



ArcelorMittal

Amstrong® Ultra - 700MCL Fact Sheet

Amstrong® Ultra - 700MCL is ArcelorMittal's proprietary hot-rolled, premium structural steel grade for cold forming. It is part of the Armstrong® Ultra series of ultra-high-strength steel grades ranging in yield strength from 650 to 1100 MPa. Armstrong® Ultra - 700MCL has been especially developed to address the demand of guaranteed mechanical properties and toughness in both the rolling and transverse directions. Armstrong® Ultra - 700MCL performs best in parts exposed to fatigue in heavy duty applications such as those encountered in truck mounted knuckle boom and telescopic cranes. It is also highly recommended for products subjected to cyclic strain as in trailers, trucks' chassis, agricultural and off highway equipment.



© Andrio/Shutterstock.com

Amstrong® Ultra - 700MCL is characterized by its excellent laser cutting ability, cold formability and weldability. Armstrong® Ultra - 700MCL constitutes an alternative to quenched and tempered plate with the additional advantages of improved surface finish and tighter dimensional tolerances.

Technical characteristics

Chemical composition (ladle analysis)

The chemical composition of Armstrong® Ultra - 700MCL meets or exceeds the requirements of ASTM A1011, ASTM A1018 and EN 10149-2 specifications. The guaranteed values are shown in the table below.

Guaranteed chemistry, ladle analysis, mass-% (max. contents unless stated otherwise)

C	Mn	Si	P	S	Al min.	Nb min.	Ti min.
0.10	2.00	0.25	0.02	0.005	0.020	0.005	0.005

Carbon equivalent

Because of its low carbon equivalent values, Armstrong® Ultra - 700MCL is easily weldable following the recommendations given here under "Fabrication guidelines, Welding". The typical carbon equivalents of this grade are shown in the table below.

Carbon equivalent	CE (IIW)	CET
Typical	0.34	0.23

The carbon equivalent was calculated in accordance with the following formula.

$$CE(IIW) = \%C + \frac{(\%Mn)}{6} + \frac{(\%Cr + \%Mo + \%V)}{5} + \frac{(\%Ni + \%Cu)}{15}$$

$$CET = \%C + \frac{(\%Mn + \%Mo)}{10} + \frac{(\%Cr + \%Cu)}{20} + \frac{\%Ni}{40}$$

Tensile properties

The tensile properties of Armstrong® Ultra - 700MCL exceed the requirements of ASTM A1011, ASTM A1018 and EN 10149-2 specifications and are guaranteed in both the rolling and transverse directions. Testing according to ASTM A370 and EN ISO 6892-1.

Guaranteed tensile properties

Testing direction	Yield strength R _{eH} * (MPa)	Ultimate tensile strength R _m (MPa)	Total elongation A ₅ (%)
Rolling	≥ 700	≥ 760	≥ 14
Transverse	≥ 700	≥ 760	≥ 12

* If a yield phenomenon is not present the 0.2 % proof strength (Rp0.2) will be used.

Impact properties

The guaranteed impact energy values, KCV of Armstrong® Ultra – 700MCL, measured according to ASTM E23 and EN ISO 148 in both the rolling and the transverse direction are presented in the table below.

Guaranteed minimum impact strength at -40°C, KCV, J (J/cm²)

Rolling direction	Transverse direction
30 (38)	27 (34)

Size availability

Armstrong® Ultra – 700MCL is available in coil form. The gauges and widths available for this grade are shown in the table below. Gauges over 6.5mm are in advanced development stage. Other dimensions and delivery forms can be available on request.

Gauge – width availability

Nominal Thickness (mm)	Width (mm)
2.0 – 3.0	1425
3.0 – 4.8	1524
> 4.8	1829

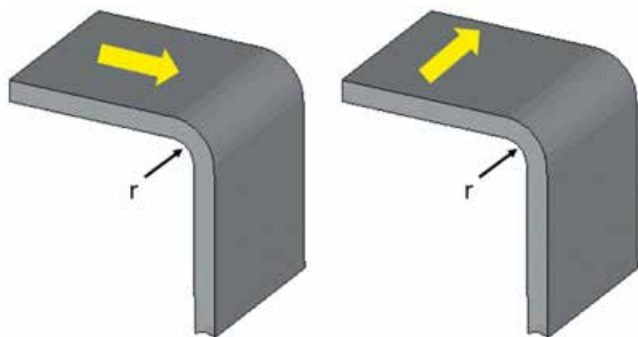
Fabrication guidelines

Thermal cutting

Armstrong® Ultra – 700MCL is suitable for all thermal cutting processes such as oxy-fuel, plasma and laser. Slight preheating is only recommended in cold environments where the temperature of the sheets is below 5°C.

Cold forming

Thanks to its high inner cleanliness and uniform properties, Armstrong® Ultra – 700MCL is characterized by its excellent cold formability. Brake press bending should be carried out using workshop practices, which include but are not limited to using hardened V-mandrels with an appropriate radius. Best results are obtained when thermally cut or sheared edges are ground, if the forming die is lubricated and if the load is applied in a smooth, steady manner. Armstrong® Ultra – 700MCL shall not be hot formed.



The yellow arrow represents the rolling direction.

The guaranteed minimum inner bending radius for 90° and 180° bending in the rolling and transverse direction is shown in the table below.

	Testing Direction	Min. inner radius for 90° bending	Min. mandrel diameter for 180° bending
Armstrong® Ultra – 700MCL	L	0.9 x t	1.8 x t
	T	0.9 x t	1.8 x t

Welding

Within the heat input constraints specified to prevent HAZ softening, any common fusion welding process can be used to weld Armstrong® Ultra – 700MCL. Flux-cored arc (FCAW), gas metal arc (GMAW), shielded metal arc (SMAW), gas tungsten arc welding (GTAW) and submerged arc welding (SAW) are common processes used in production. SAW process with high heat input should only be performed after demonstrating that the resulting weld properties meet or exceed the requirements for high heat input welding processes.

Welding consumables

Welding consumables should be selected based on the strength requirements of welded joint determined by welded structure design and service environments. Welding consumables with different strength levels are listed in the table below.

Recommended consumables by welding process:

Welding process	Filler wire	
	Designation	Specification
FCAW (Flux Core)	E12XT-X; E11XT-X; E10XT-X; E90XT-X; E80XT-X; E70XT-X;	AWS A5.29
FCAW (Metal Core)	E12XC-X; E11XC-X; E10XC-X; E90XC-X; E80XC-X; E70XC-X;	AWS A5.28
GMAW	ER120S; ER110S-X; ER100S-X; ER90S-X; ER80S-X; ER70S-X;	AWS A5.28
GTAW	E120X; E110X; E100X; E90X; E80X; E70X	AWS A5.28
SMAW	E120X; E110X; E100X; E90X; E80X; E70X	AWS A5.5
SAW	F12XX; F11XX; F10XX; F9XX; F8XX, F7XX	AWS A5.23

Notes:

1. Shielding gas selection for a given welding wire of GMAW process should be based on the requirement of mechanical properties (YS, TS and CVN) of welded joint, process stability and applications.
2. Welding wire selection for SAW process should be based on the recommendation of welding consumable manufactures and the requirement of mechanical properties (YS, TS and CVN) of welded joint.

Low hydrogen welding processes are required to weld Armstrong® Ultra – 700MCL based on the welding production environment. SMAW electrode and welding flux used to weld Armstrong® Ultra – 700MCL must be baked before welding per recommendation from welding consumable manufacturer.

Machining

Armstrong® Ultra – 700MCL can be machined without any difficulty applying the same methods as those used for classical steels.



ArcelorMittal

ArcelorMittal USA

Corporate Office
1 South Dearborn Street
18th Floor
Chicago, IL 60603-9888
USA

T +1 800 422 9422
usa.arcelormittal.com

May 2019