



Mars® 600: Ultra-High-Hardness Armor with increased workability

Mars® 600 is a multipurpose ultra-high-hard (typical 600 HBW) protection steel with an impressive ballistic behavior in terms of deformation capacity and resistance to multi-impacts together with an excellent toughness and a workability (mainly bending) close to a 500HB steel.

Its great properties suggest unlimited possibilities, as add-on armor but also as structural material.

PROPERTIES

STANDARDS

Mars® 600 can be ordered according to one of the following standards:

- > NF A36-800 THD4
- > MIL-DTL-32332 class 1

CHEMICAL COMPOSITION - LADLE ANALYSIS - MAX WEIGHT%

| Thickness | C | S | P | Si | Mn | Ni | Cr | Mo | B | CE 1) |
|-----------|------|-------|-------|-----|-----|-----|-----|-----|-------|-------|
| ≤20 mm | 0.45 | 0.002 | 0.010 | 1.0 | 1.0 | 2.4 | 0.5 | 0.5 | 0.003 | 0.77 |
| >20 mm | 0.55 | 0.002 | 0.010 | 1.0 | 0.7 | 4.5 | 0.4 | 0.5 | 0.003 | |

1) Carbon equivalence per ASTM A6/A6M, i.e. : $CE = C + [Mn/6] + [(Cr + Mo + V)/5] + [(Ni + Cu)/15]$

MECHANICAL PROPERTIES (IN BOTH DIRECTIONS)

| | Hardness | Yield Strength | UTS | Elongation | Charpy KV 2) @ -40 °C standard 10 x 10 specimen 3) | |
|----------------|-----------|----------------|--------|------------|---|--------|
| | HBW | MPa | MPa | 5d(%) | J | ft.lbs |
| Guarantees* | 577 - 655 | ≥1300 | ≥ 2000 | ≥ 7 | ≥16 | ≥ 12 |
| Typical values | 601 | 1450 | 2150 | 10 | 23 | 17 |

* For thicknesses ≤ 20 mm

2) Average of 3 tests. Single value min 70% of specified average.

3) For nominal thicknesses under 11mm, sub-size specimens are used. The specified minimum value is then proportional to the specimen cross section.

Brinell hardness test according to relevant standard (EN ISO 6506-1 / ASTM E10/E110), on each plate and in two places, one at each end of a diagonal, on a milled surface 0,5 to 1 mm below plate surface.

Charpy Impact test according to relevant standard (EN ISO 148-1 / ASTM E23) on each heat and thickness from 6mm.

Tensile test according to EN ISO 6892-1, method B on each heat and thickness when specified in the standard or order.

Ultrasonic test is performed according to standard requirements or upon special agreement up to EN 10160 Class S3/E4.

IN SERVICE CONDITIONS

BALLISTIC PROPERTIES

Mars® 600 exceeds the ballistic performance requirements of MIL-DTL-32332A up to th.10mm (extension in progress)

See our table of recommended minimum thicknesses for common protection levels.

Ballistic test to be performed upon request.

PLATE PROCESSING

For all information concerning machining, cutting, forming or welding, see our userguide for Mars® protection steels.

DELIVERY CONDITIONS

HEAT TREATMENT

Mars® 600 is quenched and tempered at low temperature ($\leq 180^{\circ}\text{C}$).

SURFACE PROPERTIES

According to MIL-DTL-32332 or EN 10163 class B - subclass 3

Shot blasting and weldable primer application can be performed upon request

SIZES AND TOLERANCES

Mars® 600 can be supplied as quarto plates or cut-to-length sheets (from hot strip mill) in standard sizes or tailor made dimensions.

| | Quarto plates | | | Cut-to-length sheets |
|--|--|--------------------------------|--------------------------------|------------------------------------|
| Thicknesses | 5.0 – 50.8 mm (.197" – 2") ⁴⁾ | | | 2.8 – 10.0 mm (.110" – .393") |
| Thickness Tolerances | Th | For width $\leq 2000\text{mm}$ | For width $\leq 2400\text{mm}$ | |
| | ≥ 5 to ≤ 12 | 0/+0.8 | 0/+0.8 | ≥ 2.8 to ≤ 8.5 : -0/+0.4 |
| | > 12 to 20 | 0/+1.0 | 0/+1.2 | > 8.5 to ≤ 10.0 : -0/+0.5 |
| | > 20 to 35 | 0/+1.2 | 0/+1.4 | |
| | > 35 to 50.8 | 0/+1.6 | 0/+1.8 | |
| Width* | 1000 – 2500 mm (39" – 98") | | | 1000 – 2000 mm (39" – 78") |
| Length | 1600 – 8100 mm (63" – 319") | | | 1800 – 8100 mm (71" – 319") |
| Shape, length, and width tolerances as per MIL-DTL-32332 or EN 10029 | | | | |

⁴⁾ Upon special agreement, thicknesses > 50.8 mm (2") and up to 80 mm (3.15") can be produced.

* Depending on plate thickness

FLATNESS

Maximum flatness deviation is 3mm/m (when measured according to EN 10029).

YOUR CONTACT

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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 protection 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.