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Ships and marine technology — Sea-going vessels — Dual traction/stowage winches for oceanographic research

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Foreword

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This document was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 4, *Outfitting and deck machinery*.

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Ships and marine technology — Sea-going vessels — Dual traction/stowage winches for oceanographic research

1 Scope

This document specifies requirements for the design, construction, safety, performance and acceptance testing of dual traction/stowage winches for oceanographic research (hereafter referred as to "dual traction / stowage winches"), with hydraulic and electric drive.

Dual traction/stowage winches are mainly used for fixed-point and towing marine survey, involving marine geological sampling, seawater water body parameter measurement and marine biological survey.

This document is applicable to the design, manufacturing, and acceptance testing of dual traction/stowage winch.

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 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*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO3828 and the following apply.

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

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

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

3.1 Technical terms

3.1.1
Safe Working Load, SWL
under design operation seastate, the maximum static load which the winch is certified to recover while the rope at nominal speed

3.1.2
nominal speed
the maximum speed while the winch recovering the rope with SWL (see 3.1.1)

3.1.3
dynamic factor
a variable factor representing the dynamic effects induced due to the ship motion including rolling, pitch and heaving, etc., while the winch is working under the design operation sea states, andby which the SWL is multiplied to represents the load on the system due to all dynamic effects

Note 1 to entry: Note1 to entry: The value of dynamic factor is referenced in Annex A.

3.1.4
holding load
maximum static load on the winch which the brake can withstand

3.2 Winch types

3.2.1
left-hand winch of vertical spooling rope and right pulling out, LVR
winches where, the drive unit is located on the left side of drum, and rope's pull out direction is parallel to drum axis, and rope is to the right side

Note 1 to entry: See Figure 1 a).

3.2.2
right-hand winch of vertical spooling rope and right pulling out, RVR
winches where, the drive unit is located on the right side of drum, and rope's pull out direction is parallel to drum axis, and rope is to the right side

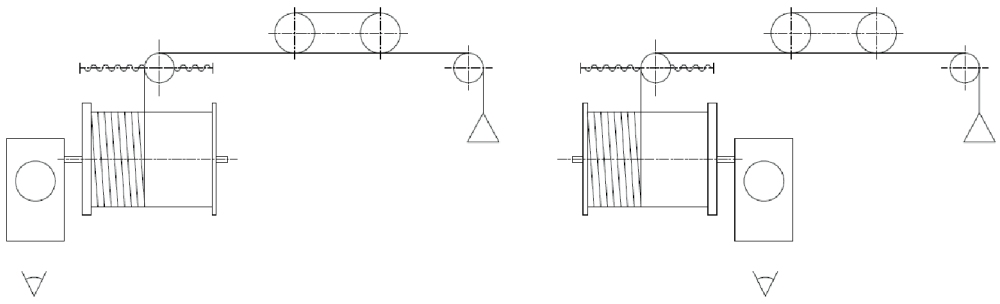
Note 1 to entry: See Figure 1 b).

3.2.3
left-hand winch of vertical spooling rope and left pulling out, LVL
winches where, the drive unit is located on the left side of drum, and rope's pull out direction is parallel to drum axis, and rope is to the left side

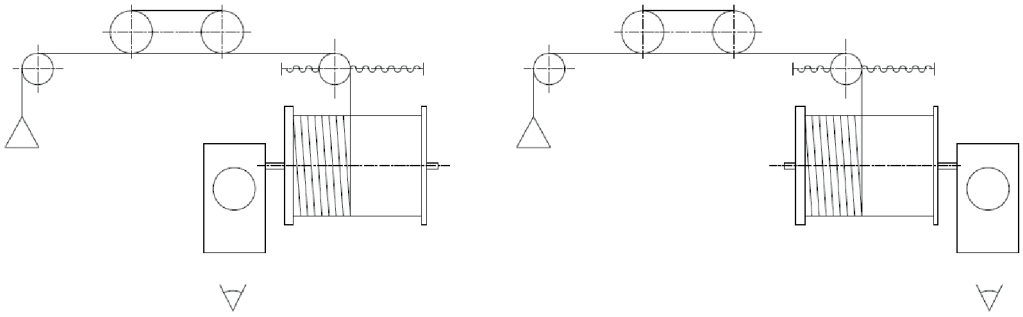
Note 1 to entry: See Figure 1 c).

3.2.4
right-hand winch of vertical spooling rope and left pulling out, RVL
winches where, the drive unit is located on the right side of drum, and rope's pull out direction is parallel to drum axis, and rope is to the left side

Note 1 to entry: See Figure 1 d).



a) Left-hand winch of vertical spooling rope, LVR b)Right-hand winch of vertical spooling rope, RVR



c) Left-hand winch of vertical spooling rope and left pulling out, LVL d)Right-hand winch of vertical spooling rope and left pulling out, RVL

Figure 1 — Typical winches types

4 Design and constructions

4.1 General requirements

Dual traction/stowage winches shall meet the general requirements for deck equipment in ISO 7825.

4.2 Strength requirements

4.2.1 Under maximum load[1)] conditions, the calculated allowable stresses of structure parts shall not greater than 0,45 times of the material upper yield strength(R_{eH}) or 0,2 % of the specified non-proportional elongation yield strength ($R_{p0,2}$).

4.2.2 Under the holding load condition, the calculated allowable stresses of related part shall not be greater than 0,9 times of the material upper yield strength(R_{eH}) or 0,2 % of the specified non-proportional elongation yield strength($R_{p0,2}$).

4.2.3 Holding load shall not be less than the product of SWL and dynamic factor. When dynamic factor is less than 1,5, hold load is 1,5 times SWL.

4.3 Drum design

4.3.1 The ropes or cables used for marine survey include: steel wire ropes, electro-mechanical cables, optical fibre cables and synthetic fibre ropes, etc.

4.3.2 For steel wire ropes, the diameter of the drum shall not be less than 16 times the diameter of the wire ropes. For electro-mechanical cables, optical fibre cables and synthetic fibre ropes, the ratio of the drum diameter to the rope or cable diameter shall meet the requirements of the rope or cable manufacturer.

4.3.3 The distance between the top layer rope and edge of flange shall not be less than 2,5 times the diameter of the rope.

4.3.4 In normalworking condition, the remaining rope on the drum shall not be less than 5 laps.

1) Maximum load is the product of SWL and dynamic factor.

4.3.5 The barrel of the drum shall be equipped with a groove shell for reeling up over 3 layers to ensure the smoothness of the rope.

4.4 Spooling device

4.4.1 The winch needs to be equipped with spooling device. The spooling device can be independently driven by a hydraulic motor or electric motor, or driven by a drum through a transmission device to ensure that the rope is smooth, free of rope jumping, traps and other defects.

4.4.2 For steel wire ropes, the diameter of the cable guide sheaves shall not be less than 16 times the diameter of the rope, and for electro-mechanical cables, optical fibre cables and optical fibre ropes, the ratio of the diameter of the rope or cable guide sheaves to the diameter of the rope or cables shall meet the requirements of the rope or cable manufacturer.

4.5 Traction device

4.5.1 The rope groove of the traction device is multiple parallel grooves.

4.5.2 For steel ropes, the diameter of the rope shall not be less than 16 times the diameter of the grooves, and for electro-mechanical cables, optical fibre cables and synthetic fibre ropes, the ratio of the grooves diameter and the rope or cable diameter shall meet the requirements of the rope or cable manufacturer.

4.5.3 Traction device shall be equipped with a device to prevent the rope or cable from jumping out of the rope groove.

4.6 Buffer device

The winch can be equipped with buffer device to ease the sudden change tension in the rope.

4.7 Drive device

4.7.1 Electric power drive and control equipment shall meet the requirements of IEC 60092, and the minimum protection level of electrical equipment on the deck should meet the requirements ofIP56 in IEC 60529.

4.7.2 Hydraulic drive and control equipment shall meet the requirements of ISO 4413.

4.7.3 Winch drive device shall meet the following requirements:

a) The winch shall be driven by an independent driving device and shall be able to control the reversing and rotating speed of the winch.

b) Under the condition of safe working load and nominal line speed, the drive device shall be able to drive the winch to run continuously, and the continuous running time shall generally not be less than 30 min[2)].

c) The drive device shall have overload protection.

2) The continuous running time under safe working load and nominal line speed shall be determined jointly by the purchaser and the manufacturer.

4.8 Brake device

4.8.1 The winch is equipped with a normally closed braking device. When the winch is in a normal stop state, braking state, or the winch loses power, the braking device is in an active state.

4.8.2 Braking devices should avoid excessive impact load.

4.8.3 The braking device shall be able to resist the maximum torque by hold load and the stressed parts shall not be damaged.

4.9 Speed control

The speed of the winch rendering and recovering shall be able to adjustable steplessly between zero and maximum speed, and shall be able to be adjusted during the winch rendering and recovering operation.

4.10 Alarm function

The winch shall be equipped with acoustic and optical alarm devices, such as misoperation warning, overload, over speed and insufficient rope margin; For the hydraulic drive winch, it should also have high oil temperature, low liquid level, filter blockage alarm and other functions.

4.11 AHC function (optional)

The active heave compensation function (AHC) is to reduce the influence of sea wave motion on the operation task and ensure the smooth operation of oceanographic research. The active heave compensation system can compensate the heave motion of the rope and equipment caused by the influence of wave on the ship.

4.12 Control system and operation parameters display

4.12.1 The winch shall be equipped with local control device, which can be configured with long-range control or portable remote control according to customer needs.

4.12.2 The control panel shall display the operation information such as the length of the storage rope, rope speed, rope tension and fault alarm in real time.

4.12.3 The direction of movement of all control mechanisms shall be permanently marked, with the handle drawn to the operator as the rope, and vice versa. The handle should automatically return to the stop position when released.

4.12.4 If the control mechanism adopts a handle, the movement direction of the handle shall be provided with a permanent indicating mark. The handle is pulled to the operator for rope recovering, and vice versa. The handle should automatically return to the stop position when released.

4.13 Subsidiary equipment

4.13.1 Tension measuring device

The winch shall be equipped with a continuous rope tension monitoring device for real-time measurement of rope tension during rope recovering, rope rendering and braking operations.

4.13.2 Speed measuring device

The winch shall be equipped with a continuous rope speed monitoring device for real-time measurement of rope speed during recovering operation.

4.13.3 Rope length measurement device

The winch shall be equipped with a continuous rope length monitoring device for real-time measure of the rope length during winch operation.

5 Acceptance tests

5.1 General

Tests shall be completed before the buyer accepts the winch, and subject to the approval of the buyer and manufacturer, part of the test may be carried out on board.

5.2 Function test

Under the condition of no-load, operate the winch for 10 min respectively in the direction of rope recovering and rendering. During the test, the stepless speed change test from zero to rated speed is completed through the control system.

5.3 Static load test[3)]

The rope end is loaded with test load, and there is no slippage of the drum within 2 min, and all stressed parts are not damaged.

When dynamic factor is less than 1,25, test load is 1,25 times SWL. When dynamic factor is greater than 1,25, test load is not less than the product of SWL and dynamic factor.

5.4 Dynamic load test

5.4.1 Under SWL, recovering the rope at nominal line speed, the winch runs smoothly and normally.

5.4.2 The dynamic load test is carried out with 1,25 times SWL, low-speed lifting, low-speed lowering, and repeated twice. The brake test is carried out during the test operation.

5.5 AHC test[4)]

If the winch is equipped with AHC function, an active wave compensation test is needed. The active wave compensation performance of the winch is tested by transmitting the information of the winch's rising motion due to sea states.

5.6 Inspection documentation project during the test period

5.6.1 The winch shall run smoothly, without noise or abnormal vibration.

5.6.2 While recovering rope, check rope and require smoothly arranged rope, no jump, trap and other defects.

5.6.3 No oil leakage and oil seepage at each lubrication point.

5.6.4 Measure maximum tension and rope speed.

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3) For electro-mechanical cables and optical fibre optic cables, the test can be performed with steel wire ropes or synthetic fibre ropes with same diameter.

4) The content of the active wave compensation test is subject to the approval of the buyer and the manufacturer.