2205 Stainless Steel Bar

Valbruna Australia Pty Ltd
Stainless Steel, Reinforcement & Nickel Alloy Bars

V225MN is a Molybdenum and Nitrogen alloy ferritic-austenitic stainless steel whose duplex structure containing approximately the same amounts of Ferrite and Austenite is able to provide a good pitting and uniform corrosion resistance, as well as very good stress corrosion cracking resistance, together with high mechanical properties and toughness.

DESIGNATIONS

VALBRUNA	V225MN
AISI	F51 / F60
W.N.	1.4462
UNS	S31803 / S32205
EN	X2CRNIMON22-5-3

DESIGN FEATURES

- High strength
- High resistance to pitting corrosion, crevice corrosion, stress corrosion cracking and corrosion fatigue.
- Good erosion and fatigue resistance
- High energy absorption
- Low thermal expansion
- Good weldability

CHEMICAL COMPOSITION

CHEMICAL ELEMENT	C	Mn	Si	S	P	Ni	Cr	Mo	N
MINIMUM VALUE %	-	-	-	-	-	4.5%	22%	3%	0.14%
MAXIMUM VALUE %	0.03%	2%	1%	0.015%	0.03%	6.5%	23%	3.5%	0.2%

MECHANICAL PROPERTIES

Condition	Subtype	Rm [N/mm²]	Rm [Ksi]	Rp0.2% [N/mm²]	Rp0.2% [Ksi]	HBW	E4d [%]
Solution Annealed	A	655 - 880	95 - 128	485 min.	70 min.	270 max.	25 min.

PHYSICAL PROPERTIES

Physical Property	SI / Metric Units	US / BS Imperial Units
Density	7.7 kg/dm³	0.278 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	13 (10^{-6}/K)	7.222 (10^{-6}/°F)
Electrical Resistivity 20° C	0.8 Ω·mm²/m	31.496 μΩin
Modulus of Elasticity 20° C	205 GPa	29732.736 ksi

HEAT TREATMENT

Description of condition	Condition	Minimum temperature °C	Maximum temperature °C	Cooling
Solution Annealed	A	1040	1100	Water

HOT WORKING

Condition	Minimum temperature °C	Maximum temperature °C	Cooling
Forging / Hot Rolling	950	1200	Air

APPLICATIONS

Pump and valve parts, pressure vessels, desalination plants, tanks, bolts, nuts, rings, stirrers, hollows bars handling solutions containing Chloride, marine environments, boat shafts where corrosion fatigue resistance is required, and reinforcing bars for structural application such as roads, bridges, harbors landing zones, and buildings.

CORROSION RESISTANCE

V225MN has very good resistance in environments containing chloride and fluoride and other aggressive solutions or materials. Particularly, it shows better results in general and pitting corrosion than type 316 and similar austenitic stainless steels, and has very good resistance to crevice corrosion thanks to high Chromium, Nitrogen and Molybdenum contents. In this case, an accurate evaluation of piece design is required in order to avoid very narrow crevices situations. Stress corrosion resistance is guaranteed thanks to presence of the Ferritic part of the duplex structure. It's important to point out that the surface of every kind of stainless steel should be free of contaminants, heat tint, scale and passivated for optimum resistance corrosion.

WELDABILITY

V225MN can be welded with the same techniques of austenitic stainless steels but a special care and suitable choices must be used. No preheating is required and the structure of HAZ should show an acceptable austenite content if the right welding parameters are applied. Autogenous welding could jeopardize the pitting corrosion resistance of weld metal (fused zone). Therefore, over -alloyed fillers should be used in order to obtain comparable properties of the base metal or, at least, an austenite content more than 40-60%. In very aggressive environments, fillers of Nickel alloys or high alloy Austenitic grades should be used. Matching filler duplex alloys could be used if the composition of FZ and HAZ is able to supply the expected results. Post welding annealing restores the balance of Ferrite/Austenite and eliminates the welding stresses.

HOT WORKING

Large shapes and ingots require a suitable preheating. Avoid overheating or reaching the upper limit of forging temperature to avoid an increase of ferrite contents. Both small pieces, rolled rings or bars could be either air or fast quenched after forging. However, an annealing with fast cooling after every kind of hot working is mandatory for best mechanical properties and corrosion resistance. Slow or improper cooling rates generate the precipitation of deleterious intermetallic phases, causing a considerable reduction of both toughness and corrosion resistance.

MACHINABILITY

V225MN, such as all duplex stainless steels, is more difficult to machine if compared to the typical austenitic grades. A careful choice of machining parameters should partially reduce the gap. For better performance in machinability, this grade could be substituted by MV274MDE, but only if this alternative grade is able to offer similar or acceptable results in terms of corrosion, toughness and weldability according to specific Norms or Design.

COLD WORKING

V225MN is suitable for the same cold heading and cold deforming processes applied to austenitic stainless steels, but it should be considered that its yield strength is higher and, therefore, more difficult to cold strain. Original mechanical properties and resistance corrosion are restored by a new annealing and fast cooling.

MELTING PRACTICES

Argon Oxygen Decarburization