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Ships and marine technology — Stud-link anchor chains

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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 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

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.

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 × 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.

5 Tolerances

5.1 Common stud links

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 mm < $d \leq 84$ mm

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

$^{0,05d}_{-4}$ mm for 122 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~+15 %.

5.1.5 The allowable manufacturing tolerance of the link except for the requirements specified above shall be ±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 ±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

7 Connections

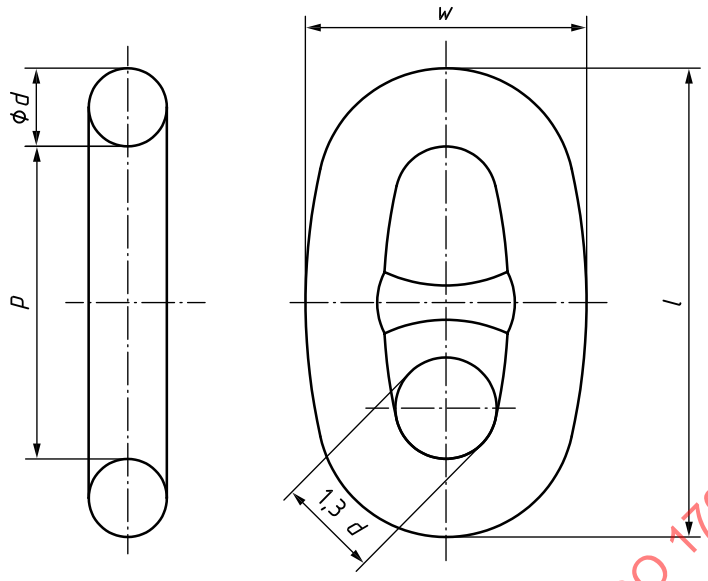
7.1 General

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.

Figure 1 — Common link

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)*

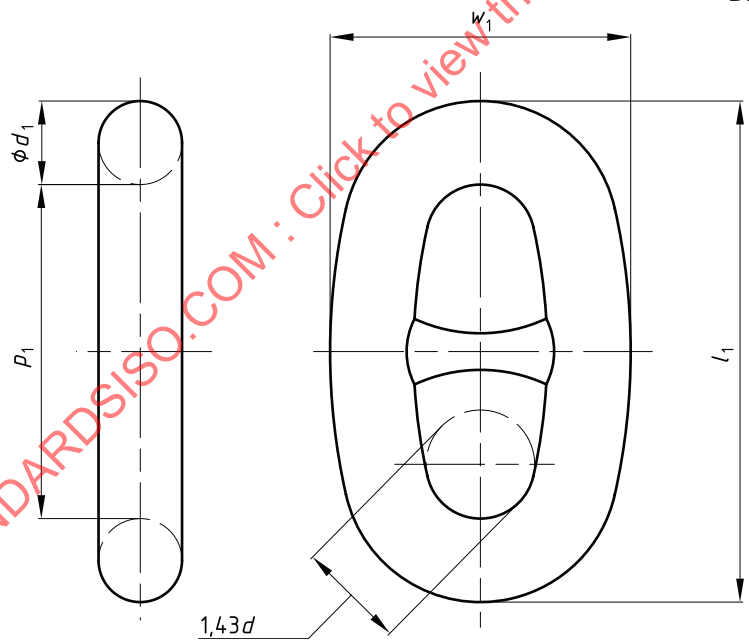
Nominal size *d*	*l*	*p*	*w*
44	264	176	158
46	276	184	166
48	288	192	173
50	300	200	180
52	312	208	187
54	324	216	194
56	336	224	202
58	348	232	209
60	360	240	216
62	372	248	223
64	384	256	230
66	396	264	238
68	408	272	245

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.

Dimensions in millimetres



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

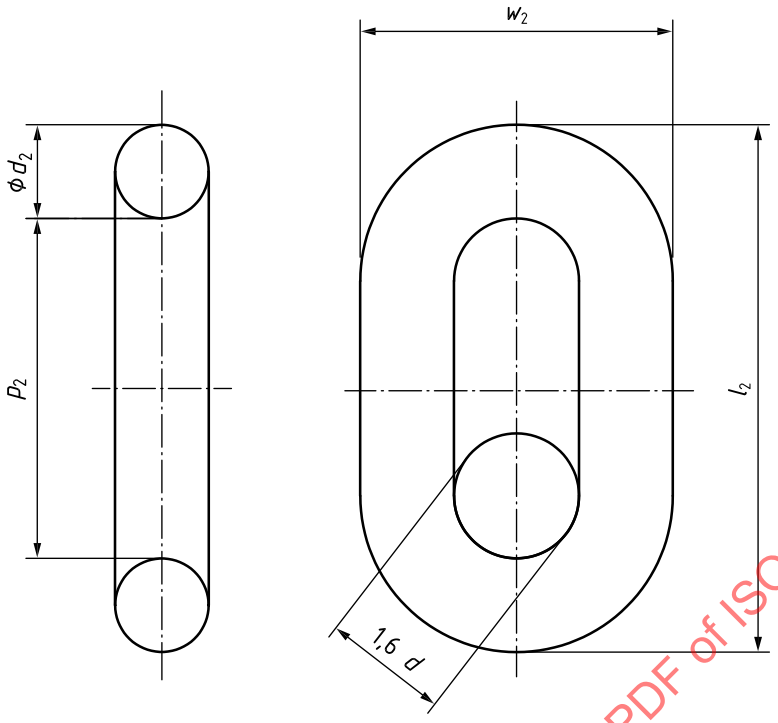
Dimensions in millimetres

Nominal size (d common link)	d_1	l_1	p_1	w_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

Nominal size (d common link)	d_1	l_1	p_1	w_1
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 $3{,}3\ d_2 \approx 4\ d$

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

Nominal size d	d_2	l_2	p_2	w_2
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

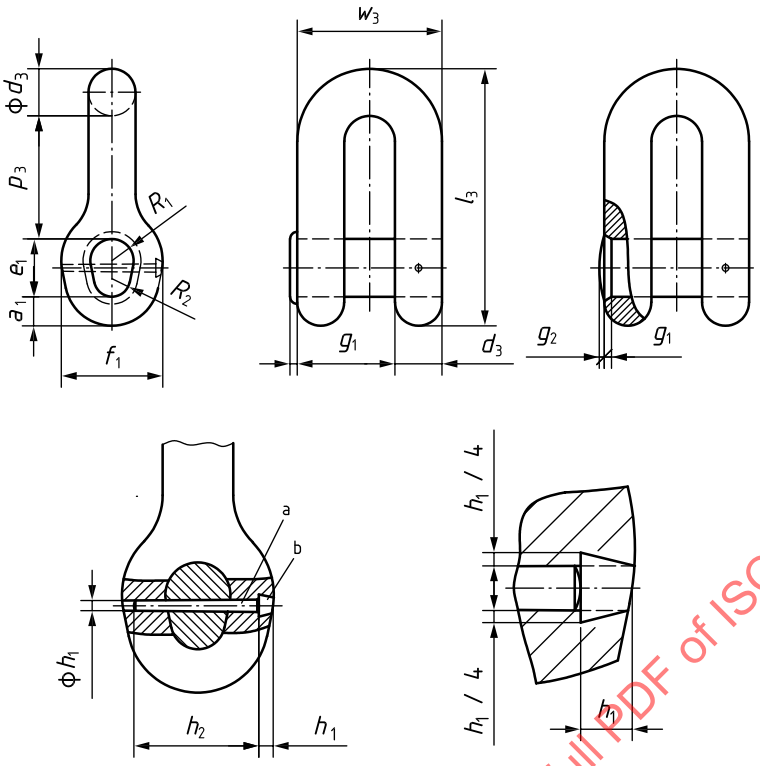
Table 4 *(continued)*

Nominal size d	d_2	l_2	p_2	w_2
34	41	230	148	136
36	43	243	157	144
38	46	257	165	152
40	48	270	174	160
42	50	284	183	168
44	53	297	191	176
46	55	311	200	184
48	58	324	209	192
50	60	338	218	200
52	62	351	226	208
54	65	365	235	216
56	67	378	244	224
58	70	392	252	232
60	72	405	261	240
62	74	419	270	248
64	77	432	278	256
66	79	446	287	262
68	82	459	296	272

Nominal size d	d_2	l_2	p_2	w_2
105	126	709	457	420
107	128	722	465	428
111	133	749	483	444
114	137	770	496	456
117	140	790	509	468
120	144	810	522	480
122	146	824	531	488
124	149	837	539	496
127	152	857	552	508
130	156	878	566	520
132	158	891	574	528
137	164	925	596	548
142	170	959	618	568
147	176	992	639	588
152	182	1 026	661	608
157	188	1 060	683	628
162	194	1 094	705	648

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.



Key

d	nominal diameter of common link	g_1	0,2 d
d_3	nominal diameter of joining shackle = 1,3 d	g_2	0,1 d
l_3	7,1 d	h_1	nominal diameter of taper pin
p_3	$l_3 - (d_3 + a_1 + e_1) = 3{,}4\ d$	h_2	nominal length of taper pin
w_3	4 d	R_1	0,6 d
a_1	0,8 d	R_2	0,5 d
e_1	1,6 d	a	Retaining pin.
f_1	2,8 d	b	Dove tail chamber.

NOTE 1 For the nominal dimensions, see Table 5.

NOTE 2 For the taper of the retaining pin, see 4.2.5.

Figure 4 — D type joining shackle

Table 5 — Nominal dimensions of a D type joining shackle

Dimensions in millimetres

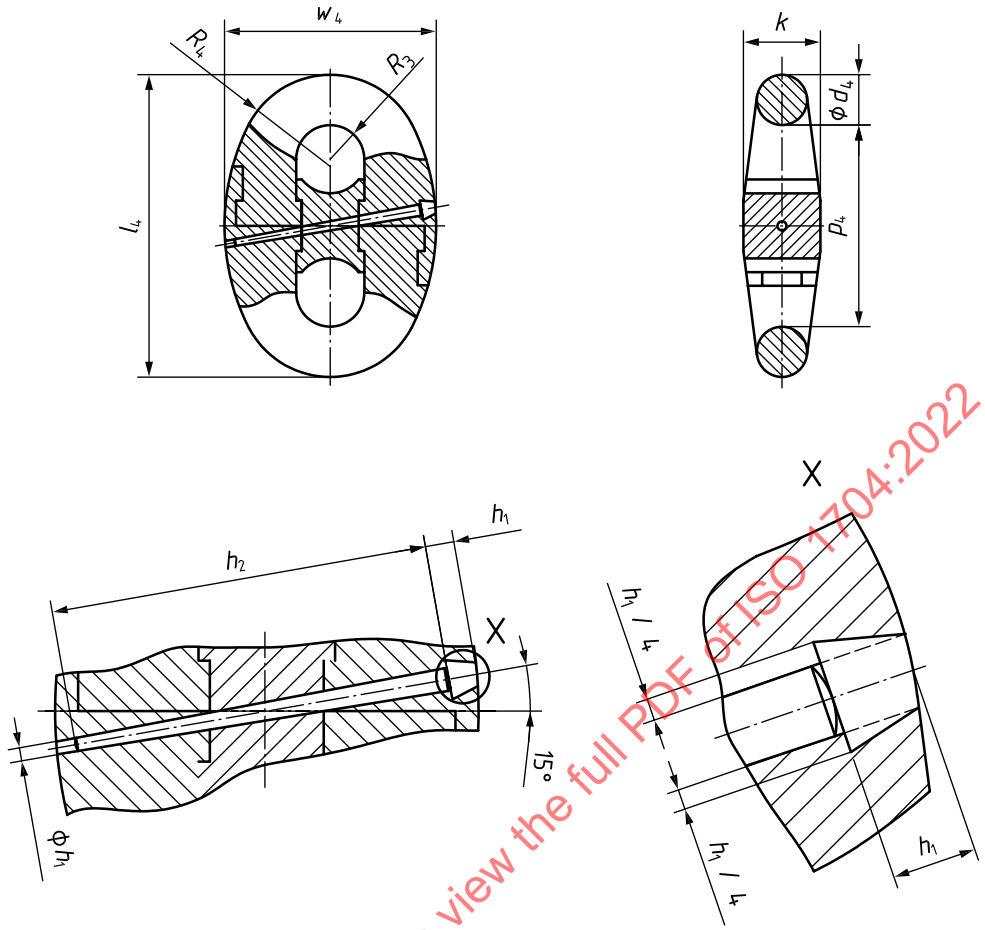
Nominal size d	d_3	l_3	p_3	w_3	a_1	e_1	f_1	g_1	g_2	h_1	h_2	$2R_1$	$2R_2$
11	15	78	37	44	9	18	31	2,2	1,1	4	23	13	11
12,5	16	89	43	50	10	20	35	2,5	1,3		25	15	12,5
14	18	99	48	56	11	22	39	3	1,4	6	28	17	14,0
16	21	114	54	64	13	26	45	3	1,6		32	19	16,0
17,5	23	124	60	70	14	28	49	3,5	1,8		38	21	17,5
19	25	135	65	76	15	30	53	4	2		40	23	19,0
20,5	27	146	70	82	16	33	57	4	2		45	25	20,5
22	29	156	75	88	18	35	62	4,4	2,2		50	26	22,0
24	31	170	82	96	19	38	67	5	2,4	8	55	29	24,0
26	34	185	88	104	21	42	73	5	2,6		60	31	26,0
28	36	199	95	112	22	45	78	5,6	2,8			34	28,0
30	39	213	102	120	24	48	84	6	3		70	36	30,0
32	42	227	109	128	26	51	90	6,4	3,2		75	38	32,0
34	44	241	116	136	27	54	95	7	3,4		80	41	34,0
36	47	256	122	144	29	58	101	7	3,6	10		43	36,0
38	49	270	129	152	30	61	106	7,6	3,8		85	46	38,0
40	52	284	136	160	32	64	112	8	4		90	48	40,0
42	55	298	143	168	34	67	118	8,4	4,2		95	50	42,0
44	57	312	150	176	35	70	123	9	4,4		100	53	44,0
46	60	327	156	184	37	74	129	9	4,6		105	55	46,0
48	62	341	163	192	38,5	77	134	9,5	4,8	12	110	58	48,0
50	65	355	170	200	40	80	140	10	5		115	60	50,0
52	68	369	177	208	42	83	146	10,4	5,2		120	62	52,0
54	70	383	184	216	43	86	151	11	5,4		125	65	54,0
56	73	398	190	224	45	90	157	11	5,6		130	67	56,0
58	75	412	197	232	46	93	162	11,6	5,8		140	70	58,0
60	78	426	204	240	48	96	168	12	6			72	60,0
62	81	440	211	248	50	99	174	12,4	6,2		145	74	62,0
64	83	454	218	256	51	102	179	13	6,4	16	150	77	64,0
66	86	469	224	264	53	106	185	13	6,6			79	66,0
68	88	483	231	272	54	109	190	13,6	6,8		155	82	68,0
70	91	497	238	280	56	112	196	14	7		160	84	70,0
73	95	518	248	292	58	117	204	14,6	7,3		170	88	73,0
76	99	540	258	304	61	122	213	15	7,6		180	91	76,0
78	101	554	265	312	62	125	218	15,6	7,8			94	78,0
81	105	575	275	324	65	130	227	16	8		190	97	81,0
84	109	596	286	336	67	134	235	17	8,4		200	101	84,0
87	113	618	296	348	70	139	244	17,4	8,7			104	87,0
90	117	639	306	360	72	144	252	18	9		210	108	90,0
92	120	653	313	368	74	147	258	18,4	9,2		220	110	92,0
95	124	675	323	380	76	152	266	19	9,5			114	95,0

Table 5 *(continued)*

Nominal size d	d_3	l_3	p_3	w_3	a_1	e_1	f_1	g_1	g_2	h_1	h_2	$2R_1$	$2R_2$
97	126	689	330	388	78	155	272	19,4	9,7		230	116	97,0
100	130	710	340	400	80	160	280	20	10			120	100,0
102	133	724	347	408	82	163	286	20,4	10,2		240	122	102,0
105	137	746	357	420	84	168	294	21	10,5		250	126	105,0
107	139	760	364	428	86	171	300	21,4	10,7		260	128	107,0
111	144	788	377	444	89	178	311	22	11	20		133	111,0
114	148	809	388	456	91	182	319	23	11,4		280	137	114,0
117	152	831	398	468	94	187	328	23,4	11,7			140	117,0
120	156	852	408	480	96	192	336	24	12		290	144	120,0
122	159	866	415	488	98	195	342	24,5	12,3		300	146	122,0
124	161	880	422	496	99	198	347	25	12,4			149	124,0
127	165	902	432	508	102	203	356	25,4	12,7			152	127,0
130	169	923	442	520	104	208	364	26	13		320	156	130,0
132	172	937	449	528	106	211	370	26,4	13,2			158	132,0
137	178	973	466	548	110	219	384	27,5	13,7			164	137,0
142	185	1 008	483	568	114	227	398	28,4	14,2	25	350	170	142,0
147	191	1 044	500	588	118	235	412	29,4	14,7			176	147,0
152	198	1 079	517	608	122	243	426	30,4	15,2			182	152,0
157	204	1 115	534	628	126	251	440	31,4	15,7		400	188	157,0
162	211	1 150	551	648	130	259	454	32,4	16,2			194	162,0

7.6 Nominal dimensions and shape of Kenter type joining shackles

The nominal dimensions and the shape of Kenter type joining shackles shall be as shown in Figure 5 and Table 6.



Key

d	nominal diameter of common link	h_1	nominal diameter of taper pin
d_4	nominal diameter of Kenter type joining shackle = d	h_2	nominal length of taper pin
l_4	6 d	k	1,52 d
p_4	4 d	R_3	0,67 d
w_4	4,2 d	R_4	1,83 d

NOTE 1 For the nominal dimensions, see Table 6.

NOTE 2 For the taper of the retaining pin, see 4.2.5.

Figure 5 — Kenter type joining shackle

Table 6 — Nominal dimensions of a Kenter type joining shackle

Dimensions in millimetres

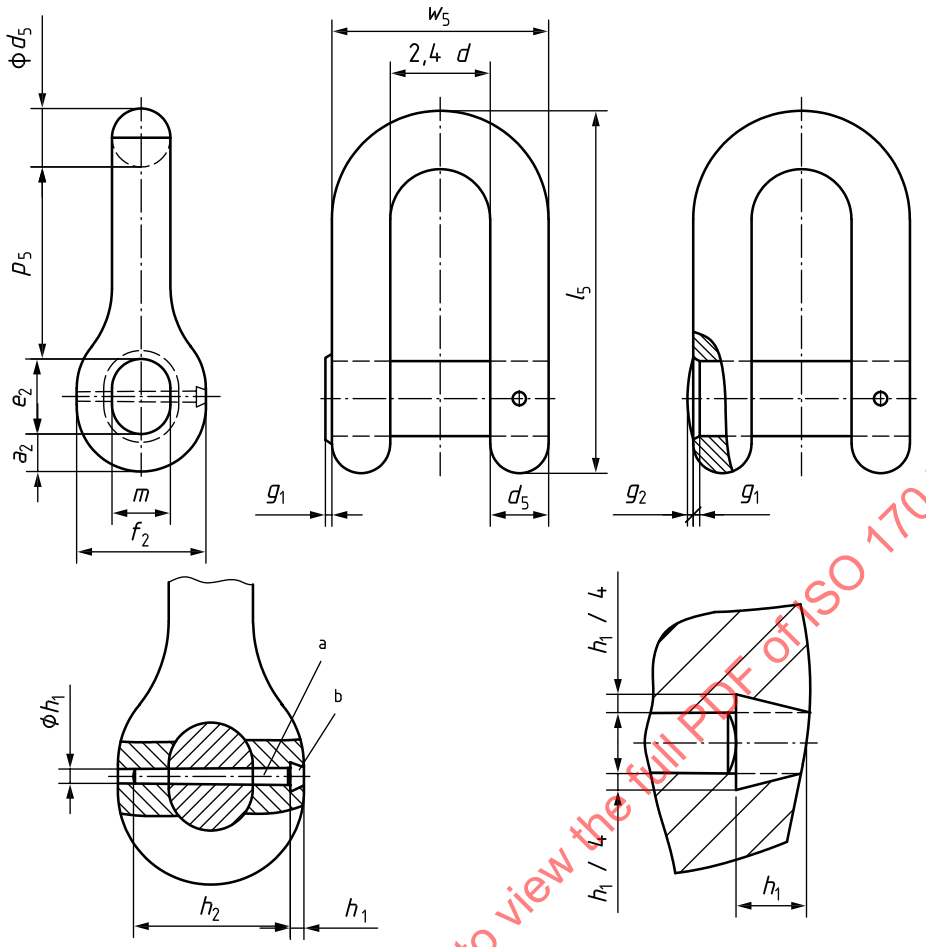
Nominal size d	l_4	p_4	w_4	h_1	h_2	k	R_3	R_4
11	66	44	46	4	38	17	7	20
12,5	75	50	53		45	19	8,5	23
14	84	56	59	6	45	21	9,5	26
16	96	64	67		55	24	10,5	29
17,5	105	70	74		60	27	12	32
19	114	76	80		65	29	13	35
20,5	123	82	86		70	31	14	38
22	132	88	92		75	33	15	40
24	144	96	101	10	80	36	16	44
26	156	104	109		85	40	17,5	48
28	168	112	118		95	43	19	51
30	180	120	126		100	46	20	55
32	192	128	134		110	49	21,5	59
34	204	136	143	12	115	52	23	62
36	216	144	151		120	55	24	66
38	228	152	160		130	58	25	70
40	240	160	168		140	61	27	73
42	252	168	176			64	28	77
44	264	176	185	16	150	67	29	81
46	276	184	193		160	70	31	84
48	288	192	202			73	32	88
50	300	200	210		170	76	34	92
52	312	208	218		180	79	35	95
54	324	216	227	20		82	36	99
56	336	224	235		190	85	38	102
58	348	232	244		200	88	39	106
60	360	240	252			91	40	110
62	372	248	260		220	94	42	113
64	384	256	269			97	43	117
66	396	264	277	25		100	44	121
68	408	272	286			103	46	124
70	420	280	294		240	106	47	128
73	438	292	307		260	111	49	134
76	456	304	319			115	51	139
78	468	312	328			119	52	143

Table 6 *(continued)*

Nominal size d	l_4	p_4	w_4	h_1	h_2	k	R_3	R_4
81	486	324	340	30	280	123	54	148
84	504	336	353			128	57	154
87	522	348	365		300	132	58	159
90	540	360	378			137	60	165
92	552	368	386		320	140	62	168
95	570	380	399	35		144	64	174
97	582	388	407		340	147	65	178
100	600	400	420			152	67	183
102	612	408	428		360	155	68	187
105	630	420	441			160	70	192
107	642	428	449			163	72	196
111	666	444	466	40	380	169	74	203
114	684	456	479			173	76	207
117	702	468	491		400	178	78	214
120	720	480	504			182	80	220
122	732	488	512		420	185	82	223
124	744	496	521			188	83	227
127	762	508	533		440	193	85	232
130	780	520	546	50		198	87	238
132	792	528	554		460	201	88	242
137	822	548	575			208	92	251
142	852	568	596		480	216	95	260
147	882	588	617		500	223	98	269
152	912	608	638		520	231	102	278
157	942	628	659		540	239	105	287
162	972	648	680		560	246	109	296

7.7 Nominal dimensions and shape of end shackle

The nominal dimensions and the shape of end shackles shall be as shown in Figure 6 and Table 7.



Key

d	nominal diameter of common link	g_1	0,2 d
d_5	nominal diameter of end shackle = 1,4 d	g_2	0,1 d
l_5	8,7 d	m	1,4 d
p_5	l_5 - (d_5 + a_2 + e_2) = 4,6 d	h_1	nominal diameter of taper pin
w_5	(4,8 ~ 5,2) d	h_2	nominal length of taper pin
a_2	0,9 d	a	Retaining pin.
e_2	1,8 d	b	Dove tail chamber.
f_2	3,1 d		

NOTE 1 For the nominal dimensions, see Table 7.

NOTE 2 For the taper of the retaining pin, see 4.2.5.

w_5 shall be selected between 4,8 d and 5,2 d.

Figure 6 — End shackle

Table 7 — Nominal dimensions of an end shackle

Dimensions in millimetres

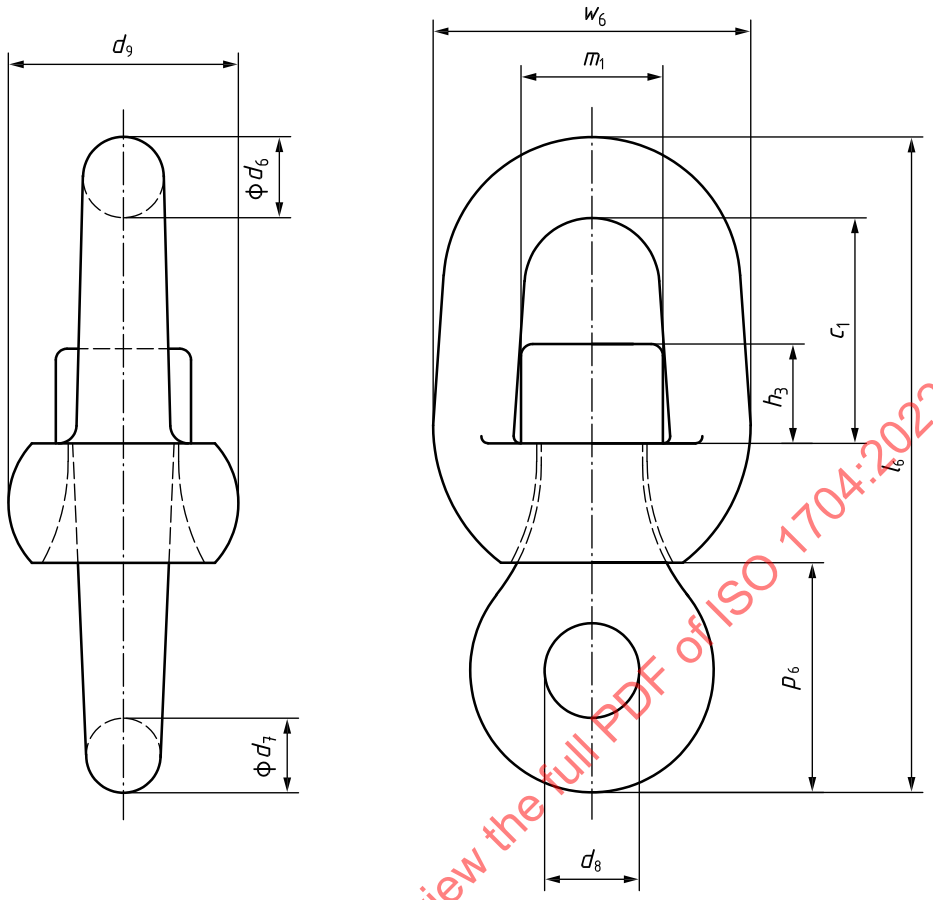
Nominal size d	d_5	l_5	p_5	w_5	a_2	e_2	f_2	g_1	g_2	h_1	h_2	m
11	15	96	51	57	10	20	34	2,0	1,1	4	25	15
12,5	18	109	58	65	11	23	39	2,5	1,3		28	18
14	20	122	64	73	13	25	43	3,0	1,4	6	30	20
16	22	139	74	83	14	29	50		1,6		35	22
17,5	25	152	81	91	16	32	54	3,5	1,8		40	25
19	27	165	87	99	17	34	59	4,0	1,9		45	27
20,5	29	178	94	107	19	37	64		2		45	29
22	31	191	101	114	20	40	68	4,4	2,2		50	31
24	34	209	110	125	22	43	74	5,0	2,4		55	34
26	36	226	120	135	23	46	81		2,6		60	37
28	39	244	129	146	25	50	87	5,6	2,8		70	39
30	42	261	138	156	27	54	93	6	3		75	42
32	45	278	147	166	29	58	99	6,4	3,2		80	45
34	48	296	156	177	31	61	105	7,0	3,4		85	48
36	50	313	166	187	32	65	112		3,6	10	85	50
38	53	331	175	198	34	69	118	7,6	3,8		90	53
40	56	348	184	208	36	72	124	8,0	4		95	56
42	59	365	193	218	38	76	130	8,4	4,2		100	59
44	62	383	202	229	40	79	136	8,7	4,4		110	62
46	64	400	212	239	41	83	143	9,0	4,6		115	64
48	67	418	221	250	43	86	149	9,6	4,8	12		67
50	70	435	230	260	45	90	155	10,0	5		120	70
52	73	452	239	270	47	93	161	10,4	5,2		125	73
54	76	470	248	281	49	97	167	11,0	5,4		130	76
56	78	487	258	291	50	101	174		5,6		140	78
58	81	505	267	302	52	104	180	11,6	5,8			81
60	84	522	276	312	54	108	186	12,0	6		150	84
62	87	539	285	322	56	112	192	12,4	6,2		160	87
64	90	557	294	333	58	115	198	13,0	6,4	16		90
66	92	574	304	343	59	119	205	13,0	6,6			92
68	95	592	313	354	61	122	211	13,6	6,8			95
70	98	609	322	364	63	126	217	14,0	7		170	98
73	102	635	336	380	66	131	226	14,6	7,3		180	102
76	106	661	350	395	68	137	236	15,0	7,6		190	106
78	109	679	359	406	70	140	242	15,6	7,8			109
81	113	705	373	421	73	146	251	16,0	8		200	113
84	118	731	386	437	76	151	260	17	8,4			118
87	122	757	400	452	78	157	270	17,4	8,7		220	122
90	126	783	414	468	81	162	279	18,0	9			126

Table 7 *(continued)*

Nominal size d	d_5	l_5	p_5	w_5	a_2	e_2	f_2	g_1	g_2	h_1	h_2	m
92	129	800	423	478	83	166	285	18,4	9,2	16	240	129
95	133	827	437	494	86	171	295	19	9,5			133
97	136	844	446	504	87	175	301	19,4	9,7	20		136
100	140	870	460	520	90	180	310	20	10,0			140
102	143	887	469	530	92	184	316	20,4	10,2		260	143
105	147	914	483	546	95	189	326	21	10,5			147
107	150	931	492	556	96	193	332	21,4	10,7			150
111	155	966	511	577	100	199	344	22	11,0		280	155
114	160	992	524	593	103	205	353	23	11,4			160
117	164	1 018	538	608	105	211	363	23,4	11,7		300	164
120	168	1 044	552	624	108	216	372	24	12,0			168
122	171	1 061	560	634	110	220	378	24,4	12,2		320	171
124	174	1 079	570	645	112	223	384	25	12,4			174
127	178	1 105	584	660	114	229	394	25,4	12,7	25		178
130	182	1 131	598	676	117	234	403	26	13,0			182
132	185	1 148	607	686	119	238	409	26,4	13,2			185
137	192	1 192	630	712	123	247	425	27,4	13,7		350	192
142	199	1 235	653	738	128	256	440	28,4	14,2			199
147	206	1 279	676	764	132	265	456	29,4	14,7			206
152	213	1 322	699	790	137	274	471	30,4	15,2		400	213
157	220	1 366	722	816	141	283	487	31,4	15,7			220
162	227	1 409	745	842	146	292	502	32,4	16,2			227

7.8 Nominal dimensions and shape of swivel

The nominal dimensions and the shape of swivels shall be as shown in Figure 7 and Table 8.



Key

d	nominal diameter of common stud link	d_7	1,1 d
d_6	nominal diameter of swivel = 1,2 d	a_3	1,75 d
l_6	9,7 d	m_1	2 d
p_6	d_9 = 3,4 d	h_3	d_8 = 1,4 d
w_6	4,7 d	c_1	3,35 d

Figure 7 — Swivel

Table 8 — Nominal dimensions of a swivel

Dimensions in millimetres

Nominal size d	d_6	l_6	w_6	d_7	d_8	d_9	a_3	c_1	m_1
11	13	107	52	12	15	37	19	37	22
12,5	15	121	59	14	18	43	22	42	25
14	17	136	66	15	20	48	25	47	28
16	19	155	75	18	22	54	28	54	32
17,5	21	170	82	19	25	60	31	59	35
19	23	184	89	21	27	65	33	64	38
20,5	25	199	96	23	29	70	36	69	41
22	26	213	103	24	31	75	39	74	44
24	29	233	113	26	34	82	42	80	48
26	31	252	122	29	36	88	46	87	52

Table 8 *(continued)*

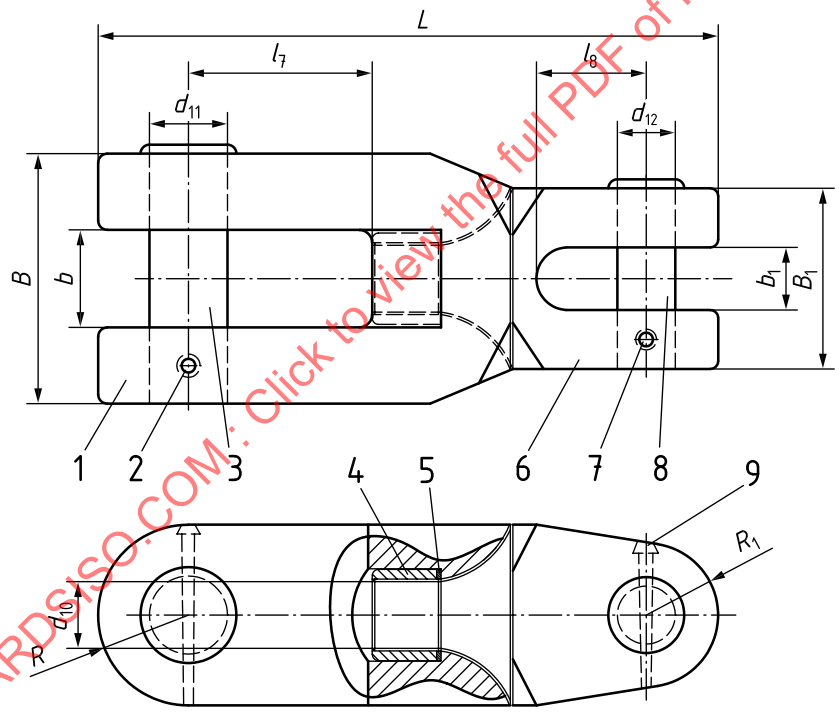
Nominal size d	d_6	l_6	w_6	d_7	d_8	d_9	a_3	c_1	m_1
28	34	272	132	31	39	95	49	94	56
30	36	291	141	33	42	102	53	101	60
32	38	310	150	35	45	109	56	107	64
34	41	330	160	37	48	116	60	114	68
36	43	349	169	40	50	122	63	121	72
38	46	369	179	42	53	129	67	127	76
40	48	388	188	44	56	136	70	134	80
42	50	407	197	46	59	143	74	141	84
44	53	427	207	48	62	150	77	147	88
46	55	446	216	51	64	156	81	154	92
48	58	466	226	53	67	163	84	161	96
50	60	485	235	55	70	170	88	168	100
52	62	504	244	57	73	177	91	174	104
54	65	524	254	59	76	184	95	181	108
56	67	543	263	62	78	190	98	188	112
58	70	563	273	64	81	197	102	194	116
60	72	582	282	66	84	204	105	201	120
62	74	601	291	68	87	211	109	208	124
64	77	621	301	70	90	218	112	214	128
66	79	640	310	73	92	224	116	221	132
68	82	660	320	75	95	231	119	228	136
70	84	679	329	77	98	236	123	235	140
73	88	708	343	80	102	248	128	245	146
76	91	737	357	84	106	258	133	255	152
78	94	757	367	86	109	265	137	261	156
81	97	786	381	89	113	275	142	271	162
84	101	815	395	92	118	286	147	281	168
87	104	844	409	96	122	296	152	291	174
90	108	873	423	99	126	306	158	302	180
92	110	892	432	101	129	313	161	308	184
95	114	921	447	105	133	323	166	318	190
97	116	941	456	107	136	330	170	325	194
100	120	970	470	110	140	340	175	335	200
102	122	989	479	112	143	347	179	342	204
105	126	1 018	494	116	147	357	184	352	210
107	128	1 038	503	118	150	364	187	358	214
111	133	1 077	522	122	155	377	194	372	222
114	137	1 106	536	125	160	388	200	382	228
117	140	1 135	550	129	164	398	205	392	234
120	144	1 164	564	132	168	408	210	402	240
122	146	1 183	573	134	171	415	214	409	244
124	149	1 203	583	136	174	422	217	415	248
127	152	1 232	597	140	178	432	222	425	254

Table 8 *(continued)*

Nominal size d	d_6	l_6	w_6	d_7	d_8	d_9	a_3	c_1	m_1
130	156	1 261	611	143	182	442	228	436	260
132	158	1 280	620	145	185	449	231	442	264
137	164	1 329	644	151	192	466	240	459	274
142	170	1 377	667	156	199	483	249	476	284
147	176	1 426	691	162	206	500	257	492	294
152	182	1 474	714	167	213	517	266	509	304
157	188	1 523	738	173	220	534	275	526	314
162	194	1 571	761	178	227	551	284	543	324

7.9 Nominal dimensions and shape of Type A swivel shackles

The nominal dimensions and the shape of Type A swivel shackles shall be as shown in Figure 8 and Table 9.



Key

1 swivel for anchor
2 retaining pin 1
3 bar 1
4 nut
5 washer
6 swivel for chain
7 retaining pin 2
8 bar 2
9 stuffing

Figure 8 — Type A swivel shackle

Table 9 — Nominal dimensions of a Type A swivel shackle

Dimensions in millimetres

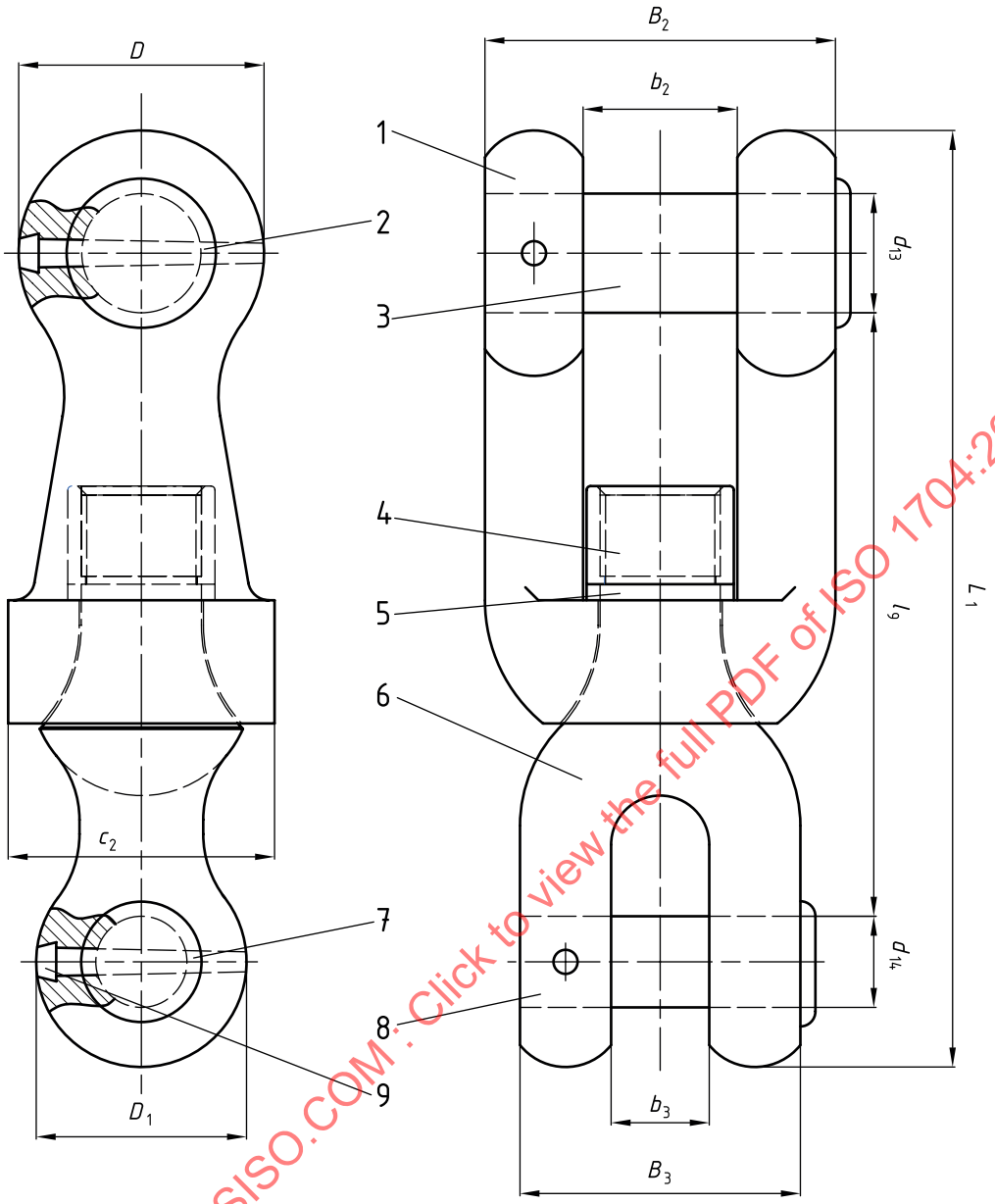
Nominal size	Used for chain d	L	B	B_7	b	b_1	R_1	R_2	d_{10}	d_{11}		d_{12}	l_7	l_8
										Grade 2	Grade 3, 4			
11	11	153	64	44	33	16,5	24,5	19	M16	26	26	14	35	31
12,5	12,5	174	73	51	38	19	28	21	M18	30	30	16	40	35
14	14	195	81	56	42	21	31	25	M20	34	36	18	45	39
17,5	16	264	95	64	51	24	35	28	M24	40	44	22	90	45
	17,5													
20,5	19	360	130	87	72	32	45	35	M33	54	56	28	100	55
	20,5													
24	22	377	143	94	80	34	48	37,5	M36	58	60	31	140	61,5
	24													
28	26	442	162	116	87	39	58	47	M42	62	68	36	157	73
	28													
32	30	493	185	124	89	45	62	53	M52	68	78	42	171	73
	32													
38	34	552	218	148	101	53	74	58	M56	76	82	49	185	94
	36													
	38													
42	40	615	243	164	110	59	82	66	M64	85	90	55	206	106
	42													
48	44	700	277	196	123	67	98	75	M76	90	98	62	235	118
	46													
	48													
52	50	782	298	202	133	73	109	88	M90	96	107	68	248	125
	52													
56	54	802	322	218	146	78	109	88	M90	102	110	73	258	135
	56													
62	58	877	356	252	157	88	126	100	M100	106	118	82	275	152
	60													
	62													
68	64	968	380	265	154	95	136	106	M110	116	128	88	320	150
	66													
	68													
76	70	1 065	426	304	168	106	152	120	M120	125	136	100	325	184
	73													
	76													
81	78	1 142	454	328	172	113	164	130	M130	132	145	105	340	183
	81													
87	84	1 218	487	352	180	122	176	140	M140	138	152	113	360	214
	87													
95	90	1 326	532	380	200	133	190	152	M150	148	160	124	400	231
	92													
	95													

Table 9 *(continued)*

Nominal size	Used for chain d	L	B	B_7	b	b_1	R_1	R_2	d_{10}	d_{11}		d_{12}	l_7	l_8
										Grade 2	Grade 3, 4			
102	97	1 448	571	412	210	143	206	164	M165	156	168	133	440	253
	100													
	102													
107	105	1 538	600	420	220	150	210	176	M175	162	178	140	475	269
	107													
117	111	1 638	660	460	225	165	230	188	M190	168	184	154	491	315
	114													
	117													
122	120	1 756	705	488	268	175	250	200	M190	190	190	165	510	284
	122													
127	124	1 828	735	508	280	185	260	210	M200	200	200	170	530	296
	127													
132	130	1 900	765	528	290	190	270	220	M205	205	205	178	550	307
	132													
137	137	1 972	795	548	300	200	285	225	M210	210	210	185	575	319
142	142	2 044	825	568	310	205	295	235	M215	215	215	190	595	330
147	147	2 116	850	588	295	215	305	240	M220	220	220	198	615	342
152	152	2 188	880	608	335	220	315	250	M225	225	225	205	635	354
157	157	2 260	910	628	345	225	325	260	M235	235	235	210	660	365
162	162	2 332	940	648	355	235	335	270	M240	240	240	218	680	377

7.10 Nominal dimensions and shape of Type B swivel shackles

The nominal dimensions and the shape of Type B swivel shackles shall be as shown in Figure 9 and Table 10.



Key

1 swivel for anchor
2 retaining pin 1
3 bar 1
4 nut
5 washer
6 swivel for chain
7 retaining pin 2
8 bar 2
9 stuffing

Figure 9 — Type B swivel shackle

Table 10 — Nominal dimensions of a Type B swivel shackle

Dimensions in millimetres

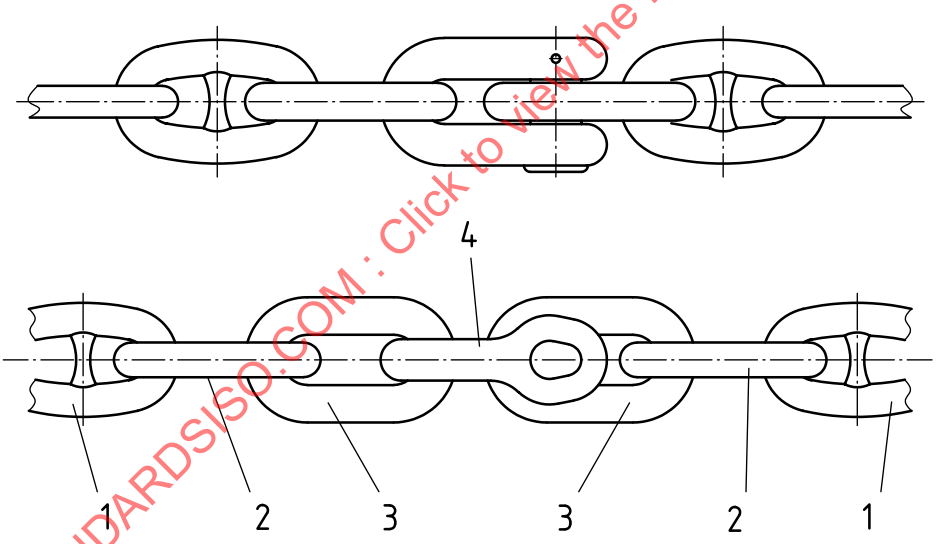
Nominal size	Used for chain d	L_1	l_9	B_2	b_2	B_3	b_3	D	D_1	d_{13}	d_{14}	c_2
11	11	147	94	55	24	44	16	39	33	19	15	42
12,5	12,5	167	107	63	28	50	18	44	38	22	17	48

Table 10 *(continued)*

Nominal size	Used for chain d	L_1	l_9	B_2	b_2	B_3	b_3	D	D_1	d_{13}	d_{14}	c_2
14	14	187	120	70	31	56	20	49	42	24	19	54
17,5	17,5	234	150	88	38	70	25	61	53	30	23	67
19	19	254	163	95	42	76	27	67	57	32	25	73
20,5	20,5	274	176	103	45	82	29	72	62	35	27	78
22	22	294	189	110	48	88	31	77	66	37	29	84
24	24	321	206	120	53	96	34	84	72	41	31	91
26	26	347	224	130	57	104	36	91	78	44	34	99
28	28	374	241	140	62	112	39	98	84	48	37	106
30	30	401	258	150	66	120	42	105	90	51	39	114
32	32	427	275	160	70	128	45	112	96	54	42	122
34	34	454	292	170	75	136	48	119	102	58	44	129
36	36	481	310	180	79	144	50	126	108	61	47	137
38	38	508	327	190	84	152	53	133	114	65	49	144
40	40	534	344	200	88	160	56	140	120	68	52	152
42	42	561	361	210	92	168	59	147	126	71	55	160
44	44	588	378	220	97	176	62	154	132	75	57	167
46	46	615	396	230	101	184	64	161	138	78	60	175
48	48	641	413	240	106	192	67	168	144	82	62	182
50	50	668	430	250	110	200	70	175	150	85	65	190
52	52	695	447	260	114	208	73	182	156	88	68	198
54	54	721	464	270	119	216	76	189	162	92	70	205
56	56	748	482	280	123	224	78	196	168	95	73	213
58	58	775	499	290	128	232	81	203	174	99	75	220
60	60	802	516	300	132	240	84	210	180	102	78	228
62	62	828	533	310	136	248	87	217	186	105	81	236
64	64	855	550	320	141	256	90	224	192	109	83	243
66	66	882	568	330	145	264	92	231	198	112	88	251
68	68	908	585	340	150	272	95	238	204	116	88	258
70	70	935	602	350	154	280	98	245	210	119	91	266
73	73	975	628	365	161	292	102	255	219	124	95	277
76	76	1 015	654	380	167	304	106	266	228	130	99	289
78	78	1 042	671	390	172	312	109	273	234	133	101	296
81	81	1 082	697	405	178	324	113	286	243	138	105	308
84	84	1 122	722	420	185	336	118	294	252	142	109	319
87	87	1 162	748	435	191	348	122	305	261	148	113	331
90	90	1 202	774	450	198	360	126	315	270	153	117	342
92	92	1 229	791	460	202	368	129	322	276	156	120	350
95	95	1269	817	475	209	380	133	333	285	162	124	361
97	97	1 296	834	485	213	388	136	340	291	165	126	369
100	100	1 336	860	500	220	400	140	350	300	170	130	380
102	102	1 363	877	510	224	408	143	357	306	173	133	388
105	105	1 403	903	525	231	420	147	368	315	178	137	399
107	107	1 430	920	535	235	428	150	375	321	182	139	407

Table 10 *(continued)*

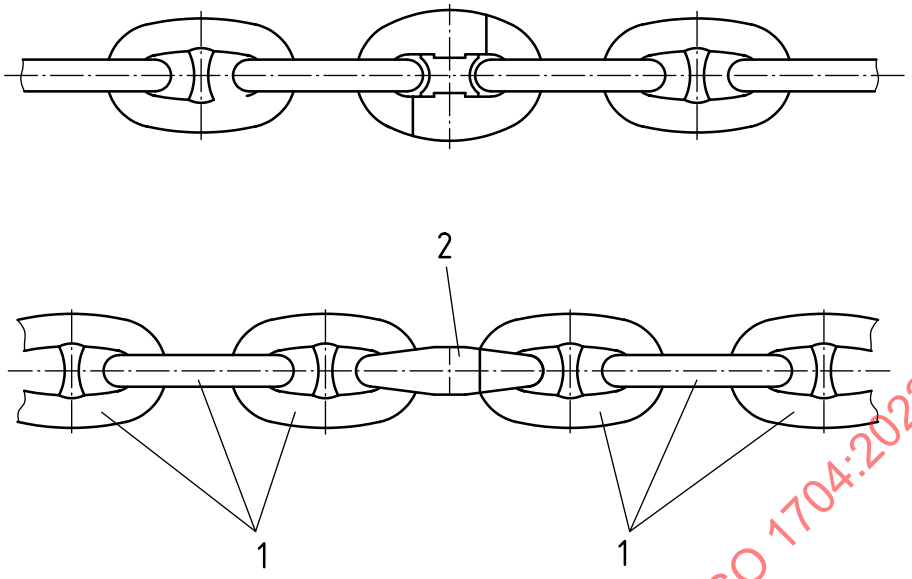
Nominal size	Used for chain d	L_1	l_9	B_2	b_2	B_3	b_3	D	D_1	d_{13}	d_{14}	c_2
111	111	1 483	955	555	244	444	155	389	333	189	144	422
114	114	1 523	980	570	251	456	160	399	342	194	148	433
117	117	1 563	1 006	585	257	468	164	410	351	199	152	445
120	120	1 699	1 104	600	264	480	168	408	338	204	156	456
122	122	1 727	1 122	610	268	488	171	415	344	207	158	464
124	124	1 755	1 140	620	273	496	174	222	350	210	161	471
127	127	1 798	1 168	635	279	508	178	435	358	216	165	482
130	130	1 840	1 196	650	286	520	182	442	366	221	169	494
132	132	1 869	1 214	660	290	528	185	448	372	224	172	502
137	137	1 940	1 260	685	301	548	192	466	386	233	178	520
142	142	2 010	1 306	710	312	568	199	482	400	241	185	540
147	147	2 080	1 352	735	323	588	206	500	415	250	191	558
152	152	2 152	1 398	760	334	608	213	516	428	258	198	578
157	157	2 223	1 444	785	345	628	220	534	442	267	204	596
162	162	2 294	1 490	810	356	648	227	550	456	275	210	616



Key

1 common link
2 enlarged link
3 end link
4 D type joining shackle

a) Connecting chain-shots with a D type joining shackle



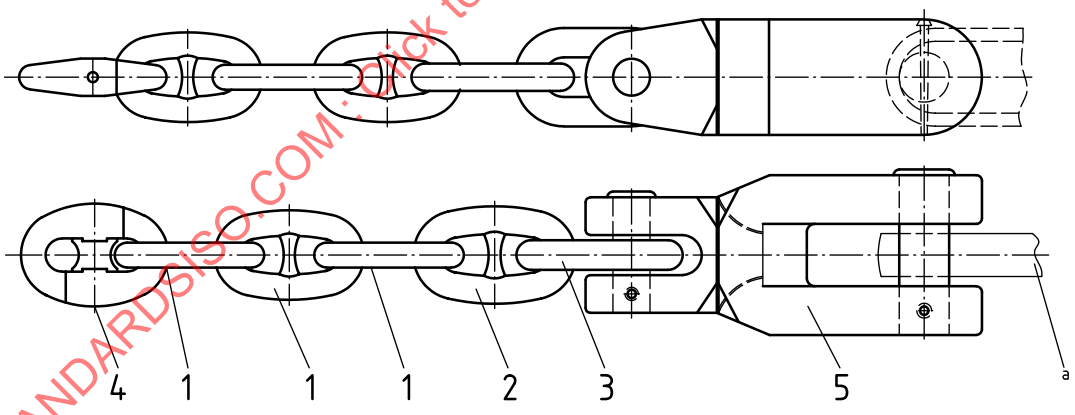
Key

1 common link

2 Kenter type joining shackle

b) Connecting chain-shots with a Kenter type joining shackle

Figure 10 — Examples of connecting chain-shots with a joining shackle



Key

1 common link

2 enlarged link

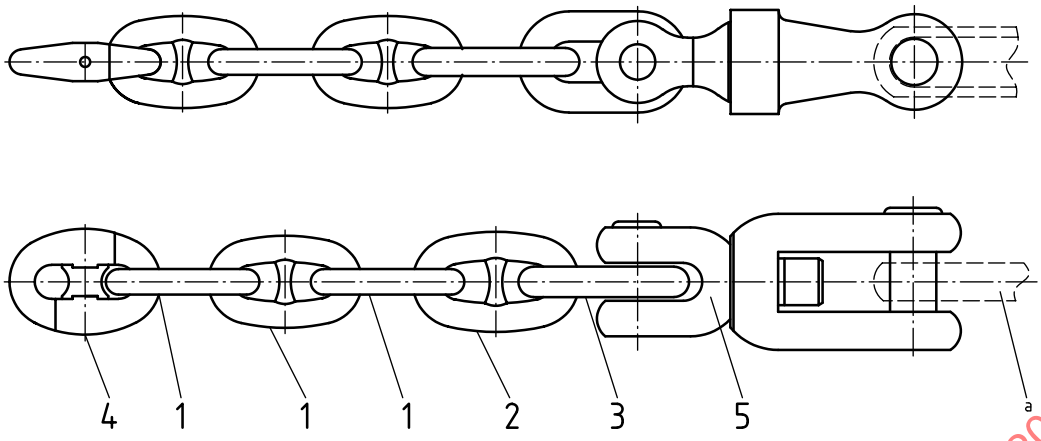
3 end link

4 Kenter type joining shackle

5 type A swivel shackle

a Anchor stock.

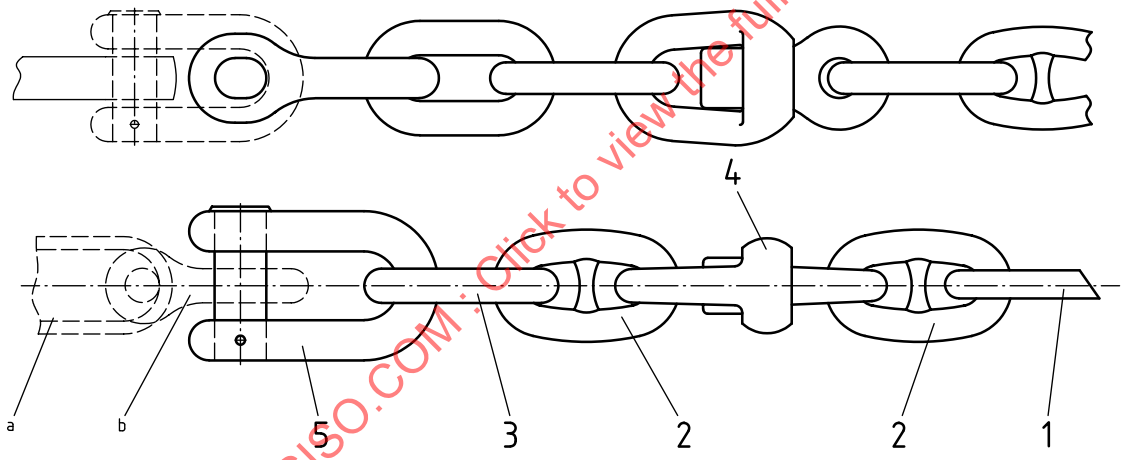
a) With Kenter type joining shackle and type A swivel shackle



Key

1	common link	4	Kenter type joining shackle
2	enlarged link	5	type B swivel shackle
3	end link	a	Anchor stock or anchor shackle.

b) With Kenter type joining shackle and type B swivel shackle



Key

1	common link	5	end shackle
2	enlarged link	a	Anchor.
3	end link	b	Anchor shackle.
4	swivel		

c) With swivel and end shackle

Figure 11 — Examples of connecting an outboard chain-shot to an anchor