

VHSSM50[®]

High Speed Steel

© VILLARES METALS S/A

No part of this document may be reproduced, detached or transmitted for commercial purposes without prior written permission of the copyright holder.

VHSSM50®, VWM2®, VWM1®, VWM7®, VIMAC3V®, VK8E®, VKM42®, VK5E® and VWM3C® are trademarks of VILLARES METALS S/A.

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, 02.2021

VHSSM50® – High Speed Steel

SIMILAR STANDARDS

VHSSM50® is similar to the following grades; AISI/SAE M50, UNS T11350, AFNOR Y80DCV.42.16, W.Nr. 1.3325, EN HS0-4-1. This steel is produced in accord with ASTM A600 AISI M50 steel.

GENERAL INFORMATION

VHSSM50® is a standardized molybdenum intermediate high speed steel with excellent toughness and grindability coupled with good wear resistance and compressive strength. It is commonly used in commercial twist drills and in tooling applications where wear resistance is less important. M50 is also

available upon enquiry in VIM+VAR version VWM50QA for aerospace applications.

MAIN CHARACTERISTICS

VHSSM50® is characterized by molybdenum based chemical composition alloyed with some vanadium. Due to its lower alloy content, VHSSM50® presents carbides in smaller quantities and size, thus improving its machinability and toughness. Properties of abrasive wear resistance and red hardness are less pronounced in this grade when compared to traditional HSS grades such as AISI M2.

CHEMICAL COMPOSITION

Typical Analysis (Weight Percent)


C	Si	Mn	Cr	Mo	V	W	Fe
0,80	0.50	0.30	4,25	4,25	1.00	-	Bal.

STANDARD PRODUCTION RANGE

Production Route	Standard	Production Range	Finishing
Rolled Products	ASTM A600 AISI M50	Hot rolled coils up to 13,50 mm Drawn coils up to 12,70 mm Round bars from 0,90 to 152.40mm	As rolled Drawn Centerless ground Peeled
Forged Products		Round bars from 152.40 to 360 mm Flats with thickness up to 150mm and width up to 410mm	Peeled Turned Milled

*Other dimensions and conditions are available upon inquiry.

DELIVERY CONDITION

VHSSM50® is supplied in the annealed condition with a maximum hardness of 248 HB, Except for round bars up to 12 mm and drawn coils, which are supplied with a maximum hardness of 262 HB. Identification colors: green, yellow, green. 

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. 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 to 860-880°C until the temperature from center to surface is equal in each step. For large parts, it is also recommended an additional preheating step at 950°C. Austenitizing temperature should be between 1100 and 1140°C for cutting tools and between 1080 and 1120°C for cold work tools. 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.

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.

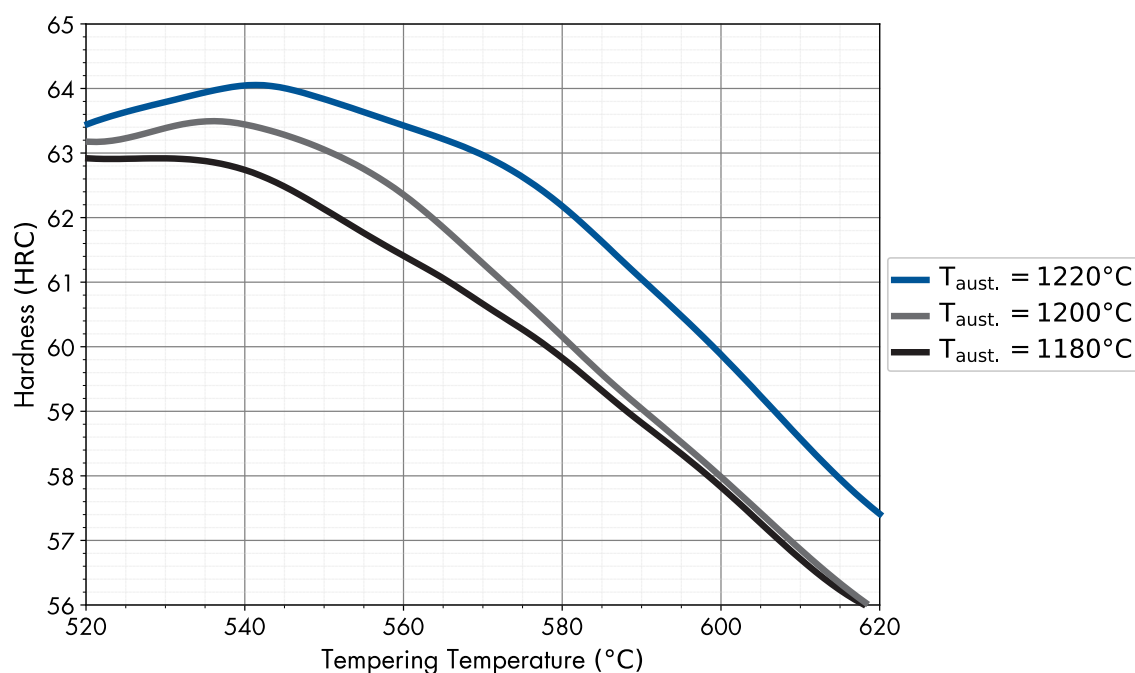
Surface treatments

Surface treatments as PVD and CVD are recommended when both abrasive and adhesive wear resistance are required. Nitriding can also be applied 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

VHSSM50® is an intermediate high speed steel which that be used in applications such as:

- Twist drills,
- Ball bearings,
- Automotive components,
- Fine blanking tools.



Tempering curve of VHSSM50® after hardening at different temperatures. Tempering time: 2 hours
Curves obtained from specimens with 20 mm x 20 mm x 20 mm

MACHINABILITY

VHSSM50® 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

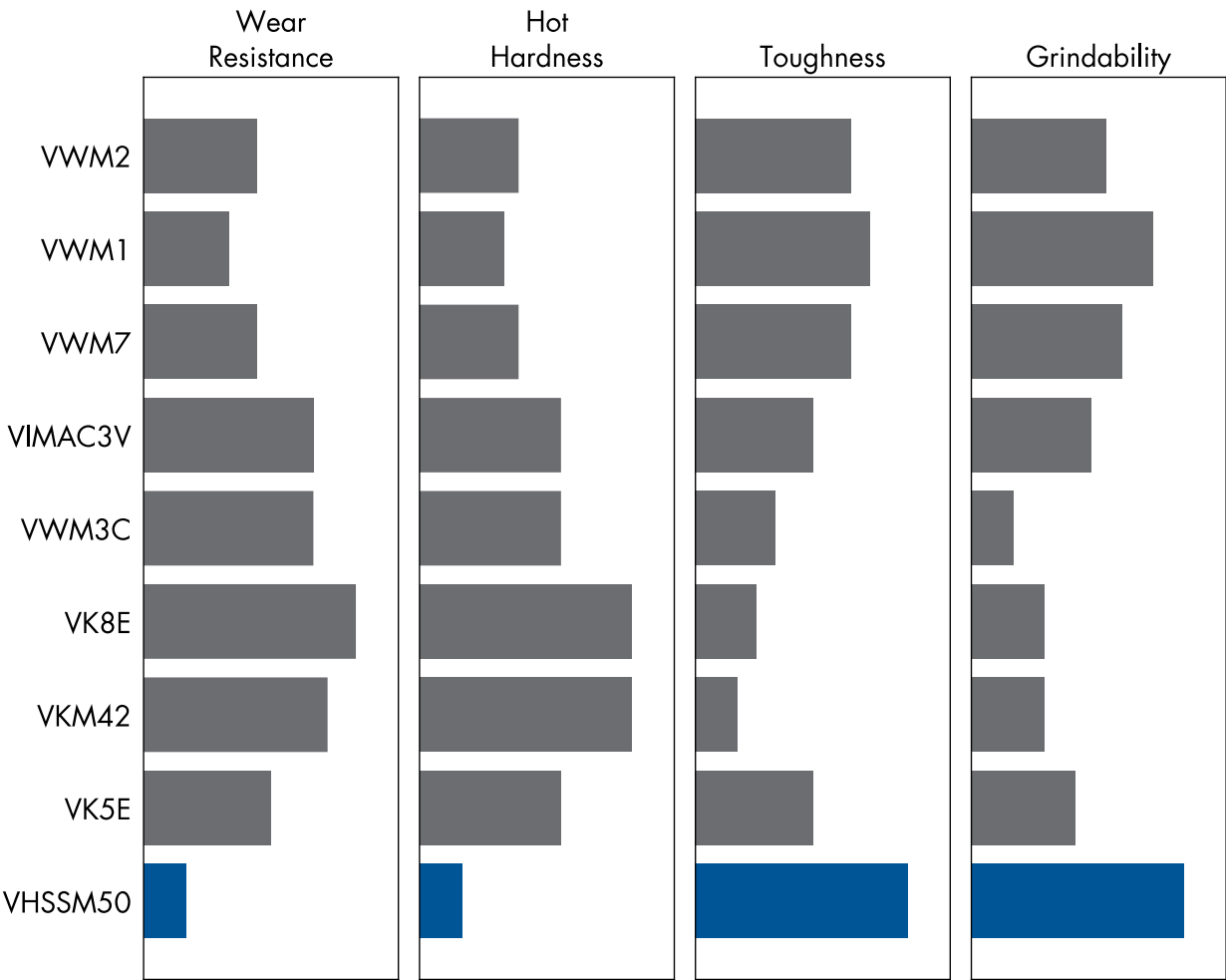
recommended to remove the superficial layer thru fine grinding wheel and perform a tempering heat treatment in temperatures around 50°C lower than that of the last tempering.

PHYSICAL PROPERTIES

Density:

Temperature	g/cm ³	lb/in ³
20°C (68°F)	7,85	0.284

COMPARISON BETWEEN VILLARES METALS HIGH SPEED STEELS



VHSSM50® – High Speed Steel

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

Joinville

Perini Business Park
Rua Dona Francisca, 8.300, bloco C7
Distrito Industrial | CEP 89219.600
Joinville - SC
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

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