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INTERNATIONAL STANDARD

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Electrical installations in ships -
Part 504: Automation, control and instrumentation

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Electrical installations in ships - Part 504: Automation, control and instrumentation

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IEC 60092-504 has been prepared by IEC technical committee 18: Electrical installations of ships and of mobile and fixed offshore units. It is an International Standard.

This fifth edition cancels and replaces the fourth edition published in 2016. This edition constitutes a technical revision.

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

a) aligned bridge and machinery alert references throughout the document;
b) transfer of EMC items to IEC 60533 throughout the document;
c) update of power management and energy management (9.5 and 9.6).

The text of this International Standard is based on the following documents:

Draft	Report on voting
18/2024/FDIS	18/2034/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 60092 series, published under the general title *Electrical installations in ships*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

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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 (SOLAS), a guide for future regulations which ~~may~~ can be prepared and a statement of practice for use by ship owners, shipbuilders and appropriate organizations.

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1 Scope

This part of IEC 60092 specifies requirements for electrical, electronic and programmable equipment supporting essential services intended for automation, control, monitoring, alert, ~~and~~ safety and protection systems ~~for in ships~~

This document is not applicable for:

– maritime navigation and radiocommunication equipment and systems making use of electrotechnical, electronic, electroacoustic, electro-optical and data processing techniques.

NOTE It is important that equipment in the scope of IEC TC 80 (Maritime navigation and radiocommunication equipment and systems) complies with IEC 60945 which already covers the requirements stated in this document.

– internal communication systems, except PA/GA (Public Adress/General Alarm).

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 (all parts), *International Electrotechnical Vocabulary (IEV)* (available at www.electropedia.org)~~

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IEC 60068-2-1, *Environmental testing - Part 2: Tests - Test A: Cold*

IEC 60068-2-2, *Environmental testing - Part 2: Tests - Test B: Dry heat*

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IEC 60068-2-6, *Environmental testing - Part 2: Tests - Test Fc: Vibration (sinusoidal)*

IEC 60068-2-30, *Environmental testing - Part 2: Tests - Test Db: Damp heat, cyclic (12 h + 12 h cycle)*

IEC 60068-2-52, *Environmental testing - Part 2: Tests - Test Kb: Salt mist, cyclic (sodium chloride solution)*

IEC 60079-14:2024, *Explosive atmospheres - Part 14: Electrical installation design, selection and installation of equipment, including initial inspection*

IEC 60092-101:~~1994~~2018, *Electrical installations in ships - Part 101: Definitions and general requirements*
~~IEC 60092-101:1994/AMD1:1995~~

IEC 60092-201:1994, *Electrical installations in ships - Part 201: System design - General*

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

~~IEC 60092-302, *Electrical installations in ships – Part 302: Low -voltage switchgear and controlgear assemblies*~~

IEC 60092-302-2, *Electrical installations in ships - Part 302-2: Low voltage switchgear and controlgear assemblies - Marine power*

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IEC 60092-353, *Electrical installations in ships - Part 353: Power cables for rated voltages 1 kV and 3 kV*

IEC 60092-376, *Electrical installations in ships - Part 376: Cables for control and instrumentation circuits 150/250 V (300 V)*

IEC 60092-501, *Electrical installations in ships - Part 501: Special features - Electric propulsion plant*

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

IEC 60331 (all parts), *Tests for electric cables under fire conditions*

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 60447, *Basic and safety principles for man-machine interface, marking and identification - Actuating principles*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 60533, *Electrical and electronic installations in ships - Electromagnetic compatibility (EMC) - Ships with a metallic hull*

~~IEC 60945, *Maritime navigation and radiocommunication equipment and systems – General requirements – Methods of testing and required test results*~~

~~IEC 61000-4-2, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measuring techniques – Electrostatic discharge immunity test*~~

~~IEC 61000-4-3, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*~~

~~IEC 61000-4-4, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*~~

~~IEC 61000-4-5:2014, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*~~

~~IEC 61000-4-6, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*~~

IEC 61000-4-11, *Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests for equipment with input current up to 16 A per phase*

IEC 61000-4-17, *Electromagnetic compatibility (EMC) - Part 4-17: Testing and measurement techniques - Ripple on d.c. input power port immunity test*

IEC 61000-4-29, *Electromagnetic compatibility (EMC) - Part 4-29: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations on d.c. input power port immunity tests*

~~IEC 61355-1, *Classification and designation of documents for plants, systems and equipment – Part 1: rules and classification tables*~~

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~~IEC 62443 (all parts), *Industrial communication networks – Network and system security*~~

IEC 62923-1:2018, *Maritime navigation and radiocommunication equipment and systems - Bridge alert management - Part 1: Operational and performance requirements, methods of testing and required test results*

IEC 81355-1, *Industrial systems, installations and equipment and industrial products - Classification and designation of information - Part 1: Basic rules and classification of information*

~~ABS publication, *Guidance notes on the application of ergonomics to marine systems (2014-02)*~~

~~CISPR 16-1-1, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-1: Radio disturbance and immunity measuring apparatus – Measuring apparatus*~~

~~CISPR 16-2-1, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-1: Methods of measurement of disturbances and immunity – Conducted disturbance measurements*~~

ISO 3740, *Acoustics - Determination of sound power levels of noise sources - Guidelines for the use of basic standards*

EN 54 (all parts), *Fire detection and fire alarm systems*

~~IMO Resolution A.1021(26):2009, *Code on alerts and Indicators*~~

SOLAS, *International Convention for the Safety of Life at Sea*:1974, consolidated edition, 2024

MSC-FAL.1/Circ.3/Rev.2, *Guidelines on maritime cyber risk management,* 2022

IMO Resolution MSC.302(87)~~:2010,~~ *Adoption of Performance Standards for Bridge Alert Management* ~~*(BAM)*~~

~~IMO Resolution A.813(19):1995, *General Requirements for Electromagnetic Compatibility (EMC) for all Electrical and Electronic Ship's Equipment*~~

~~IMO Resolution MSC.98(73):2000, *Adoption of the international code for fire safety systems (FSS Code)*~~

~~SOLAS, *International Convention for the Safety of Life at Sea (SOLAS):1974, consolidated edition, 2009*~~

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

– IEC Electropedia: available at https://www.electropedia.org/
– ISO Online browsing platform: available at https://www.iso.org/obp

3.1
accuracy
quality which characterizes the closeness of a measured value to the corresponding true value

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3.2
administration
Government of the State whose flag the ship is entitled to fly

[SOURCE: SOLAS, Chapter I, Regulation 2, Definition (b)]

3.3
alarm
condition requiring immediate attention and action by the crew, to maintain the safe navigation and safe operation of the ship

[SOURCE: IEC 62923-1:2018, 3.1.7, modified – 'bridge team' is replaced by 'crew']

3.4
alert
announcement of abnormal situations and conditions requiring attention

Note 1 to entry: Alerts are divided in four priorities: emergency alarms, alarms, warnings and cautions. An alert provides information about a defined state change in connection with information about how to announce this event in a defined way to the system and the operator.

[SOURCE: IEC 62923-1:2018, 3.1.8]

3.5
alert system
automation cluster system for the centralized processing and presentation of the alerts from a group of equipment

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Note 1 to entry: Refer to SOLAS II-1 Part E, where this is called an alarm system.

Note 2 to entry: An alert system encompassing all alerts in the engineering domain of a ship can be regarded as a Central Alert Management (CAM) system for the automation cluster, see MSC.302(87), IEC 62923-1 and IEC 62923-2.

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Note 3 to entry: This was formerly called "machinery alarm systems".

3.6
automation system
system to monitor and control a process

3.7
availability
ability of an item to be in a state to perform a required function under given conditions at a given time interval, assuming that the required external resources are provided

3.8
bridge and deck zone
area from which the ship is steered and navigated and where the antennas are located

3.9
caution
awareness of a condition which does not warrant an alarm or warning condition, but still requires attention out of the ordinary consideration of the situation or of given information

[SOURCE: IEC 62923-1:2018, 3.1.22]

3.10
centralized control
control of all operations of a controlled system from one central control position

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3.11
computer-based system
system that consists of one or more programmable electronic devices with their connections, peripherals and software necessary to carry out automatically specified functions

Note 1 to entry: The following types of programmable devices could form part of a computer system: main-frame, mini-computer, micro-processor-based computer, programmable logic controller.

3.12
control functions
functions intended to regulate the behaviour of equipment or systems

3.13
control position
control station
group of control devices by which an operator can control the performance of a machine, apparatus, process or assembly of machines and apparatus

Note 1 to entry: A control position will generally enable an operator to verify the achievement of the desired conditions by means of an appropriate monitoring system

~~**3.8**~~
~~**dependability**~~
~~extent to which a system can be relied upon to perform its intended functions under defined operational and environmental conditions~~

3.14
emergency alarm
alarm which indicates immediate danger to human life or to the ship and its machinery exists and requires immediate action

[SOURCE: IEC 62923-1:2018, 3.1.25]

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3.15
EMS
energy management system
automatic control system for the generation, distribution, storage and loads of electrical energy, including system demand control and management forecast of the electrical energy system, in order to continuously search for an optimum with respect to an operational goal

Note 1 to entry: The energy management system definition is derived from “microgrid energy management system” (IEC 60050-617:2018, 617-04-25) defined as a “system operating and controlling energy resources and loads of the microgrid”.

Note 2 to entry: Examples for such goals can be fuel consumption, emissions, wear and tear, performance and/or reliability.

Note 3 to entry: The EMS is considered to be a tertiary loop. The power management of the power source is the first control loop and the PMS the secondary control loop.

3.16
essential services
~~functions necessary for the propulsion, steering and safety of the ship and its personnel~~

services essential for the navigation, propulsion, steering or manoeuvring of the ship, or for the safety of human life, or for special characteristics of the ship (for example special services)

[SOURCE: IEC 60092-101:2018, 3.3]

3.17
failsafe
~~design property of an item which prevents its failures from resulting in critical faults~~

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