Valbruna Grade

AIST

Steel type

Austenitic Stainless Steel

Description of material

AIST is a Titanium stabilized austenitic stainless steel with both general corrosion resistance and very good intergranular corrosion resistance after welding processes or subjected to a slow cooling rate in service.

Applications

AIST is suitable for the fabrication of many products such as flanges, valves, bolting, pump shafts, food /beverages industry equipment, rings, storage tanks, many organic chemical and parts working in the mild to medium corrosive environments. This grade is chosen in the case of welding processes and in applications where intermittent heating up to 850 C° can happen.

Melting practices

Argon Oxygen Decarburization

Corrosion resistance

AIST is resistant to fresh water, several organic chemicals and inorganic compounds, atmospheric corrosion, rural applications and sterilizing solutions where the chloride level is very low. Pitting and crevice corrosion may occur in chloride environments if concentration, pH and temperature are at determinate levels. As with other standard austenitic grades, AIST suffers from stress corrosion cracking about forty degrees (C°) above room temperature and with certain levels of stress and halogen concentration. Strain hardened structures increase the risk of stress corrosion cracking. In the case of high temperature service, a stabilizing heat treatment should be carried out to improve the intergranular corrosion resistance. It should be noted that this grade, as for every kind of stainless steel, surfaces should be free of contaminant and scale, heat tint, and passivated for optimum resistance to corrosion.

Cold working

AIST can be readily fabricated by cold working operations such as cold drawing and bending but should only be used for a moderate amount of cold heading or cold upsetting.

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Machinability

Machinists should know that Austenitic grades are different from Ferritic and Alloy steels and require more rigid and powerful machines in addition to the correct choice of tools, coating and cutting fluids. The Austenite structure is prone to transform in to α'Martensite caused by strain hardening of the tool on the surface of the machined piece. The knowledge of this behavior must be correctly considered when a piece requires two or several cutting steps to be finished. The layer of α'Martensite is very hard and, if the subsequent turning or milling processes work on this hardened layer, a rapid tool wear could happen. The tool must work under this layer. AIST has special chemical balance for a suitable machining, by having a micro re-sulphured structure maintaining a composition which helps to avoid solidification cracks in the fused-zone of autogenous welds, despite its Sulphur content. In the case of a non-micro re-sulphured structure, its chip-ability is strongly decreased.

Weldability

AIST has a special chemical composition which helps to avoid solidification cracks in the fused-zone of autogenous welds. In addition, its Titanium carbides do not precipitate on the grain boundaries after slow cooling following welding. No preheating or post welding are normally necessary. However, an annealing after welding should be done if the weld works in very aggressive environments and a post welding stabilization should be done in case of high temperature service.

Hot working

Long products of AIST are not specifically designed for hot working and are usually supplied as cold finished round, hexagonal, flat and square bars for machining processes or general use. Other grades such as AISTF or AISTF1 are recommended for forging quality billets and large ingots thanks to a special composition with low ferrite content. No preheating is required. Small forgings can be cooled rapidly in air or water.

Designations

RCCM-M MATERIAL REF.	X6CrNiTi18-10
AISI	321
W.N.	1.4541
UNS	S32100
EN	X6CrNiTi18-10
BS	321S31

Specifications

ASTM	A182 / A276 / A479
ASME	SA182 / SA276 / SA479
EN	10088-3 / 10222-5 / 10272

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Chemical composition

Chemical element	C	Mn	Si	S	P	Ni	Cr	Mo	Cu	N	Ti
Minimum value %	-	-	-	-	-	9%	17%	-	-	-	5*(C+N)
Maximum value %	0,08%	2%	1%	0,03%	0,04%	12%	19%	0,75%	0,75%	0,1%	0,7%

Heat treatment

Description of condition	Condition	Minimum temperature °C	Maximum temperature °C	Cooling
Solution Annealed	A	1020	1120	Water / Air

Physical properties

Physical property	SI/metric units	US/BS Imperial units
Density	7,9 kg/dm³	0,285 lb/in³
Specific Thermal Capacity 20° C	500 J/(kg·K)	0,119 Btu/lb°F
Thermal conductivity 20° C	15 W/(m·K)	104,002 Btu in/ ft² h °F
Thermal expansion 20° - 100° C	16 (10^{-6}/K)	8,889 (10^{-6}/°F)
Electrical Resistivity 20° C	0,73 Ω·mm²/m	28,74 μΩin
Modulus of Elasticity 20° C	200 GPa	29007,548 ksi

Mechanical properties

Condition	Subtype	Rm [N/mm²]	Rm [Ksi]	Rp0.2% [N/mm²]	Rp0.2% [Ksi]	A5D [%]	HBW
Solution Annealed	A	500 - 700	73 - 102	190 min.	28 min.	40 min.	140 - 215

Hot working

Condition	Minimum temperature °C	Maximum temperature °C	Cooling
Forging / Hot Rolling	900	1200	Air

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