

Quality	39NiCrMo3
According to standard	EN 10083-3: 2006
Number	1.6510

Chemical composition

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

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%) or sulphur (S 0,020-0,040) for improved machinability

Temperature °C

Hot-forming	Normalizing	Quenching	Quenching	Tempering	Stress-relieving		
1100-900	860 air	850 oil or polymer	840 water	550-650 air	50° under the temperature of tempering		
Soft annealing	Isothermal annealing	Full annealing	End quench hardenability 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

Mechanical and physical properties

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

size d / t		Testing at room temperature (longitudinal)					
from	to	R	Rp 0.2	A%	C%	Kv	HB
mm		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

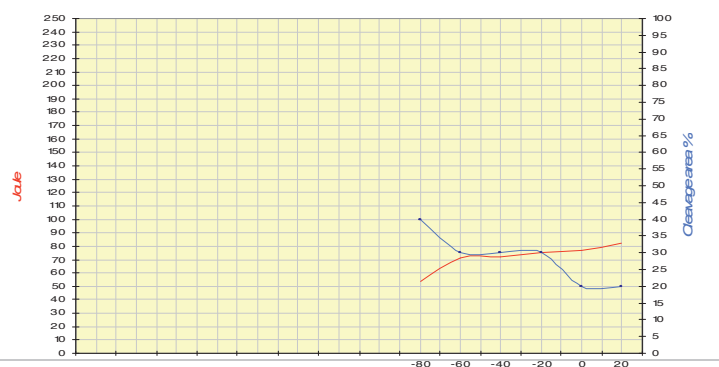
Table of tempering values obtained at room temperature on rounds of Ø 10 mm after quenching at 850 °C in oil

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
C %	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;

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** – C% **54**

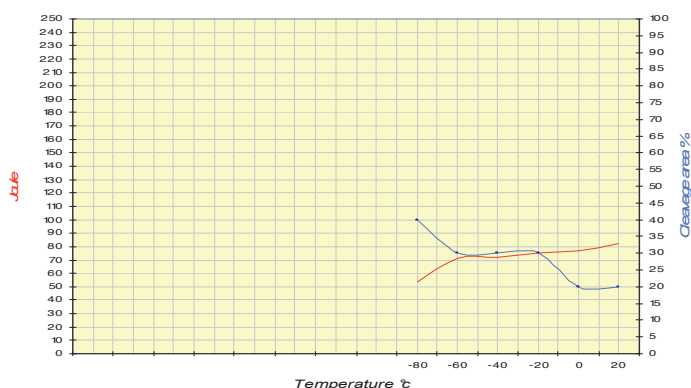
°C	J	Lat. Exp. mm	Shear %
+20	85-82-79	0,94-0,91-0,93	20
0	78-76-77	0,88-0,84-0,83	20
-20	73-77-75	0,83-0,88-0,80	30
-40	68-74-74	0,78-0,77-0,81	30
-60	66-70-64	0,80-0,78-0,77	30



Transition curve;

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 – C% 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



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Cold-drawn + quenched and tempered +C +QT

Hot-rolled annealed + peeled-reeled +A +SH

Testing at room temperature (longitudinal) ^{e)}									
size mm		R	Rp _{0.2}	A%	HB	R	Rp _{0.2}	A%	HB
from	to	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	930-1130	735	11	278-339				240
40	63	880-1080	735	12	263-327				240
63	100	880-1080	735	12	263-327				240

^{b)} for thickness < 5 mm, mechanical properties should be agreed before order placement

^{e)} values valid also for +C+QT+SL

Hot-rolled, quenched and tempered, cold-drawn +QT +C ^{c) e)}

Hot-rolled annealed + cold-drawn +A +C

Testing at room temperature (longitudinal)									
size mm		R	Rp _{0.2}	A%	HB	R	Rp _{0.2}	A%	HB
from	to	N/mm ²	N/mm ² min	min	for inform.	N/mm ² min	N/mm ² min	min	max
5 ^{b)}	10	980-1180	735	8	295-354				295
10	16	930-1130	700	8	278-339				290
16	40	930-1130	700	9	278-339				285
40	63	880-1080	625	10	263-327				280
63	100	880-1080	600	10	263-327				280

^{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 +QT+C+SL

Forged quenched and tempered UNI 7874: 1979. Use only as reference

Testing at room temperature										
size mm		R	Rp _{0.2}	A%	A%	Kv +20 °C	Kv +20 °C	HB		
from	to	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 extremity

	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	

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Temperature	Mod. of elasticity GPa		Thermal expansion			Density
Testing at °C	E long.	G tang.	$10^{-6} \cdot K^{-1}$			Kg/dm ³
20	210	80	11.2			7.80

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