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## Shipbuilding — Cargo winches

*Construction navale — Treuils de charge*

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ISO copyright office  
Ch. de Blandonnet 8 • CP 401  
CH-1214 Vernier, Geneva, Switzerland  
Tel. +41 22 749 01 11  
Fax +41 22 749 09 47  
copyright@iso.org  
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](http://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](http://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 World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

The committee responsible for this document is ISO/TC 8, *Ships and marine technology*, Subcommittee SC 4, *Outfitting and deck machinery*.

This third edition cancels and replaces the second edition (ISO 3078:1987), which has been technically revised with the following changes:

- a) definition of “maximum setting down speed” has been added which is one of the most important factor in performance;
- b) requirement of length of rope reeling off of the drum has been added to guarantee the safety operation of ropes.

# Shipbuilding — Cargo winches

## 1 Scope

This document specifies the general requirements of cargo winches on cargo derricks, particularly electric drive or hydraulic drive.

## 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, *Steel wire ropes for general purpose — Characteristics*

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

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

## 3 Terms and definitions

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

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

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

### 3.1

#### **cargo winch**

winch used for hoisting and lowering cargo

[SOURCE: ISO 3828:2008, 4.2]

### 3.2

#### **nominal size**

size which corresponds to the nominal load, i.e. the maximum working load at the hook, in kilonewtons, which the winch is rated to lift in direct operations (with a single sheave at the derrick-head and a single sheave at the foot)

Note 1 to entry: Winches are graded according to their nominal size as given in [Table 1](#).

Note 2 to entry: If the winch has reduction gear with several gear ratios, each step shall correspond to a nominal load in [Table 1](#).

Note 3 to entry: The nominal sizes are derived from the preferred number series.

Note 4 to entry: The definition of the nominal size given above is not applicable to heavy derricks.

Note 5 to entry: See [Figure 1](#).

### 3.3

#### **nominal speed of hoisting**

minimum speed at which the winch is capable of lifting the nominal load

Note 1 to entry: The minimum nominal speeds of hoisting are given in [Table 1](#).

**3.4  
drum load**

maximum rope tension measured at the drum exit when the winch is hauling in at the nominal speed with the rope wound on the drum in a single layer

Note 1 to entry: It is expressed in kilonewtons.

[SOURCE: ISO 3828:2008, 2.16]

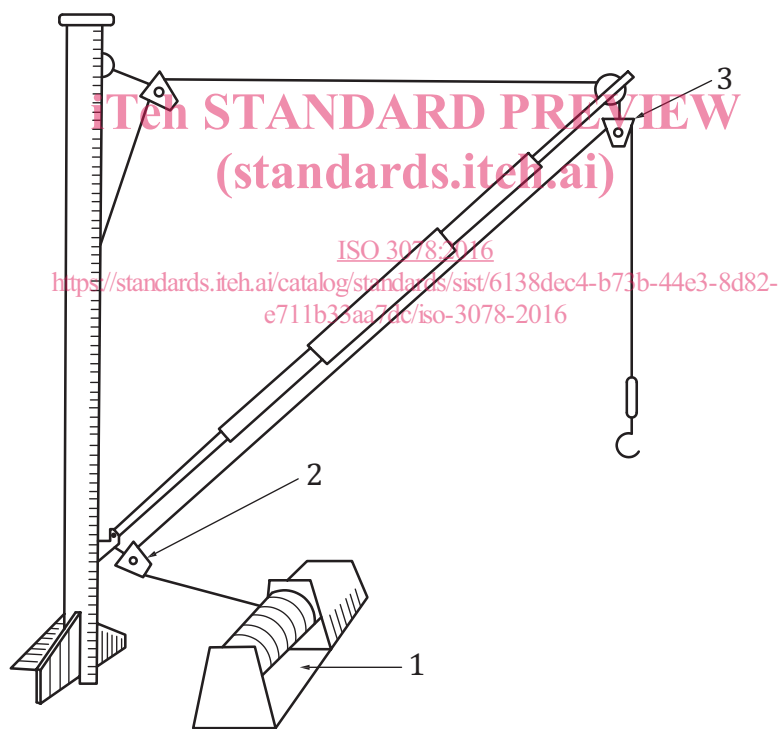
**3.5  
right-hand winch cargo winches**

winch where the reduction gear or the drive for 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 (in the case of a symmetrical winch)

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

**3.6  
left-hand winch cargo winches**

winch where the reduction gear or the drive for 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 (in the case of a symmetrical winch)



**Key**

- 1 winch
- 2 sheave at the foot
- 3 sheave at the head

**Figure 1 — Example of use of a winch**

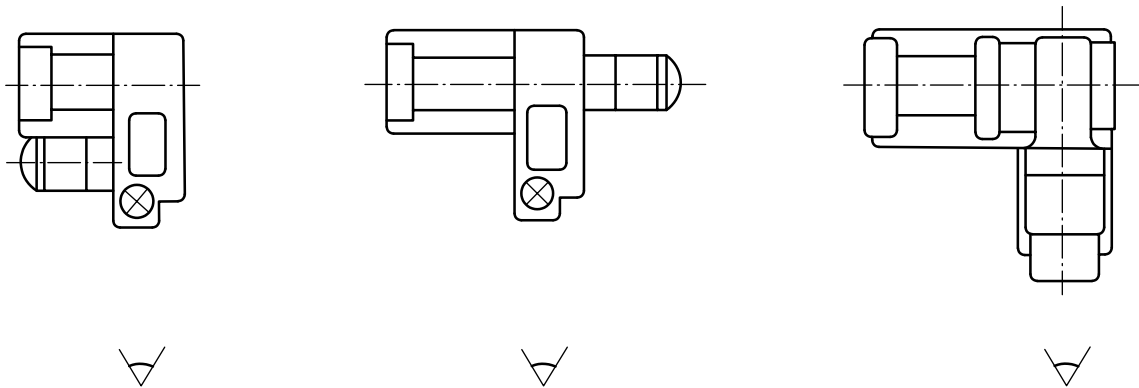


Figure 2 — Examples of right hand winch

### 3.7

#### maximum setting down speed

maximum speed at which the winch is capable of setting down the cargo

## 4 Design and operation

### 4.1 General

Winches shall meet the general requirements for deck equipment in ISO 7825 and the specific requirements given in 4.2 to 4.7. (standards.iteh.ai)

### 4.2 Stress calculation

ISO 3078:2016

The stress calculation of the mechanical parts is based on the following:

- the drum load on the winch: in this case, the allowable calculated stresses based on simple theoretical elastic limit of any part of the winch shall not be greater than 0,4 times the 0,2 % proof stress of the material;
- the maximum torque of the motor corresponding to the most severe working conditions: in this case, the allowable calculated stresses based on simple theoretical elastic limit of any part of the winch shall not be greater than 0,9 times the 0,2 % proof stress of the material.

NOTE For the winch equipped with a torque limiter, the setting value by the torque limiter.

### 4.3 Direction of motion of operating control device

The direction of motion of the operating control devices shall be such that the load is raised by clockwise movement at a hand-wheel or crank-handle, or alternatively movement of a hand-lever towards the operator.

Whatever the form of motive power, the operating control device shall be arranged to return to the braking position automatically when the operator releases the control.

Reference should be made to the ILO Code of practice on *Safety and health in dock work*.

The control stations shall be arranged such that the operator can observe the operating area of the lifting appliances and the load being lifted.

#### 4.4 Acceleration and deceleration

In direct manoeuvre at drum load, the acceleration and deceleration shall have a mean value of not more than 3 m/s<sup>2</sup>.

#### 4.5 Braking

**4.5.1** Winches shall be provided with an automatic braking system which operates when bringing the operating control device to zero, or to the braking position, and also when there is no power on the winch.

**4.5.2** The braking system shall be capable of arresting and holding a load at least 1.5 times the nominal load.

Means shall be provided for lowering the load in the event of power failure.

**4.5.3** Winches with a declutchable drum shall be provided with a locking device or a brake on the drum capable of preventing rotation of the drum.

When a brake is required to hold the load, this shall be specified by the purchaser.

**4.5.4** The braking system shall be such as not to induce an excessive shock load.

#### 4.6 Drum design

**4.6.1** For all operating conditions, the distance between the top of the wire rope on the drum and the outer edge of the drum flanges shall be at least 2,5 times the diameter of the wire rope.

NOTE This requirement only applies to drums not fitted with wire rope guards to prevent over-spilling of the wire rope.

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**4.6.2** The length of rope reeling off of the drum shall be appropriate to any operating positions within the design working range of the lifting appliances and in any case not less than three turns of rope remaining on the drum.

**4.6.3** Rope shall be capable of reeling onto the drum evenly and if necessary, coiler or other device may be fitted. The length of the rope drum shall be such that the rope will reel onto the drum in not more than three layers, but it is recommended that, where practicable, the rope should reel onto the drum in a single layer. The rope may reel up onto the drum in more than three layers if either one of the following requirements is met:

- a) the coiler is fitted;
- b) the drum has rope groove;
- c) the reeling angle is restricted up to 2°.

**4.6.4** The diameter of the drum shall be not less than 18 times the diameter of the wire rope, which for design purposes only shall conform to ISO 2408, Group 3, Class 6 × 37, IWR. Other grades and constructions may be used in service.

#### 4.7 Warping ends

A winch may be specified with or without warping ends; if warping ends are provided, their profile shall be in accordance with ISO 6482.



## 5 Performance

The performance of cargo winches is given in [Table 1](#).

**Table 1 — Performance**

Characteristic		Nominal size					
		2	3	5	8	12	16
Nominal load, kN		20	31.5	50	80	125	160
Drum load, kN		22	35	56	90	140	180
Minimum nominal speed of hoisting, $v_1$ , m/s	Series A	0,50	0,32	0,20	0,12	—	—
	Series B	1,00	0,63	0,40	0,25	0,16	0,12
	Series C	—	—	0,80	0,50	0,32	0,25
Maximum speed of setting down the load, $v_2$ , m/s		0,25	0,20	0,20	0,12	0,10	0,08
NOTE 1 The drum load is approximately 1,1 times the nominal load measured in kilonewtons.							
NOTE 2 The factor of 1,1 takes account of the loss through friction due to the sheaves; where the wire rope passes through the sheave, the friction coefficient of the sheave and rigidity loss of the wire rope shall be taken into account: the value is taken as 5 % for sliding bearings and 2 % for rolling bearings.							

## 6 Acceptance tests

### 6.1 Rules concerning acceptance tests at manufacturer's works by purchaser

#### 6.1.1 General

Tests shall be carried out at the manufacturer's works, where this is not possible, the tests may be carried out at a place to be agreed between the manufacturer and purchaser.

The result of the tests carried out in accordance with [6.1.2](#) and [6.1.3](#) shall be stated in the test certificate.

#### 6.1.2 Type testing

##### 6.1.2.1 General

One winch of each type shall be tested in accordance with [6.1.2.2](#) and [6.1.2.3](#).

##### 6.1.2.2 Testing in working conditions

The test shall be carried out as follows.

- a) 30 min continuous hoisting and lowering, through a distance of 10 m under drum load conditions allowing a 20 s pause between consecutive cycles, plus 5 min similar cycling on each additional gear ratio, as soon as possible after the 30 min test.
- b) While testing, the following shall be checked and measured:
  - 1) abnormal temperature of bearings;
  - 2) actual speed for hoisting and lowering;
  - 3) power input, in watts.
- c) The travel of the load after activation the brake system shall be checked. The operation of the automatic brake shall be checked when the power is switched off.