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

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Foreword

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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).

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For an explanation on 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 the following URL: www.iso.org/iso/foreword.html.

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

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

1 Scope

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

This document is applicable to the design, manufacture and acceptance of tandem mooring winches for the crude oil offloading system 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 9554, *Fibre ropes — General specifications*

ISO 3828, *Shipbuilding and marine structures — Deck machinery — Vocabulary and symbols*

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

ISO 3730, *Shipbuilding and marine structures — Mooring winches*

ISO 7365, *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:

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

3.1

mooring force

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

3.2

hawser deployment & 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 (see 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 withstand the hawser deployment & recovery load (see 3.2)

3.4

hawser quick release

action of a quick release device to release the mooring hawser quickly with conventional or standby power, aims 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

3.5

safe working load, SWL

maximum safe mooring pull that the tandem mooring winch or independent quick release device can support

4 Types

4.1 Left-hand winch

Winch where the reduction gear or drive of the drum is on the left-hand side of the drum, in relation to an operator situated at the back of the winch with his/her line of sight toward seas, with symbol L, see [Figure 1](#).

4.2 Right-hand winch

Winch where the reduction gear or drive of the drum is on the right-hand side of the drum, in relation to an operator situated at the back of the winch with his/her line of sight toward seas, with symbol R, see [Figure 1](#).

4.3 Bottom-side winch

Winch where the reduction gear or drive of the drum is on the bottom side of the drum, in relation to an operator situated at the back of the winch with his/her line of sight toward seas, with symbol B, see [Figure 1](#).

4.4 Top-side winch

Winch where the reduction gear or drive of the drum is on the top side of the drum, in relation to an operator situated at the back of the winch with his/her line of sight toward seas, with symbol T, see [Figure 1](#).

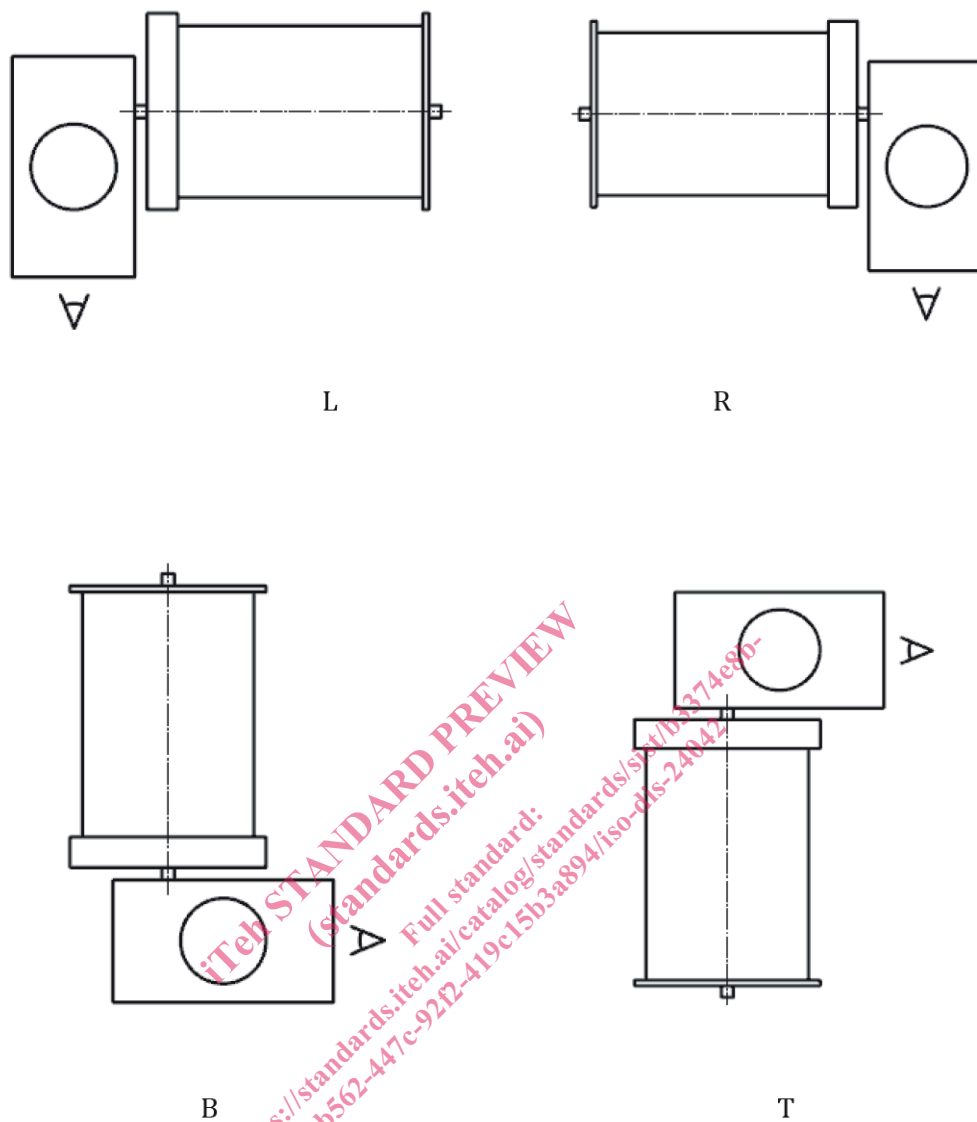


Figure 1 — Types of tandem mooring winches

5 Design

5.1 General requirements

Design of tandem mooring winch shall meet the requirements in ISO 7825 and following 5.2~5.8.

5.2 Material stresses

Winch manufacturers shall be responsible for determining the strength requirements of winch components, to enable them to withstand all loads specified in 5.3.

5.3 Basic calculation

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 calculation, 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 & 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 main rope, chafe chains, thimbles, shackles, messenger rope and buoys. Chafe chains, main rope, thimbles and shackles are parts that withstand the mooring pull. Messenger ropes and buoys are mainly used to connect the lifting vessel before mooring operation.

5.4.1.2 If the quick release device is independent, a chafe chain shall be provided each 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 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 ~ 1,3 times that of 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 if to action hawser quick release.

5.5.5 The allowable maximum delay is 4s from the quick release action to the complete release of the mooring hawser.

5.6 Brake

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

5.7 Operating device

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

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 operates 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, tandem mooring winch shall be continuously operated for 30 min at not less than the nominal speed.

6.1.3 Braking Test

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

6.1.4 SWL test

Load on the tandem mooring winch or independent quick release mechanism with the safe working load for 30 min. There shall be no significant plastic deformation.

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

6.1.5 Quick release function test

Load on the quick release mechanism with 1 % safe working load for 5 min and then quickly released. The release time shall meet the requirements of [5.5.5](#).