

INTERNATIONAL STANDARD

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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).

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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

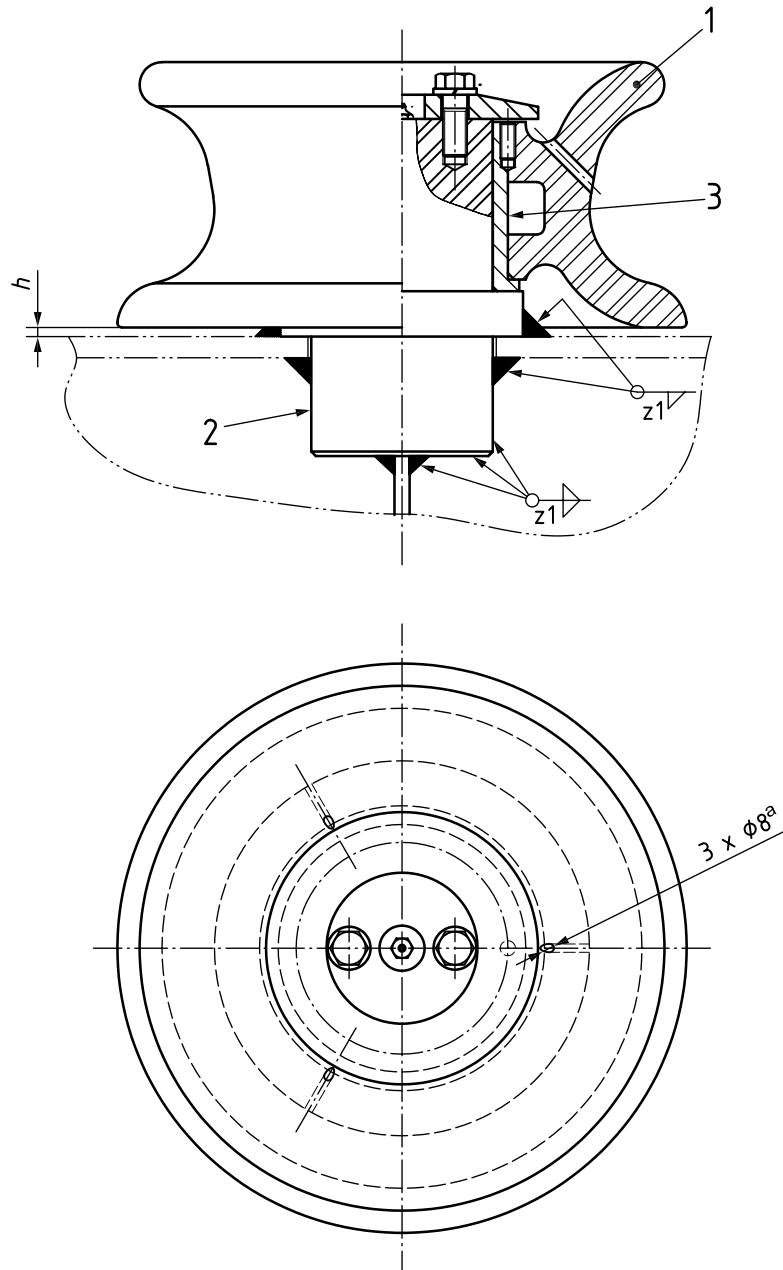
9.1 The safe working load (SWL) for the intended use of the steel rollers shall be noted in the towing and mooring plan available on board for the guidance of the shipmaster as specified in IMO circular MSC/Circ.1175.

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.

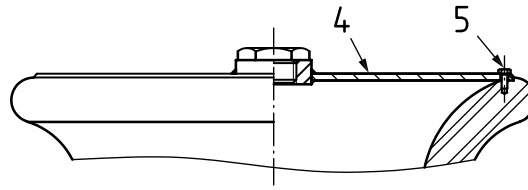
EXAMPLE SWL XXX t

Dimensions in millimetres



a) Type A

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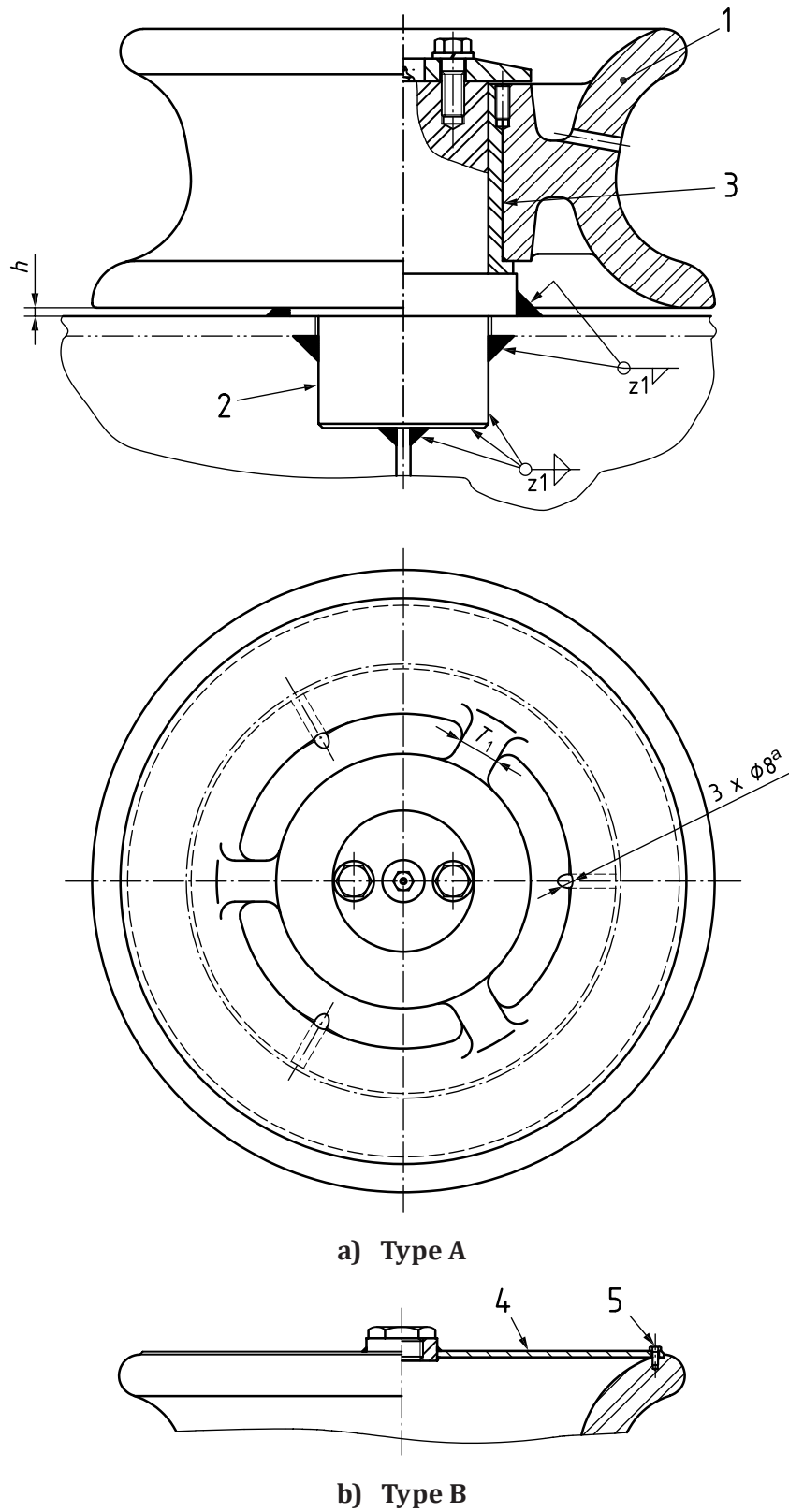
b) Type B

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



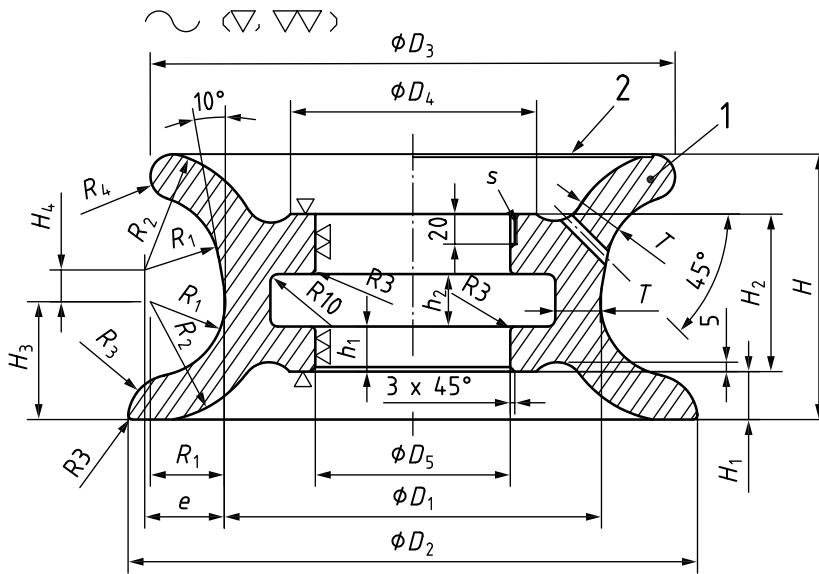
Key

- | | | | | | |
|---|--------|---|------------------------------------|---|-------------|
| 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

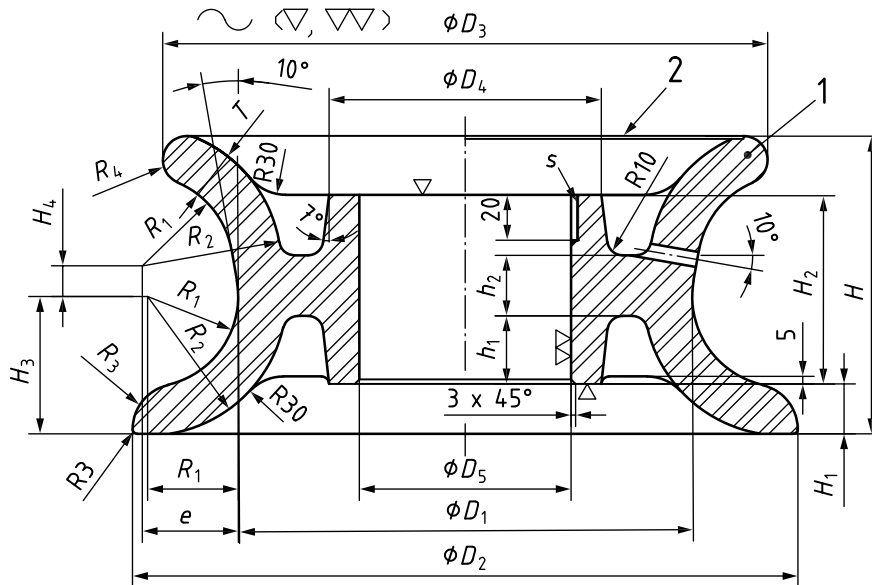


Key

- 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](#)).

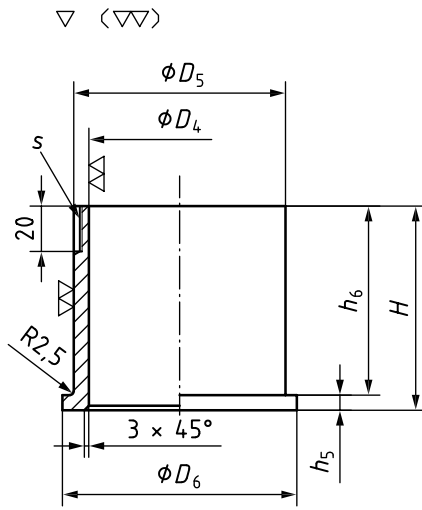
^b The “SWL” which is marked on the fitting is the maximum applicable rope tension based on 90° ($\theta = 90^\circ$) and 180° ($\theta = 0^\circ$) deflections of the rope direction by the steel roller.

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

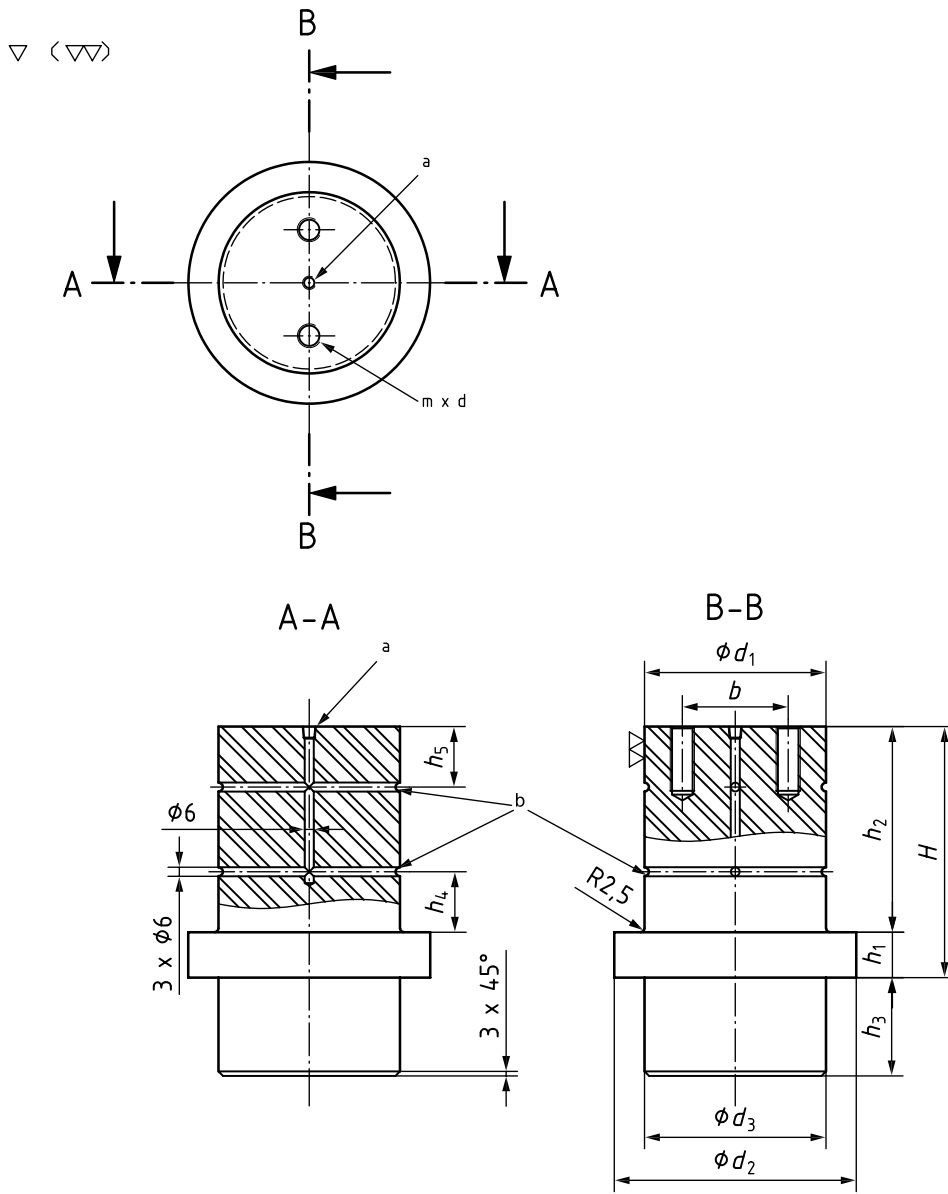
The “SWL” which is marked on the fitting may be adjusted depending on the actual loading conditions of mooring rope under the agreement between the user and the manufacturer.

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

Dimensions in millimetres



a) Bush



b) Axle

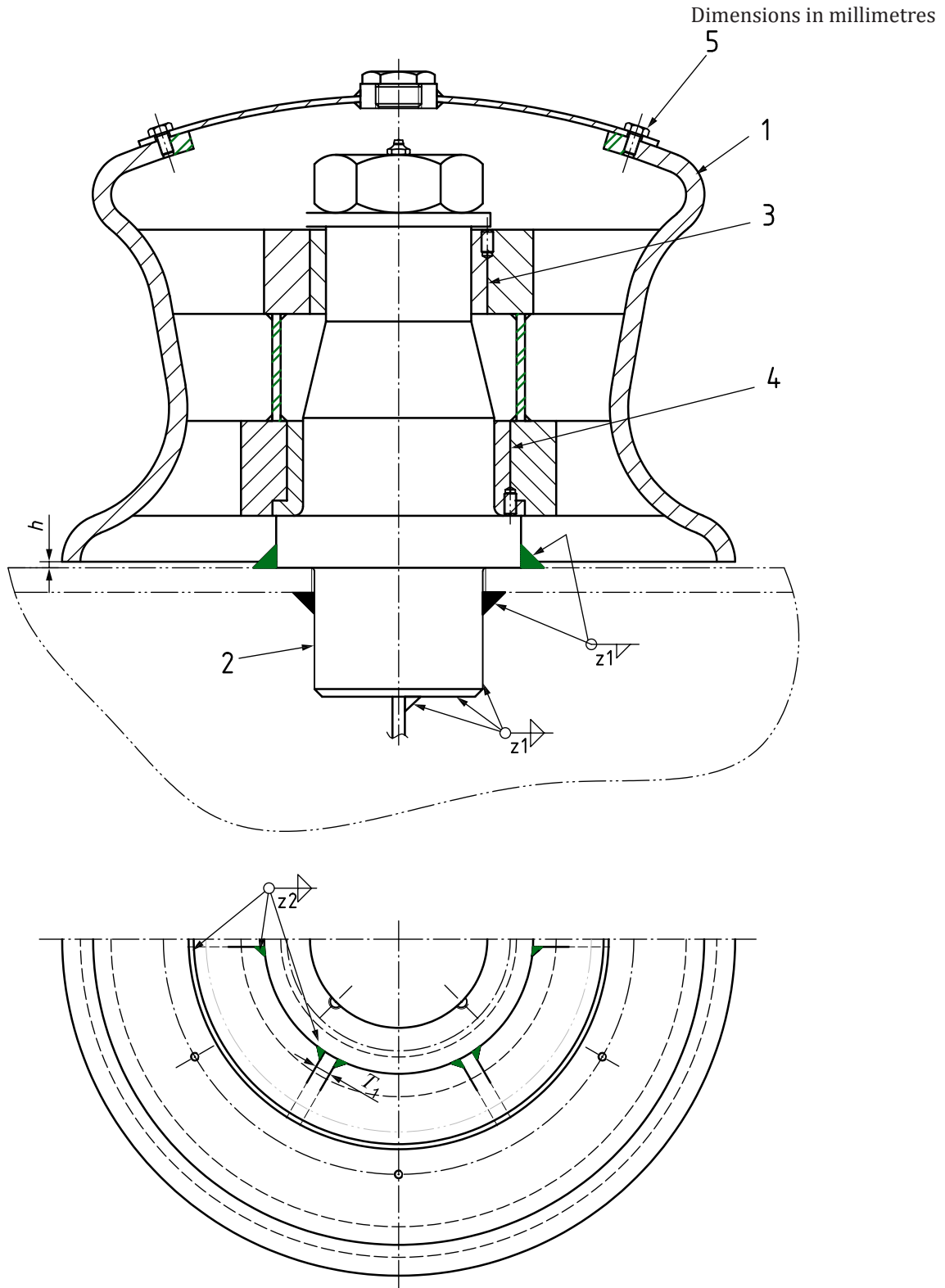
a Thread for grease nipple. b Grease way.

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	35	13	85	M20	145	167	190	150,5	10	140,5			
400	154	200	154	201	40	161	150	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

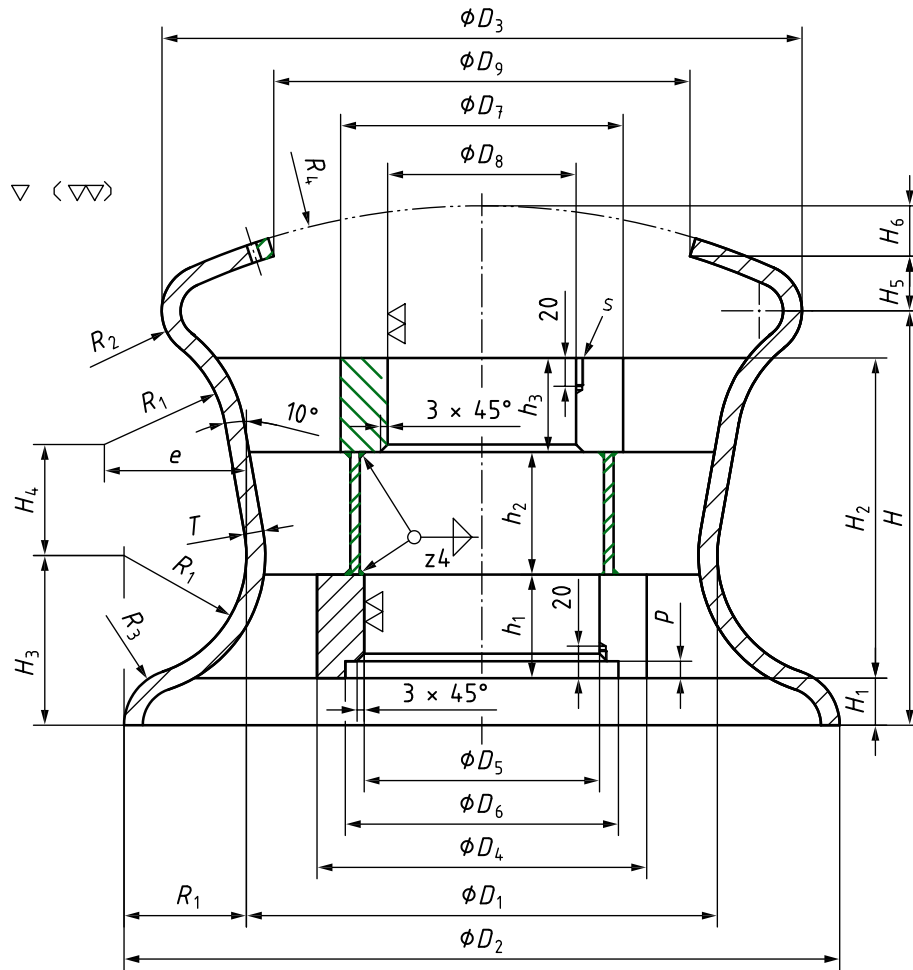


Figure 7 — Detail of steel rollers for type C

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](#)).

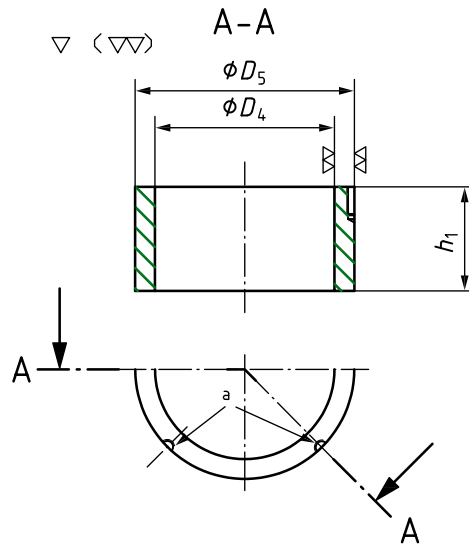
^b The “SWL” which is marked on the fitting is the maximum applicable rope tension based on 90° ($\theta = 90^\circ$) and 180° ($\theta = 0^\circ$) deflections of the rope direction by the steel roller.

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.

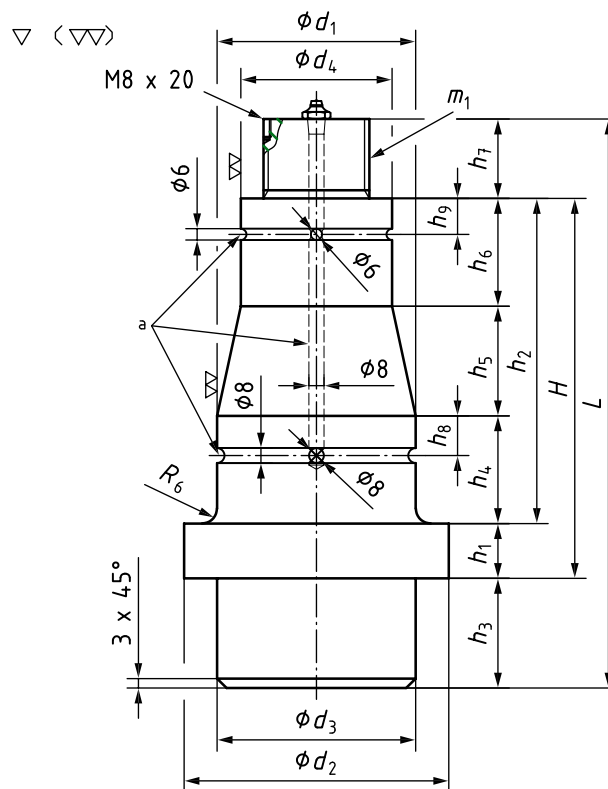
^c The calculated weight (mass) is for reference only.

Dimensions in millimetres



a 4-set screw.

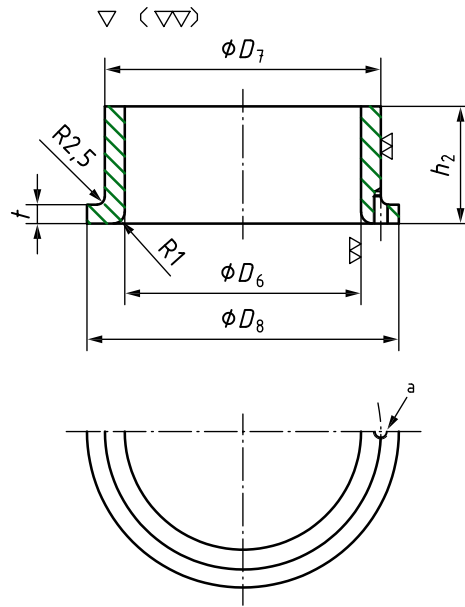
a) Upper bush



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																
	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	L	R_6	m_1
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)

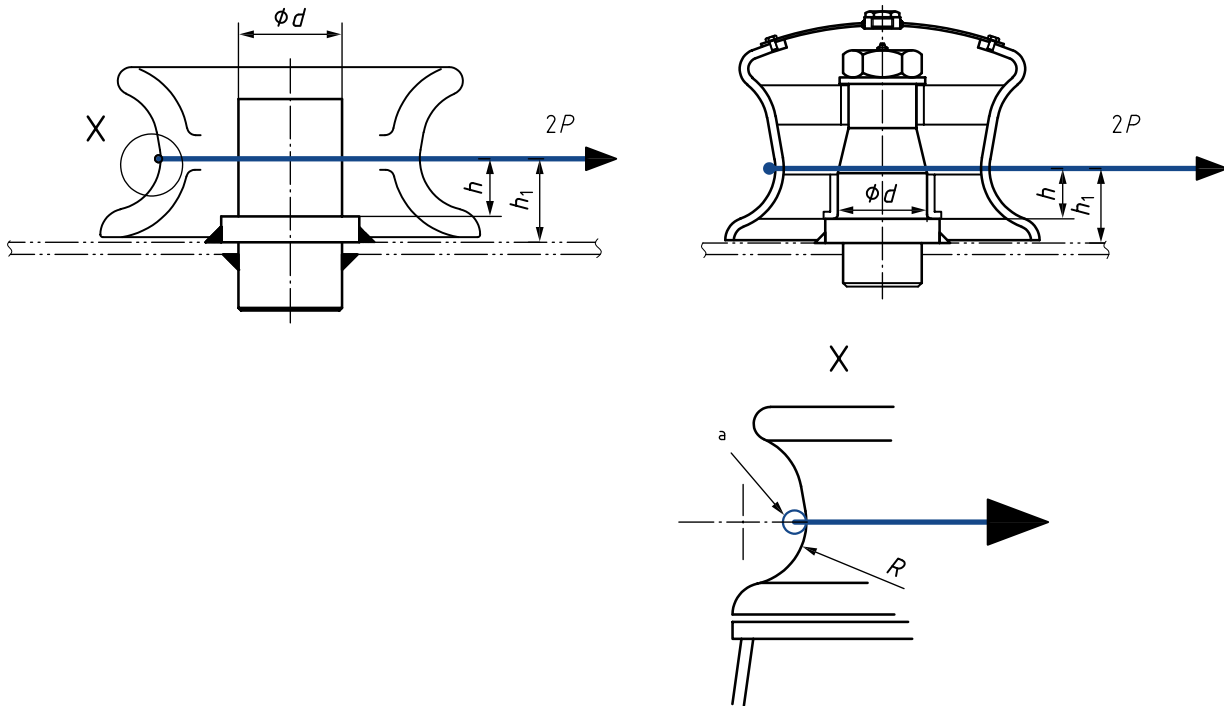
Basis for strength assessment of steel rollers

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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