

<b>Quality</b>	<b>42CrMo4</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>1.7225</b>		

### Chemical composition

C%	Si% a)	Mn%	P% max	S max	Cr%	Mo%	Cu% max	Product deviations are allowed
0,38-0,45 ± 0.03	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 42CrMoS4 n° 1.7227, 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

On request, it may be supplied Calcium (Ca) or lead Pb% 0,15-0,35 treated in order to improve the machinability

### Temperature °C

Hot-forming	Normalizing +N	Quenching +Q	Quenching +Q	Tempering +T	Stress-relieving +SR
1100-850	870 air (HB ~ 190)	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 cooling 15 °C/h to 600, then air (HB max 241)	820 furnace cooling to 670, then air (HB 180-240)	760-775 furnace cool slowly (HB max 200)	840 water	300 <b>Ac1</b> <b>Ac3</b> 745        790	550 furnace cooling <b>Ms</b> <b>Mf</b> 335         80

Hardness of naturally material (+AR) HB 301 max, hardness after controlled cooling (+ARc) HB max 279

### Mechanical properties

**42CrMo4 1.7225 – 42CrMoS4 1.7227 Hot-rolled** mechanical properties in **quenched and tempered** condition ISO 683: 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	1100-1300	900	10	40	-	331-380	
16/8	40/20	1000-1200	750	11	45	35	298-359	
40/20	100/60	900-1100	650	12	50	35	271-331	
100/60	160/100	800-950	550	13	50	35	240-286	
160/100	250/160	750-900	500	14	55	35	225-271	

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>		595	586	550	518	496	468	442	421	390	362	336	294	264
<b>HRC</b>		57	56.5	54.5	52.5	51	49	47	45	42	39	36	31	27
<b>R</b>	N/mm <sup>2</sup>	2200	2180	2030	1910	1800	1700	1590	1480	1350	1220	1100	980	880
<b>Rp 0.2</b>	N/mm <sup>2</sup>	1520	1600	1620	1590	1560	1510	1440	1340	1230	1110	1000	870	710
<b>A</b>	%	-	7.0	9.5	10.0	10.0	10.0	10.4	11.0	12.0	13.5	15.8	19.0	21.5
<b>Kv</b>	J	24	27	28	27	26	26	26	27	31	42	75	114	135
Tempering at °C		<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

+N	328	Cyclic yield strength, $\sigma_y'$
+QT	716	N/mm <sup>2</sup> low cycle number
+N	0.12	Cyclic strength exponent, n'
+QT	0.10	low cycle number
+N	673	Cyclic strength coefficient, K'
+QT	1367	N/mm <sup>2</sup> low cycle number

#### Data under fatigue +20 °C

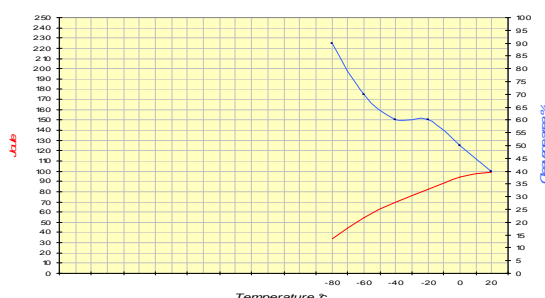
+N	1000	Fatigue strength coefficient, $\sigma_f'$
+QT	1454	N/mm <sup>2</sup> low cycle number
+N	-0.11	Fatigue strength exponent, b
+QT	-0.08	low cycle number
+N	-1.00	Fatigue ductility exponent, c
+QT	-0.72	low cycle number

#### Transition curve; LUCEFIN experience

Kv values on hot-rolled 130 mm round +QT induction for:

R = 930 N/mm<sup>2</sup> - Rp = 766 N/mm<sup>2</sup> A% = 18 Z% = 62

°C	J	Lat. Exp. mm	Shear %
<b>+20</b>	97 - 101 - 99	1,10 - 1,10 - 1,17	40
<b>0</b>	94 - 96 - 93	0,97 - 0,99 - 1,00	50
<b>-20</b>	63 - 91 - 92	0,56 - 0,52 - 0,93	60
<b>-40</b>	66 - 58 - 86	0,73 - 0,77 - 0,94	60
<b>-60</b>	50 - 55 - 58	0,54 - 0,72 - 0,78	70
<b>-80</b>	38 - 29 - 35	0,27 - 0,35 - 0,26	90



**42CrMoS4 1.7227 - 42CrMo4 1.7725 EN 10277: 2018**

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Hot-rolled annealed and **Cold-drawn** +A+CHot-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 <sup>2</sup>	N/mm <sup>2</sup> min	min	max	N/mm <sup>2</sup>	N/mm <sup>2</sup> min	min	max		
5 <sup>b)</sup>	10	-	-	-	300	-	-	-	-		
10	16	-	-	-	290	-	-	-	-		
16	40	-	-	-	285	-	-	-	241		
40	63	-	-	-	280	-	-	-	241		
63	100	-	-	-	280	-	-	-	241		

Hot-rolled, quenched and tempered and **Cold-drawn** +QT+CHot-rolled quenched and tempered + **Peeled** +QT+SH

size mm		Testing at room temperature (longitudinal) <sup>c)</sup>					Testing at room temperature (longitudinal) <sup>a)</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> min	N/mm <sup>2</sup> min	min	J min		
5 <sup>b)</sup>	10	1000-1200	770	8	-	-	-	-	-		
10	16	1000-1200	750	8	-	-	-	-	-		
16	40	1000-1200	720	9	-	1000-1200	750	11	35		
40	63	900-1100	650	10	-	900-1100	650	12	35		
63	100	900-1100	650	10	-	900-1100	650	12	35		

<sup>c)</sup> for flats and special sections, tensile strength (R) may differ by ± 10%<sup>a)</sup> values valid also for +C+QT<sup>b)</sup> for thickness < 5 mm, mechanical properties should be agreed before order placement**42CrMo4 1.7225 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 +20 °C	Kv +20 °C	HB			
		N/mm <sup>2</sup> min	N/mm <sup>2</sup> min	min (L)	min (T)	J min (L)	J min (T)	min			
250/160	500/330	750	500	14	10	30	16	225			
500/330	750/500	700	460	15	11	27	14	213			
		600	390	16	12	22	12	178			

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

Lucefin experience. Hardness after quenching at 850 °C in water and tempering at:

size mm	Tempering to 530 °C			Tempering at 620 °C		
	≤ 200	> 200 ≤ 400	> 400	≤ 200	> 200 ≤ 400	> 400
HB	320	300	290	260	250	230

ISO 683-2: 2018 **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	53	53	52	51	49	43	40	37	34	32	31	30	30	29	29	
max	61	61	61	60	60	59	59	58	56	53	51	48	47	46	45	

<b>Thermal Expansion</b>	10 <sup>-6</sup> · K <sup>-1</sup> ▶	10.5	11.4	11.5	12.1	12.7	13.2	13.6	14.0	14.4
<b>Mod. of Elasticity long.</b>	GPa	217	213	230	207	199	192	184	175	164
<b>Mod. of Elasticity tang.</b>	GPa			88	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)	45.1	45.1	44.1	41.9	39.4	36.9	34.4		
<b>Density</b>	Kg/dm <sup>3</sup>	7.85								
<b>Specific Electric Resistivity</b>	Ohm·mm <sup>2</sup> /m	0.231	0.284	0.358	0.448	0.552	0.671	0.806		
<b>Electrical Conductivity</b>	Siemens·m/mm <sup>2</sup>	4.33	3.52	2.79	2.23	1.81	1.49	1.24		
°C		-100	0	20	100	200	300	400	500	600

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
42CrMo4	42CrMo4	ML42CrMo	42CrMo4	42CD4	708M40	38ChM	4140