ArcelorMittal

Amstrong®

Advanced high strength steels

Like any organisation, ArcelorMittal constantly seeks to optimally meet – if not surpass – market expectations. In common with high-performing athletes, our ambition is to reach ever-higher targets. So it is vital for us to keep up with what really matters to our clients. The latest addition to our product range provides the answer: **Amstrong® high-strength and ultra-high strength steel** – like the pole of a pole vault athlete, it's the strong, high-performance material that enables our customers to reach higher targets thanks to innovative steel solutions, developed together with ArcelorMittal.

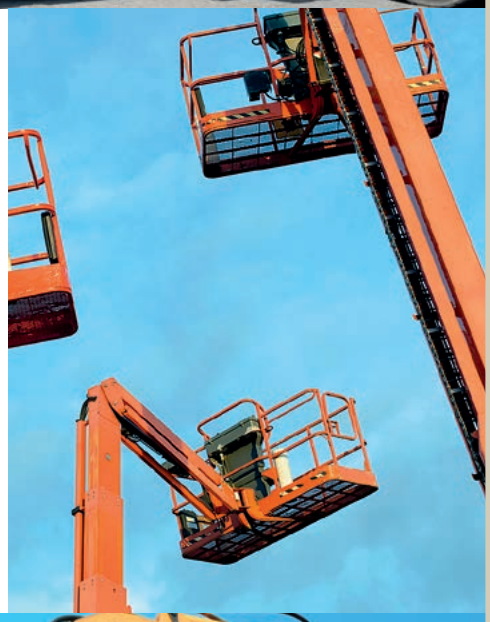
Amstrong®

Amstrong® and Amstrong® Ultra high-strength steels are available as thermomechanically hot rolled, cold formable grades. Their main properties include high yield strength and tensile strength, combined with excellent formability, toughness at low temperatures and fatigue resistance.

These grades are therefore an excellent choice for reducing structural thickness and weight whilst improving load-bearing capacity, thereby generating cost savings and securing market advantage.

Amstrong® high-strength steels can be used with considerable advantage in a wide range of applications, including:

- Construction of truck trailers and tippers
- Container construction
- Truck-mounted cranes and construction cranes
- Excavators and construction vehicles
- Agricultural vehicles and machinery
- Concrete mixers and pumps
- Freight and passenger rail cars
- Light poles
- Safety barriers
- Racks, shelving and many more…



Amstrong®

Chemistry and mechanical properties

The Amstrong® and Amstrong® Ultra product ranges are manufactured according to very strict production processes, which make it possible to provide a better range of properties.
These grades also have better ductility and bendability than standard high-strength low-alloy (HSLA) grades. They are therefore perfect for demanding processes, allowing trouble-free operations and ensuring constant properties from one batch of material to the next. This results in a better yield on the production line and helps to achieve the most severe tolerances on the finished steel parts.
With low P and Si content, the chemical composition of these grades makes them suitable for hot-dip galvanising.
Compared to the requirements of the EN 10149-2 standard, all products come with a toughness guarantee of 40 J minimum at -20 °C [1] and mechanical properties guaranteed in the rolling and transverse directions.

A 'Tough' version, with a guarantee of 27 J minimum at -40 °C[1], is available for grades Amstrong® 355MC/420MC/460MC/500MC/550MC, called Amstrong® 355MCT/420MCT/460MCT/500MCT/550MCT respectively.
'Tough' versions of other grades can also be provided on request.
For higher grades ranging from minimum guaranteed yield strength 650 to 1100 MPa, please check out the Amstrong® Ultra brochure.

[1] For standard 10 x 10 mm Charpy samples – for low thicknesses, subsize test samples are used and required values are decreased proportionally.

Chemical composition

Amstrong®	C (%)	Mn (%)	P (%)	S (%)	Si (%)	Al (%)	Nb (%)	V (%)	Ti (%)	Mo (%)	B (%)	C_{eq} (CEV)	Galvanisability
240MC	**≤ 0.100**	**≤ 0.80**	**≤ 0.020**	**≤ 0.020**	**≤ 0.03**	**≥ 0.015**	**≤ 0.025**	**≤ 0.200**	**≤ 0.150**	-	-	**≤ 0.18**	Cat A/Class 1
280MC	**≤ 0.080**	**≤ 0.80**	**≤ 0.020**	**≤ 0.015**	**≤ 0.03**	**≥ 0.015**	**≤ 0.025**	**≤ 0.200**	**≤ 0.150**	-	-	**≤ 0.23**	Cat A/Class 1
315MC	**≤ 0.100**	**≤ 0.70**	**≤ 0.020**	**≤ 0.015**	**≤ 0.03**	≥ 0.015	**≤ 0.045**	≤ 0.200	≤ 0.150	-	-	**≤ 0.25**	Cat A/Class 1
355MC	**≤ 0.100**	**≤ 1.40**	**≤ 0.020**	**≤ 0.015**	**≤ 0.03**	≥ 0.015	**≤ 0.065**	≤ 0.200	≤ 0.150	-	-	**≤ 0.32**	Cat A/Class 1
390MC	**≤ 0.100**	**≤ 1.50**	**≤ 0.020**	**≤ 0.012**	**≤ 0.03**	**≥ 0.015**	**≤ 0.065**	**≤ 0.200**	**≤ 0.150**	-	-	**≤ 0.36**	Cat A/Class 1
420MC	**≤ 0.110**	**≤ 1.50**	**≤ 0.020**	**≤ 0.012**	**≤ 0.03**	≥ 0.015	**≤ 0.065**	≤ 0.200	≤ 0.150	-	-	**≤ 0.38**	Cat A/Class 1
460MC	≤ 0.120	**≤ 1.50**	**≤ 0.020**	**≤ 0.012**	**≤ 0.03**	≥ 0.015	**≤ 0.080**	≤ 0.200	≤ 0.150	-	-	**≤ 0.40**	Cat A/Class 1
500MC	≤ 0.120	≤ 1.70	**≤ 0.020**	**≤ 0.012**	**≤ 0.03**	≥ 0.015	≤ 0.090	≤ 0.200	≤ 0.150	-	-	**≤ 0.42**	Cat A/Class 1
550MC	**≤ 0.100**	**≤ 1.70**	**≤ 0.020**	**≤ 0.012**	**≤ 0.03**	≥ 0.015	≤ 0.090	≤ 0.200	≤ 0.150	-	-	**≤ 0.44**	Cat A/Class 1
600MC	≤ 0.120	≤ 1.90	**≤ 0.020**	≤ 0.015	**≤ 0.03**	≥ 0.015	≤ 0.090	≤ 0.200	≤ 0.220	-	-	**≤ 0.44**	Cat A/Class 1

Values in bold are tighter than the EN 10149-2 standard
Galvanisability according to EN 10149-2 and NFA 35-503
V + Nb + Ti ≤ 0.22%

Mechanical properties

Thickness (mm)		R_e (MPa)	R_m (MPa)	A_{80} (%)		$A\ 5.65\sqrt{S_o}$ (%)	Bending ratio (th)*			Min. impact toughness KV (J) [1] at -20 °C	Min. impact toughness KV (J) [1] at -40 °C
Amstrong®	Direction			< 2	2-3	≥ 3	< 6	6-13	≥ 13	≥ 6	≥ 6
240MC	R	240 - 320	340 - 450	≥ 27		≥ 32				≥ 40	
	T	260 - 340	340 - 450	≥ 26		≥ 31		0			
280MC	R	280 - 350	370 - 450	≥ 26		≥ 30				≥ 40	
	T	300 - 380	370 - 450	≥ 25		≥ 29		0			
315MC	R	315 - 395	415 - 495	≥ 25		≥ 28				≥ 40	
	T	340 - 420	420 - 500	≥ 23		≥ 27		0			
355MC	R	355 - 435	430 - 520	≥ 22		≥ 25				≥ 40	
	T	380 - 460	440 - 530	≥ 21		≥ 24		0			
355MCT	R	355 - 435	430 - 520	≥ 22		≥ 25				≥ 40	≥ 27
	T	380 - 460	440 - 530	≥ 21		≥ 24		0			
390MC	R	390 - 480	460 - 560	≥ 20		≥ 24				≥ 40	
	T	420 - 500	470 - 570	≥ 19		≥ 23		0			
420MC	R	420 - 520	490 - 600	≥ 18		≥ 22				≥ 40	
	T	450 - 550	500 - 600	≥ 17		≥ 21	≥ 0.2		≥ 0.5		
420MCT	R	420 - 520	490 - 600	≥ 18		≥ 22				≥ 40	≥ 27
	T	450 - 550	500 - 600	≥ 17		≥ 21	≥ 0.2		≥ 0.5		
460MC	R	460 - 560	520 - 640	≥ 15		≥ 18				≥ 40	
	T	490 - 590	530 - 640	≥ 14		≥ 17	≥ 0.6	≥ 1			
460MCT	R	460 - 560	520 - 640	≥ 15		≥ 18				≥ 40	≥ 27
	T	490 - 590	530 - 640	≥ 14		≥ 17	≥ 0.6	≥ 1			
500MC	R	500 - 600	560 - 700	≥ 15	≥ 16	≥ 19				≥ 40	
	T	530 - 630	570 - 700	≥ 14	≥ 15	≥ 18	≥ 0.6	≥ 1			
500MCT	R	500 - 600	560 - 700	≥ 15	≥ 16	≥ 19				≥ 40	≥ 27
	T	530 - 630	570 - 700	≥ 14	≥ 15	≥ 18	≥ 0.6	≥ 1			
550MC	R	550 - 650	620 - 750	≥ 12		≥ 14				≥ 40	
	T	580 - 680	630 - 750	≥ 11		≥ 13	≥ 0.8	≥ 1.5			
550MCT	R	550 - 650	620 - 750	≥ 12		≥ 14				≥ 40	≥ 27
	T	580 - 680	630 - 750	≥ 11		≥ 13	≥ 0.8	≥ 1.5			
600MC	R	≥ 600	650 - 820	≥ 11		≥ 13				≥ 40	
	T	≥ 620	660 - 820	≥ 10		≥ 12	≥ 1.5				

** Minimum mandrel diameter for 180° bend*
[1] The impact energy is verified for products with a nominal thickness ≥ 6 mm as defined in the relevant EN standard. It is possible to have impact energy verified on request for nominal thickness ≥ 5 mm

Dimensional feasibility

One of the most outstanding features of the Amstrong® range is its dimensional feasibility.
All steel grades are available in widths exceeding 2000 mm, which can help our clients to reduce costs:

- Stock optimisation for maximum flexibility
- Improved nesting/productivity of the cutting line and higher material yield
- Manufacture of large parts simplified and lowered production cost by reducing the number of welds

Amstrong® and Amstrong® Ultra steel grades are available as mill finish coils or pickled and oiled.

Feasibility mill finish coils, mill edge

Max width (mm)

Thickness (mm)	1.5	1.8	2	3	4	5	6	7	8	10	12	15	16
Amstrong® 240MC	1540	1630	1830	2040	2130		2040		1790		1570	1370	
Amstrong® 280MC	1350	1450	1600	2030	2130				2030	1880	1710	1370	
Amstrong® 315MC	1300	1430	1600	2000	2130								2050
Amstrong® 355MC/MCT	1180	1300	1450	1790	2040	2150							
Amstrong® 390MC		1200	1350	1600	2040	2150							1370
Amstrong® 420MC/MCT		1020	1350	1650	2040	2150							2050
Amstrong® 460MC/MCT		1200	1350	1650	2020	2150						2050	
Amstrong® 500MC/MCT		1050	1280	1570	2020	2150					2130		
Amstrong® 550MC/MCT			1230	1530	2020	2150				2050	1380		
Amstrong® 600MC			1100	1340	1540	1630	2135			1930			

available

Feasibility pickled and oiled – up to 15 mm on request

Max width (mm)

Thickness (mm)	1.5	1.8	2	3	4	5	6	8	10	12	13
Amstrong® 240MC	1540	1630	1830	2030	2130		1520				
Amstrong® 280MC	1320	1450	1600	1880	1840			1525			
Amstrong® 315MC	1140	1320	1540	1880	2130			1550	1525		
Amstrong® 355MC/MCT	1090	1300	1450	1730	2040	2130		1550	1525		
Amstrong® 390MC		1100	1350	1580	2040	2130		1525			
Amstrong® 420MC/MCT		1020	1350	1580	2040	2130		1525			
Amstrong® 460MC/MCT			1350	1580	2020	2070		1525			
Amstrong® 500MC/MCT		1050	1280	1580	2020	2070		1600			
Amstrong® 550MC/MCT			1230	1530	2020	2070		1525			
Amstrong® 600MC			1100	1340	1440	1340	1525				

Processing

Amstrong® and Amstrong® Ultra products have a low carbon equivalent value and can therefore be easily welded using various welding techniques. When required as sheets, they are supplied with tight flatness tolerance thanks to the use of selected cut-to-length lines. They are therefore perfectly suited for oxy-fuel, plasma or laser cutting. Laser-cutting ability is also improved thanks to the low carbon and silicon content.

Availability

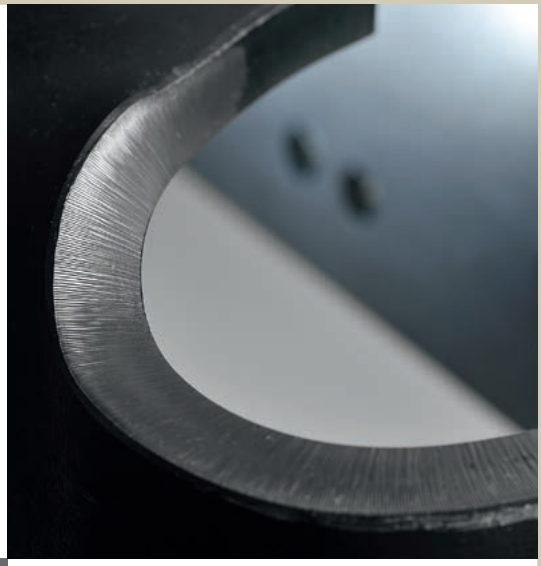
Amstrong® and Amstrong® Ultra products are manufactured in several European ArcelorMittal steel mills, which means that you will always have easy access to them wherever you are located. They can also be found in stock at various Steel Service Centres.

Since ArcelorMittal operates a policy of continuous development, our product range is naturally constantly changing.
We therefore advise you to regularly check the dedicated leaflet and product data sheets A20 and A22 in our online product catalogue at industry.arcelormittal.com/catalogue – remember that stock sizes vary over time.

ArcelorMittal's aim is to offer support to markets and clients seeking new solutions, to help them meet the challenges of tomorrow.

We therefore combine production, extensive R&D resources and a worldwide network of agencies & distribution centres.

Below you will find a few examples of successful applications.



Trailer part made of 12 mm Amstrong® Ultra 700MC, laser cut and bent

Develop your product with us.

Trailer chassis

Trailer chassis in Amstrong® Ultra 700MC and Amstrong® 420MC, **40% weight reduction** compared with chassis in structural steel.

Full support from design through to welding and avoidance of fatigue problems.

Tipper

Entire body composed of Amstrong® Ultra 700MC and Amstrong® 420MC structural components, **25% weight reduction** compared with structural steel grades. T-bone hook replaced with Amstrong® 500MC, **35% weight reduction** and **25% cost saving.**

Racking system

Amstrong® and Amstrong® Ultra products are a perfect alternative to standard structural steel grades to create **low maintenance** racking systems which are very **cost effective** over their entire lifetime.

Find out more

For the full information on our Amstrong® high-strength steels, visit the Amstrong® page at industry.arcelormittal.com/amstrong

Or contact your local account manager or technical representative.

Credits

Sparta Copenhagen, Jeroen Op de Beeck & donvictorio@o2.pl, Mark William Richardson, Jarp2, Christian Lagerek, Stephen Aaron Rees, Niels Quist, Don Donelson, Viktor1, Bailey Image, David Lade, Dmitry Kalinovsky, ETIENjones, Petinov Sergey Mihilovich / Shutterstock.com

ArcelorMittal

ArcelorMittal Europe – Flat Products

24-26, boulevard d'Avranches
L-1160 Luxembourg
industry.arcelormittal.com/amstrong

PR-BR-HSS-EN – 03/2021 – Published by ArcelorMittal Europe Communications