

INTERNATIONAL STANDARD

**ISO
13755**

Second edition
2020-08

Ships and marine technology — Ship's mooring and towing fittings — Steel rollers

*Navires et technologie maritime — Corps-morts et ferrures de
remorquage de navires — Rouleaux en acier*



Reference number
ISO 13755:2020(E)

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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 Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 4, *Outfitting and deck machinery*.

This second edition cancels and replaces the first edition (ISO 13755:2012), which has been editorially and technically revised.

The main changes compared to the previous edition are as follows:

- technical guidelines have been added in [7.3](#) and [7.4](#);
- the definition of SWL ([3.1](#)) has been reworded;
- the object line, extension line, dimension line and welding volume in [Figures 1, 4](#) and [6](#) have been amended;
- the column titles in [Table 1](#) have been amended.

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.

Introduction

The steel roller is a type of ship's mooring fitting installed on board, to lead the mooring rope from the ship's inboard to outboard as a shipside roller fairlead, and to change the direction of the ropes as a pedestal fairlead.

Ships and marine technology — Ship's mooring and towing fittings — Steel rollers

1 Scope

This document specifies the types, nominal sizes, dimensions and materials, as well as construction, manufacturing and marking requirements, for steel rollers installed to lead the mooring rope of a ship.

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 13767, *Ships and marine technology — Ship's mooring and towing fittings — Shipside roller fairleads*

ISO 13776, *Ships and marine technology — Ship's mooring and towing fittings — Pedestal fairleads*

IMO Circular MSC/Circ.1175, *Guidance on shipboard towing and mooring equipment*

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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

safe working load

SWL

safe load limit (maximum permissible load) of the fittings used for mooring and towing

4 Classification

4.1 Type

Depending on the construction, steel rollers shall be classified as belonging to one of the following three types:

- a) Type A: made of steel casting without upper dust cover;
- b) Type B: made of steel casting with upper dust cover;
- c) Type C: made of steel plate with dust cover.

4.2 Nominal sizes

The nominal sizes, D_n , of steel rollers are denoted by reference to the outside diameter of the roller, in millimetres, from a basic series of preferred numbers.

The nominal sizes are: 150, 200, 250, 300, 350, 400, 450 and 500.

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5 Dimensions

The steel rollers shall have dimensions and particulars in accordance with [Tables 1, 2, 3, 4, 5, 6, 7](#) and [8](#), and [Figures 1, 2, 3, 4, 5, 6, 7](#) and [8](#).

6 Materials

The following materials shall be used for manufacturing the different components of steel rollers:

- a) roller: steel casting having a yield point of not less than 205 N/mm², or steel plates having a yield point of not less than 235 N/mm²;
- b) axle: weldable steel casting having a yield point of not less than 350 N/mm² or equivalent;
- c) bush: brass, bronze or equivalent.

7 Construction

7.1 The rollers of the steel rollers (Type C) shall be constructed from steel tubes or formed from plate.

7.2 The foundation of the steel rollers shall be determined by the manufacturer in accordance with ISO 13767 and ISO 13776. The foundation and welding connections shall guarantee a reliable transmission of the maximum loading of the steel rollers to the hull construction without any plastic deformation or cracks.

7.3 The selection of ship's mooring fittings and mooring lines should take into account the diameter, D , of surfaces of mooring fittings that are in contact with the mooring line diameter, d , (D/d ratio) to reduce or mitigate bend loss of strength.

7.4 The tensile strength of a mooring rope may be reduced depending on the bend radius (D/d ratio) through the mooring fittings, in accordance with the rope manufacturer's guidelines.

8 Manufacturing and inspection

8.1 All surfaces of the steel rollers, including welded surfaces, shall be free from any visible flaws or imperfections.

8.2 All surfaces in contact with the ropes shall be free from surface roughness or irregularities likely to cause damage to the ropes by abrasion.

8.3 The steel rollers shall be coated externally with an anti-corrosion protective finish.

8.4 All rotating parts shall be greased.

9 Marking

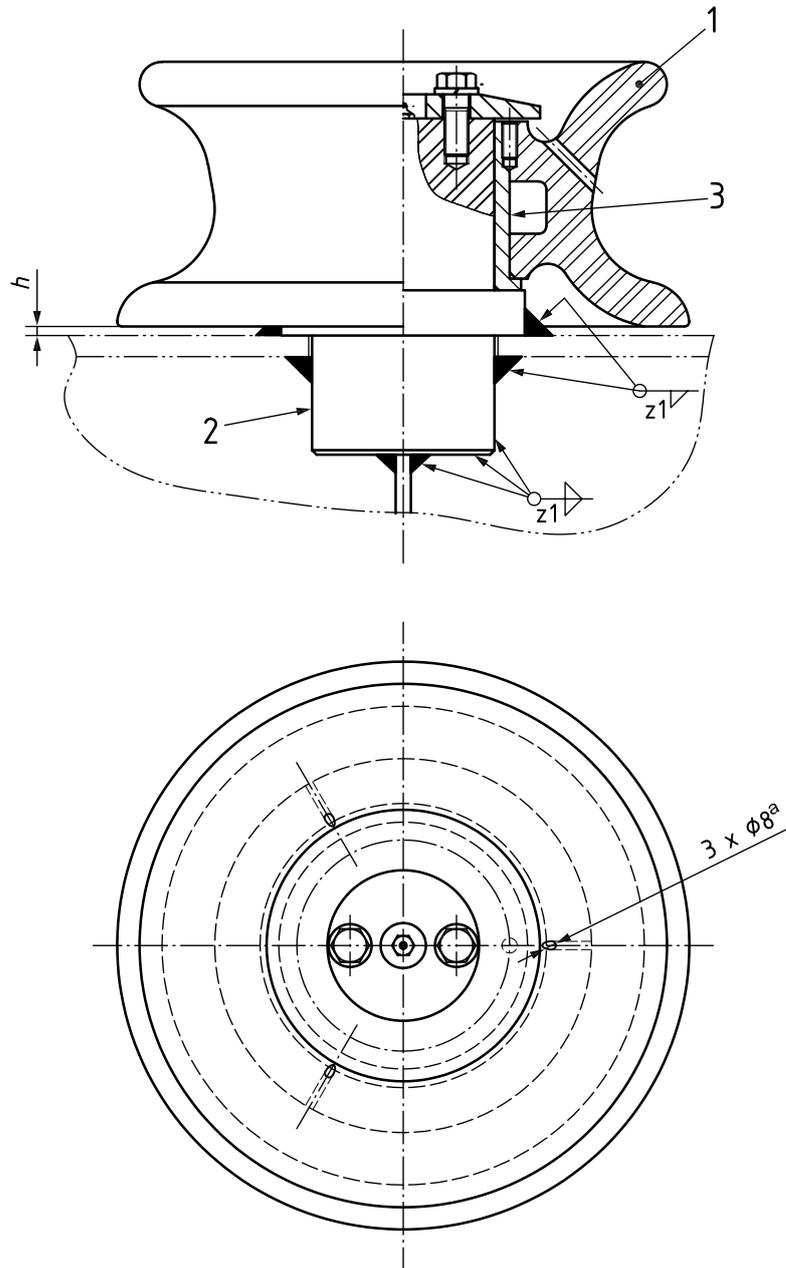
9.1 The safe working load (SWL) for the intended use of the steel rollers shall be noted in the towing and mooring plan available on board for the guidance of the shipmaster as specified in IMO circular MSC/Circ.1175.

9.2 The actual SWL on board shall be determined by considering the foundation and under deck reinforcement, and it shall be marked on the towing and mooring plan. The actual SWL shall not be over the SWL indicated in this document.

9.3 The steel rollers shall be clearly marked on their seat or foundation with their SWL by weld bead or equivalent. The SWL shall be expressed in tonnes (symbol 't') and be placed so that it is not obscured during operation of the fitting.

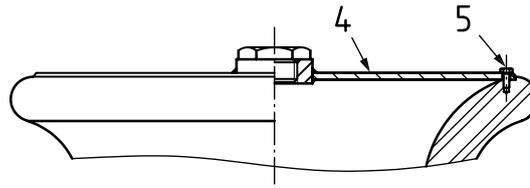
EXAMPLE SWL XXX t

Dimensions in millimetres



a) Type A

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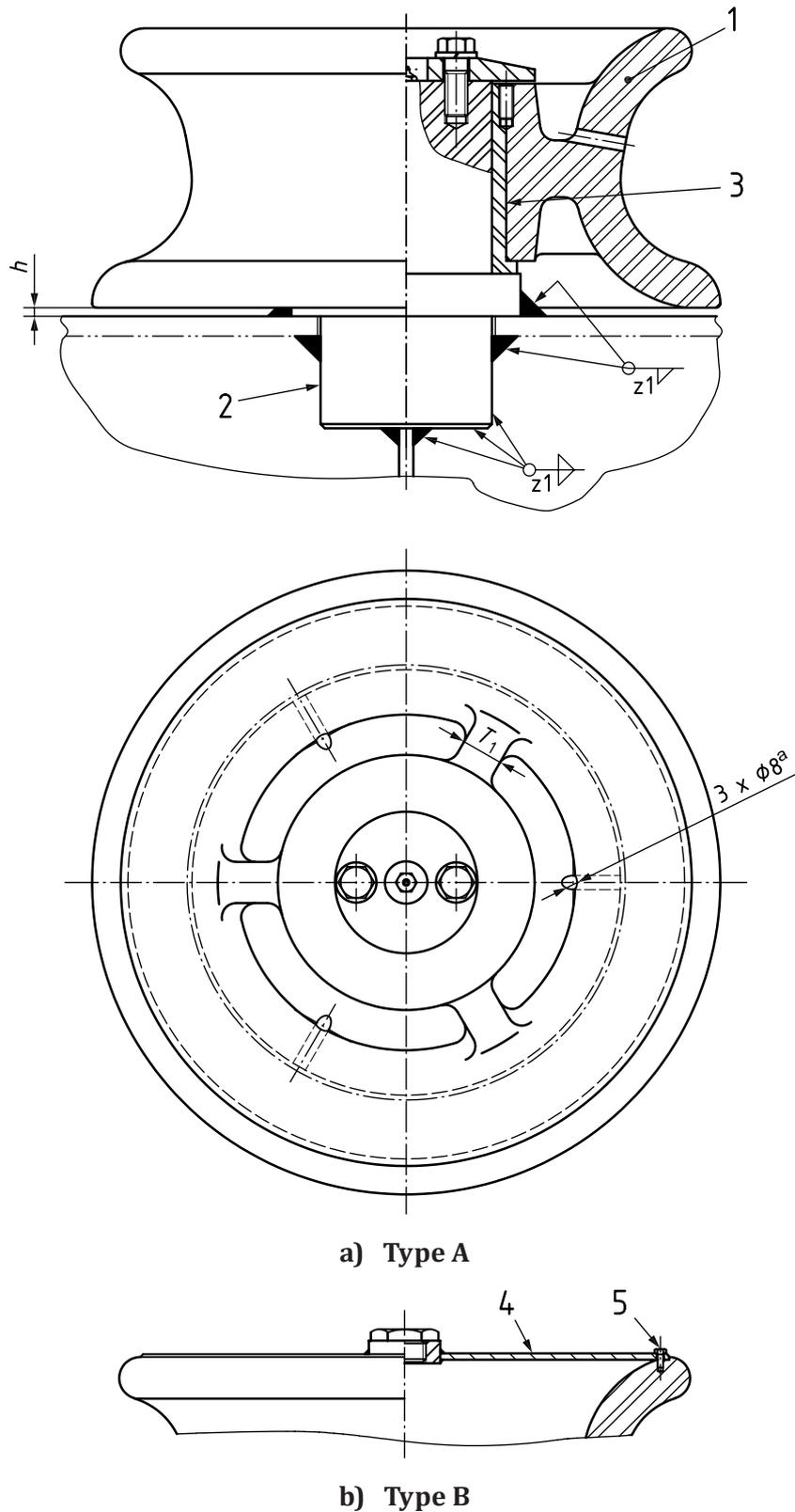
b) Type B

Key

- 1 roller
- 2 axle
- 3 bush
- 4 dust cover to apply on type B only
- 5 N-M6 bolt
- ^a Drain hole.

Figure 1 — Assembly of steel rollers for nominal sizes 150, 200 and 250 (type A and type B)

Dimensions in millimetres



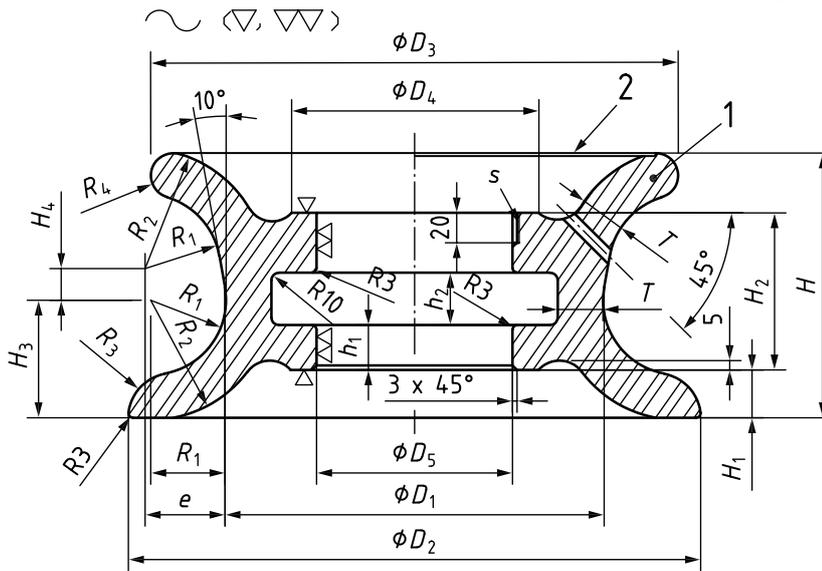
Key

- | | | | | | |
|---|--------|---|------------------------------------|---|-------------|
| 1 | roller | 3 | bush | 5 | N-M6 bolt |
| 2 | axle | 4 | dust cover to apply on type B only | a | Drain hole. |

Figure 2 — Assembly of steel rollers for nominal sizes 300 and above (type A and type B)

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Dimensions in millimetres

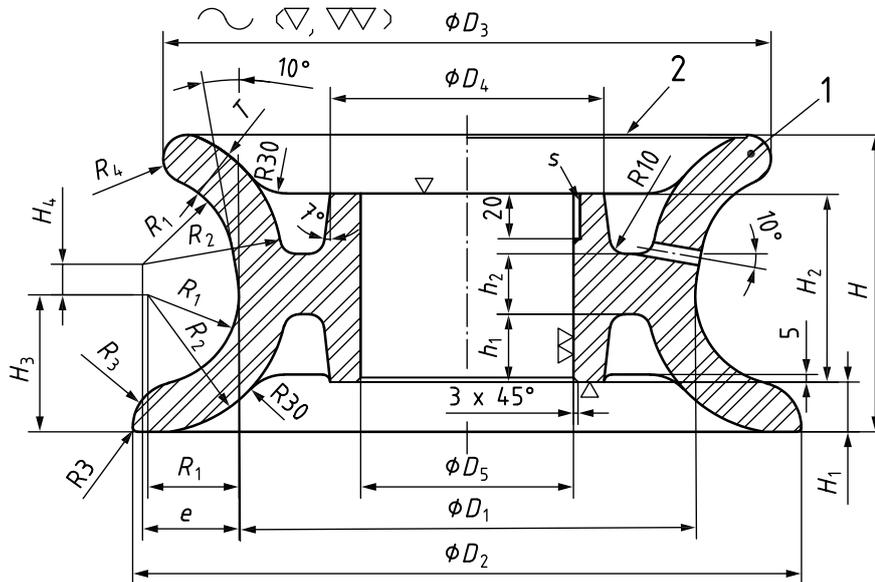


Key

- 1 roller
- 2 dust cover to apply on type B only

Figure 3 — Detail of steel rollers for nominal sizes 150, 200 and 250 (type A and type B)

Dimensions in millimetres



Key

- 1 roller
- 2 dust cover to apply on type B only

Figure 4 — Detail of steel rollers for nominal sizes 300 and above (type A and type B)

Table 1 — Dimensions of steel rollers for type A and type B

Dimensions in millimetres

| Nominal size D_n | D_1 | D_2 +2/0 | D_3 +2/0 | D_4 | D_5 H7 | R_1 | R_2 | R_3 | R_4 | H | H_1 | H_2 | H_3 | H_4 | e |
|-----------------------|-------|---------------|---------------|-------|-------------|-------|-------|-------|-------|-----|-------|-------|-------|-------|------|
| 150 | 150 | 230 | 216 | 110 | 90 | 30 | 52 | 15 | 11 | 137 | 25 | 84 | 44,7 | 43,38 | 37,7 |
| 200 | 200 | 300 | 280 | 145 | 115 | 40 | 66 | 20 | 13 | 157 | 30 | 99 | 59,2 | 35,46 | 46,3 |
| 250 | 250 | 370 | 340 | 165 | 135 | 50 | 80 | 25 | 15 | 177 | 32 | 105 | 73,5 | 28,33 | 55,0 |
| 300 | 300 | 430 | 400 | 190 | 150 | 55 | 87 | 30 | 16 | 197 | 33 | 125 | 82,6 | 32,62 | 60,8 |
| 350 | 350 | 490 | 460 | 210 | 167 | 55 | 89 | 30 | 17 | 217 | 33 | 140 | 83,7 | 49,06 | 63,7 |
| 400 | 400 | 560 | 520 | 225 | 177 | 63 | 99 | 30 | 18 | 237 | 43 | 150 | 91,8 | 52,0 | 72,2 |
| 450 | 450 | 620 | 590 | 245 | 190 | 63 | 101 | 30 | 19 | 257 | 43 | 162 | 92,5 | 67,07 | 74,8 |
| 500 | 500 | 680 | 660 | 260 | 205 | 63 | 103 | 30 | 20 | 277 | 43 | 180 | 93,0 | 82,94 | 77,6 |

Table 2 — Dimensions (continued) and SWL of steel rollers for type A and type B

Dimensions in millimetres

| Nominal size D_n | h | h_1 | h_2 | Set screw s | T | T_1 | N | Welding leg length z_1 | SWL ^b | | | | Calculated weight ^c kg/set | |
|-----------------------|-----|-------|-------|------------------|-----|-------|-----|-----------------------------|----------------------------------|-----|--------------------|-----|--|--------|
| | | | | | | | | | $\theta = 90^\circ$ ^a | | $\theta = 0^\circ$ | | Type A | Type B |
| | | | | | | | | | kN | t | kN | t | | |
| 150 | 5 | 35 | 25 | M6 | 22 | — | 6 | 8 | 265 | 27 | 186 | 19 | 23 | 24 |
| 200 | 5 | 38 | 35 | M6 | 26 | — | 6 | 10 | 441 | 45 | 314 | 32 | 42 | 43 |
| 250 | 6 | 40 | 35 | M8 | 30 | — | 6 | 11 | 579 | 59 | 412 | 42 | 77 | 80 |
| 300 | 7 | 45 | 40 | M8 | 32 | 29 | 8 | 12 | 726 | 74 | 510 | 52 | 109 | 112 |
| 350 | 7 | 50 | 45 | M8 | 34 | 29 | 8 | 15 | 1 040 | 106 | 736 | 75 | 154 | 160 |
| 400 | 7 | 53 | 49 | M8 | 36 | 30 | 12 | 17 | 1 246 | 127 | 883 | 90 | 207 | 215 |
| 450 | 7 | 57 | 53 | M8 | 38 | 32 | 12 | 20 | 1 599 | 163 | 1 128 | 115 | 275 | 286 |
| 500 | 7 | 65 | 60 | M8 | 40 | 34 | 12 | 23 | 1 942 | 198 | 1 373 | 140 | 360 | 374 |

^a θ is the relative angle of ropes on the steel roller (refer to [Annex A](#)).

^b The “SWL” which is marked on the fitting is the maximum applicable rope tension based on 90° ($\theta = 90^\circ$) and 180° ($\theta = 0^\circ$) deflections of the rope direction by the steel roller.

The SWLs shown in this table are for reference only. These are based on the loadings as mentioned in [Annex A](#).

The “SWL” which is marked on the fitting may be adjusted depending on the actual loading conditions of mooring rope under the agreement between the user and the manufacturer.

^c The calculated weight (mass) is for reference only.

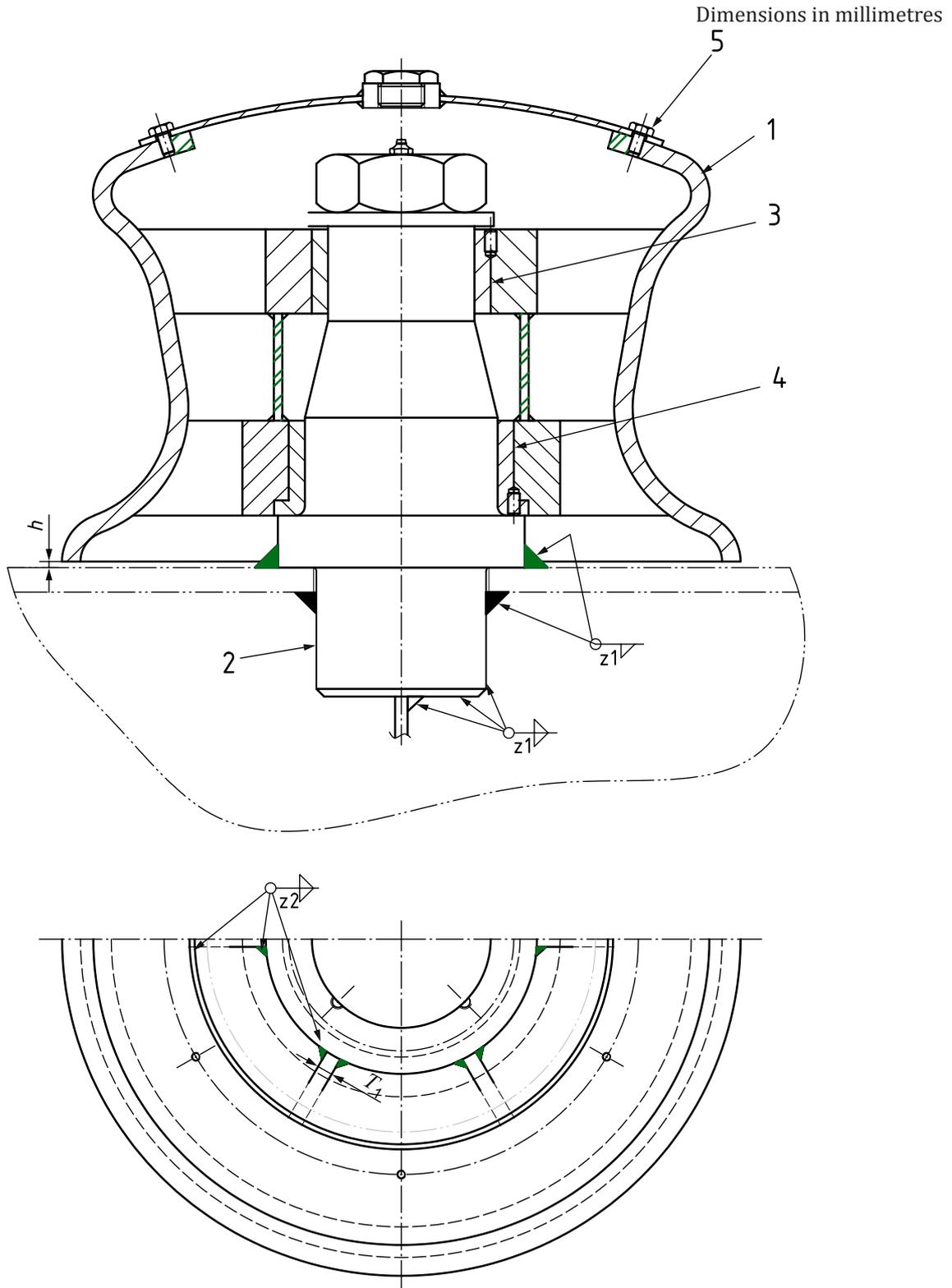
a Thread for grease nipple. b Grease way.

Figure 5 — Detail of axle and bush for steel rollers (type A and type B)

Table 3 — Dimensions of axle and bush for steel rollers (type A and type B)

Dimensions in millimetres

| Nom- inal size D_n | Axle | | | | | | | | | | | Bush | | | | | | |
|-------------------------------|-------------|-------|-------|-----|-------|-------|-------|-------|-------------|-----|--------------|-------------|-------------|-------|-------|-------|-------|-----|
| | d_1 f6 | d_2 | d_3 | H | h_1 | h_2 | h_3 | h_4 | h_5 | b | $m \times d$ | D_4 H7 | D_5 m6 | D_6 | H | h_5 | h_6 | s |
| 150 | 71 | 105 | 71 | 115 | 22 | 93 | 100 | 25 | 7 | 50 | M10 | 71 | 90 | 105 | 92,5 | 8 | 84,5 | M6 |
| 200 | 93 | 135 | 93 | 135 | 27 | 108 | | 27 | 7 | 55 | $\times 20$ | 93 | 115 | 135 | 107,5 | 8 | 99,5 | |
| 250 | 113 | 155 | 113 | 144 | 30 | 114 | 125 | 28 | 9 | 65 | M16 | 113 | 135 | 155 | 113,5 | 8 | 105,5 | M8 |
| 300 | 128 | 175 | 128 | 166 | | 136 | | 30 | 12 | 75 | $\times 30$ | 128 | 150 | 175 | 135,5 | 10 | 125,5 | |
| 350 | 145 | 190 | 145 | 181 | 151 | 40 | 150 | 35 | 13 | 85 | M20 | 145 | 167 | 190 | 150,5 | 10 | 140,5 | |
| 400 | 154 | 200 | 154 | 201 | 161 | | | 37 | 14 | 90 | $\times 40$ | 154 | 177 | 200 | 160,5 | 10 | 150,5 | |
| 450 | 167 | 220 | 167 | 213 | 173 | 40 | 15 | 105 | M24 | 167 | 190 | 220 | 172,5 | 10 | 162,5 | | | |
| 500 | 178 | 235 | 178 | 232 | 191 | 45 | 16 | 110 | $\times 50$ | 178 | 205 | 235 | 190,5 | 10 | 180,5 | | | |



Key

- | | | | |
|---|------------|---|------------|
| 1 | roller | 4 | lower bush |
| 2 | axle | 5 | N-M6 bolt |
| 3 | upper bush | | |

Figure 6 — Assembly of steel rollers for type C

Dimensions in millimetres

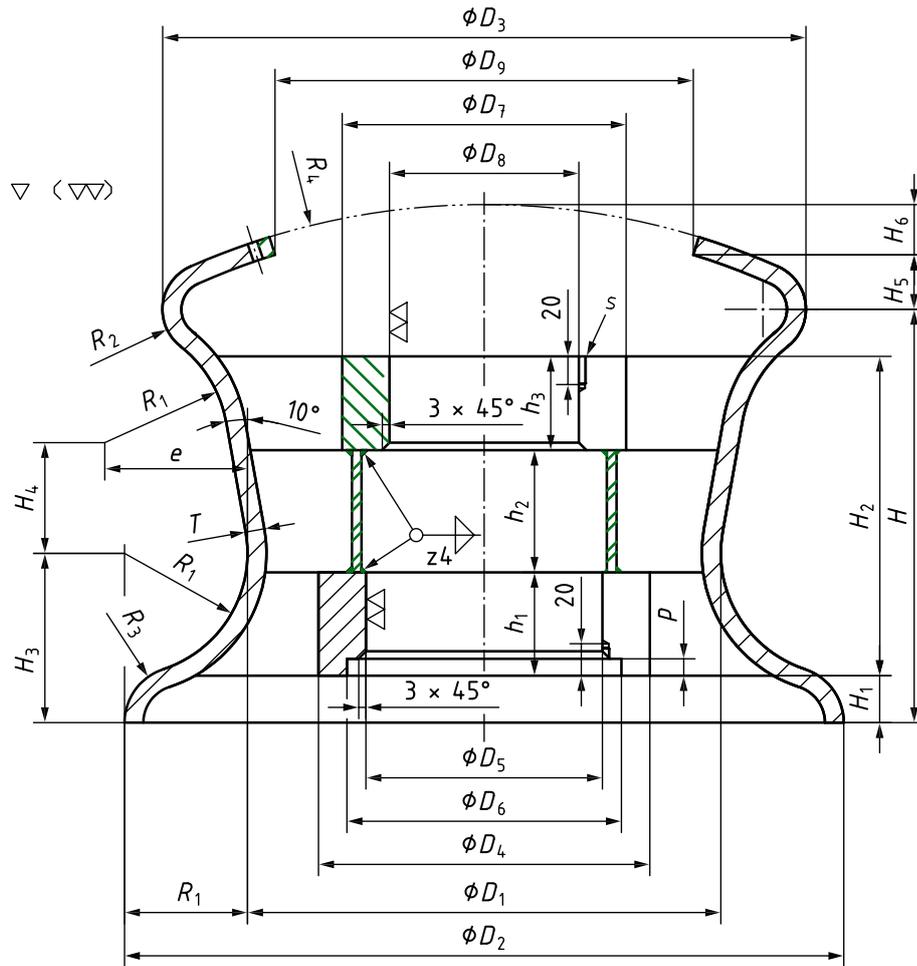


Figure 7 — Detail of steel rollers for type C

Table 4 — Dimensions of steel rollers for type C

Dimensions in millimetres

| Nominal size D_n | D_1 | D_2 +2/0 | D_3 +2/0 | D_4 | D_5 H7 | D_6 | D_7 | D_8 H7 | D_9 | R_1 | R_2 | R_3 | R_4 | H | H_1 |
|--------------------|-------|---------------|---------------|-------|-------------|-------|-------|-------------|-------|-------|-------|-------|-------|-----|-------|
| 150 | 150 | 230 | 220 | 121 | 95 | 110 | 121 | 69 | 140 | 40 | 17 | 20 | 214 | 150 | 16 |
| 200 | 200 | 300 | 280 | 162 | 118 | 140 | 144 | 86 | 190 | 50 | 21 | 25 | 279 | 185 | 21 |
| 250 | 250 | 370 | 340 | 186 | 136 | 160 | 162 | 97 | 250 | 60 | 25 | 30 | 327 | 220 | 25 |
| 300 | 300 | 430 | 400 | 209 | 149 | 180 | 175 | 114 | 300 | 65 | 28 | 32 | 446 | 240 | 30 |
| 350 | 350 | 490 | 455 | 236 | 172 | 195 | 198 | 130 | 350 | 70 | 30 | 35 | 537 | 260 | 35 |
| 400 | 400 | 560 | 520 | 254 | 184 | 207 | 215 | 145 | 400 | 80 | 40 | 40 | 680 | 280 | 40 |
| 450 | 450 | 620 | 580 | 269 | 199 | 225 | 230 | 160 | 450 | 85 | 45 | 42 | 797 | 292 | 45 |
| 500 | 500 | 680 | 640 | 293 | 217 | 240 | 254 | 178 | 500 | 90 | 50 | 45 | 885 | 305 | 50 |

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Table 5 — Dimensions (continued) of steel rollers for type C

Dimensions in millimetres

| Nominal size D_n | H_2 | H_3 | h_4 | H_5 | (H_6) | e | h | h_1 | h_2 | h_3 | p | Set screw s | T | T_1 | N |
|-----------------------|-------|-------|-------|-------|---------|-------|-----|-------|-------|-------|-----|------------------|-----|-------|-----|
| 150 | 115 | 56,6 | 44,92 | 18,0 | 22,4 | 47,9 | 5 | 35 | 45 | 35 | 7 | M6 | 10 | 10 | 6 |
| 200 | 140 | 70,7 | 56,27 | 22,8 | 27,3 | 59,9 | 5 | 45 | 55 | 40 | 8 | M6 | 10 | 10 | 6 |
| 250 | 170 | 84,9 | 67,89 | 26,4 | 35,7 | 72,0 | 6 | 55 | 65 | 50 | 9 | M8 | 10 | 10 | 6 |
| 300 | 187 | 91,6 | 74,25 | 26,3 | 38,8 | 78,1 | 7 | 62 | 70 | 55 | 10 | M8 | 12 | 12 | 8 |
| 350 | 203 | 99,0 | 82,6 | 23,8 | 46,3 | 84,6 | 7 | 68 | 75 | 60 | 11 | M8 | 16 | 16 | 8 |
| 400 | 220 | 113,1 | 71,3 | 29,0 | 50,0 | 92,6 | 7 | 75 | 80 | 65 | 11 | M8 | 19 | 19 | 12 |
| 450 | 238 | 119,9 | 67,31 | 33,8 | 52,3 | 96,9 | 7 | 87 | 81 | 70 | 11 | M8 | 19 | 19 | 12 |
| 500 | 251 | 127,3 | 63,7 | 36,9 | 58,0 | 101,2 | 7 | 87 | 89 | 75 | 12 | M8 | 21 | 21 | 12 |

Table 6 — Dimensions (continued) and SWL of steel rollers for type C

Dimensions in millimetres

| Nominal size D_n | Welding leg length | | SWL ^b | | | | Calculated weight ^c kg/set |
|-----------------------|--------------------|-------|----------------------------------|-----|--------------------|-----|--|
| | z_1 | z_2 | $\theta = 90^\circ$ ^a | | $\theta = 0^\circ$ | | |
| | | | kN | t | kN | t | |
| 150 | 8 | 7 | 265 | 27 | 186 | 19 | 21 |
| 200 | 10 | 8 | 441 | 45 | 314 | 32 | 37 |
| 250 | 11 | 8 | 579 | 59 | 412 | 42 | 56 |
| 300 | 12 | 10 | 726 | 74 | 510 | 52 | 86 |
| 350 | 15 | 10 | 1 040 | 106 | 736 | 75 | 127 |
| 400 | 17 | 12 | 1 246 | 127 | 883 | 90 | 174 |
| 450 | 20 | 12 | 1 599 | 163 | 1 128 | 115 | 215 |
| 500 | 23 | 14 | 1 942 | 198 | 1 373 | 140 | 253 |

^a θ is the relative angle of ropes on the steel roller (refer to [Annex A](#)).

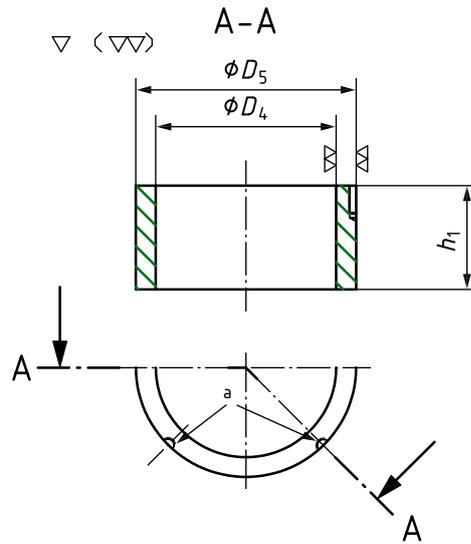
^b The “SWL” which is marked on the fitting is the maximum applicable rope tension based on 90° ($\theta = 90^\circ$) and 180° ($\theta = 0^\circ$) deflections of the rope direction by the steel roller.

The SWLs shown in this table are for reference only. These are based on the loadings as mentioned in [Annex A](#).

The “SWL” which is marked on the fitting may be adjusted depending on the actual loading conditions of mooring rope under the agreement between the user and the manufacturer.

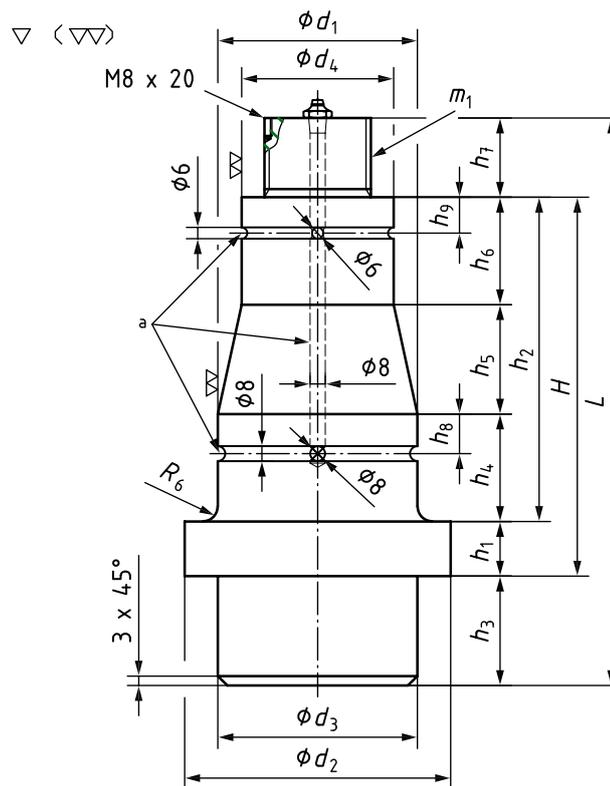
^c The calculated weight (mass) is for reference only.

Dimensions in millimetres



a 4-set screw.

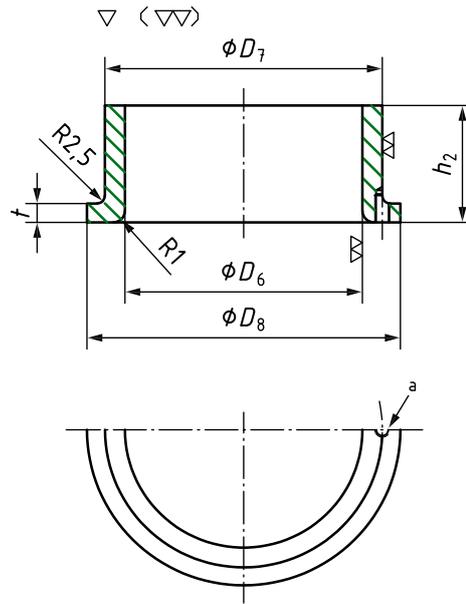
a) Upper bush



a Grease way.

b) Axle

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^a $m \times s$ set screw.

c) Lower bush

Figure 8 — Detail of axle and bush for type C

Table 7 — Dimensions of axle and bush for type C

Dimensions in millimetres

| Nominal size D_n | Axle | | | | | | | | | | | | | | | L | R_6 | m_1 |
|-----------------------|-------------|-------|-------|-------------|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-----|-----|-------|-------|
| | d_1 f6 | d_2 | d_3 | d_4 f6 | H | h_1 | h_2 | h_3 | h_4 | h_5 | h_6 | h_7 | h_8 | h_9 | | | | |
| 150 | 81 | 105 | 81 | 55 | 138 | 21 | 117 | 100 | 37 | 41 | 39 | 30 | 17 | 14 | 268 | 5 | M39 | |
| 200 | 102 | 135 | 102 | 70 | 168 | 26 | 142 | 100 | 47 | 51 | 44 | 39 | 19 | 15 | 307 | 7 | M52 | |
| 250 | 119 | 155 | 119 | 80 | 203 | 31 | 172 | 100 | 57 | 58 | 57 | 42 | 21 | 19 | 345 | 8 | M56 | |
| 300 | 130 | 175 | 130 | 95 | 226 | 37 | 189 | 125 | 64 | 63 | 62 | 47 | 23 | 20 | 398 | 8 | M64 | |
| 350 | 152 | 190 | 152 | 110 | 247 | 42 | 205 | 125 | 70 | 67 | 68 | 50 | 25 | 22 | 422 | 9 | M68 | |
| 400 | 164 | 200 | 164 | 125 | 270 | 47 | 223 | 150 | 78 | 74 | 71 | 56 | 28 | 25 | 476 | 10 | M76 | |
| 450 | 179 | 220 | 179 | 140 | 293 | 52 | 241 | 150 | 91 | 74 | 76 | 56 | 30 | 28 | 499 | 10 | M76 | |
| 500 | 195 | 235 | 195 | 156 | 311 | 57 | 254 | 150 | 91 | 82 | 81 | 58 | 30 | 28 | 519 | 11 | M80 | |

Table 8 — Dimensions (continued) of axle and bush for type C

Dimensions in millimetres

| Nominal size D_n | Bush | | | | | | | | | |
|--------------------------|-------------|-------------|-------------|-------------|-------|-------|-------|-----|-------|--------------|
| | D_4 H7 | D_5 m6 | D_6 H7 | D_7 m6 | D_8 | h_1 | h_2 | t | R_1 | $m \times s$ |
| 150 | 55 | 69 | 81 | 95 | 108 | 35 | 35 | 7 | 6 | M6 × 20 |
| 200 | 70 | 86 | 102 | 118 | 138 | 40 | 45 | 8 | 8 | |
| 250 | 80 | 97 | 119 | 136 | 158 | 50 | 55 | 9 | 9 | M8 × 20 |
| 300 | 95 | 114 | 130 | 149 | 178 | 55 | 62 | 10 | 9 | |
| 350 | 110 | 130 | 152 | 172 | 193 | 60 | 68 | 11 | 10 | |
| 400 | 125 | 145 | 164 | 184 | 205 | 65 | 75 | 11 | 11 | |
| 450 | 140 | 160 | 179 | 199 | 223 | 70 | 87 | 11 | 11 | |
| 500 | 156 | 178 | 195 | 217 | 238 | 75 | 87 | 12 | 12 | |

Annex A (normative)

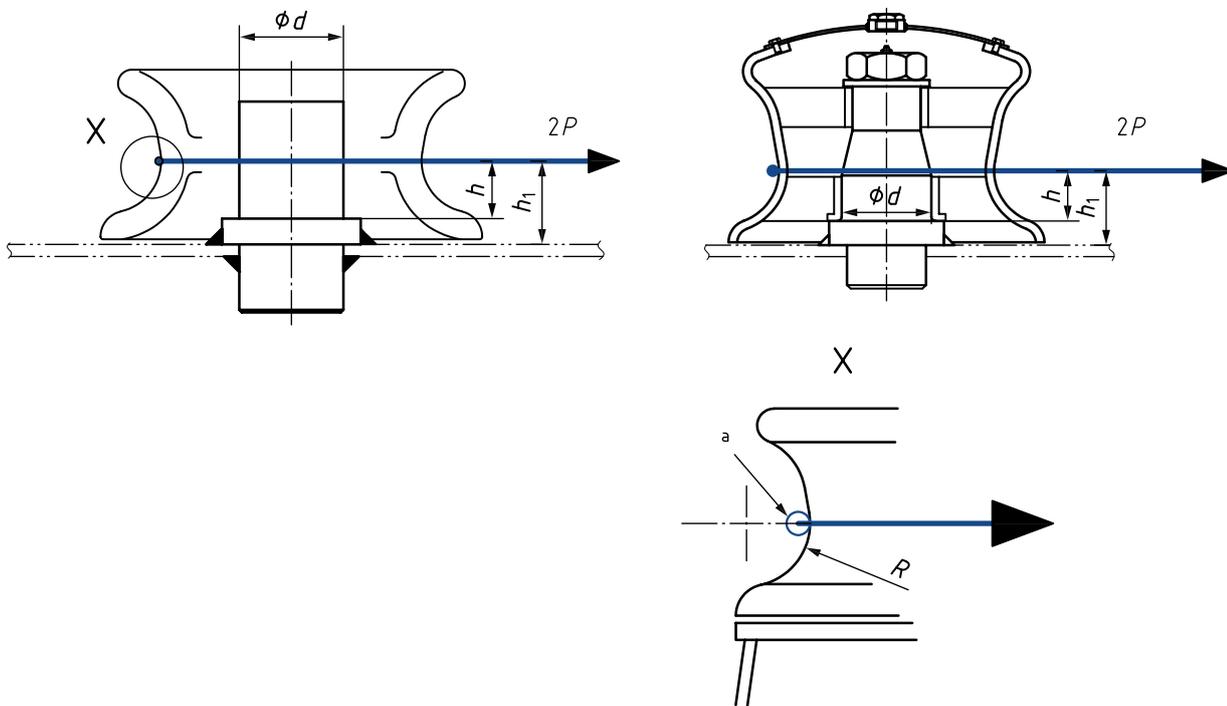
Basis for strength assessment of steel rollers

A.1 General

The strength of the steel rollers was evaluated by simple beam theory calculation and determined based on the following design criteria.

A.2 Loading

The steel rollers shall be designed to withstand the load cases given in Figure A.1.



Key

P mooring force and towing force at the conical part of the throat

a Conical part of the throat.

NOTE The loads were considered with a rope deflected 180° through the steel roller as shown in this figure.

Figure A.1 — Loading on steel roller

A.3 Load and stress criteria

Under the SWL, the following stress criteria were adopted:

- the bending stress is limited to 85 % of the yield stress of the material;
- the shear stress is limited to 60 % of the yield stress of the material;

— the combined stress is limited to 100 % of the yield stress of the material.

A.4 Wear-down allowances and corrosion additions

The wear-down margin and corrosion margin were already included in the stress criteria specified in [A.3](#).

Bibliography

- [1] ISO 2408, *Steel wire ropes — Requirements*
- [2] ISO 4990, *Steel castings — General technical delivery requirements*
- [3] IACS UR A2, *Shipboard fittings and supporting hull structures associated with towing and mooring on conventional vessels*

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