



Wear-resistant special structural steel	Steel grade		Material No.	Material Specification
	TKS-Short name	EN-Short name		
Heavy plate	XAR[®] 600	-	1.8735	705 February 2004

Scope

This Material Specification applies to 4 to 40 mm thick plates of wear-resistant special structural steel XAR[®] 600. The extraordinary high resistance to abrasion of XAR[®] 600 results from a special water quenching process.

Application

The steel may be used at the discretion of the purchaser for wear-exposed structures, e.g. excavating, mining and earth-moving machinery, truck dump bodies, conveying, crushing and pulverizing equipment and scrap presses.

The processing and application techniques as a whole are of fundamental importance for the successful use of the products fabricated of this steel. The processor/fabricator must assure himself, that his design and work methods are appropriate for the material, are state-of-the-art and are suitable for the envisaged purpose.

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

Chemical Composition (heat analysis, %)

C	Si	Mn	P	S	Cr	Mo	Ni	Nb	B
≤ 0.40	≤ 0.80	≤ 1.50	≤ 0.025	≤ 0.010	≤ 1.50	≤ 0.50	≤ 1.50	≤ 0.050	≤ 0.005

The steel is produced with a fine-grained structure. The nitrogen is fixed as nitrides by means of aluminium and, where applicable, titanium.

Delivery condition: annealed or quenched respectively quenched and tempered (see paragraph "Heat treatment").

Hardness at room temperature in annealed condition: ≤ 300 HBW
in quenched resp. quenched and tempered condition: > 550 HBW

The Brinell hardness shall be determined in accordance with ISO 6506.

Properties typical of 15 mm plate thickness

Carbon equivalent CET (%)	$[CET = C + (Mn + Mo) / 10 + (Cr + Cu) / 20 + Ni / 40]$: 0.53
Carbon equivalent CE (%)	$[CE = C + Mn / 6 + (Cr + Mo + V) / 5 + (Ni + Cu) / 15]$: 0.79
Yield strength (MPa) ^{*)}		: 1700
Tensile strength (MPa)		: 2000
Elongation at fracture A (%)		: 8
Notch-bar impact energy at - 20 °C on Charpy V-longitudinal test specimens (J)		: 20

^{*)} 1 MPa = 1 N/mm²

Number of tests

Unless otherwise agreed upon in the order, the Brinell hardness shall be determined from each heat. The hardness shall be measured roughly 1 mm below the surface.

General processing information

Prior to any processing, it is advisable to make use of the information available from the steel producer in order to draw on that experience for the processing.

The following information can deal with only a few essential points. Recommendations for welding are also given in EN 1011 part 1 and part 2 - Welding, Recommendation for welding of metallic materials -.

It is left to the discretion of the processor/fabricator to decide which of the familiar precautions must be adopted to avoid cracking during thermal cutting and welding under the prevailing construction and fabrication conditions.

Machinability

In spite of its high wear resistance, the steel exhibits good machinability if sufficiently heavy machine-tools and sharp carbide-tipped tools are used. The feed rate and cutting speed have to be adjusted to the high hardness of the material.

Heat treatment

Plates of the XAR[®] 600 grade receive the required properties as a result of austenitizing and follow-on quenching in special facilities and, where applicable, tempering below A_{c1} . The heat treatment depends on the chemical composition and the product thickness. To avoid hardness losses, the steel must not be heated above 250 °C.

Thermal cutting

Preferably the flame-cutting process is used. For small product thicknesses, however, the plasma cutting process is used in the interest of minimum distortion.

In order to avoid cold cracking, preheating to about 125 °C is recommended when flame-cutting thicknesses up to around 20 mm. For the flame-cutting of thicker plates a temperature of 175 °C is recommended.

Welding

If due consideration is given to the general rules for welding, XAR[®] 600 is weldable both manually and automatically. Preferably, the MAG-welding method is used. To prevent cold cracking in the welded joints only welding consumables giving welds of very low hydrogen content should be used.

To avoid cold cracking in the welded joints, the use of welding consumables with austenitic filler metals is recommended. Preheating is not generally necessary for welding with austenitic filler metals.

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 plus 3 mm per meter. Smaller flatness tolerances can be agreed upon at the time of ordering.

For surface quality requirements EN 10163 is applicable.

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

Publisher's addresses

EN-, ISO Standards

Beuth Verlag GmbH, P.O., D-10772 Berlin

ThyssenKrupp Steel brochures
"Wear-Resistant Steel plate
Processing Recommendations"

ThyssenKrupp Steel AG , D-47161 Duisburg

"XAR[®] steels - ThyssenKrupp Stahl's
solution to your wear problems"