International Standard 1834

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Short link chain for lifting purposes — General conditions of acceptance

Chaînes de levage à maillons courts — Conditions générales de réception

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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 1834 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
Canada	Japan	United Kingdom
Chile	Mexico	USA
Czechoslovakia	Netherlands	USSR
Denmark	Poland	Yugoslavia
France	South Africa, Rep. of	

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

Belgium
Germany, F.R.
India

This International Standard cancels and replaces ISO Recommendation R 1834-1971, of which it constitutes a technical revision.

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Short link chain for lifting purposes — General conditions of acceptance

0 INTRODUCTION

Chains covered by this International Standard are divided into quality grades which relate to the mechanical properties of the finished product and not simply to the strength of the material. Each quality grade is identified by a letter or number in the series L (3)[1], M (4), P (5)[1], S (6), T (8). This system applies also to hooks, links, shackles and other accessories. The letters indicate the mean stress at the specified minimum breaking loads as follows :

Grade	Mean stress at specified minimum breaking load MPa (N/mm^2)
L (3)[1]	315
M (4)	400
P (5)[1]	500
S (6)	630
T (8)	800

1) This grade is not the subject of an International Standard for chains.

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

Attention is drawn to the fact that repairs to hardened and tempered chain should be carried out only by the original manufacturer or as directed in ISO 3056, which gives a complete guide to the selection, use, inspection, maintenance and repair of non-calibrated chain and chain slings. A similar International Standard for calibrated chain is in preparation.

1 SCOPE

This International Standard specifies the general conditions of acceptance for electrically welded round steel short link chain for lifting purposes. It includes non-calibrated chain for use on cranes, in chain slings and for general lifting purposes and calibrated chain for use with chain hoists and other lifting appliances.

2 FIELD OF APPLICATION

This International Standard covers short link lifting chain complying with ISO 1835, ISO 1836, ISO 3075, ISO 3076, ISO 3077. Surface hardened chain is not included in the provisions of this International Standard.

3 REFERENCES

ISO 147, *Load calibration of testing machines for tensile testing of steel.*

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

ISO 1836, *Short link chain for lifting purposes — Grade M (4), calibrated, for chain hoists and other lifting appliances.*

ISO 3056, *Non-calibrated round steel link lifting chain and chain slings — Safe use and maintenance.*

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

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

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

1) This grade is not the subject of an International Standard for chains.

4 DEFINITIONS

For the purpose of this International Standard the following definitions apply :

4.1 size : Nominal diameter of the steel wire or bar from which the chain is made (d_n).

4.2 material diameter : Diameter of the material in the chain link as measured (d).

4.3 pitch of chain : Internal length of a link (p).

4.4 proof force : Force to which after processing (see definition below) the whole of the chain is subjected as specified in 6.5 (F_e).

4.5 breaking force : Maximum force which the chain withstands during the course of a static tensile test to destruction (F_m).

4.6 working load limit (lifting capacity) : Maximum mass which the chain hanging vertically is authorized to support in general service (C_p).

4.7 total ultimate elongation : Total extension at the point of fracture of the chain expressed as a proportion of the gauge length.

4.8 processing : Any treatment of the chain subsequent to welding, for example, heat treatment, polishing or calibrating.

4.9 lot : Specified length of chain from which a test sample is selected.

5 DIMENSIONS

5.1 Material diameter

The material diameter of any section of a finished link which is to accord with the size within stated tolerances, is the mean of two measurements of the section at right angles in the same plane. The measurements shall be made away from the weld.

NOTE — The mean diameter may be conveniently determined by a single measurement using an instrument of the type described in annex A.

5.2 Other link dimensions

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

6 MATERIAL, HEAT TREATMENT AND MANUFACTURE

6.1 Material

The material shall comply with the requirements of the International Standard for the particular grade of chain, those requirements being designed to ensure reliable welding quality and freedom from strain age embrittlement.

Within these limitations it is the responsibility of the chain manufacturer to select a steel such that the finished chain, suitably heat treated, possesses the specified mechanical properties.

When so required by the purchaser, the manufacturer shall supply a copy of the steel maker's cast analysis. When a check analysis of the steel is required by the purchaser, such analysis shall be made from cuttings taken from a complete transverse section of a link selected from a length tested to destruction.

NOTE — When comparing an analysis of the steel in the chain (check analysis) with the steelmaker's cast analysis, allowance must be made for the heterogeneity of the steel.

6.2 Heat treatment

All chain shall be subjected to the appropriate heat treatment before proof loading.

6.3 Manufacture

6.3.1 Workmanship

The weld, or welds, which may be of the smooth or asymmetric type (see figure 1) shall be positioned in the centre of one or both legs of the link as shown. 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 as to undercut the contours of the link (see figure 2).

6.3.2 Finish

6.3.2.1 Smooth welded chain

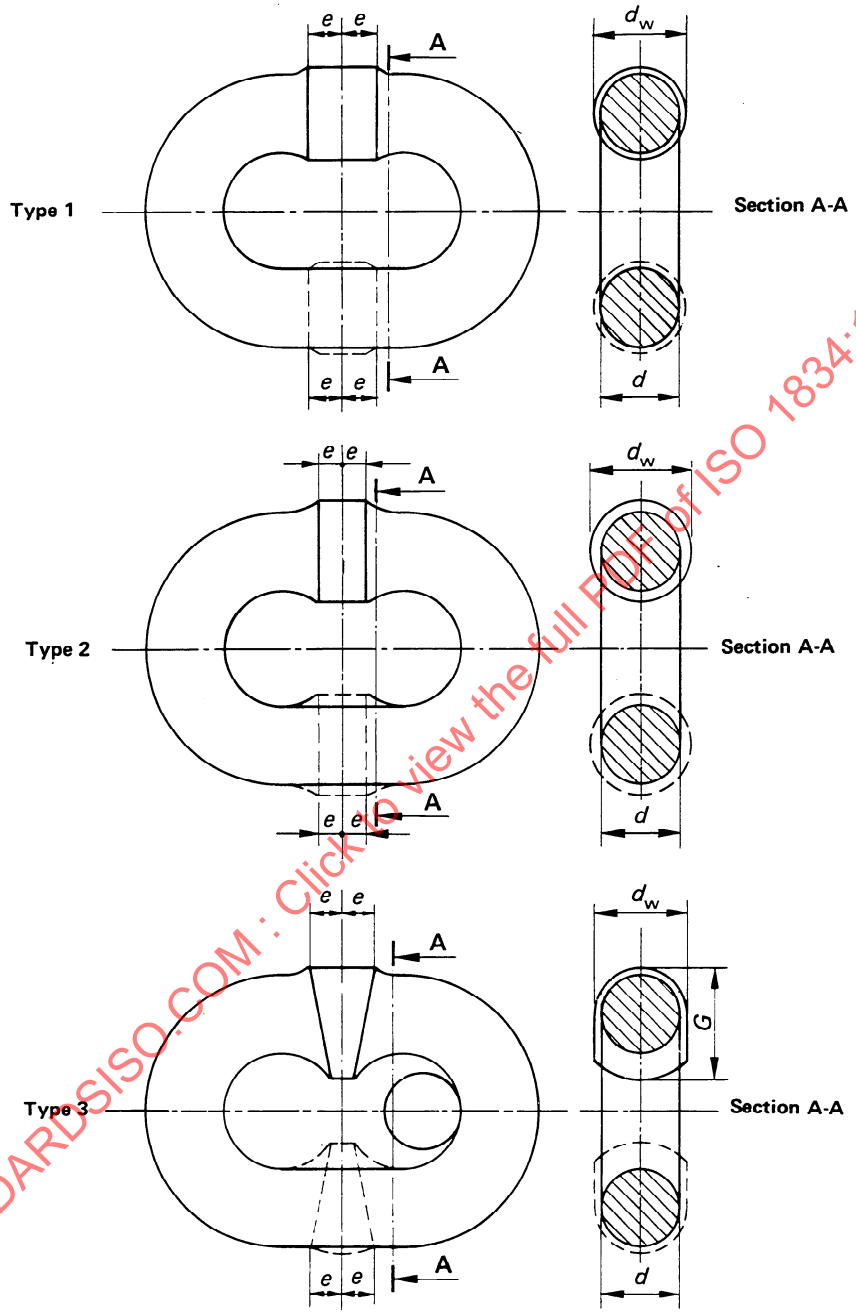
The fins caused by welding shall be removed and the weld shall be smoothly finished all round.

6.3.2.2 Asymmetric welded chain

The fins caused by welding shall be removed from the outside of the link surface leaving the projection on the inside and thus forming a smooth exterior asymmetric weld.

6.4 Surface condition

Unless otherwise agreed between the manufacturer and purchaser the finished chain shall be free from coating of any description.



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 (types 1 and 2) or weld dimension perpendicular to the plane of the link (type 3)

G = dimension in other planes (type 3)

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

FIGURE 1 — **Types of weld**

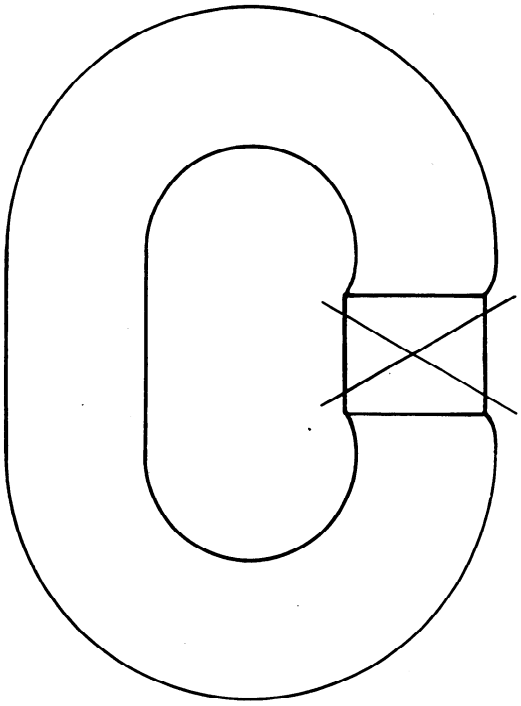


FIGURE 2 — **Undercut at weld** (not permissible)

6.5 Proof force

After heat treatment and complete processing, the finished chain shall be subjected to the proof force specified in the International Standard for the particular chain. The testing machine shall comply with the requirements of annex B. Care shall be taken that the chain is placed in the testing machine without twist. After removal of the force, the chain shall be carefully examined by a competent person and any faulty links replaced (see 6.6). The chain shall articulate freely when manipulated by the examiner.

6.6 Links inserted in the course of manufacture

Any links which have been inserted shall be processed similarly to the chain in such a way as to ensure that every link in the finished chain is in a uniform condition. Where links have been inserted after proof loading (see 6.5) that portion of the chain affected by such processing shall then be subjected to the proof force and re-examined.

7 TEST REQUIREMENTS

7.1 Condition of chain tested

Chain shall be subjected to test in the finished condition. It shall be clean and free from oil and grease or paint.

7.2 Selection of samples

At least one test sample sufficient to provide a gauge length as defined in 7.3.2 shall be selected by the inspector from each lot or part lot. The length of the lot is specified in the International Standard for each particular chain.

Where the chain length is required to be in one continuous piece so that the severance for a test sample will necessitate the insertion of a joining link, the sample shall be selected and cut from the chain before heat treatment. After the joining links have been inserted, the samples shall be wired to the lengths which they represent and shall undergo the same processing up to the application of the proof force. The samples for any or all of the lengths may, at the request of the manufacturer, be selected in triplicate in order to provide additional test samples if required (see 7.4).

Where the chain length is not required to be in one continuous piece, the samples shall be selected from the chain in its finished condition.

NOTE — The purchaser is required to state in his enquiry and order when the chain length may be in more than one piece.

7.3 Static tensile test

7.3.1 Testing machine

The testing machine shall comply with the requirements of annex B.

7.3.2 Tensile test samples

Test samples shall consist of the number of links specified in table 1, constituting the gauge length. Two additional links may be required to engage the jaws of the testing machine unless this is done by half-links or some other method; these additional links will not be taken into account when determining total elongation.

TABLE 1 — **Gauge lengths**

Nominal size of chain mm	**Minimum number of links in gauge length actually tested** *N*
Up to and including 6	9
Over 6 up to and including 17	7
Over 17	5

7.3.3 Procedure

The tensile test shall be carried out using an autographic recorder to produce a force/extension diagram (see annex B).

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. The rate of loading shall be evenly applied (for example at 10 $N/mm^2/s$) until fracture occurs.

The minimum breaking force shall be as specified in the International Standard for the particular chain.

7.3.4 Total ultimate elongation

The total ultimate elongation shall be based on the total extension at fracture, shown in the force/extension diagram (see figure 5, annex B). This shall then be expressed as a

percentage of the original inside length of the sample after proof loading, i.e. the sum of pitches according to the gauge lengths in table 1. The minimum total ultimate elongation shall be as specified in the International Standard for the particular chain.

7.4 Retests

Should any sample fail to fulfil the test requirements two further samples may be selected at the request of the manufacturer from the same lot of chain for retesting. The lot complies if both the additional tests are satisfactory.

8 INSPECTION

Where an inspector is required by the purchaser, he shall have access to the works of the manufacturer at all reasonable times for the purpose of witnessing the specified tests and inspecting the testing machine and method of examination. The manufacturer shall provide the inspector, at the time of inspection, with copies of the test sheets giving the results of all the tests made in his presence.

9 MARKING

9.1 Quality grade marking

At least each twentieth link, or links at intervals of 1 m, whichever is the lesser distance, shall be legibly stamped or embossed with the appropriate quality grade mark which shall be the letter or number appropriate to its grade, i.e. L (3), M (4), P (5), S (6) or T (8).

The marks shall be of the sizes shown in table 2.

TABLE 2

Dimensions in millimetres

Nominal size of chain	Diameter of mark
Up to and including 8,0	2
Over 8,0 up to and including 12,5	3
Over 12,5 up to and including 26	4,5
Over 26	6

Stamps, if used, shall have a concave surface and the indentation shall be neither sharp nor of excessive depth.

9.2 Identification marking

Marks shall be legibly stamped or embossed upon all end links of the chain(s) or upon idle links or upon substantial metal tabs, tallies or links permanently attached to the end links. Alternatively the marking may be at the same intervals for quality marking (see 9.1). The marking shall include the name of the manufacturer of the chain by trade-mark or symbol.

9.3 Inspection marking

Provided that the foregoing tests are satisfactory, the inspector may stamp, with a distinguishing mark, all end links of the chain(s) from which the samples were taken, in a position not immediately coinciding with a weld.

10 TEST CERTIFICATE

The manufacturer shall, if required, supply a certificate of test and examination with every supply of chain. A typical form is shown in annex C.

The certificate shall give at least the following information :

a) number of the International Standard or national standard;

b) quantity and description;

c) identification;

d) nominal size of chain, in millimetres;

e) proof force, in kilonewtons;

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

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

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

ANNEX A

INSTRUMENTS FOR MEASURING THE TRUE MEAN DIAMETER OF CHAIN LINKS

In forming a chain link from round bar, the section of the bar may become slightly flattened where it is pressed in contact with the mandrel. However, the material from the flattened region is displaced mainly tangentially across the section and neither the area of the section nor the section modulus is appreciably altered. By measurement of links deformed in this manner it has been shown that the true mean diameter corresponding to the area of the section may be determined by a single measurement using calipers or a micrometer having one flat measuring face, the other being a narrow blade shaped in a V-groove of 135° angle.

A form of caliper gauge suitable for use in the field is illustrated in figure 3. This type of gauge can be adapted for use on several chain sizes by provision of a series of interchangeable flat anvils.

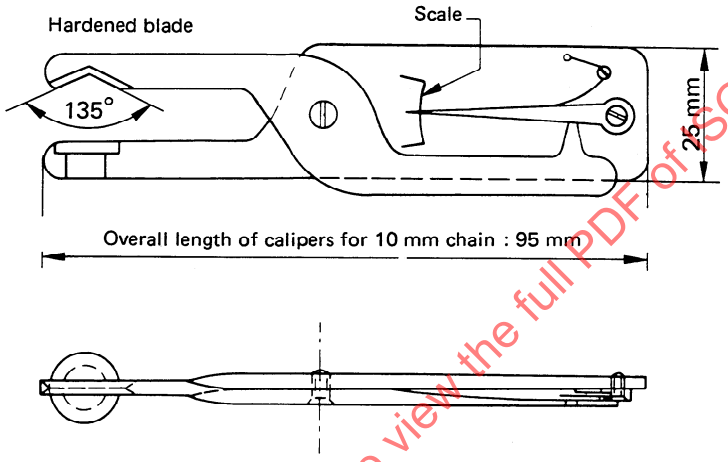


FIGURE 3 – **Caliper gauge**

For more accurate measurements an ordinary micrometer may be adapted by replacing its fixed flat anvil by a narrow blade shaped in a V-groove of 135° angle; but in order to afford this blade access to the inside of the link the outer end of the micrometer bow may need to be reduced in thickness as shown in figure 4.

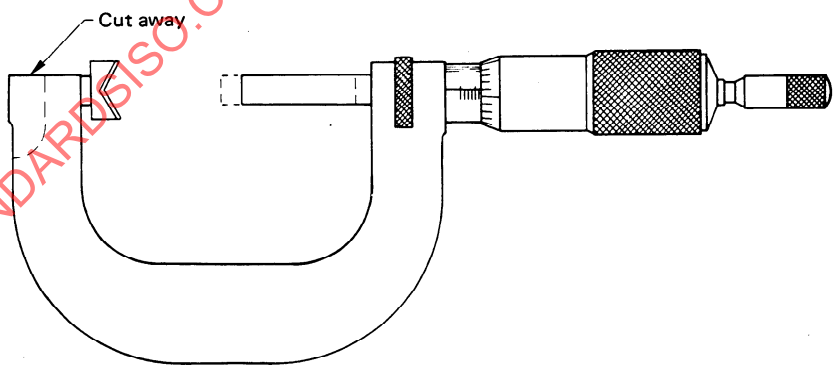


FIGURE 4 – **Micrometer gauge**

With either form of instrument the blade is fitted to the inside of the link and the flat face is brought into contact with the outside. Variation of the direction of measurement over the range ± 20° from the plane of the link makes no appreciable difference.

There is no risk of either type of instrument being used the wrong way round because it is not possible to insert the flat face inside the link.

Either type of instrument needs to be calibrated by use of round bars of known diameters covering the range of nominal diameter of chain plus 10 % to minus 10 %.

ANNEX B

REQUIREMENTS FOR CHAIN TESTING MACHINES

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

The machine shall be calibrated in accordance with ISO 147, and shall comply with grade 1,0 conditions of accuracy, or the calibration and accuracy shall be in accordance with a relevant national standard.

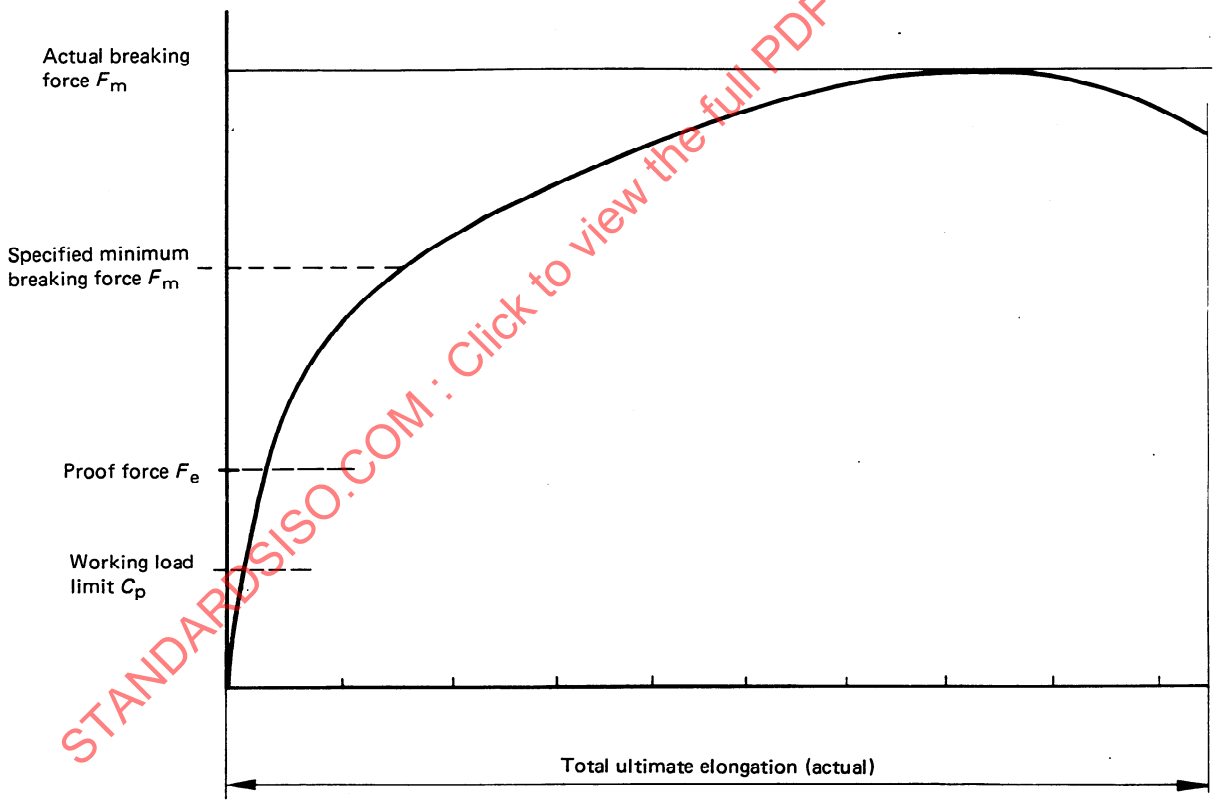
In no case shall the tolerance of the machine exceed ± 1,5 % of the force applied.

Machines shall be verified and adjusted as necessary by a competent independent person at intervals of not greater than 1 year.

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

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

The machine used for the static tensile test described in 7.3 should be provided with an autographic recorder enabling a force/extension diagram to be taken during the test. (See 7.3.3 and figure 5.)



NOTE – The purpose of the above diagram is to illustrate the terms used; the shape of the curve is schematic and it is not intended to relate to any particular grade of chain.

FIGURE 5 – **Force/extension curve**