Oil Tempered Steel

Chemical Composition

CHEMICAL COMPOSITION - STEEL TEMPERED IN OIL AND QUENCHED FOR MECHANICAL SPRINGS EN 10270-2

		Chemical composition mass %							
EN		C	Si	Mn	P	S	Cu	Cr	V
DESIG.	STANDARD	%	%	%	max. %	max. %	max. %	%	%
FDC	EN 10270-2	0.60-0.75	0.10-0.35	0.50-1.20	0.03	0.025	0.12	-	-
FDSiCr	EN 10270-2	0.50-0.60	1.20-1.60	0.50-0.90	0.03	0.025	0.12	0.50-0.80	-
FDSiCrV	EN 10270-2	0.50-0.70	1.20-1.65	0.40-0.90	0.03	0.025	0.12	0.50-1.00	0.10-0.25
TDSiCr	EN 10270-2	0.50-0.60	1.20-1.60	0.50-0.90	0.025	0.02	0.1	0.50-0.80	-
TDSiCrV	EN 10270-2	0.50-0.70	1.20-1.65	0.40-0.90	0.02	0.02	0.1	0.50-1.00	0.10-0.25
VDSiCr	EN 10270-2	0.50-0.60	1.20-1.60	0.50-0.90	0.025	0.02	0.06	0.50-0.80	-
VDSiCrV	EN 10270-2	0.50-0.70	1.20-1.65	0.40-0.90	0.02	0.02	0.06	0.50-1.00	0.10-0.25

Wire rods used for TD and VD, with few impurities present

Equivalents

Approximate equivalent				
EN		US (AISI)	Japan (JIS)	CHINESE
DESIG.	STANDARD	ASTM	JIS G3560	GB / T 18983
FDC	EN 10270-2	A 229	SWO-A B	FDC
FDSiCr	EN 10270-2	A 401	SWOSC-B	FDCrSi
FDSiCrV	EN 10270-2	-	-	-
TDSiCr	EN 10270-2	A 1000-5 Grade A	-	TDCrSi
TDSiCrV	EN 10270-2	2 A 1000-5 Grade D	-	-
VDSiCr	EN 10270-2	A 877	SWOSC-V	VDCrSi
VDSiCrV	EN 10270-2	-	-	-

Mechanical properties

MECHANICAL PROPERTIES

Steel for springs tempered in oil and quenched EN 10270-2:2011

Diameter of the wire	Tensile strength Rm (N/mm2)						
Nominal value mm	FDC	FDSiCr	FDSiCrV	TDSiCr	TDSiCrV	VDSiCr	VDSiCrV
0.50	1900-2100	2100-2300	2280-2430	2080-2230	2230-2380	2080-2230	2230-2380
0.55	1900-2100	2100-2300	2280-2430	2080-2230	2230-2380	2080-2230	2230-2380
0.60	1900-2100	2100-2300	2280-2430	2080-2230	2230-2380	2080-2230	2230-2380
0.65	1900-2100	2100-2300	2280-2430	2080-2230	2230-2380	2080-2230	2230-2380
0.70	1900-2100	2100-2300	2280-2430	2080-2230	2230-2380	2080-2230	2230-2380
0.75	1900-2100	2100-2300	2280-2430	2080-2230	2230-2380	2080-2230	2230-2380
0.80	1900-2100	2100-2300	2280-2430	2080-2230	2230-2380	2080-2230	2230-2380
0.85	1860-2060	2100-2300	2280-2430	2080-2230	2230-2380	2080-2230	2230-2380
0.90	1860-2060	2100-2300	2280-2430	2080-2230	2230-2380	2080-2230	2230-2380
0.95	1860-2060	2100-2300	2280-2430	2080-2230	2230-2380	2080-2230	2230-2380
1.00	1860-2060	2100-2300	2280-2430	2080-2230	2230-2380	2080-2230	2230-2380
1.05	1810-2010	2070-2260	2280-2430	2080-2230	2230-2380	2080-2230	2230-2380
1.10	1810-2010	2070-2260	2280-2430	2080-2230	2230-2380	2080-2230	2230-2380
1.20	1810-2010	2070-2260	2280-2430	2080-2230	2230-2380	2080-2230	2230-2380
1.30	1810-2010	2070-2260	2280-2430	2080-2230	2230-2380	2080-2230	2230-2380
1.40	1790-1970	2060-2250	2260-2410	2060-2210	2210-2360	2060-2210	2210-2360
1.50	1760-1940	2040-2220	2260-2410	2060-2210	2210-2360	2060-2210	2210-2360
1.60	1760-1940	2040-2220	2260-2410	2060-2210	2210-2360	2060-2210	2210-2360
1.70	1730-1890	2000-2180	2210-2360	2010-2160	2130-2310	2010-2160	2130-2310
1.80	1730-1890	2000-2180	2210-2360	2010-2160	2130-2310	2010-2160	2130-2310
1.90	1730-1890	2000-2180	2210-2360	2010-2160	2130-2310	2010-2160	2130-2310
2.00	1730-1890	2000-2180	2210-2360	2010-2160	2130-2310	2010-2160	2130-2310
2.25	1670-1820	1970-2140	2160-2310	1960-2060	2100-2250	1960-2060	2100-2250

Diameter of the wire	Tensile strength Rm (N/mm2)						
Nominal value mm	FDC	FDSiCr	FDSiCrV	TDSiCr	TDSiCrV	VDSiCr	VDSiCrV
2.50	1670-1820	1970-2140	2160-2310	1960-2060	2100-2250	1960-2060	2100-2250
2.70	1640-1790	1950-2120	2110-2260	1910-2010	2060-2210	1910-2010	2060-2210
3.00	1620-1770	1930-2100	2110-2260	1910-2010	2060-2210	1910-2010	2060-2210
3.20	1600-1750	1910-2080	2110-2260	1910-2010	2060-2210	1910-2010	2060-2210
3.50	1580-1730	1900-2060	2110-2260	1910-2010	2010-2160	1910-2010	2010-2160
4.00	1550-1700	1870-2030	2060-2210	1860-1960	2010-2160	1860-1960	2010-2160
4.20	1540-1690	1860-2020	2060-2210	1860-1960	1960-2110	1860-1960	1960-2110
4.50	1520-1670	1850-2000	2060-2210	1860-1960	1960-2110	1860-1960	1960-2110
4.70	1510-1660	1840-1990	2010-2160	1810-1910	1960-2111	1810-1910	1960-2111
5.00	1500-1650	1830-1980	2010-2160	1810-1910	1690-2110	1810-1910	1690-2110
5.60	1470-1620	1800-1950	2010-2160	1810-1910	1910-2060	1810-1910	1910-2060
6.00	1460-1610	1780-1930	1960-2110	1760-1860	1910-2060	1760-1860	1910-2060
6.50	1440-1590	1760-1910	1960-2110	1760-1860	1910-2060	1760-1860	1910-2060
7.00	1430-1580	1740-1890	1960-2110	1710-1810	1860-2010	1710-1810	1860-2010
7.50	1400-1550	1710-1860	1910-2050	1710-1810	1680-2010	1710-1810	1680-2010
8.00	1400-1550	1710-1860	1910-2050	1710-1810	1680-2010	1710-1810	1680-2010
8.50	1380-1530	1700-1850	1890-2030	1670-1770	1810-1960	1670-1770	1810-1960
9.00	1360-1510	1660-1810	1870-2010	1670-1770	1810-1960	1670-1770	1810-1960
9.50	1360-1510	1660-1810	1870-2010	1670-1770	1810-1960	1670-1770	1810-1960
10.00	1360-1510	1660-1810	1870-2010	1670-1770	1810-1910	1670-1770	1810-1960
11.00	1320-1470	1620-1770	1830-1970	*	*	*	*
12.00	1320-1470	1620-1770	1830-1970	*	*	*	*
13.00	1280-1430	1580-1730	1790-1930	*	*	*	*
14.00	1280-1413	1580-1730	1790-1930	*	*	*	*
15.00	1270-1420	1570-1720	1780-1920	*	*	*	*
16.00	1250-1400	1550-1700	1760-1900	*	*	*	*
17.00	1250-1400	1550-1700	1760-1900	*	*	*	*

* Under a commercial agreement.

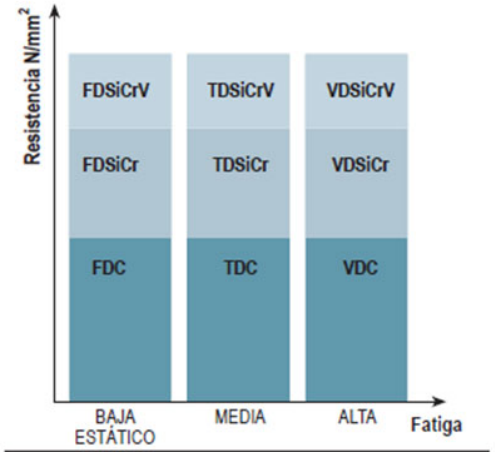
USE OF DIFFERENT TYPES OF WIRE

Applicable standard EN 10270-2

This standard is applicable to all types of steel wires for tempered and quenched springs

TYPE	DESCRIPTION
FDC	Suitable for static applications.
FDSiCr	
FDSiCrV	
TDSiCr	Steel wire for springs with medium fatigue levels, such as that required for alloy and non-alloy steel clutch springs.
TDSiCrV	
VDSiCr	Wire for alloy and non-alloy steel springs for use with severe dynamic stresses, such as springs for valves.
VDSiCrV	

TENSILE STRENGTH (N/MM2) VS FATIGUE



* SOURCE STANDARD EN 10270-2

Tensile strength	Static	Medium fatigue	High fatigue
Low	FDC	TDC	VDC
Medium	FDCrV	TDCrV	VDCrV
High	FDSiCr	TDSiCr	VDSiCr
Very high	FDSiCrV	TDSiCrV	VDSiCrV

CONDITIONING

Conditioning and measurements

Nominal value mm.	Inner diameter (approx.)	Outer diameter (approx.)	Weight of the roll
1.40-1.99	600 mm. (24'')	850 mm.	approx. 300 kg.
2.00-2.99	900 mm. (36'')	1100 mm.	500-1000 kg.
3.00-4.99	1200 mm. (48'')	1400 mm.	500-1000 kg.
5.00-8.00	1500 mm. (60'')	1800 mm.	500-1000 kg.
8.00-16.00	1800 mm. (72'')	2050 mm.	1000-2000 kg.

The material can be placed on racks and, if so, more than one roll per rack.

The rolls unwind in an ANTI-CLOCKWISE direction.

Diameters below 1.40mm and above 16.0mm on request

Finishes

SURFACE QUALITY EN 10270-1

For final diameters between 1.50 mm and 8.00 mm and for the VD-type wires, the wire can be trimmed or straightened (shaved).

PERMISSIBLE DEPTH OF SURFACE DEFECTS

Permissible depth of surface defects (mm).

Type of wire	VD	TD	FD
C	0.005 d	0.008 d	0.010 d
SiCr, SiCrV	0.010 d	0.013 d	0.015 d

PERMISSIBLE SURFACE DEFECTS THROUGH FOUCAULT CURRENT TEST (EDDY CURRENT TEST).

Tests are not normally performed for FD-type wires.

Nominal diameter *d*	Maximum depth of the defect [a]	
mm	VD	TD
2.50 ≤ d ≤ 4.99	40 µm	60 µm
4.99 ≤ d ≤ 5.99	50 µm	60 µm
5.99 ≤ d ≤ 8.00	60 µm	0.01 d

a) ECT also possible for FD quality and diameters 8mm-16mm under a commercial agreement.

SURFACE DECARBURISATION

Permissible depth of surface decarburisation (mm).

Type of wire	VD	TD	FD
C	0.005 d	0.008 d	0.010 d
SiCr, SiCrV	0.010 d	0.013 d	0.015 d

We are able to supply special qualities and qualities not covered by any standards, under a commercial agreement.

TRIMMING

FDC	On request
FDSiCr	On request
FDSiCrV	On request
TDSiCr	On request
TDSiCrV	On request
VDSiCr	<2.5mm on request
VDSiCrV	<2.5mm on request

Tolerances

DIAMETER TOLERANCES. PERMISSIBLE DEVIATIONS ACCORDING TO EN 10270-2

DIAMETER OF THE WIRE	
Nominal value mm	Permissible deviations
0.50 ≤ d < 0.85	+/- 0.010
0.85 ≤ d < 1.05	+/- 0.015
1.05 ≤ d < 1.70	+/- 0.020
1.70 ≤ d < 3.00	+/- 0.025
3.00 ≤ d < 4.20	+/- 0.030
4.20 ≤ d < 6.00	+/- 0.035
6.00 ≤ d < 7.50	+/- 0.040
7.50 ≤ d < 9.00	+/- 0.045
9.00 ≤ d < 11.00	+/- 0.050
11.00 ≤ d < 13.00	+/- 0.070
13.00 ≤ d < 16.00	+/- 0.080
16.00 ≤ d ≤ 17.00	+/- 0.090

OVALITY

Ovality, i.e. the difference between the maximum diameter and the minimum diameter of the wire in the same cross section, must be no greater than 50% of the total permissible deviation specified in the mechanical properties.

LENGTH TOLERANCES OF THE CUT LENGTHS

STANDARD LENGTH TOLERANCES

NOMINAL LENGTH	TOLERANCE
L < = 1000 mm.	+/- 1 mm.
1000 < L < = 4000	- 0mm. / +3 mm.