INTERNATIONAL STANDARD

ISO 1834

Second edition
1999-10-15

Short link chain for lifting purposes — General conditions of acceptance

Chaîne de levage à maillons courts — Conditions générales de réception

Reference number
ISO 1834:1999(E)

Contents

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Printed in Switzerland

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 1834 was prepared by Technical Committee ISO/TC 111, *Round steel link chains, chain slings, components and accessories*, Subcommittee SC 1, *Chains and chain slings*.

This second edition cancels and replaces the first edition (ISO 1834:1980), which has been technically revised.

Annex A forms a normative part of this International Standard.

Introduction

Chains covered by this International Standard are divided into grades which relate to the mechanical properties of the finished product and not simply to the strength of the material. Each grade is identified by a letter for fine tolerance chain or number for medium tolerance chain in the series: M(4), P(5), S(6), T(8), V(10). The letter or number indicates the mean stress at the minimum breaking force as shown in Table 1.

Table 1 — Basis of grade symbols

Grade		Mean stress at the specified minimum breaking force
Fine tolerance	Medium tolerance	N/mm^2
M	4	400
P	5	500
S	6	630
T	8	800
V	10	1 000
NOTE Chains of these grades may all not be the subjects of International Standards.		

The stresses in a chain link are not uniform and at the extrados, particularly at the crown, the maximum fibre stress is considerably greater than the mean stress obtained by dividing the force by the total cross-sectional area of both legs of the link.

Attention is drawn to the fact that repairs to chain should be carried out in accordance with ISO 3056, in the case of medium tolerance chain, and ISO 7592, in the case of fine tolerance chain.

This grading system has also been applied to hooks, links, shackles and other accessories, indicating their strength compatibility with the appropriate grade of chain.

Short link chain for lifting purposes — General conditions of acceptance

1 Scope

This International Standard specifies the general conditions of acceptance for electrically welded round steel short link chain for lifting purposes. It includes medium tolerance chain for use in chain slings and for general lifting purposes, and fine tolerance chain for use with chain hoists and other similar lifting appliances.

It is applicable to short link lifting chain in accordance with ISO 1835, ISO 3075, ISO 3076 and ISO 3077.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 1835:—[1], *Short link chain for lifting purposes — Grade M(4), non-calibrated, for chain slings, etc.*

ISO 3075:—[2], *Short link chain for lifting purposes — Grade S(6), non-calibrated, for chain slings, etc.*

ISO 3076:—[3], *Short link chain for lifting purposes — Grade T(8), non-calibrated, for chain slings, etc.*

ISO 3077:—[4], *Short link chain for lifting purposes — Grade T(8), calibrated, for chain hoists and other lifting appliances.*

ISO 7500-1:1999, *Metallic materials — Verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Verification and calibration of the force-measuring system.*

3 Terms and definitions

For the purposes of this International Standard, the following terms and definitions apply.

3.1
nominal size
d_n
nominal diameter of the round section steel wire or bar from which the chain is made

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[1] To be published. (Revision of ISO 1835:1980)

[2] To be published. (Revision of ISO 3075:1980)

[3] To be published. (Revision of ISO 3076:1984)

[4] To be published. (Revision of ISO 3077:1984)

3.2
material diameter
d_m
diameter of the material in the chain link as measured

3.3
weld diameter
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 2 welded chain)

3.4
length dimensionally affected by welding
e
length on either side of the centre of the link, affected by welding

3.5
pitch
p
internal length of a link as measured

3.6
manufacturing proof force
MPF
force to which during manufacture the whole of the chain is subjected

3.7
breaking force
BF
maximum force which the chain withstands during the course of a static tensile test to destruction

3.8
working load limit
WLL
maximum mass which the chain hanging vertically is authorized to sustain in general lifting service

3.9
total ultimate elongation
A
total extension at the point of fracture of the chain expressed as a percentage of the internal length of the test sample

3.10
processing
any treatment of the chain subsequent to welding

EXAMPLES heat treatment, polishing or dimensional calibration.

3.11
lot
specified quantity from which test sample(s) is/are selected

3.12
competent person
designated person, suitably trained qualified by knowledge and practical experience, and with the necessary instructions to enable the required tests and examination to be carried out

NOTE ISO 9002:1994, 4.18 gives guidance on training.

4 Dimensions

4.1 Material diameter

The material diameter of any section of a finished link shall be equal to the nominal size, within the tolerances stated in the International Standard for the particular chain. It shall be taken as the mean of two measurements of the section at right angles in the same plane. The measurements shall be made away from the weld and on the straight side of the link to avoid the effect of measuring any flattening of the section, due to contact with the forming mandrel.

4.2 Other link dimensions

The length and the width of a chain link, and the pitch and length of a number of links of fine tolerance chain, shall be as specified in the International Standard for that particular chain.

5 Material, heat treatment and manufacture

5.1 Material

The material shall conform to the requirements of the International Standard for the particular chain.

Within these limitations, the manufacturer shall select a steel such that the finished chain, complies with the mechanical properties specified in the International Standard for the particular chain.

5.2 Heat treatment

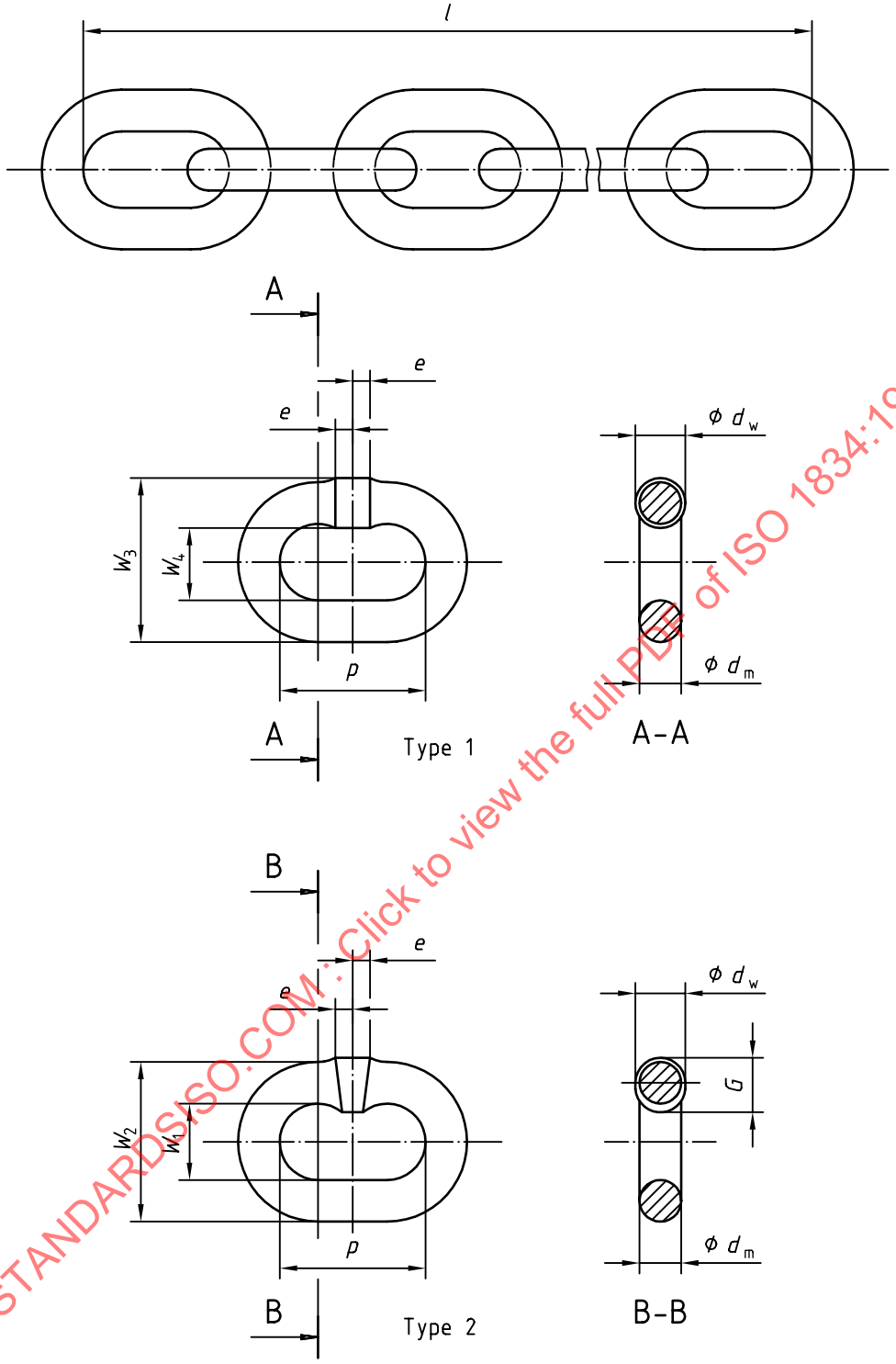
All chain shall be subjected to the heat treatment specified in the International Standard for the particular chains before the application of the manufacturing proof force.

5.3 Manufacture

5.3.1 Workmanship

The weld, which may be of the smooth or asymmetric type shall be positioned in the centre of the link as shown in Figure 1. The material affected dimensionally by welding shall not extend on either side of the centre of the leg more than the amount specified in the International Standard for the particular chain.

The weld metal shall nowhere be displaced so that it undercuts the contours of the link (see Figure 2).



l = multiple pitch length
p = pitch (internal link length)
d_m = measured diameter of the material, except at the weld
d_w = measured diameter of the material at the weld (type 1) or weld dimension perpendicular to the plane of the link (type 2)
G = dimension in other planes as per individual chain specification (type 2)
e = length affected by welding, on either side of the centre link
W_1 = internal link width away from the weld
W_2 = external link width away from the weld
W_3 = external link width over the weld
W_4 = internal link width at the weld

Figure 1 — Types of weld finish and link dimensions

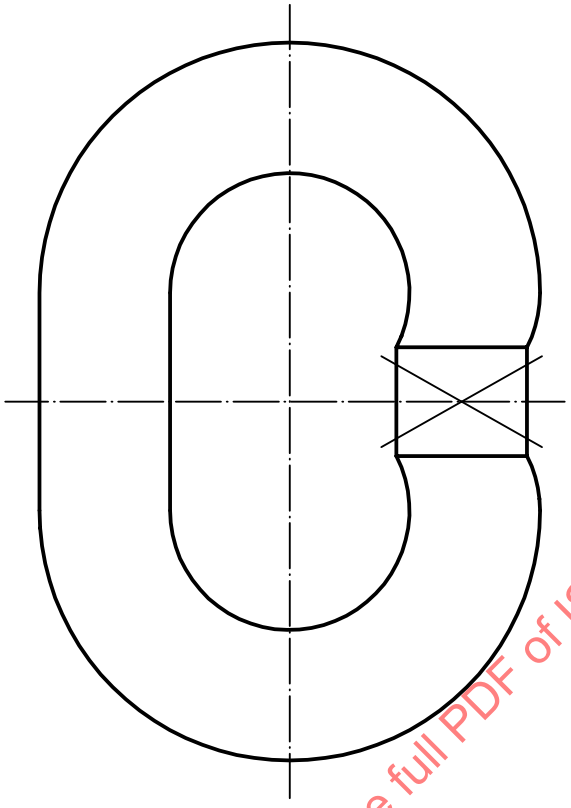


Figure 2 — Undercut at weld (not permissible)

5.3.2 Finish

5.3.2.1 Smooth welded chain

The fins caused by welding shall be removed.

5.3.2.2 Asymmetric welded chain

The fins caused by welding shall be removed from the outside of the link surface leaving the projection on the inside.

5.4 Surface condition

The "finished" condition (see 6.1) for chain shall include the surface coating, if any.

5.5 Manufacturing proof force (MPF)

After heat treatment and complete processing, the finished chain shall be subjected to the manufacturing proof force specified in the International Standard for that particular chain. The testing machine shall conform to the requirements given in annex A. The chain shall be placed in the testing machine without twisting. After the force is withdrawn, the chain shall be carefully examined by the competent person and any faulty links replaced (see 5.6). The chain shall articulate freely when manipulated by the examiner.

Where surface finishing processes are used which involve the risk of chain embrittlement, e.g. acid cleaning or electroplating, the manufacturing proof force shall be re-applied in the finished condition.

Adequate facilities shall be provided, with suitable lighting, for the purpose of examining the chains after they have been subjected to the proof force.

5.6 Links inserted in the course of manufacture

Any links which have been inserted shall be processed to ensure that every link in the finished chain is in the same condition. If links have been inserted after the application of the manufacturing proof force (see 5.5), that portion of the chain affected by such processing shall then be again subjected to the manufacturing proof force and re-examined.

5.7 Breaking force (BF) and total ultimate elongation (A)

The breaking force and total ultimate elongation of chain in the finished condition shall at least meet the requirements specified in the International Standard for the particular chain.

5.8 Bend

The minimum bend resistance of links of chain in the finished condition shall be as specified in the International Standard for the particular chain.

6 Test requirements

6.1 Condition of chain tested

The chain shall be tested in the finished condition. It shall be clean and free from oil and grease.

NOTE This requirement for the test condition is not intended to prohibit the application of a temporary protective coating prior to dispatch.

6.2 Selection of samples

The following sampling arrangements shall apply to the chain.

a) For sampling purposes the chains shall be divided into lots. The length of the lot shall be as specified in the International Standard for the particular type and grade of chain.

b) Static tensile tests: the number of samples taken from each lot of finished chains or part thereof shall be as given in Table 2.

c) Bend tests: the number of samples taken from each lot of finished chains or part thereof shall be as given in Table 2.

Table 2 — Number of samples

Nominal size d_n	Number of samples
$d_n \leqslant 6$ mm	3
6 mm $< d_n \leqslant$ 16 mm	2
$d_n >$ 16 mm	1
For bend test samples where two welding heads are employed there shall be a minimum of one sample per welding head/plane.	

6.3 Static tensile test

6.3.1 Apparatus

The testing machine shall conform to the requirements of annex A.

6.3.2 Tensile test samples

Test samples shall consist of a minimum of five links. Two additional links may be required to engage the jaws of the testing machine unless this is done by half-links or a similar method; these additional links shall not be taken into account when determining total elongation.

6.3.3 Procedure

Carry out the tensile test using an autographic recorder to produce a force/extension graph (see annex A).

Grip the chain shall be gripped in such a manner that the links can be freely loaded. The grips shall be designed and constructed so that slip does not occur. Apply the load smoothly (for example at a rate of 10 N/mm^{2}s) until fracture occurs.

6.3.4 Breaking force

The breaking force shall be recorded.

6.3.5 Ultimate elongation

The total ultimate elongation shall be based on the total extension at fracture, shown in the force/extension graph (see Figure A.1). It shall then be expressed as a percentage of the nominal internal length, i.e. the sum of pitches calculated from the gauge lengths.

The minimum total ultimate elongation A shall be calculated according to:

$$A = \frac{\Delta L_t}{L_n} \times 100\ \%$$

where

L_n is the multiple pitch length for the number of links:

$L_n = np_n$ and $p_n = 3d_n$;

n = number of links;

p_n = nominal pitch;

$\Delta L_t = L_t - L_0$

L_t is the measured internal length of sample at fracture;

L_0 is the nominal internal length of sample prior to test.

6.4 Bend test

6.4.1 Apparatus

The bend test equipment shall conform to Figure 3, where the included angle of the V-block shall be 90 ° and the diameter of the mandrel shall be twice the nominal size of the chain (d_n) to be tested.

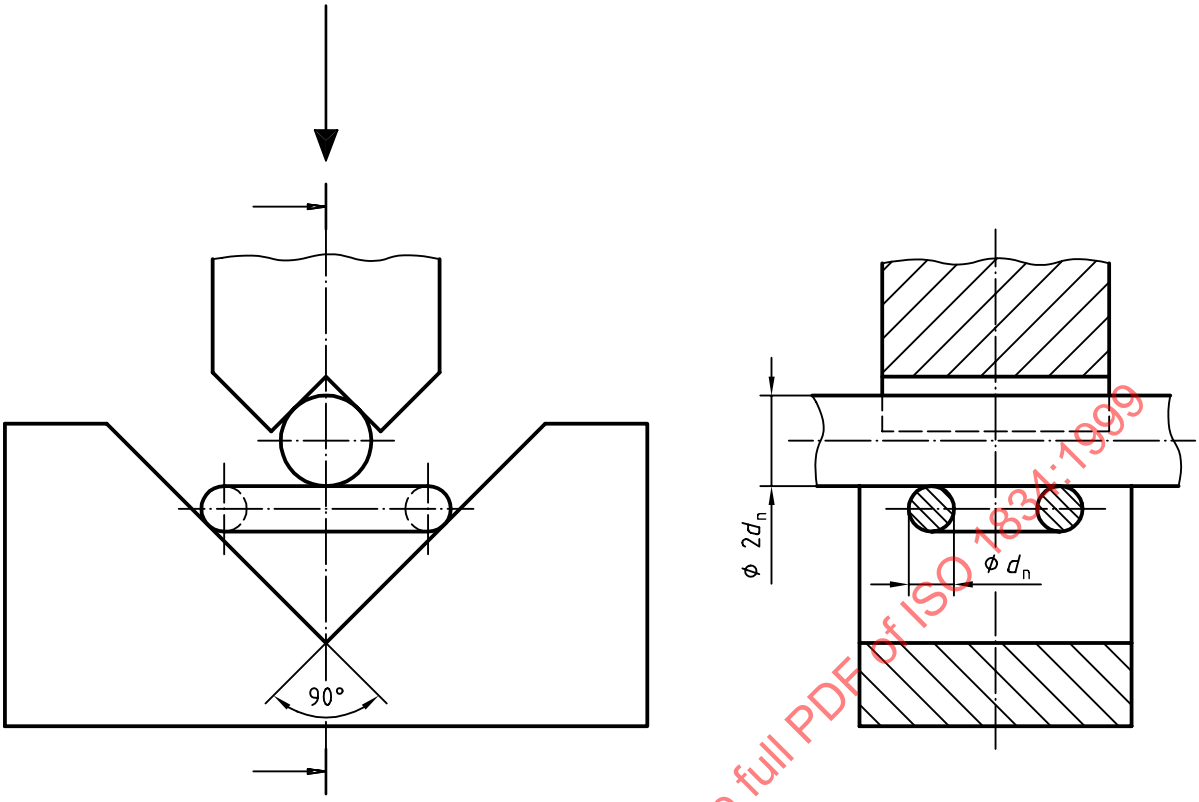


Figure 3 — Bend test equipment

6.4.2 Procedure

Each single link shall be bent in a shock-free manner as in 6.4.1, in the bend test equipment, and shall conform with the acceptance criteria specified in 6.5 and in the International Standard for the particular chain.

6.5 Acceptance criteria

The following acceptance criteria apply to both the static tensile and bend test requirements.

For nominal sizes of chain up to and including 6 mm, where three test samples shall be tested, if two or more fail to meet the individual test requirements in the appropriate International Standard for the particular chain, the lot shall be deemed not to comply with this International Standard. If only one test sample fails to meet the individual test requirements in the appropriate International Standard, the re-test procedure given in 6.6 may be applied.

For nominal sizes of chain over 6 mm up to and including 16 mm, where two test samples shall be tested, if both the test samples fail to meet the individual test requirements in the appropriate International Standard for the particular chain, the lot shall be deemed not to comply with this standard. If one test sample fails to meet the individual test requirements the re-test procedure given in 6.6 may be applied.

For nominal sizes of chain over 16 mm only one test sample shall be tested. If the test sample fails to meet the individual test requirements in the appropriate International Standard for the particular type and grade of chain, the re-test procedure in 6.6 may be applied.

6.6 Re-tests

Should one sample fail to fulfil the individual requirements of the appropriate International Standard for the particular chain, two further samples may be selected, at the request of the manufacturer, from the same lot of chain for re-testing. When a re-test is carried out the lot shall be deemed to comply with the individual test requirements only if both the additional tests are satisfactory.

7 Marking

7.1 Grade marking

The grade mark shall be the capital letter in the case of fine tolerance chain, or number, in the case of medium tolerance chain, designating the grade of chain. It shall be legibly stamped or embossed on at least every twentieth link, or links at intervals of 1 m, whichever is the lesser distance.

The height of marks shall be 2 mm or 25 % of the nominal size of the chain, whichever is the greater.

Stamps, if used, shall have a concave surface and the indentation shall be such as to not impair the mechanical properties of the chain link.

7.2 Additional marking

Any lot or other marking, e.g. manufacturer's mark or symbol shall be either:

a) in the same manner and at the same intervals as for grade marking (see 7.1); or

b) legibly stamped or embossed on all end links of chain(s) or on idle links or on metal tags, or on links permanently attached to the end links.

8 Manufacturer's certificate

The manufacturer shall supply a certificate of test and examination with every supply of chain.

The certificate shall provide at least the following information:

a) the name and address of the manufacturer or his authorized representative, including date of issue of the certificate and authentication;

b) number of the International Standard;

c) quantity and description;

d) identification;

e) nominal size, in millimetres;

f) manufacturing proof force, in kilonewtons;

g) breaking force, in kilonewtons (i.e. certification that the specified minimum breaking force was met or exceeded;

h) total ultimate elongation at fracture, (i.e. certification that the specified minimum total ultimate elongation has been met or exceeded).

NOTE Other additional information may be required for statutory purposes in certain countries.

Annex A
(normative)

Requirements for chain testing machines

The stroke of the straining mechanism in relation to the length of chain tested shall be sufficient for the full force to be applied without the need for taking a fresh hold.

The machine shall be calibrated and certified in accordance with ISO 7500-1 and conform to grade 1,0 conditions of accuracy. In no case shall the tolerance of the machine exceed ± 1,5 % of the force applied.

Machines shall be verified and adjusted as necessary by a competent, independent person at intervals not exceeding one year.

A signed certificate of the last examination shall be displayed prominently near the machine.

The machine used for the static tensile test described in 6.3 shall be provided with an autographic recorder enabling a force/extension graph to be taken during the test (see 6.3.3 and Figure A.1).