

1.3816, X8CRMNN18-18, ASTM A289

1.3816, [X8CrMnN18-18](#), ASTM [A289](#) Nonmagnetic retaining rings for 50MW-200MW power generator, acc. to ASTM [A289](#), SEW 390

Chemical Composition

Grade	Chemical composition WT %										
	C	Si	Mn	P	S	Cr	Ni	N	Ti	V	Al
ASTM A289	0.10	0.8	17.5-20	0.06	0.015	17.5-20	2.00	0.45-0.80	0.10	0.25	0.04
1.3816, X8CrMnN18-18	0.12	1.0	17.5-20	0.06	0.03	17.5-20	1.00	0.40-0.70			

Mechanical Properties

Mechanical properties acc. to ASTM A289/A289M

- Grade 1
 - Tensile strength ksi/MPa: min 145/1000
 - 0.2% Offset Yield Strength Psi/MPa: Min 135/930
 - Elongation in 2 in. or 50mm, min 28%
 - Reduction of Area, min 60%
 - Charpy V-Notch Energy, min. ft/lb/J: 70/95
- Grade 2
 - Tensile strength ksi/MPa: min 155/1070
 - 0.2% Offset Yield Strength Psi/MPa: Min 145/1000
 - Elongation in 2 in. or 50mm, min 25%
 - Reduction of Area, min 55%
 - Charpy V-Notch Energy, min. ft/lb/J: 65/88
- Grade 3
 - Tensile strength ksi/MPa: min 165/1140
 - 0.2% Offset Yield Strength Psi/MPa: Min 160/1105
 - Elongation in 2 in. or 50mm, min 20%
 - Reduction of Area, min 50%
 - Charpy V-Notch Energy, min. ft/lb/J: 60/81
- Grade 4
 - Tensile strength ksi/MPa: min 170/1170
 - 0.2% Offset Yield Strength Psi/MPa: Min 165/1140
 - Elongation in 2 in. or 50mm, min 19%
 - Reduction of Area, min 48%
 - Charpy V-Notch Energy, min. ft/lb/J: 58/79
- Grade 5
 - Tensile strength ksi/MPa: min 175/1205
 - 0.2% Offset Yield Strength Psi/MPa: Min 170/1170
 - Elongation in 2 in. or 50mm, min 17%
 - Reduction of Area, min 45%

- Charpy V-Notch Energy, min. ft/lb/J: 55/75
- Grade 6
 - Tensile strength ksi/MPa: min 185/1275
 - 0.2% Offset Yield Strength Psi/MPa: Min 180/1240
 - Elongation in 2 in. or 50mm, min 14%
 - Reduction of Area, min 40%
 - Charpy V-Notch Energy, min. ft/lb/J: 50/68
- Grade 7
 - Tensile strength ksi/MPa: min 195/1345
 - 0.2% Offset Yield Strength Psi/MPa: Min 190/1310
 - Elongation in 2 in. or 50mm, min 12%
 - Reduction of Area, min 35%
 - Charpy V-Notch Energy, min. ft/lb/J: 40/54
- Grade 8
 - Tensile strength ksi/MPa: min 200/1380
 - 0.2% Offset Yield Strength Psi/MPa: Min 195/1345
 - Elongation in 2 in. or 50mm, min 10%
 - Reduction of Area, min 30%
 - Charpy V-Notch Energy, min. ft/lb/J: 35/47

Physical Properties

- Modulus of elasticity [$10^3 \times \text{N/mm}^2$]: 195
- Density [g/cm^3]: 7.70

Coefficient of Linear Thermal Expansion $10^{-6} \text{ }^\circ\text{C}^{-1}$

20-100°C	20-200°C	20-300°C	20-400°C
16.0	17.10	17.90	18.70

Heat Treatment

Solution Heat Treatment

Harden from a temperature of 1020-1120°C followed by water or air quenching.

Forging

Hot forming temperature: 1150-950°C.

Thermal Properties

X8CrMnN18-18 has good high temperature strength and can withstand large loads under high temperature conditions. This makes it suitable for high temperature working environments.

Welding Properties

The presence of nitrogen in this grade improves its strength and corrosion resistance. However, it can also affect the weldability of the material. The welding performance of X8CrMnN18-18 can be influenced by several factors, including: 1. Welding Method: X8CrMnN18-18 can be

welded using various methods, such as shielded metal arc welding (SMAW), gas tungsten arc welding (GTAW/TIG), gas metal arc welding (GMAW/MIG), and resistance spot welding. The choice of welding method depends on the specific application and desired results. 2. Preheating and Post-weld Heat Treatment: Preheating the base material before welding can help reduce the risk of cracking and improve the material's weldability. Additionally, post-weld heat treatment processes, such as annealing or solution treatment, may be necessary to restore the material's properties after welding. 3. Welding Consumables: The selection of appropriate welding consumables, including filler metals and shielding gases, is crucial for achieving sound welds and maintaining the corrosion resistance of X8CrMnN18-18. Consultation with welding experts or referring to the manufacturer's recommendations can help determine the most suitable consumables. 4. Welding Parameters: Optimal welding parameters, such as welding current, voltage, travel speed, and heat input, should be determined to ensure proper fusion and minimize the risk of defects in the weld.

Machining Properties

Hot processing performance: X8CrMnN18-18 can be hot processed at high temperatures, such as hot extrusion, hot rolling, etc. At high temperatures, the material has good ductility and plasticity, making it easy to form complex shapes. Cold working performance: X8CrMnN18-18 can be cold processed at room temperature, such as cold rolling, cold drawing, etc. During cold working, the material has good plasticity and deformability, making it easy to carry out detailed processing and deformation. Cutting performance: X8CrMnN18-18 has good cutting performance and is suitable for drilling, milling, turning and other cutting processes. However, due to its higher strength and hardness, it may be necessary to use appropriate cutting tools and cutting parameters to ensure cutting quality.