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Chain components for lifting purposes — Forged eye hook with point and latch — Grade 4, stainless steel, solution annealed

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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.

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This document was prepared by Technical Committee ISO/TC 111, *Round steel link chains, chain slings, components and accessories*, Subcommittee SC 3, *Components and accessories*.

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.

Chain components for lifting purposes — Forged eye hook with point and latch — Grade 4, stainless steel, solution annealed

1 Scope

This document specifies the requirements for forged eye hooks with point and latch of grade 4 from stainless steel and solution annealed for use preferably as a component in chain slings of welded construction of grade 4 from stainless steel and solution annealed.

IMPORTANT — For other applications, e.g. steel wire rope slings or textile slings, it is important that the hook design is checked to ensure its fitness for a safe use.

NOTE The grade for the hook according to this document is taken from the grade of the sling chain according to ISO 1835. Both (chain slings and hooks) have identical scopes and values for the working load limit (WLL) according to [Table 2](#) and values for the mechanical requirements according to [Table 3](#). Thus, the direct correlation of hooks to the sling chain is given by the WLL and especially the code system on the product body itself. The grade of the hook does not define any values of the tensile strength of the hook material.

The range of the nominal diameter d_n of the associated sling chain according to ISO 1835 is from 4 mm to 22 mm.

Hooks according to this document are for use in the temperature range -100 °C to $+400\text{ °C}$.

These hooks are solution annealed in the finished condition and can therefore be used without restrictions with regard to the corrosion resistance of the steels according to [Clause 5.1](#).

NOTE The term “eye hook with point and latch” is taken from ISO 1837, Figure 5.

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 1835, *Round steel short link chains for lifting purposes — Medium tolerance sling chains — Grade 4, stainless steel*

ISO 1837, *Lifting hooks — Nomenclature*

ISO 4778, *Round steel short link chains for lifting purposes — Chain slings of welded construction — Grade 8*

ISO 7500-1, *Metallic materials — Calibration and verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Calibration and verification of the force-measuring system*

ISO 8539, *Forged steel lifting components for use with Grade 8 chain*

ISO 13385-1, *Geometrical product specifications (GPS) — Dimensional measuring equipment — Part 1: Design and metrological characteristics of callipers*

ISO 15510, *Stainless steels — Chemical composition*

ISO 16143-2, *Stainless steels for general purposes — Part 2: Corrosion-resistant semi-finished products, bars, rods and sections*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 1837, ISO 8539 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1 nominal size

combination of numerical values without units for designation and ordering purposes, which indicates the nominal diameter of the associated round steel link chain and the grade of the forged component, e.g. 10-4

3.2 test force

F_T
force applied to the hook during the tensile test

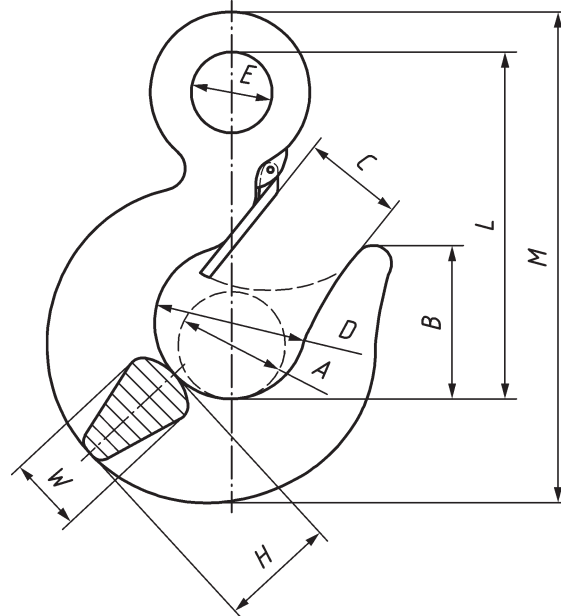
4 Dimensions and Designation

4.1 Dimensions

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The bases for calculation of the values for the dimension limits listed in Table 1 are given in Annex A. The corresponding dimension letters are shown in Figure 1. The specified values are absolute limits.

The geometry of the hook is not specified in detail. Therefore, Figure 1 specifies only where the dimension values according to Table 1 are measured.



Key

- | | | |
|-------------------------|------------------------|----------------------------------|
| A bar diameter | D seat diameter | L inner length |
| B point height | E eye dimension | M outer length, see 5.6.3 |
| C throat opening | H seat height | W seat width |

Figure 1 — Dimensions of hooks

Preferred nominal sizes are given in [Table 1](#), column 1. Other nominal sizes may be used, provided the corresponding dimensions are calculated in accordance with [Annex A](#).

Table 1 — Dimension limits

Dimensions in millimetres

1	2	3	4	5	6	7	8	9	10
Nominal size	A	B	C	C	D	E	H	L	W
	maximum	min.	min.	maximum	min.	min.	maximum	maximum	maximum
4 - 4	10	12	11	14	15	10	17	62	12
6 - 4	15	17	16	21	22	15	26	93	17
8 - 4	21	23	22	27	30	20	34	124	23
10 - 4	26	29	27	35	38	25	44	157	29
13 - 4	33	38	35	45	49	33	56	202	38
16 - 4	41	47	43	55	60	40	69	248	46
18 - 4	46	52	48	61	67	45	77	277	52
20 - 4	51	58	54	69	75	50	86	311	58
22 - 4	56	64	59	75	82	55	94	340	64

4.2 Designation

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The designation of the hook shall be in accordance with the general format given in [Figure 2](#).

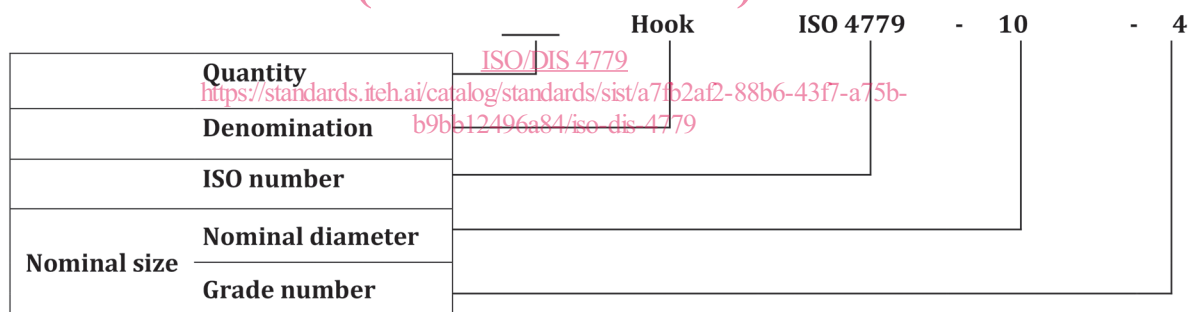


Figure 2 — General format

5 Requirements

5.1 Material

The steel used shall be austenitic stainless steels with molybdenum and shall be resistant against intergranular corrosion, for example the steel with the ISO name X6CrNiMoTi17-12-2 and the ISO 4571-316-35-I according to ISO 15510.

NOTE 1 The resistance against pitting corrosion can be increased by alloying with molybdenum.

After solution annealing intergranular corrosion is unlikely at a service temperature of +400 °C and with an extra low carbon content of the steel. To avoid this corrosive attack under severe service conditions and with higher carbon contents of the steel, a stabilization with titanium is recommended.

NOTE 2 According to ISO 15510 (see Table A.1) the above mentioned stainless steel is also well known under the number S31635, where 35 means titanium added. Internationally equivalent numbers of the steel are X6CrNiMoTi17-12-2; 1.4571; AISI/SAE 316Ti and UNS S31635.

5.2 Manufacture

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

5.3 Heat treatment

The hooks shall be solution annealed within a temperature range of 1 020 °C to 1 120 °C according to ISO 16143-2 and cooled rapidly by water. The enhanced corrosion resistance of each hook requires the passivation of the surface by pickling after heat treatment to obtain a smooth surface condition.

5.4 Dimensions

It is the responsibility of the manufacturer to select the nominal dimensions and tolerances from the dimension limits according to [Table 1](#), so that the finished hook complies with the mechanical properties specified in this document.

The dimensions shall be as given in [Table 1](#), columns 2 to 10.

The geometry of the eye shall be designed to cover a diameter equal to eye dimension, *E*, but the eye needs not to be circular.

In addition, the following requirements shall be met: ISO/DIS 4779
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- a) the actual point height, *B*, shall be equal to or greater than the actual throat opening, *C*;
- b) the actual throat opening, *C*, shall not exceed 90 % of the actual seat diameter, *D*;
- c) the latch shall be capable to close over the actual bar diameter, *A*;
- d) the actual bar diameter, *A*, shall not exceed 90 % of the actual throat opening, *C*;
- e) for direct use in wire rope slings and textile slings, the actual eye dimension, *E*, shall be larger than the value given in [Table 1](#).

5.5 Working load limit (WLL)

[Table 2](#) gives values for the working load limit (WLL) according to ISO 1835. For other nominal sizes, the values for the working load limit (WLL) shall be calculated in accordance [A.2](#).

Table 2 — Working load limit (WLL)

1	2
Nominal size	Working load limit (WLL) <i>t</i>
4 - 4	0,25
6 - 4	0,56
8 - 4	1,00
10 - 4	1,60
13 - 4	2,65

Table 2 (continued)

1	2
Nominal size	Working load limit (WLL)
	t
16 - 4	4,00
18 - 4	5,00
20 - 4	6,30
22 - 4	7,50

5.6 Mechanical properties

5.6.1 General

Hooks according to this document shall comply with the mechanical requirements as given in [Table 3](#), columns 2 and 3.

Table 3 — Mechanical requirements

1	2	3
Nominal size	Test force (TF)	Breaking force (BF)
	F_T kN	F_B kN
		min.
4 - 4	5,0	10,0
6 - 4	11,2	22,4
8 - 4	20,0	40,0
10 - 4	31,5	63,0
13 - 4	53,0	106
16 - 4	80,0	160
18 - 4	100	200
20 - 4	125	250
22 - 4	150	300

5.6.2 Test force (TF)

Each hook shall be capable of sustaining the test force (TF) specified in [Table 3](#), column 2, calculated on the bases given in [Annex A](#).

5.6.3 Elongation at test force

Following the removal of the force, the dimensions shall be within the tolerances specified on the component manufacturer's drawings. In no case shall any dimension alter by more than 1,0 % of the initial dimension after the test force has been applied and removed.

5.6.4 Breaking force (BF)

Each hook shall have a breaking force (BF) at least equal to that specified in [Table 3](#), column 3, calculated on the bases given in [Annex A](#).