

NIROSTA® 4439

Material no.	1.4439 to EN 10 088-2											
Code names	D	(DIN/EN)	X 2 CrNiMoN 17-13-5									
	USA	(ASTM)	S 31726									
	Japan		SUS 317									
	CIS		–									
Chemical composition (in % by weight)		C	Cr	Mo	Ni	N	Mn					
	min.	–	16.5	4.0	12.5	0.12	–					
	max.	0.03	18.5	5.0	14.5	0.22	2.0					
Product forms	Cold-rolled wide strip, slit strip, cut sheets, circles, blanks, precision strip											
Mechanical properties (transverse samples) at room temp. to EN 10 088-2	Dimensions range			$R_{p0.2}$ (0.2% yield strength) N/mm ²	$R_{p1.0}$ (1.0% yield strength) N/mm ²	R_m (tensile strength) N/mm ²	A_{80} (elongation) %					
	Cold-rolled strip $s \leq 8$ mm			≥ 290	≥ 320	580 to 780	≥ 35					
	Hot-rolled strip $s \leq 13.5$ mm			≥ 270	≥ 310							
Minimum properties at elevated temperatures	Temperature °C	100	150	200	250	300	350	400				
	$R_{p0.2}$ (0.2% yield strength) N/mm ²	225	200	185	175	165	155	150				
	$R_{p1.0}$ (1.0% yield strength) N/mm ²	255	230	210	200	190	180	175				
Heat treatment	Annealing temperature °C	Time min			Cooling			Microstructure				
	1060 – 1140	~ 5/mm thickness			Water/air			Austenite (possibly some ferrite)				
Physical properties	Density kg/dm ³	Modulus of elasticity in kN/mm ² 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
	8.0	200	194	186	179	172	165	16.0	16.5	17.0	17.5	18.0
	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			
	14		500			0.85			not present ¹⁾			
	¹⁾ NIROSTA® 4439 may be slightly magnetic in quenched condition. Magnetisability increases with increasing strain hardening.											
Surface finish	2 B (III c), 2 R (III d)											
Edge finish	Untrimmed, cut edges, dressed edges on request											

Chemical resistance

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

Processing

NIROSTA® 4439 can be readily cold formed (e.g. bending, flanging, spinning, deep drawing). However, the higher strain hardening compared to unalloyed steels means that correspondingly greater forces are necessary for forming. For pressure vessels, cold forming, any post heat treatment and welding should be carried out according to the regulations of AD Information Sheet HP 7/3.

This stipulates that post heat treatment is not necessary:

- a) where percent cold reduction $\leq 15\%$ and
- b) after welding.

Post heat treatment is necessary with percent cold reductions greater than 15%.

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).

Due to the tendency of to strain hardening and to the poor thermal conductivity, machining should be carried out with tools made of good quality high-speed steel (good cooling required) or, better still, with carbide alloys.

NIROSTA® 4439 can be polished.

Welding

Weldability:

NIROSTA® 4439 can be readily welded by all methods (except gas welding).

Filler metals:

Material no.	1.4440	2.4831	2.4656
THERMANIT®	18/17 E ¹⁾	625	30/40 E

¹⁾ Up to max. 350 °C with wet corrosion.

Approvals: This material and the filler metal are approved for use in the construction of pressure vessels.

Applications

Due to Mo contents of approx. 4.5%, NIROSTA® 4439 exhibits high resistance to pitting in chloride-containing media. Compared to steels containing less molybdenum, NIROSTA® 4439 possesses greater general resistance to organic acids at elevated temperatures and concentrations as well as to nonoxidizing inorganic acids.

The steel is insensitive to stress corrosion cracking and crevice corrosion. As a result of its low C content,

NIROSTA® 4439 can be welded in all dimensions without becoming susceptible to intergranular corrosion. Resistance to intergranular corrosion is retained in continuous service up to 400 °C.

As a result of its corrosion resistance and high yield strength values, NIROSTA® 4439 has many applications in the chemical industry, in sea water desalination plants and in flue gas cleaning plants.