

## 40MnB5

### Boron alloyed quenched and tempered steel

Werkstoffnummer	–
in Anlehnung an	DIN EN 10083-3
Festigkeitsklasse	C

#### General information

Steel grade 40MnB5 in accordance with DIN EN 10083-3 is one of the boron-alloyed quenched and tempered steels. These grades are characterized in particular by their formability in the hot rolled state and their high strength after the heat treatment. The strength characteristics after quenching and tempering are achieved in particular by the low boron content, in addition to the carbon and manganese. SZFG is currently delivering manganese-boron steels from 10MnB5 to 40MnB5.

#### Chemical composition <sup>1)2)</sup>

(in percent by weight)

	min. in %	max. in %
C	0.36	0.43
Si	0.15	0.35
Mn	1.05	1.45
P		0.02
S		0.005
Cr	0.35	0.60
Ti	0.020	0.055
B	0.0005	0.0050

1) Heat analysis

2) Deviating promises may be possible by arrangement.

#### Typical mechanical properties<sup>3)</sup>

Yield strength  $R_{p0.2}$  in MPa (thickness  $e \leq 6 / e > 6$ )  
390 - 780 / 400 - 760

Tensile strength  $R_m$  in MPa (thickness  $e \leq 6 / e > 6$ )  
650 - 950 / 640 - 890

Total elongation  $A_{80}^{4)}$  in %  
 $\geq 7$

Total elongation  $A_5^{4)}$  in % (thickness  $e \leq 6 / e > 6$ )  
 $\geq 11 / \geq 7$

3) Tested transverse to direction of rolling.

4) It applies to nominal thickness  $e$ :  
 $e < 3$  mm:  $A_{80}$   
 $e = 3$  mm:  $A_5$

#### Available dimensions

Hot-rolled coils unpickled, mill edge

Thickness in mm	Width in mm
2.00 – 2.24	900 – 1,400
2.25 – 2.49	900 – 1,450
2.50 – 2.99	900 – 1,500
3.00 – 3.99	900 – 1,680
4.00 – 12.70	900 – 1,750

Widths < 900 mm on request.

Hot-rolled slit strip

Thickness in mm	Width in mm
2.00 – 2.24	100 – 690
2.25 – 2.49	100 – 715
2.50 – 2.99	100 – 740
3.00 – 4.60	100 – 800
4.61 – 6.00	116 – 800
6.01 – 7.00	175 – 800
7.01 – 8.00	233 – 800

Widths < 100 mm on request.

#### Delivery form

The steel is produced as hot-rolled strip (pickled, unpickled) in nominal thicknesses from 2.0 to 12.7 mm in widths in accordance with the SZFG delivery program (strength class C). Additional thicknesses are also available upon agreement. SZFG uses a Ti-Cr concept. Where necessary, a statement of the required chemical analysis or inclusion of a customer specification is required.

The conditions of DIN EN 10083-3, Sections 6.3.1 and 8 apply to the delivery and inspection.

All quenched and tempered steels are delivered in a hot-rolled, untreated state.

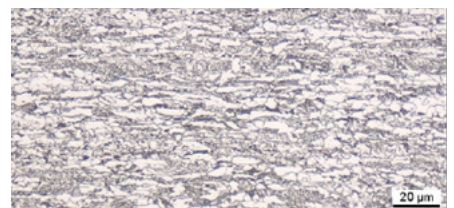
Inspection certificates in accordance with DIN EN 10204 can also be delivered in the following forms: computer medium, remote data transmission, fax, E-Mail, paper.

#### Microstructure

In the hot-rolled state, the 40MnB5 typically exhibits a ferritic-pearlitic microstructure with a typical grain size of > 9 according to ASTM.



200:1



500:1

In the hardened and tempered state, after suitable heat treatment the manganese-boron steels form a microstructure consisting of 100% martensite:



Hardened state, water cooled 200:1



Tempered state, water cooled 200:1



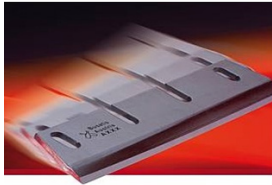
Tempered state, oil cooled 200:1

### Example applications

Thanks to the combination of ductility and hardness, the 40MnB5 is particularly used for agricultural products.



Example:  
harvester blades



Example: chopper blades



### Welding

The manganese-boron steels are suitable for welding with all known welding procedures, either by hand or with automatic systems. Resistance spot welding, gas-shielded welding and laser beam welding are particularly applicable. The steels are also suitable for welding in mixed joints with other common steel grades and in different thicknesses. The quality of the welded joint, however, depends on the welding procedure, the welding conditions and the selection of the correct filler materials.

In addition, it must be noted that when welding these steels in the quenched and tempered state, tempering effects can occur in the joining zone. This can reduce the strength of the joint compared to the base material that was strongly solidified by the preceding hot-forming process.