BÖHLER

BÖHLER W403
VMR®

HOT WORK TOOL STEELS

Available Product Variants

Long Products | Open Die Forgings

Product Description

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

Process Melting

Airmelted + VAR

Properties

- Toughness & Ductility: high
- Wear Resistance: high
- Machinability: good
- Hot Hardness (red hardness): high
- Polishability: very high
- Thermal conductivity: very high
- Micro-cleanliness: very high

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

Technical data

Material designation	
~1.2367	SEL
~X38CrMoV5-3	EN
C1885	NADCA

Standards	
#207	NADCA

Chemical composition (wt. %)

C	Si	Mn	Cr	Mo	V
0.38	0.20	0.25	5.00	2.80	0.65

Material characteristics

	High temperature strength	High temperature toughness	High temperature wear resistance	Machinability
BÖHLER W403 VMR®	★★★★	★★★★	★★★★	★★★★
BÖHLER W300 ISOBLOC®	★★	★★★★	★★	★★★★★
BÖHLER W300 ISODISC®	★★	★★★	★★	★★★★★
BÖHLER W302 ISOBLOC®	★★★	★★★★	★★★	★★★★★
BÖHLER W302 ISODISC®	★★★	★★★	★★★	★★★★★
BÖHLER W303 ISODISC®	★★★★	★★★	★★★★	★★★★★
BÖHLER W350 ISOBLOC®	★★★	★★★★★	★★★	★★★★★
BÖHLER W360 ISOBLOC®	★★★★★	★★★★	★★★★★	★★★★★
BÖHLER W400 VMR®	★★	★★★★★	★★	★★★★

Delivery condition

Annealed

Hardness (HB)	max. 205

Heat treatment

Annealing

Temperature	800 to 850 °C | 1472 to 1562 °F	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.

Stress relieving

Temperature	600 to 650 °C | 1112 to 1202 °F	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).

Hardening and Tempering

Temperature	1020 to 1030 °C | 1868 to 1886 °F	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^3 | lb/in^3)	7.85 | 0.28
Thermal conductivity (W/(m.K) | BTU (IT) ft/hr/ft^2/F)	29.8 | 17.22
Specific heat (J/(kg.K) | BTU (IT) lb/F)	470 | 112.26
Spec. electrical resistance (Ohm.mm^2/m | 10^{-4} Ohm.inch^2/ft)	-
Modulus of elasticity (10^{3}N/mm^2 | 10^{3}ksi)	211 | 30.66

Thermal Expansions between 20°C | 68°F and ...

Temperature (°C | °F)	100 | 212	200 | 392	300 | 572	400 | 752	500 | 932	600 | 1112
Thermal expansion (10^{-6} m/(m.K) | 10^{-6} inch/(inch.F))	10.63 | 5.9	10.83 | 6	12 | 6.7	12.92 | 7.2	14.13 | 7.9	14.34 | 8

For more information see https://www.voestalpine.com/bohler-edelstahl/de/

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voestalpine
ONE STEP AHEAD.