



High carbon, alloy and case hardening steels

Reliable hot rolled steels for high quality products

For a number of years ArcelorMittal has been developing its range of high carbon steels for re-rolling and heat treatment applications. We are continuing to improve our flexibility and process to meet our customers' most stringent demands.

General properties

High carbon and alloy steels are characterised by their hardness after heat treatment. They can offer high strength ratings, including fatigue resistance. Case hardening steels are characterised by their ability to form a harder skin after heat treatment.

Main advantages

High carbon and alloy steels are designed for the production of parts for intensive use. Case hardening steels are suitable for parts subjected to high pressures and/or extreme impacts. ArcelorMittal produces a high-quality hot rolled strip suitable for fulfilling the highest requirements for your end product.

Applications

This type of steel must be cold rolled and/or subjected to heat treatment (annealing, quenching and tempering), depending on the application for which it is intended. High carbon and alloy steels can be used for manufacturing mechanical parts, such as clutches, springs, saws, valves,



measuring tape etc. Case hardening steels are particularly suitable for screws, fasteners, firing pins, rifle bolts, engine camshafts etc.

ArcelorMittal product technical properties

Low thickness tolerance

In view of the tolerance values required for finished products made from re-rolled strip, ArcelorMittal normally offers a tighter tolerance range for these grades, which is 3/4 of the standard tolerance required by EN 10051:2010. On top of that, 1/2 and even 1/3 of the standard tolerance can be guaranteed under certain conditions.

Low transverse coil profile

As these products are frequently re-rolled after slitting, ArcelorMittal can supply, in certain dimensions, coils with an extra flat profile that can be 1/2 or even 1/3 of the standard tolerance defined by EN 10051:2010; on ArcelorMittal products a crown lower than 60 µm can currently be guaranteed for coil thicknesses ranging from 2 to 6 mm.

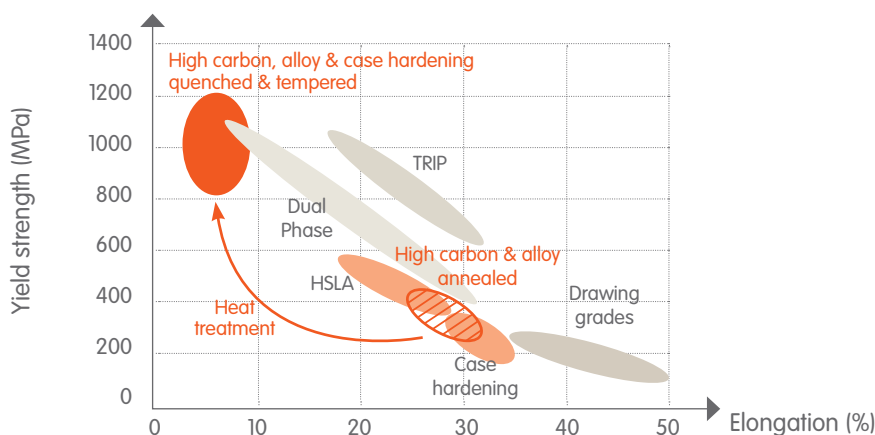
Good internal purity

Our steels have the degree of internal purity corresponding to the steel grade specified. It is possible to agree on the required degree of purity at the time of enquiry and order.

Decarburisation

Guaranteed total decarburisation is lower than 1% per side. Do not hesitate to contact us for further information regarding the technical properties we can offer.

Final cold rolled high carbon, alloy & case hardening steel properties compared with other cold rolled steels



Dimensional feasibility (mill finish or pickled)

High carbon and alloy steels

Thickness (mm)	C35E EN 10083-2, C35E AM FCE, C40E EN 10083-2, C40E AM FCE, C45E EN 10083-2, C45E AM FCE, C50E EN 10083-2, C50E AM FCE		C55E EN 10083-2, C60E EN 10083-2, C60E AM FCE, C67S AM FCE		C75S AM FCE	
	Min width	Max width	Min width	Max width	Min width	Max width
2.00 ≤ th < 2.25	1000	1380	1000	1380	1000	1350
2.25 ≤ th < 2.50		1450		1450		1450
2.50 ≤ th < 8.00		1540		1490		1490
8.00 ≤ th < 12.00		1400		1400	-	-

Other dimensions may be available after prior agreement.

NB: 51CrV4 EN 10083-3, 51CrV4 AM FCE, 42CrMo4 AM FCE, 75Cr1 AM FCE, C70S AM FCE and C80S AM FCE are available on request: please contact us for details on dimensions available.

Case hardening steels

Thickness (mm)	C10E EN 10084, C12E AM FCE, C15E EN 10084		C22E EN 10083-2		16MnCr5 EN 10084, 16MnCr5 AM FCE	
	Min width	Max width	Min width	Max width	Min width	Max width
1.70 ≤ th < 2.00	900	1200	-	-	-	-
2.00 ≤ th < 2.25	800	1600	800	1500	800	1350
2.25 ≤ th < 2.50		1650				1460
2.50 ≤ th < 2.75		1700				1550
2.75 ≤ th < 3.00		1750				
3.00 ≤ th < 8.00		1790				
8.00 ≤ th < 11.00						
11.00 ≤ th < 12.00						
12.00 ≤ th < 13.00	Please contact us regarding availability					

Mechanical properties

These grades are delivered by ArcelorMittal in the hot rolled state without further heat treatment, and are destined to undergo re-rolling and/or heat treatment at our customer's site. Consequently, no guarantees can be provided on their mechanical properties when delivered, because of quenching conditions on the coiler at the outer and inner laps.

Please contact us for further information on this subject.

Chemical properties

High carbon and alloy steels

	Notes	C (%)	Mn (%)	P (%)	S (%)	Si (%)	Al (%)	Cr (%)	Ni (%)	Mo (%)	V (%)
C35E EN 10083-2	1	0.32 - 0.39	0.50 - 0.80	≤ 0.030	≤ 0.035	≤ 0.40	-	≤ 0.40	≤ 0.40	≤ 0.10	-
C35E AM FCE	1	0.340 - 0.390	0.60 - 0.80	≤ 0.025	≤ 0.005	0.15 - 0.35	0.010 - 0.030	0.20 - 0.35	≤ 0.10	≤ 0.08	-
C40E EN 10083-2	1	0.37 - 0.44	0.50 - 0.80	≤ 0.030	≤ 0.035	≤ 0.40	-	≤ 0.40	≤ 0.40	≤ 0.10	-
C40E AM FCE	1	0.370 - 0.420	0.60 - 0.75	≤ 0.025	≤ 0.005	0.15 - 0.25	0.010 - 0.030	0.20 - 0.35	≤ 0.10	≤ 0.08	-
C45E EN 10083-2	1	0.42 - 0.50	0.50 - 0.80	≤ 0.030	≤ 0.035	≤ 0.40	-	≤ 0.40	≤ 0.40	≤ 0.10	-
C45E AM FCE	1	0.420 - 0.480	0.60 - 0.75	≤ 0.025	≤ 0.005	0.15 - 0.25	0.010 - 0.030	0.20 - 0.30	≤ 0.10	≤ 0.08	-
C50E EN 10083-2	1	0.47 - 0.55	0.60 - 0.90	≤ 0.030	≤ 0.035	≤ 0.40	-	≤ 0.40	≤ 0.40	≤ 0.10	-
C50E AM FCE	1	0.470 - 0.520	0.60 - 0.75	≤ 0.025	≤ 0.005	0.15 - 0.25	0.010 - 0.030	0.20 - 0.30	≤ 0.10	≤ 0.08	-
C55E EN 10083-2	1	0.52 - 0.60	0.60 - 0.90	≤ 0.030	≤ 0.035	≤ 0.40	-	≤ 0.40	≤ 0.40	≤ 0.10	-
C60E EN 10083-2	1	0.57 - 0.65	0.60 - 0.90	≤ 0.030	≤ 0.035	≤ 0.40	-	≤ 0.40	≤ 0.40	≤ 0.10	-
C60E AM FCE	1	0.570 - 0.650	0.60 - 0.75	≤ 0.025	≤ 0.005	0.15 - 0.25	0.010 - 0.030	0.20 - 0.30	≤ 0.10	≤ 0.08	-
C67S AM FCE		0.650 - 0.730	0.60 - 0.75	≤ 0.025	≤ 0.005	0.15 - 0.25	0.010 - 0.030	0.20 - 0.30	≤ 0.10	≤ 0.08	-
C75S AM FCE		0.700 - 0.800	0.60 - 0.75	≤ 0.025	≤ 0.005	0.15 - 0.25	≤ 0.010	0.20 - 0.30	≤ 0.10	≤ 0.08	-
51CrV4 EN 10083-3		0.47 - 0.55	0.70 - 1.10	< 0.025	< 0.025	< 0.40	-	0.90 - 1.20	-	-	0.10 - 0.25
51CrV4 AM FCE		0.500 - 0.550	0.80 - 1.00	< 0.020	≤ 0.006	0.20 - 0.30	0.015 - 0.035	0.90 - 1.10	-	-	0.10 - 0.15
42CrMo4 AM FCE		0.40 - 0.44	0.60 - 0.80	≤ 0.025	≤ 0.003	0.10 - 0.20	0.02 - 0.04	0.90 - 1.10	≤ 0.15	0.16 - 0.20	-
75Cr1 AM FCE		0.75 - 0.80	0.70 - 0.80	≤ 0.020	≤ 0.006	0.25 - 0.35	≤ 0.01	0.35 - 0.40	≤ 0.15	≤ 0.05	-

Values in bold: tighter than the standard

1. The sum of the percentages by mass of the three elements chromium, nickel and molybdenum shall not exceed 0.63%.

NB:

51CrV4 EN 10083-3, 51CrV4 AM FCE, 42CrMo4 AM FCE, 75Cr1 AM FCE, C70S AM FCE and C80S AM FCE are available on request.

Case hardening steels

	Notes	C (%)	Mn (%)	P (%)	S (%)	Si (%)	Al (%)	Cr (%)	Ni (%)	Mo (%)	N (%)
C10E EN 10084		0.07 - 0.13	0.30 - 0.60	≤ 0.035	≤ 0.035	≤ 0.40	-	-	-	-	-
C12E AM FCE		0.100 - 0.130	0.30 - 0.45	≤ 0.020	≤ 0.010	0.150 - 0.250	≤ 0.018	≤ 0.08	≤ 0.08	-	-
C15E EN 10084		0.12 - 0.18	0.30 - 0.60	< 0.035	< 0.035	≤ 0.40	-	-	-	-	-
C22E EN 10083-2	1	0.170 - 0.240	0.40 - 0.70	≤ 0.030	≤ 0.035	≤ 0.40	-	≤ 0.40	≤ 0.40	≤ 0.10	-
16MnCr5 EN 10084		0.14 - 0.19	1.00 - 1.30	≤ 0.025	≤ 0.035	≤ 0.40	-	0.80 - 1.10	-	-	-
16MnCr5 AM FCE		0.140 - 0.170	1.00 - 1.15	≤ 0.020	≤ 0.005	≤ 0.10	0.020 - 0.045	0.85 - 0.95	≤ 0.10	≤ 0.020	0.004 - 0.008

Values in bold: tighter than the standard

1. The sum of the percentages by mass of the three elements chromium, nickel and molybdenum shall not exceed 0.63%.

Brand correspondence

High carbon and alloy steels

	EN 10083-2:2006	EN 10132-4:2000	DIN 17200	BS 970 – BS 5867
C35E EN 10083-2	C35E			
C35E AM FCE	C35E			
C40E EN 10083-2	C40E			
C40E AM FCE	C40E		Ck40	080M40
C45E EN 10083-2	C45E			
C45E AM FCE	C45E		Ck45	080M46
C50E EN 10083-2	C50E			
C50E AM FCE	C50E		Ck50	080M50
C55E EN 10083-2	C55E			
C60E EN 10083-2	C60E			
C60E AM FCE	C60E		Ck60	070M60
C67S AM FCE		C67S	Ck67	CS70
C75S AM FCE		C75S	Ck75	CS80

	EN 10083-3:2006	ISO 683-1:1987	DIN	BS
51CrV4 EN 10083-3	51CrV4	51CrV4	50CrV4	735A50
51CrV4 AM FCE	51CrV4			

Case hardening steels

	EN 10084:2008	EN 10083-2:2006	ISO 683-11:1987	DIN 1721	BS 970-1
C10E EN 10084	C10E		C10	Ck10	045M10
C12E AM FCE					
C15E EN 10084	C15E		C15E4	Ck15	
C22E EN 10083-2		C22E			
16MnCr5 EN 10084	16MnCr5		16MnCr5	16MnCr5	590M17
16MnCr5 AM FCE	16MnCr5				

Any questions?

Ask them via our contact form on
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Credits

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