

Quality	36NiCrMo16	Quenching and Tempering Steel	<i>Technical card</i>
According to standard	EN 10083-3: 2006		Lucefin Group
Number	1.6773		<i>rev. 2018</i>

Chemical composition

C%	Si% max	Mn%	P% max	S% max	Cr%	Mo%	Ni%	Product deviations are allowed
0,32-0,39 ± 0.02	0,40 + 0.03	0,50-0,80 ± 0.04	0,025 + 0.005	0,025 + 0.005	1,60-2,00 ± 0.05	0,25-0,45 ± 0.04	3,60-4,10 ± 0.07	

Temperature °C

Hot-forming	Normalizing +N	Quenching +Q	Quenching +Q	Tempering +T	Stress-relieving +SR			
1100-900	850 air	880 air	830-860 oil, polymer, water or s.b. (500)	550-650 air	50° under the temperature of tempering			
Soft annealing +A	Isothermal annealing +I	Full annealing	End quench hardenableity test	Pre-heating welding			Stress-relieving after welding	
650 air (HB max 269)		790 furnace cooling (HB max 275)	825 water	250			550 furnace cooling	
				Ac1	Ac3	Ms	Mf	
				700	760	240	30	

Mechanical properties

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

size d / t mm		Testing at room temperature (longitudinal)						
from	to	R N/mm ²	R _{p 0.2} N/mm ² min.	A% min.	Z% min.	Kv J min.	HBW for information	
16/8	16/8	1250-1450	1050	9	40	-	370-415	
16/8	40/20	1250-1450	1050	9	40	30	370-415	
40/20	100/60	1100-1300	900	10	45	35	331-380	
100/60	160/100	1000-1200	800	11	50	45	298-359	
160/100	250/160	1000-1200	800	11	50	45	298-359	

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		518	496	468	448	432	409	385	357	327	301
HRC		52.5	51	49	47.5	46	44	41.5	38.5	35	32
R	N/mm ²	1900	1820	1720	1610	1520	1420	1320	1200	1090	1000
R_{p 0.2}	N/mm ²	1550	1500	1430	1360	1290	1200	1100	990	900	870
A	%	7.0	8.0	8.6	9.2	9.6	10.0	11.0	12.4	14.0	14.0
Z	%	23	24	25	27	27	28	32	38	48	50
Kv	J	28	28	27	26	26	26	28	38	64	64
Tempering at °C		200	250	300	350	400	450	500	550	600	650

36NiCrMo16

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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)			
		R	Rp 0.2	A%	HB	R	Rp 0.2	A%	HB
from	to	N/mm ²	N/mm ² min	min		N/mm ²	N/mm ² min	min	
No indications from reference standards					No indications from reference standards				
Hot-rolled, quenched and tempered and Cold-drawn +QT+C					Hot-rolled, quenched and tempered, Peeled +QT+SH				
size mm		Testing at room temperature (longitudinal)				Testing at room temperature (longitudinal)			
		R	Rp 0.2	A%	HB	R	Rp 0.2	A%	HB
from	to	N/mm ²	N/mm ² min	min		N/mm ²	N/mm ² min	min	
No indications from reference standards					No indications from reference standards				

36NiCrMo16 1.6773 **Forged** quenched and tempered UNI EN 10250-3: 2001

size d / t		Testing at room temperature						
mm		R	Rp 0.2	A%	A%	Kv	Kv	HB
from	to	N/mm ² min	N/mm ² min	min (L)	min (T)	J min (L)	J min (T)	min
	250/160	1000	800	11	8	45	22	298
250/160	500/330	1000	800	11	8	45	22	298
500/330	990/660	1000	800	11	8	45	22	298
L = longitudinal T = tangential								
d = diameter t = thickness								

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

distance in mm from quenched end																
	1.5	3	5	7	9	11	13	15	20	25	30	35	40	45	50	H
min	50	49	48	48	48	48	47	47	47	47	47	47	47	47	47	
max	57	56	56	56	56	56	55	55	55	55	55	55	55	55	55	

Thermal Expansion	10 ⁻⁶ •K ⁻¹	►	11.5	12.3	12.8	13.3	13.7	14.0	
Mod. of Elasticity long.	GPa		208						
Mod. of Elasticity tang.	GPa		80						
Specific Heat Capacity	J/(Kg•K)		460						
Thermal Conductivity	W/(m•K)		33						
Density	Kg/dm ³		7.84						
Specific Electric Resist.	Ohm•mm ² /m		0.30						
Electrical Conductivity	Siemens•m/mm ²		3.33						
°C			20	100	200	300	400	500	600

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

Lucefin experience; Forged round 300 mm quenched at 870 °C in water, tempered 590 °C air

Depth from	Longitudinal Testing						
Heat Treatment	R	Rp 0.2	A%	Z%	Kv +20°C	Kv -20°C	HB
surface	N/mm ²	N/mm ²			J	J	
½ radius	1201	1110	12,8	55,0	90-98-90	62-58-60	371
Chemical composition %							
C	Si	Mn	P	S	Cr	Mo	Ni
0.34	0.25	0.50	0.012	0.005	1.68	0.40	3.70

EUROPE	ITALY	CHINA	GERMANY	FRANCE	U.K.	RUSSIA	USA
EN	UNI	GB	DIN	AFNOR	B.S.	GOST	AISI/SAE
36NiCrMo16	34NiCrMo16		36NiCrMo16	35NCD16	835M30		