

# SVENSK STANDARD

## SS-EN 10270-2:2011

Fastställt/Approved: 2011-11-07  
Publicerad/Published: 2011-11-16  
Utgåva/Edition: 2  
Språk/Language: engelska/English  
ICS: 77.140.25; 77.140.65

---

### **Fjädertråd – Del 2: Oljehärdad fjädertråd**

### **Steel wire for mechanical springs – Part 2: Oil hardened and tempered spring steel wire**



# Standarder får världen att fungera

*SIS (Swedish Standards Institute) är en fristående ideell förening med medlemmar från både privat och offentlig sektor. Vi är en del av det europeiska och globala nätverk som utarbetar internationella standarder. Standarder är dokumenterad kunskap utvecklad av framstående aktörer inom industri, näringsliv och samhälle och befrämjar handel över gränser, bidrar till att processer och produkter blir säkrare samt effektiviserar din verksamhet.*

## Delta och påverka

Som medlem i SIS har du möjlighet att påverka framtida standarder inom ditt område på nationell, europeisk och global nivå. Du får samtidigt tillgång till tidig information om utvecklingen inom din bransch.

## Ta del av det färdiga arbetet

Vi erbjuder våra kunder allt som rör standarder och deras tillämpning. Hos oss kan du köpa alla publikationer du behöver – allt från enskilda standarder, tekniska rapporter och standardpaket till handböcker och onlinetjänster. Genom vår webbtjänst e-nav får du tillgång till ett lättnavigerat bibliotek där alla standarder som är aktuella för ditt företag finns tillgängliga. Standarder och handböcker är källor till kunskap. Vi säljer dem.

## Utveckla din kompetens och lyckas bättre i ditt arbete

Hos SIS kan du gå öppna eller företagsinterna utbildningar kring innehåll och tillämpning av standarder. Genom vår närhet till den internationella utvecklingen och ISO får du rätt kunskap i rätt tid, direkt från källan. Med vår kunskap om standarders möjligheter hjälper vi våra kunder att skapa verklig nytta och lönsamhet i sina verksamheter.

**Vill du veta mer om SIS eller hur standarder kan effektivisera din verksamhet är du välkommen in på [www.sis.se](http://www.sis.se) eller ta kontakt med oss på tel 08-555 523 00.**



# Standards make the world go round

*SIS (Swedish Standards Institute) is an independent non-profit organisation with members from both the private and public sectors. We are part of the European and global network that draws up international standards. Standards consist of documented knowledge developed by prominent actors within the industry, business world and society. They promote cross-border trade, they help to make processes and products safer and they streamline your organisation.*

## Take part and have influence

As a member of SIS you will have the possibility to participate in standardization activities on national, European and global level. The membership in SIS will give you the opportunity to influence future standards and gain access to early stage information about developments within your field.

## Get to know the finished work

We offer our customers everything in connection with standards and their application. You can purchase all the publications you need from us - everything from individual standards, technical reports and standard packages through to manuals and online services. Our web service e-nav gives you access to an easy-to-navigate library where all standards that are relevant to your company are available. Standards and manuals are sources of knowledge. We sell them.

## Increase understanding and improve perception

With SIS you can undergo either shared or in-house training in the content and application of standards. Thanks to our proximity to international development and ISO you receive the right knowledge at the right time, direct from the source. With our knowledge about the potential of standards, we assist our customers in creating tangible benefit and profitability in their organisations.

**If you want to know more about SIS, or how standards can streamline your organisation, please visit [www.sis.se](http://www.sis.se) or contact us on phone +46 (0)8-555 523 00**



Europastandarden EN 10270-2:2011 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av EN 10270-2:2011.

Denna standard ersätter SS-EN 10270-2, utgåva 1.

The European Standard EN 10270-2:2011 has the status of a Swedish Standard. This document contains the official version of EN 10270-2:2011.

This standard supersedes the Swedish Standard SS-EN 10270-2, edition 1.

© Copyright/Upphovsrätten till denna produkt tillhör SIS, Swedish Standards Institute, Stockholm, Sverige. Användningen av denna produkt regleras av slutanvändarlicensen som återfinns i denna produkt, se standardens sista sidor.

© Copyright SIS, Swedish Standards Institute, Stockholm, Sweden. All rights reserved. The use of this product is governed by the end-user licence for this product. You will find the licence in the end of this document.

*Uppllysningar om sakinnehållet i standarden lämnas av SIS, Swedish Standards Institute, telefon 08-555 520 00. Standarder kan beställas hos SIS Förlag AB som även lämnar allmänna uppllysningar om svensk och utländsk standard.*

*Information about the content of the standard is available from the Swedish Standards Institute (SIS), telephone +46 8 555 520 00. Standards may be ordered from SIS Förlag AB, who can also provide general information about Swedish and foreign standards.*

Denna standard är framtagen av kommittén för Tråd och trådprodukter, SIS/TK 138.

Har du synpunkter på innehållet i den här standarden, vill du delta i ett kommande revideringsarbete eller vara med och ta fram andra standarder inom området? Gå in på [www.sis.se](http://www.sis.se) - där hittar du mer information.



EUROPEAN STANDARD

**EN 10270-2**

NORME EUROPÉENNE

EUROPÄISCHE NORM

October 2011

ICS 77.140.25

Supersedes EN 10270-2:2001

English Version

## Steel wire for mechanical springs - Part 2: Oil hardened and tempered spring steel wire

Fils en acier pour ressorts mécaniques - Partie 2: Fils en acier trempés à l'huile et revenus

Stahldraht für Federn - Teil 2: Ölschlussvergüteter Federstahldraht

This European Standard was approved by CEN on 10 September 2011.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

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 CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, 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 United Kingdom.



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

**Management Centre: Avenue Marnix 17, B-1000 Brussels**

## Contents

Page

Foreword.....	3
1 Scope .....	4
2 Normative references .....	4
3 Terms and definitions .....	4
4 Classification.....	5
5 Information to be supplied by the purchaser .....	5
6 Requirements .....	6
6.1 Form of delivery .....	6
6.2 Surface finish .....	6
6.3 Chemical composition .....	6
6.4 Non metallic inclusions.....	6
6.5 Mechanical properties.....	6
6.6 Technological properties .....	12
6.7 Surface quality .....	12
6.8 Dimensions and dimensional tolerances.....	13
7 Testing and inspection.....	14
7.1 Inspection and inspection documents .....	14
7.2 Extent of testing for specific inspection .....	14
7.3 Sampling .....	14
7.4 Test methods.....	15
7.5 Retests .....	16
8 Marking and packaging.....	16
Annex A (informative) Additional information.....	18
A.1 Modulus of elasticity and shear modulus at room temperature.....	18

## Foreword

This document (EN 10270-2:2011) has been prepared by Technical Committee ECISS/TC 106 “Wire rod and wires”, the secretariat of which is held by AFNOR.

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 April 2012, and conflicting national standards shall be withdrawn at the latest by April 2012.

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.

This document supersedes EN 10270-2:2001.

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, Bulgaria, Croatia, 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

1.1 This European Standard applies to oil hardened and tempered spring steel wire made from unalloyed or alloyed steels. They are primarily subject to torsional stresses such as in coil springs for compression and extension and in special cases also for applications where the spring wire is subject to bending stresses such as lever springs.

As a rule unalloyed steels are used for applications at room temperature whereas alloyed steels are generally used at a temperature above room temperature. Alloyed steels may also be chosen for above average tensile strengths.

1.2 In addition to this European Standard, the general technical delivery requirements of EN 10021 are applicable.

## 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 10021, *General technical delivery conditions for steel products*

EN 10204:2004, *Metallic products — Types of inspection documents*

EN 10218-1:2011, *Steel wire and wire products — General — Part 1: Test methods*

EN 10218-2, *Steel wire and wire products — General — Part 2: Wire dimensions and tolerances*

EN 10247, *Micrographic examination of the non-metallic inclusion content of steels using standard pictures*

CEN/TR 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 377:1997)*

EN ISO 3887, *Steels — Determination of depth of decarburization (ISO 3887:2003)*

EN ISO 6892-1, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature (ISO 6892-1:2009)*

EN ISO 14284, *Steel and iron — Sampling and preparation of samples for the determination of chemical composition (ISO 14284:1996)*

ISO 7800, *Metallic materials — Wire — Simple torsion test*

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1  
**oil hardened and tempered spring steel wire**  
wire that is heat treated in line in the following way: it is first transformed into austenite, quenched in oil or similar quenching medium, followed immediately by tempering by heating to the appropriate temperature



## 4 Classification

This standard deals with all types of hardened and tempered spring steel wire. The grade for normal applications made from unalloyed or alloyed steel has the abbreviation FD and is intended for static applications.

Spring steel wire for medium fatigue levels, such as required for some clutch springs from unalloyed or alloyed steel, has the abbreviation TD.

Spring steel wire from unalloyed steel or alloyed steel intended for use under severe dynamic duty such as for valve springs or other springs with similar requirements has the abbreviation VD.

The diameter ranges for the various wire grades are shown in Table 1.

**Table 1 — Spring wire grades and diameter range**

Tensile strength	Static	Medium fatigue	High fatigue
Low tensile strength	FDC	TDC	VDC
Medium tensile strength	FDCrV	TDCrV	VDCrV
High tensile strength	FDSiCr	TDSiCr	VDSiCr
Very high tensile strength	FDSiCrV	TDSiCrV	VDSiCrV
Diameter range (mm)	0,50 to 17,00	0,50 to 10,00	0,50 to 10,00

Medium and high fatigue grades TD and VD are characterized by high steel cleanliness, specific chemical, mechanical and technological parameters and a well defined surface condition in relation to the allowable depth of surface defects and decarburization.

The static grade FD is characterized by its chemical, mechanical and technological characteristics as well as by a specified surface condition concerning surface defects and decarburization.

## 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 term spring steel wire or straightened and cut lengths;
- c) the number of this European standard: EN 10270-2;
- d) the steel grade (see Tables 1 and 2);
- e) the nominal wire diameter selected from Tables 4 or 5 and for cut length the length and the length tolerance class (see Table 9);
- f) the form of delivery and unit mass (see 6.1);
- g) the type of inspection document;
- h) any particular agreement.

EXAMPLE 5 t oil hardened and tempered spring steel wire according to this standard, grade VDC, nominal diameter 2,50 mm in coils of about 300 kg; inspection document 3.1 according to EN 10204:2004:

5 t spring steel wire EN 10270-2 – VDC-2,50 in coils of about 300 kg; EN 10204:2004 – 3.1

## 6 Requirements

### 6.1 Form of delivery

**6.1.1** Oil hardened and tempered wire shall be supplied in coils, on spools or in cut lengths. The wire in coils or on spools shall form one continuous length. Wire in coil may also be supplied on carriers containing one or more coils.

For "VD" and "TD" grades no welds are permitted after the heat treatments preceding the final drawing operation; for "FD" grades no welds shall be made at finished size unless agreed otherwise between the parties.

**6.1.2** The supplied wire units shall be tightly bound to ensure that wire spiral waps do not spring out unexpectedly. The starting end shall be marked and at the coil ends the wire shall be covered with a protective cap.

### 6.2 Surface finish

The wire shall be protected against corrosion and mechanical damage. Unless otherwise specified the wire shall be delivered in slightly oiled condition.

### 6.3 Chemical composition

The steel is characterized by the heat analysis which shall be in accordance with the values of Table 2. The permissible deviation of the product analysis from the limiting values of heat analysis shall be in accordance with Table 3.

### 6.4 Non metallic inclusions

The "VD" grades shall be checked for maximum size of inclusion according to EN 10247. The allowable level of inclusions shall be agreed between the parties at the enquiry and order.

### 6.5 Mechanical properties

For tensile strength  $R_m$  and reduction in area after fracture ( $Z$ ) the wire grades shall satisfy the values listed in Tables 4 and 5. Reduction of area is measured only for size 1,00 mm and above (see Tables 4, 5 and 11).

The range of the tensile strength values within a coil/reel shall not exceed 50 MPa for the grades "VD", 60 MPa for the grades "TD" and 70 MPa for the grades "FD".

**Table 2 — Chemical composition, % by mass**

Grade	C	Si	Mn <sup>a</sup>	P max.	S max.	Cu max.	Cr	V
VDC	0,60 to 0,75	0,15 to 0,30	0,50 to 1,00	0,020	0,020	0,06	- <sup>b</sup>	-
VDCrV	0,62 to 0,72	0,15 to 0,30	0,50 to 0,90	0,025	0,020	0,06	0,40 to 0,60	0,15 to 0,25
VDSiCr	0,50 to 0,60	1,20 to 1,60	0,50 to 0,90	0,025	0,020	0,06	0,50 to 0,80	-
VDSiCrV	0,50 to 0,70	1,20 to 1,65	0,40 to 0,90	0,020	0,020	0,06	0,50 to 1,00	0,10 to 0,25 <sup>c</sup>
TDC	0,60 to 0,75	0,10 to 0,35	0,50 to 1,20	0,020	0,020	0,10	- <sup>b</sup>	-
TDCrV	0,62 to 0,72	0,15 to 0,30	0,50 to 0,90	0,025	0,020	0,10	0,40 to 0,60	0,15 to 0,25
TDSiCr	0,50 to 0,60	1,20 to 1,60	0,50 to 0,90	0,025	0,020	0,10	0,50 to 0,80	-
TDSiCrV	0,50 to 0,70	1,20 to 1,65	0,40 to 0,90	0,020	0,020	0,10	0,50 to 1,00	0,10 to 0,25 <sup>c</sup>
FDC	0,60 to 0,75	0,10 to 0,35	0,50 to 1,20	0,030	0,025	0,12	- <sup>b</sup>	-
FDCrV	0,62 to 0,72	0,15 to 0,30	0,50 to 0,90	0,030	0,025	0,12	0,40 to 0,60	0,15 to 0,25
FDSiCr	0,50 to 0,60	1,20 to 1,60	0,50 to 0,90	0,030	0,025	0,12	0,50 to 0,80	-
FDSiCrV	0,50 to 0,70	1,20 to 1,65	0,40 to 0,90	0,030	0,025	0,12	0,50 to 1,00	0,10 to 0,25

<sup>a</sup> Manganese may be ordered with restricted range, but with a minimum range of 0,20 %.

<sup>b</sup> For heavy wire diameter (above 8,5 mm) chromium may be added up to 0,30 % for proper through hardening.

<sup>c</sup> For medium and high fatigue grades the range of vanadium content can be limited to 0,05 % to 0,15 %

**Table 3 — Permissible deviation of the product analysis from the limiting values for the heat analysis**

Chemical element	Wire grade	Permissible deviation % by mass
C	All	± 0,03
Si	SiCr, SiCrV	± 0,05
	other grades	± 0,03
Mn	All	± 0,04
P	All	+ 0,005
S	All	+ 0,005
Cu	All	+ 0,02
Cr	All	± 0,05
V	All	± 0,02