

# NIROSTA® 4589

<b>Material no.</b>	1.4589 to EN 10 088-2											
<b>Code names</b>	D	(DIN/EN)	X 5 CrNiMoTi 15-2									
	USA	(ASTM)	S 42035									
	Japan		–									
	CIS		–									
<b>Chemical composition</b> (in % by weight)	C	Cr	Mo	Ni	Ti	Mn						
min.	–	13.5	0.20	1.0	0.30	–						
max.	0.08	15.5	1.20	2.5	0.50	1.0						
<b>Product forms</b>	Hot-rolled wide strip, cold-rolled wide strip, slit strip, cut sheets, circles, blanks											
<b>Mechanical properties</b> (transverse samples) at room temp. to EN 10 088-2	Dimensions range		$R_{p0.2}$ (0.2% yield strength) N/mm <sup>2</sup>			$R_m$ (tensile strength) N/mm <sup>2</sup>		$A_{80}$ (elongation) %				
	Cold-rolled strip $s \leq 8$ mm		$\geq 420$			550 – 750		$\geq 16$				
	Hot-rolled strip $s \leq 13.5$ mm		$\geq 380$			550 – 750		$\geq 14$				
<b>Heat treatment</b>	Annealing temperature °C		Time min			Cooling		Microstructure				
	750 – 800		~ 5/mm thickness			Water/air		Ferrite/carbide				
	900 – 1100		~ 5/mm Dicke			Water/air		Ferrite/soft martensite				
<b>Physical properties</b>	Density kg/dm <sup>3</sup>	Modulus of elasticity in kN/mm <sup>2</sup> at					Thermal expansion in $10^{-6} \cdot K^{-1}$ between 20 °C and					
		20 °C	100 °C	200 °C	300 °C	400 °C	500 °C	100 °C	200 °C	300 °C	400 °C	500 °C
	7.7	220	215	210	205	195	–	10.5	11.0	11.5	12.0	12.0
	Thermal conductivity at 20 °C W/m · K		Specific heat capacity at 20 °C J/kg · K			Electrical resistivity at 20 °C $\Omega \cdot mm^2/m$		Magnetisability				
	25		460			0.60		present				
<b>Surface finish</b>	2 B (III c), 2 H (III d) on request											
<b>Edge finish</b>	Untrimmed, cut edges, dressed edges on request											

## Chemical resistance

Our publication "Chemical Resistance of NIROSTA® Steels" contains tables giving some guide chemical resistance.

## Processing

The cold formability (bending, flanging, deep drawing) of NIROSTA® 4589 is largely dependent on the thickness of the material. With cold-rolled strip and sheet, the finer grain structure ensures relatively good toughness and formability. However, the longitudinal orientation of the rolling direction must be taken into account. For example, sharp bends parallel to the rolling direction must be avoided. The bend radius should be at least 2 x sheet thickness.

Since ferritic steels are brittle at low temperatures, they must only be formed at or above room temperature.

Heat tints or scale from heat treatment or welding reduce corrosion resistance and should be removed chemically (e.g. pickling baths or pickling pastes) or mechanically (e.g. by grinding or blasting with glass beads or iron- and sulfur-free quartz sand).

Machining properties can be described as good thanks to the ferritic-soft martensitic structure. Tools should be made of good quality high-speed steel or carbide.

NIROSTA® 4589 cannot be polished.

## Welding

**Weldability:**  
NIROSTA® 4589 can be readily welded by all methods except gas welding. Heat treatment after welding is generally not necessary.

**Filler metals:**

Material no.	1.4316	1.4370
THERMANIT®	JE	X

## Applications

NIROSTA® 4589 has a similar corrosion resistance to 17% Cr steels.

NIROSTA® 4589 is mainly used for producing structural parts requiring higher yield strength. Due to its alloy composition, this steel exhibits high mechanical strength, good wear resistance, as well as good formability and weldability.

This steel is principally used for rail trucks (ferritic-carbide structure) and conveyor chains (ferritic-martensitic structure).