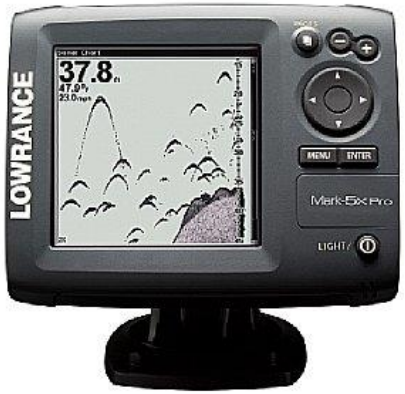
Carriage requirements for shipborne navigational systems and equipment



References:

SOLAS - International Convention for the Safety of Life at Sea, chapter V, regulation 19

Application and requirements

Ships constructed on or after 1 July 2002 shall be fitted with navigational systems and equipment which will fulfil the requirements prescribed in paragraphs A to I:

SHIPBORNE NAVIGATIONAL EQUIPMENT AND SYSTEMS

A) All ships irrespective of size shall have:

1. a properly adjusted standard magnetic compass or other means, independent of any power supply to determine the ship's heading and display the reading at the main steering position;
2. a pelorus or compass bearing device, or other means, independent of any power supply to take bearings over an arc of the horizon of 360°;

3. means of correcting heading and bearings to true at all times;
4. nautical charts and nautical publications to plan and display the ship's route for the intended voyage and to plot and monitor positions throughout the voyage. An electronic chart display and information system (ECDIS) is also accepted as meeting the chart carriage requirements of this subparagraph. Ships to which paragraph 2.10 applies shall comply with the carriage requirements for ECDIS detailed therein;

A) All ships irrespective of size shall have:

5. back-up arrangements to meet the functional requirements of paragraph 4, if this function is partly or fully fulfilled by electronic means; An appropriate folio of paper nautical charts may be used as a back-up arrangement for ECDIS. Other back-up arrangements for ECDIS are acceptable (see appendix 6 to resolution A.817(19), as amended)
6. a receiver for a global navigation satellite system or a terrestrial radionavigation system, or other means, suitable for use at all times throughout the intended voyage to establish and update the ship's position by automatic means;
7. if less than 150 gross tonnage and if practicable, a radar reflector or other means, to enable detection by ships navigating by radar at both 9 and 3 GHz;

8. when the ship's bridge is totally enclosed and unless the Administration determines otherwise, a sound reception system, or other means, to enable the officer in charge of the navigational watch to hear sound signals and determine their direction;
9. a telephone, or other means, to communicate heading information to the emergency steering position, if provided;

B) All ships of 150 gross tonnage and upwards and passenger ships irrespective of size shall, in addition to the requirements of paragraph A, be fitted with

1. a spare magnetic compass interchangeable with the magnetic compass, as referred to in paragraph A.1, or other means to perform the function referred to in paragraph A.1 by means of replacement or duplicate equipment
2. a daylight signalling lamp, or other means to communicate by light during day and night using an energy source of electrical power not solely dependent upon the ship's power supply.
3. a bridge navigational watch alarm system (BNWAS), as follows:
    1. *cargo ships of 150 gross tonnage and upwards and passenger ships irrespective of size constructed on or after 1 July 2011*
    2. *passenger ships irrespective of size constructed before 1 July 2011, not later than the first survey after 1 July 2012;*
    3. *cargo ships of 3,000 gross tonnage and upwards constructed before 1 July 2011, not later than the first survey after 1 July 2012;*
    4. *cargo ships of 500 gross tonnage and upwards but less than 3,000 gross tonnage constructed before 1 July 2011, not later than the first safety survey after 1 July 2013; and*
    5. *cargo ships of 150 gross tonnage and upwards but less than 500 gross tonnage constructed before 1 July 2011, not later than the first survey after 1 July 2014.*

The bridge navigational watch alarm system shall be in operation whenever the ship is underway at sea.

C) All ships of 300 gross tonnage and upwards and passenger ships irrespective of size shall, in addition to meeting the requirements of paragraph B, be fitted with:

1. an echo sounding device, or other electronic means, to measure and display the available depth of water;
2. a 9 GHz radar, or other means to determine and display the range and bearing of radar transponders and of other surface craft, obstructions, buoys, shorelines and navigational marks to assist in navigation and in collision avoidance;
3. an electronic plotting aid, or other means, to plot electronically the range and bearing of targets to determine collision risk;
4. speed and distance measuring device, or other means, to indicate speed and distance through the water;
5. a properly adjusted transmitting heading device, or other means to transmit heading information for input to the equipment referred to in paragraphs C.2 (radar), C.3 (EPA) and D (AIS).

D) All ships of 300 gross tonnage and upwards engaged on international voyages and cargo ships of 500 gross tonnage and upwards not engaged on international voyages and passenger ships irrespective of size shall be fitted with an automatic identification system (AIS), as follows:

1. *ships constructed on or after 1 July 2002;*
2. *ships engaged on international voyages constructed before 1 July 2002:*
    1. *in the case of passenger ships, not later than 1 July 2003;*
    2. *in the case of tankers, not later than the first survey for safety equipment* on or after 1 July 2003;*
    3. *in the case of ships, other than passenger ships and tankers, of 50,000 gross tonnage and upwards, not later than 1 July 2004;*
    4. *in the case of ships, other than passenger ships and tankers, of 300 gross tonnage and upwards but less than 50,000 gross tonnage, not later than the first safety survey after 1 July 2004 or by 31 December 2004, whichever occurs earlier; and*
3. *ships not engaged on international voyages constructed before 1 July 2002, not later than 1 July 2008;*
4. *the Administration may exempt ships from the application of the requirements of this paragraph when such ships will be taken permanently out of service within two years after the implementation date specified in subparagraphs D.2 i D.3*

5. AIS shall:
    1. *provide automatically to appropriately equipped shore stations, other ships and aircraft information, including the ship's identity, type, position, course, speed, navigational status and other safety-related information*
    2. *receive automatically such information from similarly fitted ships;*
    3. *monitor and track ships; and*
    4. *exchange data with shore-based facilities;*
6. the requirements of paragraph D.5 shall not be applied to cases where international agreements, rules or standards provide for the protection of navigational information; and
7. AIS shall be operated taking into account the guidelines adopted by the IMO. Ships fitted with AIS shall maintain AIS in operation at all times except where international agreements, rules or standards provide for the protection of navigational information.

E) All ships of 500 gross tonnage and upwards shall, in addition to meeting the requirements of paragraph C with the exception of paragraphs C.3 (EPA) and C.5 (THD), and the requirements of paragraph D, have:

1. a gyro compass, or other means, to determine and display their heading by shipborne non-magnetic means, being clearly readable by the helmsman at the main steering position. These means shall also transmit heading information for input to the equipment referred in paragraphs C.2 (radar), D (AIS) and E.5 (ATA);
2. a gyro compass heading repeater, or other means, to supply heading information visually at the emergency steering position if provided;
3. a gyro compass bearing repeater, or other means, to take bearings, over an arc of the horizon of 360º, using the gyro compass or other means referred to in subparagraph .1. However ships less than 1,600 gross tonnage shall be fitted with such means as far as possible;
4. rudder, propeller, thrust, pitch and operational mode indicators, or other means to determine and display rudder angle, propeller revolutions, the force and direction of thrust and, if applicable, the force and direction of lateral thrust and the pitch and operational mode, all to be readable from the conning position; and
5. an automatic tracking aid (ATA), or other means, to plot automatically the range and bearing of other targets to determine collision risk.

F) On all ships of 500 gross tonnage and upwards, failure of one piece of equipment should not reduce the ship's ability to meet the requirements of paragraphs A.1, A.2 and A.4.

G) All ships of 3000 gross tonnage and upwards shall, in addition to meeting the requirements of paragraph E, have:

1. a 3 GHz radar or where considered appropriate by the Administration a second 9 GHz radar, or other means to determine and display the range and bearing of other surface craft, obstructions, buoys, shorelines and navigational marks to assist in navigation and in collision avoidance, which are functionally independent of those referred to in paragraph 2.3.2; and
2. a second automatic tracking aid, or other means to plot automatically the range and bearing of other targets to determine collision risk which are functionally independent of those referred to in paragraph 2.5.5.

H) All ships of 10,000 gross tonnage and upwards shall, in addition to meeting the requirements of paragraph G with the exception of paragraph G.2, have:

1. an automatic radar plotting aid, or other means, to plot automatically the range and bearing of at least 20 other targets, connected to a device to indicate speed and distance through the water, to determine collision risks and simulate a trial manoeuvre; and
2. a heading or track control system, or other means, to automatically control and keep to a heading and/or straight track.

I) All ships of 50,000 gross tonnage and upwards shall, in addition to meeting the requirements of paragraph H, have:

1. a rate of turn indicator, or other means, to determine and display the rate of turn; and
2. a speed and distance measuring device, or other means, to indicate speed and distance over the ground in the forward and athwartships direction.

J) Ships engaged on international voyages shall be fitted with an Electronic Chart Display and Information System (ECDIS) as follows:

1. passenger ships of 500 gross tonnage and upwards constructed on or after 1 July 2012;
2. tankers of 3,000 gross tonnage and upwards constructed on or after 1 July 2012;
3. cargo ships, other than tankers, of 10,000 gross tonnage and upwards constructed on or after 1 July 2013;
4. cargo ships, other than tankers, of 3,000 gross tonnage and upwards but less than 10,000 gross tonnage constructed on or after 1 July 2014;
5. passenger ships of 500 gross tonnage and upwards constructed before 1 July 2012, not later than the first survey on or after 1 July 2014;
6. tankers of 3,000 gross tonnage and upwards constructed before 1 July 2012, not later than the first survey on or after 1 July 2015;
7. cargo ships, other than tankers, of 50,000 gross tonnage and upwards constructed before 1 July 2013, not later than the first survey on or after 1 July 2016;
8. cargo ships, other than tankers, of 20,000 gross tonnage and upwards but less than 50,000 gross tonnage constructed before 1 July 2013, not later than the first survey on or after 1 July 2017; and
9. cargo ships, other than tankers, of 10,000 gross tonnage and upwards but less than 20,000 gross tonnage constructed before 1 July 2013, not alter than the first survey on or after 1 July 2018;

K) Administrations may exempt ships from the application of the requirements of paragraph J when such ships will be taken permanently out of service within two years after the implementation date specified in subparagraphs J.5 to J.9 of paragraph J.

When "other means" are permitted under this regulation, such means must be approved by Administration in accordance with regulation 18.

The navigational equipment and systems referred to in this regulation shall be so installed, tested and maintained as to minimize malfunction.

Navigational equipment and systems offering alternative modes of operation shall indicate the actual mode of use.

Integrated bridge systems* shall be so arranged that failure of one sub-system is brought to immediate attention of the officer in charge of the navigational watch by audible and visual alarms, and does not cause failure to any other sub-system. In case of failure in one part of an integrated navigational system,** it shall be possible to operate each other individual item of equipment or part of the system separately.

MAGNETIC COMPASSES

A./Res.382(X)

Magnetic compasses carriage and performance standards

Annex I Recommendation on the carriage of magnetic compasses

1. All ships are fitted with:
   a) a standard magnetic compass, as defined in Annex II,
   b) steering magnetic compass, as defined in Annex II, unless the heading information provided by the standard compass, required under sub-paragraph (a), is made available and clearly readable by the helmsman at the main steering position;
   c) adequate means of communication between the standard compass position and the normal navigation control position to the satisfaction of the Administration.

2. A spare magnetic compass, interchangeable with the standard compass, is carried, unless the steering compass mentioned in sub-paragraph 1(b) or gyro-compass is fitted.

3. Each magnetic compass is properly compensated and its table or curve of residual deviations is available on board in the vicinity of the compass at all times.

Note: The Administration, if it considers it unreasonable or unnecessary to require a standard magnetic compass, may exempt any ship from these requirements if the nature of the voyage, the ship's proximity to land or the type of ship does not warrant a standard compass, provided that a suitable steering compass will in all cases be required.

A./Res.382(X)

Magnetic compasses carriage and performance standards

Annex II Recommendation on performance standards for magnetic compasses

1 Definitions

1.1 A magnetic compass is an instrument designed to seek a certain direction in azimuth and to hold that direction permanently, and which depends, for its directional properties, upon the magnetism of the earth.

1.2 The standard compass is a magnetic compass used for navigation, mounted in a suitable binnacle containing the required correcting devices and equipped with a suitable azimuth reading device.

1.3 The steering compass is a magnetic compass used for steering purposes mounted in a suitable binnacle containing the required correcting devices.

Note: If the transmitted image of a sector of the standard compass card of at least 15° to each side of the lubber mark is clearly readable for steering purposes at the main steering position, both in daylight and artificial light according to 7.1, the standard compass can also be regarded as the steering compass.

A./Res.382(X)

Magnetic compasses carriage and performance standards

Annex II Recommendation on performance standards for magnetic compasses

2 Compass Card

2.1 The compass card should be graduated in 360 single degrees. A numerical indication should be provided every ten degrees, starting from North (000°) clockwise to 360°. The cardinal points should be indicated by the capital letters N, E, S and W. The North point may instead be indicated by a suitable emblem.

2.2 The directional error of the card, composed of inaccuracies in graduation, eccentricity of the card on its pivot and inaccuracy of orientation of the card on the magnetic system should not exceed 0.5° on any heading.

2.3 The card of the steering compass should clearly be readable both in daylight and artificial light at a distance of 1.4 m. The use of a magnifying glass is permitted.

A./Res.382(X)

Magnetic compasses carriage and performance standards

Annex II Recommendation on performance standards for magnetic compasses

3 Materials

3.1 The magnets used in the directional system and the corrector magnets for correcting the permanent magnetic fields of the ship should have a high coercivity of at least 11.2 $^{kA}/_{m}$.

3.2 Material used for correcting induced fields should have a low remanence and coercivity.

3.3 All other materials used in the magnetic compass and in the binnacle should be non-magnetic, so far as reasonable and pracicable and such that the deviation of the card caused by these materials should not exceed (9/H)°, where H is the horizontal component of the magnetic flux density in µT (micro Tesia) at the place of the compass.

A./Res.382(X)

Magnetic compasses carriage and performance standards

Annex II Recommendation on performance standards for magnetic compasses

4 Performance

The magnetic compass equipment should operate satisfactorily and remain usable under the operational and environmental conditions likely to be experienced on board ships in which it is installed.

A./Res.382(X)

Magnetic compasses carriage and performance standards

Annex II Recommendation on performance standards for magnetic compasses

5 Constructional Error

5.1 With the compass rotating at a uniform speed of 1.5° per second and temperature of the compass of 20°C ± 3°C the deflection of the card should not exceed (36/H)°, if the diameter of the card is less than 200 mm. If the diametter of the compass card is 200 mm or more, the deflection of the card should not exceed (54/H)° ; H being defined as in sub-paragraph 3.3.

5.2 The error due to friction should not exceed (3/H)° at a temperature of 20°C ± 3°C; H being defined as in sub-paragraph 3.3.

5.3 With a horizontal component of the magnetic field of 18 μT the half period of the card should be at least 12 seconds, after an initial deflection of 40°. The time taken to return finally to within ±1° of the magnetic meridian should not exceed 60 seconds after an initial deflection of 90°. Aperiodic compasses shall comply with the latter requirements only.

A./Res.382(X)

Magnetic compasses carriage and performance standards

Annex II Recommendation on performance standards for magnetic compasses

6 Correcting Devices

6.1 The binnacle should be provided with devices for correcting semicircular and quadrantal deviation due to:

- the horizontal components of the ship's permanent magnetism;
- heeling error;
- the horizontal component of the induced horizontal magnetism;
- the horizontal component of the induced vertical magnetism.

6.2 The correcting devices provided in sub-paragraph 6.1 should ensure that no serious changes of deviation occur under the influence of the conditions described in paragraph 4 and particularly considerable alteration of magnetic latitude. Sextantal and deviations of higher order should be negligible.

A./Res.382(X)

Magnetic compasses carriage and performance standards

Annex II Recommendation on performance standards for magnetic compasses

7 Construction

7.1 Primary and emergency illumination should be installed so that the card may be read at all times. Facilities for dimming should be provided.

7.2 With the exception of the illumination, no electrical power supply should be necessary for operating the magnetic compass.

7.3 In the case where an electrical reproduction of the indication of the standard compass is regarded as a steering compass, the transmitting system should be provided with both primary and emergency electrical power supply.

7.4 Equipment should be constructed and installed in such a way that it is easily accessible for correcting and maintenance purposes.

7.5 The compass, binnacle and azimuth reading device should be marked to the satisfaction of the Administration.

A./Res.382(X)

Magnetic compasses carriage and performance standards

Annex II Recommendation on performance standards for magnetic compasses

7 Construction

7.6 The standard compass should be suspended in gimbals so that its verge ring remains horizontal when the binnacle is tilted up to 40° in any direction, and so that the compass cannot be dislodged under any condition of sea or weather. Steering compasses suspended in gimbals should meet the same requirements. If they are not suspended In gimbals they should have a freedom of the card of at least 30° in all directions

7.7 Material used for the manufacture of magnetic compasses should be of sufficient strength and be to the satisfaction of the Administration.

A./Res.382(X)

Magnetic compasses carriage and performance standards

Annex II Recommendation on performance standards for magnetic compasses

8 Positioning

8.1 The magnetic compass equipment should be installed If practicable and reasonable on the ship's centreline. The main lubber mark should indicate the ship's heading with an accuracy of ± 0.5°.

8.2 The standard compass should be installed so that from ifs position the view is as uninterrupted as possible, for the purpose of taking horizontal and celestial bearings. The steering compass should be clearly readable by the helmsman at the main steering position.

A./Res.382(X)

Magnetic compasses carriage and performance standards

Annex II Recommendation on performance standards for magnetic compasses

8 Positioning

8.3 The magnetic compasses should be installed as far as possible from magnetic material. The minimum distances of the standard compass from any magnetic material which is part of the ship's structure should be to the satisfaction of the Administration. The following diagram gives general guidelines to indicate the minimum desirable distances from the standard compass. The minimum desirable distances for the steering compass may be reduced to 65 per cent of the values given by the diagram provided that no distance is less than 1m. If there is only a steering compass the minimum distances for the standard compass should be applied as far as practicable.

8.4 The distance of the magnetic compass from electrical or magnetic equipment should be at least equal to the safe distance specified for the equipment and be to the satisfaction of the Administration

A./Res.382(X)

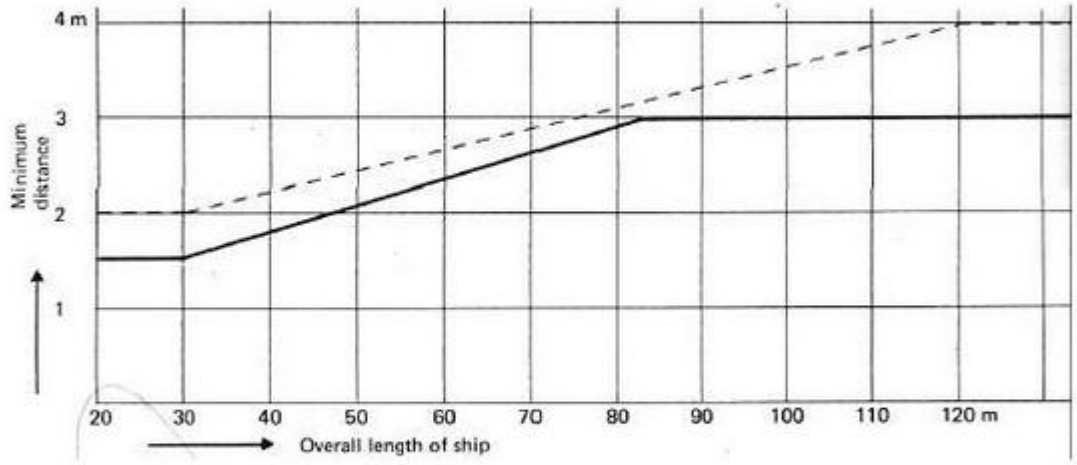
Magnetic compasses carriage and performance standards

Annex II Recommendation on performance standards for magnetic compasses

8 Positioning

Diagram

Minimum desirable distances from the Standard Compass



Uninterrupted fixed magnetic material

End parts of flued magnetic material such as top edges of walls, partitions and bulkheads, extremities of flames, girders, stanchions, beams. pillars and similar steel parts. Magnetic material subject to movement at sea such as davits. ventilators, steel doors, etc. Large masses of magnetic material with variable fields such as funnels.

GYRO-COMPASSES

A./Res.424(XI)

Performance standards for gyro-compasses

1. Introduction

1.1 The gyro-compass required by Regulation 12 of Chapter V of the International Convention for the Safety of Life at Sea,1974, should determine the direction of the ship's head in relation to geographic (true) north.

1.2 The equipment should comply with the following minimum performance requirements.

A./Res.424(XI)

Performance standards for gyro-compasses

2. Definitions

For the purpose of this recommendation, the following definitions apply:

- The term "gyro-compass" comprises the complete equipment and includes all essential elements of the complete design.
- The ''true heading" is the 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. It is measured from true north (000°) clockwise through 360°.
- The compass is said to be "settled" if any three reading taken at intervals of thirty minutes, when the compass is on a level and stationary base, are within a band of 0.7°.
- The "settle point heading" is the mean value of ten readings taken at twenty minute intervals after the compass has settled as defined in paragraph 2.3. The "settle point error" is the difference between settle point heading and true heading.
- The other errors to which the gyro-compass is subject are taken to be the difference between the observed value and the settle point heading.

A./Res.424(XI)

Performance standards for gyro-compasses

3. Method of presentation

The compass card should be graduated in equal intervals of one degree or a fraction thereof. A numerical indication should be provided at least at every ten degrees, starting from 000° clockwise through 360°.

4. Illumination

Fully adequate illumination should be provided to enable reading of scales at all times. Facilities for dimming should be provided

A./Res.424(XI)

Performance standards for gyro-compasses

5. Accuracy

5.1 Settling of equipment

5.1.1 When switched on in accordance with the manufacturer's instructions the compass should settle within six hours in latitudes of up to 60°

5.1.2 The settle point error as defined in paragraph 2.5 at any heading and at any latitude up to 60° should not exceed it 0.75 x secant latitude where heading indications of the compass should be taken as the mean of 10 readings at 20 minute intervals, and the root mean square value of the differences between individual heading indications and the mean should be less than 0.25° x secant latitude. The repeatability of settle point error from one run-up to another shall be within 0.25° x secant latitude.

A./Res.424(XI)

Performance standards for gyro-compasses

5.2 Performance under operational conditions

5.2.1 When switched on in accordance with the manufacturer's instructions, the compass should settle within six hours in latitudes of up to 60° when rolling and pitching with simple harmonic motion of any period between sin and fifteen seconds, a maximum angle of 5°, and a maximum horizontal acceleration of 0.22 m/s^2

5.2.2 The repeatability of the settle points error of the master compass shall be within ± 1° x secant latitude under the general conditions mentioned in paragraphs 6.1 and 8 and including variations in magnetic field likely to be experienced in the ship in which it is installed.

A./Res.424(XI)

Performance standards for gyro-compasses

5.2.3 In latitudes of up to 60° :

- the residual steady state error, after correction for speed and course influences at a speed of twenty knots, shall not exceed ± 0.25 x secant latitude;
- the error due to a rapid alteration of speed of twenty knots should not exceed ± 2°;
- the error due to a rapid alteration of course of 180° at a speed of twenty knots should not exceed ± 3° ;
- the transient and steady state errors due to the ship rolling, pitching and yawing, with simple harmonic motion of any period between six and fifteen seconds, maximum angle of 20°, 10° and 5° respectively, and maximum horizontal acceleration tool exceeding $1 m/s^2$, should not exceed 1° x secant latitude.

5.2.4 The maximum divergence in reading between the master compass and repeaters under all operational conditions should not exceed ± 0.5°.

Note: When the compass is used for purposes other than steering and bearing, a higher accuracy might be necessary.
To ensure that the maximum error referred to in sub-paragraph 5.2.3.4 is not exceeded in practice, it will be necessary to pay particular attention to the siting of the master compass.

A./Res.424(XI)

Performance standards for gyro-compasses

6. Power supply

6.1 The equipment should be capable of operating continuously in accordance with the requirements of this recommendation in the presence of such variations of the power supply as are normally expected in a ship.

6.2 Means should be incorporated for the protection of the equipment from excessive currents and voltages, transients and accidental reversal of power supply polarity.

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 should be Incorporated.

A./Res.424(XI)

Performance standards for gyro-compasses

7. Interference

7.1 All steps should be taken to eliminate as far as practicable the causes of, and to suppress, electromagnetic interference between the gyro-compass and other equipment on board.

7.2 Mechanical noise from all units should be so limited as not to prejudice the hearing of sounds on which the safety of the ship might depend.

7.3 Each unit of the equipment should be marked with the minimum strafe distances at which it may be mounted from a standard or a steering magnetic compass.

8 Durability and resistance to effects of climate

The equipment should be capable of continuous operation under trip conditions of vibration, humidity and change of temperature likely to be experienced in the ship in which it is installed.

A./Res.424(XI)

Performance standards for gyro-compasses

9. Construction and installation

9.1 The master compass and any repeaters used for taking visual hearing should be installed in a ship with their fore and aft datum lines parallel to the ship's fore and aft datum line to within ± 0.5°. The lubber line should be in the same vertical plane as the centre of the card of the compass and should be aligned accurately in the fore and aft direction.

9.2 Means should be provided for correcting the errors induced by speed and latitude.

9.3 An automatic alarm should be provided to indicate a major fault in the compass system.

A./Res.424(XI)

Performance standards for gyro-compasses

9.4 The system should be designed to enable heading information to be provided to other navigational aids such as radar, radio direction-finder and automatic pilot.

9.5 Information should be provided to enable competent members of a ship's staff to operate and maintain the equipment efficiently.

9.6 The equipment should be provided with an indication of manufacture, type and/or number.

9.7 The equipment should be so constructed and installed that it is readily accessible for maintenance purposes.

LOGS

A.824(19)

Performance standards for devices to indicate speed and distance

Annex Recommendation on performance standards for devices to measure and indicate speed and distance

1 - Introduction

1.1 Devices to measure and indicate speed and distance are intended for general navigational and ship manoeuvring use. The minimum requirement is to provide information on the distance run and the forward speed of the ship through the water or over the ground. Additional information on ship's motions other than in the forward axis may be provided. The equipment should comply fully with its performance standard at forward speeds up to the maximum speed of the ship. Devices measuring speed and distance through the water should meet the performance standard in water of depth greater than 3 m beneath the keel. Devices measuring speed and distance over the ground should meet the performance standard in water of depth greater than 2 m beneath the keel.

1.2 Radar plotting aids/track control equipment require a device capable of providing speed through the water in the fore and aft direction.

1.3 In addition to the general requirements in resolution A.694(17), devices to measure and indicate speed and distance should comply with the following minimum performance requirements.

A.824(19)

Performance standards for devices to indicate speed and distance

Annex Recommendation on performance standards for devices to measure and indicate speed and distance

2 - Methods of presentation

2.1 Speed information may be presented in either analogue or digital form. Where a digital display is used, its incremental steps should not exceed 0.1 knots. Analogue displays should be graduated at least every 0.5 knots and be marked with figures at least every 5 knots. If the display can present the speed of the ship in other than the forward direction, the direction of movement should be indicated unambiguously.

2.2 Distance run information should be presented in digital form. The display should cover the range from 0 to not less than 9999.9 nautical miles and the incremental steps should not exceed 0.1 nautical miles. Where practicable, means should be provided for resetting a readout to zero.

2.3 The display should be easily readable by day and by night.

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Performance standards for devices to indicate speed and distance

Annex Recommendation on performance standards for devices to measure and indicate speed and distance

2.4 Means should be provided for transmitting measured speed and distance run information to other equipment fitted on board. In this regard:

- the information on all speed and distance parameters, including direction should be transmitted in accordance with the relevant international marine interface standards[1];
- additionally, when the equipment is used for measuring forward speed, then the information may be transmitted using closing contacts and, if so, this should be in the form of one contact closure each 0.005 nautical miles run.

2.5 If equipment is capable of being operated in either the "speed through the water" or "speed over the ground" mode, mode selection and mode indication should be provided.

A.824(19)

Performance standards for devices to indicate speed and distance

Annex Recommendation on performance standards for devices to measure and indicate speed and distance

2.6 If the equipment has provision for indicating speeds other than on a single fore and aft direction, then both the forward and athwart speeds should be provided either through the water or over the ground. Resultant speed and direction information may be provided as a display selectable option. All such information should clearly indicate the direction, mode and validity status of the displayed information.

A.824(19)

Performance standards for devices to indicate speed and distance

Annex Recommendation on performance standards for devices to measure and indicate speed and distance

3 - Accuracy of measurement

3.1 Errors in the measured and indicated speed, when the ship is operating free from shallow water effect and from the effects of wind, sea bottom type, current and tide, should not exceed the following:

- for a digital display - 2% of the speed of the ship, or 0.2 knots, whichever is greater;
- for an analogue display – 2.5% of the speed of the ship, or 0.25 knots, whichever is greater; and
- for output data transmission – 2% of the speed of the ship, or 0.2 knots, whichever is greater.

A.824(19)

Performance standards for devices to indicate speed and distance

Annex Recommendation on performance standards for devices to measure and indicate speed and distance

4 - Roll and pitch

The performance of the equipment should be such that it will meet the requirements of these standards when the ship is rolling up to ± 10° and pitching up to ± 5°.

5 - Construction and installation

5.1 The system should be so designed that neither the method of attachment of parts of the equipment to the ship nor damage occurring to any part of the equipment which penetrates the hull could result in the ingress of water to the ship.

5.2 Where any part of the system is designed to extend from and retract into the hull of the ship, the design should ensure that it can be extended, operated normally and retracted at all speeds up to the maximum speed of the ship. Its extended and retracted positions should be clearly indicated at the display position.

5.3. If ships are required to carry speed logs measuring speed through the water and speed over the ground, these speed logs should be provided by two separate devices.

ECHOSOUNDERS

A.224(VII)

Performance standards for Echo-Sounding equipment

1 Introduction

1.1 The echo-sounding equipment required by Regulation. 12 of Chapter V, as amended, should provide reliable information on the depth of water under a ship to aid navigation.

1.2 The equipment should comply with the following minimum performance requirements. These Performance Standards are applicable for ship speeds from 0 up to 30 knots.

2 Range of depths

Under normal propagation conditions the equipment should be capable of measuring any clearance under the transducer between 2 meters and 200 meters.

3 Range scales

3.1 The equipment should provide a minimum of two range scales one of which, the shallow range, should cover a range of 20 m, and the other, the deep range, should cover a range of 200 m.

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4 Main display

The primary presentation should be a suitable graphical display which provides the immediate depth and a visible record of soundings. The displayed record should, show at least 15 min of soundings.

5 Other displays

Other forms of display may be added but these should not affect the normal operation of the main display.

6 Pulse repetition rate

The pulse repetition rate should not be slower than 12 pulses per minute on the deep range and 36 pulses per minute on the shallow range.

7 Roll and pitch

The performance of the equipment should be such that it will meet the requirements of these performance standards when the ship is rolling +/-10° and/or pitching +/-5°

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8. Multiple installations

More than one transducer and associated transmitter-receiver may be fitted.nIf more than one transducer is used:

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

9 Data storage

It should be possible to record on paper recording or other means the information about: the depth(s), and the associated time for 12 h.
There should be means to retrieve the recorded information.

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10 Accuracy of measurement

Based on a sound speed in water of 1500 m/s, the tolerance of the indicated depth should be either: +/- 0.5 m on the 20 m range scale, respectively +/- 5 m on the 200 m range scale; or +/- 2.5% of the indicated depth, whichever is greater.

11 Discrimination

The scale of display should not be smaller than 5.0 mm per meter depth on the shallow range scale and 0.5 mm per meter depth on the deep range scale.

12 Depth alarm

An alarm signal - both visual and audible with mute function - should be provided when the water depth is below a preset value

13 Failure or reduction in power supply

Alarm signals, both visual and audible (with mute function) to the navigator on the watch should 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

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14 Operational controls

The function of range scale selection should be directly accessible.

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

- range scale; and
- preset depth alarm

15 Marks

The graphical display should be capable of showing:

- depth marks at intervals not larger than one-tenth of the range/scale in use; and
- time marks at intervals not exceeding 5 min.

16 Paper recording

If paper is used for recording either by marks on the recording paper, or by other means, there should be a clear indication when the paper remaining is less than 1m

AUTOPILOTS

MSC 64(67)

Performance standards for heading control systems

1 Introduction

In addition to the general requirements contained in resolution A.694(l7)"·, heading control systems should comply with the following minimum performance requirements.

2 Objectives

2.1 Within limits related to the ships's manoeuvrability the heading control system , in conjunction with its source of heading information , should enable a ship to keep a preset heading with minimum operation of the ship's steering gear.

2.2 A heading control system may work together with a track control system adjusting its heading for drift.

2 .3 A tum rate control for performing turns may be provided.

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Performance standards for heading control systems

3 Functional requirements

3.1 Adaption to steering characteristics and environmental conditions
The heading control system should be capable of adapting manually or automatically to different steering characteristics of the ship under various speed, weather and loading conditions, and provide reliable operation under prevailing environment and normal operational conditions .

3.2 Performing turns The heading control system should be able to perform turns , within the turning capability of the ship, based either on a preset turning radius or a preset rate of turn.

3.3 Rudder angle limitation Means should be incorporated in the equipment to enable rudder angle limitation in the automatic mode . Means should also be available to indicate when the angle of limitation has been commanded or reached . When other means of directional control are used the requirements of this section should appropriately apply.

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Performance standards for heading control systems

3.4 Permitted yaw Means should be incorporated to prevent unnecessary activation of the rudder due to normal yaw motion .

3.5 Preset heading Any alteration of the preset heading should not be possible without intended action of the ship's personnel. 3.6 Limiting of overshoot The heading control system should change to a preset heading without significant overshoot.

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Performance standards for heading control systems

4 Change-over from automatic to manual steering and vice versa

4.1 Change-over from automatic to manual steering and vice-versa should be possible at any position of the rudder and should be effected by one manual control within 3 seconds.

4.2 Change-over from automatic to manual steering should be possible under any conditions including any failure in the automatic control system.

4.3 When changing over from manual to automatic steering the heading control system shall take over the actual heading as the preset heading.

4.4 There should be a single change-over control which should be located in such a position that it is easily accessible to the officer of the watch.

4.5 Adequate indication should be provided to show which method of steering is in operation .

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5 Change-over from track control to heading control

5.1 If the heading control system works as part of a track control system, then when switching from track control to heading control, the actual heading should be taken as the preset heading.

5.2 Any switching back to track control shall not be possible without intended action of the ship's personnel.

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6 Alarms and signalling facilities

6.1 Failure or reduction in power

An alarm both audible with mute function and visual should be provided in order to indicate failure or a reduction in the power supply to the heading control system or heading monitor, which would affect the safe operation of the equipment.

6.2 Off-heading alarm

An off-heading alarm, both audible with mute function and visual should be provided when the actual heading deviates from the preset heading beyond a preset limit.

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Performance standards for heading control systems

6.3 Heading monitor

If the ship is required to carry two independent compasses, a heading monitor should be provided to monitor the actual heading information by independent heading sources . The heading monitor is not required to be an integrated part of the heading control system . An alarm both audible with mute function and visual should be provided when the heading information in use deviates from the second heading source beyond a preset limit.

6.4 Indication of heading source A clear indication of the actual heading source should be provided .

6.5 Sensor status The heading control system should provide an indication when any input from external sensors used for control is absent. The heading control system should also repeat any alarm on the status messages concerning the quality of the input data from its external sensors when they are used for control.

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Performance standards for heading control systems

7 Controls

7.1 The number of operational controls should be such that easy and safe operation can be achieved . The controls should be designed to preclude inadvertent operation.

7.2 Unless features for automatic adjustment are incorporated in the installation , the heading control system should be provided with adequate controls to adjust to effects due to weather and the ship's steering performance .

7.3 The heading control system should be designed in such a way as to ensure altering the pre-set heading to starboard by turning the heading setting control clockwise or tilting it to the right-hand side . Normal alterations of heading should be possible by one adjustment only of the preset heading control.

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7.4 Where remote control stations are provided, facilities for the delegation of control to the remote station and unconditional return of control should be incorporated in the master station .

7.5 Except for the preset heading setting control, the actuation of any other control should not significantly affect the heading of the ship .

7.6 Additional controls at remote positions should comply with the provisions of this performance standard.

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8 Interfacing

8.1 The heading control system should be connected to a suitable source of heading information.

8.2 The heading control system should be connected to a suitable source of speed information when it is used in a turning radius mode or when any control parameters are automatically adapted to speed.

8.3 If a heading control system is capable of digital serial communication with the ship's navigation system then the interface facilities should comply with the relevant international marine interface standards.