International Standard 4779

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Forged steel lifting hooks with point and eye for use with steel chains of grade M(4)

Crochets de levage forgés en acier à bec et à œil destinés à être utilisés avec des chaînes en acier de classe M(4)

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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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 4779 was prepared by Technical Committee ISO/TC 111, *Round steel link chains, lifting hooks and accessories.*

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

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Forged steel lifting hooks with point and eye for use with steel chains of grade M(4)

1 Scope and field of application

This International Standard specifies requirements for forged steel lifting hooks with point and eye, as shown in the figure, in a range of sizes having performance compatibility with the corresponding nominal sizes of grade M(4) chain complying with ISO 1835. Performance compatability encompasses component strength and the necessary physical dimensions.

2 References

ISO 643, *Steels — Micrographic determination of the ferritic or austenitic grain size.*

ISO 1835, *Short link chain for lifting purposes — Grade M(4), non-calibrated, for chain slings, etc.*

ISO 4778, *Chain slings of welded construction — Grades M(4), S(6) and T(8).*

3 Definitions

3.1 working load limit (WLL): The maximum mass which a hook is designed to sustain in general service.

3.2 working load (WL): The maximum mass which a hook should be used to sustain in a particular stated service.

3.3 proof force, F_e: A force applied as a test to the hook as specified in clause 9.

3.4 ultimate strength: The maximum force reached during the tensile testing of the hook at the end of which the hook fails to retain the load.

4 Form and dimensions

4.1 Dimensions

The principal dimensions of the hooks shall comply with the requirements of table 1 in which the hook dimensions are related to the nominal size of the chain.

In addition, the following requirements shall be met:

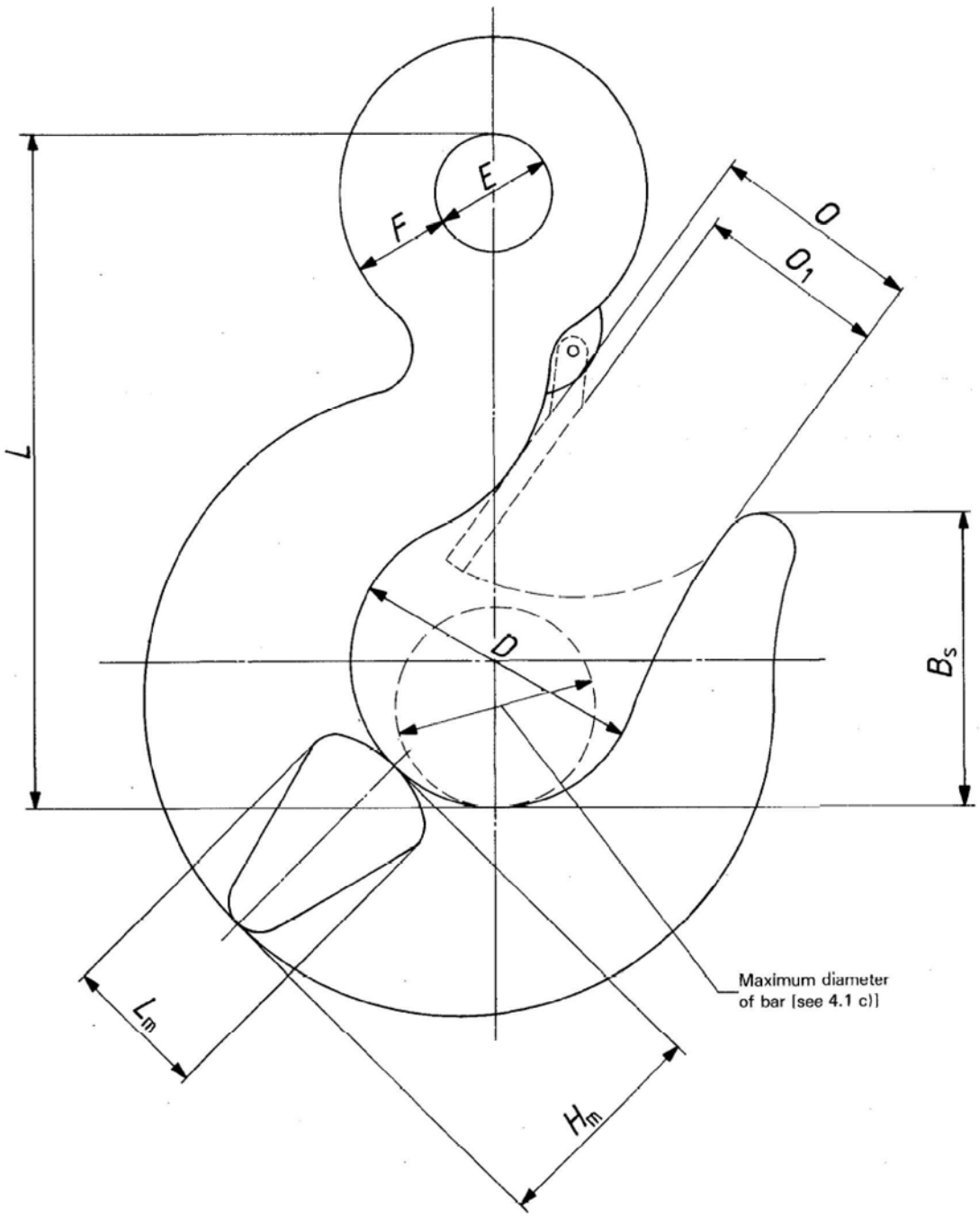
a) the actual point height, B_s, shall be equal to or greater than the actual throat opening, O, of the same hook (see the figure);

b) the actual throat opening, O, shall not exceed 95 % of the actual seat diameter, D, of the same hook;

c) if a safety latch is fitted, it shall be capable of closing over the maximum diameter of the bar which can be admitted through the actual throat opening, O_1, as indicated by the dotted line in the figure.

4.2 Form

The form of the hook is not specified in detail. For example, a minimum value of dimension E (as measured in any direction) is specified so that the eye of the hook can accommodate a pin, but the eye of the hook need not be circular.



NOTE — This diagram is only intended to show where the dimensions are measured. It does not purport to indicate any detailed design of any part of the hook. (See 4.2.)

Figure — Dimensions of hooks

Table 1 — Dimensions of hooks

Dimensions in millimetres

Nominal size of chain [1]	Working load limit (WLL)	D ($= 3{,}8\ d_n$)	O ($= 2{,}9\ d_n$)	O_1 ($= 2{,}7\ d_n$)	E ($= 1{,}75\ d_n$)	F ($= 1{,}8\ d_n$)	H_m ($= 4{,}3\ d_n$)	L ($= 15{,}5\ d_n$)	L_m ($= 2{,}9\ d_n$)
	t	min.	min.	min.	min.	max.	max.	max.	max.
6	0,57	22,8	17,4	16,2	10,5	10,8	25,8	93	17,4
7	0,78	26,6	20,3	18,9	12,3	12,6	30,1	108,5	20,3
8	1	30,4	23,2	21,6	14	14,4	34,4	124	23,2
10	1,6	38	29	27	17,5	18	43	155	29
13	2,7	49,4	37,7	35,1	22,8	23,4	55,9	201,5	37,7
16	4	60,8	46,4	43,2	28	28,8	68,8	248	46,4
18	5	68,4	52,2	48,6	31,5	32,4	77,4	279	52,2
19	5,7	72,2	55,1	51,3	33,3	34,2	81,7	294,5	55,1
20	6,3	76	58	54	35	36	86	310	58
22	7,7	83,6	63,8	59,4	38,5	39,6	94,6	341	63,8
23	8,4	87,4	66,7	62,1	40,3	41,4	98,9	356,5	66,7
25	10	95	72,5	67,5	43,8	45	107,5	387,5	72,5
26	10,8	98,8	75,4	70,2	45,5	46,8	111,8	403	75,4
28	12,5	106,4	81,2	75,6	49	50,4	120,4	434	81,2
32	16	121,6	92,8	86,4	56	57,6	137,6	496	92,8
36	20	136,8	104,4	97,2	63	64,8	154,8	558	104,4
40	25	152	116	108	70	72	172	620	116
45	32	171	130,5	121,5	78,8	81	193,5	697,5	130,5

1) Nominal diameter, d_n, in millimetres

5 Mechanical properties

5.1 General

The mechanical properties of the hooks shall be as specified in table 2 in which the hook properties are related to the nominal size of the chain.

5.2 Proof force

Each hook, tested in accordance with 8.2, shall be capable of sustaining the proof force specified in table 2 without a permanent increase in the throat opening exceeding 0,5 % of the actual throat opening or 0,2 mm, whichever is the greater.

5.3 Ultimate strength

Each hook, tested in accordance with 8.3, shall have an ultimate strength at least equal to that specified in table 2.

On completion of the test, the hook shall show evidence of an increase in the throat opening.

Table 2 — Mechanical properties of hooks

Nominal size of chain [1]	Working load limit (WLL)	Proof force F_e	Minimum ultimate strength
	t	kN	kN
6	0,57	11,4	22,8
7	0,78	15,4	30,8
8	1	20,2	40,4
10	1,6	31,5	63
13	2,7	54	108
16	4	81	162
18	5	102	204
19	5,7	114	228
20	6,3	126	252
22	7,7	153	306
23	8,4	167	334
25	10	197	394
26	10,8	213	426
28	12,5	247	494
32	16	322	644
36	20	408	816
40	25	503	1 006
45	32	637	1 274

1) Nominal diameter, d_n, in millimetres

NOTE — The values given in this table are the same as the values for grade M(4) chain specified in ISO 1835.

6 Materials and heat treatment

6.1 Quality of material

6.1.1 General

The steel used shall be produced by the open-hearth, the electric or an oxygen-blown process and shall possess reliable forging quality.

In its finished state, as supplied to the hook manufacturer, the steel shall comply with the requirements specified in 6.1.2, as determined by check analysis on the bar or finished hook.

6.1.2 Specific requirements

The steel shall be fully killed and, when heat-treated, be capable of producing in the finished hook the mechanical properties required by this International Standard.

Its content of sulfur and phosphorus shall be restricted as specified in table 3.

Table 3 — Sulfur and phosphorus content

Element	Maximum content, % (m/m), as determined by	
	cast analysis	check analysis
Sulfur	0,045	0,05
Phosphorus	0,04	0,045

The steel shall be made in conformity with fine grain practice in order to obtain an austenitic grain size of 5 or finer when tested in accordance with ISO 643. This could be achieved, for example, by ensuring that it contains sufficient aluminium or an equivalent element to permit the manufacture of hooks stabilized against strain-age embrittlement during service; a minimum value of 0,02 % (m/m) of metallic aluminium is given for guidance.

Within the limitations specified above, it is the responsibility of the hook manufacturer to select steel so that the finished hook, suitably heat-treated, complies with the requirements for the mechanical properties specified in this International Standard.

6.2 Heat treatment

All hooks shall be normalized or hardened and tempered.

7 Manufacturing methods and workmanship

The hook shall be forged hot in one piece. It shall be free from any harmful surface defects, including cracks.

8 Type testing

8.1 General

Type tests demonstrate that hooks certified by the manufacturer as complying with the requirements laid down in this International Standard possess the mechanical properties specified in this International Standard. The purpose of these tests is to prove the design, material, heat treatment and method of manufacture of each size of finished hook. Any change in design, material specification, heat treatment, method of manufacture or in any dimension outside normal manufacturing tolerances which may lead to a modification of the mechanical properties defined in clause 5 shall require that the type tests specified in 8.2 and 8.3 be carried out on the modified hook.

All hooks to be type tested shall comply with all the other requirements laid down in this International Standard. The tests specified in 8.2 and 8.3 shall be carried out on each size of hook of each design, material, heat treatment and method of manufacture.

In the tests specified in 8.2 and 8.3, the force shall be applied to the hook axially without shock, using a component of diameter approximately equal to two-thirds of the actual seat diameter of the hook.

8.2 Deformation test

Three samples shall be tested and each shall be capable of sustaining the proof force specified for the hook in table 2 without permanent deformation, as measured across the throat of the hook, exceeding 0,5 % of the actual throat opening or 0,2 mm, whichever is the greater.

NOTE — See also clause 9 for proof testing of all hooks, where required.

8.3 Static strength test

NOTE — This test may be carried out on the same hooks that have been submitted to the deformation test.

Three samples shall be tested and each shall have an ultimate strength at least equal to the minimum value specified for the hook in table 2.

It is not necessary to test the hook up to its actual ultimate strength for the mechanical property specified to be demonstrated. It is sufficient that the minimum ultimate strength specified is exceeded and that the hook deforms significantly at the maximum force of the test.

8.4 Acceptance criteria for type testing

8.4.1 Deformation test (see 8.2)

All three samples tested shall pass the deformation test in order for the hook of the size submitted for type testing to comply with this International Standard.

8.4.2 Static strength test (see 8.3)

If all three samples pass the test, the hook of the size submitted for type testing complies with this International Standard.

If one of the samples fails, two further samples shall be tested and both shall pass the test in order for the hook of the size submitted for type testing to comply with this International Standard.

If two or three samples fail the test, the hook of the size submitted for type testing does not comply with this International Standard.

9 Proof test

If required by the purchaser, by national regulations or by other standards, rules or tests, each finished hook shall be subjected to the appropriate proof force specified in table 2, which it shall sustain without permanent deformation, as measured across the throat of the hook, exceeding 0,5 % of the actual throat opening or 0,2 mm, whichever is the greater.

NOTE — If the hooks are used as part of a chain sling assembly, grade M(4), complying with ISO 4778, the proof testing requirements laid down in that International Standard apply.

10 Manufacturer's certificate

When the type testing as specified in clause 8 has been carried out with satisfactory results, the manufacturer may issue certificates of conformity for hooks of the same nominal dimensions, size, material, heat treatment and method of manufacture as the hooks tested.

The manufacturer shall keep a record, for at least 10 years after the last certificate has been issued, of the material specification, heat treatment, dimensions, test results and all relevant data concerning the hooks which have satisfied the type tests. This record shall also include the manufacturing specifications which shall apply to subsequent production.

Any change in material specification, in method of manufacture, in heat treatment or in any dimension outside normal manufacturing tolerances of a hook which may lead to a modification of the mechanical properties as specified in clause 5 shall be considered as a design change. Tests in accordance with clause 8 shall be required before the manufacturer is permitted to issue certificates of conformity for any modified design.

11 Marking

Each hook shall be legibly and indelibly marked in a manner which will not impair the mechanical properties of the hook. This marking shall include at least the following information placed on the hook by the manufacturer:

a) the nominal size of the chain with which the hook is compatible;

b) the grade letter or number, M or 4;

c) manufacturer's identification mark or symbol;

d) any marking required by national standards, statutory regulations or by agreement between the manufacturer and the purchaser.

NOTE — Care should be taken to ensure that the marking applied cannot be mistaken for the working load of the hook.