IPCO 1000SA

Austenitic molybdenum alloyed stainless steel belt

01-2021

Belt grade characteristics

The IPCO 1000SA belt grade is an austenitic molybdenum alloyed stainless steel and is characterised by:

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

IPCO 1000SA is a highly corrosion resistant steel with very good wear resistance. This makes it good for processes in chemical industries and other severe corrosive applications.

Chemical composition (typical), %

C	Si	Mn	Cr	Ni	Mo
0.03	0.6	1.5	17	10.5	2.1

Standards

EN	1.4401
AISI	316

Forms of supply

The belts are, as standard, delivered in a specially selected hard rolled 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 IPCO office.

Mechanical properties

Static strength at 20 °C (68 °F), typical values

Position	Yield strength $R_{p0.2}$		Tensile strength R_m		Elongation A (%)	Weld factor $R_{m\,weld}/R_m$	Hardness HV5
	MPa	ksi	MPa	ksi			
Parent material	910	132	970	141	10		320
Transverse weld (not heat treated)	500	73	700	102	6	0.72	*

*See figure 1 on page 2.

At high temperatures, typical values

Temperature		Yield strength $R_{p0.2}$		Tensile strength R_m		Elongation A (%)
°C	°F	MPa	ksi	MPa	ksi	
100	212	870	126	890	129	8
200	392	800	116	810	117	8
300	572	700	101	790	115	8
400	752	670	97	760	110	8

At about 450 °C (840 °F) chromium carbide precipitates, resulting in deteriorating mechanical properties and corrosion resistance.

Hence the following recommendation: If an operation temperature of or above 400 °C (750 °F) is considered, your local IPCO office should be contacted for technical assistance.

Impact properties

Austenitic stainless steels have excellent mechanical properties at low temperatures. The impact energy is enough at -80 °C (-110 °F) for a safe operation. The transition temperature (transition from ductile to brittle fracture) is lower than -200 °C (-330 °F).

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 ± 400 MPa (58 ksi).

Physical properties

Density, ρ, at 20 °C (68 °F)
8 000 kg/m^3, 0.29 lb/in^3

Modulus of elasticity, E, at 20 °C (68 °F)
182 000 MPa (26 400 ksi)

Thermal conductivity, λ

Temp	°C	20	100	200	300	400
	°F	68	212	392	572	752
	W/mK	15	16	17	19	20
	Btu/ft h °F	8.5	9.3	9.8	11.0	11.6

Specific heat capacity, C_p

Temp	°C	20	100	200	300	400
	°F	68	212	392	572	752
	kJ/kgK	0.50	0.50	0.52	0.54	0.58
	Btu/lb °F	0.12	0.12	0.12	0.13	0.14

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	16.0	17.0	17.5	17.8
	10^{-6}/ °F	8.9	9.5	9.7	9.9

Resistivity, ρ at 20 °C (68 °F)
0.8 μΩm

Magnetic properties

Remanence, B_r	0.01 Wb/m^2
Coercive force, H_c	< 1 500 A/m
Max relative permeability, m_p	1

Due to relative low thermal conductivity and high thermal expansion for austenitic stainless steels the temperature must be kept constant over the whole width of the belt. Only minor temperature differences can be allowed. As the steel is cold rolled, recovery takes place at elevated temperatures.

Corrosion resistance

General corrosion
IPCO 1000SA shows excellent corrosion resistance in rural and mild industrial atmosphere and coastal atmosphere. It has good resistance to:

- Organic acids up to high concentrations and high temperatures.
- Inorganic acids up to high concentrations and high temperatures.
- Salts (sulphates, sulphides, sulphites), sugar and vinegar.
- Strong acids of low concentrations at moderate temperatures, though not hydrochloric acid.

IPCO 1000SA is not suitable to use in any concentration of hydrochloric acid.

Pitting and crevice corrosion
The steel may be sensitive to pitting, even in solutions of a relative low chloride content. When in continuous operation at room temperature, IPCO 1000SA has good resistance to pitting providing that the belt is kept clean. IPCO 1000SA has higher pitting resistance than IPCO 1200SA and IPCO 1650SM due to higher molybdenum content.

Stress corrosion cracking
Stress corrosion cracking, although occurring relatively infrequently, can be a cause of failure in stainless steels. It occurs at temperatures 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.

Intergranular corrosion
In austenitic stainless steels chromium carbide precipitation takes place during heat treatment in the temperature range of 450–900 °C (840–1650 °F). Lowered chromium content in the matrix impairs the corrosion resistance.

Welding

Gas-shielded arc welding is a suitable fusion welding method for IPCO 1000SA, with the TIG method as first choice. Since the material has low thermal conductivity and high thermal expansion, welding should be carried out with a low heat input, to avoid distortion. Rapid cooling is required to prevent carbide precipitation in the heat-affected zone.

Welding is normally performed without welding wire. If wire is used, wire type should be IPCO 1000SA (AWS- ER316LSi). In order to increase the flatness and strength of the weld, cold working is recommended.

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

Hardness HV

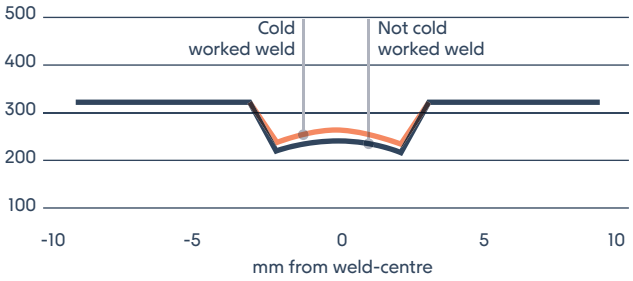

Figure 1. Example of hardness across the weld with and without cold working.