

<b>Quality</b>	<b>34CrMo4</b>	<b>Quenching and Tempering Steel</b>	<i>Technical card</i> <b>Lucefin Group</b> rev. 2018
According to standards	<b>ISO 683-2: 2018</b>		
Number	<b>1.7220</b>		

### Chemical composition

C%	Si% a)	Mn%	P% max	S% max	Cr%	Mo%	Cu% max	Permissible deviations on the <b>product</b>
0,30-0,37 ± 0.02	0,10-0,40 ± 0.03	0,60-0,90 ± 0.04	0,025 + 0.005	0,035 ± 0.005	0,90-1,20 ± 0.05	0,15-0,30 ± 0.03	0,40 + 0.05	

For 34CrMoS4 n° 1.7226, S% 0.020-0.040 product deviations ± 0.005

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	Tempering +T	Stress-relieving +SR	Natural state +U
1100-850	870 air	830-870 oil, polymer or water	540-680 air	50° under the temperature of tempering	(HB max 340)
Soft annealing +A	Isothermal annealing +I	Spheroidizing +AC	End quench hardening test	Pre-heating welding	Stress-relieving after welding
700 slowly 10 °C/h to 600, then air (HB max 223)	830 furnace cooling to 670, then air (HB 180-225)	735 furnace cooling	850 water	250 <b>Ac1</b> 745	550 furnace cooling <b>Ac3</b> 800 <b>Ms</b> 360 <b>Mf</b> 150

### Mechanical properties

**34CrMo4 1.7220 - 34CrMoS4 n° 1.7226** Hot-rolled mechanical properties in **quenched and tempered** condition ISO 683-2: 2018

size d / t mm		Testing at room temperature (longitudinal)					
from	to	R N/mm <sup>2</sup>	Rp 0.2 N/mm <sup>2</sup> min.	A% min.	Z% min.	Kv <sub>2</sub> J min.	HBW for information
	16/8	1000-1200	800	11	45	-	298-359
16/8	40/20	900-1100	650	12	50	40	271-331
40/20	100/60	800-950	550	14	55	45	240-286
100/60	160/100	750-900	500	15	55	45	225-271
160/100	250/160	700-850	450	15	60	45	213-253

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

<b>HB</b>		568	560	543	525	504	475	448	421	400	376	340	306	271	-
<b>HRC</b>		55.5	55	54	53	51.5	49.5	47.5	45	43	40.5	36.5	32.5	28	-
<b>R</b>	N/mm <sup>2</sup>	2100	2070	2020	1960	1850	1740	1610	1490	1380	1270	1130	1020	900	780
<b>Rp 0.2</b>	N/mm <sup>2</sup>	1340	1410	1530	1540	1520	1460	1400	1340	1230	1140	1040	930	820	680
<b>A</b>	%	8.0	8.2	9.0	9.6	10.0	10.4	10.8	11.0	11.4	12.2	14.0	17.5	20.0	21.8
<b>Z</b>	%	29	32	37	43	47	48	49	50	52	54	60	65	68	70
<b>Kv</b>	J	27	28	31	34	31	28	27	28	32	42	75	94	127	148
Tempering at °C		<b>50</b>	<b>100</b>	<b>150</b>	<b>200</b>	<b>250</b>	<b>300</b>	<b>350</b>	<b>400</b>	<b>450</b>	<b>500</b>	<b>550</b>	<b>600</b>	<b>650</b>	<b>700</b>

**Data under fatigue** +20 °C, for information

+N		Cyclic yield strength, $\sigma_y'$
+QT	556	N/mm <sup>2</sup> low cycle number
+N		Cyclic strength exponent, $n'$
+QT	0.12	low cycle number
+N		Cyclic strength coefficient, $K'$
+QT	1198	N/mm <sup>2</sup> low cycle number
+N		Fatigue strength coefficient, $\sigma_f'$
+QT	1160	N/mm <sup>2</sup> low cycle number
+N		Fatigue strength exponent, $b$
+QT	-0.08	low cycle number
+N		Fatigue ductility exponent, $c$
+QT	-0.61	low cycle number

+N = normalization +QT = quenching and tempering

**34CrMo4 1.7220 – 34CrMoS4 1.7226 EN 10277: 2018**
**Lucefin Group**

Hot-rolled annealed and <b>Cold-drawn</b> +A+C						Hot-rolled annealed and <b>Peeled</b> +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 <sup>2</sup>	N/mm <sup>2</sup> min	min		N/mm <sup>2</sup>	N/mm <sup>2</sup> min	min	max
5	10	-	-	-	-	-	-	-	-
10	16	-	-	-	-	-	-	-	-
16	40	-	-	-	-	-	-	-	223
40	63	-	-	-	-	-	-	-	223
63	100	-	-	-	-	-	-	-	223

Hot-rolled, quenched and tempered and <b>Cold-drawn</b> +QT+C						Hot-rolled, quenched and tempered and <b>Peeled</b> +QT+SH			
size mm		Testing at room temperature (longitudinal)				Testing at room temperature (longitudinal) <sup>e)</sup>			
from	to	R	Rp 0.2	A%	Kv <sub>2</sub>	R	Rp 0.2	A%	Kv <sub>2</sub>
		N/mm <sup>2</sup>	N/mm <sup>2</sup> min	min	J min	N/mm <sup>2</sup>	N/mm <sup>2</sup> min	min	J min
5	10	-	-	-	-	-	-	-	-
10	16	-	-	-	-	-	-	-	-
16	40	-	-	-	-	900-1100	650	12	40
40	63	-	-	-	-	800-950	550	14	45
63	100	-	-	-	-	800-950	550	14	45

<sup>e)</sup> values valid also for +C+QT

**34CrMo4 1.7220 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 <sup>2</sup>	N/mm <sup>2</sup> min	min (L)	min (T)	J min (L)	J min (T)	min
	100/70	800	550	14	14	45	45	240
100/70	250/160	700	450	15	10	40	22	213
250/160	500/330	650	410	16	12	33	17	200

L = longitudinal T = tangential d = diameter t = thickness

**Hardness after tempering. Lucefin experience**

size mm	Tempering at 530 °C			Tempering at 620 °C		
	≤ 200	> 200 ≤ 400	> 400	≤ 200	> 200 ≤ 400	> 400
<b>HB</b>	<b>280</b>	<b>265</b>	<b>250</b>	<b>250</b>	<b>220</b>	<b>200</b>

**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
<b>min</b>	49	49	48	45	42	39	36	34	30	28	27	26	25	24	24	
<b>max</b>	57	57	57	56	55	54	53	52	48	45	43	41	40	40	39	
<b>min</b>	52	52	51	49	46	44	42	40	36	34	32	31	30	29	29	<b>HH</b>
<b>max</b>	57	57	57	56	55	54	53	52	48	45	43	41	40	40	39	
<b>min</b>	49	49	48	45	42	39	36	34	30	28	27	26	25	24	24	<b>HL</b>
<b>max</b>	54	54	54	52	51	49	47	46	42	39	38	36	35	35	34	

<b>Thermal Expansion</b>	10 <sup>-6</sup> • K <sup>-1</sup> ►	10.5	11.5	12.1	12.7	13.2	13.6	14.0	14.4	
<b>Mod. of Elasticity long.</b>	GPa	217	213	212	207	199	192	184	175	164
<b>Mod. of Elasticity tang.</b>	GPa			81	79	76	73	70	67	62
<b>Specific Heat Capacity</b>	J/(Kg•K)	423	456	461	479	499	517	536	558	587
<b>Thermal Conductivity</b>	W/(m•K)			39.6	41.6	41.8	40.3	38.2	36.0	33.6
<b>Density</b>	Kg/dm <sup>3</sup>			7.81						
<b>Specific Electric Resistivity</b>	Ohm•mm <sup>2</sup> /m			0.263	0.308	0.378	0.466	0.569	0.687	0.826
<b>Electrical Conductivity</b>	Siemens•m/mm <sup>2</sup>			3.80	3.25	2.64	2.14	1.76	1.45	1.21
<b>°C</b>		<b>-100</b>	<b>0</b>	<b>20</b>	<b>100</b>	<b>200</b>	<b>300</b>	<b>400</b>	<b>500</b>	<b>600</b>

Physical properties according to DIN SEW 310 (08/1992) standard.

The symbol ► indicates temperature between -100 °C and 0 °C, -100 °C and 20 °C ...

EUROPE	ITALY	CHINA	GERMANY	FRANCE	U.K.	RUSSIA	USA
EN	UNI	GB	DIN	AFNOR	B.S.	GOST	AISI/SAE
34CrMo4	34CrMo4	ML30CrMo	34CrMo4	34CD4		34HM	4135