VKM42®
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.

Edition 1, 01.2021

SIMILAR STANDARDS

VKM42® is similar to the following grades: AISI M42, UNS T11842, DIN HS2-10-1-8, DIN HS2-9-1-8, W.Nr. 1.3247, BS BM42, JIS SKH59, AFNOR Z110DKCWV09-08-04-02-01, EN HS2-9-1-8. This steel is produced in accord with ASTM A600 and EN ISO 4957 standards.

GENERAL INFORMATION

VKM42® is a molybdenum based high speed steel, with high cobalt content. The alloy composition brings to VKM42® the capacity of attaining hardness up to 69 HRC. The high hardness leads to higher wear resistance than the usual high speed steels and the high cobalt content contributes to improve hot hardness.

MAIN CHARACTERISTICS

Due to its high hardness, coupled with a high volumetric fraction of carbides, VKM42® presents a high abrasive wear resistance. The cobalt addition ensures a high hot hardness allowing applications where high speed steels without cobalt cannot be applied. Despite its high hardness, VKM42® presents a good grindability and relatively good toughness.

CHEMICAL COMPOSITION

Typical Analysis (Weight Percent)

C	Si	Mn	Co	Cr	Mo	V	W	Fe
1.07	0.35	0.30	8.00	4.00	9.30	1.20	1.40	Bal.

STANDARD PRODUCTION RANGE

Production Route	Standard	Production Range	Finishing
Rolled Products	ASTM A600 EN ISO 4957	Round coils: 5,00-13,50 mm Round bars: 3,00-152mm	As rolled Centerless ground Peeled
Forged Products		Rd. 152.40 – 360 mm	Turned Peeled

* Square and flats are also available upon inquiry.

DELIVERY CONDITION

VKM42® 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.
Identification Colors: yellow.

HEAT TREATMENTS

Soft Annealing

Soft annealing should be carried out by heating between 850 and 880°C for 2 hours, followed by cooling with cooling rate between 10 and 20°C per hour until 650°C and, then, 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 to 400-500°C and then heat the part to 860-880°C until the temperature from center to surface is equal in each step. Austenitizing temperature should be between 1160 and 1200°C. After austenitization, the quenching can be performed in different quench media as:

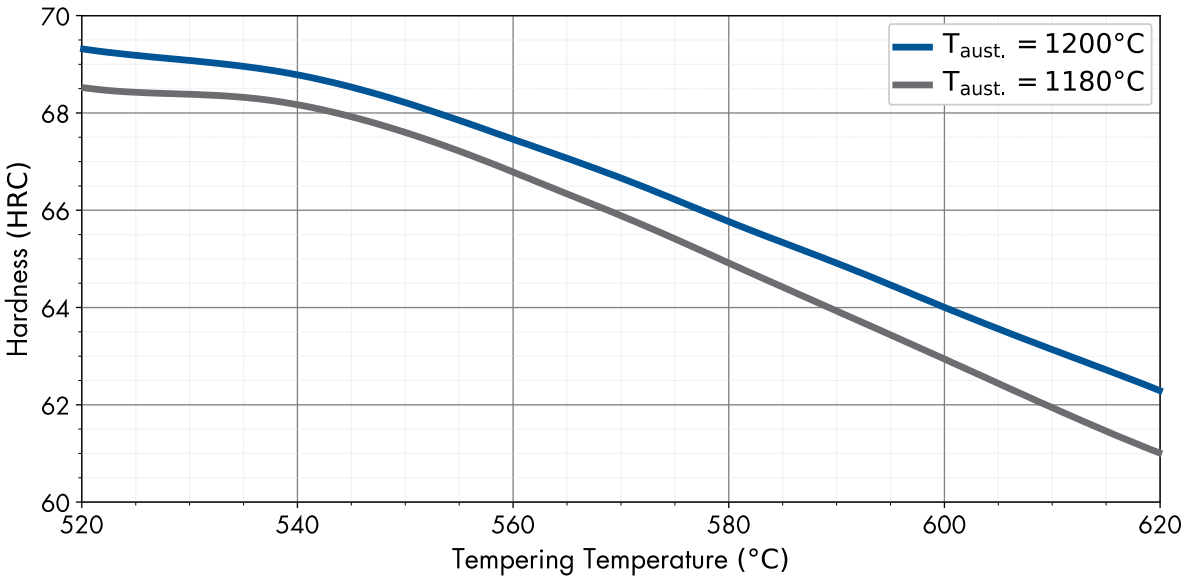
- Pressurized vacuum furnace with pressure higher than 5 bar,
- Salt or fluidized bed between 450 - 550°C,
- Air cooling.

Tempering

The parts shall be tempered immediately after quenching, i.e. as soon as they reach 60°C. It is necessary, at least, triple tempering.
Tempering temperatures are generally between 540-600°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.

Surface treatments

Surface treatments PVD and CVD are recommended when higher abrasive and adhesive wear resistance are required. Nitriding can also be applied in order to improve abrasive wear resistance. Surface treatments shall be employed after hardening and tempering.



Tempering curve of VKM42® after hardening at 1180°C and 1200°C. Tempering time: 2 hours
Curve obtained from specimens with 20 mm x 20 mm x 20 mm

MAIN APPLICATIONS

The properties of improved wear resistance and high hot hardness make possible the application of VKM42® in the following tools:

- End mills,
- Milling cutters,
- Taps,
- Broaches,
- Reamers,
- Slitting saws,
- Punches.

MACHINABILITY

VKM42® 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

Typical bend test properties of VKM42® treated for 68 HRC are presented in the table below.

Bend Strength	Fracture Energy	Total Deflection
2600 MPa	5,8 J	1.2 mm

PHYSICAL PROPERTIES

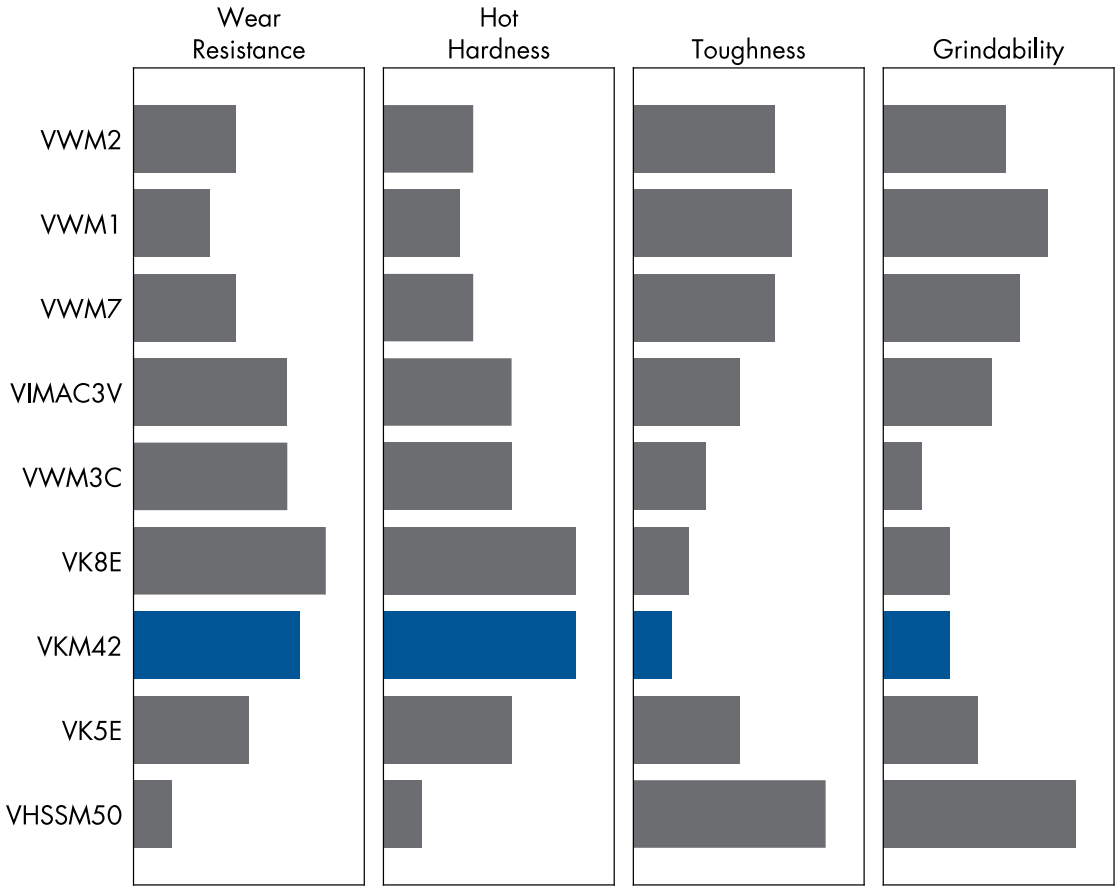
Solidification:

Temperature	°C	°F
Melting Range	1250-1400	2280-2550

Density:

Temperature	g/cm³	lb/in³
20°C (68°F)	8.00	0.289

COMPARISON OF VILLARES METALS HIGH SPEED STEELS



Headquarters | Sales Office - Worldwide

Villares Metals S.A.
Rua Alfredo Dumont Villares, 155
Jardim Santa Carolina | CEP 13178.902
Sumaré - SP
+55 19 3303 8000
tooling@villaresmetals.com

Services & Solutions Centers – Brazil

Sumaré
Rua Alfredo Dumont Villares, 155
Jardim Santa Carolina | CEP 13178.902
Sumaré - SP
0800 707 0577
cac@villaresmetals.com

Flores da Cunha
Rod VRS 814, KM 1
Lagoa Bela | CEP 95270.000
Flores da Cunha - RS
0800 707 0577
cac@villaresmetals.com

Joinville
Perini Business Park
Rua Dona Francisca, 8.300, bloco C7
Distrito Industrial | CEP 89219.600
Joinville - SC
0800 707 0577
cac@villaresmetals.com

Vespasiano
Parque Norte Business Center
Avenida Três, 105
Morro Alto | CEP 33200.000
Vespasiano - MG
0800 707 0577
cac@villaresmetals.com

Sales Office – Europe

Villares Metals International B.V.
Delftse Poort - units 17.10-17.11
Weena 505
3013 AL - Rotterdam
The Netherlands
+31 6 15 95 14 51
info@villaresmetals.com

ISO 9001:2015
ISO 14001:2004 (ANAB and UKAS)
ISO 17025
ISO 50001
OHSAS 18001:2007
IATF 16949:2016
AS 9100 D
NORSOK M-650
NADCAP – Heat Treating and Non Destructive Testing

villaresmetals.com

VILLARES METALS
a voestalpine company