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Electrical installations in ships -
Part 352: Selection, installation, and operating conditions of cables

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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Electrical installations in ships - Part 352: Selection, installation, and operating conditions of 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.
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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 60092-352:2005. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

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

This fourth edition cancels and replaces the third edition published in 2005. This edition constitutes a technical revision.

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

a) modification of the part title;
b) complete review of the document and establishment of the match with all other standards from the group IEC 60092-350 to IEC 60092-379;
c) addition of terms and definitions;
d) addition of technical requirements for the installation of symmetrical category cables with transmission characteristics up to 1 000 MHz;
e) addition of the technical requirements for the installation of fibre optic cables;
f) addition of technical requirements for the installation of cables for installation between areas with and without explosive atmospheres;
g) addition of technical requirements for Special safety requirements from SOLAS regulations.

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

Draft	Report on voting
18A/505/FDIS	18A/508/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 60095, 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 webstore.iec.ch in the data related to the specific document. At this date, the document will be

– reconfirmed,
– withdrawn, or
– revised.

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~~ can be prepared;

– 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~~ 2 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.

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.~~

This part of IEC 60092 provides the basic requirements for the selection, installation and operating conditions of electrical cables intended for fixed electrical systems on board ships at voltages (U) up to and including U_m 18/30 (36) kV, symmetrical category cables and fibre optic cables.

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.~~

Cables subject to frequent or continual flexing use, which can withstand the mechanical stress and the environment they are exposed to, are detailed in other IEC specifications such as IEC 60227 and IEC 60245. Flexible cables are frequently used for retractable thrusters, elevators, moving decks, cranes, shore connections and other moving applications on board ships.

The following cable types and applications are not included:

~~– optical fibre cables;~~

– sub-sea and umbilical cables;

– ~~data,~~ telecommunication and radio frequency cables;

– selection and installation of cables for use on offshore ~~units~~ platforms.

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 60079 series, *Explosive atmospheres*

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 60092-302-2, *Electrical installations in ships - Part 302-2: Low voltage switchgear and controlgear assemblies - Marine power*

IEC 60092-350:~~2001~~2020, *Electrical installations in ships - Part 350: ~~Shipboard power cables – General construction and test requirements~~ 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 60092-353:~~1995~~2024, *Electrical installations in ships - Part 353: ~~Single and multicore non-radial field power cables with extruded solid insulation~~ Power cables 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 60092-360, *Electrical installations in ships - Part 360: Insulating and sheathing materials for shipboard and offshore units, power, control, instrumentation and telecommunication cables*

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

IEC 60092-378, *Electrical installations in ships - Part 378: Optical fiber cables*

IEC 60092-379:2024, *Electrical installations in ships - Part 379: Symmetrical category cables with transmission characteristics up to 1 000 MHz*

IEC 60092-401, *Electrical installations in ships - Part 401: Installation and test of completed installation*

IEC 60228~~:2004~~, *Conductors of insulated cables*

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

IEC 60331-1:2018, *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 60331-2:2018, *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 60331-21:1999, *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~~2025, *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 and optical fibre cables under fire conditions - Part 3-22: Test for vertical flame spread of vertically-mounted bunched wires or cables - Category A*

IEC 60332-3-24, *Tests on electric and optical fibre cables under fire conditions - Part 3-24: Test for vertical flame spread of vertically-mounted bunched wires or cables - Category C*

IEC 60332-3-25, *Tests on electric and optical fibre cables under fire conditions - Part 3-25: Test for vertical flame spread of vertically-mounted bunched wires or cables - Category D*

IEC 60533~~:1999~~, *Electrical and electronic installations in ships - Electromagnetic compatibility (EMC)*

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 - Part 1: Determination of the ~~amount of~~ halogen acid gas content*

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

IEC 61034-2:2005+AMD1:2013+AMD2:2019, *Measurement of smoke density of cables burning under defined conditions - Part 2: Test procedure and requirements*

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FOREWORD

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9) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at https://patents.iec.ch. IEC shall not be held responsible for identifying any or all such patent rights.

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

This fourth edition cancels and replaces the third edition published in 2005. This edition constitutes a technical revision.

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

a) modification of the part title;
b) complete review of the document and establishment of the match with all other standards from the group IEC 60092-350 to IEC 60092-379;
c) addition of terms and definitions;

d) addition of technical requirements for the installation of symmetrical category cables with transmission characteristics up to 1 000 MHz;

e) addition of the technical requirements for the installation of fibre optic cables;

f) addition of technical requirements for the installation of cables for installation between areas with and without explosive atmospheres;

g) addition of technical requirements for Special safety requirements from SOLAS regulations.

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

Draft	Report on voting
18A/505/FDIS	18A/508/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 60095, 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 webstore.iec.ch in the data related to the specific document. At this date, the document will be

– reconfirmed,

– withdrawn, or

– revised.

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 can be prepared;

– 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 2 of IEC SC 18A, to update and include developments identified in other parts of the 60092 series of standards applicable to cables for installations in ships.

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.

1 Scope

This part of IEC 60092 provides the basic requirements for the selection, installation and operating conditions of electrical cables intended for fixed electrical systems on board ships at voltages (U) up to and including U_{m} 18/30 (36) kV, symmetrical category cables and fibre optic cables.

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 subject to frequent or continual flexing use, which can withstand the mechanical stress and the environment they are exposed to, are detailed in other IEC specifications such as IEC 60227 and IEC 60245. Flexible cables are frequently used for retractable thrusters, elevators, moving decks, cranes, shore connections and other moving applications on board ships.

The following cable types and applications are not included:

– sub-sea and umbilical cables;
– telecommunication and radio frequency cables;
– selection and installation of cables for use on offshore platforms.

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 60079 series, *Explosive atmospheres*

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

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

IEC 60092-302-2, *Electrical installations in ships - Part 302-2: Low voltage switchgear and controlgear assemblies - Marine power*

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 60092-353:2024, *Electrical installations in ships - Part 353: Power cables for rated voltages 1 kV and 3 kV*

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

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

IEC 60092-378, *Electrical installations in ships - Part 378: Optical fiber cables*

IEC 60092-379:2024, *Electrical installations in ships - Part 379: Symmetrical category cables with transmission characteristics up to 1 000 MHz*

IEC 60092-401, *Electrical installations in ships - Part 401: Installation and test of completed installation*

IEC 60228, *Conductors of insulated cables*

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

IEC 60331-1:2018, *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 60331-2:2018, *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 60332-1-2:2025, *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 and optical fibre cables under fire conditions - Part 3-22: Test for vertical flame spread of vertically-mounted bunched wires or cables - Category A*

IEC 60332-3-24, *Tests on electric and optical fibre cables under fire conditions - Part 3-24: Test for vertical flame spread of vertically-mounted bunched wires or cables - Category C*

IEC 60332-3-25, *Tests on electric and optical fibre cables under fire conditions - Part 3-25: Test for vertical flame spread of vertically-mounted bunched wires or cables - Category D*

IEC 60533, *Electrical and electronic installations in ships - Electromagnetic compatibility (EMC)*

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 61034-2:2005+AMD1:2013+AMD2:2019, *Measurement of smoke density of cables burning under defined conditions - Part 2: Test procedure and requirements*