HARDOX®
WEAR PLATE

Hardox® 450

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. 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 is available in thicknesses of 3.2 - 160 mm as plate, as sheet in thicknesses 2.0 - 8.0 mm and as CR sheet in thicknesses 0.8 - 2.1 mm. Hardox® 450, made from SSAB Zero™ steel, is now available in thicknesses ranging from 4.0 to 25.4 mm. For plate thicknesses over 80 mm, the preferred width is 1650 mm. More detailed information on dimensions is provided in the dimension program.

Mechanical Properties

Product	Thickness (mm)	Hardness [2] (HBW)	Typical yield strength (MPa), not guaranteed
Hardox® 450 CR sheet	0.8 - 2.10	425 - 475 [3]	1250
Hardox® 450 sheet	2.0 - 8.0	425 - 475 [3]	1250
Hardox® 450 plate [1]	3.2 - 80.0	425 - 475	1250
Hardox® 450 plate	80.1 - 103.0	410 - 475	1250
Hardox® 450 plate	103.1 - 160.0	390 - 475	1250

[1] Hardox® 450 made from SSAB Zero™ steel is available in thicknesses of 4.0 - 25.4 mm as plate. For more information about SSAB Zero™, please see the SSAB Zero™ section.

[2] 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.

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

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® 450 sheet & plate	50 J / -40 °C [2]

[1] Impact toughness measured upon agreement. For thicknesses between 3 mm and 11.9 mm, subsize Charpy V-specimens are used. The specified impact toughness 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. Average of three tests.

[2] Typical value for 20 mm.

Chemical Composition (heat analysis)

Product type	C *) (max %)	Si *) (max %)	Mn*) (max %)	P (max %)	S (max %)	Cr*) (max %)	Ni*) (max %)	Mo*) (max %)	B*) (max %)
CR sheet	0.19	0.30	1.50	0.020	0.005	0.10	0.10	0.05	0.004
Sheet & plate	0.26	0.70	1.60	0.025	0.010	1.40	1.50	0.60	0.005

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

Carbon Equivalent CET(CEV)

Product type	CR sheet	Sheet	Plate	Plate	Plate	Plate	Plate	Plate
Thickness (mm)	0.8 - 2.10	2.0 - 8.0	3.2 - 4.9	5.0 - 9.9	10.0 - 19.9	20.0 - 39.9	40.0 - 80.0	80.1 - 160.0
Max CET(CEV)	0.36 (0.49)	0.36 (0.49)	0.37 (0.48)	0.38 (0.49)	0.39 (0.52)	0.41 (0.60)	0.43 (0.74)	0.41 (0.67)
Typ CET(CEV)	0.32 (0.46)	0.33 (0.47)	0.33 (0.46)	0.33 (0.45)	0.36 (0.48)	0.38 (0.56)	0.40 (0.71)	0.39 (0.64)

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

SSAB

Tolerances

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

Thickness

Tolerances according to Hardox® Thickness Guarantees. Hardox® Guarantees meet the requirements of EN 10029 Class A for plate. For sheet, the guarantees meet the requirements of ½ EN 10051 and ¾ EN 10131 for cold rolled sheet products.

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 and EN 10131 for cold rolled sheet. For sheets, the tolerances exceeds the requirements of EN 10051.

Shape

Tolerances according to EN 10029 for plate, EN 10051 for sheet and EN 10131 for cold rolled 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. Cold rolled sheet tolerances are according to Hardox® Flatness Guarantees Class B.

Surface Properties

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

Delivery Conditions

The delivery condition is Quenched or Quenched and Tempered. Hardox® 450 plates are delivered with sheared or thermally cut edges, and thicknesses over 80 mm are delivered with mill edge as standard. Hardox® 450 sheets are delivered with an as-rolled surface and mill edge as standard. Hardox® 450 cold rolled sheets (0.80 - 2.10 mm) are supplied as cold rolled surface.

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 E. For sheet, the bendability are according to Hardox® Bending Guarantees Class B for cold rolled sheets, and Class A for sheet.

Hardox® 450 is 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.

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.

SSAB Zero™

SSAB Zero™ is made of recycled steel and produced with fossil-free electricity and biogas. It has virtually no fossil carbon emissions during steel production, without mass balancing allocation of emission reduction or carbon emission offsetting. SSAB Zero™ has the same quality and properties as the traditional steel versions. More details are given in SSAB Zero™ Certificate of Carbon Emissions at www.ssab.com.

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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