

Amstrong® Ultra 690Q-QL-QL1

Amstrong® Ultra 690Q-QL-QL1: High Yield Strength steel for welded and weight saving structures

Amstrong® Ultra 690Q-QL-QL1 is a high-strength quenched and tempered fine grained steel dedicated for structure and enables weight savings by thickness reduction thanks to a minimum yield strength of 690 MPa. Thanks to its exceptional purity rate (very low sulphur and phosphorous contents), and its adapted chemical analysis, the Amstrong Ultra® 690Q-QL-QL1 steel is easy to shape and to weld.

Amstrong® Ultra 690Q-QL-QL1 can be delivered with **XCarb®** Recycled and Renewably Produced certificate.

Properties

Standards

Amstrong® Ultra 690Q-QL-QL1 fulfills the requirements of S690Q-QL-QL1 according to EN 10025-6 standard, last edition.

Chemical Analysis (weight %-Max. values).

C	Mn	Si	Cr	Mo	P	S	V	Ni	Cu	Al
0.20	1.60	0.50	1.50	0.60	0.02	0.01	0.08	2.0	0.5	0.018 to 0.05

Carbon equivalent

	Thickness range (mm)	Amstrong® Ultra 690Q-QL		Amstrong® Ultra 690QL1	
		CET Max.	CEV Max.	CET Max.	CEV Max.
$CET = C + \frac{Mn+Mo}{10} + \frac{Cr+Cu}{20} + \frac{Ni}{40}$	4 - 50	≤ 0.33	≤ 0.56	≤ 0.37	≤ 0.57
	50.01 - 99.9	≤ 0.37	≤ 0.57	≤ 0.38	≤ 0.60
$CEV = C + \frac{Mn}{6} + \frac{Cr+Mo+V}{5} + \frac{Ni+Cu}{15}$	100 - 120	≤ 0.38	≤ 0.59	≤ 0.38	≤ 0.60
	120.01 - 150	≤ 0.39	≤ 0.63	≤ 0.39	≤ 0.63

Mechanical properties (Min. values)

Thickness range (mm)	Yield Strength ReH (MPa)	Tensile Strength Rm (MPa)	Min Elongation Lo = 5.65/So (%)
4 - 50	690	770 - 940	14
50.01 - 100	650	760 - 930	14
100.01 - 150	630	710 - 900	14

Impact tests

Minimum value (average from 3 tests) according to EN10025-6.

Amstrong® Ultra	Temperature	Longitudinal direction impact toughness	Transversal direction impact toughness
690Q	- 20°C (-4°F)	30 J (22 ft.lbs)	27 J (20 ft.lbs)
690QL	- 40°C (-40°F)		
690QL1	- 60°C (- 76°F)		

For thicknesses below 10 mm, subsize specimen will be used and requirement adapted accordingly.
Industeel can produce plates from standard grades up to the most severe specifications.
Our experts are available to help you in designing a grade matching your most demanding specification.



Weight saving and/or more resistant structures

Due to its high yield strength compared to classical steel (750 MPa in average), you can:

- > Reduce thickness of structure and save weight.
- > Support higher stresses and realize more resistant and innovative structures and design.
- > Improve payload and reduce fuel consumption.

Delivery conditions

Sizes and tolerances

Thickness		Quarto		Flatness	
mm	inches	Width (mm)	Width feet	Tol./th (mm) *	mm per 1 m
4 - 5	.16 - .20	1200 - 2000	3.93' - 6.56'	± 0.5	12
6 - 8	.23 - .31	1200 - 2500	3.93' - 8.20'	± 0.6	11
9 - 11	.35 - .43	1200 - 3100	3.93' - 10.17'	± 0.7	10
12 - 25	.47 - .98	1200 - 3500	3.93' - 11.48'	± 0.7	10
25 - 39	.98 - 1.53	1200 - 3800	3.93' - 12.47'	± 1.0	9
40 - 59	1.57 - 2.32	1200 - 3800	3.93' - 12.47'	± 1.3	8
60 - 120	2.36 - 2.56	1200 - 3800	3.93' - 12.47'	± 1.4	8
121 - 150	4.76 - 5.90	1200 - 3500	3.93' - 11.48'	± 1.6	8

Maximum length 13 m (42.65'), Minimum Length 4 m (13.12'), Max weight per plate 20 tons.
Other dimensions or restrictive tolerances possible under request.

*By default, EN 10029 cl A applies

Surface condition: according to EN 10163-2 Standard (unless other conditions agreed).

Plate processing

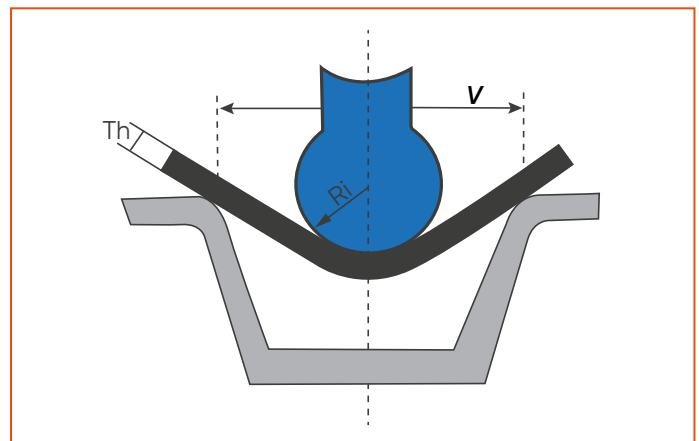
Forming

Thanks to the quality of steel making process, **Amstrong® Ultra 690Q-QL-QL1** is easy to bend providing the following conditions are respected:

- Remove heat affected zones (cut edges) by grinding,
- Sufficiently powerful equipment,
- Respect of minimum forming radius

	Perpendicular to the rolling direction	Parallel to the rolling direction
Bending internal radius R_i (mini)	3 x th	4 x th
Die opening V (mini)	8 x th	10 x th

th = plate thickness



Amstrong® Ultra 690Q-QL-QL1 is unsuitable for hot forming at a temperature higher than 500°C (932°F).

Machining

Amstrong® Ultra 690Q-QL-QL1 can be machined without any difficulty using the same methods as those used for structural steels.

Welding

The reduced carbon and alloying elements content of Armstrong® Ultra 690Q-QL-QL1 allow welding in very good conditions with excellent characteristics.

Weld preparation

The preparation of joints and surfaces is obviously very important to work in safe conditions:

- > Removing all traces of grease and water.
- > Grinding of cuts to remove any oxides, slag of grooves from cutting with excessive oxygen pressure.
- > Grinding of any sheared edges, tears, final drips.

Welding process

Any conventional fusion welding method can be used, such as submerged arc welding (SAW), manual metal arc welding (SMAW), flux core wire arc welding (FCAW), MIG, MAG (GMAW) and TIG (GTAW) Interpass temperature should be limited to a maximum of 200°C (390°F).

Preheating

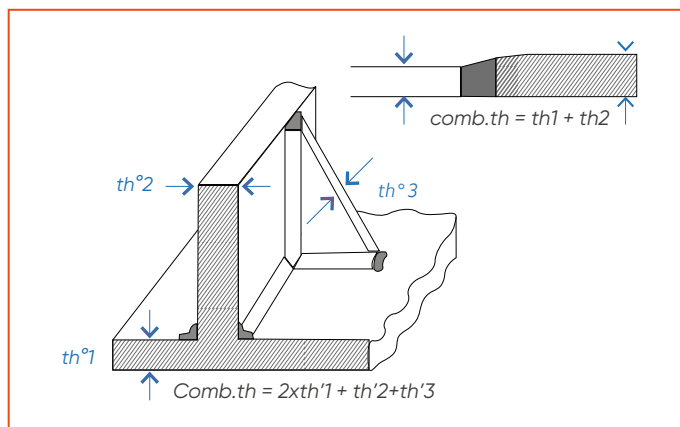
Amstrong® Ultra 690Q-QL-QL1 can be welded without any crack risk according to recommended conditions (forecast for highly clamped weld).

Post welding heat treatment- PWHT

We do not recommend PWHT for Armstrong® Ultra 690Q-QL-QL1.

Welding consumables

Electrodes and fluxes should be re-dried at 350°C (660°F) for minimum 2 hours (specified on label) and stored at 120-150°C (250-300°F) in holding oven or heated quiver before welding to maintain the lowest possible hydrogen content.



Welding processes SMAW - GMAW - SAW	Energy (kJ/cm)	Combined thickness				
		10 mm .4"	20 mm 0.8"	30 mm 1.18"	40 mm 1.57"	50 mm 1.96"
	15					
	30					

Welding processes SMAW - GMAW - SAW	Energy (kJ/cm)	Combined thickness					
		60 mm 2.4"	70 mm 2.75"	80 mm 3.15"	90 mm 3.54"	100 mm 3.93"	> 100 mm > 3.93"
	15						
	30						

- Without preheating
- With slight preheating at 75°C (165°F)
- With pre-heating ≥100°C (210°F)
- With pre-heating ≥150°C (300°F)

Process	SMAW	GMAW	FCAW	SAW
Standard	AWS 5.5 EN ISO 18275	AWS 5.28 EN ISO 16834	AWS 5.36 EN ISO 18276	AWS 5.23 EN ISO 26304
VABW	BÖHLER FOX EV 85 E11018-GH4R E 69 6 Mn2NiCrMo B 4 2 H5	BÖHLER NiCrMo 2.5-IG ER110S-G G 69 6 M21 Mn3Ni2.5CrMo	BÖHLER Kb 85 T-FD E110T5-M21A8-K4-H4 T 69 6 Mn2NiCrMo B M 3 H5	BÖHLER 3 NiCrMo 2,5-UP+BB 24 S 69 6 FB S3Ni2,5CrMo F11A8-EM4 (mod.)-M4H4
ESAB	OK 75.75 E11018-G E 69 5 Mn 2 NiCrMo B 42 H5	OK AristoRod 69 ER 110S-G G 69 4 M Mn3Ni1CrMo	Dual shield 69 E111T1- M21A6-G-H4 T 69 6 Z P M 2 H5	OK Autrod 15.27S+ Flux 10.62 F11A8-EG-G S 69 6 FB S3Ni2,5CrMo
FSH	SELECTARC B77 E11018-M E 69 4 Mn2NiCrMo B 4 2 H5	SELECTARC F77 ER100S-1 G 69 Z Mn3Ni1.5Mo	SELECTARC FCW 77-B E110T5-M21A8-K4-H4 T 69 6 Mn2NiCrMo B M 3 H5	
OERLIKON	TENACITO 80CL E11018-G H4 E 69 6 Mn2NiMo B 4 2 H5	CARBOFIL NiMoCr ER 110 S-G G 69 4 M21 Mn3NiCrMo	FLUXOFIL 42 E110T5-M21A4-K4H4 T 69 6 Mn2NiCrMo B M 2 H5	FLUXOCORD 42 / OP121TTW F11A8-EC-F5 S 69 6 FB (T3Ni2,5CrMo) H5

Above list has been determined according to suppliers data.
For your application, please confirm choice with your supplier.

Applications



Demolition shear



Lift heavy loads



Dumpers, Chassis

For more information

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