

# INTERNATIONAL STANDARD

# ISO 1704

Second edition  
1991-11-01

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## Shipbuilding — Stud-link anchor chains

*Construction navale — Chaînes d'ancre à mailles étançonnées*

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ISO 1704:1991

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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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 1704 was prepared by Technical Committee ISO/TC 8, *Shipbuilding and marine structures*.

This second edition cancels and replaces the first edition (ISO 1704 : 1973), to which the following changes have been made:

- a) the range of sizes has been extended to align with the range covered by the International Association of Classification Societies (IACS);
- b) a countersunk head on the shackle bolt is specified as an alternative to the existing flat head;
- c) a taper pin is now specified for the shackle in place of the former parallel pin;
- d) tolerances on the nominal diameter of the links have been specified more clearly, although remaining largely the same. A larger tolerance has now been proposed for links over 122 mm diameter.

Swivel devices have not been included in this revision, although proposals for this were studied. The diversity of type and individuality of the designs, some of which were patented, militated against standardization, even to a limited extent.

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# Shipbuilding — Stud-link anchor chains

## 1 Scope

This International Standard specifies the shape, proportions, dimensions and tolerances of the component parts of new stud-link anchor chains.<sup>1)</sup>

NOTE — Users of this International Standard should note that, while observing the requirements of the Standard, they should at the same time ensure compliance with such statutory requirements, rules and regulations as may be applicable to the individual ship concerned.

## 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

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

ISO 2339 : 1986, *Taper pins, unhardened*.

## 3 Shape and dimensions

### 3.1 Shape

The stud-links, shackles and component parts shall be of the shapes and proportions shown in figures 1 to 7. All links and shackles shall be of uniform shape.

### 3.2 Dimensions

#### 3.2.1 General

The dimensions of stud-links, shackles and component parts shall be in accordance with the values given in tables 1 to 6.

The nominal diameter ( $d$ ) is a design diameter measured at the crown of a common link. See figure 1 and table 1.

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.

#### 3.2.2 Enlarged links

The proportions of the enlarged links are the same as those of the common links.

#### 3.2.3 Common links and enlarged links

The inside radii of common links and enlarged links shall be sufficient to allow each link to bed properly and work freely. See figures 1 and 2.

#### 3.2.4 End links

The inside radii of end links shall be equal to half the inside width and the sides shall be parallel.

#### 3.2.5 Shackle retaining pin

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.

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.

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.

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

1) Studless anchor chains for small vessels are covered by ISO 4565 : 1986, *Small craft — Anchor chains*.

## 4 Tolerances

### 4.1 Nominal diameter $d$ of common links

The allowable manufacturing tolerances on the nominal diameter  $d$  the common links, measured at the crown, are

${}^0_{-1}$  mm for  $d < 40$  mm;

${}^0_{-2}$  mm for  $40 \text{ mm} < d < 84$  mm;

${}^0_{-3}$  mm for  $84 \text{ mm} < d < 122$  mm;

${}^0_{-4}$  mm for  $d > 122$  mm.

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

The allowable manufacturing tolerance on the nominal diameter measured elsewhere on the link is

${}^0_{-2,5}$  %.

### 4.2 Length of five links

The allowable manufacturing tolerance on a length of five links is

${}^{+5}_0$  %.

### 4.3 All other dimensions

The allowable manufacturing tolerance is  $\pm 5$  %, taking into account the fact that all components of the anchor chain shall be good fits with each other.

## 5 Range of sizes of links and shackles

The range of nominal diameters  $d$  is that specified by the Classification Societies associated in the International Association of Classification Societies (IACS).

## 6 Designation of size

The nominal size of a common link is designated by the nominal diameter  $d$  of the link.

The nominal size of other links and shackles is designated by the nominal diameter  $d$  of the common link.

The size of a stud-link anchor chain is designated by the nominal size of the common link.

## 7 Connections

Examples in the use of connecting links, shackles and swivels are shown in figure 7.

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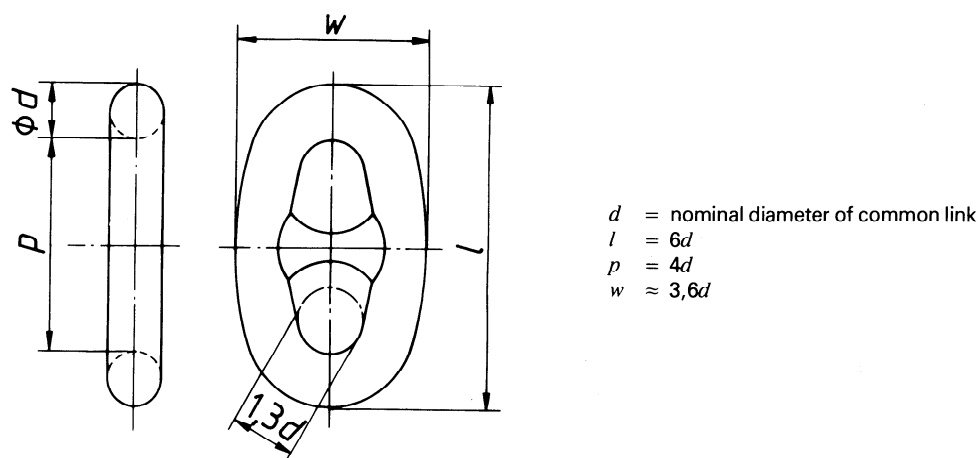
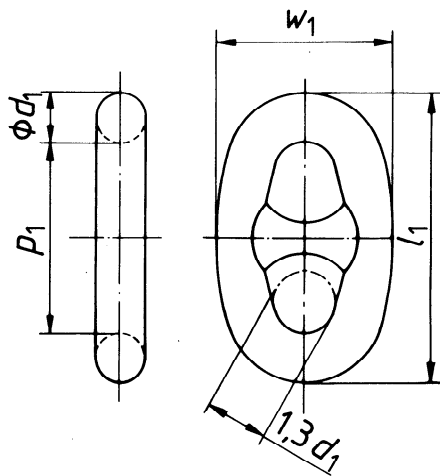


Figure 1 – Common link

Table 1 – Nominal dimensions of common link

Dimensions in millimetres

<i>d</i>	<i>l</i>	<i>p</i>	<i>w</i>	<i>d</i>	<i>l</i>	<i>p</i>	<i>w</i>
12,5	75	50	45	76	456	304	274
14	84	56	50	78	468	312	281
16	96	64	58	81	486	324	292
17,5	105	70	63	84	504	336	302
19	114	76	68				
20,5	123	82	74	87	522	348	313
22	132	88	79	90	540	360	324
24	144	96	86	92	552	368	331
				95	570	380	342
26	156	104	94				
28	168	112	101	97	582	388	349
30	180	120	108	100	600	400	360
32	192	128	115	102	612	408	367
34	204	136	122	105	630	420	378
				107	642	428	385
36	216	144	130				
38	228	152	137	111	666	444	400
40	240	160	144	114	684	456	410
42	252	168	151	117	702	468	421
44	264	176	158	120	720	480	432
46	276	184	166	122	732	488	439
48	288	192	173	124	744	496	446
50	300	200	180	127	762	508	457
52	312	208	187	130	780	520	468
54	324	216	194	132	792	528	475
56	336	224	202	137	822	548	493
58	348	232	209	142	852	568	511
60	360	240	216	147	882	588	529
62	372	248	223	152	912	608	547
64	384	256	230	157	942	628	565
				162	972	648	583
66	396	264	238				
68	408	272	245				
70	420	280	252				
73	438	292	263				



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

Figure 2 — Enlarged link

Table 2 — Nominal dimensions of enlarged link

Dimensions in millimetres

Nominal size ( $d$ common link)	$d_1$	$l_1$	$p_1$	$w_1$	Nominal size ( $d$ common link)	$d_1$	$l_1$	$p_1$	$w_1$
12,5	14	84	56	50	76	84	504	336	302
14	16	96	64	58	78	87	510	340	306
16	17,5	105	70	63	81	90	540	360	324
17,5	19	114	76	68	84	92	552	368	331
19	20,5	123	82	74					
20,5	22	132	88	79	87	97	582	388	349
22	24	144	96	86	90	100	600	400	360
24	26	156	104	94	92	102	612	408	367
					95	105	630	420	378
26	28	168	112	101					
28	30	180	120	108	97	107	642	428	385
30	34	204	136	122	100	111	666	444	400
32	36	216	144	130	102	111	672	448	403
34	38	228	152	137	105	114	684	456	410
					107	117	702	468	421
36	40	240	160	144					
38	42	252	168	151	111	122	732	488	439
40	44	264	176	158	114	124	744	496	446
42	46	276	184	166	117	130	780	520	468
44	48	288	192	173	120	132	792	528	475
46	50	300	200	180	122	137	822	548	493
48	54	324	216	194	124	137	822	548	493
50	56	336	224	202	127	142	852	568	511
52	58	348	232	209	130	142	852	568	511
54	60	360	240	216	132	147	882	588	529
56	62	372	248	223	137	152	912	608	547
58	64	384	256	230	142	157	942	628	565
60	66	396	264	238	147	162	972	648	583
62	68	408	272	245	152	167	1 002	668	601
64	70	420	280	252	157	173	1 038	692	623
					162	178	1 068	712	641
66	73	438	292	263					
68	76	456	304	274					
70	81	468	312	281					
73	81	486	324	292					



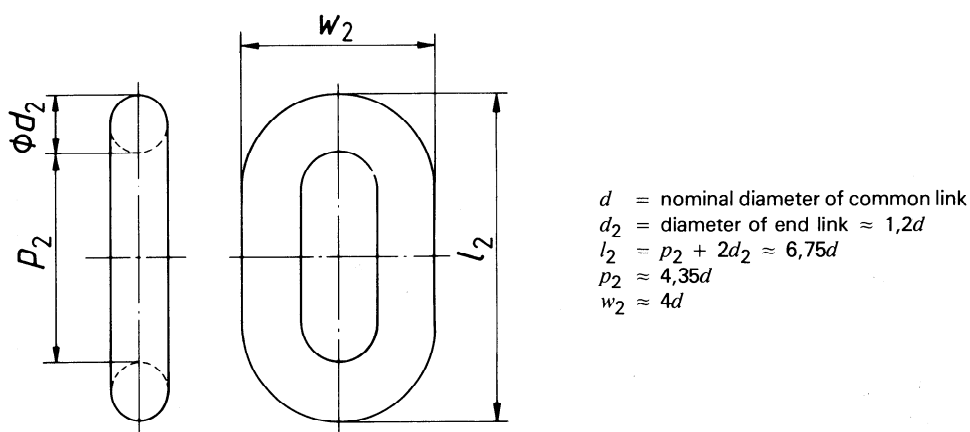
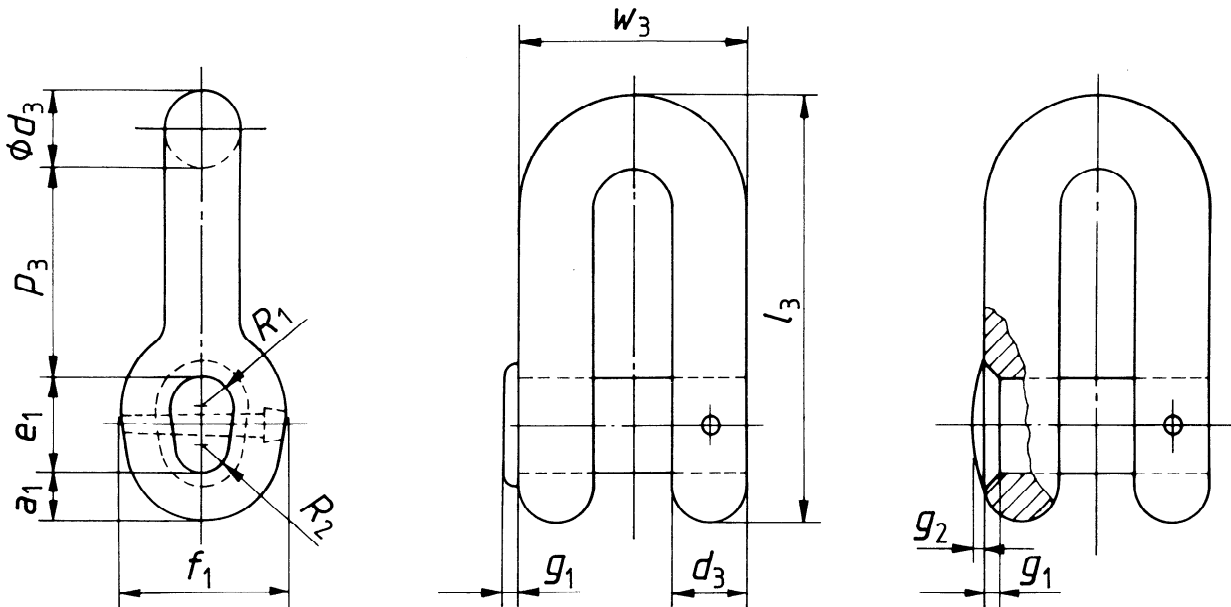


Figure 3 — End link

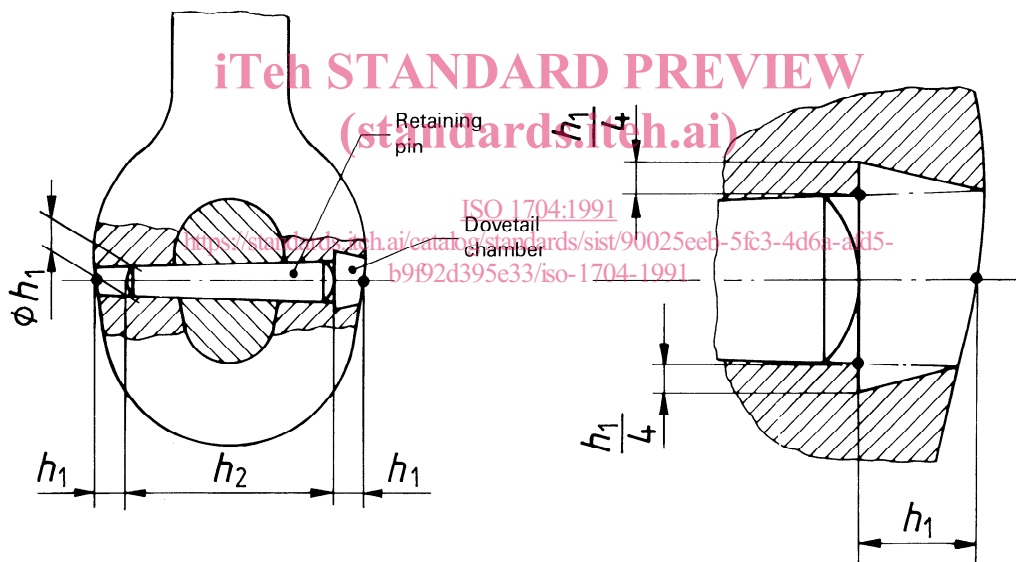
Table 3 — Nominal dimensions of end link

Dimensions in millimetres

Nominal size ( $d$ common link)	$d_2$	$l_2$	$p_2$	$w_2$	Nominal size ( $d$ common link)	$d_2$	$l_2$	$p_2$	$w_2$
12,5	16	86	54	50	76	92	515	331	304
14	17,5	96	61	56	78	95	529	339	312
16	19	108	70	64	81	97	546	352	324
17,5	20,5	117	76	70	84	100	565	365	336
19	22	127	83	76					
20,5	24	137	89	82	87	105	588	378	348
22	26	148	96	88	90	107	606	392	360
24	28	160	104	96	92	111	622	400	368
					95	114	643	413	380
26	32	177	113	104					
28	34	190	122	112	97	117	656	422	388
30	36	203	131	120	100	120	675	435	400
32	38	215	139	128	102	122	688	444	408
34	40	228	148	136	105	127	711	457	420
					107	130	725	465	428
36	44	245	157	144					
38	46	257	165	152	111	132	747	483	444
40	48	270	174	160	114	137	770	496	456
42	50	283	183	168	117	142	793	509	468
44	52	295	191	176	120	147	816	522	480
46	56	312	200	184	122	147	825	531	488
48	58	325	209	192	124	152	843	539	496
50	60	338	218	200	127	152	856	552	508
52	62	350	226	208	130	157	878	566	520
54	64	363	235	216	132	162	894	574	528
56	68	380	244	224	137	165	926	596	548
58	70	392	252	232	142	170	958	618	568
60	73	407	261	240	147	180	999	639	588
62	73	416	270	248	152	185	1 031	661	608
64	76	430	278	256	157	190	1 063	683	628
					162	195	1 095	705	648
66	81	449	287	264					
68	81	458	296	272					
70	84	473	305	280					
73	87	492	318	292					



Detail of alternative countersunk head



Detail of tapered retaining pin

Detail of dovetail chamber for retaining pellet

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

See table 4.

Taper of retaining pin : see 3.2.5.

Figure 4 — "D" type joining shackle

Table 4 – Nominal dimensions of “D” type joining shackle

Dimensions in millimetres

Nominal size (d common link)	$d_3$	$l_3$	$p_3$	$w_3$	$a_1$	$e_1$	$f_1$	$g_1$	$g_2$	$h_1$	$h_2$	$2 R_1$	$2 R_2$
12,5	16	89	43	50	10	20	35	2,5	1,3	4	25	15	12,5
14	19	99	46	56	11	23	39	3	1,5		28	17	14
16	20,5	114	54,5	64	13	26	45	3	1,5		32	19	16
17,5	23	124	59	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
20,5	27	146	69,5	82	16,5	33	57	4	2		45	25	20,5
22	29	156	74,5	88	17,5	35	61	4,5	2,3		50	27	22
24	31	170	82	96	19	38	67	5	2,5	6	55	29	24
26	34	185	88	104	21	42	73	5	2,5		60	31	26
28	36	199	95,5	112	22,5	45	78	5,5	2,8		65	34	28
30	39	213	102	120	24	48	84	6	3		70	36	30
32	42	227	108,5	128	25,5	51	90	6,5	3,3		80	38	32
34	44	241	116	136	27	54	95	7	3,5		85	41	34
36	47	256	122	144	29	58	101	7	3,5		80	43	36
38	49	271	129	152	31	62	106	7,5	3,8		85	46	38
40	52	284	136	160	32	64	112	8	4		90	48	40
42	55	300	143	168	34	68	118	8,5	4,3	10	100	50	42
44	57	312	150	176	35	70	123	9	4,5		100	53	44
46	60	327	156	184	37	74	129	9	4,5		110	55	46
48	62	341	163,5	192	38,5	77	134	9,5	4,8		110	58	48
50	65	355	170	200	40	80	140	10	5		115	60	50
52	68	369	177	208	41	83	146	10,5	5,3		120	62	52
54	70	383	184	216	43	86	151	11	5,5	12	125	65	54
56	73	398	190	224	45	90	157	11	5,5		130	67	56
58	75	412	198	232	46	93	162	11,5	5,8		140	70	58
60	78	426	204	240	48	96	168	12	6		140	72	60
62	81	440	210	248	50	99	174	12,5	6,3		150	74	62
64	83	454	218	256	51	102	180	13	6,5		150	77	64
66	86	469	224	264	53	106	185	13	6,5		150	79	66
68	88	483	232	272	54	109	190	13,5	6,8		160	82	68
70	91	497	238	280	56	112	196	14	7		160	84	70
73	95	518	248	292	58	117	204	14,5	7,3		170	88	73
76	99	540	258	304	61	122	213	15	7,5		180	91	76
78	101	554	266	312	62	125	218	15,5	7,8	16	190	94	78
81	105	575	275	324	65	130	227	16	8		190	97	81
84	109	596	286	336	67	134	236	17	8,5		200	101	84
87	113	618	296	348	70	139	246	17,5	8,8		200	104	87
90	117	639	306	360	72	144	252	18	9		220	108	90
92	120	653	312	368	74	147	258	18,5	9,3		220	110	92
95	124	675	323	380	76	152	266	19	9,5		220	114	95
97	126	689	330	388	78	155	272	19,5	9,8		240	116	97
100	130	710	340	400	80	160	280	20	10		240	120	100
102	133	724	346	408	82	163	286	20,5	10,3		240	122	102
105	137	746	357	420	84	168	294	21	10,5		260	126	105
107	139	760	364	428	86	171	300	21,5	10,8		260	128	107
111	144	788	377	444	89	178	311	22	11	20	260	133	111
114	148	809	388	456	91	182	319	23	11,5		280	137	114
117	152	831	398	468	94	187	328	23,5	11,8		280	140	117
120	156	852	408	480	96	192	336	24	12		300	144	120
122	159	866	414	488	98	195	342	24,5	12,3		300	146	122
124	161	880	422	496	99	198	347	25	12,5		300	149	124
127	165	902	432	508	102	203	356	25,5	12,8		300	152	127
130	169	923	442	520	104	208	364	26	13		320	156	130
132	172	937	448	528	106	211	370	26,5	13,3		320	158	132
137	178	973	466	548	110	219	384	27,5	13,8	25	320	164	137
142	185	1 008	482	568	114	227	398	28,5	14,3		350	170	142
147	191	1 044	500	588	118	235	412	29,5	14,8		350	176	147
152	198	1 079	516	608	122	243	426	30,5	15,3		350	182	152
157	204	1 115	524	628	126	251	440	31,5	15,8		400	188	157
162	211	1 150	550	648	130	259	454	32,5	16,3		400	194	162