

<b>Quality</b>	<b>C50E</b>	<i>Technical card</i>
According to standards	<b>EN 10083-2: 2006</b>	<i>Lucefin Group</i>
Number	<b>1.1206</b>	

### Chemical composition

C%	Si%	Mn%	P%	S%	Cr%	Mo%	Ni%	
0,47-0,55	max 0,40	0,60-0,90	max 0,030	max 0,035	max 0,40	max 0,10	max 0,40	Product deviations are allowed
± 0.02	+0.03	± 0.04	+ 0.005	+ 0.005				
Cr+Mo+Ni max 0.63%								
For C50R n° 1.1241, S% 0.020-0.040 product deviations ± 0.005								

### Temperature °C

Hot-forming	Normalizing	Quenching	Quenching	Tempering	Stress-relieving
1100-850	860 air	830 water	850 oil or polymer	550-650 air	50° under the temperature of tempering
Soft annealing	Isothermal annealing	Natural state	End quench hardenability test	Preheating welding	Stress-relieving after welding
700 air (HB max 217)	800 furnace cooling to 660, then air (HB 180-226)	(HB max 255)	850 water	250 <b>Ac1</b> 730	600 furnace cooling <b>Ac3</b> 765 <b>Ms</b> 320 <b>Mf</b> 100

### Mechanical and physical properties

Hot-rolled mechanical properties in **normalized** condition EN 10083-2: 2006

size d / t		Testing at room temperature (longitudinal)					
mm		R	Re <sup>a)</sup>	A%	C%	Kv	HB
from	to	N/mm <sup>2</sup> min	N/mm <sup>2</sup> min.	min.	min.	J min.	min
16/16	16/16	650	355	13			200
16/16	100/100	610	320	14			183
100/100	250/250	590	290	14			176

d = diameter t = thickness

Hot-rolled mechanical properties in **quenched and tempered** condition EN 10083-2: 2006

size d / t		Testing at room temperature (longitudinal)					
mm		R	Re <sup>a)</sup>	A%	C%	Kv	HB
from	to	N/mm <sup>2</sup>	N/mm <sup>2</sup> min	min.	min.	J min	for information
16/8	16/8	750-900	520	13	30		225-271
16/8	40/20	700-850	460	15	35		213-253
40/20	100/60	650-800	400	16	40		200-240

<sup>a)</sup> Re upper yield strength or, if no yield phenomenon occurs, Rp<sub>0.2</sub> has to be considered

d = diameter t = thickness

**Table of tempering** values obtained at room temperature on rounds of Ø 10 mm after quenching at 830 °C in water

<b>HB</b>	560	481	409	326	242
<b>HRC</b>	55	50	44	35	23
<b>R</b> N/mm <sup>2</sup>	2070	1760	1430	1080	810
Tempering at °C	<b>200</b>	<b>300</b>	<b>400</b>	<b>500</b>	<b>600</b>

<b>C50E 1.1206 C50R 1.1241 EN 10277-5: 2008</b>						<i>Lucefina Group</i>			
<b>Cold-drawn +C <sup>c)</sup></b>						<b>Hot-rolled + Peeled-Reeled +SH <sup>c)</sup></b>			
size		Testing at room temperature (longitudinal)				Testing at room temperature (longitudinal)			
mm		<b>R</b> <sup>a)</sup>	<b>Rp</b> <sup>0.2 a)</sup>	<b>A%</b>	<b>HB</b>	<b>R</b>	<b>Rp</b> <sup>0.2</sup>	<b>A%</b>	<b>HB</b>
from	to	N/mm <sup>2</sup>	N/mm <sup>2</sup> min	min	for inform.	N/mm <sup>2</sup>	N/mm <sup>2</sup> min	min	
5 <sup>b)</sup>	10	770-1100	590	5	231-331				
10	16	730-1080	520	6	224-327				
16	40	690-1050	440	7	210-319	610-910			181-269
40	63	650-1030	390	8	200-311	610-910			181-269
63	100					610-910			181-269

<sup>a)</sup> for flats and special sections, yield point can be – 10% and tensile strenght can be ± 10%

<sup>b)</sup> for thickness < 5 mm, mechanical properties should be agreed before order placement

<sup>c)</sup> values valid also for +C+SL and +SH+SL

<b>C50E 1.1206 C50R 1.1241 EN 10277-5: 2008</b>									
<b>Hot-rolled, quenched and tempered, cold-drawn +QT +C <sup>c)</sup></b>						<b>Cold-drawn + quenching and tempering +C +QT <sup>c)</sup></b>			
size		Testing at room temperature (longitudinal)				Testing at room temperature (longitudinal)			
mm		<b>R</b>	<b>Rp</b> <sup>0.2</sup>	<b>A%</b>	<b>HB</b>	<b>R</b>	<b>Rp</b> <sup>0.2</sup>	<b>A%</b>	<b>HB</b>
from	to	N/mm <sup>2</sup>	N/mm <sup>2</sup> min	min	for inform.	N/mm <sup>2</sup>	N/mm <sup>2</sup> min	min	for inform.
5 <sup>b)</sup>	10	870-1070	610	7	260-323				
10	16	830-1030	580	7	249-311				
16	40	790-990	555	8	237-297	700-850	460	15	213-253
40	63	730-930	510	9	224-278	650-800	400	16	200-240
63	100	680-880	475	9	208-263	650-800	400	16	200-240

<sup>b)</sup> for thickness < 5 mm, mechanical properties should be agreed before order placement

<sup>c)</sup> values valid also for +QT+C+SL and +C+QT+SL

Work-hardening by **cold-drawing** table

<b>R</b>	N/mm <sup>2</sup>	950	1050	1100	1150	1200	1300	1350	1450	1550
<b>Reduction</b>	%	<b>0</b>	<b>10</b>	<b>20</b>	<b>30</b>	<b>40</b>	<b>50</b>	<b>60</b>	<b>70</b>	<b>80</b>

**Forged** normalized EN 10250-2: 2001 C50 n° 1.0540

size		Testing at room temperature (longitudinal)								
mm		<b>R</b>	<b>Re</b> <sup>c)</sup>	<b>A% L</b>	<b>A% T</b>	<b>A% Q</b>	<b>Kv L</b>	<b>Kv T</b>	<b>HB</b>	
from	to	N/mm <sup>2</sup> min	N/mm <sup>2</sup> min	min	min	min	J min	J min	min	
	100	610	320	14					183	
100	250	590	290	14					176	

<sup>c)</sup> Re upper yield strength or, if no yield phenomenon occurs, Rp<sub>0.2</sub> has to be considered

d = diameter t = thickness

EN 10083-2: 2006 **Jominy test HRC** grain size 5 min.

mm distance from quenched extremity

	1	2	3	4	5	6	7	8	9	10	11	13	15	20	25	30	H
<b>min</b>	56	53	44	34	31	30	30	29	28	27	26	25	24	23	20		normal
<b>max</b>	63	62	61	60	58	55	50	43	36	35	34	33	32	31	29	28	

<b>Temperature</b>	<b>Mod. of elasticity GPa</b>		<b>Thermal expansion</b>				
Testing at °C	<b>E</b> long.	<b>G</b> tang.	10 <sup>-6</sup> .K <sup>-1</sup>				
<b>20</b>	210	80					
<b>EUROPE EN</b>	<b>ITALY UNI</b>	<b>CHINA GB</b>	<b>GERMANY DIN</b>	<b>FRANCE AFNOR</b>	<b>U.K. B.S.</b>	<b>RUSSIA GOST</b>	<b>USA AISI/SAE</b>
C50E	C50	50	Ck50		080M50	50	1050