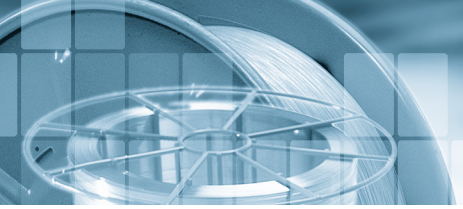

Datasheet updated 2013-02-19 14:42:52 (supersedes all previous editions)

Sandvik T302 HS spring wire

(Wire)

Sandvik T302 HS is an austenitic stainless steel with higher tensile strength and resistance to relaxation than most other steels of ASTM 302 type. The grade is also characterized by high corrosion resistance.

Service temperature: -200 to 250°C (-330 to 480°F)

STANDARDS

- ASTM 302, 304
- UNS S30200
- ISO X9 CrNi 18-8 Grade 1 HS
- EN number 1.4310 HS
- EN name X10 CrNi 18-8 HS
- JIS SUS 302 Mod.

The grade designations, except for EN 1.4310 HS, referred to above are nearest equivalents.

Product standard
EN 10270-3

CHEMICAL COMPOSITION

C	Si	Mn	P max	S max	Cr	Ni
0.07	0.5	1.3	0.035	0.015	18.5	8

FORMS OF SUPPLY

SURFACE FINISHES AND SIZE RANGE

Surface finish	Size range, mm
Coated	
Coated	0.20 - 8.50
Nicoat A (nickel plated + dry drawn)	0.22 - 2.50
Bright	
Bright	0.15 - 0.80
Nicoat B (nickel plated+ bright drawn)	0.18 - 0.80
Polished	
Mechanically polished	0.40 - 6.00
Flat wire	
Width	0.50- 7.00
Thickness	0.05- 4.00
W/t	< 25

Delivery forms
Standard delivery forms are:

- Coils with weight up to 150 kg
- Spools of various types with wire weight up to 1000 kg
- Compact coils with weight up to 1200 kg
- Straightened lengths up to 4 m

MECHANICAL PROPERTIES

Mechanical properties in delivery condition
Tensile strength and proof strength, MPa (ksi)

Wire diameter	Nominal, R_m [1]	Nominal $R_{p0,2}$			
mm	in.	MPa	ksi	MPa	ksi
0.15 – 0.20	0.0059 - 0.0079	2530	367	2150	312
>0.20 – 0.30	>0.0079 - 0.012	2470	358	2100	305
>0.30 – 0.40	>0.012 - 0.016	2420	351	2060	299
>0.40 – 0.50	>0.016 - 0.020	2365	343	2010	292
>0.50 – 0.65	>0.020 - 0.026	2310	335	1960	284
>0.65 – 0.80	>0.026 - 0.031	2260	328	1920	278
>0.80 – 1.00	>0.031 - 0.039	2200	319	1870	271
>1.00 – 1.25	>0.039 - 0.049	2150	312	1830	265
>1.25 – 1.50	>0.049 - 0.059	2100	305	1785	259
>1.50 – 1.75	>0.059 - 0.069	2040	296	1730	251
>1.75 – 2.00	>0.069 - 0.079	1990	289	1690	245
>2.00 – 2.50	>0.079 - 0.098	1880	273	1600	232
>2.50 – 3.00	>0.098 - 0.118	1830	265	1555	225
>3.00 – 3.50	>0.118 - 0.138	1775	257	1510	219
>3.50 – 4.25	>0.138 - 0.167	1720	249	1460	212
>4.25 – 5.00	>0.167 - 0.197	1670	242	1420	206
>5.00 – 6.00	>0.197 - 0.236	1610	233	1370	199
>6.00 – 7.00	>0.236 - 0.276	1560	226	1330	193
>7.00 – 8.50	>0.276 - 0.335	1505	218	1280	186
Flat wire		850-2400	123 - 348	0.85 * Rm	0,85 * ksi
Other strength levels		On request			

[1] tolerance on tensile strength + / - 7.0 % in accordance with EN 10 270-3.

The tensile strength can be increased by 100–300 MPa (15 - 44 ksi) by tempering. Please click on heat treatment for further information. Variation in tensile strength between spools/coils within the same production lot is ±50 MPa (7 ksi) maximum. Proof strength in the tempered condition is approx. 90 % of the tempered tensile strength. Tensile strength values are guaranteed and are measured directly after production. During storage, the strength will increase marginally due to ageing. Depending on the storage conditions, ageing can increase the strength by 0 - 80 MPa (0 - 12 ksi).

Straightened lengths
After straightening, the strength is approx. 7% lower than in delivery condition.

Static strength-tempered and pre-stressed cylindrical helical springs
Sandvik Steel Product Research
The strength data below is based on laboratory tests performed at Sandvik Materials Technology R&D. The data applies at 20°C in normal, dry atmosphere, unless otherwise stated. They are not guaranteed values but should be taken as recommendations in the choice of wire gauge, stress level, etc. A description of the testing procedure can be found, together with explanations under the following items:

E- and G-moduli

S-2130

Strength and mechanical testing

S-2131

The diagrams are valid for springs with the spring index 10 (mean diameter of spring/wire diameter).

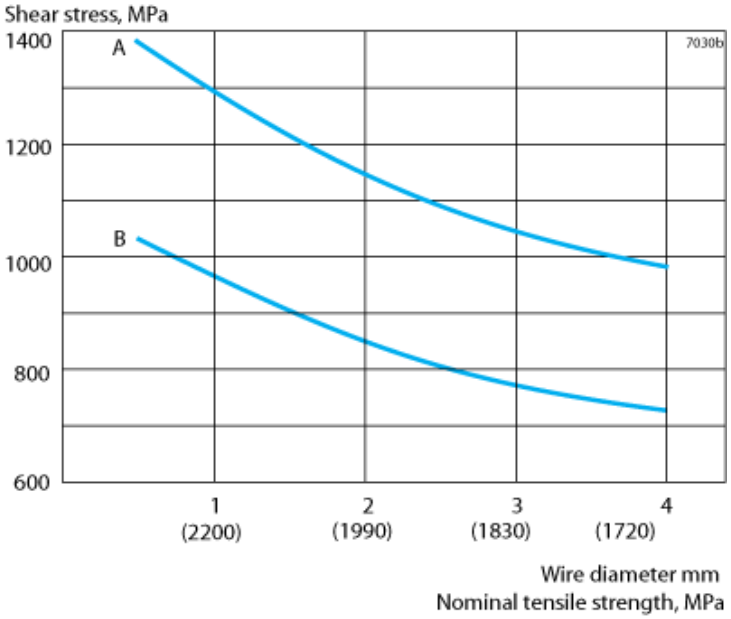

Figure 1. Setting limit, curve A, and maximum permissible shear stress, curve B, as a function of the wire diameter. The setting limit is defined as the shear stress at which the relaxation is 2% after a load time of 24 hours. Curve B lies 25% below curve A.

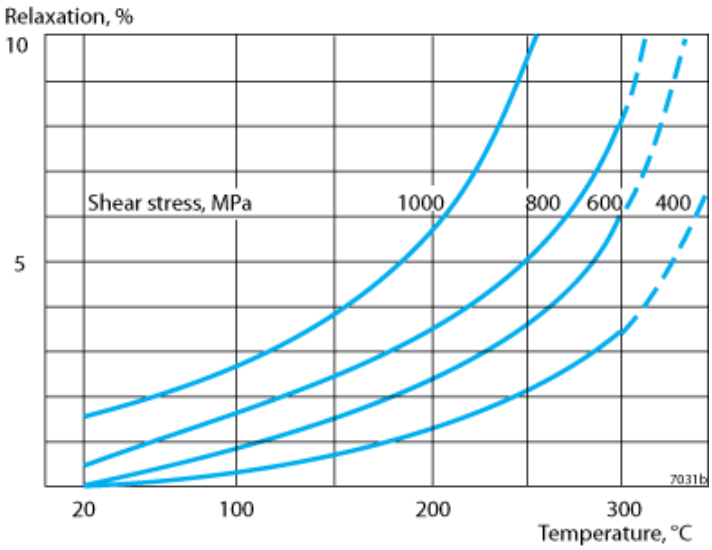

Figure 2. Relaxation (load loss) at various shear stresses as a function of service temperature. This diagram refers to a wire diameter of 1.0 mm.

PHYSICAL PROPERTIES

Density: 7.9 g/cm^3, 0.29 lb/in^3

SPECIFIC HEAT CAPACITY

500 J/kg °C	in the temperature range 50 - 100°C
0.12 Btu/lb °F	in the temperature range 120 - 210°F

THERMAL CONDUCTIVITY

Temperature °C	W/m °C	Temperature °F	Btu/ft h °F
20	15	68	9
100	16	210	9
200	18	390	10.5
300	19	570	11.5

RESISTIVITY

Temperature °C	µΩm	Temperature °F	µΩin.
20	0.90	70	35.0
100	0.95	210	37.0
200	1.00	390	39.0
300	1.05	570	41.5

THERMAL EXPANSION 1)

Temperature °C	per °C	Temperature °F	per °F
20 - 100	17	68 - 210	9.5
20 - 200	17.5	68 - 390	9.5
20 - 300	18.5	68 - 570	10.0

1) Mean values in temperatur ranges ($x10^{-6}$)

Permeability, μ_{max}: about 35

Shear modulus, MPa (ksi)
as delivered: approx. 71 000 (10 295)
tempered: approx. 73 000 (10 585)

Modulus of elasticity, MPa (ksi)
as delivered: approx.185 000 (26 825)
tempered: approx. 190 000 (27 550)
The strength will decrease by 3–4% per 100°C increase in service temperature.

HEAT TREATMENT

By tempering the springs at 350°C (660°F)/0.5–3 h, the tensile strength will increase by about 100-300 MPa (15 - 44 ksi). If a shorter tempering time is used the tempering effect will be lower. In continuous conveyor furnaces, where the holding time at temperature is very short (min. 3 minutes), the temperature can be increased to around 425°C (780°F).

In the `as delivered´ condition the ratio proof strength/tensile strength is approximately 0.80. After tempering the ratio will be approximately 0.85.

Please note that tension springs coiled with initial tension must not be tempered at the same high temperature as other types of springs. We recommend batch annealing at 200°C (390°F)/0.5–3 h, or continuous tempering in a conveyor furnace with a holding time of 3–20 minutes at around 250°C (480°F).

BENDING

The minimum bending radius should not be less than half the wire diameter. The wire surface should be free from any tooling damage, since slight imperfections in the surface can lead to fracture even at large bending radii.