SLOVENSKI STANDARD
SIST EN 10270-1:2002

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Jeklena ǵica za vzmeti - 1. del: Patentirana hladno vleḷ ena nelegirana jeklena ǵica za vzmeti

Steel wire for mechanical springs - Part 1: Patented cold drawn unalloyed spring steel wire

Stahldraht für Federn - Teil 1: Patentiert-gezogener unlegierter Federstahldraht

Fils en acier pour ressorts mécaniques - Partie 1: Fils pour ressorts en acier non allié, patentés, tréfilés a froid

Ta slovenski standard je istoveten z: EN 10270-1:2001

ICS:

77.140.25	Vzmetna jekla	Spring steels
77.140.65	Jeklene žice, jeklene vrvi in verige	Steel wire, wire ropes and link chains

SIST EN 10270-1:2002 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 10270-1

April 2001

ICS 77.140.25; 77.140.65

English version

Steel wire for mechanical springs - Part 1: Patented cold drawn unalloyed spring steel wire

Fils en acier pour ressorts mécaniques - Partie 1: Fils pour ressorts en acier non allié, patentés, tréfilés à froid

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

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

Ref. No. EN 10270-1:2001 E

Contents

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of an identical text or by endorsement, at the latest by October 2001, and conflicting national standards shall be withdrawn at the latest by October 2001.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 treatments 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 104[1)] , *Determination of the decarburization depth of unalloyed and low alloyed structural steels*

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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 term and definition 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 3 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.

Table 3 — Mechanical properties [a b] and quality requirements for wire grades SL, SM, DM, SH and DH

1	2	3	4	5	6	7	8	9	10	11	12	13
Wire diameter d[a]		Mass kg/1000 m	Tensile strength R_m [c d e] For wire grades					Minimum reduction in area after fracture Z for wire grades SL, SM, SH, DM and DH	Minimum number of twists in the torsion test for wire grades SL, SM, SH, DM and DH	Permissible depth of surface defects for wire grades DM, DH	Permissible decarburi-zation depth for wire grades DM, DH	Wire diameter d (nominal size)
Nominal size mm	Permissible Deviations mm		SL MPa	SM MPa	DM MPa	SH MPa	DH[f] MPa	%	[d]	mm	mm	mm
0,05		0,0154					2800 to 3520					0,05
0,06		0,0222					2800 to 3520					0,06
0,07	± 0,003	0,0302					2800 to 3520					0,07
0,08		0,0395					2800 to 3480					0,08
0,09		0,0499					2800 to 3430					0,09
0,10		0,0617					2800 to 3380					0,10
0,11		0,0746					2800 to 3350					0,11
0,12	± 0,004	0,0888					2800 to 3320					0,12
0,14		0,121					2800 to 3250					0,14
0,16		0,158					2800 to 3200		coiling test as specified in 7.4.3	- [g]	- [g]	0,16
0,18		0,200					2800 to 3160					0,18
0,20	± 0,005	0,247					2800 to 3110					0,20
0,22		0,298					2770 to 3080					0,22
0,25		0,385					2720 to 3010					0,25
0,28		0,488					2680 to 2970					0,28
0,30		0,555		2370 to 2650	2370 to 2650	2660 to 2940	2660 to 2940					0,30
0,32	± 0,008	0,631		2350 to 2630	2350 to 2630	2640 to 2920	2640 to 2920					0,32
0,34		0,713		2330 to 2600	2330 to 2600	2610 to 2890	2610 to 2890					0,34
0,36		0,799		2310 to 2580	2310 to 2580	2590 to 2870	2590 to 2870					0,36
0,38		0,890		2290 to 2560	2290 to 2560	2570 to 2850	2570 to 2850					0,38

Table 3 — Mechanical properties [a b] and quality requirements for wire grades SL, SM, DM, SH and DH (continued)

1	2	3	4	5	6	7	8	9	10	11	12	13
Wire diameter d[a]		Mass kg/1000 m	Tensile strength R_m [c d e] For wire grades					Minimum reduction in area after fracture Z for wire grades SL, SM, SH, DM and DH	Minimum number of twists in the torsion test for wire grades SL, SM, SH, DM and DH	Permissible depth of surface defects for wire grades DM, DH	Permissible decarburi-zation depth for wire grades DM, DH	Wire diameter d (nominal size)
Nominal size mm	Permissible Deviations mm		SL MPa	SM MPa	DM MPa	SH MPa	DH[f] MPa	%	[d]	mm	mm	mm
0,40		0,985		2270 to 2550	2270 to 2550	2560 to 2830	2560 to 2830					0,40
0,43		1,14		2250 to 2520	2250 to 2520	2530 to 2800	2530 to 2800					0,43
0,45		1,25		2240 to 2500	2240 to 2500	2510 to 2780	2510 to 2780					0,45
0,48		1,42		2220 to 2480	2220 to 2480	2490 to 2760	2490 to 2760					0,48
0,50	± 0,008	1,54		2200 to 2470	2200 to 2470	2480 to 2740	2480 to 2740		coiling test as specified in 7.4.3			0,50
0,53		1,73		2180 to 2450	2180 to 2450	2460 to 2720	2460 to 2720					0,53
0,56		1,93		2170 to 2430	2170 to 2430	2440 to 2700	2440 to 2700			- [g]	- [g]	0,56
0,60		2,22		2140 to 2400	2140 to 2400	2410 to 2670	2410 to 2670					0,60
0,63		2,45		2130 to 2380	2130 to 2380	2390 to 2650	2390 to 2650					0,63
0,65		2,60		2120 to 2370	2120 to 2370	2380 to 2640	2380 to 2640					0,65
0,70	± 0,010	3,02		2090 to 2350	2090 to 2350	2360 to 2610	2360 to 2610					0,70
0,75		3,47		2070 to 2320	2070 to 2320	2330 to 2580	2330 to 2580					0,75
0,80		3,95		2050 to 2300	2050 to 2300	2310 to 2560	2310 to 2560					0,80
0,85	± 0,015	4,45		2030 to 2280	2030 to 2280	2290 to 2530	2290 to 2530					0,85
0,90		4,99		2010 to 2260	2010 to 2260	2270 to 2510	2270 to 2510					0,90
0,95		5,59		2000 to 2240	2000 to 2240	2250 to 2490	2250 to 2490		25			0,95
1,00		6,17	1720 to 1970	1980 to 2220	1980 to 2220	2230 to 2470	2230 to 2470					1,00
1,05		6,80	1710 to 1950	1960 to 2200	1960 to 2200	2210 to 2450	2210 to 2450			1 % max. of wire diameter	1.5 % max. of wire diameter	1,05
1,10	± 0,020	7,46	1690 to 1940	1950 to 2190	1950 to 2190	2200 to 2430	2200 to 2430	40				1,10
1,20		8,88	1670 to 1910	1920 to 2160	1920 to 2160	2170 to 2400	2170 to 2400					1,20