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Ships and marine technology — Marine cranes — Design methods for drums

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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ISO 19359 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 — Marine cranes — Design methods for drums

1 Scope

This document specifies the winding layers, material selection, structural parameters, fastening of wire ropes and design calculation for drums of marine cranes.

1.1 This document is applicable to Marine cranes of the following types:

- Deck cranes mounted on ships for handling cargo or containers in harbour conditions;
- Floating cranes or grab cranes mounted on barges or pontoons for operating in harbour conditions;
- Engine room cranes and provision cranes etc. mounted on ships (including floating docks) for handling equipment and stores in harbour conditions.

1.2 This document does not apply to:

- Transport, assembly, dismantling and decommissioning of cranes,
- Lifting accessories, i.e. any item between the crane and the load,
- Lifting operations involving more than one crane,
- Hand powered cranes,
- Emergency rescue operations (except training),
- Shore-side cargo handling cranes,
- Portable cranes on board,
- Lifting appliances for lifeboats, liferafts accommodation ladders and pilot ladders.

2 Normative references

The following referenced documents are indispensable for the application 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 4306-1, *Cranes — Vocabulary — Part 1: General*

ISO 19354, *Ships and Marine Technology—Marine cranes—General requirements*

3 Terms and definitions

For the purpose of this International Standard, the terms and definitions given in ISO 4306-1, ISO 3828 and ISO 19354 apply.

**3.1
Drum**

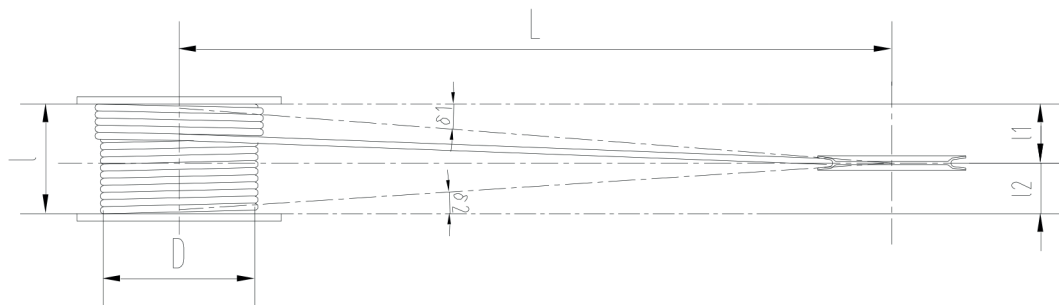
Cylinder component used to wind and accommodate wire ropes to allow the hoisting and lowering of the load or boom

**3.2
Groove**

Cut on the drum used to guide the regular winding of wire ropes on the drum

**3.3
Rope entry angle**

Deflection angle between the central line of the wire rope and the vertical plane of the drum shaft, as shown in Fig. 1, δ_1 and δ_2 .



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Figure 1 — Schematic diagram of rope entry angle

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4 Technical requirements

4.1 Drum type and winding layers

The drum of wire ropes may be divided into three types (drum without a groove, with spiral groove and with polyline groove) according to the groove on drum surface.

- a) ~~Drum without a groove: There is not a groove on drum surface. For the drum without a groove, the wire rope is wound on a single layer, with multi-layers not recommended.~~ For the drum without a groove, the wire rope shall be wound on a single layer, while multi-layers shall only be accepted in consultation with the classification society.
- b) Drum with spiral groove: There is spiral groove on drum surface. For the drum with spiral groove, the wire rope wound on the drum shall be not more than 3 layers.
- c) Drum with polyline groove: There is polyline groove on drum surface. For the drum with polyline groove, the wire rope wound on the drum may be more than 3 layers.

4.2 Material

~~For the drum of marine cranes, it is not recommended to use a cast drum. If a cast drum is used, it shall be taken into special consideration by the relevant certification authority.~~ Steel or Iron castings may be used for drums provided the casting is sufficiently ductile; minimum elongation of 12%. Grey cast iron is not to be used for drums in general.

4.3 Structural parameters

The rope drum shall meet the following requirements:

4.3.1 The intermediate diameter D of the first layer of the wire rope on the drum shall be calculated according to the [equation \(1\)](#):

$$D = h \cdot d \quad (1)$$

where

D is the intermediate diameter of the first layer of the wire rope on the drum, mm;

h is the ratio of the winding diameter and the wire rope diameter of the first layer on the drum, not less than 18 for marine cranes;

d is the nominal diameter of the wire rope, mm.

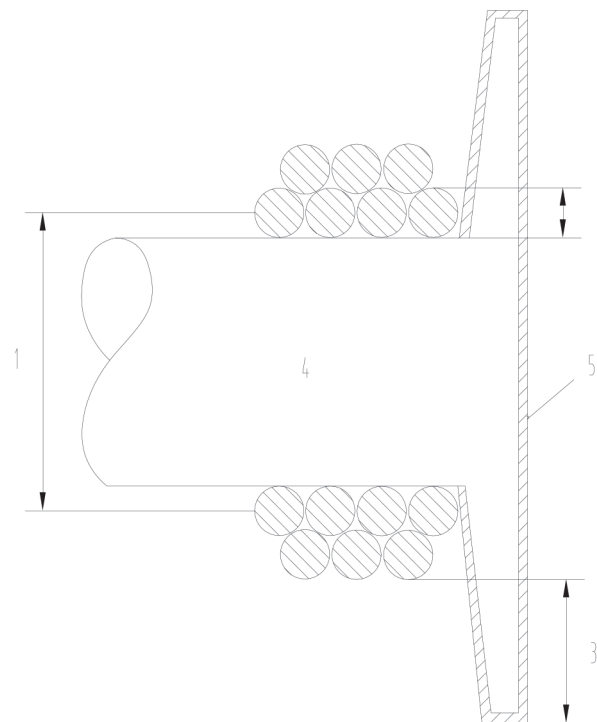
4.3.2 Unless provided with an additional device which can keep the wire rope on the drum or the drum with a groove is wound with the rope on a single layer, the flange of the drum shall be 2.5 times the wire rope diameter above the top layer of the wire rope (see [Fig. 2](#)).

4.3.3 For the recommended wire rope dimensions, the drum shall have the sufficient capacity, to enable it to operate within various jib lengths, swinging radii and hoisting height ranges determined by the manufacturer and purchaser.

4.3.4 Groove radius

The ratio of the groove radius r of the drum to the nominal diameter d of the wire rope is recommended as 0.53 d , and shall be within the range of $0.52 \cdot d \leq r < 0.57 \cdot d$.

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Key

- 1 — $D_1 \geq 18d$;
- 2 — d
- 3 — Min. $2.5d$
- 4 — Drum
- 5 — Flange

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Figure 2 — Outside view of drum

4.3.5 Deflection angle of wire rope

The drum with a smooth groove is recommended to be used for guiding of wire ropes. To prevent a wire rope from slipping from the groove, the angle between wire rope and groove α_1 and α_2 shall be as small as possible, for the single-layer winding drum, α_1 and α_2 shall be not more than 4° at any position, as shown in [Fig. 3](#).

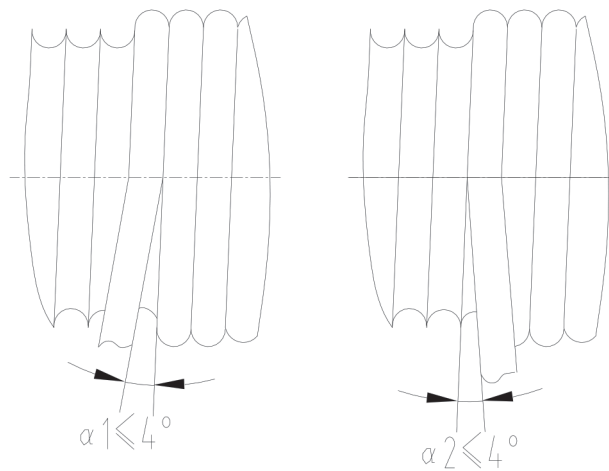


Figure 3 — Angle between wire rope and groove

4.4 Fixing of the wire rope

4.4.1 Ends of the wire rope shall be fixed on the drum in a proper manner to meet the following requirements:

- The wire rope cannot be wound on the sharp edge;
- The end connection cannot be a knot;
- The fastening end of the wire rope cannot be released accidentally;
- The fastening end of the wire rope shall be easily checked.

4.4.2 See followings for the methods of wire rope fixing:

- Wire rope is fixed on the drum with platen (Fig. 4), used for the welded or cast drum, wire rope wound on the drum shall be not more than 2 layers;
- Wire rope is fixed on the side plate of the drum with platen (Fig. 5), used for the multi-layer winding welded or cast drum;
- Wire rope is fixed into the drum by wedge (Fig. 6), used for the multi-layer winding cast drum;

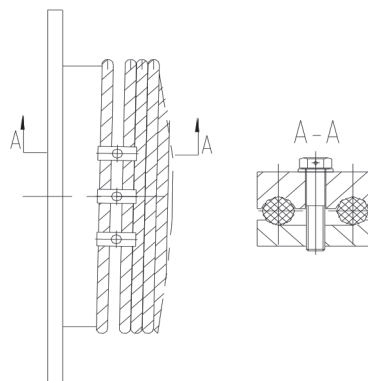


Figure 4 — Platen fixed on the drum