



Amstrong® Ultra 690QL

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

Amstrong® Ultra 690QL is a high strength quenched and tempered steel dedicated for structure and enables to make weight savings thanks to a minimum yield strength of 690 N/mm².

Thanks to its exceptional purity rate (very low sulphur and phosphorous contents), and its adapted chemical analysis, the Amstrong® Ultra 690QL steel is easy to shape and to weld.

PROPERTIES

STANDARDS

Amstrong® Ultra 690QL fulfills the requirements of S690QL according to EN 10025-6 standard, last edition.

CHEMICAL ANALYSIS - WEIGHT% max

C	Mn	Si	Cr	Mo	P	S	V	Ni	Cu	Al
.20	1.60	.50	1.50	.60	.02	.010	.080	2	.50	.02 to .05

CARBON EQUIVALENT

	Thickness range - mm (")	C.Eq	CET
$C_{eq} = C + \frac{Mn}{6} + \frac{Cr+Mo+V}{5} + \frac{Ni+Cu}{15}$	4 - 20 (.15" - .78")	≤ .45	≤ .30
	20.01 - 120 (.79" - 4.73")	≤ .55	≤ .36
$CET = C + \frac{Mn+Mo}{10} + \frac{Cr+Cu}{20} + \frac{Ni}{40}$	120.01 - 150 (4.74" - 5.9")	≤ .58	≤ .37

MECHANICAL PROPERTIES

Thickness range - mm (")	Yield Strength R _{eH} (MPa)	Tensile Strength R _m (MPa)	Min Elongation A _{l0} = 5.65√So (%)
4 - 50 mm (.15" - 1.96")	690 (100)	770 - 940 (112 - 136)	14
50.01 - 100 mm (1.97" - 3.93")	650 (94)	760 - 930 (110 - 134)	14
100.01 - 150 mm (3.94" - 5.9")	630 (91)	710 - 900 (103 - 130)	14

Minimum values

PROPERTIES

PHYSICAL PROPERTIES

Impact tests

Minimum value (guaranteed on 3 tests) according to EN10025-6

Temperature	Longitudinal direction	Transversal direction
- 40°C (- 40°F)	40 J (29 ft.lbs)	30 J (22 ft.lbs)

For 6 mm (.24") ≤ th ≤ 10 (.4"), 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.

Do not hesitate to contact us.



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 make weight saving,
- > support higher stresses and realize more resistant and innovative structures and design,
- > improve payload and reduce fuel consumption.

DELIVERY CONDITIONS

SIZES AND TOLERANCES

Thicknesses		Coils			Quarto			Flatness* mm per 2 m
mm	inches	Width mm	Width feet	Tol./Th mm	Width mm	Width feet	Tol./th mm	
4 - 7	.15 - .24	2000	4.92'	± 0.25	1200 - 2500	4.92' - 8.20'	± 0.5	14
8 - 10	.27 - .39				1200 - 3100	4.92' - 10.17'	± 0.5	8
11 - 14	.43 - .55				1200 - 3800	4.92' - 12.47'	± 0.5	8
15 - 24	.59 - .94				1200 - 3800	4.92' - 12.47'	± 0.7	8
25 - 39	.98 - 1.53				1200 - 3800	4.92' - 12.47'	± 0.8	8
40 - 59	1.57 - 2.32				1200 - 3500	4.92' - 12.47'	± 1.2	8
60 - 65	2.36 - 2.56				1200 - 3500	4.92' - 12.47'	± 1.4	8
66 - 120	2.60 - 4.72				1200 - 3500	4.92' - 11.48'	± 1.4	8
121 - 150	4.76 - 5.90				1200 - 3500	4.92' - 11.48'	± 1.6	8

Maximum length = 13 m. (42.65')

*Tighter flatness can be achieved upon request.

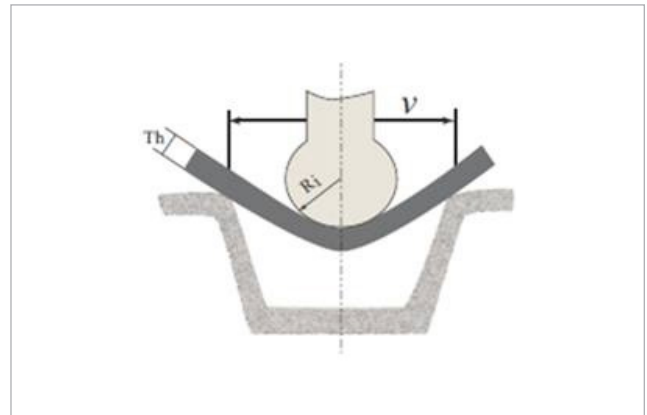
FORMING

Thanks to the quality of steel making process, Armstrong® Ultra 690QL is easy to shape providing the following conditions are respected:

- > Dressing (or grinding) of the ridges caused by gascutting to limit the hardened zones
- > Sufficiently powerful equipment
- > Respect of minimum forming radius

	Perpendicular to the rolling direction	Parallel to the rolling direction
Bending internal radius R_i (mini)	2 x th	3 x th
Die opening V (mini)	8 x th	10 x th

th = thickness



In hot condition, Armstrong® Ultra 690QL is unsuitable for hot forming at a temperature higher than 600°C (1110°F).

MACHINING

Armstrong® Ultra 690QL can be machined without any difficulty using the same methods as those used for the classical steels.

WELDING

The reduced carbon and alloying elements content of Armstrong® Ultra 690QL 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:

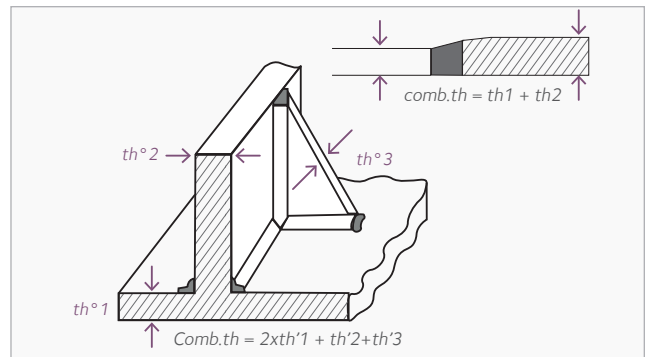
- > Removing all traces of grease and water
- > Grinding of cuts to remove any oxides, slag of grooves from cutting with excessive oxygen pressure
- > Grinding of any sheared edges, tears, final drips

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 (392°F).

Preheating

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



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

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

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

PLATE PROCESSING

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.

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	BOHLER 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 Mn3Ni1CrMo	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

APPLICATIONS



Jaw crushers



Lift heavy loads



Dumpers, Chassis

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