



## HARDOX 450 SHEET



## HARDOX 450 SHEET

### General Product Description

The most popular abrasion-resistant steel with excellent structural properties.

Hardox 450 is an abrasion-resistant steel with a nominal hardness of 450 HBW. Hardox 450 combines good bendability and weldability with an option for guaranteed impact toughness (Hardox 450 Tuf).

The products can be used in many different components and structures that are subject to wear. Hardox 450, with an extra 50 Brinell hardness over our 400 grade, provides better dent and abrasion resistance as well as longer wear life, so you can achieve even greater savings.

### Dimension Range

Hardox 450 Sheet is available in thicknesses between 2.5- 8 mm. Hardox 450 Sheet is available in widths up to 1775 mm and lengths up to 16000 mm. More detailed information on dimensions is provided in the dimension program.

### Mechanical Properties

Thickness (mm)	Hardness <sup>1)</sup> (HBW)	Typical yield strength (MPa), not guaranteed
2.50- 8.00	425- 475	1100- 1300

<sup>1)</sup> Brinell hardness, HBW, according to EN ISO 6506-1, on a milled surface 0.5 – 3 mm below surface. At least one test specimen per heat and 40 tons.

### Impact Properties

Grade	Longitudinal test, typical impact energy, Charpy V 10x10 mm test specimen.	Transverse test, guaranteed impact energy, Charpy V 10x10 mm test specimen.
Hardox 450	50 J / -40 °C	-
Hardox 450 Tuf <sup>1)</sup>		Min. 27 J / -20 °C <sup>2)</sup>

<sup>1)</sup> Impact testing is performed on thicknesses  $\geq 6$  mm. For thicknesses between 6 - 11.9 mm, sub-size Charpy V-specimens are used. The specified minimum value is then proportional to the cross-sectional area of the test specimen, compared to a full-size specimen (10 x 10 mm). Impact testing according to ISO EN 148 per heat and thickness group. Average of three tests.

<sup>2)</sup> Single value minimum 70% of specified average.

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## Chemical Composition (heat analysis)

C <sup>*)</sup> (max %)	Si <sup>*)</sup> (max %)	Mn <sup>*)</sup> (max %)	P (max %)	S (max %)	Cr <sup>*)</sup> (max %)	Ni <sup>*)</sup> (max %)	Mo <sup>*)</sup> (max %)	B <sup>*)</sup> (max %)
0.23	0.50	1.60	0.025	0.010	1.20	0.25	0.25	0.005

The steel is grain refined. <sup>\*)</sup> Intentional alloying elements.

## Carbon Equivalent CET(CEV)

Thickness (mm)	2.50 - 8.00
Max CET(CEV)	0.43 (0.55)
Typ CET(CEV)	0.35 (0.52)

$$CET = C + \frac{Mn + Mo}{10} + \frac{Cr + Cu}{20} + \frac{Ni}{40}$$

$$CEV = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Cu + Ni}{15}$$

## Tolerances

### Thickness

Tolerances according to Hardox Thickness Guarantees. Hardox® Guarantees meets the requirements of ½ EN 10 051 for cut to length sheet.

### Length and Width

According to SSAB's dimension program. Tolerances conform to EN 10 051. Tighter tolerances available on request.

### Shape

Tolerances according to EN 10 051.

### Flatness

For cut to length sheet the tolerances are according to Hardox Flatness Guarantees Class B, that offers narrower tolerances compared to EN 10 051.

### Surface Properties

According to EN 10 163-2, Class A Subclass 1.

### Bending

Tolerances for Hardox cut to length sheet are according to Hardox Bending Guarantees Class B. All Classes are closer than the requirements in EN 10 025-6.

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## Delivery Conditions

The delivery condition is Q (Quenched). Cut to length sheet are delivered with an as-rolled surface and mill edges as standard delivery condition. Delivery requirements can be found in SSAB's brochure 41-General Product Information Strenx, Hardox, ArmoX and Toolox-UK or at [www.ssab.com](http://www.ssab.com).

## Fabrication and Other Recommendations

### Welding, bending and machining.

Recommendations can be found in SSAB's brochures at [www.hardox.com](http://www.hardox.com) or consult Tech Support, [techsupport@ssab.com](mailto:techsupport@ssab.com).

Hardox 450 and Hardox 450 Tuf are not intended for further heat treatment. Mechanical properties are achieved by quenching and when necessary by means of subsequent tempering. The properties of the delivery condition cannot be retained after exposure to temperatures in excess of 250 °C. Hardox sheets can be welded and thermal cut at room temperature without pre-heating, all common welding and cutting processes can be used.

Appropriate health and safety precautions must be taken when welding, cutting, grinding or otherwise working on this product. Grinding, especially of primer coated plates, may produce dust with a high particle concentration.



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