

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%

| C | Mn | Si | Cr | Mo | P | S | V | Ni | Cu | Al |
|-----|------|-----|------|-----|-----|------|------|----|-----|------------|
| .20 | 1.60 | .50 | 1.50 | .60 | .02 | .010 | .080 | 1 | .50 | .02 to .05 |

CARBON EQUIVALENT

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

MECHANICAL PROPERTIES

| Thickness | Y.S. 0.2 N/mm ² (ksi) | UTS N/mm ² (ksi) | Elongation A 5% |
|---------------------------------------|----------------------------------|-----------------------------|-----------------|
| ≤ 50 mm (2") | 690 (100) | 770 - 940 (112 - 136) | 14 |
| 50 < th ≤ 100 mm (2" < th ≤ 4") | 650 (94) | 760 - 930 (110 - 134) | 14 |
| 100 < th ≤ 150 mm (4" < th ≤ 5.9") | 630 (91) | 710 - 900 (103 - 130) | 14 |

Minimum values

PROPERTIES

PHYSICAL PROPERTIES

Impact tests

Guaranteed Minimum value (average on several tests)

| Temperature | Transversal direction |
|--------------------|-----------------------|
| - 40° C (- 40° F) | 27 J (20 ft.lbs) |

For 6 mm (.24") ≤ th ≤ 10 (.4"), subsize specimen will be used and requirement adapted accordingly.

Charpy V typical value in cross direction at -40° C (- 40° F)

| Thickness | ≤ 10 mm | 10 - 65 mm | > 65 mm |
|-----------|---------|--------------|-----------|
| - > | (≤ .4") | (.4" - 2 ½") | (> 2 ½") |
| J | 40 - 45 | 100 | 100 - 120 |
| ft.lbs | 26 - 30 | 73 | 73 - 90 |



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, and / or
- > support higher stresses and realize more resistant structures

DELIVERY CONDITIONS

SIZES AND TOLERANCES

| Thicknesses | | Coils | | | Quarto | | Flatness* | |
|-------------|-------------|----------|------------|------------|-------------|----------------|------------|------------|
| mm | inches | Width mm | Width feet | Tol./Th mm | Width mm | Width feet | Tol./th mm | mm per 2 m |
| 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, Amstrong® 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 Ri (mini) | 2 x th | 3 x th |
| Die opening V (mini) | 8 x th | 10 x th |

th = thickness

MACHINING

Amstrong® 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 Amstrong® 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:

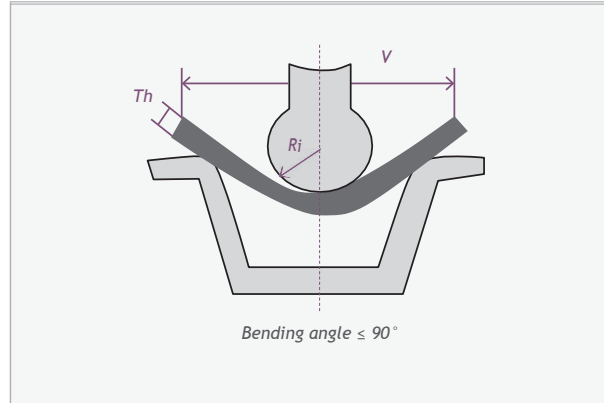
- > Removing all traces of grease and water
- > Grinding of cuts to remove any oxides, slag of grooves from cutting with excessive oxygen pressure
- > Grinding of any sheared edges, tears, final drips

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).

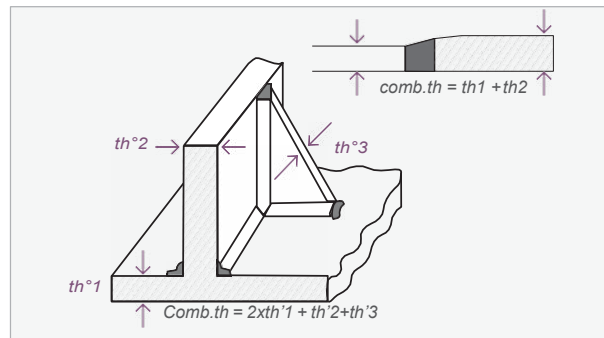
Pre - heating

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



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

difficulty using the same methods as those used for the



| Welding processes SMAW - 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 - 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 pre - heating
- With slight pre - heating 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 fluxes will have to be stored at 350°C (660°F) - 2 hours before using. They must be stocked at 160°C (320°F).

| | AFNOR | AWS | DIN |
|------|---|---|------------------------------------|
| SMAW | NFA81 - 340 EY69 1.5NiCrMoBxxT BH | A5 - 5 E 110xx | DIN 8529 EY69 xx Mn2NiCrMo B |
| GMAW | | A5 - 28 ER110 Sx | |
| FCAW | | A5 - 29 ER110 - T5 | |
| SAW | NF A81 - 322 FP/x xx/xx xB x Saxx750605 | A5 - 23 F11x6 - EF6 - F6 or F11x6 - ECF6 - F6 | |

APPLICATIONS



Jaw crushers



Lift heavy loads



Dumpers, Chassis

Technical data and information are to the best of our knowledge at the time of printing. However, they may be subject to some slight variations due to our ongoing research programme on steels. Therefore, we suggest that information be verified at time of enquiry or order. Furthermore, in service, real conditions are specific for each application. The data presented here are only for the purpose of description, and considered as guarantees when written formal approval has been delivered by our company. Further information may be obtained from the address opposite.