

Steel

TBL[®]

Hardenable boron steels with excellent processing potential for high wear protection in special vehicles.



thyssenkrupp





Agricultural machinery and cement mixers can only operate cost-efficiently if their steel structures display high wear resistance. At the same time, manufacturers must be able to depend on steels for best possible processing characteristics. With our hardenable TBL[®] boron steel grades, you have the best of both worlds. TBL[®] steels are characterized by a high degree of purity and a good surface quality, ideal prerequisite for consistently high product quality. Their close-analysis tolerances ensure uniform hardening behavior and smooth-running production processes – to keep your customers highly satisfied.

TBL[®] steels from thyssenkrupp: wear resistance and process- ability in perfect combination.

TBL[®] steels 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 – not to mention reduced costs.

Advantages at a glance



High wear resistance
for longer service life



Flexible forming
with adjustable
characteristics



Consistently high qual-
ity of end products



Substantial cost
savings

High wear resistance. For consistently high product quality.

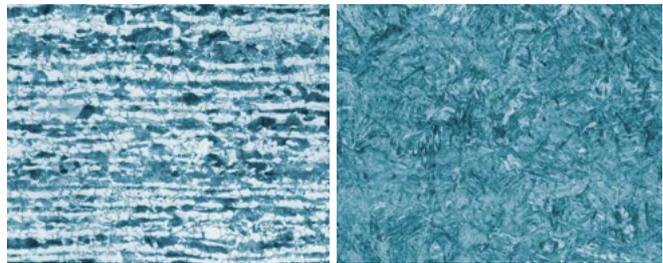
In delivery condition, thyssenkrupp TBL® steels already have excellent forming characteristics and good welding properties. Normally, they are hardened after being processed for use in agricultural machinery. And this is where the advantages of alloying with boron stand out: TBL® grades can be hardened in water, oil or polymer dispersion with no problems. This makes TBL® steels ideal for complex structures demanding high wear resistance, for instance in harrows, packers and plows. A wide range of different mechanical properties can be realized depending on the steel grade and heat-treatment conditions.

Impressive final hardnesses.

The maximum attainable hardness is 660 HBW (62 HRC) for TBL® steels. Ultimately, the hardnesses achieved depend mainly on the chemical composition and the cooling rate in the hardening process. The recommended austenitization temperature is 860–900 °C. Tempering after hardening is generally not necessary.

Effective even without hardening.

In the case of rather moderate wear applications, TBL® grades can also be successfully used in delivery condition, such as cement mixers. They owe these good wear properties to the microstructure developed during rolling, which is characterized by the presence of both hard and soft components – pearlite with ferrite.



The microstructure of TBL® shows both hard pearlite structures (dark areas) and soft ferrite components (light areas).

After hardening, the microstructure of TBL® is 100% martensite.

Delivery forms and dimensions of TBL® steels

Steel grade	Delivery form	Thickness ¹⁾ [mm]	Width ¹⁾ [mm]
		from _ to	min. _ max.
TBL® 30	Hot-rolled strip	2.50–15.00	1,000–2,000
TBL® 30	Cut-to-length plate	Dimensions on request ²⁾	
TBL® 35	Hot-rolled strip ²⁾	2.50–15.00	1,000–1,630
TBL® 35	Cut-to-length plate	Dimensions on request ²⁾	
TBL® 40	Hot-rolled strip ²⁾	3.00–12.00	1,000–1,630
TBL® 40	Cut-to-length plate	On request	
TBL® 50	Hot-rolled strip ²⁾	3.00–12.00	1,000–1,630
TBL® 50	Cut-to-length plate	On request	

Steel grades according to DIN EN ISO 683-2.

¹⁾ Not all thickness, width and length combinations are possible.

²⁾ 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.

TBL® steels are each supplied in normalized or normalized-rolled condition, the grades differing among others in their carbon content.

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® 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

Steel grade	Delivery form	Test direction	Thickness [mm]	Yield strength R _e [MPa]	Tensile strength R _m [MPa]	Elongation A ₅ [%]	Hardness in delivery condition [HBW]
TBL® 30 ¹⁾	Hot-rolled strip	Transverse to rolling direction	≥ 3 – 12	400	620	22	180
TBL® 35 ¹⁾	Hot-rolled strip	Transverse to rolling direction	≥ 3 – 12	430	680	22	200
TBL® 40 ¹⁾	Hot-rolled strip	Transverse to rolling direction	≥ 3 – 12	470	750	20	220
TBL® 50 ¹⁾	Hot-rolled strip	Transverse to rolling direction	≥ 3 – 12	620	880	17	260

¹⁾ Typical values may differ depending on testing position (beginning, middle or end of coil).

A₅ Percentage elongation after fracture using a proportional specimen with $L_0 = 5.65 \sqrt{S_0}$

Sample applications.

TBL® steels may be used for welded constructions, for instance in harrows, packers and plows in agricultural machinery as well as in cement mixers.



Excellent processing characteristics.

Hot forming.

For complex geometries, hot forming between 900 and 1,050 °C is recommended, followed by quenching in water, oil or polymer dispersion, each of which is associated with a different cooling rate. Where the geometry permits, air cooling can also be sufficient for achieving the desired final hardness.

Cold forming is also possible.

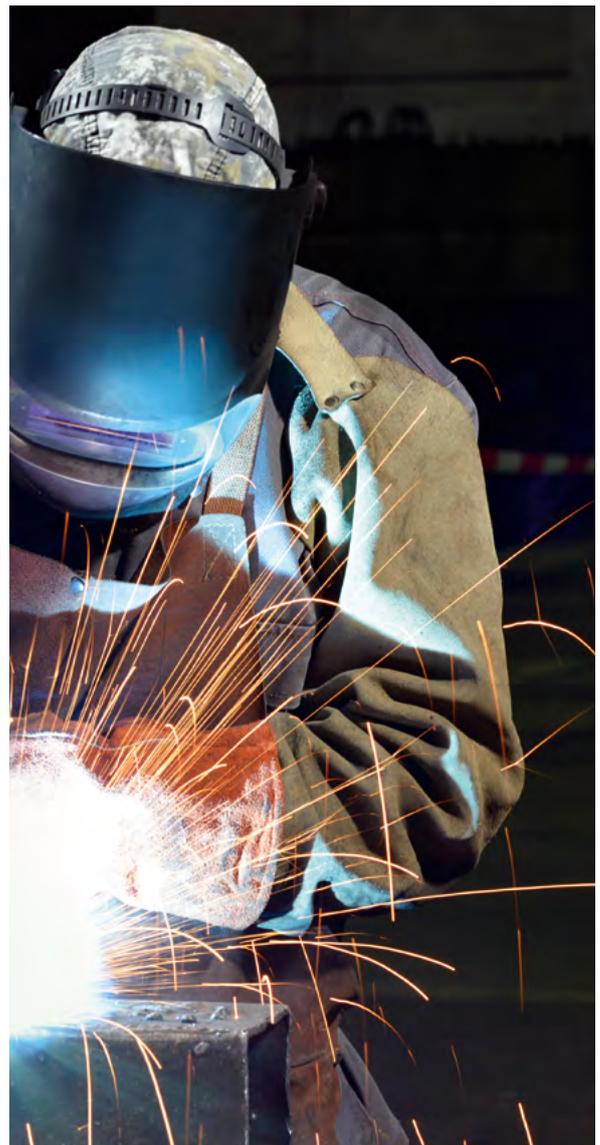
TBL® steels are cold-formable in their delivery condition. Cold forming is possible only to a limited extent in the hardened state.

Thermal cutting? No problem.

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

Excellent weldability.

Hardenable TBL® boron steels are characterized by their suitability for welding, and can be welded either automatically or manually using all commonly-used methods. Preheating is effective in preventing cold-cracking.



thyssenkrupp – a partner that understands its business. And yours.

Our mission is to advance your business – through sound advice, individual and innovative solutions and fulfillment of your specific needs. Our extensive technological know-how, gained over many years, makes this possible. As does our ability to see things the way you do. This enables us to develop an in-depth understanding of your business model. Our brand promise says it all: “engineering. tomorrow. together.” Because when it comes to finding successful solutions for tomorrow, the closer we cooperate the better.

Comprehensive advice.

To ensure that you get the best advice on the selection and processing of TBL® steels, our Technical Customer Service is at your disposal. They are 100% committed to offering you comprehensive assistance with regard to design and processing, answers to structure- and forming-related issues, product training, and of course technical support in optimizing fabrication processes.

Tailored service.

For high-quality logistics and processing, our global distribution network ensures rapid supply and just-in-time delivery of TBL® steels – in top quality and with excellent value for money. Close cooperation with our steel service centers additionally enables us to offer pre-fabricated, cold-formed or welded parts.

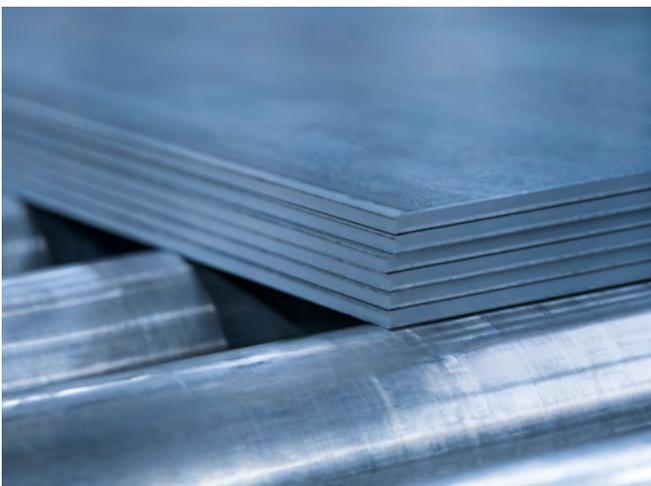
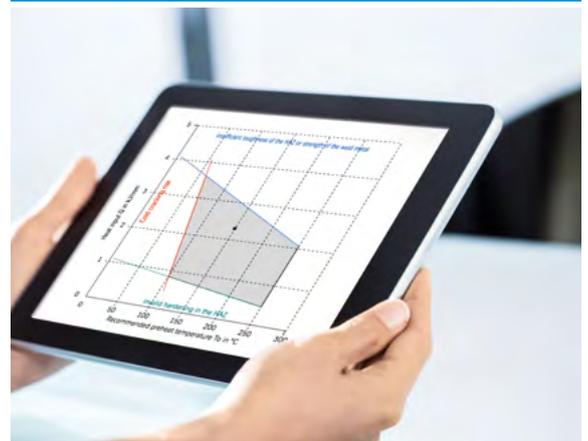
Practical virtual tool.

Naturally, you can find specific information about our special structural steels on our website:



www.thyssenkrupp-steel.com/en/cut-to-length-plate

This includes useful product information, processing recommendations and a direct line to your personal service representatives for sales and technical consulting. You can also access ProWeld, thyssenkrupp’s web-based application for welding calculations. After registering as a user, you can log in and use this tool for your projects at any time, free of charge.



General information: All statements as to the properties or utilization of the materials and products mentioned in this brochure are for the purpose of description only. Guarantees in respect of the existence of certain properties or utilization of the material mentioned are only valid if agreed in writing. Subject to technical changes without notice. Reprints, even extracts, only with the permission of thyssenkrupp Steel Europe AG.

Steel

thyssenkrupp Steel Europe AG
Kaiser-Wilhelm-Strasse 100
47166 Duisburg
P: +49 203 52-0
F: +49 203 52-25102
www.thyssenkrupp-steel.com
info.steel@thyssenkrupp.com

Industry

P: +49 203 52-75617
info.industry@thyssenkrupp.com

engineering.tomorrow.together.