



SINOXX 4903 Steel

Designation by Standards

| Brand Name | Ravne | Mat. No. | DIN | EN | AISI/SAE |
|-------------|-------|----------------|-----|---------------|----------|
| SINOXX 4903 | PT950 | Approx. 1.4903 | - | X10CrMoVNb9-1 | A213/P91 |

Chemical Composition (in weight %)

| C | Si | Mn | Cr | Mo | Ni | V | W | Others |
|------|------|------|------|------|-----------|------|---|--------------------------------|
| 0.10 | 0.35 | 0.45 | 8.50 | 0.95 | max. 0.40 | 0.22 | - | Nb=0.53, N=0.05, Al=max. 0.040 |

Description

SINOXX 4903 is creep-resistant material that is generally used for temperatures up to 630°C.

Applications

Boiler tube sector and for superheated steam fittings.

Physical properties (average values) at ambient temperature

Modulus of elasticity [$10^3 \times \text{N/mm}^2$]: 218, 207(200°C), 190(400°C), 162(650°C)

Density [g/cm^3]: 7.7

Thermal conductivity [W/m.K]: 29.2

Specific heat capacity [J/g.K]: 0.46

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

| 20-200°C | 20-400°C | 20-650°C |
|----------|----------|----------|
| 11.3 | 12.0 | 12.7 |

Annealing

Heat to 730-780°C, cool slowly in furnace or air. Structure is martensite.

Hardening

Harden from a temperature of 1040-1090°C followed by air or oil quenching.

Mechanical properties at ambient temperature

Condition: Normalised and annealed, for size <130 mm

0.2 % proof stress: 450 N/mm^2

Tensile strength: 630-730 N/mm^2

Elongation: 19% (Longit.), 17% (Transv.)

Notch impact energy (ISO-V): 40J (Longit.), 27J (Transv.)

0.2 % proof stress in N/mm^2 vs. Temperature in $^\circ\text{C}$

| 100°C | 150°C | 200°C | 250°C | 300°C | 350°C | 400°C | 450°C | 500°C | 550°C | 600°C |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 410 | 395 | 380 | 370 | 360 | 350 | 340 | 320 | 300 | 270 | 215 |

Approximate values for creep rupture strength

Mean Creep Rupture Strength in N/mm² vs. Temperature in °C

| Hours | 500°C | 520°C | 540°C | 560°C | 580°C | 600°C | 620°C | 640°C | 660°C |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 10 000 | 289 | 252 | 216 | 182 | 151 | 123 | 99 | 79 | 62 |
| 100 000 | 258 | 220 | 183 | 150 | 120 | 94 | 73 | 56 | 42 |
| 200 000 | 246 | 208 | 171 | 139 | 110 | 86 | 65 | 49 | 35 |

Forging

Hot forming temperature: 1100-800°C, cool slowly. Note: Quenching and tempering treatment must always be carried out after hot forming.

Machinability

Metal-cutting machining is the same as for special engineering steel grades of corresponding strength.

Welding

The material displays good weldability. Welding must be followed by stress relief annealing with slow cooling. Filler material is MTS 3 or Thermanit from Thyssen.

Forms manufactured: Please see the [Dimensional Sales Program](#).

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