
**Ships and marine technology —
Marine echo-sounding equipment**

Navires et technologie maritime — Appareils de sondage par écho

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ISO 9875:2023

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Published in Switzerland

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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 document 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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

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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 fourth edition cancels and replaces the third edition (ISO 9875:2000), which has been technically revised. It also incorporates the Technical Corrigendum ISO 9875:2000/Cor 1:2006.

The main changes are as follows:

- the normative references have been updated;
- bridge alert management requirements have been added in [5.6](#) and the test method in [6.8](#);
- interface requirements have been added in [5.9](#);
- [Annex B](#) has been replaced with a new Annex on alerts definition, including alert identifiers
- added new Annex C on IEC 61162 interfaces overview.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The purpose of echo-sounding equipment is to provide reliable information on the depth of water under a ship to aid navigation in particular in shallow water.

This document is aligned with IMO Resolutions, in particular IMO Resolution A.694(17), IMO Resolution A.224(VII), IMO Resolution MSC.74(69) and IMO Resolution MSC.302(87).

Any text in this document which is a citation from the IMO Resolution MSC.74(69), Annex 4, appears in italics. Within these citations, any changes to the original wording of the IMO Resolution MSC.74(69), Annex 4, are written in upright font.

In this document, the following verbal forms are used:

- “shall” indicates a requirement;
- “should” indicates a recommendation;
- “may” indicates a permission;
- “can” indicates a possibility or a capability.

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Ships and marine technology — Marine echo-sounding equipment

1 Scope

This document specifies the minimum operational and performance requirements, methods of testing and test results of marine echo-sounding equipment required to comply with the performance standards adopted by the IMO Resolution A.224(VII) as amended by IMO Resolution MSC.74(69), Annex 4.

This document is intended to be used in conjunction with IMO Resolution A.694(17) and with IEC 60945.

For bridge alert management, IMO Resolution MSC.302(87) supersedes IMO Resolution MSC.74(69), Annex 4. Accordingly, this document incorporates references to IEC 62923-1 and IEC 62923-2 which are associated with Resolution MSC.302(87) for requirements and tests where applicable.

In accordance with IMO Resolution MSC.74(69), Annex 4, Articles 1 and 2, *the purpose of echo-sounding equipment is to provide reliable information on the depth of water under a ship to aid navigation in particular in shallow water.* This document is *applicable for ship speeds from 0 kn to 30 kn.*

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

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 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 74(69), *Adoption of New and Amended Performance Standards, Annex 4, Amendments to Resolution A.224(VII) — Performance standard for echo sounding equipment*, May 1998

IMO Resolution MSC 302(87), *Adoption of Performance standards for bridge alert management*, May 2010

IMO Resolution A. 694(17), *General requirements for shipborne radio equipment forming part of the global maritime distress and safety system (GMDSS) and for electronic navigational*

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:

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

3.1 source level

S

maximum root mean square sound pressure level at a point on the principal axis of the *transducer* (3.5), as measured in the far field but referred to the distance of 1 m

Note 1 to entry: This value is expressed in decibels.

3.2 receiving directivity index

D

ratio of the acoustic power density at a distant point on the principal axis of the *transducer* (3.5), when used as a transmitter, to that of an omnidirectional transducer, with the same total radiated acoustic power

Note 1 to entry: This value is expressed in decibels.

3.3 receiving bandwidth

B

bandwidth at which the response of the overall system, measured through water, is 3 dB below the maximum response of the system

$$B = 10 \lg(f_1 - f_2)$$

where f_1 and f_2 are respectively the upper and lower frequencies, expressed in hertz.

Note 1 to entry: This value is expressed in decibels.

3.4 minimum detectable signal-to-noise ratio

E

ratio of the signal level, expressed in decibels, to the background noise level, expressed in decibels, in the bandwidth of the receiver required to give a minimum detectable signal on the display

3.5 transducer

substance or device, such as a piezoelectric element, that converts an input electrical energy into an acoustic energy and vice versa, installed on the ship's hull and exposed to the sea water

3.6 performance check

short test to confirm compliance with the essential requirements specified in the equipment standards

Note 1 to entry: In this document, a performance check is a non-quantitative visual check confirming that the system is still operative for the purpose of IEC 60945.

3.7 inspection

visual check of the equipment or documentation

3.8**pre-conditioning**

treatment of a specimen with the objective of removing or partly counteracting the effects of its previous history

3.9**bridge alert management****BAM**

overall concept for management, handling and harmonized presentation of alerts on the bridge

3.10**central alert management****CAM**

functionality for the management of the presentation of alerts on the *central alert management human machine interface (CAM-HMI)* (3.11), the communication of alert states between CAM-HMI and navigational systems and sensors

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

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

3.11**central alert management human machine interface****CAM-HMI**

human machine interface for centralized presentation and handling of alerts on the bridge

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

3.12**central alert management system****CAM system**

combined functionality of *central alert management* (3.10) and *central alert management human machine interface* (3.11)

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

4 Abbreviated terms

| | |
|---------|--|
| DPT | depth |
| ECDIS | electronic chart display and information system |
| ES | echo-sounding equipment |
| EUT | equipment under test |
| BAM | bridge alert management |
| CAM | central alert management |
| CAM-HMI | central alert management human machine interface |
| VDR | voyage data recorder |

5 Performance requirements

5.1 General

Echo-sounding equipment shall comply with IMO Resolution MSC.74(69), Annex 4 and with the general requirements of IEC 60945, where applicable.

Echo-sounding equipment shall comply with IEC 62288.

5.2 Functionality

5.2.1 Range performance

In accordance with IMO Resolution MSC.74(69), Annex 4, Article 5.1.1, *under normal propagation and sea bed reflectivity conditions, the equipment shall be capable of measuring any clearance under the transducer between 2 m and 200 m.*

5.2.2 Range scales

In accordance with IMO Resolution MSC.74(69), Annex 4, Article 5.1.2, *the equipment shall provide a minimum of two range scales one of which, the shallow range, shall cover a range of 20 m, and the other, the deep range, shall cover a range of 200 m.*

Where an automatic range is provided, a device to select these ranges manually shall be available to override the automatic range.

Where phased ranges, not starting from zero, are available, an indication shall be provided to show that such a range is in use.

Positive indication of the range in use shall be provided in all cases.

Where depth measurement relative to the sea surface is provided, in addition to measurement of the depth of water under the ship, there shall be a positive indication of a draught value.

5.2.3 Main display

In accordance with IMO Resolution MSC.74(69), Annex 4, Article 5.1.3, *the primary presentation shall be a suitable graphical display which provides the immediate depth and a visible record of soundings.*

The displayed record shall show at least 15 min of soundings on the deep range scale.

Multi-colour display may be used. In this case, the colour assignment shall be clearly explained in the manual.

5.2.4 Other displays

In accordance with IMO Resolution MSC.74(69), Annex 4, Article 5.1.4, *other forms of display may be added, but these shall not affect the normal operation of the main display.*

5.2.5 Pulse repetition rate

In accordance with IMO Resolution MSC.74(69), Annex 4, Article 5.1.5, *the pulse repetition rate shall not be slower than 12 pulses per minute on the deep range and 36 pulses per minute on the shallow range.*

5.2.6 Roll and pitch

In accordance with IMO Resolution MSC.74(69), Annex 4, Article 5.1.6, *the performance of the equipment shall be such that it will meet the requirements of this document when the ship is rolling $\pm 10^\circ$ and/or pitching $\pm 5^\circ$.*

5.3 Multiple installation

In accordance with IMO Resolution MSC.74(69), Annex 4, Article 5.1.7, *more than one transducer and associated transmitter-receiver may be fitted.*

If more than one transducer is used:

- *means shall be available to display the depths from the different transducers separately; and*
- *a clear indication of the transducer(s) in use shall be provided.*

5.4 Data storage

In accordance with IMO Resolution MSC.74(69), Annex 4, Article 5.1.8, *it shall be possible to record on paper recording or other means the information about:*

- *the depth(s), and*
- *the associated time for 12 h.*

There shall be means to retrieve the recorded information. The information may be recorded and retrieved in the form of graphics or digital readouts at intervals of 1 min.

5.5 Accuracy

5.5.1 Accuracy of measurement

In accordance with IMO Resolution MSC.74(69), Annex 4, Article 5.2.1, *based on a sound speed in water of 1 500 m/s, the tolerance of the indicated depth shall be either:*

- *$\pm 0,5$ m on the shallow range scale, respectively ± 5 m on the deep range scale; or*
- *$\pm 2,5$ % of the indicated depth,*

whichever is the greater.

NOTE These tolerances take no account of the ship's roll and pitch.

5.5.2 Discrimination

In accordance with IMO Resolution MSC.74(69), Annex 4, Article 5.2.2, *the scale of display shall not be smaller than 5,0 mm per metre depth on the shallow range scale and 0,5 mm per metre depth on the deep range scale.*

5.6 Malfunctions and alert and indications

5.6.1 General

The general presentation, handling and communication for alerts shall comply with the requirements stated in IMO Resolution MSC.302(87); IEC 62923-1:2018, Module A and Module C; and in IEC 62923-2, as a minimum.

The alerts with a standard alert identifier for echo-sounding equipment are specified in [Table B.1](#).

NOTE 1 The alert title and alert description texts which are used in [Table B.1](#) and in the body text of this document are not mandatory but are regarded as guidance. Alert titles and alert description texts used in the body text of this document are therefore indicated between double quotation marks (" ").

Manufacturers of echo-sounding equipment shall declare the EUT function type for BAM compliance test.

NOTE 2 According to the EUT function type, the relevant test set-up and test items are specified in BAM test standards. Refer to the following clauses in IEC 62923-1:2018: 4.2 (EUT function types); Clause 5 (Test methods); Clause 6 (Module A - Presentation and handling of alerts on the bridge) and Clause 8 (Module C - Interfacing).

All specific audible indication of echo-sounder equipment shall be described in the operational manual and shall be distinguishable from a BAM alert.

5.6.2 Depth alarm

In accordance with IMO Resolution MSC.74(69), Annex 4, Article 5.3.1, *an alarm signal — both visual and audible with temporary silence function*, in accordance with the requirements of IEC 62923-1— shall be provided when the water depth is below a preset value. If the preset alert depth is not referenced to the transducer position, there shall be an indication of the reference position.

5.6.3 Failure or reduction in power supply ("power fail" alert)

In accordance with IMO Resolution MSC.74(69), Annex 4, Article 5.3.2, *alert signals, both visual and audible (with temporary silence function) to the navigator on the watch*, shall be provided to indicate failure or a reduction in the power supply to the echo sounder which would affect the safe operation of the equipment.

When the echo-sounding equipment is able to detect failure or reduction in power supply and thus remains in operation after failure of one power supply due to the presence of another power supply (e.g. internal UPS), it shall, upon failure of power supply, activate a "power fail" alert of the priority caution, as specified in [Table B.1](#).

In case of total power failure to the echo-sounding equipment, it shall provide a status signal (for instance, by normally closed contact) to enable external equipment to raise the appropriate alert.

This connection with external equipment shall be clearly described in the operator's manual or installation manual.

5.6.4 System failure

An alert, both visual and audible with temporary silence function, shall be provided in order to indicate any malfunction of the echo-sounding equipment which would affect the normal operation of the equipment.

The echo-sounding equipment shall provide the system failure alert ("Fault") with an appropriate priority and description as specified in [Table B.1](#).

Where the echo-sounding equipment has a stand-by mode, this alert does not provide during a stand-by mode.

The echo-sounding equipment shall be fully operation from standby mode with a single action.

5.7 Ergonomic criteria

5.7.1 Operational controls

In accordance with IMO Resolution MSC.74(69), Annex 4, Article 6.1, *the function of range scale selection shall be directly accessible*. Other functions shall be directly accessible and immediately effected by dedicated controls or primary access in an associated menu.

The settings for the following functions shall be recognizable in all light conditions:

— range scale; and