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. .....:	65.250.20.072.01
Date of issue .....:	2021-01-26
Total number of pages.....:	110
Name of Testing Laboratory preparing the Report.....:	TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
Applicant's name.....:	Shenzhen Zhongli Power Technology Co., Ltd.
Address .....:	Bldg. F 2-4 Layer, Li Hao Yongda High-Tech Park Gongming ST, Guangming New District, 518105 Shenzhen, Guangdong, PEOPLE'S REPUBLIC OF CHINA.
Test specification:	
Standard .....:	IEC 61558-2-16:2009, AMD1:2013 used in conjunction with IEC 61558-1:2017
Test procedure.....:	GS Scheme, CE_LVD
Non-standard test method.....:	N/A
Test Report Form No.....:	IEC61558_2_16G
Test Report Form(s) Originator.....:	Intertek Testing Services (Singapore) Pte Ltd
Master TRF.....:	Dated 2020-02-21

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

General disclaimer:

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

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Test item description .....:	AC/DC ADAPTOR
Trade Mark .....:	N/A
Manufacturer.....:	Same as applicant
Model/Type reference .....:	ZL-024WLxxxyyyynn01, ZL-024WLxxxyyyyXX02 (xxx, yyyy and nn are variables; see General product information and other remarks for details of model description.)
Ratings .....:	Input: 100-240VAC, 50/60Hz, 1.0A Max Output: See General product information and other remarks for details

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):			
☒	**Testing Laboratory:**	TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch	
Testing location/ address ..... :		Building 12&13, Zhiheng Wisdomland Business Park, Nantou Checkpoint Road 2, Nanshan District, 518052 Shenzhen, CHINA	
Tested by (name, function, signature) ..... :		Kevin Chen (Project Handler)	
Approved by (name, function, signature) .. :		Phil Quan (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 No. 1: 2 pages of European Group and National Difference according to EN 61558-2-16: 2009 / A1:2013.
Attachment No. 2: 1 page of Germany GS Scheme according EK1 557-13.
Attachment No. 3: 2 pages of PAH evaluation report.
Attachment No. 4: 17 pages of European plug and UK plug test report.
Attachment No. 5: 11 pages of photo document.

Summary of testing:

Tests performed (name of test and test clause):	**Testing location:**
The submitted samples were found to comply with the requirements of: - EN IEC 61558-1:2019; - EN 61558-2-16:2009+A1:2013; - EK1 557-13. ➢ PAH risk assessment: - AfPS GS 2019:01 PAK.	TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch Building 12&13, Zhiheng Wisdomland Business Park, Nantou Checkpoint Road 2, Nanshan District, 518052 Shenzhen, CHINA

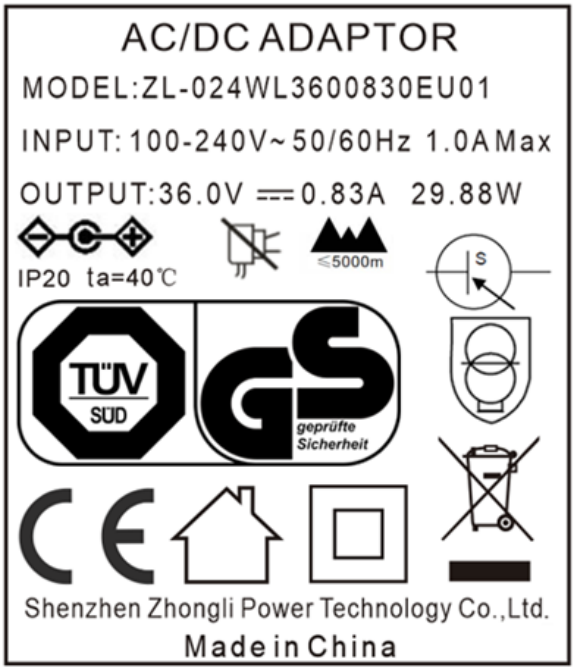
Summary of compliance with National Differences (List of countries addressed):

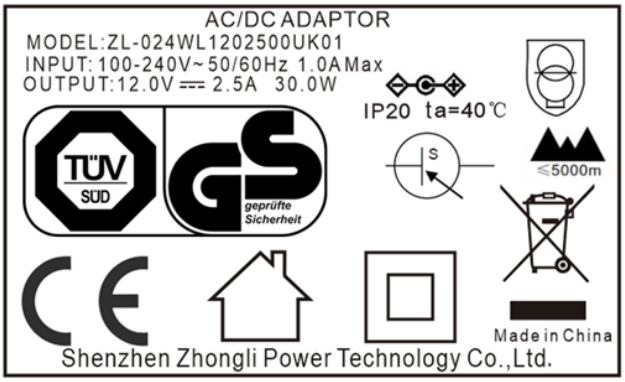
List of countries addressed: See the attachment No. 1, No. 2 of National and Group Differences for details.

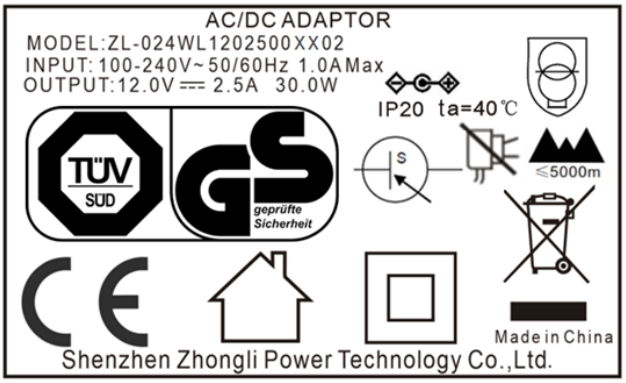
☒ **The product fulfils the requirements of** EN 61558-2-16:2009+A1:2013, EN IEC 61558-1:2019.

Copy of marking plate (representative):

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.







Importer:xxx...
Importer Address:xxx...

The importer information should be marked in label when this product import to European Marketing.

Remark:

- Representative marking as above, marking of all models are identical except for model name and output rating.

- The height dimension of CE mark should not less than 5mm, the height dimension of WEEE symbol should not less than 7mm.

-  symbol only used for European plug models.

Test item particulars .....:	AC/DC ADAPTOR
Classification of installation and use .....:	Class II equipments and portable use
Supply Connection.....:	Direct 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 ..... :	2021-01-05
Date (s) of performance of tests..... :	2021-01-06 to 2021-01-18

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.

According to the EU directives which have been aligned with EU NLF (new legislative framework), both of manufacturer and importer's name and address shall be affixed on the product or, where that is not possible, on its packaging or in a document accompanying the product before the product is placed on the EU market.

According to the German product safety law (ProdSG), the name and address of manufacturer (an EU-based importer or authorized representative if the manufacturer is not based in EU) shall be affixed on the product or, where that is not possible, on its packaging or in a document accompanying the product before the product is placed on the EU market.

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

The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided .....:	☐ **Yes** ☒ **Not applicable**

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

Name and address of factory (ies).....:	Same as applicant

General product information and other remarks:

Description of test samples:

1. AC/DC ADAPTOR, direct plug-in equipments, which designed to supply power for general use, for indoor use only.
2. The top enclosure is sealed with bottom enclosure by ultrasonic welding.
3. The maximum operating ambient temperature is 40°C.
4. The components MOV1 and the heat sink HS1 on U2 is optional.
5. The secondary components D1 and D1A is alternatively use, only use D1 or only use D1A.
6. The European plug and British plug have been evaluated according to relevant standard as following:
   - European plug was tested according to EN 50075;
   - British plug was tested according to BS 1363.
7. Clearances were evaluated for operating altitude up to 5000m above sea level.
8. Before placing the products in the different countries, the manufacturer must ensure that: operating

instructions, ratings labels and warnings labels are in an accepted or official language of the country in question; the equipment complies with the national standards and/or electrical codes of the country, province or city or in question.

Model Description:

1. Model list:

Model	Rated output voltage (VDC)	Rated output current (A)	Max. rated output power (W)	Transformer (T1)
ZL-024WLxxxyyyynn01, ZL-024WLxxxyyyyXX02	5.0-8.0	0.10-3.00	20.0	ZL-024W-05
	8.1-13.0	0.10-2.50	30.0	ZL-024W-12
	13.1-21.0	0.10-2.29	30.0	ZL-024W-18
	21.1-36.0	0.10-1.42	30.0	ZL-024W-24
- xxx=050-360, which denotes for the rated output voltage from 5.0VDC to 36.0VDC, in step of 0.1VDC; - yyyy=0100-3000, which denotes for the rated output current from 0.10A to 3.00A, in step of 0.01A; - nn=EU, UK, which denotes for the AC plug type, EU denotes for European plug, UK denotes for British plug.				

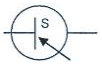
2. All models in ZL-024WLxxxyyyynn01 are identical to each other except for output rating, transformer secondary winding, some secondary electrical components, model name and plug portion type; models ZL-024WLxxxyyyyEU01 are fitted with European plug; models ZL-024WLxxxyyyyUK01 are fitted with British plug; models ZL-024WLxxxyyyyXX02 are similar with models ZL-024WLxxxyyyynn01 except for plug portion; models ZL-024WLxxxyyyyXX02 are fitted with detachable EU plug or UK plug; models ZL-024WLxxxyyyynn01 are fitted with fixed EU plug or UK plug.
3. Due to the similarities between models, the following models were selected for electrical and mechanical tests in order to represent the wholes series:
   -Models fitted with: ZL-024WL0663000EU01, ZL-024WL1202500EU01, ZL-024WL3600830EU01, ZL-024WL0663000UK01, ZL-024WL1202500UK01, ZL-024WL3600830UK01, ZL-024WL0663000XX02 (EU & UK plug), ZL-024WL1202500XX02 (EU & UK plug), ZL-024WL3600830XX02 (EU & UK plug).

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

8	MARKING AND OTHER INFORMATION		P
8.1	Transformer marked with (for symbols see Table 1):		P
	a) rated supply voltage or voltage range (V) .....:	100-240V~	P
	b) rated output voltage (V) .....:	See rating label and model list	P
	c) rated output (VA, kVA or W) .....:	See rating label and model list	P
	d) rated output current (A) .....:	See rating label and model list	P
	e) rated frequency (Hz) .....:	50/60Hz	P
	f) rated power factor (if not 1) .....:		N/A
	g) symbol AC for alternating current, or DC for direct current-output	~ for input and ⎓ for output	P
	h) symbol for electrical function (according to one or more part's 2) in addition with the symbol for SMPS (IEC 61558-2-16:09)	Symbol  and  used	P
	i) manufacturer's name or trademark or name of the responsible vendor	Manufacturer's name: Shenzhen Zhongli Power Technology Co., Ltd.	P
	j) model or type reference	See rating label and model list	P
	k) vector group according to IEC 60076 for three-phase transformer		N/A
	l) symbol for Class II		P
	symbol for Class III		N/A
	m) index IPXX if other than IP00	IP20	P
	n) rated max. ambient temperature ta (if not 25 °C) .....:	40°C	P
	o) rated minimum ambient temperature t_{amin}, if <10° C and if a temperature sensitive device is used		N/A
	p) 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 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) :		P
	– short-circuit voltage (% rated supply voltage) for stationary transformers > 1000 VA		N/A
	– electrical function of the transformer		P

IEC 61558-2-16			
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.		P
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		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:		P
	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 .....:	Non-replaceable current fuse rating marked on PCB near F1: T3.15A 250V	P
	Manufacturer's model or type reference and rating of the device for non-inherently short-circuit proof transformers with incorporated replaceable protective device (other than fuses)		N/A
	Construction 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	Evident from the design of the transformer	N/A
8.8	Instruction sheet for type X, Y, Z attachments	Type Z attachment for output cord	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 maker's name or trademark.		P
	Class II transformer with parts to be mounted – delivered with all parts for class II after mounting.		N/A
	Symbol for class II transformer placed on the part which provides class II.		N/A

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
8.11	Correct symbols:		P
	Volts	V	P
	Amperes	A	P
	Volt amperes (or volt-amperes reactive for reactors)		N/A
	Watts	W	P
	Hertz	Hz	P
	Input	PRI	N/A
	Output	SEC	N/A
	Direct current	DC or	P
	Neutral		N/A
	Single-phase a.c.		P
	Three-phase a.c.		N/A
	Three-phase and neutral a.c.		N/A
	Power factor		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-link		N/A
	Rated max. ambient temperature	t_a=40°C	P
	Rated minimum ambient temperature		N/A
	Rated minimum temperature		N/A
	Frame or core terminal		N/A
	Protective earth		N/A
	IP number	IP20	P
	Earth (ground for 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.		P
	To indicate that the power supply unit shall not be used, if pins of the plug part are damaged.	 only use for EU plug models	P

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	Additional Symbols (IEC 61558-2-16:09)		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
	SMPS (Switch mode power supply unit)		P
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

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	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):		P
	For non-inherently short-circuit proof transformers with non-self-resetting or non-replaceable devices (weak-point, thermal link): The device cannot be reset or replaced		P
	For transformers generating a protective earth conductor current greater than 10 mA (see also cl. 18.5.2): The installation shall be made according to the wiring rules.		N/A
	For stationary transformers exceeding 1000 VA: The short circuit voltage in % of the rated supply voltage		N/A
	For all transformers the electrical function: An information about the electrical function of the transformer (e.g. inherently short circuit proof safety isolating transformer)		P
	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 with more than one output winding, not for series or parallel connection		N/A
	– an information in the instruction sheet: the transformer is not intended for series/parallel connection		N/A
	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

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
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**		**P**
9.1	General		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:		P
	– it is separated from the supply by double or reinforced insulation and		P
	– the requirements of 9.2.1.2 or 9.2.1.3 are fulfilled		P
9.2.1.2	The touch voltage is ≤35 V(peak) a.c. or ≤ 60 Vd.c.	Max. 36.24Vd.c. (output terminal)	P
9.2.1.3	If the touch voltage is > 35 V (peak)a.c. or > 60 V d.c., the following requirements shall be fulfilled:		P
	The touch current shall not exceed:		P
	– for a.c. 0,7 mA (peak)	Normal condition: Max. 0.180mApeak (Tested with CY1&CY2 in series used)	P
	– for d.c. 2,0 mA (see Annex J)		N/A
	In addition, when a capacitor is connected to live parts:		—
9.2.1.3.1	discharge: < 45 μC (between 60 V and 15 kV)		P
9.2.1.3.2	energy: ≤ 350 mJ (voltage >15 kV)		N/A
9.2.2	Transformers shall have an adequate protection against accessibility to hazardous live parts:		P
	The enclosure of class I and class II transformers gives an adequate protection against accentual contact with hazardous live parts.		P
	Class I transformers: accessible parts are separated from hazardous live parts by at least basic insulation.		N/A
	Class II transformers: no accessibility to basic insulation, or conductive parts separated from hazardous live parts by basic insulation.		P
	Hazardous live parts are not accessible after removal of detachable parts.		N/A

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	Hazardous live parts are not 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, knops are not hazardous life parts.		N/A
	Compliance is checked by inspection and by relevant tests according to IEC 60 529		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 may be accessible if they are isolated from the input circuit by double or reinforced insulation and if the following conditions are fulfilled:		P
	– The no load output voltage is $\leq$ 35 V peak a.c. or $\leq$ 60 V ripple free d.c., both poles are accessible	Max. 36.24Vd.c. (output terminal)	P
	– The no load output voltage is > 35 V peak a.c. or > 60 V ripple free d.c. and $\leq$ 250 V a.c., only one pole may be accessible		N/A
9.3	Transformers with primary supply plug: 1 s after the interruption of the supply the voltage between the pins do not exceed 35 V (peak) a.c. or 60 V ripple free d.c.	No X-cap. used	N/A
	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) a.c. or 60 V ripple free d.c.		N/A
	The following tests are required:		N/A

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	If the nominal capacitance is ≤ 0,1 µF – 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		N/A
	If the measured voltage is > 60 V ripple free d.c., the discharge must be ≤ 45 µC.		N/A
10	**CHANGE OF INPUT VOLTAGE SETTING**		**P**
	Voltage setting not possible to change without a tool		N/A
	Different rated supply voltages:		N/A
	– indication of voltage for which the transformer is set, is discernible on the transformer.		N/A
10.101	A wide range of the input (100 V a. c, to 240 V a.c voltage is allowed (IEC 61558-2-16:09):	100-240V~	P
	– if the output voltages does not exceed the rated output voltage and		P
	– if the no-load voltage does not exceed the limits of output voltage deviation		P
11	**OUTPUT VOLTAGE AND OUTPUT CURRENT UNDER LOAD**		**P**
11.1	Difference from rated value (without rectifier; with rectifier):		P
	a) inherently short-circuit proof transformers with one rated output voltage for output voltage: a.c. ≤ 10%; d.c. ≤ 15%		N/A
	b) inherently short-circuit proof transformers with one more than 1 rated output voltage for highest output voltage: a.c. ≤ 10%; d.c. ≤ 15%		N/A
	c) idem for other output voltages: a.c. ≤ 15%; d.c. ≤ 20%		N/A
	d) other transformers for output voltages: a.c. ≤ 5%; d.c. ≤ 10%	(see appended table)	P
12	**NO-LOAD OUTPUT VOLTAGE (see supplementary requirements in Part 2)**		**P**
	Remark: with rectifier measuring on both sides of the rectifier		P
12.101	The no load output voltage shall not exceed (IEC 61558-2-16:09):		P
	– For SMPS incorporating separating or auto-transformers: 1000V a.c. or 1415 V ripple free d.c.		N/A
	– For SMPS including isolating transformers: 500 V a.c. or 708 V ripple-free d.c.		N/A
	– For SMPS including safety isolating transformers: 50 V a.c. or 120 V ripple-free d.c.	Max. 36.24Vd.c. (output terminal)	P

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	For independent transformers, this output voltage limitation applies even when output windings, not for interconnection, are connected in series		P
12.202	The difference between output voltage at no load and the output voltage measured in clause 11 does not exceed the values of table 101 (IEC 61558-2-16:09)	(see appended table)	P
12.103	Unless otherwise specified by the manufacturer, SMPS with high frequency output rating shall be tested with 20 cm to 200 cm length of wire connected to the output terminals under the most unfavourable conditions. Two twisted wires or cables rated 60227 IEC 53 may be used. The cross sectional area of the conductors shall be determined according to the rated output of the SMPS, and the current density shall not exceed 5 A/mm2 in normal use. (IEC 61558-2-16:09)		P
13	**SHORT-CIRCUIT VOLTAGE**		**N/A**
	Difference from marking for short-circuit voltage ≤ 20%		N/A
14	**HEATING**		**P**
14.1	General requirements		P
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 ta ± 5 °C		—
	Type X, Y, Z attachments: 1 pull (5 N) to the connection windings		P
	Upri (V): 1,1 times rated supply voltage loaded with rated impedance – for independent transformers	90Va.c. and 264Va.c.	—
	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		—
	Type X, Y, Z attachments: 1 pull (5 N) to the connection windings		P
	Max. temperature windings.....:	(see appended table)	P
	– Class A: ≤ 100 °C		N/A
	– Class E: ≤ 115 °C		N/A
	– Class B: ≤ 120 °C		P

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Clause	Requirement + Test	Result - Remark	Verdict
	– 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		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 ≤ 70 °C		N/A
	Temperature of terminals of switches ≤ 70 °C		N/A
	Temperature of internal and external wiring:		P
	– rubber: ≤ 65 °C		N/A
	– PVC: ≤ 70 °C	80°C rating output wire used (UL approved)	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		P
	Temperature of printed boards:		P
	– bonded with phenol-formaldehyde: ≤ 105 °C		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– melamine-formaldehyde: ≤ 105 °C		N/A
	– phenol-furfural: ≤ 105 °C		N/A
	– polyester: ≤ 105 °C	130°C rating PCB used (UL approved)	P
	– bonded with epoxy: ≤ 140 °C		N/A
	Electric strength between input and output windings (18.3, 1 min); test voltage (V) ..... :		P
14.101	Winding temperature measured by thermocouples at the surface of the winding (IEC 61558-2-16:09)		P
	– if the internal frequencies is > 1kHz		P
	– the values of Table 2 for windings temperatures are reduced by 10°C		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
14.3.1	General		N/A
	Cycling test (10 cycles):		N/A
	– measuring of the no-load input current (mA)		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 is ≤ 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

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Clause	Requirement + Test	Result - Remark	Verdict
	– 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**		**P**
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		—
	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
	Wining 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
	– 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

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Clause	Requirement + Test	Result - Remark	Verdict
	Max. temperature of external enclosures (accessible by test finger) ≤ 105 °C	(see appended table)	P
	Max. temperature of insulation of wiring (rubber and PVC) ≤ 85 °C	(see appended table)	P
	Temperature rise of supports ≤ 105 °C	(see appended table)	P
15.1.2	Alternative short circuit and overload test method		N/A
15.2	For inherently short-circuit proof transformers and for transformers with rectifiers test by short circuit of the output winding at rated supply voltage x 1,1: temperature rises ≤ values in table 5		N/A
15.3	For non-inherently short-circuit proof transformers and for transformers with rectifiers: temperature rises ≤ values in table 5		P
15.3.1	Output terminals short-circuited: protection device operates, test at 0,9 … 1,1 of the rated supply voltage	1) short-circuit after 14.2 at hot condition, electronic circuit protected immediately 2) short-circuit at cold condition, electronic circuit protected immediately	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 a miniature fuses in accordance to IEC 60127(all parts), 1,5 times of the rated fuse, until steady state condition (in addition)*		N/A
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	(see appended table)	P
	If an internal week 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		—

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Clause	Requirement + Test	Result - Remark	Verdict
	– Upri (V): 1,1 times rated supply voltage .....:		—
	– Isec (A): 1,5 times rated output current .....:		—
	– time until steady-state conditions t1 (h) .....:		—
	– 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 of the SMPS fulfil the requirements of **Annex H of part 1**. After a fault: no electric shock, no fire hazard and no unintentional operation.	(Details see Annex H)	P
16	**MECHANICAL STRENGTH**		**P**
16.1	General		P
	After tests of 16.2, 16.3 and 16.4		P
	– no damage		P
	– hazardous live parts not accessible by test pin according to 9.2.2		P
	– no damage for insulating barriers		N/A
	– handles, levers, etc. have not moved on shafts		N/A
16.2	Stationary transformers	Direct plug-in	N/A
	3 blows, impact energy 0,5 ±0,05 J		N/A
16.3	Portable transformers (except of direct plug in transformers)	Direct plug-in	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

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Clause	Requirement + Test	Result - Remark	Verdict
	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:	For models with BS plug equipped	P
	a) plug-in transformers: tumbling barrel test: 50 x ≤ 250 g; 25 x > 250 g	<250g, 50 times	P
	b) torque test of the plug pins with 0,4 Nm		P
	c) pull force according to table 7 for each pin		P
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	For models with EU plug equipped	P
	a) The test is carried in a tumbling barrel as described in IEC 60068-2-31.		P
	- 1000 x ≤ 100 g; 100 g< 500 x ≤ 200 g; 200 g< 100 x	Approx. 80g, 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
	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**		**P**
17.1	Degree of protection (IP code marked on the transformer)	IP20	P
17.1.1	General requirements		N/A
	Test according to 17.1.2 and for other IP ratings test according to IEC 60 529:		N/A
	– stable operating temperature before starting the test for < IPX8		N/A
	– the water for the test shall be at a temperature of 15±10℃		N/A
	– transformer mounted and wired as in normal use		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– 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		N/A
	– glands tightened with a torque equal to two-thirds of 25.6		N/A
	After the tests:		N/A
	– dielectric strength test according to 18.3		N/A
	Inspection:		N/A
	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 (ø 50 x 20 mm) shall not pass through the openings for the number 2 of the first characteristic numeral		N/A
	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
	f) no accumulation of water in transformers ≥ IPX1 so as to 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)	IP20	P
	- rigid sphere		P
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	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 to 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 ≈360°)		N/A
	I) Jet-proof transformer (IPX5) test according to fig. 6 of IEC 60 529 (nozzle 6,3mm)		N/A
	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):	30 °C, 95% R.H.,48 h (Required by client)	P
	– insulation resistance and electric strength (Cl. 18)		P
18	**INSULATION RESISTANCE AND ELECTRIC STRENGTH**		**P**
18.2	Insulation resistance between:		P
	– live parts and body for basic insulation ≥ 2 MΩ		N/A
	– live parts and body for reinforced insulation ≥ 7 MΩ	>500 MΩ	P
	– input circuits and output circuits for basic insulation ≥ 2 MΩ		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– input circuits and output circuits for double or reinforced insulation ≥ 5 MΩ	>500 MΩ	P
	– each input circuit and all other input circuits connected together ≥ 2 MΩ		N/A
	– each output circuit and all other output circuits connected together ≥ 2 MΩ		N/A
	– hazardous live parts and metal parts with basic insulation (Class II transformers) ≥ 2 MΩ		N/A
	– body and metal parts with basic insulation (Class II transformers) ≥ 5 MΩ		N/A
	– metal foil in contact with inner and outer surfaces of enclosures ≥ 7 MΩ	>500 MΩ	P
18.3	Electric strength test (1 min): no flashover or breakdown:		P
	Overvoltage category .....:	II	P
	1) functional insulation; working voltage (V); test voltage (V) :		N/A
	2) basic insulation; working voltage (V); test voltage (V) .....:	Working voltage: 240Va.c. Test voltage: 1500Va.c. (between L and N)	P
	3) supplementary insulation; working voltage (V); test voltage (V) .....:		N/A
	4) double or reinforced insulation:	Working voltage: 265Va.c. Test voltage: 3000Va.c. (between pri. circuit and sec. circuit)	P
	5) Functional insulation for windings intended to be connected in series or parallel (test voltage = working voltage + 500 V) (IEC 61558-2-16:09)		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 Ut 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
18.4	Does not apply (IEC 61558-2-16:09)		N/A
18.101	Impulse test according Table F5 of IEC 60664-1 with 1,2/50 µs (IEC 61558-2-16)		P
	– After the test of 18.3, 10 impulses of each polarity between input and output terminals		P

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Clause	Requirement + Test	Result - Remark	Verdict
	– During the tests no breakdown of the insulation between turns of a winding, between input and output circuits, or between windings and any conductive core		P
18.102 (A1)	Partial discharge tests according to IEC 60664-1 , if the working voltage is > 750 V peak		N/A
	Partial discharge is ≤ 10 pC at time P2 See Fig. 19.101		N/A
18.5	Touch current and protective earthing conductor current		P
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.	CY1 & CY2 in series used condition: Max. 0.08mA (to output terminals); Max. 0.005mA (to accessible enclosure)	P
	– switches n and e in on position		P
	– switch n: off and switch e: on		P
	– switch n: on and switch e: off		P
18.5.3	Protective earthing conductor current		-
	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**		**P**
19.1	General construction		P
19.1.1	General		N/A
19.1.2	Auto-transformers		N/A
19.1.2.1	For plug connected auto-transformers with rated input voltage > rated output voltage, the potential to earth shall not exceed the rated output voltage.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
19.1.2.2	Polarised input and output plug and socket-outlet system: an instruction is given with the information, that the transformer shall not be used with non-polarised 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 ≤ rated output voltage, also with reversed input plug.		N/A
	– The contact separation of the device is ≥ 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
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 SMPS		N/A
	– 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 SMPS		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 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
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

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Clause	Requirement + Test	Result - Remark	Verdict
	– Allowed for associated transformers by the 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:		—
	– 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
	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		P
	– Insulation between input windings and body consist of double or reinforced insulation rated to the input voltage		P
	– Insulation between output windings and body consist of double or reinforced insulation, rated to the output voltage		N/A
19.1.4.3	For transformers with intermediate conductive parts not connected to the body (between input/output):		-
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.		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 to the input voltage and output voltage), for SELV circuits only basic insulation is required.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– 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.		P
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 to intermediate conductive parts and output and intermediate parts consist of at least basic insulation	The copper between CY1 & CY2 is considered as intermediate parts	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.	The core of T1 is considered as primary part	P
19.1.4.4	For class I transformers, with protective screen, **no**t 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
	Protective screening is not allowed for transformers with plug connection to the mains		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
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
19.1.4.6	No connection between output circuit and body, except of associated transformers (allowed by equipment standard)		P
19.1.4.7	The distance between input and output terminals for the connection of external wiring is ≥ 25 mm		P
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)		P
19.1.4.10	Protective screening is not allowed for transformers with plug connection to the mains		N/A
19.2	Fiercely burning material not used		P
	Unimpregnated cotton, silk, paper and fibrous material not used as insulation		P
	Wax-impregnated, etc. not used		P
19.3	Portable transformer: short-circuit proof or fail-safe	Short-circuit proof transformer	P
19.4	Class II transformers: contact between accessible metal parts and conduits or metal sheaths of supply wiring impossible		N/A
19.5	Class II transformers: part of supplementary or reinforced insulation, during reassembly after routine servicing not omitted		N/A
19.6	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 ≤ 50% specified values (Cl. 26)	Output wire was fixed with PCB by soldering and glue	P
19.7	Conductive parts connected to accessible metal parts by resistors or capacitors shall be separated from hazardous live parts by double or reinforced insulation		P
19.8	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	Approved Y capacitor used	P
	– at least two separate components	Two Y1/Y2 type capacitors CY1&CY2 (Optional) in series used	P
	– if one component is short-circuited or opened, values specified in Cl. 9 shall not be exceeded	Max. 0.360mA peak (Tested with CY2 short-circuited)	P

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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		N/A
	– 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	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	Protection against accidental contact by insulating coating:		N/A
	a) ageing test (IEC 60068-2-14), test Ba: 168 h; 70 ºC		N/A
	b) impact test (spring-operated impact hammer according to IEC 60 068-2-75; 0,5 ± 0,05 J)		N/A
	c) scratch test (hardened steel pin) electric strength test according to Cl. 18		N/A
19.11	Handles, levers, knobs, etc.:		N/A
	– insulating material		N/A
	– supplementary insulation covering		N/A
	– separated from shafts or fixing by supplementary insulation		N/A
19.12	Windings 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:		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 cheekless bobbins the end turns of each layer shall be prevented from being displaced		N/A
19.12.3	Insulated windings wires providing basic, supplementary or reinforced insulation, meet the following requirements:	Approved TIW used	P
	• Multi-layer extruded or spirally wrapped insulation, passed the tests of annex K		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	• 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 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:	Approved TIW used	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		N/A
	• upon enamelled wire		P
	• under enamelled wire		P
	• 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 of part 1 is fulfilled	Approved TIW used	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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
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

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Clause	Requirement + Test	Result - Remark	Verdict
	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
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

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Clause	Requirement + Test	Result - Remark	Verdict
	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
	• 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

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Clause	Requirement + Test	Result - Remark	Verdict
	• 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:		–
	• 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	Handles, operating levers and the like shall be fixed		N/A
19.14	Protection against electric shock: covers securely fixed, 2 independent fixing means, one with tool		P
19.15	Transformer with pins for fixed socket-outlets: no strain on socket-outlet		P
	Additional torque ≤ 0,25 Nm	For models ZL-024WLxxxyyyyEU01: Max. 0.039Nm; For models ZL-024WLxxxyyyyUK01: Max. 0.029Nm; For models ZL-024WLxxxyyyyXX02 (with EU plug): Max. 0.045Nm; For models ZL-024WLxxxyyyyXX02 (with UK plug): Max. 0.036Nm.	P

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Clause	Requirement + Test	Result - Remark	Verdict
19.16	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	Transformers IPX1 - IPX6 totally enclosed, except for drain hole (diameter ≥ 5 mm or 20 mm² with width ≥ 3 mm); drain hole not required for transformer completely filled with insulating materials		N/A
19.18	Transformers ≥ IPX1 with a moulded-on plug, if any		N/A
19.19	Class I transformers with a non-detachable flexible cable or cord with earth conductor and a plug with earth contact		N/A
19.20	Live parts of SELV and PELV-circuits: separation not less than PRI/SEC of a safety isolating transformer		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 8 a		N/A
19.20.2	PELV-circuits double or reinforced insulation is necessary		N/A
19.21	FELV-circuits: protection against contact fulfils the min. test voltage required for the primary circuit		N/A
19.22	Class II transformers shall not be provided with means for protective earth		P
	For fixed transformers an earth conductor with double or reinforced insulation to accessible metal parts is allowed		N/A
19.23	Class III transformers shall not be provided with means for protective earth		N/A
20	**COMPONENTS**		**P**
20.1	Components such as switches, plugs, fuses, lamp holders, flexible cables and cords, comply with relevant IEC standard	(see appended table)	P
	Components inside the transformer pass all tests of this standard together with the transformer tests		P

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Clause	Requirement + Test	Result - Remark	Verdict
	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
	– 60320-2-3 or IEC 60 309 for other		N/A
20.3	Automatic controls shall comply with IEC 60 730-1		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.	No standard output plug or socket-outlets for output connections	P
	Plugs and socket-outlets for SELV systems with both a rated current = 3A and a rated voltage =24 V shall comply with following:		P
	SELV plug and socket-outlets shall comply with IEC 60 884-2-4 and IEC 60 906-3		N/A
	– It is not possible for plugs to enter socket-outlets of other standardised voltage system		P
	– Socket outlets do not accommodate plugs of other standardised voltage systems		P
	– Socket outlets do not have a protective earth contact		P
	PELV plug and socket-outlets shall comply with following:		-
	– It is not possible for plugs to enter socket-outlets of other standardised voltage system		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– 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, overload releases etc. have adequate breaking capacity	(see appended table)	P
	– 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		P
20.7.1	For Fuses According IEC 60127 and IEC 60269, the fuse current does not exceed 1,1 times of the rated value		P
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
	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 rest 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

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Clause	Requirement + Test	Result - Remark	Verdict
	– 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:		-
	1) nature of supply to IEC 60730-1:2013, cl. 6.1		N/A
	2) type of load controlled to IEC 60730-1, 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:		-
	– 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
	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		-
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

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Clause	Requirement + Test	Result - Remark	Verdict
	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 ta 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:		-
	5 cycles: transformer short-circuited for 48 h by 1,1 times of the input voltage and max. ta		N/A
	5 cycles: transformer short-circuited for 48 h by 0,9 times of the input voltage and min. ta (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.		-
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
	– ratings to IEC 60691, cl. 8 b		N/A
	– suitability of sealing components, impregnating fluids or cleaning solvents IEC 60691, cl. 8 c		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		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
20.11	Thermal cut-outs which can be reset by soldering operation are not allowed		N/A
20.12	Overload protection devices do not operate during test (20 times switched on and off, at no load); Upri (V): 1,1 times rated supply voltage.	264V, 20 times, intervals 10s	P
21	**INTERNAL WIRING**		**P**
21.1	Internal wiring and electrical connections protected or enclosed	Output wire was fixed with PCB by soldering and glue	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	Bare conductors: distances adequately maintained		N/A
21.4	When external wires are connected to terminal, internal wiring shall not work loose	Output wire was fixed with PCB by soldering and glue	P
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**		**P**
22.1	All cables, flexible cords etc. shall have appropriate current and voltage ratings	(see appended table 20)	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
	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

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Clause	Requirement + Test	Result - Remark	Verdict
22.5	Power supply cords for transformers IP20 or higher and transformers ”for indoor use only” ≥ IP20:		N/A
	– for transformers with a mass ≤ 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: ≥ IPX0: IEC 60245-4:2011 – type 60245 IEC 57		N/A
22.6	Power supply cords for single-phase portable transformers with input current ≤ 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 (mm²); input current (A) at rated output not less than shown in table 16		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 ≤ 16 A according to IEC 60 083, 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
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

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Clause	Requirement + Test	Result - Remark	Verdict
	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:		N/A
	– cord guards, if any, of insulating material and fixed		N/A
	Compliance is tested by the oscillating test according to fig. 12:		N/A
	– loaded force during the test according to fig. 12		N/A
	– 10 N for a cross-sectional area > 0,75 mm^2		N/A
	– 5 N for other cords		N/A
	After the test according to fig. 12:		N/A
	– no short-circuit between the conductors		N/A
	– no breakage of more than 10% of stands of any conductor		N/A
	– no separation of the conductor from the terminal		N/A
	– no loosening of any cord guards		N/A
	– no damage of the cord or cord guard		N/A
	– no broken strands piercing the insulation and not becoming accessible		N/A
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

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Clause	Requirement + Test	Result - Remark	Verdict
	– 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
	– 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 for output wire	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		N/A
	– not possible to push cable into transformer		P
	– 25 pulls of 1 s		P
	– 1 min torque according to table 17		P

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Clause	Requirement + Test	Result - Remark	Verdict
	– mass (kg); pull (N); torque (Nm) .....:	Approx. 0.11kg, 30N, 0.1Nm for fixed EU plug models; Approx. 0.12kg, 30N, 0.1Nm for fixed UK plug models; Approx. 0.12kg, 30N, 0.1Nm for detachable EU models; Approx. 0.13kg, 30N, 0.1Nm for detachable UK plug models	—
	– during test: cable not damaged		P
	– after test: longitudinal displacement ≤ 2 mm for cable or cord and ≤ 1 mm for conductors in terminals	Max. 0.5mm longitudinal displacement for output cord; Max. 0.3mm longitudinal displacement 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**		**N/A**
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, terminals	No such terminals used	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

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Clause	Requirement + Test	Result - Remark	Verdict
	– 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
	– 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

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Clause	Requirement + Test	Result - Remark	Verdict
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**		**P**
24.1	Class I transformers: accessible conductive parts connected to earth terminal	Class II transformer	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
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 ≤ 0,1Ω 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

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Clause	Requirement + Test	Result - Remark	Verdict
25	**SCREWS AND CONNECTIONS**		**N/A**
25.1	Screwed connections withstand mechanical stresses		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
	No damage after torque test: diameter (mm); torque (Nm); ten times		N/A
	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
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

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Clause	Requirement + Test	Result - Remark	Verdict
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 AND CLEARANCES**		**P**
26.2	Creepage distances (cr) and clearances (cr)		P
26.2.1	General		P
26.2.2	Windings covered with adhesive tape		N/A
	– the values of pollution degree 1 are fulfilled		N/A
	– all isolating material are classified acc. to IEC 60085 and IEC 60216(all parts)		N/A
	– test A of 26.2.4 is fulfilled		N/A
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(all parts)		N/A
	– values of pollution degree 1 are not applicable		N/A
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
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	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, 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
	– 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

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Clause	Requirement + Test	Result - Remark	Verdict
	– 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	Approved insulation material used	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
	– 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:		P
	– 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

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Clause	Requirement + Test	Result - Remark	Verdict
	– 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		P
	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 ≤ 100 VA 2/3 of the values for thin layers apply		P
	– rated output < 25 VA 1/3 of the values for thin layers apply		N/A
26.3.4	Mandrel test of insulation in thin sheet form (specimen of 70±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
	– 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.		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

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Clause	Requirement + Test	Result - Remark	Verdict
	– 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, clearances and distances through insulation, specified values according to (IEC 61558-2-16:09):		P
	– table 13, material group IIIa (part 1)		P
	– table C, material group II (part 1)		N/A
	– table D, material group I (part 1)		N/A
	– working voltage		P
	– rated supply frequency 50/60 Hz		P
	– rated internal frequency		P
	1. Insulation between input and output circuits (basic insulation):		N/A
	a) measured values ≥ specified values (mm) .....:		N/A
	2. Insulation between input and output circuits (double or reinforced insulation):		P
	a) measured values ≥ specified values (mm) .....:		P
	b) measured values ≥ specified values (mm) .....:		N/A
	c) measured values ≥ specified values (mm) .....:		P
	3. Insulation between adjacent input circuits: measured values ≥ specified values (mm) :		N/A
	Insulation between adjacent output circuits: measured values ≥ specified values (mm) .:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	4. Insulation between terminals for external connection:		N/A
	a) measured values ≥ specified values (mm) .....:		N/A
	b) measured values ≥ specified values (mm) .....:		N/A
	c) measured values ≥ specified values (mm) .....:		N/A
	5. Basic or supplementary insulation:		P
	a) measured values ≥ specified values (mm) .....:		P
	b) measured values ≥ specified values (mm) .....:		N/A
	c) measured values ≥ specified values (mm) .....:		N/A
	d) measured values ≥ specified values (mm) .....:		N/A
	e) measured values ≥ specified values (mm) .....:		N/A
	6. Reinforced or double insulation: measured values ≥ specified values (mm) .....:		P
	7. Distance through insulation:		P
	a) measured values ≥ specified values (mm) .....:		N/A
	b) measured values ≥ specified values (mm) .....:		N/A
	c) measured values ≥ specified values (mm) .....:	Enclosure: Min. 2.0mm	P
26.102	Values of IEC 61558-2-16 applicable for frequency up to 3 MHz (IEC 61558-2-16:09)		P
	For frequency above 3 MHz clause 7 of IEC 60664-4 is applicable (high frequency testing)		N/A
26.103	Clearance (IEC 61558-2-16:09)		P
	a) Clearance for frequency $\geq$ 30 kHz according figure 101 two determinations are necessary:		P
	– determination based on peak working voltage according Table 104 :		P
	Peak working voltage		P
	Basic insulation: required / measured		P
	Double or reinforced insulation: required / measured value		P

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Clause	Requirement + Test	Result - Remark	Verdict
	– and alternative if applicable for approximately homogeneous field according to Table 102		P
	Peak working voltage		P
	Basic insulation: required / measured		P
	Double or reinforced insulation: required / measured value		P
	– determination based on measured r.m.s. working voltage according Tables 13, C1 and D1 (see clause 26.101)		P
	The minimum clearance is the greater of the two values.		P
	b) Clearance for frequency ≤ 30 kHz according figure 101 two determinations are necessary:		P
	– determination based on peak working voltage with recurring peak voltages according Table 103 :		P
	– determination based on measured r.m.s. working voltage according Tables 13, C1 and D1 (see clause 26.101)		P
	The minimum clearance is the greater of the two values.		P
26.104	The working voltages of Table 102, 103 and 104 are peak voltages including µsec peaks (IEC 61558-2-16:09)		P
	The working voltage according to Table 13 of part 1 are r.m.s. voltages		P
26.105	Creepage distances		P
	Two determinations of creepage distances are necessary (see Figure 102)		P
	– determination based on measured peak working voltage according Tables 105 to 110		P
	Peak working voltage		P
	Pollution degree	2	P
	Basic or supplementary insulation: required / measured		P
	Double or reinforced insulation: required / measured value		P
	– determination based on measured r.m.s. working voltage according Tables 13, C1 and D1 (see clause 26.101)		P
	If the values based on table 105 to 110 are lower than the relevant values in Tables 13, C.1 or D.1, the higher values shall be applicable		P

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Clause	Requirement + Test	Result - Remark	Verdict
26.106	Distance through insulation (IEC 61558-2-16:09)		P
	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:		P
	– the max. frequency is < 10 MHz		P
	– the field strength approximately comply with Figure 103		P
	– no voids or gaps are present in between the solid insulation		P
	For thick layers d1 ≥ 0,75 the peak value of the field strength is ≤ 2 kV/mm		N/A
	For thin layers d2 ≤ 30 µm the peak value of the field strength is ≤ 10 kV/mm		N/A
	For d1 > d > d2 equation (1) is used for calculation the field strength		P
26.107 (A1)	For transformers with FIW wires the following test is required		N/A
	• 10 cycles are required		N/A
	• 68 h test at max heating temperature + 10°C or test at max. allowed winding temperature based on the insulation class (required in table 1) + 10°C		N/A
	• 1 h at 25° C		N/A
	• 2 h at 0° C		N/A
	• 1 h at 25° C – (next cycle start again with 68 h max winding temp + 10)		N/A
	• during the 10 cycles test 2 x working voltage is connected between PRI and SEC		N/A
	• after 10 cycle test 2 transformers are subjected to the 17.2 test for 48 h and direct after the 48 h the dielectric strength test of 18.3 (100 % test voltage) is done		N/A
	• after the 10 cycle test the third sample is tested at the end of the last cycle in the hot position with the dielectric strength test of 18.3 (100 % test voltage)		N/A
	• the partial discharge test according to 18.101 is done after the cycling test and after the high voltage test, if the **peak** working voltage is >750 V		N/A
27	**RESISTANCE TO HEAT, FIRE AND TRACKING**		**P**
27.1	General		P

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Clause	Requirement + Test	Result - Remark	Verdict
27.2	Resistance to heat		-
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 a.c. or 60 V d.c. and a power ≤ 72 W		P
27.2.2	External accessible parts		-
	The Ball-pressure test -: diameter of impression ≤ 2 mm; heating cabinet temperature (°C) at 70±2 ° C or the temperature T of 14.1 (T + 15±2) - is fulfilled.	(see appended table)	P
27.2.3	Internal parts		-
	For insulating material retaining current carrying parts in position , the ball-pressure test -: diameter of impression ≤ 2 mm; heating cabinet temperature (°C) at 125±2 ° C or the temperature T of 14.1 (T + 15±2) - is fulfilled	(see appended table)	P
27.3	Resistance to abnormal heat under fault conditions		N/A
27.4	Resistance to fire		-
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		-
27.4.2	External accessible parts (glow wire tests)		P
	– 650° C for enclosures	Enclosure (no ignition)	P
	– 650 ° C for parts retaining current carrying parts in position and terminals for external conductors Current ≤ 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	Plug holder, enclosure, plastic material of output connector (no ignition)	P
	– 850° C for parts retaining current carrying parts in position and terminals for external conductors with non-fixed wiring. Current > 0,2 A	Plug holder, enclosure, plastic material of output connector (no ignition)	P
27.4.3	Internal parts		P
	– 550 °C for internal insulating material – not retaining current carrying parts in position	Mylar sheet (no ignition)	P
	– 650 °C for coil formers (bobbins)	T1 Bobbin (no ignition)	P
	– 650 °C for parts retaining current carrying parts in position and terminals for external conductors. Current ≤ 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	Plug holder, enclosure, T1 Bobbin (no ignition)	P

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Clause	Requirement + Test	Result - Remark	Verdict
	– 850 °C for parts retaining current carrying parts in position and terminals for external conductors with non-fixed wiring. Current > 0,2 A	Plug holder, enclosure, T1 Bobbin, PCB (no ignition)	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	IP20	N/A
	Material group IIIb (100≤CTI≤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**		**P**
	Ferrous parts protected against rusting		P
E	**ANNEX E, GLOW WIRE TEST**		**P**
E.1	The test is required according to IEC 60695-2-10 and IEC 60695-2-11 with the following additions:		-
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
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
F	**ANNEX F, REQUIREMENTS FOR MANUALLY OPERATED SWITCHES WHICH ARE PARTS OF THE TRANSFORMER**		**N/A**
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
H	**ANNEX H, ELECTRONIC CIRCUITS** (IEC 61558-1)		**P**
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 condi-tions do not render the appliance unsafe		P
	During and after each test:		P

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	– 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
	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 x I1 test of 15.8 is repeated with fuse-link short-circuited		N/A
	– if I2 > 2,75 x I1, no other tests are necessary		P
	If I2 > 2,1 x I1 and I2 < 2,75 x 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		P

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
H.4	CREEPAGE DISTANCES, CLEARANCES AND DISTANCES THROUGH INSULATION		P
H.4.1	For live parts separated by basic insulation smaller cr and cl as in 26 are allowed, if H.3 is fulfilled.		P
	In optocouplers no requirements of cr and cl		P
	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 acc, 26.2. are applicable		N/A
H.4.2	The ma. surface temperature of optocouplers is 50 K		P
K	**ANNEX K, INSULATED WINDING WIRES**		**P**
K.1	Wire construction:		P
	• insulated winding wire for basic or supplementary insulation (see 19.12.3)		N/A
	• insulated winding wire for reinforced insulation (see 19.12.3)	Approved TIW used	P
	• splid circular winding wires and stranded winding wires with 0,05 to 5 mm diameter		N/A
	• 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 an 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

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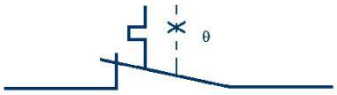
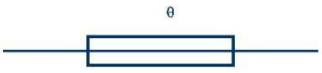
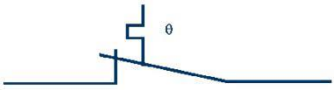
Clause	Requirement + Test	Result - Remark	Verdict
	Claus 5.1 in Test 8 of IEC 60851-3:2009 shall be used		N/A
	Test samples prepared according to clause 5.1.1.4 of IEC 60851-3:2009		N/A
	Dielectric strength test: 5,5 kV for reinforced insulation		N/A
	Dielectric strength test: 2,75 kV for basic or supplementary insulation		N/A
	Mandrel diameter according table K.1		N/A
	The tension to the wire during winding on mandrel is 118 N/mm² (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
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

IEC 61558-2-16			
Clause	Requirement + Test	Result - Remark	Verdict
	• 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
V	**ANNEX V, SYMBOLS TO BE USED FOR THERMAL CUT-OUTS**		**N/A**
Figure V.1	Restored by manual operation  IEC 489/98		N/A
Figure V.2	Restored by disconnection of the supply  IEC 490/98		N/A
Figure V.3	Thermal link  IEC 491/98		N/A
Figure V.4	Self-resetting thermal cut-out  IEC 492/98		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	
ZL-024WL0663000EU01/ 6.6VDC, 3.0A	100V/50Hz	6.51	-1.36%	6.72	3.23%	Limit: ±10%/±20%	
	100V/60Hz	6.51	-1.36%	6.72	3.23%	Limit: ±10%/±20%	
	240V/50Hz	6.51	-1.36%	6.72	3.23%	Limit: ±10%/±20%	
	240V/60Hz	6.51	-1.36%	6.72	3.23%	Limit: ±10%/±20%	
ZL-024WL1202500EU01/ 12.0VDC, 2.5A	100V/50Hz	11.94	-0.50%	12.13	1.59%	Limit: ±10%/±20%	
	100V/60Hz	11.94	-0.50%	12.13	1.59%	Limit: ±10%/±20%	
	240V/50Hz	11.94	-0.50%	12.13	1.59%	Limit: ±10%/±20%	
	240V/60Hz	11.94	-0.50%	12.13	1.59%	Limit: ±10%/±20%	
ZL-024WL3600830EU01/ 36.0VDC, 0.83A	100V/50Hz	35.97	-0.08%	36.24	0.75%	Limit: ±10%/±20%	
	100V/60Hz	35.97	-0.08%	36.24	0.75%	Limit: ±10%/±20%	
	240V/50Hz	35.97	-0.08%	36.24	0.75%	Limit: ±10%/±20%	
	240V/60Hz	35.97	-0.08%	36.24	0.75%	Limit: ±10%/±20%	

14	**TABLE: Heating Test**					**P**
	Supply voltage (V) ..... :	90V, 60Hz Vertical	90V, 60Hz Horizontal	264V, 50Hz Vertical	264V, 50Hz Horizontal	—
	Ambient (°C) ..... :	40.0	40.0	40.0	40.0	—
Maximum measured temperature T of part/at.....:		T (°C)				max. temperature limit, (°C)
For model: ZL-024WL0663000EU01						
Plug holder (Inside)		69.8	66.5	61.5	59.8	Ref.
Mylar sheet		91.9	87.9	76.3	73.6	Ref.
L1 winding		88.2	86.2	75.7	74.8	130
EC1		89.5	87.7	77.4	76.2	105
EC2		88.9	88.7	78.3	78.3	105
MOV1		90.1	82.4	77.6	71.7	125
PCB under U2		116.4	111.6	101.2	98.1	130
CY1		94.2	95.7	88.2	90.1	125
T1 winding		100.4	99.4	92.3	91.2	110
T1 core		97.2	94.8	87.1	87.2	110

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Clause	Requirement + Test		Result - Remark		Verdict
U1	85.3	83.5	80.2	78.9	110
EC5	70.5	72.1	68.5	69.6	105
EC6	70.3	71.9	68.2	69.4	105
LF1 winding	69.4	70.9	67.4	68.5	130
Output wire	68.3	69.8	66.3	67.4	80
PCB under BD1	97.6	93.1	80.0	76.7	130
PCB under D1	111.3	114.5	104.6	107.7	130
Enclosure inside top near T1	75.5	77.5	69.2	69.9	Ref.
Enclosure inside bottom near T1	86.2	84.1	79.6	78.8	Ref.
Enclosure outside top near T1	66.6	67.8	60.4	60.8	80
Enclosure outside bottom near T1	74.3	72.5	67.8	67.3	80
Support	64.0	61.3	57.3	56.0	85
Ambient	40.0	40.0	40.0	40.0	--
For model: ZL-024WL1202500EU01					
Plug holder (Inside)	74.6	70.5	64.3	62.6	Ref.
Mylar sheet	101.1	96.9	84.2	81.7	Ref.
L1 winding	96.9	94.4	79.2	77.3	130
EC1	101.1	97.9	82.7	80.9	105
EC2	98.3	97.2	82.5	82.0	105
MOV1	95.5	87.7	76.9	69.8	125
PCB under U2	119.5	113.1	100.5	96.7	130
CY1	97.7	99.0	88.9	91.0	125
T1 winding	104.7	103.6	94.0	93.7	110
T1 core	98.9	98.3	90.6	89.9	110
U1	91.3	88.4	83.0	82.3	110
EC5	74.9	74.0	71.1	71.5	105
EC6	74.2	73.4	70.5	70.9	105
LF1 winding	73.3	72.5	69.7	70.1	130
Output wire	72.1	71.3	68.5	68.9	80
PCB under BD1	103.1	97.8	80.7	77.5	130
PCB under D1	107.8	111.4	100.1	104.3	130
Enclosure inside top near T1	79.3	78.9	75.7	75.2	Ref.
Enclosure inside bottom near T1	88.0	85.4	81.6	80.5	Ref.
Enclosure outside top near T1	69.8	69.4	67.4	66.8	80
Enclosure outside bottom near T1	75.6	73.2	70.6	69.7	80
Support	67.8	64.5	59.6	58.3	85
Ambient	40.0	40.0	40.0	40.0	--
For model: ZL-024WL3600830EU01					
Plug holder (Inside)	75.8	72.1	59.9	57.7	Ref.
Mylar sheet	92.8	89.5	70.2	68.0	Ref.
L1 winding	102.2	101.2	75.5	74.3	130

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Clause	Requirement + Test	Result - Remark	Verdict

EC1	100.0	98.7	77.2	76.0	105
EC2	98.9	99.7	78.4	78.1	105
MOV1	94.7	89.6	74.0	70.1	125
PCB under U2	110.0	103.2	80.9	76.7	130
CY1	100.0	103.9	86.8	88.0	125
T1 winding	100.8	100.3	92.6	91.2	110
T1 core	96.6	96.0	89.1	87.5	110
U1	94.5	93.5	80.3	78.6	110
EC5	70.8	70.2	65.8	65.0	105
EC6	70.2	69.6	65.5	64.7	105
LF1 winding	69.3	68.8	64.3	63.5	130
Output wire	68.2	67.6	62.7	62.0	80
PCB under BD1	101.2	95.5	72.2	69.4	130
PCB under D1	96.5	99.0	88.1	88.5	130
Enclosure inside top near T1	78.9	79.5	72.6	73.7	Ref.
Enclosure inside bottom near T1	86.2	86.9	83.7	84.1	Ref.
Enclosure outside top near T1	69.7	70.0	65.2	65.8	80
Enclosure outside bottom near T1	74.6	74.9	72.3	73.3	80
Support	68.7	65.7	56.0	54.2	85
Ambient	40.0	40.0	40.0	40.0	--
For model: ZL-024WL0663000EU01 (with D1A)					
Plug holder (Inside)	65.5	--	--	--	Ref.
Mylar sheet	86.0	--	--	--	Ref.
L1 winding	84.4	--	--	--	130
EC1	85.8	--	--	--	105
EC2	86.8	--	--	--	105
MOV1	80.8	--	--	--	125
PCB under U2	108.8	--	--	--	130
CY1	93.5	--	--	--	125
T1 winding	97.1	--	--	--	110
T1 core	92.7	--	--	--	110
U1	81.8	--	--	--	110
EC5	70.8	--	--	--	105
EC6	70.6	--	--	--	105
LF1 winding	69.7	--	--	--	130

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Clause	Requirement + Test	Result - Remark	Verdict

Output wire	68.7	--	--	--	80
PCB under BD1	91.0	--	--	--	130
PCB under D1	108.7	--	--	--	130
Enclosure inside top near T1	76.1	--	--	--	Ref.
Enclosure inside bottom near T1	82.4	--	--	--	Ref.
Enclosure outside top near T1	66.7	--	--	--	80
Enclosure outside bottom near T1	71.2	--	--	--	80
Support	60.5	--	--	--	85
Ambient	40.0	--	--	--	--

Supplementary information:

Temperature T of winding:	t_1 (°C)	R_1 (Ω)	t_2 (°C)	R_2 (Ω)	T (°C)	Allowed T_{max} (°C)	Insulation class
--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--

Supplementary information:

1. Thermocouple method used.
2. Tma is 40.0°C Max., above all the tests were performed in chamber at 40°C.
3. Horizontal means the adaptor is plugged into horizontal socket-outlet; Vertical means the adaptor is plugged into vertical wall socket-outlet.

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

15	**TABLE: Short circuit and overload protection**		**P**
	Test voltage (V) ..... :	264V/50Hz	—
	Ambient (°C) ..... :	25.0	—

Thermocouple Locations	max. temperature measured, (°C)	max. temperature limit, (°C)
Model: ZL-024WL0663000EU01 (264V/50Hz, Vertical)		
T1 winding	99.9	165
T1 core	95.8	165
Output wire	72.9	85
Enclosure outside near T1 top	66.1	105
Enclosure outside near T1 bottom	75.2	105

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Clause	Requirement + Test	Result - Remark	Verdict

Support	62.1	105
Ambient	40.0	--
Model: ZL-024WL1202500EU01 (264V/50Hz, Vertical)		
T1 winding	102.8	165
T1 core	99.3	165
Output wire	77.0	85
Enclosure outside near T1 top	74.9	105
Enclosure outside near T1 bottom	79.6	105
Support	65.4	105
Ambient	40.0	--
Model: ZL-024WL3600830EU01 (264V/50Hz, Vertical)		
T1 winding	109.8	165
T1 core	107.3	165
Output wire	75.8	85
Enclosure outside near T1 top	79.1	105
Enclosure outside near T1 bottom	82.9	105
Support	65.6	105
Ambient	40.0	--
Supplementary information:		

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

18.2	TABLE: insulation resistance measurements		P
Insulation resistance R between:		R (MΩ)	Required R (MΩ)
Mylar sheet used between enclosure and PCB (BI) @		>500	2
Between mains poles before F1 (F1 disconnected) (BI) &		>500	2
Between L&N and plastic enclosure with metal foil (RI) &		>500	7
Between L&N and output terminal (RI)		>500	5
T1 primary windings to secondary windings (RI)		>500	5
T1 core to secondary windings (RI)		>500	5
Between two metal foils in contact with the inner and outer surfaces of enclosures (RI) @		>500	7
Supplementary information: &: Test models: ZL-024WL3600830EU01, ZL-024WL3600830UK01, ZL-024WL3600830XX02 (EU & UK plug). @: test repeated for all alternate materials and components listed in table 20.			

18.3	TABLE: Dielectric Strength		P
Test voltage applied between:		Test potential applied (V)	Breakdown / flashover (Yes/No)
Mylar sheet used between enclosure and PCB (BI) @		1500VAC	No
Between mains poles before F1 (F1 disconnected) (BI) &		1500VAC	No
Between L&N and plastic enclosure with metal foil (RI) &		3000VAC	No
Between L&N and output terminal (RI)		3000VAC	No
T1 primary windings to secondary windings (RI)		3000VAC	No
T1 core to secondary windings (RI)		3000VAC	No
1 layer of insulation tape used in transformer T1(RI) @		3000VAC	No
Supplementary information: &: Test models: ZL-024WL3600830EU01, ZL-024WL3600830UK01, ZL-024WL3600830XX02 (EU & UK plug). @: test repeated for all alternate materials and components listed in table 20.			

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

20	TABLE: Critical components information				P
Object / part No.	**Manufacturer/ trademark**	**Type / model**	**Technical data**	**Standard**	**Mark(s) of conformity[1)]**
Enclosure	SABIC INNOVATIVE PLASTICS US L L C	925(GG), 945 (GG)	V-0, 120°C, Min. thickness 2.0mm	UL 94, IEC/EN IEC 61558-1, IEC/EN 61558-2-16	UL, Tested with appliance
Plug holder	SABIC INNOVATIVE PLASTICS US L L C	925(GG), 945 (GG)	V-0, 120°C	UL 94, IEC/EN IEC 61558-1, IEC/EN 61558-2-16	UL, Tested with appliance
Mylar sheet used between enclosure and PCB	SHENZHEN BORNSUN INDUSTRIAL CO LTD	BN-ZD16, BN-ZD19	VTM-0, 115 °C, Min. 0.4mm thickness	UL 94, IEC/EN IEC 61558-1, IEC/EN 61558-2-16	UL, Tested with appliance
(Alternative)	CHENGDU KANGLONGXIN PLASTICS CO LTD	KLX PP WT-10-3	VTM-0, 110 °C, Min. 0.4mm thickness	UL 94, IEC/EN IEC 61558-1, IEC/EN 61558-2-16	UL, Tested with appliance
(Alternative)	SABIC INNOVATIVE PLASTICS US L L C	FR700(GG)	V-0, 125 °C, Min. 0.4mm thickness	UL 94, IEC/EN IEC 61558-1, IEC/EN 61558-2-16	UL, Tested with appliance
PCB	DONG GUAN RONG MAO ELECTRONICS CO LTD	R-1	V-0, 130°C	UL 796, IEC/EN IEC 61558-1, IEC/EN 61558-2-16	UL, Tested with appliance
(Alternative)	CHEERFUL PLASTIC ELECTRONIC PRODUCTS	03A	V-0, 130°C	UL 796, IEC/EN IEC 61558-1, IEC/EN 61558-2-16	UL, Tested with appliance
(Alternative)	DONGGUAN CITY XINRAN ELECTRONIC CO LTD	XR-V002, XR-F003	V-0, 130°C	UL 796, IEC/EN IEC 61558-1, IEC/EN 61558-2-16	UL, Tested with appliance
(Alternative)	HUIZHOU ZHENGHUA ELECTRONICS CO LTD	ZH-2, ZH-3, ZH-D	V-0, 130°C	UL 796, IEC/EN IEC 61558-1, IEC/EN 61558-2-16	UL, Tested with appliance

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Clause	Requirement + Test	Result - Remark	Verdict

(Alternative)	DONGGUAN HUATUO ELECTRONIC CO LTD	YK-02, YK-03, YK-04	V-0, 130°C	UL 796, IEC/EN IEC 61558-1, IEC/EN 61558-2-16	UL, Tested with appliance
(Alternative)	DONG GUAN CHEUNG HING (P C B) CO LTD	CH8B	V-0, 130°C	UL 796, IEC/EN IEC 61558-1, IEC/EN 61558-2-16	UL, Tested with appliance
(Alternative)	DONGGUAN CITY DESHENG CIRCUIT BOARD CO LTD	DS-1, DS-2, DS-3	V-0, 130°C	UL 796, IEC/EN IEC 61558-1, IEC/EN 61558-2-16	UL, Tested with appliance
Current fuse (F1)	Dongguan Better Electronics Technology Co., Ltd.	932	T3.15A, 250VAC	IEC/EN 60127-1, IEC/EN 60127-3	VDE
(Alternative)	Dongguan Better Electronics Technology Co., Ltd.	334 - Serie(s)	T3.15A, 250VAC	IEC/EN 60127-1, IEC/EN 60127-3	VDE
(Alternative)	Dongguan Better Electronics Technology Co., Ltd.	332	T3.15A, 250VAC	IEC/EN 60127-1, IEC/EN 60127-3	TÜV Rheinland
(Alternative)	Shenzhen Lanson Electronics Co. Ltd.	3N - Serie(s), SMT T3,15A250V, 3K T3.15A250V	T3.15A, 250VAC	IEC/EN 60127-1, IEC/EN 60127-3	VDE
(Alternative)	XC Electronics (Shen Zhen) Corp. Ltd.	5TE, 4T, 3T	T3.15A, 250VAC	IEC/EN 60127-1, IEC/EN 60127-3	VDE
(Alternative)	Dongguan Anlu Electronics Technology Co. Ltd.	32CT, 32GT, AMT	T3.15A, 250VAC	IEC/EN 60127-1, IEC/EN 60127-3	VDE
(Alternative)	Dongguan Hongda Electronic Technology Co., Ltd.	31TC	T3.15A, 250VAC	IEC/EN 60127-1, IEC/EN 60127-3	VDE
(Alternative)	Hollyland Company Limited	5ET	T3.15A, 250VAC	IEC/EN 60127-1, IEC/EN 60127-3	VDE
Varistor (MOV1) (Optional)	Cerglass MFG Inc	10D471K, 14D471K, 10D681K, 14D681K	Min. 300VAC, 125°C, Min. V-1 coating	IEC/EN 61051-1, IEC/EN 61051-2+A1, IEC/EN 61051-2-2	VDE

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Clause	Requirement + Test	Result - Remark	Verdict

(Alternative)	Shantou High-New Technology Dev. Zone Songtian Enterprise Co., Ltd.	10D471K, 14D471K, 10D681K, 14D681K	Min. 300VAC, 125°C, Min. V-1 coating	IEC/EN 61051-1, IEC/EN 61051-2+A1, IEC/EN 61051-2-2	VDE
(Alternative)	DongGuan City Jiankun Electronics Technology Co. Ltd	10D471K, 14D471K, 10D681K, 14D681K	Min. 300VAC, 125°C, Min. V-1 coating	IEC/EN 61051-1, IEC/EN 61051-2+A1, IEC/EN 61051-2-2	VDE
(Alternative)	DONGGUAN CITY DERSONIC ELECTRONIC CO., LTD.	10D471K, 14D471K, 10D681K, 14D681K	Min. 300VAC, 125°C, Min. V-1 coating	IEC/EN 61051-1, IEC/EN 61051-2+A1, IEC/EN 61051-2-2	TUV SUD
Line choke (L1)	Hui Zhou Shi Chang Rui Industry And Trade Co., Ltd	0608	130°C	IEC/EN IEC 61558-1, IEC/EN 61558-2-16	Tested with appliance
(Alternative)	Shenzhen Jia Dian Bao Electric Treasure Plastic Electronics Co., Ltd	0608	130°C	IEC/EN IEC 61558-1, IEC/EN 61558-2-16	Tested with appliance
(Alternative)	Gangbei District, Guigang City Source Xin Electronics Factory	0608	130°C	IEC/EN IEC 61558-1, IEC/EN 61558-2-16	Tested with appliance
(Alternative)	Zhongshan Fei Ting Electronics Co. Ltd.	0608	130°C	IEC/EN IEC 61558-1, IEC/EN 61558-2-16	Tested with appliance
(Alternative)	Shenzhen Coil-Rida Electronics Co., Ltd	0608	130°C	IEC/EN IEC 61558-1, IEC/EN 61558-2-16	Tested with appliance
(Alternative)	Chi Yang Technology Co., Ltd	0608	130°C	IEC/EN IEC 61558-1, IEC/EN 61558-2-16	Tested with appliance
(Alternative)	Shenzhen Xinye Yongshun Electronics Co. Ltd.	0608	130°C	IEC/EN IEC 61558-1, IEC/EN 61558-2-16	Tested with appliance
(Alternative)	Dongguan City Zhongci Electronic Technology Co., Ltd	0608	130°C	IEC/EN IEC 61558-1, IEC/EN 61558-2-16	Tested with appliance
Heat shrinkable tube (Used for L1)	Shenzhen wolida trading co ltd	RSFR-H	600V, 125°C, VW-1, min. 0.2mm thickness	IEC/EN IEC 61558-1, IEC/EN 61558-2-16, UL 224	UL Tested with appliance

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Clause	Requirement + Test	Result - Remark	Verdict

(Alternative)	CHANGYUAN ELECTRONICS GROUP CO LTD	CYG-ZHP	600V, 125°C, VW-1, min. 0.2mm thickness	IEC/EN IEC 61558-1, IEC/EN 61558-2-16, UL 224	UL Tested with appliance
(Alternative)	SHENZHEN WOER HEAT-SHRINKABLE MATERIAL CO LTD	RSFR-H	600V, 125°C, VW-1, min. 0.2mm thickness	IEC/EN IEC 61558-1, IEC/EN 61558-2-16, UL 224	UL Tested with appliance
(Alternative)	DONGGUAN SALIPT CO LTD	SALIPT S-HPT-600	600V, 125°C, VW-1, min. 0.2mm thickness	IEC/EN IEC 61558-1, IEC/EN 61558-2-16, UL 224	UL Tested with appliance
Y-Capacitor (CY1, CY2) (Optional)	Shantou High-New Technology Dev. Zone Songtian Enterprise Co., Ltd	CE	Max. 2200pF, min. 250VAC, 125°C, Y2 type	IEC/EN 60384-14	VDE
(Alternative)	Shaanxi Huaxing Electronic Development Co., Ltd	CT7Y2	Max. 2200pF, min. 250VAC, 125°C, Y2 type	IEC/EN 60384-14	VDE
(Alternative)	Shen Zhen Shi Zhc Technology Co., Ltd	CE series	Max. 2200pF, min. 250VAC, 125°C, Y2 type	IEC/EN 60384-14	VDE
(Alternative)	Zhi Wei Electronics Co., Ltd	DY	Max. 2200pF, min. 250VAC, 105°C, Y2 type	IEC/EN 60384-14	VDE
(Alternative)	Hsuan Tai Electronic Co., Ltd	CY	Max. 2200pF, min. 250VAC, 125°C, Y1 type	IEC/EN 60384-14	VDE
(Alternative)	Nanjing Yuyue Electronics Co., Ltd.	CT7	Max. 2200pF, min. 250VAC, 125°C, Y1 or Y2 type	IEC/EN 60384-14	VDE
(Alternative)	Dongguan City Dafu Electronics Co., Ltd	CT7 Y2	Max. 2200pF, min. 250VAC, 125°C, Y2 type	IEC/EN 60384-14	VDE
(Alternative)	Dongguan Cigu Electronic Technology Co., Ltd	CE	Max. 2200pF, min. 250VAC, 125°C, Y2 type	IEC/EN 60384-14	VDE
(Alternative)	Xiangtai Electronics (Shenzhen) Co., Ltd	YT	Max. 2200pF, min. 250VAC, 125°C, Y2 type	IEC/EN 60384-14	VDE
(Alternative)	Dongguan Weiqing Electronic Co., Ltd	WE	Max. 2200pF, min. 250VAC, 125°C, Y2 type	IEC/EN 60384-14	VDE

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Clause	Requirement + Test	Result - Remark	Verdict

(Alternative)	Guangdong South Hongming Electronic Science and Technology Co., Ltd	F	Max. 2200pF, min. 250VAC, 125°C, Y2 type	IEC/EN 60384-14	VDE
(Alternative)	Hongzhi Enterprises Ltd	X1Y2	Max. 2200pF, min. 250VAC, 125°C, Y2 type	IEC/EN 60384-14	VDE
(Alternative)	MACROFAR ELECTRONICS TECHNOLOGY (HK) LTD	HY	Max. 2200pF, min. 250VAC, 125°C, Y2 type	IEC/EN 60384-14	TUV
Optocoupler (U1)	Everlight Electronics Co Ltd	EL817	Reinforced insulation, Dti≥ 0.4mm, Ext. Cl.&Cr. ≥ 7.6mm, 110°C	IEC/EN 60747-5-5	VDE
(Alternative)	Shenzhen Orient Components Co Ltd	ORPC-817 x	Reinforced insulation, Dti≥ 0.4mm, Ext. Cl.&Cr. ≥ 7.6mm, 110°C	IEC/EN 60747-5-5	VDE
(Alternative)	Lite-On Technology Corp	LTV-817	Reinforced insulation, Dti≥ 0.4mm, Ext. Cl.&Cr. ≥ 7.0mm, 115°C	IEC/EN 60747-5-5	VDE
(Alternative)	Bright Led Electronics Corp	BPC-817 (A; B; C; D; L)	Reinforced insulation, Dti≥ 0.4mm, Ext. Cl.&Cr. ≥ 7.6mm, 110°C	IEC/EN 60747-5-5	VDE
(Alternative)	Cosmo Electronics Corp	K1010, KPC817	Reinforced insulation, Dti≥ 0.4mm, Ext. Cl.&Cr. ≥ 6.5mm, 115°C	IEC/EN 60747-5-5	VDE
(Alternative)	CRM ICBG (Wuxi) Co., Ltd	PC817x (blank;M;S)	Reinforced insulation, Dti≥ 0.4mm, Ext. Cl.&Cr. ≥ 7.6mm, 110°C	IEC/EN 60747-5-5	VDE
Transformer (T1)	Shenzhen Max Technology Co., Ltd	ZL-024W-05 (For modes with rated output voltage 5.0-8.0VDC) ZL-024W-12 (For modes with rated output voltage 8.1-13.0VDC)	Class B	IEC/EN IE 61558-1, IEC/EN 61558-2-16	Tested with appliance

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Clause	Requirement + Test	Result - Remark	Verdict

		ZL-024W-18 (For modes with rated output voltage 13.1-21.0VDC) ZL-024W-24 (For modes with rated output voltage 21.1-36.0VDC)			
Insulation system	Shenzhen Max Technology Co., Ltd	MAX-B	Class B	UL 1446	UL
-Bobbin	SUMITOMO BAKELITE CO LTD	PM-9820, PM-9630	Phenolic, V-0, 150°C, Min. thickness 0.45mm	UL 94	UL
-Magnet wire	TAI-I COPPER (GUANZHOU) CO LTD	UEW	130°C	UL 1446	UL
(Alternative)	SHANTOU SHENGANG ELECTRICAL INDUSTRIAL CO LTD	xUEW/130	130°C	UL 1446	UL
-Triple insulated wire	FURUKAWA ELECTRIC CO LTD	TEX-E	Reinforced insulation wire, 130°C	IEC/EN IEC 61558-1, IEC/EN 61558-2-16	VDE
(Alternative)	TOTOKU ELECTRIC CO LTD	TIW-2 xx yy	Reinforced insulation wire, 130°C	IEC/EN IEC 61558-1, IEC/EN 61558-2-16	VDE
-Insulation tape	3M COMPANY ELECTRICAL MARKETS DIV (EMD)	1350-1 (b)	130°C	UL 510	UL
(Alternative)	P LEO & CO LTD	1A025	130°C	UL 510	UL
(Alternative)	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	CT*(b)(g)	130°C	UL 510	UL
- Tube	GREAT HOLDING INDUSTRIAL CO LTD	TFS, TFT	Min. 300V, Min. 200°C, VW-1	UL 224	UL
(Alternative)	CHANGYUAN ELECTROINCS GROUP CO LTD	CB-TT-S, CB-TT-T	Min. 300V, Min. 200°C, VW-1	UL 224	UL
(Alternative)	DEVELOP ELECTRIC CO LTD	DEV-300, DEV-600	Min. 300V, Min. 105°C, VW-1	UL 224	UL

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Clause	Requirement + Test	Result - Remark	Verdict

- Varnish	ELANTAS ZHUHAI CO LTD	50(e), 50S(e)	130°C	UL 1446	UL
(Alternative)	ELANTAS PDG Inc	468-2 (d)	130°C	UL 1446	UL
Output wire*	SHEN ZHEN XIN HUA LIAN TECHNOLOGY CO LTD	2468, 2464	300VAC, VW-1, 80°C, min. 24AWG	UL 758	UL
(Alternative)	HANG LEE INDUSTRIAL CO	2468, 2464, 1185	300VAC, VW-1, 80°C, min. 24AWG	UL 758	UL
(Alternative)	SHENZHEN YUEDENG ELECTRONICS CO LTD	2468, 2464, 1185	300VAC, VW-1, 80°C, min. 24AWG	UL 758	UL
(Alternative)	DONGGUAN WEIDI CABLE TECHNOLOGY CO LTD	2468, 2464, 1185	300VAC, VW-1, 80°C, min. 24AWG	UL 758	UL
(Alternative)	SHENZHEN CITY DE XING LONG ELECTRIC CO LTD	2468, 2464	300VAC, VW-1, 80°C, min. 24AWG	UL 758	UL
(Alternative)	SHENZHEN MEIZHI ELECTRONICS CO LTD	2468	300VAC, VW-1, 80°C, min. 24AWG	UL 758	UL
Plastic material of output connector	SHENZHEN HAOCHANG PLASTIC CO LTD	HC-PVC001	94V-0, 50°C	UL 94, IEC/EN IEC 61558-1, IEC/EN 61558-2-16	UL, Tested with appliance
(Alternative)	PLASRICH INTERNATIONAL GROUP LTD	BEST-006	94V-0, 50°C	UL 94, IEC/EN IEC 61558-1, IEC/EN 61558-2-16	UL, Tested with appliance

Supplementary information:

1) Provided evidence ensures the agreed level of compliance. See OD-CB2039.
2) "*": Output cord less than 20AWG cannot be used unless it is evaluated and allowed by end product standard.
3) License available upon request.

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:			

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Clause	Requirement + Test	Result - Remark	Verdict

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)**
Line and Neutral before F1 (BI)	<420	240	2.3	3.0	2.5	3.0
Two terminals of F1 (BI)	<420	240	2.3	3.0	2.5	3.0
CY1 two terminals (BI)	<420	240	2.3	5.0	2.5	5.0
CY2 two terminals (SI)	<420	240	2.3	4.8	2.5	4.8
Primary trace to secondary trace under U1 (RI)	<420	240	4.5	6.8	5.0	6.8
Primary components to enclosure outside (RI)	<420	240	4.5	5.5	5.0	5.5
Primary trace to secondary trace under T1 (RI)	540	265	4.5	6.6	5.4	6.6
T1 primary winding to secondary pin of T1 (RI) #	540	265	4.5	5.6	5.4	5.6
T1 core to secondary pin of T1 (RI) #	540	265	4.5	7.0	5.4	7.0
Core of T1 to secondary pin of CY2 (RI) #	540	265	4.5	8.0	5.4	8.0
Core of T1 to secondary pin of U1 (RI) #	540	265	4.5	10.4	5.4	10.4
T1 primary winding to secondary component EC6 (RI) #	540	265	4.5	6.2	5.4	6.2
Live part to accessible surface of detachable plug (For models ZL-024WLxxxyyyyXX02) (RI) &	<420	240	4.5	5.3	5.0	5.3
Supplementary information: 1. T1 core considered as primary live parts. 2. FI: Functional insulation; BI: Basic insulation; SI: Supplementary insulation; RI: Reinforced insulation. 3. # means all models of transformer were considered. 4. & means min. Clearance and creepage distance for detachable European & Britain plug. 5. Clearance was evaluated for altitude up to 5000m above sea level, correction factor for clearance is 1.48. 6. If no specified, the worst conditions were recorded.						

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)
Plastic enclosure (RI)	240	3000VAC	0.8	Min. 2.0
Supplementary information: RI: reinforced insulation.				

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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.					

26.2 TEST C	**TABLE: CREEPAGE DISTANCES AND CLEARANCES AND DISTANCES THROUGH INSULATION**	**N/A**

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Clause	Requirement + Test	Result - Remark	Verdict

	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.					

26.107 61558-2-16/A1	**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.					

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Clause	Requirement + Test	Result - Remark	Verdict

27.2	**TABLE: Ball Pressure Test of Thermoplastics**		**P**
Allowed impression diameter (mm) .....:		2	—
Object/ Part No./ Material	Manufacturer/ trademark	Test temperature (°C)	Impression diameter (mm)
Enclosure / 925(GG)	SABIC INNOVATIVE PLASTICS US L L C	125	1.1
Enclosure / 945 (GG)	SABIC INNOVATIVE PLASTICS US L L C	125	1.0
Plug holder / 925(GG)	SABIC INNOVATIVE PLASTICS US L L C	125	1.1
Plug holder / 945 (GG)	SABIC INNOVATIVE PLASTICS US L L C	125	1.0
T1 bobbin / PM-9820	SUMITOMO BAKELITE CO LTD	125	0.4
T1 bobbin / PM-9630	SUMITOMO BAKELITE CO LTD	125	0.5
Supplementary information: --			

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**		
		t_E	**t_A**	**t_E**	**t_A**	**t_E**	**t_A**	**t_E**	**t_A**	
Enclosure / 925(GG)	SABIC INNOVATIVE PLASTICS US L L C			none	X	none	X	none	X	Pass
Enclosure / 945 (GG)	SABIC INNOVATIVE PLASTICS US L L C			none	X	none	X	none	X	Pass
Plug holder / 925(GG)	SABIC INNOVATIVE PLASTICS US L L C	--	--	none	X	none	X	none	X	Pass

IEC 61558-2-16										
Clause	Requirement + Test					Result - Remark				Verdict
Plug holder / 945 (GG)	SABIC INNOVATIVE PLASTICS US L L C	--	--	none	X	none	X	none	X	Pass
T1 bobbin / PM-9820	SUMITOMO BAKELITE CO LTD	--	--	none	X	none	X	none	X	Pass
T1 bobbin / PM-9630	SUMITOMO BAKELITE CO LTD	--	--	none	X	none	X	none	X	Pass
PCB / R-1	DONG GUAN RONG MAO ELECTRONICS CO LTD	--	--	--	--	--	--	none	X	Pass
PCB / 03A	CHEERFUL PLASTIC ELECTRONIC PRODUCTS	--	--	--	--	--	--	none	X	Pass
PCB / XR-V002	DONGGUAN CITY XINRAN ELECTRONIC CO LTD	--	--	--	--	--	--	none	X	Pass
PCB / XR-F003	DONGGUAN CITY XINRAN ELECTRONIC CO LTD	--	--	--	--	--	--	none	X	Pass
PCB / ZH-2	HUIZHOU ZHENGHUA ELECTRONICS CO LTD	--	--	--	--	--	--	none	X	Pass
PCB / ZH-3	HUIZHOU ZHENGHUA ELECTRONICS CO LTD	--	--	--	--	--	--	none	X	Pass
PCB / ZH-D	HUIZHOU ZHENGHUA ELECTRONICS CO LTD	--	--	--	--	--	--	none	X	Pass
PCB / YK-02	DONGGUAN HUATUO ELECTRONIC CO LTD	--	--	--	--	--	--	none	X	Pass
PCB / YK-03	DONGGUAN HUATUO ELECTRONIC CO LTD	--	--	--	--	--	--	none	X	Pass

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Clause	Requirement + Test					Result - Remark				Verdict
PCB / YK-04	DONGGUAN HUATUO ELECTRONIC CO LTD	--	--	--	--	--	--	none	X	Pass
PCB / CH8B	DONG GUAN CHEUNG HING (P C B) CO LTD	--	--	--	--	--	--	none	X	Pass
PCB / DS-1	DONGGUAN CITY DESHENG CIRCUIT BOARD CO LTD	--	--	--	--	--	--	none	X	Pass
PCB / DS-2	DONGGUAN CITY DESHENG CIRCUIT BOARD CO LTD	--	--	--	--	--	--	none	X	Pass
PCB / DS-3	DONGGUAN CITY DESHENG CIRCUIT BOARD CO LTD	--	--	--	--	--	--	none	X	Pass
Output connector / HC-PVC001	SHENZHEN HAOCHANG PLASTIC CO LTD	--	--	--	--	none	X	none	X	Pass
Output connector / BEST-006	PLASRICH INTERNATIONAL GROUP LTD	--	--	--	--	none	X	none	X	Pass
Mylar sheet type / BN-ZD16	SHENZHEN BORNSUN INDUSTRIAL CO LTD	none	X	--	--	--	--	--	--	Pass
Mylar sheet type / BN-ZD19	SHENZHEN BORNSUN INDUSTRIAL CO LTD	none	X	--	--	--	--	--	--	Pass
Mylar sheet type / KLX PP WT-10-3	CHENGDU KANGLONGXIN PLASTICS CO LTD	none	X	--	--	--	--	--	--	Pass
Mylar sheet type / FR700(GG)	SABIC INNOVATIVE PLASTICS US L L C	none	X	--	--	--	--	--	--	Pass
Ignition of the specified layer placed underneath the test specimen (Yes/No) :										No

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Clause	Requirement + Test	Result - Remark	Verdict

Supplementary information:
550 °C GWT not relevant (or applicable) to parts of material classified at least HB40 or if relevant HBF
The GWIT pre-selection option, the 850 °C GWFI pre-selection option, and the 850 °C GWT are not relevant (or applicable) for attended appliances.

Annex H	**TABLE: Electronic circuit**		P
	Ambient temperature (°C) ..... :	25.0°C, if no specified	—
	Power source for EUT: Manufacturer, model/type, output rating ..... :	--	—

Component No.	Fault	Supply voltage (V)	Test time	Fuse #	Fuse current (A)	Observation
Model: ZL-024WL3600830EU01						
MOV1 #	SC	264	< 1 s	F1	0.289→0	F1 opened immediately, no hazard.
BD1 pin 1-3 #	SC	264	< 1 s	F1	0.289→0	F1 opened immediately, no hazard.
EC1 #	SC	264	< 1 s	F1	0.289→0	F1 opened immediately, no hazard.
EC2 #	SC	264	< 1 s	F1	0.289→0	F1 opened immediately, no hazard.
R7#	SC	264	< 1 s	F1	0.289→0	F1 opened immediately, U2 damaged, no hazard.
U2 pin 1 -5,6,7,8 #	SC	264	< 1 s	F1	0.289→0	F1 opened immediately, U2 damaged, no hazard.
U2 pin 2 -5,6,7,8 #	SC	264	< 1 s	F1	0.289→0	F1 opened immediately, U2 damaged, no hazard.
U2 pin 3 -5,6,7,8 #	SC	264	< 1 s	F1	0.289→0	F1 opened immediately, U2 damaged, no hazard.
U2 pin 4 -5,6,7,8 #	SC	264	< 1 s	F1	0.289→0	F1 opened immediately, U2 damaged, no hazard.
T1 Pin 1 to 4	SC	264	10 min	F1	0.289→0.008	Unit shut down immediately, recoverable, no hazard.
T1 pin 5 to 2	SC	264	10 min	F1	0.289→0.008	Unit shut down immediately, recoverable, no hazard.
T1 Pin 6 to 7	SC	264	10 min	F1	0.289→0.008	Unit shut down immediately, recoverable, no hazard.
R16	SC	264	10 min	F1	0.289→0.008	Unit shut down immediately, recoverable, no hazard.
R17	SC	264	10 min	F1	0.289→0.008	Unit shut down immediately, recoverable, no hazard.

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Clause	Requirement + Test	Result - Remark	Verdict

D1A	SC	264	10 min	F1	0.289→ 0.008	Unit shut down immediately, recoverable, no hazard.
U1 Pin 1 to 2	SC	264	10 min	F1	0.289→ 0.008	Unit shut down immediately, recoverable, no hazard.
U1 Pin 3 to 4	SC	264	10 min	SC	0.289→ 0.008	Unit shut down immediately, recoverable, no hazard.
U1 Pin 1	OC	264	10 min	SC	0.289→ 0.008	Unit shut down immediately, recoverable, no hazard.
U1 Pin 3	OC	264	10 min	SC	0.289→ 0.008	Unit shut down immediately, recoverable, no hazard.
Output	SC	264	10 min	F1	0.289→ 0.008	Unit shut down immediately, recoverable, no hazard.

Supplementary information:

1. “SC” means short-circuited test, “OL” means overload test, “OC” means open-circuited test; Uo means output voltage at normal load, Uoc means output voltage without load. (Unit: V d.c.).
2. All the tested samples have passed the Hi-Pot test between primary and secondary (3000VAC, 1 min) after the fault test.
3. The appliance didn’t emit flames, molten metal, or poisonous or ignitable gas in hazardous amounts and temperature exceed the values shown in table 15 during the tests.

Note(s):

1. All tests were considered in AC 90V also, same result generated.

2: # means all types of current fuse listed in table 20 are considered for test and same result came out.

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Clause	Requirement + Test	Result - Remark	Verdict

AA	**Annex AA**		N/A
	Partial discharge (PD) test		N/A
			N/A
BB	**Annex BB**		N/A
	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	III	N/A
	Equipment of overvoltage category I	I	N/A
	Equipment of overvoltage category II	II	N/A
	Equipment of overvoltage category III	III	N/A
	Equipment of overvoltage category IV	IV	N/A

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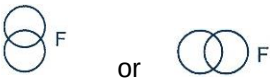
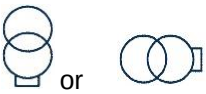
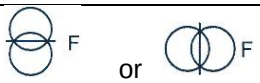
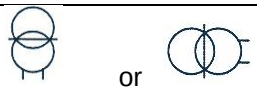
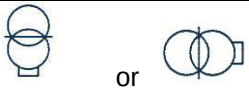
Clause	Requirement + Test	Result - Remark	Verdict
	Fuse-link		N/A
	Rated max. ambient temperature	t_a	N/A
	Rated minimum ambient temperature	t_{amin}	N/A
	Rated minimum temperature	t_{min}	N/A
	Frame or core terminal		N/A
	Protective earth		N/A
	IP number	IPXX	N/A
	Earth (ground for functional earth)		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 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

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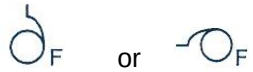
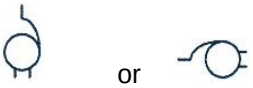
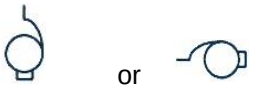
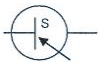
Clause	Requirement + Test	Result - Remark	Verdict
	SMPS incorporating a Short-circuit-proof safety isolating transformer (inherently or non-inherently)		N/A
	SMPS incorporating a Fail-safe auto-transformer		N/A
	SMPS incorporating a Non-short-circuit proof auto-transformer		N/A
	SMPS incorporating a Short-circuit proof auto-transformer (inherently or non-inherently)		N/A
	SMPS (Switch mode power supply unit)		N/A
BB.9	PROTECTION AGAINST ELECTRIC SHOCK		N/A
BB.10	CHANGE OF INPUT VOLTAGE SETTING		N/A
BB.11	OUTPUT VOLTAGE AND OUTPUT CURRENT UNDER LOAD		N/A
BB.12	NO-LOAD OUTPUT VOLTAGE (see supplementary requirements in Part 2)		N/A
BB.13	SHORT-CIRCUIT VOLTAGE		N/A
BB.14	HEATING		N/A
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.14.3.1	– heat run (temperature in table 2)		N/A
BB.14.3.2	– vibration test: 30 min; amplitude 0,35 mm; frequency range: 10 Hz, 55 Hz, 10 Hz		N/A
BB.14.3.3	– moisture treatment (48 h, 17.2)		N/A
BB.14.3.4	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 is ≤ 30%		N/A
	– insulation resistance acc. cl.18.1 and 18.2		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– electric strength, no breakdown (18.3); 2 min; test voltage 35% of specified value (table VI)		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		N/A
BB.16	MECHANICAL STRENGTH		N/A
BB.17	PROTECTION AGAINST HARMFUL INGRESS OF WATER AND MOISTURE		N/A
BB.18	INSULATION RESISTANCE AND ELECTRIC STRENGTH		N/A
BB.18.2	Insulation resistance between:		N/A
	– live parts and body for basic insulation ≥ 2 MΩ		N/A
	– live parts and body for reinforced insulation ≥ 7 MΩ		N/A
	– input circuits and output circuits for basic insulation ≥ 2 MΩ		N/A
	– input circuits and output circuits for double or reinforced insulation ≥ 5 MΩ		N/A
	– each input circuit and all other input circuits connected together ≥ 2 MΩ		N/A
	– each output circuit and all other output circuits connected together ≥ 2 MΩ		N/A
	– hazardous live parts and metal parts with basic insulation (Class II transformers) ≥ 2 MΩ		N/A
	– body and metal parts with basic insulation (Class II transformers) ≥ 5 MΩ		N/A
	– metal foil in contact with inner and outer surfaces of enclosures ≥ 2 MΩ		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
	3) basic or supplementary insulation between:		N/A
	a) live parts of different polarity; working voltage (V); test voltage (V) .....:		N/A
	b) live parts and the body if intended to be connected to protective earth .....:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	c) inlet bushings and cord guards and anchorages .....:		N/A
	d) live parts and an intermediate conductive part .....:		N/A
	e) intermediate conductive parts and body .:		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) (IEC 61558-2-16:2009)		N/A
18.102 (A1)	Partial discharge tests according IEC 60664-1 , if the working voltage is > 750 V peak		N/A
	Partial discharge is ≤ 10 pC at time P2 See Fig. 19.101		N/A
BB.19	CONSTRUCTION		N/A
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	For plug connected auto-transformers with rated input voltage > rated output voltage the potential to earth shall not exceed the rated output voltage.		N/A
BB.19.1.2.2	Polarised input and output plug and socket-outlet system: an instruction is given with the information, that the transformer shall not be used with non-polarised 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 ≤ rated output voltage, also with reversed input plug.		N/A
	– The contact separation of the device is ≥ 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
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 SMPS		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 SMPS		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:		N/A
	– 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
	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		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
BB.19.1.4.4	For class I transformers, with protective screen, **no**t connected to the mains by a plug the following conditions comply:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– 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
	Protective screening is not allowed for transformers with plug connection to the mains		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	Windings construction		N/A
BB.19.12.1	Undue displacement in all types of transformers not allowed:		N/A
	– 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

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Clause	Requirement + Test	Result - Remark	Verdict
BB.19.12.2	Serrated tape:		N/A
	– distance through insulation according to table 13		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
	• 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

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Clause	Requirement + Test	Result - Remark	Verdict
	• 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
	4) a coating which fulfils the requirements of basic insulation between a winding and the core		N/A
	5) 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
	6) 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
	4) a coating, which fulfil the requirements of basic insulation.		N/A
	5) 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

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Clause	Requirement + Test	Result - Remark	Verdict
	6) 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
	4) a coating, which fulfils the requirements of basic insulation.		N/A
	5) 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
	6) 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

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Clause	Requirement + Test	Result - Remark	Verdict
	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
	• 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

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Clause	Requirement + Test	Result - Remark	Verdict
	• 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
	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		N/A
BB.21	INTERNAL WIRING		N/A
BB.22	SUPPLY CONNECTION AND EXTERNAL FLEXIBLE CABLES AND CORDS		N/A
BB.23	TERMINALS FOR EXTERNAL CONDUCTORS		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
BB.24	PROVISION FOR PROTECTIVE EARTHING		N/A
BB.25	SCREWS AND CONNECTIONS		N/A
BB.26	CREEPAGE DISTANCES AND CLEARANCES		N/A
BB.26.1	See 26.101		N/A
BB.26.2	Creepage distances (cr) and clearances (cr)		N/A
BB.26.2.1	Windings covered with adhesive tape		N/A
	– the values of pollution degree 1 are fulfilled		N/A
	– all isolating material are classified acc. to IEC 60085 and IEC 60216		N/A
	– test A of 26.2.3 is fulfilled		N/A
BB.26.2.2	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.26.2.3	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
	– 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

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Clause	Requirement + Test	Result - Remark	Verdict
	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.26.2.4	Enclosed parts, by impregnation or potting		N/A
BB.26.2.4.1	– 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
	– 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 4.1.1.2.1 of IEC 60 664-1 (1,2 / 50 µs waveform) – see Annex R of IEC 61558-1		N/A
BB.26.2.4.2	– 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

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Clause	Requirement + Test	Result - Remark	Verdict
	– 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 µs waveform) – see Annex R of IEC 61558-1		N/A
BB.26.3	Distance through insulation		N/A
	For double or reinforced insulation, the required values of Tables 13, C1, and D1 – boxes 2b, 2c and 7 are fulfilled		N/A
	The insulation fulfil the material classification according IEC 60085 or 60216 or the test of 14.3		N/A
BB.26.3.1	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
	– Minimum thickness of reinforced insulation $\geq$0,2 mm		N/A
	– Minimum thickness of supplementary insulation $\geq$0,1 mm		N/A
BB.26.3.2	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 26.3.3 is fulfilled with 150 N		N/A
	– The required values for d.t.i. of Tables 13, C.1 and D.1 – marked by index ”e” 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 26.3.3 is fulfilled on each layer with 50 N		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– The required values for d.t.i. of Tables 13, C.1 and D.1 – marked by index ”e” 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 26.3.3 is fulfilled on 2/3 of the layers with 100 N		N/A
	– The required values for d.t.i. of Tables 13, C.1 and D.1 – marked by index ”e” 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 figures within square brackets in box 2 and 7 of table 13 (C.1/D.1) are used for insulation in thin sheet form as follows:		N/A
	– rated output > 100 VA values in square brackets apply		N/A
	– rated output > 25 VA ≤ 100 VA 2/3 of the value in square brackets apply		N/A
	– rated output ≤ 25 VA 1/3 of the value in square brackets apply		N/A
BB.26.3.3	Mandrel test of insulation in thin sheet form (specimen of 70 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

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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 1,25 whatever is the greater. No flashover, no breakdown.		N/A
BB.26.101	Creepage distances, clearances and distances through insulation, specified values according to (IEC 61558-2-16:09):		N/A
	– table 13, material group IIIa (part 1)		N/A
	– table C, material group II (part 1)		N/A
	– table D, material group I (part 1)		N/A
	– working voltage		N/A
	– rated supply frequency 50/60 Hz		N/A
	– rated internal frequency		N/A
	1. Insulation between input and output circuits (basic insulation):		N/A
	a) measured values ≥ specified values (mm) .....:		N/A
	2. Insulation between input and output circuits (double or reinforced insulation):		N/A
	a) measured values ≥ specified values (mm) .....:		N/A
	b) measured values ≥ specified values (mm) .....:		N/A
	c) measured values ≥ specified values (mm) .....:		N/A
	3. Insulation between adjacent input circuits: measured values ≥ specified values (mm) :		N/A
	Insulation between adjacent output circuits: measured values ≥ specified values (mm) .....:		N/A
	4. Insulation between terminals for external connection:		N/A
	a) measured values ≥ specified values (mm) .....:		N/A
	b) measured values ≥ specified values (mm) .....:		N/A
	c) measured values ≥ specified values (mm) .....:		N/A
	5. Basic or supplementary insulation:		N/A
	a) measured values ≥ specified values (mm) .....:		N/A
	b) measured values ≥ specified values (mm) .....:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	c) measured values ≥ specified values (mm) .....:		N/A
	d) measured values ≥ specified values (mm) .....:		N/A
	e) measured values ≥ specified values (mm) .....:		N/A
	6. Reinforced or double insulation: measured values ≥ specified values (mm) .....:		N/A
	7. Distance through insulation:		N/A
	a) measured values ≥ specified values (mm) .....:		N/A
	b) measured values ≥ specified values (mm) .....:		N/A
	c) measured values ≥ specified values (mm) .....:		N/A
BB.26.102	Values of IEC 61558-2-16 applicable for frequency up to 3 MHz (IEC 61558-2-16:09)		N/A
	For frequency above 3 MHz clause 7 of IEC 60664-4 is applicable (high frequency testing)		N/A
BB.26.103	Clearance (IEC 61558-2-16:09)		N/A
	a.) Clearance for frequency $\geq$ 30 kHz according figure 101 two determinations are necessary:		N/A
	– determination based on peak working voltage according Table 104 :		N/A
	Peak working voltage		N/A
	Basic insulation: required / measured		N/A
	Double or reinforced insulation: required / measured value		N/A
	– and alternative if applicable for approximately homogeneous field according to Table 102		N/A
	Peak working voltage		N/A
	Basic insulation: required / measured		N/A
	Double or reinforced insulation: required / measured value		N/A
	– determination based on measured r.m.s. working voltage according Tables 13, C1 and D1 (see clause 26.101)		N/A
	The minimum clearance is the greater of the two values.		N/A
	b.) Clearance for frequency $\leq$ 30 kHz according figure 101 two determinations are necessary:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– determination based on peak working voltage with recurring peak voltages according Table 103 :		N/A
	– determination based on measured r.m.s. working voltage according Tables 13, C1 and D1 (see clause 26.101)		N/A
	The minimum clearance is the greater of the two values.		N/A
BB.26.104	The working voltages of Table 102, 103 and 104 are peak voltages including µsec peaks IEC 61558-2-16:09)		N/A
	The working voltage according to Table 13 of part 1 are r.m.s. voltages		N/A
BB.26.105	Creepage distances		N/A
	Two determinations of creepage distances are necessary (see Figure 102)		N/A
	– determination based on measured peak working voltage according Tables 105 to 110		N/A
	Peak working voltage		N/A
	Pollution degree		N/A
	Basic or supplementary insulation: required / measured		N/A
	Double or reinforced insulation: required / measured value		N/A
	– determination based on measured r.m.s. working voltage according Tables 13, C1 and D1 (see clause 26.101)		N/A
	If the values based on table 105 to 110 are lower than the relevant values in Tables 13, C.1 or D.1, the higher values shall be applicable		N/A
BB.26.106	Distance through insulation (IEC 61558-2-16:09)		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 $\leq$ 2 kV/mm		N/A
	For thin layers d2 $\leq$ 30 µm the peak value of the field strength is $\leq$ 10 kV/mm		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	For d1 > d > d2 equation (1) is used for calculation the field strength		N/A
BB.26.107 (A1)	For transformers with FIW wires the following test is required		N/A
	• 10 cycles are required		N/A
	• 68 h test at max heating temperature + 10°C or test at max. allowed winding temperature based on the insulation class (required in table 1) + 10°C		N/A
	• 1 h at 25° C		N/A
	• 2 h at 0° C		N/A
	• 1 h at 25° C – (next cycle start again with 68 h max winding temp + 10)		N/A
	• during the 10 cycles test 2 x working voltage is connected between PRI and SEC		N/A
	• after 10 cycle test 2 transformers are subjected to the 17.2 test for 48 h and direct after the 48 h the dielectric strength test of 18.3 (100 % test voltage) is done		N/A
	• after the 10 cycle test the third sample is tested at the end of the last cycle in the hot position with the dielectric strength test of 18.3 (100 % test voltage)		N/A
	• the partial discharge test according to 18.101 is done after the cycling test and after the high voltage test, if the **peak** working voltage is >750 V		N/A
BB.27	RESISTANCE TO HEAT, FIRE AND TRACKING		N/A
IEC 61558-2-16 Annex BB			
Clause	Requirement + Test	Result - Remark	Verdict
BB.E	ANNEX E , GLOW WIRE TEST		N/A
	The test is required according to IEC 60695-2-10 and IEC 60695-2-11 with the following additions:		N/A
BB.E.1	Clause 6, ”Severities” of IEC 6095-2-11, apply with the temperature stated in 27.3 of IEC 61558-1		N/A
BB.E2	Clause 8, ”Conditioning”, of IEC 60695-2-11 apply, preconditioning is required		N/A
BB.E3	Clause 10, ”Test Procedure”, of IEC 60695-2-11apply, 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		N/A
BB.H	ANNEX H, ELECTRONIC CIRCUITS (IEC 61558-1)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
BB.K	ANNEX K, INSULATED WINDING WIRES FOR USE AS MULTIPLE LAYER INSULATION		N/A
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
	• splid 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
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	The tension to the wire during winding on mandrel is 118 N/mm² (118 MPa)		N/A
BB.K.2.4	Heat shock		N/A
	Test samples prepared according to 3.1.1 (in Test 9) of IEC 60851-6:1996		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 • Dielectric strength test: 5,5 kV for reinforced insulation • Dielectric strength test: 2,75 kV for basic or supplementary insulation		N/A
BB.K.3	Testing during manufacturing		N/A
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

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Clause	Requirement + Test	Result - Remark	Verdict
	• Dielectric strength test: 3 kV for basic or supplementary insulation		N/A
BB.U	ANNEX U – INFORMATIVE – OPTIONAL TW – MARKING FOR TRANSFORMERS		N/A
V	**ANNEX V, SYMBOLS TO BE USED FOR THERMAL CUT-OUTS**		N/A

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.					
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.					

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Clause	Requirement + Test	Result - Remark	Verdict

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	
10.					

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.26.107 61558-2-16/A1	**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.					

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Clause	Requirement + Test	Result - Remark	Verdict

BB.26.107 61558-2-16/A1	**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	
4.					
5.					
6.					
7.					
8.					
9.					
10.					

BB 18.2	**TABLE: insulation resistance measurements**	**N/A**
Insulation resistance R between:	R (MΩ)	Required R (MΩ)
Between mains poles (primary fuse disconnected)		
Between parts separated by basic or supplementary insulation		
Between parts separated by double or reinforced insulation		
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)

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Clause	Requirement + Test	Result - Remark	Verdict

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:				

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Clause	Requirement + Test	Result - Remark	Verdict

Annex ZA — P

Normative references to international publications with their corresponding European publications

Addition *to Annex ZA of EN 61558-1:*

Publication	Year	Title	EN/HD	Year
IEC 60227	Series	Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V	– [1)]	–
IEC 60364-4-41 (mod)	– [2)]	Low-voltage electrical installations - Part 4-41: Protection for safety - Protection against electric shock	HD 60364-4-41 + corr. July	2007 [3)] 2007
IEC 60601-1	– [2)]	Medical electrical equipment - Part 1: General requirements for basic safety and essential performance	EN 60601-1	2006 [3)]
IEC 60664-4	2005	Insulation coordination for equipment within low-voltage systems - Part 4: Consideration of high-frequency voltage stress	EN 60664-4 + corr. October	2006 2006
IEC 60950-1 (mod)	– [2)]	Information technology equipment - Safety - Part 1: General requirements	EN 60950-1 + A11	2006 [3)] 2009
IEC 61010-1	– [2)]	Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements	EN 61010-1 + corr. June	2001 [3)] 2002
IEC 61204-7	2006	Low voltage power supplies, d.c. output - Part 7: Safety requirements	EN 61204-7 + A11	2006 2009
IEC 61347 (mod)	Series	Lamp controlgear	EN 61347	Series
IEC 61558-1	2005	Safety of power transformers, power supplies, reactors and similar products - Part 1: General requirements and tests	EN 61558-1 + corr. August	2005 2006
IEC 61558-2-1	– [2)]	Safety of power transformers, power supplies, reactors and similar products - Part 2-1: Particular requirements and tests for separating transformers and power supplies incorporating separating transformers for general applications	EN 61558-2-1	2007 [3)]
IEC 61558-2-4	– [2)]	Safety of transformers, reactors, power supply units and similar products for supply voltages up to 1 100 V - Part 2-4: Particular requirements and tests for isolating transformers and power supply units incorporating isolating transformers	EN 61558-2-4	2009 [3)]
IEC 61558-2-6	– [2)]	Safety of transformers, reactors, power supply units and similar products for supply voltages up to 1 100 V - Part 2-6: Particular requirements and tests for safety isolating transformers and power supply units incorporating safety isolating transformers	EN 61558-2-6	2009 [3)]
IEC 61558-2-13	– [2)]	Safety of transformers, reactors, power supply units and similar products for supply voltages up to 1 100 V - Part 2-13: Particular requirements and tests for auto transformers and power supply units incorporating auto transformers	EN 61558-2-13	2009 [3)]
IEC 62040	Series	Uninterruptible Power Systems (UPS)	EN 62040	Series

Attachment No. 1

EN 61558-2-16:2009+A1:2013			
Clause	Requirement + Test	Result - Remark	Verdict

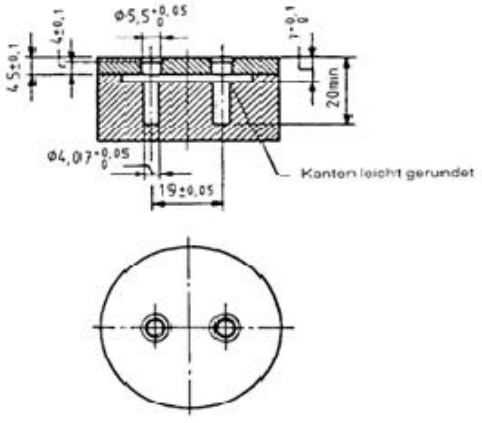
Annex ZA	**Annex ZA** (normative) **Normative references to international publications with their corresponding European publications** The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies. NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies. *Add, to the existing list of references, the following new references:*	P

Publication	Year	Title	EN/HD	Year
IEC 60317-0-7	2012	Specifications for particular types of winding wires - Part 0-7: General requirements - Fully insulated (FIW) zero-defect enamelled round copper wire with nominal conductor diameter of 0,040 mm to 1,600 mm	EN 60317-0-7	2012
IEC 60317-43	-	Specifications for particular types of winding wires - Part 43: Aromatic polyimide tape wrapped round copper wire, class 240	EN 60317-43	-
IEC 60317-56	-	Specifications for particular types of winding wires - Part 56: Solderable fully insulated (FIW) zero-defect polyurethane enamelled round copper wire with nominal conductor diameter of 0,040 mm to 1,600 mm, class 180	EN 60317-56	-
IEC 60851-3	2009	Winding wires - Test methods - Part 3: Mechanical properties	EN 60851-3	2009
IEC 60851-5	2008	Winding wires - Test methods - Part 5: Electrical properties	EN 60851-5	2008

Attachment No. 2

Clause	Requirement + Test	Result - Remark	Verdict

ATTACHMENT TO TEST REPORT Applicable for all standards applied for testing of plug-in power supplies Germany NATIONAL DIFFERENCES GS Scheme	
Differences according to.....:	all standards applied for testing of plug-in power supplies e.g. EN 60065, EN 60335, EN 60601, EN 60950-1, EN 61010, EN 61558, EN 60598, EN 61029, EN 60745, VDE 0620
Attachment Form No.....:	Germany_ND_GS_Scheme_EK1 557-13
Attachment Originator .....:	TÜV SÜD Product Service GmbH
Master Attachment.....:	Date 2013-07

	Special national conditions **Germany GS Scheme according EK1 557-13**		P
	The moulded plug of plug-in power supplies will be considered as component and will be generally evaluated in Germany according to DIN VDE 0620-1:2010 respectively DIN VDE 0620-1:2013 and DIN VDE 0620-2-1:2013. After the test according to DIN VDE 0620-2-1:2013, sub-clause 24.2, the plug be shall still pass the test according to DIN VDE 0620-101:1992 clause 7, figure 2 “Gauge for interchangeability” It should be possible to insert the plug without applying an excessive force such that the end surface touches the surface of the gauge  	Remark: The complete plug-in power supply is considered as a “plug” and has to be tested in the tumbling barrel. (For models ZL-024WLxxxyyyyEU01, ZL-024WLxxxyyyyXX02 with detachable European plug)	P

Attachment No. 3

PAH Risk Assessment according to AfPS GS 2019:01 PAK

Product Description: AC/DC ADAPTOR

Model No.: ZL-024WLxxxyyyynn01, ZL-024WLxxxyyyyXX02 (xxx=050-360; yyyy=0100-3000; nn=EU or UK).

Material No.	Location/ Function of the Material	Type/Model No. of the Material	Supplier/Manufacture Name	Category	Rigidity	Smell	Color	Chemical test needed?	Test Result	Evidence attached Technical Report No.
1.	Enclosure	925(GG), 945 (GG)	SABIC INNOVATIVE PLASTICS US L L C	☐ 1 ☐ 2 ☒ 3	☐ Soft ☐ Flexible ☒ Rigid	☐ Yes ☒ No	☒ black or dark-colored ☐ white or light-colored	☒ Yes ☐ No	☒ Passed ☐ Failed	TÜV SÜD Report No: 68.420.20.1683.01 Rev. 02
2	Plug holder	925(GG), 945 (GG)	SABIC INNOVATIVE PLASTICS US L L C	☐ 1 ☐ 2 ☒ 3	☐ Soft ☐ Flexible ☒ Rigid	☐ Yes ☒ No	☒ black or dark-colored ☐ white or light-colored	☒ Yes ☐ No	☒ Passed ☐ Failed	TÜV SÜD Report No: 68.420.20.1683.01 Rev. 02
3	Output wire	2468, 2464	SHEN ZHEN XIN HUA LIAN TECHNOLOGY CO LTD	☐ 1 ☐ 2 ☒ 3	☐ Soft ☒ Flexible ☐ Rigid	☐ Yes ☒ No	☒ black or dark-colored ☐ white or light-colored	☒ Yes ☐ No	☒ Passed ☐ Failed	TÜV SÜD Report No: 68.420.20.1683.01 Rev. 02
		2468, 2464, 1185	HANG LEE INDUSTRIAL CO	☐ 1 ☐ 2 ☒ 3	☐ Soft ☒ Flexible ☐ Rigid	☐ Yes ☒ No	☒ black or dark-colored ☐ white or light-colored	☒ Yes ☐ No	☒ Passed ☐ Failed	TÜV SÜD Report No: 68.420.20.1683.01
		2468, 2464, 1185	SHENZHEN YUEDENG ELECTRONICS CO LTD	☐ 1 ☐ 2 ☒ 3	☐ Soft ☒ Flexible ☐ Rigid	☐ Yes ☒ No	☒ black or dark-colored ☐ white or light-colored	☒ Yes ☐ No	☒ Passed ☐ Failed	FTT Report No: HLF20009236E
		2468, 2464, 1185	DONGGUAN WEIDI CABLE TECHNOLOGY CO LTD	☐ 1 ☐ 2 ☒ 3	☐ Soft ☒ Flexible ☐ Rigid	☐ Yes ☒ No	☒ black or dark-colored ☐ white or light-colored	☒ Yes ☐ No	☒ Passed ☐ Failed	UONE Report No: U05105200927052ER2
		2468, 2464	SHENZHEN CITY DE XING LONG ELECTRIC CO LTD	☐ 1 ☐ 2 ☒ 3	☐ Soft ☒ Flexible ☐ Rigid	☐ Yes ☒ No	☒ black or dark-colored ☐ white or light-colored	☒ Yes ☐ No	☒ Passed ☐ Failed	VALTEK Report No: WTH20H10072348C-1
		2468	SHENZHEN MEIZHI	☐ 1 ☐ 2	☐ Soft ☒	☐ Yes ☒ No	☒ black or dark-colored ☐ white or light-colored	☒ Yes ☐ No	☒ Passed ☐ Failed	VALTEK Report No:

Attachment No. 3

PAH Risk Assessment according to AfPS GS 2019:01 PAK

Material No.	Location/ Function of the Material	Type/Model No. of the Material	Supplier/Manufacture Name	Category	Rigidity	Smell	Color	Chemical test needed?	Test Result	Evidence attached Technical Report No.
			ELECTRONICS CO LTD	☒ 3	Flexible ☐ Rigid					WTH20H10072348C
4	Plastic of output terminal	HC-PVC001	SHENZHEN HAOCHANG PLASTIC CO LTD	☐ 1 ☐ 2 ☒ 3	☐ Soft ☐ Flexible ☒ Rigid	☐ Yes ☒ No	☒ black or dark-colored ☐ white or light-colored	☒ Yes ☐ No	☒ Passed ☐ Failed	TÜV SÜD Report No: 68.420.20.1683.01 Rev. 02
		BEST-006	PLASRICH INTERNATIONAL GROUP LTD	☐ 1 ☐ 2 ☒ 3	☐ Soft ☐ Flexible ☒ Rigid	☐ Yes ☒ No	☒ black or dark-colored ☐ white or light-colored	☒ Yes ☐ No	☒ Passed ☐ Failed	TÜV SÜD Report No: 68.420.20.1683.01 Rev. 02

Remark: all of above materials only touch short moment.

Attachment No. 4

Contains	
Cover page	1 page
EU plug portion test report	4 pages
UK plug portion test report	12 pages
Total:	17 pages

Attachment No. 4

"EU plug portion test" according to EN 50075:1990

For models: ZL-024WLxxxyyyyEU01

Clause	Requirement- Test	Result- Remark	Verdict
7	Dimension of plug shall comply with Standard Sheet 1	(See appended table)	P
8	Protection against electric shock		P
8.1	Live parts of the plugs, with the exception of the bare metal pins, should not be accessible. (75N, 60 second in 35^{0}C ambient)		P
8.2	It should not be possible to make connection between a pin of a plug and live socket contact of a socket while the other pin is accessible.		P
8.3	External parts of the plugs made of insulating material.		P
9	Construction		P
9.3	Plugs shall have adequate mechanical strength to withstand the stresses imposed during use.		P
9.4	Pins of plugs shall be locked against rotation and adequately fixed into body of the plug.		P
9.6	Plug shall be shaped in such a way and made of such material that they can easily be withdrawn by hand from the socket outlet		P
13	Mechanical Strength		P
13.1	Compression test, 150N		P
13.2	Tumbling barrel test for adapter After test, The pin shall not turn when a torque of 0.4Nm is applied, First in one direction for 1 min and then in the opposite direction for 1 min.	Tumbling barrel: 1000 times (The EK1 557-13 requirement was considered)	P
13.3	Abrasion test on the insulating sleeves		P
13.4	Pin shall not have displaced in body of the plug more than 1mm; force (N)	50N	P
15	Current-carrying parts and connection		P
15.2	Electric connection shall be so designed that contact pressure is not transmitted through insulation.		P
15.3	Current-carrying parts		P
	Copper		P
	Alloy containing at least 58% of copper or equivalent	59-63%	P

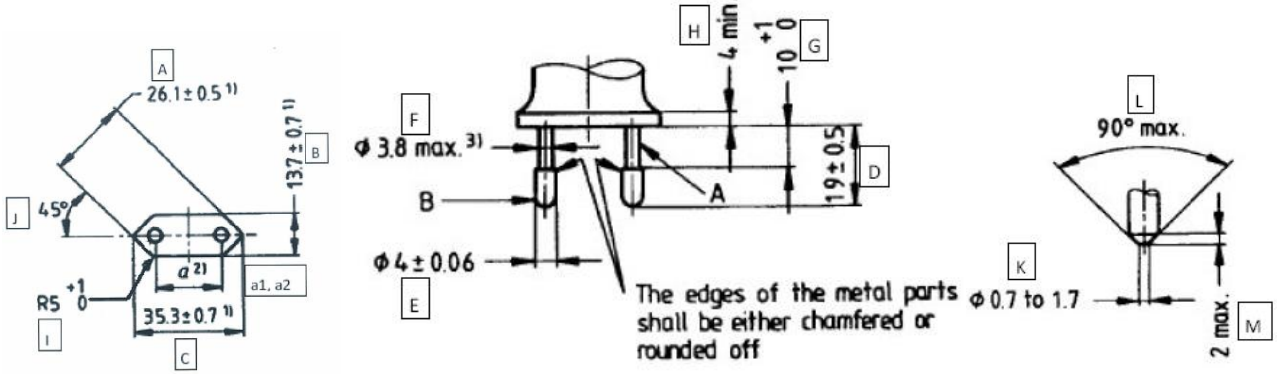
Attachment No. 4

Clause	Requirement- Test	Result- Remark	Verdict
17	Resistance of insulating material to abnormal heat and fire		P
	Glow-wire test		P
	Parts of insulating material to retain current-carrying parts:750°C		P
	Other parts: 650℃		P

7	Table: Dimension of plug			P
Location	1st Sample	2nd Sample	3rd sample	Limit (mm)
A	26.00	26.02	26.02	26.1 ± 0.5*1
B	13.50	13.52	13.51	13.7 ± 0.7*1
C	35.13	35.14	35.15	35.3 ± 0.7*1
(see note *1)	18.11	18.14	18.12	≥18
D	19.01	19.01	19.03	19 ± 0.5
E	3.95	3.97	3.97	Ø4.0 ± 0.06
F	3.65	3.60	3.64	Ø3.8 Max.
F	3.93	3.93	3.92	Ø4.0 Max.*3
F	3.83	3.85	3.83	4 Max. *3
G	10.74	10.78	10.75	10-11
a1	18.38	18.37	18.40	18-19.2*2
a2	17.38	17.35	17.34	17-18*2
H	18.11	18.14	18.12	4 Min.
I	R5.3	R5.4	R5.3	R5-R6
J	45°	45°	45°	---
Alternative for end of pins				
K	N/A	N/A	N/A	Ø0.7- Ø1.7
L	N/A	N/A	N/A	90° Max.
M	N/A	N/A	N/A	2 Max.

Note
****1: These dimension shall not exceeded within a distance of 18mm from the engagement face of plug.***
****2: a1: in the plane of the engagement face, a2: at the ends of pins.***
****3: This dimension maybe increased to 4mm within a distance of 4mm from engagement face of plug.***

Remark: see standard sheet 1 for details of location of measurement.



Standard sheet 1

Attachment No. 4

"EU plug portion test" according to EN 50075:1990

For models: ZL-024WLxxxyyyyXX02 wih detachable EU plug

Clause	Requirement- Test	Result- Remark	Verdict
7	Dimension of plug shall comply with Standard Sheet 1	(See appended table)	P

8	Protection against electric shock		P
8.1	Live parts of the plugs, with the exception of the bare metal pins, should not be accessible. (75N, 60 second in 35^{0}C ambient)		P
8.2	It should not be possible to make connection between a pin of a plug and live socket contact of a socket while the other pin is accessible.		P
8.3	External parts of the plugs made of insulating material.		P

9	Construction		P
9.3	Plugs shall have adequate mechanical strength to withstand the stresses imposed during use.		P
9.4	Pins of plugs shall be locked against rotation and adequately fixed into body of the plug.		P
9.6	Plug shall be shaped in such a way and made of such material that they can easily be withdrawn by hand from the socket outlet		P

13	Mechanical Strength		P
13.1	Compression test, 150N		P
13.2	Tumbling barrel test for adapter After test, The pin shall not turn when a torque of 0.4Nm is applied, First in one direction for 1 min and then in the opposite direction for 1 min.	Tumbling barrel: 1000 times (The EK1 557-13 requirement was considered)	P
13.3	Abrasion test on the insulating sleeves		P
13.4	Pin shall not have displaced in body of the plug more than 1mm; force (N)	50N	P

15	Current-carrying parts and connection		P
15.2	Electric connection shall be so designed that contact pressure is not transmitted through insulation.		P
15.3	Current-carrying parts		P
	Copper		P
	Alloy containing at least 58% of copper or equivalent	59-63%	P

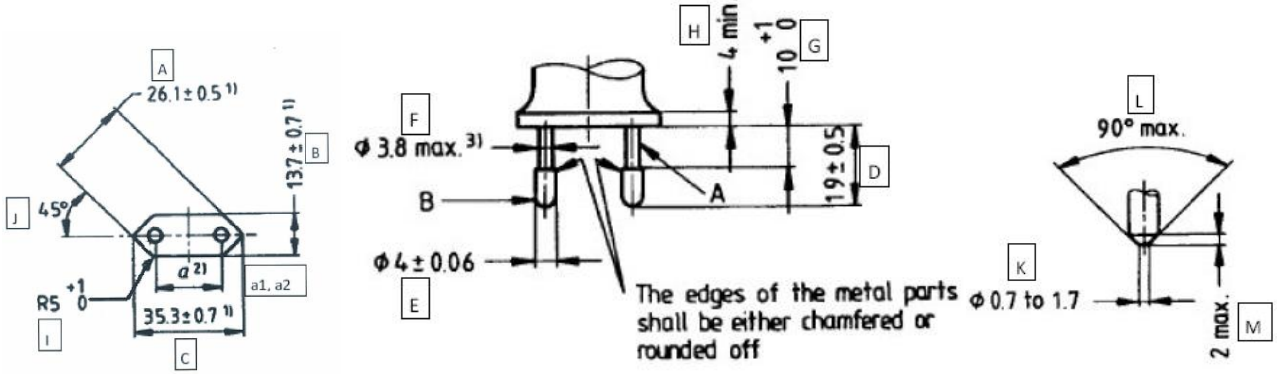
Attachment No. 4

Clause	Requirement- Test	Result- Remark	Verdict
17	Resistance of insulating material to abnormal heat and fire		P
	Glow-wire test		P
	Parts of insulating material to retain current-carrying parts:750°C		P
	Other parts: 650℃		P

7	Table: Dimension of plug				P
Location	1st Sample	2nd Sample	3rd sample	Limit (mm)	
A	25.88	25.91	25.89	26.1 ± 0.5*1	
B	13.54	13.56	13.54	13.7 ± 0.7*1	
C	35.13	35.14	35.13	35.3 ± 0.7*1	
(see note *1)	18.23	18.24	18.23	≥18	
D	19.01	19.01	19.02	19 ± 0.5	
E	3.96	3.97	3.95	Ø4.0 ± 0.06	
F	3.65	3.65	3.67	Ø3.8 Max.	
F	3.94	3.91	3.91	Ø4.0 Max.*3	
F	3.88	3.88	3.84	4 Max. *3	
G	10.36	10.35	10.37	10-11	
a1	18.35	18.34	18.35	18-19.2*2	
a2	17.34	17.35	17.34	17-18*2	
H	18.23	18.24	18.23	4 Min.	
I	R5.2	R5.4	R5.3	R5-R6	
J	45°	45°	45°	---	
Alternative for end of pins					
K	N/A	N/A	N/A	Ø0.7- Ø1.7	
L	N/A	N/A	N/A	90° Max.	
M	N/A	N/A	N/A	2 Max.	

Note
****1: These dimension shall not exceeded within a distance of 18mm from the engagement face of plug.***
****2: a1: in the plane of the engagement face, a2: at the ends of pins.***
****3: This dimension maybe increased to 4mm within a distance of 4mm from engagement face of plug.***

Remark: see standard sheet 1 for details of location of measurement.



Standard sheet 1

Attachment No. 4

For models: ZL-024WLxxxyyyyUK01

BS 1363-1:2016+A1:2018			
Clause	**Requirement – Test**	**Result – Remarks**	**Verdict**
12.1	Disposition of pins		P
12.2	Dimensions	(See appended table)	P
12.2.1	Gauging test according to figure 5,the plug portion shall enter the gauge fully with a force less than 10N	Applied force: 6N	P
	In the case of adaptors with ISODs, the test given in 13.8 of BS 1363-2:2016 shall be applied and the maximum withdrawal force from a socket-outlet conforming to BS 1363-2:2016 shall not exceed 36N	Applied force: 7N	P
12.3	Distance of pins from periphery	Measured distance: min. 9.62mm	P
12.7	Fixing of cover		N/A
12.9	Construction of pins		P
12.9.1	All exposed surfaces of the adaptor plug pins shall be smooth and free from burrs or sharp edges and other irregularities.		P
12.9.2	Those surfaces of the non-solid plug pins which are visible when the plug is correctly assembled shall be free of apertures.		N/A
12.9.3	All seams and joints of non-solid pins shall be closed over their entire length.		P
12.9.3.1	Conformity shall be checked by inspection and in case of doubt by the following test. Push a steel test probe of 0.2 mm diameter into all seams and joints. Check that the test probe does not enter into any seam or joint to a depth greater than the thickness of the material from which the plug pin is formed.		P
12.9.4.1	For solid pins, applying a force 1100N on the pin according to figure 32.		P
12.9.4.2	For non-solid pins, conformity shall be checked by the following test. 1) Applying a force 800N on the pin according to Figure 32. 50 times without impact. 2) Separate specimens applying a force 1100N on the pin according to Figure 32.		N/A
12.9.4.3	For ISOD, applying a force 400N on the pin according to figure 32.		P

Attachment No. 4

BS 1363-1:2016+A1:2018			
Clause	**Requirement – Test**	**Result – Remarks**	**Verdict**
12.9.5	Plugs with nickel plated brass pins, non-solid pins and/or ISODs shall not cause excessive wear to socket contacts or shutters of socket-outlets in accordance with BS 1363-2:2016. For plugs with nickel plated brass pins and/or non-solid pins conformity shall be checked by 12.9.5.1. For plugs with ISODs conformity shall be checked by 12.9.5.2.		P
12.9.5.1	Adaptors with nickel plated brass pins and/or non-solid pins shall not cause excessive wear to socket contacts or shutters of sockets-outlets		P
12.9.5.2	Adaptors with ISOD shall not cause excessive wear to socket contacts or shutters of sockets-outlets. One type of socket-outlet shall preferably have a shutter-operating ramp of metal.		P
12.9.6.1	1 Nm torque test on the opposite two directions according to figure 33		P
12.11	Retention of pins		P
12.12	Flexibility of pins		P
12.13	Suitable means shall be provided for withdrawing the plug without subjecting the flexible cable to stress.		P
12.16	Insulating sleeves on pins		P
12.17	Abrasion resistance of insulating sleeve		P

BS 1363-3:2016+A1:2018			
Clause	**Requirement – Test**	**Result – Remarks**	**Verdict**
13.10	The total mass of the equipment with all specified connectors shall not exceed 800g. The torque exerted on socket shall not exceed 0.7 Nm	Measured torque: Max. 0.029Nm	P

Additional test for adaptor with UK plug need to comply with IEC60950-1 & IEC 62368-1 (CB bulletin, IEC 60950-1:2005+A1:2009+A2:2013, clause 4.3.6, IEC62368-1:2014, clause G.4.2)			
Clause	**Requirement – Test**	**Result – Remarks**	**Verdict**
12.17.4	Placed in a heating cabinet at not less than 125°C for a period of 120(-5, 0) min, after which the specimen is removed and immediately cooled by immersion in water at approximately room temperature. The thickness of the insulation remaining at the point of impression is measured and shall not have been reduced by more than 50 %.		P
22.2	75ºC ball pressure test to all parts of insulating material including ISOD		P

Attachment No. 4

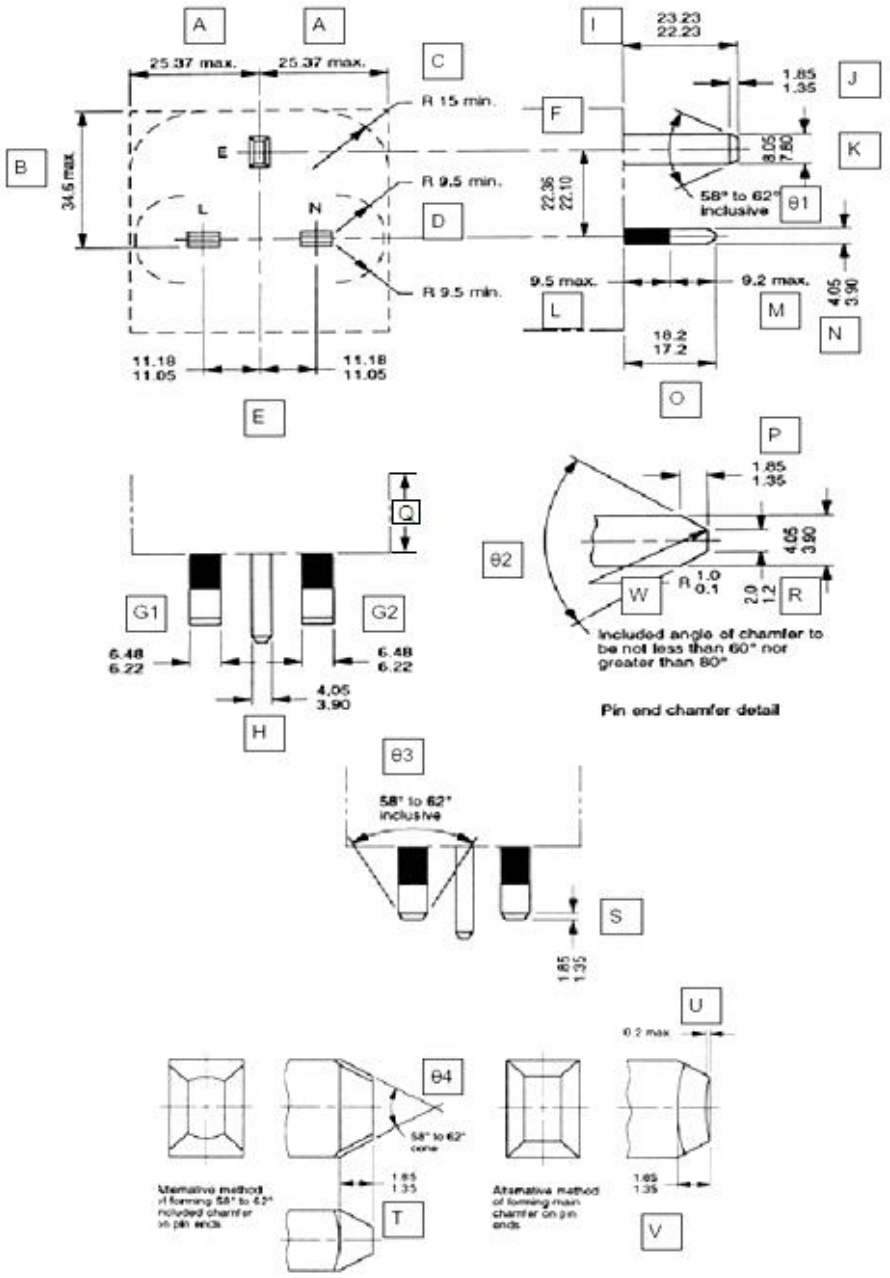
Additional test for adaptor with UK plug need to comply with IEC60950-1 & IEC 62368-1 (CB bulletin, IEC 60950-1:2005+A1:2009+A2:2013, clause 4.3.6, IEC62368-1:2014, clause G.4.2)			
Clause	**Requirement – Test**	**Result – Remarks**	**Verdict**
23.2	750ºC GWT to retain live parts in position including ISOD. 650ºC GWT to parts not necessary to retain live parts in position.		P

Attachment No. 4

Clause 12.2: Dimensions measurement				
Dimensions(mm)	**Sample 1**	**Sample 2**	**Sample 3**	**Limit**
A	25.19	25.14	25.16	25.37 max
B	33.48	33.48	33.46	34.6 max
C	N/A	N/A	N/A	15 min.
D	9.62	9.62	9.64	9.5 min.
E (L-E)	11.08	11.09	11.09	11.05-11.18
E (N-E)	11.08	11.08	11.07	11.05-11.18
F (L-E)	22.18	22.18	22.19	22.10-22.36
F (N-E)	22.20	22.19	22.19	22.10-22.36
G1	6.26	6.28	6.27	6.22-6.48
G2	6.27	6.25	6.25	6.22-6.48
H	3.98	3.98	3.99	3.90-4.05
I	22.98	22.97	22.97	22.23-23.23
J	1.73	1.72	1.72	1.35-1.85
K(earth)	N/A	N/A	N/A	7.80-8.05
K (ISOD)	8.01	8.03	8.01	7.75-8.05
L (line)	9.35	9.35	9.32	9.5 max
L (neutral)	9.34	9.32	9.31	9.5 max
M (line)	8.37	8.39	8.40	9.2 max
M (neutral)	8.41	8.42	8.42	9.2 max
N (line)	3.95	3.96	3.95	3.90-4.05
N (neutral)	3.97	3.97	3.98	3.90-4.05
O (line)	17.72	17.74	17.72	17.20-18.20
O (neutral)	17.75	17.74	17.73	17.20-18.20
P (line)	1.70	1.70	1.72	1.35-1.85
P (neutral)	1.70	1.69	1.71	1.35-1.85
Q	6.71	6.72	6.70	6.35 min.
R (line)	1.72	1.71	1.71	1.2-2.0
R (neutral)	1.73	1.72	1.71	1.2-2.0
W	0.57	0.54	0.58	R 0.1-1.0
θ 1	59.64°	59.52°	59.58°	58º-62º
θ 2 (line)	68.38°	68.28°	68.35°	60º-80º
θ 2 (neutral)	68.26°	68.29°	68.34°	60º-80º
X1 (for Solid ISOD only)	0.08	0.08	0.06	0.15 max
X2 (for Solid ISOD only)	0.06	0.07	0.06	0.15 max
H1 (for Castellated ISOD only)	N/A	N/A	N/A	≥ 0.6H (use the max. measured value to calculate limit)
K1 (for Castellated ISOD only)	N/A	N/A	N/A	≥ 0.13K (use the max. measured value to calculate limit)
K2 (for Castellated ISOD only)	N/A	N/A	N/A	≥ 0.13K (use the max. measured value to calculate limit)
X3 (for Castellated ISOD only)	N/A	N/A	N/A	0.15 max
X4 (for Castellated ISOD only)	N/A	N/A	N/A	0.15 max
Alternative chamfers on L and N pin				
S (line)	N/A	N/A	N/A	1.35-1.85
S (neutral)	N/A	N/A	N/A	1.35-1.85
θ 3 (line)	N/A	N/A	N/A	58º-62º
θ 3 (neutral)	N/A	N/A	N/A	58º-62º

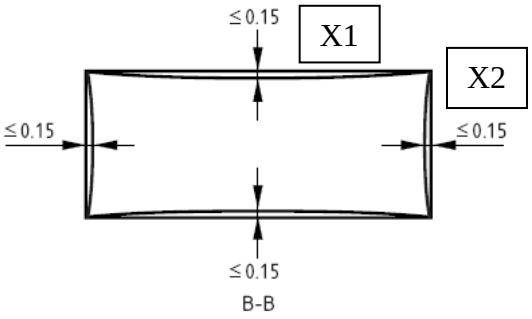
Attachment No. 4

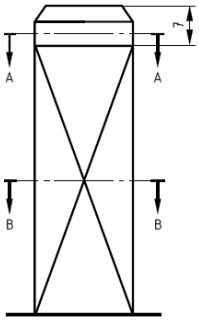
θ 4 (line)	59.72°	59.67°	59.69°	58º-62º
θ 4 (neutral)	59.50°	59.72°	59.67°	58º-62º
T (line)	1.70	1.70	1.72	1.35-1.85
T(neutral)	1.70	1.69	1.71	1.35-1.85
U (line)	N/A	N/A	N/A	0.2 Max.
U(neutral)	N/A	N/A	N/A	0.2 Max.
V (line)	N/A	N/A	N/A	1.35-1.85
V(neutral)	N/A	N/A	N/A	1.35-1.85



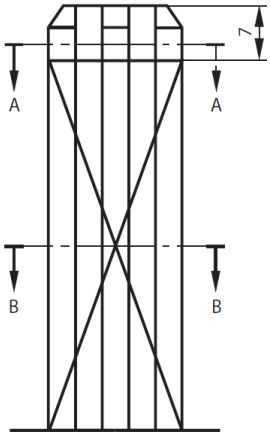
Attachment No. 4

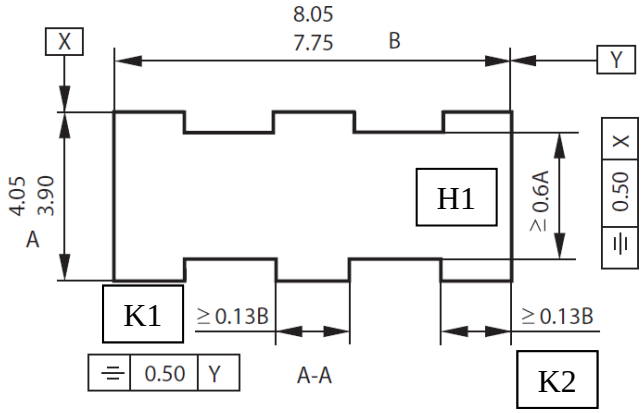
Solid ISOD

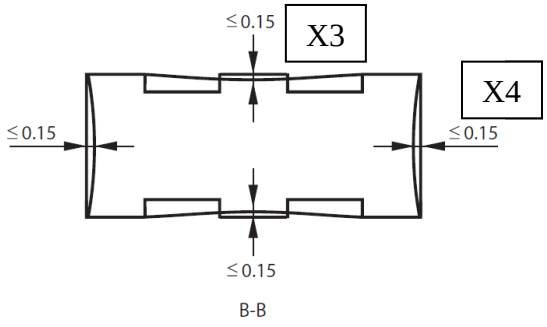




Castellated ISOD







Attachment No. 4

For models: ZL-024WLxxxyyyyXX02 with detachable UK plug

BS 1363-1:2016+A1:2018			
Clause	**Requirement – Test**	**Result – Remarks**	**Verdict**
12.1	Disposition of pins		P
12.2	Dimensions	(See appended table)	P
12.2.1	Gauging test according to figure 5,the plug portion shall enter the gauge fully with a force less than 10N	Applied force: 5N	P
	In the case of adaptors with ISODs, the test given in 13.8 of BS 1363-2:2016 shall be applied and the maximum withdrawal force from a socket-outlet conforming to BS 1363-2:2016 shall not exceed 36N	Applied force: 8N	P
12.3	Distance of pins from periphery	Measured distance: min. 9.60mm	P
12.7	Fixing of cover		N/A
12.9	Construction of pins		P
12.9.1	All exposed surfaces of the adaptor plug pins shall be smooth and free from burrs or sharp edges and other irregularities.		P
12.9.2	Those surfaces of the non-solid plug pins which are visible when the plug is correctly assembled shall be free of apertures.		N/A
12.9.3	All seams and joints of non-solid pins shall be closed over their entire length.		P
12.9.3.1	Conformity shall be checked by inspection and in case of doubt by the following test. Push a steel test probe of 0.2 mm diameter into all seams and joints. Check that the test probe does not enter into any seam or joint to a depth greater than the thickness of the material from which the plug pin is formed.		P
12.9.4.1	For solid pins, applying a force 1100N on the pin according to figure 32.		P
12.9.4.2	For non-solid pins, conformity shall be checked by the following test. 1) Applying a force 800N on the pin according to Figure 32. 50 times without impact. 2) Separate specimens applying a force 1100N on the pin according to Figure 32.		N/A
12.9.4.3	For ISOD, applying a force 400N on the pin according to figure 32.		P

Attachment No. 4

BS 1363-1:2016+A1:2018			
Clause	**Requirement – Test**	**Result – Remarks**	**Verdict**
12.9.5	Plugs with nickel plated brass pins, non-solid pins and/or ISODs shall not cause excessive wear to socket contacts or shutters of socket-outlets in accordance with BS 1363-2:2016. For plugs with nickel plated brass pins and/or non-solid pins conformity shall be checked by 12.9.5.1. For plugs with ISODs conformity shall be checked by 12.9.5.2.		P
12.9.5.1	Adaptors with nickel plated brass pins and/or non-solid pins shall not cause excessive wear to socket contacts or shutters of sockets-outlets		P
12.9.5.2	Adaptors with ISOD shall not cause excessive wear to socket contacts or shutters of sockets-outlets. One type of socket-outlet shall preferably have a shutter-operating ramp of metal.		P
12.9.6.1	1 Nm torque test on the opposite two directions according to figure 33		P
12.11	Retention of pins		P
12.12	Flexibility of pins		P
12.13	Suitable means shall be provided for withdrawing the plug without subjecting the flexible cable to stress.		P
12.16	Insulating sleeves on pins		P
12.17	Abrasion resistance of insulating sleeve		P

BS 1363-3:2016+A1:2018			
Clause	**Requirement – Test**	**Result – Remarks**	**Verdict**
13.10	The total mass of the equipment with all specified connectors shall not exceed 800g. The torque exerted on socket shall not exceed 0.7 Nm	Measured torque: Max. 0.036Nm	P

Additional test for adaptor with UK plug need to comply with IEC60950-1 & IEC 62368-1 (CB bulletin, IEC 60950-1:2005+A1:2009+A2:2013, clause 4.3.6, IEC62368-1:2014, clause G.4.2)			
Clause	**Requirement – Test**	**Result – Remarks**	**Verdict**
12.17.4	Placed in a heating cabinet at not less than 125°C for a period of 120(-5, 0) min, after which the specimen is removed and immediately cooled by immersion in water at approximately room temperature. The thickness of the insulation remaining at the point of impression is measured and shall not have been reduced by more than 50 %.		P
22.2	75ºC ball pressure test to all parts of insulating material including ISOD		P

Attachment No. 4

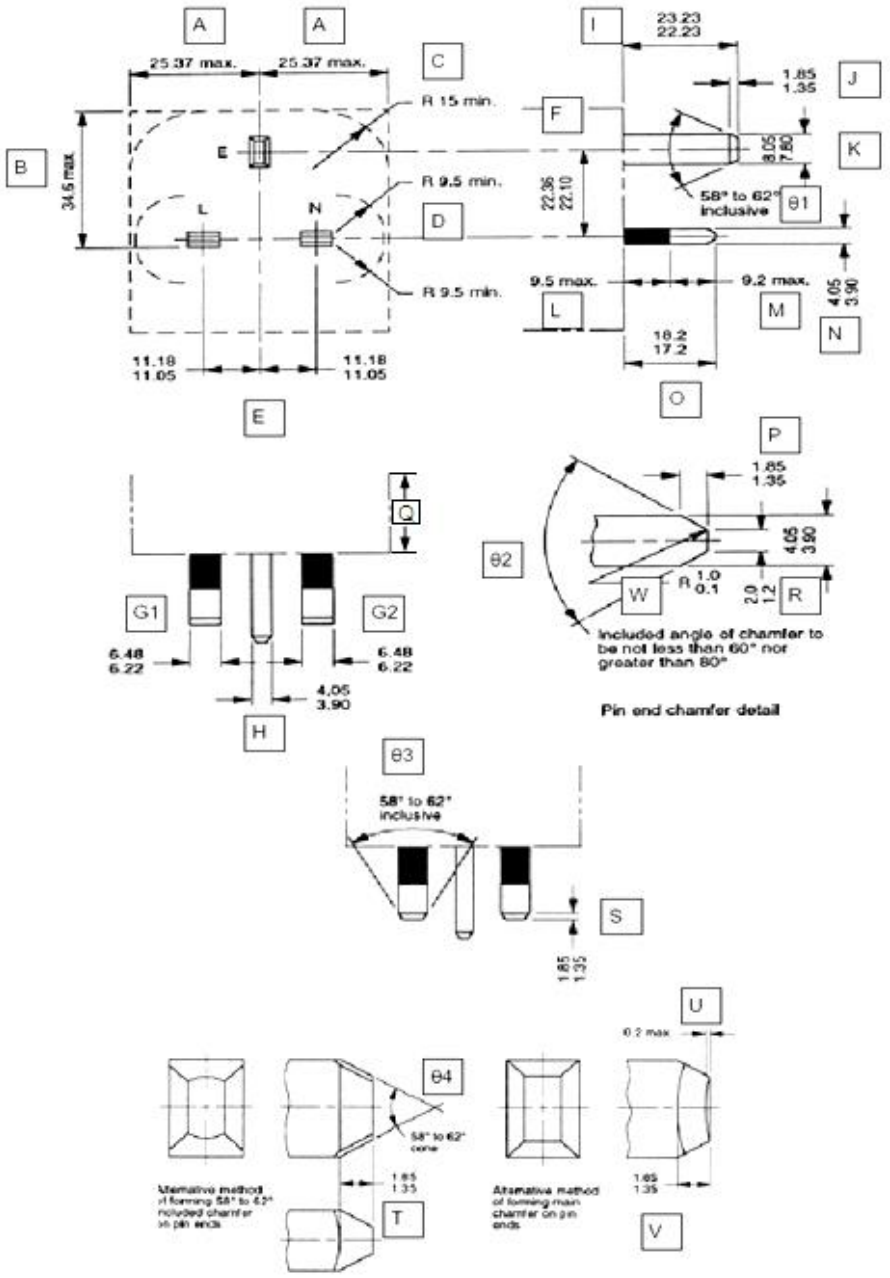
Additional test for adaptor with UK plug need to comply with IEC60950-1 & IEC 62368-1 (CB bulletin, IEC 60950-1:2005+A1:2009+A2:2013, clause 4.3.6, IEC62368-1:2014, clause G.4.2)			
Clause	**Requirement – Test**	**Result – Remarks**	**Verdict**
23.2	750ºC GWT to retain live parts in position including ISOD. 650ºC GWT to parts not necessary to retain live parts in position.		P

Attachment No. 4

Clause 12.2: Dimensions measurement				
Dimensions(mm)	**Sample 1**	**Sample 2**	**Sample 3**	**Limit**
A	24.38	24.35	24.37	25.37 max
B	33.51	33.53	33.52	34.6 max
C	N/A	N/A	N/A	15 min.
D	9.62	9.62	9.60	9.5 min.
E (L-E)	11.10	11.11	11.10	11.05-11.18
E (N-E)	11.12	11.12	11.12	11.05-11.18
F (L-E)	22.20	22.20	22.23	22.10-22.36
F (N-E)	22.20	22.19	22.20	22.10-22.36
G1	6.26	6.28	6.28	6.22-6.48
G2	6.27	6.28	6.26	6.22-6.48
H	3.98	3.97	3.97	3.90-4.05
I	22.96	22.97	22.95	22.23-23.23
J	1.70	1.72	1.71	1.35-1.85
K(earth)	N/A	N/A	N/A	7.80-8.05
K (ISOD)	7.94	7.96	7.95	7.75-8.05
L (line)	9.38	9.38	9.36	9.5 max
L (neutral)	9.35	9.36	9.37	9.5 max
M (line)	8.40	8.43	8.42	9.2 max
M (neutral)	8.41	8.42	8.42	9.2 max
N (line)	3.98	3.98	3.96	3.90-4.05
N (neutral)	3.97	3.97	3.98	3.90-4.05
O (line)	17.78	17.81	17.78	17.20-18.20
O (neutral)	17.76	17.78	17.79	17.20-18.20
P (line)	1.67	1.67	1.69	1.35-1.85
P (neutral)	1.69	1.68	1.70	1.35-1.85
Q	12.15	12.18	12.16	6.35 min.
R (line)	1.70	1.71	1.70	1.2-2.0
R (neutral)	1.68	1.67	1.70	1.2-2.0
W	0.59	0.57	0.60	R 0.1-1.0
θ 1	59.28°	59.24°	59.26°	58º-62º
θ 2 (line)	68.35°	68.27°	68.39°	60º-80º
θ 2 (neutral)	68.48°	68.72°	68.65°	60º-80º
X1 (for Solid ISOD only)	0.07	0.06	0.06	0.15 max
X2 (for Solid ISOD only)	0.06	0.06	0.07	0.15 max
H1 (for Castellated ISOD only)	N/A	N/A	N/A	≥ 0.6H (use the max. measured value to calculate limit)
K1 (for Castellated ISOD only)	N/A	N/A	N/A	≥ 0.13K (use the max. measured value to calculate limit)
K2 (for Castellated ISOD only)	N/A	N/A	N/A	≥ 0.13K (use the max. measured value to calculate limit)
X3 (for Castellated ISOD only)	N/A	N/A	N/A	0.15 max
X4 (for Castellated ISOD only)	N/A	N/A	N/A	0.15 max
Alternative chamfers on L and N pin				
S (line)	N/A	N/A	N/A	1.35-1.85
S (neutral)	N/A	N/A	N/A	1.35-1.85
θ 3 (line)	N/A	N/A	N/A	58º-62º
θ 3 (neutral)	N/A	N/A	N/A	58º-62º

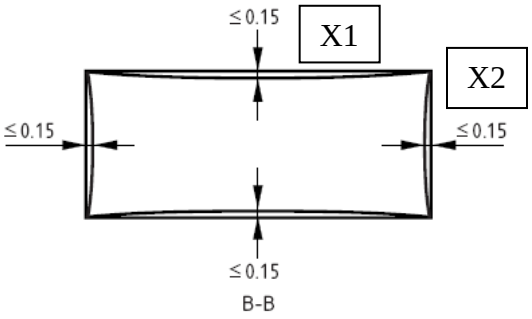
Attachment No. 4

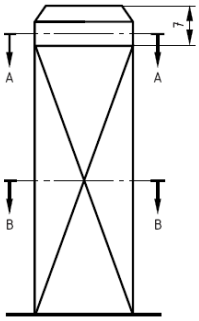
θ 4 (line)	59.46°	59.51°	59.45°	58º-62º
θ 4 (neutral)	59.67°	59.65°	59.61°	58º-62º
T (line)	1.67	1.67	1.69	1.35-1.85
T(neutral)	1.69	1.68	1.70	1.35-1.85
U (line)	N/A	N/A	N/A	0.2 Max.
U(neutral)	N/A	N/A	N/A	0.2 Max.
V (line)	N/A	N/A	N/A	1.35-1.85
V(neutral)	N/A	N/A	N/A	1.35-1.85



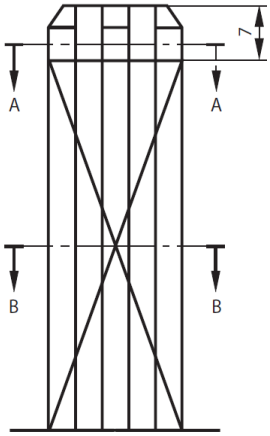
Attachment No. 4

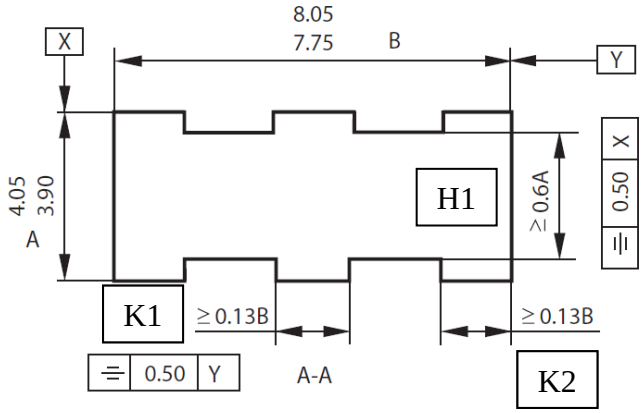
Solid ISOD

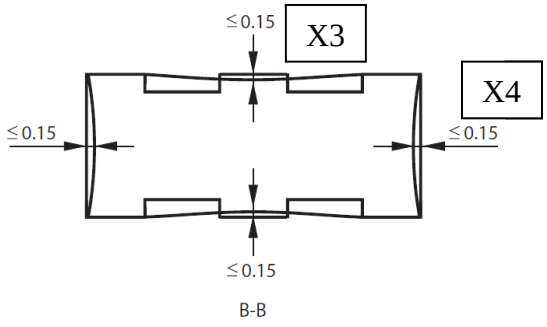




Castellated ISOD







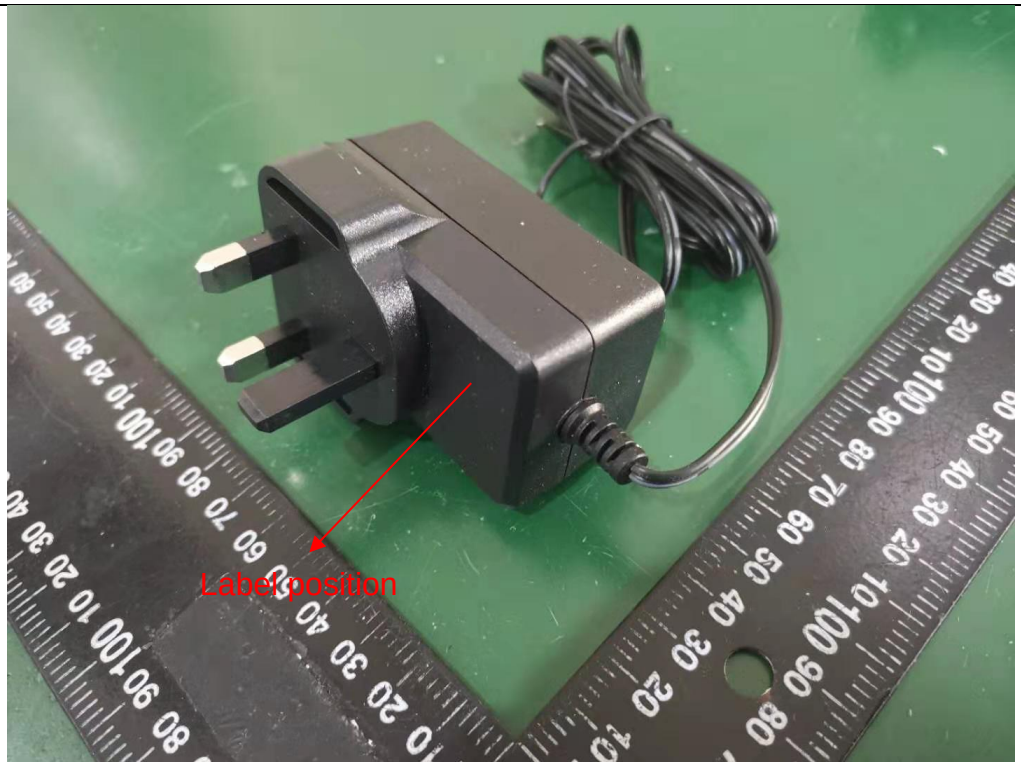
Attachment No. 5

Details of: Overall view- 1, for models ZL-024WLxxxyyyyEU01

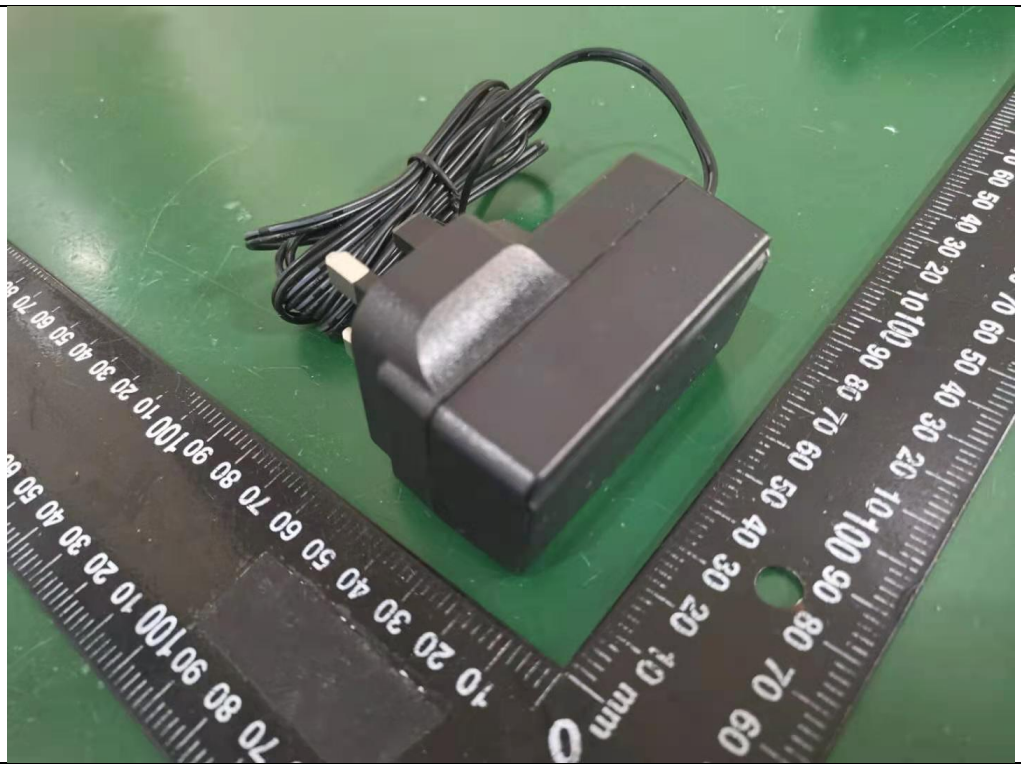
Details of: Overall view- 2, for models ZL-024WLxxxyyyyEU01

Attachment No. 5

Details of: Overall view- 3, for models ZL-024WLxxxyyyyUK01



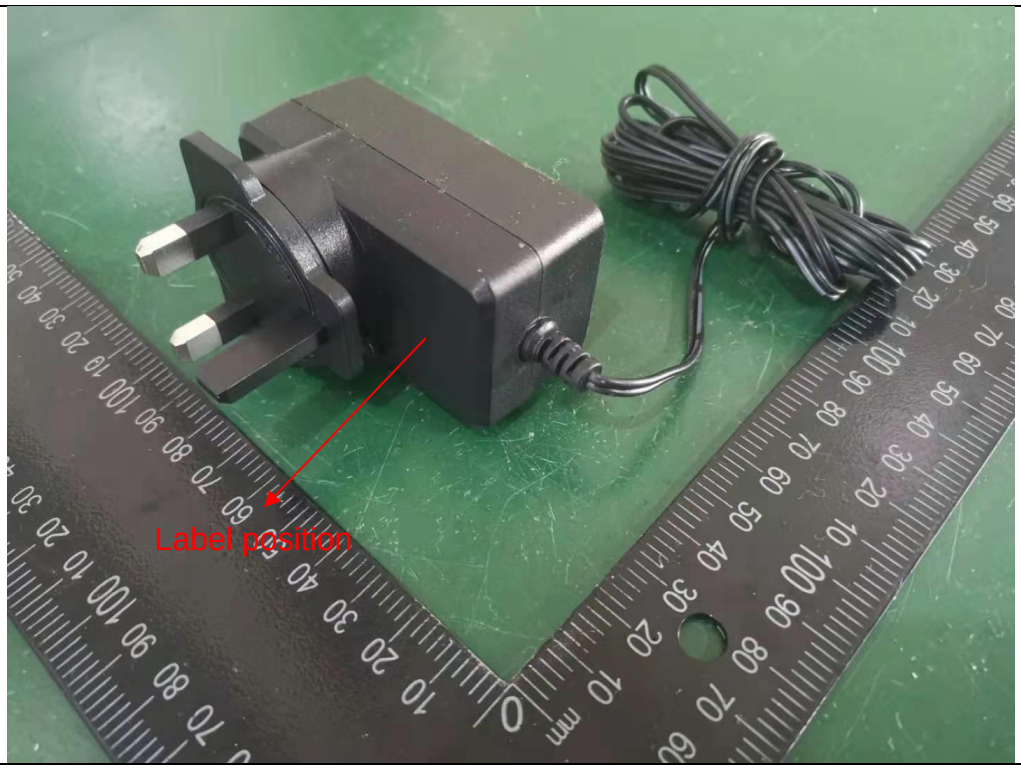
Details of: Overall view- 4, for models ZL-024WLxxxyyyyUK01



Attachment No. 5

Details of: Overall view- 5, for models ZL-024WLxxxyyyyXX02

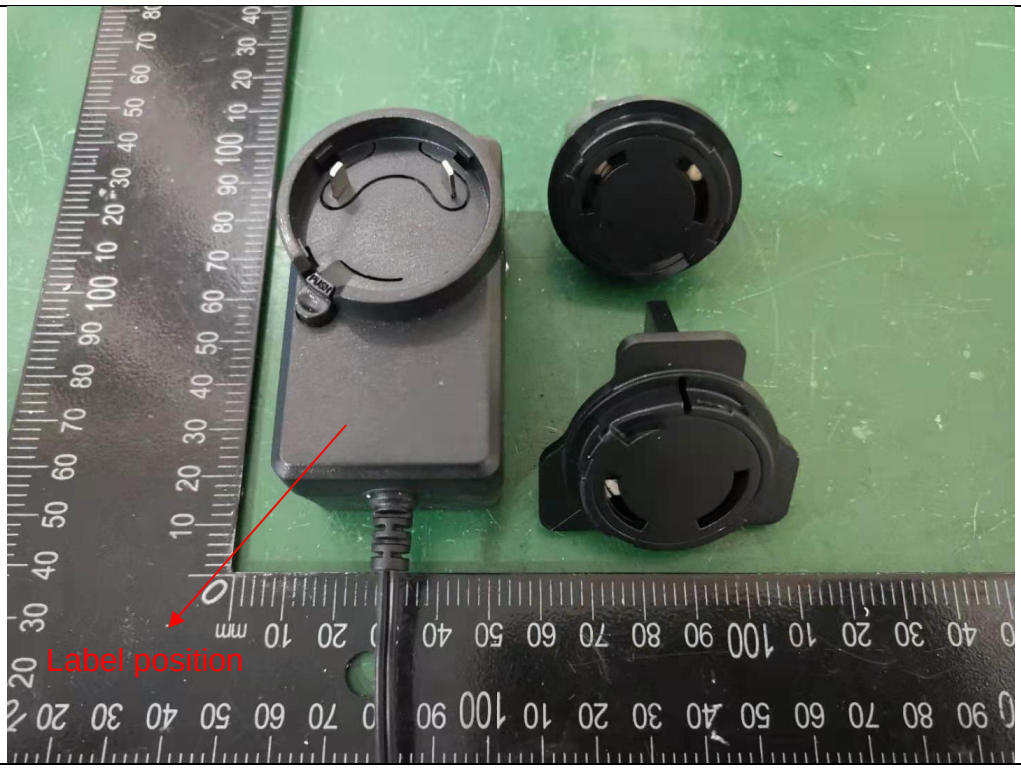
Details of: Overall view- 6, for models ZL-024WLxxxyyyyXX02



Attachment No. 5

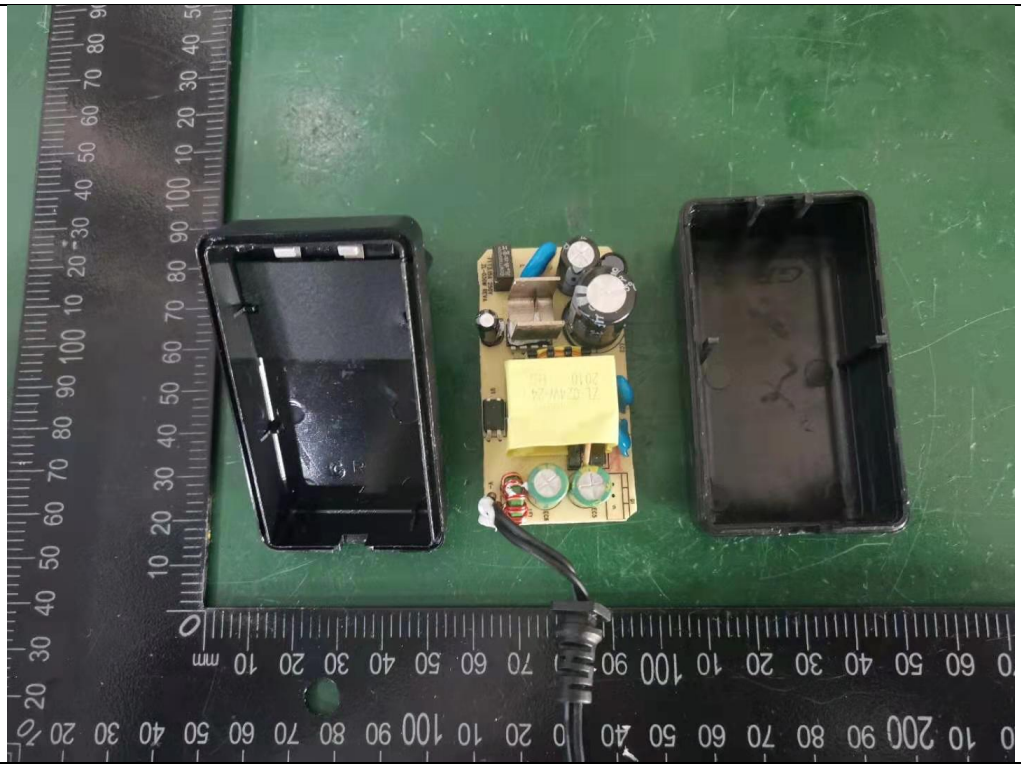
Details of: Overall view- 7, for models ZL-024WLxxxyyyyXX02

Details of: Overall view- 8, for models ZL-024WLxxxyyyyXX02

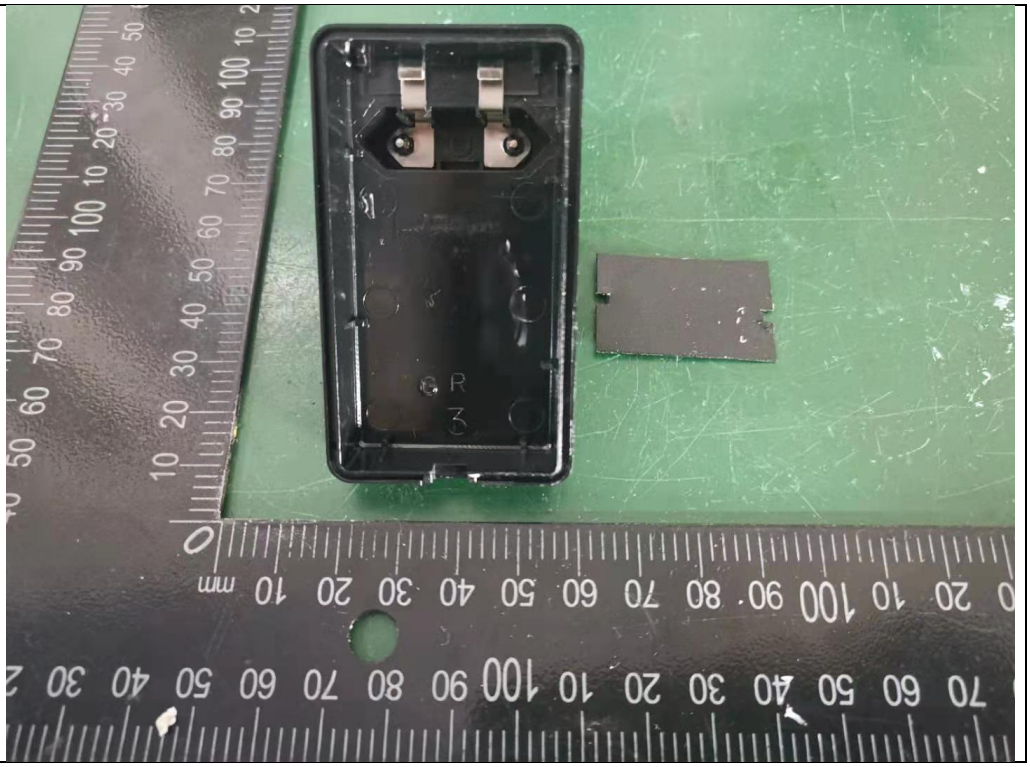


Attachment No. 5

Details of: Internal view- 1, for models ZL-024WLxxxyyyyEU01

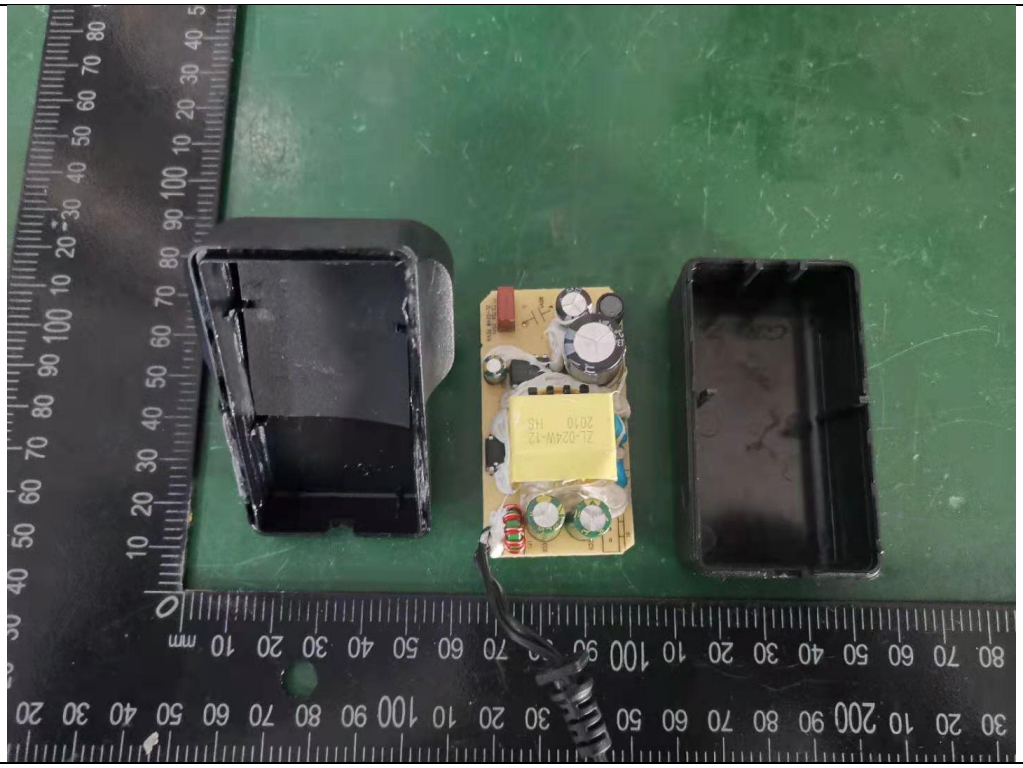


Details of: Internal view- 2, for models ZL-024WLxxxyyyyEU01

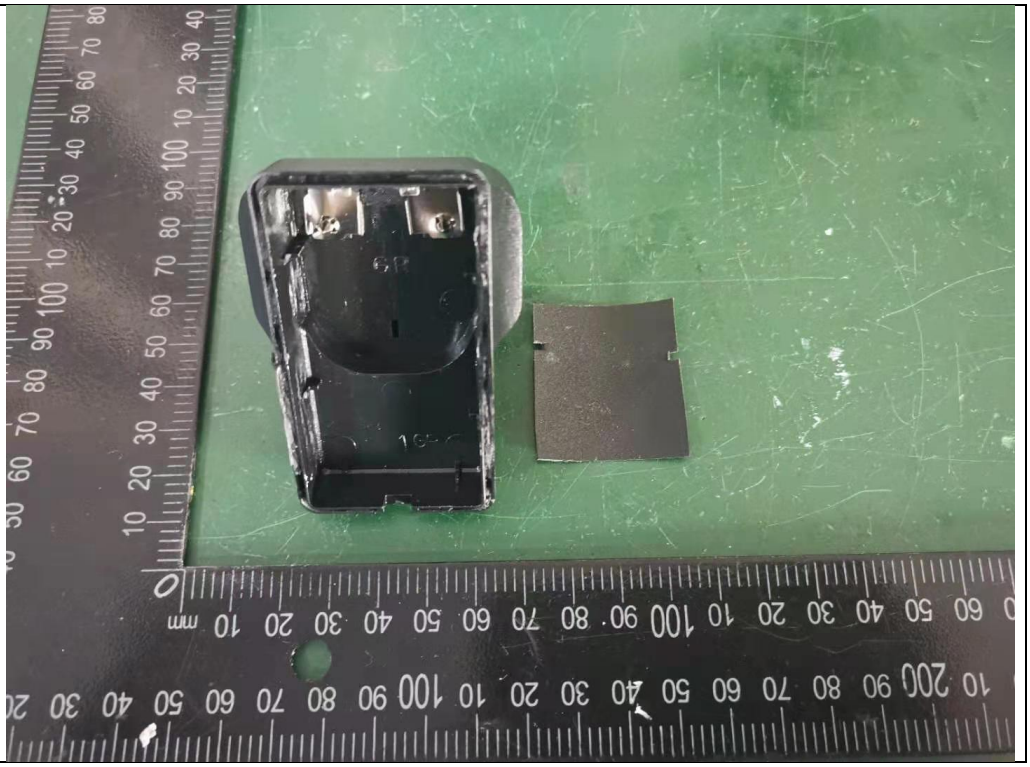


Attachment No. 5

Details of: Internal view- 3, for models ZL-024WLxxxyyyyUK01



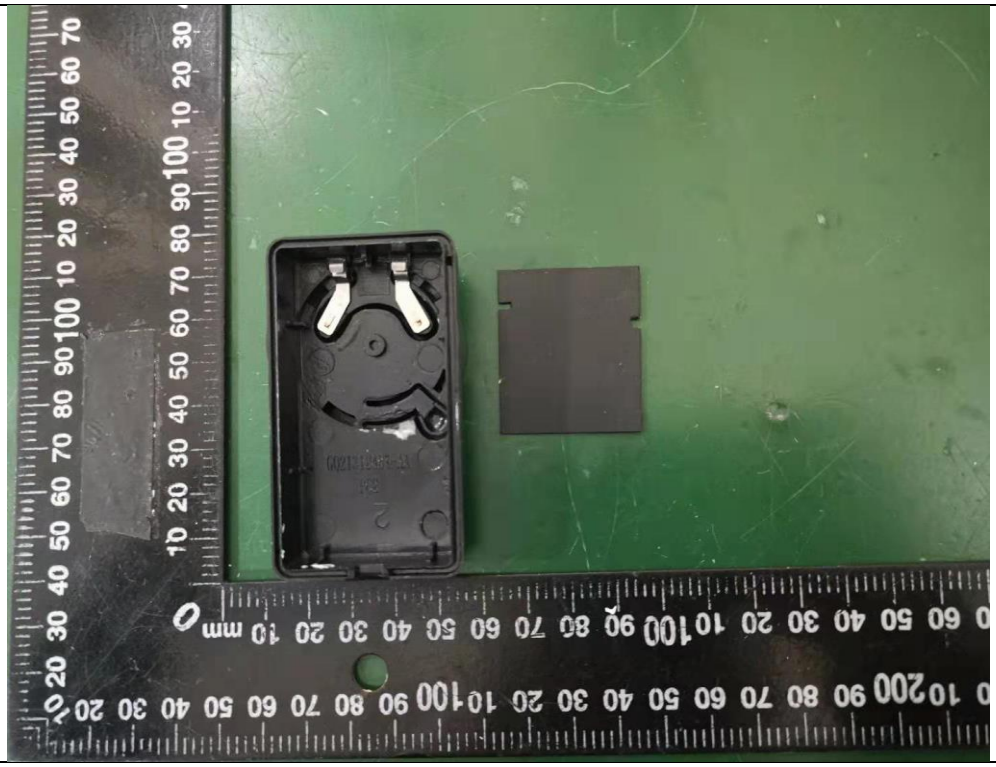
Details of: Internal view- 4, for models ZL-024WLxxxyyyyUK01



Attachment No. 5

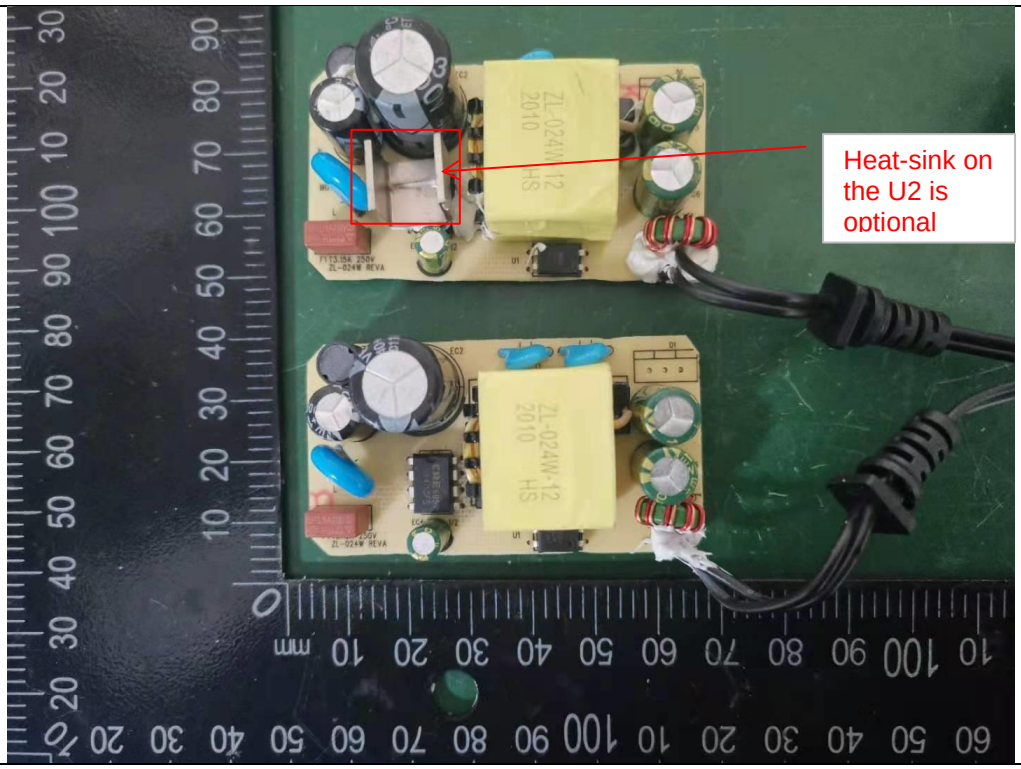
Details of: Internal view- 5, for models ZL-024WLxxxyyyyXX02

Details of: Internal view- 6, for models ZL-024WLxxxyyyyXX02

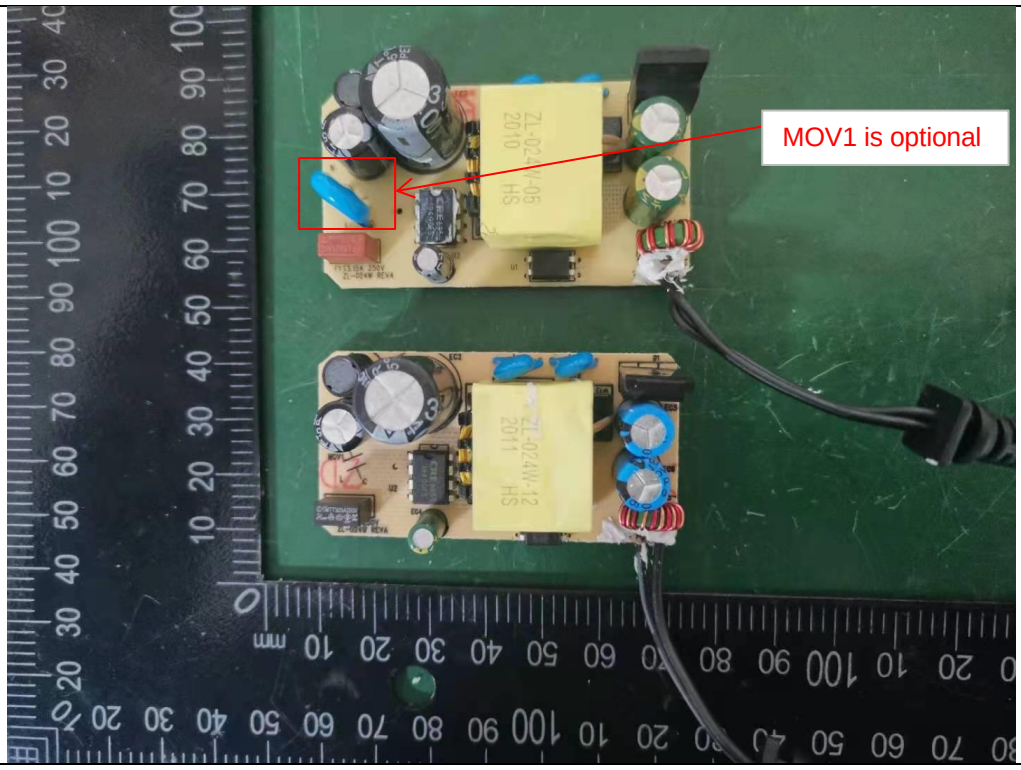


Attachment No. 5

Details of: PCB component view- 1 (Heat-sink on the U2 is optional)

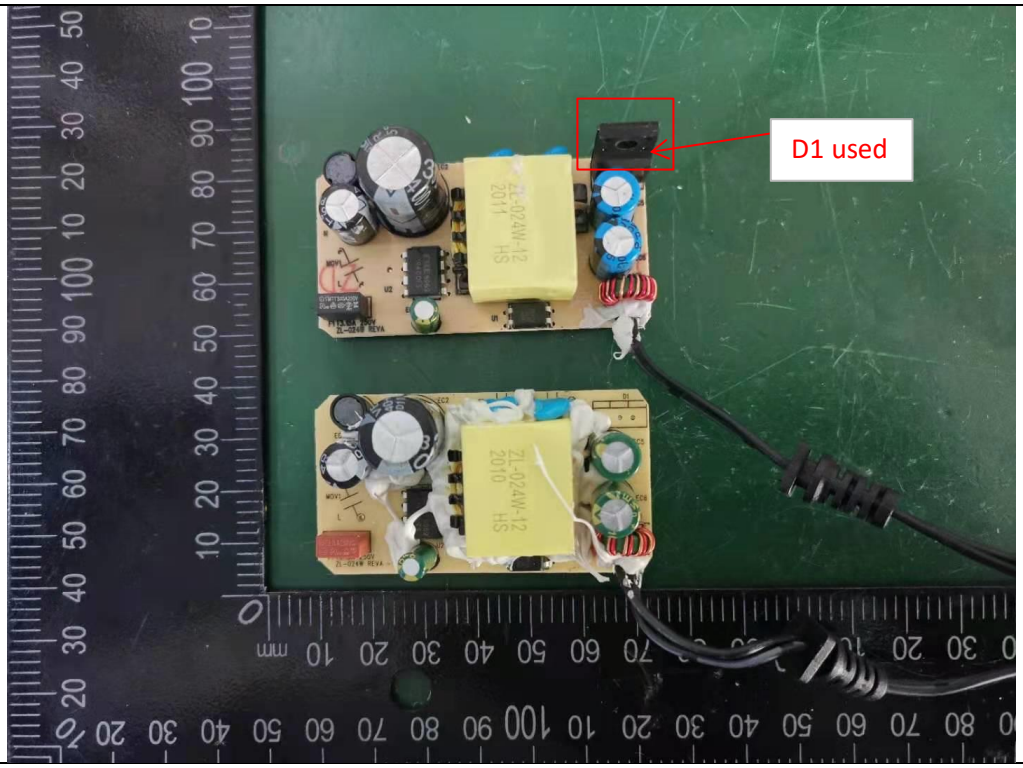


Details of: PCB component view- 2 (MOV1 is optional)

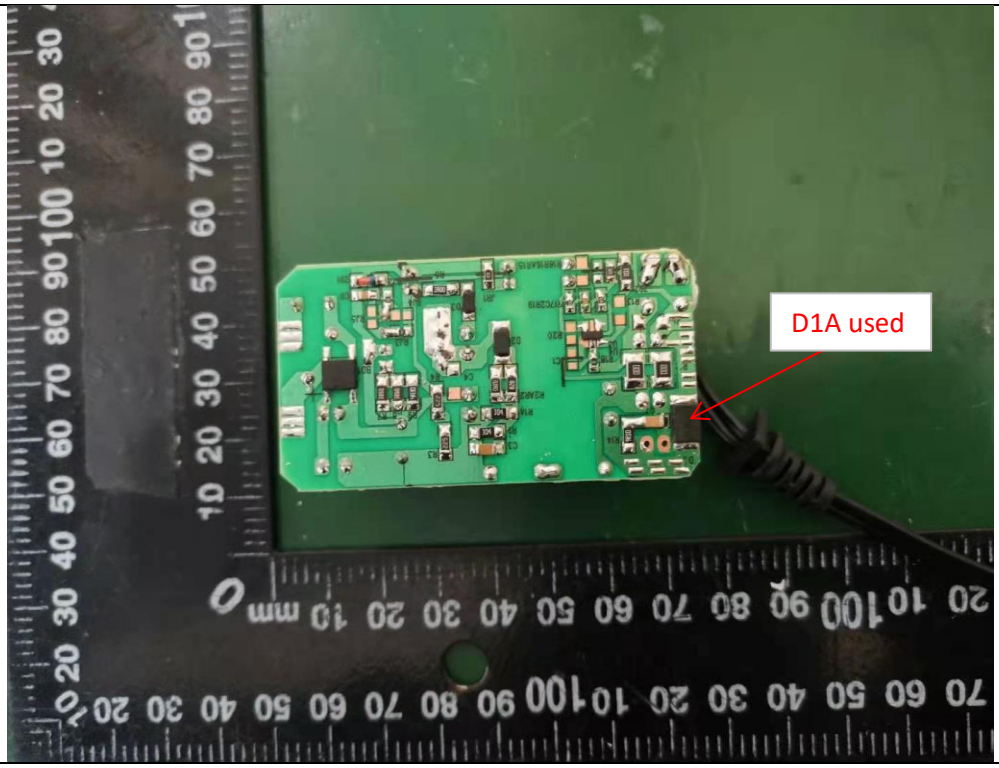


Attachment No. 5

Details of: PCB component view- 3 (D1 and D1A is alternatively use, only use D1 or only use D1A.)

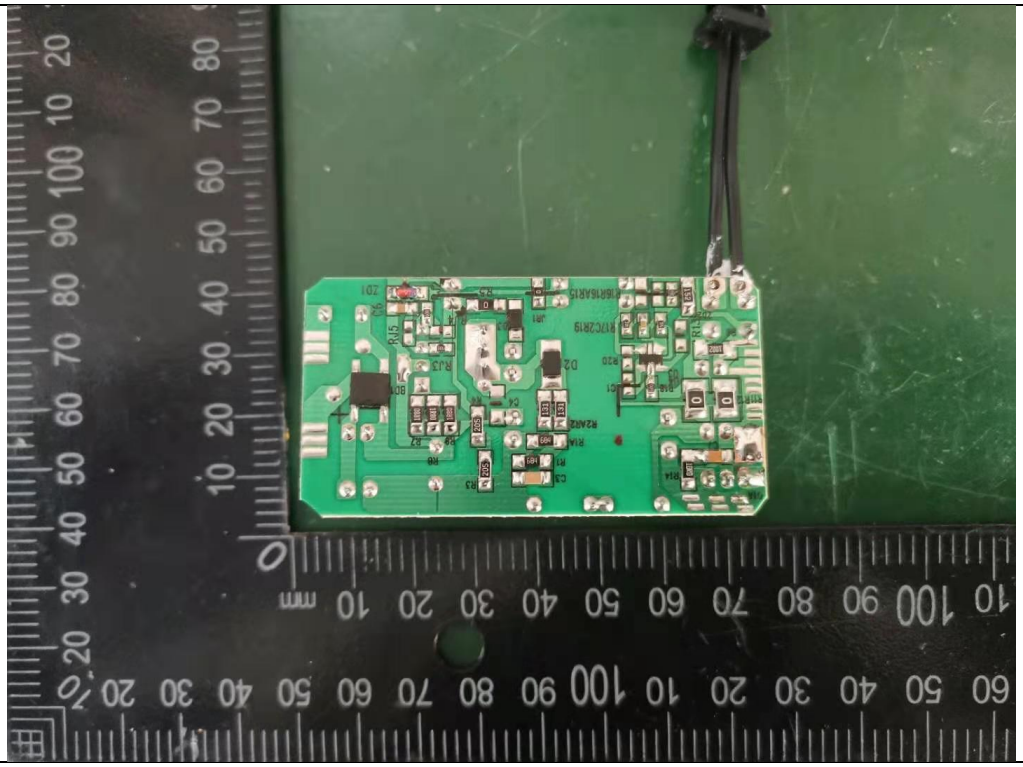


Details of: PCB component view- 4 (D1 and D1A is alternatively use, only use D1 or only use D1A.)

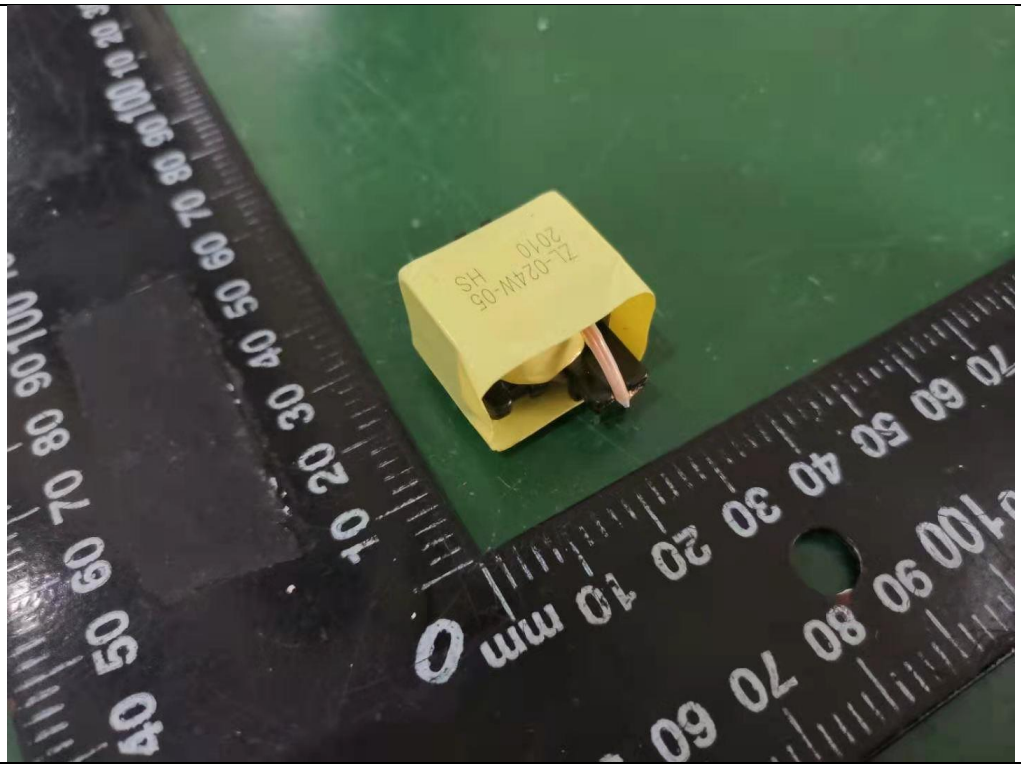


Attachment No. 5

Details of: PCB component view- 5 (Not used D1A when D1 Used)

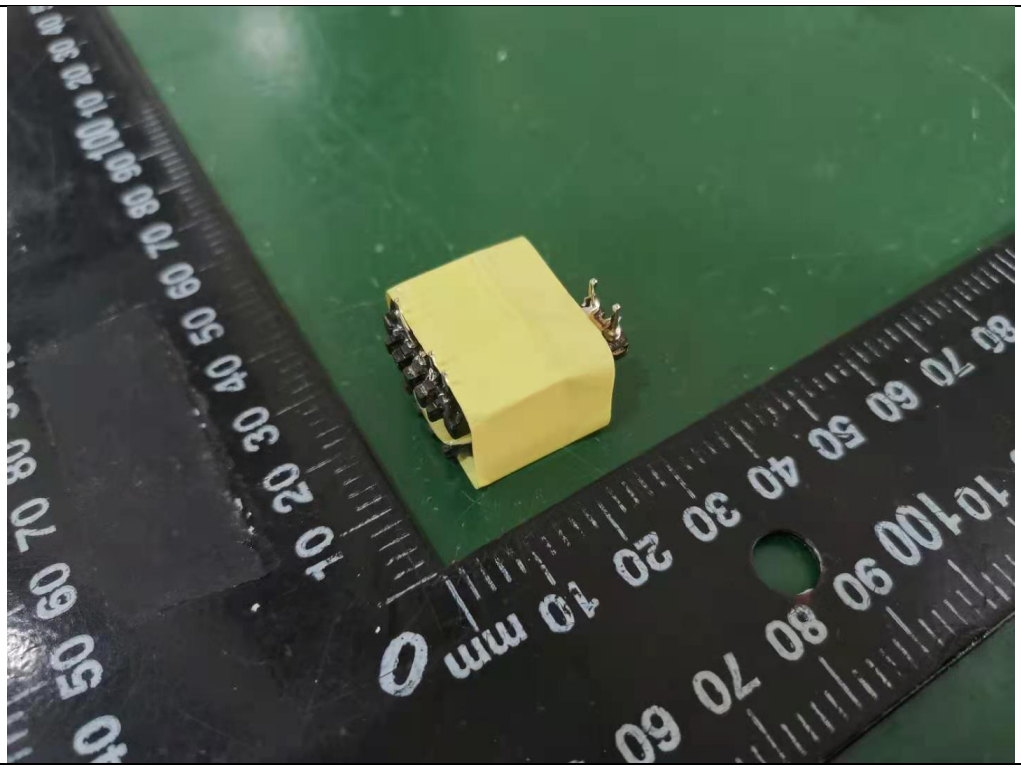


Details of: Transformer view-1



Attachment No. 5

Details of: Transformer view-2



-End-