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## **Ships and marine technology — Sound reception systems**

*Navires et technologie maritime — Systèmes de réception sonore*

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ISO 14859:2012

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ISO copyright office  
Case postale 56 • CH-1211 Geneva 20  
Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.org](mailto:copyright@iso.org)  
Web [www.iso.org](http://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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 14859 was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 6, *Navigation and ship operations*.

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## Introduction

Sound reception systems are acoustical-electronic navigational aids to enable the officer of the watch to hear outside sound signals inside a totally enclosed bridge in order to perform the lookout function as required in the International Regulations for Preventing Collisions at Sea, 1972. Optionally, they can also be installed on vessels without fully enclosed bridges.

The requirements in this International Standard take into account human factors, ergonomic principles, and advances in technology.

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# Ships and marine technology — Sound reception systems

## 1 Scope

This International Standard specifies the functional requirements and recommended installation and performance tests for sound reception systems. Guidelines have been drawn up for the methods and solutions to meet the functional requirements.

The requirements apply to fully enclosed bridges, and other bridges where such equipment is voluntarily installed.

This International Standard specifies bridge requirements that will secure a safe and efficient lookout on those seagoing ships having a fully enclosed bridge.

This International Standard will be for the design of ship bridges. It will also be useful for

- a) specifiers and procurers of ships and bridge equipment, and
- b) operators and owners for ensuring that changes made through the life of a ship still conform to its requirements.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3745, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Precision methods for anechoic rooms and hemi-anechoic rooms*

ISO 9613-1, *Acoustics — Attenuation of sound during propagation outdoors — Part 1: Calculation of the absorption of sound by the atmosphere*

IEC 60945:2002, *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 61162-450, *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*

IMO, International Regulations for Preventing Collisions at Sea, COLREG 72, *Sound Signal Appliances*

IMO Resolution A.468(XII), *Code on Noise Levels on Board Ships*

IMO Resolution A.694(17), *General Requirements for Shipborne Radio Equipment Forming Part of the GMDSS and for Electronic Navigational Aids*

MSC.86(70), Annex 1, *Recommendation on performance standards for sound reception systems*

## 3 Terms and definitions

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

### 3.1

#### **dB(A)**

sound pressure measurement in decibels using A-weighting scale

NOTE The A-weighting scale is used for industrial and environmental applications.

### 3.2

#### **SPL**

##### **Sound Pressure Level**

calculation in dB as a ratio of the measured sound pressure to a reference sound pressure, which, for SPL, is 20 uPa

## 4 Functional requirements

### 4.1 General

Users of this International Standard shall note that while attempting to implement its requirements, they shall ensure compliance with such statutory requirements, rules and regulations as may be applicable to the individual ship concerned.

NOTE All requirements that are extracted from the recommendations of IMO Resolution MSC.86(70), annex 1, Performance standards for sound reception systems, are printed in italics and the resolution and paragraph numbers are indicated in brackets.

Sound reception systems shall comply with the following minimum requirements in addition to the general requirements contained in resolution MSC.86(70), Annex 1, and A.694(17).

#### 4.1.1 Environmental

The sound reception system shall conform to the environmental requirements of IEC 60945. Those elements of the system exposed to the weather shall use the exposed category and those inside the bridge shall use the protected category.

The sound reception system shall be resistant to icing and frost conditions.

#### 4.1.2 Audio functions

[IMO MSC.86(70) Annex 1, 2.1.2, 2.1.4 and 3.1] The system shall *reproduce incoming sound signals acoustically inside the bridge. Incoming sound signals shall be reproduced inside the bridge by means of at least one loudspeaker. The system shall suppress unwanted background noise while allowing reception of meaningful sounds.* The operator must set an appropriate output level to ensure the signal is heard on the bridge.

[IMO MSC.86(70) Annex 1, 3.2] *The volume at the speaker(s) shall be adjustable by means of one volume control only. The volume control shall be capable of being set so that the sound pressure level reproduced on the bridge for an incoming signal is at least 10 dB(A) above the maximum ambient bridge noise level of 65 dB(A) measured at a distance of 1 m.*

#### 4.1.3 Frequency range

[IMO MSC.86(70) Annex 1, 2.1.1] The system shall *receive sound signals from all directions in the audio band 70 Hz-2 100 Hz.* This frequency range exceeds the limits stated in IMO Resolution MSC.86 (70), Annex 1. The audibility of a signal of the sound signal appliance is influenced by its fundamental frequency and may include higher frequency content on smaller vessels.

#### 4.1.4 Visual indicator

[IMO MSC.86(70) Annex 1, 2.1.3] There shall be a display which gives a visual indication of the incoming signals and their approximate direction. The system shall *indicate the approximate direction of incoming sound signals to determine at least whether the sound signal being detected is forward of or abaft the beam and from which side of the ship it is being detected.* The visual indication shall persist for a minimum of 3 s. The



visual indication can be a dedicated display unit or part of a combined, multifunction display as long as the performance criteria in this specification are met.

The visual display must indicate the sound being reproduced on the speaker.

#### 4.1.5 Disable function

The system shall provide an input that disables its amplifier when the ship's horn or whistle is sounded.

#### 4.1.6 Self-test

The system shall provide either a built-in self-test function or an alternate test process to verify the operational status of the microphones and system on a periodic basis. The alternate test process shall be described in the user documentation along with a suggested schedule of testing.

#### 4.1.7 Marking and identification

The sound reception systems shall conform to the marking requirements of IEC 60945.

#### 4.1.8 Information

Manufacturer documentation for the sound reception systems shall meet the requirements of IEC 60945.

### 4.2 Installation recommendations

#### 4.2.1 Microphone placement

The microphones shall be installed in such a way that they are as far from noise sources in the ship as is reasonably practicable where wind induced noise and mechanical vibrations are reasonably reduced.

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#### 4.2.2 Display placement

The display shall be installed so that it is visible from the conning position. Optionally, the information may be displayed (as on overlay) on other systems such as a radar or ECDIS display. Serial interfaces and sound reception system information display on other systems shall comply with IEC 61162-1 and IEC 62288 respectively.

#### 4.2.3 Speaker placement

[IMO MSC.86(70) Annex 1, 4.3] *The loudspeaker(s) should be installed so that incoming sound signals are audible at all positions inside the bridge.*

## 5 Type tests

### 5.1 General

Type testing of the equipment shall validate that the equipment meets the performance requirements stated in Clause 4.

Type testing of operational performance characteristics can be carried out on a ship, in a test facility, or a combination of both locations. Guidance for testing is provided in 5.2 and 5.3.

#### 5.1.1 Sensitivity and frequency response

Type testing shall confirm the sensitivity and frequency response of the audio processing functions. When type testing of sensitivity and frequency response is performed at a test facility using a test signal, the test signal shall simulate the spectrum and SPL of sources in COLREG 72, Sound Signal Appliances at the distance