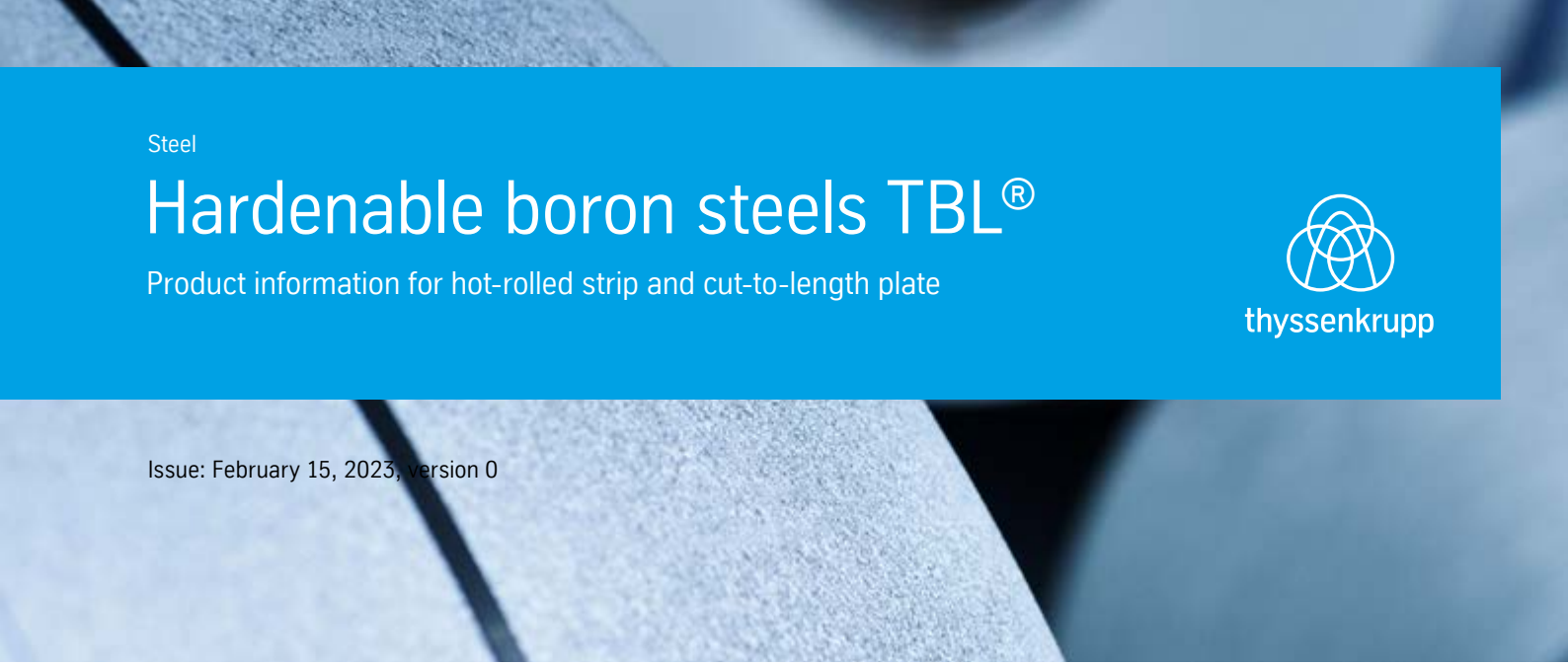
Steel

Hardenable boron steels TBL®

Product information for hot-rolled strip and cut-to-length plate

thyssenkrupp



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Brief profile

Hardenable boron steels TBL® from thyssenkrupp are fine-grain boron-alloyed special structural steels with high surface quality and high purity. These properties add up to a better-than-ever combination of excellent wear protection and superior forming and hardening characteristics.

TBL® steels are primarily used for agricultural wear parts in soil cultivation and harvesting technology, such as harrow and hollow discs, plowshares, but also for the manufacture of knives and hoes.

Content

Available steel grades

TBL® is available as uncoated wide hot strip and as cut-to-length plate.

Steel grade designations and delivery forms

	Delivery form	
	Hot-rolled strip	Cut-to-length plate
Steel grade designation		
TBL® 30	●	●
TBL® 35	●	●
TBL® 40	●	●
TBL® 45	●	●
TBL® 50	●	●

● Available

Steel grades according to DIN EN ISO 683-2.

Dimensions

Subject to finishing, steel grades are available in the dimensions shown below. Please contact Technical Customer Service before ordering. We will be pleased to inform you on request of the dimensional combinations in which our TBL® steels as cut-to-length plates are available.

		Thickness [mm]	Width [mm]
		from _ to	from _ to
Steel grade	Delivery form		
TBL® 30	Hot-rolled strip	2.50 – 18.00	1,000 – 2,030
TBL® 35	Hot-rolled strip	2.50 – 15.00	1.000 – 1,630
TBL® 40	Hot-rolled strip	2.50 – 12.00	1.000 – 1,630
TBL® 45	Hot-rolled strip	2.50 – 12.00	1.000 – 1,630
TBL® 50	Hot-rolled strip	3.00 – 12.00	1.000 – 1,630

Other dimensions and different thickness and width combinations available on request.

Comments

Wide hot strip and cut-to-length plate can be ordered in normalized annealed or normalized-rolled condition as well as in pickled or non-pickled condition and with mill or trimmed edges. Cut-to-length plate is only supplied pickled in the annealed condition.

Unless otherwise agreed upon in the order, the delivery will be governed by the conditions outlined in DIN EN 10021.

The admissible tolerances are based on DIN EN 10051 for wide hot strip and cut-to-length plate.

Technical characteristics

All TBL® steel grades from thyssenkrupp can be supplied in normalized annealed or normalized-rolled condition. Among other things, the TBL® grades differ in their carbon content and are produced with low levels of phosphorus and sulfur.

For better processability, we recommend ordering TBL® 40, TBL® 45 and TBL® 50 in the annealed condition.

Chemical composition

Mass fractions in ladle analysis	C [%]	Si [%]	Mn [%]	P [%]	S [%]	Al [%]	Cr [%]	Ni [%]	Ti [%]	B [ppm]	Typ. CEV[1)]	Typ. CET[2)]
Steel grade												
TBL® 30	0.25–0.35	≤ 0.40	1.00–1.50	≤ 0.025	≤ 0.010	0.02–0.06	≤ 0.50	–	0.02–0.05	10–50	0.55	0.40
TBL® 35	0.30–0.40	≤ 0.40	1.00–1.50	≤ 0.025	≤ 0.010	0.02–0.06	≤ 0.50	–	0.02–0.05	10–50	0.60	0.50
TBL® 40	0.35–0.45	≤ 0.40	1.00–1.50	≤ 0.025	≤ 0.010	0.02–0.06	≤ 0.50	–	0.02–0.05	10–50	0.70	0.55
TBL® 45	0.40–0.50	≤ 0.40	1.00–1.50	≤ 0.025	≤ 0.010	0.05–0.15	≤ 0.50	–	0.005–0.020	10–50	0.75	0.60
TBL® 50	0.45–0.55	≤ 0.40	1.00–1.50	≤ 0.025	≤ 0.010	0.02–0.06	≤ 0.70	0.10–0.30	0.02–0.05	10–50	0.80	0.65

The steel has a fine grained microstructure. Nitrogen is absorbed to form nitrides.

[1)] CEV (%) = C + Mn / 6 + (Cr + Mo + V) / 5 + (Ni + Cu) / 15
[2)] CET (%) = C + (Mn + Mo) / 10 + (Cr + Cu) / 20 + Ni / 40

Mechanical properties, typical values in delivery condition at room temperature

			Thickness	Yield strength	Tensile strength	Elongation	Hardness in delivery condition
			[mm]	R_e [MPa]	R_m [MPa]	A_5 [%]	[HBW]
Steel grade	Delivery form	Test direction					
TBL® 30	Hot-rolled strip	Transverse to rolling direction	≥ 3–12	400	620	22	180
TBL® 35	Hot-rolled strip	Transverse to rolling direction	≥ 3–12	430	680	22	200
TBL® 40	Hot-rolled strip	Transverse to rolling direction	≥ 3–12	470	750	20	220
TBL® 45	Hot-rolled strip	Transverse to rolling direction	≥ 3–12	510	825	17	240
TBL® 50	Hot-rolled strip	Transverse to rolling direction	≥ 3–12	620	880	17	260

Typical values may differ depending on testing position (beginning, middle or end of coil).

A_5 Percentage elongation after fracture using a proportional specimen with $L_0 = 5.65 \sqrt{S_0}$

Number of tests

Wide hot strip

The scope of testing has to be agreed when ordering.

Cut-to-length plate

Unless otherwise agreed upon in the order, the tests listed below will be performed during inspection:

Test	Scope of testing
1 tensile test	1 specimen per 40 t from each heat

Notes on application and processing

Heat treatment

Depending on the area of application, TBL® steels are hardened. They can be hardened in water, oil or polymer dispersion with no problems. The hardnesses achieved depend mainly on the chemical composition and the cooling rate during the hardening process. The maximum hardness depending on TBL® variant can be approximately 660 HBW (62 HRC).

Typical values for heat treatment

	Normalizing	Hardening	
		Austenitizing Duration ≥ 15 min.	Subsequent tempering Duration ≥ 30 min.
Steel grade			
TBL® 30	860–880 °C	860–880 °C	150–350 °C[1)]
TBL® 35	840–860 °C	840–860 °C	150–350 °C[1)]
TBL® 40	835–855 °C	835–855 °C	150–350 °C
TBL® 45	820–840 °C	820–840 °C	150–350 °C
TBL® 50	810–830 °C	810–830 °C	150–350 °C

[1)] Optional.

The desired hardness can be achieved with subsequent tempering. For the variants TBL® 40, TBL® 45 and TBL® 50, additional tempering is necessary and has to be taken into account.

Forming

TBL® steels are cold-formable in their delivery condition. Cold forming is only possible to a limited extent in the hardened state.

Welding and thermal cutting

Taking account of the carbon content, welding and thermal cutting are possible using the well-known methods.

All standard thermal cutting processes may be used to cut TBL® steels.

All hardenable TBL® boron steels can be welded either automatically or manually using any standard method. Preheating is effective in preventing cold cracking.

The instructions outlined in STAHL-EISEN-Werkstoffblatt 088 (weldable fine grain structural steels, processing directives, especially for welding) should be noted for TBL® steels.

Recommendations for welding are also given in DIN EN 1011 part 1 and part 2 – Welding, recommendation for welding of metallic materials.

Our technical experts can be consultated for any information beyond the scope of these instructions, in particular on first use.

Application examples

Agricultural machinery.

Disk harrows.

Blade disks.

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