

**STANDARD REFERENCE:**

EN ISO 683-1: 2018 (Hot-rolled products) | EN 10277: 2018 (Bright products)

**RODACCIAI REFERENCES AND COMPARABLE STANDARDS**

EUROPE		ITALY	GERMANY		FRANCE	UK	USA
EN 10083-2: 2006 EN 10277-5: 2008		(UNI 7845-78)	(DIN 17200-86)		(NF A 35-552-86)	(BS 970 pt.3-96)	ASTM A 29
Grade	N°		Werkstoff	N°			
C40E	1.1186		Ck 40	1.1186			
C40R	1.1189	C40	Cm 40	1.1189	XC 38	080M40	1040

**CHEMICAL COMPOSITION (CAST ANALYSIS) (%)**

EUROPE	C	Si	Mn	P / max	S	Cr / max	Mo / max	Ni / max	Cu / max	Al	Pb
C40E					≤ 0,035					-	-
C40R	0,37÷0,44	0,10÷0,40	0,50÷0,80	0,025	0,020÷0,040	0,40	0,10	0,40	0,30	0,020÷0,050	-
C40Rpb					0,020÷0,040					0,020÷0,050	0,15÷0,30

**MECHANICAL PROPERTIES - AS ROLLED CONDITION**

Size mm	HB max to condition		Quenched and tempered (+QT)					Normalized (+N)		
	Treated to improve shearability (+S)	Soft annealing (+A)	Rp <sub>0,2</sub> (MPa) min	R <sub>m</sub> (MPa) min	A <sub>5</sub> (%) min	Z (%) min	KV (J) min	Rp <sub>0,2</sub> (MPa) min	R <sub>m</sub> (MPa)	A <sub>5</sub> (%) min
≤ 16		-	460	650÷800	16	35	20	320	580	16
> 16 ≤ 40	it can be sheared without heat treatment	-	400	630÷780	18	40	20	290	550	17
> 40 ≤ 100		-	350	600÷750	19	45	20	290	550	17
> 100 ≤ 160		-	-	-	-	-	-	260	530	17
> 160 ≤ 250		-	-	-	-	-	-	260	530	17

**MECHANICAL PROPERTIES - BRIGHT PRODUCTS CONDITION**

Size mm	Rolled+Turned (+SH)		Quenched+Tempered+Turned (+QT +SH)*				Quenched+Tempered+Cold Drawn (+QT +C)			Cold Drawn (+C)		
	Hardness HB	R <sub>m</sub> (MPa)	Rp <sub>0,2</sub> (MPa) min	R <sub>m</sub> (MPa)	A <sub>5</sub> (%) min	KV (J) min	Rp <sub>0,2</sub> (MPa) min	R <sub>m</sub> (MPa)	A <sub>5</sub> (%) min	Rp <sub>0,2</sub> (MPa) min	R <sub>m</sub> (MPa)	A <sub>5</sub> (%) min
≥ 5 ≤ 10	-	-	-	-	-	-	560	800÷1000	8	540	700÷1000	6
> 10 ≤ 16	-	-	-	-	-	-	525	750÷950	8	460	650÷980	7
> 16 ≤ 40	164÷207	550÷710	400	630÷780	18	30	490	680÷880	9	365	620÷920	8
> 40 ≤ 63	164÷207	550÷710	350	600÷750	19	30	435	620÷820	10	330	590÷840	9
> 63 ≤ 100	164÷207	550÷710	350	600÷750	19	30	420	600÷800	11	290	550÷820	9

\*This values are valid also for Cold Drawn - Quenched + Tempered Condition (+C +QT)  
 For size <5 mm the mechanical properties may be agreed at the time of enquiry and order



**HARDNESS LIMITS (JOMINY TEST)**

Limits of range	Hardness HRC at a distance from quenched end of test pieces (mm)																
	1	2	3	4	5	6	7	8	9	10	11	13	15	20	25	30	
+H	Max	60	60	59	57	53	47	39	34	31	30	29	28	27	26	25	24
	Min	51	46	35	27	25	24	23	22	21	20	-	-	-	-	-	-

**WORKING TEMPERATURES RECOMMENDED**

Operation	Hot forgings deformation	Normalizing	Soft annealing	Quenching in oil or water	Tempering
°C	850÷1150	860÷900	650÷700	840÷880	550÷660

