INTERNATIONAL STANDARD

ISO 16856

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Ships and marine technology — Loose gear of lifting appliances on ships — Hooks

Navires et technologie maritime — Accessoires mobiles des appareils de levage sur les navires — Crocs

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Contents

Page

Foreword

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 8, *Ships and marine technology*, Subcommittee SC 4, *Outfitting and deck machinery*.

Ships and marine technology — Loose gear of lifting appliances on ships — Hooks

1 Scope

This International Standard specifies the types and basic parameters, technical requirements, marking, storage, and transportation, use and maintenance of hooks as loose gear of lifting appliances on ships.

This International Standard is applicable to lifting appliances on ships.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 1837, *Lifting hooks — Nomenclature*

ISO 16855, *Ships and marine technology — Loose gear of lifting appliances on ships — General requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 16855 and ISO 1837 apply.

4 Types

4.1 Common hook types

4.1.1 Shank hook with point (S-shaped)

For the shapes and dimensions of a shank hook with point, see A.1.

4.1.2 Shank ramshorn hook (D-shaped)

For the shapes and dimensions of a shank ramshorn hook, see A.2.

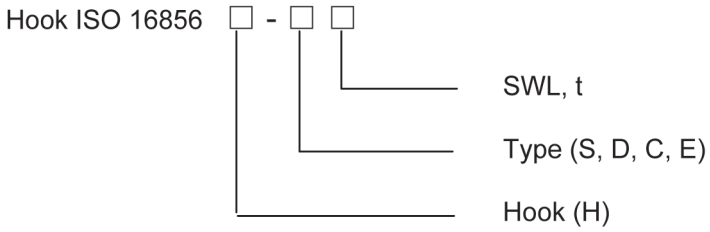
4.1.3 C-hook (C-shaped)

For the shapes and dimensions of a C-hook, see A.3.

4.2 Other types (E-shaped)

Types of hooks in ISO 1837 other than common hook types that can also be used as ship hooks fall under E-shaped.

4.3 Model designation



Figure

EXAMPLE Designation of a shank hook with point with 20 t SWL:

Hook ISO 16856 H-S20

4.4 Locking device requirement

Various types of hooks shall be provided with automatic locking devices.

5 Technical requirements

5.1 Materials

5.1.1 Hook materials must use solid steel manufactured by Martin furnaces, electric furnaces, or oxygen top-blown converters; it is recommended to use the electroslag remelting process.

5.1.2 For the chemical composition of hook materials, see Table 1. Other materials can be used (see 5.6).

Table 1 — Chemical composition of hook materials

Materials	Chemical composition (heat analysis) %						
	C	Si	Mn	P	S	Cr	Al
Carbon steel	0,17–0,24	0,17–0,35	0,45–0,80	≤0,035	≤0,035	≤0,030	≥0,025
Carbon-manganese steel	0,17–0,24	0,20–0,35	1,20–1,50	≤0,035	≤0,035	≤0,030	≥0,025

5.1.3 For the mechanical properties of hook materials, see Table 2. Other mechanical properties can be used (see 5.6).

Table 2 — Mechanical properties of hook materials

Materials	Mechanical properties						
	Tensile strength R_m MPa	Yield point R_{eH} MPa			Elongation A %		Impact energy A_K J
	Diameters or thicknesses of steel mm						
	≤100	≤16	>16–40	>40–60	≤50	≤100	≤60
Carbon steel	402–490	255	245	235	—	22	48
Carbon-manganese steel	510–608	353	343	333	22	—	41

NOTE 1 The values listed in this table refer to mechanical properties at normal temperature.

NOTE 2 For diameters or thicknesses > 60 mm, the impact energy and yield point under strain aging conditions are determined by the supplier and the purchaser based on demand.

If materials have no obvious yield points, the yield point R_{eH} shall be the yield strength $R_{P0,2}$.

5.1.4 When the design temperature of lifting appliances on ships is below −10 °C, the impact energy test temperature of hook materials shall satisfy the requirements of related organizations, such as classification societies.

5.2 Forging and heat treatment

5.2.1 The forging ratio of forged pieces shall be no less than 3 during the use of steel ingot and no less than 1,5 during the use of steel billet.

5.2.2 Heat treatment must be made after hook forging to achieve the properties specified in 5.1, with no more than three times of heat treatment.

5.3 Surface and internal quality of hooks

5.3.1 The surface of hooks shall be smooth and clean, without any defect such as burrs, cracks, folding, and burning.

5.3.2 Inside hooks, there shall be no cracks, fish eyes, or other defects such as impurities that affect their safe use. For other defects, such as impurities, allowed to exist, the following provisions shall be met: for single defects, the equivalent diameter shall be no more than 5 mm; for scattered defects, it is expected that the equivalent diameter shall be no more than 3 mm and the distributed length shall be no more than 30 mm.

5.3.3 Defects in hooks cannot be rewelded.

5.4 Tests

5.4.1 Every hook shall be proof tested, with test loads given in Table 3. Proof load shall be applied to each hook with a testing machine or test weight for a duration of not less than 5 min.

Table 3 — Proof load for hooks

Safe working load (SWL) kN	Proof load (PL) kN
≤245	2 × SWL
>245	1,22 × SWL + 196

5.4.2 After proof testing, each hook shall be thoroughly examined for deformation, cracks, or other defects and to ensure that its rotating parts can rotate freely.

5.4.3 The proof load can be applied to a shank ramshorn hook as indicated in Figure 1 a) or Figure 1 b), but in the latter case, an additional load of half the proof load is to be subsequently applied, as shown in Figure 1 c).

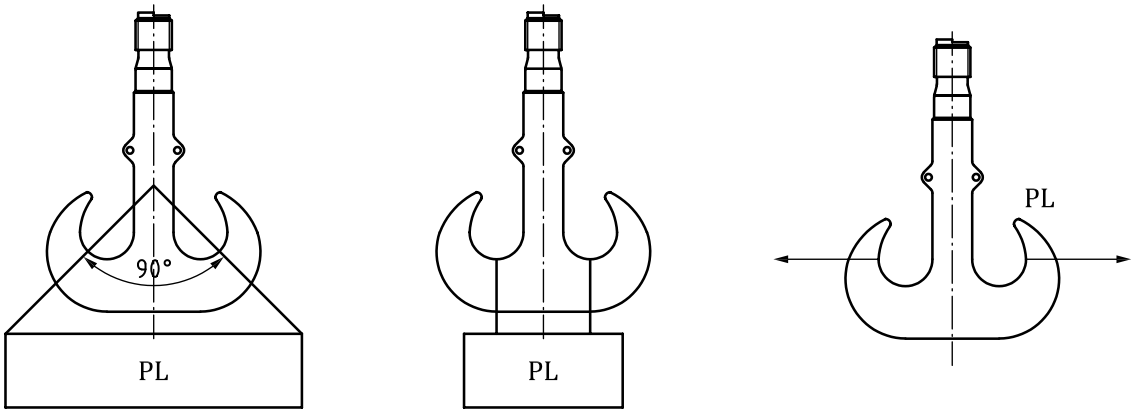


Figure 1 — Proof testing of shank ramshorn hook

5.5 Inspection

5.5.1 Inspection shall be made after the production of hooks to ensure that the surface and internal quality satisfies the requirements of 5.3, and the requirements of 5.4.2 after the test.

5.5.2 For hooks that pass the test, the manufacturer shall provide technical documents such as certifications.

5.6 Other requirements

For hooks (type or SWL, materials) beyond common types, strength shall be calculated during the design. The calculations of hook stress are checked based on the curved beam theory, in which the safety factor of the allowable stress to the yield limit of materials is no less than 1,55. Commercially available forged hooks that meet industry standards in terms of SWL, design factor, forging reduction, heat treatment, testing, and inspection are acceptable as agreed on by the supplier and the purchaser.

6 Marking

6.1 Marks of hooks shall be permanently distinct with the following items:

a) safe working load, in t;

b) test load, in kN;

c) test date;

d) hook number;

e) manufacturer's stamp or the stamp of test unit.

6.2 Hooks shall be marked at their broad space, but not at their bends, for check.

6.3 For hooks of a small size, should the place where marking is restricted, the marks of number and date can be eliminated.

7 Storage and transportation

7.1 During storage, the machined surfaces of hooks that pass the test shall be painted with anti-rust oil, and their non-machined surfaces shall be painted with anti-rust paint.

7.2 Secure packaging shall be made for hooks to prevent collision during transportation.

8 Use and maintenance

8.1 Upon installation on the lifting appliances, hooks shall be checked before each use, with major check items as follows:

a) wear;

b) normal operation of moving parts;

c) good lubrication;

d) no abnormal conditions such as loose fixed parts or defects;

e) no crack, scratch, and heat damage, including welding slag or arc striking mark, in hook bodies.

8.2 Hook defects found during the check shall be repaired and cannot be used until confirmation by an experienced personnel. Hooks shall be scrapped under the following circumstances:

a) there are defects in the hooks, such as crack, heat damage, including welding slag or arc striking mark, which prevent them from use;

b) the dimension of the worn moving part reaches 10 % of its total dimension.

Annex A
(informative)

Types and basic parameters of common hooks

A.1 Shank hook with point (S-shaped)

For the shapes and dimensions of a shank hook with point, see Figure A.1 and Table A.1.

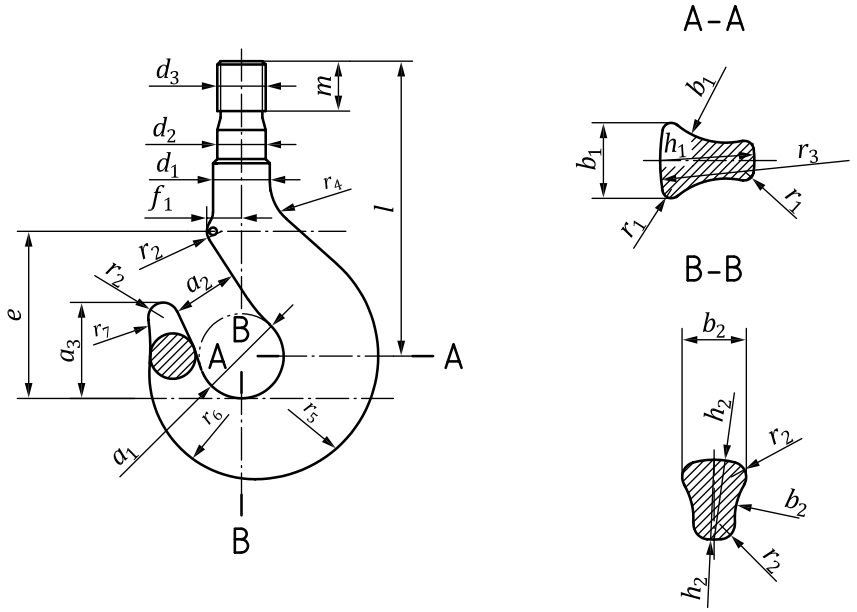


Figure A.1 — Shapes of a shank hook with point

A.2 Shank ramshorn hook (D-shaped)

For the shapes and dimensions of a shank ramshorn hook, see Figure A.2 and Table A.2.

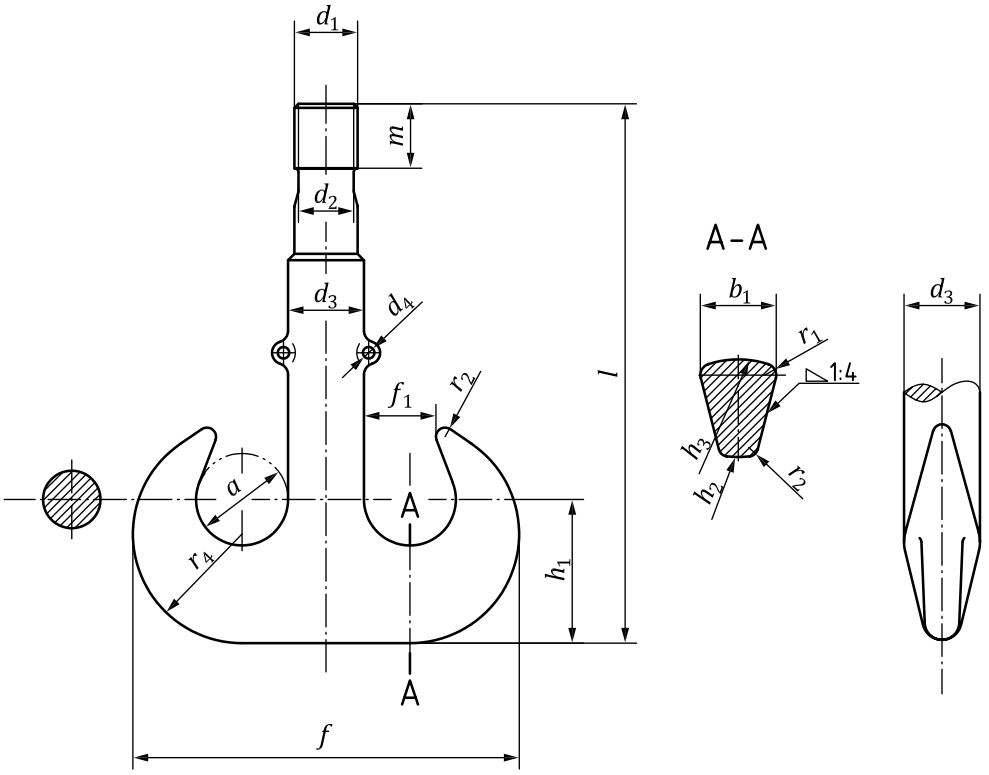


Figure A.2 — Shapes of a shank ramshorn hook

A.3 C-hook (C-shaped)

For the shapes and dimensions of a C-hook, see Figure A.3 and Table A.3.

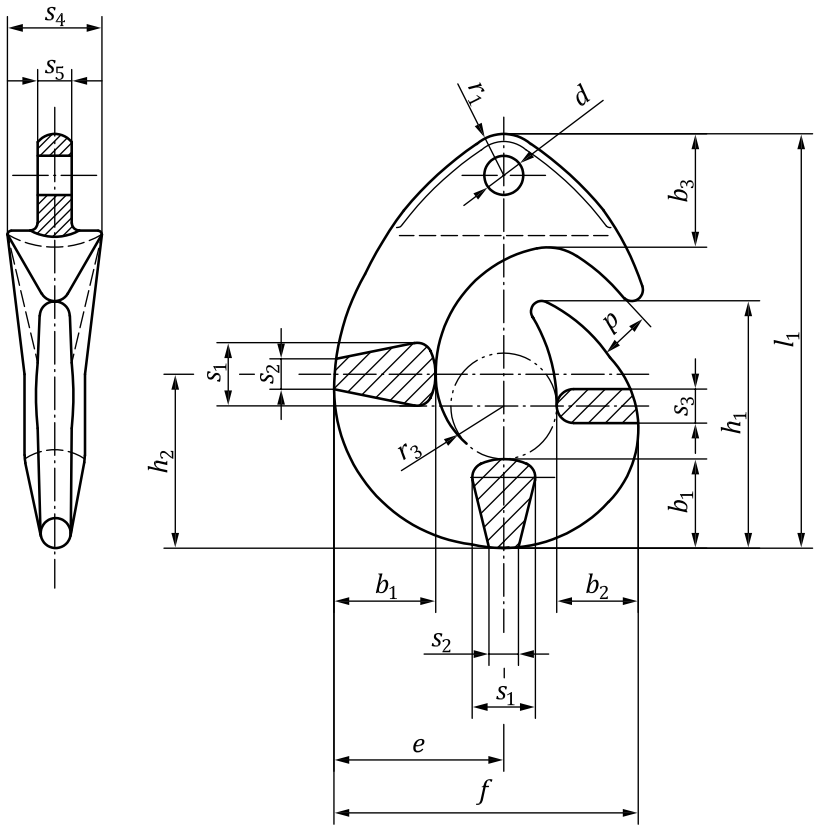


Figure A.3 — Shapes of a C-hook

Table A.1 — Dimensions of a shank hook with point

SWL t	a_1	a_2	a_3	d_1	d_2	d_3	b_1	b_2	h_1	h_2	e	r_1	r_2	r_3	r_4	r_5	r_6	r_7	f	l	m
	mm																				
0,5	36	28	41	20	16	M16	22	19	28	24	74	3	5	56	43	42	40	75	22	142	17
1	43	34	49	24	20	M20	29	24	37	31	89	4	6	74	48	53	48	90	26	164	20
2	50	40	57	30	24	M24	38	32	48	40	105	5	8	96	55	65	60	106	31	194	24
3,2	56	45	64	36	30	M30	45	38	56	48	118	6	9	112	60	76	68	118	35	221	30
5	63	50	72	42	36	M36	53	45	67	58	132	7	10	134	65	90	78	132	40	250	35
8	71	56	80	48	42	M42	63	53	80	67	148	8	12	160	71	103	90	150	45	282	39
10	80	63	90	53	45	M45	71	60	90	75	165	9	14	180	80	114	100	170	51	215	44
12,5	90	71	101	60	50	TY50 × 6[a]	80	67	100	85	185	10	16	200	90	131	112	190	57	375	55
16	100	80	112	67	56	TY50 × 6	90	75	112	95	210	11	18	224	100	146	125	212	64	413	60
20	112	90	127	75	64	TY64 × 8	100	85	125	106	221	12	20	250	65	163	140	236	46	446	66
25	125	100	142	85	72	TY72 × 8	112	95	140	118	252	14	22	280	70	182	160	265	53	505	75
32	140	112	160	95	80	TY80 × 10	125	106	160	132	280	16	25	320	80	204	180	300	58	576	83
40	160	125	180	106	90	TY90 × 10	140	118	180	150	330	18	28	360	90	232	200	335	68	645	92
50	180	140	202	118	100	TY100 × 12	160	132	200	170	360	20	32	400	100	262	224	375	74	716	102
63	200	160	225	132	110	TY110 × 12	180	150	224	190	400	22	36	448	115	292	250	425	80	788	112

[a] TY refers to trapezoidal knuckle thread.

Table A.2 — Dimensions of a shank ramshorn hook

SWL t	a_1	b_1	d_1[a]	d_3	d_4	f	f_1	e	l	h_1	h_2	h_3	m	r_1	r_2	r_4
	mm															
12,5	71	60	50 × 6	60	10,2	301	48	160	365	75	92	160	55	9	7	85
16	80	67	56 × 6	67	10,2	337	56	182	403	85	103	182	60	10	8	95
20	90	75	64 × 8	75	12,2	377	67	192	435	95	116	192	66	11	9	106
25	100	85	72 × 8	85	12,2	421	78	210	492	106	130	210	75	12,5	10	118
32	112	95	80 × 10	95	16,2	471	90	237	562	118	146	237	83	14	11	132
40	125	106	90 × 10	106	16,2	531	100	265	628	132	163	265	92	16	12,5	150
50	140	118	100 × 12	118	20,2	598	112	315	696	150	182	315	102	18	14	170
63	160	132	110 × 12	132	20,2	672	125	335	768	170	205	335	112	20	16	190
80	180	150	125 × 14	150	20,2	754	140	375	863	190	230	375	124	22	18	212
100	200	170	140 × 16	170	25,3	842	160	420	944	212	260	420	137	25	20	236
125	224	190	160 × 18	190	25,3	944	180	460	1072	236	292	460	152	28	22	265
160	250	212	180 × 20	212	25,3	1062	200	515	1212	265	325	515	172	32	25	300
200	280	236	200 × 22	236	25,3	1186	224	575	1351	300	364	575	192	36	28	335
250	315	265	225 × 24	265	30,3	1330	250	645	1522	335	408	645	215	40	32	375
320	355	300	250 × 28	300	30,3	1505	280	725	1714	375	458	725	235	45	36	425
400	400	335	280 × 32	335	30,3	1685	315	800	1962	425	515	800	265	50	40	475
500	450	375	320 × 36	375	30,3	1885	355	875	2217	475	580	875	295	56	45	530

[a] Trapezoidal knuckle thread.

Table A.3 — Dimensions of a C-hook

SWL	b_1	b_2	b_3	d	e	f	h_1	h_2	l_1	p	r_1	r_3	s_1	s_2	s_3	s_4	s_5
t	mm																
1	42	33	50	17,5	74	134	117	82	192	25	18	25	28	14	16	40	19
2	54	42	69	24	94	170	150	105	251	32	25	32	36	18	20	58	27
3,2	68	53	82	30	118	214	188	132	310	40	30	40	46	23	26	72	28
5	84	66	103	39	148	268	234	164	387	50	38	50	56	28	32	92	44
6,3	94	73	114	42	167	300	262	184	432	56	43	56	64	32	36	102	50
8	106	83	129	48	188	338	295	207	487	63	48	63	72	36	40	115	56
10	118	92	150	52	208	376	328	230	548	70	55	70	80	40	45	125	61
12,5	135	105	172	56	234	425	375	263	627	80	60	80	91	46	51	138	68
16	152	114	190	66	258	470	422	296	702	90	65	90	103	52	58	155	75
20	170	133	202	74	298	540	470	330	772	100	70	100	115	57	64	172	84
25	190	153	220	78	332	603	522	366	852	110	75	110	128	64	72	192	94
32	203	167	246	86	354	648	562	395	928	120	85	120	137	69	77	204	102
40	225	189	272	96	392	718	618	433	1020	130	95	130	152	76	85	225	117

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