METALLURGICA VENETA
ACCIAI SPECIALI

Certified Company

AISI 316

Quality	X5CrNiMo17-12-2	Austenitic Stainless Steel
Number	1.4401	

Chemical composition

C% max	Si% max	Mn% max	P% max	S% a) max	Cr%	Ni%	N% max	Mo%	
0,07	1,00	2,00	0,045	0,015	16,5-18,5	10,0-13,0	0,11	2,0-2,5	EN 10088-1: 2005
± 0.01	+ 0.05	± 0.04	+ 0.005	+ 0.003	± 0.2	± 0.15	± 0.01	± 0.1	

Product deviation are allowed

a) for improving machinability, it is allowed a controlled sulphur content of 0,015 % - 0,030 %; for polishability, it is suggested a controlled sulphur content of max 0,015 %

Temperature °C

Melting range	Hot-forming	Solution annealing (Solubilization)	Stabilizing	Soft annealing
1400-1380	1200-900	1100-1050 water	unnecessary	not suitable

Sensitization	Quenching	Tempering
sensitization test at 800-450	not suitable	not suitable

MMA **welding –** AWS electrodes

pre-heating not required

post welding slow cooling

joint with steel

carbon	CrMo alloyed	stainless
E309-E308	E309-E308	E308

cosmetic welding
E 316 or E 16-8-2

Mechanical properties

Hot-formed EN 10088-3: 2005 in conditions 1C, 1E, 1D, 1X, 1G, 2D

size mm		Testing at room temperature							
		R	**Rp** 0.2	**A%** (L)	**A%** (T)	**Kv** +20 °C (L)	**Kv** +20 °C (T)	**HB** a)	
from	to	N/mm²	N/mm² min	min		J min	J min	max	
	160	500-700	200	40		100		215	+AT solubilization
160	250	500-700	200		30		60	215	+AT solubilization

a) for information only (L) = longitudinal (T) = transversal

Cold processed EN 10088-3: 2005 in conditions 2H, 2B, 2G, 2P

size mm		Testing at room temperature						
		R	**Rp** 0.2	**A%** (L)	**A%** (T)	**Kv** +20 °C (L)	**Kv** +20 °C (T)	
from	to	N/mm²	N/mm² min	min	min	J min	J min	
	10 b)	600-950	400	25				
10	16	580-950	380	25				+AT solubilization
16	40	500-850	200	30		100		
40	63	500-850	200	30		100		
63	160	500-700	200	40		100		
160	250	500-700	200		30		60	

b) in the range of 1 mm ≤ d < 5 mm, values are valid only for rounds – the mechanical properties of non round bars of < 5 mm of thickness have to be agreed at the time of request and order

(L) = longitudinal (T) = transversal

Forged +AT solubilization

size mm		Testing at room temperature							
		R	**Rp** 0.2	**A%**	**A%**	**Kv** +20 °C	**Kv** +20 °C	**Kv** -196 °C	
from	to	N/mm²	N/mm² min	min (L)	min (T)	J min (L)	J min (T)	J min (T)	
	250	500-700	200		30	100	60		EN 10250-4: 2001
	250	510-710	205	45	35	100	60	60	EN 10222-5: 2001

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Work-hardned by cold-drawing EN 10088-3: 2005 in condition 2H (es. +AT+C)

size mm		Testing at room temperature R	Rp 0.2	A%	
from	to	N/mm²	N/mm² min	min	
	35	700-850	350	20	+AT+C700 cold-drawn material
	25	800-1000	500	12	+AT+C800 cold-drawn material

Transition curve determined by Kv impacts. Material solubilized at 1050 °C

Average	J	198	206	218	225	238	245	250
Test at	**°C**	**-160**	**-120**	**-80**	**-40**	**0**	**+40**	**+80**

Approximate mechanical properties at low temperatures. Material solubilized at 1080 °C

R	N/mm²	580	820	1270	1440
Rp 0.2	N/mm²	245	330	520	580
A	%	55	50	45	40
Test at	**°C**	**+24**	**-74**	**-196**	**-254**

X5CrNiMo17-12-2 **n° 1.4401** austenitic stainless steel

Effect of **cold-working** (hot-rolled +AT+C). Approximate values

R	N/mm²	550	660	800	1000	1110
Rp 0.2	N/mm²	260	510	640	790	840
A	%	50	22	14	13	10
Reduction	**%**	**0**	**10**	**20**	**30**	**40**

Minimum yield stress and tensile strength values at high temperatures on material +AT, EN 10088-3: 2005/EN 10269: 2001

Rp 0.2	N/mm²	175	158	145	135	127	120	115	112	110	108
R	N/mm²	460	440	420	415	410	410	410	405	390	375
Test at	**°C**	**100**	**150**	**200**	**250**	**300**	**350**	**400**	**450**	**500**	**550**

Thermal expansion	$10^{-6} \cdot K^{-1}$	12.8	13.3	14.1	►	16.0	16.5	17.0	17.5	18.8	20.2
Modulus of elasticity	longitudinal GPa				200	194	186	179	172		127
Modulus of elasticity	tangential GPa				78						
Poisson number	*v*				0.256	0.280					
Electrical resistivity	$\Omega \cdot mm^2/m$	0.58		0.66	0.75		0.86		0.97	1.07	1.15
Electrical conductivity	Siemens•m/mm²				1.33						
Specific heat	J/(Kg•K)				500		510		550	585	630
Density	Kg/dm³				7.98						
Thermal conductivity	W/(m•K)				15.0		17.5	19.9			25.1
Relative magnetic permeability	μr				1.02						
Temperature	**°C**	**-184**	**-128**	**-74**	**20**	**100**	**200**	**300**	**400**	**600**	**800**

The symbol ► indicates between 20 °C and 100 °C, 20 °C and 200 °C .....

Corrosion resistance	Atmospheric		Chemical			**x** halides, sulfuric acid, phosphoric, organic and formic acids
Fresh water	*industrial*	*marine*	*medium*	*oxidizing*	*reducing*	
x	**x**	**x**	**x**	**x**	**x**	

Magnetic	no
Machinability	low
Hardening	cold-drawn and other cold plastic deformations
Service temperature in air	continuous service up to 850 °C; intermittent service up to 800 °C

Europe	USA	USA	China	Russia	Japan	India	Rep. of Korea
EN	UNS	ASTM	GB	GOST	JIS	IS	KS
X5CrNiMo17-12-2	S31600	**316**	0Cr17Ni12Mo2	08Ch17N13M2	SUS 316	X04Cr17Ni12Mo2	STS 316

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Approximate diagram of cold-drawn hardening