IEC 61010-1

Edition 3.0 2016-12

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

AMENDMENT 1
AMENDEMENT 1

Safety requirements for electrical equipment for measurement, control, and laboratory use –
Part 1: General requirements

Règles de sécurité pour appareils électriques de mesurage, de régulation et de laboratoire –
Partie 1: Exigences générales

IEC 61010-1:2010-06/AMD1:2016-12(en-fr)

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

About the IEC
The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications
The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue
The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - www.iec.ch/searchpub
The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,…). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

Electropedia - www.electropedia.org
The world's leading online dictionary of electronic and electrical terms containing 20 000 terms and definitions in English and French, with equivalent terms in 15 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary
65 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

IEC Customer Service Centre - webstore.iec.ch/csc
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.

A propos de l'IEC
La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC
Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Catalogue IEC - webstore.iec.ch/catalogue
Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

Recherche de publications IEC - www.iec.ch/searchpub
La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,…). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished
Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

Electropedia - www.electropedia.org
Le premier dictionnaire en ligne de termes électroniques et électriques. Il contient 20 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 15 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary
65 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

Service Clients - webstore.iec.ch/csc
Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: csc@iec.ch.

IEC 61010-1

Edition 3.0 2016-12

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

AMENDMENT 1
AMENDEMENT 1

Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements

Règles de sécurité pour appareils électriques de mesurage, de régulation et de laboratoire – Partie 1: Exigences générales

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

ICS 19.080; 71.040.10

ISBN 978-2-8322-3717-5

FOREWORD

This amendment has been prepared by IEC technical committee 66: Safety of measuring, control and laboratory equipment.

The text of this amendment is based on the following documents:

FDIS	Report on voting
66/612/FDIS	66/620/RVD

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

The committee has decided that the contents of this amendment and the base publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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

The contents of the corrigendum of March 2019 have been included in this copy.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

_____

1 Scope and object

1.1 Scope

1.1.1 Equipment included in scope

Addition:

Add the following first paragraph:

This group safety publication is primarily intended to be used as a product safety standard for the products mentioned in the scope, but shall also be used by technical committees in the preparation of their publications for products similar to those mentioned in the scope of this standard, in accordance with the principles laid down in IEC Guide 104 and ISO/IEC Guide 51.

2 Normative references

Deletion:

Delete the following references:

IEC 60405, *Nuclear instrumentation – Constructional requirements and classification of radiometric gauges*

ISO 306:1994, *Plastics – Thermoplastic materials – Determination of Vicat softening temperature (VST)*

Replacement:

Replace

IEC 60364-4-44, *Low-voltage electrical installations – Part 4-44: Protection for safety – Protection against voltage disturbances and electromagnetic disturbances*

with the following:

IEC 60364-4-44:2007, *Low-voltage electrical installations – Part 4-44: Protection for safety – Protection against voltage disturbances and electromagnetic disturbances*
IEC 60364-4-44:2007/AMD1:2015

Addition:

Add the following references:

IEC 60947-2, *Low-voltage switchgear and controlgear – Part 2: Circuit-breakers*

IEC 62471, *Photobiological safety of lamps and lamp systems*

IEC TR 62471-2, *Photobiological safety of lamps and lamp systems – Part 2: Guidance on manufacturing requirements relating to non-laser optical radiation safety*

IEC 62598, *Nuclear instrumentation – Constructional requirements and classification of radiometric gauges*

ISO 306:2013, *Plastics – Thermoplastic materials – Determination of Vicat softening temperature (VST)*

ISO 13857, *Safety of machinery – Safety distances to prevent hazard zones being reached by upper and lower limbs*

EN 378-2, *Refrigerating systems and heat pumps – Safety and environmental requirements. Design, construction, testing, marking and documentation*

4 Tests

4.1 General

Addition:

Add the following paragraph after the second paragraph of the conformity statement:

Tests needed to support a RISK assessment (see Clause 17) are carried out in the combinations of conditions and operations determined during the RISK assessment.

4.4.1 General

Addition:

Add the following text at the end of item c):

If the environmental limits of the reference test conditions (see 4.3) do not allow realistic assessment of SINGLE FAULT CONDITIONS, the test shall be conducted at the least favourable RATED environmental conditions of the equipment.

4.4.2.2 PROTECTIVE IMPEDANCE

Deletion:

Delete item b) and renumber item c) as item b).

5 Marking and documentation

5.1.3 MAINS supply

Replacement:

Replace the conformity statement with the following:

Conformity is checked by inspection and by measurement of power or input current to check that the requirements of 5.1.3 c) have been met. The measurement is made at each RATED voltage range with the equipment in the condition of maximum power or current consumption as applicable with all accessories and plug-in modules connected. If the input current varies during the normal operating cycle, the steady-state current is taken as the mean indication of the highest measured r.m.s. value during a 1 min period of the normal operation cycle. To exclude any initial inrush current, the measurement is not made until the current has stabilized (usually after 1 min). Transients are ignored.

5.1.5.2 TERMINALS

Deletion:

Delete, in item c), the word "control".

5.2 Warning markings

Replacement:

Replace the first paragraph with the following:

Warning markings specified in this standard shall meet the following requirements.

Replacement:

Replace the paragraph prior to the conformity statement with the following:

If the instructions for use state that an OPERATOR is permitted to gain access, using a TOOL, to a part or location which in NORMAL USE may present a HAZARD, there shall be a warning marking indicating that the equipment must be placed in a safe state before access. Symbol 14 shall be used for this purpose with the warning text included in the documentation. Additional symbols may be used to indicate the nature of the HAZARD such as symbol 12, 13, or 17 as appropriate.

Symbols are the preferred marking method over text warnings. Supplemental text may be provided adjacent to the symbol.

5.4.1 General

Replacement:

In item h), replace "(see 7.5)" with "(see 7.5.1)".

5.4.2 Equipment RATINGS

Replacement:

Replace items d) and e) with the following:

d) a statement of the range of environmental conditions for which the equipment is designed including:
   1) indoor or outdoor use,
   2) altitude,
   3) temperature,
   4) relative humidity,
   5) MAINS supply voltage fluctuations,
   6) OVERVOLTAGE CATEGORY, except for cord/plug-connected equipment,
   7) WET LOCATION, if applicable,
   8) POLLUTION DEGREE of the intended environment,

e) for equipment RATED for ingress protection according to IEC 60529 the information required in 11.6.1;

5.4.3 Equipment installation

Replacement:

Replace the first paragraph with the following:

The documentation shall include installation and specific commissioning instructions and, if necessary for safety, warnings against HAZARDS which could arise during installation or commissioning or as a result of improper installation or commissioning of the equipment. Such information includes, if applicable:

Replacement:

Replace item f) with the following:

f) requirements and safety characteristics for special external services, for example: maximum and minimum temperature, pressure, or flow of air or cooling liquid;

5.4.5 Equipment maintenance and service

Replacement:

Replace the first paragraph with the following:

Instructions shall be provided to the RESPONSIBLE BODY in sufficient detail to permit safe maintenance, inspection and testing of the equipment, and to ensure continued safety of the equipment after the maintenance, inspection and test procedure.

6 Protection against electric shock

6.2.1 General

Replacement:

Replace, at the end of the first paragraph, "(see 6.9.1)" with "(see 6.9.2)".

6.3.1 Levels in NORMAL CONDITION

Replacement:

Replace the text of item a) with the following:

a) The a.c. voltage levels are 30 V r.m.s., 42,4 V peak, and the d.c. voltage level is 60 V. For equipment intended for use in WET LOCATIONS, the a.c. voltage levels are 16 V r.m.s., 22,6 V peak, and the d.c. voltage level is 35 V.

6.3.2 Levels in SINGLE FAULT CONDITION

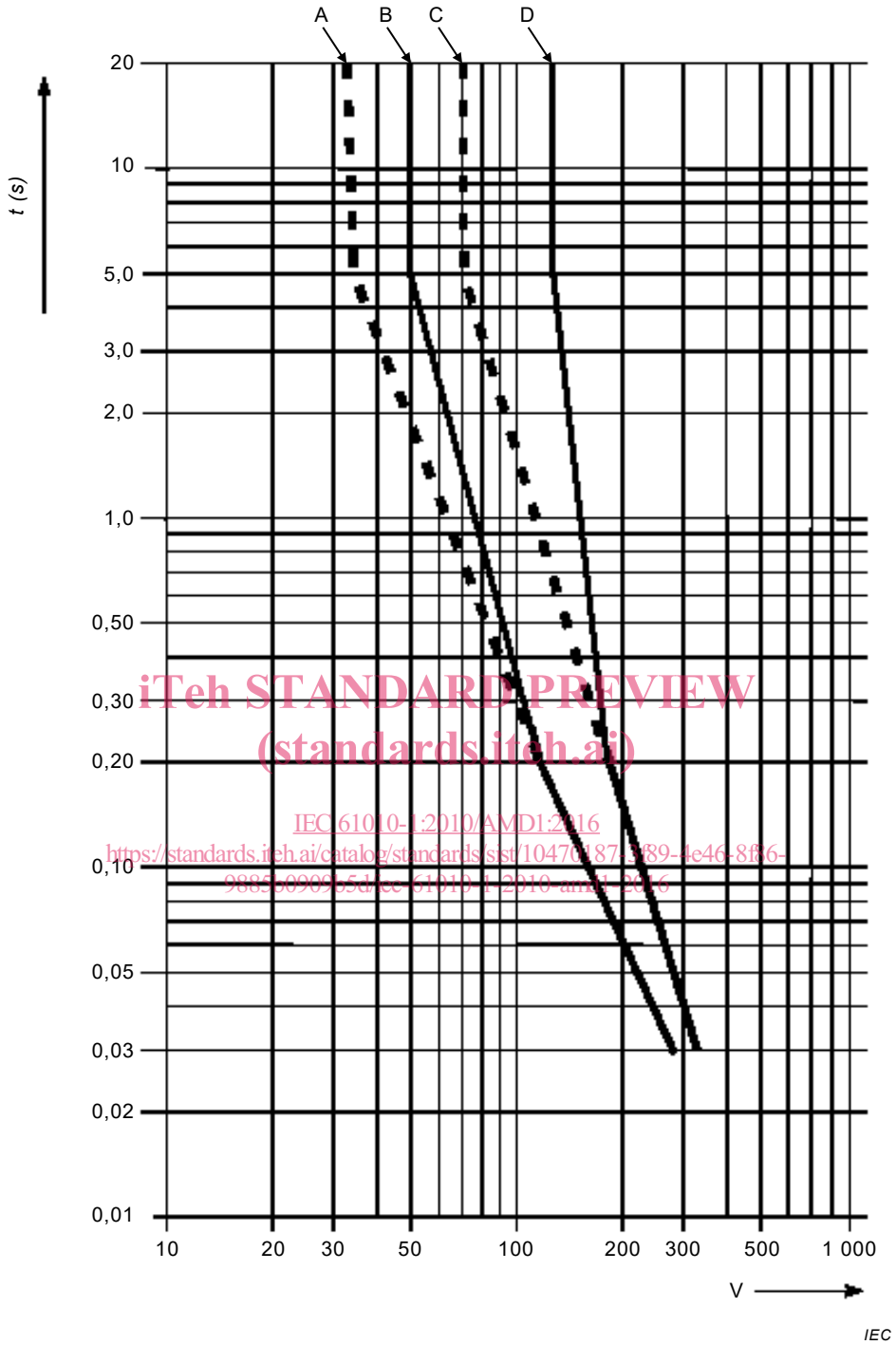
Replacement:

Replace the first two sentences of item a) with the following:

The a.c. voltage levels are 50 V r.m.s., 70 V peak, and the d.c. voltage level is 120 V. For equipment intended for use in WET LOCATIONS, the a.c. voltage levels are 33 V r.m.s., 46,7 V peak, and the d.c. voltage level is 70 V.

Replacement:

Replace Figure 2 with the following:



Key

A	a.c. voltage level in WET LOCATIONS	C	d.c. voltage level in WET LOCATIONS
B	a.c. voltage level in dry locations	D	d.c. voltage level in dry locations

NOTE The lines A and C continue with lines B and D below the value of 0,2s

Figure 2 – Maximum duration of short-term ACCESSIBLE voltages in SINGLE FAULT CONDITION (see 6.3.2 a))

6.6.4 TERMINALS for stranded conductors

Replacement:

Replace the first paragraph and its conformity statement with the following:

TERMINALS for stranded conductors that are intended to be connected during installation, maintenance, or operation of the equipment shall be located or shielded so that there is no possibility of accidental contact between HAZARDOUS LIVE parts of different polarity or between such parts and other ACCESSIBLE parts, even if a strand of a conductor escapes from a TERMINAL. This requirement does not apply to connections that are only to be made at the manufacturing facility.

Conformity is checked by inspection after fully inserting a stranded conductor:

a) with the maximum length of insulation removed as specified by the equipment manufacturer, or

b) with an 8 mm length of insulation removed if no specification is given by the equipment manufacturer.

With one of the strands free, the free strand shall not touch parts of different polarity or other ACCESSIBLE parts, when bent in every possible direction, without tearing back the insulation or making sharp bends.

6.7.1.3 CREEPAGE DISTANCES

Addition:

Add the following paragraph just before the last paragraph:

A CREEPAGE DISTANCE may be split in several portions of different materials and/or have different POLLUTION DEGREES if one of the CREEPAGE DISTANCES is dimensioned to withstand the total voltage or if the total distance is dimensioned according to the material having the lowest CTI and the highest POLLUTION DEGREE.

6.7.1.5 Requirements for insulation according to type of circuit

Addition:

Add, after NOTE 3, the following new NOTE:

NOTE 4 The assumed TRANSIENT OVERVOLTAGE level for MAINS is equal to the required RATED impulse voltage of equipment in Table 443.2 of IEC 60364-4-44:2007/AMD1:2015.

6.7.2.1 CLEARANCES and CREEPAGE DISTANCES

Addition:

Add, at the bottom of Table 4, the following:

Linear interpolation of the CREEPAGE DISTANCES is allowed.

6.7.2.2 Solid insulation

6.7.2.2.1 General

Replacement:

Replace the first conformity statement with the following:

Conformity is checked by inspection, and by the a.c. test of 6.8.3.1 or the d.c. test of 6.8.3.2 using the applicable voltage from Table 5 for 1 min.

6.7.2.2.4 Thin-film insulation

Replacement:

Replace the conformity statement for item c) with the following:

Conformity is checked by the a.c. test of 6.8.3.1 or the d.c. test of 6.8.3.2 applied to two of the three layers using the applicable voltage for REINFORCED INSULATION from Table 5 for 1 min.

6.7.3.2 CLEARANCES

Replacement:

Replace Table 6 with the following:

Table 6 – CLEARANCES and test voltages for secondary circuits derived from MAINS CIRCUITS of OVERVOLTAGE CATEGORY II up to 300 V

Secondary WORKING VOLTAGE		MAINS voltage, line-to-neutral, OVERVOLTAGE CATEGORY II			
		≤ 150 V a.c. r.m.s.		> 150 V ≤ 300 V a.c. r.m.s.	
a.c. r.m.s.	d.c. or a.c. peak	CLEARANCE	Test voltage	CLEARANCE	Test voltage
V	V	mm	V a.c. r.m.s.	mm	V a.c. r.m.s.
16	22,6	0,10	500	0,48	830
30	42,4	0,11	510	0,50	840
50	70	0,12	520	0,53	860
100	140	0,13	540	0,61	900
150	210	0,16	580	0,69	940
300	420	0,39	770	0,94	1 040
600	840	1,01	1 070	1,61	1 450
1 000	1 400	1,92	1 630	2,52	1 970
1 250	1 750	2,50	1 960	3,16	2 280
1 600	2 240	3,39	2 390	4,11	2 730
2 000	2 800	4,49	2 890	5,30	3 230
2 500	3 500	6,02	3 520	6,91	3 850
3 200	4 480	8,37	4 390	9,16	4 660
4 000	5 600	10,9	5 320	11,6	5 610
5 000	7 000	14,0	6 590	14,9	6 960
6 300	8 820	18,2	8 270	19,1	8 620
8 000	11 200	23,9	10 400	24,7	10 700
10 000	14 000	30,7	12 900	31,6	13 300
12 500	17 500	39,6	16 100	40,5	16 400
16 000	22 400	52,5	20 400	53,5	20 700
20 000	28 000	67,9	25 300	68,9	25 600
25 000	35 000	87,9	31 600	89,0	32 000
32 000	44 800	117	40 400	118	40 700
40 000	56 000	151	50 300	153	50 800
50 000	70 000	196	62 800	198	63 400
63 000	88 200	258	79 400	260	80 000
Linear interpolation is allowed.					

6.8 Procedure for voltage tests

6.8.1 General

Addition:

Add, after the fifth paragraph, the following:

When verifying a CLEARANCE within equipment, it is necessary to ensure that the specified voltage appears at the CLEARANCE. PROTECTIVE IMPEDANCE, impedances and voltage-limiting devices in parallel with the insulation to be tested may be disconnected.

6.8.3.1 The a.c. voltage test

Replacement:

Replace the first paragraph with the following:

The voltage tester shall have a regulated output capable of maintaining the test voltage throughout the test. The waveform of the test voltage shall be substantially sinusoidal. This requirement is fulfilled if the ratio between the peak value and the r.m.s. value is $\sqrt{2}$ *± 3 %.*

The a.c. voltage test is performed at the RATED MAINS frequency, but for equipment RATED for MAINS frequencies including 50 Hz and 60 Hz, a test at either 50 Hz or at 60 Hz is sufficient.

6.8.3.2 The 1 min d.c. voltage test

Replacement:

Replace the title of 6.8.3.2 with the following:

6.8.3.2 The d.c. voltage test

Replacement:

Replace the second paragraph with the following:

The d.c. test voltage is raised uniformly from 0 V to the specified value within 5 s and held at that value for at least the specified time.

6.8.3.3 The impulse voltage withstand test

Replacement:

Replace the title of 6.8.3.3 with the following:

6.8.3.3 The impulse voltage test

6.11.4.2 Switches and circuit-breakers

Replacement:

Replace the first paragraph with the following:

An equipment circuit-breaker employed as a disconnecting device shall meet the relevant requirements of IEC 60947-2, and be suitable for the application.

An equipment switch employed as a disconnecting device shall meet the relevant requirements of IEC 60947-3, and be suitable for the application.

Replacement:

Replace the second sentence of the second paragraph with the following sentence:

If there is only one device – one switch or one circuit-breaker – symbols 9 and 10 of Table 1 are sufficient if the symbols are marked on or adjacent to the switch or circuit-breaker.

7 Protection against mechanical HAZARDS

7.1 General

Replacement:

Replace the NOTE with the following:

NOTE If the equipment consists of two or more units, the value of the mass refers to the mass of each individual unit. However, if one or more units are intended to be attached to and supported by another unit, these units are treated as a single unit.

7.3.3 RISK assessment for mechanical HAZARDS to body parts

Table 12 – Protective measures against mechanical HAZARDS to body parts

Replacement:

Replace, in footnote "[d] Minimum protective measures:" *the text of B with the following:*

B = Moderate measures; emergency switches, PROTECTIVE BARRIERS or covers removable only with a TOOL, distances (see ISO 13857), or separations (see ISO 13854 or EN 349).

7.3.4 Limitations of force and pressure

Deletion:

Delete the second sentence of the third paragraph.

Addition:

Add the following at the end of the conformity statement:

For the purposes of this subclause, the width of a finger is considered to be 1,2 cm and the width of any other body part is considered to be 5,0 cm. The contact area will be determined to be the width of the body part multiplied by the width of the moving part, or the cross-sectional contact area of the moving part, if smaller.

EXAMPLE In a particular case, a finger might be able to touch a moving part that is 0,9 mm wide. If the part can exert a continuous force of 40 N, then the contact pressure would be calculated as:

Area = 1,2 cm × 0,09 cm = 0,108 cm^2

Pressure = 40 N / 0,108 cm^2 = 370 N/cm^2

In this case, the pressure exceeds the permissible limit even though the force is less than the permissible limit. In this case, the moving part would be considered to be hazardous.

7.4 Stability

Replacement:

Replace the third paragraph with the following:

Each castor and support foot shall be RATED to support a load not less than its normal load, or the castors and support feet shall be tested according to d) or e) below.

Deletion:

Delete NOTE 2 and renumber NOTE 1 as "NOTE".

9 Protection against the spread of fire

9.4 Limited-energy circuit

Replacement:

Replace item c) as follows:

c) It is separated by at least BASIC INSULATION from other circuits having energy values exceeding criteria a) or b) above.

9.6.1 General

Replacement:

Replace the conformity statement with the following:

Conformity is checked by inspection and measurement and for solid insulation by the a.c. voltage test of 6.8.3.1 or the d.c. voltage test of 6.8.3.2 (without humidity preconditioning) using the test voltage from Table 5 for BASIC INSULATION for the appropriate line-to-neutral voltage for 1 min. EMC capacitors meeting the requirements of Clause 14 may be disconnected during the voltage test.

10 Equipment temperature limits and resistance to heat

10.1 Surface temperature limits for protection against burns

Replacement:

Replace, in the NOTE in Table 19, "EN 563" *with* "ISO 13732-1".

10.4.1 General

Addition:

Add, after the second paragraph, the following:

Alternatively, temperature measurements are made at the least favourable ambient temperature within the RATED ambient temperature range of the equipment if this represents a less favourable condition. Measures are taken to eliminate errors caused by the method of achieving the test ambient temperature (e.g. suitable baffling or enclosure if the test is conducted in an environmental chamber and the forced air movements would cool the exterior of the equipment).

11 Protection against HAZARDS from fluids

Replacement:

Replace the title with the following:

11 Protection against HAZARDS from fluids and solid foreign objects

11.1 General

Replacement: