
**Ships and marine technology —
Marine cranes — General
requirements**

*Navires et technologie maritime — Grues marines — Exigences
générales*

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Contents

	Page
Foreword	iv
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
4 General requirements	3
4.1 Overall design	3
4.1.1 General	3
4.2 Structural design and requirements	5
4.3 Machinery	5
4.3.1 General	5
4.3.2 Mechanism	5
4.4 Main components	5
4.5 Drive and control systems	6
4.5.1 General	6
4.5.2 Power unit	6
4.5.3 Hydraulic system	7
4.5.4 Pneumatic system	7
4.5.5 Electric system	7
4.6 Safety devices	7
4.7 Coating	8
4.8 Test	8
4.9 Marking and label plates	9
Annex A (informative) Two types of deck crane and their main components	10
Bibliography	13
	https://standards.iteh.ai/catalog/standards/sist/f383cec6-c064-41a7-80d3-b58a5fe70b59/iso-19354-2016

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 World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: 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*.

ISO 19354:2016

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Ships and marine technology — Marine cranes — General requirements

1 Scope

This document specifies the general requirements for marine cranes of metal construction.

This document is applicable to the following types of marine cranes:

- deck cranes mounted on ships for handling cargo or containers in harbour or sheltered water 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.

NOTE Marine cranes in other types can refer to this document.

This document is not applicable to the following:

- minimum ambient operating temperatures below -20 °C ;
- maximum ambient operating temperatures above $+45\text{ °C}$;
- loads from accidents or collisions;
- lifting operations below sea level;
- 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;
- shore-side cargo handling cranes;
- portable cranes on board;
- lifting appliances for lifeboats, liferafts accommodation ladders, and pilot ladders;
- launching appliances for survival craft and rescue boats;
- gangways, accommodation and pilot ladders and their handling appliances.

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 4301-4, *Cranes and related equipment — Classification — Part 4: Jib cranes*

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

ISO 4414, *Pneumatic fluid power — General rules and safety requirements for systems and their components*

ISO 8501-1, *Preparation of steel substrates before application of paints and related products — Visual assessment of surface cleanliness — Part 1: Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings*

ISO 8502-3, *Preparation of steel substrates before application of paints and related products — Tests for the assessment of surface cleanliness — Part 3: Assessment of dust on steel surfaces prepared for painting (pressure-sensitive tape method)*

ISO 8503-1, *Preparation of steel substrates before application of paints and related products — Surface roughness characteristics of blast-cleaned steel substrates — Part 1: Specifications and definitions for ISO surface profile comparators for the assessment of abrasive blast-cleaned surfaces*

ISO 12944-2, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 2: Classification of environments*

ISO 12944-5, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 5: Protective paint systems*

ISO 16855, *Ships and marine technology — Loose gear of lifting appliances on ships — General requirements*

ISO 16856, *Ships and marine technology — Loose gear of lifting appliances on ships — Hooks*

ISO 16857, *Ships and marine technology — Loose gear of lifting appliances on ships — Shackles*

ISO 16858, *Ships and marine technology — Loose gear of lifting appliances on ships — Pulleys*

ISO 19355, *Ships and marine technology — Marine cranes — Structural requirements*

ISO 19356, *Ships and marine technology — Marine cranes — Test specifications and procedures*

ISO 19359,¹⁾ *Ships and marine technology — Marine cranes — Design methods for drums*

ISO 19360, *Ships and marine technology — Marine cranes — Technical requirements for rigging applications*

IEC 60034 (all parts), *Rotating electrical machines*

IEC 60204-32, *Safety of machinery — electrical equipment of machines — Part 32: Requirements for hoisting machines*

IEC 61892 (all parts), *Mobile and fixed offshore units — Electrical installations*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4306-1, ISO 3828, ISO 8431, ISO 19355, ISO 19356, ISO 19359, ISO 19360 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 marine crane

cranes mounted on ships (including floating docks) for handling equipment and stores, and intended for operating in harbour or sheltered water conditions, including deck cranes mounted on ships for handling cargo or containers, floating cranes or grab cranes mounted on barges or pontoons, engine room cranes and provision cranes, etc.

1) To be published.

**3.2
deck crane**

slewing crane mounted on a ship's deck and intended for loading and unloading the ship; capable of hoisting, luffing and slewing cargo, whose main structural components include pedestals, jibs and houses

Note 1 to entry: The two types of deck crane and their main components are given in [Annex A](#).

**3.3
harbour condition**

condition where is no significant movement of the ship when handling cargo

4 General requirements

4.1 Overall design

4.1.1 General

4.1.1.1 The overall design of marine cranes is conducted according to generally recognized standards and industrial regulations.

4.1.1.2 The design of marine cranes shall recognize the operational requirements for such cranes and shall also comply with the regulations published by appropriate organizations, such as classification societies.

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4.1.1.3 Applicable regulations are those issued by the responsible classification societies and national authorities.

4.1.2 Marine cranes with jibs are assigned classification grades in accordance with ISO 4301-4, as shown in [Table 1](#).

Table 1 — Classification grades for marine cranes

Crane	Operating condition	Classification grade of the whole unit	Classification grade of mechanism			
			Hoisting mechanism	Luffing mechanism	Travelling mechanism	Slewing mechanism
Deck crane	Hooking	A4	M3	M3		M3
	Grabbing	A6	M5	M3		M3
Floating crane	Installation	A4	M4	M3		M3
Grab crane	Barging	A7	M7	M3		M6
Engine room crane	Maintenance	A1	M2		M2	
Provision crane	Handling provision	A2	M2	M2		M2

Classification grades such as A4 and M4 in the table shall be in accordance with ISO 4301-4.

4.1.3 The following forces acting upon marine cranes shall be taken into consideration:

- a) dead load;
- b) the horizontal component of the dead load caused by the ship's inclination (heel and trim);
- c) other unfavourable horizontal forces (e.g. moving inertia force, snow and ice);
- d) the horizontal component of the hoisting load caused by the ship's inclination (heel and trim);

- e) the unfavourable wind load;
- f) other forces induced by the ship's inclination (heel and trim) and movement such as anchoring, locking and binding when cranes are in storage;
- g) unusual loads such as the forces created by the crane crashing into the buffers or the dropping of the test load during testing of the crane.

4.1.4 Design factor

4.1.4.1 Duty factor, Ψ_d , is a factor which makes allowances for the frequency and state of loading for which a lifting appliance is to be considered in design, and shall be considered for the live load and dead load [a) to d) in 4.1.3]. Duty factor, Ψ_d , is determined in accordance with generally recognized standards and regulations, or selected as per Table 2.

Table 2 — Duty factor to be used in marine crane design

Crane type and use	Duty factor, Ψ_d
Provision cranes, engine room cranes	1,00
Deck cranes, floating cranes	1,05
Grab cranes	1,20

4.1.4.2 Dynamic factor, Ψ_h , is a factor which takes account of dynamic effects of the appliance arising from its lifting operation, and shall be considered for the live load [b) in 4.1.3]. Dynamic factor, Ψ_h , is determined in accordance with generally recognized standards and regulations, or is given by Formula (1):

$$\Psi_h = 1 + CV \tag{1}$$

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where

- V is the hoisting speed, in m/s, but need not be taken as greater than 1,0 m/s;
- C is a coefficient depending on the stiffness of the crane concerned, taken as 0,3 for jib type cranes and 0,6 for gantry type cranes.

NOTE In any case, the value Ψ_h is not to be taken as less than 1,10 for jib cranes or 1,15 for gantry cranes.

4.1.5 The marine crane design shall be considered with respect to the loads resulting from the following four operating conditions.

4.1.5.1 Case 1: Crane operations with no wind — the combination of loads to be considered includes a) to d) in 4.1.3. Design factors shall be considered and given by Formula (2):

$$\left[(1) + (2) \times \Psi_h + (3) + (4) \right] \times \Psi_d \tag{2}$$

4.1.5.2 Case 2: Crane operations with wind — the combination of loads to be considered includes loads in 4.1.5.1 and e) in 4.1.3.

4.1.5.3 Case 3: Crane in the stowed position — the combination of loads to be considered includes e) to f) in 4.1.3.

4.1.5.4 Case 4: The crane is subjected to unusual loads — consider the loads in g) in 4.1.3.

4.2 Structural design and requirements

The structure of marine cranes shall be designed according to generally recognized standards and regulations. Requirements for structural design shall comply with ISO 19355.

4.3 Machinery

4.3.1 General

4.3.1.1 The machinery of marine cranes shall be designed according to applicable standards and regulations and be capable of withstanding the static and dynamic loads during the operation.

4.3.1.2 The composition and arrangement of machine structures of marine cranes shall conform to the regulations of appropriate organizations, such as classification societies, in order to ensure their safety and reliability.

4.3.2 Mechanism

4.3.2.1 The hoisting mechanism shall be capable of hoisting and lowering the safe working load (SWL) according to the specified service mode, and necessary means shall be taken to avoid the improper winding of the wire ropes during the hoisting.

4.3.2.2 The slewing mechanism shall be capable of starting up and stopping stably in the allowable operational condition, according to the specified service mode (including the allowable ship inclination and swing), to place the lifted SWL at the due position.

4.3.2.3 The travelling mechanism shall be capable of making the whole unit and cart start up and stop stably according to the specified service mode, and be provided with a device suitable for expected ship's inclination and swing. A crane operating in the open air along a track shall be provided with a reliable wind-proofing device (such as a rail clamping device and other anchors).

4.4 Main components

4.4.1 The bearing components of the marine crane shall be capable of meeting the safety requirements of strength (including fatigue), stiffness and stability after being loaded.

4.4.2 The loose gear of the marine crane shall conform to the requirements of ISO 16855, ISO 16856, ISO 16857 and ISO 16858.

4.4.3 The selection of wire ropes shall conform to the requirements of ISO 19360.

4.4.4 The requirements of drums shall conform to ISO 19359.

4.4.5 The hoisting, luffing and slewing mechanisms of the crane shall be provided with brakes. The brakes for hoisting and luffing mechanisms shall be normally closed. The safety factor of the brake shall be not less than 1,5.

4.4.6 Hydraulic cylinders shall be capable of withstanding the pressure and dynamic force in the working condition or off working condition. Cylinders used in the working conditions of luffing and foldable jib shall be provided with a load control valve, so that even if the pressure of cylinders fails or a hose hydraulic piping breaks, cylinders can also support the jib in position. The load control valve shall be mounted directly on the hydraulic cylinder ports.