STRENX® PERFORMANCE STEEL SHEET

Steel grade	Yield strength[1] MPa (ksi)	Tensile strength[1] MPa (ksi)		Elongation A_5 (%)	Bending radius R/t for 90° bend t=6 mm (0.236″)	CEV/CET[6] typical for 6 mm (0.236″)	Thickness mm (inches)
	min	min	max	min	min		
Strenx® 100 – 110XF – Thermomechanically rolled steel for stronger and lighter structures.							
Strenx® 100XF	690 (100)[2]	760 (110)[2]		15[3]	1.2	0.35/0.24	2.0 – 10.0 mm (0.079" – 0.393")[4]
Strenx® 110XF	760 (110)[2]	813 (118)[2]		15[3]	1.2	0.39/0.26	2.0 – 10.0 mm (0.079" – 0.393")
Strenx® MC – High-strength structural steel enabling stronger and lighter structures.							
Strenx® 600MC D/E	600 (87)	650 (94)	820 (119)	16	1.1	0.33/0.21	2.0 – 10.0 mm (0.079" – 0.393")
Strenx® 650MC D/E	650 (94)	700 (101)	850 (123)	14	1.2	0.34/0.22	2.0 – 10.0 mm (0.079" – 0.393")
Strenx® 700MC D/E	700 (101)	750 (109)	950 (138)	12	1.2	0.39/0.25	2.0 – 10.0 mm (0.079" – 0.393")
Strenx® 700MC Plus	700 (101)	750 (109)	950 (138)	13	1.0	0.38/0.24	3.0 – 12.0 mm (0.118" – 0.472")
Strenx® 900MC	900 (130)	930 (135)	1200 (174)	8	3.0	0.50/0.25	3.0 – 10.0 mm (0.118" – 0.393")
Strenx® 900 Plus	900 (130)	940 (136)	1100 (160)	11	3.0	0.50/0.34	2.0 – 8.0 mm (0.079" – 0.393")
Strenx® 960MC	960 (139)	980 (142)	1250 (181)	7	3.5	0.51/0.28	3.0 – 10.0 mm (0.118" – 0.393")
Strenx® 960 Plus	960 (139)	980 (142)	1150 (167)	10	3.5	0.50/0.34	2.0 – 8.0 mm (0.079" – 0.393")
Strenx® 1100MC	1100 (160)	1250 (181)	1450 (210)	7	4.0	0.56/0.33	3.0 – 8.0 mm (0.118" – 0.315")
Strenx® cold rolled – High-strength structural steel enabling stronger and lighter structures.							
Strenx® 700 CR	700 (102)	1000 (145)	1200 (174)	7[5]	2.0	0.40/0.29	0.70 – 2.10 mm (0.028" – 0.083")
Strenx® 960 CR	960 (139)	1100 (160)	1300 (189)	3[5]	3.5	0.38/0.26	0.80–2.10 mm (0.0315" – 0.083")
Strenx® 1100 CR	1100 (160)	1300 (189)	1500 (218)	3[5]	3.5	0.41/0.30	0.80–2.10 mm (0.0315" – 0.083")

All sheet products are produced according to Strenx® Guarantees or closer.
1. Mechanical properties of Strenx® MC, MC Plus and Plus grades are tested in longitudinal direction.
2. Mechanical properties of Strenx® XF grades are tested in transverse direction.
3. Elongation A_{50} Min. % for t ≥ 2 mm (0.078").
4. Thickness up to 12.7 mm (½″) available upon request
5. Elongation A_{80} Min.
6. EV=C+Mn/6+(Cr+Mo+V)/5+(Cu+Ni)/15, CET=C+(Mn+Mo)/10+(Cr+Cu)/20+Ni/40.

STRENX® PERFORMANCE STEEL PLATE

Steel grade	Yield strength[1] MPa (ksi)	Impact toughness CVL typical 20 mm (3/4″) J @ -40°C (ft-lb @ -40°F)	Bending properties transverse (R/t) t<8 mm (0.315″)	Tensile strength[1] MPa (ksi)		CEV/CET[3] typical for 20 mm (3/4")	Thickness range[6] mm (inches)
	min			min	max		
Strenx® – High-strength, high-performance steel, enabling lighter and more innovative structures.							
Strenx® 100[2]	690 (100)[4]	165 J (122 ft-lb)	1.5	759 (110)	900 (130)	0.43/0.29	4.76 – 127 mm (3/16" – 5")
Strenx® 700 E/F	700 (101)[7]	50 ft-lbs / -40 F	1.5	780 (113)	930 (135)	0.43/0.29	4 – 160 mm (5/32" – 6.3")
Strenx® 700 OME	700 (101)	50 ft-lbs / -40 F	1.5	780 (113)	930 (135)	0.57/0.38	4.0 – 130.0 mm (5/32" – 5.118")
Strenx® P700	700 (101)	50 ft-lbs / -40 F	1.5	780 (113)	940 (136)	0.57/0.38	4–100 mm (5/32" – 3.94")
Strenx® 900 E/F	900 (130)[7]	20 ft-lbs / -40 F	2.5	940 (136)	1100 (160)	0.55/0.36	4–120 mm (5/32" – 4.724")
Strenx® 960 E/F	960 (139)[7]	29 ft-lbs / -40 F	2.5	980 (142)	1150 (167)	0.55/0.36	4–120 mm (5/32" – 4.724")
Strenx® 1100 E/F	1100 (160)	20 ft-lbs / -40 F	3.0	1250 (181)	1550 (225)	0.55/0.36	4 – 40 mm (5/32" – 1.57")
Strenx® 1300 E/F	1300 (189)	20 ft-lbs / -40 F	3.5	1400 (203)	1700 (247)	0.65/0.42	4 – 15 mm (5-32"-0.591")

All plates are produced according to Strenx® Guarantees or closer.
1. For transverse test piece.
2. Strenx® 100 meets requirements of ASTM A514 Grade S.
3. CEV=C+Mn/6+(Cr+Mo+V)/5+(Cu+Ni)/15; CET=C+(Mn+Mo)/10+(Cr+Cu)/20+Ni/40. For Strenx® 1300, typical values are for 8 mm (0.315").
4. Values for thickness 4 – 63 mm (5/32" – 21/2").
5. For 6 mm (0.236") and half size test specimen.
6. Thicker materials are available upon request.
7. Values for thickness 4 – 53 mm (5/32" – 2.08")

STRENX® PERFORMANCE STEEL TUBE

Steel grade	Yield strength MPa (ksi)	Minimum impact toughness	Tensile strength MPa (ksi)		CEV/CET[1] typical	Wall thickness mm (inches)
	min		min	max		
Strenx® tube – Advanced high-strength structural hollow sections.						
Strenx® Tube 700MLH	700 (101)	27 J / -50°C (20 ft-lb / -58°F)	750 (109)	950 (138)	0.38/0.24	2.0 – 10.0 mm (0.079" – 0.393")
Strenx® Tube 900MH	900 (130)	40 J / -20°C (30 ft-lb / -4°F)	930 (135)	1200 (174)	0.50/0.25	4.0 – 6.0 mm (5/32" – 0.236")
Strenx® Tube 960MH	960 (139)	40 J / -20°C (30 ft-lb / -4°F)	980 (142)	1250 (181)	0.51/0.28	4.0 – 6.0 mm (5/32" – 0.236")
Strenx® Tube 700QLH	700 (101)	40 J / -40°C (30 ft-lb / -40°F)	780 (113)	930 (135)	0.48/0.34	3.0 – 6.0 mm (0.118" – 0.236")
Strenx® Tube 960QLH	960 (139)	40 J / -40°C (29 ft-lb / -40°F)	980 (142)	1150 (167)	0.54/0.36	3.0 – 6.0 mm (0.118" – 0.236")

1. CEV=C+Mn/6+(Cr+Mo+V)/5+(Cu+Ni)/15; CET=C+(Mn+Mo)/10+(Cr+Cu)/20+Ni/40.

The values stated in SI units are to be regarded as standard for all products (with the exception of Strenx® 100XF, Strenx® 110XF and Strenx® 100). The values given in parenthesis are approximate mathematical conversions from SI to US conventional units that are provided for information only and are not considered standard.

For the products described with the blue text the following is valid: the values given in parenthesis are to be regarded as standard. The values without parenthesis and stated in SI units are approximate mathematical conversions from US conventional to SI units that are provided for information only and are not considered standard.

STRENX® PERFORMANCE STEEL SECTION

Steel grade	Yield strength MPa (ksi)	Min. Impact toughness J @ -40 °C (ft-lb @ -40 °F)	Tensile strength MPa (ksi)		CEV/CET[1] typical	Wall thickness mm (inches)
	Min		min	max		
Strenx® Section – Advanced high-strength, cold-formed steel sections.						
Strenx® Section 650	650 (94)	27 J (20 ft-lb)	700 (101)	850 (123)	0.34/0.22	2.50 – 8.00 mm (0.098" – 0.314")
Strenx® Section 700	700 (101)	27 J (20 ft-lb)	750 (109)	950 (138)	0.38/0.24	2.50 – 8.00 mm (0.098" – 0.314")
Strenx® Section 900	900 (130)	27 J (20 ft-lb)	930 (135)	1200 (174)	0.51/0.28	3.0 – 6.0 mm (0.118" – 0.236")

1. CEV=C+Mn/6+(Cr+Mo+V)/5+(Cu+Ni)/15; CET=C+(Mn+Mo)/10+(Cr+Cu)/20+Ni/40.

HARDOX® WEAR PLATE

Steel grade	Hardness nominal HBW	Impact toughness CVL typical for 20 mm (3/4") J @ -40°C (ft-lb @ -40°F)	Bending properties transverse (R/t) t<8 mm (0.315″)	Rel. service life interval[1]	CEV/CET[2] typical for 20 mm (3/4")	Thickness range[4] mm (inches)
Hardox® – Workshop-friendly abrasion-resistant wear plates for all purposes, enabling lighter, stronger and more durable applications.						
Hardox® HiAce	450	50 J (37 ft-lb)			1.01/ 0.39	4 – 100 mm (0.157" – 3.937")
Hardox® HiTemp	400	60 J (44 ft-lb)	3.0		0.59/0.40	4.7 – 51 mm (0.185" – 2")
Hardox® HiTuf	350	95 J (70 ft-lb)[3]			0.55/0.36[3]	40 – 160 mm (1.57" – 6.3")
Hardox® 400	400	45 J (33 ft-lb)	2.5	1	0.44/0.28	4 – 130 mm (0.157" – 5.12")
Hardox® 450	450	50 J (37 ft-lb)	3.0	1.1 – 1.5	0.56/0.38	3.2 – 130 mm (0.126" – 5.12")
Hardox® 500 Tuf	490	45 J (33 ft-lb)	3.0	1.3 – 2.1	0.53/0.37	4 – 25.4 mm (0.157" – 1")
Hardox® 500	500	37 J (27 ft-lb)	3.5	1.3 – 2.1	0.63/0.41	4 – 103 mm (0.157" – 4.06")
Hardox® 550	550	30 J (22 ft-lb)		1.5 – 4.0	0.67/0.46	8 – 65 mm (0.315" – 2.56")
Hardox® 600	600	20 J (15 ft-lb)		1.8 – 8.0	0.66/0.55	6 – 65 mm (metric only)
Hardox® Extreme	675	<15 J (< 11 ft-lb)		2.0 – 10.0	0.66/0.55	8 – 19 mm (metric only)

All plates are produced with tolerances according to Hardox® guarantees or closer.
1. Max/min sliding wear by SSAB WearCalc (mild steel 0.2–0.8).
2. CEV=C+Mn/6+(Cr+Mo+V)/5+(Cu+Ni)/15; CET=C+(Mn+Mo)/10+(Cr+Cu)/20+Ni/40.
3. Typical for 70 mm (2 ¾").
4. Thicker material is available upon request.

HARDOX® WEAR SHEET

Steel grade	Hardness nominal HBW	Impact toughness CVL typical J @ -40°C (ft-lb @ -40°F)	Bending properties transverse (R/t) t<6 mm (0.236")	Rel. service life interval[1]	CEV/CET[2] typical	Thickness range mm (inches)
Hardox® – Workshop-friendly abrasion-resistant cut-to-length sheet for all purposes, enabling lighter, stronger and more durable applications.						
Hardox® 400	400	45 J (33 ft-lb)	3.0	1	0.39/0.26	2.0 – 8.0 mm (0.079" – 0.315")
Hardox® 450	450	50 J (37 ft-lb)	3.0	1.1 – 1.5	0.39/0.26	2.0 – 8.0 mm (0.079" – 0.315")
Hardox® 450 CR	450[3]		3.5		0.41/0.32	0.8 – 2.1 mm (0.031" – 0.089")
Hardox® 500 Tuf	490	45 J (33 ft-lb)		1.3 – 2.1	0.40/0.30	3.0 – 6.5 mm (0.118" – 0.256")
Hardox® 500	500	37 J (27 ft-lb)	3.5	1.3 – 2.1	0.45/0.33	2.0 – 7.0 (0.079" – 0.275")
Hardox® 600	600			1.8 – 8	0.64/0.48	3.0 – 6.0 mm (0.118" – 0.236")

All sheets are produced with tolerances according to Hardox® Guarantees or closer.
1. Max/min sliding wear by SSAB WearCalc (mild steel 0.2–0.8).
2. CEV=C+Mn/6+(Cr+Mo+V)/5+(Cu+Ni)/15; CET=C+(Mn+Mo)/10+(Cr+Cu)/20+Ni/40.
3. Hardness test is not performed or guaranteed for Hardox® 450 CR. The hardness value is a conversion of the tensile strength.

HARDOX® ROUNDBAR

Steel grade	Hardness nominal HBW	Impact toughness CVL typical J @ -40°C (ft-lb @ -40°F)	Bending properties transverse (R/t) t<8 mm (0.315")	Rel. service life interval[1]	CEV/CET[2] typical	Bar diameter mm (inches)
Hardox® Roundbar – Versatile, ready-to-use abrasion-resistant roundbars.						
Hardox® 400	400	45 J (33 ft-lb)			0.58/0.37	40 – 100 mm (1.57" – 3.937")
Hardox® 500	500	-	-	-	0.73/0.46[3]	40.0 – 160.0 (1.57" – 6.3")

1. Max/min sliding wear by SSAB WearCalc (mild steel 0.2–0.8).
2. CEV=C+Mn/6+(Cr+Mo+V)/5+(Cu+Ni)/15; CET=C+(Mn+Mo)/10+(Cr+Cu)/20+Ni/40.
3. Values for diameter 1.575"- 3.397".

HARDOX® TUBE

Steel grade	Hardness nominal HBW	Typical yield strength MPa (ksi)	External diameter mm (inches)	Wall thickness mm (inches)
Hardox® Tube – Abrasion-resistant tubes for extreme performance and extended service life.				
Hardox® 400	400	1000 – 1300 (145 – 188)	76.1 – 219.1 (3" – 8 5/8")	3.0 – 6.0 mm (0.118" – 0.236")
Hardox® 500	500	>1200 (> 174)	76.1 – 133 (3" – 5.24")	3.0 – 6.0 mm (0.118" – 0.236")

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TECH SUPPORT

Tech Support provides you with technical support over the phone and via e-mail. You will receive an answer straight away or at the latest within 24 hours. We welcome questions in any language and invite you to work close-ly with our Technical Managers and expert groups. Our aim is to simplify your work in design, materials selection, fatigue, deflection, bending, drilling, machining and welding.

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HARDOX® WEAR PLATE
Wear plate for maximum payload & longer service life.

STRENX® PERFORMANCE STEEL
High-strength, high-performance structural steel.

TOOLOX® ENGINEERING & TOOL STEEL
Ready-to-use engineering & tool steel for saving time to market.

TOOLOX® ENGINEERING AND TOOL STEEL

Temperature °C (°F)	Hardness guaranteed HBW	Impact energy guaranteed Min. J (ft-lb)	Yield strength $R_{p0.2}$ MPa (ksi)*	Tensile strength R_m MPa (ksi)*	Elongation A_5 (%)*	Yield strength $R_{p0.2}$ MPa (ksi)*	Impact energy J (ft-lb)*	Plate thickness mm (inches)
Toolox® 33 – A quenched and tempered engineering and tool steel, designed to have low residual stresses – resulting in good dimensional stability.								
-40 °C (-40°F)								6 – 130 mm (0.236" – 5.12")
-20°C (-4°F)								
20°C (68°F)	275–325	35 J (26 ft-lb)	850 (123)	980 (142)	16	800 (116)	100 J (74 ft-lb)	
200°C (392°F)			690 (116)	900 (131)	12	750 (108)	170 J (125 ft-lb)	
300°C (572°F)			680 (99)			700 (101)	180 J (133 ft-lb)	
400°C (752°F)			590 (86)			590 (86)	180 J (133 ft-lb)	
500°C (932°F)			560 (81)			560 (81)		

Plates are tested in transverse direction. Bars are tested in longitudinal direction.

* Typical values are for guidance only.

Temperature °C (°F)	Hardness guaranteed HBW	Impact energy guaranteed Min. J (ft-lb)	Yield strength $R_{p0.2}$ MPa (ksi)*	Tensile strength R_m MPa (ksi)*	Elongation A_5 (%)*	Yield strength $R_{p0.2}$ MPa (ksi)*	Impact energy J (ft-lb)*	Plate thickness mm (inches)
Toolox® 40 – Quenched and tempered engineering and tool steel with very low residual stresses – in combination with a typical hardness around 40 HRC.								
-40 °C (-40°F)								6 – 130 mm (0.236" – 5.12")
-20°C (-4°F)								
20°C (68°F)	360 – 420	20 J (15 ft-lb)	1150 (167)	1260 (183)	14		38 J (28 ft-lb)	
200°C (392°F)			1010 (146)	1170 (170)	14			
300°C (572°F)			990 (144)	1160 (168)	14			
400°C (752°F)			900 (131)	1060 (154)	15			
500°C (932°F)			780 (112)	900 (131)	16			

Plates are tested in transverse direction.

* Typical values are for guidance only.

Temperature °C (°F)	Hardness guaranteed HBW	Impact energy guaranteed Min. J (ft-lb)	Yield strength $R_{p0.2}$ MPa (ksi)*	Tensile strength R_m MPa (ksi)*	Elongation A_5 (%)*	Yield strength $R_{p0.2}$ MPa (ksi)*	Impact energy J (ft-lb)*	$R_{c0.2}$ after 170 hrs soaking time at actual temperature* MPa (ksi)	Plate thickness mm (inches)	Bar diameter mm (inches)
Toolox 44® – Quenched and tempered engineering and tool steel with very low residual stresses. Despite a typical hardness of 45 HRC, it has very good machinability, unmatched in the market.										
-40 °C (-40°F)									6 – 130 mm (0.236" – 5.12")	21 – 172 mm (0.826" – 6.771")
-20°C (-4°F)										
20°C (68°F)	410 – 475	18 J (13 ft-lb)	1300 (189)	1450 (210)	13	1250 (181)	30 (22)			
200°C (392°F)			1150 (174)	1380 (200)	10	1120 (162)	60 (44)			
300°C (572°F)			1120 (162)			1120 (162)	80 (59)			
400°C (752°F)			1060 (168)			1060 (154)	80 (59)	1060 (154)		
500°C (932°F)			930 (135)			930 (135)		910 (132)		

Plates are tested in transverse direction. Bars are tested in longitudinal direction.
The typical testing temperature for Toolox® is room temperature.

All other values are tested randomly and are for information only.
* Typical values are for guidance only.

SALES CONTACTS

Find your local sales contact at **www.ssab.com**

Certain restrictions apply to the product program.

This is an extract from the product data sheets and recommendations.

Consult www.ssab.com for complete recommendations and properties.