A40 - Steel coils for laser cutting applications

These steels are particularly suitable for manufacturing complex parts or for improving productivity when parts are to be produced on a small scale.

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Properties

Steel coils for laser cutting applications (CLAS) are hot rolled coils produced in specific grades, developed for applications using computer-controlled thermal and mechanical cutting equipment (laser, plasma etc).

Two ranges are available: structural and high yield strength steels for cold forming.

- The structural steel range begins with S200 CLAS AM FCE grade, which combines the drawability of DD12 AM FCE (EN 10111:2008) and a narrow tolerance range for the mechanical properties. All the other grades are improved structural steels in compliance with EN 10025-2:2004.
- The range of high yield strength steels for cold forming comprises improved versions of Amstrong® 315MC, Amstrong® 355MC, Amstrong® 420MC and Amstrong® 500MC, as per EN 10149-2:2013.

All these grades are designed to:

- Give improved productivity, quality and consistency with laser cutting
- Meet the most stringent flatness requirements after cutting

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Advantages

Steel coils supplied for laser cutting are virtually free of internal stresses and can therefore be used to produce sheets with guaranteed flatness before, during and after cutting, provided that appropriate decoiling tools and procedures are used. Sheets produced on cutting-to-length lines certified by ArcelorMittal may have guaranteed flatness before, during and after cutting (see data sheet A42).

For thicknesses below 16 mm, steels for laser cutting offer significantly higher laser cutting speeds than those obtained with standard grades and/or conventional cutting processes (plasma, oxy-cutting).

These steels can be hot dip galvanised.

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Applications

These grades are particularly suitable for manufacturing complex parts or for improving productivity when parts are to be produced on a small scale.

Since 1 July 2013, the Construction Products Regulation (Regulation (EU) No. 305/2011 – CPR) has required that CE marking be affixed to all products delivered in accordance with a harmonised standard (e.g. EN 10025). This CE marking guarantees, for the uses defined in the standard, the properties described in the declaration of performance submitted by the manufacturer.

The S235 CLAS AM FCE, S275 CLAS AM FCE and S355 CLAS AM FCE steels in this data sheet comply with this Regulation.

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Surface quality

Laser cutting speed largely depends on surface homogeneity and reflectivity. To improve productivity for our clients, ArcelorMittal has developed several surface finishes compatible with laser cutting:

- Mill finish:
  - Surface appearance: only A (unexposed) is available
  - Surface cleanliness: on request, Amstrong® grades can be delivered with an improved surface finish on black hot rolled product. Contact our commercial teams for further information.
- Pickled:
  ArcelorMittal's hydrochloric acid pickling process produces a clean, more favourable surface for laser cutting than that produced by sulphuric acid pickling.
  - Surface appearance: A (unexposed) and B (exposed) are available
  - Protection:
    - Protective oil may be applied
    - Easyfilm® HPE is available. It offers more uniform dry surface protection than oil and favourably reduces the reflectivity of the steel. Moreover, since no oil is used, workplace floors are cleaner and safer.
      For more information, see data sheet A80.

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Weldability

Due to their low carbon equivalent value (see table of chemical properties), ArcelorMittal's steel coils for laser cutting applications offer excellent weldability.

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Brand correspondence

High yield strength steels for cold forming

	EN 10025-2:2004	EN 10149-2:2013	EN 10111:2008	Old brand names
Amstrong® 320MC CLAS AM FCE		S315MC		
Amstrong® 360MC CLAS AM FCE		S355MC		Sollaser® 380/Sidlaser® 380/Superlaser 355MC
Amstrong® 420MC CLAS AM FCE		S420MC		Sollaser® 440/Sidlaser® 420
Amstrong® 500MC CLAS AM FCE		S500MC		

Structural steels

	EN 10025-2:2004	EN 10149-2:2013	EN 10111:2008	Old brand names
S200 CLAS AM FCE			DD12	Sollaser® 220/Sidlaser® 220/Superlaser DD12
S240 CLAS AM FCE	S235J0			Sollaser® 260/Sidlaser® 240/Superlaser 235
S275 CLAS AM FCE	S275J0			
S355 CLAS AM FCE	S355J0			

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Dimensions

Thickness tolerance

The consistent thickness and reduced internal stresses of these coils make it possible to operate laser cutting machines continuously by lowering the breakdown risk and the frequency of laser cutting head breakage. This allows the use of fully automated loading and discharging systems.

The following thickness tolerances (EN 10051:2010) are available: 3/4, 1/2 and 1/3 for both mill finish and pickled steels. Contact our commercial teams for stricter tolerances.

Amstrong® grades are delivered with a thickness tolerance of 1/2 EN if a tighter tolerance is not requested.

Flatness tolerance

Since the degree of sheet flatness obtained mainly depends on the uncoiling and levelling process used during laser cutting, we cannot offer any guarantee for coil products supplied.

Dimension tables

The following tables show the dimensions available for ArcelorMittal's coils:

Mill finish

Thickness (mm)	Min width	Amstrong® 320MC CLAS AM FCE	Amstrong® 360MC CLAS AM FCE	Amstrong® 420MC CLAS AM FCE	Amstrong® 500MC CLAS AM FCE	S200 CLAS AM FCE	S240 CLAS AM FCE	S275 CLAS AM FCE	S355 CLAS AM FCE
		Max width	Max width	Max width	Max width	Max width	Max width	Max width	Max width
2.00 ≤ th < 2.50	700	1400	1400	1400	-	1630	1630	1630	1440
2.50 ≤ th < 3.00		1590	1500	1500		2000	1850	1830	1540
3.00 ≤ th < 3.50		1700	1650	1650			2030	2030	1800
3.50 ≤ th < 4.00		1790	1730	1690		2130	2130	2130	2130
4.00 ≤ th < 4.50		1880	1880	1840	*				
4.50 ≤ th < 5.00		2030	2030						
5.00 ≤ th < 10.00		2130	2130	2130					
10.00 ≤ th < 11.00				2030	-				2030
11.00 ≤ th < 13.00		1930	1930						
13.00 ≤ th < 13.50				1930					1930
13.50 ≤ th < 14.00				-					
14.00 ≤ th < 15.00		-							

Thickness (mm)	Min width	Amstrong® 320MC CLAS AM FCE	Amstrong® 360MC CLAS AM FCE	Amstrong® 420MC CLAS AM FCE	Amstrong® 500MC CLAS AM FCE	S200 CLAS AM FCE	S240 CLAS AM FCE	S275 CLAS AM FCE	S355 CLAS AM FCE
		Max width	Max width	Max width	Max width	Max width	Max width	Max width	Max width
15.00 ≤ th < 15.50	700	-	1930	-	-	2130	2130	-	-
15.50 ≤ th < 16.00									

** Amstrong® 500MC CLAS AM FCE: only after prior agreement*

Pickled coils

Thickness (mm)	Min width	Amstrong® 320MC CLAS AM FCE	Amstrong® 360MC CLAS AM FCE	Amstrong® 420MC CLAS AM FCE	Amstrong® 500MC CLAS AM FCE	S200 CLAS AM FCE	S240 CLAS AM FCE, S275 CLAS AM FCE	S355 CLAS AM FCE
		Max width	Max width	Max width	Max width	Max width	Max width	Max width
2.00 ≤ th < 2.50	600	1420	1400	1400		1630	1630	1440
2.50 ≤ th < 3.00	700	1590	1500	1500	-	2000	1850	1540
3.00 ≤ th < 4.00		1700	1600	1550		2130	2000	1780
4.00 ≤ th < 5.00		1880	1880	1830	(1540)		2130	2130
5.00 ≤ th < 6.00		2130	2130	2130				
6.00 ≤ th < 7.15				1520				1550
7.15 ≤ th < 8.15		1520	1520		-	1550	1550	1520
8.15 ≤ th < 12.00						1520	1520	
12.00 ≤ th < 13.00						-		

** Amstrong® 500MC CLAS AM FCE: only after prior agreement*

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Mechanical properties

High yield strength steels for cold forming

	Direction	Thickness (mm)	R_e (MPa)	R_m (MPa)	A_{80} (%)	A 5.65$\sqrt{S_o}$ (%)	Bending ratio (th)	KV -20°C (J)
Amstrong® 320MC CLAS AM FCE	L	2 - 3	320 - 420	420 - 500	≥ 22	≥ 27	-	-
		3 - 6			-			
		6 - 14						≥ 40
	T	2 - 3	345 - 450	435 - 540	≥ 21	≥ 26	≥ 0	-
		3 - 14			-			
Amstrong® 360MC CLAS AM FCE	L	2 - 3	360 - 440	450 - 530	≥ 21	-	-	-
		3 - 6			-	≥ 26		
		6 - 16						≥ 40
	T	2 - 3	380 - 460	460 - 540	≥ 20	-	≥ 0	-
		3 - 16			-	≥ 25		
Amstrong® 420MC CLAS AM FCE	L	2 - 3	420 - 500	490 - 590	≥ 18	-	-	-
		3 - 6			-	≥ 23		
		6 - 14						≥ 40
	T	2 - 3	440 - 520	500 - 600	≥ 17	-	≥ 0.5	-
		3 - 14			-	≥ 22		
Amstrong® 500MC CLAS AM FCE	L	< 2	500 - **600**	**570 - 700**	≥ 15	-	-	-
		2 - 3			**≥ 16**			
		3 - 6			-	**≥ 19**		
		6 - 10						**≥ 40**
	T	< 2	**530 - 630**	**570 - 700**	**≥ 14**	-	≥ 0.6	-
		2 - 3			**≥ 15**			
		3 - 6			-	**≥ 18**		
		6 - 10					≥ 1	

Values in bold: tighter than the standard

Bending ratio is as defined in EN 10149-2:2013: "Bending at 180° minimum mandrel diameter".

Structural steels

	Direction	Thickness (mm)	R_e **(MPa)**	R_m **(MPa)**	A_{80} **(%)**	A $5.65\sqrt{S_o}$ **(%)**	Bending ratio **(th)**	KV 0 °C **(J)**
S200 CLAS AM FCE	T	2 - 3	200 - 310	320 - 410	≥ 27	-	-	-
		3 - 16	200 - 300	320 - 400	-	≥ 32		
S240 CLAS AM FCE	L	6 - 16	-	-	-	-	-	≥ 27
	T	2 - 3	240 - 320	360 - 440	≥ 22	-	-	-
		3 - 16	-	-	-	≥ 28		
S275 CLAS AM FCE	L	6 - 16	-	-	-	-	-	≥ 27
	T	2 - 2.5	≥ 275	430 - 580	< 16	-	-	-
		2.5 - 3			< 17			
		3 - 16		410 - 560	-	< 21		
S355 CLAS AM FCE	L	6 - 16	-	-	-	-	-	≥ 27
	T	2 - 2.5	≥ 355	510 - 610	≥ 15	-	≥ 1	-
		2.5 - 3			≥ 16			
		3 - 16		490 - 590	-	≥ 20		

Bending ratio: the values of the bending radius are applicable for bend angles ≤ 90°, as proposed in EN 10025-2:2004.

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Chemical composition

High yield strength steels for cold forming

	C (%)	Mn (%)	P (%)	S (%)	Si (%)	Al (%)	Cu (%)	Cr (%)	Ni (%)	Nb (%)	C_{eq} (%)	Galvanisation
Amstrong® 320MC CLAS AM FCE	≤ 0.100	≤ 1.30	≤ 0.025	≤ 0.012	≤ 0.03	≥ 0.020	≤ 0.25	≤ 0.15	≤ 0.25	≤ 0.040	≤ 0.36	Class 1
Amstrong® 360MC CLAS AM FCE	≤ 0.100	≤ 1.40	≤ 0.020	≤ 0.012	≤ 0.03	≥ 0.020	≤ 0.25	≤ 0.15	≤ 0.25	≤ 0.065	≤ 0.36	Class 1
Amstrong® 420MC CLAS AM FCE	≤ 0.110	≤ 1.50	≤ 0.020	≤ 0.012	≤ 0.03	≥ 0.020	≤ 0.25	≤ 0.15	≤ 0.25	≤ 0.065	≤ 0.38	Class 1
Amstrong® 500MC CLAS AM FCE	≤ 0.120	≤ 1.70	≤ 0.020	≤ 0.012	≤ 0.03	≥ 0.020	≤ 0.25	≤ 0.15	≤ 0.25	≤ 0.090	≤ 0.42	Class 1

Structural steels

	C (%)	Mn (%)	P (%)	S (%)	Si (%)	Al (%)	Cu (%)	Cr (%)	Ni (%)	Nb (%)	C_{eq} (%)	Galvanisation
S200 CLAS AM FCE	≤ 0.080	≤ 0.45	≤ 0.025	≤ 0.025	≤ 0.03	≥ 0.020	-	-	-	-	≤ 0.16	Class 1
S240 CLAS AM FCE	≤ 0.170	≤ 0.80	≤ 0.025	≤ 0.025	≤ 0.03	≥ 0.020	≤ 0.25	-	-	-	≤ 0.35	Class 1
S275 CLAS AM FCE	≤ 0.180	≤ 1.30	≤ 0.025	≤ 0.025	≤ 0.03	≥ 0.020	≤ 0.25	≤ 0.15	≤ 0.25	-	≤ 0.40	Class 1
S355 CLAS AM FCE	≤ 0.200	≤ 1.60	≤ 0.025	≤ 0.012	≤ 0.03	≥ 0.020	≤ 0.25	≤ 0.15	≤ 0.25	≤ 0.060	≤ 0.45	Class 1

Any questions?
Ask them via our contact form on https://industry.arcelormittal.com/getintouch