



**MATERIAL No.: 1.4541**

**DESCRIPTION**

<b>EN symbol (short)</b>	X6CrNiTi18-10	<b>Density kg/dm<sup>3</sup></b>	7,9
<b>AISI</b>	AISI 321	<b>Hardness HB</b>	130-190
<b>UNS</b>	S 32100 Grade TP 321	<b>Composition</b>	chromium nickel steel
<b>AFNOR</b>	X6CrNiTi18-10 / NF EN10088-5 ( 03/2009) (FR)	<b>Category</b>	Stainless steels steel, resistant to rust and acids
<b>BS</b>	X6CrNiTi18-10 / EN 10088-1 ( 06/2005) (GB)	<b>Structure</b>	austenitic
		<b>Corrosion</b>	resistant to intercrystalline corrosion with titanium addition, improvement of intercrystalline corrosion, worsens cutting property non-corroding
		<b>Additional characteristics</b>	chemically resistant

**CHEMICAL COMPOSITION**

		C	Si	Mn	Cr	S	Ni	P	Ti
<b>1.4541</b>	<b>Min %</b>				17,00		9,00		>=(5xC)
	<b>Max %</b>	0,08	1,00	2,00	19,00	0,015	12,00	0,045	<=0,70
(Key to steel 2010) S-content and Cu-content may deviate in some aspects due to different product types									
<b>AISI 321</b>	<b>Min %</b>				17,00		9,00		>=5xC
	<b>Max %</b>	0,08	0,75	2,00	20,00	0,030	13,00	0,040	<=0,70
SA-213 (TP 321)									
<b>S 32100</b>	<b>Min %</b>				17,00		9,00		>=(5xC)
	<b>Max %</b>	0,08	1,00	2,00	20,00	0,030	13,00	0,045	<= 0,70
ASTM A 312 (TP 321)									

**PHYSICAL PROPERTIES**

Property	Value
<b>Density: kg/dm<sup>3</sup></b>	7,9

<b>Hardness: HB</b>	130-190				
<b>Hardness HB 30</b>	<=215				
<b>magnetizable</b>	no (might increase due to cold deformation)				
<b>Temperature T</b> °C/F (°C/F)	<b>Specific heat</b> J / kgK (Btu / lb °F)	<b>Thermal conductivity</b> W/mK (Btu-in / ft <sup>2</sup> ·h·°F)	<b>Electric resistance</b> μΩ · cm (Ω circ mill / ft)	<b>Modulus of elasticity</b> kN/mm <sup>2</sup> (10 <sup>3</sup> ksi)	<b>Expansion rate from 70°F bis T</b> 10 <sup>-6</sup> / K (10 <sup>-6</sup> / °F)
20 / 68	500 (-)	15 (-)	0,73 (-)	200 (-)	16,0 (-)
200 / 392				186 (-)	16,5 (-)
300 / 572				179 (-)	17,0 (-)
400 / 752				172 (-)	17,5 (-)
500 / 932				165 (-)	18,0 (-)
<b>temperature</b>	<b>0,2%Yield strength in high temperatures</b>		<b>1,0% Yield strength in high temperatures</b>		
°C / °F	<b>Rp 0,2</b>		<b>Rp 1,0</b>		
	<b>N/mm<sup>2</sup> / ksi</b>		<b>N/mm<sup>2</sup> / ksi</b>		
100 / 212	176 / 25,50		208 / 30,16		
200 / 392	157 / 22,77		186 / 30,00		
300 / 572	136 / 19,70		167 / 24,20		
400 / 752	125 / 18,10		156 / 22,60		
500 / 932	119 / 17,00		149 / 21,60		
ksi value calculated					

#### MECHANICAL PROPERTIES (20°C / 68°F)

<b>1% Yield strength Rp1,0 (Mpa / ksi)</b>	240 / 34,8
<b>Tensile strength Rm (Mpa/ksi)</b>	500-700
<b>Elongation A5 (%)</b>	40
<b>impact work ISO-V</b>	60 J

#### TEMPERATURE INFORMATION

<b>Application area</b>	
<b>Operation temperature</b>	°F to 1652 °F
<b>Explanation report</b>	air
<b>Solution heat treatment</b>	
<b>Working temperature</b>	1886 °F to 2030 °F

<b>Processing information</b>	cool down: water;air
<b>Annealing</b>	
<b>Working temperature</b>	1832 °F to 2012 °F
<b>Explanation report</b>	duration 5 min; width 5 mm
<b>Processing information</b>	cool down: water;air
<b>Solution heat treatment</b>	
<b>Working temperature</b>	2102 °F to 1562 °F
<b>Processing information</b>	cool down: air

#### STANDARDS / INFORMATION

<b>Standards</b>	<b>Description</b>
<a href="#">ASTM A 182</a>	Standard Specification for Forged or Rolled Alloy-Steel Pipe Flanges,Forged Fittings and Valves and Parts for High-Temperature Service
<a href="#">ASTM A 213</a>	Standard Specification for Seamless Ferritic and Austenitic Alloy-Steel Boiler,Superheater,and Heat-Exchanger Tubes
<a href="#">ASTM A 240</a>	sheet metal and ribbons from stainless Cr and Ni pressure containers
<a href="#">ASTM A 249</a>	Standard Specification for Welded austenitic steel boiler, Superheaters, heat-exchangers,and condenser Tubes
<a href="#">ASTM A 269</a>	Standard Specification for Seamless and welded, austenitic, and stainless steel tubing for general purposes
<a href="#">ASTM A 312</a>	Standard Specification for Seamless and welded austenitic stainless steel pipes
<a href="#">ASTM A 403</a>	Standard Specification for Wrought Austenitic Stainless Steel Piping Fittings
<a href="#">ASTM A 479</a>	Rods and cross-sections made of stainless and heat-resistant steel used in boilers and other pressure tanks
<a href="#">DIN EN 10088-1 (09/2005)</a>	Stainless steels Part 1: List of stainless steels
<a href="#">DIN EN 10088-3 (09/2005)</a>	stainless steels.Technical delivery conditions for semi-finished products,bars,rods,wire selection and bright products of corrosion resisting steels for general and construction purposes
<a href="#">DIN EN 10217-7</a>	Welded steel pipes under compression load Pipes made from stainless steel
<a href="#">DIN EN 10296-2 (02/2006)</a>	Welded circular steel pipes for machine construction and general technical service stainless steel
<a href="#">DIN EN 10297-2 (02/2006)</a>	Welded circular steel pipes for machine construction and general technical service stainless steel. Pipes made from stainless steel

#### PROCESS INFORMATION

##### **Welding**

<b>- Material classification acc. CEN ISO/TR 15608</b>	<b>8.1</b>
<b>- Type</b>	well weldable WIG submerged arc welding MAG solid wire manual arc welding (E) Laser welding
<b>- Add. material</b>	1.4551.4576;1.4430,1.4551,1.4316 laser welding; consult specialist literature
<b>- Hints</b>	special post heat treating not required

#### MAIN FIELDS OF APPLICATION

<b>Details of application</b>	certified for delivery acceptance obligating pressure containers in reference to AD data sheet W2
<b>Certifications</b>	
<b>Chemical Industry</b>	for processing nitric acid the production of acetic acid
<b>food processing industry</b>	
<b>crude oil</b>	
<b>petrochemical industry</b>	
<b>food processing industry</b>	

#### RANGE OF PRODUCTS

<b>Product type</b>	<b>Product</b>
Plates / Sheets	plates/sheets plate/sheet cuts
Fittings	welded reductions Welded T-pieces seamless elbows seamless reductions seamless T-pieces Other Fittings a.o. Weldolets, Nipples
Flanges / Collars / Flared tube ends	flared tube end collars various flanges (weld neck flange,blind flange etc.) weld neck flange/blind flange

Bumped boiler ends / caps / round blanks	from sheets from bar steel
Pipes / Tubes	welded pipes/tubes welded square pipes/tubes Hollow bar seamless pipes/tubes
Round bar	forged raw
Bar steel	flat steel section steel round bar steel hexagon steel
Equipment	screws, screw nuts, shims, straight turning parts, designed components

[Pipe/Tube/Fitting/Flange/Valve/Plate](#)

Stainless Steel/Nickel Alloy/Duplex

