

VIMCOR®

Plastic Mold Steel

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Edition 16, 05.2021

SIMILAR STANDARDS

VIMCOR® is non-standardized steel grade, aims to substitute AISI 420 grades such as DIN X33CrS16 (WNr. 1.2085), UNS S42020 (AISI 420F), AFNOR Z35CD16+S, and EN X33CrS16.

GENERAL INFORMATION

VIMCOR® is a low carbon martensitic stainless steel with excellent machinability designed for hot runners, mold holders and refrigeration plates. Due the special metallurgical process applied in VIMCOR® production, including VOD, the properties of this steel meets most of needs required by mold makers and end users. VIMCOR® is applied in substitution of grades like AISI 420 F with superior machinability,

improved dimensional stability and surface finishes.

MAIN CHARACTERISTICS

VIMCOR® presents a martensitic matrix with low amount of carbides that is intended to provide high mechanical properties in combination with corrosion resistance. The high chromium content assures its application as a plastic mold steel to chlorinated plastics and also it can be applied in hot runners and storages. Due to the low amount of hard particles, this steel presents an excellent machinability. The low amount of carbon and silicon assures a high weldability of this product.

CHEMICAL COMPOSITION

Typical Analysis (Weight Percent)

C	Si	Mn	P	S	Cr	Fe
0.05	0.40	2.50	0.03 max	0.10	12.30	Bal.

STANDARD PRODUCTION RANGE

Production Route	Production Range	Finishing
Rolled Products	Thickness between 12.70 to 100 mm with width between 38.10 to 330mm Rd. 12.70-152.40mm	Centerless ground Peeled Turned
Forged Products	Thickness between 100 to 330mm and width between 500 to 1100mm	Milled

*Other dimensions and conditions are available upon inquiry.

DELIVERY CONDITION

VIMCOR® is supplied in the hardened and tempered condition with hardness between 30-34HRC ready to be processed and applied in the final applications. Others hardness are available upon request.

Identification Colors: black, white.



HEAT TREATMENTS

Stress Relief

In case of high removal during machining, a stress relief heat treatment shall be applied in order to avoid distortions during quenching and tempering heat treatments. As VIMCOR® is already supplied in the hardened and tempered condition, the recommended procedure is slow heating to 500°C, holding until complete homogenization, and cooling inside the furnace at least down to 100 °C.

Important Note (or Caution)

Since VIMCOR is supplied in the hardened and tempered condition intended for use in prehardened condition, no further heat treatment is generally required.

Hardening

VIMCOR® is already supplied in pre-benefited condition and heat treatment of quench and temper is not required. When necessary, preheat the part to 400-650°C in two steps, until the temperature from center to surface is equal in each step. The austenitizing temperature should be between 890 and 910°C holding the temperature until complete homogenization of the part.

Surface decarburization cause decrease in hardness and may cause polishing problems named “overpolishing”. Therefore, the use of protective atmosphere (or vacuum) is important during heating to hardening.

After austenitization, the quenching can be performed in warm and agitated oil, 30-70°C until the part temperature reaches 100°C, followed by air cooling until 60-70°C. The maximum expected hardness will be up to 40 HRC.

Tempering

After quenching, the parts shall be tempered immediately and as soon as reaches 60°C. It

is necessary at least double tempering. After each tempering, parts shall be slowly cooled to room temperature.

Tempering temperatures are generally between 500-600°C, depending upon the desired hardness. The time of each tempering cycle shall be at least 1 hour for each 25,4mm of thickness after temperature equalization between surface and core.

MAIN APPLICATIONS

The properties of excellent machinability and weldability combined with good corrosion resistance and mechanical strength make possible to use VIMCOR® in the following applications:

- Hot runners,
- Mold holders,
- Refrigeration plates,
- Non-chlorinated thermoplastic injection molds with low demand in polishing

MACHINABILITY

VIMCOR® can be conventionally machined in the hardened and tempered condition. Care need to be taken in the selection of the tool and the speed in order to allow a good machinability.

VIMCOR® has an excellent machining performance specially in deep drilling. A good machinability property can be evaluated by tests of cutting tool end like in milling operation. Considering a flank wear of 0.25mm, cutting tool end life. The milling volume of VIMCOR® was 36% higher than VP420T®.

Electro-erosion process can be employed in heat treated dies or molds. After electro-erosion machining it is recommended to remove the superficial layer thru fine grinding wheel. The white layer in VIMCOR® is not as hard as in AISI P20 grades, due to the lower carbon content. After electro-erosion process

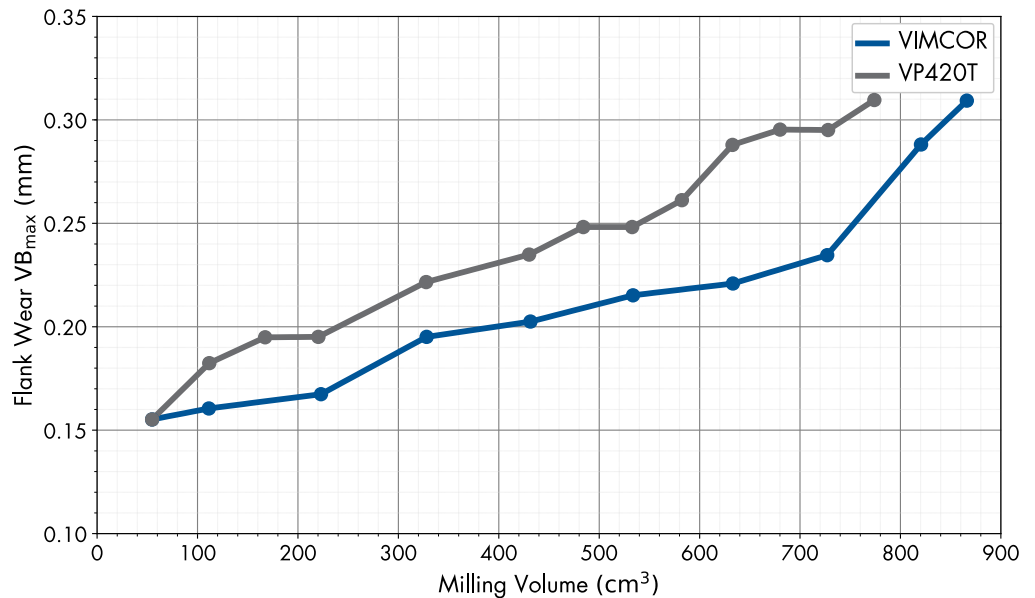
VIMCOR – Plastic Mold Steel

and removal of the white layer, it is also recommended a stress relief treatment at 400°C.

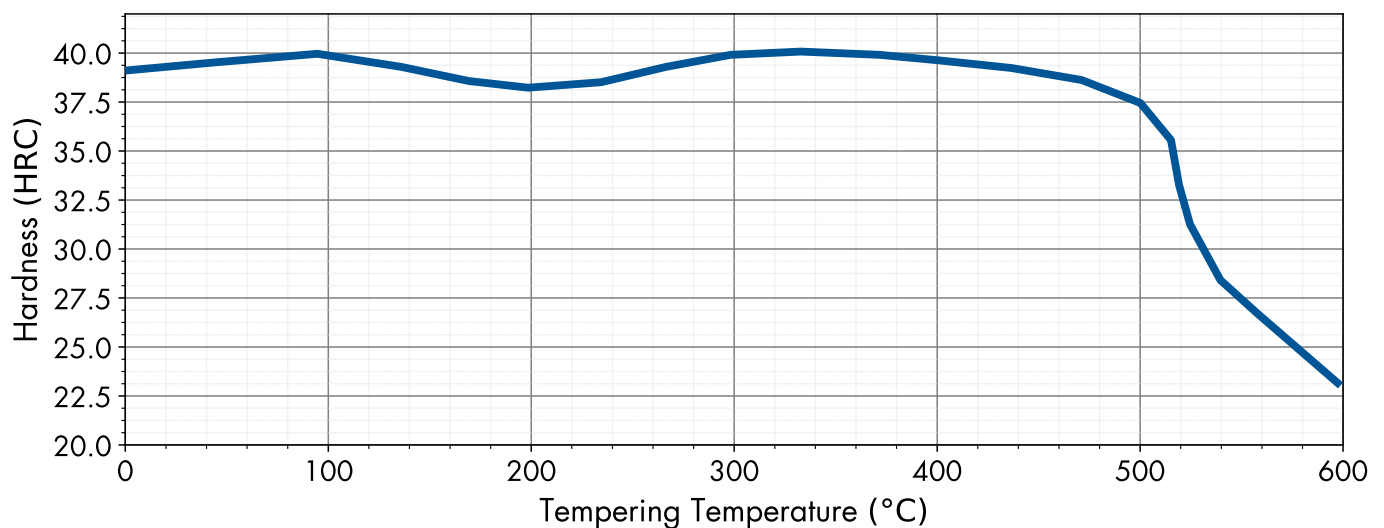
Toroidal Tool
R300-25T12-10M
Diameter = 25 mm
Number of teeth = 3

Insert
Hard metal with covered surface
R300-1032M-PH 4230
Insert Radius: 5 mm

Milling Parameters
Consistent Cut
Cutting Speed = 200 m/min
Advance = 0.12 mm/tooth
Depth of axial cut = 0.5 mm
Depth of radial cut = 10 mm



Comparison of VIMCOR and VP420T machinability.



Tempering curve of VIMCOR® after hardening at 900°C. Tempering time: 2 hours
Curve obtained from specimens with cross section of 20 mm x 20 mm.

WELDING

It is not recommended to perform welding operations on VIMCOR® steel. Welding operations will produce Heat Affected Zones (HAZ), which will reduce the performance of the steel in the application. HAZ produced during arc welding operation are harder and brittle, with risk of cracking unless great care is exercised. In exceptional cases and always considering that, the welding would be a temporary solution VIMCOR® might be welded using special procedures to minimize the HAZ. VIMCOR® has lower carbon content than usual AISI 420 series, which gives better weldability and results in lower hardness after welding. The process for welding VIMCOR® steel consist in the following sequence: (a) preheat; (b) weld with appropriate filler metal; (c) stress relief heat treatment and (d) grind to dimensions. The qualification of a specific welding procedure is the key point to obtain the desired quality. The skill and experience of the welder is also a vital factor to obtaining satisfactory results.

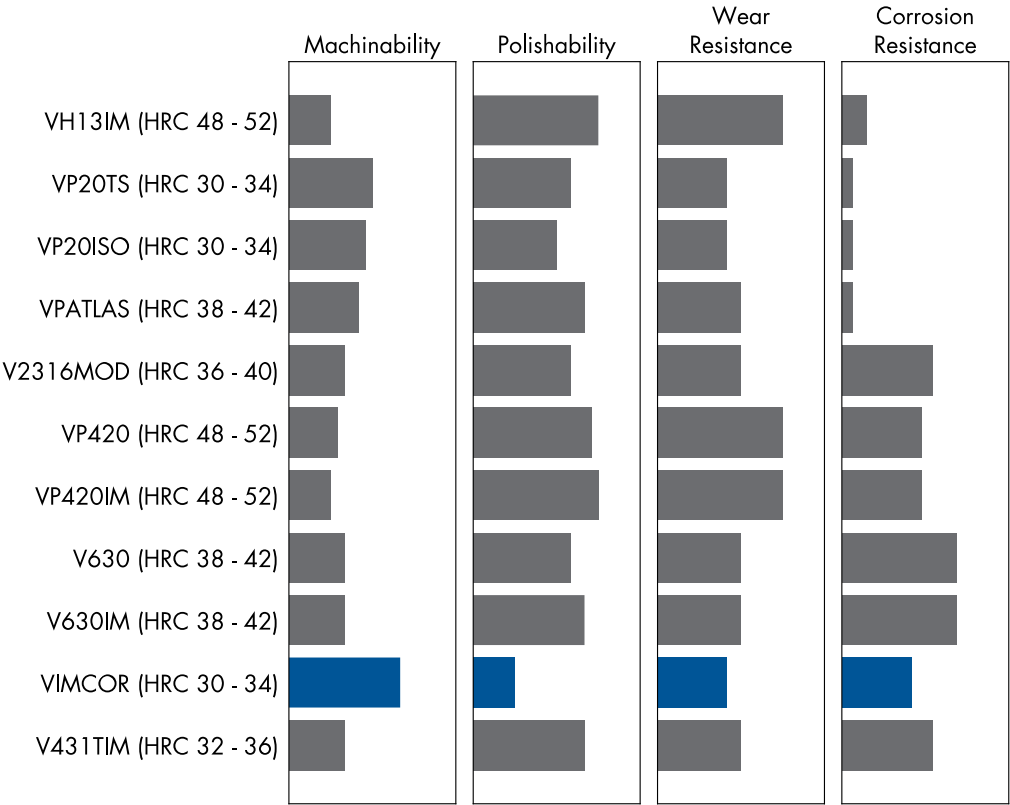
MECHANICAL PROPERTIES

VIMCOR is usually produced as blocks and which were hardened by conventional quenching and tempering treatments. The high cooling rate in quenching process of traditional steels leads to natural heterogeneity in microstructure and hardness. However, due to VIMCOR® specific metallurgical features, it is possible to reach the target properties with low cooling rates, and consequently good dimensional stability and homogeneous hardness profile.

Tensile Strength:

Hardness	Tensile Strength		Yield Strength		Elongation in 4D	Reduction of Area
HBW	[MPa]	[ksi]	[MPa]	[ksi]	[%]	[%]
320	1125	163	967	140	14	60

COMPARISON WITH VILLARES METALS PLASTIC MOLD STEELS



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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

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