

# PUBLICLY AVAILABLE SPECIFICATION

## PRE-STANDARD

**Electrical installations in ships –  
Part 510: Special features – High-voltage shore connection systems**

IEC PAS 60092-510:2009

<https://standards.iec.ch/cats/catalog/standards/sstdb/51eda-a4b8-4e45-9467-03e52dbe0555/iec-pas-60092-510-2009>

Withhold  
STANDARD PREVIEW  
(standards.iec.ch)



## THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2009 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester.

If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Central Office  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland  
Email: [inmail@iec.ch](mailto:inmail@iec.ch)  
Web: [www.iec.ch](http://www.iec.ch)

### About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

### About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

- Catalogue of IEC publications: [www.iec.ch/searchpub](http://www.iec.ch/searchpub)

The IEC on-line Catalogue enables you to search by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, withdrawn and replaced publications.

- IEC Just Published: [www.iec.ch/online\\_news/justpub](http://www.iec.ch/online_news/justpub)

Stay up to date on all new IEC publications. Just Published details twice a month all new publications released. Available on-line and also by email.

- Electropedia: [www.electropedia.org](http://www.electropedia.org)

The world's leading online dictionary of electronic and electrical terms containing more than 20 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary online.

- Customer Service Centre: [www.iec.ch/webstore/custserv](http://www.iec.ch/webstore/custserv)

If you wish to give us your feedback on this publication or need further assistance, please visit the Customer Service Centre FAQ or contact us:

Email: [csc@iec.ch](mailto:csc@iec.ch)  
Tel.: +41 22 919 02 11  
Fax: +41 22 919 03 00



IEC/PAS 60092-510

Edition 1.0 2009-04

# PUBLICLY AVAILABLE SPECIFICATION

## PRE-STANDARD

**Electrical installations in ships –  
Part 510: Special features – High voltage shore connection systems**

<https://standards.iteh.ai/catalog/standards/sist/52a5feda-a4b8-4e45-9467-03e52dbe0555/iec-pas-60092-510-2009>

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

PRICE CODE

**XC**

ICS 47.020.60

ISBN 978-2-88910-789-6

## CONTENTS

FOREWORD.....	10
INTRODUCTION.....	12
1 Scope.....	13
2 Normative references .....	13
3 Terms and definitions .....	15
<b>SECTION ONE – GENERAL REQUIREMENTS .....</b>	<b>16</b>
4 System .....	16
4.1 System description .....	16
4.2 Distribution system.....	17
4.2.1 General .....	17
4.2.2 Equipotential bonding.....	17
4.2.3 Electrochemical corrosion.....	17
4.3 Compatibility assessment before connection.....	17
4.4 System integration and management.....	18
4.4.1 During installation.....	18
4.5 Personnel safety .....	18
4.6 Design requirements .....	18
4.6.1 General .....	18
4.6.2 Protection against moisture and condensation.....	19
4.6.3 Location and construction.....	19
4.7 Electrical requirements.....	20
4.8 System study and calculations.....	20
4.9 Emergency shutdown including emergency stop facilities .....	20
<b>SECTION TWO – SHORE REQUIREMENTS .....</b>	<b>22</b>
5 HV-shore supply system.....	22
5.1 Current Inrush .....	22
5.2 Voltages and frequencies .....	22
5.3 Quality of HV-shore power supply .....	22
6 Installation.....	23
6.1 General.....	23
6.2 Components and system requirements .....	23
6.2.1 Combination circuit breaker, disconnector and earthing switch .....	23
6.2.2 Transformer.....	23
6.3 Protection system.....	24
6.4 High-voltage (HV) interlocking concept.....	24
6.4.1 Access .....	24
6.4.2 Operating of the high-voltage (HV) circuit-breakers, disconnectors and earthing switches.....	25
6.5 Shore-connection convertor equipment .....	25
6.5.1 Degree of protection .....	26
6.5.2 Cooling.....	26
6.5.3 Protection.....	26

<b>SECTION THREE – SHIP-TO-SHORE CONNECTION AND INTERFACE EQUIPMENT</b> .....	27
7 General .....	27
7.1 Ship-to-shore connection and interface equipment .....	27
7.1.1 Cable management system.....	27
7.2 Plugs and socket-outlets .....	28
7.2.1 General .....	28
7.2.2 Pilot contacts.....	29
7.3 Interlocking of earthing switches .....	29
7.3.1 Earth contact.....	30
7.4 Ship-to-shore connection cable .....	30
7.5 Control and monitoring cable.....	30
7.5.1 General .....	30
7.5.2 Control and monitoring plugs and socket-outlets.....	30
7.5.3 Data communication .....	30
7.6 Storage .....	30
<b>SECTION FOUR – SHIP REQUIREMENTS</b> .....	31
8 Installation.....	31
8.1 General.....	31
8.2 Ship-electrical-distribution-system protection.....	31
8.3 Connection switchboard .....	31
8.3.1 Combination circuit breaker, disconnector and earthing switch .....	31
8.4 Connection-switchboard instrumentation and protection .....	32
8.5 On-board transformer .....	32
8.6 Receiving switchboard connection point .....	32
8.6.1 Shore connection circuit breaker .....	32
8.6.2 Connection point instrumentation.....	33
8.6.3 Connection point protection .....	33
8.6.4 Operation of the shore-connection circuit-breaker.....	34
8.7 Ship power restoration .....	34
9 HVSC-System control and monitoring.....	35
9.1 General requirements.....	35
9.2 Load transfer via black out .....	35
9.3 Temporary parallel connection for load transfer.....	35
9.3.1 General .....	35
9.3.2 Protection requirements.....	36
<b>SECTION FIVE – VERIFICATION AND TESTING</b> .....	36
10 Initial tests.....	36
10.1 General.....	36
10.2 Initial tests of shore side installation.....	36
10.2.1 General .....	36
10.2.2 Tests .....	36
10.3 Initial tests of ship side installation .....	37
10.3.1 General .....	37
10.3.2 Tests .....	37
10.4 Tests at the first call at a shore supply point.....	37
10.4.1 General .....	37
10.4.2 Tests .....	37

11	Periodic tests and maintenance .....	38
11.1	General .....	38
11.2	Tests at repeated calls of a shore supply point .....	38
11.2.1	General .....	38
11.2.2	Verification .....	38
12	Documentation .....	38
12.1	General .....	38
12.2	System description .....	39
Annex A	(normative) Plugs and socket-outlets .....	40
A.1	Test specimen .....	40
A.2	Type testing of plugs and socket-outlets .....	41
A.3	Coding and specification of plugs and socket-outlets .....	41
A.4	Fibre optical plug/socket .....	42
Annex B	(normative) Ship-to-shore connection cable .....	44
B.1	Rated voltage .....	44
B.2	General design requirements .....	44
B.2.1	Conductors .....	44
B.2.2	Material .....	44
B.2.3	Screening .....	44
B.2.4	Earth conductors .....	45
B.2.5	Pilot element with rated voltage $U_0/U (U_m) = 150/250 (300) V$ .....	45
B.2.6	Optical fibres .....	45
B.2.7	Cabling .....	45
B.2.8	Separator tape .....	45
B.2.9	Non-metallic outer sheath .....	45
B.2.10	Markings .....	46
B.3	Tests on complete cables .....	46
Annex C	(normative) Additional requirements for ships with low voltage distribution systems .....	48
C.1	Scope .....	48
C.2	Normative references .....	48
C.3	Terms and definitions .....	48
<b>SECTION ONE – GENERAL REQUIREMENTS</b> .....		48
C.4	System .....	48
C.4.1	System description .....	48
C.4.2	Distribution system .....	49
C.4.3	Compatibility assessment before connection .....	49
C.4.4	System integration and management .....	49
C.4.5	Personnel safety .....	49
C.4.6	Design requirements .....	49
C.4.7	Electrical requirements .....	49
C.4.8	System study and calculations .....	49
<b>SECTION TWO – SHORE REQUIREMENTS</b> .....		49
C.5	HV-shore supply system .....	49

C.5.1 Current Inrush .....	49
C.5.2 Voltages and frequencies .....	49
C.5.3 Quality of HV-shore power supply .....	49
C.6 Installation.....	50
C.6.1 General .....	50
C.6.2 Components and system requirements .....	50
C.6.3 Protection system.....	50
C.6.4 High-voltage interlocking concept.....	50
C.6.5 Shore-connection convertor equipment .....	50
<b>SECTION THREE – SHORE-TO-SHIP CONNECTION AND INTERFACE EQUIPMENT .....</b>	<b>50</b>
C.7 General .....	50
C.7.1 Shore-to-ship connection and interface equipment .....	50
C.7.2 Plugs and socket-outlets .....	50
C.7.3 Interlocking of earthing switches .....	51
C.7.4 Ship-to-shore connection cable .....	51
C.7.5 Control and monitoring cable.....	51
C.7.6 Storage .....	53
<b>SECTION FOUR – SHIP REQUIREMENTS .....</b>	<b>53</b>
C.8 Installation.....	53
C.8.1 General .....	53
C.8.2 Ship-electrical-distribution-system protection.....	54
C.8.3 Connection switchboard .....	54
C.8.4 Connection-switchboard instrumentation and protection .....	54
C.8.5 On-board transformer .....	54
C.8.6 Receiving switchboard connection point .....	54
C.8.7 Emergency-stop switches and shutdown conditions.....	54
C.8.8 On board short-circuit current limits.....	54
C.9 HVSC-System control and monitoring.....	54
C.9.1 General requirements.....	54
C.9.2 Dead-transfer.....	54
C.9.3 Temporary parallel connection for load transfer.....	54
<b>SECTION FIVE – VERIFICATION AND TESTING .....</b>	<b>55</b>
C.10 Tests of completed installation .....	55
C.11 Tests after commissioning.....	55
C.12 Documentation .....	55
Annex D (normative) Additional requirements for cruise ships.....	56
D.1 Scope.....	56
D.2 Normative references .....	56
D.3 Terms and definitions.....	56
<b>SECTION ONE – GENERAL REQUIREMENTS .....</b>	<b>56</b>
D.4 System .....	56
D.4.1 System description .....	56
D.4.2 Distribution system.....	57
D.4.3 Compatibility assessment before connection .....	57

D.4.4 System integration and management.....	57
D.4.5 Personnel safety .....	58
D.4.6 Design requirements .....	58
D.4.7 Electrical requirements .....	58
D.4.8 System study and calculations.....	58
<b>SECTION TWO – SHORE REQUIREMENTS .....</b>	<b>58</b>
D.5 HV-shore supply system .....	58
D.6 Installation.....	58
<b>SECTION THREE – SHIP-TO-SHORE CONNECTION AND INTERFACE EQUIPMENT .....</b>	<b>59</b>
D.7 General .....	59
D.7.1 Ship-to-shore connection and interface equipment .....	59
D.7.2 Plugs and socket-outlets .....	59
D.7.3 Interlocking of earthing switches .....	61
D.7.4 Ship-to-shore connection cable .....	61
D.7.5 Control and monitoring cable.....	61
D.7.6 Storage .....	61
<b>SECTION FOUR – SHIP REQUIREMENTS .....</b>	<b>61</b>
D.8 Installation.....	61
D.9 HVSC-System control and monitoring.....	61
<b>SECTION FIVE – VERIFICATION AND TESTING .....</b>	<b>61</b>
D.10 Tests of completed installation .....	61
D.11 Tests after commissioning.....	62
D.11.1 General .....	62
D.11.2 Operational tests .....	62
D.12 Documentation .....	62
D.12.1 General .....	62
D.12.2 Circuit diagrams .....	62
Annex E (normative) Additional requirements of container vessels.....	63
E.1 Scope.....	63
E.2 Normative references .....	63
E.3 Terms and definitions .....	63
<b>SECTION ONE – GENERAL REQUIREMENTS .....</b>	<b>63</b>
E.4 System .....	63
E.4.1 System description .....	63
E.4.2 Distribution system.....	64
E.4.3 Compatibility assessment before connection .....	64
E.4.4 System integration and management.....	64
E.4.5 Personnel safety .....	64
E.4.6 Design requirements .....	64
E.4.7 Electrical requirements .....	64
E.4.8 System study and calculations.....	64
E.4.9 Emergency-stop switches and shutdown conditions.....	64



<b>SECTION TWO – SHORE REQUIREMENTS</b> .....	64
E.5 HV-shore supply system .....	64
E.5.1 Current Inrush .....	64
E.5.2 Voltages and frequencies .....	65
E.6 Installation .....	65
<b>SECTION THREE – SHORE-TO-SHIP CONNECTION AND INTERFACE EQUIPMENT</b> .....	66
E.7 General .....	66
E.7.1 Ship-to-shore connection and interface equipment .....	66
E.7.2 Plugs and socket-outlets .....	66
E.7.3 Interlocking of earthing switches .....	67
E.7.4 Ship-to-shore connection cable .....	67
E.7.5 Control and monitoring cable .....	67
E.7.6 Storage .....	69
<b>SECTION FOUR – SHIP REQUIREMENTS</b> .....	69
E.8 Installation .....	69
E.8.1 General .....	69
E.8.2 Ship-electrical-distribution-system protection .....	69
E.8.3 Connection switchboard .....	70
E.8.4 Connection-switchboard instrumentation and protection .....	70
E.8.5 On-board transformer .....	70
E.8.6 Receiving switchboard connection point .....	70
E.9 HVSC-System control and monitoring .....	70
<b>SECTION FIVE – VERIFICATION AND TESTING</b> .....	70
E.10 Initial tests .....	70
E.11 Periodic tests and maintenance .....	70
E.12 Documentation .....	70
Annex F (normative) Additional requirements of liquefied natural gas carriers (LNG) .....	71
F.1 Scope .....	71
F.2 Normative references .....	71
F.3 Terms and definitions .....	71
<b>SECTION ONE – GENERAL REQUIREMENTS</b> .....	71
F.4 System .....	71
F.4.1 System description .....	71
F.4.2 Distribution system .....	72
F.4.3 Compatibility assessment before connection .....	72
F.4.4 System integration and management .....	72
F.4.5 Personnel safety .....	72
F.4.6 Design requirements .....	73
F.4.7 Electrical requirements .....	73
F.4.8 System study and calculations .....	73
<b>SECTION TWO – SHORE REQUIREMENTS</b> .....	73
F.5 HV-shore supply system .....	73
F.5.1 Current Inrush .....	73

F.5.2 Voltages and frequencies .....	73
F.5.3 Quality of HV-shore power supply .....	73
F.6 Installation.....	74
F.6.1 General.....	74
F.6.2 Void .....	74
F.6.3 Components and system requirements .....	74
F.6.4 Protection system.....	74
F.6.5 HV interlocking concept.....	74
F.6.6 Shore-connection convertor equipment .....	74
<b>SECTION THREE – SHORE-TO-SHIP CONNECTION AND INTERFACE EQUIPMENT .....</b>	<b>75</b>
F.7 General .....	75
F.7.1 Ship-to-shore connection and interface equipment .....	75
F.7.2 Plugs and socket-outlets .....	75
F.7.3 Interlocking of earthing switches .....	75
F.7.4 Ship-to-shore connection cable .....	75
F.7.5 Control and monitoring cable.....	75
F.7.6 Storage .....	75
<b>SECTION FOUR – SHIP REQUIREMENTS .....</b>	<b>76</b>
F.8 Installation.....	76
F.8.1 General.....	76
F.8.2 Ship-electrical-distribution-system protection.....	76
F.8.3 Connection switchboard .....	76
F.8.4 Connection-switchboard instrumentation and protection .....	76
F.8.5 On-board transformer.....	76
F.8.6 Receiving switchboard connection point .....	76
F.8.7 Ship power restoration .....	76
F.9 HVSC-System control and monitoring.....	77
F.9.1 General requirements.....	77
F.9.2 Dead-transfer .....	77
F.9.3 Temporary parallel connection for load transfer .....	77
<b>SECTION FIVE – VERIFICATION AND TESTING .....</b>	<b>77</b>
F.10 Tests of completed installation .....	77
F.11 Tests after commissioning.....	77
F.12 Documentation .....	77
BIBLIOGRAPHY .....	78
Figure 1 – Diagram of a typical described HVSC-System arrangement .....	17
Figure A.1 – Socket Outlet.....	42
Figure A.2 – Plug.....	43
Figure B.1 – Bending test arrangement.....	47
Figure C.1 – General overview shore supply system of ships with LV-distribution system.....	48
Figure C.2 – Example of safety circuit.....	51
Figure C.3 – Power plug, touch proof.....	52

Figure C.4 – Power socket-outlet, touch proof.....	53
Figure D.1 – General overview of cruise ship HVSC-System.....	56
Figure D.2 – Example cruise ship HVSC-System single line diagram .....	57
Figure D.3 – Cruise ship plug.....	59
Figure D.4 – Cruise ship socket-outlet.....	60
Figure D.5 – Cruise ship neutral plug .....	60
Figure D.6 – Cruise ship neutral socket-outlet.....	60
Figure E.1 – Example for general system layout .....	63
Figure E.2 – Phase sequence rotation – Positive direction .....	65
Figure E.3 – Power plug and socket pin assignment .....	65
Figure E.4 – Example of safety circuit.....	67
Figure E.5 – Power plug, touch proof .....	68
Figure E.6 – Power socket-outlet, touch proof.....	69
Figure F.1 – System lay-out.....	72
Table A.1 – Electrical ratings .....	40
Table A.2 – Mechanical ratings.....	40
Table F.1 – LNGC: 140,000- 225,000 m <sup>3</sup> .....	74
Table F.2 – LNGC: >225,000m <sup>3</sup> .....	74

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTRICAL INSTALLATIONS IN SHIPS –**

**Part 510: Special features – High-voltage shore connection systems**

**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.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

A PAS is a technical specification not fulfilling the requirements for a standard, but made available to the public.

IEC-PAS 60092-510 has been processed by subcommittee IEC technical committee 18: Electrical installations of ships and of mobile and fixed offshore units.

This PAS has been prepared in cooperation with ISO technical committee 8: Ships and marine technology, Subcommittee 3: Piping and machinery.

It is published as a double logo PAS.

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

This PAS was approved for publication by the P-members of the committee concerned as indicated in the following document

Draft PAS	Report on voting
18/1094/PAS	18/1103/RVD

In ISO, the PAS was approved by 7 P members of 8 having cast a vote.

Following publication of this PAS, which is a pre-standard publication, the technical committee or subcommittee concerned may transform it into an International Standard.

This PAS shall remain valid for an initial maximum period of 3 years starting from the publication date. The validity may be extended for a single 3-year period, following which it shall be revised to become another type of normative document, or shall be withdrawn.

Withdawn

iTeh STANDARD PREVIEW  
(standards.iteh.ai)

<https://standards.iteh.ai/catalog/standards/sist/5eda-a4b8-4e45-9467-03e52dbe0555/iec-pas-60092-510-2009>

## INTRODUCTION

This PAS was ultimately developed jointly between IEC TC18 MT 26/PT 60092-510 and the technical committee of ISO TC8, Ships and Marine Technology Subcommittee SC 3, Piping and Machinery, WG11.

IEC 60092 forms a series of International Standards for electrical installations in sea-going ships, 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 for the Safety of Life at Sea, a guide for future regulations which may be prepared and a statement of practice for use by shipowners, shipbuilders and appropriate organizations.

For a variety of reasons, including environmental considerations, it is becoming an increasingly common requirement for ships to shut down ship generators and to connect to shore power for as long as practicable during stays in port.

The intention of this PAS is to define requirements that support, with the application of suitable operating practices, compliant ships to connect quickly to compliant high-voltage shore power supplies through a compatible shore to ship connection.

With the support of sufficient planning and appropriate operating procedures and assessment, compliance with the requirements of this PAS is intended to allow different ships to connect to high-voltage shore connections at different berths. This provides the benefits of standard, straightforward connection without the need for adaptation and adjustment at different locations that can satisfy the requirement to connect for as long as practicable during stays in port.

Ships that do not apply this PAS may find it impossible to connect to compliant shore supplies.

Where deviations from the requirements and recommendations in this PAS may be considered for certain designs, the potential effects on compatibility are highlighted.

Where the requirements and recommendations of this PAS are complied with, high-voltage shore supplies arrangements are likely to be compatible for visiting ships for connection.

Low-voltage shore connection is covered by IEC 60092-201, Clause 14 and IEC 60092-507.

## ELECTRICAL INSTALLATIONS IN SHIPS –

### Part 510: Special features – High-voltage shore connection systems

#### 1 Scope

This PAS describes high-voltage shore connection (HVSC)-Systems, on board the ship and on shore, to supply the ship with electrical power from shore during the port lay period.

This PAS is applicable to the specification, installation and testing of HVSC- Systems and plants and addresses:

- high-voltage shore distribution system,
- shore-to-ship connection,
- transformers/reactors,
- semiconductor convertors and rotating convertors,
- ship distribution system, and
- control, monitoring, interlocking and power management system.

This PAS does not apply to the electrical power supply during docking periods and shall not apply to HVSC-Systems that existed before the validity date of this PAS.

NOTE 1 Additional requirements and/or restrictions may be imposed by the National Administration or Authorities within whose jurisdiction the ship is intended to operate and/or by the Owners or Authorities responsible for a shore supply or distribution system.

NOTE 2 It is expected that HVSC-Systems will have practicable applications for ships requiring 1 MW or more or ships with high voltage main supply.

#### 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 60034 (all parts), *Rotating electrical machines*

IEC 60076 (all parts), *Power transformers*

IEC 60079 (all parts), *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 60092-301:1980, *Electrical installations in ships – Part 301: Equipment – Generators and motors*

IEC 60092-303, *Electrical installations in ships – Part 303: Equipment – Transformers for power and lighting*

IEC 60092-350:2008, *Electrical installations in ships – Part 350: General construction and test methods of power, control and instrumentation cables for shipboard and offshore applications*

IEC 60092-351:2004, *Electrical installations in ships – Part 351: Insulating materials for shipboard and offshore units, power, control, instrumentation, telecommunication and data cables*

IEC 60092-352:2005, *Electrical installations in ships – Part 352: Choice and installation of electrical cables*