

<b>Quality</b>	<b>16MnCr5</b>
According to standards	<b>EN 10084: 2008</b>
Number	<b>1.7131</b>

## Chemical composition

C%	Si%	Mn%	P%	S%	Cr%	Deviations allowed for analysis product
	max		max	max		
0,14-0,19 ± 0.02	0,40 + 0.03	1,00-1,30 ± 0.05	0,025 + 0.005	0,035 + 0.005	0,80-1,10 ± 0.05	
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	Core hardening	Carbonitriding	Carburizing	Hardening carburizing surf.	Tempering
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	Isothermal annealing	Spheroidizing	End quench hardenability	Pre-heating welding	Stress-relieving after welding	
750-770 cooling 15 °C/h until 680, pause, then cooling to 400, pause, then air (HB max 207)	870 furnace cooling to 650, then air (HB 156-207)	730-750 furnace cooling 50 °C/h to 680, pause, cooling to 400 then air (HB 140-187)	870 water	welding must be carried out on the annealed state and before carburizing 150-350 <b>Ac1</b> <b>Ac3</b>	<b>Ms</b> * core ** carburizing surface 400* 200**	
Transformation annealing +FP	950-1000 quick cooling to 630-650, 3 h holding, then air (HB 140-187)			<b>As-rolled</b> (HB max 230)	<b>Stress-relieving</b> 600-620	

## Mechanical and physical properties

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

size mm	Testing at room temperature (longitudinal)					
test blanks	R	Rp 0.2	A%	C%	Kcu	HB
	N/mm <sup>2</sup>	N/mm <sup>2</sup> min.	min.	min.	J min.	
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%	C%	Kcu	HB
from 10 to 100	N/mm <sup>2</sup>	N/mm <sup>2</sup> min.	min.	min.	J min.	max
	560-720	---	15	25		207

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

HB	390	385	385	385	385	381	376	362	348	319	286	240	213	200
HRC	42	41.5	41.5	41.5	41.5	41	40.5	39	37.5	34	30	22.5		
R N/mm <sup>2</sup>	1340	1335	1330	1330	1320	1300	1260	1210	1150	1050	950	800	700	650
Rp 0.2 N/mm <sup>2</sup>	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
C %	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 surface	64	63	62	60.5	59	57								
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>

## 16MnCr5 1.7139 EN 10277-4: 2008

size mm		Soft annealing +A +SH <b>Peeled-reeled, ground +SL</b>	Soft annealing +A +C <b>Cold-drawn</b>	Heat treatment +FP +SH for pearlite / ferrite structure <b>Peeled-reeled, ground</b>	Heat treatment +FP +C for pearlite / ferrite structure <b>Cold-drawn</b>
from	to	HB max	HB max	HB	HB
5 <sup>a)</sup>	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

<sup>a)</sup> for thickness < 5 mm, hardness values should be agreed before order placement

## Forged UNI 8550: 1984. Use only as reference

size mm		Testing at room temperature								
from	to	R N/mm <sup>2</sup>	Rp 0.2 N/mm <sup>2</sup> min	A% L min	A% T min	A% Q min	Kcu L J min	Kcu T J min	Kv L J min	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 T = tangential Q = radial

## EN 10084: 2008 Jominy test HRC grain size G 5 min.

mm distance from quenched extremity

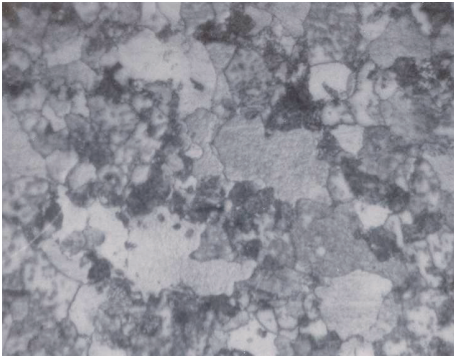
	1.5	3	5	7	9	11	13	15	20	25	30	35	40	45	50	H
<b>min</b>	39	36	31	28	24	21										normal
<b>max</b>	47	46	44	41	39	37	35	33	31	30	29	28	27			
<b>min</b>	42	39	35	32	29	26	24	22	20							HH
<b>max</b>	47	46	44	41	39	37	35	33	31	30	29	28	27			
<b>min</b>	39	36	31	28	24	21										HL
<b>max</b>	44	43	40	37	34	32	30	28	26	25	24	23	22			

Temperature Testing at °C	Mod. of elasticity GPa		Thermal expansion	
	E long.	G tang.	10 <sup>-6</sup> · K <sup>-1</sup>	
20	210	80		
100			11.1	
200			12.1	
300			12.9	
400			13.5	
500			13.9	
600				

Specific heat capacity J/(Kg·K)	Density Kg/dm <sup>3</sup>	Thermal conductivity W/(m·K)	Specific electric resist. Ohm·mm <sup>2</sup> /m	Electrical conductivity Siemens·m/mm <sup>2</sup>
460	7.85	41	0.16	6.25

EUROPE EN	ITALY UNI	CHINA GB	GERMANY DIN	FRANCE AFNOR	U.K. B.S.	RUSSIA GOST	USA AISI/SAE
16MnCr5	16MnCr5	15CrMn	16MnCr5	16MC		16HG	5115

# 16MnCr5



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

x1000