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Ships and marine technology — Stud- link anchor chains

*Navires et technologie maritime — Chaînes d'ancre à mailles
étançonnées*

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

This fourth edition cancels and replaces the third edition (ISO 1704:2008), which has been technically revised.

The main changes are as follows:

- grade 4 stud-link anchor chain with higher strength has been defined in Table 1 and mechanical properties have been specified in Clause 9;
- the terms and definitions of swivel shackles have been added in 3.8;
- tolerances on the nominal diameter of the links have been adjusted properly in Clause 5;
- the nominal dimensions of the enlarged link, end link, D type joining shackle and Kenter type joining shackle have been adjusted properly in Tables 3, 4, 5 and 6;
- the nominal diameters and shape of Type A and Type B swivel shackles have been added in 7.9 and 7.10;
- the sketch examples of connecting chain-shots with joining shackle and examples of connecting outboard chain-shot to anchor and chain end shot have been added in Figures 11 and 12;
- information on requirements for anchor chains, designation of size, material requirement, loading methods and marking has been added in Clauses 8, 9 10 and 11;
- incorrect dimensions in Table 3 of ISO 1704:2008 have been corrected.

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.

Ships and marine technology — Stud-link anchor chains

1 Scope

This document specifies the shape, proportions, dimensions and tolerances of the component parts of stud-link anchor chains.

NOTE Statutory requirements, rules and regulations can be applicable to the individual ships concerned.

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 2093:1986, *Electroplated coatings of tin — Specification and test methods*

ISO 2339, *Taper pins, unhardened*

3 Terms and definitions

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

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>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

chain-shots

component of an anchor chain consisting of *common links* (3.2) and *joining shackles* (3.5) with a given nominal length (e.g. 27,5 m or 25 m)

3.2

common link

basic link of which a *chain-shot* (3.1) consists

3.3

enlarged link

strengthened link connecting a *common link* (3.2) and an *end link* (3.4) in case of connecting chain-shots with a D type *joining shackle* (3.5), or connecting a common link and a swivel

3.4

end link

strengthened link attached to the ends of two *chain-shots* (3.1) in case of connecting chain-shots with a D type *joining shackle* (3.5), or connecting an outboard chain-shot with an end shackle

3.5

joining shackle

shackle used for connecting *chain-shots* (3.1)

Note 1 to entry: Joining shackles can be of D-type or Kenter type.

**3.6
end shackle**

enlarged shackle used for connecting the outboard chain-shot to the anchor

**3.7
swivel**

movable component of the outboard chain-shot that prevents excessive twisting of the chain cable

**3.8
swivel shackle**

shackle fastened to the anchor shackle or anchor shank with the same function as a swivel

**3.9
outboard chain-shot**

additional short chain-shot fastened to the anchor shackle or anchor, including *common link* (3.2) *enlarged link* (3.3), *end shackle* (3.6) or *swivel shackle* (3.8)

**3.10
chain end shot**

chain-shot fastened to the cable clench, including *end link* (3.4), *enlarged link* (3.3) and *common link* (3.2)

**3.11
nominal size**

nominal diameter of the *common link* (3.2)

4 Shape and dimensions

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4.1 Shape

The links, shackles and component parts should be of the shapes and proportions shown in [Figures 2 to 9](#) referred to as the standard model.

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4.2 Dimensions

4.2.1 General

4.2.1.1 The dimensions of links, shackles and component parts should be in accordance with the values given in [Tables 1 to 9](#), referred to as the standard model.

4.2.1.2 The nominal diameter d is a design diameter measured at the crown of a common link as an average value out of two measurements perpendicular to each other. See [Figure 2](#) and [Table 1](#).

4.2.1.3 All dimensions, based on the nominal diameters d of the common links, shall be measured after the chain and shackles have been subjected to the statutory proof loads in [10.3](#).

4.2.2 Enlarged links

The proportions of the enlarged links are the same as those of the common links. The nominal diameter of the enlarged link is 10 % larger than the nominal diameter of the common link, $d_1 = 1,1d$, the calculated values shall be rounded to the nearest nominal diameter of the common link.

4.2.3 Common stud links and enlarged links

The inside diameter of common links and enlarged links should be sufficient to allow each link to bed properly and work freely. See [Figures 2](#) and [3](#).

4.2.4 End links

The inside diameter of the end links should be sufficient to allow the shackle link to bed properly and work freely. See [Figure 4](#). The nominal diameter of the end link is 20 % larger than the nominal diameter of the common link, $d_2 = 1,2d$.

4.2.5 Shackle retaining pin

4.2.5.1 The retaining pin used in D type joining shackles and end shackles shall be a taper pin having a taper of not less than 1:50 and not more than 1:16 on the diameter.

4.2.5.2 The retaining pin used in Kenter type shackles shall be a taper pin having a taper of not less than 1:50 and not more than 1:32 on the diameter. The nominal diameter of the taper pin shall be $0,37 \times d$, the calculated values shall be rounded to the nearest standardised nominal diameter in accordance with ISO 2339. The nominal length of the taper pin shall be $(w_4 - 2h_1)$ nominal diameter to taper pin (see [Figure 5](#)), the calculated values shall be rounded to the nearest standardised nominal length in accordance with ISO 2339.

4.2.5.3 The nominal sizes and lengths required are given in [Tables 4, 5](#) and [6](#). Other details of the taper pins, e.g. end-radius, cone tolerance and surface finish, shall be in accordance with ISO 2339.

4.2.5.4 Taper pins shall be either of stainless steel or tin-coated carbon steel. If tin-coated, this shall be either by a hot-dip process or electroplating in accordance with ISO 2093:1986, 7.1, service condition 4.

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5 Tolerances

ISO/FDIS 1704

5.1 Common stud links

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5.1.1 The allowable manufacturing tolerances on the nominal diameter d of the common links, measured at the crown, should be:

$0,05d$
 -1 mm for $d \leq 40$ mm

$0,05d$
 -2 mm for $40 \text{ mm} < d \leq 84$ mm

$0,05d$
 -3 mm for $84 \text{ mm} < d \leq 122$ mm

$0,05d$
 -4 mm for $122 \text{ mm} < d \leq 152$ mm

$0,05d$
 -6 mm for $d > 152$ mm

5.1.2 The cross-sectional area at the crown of the link shall be not less than the area of a circle of the nominal diameter.

5.1.3 The allowable manufacturing tolerances on the nominal diameter measured elsewhere on the link shall be ${}^+5_0\%$.

5.1.4 The tolerance of the diameter on the flush-butt welded parts shall be $0 \sim +15\%$.

5.1.5 The allowable manufacturing tolerance of the link except for the requirements specified above shall be $\pm 2,5\%$, taking into account the fact that all components of the anchor chain shall fit in with each other.

5.2 Length of five links

5.2.1 The length of five links is defined as $5 \times p + 2d = 22d$. The measurement shall be taken from the outside.

5.2.2 The allowable manufacturing tolerances on a length of five links shall be $+2,5_0\%$.

5.3 All other dimensions

5.3.1 The tolerances on diameters shall be $+5_0\%$.

5.3.2 The tolerances on other than diameters shall be $\pm 2,5\%$.

6 Grade of the anchor chain

The grade of the anchor chain shall be shown in [Table 1](#).

Table 1 — Grade of anchor chain

Dimensions in millimetres

Grade	Title	Nominal size
1	1 stud-link	11 ~ 162
2	2 stud-link	
3	3 stud-link	16 ~ 162
4	4 stud-link	30 ~ 162

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7 Connections

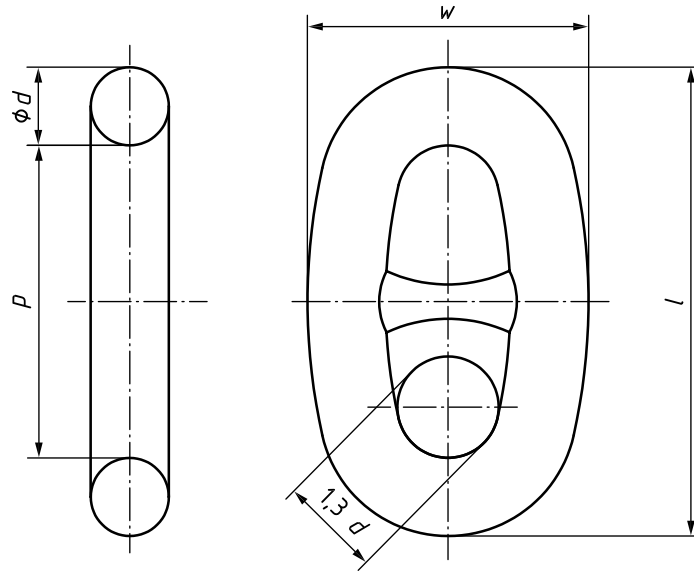
7.1 General

7.1.1 Examples in the use of connecting chain-shots with a joining shackle are shown in [Figure 10](#).

7.1.2 Examples in the use of connecting an outboard chain-shot to an anchor are shown in [Figure 11](#) and to a chain end shot are shown in [Figure 12](#).

7.2 Nominal dimensions and shape of common links

The nominal dimensions and the shape of common links shall be as shown in [Figure 1](#) and [Table 2](#).



Key

- d nominal diameter of common link
- l $6 d$
- p $4 d$
- w $3,6 d$

NOTE For the nominal dimensions, see Table 2.

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Figure 1 — Common link

ISO/FDIS 1704

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Table 2 — Nominal dimensions of a common link

Dimensions in millimetres

Nominal size d	l	p	w
11	66	44	40
12,5	75	50	45
14	84	56	50
16	96	64	58
17,5	105	70	63
19	114	76	68
20,5	123	82	74
22	132	88	79
24	144	96	86
26	156	104	94
28	168	112	101
30	180	120	108
32	192	128	115
34	204	136	122
36	216	144	130
38	228	152	137
40	240	160	144
42	252	168	151

Nominal size d	l	p	w
70	420	280	252
73	438	292	263
76	456	304	274
78	468	312	281
81	486	324	292
84	504	336	302
87	522	348	313
90	540	360	324
92	552	368	331
95	570	380	342
97	582	388	349
100	600	400	360
102	612	408	367
105	630	420	378
107	642	428	385
111	666	444	400
114	684	456	410
117	702	468	421

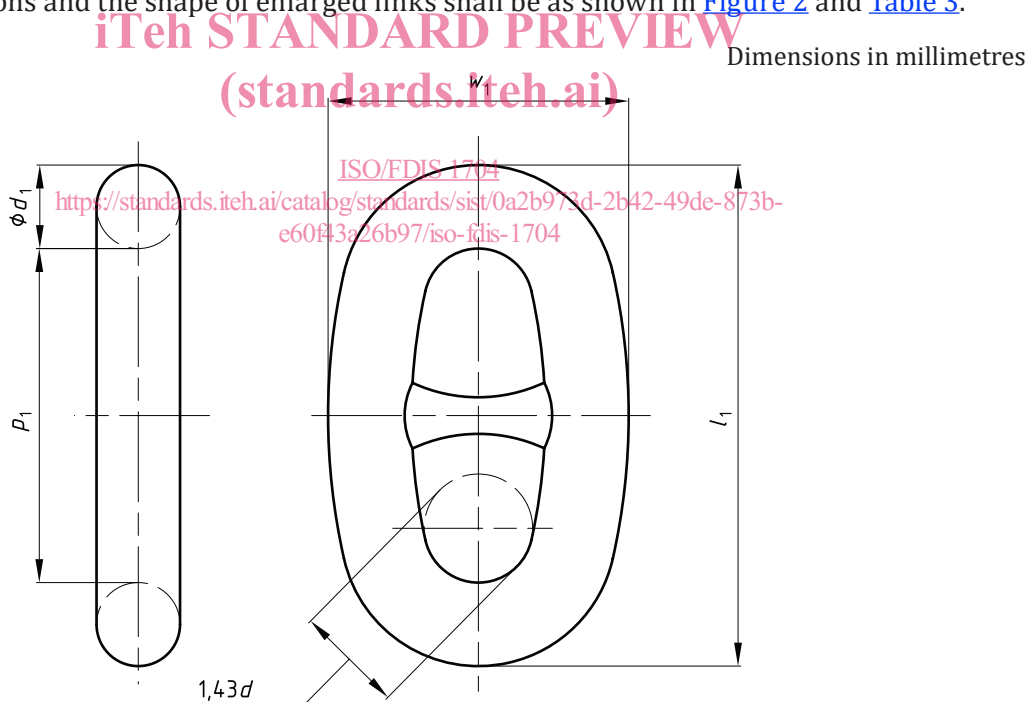
Table 2 (continued)

Nominal size d	l	p	w
44	264	176	158
46	276	184	166
48	288	192	173
50	300	200	180
52	312	208	187
54	324	216	194
56	336	224	202
58	348	232	209
60	360	240	216
62	372	248	223
64	384	256	230
66	396	264	238
68	408	272	245

Nominal size d	l	p	w
120	720	480	432
122	732	488	439
124	744	496	446
127	762	508	457
130	780	520	468
132	792	528	475
137	822	548	493
142	852	568	511
147	882	588	529
152	912	608	547
157	942	628	565
162	972	648	583

7.3 Nominal dimensions and shape of enlarged links

The nominal dimensions and the shape of enlarged links shall be as shown in Figure 2 and Table 3.



Key

- d nominal diameter of common link
- d_1 nominal diameter of enlarged link = 1,1 d
- l_1 $6 d_1 \approx 6,6 d$
- p_1 $4 d_1 \approx 4,4 d$
- w_1 $3,6 d_1 \approx 3,96 d$

Figure 2 — Enlarged link

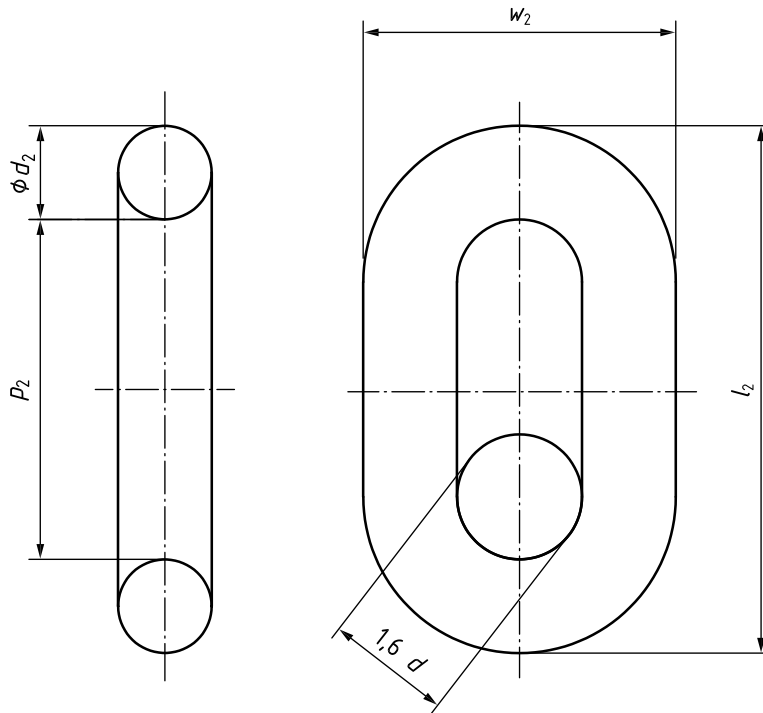
Table 3 — Nominal dimensions of an enlarged link

Dimensions in millimetres

Nominal size (<i>d</i> common link)	<i>d</i> ₁	<i>l</i> ₁	<i>p</i> ₁	<i>w</i> ₁
11	12,5	73	49	45
12,5	14	84	56	50
14	16	96	64	58
16	17,5	105	70	63
17,5	19	114	76	68
19	20,5	123	82	74
20,5	22	132	88	79
22	24	144	96	86
24	26	156	104	94
26	28	168	112	101
28	30	180	120	108
30	34	204	136	122
32	36	216	144	130
34	38	228	152	137
36	40	240	160	144
38	42	252	168	151
40	44	264	176	158
42	46	276	184	166
44	48	288	192	173
46	50	300	200	180
48	54	324	216	194
50	56	336	224	202
52	58	348	232	209
54	60	360	240	216
56	62	372	248	223
58	64	384	256	230
60	66	396	264	238
62	68	408	272	245
64	70	420	280	252
66	73	438	292	263
68	76	456	304	274
70	78	468	312	281
73	81	486	324	292
76	84	504	336	302
78	87	510	340	306
81	90	540	360	324
84	92	552	368	331
87	97	582	388	349
90	100	600	400	360
92	102	612	408	367
95	105	630	420	378
97	107	642	428	385
100	111	666	444	400
102	111	672	448	403
105	114	684	456	410
107	117	702	468	421
111	122	732	488	439
114	124	744	496	446
117	130	780	520	468
120	132	792	528	475
122	137	822	548	493
124	137	822	548	493
127	142	852	568	511
130	142	852	568	511
132	147	882	588	529
137	152	912	608	547
142	157	942	628	565
147	162	972	648	583
152	167	1 002	668	601
157	173	1 038	692	623
162	178	1 068	712	641

7.4 Nominal dimensions and shape of end links

The nominal dimensions and the shape of end links shall be as shown in [Figure 3](#) and [Table 4](#).



Key

- d nominal diameter of common link
- d_2 nominal diameter of end link = $1,2 d$
- l_2 $p_2 + 2 d_2 \approx 6,75 d \sim 7 d$
- p_2 $3,65 d_2 \approx 4,35 d$
- w_2 $3,3 d_2 \approx 4 d$

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NOTE For the nominal dimension, see [Table 4](#).

Figure 3 — End link

Table 4 — Nominal dimensions of an end link

Dimensions in millimetres

Nominal size d	d_2	l_2	p_2	w_2
11	13	74	48	44
12,5	15	84	54	50
14	17	95	61	56
16	19	108	70	64
17,5	21	117	76	70
19	23	128	83	76
20,5	25	138	89	82
22	26	149	96	88
24	29	162	104	96
26	31	176	113	104
28	34	189	122	112
30	36	203	131	120
32	38	216	139	128
70	84	473	305	280
73	88	493	318	292
76	91	513	331	304
78	94	527	339	312
81	97	547	352	324
84	101	567	365	336
87	104	587	378	348
90	108	608	392	360
92	110	621	400	368
95	114	641	413	380
97	116	655	422	388
100	120	675	435	400
102	122	689	444	408

Table 4 (continued)

Nominal size d	d_2	l_2	p_2	w_2	Nominal size d	d_2	l_2	p_2	w_2
34	41	230	148	136	105	126	709	457	420
36	43	243	157	144	107	128	722	465	428
38	46	257	165	152	111	133	749	483	444
40	48	270	174	160	114	137	770	496	456
42	50	284	183	168	117	140	790	509	468
44	53	297	191	176	120	144	810	522	480
46	55	311	200	184	122	146	824	531	488
48	58	324	209	192	124	149	837	539	496
50	60	338	218	200	127	152	857	552	508
52	62	351	226	208	130	156	878	566	520
54	65	365	235	216	132	158	891	574	528
56	67	378	244	224	137	164	925	596	548
58	70	392	252	232	142	170	959	618	568
60	72	405	261	240	147	176	992	639	588
62	74	419	270	248	152	182	1 026	661	608
64	77	432	278	256	157	188	1 060	683	628
66	79	446	287	262	162	194	1 094	705	648
68	82	459	296	272					

7.5 Nominal dimensions and shape of D type joining shackles

The nominal dimensions and the shape of D type joining shackles shall be as shown in [Figure 4](#) and [Table 5](#).