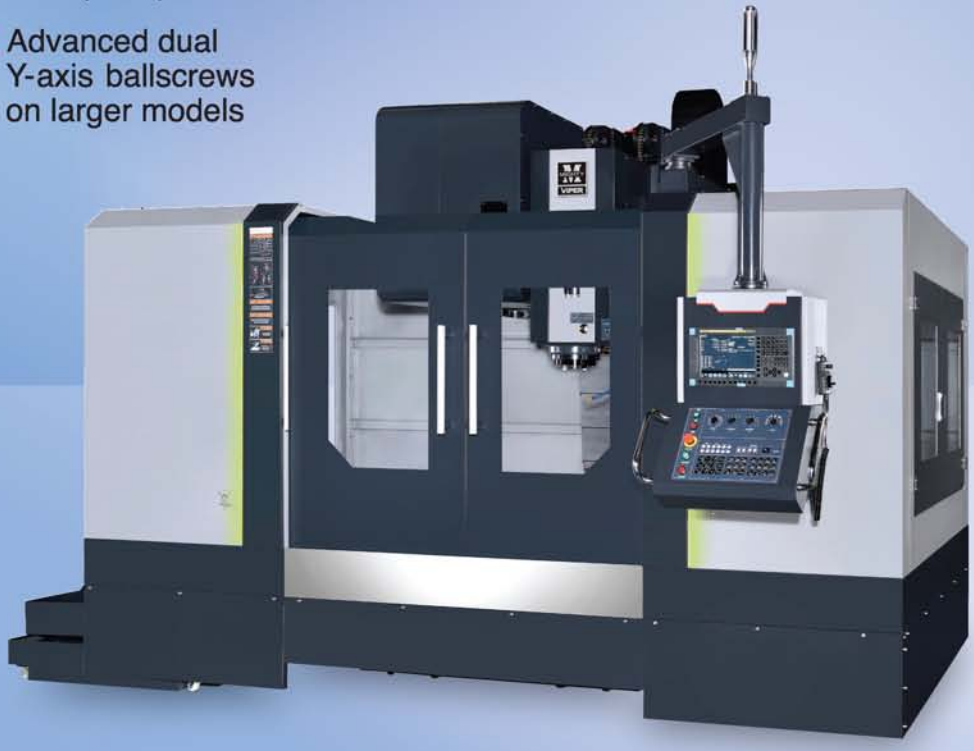
HEAVY-DUTY BOX WAYS

## VMC VERTICAL MILL

# HEAVY CUTTING

## PRECISION CNC MACHINING

- Full box way structure
- 50-taper spindle
- Advanced dual Y-axis ballscrews on larger models



VIPER

MIGHTY VI MACHINE TOOLS

*Powerful high speed spindle*

VMC Series

1160
1265
1370
1688
2100
3100

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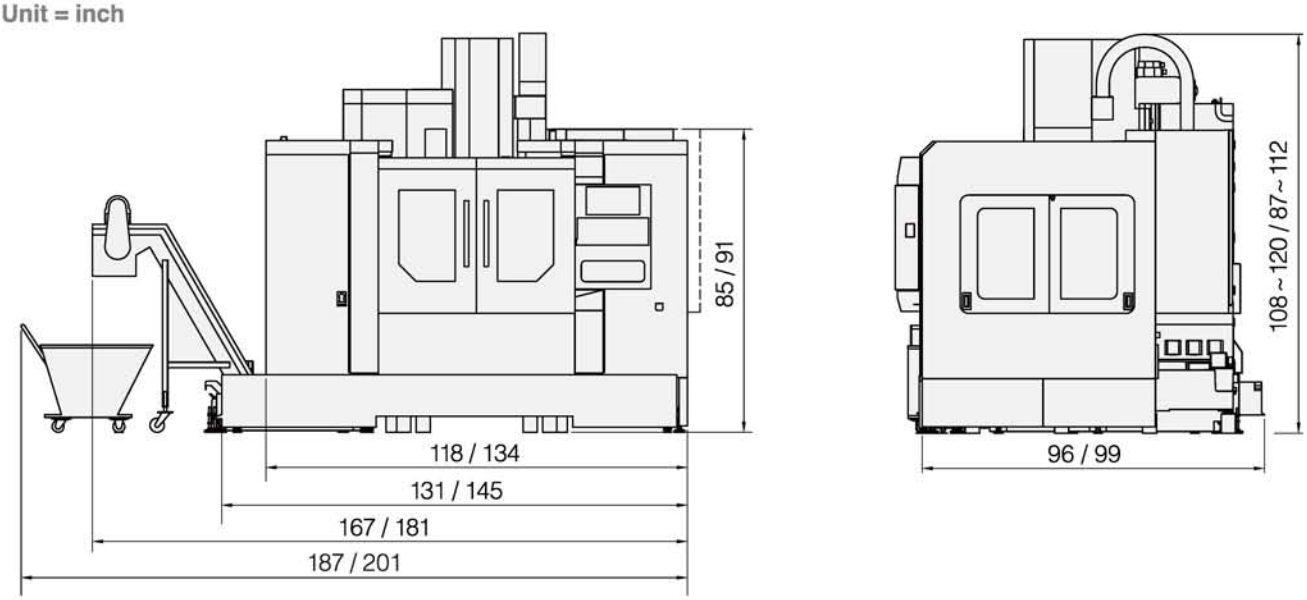
Machining on a small footprint.

# VMC-1160/VMC-1265

- Base casting box structure provides high rigidity.
- Slide ways are precision hand-scraped and coated with friction reducing Turcite-B.
- Direct drive motors on all 3-axes for precision machining and pre-tensioned ballscrews to minimize backlash.
- One-piece base casting ensures no leakage and excellent chip removal.
- Direct drive / belt drive / gear head (CAT-40 / CAT-50) are available to meet all customer's needs.
- Spindle-to-table clearance can be extended 8˝ to accomodate a rotary table.
- The A-shaped column enhances structural support to the machine—bears heavy loading and cutting—increases spindle head rigidity and machining accuracy.
- The ratio for spindle vertical to Y-axis travel is almost 1:1

Unit = inch




## VMC-1160 / VMC-1265

24-tool Magazine • Chip Conveyor • Spindle Oil Chiller • CTS System (Option)

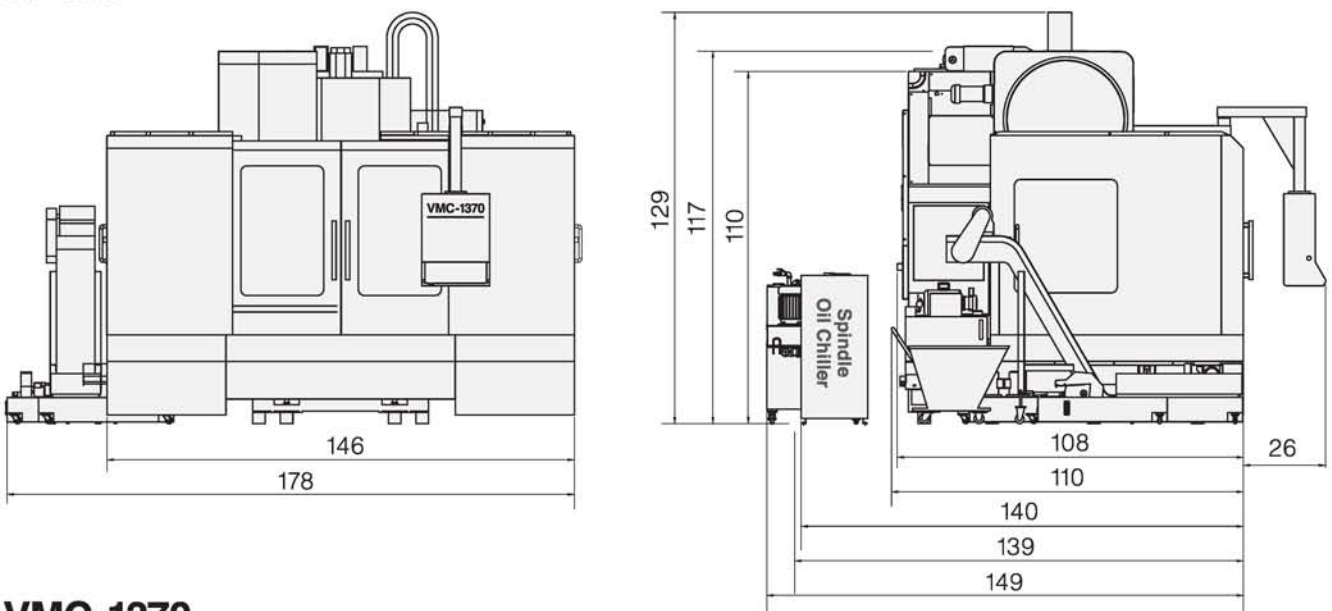
Reduced cycle times. Higher parts volume.

# VMC-1370

- Base casting box structure provides high rigidity.
- Box ways on all 3-axes are precision hand-scraped and coated with friction reducing Turcite-B for long service life.
- Direct drive motors on all 3-axes for precision machining, and pre-tensioned ballscrews to minimize backlash.
- One-piece base casting to ensure no leakage and excellent chip removal.
- Base utilizes 4 box ways along Y-axis —provides heavy loading capacity and excellent cutting rigidity.
- The A-shaped column enhances structural support to the machine—bears heavy loading and cutting—increases spindle head rigidity and machining accuracy.

- Direct drive or gear head spindle are available to meet customer's needs.

Unit = inch




**VMC-1370**

24-tool Magazine • Chip Conveyor • Spindle Oil Cooler • CTS System (Option)

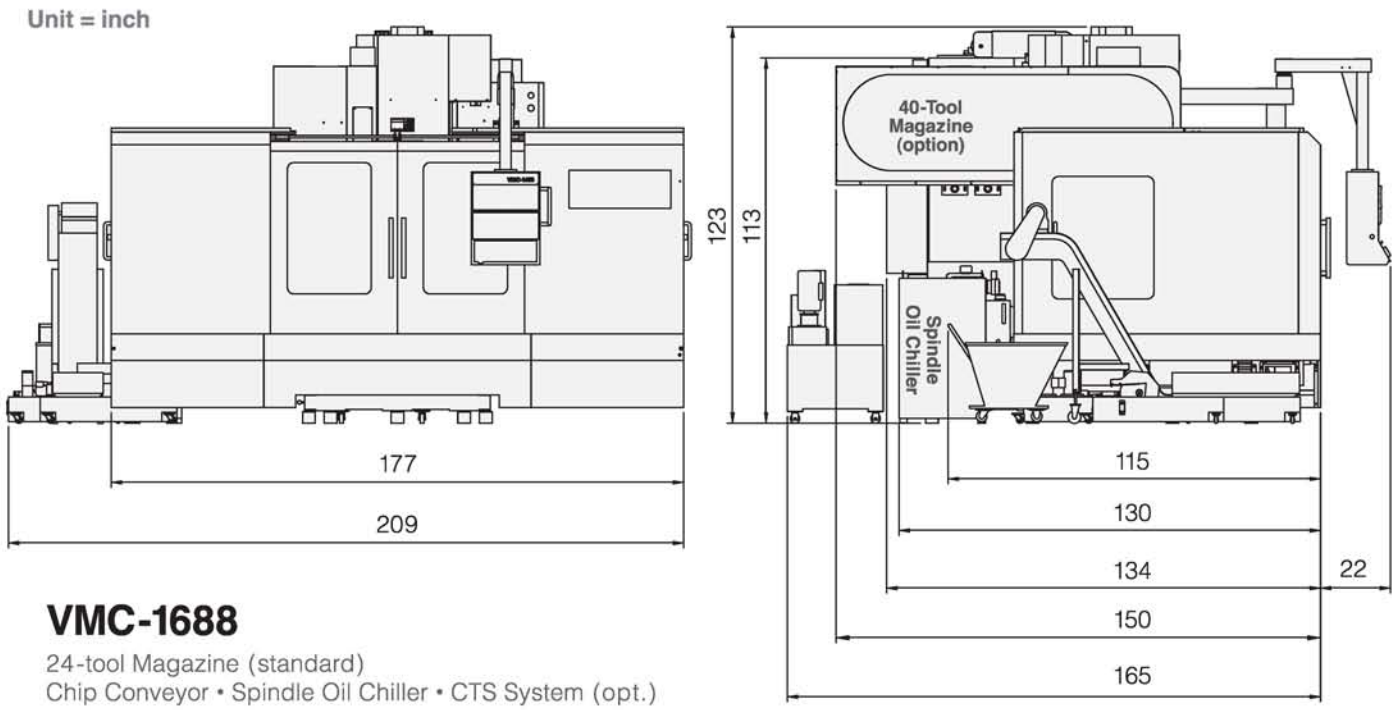
Heavy-duty machining with shorter production time.

# VMC-1688


*4 slide ways along Y-axis provide heavy loading capacity and excellent cutting rigidity.*

- The A-shaped column enhances structural support to the machine—bears heavy loading and cutting—increases spindle head rigidity and machining accuracy.
- Direct drive motors on 3-axes for precision machining and pre-tensioned ballscrews to minimize backlash.
- Base casting box structure provides high rigidity.
- Direct drive / gear head are available to meet customer's needs
- One-piece base casting ensures no leakage and excellent chip removal.
- Slide ways are precision hand-scraped and coated with friction reducing Turcite-B.
- Balanced casting design has a near one-to-one ratio. Base-column span / X-axis travel; and spindle head height / Y-axis travel.

Unit = inch




## VMC-1688

24-tool Magazine (standard)
Chip Conveyor • Spindle Oil Chiller • CTS System (opt.)

Powerful high speed spindle.

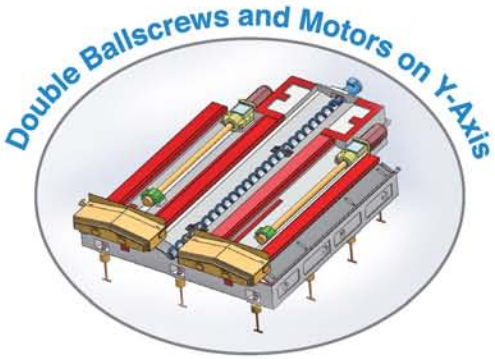
# VMC-2100

**VMC-2600 / VMC-3100**

*4th axis interface available*

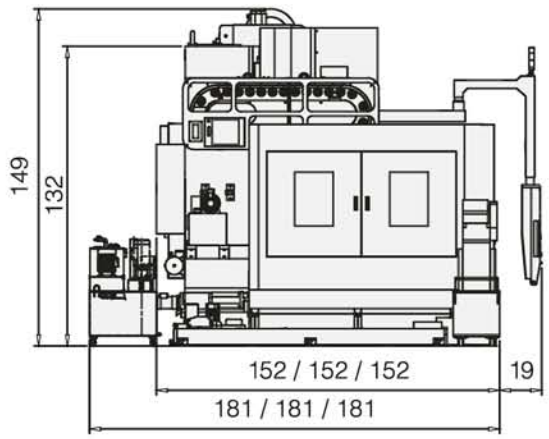
*VMC-2100 model shown*

- Base casting box structure provides high rigidity.
- Slide ways are precision hand-scraped and coated with friction reducing Turcite-B.
- Direct drive motors on all 3-axes for precision machining, and pre-tensioned ballscrews to minimize backlash.
- Base utilizes extra wide slide ways along Y-axis—provides heavy loading capacity and excellent cutting rigidity.
- Dual ballscrews on Y-axis enhances accuracy by eliminating uneven table load distribution.

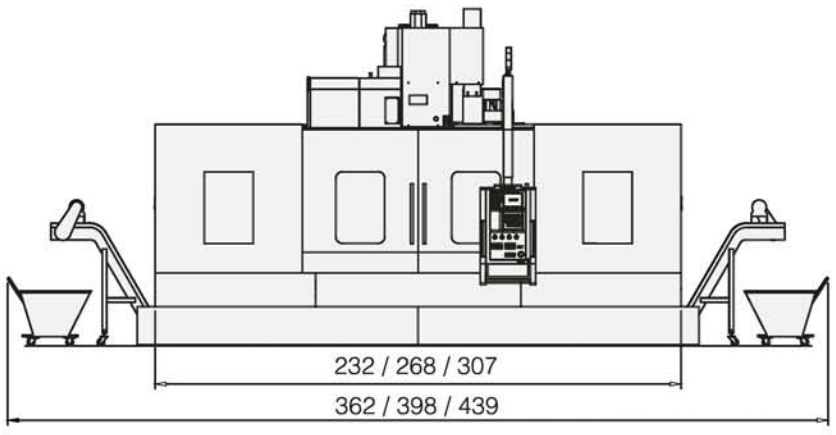



*Dual ballscrews on Y-axis provide fast traverse rates and high-speed acceleration.*

**Unit = inch**




**[ VMC Series: 2100 / 2600 / 3100 ]**




**[ VMC Series: 2100 / 2600 / 3100 ]**

## VMC-2100 / VMC-2600 / VMC-3100

24-tool Magazine • Chip Conveyor • Spindle Oil Chiller • CTS System (option)

Wider design yields high rigidity.

# Large Capacity—Rigid Construction

The Viper **VMC** series represents an innovative design concept for a modern vertical machining center. Its features are big in every way—capacity, rigidity and productivity—to satisfy the most demanding requirements and expectations. The unique structure design enables the VMC machine to deliver an exceptional value in machine rigidity, cutting precision, and more productivity for reliable performance.

**Excellent Machine Design**
Features that support greater productivity:

- Dual ballscrews and servo motors on Y-axis
- Robust cast iron headstock
- Wide A-shaped column
- Extra-wide Y-axis travel
- 3 axes direct-coupled servomotors
- 3 axes pretensioned ballscrews

** Optional accessory.*

*Powerful machining on a small footprint.*

## VMC-1160 / VMC-1265

| | |
|---|---|
| **X-Travel** | 43″ / 50″ |
| **Y-Travel** | 24″ / 26″ |
| **Z-Travel** | 25″ / 26″ |
| **Max load** | 2600 / 2600 lb |
| **Table size** | 49″ × 24″ / 53″ × 26″ |

Heavy Box Ways • 2 slide ways

*Reduced cycle times. Higher parts volume.*

## VMC-1370

| | |
|---|---|
| **X-Travel** | 51″ |
| **Y-Travel** | 28″ |
| **Z-Travel** | 28″ |
| **Max load** | 3300 lb |
| **Table size** | 59″ × 28″ |

Heavy Box Ways • 4 slide ways

## VMC-1688

| | |
|---|---|
| **X-Travel** | 63″ |
| **Y-Travel** | 35″ |
| **Z-Travel** | 28″ / (35.4″)* |
| **Max load** | 5500 lb |
| **Table size** | 71″ × 37″ |

Heavy Box Ways • 4 slide ways

*Heavy-duty machining with shorter production time.*

## VMC-2100 / 2600

| | |
|---|---|
| **X-Travel** | 83″ / 102″ |
| **Y-Travel** | 40″ |
| **Z-Travel** | 42″ |
| **Max load** | 6600 lb |
| **Table size** | 83″ × 39″ / 102″ × 39″ |

Heavy box ways • 4 slide ways

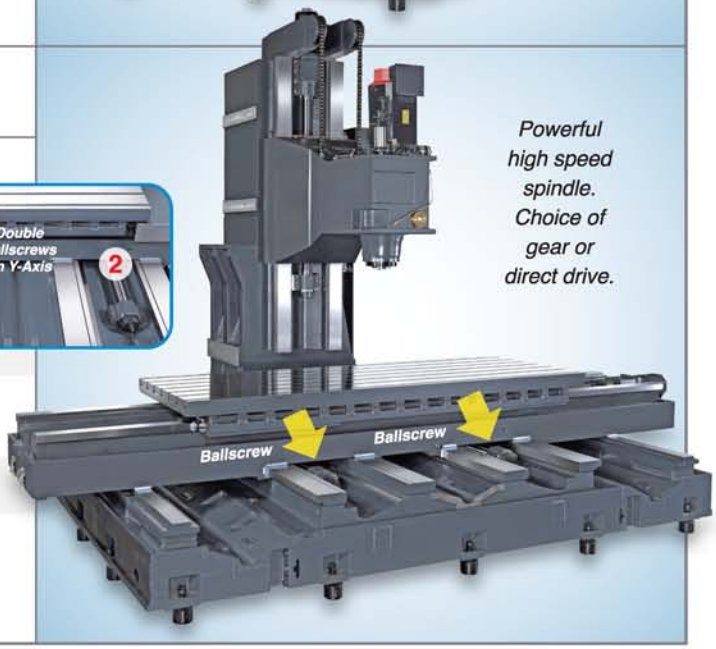


*Dual Y-axis ballscrews on VMC-2100 to VMC-4100 (standard).*

## VMC-3100

| | |
|---|---|
| **X-Travel** | 122″ |
| **Y-Travel** | 40″ |
| **Z-Travel** | 42″ |
| **Max load** | 8800 |
| **Table size** | 122″ × 39″ |

Heavy box ways • 6 slide ways


*Powerful high speed spindle. Choice of gear or direct drive.*

# Excellent Gearbox Design

Smooth and stable gear shifting

## Gear Head Features

- 2-speed precision gear system
- High-speed cutting with powerful torque
- Rigid spindle housing
- 8000 rpm

Spindle chiller circulates oil through the gears and **spindle cartridge**—eliminating thermal expansion and lengthens life of bearings.

*Box-type **headstock** provides absolute rigidity and stability during heavy machining.*

## High Torque with Low Noise Performance

Two-speed gearbox consist of DIN level 5 gears, high performing bearings and oil cooling system to minimize thermal expansion. Every **gearbox** set is inspected using vibration and run-in tests to ensure each gear is shifting smooth and stable, achieving a G1 vibration level.

# Outstanding Spindle Performance

Next generation design provides high speed, high precision and high performance.

***Direct Drive Spindle***
*10,000 rpm*

## CAT-50

Optional
**BT-50**

Gear
**8000**

Direct Drive
**10,000**

*Rigid tapping without noise, backlash or vibration problems.*

***Belt Spindle***
*10,000 rpm*

## CAT-40

Optional
**BT-40**

Gear
**8000**

Belt
**10,000**

Direct Drive
**12,000**

*Spindle accuracy enhanced with oil coolant system.*

# High Speed Spindle

Choice of Gear or Direct Drive spindle head

Torque diagrams.

Featuring powerful 20, 25 or 35 hp high torque spindle motor. Big 50-taper and 40-taper spindle size. The maximum spindle speed is 8000 rpm for Gear and 10,000 rpm for Direct-Drive.

Forced cooling circulation around the spindle housing, bearings and gear box maintains a consistent temperature between the spindle and the machine with a coolant system as a standard feature.

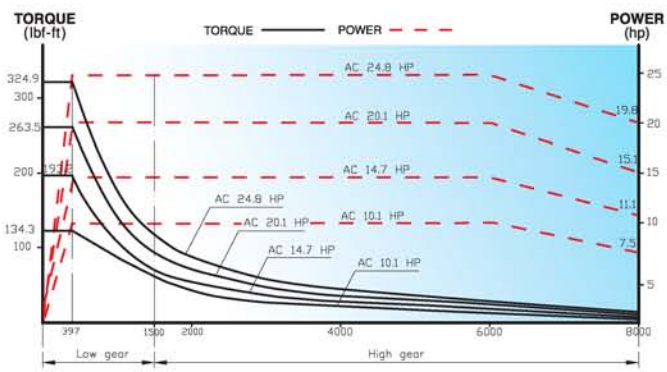
**Excellent Spindle Performance**

Features that push productivity:

- Coolant system
- Coolant through spindle
- Coolant through tool
- Large spindle head
- Fast spindle speeds
- Powerful gearbox

**VMC-1160/VMC-1265**

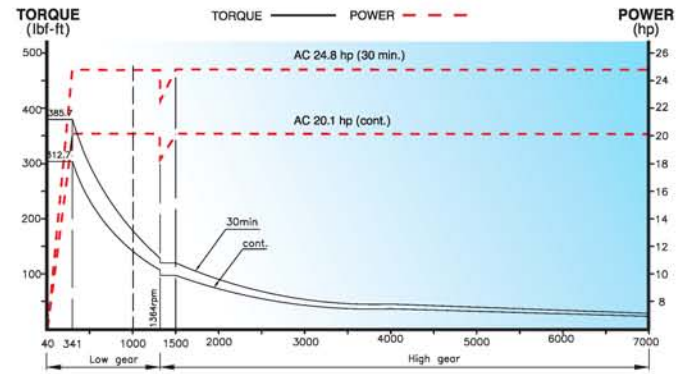
CAT-40 / 50 Gear 8,000 rpm (FANUC α8/α12/α15)




SPINDLE SPEED (rpm)

**VMC-1370 / 1688 / 2100 / 3100**

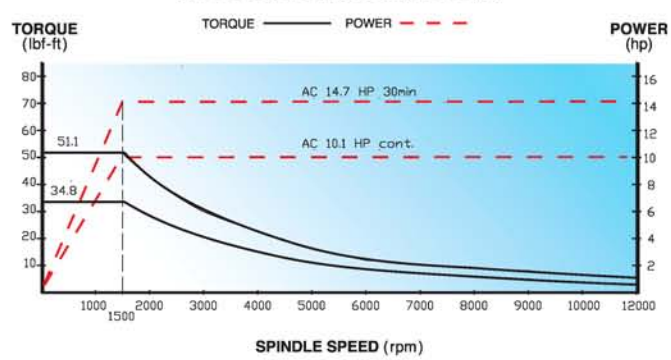
CAT-50 Gear 7,000 rpm (FANUC α15)




SPINDLE SPEED (rpm)

**VMC-1160/VMC-1265**

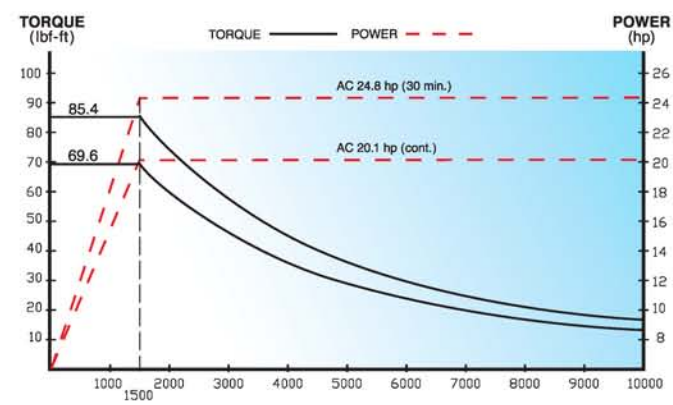
CAT-40 Direct Drive 12,000 rpm (FANUC α8)




SPINDLE SPEED (rpm)

**VMC-1370 / 1688 / 2100 / 3100**

CAT-50 Direct Drive 10,000 rpm (FANUC α15)




SPINDLE SPEED (rpm)

# Cutting Performance

Face milling, end milling, drilling and tapping test results.

| MACHINING SPECIFICATIONS | **Taper:** CAT-50 **Speed:** 6000 rpm (Gear) **Motor:** Fanuc (25 hp) α15i / 7000 |
|---|---|

### FACE MILLING

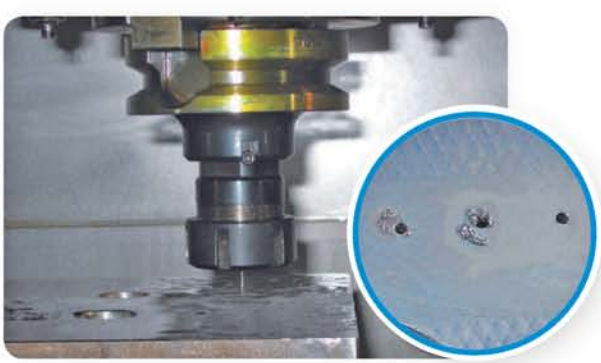
| | |
|---|---|
| Workpiece Material | S45C (SAE 1045) |
| Tool used: | Ø3.2″ Face Mill |
| Spindle speed: | 700 rpm |
| Feedrate: | 79 ipm |
| Depth/Width of Cut: | 0.2″ / 2.8″ |
| Metal Removal Rate: | 34 $in^3$ / min |

### DRILLING

| | |
|---|---|
| Workpiece Material: | S45C (SAE 1045) |
| Tool used: | Ø2.0″ Insert Drill |
| Spindle speed: | 1500 rpm |
| Feedrate: | 7.1 ipm |
| Metal Removal Rate: | 22 $in^3$ / min |

### TAPPING

| | |
|---|---|
| Workpiece Material: | S45C (SAE 1045) |
| Tool used: | M42 × 4.5P tap |
| Spindle speed: | 200 rpm |
| Feedrate: | 35 ipm |



### TAPPING

| | |
|---|---|
| Workpiece Material: | S45C (SAE 1045) |
| Tool used: | M2 × 0.4P tap |
| Spindle speed: | 1200 rpm |
| Feedrate: | 19 ipm |

# Automatic Tool Change (ATC)

Double swivel arm type ATC uses a fast and accurate pneumatic system that selects tools through the shortest distance avoiding cutting chips and work piece interference.

**High Speed ATC**

## Tool
Size

- Magazine accepts tools with **4.3˝** maximum diameter
- **8.5˝** maximum diameter without adjacent tools
- **12˝** tool length
- **33 lb.** maximum weight capacity

## Tool Capacity

**24**
**Tools**
Standard

OPTIONAL TOOL CAPACITY
**32 40 60**

### Tool Change Time

**2.8**
**Seconds**
Tool-to-Tool

## Tool
Magazine

Arm style tool magazine is fully enclosed to prevent chips from lodging in the tool carousel.



# Quality Assurance

Rigorous tests and inspection–Extra level of quality control performed on key components.

## 3D Probe


3D probe system-quality assurance (CMM)

## Heavy Cutting

Heavy cutting test-face milling

## Laser


Laser inspection

## Ball Milling

3D cutting test - circular ball milling

## Cutting Test

Light cutting test - 45° parallel
and 2D circular milling

## Ball Bar

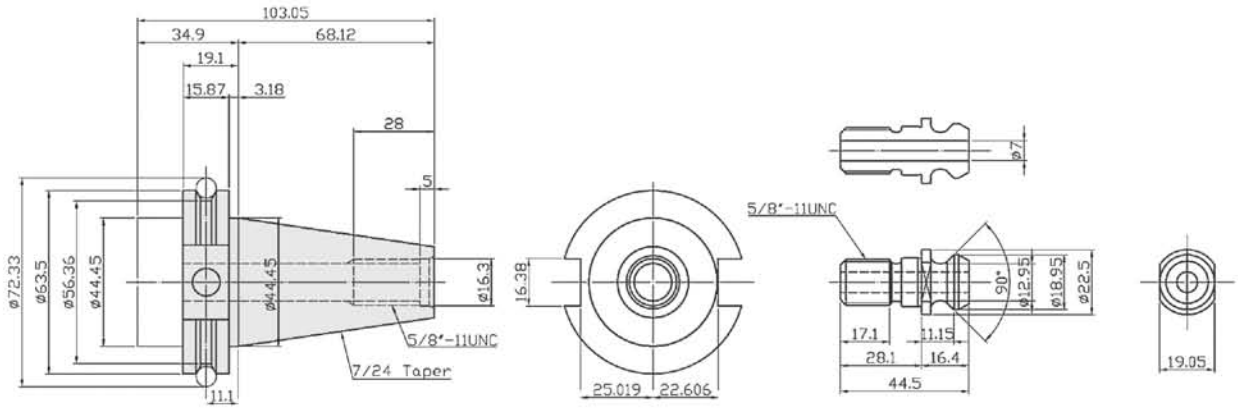
Ball bar inspection

## Tool Shank

Tool holder dimensions.

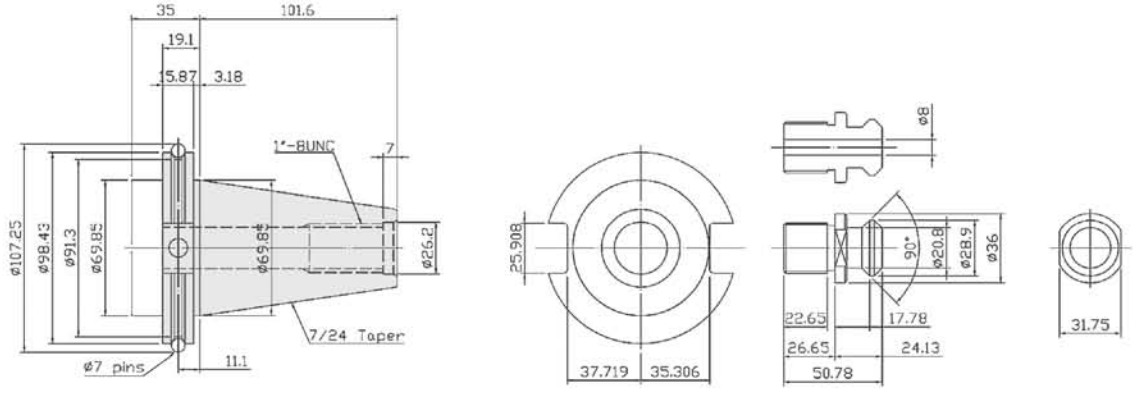
### CAT-40

Tooling Dimension (CTS)




### CAT-50

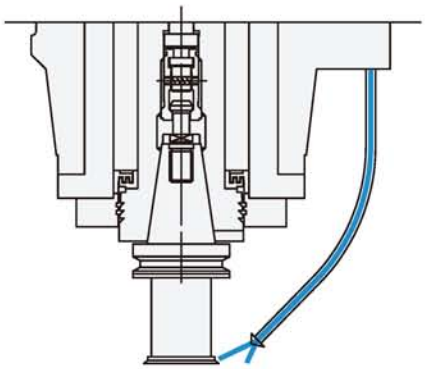
Tooling Dimension (CTS)



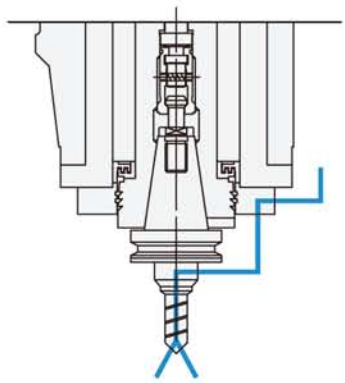
## Tool Cooling

Spindle tool temperature cooling

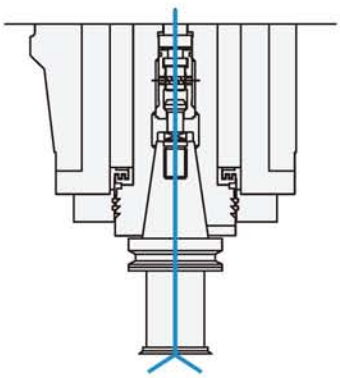
**Coolant Nozzle** (Standard)



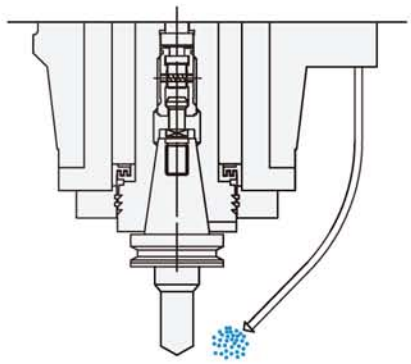
**Coolant Through Tool** (Optional)



**Coolant Through Spindle** (Optional)

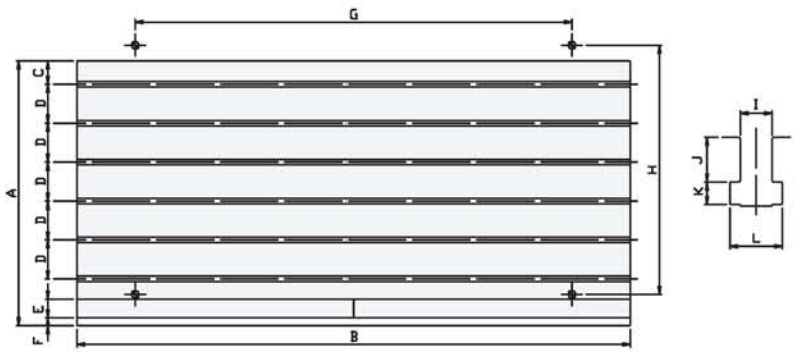


**Oil-mist Coolant System** (Optional)



## Table Dimensions

Table length, width and T-slot dimensions.




| Item | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VMC-1160 | 24 | 49 | 2 | 5 | — | — | 43 | 24 | 0.71 | 0.94 | 0.47 | 1.2 |
| VMC-1265 | 26 | 53 | 3 | 5 | — | — | 50 | 26 | 0.71 | 0.94 | 0.47 | 1.2 |
| VMC-1370 | 28 | 59 | 4 | 5 | — | — | 55 | 28 | 0.71 | 0.94 | 0.47 | 1.2 |
| VMC-1688 | 37 | 71 | 2.6 | 5 | 1.7 | 0.98 | 63 | 35 | 0.87 | 1.14 | 0.63 | 1.45 |
| VMC-2100 | 39 | 83 | 2 | 6 | — | — | 83 | 40 | 0.87 | 1.14 | 0.63 | 1.45 |
| VMC-2600 | 39 | 102 | 2 | 6 | — | — | 102 | 40 | 0.87 | 1.14 | 0.63 | 1.45 |
| VMC-3100 | 39 | 122 | 2 | 6 | — | — | 122 | 40 | 0.87 | 1.14 | 0.63 | 1.45 |

# Machine Specifications

*Design and specifications subject to change without prior notice • (*) = Optional accessory.*

| ITEM | UNIT | VMC-1160A | VMC-1160B | VMC-1265A | VMC-1265B | VMC-1370 |
|---|---|---|---|---|---|---|
| **Travel** | | | | | | |
| X-travel | inch | 43 | | 50 | | 51 |
| Y-travel | inch | 24 | | 26 | | 28 |
| Z-travel | inch | 25 | | 26 | | 28 |
| Distance spindle nose to table surface | inch | 4 ~ 29 | | 4 ~ 30 | | 8 ~ 35 |
| Distance spindle centerline to Z-axis ways | inch | 24.4 | | 28.5 | | 28 |
| **Table** | | | | | | |
| Table Size ( X × Y ) | inch | 49 × 24 | | 53 × 26 | | 59 × 28 |
| Max. table load | lb | 2650 | | 2650 | | 3300 |
| T-Slots (numbers x width × pitch) | inch | 5 × 0.7 × 5 | | 5 × 0.7 × 5 | | 5 × 0.7 × 5 |
| **Spindle** | | | | | | |
| Spindle Speed - (Standard) | rpm | 8000 (Gear) | | 8000 (Gear) | | 8000 (Gear) |
| Spindle Speed - (Option) | rpm | 10,000 / 12,000 (Direct Drive) | — | 10,000 / 12,000 (Direct Drive) | 10,000 (Direct Drive) | 10,000 (Direct Drive) |
| Spindle Taper | — | #40 | #50 | #40 | #50 | #50 |
| **Feedrate** | | | | | | |
| Rapid (X/Y/Z) | ipm | 945 / 945 / 787 | | 945 / 945 / 787 | | 945 / 945 / 787 |
| Cutting feedrate | ipm | 394 | | 394 | | 394 |
| **ATC** | | | | | | |
| Tool Shank type | — | CAT-40 | CAT-50 | CAT-40 | CAT-50 | CAT-50 |
| Magazine Capacity (Standard) | tools | 24 | | 24 | | 24 |
| Magazine Capacity (Optional) | tools | 32* / 40* | 30 | 32* / 40* | 30 | 30* / 40* |
| Max Tool Diameter (with adjecent tools) | inch | Ø3.0 | Ø4.3 | Ø3.0 | Ø4.3 | Ø4.3 |
| Max Tool Diameter (without adjecent tools) | inch | Ø5.9 | Ø8.5 | Ø5.9 | Ø8.5 | Ø8.5 |
| Max Tool Length | inch | 12 | | 12 | | 12 |
| Max Tool Weight | lb | 15 | 33 | 15 | 33 | 33 |
| Tool Change Time (Tool-to-Tool) | sec | 2.0 | 2.8 | 2.0 | 2.8 | 2.8 |
| Tool Change Time (Chip-to-Chip) | sec | 5.8 | 6.0 | 4.5 | 6.0 | 6.0 |
| **Motor** | | | | | | |
| Spindle Motor ( 30 min.) | hp | 10 / 15 | 20 / 25 | 10 / 15 | 20 / 25 | 20 / 25 |
| Servomotors X / Y / Z | hp | 4.0 / 4.0 / 5.4 | | 4.0 / 5.4 / 9.4 | | 5.4 / 5.4 / 9.4 |
| **Power Supply** | | | | | | |
| Power Supply | kVA | 20 | | 20 | | 20 |
| Compressed Air Supply | psi | 90 | | 90 | | 90 |
| Coolant Tank Capacity | gal | 120 | | 140 | | 110 |
| **External Dimension** | | | | | | |
| Width | inch | 187 | 187 | 201 | 201 | 178 |
| Length | inch | 96 | 96 | 99 | 99 | 139 |
| Height | inch | 120 | 120 | 112 | 122 | 129 |
| Weight | lb | 19,000 | 19,000 | 19,500 | 19,500 | 28,700 |
| **Accuracy** | | ( following values were tested in the temperature-controlled room ) | | | | |
| Positioning Accuracy - JIS 6338 ( within 12″ ) | inch | ±0.00020 | | ±0.00020 | | ±0.00020 |
| Repeatability Accuracy - JIS 6338 ( within 12″ ) | inch | ±0.00008 | | ±0.00008 | | ±0.00012 |

# Machine Specifications

*Design and specifications subject to change without prior notice • (*) = Optional accessory.*

| ITEM | UNIT | VMC-1688 | VMC-2100 | VMC-2600 | VMC-3100 |
|---|---|---|---|---|---|
| **Travel** | | | | | |
| X-travel | inch | 63 | 83 | 102 | 122 |
| Y-travel ($Y_1$ / $Y_2$) Dual Y-axis ballscrews | inch | 35 | 40 | | |
| Z-travel | inch | 28 | 35 / 42* | | |
| Distance spindle nose to table surface | inch | 8 ~ 35 | 4 ~ 39 / 4 ~ 46* | | |
| Distance spindle centerline to Z-axis ways | inch | 28 / (35)* | 40 | | |
| **Table** | | | | | |
| Table Size (X × Y) | inch | 71 × 37 | 83 × 39 | 103 × 39 | 122 × 39 |
| Max. table load | lb | 5500 | 6600 | 6600 | 8800 |
| T-Slots (numbers × width × pitch) | inch | 7 × 0.87 × 5 | 7 × 0.87 × 6 | | |
| **Spindle** | | | | | |
| Spindle Speed - (Standard) | rpm | | 8000 (Gear) | | |
| Spindle Speed - (Option) | rpm | 10,000 (Direct Drive) | 4000 (Gear)<br>10,000 (Direct Drive) | | |
| Spindle Taper | — | | #50 | | |
| **Feed** | | | | | |
| Rapid X / Y / Z | ipm | 787 / 787 / 590 | 394 / 394 / 394 | | |
| Cutting feedrate | ipm | 394 | 275 | | |
| **ATC** | | | | | |
| Tool Shank type | — | CAT-50 | | | |
| Magazine Capacity (Std.) | tools | 24 | | | |
| Magazine Capacity (Optional) | tools | 30* / 40* / 60* | | | |
| Max Tool Diameter (with adjecent tools) | inch | Ø4.3 | | | |
| Max Tool Diameter (without adjecent tools) | inch | Ø8.5 | | | |
| Max Tool Length | inch | 12 | | | |
| Max Tool Weight | lb | 33 | | | |
| Tool Change Time (Tool-to-Tool) | sec | 2.8 | | | |
| Tool Change Time (Chip-to-Chip) | sec | 6.0 | | | |
| **Motor** | | | | | |
| Spindle Motor (30 min.) | hp | 20 / 25 | 35 | | |
| Servomotors X / (Y1 / Y2) / Z | hp | 5.4 / 5.4 / 9.4 | *Dual Y-axis Ballscrews* | 9.4 / ( 9.4 / 9.4 ) / 9.4 | |
| **Power Supply** | | | | | |
| Power Supply | kVA | 35 | 55 | | |
| Compressed Air Supply | psi | 90 | 90 | | |
| Coolant Tank Capacity | gal | 110 | 200 | | |
| **External Dimension** | | | | | |
| Width | inch | 209 | 220 | 264 | 307 |
| Length | inch | 165 | 186 | 186 | 186 |
| Height | inch | 123 | 136 / 146 | 136 / 146 | 136 / 146 |
| Weight | lb | 37,100 | 47,100 | 50,700 | 53,000 |
| **Accuracy** | | ( following values were tested in the temperature-controlled room ) | | | |
| Positioning Accuracy - JIS 6338 ( within 12″ ) | inch | ±0.00020 | ±0.00020 | ±0.00020 | ±0.00031 |
| Repeatability Accuracy - JIS 6338 ( within 12″ ) | inch | ±0.00012 | ±0.00012 | ±0.00012 | ±0.00020 |

# Optional Accessories

(●) = Standard (O) = Optional (X) = Not Available (■) = Consult Mighty USA

| | | VMC-1160A | VMC-1160B | VMC-1265A | VMC-1265B | VMC-1370 | VMC-1688 | VMC-2100 | VMC-2600 | VMC-3100 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Spindle** | | | | | | | | | | |
| CAT-40 Belt 10,000 rpm (7/10 hp) | | ● | X | ● | X | X | X | X | X | X |
| CAT-40 Direct Drive 12,000 rpm (7/10 hp) | | ● | X | ● | X | X | X | X | X | X |
| CAT-40 Gear 6000 rpm (10/15 hp) | | ● | X | ● | X | X | X | X | X | X |
| CAT-40 Gear 7000 rpm (10/15 hp) | | ● | X | ● | X | X | X | X | X | X |
| CAT-40 Belt 10,000/12,000 rpm (10/15 hp) | | ● | X | ● | X | X | X | X | X | X |
| CAT-40 Belt 12,000 rpm (15/20 hp) | | ● | X | ● | X | X | X | X | X | X |
| CAT-50 Gear 6000 rpm (20/25 hp) | | X | ● | X | ● | ● | ● | ● | ● | ● |
| CAT-50 Gear 6000 rpm (30/35 hp) | | X | X | X | X | ● | ● | ● | ● | ● |
| CAT-50 Gear 8000 rpm (20/25 hp) | | X | ● | X | ● | ● | ● | ● | ● | ● |
| CAT-50 Gear 8000 rpm (30/35 hp) | | X | X | X | X | X | ● | ● | ● | ● |
| CAT-50 Direct Drive 10,000 rpm (20/25 hp) | | X | X | X | X | O | O | O | O | O |
| CAT-50 Direct Drive 10,000 rpm (30/35 hp) | | X | X | X | X | X | O | O | O | O |
| **Tool magazine** | | | | | | | | | | |
| Magazine capacity | 24 tools | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | 30 tools | X | O | X | O | ● | ● | ● | ● | ● |
| | 32 tools | O | X | O | X | X | X | X | X | X |
| | 40 tools | O | X | O | X | O | O | O | O | O |
| | 60 tools | X | X | X | X | O | O | O | O | O |
| **Tool** | | | | | | | | | | |
| Tool shank | — | — | — | — | — | — | — | — | — | — |
| | CAT-40 | O | X | O | X | X | X | X | X | X |
| | DIN-40 | O | X | O | X | X | X | X | X | X |
| | MAS BT-50 | X | ● | X | ● | ● | ● | ● | ● | ● |
| | CAT-50 | X | ● | X | ● | ● | ● | ● | ● | ● |
| | DIN-50 | X | O | X | O | O | O | O | O | O |
| Pull stud | — | — | — | — | — | — | — | — | — | — |
| | — | — | — | — | — | — | — | — | — | — |
| **Coolant** | | | | | | | | | | |
| Coolant system | | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Coolant through spindle | | O | O | O | O | O | O | O | O | O |
| Coolant through tool | | O | O | O | O | O | O | O | O | O |
| Oil skimmer | | ● | ● | ● | ● | ● | O | O | O | O |
| Chip flush coolant system | | O | O | O | O | O | O | O | O | O |
| Coolant gun | | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| **Chip disposal system** | | | | | | | | | | |
| Lift-up chip conveyor w/ bucket (Chain type) | | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Lift-up chip conveyor w/ bucket (Scrape type) | | O | O | O | O | O | O | O | O | O |
| Screw type chip conveyor (Front of base) | | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Screw type chip conveyor (Behind table) | | X | X | X | X | ● | ● | X | X | X |
| Screw type chip conveyor (Side/center of base) | | X | X | X | X | ● | ● | ● | ● | ● |
| Air blast function for workpiece | | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Spindle air blast | | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Oil-mist collection system | | O | O | O | O | O | O | O | O | O |
| **Measurement system** | | | | | | | | | | |
| Tool length measurement | | O | O | O | O | O | O | O | O | O |
| Workpiece length measurement | | O | O | O | O | O | O | O | O | O |
| Manual Pulse generator (MPG) | | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| **Operation support** | | | | | | | | | | |
| Auto power off (M30) | | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Automatic door | | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| **High accuracy control** | | | | | | | | | | |
| Liner scales (XYZ axes) | | O | O | O | O | O | O | O | O | O |
| **Safety system** | | | | | | | | | | |
| Full enclosure | | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| **Others** | | | | | | | | | | |
| Interior lighting lamp | | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Work light and tri-status light | | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Leveling bolts and pads | | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Tool box | | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 4th axis interface | | O | O | O | O | O | O | O | O | O |
| Rotary table 4th axis | | O | O | O | O | O | O | O | O | O |
| Air conditioner unit for electric cabinet | | O | O | O | O | O | O | O | O | O |
| Customized calculator software function | | O | O | O | O | O | O | O | O | O |
| Z-axis riser | | — | — | — | — | — | — | O | O | O |
| Z-axis travel extension | | O | O | O | O | X | X | O | O | O |

# MIGHTY NOTES ...

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