Quality	**X46CrS13**	**Martensitic Stainless Steel**	*Technical card 2018*
Number	**1.4035**		*Lucefin Group*

Chemical composition

C%	Si% max	Mn% max	P% max	S%	Cr%	
0,43-0,50	1,00	2,00	0,040	0,15-0,35	12,5-14,0	EN 10088-3: 2014
± 0.02	+ 0.05	± 0.04	+ 0.005	± 0.02	± 0.15	

Product deviations are allowed

Temperature °C

Melting range	Hot-forming	Recrystallization +RA	Soft annealing +A
1480-1460	1100-930	not suitable	850-750 slow cooling to 600, then air
Quenching +Q		**Tempering +T**	**Stress-relieving +SR**
1050-950 oil / air		675-625 fast cooling in air	200 air

MMA **welding –** AWS electrodes
pre-heating *annealing after w.*
not recommended

joint with steel
carbon CrMo alloyed stainless

cosmetic welding

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

Chemical treatment ▪ *Pickling* (10 - 15% HNO_3)+ (0,5 -1,05% HF) hot or cold

Mechanical properties

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

size mm		Testing at room temperature R	Rp 0.2	A%	Kv_2 +20 °C	HBW a)	a) for information only
from	to	N/mm²	N/mm² min	min	J min	max	
	63	800 max	-	-	-	245	+A annealed material

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

size mm		Testing at room temperature R	HBW a)	R	Rp 0.2	A%	Kv_2 +20 °C
from	to	N/mm² max	max	N/mm²	N/mm² min	min	J min
	10 b)	880	280	-	-	-	-
10	16	880	280	-	-	-	-
16	40	800	250	-	-	-	-
40	63	760	230	-	-	-	-
		+A annealed material					

a) for information only

b) in the range 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 R	Rp 0.2	A%	Kv +20 °C	HB a)	
from	to	N/mm²	N/mm² min	min	J min	max	
		-	-	-	-	245	+A annealed material

a) for information only

Table of tempering values at room temperature on rounds of Ø 10 mm after quenching at 1000 °C in oil
For information, steel 1.4034 values are quoted

R	N/mm²	1800	1700	1700	1690	1680	1640	1300	1000	840	750
Rp 0.2	N/mm²	1400	1320	1300	1300	1290	1250	1000	700	600	550
A	%	6	8	8	9	9	10	11	13	16	16
Kv	J	14	20	18	14	12	12	14	20	28	40
Tempering	**°C**	**200**	**300**	**350**	**400**	**450**	**500**	**550**	**600**	**650**	**700**

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

R	N/mm²	640	710	740	760	830	840	860	880	895	920
Reduction	**%**	**0**	**8**	**10**	**15**	**18**	**20**	**22**	**24**	**26**	**30**

X46CrS13 **n° 1.4035** martensitic stainless steel *Lucefin Group*

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	*v*	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^3	7.70				
Thermal conductivity	$W/(m \cdot K)$	30				
Relative magnetic permeability	μr	700-1000 ~				
°C		**20**	**100**	**200**	**300**	**400**

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

Corrosion resistance	Atmospheric		Chemical			**x** weak acid, steam, ammonia, petroleum, organic material
Fresh water	*industrial*	*marine*	*medium*	*oxidizing*	*reducing*	
x						

Magnetic	yes
Machinability	high
Hardening	by quenching
Service temperature in air	continuous service up to 600 °C; intermittent service up to 700 °C

Europe EN	**USA** UNS	**USA** ASTM	**China** GB	**Russia** GOST	**Japan** JIS	**India** IS	**Republic of Korea** KS
X46CrS13							

Lifting pins