TECHNICAL REPORT

IEC TR 61010-3-1

Second edition
2003-04

Safety requirements for electrical equipment for measurement, control, and laboratory use –

Part 3-1: Conformity verification report for IEC 61010-1:2001 – General requirements

Règles de sécurité pour appareils électriques de mesurage, de régulation et de laboratoire –

Partie 3-1: Rapport de vérification de la conformité de la CEI 61010-1:2001 – Prescriptions générales

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

SAFETY REQUIREMENTS FOR ELECTRICAL EQUIPMENT FOR MEASUREMENT, CONTROL, AND LABORATORY USE –

Part 3-1: Conformity verification report for IEC 61010-1:2001 General requirements

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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The main task of IEC technical committees is to prepare International Standards. However, a technical committee may propose the publication of a technical report when it has collected data of a different kind from that which is normally published as an International Standard, for example “state of the art”.

IEC 61010-3-1, which is a technical report, has been prepared by IEC technical committee 66: Safety of measuring, control, and laboratory equipment.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
66/278/DTR	66/316 /RVC

Full information on the voting for the approval of this technical report can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the IEC/ISO Directives, Part 2.

This report is a Technical Report and is of a purely informative nature and is therefore by itself not to be regarded as an International Standard. It is to assist users of the standard with determining and recording verification of conformity of the equipment under test with the requirements of:

IEC 61010-1: 2001 2nd edition

The protocol for completion of this report is contained in publication IEC 61010-3:2003 2nd edition.

The IEC sells read-only PDF files as a general rule. In the present instance, and quite exceptionally, to enable the user to fill in the forms, a revisable file is included in a pocket affixed to the back cover of this publication.

This file can also be downloaded from the Web as a PDF file. There is, however, at the end of the document, a revisable file containing the forms. Please use the zip/unzip function.

WARNING – Experience has shown that if a version is downloaded in Word 97 or Word 2000 and is subsequently converted to Word 6, some of the symbols may have been incorrectly changed in the conversion. Care must, therefore, be taken to verify the symbols used in the converted document.

The committee has decided that the contents of this publication will remain unchanged until 2006. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

TEST REPORT **IEC 61010-1:2001** **Safety requirements for electrical equipment for measurement, control, and laboratory use** **Part 1: General requirements**	
Report Reference No. ..... : Tested by (name and signature) . : Approved by (name and signature) ..... : Date of issue ..... : Contents ..... : Pages	
Testing organisation ..... : Address ..... : Testing location ..... :	
Applicant's name ..... : Address ..... :	
Test specification: Standard ..... : IEC 61010 – 1 : 2001 (2nd Edition); Copyright blank test report ..... : This report has been prepared by IEC TC 66, which retains responsibility for any changes or corrections required. Test Procedure ..... : Procedure deviation ..... : Non-standard test method ..... :	
Test item description ..... :	
Trademark ..... :	
Model/Type reference ..... :	
Rating(s) ..... :	

Test item particulars..... :	
Type of item tested .....:	Measurement / Control / Laboratory
Description of equipment function ..... :	
Intended use ..... :	
INSTALLATION/OVERVOLTAGE CATEGORY..... :	
POLLUTION DEGREE ..... :	
Environmental rating ..... :	standard / extended (specify):
Equipment mobility..... :	portable / hand-held / floorstanding / fixed / built in/ benchmounted/other (specify):
Connection to mains supply..... :	Permanent / detachable cord set / non detachable cord set / none
Operating conditions ..... :	continuous / short-time / intermittent
Overall size of the equipment (L x W x H) ..... :	
Mass of the equipment (kg) ..... :	
Marked degree of protection to IEC 60529..... :	IP_____ _____
Accessories and detachable parts included in the evaluation..... :	
Options included ..... :	
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)

General remarks:

The test results presented in this report relate only to the item(s) tested.

"(see remark #)" refers to a remark appended to the report.
"(see Annex #)" refers to an annex appended to the report.
"(see Form A.#)" refers to a table appended to the report.

Throughout this report a comma (point) is used as the decimal separator.

Copy of equipment markings :

Summary of test results (information/comments):

TABLE 1 – Documents reviewed					
Document Name	**Version**	**Date**	**Editor**	**Attached Yes / No**	**Page Numbers**

TABLE 2 – Test equipment list

Test equipment number	Type and make	Unique identification number	Calibration date		Ranges used note 2	Comments
			Last note 1	Due		

Note 1 Or interval between calibrations
Note 2 Range used to be noted using the Instrument Code on the specific Form.

TABLE 3 – List of components and circuits relied on for safety

Unique component reference or location (including drawing reference if required)	Safety Function	Manufacturer (note 1)	Part number	RATING (note 2)	Evidence of acceptance (note 3)

NOTE 1 - List all manufacturers concerned.
NOTE 2 - Electrical, mechanical, flammability, etc.
NOTE 3 - Licence number, file number or other documentary evidence of acceptance

Clause	Requirement – Test	Result - Remarks	Verdict
5	**MARKING AND DOCUMENTATION**		
5.1.1	General		
	Required equipment markings are:		
	visible:		
	From the exterior; or		
	After removing a cover; or		
	Opening a door		
	After removal from a rack or panel		
	Not put on parts which can be removed by an OPERATOR		
	Letter symbols (IEC 60027) used		
	Graphic symbols (IEC 61010-1: Table 1) used		
5.1.2	Identification		
	Equipment is identified by:		
5.1.2a)	Manufacturer's or supplier's name or trademark		
5.1.2b)	Model number, name or other means		
	Manufacturing location identified		
5.1.3	Mains supply		
	Equipment is marked as follows:		
5.1.3a)	Nature of supply:		
	1) A.C. RATED mains frequency or range of frequencies :		
	2) D.C. with symbol 1		
5.1.3b)	RATED supply voltage(s) or range :		
5.1.3c)	Max. RATED power (W or VA)or input current :		
	The measured value not more than 110 %	(See Form A.3)	
	If more than one voltage range:		
	Separate values marked; or		
	Values differ by less than 20 %	(See Form A.3)	
5.1.3d)	OPERATOR-set for different RATED supply voltages:		
	Indicates the equipment set voltage		
	PORTABLE EQUIPMENT indication is visible from the exterior		
	Changing the setting changes the indication		
5.1.3e)	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		
	If not marked for specific equipment it is marked with:		
	The maximum RATED current or power; or		
	Symbol 14 with full details in the documentation		
5.1.4	Fuses		
	OPERATOR replaceable fuse marking (see also 5.4.5) :		

Clause	Requirement – Test	Result - Remarks	Verdict
5.1.5	TERMINALS, connections and operating devices		
	Where necessary for safety, indication of purpose of TERMINALS, connectors, controls and indicators marked		
	If insufficient space, symbol 14 used		
5.1.5.1	TERMINALS		
	Mains supply TERMINALS identified		
	Other TERMINAL marking :		
5.1.5.1a)	FUNCTIONAL EARTH TERMINALS (symbol 5 used)		
5.1.5.1b)	PROTECTIVE CONDUCTOR TERMINALS:		
	Symbol 6 is placed close to or on the TERMINAL; or		
	Part of appliance inlet		
5.1.5.1c)	TERMINALS of measuring and control circuits (symbol 7 used)		
5.1.5.1d)	HAZARDOUS LIVE TERMINALS supplied from the interior		
	Standard MAINS socket outlet; or		
	RATINGS marked; or		
	Symbol 14 used		
5.1.5.1e)	ACCESSIBLE FUNCTIONAL EARTH TERMINALS:		
	Self-evident; or		
	Indication (symbol 8 acceptable)		
5.1.5.2	Measuring circuit TERMINALS		
	For TERMINALS other than those permanently connected and not ACCESSIBLE:		
	RATED voltage or current marked		
	Unless clear indication that below limits:		
	Maximum RATED voltage to earth is marked; or		
	For specific connection to other equipment TERMINALS only, and means for identifying provided		
	Appropriate measurement category marked (CAT II, CAT III or CAT IV); or		
	No measurement category marked (CAT I)		
	Required markings are adjacent to TERMINALS; OR		
	If insufficient space:		
	On the RATING plate or scale plate; or		
	TERMINAL is marked with symbol 14		
5.1.6	Switches and circuit breakers		
	If disconnecting device, on or off position marked		
5.1.7	Equipment protected by DOUBLE INSULATION or REINFORCED INSULATION		
	Protected throughout (symbol 11 used)		
	Only partially protected (symbol 11 not used)		
5.1.8	Field-wiring TERMINAL boxes		
	If TERMINAL or ENCLOSURE exceeds 60 °C:	(See 10.3a))	
	Cable temperature RATING marked		
	Marking visible or beside TERMINAL		

Clause	Requirement – Test	Result - Remarks	Verdict
5.2	Warning markings		
	Visible when ready for NORMAL USE		
	Are near or on applicable parts		
	Symbols and text correct dimensions and colour		
	If necessary marked with symbol 14		
	Statement to isolate or disconnect		
5.3	Durability of markings		
	The required markings remain clear and legible in NORMAL USE	(See Form A.4)	
5.4	Documentation		
5.4.1	General		
	Equipment is accompanied by documentation which includes:	(For documents see Table 1)	
5.4.1a)	Intended use		
5.4.1b)	Technical specification		
5.4.1c)	Instructions for use		
5.4.1d)	Name and address of manufacturer or supplier		
5.4.1e)	Information specified in 5.4.2 to 5.4.5		
5.4.1f)	If marking of TERMINALS required, definition of measurement category		
5.4.1g)	If CAT 1:		
	Warning		
	RATINGS		
	Warning statements and a clear explanation of warning symbols:		
	Provided in the documentation; or		
	Information is marked on the equipment		
5.4.2	Equipment RATINGS		
	Documentation includes:		
5.4.2a)	Supply voltage or voltage range		
	Frequency or frequency range		
	Power or current RATING		
5.4.2b)	Description of all input and output connections		
5.4.2c)	RATING of insulation of external circuits, when such circuits are nowhere ACCESSIBLE		
5.4.2d)	Statement of the range of environmental conditions		
5.4.2e)	Degree of protection (IEC 60529)		
5.4.3	Equipment installation		
	Documentation includes instructions for:		
5.4.3a)	Assembly, location and mounting		
5.4.3b)	Protective earthing		
5.4.3c)	Connections to supply		
5.4.3d)	PERMANENTLY CONNECTED EQUIPMENT:		
	1) Supply wiring requirements		

Clause	Requirement – Test	Result - Remarks	Verdict
	2) If external switch or circuit-breaker, requirements and location recommendation		
5.4.3e)	Ventilation requirements		
5.4.3f)	Special services (examples - air, cooling liquid)		
5.4.3g)	Maximum sound power level		
5.4.3h)	Instructions about sound pressure		
5.4.3i)	Permanently connected measuring TERMINALS:		
	Measurement category		
	RATED maximum WORKING VOLTAGE or current		
5.4.4	Equipment operation		
	Instructions for use include:		
5.4.4a)	Details of operating controls		
5.4.4b)	Positioning for disconnection		
5.4.4c)	Interconnection		
5.4.4d)	Specification of intermittent operation limits		
5.4.4e)	Explanation of symbols used		
5.4.4f)	Replacement of consumable materials		
5.4.4g)	Cleaning and decontamination (see 11.2)		
5.4.4h)	Listing of any poisonous or injurious gases and quantities		
5.4.4i)	Risk-reduction procedures relating to flammable liquids		
	A statement about protection impairment if used in a manner not specified by the manufacturer		
5.4.5	Equipment maintenance		
	Instructions include:		
	Sufficient preventive maintenance and inspection information		
	Replacement of hoses, etc.		
	Specific battery type		
	Any manufacturer specified parts		
	RATING and characteristics of fuses		
6	**PROTECTION AGAINST ELECTRIC SHOCK**	(See Form A.5)	
6.1	General		
6.1.1	Requirements		
	ACCESSIBLE parts not HAZADOUS LIVE in NORMAL CONDITION and SINGLE FAULT CONDITION		
	Conformity is checked by the determination of 6.2 and 6.3 followed by the tests of 6.4 to 6.11		
6.1.2	Exceptions		
	Capacitance test	(See Forms A.6 and A.7)	
	Parts not HAZARDOUS LIVE 10 s after interruption of supply		
6.2	Determination of ACCESSIBLE parts	(See Form A.6)	
6.2.1	General examination		
6.2.2	Openings above parts that are HAZARDOUS LIVE		
6.2.3	Openings for pre-set controls		

Clause	Requirement – Test	Result - Remarks	Verdict
6.3	Permissible limits for ACCESSIBLE parts		
6.3.1	Values in NORMAL CONDITION	(See Form A.7)	
6.3.2	Values in SINGLE FAULT CONDITION	(See Form A.8)	
6.4	Protection in NORMAL CONDITION (see 6.2, 6.3.1, 6.7, 6.8 and 8.1)		
6.5	Protection in SINGLE FAULT CONDITION		
	Additional protection is provided by:		
	One or more of 6.5.1 to 6.5.3; or		
	Automatic disconnection of the supply (6.5.4)		
6.5.1	Protective BONDING		
	ACCESSIBLE conductive parts:		
	Separated by DOUBLE INSULATION or REINFORCED INSULATION; or		
	Bonded to the PROTECTIVE CONDUCTOR TERMINAL; or		
	Separated by screen or BARRIER bonded to PROTECTIVE CONDUCTOR TERMINAL from parts which are HAZARDOUS LIVE		
6.5.1.1	Integrity of PROTECTIVE BONDING		
6.5.1.1a)	PROTECTIVE BONDING consists of directly connected structural parts or discrete conductors or both; and withstands thermal and dynamic stresses		
6.5.1.1b)	Soldered connections:		
	Independently secured		
	Not used for other purposes		
	Screw connections are secured		
6.5.1.1c)	PROTECTIVE BONDING not interrupted		
6.5.1.1d)	Any moveable connection specifically designed, and meets 6.5.1.3		
6.5.1.1e)	No external metal braid of cables used		
6.5.1.1f)	If MAINS supply passes through:		
	Means provided for passing protective conductor;		
	Impedance meets 6.5.1.3.		
6.5.1.1g)	Protective conductors bare or insulated, if insulated, green/yellow		
	Exceptions:		
	1) earthing braids;		
	2) internal protective conductors etc.;		
	Green/yellow not used for other purposes		
6.5.1.1h)	TERMINAL suitable, and meets 6.5.1.2		
6.5.1.2	PROTECTIVE CONDUCTOR TERMINAL		
6.5.1.2a)	Contact surfaces are metal		
6.5.1.2b)	Appliance inlet used		
6.5.1.2c)	For rewireable cords and PERMANENTLY CONNECTED EQUIPMENT, PROTECTIVE CONDUCTOR TERMINAL is close to MAINS supply TERMINALS		
6.5.1.2d)	If no MAINS supply is required, any PROTECTIVE CONDUCTOR TERMINAL:		

Clause	Requirement – Test	Result - Remarks	Verdict
	Is near TERMINALS of circuit for which protective earthing is necessary		
	External if other TERMINALS external		
6.5.1.2e)	Equivalent current-carrying capacity to MAINS supply TERMINALS		
6.5.1.2f)	If plug-in, makes first and breaks last		
6.5.1.2g)	If also used for other bonding purposes, protective conductor:		
	Applied first;		
	Secured independently;		
	Unlikely to be removed by servicing; or		
	Warning marking requires replacement of protective conductor		
6.5.1.2h)	Protective conductor of measuring circuit:		
	1) Current RATING;		
	2) PROTECTIVE BONDING:		
	Not interrupted; or		
	Indirect bonding used (see 6.5.1.5)		
6.5.1.2i)	FUNCTIONAL EARTH TERMINALS allow independent connection		
6.5.1.2j)	If a binding screw:		
	Suitable size for bond wire		
	Not smaller than M 4 (No. 6)		
	At least 3 turns of screw engaged		
	Contact pressure not capable of reduction by deformation of materials		
	Passes tightening torque test	(See Form A.9)	
6.5.1.3	Impedance of PROTECTIVE BONDING of plug-connected equipment	(See Form A.10)	
6.5.1.4	Bonding impedance of PERMANENTLY CONNECTED EQUIPMENT	(See Form A.10)	
6.5.1.5	Indirect bonding for measuring and test equipment	(See Form A.11)	
6.5.2	DOUBLE INSULATION and REINFORCED INSULATION (see 6.7, 6.8 and 6.9.2)		
6.5.3	PROTECTIVE IMPEDANCE	(See Form A.12)	
6.5.3a)	HIGH-INTEGRITY single component used (s. 14.6); or		
6.5.3b)	A combination of components used; or		
6.5.3c)	A combination of BASIC INSULATION and current- or voltage-limiting device used		
	Components, wires and connections are RATED as required		
6.5.4	Automatic disconnection of the supply		
	If used, it meets :		
6.5.4a)	Supplied with the equipment; or		
	Specified by installation instruction		
6.5.4b)	RATED disconnecting time within limit specified		
6.5.4c)	RATED for maximum RATED LOAD		

Clause	Requirement – Test	Result - Remarks	Verdict
6.6	Connections to external circuits		
6.6.1	General		
	Connections do not cause ACCESSIBLE parts of the following to become HAZARDOUS LIVE in NORMAL CONDITION or SINGLE FAULT CONDITION:		
6.6.1a)	The external circuits		
6.6.1b)	The equipment		
	Separation of circuits provided; or		
	Short circuit of separation does not cause a HAZARD		
	Instructions or markings include:		—
	1) RATED conditions for TERMINAL		
	2) Required RATING of external circuit insulation		
6.6.2	TERMINALS for external circuits		
	TERMINALS which receive a charge from an internal capacitor are not HAZARDOUS LIVE	(See Form A.7)	
	High voltage TERMINALS energized from the interior are:		
	Not ACCESSIBLE or		
	When unmated, no HAZARDOUS LIVE voltage; or		
	marked with symbol 12		
6.6.3	Circuits with TERMINALS which are HAZARDOUS LIVE		
	These circuits are:		
	Not connected to ACCESSIBLE conductive parts; or		
	Connected to ACCESSIBLE conductive parts, but are not MAINS CIRCUITS and have one TERMINAL contact at earth potential		
	No ACCESSIBLE conductive parts are HAZARDOUS LIVE		
6.6.4	ACCESSIBLE TERMINALS for stranded conductors		
6.6.4a)	No risk of accidental contact because:		
	Located or shielded		
	Self-evident or marked whether connected to ACCESSIBLE conductive parts		
6.6.4b)	ACCESSIBLE TERMINALS will not work loose		
6.7	CLEARANCES and CREEPAGE DISTANCES	(See Form A.5 and A.13)	
6.8	Procedure for dielectric strength tests	(See Form A.5 and A.14)	
6.9	Constructional requirements for protection against electric shock		
6.9.1	General		
	If a failure could cause a HAZARD:		
6.9.1a)	Security of wiring connections		
6.9.1b)	Screws securing removable covers		
6.9.1c)	Accidental loosening		
	Easily damaged materials not used		
	Non-impregnated hydroscopic materials not used		

Clause	Requirement – Test	Result - Remarks	Verdict
6.9.2	ENCLOSURES of equipment with DOUBLE INSULATION or REINFORCED INSULATION		
	ENCLOSURE surrounds all metal parts except for small metal parts which are separated		
	ENCLOSURES or parts made of insulating material		
	Protection for metal ENCLOSURES or parts by:		
6.9.2a)	An insulating coating or BARRIER on the inside; or		
6.9.2b)	CLEARANCES and CREEPAGE DISTANCES cannot be reduced by loosening of parts or wires		
6.9.3	Over-range indication		
	Unambiguous		
6.10	Connection to MAINS supply source and connections between parts of equipment		
6.10.1	MAINS supply cords		
6.10.1a)	RATED for maximum equipment current (see 5.1.3c)		
	Cable complies with IEC 60227 or IEC 60245 or is a certified cord		
6.10.1b)	Heat-resistant if likely to contact hot parts		
6.10.1c)	Temperature RATING (cord and inlet)		
6.10.1d)	Green/yellow used only for connection to PROTECTIVE CONDUCTOR TERMINALS		
	Detachable cords with IEC 60320 MAINS connectors:		
	Conform to IEC 60799; or		
	Have the current RATING of the MAINS connector		
6.10.2	Fitting of non-detachable MAINS supply cords		
	Non-detachable cord protection:		
6.10.2a)	Inlet or bushing smoothly rounded; or		
6.10.2b)	Insulated cord guard protruding ≥ 5D		
	The protective earth conductor is the last to take the strain		
6.10.2	Cord anchorages:		
6.10.2a)	Cord is not clamped by direct pressure from a screw		
6.10.2b)	Knots are not used		
6.10.2c)	Cannot push the cord into the equipment to cause a HAZARD		
6.10.2d)	No failure of cord insulation in anchorage with metal parts		
6.10.2e)	Compression bushing:		
	Clamps all types and sizes of MAINS cords; and Is suitable for connection to TERMINALS provided; or		
	:		
	It is designed for a specified screened MAINS cord		
6.10.2f)	Cord replacement does not cause a HAZARD and method of strain relief is clear		
	Push-pull test	(See Form A.16)	

Clause	Requirement – Test	Result - Remarks	Verdict
6.10.3	Plugs and connectors		
6.10.3a)	MAINS supply plugs, connectors etc., conform with relevant specifications		
6.10.3b)	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		
	MAINS-type plugs used only for connection to MAINS supply		
6.10.3c)	Plug pins which receive a charge from an internal capacitor	(See Form A.7)	
6.10.3d)	Accessory MAINS socket outlets:		
	1) Marking if accepts a standard MAINS plug (see 5.1.3e)		
	2) Input has a protective earth conductor if outlet has earth TERMINAL contact		
6.11	Disconnection from supply source		
6.11.1	General (see 6.11.1.1 to 6.11.2.6)		
	Disconnects all current carrying conductors		
6.11.1.1	Exceptions		
6.11.1.1a)	Equipment supplied by low energy source; or		
6.11.1.1b)	Equipment connected to impedance protected supply; or		
6.11.1.1c)	Equipment constitutes an impedance protected load		
6.11.2	Requirements according to type of equipment		
6.11.2.1	PERMANENTLY CONNECTED EQUIPMENT and multi-phase equipment		
	Employs switch or circuit-breaker		
	If switch or circuit-breaker is not part of the equipment, documentation specifies:		
6.11.2.1a)	Switch or circuit-breaker to be included in building installation		
6.11.2.1b)	Location		
6.11.2.1c)	Marking		
6.11.2.2	Single-phase cord-connected equipment		
	Equipment is provided with:		
6.11.2.2a)	Switch or circuit-breaker; or		
6.11.2.2b)	Appliance coupler (disconnectable without TOOL); or		
6.11.2.2c)	Separable plug (without locking device)		
6.11.2.3	HAZARDS arising from function		
	Emergency switch		
	Emergency switch ≤ 1 m from the moving part		
6.11.3	Disconnecting devices		
	Electrically close to the supply		
6.11.3.1	Switches and circuit-breakers		
	When used as disconnection device:		
	Meets IEC 60947-1 and IEC 60947-3		
	Marked to indicate function		

Clause	Requirement – Test	Result - Remarks	Verdict
	Not incorporated in MAINS cord		
	Does not interrupt protective earth conductor		
	If has other contacts meets separation requirements of 6.6 and 6.7		
6.11.3.2	Appliance couplers and plugs		
	Where an appliance coupler or separable plug is used as the disconnecting device (see 6.11.2.2):		
	Readily identifiable and easily reached by the OPERATOR		
	Single-phase PORTABLE EQUIPMENT cord length ≤ 3 m		
	Protective earth conductor connected first and disconnected last		
7	**PROTECTION AGAINST MECHANICAL HAZARDS**		
7.1	General		
	Conformity is checked by 7.2 to 7.6		
7.2	Moving parts		
	Moving parts not able to crush, etc. (see also 6.11.2.3)		
	If OPERATOR access permitted:		
	a) Access requires TOOL		
	b) Statement about training		
	c) Warning markings or symbol 14		
7.3	Stability		
	Marking of non-automatic means		
	Conformity tests:		
7.3a)	10° tilt test		
7.3b)	multi-directional force test		
7.3c)	downward force test		
7.4	Provisions for lifting and carrying		
	Handles or grips withstand four times weight		
	Equipment >18 kg :		
	Has means for lifting or carrying; or		
	Directions in documentation		
7.5	Wall mounting		
	Mounting brackets withstand four times weight		
7.6	Expelled parts		
	Equipment contains or limits the energy		
	Protection not removable without the aid of a TOOL		
8	**MECHANICAL RESISTANCE TO SHOCK AND IMPACT**		
	After the tests of 8.1 to 8.2:		
	Voltage tests	(See Form A.14)	
	Inspections:		
8a)	HAZARDOUS LIVE parts not accessible		
8b)	ENCLOSURE shows no cracks (HAZARD)		
8c)	CLEARANCES not less than their permitted values	(See Form A.13)	

Clause	Requirement – Test	Result - Remarks	Verdict
8d)	BARRIERS not damaged or loosened		
8e)	No moving parts exposed, except permitted by 7.2		
8f)	No damage which could cause spread of fire		
8.1	ENCLOSURE rigidity test	(See Form A.15)	
8.2	Drop test	(See Form A.15)	
9	**PROTECTION AGAINST THE SPREAD OF FIRE**		
	Conformity for each source of HAZARD or area of the equipment is checked by one of the following:	(See Form A.17)	
9a)	Fault test of 4.4; or	(See Forms A.1 and A.2)	
9b)	Application of 9.1 (eliminating or reducing the sources of ignition); or		
9c)	Application of 9.2 (containment of fire within the equipment)		
9.1	Eliminating or reducing the sources of ignition within the equipment		
9.1a)	1) Limited-energy circuit (see 9.3); or		
	2) Insulation meets the requirements for BASIC INSULATION; or	(See Form A.5 and A.14)	
	Bridging the insulation does not cause ignition	(See Form A.2)	
9.1b)	Surface temperature of liquids and parts (see 9.4.a)		
9.1c)	No ignition in circuits designed to produce heat	(See Form A.2)	
9.2	Containment of the fire within the equipment, should it occur		
9.2a)	Energizing of the equipment is controlled by an OPERATOR held switch		
9.2b)	ENCLOSURE conforms with constructional requirements of 9.2.1; and		
	Requirements of 9.4b) or c) are met		
9.2.1	Constructional requirements		
9.2.1a)	Insulated wires have flammability classification FV1 or better	(See Table 3 or Form A.18)	
	Connectors and insulating material have flammability classification FV2 or better	(See Table 3 or Form A.18)	
9.2.1b)	The ENCLOSURE is constructed as follows :	(See Form A.17)	
	1) Bottom constructed with:		
	No openings; or		
	Extent as specified in figure 7; or		
	Baffles as specified in figure 6; or		
	Perforated as specified in table 12; or		
	Metal screen with a mesh		
	2) Sides have no openings as specified in figure 7		
	3) Material of ENCLOSURE and any baffle or flame BARRIER is made of		
	Metal (except magnesium); or		
	Non metallic materials have flammability classification FV1 or better	(See Table 3 or Form A.18)	
	4) ENCLOSURE and any baffle or flame BARRIER have adequate rigidity		

Clause	Requirement – Test	Result - Remarks	Verdict
9.3	Limited-energy circuit		
9.3a)	Potential not more than 30 r.m.s. and 42.4 V peak, or 60 V d.c.		
9.3b)	Current limited by one of following means:		
	1) Inherently or by impedance; or		
	2) Overcurrent protective device; or		
	3) A regulating network limits also in SINGLE FAULT CONDITION		
9.3c)	Is separated by at least BASIC INSULATION		
	If Overcurrent protective device used:		
	Fuse or a non adjustable electromechanical device		
9.4	Requirements for equipment containing or using flammable liquids		
	Flammable liquids contained in or specified for use with equipment do not cause spread of fire		
	Risk is reduced to a tolerable level :	(See Form A.20)	
9.4a)	The temperature of surface or parts in contact with flammable liquids is 25 °C below fire point	(See 10.3b))	
9.4b)	The quantity of liquid is limited		
9.4c)	Flames are contained within the equipment		
	Detailed instructions for risk-reduction provided		
9.5	Overcurrent protection		
	Devices not in the protective conductor		
	Fuses or single-pole circuit-breakers not fitted in neutral (multi-phase)		
9.5.1	PERMANENTLY CONNECTED EQUIPMENT		
	Overcurrent device:		
	Fitted within the equipment; or		
	Specified in manufacturer's instructions		
9.5.2	Other equipment		
	Protection within the equipment		
10	**EQUIPMENT TEMPERATURE LIMITS AND RESISTANCE TO HEAT**		
10.1	Surface temperature limits for protection against burns		
	Easily touched surfaces within the limits	(See Form A.21A)	
	Heated surfaces necessary for functional reasons exceeding specified values:		
	Are recognizable as such by appearance or function; or		
	Are marked with symbol 13		
	Guards are not removable without TOOL		
10.2	Temperatures of windings	(See Form A.21B)	
	Limits not exceeded in:		
	NORMAL CONDITION		
	SINGLE FAULT CONDITION		
10.3	Other temperature measurements	(See Form A.21A)	
	Following measurements conducted if applicable:		

Clause	Requirement – Test	Result - Remarks	Verdict
10.3a)	Value of 60 °C of field-wiring TERMINAL box not exceeded		
10.3b)	Surface of flammable liquids and parts in contact with this liquids		
10.3c)	Surface of non-metallic ENCLOSURES		
10.3d)	Parts made of insulating material supporting parts connected to MAINS supply		
10.3e)	TERMINALS carrying a current more than 0.5 A		
10.4	Conduct of temperature test		
10.5	Resistance to heat		
10.5.1	Integrity of CLEARANCE and CREEPAGE DISTANCES	(See Form A.13)	
10.5.2	Non-metallic ENCLOSURES	(See Forms A.22)	
	After treatment:		
	No HAZARDOUS LIVE parts ACCESSIBLE;		
	Tests of 8.1 and 8.2	(See Form A.13)	
	In case of doubt, tests of 6.8 (without humidity preconditioning)	(See Form A.14)	
10.5.3	Insulating material		
10.5.3a)	Parts supporting parts connected to MAINS supply	(See 10.3d))	
10.5.3b)	TERMINALS carrying a current more than 0.5 A	(See 10.3e))	
	In case of doubt, examination of material data		
	If not conclusive:,		
	1) Ball pressure test; or	(See Form A.23)	
	2) Vicat softening test of ISO 306	(See Form A.23)	
11	**PROTECTION AGAINST HAZARDS FROM FLUIDS**		
11.1	General		
11.2	Cleaning	(See Form A.24)	
11.3	Spillage	(See Form A.24)	
11.4	Overflow	(See Form A.24)	
11.5	Battery electrolyte		
	Battery electrolyte leakage presents no hazard		
11.6	Specially protected equipment	(See Form A.24)	
11.7	Fluid pressure and leakage		
11.7.1	Maximum pressure		
	Maximum pressure of any part does not exceed P_{RATED}		
11.7.2	Leakage and rupture at high pressure	(See Form A.25)	
	Test to IEC 60335 (refrigeration only)		
11.7.3	Leakage from low-pressure parts	(See Form A.25)	
11.7.4	Overpressure safety device		
	Does not operate in NORMAL USE		
	Meets ISO 4126-1; and		
	It conforms with:		
11.7.4a)	Connected as close as possible to parts intended to be protected		

Clause	Requirement – Test	Result - Remarks	Verdict
11.7.4b)	Easy access for inspection, maintenance and repair		
11.7.4c)	Adjustment only with TOOL		
11.7.4d)	No discharge towards person		
11.7.4e)	No HAZARD from deposit of discharged material		
11.7.4f)	Adequate discharge capacity		
11.7.4g)	No shut-off valve between overpressure safety device and protected parts		
12	**PROTECTION AGAINST RADIATION, INCLUDING LASER SOURCES, AND AGAINST SONIC AND ULTRASONIC PRESSURE**		
12.1	General		
	Equipment provides protection		
12.2	Equipment producing ionizing radiation		
12.2.1	Ionizing radiation	(See Form A.26)	
12.2.2	Accelerated electrons		
12.3	Ultra-violet (UV) radiation	(Conformity test under consideration)	
12.4	Micro-wave radiation		
	Power density does not exceed 10 W/m^2 :		
12.5	Sonic and ultrasonic pressure		
12.5.1	Sound level	(See Form A.27)	
12.5.2	Ultrasonic pressure	(See Form A.27)	
12.6	Laser sources (IEC 60825-1)		
13	**PROTECTION AGAINST LIBERATED GASES, EXPLOSION AND IMPLOSION**		
13.1	Poisonous and injurious gases		
	Attached data/test reports demonstrate conformity		
13.2	Explosion and implosion		
13.2.1	Components		
	Components liable to explode:		
	Pressure release device provided; or		
	Apparatus incorporates OPERATOR protection (see also 7.6)		
	Pressure release device:		
	Discharge without danger		
	Cannot be obstructed		
13.2.2	Batteries and battery charging		
	If explosion or fire HAZARD could occur:		
	Protection incorporated in the equipment; or		
	Instructions specify batteries with built-in protection		
	If wrong type of battery used:		
	No HAZARD; or		
	Warning by marking and in instructions		
	Equipment with means to charge rechargeable batteries:		
	Warning against the charging of non-rechargeable batteries; and		

Clause	Requirement – Test	Result - Remarks	Verdict
	Type of rechargeable battery indicated; or		
	Symbol 14 used		
	Battery compartment design, no fire or explosive HAZARD		
	Single component failure	(See Form A.28)	
	Polarity reversal test	(See Form A.28)	
13.2.3	Implosion of cathode ray tubes		
	If maximum face dimensions > 160 mm :		
	Intrinsically protected and correctly mounted; or		
	ENCLOSURE provides protection		
	If non-intrinsically protected:		
	Screen not removable without TOOL		
	If glass screen, not in contact with surface of tube		
13.2.4	Equipment RATED for high pressure	(See 11.7)	
14	**COMPONENTS**		
14.1	General		
	Where safety is involved, components meet relevant requirements	(See Table 3)	
14.2	Motors		
14.2.1	Motor temperatures		
	Does not present a HAZARD when stopped or prevented f from starting; or	(See Form A.21B)	
	Protected by overtemperature or thermal protection device conform with 14.3		
14.2.2	Series excitation motors		
	Connected direct to device, if overspeeding causes a HAZARD		
14.3	Overtemperature protection devices	(See Form A.29)	
14.3a)	Reliable function is ensured		
14.3b)	RATED to interrupt maximum current and voltage		
14.3c)	Does not operate in NORMAL USE		
14.4	Fuse holders		
	No access to HAZARDOUS LIVE parts		
14.5	Mains voltage selecting devices		
	Accidental change not possible		
14.6	HIGH INTEGRITY components		
	Used in applicable positions	(See Table 3)	
	Conforms with IEC publications		
	Single electronic device not used		
14.7	Mains transformers tested outside equipment	(See Forms A.30 and A.31)	
14.8	Printed circuit boards		
	Data shows conformity with FV-1 of IEC 60707 or better; or		
	Test shows conformity with FV-1 of IEC 60707 or better; or	See Form A.18	
	Thin film flexible PCB with limited-energy circuit used		

Clause	Requirement – Test	Result - Remarks	Verdict
14.9	Circuits or components used as transient overvoltage limiting devices		
	After test, no sign of overload or degradation		
15	**PROTECTION BY INTERLOCKS**		
15.1	General		
	Interlocks are designed to remove a hazard before OPERATOR exposed		
15.2	Prevention of reactivation		
15.3	Reliability		
	Single fault unlikely to occur; or		
	Cannot cause a HAZARD		
16	**TEST AND MEASUREMENT EQUIPMENT**		
16.1	Current measuring circuits	(See Form A.32)	
16.2	Multifunction meters and similar equipment	(See Form A.33)	
	No HAZARD from:		—
	RATED input voltage combinations		
	Settings of functions		
	Settings of range controls		
ANNEX F	**ROUTINE TESTS**		
	Manufacturer's declaration		

4.4.2	TABLE – Summary of single fault conditions			**Form A.1**
Subclause	**Title**	**Does not apply**	**Carried out**	**Comments**
4.4.2.1	PROTECTIVE IMPEDANCE			
4.4.2.2	Protective conductor			
4.4.2.3	Equipment or parts for short-term or intermittent operation			
4.4.2.4	Motors			
4.4.2.5	Capacitors			
4.4.2.6	Mains transformers Attach drawing of MAINS Txs showing all protective devices (see Forms A.29 and A.30)			
4.4.2.7	Outputs			
4.4.2.8	Equipment for more than one supply			
4.4.2.9	Cooling (see note) – air holes closed – fans stopped – coolant stopped			
4.4.2.10	Heating devices (see note) – timer overridden – temperature controller overridden – loss of cooling liquid – overfilled or empty or both			
4.4.2.11	Insulation between circuits and parts			
4.4.2.12	Interlocks			
List below all SINGLE FAULT CONDITIONS not covered by 4.4.2.1 to 4.4.2.12:				
NOTE – Record surface temperatures of flammable liquids and parts in contact with them in Form A.20A				
Supplementary information: See Form A.2 for details of tests.				

4.4	**TABLE – Testing in single FAULT CONDITION – Results**				**Form A.2**
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 h:min:s Record dielectric strength test on Form A.14 and temperature tests on Form A.20. Record in the comments column for each test whether carried out during or after SINGLE FAULT CONDITION.					

5.1.3c)	TABLE: Mains supply	Form A.3
	Marked rating ..... :	V
	Phase ..... :	
	Frequency ..... :	Hz
	Current ..... :	A
	Power ..... :	W
	Power ..... :	VA

Test No.	Voltage V	Frequency Hz	Current A	Power in W	Power in VA	Comments

NOTE – Measurements are only required for marked ratings.

Supplementary information:

5.3	TABLE: Durability of markings	Form A.4

Marking method (see note)	Agent
1)	A Water
2)	B Isopropyl alcohol
3)	C Solvents and reagents likely to be used in NORMAL USE (specify)
4)	D (specify agent)
5)	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 (5.1.5.1)	
Measuring circuit TERMINALS (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 Verdict	Label loose Verdict	Curled edges Verdict	Comments

	TABLE: Protection against electric shock - Block diagram of system	Form A.5

POLLUTION degree ... :	

Requirements according to 6.4 to 6.8 and annex D

Location or description	Required insulation type (note 1)	Maximum working Voltage (note 2)	CREEPAGE DISTANCE (note 3)				CLEARANCE (note 3)	Test voltage (note 2)	Comments
			PWB mm	CTI	Other mm	CTI	mm	V	

NOTE 1 – Type of insulation:
BI = BASIC INSULATION
DI = DOUBLE INSULATION
PI = PROTECTIVE IMPEDANCE
RI = REINFORCED INSULATION
SI = SUPPLEMENTARY INSULATION

NOTE 2 – Types of voltage
Peak impulse test voltage
(pulse)
r.m.s.
d.c.
peak

NOTE 3 POLLUTION DEGREES, which differ from these, should be shown under "Comments".

Supplementary Information:

6.2	**TABLE: List of ACCESSIBLE parts**		**Form A.6**
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 6.2.1)

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 note to paragraph 1 of 6.4).

NOTE 4 – Capacitor test may be required (see Form A.7).

NOTE 5 – The determination methods are: visual; rigid test finger; jointed test finger; pin 3 mm diameter; pin 4 mm diameter.

Supplementary information

6	TABLE: Values in NORMAL CONDITION													Form A.7
6.1.1	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	Voltage			Current				Capacitance		10 s test (note 2)			Comments	
(see Form A.6)	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 1 – The requirements of 6.3.1 include drying out (if specified). For PERMANENTLY CONNECTED EQUIPMENT, the current values are 1,5 times the specified values.

NOTE 2 – A 5 s test is specified in 6.10.3c).

6.3.2	TABLE: Values in SINGLE FAULT CONDITION											Form A.8
Item (See Form A.6)	Subclause and fault No. (see Form A.2)	Voltage			Transient (see note)		Current				Capacitance µF (note)	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.		
NOTE – Transient voltages must be below the limits given from Figure 1 and the capacitance below the limits from Figure 2 of IEC 61010-1.												

6.5.1.2	TABLE: PROTECTIVE CONDUCTOR TERMINAL - Tightening torque test		Form A.9
Location	**Size of Screw**	**Tightening torque Nm**	**Verdict**

6.5.1.3	TABLE: Bonding impedance of plug connected equipment			Form A.10
ACCESSIBLE part under test	Test current A	Voltage attained after 1 min V	Calculated resistance (maximum allowed 0,1) Ω	Verdict
Supplementary information:				

6.5.1.4	TABLE: Bonding impedance of PERMANENTLY CONNECTED EQUIPMENT		
ACCESSIBLE part under test	Test current A	Voltage attained after 1 min (maximum 10 V) V	Verdict
Supplementary information:			

6.5.1.5	TABLE: Indirect bonding for measuring and test equipment		Form A.11
ACCESSIBLE part under test	**Voltage attained V**	**Time for voltage to drop to allowable levels s**	**Verdict**
a) Voltage limiting device	–	–	–
Supplementary Information:			
ACCESSIBLE part under test	**Voltage applied V**	**Time for device to trip s**	**Verdict**
b) Voltage-sensitive tripping device	–	–	–
Supplementary Information:			

6.5.3	TABLE: PROTECTIVE IMPEDANCE	Form A.12
A HIGH INTEGRITY single component		
Component	**Location**	**Comments**
A combination of components		
Component	**Location**	**Comments**
A combination of BASIC INSULATION and a current or voltage limiting device		
Component	**Location**	**Comments**
Supplementary information:		

6.7	**TABLE: CLEARANCES and CREEPAGE DISTANCES**												**Form A.13**
8	Mechanical resistance to shock and impact												
10.5.1	Integrity of CLEARANCES and CREEPAGE DISTANCES												
Location (see Form A.5)	**Measured (initial – 6.7)**		**Verdict**	**Mechanical tests (note)**					**Test at max. RATED ambient (10.5.1)**	**Measured after test (if required)**		**Verdict**	**Comments**
	CREEPAGE DISTANCE mm	**CLEARANCE** mm		**Applied force (6.7) N**	**Rigidity (8.1)**		**Drop (8.2)**			CREEPAGE DISTANCE mm	CLEARANCE mm		
					Static	**Dynamic**	**Normal**	**Hand-held/ Plug-in**					
NOTE – Refer to Form A.12 for dielectric strength tests following the above tests.													

6.8	**TABLE: Dielectric strength tests**	**Form A.14**
4.4.4.1 b)	Conformity after application of fault conditions (see note)	
6.4	Protection in NORMAL CONDITION	
6.5.2	DOUBLE INSULATION and REINFORCED INSULATION	
6.6.1	Connections to external circuits	
6.7.3.1 c)	CLEARANCE values – General: reduced CLEARANCES for homogeneous construction	
6.10.2.5	Fitting of non-detachable MAINS SUPPLY cords[1]	
8	Mechanical resistance to shock and impact	
9.1 a) 2)	Eliminating or reducing the sources of ignition within the equipment	
9.3 c)	Limited-energy circuit	
11.2	Cleaning (see note)	
11.3	Spillage (see note)	
11.4	Overflow (see note)	
11.6	Specially protected equipment (see note)	
NOTE – Record the fault, test or treatment applied before the dielectric strength test		
	Test site altitude :	m
	Test voltage correction factor (see Table 10) :	

Location or references from Forms A.2 and A.5	**Clause or sub-clause**	**Humidity Yes/No**	**Atmo-spheric pressure**	**Working voltage V**	**Test voltage r.m.s./peak/d.c V**	**Comments**	**Verdict**

Supplementary information:

8.1	**ENCLOSURE rigidity test**		**Form A.15**
8.2	**Drop test**		
8.1.1	**Static test**		
Material of ENCLOSURE	**Preparation for the test**	**Comments**	**Verdict**
Plastic / Non-metallic	Operated at an ambient temperature of .....°C for.....h	Reason:	
Location	**–**	–	–
1			
2			
3			
8.1.2	**Dynamic test**		
ENCLOSURE material	**Preparation for the test**	**Comments**	–
Plastic / Non-metallic	Cooled to.....°C	Reason:	
Location	Steel sphere to: top/side/bottom	**–**	–
1			
2			
8.2.1.1	**Corner drop test**		
Dropped on corner	**Raised up to:**	**Comments**	–
1	100mm / 30 °C		
2	100mm / 30 °C		
3	100mm / 30 °C		
4	100mm / 30 °C		
8.2.1.2	**Face drop test**	**Comments**	
Dropped on face	**Raised up to:**	–	–
1	25mm /30°C		
2	25mm /30 °C		
3	25mm /30 °C		
4	25mm /30 °C		
8.2.2	**HAND -HELD EQUIPMENT and direct plug-in equipment**		
ENCLOSURE material	**Preparation for the test**	**Comments**	–
Plastic / Non-metallic	Cooled to .....°C		
Landed on side / edge / corner			

6.10.2	TABLE: Cord anchorage					Form A.16
Location	**Mass kg**	**Pull N**	**Verdict**	**Torque Nm**	**Verdict**	**Comment**
Supplementary information:						

9	TABLE: Protection against the spread of fire			Form A.17
Item	**Source of HAZARD or area of the equipment considered (circuit, component, liquid etc.)**	**Protection Method (9a, 9b or 9c)**	**Protection details**	**Verdict**
Supplementary information:				

9.2.1	**TABLE: Constructional requirements**	**Form A.18**
14.8	**Printed circuit boards**	

Material tested ..... :	
Generic name ..... :	
Material manufacturer ..... :	
Type ..... :	
Colour ..... :	
Conditioning details ..... :	

		Sample 1	**Sample 2**	**Sample 3**
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

9.3	TABLE: Limited-energy circuit						Form A.19
Item	9.3 a)	9.3 b) Current and power limitation			9.3 c)	Verdict	
(see Form A.16)	Maximum potential in circuit voltage r.m.s./d.c. V	Maximum available current A	Maximum available power VA	Overload protection after 120 s A	Circuit separation	Yes/No	Comments
Supplementary information:							

9.4	TABLE: Requirements for equipment containing or using flammable liquids		Form A.20
Type of liquid	**9.4 Flammable liquids**		**Verdict**
	b) quantity	**c) Containment**	
Supplementary information:			

10.	**TABLE : Temperature Measurements**	**Form A.21A**
10.1	**Surface temperature limits - NORMAL CONDITION or SINGLE FAULT CONDITION**	
10.2	**Temperature of windings- NORMAL CONDITION or SINGLE FAULT CONDITION**	

NOTE – Use separate forms for NORMAL CONDITION and SINGLE FAULT CONDITION

Operating conditions:			
Frequency.....:	Hz	Test room ambient temperature (t_a) :	°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.20B for details of winding temperature measurements.

10.	**TABLE : Temperature Measurements**					**Form A.21A**
10.1	**Surface temperature limits - NORMAL CONDITION or SINGLE FAULT CONDITION**					
10.2	**Temperature of windings- NORMAL CONDITION or SINGLE FAULT CONDITION**					
NOTE – Use separate forms for NORMAL CONDITION and SINGLE FAULT CONDITION						
Operating conditions:						
Frequency.....:	Hz	Test room ambient temperature (t_a) :				°C
Voltage .....:	V	Test duration ..... :				h min
Part / Location		**t_m °C**	**t_c °C**	**t_{max} °C**	**Verdict**	**Comments**
Supplementary information:						

10.2	**TABLE: Temperature of windings** **Resistance method for temperature measurements**	**Form A.21B**
4.4.2.6	**MAINS Transformers**	
14.2.1	**Motor temperatures**	

Operating conditions:								
Frequency.....:	Hz	Test room ambient temperature (t_{a1}/t_{a2}) .....:				/	°C (initial / final)	
Voltage .....:	V	Test duration.....:				h	min	
Part / Designation	**R_{cold} Ω**	**R_{warm} Ω**	**Current A**	**t_r K**	**t_c °C**	**t_{max} °C**	**Verdict**	**Comments**

NOTE 1 – R_{cold} = initial resistance

R_{warm} = final resistance

t_r = temperature rise

t_c = t_r corrected (t_c= t_r - { t_{a2} - t_{a1}} + [40 °C or max RATED ambient])

t_{max} = 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:

10.5.2	TABLE: Resistance to heat of non-metallic ENCLOSURES		Form A.22
	Test method used:		
	Non operative treatment.....:	[ ]	
	Empty ENCLOSURE.....:	[ ]	
	Operative treatment.....:	[ ]	
	Temperature during tests .....:		
	ENCLOSURE samples tested were .....:		

Description	Material	Comments	Verdict

Dielectric strength test (6.8) ..... :	V	r.m.s./peak/d.c.

Supplementary information:

10.5.3	TABLE: Insulating Materials		Form A.23
10.5.3a)	Ball-pressure test		
	Max. allowed impression diameter..... :	2 mm	

Part	Test temperature °C	Impression Diameter (mm)	Verdict

Supplementary information:

10.5.3b)	Vicat softening test (ISO 306)		

Part	Vicat softening temperature °C	Thickness of sample (mm)	Verdict

Supplementary information:

8	TABLE: Mechanical resistance to shock and impact											Form A.24
11	Protection against HAZARDS from fluids											
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	**Clause 8 tests**				**Clause 11 tests**				**Working voltage**	**Test voltage**	**Verdict**	**Comments**
(see form A.5)	**Static**	**Dynamic**	**Normal**	**Handheld Plug-in**	**Cleaning (11.2)**	**Spillage (11.3)**	**Overflow (11.4)**	**IEC 60529 (11.6)**	**V**	**V**		
NOTE – Use r.m.s., d.c. or peak to indicate the used test voltage.												

11.7.2	TABLE: Leakage and rupture at high pressure				Form A.25
Part	**Maximum permissible working pressure MPa**	**Test pressure MPa**	**Leakage Yes/No**	**Burst Yes/No**	**Comments**
Supplementary information:					

11.7.3	Leakage from low-pressure parts		
Part	**Test pressure MPa**	**Leakage Yes / No**	**Comments**
Supplementary information:			

12.2.1	TABLE: Ionizing radiation		Form A 26
Locations tested	**Measured values µSv/h**	**Verdict**	**Comments**
Supplementary information:			

12.5.1	TABLE: Sound level	Form A.27

Locations tested	Measured values dBA	Calculated maximum sound pressure level
At operator's normal position		
At bystanders' positions	–	–
a)		
b)		
c)		
d)		
e)		
Supplementary information:		

12.5.2	Ultrasonic pressure

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:

13.2.2	**TABLE: Batteries**	**Form A.28**
	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:		

14.3	TABLE: Overtemperature protection devices	Form A.29

Reliability test

Component	Type (note)	Verdict	Comments

NOTE – SR = self-resetting (200 times)
NSR = non-self-resetting (10 times)
NR = non-resetting (1 time)

Supplementary information:

4.4.2.6	**TABLE: Mains transformer**	**Form A.30**
4.4.2.6.1	**Short circuit**	
14.7.1	**MAINS transformers tested outside equipment**	

Type..... :	
Manufacturer ..... :	
Test in equipment	
Test on bench	
Test repeated inside equipment (see 14.7)	
Optional – Insulation class (IEC 60085) of the lowest RATED winding ..... :	

Winding identification				
Type of Protector for winding (see 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 FormA.20B!.

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

Supplementary information:

4.4.2.6	**TABLE: Mains transformer**				**Form A.31**
14.7.2	**Overload tests (for MAINS transformers)**				
Type..... :					
Manufacturer ..... :					
Test in equipment					
Test on bench					
Test repeated inside equipment (see 14.7)					
Optional – Insulation class (IEC 60085) of the lowest RATED winding ..... :					
Winding identification					
Type of Protector for winding (see 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 FormA.20B!

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

Supplementary information:

16.1	TABLE: Current measuring circuits	Form A.32

These tests are performed with all types and models of current transformers without internal protection, and which are specified by the manufacturer for use with the equipment

a) Current transformers

Type/Model	RATED current A	Test current A	Interrupt Yes / No	Verdict	Comments

Supplementary information:

b) Range changing switches

Type / Model	Maximum rated current of switch A	Cycling test Verdict	Comments

Supplementary information:

16.2	TABLE: Multifunctional meters and similar equipment		Form A.33
	Function switch position		
	Maximum RATED voltage applied (V).....		
	Measurement category.....		
	Test source limit (KVA).....		

Maximum RATED voltage applied (V) :

Measuring TERMINALS	Range	Verdict

Maximum RATED voltage applied (V) :

Measuring TERMINALS	Range	Verdict

Supplementary information:

Annex A (Informative)

List of applicable and omitted clauses/subclauses in the test report

If any clauses and subclauses are considered to be not applicable to the equipment under test and are omitted from the test report itself, the following list of contents is to be attached with these omitted clauses and subclauses clearly identified with a line through them. If there are no omitted clauses/subclauses, annex A is not required and need not be attached.

Summary of tests

5	Marking and documentation
5.1.1	General
5.1.2	Identification
5.1.3	Mains supply
5.1.4	Fuses
5.1.5	TERMINALS, connections and operating devices
5.1.6	Switches and circuit-breakers
5.1.7	Equipment protected by DOUBLE INSULATION or REINFORCED INSULATION
5.1.8	Field-wiring TERMINAL boxes
5.2	Warning markings
5.3	Durability of markings
5.4	Documentation
5.4.1	General
5.4.2	Equipment RATINGS
5.4.3	Equipment installation
5.4.4	Equipment operation
5.4.5	Equipment maintenance
6	Protection against electric shock
6.1	General
6.1.1	Requirements
6.1.2	Exceptions
6.2	Determination of ACCESSIBLE parts
6.2.1	Examination
6.2.2	Openings above parts that are HAZARDOUS LIVE
6.2.3	Openings for pre-set controls
6.3	Permissible limits for ACCESSIBLE parts
6.3.1	Values in NORMAL CONDITION
6.2.3	Values in SINGLE FAULT CONDITION
6.4	Protection in NORMAL CONDITION
6.5	Protection in SINGLE FAULT CONDITION

Annexes

Forms

A.12
A.13
A.14
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A.33

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librarian ❑
researcher ❑
design engineer ❑
safety engineer ❑
testing engineer ❑
marketing specialist ❑
other.....

Q3 I work for/in/as a: *(tick all that apply)*

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government ❑
test/certification facility ❑
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education ❑
military ❑
other.....

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product design/development ❑
specifications ❑
tenders ❑
quality assessment ❑
certification ❑
technical documentation ❑
thesis ❑
manufacturing ❑
other.....

Q5 This standard meets my needs: *(tick one)*

not at all ❑
nearly ❑
fairly well ❑
exactly ❑

Q6 If you ticked NOT AT ALL in Question 5 the reason is: *(tick all that apply)*

standard is out of date ❑
standard is incomplete ❑
standard is too academic ❑
standard is too superficial ❑
title is misleading ❑
I made the wrong choice ❑
other .....

Q7 Please assess the standard in the following categories, using the numbers:
(1) unacceptable,
(2) below average,
(3) average,
(4) above average,
(5) exceptional,
(6) not applicable

timeliness.....
quality of writing.....
technical contents.....
logic of arrangement of contents .....
tables, charts, graphs, figures.....
other .....

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