INTERNATIONAL STANDARD

IEC 60092-352

Third edition
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Electrical installations in ships –

Part 352:
Choice and installation of electrical cables

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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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.
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International Standard IEC 60092-352 has been prepared by subcommittee 18A: Cables and cable installations, of IEC technical committee TC 18: Electrical installations of ships and of mobile and fixed offshore units.

This third edition cancels and replaces the second edition published in 1997, of which it constitutes a technical revision. Main changes with respect to the second edition relate to:

– sizes of earth continuity conductors and equipment earthing connections;
– bending radii for cables rated at 3,6/6,0 (7,2) kV and above;
– current carrying capacities in amperes at core temperatures of 70 °C and 90 °C;
– tabulated current carrying capacities – defined installations.

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

FDIS	Report on voting
18A/277/FDIS	18A/280/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 electric cables

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 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

The committee has decided that the contents of this publication will remain unchanged until the maintenance result 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.

A bilingual version of this publication 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 or 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 owners and builders of ships and fixed or mobile and offshore units and other appropriate organisations.

This revision of IEC 60092-352 has been prepared by Maintenance Team 1 of IEC SC 18A, to update and include developments identified in other parts of the 60092 series of standards applicable to electric cables for electrical installations in ships, viz:

– the increase in maximum rated conductor temperature during normal operation for EPR, XLPE type insulations – see IEC 60092-351 – and the effect on current carrying capacities;

– the publication of IEC 60092-376 covering cables for control and instrumentation 150/250V(300V);

– changes in test methods to demonstrate the capability of cables to continue to operate in fire conditions and to limit the spread of flame;

– the inclusion of a method for the determination of current carrying capacities based upon those that have been accepted and established in other applications of cable use. This method has been derived from a technical basis and allows a greater choice of use in different installation methods as opposed to that currently specified, which was established from experimental data on a limited number of cables and installation information. The existing ratings are included as informative annexes A and B, and their use is valid under certain conditions, e.g. refurbishment of ships;

– the inclusion of a method for the determination of the cross-sectional areas of earthing conductors based on the current carrying capacities of the fuse or circuit protection device installed to protect the circuit.

NOTE Guidance for the use and installation of cables for offshore applications is being prepared jointly by SC18A, MT 2 and TC 18, MT 18, and will be issued by TC 18, MT 18.

ELECTRICAL INSTALLATIONS IN SHIPS –

Part 352: Choice and installation of electrical cables

1 Scope

This standard provides the basic requirements for the choice and installation of cables intended for fixed electrical systems on board ships at voltages (*U*) up to and including 15 kV.

The reference to fixed systems includes those that are subjected to vibration (due to the movement of the ship) or movement (due to motion of the ship) and not to those that are intended for frequent flexing. Cables suitable for frequent or continual flexing use are detailed in other IEC specifications e.g. IEC 60227 and IEC 60245, and their uses on board ship is restricted to those situations which do not directly involve exposure to a marine environment e.g. portable tools or domestic appliances.

The following types and applications of cables are not included:

– optical fibre cables;
– sub-sea and umbilical cables;
– data, telecommunication and radio frequency cables;
– the choice and installation of cables for use on offshore units.

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 60092-101, *Electrical installations in ships – Part 101: Definitions and general requirements*

IEC 60092-201:1994, *Electrical installations in ships – Part 201: System design – General*

IEC 60092-203, *Electrical installations in ships – Part 203: System design – Acoustic and optical signals*

IEC 60092-350:2001, *Electrical installations in ships – Part 350: Shipboard power cables – General construction and test requirements*

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

IEC 60092-353:1995, *Electrical installations in ships – Part 353: Single and multicore non-radial field power cables with extruded solid insulation for rated voltages 1 kV and 3 kV*
Amendment 1 (2001)

IEC 60092-354, *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)*

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

IEC 60092-376, *Electrical installations in ships – Part 376: Cables for control and instrumentation circuits 150/250 V (300 V)*

IEC 60228:2004, *Conductors of insulated cables*

IEC 60287 (all parts), *Electric cables – Calculation of the current rating*

IEC 60331-21:1999, *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 60331-31:2002, *Tests for electric cables under fire conditions – Circuit integrity – Part 31: Procedures and requirements for fire with shock – Cables of rated voltage up to and including 0,6/1,0 kV*

IEC 60332-1-2:2004, *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 60332-3-22:2000, *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 60533:1999, *Electrical and electronic installations in ships – Electromagnetic compatibility.*

IEC 60684-2:2003, *Flexible insulating sleeving – Part 2: Methods of test*
Amendment 1 (2003)

IEC 60702-1:2002, *Mineral insulated cables and their terminations with a rated voltage not exceeding 750V*

IEC 60702-2:2002, *Mineral insulated cables and their terminations with a rated voltage not exceeding 750 V – Terminations*

IEC 60754-1:1994, *Test on gases evolved during combustion of materials from cables – Determination of the amount of halogen acid gas.*

IEC 60754-2:1991 *Test on gases evolved during combustion of electric cables – Determination of degree of acidity of gases evolved during the combustion of materials taken from electric cables by measuring pH and conductivity*
Amendment 1 (1997)

IEC 61034-2:2005 *Measurement of smoke density of cables burning under defined conditions – Test procedure and requirements.*