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Ships and marine technology — Heading control systems

Navires et technologie maritime — Systèmes de pilotage

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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 3.

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

International Standard ISO 11674 was prepared jointly by Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 6, *Navigation* and IEC/TC 80, *Maritime navigation and radiocommunication equipment and systems*.

This first edition cancels and replaces ISO/TR 11674:1996.

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Ships and marine technology — Heading control systems

1 Scope

This International Standard specifies the structure, performance, inspection and testing of heading control systems to be installed on board ships.

It applies to the heading control systems which enable a ship *to keep a preset heading with minimum operation of the ship's steering gear, within limits related to the ship's manoeuvrability in conjunction with their sources of heading information.*

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

A turn rate control or a turning-radius control for performing turns may be provided.

NOTE All the text in this International Standard identical to that in IMO Resolutions [Resolution A.342(IX) as amended by resolution MSC.64(67), annex 3 and Resolution A.694(17)] are printed in italics.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 694:2000, *Ships and marine technology — Positioning of magnetic compasses in ships.*

IEC 60945:1996, *Maritime navigation and radiocommunication equipment and systems — General requirements — Methods of testing and required test results.*

IEC 61162, *Maritime navigation and radiocommunication equipment and systems — Digital interfaces.*

3 Terms and definitions

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

3.1

adjustment control

device which changes the characteristics of an automatic steering device, including proportional rudder adjustment, derivative rudder adjustment, integral rudder adjustment and weather adjustment

NOTE The term "derivative rudder adjustment" is also called "counter rudder adjustment" customarily.

**3.2
automatic steering**

method of controlling the steering gear automatically to enable a ship to keep a preset heading, processing the heading information which is obtained from a gyro-compass or magnetic compass, etc.

**3.3
automatic-steering device**

device which controls automatic steering

**3.4
change-over device**

device for changing over from automatic to manual steering and vice versa

**3.5
derivative rudder adjustment**

counter rudder adjustment
adjustment of a component of the total rudder command which acts to control the rate of turn of the ship

**3.6
heading**

horizontal direction in which a ship actually points or heads at any instant

NOTE Heading is expressed in degrees from a reference direction, usually from 000° at the reference direction clockwise through 360°.

**3.7
heading-signal processor**

unit which processes the heading signal (generated by a gyro-compass, magnetic compass, etc.), and adapts it before its use by the heading control system

**3.8
integral rudder adjustment**

adjustment of a component of the total rudder command which is in proportion to the integral value of the heading deviation

**3.9
manual steering**

method of controlling the steering gear manually

EXAMPLE Using a steering wheel.

**3.10
operational device**

switch, key, knob, etc. which is used for operating a heading control system

**3.11
preset heading**

horizontal direction in which a ship is steered or intended to be steered

NOTE Preset heading is expressed as the angular direction in degrees with respect to north (true/magnetic), from 000° clockwise through 360°.

**3.12
proportional rudder adjustment**

adjustment of a component of the total rudder command in proportion to an instantaneous value of the difference between the preset heading and actual heading

**3.13
turning-radius control**

method of controlling the rate of turn of a vessel to perform turns with a preset turning radius through the water

3.14**turn-rate control**

method of controlling the rudder of a vessel to perform turns with a preset rate of turn

3.15**weather adjustment**

adjustment which minimizes unnecessary steering motion against yawing caused by waves, swells and wind

4 Performance**4.1 General**

4.1.1 *The heading control system shall 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.*

4.1.2 Heading control systems shall conform to the environmental requirements of IEC 60945 for equipment categories protected from the weather.

4.2 Constituents

A heading control system shall be composed, as a minimum, of the following components (see Figure 1):

- a) heading-signal processor (including an indicator of the heading);
- b) operational control for preset heading;
- c) operational controls for adjustments; [ISO 11674:2000](https://standards.iteh.ai/catalog/standards/sist/e0e67bbb-fd61-4492-a38c-8ca21c575d57/iso-11674-2000)
- d) automatic steering device; <https://standards.iteh.ai/catalog/standards/sist/e0e67bbb-fd61-4492-a38c-8ca21c575d57/iso-11674-2000>
- e) change-over device (with steering-mode indicator) which is not required to be an integrated part of the heading control system;
- f) alarm signalling facilities compliant with the requirements of this International Standard;
- g) indicators for steering mode and heading source in use.

4.3 Functional requirements**4.3.1 Change-over from automatic to manual steering and vice versa**

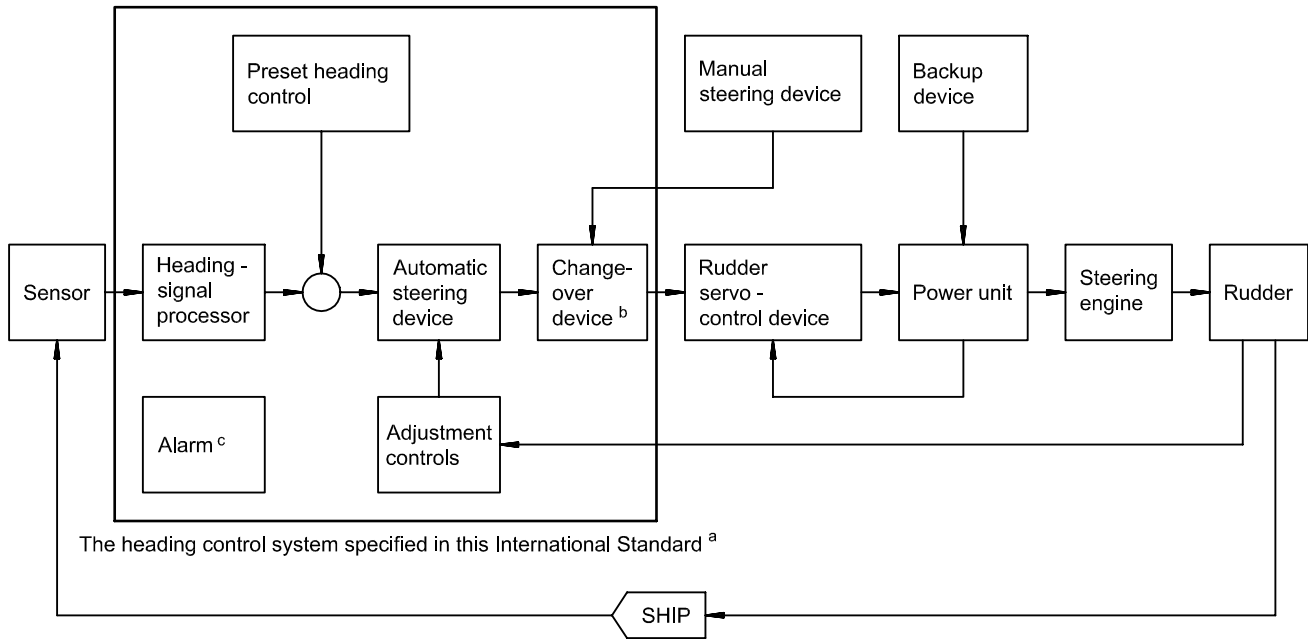
4.3.1.1 *Change-over from automatic to manual steering and vice versa shall be possible at any position of the rudder and shall be activated by one manual control within 3 seconds.*

4.3.1.2 *Change-over from automatic to manual steering shall be possible under any conditions including any failure in the heading control system.*

4.3.1.3 *When changing-over from manual to automatic steering, if there is no new safe input of command, the heading control system shall take over the actual heading of this time as the preset heading.*

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

4.3.1.5 *Adequate indication shall be provided to show which method of steering is in operation at a particular moment. This indicator shall be fitted near the change-over.*



- a The portion enclosed by the thick line shows the constituent devices of a heading control system which are specified in this International Standard.
- b The change-over device is not required to be an integrated part of the heading control systems.
- c Alarm indicating devices may be external units.

Figure 1 — Typical block diagram for heading control system

4.3.2 Operational controls including adjustment controls

4.3.2.1 All operational controls shall permit normal adjustments to be easily performed and shall be easy to identify from the position at which the equipment is normally operated. Controls not required for normal operation shall not be readily accessible.

4.3.2.2 The number of operational controls shall be such that easy and safe operation can be achieved. The controls shall be designed and arranged to preclude inadvertent operation. Their manner of functioning, location and size shall provide for simple, quick and effective operation.

4.3.2.3 Adequate illumination shall be provided in the equipment or in the ship to enable identification of controls and facilitate reading of indicators at all times. Means shall be provided for dimming the output of the light source which is capable of interfering with navigation.

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

4.3.2.5 The heading control system shall be designed in such a way as to ensure altering the preset heading to starboard by turning the heading setting control clockwise or tilting it to the right-hand side. Turning the control counterclockwise or tilting it to the left shall effect a similar alteration to port. Normal alterations of heading shall be possible by one adjustment only of the preset heading control. Requirements shall be made by means of the design and the construction of the preset heading control to preclude unintended alteration of heading.

4.3.2.6 When changing heading, the clockwise or counterclockwise direction of preset heading adjustment shall determine the ship's turning direction.

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

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

4.3.2.9 Additional controls at remote positions shall comply with the provisions of this standard.

4.3.3 Rudder angle limitation

Means shall be incorporated in the equipment to enable adjustable rudder angle limitation in the automatic mode. Means shall 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 shall appropriately apply.

4.3.4 Permitted yaw

Means shall be incorporated to prevent unnecessary activation of the rudder due to normal yaw motion.

4.3.5 Heading indication accuracy

If there is a heading indication, it shall not deviate from the heading sensor by more than 0,5°.

4.3.6 Preset heading

Any alteration of the preset heading shall not be possible without a form of activation by the ship's personnel.

4.3.7 Preset rate of turn

If the heading control system is provided with the function to perform turns with a preset rate of turn, the accuracy of the rate of turn after becoming constant in a turn, shall be within $\pm 10\%$ of its preset value or 3°/min, whichever is the greater, with the ship's normal load condition and in a calm sea which is sufficiently broad and deep to be able to manoeuvre free from disturbances against the ship's manoeuvrability.

NOTE There are some cases where it is not possible to turn at the preset rate, even if steered at the maximum rudder angle, due to the effects of weather, sea state or ship's manoeuvrability.

4.3.8 Preset turning radius

If the heading control system is provided with the function to perform turns with a preset turning radius, the accuracy of the radius after becoming constant in a turn, shall be calculated using the data of 4.3.7.

NOTE There are some cases where it is not possible to turn at the preset turning radius, even if steered at the maximum rudder angle, due to the effects of weather, sea state or ship's manoeuvrability.

4.3.9 Limiting of overshoot

The heading control system shall include a counter rudder-angle adjustment control or similar system to allow the change to a preset heading without significant overshoot.

4.3.10 Power supply

4.3.10.1 A heading control system shall be capable of normal operation when its power supply varies as specified in IEC 60945.

4.3.10.2 If provision is made for operating equipment from more than one source of electrical energy, arrangements for rapidly changing from one source to the other shall be provided but not necessarily incorporated in the equipment. Means shall be provided to retain the current heading during alteration of the power source.