

Mars® 190

Mars® 190: Rolled Homogeneous Armor (< 400 HB) for ballistic protection & evaluation of armor-defeating ammunition

Mars®190 steel is designed for all vehicle structures (main battle tanks, armoured personal carriers ...), stationary protection (buildings, sentry boxes, observation posts, etc.) and for ammunition testing targets.

Mars® 190 steel is highly versatile, combining ease of use even in important thicknesses, with good ballistic properties against all ammunitions.

PROPERTIES

STANDARDS

INDUSTEEL: Mars® 190

Mars® 190 satisfies requirements of following specifications:

- > France **NF A36-800-1 CLA**
- > Germany **TL 2350 – 0000 Quality G, H, K, L**
- > U.K. **Def Stan 95-24 Class 1& 2, Def Stan 95-13**
- > USA **MIL-DTL-12560 Class 1, 2 & 3**

CHEMICAL ANALYSIS - WEIGHT%

C	S	P	Si	Mn	Ni	Cr	Mo	V
≤ .30	≤ .005	≤ .012	≤ .4	< 1.20	≤ 1.8	≤ 1.5	≤ .6	≤ .10

Chemical composition depends on thickness range (particularly Ni and Cr contents) and, possibly, on customer's specification

MECHANICAL PROPERTIES (Guarantees)

	Plate thickness (t)		Hardness (HB)	Charpy KV -40° Transverse to rolling direction*	
	mm	Inch		J	ft.lbs
Class 1	≤ 12	≤ .47	352 - 388	≥ 20	≥ 15
	12 < t ≤ 35	.47 < t ≤ 1.38	331 - 375	≥ 24	≥ 18
	35 < t ≤ 60	1.38 < t ≤ 2.36	302 - 341	≥ 32	≥ 24
	60 < t ≤ 85	2.36 < t ≤ 3.30	262 - 331	≥ 36	≥ 26
	85 < t ≤ 120	3.30 < t ≤ 4.72	248 - 285	≥ 56	≥ 41
	120 < t ≤ 150	4.72 < t ≤ 6	241 - 277	≥ 64	≥ 47
Class 2	5,5 < t ≤ 50	0.216 < t ≤ 2	260 - 310	≥ 43	≥ 32

* Standard specimen: 10 x 10 mm

HEAT TREATMENT

Mars® 190 is a quenched and high tempered armor steel (≥500°C / 930°F).

IN SERVICE CONDITIONS

BALLISTIC PROPERTIES

> See our table of recommended minimum thicknesses for protection

DELIVERY CONDITIONS

SIZES AND TOLERANCES

Mars® 190 can be supplied as standard size plates or tailor made mill plates.

Sizes

Thickness range	5.5-150 mm (.216"-6")
Width	≤ 3300 mm (130")
Length	≤ 8100 mm (318")

For other sizes, please contact us.

For the evaluation of armor-defeating ammunition, we can supply plates up to 600 mm (23.6") thick (see parts & kit offer).

Thickness tolerances (quarto plates)

(Possibility of tighter tolerances on request)

Th=Thickness		Tolerance for width ≤ 2000 mm (≤ 79")		Tolerance for 2000 < width ≤ 2500 mm (79" < w ≤ 98")	
mm	inch	mm	inch	mm	inch
≤ 12	≤ .47	0.8	.031	1	.04
> 12 to 20	> .47 to .79	1	.04	1.2	.047
> 20 to 35	> .79 to 1.38	1.2	.047	1.4	.055
> 35 to 50	> 1.38 to 1.97	1.6	.063	1.8	.071
> 50 to 80	> 1.98 to 3.15	2	.079	2.2	.087
> 80 to 150	> 3.15 to 5.91	2.2	.087	2.4	.094

Flatness

Our product are delivered with a guaranteed flatness ≤ 3mm/m (1/8" in every 40").
95% of plates are delivered with a typical flatness ≤ 1.5 mm/m (1/16" in every 40").



Medium thickness plates (8 -20 mm / .315" - .79")

Tight thickness tolerances (cut-to-length plates)

Thickness		Width		Tolerance
mm	in	mm	in	mm (in)
5,5 ≤ th < 7,8	0.217 < th < 0.307	2000	78.74	-0/+0,4 mm (-0/+0.016)
7,8 ≤ th < 10,8	0.307 < th < 0.425	2000	78.74	-0/+0,5 mm (-0/+0,020)

DELIVERY CONDITIONS

PARTS - KIT OFFER

Following customers requests, we can supply Mars® 190 parts: laser or oxygas/plasma cut (depending on thickness), formed, welded, machined, painted options... Please, contact us for your specific project.

For the evaluation of armor-defeating ammunition, Mars® 190 parts can be supplied with holes or handles for manutention.

Parts in 80 mm (3.15") thickness manufactured according to customer request: piling, welding, machining, shotblasting, varnishing

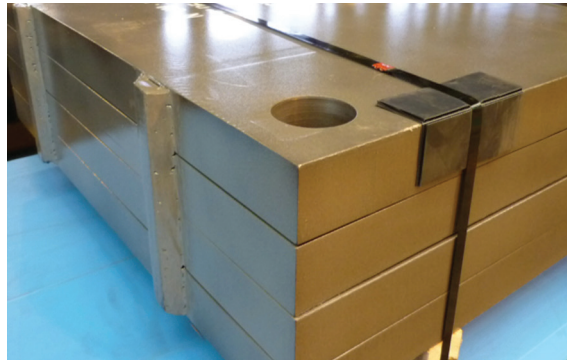


PLATE PROCESSING

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

As a general rule, when using Mars® protection steel, the increased mechanical characteristics of this material must be taken into account.

It is crucial to wear appropriate individual safety equipment and to equip machines with collective protection.

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.