

FINAL
DRAFT

INTERNATIONAL
STANDARD

ISO/FDIS
8728

ISO/TC 8/SC 6

Secretariat: JISC

Voting begins on:
2023-09-11

Voting terminates on:
2023-11-06

Ships and marine technology — Marine gyro-compasses

*Navires et technologie maritime — Compas gyroskopiques à usage
marin*

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO/FDIS 8728

<https://standards.iteh.ai/catalog/standards/sist/43e8c715-349a-4627-8c47-f29524a3cbb4/iso-fdis-8728>

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.



Reference number
ISO/FDIS 8728:2023(E)

© ISO 2023

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO/FDIS 8728

<https://standards.iteh.ai/catalog/standards/sist/43e8c715-349a-4627-8c47-f29524a3cbb4/iso-fdis-8728>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2023

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

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

Published in Switzerland

Contents

	Page
Foreword.....	v
Introduction.....	vi
1 Scope.....	1
2 Normative references.....	1
3 Terms and definitions.....	1
4 Abbreviated terms.....	3
5 Construction requirements.....	4
6 Performance requirements.....	5
6.1 Accuracy in latitudes up to 60°.....	5
6.1.1 Settling time.....	5
6.1.2 Settle point error.....	5
6.1.3 Settling time under operational conditions.....	5
6.1.4 Settle point error under general conditions.....	5
6.1.5 Residual error in correction.....	5
6.1.6 Effect of alteration of speed.....	5
6.1.7 Effect of alteration of course.....	5
6.1.8 Accuracy on a Scorsby table.....	6
6.1.9 Synchronization between the master compass and repeaters.....	6
6.2 Interface.....	6
6.3 Alert management.....	6
6.3.1 General.....	6
6.3.2 Power failure in the gyro-compass (“GC power fail” alert).....	6
6.3.3 Malfunction of the gyro-compass system (“System fault” alert).....	7
7 Type tests.....	7
7.1 General.....	7
7.2 Settling time test.....	7
7.3 Settle point error test.....	7
7.4 Settle point heading repeatability test.....	7
7.5 Settling time on a Scorsby table.....	8
7.6 Scorsby test.....	8
7.7 Intercardinal motion test.....	8
7.8 Repeater accuracy test.....	9
7.9 Speed correction test.....	9
7.10 General requirement test.....	9
7.10.1 General.....	9
7.10.2 Voltage variation test.....	10
7.10.3 Frequency variation test.....	10
7.10.4 Vibration tests.....	10
7.10.5 Temperature test.....	11
7.10.6 Damp heat test.....	11
7.10.7 Other tests.....	11
7.11 Interface test.....	12
7.12 Alert management test.....	12
7.12.1 Basic test for alert management.....	12
7.12.2 “Power fail” alert or output of a status signal on the EUT power.....	12
7.12.3 “System fault” alert.....	12
8 Marking.....	13
9 Information.....	13
Annex A (normative) Requirements for ship surveyors for the installation of gyro-compasses and repeater compasses on board ships.....	14

Annex B (normative) Alerts definition for gyro-compasses	15
Annex C (normative) IEC 61162 interfaces for VDR and other external equipment	16
Bibliography	18

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO/FDIS 8728

<https://standards.iteh.ai/catalog/standards/sist/43e8c715-349a-4627-8c47-f29524a3cbb4/iso-fdis-8728>

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.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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 8728:2014), which has been technically revised.

The main changes are as follows:

- [Clause 4](#) (abbreviated terms) has been added;
- in [6.3](#), requirements related to bridge alert management have been added;
- in [7.1](#), a requirement for display equipment has been added;
- in [7.12](#), test method for requirements related to bridge alert management has been added;
- in [Annex B](#), the equivalent requirements in ISO 8728 and IMO Resolution have been deleted and the alerts with a standard alert identifier have been defined;
- in [Annex C](#), IEC 61162 interfaces overview has been added;
- the normative references and bibliography have been updated.

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

This document is aligned with IMO Resolution A.424(XI) on performance standards for gyro-compasses.

Any text in this document which is a citation from the IMO Resolution A.424(XI), appears in italics. Within these citations, any changes to the original wording of the IMO Resolution A.424(XI) 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.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO/FDIS 8728

<https://standards.iteh.ai/catalog/standards/sist/43e8c715-349a-4627-8c47-f29524a3cbb4/iso-fdis-8728>

Ships and marine technology — Marine gyro-compasses

1 Scope

This document specifies the construction, performance, and type testing for gyro-compasses which are required by the International Convention for the Safety of Life at Sea (SOLAS), 1974 (as amended), Chapter V, Regulation 19.

This document specifies the minimum requirements, the construction, performance, and type testing for gyro-compasses, which required to comply with the performance standards adopted by the IMO Resolution A.424(XI).

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, *Marine 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 302(87), *Performance standards for bridge alert management*

IMO Resolution MSC 191(79), *Performance standards for the presentation of navigation-related information on shipborne navigational displays*

IMO Resolution MSC 466(101), *Amendments to the performance standards for the presentation of navigation-related information on shipborne navigational displays (Resolution MSC.191(79))*

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
gyro-compass**
complete equipment comprising all essential elements of the complete design, including both the gyro-compass as heading sensor and the associated heading transmission system

[SOURCE: IMO Resolution A.424(XI), 2.1, modified — elements of complete design have been specified.]

**3.2
true heading**
horizontal angle between the vertical plane passing through the true meridian and the vertical plane passing through the ship's fore-and-aft datum line

Note 1 to entry: The true heading is measured from true north (000°) clockwise through 360°.

Note 2 to entry: When the gyro-compass equipment is not installed on board ship, this “true heading” is regarded as the true heading of the lubber line. Where a gyro-compass has the facility of introducing a correction by moving the lubber line, the correction is set for the local latitude.

[SOURCE: IMO Resolution A.424(XI), 2.2, modified — notes 1 and 2 to entry have been added.]

**3.3
settled**
stable situation when any three readings taken at intervals of 30 min are within a band of 0,7°, with the compass level and stationary

Note 1 to entry: The settling time is the elapsed time between the time of switch-on at the initial heading error and the third recording of the settle.

[SOURCE: IMO Resolution A.424(XI), 2.3, modified — note 1 to entry has been added.]

**3.4
settle point heading**
mean value of ten readings taken at 20 min intervals after the compass has *settled* (3.3)

[SOURCE: IMO Resolution A.424(XI), 2.4]

**3.5
settle point error**
difference between the *settle point heading* (3.4) and the *true heading* (3.2)

[SOURCE: IMO Resolution A.424(XI), 2.5]

**3.6
error**
difference between the observed value and the *settle point heading* (3.4)

[SOURCE: IMO Resolution A.424(XI), 2.6]

**3.7
repeater compass**
device that reproduces the master compass card at a remote location

**3.8
bearing repeater compass**
device that reproduces the master compass card for the purpose of taking bearings

**3.9
compass card**
graduated dial of the compass which indicates the measured direction of the meridian

3.10**latitude error**

error (3.6) to which some *gyro-compasses* (3.1) are subject, the magnitude and sign of which depend upon the local latitude

Note 1 to entry: Means are provided for correcting this error.

3.11**speed error**

error (3.6) to which *gyro-compasses* (3.1) are subject, the magnitude and sign of which depend upon the speed, course, and latitude of the ship

Note 1 to entry: Means are provided for correcting this error.

3.12**lubber line**

index line situated on the body of a compass against which the compass heading is read

3.13**master compass**

main compass unit which supplies the heading information to the repeaters and other navigational aids

3.14**Scorsby table**

test machine which enables a platform to oscillate independently about three axes

Note 1 to entry: It is used to simulate the motion of a ship.

3.15**bridge alert management****BAM**

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

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

3.16**central alert management system****CAM system**

combined functionality of the central alert management and the central alert management human machine interface

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

4 Abbreviated terms

For the purposes of this document, the following abbreviated terms apply.

BAM	bridge alert management
CAM	central alert management
EUT	equipment under test
GC	gyro-compass
GNSS	global navigation satellite system
SDME	speed and distance measuring system
VDR	Voyage Data Recorder

5 Construction requirements

Gyro-compass units shall conform to the following requirements.

- a) In accordance with IMO Resolution A.424(XI), 6.1 and 8, *the equipment shall be capable of continuous operation under conditions of vibration, humidity, change of temperature and variations of the power supply as specified in 7.10.2 to 7.10.6.*
- b) For ships which are required to carry bearing repeater compasses, the construction of these shall be as follows.
 - 1) The bearing repeater compass shall be designed to be fitted with an azimuth reading device.
 - 2) A gimbal mechanism shall be provided to enable the bearing repeater compass card to be held horizontally against the ship's motion.
 - 3) Any bearing repeater compass intended for use on an open deck shall be waterproof.
- c) In accordance with IMO Resolution A.424(XI), 3, *the compass card shall be graduated at equal intervals of 1° or fraction thereof.*

The graduation error shall be less than $\pm 0,2^\circ$.

A numerical indication shall be provided at least at every 10°, starting from 000° clockwise through 360°.

- d) In accordance with IMO Resolution A.424(XI), 4, *fully adequate illumination shall be provided to enable the reading of all compass cards at all times. Facilities for dimming shall be provided.*
- e) Both master compass and repeater compasses shall be provided with a lubber line to indicate the ship's heading.

The base or some other fixed extremity of the compass shall be marked or identified in such a way as to facilitate the installation of the compass in a ship, so that the lubber line lies in a vertical fore-and-aft plane of the ship. Where a gyro-compass has the facility of introducing a correction by moving the lubber line, the correction during installation shall be set to zero. If such marks or identifications are not in the same vertical planes as the uncorrected lubber line, then the horizontal angular relationship between them shall be clearly indicated.

- f) In accordance with IMO Resolution A.424(XI), 9.1, *the master compass and any repeaters used for taking visual bearings shall be installed or adjusted in a ship with their fore and aft datum lines parallel to the ship's fore and aft datum line to within $\pm 0,5^\circ$. The lubber line shall be in the same vertical plane passing through the centre of the card of the compass and shall be aligned accurately in the fore and aft direction.*

Requirements for ship surveyors for installation of gyro-compasses and repeater compasses on board ships shall be in accordance with [Annex A](#).

- g) In accordance with IMO Resolution A.424(XI), 9.2, *means shall be provided for correcting the errors induced by speed and latitude.* Graphical or tabular means of correction can be used.
- h) In accordance with IMO Resolution A.424(XI), 7.1, *steps shall be taken to eliminate as far as is practicable, the causes of, and to suppress, electromagnetic interference between the gyro-compass and other equipment on board.*
- i) In accordance with IMO Resolution A.424(XI), 7.2, *mechanical noise from all units shall be so limited as to ensure the hearing of sounds on which the safety of the ship may depend.*
- j) In accordance with IMO Resolution A.424(XI), 9.7, *the equipment shall be so constructed that it is readily accessible for maintenance purposes.*

- k) In accordance with IMO Resolution A.424(XI), 6.2, means shall be incorporated for the protection of the equipment from excessive currents and voltages, transients and accidental reversal of power supply polarity.
- l) In accordance with IMO Resolution A.424(XI), 6.3, if provision is made for operating the equipment from more than one source of electrical energy, arrangements for rapidly changing from one source of supply to the other shall be incorporated.
- m) In accordance with IMO Resolution A.424(XI), 9.4, the gyro-compass shall be designed to enable heading information to be provided to other navigational aids. See [6.2](#).

6 Performance requirements

6.1 Accuracy in latitudes up to 60°

6.1.1 Settling time

In accordance with IMO Resolution A.424(XI), 5.1.1, when switched on in accordance with the manufacturer's instructions, the compass shall settle within 6 h.

6.1.2 Settle point error

In accordance with IMO Resolution A.424(XI), 5.1.2, the settle point error at any heading shall not exceed $\pm 0,75^\circ \times \secant\ latitude$, and the RMS value of the differences between individual heading indications and the mean value shall be less than $0,25^\circ \times \secant\ latitude$. The repeatability of settle point error from one run-up to another shall be within $0,25^\circ \times \secant\ latitude$.

6.1.3 Settling time under operational conditions

In accordance with IMO Resolution A.424(XI), 5.2.1, when switched on in accordance with the manufacturer's instructions, the compass shall settle within 6 h when rolling and pitching with simple harmonic motion of any period between 6 s and 15 s, a maximum angle of 5°, and a maximum horizontal acceleration of 0,22 m/s².

6.1.4 Settle point error under general conditions

In accordance with IMO Resolution A.424(XI), 5.2.2, the repeatability of the settle point error of the master compass shall be within $\pm 1^\circ \times \secant\ latitude$ under the general conditions and including variations in magnetic fields likely to be experienced in the ship in which it is installed.

6.1.5 Residual error in correction

In accordance with IMO Resolution A.424(XI), 5.2.3.1, the residual steady-state error, after correction for speed and course influences at a speed of 20 kn¹⁾, shall not exceed $\pm 0,25^\circ \times \secant\ latitude$.

6.1.6 Effect of alteration of speed

In accordance with IMO Resolution A.424(XI), 5.2.3.2, the error due to a rapid alteration of speed of 20 kn¹⁾ shall not exceed $\pm 2^\circ$.

6.1.7 Effect of alteration of course

In accordance with IMO Resolution A.424(XI), 5.2.3.3, the error due to a rapid alteration of course of 180° at a speed of 20 kn¹⁾ shall not exceed $\pm 3^\circ$.

1) 1 kn = 1,852 km/h.