

Steel

XAR[®]

Product information for wear-resistant steels



thyssenkrupp

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Profile

XAR[®] steels from thyssenkrupp are wear-resistant steels with excellent workability and exceptionally high toughness. XAR[®] stands for "eXtra Abrasion Resistant". Hardnesses of 400 and 450 HBW and sheet thicknesses from 4.0 to 8.0 mm make these steels ideal for a wide range of applications, from moderate wear to heavy abrasion.

Modern, low carbon equivalent alloying concepts that are optimally matched to the thickness range ensure good cutting and welding properties.

These steels are ideal for applications subject to wear such as:

1. Tipper bodies
2. Agricultural machinery
3. Snowplow blades
4. Laser-cut parts
5. Scrap containers

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Available steel grades

XAR® steels are available as cut-to-length sheet in nominal hardnesses of 400 and 450 HBW and in the sizes listed under “Available sizes”.

XAR® family overview			
	Material number	Special feature	Delivery form
Name of steel grade			
XAR® 400	1.8714	Guaranteed toughness	Cut-to-length sheet
XAR® 450	1.8722	Guaranteed toughness	Cut-to-length sheet

Remarks

Permissible dimensions and shape tolerances for cut-to-length sheet are based on DIN EN 10051.

Cut-to-length sheet is supplied with maximum flatness tolerances in accordance with DIN EN 10029, Table 5, steel group H. Closer flatness tolerances can be agreed upon ordering.

Surface quality requirements for cut-to-length sheet are set out in DIN EN 10163. Cut-to-length sheet is supplied untrimmed as standard.

Unless otherwise agreed in the order, the provisions of DIN EN 10021 apply for delivery.

Available sizes

Cut-to-length sheet		
	Thickness [mm]	Max. width [mm]
Name of steel grade		
XAR® 400	$4,0 \leq t \leq 8,0$	1.500
XAR® 450	$4,0 \leq t < 6,0$	1.500
	$6,0 \leq t \leq 8,0$	1.600

Length: Min. 2.000 mm, max. 16.000 mm.
Further sizes on request.

Technical features

Chemical composition

Name of steel grade	Mass fraction in ladle analysis									Typical carbon equivalent	
	C [%] max.	Si [%] max.	Mn [%] max.	P [%] max.	S [%] max.	Cr [%] max.	Mo [%] max.	B [%] max.	Ni [%] max.	CE [%]	CET [%]
XAR® 400	0,20	0,80	1,50	0,020	0,010	1,00	0,50	0,005	1,50	0,36	0,26
XAR® 450	0,22	0,80	1,50	0,020	0,010	1,30	0,50	0,005	1,50	0,41	0,30

CE [%] = $C + Mn/6 + (Cr + Mo + V)/5 + (Ni + Cu)/15$

CET [%] = $C + (Mn + Mo)/10 + (Cr + Cu)/20 + Ni/40$

The steel has a fine-grain microstructure. The nitrogen is bound as nitrides with Al as well as Nb or Ti where applicable.

Mechanical properties – testing in direction of rolling, as-delivered condition: thermomechanically rolled with accelerated cooling

Name of steel grade	Brinell hardness	Impact energy		Yield strength	Tensile strength	Elongation
	[HBW]	KV min. [J] at -20 °C	KV typ. [J] at -40 °C	R _{p0,2} typ. [MPa]	R _m typ. [MPa]	A typ. [%]
XAR® 400	370–430	27	45	1.100	1.300	11
XAR® 450	420–480	27	40	1.200	1.450	10

The Brinell hardness is determined in accordance with DIN EN ISO 6506, measured approx. 1 mm below the sheet surface.

Notch impact testing to DIN EN ISO 148-1 is carried out on longitudinal samples from the area of the product surface. The minimum values represent an average of three samples, for which no single value may be less than 70% of the prescribed value.

For thicknesses below 10 mm the impact energy value stated in the table decreases in proportion to the sample width (product thickness). No notch impact tests are carried out on products of less than 6 mm thickness.

Tensile testing is carried out on longitudinal samples at room temperature in accordance with DIN EN ISO 6892-1, method B.

Scope of testing

Unless otherwise agreed when ordering, the following scope applies for acceptance testing:

Scope of testing		
	Hardness	Impact energy (1 set = 3 samples)
Name of steel grade		
XAR® 400	Min. 1 x per Coil	Thickness: ≥ 6 mm: mind. 1 x per Coil
XAR® 450	Min. 1 x per Coil	Thickness: ≥ 6 mm: mind. 1 x per Coil

Notes on use and processing

The following notes can only address a few key points. More detailed recommendations are contained in the brochure “Wear-resistant steels XAR® – Processing recommendations” and in more general terms in “STAHL-EISEN-Werkstoffblatt 088”.

Our technical customer service team will

be pleased to help with questions on processing.

Processors must ensure that their calculations for design and manufacture are appropriate to the material, in line with the state of the art and suitable for the intended purpose.

The customer is responsible for the choice of material.

Cold forming

XAR® steels are readily suitable for cold bending, taking into account their high hardness. Under favorable conditions (e.g. deburred and notch-free edges, slow forming,

die lubrication), crack-free forming is possible with the following minimum bending radii and die widths:

Minimum bending radii and die widths for cold forming					
	Nominal thickness [mm]	r/t ⊥	r/t II	W/t ⊥	W/t II
Name of steel grade					
XAR® 400	4,0–8,0	3,0	4,0	10,0	10,0
XAR® 450	4,0–8,0	4,0	4,5	10,0	12,0

⊥ = bending line perpendicular to rolling direction; II = bending line in rolling direction; W = die width; r/t = radius/nominal thickness

Machining

Despite their high wear resistance, XAR® steels are readily machinable using suitable machine tools and sharp carbide tools. Feed rate and cutting speed must be adapted to the hardness of the steel.

Heat treatment

To avoid loss of hardness, the steel must not be heated above 250 °C.

Thermal cutting

The optimized analysis concepts with low carbon equivalent (see “Chemical composition”) ensure good cutting and welding properties. Depending on sheet thickness, the following thermal cutting methods can be used with XAR® steels: plasma cutting, laser cutting, oxy-fuel cutting. No preheating is required for welding or cutting. Processors themselves must decide on additional precautions to avoid cracking during thermal cutting and welding under the given design and manufacturing conditions.

Welding

If generally accepted good engineering practice is observed, XAR® steels are suitable for both manual and automated welding. Information on welding is contained in DIN EN 1011 parts 1 and 2, in our processing recommendations, and online in our ProWeld welding calculator.

Sample applications



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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