

Steel

tubor®

Product information manganese-boron steels for precision steel tubes



thyssenkrupp

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Areas of application

Owing to their excellent forming behavior, thyssenkrupp steels of the tubor® range are very well suited for welded, cold-rolled or cold-drawn precision steel tubes.

The material features a homogeneous and fine-grained microstructure with a low sulfur and phosphor content. Segregations in the microstructure are reduced by means of special technical processes. Thanks to the combination of an optimized manufacturing process on the one hand and chemical analysis attuned to the end application on the other, the tubor® steel grades offer greater strength and an improved ductility after quenching and tempering.

In automotive manufacturing, precision steel tubes offer great potential for cost and weight reduction and are used among other things for stabilizers, piston rods in shock absorbers or driving shafts and camshafts.

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Available steel grades

tubor® is available as uncoated wide hot strip in the dimensions specified under “Available dimensions“.

Steel grade	Standard designation ¹⁾	Delivery form
tubor® 26	26MnB5	Hot-rolled strip, slit strip
tubor® 34	34MnB5	Hot-rolled strip, slit strip

¹⁾ Analytically according to DIN EN ISO 683-2 (previously DIN EN 10083-3).

Comments

tubor® steels delivered as wide hot strip is available with pickled and unpickled surface finishes as well as with mill edge or trimmed edge. Moreover, tubor® can be ordered as pickled or unpickled slit strip. tubor® steel grades can also be delivered annealed.

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.

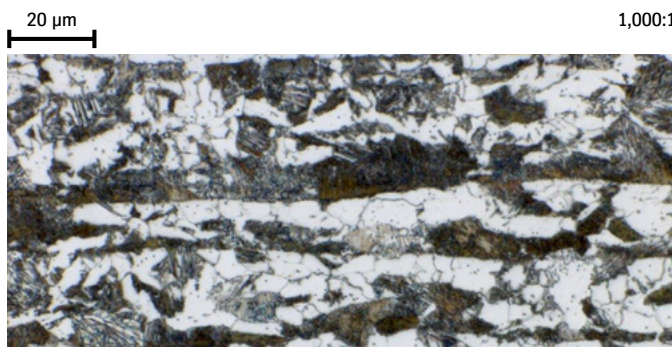
Material characteristics

tubor® steels are characterized by a homogeneous fine-grained microstructure. In the as-delivered condition (complies with as-rolled condition), the microstructure consists

typically of ferritic and pearlitic components. After hardening, the microstructure consists of 100% martensite.

Microstructure of tubor® 34 – etching with nital

As-delivered condition (comply with as-rolled condition)



Ferritic-pearlitic microstructure.



Ferritic-pearlitic microstructure.

Hardened condition
Quenched in oil



Microstructure consisting of 100% martensite.

Quenched in water



Microstructure consisting of 100% martensite.

Technical features

thyssenkrupp supplies MnB steels for precision steel tubes of the tubor® range with low sulfur and phosphorus contents. Customer-specific analyses are possible and must be agreed upon before the order is placed. For further information and advice, please contact our Technical Customer Service.

Chemical composition

Mass fractions in ladle analysis	C [%]	Si [%]	Mn [%]	P [%] max.	S [%] max.	Al [%]	Cr [%]	Ti [%]	B [ppm]
Steel grade									
tubor® 26	0.23–0.27	0.15–0.35	1.15–1.40	0.020	0.006	0.015–0.055	0.05–0.20	0.015–0.045	15–40
tubor® 34	0.33–0.37	0.15–0.35	1.15–1.40	0.020	0.006	0.015–0.055	0.05–0.20	0.020–0.050	15–40

Carbon equivalent, typical value

	CEV [%]
Steel grade	
tubor® 26	0.49
tubor® 34	0.58

$$CEV = C + Mn/6 + (Cu + Ni)/15 + (Cr + Mo + V)/5$$

Mechanical properties, typical values in as-received condition at room temperature

Test direction in rolling direction	Yield strength	Tensile strength	Elongation
	R _{p0.2} [MPa]	R _m [MPa] min.	A ₅ [%] min.
Steel grade			
tubor® 26	300–510	500–710	16
tubor® 34	340–650	550–870	14

R_{p0.2} Proof strength at 0.2% plastic elongation

R_m Tensile strength

A₅ Percentage elongation after fracture using a proportional specimen with L₀ = 5.65 √S₀ for sheet thicknesses ≥ 3.0 mm

Notes on application and processing

Heat treatment

The aim of heat treatment is to influence the microstructure and thus to obtain the mechanical and technological properties of a workpiece in line with requirements by heating and then cooling it. A detailed insight into the topics “hardening”, “quenching and tempering” and “austempering” can be found in the bulletin “Merkblatt 450 – Heat treatment of steel” of Wirtschaftsvereinigung Stahl.

Joining

Joining MnB-alloyed tubor® steels is possible in the as-delivered condition and after heat treatment in both same-grade and hybrid joints with other common steel grades. They can be welded both automatically and manually, using the commonly used methods.

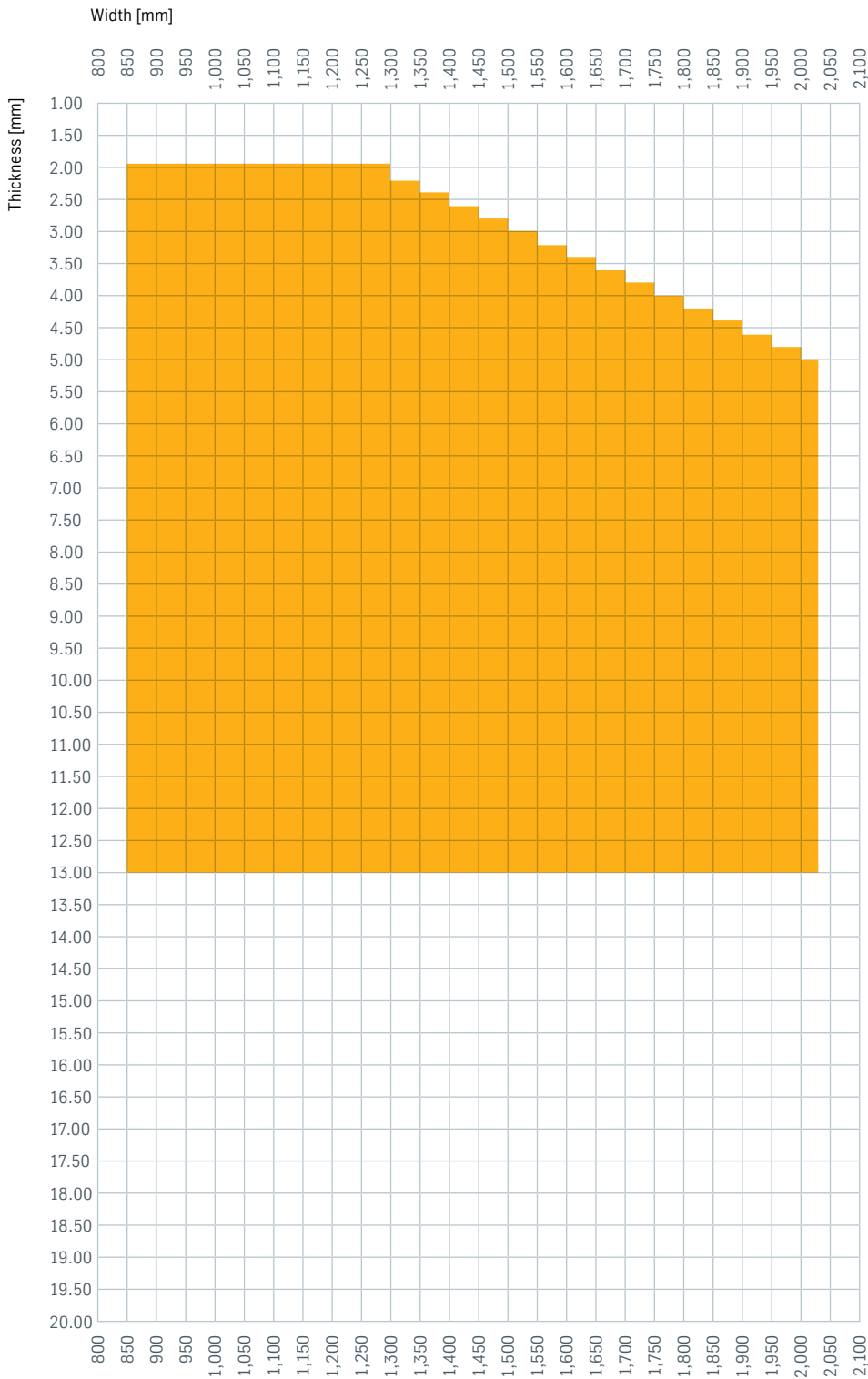
tubor® steels are suited for high-frequency welding (HF). The precondition is welding parameters matched to the material. Weldability and mechanical properties like hardness, strength and toughness of the joints mainly depend on the carbon equivalent and the heat-treated condition.

Resistance spot, inert gas and laser beam welding can also be used.

Available dimensions

Wide hot strip

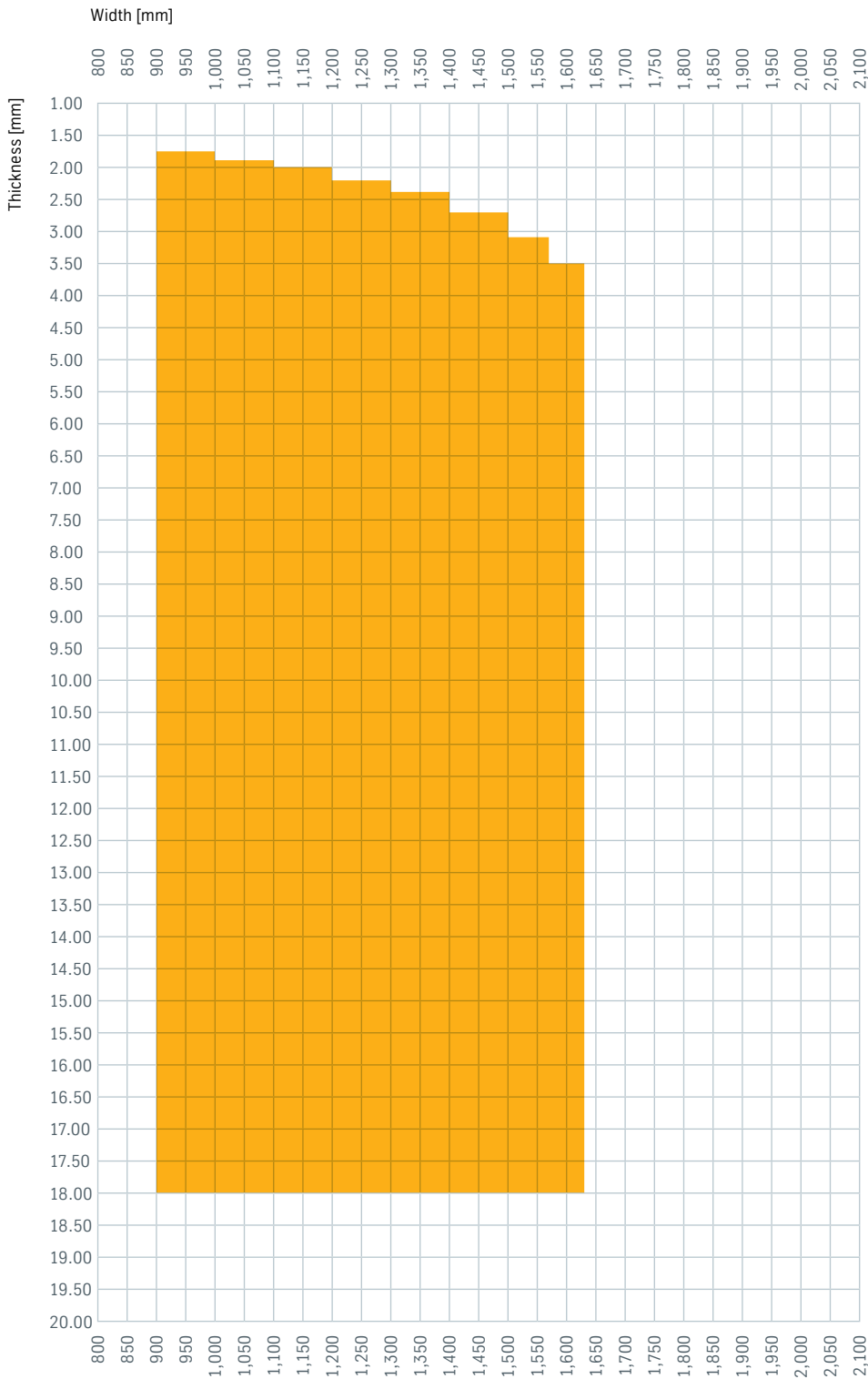
tubor® 26



Wide hot strip
Further dimensions on request.

Wide hot strip

tubor® 34



Sample applications



Stabilizer.



Camshaft.

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.

General information

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