

INTERNATIONAL STANDARD

Electrical installations in ships –
Part 376: Cables for control and instrumentation circuits 150/250 V (300 V)
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRICAL INSTALLATIONS IN SHIPS –**Part 376: Cables for control and instrumentation
circuits 150/250 V (300 V)**

FOREWORD

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International Standard IEC 60092-376 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 of IEC 60092-376 cancels and replaces the second edition published in 2003, of which it constitutes a technical revision.

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

- a) new structure in line with IEC 60092-353 and IEC 60092-354;
- b) requirements and test methods have been divided in several tables for clarification (enhanced cold properties, oil resistance or resistance to drilling fluids) and have been aligned to IEC 60092-350;

c) the new testing methods for fire resistant cables are referenced in this document.

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

FDIS	Report on voting
18A/404/FDIS	18A/409/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 in 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- withdrawn,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.

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ELECTRICAL INSTALLATIONS IN SHIPS –

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

1 Scope and object

This part of IEC 60092 is applicable to screened and unscreened cables for control and instrumentation circuits on ships and offshore units. The cables have extruded solid insulation with a voltage rating of 150/250V (300V) (see Clause 4) and are intended for fixed installations.

The various types of cables are given in Clause 5. 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 standardise cables whose safety and reliability are ensured when they are installed in accordance with the requirements of IEC 60092-352,
- to lay down standard manufacturing requirements and characteristics of such cables directly or indirectly bearing on safety, and
- to specify test methods for checking conformity with those requirements.

2 Normative references

[IEC 60092-376:2017](https://standards.iteh.ai/catalog/standards/sist/4a02a090-183e-47f7-a9fa-bcbe6af53bb4/iec-60092-376-2017)

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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 60050-461, *International Electrotechnical Vocabulary – Part 461: Electric cables*

IEC 60092-350:2014, *Electrical installations in ships – Part 350: General construction and test methods of power, control and instrumentation cables for shipboard and offshore applications*

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

IEC 60092-360:2014, *Electrical installations in ships – Part 360: Insulating and sheathing materials for shipboard and offshore units, power, control, instrumentation and telecommunication cables*

IEC 60331-1, *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*

IEC 60331-2, *Tests for electric cables under fire conditions – Circuit integrity – Part 2: 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 not exceeding 20 mm*

IEC 60331-21, *Tests for electric cables under fire conditions – Circuit integrity – Part 21: Procedures and requirements – Cables of rated voltage up to and including 0,6/1,0 kV*

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 60445, *Basic and safety principles for man-machine interface, marking and identification – Identification of equipment terminals, conductor terminations and conductors*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60092-350 and IEC 60050-461 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

4 General requirements

4.1 Rated voltage

The standard method of designating the rated voltages of cables covered by this document shall take the form $U_o/U (U_m)$,

where

- U_o is the rated power-frequency voltage between phase conductor and earth or metallic screen, for which the cable is designed;
- U is the rated power-frequency voltage between phase conductors for which the cable is designed;
- U_m is the maximum value of the "highest system voltage" for which the equipment (including cable) may be used (see IEC 60038).

All voltages are given as RMS values.

The standard rated voltages $U_o/U (U_m)$ of the cables considered in this document are:

$$U_o/U (U_m) = 150 \text{ V}/250 \text{ V (300 V) AC}$$

For 150/250 (300) V cables, DC voltage up to a maximum of 1,5 times the AC voltage may be used provided that the voltage to earth does not exceed 250 V.

NOTE When circuits are to be supplied from a low impedance source, attention is drawn to IEC 60092-353 for 600/1000 V cables having a minimum conductor size of 1,5 mm².

4.2 Markings

4.2.1 Indication of origin and voltage identification

Cables shall comply with 4.1.3 of IEC 60092-350:2014 with respect to:

- indication of origin;
- rated voltage and cable construction (number of cores and cross sectional area of the construction);
- continuity of marking;
- durability/legibility.

4.2.2 Continuity of marking

The marking is deemed to be continuous if the distance between the end of any marking and the beginning of the next does not exceed

- 550 mm if the marking is on the outer surface of the cable, and
- 275 mm in all other cases.

4.2.3 Core identification (standards.iteh.ai)

4.2.3.1 General

Cable cores shall be clearly identified by either colours or numbers.

4.2.3.2 Coloured cores

The core colours shall be in accordance with IEC 60445.

NOTE Annex A gives details of preferred colour code.

4.2.3.3 Numbered cores – multicore cables

Identification should be made by inscription of numbers on each core starting from the centre beginning with 1 in accordance with Annex B.

4.2.3.4 Unit identification

When requested by the purchaser, identification of the individual units of multiunit cables is permitted by the use of tape(s) marked with numbers.

5 Constructional requirements

5.1 General description

5.1.1 Overview

Shipboard and offshore cables for fixed installations shall be single or multicore cables generally constructed as follows.

5.1.2 Unarmoured single- or double-sheathed cable

- copper conductor, see 5.2;
- insulation, see 5.3;
- cabling (for multicore cables), see 5.4;
- inner covering (optional, but mandatory when a braided electrostatic screening is applied over the core lay-up), see 5.5;
- electrostatic screening (optional), see 5.6;
- inner sheath (optional), see 5.7;
- outer sheath applied as either one or two layer systems, see 5.9.

5.1.3 Armoured single-sheathed cable with outer sheath only

- copper conductor, see 5.2;
- insulation, see 5.3;
- cabling (for multicore cables), see 5.4;
- inner covering below electrostatic screening (optional, but mandatory when a braided electrostatic screening is applied over the core lay-up), see 5.5;
- electrostatic screening (optional), see 5.6;
- inner covering (optional, but mandatory in case of a braid armour of galvanised steel wires in which case the inner covering shall be extruded), see 5.5;
- braid armour, see 5.8;
- outer sheath applied as either one or two layer systems, see 5.9.

5.1.4 Armoured double-sheathed cable with inner and outer sheath only

- copper conductor, see 5.2;
- insulation, see 5.3;
- cabling (for multicore cables), see 5.4;
- inner covering (optional, but mandatory when a braided electrostatic screening is applied over the core lay-up), see 5.5;
- electrostatic screening (optional), see 5.6;
- inner sheath, see 5.7;
- braid armour, see 5.8;
- outer sheath applied as either one or two layer systems, see 5.9.

5.1.5 Armoured single-sheathed cable with inner sheath only

- copper conductor, see 5.2;
- insulation, see 5.3;
- cabling (for multicore cables), see 5.4;
- inner covering (optional, but mandatory when a braided electrostatic screening is applied over the core lay-up), see 5.5;
- electrostatic screening (optional), see 5.6;
- inner sheath, see 5.7;
- braid armour, see 5.8.

Cables for installation in spaces where corrosion can occur, for example weather decks, wet locations, battery compartments, refrigeration rooms, should have an outer sheath over the braid, unless the braid itself is corrosion-resistant.