INTERNATIONAL STANDARD

IEC 60092-351

Third edition
2004-04

Electrical installations in ships –

Part 351: Insulating materials for shipboard and offshore units, power, control, instrumentation, telecommunication and data cables

Reference number
IEC 60092-351:2004(E)

Publication numbering

As from 1 January 1997 all IEC publications are issued with a designation in the 60000 series. For example, IEC 34-1 is now referred to as IEC 60034-1.

Consolidated editions

The IEC is now publishing consolidated versions of its publications. For example, edition numbers 1.0, 1.1 and 1.2 refer, respectively, to the base publication, the base publication incorporating amendment 1 and the base publication incorporating amendments 1 and 2.

Further information on IEC publications

The technical content of IEC publications is kept under constant review by the IEC, thus ensuring that the content reflects current technology. Information relating to this publication, including its validity, is available in the IEC Catalogue of publications (see below) in addition to new editions, amendments and corrigenda. Information on the subjects under consideration and work in progress undertaken by the technical committee which has prepared this publication, as well as the list of publications issued, is also available from the following:

- **IEC Web Site (www.iec.ch)**

- **Catalogue of IEC publications**

  The on-line catalogue on the IEC web site (http://www.iec.ch/searchpub/cur_fut.htm) enables you to search by a variety of criteria including text searches, technical committees and date of publication. On-line information is also available on recently issued publications, withdrawn and replaced publications, as well as corrigenda.

- **IEC Just Published**

  This summary of recently issued publications (http://www.iec.ch/online_news/justpub/jp_entry.htm) is also available by email. Please contact the Customer Service Centre (see below) for further information.

- **Customer Service Centre**

  If you have any questions regarding this publication or need further assistance, please contact the Customer Service Centre:

  Email: custserv@iec.ch
  Tel: +41 22 919 02 11
  Fax: +41 22 919 03 00

INTERNATIONAL STANDARD

IEC 60092-351

Third edition
2004-04

Electrical installations in ships –

Part 351: Insulating materials for shipboard and offshore units, power, control, instrumentation, telecommunication and data cables

International Electrotechnical Commission, 3, rue de Varembé, PO Box 131, CH-1211 Geneva 20, Switzerland
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: inmail@iec.ch Web: www.iec.ch

Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE P

For price, see current catalogue

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRICAL INSTALLATIONS IN SHIPS –

Part 351: Insulating materials for shipboard and offshore units, power, control, instrumentation, telecommunication and data cables

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of 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, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). 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. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60092-351 has been prepared by subcommittee 18A: Cables and cable installations, of IEC technical committee 18: Electrical installations of ships and of mobile and fixed offshore units.

This third edition cancels and replaces the second edition published in 2000, and constitutes a technical revision. The title has been updated and changes introduced to the tables.

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

FDIS	Report on voting
18A/252/FDIS	18A/254/RVD

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

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

IEC 60092 consists of the following parts under the general title *Electrical installations in ships:*

Part 101: Definitions and general requirements

Part 201: System design – General

Part 202: System design – Protection

Part 203: System design – Acoustic and optical signals

Part 204: System design – Electric and electrohydraulic steering gear

Part 301: Equipment – Generators and motors

Part 302: Low-voltage switchgear and controlgear assemblies

Part 303: Equipment – Transformers for power and lighting

Part 304: Equipment – Semiconductor convertors

Part 305: Equipment – Accumulator (storage) batteries

Part 306: Equipment – Luminaires and accessories

Part 307: Equipment – Heating and cooking appliances

Part 350: Shipboard power cables – General construction and test requirements

Part 351: Insulating materials for shipboard and offshore units, power, control, instrumentation, telecommunication and data cables

Part 352: Choice and installation of cables for low-voltage power systems

Part 353: Single and multicore non-radial field power cables with extruded solid insulation for rated voltages 1 kV and 3 kV

Part 354: Single- and three-core power cables with extruded solid insulation for rated voltages 6 kV (Um = 7,2 kV) up to 30 kV (Um = 36 kV)

Part 359: Sheathing materials for shipboard power and telecommunication cables

Part 373: Shipboard telecommunication cables and radio-frequency cables – Shipboard flexible coaxial cables

Part 374: Shipboard telecommunication cables and radio-frequency cables – Telephone cables for non-essential communication services

Part 375 Shipboard telecommunication cables and radio-frequency cables – General instrumentation, control and communication cables

Part 376: Cables for control and instrumentation circuits 150/250 V (300 V)

Part 390: Cable penetrations – Fire type test procedures

Part 401: Installation and test of completed installation

Part 501: Special features – Electric propulsion plant

Part 502: Tankers – Special features

Part 503: Special features – A.C. supply systems with voltages in the range above 1 kV up to and including 11 kV

Part 504: Special features – Control and instrumentation

Part 506: Special features – Ships carrying specific dangerous goods and materials hazardous only in bulk

Part 507: Pleasure craft

Part 508: Switchgear and controlgear assemblies for rated voltages above 1kV and up to and including 15kV (in preparation)

The committee has decided that the contents of this publication will remain unchanged until 2008. At this date, the publication will be

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

A bilingual version may be issued at a later date.

INTRODUCTION

IEC 60092 forms a series of International Standards concerning electrical installations in sea-going ships and fixed and mobile offshore units, incorporating good practice and co-ordinating as far as possible existing rules.

These standards form a code of practical interpretation and amplification of the requirements of the International Convention on Safety of Life at Sea, a guide for future regulations which may be prepared and a statement of practice for use by shipowners, shipbuilders, mobile and fixed offshore unit owners and builders and appropriate organisations.

ELECTRICAL INSTALLATIONS IN SHIPS –

Part 351: Insulating materials for shipboard and offshore units, power, control, instrumentation, telecommunication and data cables

1 Scope

This part of IEC 60092 specifies the requirements for electrical, mechanical and particular characteristics of insulating materials intended for use in shipboard and fixed and mobile offshore unit power, control, instrumentation, telecommunication and data cables.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60502-1:1997, *Power cables with extruded insulation and their accessories for rated voltages from 1 kV (U_m = 1,2 kV) up to 30 kV (U_m = 36 kV) – Part 1: Cables for rated voltages of 1 kV (U_m= 1,2 kV) and 3 kV (U_m = 3,6 kV)*

IEC 60754-2, *Test on gases evolved during combustion of electric cables – Part 2: Determination of degree of acidity of gases evolved during the combustion of materials taken from electric cables by measuring pH and conductivity*

IEC 60811-1-1:1993, *Common test methods for insulating and sheathing materials of electric cables – Part 1: Methods for general application – Measurement of thickness and overall dimensions – Tests for determining the mechanical properties* [1)]
Amendment 1 (2001)

IEC 60811-1-2:1995, *Common test methods for insulating and sheathing materials of electric cables – Part 1: Methods for general application – Section Two: Thermal ageing methods*
Amendment 1 (1989)
Amendment 2 (2000)

IEC 60811-1-4:1985 *Common test methods for insulating and sheathing materials of electric cables – Part 1: Methods for general application – Section four: Test at low temperature*
Amendment 1 (1993)
Amendment 2 (2001)

IEC 60811-2-1:1998 *Insulating and sheathing materials of electric and optical cables – Common test methods – Part 2-1: Methods specific to elastomeric compounds – Ozone resistance, hot set and mineral oil immersion tests* [2)]
Amendment 1 (2001)

IEC 60811-3-1:1985 *Common test methods for insulating and sheathing materials of electric cables – Part 3: Methods specific to PVC compounds – Section One: Pressure test at high temperature – Tests for resistance to cracking*
Amendment 1 (1994)
Amendment 2 (2001)

[1)] A consolidated edition 2.1 (2001) exists, including edition 2.0 and its Amendment 1.

[2)] A consolidated edition 2.1 (2001) exists, including edition 2.0 and its Amendment 1.

IEC 60811-3-2:1985 *Common test methods for insulating and sheathing materials of electric cables – Part 3: Methods specific to PVC compounds – Section Two: Loss of mass test – Thermal stability test*
Amendment 1 (1993)

ISO 48, *Rubber, vulcanized or thermoplastic – Determination of hardness (hardness between 10 IRHD and 100 IRHD)*

3 Insulating materials

3.1 General

The types of insulating compound covered by this standard are listed in the following Table 1 together with their abbreviated designations and maximum rated conductor temperatures during normal operation and short-circuit.

Table 1 – Type of insulating compounds, abbreviated designation and maximum rated conductor temperature during normal operation and short circuit

Type of insulating compound	Abbreviated designation	Maximum rated conductor temperature °C	
		Normal operation	Short-circuit
a) Thermoplastic:			
– based upon polyvinyl chloride or copolymer of vinyl chloride and vinyl acetate	PVC	70	150
b) Elastomeric or thermoset:			
– based upon ethylene-propylene rubber or similar (EPM or EPDM)	EPR	90	250
– based upon high modulus or hard grade ethylene propylene rubber	HEPR	90	250
– based upon cross-linked polyethylene	XLPE	90	250
– based upon silicone rubber	S 95	95	350 [a]
– based upon ethylene-propylene rubber or similar (EPM or EPDM) halogen-free	HF EPR	90	250
– based upon high modulus or hard grade halogen-free ethylene propylene rubber	HF HEPR	90	250
– based upon halogen-free cross-linked polyethylene	HF XLPE	90	250
– based upon halogen-free silicone rubber	HF S 95	95	350 [a]
– based upon cross-linked polyolefin material for halogen-free cables	HF 90	90	250

[a] This temperature is applicable only to power cables and not appropriate for tinned copper conductors.

3.2 Electrical characteristics

The test requirements for electrical characteristics of insulating compounds are listed in the following Table 2.

Table 2 – Test requirements for electrical characteristics of insulating compounds

Designation of the insulating compound	EPR and HF EPR	HEPR and HF HEPR	XLPE and HF XLPE	S 95 and HF S 95	HF 90	PVC
1 Insulation resistance constant K_i (MΩ·km) (see Clause 17 of IEC 60502-1)						
1a – at 20 °C, minimum;	3 670	3 670	3 670	1 500	500	36,7
1b – at maximum operating temperature, minimum	3,67	3,67	3,67	2	0,5	0,037
2 Increase in a.c. capacity after immersion in water at 50 °C						
2a – between the end of the 1st and the end of the 14th day, maximum (%)	15	15	–	15	15	15
2b – between the end of the 7th and the end of the 14th day, maximum (%)	5	5	–	5	5	5

3.3 Mechanical characteristics

The test requirements for mechanical characteristics of insulating compounds are listed in the following Table 3.

Table 3 – Test requirements for mechanical characteristics of insulating compounds

Designation of the insulating compound		EPR and HF EPR	HEPR and HF HEPR	XLPE and HF XLPE	S 95 and HF S 95	HF 90	PVC
Mechanical characteristics without ageing (see 9.1 of IEC 60811-1-1)							
Tensile strength, minimum	(N/mm^2)	4,2	8,5	12,5	5,0	9,0	12,5
Elongation at break, minimum	(%)	200	200	200	150	120	150
Mechanical characteristics after ageing in air oven (see 8.1 of IEC 60811-1-2)							
After ageing without conductor							
Treatment – temperature	(°C)	135	135	135	200	135	100
– tolerance	(°C)	±2	±2	±2	±3	±2	±2
– duration	(h)	168	168	168	240	168	168
Tensile strength:							
a) minimum value	(N/mm^2)	–	–	–	4,0	–	12,5
b) variation, maximum	(%)	±30	±30	±25	–	±30	±25
Elongation at break:							
a) minimum value	(%)	–	–	–	120	100	150
b) variation, maximum	(%)	±30	±30	±25	–	±30	±25
After ageing with copper conductor							
Treatment – temperature	(°C)	–	150	–	–	–	–
– tolerance	(°C)		±3				
– duration	(h)	–	168	–	–	–	–
Tensile strength: variation, maximum	(%)	–	±30	–	–	–	–
Elongation at break: variation, maximum	(%)	–	±30	–	–	–	–
Mechanical characteristics after ageing in air bomb at (0,55 ± 0,02) MPa (see 8.2 of IEC 60811-1-2)							
Treatment – temperature	(°C)	127	127	–	–	–	–
– tolerance	(°C)	±1	±1				
– duration	(h)	40	40	–	–	–	–
Tensile strength: variation, maximum	(%)	±30	±30	–	–	–	–
Elongation at break: variation, maximum	(%)	±30	±30	–	–	–	–

[a] Test is only applicable to cables having bare copper conductors without any separator on the conductor.

3.4 Particular characteristics

The test requirements for particular characteristics of insulating compounds are listed in the following Table 4.

Table 4 – Test requirements for particular characteristics of insulating compounds

Designation of the insulating compound	EPR	HEPR	XLPE	S 95	HF EPR	HF HEPR	HF XLPE	HF S 95	HF 90	PVC
Pressure test at high temperature (see 8.1 of IEC 60811-3-1)										
– Test temperature (°C)	–	–	–	–	–	–	–	–	–	80
– Tolerance (°C)	–	–	–	–	–	–	–	–	–	±2
– Time under load – 1st case (h)	–	–	–	–	–	–	–	–	–	4
– 2nd case (h)	–	–	–	–	–	–	–	–	–	6
Maximum permissible depth of indentation (%)	–	–	–	–	–	–	–	–	–	50
Hot set test (see Clause 9 of IEC 60811-2-1) Treatment										
– temperature (°C)	250	250	200	250	250	250	200	250	200	–
– tolerance (°C)	±3	±3	±3	±3	±3	±3	±3	±3	±3	–
– time under load (min)	15	15	15	15	15	15	15	15	15	–
– mechanical stress (N/cm^2)	20	20	20	20	20	20	20	20	20	–
Maximum elongation under load (%)	175	175	175	175	175	175	175	175	175	–
Maximum permanent elongation (%)	15	15	15	25	15	15	15	25	15	–
Heat shock test (see 9.1 of IEC 60811-3-1) Treatment										
– temperature (°C)	–	–	–	–	–	–	–	–	–	150
– tolerance (°C)	–	–	–	–	–	–	–	–	–	±3
– duration (h)	–	–	–	–	–	–	–	–	–	1
Loss of mass test (see 8.1 of IEC 60811-3-2) Treatment										
– temperature (°C)	–	–	–	–	–	–	–	–	–	80
– tolerance (°C)	–	–	–	–	–	–	–	–	–	±2
– duration (h)	–	–	–	–	–	–	–	–	–	168
Maximum permissible loss of mass (mg/cm^2)	–	–	–	–	–	–	–	–	–	2
Behaviour at low temperature (see Clause 8 of IEC 60811-1-4) Tests to be carried out without previous ageing:										
Bending test (for core diameter ≤12,5 mm)										
– Test temperature (°C)	–	–	–	–	–	–	–	–	–	–15
– Tolerance (°C)	–	–	–	–	–	–	–	–	–	±2
Elongation test (for cores not subjected to the bending test)										
– Test temperature (°C)	–	–	–	–	–	–	–	–	–	–15
– Tolerance (°C)	–	–	–	–	–	–	–	–	–	±2
– Elongation at break, minimum (%)	-	-	-	-	-	-	-	-	-	30
Impact test										
– Test temperature (°C)	–	–	–	–	–	–	–	–	–	–15
– Tolerance (°C)	–	–	–	–	–	–	–	–	–	±2

Table 4 (*continued*)

Designation of the insulating compound	EPR	HEPR	XLPE	S 95	HF EPR	HF HEPR	HF XLPE	HF S 95	HF 90	PVC
Ozone resistance test (see Clause 8 of IEC 60811-2-1)										
Ozone concentration (by volume) (%)	0,025 to 0,030	0,025 to 0,030	–	–	0,025 to 0,030	0,025 to 0,030	–	–	0,025 to 0,030	–
Test duration without cracks [a] (h)	30	30	–	–	30	30	–	–	30	–
Determination of degree of acidity of gases evolved during the combustion of materials taken from electric cables by measuring pH and conductivity (see IEC 60754-2)										
pH	–	–	–	–	≥4,3	≥4,3	≥4,3	≥4,3	≥4,3	–
conductivity ($\mu S.mm^{-1}$)	–	–	–	–	≤10	≤10	≤10	≤10	≤10	–
Determination of hardness (see Annex A)										
IRHD [b] minimum	–	80	–	–	–	80	–	–	–	–
Determination of elastic modulus (see Annex B)										
Modulus at 150 % elongation minimum (N/mm^2)	–	4,5	–	–	–	4,5	–	–	–	–

[a] An alternative test method may be used in some countries for legal reasons. In this case, the ozone concentration and test duration listed here are replaced by the conditions in Annex C.

[b] IRHD = International Rubber Hardness Degree

Annex A
(normative)

Determination of hardness of HEPR and HF HEPR insulation

A.1 Test piece

The test piece shall be a sample of completed cable with all the coverings external to the rubber surface to be measured carefully removed. Alternatively, a sample of insulated core may be used.

A.2 Test procedure

Tests shall be made in accordance with ISO 48 with exceptions as indicated below.

A.2.1 Surfaces of large radius of curvature

The test instrument, in accordance with ISO 48, shall be constructed so as to rest firmly on the rubber surface and permit the presser foot and indentor to make vertical contact with this surface. This is done in one of the following ways:

a) the instrument is fitted with feet movable in universal joints so that they adjust themselves to the curved surface;

b) the base of the instrument is fitted with two parallel rods A and A' at a distance apart depending on the curvature of the surface (see figure A.1).

These methods may be used on surfaces with a radius of curvature down to 20 mm.

When the thickness of rubber tested is less than 4 mm, an instrument as described in the method in ISO 48 for thin and small test pieces shall be used.

A.2.2 Surfaces of small radius of curvature

On surfaces with too small a radius of curvature for the procedures described in A.2.1, the test piece shall be supported on the same rigid base as the test instrument, in such a way as to minimise bodily movement of the rubber surface when the indenting force increment is applied to the indentor and so that the indentor is vertically above the axis of the test piece. Suitable procedures are as follows:

a) by resting the test piece in a grove or trough in a metal jig (see Figure A.2a);

b) by resting the ends of the conductor of the test piece in V-blocks (see Figure A.2b).

The smallest radius of curvature of the surface to be measured by these methods shall be at least 4 mm.

For smaller radii, an instrument as described in the method in ISO 48 for thin and small test pieces shall be used.

A.2.3 Conditioning and test temperature

The minimum time between manufacture, i.e. vulcanisation, and testing shall be 16 h.

The test shall be carried out at a temperature of (20 ± 2) °C and the test pieces shall be maintained at this temperature for at least 3 h immediately before testing.

A.2.4 Number of measurements

One measurement shall be made at each of three or five different points distributed around the test piece. The median of the results shall be taken as the hardness of the test piece, reported to the nearest whole number in International Rubber Hardness Degrees (IRHD).

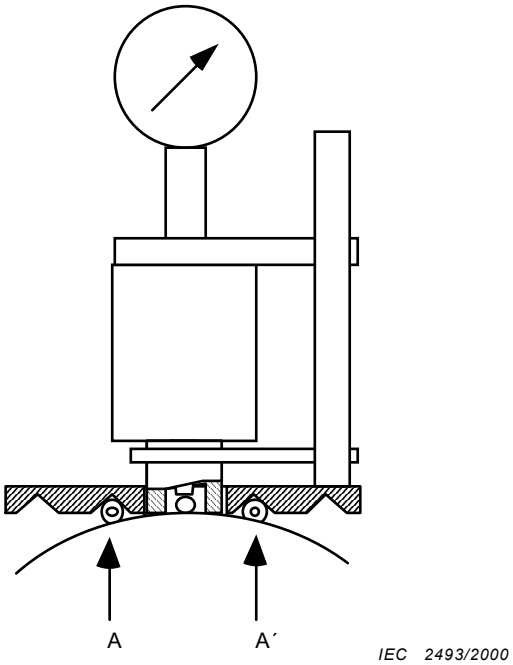
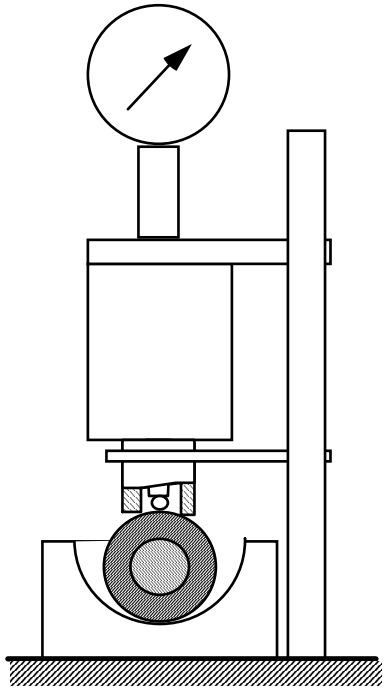
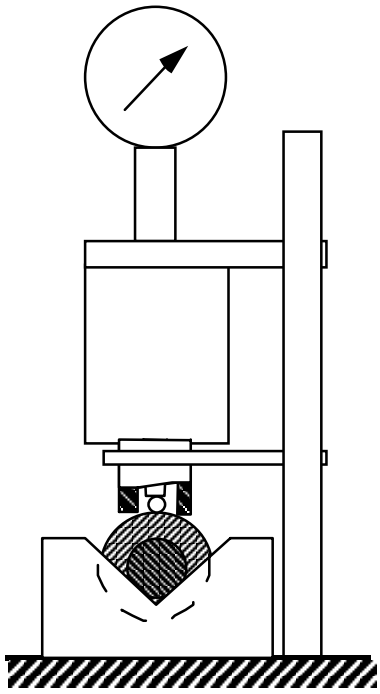


Figure A.1 – Testing surfaces of large radius of curvature



IEC 2494/2000

Figure A.2a – Metal jig



IEC 2495/2000

Figure A.2b – V blocks

Figure A.2 – Testing surfaces of small radius of curvature

Annex B
(normative)

Determination of the elastic modulus of HEPR and HF HEPR insulation

B.1 Procedure

Sampling, preparation of the test pieces and the test procedure shall be carried out in accordance with Clause 9 of IEC 60811-1-1.

The loads required for 150 % elongation shall be measured. The corresponding stresses shall be calculated by dividing the loads measured by the cross-sectional areas of the unstretched test pieces. The ratios of the stresses to strains shall be determined to obtain the elastic moduli at 150 % elongation.

The elastic modulus shall be the respective median values.

B.2 Requirements

The results of the test shall comply with the requirements of Table 4.

Annex C
(informative)

Ozone resistance test – Alternative test method

Table C.1 – Test requirements for ozone resistance of insulating compounds

Designation of insulating compound	EPR and HF EPR	HEPR and HF HEPR	XLPE and HF XLPE	S95 and HF S95	HF 90	PVC
Ozone resistance test Treatment						
– temperature (°C)	40 ± 2	40 ± 2	–	–	40 ± 2	–
– duration (h)	72	72	–	–	72	–
– Ozone concentration (by volume) (%)	(200 ± 50) 10^{-6}	(200 ± 50) 10^{-6}	– –		(200 ± 50) 10^{-6}	
– Relative humidity (%)	55 ± 10	55 ± 10	–		55 ± 10	
– Minimum air speed at the level of the test piece (mm/s)	500	500	–	–	500	–

Standards Survey

The IEC would like to offer you the best quality standards possible. To make sure that we continue to meet your needs, your feedback is essential. Would you please take a minute to answer the questions overleaf and fax them to us at +41 22 919 03 00 or mail them to the address below. Thank you!

Customer Service Centre (CSC)

International Electrotechnical Commission
3, rue de Varembé
1211 Genève 20
Switzerland

or

Fax to: **IEC**/CSC at +41 22 919 03 00

Thank you for your contribution to the standards-making process.

Nicht frankieren
Ne pas affranchir

Non affrancare
No stamp required

A Prioritaire

RÉPONSE PAYÉE

SUISSE

Customer Service Centre (CSC)
International Electrotechnical Commission
3, rue de Varembé
1211 GENEVA 20
Switzerland

Q1 Please report on **ONE STANDARD** and **ONE STANDARD ONLY**. Enter the exact number of the standard: *(e.g. 60601-1-1)*

.....

Q2 Please tell us in what capacity(ies) you bought the standard *(tick all that apply).* I am the/a:

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

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

manufacturing ❑
consultant ❑
government ❑
test/certification facility ❑
public utility ❑
education ❑
military ❑
other.....

Q4 This standard will be used for: *(tick all that apply)*

general reference ❑
product research ❑
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 .....

Q8 I read/use the: *(tick one)*

French text only ❑
English text only ❑
both English and French texts ❑

Q9 Please share any comment on any aspect of the IEC that you would like us to know:

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

ISBN 2-8318-7485-8

ICS 29.035.01; 47.020.60; 29.060.20

Typeset and printed by the IEC Central Office
GENEVA, SWITZERLAND