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Ships and marine technology — Propeller shaft revolution indicators — Electric type and electronic type

Navires et technologie maritime — Indicateurs de vitesse d'arbre du propulseur — Type électrique et type électronique

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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.org
Web www.iso.org

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: Foreword — Supplementary information.

The committee responsible for this document is ISO/TC 8, *Ships and marine technology*, Subcommittee SC 6, *Navigation and ship operations*.

This second edition cancels and replaces the first edition (ISO 22554:2007), subclauses 5.2, 5.3, 5.4, and 5.6 of which have been technically revised.

Ships and marine technology — Propeller shaft revolution indicators — Electric type and electronic type

1 Scope

This International Standard specifies the construction, performance requirements, methods of testing, and required test results for electric and electronic propeller shaft revolution indicators (hereinafter referred to as "indicator system") required by 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 differs from IEC 60945, the requirement in this International Standard takes precedence.

NOTE When this indicator system can be used as the tachometer for the engine of a ship, its usage as the tachometer will be accepted.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies..

IEC 60945, *Maritime 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*

IEC 62288:2014, *Maritime navigation and radiocommunication equipment and systems — Presentation of navigation-related information on shipborne navigational displays — General requirements, methods of testing and required test results*

3 Terms and definitions

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

3.1
propeller shaft revolution indicator
remote device capable of indicating the number of revolutions per minute only, or the number of revolutions per minute and the direction of the revolution of the shaft on which it is mounted

3.2
electric propeller shaft revolution indicator
electric type indicator that employs a generator driven by the propeller shaft through the driving unit that transmits the revolution speed (number of revolutions per minute) and direction of rotation of the propeller shaft

3.3
electronic propeller shaft revolution indicator
electronic type indicator that employs a revolution sensor that detects pulses generated by a gear turning the propeller shaft or a circular disc with a slit and transmits these pulses to a signal converter

3.4
indicator
means by which the state of the equipment or machinery is represented to an observer

Note 1 to entry: An indicator shows both the sense and magnitude of the information it presents. An indicator can be analog or digital.

3.5
analog type indicator
indicator that shows the revolution speed in a continuous way, such as by means of an arrow pointer and graduated scale

3.6
digital type indicator
indicator that shows the revolution speed in a discrete, alphanumeric way

3.7
calibration accuracy
difference between the true revolution speed of a propeller shaft and the revolution speed indicated by the indicator

3.8
damping efficiency
amount by which an indicator initially over-reads in response to a sudden signal input, as a percentage of the maximum reading

4 Construction of indicator system

4.1 Indicator system

4.1.1 An indicator system should show information on the state of the equipment or machinery to which it is connected at locations adjacent to, or remote from, the equipment or machinery. At the equipment or machinery, such systems will generally comprise a sensor and transmitter; at the observer's location, such systems will generally contain an indicator.

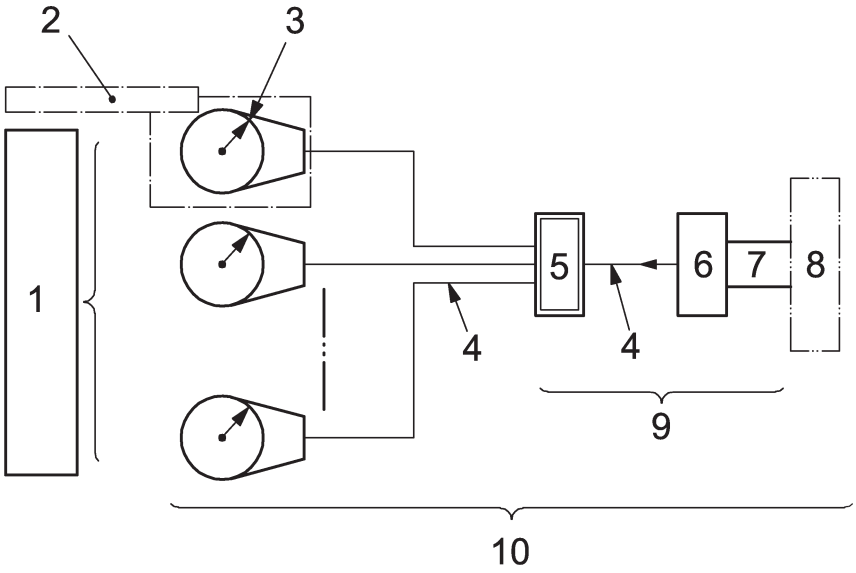
In general, the system construction shall comply with the following requirements.

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

4.1.3 The indicator system with instrument panel lights and the instrument panel light dimmers shall be equipped with a grounding terminal or shall be constructed so that an earth-grounding is securely established. In the electronic type case, however, these requirements shall also be applied to the signal converters.

4.1.4 The indicator system may be self-contained or it may form part of, or derive information from, any other appropriate equipment.

4.1.5 An analog type indicator may be used as indicator(s) of the indicator system. It may be additionally provided by a digital type if fitted.



Key

1 indicators
2 indicator
3 arrow pointer
4 electric cable
5 junction box (as appropriate)/signal converter
6 transmitter
7 driving unit/revolution sensor
8 revolution mechanism
9 transmitters (term used in the broad sense, including the functions of signal pickup and transmission)
10 indicator system

Figure 1 — Construction of an indicator system

4.2 Transmitters

4.2.1 General

The indicator system shall fulfil the following individual structural requirements.

4.2.2 Electric type

4.2.2.1 Driving unit

Driving units shall comply with the following requirements. However, an indicator directly connected to a camshaft or another part of the main machine shall not be equipped with a driving unit.

a) The driving unit shall be constructed so that the revolution of a propeller shaft is conveyed to the transmitter smoothly and without slippage.

b) Recommendations call for providing the driving unit with a clutch system so that transmitter can be suspended and driven at any time while the propeller shaft is spinning.

c) A gear mechanism is recommended for imparting drive force from the propeller shaft system.

d) The drive gear should permit secure, easy mounting on the revolution parts of the propeller shaft.

e) Where the transmitter drive includes pivot connections, such connections shall be designed to resist loosening when subject to vibration.

4.2.2.2 Transmitter

The transmitter shall comply with the following requirements.

a) Driven by the propeller shaft via the conductor, the transmitter employs an electric generator that transmits the revolution speed (number of revolutions per minute) and direction of propeller shaft rotation.

b) The transmitter shall have sufficient capacity to simultaneously drive all connected indicator(s). Also, additional capacity shall be taken into consideration if the transmitter provides output to automation and measurement devices. The manufacturer should specify the capacity of connected indicators.

4.2.2.3 Junction box

Junction boxes shall be capable of being connected to the required number of indicators. Junction boxes shall be equipped with a compensating device to prevent indicator errors, regardless of the number of indicators.

4.2.3 Electronic type

4.2.3.1 Revolution sensor

Revolution sensors shall be constructed so as to correctly detect pulses generated by a propeller shaft's turning gear or circular disc with slit.

4.2.3.2 Signal converter

Signal converters shall be constructed so that each can convert pulses from the propeller shaft into electric signals for output.

4.3 Indicator

4.3.1 The indicator may consist of a receiving portion and indication portion. A receiving portion is electrically connected with a transmitter and indication portion is so constructed that it indicates the direction of the rotation and the number of revolutions per minute of a propeller shaft.

The direction "Ahead" shall be such as identified by the "plus" sign or by the letters "AH" or "AHEAD", while "Astern" shall be identified by the "minus" sign or by the letters "AS" or "ASTERN".

4.3.2 The letters and graduations on a dial shall be such that the direction of ahead and astern can be clearly distinguished.

4.3.3 The clockwise direction of a revolution speed panel shall indicate the forward movement of a ship. It is recommended that the maximum scale value for both forward and backward movements be set to one of 100, 125, 150, 200, 250, 300, 400, or 450 min^{-1} (rev/min). Additional linear range scales may be provided.

4.3.4 The calibration of zero point of an indicator and its indication shall be capable of being adjusted by appropriate measures.

4.3.5 An indicator shall be constructed so that it can be read easily and clearly.

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

4.3.7 The illumination and lighting of an 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 the dark.

4.3.8 The digital indications of propeller shaft revolution indicators on shipborne navigational displays shall be in compliance with IEC 62288:2014.

5 Performance requirements

5.1 General

Any transmitter shall have the capacity to satisfy the requirements of this clause when all connected indicators are operating simultaneously.

5.2 Balance

When an indicator without current rotates to either side by 30° from its upright position, the deviation of a pointer from its zero point shall be within ±1° of the combined maximum scale values ahead and astern for an indicator with a visible diameter of greater than or equal to 150 mm; and ±2 % for an indicator with a visible diameter of less than 150 mm.

5.3 Friction error

When the power at the electric signal equivalent to the number of revolutions of an indicator is applied to the indicator, to allow the pointer to gradually move forward and backward to the maximum scales to find calibration accuracy at points of 0 %, 25 %, 75 %, and 100 % of the maximum scale value, respectively, the difference between the indication of forward and backward movement shall be within ±0,5 % of the combined maximum scale values for ahead and astern movement for an indicator with visible diameter of greater than or equal to 150 mm; and ±1,0 % for an indicator with visible diameter of less than 150 mm.

5.4 Calibration accuracy

When a revolution sensor and a signal converter are operated using an approved testing machine to determine calibration accuracy at points of 0 %, 25 %, 75 %, and 100 % of the maximum scale value of an indicator respectively, the margin of error with respect to the approved testing machine shall be within ±0,5 % of the combined maximum scale values ahead and astern for an indicator with visible diameter of greater than or equal to 150 mm; and ±1,0 % for an indicator with visible diameter of less than 150 mm (using 20 °C as the reference temperature).

5.5 Damping

When a test electric signal equivalent to half of the maximum scale value is suddenly applied to an indicator, the movements of the indicator pointer shall not show a value exceeding two-thirds of the maximum value.

5.6 Zero point

When an electric signal equivalent to an indicator's maximum scale value is applied to an indicator for 30 min, after which power is turned off and the zero position error is immediately corrected by eliminating friction from the moving parts by gently patting the outer casing, any zero point error shall be within ±0,25 % of the combined maximum scale values ahead and astern for an indication portion with visible diameter of greater than or equal to 150 mm; and ±0,5 % for an indication portion with a visible diameter of less than 150 mm.