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Ships and marine technology — Deep-sea hydraulic winch equipments

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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).

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For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

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Ships and marine technology — Deep-sea hydraulic winch equipments

1 Scope

This document specifies requirements for the design, operation, safety, performance, acceptance tests and designation system of deep-sea hydraulic winch equipments (hereafter referred to as “winch equipments”).

This document is applicable to the design, manufacture and acceptance of deep-sea hydraulic winch equipments. The deep-sea hydraulic winch equipments are intended to be used underwater 3000m ~ 11000m for large load deep-sea operations.

2 Normative references

The following documents, in whole or in part, are normatively referred 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 780, *Packaging — Distribution packaging — Graphical symbols for handling and storage of packages*

ISO 3154, *Stranded wire ropes for mine hoisting — Technical delivery requirements*

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

ISO 4406:2017, *Hydraulic fluid power — Fluids — Method for coding the level of contamination by solid particles*

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

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

IEC 60529:2013, *Degrees of protection provide by enclosure (IP code)*

3 Terms and definitions

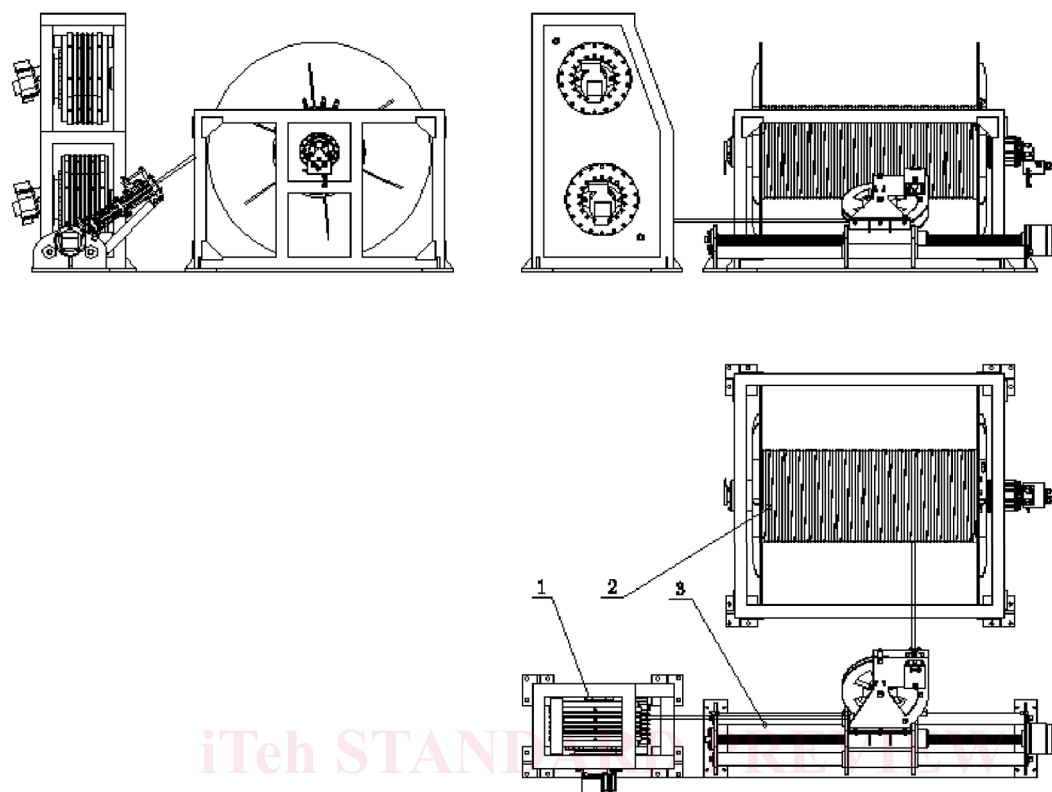
For the purposes of this document, the terms and definitions given in ISO 3828 and the following apply.

3.1

deep-sea hydraulic winch equipments

combined winch equipments adopt hydraulic drive, double drums, traction winch, cable storage winch and right-angle cable spooling device

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



Key

- 1 traction winch
- 2 cable storage winch
- 3 cable spooling device

Figure 1 — Split structure diagram of the winch equipments

3.2

traction winch

a winch towed by double drums with straight grooves

3.3

storage winch

a winch which can store cables with constant tension

3.4

cable spooling device

a device with automatic right-angle cable spooling

3.5

working load

maximum load of traction winch in continuous operation

3.6

nominal speed

maximum speed of traction winch when it is continuously operating under working load 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>

4 Design and operation

4.1 Composition

Winch equipments include traction winch, cable spooling device, cable storage winch, hydraulic pump station and control system.

4.2 Types

4.2.1 Winch equipments are divided into the following types according to different cables applied:

- a) winch equipments with steel cables;
- b) winch equipments with coaxial cables;
- c) winch equipments with photoelectric composite cables;
- d) winch equipments with fiber cables.

4.2.2 Winch equipments are divided into the following types according to structures:

- a) Split winch equipments;
- b) Combination winch equipments.

4.3 General design requirements

4.3.1 Winch equipments shall be designed in accordance with ISO 7825 and ISO 4413.

4.3.2 Winch equipments can be designed to be arranged on open/weather deck or cabin according to the needs of the actual ship.

4.3.3 The electrical equipment installed on open/weather deck shall have a minimum IP rating of IP 56 as per to IEC 60529. The electrical equipment installed in cabin shall have a minimum IP rating of IP 44.

4.3.4 The motor of winch equipments shall adopt continuous duty.

4.3.5 The steel cables shall conform to ISO 3154 when used for winch equipments.

4.3.6 If steel cables are used for winch equipments, the diameter of the traction wheel, storage cable winch drum and guide pulley shall not be less than 16 times the diameter of the selected steel cable. If coaxial cable or photovoltaic composite cable or fiber cable are used, the diameter of traction wheel, storage winch drum and guide pulley and all related structures shall be designed according to the curvature radius and material requirements provided by the cable manufacturer.

4.3.7 Winch equipments shall be designed as right-angle cable arrangement driven by hydraulic motors.

4.3.8 Winch equipments shall be designed for load, length and speed measurement and display functions.

4.3.9 The towing wheel friction grooves of the traction winch shall be designed as straight grooves, staggered symmetrically arranged and replaceable.

4.3.10 Corresponding guide pulleys shall be installed according to the requirements of the use position of the traction winch and cable storage winch.

4.3.11 The hydraulic system shall be closed system, which is energy-saving and convenient for control and operation.

4.3.12 Traction winch, cable spooling device and storage winch shall be operated both independently and simultaneously. Winch equipments shall be operated both manually and automatically.

4.3.13 Solid particulate contamination level of hydraulic system fluids shall not be higher than -/18/15 in ISO 4406.

4.4 Strength requirements

4.4.1 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.

4.4.2 With the maximum torque of prime mover or the set pressure of the safety valve, the allowable stress 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.

4.4.3 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.

4.5 Traction winch

4.5.1 The traction winch shall be equipped with independent braking devices.

4.5.2 The traction winch is composed of two towing wheels, each of which has a friction groove that can be embedded into a cable with an appropriate external diameter.

4.5.3 Each towing wheel should have an independent driving device, which adopts variable hydraulic motor and compact and efficient reducer.

4.5.4 The cantilever arm end of the towing wheel shall be fastened with a pull plate.

4.5.5 Protection devices should be equipped at the entrance and exit of the traction wheel in order to prevent the cable from slipping out.

4.6 Cable spooling device

4.6.1 Cable spooling device shall adopt the right-angle cable spooling method.

4.6.2 Cable spooling device shall be independently driven and operated, and shall be fully automatic and independent cable spooling.

4.6.3 The swing angle of the cable pulley shall adapt to the changing layers of the cable storage drum.

4.7 Cable storage winch

- 4.7.1 The cable storage winch shall have an independent operating drive device.
- 4.7.2 The cable storage winch shall have independent braking devices.
- 4.7.3 Coaxial cable and photoelectric composite cable shall be equipped with slip ring.
- 4.7.4 The cable storage winch drum shall be provided with broken line type groove.

4.8 Control system

- 4.8.1 The control system shall be able to control the synchronous operation of traction, storage cable and cable spooling, and shall maintain the cable tension and cable spooling in an orderly manner.
- 4.8.2 The control system shall be designed for both operation and debugging.
- 4.8.3 ———The hydraulic pump station motor cannot be started unless the operating handle is not in the middle position.
- 4.8.4 Emergency stop buttons shall be arranged at all operating locations with the highest priority, the emergency stop function shall be safe and reliable.

5 Performance parameters and requirements

5.1 Preferred numbers of working load

The preferred numbers of working load are taken according to the R10 rounded values: 50, 63, 80, 100, 125, 160, 200 and 250 (kN), respectively.

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

5.2 Nominal speed

Nominal speeds of winch equipments are shown in [Table 1](#).

Table 1 — Nominal speeds of winch equipments

Operating condition	Nominal speed m/min
Rated load condition	40
	60
Light load condition	120

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

5.3 Pressure

The hydraulic piping system of the winch equipments shall be capable of withstanding 1,5 times the system working pressure without leakage and deformation.

5.4 Sealing

The hydraulic system of the winch equipments shall be capable of withstanding 1,25 times the system working pressure without any leakage.

5.5 No-load

In the no-load state of the winch equipments, the high-speed and low-speed operation shall be free from jamming, abnormal noise and vibration.

5.6 Load

Under 25%, 50%, 100% working load and nominal speed respectively, the traction winch shall be able to run synchronously with the cable spooling device and the cable storage winch without sticking, abnormal noise and vibration.

5.7 Overload

Under 125% working load, the traction winch shall run synchronously with the cable spooling device and the cable storage winch without sticking, abnormal noise and vibration, and the mechanical structure shall have no permanent deformation.

5.8 Braking

The static braking capacity of the traction winch shall not be less than 1,5 times the working load.

6 Acceptance tests

6.1 General

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

Type test may not be carried out, if the prototype test certificate is available and agreed by the manufacturer and purchaser.

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

6.2.1 Pressure test

After the hydraulic system piping passed the initial assembly and flushing, the pressure test with 1,5 times the working pressure shall be carried out for one piece. The pressure shall be kept for 5 minutes.

6.2.2 Sealing test

The sealing performance test shall be carried out for the hydraulic system, with the test pressure 1,25 times the working pressure. If the test pressure is greater than 7 MPa of the working pressure, test shall be carried out with a pressure of working pressure plus 7 MPa. The pressure shall be kept for 10 minutes without leakage.