

S690/MAXIL® 690

High Strength, Quenched & Tempered Fine-Grain Structural Steel

Works Designation

MAXIL® 690 Q / MAXIL® 690 QL / MAXIL® 690 QL1
DIN EN S690 Q / S 690 QL / S690 QL1

Condition of Delivery

Water quenched and tempered.

Typical Applications

Heavy road vehicles: chassis, dumper bodies. Cranes construction: booms of mobile cranes. Structural steelworks: bridges, bridge components, components for offshore structures. Pressure vessels: fixed and transportable storage tanks, vessels. Power plants: penstocks, spiral cases. Materials handling: lifting and mobile equipment. Mining and earthmoving equipment: roof supports. Agricultural equipment and trailers.

Chemical Composition (Heat analysis in %)

| C | Si | Mn | P | S | Cr | Mo | Ni | Al |
|--------------|--------------|--------------|---------------|---------------|--------------|--------------|-------------|---------------|
| 0.20 max. | 0.80 max. | 1.70 max. | 0.020 max. | 0.005 max. | 1.50 max. | 0.70 max. | 2.0 max. | 0.015 min. |

In addition: Ti or/and V or/and Nb.

The manufacturer reserves the right to change the chemical composition.

Mechanical Properties

| Plate Thickness Mm | Re MPa | Rm MPa | A5 % |
|-----------------------|-----------|-----------|---------|
| ≤ 50 | 690 | 770 - 940 | 14 |
| > 50 ≤ 100 | 650 | 760 - 930 | 14 |
| > 100 | 630 | 710 - 900 | 14 |

Notch Impact Energy

| Steel Grade | Position of Samples | 0°C | - 20°C | - 40°C | - 60°C |
|------------------------|---------------------|------|--------|--------|--------|
| S690Q/MAXIL® 690 Q | Longitudinal | 40 J | 30 J | | |
| | Transverse | 30 J | 27 J | | |
| S690QL/MAXIL® 690 QL | Longitudinal | 50 J | 40 J | 30 J | |
| | Transverse | 35 J | 30 J | 27 J | |
| S690QL1/MAXIL® 690 QL1 | Longitudinal | 60 J | 50 J | 40 J | 30 J |
| | Transverse | 40 J | 35 J | 30 J | 27 J |

Number of Tests

Tensile test and impact test (3 samples), every 40 t, or per heat treatment unit respectively.

Processing

Cold-Forming

The steel is suitable for cold-forming adhering to a bending or folding radius of > 4 times plate thickness longitudinal and > 3 times plate thickness transverse to rolling direction. A subsequent stress relief annealing is possible up to a temperature of 580°C.

Hot-Forming

Hot-forming above 580°C is possible. A subsequent quenching and tempering has to be carried out according to the conditions of delivery.

Milling

Drilling with cobalt-alloyed high-speed steels HSSCO. Cutting speed should be approximately 17-19 m/min. If HSS drills are used, cutting speed should be approximately 3–5 m/min.

Flame-Cutting

The temperature of the material should be at least RT for flame-cutting. In addition, the following preheating temperatures are recommended for certain plate thicknesses: For plate thicknesses over 40mm, preheat to 100°C and for thicknesses over 80mm, preheat to 150°C.

Welding

The steel is suitable for all current welding methods. The temperature of the material should be at least RT for welding. In addition, the following preheating temperatures are recommended for certain plate thicknesses: For plate thickness of 20-40mm, preheat to 75°C; for thicknesses over 40mm, preheat to 100°C; and for thicknesses over 60mm, preheat to 150°C. Interpass temperature should be between 150°C and 225°C.

These indications are standard values only, in principle, indications of SEW 088 should be adhered to.

The t_{8/5} times should be between 5 and 25 s, depending on the welding technique used. Should stress relief annealing be necessary for constructional reasons, this should be done in the temperature range of 530°C-580°C.

Filler:

| Welding Method | Type of Electrode | | |
|----------------|---|-------------------------------|----------------|
| E-Hand | FOX EV 85, FOX U 100 N OK 75.75 | E11018-G E11018-M | Böhler ESAB |
| UP | U 100-UP, NiCrMo 2,5-UP/BB24 OK Autrod 13.44/OK Flux 10.62 | EF6, F11A8-EM4-M4 | Böhler ESAB |
| MAG | 70-IG/M21 OK Autrod 13.29, OK Tubrod 14.03 | ER110S-G ER100S-G, E110T-G | Böhler ESAB |

Full specification and details are available on request.

The above information is provided for guidance purposes only.

For specific design requirements please contact our technical sales staff.