DOOSAN

Optimal Solutions for the Future

VM 5400 / 6500

High Performance Vertical Machining Center for Die / Mold Machine

VM 5400 / 6500

VM 5400
VM 6500

ver. EN 160803 SU

VM 5400/6500

Standard core features for high precision mold processing

The efficiency and competitiveness achieved by the user is optimised by the core features which are standard on the machine. These include face / taper contact spindle nose (BBT40), effective spindle cooling system and air blower for chip removal when dry cutting. These features contribute to the machine's capability to produce high quality dies and moulds.

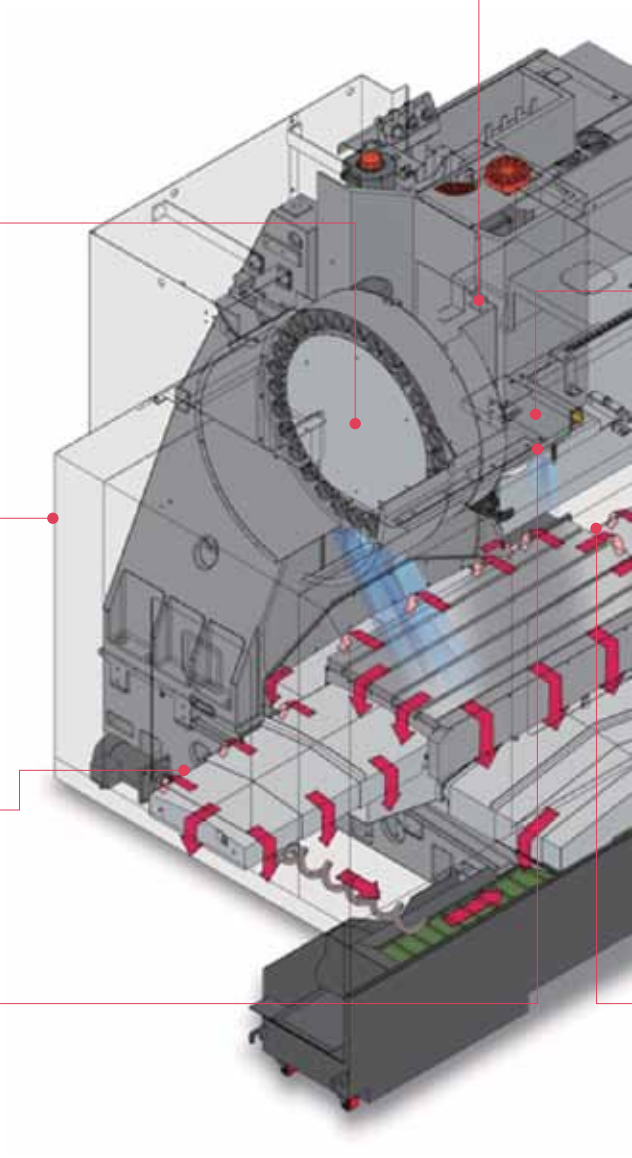
Spindle
- 12000 r/min

Cam type ATC
ISO #40, 7/24 TAPER
ATC time : 1.3sec (T-T-T)
- 30 Tools
- 40 Tools opt.

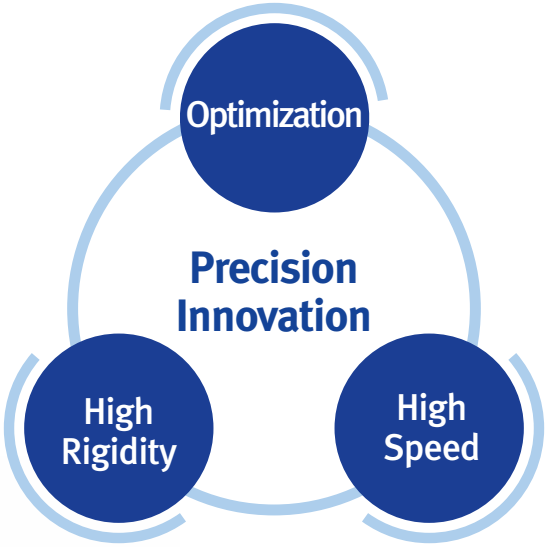
Oil cooler

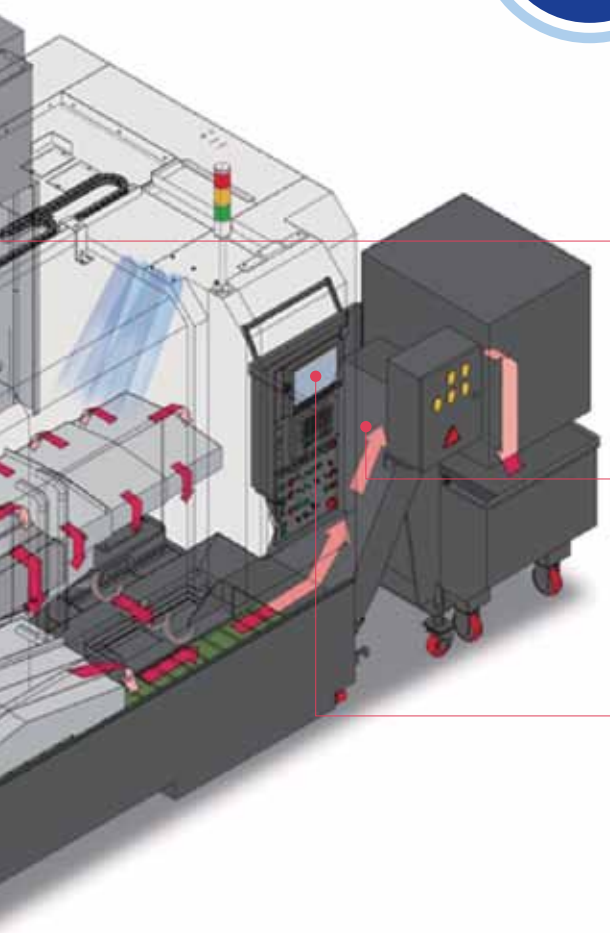
Screw conveyor
- Both sides screw conveyor

Air blower
- MQL Available



High Performance Vertical Machining Center for Die / Mold Machine





Spindle thermal compensation system and Dual contact spindle
(BBT40)

Air port
- For Air-gun opt.

Swivelling operator's consol
- Fanuc 32i-B
- DSQ1 (200 Block)

Automatic tool measurement
(TS27R)

Die & Mold Solution

The VM Series provides ultra-precise machining capability using high speed / precision contour feed control and the optimum machine stability.

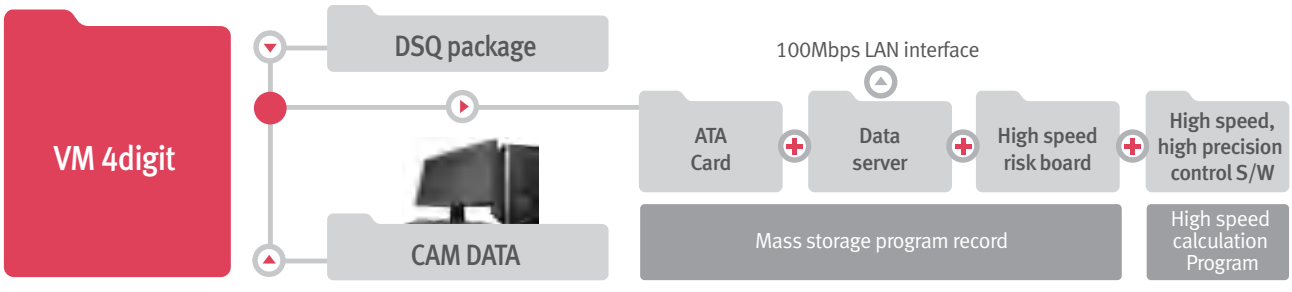
VM 5400 / 6500

Die & Mold Solution

- DSQ1 (Look ahead 200 Block + Machining condition selection function) std.

Data Server & Risc Board

With a mounted mass storage data server and CPU, it is possible for high end processing of mass storage programs.



DSQ package upgrades productivity and mold processing quality with individual tuning of machinery features, high speed processing by mass storage programs and enhanced superb command following capacity.

Optimized Tool Processing Solution

Superior surface finishes and machining accuracy are achieved through using standard processing solutions such as high-speed / high - precision contour control and thermal displacement compensation.

VM 5400 / 6500

High speed / Precision contour control

* DSQ : Doosan Super Quality

Smoothes the movement of the machine, improving surface roughness and profile accuracy of corners and edges.

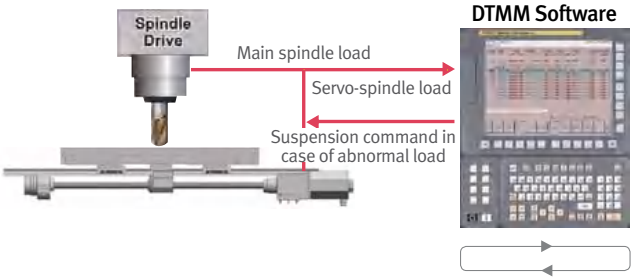
- DSQ1 (AICC2_200 Block + Machining condition selection function) std.
- DSQ2 (DSQ1 + Data server [1GB]) opt.

▶ with DSQ ▶ without DSQ

High efficient DTMM opt.

* DTMM : Doosan Tool load Monitoring for Machining Centers

Damage minimization technology in each tool and device part during processing.

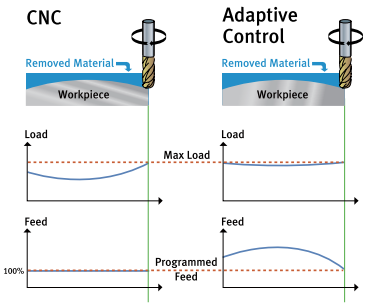


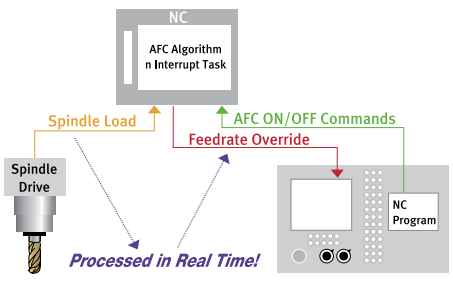
Detection cycle = Program interpolation cycle ☑
Equipment suspension command in case of abnormal load ☑
Replacement tool decision and command to NC ☑

The optimal feed control opt.

* DAFC : Doosan Adaptive Feed Control

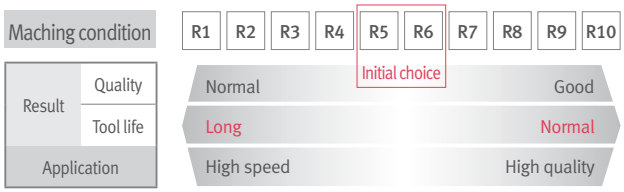
Optimal feed control is based on checking the load of spindle at real time.





Machining condition selection function

- It is possible to change machining condition in 10 steps by using R code at the program.
  - Improving productivity (high speed at rough machining, high precision at precision machining)
- NC parameter such as maximum feed and accelation time constant can be set automatically.



High Rigidity

The highly-rigid body found on the VM series enables exceptionally heavy-duty machining.

High Rigidity Design

High Rigidity construction is achieved by 3D computer simulation.

Static rigidity

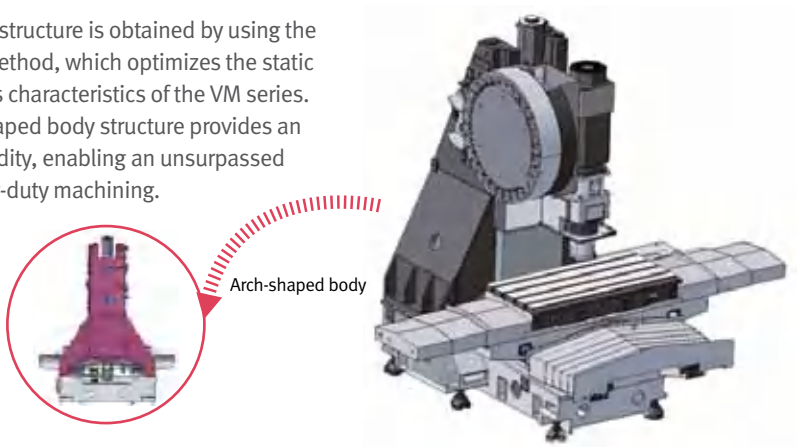
The high rigidity structure of VM series has raised the static rigidity up by 30% more than previous model with no weak point through FEM analysis.

Dynamic rigidity

Improving the frequency response and the damping ability of vibration makes it possible to increase the high eigenfrequency 30% up on the previous model.

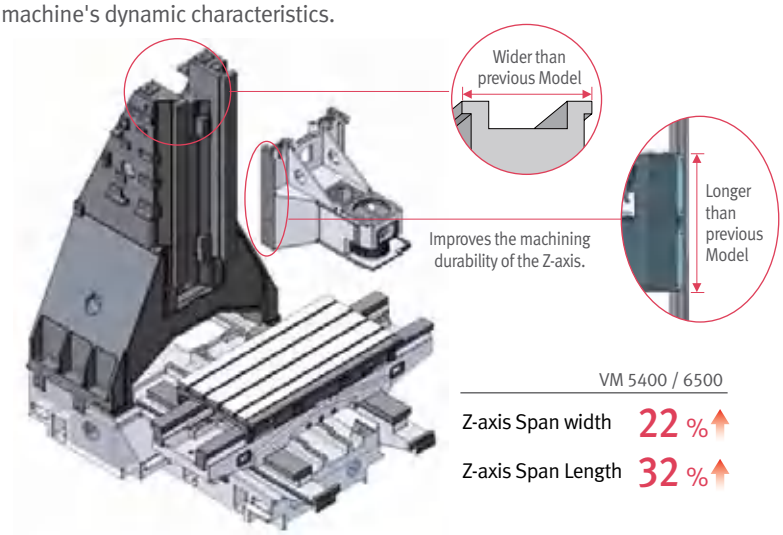
• FEM analysis used to design a stable body. (FEM : Finite Elements Method)

The highly-rigid body structure is obtained by using the latest FEM analysis method, which optimizes the static and dynamic stiffness characteristics of the VM series. The resulting arch-shaped body structure provides an unrivalled level of rigidity, enabling an unsurpassed performance in heavy-duty machining.



Broader Box Guideways

Compared to the previous models, the broader box guideways greatly improve the machine's dynamic characteristics.



	VM 5400 / 6500
Z-axis Span width	22 % ↑
Z-axis Span Length	32 % ↑

Scraping of surface

The sliding surface of each guideway is bonded with Rulon® 142 to reduce friction, then hand scraped for a perfect fit.

High Speed / Precision Built-in Spindle

Since the main spindle is supported by 4 rows of P4 level high precision bearings, it maintains stable precision under high speed cutting operation for long periods. Moreover, the high torque 15.6 kW (20.9 Hp) direct connection type main spindle motor is equipped for high speed mold processing.

High Speed / Precision Built-In Spindle

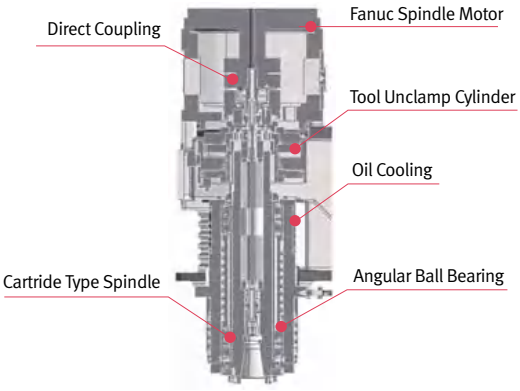
Spindle motor

15.6 kW (20.9 Hp)

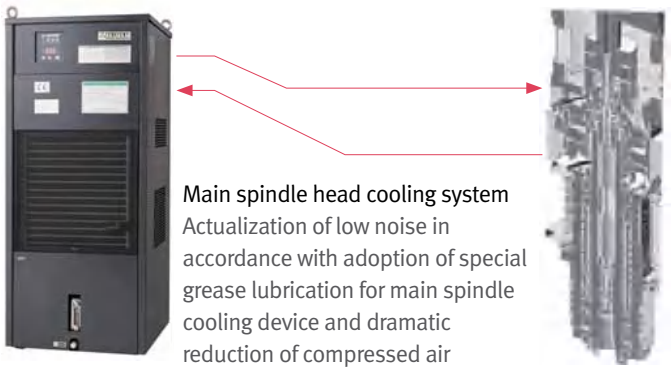
Max. speed

12000 r/min

Minimization of direct-connection type main spindle thermal deformation



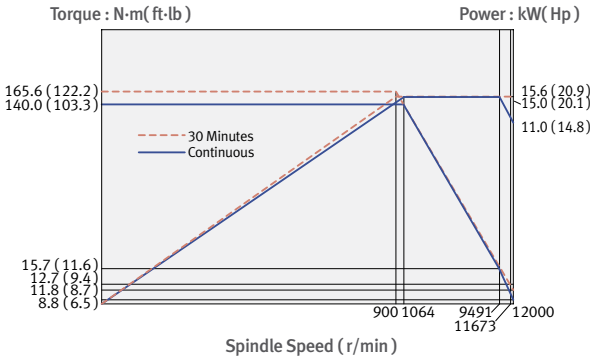
Low friction and heat generation of main spindle



Main spindle head cooling system

Actualization of low noise in accordance with adoption of special grease lubrication for main spindle cooling device and dramatic reduction of compressed air consumption allows minimization of main spindle thermal deformation.

Spindle power- torque diagram

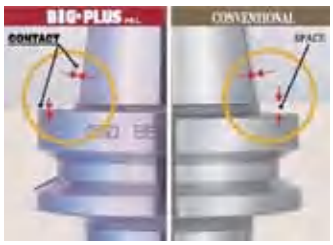


Z-axis free fall prevention function std.

Prevention of damage caused by Z axis freefall following power shutdown is included as standard.

Face / taper contact spindle std.

(BBT40)



Common utilization of BT40 Tool and 2-face binding tool (BIG PLUS)

Air Blower std.

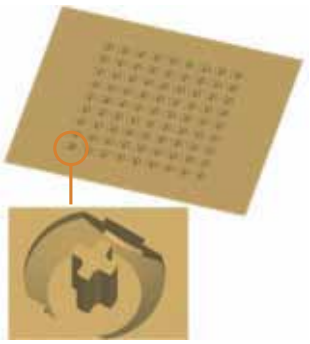
Dry processing and easy MQL connection

High speed / High precision

The unsurpassed quality and accuracy of the DVM series achieves world-class performance in the machining of die & mold products.

High Productivity

Cycle time of rubber die machining



The comparison of cycle time (actual result)

A competitor's machine
42hr 20min

12% up

VM 5400
37hr 50min

PDA mold processing

The comparison of cycle time (actual result)

A competitor's machine
1hr 48min 38s

23% up

VM 5400
1hr 23min 29s

VASE (Verification sample) cycle time

The comparison of cycle time (actual result)

A competitor's machine
25min 42s

8% up

VM 5400
23min 26s

Air filter mold processing

The comparison of cycle time (actual result)

A competitor's machine
89hr 42min

10% up

VM 5400
80hr 55min

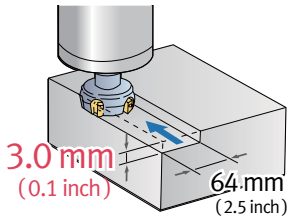
Machining Capacity (VM 5400)

The VM series provides high machining performance in various cutting processes.

Machining Capacity

Face mill BT40 — Carbon steel (SM45C)

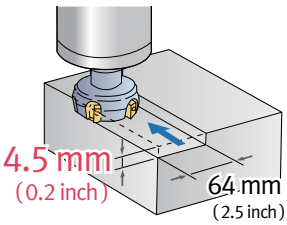
• ø80mm (3.15 inch) Face mill (5Z)



Machining rate	427 cm^3/min (16.8 in^3/min)
Spindle speed	750 r/min
Feedrate	2226 mm/min (87.6 ipm)

Face mill BT40 — Gray Casting (GC25)

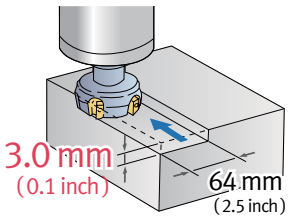
• ø80mm (3.15 inch) Face mill (5Z)



Machining rate	732 cm^3/min (28.8 in^3/min)
Spindle speed	1060 r/min
Feedrate	2544 mm/min (100.2 ipm)

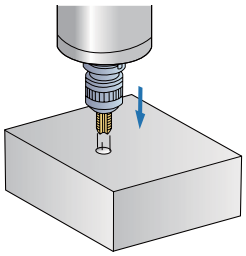
Face mill BT40 — Aluminum (AL6061)

• ø80mm (3.15 inch) Face mill (5Z)



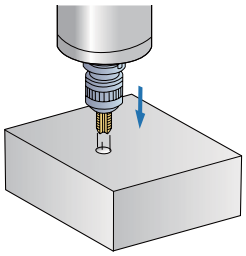
Machining rate	1728 cm^3/min (68.0 in^3/min)
Spindle speed	6000 r/min
Feedrate	9000 mm/min (354.3 ipm)

Tap BT40 — Carbon steel (SM45C)



Tool	M30 x P3.5
Spindle speed	220 r/min
Feedrate	770 mm/min (30.3 ipm)

Tap BT40 — Gray Casting (GC25)



Tool	M36 x P4.0
Spindle speed	200 r/min
Feedrate	800 mm/min (31.5 ipm)

• The results, indicated in this catalogue are provides as example. They may not be obtained due to differences in cutting conditions and environmental conditions during measurement.

Chip Disposal

Chip control is important to increase productivity and to enhance the operator's working environment.
The VM series offers many features to optimize chip disposal.

Chip Removal

Inner structure for effective chips and coolant flow

The inner structure of the Mynx series machines is designed to lead the flow of chips and coolant into a front-mounted chip pan for effective chip disposal.

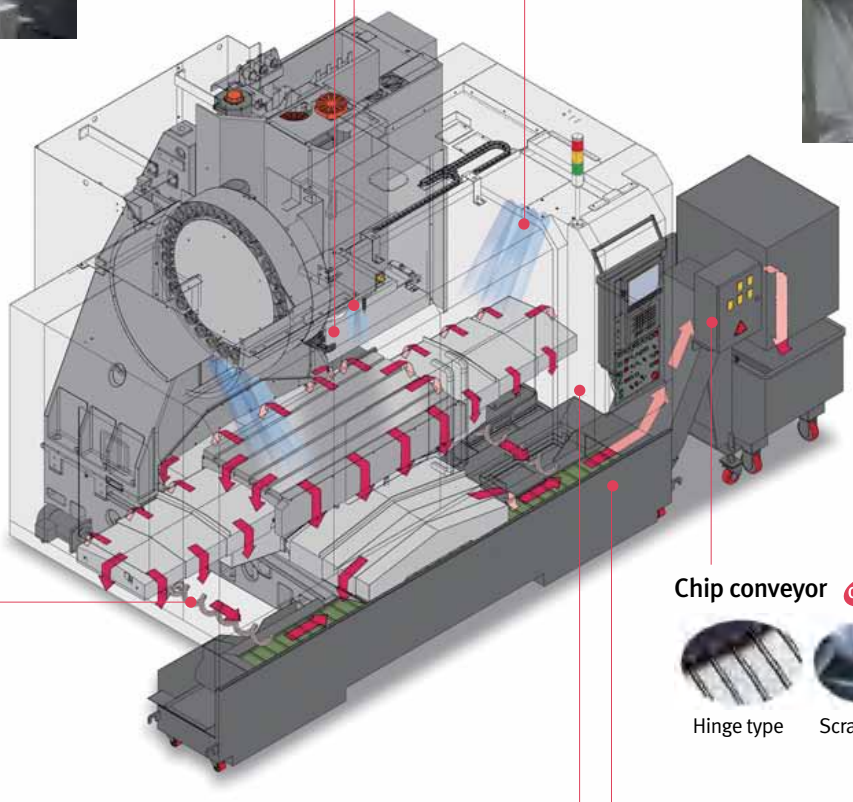
Through spindle coolant opt.

Middle pressure 1.96 Mpa (284.2 psi) [20 bar]
High pressure 6.86 Mpa (994.7 psi) [70 bar]

• Measured at pump outlet with 60Hz power.

Flood coolant std.

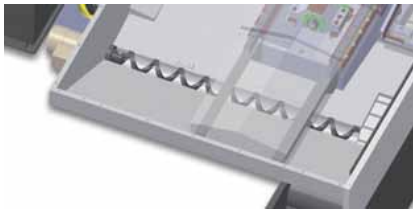
Shower coolant opt.



Chip conveyor opt.

Hinge type Scraper type Drum filter type

Internal screw conveyor std.



Coolant Gun opt.

Larger Coolant Tank Capacity

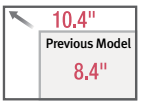
Previous Model		VM series	
VM 510	300 ℓ (79.3 galon)	VM 5400	380 ℓ (100.4 galon)
VM 650	300 ℓ (79.3 galon)	VM 6500	380 ℓ (100.4 galon)

Easy Set-up

Operating Console std.

1 10.4" Color TFT LCD Monitor as Standard Feature

The wide screen displays more useful infromation for the operator. Doosan's customized pages make setting up, operating, and machine conditionmonitoring easier.



2 Pentium Board is standard.

3 Portable MPG

It makes workpiece setting easier for the operator

4 Easier ATC operation and maintenance.

Magazine : CW
Magazine : CCW

It gives much easier operation and maintenance for ATC.

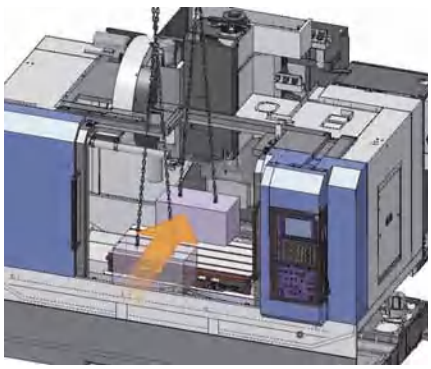
5 PCMCIA Card

6 Embedded Ethernet / RS-232C

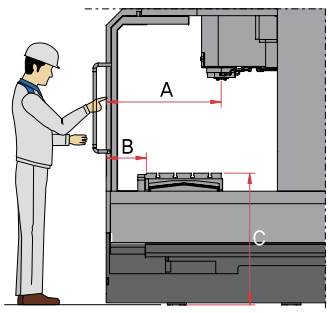
7 Swivelling Operating Console

The easy-to-use operation panel can swivel 0-90°

Workpiece loading



Accessibility



Unit : mm (inch)

A	VM 5400	830 (32.7)
	VM 6500	895 (35.2)
B	VM 5400	290 (11.4)
	VM 6500	224 (8.8)
C	VM 5400	950 (37.4)
	VM 6500	950 (37.4)

Easy Operation Package *EOP (Easy Operation Package)

Doosan's easy operation software package is customized to provide fast and easy operation for tooling, workpiece and program setup. These features maximize productivity by minimizing time lost during process setup.

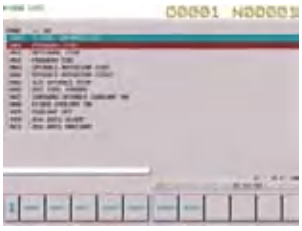
Programming

std.
- Doosan Fanuc 32i-B
- 10.4" color TFT LCD
- Embedded Ethernet

G Code List

Operator can check the meaning of each G-code.

M Code List



Operator can check the meaning of each M-code.

Tool Data Registry Table

Operator can edit & check the tool number of the tool magazine pot.

Pattern Cycle

It is easy to make pattern cycle program by this funciton.

Calculator

Operator can calcute numerical formula in relation to arc and hole easily.

ENGRAVING opt.

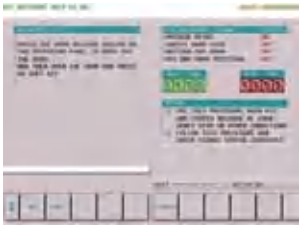
It makes "Engraving" programming easy.

Operation / Maintenance

Table Moving for Setup

Enables quick and easy table movement to either of three positions during setup.

ATC Recovery Help



Allows easy recovery of ATC from ATC alarm status.

Sensor Status Monitor

Solenoid valve and sensor status can be checked without the electric diagram.

Alarm Guidance

The alarm remedy method for selected important alarms is displayed on the screen.

Easy NC Parameter Help

Operator can check some useful parameters for easy operation.

Operation Rate

Manages working and operation times for each operator.

Tool Load Monitor opt.

Damage to tools is minimized by monitoring the axis and spindle load during cutting operations.

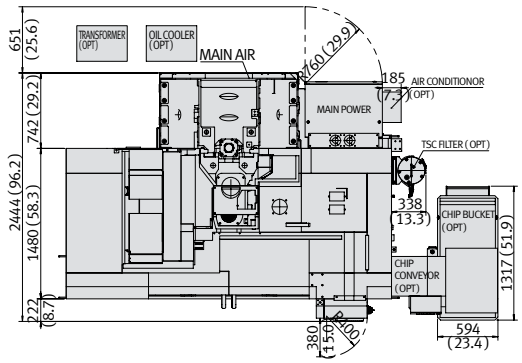
Renishaw Gui opt. Tool measure Work measure

Tooling and the work piece measurement are operated through a conversational control screen.

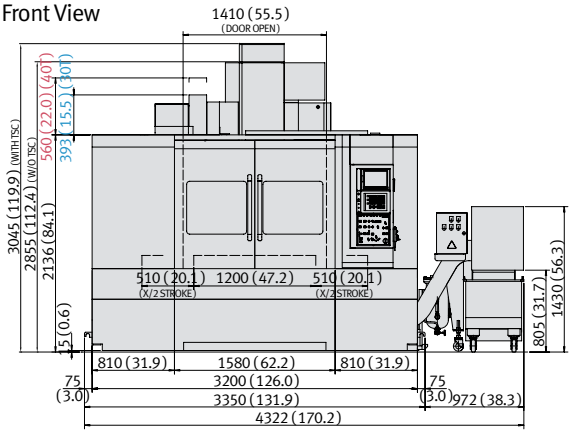
External Dimensions

VM 5400

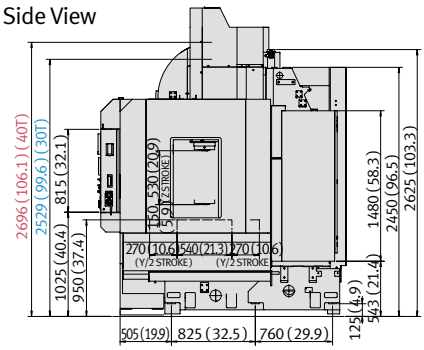
Top View



Front View

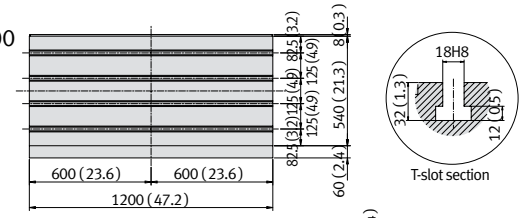


Side View

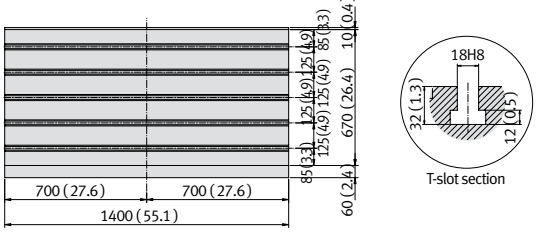


Table

VM 5400



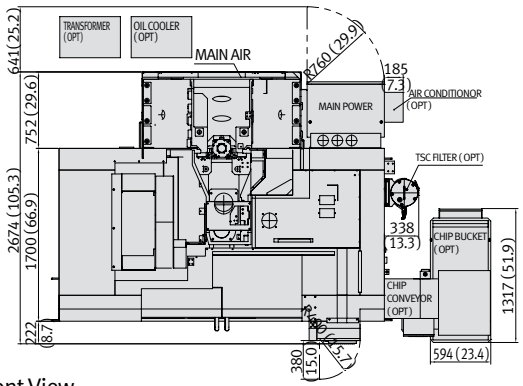
VM 6500



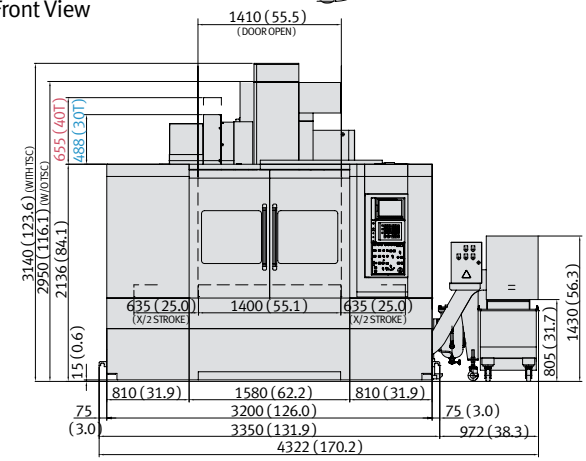
VM 6500

Unit : mm (inch)

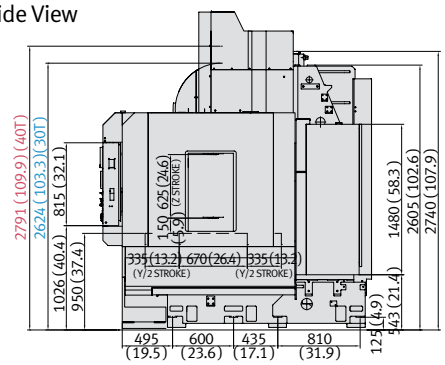
Top View



Front View

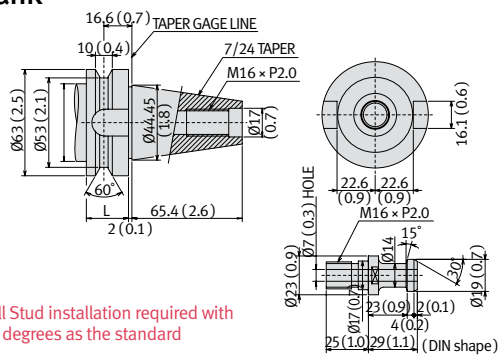


Side View



Tool Shank

BT40 Tool



※ Pull Stud installation required with 15 degrees as the standard

Machine Specifications

Description			Unit	VM5400	VM6500
Travels	Travel distance	X-axis	mm (inch)	1020 (40.2)	1270 (50.0)
		Y-axis	mm (inch)	540 (21.3)	670 (26.4)
		Z-axis	mm (inch)	530 (20.9)	625 (24.6)
	Distance from spindle nose to table top		mm (inch)	150 ~ 680 (5.9 - 26.8)	150 ~ 775 (5.9 - 30.5)
	Distance from spindle nose to column		mm (inch)	676 (26.6)	772 (30.4)
Feedrates	Rapid Traverse Rate (X / Y / Z-axis)		m/min (ipm)	30 / 30 / 24 (1181.1 / 1181.1 / 944.9)	
	Cutting feedrate		mm/min (ipm)	12000 (472.4)	
Table	Table size		mm (inch)	1200 × 540 (47.2 × 21.3)	1400 × 670 (55.1 × 26.4)
	Table loading capacity		kg (lb)	800 (1763.7)	1000 (2204.6)
Spindle	Max. Spindle speed		r/min	12000	
	Spindle taper		-	ISO #40 7/24 Taper	
	Max. Spindle torque		N·m (ft·lb)	165.6 (122.2)	
Automatic Tool Changer	Type of took shank		-	MAS406-BT40	
	Tool storage capa.		ea	30 { 40 }	
	Max. tool diameter (Without Adjacent Tools)		mm (inch)	80 [150], 76 [150]* (3.1 [5.9], 3.0 [5.9])	
	Max. tool length		mm (inch)	300 (11.8)	
	Max. tool weight		kg (lb)	8 (17.6)	
	Tool selection		-	Random	
	Tool change time (Tool-to-tool)		s	1.3	
	Tool change time (Chip-to-chip)		s	3.7	
Motors	Spindle motor power (30min)		kW (Hp)	15.6 (20.9)	
Power source	Electric power supply (rated capacity)		kVA	41.7	45.1
	Air Consumption		NL/min	250	
Machine Dimensions	Height (with TSC / without TSC)		mm (inch)	3045 / 2855 (119.9 / 112.4)	3140 / 2950 (123.6 / 116.1)
	Length × Width		mm (inch)	2444 × 3350 (96.2 × 131.9)	2674 × 3350 (105.3 × 131.9)
	Weight		kg (lb)	7000 (15432.1)	9000 (19841.3)

*40 Tools { } : opt.

Standard Feature

- Air blower
- Assembly & operation tools
- Automatic power off
- Coolant tank & chip pan
- Door interlock
- DSQ1 (AICC II _ 200 Block + Machine condition selection function)
- Full enclosure splash guard
- Installation parts
- Portable MPG
- Screw conveyor
- Signal tower (red, yellow, green)
- Spindle head cooling system
- work light

Optional Feature

- 3th axis MPG
- 4th axis preparation
- Air dryer
- Automatic tool length measurement with sensor
- Automatic tool measurement
- Chip conveyor & chip bucket
- DSQ2 (DSQ1+Data server [1GB])
- Mist Collector
- Rotary table
- Test bar (BT40)
- Through spindle coolant

• The specifications and information above-mentioned may be changed without prior notice.
• For more details, please contact Doosan

NC Unit Specifications

FANUC 32i-B

AXES CONTROL

- Controlled axes	3 (X, Y, Z)
- Simultaneously controllable axes Positioning(G00)/ Linear interpolation (G01) : 3 axes Circular interpolation (G02, G03) : 2 axes	
- Backlash compensation	
- Emergency stop/overtravel	
- Follow up	
- Least command increment	0.001mm / 0.0001inch
- Least input increment	0.001mm / 0.0001inch
- Machinelock	All axes/ Z axis
- Mirror image	Reverse axis movement (Setting screen and M - function)
- Stored pitch error compensation Pitch error offset compensation for each axis	
- Stored stroke check 1	Overtravel controlled by software
- Absolute pulse corder	

INTERPOLATION & FEED FUNCTION

- 2nd reference point return	G30
- Circular interpolation	G02, G03
- Dwell	G04
- Exact stop check	G09, G61 (mode)
- Feed per minute	
- Feedrate override (10% increments)	0 - 200%
- Jog override (10% increments)	0 - 200%
- Linear interpolation	G01
- Manual handle feed 1 unit	
- Manual handle feedrate	x1, x10, x100 (per pulse)
- Override cancel	M48 / M49
- Positioning	G00
- Rapid traverse override	F0 (fine feed), 25 / 50 / 100%
- Reference point return	G27, G28, G29
- Skip function	G31
- Helical interpolation	
- DSQ1 (AICC II+ Machining condition selection function)	200 block preview
- Thread cutting, synchronous cutting	G95
- Program restart	
- Automatic corner deceleration	
- Feedrate clamp by circular acceleration	
- Linear ACC / DEC before interpolation	
- Linear ACC / DEC after interpolation	
- Rapid traverse bell-shaped acceleration/deceleration	
- Smooth backlash compensation	

SPINDLE & M-CODE FUNCTION

- M- code function	M3 digits
- Spindle orientation	
- Spindle serial output	
- Spindle speed command	S5 digits
- Spindle speed override (10% increments)	50 - 150%
- Spindle output switching 1st	
- Retraction for rigid tapping	
- Rigid tapping	G84, G74

TOOL FUNCTION

- Tool nose radius compensation	G40, G41, G42
- Number of tool offsets	64ea
- Tool length compensation	G43, G44, G49
- Tool number command	T2 digits
- Tool life management	
- Tool offset memory C	H/D code, Geometry / Wear memory
- Tool length measurement	

PROGRAMMING & EDITING FUNCTION

- Absolute / Incremental programming	G90 / G91
- Auto. Coordinate system setting	
- Background editing	
- Canned cycle	G73, G74, G76, G80 - G89, G99
- Circular interpolation by radius programming	
- Plane selection	G17, G18, G19
- Custom macro B	
- Custom softwear size 512kB	
- Extended P-code Variables size 512kB	
- Decimal point input	
- Reader / puncher interface	RS - 232C
- Inch / metric conversion	G20 / G21
- Label skip	
- Local / Machine coordinate system	G52 / G53
- Maximum commandable value	±99999.999mm (±9999.9999 inch)
- Part program storage size 256KB (640m)	256 KB
- No. of Registered programs	500ea
- Optional block skip 1	
- Optional stop	M01
- Program file name	32s
- Sequence number	N 8-digit
- Program protect	
- Program stop / end	M00 / M02,M30
- Programable data input	Tool offset and work offset are entered by G10, G11
- Sub program call	Up to 10 nesting
- Tape code	ISO / EIA Automatic discrimination
- Work coordinate system	G54 - G59
- Additional work coordinate system	G54.1 P1 - 48 pairs
- Coordinate system rotation	G68, G69
- Extended part program editing	
- Optional angle chamfering corner R	
- Macro executor	

OTHERS FUNCTIONS (Operation, Setting & Display, etc)

- Alarm display	
- Alarm history display	
- Clock function	
- Cycle start / Feed hold	
- Display of PMC alarm message	Message display when PMC alarm occurred
- Dry run	
- Ethernet function (Embedded)	
- Graphic display	Tool path drawing
- Help function	
- Loadmeter display	
- MDI / DISPLAY unit	10.4" Color LCD, Keyboard for data input, soft-keys
- Memory card interface	
- Operation functions	Tape / Memory / MDI / Manual
- Operation history display	
- Program restart	
- Run hour and part number display	
- Search function	Sequence NO. / Program NO.
- Self - diagnostic function	
- Servo setting screen	
- Single block	
- External data input	
- Multi language display	

OPTIONAL SPECIFICATIONS

- 3D Cordinate Conversion	
- 3D tool compensation	
- 3rd / 4th reference return	
- Addition of tool pairs for tool life management	1024 pairs
- Additional controlled axes	max. 5 axes in total
- DSQ 2 (AICC II+Machining condition selection function + Data server + 1GB)	200 block preview

Doosan Machine Tools

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