

Steel wire for mechanical springs —

Part 1: Patented cold drawn unalloyed spring steel wire

The European Standard EN 10270-1:2001 has the status of a
British Standard

ICS 77.140.25

National foreword

This British Standard is the official English language version of EN 10270-1:2001. It supersedes BS 5216:1991 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee ISE/26, Steel wire, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

Cross-references

A list of organizations represented on this committee can be obtained on request to its secretary.

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled “International Standards Correspondence Index”, or by using the “Find” facility of the BSI Standards Electronic Catalogue.

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This British Standard, having been prepared under the direction of the Engineering Sector Committee, was published under the authority of the Standards Committee and comes into effect on 15 May 2001

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This European Standard was approved by CEN on 19 February 2001.

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Foreword

This European Standard has been prepared by Technical Committee ECISS/TC 30, Steel wires, the Secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2001, and conflicting national standards shall be withdrawn at the latest by October 2001.

This European Standard for steel wire for mechanical springs is composed of the following parts:

Part 1: Patented cold drawn unalloyed spring steel wire.

Part 2: Oil hardened and tempered spring steel wire.

Part 3: Stainless spring steel wire.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

1.1 This part of EN 10270 applies to patented cold drawn unalloyed steel wire of circular cross-section for the manufacture of mechanical springs for static duty and dynamic duty applications.

1.2 In addition to this part of EN 10270 the general technical delivery requirements of EN 10021 are applicable.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 10002-1, *Metallic materials — Tensile test — Part 1: Method of test (at ambient temperature)*.

EN 10016-1, *Non-alloy steel rod for drawing and/or cold rolling — Part 1: General requirements*.

EN 10016-2, *Non-alloy steel rod for drawing and/or cold rolling — Part 2: Specific requirements for general purposes*.

EN 10016-4, *Non-alloy steel rod for drawing and/or cold rolling — Part 4: Specific requirements for rod for special applications*.

EN 10021, *General technical delivery requirements for steel and iron products*.

EN 10052, *Vocabulary of heat treatment terms for ferrous products*.

EN 10204, *Metallic products — Types of inspection documents*.

EN 10218-1:1994, *Steel wire and wire products — General — Part 1: Test methods*.

EN 10218-2:1996, *Steel wire and wire products — General — Part 2: Dimensions and tolerances*.

EN 10244-2, *Non-ferrous metallic coatings on wire — Part 2: Zinc and zinc alloy coatings for steel wire and products*.

CR 10261, *Iron and steel — Review of available methods of chemical analysis*.

EN ISO 377, *Steel and steel products — Location and preparation of samples and test pieces for mechanical testing*.

ISO 14284, *Steel and iron — Sampling and preparation of samples for the determination of chemical composition*.

EU 104¹⁾, *Determination of the decarburization depth of unalloyed and low alloyed structural steels*.

¹⁾ It may be agreed at the time of ordering, until this Euronorm has been adopted as a European Standard, that either this Euronorm or a corresponding national standard should be applied.

3 Terms and definitions

For the purposes of this standard the following terms and definitions apply.

3.1

patented cold drawn wire

wire drawn to size by cold deformation of a starting material that has been subjected to a thermal treatment of patenting (see EN 10052)

4 Classification and designation

4.1 Classification

The grade of spring wire used depends on the stress level and the nature of the duty. Where springs are subjected to static stresses or infrequent dynamic loading, a wire grade for static duty (S) shall be used. In the other cases with frequent or predominantly dynamic loading and where small coiling ratios or severe bending radius is required, a wire grade for dynamic duty (D) shall be used. Depending on the stress level, spring wire is manufactured in three tensile strength grades: low, medium and high.

Table 1 gives an overview of the different grades.

Table 1 — Spring wire grades

Tensile strength^a	Static	Dynamic
Low tensile strength	SL	-
Medium tensile strength	SM	DM
High tensile strength	SH	DH
^a For specific applications another tensile strength may be agreed.		

4.2 Designation

For products supplied according to this standard the designation shall state in the following order:

- the term: spring wire;
- the number of this European Standard: EN 10270-1;
- the wire grade (see Table 1);
- the required nominal diameter selected from Table 3;
- the coating indicated by its abbreviation (see 6.3).

EXAMPLE: Standard designation of a steel spring wire according to this standard of spring wire grade SM, with a nominal diameter of 2,50 mm, phosphate coated:

Spring wire EN 10270-1 - SM - 2,50 ph.

5 Information to be supplied by the purchaser

The purchaser shall clearly state in his enquiry or order the product and following information:

- a) the desired quantity;
- b) the number of this European Standard: EN 10270-1;
- c) wire grade, coating and surface finish (see 6.3);
- d) the nominal wire diameter;
- e) the form of delivery and unit mass (see 6.2);
- f) the type of inspection document;
- g) any particular agreement made.

EXAMPLE 5 t spring steel wire EN 10270-1 - SM - 2,50 ph
on spools of about 500 kg
inspection document EN 10204-3.1.B

6 Requirements

6.1 Material

6.1.1 General

Steel spring wire shall be made from steel corresponding to EN 10016-1 with in addition:

- for SL, SM and SH: EN 10016-2;
- for DM and DH: EN 10016-4.

6.1.2 Chemical composition

The chemical composition according to the heat analysis shall comply with the limit values shown in Table 2. The permissible deviation of the product analysis from the heat analysis shall be in accordance with EN 10016-2 and EN 10016-4 respectively.

Table 2 — Chemical composition, % by mass

Grade	C ^a	Si	Mn ^b	P max.	S max.	Cu max.
SL, SM, SH	0,35-1,00	0,10-0,30	0,50-1,20	0,035	0,035	0,20
DM, DH	0,45-1,00	0,10-0,30	0,50-1,20	0,020	0,025	0,12
^a Such a wide range is stipulated to accommodate the whole range of sizes. For individual sizes the carbon range is substantially more restricted. ^b The range of manganese content in the table is wide to cope with various processing situations and the broad size range. The actual figures per size shall be more restricted.						

The addition of micro-alloying elements may be agreed between the manufacturer and the purchaser.

NOTE Some diameter ranges require particular attention for residuals. Therefore no figures are mentioned for chromium, nickel, molybdenum, tin, etc., leaving room for special arrangements between purchaser and supplier, dependent on their mutual processing conditions. This is also the case for the aluminium content.

6.2 Form of delivery

The wire shall be delivered in unit packages of a coil, individualized or on carriers, or a spool or spoolless core or as straight lengths.

Unless otherwise agreed at the time of ordering, the form of delivery will be coils; straight lengths shall be supplied in bundles.

6.3 Coating and surface finish

The spring wire may be supplied phosphate coated (ph) either dry drawn or wet drawn, copper coated (Cu), zinc (Z) or zinc/aluminium (ZA) coated.

Other coatings, considered as special, can be agreed between the purchaser and the supplier (see annex A).

If no specific surface finish is specified, the type of finish shall be at the manufacturer's discretion.

In addition, the wire can be ordered with an oiled surface for all surface finishes.

6.4 Mechanical properties

For the tensile strength (R_m) and reduction in area after fracture (Z), the wire grades shall satisfy the values listed in Table 3. Reduction of area shall be measured only for wire diameter 0,80 mm and above.

The range of tensile strength values within a unit package shall not exceed the values of Table 4.