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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 6, *Navigation and ship operations*.

This third edition cancels and replaces the second edition (ISO 11674:2006), which has been technically revised.

The main changes compared to the previous edition are as follows.

— Clause 1: The bridge alert management (BAM) requirement was added.

— Clause 2: The referenced documents such as related to BAM were added.

— Clause 3: Along with renewal of the overall structure of the document, the terms, definitions and abbreviated terms were also updated.

— Clause 4: The IMO performance requirements that were defined in each clauses were summarized in Clause 4. In addition, Clause 4 was classified into Operational requirements (4.2), Functional requirements (4.3), and Control performance requirements (4.4) and the corresponding tests are specified in Clause 6, Clause 7 and Clause 8.

— 4.3.4, 7.4, Annex B: Because the HCS becomes the BAM compliant equipment, alerts with a standard alert identifier, BAM requirements, test methods, communication procedures, and other requirements regarding implementation were added.

— Clause 5: To harmonize with IEC 62065:2014, the test procedure positively utilizing the ship motion simulator of IEC 62065:2014 and the required test results were specified.

— Annex A: In connection with the change in Clause 8, the use of IEC 62065:2014 ship models and wave disturbances for the HCS performance test was specified.

— The IEC 61162 interface requirements specified in the main body of this document were transferred to Annex C, and details were specified.

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Ships and marine technology — Heading control systems

1 Scope

This document specifies the minimum operational, functional and performance requirements, as well as methods of testing and the corresponding required test results, for heading control systems installed on board ships conforming to performance standards adopted by IMO Resolution MSC.64(67), Annex 3.

In addition, it takes into account parts of IMO resolution A.694(17) to which IEC 60945 is associated.

Also it takes into account IMO resolution MSC.302(87) on bridge alert management (BAM).

In this document, the ship models of simulators used for performance testing are based on those from ships with a combined system of propeller propulsion and conventional rudder, with a speed range of up to 30 knots.

The test results are considered also to be valid for ships with multiple parallel operated rudders.

NOTE The text in this document that is identical to that in IMO Resolution A.342(IX), as amended by IMO Resolution MSC.64(67) Annex 3, and IMO Resolution A.694(17), is printed in italics.

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 61162-1, *Maritime navigation and radiocommunication equipment and systems — Digital interfaces — Part 1: Single talker and multiple listeners*

IEC 61162-2, *Maritime navigation and radiocommunication equipment and systems — Digital interfaces — Part 2: Single talker and multiple listeners, high-speed transmission*

IEC 61162-450, *Maritime navigation and radiocommunication equipment and systems — Digital interfaces — Part 450: Multiple talkers and multiple listeners — Ethernet interconnection*

IEC 62288, *Maritime navigation and radiocommunication equipment and systems — Presentation of navigation-related information on shipborne navigational displays — General requirements, methods of testing and required test results*

IEC 62065:2014, *Maritime navigation and radiocommunication equipment and systems — Track control systems — Operational and performance requirements, methods of testing and required test results*

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 62923-2, *Maritime navigation and radiocommunication equipment and systems — Bridge alert management — Part 2: Alert and cluster identifiers and other additional features*

IMO Resolution MSC.302(87), *Performance standards for bridge alert management*

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3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

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

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

— ISO Online browsing platform: available at https://www.iso.org/obp/

— IEC Electropedia: available at http://www.electropedia.org/

3.1.1
adjustment control
control which changes the characteristics of an automatic *heading* (3.1.7) control unit

3.1.2
back-up navigator
individual, generally an officer, designated by the ship master to be on call if assistance is needed on the bridge

[SOURCE: IMO Resolution MSC.74(69), Annex 2:1998, para 4]

3.1.3
change-over control
function for changing over from automatic to *manual steering* (3.1.10) and vice versa

3.1.4
central alert management
CAM
functionality for the management of the presentation of alerts on the *CAM-HMI* (3.1.5), the communication of alert states between CAM-HMI and navigational systems and sensors

Note 1 to entry: The functions may be centralized or partly centralized in subsystems and interconnected via a standardized alert-related communication.

[SOURCE: IMO Resolution MSC.302(87):2010, Appendix 1]

3.1.5
central alert management HMI
CAM-HMI
human machine interface for centralized presentation and handling of alerts on the bridge

[SOURCE: IMO Resolution MSC.302(87):2010, Appendix 1]

3.1.6
central alert management system
CAM system
combined functionality of *CAM* (3.1.4) and *CAM-HMI* (3.1.5)

[SOURCE: IEC 62923-1:2018, 3.1.18]

3.1.7
heading
direction in which the longitudinal axis of the ship is pointed, defined by the angle between the meridian through its position and the fore-and-aft line of the ship, expressed in angular units from true north

Note 1 to entry: The heading is expressed in degrees from true north 000° clockwise through 360°, where 360° becomes identical to 000°.

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3.1.8
heading changing
function of the *heading* (3.1.7) control unit to change a ship's heading towards the altered *preset heading* (3.1.14) by taking the rudder order within the rudder limit, while if possible turning with a preset turn rate or with a preset turning radius, within limits related to the ship's manoeuvrability

3.1.9
heading keeping
function of the *heading* (3.1.7) control unit to keep a ship's heading at the *preset heading* (3.1.14) by taking the rudder order within the rudder limit, within limits related to the ship's manoeuvrability

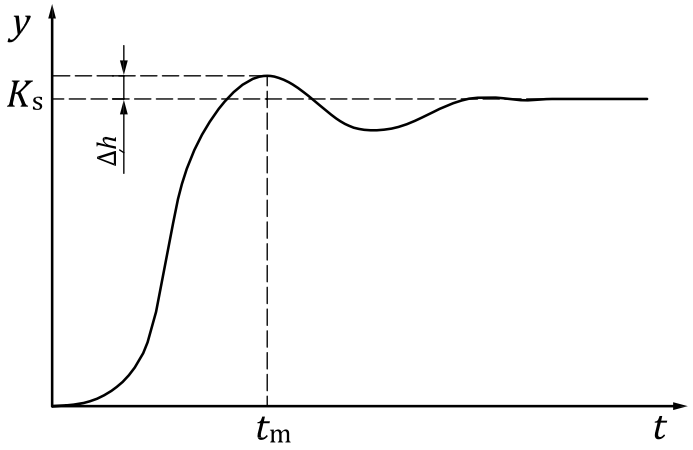
3.1.10
manual steering
method of controlling the steering gear manually

EXAMPLE Using a steering wheel.

3.1.11
off-heading
situation in *heading keeping* (3.1.9), where the ship's *heading* (3.1.7) has deviated from the *preset heading* (3.1.14) beyond a preset limit

3.1.12
overshoot
occurrence of a ship's *heading* (3.1.7) response exceeding the *preset heading* (3.1.14) during *heading changing* (3.1.8), when the preset heading is given as a step input to the HCS

Note 1 to entry: See Figure 1.



Key

Δh	absolute value of overshoot
y	ship' s heading response relative to the previous preset heading during heading changing
k_s	change of the preset heading
t_m	time when ship's heading response reached the maximum value after exceeding k_s
t	time

Figure 1 — Overshoot

3.1.13
power supply
connection point of the HCS to the electrical system on board

Note 1 to entry: A power supply is an external interface to the HCS and may include any AC or DC voltage as defined by the manufacturer. A HCS may have multiple power supplies.

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3.1.14
preset heading
direction in which a ship is steered or intended to be steered as entered into the *heading* (3.1.7) control system

Note 1 to entry: Preset heading is expressed as the angular direction in degrees from true north 000° clockwise through 360°, where 360° becomes identical to 000°.

3.1.15
single operator action
one manual control
procedure achieved by no more than one hard-key or soft-key action, excluding any necessary cursor movements, or voice actuation using programmed codes

[SOURCE: IMO Resolution MSC.302(87):2010, Appendix 1]

3.1.16
steering gear control system
SGCS
function that calculates and provides commands to the rudder actuator(s) to achieve the rudder angle according to the rudder order provided

3.1.17
total power failure
absence of sufficient electrical voltage on all power supplies of the EUT

3.1.18
turning-radius control
method of controlling the rate of turn of a ship to perform turns with a preset turning radius through the water

3.1.19
turn rate control
method of controlling the rudder of a ship to perform turns with a preset turn rate

3.1.20
undershoot
occurrence that during *heading changing* (3.1.8), the ship's *heading* (3.1.7) has never reached the *preset heading* (3.1.14) and the difference between the preset heading and the heading is not within the specified range from the preset heading before/at specified time t_u

Note 1 to entry: See 4.4.3.1.

3.1.21
waypoint
geographic position together with its associated data

[SOURCE: IEC 62065:2014, 3.1.43]

3.2 Abbreviated terms

BAM bridge alert management

BNC back-up navigator call

BNWAS bridge navigational watch alarm system

CAM central alert management

CAM-HMI central alert management-human machine interface

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