Haas VF3 vs. Doosan DNM 5700

APT Machine Tools

(321)280-2482  |  www.aptmtools.com  |  4180 St. Johns Parkway, Sanford, FL 32771
UNDER THE HOOD

VF casting
12,474 lbs

DNM 5700
14,330 lbs
BASIC CONSTRUCTION

HAAS VF platform

Doosan DNM platform

Still using a counter balance for Z axis.
HAAS COUNTERBALANCE

VF-Series Hydraulic Counterbalance - Right Side View

VF-Series Hydraulic Counterbalance - Left Side View
Every spindle drawing I was able to get was slightly different. When I read chat online, the common complaint was the tools wearing at the large end of the taper.
SPINDLE CONSTRUCTION

Haas Spindle

- Two Double angle contact bearings at the spindle nose and two Ball bearings at the top end of the spindle.
- This means there is only one bearing to handle the end load / thrust from drilling.

DNM Spindle

- Four double angle contact bearings.
- Two bearings to handle the end load / thrust from drilling.
ROLLER – VS – BALL TYPE LM GUIDE

Haas:
Ball Type LM Guide

DNM:
Roller Type LM Guide

APT
MACHINE TOOLS & INDUSTRIAL SUPPLIES
<table>
<thead>
<tr>
<th>Guide Way Type</th>
<th>Ball+Roller</th>
<th>Roller</th>
<th>Roller</th>
<th>Roller</th>
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<td>LM Guide Width</td>
<td>X: 1.26” (32mm)</td>
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<td>Y: 1.26” (32mm)</td>
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<td>Z: 1.77” (45mm)</td>
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<tr>
<td>Ball Screw Dia. X/Y/Z</td>
<td>X: 1.26” (32mm)</td>
<td>X: 1.42” (36mm)</td>
<td>X: 1.42” (36mm)</td>
<td>X: 1.57” (40mm)</td>
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<td>Y: 1.42” (36mm)</td>
<td>Y: 1.42” (36mm)</td>
<td>Y: 1.57” (40mm)</td>
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<td>Z: 1.42” (36mm)</td>
<td>Z: 1.57” (40mm)</td>
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</table>
2-1 High rigidity_Roller LMG

1. Rigidity ⇒ Better geometry accuracy and finish surface

Applied Roller LM for rigidity
- Better geometry accuracy, finish surface and longer life of guideway

2. Longer life of Guideway

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<th>Axis</th>
<th>Service Life</th>
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<td>X axis</td>
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<td>RG35C-ZB</td>
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<td>HG35C-ZB</td>
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<tr>
<td>RG45C-ZA</td>
<td>88,345 (km)</td>
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<td>HG45C-ZA</td>
<td>41,654 (km)</td>
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<tr>
<td>Z axis</td>
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<tr>
<td>RG45C-ZA</td>
<td>116,088 (km)</td>
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<tr>
<td>HG45C-ZA</td>
<td>60,185 (km)</td>
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</table>

Rigidity
: Roller better about 3 times

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<th>Y</th>
<th>Z</th>
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<tr>
<td>Roller</td>
<td>0μm</td>
<td>0.64μm</td>
<td>-1.885μm</td>
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<tr>
<td>Ball</td>
<td>0μm</td>
<td>1.48μm</td>
<td>-5.074μm</td>
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</table>

Deflection of heavy body

EX 1: Ball type 35mm (HGH35)
- C=49.5 kN
- P=10 kN
- 121.287*31=375.7 miles

EX 2: Roller type 35mm (RGH35)
- C=57.9 kN
- P=10 kN
- 348.527*62=2160.8 miles

Ball type:
\[ L = \left( \frac{C}{P} \right)^3 \times 50 \text{km} = \left( \frac{C}{P} \right)^3 \times 31 \text{mile} \]

Roller type:
\[ L = \left( \frac{10}{P} \right)^3 \times 100 \text{km} = \left( \frac{10}{P} \right)^3 \times 62 \text{mile} \]
Z AXIS BALL SCREW

**Haas**

Double anchored
NOT pre-tensioned
X & Y BALL SCREWS

Haas Axis configuration:
All 3 axis are **only Double Anchored**
not pre-tensioned.
ADJUSTING THE HAAS ATC

This is actually from the Haas Maintenance manual. This was “how to adjust the knock out”. Shims seem to be a favorite method of adjusting. Similar procedures can be found throughout the manual.
THERMAL COMPENSATION

Haas Thermal Comp

Compensation for Thermal Growth
During normal operation, small inaccuracies in the work pieces may develop due to thermal expansion of the ball screws. Ball screws are made of steel which expands at the rate of 11 millionths of an inch per degree C.

The Haas control contains built-in features to electronically correct for ball screw growth. This compensation works by estimating the heating of the screw based on the amount of travel over the length of the screw and is measured from the motor. Adjustments can be made to the settings as needed. The user can fine-tune this compensation up to plus or minus 30% with the use of settings 158, 159 and 160. If the part size is too big, decrease the amount of compensation for the appropriate axis. For example, increasing the value in Setting 158, "X Screw Thermal Comp%", can increase the amount of thermal compensation.

Doosan DNM Thermal Comp

The Pre-Tensioned ball screws are “stretched” to the warm state so Thermal comp can be eliminated. The DNM Series use a Sensorless type compensation which is established at the factory and creating a Matrix for each model based on testing over a long period of time in the “Reliability bay” shown on the next page. No Operator intervention is required.
TEMPERATURE CONTROLLED TESTING ROOM

This room is used to test and map the thermal growth and straightness deviation from extreme temperature swings from an ambient temperature of 70 degrees.

- There are 5 Thermal Compensation types used by Doosan
  1) Active Cooling via oil cooler / heat exchanger
  2) Sensor type
  3) Sensor less type
  4) Straightness compensation
BALL BAR EXPECTATIONS

Haas VF Ball Bar from new machine

Reading news groups, the largest complaint among Haas users concerning accuracy is Squareness. This one is at 41% of the top 5 issues. Circularity is .0010”

DNM650II actual measured results.
STANDARD USA SPEC

DNM5700 Standard USA Spec

✓ Big Plus spindle
✓ 8k, 12k or 15k Spindle
✓ 30 or 40 Side Mount Atc
✓ 230 psi Coolant through Spindle
✓ Probe ready system (minus probe)
✓ Cabinet cooler
✓ Chip augers
✓ Dynamic work offsets & TCP
✓ G30 & G30P3, P4
✓ AICC 20 block look ahead
✓ Remote MPG
✓ Work light and 3 color tower signal light
✓ Cyclonic coolant filter
✓ Oil Skimmer
✓ 2 year warranty (Haas option for 2nd year)
✓ Tool Load Monitoring
✓ Adaptive Control
✓ EZ Guide i Programming & Operation
# BASIC SPECS

<table>
<thead>
<tr>
<th>Spec</th>
<th>HAAS VF3/40</th>
<th>DNM500/40</th>
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<tbody>
<tr>
<td>Max table weight</td>
<td>1750</td>
<td>2,204</td>
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<tr>
<td>Spindle RPM</td>
<td>8100</td>
<td>8000</td>
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<tr>
<td>Spindle HP</td>
<td>30</td>
<td>20</td>
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<tr>
<td>Spindle torque max</td>
<td>122Nm @ 2000rpm</td>
<td>210Nm @ 680rpm</td>
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<tr>
<td>Rapid rates</td>
<td>25.4 m/min</td>
<td>36/36/30 m/min</td>
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<tr>
<td>Table size</td>
<td>48/18</td>
<td>47.2/21.2</td>
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<tr>
<td>Travel X/Y/Z</td>
<td>40/20/25</td>
<td>40/21.2/20.1</td>
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<tr>
<td>Spindle nose to table</td>
<td>4/29</td>
<td>5.9/26</td>
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<td>Continuous [Max] thrust X *</td>
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<td>1,290 [NA] lbs</td>
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<td>Ballscrew cooling</td>
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<tr>
<td>Machine weight</td>
<td>12,474 lbs</td>
<td>14,300 lbs</td>
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* Haas does not report Continuous, Doosan does not report Intermittent.
Mylar cover, wears from use then leaks coolant onto pcb underneath.

No Override knobs, step up/down by pressing the button many times. Operators hate this.

No QWERTY keyboard

- Standard QWERTY keyboard
- Hard buttons
- Feedrate Override knobs
- Hot Keys
HAAS CONTROL - PROGRAMMING

QUICKCODE

START UP COMMANDS...
1. MACHINE MoveS...
2. CUTTER COMP. MOVEs...
3. DRILL / TAP / BORE CYCLES...
4. DRILL / TAP / BORE LOCATIONS...
5. CIRCULAR POCKET MACHINING...
6. CUSTOM SETTINGS...
7. MISC COMMANDS...
ENDING COMMANDS...

Turn handle CCW for a SUB-MENU to start Entering a tool sequence.
Turn handle CW to go back to the MAIN MENU and these CCW again to start the SUB-MENU selection.

QUICKCODE

3. DRILL/TAP/BORE CYCLES...
Drill G81...
Drill with Dwell G82.
Deep Hole Feck Drill G83.
High Speed Pack Drill G73.
H.S.P.D.W/Return R Plane G73..
Bore IN Bore OUT G88..
Bore IN Rapid OUT G88.
Bore IN Shift Rapid OUT G78..
Right Hand Tapping G84.
G80 CANCEL Canned Cycle..

EXAMPLE: G82 G99 Z-1.5 F4 R1.1 F5.
G98 Initial point return
G99 Rapid plane return
F5 = 1/2 Second dwell at Z depth.
ENTER drill locations with menu #6.

QUICKCODE

4. DRILL/TAP/BORE LOCATIONS...
X Location...
Y Location...
X & Y Location...
A Location...
Initial Point or R Plane Return...

Bolt Hole Circle Locations:
Bolt Hole Arc Locations:
Bolt Holes At Angle Locations:
More Bolt Hole Pattern Help:
G40 CANCEL Canned Cycle.

First define drill cycle and center Location of R.H.C.
If you don't want hole in center of R.H.C. Then put an L0 on the time before R.H.C. To not drill hole.

END OF BLOCK

VQC

O00001 N00000

G70 BOLT HOLE CIRCLE

I=?
J=?
NumHoles=?
ToolNo=?
WrtkOffset=?
XPos=?
YPos=?
Spdlkrpm=?
DrdDepth=?
Explm=?
Dwell=?
New Control offers several User Friendly Features as Standard.

- USB & PCMCIA Card Ports
- 10.4” Color LCD
- Easy Operation Pkg. Software
- QWERTY keyboard
- HOT Keys
SCREEN SHOTS

Position & Program Check
### Offset & Tool Life management

#### Offset

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<th>(LENGTH)</th>
<th>(RADIUS)</th>
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#### Tool Life

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GROUP00000001
- TYPE: NO DATA
- LIFE: COUNT

GROUP00000002
- TYPE: NO DATA
- LIFE: COUNT

GROUP TO BE CHANGE
- ****

APT Machine Tools Industrial Supplies
SCREEN SHOTS

Big Tool / Tool condition & Adaptive machining control
SCREEN SHOTS

BORE CYCLE

<table>
<thead>
<tr>
<th>MACHINE POSITION</th>
<th>DISTANCE TO GO</th>
<th>CYCLE INPUTS</th>
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<tbody>
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<td>049.995</td>
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<td>Y</td>
<td>699.995</td>
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<tr>
<td>B</td>
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METRIC

Probing Bore & Slot

POCKET CYCLE

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<th>CYCLE INPUTS</th>
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<tr>
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METRIC

APT MACHINE TOOLS & INDUSTRIAL SUPPLIES

25
Probing Surface
SCREEN SHOTS

Probing for B axis alignment &
Web or 2 point centering
### Status & ATC Maintenance mode for recovery

#### CONTENTS

<table>
<thead>
<tr>
<th>CONTENTS</th>
<th>SIGNAL</th>
<th>STATUS</th>
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<tbody>
<tr>
<td>TOOL UNCLAMP SOLENOID</td>
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<td>TOOL UNCLAMP CONFIRM SENSOR</td>
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<td>MAIN DOOR SAFETY LOCK SENSOR</td>
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</table>

#### GUIDE

1. You can find the relevant sensor and solenoid position by using cursor key.

---

### Sensor Status Monitor V1.00

![Sensor Status Monitor V1.00](image1)

![Sensor Status Monitor V1.00](image2)

![Sensor Status Monitor V1.00](image3)

![Sensor Status Monitor V1.00](image4)
1-1. Doosan Adaptive Feedrate Control (DAFC)

DNM (8,000rpm) Standard Control Feature

DNM II (8,000rpm) is equipped with exceptional control feature that significantly improves efficiency (standard feature)

Adaptive Feedrate Control:
- Monitors the amount of spindle load to adjust feedrate adaptively
- When cutting conditions favorable, NC increases feedrate to reduce cycle time
- Results an Improved Cycle Time & Cutting Process Protection due to Optimized Machining Conditions
Standard Big Plus on all DNM Series provides better machining performance

Big Plus: Dual (Taper & Face) Contact offers up to 40% additional Radial Rigidity
- Better finishes
- Greater Stock Removal Rates
- More Accurate Boring
- Less Blending
CONCLUSION

- Pre-tensioned ball screws
- Big Plus two face contact spindle
- Probe ready
- Oil skimmer
- Adaptive feed control
- Tool load monitoring with “no Load”
- Tighter ball bar spec
- EZ Guide
- EZ OP Operator assistance
- Built to stand the test of time