

Safe 500 Protection Steel

Safe 500 is a protection steel with superior flatness. Optimized chemical composition together with its carefully controlled heating, rolling and heat treatment sequences give Safe 500 an optimal combination of weldability, bendability and ballistic protection performance.

It can be used in most civilian protection applications i.e. civil armored vehicles (limousines and sedans, SUVs), Cash-In-Transit vehicles, police cars, bulletproof doors, window frames and wall panels, etc.

Properties

Chemical composition – Ladle analysis – Max weight %

C	S	P	Si	Mn
0,39	0,003	0,025	0,40	1,5
Cr	B	CE ¹⁾		
0,40	0.004	0.67		

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	YS	UTS	Elongation	Charpy KV ²⁾ @ -40°C standard 10 x 10 specimen ³⁾	
	HBW	MPa	MPa	5d (%)	J	ft.lbs
Typical Values	520*	1350	1850	11	24	18

* Minimum guaranteed value : 477 HBW

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 65061 / ASTM E10/E110), on each plate and in two places, one at each end of a diagonal, on a milled surface 0,5 to 1mm below plate surface.

In service

Cutting

Safe 500 can be cut either by abrasive waterjet, laser or plasma.

In service conditions

Bending

Safe 500 offers ability to cold forming but as other protection steels must be used with caution. The elastic energy stored during forming may lead to rupture or shifting. The most important parameter when bending are the use of a correct punch radius. Please contact us if you need assistance.

General recommendations :

- Minimal recommended temperature: 15°C
- Ensure that there are no obvious defects, especially on edges. Ideally, plate edges in the bending area should be ground smooth and rounded prior to operation.
- Die edges must remain clean, smooth, and ideally lubricated (CRC SP 350).
- Perform preliminary trials on prototypes and form the first pieces with low speed recommendation.

Grade	Thickness mm (inch)	Mandrel Radius		Width of the die
		//	⊥	
Safe 500	< 8 (0.315")	7t	7t	Die width > 2 x radius + 3 x thickness

Welding

Safe 500 can be welded using common welding processes. Like the other protection steels, it can be sensitive to cold cracking in the heat affected zone of a weld. The best results can be obtained by :

- Make sure that the steel is at least at room temperature ($\approx 20^\circ\text{C}$)
- Clean the weld area, removing potential sources of hydrogen: rust, scale, etc
 - Using low hydrogen welding methods and consumables (filler material hydrogen content $\text{HD} \leq 5 \text{ ml/100 g}$).
 - Preferably use MAG welding and a welding sequence that is designed to minimize residual stresses.
 - Austenitic consumables must be used (Type AWS 307).

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Delivery conditions

Safe 500 is quenched and tempered at low temperature ($\leq 200^\circ\text{C}$) with a surface quality according to EN 10163 class B – subclass 3. Shot blasting and weldable primer application can be performed upon request.

Cut-to-length sheets	
Thickness	4,2 mm – 8mm (0.165" – 0.315")
Tolerances	4,2mm : - 0 / + 0.4 mm 6,5mm : - 0 / + 0.5 mm 8mm : - 0 / + 0.5 mm
Width	1500 – 2000 mm (59" – 78")
Length	3000 – 6000 mm (118" – 236")

Your contact

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Technical data and information are to the best of our knowledge at the time of editing. 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.