

Quenched and tempered special structural steel	Steel grade		Material No.	Material Specification
	TKSE-Short name	EN-Short name		
Heavy plate	XABO[®] 1100	-	1.8942	247 August 2018

Scope

This Material Specification applies to liquid quenched and tempered heavy plates made of the high strength special structural steel XABO[®] 1100, which are available as standard in thicknesses from 4 to 20 mm (larger thicknesses up to 40 mm on request).

Application

The steel may be used at the discretion of the purchaser for welded constructions of all kinds such as transport vehicles, mobile cranes, hoistings, mining equipment etc.

The entire processing technique is of fundamental importance for the good performance of the products made of this steel. The processor must assure himself, that his methods of calculation, designing and working conform with the material to be used, meet the latest requirements of technical progress, and are suited to the proposed application. Due consideration must be given to relevant construction specifications.

The selection of the material is left up to the purchaser.

Chemical composition (heat analysis, %)

C	Si	Mn	P	S	Cr	Mo	Ni	V
≤ 0.20	≤ 0.5	≤ 1.7	≤ 0.020	≤ 0.005	≤ 1.5	≤ 0.7	≤ 2.5	≤ 0.12

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

Delivery condition: quenched and tempered (see paragraph "Heat treatment")

Mechanical properties in the delivery condition at room temperature (transverse test specimens acc. to ISO 6892-1, method B).

Minimum yield strength R_{eH} ^{*)} MPa ¹⁾	Tensile strength R_m MPa	Minimum elongation A %
1100	1200 - 1500	8

^{*)} If continuous yielding occurs, the yield strength is determined as $R_{p0,2}$

¹⁾ 1 MPa = 1 N/mm²

Impact energy in the state of delivery condition (Charpy V-specimens according to ISO 148-1)

Specimen direction	Impact energy KV in J at a test temperature of - 40 °C
longitudinal	30
transverse	27

The values stated for the impact energy are minimum values obtained as the average of 3 specimens, no single value being less than 70 % of the values stated in the table. For plate thicknesses < 40 mm the specimens are taken near the surface and for 40 mm they are taken at a distance of ¼ of the plate thickness. For thicknesses < 10 mm the impact energy value is reduced proportionally to the specimen width (product thickness).

According to EN 10025-1 impact tests are not required for nominal thickness < 6 mm.

Number of tests

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

1 tensile test	1 test specimen from one end of each plate
1 notched bar impact test (3 specimens)	1 set specimens from one end of each plate at a specified specimen direction to be agreed in the order. If no mention is made in the order, the impact energy will be determined on transverse specimens.

General processing information

For those who process this steel for the first time, it is recommended to consult the steel supplier to take advantage of the experiences gathered so far.

The general information stated below can cover only a few of important points.

The instructions outlined in STAHL-EISEN-Werkstoffblatt 088 (weldable fine grain structural steels, processing directives especially for welding) apply equally to XABO[®] 1100.

Recommendations for welding are also given in EN 1011 part 1 and part 2 - Welding, Recommendation for welding of metallic materials-.

It is specifically stated, that the processing of the steel at temperatures above 250 °C is to avoid, because the steel can lose its excellent characteristics at higher temperatures.

Cold forming

The steel is generally processed cold. An additional heat treatment to reduce the effects of cold forming and to improve the ductility, which has been impaired due to the cold forming, only is possible to a maximum temperature of 250 °C.

Hot forming

Hot forming basically is possible. Such an operation, however, will remove the effect of the original heat treatment. Therefore, after hot forming it is necessary to perform a heat treatment equivalent to that of the state of delivery condition.

Heat treatment

In general the steel obtains its mechanical properties through austenitization followed by conventional quenching and tempering. Direct quenching after hot rolling followed by tempering is considered equivalent to conventional quenching and tempering according to EN 10025-6. The heat treatment is governed by the chemical composition and the thickness of the material. Information on this can be obtained from the manufacturer.

Thermal cutting

Under suitable conditions flame cutting is possible without any difficulty. The processing conditions correspond to unalloyed or alloyed steels. The surface condition of the plates exerts a substantial influence on the flame cutting parameters and the attainable quality of the cut edge. In cases where a higher quality for the flame cut surface is required, then it is recommended to clean the upper and lower sides of the cutting edge. In that case rust, scale and other kinds of dirt must be removed.

In order to avoid cold cracking, for plate thicknesses > 20 mm it is recommended to preheat a zone of around 100 mm wide to about 150 °C before flame cutting.

For workpiece temperatures below 5 °C and also if the flame cut edges are to undergo cold forming in the course of further processing it is advisable to preheat the material to about 150 °C before flame cutting.

Welding

If due consideration is given to the general rules for welding, this steel is weldable both manually and automatically. The manual arc welding and the gas shielded arc welding procedures are preferably used. Depending on plate thickness, hydrogen content of the weld metal and heat input the welding may be carried out under preheating. The recommendations of the STAHL-EISEN-Werkstoffblatt 088 should be followed. The working temperature should not go beyond 250 °C.

It is specifically stated, that with presently available welding consumables equal strength properties in the weld compared to the base material cannot always be achieved. To prevent cold cracking in the welded joints only welding consumables giving welds with very low hydrogen content should be used. A high cooling rate in the weld region should be avoided. Detailed information is given in our recommendations for welding and our processing brochures.

To ensure, that the steel properties are not impaired to an inadmissible extent by thermal cycles during welding, an upper limit for the heat input has to be fixed. The heat input for welding is governed by the welding process, the plate thickness, the preheating temperature, the form of the welding seam and the requirements imposed on the construction.

General information

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

The admissible tolerances are based on EN 10051 for plates cut from hot strip and EN 10029 for four-high mill plates, unless other terms have been agreed upon.

The plates will be supplied with a maximum flatness tolerance according to EN 10029, table 4, steel type H. Smaller flatness tolerances can be agreed upon at the time of ordering.

For surface quality requirements EN 10163 is applicable.

At the time of ordering it is possible to make further agreements with regard to the testing conditions.

As per special agreement it is possible to supply plates descaled or descaled and primed.

Publisher`s addresses

EN-, ISO Standards

Beuth Verlag GmbH, Postfach, D-10772 Berlin

STAHL-EISEN-Werkstoffblätter

Verlag Stahleisen GmbH, Postfach 10 51 64, D-40042 Düsseldorf

ThyssenKrupp Steel Europe brochures

ThyssenKrupp Steel Europe AG , D-47161 Duisburg

„Processing of Quenched and Tempered
Special Structural Steels“

“Recommendations for thermal cutting
of XABO[®] 1100”

“Recommendations for welding
of XABO[®] 1100”

“Quenched and tempered N-A-XTRA[®]
and XABO[®] steels - for lighter living”

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