

Martensitic Stainless Steel Belt

Sandvik I650SM

DATASHEET PS-SB-463-ENG. Aug 2013.

The Sandvik I650SM belt grade is made of low carbon, martensitic, precipitation hardened, stainless steel of type I5-7 PH and is characterised by:

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

Sandvik I650SM 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	Ti	Mo
0.08	1.5	1.0	14.0	7.0	0.7	0.3	0.8

Specification

Werkstoff Nr.	
AISI	No standard

Forms of Supply

The belts are, as standard, delivered in a heat-treated 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.

Mechanical properties Static strength

Static strength

Position	Standard strength at room temperature, nominal values						Weld factor Rm/Rm	Hardness HV5	
	Proportional limit		Yield strength		Tensile strength				Elongation A5 (%)
	MPa	ksi	MPa	ksi	MPa	ksi			
Parent material	1590	231	1580	229	1600	232	5	480	
Transverse weld (not heat treated)	890	129	1100	160	1150	167	5	0.72 *	
Transverse weld (heat treated)	1120	162	1250	181	1300	188	3	0.81 *	

*See figure on page 2.

Standard strength at elevated temperature

Temperature °C	°F	Proportional limit		Yield strength		Tensile strength		Elongation A5 (%)	Hardness HV5
		MPa	ksi	MPa	ksi	MPa	ksi		
100	212	1500	218	1440	209	1450	210	4	
200	392	1370	199	1350	196	1360	197	5	
300	572	1310	190	1290	187	1310	190	5	
400	752	1160	168	1180	171	1190	173	6.5	

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

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 properties

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

Dynamic 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 ± 630 MPa (91 ksi).

Physical properties

Modulus of elasticity, E	197 000 MPa	28 600 ksi
Density,	7740 kg/m ³	0.280 lb/in ³

Thermal conductivity, λ

Temp, °C	20	100	200	300	400
°F	68	212	392	572	752
W/mK	15	16	18	19	20
Btu/ft h °F	8.7	9.2	10.4	11	11.6

Specific Heat, C_p

Temp, °C	20	100	200	300	400
°F	68	212	392	572	752
kJ/kgK		0.50	0.50		
Btu/lb °F	0.12	0.12			

Thermal expansion, α

Temp, °C	20-100	20-200	20-300	20-400
°F	68-212	68-392	68-572	68-752
10-6/ °C	10.9	11.5	11.7	11.9
10-6/ °F	6.1	6.4	6.5	6.6

Resistivity, ρ

At 20° C (68° F)	0,8 $\mu\Omega\text{m}$
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Magnetic properties

Remanence, B_r	
Coercive force, H_c	
Max relative permeability, μ_r	

The thermal conductivity of precipitation hardened 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 1650SM shows a good corrosion resistance 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 1650SM 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 1650SM 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 temperature above about 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.

Welding

Joints with very good strength and toughness can be formed in Sandvik 1650SM. A suitable fusion welding method is gas-shielded arc welding, with the TIG method as first choice.

If welding wire is used, type should be 1650SM.

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

Hardness profile

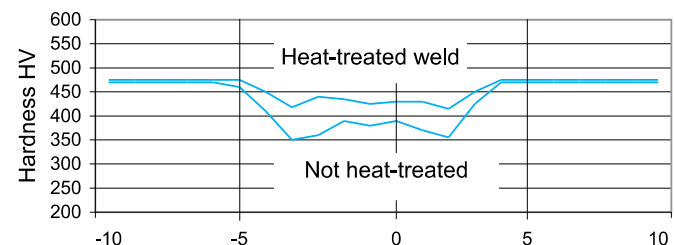


Figure 1. Example of hardness profile across a transverse weld, with and without heat-treatment in a Sandvik 1650SM belt

