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INTERNATIONAL STANDARD

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

INTERNATIONAL
ELECTROTECHNICAL
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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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.
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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

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 fourth edition cancels and replaces the third edition published in 2011. This edition constitutes a technical revision.

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

a) updated references to IEC 60092-350 for general construction and test methods and IEC 60092-360 for insulating and sheathing materials.

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

FDIS	Report on voting
18A/399/FDIS	18A/400/RVD

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 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 website under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
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- replaced by a revised edition, or
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ELECTRICAL INSTALLATIONS IN SHIPS –

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

1 Scope and object

This part of IEC 60092 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~~ or 1,8/3 (3,6) kV intended for fixed installations.

Cables ~~for use in circuits requiring resistance to~~ designed to maintain circuit integrity during fire are included.

The various types of power cables are given in 5.1. The constructional requirements and test methods ~~shall comply~~ 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, and

– to specify test methods for checking conformity with those requirements.

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 60038:2009, *IEC standard voltages*~~

IEC 60050-461~~:2008~~, *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 60092-351, *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 60092-360, *Electrical installations in ships – Part 360: Insulating and sheathing materials for shipboard and offshore units, power, control, instrumentation 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*

IEC 60331-2~~:2009~~, *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 60331-11:1999, *Tests for electric cables under fire conditions – Circuit integrity – Part 11: Apparatus – Fire alone at a flame temperature of at least 750 °C*~~
~~Amendment 1 (2009)[1]~~

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 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 and optical fibre cables under fire conditions – Part 3-22: Test for vertical flame spread of vertically-mounted bunched wires or cables – Category A*
~~Amendment 1 (2008)[2]~~

IEC 60445~~:2010~~, *Basic and safety principles for man-machine interface, marking and identification – Identification of equipment terminals, conductor terminations and conductors*

IEC 60684-2~~:1997~~, *Flexible insulating sleeving – Part 2: Methods of test*
~~Amendment 1 (2003)[3]~~

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 pH~~ acidity (by pH measurement) and conductivity*
~~Amendment 1 (1997)~~

~~IEC 61034-1:2005, *Measurement of smoke density of cables burning under defined conditions – Part 1: Test apparatus*~~

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

~~IEC 61892-4, *Mobile and fixed offshore units – Electrical installations – Part 4: Cables*~~

~~1 There exists a consolidated edition (1.1) which includes IEC 60331-11:1999 and its amendment 1.~~

~~2 There exists a consolidated edition (1.1) which includes IEC 60332-3-22:2000 and its amendment 1.~~

~~3 There exists a consolidated edition (2.1) which includes IEC 60684-2:1997 and its amendment 1 and its corrigendum.~~

IEC 60092-353

Edition 4.0 2016-09

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

IEC 60092-353:2016-09(en-fr)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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ELECTRICAL INSTALLATIONS IN SHIPS –

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

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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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ELECTRICAL INSTALLATIONS IN SHIPS –

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

1 Scope and object

This part of IEC 60092 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 or 1,8/3 (3,6) kV intended for fixed installations.

Cables designed to maintain circuit integrity during fire are included.

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, and

– to specify test methods for checking conformity with those requirements.

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

IEC 60228, *Conductors of insulated 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 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 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*

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COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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INSTALLATIONS ÉLECTRIQUES À BORD DES NAVIRES –

Partie 353: Câbles d'énergie pour les tensions assignées 1 kV et 3 kV

AVANT-PROPOS

1) La Commission Électrotechnique Internationale (IEC) est une organisation mondiale de normalisation composée de l'ensemble des comités électrotechniques nationaux (Comités nationaux de l'IEC). L'IEC a pour objet de favoriser la coopération internationale pour toutes les questions de normalisation dans les domaines de l'électricité et de l'électronique. À cet effet, l'IEC – entre autres activités – publie des Normes internationales, des Spécifications techniques, des Rapports techniques, des Spécifications accessibles au public (PAS) et des Guides (ci-après dénommés "Publication(s) de l'IEC"). Leur élaboration est confiée à des comités d'études, aux travaux desquels tout Comité national intéressé par le sujet traité peut participer. Les organisations internationales, gouvernementales et non gouvernementales, en liaison avec l'IEC, participent également aux travaux. L'IEC collabore étroitement avec l'Organisation Internationale de Normalisation (ISO), selon des conditions fixées par accord entre les deux organisations.
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La Norme internationale IEC 60092-353 a été établie par le sous-comité 18A: Câbles électriques pour navires et unités mobiles et fixes en mer, du comité d'études 18 de l'IEC: Installations électriques des navires et des unités mobiles et fixes en mer.

Cette quatrième édition annule et remplace la troisième édition parue en 2011. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

a) mise à jour des références à l'IEC 60092-350 pour la construction générale et les méthodes d'essai et à l'IEC 60092-360 pour les matériaux d'isolation et de gainage.

Le texte de ce document est issu des documents suivants:

FDIS	Rapport de vote
18A/399/FDIS	18A/400/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette norme.

Cette publication a été rédigée selon les Directives ISO/IEC, Partie 2.

Une liste de toutes les parties de la série IEC 60092, publiées sous le titre général *Installations électriques à bord des navires*, peut être consultée sur le site web de l'IEC.

Le comité a décidé que le contenu de cette publication ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous "http://webstore.iec.ch" dans les données relatives à la publication recherchée. À cette date, la publication sera

- reconduite,
- supprimée,
- remplacée par une édition révisée, ou
- amendée.

INSTALLATIONS ÉLECTRIQUES À BORD DES NAVIRES –

Partie 353: Câbles d'énergie pour les tensions assignées 1 kV et 3 kV

1 Domaine d'application et objet

La présente partie de l'IEC 60092 est applicable aux câbles pour installations à bord des navires et en mer, à champ non radial, à isolement massif extrudé et avec une tension assignée de 0,6/1 (1,2) kV ou de 1,8/3 (3,6) kV destinés aux installations fixes.

Les câbles conçus pour assurer l'intégrité des circuits au cours d'un incendie sont inclus.

Les différents types de câbles d'énergie sont indiqués en 5.1. Leurs exigences de fabrication et leurs méthodes d'essai sont conformes à celles qui sont indiquées dans l'IEC 60092-350 sauf spécification contraire dans le présent document.

L'objet du présent document est

– de normaliser des câbles qui soient sûrs et fiables lorsqu'ils sont installés conformément aux exigences de l'IEC 60092-352 ou de l'IEC 61892-4,

– d'établir les caractéristiques pour de tels câbles et les exigences normalisées relatives à leur fabrication se référant directement ou indirectement à la sécurité, et

– de préciser les méthodes d'essai pour vérifier la conformité à ces exigences.

2 Références normatives

Les documents ci-après, dans leur intégralité ou non, sont des références normatives indispensables à l'application du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 60050-461, *Vocabulaire Électrotechnique International – Partie 461: Câbles électriques*

IEC 60092-350:2014, *Installations électriques à bord des navires – Partie 350: Construction générale et méthodes d'essai des câbles d'énergie, de commande et d'instrumentation des navires et des unités mobiles et fixes en mer*

IEC 60092-360, *Installations électriques à bord des navires – Partie 360: Matériaux d'isolation et de gainage des câbles d'alimentation, de commande, d'instrumentation et de télécommunication installés à bord des navires et des unités en mer*

IEC 60228, *Âmes des câbles isolés*

IEC 60331-1, *Essais pour câbles électriques soumis au feu – Intégrité des circuits – Partie 1: Méthode d'essai au feu avec chocs pour les câbles de tension assignée au plus égale à 0,6/1,0 kV et de diamètre externe supérieur à 20 mm, à une température d'au moins 830 °C*

IEC 60331-2, *Essais pour câbles électriques soumis au feu – Intégrité des circuits – Partie 2: Méthode d'essai au feu avec chocs pour les câbles de tension assignée au plus égale à 0,6/1,0 kV et de diamètre externe inférieur ou égal à 20 mm, à une température d'au moins 830 °C*

IEC 60331-21, *Essais de câbles électriques soumis au feu – Intégrité des circuits – Partie 21: Procédures et prescriptions – Câbles de tension assignée jusque et y compris 0,6/1,0 kV*

IEC 60332-1-2, *Essais des câbles électriques et à fibres optiques soumis au feu – Partie 1-2: Essai de propagation verticale de la flamme sur conducteur ou câble isolé – Procédure pour flamme à prémélange de 1 kW*

IEC 60332-3-22, *Essais des câbles électriques et des câbles à fibres optiques soumis au feu – Partie 3-22: Essai de propagation verticale de la flamme des fils ou câbles montés en nappes en position verticale – Catégorie A*

IEC 60445, *Principes fondamentaux et de sécurité pour les interfaces homme-machines, le marquage et l'identification – Identification des bornes de matériels, des extrémités de conducteurs et des conducteurs*

IEC 60684-2, *Gaines isolantes souples – Partie 2: Méthodes d'essai*

IEC 60754-1, *Essai sur les gaz émis lors de la combustion des matériaux prélevés sur câbles – Partie 1: Détermination de la quantité de gaz acide halogéné*

IEC 60754-2, *Essai sur les gaz émis lors de la combustion des matériaux prélevés sur câbles – Partie 2: Détermination de la conductivité et de l'acidité (par mesure du pH)*

IEC 61034-2, *Mesure de la densité de fumées dégagées par des câbles brûlant dans des conditions définies – Partie 2: Procédure d'essai et exigences*