



<b>Quality</b>	<b>X2CrNi19-11</b>	<b>Austenitic</b>	<i>Technical card 2018</i>
Number	<b>1.4306</b>	<b>Stainless Steel</b>	<i>Lucefin Group</i>

## Chemical composition

C%	Si%	Mn%	P%	S% <sup>a)</sup>	Cr%	Ni%	N%	
max	max	max	max	max			max	
0,03	1,00	2,00	0,045	0,030	18,0-20,0	10,0-12,0	0,10	EN 10088-3: 2014
+ 0.005	+ 0.05	+ 0.04	+ 0.005	± 0.005	± 0.2	± 0.15	+ 0.01	

Product deviations are allowed

<sup>a)</sup> for 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) +AT	Stabilizing	Soft annealing +A	MMA welding – AWS electrodes
1450-1400	1200-930	1100-1050 water	885 calm air	not suitable	<i>pre-heating</i> not necessary
					<i>post welding</i> slow cooling
Sensitization	Quenching +Q	Tempering +T	Stress-relieving +SR		<i>joint with steel</i>
not suitable	not suitable	not suitable	450-200 furnace		carbon CrMo alloyed stainless
					E309-E308 E309-E308 E308
					<i>cosmetic welding</i> E308 L

**Chemical treatment** - Pickling (6 - 25% HNO<sub>3</sub>) + (0.5 - 8% HF) hot - Passivation 20 - 50% HNO<sub>3</sub> hot

## Mechanical properties

**Heat-treated material** EN 10088-3: 2014 in conditions 1C, 1E, 1D, 1X, 1G, 2D

size		Testing at room temperature						
mm		R	Rp 0.2	A%	A%	Kv <sub>2</sub> +20 °C	Kv <sub>2</sub> +20 °C	HBW <sup>a)</sup>
from	to	N/mm <sup>2</sup>	N/mm <sup>2</sup> min	min (L)	min (T)	J min (L)	J min (T)	max
160	160	460-680	180	45	-	100	-	215 +AT solubilization
160	250	460-680	-	-	35	-	60	215 +AT solubilization

<sup>a)</sup> for information only

(L) = longitudinal (T) = transversal

**Bright bars of heat-treated material** EN 10088-3: 2014 in conditions 2H, 2B, 2G, 2P

size		Testing at room temperature						
mm		R	Rp 0.2	A%	A%	Kv <sub>2</sub> +20 °C	Kv <sub>2</sub> +20 °C	
from	to	N/mm <sup>2</sup>	N/mm <sup>2</sup> min	min (L)	min (T)	J min (L)	J min (T)	
	10 <sup>b)</sup>	600-930	400	25	-	-	-	
10	16	600-930	380	25	-	-	-	+AT solubilization
16	40	460-830	180	30	-	100	-	
40	63	460-830	180	30	-	100	-	
63	160	460-680	180	45	-	100	-	
160	250	460-680	180	-	35	-	60	

<sup>b)</sup> 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** UNI EN 10250-4: 2001

size		Testing at room temperature						
mm		R	Rp 0.2	A%	A%	Kv +20 °C	Kv +20 °C	
from	to	N/mm <sup>2</sup>	N/mm <sup>2</sup> min	min (L)	min (T)	J min (L)	J min (T)	
	250	460-680	180	-	35	100	60	+AT solubilization

**Work-hardened by cold-drawing** EN 10088-3: 2014 in condition 2H (es. +AT+C)

size		Testing at room temperature						
mm		R	Rp 0.2	A%				
from	to	N/mm <sup>2</sup>	N/mm <sup>2</sup> min	min				
	35	700-850	350	20				+AT+C700 cold-drawn material
	25	800-1000	500	12				+AT+C800 cold-drawn material

**Approximate mechanical properties at low temperatures.** Material solubilized at 1050 °C

<b>R</b>	N/mm <sup>2</sup>	1450	1300	1000	600			
<b>Rp 0.2</b>	N/mm <sup>2</sup>	350	320	320	290			
<b>A</b>	%	40	45	50	55			
<b>Test at</b>	<b>°C</b>	<b>-254</b>	<b>-196</b>	<b>-100</b>	<b>0</b>			

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

<b>R</b>	N/mm <sup>2</sup>	600	780	880	1000	1080	1150	1220	1350
<b>Rp 0.2</b>	N/mm <sup>2</sup>	300	440	600	720	820	960	1040	1180
<b>A</b>	%	60	40	20	14	12	12	12	12
<b>Reduction</b>	%	<b>0</b>	<b>10</b>	<b>20</b>	<b>30</b>	<b>40</b>	<b>50</b>	<b>60</b>	<b>70</b>

**Minimum values at high temperatures** on material +AT, EN 10088-3: 2014 solubilized

<b>Rp 0.2</b>	N/mm <sup>2</sup>	145	130	118	108	100	94	89	85	81	80
<b>Test at</b>	°C	<b>100</b>	<b>150</b>	<b>200</b>	<b>250</b>	<b>300</b>	<b>350</b>	<b>400</b>	<b>450</b>	<b>500</b>	<b>550</b>

<b>Thermal expansion</b>	10 <sup>-6</sup> • K <sup>-1</sup>		▶	16.0	16.5	17.0	17.5	18.0	
<b>Modulus of elasticity</b>	long. GPa			200	194	186	179	172	165
<b>Poisson number</b>	$\nu$		0.30	0.30	0.30	0.31	0.31	0.32	0.32
<b>Electrical resistivity</b>	$\Omega \cdot \text{mm}^2/\text{m}$			0.73					
<b>Electrical conductivity</b>	Siemens•m/mm <sup>2</sup>			1.37					
<b>Specific heat</b>	J/(Kg•K)			500					
<b>Density</b>	Kg/dm <sup>3</sup>			7.90					
<b>Thermal conductivity</b>	W/(m•K)			15.0					
<b>Relative magnetic permeability</b>	$\mu_r \text{ max}$		~ 2	1.02					
<b>°C</b>			<b>-196</b>	<b>20</b>	<b>100</b>	<b>200</b>	<b>300</b>	<b>400</b>	<b>500</b>

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

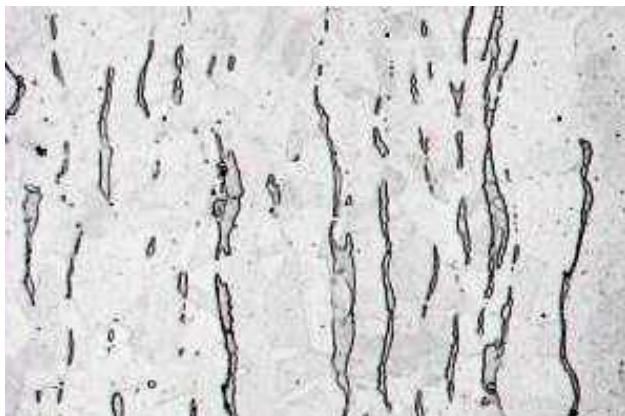
<b>Corrosion resistance</b>	Atmospheric		Chemical			x intercrystalline corrosion, foods, colouring and organic substances
Fresh water	<i>industrial</i>	<i>marine</i>	<i>medium</i>	<i>oxidizing</i>	<i>reducing</i>	
x	x		x	x	x	

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

<b>Europe</b>	<b>USA</b>	<b>USA</b>	<b>China</b>	<b>Russia</b>	<b>Japan</b>	<b>India</b>	<b>Republic of Korea</b>
EN	UNS	ASTM	GB	GOST	JIS	IS	KS
X2CrNi19-11	S30403	(304L)	022Cr19Ni10	(03Ch18N11)		X02CrNi19-10	

1.4306 untreated steel

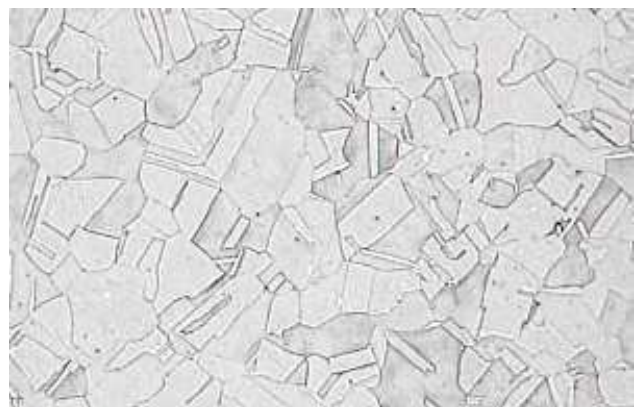
Austenite and 5% ferrite delta



500 x

1.4306 solubilized steel

Grain size 4-5, according to ASTM E 112 standard



100 x