

Quality	X17CrNi16-2	Martensitic
Number	1.4057	Stainless Steel

Chemical composition

C%	Si%	Mn%	P%	S% ^{a)}	Cr%	Ni%	
0,12-0,22	max	max	max	max	15,0-17,0	1,50-2,50	EN 10088-1: 2005
± 0.01	+ 0.05	± 0.04	+ 0.005	+ 0.003	± 0.20	± 0.07	

Product deviations 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	Recrystallization	Soft annealing	MMA welding – AWS electrodes
1510-1430	1100-900	not suitable	750-680 furnace cooling 10 °C/h to 600, then air	<i>pre-heating</i> 350 <i>annealing after w.</i> 750
Isothermal annealing	Quenching	Tempering	Stress-relieving	joint with steel
not suitable	1030-980 oil / polymer / air (HRC 45 ~)	670-600 air	250-210 air	carbon CrMo alloyed stainless E60–E309 E8016-B 2 E309-E308 <i>cosmetic welding</i> E309 special

Transformation temperature during heating **Ac1** ~ 725, **Ac3** ~ 815 and during cooling **Ms** ~ 145

Mechanical properties

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

size mm		Testing at room temperature					a) for information only	
from	to	R	R _p 0.2	A%	Kv +20 °C	HB ^{a)}		
		N/mm ²	N/mm ² min	min	J min	max		
		950 max				295	+A annealed material	
60	60	800-950	600	14	25		+QT800 quenched and tempered material	
60	160	800-950	600	12	20			
	60	900-1050	700	12	20		+QT900 quenched and tempered material	
60	160	900-1050	700	10	15			

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

size mm		Testing at room temperature			R	R _p 0.2	A%	Kv +20 °C
from	to	N/mm ² max	HB ^{a)} max		N/mm ²	N/mm ² min	min	J min
	10 ^{b)}	1050	330		850-1100	750	7	
10	16	1050	330		850-1100	700	7	
16	40	1000	310		800-1050	650	9	25
40	63	850	295		800-1000	650	12	25
63	160	850	295		800-950	650	12	20
		+A annealed material			+QT800 quenched and tempered material			

^{a)} for information only

^{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 have to be agreed at the time of request and order

Forged EN 10250-4: 2001

size mm		Testing at room temperature						
from	to	R	R _p 0.2	A%	A%	Kv +20 °C	Kv +20 °C	HB
		N/mm ²	N/mm ² min	min (L)	min (T)	J min (L)	J min (T)	max
	250	1000 max						295
	250	800-950	600	10	8	20	15	+A annealed
	250	900-1050	700	10	8	15	10	+QT800 quenched and tempered
								+QT900 quenched and tempered

Table of tempering values at room temperature on rounds of Ø 10 mm after quenching at 1000°C in oil											
R	N/mm ²	1580	1490	1460	1440	1400	1360	1250	1080	910	800
Rp 0.2	N/mm ²	1290	1240	1220	1190	1130	1060	980	860	780	690
A	%	14	15	15	14	14	15	16	17	18	19
Tempering	°C	200	300	350	400	450	500	550	600	650	700

X17CrNi16-2 n° 1.4057 martensitic stainless steel

Effect of cold-working (hot-rolled +QT+C). Approximate values											
R	N/mm ²	836	900	910	930	945	965	990	1000	1020	
Rp 0.2	N/mm ²	720	754	792	820	804	880	910	920	950	
A	%	23	18	16	14	14	14	14	13	13	
Reduction	%	0	7	8	10	12	14	17	18	20	

Minimum values at high temperatures, quenched and tempered material EN 10088-3: 2005										
Rp 0.2	N/mm ²	515	495	475	460	440	405	355	+QT800	
Rp 0.2	N/mm ²	565	525	505	490	470	430	375	+QT900	
Test at	°C	100	150	200	250	300	350	400		

Thermal expansion	10 ⁻⁶ • K ⁻¹	▶	10.0	10.5	10.5	10.5				
Modulus of elasticity	longitudinal GPa	215	212	205	200	190				
Poisson number	ν	0.144	0.138							
Electrical resistivity	Ω • mm ² /m	0.70								
Electrical conductivity	Siemens•m/mm ²	1.43								
Specific heat	J/(Kg•K)	460		500		590	720	860		
Density	Kg/dm ³	7.70								
Thermal conductivity	W/(m•K)	25								
Relative magnetic permeability	μ _r	700-1100 ~								
Temperature	°C	20	100	200	300	400	600	800		

The symbol ▶ indicates temperature between 20 °C and 100 °C, 20 °C and 200 °C

Corrosion resistance	Atmospheric		Chemical			x nitric acid, alkaline water and well water
	<i>industrial</i>	<i>marine</i>	<i>medium</i>	<i>oxidizing</i>	<i>reducing</i>	
Fresh water						
x	x	x	x			

Magnetic	yes
Machinability	good in annealed condition, mean for quenched and tempered material
Hardening	by quenching
Service temperature in air	continuous service up to 750 °C; intermittent service up to 800 °C

Europe	USA	USA	China	Russia	Japan	India	Republic of Korea
EN	UNS	ASTM	GB	GOST	JIS	IS	KS
X17CrNi16-2	S43100	431	1Cr17Ni2	14Ch17N2	SUS 431	15Cr16Ni2	STS 431

AISI 431

Continuous Cooling Transformations
AISI 431 steel

austenitization 1040 °C

