

**IEC 61010-1 / EN 61010-1 / UL 61010-1  
Safety requirements for electrical equipment for measurement,  
control, and laboratory use  
Part 1: General requirements**

**Report Reference No.** .....: TSSM2401000018L0  
**Tested by**.....: Zang Lee  
 Engineer *Zang Lee*  
**Approved by**.....: Justin Tseng  
 Reviewer *Jt*  
**Date of issue**.....: 2024-07-26 .....  
**Total number of pages**.....: 108 .....

**Testing Laboratory** .....: SGTaiwan Ltd., Safety Laboratory  
**Address** .....: No.33, Wu Chyuan Road, New Taipei Industrial Park, Wu Ku District, New Taipei City, Taiwan

**Applicant's name** .....: White Knight Fluid Handling Inc.  
**Address** .....: 187 East 670 South Kamas, UT 84036

**Test specification:**  
**Standard**.....: IEC 61010-1:2010, AMD1:2016; EN 61010-1:2010, AMD1:2019; UL 61010-1 (3<sup>rd</sup> Ed.); Am. 1  
**Test procedure**.....: V o C Scheme  
**Non-standard test method**.....: None

**Test Report Form No.** .....: SGS\_IEC61010\_1L  
**Test Report Form Originator** .....: VDE Testing and Certification Institute  
**Master TRF**.....: 2017-10-20

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**Test item description**.....: PFA Immersion Tank Heater  
**Trade Mark** .....: Heateflex  
**Manufacturer** .....: White Knight Fluid Handling Inc.

Model/Type reference.....:	HFI-0705-010-B, HFI-0705-023-E, HFI-0707-020-B, HFI-0707-030-F, HFI-0905-020-B, HFI-0905-030-F, HFI-0905-030-XX, HFI-0907-040-D, HFI-0909-050-F, HFI-0909-055-L, HFI-1105-040-D, HFI-1107-050-F, HFI-1107-055-L, HFI-1109-070-F, HFI-1111-088-L, HFI-1305-050-F, HFI-1305-045-L, HFI-1307-070-F, HFI-1309-070-F, HFI-1309-068-L, HFI-1311-108-E, HFI-1311-110-L, HFI-1505-050-F, HFI-1505-055-L, HFI-1507-070-XX, HFI-1509-100-F, HFI-1509-090-L, HFI-1905-070-XX, HFI-1907-088-L, HFI-1311-090-Q, HFI-1311-090-W, HFI-1511-120-O, HFI-1511-113-W, HFI-1514-150-Q, HFI-1514-165-V, HFI-1909-090-Q, HFI-1909-090-W, HFI-1911-150-Q, HFI-1911-135-V, HFI-1914-208-Q, HFI-1914-205-V, H670652J-03-08, H670728J-P612, HFI-1909-080-D-CP0073, H670740JP-P696, H670679J-P681
Ratings.....:	<p>HFI-1914-205-V: 380-480 Vac (3-phase), DC, 50/60 (Hz); 19.4A@380V/ 20.5A@400V/ 24.7A@480V (Maximum Rating of representative model of 3-phase)</p> <p>HFI-1907-088-L: 380-480 Vac (1-phase), DC, 50/60 (Hz); 14.3A@380V/ 15.3A@400V/ 18.3@480V (Maximum Rating of representative model of 1-phase)</p>

<b>List of Attachments:</b>		
Document No.	Documents included / attached to this report (description)	Page Numbers
1	- National Difference (7 pages)	
2	- Photo (3 pages)	
3	- Model difference list (3 pages)	
<b>Summary of testing:</b>		
Ref. No.	Item	
6.8	Dielectric Voltage Withstand Test	
10.5.3	Ball Pressure Test	
<b>Tests performed (name of test and test clause):</b>		<b>Testing location:</b>
<p>All applicable tests as described throughout this test report and in the Measurement Section were performed.</p> <ul style="list-style-type: none"> <li>If no special specification, all tests are test on HFI-1914-205-V (representative model of 3-phase) and HFI-1907-088-L (representative model of 1-phase).</li> <li>Model difference list, see attachment.</li> <li>Environmental conditions: 5-200°C</li> </ul>		<p>All tests as described within this test report and as described in the Measurement Section were performed at the laboratory described on cover page.</p>

Details and test results are given in subsequent pages of this report.

This report refers only to the unit(s) submitted for test.

"(see Enclosure #)" refers to additional information appended to the report.

"(see appended table)" refers to a table appended to the report.

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Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

**Copy of marking plate**

To be evaluated in end-product

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**Test item particulars:**

Type of item .....: To be evaluated in end-product  
 Description of equipment function .....: PFA Immersion Tank Heater  
 Connection to MAINS supply.....: To be evaluated in end-product  
 Overvoltage category.....: II  
 POLLUTION DEGREE.....: 2  
 Means of protection .....: Class I  
 Environmental conditions.....: Normal  
 For use in wet locations .....: To be evaluated in end-product  
 Equipment mobility .....: To be evaluated in end-product  
 Operating conditions.....: To be evaluated in end-product  
 Overall size of equipment (W x D x H).....: HFI-1914-205-V: 48.3 x 35.6 x 4.2 cm  
 (representative model of 3-phase)  
 HFI-1907-088-L: 48.3 x 17.8 x 4.2 cm  
 (representative model of 1-phase)  
 Mass of equipment (kg).....: To be evaluated in end-product  
 Marked degree of protection to IEC 60529 .....: To be evaluated in end-product

**Possible test case verdicts:**

- Test case does not apply to the test object.....: N/A
- Test object does meet the requirement .....: P (Pass)
- Test object does not meet the requirement.....: F (Fail)

**Testing:**

Date of receipt of test item .....: 2024-04-30  
 Date (s) of performance of tests .....: 2024-06-12 to 2024-06-20

**General remarks:**

The test results presented in this report relate only to the object tested.  
 This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.  
 "(see ENCLOSURE #)" refers to additional information appended to the report.  
 "(see Form A.xx)" refers to a table appended to the report.  
 Bottom lines for measurement tables Form A.xx are optional if used as record.  
 If there are no special requirements of the certification scheme and its standard specifications, according to IEC GUIDE 115 (without considering the influence of measurement uncertainty), the test report issued by the test Lab. do not include measurement uncertainty.  
 When the test report issued by the Lab. is required to provide a declaration of conformity, its conformity determination rule will not take into account the measurement uncertainty.  
 Throughout this report a  comma /  point is used as the decimal separator.

**Manufacturer's Declaration per sub-clause 6.2.5 of IECEE 02:**

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

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

**Name and address of factory (ies) .....**: White Knight Fluid Handling Inc.  
187 East 670 South Kamas, UT 84036

**General product information:**

PFA Immersion Tank Heater

**Description of change(s):**

This is an original report.

**For the above described change(s) the following was considered necessary:**

Change	Testing	Comments
--	--	--

**History of amendments and modifications:**

Ref. No. TSSM2401000018L0, 2024-07-26 (original test report)

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
<b>4</b>	<b>TESTS</b>		N/A
4.4	Testing in SINGLE FAULT CONDITIONS	To be evaluated in end-product	N/A
4.4.1	Fault tests		N/A
4.4.2	Application of SINGLE FAULT CONDITIONS		N/A
4.4.2.1	SINGLE FAULT CONDITIONS not covered by 4.4.2.2 to 4.4.2.14		N/A
4.4.2.2	PROTECTIVE IMPEDANCE		N/A
4.4.2.3	PROTECTIVE CONDUCTOR		N/A
4.4.2.4	Equipment or parts for short-term or intermittent operation		N/A
4.4.2.5	Motors		—
	– stopped while fully energized		N/A
	– prevented from starting		N/A
	– one phase interrupted (multi-phase)		N/A
4.4.2.6	Capacitors		N/A
4.4.2.7	MAINS transformers		N/A
4.4.2.7.2	Short circuit		N/A
4.4.2.7.3	Overload		N/A
4.4.2.8	Outputs		N/A
4.4.2.9	Equipment for more than one supply		N/A
4.4.2.10	Cooling		—
	– air holes closed		N/A
	– fans stopped		N/A
	– coolant stopped		N/A
	– loss of cooling liquid		N/A
4.4.2.11	Heating devices		—
	– timer overridden		N/A
	– temperature controller overridden		N/A
4.4.2.12	Insulation between circuits and parts		N/A
4.4.2.13	Interlocks		N/A

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IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
4.4.2.14	Voltage selectors		N/A
4.4.3	Duration of tests		—
4.4.4	Conformity after application of fault conditions		N/A

5	MARKING AND DOCUMENTATION		N/A
5.1	Marking	To be evaluated in end-product	N/A
5.1.1	General		N/A
	Required equipment markings		—
	– Visible from the exterior; or		N/A
	– Visible after removing cover or opening door		N/A
	– Visible after removal from a rack or panel		N/A
	Not put on parts which can be removed by an operator		N/A
	Letter symbols (IEC 60027) used		N/A
	Graphic symbols of Table 1 used		N/A
5.1.2	Identification		N/A
	Equipment is identified by:		—
	a) Manufacturer's or supplier's name or trademark		N/A
	b) Model number, name or other means		N/A
	Manufacturing location identified		N/A
5.1.3	MAINS supply		N/A
	Equipment is marked as follows:		—
	a) Nature of supply:		—
	1) a.c. RATED MAINS frequency or range of frequencies .....		—
	2) d.c. with symbol 1 .....		—
	b) RATED supply voltage(s) or range .....		—
	c) Max. RATED power (W or VA) or input current .....		—
	The marked value not less than 90 % of the maximum value		N/A
	If more than one voltage range:		—

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IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Separate values marked; or		N/A
	Values differ by less than 20 %		N/A
	d) OPERATOR-set for different RATED supply voltages:		—
	Indicates the equipment set voltage		N/A
	PORTABLE EQUIPMENT indication is visible from the exterior		N/A
	Changing the setting changes the indication		N/A
	e) Accessory MAINS socket-outlets accepting standard MAINS plugs are marked:		—
	With the voltage if it is different from the MAINS supply voltage .....		—
	For use only with specific equipment		N/A
	If not marked for specific equipment it is marked with:		—
	The maximum RATED current or power; or		N/A
	Symbol 14 with full details in the documentation		N/A
5.1.4	Fuses		N/A
	OPERATOR replaceable fuse marking (see also 5.4.5).....		—
5.1.5	TERMINALS, connections and operating devices		N/A
5.1.5.1	General		N/A
	Where necessary for safety, indication of purpose of TERMINALS, connectors, controls and indicators marked		N/A
	If insufficient space, symbol 14 used		N/A
	Push-buttons and actuators of emergency stop devices and indicators:		—
	– used only to indicate a warning of danger; or		N/A
	– the need for urgent action		N/A
	– coloured red		N/A
	– coded as specified in IEC 60073		N/A
	Supplementary means of coding provided, if meaning of colour relates (see IEC 60073):		—

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Clause	Requirement + Test	Result - Remark	Verdict
	– to safety of persons; or		N/A
	– safety of the environment		N/A
5.1.5.2	TERMINALS		—
	MAINS supply TERMINAL identified		N/A
	Other TERMINAL marking:		—
	a) FUNCTIONAL EARTH TERMINALS marked with symbol 5		N/A
	b) PROTECTIVE CONDUCTOR TERMINALS:		—
	Symbol 6 is placed close to or on the TERMINAL; or		N/A
	Part of appliance inlet		N/A
	c) TERMINALS of circuits (symbol 7 used)		N/A
	d) HAZARDOUS LIVE TERMINALS supplied from the interior		N/A
	Standard MAINS socket outlet used; or		N/A
	RATINGS marked; or		N/A
	Symbol 14 used		N/A
5.1.6	Switches and circuit-breakers		N/A
	If disconnecting device, off position clearly marked		N/A
	If push-button used as power supply switch:		—
	– Symbol 9 and 15 used for on-position		N/A
	– Symbol 10 and 16 used for off-position		N/A
	– Pair of symbols 9, 15 and 10, 16 close together		N/A
5.1.7	Equipment protected by DOUBLE INSULATION or REINFORCED INSULATION		N/A
	Protected throughout (symbol 11 used)		N/A
	Only partially protected (symbol 11 not used)		N/A
5.1.8	Field-wiring TERMINAL boxes		N/A
	If TERMINAL or ENCLOSURE exceeds 60 °C:		—
	Cable temperature RATING marked .....		—
	Marking visible before and during connection or beside TERMINAL		N/A

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
<b>5.2</b>	<b>Warning markings</b>	To be evaluated in end-product	N/A
	Visible when ready for NORMAL USE		N/A
	Are near or on applicable parts		N/A
	Symbols and text correct dimensions and colour:		—
	a) Symbols min 2,75 mm and text 1,5 mm high and contrasting in colour with background		N/A
	b) Symbols and text moulded, stamped or engraved in material min. 2,0 mm high and		N/A
	0,5 mm depth or raised if not contrasting in colour		N/A
	If necessary marked with symbol 14, or		N/A
	Additional symbols such as symbol 12, 13 or 17 used to indicate the nature of HAZARD		N/A
	Statement to place equipment in a safe state before access by using a tool to HAZARDOUS parts is permitted		N/A
<b>5.3</b>	<b>Durability of markings</b>	To be evaluated in end-product	N/A
	The required markings remain clear and legible in NORMAL USE		N/A
<b>5.4</b>	<b>Documentation</b>	To be evaluated in end-product	N/A
5.4.1	General		N/A
	Equipment is accompanied by documentation for safety purposes for OPERATOR or RESPONSIBLE BODY		N/A
	Safety documentation for service personnel authorized by the manufacturer		N/A
	Documentation necessary for safe operation is provided in printed media or		N/A
	in electronic media if available at any time		N/A
	Documentation includes:		—
	a) Intended use		N/A
	b) Technical specification		N/A
	c) Name and address of manufacturer or supplier		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	d) Information specified in 5.4.2 to 5.4.6		N/A
	e) Information to mitigate residual RISK (see also subclause 17)		N/A
	f) Accessories for safe operation of the equipment specified		N/A
	g) Guidance provided to check correct function of the equipment, if incorrect reading may cause a HAZARD from harmful or corrosive substances of HAZARDOUS live parts		N/A
	h) Instructions for lifting and carrying		N/A
	Warning statements and a clear explanation of warning symbols:		—
	– provided in the documentation; or		N/A
	– information is marked on the equipment		N/A
5.4.2	Equipment RATINGS		N/A
	Documentation includes:		—
	a) Supply voltage or voltage range.....:		—
	Frequency or frequency range.....:		—
	Power or current rating.....:		—
	b) Description of all input and output connections in accordance to 6.6.1 a)		N/A
	c) RATING of insulation of external circuits in accordance to 6.6.1 b)		N/A
	d) Statement of the range of environmental conditions (refer to 1.4):		—
	1) indoor or outdoor use,		N/A
	2) altitude,		N/A
	3) temperature,		N/A
	4) relative humidity,		N/A
	5) MAINS supply voltage fluctuations,		N/A
	6) OVERVOLTAGE CATEGORY,		N/A
	7) WET LOCATION, if applicable,		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	8) POLLUTION DEGREE of the intended environment		N/A
	e) Degree of ingress protection (IEC 60529)		N/A
	f) If impact rating less than 5 J:		—
	IK code in accordance to IEC 62262 marked; or		N/A
	symbol 14 of Table 1 marked, with		N/A
	RATED energy level and test method stated		N/A
5.4.3	Equipment installation		N/A
	Documentation includes instructions for:		—
	a) Assembly, location and mounting requirements		N/A
	b) Instructions for protective earthing		N/A
	c) Connections to supply		N/A
	d) PERMANENTLY CONNECTED EQUIPMENT:		—
	1) Supply wiring requirements		N/A
	2) If external switch or circuit-breaker, requirements and location recommendation		N/A
	e) Ventilation requirements		N/A
	f) Safety characteristics for special external services (e. g. maximum and minimum temperature, pressure, flow of air, cooling liquid)		N/A
	g) Instructions relating to sound level		N/A
5.4.4	Equipment operation		N/A
	Instructions for use include:		—
	a) Identification and description of operating controls		N/A
	b) Positioning for disconnection		N/A
	c) Instructions for interconnection to accessories or other equipment		N/A
	d) Specification of intermittent operation limits		N/A
	e) Explanation of symbols used		N/A
	f) Replacement of consumable materials		N/A
	g) Cleaning and decontamination		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	h) Listing of any poisonous or injurious gases and quantities		N/A
	i) RISK reduction procedures relating to flammable liquids (see 9.5 c)		N/A
	j) RISK reduction procedures relating burn from surfaces permitted to exceed limits of 10.1		N/A
	Additional precautions for IEC 60950 conforming equipment in regard to moistures and liquids		N/A
	A statement about protection impairment if used in a manner not specified by the manufacturer		N/A
5.4.5	Equipment maintenance and service		N/A
	Instructions for RESPONSIBLE BODY include:		—
	Instructions sufficient in detail permitting safe maintenance and inspection and continued safety:		—
	Instruction against the use of detachable MAINS supply cord with inadequate RATING		N/A
	Specific battery type of user replaceable batteries		N/A
	Any manufacturer specified parts		N/A
	RATING and characteristics of fuses		N/A
	Instructions include following subjects permitting safe servicing and continued safety:		—
	a) Product specific RISKS may affect service personnel		N/A
	b) Protective measures for these RISKS		N/A
	c) Verification of the safe state after repair		N/A
5.4.6	Integration into systems or effects resulting from special conditions		N/A
	Aspects described in documentation		N/A

<b>6</b>	<b>PROTECTION AGAINST ELECTRIC SHOCK</b>		<b>P</b>
<b>6.1</b>	<b>General</b>	To be evaluated in end-product	N/A
6.1.1	Requirements		N/A
	Protection against electric shock maintained in NORMAL CONDITION and SINGLE FAULT CONDITION		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	ACCESSIBLE parts not HAZARDOUS LIVE		N/A
	Voltage, current, charge or energy below the limits in NORMAL CONDITION and in SINGLE FAULT CONDITION between:		—
	ACCESSIBLE parts and earth		N/A
	two ACCESSIBLE parts on same piece of the equipment within a distance of 1,8 m		N/A
	Conformity is checked by the determination of 6.2 and 6.3 followed by the tests of 6.4 to 6.11		N/A
6.1.2	Exceptions		N/A
	Following HAZARDOUS LIVE parts may be ACCESSIBLE to an OPERATOR:		—
	a) parts of lamps and lamp sockets after lamp removal		N/A
	b) parts to be replaced by OPERATOR only by the use of tool and warning marking		N/A
	Those parts not HAZARDOUS LIVE 10 s after interruption of supply		N/A
	Capacitance test if charge is received from internal capacitor		N/A
<b>6.2</b>	<b>Determination of ACCESSIBLE parts</b>	To be evaluated in end-product	N/A
6.2.1	General		N/A
	Unless obviously determination of ACCESSIBLE parts as specified in 6.2.2 to 6.2.4		N/A
6.2.2	Examination		N/A
	– with jointed test finger (as specified B.2)		N/A
	– with rigid test finger (as specified B.1) and a force of 10 N		N/A
6.2.3	Openings above parts that are HAZARDOUS LIVE		N/A
	– test pin with length of 100 mm and 4 mm in diameter applied		N/A
6.2.4	Openings for pre-set controls		N/A
	– test pin with length of 100 mm and 3 mm in diameter applied		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
<b>6.3</b>	<b>Limit values for ACCESSIBLE parts</b>	To be evaluated in end-product	N/A
6.3.1	Levels in NORMAL CONDITION		N/A
	a) Voltage limits less than 30 V r.m.s. and 42,4 V peak or 60 V d.c.		N/A
	for WET LOCATIONS voltage limits less than 16 V r.m.s. and 22,6 V peak or 35 V d.c.		N/A
	Voltagages are not HAZARDOUS LIVE the levels of:		—
	b) Current less than 0,5 mA r.m.s. for sinusoidal, 0,7 mA peak non-sinusoidal or mixed frequencies or 2 mA d.c. when measured with measuring circuit A.1 or A.2 if less than 100 Hz		N/A
	for WET LOCATIONS measuring circuit A.4 used		N/A
	70 mA r.m.s. when measured with circuit A.3 for higher frequencies		N/A
	c) Levels of capacitive charge or energy less:		—
	1) 45 µC for voltages up to 15 kV peak or d.c. or line A of Figure 3		N/A
	2) 350 mJ stored energy for voltages above 15 kV peak or d.c.		N/A
6.3.2	Levels in SINGLE FAULT CONDITION		N/A
	a) Voltage limits less than 50 V r.m.s. and 70 V peak or 120 V d.c.		N/A
	for WET LOCATIONS voltage limits less than 33 V r.m.s. and 46,7 V peak or 70 V d.c.		N/A
	Voltagages are not HAZARDOUS LIVE the levels of:		—
	b) Current less than 3,5 mA r.m.s. for sinusoidal, 5 mA peak non-sinusoidal or mixed frequencies or 15 mA d.c. when measured with measuring circuit A.1 or A.2 if less than 100 Hz		N/A
	for WET LOCATIONS measuring circuit A.4 used		N/A
	500 mA r.m.s. when measured with circuit A.3 for higher frequencies		N/A
	c) Levels of capacitive charge or energy less line B of Figure 3		N/A
<b>6.4</b>	<b>Primary means of protection</b>		P

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Clause	Requirement + Test	Result - Remark	Verdict
6.4.1	General		N/A
	ACCESSIBLE parts prevented from being HAZARDOUS LIVE by one or more of following means:		—
	a) ENCLOSURES or PROTECTIVE BARRIERS (see 6.4.2)		N/A
	b) BASIC INSULATION (see 6.4.3)		P
	c) Impedance (see 6.4.4)		N/A
6.4.2	ENCLOSURES or PROTECTIVE BARRIERS		N/A
	– meet rigidity requirements of 8.1		N/A
	– meet requirements for BASIC INSULATION, if protection is provided by insulation		N/A
	– meet requirements of 6.7 for CREEPAGE and CLEARANCES between ACCESSIBLE parts and HAZARDOUS live parts, if protection is provided by limited access		N/A
6.4.3	BASIC INSULATION		P
	– meet CLEARANCE, CREEPAGE DISTANCE and solid insulation requirements of 6.7	(see Form A.18)	P
6.4.4	Impedance		N/A
	Impedance used as primary means of protection meets all the following requirements:		—
	a) limits current or voltage to level of 6.3.2		N/A
	b) RATED for maximum WORKING VOLTAGE and the amount of power it will dissipate		N/A
	c) CLEARANCE, CREEPAGE DISTANCE between terminations of the impedance meet requirements of BASIC INSULATION of 6.7		N/A
6.5	<b>Additional means of protection in case of SINGLE FAULT CONDITION</b>		P
6.5.1	General		P
	ACCESSIBLE parts are prevented from becoming HAZARDOUS live by the primary means of protection and supplemented by one of:		—
	a) PROTECTIVE BONDING (see 6.5.2)		N/A
	b) SUPPLEMENTARY INSULATION (see 6.5.3)		N/A
	c) automatic disconnection of the supply (see 6.5.5)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	d) current- or voltage-limiting device (see 6.5.6)		N/A
	Alternatively one of the single means of protection is used:		—
	e) REINFORCED INSULATION (see 6.5.3)	(see Form A.18)	P
	f) PROTECTIVE IMPEDANCE (see 6.5.4)		N/A
6.5.2	PROTECTIVE BONDING	have Protective earth part, but the PROTECTIVE BONDING shall be evaluated in end-product	N/A
6.5.2.1	General		N/A
	ACCESSIBLE conductive parts, may become HAZARDOUS LIVE in SINGLE FAULT CONDITION:		—
	Bonded to the PROTECTIVE CONDUCTOR TERMINAL; or		N/A
	Separated by conductive screen or barrier bonded to PROTECTIVE CONDUCTOR TERMINAL		N/A
6.5.2.2	Integrity of PROTECTIVE BONDING		—
	a) PROTECTIVE BONDING consists of directly connected structural parts or discrete conductors or both; and withstands thermal and dynamic stresses		N/A
	b) Soldered connections:		—
	Independently secured against loosening		N/A
	Not used for other purposes		N/A
	c) Screw connections are secured		N/A
	d) PROTECTIVE BONDING not interrupted; or		N/A
	except as removable part that carries MAINS SUPPLY input connection to the whole equipment		N/A
	e) Any movable PROTECTIVE BONDING connection specifically designed, and meets 6.5.2.4		N/A
	f) No external metal braid of cables used (not regarded as PROTECTIVE BONDING)		N/A
	g) IF MAINS SUPPLY passes through:		—
	Means provided for passing protective conductor;		N/A
	Impedance meets 6.5.2.4		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	h) Protective conductors bare or insulated, if insulated, green/yellow		N/A
	Exceptions:		—
	1) earthing braids;		N/A
	2) internal protective conductors etc.;		N/A
	Green/yellow not used for other purposes		N/A
	TERMINAL suitable for connection of a PROTECTIVE CONDUCTOR, and meets 6.5.2.3		N/A
6.5.2.3	PROTECTIVE CONDUCTOR TERMINAL		—
	a) Contact surfaces are metal		N/A
	b) Appliance inlet used		N/A
	c) For rewirable cords and PERMANENTLY CONNECTED EQUIPMENT, PROTECTIVE CONDUCTOR TERMINAL is close to MAINS supply TERMINALS		N/A
	d) If no MAINS supply is required, any PROTECTIVE CONDUCTOR TERMINAL:		—
	Is near terminals of circuit for which protective earthing is necessary		N/A
	External if other terminals external		N/A
	e) Equivalent current-carrying capacity to MAINS supply TERMINALS		N/A
	f) If plug-in, makes first and breaks last		N/A
	g) If also used for other bonding purposes, PROTECTIVE CONDUCTOR:		—
	Applied first;		N/A
	Secured independently;		N/A
	Unlikely to be removed by servicing		N/A
	h) PROTECTIVE CONDUCTOR of measuring circuit:		—
	1) Current RATING equivalent to measuring circuit TERMINAL;		N/A
	2) PROTECTIVE BONDING: not interrupted by any switch or interrupting device		N/A
	i) FUNCTIONAL EARTH TERMINALS allow independent connection		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	j) If a binding screw used for PROTECTIVE CONDUCTOR TERMINAL:		—
	Suitable size for bond wire		N/A
	Not smaller than M 4		N/A
	At least 3 turns of screw engaged		N/A
	Passes tightening torque test		N/A
	k) Contact pressure not capable being reduced by deformation of materials		N/A
6.5.2.4	Impedance of PROTECTIVE BONDING of plug-connected equipment		N/A
	Impedance between PROTECTIVE CONDUCTOR TERMINAL and each ACCESSIBLE part where PROTECTIVE BONDING is specified, is:		—
	– less than 0,1 Ohm; or		N/A
	– less than 0,2 Ohm if equipment is provided with non-detachable cord		N/A
6.5.2.5	Impedance of PROTECTIVE BONDING OF PERMANENTLY CONNECTED EQUIPMENT		N/A
6.5.2.6	Transformer PROTECTIVE BONDING screen		N/A
	Transformer provided with screen for PROTECTIVE BONDING:		—
	screen bonding consists of directly connected structural parts or discrete conductors or both; and withstands thermal and dynamic stresses (see 6.5.2.2 a )		N/A
	screen bonding with soldered connection (see 6.5.2.2 b ) is:		—
	– Independently secured against loosening		N/A
	– Not used for other purposes		N/A
6.5.3	SUPPLEMENTARY and REINFORCED INSULATION		P
	Meet CLEARANCE, CREEPAGE DISTANCE and solid insulation requirements of 6.7		P
6.5.4	PROTECTIVE IMPEDANCE		N/A
	Limits current or voltage to level of 6.3.1 in NORMAL and to level of 6.3.2 in SINGLE FAULT CONDITION		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	CLEARANCE, CREEPAGE DISTANCE between terminations of the impedance meet requirements of DOUBLE or REINFORCED INSULATION of 6.7		N/A
	The PROTECTIVE IMPEDANCE consists of one or more of the following:		—
	a) appropriate single component suitable for safety and reliability for protection, it is:		—
	1) RATED twice the maximum WORKING VOLTAGE		N/A
	2) resistor RATED for twice the power dissipation for maximum WORKING VOLTAGE		N/A
	b) combination of components		N/A
	Single electronic device not used as PROTECTIVE IMPEDANCE		N/A
6.5.5	Automatic disconnection of the supply		N/A
	a) RATED to disconnect the load within time specified in Figure 2		N/A
	b) RATED for the maximum load conditions of the equipment		N/A
6.5.6	Current- or voltage-limiting devices		N/A
	Device complies with all of:		—
	a) RATED to limit the current or voltage to the level of 6.3.2		N/A
	b) RATED for the maximum WORKING VOLTAGE; and		N/A
	RATED for the maximum operational current if applicable		N/A
	c) CLEARANCE, CREEPAGE DISTANCE between terminations of the impedance meet requirements of SUPPLEMENTARY INSULATION of 6.7		N/A
6.6	<b>Connections to external circuits</b>	To be evaluated in end-product	N/A
6.6.1	General		N/A
	Connections do not cause ACCESSIBLE parts of the following to become HAZARDOUS LIVE in NORMAL CONDITION or SINGLE FAULT CONDITION:		—
	– the external circuits		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– the equipment		N/A
	Protection achieved by separation of circuits; or		N/A
	short circuit of separation does not cause a HAZARD		N/A
	Instructions or markings for each terminal include:		—
	a) RATED conditions for TERMINAL		N/A
	b) Required RATING of external circuit insulation		N/A
6.6.2	TERMINALS for external circuits		N/A
	TERMINALS which receive a charge from an internal capacitor are not HAZARDOUS LIVE after 10 s of interrupting supply connection		N/A
6.6.3	Circuits with terminals which are HAZARDOUS LIVE		N/A
	These circuits are:		—
	Not connected to ACCESSIBLE conductive parts; or		N/A
	Connected to ACCESSIBLE conductive parts, but are not MAINS CIRCUITS and have one TERMINAL contact at earth potential		N/A
	No ACCESSIBLE conductive parts are HAZARDOUS LIVE		N/A
6.6.4	Terminals for stranded conductors		N/A
	No RISK of accidental contact because:		—
	– Located or shielded		N/A
	– Self-evident or marked whether or not connected to ACCESSIBLE conductive parts		N/A
	Complies as applicable:		—
	a) Manufacturer's specified maximum length of removed insulation, or		N/A
	b) 8 mm length of insulation removed		N/A
<b>6.7</b>	<b>Insulation requirements</b>		<b>P</b>
6.7.1	The nature of insulation		P
6.7.1.1	General		P
	Insulation between ACCESSIBLE parts or between separate circuits consist of CLEARANCES, CREEPAGE DISTANCES and solid insulation if provided as protection against a HAZARD		P

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Clause	Requirement + Test	Result - Remark	Verdict
6.7.1.2	CLEARANCES		N/A
	Required CLEARANCES reflecting factors of 6.7.1.1		N/A
	Equipment rated for operating altitude greater than 2000 m correction factor of Table 3 of 61010-1 applied		N/A
6.7.1.3	CREEPAGE DISTANCES		N/A
	Required CREEPAGE DISTANCES reflecting factors of 6.7.1.1 a) to d)		N/A
	CTI material group reflected by requirements		N/A
	CTI test performed		N/A
6.7.1.4	Solid insulation		P
	Required solid insulation reflecting factors of 6.7.1.1 a) to d)		P
6.7.1.5	Requirements for insulation according to type of circuit		P
	a) 6.7.2 MAINS circuits of OVERVOLTAGE CATEGORY II up to nominal supply voltage of 300 V		N/A
	b) 6.7.3 secondary circuits separated from circuits defined in a) by transformer		N/A
	c) K.1 MAINS circuits of OVERVOLTAGE CATEGORY III and IV or OVERVOLTAGE CATEGORY II over 300 V	OVERVOLTAGE CATEGORY II, 480Vac (>300, ≤600)	P
	d) K.2 secondary circuits separated from circuits defined in c) by transformer		N/A
	e) K.3 circuits having one or more of:		—
	1) maximum TRANSIENT OVERVOLTAGE is limited to known level below the level of MAINS CIRCUIT		N/A
	2) maximum TRANSIENT OVERVOLTAGE above the level of MAINS CIRCUIT		N/A
	3) WORKING VOLTAGE is the sum of more than one circuit or a mixed voltage		N/A
	4) WORKING VOLTAGE includes recurring peak voltage, may include non-sinusoidal or non-periodic waveform		N/A
	5) WORKING VOLTAGE with a frequency above 30 kHz		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
6.7.2	Insulation for MAINS CIRCUITS of OVERVOLTAGE CATEGORY II with a nominal supply voltage up to 300 V		N/A
6.7.2.1	CLEARANCES and CREEPAGE DISTANCES		—
	Values for MAINS CIRCUITS of Table 4 are met		N/A
	Coatings to achieve reduction to POLLUTION DEGREE 1 comply with requirements of Annex H		N/A
6.7.2.2	Solid insulation		P
6.7.2.2.1	General		P
	Withstands electrical and mechanical stresses in normal use and all RATED environmental conditions of 1.4		P
	Equipment passed voltage tests of 6.8.3 with values of Table 5	(see Form A.18)	P
	Complies as applicable:		—
	a) ENCLOSURE or PROTECTIVE BARRIER of Clause 8		N/A
	b) moulded and potted parts requirements of 6.7.2.2.2		N/A
	c) inner layers of printed wiring boards requirements of 6.7.2.2.3		N/A
	d) thin-film insulation requirements of 6.7.2.2.4		P
6.7.2.2.2	Moulded and potted parts		—
	Conductors between same two layers are separated by at least 0,4 mm after moulding is completed		N/A
6.7.2.2.3	Inner insulating layers of printed wiring boards		—
	Separated by at least 0,4 mm between same two layers		N/A
	REINFORCED INSULATION have adequate electric strength; one of following methods used:		—
	a) thickness of insulation is at least 0,4 mm		N/A
	b) insulation is assembled of minimum two separate layers, each RATED for test voltage of Table 5 for BASIC INSULATION		N/A
	c) insulation is assembled of minimum two separate layers, where the combination is rated for test voltage of Table 5 for REINFORCED INSULATION		N/A



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Clause	Requirement + Test	Result - Remark	Verdict
6.7.2.2.4	Thin-film insulation		—
	Conductors between same two layers are separated by applicable CLEARANCES and CREEPAGE DISTANCE of 6.7.2.1		N/A
	REINFORCED INSULATION have adequate electric strength; one of the following methods used:		—
	a) thickness through the insulation at least 0,4 mm	Minimum 0.6mm thick for OVERVOLTAGE CATEGORY II, 480Vac (>300, ≤600) (see Form A.18)	P
	b) insulation is assembled of min. two separate layers, each RATED for test voltage of Table 5 for BASIC INSULATION		N/A
	c) insulation is assembled of min. three separate layers, where the combination of two layers passed voltage tests of 6.8.3 with values of Table 5 for REINFORCED INSULATION		N/A
6.7.3	Insulation for secondary circuits derived from MAINS CIRCUITS of OVERVOLTAGE CATEGORY II up to 300 V		N/A
6.7.3.1	General		N/A
	Secondary circuits where separation from MAINS CIRCUITS is achieved by a transformer providing:		—
	– REINFORCED INSULATION		N/A
	– DOUBLE INSULATION		N/A
	– screen connected to the PROTECTIVE CONDUCTOR TERMINAL		N/A
6.7.3.2	CLEARANCES		N/A
	a) meet the values of Table 6 for BASIC INSULATION and SUPPLEMENTARY INSULATION; or		N/A
	twice the values of Table 6 for REINFORCED INSULATION; or		N/A
	b) pass the voltage tests of 6.8 with values of Table 6;		N/A
	with following adjustments:		—
	1) values for reinforced insulation are 1,6 times the values for basic insulation		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	2) if operating altitude is greater than 2000 m values of CLEARANCES multiplied with factor of Table 3		N/A
	3) minimum CLEARANCE is 0,2 mm for POLLUTION DEGREE 2 and 0,8 mm for POLLUTION DEGREE 3		N/A
6.7.3.3	CREEPAGE DISTANCES		N/A
	Based on WORKING VOLTAGE meets the values of Table 7 for BASIC and SUPPLEMENTARY INSULATION		N/A
	Values for REINFORCED INSULATION are twice the values of BASIC INSULATION		N/A
	Coatings to achieve reduction to POLLUTION DEGREE 1 comply with requirements of Annex H		N/A
6.7.3.4	Solid insulation		N/A
6.7.3.4.1	General		N/A
	Withstands electrical and mechanical stresses in normal use and all RATED environmental conditions of 1.4		—
	a) Equipment passed voltage test of 6.8.3.1 for 5 s with VALUES of Table 6 for BASIC and SUPPLEMENTARY INSULATION		N/A
	values for REINFORCED INSULATION are 1,6 times the values of BASIC INSULATION		N/A
	b) if WORKING VOLTAGE exceeds 300 V, equipment passed voltage test of 6.8.3.1 for 1 min with a test voltage of 1,5 times working voltage for BASIC or SUPPLEMENTARY INSULATION		N/A
	value for REINFORCED INSULATION are twice the WORKING VOLTAGE		N/A
	Complies as applicable:		—
	1) ENCLOSURE or PROTECTIVE BARRIER of Clause 8		N/A
	2) moulded and potted parts requirements of 6.7.3.4.2		N/A
	3) inner layers of printed wiring boards requirements of 6.7.3.4.3		N/A
	4) thin-film insulation requirements of 6.7.3.4.4		N/A
6.7.3.4.2	Moulded and potted parts		—

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Clause	Requirement + Test	Result - Remark	Verdict
	Conductors between same two layers are separated by applicable distances of Table 8		N/A
6.7.3.4.3	Inner insulation layers of printed wiring boards		—
	Separated by at least the applicable distances of Table 8 between same two layers		N/A
	REINFORCED INSULATION have adequate electric strength; one of following methods used:		—
	a) thickness at least applicable distance of Table 8		N/A
	b) insulation is assembled of minimum two separate layers, each RATED for test voltage of Table 6 for BASIC INSULATION		N/A
	c) insulation is assembled of min. two separate layers, where the combination is RATED for 1,6 times the test voltage of Table 6		N/A
6.7.3.4.4	Thin-film insulation		—
	Conductors between same two layers are separated by applicable CLEARANCES and CREEPAGE DISTANCE of 6.7.3.2 and 6.7.3.3		N/A
	REINFORCED INSULATION have adequate electric strength; one of following methods used:		—
	a) thickness at least applicable distance of Table 8		N/A
	b) insulation is assembled of min. two separate layers, each RATED for test voltage of Table 6 for BASIC INSULATION		N/A
	c) insulation is assembled of min. three separate layers, where the combination of two layers passed voltage tests with 1,6 time values of Table 6:		—
	a.c. test of 6.8.3.1; or		N/A
	d.c. test of 6.8.3.2 for circuits stressed only by d.c. voltages		N/A
6.8	<b>Procedure for voltage tests</b>	(see Forms A.14 and A.18)	P
6.9	<b>Constructional requirements for protection against electric shock</b>	To be evaluated in end-product	N/A
6.9.1	General		N/A
	If a failure could cause a HAZARD:		—

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Clause	Requirement + Test	Result - Remark	Verdict
	a) security of wiring connections		N/A
	b) screws securing removable covers		N/A
	c) accidental loosening		N/A
	d) CLEARANCES and CREEPAGE DISTANCES not reduced below the values of basic insulation by loosening of parts or wires		N/A
6.9.2	Insulating materials	To be evaluated in end-product	N/A
	Material not to be used for safety relevant insulation:		—
	a) easily damaged materials not used		N/A
	b) non-impregnated hygroscopic materials not used		N/A
6.9.3	Colour coding		P
	Green-and-yellow insulation shall not be used except:		—
	a) protective earth conductors;		P
	b) PROTECTIVE BONDING conductors;		N/A
	c) potential equalization conductors;		N/A
	d) functional earth conductors		N/A
<b>6.10</b>	<b>Connection to MAINS supply source and connections between parts of equipment</b>	To be evaluated in end-product	N/A
6.10.1	MAINS supply cords		N/A
	RATED for maximum equipment current (see 5.1.3 c)		N/A
	Cable complies with IEC 60227 or IEC 60245		N/A
	Heat-resistant if likely to contact hot parts		N/A
	Temperature RATING (cord and inlet) ..... :		—
	Green/yellow used only for connection to PROTECTIVE CONDUCTOR TERMINALS		N/A
	Detachable cords with IEC 60320 MAINS connectors:		—
	Conform to IEC 60799; or		N/A
	Have the current RATING of the MAINS connector		N/A
6.10.2	Fitting of non-detachable MAINS supply cords		N/A
6.10.2.1	Cord entry		—

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Clause	Requirement + Test	Result - Remark	Verdict
	a) inlet or bushing with a smoothly rounded opening; or		N/A
	b) insulated cord guard protruding >5 D (diameter)		N/A
6.10.2.2	Cord anchorage		—
	Protective earth conductor is the last to take the strain		N/A
	a) cord is not clamped by direct pressure from a screw		N/A
	b) knots are not used		N/A
	c) cannot push the cord into the equipment to cause a HAZARD		N/A
	d) no failure of cord insulation in anchorage with metal parts		N/A
	e) not to be loosened without a tool		N/A
	f) cord replacement does not cause a HAZARD and method of strain relief is clear		N/A
	Push-pull and or torque test		N/A
6.10.3	Plugs and connectors		N/A
	MAINS supply plugs, connectors etc., conform with relevant specifications		N/A
	If equipment supplied at voltages below 6.3.2.a) or from a sole source:		—
	Plugs of supply cords do not fit MAINS sockets above rated SUPPLY voltage		N/A
	MAINS type plugs used only for connection to MAINS supply		N/A
	Plug pins which receive a charge from an internal capacitor		N/A
	Accessory MAINS socket outlets:		—
	a) marking if accepts a standard MAINS supply plug (see 5.1.3e)		N/A
	b) input has a protective earth conductor if outlet has EARTH TERMINAL CONTACT		N/A
6.11	<b>Disconnection from supply source</b>	To be evaluated in end-product	N/A

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
6.11.1	Disconnects all current-carrying conductors		N/A
6.11.2	Exceptions		N/A
6.11.3	Requirements according to type of equipment		N/A
6.11.3.1	PERMANENTLY CONNECTED EQUIPMENT and multi-phase equipment		N/A
	Employs switch or circuit-breaker		N/A
	If switch or circuit-breaker is not part of the equipment, documentation requires:		—
	a) switch or circuit-breaker to be included in building installation		N/A
	b) suitable location easily reached		N/A
	c) marking as disconnecting for the equipment		N/A
6.11.3.2	Single-phase cord-connected equipment		N/A
	Equipment is provided with one of the following:		—
	a) switch or circuit-breaker		N/A
	b) appliance coupler (disconnectable without tool)		N/A
	c) separable plug (without locking device)		N/A
6.11.4	Disconnecting devices		N/A
6.11.4.1	General		N/A
	Disconnecting device part of equipment		N/A
	Electrically close to the SUPPLY		N/A
	Power-consuming components not electrically located between the supply source and the disconnecting device		N/A
	Except electromagnetic interference suppression circuits permitted to be located on the supply side of the disconnecting device		N/A
6.11.4.2	Switches and circuit-breakers		N/A
	When used as disconnection device:		—
	Circuit breaker meets the relevant requirements IEC 60947-2 and is suitable for the application		N/A
	Switch meets the relevant requirements IEC 60947-3 and is suitable for the application		N/A

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IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Marked to indicate function .....		—
	Not incorporated in MAINS cord		N/A
	Does not interrupt PROTECTIVE EARTH CONDUCTOR		N/A
6.11.4.3	Appliance couplers and plugs		N/A
	Where an appliance coupler or separable plug is used as the disconnecting device (see 6.11.3.2):		—
	Readily identifiable and easily reached by the operator		N/A
	Single-phase portable equipment cord length not more than 3 m		N/A
	PROTECTIVE EARTH CONDUCTOR connected first and disconnected last		N/A

<b>7</b>	<b>PROTECTION AGAINST MECHANICAL HAZARDS</b>		N/A
<b>7.1</b>	<b>General</b>	To be evaluated in end-product	N/A
	Equipment does not cause a mechanical HAZARD in NORMAL nor in SINGLE FAULT CONDITION		N/A
	Conformity is checked by 7.2 to 7.7		N/A
<b>7.2</b>	<b>Sharp edges</b>	To be evaluated in end-product	N/A
	Easily-touched parts are smooth and rounded		N/A
	Do not cause injury during NORMAL USE and		N/A
	Do not cause injury during SINGLE FAULT CONDITION		N/A
<b>7.3</b>	<b>Moving parts</b>	To be evaluated in end-product	N/A
7.3.1	General		N/A
	HAZARDS from moving parts limited to a tolerable level with the conditions specified in 7.3.2 and 7.3.5		N/A
	RISK assessment in accordance with 7.3.3 carried out		N/A
7.3.2	Exceptions		N/A
	Access to HAZARDOUS moving parts permitted under following circumstances:		—

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Clause	Requirement + Test	Result - Remark	Verdict
	a) obviously intended to operate on parts or materials external of the equipment		N/A
	inadvertent touching of moving parts minimized by equipment design (e .g. guards or handles)		N/A
	b) If OPERATOR access is unavoidable outside NORMAL USE following precautions have been taken:		—
	1) access requires TOOL		N/A
	2) statement about training in the instructions		N/A
	3) warning markings on covers prohibiting access by untrained OPERATORS		N/A
	or symbol 14 with full details in documentation		N/A
7.3.3	RISK assessment for mechanical HAZARDS to body parts		N/A
	RISK is reduced to a tolerable level by protective measures as specified in Table 12		N/A
	Minimum protective measures:		—
	A. Low level measures		N/A
	B. Moderate measures		N/A
	C. Stringent measures		N/A
7.3.4	Limitation of force and pressure		N/A
	Following levels are met in NORMAL and SINGLE FAULT CONDITION:		—
	Continuous contact pressure below 50 N / cm <sup>2</sup> with force below 150 N		N/A
	Temporary force below 250 N for an area at least of 3 cm <sup>2</sup> for a maximum duration of 0,75 s		N/A
7.3.5	Gap limitations between moving parts		N/A
7.3.5.1	Access normally allowed		—
	If levels of 7.3.4 exceeded and a body part may be inserted minimum gap as specified in Table 13 assured in NORMAL and in SINGLE FAULT CONDITION		N/A
7.3.5.2	Access normally prevented		—
	Maximum gap as specified in Table 14 assured in NORMAL and in SINGLE FAULT CONDITION		N/A



IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
<b>7.4</b>	<b>Stability</b>	To be evaluated in end-product	N/A
	Equipment not secured to building structure is physical stable		N/A
	Stability maintained after opening of drawers etc. by automatic means, or		N/A
	warning marking requires the application of means		N/A
	Compliance checked by following tests as applicable:		—
	a) 10° tilt test for other than handheld equipment		N/A
	b) multi-directional force test for equipment exceeds height of 1 m and mass of 25 kg		N/A
	c) downward force test for floor-standing equipment		N/A
	d) overload test with 4 times maximum load for castor or support foot that supports greatest load, or		N/A
	e) castor or support foot that supports greatest load removed from equipment		N/A
<b>7.5</b>	<b>Provisions for lifting and carrying</b>	To be evaluated in end-product	N/A
7.5.1	General		N/A
	Equipment more than 18 kg..... :		N/A
	Has means for lifting or carrying; or		N/A
	Directions are given in documentation		N/A
7.5.2	Handles and grips		N/A
	Handles or grips withstand four times weight		N/A
7.5.3	Lifting devices and supporting parts		N/A
	RATED for maximum load; or		N/A
	Tested with four times maximum static load		N/A
<b>7.6</b>	<b>Wall mounting</b>	To be evaluated in end-product	N/A
	Mounting brackets withstand four times weight		N/A
	One fastner removed and test repeated with two times weight		N/A

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IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
7.7	<b>Expelled parts</b>	To be evaluated in end-product	N/A
	Equipment contains or limits the energy		N/A
	Protection not removable without the aid of a tool		N/A

8	<b>RESISTANCE TO MECHANICAL STRESSES</b>		N/A
8.1	<b>General</b>	To be evaluated in end-product	N/A
	Equipment does not cause a HAZARD when subjected to mechanical stresses in NORMAL USE		N/A
	Normal protection level is 5 J		N/A
	Levels below 5 J but not less than 1 J are acceptable if all of the following criteria are met:		—
	a) Lower level justified by RISK assessment of manufacturer		N/A
	b) Equipment installed in its intended application is not easily touched		N/A
	c) Only occasional access during NORMAL USE		N/A
	d) IK code in accordance to IEC 62262 marked or symbol 14 used with full information in the documentation		N/A
	for non-metallic ENCLOSURES rated below 2 °C ambient temperature value chosen for minimum RATED temperature		N/A
	impact energies between IK values, the IK code marked for nearest lower value		N/A
	Conformity is checked by performing following tests:		—
	1) Static test of 8.2.1		N/A
	2) Impact test of 8.2.2 with 5 J except for HAND-HELD EQUIPMENT		N/A
	if specified impact energy is not 5 J alternate method of IEC 62262 used		N/A
	3) Drop test of 8.3.1 or 8.3.2 except for FIXED EQUIPMENT and equipment with mass over 100 kg		N/A

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IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Equipment RATED with an impact rating of IK 08 that obviously meets the criteria		N/A
	After the tests inspection with following results:		—
	– HAZARDOUS LIVE parts above the limits of 6.3.2 not ACCESSIBLE		N/A
	– insulation pass the voltage tests of 6.8		N/A
	i) No leaks of corrosive and harmful substances		N/A
	ii) ENCLOSURE shows no cracks resulting in a HAZARD		N/A
	iii) CLEARANCES not less than their permitted values		N/A
	iv) Insulation of internal wiring remains undamaged		N/A
	v) PROTECTIVE BARRIERS not damaged or loosened		N/A
	vi) No moving parts exposed, except permitted by 7.3		N/A
	vii) No damage which could cause spread of fire		N/A
<b>8.2</b>	<b>ENCLOSURE rigidity test</b>	To be evaluated in end-product	N/A
8.2.1	Static test		N/A
	– 30 N with 12 mm rod applied to each part of ENCLOSURE		N/A
	– in case of doubt test conducted at maximum RATED ambient temperature		N/A
8.2.2	Impact test		N/A
	Impact applied to any part of ENCLOSURE causing a HAZARD if damaged		N/A
	Impact energy level and corresponding IK code ..... :		—
	Non-metallic ENCLOSURES cooled to minimum RATED ambient temperature if below 2 °C		N/A
<b>8.3</b>	<b>Drop test</b>	To be evaluated in end-product	N/A
8.3.1	Other than HAND-HELD and DIRECT-PLUG-IN EQUIPMENT		N/A
	Tests conducted with a drop height or angle of..... :		—
8.3.2	HAND-HELD and DIRECT-PLUG-IN EQUIPMENT		N/A

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Non-metallic ENCLOSURES cooled to minimum RATED ambient temperature if below 2 °C		N/A
	Drop test conducted with an height of 1 m		N/A

<b>9</b>	<b>PROTECTION AGAINST THE SPREAD OF FIRE</b>		N/A
<b>9.1</b>	<b>General</b>	To be evaluated in end-product	N/A
	No spread of fire in NORMAL and SINGLE FAULT CONDITION		N/A
	MAINS supplied equipment meets requirements of 9.6 additionally		N/A
	Conformity is checked by minimum one or a combination of the following (see Figure 11):		—
	a) SINGLE FAULT test of 4.4; or		N/A
	b) Application of 9.2 (eliminating or reducing the sources of ignition); or		N/A
	c) Application of 9.3 (containment of fire within the equipment)		N/A
<b>9.2</b>	<b>Eliminating or reducing the sources of ignition within the equipment</b>	To be evaluated in end-product	N/A
	a) 1) Limited-energy circuit (see 9.4); or		N/A
	2) BASIC INSULATION provided for parts of different potential; or		N/A
	Bridging the insulation does not cause ignition		N/A
	b) Surface temperature of liquids and parts (see 9.5)		N/A
	c) No ignition in circuits designed to produce heat		N/A
<b>9.3</b>	<b>Containment of the fire within the equipment, should it occur</b>	To be evaluated in end-product	N/A
9.3.1	General		N/A
	Spread of fire outside equipment reduced to a tolerable level if:		—
	a) Energizing of the equipment is controlled by an OPERATOR held switch		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	b) ENCLOSURE is conform with constructional requirements of 9.3.2; and		N/A
	Requirements of 9.5 are met		N/A
9.3.2	Constructional requirements		N/A
	a) Connectors and insulating material have flammability classification V-2 or better		N/A
	b) Insulated wires and cables are flame retardant (VW-1 or equivalent)	Flammability: FEP resists combustion and does not promote flame spread	N/A
	c) ENCLOSURE meets following requirements:		—
	1) Bottom and sides in arc of 5 ° (see Figure 13) to non-limited circuits (9.4) meets:		—
	i) no openings; or		N/A
	ii) perforated as specified in Table 16; or		N/A
	iii) metal screen with a mesh; or		N/A
	iv) baffles as specified in Figure 12		N/A
	2) Material of ENCLOSURE and any baffle or flame barrier is made of:		—
	Metal (except magnesium); or		N/A
	Non-metallic materials have flammability classification V-1 or better		N/A
	3) ENCLOSURE and any baffle or flame barrier have adequate rigidity		N/A
9.4	<b>Limited-energy circuit</b>	To be evaluated in end-product	N/A
	a) Potential not more than 30 r.m.s. and 42,4 V peak, or 60 V d.c.		N/A
	b) Current limited by one of following means:		—
	1) Inherently or by impedance (see Table 17); or		N/A
	2) Overcurrent protective device (see Table 18); or		N/A
	3) A regulating network limits also in SINGLE FAULT CONDITION (see Table 17)		N/A
	c) Is separated by at least BASIC INSULATION		N/A

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IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Fuse or a nonadjustable electromechanical device is used		N/A
<b>9.5</b>	<b>Requirements for equipment containing or using flammable liquids</b>	To be evaluated in end-product	N/A
	Flammable liquids contained in or specified for use with equipment do not cause spread of fire		N/A
	RISK is reduced to a tolerable level:		—
	a) The temperature of surface or parts in contact with flammable liquids is 25 °C below fire point		N/A
	b) The quantity of liquid is limited		N/A
	c) Flames are contained within the equipment		N/A
	Detailed instructions for RISK-reduction provided		N/A
<b>9.6</b>	<b>Overcurrent protection</b>	To be evaluated in end-product	N/A
9.6.1	General		N/A
	MAINS supplied equipment protected		N/A
	BASIC INSULATION between MAINS parts of opposite polarity provided		N/A
	Overcurrent protection devices not fitted in the protective conductor		N/A
	Fuses or single-pole circuit-breakers not fitted in neutral (multi-phase equipment)		N/A
9.6.2	PERMANENTLY CONNECTED EQUIPMENT		N/A
	Overcurrent protection device:		—
	Fitted within the equipment; or		N/A
	Specified in manufacturer's instructions		N/A
9.6.3	Other equipment		N/A
	Protection within the equipment		N/A

<b>10</b>	<b>EQUIPMENT TEMPERATURE LIMITS AND RESISTANCE TO HEAT</b>		P
<b>10.1</b>	<b>Surface temperature limits for protection against burns</b>	To be evaluated in end-product	N/A
	Easily touched surfaces within the limits in NORMAL and in SINGLE FAULT CONDITION:		—

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Clause	Requirement + Test	Result - Remark	Verdict
	– at an specified ambient temperature of 40 °C		N/A
	– for equipment rated above 40 °C ambient temperature limits not exceeded raised by the difference to 40 °C		N/A
	Heated surfaces necessary for functional reasons exceeding specified values:		—
	– Are recognizable as such by appearance or function; or		N/A
	– Are marked with symbol 13		N/A
	– Guards are not removable without tool		N/A
<b>10.2</b>	<b>Temperatures of windings</b>	To be evaluated in end-product	N/A
	Limits not exceeded in:		—
	NORMAL CONDITION		N/A
	SINGLE FAULT CONDITION		N/A
<b>10.3</b>	<b>Other temperature measurements</b>	To be evaluated in end-product	N/A
	Following measurements conducted if applicable:		—
	a) Value of 60 °C of field-wiring terminal box not exceeded		N/A
	b) Surface of flammable liquids and parts in contact with this liquids		N/A
	c) Surface of non-metallic ENCLOSURES		N/A
	d) Parts made of insulating material supporting parts connected to MAINS supply		N/A
	e) Terminals carrying a current more than 0,5 A		N/A
<b>10.4</b>	<b>Conduct of temperature tests</b>	To be evaluated in end-product	N/A
10.4.1	General		N/A
	Tests conducted under reference test conditions and manufacturer's instructions		N/A
	Tests alternatively conducted at the least favourable ambient temperature within the RATED ambient temperature..... :		—
10.4.2	Temperature measurement of heating equipment		N/A

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IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Tests conducted in test corner		N/A
10.4.3	Equipment intended for installation in a cabinet or wall		N/A
	Equipment built in as specified in installation instructions		N/A
<b>10.5</b>	<b>Resistance to heat</b>		P
10.5.1	Integrity of CLEARANCE and CREEPAGE DISTANCES		N/A
10.5.2	Non-metallic ENCLOSURES		N/A
	Within 10 min after treatment:		—
	Equipment subjected to suitable stresses of 8.2 and 8.3 complying with criteria of 8.1		N/A
10.5.3	Insulating material		P
	a) Parts supporting parts connected to MAINS supply		P
	b) TERMINALS carrying a current more than 0,5 A		N/A
	Examination of material data; or		N/A
	in case of doubt:		N/A
	1) Ball pressure test; or	(see Form A.28)	P
	2) Vicat softening test of ISO 306		N/A

<b>11</b>	<b>PROTECTION AGAINST HAZARDS FROM FLUIDS AND SOLID FOREIGN OBJECTS</b>		N/A
<b>11.1</b>	<b>General</b>	To be evaluated in end-product	N/A
	Protection to OPERATORS and surrounding area provided by EQUIPMENT		N/A
	All fluids specified by manufacturer considered		N/A
<b>11.2</b>	<b>Cleaning</b>	To be evaluated in end-product	N/A
<b>11.3</b>	<b>Spillage</b>	To be evaluated in end-product	N/A
<b>11.4</b>	<b>Overflow</b>	To be evaluated in end-product	N/A



IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
11.5	<b>Battery electrolyte</b>	To be evaluated in end-product	N/A
	Battery electrolyte leakage presents no HAZARD		N/A
11.6	<b>Equipment RATED with a degree of ingress protection (IP code)</b>	To be evaluated in end-product	N/A
11.6.1	General		N/A
	Equipment marked with IP code..... :		—
	Conditions specified in the documentation		N/A
11.6.2	Conditions for testing		N/A
	Equipment in clean and new condition, all parts in place and mounted as specified by manufacturer		N/A
	Complete equipment tested, or		N/A
	representative parts tested		N/A
	HAND-HELD EQUIPMENT and PORTABLE EQUIPMENT placed in least favourable position of NORMAL use		N/A
	Other equipment positioned or installed as specified		N/A
	TERMINALS provided with protective cap or cover, are installed as specified by manufacturer		N/A
	The equipment is operating (energized) during the treatment except:		—
	a) If manufacturer specifies degrees of protection for non-operating (de-energized) equipment, or		N/A
	b) Equipment is operating or non-operating during the treatment with does not affect the test results		N/A
11.6.3	Protection against solid foreign objects (including dust)		N/A
	Applicable test of IEC 60529 for protection against solid foreign objects conducted		N/A
	Additionally inspection of equipment resulted:		—
	a) No deposit on insulation parts that could lead to a HAZARD		N/A
	b) No created accumulations that have the potential to cause spread of fire		N/A
11.6.4	Protection against water		N/A

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IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Applicable test of IEC 60529 for protection against water conducted		N/A
	If any water has entered, safety is not impaired, inspection of equipment resulted:		—
	a) No deposit on insulation parts that could lead to a HAZARD		N/A
	b) Water has not reached hazardous live parts or windings which are not designed to operate when wet		N/A
	c) No accumulations near the end of cable nor enter the cable where it could cause a HAZARD		N/A
	d) No accumulations where it could lead to a HAZARD taking in consideration movement of the equipment		N/A
<b>11.7</b>	<b>Fluid pressure and leakage</b>	To be evaluated in end-product	N/A
11.7.1	Maximum pressure .....		
	Maximum pressure of any part does not exceed P <sub>RATED</sub>		
11.7.2	Leakage and rupture at high pressure		
	Fluid-containing parts checked by inspection or if a HAZARD could arise subjected to hydraulic test, if:		
	a) product of pressure and volume > 200 kPa·l; and		
	b) pressure > 50 kPa		
	Safety evidence established by calculation in acc. to national authorities (e.g. Pressure Equipment Directive 2014/68/EU)		
	Parts of refrigerating systems meets pressure-related requirements of EN 378-2 or IEC 60335-2-89 as applicable		
11.7.3	Leakage from low-pressure parts		
11.7.4	Overpressure safety device		
	Does not operate in NORMAL USE		
	a) Connected as close as possible to parts intended to be protected		N/A

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IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	b) Easy access for inspection, maintenance and repair		N/A
	c) Adjustment only with TOOL		N/A
	d) No discharge towards person		N/A
	e) No HAZARD from deposit of discharged material		N/A
	f) Adequate discharge capacity		N/A
	No shut-off valve between overpressure safety device and protected parts		N/A

<b>12</b>	<b>PROTECTION AGAINST RADIATION, INCLUDING LASER SOURCES, AND AGAINST SONIC AND ULTRASONIC PRESSURE</b>		N/A
<b>12.1</b>	<b>General</b>	To be evaluated in end-product	N/A
	Equipment provides protection		N/A
<b>12.2</b>	<b>Equipment producing ionizing radiation</b>	To be evaluated in end-product	N/A
12.2.1	Ionizing radiation		N/A
12.2.1.1	General		N/A
	Equipment meets the following requirements:		—
	a) if intended to emit radiation meets requirements of 12.2.1.2; or		N/A
	tested, classified and marked in accordance to IEC 62598		N/A
	b) if only emits stray radiation meets requirements of 12.2.1.3		N/A
12.2.1.2	Equipment intended to emit radiation		—
	Effective dose rate of radiation measured .....		—
	If dose rate exceeds 5 µSv/h marked with the following:		—
	a) symbol 17 (ISO 361)		N/A
	b) abbreviations of the radionuclides.....		—
	c) with maximum dose at 1 m; or .....		—
	with dose rate value between 1 µSv/h and 5 µSv/h in m.....		—

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
12.2.1.3	Equipment not intended to emit radiation		—
	Limit for unintended stray radiation of 1 µSv/h at any easily reached point kept .....		N/A
12.2.2	Accelerated electrons		N/A
	Compartments opened only by the use of a TOOL		N/A
<b>12.3</b>	<b>Optical radiation</b>	To be evaluated in end-product	N/A
	No unintentional HAZARDOUS escape of optical radiation as ultraviolet, visible or infrared radiation, including light emitting diodes:		—
	– Checked by inspection; and		N/A
	– Radiation sources assessed in acc. to the requirements of IEC 62471, except for sources considered to be safe (Table 22) or conditionally safe (Table 23).		N/A
	– Lamp and lamp systems assessed to Risk Groups 1, 2, or 3 of IEC 62471 are labelled in acc. to IEC 62471-2		N/A
	– If labelling impractical, lamp or lamp systems marked with symbol 14		N/A
	– Protective measures, restrictions on use, and operating instructions that may be necessary are provided, including the applicable conditions of use of Table 23.		N/A
<b>12.4</b>	<b>Microwave radiation</b>	To be evaluated in end-product	N/A
	Power density does not exceed 10 W/m <sup>2</sup> .....		N/A
<b>12.5</b>	<b>Sonic and ultrasonic pressure</b>	To be evaluated in end-product	N/A
12.5.1	Sound level		N/A
	No HAZARDOUS sound emission		N/A
	Maximum sound pressure level measured and calculated for maximum sound power level as specified in ISO 3746 or ISO 9614-1		N/A
	Instruction describes measures for protection		N/A
12.5.2	Ultrasonic pressure		N/A

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IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Equipment not intended to emit ultrasound does not exceed limit of 110 dB between 20 kHz and 100 kHz		N/A
	Equipment intended to emit ultrasound:		N/A
	Outside useful beam does not exceed limit of 110 dB between 20 kHz and 100 kHz		N/A
	If inside useful beam above values exceeded:		—
	Marked with Symbol 14 of Table 1		N/A
	and following information in the documentation:		—
	a) dimensions of useful beam		N/A
	b) area where ultrasonic pressure exceed 110 dB		N/A
	c) maximum sound pressure inside beam area		N/A
<b>12.6</b>	<b>Laser sources</b>	To be evaluated in end-product	N/A
	Equipment meets requirements of IEC 60825-1		N/A

<b>13</b>	<b>PROTECTION AGAINST LIBERATED GASES AND SUBSTANCES, EXPLOSION AND IMPLOSION</b>		N/A
<b>13.1</b>	<b>Poisonous and injurious gases and substances</b>	To be evaluated in end-product	N/A
	No hazardous substances liberated in NORMAL CONDITION and in SINGLE FAULT CONDITION		N/A
	If potentially-hazardous substances are liberated:		—
	Operator is not directly exposed to a quantity of the substance that could cause harm		N/A
	Requirements to discharge of hazardous substances during NORMAL operation in accordance to manufacturer's instructions not considered as liberation		N/A
	Attached data/test reports demonstrate conformity		N/A
<b>13.2</b>	<b>Explosion and implosion</b>	To be evaluated in end-product	N/A
13.2.1	Components		N/A
	Components liable to explode:		—
	Pressure release device provided; or		N/A

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Apparatus incorporates operator protection (see also 7.7)		N/A
	Pressure release device:		—
	Discharge without danger		N/A
	Cannot be obstructed		N/A
13.2.2	Batteries and battery charging		N/A
	If explosion or fire HAZARD could occur:		—
	Protection incorporated in the equipment; or		N/A
	Instructions specify batteries with built-in protection		N/A
	In case of wrong type of battery used:		—
	No HAZARD; or		N/A
	Warning by marking and within instructions		N/A
	Equipment with means to charge rechargeable batteries:		—
	Warning against the charging of non-rechargeable batteries; and		N/A
	Type of rechargeable battery indicated; or		N/A
	Symbol 14 used		N/A
	Battery compartment design		N/A
	Single component failure		N/A
	Polarity reversal test		N/A
13.2.3	Implosion of cathode ray tubes		N/A
	If maximum face dimensions > 160 mm .....		—
	Intrinsically protected and correctly mounted; or		N/A
	ENCLOSURE provides protection:		N/A
	If non-intrinsically protected:		—
	Screen not removable without TOOL		N/A
	If glass screen, not in contact with surface of tube		N/A

<b>14</b>	<b>COMPONENTS AND SUBASSEMBLIES</b>		N/A
<b>14.1</b>	<b>General</b>	To be evaluated in end-product	N/A

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Where safety is involved, components and subassemblies meet relevant requirements		N/A
<b>14.2</b>	<b>Motors</b>	To be evaluated in end-product	N/A
14.2.1	Motor temperatures		N/A
	Does not present a HAZARD when stopped or prevented from starting; or		N/A
	Protected by over-temperature or thermal protection device conform with 14.3		N/A
14.2.2	Series excitation motors		N/A
	Connected direct to device, if overspeeding causes a HAZARD		N/A
<b>14.3</b>	<b>Overtemperature protection devices</b>	To be evaluated in end-product	N/A
	Devices operating in a SINGLE FAULT CONDITION		N/A
	a) Reliable function is ensured		N/A
	b) RATED to interrupt maximum current and voltage		N/A
	c) Does not operate in NORMAL USE		N/A
	If self-resetting device used to prevent a HAZARD, protected part requires intervention before restarting		N/A
<b>14.4</b>	<b>Fuse holders</b>	To be evaluated in end-product	N/A
	No access to HAZARDOUS LIVE parts		N/A
<b>14.5</b>	<b>MAINS voltage selecting devices</b>	To be evaluated in end-product	N/A
	Accidental change not possible		N/A
<b>14.6</b>	<b>MAINS transformers tested outside equipment</b>	To be evaluated in end-product	N/A
<b>14.7</b>	<b>Printed wiring boards</b>	To be evaluated in end-product	N/A
	Data shows conformity with V-1 of IEC 60695-11-10 or better; or		N/A
	Test shows conformity with V-1 of IEC 60695-11-10 or better		N/A

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Not applicable for printed wiring boards with limited-energy circuits (9.4)		N/A
<b>14.8</b>	<b>Circuits used to limit TRANSIENT OVERVOLTAGES</b>	To be evaluated in end-product	N/A
	Test conducted between each pair of MAINS SUPPLY TERMINALS		N/A
	No ignition or overheating of other materials:		—
	– no ignition		N/A
	– no heat to other parts above the self-ignition points		N/A
	Safely suppressing and properly functional after applied tests		N/A

<b>15</b>	<b>PROTECTION BY INTERLOCKS</b>		N/A
<b>15.1</b>	<b>General</b>	To be evaluated in end-product	N/A
	Interlocks are designed to remove a HAZARD before OPERATOR exposed		N/A
<b>15.2</b>	<b>Prevention of reactivation</b>	To be evaluated in end-product	N/A
<b>15.3</b>	<b>Reliability</b>	To be evaluated in end-product	N/A
	Single fault unlikely to occur; or		N/A
	Cannot cause a HAZARD		N/A

<b>16</b>	<b>HAZARDS RESULTING FROM APPLICATION</b>		N/A
<b>16.1</b>	<b>REASONABLY FORESEEABLE MISUSE</b>	To be evaluated in end-product	N/A
	No HAZARDS arising from settings not intended and not described in the instructions		N/A
	Other cases of REASONABLY FORESEEABLE MISUSE addressed by RISK assessment		N/A
<b>16.2</b>	<b>Ergonomic aspects</b>	To be evaluated in end-product	N/A
	Factors giving rise to a HAZARD the RISK assessment is reflecting those aspects:		—



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Clause	Requirement + Test	Result - Remark	Verdict
	a) limitation of body dimensions		N/A
	b) displays and indicators		N/A
	c) accessibility and conventions of controls		N/A
	d) arrangement of TERMINALS		N/A

<b>17</b>	<b>RISK ASSESSMENT</b>		N/A
	RISK assessment conducted, if HAZARD might arise and not covered by Clauses 6 to 16	To be evaluated in end-product	N/A
	TOLERABLE RISK achieved by iterative documented process covering the following:		—
	a) RISK analysis		N/A
	Identifies HAZARDS and estimates RISK		N/A
	b) RISK evaluation		N/A
	Plan to judge acceptability of resulting RISK level based on the estimated severity and likelihood of a RISK		N/A
	c) RISK reduction		N/A
	Initial RISK reduced by counter measures;		N/A
	Repeated RISK evaluation without new RISKS introduced		N/A
	RISKS remaining after RISK assessment addressed in instructions to RESPONSIBLE BODY:		—
	Information contained how to mitigate these RISKS		N/A
	Following principles in methods of RISK reduction applied by manufacturer in given order:		—
	1) RISKS eliminated or reduced as far as possible		N/A
	2) Protective measures taken for RISKS that cannot be eliminated		N/A
	3) User information about residual RISK due to any defect of the protective measures		N/A
	Indication of particular training is required		N/A
	Specification of the need for personal protective equipment		N/A

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Conformity checked by evaluation of the RISK assessment documentation		N/A

ANNEX F	ROUTINE TESTS		N/A
	Manufacturer 's declaration		N/A

ANNEX H	QUALIFICATION OF CONFORMAL COATINGS FOR PROTECTION AGAINST POLLUTION		N/A
H.1	<b>General</b>	To be evaluated in end-product	N/A
	Conformal coatings meet the requirements of Clause H.2 and H.3.		N/A
H.2	<b>Technical properties</b>	To be evaluated in end-product	N/A
	Technical properties of conformal coatings are suitable for the intended application. In particular:		—
	a) Manufacturer indicate that it is a coating for PWBs;		N/A
	b) RATED operating temperature include the temperature range of the indicated application;		N/A
	c) CTI, insulation resistance and dielectric strength are suitable for the intended application;		N/A
	d) Coating have adequate UV resistance, if it is exposed to sunlight;		N/A
	e) Flammability RATING of the coating is at least the required flammability RATING of the applied PWB.		N/A
H.3	<b>Qualification of coatings</b>	To be evaluated in end-product	N/A
	Coating complies with the conformity requirements.		N/A

ANNEX K	INSULATION REQUIREMENTS NOT COVERED BY CLAUSE 6.7	(see Forms A.15 and A.18)	P
K.1.3.1	a) the a.c. test of 6.8.3.1 with a duration of at least 5 s or the peak impulse test of 6.8.3.3 using the applicable voltages from Tables K.5, K.6 or K.7;	Test voltage BASIC INSULATION: 2210Vac REINFORCED INSULATION: 3510Vac	P

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IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	b) the a.c. test of 6.8.3.1 with a duration of at least 1 min, or for MAINS CIRCUITS stressed only by d.c. the 1 min d.c. test of 6.8.3.2 using the applicable voltages from Table K.8.	Test voltage BASIC INSULATION: 1800Vac REINFORCED INSULATION: 3600Vac	P
<b>K.1.3.4</b>	a) The thickness through the insulation is at least the value of Table K.9.	Minimum thickness: 0.6mm	P

IEC 61010-1			
Clause	Requirement — Test	Result — Remark	Verdict

4.4 TABLE: Testing in SINGLE FAULT CONDITION – Results					Form A.1	N/A
Test subclause	Fault No.	Fault description	Td 4.4.3 (NOTE)	How was test terminated Comments	Meets 4.4.4	

NOTE Td = Test duration in hh:mm:ss  
 Record dielectric strength test on Form A.18 and temperature tests on Forms A.26A and / or A.26B.  
 Record in the comments column for each test whether carried out during or after SINGLE FAULT CONDITION.

Supplementary information:  
 Test on model U-HEA (9kw)

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IEC 61010-1						
Clause	Requirement — Test			Result — Remark		Verdict
<b>5.1.3c)</b>	<b>TABLE: MAINS supply</b>			<b>Form A.2</b>		<b>N/A</b>
	Marked rating.....:		--	V		—
	Phase .....		--			—
	Frequency .....		--	Hz		—
	Current .....		--	A		—
	Power .....		--	W		—
	Power .....		--	VA		—
Test No.	Voltage [V]	Frequency [Hz]	Current [A]	Power		Comments
				[W]	[VA]	
NOTE – Measurements are only required for marked ratings. Initial inrush currents are not regarded.						
Supplementary information:						

IEC 61010-1			
Clause	Requirement — Test	Result — Remark	Verdict

<b>5.3</b>	<b>TABLE: Durability of markings</b>	<b>Form A.3</b>	<b>N/A</b>
Marking method (see NOTE)		Agent	
1) Adhesive label		A Water	
2) Ink printed		B Isopropyl alcohol 70%	
3) Laser marked		C (specify agent)	
4) Film-coated (plastic foil control panel)		D (specify agent)	
5) Imprinted on plastic (moulded in)		E (specify agent)	

NOTE – Where applicable include print method, label material, ink or paint type, fixing method, adhesive and surface to which marking is fixed.

Marking location	Marking method (see above)
Identification (5.1.2)	
MAINS supply (5.1.3)	
Fuses (5.1.4)	
Terminals and operating devices (5.1.5.2)	
Switches and circuit breakers (5.1.6)	
Double/reinforced equipment (5.1.7)	
Field wiring Terminal boxes (5.1.8)	
Warning marking (5.2)	
Battery charging (13.2.2)	

Method	Test agent	Remains legible	Label loose	Curled edges	Comments
		Verdict	Verdict	Verdict	

Supplementary information:

IEC 61010-1			
Clause	Requirement — Test	Result — Remark	Verdict
6.2	<b>TABLE: List of ACCESSIBLE parts</b>		Form A.4
6.1.2	Exceptions		—
6.2	Determination of ACCESSIBLE parts		—
Item	Description	Determination method (NOTE 5)	Exception under 6.1.2 (NOTE 4)
NOTE 1 – Test fingers and pins are to be applied without force unless a force is specified (see 6.2.2) NOTE 2 – Special consideration should be given to inadequate insulation and high voltage parts (see 6.2) NOTE 3 – Parts are considered to be ACCESSIBLE if they could be touched in the absence of any covering which is not considered to provide suitable insulation (see 6.4). NOTE 4 – Capacitance test may be required (see Form A.5). NOTE 5 – The determination methods are: V = visual; R = rigid test finger; J = jointed test finger; P3 = pin 3 mm diameter; P4 = pin 4 mm diameter.			
Supplementary information:			

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IEC 61010-1			
Clause	Requirement — Test	Result — Remark	Verdict

6	TABLE: Values in NORMAL CONDITION											Form A.5	N/A
6.1.2	Exceptions							11.2 Cleaning and decontamination				—	
6.3.1	Values in NORMAL CONDITION (see NOTE 1)							11.3 Spillage				—	
6.6.2	Terminals for external circuit							11.4 Overflow				—	
6.10.3	Plugs and connections											—	
Item (see Form A.4)	Voltage			Current				Capacitance		10 s / 5 s test (NOTE)			Comments
	V r.m.s.	V peak	V d.c.	Test circuit A1/A2/A3	mA r.m.s.	mA peak	mA d.c.	μC	mJ	V	μC	mJ	

NOTE – A 10 s test is specified in 6.1.2 a) b). A. 5 s test is specified in 6.10.3. The capacitance level versus voltage below the limits given from figure 3 of IEC 61010-1.

Supplementary information:



IEC 61010-1			
Clause	Requirement — Test	Result — Remark	Verdict

6.3.2	TABLE: Values in SINGLE FAULT CONDITION											Form A.6	N/A
Item  (see Form A.4)	Subclause and fault No. (see Form A.1)	Voltage			Transient (see NOTE)		Current			Capacitance	Comments		
	V r.m.s.	V peak	V d.c.	V	s	Test circuit A1/A2/A3	mA r.m.s.	mA peak	mA d.c.	µF (see NOTE)			

NOTE – Transient voltages must be below the limits given from Figure 2 and the capacitance below the limits from figure 3 of IEC 61010-1.

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IEC 61010-1			
Clause	Requirement — Test	Result — Remark	Verdict

<b>6.5.2.2</b>	<b>TABLE: Cross-sectional area of bonding conductors</b>	<b>Form A.7</b>	N/A
----------------	--	-----------------	-----

Conductor location	CROSS-SECTIONAL AREA [mm <sup>2</sup> ]	Verdict

Supplementary information:

<b>6.5.2.3</b>	<b>TABLE: Tightening torque test</b>	<b>Form A.8</b>	N/A
----------------	--------------------------------------	-----------------	-----

Conductor location	Size of screw	Tightening torque [Nm]	Verdict

Supplementary information:

IEC 61010-1					
Clause	Requirement — Test		Result — Remark	Verdict	
<b>6.5.2.4</b>	<b>TABLE: BONDING impedance of plug-connected equipment</b>			<b>Form A.9</b>	
	ACCESSIBLE part under test	Test current [A]	Voltage attained after 1 min [V]	Calculated resistance (Maximum 0,1 or 0,2 Ω) [Ω] (NOTE 1)	Verdict
NOTE 1 – For none-detachable power cord the impedance between protective conductor plug pin of MAINS cord and each ACCESSIBLE part shall not exceed 0,2 Ohm.					
Supplementary information:					
<b>6.5.2.5</b>	<b>TABLE: BONDING impedance of PERMANENTLY CONNECTED EQUIPMENT</b>			<b>Form A.10</b>	
	ACCESSIBLE part under test	Test current [A]	Voltage attained after 1 min (maximum 10 V) [V]	Verdict	
Supplementary information:					
<b>6.5.2.6</b>	<b>TABLE: Transformer PROTECTIVE BONDING screen</b>			<b>Form A.11</b>	
	ACCESSIBLE part under test	Test current (see NOTE) [A]	Voltage attained after 1 min (maximum 10 V) [V]	Calculated resistance (maximum 0,1 Ω) [Ω]	Verdict
NOTE – Test current must be twice the value of the overcurrent protection means of the winding. Test is specified in 6.5.2.6 a) or b).					
Supplementary information:					

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IEC 61010-1			
Clause	Requirement — Test	Result — Remark	Verdict

<b>6.5.4</b>	<b>TABLE: PROTECTIVE IMPEDANCE</b>					<b>Form A.12</b>	<b>N/A</b>	
A single component								
Component	Location	Measured		Calculated	Rated		Verdict	Comments
		Working voltage [V]	Current [A]	Power dissipation [W]	Working voltage [V]	Power dissipation [W]		
A combination of components								
Component	Location			Comments				
NOTE – A PROTECTIVE IMPEDANCE shall not be a single electronic device that employs electron conduction in a vacuum, gas or semiconductor.								
Supplementary information:								

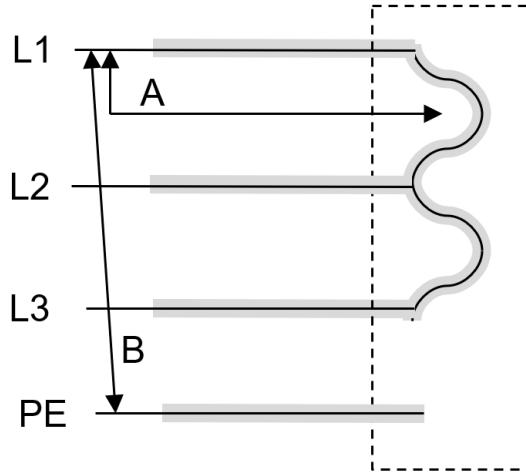
IEC 61010-1			
Clause	Requirement — Test	Result — Remark	Verdict

<b>6.5.6</b>	<b>TABLE: Current- or voltage-limiting device</b>					<b>Form A.13</b>	<b>N/A</b>
Component	Location	Measured		Rated		Verdict	Comments
		Working voltage [V]	Current [A]	Working voltage [V]	Current [A]		
Supplementary information:							

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IEC 61010-1			
Clause	Requirement — Test	Result — Remark	Verdict

6.7	TABLE: Insulation requirements - Block diagram of system -	Form A.14	P
-----	--	-----------	---



Conducted wire covered by insulating PFA tubing

Pollution degree ..... : 2	Overvoltage category .....: OVERVOLTAGE CATEGORY II
----------------------------	---

Area	Location	Insulation type (NOTE 1)	WORKING VOLTAGE			CLEARANCE (NOTE 3) [mm]	CREEPAGE DISTANCE (NOTE 3)				Test voltage (NOTE 2) [V]	Comments (NOTE 3)
			RMS [V]	Peak [V]	Freq. [kHz]		PWB [mm]	CTI	Other [mm]	CTI		
A	Line to HEATER surface intended to be covered by liquid	DI	480	--	60Hz	Insulated by PFA tubing	--	--	--	--	3510V/5s; 3600V/1min	Creepage and clearance should be evaluated in end-product
B	Line to PE part	DI	480	--	60Hz	Insulated by PFA tubing	--	--	--	--	2210V/5s; 1800V/1min	Creepage and clearance should be evaluated in end-product

NOTE 1 – Type of insulation:  
 BI = BASIC INSULATION  
 DI = DOUBLE INSULATION

NOTE 2 - Types of voltage  
 Peak impulse test voltage (pulse)  
 r.m.s.

NOTE 3 - OVERVOLTAGE CATEGORIES OR POLLUTION DEGREES which differ should be shown under "Comments"

IEC 61010-1			
Clause	Requirement — Test	Result — Remark	Verdict
6.7	<b>TABLE: Insulation requirements - Block diagram of system -</b>		<b>Form A.14</b>
	PI = PROTECTIVE IMPEDANCE	d.c.	P
	RI = Reinforced INSULATION	Peak	
	SI = Supplementary INSULATION		
	see also Form A.15 for further details		
	Supplementary Information:		

IEC 61010-1												
Clause	Requirement — Test					Result — Remark					Verdict	
<b>6.7</b>	<b>TABLE: Insulation requirements - CLEARANCES and CREEPAGES</b>										<b>Form A.15</b>	N/A
6.2.2	Examination					6.5.4	Protective impedance					—
6.4.2	ENCLOSURES and protective barriers					6.5.6	Current- or voltage-limiting device					—
6.4.4	Impedance					9.6.1	BASIC INSULATION between opposite polarity					—
Area	Location (See Form A.14)	Insulation type (NOTE 1)	WORKING VOLTAGE (NOTE 2)			CLEARANCE		CREEPAGE DISTANCE		CTI	Verdict	Comments
			RMS [V]	Peak [V]	Frequency [kHz]	Required [mm]	Measured [mm]	Required [mm]	Measured [mm]			
A												
B												
C												
D												
NOTE 1 – refer to Form A.14 for type of insulation shown in the insulation diagram						NOTE 2 - to be used for definition of required insulation (see Form A.14)						
Input supply voltage.....:			V		Hz							
Supplementary information:												



IEC 61010-1			
Clause	Requirement — Test	Result — Remark	Verdict

<b>6.7</b>	<b>TABLE: Insulation requirements - CLEARANCES and CREEPAGES</b>		<b>Form A.16</b>	N/A
6.4.2	ENCLOSURES or PROTECTIVE BARRIERS	9.6.1	Overcurrent protection basic insulation between MAINS parts	—
8	Mechanical resistance to shock and impact	10.5.1	Integrity of CLEARANCES and CREEPAGE DISTANCES	—

Area	Location (See Form A.14)	Insulation type	Mechanical tests (NOTE)				Test at max.	Measured after test (if required)		Verdict	Comments
			Applied force [N]	Rigidity (8.2)		Drop (8.3)		RATED ambient (10.5.1)	CLEARANCE [mm]		
				Static (8.2.1)	Impact (8.2.2)	Normal (8.3.1)	Hand-held/ Plug-in				
A											
B											
C											
D											

NOTE – Refer to Form A.18 for dielectric strength tests following the above tests.

Supplementary information:

IEC 61010-1						
Clause	Requirement – Test			Result — Remark		Verdict
6.7.2.2.2	TABLE: Reliability of potted components			Form A.17 (optional)		N/A
14.1 b)	Components and subassemblies					N/A
Temperature Cycling Test						
Manufacturer .....						
Type .....						
Construction .....						
Potting compound.....						
CREEPAGE DISTANCES measured .....						
CLEARANCES measured.....						
Thickness through insulation .....						
Adhesive test Pass/Fail .....						
Test temperature T °C .....						
Cycles at U= AC 500 V				Leakage current (at AC 500 V) mA		
Number of cycles	Date			68 h /	1 h /	2 h /
				125 °C	25 °C	0 °C
1. Cycle from		to				
2. Cycle from		to				
3. Cycle from		to				
4. Cycle from		to				
5. Cycle from		to				
6. Cycle from		to				
7. Cycle from		to				
8. Cycle from		to				
9. Cycle from		to				
10. Cycle from		to				
After Cycling Test :						
Humidity conditioning				48 h		
Requirements for dielectric strength (s. insulation diagram)				Test voltage V r.m.s.		Verdict
Basic insulation _____ V r.m.s.						

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IEC 61010-1			
Clause	Requirement – Test	Result — Remark	Verdict
<b>6.7.2.2.2</b>	<b>TABLE: Reliability of potted components</b>	<b>Form A.17 (optional)</b>	N/A
<b>14.1 b)</b>	<b>Components and subassemblies</b>		N/A
Supplementary insulation _____ V r.m.s.			
Reinforced insulation _____ V r.m.s.			
NOTE - to be used for evaluation of components containing insulation through solid insulation, when the component standard require thermal cycling test. Ref Clause 14.1 and Figure 15, option b)			
Supplementary information:			

IEC 61010-1						
Clause	Requirement — Test			Result — Remark	Verdict	
<b>6.8</b>	<b>TABLE: Dielectric strength tests</b>			<b>Form A.18</b>	P	
4.4.4.1 b)	Conformity after application of SINGLE FAULT CONDITIONS <sup>1</sup>				N/A	
6.4	Primary means of protection <sup>2</sup>				P	
6.6	Connections to external circuits				N/A	
6.7	Insulation requirements <sup>2</sup> (see Annex K)				P	
6.10.2	Fitting of non-detachable MAINS supply cords <sup>1</sup>				N/A	
9.2 a) 2)	Eliminating or reducing the sources of ignition within the equipment				N/A	
9.4 c)	Limited-energy circuit				N/A	
9.6.1	Overcurrent protection basic insulation between MAINS - parts				N/A	
	Test site altitude .....			m	—	
	Test voltage correction factor (see table 10) .....				—	
Location or references from Forms A.1 and A.14	Clause or sub-clause	Humidity	Working voltage	Test voltage	Comments (NOTE)	Verdict
		Yes/No	[r.m.s./d.c.]	[r.m.s./peak/d.c.]		
<b>(1) HFI-1914-205-V-J-GE (3PH) Mains part to PFA Jacketed heating coil</b>	<b>K.1.3.1 Table K.5</b>	Yes	480Vac	3510Vac	5 s	P
<b>(2) HFI-1907-088-L-J-GE (1PH) Mains part to PFA Jacketed heating coil</b>	<b>K.1.3.1 Table K.5</b>	Yes	480Vac	3510Vac	5 s	P
<b>(1) HFI-1914-205-V-J-GE (3PH) Mains part to PE part</b>	<b>K.1.3.1 Table K.5</b>	Yes	480Vac	2210Vac	5 s	P
<b>(2) HFI-1907-088-L-J-GE (1PH) Mains part to PE part</b>	<b>K.1.3.1 Table K.5</b>	Yes	480Vac	2210Vac	5 s	P

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IEC 61010-1							
Clause	Requirement — Test				Result — Remark	Verdict	
6.8	<b>TABLE: Dielectric strength tests</b>					<b>Form A.18</b>	<b>P</b>
(1) HFI-1914-205-V-J-GE (3PH) Mains part to PFA Jacketed heating coil	K.1.3.1 Table K.8	Yes	480Vac	3600Vac	1 min	P	
(2) HFI-1907-088-L-J-GE (1PH) Mains part to PFA Jacketed heating coil	K.1.3.1 Table K.8	Yes	480Vac	3600Vac	1 min	P	
(1) HFI-1914-205-V-J-GE (3PH) Mains part to PE part	K.1.3.1 Table K.8	Yes	480Vac	1800Vac	1 min	P	
(2) HFI-1907-088-L-J-GE (1PH) Mains part to PE part	K.1.3.1 Table K.8	Yes	480Vac	1800Vac	1 min	P	
<sup>1</sup> Record the fault, test or treatment applied before the dielectric strength test. <sup>2</sup> Humidity preconditioning required. NOTE: Test duration may be recorded. Supplementary information:							

IEC 61010-1			
Clause	Requirement — Test	Result — Remark	Verdict

<b>6.10.2</b>	<b>TABLE: Cord anchorage</b>					<b>Form A.19</b>	N/A
Location	Mass [kg]	Pull [N]	Verdict	Torque [Nm]	Verdict	Comment	
Dielectric strength test for 1 min. (6.8.3.1).....:					V r.m.s.		
Supplementary information:							

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IEC 61010-1															
Clause	Requirement — Test										Result — Remark			Verdict	
7.	<b>TABLE: Protection against mechanical HAZARDS</b>													Form A.20	N/A
7.3.4	Limitation of force and pressure														—
7.3.5	Gap limitations between moving parts														—
Part / Location	Clause 7.3.4		Clause 7.3.5.1								Clause 7.3.5.2			Verdict	Comments
	Continuous	Temporary	Minimum gaps [mm]								Maximum gaps [mm]				
	Contact pressure max. 50 N /cm <sup>2</sup> @ max. 150 N	max. 250 N / 3 cm <sup>2</sup> @ max. 0,75 s	Torso 500	Head 300	Leg 180	Foot 120	Toes 50	Arm 120	Hand 100	Finger 25	Head 120	Foot 35	Finger 4		
Supplementary information:															

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IEC 61010-1							
Clause	Requirement – Test				Result - Remark		Verdict
<b>7.4</b>	<b>TABLE: Stability</b>				<b>Form A.20A</b>		N/A
	Equipment height / mass .....				mm	kg	—
	Equipment (Containers) loaded .....				[yes / no]		—
	Castors at unfavourable position.....				[yes / no]		—
	Doors, drawers and movable arms closed .....				[yes / no]		—
	Doors and drawers at unfavourable position.....				[yes / no]		—
Location	Tilt angle	Applied force				Comments	Verdict
	10°	250 N	20% [N]	800 N	4 times load [N]		
Front side				—			
Left side				—			
Rear side				—			
Right side				—			
Top side	—						
Working surface	—	—	—				
Ledge	—	—	—				
Castor / support foot							
Castor / support foot removed							
Supplementary information:							
<b>7.6</b>	<b>TABLE: Wall mounting</b>				<b>Form A.20B</b>		
	Equipment weight .....				kg		—
	Equipment mounted as specified by manufacturer ..				[yes / no]		—
	Equipment mounted at plasterboard (drywall) .....				[yes / no]		—
	More than one fastener used.....				[yes / no]		—
	Test maintained (after 5 s to 10 s to full load) .....				1 min		—
Location	Applied weight		Comments	Verdict			
	4 times weight [kg]	2 times weight [kg]					
Mounting brackets							
Supplementary information:							

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IEC 61010-1			
Clause	Requirement – Test	Result - Remark	Verdict
<b>8.2</b>	<b>TABLE: ENCLOSURE rigidity test</b>	<b>Form A.21A</b>	N/A
8.2.1	Static test		N/A
	Material of enclosure .....	Metal / non-metallic	—
	Preparation for the test:		—
	Operated at ambient temperature .....	°C      h	—
	<b>Location</b>	<b>Comments</b>	<b>Verdict</b>
	1)		
	2)		
	3)		
	4)		
Supplementary information:			
<b>8.2.2</b>	<b>TABLE: Impact test</b>		
	Material of enclosure .....	Metal / non-metallic	—
	Corresponding IK-code.....		—
	Preparation for the test:		—
	Cooled to (temperature).....	°C	—
	<b>Location</b>	<b>Comments</b>	<b>Verdict</b>
	1) Top		
	2) Side left / right		
	3) Bottom		
Supplementary information:			

IEC 61010-1					
Clause	Requirement – Test	Result - Remark	Verdict		
8.3	<b>TABLE: Drop test</b>	<b>Form A.21B</b>	N/A		
8.3.1	Other equipment		N/A		
	Location	Raised up to		Comments	—
		[mm]	30 °		
1)					
2)					
3)					
4)					
Supplementary information:					
8.3.2	HAND-HELD EQUIPMENT and DIRECT PLUG-IN EQUIPMENT				
	Material of enclosure .....	:	Metal / non-metallic		—
	Preparation for the test:				—
	Cooled to (temperature).....	:	°C		—
Location		Comments		Verdict	
1) Side					
2) Edge					
3) Corner					
Supplementary information:					

IEC 61010-1				
Clause	Requirement — Test		Result — Remark	Verdict
<b>9</b>	<b>TABLE: Protection against the spread of fire</b>			<b>Form A.22</b> N/A
Item	Source of HAZARD or area of the equipment considered (circuit, component, liquid etc.)	Protection Method (9.1 a, b or c)	Protection details	Verdict
Supplementary information:				

IEC 61010-1							
Clause	Requirement — Test	Result — Remark				Verdict	
9.3.2	<b>TABLE: Constructional requirements</b>	<b>Form A.23</b>				N/A	
14.7	Printed wiring boards					N/A	
Material tested .....						—	
Generic name .....						—	
Material manufacturer .....						—	
Type.....						—	
Colour .....						—	
Conditioning details.....						—	
		Sample					
		1	2	3	4	5	6
Thickness of specimen	mm						
Duration of flaming after first Application	s						
Duration of flaming plus glowing After second application	s						
Specimen burns to holding clamp	Yes/No						
Cotton ignited	Yes/No						
Sample result	Pass/Fail						
Supplementary information:							

IEC 61010-1			
Clause	Requirement — Test	Result — Remark	Verdict

<b>9.4</b>	<b>TABLE: Limited-energy circuit</b>				<b>Form A.24</b>	<b>N/A</b>
Item or Location  (see Form A.22)	9.4 a)	9.4 b) Current limitation (NOTE)		9.4 c)	Decision	Comments
	Maximum potential in circuit voltage r.m.s./d.c. [V]	Maximum available current [A]	Overload protection after 120 s [A]	Circuit separation	Yes/No	
NOTE – Maximum values see Tables 17 and 18 of IEC 61010-1						
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IEC 61010-1			
Clause	Requirement — Test	Result — Remark	Verdict
<b>9.5</b>	<b>TABLE: Requirements for equipment containing or using flammable liquids</b>		<b>Form A.25</b>
	Type of liquid	9.5 Flammable liquids	
		b) Quantity	c) Containment
Supplementary information:			

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IEC 61010-1					
Clause	Requirement — Test			Result — Remark	Verdict
<b>10.</b>	<b>TABLE: Temperature Measurements</b>			<b>Form A.26A</b>	N/A
10.1	Surface temperature limits – NORMAL CONDITION and / or SINGLE FAULT CONDITION				N/A
10.2	Temperature of windings – NORMAL CONDITION and / or SINGLE FAULT CONDITION				N/A
10.3	Other temperature measurements				N/A
Operating conditions:		Test on model U-HEA (9kw) Maximum overload			
Frequency.....:	Hz	Test room ambient temperature (ta) ...:		°C	
Voltage .....	V	Test duration.....:		h	min
Part / Location	$t_m$ [°C]	$t_c$ [°C]	$t_{max}$ [°C]	Verdict	Comments
NOTE 1 - $t_m$ = measured temperature $t_c$ = $t_m$ corrected ( $t_m - t_a + 40$ °C or max. RATED ambient) $t_{max}$ = maximum permitted temperature NOTE 2 - see also 14.1 with reference to component operating conditions NOTE 3 - Record values for NORMAL CONDITION and / or SINGLE FAULT CONDITION in this Form use additional form if necessary NOTE 4 - see Form A.26B for details of winding temperature measurements					
Supplementary information:					

IEC 61010-1								
Clause	Requirement — Test					Result — Remark		Verdict
<b>10.2</b>	<b>TABLE: Temperature of windings Resistance method Temperature Measurements</b>					<b>Form A.26B</b>		N/A
4.4.2.7	MAINS transformers							N/A
14.2.1	Motor temperatures							N/A
Operating conditions...:								
Frequency.....:	Hz	Test room ambient temperature (ta1/ta2) :				/	°C (initial / final)	
Voltage .....	V	Test duration .....				h	min	
Part / Designation	Rcold [Ω]	Rwarm [Ω]	Current [A]	<i>t<sub>r</sub></i> [K]	<i>t<sub>c</sub></i> [°C]	<i>t<sub>max</sub></i> [°C]	Verdict	Comments
NOTE 1- <i>R<sub>cold</sub></i> = initial resistance <span style="margin-left: 200px;"><i>R<sub>warm</sub></i> = final resistance</span> <i>t<sub>r</sub></i> = temperature rise <span style="margin-left: 200px;"><i>t<sub>c</sub></i> = <i>t<sub>r</sub></i> corrected (<i>t<sub>c</sub></i> = <i>t<sub>r</sub></i> + [40 °C or max RATED ambient])</span> <i>t<sub>max</sub></i> = maximum permitted temperature								
NOTE 2 - Indicate insulation class (IEC 60085) under comments (optional)								
NOTE 3 - Record values for NORMAL CONDITION and / or SINGLE FAULT CONDITION in this Form use additional form if necessary								
Supplementary information:								

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IEC 61010-1			
Clause	Requirement — Test	Result — Remark	Verdict
<b>10.5.2</b>	<b>TABLE: Resistance to heat of non-metallic ENCLOSURES</b>	<b>Form A.27</b>	N/A
	Test method used:		—
	Non-operative treatment .....	[ ]	
	Empty ENCLOSURE .....	[ ]	
	Operative treatment .....	[ ]	
	Temperature during tests .....		—
Description	Material	Comments	Verdict
Dielectric strength test (6.8) .....		V	[r.m.s./peak/d.c.]
NOTE – Within 10 minutes of the end of treatment suitable tests in acc. to 8.2 and 8.3 must be conducted and pass criteria of 8.1.			
Supplementary information:			

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IEC 61010-1			
Clause	Requirement — Test	Result — Remark	Verdict
<b>10.5.3</b>	<b>TABLE: Insulating material</b>	<b>Form A.28</b>	<b>P</b>
10.5.3 1)	Ball-pressure test		P
	Max. allowed impression diameter .....	2 mm	—
Part	Test temperature [°C]	Impression diameter [mm]	Verdict
Plastic frame of heater	200	13:00 to 14:00	P
Supplementary information:			
10.5.3 2)	<b>Vicat softening test (ISO 306)</b>	<b>Form A.29</b>	<b>N/A</b>
Part	Vicat softening temperature [°C]	Thickness of sample [mm]	Verdict
Supplementary information:			

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IEC 61010-1			
Clause	Requirement — Test	Result — Remark	Verdict

<b>8</b>	<b>TABLE: Mechanical resistance to shock and impact</b>	<b>Form A.30</b>	N/A
<b>11</b>	<b>Protection against HAZARDS from fluids and solid foreign objects</b>		N/A

Voltage tests can be carried out once after performing the tests of clause 8 and clause 11. However, if voltage tests are carried out separately after each set of tests, two forms can be used.

Location (see Form A.14)	Clause 8 tests				Clause 11 tests				Working voltage [r.m.s./d.c.]	Test voltage [r.m.s./peak/d.c.]	Verdict	Comments
	Static (8.2.1) 30 N	Impact (8.2.2)	Normal (8.3.1)	Handheld Plug-in (8.3.2)	Cleaning (11.2)	Spillage (11.3)	Overflow (11.4)	IEC 60529 (11.6)				

NOTE – Use r.m.s., d.c. or peak to indicate the used test voltage.

Supplementary information:

IEC 61010-1			
Clause	Requirement — Test	Result — Remark	Verdict

<b>11.7.2</b>	<b>TABLE: Leakage and rupture at high pressure</b>	<b>Form A.31</b>	<b>N/A</b>
---------------	--	------------------	------------

Part	Maximum permissible working pressure [MPa]	Test pressure [MPa]	Leakage Yes / No	Deformation Yes / No	Burst Yes / No	Comments

NOTE – see also Annex G with requirements for USA and Canada.

Supplementary information:

<b>11.7.3</b>	<b>TABLE: Leakage from low-pressure parts</b>	<b>Form A.32</b>	<b>N/A</b>
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Part	Test pressure [MPa]	Leakage Yes / No	Comments

Supplementary information:

IEC 61010-1			
Clause	Requirement — Test	Result — Remark	Verdict
<b>12.2.1</b>	<b>TABLE: Ionizing radiation</b>	<b>Form A.33</b>	N/A
12.2.1.2	Equipment intended to emit radiation		N/A
Locations tested	Measured values [μSv/h]	Verdict	Comments
Supplementary information:			
<b>12.2.1.3</b>	<b>Equipment not intended to emit radiation</b>	<b>Form A.34</b>	N/A
	Max. allowed effective dose rate at 100 mm.....:	1 μSv/h	—
Locations tested	Measured values [μSv/h]	Verdict	Comments
Supplementary information:			

IEC 61010-1			
Clause	Requirement — Test	Result — Remark	Verdict

<b>12.5.1</b>	<b>TABLE: Sound level</b>	<b>Form A.35</b>	N/A
Locations tested	Measured maximum sound pressure level dB(A)	Calculated maximum sound power level	
At operator's normal position and at bystanders' positions			
a)			
b)			
c)			
d)			
e)			
f)			

Supplementary information:

<b>12.5.2</b>	<b>TABLE: Ultrasonic pressure</b>	<b>Form A.36</b>	N/A
Locations tested	Measured values		Comments
	[dB]	[kHz]	
At operator's normal position			
At 1 m from the ENCLOSURE			
a)			
b)			
c)			
d)			
e)			

NOTE – No limit is specified at present, but a limit of 110 dB above the reference pressure value of 20 μPa is under consideration for applicable frequencies between 20 kHz and 100 kHz.

Supplementary information:

IEC 61010-1			
Clause	Requirement — Test	Result — Remark	Verdict

13.2.2	<b>TABLE: Batteries and battery charging</b>	<b>Form A.37</b>	N/A
	Battery load and charging circuit diagram:		



	Battery type.....:		—
	Battery manufacturer/model/catalogue No. ....:		—
	Battery ratings.....:		—
	Reverse polarity instalment test		

Single component failures		Verdict	
Component		Open circuit	Short circuit

Supplementary information:

IEC 61010-1			
Clause	Requirement — Test	Result — Remark	Verdict
14.3	<b>TABLE: Overtemperature protection devices</b>	<b>Form A.38</b>	N/A
Reliability test			
Component	Type (NOTE)	Verdict	Comments
NOTE: NSR = non-self-resetting (10 times) NR = non-resetting (1 time) SR = self-resetting (200 times)			
Supplementary information:			

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IEC 61010-1			
Clause	Requirement — Test	Result — Remark	Verdict
4.4.2.7	<b>TABLE: MAINS transformer</b>	<b>Form A.39</b>	N/A
4.4.2.7.2	Short circuit		N/A
14.6	MAINS transformers tested outside equipment		
Type.....:			—
Manufacturer.....:			—
Test in equipment			
Test on bench			
Test repeated inside equipment (see 14.6)			
Optional – Insulation class (IEC 60085) of the lowest rated winding.....:			—
Winding identification			
Type of Protector for winding (NOTE 1)			
Elapsed time			
Current, A	primary		
	Secondary		
Winding temperature, °C primary			
(see NOTE 2) secondary			
Tissue paper / cheesecloth OK ? (Pass / Fail)			
Voltage tests (see NOTE 3)			
Primary to secondary	_____ V _____		
Primary to core	_____ V _____		
Secondary to secondary	_____ V _____		
Secondary to core	_____ V _____		
Verdict			
NOTE 1:	Primary fuse	- PF / ( ) A	
	Secondary fuse	- SF / ( ) A	
	Overtemperature protection	- OP / ( ) °C	
	Impedance protection	- Z	
NOTE 2:	Indicate method of measurement	- TC = with thermocouple - R = resistance method	
NOTE 3:	If resistance method is used, record resistance in cold and warm condition in Form A.26B. Record the voltage applied and the type of voltage (r.m.s. / d.c. / peak) and for results use NB = no breakdown or B = breakdown		
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IEC 61010-1			
Clause	Requirement — Test	Result — Remark	Verdict
4.4.2.7	<b>TABLE: MAINS transformer</b>	<b>Form A.40</b>	N/A
4.4.2.7.3	Overload tests (for MAINS transformers)		N/A
14.6	MAINS transformers tested outside equipment		
Type .....			—
Manufacturer .....			—
Test in equipment			
Test on bench			
Test repeated inside equipment (see 14.6)			
Optional – Insulation class (IEC 60085) of the lowest rated winding .....			—
Winding identification			
Type of Protector for winding (NOTE 1)			
Elapsed time			
Current, A primary			
Secondary			
Winding temperature, °C primary			
(see NOTE 2) secondary			
Tissue paper / cheesecloth OK ? (Pass / Fail)			
Voltage tests (see NOTE 3)			
Primary to secondary	_____ V _____		
Primary to core	_____ V _____		
Secondary to secondary	_____ V _____		
Secondary to core	_____ V _____		
Verdict			
NOTE 1:	Primary fuse	- PF / ( ) A	
	Secondary fuse	- SF / ( ) A	
	Overtemperature protection	- OP / ( ) °C	
	Impedance protection	- Z	
NOTE 2:	Indicate method of measurement	TC = with thermocouple R = resistance method	
	If resistance method is used, record resistance in cold and warm condition in Form A.26B.		
NOTE 3:	Record the voltage applied and the type of voltage (r.m.s. / d.c. / peak) and for results use NB = no breakdown or B = breakdown		
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IEC 61010-1			
Clause	Requirement — Test	Result — Remark	Verdict

<b>14.8</b>	<b>TABLE: Circuits used to limit TRANSIENT OVERVOLTAGES</b>										<b>Form A.41</b>	<b>N/A</b>
Circuit / Designation	Overvoltage Category	MAINS voltage [V r.m.s.]	Test voltage [V]	$t_m$ [°C]	$t_c$ [°C]	$t_{max}$ [°C]	Ignited Yes / No	Safely suppressed Yes / No	Properly functional Yes / No	Verdict	Comments	
Test room ambient temperature:												°C
NOTE - $t_m$ = measured temperature $t_c$ = $t_m$ corrected ( $t_m - t_a + 40$ °C or max. RATED ambient) $t_{max}$ = maximum permitted temperature Conformity is checked by applying 5 positive and 5 negative impulses with the applicable impulse withstand voltage, spaced up to 1 min apart, from a hybrid impulse generator (see IEC 61180-1).												
Supplementary information:												

IEC 61010-1			
Clause	Requirement – Test	Result — Remark	Verdict

<b>Annex H</b>	<b>TABLE: Qualification of conformal coating for protection against pollution</b>	<b>Form A.42</b>	<b>N/A</b>
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Technical properties			
Manufacturer			—
Type			—
Meet requirements of ANSI / UL 746E		[yes / no]	
Manufacturer declaration of coating material		[yes / no]	
Operating temperature of coating		[ ] °C	
Comparative tracking index (CTI)		[ ]	
Insulation resistance		[ ] MΩ	
Dielectric strength		[ ] V	
UV resistance (if required)		[yes / no]	
Flammability rating			
Preparation of the test specimens conducted		[yes / no]	

Item	Test conditioning	Parameter	Td h	Samples						Verdict	Comments
				1	2	3	4	5	6		
1	Cold		24								
2	Dry heat		48								
3	Rapid temp. change										
4	Damp heat		24								
5	Adhesion of coating	5 N									
	Visual inspection										
6	Humidity		48								
7	Insulation resistance	≥ 100 MΩ									
	Visual inspection										

NOTE Td = Test duration time

Supplementary information:



IEC 61010-1			
Clause	Requirement — Test	Result — Remark	Verdict

TABLE 1.A: List of components and circuits relied on for safety							P
Unique component reference or location	Application/function	Manufacturer / trademark (NOTE 1)	Type / model	Technical data (NOTE 2)	Standard	Mark(s) of conformity evidence of acceptance (NOTE 3 and 4)	
--	Heater Lead	Interchangeable	Interchangeable	FEP - Type 1199 (AWM), min. 600V, 200 degree C	UL1331	--	
--	PFA tubing for heater wire	ALTAFLOR LLC	ALTAFLUOR® 200 FEP	FEP, Min. 0.6 mm thick, 200 degree C.	meets or exceeds the requirements listed in ASTM D2116 Type IV	Compliance with this standard	
--	Housing material for heater frame	GUARNIFLON S.p.A.	PTFE G400	PTFE, Min. 0.6 mm thick, max. Service Temperature 260 degree C.	Compliance with this standard	Compliance with this standard	
NOTE → 1 List all different manufacturers of the above components → 4 asterisk indicates mark assuring agreed level of surveillance → 2 May include electrical, mechanical values → 3 List licence no or method of acceptance							

## Attachment 1: National Difference

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IEC61010_1L ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
<b>ATTACHMENT TO TEST REPORT</b>			
<b>IEC 61010-1</b>			
<b>US NATIONAL DIFFERENCES</b>			
Electrical Equipment For Measurement, Control, and Laboratory Use; Part1: General Requirements			
<b>Differences according to .....</b>	UL 61010-1 (3 <sup>rd</sup> Ed.); Am. 1		
<b>Attachment Form No. ....</b>	US_ND_IEC61010_1L		
<b>Attachment Originator .....</b>	UL(US)		
<b>Master Attachment.....</b>	Date 2019-04-11		
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Clause	USA National Differences		P
1.1.4	Equipment installation complies with the National Electrical Code (NEC), ANSI/NFPA 70 and the Canadian Electrical Code (CEC) CAN/CSA C22.2 No. 0 and Part 1, CSA C22.1	To be evaluated in end-product	N/A
5.1.3	Measurement of maximum input power or current with all accessories and plug-in modules connected during a 10 second period complies with the marked mains supply rating requirements.	To be evaluated in end-product	N/A
6.5.2.4	Impedance of PROTECTIVE BONDING of plug-connected equipment		N/A
	The impedance does not cause a potential drop of more than 4V.		N/A
	Test current is twice the rating of the plug, not less than 40A, twice the rating of the internal overcurrent protection or complies with CAN/CSA-C22.2 No 0.4. with the duration specified in Table 6.5.2.4 DV.1		N/A
6.5.2.5	Impedance of PROTECTIVE BONDING of PERMANENTLY CONNECTED EQUIPMENT	To be evaluated in end-product	N/A
	Test duration specified in Table 6.5.3.4DV.1		N/A
	Voltage drop did not exceed 4V		N/A
6.7.3.4.1	For solid insulation the equivalent d.c. voltage test values for an a.c. circuit was used		N/A
6.7.3.4.4	For thin film insulation the equivalent d.c. voltage test values for an a.c. circuit was used		N/A
6.10.1	MAINS supply cords		N/A
	MAINS supply cords or cord sets comply with ANSI/UL 817 and CSA C22.2. No.1		N/A

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Clause	USA National Differences	P
	General use receptacles, attachment plugs and similar wiring devices comply with ANSI/UL 498 and CSA C22.2 No. 42, CSA C22.2 No. 182.1, CSA C22.2 No. 182.2 and CSA C22.2 No. 182.3	N/A
	Green covered conductors (with or without yellow stripes) used only for PROTECTIVE CONDUCTOR TERMINALS	N/A
6.10.3	Plugs of MAINS cords comply with ANSI/UL 498 and CSA C22.2 No. 42, CSA C22.2 No. 182.1, CSA C22.2 No. 182.2 and CSA C22.2 No. 182.3	N/A
6.10.4	PERMANENTLY CONNECTED EQUIPMENT	N/A
	Equipment intended for permanent connection to MAINS complies with Annex DVD	To be evaluated in end-product N/A
	Open-type equipment intended for permanent connection to MAINS complies with Annex DVE	To be evaluated in end-product N/A
6.11.5	Polarity of MAINS circuits for line-connected single-pole switch, center contact of a lampholder and any automatic control with a marked off position connected to ungrounded conductor.	To be evaluated in end-product N/A
9.3.2	Flammability RATINGS of ANSI/UL94, V-0, V-1, V-2 and VW-1 of ANSI/UL 1581 are considered equivalent to IEC classifications. Flammability rating FT-1 and CSA C22.2. No. 0.3 and VW-1 or ANSI/UL 1581 are considered acceptable for wire and cable.	Flammability: FEP resists combustion and does not promote flame spread N/A
9.6.1	Overcurrent protection	N/A
	Single-pole circuit breaker connected in the ungrounded supply conductor.	N/A
	Multiple-pole circuit breaker interrupt all neutral (grounded) and ungrounded conductors simultaneously.	N/A
	A single fuse used connected in the ungrounded supply conductor.	N/A
	Fuses connected in both the neutral (grounded) and ungrounded supply conductors are mounted adjacent to each other and have the same RATING.	N/A
	The screw shell of a plug fuseholder and the ACCESSIBLE contact of an extractor fuseholder connected to the ungrounded supply is connected towards the load. The ACCESSIBLE contact or screw shell of fuseholder connected in the neutral (grounded) conductor is connected towards the grounded supply line.	N/A
11.6	Replace IP code with Type rating specified in UL 50E and CSA C22.2 No. 94.2.	N/A
11.6.1	IEC 60529 rating, and marking replaced by UL 50E and CSA C22.2 No. 94.2	N/A
11.6.3	Protection against solid foreign objects, IEC 60529 replaced by UL 50E and CSA C22.2 No. 94.2.	N/A
11.6.4	Protection against water, IEC 60529 replaced by	N/A

Clause	USA National Differences		P
	UL 50E and CSA C22.2 No. 94.2		
11.7.1	Leakage and rupture at high pressure comply with 11.7.2 and Annex G		N/A
12.1	X-ray equipment complies with 21 CFR 1020 and laser equipment complies with 21 CFR 1040		N/A
14.1	Components meet applicable ANSI/UL, CAN, CSA requirements		N/A
14.9	Nonmetallic enclosure for outdoor use comply with UV requirements in ANSI/UL746C or CSA C22.2 No.0.17 as applicable		N/A
14.10	Conductive coatings if peeling or flaking would reduce spacings or bridge live part comply with ANSI/UL 746C or CSA C22.2 No.0.17 as applicable		N/A
14.11	Direct plug-in transformer units comply with ANSI/UL1310, CAN/CSA C22.2 No.223, ANSI/UL 60950-1, or CSA C22.2 No.60950-1		N/A
Annex DVC	Addition: UV radiation limits comply with the ACGIH requirements		N/A
Annex DVD	Addition: Permanent connection to MAINS		N/A
DVD.1.1	Equipment has provision for connection of a wiring system according to ANSI/NFPA 70, NEC or CSA C22.2, CEC, Part I as applicable		N/A
DVD.2.1.1	Equipment provided with TERMINALS or leads for connection and sized per the NEC or CEC		N/A
DVD2.1.2	Equipment provided with a TERMINAL or splice compartment is complete		N/A
DVD.2.1.3	TERMINAL or splice compartment not exposed to damage or strain and able to be inspected after installation		N/A
DVD.2.2	Wiring TERMINALS provide effective connection device or sufficient wire binding screw		N/A
DVD.2.3	Leads used for field wiring minimum 6 inches long	No field wiring	N/A
DVD.2.4.1	TERMINALS and lead identified for their intend use	To be evaluated in end-product	N/A
DVD.2.4.2	Polarized convenience receptacle or polarized lamp socket identifies the neutral (grounded) conductor		N/A
DVD.2.4.3	TERMINAL intended for neutral (grounded) conductor identified		N/A
DVD.2.4.4	Neutral (grounded) field wiring lead white or gray color		N/A
DVD.2.4.5	Protective earth TERMINAL marked per 5.1.5.2 or "G", "GR", "GND", "GROUND", or "GROUNDING" or green colored screwhead		N/A
DVD.2.4.6	Protective grounding conductor green color with or without yellow stripes		N/A
DVD.3.1	ENCLOSURE complies with the pulling, torque and bending test		N/A
DVD.3.2	Metallic ENCLOSURE meet minimum thickness		N/A

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Clause	USA National Differences	P
DVD.3.3	Bonding between all metallic conduits entering the ENCLOSURE provided	N/A
DVD.4.1	ENCLOSURE complies with the Conduit pull-out test	N/A
DVD.4.2	ENCLOSURE complies with the Conduit torque test	N/A
DVD.4.3	ENCLOSURE complies with the Conduit bending test	N/A
DVD.4.4	ENCLOSURE complies with the Knockout test	N/A
DVE	Addition: Permanently installed equipment	N/A
DVE.1.2	Energy-monitoring equipment is not intended for retrofit field installation within the enclosure of switchgears/panel boards unless it has been specifically covered as and accessory by the switchgear/panel board listing	Not Energy-monitoring equipment N/A
DVE.1.3	Meter is not an electric utility meters Type S and Type A evaluated to UL2735 or CSA CAN3-C-17	N/A
DVE.1.5	Meter is not intended for use in utility substations or equivalent areas greater than CAT IV	N/A
DVE.3.1.1.1	Contact device (switch, relay) rated for intended load	N/A
DVE.3.1.2	Current Transformer warning and correlation marking	N/A
DVE.3.1.2.1	Warning marking to disconnect power when installing or servicing current transformer provided	N/A
DVE.3.1.2.2	Marking for use with listed Energy-Monitoring Current Transformers provided	N/A
DVE.3.1.2.3	Marking for use with specific energy monitoring current transformer provided	N/A
DVE.3.1.3	Field-wiring terminal markings	N/A
DVE.3.1.3.1	Field-wiring terminal marking specifying the use of copper or aluminum or both provided	N/A
DVE.3.1.3.2	Field-wiring terminal marking in DVE.3.1.3.1 abbreviated.	N/A
DVE.3.1.3.3	Wire connectors for field installation comply with DVE.4.4.3 and if necessary marked to restrict its use to the smaller size conductor	N/A
DVE.3.1.3.4	Markings required in DVE.3.1.3.1 to DVE.3.1.3.3 use a coded correlation marking or Table 1, symbol 14	N/A
DVE.3.2	Documentation: equipment installation	N/A
DVE.3.2.1	Current transformers intended for field installation inside a panel board or switchgear have the following markings	—
	a) Disconnect power to equipment before installing or servicing	N/A
	b) Minimum 75 percent wiring space required	N/A
	c) Do not restrict ventilation openings	N/A
	d) Do not install near breaker arc vent	N/A
	e) Not suitable for Class 2 applications	N/A
	f) Secure current transformer and route conductors away from live terminals or bus structure	N/A
	g) Warning to disconnect power before installing or	N/A

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Clause	USA National Differences		P
	servicing		
DVE.3.2.2	Instructions for OPEN EQUIPMENT installed within the same end-product enclosure have the following information		—
	a) Correlation statement identifying the current transformer being used		N/A
	b) Statement that the leads are maintained within the same end-product enclosure		N/A
	c) Statement to segregate of or insulate the leads from different circuits		N/A
	d) Statement that the current transformers are for installation within the same enclosure as the equipment but not switchgears and panel boards		N/A
DVE.4.1.1	Current transformer leads considered NFPA 70 C22.1 Class 1 wiring		N/A
DVE.4.1.2	Segregation between the following circuits is provided		—
	a) Class 1, factory wiring, terminal and uninsulated live parts		N/A
	b) Class 2 and Class 3 wiring and uninsulated live parts		N/A
DVE.4.1.3	Segregation by clamping, routing or equivalent min. 6.0 mm distance		N/A
DVE.4.1.4	Insulation rated for highest voltage		N/A
DVE.4.1.5	Kit provided with the equipment and statement in the installation manual explaining how to maintain segregation between circuits		N/A
DVE.4.2.1	Class 2 Circuit and connections comply with NFPA 70 ARTICLE 725, and C22.1, Section 16		N/A
DVE.4.3.1	Neutral conductors are evaluated as hazardous live MAINS circuit		N/A
DVE.4.4	Permanent connection to MAINS		N/A
DVE.4.4.1	Field-wiring leads not smaller than two wire sizes and not smaller than 18 AWG	To be evaluated in end-product	N/A
DVE.4.4.2	18 AWG field-wiring lead connection to No. 12 AWG applied		N/A
DVE.4.4.3	Field-wiring lead more than two wire sizes but not small than 18 AWG if more than one wire connected to the same field-provided lead and complies with a) to c) below		N/A
	a) Wire connector provided and suitable for combination of wires		N/A
	b) Field-wiring leads are arranged to reduce stress on individual leads		N/A
	c) Equipment marked to specify the wire connector to be used		N/A
DVE.4.4.4	Pigtail leads comply with testing in DVE.4.4.5	No Pigtail leads	N/A
	a) Pigtail lead extending from enclosure complies with direct pull test of 89 N (20 lb)		N/A
	b) Pigtail lead within a wiring compartment		N/A

Clause	USA National Differences		P
	complies with direct pull test of 44.5 N (10 lb)		
DVE.4.4.6	Protective grounding terminals noted in DVD.2.4.5 marked on wiring diagram	To be evaluated in end-product	N/A
DVE.5.1.1	Enclosure withstands an impact test of 6.8 joules	To be evaluated in end-product	N/A
DVE.6.1	Enclosure comply with UL50 and/or UL50E or as appropriate CSA C22.2 Nos. 94.1 and 94.2	To be evaluated in end-product	N/A
DVE.7.1	OPEN EQUIPMENT tested per installation instructions or referenced test ambient condition	To be evaluated in end-product	N/A
DVE.7.2.1	Wiring for connection to the field-wiring terminal min. 1.22 m (4 ft) long and sized per Table 310-15(B), column 60°C or 75°C for greater than 100 A.	To be evaluated in end-product	N/A
DVE.8.1	Current transformers		N/A
DVE.8.1.1	Current transformers for field installation are Listed energy monitoring current transformer or comply with DVE.8.1.2	To be evaluated in end-product	N/A
DVE.8.1.2	Accessory current transformers for field installation with OPEN EQUIPMENT comply with a) to e) below		N/A
	a) Case and potting material minimum basic insulation between internal circuits and external surfaces		N/A
	b) Minimum 105°C case and potting material used		N/A
	c) Minimum case and potting material used is based on intended conductor insulation (60°C, 75°C or 90°C)		N/A
	d) Current transformer leads and electrical sleeving voltage rating complies		N/A
	e) Current transformer leads rated minimum 90°C		N/A

## Attachment 2: Photo

Photo-1	External view of HFI-1914-205-V
Photo-2	External view of HFI-1914-205-V
Photo-3	External view of HFI-1907-088-L
Photo-4	External view of HFI-1907-088-L

Photo-1 External view of HFI-1914-205-V

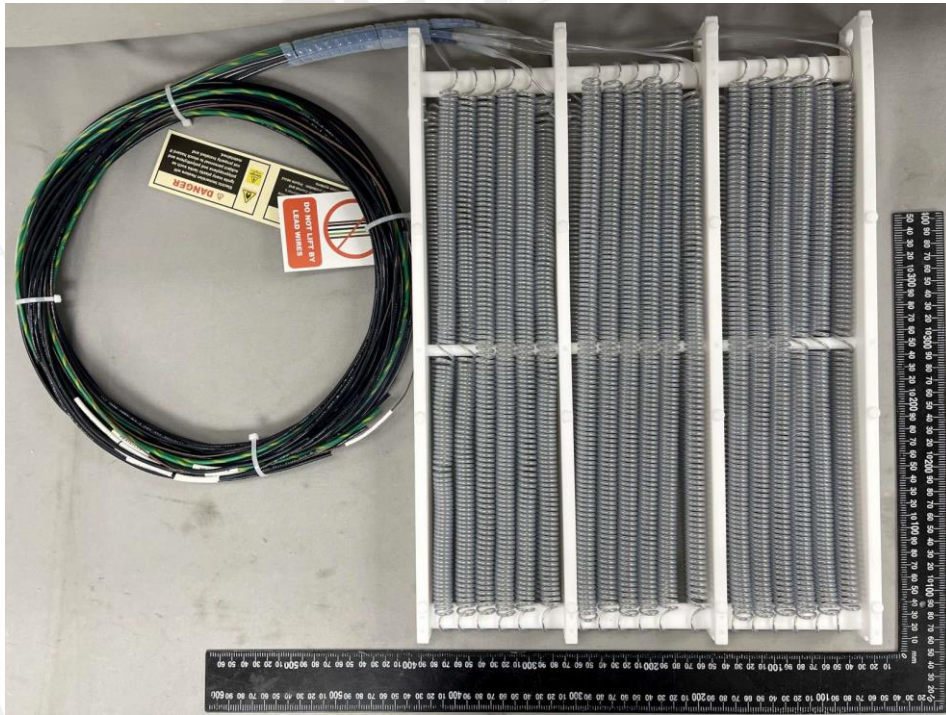


Photo-2 External view of HFI-1914-205-V



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Photo-3 External view of HFI-1907-088-L

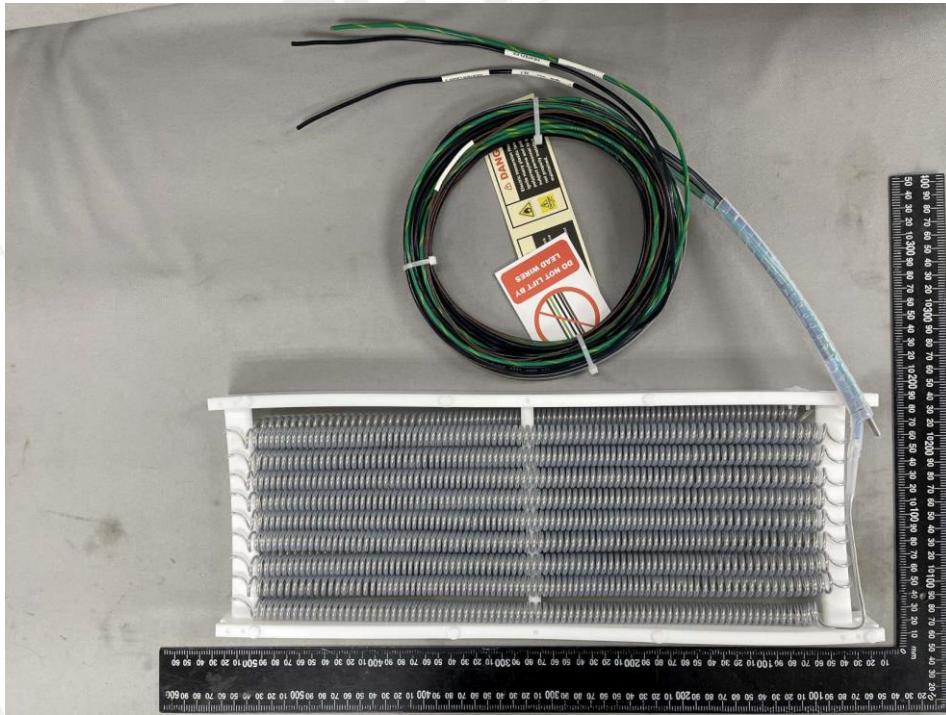


Photo-4 External view of HFI-1907-088-L



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## Attachment 3: Model difference lists

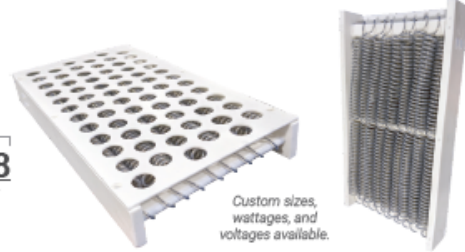
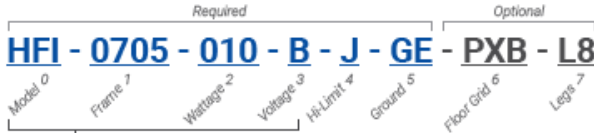
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Model difference list (1)

**WHITE KNIGHT®** HFI Heater Ordering Instructions

**Configuration**

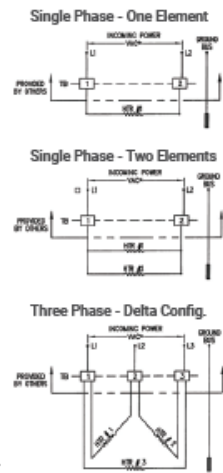
Options in the example are **highlighted** below.



Standard Base Models Available	1. Frame *L x W (in)	2. Wattage *Max. (kW)	3. Voltage *Max. (VAC)	Specific kW at VAC													
				120	200	208	220	230	240	380	400	480					
HFI-0705-010-B	7 x 5	0705	1.0 010	120	1φ	B	1.0	-	-	-	-	-	-	-	-	-	-
HFI-0705-023-E			2.3 023	230	1φ	E	-	1.7	1.9	2.1	2.3	-	-	-	-	-	-
HFI-0707-020-B	7 x 7	0707	2.0 020	120	1φ	B	2.0	-	-	-	-	-	-	-	-	-	
HFI-0707-030-F			3.0 030	240	1φ	F	2.1	2.3	2.5	2.8	3.0	-	-	-	-	-	
HFI-0905-020-B	9 x 5	0905	2.0 020	120	1φ	B	2.0	-	-	-	-	-	-	-	-	-	
HFI-0905-030-F			3.0 030	240	1φ	F	2.1	2.3	2.5	2.8	3.0	-	-	-	-	-	
HFI-0907-040-D	9 x 7	0907	4.0 040	220	1φ	D	3.3	3.6	4.0	-	-	-	-	-	-	-	
HFI-0909-050-F	9 x 9	0909	5.0 050	240	1φ	F	3.5	3.7	4.2	4.6	5.0	-	-	-	-	-	
HFI-0909-055-L			5.5 055	480	1φ	L	-	-	-	-	-	3.4	3.8	5.5	-	-	
HFI-1105-040-D	11 x 5	1105	4.0 040	220	1φ	D	3.3	3.6	4.0	-	-	-	-	-	-	-	
HFI-1107-050-F	11 x 7	1107	5.5 055	240	1φ	F	3.5	3.7	4.2	4.6	5.0	-	-	-	-	-	
HFI-1107-055-L			5.0 050	480	1φ	L	-	-	-	-	-	3.4	3.8	5.5	-	-	
HFI-1109-070-F	11 x 9	1109	7.0 070	240	1φ	F	4.8	5.2	5.9	6.4	7.0	-	-	-	-	-	
HFI-1111-088-L	11 x 11	1111	8.8 088	480	1φ	L	-	-	-	-	-	5.5	6.1	8.8	-	-	
HFI-1305-050-F	13 x 5	1305	5.0 050	240	1φ	F	3.5	3.7	4.2	4.6	5.0	-	-	-	-	-	
HFI-1305-045-L			4.5 045	480	1φ	L	-	-	-	-	-	2.8	3.1	4.5	-	-	
HFI-1307-070-F	13 x 7	1307	7.0 070	240	1φ	F	4.8	5.2	5.9	6.4	7.0	-	-	-	-	-	
HFI-1309-070-F	13 x 9	1309	7.0 070	240	1φ	F	4.9	5.3	5.9	6.4	7.0	-	-	-	-	-	
HFI-1309-068-L			6.8 068	480	1φ	L	-	-	-	-	-	4.3	4.7	6.8	-	-	
HFI-1311-104-E*	13 x 11	1311	10.4 104	230	1φ	E	7.9	8.5	9.6	10.4	-	-	-	-	-	-	
HFI-1311-110-L*			11.0 110	480	1φ	L	-	-	-	-	-	6.9	7.6	11.0	-	-	
HFI-1505-050-F	15 x 5	1505	5.0 050	240	1φ	F	3.5	3.7	4.2	4.6	5.0	-	-	-	-	-	
HFI-1505-055-L			5.5 055	480	1φ	L	-	-	-	-	-	3.4	3.8	5.5	-	-	
HFI-1507-070-XX	15 x 7	1507	7.0 070	400	1φ	XX	-	-	-	-	-	6.3	7.0	-	-		
HFI-1509-100-F*	15 x 9	1509	10.0 010	240	1φ	F	6.9	7.5	8.4	9.2	10.0	-	-	-	-	-	
HFI-1509-090-L*			9.0 090	480	1φ	L	-	-	-	-	-	5.6	6.3	9.0	-	-	
HFI-1905-070-XX	19 x 5	1905	7.0 070	400	1φ	XX	-	-	-	-	-	6.3	7.0	-	-		
HFI-1907-088-L	19 x 7	1907	8.8 088	480	1φ	L	-	-	-	-	-	5.5	6.1	8.8	-	-	
HFI-1311-090-Q	13 x 11	1311	9.0 090	240	3φ	Q	6.2	6.8	7.6	8.3	9.0	-	-	-	-	-	
HFI-1311-090-W			400	3φ	W	-	-	-	-	-	-	8.1	9.0	-	-		
HFI-1511-120-O	15 x 11	1511	12.0 120	220	3φ	O	9.9	10.7	12.0	-	-	-	-	-	-	-	
HFI-1511-113-W			11.3 113	400	3φ	W	-	-	-	-	-	10.2	11.3	-	-		
HFI-1514-150-Q	15 x 14	1514	5.0 050	240	3φ	Q	10.4	11.2	12.6	13.7	15.0	-	-	-	-	-	
HFI-1514-165-V			6.5 065	480	3φ	V	-	-	-	-	-	10.3	11.4	16.4	-	-	
HFI-1909-090-Q	19 x 9	1909	9.0 090	240	3φ	Q	6.2	6.8	7.6	8.3	9.0	-	-	-	-	-	
HFI-1909-090-W			400	3φ	W	-	-	-	-	-	-	8.1	9.0	-	-		
HFI-1911-150-Q	19 x 11	1911	15.0 150	240	3φ	Q	10.4	11.2	12.6	13.7	15.0	-	-	-	-	-	
HFI-1911-135-V			13.5 135	480	3φ	V	-	-	-	-	-	8.5	9.4	13.5	-	-	
HFI-1914-208-Q	19 x 14	1914	20.8 208	240	3φ	Q	14.5	15.6	17.5	19.2	20.8	-	-	-	-	-	
HFI-1914-205-V			20.5 205	480	3φ	V	-	-	-	-	-	12.8	14.2	20.5	-	-	

4. Hi-Limit Sensor	
Type J T/C	<b>J</b>
5. Ground Wire	
No Ground	GN
Encapsulated	<b>GE</b>
6. Perforated Grid	
No Grids	blank
Top Grid Only	PTX
Bottom Grid Only	PXB
Top & Bottom Grid	PTB
7. Raised Legs	
No Legs	blank
1/2-in Raised Legs	L8

Accessories	
Description	Part Number
Process T/C, Type J	HAT04-XX-0002
Process T/C, Type K	HAT04-XX-0026
Thermal Cut-Off	Varies on rating



\* Two heaters per frame.

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11 Jan 2024 | Subject to change  
<https://wkfluid.com/hfi/>

**Model difference list (2)**

Model name	Frame dimension	Input rating
H670652J-03-08	29.2 x 17.8 x 4.2 cm (L11.5xW7xH1.63")	208V (1-phase), 2.8kw
H670679J-P681	29.2 x 17.8 x 6.4 cm (L11.5xW7xH2.5")	208V (1-phase), 5.2kw
H670728J-P612	48.9 x 22.9 x 4.2 cm (L19.25xW9xH1.63")	220V (1-phase), 8kw
HFI-1909-080-D-CP0073	48.3 x 22.9 x 4.4 cm (L19"xW9"xH1.75")	220V (1-phase), 8kw
H670740JP-P696	38.1 x 38.1 x 7.3 cm (L15xW15xH2.875")	220V (3-phase), 12kw

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