



**C:** 0,10 - 0,17  
**Cr:** 15,5 - 17,5  
**Mo:** 0,20 - 0,40  
**S:** 0,15 - 0,35

**NIROSTA® 4104**  
X14CrMoS 17

**NIROSTA® 4104**

**Chromium ferritic stainless steel with sulphur**

Relevant current and obsolete standards:

- EN 10088-3 : 1.4104 X14CrMoS 17
- AISI : 430 F
- BS : -
- JIS : 430 F
- AFNOR : Z13CF 17
- DIN 17440 : 1.4104
- SIS : 2383

**General properties**

- corrosion resistance : poor
- mechanical properties : good
- forgeability : average
- weldability : poor
- machinability : very good

**Special properties**

- ferromagnetic grade with good machinability

**Physical properties**

- density (kg/dm<sup>3</sup>) : 7,7
- electrical resistivity at 20°C (Ω mm<sup>2</sup>/m) : 0,70
- magnetisable : yes
- thermal conductivity at 20°C (W/m K) : 25
- specific heat capacity at 20°C (J/kg K) : 460
- thermal expansion (10<sup>-6</sup>K<sup>-1</sup>) between
  - 20 and 100°C : 10
  - 20 and 200°C : 10,5
  - 20 and 300°C : 10,5
  - 20 and 400°C : 10,5

**Typical applications**

- automotive industry
- decorative applications and kitchen utensils
- electronic equipment

Hint: - available from stock

**Processing**

- automated machining : yes
- machinable : yes
- hammer and die forging : seldom
- cold forming : yes
- cold heading : not common
- suited to polishing : no

**Finished product forms and conditions**

- wire rod Ø 5,5 - 27
- peeled bars Ø 20 - 80
- bright bar h9, Ø 3 - 80
- bright coils h9, Ø 3 - 20
- black bar Ø 5,5 - 25
- annealed
- tempered
- pickled
- drawn
- straightened
- peeled
- ground

**Demand tendency**

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## Properties, applications and processing

The machinability of **NIROSTA® 4104** is far superior to that of the ferritic 17% chromium steel, **NIROSTA® 4016** as a result of the controlled sulphur addition to this grade of steel. The addition of sulphur however reduces the resistance to corrosion, and as such **NIROSTA® 4016** is significantly more resistant to corrosion than **NIROSTA® 4104**, despite their similar chromium contents.

### Corrosion resistance (PRE = 16.16 to 19.48)\*

Although **NIROSTA® 4104**, contains 17% chromium, the corrosion resistance of this steel is severely compromised by the addition of sulphur. This is particularly true when exposed to environments that promote pitting and crevice corrosion.

\* The range of PRE values that are possible for this grade of steel thus have to be viewed with some scepticism since the detrimental effects of sulphur are not taken into account in the determination of PRE values.

### Heat treatment / mechanical properties

#### Annealed condition:

**NIROSTA® 4104** may be annealed to a fully soft structure by holding the steel or component at a temperature of 800°C followed by slow cooling in air. Care must however be taken to ensure that a temperature of 825°C is not exceeded during annealing. In this condition, the following mechanical properties can be expected:

Property	Specification
- tensile strength (N/mm <sup>2</sup> )	R <sub>m</sub> : ≤ 730
- hardness	HB : ≤ 220

Note: the HB values could be 60 units higher and the tensile strengths 150 N/mm<sup>2</sup> higher due to cold work during straightening of profiles ≤ 35mm.

#### Tempering:

The mechanical properties may be improved by quenching and tempering, in which the steel is first hardened by holding the steel at a temperature between 950 and 1070°C followed by quenching in air, oil or polymer. The tempering temperature is dependent on the desired strength. In most cases, the QT 650 condition is specified and may be obtained by following the hardening treatment with a tempering treatment in the temperature range 550 to 650°C / air cooled. In this condition, the following mechanical properties can be expected:

Property	Spec. QT650	Typical
- yield strength (N/mm <sup>2</sup> )	R <sub>p0.2</sub> : ≥ 500	525
- tensile strength (N/mm <sup>2</sup> )	R <sub>m</sub> : 650 – 850	725
- tensile elongation (%), A <sub>5</sub>	: ≥ 12, if d ≤ 60 : ≥ 10, if 60 < d ≤ 160	19

### Welding

In general, **NIROSTA® 4104** is not welded, other than occasionally being friction or resistance welded.

### Forging

As a result of the high sulphur content and mixed ferrite-austenite structure that exists at the forging temperatures, care should be taken when forging **NIROSTA® 4104**. When forging is to be performed, gradual heating to a temperature of about 850°C is recommended prior to more rapid heating to a temperature of between 1100 and 1130°C. Forging then takes place between 1130 - 1050°C.

### Machining

The machinability of this grade of stainless steel is superior to other 12 and 17% chromium steels as a result of the sulphur addition. When machining **NIROSTA® 4104**, the following parameters can be used as a guideline:

#### 1. Turning CNC

Tensile strengths R <sub>m</sub> in N/mm <sup>2</sup>	Depth of cut (mm) Feed rate (mm/rev)		
	6 mm 0,5 mm/r	3 mm 0,4 mm/r	1 mm 0,2 mm/r
Annealed (650 - 720)	250 m/min	300 m/min	380 m/min

#### 2. Automated machining

Tensile strengths R <sub>m</sub> in N/mm <sup>2</sup>	Depth of cut (mm) Feed rate (mm/rev)		
	6 mm 0,5 mm/r	3 mm 0,4 mm/r	1 mm 0,2 mm/r
Annealed (650 - 720)	140 m/min	155 m/min	165 m/min
Quenched and tempered (730-790)	125 m/min	140 m/min	150 m/min

### General comments

It should be noted that as a result of the sulphur addition, neither minimum impact properties, nor elevated temperature properties are specified.