Hardox® 400

General Product Description

The versatile steel that resists wear and abrasion.

Hardox®400 is an abrasion-resistant steel with a nominal hardness of 400 HBW. Hardox® 400 is a versatile wear-resistant steel. As a result of its high toughness, good bendability and weldability, this steel can be used in structures with moderate wear.

Dimension Range

Hardox® 400 is available as plate in thicknesses of 4.0 – 130 mm (5/32 - 5.12”), and as sheet in thicknesses of 2.0 - 8.0 mm (0.079 - 0.315”). Hardox® 400 plate is available in widths up to 3350 mm (131.89”) and lengths up to 14630 mm (575.98”). Hardox® 400 sheet is available in widths up to 1650 mm (64.96”) and lengths up to 16000 mm (629.92”). More detailed information on dimensions is provided in the dimension program.

Mechanical Properties

Product	Thickness (mm)	Hardness [1] (HBW)	Typical yield strength (MPa), not guaranteed
Hardox® 400 sheet	2.0 - 8.0	370 - 430 [2]	1100
Hardox® 400 plate	4.0 - 130.0	370 - 430	1100

[1] 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. The nominal thickness of supplied plates will not deviate more than +/- 15 mm from the thickness of the test specimen used for hardness testing. For sheet the Brinell hardness test is according to EN ISO 6506-1 on each heat treatment individual/coil. Hardness is measured on a milled surface 0.3 - 2 mm below surface.

[2] Hardness test is not performed or guaranteed for Hardox® products with thicknesses < 2.5 mm. The tabulated hardness values for thickness < 2.5 mm is a conversion from the tensile strength. For more information please see the datasheet 2067- Hardness conversion of thin Hardox® wear sheet.

The nominal thickness of supplied plates will not deviate more than +/- 15 mm from the thickness of the test specimen used for hardness testing.

Hardox® wear plate is through-hardened. Minimum core hardness is 90 % of the guaranteed minimum hardness.

Impact Properties

Product	Longitudinal test, typical impact energy, Charpy V 10x10 mm test specimen [1]
Hardox® 400 sheet & plate	45 J / -40 °C

[1] Impact toughness measured upon agreement. For thicknesses between 3 mm and 11.9 mm, sub-size Charpy V-specimens are used. Impact testing according to ISO EN 148 per heat and thickness group. Average of three tests.

Chemical Composition (heat analysis)

C *) (max %)	Si *) (max %)	Mn*) (max %)	P (max %)	S (max %)	Cr*) (max %)	Ni*) (max %)	Mo*) (max %)	B*) (max %)
0.32	0.70	1.60	0.025	0.010	2.50	1.50	0.60	0.004

The steel is grain refined. *) Intentional alloying elements.

Carbon Equivalent CET(CEV)

Product type	Sheet	Plate	Plate	Plate	Plate	Plate	Plate	Plate
Thickness (mm)	2.0 - 8.0	4.0 - 7.9	8.0 - 20.0	20.1 - 32.0	32.1 - 45.0	45.1 - 51.0	51.1 - 80.0	80.1 - 130.0
Max CET(CEV)	0.30 (0.43)	0.26 (0.41)	0.31 (0.47)	0.32 (0.52)	0.33 (0.67)	0.33 (0.67)	0.43 (0.82)	0.43 (0.92)
Typ CET(CEV)	0.28 (0.41)	0.24 (0.39)	0.28 (0.44)	0.29 (0.48)	0.31 (0.62)	0.31 (0.62)	0.37 (0.77)	0.41 (0.89)

$$CET = C + \frac{Mn + Mo}{10} + \frac{Cr + Cu}{20} + \frac{Ni}{40} \qquad CEV = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Cu + Ni}{15}$$

Tolerances

More details are given in SSAB's brochure Hardox® Guarantees or at www.ssab.com.

Thickness

Tolerances according to Hardox® Thickness Guarantee.
Hardox® Guarantees meet the requirements of EN 10029 Class A for plate, but offer more narrow tolerances. For sheets the guarantees meets the requirements of 1/2 EN 10051.

Length and Width

According to SSAB's dimension program. For plate, the tolerances are according to SSAB´s mill edge standard or tolerances that conform to EN 10029. For sheet the tolerances conform to EN 10051, tighter tolerances available on request.

Shape

Tolerances according to EN 10029 for plate and according to EN 10051 for sheet.

Flatness

Tolerances are according to Hardox® Flatness Guarantees Class C for plate, which are more restrictive than EN 10029. For sheet, the tolerances are according to Hardox® Flatness Guarantees Class A, that offer narrower tolerances compared to EN 10051.

Surface Properties

According to EN 10163-2 Class A, Subclass 1.

Delivery Conditions

The delivery condition is Quenched or Quenched and Tempered. Plates are delivered with sheared or thermally cut edges and thicknesses over 80 mm are delivered with mill edge as standard. Sheets are delivered with an as-rolled surface and mill edge as standard.

Delivery requirements can be found in SSAB's brochure Hardox® Guarantees or www.ssab.com.

Fabrication and Other Recommendations

Welding, bending and machining

Recommendations can be found in SSABs brochures at www.hardox.com or consult Tech Support.

Bendability for plate are according to Hardox® Bending Guarantees Class D. For sheet, the bendability are according to Hardox® Bending Guarantees Class A.

Hardox® wear plate is not intended for further heat treatment. It has obtained its mechanical properties 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 250ºC .

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.

Contact Information

www.ssab.com/contact

The English version of this document shall prevail in case of discrepancy. Minor changes and updates to the document may occur, please download the latest version of this document at www.ssab.com

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