SINOXX 4541 Steel

Designation by Standards

Brand Name	Ravne	Mat. No.	DIN	EN	AISI/SAE
SINOXX 4541	PK11SP	1.4541	-	X6CrNiTi18-10	321

Chemical Composition (in weight %)

C	Si	Mn	Cr	Mo	Ni	V	W	Others
max. 0.08	max. 1.00	max. 2.00	18.00	-	10.50	-	-	min. Ti=5 x C x 0.7

Description
The key feature of 321 stainless is its resistance to intergranular corrosion. It employs titanium as a stabilizing element against chromium carbide formation. This alloy also exhibits strength characteristics superior to those of 304 stainless.

Applications
Jet engine parts, furnace heat treated parts, expansion joints, turbo superchargers, oil refiners, exhaust manifolds and high temperature chemical production equipment.

Physical properties (average values) at ambient temperature
Modulus of elasticity [10^3 x N/mm^2]: 203, 186 (200^{o}C), 172(400^{o}C)
Density [g/cm^3]: 7.9
Thermal conductivity [W/m.K]: 14.6
Electric resistivity [Ohm mm^2/m]: 0.73
Specific heat capacity[J/g.K]: 0.502

Coefficient of Linear Thermal Expansion 10^{-6} ^{o}C^{-1}

20-100^{o}C	20-200^{o}C	20-300^{o}C	20-400^{o}C	20-500^{o}C
16.0	17.0	17.0	18.0	18.0

Hardening
Harden from a temperature of 1020-1100^{o}C followed by water or air quenching. Structure is austenite with small ferrite component.

Mechanical properties in solution-annealed condition and resistance to intercrystalline corrosion
Hardness: 130-190 HB
0.2 % proof stress: 190 N/mm^2
1.0 % proof stress: 225 N/mm^2
Tensile strength: 500-700 N/mm^2
Elongation: 40% (for d<=160, longit.)
Resistance to interystalline corrosion: yes (in as delivered condition), yes (in sensitised condition)
Note: Sensitisation treatment for 15 min at 700^{o}C with subsequent cooling in air.

Mechanical Properties At Elevated Temperatures

Quenched Condition

Temperature	50°C	100°C	150°C	200°C	250°C	300°C	350°C	400°C
0.2 % proof stress in N/mm^2	190	176	167	157	147	136	130	124

Forging

Hot forming temperature: 1150-850°C.

Machinability

Excellent speeds and feeds are capable with this material. The addition of sulfur causes a very brittle chip. Many companies now offer premium machinability grades, such as CarTech with their Project 70 and 7000 series.

Corrosion Resistance

Resistant to a variety of organic and inorganic chemicals, fresh water and atmospheric corrosion.

Welding

Although not recommended, welding may be performed if low temperatures are employed. Recommended filler metal is AWS E/ER312. At high temperature, the sulfur in 303 tends to precipitate at the weld boundary resulting in weak and brittle joints.

Cold working

Minor deformation is possible with this alloy, although it is not its strong point. Type 303 Se is superior in this aspect.

Forms manufactured: Please see the Dimensional Sales Program.

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