

Quality	C50E
According to standards	EN 10083-2: 2006
Number	1.1206

Chemical composition

C%	Si%	Mn%	P%	S%	Cr%	Mo%	Ni%	Deviations allowed for analysis product
	max		max	max	max	max	max	
0,47-0,55	0,40	0,60-0,90	0,030	0,035	0,40	0,10	0,40	
± 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	600 furnace cooling	
				Ac1	Ac3	Ms Mf
				730	765	320 100

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 ^{a)}	A%	C%	Kv	HB
from	to	N/mm ² min	N/mm ² min.	min.	min.	J min.	min
	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 ^{a)}	A%	C%	Kv	HB
from	to	N/mm ²	N/mm ² min	min.	min.	J min	for information
	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

^{a)} Re upper yield strength or, if no yield phenomenon occurs, Rp_{0.2} 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

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

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Cold-drawn +C ^{c)}						Hot-rolled + Peeled-Reeled +SH ^{c)}			
size		Testing at room temperature (longitudinal)				Testing at room temperature (longitudinal)			
mm		R ^{a)}	Rp 0.2 ^{a)}	A%	HB	R	Rp 0.2	A%	HB
from	to	N/mm ²	N/mm ² min	min	for inform.	N/mm ²	N/mm ² min	min	
5 ^{b)}	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

^{a)} for flats and special sections, yield point can be – 10% and tensile strength can be ± 10%

^{b)} for thickness < 5 mm, mechanical properties should be agreed before order placement

^{c)} values valid also for +C+SL and +SH+SL

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Hot-rolled, quenched and tempered, cold-drawn +QT +C ^{c)}						Cold-drawn + quenching and tempering +C +QT ^{c)}			
size		Testing at room temperature (longitudinal)				Testing at room temperature (longitudinal)			
mm		R	Rp 0.2	A%	HB	R	Rp 0.2	A%	HB
from	to	N/mm ²	N/mm ² min	min	for inform.	N/mm ²	N/mm ² min	min	for inform.
5 ^{b)}	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

^{b)} for thickness < 5 mm, mechanical properties should be agreed before order placement

^{c)} values valid also for +QT+C+SL and +C+QT+SL

Work-hardening by cold-drawing table

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

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

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

^{c)} Re upper yield strength or, if no yield phenomenon occurs, Rp 0.2 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
min	56	53	44	34	31	30	30	29	28	27	26	25	24	23	20		normal
max	63	62	61	60	58	55	50	43	36	35	34	33	32	31	29	28	

Temperature Mod. of elasticity GPa

Testing at °C	Mod. of elasticity GPa		Thermal expansion	
	E long.	G tang.	10 ⁻⁶ .K ⁻¹	
20	210	80		

EUROPE EN	ITALY UNI	CHINA GB	GERMANY DIN	FRANCE AFNOR	U.K. B.S.	RUSSIA GOST	USA AISI/SAE
C50E	C50	50	Ck50		080M50	50	1050