

Quality	50CrMo4	Quenching and Tempering Steel	<i>Technical card</i>
According to standards	ISO 683-2: 2018		Lucefin Group
Number	1.7228		rev. 2018

Chemical composition

C%	Si% a)	Mn%	P% max	S% max	Cr%	Mo%	Cu% max	
0,46-0,54	0,10-0,40	0,50-0,80	0,025	0,035	0,90-1,20	0,15-0,30	0,40	Product deviations are allowed
± 0.02	± 0.03	± 0.04	+ 0.005	± 0.005	± 0.05	± 0.03	+ 0.05	

On request, it may be supplied Sulfur (S%) 0,020-0,035 treated

a) Steels may be supplied with a lower silicon content. In this case, alternative means of deoxidation shall be used

Temperature °C

Hot-forming	Normalizing +N	Quenching +Q	Quenching +Q	Tempering +T	Stress-relieving +SR		
1100-850	860 air (HB ~ 321)	860 oil or polymer	820 water	540-680 air	50° under the temperature of tempering		
Soft annealing +A	Isothermal annealing +I	Spheroidizing +AC	End quench hardenability test	Pre-heating welding	Stress-relieving after welding		
720 air (HB max 248)	790 furnace cooling to 660, then air (HB max ~ 222)	-	850 water	300	550 furnace cooling		
				Ac1	Ac3	Ms	Mf
				720	760	320	100

Mechanical properties

50CrMo4 1.7228 Hot-rolled mechanical properties in **quenched and tempered** condition ISO 683-2: 2018

size diameter / thickness mm		Testing at room temperature (longitudinal)					
from	to	R N/mm ²	Rp 0.2 N/mm ² min.	A% min.	Z% min.	Kv₂ J min.	HBW for information
	16/8	1100-1300	900	9	40		331-380
16/8	40/20	1000-1200	780	10	45	30	298-359
40/20	100/60	900-1100	700	12	50	30	271-331
100/60	160/100	850-1000	650	13	50	30	253-298
160/100	250/160	800-950	550	13	50	30	240-286

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

HB	448	421	390	353	327	294	264
HRC	47.5	45	42	38	35	31	27
R N/mm ²	1620	1490	1350	1185	1070	960	880
Rp 0.2 N/mm ²	1370	1270	1165	1060	930	840	785
A %	7.0	10.0	12.0	13.0	13.5	15.5	20.0
Z %	-	30	40	49	57	60	60
Kv J	26	28	28	38	94	146	166
Tempering at °C	400	450	500	550	600	650	700

Data under fatigue +20 °C

+N		Cyclic yield strength, σ_y'
+QT	700	N/mm ² low cycle number
+N		Cyclic strength exponent, n'
+QT	0.13	low cycle number
+N		Cyclic strength coefficient, K'
+QT	1568	N/mm ² low cycle number
+N		Fatigue strength coefficient, σ_f'
+QT	490	N/mm ² high cycle number
+N		Fatigue strength coefficient, σ_f'
+QT	1642	N/mm ² low cycle number
+N		Fatigue strength exponent, b
+QT	-0.09	low cycle number
+N		Fatigue ductility exponent, c
+QT	-0.71	low cycle number

+N = normalization +QT = quenching and tempering

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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		N/mm ²	N/mm ² min	min	max	
5	10	-	-	-	-	-	-	-	-	-
10	16	-	-	-	-	-	-	-	-	-
16	40	-	-	-	-	-	-	-	248	
40	63	-	-	-	-	-	-	-	248	
63	100	-	-	-	-	-	-	-	248	

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) ^{a)}				
from	to	R	Rp 0.2	A%	Kv ₂	R	Rp 0.2	A%	Kv ₂	
		N/mm ²	N/mm ² min	min	J min	N/mm ²	N/mm ² min	min	J min	
5	10	-	-	-	-	-	-	-	-	-
10	16	-	-	-	-	-	-	-	-	-
16	40	-	-	-	-	1000-1200	780	10	30	
40	63	-	-	-	-	900-1100	700	12	30	
63	100	-	-	-	-	900-1100	700	12	30	

a) Values valid also for +C+QT

50CrMo4 1.7228 **Forged** quenched and tempered UNI EN 10250-3: 2001

size d / t		Testing at room temperature						
from	to	R	Rp 0.2	A%	A%	Kv	Kv	HB
		N/mm ² min	N/mm ² min	min (L)	min (T)	J min (L)	J min (T)	min
	250/160	800	550	13	9	25	14	240
250/160	500/330	750	540	14	10	20	12	225
500/330	750/500	700	490	15	11	15	10	213

L = longitudinal T = tangential

d = diameter t = thickness

ISO 683-2: 2018 **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	58	58	57	55	54	53	51	48	45	41	39	38	37	36	36	
max	65	65	64	64	63	63	63	62	61	60	58	57	55	54	54	

Thermal Expansion	10 ⁻⁶ • K ⁻¹	▶	11.1	12.1	12.9	13.5	13.9	14.1	
Mod. of Elasticity long.	GPa		210						
Mod. of Elasticity tang.	GPa		80						
Specific Heat Capacity	J/(Kg•K)		460						
Thermal Conductivity	W/(m•K)		42						
Density	Kg/dm ³		7.85						
Specific Electric Resist.	Ohm•mm ² /m		0.19						
Electrical Conductivity	Siemens•m/mm ²		5.26						
°C			20	100	200	300	400	500	600

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

EUROPE	ITALY	CHINA	GERMANY	FRANCE	U.K.	RUSSIA	USA
EN	UNI	GB	DIN	AFNOR	B.S.	GOST	AISI/SAE
50CrMo4		ZG50CrMo	50CrMo4			50HM	4150