



## SINOXX 4005 Steel

### Designation by Standards

Brand Name	Ravne	Mat. No.	DIN	EN	AISI/SAE
SINOXX 4005	PK333	1.4005	-	X12CrS13	416

### Chemical Composition (in weight %)

C	Si	Mn	Cr	Mo	Ni	V	W	Others
0.12	max. 1.00	max. 1.50	13.00	max. 0.60	-	-	-	-

### Description

416 was the first free machining stainless steel. It is a heat treatable chromium steel with excellent machinability and non-galling characteristics. The alloy is magnetic in all conditions.

### Applications

A wide variety of screw machine parts including nuts, bolts, screws, gears and pinions, valve trim, shafts, axles and other machine components, on automatic lathes, if parts are not subject to excessive corrosion stress.

### Physical properties (average values) at ambient temperature

#### Modulus of elasticity [ $10^3$ N/mm<sup>2</sup> vs. Temperature in °C

20°C	200°C	400°C
215	205	190

Density [g/cm<sup>3</sup>]: 7.70

Thermal conductivity [W/m.K]: 30

Electric resistivity [Ohm mm<sup>2</sup>/m]: 0.60

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

#### Coefficient of Linear Thermal Expansion 10<sup>-6</sup> °C<sup>-1</sup>

20-100°C	20-200°C	20-400°C
10.5	11.0	12.0

### Soft Annealing

Heat to 745-825°C, cool slowly in air. Structure is ferrite.

### Hardening

Harden from a temperature of 950-1000°C followed by oil or air quenching.

### Tempering

Tempering temperature: 680-780°C, air. Structure is martensite.

### Mechanical properties at ambient temperature

Condition: Quenched and tempered at 650°C, diameter d≤160 mm

Hardness: 220 HB

0.2% proof stress: 450 N/mm<sup>2</sup>

Tensile strength: 650-850 N/mm<sup>2</sup>

Elongation: 12% (Longit.)

#### **Forging**

Hot forming temperature: 1100-800°C, air cooling.

#### **Machinability**

Speeds and feed comparable with those of some of the free machining carbon steels. Good chip breakage. Material heat treated at 95°C and cold drawn will give best results.

#### **Corrosion Resistance**

Resistant to atmosphere, fresh water, steam, several petroleum products and organic materials and some dilute acids.

#### **Welding**

Welding of any type is not recommended, as the high sulfur content creates porosity.

#### **Cold working**

This alloy will accept only minor cold working. Severe deformation will result in cracking.

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

#### **Disclaimer**

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