

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

---

**Electrical installations in ships –  
Part 353: Power cables for rated voltages 1 kV and 3 kV**

**Installations électriques à bord des navires –  
Partie 353: Câbles d'énergie pour les tensions assignées 1 kV et 3 kV**





## THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2011 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.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de la CEI ou du Comité national de la CEI du pays du demandeur.

Si vous avez des questions sur le copyright de la CEI ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de la CEI de votre pays de résidence.

IEC Central Office  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland  
Email: [inmail@iec.ch](mailto:inmail@iec.ch)  
Web: [www.iec.ch](http://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.

- Catalogue of IEC publications: [www.iec.ch/searchpub](http://www.iec.ch/searchpub)

The IEC on-line Catalogue enables you to search by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, withdrawn and replaced publications.

- IEC Just Published: [www.iec.ch/online\\_news/justpub](http://www.iec.ch/online_news/justpub)

Stay up to date on all new IEC publications. Just Published details twice a month all new publications released. Available on-line and also by email.

- Electropedia: [www.electropedia.org](http://www.electropedia.org)

The world's leading online dictionary of electronic and electrical terms containing more than 20 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary online.

- Customer Service Centre: [www.iec.ch/webstore/custserv](http://www.iec.ch/webstore/custserv)

If you wish to give us your feedback on this publication or need further assistance, please visit the Customer Service Centre FAQ or contact us:

Email: [csc@iec.ch](mailto:csc@iec.ch)  
Tel.: +41 22 919 02 11  
Fax: +41 22 919 03 00

---

### A propos de la CEI

La Commission Electrotechnique Internationale (CEI) 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 CEI

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

- Catalogue des publications de la CEI: [www.iec.ch/searchpub/cur\\_fut-f.htm](http://www.iec.ch/searchpub/cur_fut-f.htm)

Le Catalogue en-ligne de la CEI vous permet d'effectuer des recherches en utilisant différents critères (numéro de référence, texte, comité d'études,...). Il donne aussi des informations sur les projets et les publications retirées ou remplacées.

- Just Published CEI: [www.iec.ch/online\\_news/justpub](http://www.iec.ch/online_news/justpub)

Restez informé sur les nouvelles publications de la CEI. Just Published détaille deux fois par mois les nouvelles publications parues. Disponible en-ligne et aussi par email.

- Electropedia: [www.electropedia.org](http://www.electropedia.org)

Le premier dictionnaire en ligne au monde de termes électroniques et électriques. Il contient plus de 20 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans les langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International en ligne.

- Service Clients: [www.iec.ch/webstore/custserv/custserv\\_entry-f.htm](http://www.iec.ch/webstore/custserv/custserv_entry-f.htm)

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions, visitez le FAQ du Service clients ou contactez-nous:

Email: [csc@iec.ch](mailto:csc@iec.ch)  
Tél.: +41 22 919 02 11  
Fax: +41 22 919 03 00



IEC 60092-353

Edition 3.0 2011-08

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

---

**Electrical installations in ships –  
Part 353: Power cables for rated voltages 1 kV and 3 kV**

**Installations électriques à bord des navires –  
Partie 353: Câbles d'énergie pour les tensions assignées 1 kV et 3 kV**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

PRICE CODE  
CODE PRIX

S

---

ICS 29.060.20; 47.020.60

ISBN 978-2-88912-639-2

## CONTENTS

FOREWORD.....	4
1 Scope and object.....	6
2 Normative references.....	6
3 Terms and definitions .....	7
4 General requirements .....	8
4.1 Rated voltage .....	8
4.2 Markings .....	8
4.2.1 Indication of origin and voltage identification .....	8
4.2.2 Continuity .....	8
4.2.3 Core identification.....	8
5 Constructional requirements .....	9
5.1 General description .....	9
5.1.1 Overview .....	9
5.1.2 Unarmoured cables (excluding 1,8/3 kV) .....	9
5.1.3 Armoured cables.....	9
5.2 Conductors.....	10
5.3 Insulation.....	10
5.3.1 Material .....	10
5.3.2 Application.....	10
5.3.3 Thickness of insulation .....	10
5.4 Cabling (including fillers & binders).....	11
5.5 Inner covering.....	11
5.5.1 General .....	11
5.5.2 Thickness of inner covering .....	11
5.6 Screen.....	12
5.6.1 Construction .....	12
5.6.2 Application.....	13
5.7 Inner sheath .....	13
5.7.1 Material .....	13
5.7.2 Application.....	13
5.7.3 Thickness of inner sheath .....	13
5.8 Braid armour .....	13
5.8.1 General .....	13
5.8.2 Braid wire diameter.....	14
5.8.3 Coverage density .....	14
5.8.4 Application of the armour .....	14
5.9 Outer sheath .....	14
5.9.1 Material .....	14
5.9.2 Application.....	14
5.9.3 Thickness of outer sheath.....	14
5.9.4 Colour of outer sheath .....	15
6 Tests – methods and requirements .....	15
Annex A (informative) Alternative enhanced insulation thickness for 0,6/1 kV.....	18
Annex B (informative) Identification of cores of multicore cables .....	19
Figure B.1 – Arrangement of the marks .....	19

Table 1 – Insulation thickness ..... 11

Table 2 – Thickness of extruded inner covering and fictitious diameters..... 12

Table 3 – Requirements of drain wire ..... 12

Table 4 – Tests applicable to all cables ..... 15

Table 5 – Additional tests required for halogen-free cables ..... 16

Table 6 – Additional test required for low smoke cables ..... 17

Table 7 – Additional tests required for fire resistant cables ..... 17

Table 8 – Additional tests required for specific performances..... 17

Table A.1 – Alternative enhanced insulation thickness for 0,6/1 kV ..... 18

Table B.1 – Dimensions of the marks ..... 20

# INTERNATIONAL ELECTROTECHNICAL COMMISSION

---

## ELECTRICAL INSTALLATIONS IN SHIPS –

### Part 353: Power cables for rated voltages 1 kV and 3 kV

#### 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, access 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 60092-353 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 third edition cancels and replaces the second edition published in 1995 and Amendment 1 (2001). This edition constitutes a technical revision.

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

- a) Rationalization of the number of insulating and sheathing materials. In particular polyvinyl chloride based insulation (PVC) and sheath (ST1) have been removed. PVC sheath ST2 is permitted even though it releases harmful fumes under fire conditions;
- b) Modification of construction requirements in line with IEC 60092-350;

- c) Requirements and test methods have been divided in several tables for clarification. Requirements for enhanced cold properties, oil resistance and resistance to drilling fluids have been aligned to IEC 60092-350;
- d) The new testing methods for fire resistant cables are referenced in the standard.

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

FDIS	Report on voting
18A/316A/FDIS	18A/319/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.

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

The committee has decided that the contents of this 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.

## ELECTRICAL INSTALLATIONS IN SHIPS –

### Part 353: Power cables for rated voltages 1 kV and 3 kV

#### 1 Scope and object

This part of the IEC 60092 series is applicable to shipboard and offshore non radial field power cables with extruded solid insulation, having a voltage rating of 0,6/1 (1,2) kV and 1,8/3 (3,6) kV intended for fixed installations.

Cables for use in circuits requiring resistance to fire are included.

The various types of power cables are given in 5.1. The constructional requirements and test methods shall comply with those indicated in IEC 60092-350, unless otherwise specified in this standard.

The object of this standard is:

- to standardize cables whose safety and reliability is ensured when they are installed in accordance with the requirements of IEC 60092-352 or IEC 61892-4;
- to lay down standard manufacturing requirements and characteristics of such cables directly or indirectly bearing on safety;
- to specify test methods for checking conformity with those requirements.

#### 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 60038:2009, *IEC standard voltages*

IEC 60050-461:2008, *International electrotechnical vocabulary – Part 461: Electric cables*

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

IEC 60092-351, *Electrical installations in ships – Part 351: Insulating materials for shipboard and offshore units, power, control, instrumentation, telecommunication and data cables*

IEC 60092-352, *Electrical installations in ships – Part 352: Choice and installation of electrical cables*

IEC 60092-359, *Electrical installations in ships – Part 359: Sheathing materials for shipboard power and telecommunication cables*

IEC 60228:2004, *Conductors of insulated cables*

IEC 60331-1:2009, *Tests for electric cables under fire conditions – Circuit integrity – Part 1: Test method for fire with shock at a temperature of at least 830 °C for cables of rated voltage up to and including 0,6/1,0 kV and with an overall diameter exceeding 20 mm*