

Precipitation hardened martensitic stainless steel belt

Sandvik I500SM

DATA SHEET PS-SB-464. 11.2013

Sandvik I500SM

The Sandvik 1500SM belt grade is made of low carbon, martensitic, precipitation hardening, stainless steel of type 15-5 PH and is characterised by:

- Excellent static strength
- Excellent fatigue strength
- Good corrosion resistance
- Very good wear resistance
- Very good repairability

Sandvik 1500SM is a high strength steel with excellent mechanical properties. This, in combination with good corrosion resistance, makes it the ideal choice for applications in very harsh conditions. Another advantage is that it is easy to repair.

Chemical Composition (Nominal), %

C	Si	Mn	Cr	Ni	Cu	Ta	Nb
0.07	1.0	1.0	15	5.0	3.5	0.3	0.3

Mechanical Properties

Static Strength

At 20 °C (68 °F), nominal values

Position	Proportional limit		Yield strength		Tensile strength		Elongation A (%)	Weld factor $R_{m\ weld}/R_m$	Hardness Vickers, HV5
	$R_{p0.01}$ MPa	ksi	$R_{p0.2}$ MPa	ksi	R_m MPa	ksi			
Parent material	1380	200	1420	206	1500	218	7		460
Transverse weld (not heat treated)			1100	160	1150	167	5	0.77	*
Transverse weld (heat treated)			1260	183	1310	190	5	0.87	*

*See figure 1 on page 2.

At high temperatures, nominal values

Temperature		Yield strength $R_{p0.2}$		Tensile strength R_m		Elongation A (%)
°C	°F	MPa	ksi	MPa	ksi	
100	200	1270	184	1360	197	10
200	400	1150	166	1290	187	11
300	600	1070	155	1210	175	11
400	800	1020	148	1140	165	9

An increase in mechanical strength (hardness) and brittleness can be noticed after long term use between 350–450 °C (660–840 °F).

Standards

EN	1.4542
AISI	630

Forms of Supply

The belts are, as standard, delivered in a precipitation hardened condition with a mill finish and have well-rounded edges. If required practically any surface finish can be supplied. Perforated belts are also available.

The belts are levelled and straightened to obtain optimal flatness and straightness. The belts can be supplied in open lengths, with the ends prepared for welding on site, or in endless condition with a welded joint.

For tracking, the belts can be provided with V-ropes, either rubber or in the form of a specially designed steel spiral. If required, the product side of the belt can be fitted with retaining strips to keep the conveyed material on the belt or with transverse flights to prevent material from sliding backwards when the belt is steeply inclined.

Different tolerance grades are available to ensure that the best belt can be selected from an economic point of view.

Recommendation and advice are available from your local Sandvik office.

Hence the following recommendation: If an operation temperature of or above 350 °C (660 °F) is considered, your local Sandvik office should be contacted for technical assistance.

Impact strength

This belt grade is not recommended for use at low temperature, i.e. such as in freezing operations.

Fatigue strength

The fatigue limit is defined as the reverse bending stress at which 50 % of the test specimen withstand a minimum of 2×10^6 load cycles. These values refer to 20 °C (68 °F), a normal dry atmosphere and standard prepared specimen. The fatigue limit for the parent material is approximately ± 580 MPa (84 ksi).

Physical Properties

Density, at 20 °C (68 °F)

7.8 kg/dm³, 0.29 lb/in³

Modulus of elasticity at 20 °C (68 °F)

197 000 MPa (28 600 ksi)

Thermal conductivity, λ

Temperature °C	λ W/mK °C	Temperature °F	λ Btu/ft h °F
20	16	68	9.2
100	17	200	9.8
200	19	400	11.0
300	20	600	11.6
400	22	800	12.7

Specific heat capacity, C_p

Temperature °C	C_p kJ/kgK	Temperature °F	C_p Btu/lb °F
100	0.46	200	0.11

Thermal expansion, α

Temperature °C	α $\times 10^{-6}/^{\circ}\text{C}$	Temperature °F	α $\times 10^{-6}/^{\circ}\text{F}$
20-100	10.8	68-200	6.0
20-200	10.8	68-400	6.0
20-300	11.2	68-600	6.2
20-400	11.3	68-800	6.3

Resistivity, ρ at 20 °C (68 °F)

0.8 $\mu\Omega\text{m}$

Magnetic properties

Remanence, Br 0.6 Wb/m²
Coercive force, Hc <2500 A/m
Max relative permeability, μ_r 150

The thermal conductivity of precipitation hardening steel is comparable to austenitic stainless steels, but the thermal expansion is much lower. This makes the precipitation-hardened steel less sensitive to thermal strain and buckling caused by uneven temperature.

Corrosion Resistance

General corrosion

Sandvik 1500SM shows a very good corrosion resistance, equivalent to Sandvik 1200SA in rural and mild industrial atmosphere and almost equal good when expose to coastal atmosphere.

It has good resistance to:

- Organic acids, such as acetic acid, up to high concentrations and high temperatures and formic acid at low concentrations and high temperatures.
- Inorganic acids, e.g. sulphuric acid at low concentration and phosphoric and nitric acids at moderate concentration and temperatures.
- Ammonium hydroxide up to boiling point and sodium hydroxide at moderate concentrations and temperatures.

Sandvik 1500SM is not suitable to use in any concentration of hydrochloric acid, or in phosphoric and nitric acids of high concentration and high temperature, and sulphuric acid of moderate and high concentration at elevated temperatures.

Pitting and crevice corrosion

The steel may be sensitive to pitting, even in solutions of a relative low chloride content. When continuous operation at room temperature, Sandvik 1500SM has good resistance to pitting providing that the belt is kept clean.

Stress corrosion cracking

Stress corrosion cracking, although occurring relatively infrequently, can be cause of failure in stainless steels. It occurs at temperatures above 70 °C (160 °F), if the steel is subjected to tensile stresses and comes into contact with certain solutions, particularly those containing chlorides.

Hydrogen Embrittlement

Hydrogen embrittlement is a potential danger to all high strength martensitic steels whenever the reduction of hydrogen ions to atomic hydrogen occurs. If this is the case, contact your local Sandvik office.

Hardness HV

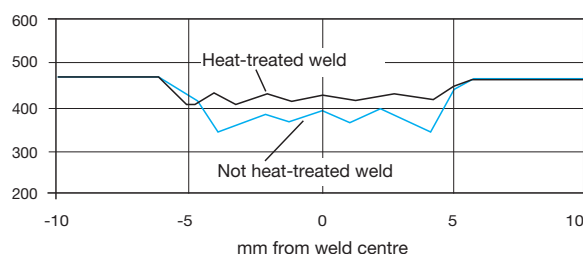


Figure 1. Example of hardness profile across a transverse weld, with and without heat-treatment in a Sandvik 1500SM belt.

Welding

Joints with very good strength and toughness can be formed in Sandvik 1500SM. A suitable fusion welding method is gas-shielded arc welding, with the TIG method as first choice. Welding wire of type Sandvik 1500SM (Werkstoff nr 1.4545) should be used.

Further information concerning method and equipment etc. required can be obtained from your local Sandvik office.



Sandvik Process Systems

SE-811 81 Sandviken, Sweden, Phone +46 26 26 56 00, Fax +46 26 25 86 75

www.processsystems.sandvik.com