INTERNATIONAL STANDARD

**ISO 21125**

First edition
2019-06

# Ships and marine technology — Marine cranes — Manufacturing requirements

*Navires et technologie maritime — Grues marines — Exigences de fabrication*



Reference number
ISO 21125:2019(E)



ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

# Contents

Page

# 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 of 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 www.iso.org/iso/foreword.html.

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

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.



# Ships and marine technology — Marine cranes — Manufacturing requirements

## 1 Scope

This document specifies the general technical manufacturing 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 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 of crane can refer to this document.

This document does not apply to cranes manufactured to operate in:

— ambient operating temperatures below –20 °C;

— ambient operating temperatures above +45 °C;

— lifting operations below sea level;

— lifting operations involving more than one crane;

— emergency rescue operations;

— shore-side cargo handling cranes;

— lifting lifeboats, liferafts accommodation ladders, pilot ladders, gangways and their handling appliances;

— launching appliances for survival craft and rescue boats.



## 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 4306-1, *Cranes — Vocabulary — Part 1: General*

ISO 19354:2016, *Ships and marine technology — Marine cranes — General requirements*

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

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

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

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4306-1, ISO 3828 and the following apply.

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

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

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

**3.1**
**oil sealing**
process of coating the machining surface of metal components with anti-corrosion grease to prevent corrosion

## 4 General requirements

The manufacturing of marine cranes shall be in accordance with ISO 19354, ISO 19355, ISO 19356 and ISO 19360.

## 5 Fabrication standard

### 5.1 Materials

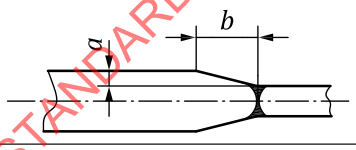
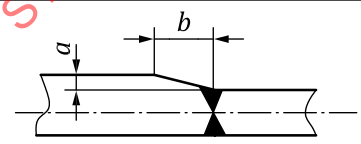
**5.1.1** Materials of marine cranes shall meet the requirements of 4.3 in ISO 19354:2016.

**5.1.2** Detailed test records shall be kept for all the specified materials requiring testing. Inspection certificates shall be provided for the inspected materials required by a ship inspection institution.

### 5.2 Welded connection of steel plates

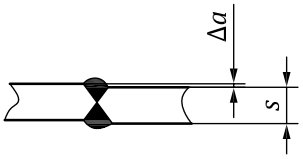
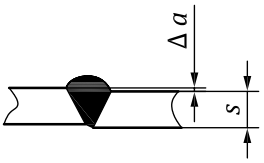
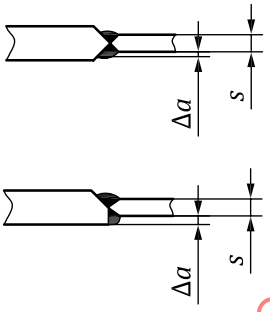
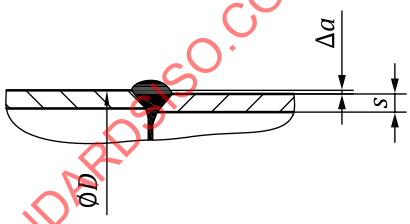
**5.2.1** The connection of components of different thickness shall be in accordance with Table 1.

**Table 1 — Requirements for the connection of components of different thickness**

| Butting form | Transitional slope |
|---|---|
|  | $a:b \leq 1:3$ |
|  | $a:b \leq 1:3$ |
| NOTE If the thickness difference is less than 4 mm, the connection can be done by its shape evenly within the welding width. | |

**5.2.4** The mismatch allowable value of single-sided or double-sided butt welding bevel is given in Table 2.

**Table 2 — Allowable value for mismatch of different butting forms**

| Butting form | Allowable value for mismatch (mm) | | |
|---|---|---|---|
| Double-sided welded seam for isopachous plates   | $\Delta a < 0{,}10 \times s$, maximum 2 ($s$ is the plate thickness) | | |
| Single-sided welded seam for isopachous plates   | $\Delta a < 0{,}10 \times s$, maximum 2 ($s$ is the plate thickness) | | |
| Butt welded seam of components with different thickness   | $\Delta a < 0{,}10 \times s$, maximum 3 ($s$ is the smaller thickness ) | | |
| Single-sided girth welding of tube   | Outer diameter | $D < 100$ | $\Delta a < 0{,}10 \times s$, maximum 2 ($s$ is the tube thickness) |
| | | $D \geq 100$ | $\Delta a < 0{,}10 \times s$, maximum 3 ($s$ is the tube thickness) |



**5.2.5** During the cold working and assembly of the metal structure, the parallel distance of butt welded seams shall be no less than 200 mm, which shall also avoid the contact between sharp angles; the parallel distance between butt welded seams and angle welded seams shall be no less than 50 mm.

**5.2.6** The unnoted allowance of the assembly dimensions of the metal structure shall meet the following requirements:

a) the unnoted allowance of dimensions shall comply with the requirements in Table 3;

b) the unnoted allowance of angles shall comply with the requirements in Table 4;

c) the unnoted allowance of aligning degree, planarity and parallelism shall comply with the requirements in Table 5;

d) the unnoted allowance of circular degree for butt parts shall comply with the requirements in Table 6.

**Table 3 — Unnoted allowance of dimensions**

Dimensions in millimetres

| | | | | | |
|---|---|---|---|---|---|
| Nominal dimension | >30~315 | >315~1 000 | >1 000~2 000 | | >2 000~4 000 |
| Allowance | ±2 | ±3 | ±4 | | ±6 |
| Nominal dimension | >4 000~8 000 | >8 000~12 000 | >12 000~16 000 | >16 000~20 000 | >20 000 |
| Allowance | ±8 | ±10 | ±12 | ±14 | ±16 |

**Table 4 — Unnoted allowance of angles**

| | | | |
|---|---|---|---|
| Length of the short side(mm) | ≤315 | >315~1 000 | >1 000 |
| Allowance (′) | ±45′ | ±30′ | ±20′ |
| Allowance (mm/m)[a] | ±13 | ±9 | ±6 |

[a] The allowance unit shall be given in ° or ′ if the angle unit in the technical document provided by the manufacturers is given in ° or ′. The allowance unit shall be given in mm/m if only linear dimensions are given on the technical document provided by the manufacturers without the angles marked.

**Table 5 — Unnoted allowance of aligning degree, planarity and parallelism**

Dimension in millimetres

| | | | | | |
|---|---|---|---|---|---|
| **Nominal dimension** | >30~120 | >120~315 | >315~1 000 | >1 000~2 000 | >2 000~4 000 |
| **Allowance** | 1 | 1,5 | 3 | 4,5 | 6 |
| **Nominal dimension** | >4 000~8 000 | >8 000~12 000 | >12 000~16 000 | >16 000~20 000 | >20 000 |
| **Allowance** | 8 | 10 | 12 | 14 | 16 |

**Table 6 — Unnoted allowance of circular degree for butt parts**

Dimension in millimetres

| **Cylindrical** | | **Coniform** | |
|---|---|---|---|
| Nominal diameter | Allowance | Nominal diameter of large diameter | Allowance |
| <2 000 | 3 | <2 000 | 4 |
| ≥2 000 | 4 | ≥2 000 | 5 |

## 5.3 Machinery processing

**5.3.1** The metal structure of marine cranes shall be processed according to the requirements of technical document provided by the manufacturers. The corresponding inspection records shall be kept for important dimensions for the shaft, holes, surface which need to be mated in installation of lifting mechanism, luffing mechanism, rotation mechanism, turning supporting, luffing cylinder, sheave.

**5.3.2** During shipboard installation, planarity of the flange surface of the base (or twin platform, eccentric platform) shall be checked to meet the requirements from bearing manufactures. If the requirements are not met, flanges need to be grinded. The values in Table 7 can be used as a reference.

**Table 7 — Planarity of the flange surface of the base**

Dimensions in millimetres

| SN | Flange diameter | Planarity |
|---|---|---|
| 1 | <1 000 | ≤0,10 |
| 2 | 1 000~1 500 | ≤0,12 |
| 3 | 1 500~2 000 | ≤0,15 |
| 4 | 2 000~2 500 | ≤0,17 |
| 5 | 2 500~4 000 | ≤0,20 |
| 6 | 4 000~6 000 | ≤0,30 |
| 7 | 6 000~8 000 | ≤0,40 |

## 5.4 Anticorrosion and oil seal

**5.4.1** Metal surfaces shall be visually inspected before oil seal is applied. Oil seal shall be applied only when no rust is found. Oil sealing methods shall be continuous and uninterrupted.

**5.4.2** For temporary rust prevention and rust prevention during processing intervals, metal surfaces shall be rust-free and dust-free before oil sealing. Rust on metal surface can be removed using zero iron gauze. After the rust removal, the metal surface can be cleaned using alkaline cleaners.

# 6 Mechanical, hydraulic and electrical assembly

## 6.1 Field requirements

A specific workshop and assembly platform shall be provided for the assembly of hydraulic components and electrical components.

## 6.2 Mechanical assembly

**6.2.1** According to the installation schematic technical document provided by the manufacturers from the parts list, record the type, manufacturing number and furnace batch number of the main parts.

**6.2.2** Before the assembly, clean all parts and purchased components to ensure that dirt and metallic shavings are removed. Ensure all burs and sharp corners are removed from mating surfaces. If defects such as abrasion, scoring or rust are present on mating surfaces, the part should not be used.

**6.2.3** Clean all fastener and lubrication holes with compressed air or similar means to ensure there are no debris present.

**6.2.4** For the parts with mating requirements, mating component dimensions shall be checked using an appropriate metering device before the assembly, and recorded for future checks.

**6.2.5** For the hoisting mechanism, a luffing winch shall be applied according to the rotation direction of the drum specified in the technical document provided by the manufacturers. There shall be no oily dirt, oil mark or other dirt on the brake ribbon of the external brake. During the installation, the distance of the two sides of the brake ribbon shall be adjusted equally. When the brake ribbon looses, the clearance shall comply with the requirements of the technical document provided by the manufacturers.

**6.2.6** The ball ring shall be oriented in accordance with the manufacturers drawings/recommendations.

**6.2.7** The flank clearance of the pinion and slew bearing big gear ring for slew mechanism shall comply with the requirements of the technical document provided by the manufacturers.

**6.2.8** For critical bolted connections such as the hoisting mechanism, luffing mechanism, slew mechanism, slew bearing and boom support, the crane manufacturers recommendations shall be followed for torque values and procedures. Before installation, the screw part of the bolt shall be coated with lubricant; the screwing up of bolts shall be in symmetrical order.

**6.2.9** The installation and securing of wire ropes shall be conducted according to the correct method specified in the technical document provided by the manufacturers.

## 6.3 Hydraulic assembly

**6.3.1** Before the assembly, the connection ports of each hydraulic component shall be checked for various functional markings according to the technical document provided by the manufacturers.

**6.3.2** Before the assembly, the integrity of each hydraulic component oil port seal shall be cleaned and sealed.

**6.3.3** Before the assembly, the pipeline, adaptor, flange and the inside of the oil tank shall be cleaned thoroughly and blown off (sucked) with compressed air (or other methods). Seal the exposed connecting ports, which shall be unpacked during the connection step.

**6.3.4** During the installation of hydraulic components and pipelines, the butting between ports shall comply with the schematic technical document provided by the manufacturers and the arrangement technical document provided by the manufacturers of the hydraulic system. The permanent markings of the hydraulic pipes shall be consistent with the drawings.

**6.3.5** Sealant shall be applied to the worm adaptors installation. Worm adaptors shall be screwed up and marked.

## 6.4 Installation of electrical system

### 6.4.1 General requirements

Before the assembly, check if the type, voltage, frequency and appearance of all electrical components and electrical parts meet the requirements of the technical document provided by the manufacturers.

### 6.4.2 Cable lay

**6.4.2.1** Cables shall be guarded from damage using conduit, shields, or similar means.

**6.4.2.2** When cables leave or enter a machinery space or similar enclosure, the penetration should be protected from water ingress.

## 6.5 Other installations

**6.5.1** During the installation of cranes, with the upper part unwelded, the crane house docked, and allowed to pre-install the hoisting, install the luffing winch and other components into the lower part of the crane house, then conduct the welding, and defect detecting, according to the requirements of the technical document provided by the manufacturers. See IEC 60092.

**6.5.2** Upon completion of windows and doors installation of the cab and tower, conduct a weathertight test according to applicable standards and specifications — see IEC 60092.

**6.5.3** Hydraulic and electrical limit switches shall be applied correctly and tested per the manufacturers' procedure.

**6.5.4** If practicable, the outfitting of steel structures such as a ladder, a platform, or the handrail of the crane shall be pre-applied and marked permanently for matching to ensure a successful installation on board.

**6.5.5** After the application of paint on the crane, place warning signs at the corresponding position inside and outside the crane house, on the outsides of arm support, inside the base, inside the twin platform and eccentric platform. Place operation instruction, warning plate, escape schematic drawing, of crane at the corresponding position inside the cab.

**6.5.9** During electric crane hoisting, if welding is required inside the crane house, all rectifiers shall be disconnected before welding.

### 6.6 Shipboard installation

**6.6.1** The ship number and manufacturing number of the crane house, arm support and base for each crane shall be consistent. The markings of the components such as hoisting, luffing wire rope and hook sheave shall be consistent with the technical installation document of the crane.

**6.6.2** Clean the base flange surface (or the flange surface of a twin platform, or the flange surface of an eccentric platform) before the hoisting of the crane house.

**6.6.3** The crane house and the base (the form of a twin platform crane is a twin platform and a crane house, a twin platform and a base; the form of an eccentric platform crane is a crane house and an eccentric platform, an eccentric platform and a base) ,and the connection assembly of electrical, hydraulic pipeline shall be conducted only after the inspection qualification of completed mechanical assembly of the crane house and arm support machine.

**6.6.4** The hydraulic cylinder of the drive locking pin on slewing locking device shall be able to lock and unlock effectively, no damage, shock and clamping stagnation of the components shall be found.

**6.6.5** Wire rope installation shall meet the requirements of ISO 19360.

**6.6.6** If parts need to be welded on the crane house during shipboard installation, the grounding line shall get over the slewing bearing then connected to the crane house, but not connected on the base directly.

## 7 Lubricating, oil sealing and coating

**7.1** After the assembly of the crane, pour lubricant into the nozzle of each rotation part according to the design document, then grease the gear surface of the big and small gears of the mechanism, as well as the surface of the wire rope.

**7.2** Fill with lubrication oil each drive gear to the specified oil level.

**7.3** Pour sufficient lubricant to the mechanical lubrication parts of each bearings and couplings according to the specification.