VK8E®

High Speed Steel

VILLARES METALS
a voestalpine company

The presented information in this datasheet is only for technical guidance and represents our present state of knowledge of this product. This information shall not be considered as warranty of specific properties or fitness for a particular application of this product.

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SIMILAR STANDARDS

VK8E® is similar to the following grades: HS5-6-2-8; W.Nr. 1.3209.

GENERAL INFORMATION

VK8E® is a molybdenum-tungsten based high speed steel with 8% cobalt. Its design ensures high hardness, excellent wear resistance, outstanding red-hardness and improved toughness and machinability when compared to AISI M42 grade.

MAIN CHARACTERISTICS

Cobalt content ensures VK8E® a high hot hardness which, coupled with an outstanding wear resistance, allows its application in special purpose tools where other high speed steels cannot be applied. Despite its higher vanadium content, which improves wear resistance, VK8E® presents higher toughness when compared to AISI M42 steel.

CHEMICAL COMPOSITION

Typical Analysis (Weight Percent)

C	Si	Mn	Cr	Mo	W	V	Co	Fe
1.10	0.40	0.30	4,00	6,00	5,00	1,60	8,00	Bal.

STANDARD PRODUCTION RANGE

Production Route	Standard	Production Range*	Finishing
Rolled Products	-	Round coils: 5,00-13,50 mm Round bars: 3,00-152mm	As rolled Centerless ground Peeled
Forged Products		Rounds: 152 – 360 mm	Turned Peeled

*Square and flats are also available upon inquiry.

DELIVERY CONDITION

VK8E® is supplied in the annealed condition with a maximum hardness of 270 HB, except for round bars up to 12 mm, which are supplied with a maximum hardness of 290 HB.

HEAT TREATMENTS

Soft Annealing

Soft annealing should be carried out by heating between 870 and 900°C for 2 hours, controlled from the core, followed by cooling with a cooling rate between 10 and 20°C per hour until 650°C followed by air cooling. In this treatment, the use of protective atmosphere is important to avoid surface oxidation and decarburization.

Stress Relief

Stress relief heat treatment consists in heating to 600-700°C for 2 hours minimum followed by furnace cooling until 500°C.

Hardening

Preheat the part in to steps at 540-650°C and 845-870°C and followed by austenitizing to a temperature between 1180 and 1200°C. Lower austenitizing temperatures (1100 to 1150°C) should be considered for cold-work applications.

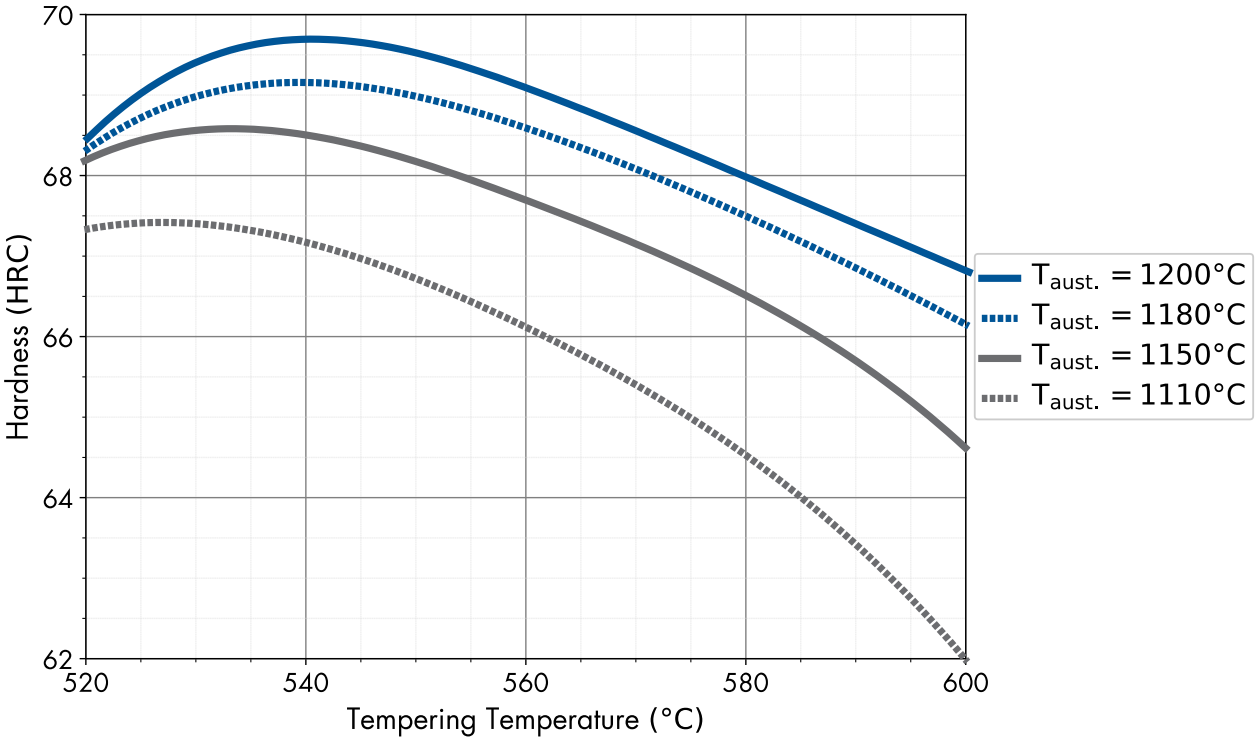
After austenitization, the quenching can be performed in different quench media as:

- Pressurized vacuum furnace with pressure higher than 5 bar
- Salt or fluidized bed between 450 - 550°C
- Air cooling

Tempering

The parts shall be tempered immediately after quenching, i.e. as soon as they reach 60°C. It is necessary, at least, double tempering. Triple tempering is recommended. After each tempering parts shall be slowly cooled to room temperature.

Tempering temperatures are generally between 540-595°C depending upon the desired hardness. The time of each tempering cycle shall be at least 2 hours in temperature. For parts with thickness larger than 70 mm, the time at temperature should be calculated according to their size, being a reference for calculation about one hour for each inch of thickness.



Tempering curve of VK8E® after hardening at 1110°C, 1150°C, 1180°C and 1200°C. Tempering time: 2 hours
Curve obtained from specimens with 20 mm x 20 mm x 20 mm

Surface Treatments

Surface treatments as PVD and CVD are recommended when higher adhesive and abrasive wear resistance are required. Nitriding can also be performed in order to improve abrasive wear resistance. Surface treatments shall be carried out after hardening and tempering, as long as the temperature is at least 50°C lower than the last tempering heat treatment.

MAIN APPLICATIONS

The combination of improved wear resistance, high hot hardness and good toughness make possible the application of VK8E® in the following tools:

- End Mills
- Milling cutters
- Twist drills
- Taps
- Broaches
- Reamers
- Cold work tools

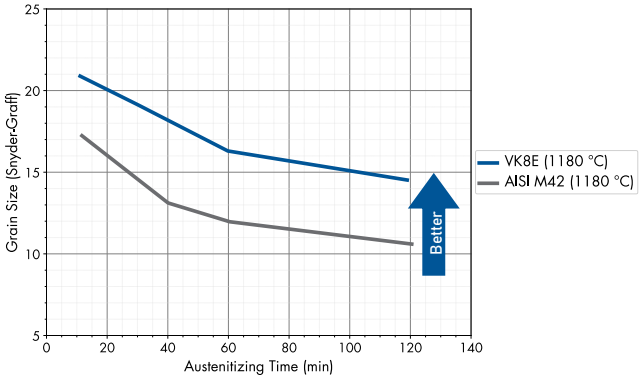
MACHINABILITY

VK8E® can be conventionally machined in the annealed condition. Care need to be taken in the selection of the tool and the speed in order to allow a good machinability and reduce the risk to surface overheating and cracking. When machining removal is greater than 30%, a stress relief is recommended as to avoid distortions on the part during the hardening and tempering,

Electro-erosion process can be employed in heat treated parts. After electro-erosion machining it is recommended to remove the superficial layer thru fine grinding wheel and perform a tempering heat treatment in temperatures around 50°C lower than that of the last tempering.

MECHANICAL PROPERTIES

Due to its chemical composition, VK8E® is less prone to grain coarsening during hardening and, thus, presents a finer structure when compared to AISI M42 steel. This refinement results in greater toughness and hence improves tool life. Below the comparison between VK8E® and AISI M42 grain size after hardening:



PHYSICAL PROPERTIES

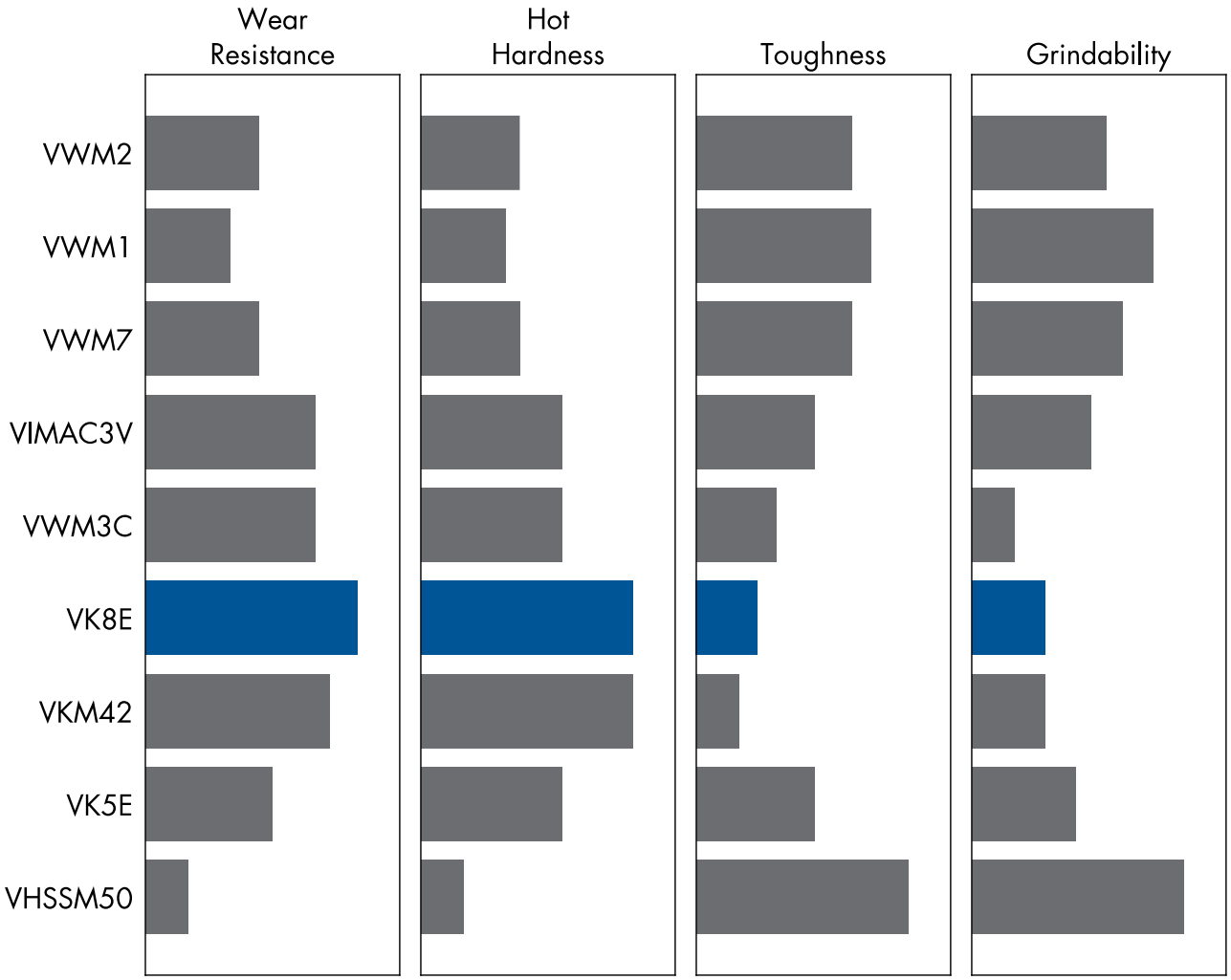
Density:

Temperature	g/cm³	lb/in³
20°C (68°F)	8.10	0.292

Specific Heat:

Temperature 20 °C to (68°F to)	J/kg.K	Btu/lb.°F
100°C (212°F)	460	0.110

COMPARISON BETWEEN VILLARES METALS HIGH SPEED STEELS



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ISO 9001:2015
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ISO 17025
ISO 50001

OHSAS 18001:2007
IATF 16949:2016
AS 9100 D
NORSOK M-650
NADCAP – Heat Treating and Non Destructive Testing