NIROSTA® 4571

Material no.	1.4571 to EN 10 088-2		
Code names	D	(DIN/EN)	X 6 CrNiMoTi 17-12-2
	USA	(ASTM)	316 Ti
	Japan		SUS 316 Ti
	CIS		10 Ch 17 N 13 M 2 T

Chemical composition (in % by weight)

	C	Cr	Mo	Ni	Ti	Mn
min.	–	16.5	2.0	10.5	5 x C	–
max.	0.08	18.5	2.5	13.5	0.70	2.0

Product forms

Hot-rolled wide strip, 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	$R_{p\,0.2}$ (0.2% yield strength) N/mm²	$R_{p\,1.0}$ (1.0% yield strength) N/mm²	R_m (tensile strength) N/mm²	A_{80} (elongation) %
Cold-rolled strip s ≤ 8 mm	≥ 240	≥ 270	540 to 690	≥ 40
Hot-rolled strip s ≤ 13.5 mm	≥ 220	≥ 260		

Minimum properties at elevated temperatures

Temperature °C	100	150	200	250	300	350	400	450	500	550
$R_{p\,0.2}$ (0.2% yield strength) N/mm²	185	177	167	157	145	140	135	131	129	127
$R_{p\,1.0}$ (1.0% yield strength) N/mm²	218	206	196	186	175	169	164	160	158	157

Heat treatment

Annealing temperature °C	Time min	Cooling	Microstructure
1030 – 1110	~ 5/mm thickness	Water/air	Austenite (possibly some ferrite)

Physical properties

Density kg/dm³	Modulus of elasticity in kN/mm² 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	16.5	17.5	18.0	18.5	19.0

Thermal conductivity at 20 °C W/m · K	Specific heat capacity at 20 °C J/kg · K	Electrical resistivity at 20 °C Ω · mm²/m	Magnetisability
15	500	0.75	not present[1)]

[1)] NIROSTA® 4541 may be slightly magnetic in quenched condition. Magnetisability increases with increasing strain hardening.

Surface finish

1 D (II a), 2 H (III a), 2 R (III d)

Edge finish

Untrimmed, cut edges, dressed edges on request

Published by: ThyssenKrupp Nirosta GmbH · 47794 Krefeld · www.nirosta.de

Chemical resistance

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

Processing

NIROSTA® 4571 can be very readily cold formed (e.g. bending, flanging, deep drawing, spinning). However, the higher strain hardening compared to unalloyed steels means that correspondingly greater forces are necessary for forming. By grading the chemical composition within the standard analysis, specific welding properties (e.g. longitudinal welded pipes) can be achieved. 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 ≤ 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 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 tools.

NIROSTA® 4571 cannot be polished.

Welding

Weldability:
NIROSTA® 4571 can be readily welded by all methods except gas welding.

Filler metals:

Material no.	1.4576	1.4430
THERMANIT®	A	GE

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

Applications

Due to the addition of titanium, NIROSTA® 4571 can be welded in all dimensions without becoming susceptible to intergranular corrosion. Resistance to intergranular corrosion is retained up to 400 °C in continuous service. The Mo content increases chemical resistance and resistance to pitting in chloride-containing media.

NIROSTA® 4571 is widely used in the chemical, petrochemical and coal chemicals industries, cellulose production, textile finishing and in water and food technology.

NIROSTA® 4571 is also approved for use as wall ties in the building industry.