

# HOT WORK TOOL STEELS

## Available Product Shapes

Long Products

Open Die Forgings

## Product Description

Vacuum remelted hot work tool steel with high temper resistance and therefore maximum resistance to heat checking.

## Properties

- High toughness & ductility
- High wear resistance
- Good machinability
- High hot hardness
- Mirror finish polishability
- Very high thermal conductivity
- Very high micro-cleanliness
- High resistance to fire cracking
- Excellent homogeneity and isotropy
- Coatable
- Lowest levels of unwanted trace elements
- Can be nitrated
- Very high thermal stability

## Applications

- > Extrusion
- > Gravity / Low Pressure Die-Casting
- > Press Hardening / Hot Stamping
- > Forging (Hot / Semi-hot)
- > High Pressure Die-Casting
- > Progressive Forging (Hatebur)
- > General Components for Mechanical Engineering
- > Injection Molding
- > Mechanical Engineering / Machine Building General

## Technical data

Material designation		Standards	
~1.2367	SEL	#207	NADCA
~X38CrMoV5-3	EN		
C1885	NADCA		

## Chemical composition (wt. %)

C	Si	Mn	Cr	Mo	V
0.38	0.2	0.25	5	2.8	0.65

**Material characteristics**

	High temperature strength	High temperature toughness	High temperature wear resistance	Machinability
<b>BÖHLER W403</b> <b>VMR</b>	★★★★	★★★★	★★★★	★★★★
<b>BÖHLER W300</b> <b>ISOBLOC</b>	★★	★★★★	★★	★★★★★
<b>BÖHLER W300</b> <b>ISODISC</b>	★★	★★★	★★	★★★★★
<b>BÖHLER W302</b> <b>ISOBLOC</b>	★★★	★★★★	★★★	★★★★★
<b>BÖHLER W302</b> <b>ISODISC</b>	★★★	★★★	★★★	★★★★★
<b>BÖHLER W303</b> <b>ISODISC</b>	★★★★	★★★	★★★★	★★★★★
<b>BÖHLER W350</b> <b>ISOBLOC</b>	★★★	★★★★★	★★★	★★★★★
<b>BÖHLER W360</b> <b>ISOBLOC</b>	★★★★★	★★★★	★★★★★	★★★★★
<b>BÖHLER W400</b> <b>VMR</b>	★★	★★★★★	★★	★★★★

**Delivery condition**

<b>Annealed</b>	
Hardness	max. 205 HB

**Heat treatment**

<b>Annealing</b>		
Temperature (°C   °F)	800   1472 to 850   1562	Slow controlled cooling in furnace at a rate of 10 to 20 °C/hr (50 to 68 °F/hr) down to approx. 600 °C (1110 °F), further cooling in air.
<b>Stress relieving</b>		
Temperature (°C   °F)	600   1112 to 650   1202	Slow cooling in furnace. To relieve stress caused by extensive machining, or for complex shapes. Soak for 1 - 2 hours after temperature equalization (in neutral atmosphere).
<b>Hardening and Tempering</b>		
Temperature (°C   °F)	1020   1868 to 1030   1886	Oil, salt bath (500 - 550 °C [930 - 1020 °F]), air or vacuum with gas quenching. Holding time after temperature equalization: 15 to 30 minutes. In order to prevent coarsening of the grain, hardening must be carried out at the recommended temperature of 1020 - 1030 °C (1870 - 1885 °F). After hardening, tempering to the desired working hardness, see tempering chart.

## Physical Properties

Temperature (°C   °F)	20   68
Density (kg/dm <sup>3</sup>   lb/in <sup>3</sup> )	7.85   0.28
Thermal conductivity (W/(m.K)   BTU (IT) ft/hr/ft <sup>2</sup> /F)	29.8   17.22
Specific heat (J/(kg.K)   BTU (IT) lb/F)	470   112.26
Spec. electrical resistance (Ohm.mm <sup>2</sup> /m   10 <sup>-4</sup> Ohm.inch <sup>2</sup> /ft)	-
Modulus of elasticity (10 <sup>3</sup> N/mm <sup>2</sup>   10 <sup>3</sup> ksi)	211   30.66

## Thermal Expansions

Temperature (°C   °F)	100   212	200   392	300   572	400   752	500   932	600   1112
Thermal expansion (10 <sup>-6</sup> m/(m.K)   10 <sup>-6</sup> inch/(inch.F))	10.63   5.906	10.83   6.017	12   6.667	12.92   7.178	14.13   7.85	14.34   7.967

For more information see [www.voestalpine.com/boehler-edelstahl](http://www.voestalpine.com/boehler-edelstahl)

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MATERIALS | MACHINING | PVD COATINGS | ADDITIVE



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