

© Copyright SEK Svensk Elstandard. Reproduction in any form without permission is prohibited.

## Elinstallationer i fartyg – Del 354: En- och treledarkablar med extruderad isolering med märkspänning 6 kV ( $U_m = 7,2$ kV) till 30 kV ( $U_m = 36$ kV)

*Electrical installations in ships –*

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

Denna svenska standard innehåller den engelska texten i nedan angiven IEC-publikation, utarbetad inom International Electrotechnical Commission, IEC:

- **IEC 60092-354, Fourth edition, 2020 - Electrical installations in ships - Part 354: Single- and three-core power cables with extruded solid insulation for rated voltages 6 kV ( $U_m = 7,2$  kV) up to 30 kV ( $U_m = 36$  kV)**

### Nationellt förord

Tidigare fastställd svensk standard SS-IEC 60092-354, utgåva 1, 2017, gäller ej fr o m 2021-12-15.

### *Standarder underlättar utvecklingen och höjer elsäkerheten*

Det finns många fördelar med att ha gemensamma tekniska regler för bl a mätning, säkerhet och provning och för utförande, skötsel och dokumentation av elprodukter och elanläggningar.

Genom att utforma sådana standarder blir säkerhetsfordringar tydliga och utvecklingskostnaderna rimliga samtidigt som marknadens acceptans för produkten eller tjänsten ökar.

Många standarder inom elområdet beskriver tekniska lösningar och metoder som åstadkommer den elsäkerhet som föreskrivs av svenska myndigheter och av EU.

### *SEK är Sveriges röst i standardiseringsarbetet inom elområdet*

SEK Svensk Elstandard svarar för standardiseringen inom elområdet i Sverige och samordnar svensk medverkan i internationell och europeisk standardisering. SEK är en ideell organisation med frivilligt deltagande från svenska myndigheter, företag och organisationer som vill medverka till och påverka utformningen av tekniska regler inom elektrotekniken.

SEK samordnar svenska intressenters medverkan i SEKs tekniska kommittéer och stödjer svenska experters medverkan i internationella och europeiska projekt.

### *Stora delar av arbetet sker internationellt*

Utformningen av standarder sker i allt väsentligt i internationellt och europeiskt samarbete. SEK är svensk nationalkommitté av International Electrotechnical Commission (IEC) och Comité Européen de Normalisation Electrotechnique (CENELEC).

Standardiseringsarbetet inom SEK är organiserat i referensgrupper bestående av ett antal tekniska kommittéer som speglar hur arbetet inom IEC och CENELEC är organiserat.

Arbetet i de tekniska kommittéerna är öppet för alla svenska organisationer, företag, institutioner, myndigheter och statliga verk. Den årliga avgiften för deltagandet och intäkter från försäljning finansierar SEKs standardiseringsverksamhet och medlemsavgift till IEC och CENELEC.

### *Var med och påverka!*

Den som deltar i SEKs tekniska kommittéarbete har möjlighet att påverka framtida standarder och får tidig tillgång till information och dokumentation om utvecklingen inom sitt teknikområde. Arbetet och kontakterna med kollegor, kunder och konkurrenter kan gynnsamt påverka enskilda företags affärsutveckling och bidrar till deltagarnas egen kompetensutveckling.

Du som vill dra nytta av dessa möjligheter är välkommen att kontakta SEKs kansli för mer information.

### **SEK Svensk Elstandard**

Box 1284  
164 29 Kista  
Tel 08-444 14 00  
[www.elstandard.se](http://www.elstandard.se)

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

---

**Electrical installations in ships –**

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

**Installations électriques à bord des navires –**

**Partie 354: Câbles d'énergie unipolaires et tripolaires à isolement massif extrudé pour des tensions assignées allant de 6 kV ( $U_m = 7,2$  kV) jusqu'à 30 kV ( $U_m = 36$  kV)**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

---

ICS 29.060.20; 47.020.60

ISBN 978-2-8322-7840-6

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

**Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

## CONTENTS

FOREWORD.....	4
1 Scope.....	6
2 Normative references .....	6
3 Terms and definitions .....	7
4 General requirements .....	7
4.1 Rated voltage .....	7
4.2 Markings.....	8
4.2.1 Indication of origin and voltage identification .....	8
4.2.2 Continuity of marking.....	8
4.2.3 Core identification for three-cores.....	8
5 Constructional requirements .....	8
5.1 General cable description .....	8
5.1.1 Overview .....	8
5.1.2 Armoured single-sheathed cable with outer sheath only.....	8
5.1.3 Armoured double-sheathed cable with inner and outer sheath .....	8
5.1.4 Armoured single-sheathed cable with inner sheath only.....	9
5.1.5 Unarmoured single-sheathed cable.....	9
5.2 Conductors .....	9
5.3 Insulation .....	9
5.3.1 Material .....	9
5.3.2 Application.....	10
5.3.3 Thickness of insulation .....	10
5.4 Screening of cores.....	10
5.4.1 General .....	10
5.4.2 Conductor screening.....	10
5.4.3 Insulation screening.....	10
5.5 Metallic screen.....	11
5.5.1 Construction .....	11
5.5.2 Requirements .....	11
5.6 Assembly of three-core cables, inner coverings and fillers .....	11
5.7 Inner covering.....	11
5.7.1 General .....	11
5.7.2 Thickness of inner covering .....	11
5.8 Inner sheath.....	12
5.8.1 Material .....	12
5.8.2 Application.....	12
5.8.3 Thickness of inner sheath.....	12
5.9 Braid armour .....	12
5.9.1 General .....	12
5.9.2 Braid wire armour .....	13
5.9.3 Braid wire diameter.....	13
5.10 Outer sheath.....	13
5.10.1 Material .....	13
5.10.2 Application.....	13
5.10.3 Thickness of outer sheath.....	13
5.10.4 Colour of outer sheath .....	14

6 Tests – Methods and requirements .....	14
Annex A (normative) Electrical tests after installation .....	17
Bibliography .....	18
Table 1 – Insulation thickness .....	10
Table 2 – Thickness of extruded inner covering for calculation of fictitious diameters .....	12
Table 3 – Tests applicable to all cables .....	14
Table 4 – Additional tests for halogen-free cables .....	15
Table 5 – Additional test for low smoke cables .....	16
Table 6 – Additional tests when required .....	16

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTRICAL INSTALLATIONS IN SHIPS –****Part 354: Single- and three-core power cables  
with extruded solid insulation for rated voltages  
6 kV ( $U_m = 7,2$  kV) up to 30 kV ( $U_m = 36$  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 60092-354 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 fourth edition cancels and replaces the third 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) Editorial adaptations have been made.

The text of this International Standard is based on the following documents:

CDV	Report on voting
18A/419/CDV	18A/424/RVC

Full information on the voting for the approval of this document 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.

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

## 1 Scope

This part of IEC 60092 is applicable to shipboard and offshore power cables with extruded solid insulation, conductor and core screening, having a voltage rating of one of the following: 3,6/6 (7,2) kV, 6/10 (12) kV, 8,7/15 (17,5) kV, 12/20 (24) kV, 18/30 (36) kV.

NOTE 1 Subclause 4.1 gives more details.

The cables are intended for fixed installations.

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

The object of this document 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.

NOTE 2 Only radial field cables are covered.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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, *IEC standard voltages*

IEC 60228, *Conductors of insulated 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*<sup>1</sup>

IEC 60092-360, *Electrical installations in ships – Part 360: Insulating and sheathing materials for shipboard and offshore units, power, control, instrumentation and telecommunication cables*

---

<sup>1</sup> Under preparation. Stage at the time of publication: IEC/BPUB 60092-350:2019.



IEC 60332-1-2, *Tests on electric and optical fibre cables under fire conditions – Part 1-2: Test for vertical flame propagation for a single insulated wire or cable – Procedure for 1 kW pre-mixed flame*

IEC 60332-3-22, *Tests on electric cables under fire conditions – Part 3-22: Test for vertical flame spread of vertically-mounted bunched wires or cables – Category A*

IEC 60684-2, *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 60885-2, *Electrical test methods for electric cables. Part 2: Partial discharge tests*

IEC 61034-1, *Measurement of smoke density of cables burning under defined conditions – Part 1: Test apparatus*

IEC 61034-2, *Measurement of smoke density of cables burning under defined conditions – Part 2: Test procedure and requirements*