Valbruna Grade

AMSL

Steel type

Austenitic Stainless Steel

Description of material

AMSL is a low-carbon austenitic stainless steel with a high Molybdenum content. It has good general / pitting corrosion resistance together with a good intergranular corrosion resistance after welding processes.

Applications

AMSL is suitable for the fabrication of many products such as flanges, valves, bolting, pump shafts, food /beverages industry equipment, pulp and paper equipment, heat exchangers, marine devices, storage tanks, offshore oil production, many products used in chemical processes, and rural applications. It is used when a better resistance to general and pitting corrosion, in comparison with APML, is necessary.

Melting practices

Argon Oxygen Decarburization

Corrosion resistance

AMSL is resistant to fresh water, many organic chemicals and inorganic compounds, atmospheric corrosion, marine environments, and in contact with sterilizing solutions. In sea water, this grade is a more resistant to pitting than type 316 grades such as APML and similar. However, pitting and crevice corrosion may occur in environments if the chloride concentrations, pH and temperature are at determinate levels. As with other standard austenitic grades, AMSL suffers from stress corrosion cracking about fifty degrees (C°) above room temperature and above certain levels of stress and halogen concentrations. Very strain hardened structures increase the risk of stress corrosion cracking. Thanks to its low Carbon content AMSL offers a good 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

AMSL can be readily fabricated by cold working operations such as cold drawing and bending, and allows a good amount of cold heading and cold up setting thanks to its high Nickel and low Carbon content. Its structure after cold deformation is less hard than APML.

Head office and works:
Viale della Scienza, 25
36100 **VICENZA**
Tel. +39 0444 968211
Fax. +39 0444 963836
www.valbruna-stainless-steel.com

Via Volta, 4
39100 **BOLZANO**
Tel. +39 0471 924111
Fax. +39 0471 924497
www.valbruna-stainless-steel.com

2400 Taylor Street West
46801 **Fort Wayne**, IN - USA
Tel. +1 260 434 2800
Fax. +1 260 434 2801
E-mail: info@valbruna.us
www.valbrunastainless.com

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. AMSL isn't normally supplied with a micro re -sulphured structure and, therefore, doesn't offer a good chip-ability.

Weldability

No preheating or post welding are normally necessary. However, an annealing after welding should be done if the weld works in very aggressive environments. In the case of autogenous welding processes, there could be some risk of hot cracking in the fused zone due to a solidification mode from primary ferrite to primary austenite. This could be avoided only if the heat of supplied product has a chemical balance that allows a primary ferrite solidification mode or, alternatively, by use of a right filler metal and accurate welding procedures involving heat inputs and joint geometry.

Hot working

AMSL has a good hot plasticity and is suitable for processing by hot extrusion or by upsetting with electric resistance heating. However, overheating must be always avoided. The choice of hot working temperature and process parameters must always evaluate the strain rate and the consequent increasing of temperature that is reached after hot deformation. High strain rates and temperature at the top end of the range during the extrusion and forging process, could generate internal bursts. Small forgings should be cooled rapidly in air or water quenched. However, the best corrosion resistance is obtained by annealing followed by quenching in water.

Designations

AISI	317L
UNS	S31703

Specifications

ASTM	A182 / A479
ASME	SA182 / SA479

Chemical composition

Chemical element	C	Mn	Si	S	P	Ni	Cr	Mo	N
Minimum value %	-	-	-	-	-	11%	18%	3%	-
Maximum value %	0.03%	2%	1%	0.03%	0.045%	15%	20%	4%	0.1%

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Heat treatment

Description of condition	Condition	Minimum temperature °C	Maximum temperature °C	Cooling
Solution Annealed	A	1040	-	Water / Air

Physical properties

Physical property	SI/metric units	US/BS Imperial units
Density	8 kg/dm³	0.289 lb/in³
Specific Thermal Capacity 20° C	450 J/(kg·K)	0.107 Btu/lb°F
Thermal conductivity 20° C	14.4 W/(m·K)	99.842 Btu in/ ft² h °F
Thermal expansion 20° - 100° C	16.5 (10^{-6}/K)	9.167 (10^{-6}/°F)
Electrical Resistivity 20° C	0.85 Ω·mm²/m	33.465 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]	HBW	E4d [%]
Solution Annealed	A	515 min.	75 min.	205 min.	30 min.	235 max.	40 min.

Hot working

Condition	Minimum temperature °C	Maximum temperature °C	Cooling
Forging / Hot Rolling	1150	1200	Air

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