

# DECLARACIÓN JURADA DE CONFORMIDAD (DJC)

## Res. S.I. y C. N° 16/2025

Número de Identificación de DJC: NAT-DJC-2026-001



*(número único de identificación autodeterminado)*

### Información del Fabricante o Importador:

- Razón Social: NATPATAGONIA S.A.
- C.U.I.T. N° (cuando fuera aplicable): 30-71691243-0
- Nombre Comercial o Marca Registrada: Segway Navimow
- Domicilio Legal: Ramón Freire 2575, Piso 6°, Departamento «A», Ciudad Autónoma de Buenos Aires, República Argentina.
- Domicilio de la planta de producción o del depósito del importador: Av. 101 Dr. Ricardo Balbín 3982, Provincia de Buenos Aires, República Argentina.
- Teléfono: +54 11 4966-4100
- Correo Electrónico: info@navimow.com.ar

### Representante Autorizado (si corresponde):

- Nombre y Apellido / Razón Social: NATPATAGONIA S.A.
- Domicilio Legal: Ramón Freire 2575, Piso 6°, Departamento «A», Ciudad Autónoma de Buenos Aires, República Argentina.
- C.U.I.T. N°: 30-71691243-0

### Información del Producto (por producto o familia de productos):

- Código de Identificación Único del Producto (autodeterminado): CARG-NAVIMOW-I2
- Fabricante (incluir domicilio de la planta de producción): Dong Guan City GangQi Electronic Co., Ltd. — 1 Building, No. 13 Maoye Road, ChangXiang Village, HengLi Town, 523600 DongGuan, GuangDong, República Popular China.
- Identificación del producto (marca, modelo, características técnicas):
  - Producto: Fuente de alimentación conmutada (cargador) para cortadora de césped robótica Navimow serie i2.
  - Marca: Segway Navimow
  - Modelos: NBW32D002D5N02-EU; NBW32D002D5N02-UK; NBW32D002D5N02-CH; NBW32D002D5N02-AU. Los cuatro son idénticos y difieren únicamente en el tipo de ficha de conexión a la red.
  - Características Generales: Entrada 100-240 V~, 50-60 Hz, 2,0 A máx., Clase II. Salida 32,0 V c.c., 2,5 A. IP67. ta 40 °C.

### Normas y Evaluación de la Conformidad:

- Reglamento/s Aplicable/s: Res. 237/24; Res. 16/25.  
*(Detallar el o los reglamentos bajo los cuales se encuentra alcanzado el producto)*
- Norma/s Técnica/s: IEC 61558-2-16:2021; IEC 61558-1:2017; IEC 60529 (grado IP67).  
*(Incluir normas técnicas específicas a las que se ajusta el producto)*

- Procedimiento de Evaluación de la Conformidad emitido por un OEC: Certificación por ensayo de tipo en el marco del Esquema IECEE CB, esquema 1b conforme Norma ISO/IEC 17067. Ver documento adjunto, Nro. de Informe de Ensayo: 250821040SZN-001. Fecha de emisión: 11 de octubre de 2025 / Fecha de próxima vigilancia: 11 de octubre de 2027.

*(Especificar el proceso al que fue sometido el producto para garantizar el cumplimiento a los requisitos técnicos exigidos por la reglamentación. En caso de certificación indicar además el esquema de certificación de producto conforme Norma ISO/IEC 17067, fecha de última y próxima vigilancia, de corresponder.)*

- Referencia al Documento de Evaluación de la Conformidad: SG ITS-38487 (CB Test Certificate). Informe de ensayo asociado: 250821040SZN-001.

*(Emitido por un OEC, especificar el número de referencia)*

- Datos del OEC Interviniente:

*(Organismo de Evaluación de la Conformidad, incluir nombre y datos de contacto, o, si procede, de informes técnicos respaldatorios. Si intervinieron varios organismos, indicar el número y nombre de cada uno)*

- INTERTEK TESTING SERVICES (SINGAPORE) PTE LTD — 5 Pereira Road, #06-01, Asiawide Industrial Building, Singapore 368025. Organismo de certificación (NCB) emisor del certificado.
- INTERTEK TESTING SERVICES SHENZHEN LTD. LONGHUA BRANCH — No. 101 & 201, Building B, No. 308 Wuhe Avenue, Longhua District, Shenzhen, Guangdong, China. Laboratorio emisor del informe de ensayo.

## Otros Datos:

- Enlace a la copia de la Declaración de la Conformidad en Internet:  
<https://djcnavigimow.com.ar/djc/carg-navigimow-i2/>

*(Enlace permanente al que remite el código QR del marcado de conformidad, conforme Resolución S.I. y C. N° 237/2024 y Disposición D.N.R.T. N° 1/2024)*

- Documentación adjunta: Certificado N° SG ITS-38487 e Informe de Ensayo N° 250821040SZN-001, que se agregan a continuación y forman parte de la presente DJC.

## Responsabilidad y Sanciones

La presente Declaración Jurada de Conformidad (DJC) se emite en total conformidad con el Reglamento Técnico que establece «los requisitos y características esenciales de calidad y seguridad que deberá cumplir el equipamiento eléctrico que se comercialice en el territorio de la REPÚBLICA ARGENTINA», aprobado por la Resolución N° 16/2025 de la SECRETARÍA DE INDUSTRIA Y COMERCIO, asumiendo la responsabilidad directa por los datos declarados, por la conformidad del producto y por la conservación de la DJC, así como la totalidad de la documentación respaldatoria de los datos aquí denunciados, durante DIEZ (10) años después de la introducción del producto en el mercado de la República Argentina.

La inexactitud, falsedad u omisión de carácter esencial de cualquier dato o información en esta Declaración, o la falta de presentación de la documentación requerida por la Autoridad, será pasible de las sanciones previstas en la Ley N° 24.240 y sus modificatorias, así como en el Decreto N° 274/2019, sin perjuicio de la responsabilidad penal, civil o administrativa aplicable, conforme al Artículo 110 del Reglamento de Procedimientos Administrativos, Decreto N° 1.759/72 — T.O. 2017.

Fecha y Lugar: 28 de agosto de 2026, Ciudad Autónoma de Buenos Aires, República Argentina

Firma:



Rodrigo Espinosa  
Presidente — NATPATAGONIA S.A.  
C.U.I.T. N° 30-71691243-0

*\* Si en el marco de un Reglamento Técnico se requiere otra información no contemplada en los puntos precedentes, se deberá añadir la misma a la presente DJC.*

## **Anexo I**

CB Test Certificate N° SG ITS-38487 — Intertek Testing Services (Singapore) Pte Ltd

Documentación respaldatoria de la DJC N° NAT-DJC-2026-001



Ref. Certif. No.

SG ITS-38487

IEC SYSTEM FOR MUTUAL RECOGNITION OF TEST CERTIFICATES FOR ELECTRICAL EQUIPMENT  
(IECEE) CB SCHEME

## CB TEST CERTIFICATE

Product

Power Supply

Name and address of the applicant

Dong Guan City GangQi Electronic Co., Ltd.  
1 Building, No.13 Maoye Road, ChangXiang Village, HengLi Town,  
523600 DongGuan, Guangdong, PEOPLE'S REPUBLIC OF CHINA.

Name and address of the manufacturer

Dong Guan City GangQi Electronic Co., Ltd.  
1 Building, No.13 Maoye Road, ChangXiang Village, HengLi Town,  
523600 DongGuan, Guangdong, PEOPLE'S REPUBLIC OF CHINA.

Name and address of the factory

Dong Guan City GangQi Electronic Co., Ltd.  
1 Building, No.13 Maoye Road, ChangXiang Village, HengLi Town,  
523600 DongGuan, Guangdong, PEOPLE'S REPUBLIC OF CHINA.

Note: When more than one factory, please report on page 2

Ratings and principal characteristics

Input: 100-240V~, 50-60Hz, 2.0A MAX, Class II  
Output: 32.0VDC, 2.5A  
IP67

Trademark / Brand (if any)

Customer's Testing Facility (CTF) Stage used

-

Model / Type Ref.

NBW32D002D5N02-EU, NBW32D002D5N02-UK,  
NBW32D002D5N02-CH, NBW32D002D5N02-AU

Additional information (if necessary may also be reported on page 2)

(AUSTRALIA/NEW ZEALAND) NATIONAL DIFFERENCES have been considered.

A sample of the product was tested and found to be in conformity with

IEC 61558-2-16:2021  
IEC 61558-1:2017

As shown in the Test Report Ref. No. which forms part of this Certificate

250821040SZN-001

This CB Test Certificate is issued by the National Certification Body

Intertek Testing Services (Singapore) Pte Ltd  
5, Pereira Road, #06-01  
Asiawide Industrial Building  
Singapore 368025

Date: 11 October 2025

Signature:

  
Jacky Chen

## **Anexo II**

Informe de Ensayo N° 250821040SZN-001 — Intertek Testing Services Shenzhen Ltd. Longhua Branch

Documentación respaldatoria de la DJC N° NAT-DJC-2026-001



Test Report issued under the responsibility of:



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

**Safety of power transformers, power supplies, reactors and similar  
products for supply voltages up to 1100 V  
Part 2: Particular requirements and tests for switch mode power  
supply units and transformers for switch mode power supply units**

**Report Number..... :** 250821040SZN-001  
**Date of issue..... :** Sep. 29, 2025  
**Total number of pages .....** : See page 3 for details

**Name of Testing Laboratory  
preparing the Report .....** : Intertek Testing Services Shenzhen Ltd. Longhua Branch

**Applicant's name .....** : Dong Guan City GangQi Electronic Co., Ltd.  
**Address..... :** 1 Building, No.13 Maoye Road, ChangXiang Village, HengLi  
Town, 523600 DongGuan, Guangdong, PEOPLE'S REPUBLIC  
OF CHINA.

**Test specification:**

**Standard .....** : IEC 61558-2-16:2021 used in conjunction with IEC 61558-1:2017  
**Test procedure .....** : CB Scheme  
**Non-standard test method .....** : N/A

**TRF template used..... :** IECEE OD-2020-F1:2021, Ed.1.4

**Test Report Form No. .... :** IEC61558\_2\_16H

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

**Master TRF .....** : Dated 2022-08-02

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Equipment and Components (IECEE System). All rights reserved.**

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If this Test Report Form is used by non-IECEE members, the IECEE/IEC logo and the reference to the CB Scheme procedure shall be removed.

**This report is not valid as a CB Test Report unless signed by an approved IECEE 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.

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

|                                                                                                   |                                                                                                                                    |                  |
|---------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|------------------|
| <b>Test item description</b> ..... :                                                              | Power supply                                                                                                                       |                  |
| <b>Trade Mark(s)</b> .....                                                                        | <b>NAVIMOW</b>                                                                                                                     |                  |
| <b>Manufacturer</b> .....                                                                         | Same as applicant                                                                                                                  |                  |
| <b>Model/Type reference</b> .....                                                                 | NBW32D002D5N02-EU, NBW32D002D5N02-UK,<br>NBW32D002D5N02-CH, NBW32D002D5N02-AU                                                      |                  |
| <b>Ratings</b> .....                                                                              | Input: 100-240V~, 50-60Hz, 2.0A MAX, Class II<br>Output: 32.0V===, 2.5A<br>IP67                                                    |                  |
| <b>Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):</b> |                                                                                                                                    |                  |
| <input checked="" type="checkbox"/> <b>CB Testing Laboratory:</b>                                 | Intertek Testing Services Shenzhen Ltd. Longhua Branch                                                                             |                  |
| <b>Testing location/ address</b> ..... :                                                          | No.101&201, Building B, No.308, Wuhe Avenue,<br>Zhangkengjing, Guanhu Subdistrict, Longhua District,<br>Shenzhen, Guangdong, China |                  |
| <b>Tested by (name, function, signature)</b> ..... :                                              | Zoe Qin<br>Engineer                                                                                                                | <i>Zoe Qin</i>   |
| <b>Approved by (name, function, signature)</b> ... :                                              | Porly Lai<br>Reviewer                                                                                                              | <i>Porly Lai</i> |
| <b>Testing procedure: CTF Stage 1:</b>                                                            |                                                                                                                                    |                  |
| <b>Testing location/ address</b> ..... :                                                          |                                                                                                                                    |                  |
| <b>Tested by (name, function, signature)</b> ..... :                                              |                                                                                                                                    |                  |
| <b>Approved by (name, function, signature)</b> ... :                                              |                                                                                                                                    |                  |
| <b>Testing procedure: CTF Stage 2:</b>                                                            |                                                                                                                                    |                  |
| <b>Testing location/ address</b> ..... :                                                          |                                                                                                                                    |                  |
| <b>Tested by (name + signature)</b> .....                                                         |                                                                                                                                    |                  |
| <b>Witnessed by (name, function, signature) . :</b>                                               |                                                                                                                                    |                  |
| <b>Approved by (name, function, signature)</b> ... :                                              |                                                                                                                                    |                  |
| <b>Testing procedure: CTF Stage 3:</b>                                                            |                                                                                                                                    |                  |
| <b>Testing procedure: CTF Stage 4:</b>                                                            |                                                                                                                                    |                  |
| <b>Testing location/ address</b> ..... :                                                          |                                                                                                                                    |                  |
| <b>Tested by (name, function, signature)</b> ..... :                                              |                                                                                                                                    |                  |
| <b>Witnessed by (name, function, signature) . :</b>                                               |                                                                                                                                    |                  |
| <b>Approved by (name, function, signature)</b> ... :                                              |                                                                                                                                    |                  |
| <b>Supervised by (name, function, signature) :</b>                                                |                                                                                                                                    |                  |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>List of Attachments (including a total number of pages in each attachment):</b> <ul style="list-style-type: none"> <li>- Main report (113 pages): IEC 61558 TRF</li> <li>- Appendix 1 (3 pages): (AUSTRALIA/NEW ZEALAND) NATIONAL DIFFERENCES</li> <li>- Appendix 2 (6 pages): Product photos</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                    |
| <b>Summary of testing:</b> The product fulfils the requirements of IEC 61558-2-16:2021 used in conjunction with IEC 61558-1:2017.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                    |
| <b>Tests performed (name of test and test clause):</b><br><b>Refer to content of this test report</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Testing location:</b><br>Intertek Testing Services Shenzhen Ltd. Longhua Branch<br>No.101&201, Building B, No.308, Wuhe Avenue, Zhangkengjing, Guanhu Subdistrict, Longhua District, Shenzhen, Guangdong, China |
| <b>Summary of compliance with National Differences (List of countries addressed):</b><br><br>(AUSTRALIA/NEW ZEALAND) NATIONAL DIFFERENCES were checked.<br><br><input checked="" type="checkbox"/> <b>The product fulfils the requirements of</b> IEC 61558-2-16:2021, IEC 61558-1:2017 and AS/NZS 61558.1:2018+A1:2020+A2:2020, AS/NZS 61558.2.16: 2022.                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                    |
| <b>Use of uncertainty of measurement for decisions on conformity (decision rule) :</b><br><br><input checked="" type="checkbox"/> No decision rule is specified by the IEC standard, when comparing the measurement result with the applicable limit according to the specification in that standard. The decisions on conformity are made without applying the measurement uncertainty ("simple acceptance" decision rule, previously known as "accuracy method").<br><br><input type="checkbox"/> Other:... (to be specified, for example when required by the standard or client, or if national accreditation requirements apply)                                                                                                 |                                                                                                                                                                                                                    |
| <b>Information on uncertainty of measurement:</b><br>The uncertainties of measurement are calculated by the laboratory based on application of criteria given by OD-5014 for test equipment and application of test methods, decision sheets and operational procedures of IECEE.<br>IEC Guide 115 provides guidance on the application of measurement uncertainty principles and applying the decision rule when reporting test results within IECEE scheme, noting that the reporting of the measurement uncertainty for measurements is not necessary unless required by the test standard or customer.<br>Calculations leading to the reported values are on file with the NCB and testing laboratory that conducted the testing. |                                                                                                                                                                                                                    |

**Copy of marking plate:**

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

**NAVIMOW**

---

**Power Supply 80.0W**

For Navimow equipment only.  
Uniquement pour les produits Navimow.  
Nur für den Gebrauch mit Navimow  
produkten geeignet.

Model: NBW32D002D5N02-EU  $\cos\phi > 0.40$   
Input: 100-240V~50-60Hz 2.0A MAX  
Output: 32.0V= 2.5A



**WARNIG/AVERTISSEMENT/WARNING**

 Risk of electric shock. Do not disassemble the  
the metal contacts.

Risque de choc électrique. Il est strictement interdit de  
démonter ou de toucher les contacts métalliques.

Gefahr eines Stromschlags. Zerlegen Sie nicht das  
Gehäuse und berühren Sie keine Metallkontakte.


  
 IP67  
 ta:40°C  


  
 $\leq 5000m$   


Manufacturer: Dong Guan City GangQi Electronic  
Co., Ltd.  
Address: 1 Building, No.13 Maoye Road, ChangXiang  
Village, 523600 HengLi Town, DongGuan,  
GuangDong, China.  
Email address: luo@gangqi.com.cn

Made in China

  
 Z0BFA00256KA0000

**NAVIMOW**

---

**Power Supply 80.0W**

For Navimow equipment only.  
Uniquement pour les produits Navimow.  
Nur für den Gebrauch mit Navimow  
produkten geeignet.

Model: NBW32D002D5N02-UK  $\cos\phi > 0.40$   
Input: 100-240V~50-60Hz 2.0A MAX  
Output: 32.0V= 2.5A



**WARNIG/AVERTISSEMENT/WARNING**

 Risk of electric shock. Do not disassemble the  
the metal contacts.

Risque de choc électrique. Il est strictement interdit de  
démonter ou de toucher les contacts métalliques.

Gefahr eines Stromschlags. Zerlegen Sie nicht das  
Gehäuse und berühren Sie keine Metallkontakte.

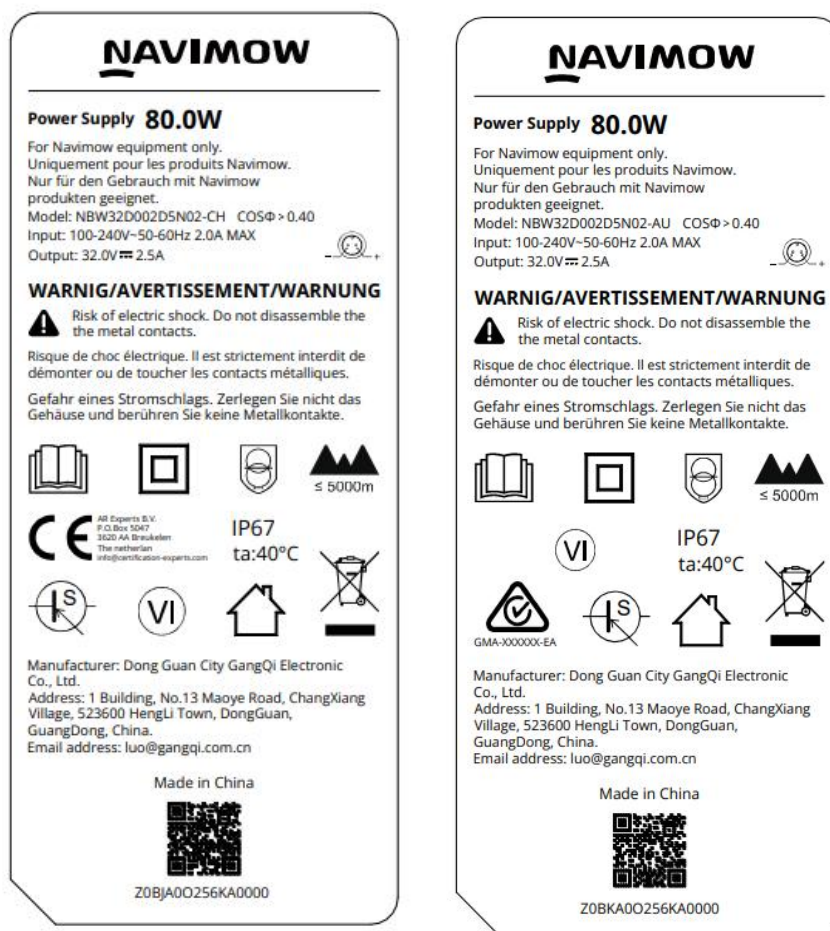

  
 IP67  
 ta:40°C  


  
 $\leq 5000m$   


Manufacturer: Dong Guan City GangQi Electronic  
Co., Ltd.  
Address: 1 Building, No.13 Maoye Road, ChangXiang  
Village, 523600 HengLi Town, DongGuan,  
GuangDong, China.  
Email address: luo@gangqi.com.cn

Made in China

  
 Z0BGA00256KA0000



Label

## Remark:

- The above markings are the minimum requirements required by the safety standard. For the final production samples, the additional markings which do not give rise to misunderstanding may be added.
- The height of CE logo and WEEE directive mark is at least 5.0mm and 7.0mm.

|                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <b>Test item particulars.....:</b>                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                  |
| <b>Classification of installation and use.....:</b> Switching power supply incorporating safety isolating transformer, Class II                                                                                                                                                                                                                                                                     |                                                                                                  |
| <b>Supply Connection .....</b> Non-detachable flexible cable and cord                                                                                                                                                                                                                                                                                                                               |                                                                                                  |
| <b>Possible test case verdicts:</b><br>- test case does not apply to the test object..... : N/A<br>- test object does meet the requirement..... : P (Pass)<br>- test object does not meet the requirement..... : F (Fail)                                                                                                                                                                           |                                                                                                  |
| <b>Testing.....:</b>                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                  |
| <b>Date of receipt of test item .....</b> Aug. 21, 2025                                                                                                                                                                                                                                                                                                                                             |                                                                                                  |
| <b>Date (s) of performance of tests .....</b> Aug. 21, 2025 to Sep. 19, 2025                                                                                                                                                                                                                                                                                                                        |                                                                                                  |
| <b>General remarks:</b>                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                  |
| "(See Enclosure #)" refers to additional information appended to the report.<br>"(See appended table)" refers to a table appended to the report.<br><br><b>Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator.</b><br>When determining for test conclusion, measurement uncertainty of tests has been considered. |                                                                                                  |
| <b>Manufacturer's Declaration per sub-clause 4.2.5 of IEC60335-1:</b>                                                                                                                                                                                                                                                                                                                               |                                                                                                  |
| 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 .....:                                                                                                                          | <input type="checkbox"/> <b>Yes</b><br><input checked="" type="checkbox"/> <b>Not applicable</b> |
| <b>When differences exist; they shall be identified in the General product information section.</b>                                                                                                                                                                                                                                                                                                 |                                                                                                  |
| <b>Name and address of factory (ies) .....</b> Dong Guan City GangQi Electronic Co., Ltd.<br>1 Building, No.13 Maoye Road, ChangXiang Village, HengLi Town, 523600 DongGuan, Guangdong, PEOPLE'S REPUBLIC OF CHINA.                                                                                                                                                                                 |                                                                                                  |

**General product information and other remarks:**

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.

The test report only allows to be revised only within the report defined retention period unless standard or regulation was withdrawn or invalid.

The product covered by this report is Power Supply. It's classified as class II equipment for indoor use. The enclosure of the unit is ultrasonic-wave welding.

The equipment mass: Approx. 0.5182 kg.

Max. altitude of product: 5000m, Max. operate temperature of product: 40°C.

IP67 refer to test report 250821013SZN-001 according to IEC 60529 issued by Intertek Testing Services Shenzhen Ltd. Longhua Branch.

All models are identical except different model and plug type, see below for details.

| Model No.         | Plug type |
|-------------------|-----------|
| NBW32D002D5N02-EU | EU        |
| NBW32D002D5N02-UK | UK        |
| NBW32D002D5N02-CH | CH        |
| NBW32D002D5N02-AU | AU        |

| IEC 61558-2-16 |                                                                                                                                                                                              |                                                                                                     |            |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|------------|
| Clause         | Requirement + Test                                                                                                                                                                           | Result - Remark                                                                                     | Verdict    |
| <b>8</b>       | <b>MARKING AND OTHER INFORMATION</b>                                                                                                                                                         |                                                                                                     | <b>P</b>   |
| 8.1            | Transformers shall be marked with the following (for symbols see Table 1):                                                                                                                   |                                                                                                     | <b>P</b>   |
|                | a) rated supply voltage(s) or the rated supply voltage range(s) (V) .....                                                                                                                    | 100-240V~                                                                                           | <b>P</b>   |
|                | b) rated output voltage(s) (V or kV) .....                                                                                                                                                   | 32.0V                                                                                               | <b>P</b>   |
|                | c) rated output (VA, kVA, or W) .....                                                                                                                                                        |                                                                                                     | <b>N/A</b> |
|                | d) rated output current(s) (A or mA) .....                                                                                                                                                   | 2.0A MAX                                                                                            | <b>P</b>   |
|                | e) rated supply frequency(ies) (Hz) .....                                                                                                                                                    | 50-60Hz                                                                                             | <b>P</b>   |
|                | f) rated power factor (if not 1) .....                                                                                                                                                       |                                                                                                     | <b>N/A</b> |
|                | g) symbol AC for alternating current, or DC for direct current-output                                                                                                                        | ~ for input;<br>=== for output                                                                      | <b>P</b>   |
|                | h) relevant graphical symbols shown in Table 101 that indicate the kind of transformer in addition with the symbol for SMPS. (IEC 61558-2-16: 2021)                                          | For example:<br> | <b>P</b>   |
|                | i) name or trademark of the manufacturer or responsible vendor                                                                                                                               | See marking plate                                                                                   | <b>P</b>   |
|                | j) model or type reference                                                                                                                                                                   | See marking plate                                                                                   | <b>P</b>   |
|                | k) vector group in accordance with IEC 60076-1 for three phase transformer                                                                                                                   | Single-phase                                                                                        | <b>N/A</b> |
|                | l) symbol for class II construction                                                                                                                                                          |                | <b>P</b>   |
|                | symbol for class III construction                                                                                                                                                            |                | <b>N/A</b> |
|                | m) indication of the protection index IP                                                                                                                                                     | IP67                                                                                                | <b>P</b>   |
|                | n) rated maximum ambient temperature $t_a$ , if other than 25 °C .....                                                                                                                       | 40°C                                                                                                | <b>P</b>   |
|                | o) rated minimum ambient temperature $t_{amin}$ , if lower than +10 °C and if a temperature sensitive device is used                                                                         |                                                                                                     | <b>N/A</b> |
|                | p) duty cycle, if any, unless the operating time is limited by the construction of the transformer or corresponds to the operating conditions specified in the relevant part of IEC 61558-2. |                                                                                                     | <b>N/A</b> |
|                | q) symbol for overvoltage category, if other than OVC II                                                                                                                                     | OVC II                                                                                              | <b>N/A</b> |
|                | r) transformers used with forced air cooling shall be marked with "AF" in m/s                                                                                                                |                                                                                                     | <b>N/A</b> |
|                | s) Information from the manufacturer to the purchaser (data sheet)                                                                                                                           |                                                                                                     | <b>N/A</b> |
|                | - short-circuit voltage (% rated supply voltage) for stationary transformers > 1000 VA                                                                                                       |                                                                                                     | <b>N/A</b> |
|                | - electrical function of the transformer                                                                                                                                                     |                                                                                                     | <b>P</b>   |

| 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                                                                                                                           | 5000m                                                                                                   | 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 designed to be protected by fuses shall be marked:                                                              |                                                                                                         | 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 fuse used, marking "T3.15AL/250V" provided on PCB near F1                               | P       |
|                | For non-short-circuit proof transformers or non-inherently short-circuit proof transformers designed to be protected with protective devices other than fuses shall be marked:                              |                                                                                                         | N/A     |
|                | Manufacturer's models or type reference of the protective device, and/or the ratings of the protective device                                                                                               |                                                                                                         | N/A     |
|                | Instruction sheet for transformers with replaceable protective device (other than fuses) information with information about the replacement.                                                                |                                                                                                         | N/A     |
| 8.6            | Terminals for neutral: "N"                                                                                                                                                                                  |                                                                                                         | N/A     |
|                | Terminal for protective earth marked with earthing symbol                                                                                                                                                   |                    | N/A     |
|                | Identification of input terminals:                                                                                                                                                                          |                                                                                                         | N/A     |
|                | Identification of output terminals:                                                                                                                                                                         |                                                                                                         | N/A     |
|                | Symbol for any point/terminal in connection with frame or core                                                                                                                                              |                    | N/A     |
| 8.7            | Indication for correct connection                                                                                                                                                                           | See the marking plate                                                                                   | P       |
| 8.8            | Instruction sheet for type X, Y, Z attachments                                                                                                                                                              | As type Z for external flexible cable or cord                                                           | P       |
| 8.9            | Transformer for indoor use shall be marked with the relevant symbol.                                                                                                                                        |  or for indoor use | P       |
| 8.10           | Symbol for Class II construction not confused with manufacturer's name or any other identification                                                                                                          |                                                                                                         | P       |

| IEC 61558-2-16 |                                                                                                       |                                                                                                  |         |
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| Clause         | Requirement + Test                                                                                    | Result - Remark                                                                                  | Verdict |
|                | 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     |
| 8.11           | Correct symbols:                                                                                      |                                                                                                  | P       |
|                | Volts                                                                                                 | V                                                                                                | P       |
|                | Amperes                                                                                               | A (mA)                                                                                           | P       |
|                | Volt amperes (or volt-amperes reactive for reactors)                                                  | VA or (VAR)                                                                                      | N/A     |
|                | Watts                                                                                                 | W                                                                                                | P       |
|                | Hertz                                                                                                 | Hz                                                                                               | P       |
|                | Input                                                                                                 | PRI                                                                                              | P       |
|                | Output                                                                                                | SEC                                                                                              | P       |
|                | Direct current                                                                                        | d.c. (DC) or  | P       |
|                | Neutral                                                                                               | N                                                                                                | N/A     |
|                | Single-phase a.c.                                                                                     |             | P       |
|                | Three-phase a.c.                                                                                      | 3           | N/A     |
|                | Three-phase and neutral a.c.                                                                          | 3N          | N/A     |
|                | Power factor                                                                                          | cos φ                                                                                            | P       |
|                | Class II construction                                                                                 |             | P       |
|                | Class III construction                                                                                |             | N/A     |
|                | Equipment of overvoltage category I                                                                   |             | N/A     |
|                | Equipment of overvoltage category II                                                                  |             | N/A     |
|                | Equipment of overvoltage category III                                                                 |             | N/A     |
|                | Equipment of overvoltage category IV                                                                  |             | N/A     |
|                | Fuse                                                                                                  |             | N/A     |
|                | Rated max. ambient temperature                                                                        | $t_a$                                                                                            | P       |
|                | Rated minimum ambient temperature                                                                     | $t_{amin}$                                                                                       | N/A     |
|                | Rated minimum temperature                                                                             | $t_{min}$                                                                                        | N/A     |

| IEC 61558-2-16 |                                                                                                      |                                                                                                       |         |
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| Clause         | Requirement + Test                                                                                   | Result - Remark                                                                                       | Verdict |
|                | Frame or chassis (or core terminal)                                                                  |                    | N/A     |
|                | Protective earth (ground)                                                                            |                    | N/A     |
|                | IP number                                                                                            | IP67                                                                                                  | P       |
|                | Earth (ground or functional earth)                                                                   |                    | N/A     |
|                | For indoor use only                                                                                  |  or for indoor use | 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.      |                    | N/A     |
|                | Additional Symbols (IEC 61558-2-16:2021)                                                             |                                                                                                       | P       |
|                | SMPS (Switch mode power supply unit)                                                                 |                   | P       |
|                | SMPS incorporating a Fail-safe separating transformer                                                |                  | N/A     |
|                | SMPS incorporating a Non-short-circuit-proof separating transformer                                  |                  | N/A     |
|                | SMPS incorporating a Short-circuit-proof separating transformer (inherently or non-inherently)       |                  | N/A     |
|                | SMPS incorporating a Fail-safe isolating transformer                                                 |                  | N/A     |
|                | SMPS incorporating a Non-short-circuit-proof isolating transformer                                   |                  | N/A     |
|                | SMPS incorporating a Short-circuit-proof isolating transformer (inherently or non-inherently)        |                  | N/A     |
|                | SMPS incorporating a Fail-safe safety isolating transformer                                          |                  | N/A     |
|                | SMPS incorporating a Non-short-circuit-proof safety isolating transformer                            |                  | N/A     |
|                | SMPS incorporating a Short-circuit-proof safety isolating transformer (inherently or non-inherently) |                  | P       |

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

| IEC 61558-2-16 |                                                                                                                                                                                                                                                                                                                                           |                                                                                                                 |          |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|----------|
| Clause         | Requirement + Test                                                                                                                                                                                                                                                                                                                        | Result - Remark                                                                                                 | Verdict  |
|                | the limiting temperature of the winding under abnormal conditions which shall be respected when the transformer is built into an appliance as information for appliance design;                                                                                                                                                           |                                                                                                                 | N/A      |
|                | For transformers not designed for series and/or parallel connection with more than one output winding, not for series or parallel connection                                                                                                                                                                                              |                                                                                                                 | N/A      |
|                | For IP00-transformers the test of 27.2 is not performed. The result may be affected by the enclosure in the final application.                                                                                                                                                                                                            |                                                                                                                 | N/A      |
| 8.15           | Marking durable and easily legible                                                                                                                                                                                                                                                                                                        |                                                                                                                 | P        |
| 8.16           | Portable transformers with integrated plugs complying with EN 50075 (IEC plug type C), shall use the symbol IEC 60417-6352:2015-10.<br>The instruction sheet of the plug-in transformer shall contain the following information, or equivalent:<br>if the pins of the plug parts are damaged, the plug-in power supply shall be scrapped. |                                                                                                                 | N/A      |
| <b>9</b>       | <b>PROTECTION AGAINST ELECTRIC SHOCK</b>                                                                                                                                                                                                                                                                                                  |                                                                                                                 | <b>P</b> |
| 9.1            | General                                                                                                                                                                                                                                                                                                                                   |                                                                                                                 | P        |
|                | Transformers shall be enclosed and provided with adequate protection against contact with hazardous-live-parts and shall have no risk of an electric shock from stored charge on capacitors.                                                                                                                                              |                                                                                                                 | P        |
| 9.2            | Protection against contact with hazardous-live-parts                                                                                                                                                                                                                                                                                      |                                                                                                                 | P        |
| 9.2.1          | Determination of hazardous-live-parts                                                                                                                                                                                                                                                                                                     |                                                                                                                 | P        |
| 9.2.1.1        | A live part is not a hazardous-live-part if it is separated from the supply by double or reinforced insulation and the requirements of 9.2.1.2 or 9.2.1.3 are met when the transformer is supplied at rated supply voltage                                                                                                                |                                                                                                                 | P        |
| 9.2.1.2        | The voltage shall not exceed 35 V AC peak or 60 V ripple free DC.                                                                                                                                                                                                                                                                         | No load max. 31.21VDC (output terminal)                                                                         | P        |
| 9.2.1.3        | Where the voltage exceeds 35 V (peak) AC or 60 V ripple free DC, the touch current shall not exceed:                                                                                                                                                                                                                                      |                                                                                                                 | P        |
|                | - for AC. 0,7 mA (peak)                                                                                                                                                                                                                                                                                                                   | Normal: 0.358 mA(peak) max.<br>CY2 Short-circuited: 0.518mA(peak) max<br>CY4 Short-circuited: 0.518mA(peak) max | P        |
|                | - for DC. 2,0 mA                                                                                                                                                                                                                                                                                                                          |                                                                                                                 | N/A      |
|                | In addition, when a capacitor is connected to live parts:                                                                                                                                                                                                                                                                                 |                                                                                                                 | P        |

| IEC 61558-2-16 |                                                                                                                                                                                                                                                                                           |                                                                                                                        |         |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|---------|
| Clause         | Requirement + Test                                                                                                                                                                                                                                                                        | Result - Remark                                                                                                        | Verdict |
| 9.2.1.3.1      | The discharge shall not exceed 45 $\mu\text{C}$ for stored voltages between 60 V and 15 kV, or                                                                                                                                                                                            | 0.774 $\mu\text{C}$ (normal)<br>1.162 $\mu\text{C}$ (CY2 Short-circuited)<br>1.162 $\mu\text{C}$ (CY4 Short-circuited) | P       |
| 9.2.1.3.2      | The energy of discharge shall not exceed 350 mJ for stored voltages exceeding 15 kV.                                                                                                                                                                                                      |                                                                                                                        | N/A     |
| 9.2.2          | Accessibility to hazardous-live-parts                                                                                                                                                                                                                                                     |                                                                                                                        | P       |
|                | Transformers shall be constructed to provide adequate protection against accessibility to hazardous-live-parts.                                                                                                                                                                           |                                                                                                                        | P       |
|                | Class I and II transformers shall be so constructed and enclosed that there is adequate protection against accidental contact with hazardous-live-parts.                                                                                                                                  |                                                                                                                        | P       |
|                | For class I transformers, accessible parts shall be separated from hazardous-live-parts by at least basic insulation.                                                                                                                                                                     |                                                                                                                        | N/A     |
|                | Class II transformers shall be so constructed and enclosed that there is adequate protection against accessibility to basic insulation and to conductive parts separated from hazardous-live-parts by basic insulation only.                                                              |                                                                                                                        | P       |
|                | Only parts separated from hazardous-live parts by double or reinforced insulation may be accessible                                                                                                                                                                                       |                                                                                                                        | P       |
|                | Hazardous-live-parts shall not be accessible after removal of detachable parts except for                                                                                                                                                                                                 | No detachable parts                                                                                                    | N/A     |
|                | - lamps having caps larger B9 and E10                                                                                                                                                                                                                                                     |                                                                                                                        | N/A     |
|                | - type D fuse holder                                                                                                                                                                                                                                                                      |                                                                                                                        | N/A     |
|                | IP00 transformers shall comply with the end product standard after incorporation in the end product.                                                                                                                                                                                      |                                                                                                                        | N/A     |
|                | The insulating properties of lacquer, enamel, paper, cotton, oxide film on conductive parts and sealing compound shall not be considered as giving the required protection against accidental contact with hazardous-live-parts with the exception of fully insulated winding wire (FIW). |                                                                                                                        | P       |
|                | Shafts, handles, operating levers, knobs and the like shall not be hazardous-live-parts.                                                                                                                                                                                                  |                                                                                                                        | N/A     |
|                | Compliance is checked by inspection and by the relevant tests of IEC 60529.                                                                                                                                                                                                               | IP67                                                                                                                   | 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       |

| IEC 61558-2-16 |                                                                                                                                                                                    |                 |         |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause         | Requirement + Test                                                                                                                                                                 | Result - Remark | Verdict |
|                | for Class II transformers: conductive parts separated by basic insulation from hazardous live parts not touchable by test finger                                                   |                 | P       |
|                | hazardous live parts shall not be touchable with the test pin                                                                                                                      |                 | P       |
| 9.2.3          | Accessibility of non-hazardous live parts                                                                                                                                          |                 | P       |
|                | Non-hazardous live parts of the output circuit isolated from the input circuit by double or reinforced insulation may be accessible under the following conditions:                |                 | P       |
|                | - for no-load output voltages not exceeding 35 V peak AC or 60 V ripple-free DC, both poles may be accessible;                                                                     |                 | P       |
|                | - for no-load output voltages exceeding 35 V peak AC or 60 V ripple-free DC and not exceeding 250 V AC, only one of the poles may be accessible.                                   |                 | N/A     |
| 9.3            | Protection against hazardous electrical discharge                                                                                                                                  |                 | P       |
|                | Transformers with primary supply plug: 1 s after the interruption of the supply the voltage between the pins do not exceed 35 V (peak) AC or 60 V ripple free DC                   | 16Vpeak         | P       |
|                | Transformers without a primary supply plug: 5 s after the interruption of the supply the voltage between the input terminals do not exceed 35 V (peak) AC. or 60 V ripple free DC. |                 | N/A     |
|                | If the nominal capacitance is $\leq 0,1 \mu\text{F}$ – no test is conducted.                                                                                                       |                 | N/A     |
|                | - 10 times switch the supply source on and off, or use a special equipment for to switch off at the most unfavourable electrical angle                                             |                 | N/A     |
|                | If the measured voltage is $> 60 \text{ V}$ ripple free DC, the discharge must be $\leq 45 \mu\text{C}$ .                                                                          |                 | P       |
| <b>10</b>      | <b>CHANGE OF INPUT VOLTAGE SETTING</b>                                                                                                                                             |                 | P       |
|                | Transformers with more than one rated supply voltage shall be so constructed that the voltage setting cannot be changed without the aid of a tool.                                 |                 | N/A     |
|                | Transformers which can be set to different rated supply voltages:                                                                                                                  |                 | N/A     |
|                | - The indication of voltage for which the transformer is set is discernible on the transformer.                                                                                    |                 | N/A     |
| 10.101         | A wide range (e.g. 100 V AC to 240 V AC) of supply voltage is allowed (IEC 61558-2-16: 2021)                                                                                       |                 | P       |
|                | - if the output voltage does not exceed the rated output voltage                                                                                                                   |                 | P       |

| IEC 61558-2-16 |                                                                                                                                                                                                     |                 |         |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause         | Requirement + Test                                                                                                                                                                                  | Result - Remark | Verdict |
|                | - if the no-load output voltage does not exceed the limits of the output voltage deviation                                                                                                          |                 | P       |
| <b>11</b>      | <b>OUTPUT VOLTAGE AND OUTPUT CURRENT UNDER LOAD</b>                                                                                                                                                 |                 | P       |
| 11.1           | Difference from rated value (without rectifier; with rectifier):                                                                                                                                    |                 | P       |
|                | a) inherently short-circuit proof transformers with one rated output voltage for the output voltage: AC≤ 10%; DC≤ 15%                                                                               |                 | N/A     |
|                | b) inherently short-circuit proof transformers with more than one rated output voltage for the highest output voltage: AC≤10%; DC≤15%                                                               |                 | N/A     |
|                | c) inherently short-circuit proof transformers with more than one rated output voltage for the other output voltages: AC≤15%; DC≤20%                                                                |                 | N/A     |
|                | d) other transformers for the output voltages: AC≤5%; DC≤10%                                                                                                                                        |                 | P       |
| 11.2           | If a transformer is marked with the rated output, the rated output voltage, the rated output current, and the rated power factor, these values shall be substantially in agreement with each other. |                 | P       |
|                | If no rated output current is assigned to the transformer, the rated output current for the purpose of this specification can be calculated from the rated output and the rated output voltage.     |                 | N/A     |
| <b>12</b>      | <b>NO-LOAD OUTPUT VOLTAGE (IEC 61558-2-16:2021)</b>                                                                                                                                                 |                 | P       |
|                | Remark: with rectifier measuring on both sides of the rectifier if they are accessible to the user                                                                                                  |                 | P       |
| 12.101         | The no load output voltage shall not exceed :                                                                                                                                                       |                 | P       |
|                | - For SMPS incorporating separating or auto-transformers: 1000V AC. or 1415 V ripple free DC                                                                                                        |                 | N/A     |
|                | - For SMPS including isolating transformers: 500 V AC. or 708 V ripple-free DC                                                                                                                      |                 | N/A     |
|                | - For SMPS including safety isolating transformers: 50 V AC. or 120 V ripple-free DC                                                                                                                |                 | P       |
|                | For independent SMPS incorporating separating transformers, isolating transformers or auto-transformers: 50 V AC. or 120 V ripple-free DC                                                           |                 | N/A     |
|                | For independent SMPS, this output voltage limitation applies even when output windings, not for interconnection, are connected in series                                                            |                 | N/A     |
|                | The requirement for series connection does not apply to associated or IP 00 SMPS                                                                                                                    |                 | N/A     |
| 12.102         | The difference between no-load output voltage and the output voltage measured in clause 11 does not exceed the values of table 102                                                                  |                 | P       |

| IEC 61558-2-16 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                 |         |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause         | Requirement + Test                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Result - Remark | Verdict |
| 12.103         | Unless otherwise specified by the manufacturer, SMPS shall be tested with 20 cm to 200 cm length of wire connected to the output terminals under the most unfavourable conditions. Twisted wires or cables rated in accordance with IEC 60227-5:2011 (type 60227 IEC 53) may be used. The cross sectional area of the conductors shall be determined in accordance with the rated output current of the SMPS, and the current density shall not exceed 5 A/mm <sup>2</sup> in normal use. |                 | N/A     |
| <b>13</b>      | <b>SHORT-CIRCUIT VOLTAGE</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                 | N/A     |
|                | The short-circuit voltage measured shall not deviate by more than 20 % from the value marked.                                                                                                                                                                                                                                                                                                                                                                                             |                 | N/A     |
| <b>14</b>      | <b>HEATING</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                 | 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 $t_a \pm 5^\circ\text{C}$                                                                                                                                                                                                                                                                                                                                                                                                                     |                 | P       |
|                | 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                                                                                                                                                                                                                                                                                                                                                                                       |                 | P       |
|                | Upri (V): 1,1 times rated supply voltage: with 1 sec (A), measured with rated impedance and 1,0 times of the rated supply voltage for others than independent transformers                                                                                                                                                                                                                                                                                                                |                 | N/A     |
|                | Max. temperature windings .....: (see appended table)                                                                                                                                                                                                                                                                                                                                                                                                                                     |                 | P       |
|                | - Class A: 100 °C                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                 | N/A     |
|                | - Class E: 115 °C                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                 | N/A     |
|                | - Class B: 120 °C                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                 | P       |
|                | - Class F: 140 °C                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                 | N/A     |
|                | - Class H: 165 °C                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                 | N/A     |
|                | - other classes                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                 | N/A     |
|                | Temperature of external enclosures of stationary transformers:                                                                                                                                                                                                                                                                                                                                                                                                                            |                 | N/A     |
|                | - bare metal: 65 °C                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                 | N/A     |
|                | - metal covered by lac or varnish: 70 °C                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                 | N/A     |

| IEC 61558-2-16 |                                                                                                            |                                     |         |
|----------------|------------------------------------------------------------------------------------------------------------|-------------------------------------|---------|
| Clause         | Requirement + Test                                                                                         | Result - Remark                     | Verdict |
|                | - other material: 80 °C                                                                                    |                                     | N/A     |
|                | Temperature of external enclosure of stationary transformer 85 °C (not touchable with the IEC test finger) |                                     | N/A     |
|                | Temperature of external enclosures, handles, etc. of portable transformers:                                |                                     | P       |
|                | - continuously held parts of metal: 48 °C                                                                  |                                     | N/A     |
|                | - continuously held parts of other material: 48 °C                                                         |                                     | N/A     |
|                | - not continuously held parts of metal: 60 °C                                                              |                                     | N/A     |
|                | - not continuously held parts of other material: 80 °C                                                     |                                     | P       |
|                | Temperature of terminals for external conductors and terminals of switches 70 °C                           |                                     | N/A     |
|                | Temperature of internal and external wiring:                                                               |                                     | P       |
|                | - rubber: 65 °C                                                                                            |                                     | N/A     |
|                | - PVC: 70 °C                                                                                               |                                     | P       |
|                | Temperature of parts where safety can be affected:                                                         |                                     | N/A     |
|                | - rubber: 75 °C                                                                                            |                                     | N/A     |
|                | - phenol-formaldehyde: 105 °C                                                                              |                                     | N/A     |
|                | - urea-formaldehyde: 85 °C                                                                                 |                                     | N/A     |
|                | - impregnated paper and fabric: 85 °C                                                                      |                                     | N/A     |
|                | - impregnated wood: 85 °C                                                                                  |                                     | N/A     |
|                | - PVC, polystyrene and similar thermoplastic material: 65 °C                                               |                                     | N/A     |
|                | - varnished cambric: 75 °C                                                                                 |                                     | N/A     |
|                | Temperature rise of supports 85 °C                                                                         |                                     | P       |
|                | Temperature of printed boards:                                                                             |                                     | P       |
|                | - bonded with phenol-formaldehyde: 105 °C                                                                  |                                     | N/A     |
|                | - melamine-formaldehyde: 105 °C                                                                            |                                     | N/A     |
|                | - phenol-furfural: 105 °C                                                                                  |                                     | N/A     |
|                | - polyester: 105 °C                                                                                        |                                     | N/A     |
|                | - bonded with epoxy: 140 °C                                                                                | 130°C rating PCB used (UL approved) | P       |
|                | Electric strength between input and output windings (18.3, 1 min); test voltage (V) .....:                 | 3000Vac                             | P       |

| IEC 61558-2-16 |                                                                                                                                                                                                                         |                 |         |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause         | Requirement + Test                                                                                                                                                                                                      | Result - Remark | Verdict |
| 14.101         | Winding temperature measured by thermocouples at the surface of the winding (IEC 61558-2-16: 2021)                                                                                                                      |                 | P       |
|                | - if the internal frequencies is > 500Hz                                                                                                                                                                                |                 | P       |
|                | - the values of Table 2 for windings temperatures are reduced by 10°C                                                                                                                                                   |                 | P       |
| 14.102         | SMPS shall be tested at 0,9 times and 1,1 times the rated supply voltage                                                                                                                                                |                 | P       |
| 14.2           | Application of 14.1 or 14.3 according to the insulation system                                                                                                                                                          |                 | P       |
| 14.2.1         | Class of insulation system (classified materials according to IEC 60 085 and IEC 60 216)                                                                                                                                |                 | 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<br>Cycling test (10 cycles):                                                                                                                                                                                    |                 | N/A     |
| 14.3.2         | Heat run (temperature in table 4)                                                                                                                                                                                       |                 | N/A     |
| 14.3.3         | Vibration test: 30 min; amplitude 0,35 mm; frequency range: 10 Hz, 55 Hz, 10 Hz                                                                                                                                         |                 | N/A     |
| 14.3.4         | Moisture treatment (48 h, 17.2)                                                                                                                                                                                         |                 | N/A     |
| 14.3.5         | Measurements and tests at the beginning and after each test:                                                                                                                                                            |                 | N/A     |
|                | - deviation of the no-load input current, measured at the beginning of the test less than 30%                                                                                                                           |                 | N/A     |
|                | - insulation resistance acc. cl.18.1 and 18.2                                                                                                                                                                           |                 | N/A     |
|                | - electric strength, no breakdown (18.3 and 18.4); 2 min; test voltage 35% of specified value                                                                                                                           |                 | N/A     |
|                | - Transformers (50 or 60 Hz version) are tested after the dielectric strength test as follows:<br>under no load; duration: 5 min;<br>Upri(V):1,2 times rated supply voltage;<br>frequency (Hz): 2 times rated frequency |                 | N/A     |
| <b>15</b>      | <b>SHORT-CIRCUIT AND OVERLOAD PROTECTION</b>                                                                                                                                                                            |                 | P       |
| 15.1           | General requirements                                                                                                                                                                                                    |                 | P       |
| 15.1.1         | Short circuit and overload test method                                                                                                                                                                                  |                 | P       |

| IEC 61558-2-16 |                                                                                                                                                                                                               |                      |         |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------|
| Clause         | Requirement + Test                                                                                                                                                                                            | Result - Remark      | Verdict |
|                | Tests direct after 14.1 at the same $t_a$ and without changing position.                                                                                                                                      | (see appended table) | P       |
|                | Supply voltage between 0,9 times and 1,1 times of the rated supply voltage                                                                                                                                    |                      | P       |
|                | Transformer with rectifier tests of 15.2 and 15.3 at the input and the output terminals of the rectifier.                                                                                                     |                      | P       |
|                | Transformers with more than one output winding or tapping, all windings tested with normal load, the winding with the highest temperature is short circuited.                                                 |                      | N/A     |
|                | Winding protected inherently (15.2)                                                                                                                                                                           |                      | N/A     |
|                | - Max. temperature of winding protected inherently (insulation class): 150°C (A); 165°C (E); 175°C (B); 190°C (F); 210°C (H)                                                                                  |                      | N/A     |
|                | Winding protected by protective device:                                                                                                                                                                       |                      | P       |
|                | - Test according 15.3.2 - 15.3.3 – 15.3.4: max. temperature of winding during the time required or the time T given in table 6 (insulation class): 200 °C (A); 215 °C (E); 225 °C (B); 240 °C (F); 260 °C (H) |                      | N/A     |
|                | - Test according 15.3.1: max. temperature of winding during the first hour, peak value (insulation class): 200 °C (A); 215 °C (E); 225 °C (B); 240 °C (F); 260 °C (H)                                         |                      | P       |
|                | - Test according 15.3.1: max. temperature of winding after first hour, peak value (insulation class): 175 °C (A); 190 °C (E); 200 °C (B); 215 °C (F); 235 °C (H)                                              |                      | P       |
|                | - Test according 15.3.1: max. temperature of winding after first hour, arithmetic mean value (insulation class): 150 °C (A); 165 °C (E); 175 °C (B); 190 °C (F); 210 °C (H)                                   |                      | P       |
|                | - Test according 15.3.5: max. temperature of winding (insulation class): 175 °C (A); 190 °C (E); 200 °C (B); 215 °C (F); 235 °C (H)                                                                           |                      | P       |
|                | Max. temperature of external enclosures (accessible by test finger) 105 °C                                                                                                                                    |                      | P       |
|                | Max. temperature of insulation of wiring (rubber and PVC) 85 °C                                                                                                                                               |                      | P       |
|                | Temperature rise of supports 105 °C                                                                                                                                                                           |                      | P       |
| 15.1.2         | Alternative short circuit and overload test method                                                                                                                                                            |                      | N/A     |
|                | The manufacturer may choose to apply any of the following methods described in 14.1.2.1 and 14.1.2.2. These test procedures are according to IEC 60076-11:2004, 23.2.1 and 23.2.2                             |                      | N/A     |

| IEC 61558-2-16 |                                                                                                                                                                                                                                                                                                                                                                        |                      |         |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------|
| Clause         | Requirement + Test                                                                                                                                                                                                                                                                                                                                                     | Result - Remark      | Verdict |
| 15.2           | Inherently short-circuit proof transformers                                                                                                                                                                                                                                                                                                                            |                      | N/A     |
|                | Inherently short-circuit proof transformers are tested by short-circuiting the output windings until steady-state conditions are reached                                                                                                                                                                                                                               |                      | N/A     |
| 15.3           | Non-inherently short-circuit proof transformers                                                                                                                                                                                                                                                                                                                        |                      | P       |
|                | Non-inherently short-circuit proof transformers are tested as follows                                                                                                                                                                                                                                                                                                  |                      | P       |
| 15.3.1         | Output terminals short-circuited: protection device operates, test at 0,9 ... 1,1 of the rated supply voltage                                                                                                                                                                                                                                                          |                      | P       |
| 15.3.2         | If protected by a fuse accordance with either IEC 60 269-2 or IEC 60 269-3, or a technical equivalent fuse, the transformer is loaded as in table 6.                                                                                                                                                                                                                   |                      | N/A     |
| 15.3.3         | If protected by a fuse accordance with either IEC 60 127(all parts) or ISO 8820(all parts), or a technical equivalent fuse, the transformer is loaded with the current as specified for the longest pre arcing time.<br>If protected by miniature fuses in accordance to IEC 60127(all parts), 1,5 times of the rated fuse, until steady state condition (in addition) |                      | N/A     |
| 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 weak point is used, the test must be repeated with two new samples. The two additional samples works similar to the first sample.<br>Temperatures in the limit of table 5                                                                                                                                                                               |                      | N/A     |
| 15.4           | For non-short-circuit proof transformers: temperature rises values in table 5, tests as indicated in 15.3                                                                                                                                                                                                                                                              |                      | N/A     |
| 15.5           | For fail-safe transformers:                                                                                                                                                                                                                                                                                                                                            |                      | N/A     |
| 15.5.1         | Three additional new specimens are used                                                                                                                                                                                                                                                                                                                                |                      | N/A     |
|                | - Upri (V): 1,1 times rated supply voltage .....                                                                                                                                                                                                                                                                                                                       |                      | N/A     |
|                | - Isec (A): 1,5 times rated output current .....                                                                                                                                                                                                                                                                                                                       |                      | N/A     |
|                | - time until steady-state conditions t1 (h) .....                                                                                                                                                                                                                                                                                                                      |                      | N/A     |
|                | - time until failure t2 (h): t1; 5 h .....                                                                                                                                                                                                                                                                                                                             |                      | N/A     |
| 15.5.2         | During the test:                                                                                                                                                                                                                                                                                                                                                       |                      | N/A     |

| IEC 61558-2-16 |                                                                                                                                                                                                                                                     |                       |         |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------|
| Clause         | Requirement + Test                                                                                                                                                                                                                                  | Result - Remark       | Verdict |
|                | - no flames, molten material, etc.                                                                                                                                                                                                                  |                       | N/A     |
|                | - temperature of enclosure 175 °C                                                                                                                                                                                                                   |                       | N/A     |
|                | - temperature of plywood support 125 °C                                                                                                                                                                                                             |                       | N/A     |
|                | After the test:                                                                                                                                                                                                                                     |                       | N/A     |
|                | - electric strength (Cl. 18, 1 min, test voltage: 35% of specified value); no flashover or break-down for primary-to-secondary only for safety isolating, isolating and separating transformer and for primary-to-body for all kinds of transformer |                       | N/A     |
|                | - bare hazardous live parts not accessible by test finger through holes of enclosure                                                                                                                                                                |                       | N/A     |
| 15.101         | Electronic circuits shall be so designed and applied that a fault condition within the SMPS will not cause electric shock, or fire hazard, and unintentional operation of the appliance will not impair safety.                                     | (Details see Annex H) | P       |
| <b>16</b>      | <b>MECHANICAL STRENGTH</b>                                                                                                                                                                                                                          |                       | 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                                                                                                                                                                                                                             |                       | N/A     |
|                | 3 blows, impact energy 0,5 ±0,05 J                                                                                                                                                                                                                  |                       | N/A     |
| 16.3           | Portable transformers (except of direct plug in transformers)                                                                                                                                                                                       |                       | P       |
|                | For portable transformers: 100 falls, 25 mm                                                                                                                                                                                                         |                       | P       |
| 16.4           | Portable transformers provided with integral pins for introduction in socket outlets of the fixed wiring                                                                                                                                            |                       | N/A     |
| 16.4.1         | General requirements                                                                                                                                                                                                                                |                       | N/A     |
|                | Portable transformers with integral pins for introduction into fixed socket-outlets shall have adequate mechanical strength.                                                                                                                        |                       | N/A     |
|                | Plug in power supply units with integral main plug complying with IEC TR 60083, without plugs complying with EN 50075 (IEC plug type C) shall be tested:                                                                                            |                       | N/A     |
|                | a) plug-in transformers: tumbling barrel test: 50 times, $x \leq 250$ g; 25 times, $x > 250$ g                                                                                                                                                      |                       | N/A     |

| IEC 61558-2-16 |                                                                                                                                                                                |                 |          |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------|
| Clause         | Requirement + Test                                                                                                                                                             | Result - Remark | Verdict  |
|                | b) torque test of the plug pins with 0,4 Nm                                                                                                                                    |                 | N/A      |
|                | c) pull force according to table 7 for each pin                                                                                                                                |                 | N/A      |
| 16.4.2         | Portable transformers provided with integral pins according to EN 50075 (IEC plug type C) for introduction in socket-outlets of the fixed wiring                               |                 | N/A      |
|                | a) The test is carried in a tumbling barrel as described in IEC 60068-2-31.                                                                                                    |                 | N/A      |
|                | - 1000 times: $x \leq 100$ g; 500 times: $100$ g < $x \leq 200$ g; 200 times: $g < 100$ x                                                                                      |                 | N/A      |
|                | - pull force according to IEC 60884-1:2002, 24.10 for each pin                                                                                                                 |                 | N/A      |
|                | b) torque test of the plug pins with 0,4 Nm                                                                                                                                    |                 | N/A      |
| 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      |
| <b>17</b>      | <b>PROTECTION AGAINST HARMFUL INGRESS OF WATER AND MOISTURE</b>                                                                                                                |                 | <b>P</b> |
| 17.1           | Degree of protection (IP code marked on the transformer)                                                                                                                       |                 | <b>P</b> |
| 17.1.1         | General requirements                                                                                                                                                           |                 | <b>P</b> |
|                | Test according to 17.1.2 and for other IP ratings test according to IEC 60 529:                                                                                                |                 | <b>P</b> |
|                | - stable operating temperature before starting the test for < IPX8                                                                                                             |                 | <b>P</b> |
|                | - the water for the test shall be at a temperature of $15 \pm 10^\circ\text{C}$                                                                                                |                 | <b>P</b> |
|                | - transformer mounted and wired as in normal use                                                                                                                               |                 | N/A      |
|                | - fixed transformer mounted as in normal use by the tests according to 17.1.2 A to J                                                                                           |                 | N/A      |
|                | - portable transformers placed in the most unfavourable position and wired as in normal use                                                                                    |                 | <b>P</b> |
|                | - glands tightened with a torque equal to two-thirds of 25.6                                                                                                                   |                 | N/A      |

| IEC 61558-2-16 |                                                                                                                                                                                                                                                                                                                                          |                 |         |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause         | Requirement + Test                                                                                                                                                                                                                                                                                                                       | Result - Remark | Verdict |
|                | After the tests:                                                                                                                                                                                                                                                                                                                         |                 | P       |
|                | - dielectric strength test according to 18.3                                                                                                                                                                                                                                                                                             |                 | P       |
|                | Inspection:                                                                                                                                                                                                                                                                                                                              |                 | P       |
|                | a) no access with hazardous-live-parts or hazardous moving parts with the relevant test probe according to the test described in 17.1.2, items A 1), B 1) and C 1). The test finger may penetrate but the stop face ( $\varnothing$ 50 x 20 mm) shall not pass through the openings for the number 2 of the first characteristic numeral |                 | P       |
|                | b) no entry into the transformer enclosure by the relevant test probe for solid-object-proof transformers according to test described in 17.1.2, items A 2) and B 2). The protection is satisfactory if the full diameter of the probe does not pass through any openings;                                                               |                 | P       |
|                | 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 inside the enclosures of drip-proof, spray-proof, splash-proof and jet-proof transformers, which may impair safety                                                                                                                                                                                           |                 | N/A     |
|                | g) no trace of water entered in any part of water-tight transformer                                                                                                                                                                                                                                                                      |                 | N/A     |
| 17.1.2         | Tests on transformers with enclosure:                                                                                                                                                                                                                                                                                                    |                 | P       |
|                | A) Solid-object-proof transformers:                                                                                                                                                                                                                                                                                                      |                 | N/A     |
|                | - 2 IP2X test finger (IEC 60 529) and test pin (fig. 3)                                                                                                                                                                                                                                                                                  |                 | N/A     |
|                | - rigid sphere                                                                                                                                                                                                                                                                                                                           |                 | N/A     |
|                | B) Solid-object-proof transformers:                                                                                                                                                                                                                                                                                                      |                 | N/A     |
|                | - IP3X, wire 2,5 mm; force 3 N                                                                                                                                                                                                                                                                                                           |                 | N/A     |
|                | - IP4X, wire 1 mm; force 1 N                                                                                                                                                                                                                                                                                                             |                 | N/A     |
|                | C) Dust-proof transformers, IP5X;                                                                                                                                                                                                                                                                                                        |                 | N/A     |
|                | 1) At every possible point with a probe according to test probe D of B 1).                                                                                                                                                                                                                                                               |                 | N/A     |
|                | 2) dust chamber according to IEC 60 529, fig. 2:                                                                                                                                                                                                                                                                                         |                 | N/A     |
|                | a) transformer has operating temperature                                                                                                                                                                                                                                                                                                 |                 | N/A     |

| IEC 61558-2-16 |                                                                                                                                                                                    |                      |          |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------|
| Clause         | Requirement + Test                                                                                                                                                                 | Result - Remark      | Verdict  |
|                | b) transformer, still operating, is placed in the dust chamber                                                                                                                     |                      | N/A      |
|                | c) the door of the dust chamber is closed                                                                                                                                          |                      | N/A      |
|                | d) fan/blower is switched on                                                                                                                                                       |                      | N/A      |
|                | e) after 1 min transformer is switched off for cooling time of 3 h                                                                                                                 |                      | N/A      |
|                | D) Dust-tight transformers (IP6X) test according with C)                                                                                                                           |                      | P        |
|                | E) Drip-proof transformers (IPX1) test according to fig. 3 of IEC 60 529 for 10 min                                                                                                |                      | N/A      |
|                | F) Rain-proof transformers (IPX2) test according to fig. 3 of IEC 60 529 for 10 min in operation, any angle up to 15°                                                              |                      | N/A      |
|                | G) Spray proofed transformers (IPX3) test according to fig. 4 of IEC 60 529 for 10 min in operation and 10 min switched off , time for complete oscillation (2 x 120°) is 4 sec.   |                      | N/A      |
|                | H) Splash-proof transformers (IPX4) test according to fig. 4 of IEC 60 529 (see F) for 10 min in operation and 10 min switched off (the tube shall oscillate $\approx 360^\circ$ ) |                      | N/A      |
|                | I) Jet-proof transformer (IPX5) test according to fig. 6 of IEC 60 529 (nozzle 6,3mm)                                                                                              |                      | N/A      |
|                | J) Powerful Jet-proof transformer (IPX6) test according to fig. 6 of IEC 60 529 (nozzle 12 mm)                                                                                     |                      | N/A      |
|                | K) Watertight transformers (IPX7)                                                                                                                                                  |                      | P        |
|                | L) Pressure watertight transformers (IPX8)                                                                                                                                         |                      | N/A      |
| 17.2           | After moisture test (48 h for IP20, 168 h for other transformers):                                                                                                                 | 168h                 | P        |
|                | - insulation resistance and electric strength (Cl. 18)                                                                                                                             |                      | P        |
| <b>18</b>      | <b>INSULATION RESISTANCE AND ELECTRIC STRENGTH</b>                                                                                                                                 |                      | <b>P</b> |
| 18.2           | Insulation resistance between:                                                                                                                                                     |                      | P        |
|                | - live parts and body for basic insulation $\geq 2 \text{ M}\Omega$                                                                                                                |                      | N/A      |
|                | - live parts and body for reinforced insulation $\geq 7 \text{ M}\Omega$                                                                                                           | (see appended table) | P        |
|                | - input circuits and output circuits for basic insulation $\geq 2 \text{ M}\Omega$                                                                                                 |                      | N/A      |
|                | - input circuits and output circuits for double or reinforced insulation $\geq 5 \text{ M}\Omega$                                                                                  | (see appended table) | P        |

| IEC 61558-2-16 |                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                      |         |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------|
| Clause         | Requirement + Test                                                                                                                                                                                                                                                                                                                                                                                                                                         | Result - Remark      | Verdict |
|                | - each input circuit and all other input circuits connected together $\geq 2 \text{ M}\Omega$                                                                                                                                                                                                                                                                                                                                                              |                      | N/A     |
|                | - each output circuit and all other output circuits connected together $\geq 2 \text{ M}\Omega$                                                                                                                                                                                                                                                                                                                                                            |                      | N/A     |
|                | - hazardous live parts and metal parts with basic insulation (Class II transformers) $\geq 2 \text{ M}\Omega$                                                                                                                                                                                                                                                                                                                                              |                      | N/A     |
|                | - conductive parts of class II transformers which are separated from hazardous-live parts by basic insulation only, and the body $\geq 5 \text{ M}\Omega$                                                                                                                                                                                                                                                                                                  |                      | N/A     |
|                | - metal foil in contact with inner and outer surfaces of insulating enclosures $\geq 7 \text{ M}\Omega$                                                                                                                                                                                                                                                                                                                                                    | (see appended table) | P       |
| 18.3           | Electric strength test (1 min): no flashover or break-down:                                                                                                                                                                                                                                                                                                                                                                                                |                      | 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) .....                                                                                                                                                                                                                                                                                                                                                                                           | (see appended table) | P       |
|                | 3) supplementary insulation; working voltage (V); test voltage (V) .....                                                                                                                                                                                                                                                                                                                                                                                   | (see appended table) | P       |
|                | 4) double or reinforced insulation.....                                                                                                                                                                                                                                                                                                                                                                                                                    | (see appended table) | P       |
|                | 5) Functional insulation for windings intended to be connected in series or parallel (test voltage = working voltage + 500 V)                                                                                                                                                                                                                                                                                                                              |                      | N/A     |
| 18.3.1         | A partial discharge test according to IEC 60664-1, (see test description below) shall be performed, if FIW wires or TIW wires are used and if the recurring peak working voltage $U_t$ across the insulation is greater than 750 V. The relevant recurring peak voltage is the maximum measured voltage between the input and the output circuit, if the secondary side is earthed. The measuring shall be done at 1,0 of the maximum rated input voltage. |                      | N/A     |
| 18.3.1.101     | For transformers incorporated in an SMPS in accordance with Annex BB, a partial discharge type test in accordance with Annex AA shall be performed                                                                                                                                                                                                                                                                                                         |                      | N/A     |
| 18.4           | Does not apply (IEC 61558-2-16:2021)                                                                                                                                                                                                                                                                                                                                                                                                                       |                      | N/A     |
| 18.101         | SMPS shall fulfil the impulse dielectric test in accordance with Annex R of IEC 61558-1:2017                                                                                                                                                                                                                                                                                                                                                               |                      | P       |
|                | After the test of 18.3, the SMPS shall be connected to the impulse test equipment. The impulse dielectric test shall be carried out in accordance with Annex R of IEC 61558-1:2017 between the input and output terminals of the SMPS. The interval between the impulses shall be at least 1 s if the impulses are produced inside the SMPS.                                                                                                               |                      | P       |

| IEC 61558-2-16 |                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                        |          |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Clause         | Requirement + Test                                                                                                                                                                                                                                                                                                                           | Result - Remark                                                                                                                                                                                                                                                                                        | Verdict  |
|                | During the test, there shall be no breakdown of the insulation between turns of a winding, between input and output circuits, between adjacent input or output circuits, or between the windings and any conductive core                                                                                                                     |                                                                                                                                                                                                                                                                                                        | P        |
| <b>18.5</b>    | <b>Touch current and protective earthing conductor current</b>                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                        | <b>P</b> |
| 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.<br>The measured values are less than the required values of table 15.                                                                                                                                                             |                                                                                                                                                                                                                                                                                                        | P        |
|                | switches n and e in on position                                                                                                                                                                                                                                                                                                              | Normal:<br>Output terminal: 0.165mA<br>r.m.s.<br>Enclosure with foil: 0.005 mA<br>r.m.s.<br>CY2 short circuit:<br>Output terminal: 0.246mA<br>r.m.s.<br>Enclosure with foil: 0.005 mA<br>r.m.s.<br>CY4 short circuit:<br>Output terminal: 0.246mA<br>r.m.s.<br>Enclosure with foil: 0.005 mA<br>r.m.s. | P        |
|                | switch n: off and switch e: on                                                                                                                                                                                                                                                                                                               | Normal:<br>Output terminal:0.266mA<br>r.m.s.<br>Enclosure with foil:0.005 mA<br>r.m.s.<br>CY2 short circuit:<br>Output terminal: 0.410mA<br>r.m.s.<br>Enclosure with foil: 0.005 mA<br>r.m.s.<br>CY4 short circuit:<br>Output terminal: 0.410mA<br>r.m.s.<br>Enclosure with foil: 0.005 mA<br>r.m.s.   | P        |

| IEC 61558-2-16 |                                                                                                                                                                                                                        |                 |          |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------|
| Clause         | Requirement + Test                                                                                                                                                                                                     | Result - Remark | Verdict  |
|                | switch n: on and switch e: off                                                                                                                                                                                         |                 | P        |
| 18.5.3         | Protective earthing conductor current                                                                                                                                                                                  |                 | P        |
|                | The transformer is connected as in clause 14<br>Impedance of the ammeter < 0,5 ohm, connected between earthing terminal of the transformer and protective earthing conductor                                           |                 | P        |
|                | The measured values are less than the required values of table 15.                                                                                                                                                     |                 | P        |
| <b>19</b>      | <b>CONSTRUCTION</b>                                                                                                                                                                                                    |                 | <b>P</b> |
| 19.1           | General construction                                                                                                                                                                                                   |                 | P        |
| 19.1.1         | General                                                                                                                                                                                                                |                 | P        |
| 19.1.2         | Auto-transformers                                                                                                                                                                                                      |                 | N/A      |
| 19.1.2.1       | Plug connected auto-transformers where the rated input voltage is higher than the rated output voltage, shall not have any potential to protective earthing at the output socket higher than the rated output voltage. |                 | N/A      |
| 19.1.2.2       | Polarised input and output plug and socket-outlet system: an instruction shall be given for not using such a transformer with a nonpolarized plug and socket-outlet system.                                            |                 | N/A      |
| 19.1.2.3       | A polarity detecting device only energises the output in the case: output potential to earth $\leq$ rated output voltage, also with reversed input plug.                                                               |                 | N/A      |
|                | - The contact separation of the device is $\geq$ 3mm                                                                                                                                                                   |                 | N/A      |
|                | - A current to earth does not exceed 0,75 mA.                                                                                                                                                                          |                 | N/A      |
|                | - All tests are repeated under fault conditions of H.3.3. The potential to earth does not exceed 1,1 times the max output voltage for more than 5 s.                                                                   |                 | N/A      |
|                | - for class I transformers, the insulation between the input / output winding and the body shall consist of at least basic insulation (rated for the working voltage)                                                  |                 | N/A      |
|                | - for class II transformers, the insulation between the input / output winding and the body shall consist of double or reinforced insulation (rated for the working voltage).                                          |                 | N/A      |
| 19.1.3         | Separating transformers                                                                                                                                                                                                |                 | N/A      |
| 19.1.3.1       | Input and output circuits electrically separated.                                                                                                                                                                      |                 | N/A      |
| 19.1.3.2       | The insulation between input and output winding(s) consist of basic insulation                                                                                                                                         |                 | N/A      |
|                | Class I transformer                                                                                                                                                                                                    |                 | N/A      |

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

| IEC 61558-2-16 |                                                                                                                                                                                                                                                                                                                     |                 |         |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause         | Requirement + Test                                                                                                                                                                                                                                                                                                  | Result - Remark | Verdict |
|                | Class I transformers intended for connection to the mains by a plug:                                                                                                                                                                                                                                                |                 | N/A     |
|                | - Insulation between input windings and body connected to earth consist of basic insulation (rated to the working voltage)                                                                                                                                                                                          |                 | N/A     |
|                | - Insulation between output windings and body, connected to earth consist of supplementary insulation (rated for the working voltage)                                                                                                                                                                               |                 | N/A     |
|                | Class II transformers                                                                                                                                                                                                                                                                                               |                 | P       |
|                | - Insulation between input windings and body consist of double or reinforced insulation (rated for the input voltage)                                                                                                                                                                                               |                 | P       |
|                | - Insulation between output windings and body consist of double or reinforced insulation (rated for the output voltage)                                                                                                                                                                                             |                 | P       |
| 19.1.4.3       | For transformers with intermediate conductive parts not connected to the body (between input/output):                                                                                                                                                                                                               |                 | N/A     |
| 19.1.4.3.1     | For class I and class II transformers the insulation between input and output windings, via intermediate conductive parts, consist of double or reinforced insulation (rated for the working voltage)                                                                                                               |                 | 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 for the input voltage and output voltage), for SELV circuits only basic insulation is required. |                 | P       |
|                | - For transformers, different from independent, the insulation between input and output windings, via intermediate conductive parts, consist of double or reinforced insulation (rated for the working voltage)                                                                                                     |                 | N/A     |
| 19.1.4.3.2     | Class I transformers with earthed core, and not allowed for class II equipment                                                                                                                                                                                                                                      |                 | N/A     |
|                | - Insulation between the input winding and the earthed core: basic insulation rated for the input voltage                                                                                                                                                                                                           |                 | N/A     |
|                | - Insulation between the output winding and the earthed core: basic insulation rated for the output voltage                                                                                                                                                                                                         |                 | N/A     |
| 19.1.4.3.3     | Insulation between: input and intermediate conductive parts, and output and intermediate parts consist of at least basic insulation                                                                                                                                                                                 |                 | P       |

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

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|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|---------|
| Clause         | Requirement + Test                                                                                                                                                                                                    | Result - Remark                                               | Verdict |
| 19.2           | Flammability of materials                                                                                                                                                                                             |                                                               | P       |
|                | Materials known to be highly flammable, such as celluloid, shall not be used in the construction of transformers.                                                                                                     | No used such material                                         | N/A     |
|                | Cotton, silk, paper and similar fibrous material shall not be used as insulation, unless impregnated.                                                                                                                 | No used such material                                         | N/A     |
|                | Wax and similar impregnators shall not be used, unless suitably restrained from migration                                                                                                                             | No used such material                                         | N/A     |
|                | Wood, even if impregnated, shall not be used as supplementary or reinforced insulation                                                                                                                                | No used such material                                         | N/A     |
| 19.3           | Short-circuit characteristics of portable transformers                                                                                                                                                                |                                                               | P       |
|                | Portable transformer: short-circuit proof or fail-safe                                                                                                                                                                |                                                               | P       |
| 19.4           | Class II transformer contact prevention of accessible conductive parts                                                                                                                                                |                                                               | P       |
|                | There shall be provisions to prevent contact between accessible conductive parts and conduits or metal sheaths of supply wiring for class II transformers.                                                            |                                                               | P       |
| 19.5           | Class II transformer insulation reassembling after service                                                                                                                                                            |                                                               | P       |
|                | Parts of class II transformers serving as supplementary insulation or reinforced insulation which might be omitted during reassembly after servicing, shall either:                                                   | Enclosure fixed by ultra-sonic welding, not routine servicing | P       |
|                | - be fixed in such a way that they cannot be removed without being seriously damaged; or                                                                                                                              |                                                               | P       |
|                | - be so designed that they cannot be replaced in an incorrect position and that, if they are omitted, the <b>transformer</b> is rendered inoperable or is manifestly incomplete                                       |                                                               | N/A     |
|                | Sleeving may, however, be used as <b>supplementary insulation</b> on internal wiring, if it is retained in position by positive means.                                                                                |                                                               | N/A     |
| 19.6           | Loosening of wires, screws or similar parts                                                                                                                                                                           |                                                               | N/A     |
|                | Class I and II transformers: creepage distances and clearances over supplementary or reinforced insulation if wire, screw, nut, etc. become loose or fall out of position not less than 50% specified values (Cl. 26) |                                                               | N/A     |
| 19.7           | Resistor or capacitor connection with accessible conductive parts                                                                                                                                                     |                                                               | P       |
|                | 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           | Bridging of separated conductive parts by resistors or capacitors                                                                                                                                                     |                                                               | P       |
|                | Resistors or capacitors connected between hazardous live parts and the body (accessible metal parts) consist of:                                                                                                      |                                                               | P       |

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|----------------|------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause         | Requirement + Test                                                                                                                 | Result - Remark | Verdict |
|                | - components according to IEC 60 065, 14.2 or capacitor Y2 according to IEC 60 384-14                                              |                 | P       |
|                | - at least two separate components                                                                                                 |                 | P       |
|                | - if one component is short-circuited or opened, values specified in Cl. 9 shall not be exceeded                                   |                 | P       |
|                | - if the working voltage is $\leq 250$ 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           | Insulating material separating input and output windings                                                                           |                 | N/A     |
|                | Insulation material input/output and supplementary insulation of rubber resistant to ageing                                        |                 | N/A     |
|                | Creepage distances (if cracks) > specified values (Cl. 26)                                                                         |                 | N/A     |
| 19.10          | Accidental contact protection against hazardous-live-parts provided by isolating coating                                           |                 | N/A     |
|                | Protection against accidental contact by insulating coating:                                                                       |                 | N/A     |
|                | a) ageing test (IEC 60068-2-14), test Na: 168 h; $70 \pm 2^\circ\text{C}$                                                          |                 | N/A     |
|                | b) impact test (spring-operated impact hammer according to IEC 60 068-2-75; $0,5 \pm 0,05$ J)                                      |                 | N/A     |
|                | c) scratch test (hardened steel pin) electric strength test according to Cl. 18.3                                                  |                 | N/A     |
| 19.11          | Insulating material of handles, operating levers, knobs and similar parts                                                          |                 | N/A     |
|                | Handles, levers, knobs, etc.:                                                                                                      |                 | N/A     |
|                | - insulating material                                                                                                              |                 | N/A     |
|                | - supplementary insulation covering                                                                                                |                 | N/A     |
|                | - separated from shafts or fixing by supplementary insulation                                                                      |                 | N/A     |
| 19.12          | Winding construction                                                                                                               |                 | P       |
| 19.12.1        | Undue displacement in all types of transformers not allowed:                                                                       |                 | P       |
|                | - of input or output windings or turns thereof                                                                                     |                 | P       |
|                | - of internal wiring or wires for external connection                                                                              |                 | P       |
|                | - of parts of windings or of internal wiring in case of rupture or loosening                                                       |                 | P       |
| 19.12.2        | Serrated tape:                                                                                                                     |                 | N/A     |

| IEC 61558-2-16 |                                                                                                                                                     |                 |         |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause         | Requirement + Test                                                                                                                                  | Result - Remark | Verdict |
|                | - 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 winding wires, in an insulation system providing basic, supplementary or reinforced insulation, shall meet the following requirements.    |                 | P       |
|                | • Multi-layer extruded or spirally wrapped insulation, passed the tests of annex K                                                                  |                 | N/A     |
|                | • Basic insulation: two wrapped or one extruded wire                                                                                                |                 | N/A     |
|                | • Supplementary insulation: two layers, wrapped or extruded                                                                                         |                 | N/A     |
|                | • Reinforced insulation: three layers wrapped or extruded                                                                                           |                 | P       |
|                | Spirally wrapped insulation:                                                                                                                        |                 | N/A     |
|                | • creepage distances between wrapped layers > cl. 26 _ P1 values                                                                                    |                 | N/A     |
|                | • path between wrapped layers sealed, the test voltage of K2 is multiplied with 1,35                                                                |                 | N/A     |
|                | • test 26.2.4 – Test A, passed for wrapped layers                                                                                                   |                 | N/A     |
|                | • the finished component pass routine test for the electric strength test according to cl. 18.3                                                     |                 | N/A     |
| a)             | Insulated winding wire used for basic or supplementary insulation in a wound part:                                                                  |                 | N/A     |
|                | • comply with annex K                                                                                                                               |                 | N/A     |
|                | • two layers for supplementary insulation                                                                                                           |                 | N/A     |
|                | • one layer for basic insulation                                                                                                                    |                 | N/A     |
|                | • one layer for mechanical separation between the insulated wires of primary and secondary. This layer fulfils the requirement of basic insulation. |                 | N/A     |
| b)             | Insulated winding wire used for reinforced insulation in a wound part:                                                                              |                 | P       |
|                | • comply with annex K                                                                                                                               |                 | P       |
|                | • three layers                                                                                                                                      |                 | P       |
|                | • relevant dielectric strength test of 18.3                                                                                                         |                 | P       |

| IEC 61558-2-16 |                                                                                                                                                                                                                                                                                                                                                   |                                     |         |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|---------|
| Clause         | Requirement + Test                                                                                                                                                                                                                                                                                                                                | Result - Remark                     | Verdict |
|                | Where the insulated winding wire is wound:                                                                                                                                                                                                                                                                                                        |                                     | P       |
|                | • upon metal or ferrite cores                                                                                                                                                                                                                                                                                                                     |                                     | P       |
|                | • 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 is fulfilled                                                                                                                                                                                                                                                                                                       | Approved triple insulated wire used | N/A     |
|                | 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     |

| IEC 61558-2-16 |                                                                                                                                                                                                                                                                                                                                    |                 |         |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause         | Requirement + Test                                                                                                                                                                                                                                                                                                                 | Result - Remark | Verdict |
|                | 2) The primary winding consists of FIW wire for reinforced insulation and the secondary winding consist of FIW wire – of basic insulation. These independent windings shall not be able to contact each other either by mechanical separation or a gap which fulfil the dielectric strength test for basic insulation.             |                 | N/A     |
|                | 3) For polyfilar windings (primary and secondary windings in contact with each other), the primary winding and the secondary winding consist of FIW wire for reinforced insulation. This construction also is allowed to use for EE-core or similar.                                                                               |                 | N/A     |
| e)             | Toroidal cores used with TIW in combination with FIW wire, for double or reinforced insulation between the primary and secondary circuits shall comply with the following:                                                                                                                                                         |                 | N/A     |
|                | 1) a coating, which fulfils the requirements of basic insulation.                                                                                                                                                                                                                                                                  |                 | N/A     |
|                | 2) The primary winding consists of FIW wire for reinforced insulation, and the secondary winding consists of TIW wire for basic insulation (1 layer). These independent windings shall not be able to contact each other either by mechanical separation or a gap which fulfil the dielectric strength tests for basic insulation. |                 | N/A     |
|                | 3) For polyfilar windings (primary and secondary windings in contact with each other), the primary winding consists of TIW wire for reinforced insulation (3 layer) and the secondary winding consists of FIW wire for reinforced insulation. This construction also is allowed for use with EE-cores or similar.                  |                 | N/A     |
| f)             | Toroidal cores used with TIW in combination with FIW wire, for basic insulation between the primary and secondary circuits shall comply with the following:                                                                                                                                                                        |                 | N/A     |
|                | 1) a coating, which fulfils the requirements of basic insulation                                                                                                                                                                                                                                                                   |                 | N/A     |
|                | 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     |

| IEC 61558-2-16 |                                                                                                                                                                                                                                                                                                                                                                    |                 |         |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause         | Requirement + Test                                                                                                                                                                                                                                                                                                                                                 | Result - Remark | Verdict |
|                | 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:<br>4.1) Primary winding consists of enamelled wire, secondary winding consists of FIW wire for reinforced insulation<br>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     |
|                | <ul style="list-style-type: none"> <li>other nominal diameter as mentioned in table 24 can be calculated with the Formula (6) in 26.3.5:</li> </ul>                                                                                                                                                                                                                |                 | N/A     |
|                | FIW wire used for basic or supplementary insulation for transformers according 19.1.3:                                                                                                                                                                                                                                                                             |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>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</li> </ul>                                                                                                                                                               |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>one layer for mechanical separation is located between the insulated wires of primary and secondary. This layer fulfil the requirement of basic insulation</li> </ul>                                                                                                                                                       |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>between FIW and enamelled wire, no requirements of creepage distances and clearances</li> </ul>                                                                                                                                                                                                                             |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>no touch of FIW and enamelled wires</li> </ul>                                                                                                                                                                                                                                                                              |                 | N/A     |
|                | FIW wire used for double or reinforced insulation for transformers according 19.1.4:                                                                                                                                                                                                                                                                               |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>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</li> </ul>                                                                                                                                                               |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>for primary and secondary winding FIW-wire for basic insulation is used</li> </ul>                                                                                                                                                                                                                                          |                 | N/A     |

| IEC 61558-2-16 |                                                                                                                                                                                                                            |                 |         |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause         | Requirement + Test                                                                                                                                                                                                         | Result - Remark | Verdict |
|                | <ul style="list-style-type: none"> <li>one layer for mechanical separation is located between the insulated wires of primary and secondary. This layer fulfil the requirement of basic insulation</li> </ul>               |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>no touch between the basic insulated PRI and SEC FIW-wires</li> </ul>                                                                                                               |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>between PRI- and SEC-FIW wires, no requirements of creepage distances and clearances</li> </ul>                                                                                     |                 | N/A     |
|                | Alternative construction used for reinforced insulation (reinforced insulated FIW wire and enamelled wire)                                                                                                                 |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>the test voltage of table 14, based on the working voltage reinforced insulation, comply with the min. voltage strength of table 24</li> </ul>                                      |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>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</li> </ul>   |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>no touch between the FIW wire and the enamelled wire</li> </ul>                                                                                                                     |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>between the reinforced FIW wire and any other parts, no requirements of creepage distances and clearances exist</li> </ul>                                                          |                 | N/A     |
|                | Alternative construction with FIW wires, basic or supplementary insulated for transformers with double or reinforced insulation:                                                                                           |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>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</li> </ul>                       |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>PRI or SEC basic insulated FIW wire and to the other winding (enamelled wire) requirements of supplementary insulation</li> </ul>                                                   |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>creepage distances and clearances between the basic insulated FIW wire and the enamelled wire for basic or supplementary insulation are required.</li> </ul>                        |                 | N/A     |
|                | Where the FIW wire is wound                                                                                                                                                                                                |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>upon metal or ferrite cores</li> </ul>                                                                                                                                              |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>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.</li> </ul> |                 | N/A     |

| IEC 61558-2-16 |                                                                                                                                                                                                      |                 |         |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause         | Requirement + Test                                                                                                                                                                                   | Result - Remark | Verdict |
|                | <ul style="list-style-type: none"> <li>both windings shall not touch each other and also not the core.</li> </ul>                                                                                    |                 | N/A     |
| 19.13          | Fixing of handles, operating levers and similar parts                                                                                                                                                |                 | N/A     |
|                | Handles, operating levers and similar parts shall be fixed in a reliable manner so that they will not become loose as a result of heating, vibration, etc. which may occur in normal use.            |                 | N/A     |
| 19.14          | Fixing of covers providing protection against electric shock                                                                                                                                         |                 | P       |
|                | Protection against electric shock: covers securely fixed, 2 independent fixing means, one with tool                                                                                                  |                 | P       |
| 19.15          | Strain on fixed socket-outlets caused by pin-transformers connection                                                                                                                                 |                 | N/A     |
|                | Transformer with pins for fixed socket-outlets: no strain on socket-outlet                                                                                                                           |                 | N/A     |
|                | Additional torque $\leq 0,25$ Nm                                                                                                                                                                     |                 | N/A     |
| 19.16          | Portable transformers for use in irregular or harsh conditions                                                                                                                                       |                 | N/A     |
|                | Portable transformers for use in irregular or harsh conditions                                                                                                                                       |                 | N/A     |
|                | Portable transformers having a weight not exceeding 18 kg shall have a protection index IPX4 or higher.                                                                                              |                 | N/A     |
| 19.17          | Drain hole of transformers protected against ingress of water                                                                                                                                        |                 | N/A     |
|                | Transformers having a protection index from IPX1 up to and including IPX6 shall have an effective drain hole at least 5 mm in diameter or 20 mm <sup>2</sup> in area, with a width of at least 3 mm. |                 | N/A     |
|                | The drain hole is not required if the transformer, including its windings and core and all uninsulated live parts, are completely embedded in a potting material.                                    |                 | N/A     |
| 19.18          | Plug connected transformers protected against ingress of water                                                                                                                                       |                 | N/A     |
|                | Transformers classified for a protection index higher than IPX1 and having a cord provided with a plug; it shall be a moulded-on plug.                                                               |                 | N/A     |
| 19.19          | Flexible cable or flexible cord connection for class I portable transformers                                                                                                                         |                 | N/A     |
|                | Class I transformers with a non-detachable flexible cable or cord with earth conductor and a plug with earth contact                                                                                 |                 | N/A     |
| 19.20          | SELV- and PELV-circuit separation of live parts                                                                                                                                                      |                 | P       |
|                | Live parts of SELV- and PELV-circuits shall be electrically separated from each other and from other circuits                                                                                        |                 | P       |
|                | - SELV output circuits separated by double or reinforced insulation from all other than SELV or PELV circuits                                                                                        |                 | P       |

| IEC 61558-2-16 |                                                                                                                                                                                                                                                                                                    |                 |          |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------|
| Clause         | Requirement + Test                                                                                                                                                                                                                                                                                 | Result - Remark | Verdict  |
|                | - SELV output circuits separated by basic insulation from other SELV or PELV circuits                                                                                                                                                                                                              |                 | N/A      |
| 19.20.1        | SELV circuits and parts not connected to protective earth, to live parts, or protective conductors forming part of other circuits                                                                                                                                                                  |                 | P        |
|                | Nominal voltage (V) > 25 V a.c. or 60 V d.c., the required insulation fulfils the high voltage test according to table 14                                                                                                                                                                          |                 | N/A      |
| 19.20.2        | PELV-circuits double or reinforced insulation is necessary                                                                                                                                                                                                                                         |                 | N/A      |
| 19.21          | Protection against contact for FELV-circuit                                                                                                                                                                                                                                                        |                 | N/A      |
|                | FELV-circuits: protection against contact fulfils the min. test voltage required for the primary circuit                                                                                                                                                                                           |                 | N/A      |
| 19.22          | Protective earthing regarding class II transformers                                                                                                                                                                                                                                                |                 | N/A      |
|                | Class II transformers shall not be provided with means for protective earth                                                                                                                                                                                                                        |                 | N/A      |
|                | A class II transformer intended for looping-in may have an internal terminal for maintaining the electrical continuity of a protective earthing conductor not terminating in the transformer, provided that the terminal is insulated from the accessible conductive parts by class II insulation. |                 | N/A      |
| 19.23          | Protective earthing regarding class III transformers                                                                                                                                                                                                                                               |                 | N/A      |
|                | Class III transformers shall not be provided with means for protective earth                                                                                                                                                                                                                       |                 | N/A      |
| <b>20</b>      | <b>COMPONENTS</b>                                                                                                                                                                                                                                                                                  |                 | <b>P</b> |
| 20.1           | Components such as switches, plugs, fuses, lamp holders, capacitor and flexible cables and cords, comply with relevant IEC standard                                                                                                                                                                |                 | P        |
|                | Components inside the transformer pass all tests of this standard together with the transformer tests                                                                                                                                                                                              |                 | P        |
|                | Testing of components separately to the transformer according the relevant standard:                                                                                                                                                                                                               |                 | P        |
|                | - Ratings of the component in line with the transformer ratings, including inrush current. Component test according the component standard, based on the component marking (rating).                                                                                                               |                 | P        |
|                | - Components without markings tested under transformer conditions including inrush current.                                                                                                                                                                                                        |                 | P        |
|                | - If no IEC standard exists, the component is tested under transformer conditions.                                                                                                                                                                                                                 |                 | P        |
| 20.2           | Appliance couplers for main supply shall comply with:                                                                                                                                                                                                                                              |                 | N/A      |

| IEC 61558-2-16 |                                                                                                                                                                                                    |                                                                  |         |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|---------|
| Clause         | Requirement + Test                                                                                                                                                                                 | Result - Remark                                                  | Verdict |
|                | - IEC 60 320 for IPX0                                                                                                                                                                              |                                                                  | N/A     |
|                | - IEC 60320-2-3 or IEC 60309 for other                                                                                                                                                             |                                                                  | N/A     |
| 20.3           | Automatic controls shall comply with IEC 60730-1                                                                                                                                                   |                                                                  | N/A     |
| 20.4           | Thermal-links comply with IEC 60691                                                                                                                                                                |                                                                  | N/A     |
| 20.5           | Switches shall comply with annex F                                                                                                                                                                 |                                                                  | N/A     |
|                | Disconnection from the supply:                                                                                                                                                                     |                                                                  | N/A     |
|                | - by a switch, disconnecting all poles of the supply (full disconnection under the relevant overvoltage category)                                                                                  |                                                                  | N/A     |
|                | - or a flexible supply cable and cord with plug                                                                                                                                                    |                                                                  | N/A     |
|                | - or an instruction sheet: disconnection by all-poles switches incorporated in fixed wiring                                                                                                        |                                                                  | N/A     |
| 20.6           | Socket-outlets of the output circuit shall be such that there is no unsafe compatibility to plugs complying with input circuit.                                                                    | No standard output plug or socket-outlets for output connections | P       |
|                | SELV plug and socket-outlets shall comply with IEC 60 884-2-4 and IEC 60 906-3                                                                                                                     |                                                                  | N/A     |
|                | Plugs and socket-outlets for SELV systems with both a rated current $\leq 3A$ and a rated voltage $\leq 24$ VAC or 60VDC with a power not exceeding 72W are allowed to comply only with following: |                                                                  | N/A     |
|                | - It is not possible for plugs to enter socket-outlets of other standardised voltage system                                                                                                        |                                                                  | N/A     |
|                | - Socket outlets do not accommodate plugs of other standardised voltage systems                                                                                                                    |                                                                  | N/A     |
|                | - Socket outlets do not have a protective earth contact                                                                                                                                            |                                                                  | N/A     |
|                | PELV plug and socket-outlets shall comply with following:                                                                                                                                          |                                                                  | N/A     |
|                | - It is not possible for plugs to enter socket-outlets of other standardised voltage system                                                                                                        |                                                                  | N/A     |
|                | - Socket outlets do not accommodate plugs of other standardised voltage systems                                                                                                                    |                                                                  | N/A     |
|                | - Socket outlets do not have a protective earth contact                                                                                                                                            |                                                                  | N/A     |
|                | FELV plug and socket-outlets shall comply with following:                                                                                                                                          |                                                                  | N/A     |
|                | - It is not possible for plugs to enter socket-outlets of other standardised voltage system                                                                                                        |                                                                  | N/A     |
|                | - Socket outlets do not accommodate plugs of other standardised voltage systems                                                                                                                    |                                                                  | N/A     |

| IEC 61558-2-16 |                                                                                                                                                      |                                |         |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|---------|
| Clause         | Requirement + Test                                                                                                                                   | Result - Remark                | Verdict |
| 20.7           | Thermal cut-outs, thermal links, overload relays, fuses and other overload protective devices shall have adequate breaking capacity                  |                                | 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       |
|                | For fuses according IEC 60127 and IEC 60269, the fuse current does not exceed 1,1 times of the rated value                                           | Fuses According IEC 60127 used | 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 reset have a trip free mechanism (type 1.E and 2.E) (see IEC 60730-1:2013)                                           |                                | N/A     |
|                | d) The number of cycles of automatic action shall be:                                                                                                |                                | N/A     |
|                | - 3000 cycles for self-resetting thermal cut-outs                                                                                                    |                                | N/A     |
|                | - 300 cycles for non-self-resetting thermal cut-outs resetting by hand                                                                               |                                | N/A     |
|                | - 300 cycles for non-self-resetting thermal cut-outs resetting disconnecting                                                                         |                                | N/A     |
|                | - 30 cycles for non-self-resetting thermal cut-outs which are only resettable by a tool                                                              |                                | N/A     |
|                | e) Thermal cut outs fulfil the electrical stress according 6.14.2 of IEC 60730-1:2013                                                                |                                | N/A     |
|                | f) Characteristic of thermal cut-outs:                                                                                                               |                                | N/A     |
|                | - ratings according IEC 60730-1:2013, cl. 5                                                                                                          |                                | N/A     |
|                | - classification according to:                                                                                                                       |                                | N/A     |
|                | 1) nature of supply to IEC 60730-1:2013, cl. 6.1                                                                                                     |                                | N/A     |

| IEC 61558-2-16 |                                                                                                                                                                                                                                                      |                 |         |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause         | Requirement + Test                                                                                                                                                                                                                                   | Result - Remark | Verdict |
|                | 2) type of load controlled to IEC 60730-1:2013, cl. 6.2                                                                                                                                                                                              |                 | N/A     |
|                | 3) degree of protection IPX0 to IEC 60730-1:2013, cl. 6.5.1                                                                                                                                                                                          |                 | N/A     |
|                | 4) degree of protection IP0X to IEC 60730-1:2013, cl. 6.5.2                                                                                                                                                                                          |                 | N/A     |
|                | 5) pollution degree to IEC 60730-1:2013, cl. 6.5.3                                                                                                                                                                                                   |                 | N/A     |
|                | 6) comparative tracking index to IEC 60730-1:2013, cl. 6.13                                                                                                                                                                                          |                 | N/A     |
|                | 7) max. ambient temperature to IEC 60730-1:2013, cl. 6.7                                                                                                                                                                                             |                 | N/A     |
| 20.8.1.2       | Thermal cut-out tested as a part of the transformer, test with 3 samples:                                                                                                                                                                            |                 | N/A     |
|                | - at least micro-interruption or micro-disconnection (IEC 60730-1:2013)                                                                                                                                                                              |                 | N/A     |
|                | - 300 h aged at $t_a$ (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                                                                                                                                                                                               |                 | N/A     |
| 20.8.2.1       | The output of the transformer with a non-self-resetting thermal cut out is short circuited at a supply voltage 1, 1 of rated supply voltage. After opening of the cut off, the supply voltage is switched of, until the transformer is cooling down. |                 | N/A     |
|                | - 3 cycles at 25° C for transformers without $t_{amin}$                                                                                                                                                                                              |                 | N/A     |
|                | - 3 cycles at $t_{amin}$ for transformers with $t_{amin}$                                                                                                                                                                                            |                 | N/A     |
|                | - after the 3 cycles short circuit of the output at 1,1 of rated supply voltage for 48 h.                                                                                                                                                            |                 | N/A     |
|                | During the tests no sustaining arcing shall occur<br>After the test: withstand the test of clause 18, show no damage in sense of this standard, and be operational.                                                                                  |                 | N/A     |
| 20.8.2.2       | The output of the transformer with a self-resetting thermal cut out is short circuited at a supply voltage 1, 1 of rated supply voltage.                                                                                                             |                 | N/A     |
|                | - 48 h at 25° C for transformers without $t_{amin}$                                                                                                                                                                                                  |                 | N/A     |
|                | - 24 h at $t_a$ and 24 h at $t_{amin}$ for transformers with $t_{amin}$                                                                                                                                                                              |                 | N/A     |

| IEC 61558-2-16 |                                                                                                                                                                     |                 |          |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------|
| Clause         | Requirement + Test                                                                                                                                                  | Result - Remark | Verdict  |
|                | During the tests no sustaining arcing shall occur<br>After the test: withstand the test of clause 18, show no damage in sense of this standard, and be operational. |                 | N/A      |
| 20.8.3         | Test of a PTC resistor:                                                                                                                                             |                 | N/A      |
|                | 5 cycles: transformer short-circuited for 48 h by 1,1 times of the input voltage and max. $t_a$                                                                     |                 | N/A      |
|                | 5 cycles: transformer short-circuited for 48 h by 0,9 times of the input voltage and min. $t_a$ (if declared)                                                       |                 | N/A      |
|                | After the test: withstand the test of clause 18, show no damage in sense of this standard, and be operational.                                                      |                 | N/A      |
| 20.9           | Thermal links shall be tested in one of the following two ways.                                                                                                     |                 | N/A      |
| 20.9.1         | Thermal-links shall comply with IEC 60 691 as a separate component.                                                                                                 |                 | N/A      |
|                | - electrical conditions to IEC 60691, cl. 6.1                                                                                                                       |                 | N/A      |
|                | - thermal conditions to IEC 60691, cl. 6.2                                                                                                                          |                 | N/A      |
|                | - ratings to 8 b) of IEC 60691:2015                                                                                                                                 |                 | N/A      |
|                | - suitability of sealing components, impregnating fluids or cleaning solvents 8 c) of IEC 60691:2015                                                                |                 | N/A      |
| 20.9.2         | Thermal-links tested as a part of the transformer:                                                                                                                  |                 | N/A      |
|                | - ageing test 300 h by 35 °C or $t_a + 10$ °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      |
| 20.11          | Thermal cut-outs intended to be reset by soldering operation shall not be used for overload protection.                                                             |                 | N/A      |
| 20.12          | Overload protection devices do not operate during test (20 times switched on and off, at no load);<br>Upri (V): 1,1 times rated supply voltage.                     |                 | N/A      |
| <b>21</b>      | <b>INTERNAL WIRING</b>                                                                                                                                              |                 | <b>P</b> |

| IEC 61558-2-16 |                                                                                                                                                |                                                                        |          |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|----------|
| Clause         | Requirement + Test                                                                                                                             | Result - Remark                                                        | Verdict  |
| 21.1           | Internal wiring and electrical connections protected or enclosed                                                                               | The internal and external wire were double fixed by soldering and glue | P        |
|                | Wire-ways smooth and free from sharp edges                                                                                                     |                                                                        | P        |
| 21.2           | Openings in sheet metal: edges rounded (radius $\geq 1,5$ mm) or bushings of insulating material                                               |                                                                        | N/A      |
| 21.3           | Uninsulated conductors: distances adequately maintained                                                                                        |                                                                        | N/A      |
| 21.4           | When external wires are connected to terminal, internal wiring shall not loosen up                                                             |                                                                        | 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      |
| <b>22</b>      | <b>SUPPLY CONNECTION AND EXTERNAL FLEXIBLE CABLES AND CORDS</b>                                                                                |                                                                        | <b>P</b> |
| 22.1           | All cables, flexible cords etc. shall have appropriate current and voltage ratings                                                             |                                                                        | 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:                                                                                         |                                                                        | P        |
|                | - not exceed 2 m for cross-sectional area of $0,5 \text{ mm}^2$                                                                                |                                                                        | P        |
|                | - exceed 2 m for cross-sectional areas greater than $0,5 \text{ mm}^2$ .                                                                       |                                                                        | N/A      |
| 22.5           | Power supply cords for transformers IP20 or higher and transformers for "indoor use only" $\geq$ IP20:                                         |                                                                        | P        |

| IEC 61558-2-16 |                                                                                                                                                                                               |                 |         |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause         | Requirement + Test                                                                                                                                                                            | Result - Remark | Verdict |
|                | - for transformers with a mass $\leq 3$ kg: IEC 60227-5:2011 – type 60227 IEC 52 or ordinary tough rubber sheathed flexible cable or cords according to IEC 60245-4:2011 – type 60245 IEC 53; |                 | P       |
|                | - for transformers with a mass $> 3$ kg: IEC 60227-5:2011 – type 60227 IEC 53 or ordinary tough rubber sheathed flexible cable or cords according to IEC 60245-4:2011 – type 60245 IEC 53.    |                 | N/A     |
|                | Power supply cords for transformers for outdoor use: $\geq$ IPX0: IEC 60245-4:2011 – type 60245 IEC 57                                                                                        |                 | N/A     |
| 22.6           | Power supply cords for single-phase portable transformers with input current $\leq 16$ A:                                                                                                     |                 | P       |
|                | - cord set fitted with an appliance coupler in accordance with IEC 60320(all parts)                                                                                                           |                 | N/A     |
| 22.7           | Nominal cross-sectional area (mm <sup>2</sup> ); input current (A) at rated output not less than shown in table 16                                                                            | See table 20    | P       |
| 22.8           | Class I transformer with power supply flexible cable: green/yellow core connected to earth terminal                                                                                           |                 | N/A     |
|                | Plug for single-phase transformer with input current at rated output $\leq 16$ A shall comply with IEC TR 60083, IEC 60 906-1 or IEC 60 309(all parts)                                        |                 | P       |
| 22.9           | Type X, Y or Z attachments: see relevant part of IEC 61558-2.                                                                                                                                 |                 | 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     |

| IEC 61558-2-16 |                                                                                                         |                 |         |
|----------------|---------------------------------------------------------------------------------------------------------|-----------------|---------|
| 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                                                                |                 | 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 strands 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     |

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|----------------|----------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause         | Requirement + Test                                                                                                                     | Result - Remark | Verdict |
|                | - suitable for different types of cable unless only one type of cable for transformer                                                  |                 | N/A     |
|                | - the entire flexible cable or cord with covering can be mounted into the cord anchorage                                               |                 | N/A     |
|                | - if tightened or loosened no damage                                                                                                   |                 | N/A     |
|                | - no contact between cable or cord and accessible or electrically connected clamping screws                                            |                 | N/A     |
|                | - cord clamped by metal screw not allowed                                                                                              |                 | N/A     |
|                | - one part securely fixed to transformer                                                                                               |                 | N/A     |
|                | - for Class I transformer: insulating material or insulated from metal parts                                                           |                 | N/A     |
|                | - for Class II transformers: insulating material or supplementary insulation from metal parts                                          |                 | N/A     |
|                | Cord anchorages for type X, Y, Z attachments: cores of power external flexible cable or cord insulated from accessible metal parts by: |                 | P       |
|                | - 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                       |                 | P       |
|                | 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                                                                                    |                 | 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       |

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|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------|
| Clause         | Requirement + Test                                                                                                                                                                              | Result - Remark | Verdict  |
|                | - 25 pulls of 1 s                                                                                                                                                                               |                 | P        |
|                | - 1 min torque according to table 17                                                                                                                                                            |                 | P        |
|                | - mass (kg); pull (N); torque (Nm) .....: 518.2g, 30N, 0.1Nm                                                                                                                                    |                 | P        |
|                | - during test: cable not damaged                                                                                                                                                                |                 | P        |
|                | - after test: longitudinal displacement $\leq 2$ mm for cable or cord and $\leq 1$ mm for conductors in terminals                                                                               |                 | P        |
|                | - creepage distances and clearances values specified in Cl. 26                                                                                                                                  |                 | P        |
| 22.9.6         | Space for external cords or cable for fixed wiring and for type X and Y attachments:                                                                                                            |                 | N/A      |
|                | - before fitting cover, possibility to check correct connection and position of conductors                                                                                                      |                 | N/A      |
|                | - cover fitted without damage to supply cords                                                                                                                                                   |                 | N/A      |
|                | - for portable transformers: contact with accessible metal parts if conductor becomes loose not allowed unless for type X and Y attachments terminations of cords do not slip free of conductor |                 | N/A      |
|                | Space for external cords or cable for type X attachment and for connection to fixed wiring, in addition:                                                                                        |                 | N/A      |
|                | - conductor easily introduced and connected                                                                                                                                                     |                 | N/A      |
|                | - possibility of access to terminal for external conductor after removal of covers without special purpose tool                                                                                 |                 | N/A      |
| <b>23</b>      | <b>TERMINALS FOR EXTERNAL CONDUCTORS</b>                                                                                                                                                        |                 | <b>P</b> |
| 23.1           | Transformer for connection to fixed wiring and transformer without power supply cords with type Y and Z attachments: only connections by screws, nuts or equally effective devices.             |                 | N/A      |
|                | Terminals are integral part of the transformer:                                                                                                                                                 |                 | N/A      |
|                | - comply with IEC 60 999-1 under transformer conditions                                                                                                                                         |                 | N/A      |
|                | Other terminals:                                                                                                                                                                                |                 | N/A      |
|                | - separately checked according to IEC 60 998-2-1, IEC 60 998-2-2 or IEC 60 947-7-1                                                                                                              |                 | N/A      |
|                | - used in accordance with their marking                                                                                                                                                         |                 | N/A      |
|                | - checked according to IEC 60 999-1 under transformer conditions                                                                                                                                |                 | N/A      |

| IEC 61558-2-16 |                                                                                                                                                                                                                                                                                                                                            |                 |         |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause         | Requirement + Test                                                                                                                                                                                                                                                                                                                         | Result - Remark | Verdict |
|                | 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                                                                                                                                                                                                                     |                 | P       |
|                | 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                                            |                 | P       |
| 23.2           | Terminals for type X with special cords Y and Z attachments shall be suitable for their purpose:                                                                                                                                                                                                                                           |                 | P       |
|                | - test by inspection according to 23.1 and 23.2                                                                                                                                                                                                                                                                                            |                 | P       |
|                | - pull of 5 N to the connection before test according to 14.1                                                                                                                                                                                                                                                                              |                 | P       |
| 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     |
| 23.7           | Transformer with type X attachments: stranded conductor test (8 mm removed):                                                                                                                                                                                                                                                               |                 | N/A     |

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|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause         | Requirement + Test                                                                                                                                                                                       | Result - Remark | Verdict |
|                | - 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     |
| <b>24</b>      | <b>PROVISION FOR PROTECTIVE EARTHING</b>                                                                                                                                                                 |                 | N/A     |
| 24.1           | Class I transformers: accessible conductive parts connected to earth terminal                                                                                                                            |                 | N/A     |
|                | Class II transformers: no provision for protective earth                                                                                                                                                 |                 | N/A     |
| 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 $\leq 0,1\Omega$ with a min. 25 A or 1,5 times rated input current at 1 min                                                              |                 | N/A     |
| 24.5           | Class I transformers with external flexible cables or cords:                                                                                                                                             |                 | N/A     |
|                | - current-carrying conductors becoming touch before the earth conductor                                                                                                                                  |                 | N/A     |

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|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------|
| Clause         | Requirement + Test                                                                                                                                                                                  | Result - Remark | Verdict    |
| <b>25</b>      | <b>SCREWS AND CONNECTIONS</b>                                                                                                                                                                       |                 | <b>N/A</b> |
| 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        |
|                | For a screw in engagement with the threads of insulating material: No damage after torque test: diameter (mm); torque (Nm); ten times                                                               |                 | N/A        |
|                | For nuts and other screws: No damage after torque test: diameter (mm); torque (Nm); five times                                                                                                      |                 | N/A        |
| 25.2           | Screws in engagement with thread of insulating material:                                                                                                                                            |                 | N/A        |
|                | - length of engagement $\geq 3 \text{ mm} + 1/3 \text{ screw diameter}$ 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      |
| <b>26</b>      | <b>CREEPAGE DISTANCES, CLEARANCES AND DISTANCES THROUGH INSULATION</b>                                              |                      | <b>P</b> |
| 26.2           | Creepage distances and clearances                                                                                   |                      | P        |
| 26.2.1         | General                                                                                                             |                      | P        |
|                | The creepage distance and clearance values are shown in Table 20 and Table 21.                                      |                      | P        |
| 26.2.2         | Windings covered with adhesive tape                                                                                 |                      | N/A      |
|                | - all insulating materials are classified according to IEC 60085 and IEC 60216 (all parts);                         |                      | N/A      |
|                | - the impulse voltage dielectric test of 6.1.2.2.1 of IEC 60664-1:2007 is fulfilled; and                            |                      | N/A      |
|                | - test A of 26.2.4 is fulfilled                                                                                     |                      | N/A      |
| 26.2.3         | Uncemented insulating parts pollution degree P2 or P3                                                               |                      | 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      |

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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     |
|                | Impulse dielectric test according to 6.1.2.2.1 of IEC 60664-1:2007 – see Annex R of IEC 61558-1                                                                                         |                      | N/A     |
| 26.2.5         | Enclosed parts (e.g. by impregnation or potting)                                                                                                                                        |                      | N/A     |
| 26.2.5.1       | - The requirements of reduced values as stated for pollution degree 1 (P1) are fulfilled                                                                                                |                      | N/A     |
|                | - all isolating materials are classified acc. to IEC 60085 and IEC 60216(all parts)                                                                                                     |                      | N/A     |
|                | Test B                                                                                                                                                                                  |                      | N/A     |
|                | - thermal class                                                                                                                                                                         |                      | N/A     |
|                | - test voltage of 500 V or the working voltage                                                                                                                                          |                      | N/A     |
|                | - Test with three specially specimens, potted or impregnated. The dielectric strength test is applied directly to the joint.                                                            | (see appended table) | N/A     |
|                | Two of the three specimens are subjected to:                                                                                                                                            |                      | N/A     |
|                | - the relevant humidity treatment according to 17.2 (48 h)                                                                                                                              |                      | N/A     |
|                | - the relevant dielectric strength test of 18.3 multiplied with factor 1,25                                                                                                             |                      | N/A     |
|                | - One of the three specimens is subjected to the relevant dielectric strength test of 18.3 multiplied by the factor 1,25 immediately at the end of the last cycle with high temperature |                      | N/A     |
|                | The three spacemen pass the Impulse dielectric test according to 6.1.2.2.1 of IEC 60664-1:2007– see Annex R of IEC 61558-1                                                              |                      | N/A     |
| 26.2.5.2       | - The requirements of distance through insulation (dti) are fulfilled. (P1 values are not required)                                                                                     |                      | N/A     |
|                | - 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     |

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|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------|
| Clause         | Requirement + Test                                                                                                                                                                      | Result - Remark                   | Verdict |
|                | - the relevant humidity treatment according to 17.2 (48 h)                                                                                                                              |                                   | N/A     |
|                | - the relevant dielectric strength test of 18.3 multiplied with factor 1,35                                                                                                             |                                   | N/A     |
|                | - One of the three specimens is subjected to the relevant dielectric strength test of 18.3 multiplied by the factor 1,35 immediately at the end of the last cycle with high temperature |                                   | N/A     |
|                | The three spacemen pass the Impulse dielectric test according to 6.1.2.2.1 of IEC 60664-1:2007 – see Annex R of IEC 61558-1                                                             |                                   | N/A     |
| 26.3           | Distance through insulation                                                                                                                                                             |                                   | P       |
| 26.3.1         | For supplementary, double or reinforced insulation, the required values of Tables 22 are fulfilled                                                                                      |                                   | P       |
|                | The insulation fulfil the material classification according IEC 60085 and 60216(all parts) or the test of 14.3                                                                          | 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 $150 \pm 10$ 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                                                                                                                                              |                                   | P       |

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|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause         | Requirement + Test                                                                                                                                                                             | Result - Remark | Verdict |
|                | <ul style="list-style-type: none"> <li>If serrated tape is used, 1 additional layer (serrated) and one additional layer without serration is required</li> </ul>                               |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>The mandrel test according 26.3.4 is fulfilled on each layer with <math>50 \pm 5</math> N</li> </ul>                                                    |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>The required values for d.t.i. of thin layers in Tale 22 is fulfilled.</li> </ul>                                                                       |                 | P       |
|                | - If the layers are separated (alternative):                                                                                                                                                   |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>The requirement of 3 layers is fulfilled</li> </ul>                                                                                                     |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>If serrated tape is used, 1 additional layer (serrated) and one additional layer without serration is required</li> </ul>                               |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>The mandrel test according 26.3.4 is fulfilled on 2/3 of the layers with <math>100 \pm 5</math> N</li> </ul>                                            |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>The required values for d.t.i. of thin layers in Tale 22 is fulfilled.</li> </ul>                                                                       |                 | N/A     |
|                | Test according to 14.3 and if the isolating materials are classified acc. to IEC 60085 and IEC 60216(all parts) no distances through insulation are required for insulation in thin sheet form |                 | N/A     |
|                | The values for thin layers are used for insulation in thin sheet form as follows:                                                                                                              |                 | P       |
|                | - rated output > 100 VA values for thin layers apply                                                                                                                                           |                 | N/A     |
|                | - rated output $\geq 25$ VA and $\leq 100$ VA 2/3 of the values for thin layers apply                                                                                                          |                 | N/A     |
|                | - rated output < 25 VA 1/3 of the values for thin layers apply                                                                                                                                 |                 | P       |
| 26.3.4         | Mandrel test of insulation in thin sheet form (specimen of $70 \pm 0,5$ mm width are necessary):                                                                                               |                 | N/A     |
|                | - If the layers are non-separable – at least 3 layers glued together fulfil the test:                                                                                                          |                 | N/A     |
|                | - pull force of $150 \pm 10$ N                                                                                                                                                                 |                 | N/A     |
|                | - high voltage test of 5,0 kV or the test voltage of 18.3 multiplied by 1,35 whatever is the greater. No flashover, no breakdown.                                                              |                 | N/A     |
|                | - If the layers are separable and 2/3 of at least 3 layers fulfil the test.                                                                                                                    |                 | N/A     |
|                | - pull force of $100 \pm 5$ 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 breakdowns.                                                             |                 | N/A     |

| IEC 61558-2-16 |                                                                                                                                                                                                                                                                                                                                                                                                                    |                      |         |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------|
| Clause         | Requirement + Test                                                                                                                                                                                                                                                                                                                                                                                                 | Result - Remark      | Verdict |
|                | - If the layers are separable 1 of at least 2 layers fulfil the test:                                                                                                                                                                                                                                                                                                                                              |                      | N/A     |
|                | - pull force of 50±5 N                                                                                                                                                                                                                                                                                                                                                                                             |                      | N/A     |
|                | - high voltage test of 5,0 kV or the test voltage of 18.3 multiplied by 1,25 whatever is the greater. No flashover, no breakdown.                                                                                                                                                                                                                                                                                  |                      | N/A     |
| 26.3.5         | For transformers with FIW wires                                                                                                                                                                                                                                                                                                                                                                                    |                      | N/A     |
|                | - thermal cycles                                                                                                                                                                                                                                                                                                                                                                                                   |                      | N/A     |
|                | - test voltage of 500 V or the working voltage                                                                                                                                                                                                                                                                                                                                                                     |                      | N/A     |
|                | - Test with three specimens                                                                                                                                                                                                                                                                                                                                                                                        | (see appended table) | N/A     |
|                | Two of the three specimens are subjected to:                                                                                                                                                                                                                                                                                                                                                                       |                      | N/A     |
|                | - the relevant humidity treatment according to 17.2 (48 h)                                                                                                                                                                                                                                                                                                                                                         |                      | N/A     |
|                | - the relevant dielectric strength test of 18.3                                                                                                                                                                                                                                                                                                                                                                    |                      | N/A     |
|                | - One of the three specimens is subjected to the relevant dielectric strength test of 18.3 immediately at the end of the last cycle with high temperature                                                                                                                                                                                                                                                          |                      | N/A     |
|                | The partial discharge test shall be done at the end of the cycling test at normal room temperature as performed in 18.3.1.                                                                                                                                                                                                                                                                                         |                      | N/A     |
|                | The values of allowed voltage strength for other FIW dimensions than defined in Table 24 are calculated                                                                                                                                                                                                                                                                                                            |                      | N/A     |
| 26.101         | Creepage distances and distances through insulation given in Table 21, Table 22 and Table 23 of IEC 61558-1:2017 are generally applicable (IEC 61558-2-16: 2021)                                                                                                                                                                                                                                                   | (see appended table) | P       |
| 26.102         | In compliance with IEC 60664-4:2005, the requirements of 26.103 to 26.106 for creepage distances, clearances and solid insulation are required above 30 kHz and up to the frequency of 3 MHz. For frequencies above 3 MHz, the tests in accordance with 7.4 and 7.5 of IEC 60664-4:2005, high-frequency testing (high-frequency high-voltage test and high-frequency partial discharge test) shall be carried out. |                      | P       |
| 26.103         | Clearance (IEC 61558-2-16:2021)                                                                                                                                                                                                                                                                                                                                                                                    |                      | P       |
|                | a) Clearance for frequency $\geq 30$ kHz according figure 101 two determinations are necessary:                                                                                                                                                                                                                                                                                                                    |                      | P       |
|                | • determination based on the rated impulse voltage of the rated supply voltage in accordance with Table 103 and Table 104.                                                                                                                                                                                                                                                                                         |                      | P       |
|                | • determination based on the measured peak working voltage in accordance with Table 106.                                                                                                                                                                                                                                                                                                                           |                      | P       |

| IEC 61558-2-16 |                                                                                                                                                                                                                |                 |         |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause         | Requirement + Test                                                                                                                                                                                             | Result - Remark | Verdict |
|                | b) Clearance for frequency $\leq 30$ kHz according figure 101 two determinations are necessary:                                                                                                                |                 | P       |
|                | <ul style="list-style-type: none"> <li>determination based on the rated impulse voltage of the rated supply voltage in accordance with Table 103 and Table 104.</li> </ul>                                     |                 | P       |
|                | <ul style="list-style-type: none"> <li>determination based on the measured peak working voltage in accordance with Table 105.</li> </ul>                                                                       |                 | P       |
| 26.104         | The working voltages of Table 105 and Table 106 for determination of clearances are peak working voltages. (IEC 61558-2-16: 2021)                                                                              |                 | P       |
|                | All peak working voltages including $\mu$ s-peaks shall be used to determine clearances in accordance with Table 105 and Table 106.                                                                            |                 | P       |
| 26.105         | Creepage distances (IEC 61558-2-16: 2021)                                                                                                                                                                      |                 | P       |
|                | Two determinations of creepage distances are necessary (see Figure 102)                                                                                                                                        |                 | P       |
|                | <ul style="list-style-type: none"> <li>determination based on the measured RMS working voltage in accordance with Table 21 of IEC 61558-1:2017;</li> </ul>                                                     |                 | P       |
|                | <ul style="list-style-type: none"> <li>determination based on the measured peak working voltage in accordance with Table 107 to Table 112 and the fundamental frequency shall be considered</li> </ul>         |                 | P       |
|                | A high-frequency RMS ripple voltage content not more than 10% can be neglected.                                                                                                                                |                 | P       |
|                | The values in Table 107 to Table 112 do not take into account the effects of tracking phenomena for frequencies above 30 kHz.                                                                                  |                 | P       |
|                | The most severe value of the required creepage distances in accordance with Table 107 to Table 112 for frequencies above 30 kHz and the relevant values in Table 21 of IEC 61558-1:2017 shall take precedence. |                 | P       |
|                | If the value of the creepage distance is lower than the value of the clearance, the value of the clearance shall be applicable for the creepage distance.                                                      |                 | P       |
|                | The peak working voltage also includes any DC voltage and any repetitive peak impulse generated by the SMPS (see 26.105). A determination based on RMS values is also required (see 26.104 and Table 112).     |                 | P       |
| 26.106         | Distance through insulation (IEC 61558-2-16:2021)                                                                                                                                                              |                 | N/A     |
|                | Instead of partial discharge with high frequency voltage the test of the distance and the calculation of the electric field is applicable under the following conditions:                                      |                 | N/A     |
|                | - the max. frequency is $< 10$ MHz                                                                                                                                                                             |                 | N/A     |

| IEC 61558-2-16 |                                                                                                                                                                                                                                                                          |                      |          |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------|
| Clause         | Requirement + Test                                                                                                                                                                                                                                                       | Result - Remark      | Verdict  |
|                | - 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 $d2 \leq 30$ $\mu$ m the peak value of the field strength is $\leq 10$ kV/mm                                                                                                                                                                             |                      | N/A      |
|                | For $d1 > d > d2$ formula (2) is used for calculation the field strength                                                                                                                                                                                                 |                      | N/A      |
| <b>27</b>      | <b>RESISTANCE TO HEAT, FIRE AND TRACKING</b>                                                                                                                                                                                                                             |                      | <b>P</b> |
| 27.1           | General                                                                                                                                                                                                                                                                  |                      | P        |
| 27.2           | Resistance to heat                                                                                                                                                                                                                                                       |                      | P        |
| 27.2.1         | All insulating parts are resistant to heat                                                                                                                                                                                                                               |                      | P        |
|                | For parts of rubber, which passed the test of 19.9, no additional test is required.                                                                                                                                                                                      |                      | N/A      |
|                | The tests are not required for cables and small connectors with a rated current $\leq 3$ A, a rated voltage $\leq 24$ V AC or 60 V DC and a power $\leq 72$ W                                                                                                            |                      | N/A      |
| 27.2.2         | External accessible parts                                                                                                                                                                                                                                                |                      | P        |
|                | The Ball-pressure test: diameter of impression $\leq 2$ mm; heating cabinet temperature ( $^{\circ}$ C) at $70 \pm 2$ $^{\circ}$ C or the temperature T of 14.1 ( $T + 15 \pm 2$ ) is fulfilled.                                                                         | (see appended table) | P        |
| 27.2.3         | Internal parts                                                                                                                                                                                                                                                           |                      | N/A      |
|                | For insulating material retaining current carrying parts in position, the ball-pressure test -: diameter of impression $\leq 2$ mm; heating cabinet temperature ( $^{\circ}$ C) at $125 \pm 2$ $^{\circ}$ C or the temperature T of 14.1 ( $T + 15 \pm 2$ ) is fulfilled |                      | N/A      |
| 27.3           | Resistance to abnormal heat under fault conditions                                                                                                                                                                                                                       |                      | P        |
| 27.4           | Resistance to fire                                                                                                                                                                                                                                                       |                      | P        |
| 27.4.1         | All isolating parts of the transformer shall be resistant to ignition and spread of fire. The test according to IEC 60695-2-10 is required                                                                                                                               |                      | P        |
| 27.4.2         | External accessible parts (glow wire tests)                                                                                                                                                                                                                              |                      | P        |
|                | - 650 $^{\circ}$ C for enclosures                                                                                                                                                                                                                                        |                      | P        |
|                | - 650 $^{\circ}$ C for parts retaining current carrying parts in position and terminals for external conductors Current $\leq 0,2$ A                                                                                                                                     |                      | N/A      |

| IEC 61558-2-16 |                                                                                                                                                                                          |                      |          |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------|
| Clause         | Requirement + Test                                                                                                                                                                       | Result - Remark      | Verdict  |
|                | - 750° C for parts retaining current carrying parts in position and terminals for external conductors with fixed wiring. Current > 0,2 A                                                 |                      | P        |
|                | - 850° C for parts retaining current carrying parts in position and terminals for external conductors with non-fixed wiring. Current > 0,2 A                                             |                      | P        |
| 27.4.3         | Internal parts                                                                                                                                                                           |                      | P        |
|                | - 550 °C for internal insulating material – not retaining current carrying parts in position                                                                                             |                      | N/A      |
|                | - 650 °C for coil formers (bobbins)                                                                                                                                                      |                      | P        |
|                | - 650 °C for parts retaining current carrying parts in position and terminals for external conductors. Current $\leq$ 0,2 A                                                              |                      | N/A      |
|                | - 750 °C for parts retaining current carrying parts in position and terminals for external conductors with fixed wiring. Current > 0,2 A                                                 |                      | N/A      |
|                | - 850 °C for parts retaining current carrying parts in position and terminals for external conductors with non-fixed wiring. Current > 0,2 A                                             | (see appended table) | 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 |                      | P        |
|                | Material group IIIb ( $100 \leq CTI \leq 175$ ) is not recommended for application in pollution degree 3 above 630V                                                                      |                      | N/A      |
|                | Test (175 V): no flashover or breakdown before 50 drops                                                                                                                                  |                      | N/A      |
| <b>28</b>      | <b>RESISTANCE TO RUSTING</b>                                                                                                                                                             |                      | <b>P</b> |
|                | Ferrous parts protected against rusting                                                                                                                                                  |                      | P        |
| <b>ANNEX E</b> | <b>GLOW WIRE TEST</b>                                                                                                                                                                    |                      | <b>P</b> |
| E.1            | The test is required according to IEC 60695-2-10 and IEC 60695-2-11 with the following additions:                                                                                        |                      | P        |
| E.2            | The requirements of 8.2, "Test temperatures" of IEC 60695-2-11:2014, apply with the temperature stated in 27.4 of IEC 61558-1                                                            |                      | P        |
| E.3            | Clause 7, "Conditioning", of IEC 60695-2-11:2014 apply, preconditioning is required                                                                                                      |                      | P        |
| 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        |

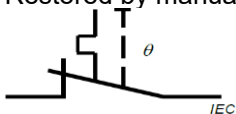
| IEC 61558-2-16 |                    |                 |         |
|----------------|--------------------|-----------------|---------|
| Clause         | Requirement + Test | Result - Remark | Verdict |

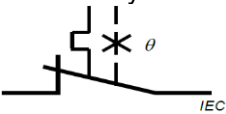
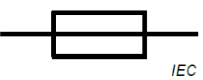
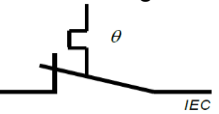
|                |                                                                                                                                                                            |  |          |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------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

| IEC 61558-2-16 |                                                                                                                                                            |                            |         |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|---------|
| Clause         | Requirement + Test                                                                                                                                         | Result - Remark            | Verdict |
|                | 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 $I_2 < 2,1 \times I_1$ test of 15.8 is repeated with fuse-link short-circuited                                                                        |                            | N/A     |
|                | - if $I_2 > 2,75 \times I_1$ , no other tests are necessary                                                                                                |                            | P       |
|                | If $I_2 > 2,1 \times I_1$ and $I_2 < 2,75 \times I_1$ test of 15.8 is repeated as specified                                                                |                            | N/A     |
|                | For fuses other than those complying with IEC 60 127-3, the test is carried out as specified 15.3.2 to 15.3.5                                              |                            | N/A     |
| H.4            | CREEPAGE DISTANCES, CLEARANCES AND DISTANCES THROUGH INSULATION (ADDITION TO CLAUSE 26)                                                                    |                            | N/A     |
| H.4.1          | For live parts separated by basic insulation smaller cr and cl as in 26 are allowed, if H.3 is fulfilled.                                                  |                            | N/A     |
|                | In optocouplers no requirements of cr and cl                                                                                                               |                            | N/A     |
|                | For coatings annex W applies. Smaller distances as required in IEC 60664-3:2016, clause 4 are applicable,                                                  |                            | N/A     |
|                | For potted transformers cycling tests according to 26.2. are applicable                                                                                    |                            | N/A     |
| H.4.2          | The ma. surface temperature of optocouplers is 50 K                                                                                                        |                            | N/A     |
| <b>ANNEX K</b> | <b>INSULATED WINDING WIRES</b>                                                                                                                             |                            | N/A     |
| K.1            | Wire construction:                                                                                                                                         | Approved TIW wire was used | N/A     |
|                | • insulated winding wire for basic or supplementary insulation (see 19.12.3)                                                                               |                            | N/A     |
|                | • insulated winding wire for reinforced insulation (see 19.12.3)                                                                                           |                            | N/A     |
|                | • solid circular winding wires and stranded winding wires with 0,05 to 5,0 mm diameter                                                                     |                            | N/A     |
|                | • spirally wrapped insulation – overlapping                                                                                                                |                            | N/A     |

| IEC 61558-2-16 |                                                                                                           |                 |         |
|----------------|-----------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause         | Requirement + Test                                                                                        | Result - Remark | Verdict |
| K.2            | Type tests                                                                                                |                 | N/A     |
| K.2.1          | General<br>Tests between ambient temperature between 15°C and 35°C and at a humidity between 25% and 75 % |                 | N/A     |
| K.2.2          | Electric strength test                                                                                    |                 | N/A     |
| K.2.2.1        | Solid circular winding wires and stranded winding wires                                                   |                 | N/A     |
|                | Test samples prepared according to clause 4.4.1 of IEC 60851-5:2008 (twisted pair)                        |                 | N/A     |
|                | Dielectric strength test: 6 kV for reinforced insulation                                                  |                 | N/A     |
|                | Dielectric strength test: 3 kV for basic or supplementary insulation                                      |                 | N/A     |
| K.2.2.2        | Square or rectangular wires.                                                                              |                 | N/A     |
|                | Test samples prepared according to clause 4.7.1 of IEC 60851-5:2008                                       |                 | N/A     |
|                | Dielectric strength test: 5,5 kV for reinforced insulation                                                |                 | N/A     |
|                | Dielectric strength test: 2,75 kV for basic or supplementary insulation                                   |                 | N/A     |
| K.2.3          | Flexibility and adherence                                                                                 |                 | N/A     |
|                | Claus 5.1 in Test 8 of IEC 60851-3:2009 shall be used                                                     |                 | N/A     |
|                | Test samples prepared according to clause 5.1.1.4 of IEC 60851-3:2009                                     |                 | N/A     |
|                | Dielectric strength test: 5,5 kV for reinforced insulation                                                |                 | N/A     |
|                | Dielectric strength test: 2,75 kV for basic or supplementary insulation                                   |                 | N/A     |
|                | Mandrel diameter according table K.1                                                                      |                 | N/A     |
|                | The tension to the wire during winding on mandrel is 118 N/mm <sup>2</sup> (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     |

| IEC 61558-2-16 |                                                                                                                           |                 |         |
|----------------|---------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause         | Requirement + Test                                                                                                        | Result - Remark | Verdict |
| K.2.5          | Retention of dielectric strength after bending (test as specified under test 13 of 4.6.1 c) of IEC 60 851-5)              |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>high voltage test immediately after this test</li> </ul>                           |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>Dielectric strength test: 5,5 kV for reinforced insulation</li> </ul>              |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>Dielectric strength test: 2,75 kV for basic or supplementary insulation</li> </ul> |                 | N/A     |
| K.3            | Testing during manufacturing                                                                                              |                 | N/A     |
| K.3.1          | General<br>Tests as subjected in K.3.2 and K.3.3                                                                          |                 | N/A     |
| K.3.2          | Routine test                                                                                                              |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>Dielectric strength test: 4,2 kV for reinforced insulation</li> </ul>              |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>Dielectric strength test: 2,1 kV for basic or supplementary insulation</li> </ul>  |                 | 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     |
|                | <ul style="list-style-type: none"> <li>Dielectric strength test: 6 kV for reinforced insulation</li> </ul>                |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>Dielectric strength test: 3 kV for basic or supplementary insulation</li> </ul>    |                 | 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     |
|                | <ul style="list-style-type: none"> <li>Dielectric strength test: 5,5 kV for reinforced insulation</li> </ul>              |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>Dielectric strength test: 3 kV for basic or supplementary insulation</li> </ul>    |                 | N/A     |

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

| IEC 61558-2-16 |                                                                                                                              |                 |         |
|----------------|------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause         | Requirement + Test                                                                                                           | Result - Remark | Verdict |
| Figure V.2     | Restored by disconnection of the supply<br> |                 | N/A     |
| Figure V.3     | Thermal link<br>                            |                 | N/A     |
| Figure V.4     | Self-resetting thermal cut-out<br>          |                 | N/A     |

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

| 11 and 12                  |                   | TABLE: OUTPUT VOLTAGE AND OUTPUT CURRENT UNDER LOAD;<br>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                                                     |
| DC 32.0V, 2.5A             | 100V 50Hz         | 31.09                                                                          | -2.84          | 31.21                 | -2.46                       | Limit: $\pm 10\%$ (delta Usec) / $\pm 20\%$ (delta Usec no-load output) |
|                            | 100V 60Hz         | 31.09                                                                          | -2.84          | 31.21                 | -2.46                       | Limit: $\pm 10\%$ (delta Usec) / $\pm 20\%$ (delta Usec no-load output) |
|                            | 240V 50Hz         | 31.09                                                                          | -2.84          | 31.21                 | -2.46                       | Limit: $\pm 10\%$ (delta Usec) / $\pm 20\%$ (delta Usec no-load output) |
|                            | 240V 60Hz         | 31.09                                                                          | -2.84          | 31.21                 | -2.46                       | Limit: $\pm 10\%$ (delta Usec) / $\pm 20\%$ (delta Usec no-load output) |
| Supplementary information: |                   |                                                                                |                |                       |                             |                                                                         |

|                        |                          |                                 |            |             |                              |            |
|------------------------|--------------------------|---------------------------------|------------|-------------|------------------------------|------------|
| 14                     | TABLE: Heating Test      |                                 |            |             | P                            |            |
|                        | Test voltage (V) ..... : |                                 | See below  |             | —                            |            |
|                        | Ambient (°C) .....:      |                                 | 40.0       |             | —                            |            |
| Thermocouple Locations |                          | max. temperature measured, (°C) |            |             | max. temperature limit, (°C) |            |
|                        |                          | 90VAC/60Hz                      |            | 264VAC/50Hz |                              |            |
|                        |                          | Label up                        | Label down | Label up    |                              | Label down |
| Ambient                |                          | 40.0                            | 40.0       | 40.0        | 40.0                         | --         |
| Input wire             |                          | 65.0                            | 67.4       | 54.1        | 55.7                         | 80         |
| VD1 body               |                          | 73.4                            | 75.8       | 58.5        | 59.9                         | 105        |
| LF1 coil               |                          | 88.6                            | 89.5       | 65.3        | 65.8                         | 130        |
| CX1 body               |                          | 88.7                            | 88.2       | 68.7        | 68.3                         | 110        |
| LF2 coil               |                          | 113.4                           | 110.9      | 80.7        | 79.8                         | 130        |
| EC1 body               |                          | 100.2                           | 98.0       | 79.4        | 78.7                         | 105        |
| T1 coil (Primary)      |                          | 103.6                           | 101.8      | 98.7        | 97.2                         | 110        |
| T1 coil (Secondary)    |                          | 100.5                           | 98.5       | 96.7        | 95.4                         | 110        |
| CY1 body               |                          | 88.8                            | 90.8       | 83.2        | 85.2                         | 125        |
| CY3 body               |                          | 89.3                            | 92.9       | 85.0        | 87.7                         | 125        |

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|---------------------------------------------------------|--------------------|-------|------|-----------------|---------|
| Clause                                                  | Requirement + Test |       |      | Result - Remark | Verdict |
| U2 body                                                 | 76.2               | 80.9  | 73.1 | 76.2            | 100     |
| PCB near BD1                                            | 111.1              | 111.1 | 83.4 | 83.4            | 130     |
| PCB near Q1                                             | 114.6              | 113.1 | 93.0 | 92.0            | 130     |
| PCB near D8                                             | 87.6               | 89.4  | 91.7 | 93.4            | 130     |
| Output wire                                             | 62.6               | 64.6  | 64.4 | 66.4            | 80      |
| LF3 coil                                                | 76.5               | 78.7  | 79.7 | 81.7            | 130     |
| Internal enclosure surface near T1(Top)                 | 74.9               | 79.0  | 73.4 | 76.2            | Ref.    |
| Internal enclosure surface near T1(Bottom)              | 85.6               | 82.4  | 81.4 | 79.2            | Ref.    |
| External enclosure surface near T1(Top)                 | 67.6               | 69.4  | 66.3 | 69.9            | 80      |
| External enclosure surface near T1(Bottom)              | 75.6               | 74.2  | 73.4 | 72.5            | 80      |
| Support 1                                               | 69.8               | 69.0  | 69.5 | 58.5            | 85      |
| Support 2                                               | 74.6               | 63.5  | 71.2 | 58.6            | 85      |
| Supplementary information:<br>Thermocouple method used. |                    |       |      |                 |         |

|                             |                                               |                    |                    |        |             |                  |
|-----------------------------|-----------------------------------------------|--------------------|--------------------|--------|-------------|------------------|
| <b>14</b>                   | <b>TABLE: Heating test, resistance method</b> |                    |                    |        |             | <b>N/A</b>       |
|                             | Test voltage (V) .....                        | --                 |                    |        |             | —                |
|                             | Ambient, t <sub>1</sub> (°C).....             | --                 |                    |        |             | —                |
|                             | Ambient, t <sub>2</sub> (°C).....             | --                 |                    |        |             | —                |
| Temperature rise of winding |                                               | R <sub>1</sub> (Ω) | R <sub>2</sub> (Ω) | ΔT (K) | Max. dT (K) | Insulation class |
| --                          |                                               | --                 | --                 | --     | --          | --               |
| --                          |                                               | --                 | --                 | --     | --          | --               |
| --                          |                                               | --                 | --                 | --     | --          | --               |
| Supplementary information:  |                                               |                    |                    |        |             |                  |

|                   |                                                     |             |             |                  |               |                     |                        |
|-------------------|-----------------------------------------------------|-------------|-------------|------------------|---------------|---------------------|------------------------|
| <b>15</b>         | <b>TABLE: SHORT-CIRCUIT AND OVERLOAD PROTECTION</b> |             |             |                  |               |                     | <b>N/A</b>             |
|                   | ambient temperature (°C) .....                      |             |             | 25.0             |               |                     |                        |
| type/rated output | r-cold<br>Ω                                         | r-warm<br>Ω | temp.<br>°C | ext. encl.<br>°C | support<br>°C | int. + ext.<br>wire | further<br>information |
| --                | --                                                  | --          | --          | --               | --            | --                  | --                     |
| --                | --                                                  | --          | --          | --               | --            | --                  | --                     |
| --                | --                                                  | --          | --          | --               | --            | --                  | --                     |
| --                | --                                                  | --          | --          | --               | --            | --                  | --                     |

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| Clause         | Requirement + Test | Result - Remark | Verdict |

| <b>15</b>         | <b>TABLE: SHORT-CIRCUIT AND OVERLOAD PROTECTION</b> |             |             |                  |               |                     | <b>N/A</b>             |
|-------------------|-----------------------------------------------------|-------------|-------------|------------------|---------------|---------------------|------------------------|
|                   | ambient temperature (°C) .....: 25.0                |             |             |                  |               |                     |                        |
| type/rated output | r-cold<br>Ω                                         | r-warm<br>Ω | temp.<br>°C | ext. encl.<br>°C | support<br>°C | int. + ext.<br>wire | further<br>information |
| --                | --                                                  | --          | --          | --               | --            | --                  | --                     |
| --                | --                                                  | --          | --          | --               | --            | --                  | --                     |

|                                                                                                                                                                |                                              |                                 |             |                              |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------|-------------|------------------------------|
| 15                                                                                                                                                             | TABLE: Short circuit and overload protection |                                 |             | P                            |
|                                                                                                                                                                | Test voltage (V) :                           |                                 | 264VAC/50Hz | —                            |
|                                                                                                                                                                | Ambient (oC) :                               |                                 | 40.0        | —                            |
| Thermocouple Locations                                                                                                                                         |                                              | max. temperature measured, (°C) |             | max. temperature limit, (°C) |
| T1 coil (Primary)                                                                                                                                              |                                              | 118.5                           |             | 165                          |
| T1 coil (Secondary)                                                                                                                                            |                                              | 115.9                           |             | 165                          |
| External enclosure surface near T1(Top)                                                                                                                        |                                              | 78.5                            |             | 105                          |
| External enclosure surface near T1(Bottom)                                                                                                                     |                                              | 81.5                            |             | 105                          |
| Support 1                                                                                                                                                      |                                              | 65.0                            |             | 105                          |
| Support 2                                                                                                                                                      |                                              | 64.4                            |             | 105                          |
| Supplementary information:                                                                                                                                     |                                              |                                 |             |                              |
| 1. All the conditions were considered for clause 15, and also Max. temperature with rated 1.1 times voltage during test output overload for recorded as above. |                                              |                                 |             |                              |
| 2. Thermocouple method used.                                                                                                                                   |                                              |                                 |             |                              |
| 3. Limited temperature for winding is 165°C (Class B).                                                                                                         |                                              |                                 |             |                              |
| For T1 output shorted, the unit shutdown immediately, recoverable, no damage, no hazards.                                                                      |                                              |                                 |             |                              |
| For T1 output overload, the unit output is the max. load. 3.17A, no damage, no hazards.                                                                        |                                              |                                 |             |                              |

|                                                                      |                                           |        |                 |
|----------------------------------------------------------------------|-------------------------------------------|--------|-----------------|
| 18.2                                                                 | TABLE: insulation resistance measurements |        | P               |
| Insulation resistance R between:                                     |                                           | R (MΩ) | Required R (MΩ) |
| Hazardous live parts and the body (Reinforced)                       |                                           | >100M  | 7               |
| Live parts of different polarity (Basic)                             |                                           | >100M  | 2               |
| Input circuits and output circuits (Reinforced)                      |                                           | >100M  | 5               |
| Primary winding and secondary winding of transformer (Reinforced)    |                                           | >100M  | 5               |
| Secondary winding and Core of transformer (Reinforced)               |                                           | >100M  | 5               |
| 1 layers of insulation tape outside on Transformer core (Reinforced) |                                           | >100M  | 5               |
| Supplementary information:                                           |                                           |        |                 |

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|----------------|--------------------|-----------------|---------|
| Clause         | Requirement + Test | Result - Remark | Verdict |

| 18.3                                                                 | TABLE: Dielectric Strength |                            | P                              |
|----------------------------------------------------------------------|----------------------------|----------------------------|--------------------------------|
| Test voltage applied between:                                        |                            | Test potential applied (V) | Breakdown / flashover (Yes/No) |
| Hazardous live parts and the body (Reinforced)                       |                            | 3000                       | No                             |
| Live parts of different polarity (Basic)                             |                            | 1500                       | No                             |
| Input circuits and output circuits (Reinforced)                      |                            | 3000                       | No                             |
| Primary winding and secondary winding of transformer (Reinforced)    |                            | 3000                       | No                             |
| Secondary winding and Core of transformer (Reinforced)               |                            | 3000                       | No                             |
| 1 layers of insulation tape outside on Transformer core (Reinforced) |                            | 3000                       | No                             |
| Supplementary information:                                           |                            |                            |                                |

| 20                       | TABLE: Critical components information |                                        |                                                                                            |                           |                                     | P |
|--------------------------|----------------------------------------|----------------------------------------|--------------------------------------------------------------------------------------------|---------------------------|-------------------------------------|---|
| Object / part No.        | Manufacturer/ trademark                | Type / model                           | Technical data                                                                             | Standard                  | Mark(s) of conformity <sup>1)</sup> |   |
| Power Plug (for EU plug) | Dongguan Chuangxu Wire Co., Ltd.       | CX-805                                 | 250VAC, 16A                                                                                | IEC 60884-1               | SGS PS/22/GEN/0048                  |   |
| (Alternative)            | Interchangeable                        | Interchangeable                        | 250VAC, 16A                                                                                | IEC 60884-1               | VDE & other EU certification marks  |   |
| Power Plug (for UK plug) | SHENZHEN XIEKANG CO LTD                | XK-28                                  | 250VAC, 13A                                                                                | BS1363-1                  | ASTA (972)                          |   |
| (Alternative)            | Dongguan Chuangxu Wire Co., Ltd.       | CX-33                                  | 250VAC, 13A                                                                                | BS 1363-1                 | SGS PS/19/GEN/0042                  |   |
| (Alternative)            | Dongguan Ubill Electrical Co.,Ltd.     | UBL 8008                               | 250VAC, 13A                                                                                | BS 1363-1                 | ASTA (1183)                         |   |
| (Alternative)            | Interchangeable                        | Interchangeable                        | 250VAC, 13A                                                                                | BS 1363-1: 2016 +A1: 2018 | ASTA & other BS certification marks |   |
| Power cord (for EU/UK)   | SHENZHEN XIEKANG ELECTRIC CO., LTD     | H03VV-F, H05VV-F, H03VVH2-F, H05VVH2-F | 2 x 0,5 mm <sup>2</sup> (1.9m Length max.),<br>2 x 0,75 mm <sup>2</sup><br>300/500V, 105°C | EN 50525-2-11             | VDE 40029225                        |   |

| IEC 61558-2-16       |                                           |                                        |                                                                                                      |               |                                    |
|----------------------|-------------------------------------------|----------------------------------------|------------------------------------------------------------------------------------------------------|---------------|------------------------------------|
| Clause               | Requirement + Test                        |                                        | Result - Remark                                                                                      |               | Verdict                            |
| (Alternative)        | Dongguan Chuangxu Wire Co., Ltd.          | H03VV-F, H05VV-F, H03VVH2-F, H05VVH2-F | 2 x 0,5 mm <sup>2</sup> (1.9m Length max.),<br>2 x 0,75 mm <sup>2</sup><br>300/500V, 105°C           | EN 50525-2-11 | VDE 40045924                       |
| (Alternative)        | Dongguan Ubill Electrical Co.,Ltd.        | H03VV-F, H05VV-F, H03VVH2-F, H05VVH2-F | 2 x 0,5 mm <sup>2</sup> (1.9m Length max.),<br>2 x 0,75 mm <sup>2</sup><br>300/500V, 105°C           | EN 50525-2-11 | VDE 40042748                       |
| (Alternative)        | Interchangeable                           | Interchangeable                        | 2 x 0,5 mm <sup>2</sup> (1.9m Length max.),<br>2 x 0,75 mm <sup>2</sup><br>300/500V, 105°C           | EN 50525-2-11 | VDE & other EU certification marks |
| Fuse used in UK plug | Ningbo Weiyun Electronic Co., Ltd         | SAFE                                   | 240VAC, 3A for 2x0.5mm <sup>2</sup> (1.9m Length max.),<br>240VAC, 7A ,13A for 2x0.75mm <sup>2</sup> | BS 1363-2     | ASTA 854                           |
| (Alternative)        | Dongguan Cooper Electronics Co., Ltd      | TDC 180                                | 240VAC, 3A for 2x0.5mm <sup>2</sup> (1.9m Length max.),<br>240VAC, 7A ,13A for 2x0.75mm <sup>2</sup> | BS 1363-2     | ASTA 658                           |
| (Alternative)        | AsiaFuse (UK) Electronics Limited         | AF63B-3A                               | 240VAC, 3A for 2x0.5mm <sup>2</sup> (1.9m Length max.),<br>240VAC, 7A ,13A for 2x0.75mm <sup>2</sup> | BS 1363-2     | ASTA 974                           |
| (Alternative)        | Dongguan Ubill Electrical Co.,Ltd         | UBL8808                                | 240VAC, 3A for 2x0.5mm <sup>2</sup> (1.9m Length max.),<br>240VAC, 7A ,13A for 2x0.75mm <sup>2</sup> | BS 1362       | ASTA (1204)                        |
| (Alternative)        | Dongguan Dawei Metal Electronics Co, Ltd. | 625                                    | 240VAC, 3A for 2x0.5mm <sup>2</sup> (1.9m Length max.),<br>240VAC, 7A ,13A for 2x0.75mm <sup>2</sup> | BS 1362       | ASTA (1207)                        |

| IEC 61558-2-16           |                                                  |                                        |                                                                                |                                     |                                                                                                      |
|--------------------------|--------------------------------------------------|----------------------------------------|--------------------------------------------------------------------------------|-------------------------------------|------------------------------------------------------------------------------------------------------|
| Clause                   | Requirement + Test                               |                                        | Result - Remark                                                                |                                     | Verdict                                                                                              |
| Power plug (for AU plug) | SHENZHEN XIEKANG ELECTRIC CO.,LTD                | XK-15A                                 | 3A, 250VAC                                                                     | AS/NZS 3112                         | NSW21010                                                                                             |
| (Alternative)            | SHENZHEN XIEKANG ELECTRIC CO.,LTD                | XK-15                                  | 10A, 250VAC                                                                    | AS/NZS 3112                         | NSW21010                                                                                             |
| (Alternative)            | SHENZHEN XIEKANG ELECTRIC CO.,LTD                | XK-05                                  | 2.5A, 250VAC                                                                   | AS/NZS 3112                         | NSW22062                                                                                             |
| (Alternative)            | Dongguan Chuangxu Wire Co., Ltd.                 | CX-27                                  | 7.5A/10A, 250V                                                                 | AS/NZS 3112                         | SAA-171098-EA                                                                                        |
| (Alternative)            | Dongguan Ubill Electrical Co.,Ltd.               | YG-805, YG-806                         | 7.5A/10A,250V                                                                  | AS/NZS 3112                         | NSW27480                                                                                             |
| (Alternative)            | Interchangeable                                  | Interchangeable                        | Min. 2.5A, 250V                                                                | AS/NZS 3112                         | AU certification marks                                                                               |
| Power cord (for AU plug) | SHENZHEN XIEKANG ELECTRIC CO.,LTD                | H03VV-F, H05VV-F, H03VVH2-F, H05VVH2-F | 2x0.5mm <sup>2</sup> (1.9m Length max.), 2x0.75mm <sup>2</sup> 300/500V, 105°C | AS/NZS IEC 60227.5                  | NSW27131                                                                                             |
| (Alternative)            | Dongguan Chuangxu Wire Co., Ltd.                 | H03VV-F, H05VV-F, H03VVH2-F, H05VVH2-F | 2x0.5mm <sup>2</sup> (1.9m Length max.), 2x0.75mm <sup>2</sup> 300/500V, 105°C | AS/NZS IEC 60227.5                  | SAA-162527-EA                                                                                        |
| (Alternative)            | Dongguan Ubill Electrical Co.,Ltd.               | H03VV-F, H05VV-F, H03VVH2-F, H05VVH2-F | 2x0.5mm <sup>2</sup> (1.9m Length max.), 2x0.75mm <sup>2</sup> 300/500V, 105°C | AS/NZS IEC 60227.5                  | SAA-151497-EA                                                                                        |
| (Alternative)            | Interchangeable                                  | Interchangeable                        | 2x0.5mm <sup>2</sup> (1.9m Length max.), 2x0.75mm <sup>2</sup> 300/500V, 105°C | AS/NZS IEC 60227.5                  | AU certification marks                                                                               |
| Power plug (for CH plug) | Dongguan Linoya Intelligent Technology Co., Ltd. | XYP-296                                | 250VAC, 10A, CH-type 11, IP55                                                  | IEC 60884-1 SN 441011-1 SN 441011-2 | <br>No. 22.0032 |
| (Alternative)            | Konice Electronics Technology Co., Ltd.          | KNC-92                                 | 250V~, 10A, CH-type 11, IP55                                                   | IEC 60884-1 SN 441011-1 SN 441011-2 | <br>No.25.0227  |
| (Alternative)            | Interchangeable                                  | Interchangeable                        | 250VAC, 10A, IP55                                                              | IEC 60884-1 SN 441011-1 SN 441011-2 |                 |

| IEC 61558-2-16           |                                                  |                               |                                                                                              |                                                 |                                                                                                   |
|--------------------------|--------------------------------------------------|-------------------------------|----------------------------------------------------------------------------------------------|-------------------------------------------------|---------------------------------------------------------------------------------------------------|
| Clause                   | Requirement + Test                               |                               | Result - Remark                                                                              |                                                 | Verdict                                                                                           |
| Power cord (for CH plug) | Dongguan Linoya Intelligent Technology Co., Ltd. | H05VV-F                       | 2x1.0mm <sup>2</sup> ,<br>2x0.75mm <sup>2</sup> ,<br>2x0.5mm <sup>2</sup> (1.9m Length max.) | SN 441011-1<br>SN 441011-2-1                    | <br>No 22.0032 |
| (Alternative)            | Konice Electronics Technology Co., Ltd.          | H05VV-F                       | 2x1.0mm <sup>2</sup> ,<br>2x0.75mm <sup>2</sup> ,<br>2x0.5mm <sup>2</sup> (1.9m Length max.) | SN 441011-1<br>SN 441011-2-1                    | <br>No 25.0227 |
| (Alternative)            | Interchangeable                                  | Interchangeable               | 2x1.0mm <sup>2</sup> ,<br>2x0.75mm <sup>2</sup> ,<br>2x0.5mm <sup>2</sup> (1.9m Length max.) | SN 441011-1<br>SN 441011-2-1                    |                |
| Plastic enclosure        | SABIC INNOVATIVE PLASTICS US L L C               | 940(f1)(gg*)                  | PC, V-0, Min. thickness: 2,0 mm, 120°C                                                       | IEC 61588-1<br>IEC 61558-2-16<br>UL94<br>UL746C | Tested with appliance<br>UL E121562                                                               |
| PCB                      | DONGGUAN CITY XINRAN ELECTRONIC CO LTD           | XR-V002,<br>XR-F003           | V-0, 130°C                                                                                   | UL 796<br>IEC 61558-1<br>IEC 61558-2-16         | UL E330704                                                                                        |
| (Alternative)            | KAIMAU ELECTRONICS CO LTD                        | 2V0, 4CEM, 5CEM, 6FR-4        | V-0, 130°C                                                                                   | UL 796<br>IEC 61558-1<br>IEC 61558-2-16         | UL E237305                                                                                        |
| (Alternative)            | Xinfeng Senlian Technology Co., Ltd              | SL-M (ASP 1),<br>SL-D (ASP 1) | V-0, 130°C                                                                                   | UL 796<br>IEC 61558-1<br>IEC 61558-2-16         | UL E526535                                                                                        |
| (Alternative)            | LONG CHANG PRINTED CIRCUIT LTD                   | LC-04V0A                      | V-0, 130°C                                                                                   | UL 796<br>IEC 61558-1<br>IEC 61558-2-16         | UL E94733                                                                                         |
| (Alternative)            | MEIZHOU WORLD TONG ELECTRONIC CO LTD             | SY02                          | V-0, 130°C                                                                                   | UL 796<br>IEC 61558-1<br>IEC 61558-2-16         | UL E326265                                                                                        |
| (Alternative)            | Interchangeable                                  | Interchangeable               | V-0, 130°C                                                                                   | UL 796<br>IEC 61558-1<br>IEC 61558-2-16         | UL                                                                                                |
| Fuse (F1)                | ZHONG SHAN LANBAO ELECTRICAL APPLIANCES CO LTD   | TB, TR                        | T3.15AL,<br>250VAC                                                                           | IEC/EN 60127-1<br>IEC/EN 60127-3<br>UL248       | TUV Rheinland J 50420445<br>UL E213695                                                            |

| IEC 61558-2-16               |                                                      |                                                                                                                                                                                                                                                                                                                                                                         |                                        |                                                                 |                            |
|------------------------------|------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|-----------------------------------------------------------------|----------------------------|
| Clause                       | Requirement + Test                                   |                                                                                                                                                                                                                                                                                                                                                                         | Result - Remark                        |                                                                 | Verdict                    |
| (Alternative)                | Dongguan Chevron Electronic Technology Co., Ltd.     | SET                                                                                                                                                                                                                                                                                                                                                                     | T3.15AL, 250VAC                        | IEC/EN 60127-1<br>IEC/EN 60127-3<br>UL 248-1<br>UL 248-14       | VDE 40038565<br>UL E358589 |
| (Alternative)                | XC Electronics (Shen Zhen) Corp. Ltd.                | 5TE                                                                                                                                                                                                                                                                                                                                                                     | T3.15AL, 250VAC                        | IEC/EN 60127-1<br>IEC/EN 60127-3<br>UL248                       | VDE 40029550<br>UL E249609 |
| (Alternative)                | Shenzhen Lanson Electronics Co. Ltd.                 | SMT                                                                                                                                                                                                                                                                                                                                                                     | T3.15AL, 250VAC                        | IEC/EN 60127-1<br>IEC/EN 60127-3<br>UL248                       | VDE 40012592<br>UL E221465 |
| Thermistor-type (PTC1, PTC2) | Shenzhen Jinrui Electronic Materials Co., Ltd.       | JK60-500                                                                                                                                                                                                                                                                                                                                                                | 5A/60V<br>-40°C to +85°C               | EN 60738-1-1<br>EN 60738-1                                      | TUV Rheinland R50254784    |
| (Alternative)                | Dongguan TLC Electronic Technology Co., Ltd.         | TRC500                                                                                                                                                                                                                                                                                                                                                                  | 5A/60V<br>-40°C to +85°C               | EN 60738-1-1<br>EN 60738-1                                      | TUV Rheinland R50322003    |
| Varistor (VD1) (Optional)    | DongGuan City Jiankun Electronics Technology Co. Ltd | 10D471K,<br>10D471KT,<br>10D471KH,<br>10D471KTH,<br>10D561K,<br>10D561KT,<br>10D561KH,<br>10D561KTH,<br>10D621K,<br>10D621KT,<br>10D621KH,<br>10D621KTH,<br>10D681K,<br>10D681KT,<br>10D681KH,<br>10D681KTH,<br>14D561K,<br>14D561KT,<br>14D561KH,<br>14D561KTH,<br>14D621K,<br>14D621KT,<br>14D621KH,<br>14D621KTH,<br>14D681K,<br>14D681KT,<br>14D681KH,<br>14D681KTH | Min. AC 300V,<br>125°C,<br>coating V-0 | IEC/EN 61051-1<br>IEC/EN 61051-2<br>IEC/EN 61051-2-2<br>UL 1449 | UL E489693<br>VDE 40056157 |

| IEC 61558-2-16 |                                                                     |                                                                                                                   |                                            |                                                                 |                               |
|----------------|---------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|--------------------------------------------|-----------------------------------------------------------------|-------------------------------|
| Clause         | Requirement + Test                                                  |                                                                                                                   | Result - Remark                            |                                                                 | Verdict                       |
| (Alternative)  | Shantou High-New Technology Dev. Zone Songtian Enterprise Co., Ltd. | 10D471K,<br>14D471K,<br>10D561K<br>14D561K,<br>10D621K<br>10D681K,<br>14D621K,<br>14D681K                         | Min. AC 300V,<br>125°C,<br>coating V-0     | IEC/EN 61051-1<br>IEC/EN 61051-2<br>IEC/EN 61051-2-2<br>UL 1449 | UL E330837<br>VDE<br>40023049 |
| (Alternative)  | Dongguan City Dafu Electronics Co Ltd                               | NDF10D471K,<br>NDF14D471K,<br>NDF10D561K<br>NDF14D561K,<br>NDF10D621K<br>NDF10D681K,<br>NDF14D621K,<br>NDF14D681K | Min. AC 300V,<br>Min.125°C,<br>coating V-0 | IEC/EN 61051-1<br>IEC/EN 61051-2<br>IEC/EN 61051-2-2<br>UL 1449 | UL E502211<br>VDE<br>40050909 |
| (Alternative)  | CERGLASS MFG INC                                                    | 10D471K,<br>14D471K,<br>10D561K<br>14D561K,<br>10D621K<br>10D681K,<br>14D621K,<br>14D681K                         | Min. AC 300V,<br>125°C,<br>coating V-0     | IEC/EN 61051-1<br>IEC/EN 61051-2<br>IEC/EN 61051-2-2<br>UL 1449 | VDE<br>40028836<br>ULE317616  |
| (Alternative)  | Thinking Electronic Industrial Co., Ltd.                            | TVR10D471K,<br>TVR14D471K,<br>TVR10D561K<br>TVR14D561K,<br>TVR10D621K<br>TVR10D681K,<br>TVR14D621K,<br>TVR14D681K | Min. AC 300V,<br>Min.105°C,<br>coating V-0 | IEC/EN 61051-1<br>IEC/EN 61051-2<br>IEC/EN 61051-2-2<br>UL 1449 | VDE 005944<br>UL E314979      |

| IEC 61558-2-16                   |                                                                     |                                                                                                                                   |                                                |                                                                 |                                       |
|----------------------------------|---------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|-----------------------------------------------------------------|---------------------------------------|
| Clause                           | Requirement + Test                                                  |                                                                                                                                   | Result - Remark                                |                                                                 | Verdict                               |
| (Alternative)                    | Thinking Electronic Industrial Co., Ltd.                            | TVR10D471K-D,<br>TVR14D471K-D,<br>TVR10D561K-D<br>TVR14D561K-D,<br>TVR10D621K-D<br>TVR10D681K-D,<br>TVR14D621K-D,<br>TVR14D681K-D | Min. AC 300V,<br>Min.105°C,<br>coating V-0     | IEC/EN 61051-1<br>IEC/EN 61051-2<br>IEC/EN 61051-2-2<br>UL 1449 | VDE4002124 <sup>3</sup><br>UL E314979 |
| X-Capacitor (CX1)                | Dongguan Weiqing Electronic Co., Ltd.                               | MPX                                                                                                                               | Min.275Vac<br>Max.0.33uF,<br>110°C, X2 type    | UL 60384-14<br>IEC/EN 60384-14                                  | UL E466405<br>VDE 40040406            |
| (Alternative)                    | DongGuan City Jiankun Electronics Technology Co. Ltd                | MPX/MKP                                                                                                                           | Min. 275ac,<br>Max.0.33uF,<br>110°C, X2 type   | IEC/EN 60384-14<br>UL 60384-14                                  | UL E340699<br>VDE 40050012            |
| (Alternative)                    | Shantou High-New Technology Dev. Zone Songtian Enterprise Co., Ltd. | MPX / MKP                                                                                                                         | Min. 275 Vac,<br>Max.0.33uF,<br>110°C, X2 type | IEC/EN 60384-14<br>UL 60384-14                                  | UL E357475<br>VDE 40036065            |
| (Alternative)                    | Dongguan City Dafu Electronics Co Ltd                               | MPX                                                                                                                               | Min. 275 Vac,<br>Max.0.33uF,<br>110°C, X2 type | IEC/EN 60384-14                                                 | UL E465278<br>VDE 40044620            |
| Y-capacitor (CY1, CY2, CY3, CY4) | DONG GUAN CITY JIANKUN ELECTRONICS TECHNOLOGY CO LTD                | JT                                                                                                                                | Min. 250VAC,<br>Max. 2200pF,<br>125°C, Y1 type | UL 60384-14<br>IEC/EN 60384-14                                  | UL E340699<br>VDE 40041534            |
| (Alternative)                    | Shantou High-New Technology Dev. Zone Songtian Enterprise Co., Ltd. | CD                                                                                                                                | Min. 250VAC,<br>Max.2200pF,<br>125°C, Y1 type  | UL 60384-14<br>IEC/EN 60384-14                                  | UL E208107<br>VDE 40025754            |
| (Alternative)                    | Jyh Chung Electronic Co., Ltd.                                      | JD                                                                                                                                | 400VAC,<br>Max. 2200pF,<br>125°C, Y1 type      | IEC/EN 60384-14                                                 | UL E356696<br>VDE 137027              |

| IEC 61558-2-16     |                                                |                    |                                          |                                          |                                     |
|--------------------|------------------------------------------------|--------------------|------------------------------------------|------------------------------------------|-------------------------------------|
| Clause             | Requirement + Test                             |                    | Result - Remark                          |                                          | Verdict                             |
| (Alternative)      | Dongguan City Dafu Electronics Co Ltd          | CT7                | Min. 250VAC, Max. 2200pF, 125°C, Y1 type | IEC/EN 60384-14                          | UL E465278<br>VDE 40041523          |
| (Alternative)      | Suzhou Jiarong Electronic Technology Co Ltd    | RA                 | Min. 250VAC, Max. 2200pF, 125°C, Y1 type | IEC/EN 60384-14                          | UL E525281<br>VDE40054148           |
| Line choke (LF2)   | PUHANG (DONGGUANSHI) ELECTRONIC CO LTD         | 1515               | 130°C                                    | IEC 61558-1<br>IEC 61558-2-16            | Tested with appliance               |
| (Alternative)      | DONG GUAN RONGJU ELECTRONICS CO LTD            | 1515               | 130°C                                    | IEC 61558-1<br>IEC 61558-2-16            | Tested with appliance               |
| (Alternative)      | CHONGQING JINLAI TECHNOLOGY CORP               | 1515               | 130°C                                    | IEC 61558-1<br>IEC 61558-2-16            | Tested with appliance               |
| (Alternative)      | DONGGUAN MEIXI ELECTRONICS CO.LTD              | 1515               | 130°C                                    | IEC 61558-1<br>IEC 61558-2-16            | Tested with appliance               |
| (Alternative)      | DONGGUAN HONGSHANG ELECTRONICS CO.LTD          | 1515               | 130°C                                    | IEC 61558-1<br>IEC 61558-2-16            | Tested with appliance               |
| Magnet wire of LF2 | WELL ASCENT ELECTRONIC (GANZHOU) CO LTD        | SFT-UEWH           | 180°C                                    | UL 1446<br>IEC 61558-1<br>IEC 61558-2-16 | UL E318511<br>Tested with appliance |
| (Alternative)      | CHENG DU SOUTH-WEST ELECTRIC LTD CO            | UEW, UEW-Y         | 130°C                                    | UL 1446<br>IEC 61558-1<br>IEC 61558-2-16 | UL E178366<br>Tested with appliance |
| (Alternative)      | HUIZHOU GOLDEN OCEAN MAGNET WIRE FACTORY       | xUEW, UEW-x        | 130°C                                    | UL 1446<br>IEC 61558-1<br>IEC 61558-2-16 | UL E225143<br>Tested with appliance |
| (Alternative)      | SHANTOU SHENGANG ELECTRICAL INDUSTRIAL CO. LTD | xUEW/130, QA-x/130 | 130°C                                    | UL 1446<br>IEC 61558-1<br>IEC 61558-2-16 | UL E239508<br>Tested with appliance |

| IEC 61558-2-16       |                                                               |                                                                                                   |                                                                     |                                          |                                     |
|----------------------|---------------------------------------------------------------|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|------------------------------------------|-------------------------------------|
| Clause               | Requirement + Test                                            |                                                                                                   | Result - Remark                                                     |                                          | Verdict                             |
| (Alternative)        | SHENZHEN DAYANG INDUSTRY CO LTD                               | xUEW-NY/180<br>xQAN/180                                                                           | 180°C                                                               | UL 1446<br>IEC 61558-1<br>IEC 61558-2-16 | UL E176101<br>Tested with appliance |
| (Alternative)        | GUANGDONG SUNTEK WIRE CO.,LTD                                 | *xUEW180                                                                                          | 180°C                                                               | UL 1446<br>IEC 61558-1<br>IEC 61558-2-16 | UL E234867<br>Tested with appliance |
| Bobbin of LF2        | CHANG CHUN PLASTICS CO LTD                                    | T375J(G5)(G6),<br>T373J, T375HF                                                                   | Phenolic, V-0,<br>150°C, Min.<br>0.8mm<br>thickness                 | UL94<br>IEC 61558-1<br>IEC 61558-2-16    | UL E59481<br>Tested with appliance  |
| Optical coupler (U2) | Shenzhen Orient Components Co. Ltd.                           | ORPC-817,<br>ORPC-817A,<br>ORPC-817B,<br>ORPC-817C,<br>ORPC-817 x,<br>ORPC-817S x,<br>ORPC-817M x | 5000V,110°C<br>Dti=0.4mm,<br>Ext.dcr=7.6mm,<br>110°C                | IEC /EN 60747-5-5<br>UL1577              | VDE 40029733<br>UL E323844          |
| (Alternative)        | Everlight Electronics Co., Ltd.                               | EL817                                                                                             | 4000V,<br>Dti=0.5mm,<br>Int.cr.=5.0mm,<br>Ext.cr.=7.0mm,<br>110°C   | IEC /EN 60747-5-5<br>UL1577              | VDE 132249<br>UL E214129            |
| (Alternative)        | Bright Led Electronics Corp.                                  | BPC-817                                                                                           | 6000V,<br>Dti=0.4mm,<br>Int.dcr.=4.0mm,<br>Ext.dcr=8.0mm,<br>100°C  | IEC /EN 60747-5-5<br>UL1577              | VDE 40007240<br>UL E236324          |
| (Alternative)        | Lite-On Technology Corporation                                | LTV-817                                                                                           | 8000V,<br>Dti=0.8mm,<br>Int.dcr.=5.2mm,<br>Ext.dcr=7.8mm,<br>110°C  | IEC /EN 60747-5-5<br>UL1577              | VDE 40015248<br>UL E113898          |
| (Alternative)        | COSMO Electronics Corporation                                 | K1010,<br>KP1010,<br>KPC817                                                                       | 6000V,<br>Dti=0.5mm,<br>Int.dcr.=5.3mm,<br>Ext.dcr=8.0mm,,<br>100°C | IEC /EN 60747-5-5<br>UL1577              | VDE 101347<br>UL E169586            |
| Thermistor (NTC1)    | GUANGDONG XINCHENG SCIENCE AND TECHNOLOGY INDUSTRIAL CO., LTD | MF72 2.5D-15                                                                                      | 7A, 240V,<br>Class C3                                               | UL 1434<br>IEC/EN 60539-1                | UL E469681<br>TUV R 50389270        |

| IEC 61558-2-16                |                                                                     |                 |                                         |                               |                               |
|-------------------------------|---------------------------------------------------------------------|-----------------|-----------------------------------------|-------------------------------|-------------------------------|
| Clause                        | Requirement + Test                                                  |                 | Result - Remark                         |                               | Verdict                       |
| (Alternative)                 | Guang Dong Hong Zhi Electronics Technology CO., Ltd                 | 2.5D-15         | 7A, 240V, Class C3                      | UL 1434                       | UL E319959                    |
| (Alternative)                 | Shantou High-New Technology Dev. Zone Songtian Enterprise Co., Ltd. | MF72 2.5D-15    | 7A, 240V, Class C3                      | UL1434<br>EN 60539-1          | UL E474052<br>VDE<br>40050168 |
| Bridge diode (BD1)            | Yangzhou Yangjie Electronic Technology Co., Ltd                     | GBU610          | Min. 1000V, min. 6A                     | IEC 61558-1<br>IEC 61558-2-16 | Tested with appliance         |
| (Alternative)                 | Interchangeable                                                     | Interchangeable | Min. 1000V, min. 6A                     | IEC 61558-1<br>IEC 61558-2-16 | Tested with appliance         |
| Electrolytic capacitors (EC1) | DONG GUAN SHI CHENG XING ELECTRONICS CO.,LTD                        | GL              | Min. 400V, max. 150 $\mu$ F, min. 105°C | IEC 61558-1<br>IEC 61558-2-16 | Tested with appliance         |
| (Alternative)                 | Interchangeable                                                     | Interchangeable | Min. 400V, max. 150 $\mu$ F, min. 105°C | IEC 61558-1<br>IEC 61558-2-16 | Tested with appliance         |
| Inductance (LF1)              | DONGGUAN YANGYI CITY ELECTRONIC CO.,LTD                             | T12*6*4         | 2mH, 130°C                              | IEC 61558-1<br>IEC 61558-2-16 | Tested with appliance         |
| (Alternative)                 | DONGGUAN QINGXI XKW ELECTRONIC FACTOR                               | T12*6*4         | 2mH, 130°C                              | IEC 61558-1<br>IEC 61558-2-16 | Tested with appliance         |
| (Alternative)                 | Dongguan Fengyue Electronics Co.,Ltd.                               | T12*6*4         | 2mH, 130°C                              | IEC 61558-1<br>IEC 61558-2-16 | Tested with appliance         |
| Transformer (T1)              | Sichuan Gangyuan Electronics Co Ltd                                 | GQ80B-T-3X      | Class B                                 | IEC 61558-1<br>IEC 61558-2-16 | Tested with appliance         |
| Insulation system             | Sichuan Gangyuan Electronics Co Ltd                                 | GY-130          | Class B 130°C                           | UL1446,                       | UL E534643                    |

| IEC 61558-2-16                 |                                                 |                      |                                           |                                          |                                   |
|--------------------------------|-------------------------------------------------|----------------------|-------------------------------------------|------------------------------------------|-----------------------------------|
| Clause                         | Requirement + Test                              |                      | Result - Remark                           |                                          | Verdict                           |
| - Bobbin                       | CHANG CHUN PLASTICS CO LTD                      | T375J, T200HF        | PMC, V-0, 150°C<br>Min.thickness:0.5 1mm  | UL94, UL746C, IEC 61558-1 IEC 61558-2-16 | UL E59481<br>Tested in appliance  |
| (Alternative)                  | SUMITOMO BAKELITE CO LTD                        | PM-9820              | PMC, V-0, 150°C<br>Min.thickness:0.5 1mm  | UL94, UL746C, IEC 61558-1 IEC 61558-2-16 | UL E41429<br>Tested in appliance  |
| - Insulation Tape              | SHEN ZHEN XINHUAHUI ELECTRONIC MATERIALS CO LTD | HMT803               | 130°C                                     | UL510, IEC 61558-1 IEC 61558-2-16        | UL E328315<br>Tested in appliance |
| (Alternative)                  | JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD  | PZ* (b)              | 130°C                                     | UL510, IEC 61558-1 IEC 61558-2-16        | UL E165111<br>Tested in appliance |
| (Alternative)                  | 3M COMPANY ELECTRICAL MARKETS DIV (EMD)         | 1350F-1 (b)          | 130°C                                     | UL510, IEC 61558-1 IEC 61558-2-16        | UL E17385<br>Tested in appliance  |
| -Magnet wire (Primary winding) | ZHEJIANG HONGBO TECHNOLOGY CO LTD               | xUEW/130, QA-x/130   | 130°C                                     | UL1446, IEC 61558-1 IEC 61558-2-16       | UL E221719<br>Tested in appliance |
| (Alternative)                  | CHENG DU SOUTH-WEST ELECTRIC LTD CO             | UEW, UEW-Y           | 155°C for model °C, 130°C for model UEW-Y | UL 1446 IEC 61558-1 IEC 61558-2-16       | UL E178366<br>Tested in appliance |
| (Alternative)                  | HUIZHOU GOLDEN OCEAN MAGNET WIRE FACTORY        | xUEW, UEW-x          | 130°C                                     | UL 1446 IEC 61558-1 IEC 61558-2-16       | UL E225143<br>Tested in appliance |
| (Alternative)                  | SHANTOU SHENGANG ELECTRICAL INDUSTRIAL CO. LTD  | xUEW/130, QA-x/130   | 130°C                                     | UL 1446 IEC 61558-1 IEC 61558-2-16       | UL E239508<br>Tested in appliance |
| (Alternative)                  | SHENZHEN DAYANG INDUSTRY CO LTD                 | xUEW-NY/180 xQAN/180 | 180°C                                     | UL 1446 IEC 61558-1 IEC 61558-2-16       | UL E176101<br>Tested in appliance |
| (Alternative)                  | Interchangeable                                 | Interchangeable      | Min. 130°C                                | UL1446, IEC 61558-1 IEC 61558-2-16       | UL<br>Tested in appliance         |

| IEC 61558-2-16                             |                                                     |                                                                                                        |                                       |                                     |                                |
|--------------------------------------------|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------|---------------------------------------|-------------------------------------|--------------------------------|
| Clause                                     | Requirement + Test                                  |                                                                                                        | Result - Remark                       |                                     | Verdict                        |
| -Varnish                                   | Tianyi Insulation Material (Shenzhen) Co Ltd        | MG209                                                                                                  | 130°C                                 | UL 1446, IEC 61558-1 IEC 61558-2-16 | UL E527258 Tested in appliance |
| (Alternative)                              | ELANTAS ELECTRICAL INSULATION ELANTAS PDG INC ()    | 468-2 (d), 468-2FC (d), 468-2-7-xxF (d), 468-2-7FC-xxF (d)                                             | Min. 155°C                            | UL 1446, IEC 61558-1 IEC 61558-2-16 | UL E75225 Tested in appliance  |
| (Alternative)                              | John C Dolph Co                                     | BC-346A, BC-346-A, BC-346B, BC-346-E, BB-348, BB-346-HF, BC-346HF, BG-346A, BB-346-A, BB-346/A, BC-370 | Min. 130°C                            | UL 1446, IEC 61558-1 IEC 61558-2-16 | UL E317427 Tested in appliance |
| -Triple insulated wire (Secondary winding) | FURUKAWA ELECTRIC CO LTD (E206440)                  | TEX-E, TEX-EA                                                                                          | 130°C                                 | UL 2353 EN/IEC 61558-1              | VDE 006735 UL E206440          |
| (Alternative)                              | TOTOKU ELECTRIC CO LTD (E166483)                    | TIW-3X\$                                                                                               | 155°C                                 | UL 2353, EN/IEC 61558-1             | UL E166483 VDE 40051888        |
| (Alternative)                              | DONGGUAN YU DAN ELECTRONIC TECHNOLOGY CO LTD        | YTW-B*                                                                                                 | Min. 130°C                            | UL 2353 EN/IEC 61558-1              | UL E486810 VDE 40052183        |
| -Tube                                      | DONGGUAN LING FREE HARDWARE PLASTICS PRODUCT CO LTD | LING FREE PTFE TUBE, LING FREE PTFE TUBE (300V)                                                        | 300V/600V. 200°C, VW-1                | UL 224, IEC 61558-1 IEC 61558-2-16  | UL E352366 Tested in appliance |
| (Alternative)                              | GREAT HOLDING INDUSTRIAL CO LTD                     | TFT, TFS                                                                                               | 300/600V. 200°C, VW-1                 | UL 224, IEC 61558-1 IEC 61558-2-16  | UL E156256 Tested in appliance |
| Output cord                                | HONGKONG XIE KANG INDUSTRIAL CO LTD                 | 2464, 2468, 1185                                                                                       | VW-1, Min 80°C, Min. 300V, Min. 20AWG | UL 758 IEC 61558-1 IEC 61558-2-16   | UL E315696                     |

| IEC 61558-2-16   |                                                 |                                                  |                                       |                                                  |                                     |
|------------------|-------------------------------------------------|--------------------------------------------------|---------------------------------------|--------------------------------------------------|-------------------------------------|
| Clause           | Requirement + Test                              |                                                  | Result - Remark                       |                                                  | Verdict                             |
| (Alternative)    | DONGGUAN FU WEI ELECTRONICS CO LTD              | 2464, 2468, 1185                                 | VW-1, Min 80°C, Min. 300V, Min. 20AWG | UL 758<br>IEC 61558-1<br>IEC 61558-2-16          | UL E485741                          |
| (Alternative)    | DONGGUAN HONGFUWEI CABLE TECHNOLOGY CO LTD      | 2464, 2468, 1185                                 | VW-1, Min 80°C, Min. 300V, Min. 20AWG | UL 758<br>IEC 61558-1<br>IEC 61558-2-16          | UL E316005                          |
| (Alternative)    | Chenzhou Xiangtian Electronic Technology        | 2464, 2468, 1185                                 | VW-1; Min 80°C; 300V; Min 20AWG       | UL758<br>IEC 61558-1<br>IEC 61558-2-16           | UL E527553                          |
| (Alternative)    | Fujian Xinyi United Electronic Materials Co Ltd | 2464, 2468, 1185                                 | VW-1; Min 80°C; 300V; Min 20AWG       | UL758<br>IEC 61558-1<br>IEC 61558-2-16           | UL E514452                          |
| (Alternative)    | SHENZHEN CITY WEITAIXING ELECTRONIC CO LTD      | 1185, 2464, 2468                                 | VW-1; Min 80°C; 300V; Min 20AWG       | UL758<br>IEC 61558-1<br>IEC 61558-2-16           | UL E481928                          |
| (Alternative)    | Henan CARVE Electronic Technology Co., Ltd.     | 2464                                             | VW-1; Min 80°C; 300V; Min 20AWG       | UL758<br>IEC 61558-1<br>IEC 61558-2-16           | UL E346485                          |
| (Alternative)    | Suzhou Dian Hang Electronic Co Ltd              | 1185, 2464, 2468                                 | VW-1; Min 80°C; 300V; Min 20AWG       | UL758<br>IEC 61558-1<br>IEC 61558-2-16           | UL E354173                          |
| (Alternative)    | DONG GUAN CHUANG XU WIRE CO.LTD                 | NISPT-1, NISPT-2, SPT-1, SPT-2, SPT-1W, SVT      | VW-1, Min 80°C, Min. 300V, Min. 20AWG | UL 62<br>IEC 61558-1<br>IEC 61558-2-16           | UL E497540                          |
| (Alternative)    | HONGKONG XIE KANG INDUSTRIAL CO LTD             | SJT, SVT, NISPT-1, NISPT-2, SPT-1, SPT-2, SPT-1W | VW-1, Min 80°C, Min. 300V, Min. 20AWG | UL 62<br>IEC 61558-1<br>IEC 61558-2-16           | UL E313344                          |
| (Alternative)    | Interchangeable                                 | Interchangeable                                  | VW-1, Min 80°C, Min. 300V, Min. 20AWG | UL 758<br>UL 62<br>IEC 61558-1<br>IEC 61558-2-16 | UL                                  |
| Output connector | KINGFA SCI & TECH CO LTD                        | PA66-RG301(##) (f1)                              | V-0, 125°C, Min. thickness 0.4mm      | UL 94<br>IEC 61558-1<br>IEC 61558-2-16           | UL E171666<br>Tested with appliance |

| IEC 61558-2-16                                                                                            |                                              |                         |                                      |                                        |                                     |
|-----------------------------------------------------------------------------------------------------------|----------------------------------------------|-------------------------|--------------------------------------|----------------------------------------|-------------------------------------|
| Clause                                                                                                    | Requirement + Test                           |                         | Result - Remark                      |                                        | Verdict                             |
| (Alternative)                                                                                             | DONGGUAN CITY FENG TONG PLASTIC CO LTD       | ST-PBT 301              | V-0;Min 75°C<br>Min. thickness 0.4mm | UL 94<br>IEC 61558-1<br>IEC 61558-2-16 | UL E352852<br>Tested with appliance |
| (Alternative)                                                                                             | DONGGUAN BEST PLASTIC CO LTD                 | PBT301-G20<br>PBT 4806B | V-0;Min 75°C<br>Min. thickness 0.4mm | UL 94<br>IEC 61558-1<br>IEC 61558-2-16 | UL E320069<br>Tested with appliance |
| (Alternative)                                                                                             | DONG GUAN YU CHUN PLASTICS TECHNOLOGY CO LTD | FR8330                  | V-0;Min 75°C<br>Min. thickness 0.4mm | UL 94<br>IEC 61558-1<br>IEC 61558-2-16 | UL E363107<br>Tested with appliance |
| Supplementary information:<br>1) Provided evidence ensures the agreed level of compliance. See OD-CB2039. |                                              |                         |                                      |                                        |                                     |

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

| 26                                             | TABLE: Clearance And Creepage Distance Measurements |              |                  |         |                   |          | P |
|------------------------------------------------|-----------------------------------------------------|--------------|------------------|---------|-------------------|----------|---|
| clearance cl and creepage distance dcr at/of:  | Up (V)                                              | U r.m.s. (V) | Required cl (mm) | cl (mm) | required dcr (mm) | dcr (mm) |   |
| L / N before F1 (BI)                           | 340                                                 | 240          | 2.3(1.5*1.48)    | 5.4     | 2.5               | 5.4      |   |
| Two poles of F1 (BI)                           | 340                                                 | 240          | 2.3(1.5*1.48)    | 4.8     | 2.5               | 4.8      |   |
| Two poles of CY1 on PCB trace (BI)             | 352                                                 | 255          | 2.3(1.5*1.48)    | 4.0     | 2.6               | 4.0      |   |
| Two poles of CY2 on PCB trace (SI)             | 352                                                 | 255          | 2.3(1.5*1.48)    | 4.0     | 2.6               | 4.0      |   |
| Two poles of CY1 to CY2 on PCB trace (DI)      | 352                                                 | 255          | 4.5(3.0*1.48)    | 8.0     | 5.2               | 8.0      |   |
| Two poles of CY3 on PCB trace (BI)             | 340                                                 | 240          | 2.3(1.5*1.48)    | 4.0     | 2.5               | 4.0      |   |
| Two poles of CY4 on PCB trace (SI)             | 340                                                 | 240          | 2.3(1.5*1.48)    | 4.0     | 2.5               | 4.0      |   |
| Two poles of CY3 to CY4 on PCB trace (DI)      | 340                                                 | 240          | 4.5(3.0*1.48)    | 8.0     | 5.0               | 8.0      |   |
| Two poles of U2 (RI)                           | 340                                                 | 240          | 4.5(3.0*1.48)    | 7.2     | 5.0               | 7.2      |   |
| Primary live part to accessible enclosure (RI) | 340                                                 | 240          | 4.5(3.0*1.48)    | >5.9    | 5.0               | >7.8     |   |

| IEC 61558-2-16                                                                                                                               |                    |     |               |                 |     |         |
|----------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-----|---------------|-----------------|-----|---------|
| Clause                                                                                                                                       | Requirement + Test |     |               | Result - Remark |     | Verdict |
| Primary trace to secondary trace under T1 on PCB bottom layer (RI)                                                                           | 464                | 296 | 4.5(3.0*1.48) | >5.9            | 6.0 | >7.8    |
| Core of T1 to secondary winding of T1 (RI)                                                                                                   | 464                | 296 | 4.5(3.0*1.48) | >5.9            | 6.0 | >7.8    |
| Primary winding of T1 to secondary winding of T1 (RI)                                                                                        | 464                | 296 | 4.5(3.0*1.48) | >5.9            | 6.0 | >7.8    |
| Supplementary information:<br>RI: Reinforced insulation; SI: Supplementary insulation, BI: Basic insulation, DI: Double insulation.<br>5000m |                    |     |               |                 |     |         |

| 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)       |
| Enclosure                                                            |                                                 | 240          | 3000             | ≥1.0             | Min. 0.51     |
| Tape of transformer                                                  |                                                 | 296          | 5000*            | 2 layers         | Min. 2 layers |
| Supplementary information: * means 5000Vac/2 layers insulation tape. |                                                 |              |                  |                  |               |

|                                                            |                                                                                                    |                 |                |                 |    |     |
|------------------------------------------------------------|----------------------------------------------------------------------------------------------------|-----------------|----------------|-----------------|----|-----|
| 26.2<br>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<br>2 x working voltage<br>between<br>pri / sec | 68 h at the<br>temperature acc.<br>Cl. 14<br>(min. 85 °C)                                          | 1 hour<br>25 °C | 2 hour<br>0 °C | 1 hour<br>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 |
|-------------|---------------------------------------------------------------------------|--|--|--|--|-----|
|-------------|---------------------------------------------------------------------------|--|--|--|--|-----|

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| Clause         | Requirement + Test | Result - Remark | Verdict |

| Test with three specially prepared specimens with potted – P1 values are required |                                                           |                 |                |                 |    |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------|-----------------|----------------|-----------------|----|
| cycles with<br>2 x working voltage<br>between<br>pri / sec                        | 68 h at the<br>temperature acc.<br>Cl. 14<br>(min. 85 °C) | 1 hour<br>25 °C | 2 hour<br>0 °C | 1 hour<br>25 °C |    |
| 1.                                                                                | --                                                        | --              | --             | --              | -- |
| 2.                                                                                | --                                                        | --              | --             | --              | -- |
| 3.                                                                                | --                                                        | --              | --             | --              | -- |
| 4.                                                                                | --                                                        | --              | --             | --              | -- |
| 5.                                                                                | --                                                        | --              | --             | --              | -- |
| 6.                                                                                | --                                                        | --              | --             | --              | -- |
| 7.                                                                                | --                                                        | --              | --             | --              | -- |
| 8.                                                                                | --                                                        | --              | --             | --              | -- |
| 9.                                                                                | --                                                        | --              | --             | --              | -- |
| 10.                                                                               | --                                                        | --              | --             | --              | -- |

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

| 26.3.5 | TABLE: CREEPAGE DISTANCES AND CLEARANCES AND DISTANCES THROUGH INSULATION |  |  |  |  | N/A |
|--------|---------------------------------------------------------------------------|--|--|--|--|-----|
|        | Test for transformers, use FIW-wire                                       |  |  |  |  |     |

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| Clause         | Requirement + Test | Result - Remark | Verdict |

| cycles with<br>2 x working voltage<br>between<br>pri / sec | 68 h at the<br>temperature acc.<br>Cl. 14<br>(min. 85 °C) | 1 hour<br>25 °C | 2 hour<br>0 °C | 1 hour<br>25 °C |    |
|------------------------------------------------------------|-----------------------------------------------------------|-----------------|----------------|-----------------|----|
| 1.                                                         | --                                                        | --              | --             | --              | -- |
| 2.                                                         | --                                                        | --              | --             | --              | -- |
| 3.                                                         | --                                                        | --              | --             | --              | -- |
| 4.                                                         | --                                                        | --              | --             | --              | -- |
| 5.                                                         | --                                                        | --              | --             | --              | -- |
| 6.                                                         | --                                                        | --              | --             | --              | -- |
| 7.                                                         | --                                                        | --              | --             | --              | -- |
| 8.                                                         | --                                                        | --              | --             | --              | -- |
| 9.                                                         | --                                                        | --              | --             | --              | -- |
| 10.                                                        | --                                                        | --              | --             | --              | -- |

|                                          |                                             |                       |                          |   |
|------------------------------------------|---------------------------------------------|-----------------------|--------------------------|---|
| 27.2                                     | TABLE: Ball Pressure Test of Thermoplastics |                       |                          | P |
| Allowed impression diameter (mm) ..... : |                                             | ≤ 2.0                 |                          | — |
| Object/ Part No./ Material               | Manufacturer/<br>trademark                  | Test temperature (°C) | Impression diameter (mm) |   |
| PCB                                      | Ref. to table 20                            | 125                   | 0.86                     |   |
| Bobbin                                   | Ref. to table 20                            | 125                   | 1.12                     |   |
| Supplementary information:               |                                             |                       |                          |   |

| 27.4                                                                                | TABLE: Resistance to heat and fire - Glow wire tests |                            |     |    |     |    |          | P       |
|-------------------------------------------------------------------------------------|------------------------------------------------------|----------------------------|-----|----|-----|----|----------|---------|
| Object/<br>Part No./<br>Material                                                    | Manufacturer<br>/<br>trademark                       | Glow wire test (GWT); (°C) |     |    |     |    |          | Verdict |
|                                                                                     |                                                      | 550                        | 650 |    | 750 |    | 850      |         |
|                                                                                     |                                                      |                            | te  | ti | te  | ti |          |         |
| Enclosure                                                                           | See table 20                                         | --                         | 0   | 0  | --  | -- | --       | P       |
| Output terminal                                                                     | See table 20                                         | --                         | --  | -- | 0   | 0  | No flame | P       |
| PCB                                                                                 | See table 20                                         | --                         | --  | -- | 0   | 0  | No flame | P       |
| Bobbin of transformer (T1)                                                          | See table 20                                         | --                         | --  | -- | 0   | 0  | No flame | P       |
| Ignition of the specified layer placed underneath the test specimen (Yes/No)..... : |                                                      |                            |     |    |     |    |          |         |
| Supplementary information:                                                          |                                                      |                            |     |    |     |    |          |         |

|                |                                                     |          |
|----------------|-----------------------------------------------------|----------|
| <b>Annex H</b> | <b>TABLE: short-circuit and overload protection</b> | <b>P</b> |
|----------------|-----------------------------------------------------|----------|

| IEC 61558-2-16 |                                                                     |                    |                   |                 |                                                                                                                                                                             |
|----------------|---------------------------------------------------------------------|--------------------|-------------------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Clause         | Requirement + Test                                                  |                    |                   | Result - Remark |                                                                                                                                                                             |
|                | Power source for EUT: Manufacturer, model/type, output rating ..... |                    |                   | 25.0            | —                                                                                                                                                                           |
|                | Ambient temperature (°C) .....                                      |                    |                   | 90/264          | —                                                                                                                                                                           |
| Comonent No.   | Fault                                                               | Supply voltage (V) | Input current (A) | Test time       | Observation                                                                                                                                                                 |
| Output         | SC                                                                  | 264VAC             | 0.077             | 10min           | Unit shut down, recoverable, no visible defect on enclosure.                                                                                                                |
| T1 pin1-4      | SC                                                                  | 264VAC             | 0.077             | 10min           | Unit shut down, recoverable, no visible defect on enclosure.                                                                                                                |
| T1 pin5-6      | SC                                                                  | 264VAC             | 0.077             | 10min           | Unit shut down, recoverable, no visible defect on enclosure.                                                                                                                |
| T1 pin8-9      | SC                                                                  | 264VAC             | 0.077             | 10min           | Unit shut down, recoverable, no visible defect on enclosure.                                                                                                                |
| D8             | SC                                                                  | 264VAC             | 0.077             | 10min           | Unit shut down, recoverable, no visible defect on enclosure.                                                                                                                |
| EC3            | SC                                                                  | 264VAC             | 0.077             | 10min           | Unit shut down, recoverable, no visible defect on enclosure.                                                                                                                |
| U2 pin1-2      | SC                                                                  | 264VAC             | 0.074             | 10min           | Unit shut down, recoverable, no visible defect on enclosure.                                                                                                                |
| U2 pin3-4      | SC                                                                  | 264VAC             | 0.074             | 10min           | Unit shut down, recoverable, no visible defect on enclosure.                                                                                                                |
| U2 pin 1       | OC                                                                  | 264VAC             | 0.074             | 10min           | Unit shut down, recoverable, no visible defect on enclosure.                                                                                                                |
| Q1<br>Pin G-S  | SC                                                                  | 264VAC             | 0.074             | 10min           | Unit shut down, recoverable, no visible defect on enclosure.                                                                                                                |
| Q1<br>Pin D-S  | SC                                                                  | 264VAC             | 0                 | 1s              | Current fuse F1 opened immediately with Current fuse F1 open current exceeding 2.75 times resistors link rated current, repeated 10 times, had same test result, no hazard. |
| Q1<br>Pin G-D  | SC                                                                  | 264VAC             | 0                 | 1s              | Current fuse F1 opened immediately with Current fuse F1 open current exceeding 2.75 times resistors link rated current, repeated 10 times, had same test result, no hazard. |
| U1<br>pin 2-5  | SC                                                                  | 264VAC             | 0.074             | 10min           | Unit shut down, recoverable, no visible defect on enclosure.                                                                                                                |
| U1<br>pin 2-6  | SC                                                                  | 264VAC             | 0.074             | 10min           | Unit shut down, recoverable, no visible defect on enclosure.                                                                                                                |
| EC1            | SC                                                                  | 264VAC             | 0                 | 1s              | Current fuse F1 opened immediately with Current fuse F1 open current exceeding 2.75 times resistors link rated current, repeated 10 times, had same test result, no hazard. |
| BD1<br>pin1-2  | SC                                                                  | 264VAC             | 0                 | 1s              | Current fuse F1 opened immediately with Current fuse F1 open current exceeding 2.75 times resistors link rated current, repeated 10 times, had same test result, no hazard. |

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|----------------------------|--------------------|--------|-------|-------|--------------------------------------------------------|---------|
| Clause                     | Requirement + Test |        |       |       | Result - Remark                                        | Verdict |
| R28                        | SC                 | 264VAC | 0.695 | 10min | Unit normal operation, no visible defect on enclosure. |         |
| Supplementary information: |                    |        |       |       |                                                        |         |

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|----------------|--------------------|-----------------|---------|
| Clause         | Requirement + Test | Result - Remark | Verdict |

|           |                                                                                                                       |                                                                                                    |     |
|-----------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|-----|
| <b>AA</b> | <b>Annex AA</b>                                                                                                       |                                                                                                    | N/A |
|           | Partial discharge (PD) test                                                                                           |                                                                                                    | N/A |
|           |                                                                                                                       |                                                                                                    | N/A |
| <b>BB</b> | <b>Annex BB</b>                                                                                                       |                                                                                                    | 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                                                                                                |               | N/A |
|           | Equipment of overvoltage category I                                                                                   |               | N/A |
|           | Equipment of overvoltage category II                                                                                  |               | N/A |

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

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|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------|
| Clause         | Requirement + Test                                                                                                                                                | Result - Remark                                                                      | Verdict |
|                | 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)                                                              |   | N/A     |
|                | SMPS incorporating a Fail-safe auto-transformer                                                                                                                   |   | N/A     |
|                | SMPS incorporating a Non-short-circuit proof auto-transformer                                                                                                     |   | N/A     |
|                | SMPS incorporating a Short-circuit proof auto-transformer (inherently or non-inherently)                                                                          |  | N/A     |
| BB.9           | PROTECTION AGAINST ELECTRIC SHOCK                                                                                                                                 |                                                                                      | 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.14.3.2      | – heat run (temperature in table 4)                                                                                                                               |                                                                                      | N/A     |

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|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause         | Requirement + Test                                                                                                                                                                                             | Result - Remark | Verdict |
| BB.14.3.3      | – vibration test: 30 min; amplitude 0,35 mm; frequency range: 10 Hz, 55 Hz, 10 Hz                                                                                                                              |                 | N/A     |
| BB.14.3.4      | – moisture treatment (48 h, 17.2)                                                                                                                                                                              |                 | N/A     |
| BB.14.3.5      | Measurements and tests at the beginning and after each test:                                                                                                                                                   |                 | N/A     |
|                | – deviation of the no-load input current, measured at the beginning of the test less than 30%                                                                                                                  |                 | N/A     |
|                | – insulation resistance acc. Cl.18.1 and 18.2                                                                                                                                                                  |                 | N/A     |
|                | – electric strength, no breakdown (18.3 and 18.4); 2 min; test voltage 35% of specified value                                                                                                                  |                 | N/A     |
|                | – Transformers (50 or 60 Hz version) are tested after the dielectric strength test as follows: under no load; duration: 5 min; Upri(V):1,2 times rated supply voltage; frequency (Hz): 2 times rated frequency |                 | N/A     |
| BB.15          | SHORT-CIRCUIT AND OVERLOAD PROTECTION                                                                                                                                                                          |                 | 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 $\geq 2 \text{ M}\Omega$                                                                                                                                            |                 | N/A     |
|                | – live parts and body for reinforced insulation $\geq 7 \text{ M}\Omega$                                                                                                                                       |                 | N/A     |
|                | – input circuits and output circuits for basic insulation $\geq 2 \text{ M}\Omega$                                                                                                                             |                 | N/A     |
|                | – input circuits and output circuits for double or reinforced insulation $\geq 5 \text{ M}\Omega$                                                                                                              |                 | N/A     |
|                | – each input circuit and all other input circuits connected together $\geq 2 \text{ M}\Omega$                                                                                                                  |                 | N/A     |
|                | – each output circuit and all other output circuits connected together $\geq 2 \text{ M}\Omega$                                                                                                                |                 | N/A     |
|                | – hazardous live parts and metal parts with basic insulation (Class II transformers) $\geq 2 \text{ M}\Omega$                                                                                                  |                 | N/A     |
|                | – body and metal parts with basic insulation (Class II transformers) $\geq 5 \text{ M}\Omega$                                                                                                                  |                 | N/A     |
|                | – metal foil in contact with inner and outer surfaces of enclosures $\geq 2 \text{ M}\Omega$                                                                                                                   |                 | N/A     |
| BB.18.3        | Electric strength test (1 min): no flashover or breakdown:                                                                                                                                                     |                 | N/A     |

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

| IEC 61558-2-16 |                                                                                                                                                                                                    |                 |         |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause         | Requirement + Test                                                                                                                                                                                 | Result - Remark | Verdict |
| BB.19.1.3      | Separating transformers                                                                                                                                                                            |                 | N/A     |
| BB.19.1.3.1    | Input and output circuits electrically separated.                                                                                                                                                  |                 | N/A     |
| BB.19.1.3.2    | The insulation between input and output winding(s) consist of basic insulation                                                                                                                     |                 | N/A     |
|                | Class I transformer                                                                                                                                                                                |                 | N/A     |
|                | – Insulation between input windings and body consist of basic insulation                                                                                                                           |                 | N/A     |
|                | – Insulation between output windings and body consist of basic insulation                                                                                                                          |                 | N/A     |
|                | Class II transformer                                                                                                                                                                               |                 | N/A     |
|                | – Insulation between input windings and body consist of double or reinforced insulation                                                                                                            |                 | N/A     |
|                | – Insulation between output windings and body consist of double or reinforced insulation                                                                                                           |                 | N/A     |
| BB.19.1.3.3    | The insulation between input windings and intermediate conductive parts and the output windings and intermediate part consist of basic insulation                                                  |                 | N/A     |
|                | For class I SMPS the insulation between input and output windings via the intermediate conductive parts consist of basic insulation                                                                |                 | N/A     |
|                | For class II SMPS the insulation between input winding and the body and between the output windings and the body via the intermediate conductive parts consist of double or reinforced insulation. |                 | N/A     |
| BB.19.1.3.4    | Parts of output circuits may be connected to protective earth                                                                                                                                      |                 | N/A     |
| BB.19.1.3.5    | No direct contact between output circuits and the body, unless:                                                                                                                                    |                 | N/A     |
|                | – Allowed for associated transformers by the equipment standard                                                                                                                                    |                 | N/A     |
| BB.19.1.4      | Isolating transformers and safety isolating transformers                                                                                                                                           |                 | N/A     |
| BB.19.1.4.1    | Input and output circuits electrically separated                                                                                                                                                   |                 | N/A     |
|                | No possibility of any connection between these circuits                                                                                                                                            |                 | N/A     |
| BB.19.1.4.2    | The insulation between input and output winding(s) consist of double or reinforced insulation (exception see 19.1.4.4)                                                                             |                 | N/A     |

| IEC 61558-2-16 |                                                                                                                                                                                                                                                                                                |                 |         |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause         | Requirement + Test                                                                                                                                                                                                                                                                             | Result - Remark | Verdict |
|                | Class I transformers <b>not</b> 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                                                                                                                                                                                                                                                                          |                 | 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     |

| IEC 61558-2-16 |                                                                                                                                                                                         |                 |         |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause         | Requirement + Test                                                                                                                                                                      | Result - Remark | Verdict |
|                | – 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, <b>not</b> connected to the mains by a plug the following conditions comply:                                                          |                 | N/A     |
|                | – The insulation between input winding and protective screen consist of basic insulation (rated input voltage)                                                                          |                 | N/A     |
|                | – The insulation between output winding and protective screen consist of basic insulation (rated output voltage)                                                                        |                 | N/A     |
|                | – The protective screen consist of metal foil or a wire wound screen extending the full width of the windings and has no gaps or holes                                                  |                 | N/A     |
|                | – Where the protective screen does not cover the entire width of the input winding, additional insulation to ensure double insulation in this area, is used.                            |                 | N/A     |
|                | – If the screen is made by a foil, the turns are isolated, overlap at least 3 mm                                                                                                        |                 | N/A     |
|                | – The cross-section of the screen and the lead out wire is at least corresponding to the rated current of the overload device                                                           |                 | N/A     |
|                | – The lead out wire is soldered or fixed to the protective screen.                                                                                                                      |                 | N/A     |
|                | For transformers for connection to the mains by the means of a plug of any type (incorporating or not), the alternative with basic insulation plus protective screening is not allowed. |                 | N/A     |
| BB.19.1.4.5    | No connection between output circuit and protective earth, except of associated transformers (allowed by equipment standard) or 19.8 is fulfilled.                                      |                 | N/A     |
| BB.19.1.4.6    | No connection between output circuit and body, except of associated transformers (allowed by equipment standard)                                                                        |                 | N/A     |
| BB.19.1.4.7    | The distance between input and output terminals for the connection of external wiring is $\geq 25$ mm                                                                                   |                 | N/A     |

| IEC 61558-2-16 |                                                                                                                                      |                 |         |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause         | Requirement + Test                                                                                                                   | Result - Remark | Verdict |
| BB.19.1.4.8    | Portable transformers having an rated output $\leq 630$ VA shall be class II.                                                        |                 | N/A     |
| BB.19.1.4.9    | No connection between output circuit and body except of associated transformers (allowed by equipment standard)                      |                 | N/A     |
| BB.19.1.4.10   | Protective screening is not allowed for transformers with plug connection to the mains                                               |                 | N/A     |
| BB.19.12       | Winding construction                                                                                                                 |                 | N/A     |
| BB.19.12.1     | Undue displacement in all types of transformers not allowed:                                                                         |                 | N/A     |
|                | – of input or output windings or turns thereof                                                                                       |                 | N/A     |
|                | – of internal wiring or wires for external connection                                                                                |                 | N/A     |
|                | – of parts of windings or of internal wiring in case of rupture or loosening                                                         |                 | N/A     |
| BB.19.12.2     | Serrated tape:                                                                                                                       |                 | N/A     |
|                | – distance through insulation according to table 22                                                                                  |                 | N/A     |
|                | – one additional layer of serrated tape, and                                                                                         |                 | N/A     |
|                | – one additional layer without serration                                                                                             |                 | N/A     |
|                | – in case of cheek less bobbins the end turns of each layer shall be prevented from being displaced                                  |                 | N/A     |
| BB.19.12.3     | Insulated windings wires providing basic, supplementary or reinforced insulation, meet the following requirements:                   |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>Multi-layer extruded or spirally wrapped insulation, passed the tests of annex K</li> </ul>   |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>Basic insulation: two wrapped or one extruded wire</li> </ul>                                 |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>Supplementary insulation: two layers, wrapped or extruded</li> </ul>                          |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>Reinforced insulation: three layers wrapped or extruded</li> </ul>                            |                 | N/A     |
|                | Spirally wrapped insulation:                                                                                                         |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>creepage distances between wrapped layers &gt; cl. 26 _ P1 values</li> </ul>                  |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>path between wrapped layers sealed, the test voltage of K2 is multiplied with 1,35</li> </ul> |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>test 26.2.4 – Test A, passed for wrapped layers</li> </ul>                                    |                 | N/A     |

| IEC 61558-2-16 |                                                                                                                                                                                                                            |                 |         |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause         | Requirement + Test                                                                                                                                                                                                         | Result - Remark | Verdict |
|                | <ul style="list-style-type: none"> <li>the finished component pass the electric strength test according to cl. 18.3</li> </ul>                                                                                             |                 | N/A     |
| a)             | Insulated winding wire used for basic or supplementary insulation in a wound part:                                                                                                                                         |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>comply with annex K</li> </ul>                                                                                                                                                      |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>two layers for supplementary insulation</li> </ul>                                                                                                                                  |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>one layer for basic insulation</li> </ul>                                                                                                                                           |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>one layer for mechanical separation between the insulated wires of primary and secondary. This layer fulfils the requirement of basic insulation.</li> </ul>                        |                 | N/A     |
| b)             | Insulated winding wire used for reinforced insulation in a wound part:                                                                                                                                                     |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>comply with annex K</li> </ul>                                                                                                                                                      |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>three layers</li> </ul>                                                                                                                                                             |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>relevant dielectric strength test of 18.3</li> </ul>                                                                                                                                |                 | N/A     |
|                | Where the insulated winding wire is wound:                                                                                                                                                                                 |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>upon metal or ferrite cores</li> </ul>                                                                                                                                              |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>upon enamelled wire</li> </ul>                                                                                                                                                      |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>under enamelled wire</li> </ul>                                                                                                                                                     |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>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.</li> </ul> |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>both windings shall not touch each other and also not the core.</li> </ul>                                                                                                          |                 | N/A     |
|                | 100 % routine test of Annex K3 of part 1 is fulfilled                                                                                                                                                                      |                 | N/A     |
|                | no creepage distances and clearances for insulated winding wires                                                                                                                                                           |                 | N/A     |
| c)             | Toroidal cores used with TIW wires for double or reinforced insulation between the primary and secondary circuits shall comply with the following:                                                                         |                 | N/A     |
|                | 1) a coating which fulfils the requirements of basic insulation between a winding and the core                                                                                                                             |                 | N/A     |

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

| IEC 61558-2-16 |                                                                                                                                                                                                                                                                                                                                                                    |                 |         |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause         | Requirement + Test                                                                                                                                                                                                                                                                                                                                                 | Result - Remark | Verdict |
|                | 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:<br>4.1) Primary winding consists of enamelled wire, secondary winding consists of FIW wire for reinforced insulation<br>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     |
|                | <ul style="list-style-type: none"> <li>other nominal diameter as mentioned in table 24 can be calculated with the Formula (6) in 26.3.5:</li> </ul>                                                                                                                                                                                                                |                 | N/A     |
|                | FIW wire used for basic or supplementary insulation for transformers according 19.1.3:                                                                                                                                                                                                                                                                             |                 | N/A     |

| IEC 61558-2-16 |                                                                                                                                                                                                                          |                 |         |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause         | Requirement + Test                                                                                                                                                                                                       | Result - Remark | Verdict |
|                | <ul style="list-style-type: none"> <li>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</li> </ul>                     |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>one layer for mechanical separation is located between the insulated wires of primary and secondary. This layer fulfil the requirement of basic insulation</li> </ul>             |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>between FIW and enamelled wire, no requirements of creepage distances and clearances</li> </ul>                                                                                   |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>no touch of FIW and enamelled wires</li> </ul>                                                                                                                                    |                 | N/A     |
|                | FIW wire used for double or reinforced insulation for transformers according 19.1.4:                                                                                                                                     |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>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</li> </ul>                     |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>for primary and secondary winding FIW-wire for basic insulation is used</li> </ul>                                                                                                |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>one layer for mechanical separation is located between the insulated wires of primary and secondary. This layer fulfil the requirement of basic insulation</li> </ul>             |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>no touch between the basic insulated PRI and SEC FIW-wires</li> </ul>                                                                                                             |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>between PRI- and SEC-FIW wires, no requirements of creepage distances and clearances</li> </ul>                                                                                   |                 | N/A     |
|                | Alternative construction used for reinforced insulation (reinforced insulated FIW wire and enamelled wire)                                                                                                               |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>the test voltage of table 14, based on the working voltage reinforced insulation, comply with the min. voltage strength of table 24</li> </ul>                                    |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>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</li> </ul> |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>no touch between the FIW wire and the enamelled wire</li> </ul>                                                                                                                   |                 | N/A     |

| IEC 61558-2-16 |                                                                                                                                                                                                                            |                 |         |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause         | Requirement + Test                                                                                                                                                                                                         | Result - Remark | Verdict |
|                | <ul style="list-style-type: none"> <li>between the reinforced FIW wire and any other parts, no requirements of creepage distances and clearances exist</li> </ul>                                                          |                 | N/A     |
|                | Alternative construction with FIW wires, basic or supplementary insulated for transformers with double or reinforced insulation:                                                                                           |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>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</li> </ul>                       |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>PRI or SEC basic insulated FIW wire and to the other winding (enamelled wire) requirements of supplementary insulation</li> </ul>                                                   |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>creepage distances and clearances between the basic insulated FIW wire and the enamelled wire for basic or supplementary insulation are required.</li> </ul>                        |                 | N/A     |
|                | Where the FIW wire is wound                                                                                                                                                                                                |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>upon metal or ferrite cores</li> </ul>                                                                                                                                              |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>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.</li> </ul> |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>both windings shall not touch each other and also not the core.</li> </ul>                                                                                                          |                 | 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     |
| 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      | General                                                                                                                                                                                                                    |                 | N/A     |
|                | The creepage distance and clearance values are shown in Table 20 and Table 21.                                                                                                                                             |                 | N/A     |
| BB.26.2.2      | Windings covered with adhesive tape                                                                                                                                                                                        |                 | N/A     |
|                | <ul style="list-style-type: none"> <li>all insulating materials are classified according to IEC 60085 and IEC 60216 (all parts);</li> </ul>                                                                                |                 | N/A     |

| IEC 61558-2-16 |                                                                                                                                                                                         |                      |         |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------|
| Clause         | Requirement + Test                                                                                                                                                                      | Result - Remark      | Verdict |
|                | – the impulse voltage dielectric test of 6.1.2.2.1 of IEC 60664-1:2007 is fulfilled; and                                                                                                |                      | N/A     |
|                | – test A of 26.2.4 is fulfilled                                                                                                                                                         |                      | N/A     |
| BB.26.2.3      | Uncemented insulating parts pollution degree P2 or P3                                                                                                                                   |                      | N/A     |
|                | – all isolating material are classified acc. To IEC 60085 and IEC 60216                                                                                                                 |                      | N/A     |
|                | – values of pollution degree 1 are not applicable                                                                                                                                       |                      | N/A     |
| BB.26.2.4      | Cemented insulating parts                                                                                                                                                               |                      | N/A     |
|                | – all isolating materials are classified acc. To IEC 60085 and IEC 60216                                                                                                                |                      | N/A     |
|                | – values of distance through insulation (dti) are fulfilled                                                                                                                             |                      | N/A     |
|                | – creepage distances and clearances are not required                                                                                                                                    |                      | N/A     |
|                | – test A of this sub clause is fulfilled                                                                                                                                                |                      | N/A     |
|                | Test A                                                                                                                                                                                  |                      | N/A     |
|                | – thermal class                                                                                                                                                                         |                      | N/A     |
|                | – working voltage                                                                                                                                                                       |                      | N/A     |
|                | – Test with three specially specimens, with uninsulated wires, without impregnation or potting                                                                                          | (see appended table) | N/A     |
|                | Two of the three specimens are subjected to:                                                                                                                                            |                      | N/A     |
|                | – the relevant humidity treatment according to 17.2 (48 h)                                                                                                                              |                      | N/A     |
|                | – the relevant dielectric strength test of 18.3 multiplied with factor 1,35                                                                                                             |                      | N/A     |
|                | – One of the three specimens is subjected to the relevant dielectric strength test of 18.3 multiplied by the factor 1,35 immediately at the end of the last cycle with high temperature |                      | N/A     |
|                | Impulse dielectric test according to 6.1.2.2.1 of IEC 60664-1:2007 – see Annex R of IEC 61558-1                                                                                         |                      | N/A     |
| BB.26.2.5      | Enclosed parts, by impregnation or potting                                                                                                                                              |                      | N/A     |
| BB.26.2.5.1    | – The requirements of reduced values as stated for pollution degree 1 (P1) are fulfilled                                                                                                |                      | N/A     |
|                | – all isolating materials are classified acc. To IEC 60085 and IEC 60216                                                                                                                |                      | N/A     |

| IEC 61558-2-16 |                                                                                                                                                                                         |                      |         |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------|
| Clause         | Requirement + Test                                                                                                                                                                      | Result - Remark      | Verdict |
|                | 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     |
| BB.26.2.5.2    | – The requirements of distance through insulation (dti) are fulfilled. (P1 values are not required)                                                                                     |                      | N/A     |
|                | – all isolating materials are classified acc. To IEC 60085 and IEC 60216                                                                                                                |                      | N/A     |
|                | Test C                                                                                                                                                                                  |                      | N/A     |
|                | – thermal class                                                                                                                                                                         |                      | N/A     |
|                | – working voltage                                                                                                                                                                       |                      | N/A     |
|                | – Test with three specimens, potted or impregnated. (finished components)                                                                                                               | (see appended table) | N/A     |
|                | – Neither cracks, nor voids in the insulating compounds                                                                                                                                 |                      | N/A     |
|                | Two of the three specimens are subjected to:                                                                                                                                            |                      | N/A     |
|                | – the relevant humidity treatment according to 17.2 (48 h)                                                                                                                              |                      | N/A     |
|                | – the relevant dielectric strength test of 18.3 multiplied with factor 1,35                                                                                                             |                      | N/A     |
|                | – One of the three specimens is subjected to the relevant dielectric strength test of 18.3 multiplied by the factor 1,35 immediately at the end of the last cycle with high temperature |                      | N/A     |

| IEC 61558-2-16 |                                                                                                                                                 |                 |         |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause         | Requirement + Test                                                                                                                              | Result - Remark | Verdict |
|                | The three spacemen pass the Impulse dielectric test according to 4.1.1.2.1 of IEC 60 664-1 (1,2 / 50 s waveform) – see Annex R of IEC 61558-1   |                 | N/A     |
| BB.26.3        | Distance through insulation                                                                                                                     |                 | N/A     |
| BB.26.3.1      | For supplementary, double or reinforced insulation, the required values of Tables 22 are fulfilled                                              |                 | N/A     |
|                | The insulation fulfil the material classification according IEC 60085 and 60216(all parts) or the test of 14.3                                  |                 | N/A     |
| BB.26.3.2      | Reduced values of the thickness of insulation for supplementary or reinforced insulation are allowed if the following conditions are fulfilled: |                 | N/A     |
|                | – the isolating materials are classified acc. To IEC 60085 and IEC 60216                                                                        |                 | N/A     |
|                | – the test of 14.3 is fulfilled                                                                                                                 |                 | N/A     |
|                | – If both requirements are fulfilled, the required values for solid insulation can be multiplied by 0,4                                         |                 | N/A     |
|                | – Minimum thickness of reinforced insulation $\geq 0,2$ mm                                                                                      |                 | N/A     |
|                | – Minimum thickness of supplementary insulation $\geq 0,1$ mm                                                                                   |                 | N/A     |
| BB.26.3.3      | Insulation in thin sheet form                                                                                                                   |                 | N/A     |
|                | – If the layers are non-separable (glued together):                                                                                             |                 | N/A     |
|                | – The requirement of 3 layers is fulfilled                                                                                                      |                 | N/A     |
|                | – The mandrel test according 26.3.4 is fulfilled with 150 N                                                                                     |                 | N/A     |
|                | – The required values for d.t.i. of thin layers in Tables 22 is fulfilled.                                                                      |                 | N/A     |
|                | – If the layers are separated:                                                                                                                  |                 | N/A     |
|                | – The requirement of 2 layers is fulfilled                                                                                                      |                 | N/A     |
|                | – If serrated tape is used, 1 additional layer (serrated) and one additional layer without serration is required                                |                 | N/A     |
|                | – The mandrel test according 26.3.4 is fulfilled on each layer with $50 \pm 5$ N                                                                |                 | N/A     |
|                | – The required values for d.t.i. of thin layers in Tale 22 is fulfilled.                                                                        |                 | N/A     |
|                | – If the layers are separated (alternative:                                                                                                     |                 | N/A     |

| IEC 61558-2-16 |                                                                                                                                                                                     |                 |         |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause         | Requirement + Test                                                                                                                                                                  | Result - Remark | Verdict |
|                | - The requirement of 3 layers is fulfilled                                                                                                                                          |                 | N/A     |
|                | - If serrated tape is used, 1 additional layer (serrated) and one additional layer without serration is required                                                                    |                 | N/A     |
|                | - The mandrel test according 26.3.4 is fulfilled on 2/3 of the layers with 100±5 N                                                                                                  |                 | N/A     |
|                | - The required values for d.t.i. of thin layers in Tale 22 is fulfilled.                                                                                                            |                 | N/A     |
|                | Test according to 14.3 and if the isolating materials are classified acc. To IEC 60085 and IEC 60216 no distances through insulation are required for insulation in thin sheet form |                 | N/A     |
|                | The values for thin layers are used for insulation in thin sheet form as follows:                                                                                                   |                 | N/A     |
|                | - rated output > 100 VA values for thin layers apply                                                                                                                                |                 | N/A     |
|                | - rated output ≥ 25 VA and ≤ 100 VA 2/3 of the values for thin layers apply                                                                                                         |                 | N/A     |
|                | - rated output < 25 VA 1/3 of the values for thin layers apply                                                                                                                      |                 | N/A     |
| BB.26.3.4      | Mandrel test of insulation in thin sheet form (specimen of 70±0,5 mm width are necessary):                                                                                          |                 | N/A     |
|                | - If the layers are non-separable – at least 3 layers glued together fulfil the test:                                                                                               |                 | N/A     |
|                | - pull force of 150 N                                                                                                                                                               |                 | N/A     |
|                | - high voltage test of 5,0 Kv or the test voltage of 18.3 multiplied by 1,25 whatever is the greater. No flashover, no breakdown.                                                   |                 | N/A     |
|                | - If the layers are separable and 2/3 of at least 3 layers fulfil the test.                                                                                                         |                 | N/A     |
|                | - pull force of 100 N                                                                                                                                                               |                 | N/A     |
|                | - high voltage test of 5,0 Kv or the test voltage of 18.3 multiplied by 1,25 whatever is the greater. No flashover, no breakdowns.                                                  |                 | N/A     |
|                | - If the layers are separable 1 of at least 2 layers fulfil the test:                                                                                                               |                 | N/A     |
|                | - pull force of 50 N                                                                                                                                                                |                 | N/A     |
|                | - high voltage test of 5,0 Kv or the test voltage of 18.3 multiplied by 1,25 whatever is the greater. No flashover, no breakdown.                                                   |                 | N/A     |

| IEC 61558-2-16 |                                                                                                                                                                                                                                                                                                                                                                                                                    |                      |         |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------|
| Clause         | Requirement + Test                                                                                                                                                                                                                                                                                                                                                                                                 | Result - Remark      | Verdict |
| BB.26.101      | Creepage distances and distances through insulation given in Table 21, Table 22 and Table 23 of IEC 61558-1:2017 are generally applicable (IEC 61558-2-16: 2021)                                                                                                                                                                                                                                                   | (see appended table) | N/A     |
| BB.26.102      | In compliance with IEC 60664-4:2005, the requirements of 26.103 to 26.106 for creepage distances, clearances and solid insulation are required above 30 kHz and up to the frequency of 3 MHz. For frequencies above 3 MHz, the tests in accordance with 7.4 and 7.5 of IEC 60664-4:2005, high-frequency testing (high-frequency high-voltage test and high-frequency partial discharge test) shall be carried out. |                      | N/A     |
| BB.26.103      | Clearance (IEC 61558-2-16:2021)                                                                                                                                                                                                                                                                                                                                                                                    |                      | N/A     |
|                | a.) Clearance for frequency $\geq 30$ kHz according figure 101 two determinations are necessary:                                                                                                                                                                                                                                                                                                                   |                      | N/A     |
|                | determination based on the rated impulse voltage of the rated supply voltage in accordance with Table 103 and Table 104.                                                                                                                                                                                                                                                                                           |                      | N/A     |
|                | determination based on the measured peak working voltage in accordance with Table 106.                                                                                                                                                                                                                                                                                                                             |                      | N/A     |
|                | b.) Clearance for frequency $\leq 30$ kHz according figure 101 two determinations are necessary:                                                                                                                                                                                                                                                                                                                   |                      | N/A     |
|                | – determination based on the rated impulse voltage of the rated supply voltage in accordance with Table 103 and Table 104.                                                                                                                                                                                                                                                                                         |                      | N/A     |
|                | – determination based on the measured peak working voltage in accordance with Table 105.                                                                                                                                                                                                                                                                                                                           |                      | N/A     |
| BB.26.104      | The working voltages of Table 105 and Table 106 for determination of clearances are peak working voltages. (IEC 61558-2-16: 2021)                                                                                                                                                                                                                                                                                  |                      | N/A     |
|                | All peak working voltages including $\mu$ s-peaks shall be used to determine clearances in accordance with Table 105 and Table 106.                                                                                                                                                                                                                                                                                |                      | N/A     |
| BB.26.105      | Creepage distances (IEC 61558-2-16: 2021)                                                                                                                                                                                                                                                                                                                                                                          |                      | N/A     |
|                | Two determinations of creepage distances are necessary (see Figure 102)                                                                                                                                                                                                                                                                                                                                            |                      | N/A     |
|                | – determination based on the measured RMS working voltage in accordance with Table 21 of IEC 61558-1:2017;                                                                                                                                                                                                                                                                                                         |                      | N/A     |
|                | determination based on the measured peak working voltage in accordance with Table 107 to Table 112 and the fundamental frequency shall be considered                                                                                                                                                                                                                                                               |                      | N/A     |

| IEC 61558-2-16 |                                                                                                                                                                                                                |                 |         |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause         | Requirement + Test                                                                                                                                                                                             | Result - Remark | Verdict |
|                | A high-frequency RMS ripple voltage content not more than 10% can be neglected.                                                                                                                                |                 | N/A     |
|                | The values in Table 107 to Table 112 do not take into account the effects of tracking phenomena for frequencies above 30 kHz.                                                                                  |                 | N/A     |
|                | The most severe value of the required creepage distances in accordance with Table 107 to Table 112 for frequencies above 30 kHz and the relevant values in Table 21 of IEC 61558-1:2017 shall take precedence. |                 | N/A     |
|                | If the value of the creepage distance is lower than the value of the clearance, the value of the clearance shall be applicable for the creepage distance.                                                      |                 | N/A     |
|                | The peak working voltage also includes any DC voltage and any repetitive peak impulse generated by the SMPS (see 26.105). A determination based on RMS values is also required (see 26.104 and Table 112).     |                 | N/A     |
| BB.26.106      | Distance through insulation (IEC 61558-2-16:2021)                                                                                                                                                              |                 | N/A     |
|                | Instead of partial discharge with high frequency voltage the test of the distance and the calculation of the electric field is applicable under the following conditions:                                      |                 | N/A     |
|                | – the max. frequency is < 10 MHz                                                                                                                                                                               |                 | N/A     |
|                | – the field strength approximately comply with Figure 103                                                                                                                                                      |                 | N/A     |
|                | – no voids or gaps are present in between the solid insulation                                                                                                                                                 |                 | N/A     |
|                | For thick layers $d_1 \geq 0,75$ the peak value of the field strength is $\leq 2$ Kv/mm                                                                                                                        |                 | N/A     |
|                | For thin layers $d_2 \leq 30 \mu\text{m}$ the peak value of the field strength is $\leq 10$ Kv/mm                                                                                                              |                 | N/A     |
|                | For $d_1 > d > d_2$ formula (2) is used for calculation the field strength                                                                                                                                     |                 | N/A     |
| BB.27          | RESISTANCE TO HEAT, FIRE AND TRACKING                                                                                                                                                                          |                 | N/A     |

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| Clause         | Requirement + Test | Result - Remark | Verdict |

| IEC 61558-2-16 Annex BB |                                                                                                                                      |                 |         |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause                  | Requirement + Test                                                                                                                   | Result – Remark | Verdict |
| BB.E                    | ANNEX E , GLOW WIRE TEST                                                                                                             |                 | N/A     |
| BB.E.1                  | The test is required according to IEC 60695-2-10 and IEC 60695-2-11 with the following additions:                                    |                 | N/A     |
| BB.E.2                  | The requirements of 8.2, “Test temperatures” of IEC 60695-2-11:2014, apply with the temperature stated in 27.4 of IEC 61558-1        |                 | N/A     |
| BB.E.3                  | Clause 7, “Conditioning”, of IEC 60695-2-11:2014 apply, preconditioning is required                                                  |                 | N/A     |
| BB.E.4                  | Clause 8, “Test procedure”, of IEC 60695-2-11:2014 apply, the tip of the glow wire is applied to the flat side of the surface.       |                 | N/A     |
| BB.F                    | ANNEX F, REQUIREMENTS FOR MANUALLY OPERATED SWITCHES WHICH ARE PARTS OF THE TRANSFORMER                                              |                 | N/A     |
| BB.H                    | ANNEX H, ELECTRONIC CIRCUITS (IEC 61558-1)                                                                                           |                 | N/A     |
| BB.K                    | ANNEX K, INSULATED WINDING WIRES FOR USE AS MULTIPLE LAYER INSULATION                                                                |                 | N/A     |
| BB.K.1                  | Wire construction:                                                                                                                   |                 | N/A     |
|                         | <ul style="list-style-type: none"> <li>insulated winding wire for basic or supplementary insulation (see 19.12.3)</li> </ul>         |                 | N/A     |
|                         | <ul style="list-style-type: none"> <li>insulated winding wire for reinforced insulation (see 19.12.3)</li> </ul>                     |                 | N/A     |
|                         | <ul style="list-style-type: none"> <li>solid circular winding wires and stranded winding wires with 0,05 to 5 mm diameter</li> </ul> |                 | N/A     |
|                         | <ul style="list-style-type: none"> <li>spirally wrapped insulation – overlapping</li> </ul>                                          |                 | N/A     |
| BB.K.2                  | Type tests                                                                                                                           |                 | N/A     |
| BB.K.2.1                | General<br>Tests between ambient temperature between 15° C and 35° C and at an humidity between 45% and 75 %                         |                 | N/A     |
| BB K.2.2                | Electric strength test                                                                                                               |                 | N/A     |
| BB K.2.2.1              | Solid circular winding wires and stranded winding wires                                                                              |                 | N/A     |
|                         | Test samples prepared according to clause 4.4.1 of IEC 60851-5:2008 (twisted pair)                                                   |                 | N/A     |
|                         | Dielectric strength test: 6 Kv for reinforced insulation                                                                             |                 | N/A     |

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| Clause         | Requirement + Test | Result - Remark | Verdict |

| IEC 61558-2-16 Annex BB |                                                                                                                           |                 |         |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause                  | Requirement + Test                                                                                                        | Result – Remark | Verdict |
|                         | Dielectric strength test: 3 Kv for basic or supplementary insulation                                                      |                 | N/A     |
| BB K.2.2.2              | Square or rectangular wires .                                                                                             |                 | N/A     |
|                         | Test samples prepared according to clause 4.7.1 of IEC 60851-5:2008                                                       |                 | N/A     |
|                         | Dielectric strength test: 5,5 Kv for reinforced insulation                                                                |                 | N/A     |
|                         | Dielectric strength test: 2,75 Kv for basic or supplementary insulation                                                   |                 | N/A     |
| BB K.2.3                | Flexibility and adherence                                                                                                 |                 | N/A     |
|                         | Claus 5.1 in Test 8 of IEC 60851-3:2009 shall be used                                                                     |                 | N/A     |
|                         | Test samples prepared according to clause 5.1.1.4 of IEC 60851-3:2009                                                     |                 | N/A     |
|                         | Dielectric strength test: 5,5 Kv for reinforced insulation                                                                |                 | N/A     |
|                         | Dielectric strength test: 2,75 Kv for basic or supplementary insulation                                                   |                 | N/A     |
|                         | Mandrel diameter according table K.1                                                                                      |                 | N/A     |
|                         | The tension to the wire during winding on mandrel is 118 N/mm <sup>2</sup> (118 MPa)                                      |                 | N/A     |
| BB.K.2.4                | Heat shock                                                                                                                |                 | N/A     |
|                         | Test samples prepared according to 3.2.1 (in Test 9) of IEC 60851-6:2012                                                  |                 | N/A     |
|                         | <ul style="list-style-type: none"> <li>high voltage test immediately after this test</li> </ul>                           |                 | N/A     |
|                         | <ul style="list-style-type: none"> <li>Dielectric strength test: 5,5 Kv for reinforced insulation</li> </ul>              |                 | N/A     |
|                         | <ul style="list-style-type: none"> <li>Dielectric strength test: 2,75 Kv for basic or supplementary insulation</li> </ul> |                 | 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     |
|                         | <ul style="list-style-type: none"> <li>high voltage test immediately after this test</li> </ul>                           |                 | N/A     |
|                         | <ul style="list-style-type: none"> <li>Dielectric strength test: 5,5 Kv for reinforced insulation</li> </ul>              |                 |         |
|                         | <ul style="list-style-type: none"> <li>Dielectric strength test: 2,75 Kv for basic or supplementary insulation</li> </ul> |                 |         |

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| Clause         | Requirement + Test | Result - Remark | Verdict |

| IEC 61558-2-16 Annex BB |                                                                                                                          |                 |         |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause                  | Requirement + Test                                                                                                       | Result – Remark | Verdict |
| BB.K.3                  | Testing during manufacturing                                                                                             |                 | N/A     |
| BB.K.3.1                | General<br>Tests as subjected in K.3.2 and K.3.3                                                                         |                 | N/A     |
| BB K.3.2                | Routine test                                                                                                             |                 | N/A     |
|                         | <ul style="list-style-type: none"> <li>Dielectric strength test: 4,2 Kv for reinforced insulation</li> </ul>             |                 | N/A     |
|                         | <ul style="list-style-type: none"> <li>Dielectric strength test: 2,1 Kv for basic or supplementary insulation</li> </ul> |                 | 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     |
|                         | <ul style="list-style-type: none"> <li>Dielectric strength test: 6 Kv for reinforced insulation</li> </ul>               |                 | N/A     |
|                         | <ul style="list-style-type: none"> <li>Dielectric strength test: 3 Kv for basic or supplementary insulation</li> </ul>   |                 | 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     |
|                         | <ul style="list-style-type: none"> <li>Dielectric strength test: 5,5 Kv for reinforced insulation</li> </ul>             |                 | N/A     |
|                         | <ul style="list-style-type: none"> <li>Dielectric strength test: 3 Kv for basic or supplementary insulation</li> </ul>   |                 | N/A     |
| BB.U                    | ANNEX U – INFORMATIVE – OPTIONAL TW – MARKING FOR TRANSFORMERS                                                           |                 | N/A     |
| <b>V</b>                | <b>ANNEX V, SYMBOLS TO BE USED FOR THERMAL CUT-OUTS</b>                                                                  |                 | N/A     |

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

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| Clause         | Requirement + Test | Result - Remark | Verdict |

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

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

|                           |                                                                                  |  |  |  |  |     |
|---------------------------|----------------------------------------------------------------------------------|--|--|--|--|-----|
| <b>BB.26.2<br/>TEST C</b> | <b>TABLE: CREEPAGE DISTANCES AND CLEARANCES AND DISTANCES THROUGH INSULATION</b> |  |  |  |  | N/A |
|                           | Test with three specially prepared specimens with potting (only dti is required) |  |  |  |  |     |

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| Clause         | Requirement + Test | Result - Remark | Verdict |

| cycles with<br>2 x working voltage<br>between<br>pri / sec | 68 h at the<br>temperature acc.<br>Cl. 14<br>(min. 85 °C) | 1 hour<br>25 °C | 2 hour<br>0 °C | 1 hour<br>25 °C |    |
|------------------------------------------------------------|-----------------------------------------------------------|-----------------|----------------|-----------------|----|
| 1.                                                         | --                                                        | --              | --             | --              | -- |
| 2.                                                         | --                                                        | --              | --             | --              | -- |
| 3.                                                         | --                                                        | --              | --             | --              | -- |
| 4.                                                         | --                                                        | --              | --             | --              | -- |
| 5.                                                         | --                                                        | --              | --             | --              | -- |
| 6.                                                         | --                                                        | --              | --             | --              | -- |
| 7.                                                         | --                                                        | --              | --             | --              | -- |
| 8.                                                         | --                                                        | --              | --             | --              | -- |
| 9.                                                         | --                                                        | --              | --             | --              | -- |
| 10.                                                        | --                                                        | --              | --             | --              | -- |

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

|                                  |                                                  |        |                 |
|----------------------------------|--------------------------------------------------|--------|-----------------|
| <b>BB 18.2</b>                   | <b>TABLE: insulation resistance measurements</b> |        | N/A             |
| Insulation resistance R between: |                                                  | R (MΩ) | Required R (MΩ) |
| --                               |                                                  | --     | --              |
| --                               |                                                  | --     | --              |
| --                               |                                                  | --     | --              |
| Supplementary information:       |                                                  |        |                 |

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

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

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

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

## Appendix 1

| ATTACHMENT TO IEC61558_2_16H                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                   |                                                                  |         |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|---------|
| Clause                                                                                                                                                                                                                                                                                                                                                                        | Requirement + Test                                                                                                                                                                | Result - Remark                                                  | Verdict |
| <b>ATTACHMENT TO TEST REPORT</b><br><b>IEC 61558-2-16:2021</b><br><b>(AUSTRALIA/NEW ZEALAND) NATIONAL DIFFERENCES</b><br>(Safety of transformers, reactors, power supply units and combinations thereof -<br>Part 2-16: Particular requirements and tests for switch mode power supply units and<br>transformers for switch mode power supply units for general applications) |                                                                                                                                                                                   |                                                                  |         |
| <b>Differences according to</b> .....                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                   | AS/NZS 61558.2.16:2022<br>AS/NZS 61558.1:2018 +A1:2020 + A2:2020 |         |
| <b>TRF template used:</b> .....                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                   | IECEE OD-2020-F3:2022, Ed. 1.2                                   |         |
| <b>Attachment Form No.</b> .....                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                   | AU_NZ_ND_IEC61558_2_16H                                          |         |
| <b>Attachment Originator</b> .....                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                   | NZ Electrotechnical Committee/Standards New Zealand              |         |
| <b>Master Attachment</b> .....                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                   | Date 2023-09-15                                                  |         |
| <b>Copyright © 2023 IEC System for Conformity Testing and Certification of Electrical Equipment (IECEE), Geneva, Switzerland. All rights reserved.</b>                                                                                                                                                                                                                        |                                                                                                                                                                                   |                                                                  |         |
|                                                                                                                                                                                                                                                                                                                                                                               | <b>National Differences</b>                                                                                                                                                       |                                                                  | P       |
| <b>5</b>                                                                                                                                                                                                                                                                                                                                                                      | <b>GENERAL CONDITIONS FOR THE TESTS</b>                                                                                                                                           |                                                                  | P       |
| 5.2                                                                                                                                                                                                                                                                                                                                                                           | Add the following variation:                                                                                                                                                      |                                                                  | P       |
|                                                                                                                                                                                                                                                                                                                                                                               | If the tests of AZ.19.201 need to be performed they are carried out on separate specimens, the number of specimens is that required by AS/NZS 3112. (AS/NZS 61558.1:2018/A2:2020) |                                                                  | P       |
| 5.5                                                                                                                                                                                                                                                                                                                                                                           | Replace the text with the following variation:                                                                                                                                    |                                                                  | P       |
|                                                                                                                                                                                                                                                                                                                                                                               | For a.c., test voltages are of substantially sinusoidal wave form, and, if not otherwise specified, have a frequency of 50 Hz. (AS/NZS 61558.1:2018)                              |                                                                  | P       |
| <b>16</b>                                                                                                                                                                                                                                                                                                                                                                     | <b>MECHANICAL STRENGTH</b>                                                                                                                                                        |                                                                  | P       |
| 16.4                                                                                                                                                                                                                                                                                                                                                                          | Replace the text with the following variation:                                                                                                                                    |                                                                  | P       |
|                                                                                                                                                                                                                                                                                                                                                                               | VOID (AS/NZS 61558.1:2018/A2:2020)                                                                                                                                                |                                                                  | P       |
| <b>19</b>                                                                                                                                                                                                                                                                                                                                                                     | <b>CONSTRUCTION</b>                                                                                                                                                               |                                                                  | P       |
| 19.15                                                                                                                                                                                                                                                                                                                                                                         | Replace the test specification with the following variation:                                                                                                                      |                                                                  | P       |
|                                                                                                                                                                                                                                                                                                                                                                               | VOID (AS/NZS 61558.1:2018/A2:2020)                                                                                                                                                |                                                                  | P       |

## Appendix 1

| ATTACHMENT to IEC61558_2_16H |                                                                                                                                                                                                                                                   |                 |         |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause                       | Requirement + Test                                                                                                                                                                                                                                | Result - Remark | Verdict |
|                              | Insert the following variation:                                                                                                                                                                                                                   |                 | N/A     |
| AZ.19.201                    | Transformers having integral pins for insertion into socket outlets shall comply with the appropriate requirements of AS/NZS 3112.                                                                                                                |                 | N/A     |
|                              | Compliance is checked as specified in Appendix J of AS/NZS 3112 (AS/NZS 61558.1:2018)                                                                                                                                                             |                 | N/A     |
| <b>20</b>                    | <b>COMPONENTS</b>                                                                                                                                                                                                                                 |                 | P       |
|                              | Replace the first paragraph with the following variation:                                                                                                                                                                                         |                 | P       |
|                              | Components shall comply with the safety requirements specified in the relevant IEC or Australian/New Zealand Standards as far as they reasonably apply. (AS/NZS 61558.1:2018)                                                                     |                 | P       |
|                              | Replace the third paragraph with the following variation:                                                                                                                                                                                         |                 | P       |
|                              | Compliance with the IEC or Australian/New Zealand Standards for the relevant component does not necessarily ensure compliance with the requirements of this Standard (AS/NZS 61558.1:2018)                                                        |                 | P       |
| 20.6                         | Insert the following variation:                                                                                                                                                                                                                   |                 | P       |
|                              | Plugs and socket-outlets for SELV systems may also comply with the requirements of Appendix E in AS/NZS 3112 (AS/NZS 61558.1:2018/A2:2020)                                                                                                        |                 | P       |
| <b>22</b>                    | <b>SUPPLY CONNECTION AND OTHER EXTERNAL FLEXIBLE CABLES OR CORDS</b>                                                                                                                                                                              |                 | N/A     |
| 22.4                         | Replace the text by the following variation:                                                                                                                                                                                                      |                 | N/A     |
|                              | VOID. (AS/NZS 61558.1:2018)                                                                                                                                                                                                                       |                 | N/A     |
| 22.6                         | Replace the text by the following variation:                                                                                                                                                                                                      |                 | N/A     |
|                              | Power supply cords may be cord sets fitted with appliance couplers in accordance with IEC 60320, provided the transformers are single-phase portable transformers with input current not exceeding 10 A at the rated output (AS/NZS 61558.1:2018) |                 | N/A     |
| 22.8                         | Replace the second paragraph in the requirement, with the following variation:                                                                                                                                                                    |                 | P       |
|                              | Power supply cords of portable transformers shall be fitted with an appropriately rated plug complying with AS/NZS 3112 or AS/NZS 3123 or IEC 60309-1 (AS/NZS 61558.1:2018)                                                                       |                 | P       |

## Appendix 1

| ATTACHMENT to IEC61558_2_16H |                                                                                                                                                                                                                                                                                                      |                 |            |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------|
| Clause                       | Requirement + Test                                                                                                                                                                                                                                                                                   | Result - Remark | Verdict    |
| <b>ANNEX H</b>               | <b>ELECTRONIC CIRCUITS</b>                                                                                                                                                                                                                                                                           |                 | <b>P</b>   |
| H.3.1                        | Add the following to the test specification after the existing fourth paragraph:                                                                                                                                                                                                                     |                 | <b>P</b>   |
|                              | During and after the tests the no-load output voltage of an accessible safety extra-low voltage outlet or connector or Universal Serial Bus (USB) outlet shall not have increased by more than 3 V or 10% of its no-load output voltage in normal use, whichever is higher.<br>(AS/NZS 61558.1:2018) | 31.21VDC Max.   | <b>P</b>   |
|                              | <b>Special national conditions (if any)</b>                                                                                                                                                                                                                                                          |                 | <b>N/A</b> |
|                              | <b>Australia</b>                                                                                                                                                                                                                                                                                     |                 | <b>N/A</b> |
| <b>8</b>                     | <b>MARKING AND OTHER INFORMATION</b>                                                                                                                                                                                                                                                                 |                 | <b>P</b>   |
| 8.1                          | After Item a) insert the following variation:                                                                                                                                                                                                                                                        |                 | <b>P</b>   |
|                              | The marking of rated supply voltage or rated supply voltage range of single-phase transformers shall cover 240 V and for poly-phase transformers, 415 V<br>(AS/NZS 61558.1:2018/A2:2020)                                                                                                             |                 | <b>P</b>   |
|                              | <b>New Zealand</b>                                                                                                                                                                                                                                                                                   |                 | <b>P</b>   |
| <b>8</b>                     | <b>MARKING AND OTHER INFORMATION</b>                                                                                                                                                                                                                                                                 |                 | <b>P</b>   |
| 8.1                          | After Item a) insert the following variation:                                                                                                                                                                                                                                                        |                 | <b>P</b>   |
|                              | The marking of rated supply voltage of single-phase transformers shall be 230 V and for poly-phase transformers shall be 400 V.<br>(AS/NZS 61558.1:2018/A2:2020)                                                                                                                                     |                 | <b>N/A</b> |
|                              | The marking of rated supply voltage range of single-phase transformers shall cover 230 V and for poly-phase transformers, 400 V<br>(AS/NZS 61558.1:2018/A2:2020)                                                                                                                                     |                 | <b>P</b>   |

## Appendix 2: Product photos



Photo -1 External Photo for model NBW32D002D5N02-EU



Photo -2 External Photo for model NBW32D002D5N02-EU

Appendix 2: Product photos

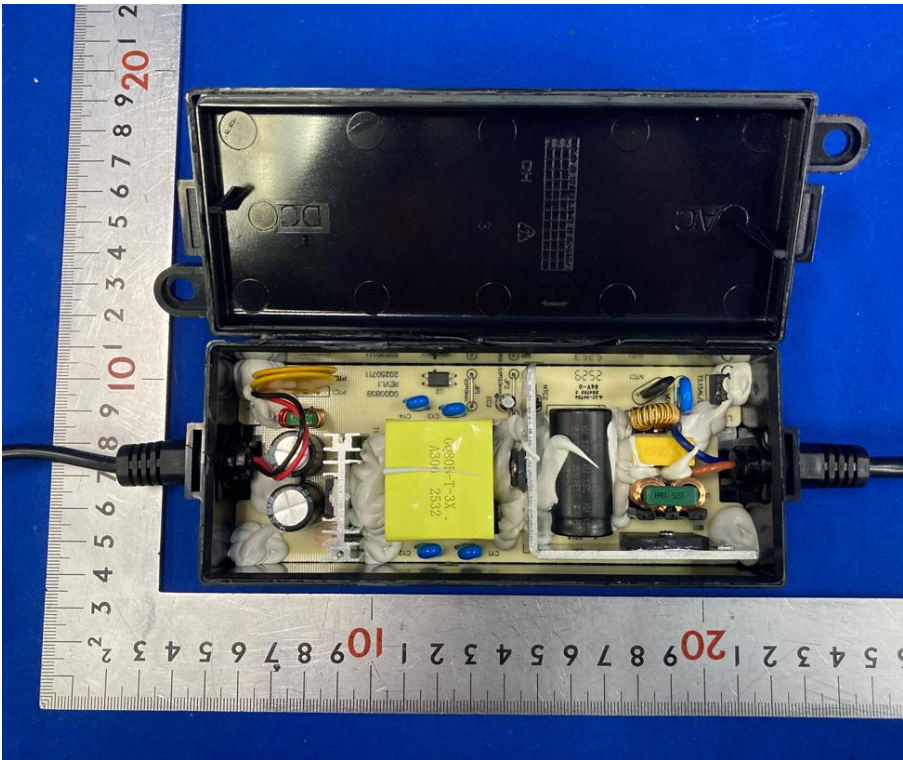


Photo -3 Internal Photo



Photo -4 Internal Photo

## Appendix 2: Product photos

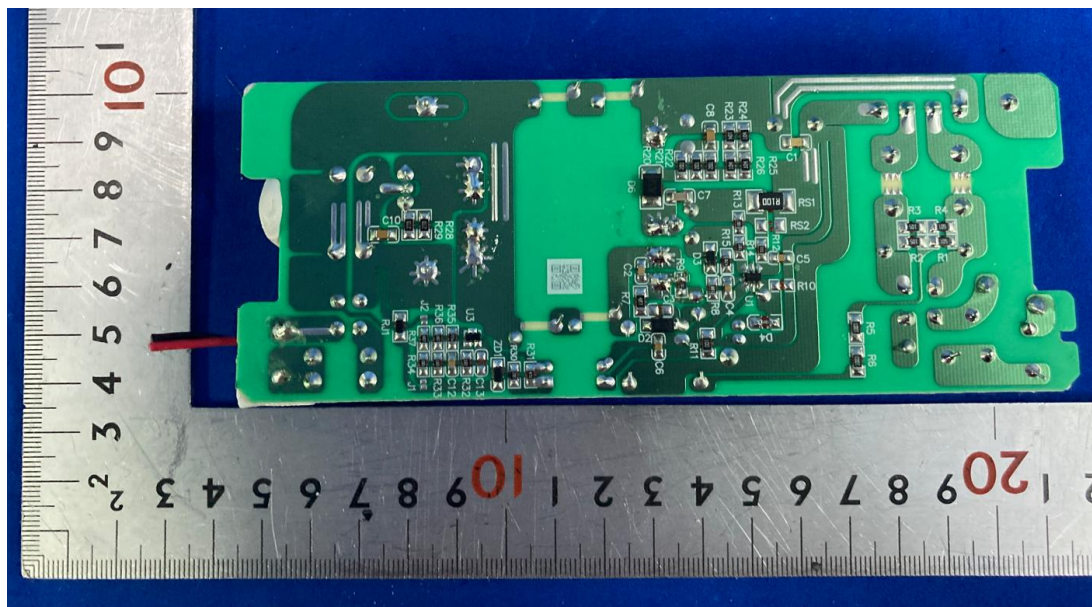


Photo -5 Internal Photo

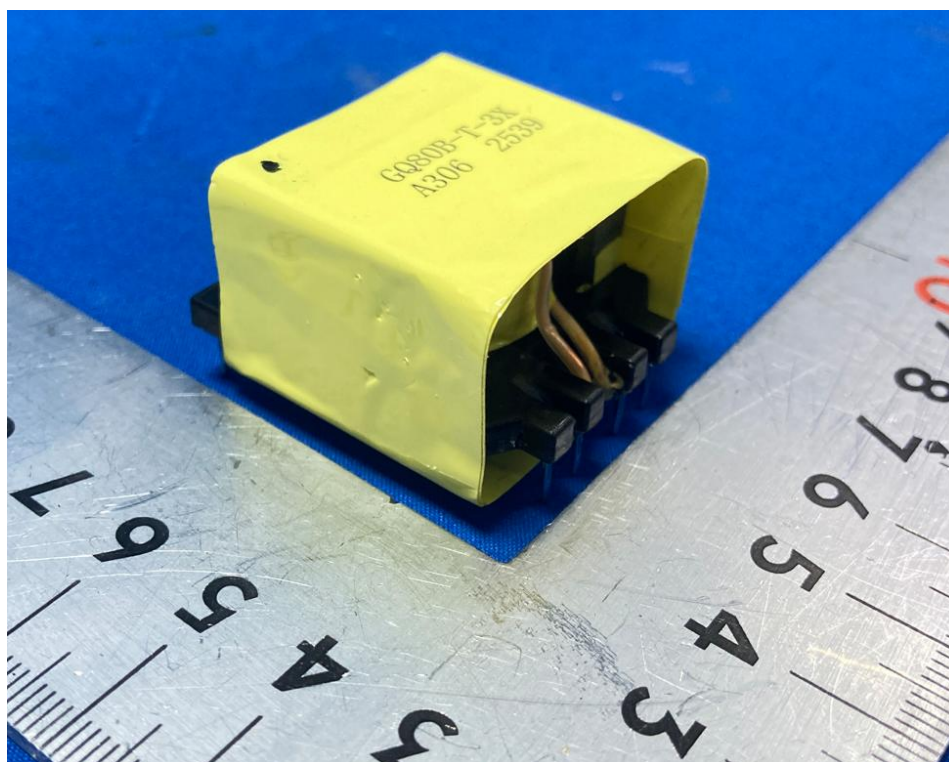


Photo -6 External view\_1 of transformer T1

Appendix 2: Product photos

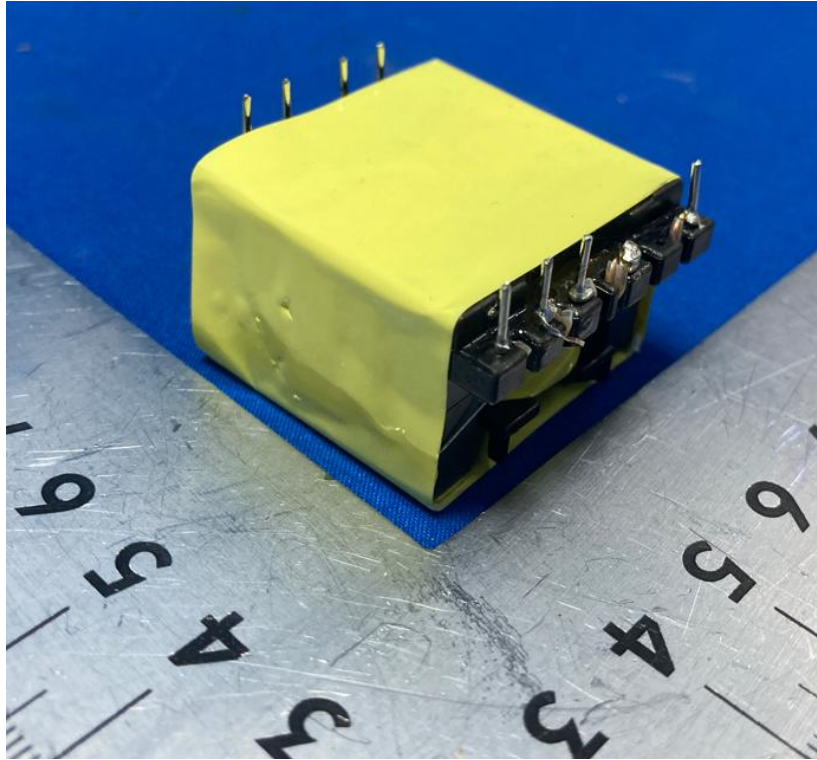


Photo -7 External view\_2 of transformer T1



Photo -8 External view\_3 of transformer T1

## Appendix 2: Product photos

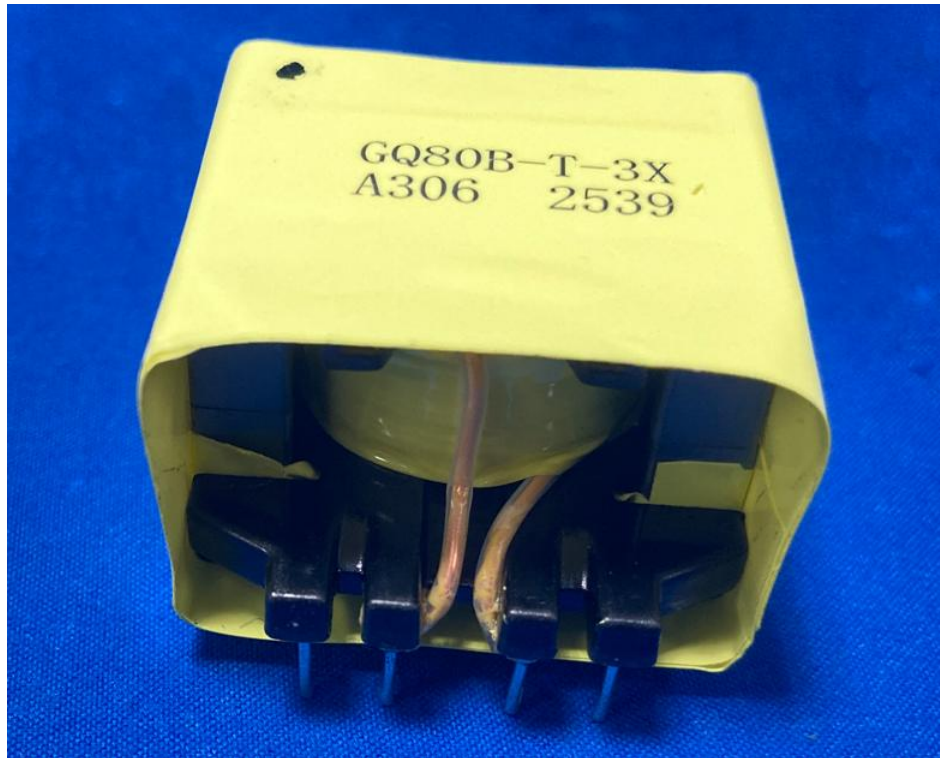


Photo - 9 External view\_4 of transformer T1

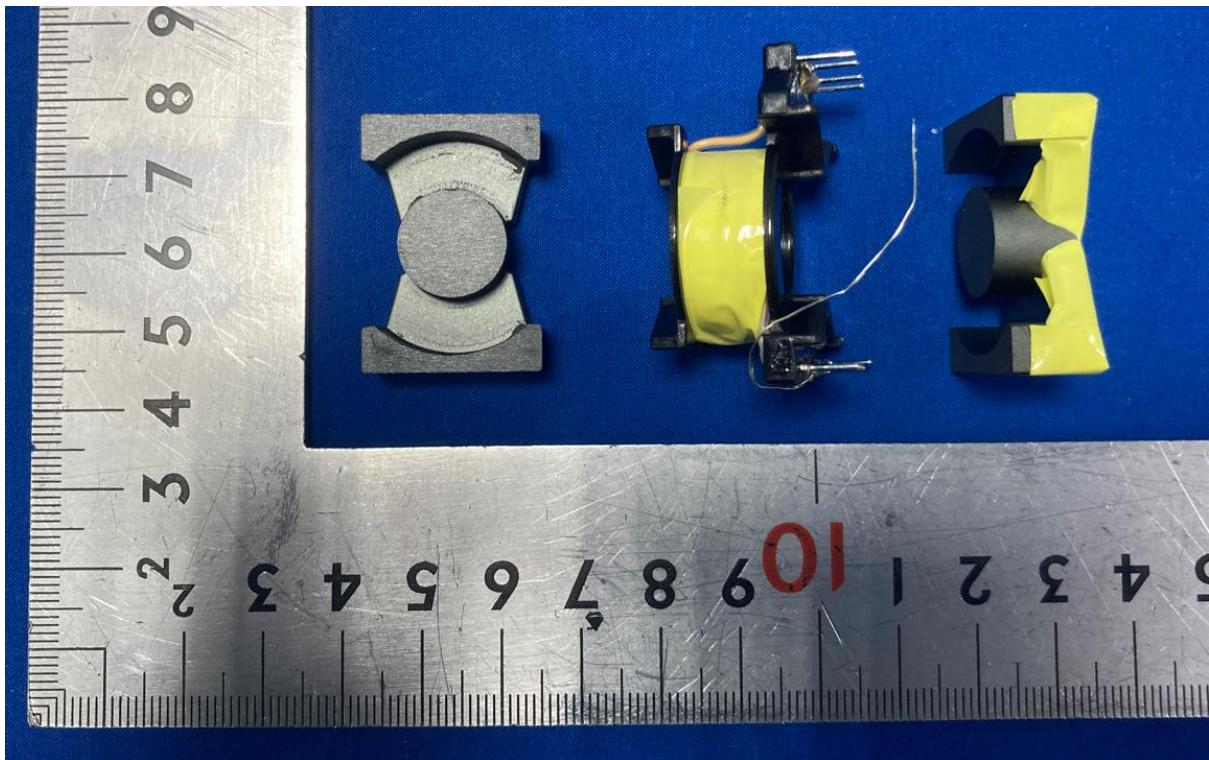


Photo -10 Internal view\_1 of transformer T1

Appendix 2: Product photos

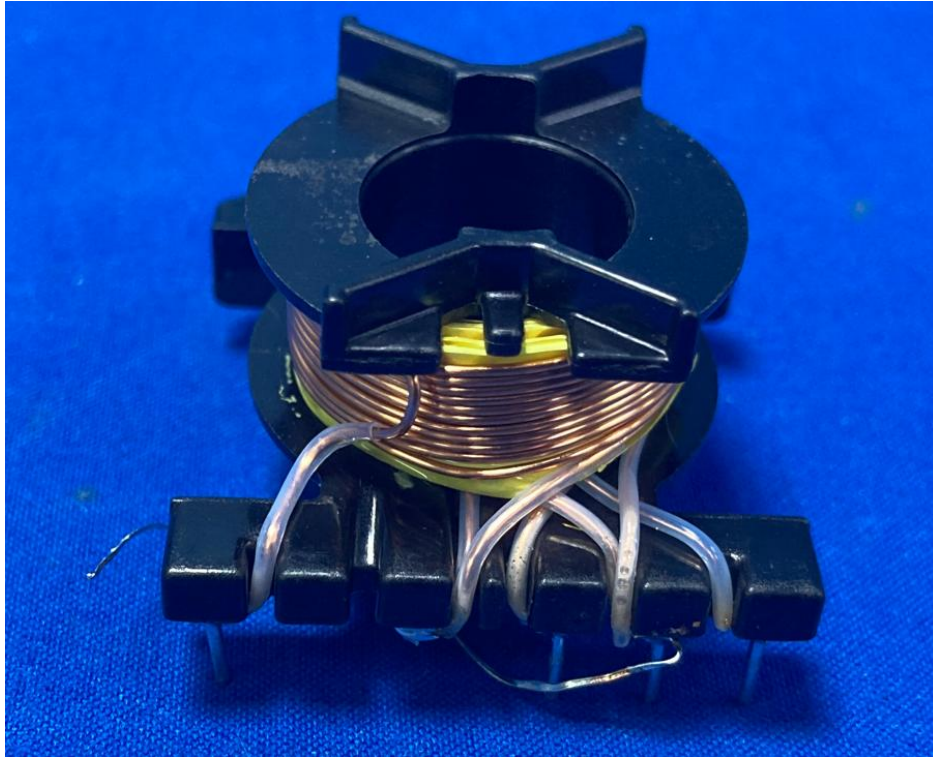


Photo -11 Internal view\_2 of transformer T1

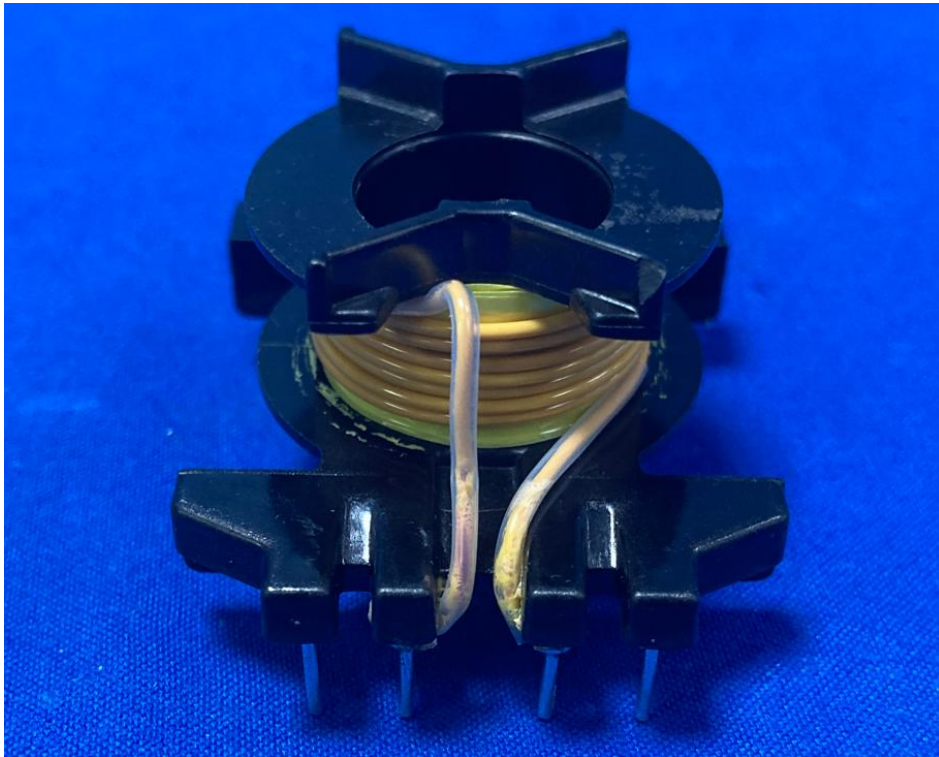


Photo -12 Internal view\_3 of transformer T1

End of report