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Ships and marine technology — Ship-shifting winches

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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

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.

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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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 4, *Outfitting and deck machinery*.

Ships and marine technology — Ship-shifting winches

1 Scope

This International Standard specifies requirements for the design, operation, safety, performance, and inspection rules of ship-shifting winches, with electric or hydraulic drive.

Such winches are applicable to longitudinal and transverse movements or positioning of engineering vessels for offshore operation. It can be used as a reference for inland operation.

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.

ISO 2408, *Steel wire ropes for general purposes — Minimum requirements*

ISO 3828, *Shipbuilding and marine structures — Deck machinery — Vocabulary and symbols*

ISO 4413, *Hydraulic fluid power — General rules and safety requirements for systems and their components*

ISO 6482, *Shipbuilding — Deck machinery — Warping end profiles*

ISO 7825, *Shipbuilding — Deck machinery — General requirements*

IEC 60092 (all parts), *Electrical installations in ships — Special features — High Voltage Shore Connection Systems (HVSC-Systems)*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

3 Terms and definitions

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

3.1 Technical terms

3.1.1

light load pull

pull of steel wire ropes not less than 25 % that of the drum load with a rope wound on the drum in a single layer

3.1.2

light line speed

minimum hauling speed measured when the ship-shifting winch is under the light load pull with a rope wound on the drum in a single layer

3.1.3

normally closed brake

brake that is always in the braking condition except for the operation conditions of hoisting and rendering a rope

3.2 Types of ship-shifting winches

3.2.1

left-hand ship-shifting winch

winch where the reduction gear or the drive of the drum is on the left-hand side of the drum, in relation to an observer situated on the side of the motor, power supply, or controller

Note 1 to entry: See [Figure 1](#).

3.2.2

right-hand ship-shifting winch

winch where the reduction gear or the drive of the drum is on the right-hand side of the drum, in relation to an observer situated on the side of the motor, power supply, or controller

Note 1 to entry: See [Figure 2](#).

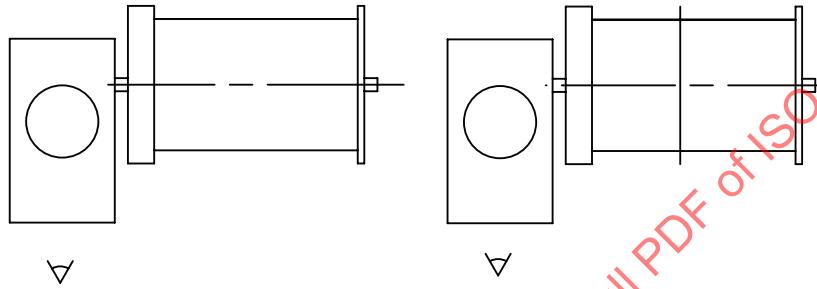


Figure 1 — Left-hand ship-shifting winch

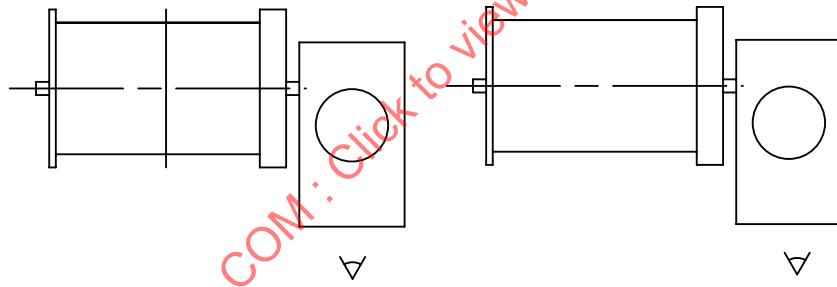


Figure 2 — Right-hand ship-shifting winch

4 Design and operation

4.1 General requirements

Ship-shifting winches shall meet the general requirements for deck equipment in ISO 7825.

NOTE Attention is drawn to the existence of safety regulations in certain countries and organizations affecting ship-shifting winch controls.

4.2 Strength requirements

4.2.1 The allowable calculated stresses of any drive part under the drum load, based on simple elastic theory, shall not be greater than 0,4 times the upper yield strength (R_{eH}) or the 0,2 % proof strength, non-proportional extension ($R_{P0,2}$) of the material.

4.2.2 With maximum torque of prime mover or set pressure of safety valve, the allowable stresses of any affected part shall not be greater than 0,9 times the upper yield strength (R_{eH}) or the 0,2 % proof strength, non-proportional extension ($R_{P0,2}$) of the material.

4.2.3 The allowable calculated stresses of any affected part under 80 % of the breaking strength of the rope shall not be greater than 0,9 times the upper yield strength (R_{eH}) or the 0,2 % proof strength, non-proportional extension ($R_{P0,2}$) of the material.

4.3 Steel wire ropes

Steel wire ropes shall have the construction of applicable use. For design purposes, the drum shall be based on 6 × 36WS-IWRC or 6 × 41WS-IWRC steel rope manufactured from 1 960 N/mm² or 1 770 N/mm² tensile grade wire in accordance with ISO 2408, C.9.

NOTE The above requirement does not preclude the use of other types of rope in service.

4.4 Drum design

4.4.1 Drum diameter

The drum diameter shall be not less than 16 times the diameter of the design rope.

4.4.2 Drum length

The length of the running part of the drum shall be enough for winding of at least 10 turns of ropes on each layer.

4.4.3 Drum flange height

The drum flange height shall be determined according to the following requirements.

- For the winch without a rope guide, when all the rope is reeled on a drum, the flange shall project at least 2,0 times the rope diameter above the outermost layer.
- For the winch with a rope guide, when all the rope is reeled on a drum, the flange shall project at least 1,0 time the rope diameter above the outermost layer.
- When calculating the drum size, layers of rope shall be superimposed directly upon each other without a half rope diameter offset between adjacent layers.

4.4.4 Drum clutch

The clutch shall be mounted between the drum and drive equipment. It shall be provided with a reliable locking device; if it is power driven, the manually operated device shall be provided as well.

4.5 Auxiliary equipment

- The ship-shifting winch may be designed to be provided with or without warping-ends; if fitted, the profile of warping-ends shall conform to the requirement of ISO 6482.
- An automatic rope guide may be fitted to the ship-shifting winches, if proposed by the purchaser.

4.6 Brakes

4.6.1 Automatic braking system

4.6.1.1 Electric ship-shifting winches shall be provided with an automatic braking system which operates when bringing the operating device to the stop or braking position. The brake shall be capable of holding a load on the hawser of 1,5 times the drum load and of stopping the drum rotation from its maximum speed without suffering damage.

4.6.1.2 For winches of hydraulic drive, a proper automatic braking system shall be used, if agreed between the purchaser and manufacturer. The braking system shall be capable of holding a load on the hawser of 1,25 times the drum load, and the movement of the rope shall be controlled within 1,0 m/min.

4.6.2 Drum brakes

- a) Winches shall be provided with a drum brake, which shall be normally closed; the brake is released by either manual operation or power operation. If this brake is power operated, it shall also be capable of manual operation. The maximum holding force is the holding load.
- b) The function of the power operated system of the power operated brake shall not be affected by the fault of the primary power source.
- c) The braking force shall be adjustable, and the position mark of the holding load shall be fitted, to avoid the excessive or insufficient set holding load.
- d) In an emergency, the drum brake shall be capable of completing the emergency release within 10 s.

NOTE The provision of a braking force test device shall be determined by the purchaser and manufacturer.

4.7 Safety and protection

4.7.1 When being subjected to the impact or over-torque, the prime mover and drive shall be provided with safety protection, such as overpressure protection for hydraulic drives and overcurrent protection for motors.

4.7.2 The minimum ingress protection of electrical equipment on the weather deck is IP56 of IEC 60529, or any other ingress protection applicable to the installation and operation environment of the equipment.

4.7.3 The breaking strength range of the rope selected for design shall be marked at the conspicuous place of the ship-shifting winch.

4.8 Speed control

The speed of the winch shall be adjustable between stop and maximum within each gear step. It shall be possible to adjust the speed while the winch is working.

4.9 Operating devices

4.9.1 For ship-shifting winches remotely operated, emergency stop mechanisms shall be installed beside the winch, to cut off the power of the winch and automatically brake if the power sources fail.

4.9.2 Every remotely operable control component shall be operated manually beside the winch.

4.9.3 Whatever the form of motive power, the operating devices shall, when under manual control, be arranged to return to the braking or stop position automatically, unless otherwise agreed between the purchaser and manufacturer.

4.9.4 The direction of motion of the operating devices shall be clearly and permanently marked. It shall be such that the rope is hauled-in by the clockwise movement at a hand-wheel or crank handle or, alternatively, by the movement of a hand-lever towards the operator, and vice versa.

4.10 Drive equipment

4.10.1 Electrical drives and control equipment shall conform to the requirements of IEC 60092;

4.10.2 Hydraulic drives and control equipment shall conform to the requirements of ISO 4413.

4.10.3 The drive equipment of winches shall meet the following conditions.

- a) Ship-shifting winches shall be driven with an independent prime mover, and be able to control the hauling, veering, and speed of the rope.
- b) The time when the drive equipment runs continuously under drum load at nominal mooring speed shall be determined by the purchaser and manufacturer according to the length of the rope, at least 30 min.

5 Performance specifications

5.1 Preferred numbers of drum load

Preferred numbers of drum load are taken according to R10 rounded values: 50, 63, 80, 100, 125, 160, 200, 250, 315, 400, 500, 630, and 800(kN) respectively.

NOTE The use of other drum loads of winches is not precluded, if agreed between the purchaser and manufacturer.

5.2 Preferred numbers of nominal hauling speed

Preferred numbers of nominal hauling speed are 0,1 m/s, 0,15 m/s, 0,2 m/s, 0,25 m/s, 0,3 m/s, 0,35 m/s, 0,4 m/s, and 0,5 m/s.

NOTE The use of other nominal hauling speeds of winches is not precluded, if agreed between the purchaser and manufacturer.

5.3 Preferred numbers of drum capacity

Preferred numbers of drum capacity are taken according to R10 rounded values: 200 m, 250 m, 315 m, 400 m, 500 m, 630 m, 800 m, 1 000 m, 1 250 m, and 1 600 m respectively.

NOTE The use of drums with other capacity is not precluded in service, if agreed between the purchaser and manufacturer.

5.4 Light line speed

The light line speed of the winch shall be twice the nominal mooring speed.

NOTE The use of other light line speeds is not precluded in service, if agreed between the purchaser and manufacturer.

5.5 Holding load

The holding load of the drum brake shall be 0,8 times the minimum breaking strength of the design rope.

5.6 Breaking strength of ropes

The breaking strength of ropes shall be 3,33~4,55 times the drum load.

5.7 Control requirements for automatic tension

For winches with automatic tension, the recovery load shall be not less than 50 % of the set value and the rendering load shall be not more than 1,5 times the set value.

6 Acceptance tests

6.1 General

Type tests or individual tests shall be carried out after ship-shifting winches are assembled at the manufacturer. Where tests are required in excess of the following requirements, these shall be agreed between the purchaser and manufacturer.

NOTE 1 Some tests can take place at the factory or on board, as agreed by the manufacturer and purchaser.

NOTE 2 Attention is drawn to the requirements of national authorities or classification societies.

6.2 Type test

This test may be replaced by a prototype test certificate, if agreed by the manufacturer and purchaser. The type test shall be carried out as follows.

6.2.1 Operation under no-load

The winch shall run for 30 min, 15 min continuously in each direction under no-load at the speed not less than the nominal mooring speed; after testing for 30 min, it shall run for 10 min at the light line speed, 5 min in each direction at each step of speed.

6.2.2 Light load test

The winch shall make hoisting and rendering operations continuously for 15 min under the light load pull at the light line speed.

6.2.3 Drum load test

The winch shall make hoisting and rendering operations continuously for 30 min under the drum load at the nominal mooring speed.

6.2.4 Automatic tension test

For winches with automatic tension, with a rope wound on the drum in a single layer, the load shall be reduced or increased in a proper manner, starting from the drum load, and the instantaneous pull at the drum exit shall be recorded when the drum starts to rotate in the direction of hauling or rendering. The hauling and rendering shall be tested for three times.

6.2.5 Automatic braking system test

This test shall be carried out once or twice according to the requirements of [4.6.1](#).

6.2.6 Holding load test on drum brakes

The calibration and test of the holding load shall be carried out for drum brakes according to the requirement of [5.5](#) and [4.6.2](#) c). The drum shall not rotate within 2 min under the holding load.

6.2.7 Drum clutch test

Clutch test shall be carried out under no-load.

6.2.8 Others

In case of remote or other special devices, their operations shall be checked.

6.2.9 Check items during test

- a) tightness against oil leakage
- b) presence of abnormal temperature of bearings
- c) measurement of actual pull and speed
- d) presence of abnormal noise
- e) power consumption

6.3 Individual test

6.3.1 Operation under no-load

The winch shall run for 30 min, 10 min continuously in each direction under no-load at the speed not less than the nominal mooring speed. After testing for 20 min, it shall run for 10 min at the no-load speed, 5 min in each direction at each step of speed.

6.3.2 Drum load test

The winch shall make hoisting and rendering operations continuously for three times under the drum load specified in [5.1](#) and at the nominal mooring speed specified in [5.2](#).

6.3.3 Automatic braking system test

The same test method given in [6.2.5](#).

6.3.4 Holding load test on drum brakes

The same test method given in [6.2.6](#).

NOTE This test can be carried out on-board ship, if agreed by the purchaser.

6.3.5 Check items during test

- a) tightness against oil leakage
- b) presence of abnormal temperature of bearings
- c) measurement of actual pull and speed
- d) presence of abnormal noise