P2000

Where corrosion resistance meets strength and toughness

Mat.-no.: 1.4452 – X13CrMnMoN18-14-3

P2000 is a non-magnetic, stable austenitic stainless steel with a high nitrogen content and exceptional corrosion resistance and ductility, offering tensile strengths of up to 2000 MPa. P2000 combines unique properties that enable high-end products to meet demanding operational requirements for outstanding toughness, strength, rigidity and excellent corrosion resistance.
During the remelting process, nitrogen is added to stabilize the austenitic matrix. Using the Pressure Electro-Slag Remelting process (PESR), the alloying elements exceed their solubility limits under atmospheric conditions. This results in a homogeneous microstructure consisting of an ultra-clean metallic matrix which, after heat treatment and with a maximum service temperature of 500 °C, provides excellent polishability, exceptional wear resistance and high dimensional stability.
The positive effect of the high nitrogen content is not limited to excellent corrosion resistance. Its progressive impact on the steel's mechanical properties results in very high tensile strength and an outstanding ratio of fracture toughness to elastic modulus – unmatched by any other corrosion-resistant steel available on the market.

Outstanding benefits:

- Exceptional corrosion resistance
- High yield strength and tensile strength
- High ductility
- Significant work-hardening potential
- Low magnetic permeability
- Biocompatibility

MAIN APPLICATION AREAS

- Aerospace, medical engineering, automotive industry, motorsports and mechanical engineering, oil & gas, pharmaceutical and food industries
- Power plant technology, offshore and marine applications, engine manufacturing, fastening and joining components (e.g., bolts, screws), blades, spindles, extrusion and dosing systems for the chemical and pharmaceutical industries, instruments for the medical sector, high-quality jewellery and watch components

Properties: (1 = low – 10 = excellent)

Weldability	2
Machinability	7
Wear resistance	8
Corrosion resistance	9
Toughness	9
Strength	9
Polishability	10

Chemical Analysis:

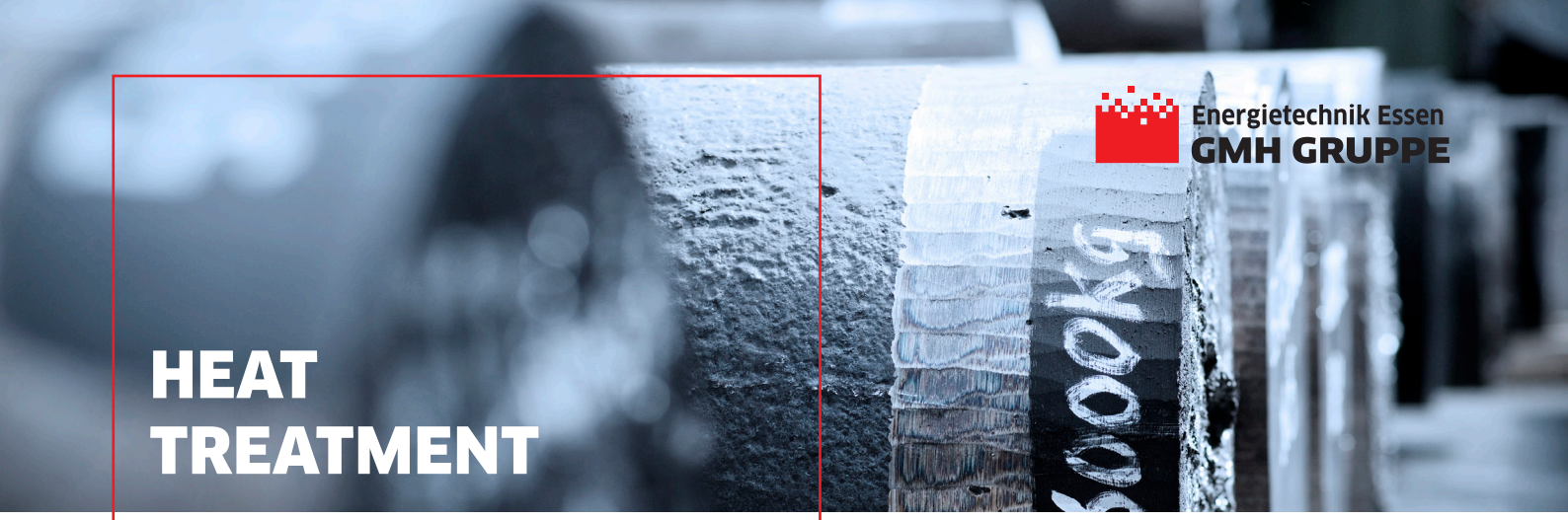
1.4452 X13CrMnMoN18-14-3	C	Si	Mn	Cr	Mo	Ni	N
min.	-	-	12.00	16.00	2.50	-	0.75
max.	0,0.15	1.00	16.00	20.00	4.20	0.30	1.00

Also available with Ni < 0.05 wt.%

Product Portfolio:

1.4452 X13CrMnMoN18-14-3	Bars Ø	Bars Ø	Wire Rod Ø
min.	5 mm	40 mm	5 mm
max.	20 mm	85 mm	20 mm
min. Production Quantity	600 kg	1000-1400 kg	600 kg

Other dimensions available on request – also available as plate



HEAT TREATMENT

Hot Forming

Hot forming should be carried out at temperatures between 1000 °C and 1200 °C.

Solution Annealing

P2000 must be heated uniformly to a temperature between 1120 and 1150 °C. The holding time at solution-annealing temperature, after complete homogenization, is 30 minutes. Cooling must then be performed with water down to room temperature. The final strength after quenching exceeds 900 MPa.

Work Hardening

The required final strength of austenitic steels is achieved through cold working. Depending on the degree of deformation, final tensile strength (Rm) of up to 2000 MPa can be achieved. Due to the substantial work-hardening potential, forming parameters must be evaluated in advance for technical feasibility.

Stress Relief Annealing

If required, stress relief annealing can be performed at temperatures up to 400 °C.

Temper Resistance

Since the final strength of austenitic steels is obtained through cold working, prolonged exposure to high temperatures has a negative effect on this strength. No loss of strength is expected at temperatures below 100 °C.

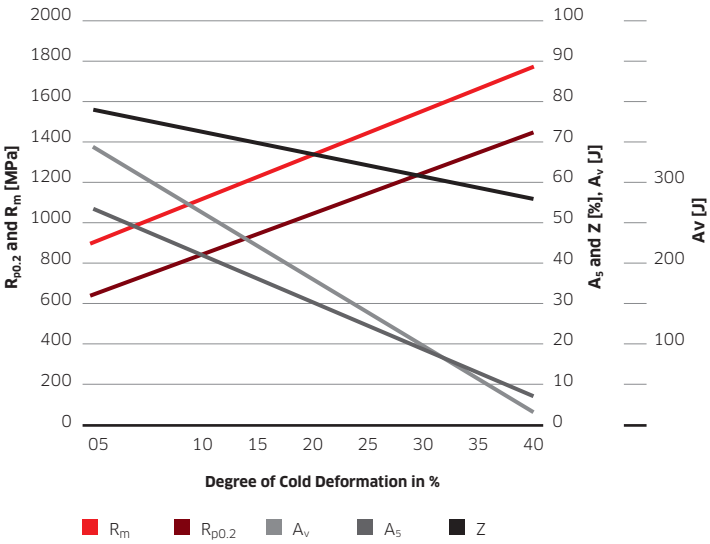
Low-Temperature Performance

Due to its exceptional alloy composition and high nitrogen content, P2000 exhibits superior toughness even at low temperatures. The ductile-to-brittle transition temperature (DBTT) for this material is approximately –100 °C.

Mechanical Properties of Solution-Annealed P2000

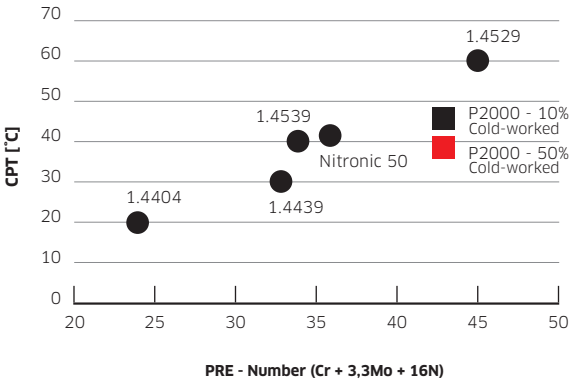
Yield strength	>600 MPa
Tensile strength	>900 MPa
Elongation at break	>50 %
Impact toughness	>350 J

Effects of Cold Working on Mechanical Properties



Comparison of P2000 with Other Grades

Corrosion Resistance of Solution-Annealed Conditions
Critical pitting temp. according to ASTM G48 vs. PRE-number



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