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Ships and marine technology — Combined rigging for deep-sea mooring

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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~~www.iso.org/directives).

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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~~www.iso.org/members.html.

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Ships and marine technology — Combined rigging for deep-sea mooring

1 Scope

This document specifies types, dimensions, tests and other technical requirements for combined rigging used for deep-sea mooring (hereinafter referred to as "combined rigging").

This document is applicable to the combined rigging consisting of ~~High~~high modulus polyethylene (HMPE) fibre ropes, mooring chains, and shackles used for mooring and positioning offshore structures with depths of 1 000 m to 5 000 m.

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~~,~~ 18692-3~~:2020~~, *Fibre ropes for offshore ~~station keeping~~stationkeeping — Part 3: High modulus polyethylene (HMPE)*

ISO 20438:2017, *Ships and marine technology — Offshore mooring chains*

3 Terms and definitions

~~For the purposes of this document, the following~~No terms and definitions ~~apply~~are listed in this document.

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

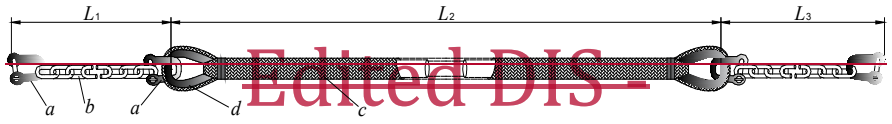
— ISO Online browsing platform: available at ~~https://www.iso.org/obp~~https://www.iso.org/obp

— IEC Electropedia: available at ~~https://www.electropedia.org/~~https://www.electropedia.org/

4 Design

4.1 Structural types of combined rigging

The combined rigging consists of fibre ropes, mooring chains and shackles, as shown in Figure 1.



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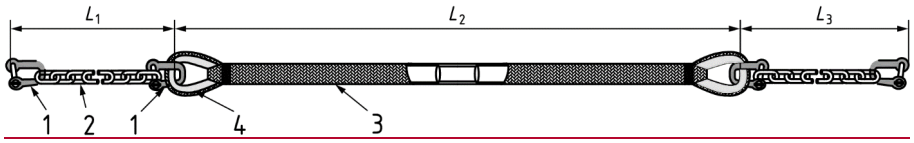

Key

L_1 length of the outlet end of mooring chains which connects with windlasses
L_2 length of the middle part of combine rigging which is fibre rope
L_3 length of the end of mooring chains which connects with anchors
~~a~~1 shackle
~~b~~2 mooring chain
~~c~~3 fibre rope
~~d~~4 thimble

Figure 1 — Combined rigging diagram

4.2 Combination design

4.2.1 The strength design of the combined rigging shall meet the following requirements:

a) The strength of the fibre rope shall meet the minimum breaking strength at the end of service time.

b) The ratio of the fibre rope and mooring chain ~~is shown~~shall be in accordance with Annex A.

c) The strength of the mooring chain shall meet the minimum breaking strength at the end of service time, and the corrosion allowance of the mooring chain ~~shall refer to~~should be as specified in Annex B.

d) The strength ratio of the mooring chain and fibre rope shall be 1,05 ~ 1,1. The size of the end link shall be 1,2 times that of the common link.

e) The size of the shackle shall be identical to the size of the end link.

4.2.2 The length design of combined rigging shall meet the following requirements:

a) The creep of the fibre rope shall be considered in the length design of L_1 and L_3 of mooring chain.

b) The length of L_1 of mooring chain shall keep the fibre rope below the water surface from the period of structure installation finished until ~~it's~~it is retired.

c) The length of L_3 mooring chain shall keep the fibre rope from any friction with the seabed from the period of structure installation finished until ~~it's~~it is retired.

5 Performance

5.1 Overall performance

5.1.1 The components of each combined rigging shall be firmly and reliably connected. The components of different combined rigging of the same specification shall be interchanged.

5.1.2 The overall performance of the combined rigging specified in this document shall meet the design service time of not less than 10 years.

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5.2 Fibre ropes

5.2.1 Composition

The fibre rope consists of a core rope, a particle-resistant isolating layer, a protective layer and thimbles at two ends.

5.2.2 Fibre rope performances

5.2.2.1 The raw material of fibre rope shall be HMPE fibre with high tenacity~~, and the~~. The average tenacity shall not be less than 2~~,5N~~ 500 MPa (2,5 N/tex~~.~~). If the protective layer is polyester fibre, the minimum tenacity shall be 730 MPa (0~~,73N~~73 N/tex~~.~~). If other materials are used in the rope, they shall be identified according to the rope design / manufacturing specification, and the test method shall ~~refer to~~ be in accordance with ISO 18692-3~~:2020~~.

5.2.2.2 The strength of the braided fibre rope shall meet the minimum breaking strength (MBS) of the rope in Table 1. The ~~minimum breaking strength (~~MBS~~)~~ of the rope ~~refers to~~shall be in accordance with ISO 18692-3~~:2020~~. The minimum tenacity of the core rope shall be 1~~,3N~~ 300 MPa (1,3 N/tex~~, and all~~). All test samples shall meet the minimum value of this ~~technical specification.~~document. The rope shall be ~~so~~ constructed so as to prevent the infiltration of size from exceeding 20-µm- or the size agreed by relevant parties.

Table 1 — Minimum breaking strength of fibre rope

Reference number[a]	MBS (kN)
63	2-500
71	3-200
80	4-000
90	5-000
100	6-300
106	7-100
112	8-000
118	9-000
125	10-000
132	11-200
140	12-500
150	14-000
160	16-000
170	18-000
180	20-000

[a] The reference number refers to the diameter of the core rope of the fibre rope. The actual diameter of the fibre rope may different from its reference number.

5.2.3 Typical types

5.2.3.1 The core rope structure of the fibre rope is composed of a single braided structure or a parallel multi-bundle structure. The particle-resistant isolating layer is evenly covered between the core rope and the protective layer. The protective layer shall be wrapped outside the particle-resistant isolating layer. See Figure 2 and Figure 3 for the typical structure diagram.

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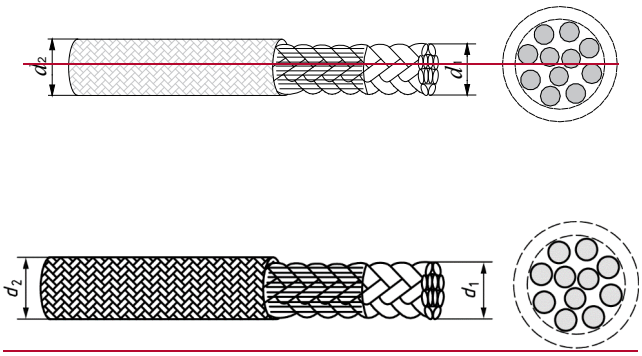

Key

d_1 diameter of rope core

d_2 diameter of fibre rope consisting of a core rope, a particle-resistant isolating layer and a sheath

Figure 2 — Type A fibre rope

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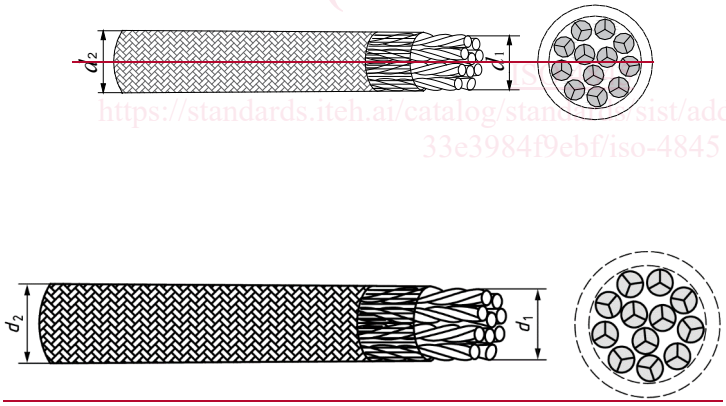

Key

d_1 diameter of rope core

d_2 diameter of fibre rope consisting of a core rope, a particle-resistant isolating layer and a sheath

Figure 3 — Type B fibre rope

5.2.3.2 The protective layer is used to protect the rope from mechanical damage during operation and use. The thickness of the protective layer shall be not less than 7,0 mm. The protective layer shall have at least one S-shaped and one Z-shaped coloured ~~strands~~strand cross-woven to identify whether it is twisted.