UDC 672.61

Ref. No. : ISO/R 1835-1971 (E)

ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION

R 1835

SHORT LINK CHAIN FOR LIFTING PURPOSES

GRADE 40 NON-CALIBRATED CHAIN

FOR CHAIN SLINGS, ETC.

1st EDITION

March 1971

Printed in Switzerland

Also issued in French and Russian. Copies to be obtained through the national standards organizations.

BRIEF HISTORY

The ISO Recommendation R 1835, *Short link chain for lifting purposes – Grade 40 non-calibrated chain for chain slings, etc.*, was drawn up by Technical Committee ISO/TC 111, *Round steel link chains, chain wheels, lifting hooks and accessories*, the Secretariat of which is held by the British Standards Institution (BSI).

Work on this question led to the adoption of Draft ISO Recommendation No. 1835, which was circulated to all the ISO Member Bodies for enquiry in May 1969. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies :

Australia	Israel	South Africa, Rep. of
Austria	Italy	Sweden
Brazil	Netherlands	Thailand
France	New Zealand	Turkey
Greece	Norway	U.A.R.
India	Peru	United Kingdom

The following Member Bodies opposed the approval of the Draft :

Belgium
Germany
Japan
U.S.A.

This Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided to accept it as an ISO RECOMMENDATION.

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ISO Recommendation R 1835 March 1971

SHORT LINK CHAIN FOR LIFTING PURPOSES

GRADE 40 NON-CALIBRATED CHAIN

FOR CHAIN SLINGS, ETC.

1. GENERAL

1.1 Scope

This ISO Recommendation covers requirements for lifting chains, Grade 40, non-calibrated, for lifting purposes. These are electrically welded round steel short link chains fully tested and heat treated, and comply with the general conditions of acceptance of ISO Recommendation R 1834(1). The range of size is from 6 to 45 mm.

This ISO Recommendation does not apply to surface-hardened chain.

1.2 Definitions

For the purpose of this ISO Recommendation, the definitions given in ISO Recommendation R 1834(1) apply.

1.3 General conditions of acceptance

The chain shall comply fully with the requirements of ISO Recommendation R 1834(1) as well as with those of this ISO Recommendation.

The size of the chain shall be one of the sizes listed in Table 1, column 1, which correspond to dimensions given in ISO Recommendations R 388(2) for wire and R 1035/I(3) for bar material.(4)

2. DIMENSIONS

2.1 Material diameter

2.1.1 *Measurement.* Material diameter is defined, and a suitable measuring instrument described, in ISO Recommendation R 1834(1).

2.1.2 *Tolerances*(5)

2.1.2.1 TOLERANCES ON DIAMETER OF MATERIAL IN THE LINK. For sizes up to and including 16 mm, the diameter d of the material in the finished link shall nowhere differ from the nominal diameter by more than + 2 % or – 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.

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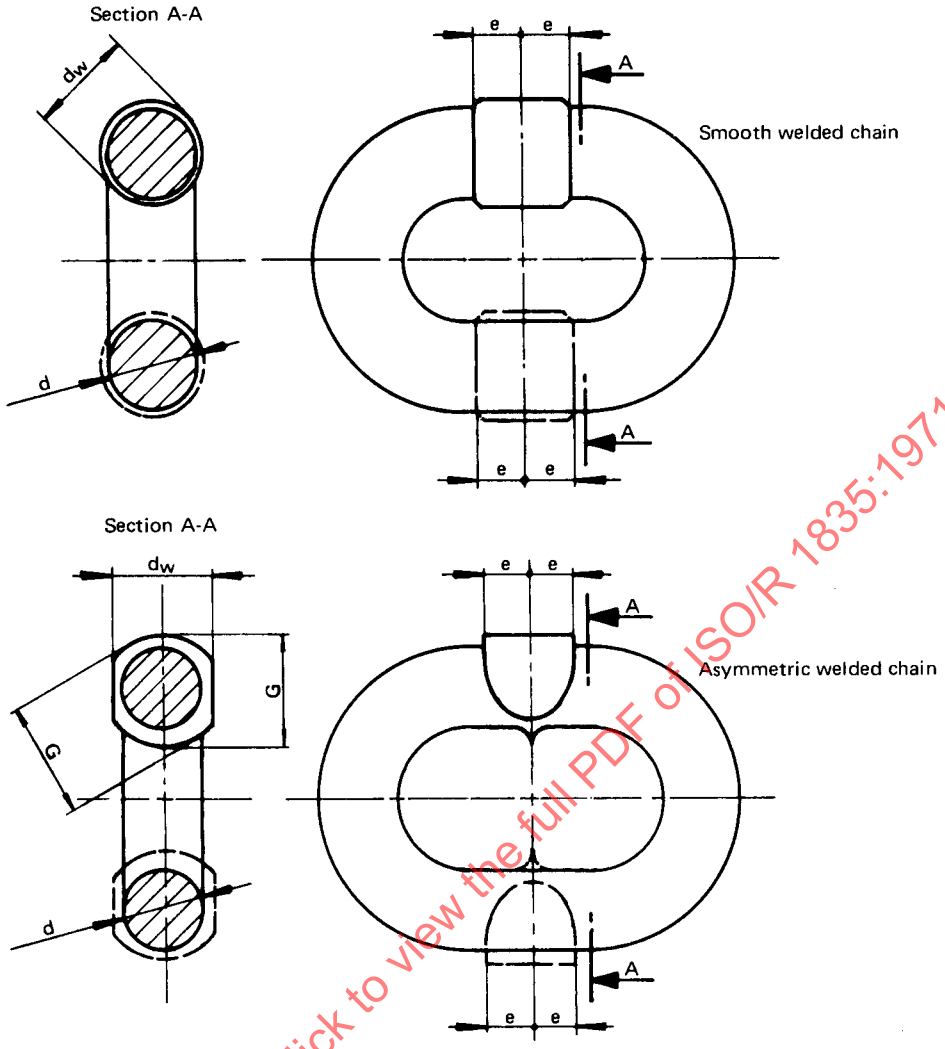
(1) ISO/R 1834, *Short link chain for lifting purposes – General conditions of acceptance.*

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

(3) ISO/R 1035/I, *Dimensions of hot-rolled steel bars – Round bars – Metric series.*

(4) The temporary addition of ten further sizes based on inch units for use in those countries still using this system of measurement is being considered.

(5) Control over the size of the material (bar or wire) from which the chain is made is important, but this ISO Recommendation 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.



d_n is the size (nominal diameter of the material).

d is the measured diameter of the material except at the weld.

d_w is the measured diameter of the material at the weld (smooth welded chain) or the weld dimension perpendicular to the plane of the link (asymmetric welded chain).

G is the dimension in other planes (asymmetric welded chain).

e is the length affected by welding on either side of the link.

For $d_n \leqslant 16$ mm, $d = d_n {}^{+2\ \%}_{-6\ \%}$

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

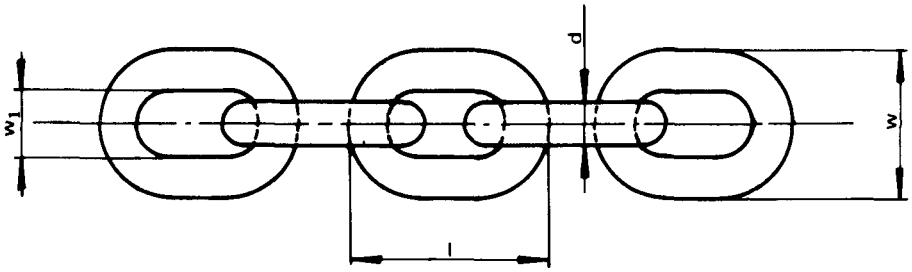
$d_w = d {}^{+20\ \%}_{0}$

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

$e \leqslant 0.6\, d_n$

For smooth welded chain, d_w max. is customarily $d + 8\ \%$.

FIG. 1 – **Material and weld dimensions**



l is the outside link length.

w is the outside link width.

w_1 is the inside link width.

$4.75\ d_n \leqslant l \leqslant 5\ d_n$

w, except at the weld $\leqslant 3.5\ d_n$

w, at the weld $\leqslant 1.05 \times$ width adjacent

w_1, except at the weld $\geqslant 1.25\ d_n$
(Smooth welded links customarily meet this requirement at the weld.)

FIG. 2 – **Chain and link dimensions**

2.1.2.2 TOLERANCES AT THE WELD. The dimension of the steel at the weld shall nowhere be less than the diameter of the steel adjacent to the weld, or exceed it by more than the following tolerances :

Asymmetric welded chain of the pattern shown in Fig. 1 :

20 % in the direction normal to the plane of the link;
35 % in any other plane.

Smooth welded chain :

The diameter at the weld will not normally exceed that of the steel adjacent by more than 8 %.

2.1.2.3 AREA AFFECTED DIMENSIONALLY BY WELDING. The weld, or welds, are positioned in the centre of one or both legs of the link. The area affected dimensionally by welding shall not extend by more than 0.6 of the material diameter to either side of the centre.

2.2 Length and width

The outside dimensions of the links are limited as follows :

Outside length l : Not more than 5 times and not less than 4.75 times the size.

Outside width w : Not more than 3.5 times the size, except at the weld. At the weld, not more than 1.05 times the width adjacent.

Inside width w_1 : Not less than 1.25 times the size, except at the weld. Smooth welded chains customarily meet this requirement at the weld.

3. MATERIAL AND MANUFACTURE

3.1 Quality of material

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

In its finished state as supplied to the chain maker, the steel 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 not less than 0.020 % of aluminium;

– it shall contain no more than 0.050 % of sulphur
and no more than 0.045 % of phosphorus.(1)

Within the above limitations it is the responsibility of the chain manufacturer to select a steel so that the finished chain, suitably heat treated, meets the specified mechanical property requirements.

3.2 Heat treatment

All chain shall be hardened and tempered before proof loading.(2)

3.3 Workmanship

The fins caused by welding shall be removed, and the weld shall be smoothly finished all round a smooth weld and on the outside of the link surface of an asymmetric weld, leaving the projection on the inside of the link.

3.4 Quality marking

The quality marking for the chains is as follows :

"4" in a circle. i.e. ④

The quality mark shall be applied as recommended in ISO Recommendation R 1834.(3)

3.5 Proof loading

The proof load for the chain as given in Table 3, column 2, shall be applied as recommended in ISO Recommendation R 1834.(3)

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(1) Sulphur and phosphorus tend to segregate, and the proportions found in millings from a finished link may be in excess of those in the cast analysis.

(2) Repairs on hardened and tempered chain should be performed by the original chain manufacturer or by another qualified chain manufacturer or chain tester according to the instructions of the original manufacturer.

(3) ISO/R 1834, *Short link chain for lifting purposes – General conditions of acceptance.*

4. TEST REQUIREMENTS

4.1 Mechanical properties and test loads

The mechanical properties required of this grade of chain are summarized in Table 2. The actual test loads for each size are given in Table 3.

4.2 Selection of samples

Samples are to be selected as recommended in ISO Recommendation R 1834.(1) The length of the lot from which the inspector selects the sample(s) shall be 200 m or less.

4.3 Static tensile test

4.3.1 *Testing machine and method.* The testing machine and method of testing are specified in ISO Recommendation R 1834.(1)

4.3.2 *Breaking load.* The breaking load shall be not less than that specified in Table 3, column 3.

4.3.3 *Elongation at fracture.* The permanent elongation at fracture as defined in ISO Recommendation R 1834(1) shall be not less than 14.4 %, i.e. 14.4 cm on a gauge length of 1 m.

4.3.4 *Energy absorption factor.* The energy absorption factor as defined in ISO Recommendation R 1834(1) shall be not less than that specified in Table 3, column 4.

5. INSPECTION

5.1 Acceptance

The acceptance procedure specified in ISO Recommendation R 1834(1) applies.

5.2 Marking

5.2.1 *Identification marking.* The identification marking specified in ISO Recommendation R 1834(1) applies.

5.2.2 *Inspection marking.* The inspection marking specified in ISO Recommendation R 1834(1) applies.

5.3 Test certificate

The manufacturer shall supply a certificate of test and examination in the appropriate statutory form with every supply of chain. The certificate shall give the results of all the tests. A typical form is given in ISO Recommendation R 1834, (1) Annex A.

5.4 Provision for inspection

The provision for inspection specified in ISO Recommendation R 1834(1) applies.

(1) ISO/R 1834, *Short link chain for lifting purposes – General conditions of acceptance.*

TABLE 1 – **Dimensions of Grade 40 non-calibrated chain**
(For symbols see Fig. 1 and 2)

Dimensions in millimetres

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Nominal size d_n	**Diameter tolerance** $(d - d_n)$	**Maximum additional weld dimensions** (see Fig. 1)		**Outside link length limits**		**Outside link width** w max.		**Minimum inside link width** $(1.25\ d_n)$
		$(d_w - d)$ max.	(asymm.) $(G - d)$ max.	max. $(5\ d_n)$	min. $(4.75\ d_n)$	away from weld $(3.5\ d_n)$	max. extra at weld $(0.05\ w)$	
6.3	$^{+0.12}_{-0.38}$	1.2	2.2	32	30	22	1.1	7.9
7.1	$^{+0.14}_{-0.43}$	1.4	2.5	36	34	25	1.2	8.9
8	$^{+0.16}_{-0.48}$	1.6	2.8	40	38	28	1.4	10
9	$^{+0.18}_{-0.54}$	1.8	3.1	45	43	31	1.6	11
10	$^{+0.20}_{-0.60}$	2.0	3.5	50	48	35	1.8	12
11.2	$^{+0.22}_{-0.67}$	2.2	3.9	56	53	39	2.0	14
12.5	$^{+0.25}_{-0.75}$	2.5	4.4	62	59	44	2.2	16
14	$^{+0.28}_{-0.84}$	2.8	4.9	70	66	49	2.5	18
16	$^{+0.32}_{-0.96}$	3.2	5.6	80	76	56	2.8	20
18	±0.90	3.6	6.3	90	86	63	3.1	22
20	±1.0	4.0	7.0	100	95	70	3.5	25
22.4	±1.1	4.4	7.7	110	105	77	3.9	28
25	±1.2	5.0	8.7	125	120	87	4.4	31
28	±1.4	5.6	9.8	140	130	98	4.9	35
32	±1.6	6.4	11	160	150	110	5.5	40
36	±1.8	7.2	12	180	170	120	6.0	45
40	±2.0	8.0	14	200	190	140	7.0	50
45	±2.2	9.0	16	225	215	160	8.0	56

NOTE. – The measurements given in column 9 are made away from the weld, but smooth welded chains customarily meet the requirement at the weld also.