INTERNATIONAL STANDARD

IEC 60092-506

Second edition
2003-06

Electrical installations in ships –

Part 506: Special features – Ships carrying specific dangerous goods and materials hazardous only in bulk

Installations électriques à bord des navires –

Partie 506: Caractéristiques spéciales – Navires transportant des matières ou des marchandises spécifiques dangereuses, seulement en vrac

Reference number
IEC 60092-506:2003(E)

Publication numbering

As from 1 January 1997 all IEC publications are issued with a designation in the 60000 series. For example, IEC 34-1 is now referred to as IEC 60034-1.

Consolidated editions

The IEC is now publishing consolidated versions of its publications. For example, edition numbers 1.0, 1.1 and 1.2 refer, respectively, to the base publication, the base publication incorporating amendment 1 and the base publication incorporating amendments 1 and 2.

Further information on IEC publications

The technical content of IEC publications is kept under constant review by the IEC, thus ensuring that the content reflects current technology. Information relating to this publication, including its validity, is available in the IEC Catalogue of publications (see below) in addition to new editions, amendments and corrigenda. Information on the subjects under consideration and work in progress undertaken by the technical committee which has prepared this publication, as well as the list of publications issued, is also available from the following:

- **IEC Web Site (www.iec.ch)**

- **Catalogue of IEC publications**

  The on-line catalogue on the IEC web site (http://www.iec.ch/searchpub/cur_fut.htm) enables you to search by a variety of criteria including text searches, technical committees and date of publication. On-line information is also available on recently issued publications, withdrawn and replaced publications, as well as corrigenda.

- **IEC Just Published**

  This summary of recently issued publications (http://www.iec.ch/online_news/justpub/jp_entry.htm) is also available by email. Please contact the Customer Service Centre (see below) for further information.

- **Customer Service Centre**

  If you have any questions regarding this publication or need further assistance, please contact the Customer Service Centre:

  Email: custserv@iec.ch
  Tel: +41 22 919 02 11
  Fax: +41 22 919 03 00

INTERNATIONAL STANDARD

IEC 60092-506

Second edition
2003-06

Electrical installations in ships –

Part 506: Special features – Ships carrying specific dangerous goods and materials hazardous only in bulk

Installations électriques à bord des navires –

Partie 506: Caractéristiques spéciales – Navires transportant des matières ou des marchandises spécifiques dangereuses, seulement en vrac

International Electrotechnical Commission, 3, rue de Varembé, PO Box 131, CH-1211 Geneva 20, Switzerland
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: inmail@iec.ch Web: www.iec.ch

Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE M

For price, see current catalogue

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

ELECTRICAL INSTALLATIONS IN SHIPS –

Part 506: Special features – Ships carrying specific dangerous goods and materials hazardous only in bulk

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The 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 the 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 National Committees.

3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.

4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.

5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.

6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60092-506 has been prepared by IEC technical committee 18: Electrical installations of ships and of mobile and fixed offshore units.

This second edition of IEC 60092-506 cancels and replaces the first edition published in 1996 and constitutes a technical revision.

The major changes with respect to the first edition are as follows:

a) the latest revisions of the IMO Conventions have been incorporated;

b) cognisance has been taken of the publication of IEC 60092-502, fifth edition, by giving comparisons with zones 1 and 2 hazardous areas and the incorporation of protection by overpressure.

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

FDIS	Report on voting
18/937/FDIS	18/940/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.

This standard is based on the following IMO documents:

– *International Convention for the Safety of Life at Sea (SOLAS)*
  - Chapter II-2, Regulation 19 Part G: Special requirements for ships carrying dangerous goods
  - Chapter VII: Carriage of dangerous goods
– *Code of safe practice for solid bulk cargoes (BC-Code)*
– *International Maritime Dangerous Goods Code (IMDG Code)*

The committee has decided that the contents of this publication will remain unchanged until 2009. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

A bilingual version of this standard may be issued at a later date.

INTRODUCTION

The Regulations and Codes of the International Maritime Organization (IMO) applicable to the carriage of dangerous goods and materials hazardous only in bulk are contained in several chapters and paragraphs spread over a number of publications. The conditions necessary for the stowage of particular types and sources of ignition etc. are laid down in these IMO publications. These conditions are updated from time to time as ships become more complex with advancing technology. This part of IEC 60092 summarizes the present IMO electrical requirements and gives in a single publication details of suitable measures regarding the explosion protection of electrical equipment, where such cargoes might cause risk of fire or explosion.

ELECTRICAL INSTALLATIONS IN SHIPS –

Part 506: Special features – Ships carrying specific dangerous goods and materials hazardous only in bulk

1 Scope

1.1 This part of IEC 60092 is applicable to the electrical installations on the following types of ships and cargo spaces:

a) ships and cargo spaces not specifically designed for the carriage of freight containers but intended for the carriage of dangerous goods in packaged form including goods in freight containers and portable tanks;

b) purpose-built container ships and cargo spaces intended for the carriage of dangerous goods in freight containers and portable tanks;

c) ro/ro ships and ro/ro cargo spaces intended for the carriage of dangerous goods;

d) ships and cargo spaces intended for the carriage of solid dangerous goods in bulk and materials hazardous only in bulk (MHB);

e) ships and cargo spaces intended for the carriage of dangerous goods, other than liquids and gases in bulk, in shipborne barges.

1.2 Dangerous goods, for which safety measures may be required with respect to the electrical equipment, are specified in the IMO documents listed in the Foreword and grouped into the following classes.

a) Dangerous goods in packaged form

Class 1	Explosives, except goods in division 1.4, compatibility group S of the IMDG Code
Class 2.1	All flammable gases, compressed, liquefied or dissolved under pressure
Class 3	All flammable liquids having a flashpoint from –18 °C up to 23 °C (closed-cup test)
Class 6.1	All toxic substances having a flashpoint below 23 °C (closed-cup test)
Class 8	All corrosive liquids having a flashpoint 23 °C and below (closed-cup test)

b) Solid dangerous goods in bulk

Class 4.1	Flammable solids
Class 4.2	Substances liable to spontaneous combustion
Class 4.3	Substances which, in contact with water, emit flammable gases
Class 5.1	Oxidizing substances
Class 9	Miscellaneous dangerous substances, that is, any other substance which experience has shown, or may show, to be of such a dangerous character that the provisions of this part will apply to it.

c) MHB Materials which, when carried in bulk, present sufficient hazards to require specific precautions

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 60079 (all parts), *Electrical apparatus for explosive gas atmospheres*

IEC 60092-101:1994, *Electrical installations in ships – Part 101: Definitions and general requirements*

IEC 60092-502:1999, *Electrical installations in ships – Part 502: Tankers – Special features*

IEC 60529:1989, *Degrees of protection provided by enclosures (IP code)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
hazardous area
area in which an explosive atmosphere is likely to occur in normal operation (comparable with zone 1 as defined in IEC 60092-502)

NOTE An explosive atmosphere may exist due to gas and/or dust.

3.2
extended hazardous area

area in which an explosive atmosphere is not likely to occur in normal operation and, if it does occur, is likely to do so only infrequently and will exist for a short period only (and comparable with zone 2 as defined in IEC 60092-502)

4 Hazardous areas

4.1 General

Any electrical apparatus permitted in these areas requires special precautions with respect to its construction, certification, and use and, when applicable, its installation.

NOTE All appropriate measures should be taken to prevent flammable gas and/or dust entering spaces adjacent to the hazardous areas.

The following are identified as hazardous areas.

4.2 Dangerous goods class 1

Hazardous areas for dangerous goods class 1 as defined in 1.2a):

a) closed cargo spaces and closed or open ro/ro cargo spaces as indicated in Annex B, item A

b) permanently fixed magazines as indicated in Annex B, item A

4.3 Dangerous goods as defined in 1.2b) and 1.2c)

4.3.1 Classes 4.1, 4.2, 9 and MHB capable of creating explosive dust atmosphere

Hazardous areas (comparable with zone 1):

a) closed cargo spaces as indicated in Annex B, item A;

b) ventilation ducts, if any, serving the spaces identified in 4.3.1 as indicated in Annex B, item B.

4.3.2 Class 4.3 capable of creating explosive gas atmosphere

- Hazardous areas (comparable with zone 1):
  - a) closed cargo spaces as indicated in Annex B, item A;
  - b) ventilation ducts, if any, serving the spaces identified in 4.3.2 as indicated in Annex B, item B;
  - c) areas on open deck, or semi-enclosed spaces on open deck, within 1,5 m of any exhaust ventilation outlet of a hazardous area as indicated in Annex B, item G;
  - d) enclosed or semi-enclosed spaces having a direct opening into any of the areas as identified in 4.3.2a) or 4.3.2b) as indicated in Annex B, item C, unless appropriate measures are taken to prevent flammable gas or dust entering such spaces as indicated in Annex B, items D, E or F;
- Extended hazardous areas (comparable with zone 2):
  - e) Enclosed or semi-enclosed spaces having a direct opening into any of the areas identified in 4.3.2a) or 4.3.2b) which are provided with the closing arrangements indicated in Annex B, item D, and inside the air lock itself if arranged as indicated in Annex B, item F;
  - f) Areas of 1,5 m surrounding open or semi-enclosed spaces of Zone 1 as specified in 4.3.2c) as indicated in Annex B, item G.

4.3.3 Dangerous goods class 2.1, 3, 6.1* and 8*, as defined in 1.2a)

- Hazardous areas (comparable with zone 1):
  - a) closed cargo spaces as indicated in Annex B, item A;
  - b) ventilation ducts, if any, serving the spaces identified in 4.3.3 as indicated in Annex B, item B;
  - c) areas on open deck, or semi-enclosed spaces on open deck, within 1,5 m of any exhaust ventilation outlet of a hazardous area as indicated in Annex B, item G;
  - d) enclosed or semi-enclosed spaces having a direct opening into any of the areas as identified in 4.3.3a) or 4.3.3b) as indicated in Annex B, item C, unless appropriate measures are taken to prevent flammable gas or dust entering such spaces as indicated in Annex B, items D, E or F.
- Extended hazardous areas (comparable with zone 2):
  - e) enclosed or semi-enclosed spaces having a direct opening into any of the areas identified in 4.3.3a) or 4.3.3b) which are provided with the closing arrangements indicated in Annex B, item D, and inside the air lock itself if arranged as indicated in Annex B, item F;
  - f) areas of 1,5 m surrounding open or semi-enclosed spaces of zone 1 as specified in 4.3.3c) as indicated in Annex B, item G.

---

* Liquids having a flashpoint of 23 °C and below (closed-cup test)

5 Electrical equipment in hazardous areas and areas where explosives are stored

5.1 General

Electrical equipment and wiring shall not be fitted in hazardous areas and in areas where explosives are stored unless it is essential for the safety and operation of the ship. The electrical equipment installed and employed shall be suitable for the dangerous goods to be carried with due consideration of the following criteria:

– for explosive dust concentration and in areas where explosives are stored
  • degree of protection IPXX (see IEC 60529);
  • surface temperature;
– for explosive gas atmosphere
  • temperature class (IEC 60079 and IEC 60092-101, Clause 12);
  • apparatus group (see IEC 60079 and IEC 60092-101, Clause 12).

5.2 Risk due to explosive dust only from solid bulk cargoes

The electrical equipment shall comply with the following minimum requirements, unless otherwise specified (see also 5.3 and Annex A):

– degree of protection IP5X and surface temperature maximum 200 °C, or
– certified safe type equipment of temperature class T3 having a degree of protection IP5X.

If cargoes are to be carried which require a lower surface temperature, this shall be taken into consideration.

NOTE Certain cargoes in class 5.1 and 9 require that the electrical equipment is disconnected.

5.3 Risk due to explosive gas atmosphere only

Unless otherwise specified, the minimum requirements are (see also 5.4 and Annex A):

– temperature class T3;
– apparatus group IIB.

If dangerous cargoes are to be carried which require equipment of a higher grading (for example, temperature class T4, T5 or T6, or apparatus group IIC), this shall be taken into consideration.

The certified-safe type equipment used shall be suitable for at least zone 1 (see note 1).

NOTE 1 Certified-safe type equipment means electrical equipment for which satisfactory guarantees are furnished to the appropriate authority concerning the safety of its operation in the flammable atmosphere concerned.

NOTE 2 For increased-safety type motors, due consideration should be given to protection against overcurrent.

5.4 Where solid bulk cargoes and MHB only are to be carried, the type of electrical equipment shall be in accordance with 5.2 and 5.3, and the minimum requirements are shown in Annex A.

5.5 Risk due to both explosive gas atmosphere and dust

Electrical equipment is to be of a type acceptable to the appropriate authority concerning the safety of its operation in the flammable atmosphere and flammable dust concerned (see also 5.2 and 5.3).

5.6 For dangerous goods class 1 as defined in 1.2a) the electrical equipment shall meet the following requirements (see note 1):

– degree of protection IP6X

– surface temperature maximum 100 °C

NOTE 1 Where dangerous goods of class I division 1.4, compatibility group S, only are to be carried, special precautions for the construction installation and use of electrical equipment are not required.

NOTE 2 Equipment other than of a certified-safe type may be used when safe operation is secured and it is acceptable to the appropriate authority.

5.7 Electrical equipment in the extended hazardous areas defined in 4.3.2e) and f) and 4.3.3e) and f) and as indicated in Annex B, items D, F or G shall at least be suitable for zone 2 shall be either:

a) appropriate for use in the adjacent space in accordance with 5.1 to 5.6, or

b) of type of protection "n" and of appropriate temperature class, apparatus group and degree of protection in accordance with 5.1 to 5.6, or

c) of a type which ensures absence of sparks or arcs and hot spots during normal operation and which is approved by the appropriate authority.

6 Installation of electrical equipment in hazardous areas

6.1 In areas which are classified as hazardous when dangerous goods are carried, electrical equipment which is not essential for the safety and operation of the ship and which is not of a type approved for use in the hazardous areas specified in Clause 5, shall be

– completely disconnected, and

– protected against unauthorized re-connection.

Disconnection shall be made outside the hazardous areas and be effected with isolating links or lockable switches.

6.2 All cables and electrical equipment shall be protected against mechanical damage.

6.3 Cable penetrations of decks and bulkheads shall be sealed against passage of gas.

6.4 Cable joints in cargo spaces shall be avoided where possible. Where joints are unavoidable, they shall be enclosed in metal-clad or impact strength plastic junction boxes of certified-safety type as specified in Clause 5 or heat-shrink or encapsulated-crimp sleeve cable joints.

6.5 Cables shall be either

a) enclosed in screwed heavy gauge steel drawn or seam-welded and galvanized conduit, or

b) protected by electrically continuous metal sheathing or metallic wire armour braid or tape.

7 Protection by overpressure

7.1 Where a space has an opening into an adjacent hazardous space or area, it may be made into a non-hazardous space in accordance with the following requirements as indicated in Annex B, item E.

7.1.1 A minimum overpressure of 25 Pa (0,25 mbar) with respect to the adjacent, hazardous space or area shall be maintained at all points inside the space and its associated ducts at which leaks are liable to occur, all doors and windows being closed.

7.1.2 During initial start-up or after shut-down, it is necessary, before energizing any electrical apparatus within the space which is not suitably protected for the classification of the space in the absence of pressurization, to

a) either ensure that the internal atmosphere is non-hazardous, or proceed with prior purging of sufficient duration that the internal atmosphere may be considered as non-hazardous, and

b) pressurize the space.

NOTE The atmosphere is considered non-hazardous when, at all points in the space, the equipment enclosures and any associated ducts, the concentration of explosive gases or vapours is below 30 % of the lower explosive limit. The place of measurement should be judiciously chosen to determine the highest concentration of gas.

7.1.3 Monitoring shall be provided to ensure the satisfactory functioning of pressurization of spaces having an opening into a more hazardous zone.

7.1.4 Where a flow monitoring device is used to indicate failure of pressurization, it should be verified that either the pressurization level required by 6.1.1 is maintained with any door or other opening open, or an alarm is given if any door or opening is not closed.

7.1.5 In the event of the loss of overpressure, the following protective measures shall apply to electrical equipment not protected for use in hazardous areas (see 5.6):

– suitable alarm (visible and audible);

– immediate action to restore pressurization;

– programmed disconnection of power supply if the pressurization cannot be restored for an extended period or if the concentration of flammable gas is rising to a dangerous level.

8 Portable electrical equipment

Portable electrical equipment shall normally have its own self-contained electrical source of energy, except for intrinsically safe circuits, and shall be certified-safe type as specified in Clause 6 for the appropriate risk, unless specifically allowed by the appropriate authority (for example, portable bilge pumps).