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Ships and marine technology — Rate of turn indicators

Navires et technologie maritime — Fréquence des indicateurs de direction

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Contents

Page

Foreword

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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.

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ISO 20672 was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 6, *Navigation*.

Ships and marine technology — Rate of turn indicators

1 Scope

This International Standard specifies the construction, performance requirements, methods of testing and required test results for the rate of turn indicators required by clause 2.9.1, Regulation 19, chapter V, SOLAS 1974 (as amended, 2000).

It is based upon the requirements of IMO Resolution A.526(13), and is also associated with IMO Resolution A.694 (17) and IEC 60945.

Where a requirement in this International Standard is different from that in IEC 60945, the requirement in this International Standard takes precedence.

NOTE 1 All requirements that are extracted from the recommendations of IMO Resolution A.526(13) on performance standards for rate of turn indicators are printed in italics and the resolution and paragraph numbers are indicated in brackets.

NOTE 2 The rate of turn indicators specified in IMO Resolution A.526(13) may be self-contained; alternatively it may form part of, or derive information from, any other appropriate equipment. In order to define the minimum requirements about the rate of turn indicators specified in IMO Resolution A.526(13), this International Standard specifies it may form part of, or derive information from, any other appropriate equipment.

2 Normative references

The following referenced documents are indispensable for the application 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, *Marine 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 61162-2, *Maritime navigation and radiocommunication equipment and systems — Digital interfaces — Part 2: Single talker and multiple listeners, high-speed transmission*

IMO Resolution A.526(13), *Performance standards for rate-of-turn indicators*

3 Terms and definitions

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

3.1
rate of turn indicator
indicator capable of indicating rates of turn in degrees per minute *to starboard and to port of the ship to which it is fitted*

NOTE 1 A *rate of turn indicator may be self-contained; alternatively it may form part of, or derive information from, any other appropriate equipment.*

NOTE 2 Based on IMO Resolution A.526(13)/2.1 and 2.2.

3.2
analog type indicator
indicator that shows the rate of turn in a continuous way, such as by means of an arrow pointer and graduated scale

3.3
digital type indicator
indicator that shows the rate of turn in a discrete, alphanumeric way

3.4
full scale
from 0° per minute to the greatest angular rate scale of port (or starboard) direction

4 Construction

The rate of turn indicators shall conform to the following requirements.

4.1 Indication

4.1.1 *The indication required* shall *be provided by a centre-zero analogue type indicator (preferably circular). Where a circular scale indicator is used, the zero* shall *be uppermost.*

[A.526(13)/2.3.1]

4.1.2 *A turn of ship to port* shall *be indicated on the left of the zero point and a starboard turn to the right of the zero point. If the actual rate of turn exceeds full scale deflection, this* shall *be clearly indicated on the display.*

[A.526(13)/2.3.2]

4.1.3 *In addition, an alphanumeric display may be provided*. *Positive indication of port and starboard* shall *be provided on such displays.*

[A.526(13)/2.3.3]

4.1.4 *The length of scale in either direction from zero* shall *not be less than 120 mm. The sensitivity of the system* shall *ensure that a change in the rate of turn of 1° per minute is represented by a distance of not less than 4 mm on its scale.*

[A.526(13)/2.3.4]

4.2 Range scales

4.2.1 *A linear range scale of not less than ± 30° per minute* shall *be provided.* The scale for 30° per minute indicator shall *be marked in intervals of 1° per minute on both sides of zero. The scale* shall *be marked with figures every 10° per minute. Every 10° mark* shall *be significantly longer than the 5° mark which in turn* shall

be significantly longer than the 1° mark. The marks and figures shall *preferably be red or a light colour on a dark background.*

[A.526(13)/2.4.1]

4.2.2 *Additional linear range scales* of ± 120° and ± 300° per minute *may be provided* and the scale and figures of each range shall be marked in intervals proportionate to the 30° per minutes indicator as defined in 4.2.1 (see Table 1).

[A.526(13)/2.4.2]

Table 1 — Scaling reference

Scale	Numerical mark	Short mark	Half mark	Longer mark
30°	0, 10, 20, 30	every 1 deg	every 5 deg	every 10 deg
120°	0, 40, 80, 120	every 4 deg	every 20 deg	every 40 deg
300°	0, 100, 200, 300	every 10 deg	every 50 deg	every 100 deg

Any other range scale may be acceptable under approval by the appropriate authority.

4.3 Illumination and lighting

The illumination and lighting of the indicator shall be arranged in order not to hinder an operator's vision at night and in order to make the scale, pointer and letters as equally visible as possible even in dim light or darkness.

4.4 Type of indicator

The rate of turn indicator shall be an analog type. A digital type indicator may additionally be used, if fitted.

5 Performance requirements

5.1 Accuracy

5.1.1 *The indicated rate of turn* shall *not deviate from the actual rate of turn of the ship by more than 0,5° per minute plus 5 per cent of the indicated rate of turn of the ship. These values include the influence of earth rate.*

[A.526(13)/2.5.1]

5.1.2 *Periodic rolling motion of the ship with an amplitude of ± 5° and period of up to 25 seconds and periodic pitching motion with an amplitude of ± 1° and period of up to 20 seconds* shall *not change the mean value of the indicated rate of turn by more than ± 0,5° per minute.*

[A.526(13)/2.5.2]

5.1.3 A *rate of turn indicator* shall *meet these accuracy requirements at all ship speeds up to* 30 *knots.*

[A.526(13)/2.5.3]

5.1.4 The *damping of the rate of turn indicators* shall *be provided with a time constant which may be varied during operation in the range zero to at least 10 seconds.*

[A.526(13)/2.4.3]

5.2 Operation

5.2.1 A *rate of turn indicator* shall *be ready for operation and comply with* this International Standard *within 4 minutes of being switched on.*

[A.526(13)/3.1]

5.2.2 *The design* shall *be such that whether operating or not the rate of turn indicator will not degrade the performance of any other equipment to which it is connected.*

[A.526(13)/3.2]

5.2.3 *The rate of turn indicator* shall *include a means of enabling the operator to verify that it is operating.*

[A.526(13)/3.3]

5.3 Insulation resistance and high voltage

When insulation resistance and high voltage tests are to be carried out, IEC 60092-504 may be applied.

6 Methods of testing and required test results

6.1 Construction

The construction of the rate of turn indicator shall comply with the requirements specified in Clause 4.

6.2 Environmental tests

Unless otherwise stated in this International Standard, all the tests shall be carried out according to the requirements of IEC 60945. The manufacturer shall determine which components of the rate of turn indicators will be protected or exposed, as defined in IEC 60945.

6.3 Accuracy test

6.3.1 The following tests shall satisfy the accuracy requirements of 5.1.1. The indicated rate of turn is tested with a dummy signal or internal sensor signal in accordance with 6.3.2, 6.3.3 and 6.3.4.

6.3.2 Rate of turn indicators shall be set on a test table and tested with a dummy signal or internal sensor signal under one of following conditions:

a) ± 30°/min indicator: pitch axis 1°, period 20 s; roll axis 5°, period 25 s;

b) ± 120°/min indicator: pitch axis 1°, period 6 s; roll axis 5°, period 15 s;

c) ± 300°/min indicator: pitch axis 1°, period 6 s; roll axis 5°, period 15 s.

Indicator data shall be taken at 10 s intervals for a period of 10 min. The resultant mean value of the indicated rate of turn shall meet the requirement of 5.1.2.

6.3.3 The rate of turn indicator shall be tested for consistency at simulated ship speeds up to 30 knots using a dummy signal or internal sensor signal which contains the ship's speed factors.

6.3.4 Damping of the rate of turn indicator shall be tested in response to a step-shaped dummy signal or internal sensor signal. The signal may be adjusted to have time constant range of zero to 10 s.

6.4 Operation test

The operation test shall be carried out in accordance with 5.2 and shall satisfy the requirements specified therein.

6.5 Power supply fluctuation test

The power supply fluctuation test shall be carried out in accordance with 5.3 and shall satisfy the requirements specified therein.

7 Interface

If the rate of turn indicator provides an interface facility, it shall meet the requirements laid down in IEC 61162-1 and IEC 61162-2.

8 Marking and identification

Each unit of a rate of turn indicator shall be marked with the following:

— identification of the manufacturer;

— equipment type number or model identification number under which it was type tested;

— serial number of the unit.

Each unit shall be marked with the minimum safe distance from a magnetic compass (for bridge installation). The safe distance shall be measured in accordance with IEC 60945.

9 Information

The manufacturer shall provide adequate equipment documentation to enable competent members of a ship's crew to operate and maintain the equipment efficiently.

Bibliography

[1] ISO 8468, *Ships and marine technology — Ship's bridge layout and associated equipment — Requirements and guidelines*

[2] IEC 60092-504, *Electrical installations in ships — Part 504: Special features — Control and instrumentation*

[3] *International Convention for the Safety of Life at Sea* (SOLAS), 1974 (amended)

[4] 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*

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