

BSI Standards Publication

Liquid cargo handling equipment — Crude oil offloading system — Tandem mooring winches

National foreword

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Liquid cargo handling equipment —
Crude oil offloading system —Tandem
mooring winches

*Équipement pour la manutention de cargaisons liquides — Systèmes
de déchargement de pétrole brut — Treuils d'amarrage en tandem*



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Foreword

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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.

Liquid cargo handling equipment — Crude oil offloading system — Tandem mooring winches

1 Scope

This document specifies requirements for the design, operation, performance, and acceptance tests of tandem mooring winches.

It is applicable to the design, manufacture and acceptance of tandem mooring winches for crude oil offloading systems of liquid cargo handling equipment.

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 7825](#), *Shipbuilding — Deck machinery — General requirements*

[ISO 3730:2012](#), *Shipbuilding and marine structures — Mooring winches*

[ISO 7365:2012](#), *Shipbuilding and marine structures — Deck machinery — Towing winches for deep sea use*

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:

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

3.1

mooring pull

pulling force from the receiving tanker to the tandem mooring winch during crude oil offloading

3.2

hawser deployment and recovery load

maximum pull of the rope measured at the drum exit as the tandem mooring winch starts to haul or veer at the *nominal speed* ([3.3](#)) with a hawser wound on the drum in a single layer

3.3

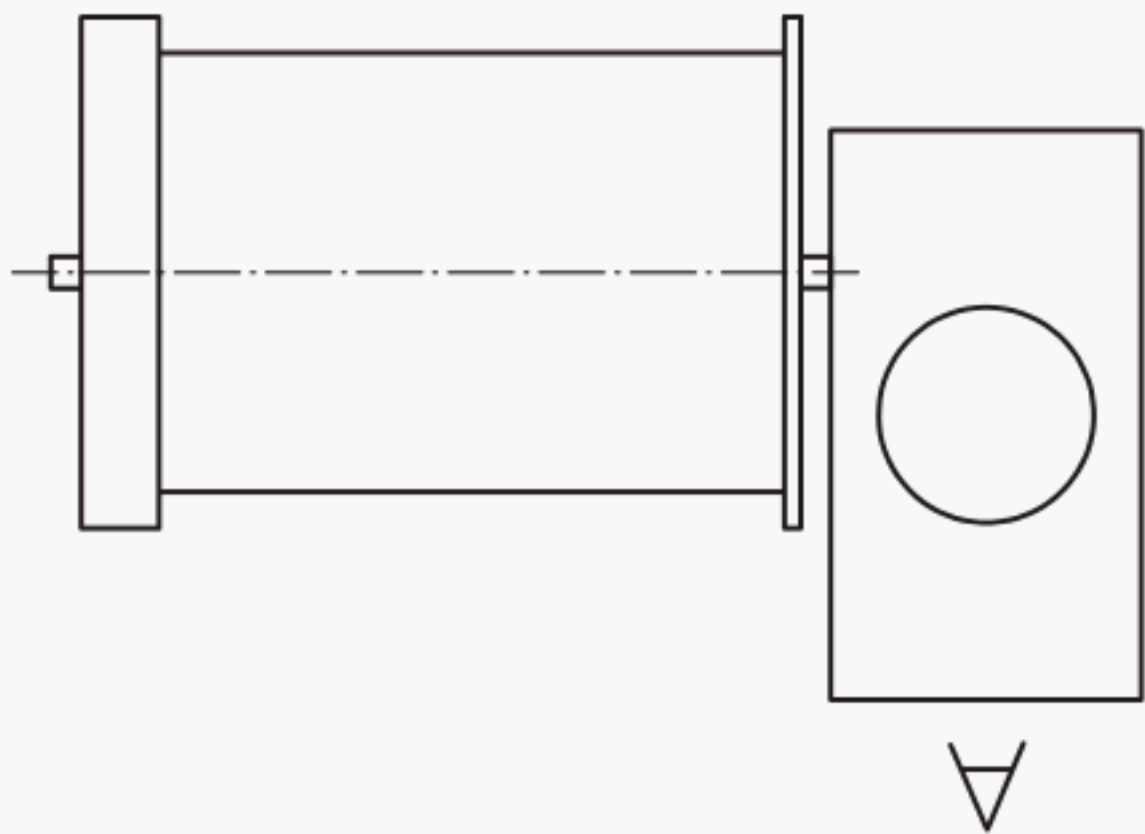
nominal speed

maximum rope speed that the tandem mooring winch can maintain when withstanding the *hawser deployment and recovery load* ([3.2](#))

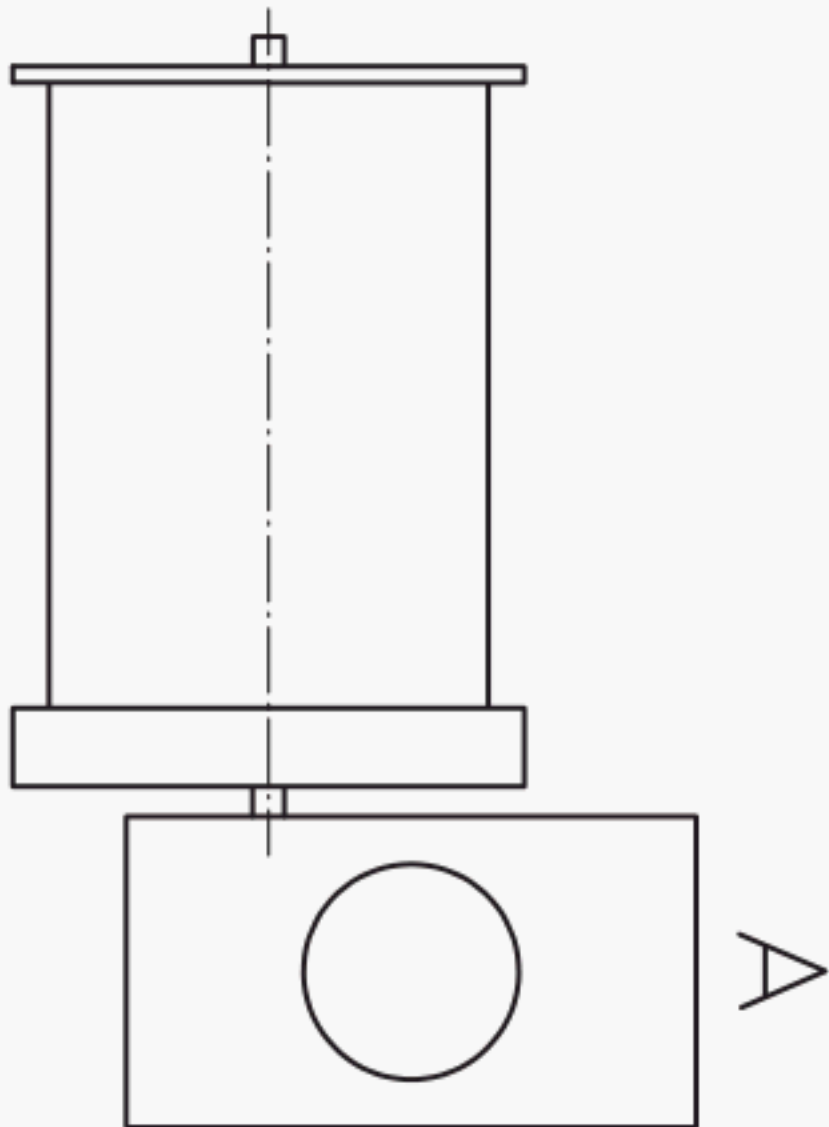
3.4

hawser quick release

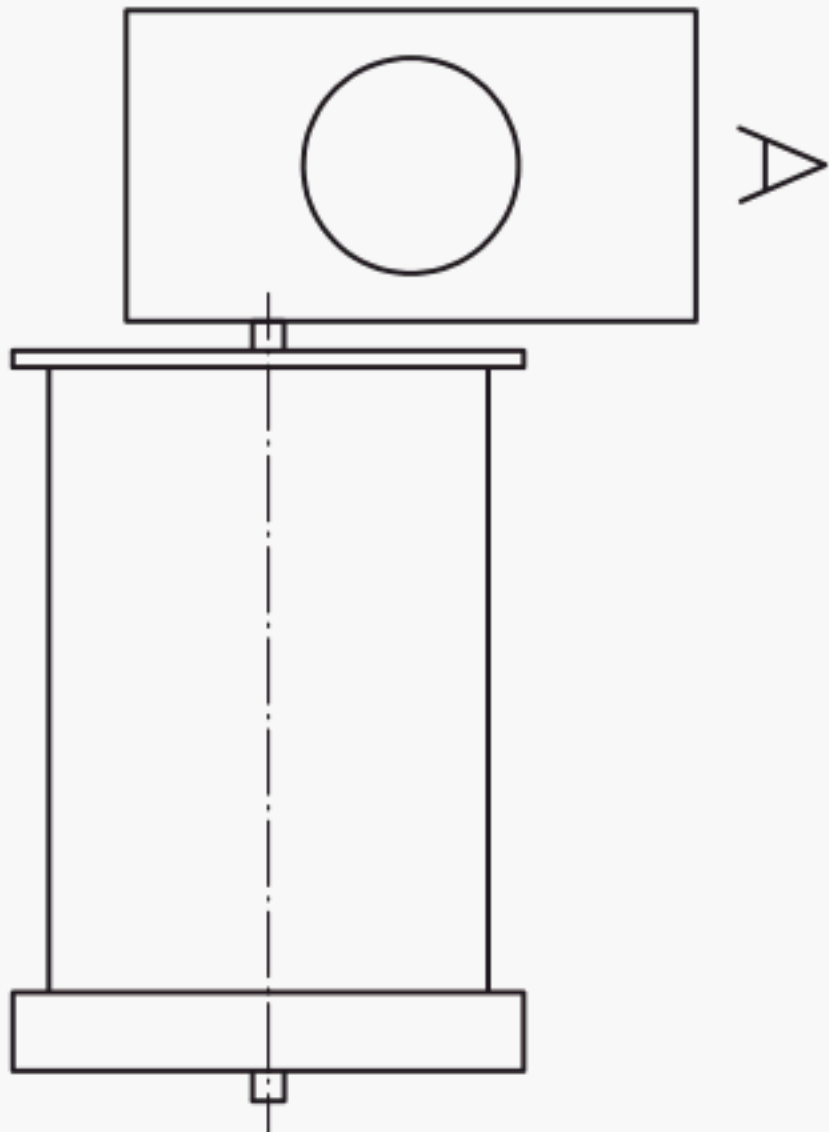
action of a quick release device to release the mooring hawser quickly with conventional or standby power, aiming to release the excessive mooring pull between the hawser winch and lifting vessel under special conditions, such as extreme sea conditions, so as to disconnect the lifting vessel and guarantee the safety of crude oil offloading



b) R type mooring winch



c) B type mooring winch



d) T type mooring winch

Figure 1 — Types of tandem mooring winches

5 Design

5.1 General requirements

The design of tandem mooring winches shall meet the requirements of [ISO 7825](#) and [5.2](#) to [5.8](#).

5.2 Material stresses

In accordance with material stresses given in [ISO 3730:2012](#), 4.2 and [ISO 7365:2012](#), 4.1, winch manufacturers shall determine the strength requirements of winch components to enable them to withstand the loads specified in [5.3](#).

5.3 Basic calculations

5.3.1 The allowable calculated stress of any affected part under the hawser deployment and recovery load shall not be greater than 0,4 times the upper yield strength of the material.

5.3.2 The allowable calculated stress of any affected part under the safe working load shall not be greater than 90 % the upper yield strength of the material.

5.3.3 In dynamical calculations, the required power of actuators on the drive chain shall not be greater than 80 % the rated power of actuators.

5.3.4 The hawser deployment and recovery load of the tandem mooring winch shall be not more than 33 % of the design breaking load of the hawser when it operates under the corresponding nominal speed.

5.3.5 The safe working load shall be not more than 80 % of the design breaking load of the hawser.

5.4 Drum and hawser

5.4.1 Hawser

5.4.1.1 The hawser is generally composed of a main rope, chafe chains, thimbles, shackles, a messenger rope and buoys. The chafe chains, main rope, thimbles and shackles withstand the mooring pull. The messenger ropes and buoys are mainly used to connect the lifting vessel before the mooring operation.

5.4.1.2 If the quick release device is independent, a chafe chain shall be provided at the head and tail of the main rope. The head chafe chain is used to connect the lifting vessel, while the tail chafe chain is used to connect the quick release device.

5.4.1.3 If the quick release device is integrated into a tandem mooring winch, only head chafe chains rather than tail chafe chains can be configured for the connection of the receiving tanker.

5.4.2 Drum diameter

5.4.2.1 For polyester and polyamide (nylon) hawser main ropes, the diameter of the drum shall be not less than six times the design diameter of the main rope.

5.4.2.2 For polypropylene hawser main ropes, the diameter of the drum shall be not less than four times the design diameter of the main rope.

5.4.3 Drum flange height

When all the rope is reeled on a drum, the flange shall project at least 1,5 times the main rope diameter above the outermost layer.

5.5 Quick release mechanism

5.5.1 The quick release device can be integrated into the hawser winch or be designed as a relatively independent device. There is no mutual interference between them in terms of functions during use.

5.5.2 After the hawser fully protrudes from the drum and the quick release device withstands the entire mooring pull, the crude oil offloading can be made.

5.5.3 The quick release device shall be able to monitor the mooring pull with a range of 1,1 to 1,3 times that of the safe working load.

5.5.4 When the mooring pull reaches 60 % and 75 % of the safe working load, the tandem mooring winch shall give an alarm signal to remind the operator to observe and decide whether it is necessary to action the hawser quick release.

5.5.5 There shall be an allowable maximum delay of 4 s from the quick release action to the complete release of the mooring hawser.

5.6 Brake

The tandem mooring winch shall be equipped with a drum braking device to prevent the drum from rolling. The braking force shall be able to withstand the hawser deployment and recovery load.

5.7 Operating device

5.7.1 Permanent signs shall be fixed or marked in the direction of movement of the operating device. When the handwheel or the crank cranks the clockwise rotation, or when the handle moves towards the operator, the tandem mooring winch shall recover the hawser.

5.7.2 Unless agreed between the manufacturer and the purchaser, no matter what kind of power source is used, the operating device shall be designed to automatically return to the stop position when the operator releases the controller.

5.8 Auxiliary equipment

The tandem mooring winch can be equipped with automatic or manually controlled hawser sorting devices.

6 Acceptance tests

6.1 Test items

6.1.1 No-load test

The tandem mooring winch shall operate continuously for 30 min at no less than the nominal speed. Operate in the forward and reverse directions each for 15 min.

6.1.2 Hawser deployment and recovery test

Under the deployment and recovery load of the hawser, the tandem mooring winch shall be continuously operated for 30 min at not less than the nominal speed.

6.1.3 Braking test

Each winch shall be equipped with a drum brake device to enable the drum to withstand hawser retraction loads without rotation.

6.1.4 SWL test

Apply the SWL on the tandem mooring winch or the independent quick release mechanism for 30 min. There shall be no significant plastic deformation.

NOTE This test can be conducted onboard with agreement between the order owner and the manufacturers.

6.1.5 Quick release function test

Apply 1 % of the SWL on the quick release mechanism for 5 min and then quickly release. The release time shall meet the requirements of 5.5.5.

6.1.6 Full load quick release test

Apply 100 % of the SWL on the quick release mechanism for 5 min and then quickly release. The release time shall meet the requirements of 5.5.5.

NOTE This test can be conducted in factory or onboard.

7 Designation system

7.1 Designation of product models

The designation shall be as shown in the example in Figure 2.

EXAMPLE Tandem mooring winch with hydraulic drive, deployment and recovery load of 150 kN, and safe working load of 2 000 kN: **Tandem mooring winch ISO 24042-H-150-2 000-R**

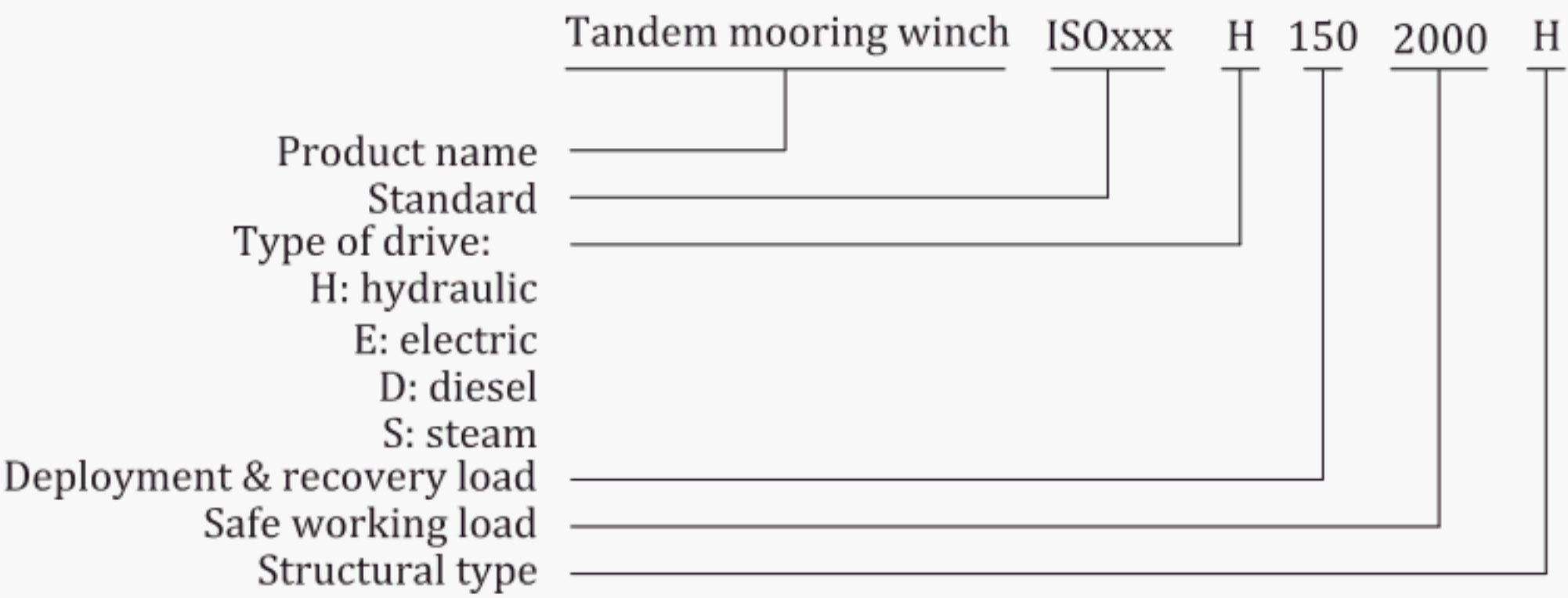


Figure 2 — Product model designation example

7.2 Nameplate

A nameplate shall be permanently affixed on an open area of the tandem mooring winch, with anti-corrosive bolts or rivets, containing at least the following information:

- a) product name;
- b) product model;
- c) designation;
- d) product weight;
- e) inspection stamp;
- f) manufacturing number;
- g) manufacturing date;
- h) manufacturer name.

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