INTERNATIONAL STANDARD

ISO 20673

First edition
2007-05-15

Ships and marine technology — Electric rudder angle indicators

Navires et technologie maritime — Indicateurs de direction des gouvernails électriques

Reference number
ISO 20673:2007(E)

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Publié en Suisse

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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 2.

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

ISO 20673 was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 6, *Navigation*.

Ships and marine technology — Electric rudder angle indicators

1 Scope

This International Standard specifies the construction, performance requirements, methods of testing and required test results for electric rudder angle indicators required to comply with clause 2.5.4, Regulation 19, chapter V, SOLAS 1974 (as amended, 2000).

This International Standard is associated with IMO Resolution A.694 (17) and IEC 60945.

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

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*

3 Terms and definitions

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

3.1
rudder angle indicator
remote device that indicates ship's rudder angle and direction

NOTE An indicator system consists of a transmitter and a receiver (indicator).

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

3.3
digital type indicator
indicator that shows the rudder angle in a discrete, alphanumeric way

3.4
calibration accuracy
difference between the angle of the receiver (indicator) shaft and the angle of the transmitter shaft

3.5
damping efficiency
time elapsed for the indicated angle to match the angle of the transmitter shaft

3.6
full scale
from 0° to the greatest angle of port (or starboard) direction

4 Construction of the indicator system

4.1 General

The construction shall generally comply with the following requirements.

4.1.1 The indicator system enclosures shall be robust and constructed so as to facilitate adjustment and maintenance.

4.1.2 The indicator system shall be provided with an earthing terminal or shall be constructed so as to be capable of being connected to an electrical earth.

4.1.3 The indicator system shall include an analog type indicator. A digital type indicator may additionally be used, if fitted.

4.2 Transmitter

The transmitters shall comply with the following requirements.

4.2.1 The transmitter shall be driven by lever or belt, or other suitable means from the rudder head.

4.2.2 The transmitter shall be capable of being adjusted.

4.2.3 Where the transmitter drive includes pivot connections, they shall be designed so as not to be loosened by vibration.

4.3 **Receiver** (indicator)

The indicator shall comply with the following requirements.

4.3.1 The indicator shall be connected to the transmitters and shall indicate rudder angle and direction.

4.3.2 The maximum angle indicated by the indicator shall be the same for both port and starboard directions and shall not be less than 40°. Scale graduations shall be no less than 1°. The graduation marks for every 5° shall be longer than those for each degree. In the case of wide angle indicators, with angles of 70° or greater, the graduations may be 2°.

In the case of a 2° scale, the graduation line shall be made longer than other scales for every 10° scale.

4.3.3 The pointer of the indicator shall be capable of being adjusted to zero.

4.3.4 The letters and graduations for angles to port on the dial shall be clearly distinguishable from those for angles to starboard.

4.3.5 All illumination and lighting of the indicator shall be adjustable down to zero, except the control of the dimmers which shall remain readable.

4.3.6 The illumination and lighting of the indicators shall be arranged so as not to obstruct an operator's vision at night, and so as to make the scale, pointer and letters as equally visible as possible even in dim light or the dark.

5 Performance requirements

5.1 General

The transmitter shall have sufficient capacity to satisfy the requirements specified in 5.2, 5.3 and 5.4 when all the connected indicators are operating simultaneously. The manufacturer should specify the capacity of connected indicators.

5.2 Calibration accuracy

5.2.1 When the shaft of the transmitter is gradually rotated from the zero position to the maximum angle port and starboard, and the angles shown by the indicator are recorded every 5° of the rotation, the difference between the angles of the transmitter shaft and the corresponding value shown at the indicator shall be within [1,5] % of the maximum angle.

5.2.2 In equipment where there is conversion into rudder scale, the minimum unit of angle shall be 0,1° and any value less than 0,1° shall be rounded up to 0,1° after conversion.

5.2.3 In cases of wider angle indication (such as 70°), the angles shown by the indicator may be recorded at every 10°.

5.3 Damping efficiency

When a voltage is suddenly applied while the transmitter shaft is approximately at half of full-scale position and the indicator pointer is set to the zero position, the pointer shall come to reset to that position within 5 s or less.

5.4 Power supply fluctuation

5.4.1 When the power supply fluctuations specified in 5.4.3 are applied, the performance required by 5.1 and 5.2 shall be maintained.

5.4.2 After repeated makings and breakings, the designated performance shall be demonstrated without carrying out manual adjustments.

5.4.3 When the rated voltage and frequency are subjected to the combinations of fluctuations, as given in Table 1, the designated performance shall be demonstrated.

Table 1 — Power supply fluctuation

Settled condition	Voltage fluctuation	± 10 %	Fluctuating period: 600 s
	Frequency fluctuation	± 5 %	
Transient condition	Voltage fluctuation	± 20 %	Fluctuating period: 3 s
	Frequency fluctuation	± 10 %	

5.5 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 electric rudder angle indicators shall comply with the requirements specified in Clause 4.

6.2 Environmental test

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 electric rudder angle indicators will be protected or exposed, as defined in IEC 60945.

6.3 Calibration test

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

6.4 Damping test

The damping test shall be carried out in accordance with 5.3 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 5.4 and shall satisfy the requirements specified therein.

7 Interface

When the indicator system provides an interface facility, it shall meet the requirements laid down in IEC 61162-1 and IEC 61162-2.

8 Marking and identification

8.1 Identification

Each unit of the indicator system 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.

8.2 Compass safe distance

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.