

<b>Quality</b>	<b>X46Cr13</b>	<b>Martensitic</b>	<i>Technical card</i>
Number	<b>1.4034</b>	<b>Stainless Steel</b>	<i>Lucefin Group</i>

### Chemical composition

C%	Si%	Mn%	P%	S% <sup>a)</sup>	Cr%	
0,43-0,50	max 1,00	max 1,00	max 0,040	max 0,015	12,5-14,5	EN 10088-1: 2005
± 0.02	+ 0.05	+ 0.03	+ 0.005	+ 0.003	± 0.15	

Product deviations are allowed

<sup>a)</sup> 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
1480-1470	1100-800	not suitable	850-750 slow cooling to 600, then air	<i>pre-heating</i> 250-200 <i>annealing after w.</i> 750
Quenching	Tempering	Stress-relieving	<i>joint with steel</i>	
1050-950 oil / air (HRC 50 ~)	700-650 air	200 air	carbon	CrMo alloyed stainless E70 xx E8016-B 2 E309-E308 <i>cosmetic welding</i> E420

Transformation temperature during heating **Ac1** ~ 805, **Ac3** ~ 870 and during cooling **Ms** ~ 280, **Mf** ~ 130

### Mechanical properties

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

size mm		Testing at room temperature					
from	to	R	Rp 0.2	A%	Kv +20 °C	HB <sup>a)</sup>	
		N/mm <sup>2</sup>	N/mm <sup>2</sup> min	min	J min	max	<sup>a)</sup> for information only
		800 max				245	+A annealed material
160		850-1000	650	10	12		+QT850 quenched and tempered

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

size mm		Testing at room temperature					
from	to	R	HB <sup>a)</sup>	R	Rp 0.2	A%	Kv +20 °C
		N/mm <sup>2</sup> max	max	N/mm <sup>2</sup>	N/mm <sup>2</sup> min	min	J min
	10 <sup>b)</sup>	950	305	900-1150	700	7	
10	16	950	305	900-1150	700	7	
16	40	900	280	850-1100	650	8	12
40	63	840	260	850-1000	650	8	12
63	160	800	245	850-1000	650	10	12
		+A annealed material		+QT850 quenched and tempered material			

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

<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

### Forged

size mm		Testing at room temperature						
from	to	R	Rp 0.2	A%	C%	Kv +20 °C	HB <sup>a)</sup>	
		N/mm <sup>2</sup>	N/mm <sup>2</sup> min	min	min	J min	max	
							245	
								+A annealed material

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

**Table of tempering** values at room temperature on rounds of Ø 10 mm after quenching at 1000°C in oil

<b>R</b>	N/mm <sup>2</sup>	1800	1700	1700	1690	1680	1640	1300	1000	840	750
<b>Rp 0.2</b>	N/mm <sup>2</sup>	1400	1320	1300	1300	1290	1250	1000	700	600	550
<b>A</b>	%	6	8	8	9	9	10	11	13	16	16
<b>Kv</b>	J	14	20	18	14	12	12	14	20	28	40
<b>Tempering</b>	°C	<b>200</b>	<b>300</b>	<b>350</b>	<b>400</b>	<b>450</b>	<b>500</b>	<b>550</b>	<b>600</b>	<b>650</b>	<b>700</b>

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

<b>R</b>	N/mm <sup>2</sup>	650	750	755	760	770	795	805	835	900	960
<b>Reduction %</b>		<b>0</b>	<b>5</b>	<b>6</b>	<b>8</b>	<b>10</b>	<b>15</b>	<b>18</b>	<b>20</b>	<b>25</b>	<b>36</b>

Thermal expansion	$10^{-6} \cdot K^{-1}$	▶	10.5	11.0	11.5	12.0			
Modulus of elasticity	longitudinal	GPa	215	212	205	200	190		
Poisson number		$\nu$	0.235						
Electrical resistivity		$\Omega \cdot mm^2/m$	0.55						
Electrical conductivity		Siemens $\cdot m/mm^2$	1.82						
Specific heat		J/(Kg $\cdot$ K)	460						
Density		Kg/dm <sup>3</sup>	7.70						
Thermal conductivity		W/(m $\cdot$ K)	30						
Relative magnetic permeability		$\mu_r$	700 ~						
Temperature		°C	20	100	200	300	400	600	800

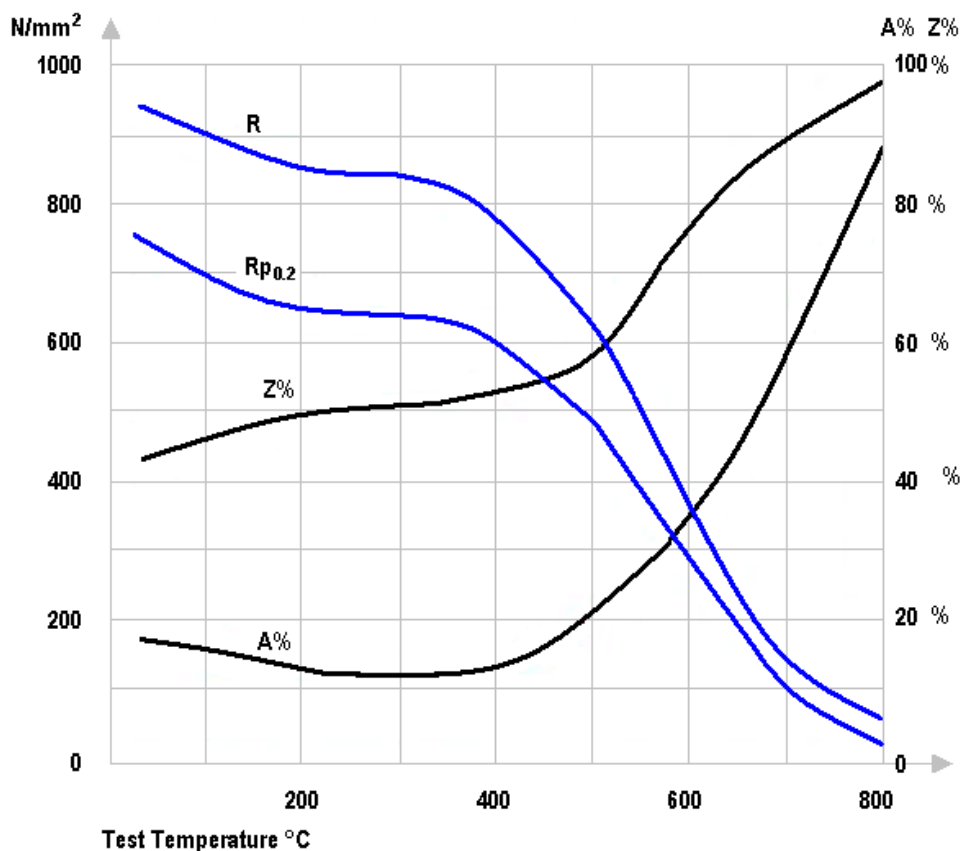
The symbol ▶ indicates temperature between 20 °C and 100 °C, 20 °C and 200 °C .....

<b>Corrosion resistance</b>	Atmospheric	Chemical	x rust, diluted nitric acid, weak organic acids in the passive state
Fresh water	<i>industrial</i> <i>marine</i>	<i>medium</i> <i>oxidizing</i> <i>reducing</i>	
x			

<b>Magnetic</b>	yes
<b>Machinability</b>	good after annealing
<b>Hardening</b>	by quenching
<b>Service temperature in air</b>	continuous service up to 650 °C; intermittent service up to 750 °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
X46Cr13	S42000	<b>420C</b>		(Ch13)			

Behavior of mechanical properties at high temperatures



Approximate values for rounds of Ø 16 mm after quenching at 1000°C in oil and tempering at 650 °C