



## 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.

#### 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



Premium quality  
with reduced carbon footprint

**durostat®**  
greentec steel

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.

## 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.

# OUR PATH TO A GREENER FUTURE

## Premium products in the greentec steel Edition

With greentec steel, voestalpine is pursuing an ambitious step-by-step plan in the long-term decarbonization of steel production. The declared objective is to achieve carbon-neutral production by 2050, and the initial steps have already been taken. Process-optimized production operations already prevent up to 10% of the direct CO<sub>2</sub> emissions at the Linz site. The material and processing properties of the steel are not affected in any way in this production route. Each voestalpine heavy plate product is available in premium quality in the greentec steel Edition with a reduced carbon footprint and unique benefits.



Premium quality with reduced carbon footprint

**durostat®**  
greentec steel

Heavy plates (excl. heads and clad plates) – greentec steel Edition

Max. carbon footprint 2.21 kg CO<sub>2</sub>e per kg of steel <sup>1)</sup>

<sup>1)</sup> per EN 15804+A2 (EPD methodology) cradle to gate

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