

Quality	16MnCr5	Case-hardening Steel	<i>Technical card</i>
According to standards	ISO 683-3: 2018		Lucefin Group
Number	1.7131		rev. 2018

Chemical composition

C%	Si%	Mn%	P% max	S% max	Cr%	Cu% max	
0,14-0,19 ± 0.02	0,15-0,40 ± 0.03	1,00-1,30 ± 0.06	0,025 + 0.005	0,035 ± 0.005	0,80-1,10 ± 0.05	0,40 + 0.05	Product deviations are allowed
16MnCrS5 n° 1.7139 S% 0.020-0.040 product deviation ± 0.005%							
On request, this steel grade can be supplied with addition of lead (Pb) 0.15-0.35%							

Temperature °C

Hot-forming	Normalizing +N	Core hardening	Carbonitriding	Carburizing	Hardening carburizing surf.	Str-reliev. +SR
1150-850	880 air (HB 138-187)	860-900 oil-polymer salt bath	750-930 gas	880-980	810-840 oil polymer salt bath (160-250 °C)	150 200
Soft annealing +A	Isothermal annealing +I	Spheroidizing +AC	End quench hardenableity	Pre-heating welding	Stress-relieving after welding	
650-700 furnace cooling	870 furnace cooling to 650, then air	730-750 furnace cooling 50 °C/h to 680, pause, cooling to 400 then air	870 water	welding must be carried out on the annealed state and before carburizing	600 furnace cooling	
				150-350 Ac1	600 furnace cooling Ac3	Ms * core ** carburizing surface
(HB max 207)	(HB 156-207)	(HB 140-187)		740	840	400* 200**
Transformation annealing +FP	950-1000 quick cooling to 630-650, stop according to the thickness of the material, then air (HB 140-187)			As-rolled +AR	Stress-relieving +SR	
				(HB max 230)	600-620	

Mechanical properties

16MnCr5 Hot-rolled values obtained on test blanks after **core hardening** + stress-relieving UNI 7846: 1978. Use only as reference

size mm test blanks	Testing at room temperature (longitudinal)					
	R	Rp 0.2	A%	Z%	Kcu	HB
11	1030-1370	735	8	-	25	311-394
30	740-1030	490	9	-	25	224-311 for information only
63	640-930	440	10	-	25	198-278 for information only

Hot-rolled natural state. **Lucefin** experience

size mm	R	Rp 0.2	A%	Z%	Kcu	HB
	N/mm ²	N/mm ² min.	min.	min.	J min.	max
from 10 to 100	560-720	350	15	25	-	207

Table of tempering values at room temperature on rounds of Ø 10 mm after quenching at 870 °C in oil

		390	385	385	385	385	381	376	362	348	319	286	240	213	200
HB															
HRC		42	41.5	41.5	41.5	41.5	41	40.5	39	37.5	34	30	22.5		
R	N/mm ²	1340	1335	1330	1330	1320	1300	1260	1210	1150	1050	950	800	700	650
Rp 0.2	N/mm ²	1020	1060	1110	1140	1145	1140	1110	1070	1010	930	830	710	620	560
A	%	12.0	12.5	12.5	12.5	12.0	12.0	12.5	13.0	14.0	15.5	17.5	20.0	23.0	25.5
Z	%	52.0	52.0	53.0	54.0	55.0	57.0	59.0	61.0	63.0	64.0	68.0	72.0	75.0	
Kv	J	42	46	46	45	42	40	42	62	90	124	135	155	180	194
HRC carburizing		64	63	62	60.5	59	57								
Tempering at °C		50	100	150	200	250	300	350	400	450	500	550	600	650	700

16MnCr5 1.7131 - 16MnCrS5 1.7139 EN 10277: 2018					<i>Lucefin Group</i>	
size mm		Soft annealing +A+SH Peeled, Ground +G	Soft annealing +A+C Cold-drawn	Heat treatment +FP+SH, +G for pearlite / ferrite structure Peeled, Ground	Heat treatment +FP+C for pearlite / ferrite structure Cold-drawn	
from	to	HBW max	HBW max	HBW	HBW ^{b)}	
5 ^{a)}	10	-	260	-	-	
10	16	-	250	-	-	
16	40	207	245	140-187	140-240	
40	63	207	240	140-187	140-235	
63	100	207	240	140-187	140-235	

^{a)} for thickness < 5 mm, hardness values should be agreed before order placement

^{b)} te hardness values for flats may deviate by ± 10%

18MnCr5 Forged UNI 8550: 1984. Use only as reference						
size mm		Testing at room temperature				
from	to	R N/mm ²	Rp 0.2 N/mm ² min	A% min (L)	Kcu J min (L)	HB <i>for inform.</i>
	11	1030-1375	735	8	25	311-395
11	25	785-1080	540	9	30	234-327
25	50	685-930	490	10	30	209-278

Mechanical properties obtained on test blanks after core hardening + stress-relieving
L = longitudinal

ISO 683-3: 2018 Jominy test HRC grain size G 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	39	36	31	28	24	21	-	-	-	-	-	-	-	-	-	
max	47	46	44	41	39	37	35	33	31	30	29	28	27			
min	42	39	35	32	29	26	24	22	20							HH
max	47	46	44	41	39	37	35	33	31	30	29	28	27			
min	39	36	31	28	24	21	-	-	-	-	-	-	-	-	-	HL
max	44	43	40	37	34	32	30	28	26	25	24	23	22			

Thermal Expansion	10 ⁻⁶ •K ⁻¹	▶	11.1	12.1	12.9	13.5	13.9
Mod. of Elasticity long.	GPa		210				
Mod. of Elasticity tang.	GPa		80				
Specific Heat Capacity	J/(Kg•K)		460				
Thermal Conductivity	W/(m•K)		41				
Density	Kg/dm ³		7.85				
Specific Electric Resist.	Ohm•mm ² /m		0.16				
Electrical Conductivity	Siemens•m/mm ²		6.25				
°C			20	100	200	300	400 500

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
16MnCr5	16MnCr5	15CrMn	16MnCr5	16MC		16HG	5115



Structure of hot-rolled annealed steel (+A)
and subsequently cold-drawn (+C)

x1000