Belt grade characteristics

The IPCO 1200SA belt grade is an austenitic stainless steel and is characterised by:

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

IPCO 1200SA is a high corrosion resistant steel with good wear resistance. This makes it the universal choice for food and chemical industries (cooling, freezing and drying processes). Another advantage is that it is easy to repair.

Chemical composition (typical), %

<table>
<thead>
<tr>
<th>Element</th>
<th>C</th>
<th>Si</th>
<th>Mn</th>
<th>Cr</th>
<th>Ni</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>0.1</td>
<td>0.8</td>
<td>1.0</td>
<td>17</td>
<td>7</td>
</tr>
</tbody>
</table>

Standards

- EN 1.4310
- AISI 301

Mechanical properties

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

<table>
<thead>
<tr>
<th>Position</th>
<th>Yield strength R\text{p}_{0.2}</th>
<th>Tensile strength R\text{m}</th>
<th>Elongation A (%)</th>
<th>Weld factor R\text{m}\text{weld}/R\text{m}</th>
<th>Hardness HVS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent material</td>
<td>980 MPa (142 ksi)</td>
<td>1 200 MPa (174 ksi)</td>
<td>28</td>
<td>380</td>
<td></td>
</tr>
<tr>
<td>Transverse weld (not heat treated)</td>
<td>630 MPa (91 ksi)</td>
<td>880 MPa (128 ksi)</td>
<td>18</td>
<td>0.73</td>
<td>*</td>
</tr>
</tbody>
</table>

*See figure 1 on page 2.

At high temperatures, typical values

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Yield strength R\text{p}_{0.2}</th>
<th>Tensile strength R\text{m}</th>
<th>Elongation A (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>°C</td>
<td>MPa (ksi)</td>
<td>MPa (ksi)</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>910 (132)</td>
<td>1 020 (148)</td>
<td>16</td>
</tr>
<tr>
<td>200</td>
<td>820 (119)</td>
<td>950 (138)</td>
<td>8</td>
</tr>
<tr>
<td>300</td>
<td>720 (104)</td>
<td>930 (135)</td>
<td>7</td>
</tr>
<tr>
<td>400</td>
<td>690 (100)</td>
<td>890 (129)</td>
<td>10</td>
</tr>
</tbody>
</table>

Forms of supply

The belts are, as standard, delivered in a specially selected cold rolled temper 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.

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 $2 \times 10^6$ 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 ± 470 MPa (68 ksi).
Physical properties

Density, \( \rho \), at 20 °C (68 °F)
7 930 kg/m\(^3\), 0.287 lb/in\(^3\)

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

Thermal conductivity, \( \lambda \)

<table>
<thead>
<tr>
<th>Temp °C</th>
<th>20</th>
<th>100</th>
<th>200</th>
<th>300</th>
<th>400</th>
</tr>
</thead>
<tbody>
<tr>
<td>W/mK</td>
<td>15</td>
<td>16</td>
<td>17</td>
<td>18</td>
<td>19</td>
</tr>
<tr>
<td>BTU/ft h °F</td>
<td>8.5</td>
<td>9.3</td>
<td>9.8</td>
<td>10.3</td>
<td>11.0</td>
</tr>
</tbody>
</table>

Specific heat capacity, \( C_p \)

<table>
<thead>
<tr>
<th>Temp °C</th>
<th>20</th>
<th>100</th>
<th>200</th>
<th>300</th>
<th>400</th>
</tr>
</thead>
<tbody>
<tr>
<td>kJ/kgK</td>
<td>0.50</td>
<td>0.50</td>
<td>0.52</td>
<td>0.54</td>
<td>0.58</td>
</tr>
<tr>
<td>BTU/lb °F</td>
<td>0.12</td>
<td>0.12</td>
<td>0.12</td>
<td>0.13</td>
<td>0.14</td>
</tr>
</tbody>
</table>

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 1200SA shows a very good corrosion resistance in rural and mild industrial atmosphere and coastal atmosphere.

It has good resistance to:
- Organic acids as citric, lactic and acetic acids in high concentrations and moderate temperatures, tartaric acid at relative high concentrations and high temperatures, and formic acid at low concentrations and moderate temperatures.
- Inorganic acids as boric, nitric, phosphoric and sulphurous acids at moderate concentrations and temperatures.
- Salts as sulphates, sulphides and sulphites.

IPCO 1200SA is not suitable to use in any concentration of hydrochloric acid or in sulphuric acid of most concentrations, especially in combination with 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, IPCO 1200SA has good resistance to pitting providing that the belt is kept clean. To achieve even better resistance to pitting than IPCO 1200SA, IPCO 1000SA, which has a molybdenum content, is recommended.

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.

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

Joints with good strength and toughness can be formed in IPCO 1200SA. A suitable fusion welding method is gas-shielded arc welding, 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. In case of using wire, wire type should be IPCO 1200SA (AWS A5.9 ER 308 LSI). 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.