METALLURGICA VENETA
ACCIAI SPECIALI

Certified Company IQNet CSQ

C15E

Quality	C15E
According to standards	EN 10084: 2008
Number	1.1141

Chemical composition

C%	Si% max	Mn%	P% max	S% max
0,12-0,18	0,40	0,30-0,60	0,035	0,035
± 0.02	+ 0.03	± 0.04	+ 0.005	+ 0.005

Deviations allowed for analysis product

C 15R n° 1.1140 S% 0.020-0.040 product deviation ± 0.005%
C15 n° 1.0401 P% - S% max 0.045
C15Pb Pb = 0.15- 0.35

Temperature °C

Hot-forming	Normalizing	Core hardening	Carbonitriding	Carburizing	Hardening carburizing surface	Tempering
1150-850	890-920 air (HB 95 – 150)	880-920 water	750-930 gas	880-980	780-820 water	150 200

Soft anealing	Isothermal annealing	Intermediate annealing	Natural state	Pre-heating welding		Stress-relieving after welding
690 air	930 furnace cooling to 650, then air	650-700 air		welding must be carried out on the annealed state and before carburizing		
				100		slow cooling
(HB max 143)	(HB 115-145)		(HB 170)	**Ac1**	**Ac3**	**Ms** * core ** carburizing surface
				725	860	460* 220**

Mechanical and physical properties

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

size	Testing at room temperature (longitudinal)						
mm	**R**	**Rp** 0.2	**A**%	**C**%	**Kcu**	***HB***	
test blanks	N/mm²	N/mm² min.	min.	min.	J min.		
11	740-1180	440	9		22.5	*224-354*	
30	540-780	295	13		30	*158-232*	for information
63							

Tensile strength after hardening and tempering at +200 °C.

size mm	d ≤ 16	> 16 d ≤ 40
R N/mm² min.	800	600

Heat treatment	Temperature (+ …°C) - min. values								**Fatigue** data
	20	**200**	**300**	**350**	**400**	**450**	**500**	**600**	
+A	249								Cyclic yield strength, σ_y'
+N	269								N/mm² low cycle fatigue
+A	0.19								Cyclic strength exponent, **n'**
+N	0.18								low cycle fatigue
+A	824								Cyclic strength coefficient, **K'**
+N	813								N/mm² low cycle fatigue
+A	807								Fatigue strength coefficient, σ_f'
+N	984								N/mm² low cycle fatigue
+A	- 0.12								Fatigue strength exponent, **b**
+N	- 0.13								low cycle fatigue
+A	0.42								Fatigue ductility coefficient, g_f'
+N	0.81								low cycle fatigue
+A	- 0.53								Fatigue ductility exponent, **c**

METALLURGICA VENETA
ACCIAI SPECIALI

Certified Company

C15E

Heat treatment	Temperature (+ …°C) - min. values								**Fatigue** data
	20	**200**	**300**	**350**	**400**	**450**	**500**	**600**	
+A	249								Cyclic yield strength, σ_y'
+N	269								N/mm² low cycle fatigue
+A	0.19								Cyclic strength exponent, **n'**
+N	0.18								low cycle fatigue
+A	824								Cyclic strength coefficient, **K'**
+N	813								N/mm² low cycle fatigue
+A	807								Fatigue strength coefficient, σ_f'
+N	984								N/mm² low cycle fatigue
+A	- 0.12								Fatigue strength exponent, **b**
+N	- 0.13								low cycle fatigue
+A	0.42								Fatigue ductility coefficient, g_f'
+N	0.81								low cycle fatigue
+A	- 0.53								Fatigue ductility exponent, **c**
+N	- 0.58								low cycle fatigue
+N	170								Fatigue limit, σ_L' N/mm² high cycle fatigue

+A Annealed +N Normalized

C15R 1.1140

Cold-drawn +C EN 10277-4: 2008 c)

size mm		Testing at room temperature (longitudinal)			
		R a)	**Rp 0.2** a)	**A%**	***HB***
from	to	N/mm²	N/mm² min	min	
5 b)	10	500-800	380	7	*152-240*
10	16	480-780	340	8	*146-232*
16	40	430-730	280	9	*128-224*
40	63	380-670	240	11	*110-203*
63	100	340-600	215	12	*100-178*

Hot-rolled + peeled-reeled +SH

size mm		Testing at room temperature (longitudinal)			
		R	**Rp 0.2**	**A%**	**HB**
from	to	N/mm²	N/mm² min	min	
16	40	330-600			98-178
40	63	330-600			98-178
63	100	330-600			98-178

size mm		Soft annealing +A +SH **Peeled-reeled, ground** +SL	Soft annealing +A +C **Cold-drawn**
from	to	**HB** max	**HB** max
5 b)	10		238
10	16		231
16	40	143	216
40	63	143	198
63	100	143	178

a) for flats and special sections, yield point can be – 10% and tensile strenght 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

Forged UNI 8550: 1984. Use only as reference

size mm		Testing at room temperature (longitudinal)							
		R	**Rp** 0.2	**A%** L	**A%** T	**A%** Q	**Kcu** L	**Kv** L	***HB***
from	to	N/mm²	N/mm² min	min	min	min	J min	J min	*for inform.*
	11	735-1180	440	9			22.5		*224-354*
11	25	540-785	345	11			30		*158-234*
25	40	490-735	295	14			35		*149-224*

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

L = longitudinal T = tangential Q = radial

METALLURGICA VENETA
ACCIAI SPECIALI

Certified Company

C15E

Jominy test HRC for information only distance in mm from quenched end								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
min	*39*	*35*	*31*	*27*	*25*	*22*	*20*	
max	*45*	*42*	*35*	*33*	*32*	*28*	*26*	*24*

Max hardness of the layer casehardened and hardened as a function of carbon content

C%	0.40	0.50	0.60	0.70	0.80	0.90	1.00
HV1	653	746	800	865	900	865	832

Temperature	**Mod. of elasticity** GPa		**Thermal expansion**
Testing at **°C**	**E** long.	**G** tang.	$10^{-6} \cdot K^{-1}$
20	210	80	
100			11.1
200			12.1
300			12.9
400			13.5
500			13.9
600			14.1

Specific heat capacity	**Density**	**Thermal conductivity**	**Specific electric resist.**	**Electrical conductivity**
J/(Kg•K)	Kg/dm^3	W/(m•K)	Ohm•mm^2/m	Siemens•m/mm^2
460	7.85	58	0.11	9.09

EUROPE EN	**ITALY** UNI	**CHINA** GB	**GERMANY** DIN	**FRANCE** AFNOR	**U.K.** B.S.	**RUSSIA** GOST	**USA** AISI/SAE
C15E	C15	15	Ck15	XC12		15	1015