International Standard 1836

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

Short link chain for lifting purposes — Grade M (4), calibrated, for chain hoists and other lifting appliances

Chaînes de levage à maillons courts, classe M (4), calibrées, pour palans à chaînes et autres appareils de levage

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FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (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 set up 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 1836 was developed by Technical Committee ISO/TC 111, *Round steel link chains, chain wheels, lifting hooks and accessories*, and was circulated to the member bodies in March 1978.

It has been approved by the member bodies of the following countries :

Australia	Ireland	Sweden
Austria	Italy	Turkey
Belgium	Japan	United Kingdom
Canada	Korea, Rep. of	USA
Chile	Mexico	USSR
Czechoslovakia	Netherlands	Yugoslavia
Denmark	Poland	
India	South Africa, Rep. of	

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

Germany, F.R.
France

This International Standard cancels and replaces ISO Recommendation R 1836-1971, of which it constitutes a technical revision.

Printed in Switzerland

Short link chain for lifting purposes — Grade M (4), calibrated, for chain hoists and other lifting appliances

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies requirements for lifting chains, grade M (4), accurately calibrated for use as load chains in chain hoists and similar appliances. 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 to 32 mm. The annex gives a range of temporary additional sizes 6 to 46 mm.

2 REFERENCES

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

ISO/R 643, *Micrographic determination of the austenitic grain size of steels.*

ISO 1035/1, *Dimensions of hot rolled steel bars — Part 1 : Round bars — Metric series.*[1)]

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

3 DEFINITIONS

For the purposes 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 of chain (see ISO 1834, clause 4, "Definitions")

The size of chain shall be one of the sizes listed in table 2, 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 must 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 2.)

Type 1 : 8 % of the nominal diameter in any direction;

Type 3 : 8 % of the nominal diameter in the direction perpendicular to the plane of the link and 17 % in other planes.

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.

1) At present at the stage of draft. (Revision of ISO/R 1035/1-1969.)

5.3 Length and width (see figure 2 and table 2)

5.3.1 Nominal dimensions

Preferred nominal dimensions are as follows :

— Pitch p (i.e. inside length) : 3 times the nominal chain size (d_n);

— Outside width w : 3,25 times the nominal chain size (d_n).

Where the chain has to fit a load wheel designed for different dimensions, the nominal pitch (inside length) and the nominal outside width shall be clearly specified at the time of the enquiry and order.

5.3.2 Tolerances

5.3.2.1 Outside width w (measured on the chain in the finished condition)

The outside width, w, measured clear of the weld zone is given by the formula

w = nominal outside width, $^{+\ 0,075\ d_n}_{0}$

5.3.2.2 Length (measured on the chain in the finished condition)

The inside length of one link or the sum L of the inside lengths of any number of links N measured bearing to bearing under a force not greater than half the specified proof force of the chain, shall not vary from the nominal length (N_p) by more than the following percentage tolerance :

$$\frac{\Delta L}{N_p} \times 100 = {}^{+\ (1,6/N + 0,33)}_{0}\ \%$$

TABLE 1 — **Examples**

Nominal size d_n mm	Number of links in chain N	Tolerance (+ only) %	Tolerance (+ only) mm
6,3	1	1,93	0,37
	5	0,65	0,61
	21	0,406	1,61
10	1	1,93	0,58
	5	0,65	0,975
	21	0,406	2,56
20	1	1,93	1,16
	5	0,65	1,95
	21	0,406	5,12

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 when heat treated, be capable of producing in the finished chain the mechanical properties required by this specification.

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

	Cast analysis	Check analysis
Sulphur max.	0,045 %	0,050 %
Phosphorus max.	0,040 %	0,045 %

The steel shall be made in conformity with fine grain practice to give an austenitic grain size of five or finer when tested in accordance with ISO/R 643. This could be accomplished, for example, by ensuring that it contains sufficient aluminium or an equivalent element to permit the manufacturer of chain stabilized against strain 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 steels 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 normalized or hardened and tempered before being subjected to the proof force.

6.3 Proof force

The proof force shall be as specified in table 4, column 2 or table 6, column 2 and shall be applied as specified in ISO 1834.

7 TEST REQUIREMENTS

7.1 Mechanical properties and test forces

The mechanical properties shall be as specified in table 3 and the test forces to be applied for each size are specified in table 4 and table 6.

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 4, column 3 or table 6, 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 M or 4. It shall be applied as specified in ISO 1834.

9.2 Identification marking

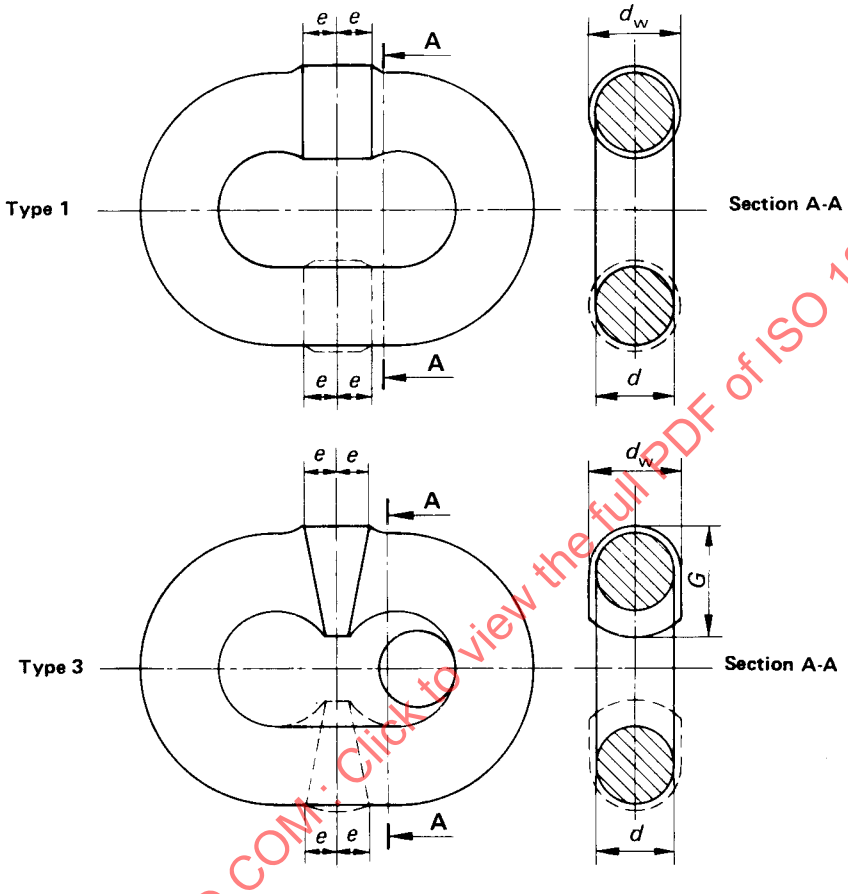
The identification marking shall be as specified in ISO 1834.

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 in 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 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, $d = d_n \begin{smallmatrix} + 2 \\ - 6 \end{smallmatrix}$ %

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

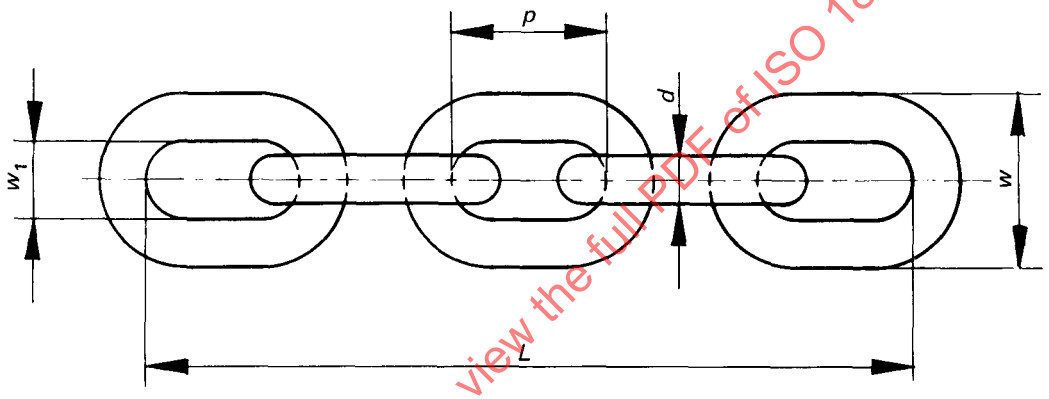
Weld tolerance :

Type 1 : $d_w = d \begin{smallmatrix} + 0{,}08 \\ 0 \end{smallmatrix} d_n$

Type 3 . $d_w = d \begin{smallmatrix} + 0{,}08 \\ 0 \end{smallmatrix} d_n$

$G = d \begin{smallmatrix} + 0{,}17 \\ 0 \end{smallmatrix} d_n$

FIGURE 1 — **Material and weld tolerances**



Given in terms of the nominal size of the chain d_n.
Pitch p (inside length) – preferred value 3 d_n.
Outside width w except at the weld – preferred value 3,25 d_n.
Inside width w_1 – minimum permitted value 1,25 d_n except at the weld, or such minimum value as will prevent kinking.
Length L (see 5.3.2.2).

FIGURE 2 – **Chain and link dimensions**

TABLE 2 – **Dimensions of grade M (4) calibrated chain**
(for symbols see figures 1 and 2)

Dimensions in millimetres

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Nominal size	**Diameter tolerance**	**Maximum tolerance at the weld** (see figure 1)		**Preferred pitch** (inside length)	**Pitch tolerance on the single link** (+ only)	**Preferred outside width**	**Outside width tolerance** (+ only) **away from weld**
		Types 1 and 3	**Type 3**				
d_n	$(d - d_n)$	$(d_w - d)$	$(G - d)$	p $(3\,d_n)$		w $(3{,}25\,d_n)$	$(0{,}075\,d_n)$
5	$^{+\,0{,}10}_{-\,0{,}30}$	0,4	0,85	15	0,29	17	0,38
6,3	$^{+\,0{,}13}_{-\,0{,}38}$	0,5	1,05	19	0,37	21	0,48
7,1	$^{+\,0{,}14}_{-\,0{,}43}$	0,57	1,2	21	0,41	23	0,54
8	$^{+\,0{,}16}_{-\,0{,}48}$	0,64	1,35	24	0,46	26	0,60
9	$^{+\,0{,}18}_{-\,0{,}54}$	0,72	1,55	27	0,52	30	0,68
10	$^{+\,0{,}20}_{-\,0{,}60}$	0,8	1,7	30	0,58	33	0,75
11,2	$^{+\,0{,}22}_{-\,0{,}67}$	0,9	1,9	34	0,66	37	0,84
12,5	$^{+\,0{,}25}_{-\,0{,}75}$	1,0	2,15	38	0,73	41	0,94
14	$^{+\,0{,}28}_{-\,0{,}84}$	1,12	2,4	42	0,81	46	1,05
16	$^{+\,0{,}32}_{-\,0{,}96}$	1,28	2,7	48	0,93	52	1,2
18	± 0,90	1,44	3,05	54	1,04	59	1,35
20	± 1,0	1,6	3,4	60	1,16	65	1,5
22,4	± 1,1	1,79	3,8	67	1,29	73	1,68
25	± 1,25	2,0	4,25	75	1,45	82	1,88
28	± 1,4	2,24	4,75	84	1,62	91	2,1
32	± 1,6	2,56	5,45	96	1,85	104	2,4

NOTE – See annex for temporary additional sizes.

TABLE 3 – **Mechanical properties**

Mechanical property	Requirement
Mean stress at specified minimum breaking force $\frac{2F_{m\ min}}{\pi d_n^2}$	400 MPa (N/mm^2)
Mean stress at proof force $\frac{2F_e}{\pi d_n^2}$	200 MPa (N/mm^2)
Ratio of proof force to specified minimum breaking force	50 %
Specified minimum total ultimate elongation	17 %
Mean stress at working load limit	100 MPa (N/mm^2)

NOTES

1 The stresses quoted in table 3 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 it must in no case exceed the load in table 4, column 4 or table 6, column 4.

TABLE 4 – **Grade M (4), calibrated, test requirements and working load limits**

(1)	(2)	(3)	(4)
Nominal size d_n mm	**Proof force to which the whole chain is subjected** kN	**Minimum breaking force** kN	**Working load limit** t
5	7,9	15,8	0,4
6,3	12,5	25	0,63
7,1	15,9	31,8	0,8
8	20,2	40,4	1,0
9	25,5	51	1,25
10	31,5	63	1,6
11,2	39,5	79	2,0
12,5	49,1	98,2	2,5
14	63	126	3,2
16	81	162	4,0
18	102	204	5,0
20	126	252	6,3
22,4	158	316	8,0
25	197	394	10
28	247	494	12,5
32	322	644	16