

Specification for

High-tensile steel chains (round link) for chain conveyors and coal ploughs

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The Mining and Quarrying Requisites Standards Committee, under whose direction this British Standard was prepared, consists of representatives from the following Government department and scientific and industrial organizations:

- Association of British Mining Equipment Companies*
- Association of Mining Electrical and Mechanical Engineers
- Council for Electrical Equipment for Flammable Atmospheres (BEAMA)
- Engineering Equipment Users' Association
- Health and Safety Executive*
- Institute of Quarrying
- Institution of Mechanical Engineers
- Institution of Mining and Metallurgy
- Institution of Mining Engineers*
- Mechanical Handling Engineers' Association
- National Coal Board*

The organizations marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation of this British Standard:

- British Steel Industry
- Machine Made Chain Manufacturers' Association

This British Standard, having been prepared under the direction of the Mining and Quarrying Requisites Standards Committee, was published under the authority of the Executive Board and comes into effect on 28 November 1980

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National foreword

This British Standard is identical with ISO 610:1979 *“High-tensile steel chains (round link) for chain conveyors and coal ploughs”*, including the Erratum issued 15 May 1980, and is published under the direction of the Mining and Quarrying Requisites Standards Committee. The United Kingdom has taken part in the preparation of the International Standard through Sub-Committee 2 of Technical Committee 82 of the International Organization for Standardization (ISO).

This standard supersedes the previous issue of BS 2969:1969 *“Calibrated high tensile steel chain (round link) for coal face machines and conveyors”*, which is now withdrawn.

Terminology and conventions. The text of the International Standard has been approved as suitable for publication, without deviation, as a British Standard. Some terminology and certain conventions are not identical with those used in British Standards; attention is especially drawn to the following.

The comma has been used throughout as a decimal marker. In British Standards it is current practice to use a full point on the baseline as the decimal marker.

Wherever the words “International Standard” appear, referring to this standard, they should be read as “British Standard”.

Cross-references

International Standard	Corresponding British Standard
ISO 83:1976	BS 131 <i>Methods for notched bar tests</i> Part 3:1972 <i>The Charpy U-notch impact test on metals</i> (Technically equivalent)
ISO/R 147:1960	BS 1610:1964 <i>Methods for the load verification of testing machines</i> (Technically equivalent)
ISO/R 643:1967	BS 4490:1969 <i>Methods for the determination of the austenitic grain size of steel</i> (Technically equivalent)

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 20, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope and field of application

This International Standard specifies the requirements for a range of high grade special purpose calibrated, high-tensile, electrically welded, steel chains (round link) for use with machines and equipment in mining, such as the following:

- a) conveyors, flexible and rigid, of the chain type, chain belt conveyors, gate end and stage loaders;
- b) coal ploughs, coal cutters and power loaders;
- c) bucket elevators;
- d) other similar machines used in mines.

This International Standard covers a size range from 14 to 30 mm. Three grades of quality (B, C and D) are specified with regard to the mechanical properties of chain. The values given for grade D in Table 3, Table 4, Table 7 and Table 8 are, however, provisional.

Chains covered by this International Standard are not designed for lifting appliances, such as cranes and slings.

2 References

ISO 83, *Steel — Charpy impact test (U-notch)*.

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

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

3 Definitions

For the purposes of this International Standard, the following definitions apply:

3.1

size of chain

the nominal diameter d of the steel wire or bar from which the chain is made

3.2

breaking force

the maximum force which a sample of finished chain withstands during the course of a tensile test to destruction

3.3

test force

the specified force to which a sample of the finished chain has to be subjected without exceeding the stated elongation

3.4

proof force

the specified force to which, after processing (see 3.6), the whole of the chain has to be subjected without significant permanent deformation or damage

this force may be re-applied to the whole of the new chain or to any part thereof by the purchaser or by his inspector at their discretion

3.5

percentage elongation

the extension expressed as a percentage of the gauge length

3.6

processing

any treatment of the chain subsequent to welding, for example heat treatment, calibration or surface treatment

3.7

calibration

the application of force to the whole of the chain during the production process to control the link dimensions

3.8
elastic limit

the maximum force which can be applied to the chain without producing permanent deformation

3.9
setting force

the force applied to hold the sample under tension while the gauge length is marked and/or the extensometer is fitted

NOTE Other technical terms are illustrated in the force-extension diagram given in Annex A.

3.10
inspector

the representative of the purchaser

4 Dimensions of chains

The dimensions of chains shall be as shown in Figure 1 and Figure 2 and Table 1.

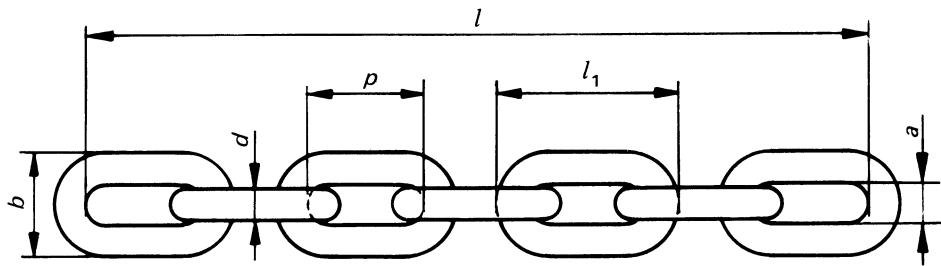


Figure 1 — Dimensions of chains

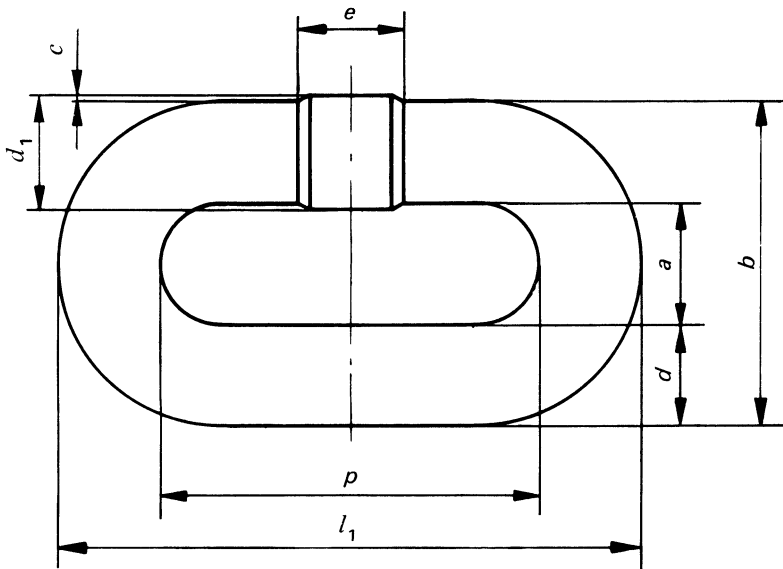


Figure 2 — Chain link dimensions

Table 1 — Chain link dimensions and mass

Dimensions in millimetres

1	2	3	4	5	6	7	8	9	10	11	12
Diameter of material in the finished link		Pitch		Width		Length		Weld			Mass per unit length
Nominal diameter d	Tolerance	Nominal p	Tolerance	Inside a min.	Outside b max.	Nominal l_1	Tolerance	Allowable offset c max.	Diameter d_1 max.	Length e	$\approx$ kg/m
14	$\pm 0,4$	50	$\pm 0,5$	17	48	78	$+ 0,5$ $- 1,3$	0,4	15	10	4,0
18	$\pm 0,5$	64	$\pm 0,6$	21	60	100	$+ 0,6$ $- 1,6$	0,5	19,5	13	6,6
22	$\pm 0,7$	86	$\pm 0,9$	26	74	130	$+ 0,9$ $- 2,3$	0,7	23,5	15,5	9,5
24	$\pm 0,8$	86	$\pm 0,9$	28	79	134	$+ 0,9$ $- 2,5$	0,7	26	17	11,6
24	$\pm 0,8$	87,5	$\pm 0,9$	28	79	135,5	$+ 0,9$ $- 2,5$	0,7	26	17	11,5
26	$\pm 0,8$	92	$\pm 0,9$	30	86	144	$+ 0,9$ $- 2,5$	0,8	28	18	13,7
30	$\pm 0,9$	108	$\pm 1,0$	34	98	168	$+ 1,0$ $- 2,8$	0,9	32,5	21	18,0

4.1 Material diameter

4.1.1 Diameter of material in the link

The diameter d of the material in the link (except at the weld) shall be as stated in column 1 of Table 1, subject to the tolerance shown in column 2.

The tolerance on the diameter of material in the link shall be applied to the average of two diameters measured at right angles in the same section.

4.1.2 Weld diameter

The diameter of the weld d_1 shall be not less than the actual diameter of the steel adjacent to the weld, nor shall it exceed the diameter stated in column 10 of Table 1.

The weld offset c shall not exceed the actual diameter of the wire by more than the value stated in column 9 of Table 1, and shall not be below the surface of the wire.

4.1.3 Position and extent of weld

The weld or welds shall be positioned equidistant about the centre of one or both legs of the link. The area affected dimensionally by welding shall not exceed the value given in column 11 of Table 1.

4.2 Pitch

The nominal pitch p of the link shall be as stated in column 3 of Table 1, and shall be subject to the tolerances shown in column 4 of that table.

4.3 Width of link

4.3.1 Inside width

The minimum inside width a of the link shall be as shown in column 5 of Table 1, except at the weld.

4.3.2 Outside width

The maximum outside width b of the link shall be as shown in column 6 of Table 1, except at the weld.

4.4 Length of link

The nominal length l_1 of the link shall be as stated in column 7 of Table 1 and shall be subject to the tolerances stated in column 8 of that table. This is the theoretical length of the link and may be greater than the actual overall length due to flattening during manufacture.

4.5 Multiple pitch length

4.5.1 Nominal multiple pitch length

The nominal multiple pitch length l (see Figure 1 and Annex B, Annex C and Annex D) is the nominal pitch of the chain multiplied by the number of links specified. The number of links per length (being an odd number) shall be stated at the time of ordering.

4.5.2 Tolerance on actual multiple pitch length

The actual multiple pitch length of the chain shall be measured on the chain in the finished condition under the setting force stated in Table 5 (See 6.5.3.)

The length so measured shall not vary from the sum of nominal inside lengths (i.e. pitches) of the individual links by more than

$$\pm \frac{p}{100} (1 + 0,15 n)$$

where

p is the nominal pitch,

n is the specified number of links.

4.6 Matching of lengths

Where chain is required in short lengths having a specified number of links for use in double or triple chain conveyors, it shall be ordered and supplied in "matched lengths".

When measured under the setting force stated in Table 5, the difference between any two matched lengths shall not be greater than:

- for lengths up to 2 m: 0,10 % of the multiple pitch length;
- for lengths greater than 2 m: 0,15 % of the multiple pitch length.

If the purchaser requires chain with tighter matching tolerances, they shall be the subject of special agreement between the purchaser and the manufacturer. An example of tighter matching tolerances is given in Annex C.

4.7 Mass

The approximate mass per metre of single chain calculated on nominal dimensions is stated in column 12 of Table 1.

5 Material and manufacture

5.1 Quality of material

The chain shall be made from steel which in its finished state as supplied to the chain manufacturer, shall meet the following requirements:

- The steel shall be fully killed and shall possess reliable welding properties.
- The content of sulphur and phosphorus shall be as shown in Table 2.

Table 2 — Content of sulphur and phosphorus

Element	Cast analysis		Check analysis	
	Quality B	Qualities C and D	Quality B	Qualities C and D
Sulphur, max.	0,040 %	0,030 %	0,045 %	0,035 %
Phosphorus, max.	0,035 %	0,030 %	0,040 %	0,035 %

- The steel shall be of such composition as to guarantee the mechanical properties of the chain after appropriate heat treatment. For grades C and D, an alloy steel containing alloying elements (such as nickel, chromium and molybdenum) shall be used. Care shall be exercised in the choice of steel so that the achievement of high ultimate tensile stress in the material does not result in the disproportionate loss of other properties, particularly notch toughness.