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ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION

R 613

MAGNETIC COMPASSES, BINNACLES AND AZIMUTH READING DEVICES, CLASS B

GENERAL REQUIREMENTS

1st EDITION

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BRIEF HISTORY

The ISO Recommendation R 613, *Magnetic Compasses, Binnacles and Azimuth Reading Devices, Class B, General Requirements*, was drawn up by Technical Committee ISO/TC 8, *Shipbuilding Details*, the Secretariat of which is held by the Nederlands Normalisatie-instituut (NNI).

Work on this question by the Technical Committee began in 1959 and led, in 1964, to the adoption of a Draft ISO Recommendation.

In October 1965, this Draft ISO Recommendation (No. 857) was circulated to all the ISO Member Bodies for enquiry. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies:

Argentina	Finland	Spain
Australia	France	Sweden
Austria	India	U.A.R.
Belgium	Ireland	United Kingdom
Brazil	Israel	U.S.S.R.
Canada	Netherlands	Yugoslavia
Chile	New Zealand	
Czechoslovakia	Poland	

Three Member Bodies opposed the approval of the Draft:

Germany
Italy
Japan

The Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided, in August 1967, to accept it as an ISO RECOMMENDATION.

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MAGNETIC COMPASSES, BINNACLES AND AZIMUTH READING DEVICES, CLASS B

GENERAL REQUIREMENTS

INTRODUCTION

This ISO Recommendation refers to the general requirements for the construction and performance of magnetic compasses, binnacles and azimuth reading devices, Class B.*

1. GENERAL

1.1 Scope

This ISO Recommendation refers to liquid magnetic compasses

— intended for use on board ships in which a Class A compass is not essential,
— equipped with a direct reading system
— and which may be of the reflecting, projecting or transmitting type.

In this context, a magnetic compass is an instrument consisting of a directional system supported on a single pivot inside a bowl which is completely filled with liquid and which is supported in gimbals.

Hemispherical compasses, which are not supported in gimbals, are also covered by this ISO Recommendation. The requirements relating to gimbals do not, however, apply to such compasses.

1.1.1 *Exclusions.* This ISO Recommendation does not refer to

(*a*) dry card compasses,

(*b*) types of compasses designed on principles different from those stated in clause 1.1 above or not complying with the description in that clause.

1.2 Units

In view of the present established practice, the following units have been retained:

the *oersted* as the unit of *magnetic field strength* and

the *CGS unit* as the unit of *magnetic moment.*

Corresponding units in the International System (S.I.) are:

The *magnetic field strength* A × m^{-1} corresponds to $4\pi 10^{-3}$ oersted.

The *magnetic moment* A × m^2 corresponds to 10^3 CGS units.

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* Other ISO Recommendations for magnetic compasses:

ISO/R 449, *Magnetic Compasses and Binnacles, Class A, for Use in Sea Navigation.*

ISO/R ..., *Positioning of Magnetic Compasses in Ships*, at present Draft ISO Recommendation No. 858.

ISO/R ..., *Magnetic Compasses and Binnacles for Sea Navigation—Vocabulary of Terminology*, at present Draft ISO Recommendation No. 1145.

ISO/R ..., *Rules for Testing and Certification of Magnetic Compasses and Accessories—Part I—Type Testing and Certification*, at present at the stage of draft proposal.

ISO/R ..., *Rules for Testing and Certification of Magnetic Compasses and Accessories—Part II—Individual Testing and Certification*, at present at the stage of draft proposal.

1.3 Definitions

The terms used in this ISO Recommendation are defined in ISO Recommendation R ...*, *Magnetic Compasses and Binnacles for Sea Navigation—Vocabulary of Terminology.*

1.4 Marking

The following parts should be marked with the information and in the position shown in Table 1.

TABLE 1. — **Marking requirements**

Name of part	Position of manufacturer's name or other means of identification	Position of serial number on the part
Magnetic compass	(*a*) the directional system (*b*) the verge ring	(*a*) the directional system (*b*) the verge ring (*c*) the gimbal ring or rings
Binnacle	any convenient position	not required
Azimuth reading device	on top of the base of the azimuth reading device	on top of the base of the azimuth reading device

NOTE. — The type of liquid used, if other than alcohol, should be indicated on the bowl in the vicinity of the filling plug.

2. MAGNETIC COMPASSES

2.1 Construction and materials

2.1.1 The magnets used in the directional systems of magnetic compasses should be of a suitable magnetic material having a high remanence and a high coercivity. All other materials used in magnetic compasses, other than transmitting compasses, should be of non-magnetic material.

2.1.2 The distance between the lubber mark and the outer edge of the card should be between 1.5 and 3.0 mm. The width of the lubber mark should not be greater than 1° of the graduation of the card. The lubber mark should be so designed as to allow the compass to be read when the bowl is tilted 10°, in the case of a gimballed compass, or 30° in the case of a hemispherical compass.

* At present Draft ISO Recommendation No. 1145.

2.1.3 When the verge ring (and, if applicable, the seating of the azimuth reading device) is (are both) horizontal, the graduated edge of the card, the lubber mark, if a point, the pivot point and the outer gimbal axis, should all lie within 1 mm of the horizontal plane passing through the gimbal axis fixed to the bowl.

2.1.4 The gimbal axes should be mutually perpendicular within a tolerance of 1°.

2.1.5 The thickness of the top glass cover and of the bottom glass of the compass should be not less than 3.0 mm if non-toughened, and not less than 2.0 mm if toughened. When the inner diameter of the verge ring is 150 mm or more, these figures should be increased to 4.5 mm and 3 mm respectively. These limits apply also to the thickness of the top glass in hemispherical compasses. If material other than glass is used, it should be of equivalent strength.

2.1.6 Within the temperature range −30 to + 60 °C,

(*a*) the liquid in the compass bowl should remain clear and free from bubbles, and neither emulsify nor freeze;

(*b*) there should be neither inward leak of air nor outward leak of liquid.

NOTE. — This requirement does not apply to the normal functioning of liquid compasses which have a combined gravity liquid reservoir and free expansion chamber fitted to the top glass cover so as to allow for changes in the density of the liquid.

(*c*) paint should not blister, crack or discolour appreciably.

2.1.7 The balance of the compass bowl should not be disturbed by any magnifying device or by any azimuth reading device provided for use with the compass.

2.2 Mounting

2.2.1 The bowl of the compass should be mounted so that the verge ring remains horizontal when the supporting device is tilted 40° in any direction and the compass cannot be dislodged whatever the conditions of sea or weather.

2.2.2 In compasses of the hemispherical type, in which no supporting gimbal is provided, the freedom of tilt of the card should be at least 25° in the fore-and-aft direction and 30° athwartship.

2.3 Directional system

2.3.1 *Moment of inertia.* The moment of inertia of the directional system should be appreciably the same about all horizontal axes passing through the bearing surface of the pivot jewel.

2.3.2 *Suspension.* The directional system should be retained in position by suitable means and remain free when the bowl is tilted 10° in any direction.

2.3.3 *Supporting force.* When measured at a temperature of 20 ± 3 °C, the force exerted by the directional system on the pivot in the liquid used should be between 3 and 12 gf (3 to 12 cN)* when the diameter of the card is 165 mm or less, and between 4 and 14 gf (4 to 14 cN)* when the diameter of the card is greater than 165 mm.

2.3.4 *Magnetic moment.* The magnetic moment of the magnets in the directional system should not be less than the value given in the figure, page 11.

2.3.5 *Period.* When measured at a temperature of 20 ± 3 °C, the half period of the directional system, following an initial deflection of the card of 40° from the magnetic meridian, should not be less than

$\sqrt{4/H}$ seconds for cards of less than 100 mm diameter,

$\sqrt{12/H}$ seconds for cards from 100 to 150 mm diameter,

$\sqrt{26/H}$ seconds for cards in excess of 150 mm,

H being the horizontal magnetic field strength in oersted.

After the initial deflection has been given, the half-period is measured between the first two consecutive passings of the original indication of the course.

Alternatively, the compass may be aperiodic or heavily damped. In this case, the time taken to return to within 1° of the magnetic meridian, following an initial deflection of the card of 90°, should not be more than $\sqrt{(576/H)}$ seconds, at the above temperature.

2.4 Graduation

2.4.1 *Compass card.* The compass card should be graduated in equal intervals not greater than 5° for cards up to 100 mm in diameter and not greater than 2° for larger cards, starting from North in a clockwise direction as viewed from above. The cardinal points should be indicated by the capital letters N, E, S, W. The letter N may be omitted and the North point indicated by a suitable emblem. The intermediate points may also be marked.

2.4.2 *Readability.* It should be possible for a person with normal vision to read the course, the lubber mark and the graduations on the card at a distance of one metre, in both daylight and artificial light. The use of a magnifying device is permitted.

If only a part of the card is visible, it should be possible to read a minimum of 15° on each side of the lubber mark.

* 1 gf = 0.0098 newton (N) = 0.98 centinewton (cN), or 1 cN, with an approximation of 2%.