International Standard 3076

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

Short link chain for lifting purposes — Grade T (8), non-calibrated, for chain slings, etc.

Chaînes de levage à maillons courts, classe T (8), non calibrées, pour élingues à chaînes, etc.

Second edition — 1984-08-01

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Descriptors : lifting equipment, hoisting slings, chains, welded chains, specifications, dimensions, dimensional tolerances, tests, tension tests, mechanical properties.

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been authorized 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.

International Standard ISO 3076 was developed by Technical Committee ISO/TC 111, *Round steel link chains, lifting hooks and accessories*.

The first edition (ISO 3076-1980) had been approved by the member bodies of the following countries :

Australia
Austria
Bulgaria
Canada
Chile
Czechoslovakia
Germany, F.R.
India
Ireland
Italy
Korea, Rep. of
Mexico
Poland
South Africa, Rep. of
Spain
Sweden
United Kingdom
USA
USSR
Yugoslavia

The member bodies of the following countries had expressed disapproval of the document on technical grounds :

Belgium
France
Japan
Netherlands

This second edition, which cancels and replaces ISO 3076-1980, incorporates draft Amendment 1, which was circulated to the member bodies in May 1983 and has been approved by the member bodies of the following countries :

Australia
Austria
Belgium
Bulgaria
Canada
Egypt, Arab Rep. of
Japan
Poland
Romania
South Africa, Rep. of
Sweden
United Kingdom
USSR
Yugoslavia

The member bodies of the following countries expressed disapproval of the document on technical grounds :

Germany, F.R.
India

Printed in Switzerland

Short link chain for lifting purposes — Grade T (8), non-calibrated, for chain slings, etc.

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies the requirements for lifting chains, grade T (8), non-calibrated, for use on cranes, in chain slings and for general lifting purposes. These are electrically welded round steel short link chains, fully heat treated and tested and comply with the general conditions of acceptance of ISO 1834.

The range of sizes covered by this International Standard is from 5 mm to 45 mm. The annex gives a range of temporary additional sizes 6 mm to 35 mm.

2 REFERENCES

ISO/R 388, *ISO metric series for basic thicknesses of sheet and diameters of wire.*

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

ISO 1035/1, *Hot-rolled steel bars — Part 1 : Dimensions of round bars.*

ISO 1834, *Short link chain for lifting purposes — General conditions of acceptance.*

3 DEFINITIONS

For the purpose of this International Standard the definitions given in ISO 1834 apply.

4 GENERAL CONDITIONS OF ACCEPTANCE

The chain shall comply fully with the requirements of ISO 1834 as well as those of this International Standard.

5 DIMENSIONS

5.1 Size (see ISO 1834, clause 4, Definitions)

The size of chain shall be one of the sizes listed in table 1, column 1 corresponding to the nominal diameter (d_n) of the steel wire (ISO/R 388) or bar (ISO 1035/1) from which the chain is made.

NOTE — Control over the size of the material (bar or wire) from which the chain is made is important but this International Standard concerns finished chain and shall assume that the inspector may not have the opportunity of retrospective measurement of the original material. The chain manufacturer will realize the need for the size of this material to be kept within accepted tolerances.

5.2 Material diameter (see ISO 1834 for definition of material diameter and method of measurement)

5.2.1 Tolerance on material diameter

For sizes less than 18 mm the diameter d of the material in the finished link shall nowhere differ from the nominal diameter by more than $^{+\ 2}_{-\ 6}$ %, except at the weld.

For sizes 18 mm and over, the diameter d of the material in the finished link shall nowhere differ from the nominal diameter by more than ± 5 %, except at the weld.

5.2.2 Tolerances at the weld

The dimension of the steel at the weld shall nowhere be less than the diameter d of the steel adjacent to the weld, or exceed it by more than the following tolerances. (See figure 1 and table 1.)

Type 1 : 10 % of the nominal diameter in any direction;

Type 2 : 20 % of the nominal diameter in the direction perpendicular to the plane of the link and 20 % in other planes;

Type 3 : 20 % of the nominal diameter in the direction perpendicular to the plane of the link and 35 % in other planes.

NOTE — Type 1 eliminates functional problems such as kinking or locking by severely limiting the weld oversize to 10 % of the nominal diameter. Both types 2 and 3 ensure freedom from these hazards by limiting the oversize beyond the 10 % allowed under type 1 to certain areas of the link only (see figure 1), thus providing clearance where required.

5.2.3 Area affected dimensionally by welding

The area affected dimensionally by welding shall not extend by more than 0,6 of the material diameter to either side of the centre of the link.

5.3 Length and width

The dimensions of the length and width of the links shall be as specified in table 1 and illustrated in figure 2.

6 MATERIAL AND MANUFACTURE

6.1 Quality of material

The steel shall be produced by the open hearth or electric process or by an oxygen blown process.

In its finished state as supplied to the chain maker it shall meet the following requirements as determined by check analysis on the rod, wire or finished link.

It shall be fully killed, shall possess reliable welding quality and shall contain alloying elements in sufficient quantities to guarantee the mechanical properties of the chain after appropriate heat treatment. The alloy steel used shall contain nickel and at least one of the following alloying elements :

chromium;

molybdenum.

Its content of sulfur and phosphorus shall be restricted as follows :

	Cast analysis	Check analysis
Sulfur max.	0,035 %	0,040 %
Phosphorus max.	0,035 %	0,040 %

The steel shall be made in conformity with fine grain practice to give an austenitic grain size of 5 or finer when tested in accordance with ISO 643.

This could be accomplished, for example, by ensuring that it contains sufficient aluminium or an equivalent element to permit the manufacture of chain stabilized against age embrittlement during service; a minimum value of 0,02 % metallic aluminium is given for guidance.

Within the above limitations it is the responsibility of the chain maker to select steel so that the finished chain, suitably heat treated, meets the mechanical properties specified in this International Standard.

6.2 Heat treatment

All chain shall be hardened and tempered before being subjected to the manufacturing test force. The tempering temperature shall be not less than 400 °C.

NOTE — The requirement that the tempering temperature shall be not less than 400 °C is the responsibility of the chain manufacturer. The purchaser may, in consultation with the chain manufacturer, check the finished chain for compliance by means of type tests.

6.3 Manufacturing test force

During manufacture, the heat treated chain shall be subjected to a force of 60 % of the minimum breaking force specified in table 3, column 5 or table 5, column 5.

6.4 Proof force (acceptance)

The proof force shown in table 3, column 2 or table 5, column 2, shall be applied only when called up in connection with acceptance testing and inspection since, in this Grade, the manufacturing test force (see 6.3) assumes the function prescribed in ISO 1834, clause 6.5, proof force.

7 TEST REQUIREMENTS

7.1 Mechanical properties and test forces

The mechanical properties shall be as specified in table 2 and the test forces to be applied for each size are specified in table 3 and table 5.

7.2 Selection of samples

Samples shall be selected as specified in ISO 1834. The length of the lot from which the inspector selects the samples shall be 200 m or lesser length.

7.3 Static tensile test

7.3.1 Testing machine and method

The testing machine and method of testing shall be as specified in ISO 1834.

7.3.2 Tensile test

The breaking force shall be not less than that specified in table 3, column 3 or table 5, column 3.

7.3.3 Total ultimate elongation

The total ultimate elongation as defined in ISO 1834 shall be not less than 17 %.

8 INSPECTION

8.1 Provision for inspection

The provision for inspection shall be as specified in ISO 1834.

8.2 Acceptance

The acceptance procedure shall be as specified in ISO 1834.

9 MARKING

9.1 Quality marking

The quality mark for the chain is T or 8. It shall be applied as specified in ISO 1834.

9.2 Identification marking

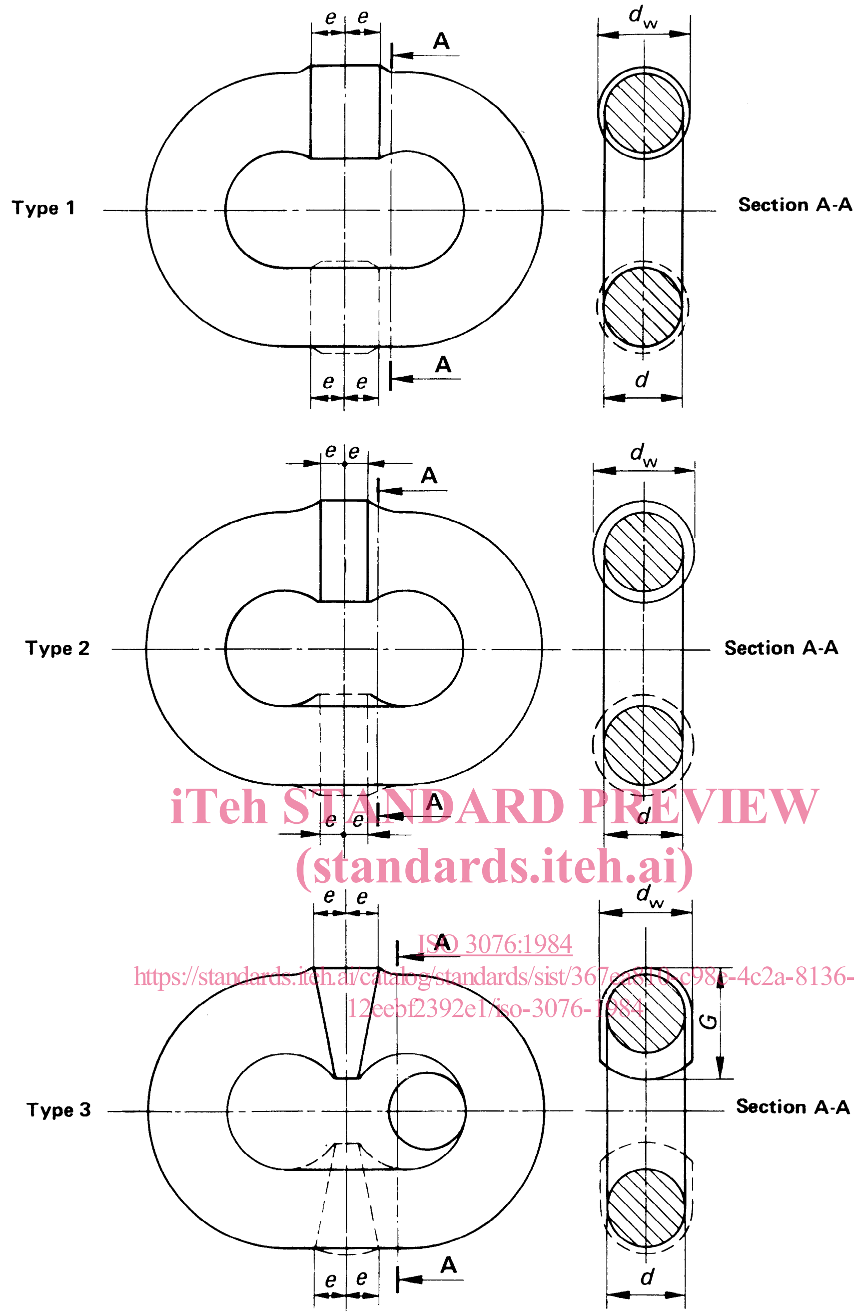
The identification marking shall be as specified in ISO 1834.

9.3 Inspection marking

The inspection marking shall be as specified in ISO 1834.

10 TEST CERTIFICATE

The manufacturer shall, if required, supply a certificate of test and examination with every supply of chain, containing the information detailed in ISO 1834. A typical form is given is ISO 1834, annex C.



d_n = size (nominal diameter of the material)

d = measured diameter of the material except at the weld

d_w = measured diameter of the material at the weld (type 1 and 2 welded chain) or weld dimension perpendicular to the plane of the link (type 3 welded chain)

G = dimension in other planes (type 3 welded chain)

e = length affected by welding on either side of the centre of the link

For all welds

$e \leqslant 0,6\, d_n$

For $d_n < 18$ mm, $d = d_n \,{}^{+2}_{-6}$ %

For $d_n \geqslant 18$ mm, $d = d_n \pm 5$ %

Weld tolerance :

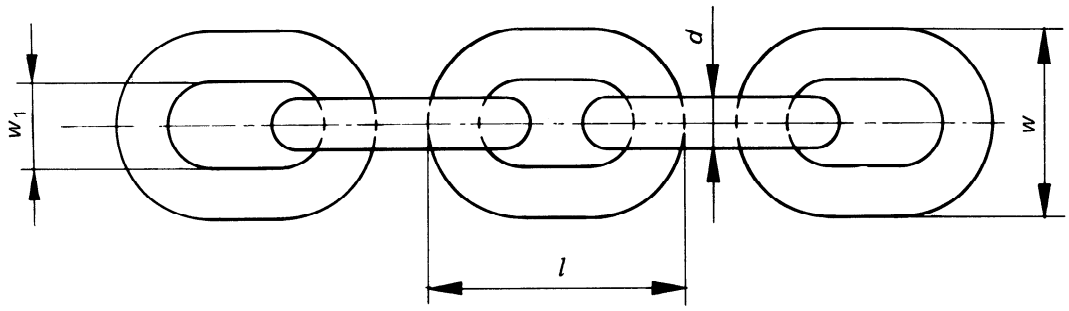
Type 1 : $d_w = d + {}^{0,10\, d_n}_{0}$

Type 2 : $d_w = d + {}^{0,20\, d_n}_{0}$

Type 3 : $d_w = d + {}^{0,20\, d_n}_{0}$

$G = d + {}^{0,35\, d_n}_{0}$

FIGURE 1 — **Material and weld tolerances**



l = outside link length (4,75 d_n min., 5 d_n max.)

w = outside link width (3,5 d_n max. except at weld)

w_1 = inside link width (1,25 d_n min. except at weld)

FIGURE 2 — Chain and link dimensions

TABLE 1 — **Dimensions of grade T (8) non-calibrated chain**
(for symbols, see figures 1 and 2)

Dimensions in millimetres

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Nominal size	**Diameter tolerance**	**Maximum tolerance at the weld** (see figure 1)			**Outside link length limits**		**Outside link width, away from weld**	**Minimum inside link width away from weld**
		Type 1	**Types 2 and 3**	**Type 3**	max.	min.	w max.	w_1
d_n	$(d - d_n)$	$(d_w - d)$	$(d_w - d)$	$(G - d)$	$(5\ d_n)$	$(4{,}75\ d_n)$	$(3{,}5\ d_n)$	$(1{,}25\ d_n)$
5	+ 0,10 − 0,30	0,5	1,0	1,75	25	24	18	6,3
6,3	+ 0,13 − 0,38	0,63	1,26	2,2	32	30	22	7,9
7,1	+ 0,14 − 0,43	0,71	1,42	2,5	36	34	25	8,9
8	+ 0,16 − 0,48	0,8	1,6	2,8	40	38	28	10
9	+ 0,18 − 0,54	0,9	1,8	3,15	45	43	32	11,3
10	+ 0,20 − 0,60	1,0	2,0	3,5	50	47	35	12,5
11,2	+ 0,22 − 0,67	1,12	2,24	3,9	56	53	39	14
12,5	+ 0,25 − 0,75	1,25	2,5	4,4	63	59	44	15,7
14	+ 0,28 − 0,84	1,4	2,8	4,9	70	66	49	18
16	+ 0,32 − 0,96	1,6	3,2	5,6	80	76	56	20
18	± 0,90	1,8	3,6	6,3	90	85	63	23
20	± 1,0	2,0	4,0	7,0	100	95	70	25
22,4	± 1,1	2,24	4,48	7,85	112	106	78	28
25	± 1,25	2,5	5,0	8,75	125	119	88	32
28	± 1,4	2,8	5,6	9,8	140	133	98	35
32	± 1,6	3,2	6,4	11,2	160	152	112	40
36	± 1,8	3,6	7,2	12,6	180	171	126	45
40	± 2,0	4,0	8,0	14,0	200	190	140	50
45	± 2,25	4,5	9,0	15,75	225	214	158	57

NOTE — See annex for temporary additional sizes.

TABLE 2 – **Mechanical properties**

Mechanical property	Requirement
Mean stress at specified minimum breaking force $\frac{2F_{m\,min}}{\pi d_n^2}$	800 MPa (N/mm^2)
Mean stress at proof force $\frac{2F_e}{\pi d_n^2}$	400 MPa (N/mm^2)
Ratio of proof force (acceptance) to specified minimum breaking force	50 %
Specified minimum total ultimate elongation	17 %
Mean stress at working load limit	200 MPa (N/mm^2)

NOTES

1 The stresses quoted in table 2 are obtained by dividing the force by the total cross-section of both sides of the link, i.e. they are mean stresses. The stress is in fact not uniform and particularly at the extrados the maximum fibre stress is considerably greater.

2 The working load may be selected to comply with national regulations but is shall in no case exceed the load in table 3, column 4 or table 5, column 4.

TABLE 3 – **Grade T (8), non-calibrated, test requirements and working load limits**

(1)	(2)	(3)	(4)	(5)
Nominal size d_n mm	**Proof force (acceptance)** kN	**Minimum breaking force** kN	**Working load limit** t	**Manufacturing test force** kN
5	15,8	31,6	0,8	19
6,3	25	50	1,25	30
7,1	31,7	63,4	1,6	38
8	40,3	80,6	2,0	48
9	51	102	2,5	61
10	63	126	3,2	76
11,2	79	158	4,0	94
12,5	99	198	5,0	119
14	124	248	6,3	149
16	161	322	8,0	193
18	204	408	10	245
20	252	504	12,5	302
22,4	316	632	16	379
25	393	786	20	472
28	493	986	25	592
32	644	1 288	32	773
36	815	1 630	40	978
40	1 006	2 012	50	1207
45	1 273	2 546	63	1528