Steel

Boron steels TBL and TBL Plus

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

thyssenkrupp

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Brief profile

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

Content

Available steel grades

TBL and TBL Plus is available as uncoated wide hot strip and quarto plate. Cut-to-length plates on request.

Steel grade designation and delivery form

	Delivery form		
	Hot-rolled strip	Cut-to-length plate	Quarto plate
Steel grade designation			
TBL [1]	●	○	●
TBL Plus	●	○	○

● Available
○ On request

[1] Analytically according to DIN EN 10083-3

Dimensions

		Thickness [2] [mm]	Width [2] [mm]
		from _ to	min. _ max.
Steel grade	Delivery form		
TBL	Hot-rolled strip	2.50 – 15.00	1,000 – 2,000
TBL Plus	Hot-rolled strip	2.50 – 15.00	800 – 1,630
TBL	Quarto plate	4.00 – 100.00	1,300 – 3,600

Length quarto plate: max. 19,000 mm

Other sizes on request.

[2] Not all thickness, width and length combinations are possible.

Comments

Wide hot strip [3] and cut-to-length plate can be ordered in pickled or non-pickled condition and with mill or trimmed edges.

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 10029 for quarto plates and on DIN EN 10051 for wide hot strip and cut-to-length plates.

Cut-to-length and quarto plates are supplied with a maximum flatness tolerance in accordance with DIN EN 10029, table 4.

For surface quality requirements of cut-to-length and quarto plates DIN EN 10163 is applicable.

[3] Not all thickness and width combinations are possible.

Technical characteristics

TBL and TBL Plus 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 [%]	Cr [%]	B [%]	Typ. CEV[4]	Typ. CET[5]
Steel grade									
TBL	0.24–0.31	≤0.40	1.10–1.40	≤0.020	≤0.010	≤0.50	0.0008–0.0040	0.55	0.41
TBL Plus	0.32–0.38	≤0.40	1.10–1.40	≤0.020	≤0.005	≤0.50	0.0008–0.0040	0.60	0.49

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

[4] CEV (%) = C + Mn / 6 + (Cr + Mo + V) / 5 + (Ni + Cu) / 15
[5] 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[1]	Hot-rolled strip	in rolling direction	3.00–8.00	400	620	22	180
TBL	Quarto plates	transverse in rolling direction	15	410	610	22	180
TBL Plus[1]	Hot-rolled strip	in rolling direction	4	430	680	22	200

[1] Depending on testing position (beginning, middle or end of coil) typical values may differ.

A 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 and quarto plate

Unless otherwise agreed upon in the order, the test 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 in the hardening process. The maximum attainable hardness is 560 HBW (55 HRC) for TBL Plus and 500 HBW (51 HRC) for TBL.

Typical values for heat treatmaent

	Normalising	Hardening	
	Subsequent to temperature equalisation, cooling in still air	Quenching in water	Quenching in oil
Steel grade			
TBL	870 – 920 °C	870 – 920 °C	900 – 950 °C
TBL Plus	820 – 870 °C	820 – 870 °C	860 – 910 °C

The desired hardness can be achieved with subsequent tempering.

Forming

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

Welding and thermal cutting

Considering the carbon content, welding and thermal cutting is possible appropriate to the well known methods.

All commonly used thermal cutting processes may be used to cut TBL and TBL Plus. Material of up to 20 mm thickness can be cut without preheating.

Both hardenable boron steels, TBL and TBL Plus can be welded either automatically or manually using all commonly-used methods. 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.

For any information beyond the scope of these instructions, in particular that on the first use, our technical experts are at the disposal of the purchaser.

Sample applications

Agricultural machinery.

Disc harrows.

Blade discs.

Concrete mixer.

Special mill grades are supplied subject to the special conditions of thyssenkrupp. Other delivery conditions not specified here will be based on the applicable specifications. The specifications used will be those valid on the date of issue of this product information brochure.

General information

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