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Small craft — Steering gear — Cable over pulley systems

Petits navires — Appareils à gouverner — Systèmes à câble sur poulie

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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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This document was prepared by Technical Committee ISO/TC 188, *Small craft*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 464, *Small craft*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition (ISO 8847:2004), which has been technically revised.

The main changes compared to the previous edition are as follows:

— update of the scope to clarify application on small craft with and without propulsion engine(s);

— addition to the scope of small craft with outboard engines up to and including 37 kW total power;

— update of the definitions;

— update of requirements to meet state of the art;

— addition of informative Annexes A and B.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Small craft — Steering gear — Cable over pulley systems

1 Scope

This document specifies the requirements for the design, installation and testing of cable over pulley steering systems on small craft with or without a propulsion engine(s), and on small craft with outboard engine(s) up to and including 37 kW total power.

It specifies the requirements for the design and testing of all components of a cable over pulley steering system, from the steering mechanism to the mechanical interface with the rudder shaft or the outboard engine. It applies to cable over pulley steering systems, whether for pedestal or bulkhead types.

This document does not address emergency means of steering the craft.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

ISO 2408:2017, *Steel wire ropes — Requirements*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
accessible
capable of being reached for operation, inspection or maintenance without removal of permanent structure of the craft

3.2
cable
flexible mechanical means of transmitting tension forces from one location to another

Note 1 to entry: This cable can be metallic or non-metallic.

3.3
cable drum
circular feature of the *steering mechanism* (3.10) over which the steering *cable* (3.2) is routed to provide the required cable travel

3.4
cable over pulley steering system
steering system in which rotation of the steering wheel transmits movement to either the steering arm quadrant fastened to the rudder shaft, or to the outboard engine steering arm, by mechanical means including flexible cable over pulleys mounted to the structure of the craft

3.5
cable load
force applied to the *cable* (3.2) providing the necessary torque to move either the rudder through the rudder shaft/steering arm or the outboard engine while the craft is underway

3.6
cable-in conduit-steering system
steering system in which rotation of the steering wheel transmits movement to either the steering arm quadrant fastened to the rudder shaft, or to the outboard engine steering arm, by mechanical means including flexible *cable* (3.2) and conduits with or without use of pulleys

3.7
fairlead
ring, eye or loop that guides a *cable* (3.2) in the desired direction

Note 1 to entry: A pulley can also perform the function of a fairlead.

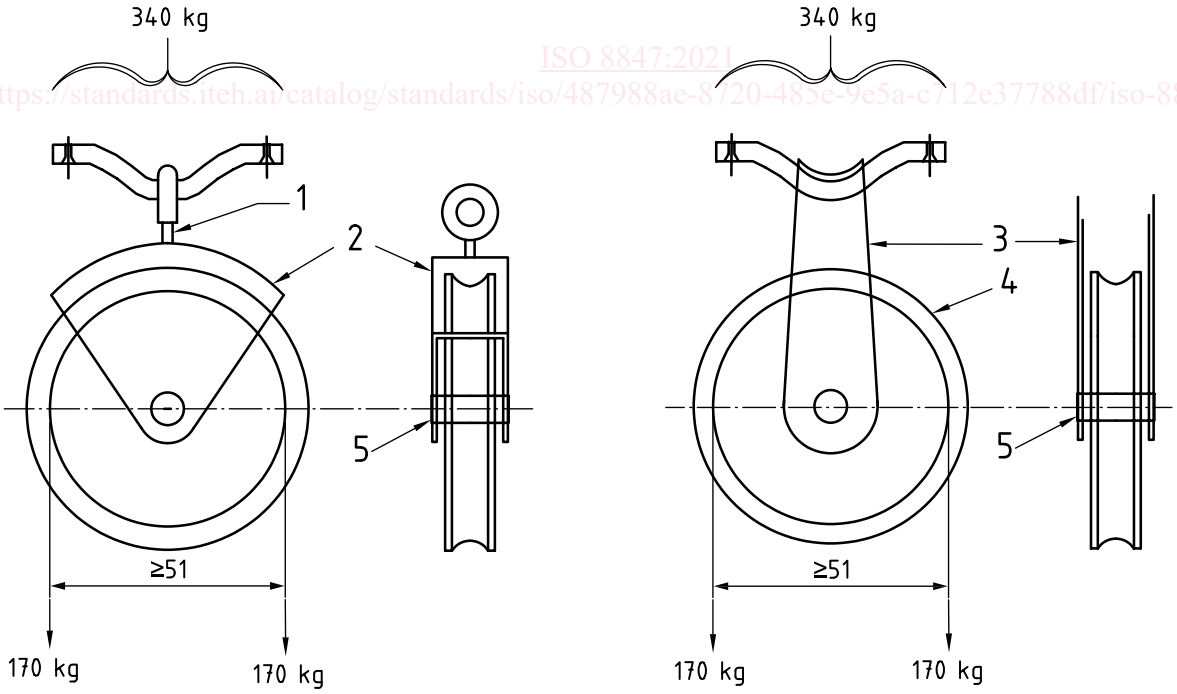
3.8
swivel pulley
pulley whose attachment feature is designed to allow the pulley to rotate freely about the swivel centreline

Note 1 to entry: See Figure 1, left side.

3.9
fixed strap pulley
pulley whose attachment is designed for minimum, if any, rotation of the pulley assembly about the fixed strap axis

Note 1 to entry: See Figure 1, right side.

Dimensions in millimetres



Key

1 swivel
2 cheek strap
3 fixed strap
4 sheave
5 pulley pin

Figure 1 — Swivel and fixed strap pulleys cable over pulley systems

3.10
steering mechanism
device to which a *control element* (3.20) is attached for manual application of a controlling force, and by which the controlling force is fed into a *steering system* (3.14)

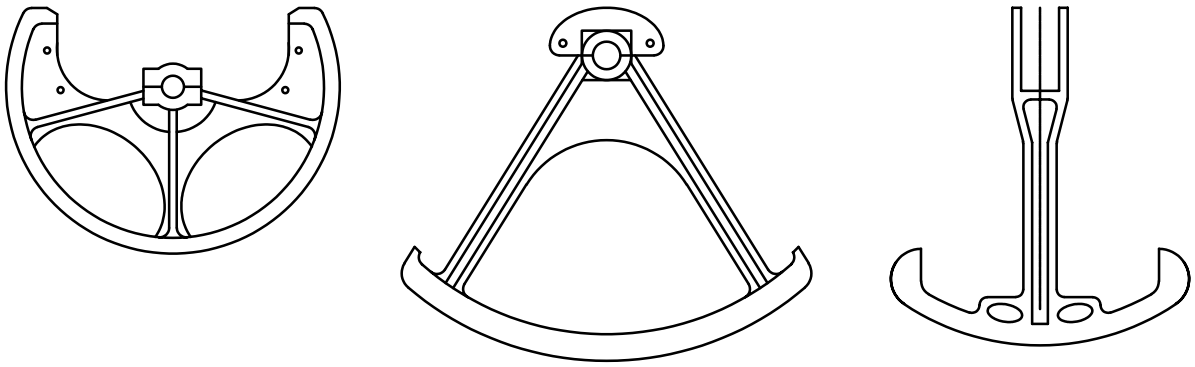
3.11
helm station
location from which steering, propulsion and thrust can be controlled

3.12
minimum retained system performance
system capability after test(s) such that at least 90 % of the outboard engine steering arm travel normally available each side of the mid-position can be attained by exertion of no more than 27 Nm of torque at the helm through the *steering mechanism* (3.10), through the *control element* (3.20)

Note 1 to entry: These limits are not intended to define a condition under which a craft can or cannot be safely operated but are intended to provide quantitative limits for design and testing purposes.

3.13
steering arm
component fixed to the rudder shaft with at least one groove for the *cable* (3.2) concentric to the shaft centre or for outboard engines, the portion of the outboard engine that the steering system makes *mechanical interface* (3.21) with

Note 1 to entry: The steering arm can be a wheel quadrant (see Figure 2a), a quadrant (see Figure 2b) or a tiller quadrant (see Figure 2c).



a) Wheel quadrant **b) Quadrant** **c) Tiller quadrant**

Figure 2 — Examples of steering arm types

3.14
steering system
assembly including all components necessary to transmit remote manual effort to the rudder blade steering arm quadrant or to the outboard engine steering arm

3.15
total steering loss
complete loss of the ability to steer the craft from the *helm station* (3.11) by application of manual effort to the *control element* (3.20)

3.16
steering wheel
mechanical means for applying manual steering effort to the helm, normally a circular configuration with a continuous loop at the distal end of support spokes with the *steering mechanism* (3.10) connected at the rotational axis

3.17
steering wheel diameter
actual diameter
D_a
diameter of the circle formed by the outermost sections of the *steering wheel* (3.16)

Note 1 to entry: See Figure 3.

3.18
steering wheel dish
distance between the two parallel planes formed by the aft rim surface and the forward hub surface of a *steering wheel* (3.16)

Note 1 to entry: see Figure 3.

3.19
craft
small craft
recreational boat, and other watercraft using similar equipment, of up to 24 m length of hull (L_H)

Note 1 to entry: The measurement methodology for the length of hull is defined in ISO 8666.

[SOURCE: ISO 8666:2020, 3.15, modified – Note 1 to entry has been added.]

3.20
control element
device connected to the *steering mechanism* (3.10) that allows the operator to apply manual steering effort to *the steering system* (3.14)

3.21
mechanical interface
interface where force and motion are transmitted mechanically

3.22
sailing boat
craft (3.19) for which the primary means of propulsion is by wind power, having reference sail area (A_S) ≥ 0,07 $(m_{LDC})^{2/3}$

[SOURCE: ISO 8666:2020, 3.11]

4 General requirements

4.1 Components of the steering system shall be fastened securely to the structure of the craft, reinforced where necessary, especially at the steering mechanism bulkhead/pedestal mounting and at pulleys.

4.2 On a sailing boat, the steering arm connection to the rudder shaft shall be capable of transmitting the required steering torque to the rudder.

NOTE Rudder requirements are addressed in ISO 12215-8.

4.3 Cable over pulley steering systems designed to meet the requirements of this document shall not be used to steer craft having outboard engine(s) in excess of 37 kW total power.

4.4 All threaded fasteners whose integrity affects safe operation of the steering system so that separation or loss of the fasteners can cause total steering loss without warning shall be provided with a locking means.

4.4.1 Threaded fasteners that can be expected to be disturbed by installation or adjustment procedures shall be referenced by instructions for correct assembly and:

a) shall be locked by a device whose presence is determined by visual inspection or by feel following assembly, or

b) shall incorporate an integral locking means, provided the fastener cannot be omitted or substituted without making the steering system inoperable.

NOTE Self-locking nuts with plastic inserts that create mechanical plastic interference meet the above stated requirements.

4.5 Loose lock washers, distorted thread nuts or separately applied adhesives shall not be used.

4.6 Plain threaded jam nuts may be used to permit adjustments and shall be designed so that total separation of parts or other complete loss of steering will not occur should they loosen.

4.7 Plastics and elastomers shall be designed to resist degradation from ultraviolet radiation, salt water, hydrocarbons and ozone.

4.8 Components of the steering system shall be resistant to corrosion, either by virtue of material or coating thereof, and shall be galvanically compatible with adjoining components.

4.9 Components of the steering system shall be sized to prevent derailing or jamming of the cable.

4.10 Components of the steering system shall be accessible for inspection and maintenance.

4.11 Compass interference — Materials used in the various components of the steering system as supplied shall not affect the accuracy and reliability of a compass mounted on the pedestal, if used, whatever steering angle is used.

5 Steering system requirements

5.1 Steering stops for the outboard engine shall permit at least 30° of angular movement either side of centre. Stops for the rudder blade steering arm quadrant shall be set by the sailing boat manufacturer.

5.2 When used with an outboard engine, the cable over pulley steering system attachment to the engine shall be designed so that with any combination of engine turn and tilt, there will be no damaging interference between the engine, its accessories, the steering system and the craft.

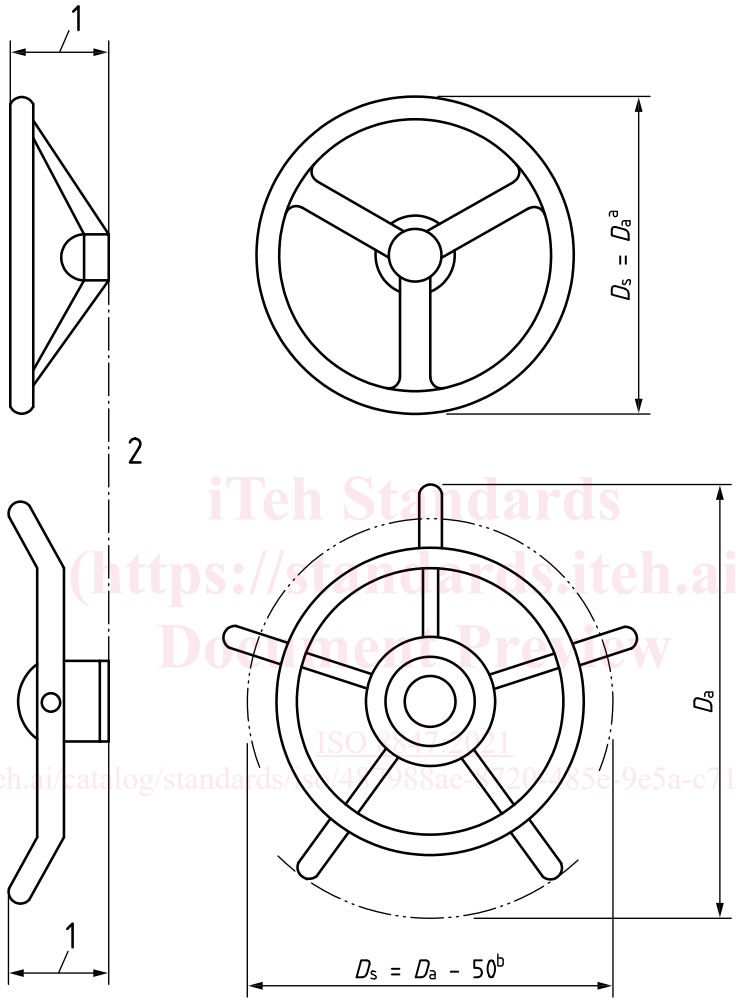
5.3 Steering wheels and helm shafts shall be selected to fit each other. See Annex A, Figure A.1 a), b), c).

NOTE Steering wheel requirements are addressed in ISO 23411.

5.3.1 The largest diameter D_s and deepest dish steering wheel information shall be permanently marked by the component manufacturer on the steering mechanism so as to be visible with the steering mechanism installed, and the wheel removed. See Figure 3.

5.3.2 When equipped with the largest diameter D_s and deepest dish steering wheel for which the helm is rated, all steering components shall be of sufficient strength to successfully pass the testing requirements of Clause 7.

Dimensions in millimetres



Key

1 steering wheel dish
2 forward hub surface
D_a actual diameter
D_s standard diameter for the application of loads
a For steering wheels without handgrips, $D_s = D_a$.
b For external spoke steering wheels, $D_s = D_a - 50$ mm.

NOTE For non-circular steering wheels, D_s is the largest diameter that can be inscribed in the steering wheel shape.

Figure 3 — Steering wheel terms