

HOT WORK TOOL STEELS

Available Product Shapes

Long Products

Open Die Forgings

Product Description

Tool steel that has proved highly satisfactory for hot and cold work and long-time service up to approx. 450°C (842°F) in various fields of application. Tools for hydrostatic presses, cold extrusion tools, cold heading and embossing tools, molds for the plastics industry, die casting tools for aluminium and zinc alloys, hot pressing tools, cold pilger mandrels.

Properties

Ultra-high-strength maraging steel. In contrast to heat treatable steels its outstanding tensile properties are not due to a hardened structure with relatively high carbon content, but to precipitation of intermetallic phases from a ductile nickel bearing matrix containing almost no carbon. This results in the following advantages: High tensile strength and excellent yield point ratio, satisfactory toughness (reduction of area, elongation, impact strength, fracture toughness) even at low temperatures, superior notched tensile strength and heat checking resistance, practically no size change in heat treatment, no decarburization, no cracking, full hardening even in sizes above average. Convenient machinability in the solution annealed condition (machining is also possible in the precipitation-hardened condition). Good cold forming properties owing to reduced susceptibility to work hardening, eminent weldability, simple heat treatment at low temperatures.

Applications

- > Extrusion
 - > Injection Molding
- > Fasteners, Bolts, Nuts
 - > General Components for Mechanical Engineering
- > High Pressure Die-Casting

Material designation	
1.6358	SEL
~1.2709	
K93120	UNS

Chemical composition (wt. %)

C	Si	Mn	Mo	Ni	Co	Ti	Al
≤ 0,030	≤ 0,10	≤ 0,10	5.00	18.50	9.00	0.70	0.10

Delivery condition

Solution annealed

Hardness	max. 353 HB
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Solution annealed + precipitation hardened

Ultimate tensile strength (UTS)	min. 1900 MPa
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Heat treatment

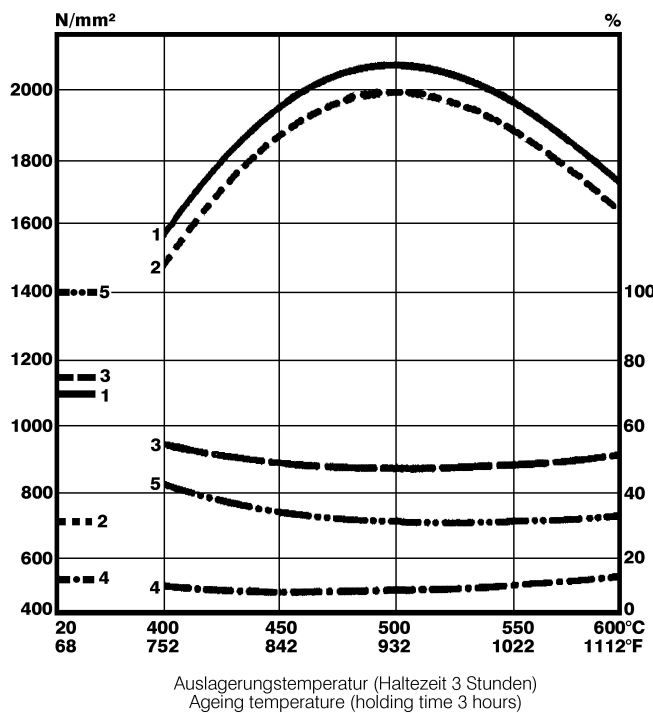
Solution annealing

Temperature (°C °F)	820 1508	1 hour air, gas
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Precipitation hardening

Temperature (°C °F)	430 806	3 hours / air 1720 to 1870 N/mm ²
Temperature (°C °F)	480 896	3 hours / air 1860 to 2260 N/mm ²

Ageing chart



- 1... Tensile strength N/mm²
- 2... 0.2% proof stress N/mm²
- 3... Reduction of area %
- 4... Elongation A₅, %
- 5... Impact strength (DVM), J

Physical Properties

Temperature (°C °F)	20 68
Density (kg/dm ³ lb/in ³)	8.2 0.3
Thermal conductivity (W/(m.K) BTU (IT) ft/hr/ft ² /F)	14 8.09
Specific heat (J/(kg.K) BTU (IT) lb/F)	460 109.87
Spec. electrical resistance (Ohm.mm ² /m 10 ⁻⁴ Ohm.inch ² /ft)	0.4 1.89
Modulus of elasticity (10 ³ N/mm ² 10 ³ ksi)	193 27.99

Thermal Expansions

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))	10.2 5.667	10.8 6	11 6.111	11.4 6.333	11.8 6.556	11.8 6.556

For more information see www.voestalpine.com/boehler-edelstahl

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ONE STEP AHEAD.