INTERNATIONAL STANDARD

ISO 22090-1

First edition
2002-09-01

Ships and marine technology — Transmitting heading devices (THDs) —

Part 1: Gyro-compasses

Navires et technologie maritime — Dispositifs de pilotage à transmission de données —

Partie 1: Compas gyroscopiques

Reference number
ISO 22090-1:2002(E)

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.ch
Web www.iso.ch

Printed in Switzerland

Contents

Page

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 3.

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 part of ISO 22090 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 22090-1 was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 6, *Navigation*.

ISO 22090 consists of the following parts, under the general title *Ships and marine technology — Transmitting heading devices (THDs)*:

— *Part 1: Gyro-compasses*

— *Part 2: Geo-magnetic principles*

— *Part 3: GNSS principles*

Annex A of this part of ISO 22090 is for information only.

Ships and marine technology — Transmitting heading devices (THDs) —

Part 1: Gyro-compasses

1 Scope

This part of ISO 22090 specifies the construction, performance and testing of gyro-compasses as transmitting heading devices required by chapter V, SOLAS 1974 (as amended).

A Transmitting heading device (THD) is an electronic device that provides information about the ship's true heading.

In addition to the general requirements contained in IMO Resolution A.694 (17) to which IEC 60945 is associated and the relevant standard for the sensing part used, the THD equipment should comply with the following minimum requirements.

Where the IMO performance standards that apply to the sensing part do not specify a geographical operating area that the THD should operate;

a) at maximum rate of turn 20°/s;

b) from 70° latitude south to 70° latitude north as minimum.

The THDs complying with the requirements contained in this part of ISO 22090 can be used for heading information as contained in chapter V of the SOLAS Convention.

However, ships within a speed range of 30 knots to 70 knots should comply with the requirements of IMO Resolution A.821(19)

In addition, such THDs should meet the dynamic requirements contained in the HSC Code, chapter 13 for the carriage of a suitable device providing heading information.

NOTE 1 Several technologies can be used to detect and transmit heading information. It is illogical to standardize the detection of the heading separately from the transmission of the heading. Therefore, separate parts of this part of ISO 22090 refer to different technologies. The requirements of this part of ISO 22090 only apply to gyroscopic technology. Other technologies are covered in other parts of ISO 22090.

NOTE 2 All requirements that are extracted from the recommendations of IMO Resolution MSC. 116 (73) on performance standards for transmitting heading devices are printed in italics.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 22090. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 22090 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 694, *Ships and marine technology — Positioning of magnetic compasses in ships*

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*

IMO Resolution A. 424(XI), *Performance standards for gyro-compasses*

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 aids*

IMO Resolution A.813(19), *General requirements for electromagnetic compatibility (EMC) for all electrical and electronic ship's equipment*

IMO Resolution A.821(19), *Performance standards for gyro-compasses for high-speed craft*

3 Terms and definitions

For the purposes of this part of ISO 22090, the following terms and definitions apply.

3.1
gyro-compass
complete equipment including all essential elements of the complete design including both the gyro-compass as heading sensor and the associated heading transmission system

3.2
heading
any ship's heading to be input to the THD function

NOTE It is defined by the direction of the vertical projection of the fore-and-aft line of the ship onto the horizontal plane. When measured relative to the true north, magnetic north or compass north, it is respectively defined as true heading, magnetic heading or compass heading, and is usually expressed in degrees as a three-figure group, starting from north, in a clockwise direction around the compass card.

3.3
sensing part
sensing function of detecting any heading information connected to the transmitting part

3.4
transmitting part
device which receives heading information from the sensing part and converts this to the required accurate signal

3.5
true heading
horizontal angle between the vertical plane passing through the true meridian and the vertical plane passing through the craft's fore and aft datum line, measured from true north (000°) clockwise through 360°

3.6
transmission and resolution error
error which is caused by the method used to transmit the original information to a receiving device

NOTE Such a method may have a limited capability to code any possible value of the information e.g. step output with 1/6° resolution. This error is also caused by the method used inside the THD and at its output to code the information.

3.7
static error
error caused by any reason and which stays unchanged in value during the operation of the system, measured under static conditions

NOTE This error is the same as that defined in 3.12.

3.8
dynamic error
error caused by dynamic influences acting on the system, such as vibration, roll, pitch or linear acceleration

NOTE This error may have an amplitude and usually a frequency related to the environmental influences and the parameters of the system itself. This error is the same as defined in 3.13.

3.9
follow-up error
error caused by the delay between the existence of a value to be sensed and the availability of the corresponding signal or data stream at the output of the system; e.g. the difference between the real heading of a turning vessel and the available information at the output of the system

NOTE A follow-up error disappears when the system is static.

3.10
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 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.

3.11
settle point heading
mean value of ten readings taken at 20 min intervals after the compass has settled as defined in 3.10

3.12
settle point error
difference between the settle point heading as defined in 3.11 and the true heading

See 3.7.

3.13
error
difference between the observed value and the settle point heading as defined in 3.11

See 3.8.

3.14
latitude error
error to which some gyro-compasses are subject and whose magnitude and sign depend upon the local latitude

3.15
speed error
error to which gyro-compasses are subject and whose magnitude and sign depend upon the speed, course and latitude of the ship

3.16
master compass
main compass unit which supplies the heading information to the transmitting part or other navigational aids

3.17
Scorsby table
test machine which independently oscillates a platform about three axes and is used to simulate the motion of a ship

3.18
intercardinal motion
representing an integral motion of the ship and is used for error test within motion in dynamic simulation test

4 Performance requirements

4.1 Functionality

In this part of ISO 22090, the gyro-compass is specified as the function of THD.

The THD generates a heading signal and outputs a suitable signal for other devices.

Any sensing part defined in 3.3 may be included in the device.

If any correcting devices or parameters have been associated, they shall be protected against inadvertent operation.

Manually entered values used for electronic correction shall be indicated by adequate means.

Gyro-compass units shall conform to the requirements listed in 4.2 to 4.8.

4.2 Continuous operation

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 6.10.

4.3 Information

All displays with the exception of the sensor, and all outputs of heading shall indicate true heading.

Indication shall be displayed, readable to a tenth of a degree.

4.4 Fore and aft mark

The compass shall be marked to facilitate installation in fore and aft line of the ship.

4.5 Speed error correction

Means shall be provided for correcting the errors induced by speed and latitude. An approved accurate speed source shall be used for automatic speed error corrections.

4.6 Heading information

The THD shall provide true heading information to the other navigational equipment.

Heading information shall provide an output with an accuracy as defined in clause 5.

At least one output shall be in accordance with the relevant international marine interface standard, IEC 61162-1 and IEC 61162-2.

4.7 Status indication

Status shall be indicated that the gyro-compass is ready to use.

4.8 Alarm signal

An alarm shall be provided to indicate malfunctions of the THD or a failure of the power supply.

5 Accuracy

5.1 General

The THD shall meet at least the following accuracy at the output of the device under sea conditions as specified in IMO Resolution A.424(XI) or A.821(19) as applicable.

5.2 Accuracy of transmission data

The transmission error, including the resolution error, shall be less than ± 0,2°.

5.3 Accuracy under static conditions

5.3.1 Settling time under static conditions

When switched on in accordance with the manufacturer's instructions, the compass shall settle within 6 h.

5.3.2 Static error (settle point error)

5.3.2.1 The static error (settle point error) as defined in 3.7 (3.12), at any heading shall be less than ± 1,0° × secant latitude, and the RMS value of the differences between individual heading indications and the mean value shall be less than 0,35° × secant latitude.

5.3.2.2 The repeatability of settle point error from one run-up to another shall be within 0,35° × secant latitude.

5.4 Accuracy under dynamic conditions

5.4.1 Settling time under dynamic conditions

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, at a maximum angle of 5°, and a maximum horizontal acceleration of 0,22 m/s^2.

5.4.2 Dynamic error

The dynamic error amplitude shall be less than ± 1,5° × secant latitude. The dynamic error frequency shall be less than 0,033 Hz equivalent to a period not shorter than 30 s if the amplitude of the dynamic error exceeds ± 0,5°.