

# INTERNATIONAL STANDARD

**IEC**  
**60092-503**

Second edition  
2007-06

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**Electrical installations in ships –**

**Part 503:**

**Special features –**

**AC supply systems with voltages in the range  
of above 1 kV up to and including 15 kV**

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Reference number  
IEC 60092-503:2007(E)



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Commission Electrotechnique Internationale  
International Electrotechnical Commission  
Международная Электротехническая Комиссия

PRICE CODE

**R**

*For price, see current catalogue*

## CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references .....	7
3 Terms and definitions .....	8
3.1 AC voltages.....	8
3.2 Earthed neutral systems.....	9
3.3 Insulation .....	9
4 General requirements.....	9
4.1 Voltage and frequency.....	9
4.2 Warning notices .....	10
4.3 Access .....	10
4.4 Insulation level .....	10
4.5 Clearances and creepage distances .....	10
4.5.1 Clearance distance.....	10
4.5.2 Creepage distance .....	10
4.6 Earthing .....	11
4.7 Distribution systems.....	12
4.7.1 Divided system.....	12
4.7.2 Auxiliary circuits .....	12
4.7.3 Busbars of main switchboards.....	12
4.7.4 Generator circuits.....	13
4.7.5 Outgoing circuits.....	13
4.7.6 Power-transformer circuits.....	13
4.7.7 Shore-connection circuits and circuits to other units .....	13
4.7.8 Control and instrumentation circuits.....	13
4.8 Generator and transformer neutrals.....	13
4.8.1 Generator neutrals interconnected.....	13
4.8.2 Disconnection.....	14
4.9 Electrical protection.....	14
4.9.1 General .....	14
4.9.2 Generator protection.....	14
4.9.3 Motor protection .....	14
4.9.4 Power-transformer protection .....	14
4.9.5 Voltage-transformer protection .....	14
4.9.6 Overvoltage protection .....	14
4.9.7 Earth-fault monitoring .....	14
5 Equipment.....	15
5.1 AC generators and motors.....	15
5.1.1 Enclosures .....	15
5.1.2 Performance.....	15
5.1.3 De-excitation .....	16
5.1.4 Mechanical characteristics.....	16
5.2 Transformers.....	16
5.2.1 Enclosures and installations .....	16

5.2.2	Accumulation of moisture and condensation .....	16
5.2.3	Transient voltage conditions .....	17
5.2.4	Current inrush .....	17
5.3	Switchgear and controlgear assemblies (switchboards) .....	17
5.3.1	Design and construction .....	17
5.3.2	Passageways .....	18
5.4	Switchgear and controlgear and fuses .....	18
5.5	Cables.....	18
5.5.1	General .....	18
5.5.2	Installation.....	18
5.5.3	Conductors and terminations .....	18
5.5.4	Current rating .....	19
5.5.5	Testing .....	19
5.5.6	Socket-outlets .....	19

Table 1	– AC three-phase systems having a nominal voltage above 1 kV and up to and including 15 kV .....	9
Table 2	– Minimum clearance for equipment.....	10
Table 3	– Minimum creepage distances for main switchboards and generators .....	11
Table 4	– Minimum creepage distances for other equipment.....	11

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**ELECTRICAL INSTALLATIONS IN SHIPS –****Part 503: Special features –  
AC supply systems with voltages in the range  
of above 1 kV up to and including 15 kV**

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International Standard IEC 60092-503 has been prepared by IEC technical committee 18:  
Electrical installations of ships and of mobile and offshore units

This second edition cancels and replaces the first edition published in 1975. This edition constitutes a technical revision.

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

- a) The scope is changed to an upper limit of the system voltage from 11 kV to 15 kV.
- b) General requirements regarding warning notices, access to installations, clearances and creepage distances of uninsulated conductors and earthing have been introduced.
- c) Technical review has generally been made to update the standard according to general requirements and referenced equipment standards.

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

FDIS	Report on voting
18/1053/FDIS	18/1059/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.

A list of all 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 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.

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## INTRODUCTION

IEC 60092 forms a series of International Standards for electrical installations in sea-going ships, incorporating good practice and coordinating, 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.

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## ELECTRICAL INSTALLATIONS IN SHIPS –

### Part 503: Special features – AC supply systems with voltages in the range of above 1 kV up to and including 15 kV

#### 1 Scope

This part of IEC 60092 is applicable to a.c. supply systems with voltages from 1 kV up to and including 15 kV. The requirements contained in other parts of IEC 60092 apply where appropriate, subject to the exceptions stated in the following clauses.

#### 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 60038:1983, *IEC standard voltages*

IEC 60071-1, *Insulation co-ordination – Part 1: Definitions, principles and rules*  
[IEC 60092-503:2007](#)

IEC 60071-2, *Insulation co-ordination – Part 2: Application guide*  
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IEC 60076 (all parts), *Power transformers*

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

IEC 60092-202, *Electrical installations in ships – Part 202: System design – Protection*

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

IEC 60092-353, *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*

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 60265-1, *High-voltage switches – Part 1: Switches for rated voltages above 1 kV and less than 52 kV*

IEC 60282-1:2005, *High-voltage fuses – Part 1: Current-limiting fuses*

IEC 60502 (all parts), *Power cables with extruded insulation and their accessories for rated voltages from 1 kV ( $U_m = 1,2$  kV) up to 30 kV ( $U_m = 36$  kV)*

IEC 60502-1, *Power cables with extruded insulation and their accessories for rated voltages from 1 kV ( $U_m = 1,2$  kV) up to 30 kV ( $U_m = 36$  kV) – Part 1: Cables for rated voltages of 1 kV ( $U_m = 1,2$  kV) up to 3 kV ( $U_m = 3,6$  kV)*

IEC 60502-2, *Power cables with extruded insulation and their accessories for rated voltages from 1 kV ( $U_m = 1,2$  kV) up to 30 kV ( $U_m = 36$  kV) – Part 2: Cables for rated voltages from 6 kV ( $U_m = 7,2$  kV) up to 30 kV ( $U_m = 36$  kV)*

IEC 60694:1996, *Common specifications for high-voltage switchgear and controlgear standards*

IEC 62271(all parts), *High-voltage switchgear and controlgear*

IEC 62271-200:2003, *High-voltage switchgear and controlgear – Part 200: AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV*

### 3 Terms and definitions

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

#### 3.1 AC voltages

For alternating voltages, the voltages stated below are r.m.s. values.

##### 3.1.1

##### **nominal system voltage**

voltage by which a system is designated

[IEC 60038, Clause 1]

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##### 3.1.2

##### **highest and lowest voltages of a system** (excluding transient or abnormal conditions)

##### 3.1.2.1

##### **highest voltage of a system**

highest value of voltage which occurs under normal operating conditions at any time and at any point on the system

NOTE It excludes voltage transients, such as those due to system switching and temporary voltage variations.

[IEC 60038, 2.1, modified]

##### 3.1.2.2

##### **lowest voltage of a system**

lowest value of voltage which occurs under normal operating conditions at any time and at any point on the system

NOTE It excludes voltage transients, such as those due to system switching and temporary voltage variations.

[IEC 60038, 2.2, modified]

##### 3.1.2.3

##### **highest voltage for equipment**

maximum value of the "highest system voltage" (see 3.1.2.1) for which the equipment may be used

NOTE Attention is drawn to the fact that in some equipment standards the term "voltage range" has a different meaning.

[IEC 60038, Clause 9, modified]

## 3.2 Earthed neutral systems

### 3.2.1

#### high-resistance earthed neutral

system where the neutral is earthed through a resistance with numerical value equal to, or somewhat less than, one-third of the capacitive reactance between phase and earth

### 3.2.2

#### low-resistance earthed neutral

system where the neutral is earthed through a resistance which limits the earth fault current to a minimum value of 20 % and a maximum value of 100 % of the rated current of the largest generator

## 3.3 Insulation

### 3.3.1

#### insulation coordination

selection of the dielectric strength of equipment in relation to the voltages which can appear on the system for which the equipment is intended and taking into account the service environment and the characteristics of the available protective devices

[IEC 60071-1, 3.1]

### 3.3.2

#### rated insulation level

set of rated withstand voltages which characterize the dielectric strength of the insulation

[IEC 60071-1, 3.35]

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## 4 General requirements

### 4.1 Voltage and frequency

Voltage and frequency shall be chosen in accordance with IEC 60038. The maximum nominal system voltage is 15 kV. The preferred values for ship supply systems are stated in Table 1.

**Table 1 – AC three-phase systems having a nominal voltage above 1 kV and up to and including 15 kV**

Nominal system voltage <sup>a</sup> kV	Nominal frequency Hz	Highest voltage for equipment kV
3	50 or 60	3,6
3,3		3,6
6		7,2
6,6		7,2
10		12
11		12
15		17,5

<sup>a</sup> The values are voltages between phases.