

INTERNATIONAL STANDARD

**Electrical installations in ships –
Part 360: Insulating and sheathing materials for ship board and offshore units,
power, control, instrumentation and telecommunication cables**



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2021 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

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

Tel.: +41 22 919 02 11
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 corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

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 It also gives information on projects, replaced and withdrawn publications.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 once a month by email.

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: sales@iec.ch.

IEC online collection - oc.iec.ch

Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 18 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

INTERNATIONAL STANDARD

**Electrical installations in ships –
Part 360: Insulating and sheathing materials for shipboard and offshore units,
power, control, instrumentation and telecommunication cables**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 47.020.60

ISBN 978-2-8322-9229-7

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD	4
1 Scope	6
2 Normative references	6
3 Terms and definitions	7
4 Cross-linked insulating compounds	9
4.1 General	9
4.2 Electrical characteristics	9
4.3 Mechanical characteristics	10
5 Cross-linked sheathing compounds	13
5.1 General	13
5.2 Mechanical characteristics	13
6 Thermoplastic sheathing compounds	15
6.1 General	15
6.2 Mechanical characteristics	16
7 Additional optional properties of sheathing compounds	17
7.1 General	17
7.2 Test requirements	17
Annex A (normative) Determination of hardness of HEPR insulation	19
A.1 Test piece	19
A.2 Test procedure	19
A.2.1 General	19
A.2.2 Surfaces of large radius of curvature	19
A.2.3 Surfaces of small radius of curvature	20
A.2.4 Conditioning and test temperature	20
A.2.5 Number of measurements	21
Annex B (normative) Determination of the elastic modulus of HEPR insulation	22
B.1 Procedure	22
B.2 Requirements	22
Annex C (normative) Procedure for enhanced hot oil immersion test for sheaths	23
C.1 Sampling and preparation of the test pieces	23
C.2 Determination of the cross-sectional area of the test piece	23
C.3 Oil to be used	23
C.4 Procedure	23
C.5 Expression of results	23
C.6 Requirements	24
Annex D (normative) Procedure for drilling fluid immersion test for sheaths	25
D.1 Drilling fluid resistance test	25
D.2 Test fluids	25
D.3 Procedure	25
D.4 Expression of results	25
D.5 Requirements	26
Figure A.1 – Testing surfaces of large radius of curvature	19
Figure A.2 – Testing surfaces of small radius of curvature	20

Table 1 – Categories and types of materials	6
Table 2 – Types of cross-linked insulating compounds.....	9
Table 3 – Electrical requirements of insulation compounds	10
Table 4 – Test requirements for cross-linked elastomeric insulating compounds	11
Table 5 – Types of cross-linked sheathing compound	13
Table 6 – Test requirements for cross-linked sheathing compounds.....	14
Table 7 – Types of thermoplastic sheathing compound	16
Table 8 – Test requirements for thermoplastic sheathing compounds.....	16
Table 9 – Test requirements for sheathing compounds with enhanced oil resistance properties	18
Table 10 – Test requirements for sheathing compounds with drilling fluids resistance properties (test for mud resistance).....	18

Currently in preview, click buy full version

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRICAL INSTALLATIONS IN SHIPS –**Part 360: Insulating and sheathing materials for shipboard and offshore units, power, control, instrumentation and telecommunication 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 itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, accept to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 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 60092-360 has been prepared by Subcommittee 18A: Electric cables for ships and mobile and fixed offshore units, of IEC Technical Committee 18: Electrical installations of ships and of mobile and fixed offshore units.

This second edition cancels and replaces the first edition published in 2014. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) updates of normative references;
- b) replacement of linear swelling with volume swelling;
- c) correction of a calculation mistake in Table 3;

- d) change in Table 4 and Table 6 (treatment conditions) of time under load (from 15 min to 10 min);
- e) addition of mechanical properties after aging in oil based test fluid in Table 10 (CAS number 64742-46-7; EC number: 934-956-3).

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

FDIS	Report on voting
18A/437/FDIS	18A/440/RVD

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

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

A list of all parts of the IEC 60092 series, published under the general title *Electrical installations in ships*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

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

ELECTRICAL INSTALLATIONS IN SHIPS –

Part 360: Insulating and sheathing materials for shipboard and offshore units, power, control, instrumentation and telecommunication cables

1 Scope

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

The different insulating and sheathing materials have been divided into three categories as listed in Table 1.

Table 1 – Categories and types of materials

Title	Compounds included
Cross-linked insulating compounds	EPR; HEPR; XLPE; S 95; S 90
Cross-linked sheathing compounds	SE; SH; SHF 2
Thermoplastic sheathing compounds	SHF 1; ST 2

2 Normative references

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

IEC 60092-350:2020, *Electrical installations in ships – Part 350: General construction and test methods of power, control and instrumentation cables for shipboard and offshore applications*

IEC 60684-2:2011, *Flexible insulating sleeving – Part 2: Methods of test*

IEC 60754-1, *Test on gases evolved during combustion of materials from cables – Part 1: Determination of the halogen acid gas content*

IEC 60754-2, *Test on gases evolved during combustion of materials from cables – Part 2: Determination of acidity (by pH measurement) and conductivity*

IEC 60811-201:2012, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 201: General tests – Measurement of insulation thickness*
IEC 60811-201:2012/AMD1:2017

IEC 60811-202:2012, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 202: General tests – Measurement of thickness of non-metallic sheath*
IEC 60811-202:2012/AMD1:2017

IEC 60811-401:2012, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 401: Miscellaneous tests – Thermal ageing methods – Ageing in an air oven*
IEC 60811-401:2012/AMD1:2017