



## durostat 400/450 toughcore

### **Wear-resistant steels with especially high toughness and best processing properties**

durostat 400 toughcore and durostat 450 toughcore are special steels with a hardness of roughly 400 HB and 450 HB and excellent toughness, even at low application temperatures.

#### **durostat 400 toughcore**

durostat 400 toughcore offers significant advantages when compared to conventional wear-resistant steels with respect to surface hardness and toughness. The unique combination of high hardness and excellent toughness properties down to a temperature of minus 40 °C is not achievable when conventional manufacturing technologies are used. The toughcore® process makes it possible to shift current limits and to match the most effective material properties.

#### **durostat 450 toughcore**

The new and patented toughcore® manufacturing technology maintains the same hardness while significantly improving the toughness of durostat 450 to a level not achieved by conventional wear-resistant steels. Their exceptional toughness results in a higher level of safety and can be used in applications where conventional materials meet their limits.

durostat 400 toughcore and durostat 450 toughcore steels are particularly suitable for applications marked by high mechanical stress and heavy abrasion, especially at low operating temperatures. The exceptional properties are achieved by the unique toughcore® manufacturing technology. State-of-the-art alloying and low carbon content guarantee excellent weldability.

#### **Convincing advantages**

- » Longer service life with much higher resistance to wear
- » Guaranteed toughness for low temperature applications
- » Weight savings due to reduced plate thickness as a result of high hardness
- » Good surface quality due to thinner, more easily removable rolling scale
- » Good weldability with elimination of preheating for small plate thicknesses

## Chemical composition

Heat analysis in mass %

Steel grade	C max.	Si max.	Mn max.	P max.	S max.	Al <sub>tot.</sub> min.	Cr max.	Mo max.	B max.	Ti max.	Ni max.
durostat 400 toughcore	0.18	0.60	2.10	0.025	0.010	0.020	1.00	0.70	0.005	0.050	0.40
durostat 450 toughcore	0.23	0.60	2.10	0.025	0.010	0.020	1.00	0.70	0.005	0.050	0.40

The steel is fine grain melted and may contain microalloying elements such as Nb and V.

## Carbon equivalent

Steel grade	Plate thickness [mm]	Mass percentages [%]	
		CEV <sup>1)</sup> max.	CET <sup>2)</sup> max.
durostat 400 toughcore	20 ≤ 35	0.52	0.35
	> 35 ≤ 45	0.57	0.37
	> 45 ≤ 90	0.70	0.40
durostat 450 toughcore	20 - 40	0.59	0.39

<sup>1)</sup> CEV = C + Mn/6 + (Cr + Mo + V)/5 + (Ni + Cu)/15, according to IIW

<sup>2)</sup> CET = C + (Mn + Mo)/10 + (Cr + Cu)/20 + Ni/40, according to SEW 088

## Mechanical properties: Hardness/Tensile strength

Steel grade	Hardness [HB]	Standard values <sup>1)</sup>			
		Hardness [HB]	Yield strength R <sub>eH</sub> [MPa]	Tensile strength R <sub>m</sub> [MPa]	Fracture elongation A <sub>5</sub> [%]
durostat 400 toughcore	360 - 440	400	1,000	1,250	10
durostat 450 toughcore	410 - 490	450	1,100	1,400	9

<sup>1)</sup> Typical values for plate thickness of 20 mm

**Mechanical properties: Notch impact energy/Edging radii**

Steel grade	Plate thickness [mm]	Notch impact energy <sup>1)</sup> -40 °C, transverse min. [J]	Edging radii Ri min. at 90° edging (s = plate thickness) Position of the bending edge to the rolling direction	
			Longitudinal	Transverse
<b>Guaranteed values</b>				
durostat 400 toughcore	20 - 90	40	-	-
durostat 450 toughcore	20 - 40	27	-	-
<b>Standard values</b>				
durostat 400 toughcore	20 - 45	80	4 s	3 s
	> 45 - 90	60		
durostat 450 toughcore	20 - 40	50	5 s	4 s

<sup>1)</sup>The mean value from 3 individual samples must reach the specified requirements. No individual value may be below 70% of the guaranteed mean value. For thicknesses < 12 mm, subsize-specimen with dimensions of 10 x 7.5 mm or 10 x 5 mm are tested. The guaranteed value is reduced in proportion to the sample cross-section.

**Available dimensions**

Maximum width per thickness; minimum width 1,500 mm

Steel grade	Plate thickness [mm]	Max. width [mm]	Max. length [mm]	As-delivered condition
durostat 400 toughcore	20 - 90	3,000	12,000	toughcore®
durostat 450 toughcore	20 - 40			

Weight per plate is max. 16 t.  
Detailed dimensions on request.

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