

Electrical installations in ships —

Part 201: System design — General

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National foreword

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The UK participation in its preparation was entrusted to Technical Committee JPEL/18, Electrical installations of ships and of mobile and fixed offshore units, which has the responsibility to:

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Electrical installations in ships –

Part 201:
System design – General



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CONTENTS

	Page
FOREWORD.....	4
INTRODUCTION	7
Clause	
1 Scope.....	8
SECTION 1: DEFINITIONS	
2 Definitions	9
SECTION 2: SAFETY ASPECTS	
3 General	11
SECTION 3: DISTRIBUTION SYSTEMS	
4 D.C. distribution systems.....	11
5 A.C. distribution systems	12
SECTION 4: SOURCES OF ELECTRICAL POWER	
6 Source of electrical power for auxiliary services.....	14
SECTION 5: DISTRIBUTION SYSTEM REQUIREMENTS	
7 General	19
8 Methods of distribution.....	19
9 Balance of loads	20
10 Single-wire systems with hull return	20
11 Final sub-circuits.....	21
12 Socket-outlets	23
13 Lighting circuits in machinery spaces, accommodation spaces, cargo spaces, etc.....	23
14 Shore connections	23
15 Navigation lights	24
16 Radio installations.....	24
17 Submersible, permanently installed bilge-pumps	24
18 Motor circuits	25
19 Luminaires	26
20 Internal communication circuits	26

SECTION 6: DIVERSITY (DEMAND) FACTORS

Clause		Page
21	Final sub-circuits	27
22	Circuits other than final sub-circuits	27
23	Application of diversity (demand) factors	27
24	Motive-power circuits — General	27
25	Cargo handling winch and crane circuits	28

SECTION 7: DEGREES OF PROTECTION

26	General	29
----	---------------	----

SECTION 8: CABLES

27	Choice of cables	29
28	Choice of insulation	29
29	choice of protective coverings	31
30	Cables for fire alarm, fire detection and emergency fire extinguishing services	32
31	Determination of the cross-sectional areas of conductors	32
32	Current ratings for continuous services	33
33	Correction factors for different ambient air temperatures	33
34	Correction factors for cable grouping	34
35	Correction factors for non-continuous services	36
36	Voltage drop	36
37	Parallel connection of cables	37
38	Separation of circuits	37
39	Short-circuit capacity	37
40	Cables in refrigeration spaces	37

Figures	39
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRICAL INSTALLATIONS IN SHIPS –

Part 201: System design – General

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 cooperation 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.
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This part of International Standard IEC 92 has been prepared by IEC technical committee 18: Electrical installations of ships and of mobile and fixed offshore units.

It forms the fourth edition of IEC 92-201, cancels and replaces the third edition, published in 1980, and its amendment No. 5 (1990); it is in line with the International Convention for the safety of life at sea.

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

DIS	Report on voting
18A(CO)74	18A(CO)83

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

IEC 92 consists of the following parts, under the general title: *Electrical installations in ships*:

IEC 92-101: 1980, *Part 101: Definitions and general requirements*

IEC 92-201: 199X, *Part 201: System design – General*

IEC 92-202: 1980, *Part 202: System design – Protection*

- IEC 92-203: 1985, *Part 203: System design – Acoustic and optical signals*
- IEC 92-204: 1987, *Part 204: System design – Electric and electrohydraulic steering gear*
- IEC 92-301: 1980, *Part 301: Equipment – Generators and motors*
- IEC 92-302: 1980, *Part 302: Equipment – Switchgear and controlgear assemblies*
- IEC 92-303: 1980, *Part 303: Equipment – Transformers for power and lighting*
- IEC 92-304: 1980, *Part 304: Equipment – Semiconductor convertors*
- IEC 92-305: 1980, *Part 305: Equipment – Accumulator (storage) batteries*
- IEC 92-306: 1980, *Part 306: Equipment – Luminaires and accessories*
- IEC 92-307: 1980, *Part 307: Equipment – Heating and cooking appliances*
- IEC 92-350: 1988, *Part 350: Low-voltage shipboard power cables – General construction and test requirements*
- IEC 92-351: 1983, *Part 351: Insulating materials for shipboard power cables*
- IEC 92-352: 1979, *Part 352: Choice and installation of cables for low-voltage power systems*
- IEC 92-353: 1988, *Part 353: Single and multicore cables with extruded solid insulation for rated voltages 0,6/1 kV*
- IEC 92-359: 1987, *Part 359: Sheathing materials for shipboard power and telecommunication cables*
- IEC 92-373: 1977, *Part 373: Shipboard telecommunication cables and radio-frequency cables – Shipboard flexible coaxial cables*
- IEC 92-374: 1977, *Part 374: Shipboard telecommunication cables and radio-frequency cables – Telephone cables for non-essential communication services*
- IEC 92-375: 1977, *Part 375: Shipboard telecommunication cables and radio-frequency cables – General instrumentation, control and communication cables*
- IEC 92-376: 1983, *Part 376: Shipboard multicore cables for control circuits*
- IEC 92-401: 1980, *Part 401: Installation and test of completed installation*

IEC 92-501: 1984, *Part 501: Special features – Electric propulsion plant*

IEC 92-502: 1980, *Part 502: Special features – Tankers*

IEC 92-503: 1975, *Part 503: Special features – A.C. supply systems with voltages in the range above 1 kV up to and including 11 kV*

IEC 92-504: 1974, *Part 504: Special features – Control and instrumentation*

IEC 92-504A: 1977, *First supplement: Specific control and instrumentation installations*

IEC 92-505: 1984, *Part 505: Special features – Mobile offshore drilling units*

INTRODUCTION

IEC 92: *Electrical installations in ships*, 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 on 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.

ELECTRICAL INSTALLATIONS IN SHIPS –

Part 201: System design – General

1 Scope

This standard is applicable to the main features of system design of electrical installations for use in ships.

1.1 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 92. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this part of IEC 92 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 79-0: 1983, *Electrical apparatus for explosive gas atmospheres – Part 0: General requirements*
Amendment No. 2 (1991)

IEC 92-101: 1980, *Electrical installations in ships – Part 101: Definitions and general requirements*
Amendment No. 2 (1987)

IEC 92-401: 1980, *Electrical installations in ships – Part 401: Installation and test of completed installation*
Amendment No. 1 (1987)

IEC 92-502: 1980, *Electrical installations in ships – Part 502: Special features – Tankers*

IEC 92-503: 1975, *Electrical installations in ships – Part 503: Special features – A.C. supply systems with voltages in the range above 1 kV up to and including 11 kV*

IEC 331: 1970, *Fire-resisting characteristics of electric cables*

IEC 332: XXX, *Tests on electric cables under fire conditions*

IEC 529: 1989, *Degrees of protection provided by enclosures (IP codes)*

Section 1: Definitions

2 Definitions

2.1 General

2.1.1 *Bunched cables*

Two or more cables contained within a single conduit, duct or groove, or, if not enclosed, not separated from each other.

2.1.2 *Branch*

An electrical line intended for connecting a current-consuming installation to the distribution network.

2.1.3 *Branch system*

An assembly of branches.

2.1.4 *Meshed network or ring-main*

A set of conductors which connect feeding points (nodes) and form a closed circuit.

2.1.5 *Diversity factor (demand factor)*

The ratio of the estimated total load of a group of consumers under their normal working conditions to the sum of their nominal ratings.

2.1.6 *Primary distribution system*

A system having electrical connection with the generator.

2.1.7 *Secondary distribution system*

A system having no electrical connection with the generator, e.g. isolated therefrom by a double-wound transformer or motor-generator.

2.1.8 *Hull-return system*

A system in which insulated conductors are provided for connection to one pole or phase of the supply, the hull of the ship or other permanently earthed structure being used for effecting connections to the other pole or phase.

2.1.9 *Dead-ship condition*

The condition under which the main propulsion plant, boilers and auxiliaries are not in operation due to the absence of power.

2.2 *D.C. systems of distribution*

2.2.1 *Two-wire d.c. system*

A d.c. system comprising two conductors only, between which the load is connected.

2.2.2 *Three-wire d.c. system*

A d.c. system comprising two conductors and a middle wire, the supply being taken from the two outer conductors or from the middle wire and either outer conductor, the middle wire carrying only the difference-current.

2.3 *A.C. systems of distribution*

2.3.1 *Single-phase two-wire a.c. system*

A single-phase a.c. system comprising two conductors only, between which the load is connected.

2.3.2 *Single-phase three-wire a.c. system*

A single-phase a.c. system comprising two conductors and a neutral wire, the supply being taken from the two outer conductors or from the neutral wire and either outer conductor, the neutral wire carrying only the difference-current.

2.3.3 *Three-phase three-wire system*

A system comprising three conductors connected to a three-phase supply.

2.3.4 *Three-phase four-wire system*

A system comprising four conductors of which three are connected to a three-phase supply and the fourth to a neutral point in the source of supply.

2.4 *Sources of electrical power*

2.4.1 *Main source of electrical power*

A source intended to supply electrical power to the main switchboard for distribution to all services necessary for maintaining the ship in normal operational and habitable condition.

2.4.2 *Emergency source of electrical power*

A source of electrical power intended to supply the emergency switchboard in the event of failure of the supply from the main source of electrical power.

Section 2: Safety aspects

3 General

Electrical installations in ships shall be such that:

- services essential for safety will be maintained under various emergency conditions;
- the safety of passengers, crew and ship from electrical hazards will be ensured;
- the requirements with respect to safety in this publication are considered;
- the SOLAS regulations are met as far as is applicable.

Section 3: Distribution systems

4 D.C. distribution systems

4.1 D.C. distribution systems

The following systems are considered as standard:

- two-wire insulated;
- single-wire with hull return;
- two-wire with one pole earthed;
- three-wire with middle wire earthed but without hull return;
- three-wire with middle wire earthed and with hull return.

4.2 Voltages (d.c.)

Table 1 gives recommended values of nominal voltages and maximum voltages allowed for ship's service systems of supply:

Table 1 – D.C. voltages for ship's service systems of supply

Application	Nominal voltages V	Maximum voltages V
Power	110; 220	500
Cooking, heating	110; 220	250
Lighting and socket-outlets	24; 110; 220	250

5 A.C. distribution systems

5.1 *Primary a.c. distribution systems*

The following systems are recognized as standard for primary distribution:

- three-phase three-wire insulated;
- three-phase three-wire with neutral earthed.

In addition for all voltages up to and including 500 V:

- three-phase four-wire with neutral earthed but without hull return;
- single-phase two-wire insulated;
- single-phase two-wire with one pole earthed.

NOTE – For tankers see IEC 92-502: Special features – Tankers.