
1.7 (7.24)	Photobiological hazards		N/A
1.7 (7.24.1)	Actinic UV hazards for skin and eye 200 nm to 400 nm)		N/A
	No excessive UV radiation; luminaires used with:		N/A
	- self-shielded lamps or light sources having a UV emission $\leq 2 \text{ mW} \cdot \text{klm}^{-1}$		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- light sources emitting $\leq 6 \text{ mW} \cdot \text{klm}^{-1}$ and having a glass cover		N/A
	- light sources emitting $> 6 \text{ mW} \cdot \text{klm}^{-1}$, compliance with Annex M		N/A
1.7 (7.24.2)	UV-A hazard for the eye lens (315 nm to 400 nm)		N/A
	No excessive UV-A radiation		N/A
1.7 (7.24.3)	Retinal blue light hazard		N/A
1.7 (7.24.3.2)	Luminaire assessment according to IEC 62471-7:2023		N/A
	Luminaire application group.....: ☐ BLH-A ☒ BLH-B ☐ BLH-C		—
	Blue light radiance emission limit not exceeded for application group at applicable assessment distance		N/A
	Increased assessment distance for fixed luminaire based on luminaire application applied		N/A
	Assessment distance used (m).....:		—
	Information according to clause 6.3.22 a) provided		N/A
	Luminaire assessment based on light source data		N/A
	Light source application group: ☐ BLH-A ☐ BLH-B ☐ BLH-C		—
	Data in accordance with luminaire application group emission limit		N/A
1.7 (7.24.3.3)	Luminaire assessment according to IEC TR 62778:2014		N/A
	Class of risk group assessed according to IEC TR 62778		—
	Luminaires with E_{thr} :		N/A
	a) Fixed luminaires		N/A
	- distance x m, borderline between RG1 and RG2 .. :		N/A
	- marking and instruction according 6.3.22		N/A
	b) Portable and handheld luminaires		N/A
	- marking according 6.3.22 if RG1 exceeded at 200 mm according to IEC/TR 62778		N/A
	Portable luminaires for children IEC 60598-2-10 and Mains socket outlet nightlights IEC 60598-2-12 not exceed RG1 at 200 mm according to IEC TR 62778		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
1.7 (7.24.4)	Retinal thermal hazard (380 nm to 1400 nm)		N/A
	Not exceeding retinal thermal radiance limits		N/A
1.7 (7.24.5)	Infrared hazard for the eye (780 nm to 3000 nm)		N/A
	Not exceeding limits for IR radiation		N/A
1.7 (7.24.6)	Thermal hazard for the skin (380 nm to 3000 nm)		N/A
	Not exceeding exposure limit		—
1.7 (7.25)	Mechanical hazard		P
	No sharp point or edges		P
1.7 (7.26)	Short-circuit protection		N/A
1.7 (7.26.1)	Means preventing impairing of safety of uninsulated accessible SELV / PELV parts		N/A
	Short-circuit test with test chain according 7.26.2:		N/A
	Supply source ES1 PSE		N/A
	Test chain does not melt through		N/A
	Test sample does not exceed values of Table 21 and 22		N/A
1.7 (7.27)	Terminal blocks with integrated screwless protective earthing contacts		N/A
	Test according to Annex R		N/A
	Pull test of terminal fixing (20 N)		N/A
	After test, resistance < 0,05 Ω		N/A
	Pull test of mechanical connection (50 N)		N/A
	After test, resistance < 0,05 Ω		N/A
	Voltage drop test, resistance < 0,05 Ω		N/A
1.7 (7.28)	Fixing of thermal sensing control		N/A
	Not plug-in or easily replaceable type		N/A
	Reliably kept in position		N/A
	No adhesive fixing if UV radiations from light source can degrade the fixing		N/A
	Not outside the luminaire enclosure		N/A
	Test of adhesive fixing:		N/A
	Max. temperature on adhesive material (°C) :		—
	100 cycles between t min and t max		N/A
	Temperature sensing control still in position		N/A
1.7 (7.29)	Luminaires with non-replaceable light source		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Not possible to replace light source		N/A
	Hazardous live part not accessible after parts have been opened by hand or tools		N/A
1.7 (7.30)	Luminaires with non-user replaceable light source and non-user serviceable components		N/A
	If protective cover provide protection against electric shock and marked with "caution, electric shock risk" symbol:		N/A
	At least one fixing means requiring use of tool		N/A
1.7 (7.31)	Insulation between circuits		P
1.7 (7.31.1)	Circuits insulated from mains supply fulfil requirements according 7.31.2 – 7.31.4		P
	Controllable luminaires requiring same level of insulation for all components, the insulation between control terminals and mains supply fulfil requirements according 7.31.2 – 7.31.4		N/A
1.7 (7.31.2)	SELV or PELV circuits		P
	Used SELV/PELV source		N/A
	Voltage $\leq$ ELV		P
	PELV connected to earth		P
	Insulation of SELV/PELV circuits from mains supply		N/A
	Insulation of SELV/PELV circuits from other non SELV/PELV circuits		N/A
	Insulation of SELV/PELV circuits from FELV		N/A
	Insulation of SELV/PELV circuits from other SELV/PELV circuits		N/A
	SELV/PELV circuits insulated from accessible parts according Table T.1		N/A
	Plugs not able to make any electrical contact with socket-outlets of other voltage systems		N/A
	Socket outlets do not admit plugs of other voltage systems		N/A
	Plugs and socket-outlets do not have protective conductor contact		N/A
1.7 (7.31.3)	FELV circuits		N/A
	Used FELV source		N/A
	Voltage $\leq$ ELV		N/A
	Insulating of FELV circuits from mains supply		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	FELV circuits insulated from accessible parts according Table T.1		N/A
	Plugs not able to make any electrical contact with socket-outlets of other voltage systems		N/A
	Socket outlets do not admit plugs of other voltage systems		N/A
	Socket-outlets have protective conductor contact		N/A
1.7 (7.31.4)	Other circuits		N/A
	Other circuits insulated from accessible conductive parts according Table T.1		N/A
	Class II construction with equipotential bonding for protection against indirect contacts with hazardous live parts:		N/A
	- conductive parts are connected together		N/A
	- test according 9.2.3		N/A
	- conductive part does not cause electric shock in case of insulation fault		N/A
	- equipotential bonding used in applications when one or more luminaires supplied by another		N/A
	- supplying luminaire provided with terminal for accessible conductive parts of other luminaires		N/A
	- other luminaire constructed as class I		N/A
1.7 (7.31.5)	Additional requirements for luminaires using controllable controlgear providing SELV output(s)		N/A
	Insulation between SELV output(s) of controlgear and control port meets requirements of IEC 61347-1 for interconnected controlgear		N/A
1.7 (7.32)	Overvoltage protective devices external to controlgear		N/A
1.7 (7.32.1)	SPDs comply with requirements in 7.32.2		N/A
	SPCs comply with requirements in 7.32.3		N/A
	SPDs or SPCs requiring connection to earth:		N/A
	- only used in fixed luminaires		N/A
	- only connected to protective earth		N/A
1.7 (7.32.2)	Surge protective devices (SPDs)		N/A
	Compliance with IEC 61643-11		N/A
	Rated ambient temperature verified according to test in 14.4		N/A
1.7 (7.32.3)	Surge protective components (SPCs)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
1.7 (7.32.3.1)	Only connected across the mains (L to L or L to N)		N/A
	Compliance with IEC 61051-2:2021 or IEC 61643-331:2020		N/A
	Compliance with requirements in 7.32.3.2 – 7.32.3.6		N/A
1.7 (7.32.3.2)	Climatic conditions		N/A
	Climatic conditions according to:		N/A
	- Option A		N/A
	- Option B		N/A
1.7 (7.32.3.3)	Maximum continuous voltage		N/A
	At least 1.25 times rated voltage of luminaire / upper voltage of rated voltage range		N/A
1.7 (7.32.3.4)	Surge capability		N/A
	Mains supply voltage (V).....:		—
1.7 (7.32.3.5)	SPC resistance to fire		N/A
	Needle flame test	See Test Table 1.16 (15.3.2)	N/A
1.7 (7.32.3.6)	SPC overload test		N/A
1.7 (7.33)	Luminaire powered via information technology communication cabling		N/A
	Requirements for Class III luminaire		N/A
	Rated voltage does not exceed maximum voltage of used connector		N/A
	Luminaire does not create any hazard from overvoltage	(see Annex 2)	N/A
1.7 (7.34)	Electromagnetic fields (EMF)		P
	No harmful electromagnetic fields		P
1.7 (7.35)	Protection against moving fan blades		N/A
	Test with a standard test finger		N/A
	Test with test probe acc. to Figure 13 (IEC 61032) for portable luminaire		N/A
	Blades rounded with radius ≥ 0.5 mm and:		N/A
	-hardness less than D60 Shore		N/A
	-peripheral speed less than 15 m/s		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	-input power of fan ≤ 2 W at rated voltage		N/A
1.7 (7.36)	Track-mounted luminaires		N/A
	Test in accordance with Annex A of IEC 60570:2003/AMD2:2019		N/A
1.8 (13)	CREEPAGE DISTANCES AND CLEARANCES Refer to 704022605251-00		N/A
1.8 (13.2.1)	Impulse withstand category (Normal category II)	Category II ☒ Category III ☐	—
	Category III according to Annex Q		N/A
	Protected against pollution, reduced creepage and clearance according Annex P of IEC 61347-1:2015		N/A
1.8 (13.2.2)	Creepage distances for frequency up to 30 kHz	See Test Table 1.8 (13) I	N/A
	Creepage distances for frequency over 30 kHz:		N/A
	- Controlgear marked with $\hat{U}_{OUT}$ and f_{UOUT} according to IEC 61347-1:2015, clause 7.1, item w	See Test Table 1.8 (13) II	N/A
	- Requirements according to IEC 60664-4 for controlgear not covered by IEC 61347	See Test Table 1.8 (13) II	N/A
1.8 (13.2.3)	Clearances for frequency up to 30 kHz	See Test Table 1.8 (13) I	N/A
	Clearances distances for frequency over 30 kHz:		N/A
	- Controlgear marked with U_P	See Test Table 1.8 (13) II	N/A
	- Requirements according to IEC 60664-4 for controlgear not covered by IEC 61347	See Test Table 1.8 (13) II	N/A
1.9 (9)	PROVISION FOR EARTHING		N/A
1.9 (9.2.1 + 9.2.3)	Accessible metal parts		N/A
	Metal parts in contact with supporting surface		N/A
	Resistance $< 0,5 \Omega$		N/A
	Self-tapping screws used		N/A
	Thread-forming screws		N/A
	Thread-forming screw used in a grove		N/A
	Protective earth makes contact first		N/A
	Terminal blocks with integrated screwless protective earthing contacts tested according to Annex R		N/A
	Protective earthing of the luminaire not via built-in controlgear		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
1.9 (9.2.2 + 9.2.3)	Protective earth continuity in joints, etc.		N/A
1.9 (9.2.4)	Locking of clamping means		N/A
	Compliance with 7.7.3		N/A
1.9 (9.2.5)	Protective earth terminal integral part of connector socket		N/A
1.9 (9.2.6)	Protective earth terminal adjacent to mains terminals		N/A
1.9 (9.2.7)	Electrolytic corrosion of the protective earth terminal		N/A
1.9 (9.2.8)	Material of protective earth terminal		N/A
	Contact surface bare metal		N/A
1.9 (9.2.10)	Class II luminaire for looping-in or through wiring		N/A
	Double or reinforced insulation to functional earth		N/A
1.9 (9.2.11)	Protective earthing core coloured green-yellow		N/A
	Length of protective earthing conductor		N/A
1.9 (9.2.12)	PELV circuit connected to protective earth for functional purpose		N/A
1.10 (16)	SCREW TERMINALS		N/A
	Separately approved; component list	(See Annex 1)	N/A
	Part of the luminaire	(See Annex 3)	N/A
1.10 (17)	SCREWLESS TERMINALS AND ELECTRICAL CONNECTIONS		N/A
	Separately approved; component list..... :	(See Annex 1)	N/A
	Part of the luminaire :	(See Annex 4)	N/A
1.11 (8)	EXTERNAL AND INTERNAL WIRING		P
1.11 (8.2)	Supply connection and external wiring		P
1.11 (8.2.1)	Means of connection..... :	Plug	P
	Outdoor luminaire without PVC insulated external wiring unless Class III or SELV/PELV circuits ≤ 25 V AC or 60 V DC or 25 V peak interrupted DC voltage with frequency 10Hz -200 Hz or protected from outdoor environment		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
1.11 (8.2.2)	Type of cable..... :	Refer to CDF	P
	Nominal cross-sectional area (mm ²)..... :		N/A
	Cables equal to IEC 60227 or IEC 60245		N/A
1.11 (8.2.3)	Type of attachment, X, Y or Z		P
1.11 (8.2.5)	Type Z not connected to screws		P
1.11 (8.2.6)	Cable entries:		P
	- suitable for introduction		P
	- adequate degree of protection		P
1.11 (8.2.7)	Cable entries through rigid material have rounded edges		N/A
1.11 (8.2.8)	Insulating bushings:		N/A
	- suitably fixed		N/A
	- material in bushings		N/A
	- material not likely to deteriorate		N/A
	- tubes or guards made of insulating material		N/A
1.11 (8.2.9)	Locking of screwed bushings		N/A
1.11 (8.2.10)	Cord anchorage:		P
	- covering protected from abrasion		P
	- clear how to be effective		P
	- no mechanical or thermal stress		P
	- no tying of cables into knots etc.		P
	- insulating material or lining		N/A
1.11 (8.2.10.2)	Cord anchorage for type X attachment:		N/A
	a) at least one part fixed		N/A
	b) types of cable		N/A
	c) no damaging of the cable		N/A
	d) whole cable can be mounted		N/A
	e) no touching of clamping screws		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	f) metal screw not directly on cable		N/A
	g) replacement without special tool		N/A
	Glands not used as anchorage		N/A
	Labyrinth type anchorages		N/A
1.11 (8.2.10.3)	Adequate cord anchorage for type Y and type Z attachment		P
1.11 (8.2.10.4)	Tests:		P
	- impossible to push cable; unsafe		P
	- pull test: 25 times; pull (N) : 60		P
	- torque test: torque (Nm)..... : 0,15		P
	- displacement ≤ 2 mm		P
	- no movement of conductors		P
	- no damage of cable or cord		P
	- function independent of electrical connection		N/A
1.11 (8.2.10.5)	Luminaire with/ designed for use with supply cord with maximum current of 2A:		N/A
	- Ordinary Class III luminaire supplied with SELV ≤ 25 V RMS or 60 V DC		N/A
	- Ordinary Class III luminaire supplied with PELV ≤ 12 V RMS or 30 V DC		N/A
	- Other than ordinary Class III luminaire supplied with voltage ≤ 12 V RMS or 30 V DC		N/A
	Pull test of 30 N		N/A
1.11 (8.2.11)	External wiring passing into luminaire		P
1.11 (8.2.12)	Looping-in terminals		N/A
1.11 (8.2.13)	Wire ends not tinned		N/A
	Wire ends tinned: no cold flow		N/A
1.11 (8.2.14)	Mains plug same protection		N/A
	Class III luminaire plug		N/A
	No unsafe compatibility		N/A
1.11 (8.2.15)	Connectors for Class III luminaires (IEC 60603 or IEC 62680)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
1.11 (8.2.16)	Appliance inlets (IEC 60320)		N/A
	Installation couplers (IEC 61535)		N/A
	Appliance inlet or connector systems (IEC 61984)		N/A
1.11 (8.2.17)	No standardized interconnecting cables properly assembled		N/A
1.11 (8.2.18)	Used plug in accordance with:		P
	- IEC 60083		N/A
	- other standard		P
1.11 (8.3)	Internal wiring		P
1.11 (8.3.1.1)	Internal wiring of suitable size and type		P
	Through wiring:		N/A
	- not delivered/ mounting instruction		N/A
	- factory assembled		N/A
	Green-yellow for protective earth only		N/A
1.11 (8.3.1.2)	Internal wiring connected directly to fixed wiring:		P
	Cross-sectional area (mm ²) :	Refer to CDF	P
	Insulation thickness (mm):		N/A
	Extra insulation added where necessary		N/A
1.11 (8.3.1.3)	Internal wiring connected to fixed wiring via internal current-limiting device:		N/A
	Cross-sectional area (mm ²):		N/A
1.11 (8.3.1.4)	Double or reinforced insulation for class II		P
1.11 (8.3.1.5)	Conductors without insulation		N/A
1.11 (8.3.1.6)	SELV/PELV current-carrying parts		N/A
1.11 (8.3.1.7)	Insulation thickness other than PVC or rubber		N/A
1.11 (8.3.2)	Sharp edges etc.		P
	No moving parts of switches etc.		N/A
	Joints, raising/lowering devices		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Telescopic tubes etc.		N/A
	No twisting over 360°		P
1.11 (8.3.3)	Insulating bushings:		N/A
	- suitable fixed		N/A
	- material in bushings		N/A
	- material not likely to deteriorate		N/A
	- cables with protective sheath		N/A
1.11 (8.3.4)	Joints and junctions effectively insulated		N/A
1.11 (8.3.5)	Strain on internal wiring		N/A
1.11 (8.3.6)	Wire carriers		N/A
1.11 (8.3.7)	Wire ends not tinned		N/A
	Wire ends tinned: no cold flow		N/A
1.11 (8.4)	Test to determine suitability of conductors having a reduced cross-sectional area		N/A
	Under test the temperature of the luminaire wiring insulation does not exceed the limits stated in Table 22	(see Annex 2)	N/A
	No damage to luminaire wiring after test		N/A
1.12 (10)	PROTECTION AGAINST ELECTRIC SHOCK		P
1.12 (10.2.1)	Hazardous live parts not accessible		P
	Basic insulated parts not used on the outer surface without appropriate protection		N/A
	Basic insulated parts not accessible with standard test finger on portable, settable and adjustable luminaires		P
	Basic insulated parts not accessible with Ø 50 mm probe from outside, other types of luminaires		N/A
	Lamp and starter holders in portable, settable and adjustable luminaires comply with double or reinforced insulation requirements		N/A
	Basic insulation only accessible under light source/ starter replacement or for accessing serviceable components		N/A
	Protection in any position		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Double-ended tungsten filament lamp or equivalent lamps		N/A
	Insulation lacquer not reliable		N/A
	Double-ended high-pressure discharge lamp		N/A
	Relevant warning according to 6.3.18 fitted to the luminaire		N/A
1.12 (10.2.2)	Portable luminaire adjusted in most unfavourable position		N/A
1.12 (10.2.3.a)	Class II luminaire:		N/A
	- basic insulated metal parts not accessible		N/A
	- required insulation from hazardous live parts in compliance with Table T.1		N/A
	- glass protective shields not used as supplementary insulation		N/A
1.12 (10.2.3.b)	BC lamp holder of metal in class I luminaires shall be connected to protective earth		N/A
1.12 (10.2.3.c)	SELV circuits with exposed current carrying parts:		P
	Ordinary luminaire:		P
	- voltage under load/ no-load AC (V)		N/A
	- voltage under load/ no-load DC (V).....	3.5VDC	P
	- interrupted DC voltage (V)		N/A
	- touch current if applicable (mA)		N/A
	One conductive part insulated if required		N/A
	Other than ordinary luminaire:		N/A
	- voltage under load/ no-load AC (V)		N/A
	- voltage under load/ no-load DC (V).....		N/A
	- Interrupted DC ($f < 10\text{Hz}$ or $f > 200\text{Hz}$) (mA).....		N/A
	- Interrupted DC ($10\text{Hz} \leq f \leq 200\text{Hz}$) (mA).....		N/A
	Class III luminaire only for connection to SELV/PELV		N/A
1.12 (10.2.3.d)	PELV circuits with exposed current carrying parts:		N/A
	Ordinary luminaire:		N/A
	- voltage under load/ no-load AC (V)		N/A
	- voltage under load/ no-load DC (V).....		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Other than ordinary luminaire:		N/A
	- voltage under load/ no-load AC (V)		N/A
	- voltage under load/ no-load DC (V).....		N/A
	One pole insulated if required		N/A
1.12 (10.2.4)	Portable luminaire has protection independent of mounting surface		N/A
1.12 (10.2.5)	Compliance with the standard test finger or relevant probe		N/A
1.12 (10.2.6)	Covers reliably secured		N/A
1.12 (10.2.7)	Luminaire other than below with capacitor > 0,5 μ F not exceed 50 V, 1 min after disconnection		N/A
	Portable luminaire with capacitor > 0,1 μ F (0.25) not exceed 34 V, 1 s after disconnection		N/A
	Other luminaires with capacitor > 0,1 μ F (0.25) with plug and track adaptors not exceed 60 V, 5 s after disconnection		N/A

1.13 (14)	ENDURANCE TEST AND THERMAL TEST		P
1.13 (-)	If IP > IP 20 relevant test of (14.4), (14.5), (14.6) and (14.7) after (11.2) before (11.3) as specified in 1.14		—
1.13 (14.2)	Selection of lamps and controlgear		—
	Lamp used according to Annex B	(Lamp used see Annex 2)	—
	Controlgear if separate and not supplied	(Controlgear used see Annex 2)	—
1.13 (14.3)	Endurance test		P
1.13 (14.3.2)	a) mounting-position	Fixed mounted	—
	b) test temperature (°C)	35	—
	c) total duration (h)	240	—
	d) supply voltage (V)	1,1x230	—
	d) if not equipped with control gear, constant voltage/current (V) or (A)	Filament lamps	—
	d) Class III luminaires powered via information technology communication cable:		N/A
	- voltage under normal operation (V).....		—
	- voltage under abnormal operation (V).....		—
	e) luminaire ceases to operate		—

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Clause	Requirement + Test	Result - Remark	Verdict
	f) luminaire with constant light output function		N/A
1.13 (14.3.3)	After endurance test:		P
	- no part unserviceable		P
	- luminaire not unsafe		P
	- no damage to track system		N/A
	- marking legible		P
	- no cracks, deformation etc.		P
1.13 (14.4)	Thermal test (normal operation)	(see Annex 2)	P
1.13 (14.5)	Thermal test (abnormal operation)	(see Annex 2)	P
1.13 (14.6)	Thermal test (failed windings in controlgear):		N/A
1.13 (14.6.2)	Through wiring or looping-in wiring loaded by a current of (A)		—
	- case of abnormal conditions		—
	- electronic controlgear		N/A
	- measured winding temperature (°C): at 1,1 Un		—
	- measured mounting surface temperature (°C) at 1,1 Un		N/A
	- calculated mounting surface temperature (°C)		N/A
	- track-mounted luminaires		N/A
1.13 (14.6.3)	Temperature sensing control		N/A
	- case of abnormal conditions		—
	- thermal link		N/A
	- manual reset cut-out		N/A
	- auto reset cut-out		N/A
	- measured mounting surface temperature (°C)		N/A
	- track-mounted luminaires		N/A
1.13 (14.7)	Thermal test in regard to fault conditions in controlgear or electronic devices incorporated in thermoplastic luminaires		N/A
1.13 (14.7.2)	Luminaire without temperature sensing control		N/A
1.13 (14.7.2.1)	Luminaire with fluorescent lamp ≤ 70W:		N/A
	Test method 14.7.1.1 or Annex S		—

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Clause	Requirement + Test	Result - Remark	Verdict
	Test according to 14.7.1.1:		N/A
	- case of abnormal conditions		—
	- Ballast failure at supply voltage (V)		—
	- Components retained in place after the test		N/A
	- Test with standard test finger after the test		N/A
	Test according to Annex S:		N/A
	- case of abnormal conditions		—
	- measured winding temperature (°C): at 1,1 Un		—
	- measured temperature of fixing point/exposed part (°C): at 1,1 Un		—
	- calculated temperature of fixing point/exposed part (°C)		—
	Ball-pressure test	See Test Table 1.16 (15.2.2)	N/A
1.13 (14.7.2.2)	Luminaire with discharge lamp, fluorescent lamp > 70W, transformer > 10 VA:		N/A
	- case of abnormal conditions		—
	- measured winding temperature (°C): at 1,1 Un		—
	- measured temperature of fixing point/exposed part (°C): at 1,1 Un		—
	- calculated temperature of fixing point/exposed part (°C)		—
	Ball-pressure test	See Test Table 1.16 (15.2.2)	N/A
1.13 (14.7.2.3)	Luminaire with short circuit proof transformers ≤ 10 VA:		N/A
	- case of abnormal conditions		—
	- Components retained in place after the test		N/A
	- Test with standard test finger after the test		N/A
1.13 (14.7.3)	Luminaire with temperature sensing control		N/A
	- thermal link	Yes ☐ No ☐	—
	- manual reset cut-out	Yes ☐ No ☐	—
	- auto reset cut-out	Yes ☐ No ☐	—
	- case of abnormal conditions		—
	- highest measured temperature of fixing point/exposed part (°C):		—

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Clause	Requirement + Test	Result - Remark	Verdict
	Ball-pressure test:	See Test Table 1.16 (15.2.2)	N/A
1.14 (11)	RESISTANCE TO DUST, SOLID OBJECTS AND MOISTURE		P
1.14 (-)	If IP > IP 20 the order of tests as specified in clause 1.13		P
1.14 (11.2.1)	Tests for ingress of dust, solid objects and moisture:		P
	- classification according to IP	IP 20	—
	- mounting position during test.....	Normal position	—
	- fixing screws tightened; torque (Nm).....	N/A	—
	- tests according to clauses	cl 11.2.2	—
	- electric strength test afterwards	(see cl 12.2.3)	P
	a) no deposit in dust-proof luminaire		N/A
	b) no talcum in dust-tight luminaire		N/A
	c) no trace of water on current-carrying parts or on insulation where it could become a hazard		N/A
	c.1) For luminaires without drain holes – no water entry		N/A
	c.2) For luminaires with drain holes – no hazardous water entry		N/A
	d) no water in watertight, pressure watertight, high pressure and temperature water jet-proof or high pressure and cold-water jet-proof luminaire		N/A
	e) no contact with live parts (IP 2X)		P
	e) no entry into enclosure (IP 3X and IP 4X)		N/A
	e) no contact with live parts through drain holes and ventilation slots (IP3X and IP4X)		N/A
	f) no trace of water on part of lamp requiring protection from splashing water		N/A
	g) no damage of protective shield or glass envelope		P
1.14 (11.3)	Humidity test 48 h		P
1.15 (12)	INSULATION RESISTANCE AND ELECTRIC STRENGTH, TOUCH CURRENT AND PROTECTIVE CONDUCTOR CURRENT		N/A
	Refer to 704022605250-00		
1.15 (12.2.2)	Insulation resistance test		N/A
	Cable or cord covered by metal foil or replaced by a metal rod of mm Ø	Coved by metal foil	—

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Clause	Requirement + Test	Result - Remark	Verdict
	Insulation resistance (MΩ):		N/A
	SELV/PELV:		N/A
	- between current-carrying parts of different polarity :		N/A
	- between current-carrying parts and mounting surface :		N/A
	- between current-carrying parts and metal parts of the luminaire..... :		N/A
	- between the outer surface of a flexible cord or cable where it is clamped in a cord anchorage and accessible metal parts..... :		N/A
	- Insulation bushings as described in Clause 8 :		N/A
	Other than SELV/PELV:		N/A
	- between hazardous live parts of different polarity . :		N/A
	- between hazardous live parts and mounting surface :		N/A
	- between hazardous live parts and metal parts :		N/A
	- between hazardous live parts of different polarity through action of a switch :		N/A
	- between the outer surface of a flexible cord or cable where it is clamped in a cord anchorage and accessible metal parts..... :		N/A
	- Insulation bushings as described in Clause 8 :		N/A
1.15 (12.2.3)	Electric strength test		N/A
	Dummy lamp		N/A
	Luminaires with ignitors after 24 h test		N/A
	Luminaires with manual ignitors		N/A
	Test voltage (V):		N/A
	SELV/PELV:		N/A
	- between current-carrying parts of different polarity :		N/A
	- between current-carrying parts and mounting surface :		N/A
	- between current-carrying parts and metal parts of the luminaire..... :		N/A
	- between the outer surface of a flexible cord or cable where it is clamped in a cord anchorage and accessible metal parts..... :		N/A
	- Insulation bushings as described in Clause 8 :		N/A

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Clause	Requirement + Test				Result - Remark		Verdict
	Other than SELV/PELV:						N/A
	- between hazardous live parts of different polarity . :						N/A
	- between hazardous live parts and mounting surface :						N/A
	- between hazardous live parts and metal parts :						N/A
	- between hazardous live parts of different polarity through action of a switch :						N/A
	- between the outer surface of a flexible cord or cable where it is clamped in a cord anchorage and accessible metal parts..... :						N/A
	- Insulation bushings as described in Clause 8 :						N/A
1.15 (12.3)	Touch current, protective conductor current and electric burn						N/A
1.15 (12.3)	Touch current (mA).....:						N/A
	Protective conductor current (mA).....:						N/A
1.16 (15)	RESISTANCE TO HEAT, FIRE AND TRACKING Refer to 704022605251-00						N/A
1.16 (15.2.2)	Ball-pressure test :				See Test Table 1.16 (15.2.2)		N/A
1.16 (15.3.2)	Needle-flame test (10 s)..... :				See Test Table 1.16 (15.3.2)		N/A
1.16 (15.3.3)	Glow-wire test (650°C)..... :				See Test Table 1.16 (15.3.3)		N/A
1.16 (15.4.2)	Proof tracking test (IEC 60112)..... :				See Test Table 1.16 (15.4.1)		N/A
1.8 (13)	TABLE I: Creepage distances and clearances Refer to 704022605251-00						N/A
	Minimum distances (mm) for AC up to 30 kHz sinusoidal voltages						N/A
	Applicable part of IEC 60598-1 Table 18*, 19* and 20*						N/A
	Insulation type **	Measured clearance	Required		Measured creepage	Required	
			clearance	*Table		creepage	*Table
Distance 1:							
Working voltage (V) :							—
PTI :					< 600 ☒ ≥ 600 ☐		—
Pulse voltage or U_P if applicable (kV) :					N/A		—
Supplementary information:							

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Clause	Requirement + Test				Result - Remark		Verdict
Distance 2:							
Working voltage (V)							—
PTI					< 600 ☒ ≥ 600 ☐		—
Pulse voltage or U_P if applicable (kV)							—
Supplementary information: Live part to accessible insulation part							
Distance 3:							
Working voltage (V)							—
PTI					< 600 ☒ ≥ 600 ☐		—
Pulse voltage or U_P if applicable (kV)							—
Supplementary information:							

** Insulation type: B – Basic; S – Supplementary; R – Reinforced. See also IEC 60598-1 Annex K.

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Clause	Requirement + Test				Result - Remark		Verdict
1.8 (13)	TABLE II: Creepage distances and clearances						N/A
	Minimum distances (mm) for AC higher than 30 kHz sinusoidal voltages						N/A
	Applicable part of IEC 61347-1 Table 7 and 8* or IEC 60664-4 Table 1 and 2						N/A
Distances	Insulation type **	Measured clearance	Required		Measured creepage	Required	
			clearance	*Table		creepage	*Table
Distance 1:							
Working voltage (V)							—
Frequency if applicable (kHz)							—
PTI					< 600 ☐ ≥ 600 ☐		—
Peak value of the working voltage $\hat{U}_{out}$ if applicable (kV)							—
Supplementary information:							
Distance 2:							
Working voltage (V)							—
Frequency if applicable (kHz)							—
PTI					< 600 ☐ ≥ 600 ☐		—
Peak value of the working voltage $\hat{U}_{out}$ if applicable (kV)							—
Supplementary information:							
Distance 3:							
Working voltage (V)							—
Frequency if applicable (kHz)							—
PTI					< 600 ☐ ≥ 600 ☐		—
Peak value of the working voltage $\hat{U}_{out}$ if applicable (kV)							—
Supplementary information:							

** Insulation type: B – Basic; S – Supplementary; R – Reinforced.

IEC 60598-2-1				
Clause	Requirement + Test		Result - Remark	Verdict
1.16 (15.2.2)	TABLE: Ball Pressure Test of Thermoplastics			N/A
Allowed impression diameter (mm) :		2	—	
Object/ Part No./ Material		Manufacturer/ trademark	Test temperature (°C)	Impression diameter (mm)
Supplementary information:				

1.16 (15.3.2)	TABLE: Needle-flame test				N/A
Object/ Part No./ Material	Manufacturer/ trademark	Duration of application of test flame (ta); (s)	Ignition of specified layer Yes/No	Duration of burning (tb) (s)	Verdict
Supplementary information:					

1.16 (15.3.3)	TABLE: Resistance to heat and fire - Glow wire tests					N/A
Object/ Part No./ Material	Manufacturer/ trademark	GWT (°C) : 650			Ignition of specified layer	Verdict
		t_E (s)	t_I (s)	t_R (s)	Yes/No	
Supplementary information:						

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Clause	Requirement + Test			Result - Remark	Verdict
1.16 (15.4.2)	TABLE: Proof tracking test				N/A
Test voltage PTI		175 V			—
Object/ Part No./ Material	Manufacturer/ trademark	Withstand 50 drops without failure on three places or on three specimens			Verdict
Supplementary information:					

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Clause	Requirement + Test	Result - Remark	Verdict

ANNEX 1	TABLE: Critical components information Refer to 704022605251-00					P
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Object / part No.	Code	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity ¹⁾

Supplementary information:

¹⁾ Provided evidence ensures the agreed level of compliance. See OD-CB2039.

The codes above have the following meaning:

- A - The component is replaceable with another one, also certified, with equivalent characteristics
- B - The component is replaceable if authorised by the test house
- C - Integrated component tested together with the appliance
- D - Alternative component

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When the internal wire couldn't meet the cross-sectional requirement of terminal block, the end of that should be covered with a tight copper cap.

ANNEX 2	TABLE: Thermal tests of Section 14		P
	Type reference	999999-017-6	—
	Light source used	3.5Vd.c. filament lamps	—
	Controlgear used	N/A	—
	Battery/EDLC used	N/A	—
	Mounting position of luminaire	Normal position	—
	Supply wattage (W)	5,0	—
	Supply current (A)	0,05	—

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Clause	Requirement + Test				Result - Remark		Verdict
	Temperatures in test 1 - 4 below are corrected for t_a (°C)				25 °C		—
	- abnormal operating mode				Output short-circuited/ Double loaded		—
1.13 (14.4)	- test 1: rated voltage				230V~		—
	- test 2: 1,06 times rated voltage, or 1,05 times rated wattage or 1,1 times constant voltage/current				1,06 x 230V = 243,8V~		—
	- test 3: Load on wiring to socket-outlet, 1,06 times voltage or 1,05 times wattage				N/A		—
	Through wiring or looping-in wiring loaded by a current of A during the test				N/A		—
1.13 (14.5)	- test 4: 1,1 times rated voltage, or 1,05 times rated wattage or 1,1 times constant voltage/current or 130/150% of rated input voltage				1,1 x 230V = 253V~		—
Temperature measurements (°C)							
Part	Ambient	Sub-cl. 14.4 – normal				Sub-cl. 14.5 – abnormal	
		test 1	test 2	test 3	limit	test 4	limit
Enclosure (tc)	25	35,1	-	-	40	29,8	Ref.
Mounting surface	25	-	29,0	-	90	27,0	130
PCB	25	-	50,4	-	130	30,1	Ref.
Transformer	25	-	56,5	-	130	31,1	Ref.
C1	25	-	42,8	-	105	27,0	Ref.
C10	25	-	49,0	-	105	27,2	Ref.
CY1	25	-	49,9	-	85	27,9	Ref.
U1	25	-	48,1	-	110	25,8	Ref.
Input wiring	25	-	25,7	-	105	25,5	Ref.
Output wiring	25	-	41,8	-	80	31,2	Ref.
PCB for connector	25	-	28,7	-	130	26,4	Ref.
Enclosure of connector	25	-	35,2	-	100	30,4	Ref.
Supplementary information:							
ANNEX 3	Screw terminals (part of the luminaire)						N/A

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Clause	Requirement + Test	Result - Remark	Verdict
(16)	SCREW TERMINALS		N/A
(16.2)	Type of terminal		—
	Rated current (A).....		—
(16.2.2.2)	One or more conductors		N/A
(16.2.2.3)	Special preparation		N/A
(16.2.2.4)	Terminal size		N/A
	Cross-sectional area (mm ²).....		—
(16.2.3)	Conductor space (mm).....		N/A
(16.3)	Mechanical requirements and tests		N/A
(16.3.1)	Minimum distance		N/A
(16.3.2)	Cannot slip out		N/A
(16.3.3)	Special preparation		N/A
(16.3.4)	Nominal diameter of thread (metric ISO thread)	M	N/A
	External wiring		N/A
	No soft metal		N/A
(16.3.5)	Corrosion		N/A
(16.3.6)	Nominal diameter of thread (mm)		N/A
	Torque (Nm)		N/A
(16.3.7)	Between metal surfaces		N/A
	Lug terminal		N/A
	Mantle terminal		N/A
	Pull test; pull (N)		N/A
(16.3.8)	Without undue damage		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
ANNEX 4	Screwless terminals (part of the luminaire)		N/A
(17)	SCREWLESS TERMINALS		N/A
(17.2)	Type of terminal		—
	Rated current (A).....		—
(17.2.1)	Material		N/A
(17.2.2)	Clamping		N/A
(17.2.3)	Stop		N/A
(17.2.4)	Unprepared conductors		N/A
(17.2.5)	Pressure on insulating material		N/A
(17.2.6)	Clear connection method		N/A
(17.2.7)	Clamping independently		N/A
(17.2.8)	Fixed in position		N/A
(17.2.10)	Conductor size		N/A
	Type of conductor		N/A
(17.4)	Terminals and connections for internal wiring		N/A
(17.4.1)	Mechanical tests		N/A
(17.4.1.2.1)	Pull test spring-type terminals (4 N, 4 samples)		N/A
(17.4.1.2.3)	Pull test pin or tab terminals (4 N, 4 samples)		N/A
	Insertion force not exceeding 50 N		N/A
(17.4.1.3)	Permanent connections: pull-off test (20 N)		N/A
(17.4.2)	Electrical tests		N/A
	Voltage drop (mV) after 1 h (4 samples).....		N/A
	Voltage drop of two inseparable joints		N/A
	Number of cycles:		—
	Voltage drop (mV) after 10th alt. 25th cycle (4 samples)		N/A
	Voltage drop (mV) after 50th alt. 100th cycle (4 samples)		N/A
	After ageing, voltage drop (mV) after 10th alt. 25th cycle (4 samples)		N/A
	After ageing, voltage drop (mV) after 50th alt. 100th cycle (4 samples)		N/A
(17.5)	Terminals and connections for external wiring		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
(17.5.1)	Conductors		N/A
	Terminal size and rating		N/A
17.5.2	Mechanical tests		N/A
(17.5.2.2)	Pull test spring-type terminals or welded connections (4 samples); pull (N)		N/A
(17.5.2.3)	Pull test pin or tab terminals (4 samples); pull (N)		N/A
(17.5.3)	Electrical tests		N/A
	Tests according 17.5.3.2 + 17.5.3.3 in IEC 60598-1		N/A

(17.5.3.2) (17.5.3.3)	TABLE: Contact resistance test / Heating tests										N/A
	Voltage drop (mV) after 1 h										—
terminal	1	2	3	4	5	6	7	8	9	10	
voltage drop (mV)											
	Voltage drop of two inseparable joints										N/A
	Voltage drop after 10th alt. 25th cycle										N/A
	Max. allowed voltage drop (mV) :										—
terminal	1	2	3	4	5	6	7	8	9	10	
voltage drop (mV)											
	Voltage drop after 50th alt. 100th cycle										N/A
	Max. allowed voltage drop (mV) :										—
terminal	1	2	3	4	5	6	7	8	9	10	
voltage drop (mV)											
	Continued ageing: voltage drop after 10th alt. 25th cycle										N/A
	Max. allowed voltage drop (mV) :										—
terminal	1	2	3	4	5	6	7	8	9	10	
voltage drop (mV)											
	Continued ageing: voltage drop after 50th alt. 100th cycle										N/A
	Max. allowed voltage drop (mV) :										—
terminal	1	2	3	4	5	6	7	8	9	10	
voltage drop (mV)											

IEC 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict

Supplementary information:

ANNEX 5	Battery/EDLC-operated luminaires		N/A
(Annex W)	Battery/EDLC-operated luminaires		N/A
(W.3)	Marking		N/A
(W.3.2)	Luminaires with replaceable battery		N/A
	Relevant information and warnings provided		N/A
(W.3.3)	Coin and button batteries		N/A
	Relevant information, warnings and marking provided		N/A
(W.3.4)	Other standardized batteries		N/A
	Compartment and polarity correctly marked		N/A
	Compartment marked with the shape of the batteries		N/A
(W.3.5)	Luminaires with non-standardized replaceable rechargeable battery		N/A
	Relevant information, warnings and marking provided		N/A
(W.3.6)	Luminaires with non-user replaceable battery/EDLC		N/A
	Relevant information, warnings and marking provided		N/A
(W.3.7)	Luminaires with non-replaceable battery/EDLC		N/A
	Relevant information, warnings and marking provided		N/A
(W.3.8)	Luminaires supplied by external dedicated power supply units		N/A
	Relevant information, warnings and marking provided		N/A
(W.3.9)	Rechargeable luminaires other than ordinary		N/A
	Relevant information provided		N/A
(W.3.10)	Conditions for charging		N/A
	Relevant information provided		N/A
(W.4)	Construction		N/A
(W.4.1)	Luminaires with a replaceable battery/EDLC, the compartment is designed to reduce the possibility of children removing the battery:		—
	- tool required		N/A
	- two independent and simultaneous movements required		N/A
	Luminaires with a non-replaceable battery/EDLC, no access to the battery or EDLC		N/A
	No recharging function for luminaires intended for non-rechargeable and rechargeable batteries		N/A

IEC 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
(W.4.2)	Small batteries		N/A
	Batteries that fit within the small parts cylinder not removable without a tool		N/A
	Parts that fit within the small parts cylinder not removable without a tool		N/A
	Battery compartment has adequate mechanical strength		N/A
(W.4.3)	Battery compartment fasteners for small batteries and other standardized batteries		N/A
	Screws or fasteners are captive		N/A
(W.4.4)	Battery/EDLC chargers incorporated in luminaires		N/A
	Electronic circuits used in battery or EDLC chargers comply with IEC 61347-2-11		N/A
	Battery or EDLC charger considered a controlgear and comply with :		N/A
(W.4.5)	Short-circuit protection		N/A
	The luminaire is operated under the following fault conditions:		—
	- cord short-circuited		N/A
	- battery terminals short-circuited		N/A
	- simultaneously accessible charging terminal short-circuited		N/A
	Appliance does not emit flames, molten metal, or ignitable gas		N/A
	No explosion or ignition of the battery		N/A
	Venting of the cells		N/A
(W.4.6)	Electrical parameters of batteries operation		N/A
(W.4.6.2)	Normal charging of lithium-ion systems		N/A
	Specified operating region for charging not exceeded		N/A
	- min. temperature (°C) :		—
	- max. temperature (°C) :		—
	Imbalanced battery		N/A
(W.4.7)	Protection against overpressure for Li-ion batteries used in luminaires		N/A
	The battery enclosure or compartment withstands the pressure generated when a cell vents during failure:		N/A
	- capacity of the single Li-ion cell (Ah) :		—
	a) area of the unobstructed openings (mm ²) :		N/A
	b) volume of air injected (ml)..... :		N/A

IEC 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
(W.4.8)	Protection against the consequence of failure of cells or EDLCs		N/A
	Vents of cells not obstructed		N/A
	Space provided to allow EDLC expansion		N/A
(W.5)	Protection against electric shock		N/A
	Hazardous live parts not accessible when the luminaire is opened for replacing batteries		N/A
	Protective cover provided		N/A
(W.6)	Endurance test and thermal test		N/A
(W.6.1)	Endurance test		N/A
	Luminaires with charging function:	Yes ☐ No ☐	—
	c) total duration (h)		—
	d) supply voltage (V)		—
(W.6.2)	Thermal test (normal operation)	(see Annex 2)	N/A
(W.6.3)	Thermal test (abnormal operation)	(see Annex 2)	N/A
(W.6.4)	Lithium-ion charging systems – Fault conditions		N/A
	a) electronic components in the charging system of the luminaire subjected to the fault condition test according to IEC 61347-1:2015, Clause 14		N/A
	b) series configured battery charged with a deliberate imbalance		N/A
	c) one cell shorted		N/A
	No explosion during the test		N/A
	No charring or burning of the gauze or tissue paper		N/A
	No evidence of damage to any cell vent		N/A
	Upper limit charging voltage not exceeded		N/A
	Charging system permanently disabled		N/A
	Hazardous live parts shall not become accessible		N/A
(W.6.4)	TABLE: Lithium-ion charging systems – Fault conditions		N/A
Part	Simulated fault		Hazard
			YES/NO

IEC 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict

ATTACHMENT to IEC 60598-2-1:2020			
IEC 60598-2-1:2020			
EUROPEAN GROUP DIFFERENCES AND EUROPEAN NATIONAL DIFFERENCES			
Luminaires			
Part 2-1: Particular requirements – Fixed general purpose luminaires			
Differences according to.....:		EN IEC 60598-2-1:2021 used in conjunction with EN IEC 60598-1:2024 + A11:2024	
TRF template used		IECEE OD-2020-F2:2025, Ed. 2.1	
Attachment Form No.....:		EU_GD_IEC60598-2-1_2020A	
Attachment Originator		UL Solutions (Demko)	
Master Attachment		Dated 2025-10-09	
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Clause	Requirement + Test	Result - Remark	Verdict
	CENELEC COMMON MODIFICATIONS		P
1. 11 (8)	EXTERNAL AND INTERNAL WIRING		N/A
1.11 (8.2.2)	Cables equal to EN 50525 series		N/A
	Paragraph 2 deleted		N/A
	Replace table 11 – Supply cord		N/A
1.13 (14)	ENDURANCE TESTS AND THERMAL TESTS		P
1.13 (14.4.3 c)	Thermal test (normal operation) see footnote c to table 22 relating to unsleeved fixed wiring		P
	ANNEX ZB, SPECIAL NATIONAL CONDITIONS		N/A
(6.4)	DK: power supply cords of class I luminaires with label		N/A
(8.2.1)	CY, DK, FI, UK: type of plug		N/A
(8.2.18)	DK: socket-outlets		N/A

IEC 60598-2-1			
Clause	Requirement + Test	Result - Remark	Verdict
Clause	Requirement + Test	Result - Remark	Verdict
	ANNEX ZC, NATIONAL DEVIATIONS		N/A
(7 & 8)	FR: Shuttered socket-outlets 10/16A		N/A
	FR: Safety requirements for high buildings (Decree of 30 December 2011 on safety regulations for the construction of high-rise buildings and their protection against fire and panic risks; Section VIII; Article GH 48, Lighting) Glow-wire test for outer parts of luminaires:		N/A
	- 850°C for luminaires in stairways and horizontal travel paths		N/A
	- 650°C for indoor luminaires		N/A
	UK: Requirements according to United Kingdom Building Regulation		N/A



TEST REPORT IEC 62493 Assessment of lighting equipment related to human exposure to electromagnetic fields		
Report Number	704022605251-00 Attachment No. 2	
Date of issue	2026-08-06	
Total number of pages	16	
Name of Testing Laboratory preparing the Report	TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch	
Applicant's name	Wandera GmbH	
Address	Am Wellenbach 9 93149 Nittenau GERMANY	
Test specification:		
TRF template used:	IECEE OD-2020-F7:2020; ed. 2.1	
Standards	IEC 62493:2015, IEC 62493:2015/AMD1:2022	
Test procedure	Without certification	
Test Report Form No.	IEC62493C	
Test Report Form(s) Originator	UL Solutions (US)	
Master TRF	Dated 2023-02-16	
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General disclaimer:		
The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of the Issuing NCB. The authenticity of this Test Report and its contents can be verified by contacting the NCB, responsible for this Test Report.		

Test item description	Electronic transformer (Safety light transformer)		
Trademark or brand name.....			
Manufacturer.....	Same as applicant		
Model/Type reference(s).....	Refer to 704022605251-00		
Ratings	Refer to 704022605251-00		
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):			
☒	Testing Laboratory:	TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch No.151 Heng Tong Road. Shanghai 200070 P.R. China	
Testing location/ address.....		No. 1999, Duhui Road, Shanghai, 201108, P. R. China	
Tested by (name, function, signature)		Jiani WANG Project handler	
Approved by (name, function, signature) ...:		Xudong ZANG Designated reviewer	 
☐	Testing procedure: CTF Stage 1:	N/A	
Testing location/ address		N/A	
Tested by (name, function, signature)		N/A	
Approved by (name, function, signature) ...:		N/A	
☐	Testing procedure: CTF Stage 2:	N/A	
Testing location/ address		N/A	
Tested by (name + signature)		N/A	
Witnessed by (name, function, signature)...		N/A	
Approved by (name, function, signature) ...:		N/A	
☐	Testing procedure: CTF Stage 3:	N/A	
☐	Testing procedure: CTF Stage 4:	N/A	
Testing location/ address		N/A	
Tested by (name, function, signature)		N/A	
Witnessed by (name, function, signature)...		N/A	
Approved by (name, function, signature) ...:		N/A	
Supervised by (name, function, signature) :		N/A	

List of Attachments (including a total number of pages in each attachment):

N/A

Summary of testing

All applicable hazards are covered by the harmonized standard.

The sample's mentioned in this report is/are submitted/ supplied/ manufactured by client. The laboratory therefore assumes no responsibility for accuracy of information on the brand name, model number, origin of manufacture, consignment or any information supplied.

Tests performed (name of test, test Clause and date test performed):

EN 62493:2015+A1:2022

Testing location:

TÜV SÜD Certification and Testing (China) Co., Ltd.
Shanghai Branch
No. 1999, Duhui Road, Shanghai, 201108, P. R. China

Summary of compliance with National Differences**Country code****National differences standard**

European group differences

EN 62493:2015+A1:2022

The EUROPEAN GROUP DIFFERENCES between EN 62493:2015+A1:2022 and IEC 62493:2015+AMD1:2022 is taken into account and found to be without any modification.

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

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

☐ Other:... (to be specified, for example when required by the standard or client).

Information on uncertainty of measurement:

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

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

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

Copy of marking plate	The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.
Refer to 704022605251-00	

Possible test case verdicts:	
- test case does not apply to the test item .:	N/A (Not Applicable)
- test item does meet the requirement	P (Pass)
- test item does not meet the requirement .:	F (Fail)
Date of receipt of test item	2026-06-01
Date (s) of performance of tests	2026-06-01 to 2026-08-06
General remarks:	
"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report. Throughout this report a ☒ comma / ☐ point is used as the decimal separator. Note: Throughout this TRF, numerical data taken from IEC standards are using a comma as the decimal separator. Throughout this report, the term "Test item" is used over terms such as Test object, EUT or DUT. The manufacturer/ Importer has to ensure the appliance placing on the EU market conforms to the applicable EU directives which provide the affixing of the CE marking, such as LVD, EMC, RoHS, ErP, and so on.	
Name and address of factory (ies)	NINGBO KELI POWER CO., LTD Lishan Lucheng Miao Development Zone 315490 Yuyao City, Zhejiang PEOPLE'S REPUBLIC OF CHINA
General product information (GPI) and other remarks:	
Refer to 704022605251-00	

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1 General description of test item

Note: The information in this section has been provided by the applicant.

1.1 Photo(s) of the test item

Photo 1.1.1	<i>Refer to 704022605251-00 Attachment No. 3</i>

1.2 Test item(s)

No.	Test item name	Unique identification / type / description	Extent of test
1	N/A	N/A	N/A
2			
3			
4			
5			
6			
7			
8			
Engineering statement for untested variants / product family:			
N/A			
Supplementary information: N/A			

1.3 Port(s)

No.	Port Name	Type	Cable		
			Specified length in m	Attached during test	Shielded
1	Mains power	AC Mains	-	-	-
2			-	☐	☐
3				☐	☐
4				☐	☐
5				☐	☐
6				☐	☐
7				☐	☐
8				☐	☐
9				☐	☐
10				☐	☐
Supplementary information: N/A					

1.4 Power rating(s)

Power supply type..... :	☐	AC, 1 phase
	☒	AC, 2 phases
	☐	AC, 3 phases
	☐	Neutral
	☐	Protective Earth
	☐	DC
	☐	Battery, not rechargeable in the device
	☐	Battery, rechargeable in the device
Rated voltage	Refer to 704022605251-00	
Rated frequency	Refer to 704022605251-00	
Rated power	Refer to 704022605251-00	

1.5 Additional parameters

Protection class	Class II	
Clock frequencies	N/A	
Other parameters	N/A	
Software version	N/A	
Hardware version	N/A	
Dimensions (W x H x D) ...	Refer to 704022605251-00	
Mounting position	☒	Table-top equipment
	☐	Wall/Ceiling mounted equipment
	☐	Floor standing equipment
	☐	Hand-held equipment
	☐	Other: <i>Click or tap here to enter text</i>

1.6 Operating mode(s)

No.	Abbreviation	Detailed description of the operating mode	Used for testing	
			Emission	Immunity
1	N/A	N/A	☐	☐
2			☐	☐
3			☐	☐
4			☐	☐
5			☐	☐
6			☐	☐
7			☐	☐
8			☐	☐
Supplementary information: N/A				

1.7 Auxiliary equipment

Advice to the TRF User: Include accessories which are not to be considered test items.

No.	Aux Item Name	Type and description	Manufacturer (if not the same)
1	N/A	N/A	N/A
2			
3			
4			
5			
6			
7			
8			
Supplementary information: N/A			

1.8 Documents as provided by the applicant

No.	Document ref.	Type and description	Doc date
1	N/A	N/A	N/A
2			
3			
4			
5			
6			
7			
8			
Supplementary information: N/A			

1.9 Modifications to the test item during testing

☐	No modifications done during testing	
☐	Modifications done during testing (see details below)	
No.	Description of modification (if any)	Date of modification
1	N/A	N/A
2		
3		
Supplementary information: N/A		

2 Verdict summary section

Rationale for verdicts, including N/A (Not Applicable), are listed on each test sheet.
If applicable test was not performed then CB Test Certificate cannot be issued.

Table/ Clause	Requirement – Test case	Basic standard	Verdict
6.6	Calculation of the results	IEC 62493: 2022	N/A
7.2	Low-power exclusion method	IEC 62493: 2022	N/A
7.3	Application of the EMF product standard for body worn-equipment	IEC 62209-2: 2010	N/A
7.4	Application of the EMF product standard for base stations	IEC 62232: 2011	N/A
7.5	Application of another EMF standard	IEC 62311: 2007	N/A
Supplementary information (e.g. detailed information to verdicts):			

2.1 Test setups

Figure 2.1.1	Test setup 1
N/A	

3 Limits

3.1 General

Devices must either be inherently compliant in 4.2.2 or comply with Van der Hoofden test limit in 4.2.3 and pass assessment procedure for intentional radiators in 4.3

4.2 Unintentional radiating part of lighting equipment

4.2.2 Lighting equipment deemed to comply with the Van der Hoofden test without testing

Name	Electronic transformer (Safety light transformer)
Date	2026-08-06
Rationale for verdict N/A	N/A

Lighting equipment is deemed to comply with the requirements of this standard without testing if it fulfils one of the following inherent-compliance conditions:	☐	electronic controlgear
	☐	incandescent-lamp technology
	☒	LED-light-source technology
	☐	OLED-light-source technology
	☐	high-pressure discharge lamp LED-light-source technologies
	☐	low-pressure discharge lamp technologies with exposure distance ≥ 50 cm
	☐	independent auxiliary
Supplementary information	N/A	

4.2.3 Application of limits

Name	:	N/A
Date	:	N/A
Rationale for verdict N/A	:	N/A

☐	Lighting equipment does not inherently comply with the Van der Hoofden test without testing but the compliance factor F is ≤ 1
Supplementary information	: N/A

5.6 Measurement uncertainty

Where relevant, the following measurement instrumentation uncertainty levels have been estimated for tests performed on the apparatus:

Type of disturbance / Test method	Calculated expanded uncertainty U_{Lab}	U_{basic}
Van der Hoofden Test	N/A	30%

5.8 Decision rule

If the uncertainty calculated with the instrumentation actually used for the test (U_{Lab}) is less than or equal to the uncertainty given in 5.6 (U_{basic}) then:

- compliance is deemed if the measurement result does not exceed the applicable limit;
- non-compliance is deemed to occur if the measurement result exceeds the applicable limit.

If the uncertainty calculated with the instrumentation used for the test () is higher than the uncertainty given in 5.6 (U_{basic}) then:

- compliance is deemed to occur if the measurement result, increased by ($U_{\text{Lab}} - U_{\text{basic}}$), does not exceed the applicable limit.
- non-compliance is deemed to occur if the measurement result, increased by ($U_{\text{Lab}} - U_{\text{basic}}$), exceeds the applicable limit.

6.2 Operating Conditions

Name	N/A
Date	N/A
Rationale for verdict N/A	N/A

Test location (stand)..... :	N/A	
Stabilization Time :	☐	15 minutes for low-pressure discharge lamps
	☐	30 minutes for all other discharge lamps
	☐	Other (minutes):
Operating Conditions: :	☐	Specified by the manufacturer (ref. cl. 1.6)
	☐	Multiple lamp lighting equipment with all lamps operated simultaneously
	☐	Self-contained emergency lighting operated from mains
	☐	Lighting equipment with light regulation measured at the minimum and maximum limit of light regulation.
Measurement Distance :	N/A	
Supplementary information :	N/A	

Photo 6.2.1	Test Setup – Van der Hoofden
N/A	

Test results for Induced internal electric field	
Test item no(s) ref. cl. 1.2	N/A
Operating mode no(s) ref. cl. 1.6	N/A
Test setup no(s) ref. cl. 3.2	N/A

7 Assessment procedure intentional radiators

Name	N/A
Date	N/A

Rationale for verdict N/A	N/A
---------------------------------	-----

7.2 Low-power exclusion method

Input $P_{\text{int,rad}}$	N/A
Exclusion level P_{max}	N/A
Input power $P_{\text{int,rad}} < \text{exclusion level } P_{\text{max}}$	☐ Yes
	☐ No
Supplementary information	N/A

7.3 Application of the EMF product standard for body worn-equipment

If low-power exclusion is not met and exposure distance ≤ 0.05 m, does device comply with IEC 62209-2	☐ Yes
	☐ No
Supplementary information	N/A

7.4 Application of the EMF product standard for base stations

If low-power exclusion is not met and intentional radiator is a base station, does device comply with IEC 62232	☐ Yes
	☐ No
Supplementary information	N/A

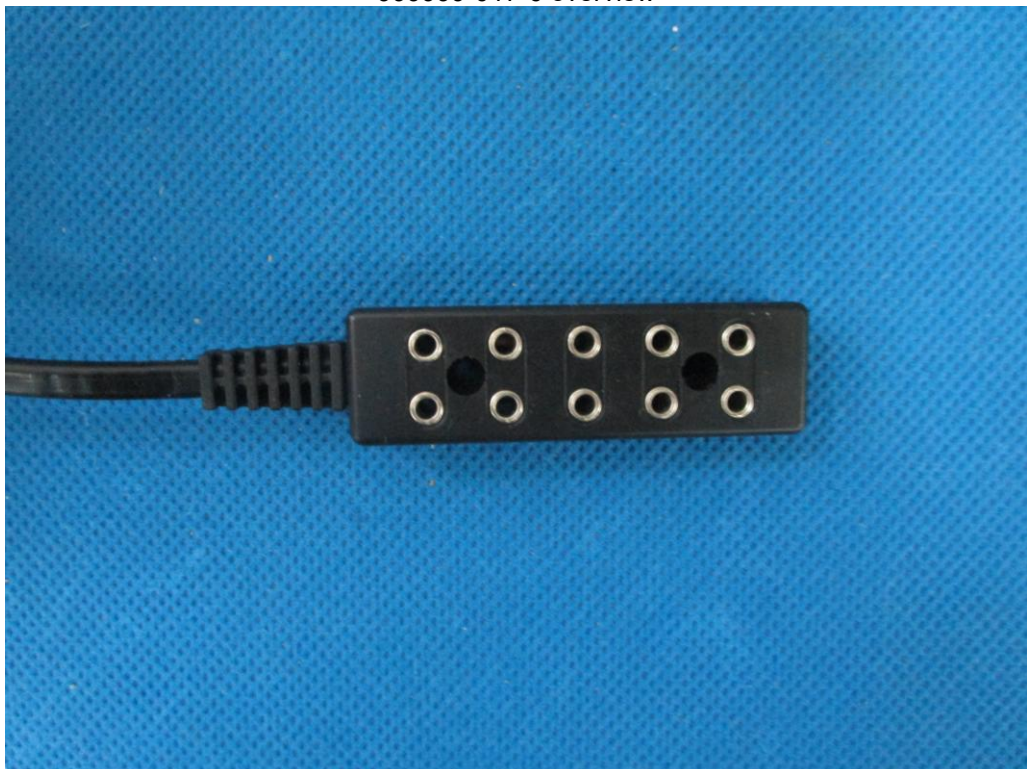
7.5 Application of another EMF standard

If low-power exclusion is not met and intentional radiator is not considered as body-worn equipment or base station equipment, does device comply with IEC 62311	☐ Yes
	☐ No
Supplementary information	N/A

Photographs

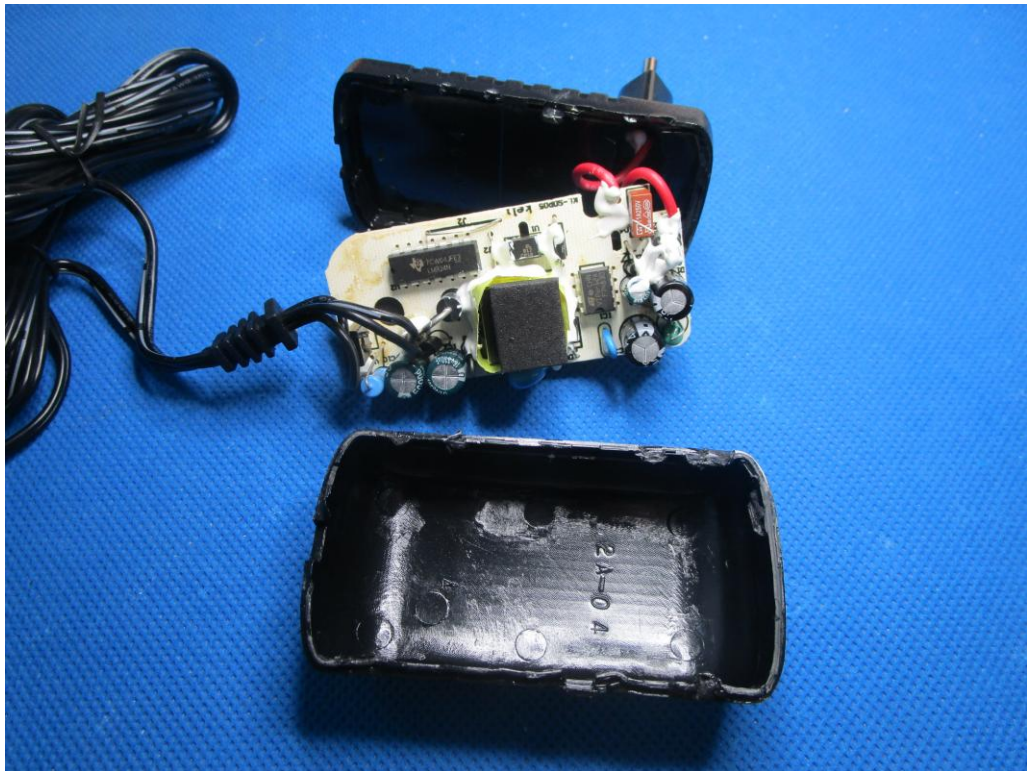


999999-017-6 overview

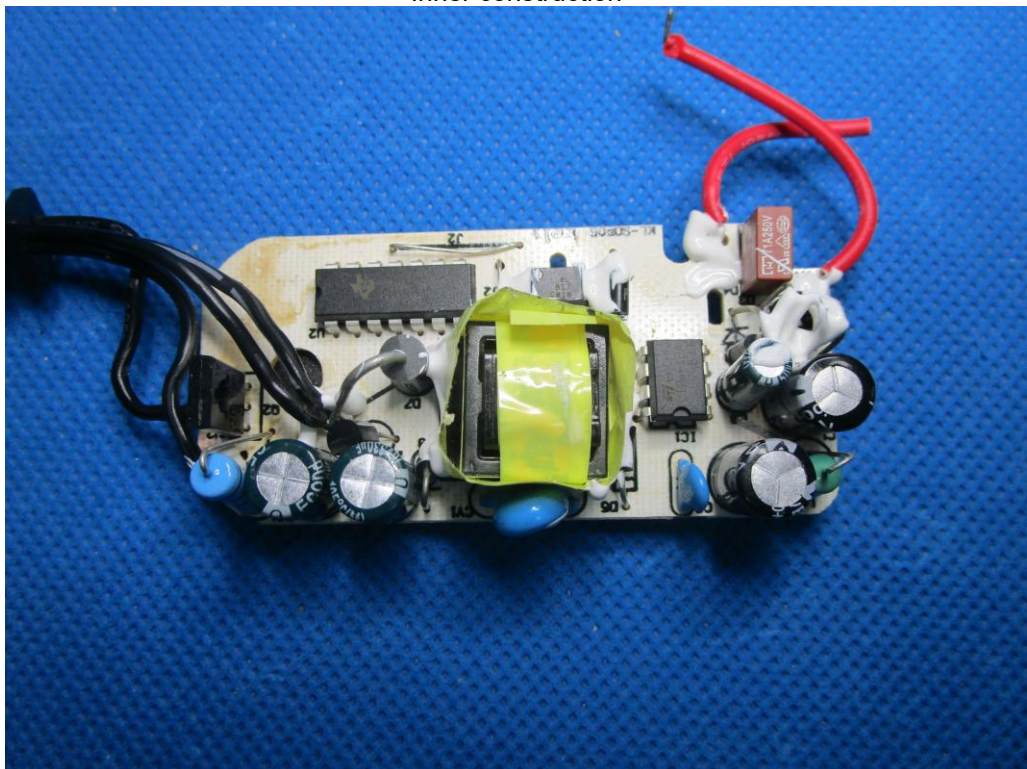


Output connector

Photographs

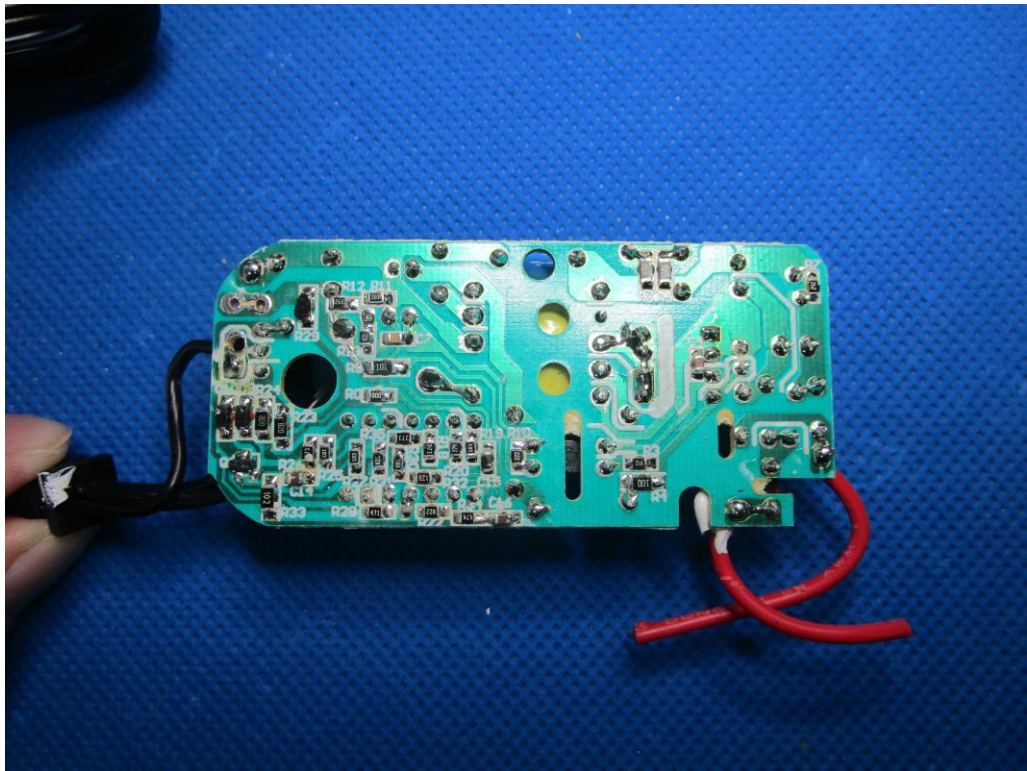


Inner construction



PCB

Photographs



PCB



Transformer

Photographs



Transformer



Transformer

Photographs



Transformer



Core

Photographs

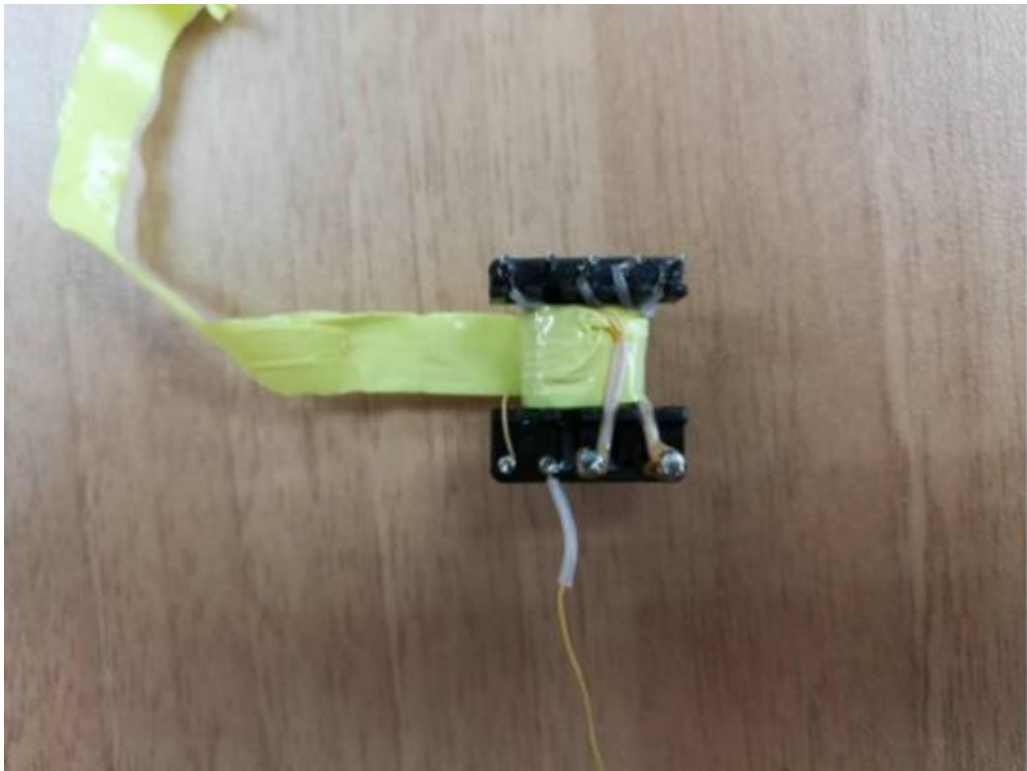


Triple-insulated secondary winding

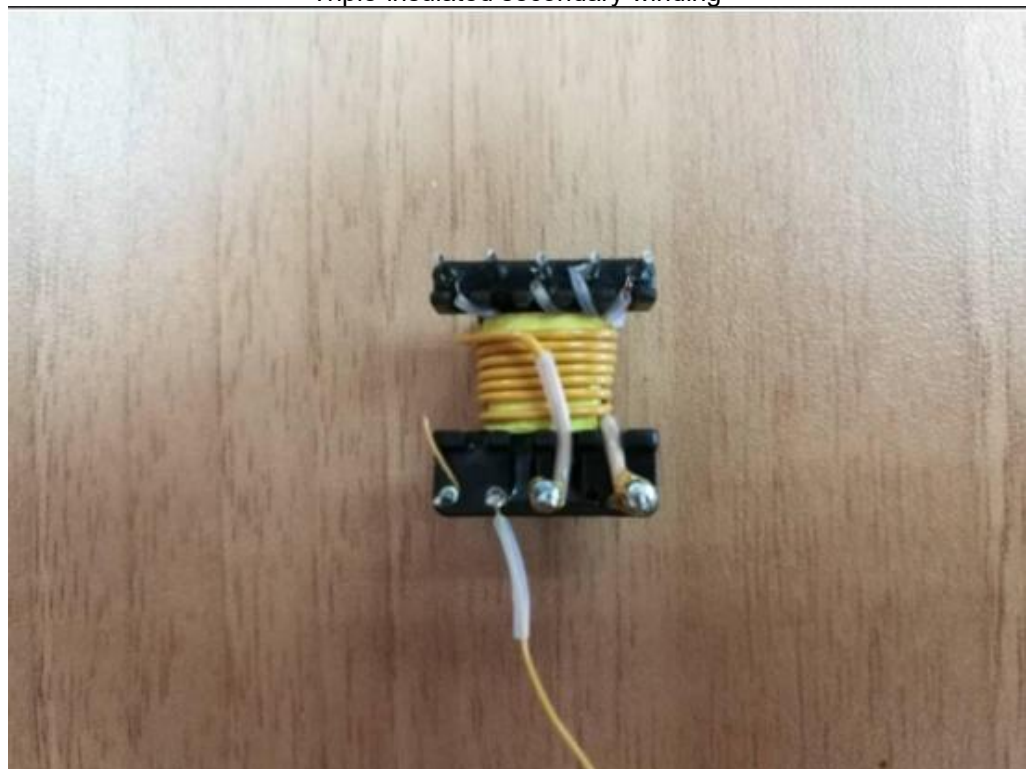


Triple-insulated secondary winding

Photographs

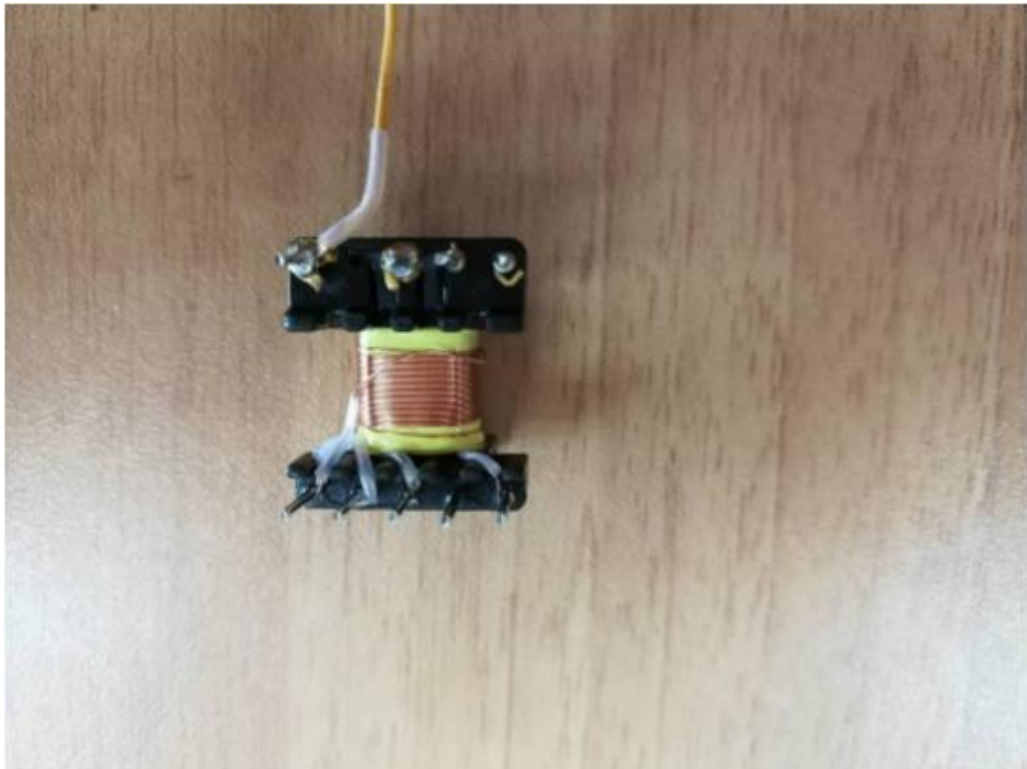


Triple-insulated secondary winding



Triple-insulated secondary winding

Photographs



Primary winding