

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

Grade	Thickness (mm)	Hardness ¹⁾ (HBW)	Typical yield strength (MPa), not guaranteed
Hardox® 400 sheet	2.0- 8.0	370- 430	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.

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

Impact Properties

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

¹⁾ Impact toughness measured upon agreement. For thicknesses between 6- 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)

Grade	C ^{*)} (max %)	Si ^{*)} (max %)	Mn ^{*)} (max %)	P (max %)	S (max %)	Cr ^{*)} (max %)	Ni ^{*)} (max %)	Mo ^{*)} (max %)	B ^{*)} (max %)
Sheet & plate	0.32	0.70	1.60	0.025	0.010	1.40	1.50	0.60	0.004

The steel is grain refined. ^{*)} Intentional alloying elements.

Carbon Equivalent CET(CEV)

Thickness (mm)	sheet 2.0 - 8.0	plate 4.0 - 7.9	plate 8.0 - 20.0	plate 20.1 - 32.0	plate 32.1 - 45.0	plate 45.1 - 51.0	plate 51.1 - 80.0	plate 80.1 - 130
Max CET(CEV)	0.28(0.41)	0.26(0.41)	0.31(0.47)	0.32(0.52)	0.33(0.60)	0.40(0.59)	0.43(0.82)	0.50(0.82)
Typ CET(CEV)	0.26(0.39)	0.24(0.39)	0.28(0.44)	0.29(0.48)	0.31(0.58)	0.38(0.57)	0.41(0.65)	0.48(0.73)

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

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

Tolerances

More details are given in SSAB's brochure 41-General Product Information Strenx, Hardox®, Armox and Toolox-UK and Hardox® Guarantees or at www.ssab.com.

Thickness

Tolerances according to Hardox® Thickness Guarantees. Hardox® Guarantees meet the requirements of EN 10 029 Class A for plate and ½ EN 10 051 for sheet.

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 10 029. Tolerances conform to EN 10 051 for sheet, tighter tolerances available on request.

Shape

Tolerances are according to EN 10 029 for plate and EN 10 051 for sheet.

Flatness

Tolerances are according to Hardox® Flatness Guarantees Class D for plate, which are more restrictive than EN 10 029. For sheet, the tolerances are according to Hardox® Flatness Guarantees Class A, that offer narrower tolerances compared to EN 10 051.

Surface Properties

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

Bending

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

Delivery Conditions

The delivery condition is Q or QT (Quenched or Quenched and Tempered). Hardox® 400 plates are delivered with sheared or thermally cut edges and thicknesses over 80 mm are delivered with mill edge as standard. Hardox® 400 sheets are delivered with an as-rolled surface and mill edge as standard.

Delivery requirements can be found in SSAB's brochure 41-General product information Strenx, Hardox®, Armox and Toolox-UK or at www.ssab.com.

Fabrication and Other Recommendations

Welding, bending and machining

Recommendations can be found in SSAB's brochures at www.hardox.com or consult Tech Support, techsupport@ssab.com.

Hardox® 400 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 250°C (482 °F).

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