SIST

SLOVENSKI STANDARD
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Vijaļ ne valjaste vzmeti iz okrogle ģice - Specifikacija kakovosti za hladno oblikovane tlaļ ne vzmeti

Cylindrical helical springs made of round wire - Quality specifications for cold coiled compression springs

Zylindrische Schraubenfedern aus runden Drähten - Gütevorschriften für kaltgeformte Druckfedern

Ressorts cylindriques hélicoïdaux en fils ronds - Prescriptions de qualité des ressorts de compression façonnés à froid

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English Version

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Foreword

This document (EN 15800:2008) has been prepared by Technical Committee CEN/TC 378 "Project Committee – Springs", the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by June 2009, and conflicting national standards shall be withdrawn at the latest by June 2009.

This European Standard has been prepared by the initiative of the Association of the European Spring Federation ESF and is based on the German Standard DIN 2095 "Helical springs made of round wire — Specification for cold coiled compression springs", which is known and used in many European countries.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

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

1 Scope

This European Standard applies to cylindrical helical compression springs made of round spring wire. Cold coiled compression springs can be made with wire up to about 16 mm diameter. (See also EN 13906-1).

Cylindrical helical springs made of round wire from European Standard materials are subject to the limiting values in Table 1:

Table 1

Characteristic	Cold coiled compression springs
Wire diameter	0,07 mm ≤ d ≤ 16 mm
Mean coil diameter	0,63 mm ≤ D ≤ 200 mm
Length of unloaded spring	L_o ≤ 630 mm
Number of active coils	$n \geq 2$
Spring index	4 ≤ w ≤ 20

A specification for the parameters of cold formed helical compression springs is given in Annex B.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 10270-1, *Steel wire for mechanical springs — Part 1: Patented cold drawn unalloyed spring steel wire*

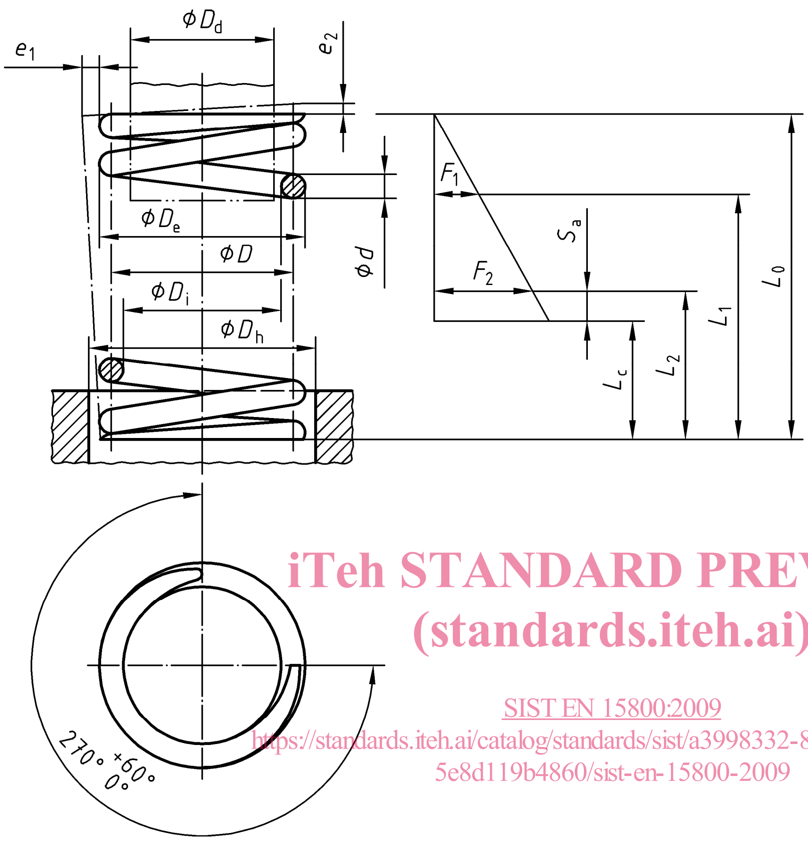
EN 10270-2, *Steel wire for mechanical springs — Part 2: Oil hardened and tempered spring steel wire*

EN 10270-3, *Steel wire for mechanical springs — Part 3: Stainless spring steel wire*

EN 12166, *Copper and copper alloys — Wire for general purposes*

3 Representation

Dimensions in millimetres



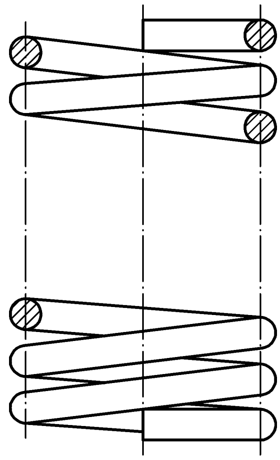


Figure 1 — Type 1 Spring ends closed and ground (with theoretical characteristic)

Figure 2 — Type 2 Spring ends closed

4 Definitions, symbols, units and terms

Table 2

Symbols	Units	Terms
a_F	N	Value for determining variations of spring force and spring length (effect of geometry and dimensions)
A_D	mm	Permissible variation of coil diameter (D_e, D_i, D) of unloaded spring
A_F	N	Permissible variation of spring force F at given spring length L
A_{L0}	mm	Permissible variation of length L_0 of unloaded spring
d	mm	Nominal diameter of wire (or bar)
d_{max}	mm	Upper deviation of d
D_e	mm	Outside diameter of spring
D_d	mm	Mandrel diameter (inner guide)
D_h	mm	Sleeve diameter (outer guide)
D_i	mm	Inside diameter of spring
$D = \frac{D_e + D_i}{2}$	mm	Mean diameter of spring
e_1	mm	Permissible variation of squareness of the unloaded ground spring
e_2	mm	Permissible variation in parallelism of the ground spring bearing surfaces, measured for D_e
F	N	Spring force
$F_1, F_2 \ldots\ldots$	N	Spring forces for the spring lengths L_1, L_2 (at ambient temperature of 20 °C)
$F_{c\,th}$	N	Theoretical spring force at solid length L_c NOTE The actual spring force at the solid length is as a rule greater than the theoretical force.
k_f	—	Factor for determining variations of spring force and spring length (effect of active coils)
L	mm	Spring length
L_0	mm	Nominal free length of spring
L_1	mm	Length at smallest test load F_1
$L_1, L_2 \ldots\ldots$	mm	Spring lengths for the spring forces F_1, $F_2 \ldots\ldots$
L_c	mm	Solid length
L_n	mm	Minimum permissible spring length (depending upon S_a)
n	—	Number of active coils
n_t	—	Total number of coils
Q	—	Coefficient of quality grade
$R = \frac{\Delta F}{\Delta s}$	N/mm	Spring rate
s_1 , $s_2 \ldots.$	mm	Spring deflections, for the spring forces F_1, $F_2 \ldots.$
s_c	mm	Spring deflection for the solid length L_c
s_h	mm	Deflection of spring (stroke) between two positions
S_a	mm	Sum of minimum gaps between adjacent active coils at spring length L_n
$w = \frac{D}{d}$	—	Spring index
$\lambda = \frac{L_0}{d}$	—	Slenderness ratio

5 Requirements

5.1 Coiling direction

Compression springs are generally made with right-hand coiling, or with alternating right-hand and left-hand coiling for nested spring assemblies; in this case the outer spring is usually right-hand coiled. If left-hand coiling for springs is required, this shall be obvious from the note "left-hand coiled" which shall appear in drawings or enquiries and order documents. See Annex B.

5.2 Spring ends

The spring ends whereby the spring force is transmitted to the connecting components shall be designed so that the deflection of the spring is as nearly axial as possible in every position of the spring. This is generally achieved by reducing the pitch of one finishing coil at each end. To obtain adequate bearing surfaces perpendicular to the spring axis, the wire ends are ground in accordance with Figure 1.

If grinding of the spring ends is found to be inexpedient, the spring should be made according to Figure 2, that means without ground wire ends. In all cases the type of finish for the spring ends shall be stated in one of the contractual documents: descriptive, drawings or enquiries and order documents. See Annex B.

If unground spring ends are acceptable for the particular use concerned, e.g. when the compression springs are made of wire having a diameter less than approximately 1 mm or with a spring index over 15, grinding of the wire ends should be omitted for economic reasons. See Annex B.

When the compression springs are made of wire having a diameter under 0,3 mm the wire ends should not be ground.

With regard to the simultaneous grinding of the spring ends of compression springs having a wire diameter from 0,3 mm up to about 5 mm it should be noted that only springs which allow adequate contact pressure can be ground flat.

Tests so far carried out indicate that this contact pressure shall amount to approximately

$$\frac{R}{d} \geq 0{,}03 \text{ N/mm}^2 \quad (1)$$

The spring ends should only be deburred if this is required for proper functioning, and shall be agreed between the spring manufacturer and the customer. This information shall be included in enquiries, drawings, and orders. See Annex B.

5.3 Solid length L_c

(all coils are closed)

For springs with ground ends according to Figure 1, the solid length is:

$$L_c \leq n_t \cdot d_{max} \quad (2)$$

For springs without ground ends according to Figure 2, the following applies:

$$L_c \leq (n_t + 1{,}5) \cdot d_{max} \quad (3)$$

where

n_t = $n + 2$

2 = Number of non-active coils