

Quality	39NiCrMo3	Quenching and Tempering Steel	<i>Technical card</i>
According to standard	EN 10083-3: 2006		Lucefin Group
Number	1.6510		<i>rev. 2018</i>

Chemical composition

C%	Si% max	Mn%	P% max	S% max	Cr%	Mo%	Ni%	
0,35-0,43 ± 0.02	0,40 + 0.03	0,50-0,80 ± 0.04	0,025 + 0.005	0,035 + 0.005	0,60-1,00 ± 0.05	0,15-0,25 ± 0.03	0,70-1,00 ± 0.05	Product deviations are allowed

On request, this steel grade may be supplied Calcium (Ca) treated

On request, it can also be supplied with the addition of Lead (Pb) 0,15 – 0,35%, Sulphur (S) 0,020-0,040% or Bismuth (Bi 0,030-0,080%) for improved machinability

Temperature °C

Hot-forming	Normalizing +N	Quenching +Q	Quenching +Q	Tempering +T	Stress-relieving +SR		
1100-900	860 air (HB 370 ~)	850 oil or polymer	840 water	550-650 air	50° under the temperature of tempering		
Soft annealing +A	Isothermal annealing +I	Full annealing	End quench hardening test	Pre-heating welding	Stress-relieving after welding		
700 air cooling (HB max 240)	820 furnace cooling to 650, then air (HB 195-240)	820 air cooling (HB max 235)	850 water	300	550 furnace cooling		
				Ac1 740	Ac3 790	Ms 330	Mf 110

Natural state HB 285 ~

Mechanical properties

Hot-rolled mechanical properties in quenched and tempered condition EN 10083-3: 2006

size d / t		Testing at room temperature (longitudinal)					
mm		R	Rp 0.2	A%	Z%	Kv	HB
from	to	N/mm ²	N/mm ² min.	min.	min.	J min.	
	16/8	980-1180	785	11	40	-	295-354
16/8	40/20	930-1130	735	11	40	35	278-339
40/20	100/60	880-1080	685	12	45	40	263-327
100/60	160/100	830-980	635	12	50	40	249-295
160/100	250/160	740-880	540	13	50	40	224-263

d = diameter t = thickness

Table of tempering values obtained at room temperature on rounds of Ø 10 mm after quenching at 850 °C in oil

HB		577	560	525	496	468	442	426	409	390	362	336	286	240
HRC		56	55	53	51	49	47	45.5	44	42	39	36	30	22.5
R	N/mm ²	2160	2070	1950	1820	1700	1580	1500	1430	1340	1220	1100	950	800
Rp 0.2	N/mm ²	1440	1520	1540	1520	1490	1440	1370	1290	1220	1110	980	830	670
A	%	8.0	9.8	10.4	10.6	10.7	10.8	11.0	11.5	12.5	13.8	16.0	19.0	22.0
Z	%	30	42	48	52	53	53	54	55	56	57	60	63	68
Kv	J	28	31	32	28	28	27	27	28	36	46	86	114	128
Tempering at °C		100	150	200	250	300	350	400	450	500	550	600	650	700

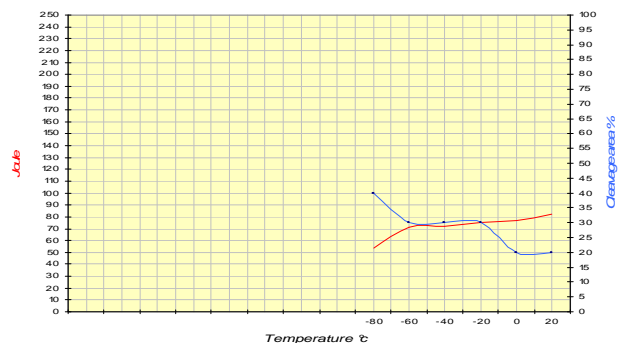
Transition curve; LUCEFIN experience

Kv values obtained on hot-rolled 100 mm round

Quenched and tempered (induction) R = 1002 N/mm²

Rp 0.2 = 879 N/mm² – A% = 14,6 – Z% = 54

°C	J	Lat. Exp. mm	Shear %
+20	85-82-79	0,94-0,91-0,93	20
0	78-76-77	0,88-0,84-0,83	20
-20	73-77-75	0,83-0,88-0,80	30
-40	68-74-74	0,78-0,77-0,81	30
-60	66-70-64	0,80-0,78-0,77	30
-80	55-50-58	0,45-0,57-0,51	40



39NiCrMo3 1.6510 EN 10277-5: 2008

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Hot-rolled annealed and Cold-drawn +A+C						Hot-rolled annealed and Peeled +A+SH				
size mm		Testing at room temperature (longitudinal)				Testing at room temperature (longitudinal)				
from	to	R	Rp 0.2	A%	HBW	R	Rp 0.2	A%	HBW	
		N/mm ²	N/mm ² min	min	for inform.	N/mm ²	N/mm ² min	min	max	
5 ^{b)}	10	-	-	-	-	-	-	-	-	
10	16	-	-	-	-	-	-	-	-	
16	40	-	-	-	-	-	-	-	240	
40	63	-	-	-	-	-	-	-	240	
63	100	-	-	-	-	-	-	-	240	

Hot-rolled, quenched and tempered and Cold-drawn +QT+C ^{c)}						Hot-rolled, quenched and tempered and Peeled +QT+SH				
size mm		Testing at room temperature (longitudinal)				Testing at room temperature (longitudinal) ^{e)}				
from	to	R	Rp 0.2	A%	Kv₂	R	Rp 0.2	A%	Kv₂	
		N/mm ²	N/mm ² min	min	J min	N/mm ² min	N/mm ² min	min	J min	
5 ^{b)}	10	980-1180	735	8	-	-	-	-	-	
10	16	930-1130	700	8	-	-	-	-	-	
16	40	930-1130	700	9	-	930-1130	735	11	-	
40	63	880-1080	625	10	-	880-1080	735	12	-	
63	100	880-1080	600	10	-	880-1080	735	12	-	

^{c)} for flats and special sections, tensile strength (R) may differ by ± 10%^{b)} for thickness < 5 mm, mechanical properties should be agreed before order placement^{e)} values valid also for +C+QT**39NiCrMo3 Forged** quenched and tempered UNI 7874: 1979. Use only as reference

size mm		Testing at room temperature							Kv +20 °C		HB
from	to	R	Rp 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)	for inform.			
	100	880-1080	685	12		40		263-327			
100	250	685-835	540	13	12	30	25	209-250			
250	500	655-805	490	15	14	30	25	201-241			
500	1000	635-785	440	16	15	25	-	195-234			
1000		590-740	390	15	14	25	-	176-224			

L = longitudinal T = tangential

d = diameter t = thickness

EN 10083-3: 2006 **Jominy test HRC** grain size 5 min.

mm distance from quenched end																
	1.5	3	5	7	9	11	13	15	20	25	30	35	40	45	50	H
min	52	51	50	49	48	46	44	43	39	36	34	33	32	31	30	normal
max	60	60	59	58	58	57	57	56	55	52	51	49	48	46	45	

Thermal Expansion	10 ⁻⁶ • K ⁻¹	▶	11.2
Mod. of Elasticity long.	GPa		210
Mod. of Elasticity tang.	GPa		80
Specific Heat Capacity	J/(Kg•K)		
Thermal Conductivity	W/(m•K)		
Density	Kg/dm ³		7.85
Specific Electric Resist.	Ohm•mm ² /m		
Electrical Conductivity	Siemens•m/mm ²		
°C		20	100

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

EUROPE	ITALY	CHINA	GERMANY	FRANCE	U.K.	RUSSIA	USA
EN	UNI	GB	DIN	AFNOR	B.S.	GOST	AISI/SAE
39NiCrMo3	39NiCrMo3		36CrNiMo4	40NCD3		39HNM	9840