RIVA ACCIAIO

Hot Rolled Flat Steel Bars

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Production units:

Cerveno (BS), Italy

Sellero (BS), Italy

RIVA ACCIAIO

Hot Rolled Flat Steel Bars

Products

STRUCTURAL AND GENERAL USE NON-ALLOY QUALITY STEEL	EN 10025-04
CASE HARDENING CARBON AND ALLOY SPECIAL STEEL	EN 10084/08 UNI 7846
QUENCHED AND TEMPERED CARBON AND ALLOY SPECIAL STEELS	UNI EN 10083-2 AND 3 UNI 7845 UNI 7847
QUENCHED AND TEMPERED QUALITY CARBON STEEL	UNI 10083-2/06
QUENCHED AND TEMPERED BORON STEEL	EN 10083-3
Mn-Si, Mn-Si-Cr, Cr, Cr-V, Cr-Mo-V QUENCHED AND TEMPERED STEEL	UNI 3545
Mn-B, Mn-Cn-B QUENCHED AND TEMPERED STEEL	UPON CUSTOMER SPECIFICATIONS

STANDARD DIMENSIONS

SECTION SIDE

Standard manufacturing dimensions are shown in the size-table for flat rolled products at next page.

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FLAT ROLLED PRODUCTS MANUFACTURING RANGE

Thickness	8	9	10	11	12	13	15	16	16,5	20	21,5	25	26,5	30	35	40	45	50	55	60	65	70	75	80	90	Thickness
Width																										Width
35																										35
37																										37
40										**		**		**												40
45													G2													45
50			**							**		**		**	**	**										50
55																										55
60			**		G2		**			**		**		**	**	**		**								60
65													G3													65
70			**				**			**		**		**		**		**								70
80			**				**					**		**	**	**		**		**						80
90														**		**		**		**						90
100			**		**			G4		**		**		**	**	**		**		**		G4				100
110														**	**	**										110
120					**		**			**				**		**		**		**						120
130																										130
140														**				**								140
150										**		**		**		**		**		**						150
160																										160
170						G5											G5									170
180												**														180
190																										190
200												**				**		**		**						200
220										**				**		**		**								220
240										**		G6		**		**		**								240
250										**				**		**		**								250
260										**				**		**		G6								260
280										**				**		**		**								280
300										**				**		**		**								300
Width																										Width
Tickness	8	9	10	11	12	13	15	16	16,5	20	21,5	25	26,5	30	35	40	45	50	55	60	65	70	75	80	90	Thickness

Legend:
G2 = Range 2 Cerveno
G3 = Small flat bar Cerveno
G4 = Large flat bar Cerveno
G5 = Flat bar Cerveno
G6 = Flat bar Sellero
** = Regular size

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FLAT BARS METRIC

TABLE

Width mm	Thickness mm																					
	8	10	12	14	15	16	18	20	22	25	30	35	40	45	50	55	60	65	70	75	80	90
	Weight Kg/m																					
35									6,04	6,87	8,24											
40								6,28	6,91	7,85	9,42	10,99										
45								7,06	7,77	8,83	10,60	12,36	14,13									
50		3,92	4,71	5,49	5,89	6,28	7,06	7,85	8,63	9,81	11,77	13,74	15,70	17,66								
55		4,32	5,18	6,04	6,48	6,91	7,77	8,63	9,50	10,79	12,95	15,11	17,27	19,43	21,59							
60		4,71	5,65	6,59	7,06	7,54	8,48	9,42	10,36	11,77	14,13	16,48	18,84	21,19	23,55	25,90						
65		5,10	6,12	7,14	7,65	8,16	9,18	10,20	11,22	12,76	15,31	17,86	20,41	22,96	25,51	28,06	30,61					
70		5,49	6,59	7,69	8,24	8,79	9,89	10,99	12,09	13,74	16,48	19,23	21,98	24,73	27,47	30,22	32,97	35,72				
75	4,71	5,89	7,06	8,24	8,83	9,42	10,60	11,77	12,95	14,72	17,66	20,61	23,55	26,49	29,44	32,38	35,32	38,27	41,21			
80	5,02	6,28	7,54	8,79	9,42	10,05	11,30	12,56	13,82	15,70	18,84	21,98	25,12	28,26	31,40	34,54	37,68	40,82	43,96	47,10		
90	5,65	7,06	8,48	9,89	10,60	11,30	12,72	14,13	15,54	17,66	21,19	24,73	28,26	31,79	35,32	38,86	42,39	45,92	49,45	52,99	56,52	
100	6,28	7,85	9,42	10,99	11,77	12,56	14,13	15,70	17,27	19,62	23,55	27,47	31,40	35,32	39,25	43,17	47,10	51,02	54,95	58,87	62,80	70,65
110	6,91	8,63	10,36	12,09	12,95	13,82	15,54	17,27	19,00	21,59	25,90	30,22	34,54	38,86	43,17	47,49	51,81	56,13	60,44	64,76	69,08	77,71
120	7,54	9,42	11,30	13,19	14,13	15,07	16,96	18,84	20,72	23,55	28,26	32,97	37,68	42,39	47,10	51,81	56,52	61,23	65,94	70,65	75,36	
130	8,16	10,20	12,25	14,29	15,31	16,33	18,37	20,41	22,45	25,51	30,61	35,72	40,82	45,92	51,02	56,13	61,23	66,33	71,43	76,54	81,64	
140		10,99	13,19	15,39	16,48	17,58	19,78	21,98	24,18	27,47	32,97	38,46	43,96	49,45	54,95	60,44	65,94	71,43	76,93	82,42	87,92	
150		11,77	14,13	16,48	17,66	18,84	21,19	23,55	25,90	29,44	35,32	41,21	47,10	52,99	58,87	64,76	70,65	76,54	82,42	88,31	94,20	
160		12,56	15,07	17,58	18,84	20,10	22,61	25,12	27,63	31,40	37,68	43,96	50,24	56,52	62,80	69,08	75,36	81,64	87,92	94,20	100,48	
170		13,34	16,01	18,68	20,02	21,35	24,02	26,69	29,36	33,36	40,03	46,71	53,38	60,05	66,72	73,40	80,07	86,74	93,41	100,09	106,76	
180		14,13	16,96	19,78	21,19	22,61	25,43	28,26	31,09	35,32	42,39	49,45	56,52	63,58	70,65	77,71	84,78	91,84	98,91	105,97	113,04	
190		14,91	17,90	20,88	22,37	23,86	26,85	29,83	32,81	37,29	44,74	52,20	59,66	67,12	74,57	82,03	89,49	96,95	104,40			
200		15,70	18,84	21,98	23,55	25,12	28,26	31,40	34,54	39,25	47,10	54,95	62,80	70,65	78,50	86,35	94,20					
220								34,54	37,99	43,17	51,81	60,44	69,08	77,71	86,35	94,98	103,62					
240								37,68	41,45	47,10	56,52	65,94	75,36	84,78	94,20	103,62	113,04					
250								39,25	43,17	49,06	58,87	68,69	78,50	88,31	98,12	107,94	117,75					
260								40,82	44,90	51,02	61,23	71,43	81,64	91,84	102,05	112,25	122,46					
280								43,96	48,36	54,95	65,94	76,93	87,92	98,91	109,90	120,89	131,88					
300								47,10	51,81	58,87	70,65	82,42	94,20	105,97	117,75	129,52	141,30					

LENGTH

Lenght in as rolled condition:
Cerveno: 5 ÷ 12 m
Sellero: 5 ÷ 12 m

Lenght in annealed condition: max 9,20 m

ENDS APPEARANCE

shear cut with plane knives cesoia a caldo con coltelli piani per le gamme G2-G5.

Saw cut fresa ad inserti ceramici per la gamma G6.

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TOLERANCES

Conforming to EN 10058 standard, with some amendments according the table

EN 10058 Tolerances General Use Steel					
Width [mm] (1)	Tolerances [mm] (3)	Thickness [mm] (2)	Tolerances [mm] (3)	Lenght Tolerances [mm]	Camber
35÷40	± 0,75	6÷20	± 0,5	± 100	4‰ UP TO ≤ 1.000 mm² AND 2,5‰ OVER
45÷80	± 1,0	21,5÷40	± 1,0	± 100	
90÷100	± 1,5	45÷90	± 1,5	± 100	
110÷120	± 2,0	-	-	± 100	
130÷200	± 2,5	-	-	± 100	
220÷300	-0/+3	20-50	-0/+3	± 100	4‰

NOTES: Size tolerances also match DIN 1017. On request one side tolerances can be obtained.

(1) Sizes 150-300 are not included in EN10058 but are included in UNI 6557 and DIN 59200 that refer to wide flats.

(2) Sizes 80-90 are not included in EN10058.

(3) Tolerances for sizes 150-300 are “internal” tolerances and don’t match the tolerances of wide flat standards.

SURFACE FINISHING

Upon request sanblasted bars with 5-12 m lengths may be supplied.

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Hot Rolled Flat Steel Bars

General Supply Conditions

PRODUCTION CAMPAIGN		
Rolled products	(flat bars)	40 days

LENGTH
COMMERCIAL
5 ÷ 8 m, with increased ≥ 1 m.
FIXED
According to the product, with increase ≥ 200 mm.
CROP BAR END
If agreed on order ≥ 3 m for max ≤ 15 % of the quantity.

MINIMUN QUANTITY PER ORDER	
flats marked in the size range with **	5 ton
flats in other sizes.	10 ton

WEIGHT TOLERANCES ON THE ORDERED QUANTITY	
for orders ≤ 5 ton	± 20%
for orders > 5 ÷ 25 ton	± 10 %
for orders > 25 ton	± 6%

PACKING	
BUNDLE WEIGHT	
Rolled products.	2 ÷ 3 ton
WRAPPINGS	
By wire rod Ø 7 mm; N° 4 wrapping per bundle.	
MARKING	
Each bundle is identified with a metallic lable indicating heat n°, steel quality, order n°, steel grades, and 3 adhesive labels on bar end.	

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Hot Rolled Flat Steel Bars

Quality Conditions

SURFACE DEFECTS

Defects are allowed up to a depth ≤ 0,8 % of the diameter or the section side, with min. 0,3 mm and max 0,6 mm in conforming to the following standards:

ISO 9443 - 91 - class 2

EN 10221 class B

NF A 35 - 552 class 2

UNI 7845 - 7846 - 7847 - class A

INTERNAL DEFECTS

Macro cleanliness ≤ 2 grade according S.E.P. 1584 standard

Micro cleanliness ≤ 2,5 grade according ASTM E 45 or by K method according to values foreseen by the EN 10083-1/06, App E

Macro etch test according to ASTM E 381 : ≤ C3-R2-S2

Structure segregation ≤ Grado IV norma UNI 8449

Above conditions may be significantly enhanced with vacuum-degassed steels as per special specifications and applications' requirements.

AUSTENITIC GRAIN SIZE FOR SPECIAL STEELS

By Al + Ti grain 5 ÷ 8 o 6 ÷ 9 conforming to EN ISO 943, UNI 3245 o ASTM E112 standards.

QUALITY ASSURANCE

ISO 9001 - Certification - Quality Management Systems
ISO 14001 - Certification - Environmental management system
ISO BH OHSAS 18001 - Certification - occupational health and safety management system

INSPECTION CERTIFICATES

3.1.B conforming to EN 10204 standard.

CE mark for rolled products for metal structures or for building.

RIVA ACCIAIO

Hot Rolled Flat Steel Bars

STRUCTURAL AND GENERAL USE NON-ALLOY QUALITY STEEL EN 10025-04

DESCRIPTION AND APPLICATIONS

Non alloy quality steel suitable for the manufacturing of structural elements, as welded, bolted and riveted structures for room temperature applications.

EN 10025/04 QUALITIES AND MAIN CORRESPONDING INTERNATIONAL STANDARDS

EN 10025-04	EN 10025-95	Italy UNI EN 10025-90	Germany DIN 17100	France AFNOR NF A 35.501	G.B. B.S. 4360	Spain UNE 36080	U.S.A. ASTM
S235JR	S235JRG2	Fe 360 B	RSt 37-2	-	40 B	AE 235 B-FN	-
S235J0	S235J0	Fe 360 C	St 37-3U	E 24-3	40 C	AE 235 C	-
S235J2	S235J2G3	Fe 360 D	St 37-3N	E 24-4	40 D	AE 235 D	-
-	S235J2G4	-	-	-	-	-	-
S275JR	S275JR	Fe 430 B	St 44-2	E 28-2	43 B	AE 275 B	A 36/A 283D
S275J0	S275J0	Fe 430 C	St 44-3U	E 28-3	43 C	AE 275 C	-
S275J2	S275J2G3	Fe 430 D	St 44-3N	E 28-4	43 D	AE 275 D	A 633 GR. A
-	S275J2G4	-	-	-	-	-	-
S355JR	S355JR	Fe 510 B	-	E 36-2	50 B	AE 355 B	A 572 GR.50/A 678 GR.A
S355J0	S355J0	Fe 510 C	St 52-3U	E 36-3	50 C	AE 355 C	-
S355J2	S355J2G3	Fe 510 D	St 52-3N	-	50 D	AE 355 D	-
-	S355J2G4	-	-	-	-	-	-
S355K2	S355K2G3	Fe 510 DD1	-	E36-4	50 DD	-	-
-	S355K2G4	-	-	-	-	-	-
E295	E295	Fe 490	St 50-2	A 50-2	-	A 490	-
E355	E355	Fe 590	St 60- 2	A 60-2	-	A 590	-
E360	E360	Fe 690	St 70-2	A 70-2	-	A 690	-
S450J0	-	-	-	-	55 C	-	-

IMPORTANT: Correspondance based on minimum strength value (Rm) and on impact test temperature.

RIVA ACCIAIO

Hot Rolled Flat Steel Bars

HEAT CHEMICAL COMPOSITION

Quality	N°	C % Max			Mn % Max	Si % Max	P % Max	S % Max	N % Max
		Nominal Thickness (mm)							
		≤ 16	> 16 ≤ 40	> 40					
S235JR	1.0038	0,170	0,170	0,200	1,400	-	0,035	0,035	0,012
S235J0	1.0114	0,170	0,170	0,170	1,400	-	0,030	0,030	0,012
S235J2	1.0117	0,170	0,170	0,170	1,400	-	0,025	0,025	-
S275JR	1.0044	0,210	0,210	0,220	1,500	-	0,035	0,035	0,012
S275J0	1.0143	0,180	0,180	0,180	1,500	-	0,030	0,030	0,012
S275J2	1.0145	0,180	0,180	0,180	1,500	-	0,025	0,025	-
S355JR	1.0045	0,240	0,240	0,240	1,600	0,550	0,035	0,035	0,012
S355J0	1.0553	0,200	0,200	0,220	1,600	0,550	0,030	0,030	0,012
S355J2	1.0577	0,200	0,200	0,220	1,600	0,550	0,025	0,025	-
S355K2	1.0596	0,200	0,200	0,220	1,600	0,550	0,025	0,025	-
E295	1.0050	-	-	-	-	-	0,045	0,045	0,009
E335	1.0060	-	-	-	-	-	0,045	0,045	0,009
E360	1.0070	-	-	-	-	-	0,045	0,045	0,009
S450J0*	1.0590	0,200	0,200	0,220	1,700	0,550	0,090	0,090	0,025

IMPORTANT: Limit on N content does not apply when minimum tot Al content is 0,20% or when other N binding elements are present.

(*) Microalloyed with Nb max 0,05%, V max 0,13% and Ti max 0,05%.

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Hot Rolled Flat Steel Bars

MECHANICAL PROPERTIES

Quality	Re_H (N/mm²) Min								Rm (N/mm²) *			Impact Strength (J) Min		
	Nominal Thickness (mm)								Nominal Thickness (mm)			Temp. °C	Nominal Thickness (mm)	
	≤ 16	> 16 ≤ 40	> 40 ≤ 63	> 63 ≤ 80	> 80 ≤ 100	> 100 ≤150	> 150 ≤ 200	> 200 ≤ 250	≤ 100	> 100 ≤ 150	> 150 ≤ 250		> 10 ≤ 150	> 150 ≤ 250
S235JR	235	225	215	215	215	195	185	175	360 ÷ 510	350 ÷ 500	340 ÷ 490	20	27	27
S235J0	235	225	215	215	215	195	185	175	360 ÷ 510	350 ÷ 500	340 ÷ 490	0	27	27
S235J2	235	225	215	215	215	195	185	175	360 ÷ 510	350 ÷ 500	340 ÷ 490	- 20	27	27
S275JR	275	265	255	245	235	225	215	205	410 ÷ 560	400 ÷ 540	380 ÷ 540	20	27	27
S275J0	275	265	255	245	235	225	215	205	410 ÷ 560	400 ÷ 540	380 ÷ 540	0	27	27
S275J2	275	265	255	245	235	225	215	205	410 ÷ 560	400 ÷ 540	380 ÷ 540	- 20	27	27
S355JR	355	345	335	325	315	295	285	275	470 ÷ 630	450 ÷ 600	450 ÷ 600	20	27	27
S355J0	355	345	335	325	315	295	285	275	470 ÷ 630	450 ÷ 600	450 ÷ 600	0	27	27
S355J2	355	345	335	325	315	295	285	275	470 ÷ 630	450 ÷ 600	450 ÷ 600	- 20	27	27
S355K2	355	345	335	325	315	295	285	275	470 ÷ 630	450 ÷ 600	450 ÷ 600	- 20	40	33
E295	295	285	275	265	255	245	235	225	470 ÷ 610	450 ÷ 610	440 ÷ 610	-	-	-
E335	335	325	315	305	295	275	265	255	570 ÷ 710	550 ÷ 710	540 ÷ 710	-	-	-
E360	360	355	345	335	325	305	295	285	670 ÷ 830	650 ÷ 830	640 ÷ 830	-	-	-
S450J0	450	430	410	390	380	380	-	-	550 ÷ 720	530 ÷ 700	-	0	27	-

(*) The tensile tests values apply to longitudinal specimens (l).

However for flat products of 600 mm width transverse ones (t) are to be used.

Quality	A_5 % Min				
	Nominal Thickness (mm)				
	≤ 40	> 40 ≤ 63	> 63 ≤ 100	> 100 ≤ 150	> 150 ≤ 250
S235JR S235J0 S235J2G4	26	25	24	22	21
S275JR S275J0 S275J2G4	23	22	21	19	18
S355JR S355J0 S355J2 S355K2	22	21	20	18	17
E295	20	19	18	16	15
E335	16	15	14	12	11
E360	11	10	9	8	7
S450J0	17	17	17	17	-

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Hot Rolled Flat Steel Bars

CASE HARDENING CARBON AND ALLOY SPECIAL STEEL
EN 10084/08
UNI 7846

DESCRIPTION AND APPLICATIONS

Other qualities conforming to the above standards have been omitted, being out of current use.
Qualities up to a max. alloy content of 3% may be produced.

HEAT CHEMICAL COMPOSITION

Quality	N°	C %	Mn %	Si %	P % Max	S %	Cr %	Ni %	Mo %
C10E	1.1121	0,07÷0,13	0,30÷0,60	≤ 0,40	0,035	≤ 0,035	-	-	-
C10R	1.1207	0,07÷0,13	0,30÷0,60	≤ 0,40	0,035	0,020÷0,040	-	-	-
C15E	1.1141	0,12÷0,18	0,30÷0,60	≤ 0,40	0,035	≤ 0,035	-	-	-
C15R	1.1140	0,12÷0,18	0,30÷0,60	≤ 0,40	0,035	0,020÷0,040	-	-	-
C16E	1.1148	0,12÷0,18	0,60÷0,90	≤ 0,40	0,035	≤ 0,035	-	-	-
C16R	1.1208	0,12÷0,18	0,60÷0,90	≤ 0,40	0,035	0,020÷0,040	-	-	-
16MnCr5	1.7131	0,14÷0,19	1,00÷1,30	≤ 0,40	0,035	≤ 0,035	0,80÷1,10	-	-
16MnCrS5	1.7139	0,14÷0,19	1,00÷1,30	≤ 0,40	0,035	0,020÷0,040	0,80÷1,10	-	-
20MnCr5	1.7147	0,17÷0,22	1,10÷1,40	≤ 0,40	0,035	≤ 0,035	1,00÷1,30	-	-
20MnCrS5	1.7149	0,17÷0,22	1,10÷1,40	≤ 0,40	0,035	0,020÷0,040	1,00÷1,30	-	-
16CrNi4	-	0,13÷0,18	0,70÷1,00	0,15÷0,40	0,035	≤ 0,035	0,80÷1,10	0,80÷1,10	-
16CrNiS4	-	0,13÷0,18	0,70÷1,00	0,15÷0,40	0,035	0,020÷0,035	0,80÷1,10	0,80÷1,10	-
20CrNi4	-	0,18÷0,23	0,80÷1,10	0,15÷0,40	0,035	≤ 0,035	0,90÷1,20	0,90÷1,20	-
20CrNiS4	-	0,18÷0,23	0,80÷1,10	0,15÷0,40	0,035	0,020÷0,035	0,90÷1,20	0,90÷1,20	-
20NiCrMo2.2	1.6523	0,17÷0,23	0,65÷0,95	≤ 0,40	0,035	≤ 0,035	0,35÷0,70	0,40÷0,70	0,15÷0,25
20NiCrMoS2.2	1.6526	0,17÷0,23	0,65÷0,95	≤ 0,40	0,035	0,020÷0,040	0,35÷0,70	0,40÷0,70	0,15÷0,25
18CrMo4	1.7243	0,15÷0,21	0,60÷0,90	≤ 0,40	0,035	≤ 0,035	0,90÷1,20	-	0,15÷0,25
18CrMoS4	1.7244	0,15÷0,21	0,60÷0,90	≤ 0,40	0,035	0,020÷0,040	0,90÷1,20	-	0,15÷0,25
18NiCrMo5	-	0,15÷0,21	0,60÷0,90	≤ 0,40	0,035	≤ 0,035	0,70÷1,00	1,20÷1,50	0,15÷0,25
18NiCrMoS5	-	0,15÷0,21	0,60÷0,90	≤ 0,40	0,035	0,020÷0,035	0,70÷1,00	1,20÷1,50	0,15÷0,25

IMPORTANT: Processing at austenitic grain 5 or finer, conforming to EN ISO 643 standard. On request: grain 6 or finer.

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HARDNESS LIMITS AT JOMINY HARDENABILITY TEST (H TYPES)

Quality	HRc Hardness from Quenched End of Test Specimen (mm)														
	1,5	3	5	7	9	11	13	15	20	25	30	35	40	45	50
16MnCr5 16MnCrS5	39/47	36/46	31/44	28/41	24/39	21/37	≤ 35	≤ 33	≤ 31	≤ 30	≤ 29	≤ 28	≤ 27	-	-
20MnCr5 20MnCrS5	41/49	39/49	36/48	33/46	30/43	28/42	26/41	25/39	23/37	21/35	≤ 34	≤ 33	≤ 32	-	-
16CrNi4 16CrNiS4	38/47	35,5/ 45,5	33/44	30/42	28/40	26/38	24/36	22/35	19/32	17/ 29,5	≤ 28	≤ 26,5	≤ 26	≤ 25,5	≤ 25
20CrNi4 20CrNiS4	40/50	38,5/ 49	36,5/ 48	34/47	32/45	29/44	27/42	25,5/ 41	23/38	21/35	19,5/ 33	18/32	17/31	16/ 30,5	15/30
20NiCrMo2.2 20NiCrMoS2.2	41/49	37/48	31/45	25/42	22/36	20/33	≤ 31	≤ 30	≤ 27	≤ 25	≤ 24	≤ 24	≤ 23	-	-
18CrMo4 18CrMoS4	39/47	37/46	34/45	30/42	27/39	24/37	22/35	21/34	≤ 31	≤ 29	≤ 28	≤ 27	≤ 26	-	-
18NiCrMo5 18NiCrMoS5	39/49	38/ 48,5	36/48	34/ 46,5	31/45	29/ 43,5	27/41	25,5/ 40	23/37	21/ 35,5	20,5/ 34,5	20/ 33,5	≤ 33	≤ 32,5	≤ 32

IMPORTANT: On request all the qualities can be processed with restricted hardenability at 2/3 of standard H range, that is HL (2/3 inferior) and HH (2/3 superior) types.
Reference forJominy test: EN ISO 942 standard.

RIVA ACCIAIO

Hot Rolled Flat Steel Bars

QUENCHED AND TEMPERED CARBON AND ALLOY SPECIAL STEELS
UNI EN 10083-2 E 3
UNI 7845
UNI 7847

DESCRIPTION AND APPLICATIONS

Other qualities conforming to the above standards have been omitted, being out of current use.
Qualities up to a max. alloy content of 3% may be produced.

HEAT CHEMICAL COMPOSITION

Quality	N°	C %	Mn %	Si % Max	P % Max	S %	Cr %	Mo %
C22E	1.1151	0,17 ÷ 0,24	0,40 ÷ 0,70	0,40	0,03	≤ 0,035	≤ 0,040	≤ 0,010
C22R	1.1149	0,17 ÷ 0,24	0,40 ÷ 0,70	0,40	0,03	0,020 ÷ 0,040	≤ 0,040	≤ 0,010
C35E	1.1181	0,32 ÷ 0,39	0,50 ÷ 0,80	0,40	0,03	≤ 0,035	≤ 0,040	≤ 0,010
C35R	1.1180	0,32 ÷ 0,39	0,50 ÷ 0,80	0,40	0,03	0,020 ÷ 0,040	≤ 0,040	≤ 0,010
C40E	1.1186	0,37 ÷ 0,44	0,50 ÷ 0,80	0,40	0,03	≤ 0,035	≤ 0,040	≤ 0,010
C40R	1.1189	0,37 ÷ 0,44	0,50 ÷ 0,80	0,40	0,03	0,020 ÷ 0,040	≤ 0,040	≤ 0,010
C45E	1.1191	0,42 ÷ 0,50	0,50 ÷ 0,80	0,40	0,03	≤ 0,035	≤ 0,040	≤ 0,010
C45R	1.1201	0,42 ÷ 0,50	0,50 ÷ 0,80	0,40	0,03	0,020 ÷ 0,040	≤ 0,040	≤ 0,010
C50E	1.1206	0,47 ÷ 0,55	0,60 ÷ 0,90	0,40	0,03	≤ 0,035	≤ 0,040	≤ 0,010
C50R	1.1241	0,47 ÷ 0,55	0,60 ÷ 0,90	0,40	0,03	0,020 ÷ 0,040	≤ 0,040	≤ 0,010
C55E	1.1203	0,52 ÷ 0,60	0,60 ÷ 0,90	0,40	0,03	≤ 0,035	≤ 0,040	≤ 0,010
C55R	1.1209	0,52 ÷ 0,60	0,60 ÷ 0,90	0,40	0,03	0,020 ÷ 0,040	≤ 0,040	≤ 0,010
C60E	1.1221	0,57 ÷ 0,65	0,60 ÷ 0,90	0,40	0,03	≤ 0,035	≤ 0,040	≤ 0,010
C60R	1.1223	0,57 ÷ 0,65	0,60 ÷ 0,90	0,40	0,03	0,020 ÷ 0,040	≤ 0,040	≤ 0,010
28Mn6	1.1170	0,25 ÷ 0,32	1,30 ÷ 1,65	0,40	0,03	≤ 0,035	≤ 0,040	≤ 0,010

IMPORTANT: Processing at austenitic grain 5 or finer, conforming to EN ISO 943 standard.

RIVA ACCIAIO

Hot Rolled Flat Steel Bars

Quality	N°	C %	Mn %	Si % Max	P % Max	S %	Cr %	Mo %
34Cr4	1.7033	0,30 ÷ 0,37	0,60 ÷ 0,90	0,40	0,025	≤ 0,035	0,90 ÷ 1,20	-
34CrS4	1.7037	0,30 ÷ 0,37	0,60 ÷ 0,90	0,40	0,025	0,020 ÷ 0,040	0,90 ÷ 1,20	-
37Cr4	1.7034	0,34 ÷ 0,41	0,60 ÷ 0,90	0,40	0,025	≤ 0,035	0,90 ÷ 1,20	-
37CrS4	1.7038	0,34 ÷ 0,41	0,60 ÷ 0,90	0,40	0,025	0,020 ÷ 0,040	0,90 ÷ 1,20	-
41Cr4	1.7035	0,38 ÷ 0,45	0,60 ÷ 0,90	0,40	0,025	≤ 0,035	0,90 ÷ 1,20	-
41CrS4	1.7039	0,38 ÷ 0,45	0,60 ÷ 0,90	0,40	0,025	0,020 ÷ 0,040	0,90 ÷ 1,20	-
25CrMo4	1.7218	0,22 ÷ 0,29	0,60 ÷ 0,90	0,40	0,025	≤ 0,035	0,90 ÷ 1,20	0,15 ÷ 0,30
25CrMoS4	1.7213	0,22 ÷ 0,29	0,60 ÷ 0,90	0,40	0,025	0,020 ÷ 0,040	0,90 ÷ 1,20	0,15 ÷ 0,30
34CrMo4	1.7220	0,30 ÷ 0,37	0,60 ÷ 0,90	0,40	0,025	≤ 0,035	0,90 ÷ 1,20	0,15 ÷ 0,30
34CrMoS4	1.7226	0,30 ÷ 0,37	0,60 ÷ 0,90	0,40	0,025	0,020 ÷ 0,040	0,90 ÷ 1,20	0,15 ÷ 0,30
42CrMo4	1.7225	0,38 ÷ 0,45	0,60 ÷ 0,90	0,40	0,025	≤ 0,035	0,90 ÷ 1,20	0,15 ÷ 0,30
42CrMoS4	1.7227	0,38 ÷ 0,45	0,60 ÷ 0,90	0,40	0,025	0,020 ÷ 0,040	0,90 ÷ 1,20	0,15 ÷ 0,30
50CrMo4	1.7228	0,46 ÷ 0,54	0,50 ÷ 0,80	0,40	0,025	≤ 0,035	0,90 ÷ 1,20	0,15 ÷ 0,30

IMPORTANT: Processing at austenitic grain 5 or finer, conforming to EN ISO 943 standard.

HARDNESS LIMITS AT JOMINY HARDENABILITY TEST (H TYPES)

Quality	HRc Hardness from Quenched End of Test Specimen (mm)														
	1,5	3	5	7	9	11	13	15	20	25	30	35	40	45	50
C35E C35R	48/58	33/55	22/49	≤ 34	≤ 28	≤ 26	≤ 25	≤ 24	-	-	-	-	-	-	-
C40E C40R	51/60	35/59	25/53	23/39	21/31	≤ 29	≤ 28	≤ 27	-	-	-	-	-	-	-
C45E C45R	55/62	37/61	28/57	26/44	24/34	22/32	21/31	20/30	-	-	-	-	-	-	-
C50E C50R	56/63	44/61	31/58	30/50	28/36	26/34	25/33	24/32	23/31	20/29	≤ 28	-	-	-	-
C55E C55R	58/65	47/63	33/60	31/52	29/37	27/35	26/34	25/33	24/32	22/30	20/ 29	-	-	-	-
C60E C60R	60/67	50/65	35/62	32/54	30/39	28/36	27/35	26/34	25/33	23/31	21/30	-	-	-	-
28Mn6	45/54	42/53	37/51	27/48	21/44	≤ 41	≤ 38	≤ 35	≤ 31	≤ 29	≤ 27	≤ 26	≤ 25	≤ 25	≤ 24
34Cr4 34CrS4	49/57	48/57	45/56	41/54	35/52	32/49	29/46	27/44	23/39	21/37	20/35	≤ 34	≤ 33	≤ 32	≤ 31
37Cr4 37CrS4	51/59	50/59	48/58	44/57	39/55	36/52	33/50	31/48	26/42	24/39	22/37	20/36	≤ 35	≤ 34	≤ 33
41Cr4 41CrS4	53/61	52/61	50/60	47/59	41/58	37/56	34/54	32/52	29/46	26/42	23/40	21/38	≤ 37	≤ 36	≤ 35
25CrMo4 25CrMoS4	44/52	43/52	40/51	37/50	34/48	32/46	29/43	27/41	23/37	21/35	20/33	≤ 32	≤ 31	≤ 31	≤ 31
34CrMo4 34CrMoS4	49/57	49/57	48/57	45/56	42/55	39/54	36/53	34/52	30/48	28/45	27/43	26/41	25/40	24/40	24/39
42CrMo4 42CrMoS4	53/61	53/61	52/61	51/60	49/60	43/59	40/59	37/58	34/56	32/53	31/51	30/48	30/47	29/46	29/45
50CrMo4	58/65	58/65	57/64	55/64	54/63	53/63	51/63	48/62	45/61	41/60	39/58	38/57	37/55	36/54	36/54

IMPORTANT: On request all the qualities can be manufactured with restricted hardenability at 2/3 of standard H range, that is HL (2/3 inferior) and HH (2/3 superior) types.
Reference forJominy test: EN ISO 642 standard.

RIVA ACCIAIO

Hot Rolled Flat Steel Bars

MECHANICAL PROPERTIES IN THE QUENCHED AND TEMPERED CONDITION (*)

Quality	Tensile Test				Impact Test	Heat Treatment	
	Rm N/mm²	Re Min N/mm²	A_5 Min %	Z Min %	$KV_{20°}$ Min J	Quenching (1) °C	Tempering °C
C22E	500 ÷ 650	340	20	50	50	880 ± 20	550 ± 660
C22R	500 ÷ 650	340	20	50	50	880 ± 20	550 ± 660
C35E	630 ÷ 780	430	17	40	35	860 ± 20	550 ± 660
C35R	630 ÷ 780	430	17	40	35	860 ± 20	550 ± 660
C40E	650 ÷ 800	460	16	35	30	850 ± 20	550 ± 660
C40R	650 ÷ 800	460	16	35	30	850 ± 20	550 ± 660
C45E	700 ÷ 850	490	14	35	25	840 ± 20	550 ± 660
C45R	700 ÷ 850	490	14	35	25	840 ± 20	550 ± 660
C50E	750 ÷ 900	520	13	30	-	830 ± 20	550 ± 660
C50R	750 ÷ 900	520	13	30	-	830 ± 20	550 ± 660
C55E	800 ÷ 950	550	12	30	-	830 ± 20	550 ± 660
C55R	800 ÷ 950	550	12	30	-	830 ± 20	550 ± 660
C60E	850 ÷ 1000	580	11	25	-	830	550 ± 660
C60R	850 ÷ 1000	580	11	25	-	830 ± 20	550 ± 660
28Mn6	800 ÷ 950	590	13	40	40	860 ± 20	340 ± 680
34Cr4	900 ÷ 1100	700	12	35	40	850 ± 20	610 ± 70
34CrS4	900 ÷ 1100	700	12	35	40	850 ± 20	610 ± 70
37Cr4	950 ÷ 1150	750	11	35	35	845 ± 20	610 ± 70
37CrS4	950 ÷ 1150	750	11	35	35	845 ± 20	610 ± 70
41Cr4	1000 ÷ 1200	800	11	30	35	840 ± 20	610 ± 70
41CrS4	1000 ÷ 1200	800	11	30	35	840 ± 20	610 ± 70
25CrMo4	900 ÷ 1100	700	12	50	30	860 ± 20	610 ± 70
25CrMoS4	900 ÷ 1100	700	12	50	30	860 ± 20	610 ± 70
34CrMo4	1000 ÷ 1200	800	11	45	40	850 ± 20	610 ± 70
34CrMoS4	1000 ÷ 1200	800	11	45	40	850 ± 20	610 ± 70
42CrMo4	1000 ÷ 1300	900	10	40	35	840 ± 20	610 ± 70
42CrMoS4	1000 ÷ 1300	900	10	40	35	840 ± 20	610 ± 70
50CrMo4	1100 ÷ 1300	900	9	40	30	840 ± 20	610 ± 70

(*) The tensile test values apply to reference specimens Ø16 mm

IMPORTANT: (1) Quenching: in water for qualities C22 ÷ C45 and 28Mn6; in oil for qualities C50 ÷ C60 and 34Cr4 ÷50CrMo4

RIVA ACCIAIO

Hot Rolled Flat Steel Bars

MECHANICAL PROPERTIES IN NORMALIZED CONDITION

Quality	Tensile Test						Normalization °C
	On Reference Specimen Ø 16 mm			On Rolled Product Ø or Thickness 16 ÷ 100 mm			
	Rm Min N/mm²	Re Min N/mm²	A_5 Min %	Rm Min N/mm²	Re Min N/mm²	A_5 Min %	
C22E	430	240	24	410	210	25	880 ± 940
C22R	430	240	24	410	210	25	880 ± 940
C35E	550	300	18	520	270	19	860 ± 920
C35R	550	300	18	520	270	19	860 ± 520
C40E	580	320	16	550	290	17	850 ± 510
C40R	580	320	16	550	290	17	850 ± 910
C45E	620	340	14	580	305	16	840 ± 900
C45R	620	340	14	580	305	16	840 ± 900
C50E	650	355	13	610	320	14	830 ± 890
C50R	650	355	13	610	320	14	830 ± 890
C55E	680	370	11	640	330	12	825 ± 885
C55R	680	370	11	640	330	12	825 ± 885
C60E	710	380	10	670	340	11	820 ± 880
C60R	710	380	10	670	340	11	820 ± 880
28Mn6	630	345	17	600	310	18	850 ± 890

IMPORTANT: The normalization may be substituted by a “controlled rolling” (Reference: Table 1 EN 10083-2 standard).

Table values comform to the following standards: EN 100083 - 2 - UNI 7845.

ANNEALING AND SOFTENING HEAT TREATMENTS

Brinell Hardness		Case Hardening Steel	Quenched and Tempered Steel
HB Max	~ Rm		
207	710	16MnCr5 18CrMo4	-
210	720	-	25CrMo4
217	740	20MnCr5 16CrNi4	C50
223	760	20CrNi4	28Mn6 34Cr4 34CrMo4
229	780	18NiCrMo5	C55 41Cr4
235	800	-	37Cr4
241	810	-	C60 42CrMo4
248	840	-	50CrMo4

Table values comform to the following standards: EN 100084 - UNI 7846 - EN 100083 - 2 - EN 100083 - 3 - UNI 7845.
Max length of rolled material: 9,20 m.

RIVA ACCIAIO

Hot Rolled Flat Steel Bars

QUENCHED AND TEMPERED QUALITY CARBON STEEL
UNI 10083-2/06

DESCRIPTION AND APPLICATIONS

A number of qualities conforming to the above standars have been omitted as being out of current use.

HEAT CHEMICAL COMPOSITION

Quality	N°	C %	Mn %	Si % Max	P % Max	S % Max
C35	1.0501	0,32 ÷ 0,39	0,50 ÷ 0,80	0,40	0,045	0,045
C40	1.0511	0,37 ÷ 0,44	0,50 ÷ 0,80	0,40	0,045	0,045
C45	1.0503	0,42 ÷ 0,50	0,50 ÷ 0,80	0,40	0,045	0,045
C55	1.0535	0,52 ÷ 0,60	0,60 ÷ 0,90	0,40	0,045	0,045
C60	1.0601	0,57 ÷ 0,65	0,60 ÷ 0,90	0,40	0,045	0,045

MECHANICAL PROPERTIES IN THE NORMALIZED CONDITION

Quality	Tensile Test						Normalization °C
	On Rolled Product			On Rolled Product			
	Ø or Thickness > 16 ÷ 100 mm			Ø or Thickness > 100 ÷ 250 mm			
	Rm Min N/mm²	Re Min N/mm²	A_5 Min %	Rm Min N/mm²	Re Min N/mm²	A_5 Min %	
C35	520	270	19	500	245	19	860 ± 920
C40	550	290	17	530	260	17	850 ± 910
C45	580	305	16	560	275	16	840 ± 900
C55	640	330	12	620	300	12	825 ± 885
C60	670	340	11	650	310	11	820 ± 880

IMPORTANT: The normalization may be substituted by a “controlled rolling” (Reference Table 1 EN 10083 - 2 standard).

MECHANICAL PROPERTIES AT TEMPERED CONDITION (*)

Quality	Tensile Test					Heat Treatment
	Rm	Re Min	A_5 Min	Z Min	Quenching	Tempering
	N/mm²	N/mm²	%	N/mm²	N/mm²	
C35	630 ÷ 780	430	17	40	840 ± 880	550 ± 660
C40	650 ÷ 800	460	16	35	830 ± 870	550 ± 660
C45	700 ÷ 850	490	14	35	820 ± 860	550 ± 660
C55	800 ÷ 950	550	12	30	810 ± 850	550 ± 660
C60	850 ÷ 1000	580	11	25	810 ± 850	550 ± 660

(*) The tensile test values apply to reference specimens Ø 16 mm

NOTE: (1) Quenching: in water for qualities C35 ÷ C45; in oil for qualities C55 ÷ C60.

RIVA ACCIAIO

Hot Rolled Flat Steel Bars

QUENCHED AND TEMPERED BORON STEEL
EN 10083-3

DESCRIPTION AND APPLICATIONS

A number of qualities conforming to the above standars have been omitted as being out of current use.

HEAT CHEMICAL COMPOSITION

Quality	N°	C %	Mn %	Si % Max	P % Max	S % Max	Cr %	B %
30MnB5	1.5531	0,27 ÷ 0,33	1,15 ÷ 1,45	0,40	0,035	0,040	-	0,0010 ÷ 0,0050
38MnB5	1.5532	0,36 ÷ 0,42	1,15 ÷ 1,45	0,40	0,035	0,040	-	0,0010 ÷ 0,0050
27MnCrB5-2	1.7182	0,24 ÷ 0,30	1,10 ÷ 1,40	0,40	0,035	0,040	0,30 ÷ 0,60	0,0010 ÷ 0,0050
33MnCrB5-2	1.7185	0,30 ÷ 0,36	1,20 ÷ 1,50	0,40	0,035	0,040	0,30 ÷ 0,60	0,0010 ÷ 0,0050

HARDENABILITY JOMINY TEST HARDNESS LIMITS (H TYPES)

Quality	HRc Hardness from Specimen's Hardened End, mm												
	1,5	3	5	7	9	11	13	15	20	25	30	35	40
30MnB5	47/56	46/55	45/55	44/54	42/53	39/51	36/50	31/47	22/40	≤ 37	≤ 33	-	-
38MnB5	52/60	51/60	50/59	49/58	47/57	44/57	41/55	35/53	28/48	24/41	20/37	≤ 33	≤ 31
27MnCrB5-2	47/55	46/55	45/55	44/54	43/54	41/53	39/52	36/51	30/47	24/44	20/40	≤ 37	-
33MnCrB5-2	48/57	47/57	47/57	46/57	45/57	44/56	43/55	41/54	36/53	31/50	25/47	20/45	-

IMPORTANT: For earth-moving and tractors applications more than 100 steel qualities may be produced upon customers specifications.

RIVA ACCIAIO

Hot Rolled Flat Steel Bars

Mn-Si, Mn-Si-Cr, Cr, CR-V, Cr-Mo-V QUENCHED AND TEMPERED STEEL UNI 3545 (FOR AGRICULTURAL EQUIPMENT OR MECHANICAL APPLICATIONS, NOT FOR WHEEL SUSPENSIONS)

HEAT CHEMICAL COMPOSITION

Quality	C %	Mn %	Si %	P % Max	S % Max	Cr %	Mo %	V %
48Si7	0,42 ÷ 0,52	0,50 ÷ 0,80	1,50 ÷ 2,00	0,035	0,035	-	-	-
55Si7	0,52 ÷ 0,60	0,60 ÷ 0,90	1,50 ÷ 2,00	0,035	0,035	(0,15 ÷ 0,45)	-	-
60Si7	0,57 ÷ 0,64	0,60 ÷ 0,90	1,50 ÷ 2,00	0,035	0,035	-	-	-
60SiCr8	0,57 ÷ 0,64	0,70 ÷ 1,00	1,70 ÷ 2,20	0,035	0,035	0,25 ÷ 0,40	-	-
55Cr3	0,52 ÷ 0,59	0,70 ÷ 1,00	0,15 ÷ 0,40	0,035	0,035	0,60 ÷ 0,90	-	-
50CrV4	0,47 ÷ 0,55	0,70 ÷ 1,10	0,15 ÷ 0,40	0,035	0,035	0,80 ÷ 1,20	-	0,10 ÷ 0,20
51CrMoV4	0,48 ÷ 0,56	0,70 ÷ 1,00	0,15 ÷ 0,40	0,035	0,035	0,90 ÷ 1,20	0,15 ÷ 0,25	0,07 ÷ 0,12

IMPORTANT: The values in brackets are to be intended as optional.
Can be also supplied qualities conforming to the following standards: NF A35-552; NF A35-553; NF A35-571; DIN 17221.

MECHANICAL PROPERTIES IN THE QUENCHED AND TEMPERED CONDITION (*)

Quality	Tensile Test			Heat Treatment	
	Rm	$Rp_{0,2}$ Min	A_5 Min	Quenching	Tempering
	N/mm²	N/mm²	%	°C	°C
48Si7	1300 ÷ 1550	1110	6	860 ± 15 Water	425 ± 25
55Si7	1350 ÷ 1600	1160	6	855 ± 15 Oil	425 ± 25
60Si7	1380 ÷ 1630	1180	6	845 ± 15 Oil	425 ± 25
60SiCr8	1450 ÷ 1700	1250	5	845 ± 15 Oil	425 ± 25
55Cr3	1380 ÷ 1630	1180	6	845 ± 15 Oil	425 ± 25
50CrV4	1330 ÷ 1580	1140	6	865 ± 15 Oil	425 ± 25
51CrMoV4	1380 ÷ 1630	1180	6	865 ± 15 Oil	425 ± 25

(*) The tensile test values apply to reference specimens Ø 10 mm

HARDNESS LIMITS AT JOMINY HARDENABILITY TEST (H TYPES)

Quality	HRc Hardness from Quenched End of Test Specimen (mm)														
	1,5	3	5	7	9	11	13	15	20	25	30	35	40	45	50
48Si7	56/64	52/61	42/56	36/52	32/47	29/43	27/41	26/38	22/35	21/33	32	31	29	28	27
55Si7	57/65	55/63	49/62	43/59	37/57	34/55	32/53	31/50	28/43	27/41	26/38	26/37	25/36	24/35	24/35
60Si7	58/66	56/65	50/63	45/62	39/61	36/59	34/55	33/51	31/44	29/40	28/38	27/36	26/35	25/34	25/33
60SiCr8	58/66	58/66	57/65	51/64	45/63	40/61	38/59	37/57	33/50	30/45	29/43	28/41	27/40	26/39	25/39
55Cr3	57/65	56/65	55/64	54/63	52/63	48/62	43/61	39/60	33/57	30/52	28/48	27/45	26/42	25/40	24/39
50CrV4	57/65	56/65	56/64	55/64	53/63	50/62	46/61	43/60	37/57	35/53	33/50	32/48	30/45	29/44	28/43
51CrMoV4	57/65	56/65	56/64	55/64	53/63	52/63	51/63	50/62	48/62	47/62	46/62	46/61	45/61	44/61	44/60

RIVA ACCIAIO

Hot Rolled Flat Steel Bars

DELIVERIES IN ANNEALED CONDITIONS

Brinell Hardness		Case hardening steels	Quench and tempering steels
HB Max	~ Rm		
207	710	16MNCR5 18CRMO4	-
210	720	-	25CRMO4
217	740	20MNCR5 16CRNI4	C50
223	760	20CRNI4	28MN6 34CR4 34CRMO4
229	780	18NICRMO5	C55 41CR4
235	800	-	37CR4
241	810	-	C60 42CRMO4
248	840	-	50CRMO4

Table values comform to the following standards: Table values comform to the following standards

Max length of rolled material: 9,20 m.