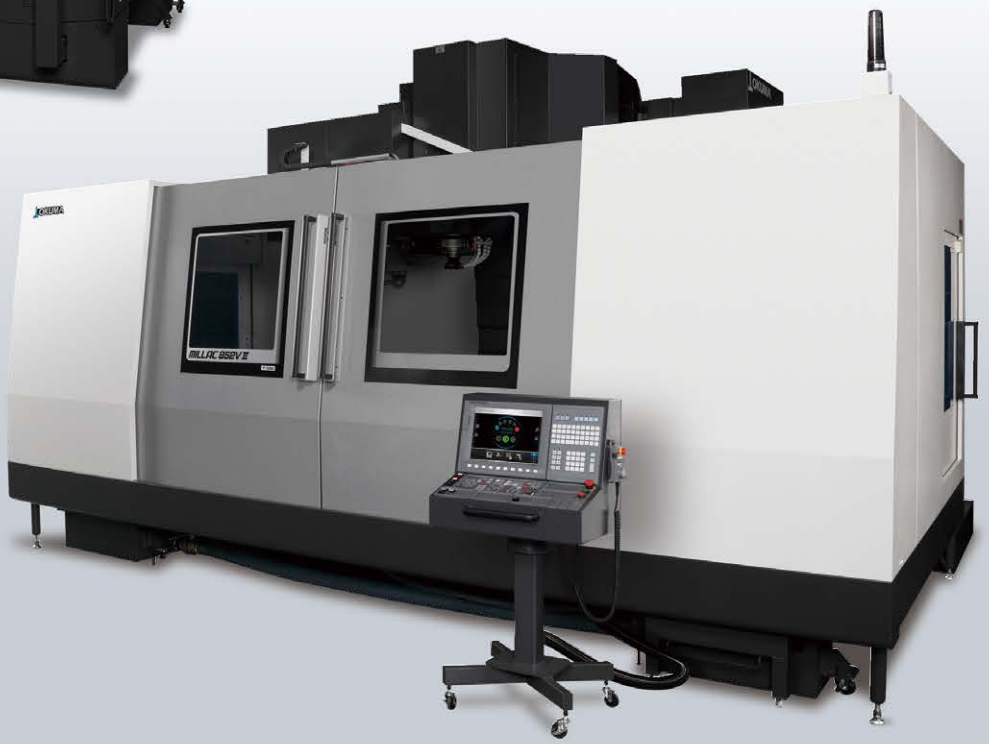
OKUMA

OPEN POSSIBILITIES

Vertical Machining Centers

MILLAC V II series

MILLAC 468V II / MILLAC 561V II
MILLAC 611V II / MILLAC 761V II
MILLAC 852V II / MILLAC 1052V II



Vertical Machining Centers

MILLAC VII series

MILLAC 468V II / MILLAC 561V II / MILLAC 611V II
MILLAC 761V II / MILLAC 852V II / MILLAC 1052V II

Intelligent Technology

Thermo-Friendly Concept

Collision Avoidance System

Machining Navi

SERVONAVI

MILLAC VII Series for heavy-duty cutting of medium-sized and large parts

Highly rigid slide guideway structure for powerful cutting and reduced cycle time

Thermo-Friendly Concept enables improved productivity with high dimensional stability

MILLAC 611V II

Table size: 1,600 × 610 mm

OSP | FANUC

Integral motor/spindle | Gear

No.50 20 to 4,000 min^{-1}

<Standard Specifications : Spindle speed>

MILLAC 761V II

Table size: 1,800 × 720 mm

OSP | FANUC

Integral motor/spindle | Gear

No.50 20 to 4,000 min^{-1}

<Standard Specifications : Spindle speed>

MILLAC 852V II

Table size: 2,200 × 850 mm
3,200 × 850 mm

OSP | FANUC

Integral motor/spindle | Gear

No.50 20 to 4,000 min^{-1}

<Standard Specifications : Spindle speed>

MILLAC 1052V II

Table size: 2,200 × 1,050 mm
3,200 × 1,050 mm

OSP | FANUC

Integral motor/spindle | Gear

No.50 20 to 4,000 min^{-1}

<Standard Specifications : Spindle speed>

MILLAC 468V II

Table size: 1,050 × 460 mm

OSP | FANUC

Integral motor/spindle

No.40 50 to 15,000 min^{-1}

No.50 60 to 6,000 min^{-1}

<Standard Specifications : Spindle speed>

MILLAC 561V II

Table size: 1,350 × 560 mm

OSP | FANUC

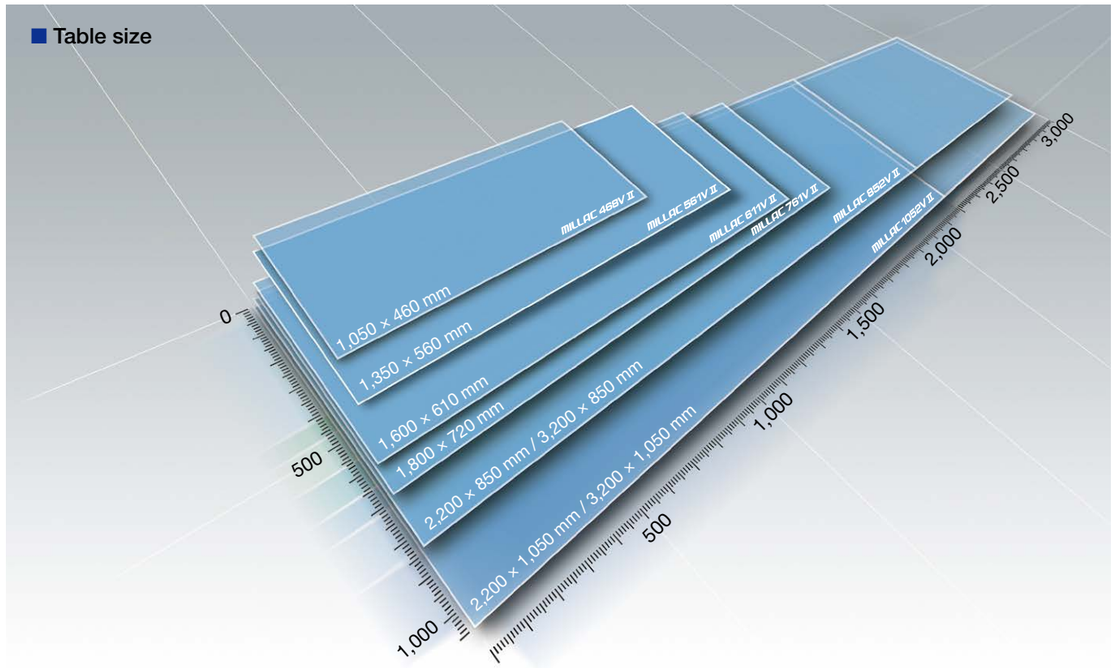
Integral motor/spindle | Gear

No.50 30 to 6,000 min^{-1}

<Standard Specifications : Spindle speed>

Photos shown in this brochure may include optional equipment.

Diverse lineup to meet all kinds of needs



Spindle specifications

: Standard Specifications

OSP Specifications			MILLAC 468V II	MILLAC 561V II	MILLAC 611V II	MILLAC 761V II	MILLAC 852V II	MILLAC 1052V II
No.40	Integral motor/spindle	Spindle speed [min^{-1}]	50 to 15,000	80 to 12,000	50 to 15,000			
		Motor output	26/18.5 kW	22/18.5 kW	26/18.5 kW			
No.50	Integral motor/spindle	Spindle speed [min^{-1}]	60 to 6,000	60 to 10,000	50 to 12,000			
		Motor output	18.5/11 kW	22/18.5 kW	26/18.5 kW			
	Gear	Spindle speed [min^{-1}]	–		20 to 4,000	20 to 4,000		20 to 4,000
		Motor output	–		15/11 kW	18.5/15 kW		22/18.5 kW
		Spindle speed [min^{-1}]	–	30 to 6,000	30 to 6,000	30 to 6,000		30 to 6,000
		Motor output	–	15/11 kW	15/11 kW	18.5/15 kW		22/18.5 kW

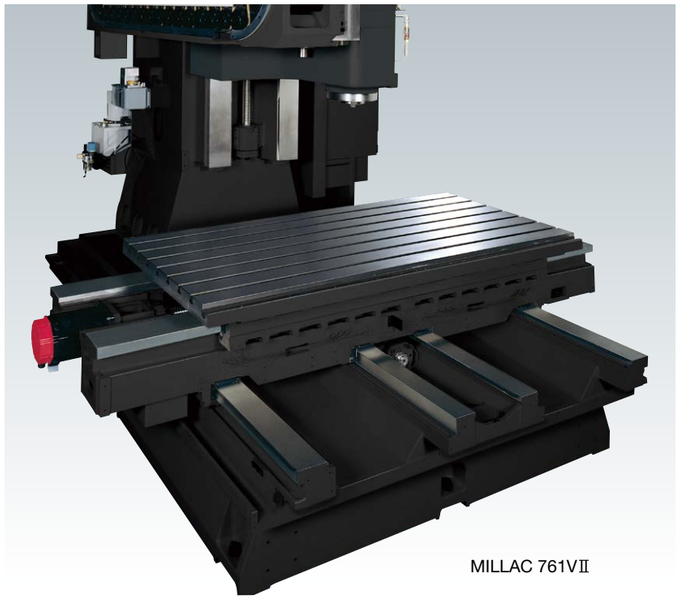
FANUC Specifications			MILLAC 468V II	MILLAC 561V II	MILLAC 611V II	MILLAC 761V II	MILLAC 852V II	MILLAC 1052V II
No.40	Integral motor/spindle	Spindle speed [min^{-1}]	50 to 15,000	80 to 12,000	50 to 15,000			
		Motor output	22/18.5 kW	22/18.5 kW	22/18.5 kW			
No.50	Integral motor/spindle	Spindle speed [min^{-1}]	60 to 6,000	60 to 10,000	50 to 12,000			
		Motor output	18.5/11 kW	22/18.5 kW	22/18.5 kW			
	Gear	Spindle speed [min^{-1}]	–		20 to 4,000	20 to 4,000		20 to 4,000
		Motor output	–		15/11 kW	18.5/15 kW		22/18.5 kW
		Spindle speed [min^{-1}]	–	30 to 6,000	30 to 6,000	30 to 6,000		30 to 6,000
		Motor output	–	15/11 kW	15/11 kW	18.5/15 kW		22/18.5 kW

Reliable, highly rigid construction allows for high-speed, heavy-duty cutting

Highly rigid construction

Bed column

Strong base column construction has optimally-placed ribs to counter chatter and twisting during heavy-duty cutting. Traditional box ways is used for all axes to give high accuracy and rigidity over the long term.



MILLAC 761V II

Machining Capacity

360 cm^3/min	No.50 6,000 min^{-1} 18.5 kW Integral motor/spindle MILLAC 468V II
588 cm^3/min	No.50 10,000 min^{-1} 22 kW Integral motor/spindle MILLAC 561V II
540 cm^3/min	No.50 4,000 min^{-1} 18.5 kW 2-speed gear head spindle MILLAC 761V II, MILLAC 852V II
756 cm^3/min	No.50 4,000 min^{-1} 22 kW 2-speed gear head spindle MILLAC 1052V II

Note: The “actual data” referred to above for this brochure represent examples, and may not be obtained due to differences in specifications, tooling, cutting, and other conditions.

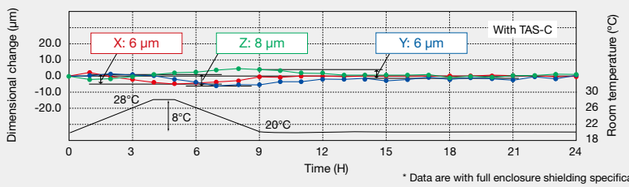
Okuma Intelligent Technology for competitive machine shops

The innovation that accepts temperature changes

Thermo-Friendly Concept

MILLAC 561V Ⅱ uses thermo active stabilizer—construction (TAS-C) (Opt)

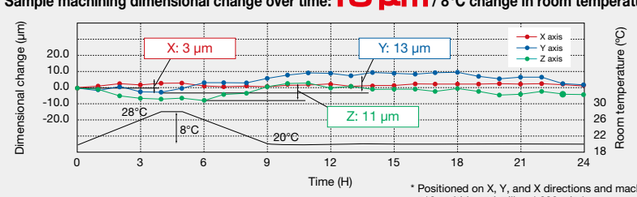
Sample machining dimensional change over time: 8 µm / 8°C change in room temperature



* Data are with full enclosure shielding specifications.

MILLAC 1052V Ⅱ (X-axis travel 2,050 mm specs)

Sample machining dimensional change over time: 13 µm / 8°C change in room temperature



* Positioned on X, Y, and X directions and machined with ø10 carbide end mill at 4,000 min^{-1}
Measurement position: Table center with use of coolant.
Data are with full enclosure shielding specifications.

* The “actual data” referred to above for this brochure represent examples, and may not be obtained due to differences in specifications, tooling, cutting, and other conditions.

Eliminate waste with the Thermo-Friendly Concept

In addition to maintaining high dimensional accuracy when room temperature changes, Okuma’s Thermo— Friendly Concept provides high dimensional accuracy during machine startup and machining restart. To stabilize thermal deformation, warming-up time is shortened and the burden of dimensional correction during machining restart is reduced.

Machine startup

Machining restart

Room temp change

High dimensional stability

Thermo-Friendly structure gives outstanding thermal stability

TAS-C: Thermo Active Stabilizer—Construction
“Proactively” keeps the machine [construction] in optimum, stable condition during shop environment temperature change–resulting in superb (stable) machining accuracies.

TAS-S: Thermo Active Stabilizer—Spindle
Spindle deformation will be accurately controlled even during operations with frequent speed changes.

*Optional on MILLAC 468VⅡ/561VⅡ.
Standard on MILLAC 611VⅡ/761VⅡ/852VⅡ/1052VⅡ

Machine tool idling stop

ECO Idling Stop

ECO suite

(OSP-P300MA only)

Only the necessary units run

Accuracy ensured, cooler off

ECO Idling Stop

Intelligent energy-saving function with the Thermo-Friendly Concept. The machine itself determines whether or not cooling is needed and cooler idling is stopped with no loss to accuracy. (Standard application on machines with Thermo-Active Stabilizer—Spindle)

On-the-spot check of energy savings

ECO Power Monitor

Power is shown individually for spindle, feed axes, and auxiliaries on the OSP operation screen. The energy-saving benefits from auxiliary equipment stopped with ECO Idling Stop can be confirmed on the spot.

ECO suite benefits

Electricity consumption during non-machining time greatly reduced with “ECO Idling Stop,” which shuts down each piece of auxiliary equipment not in use.

ECO suite provides a suite of energy-saving functions that can be used on machines

- **“ECO Idling Stop”** for operation of necessary units only
- **“ECO Power Monitor”** for visual graphics of power
- Intermittent/continuous operation of chip conveyor and mist collector during operation—**“ECO Operation”** (Optional)

Cutting condition search for milling

Machining Navi M-*i*, M-*g*Ⅱ+, M-*g*Ⅱ* (Optional: OSP-P300MA only)

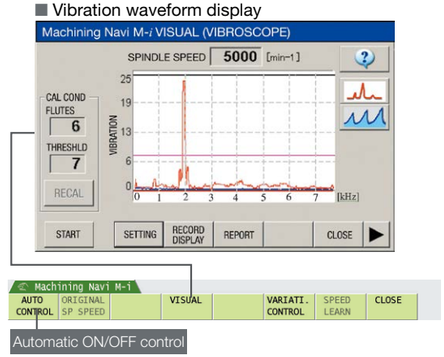
* Harmonic Spindle Speed Control available only with M-*i* or M-*g*Ⅱ+. (N/A with M-*g*Ⅱ.)

Automatically changes to optimum spindle speed (M-*i*)

Built-in sensors measure chatter vibration and the machine automatically changes to the best spindle speed.

- Available only with Okuma integral motor/spindles. (N/A with gear spindles.)

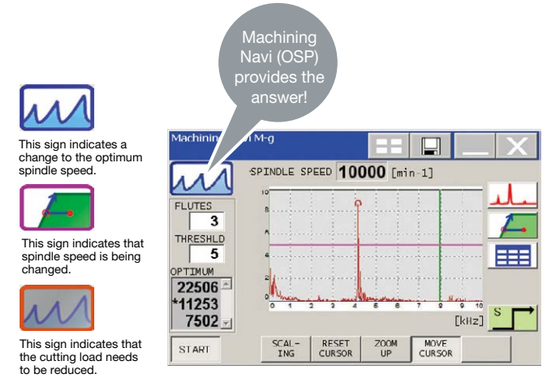
■ Vibration waveform display



Adjust cutting conditions while monitoring the data (M-*g*Ⅱ+, M-*g*Ⅱ)

Navigates effective measures by detecting and analyzing machining chatter with a microphone attached to the machine.

- **M-*g*Ⅱ+** : compatible with integral spindles
- **M-*g*Ⅱ** : compatible with gear spindles



Optimized Servo Control

SERVONAVI (OSP-P300MA only)

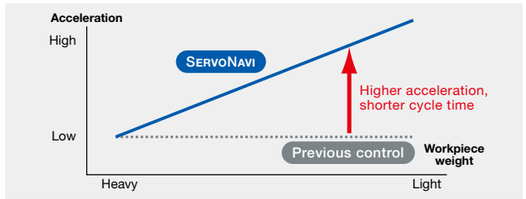
Achieves long term accuracy and surface quality

SERVONAVI AI (Automatic Identification)

Cycle time shortened with faster acceleration Work Weight Auto Setting

On table travel type machining centers, the table feed acceleration with the previous system was the same regardless of weight, such as workpieces and fixtures loaded on the table.

Work Weight Auto Setting estimates the weight of the workpiece and fixture on the table and automatically sets servo parameters, including acceleration, to the optimum values. Cycle times are shortened with no changes to machining accuracy.



Collision prevention

Collision Avoidance System

(Optional: OSP-P300M only)

World’s first “Collision-Free Machine”

CAS prevents collisions in automatic or manual mode, providing risk-free protection for the machine and great confidence for the operator.

SERVONAVI SF (Surface Fine-tuning)

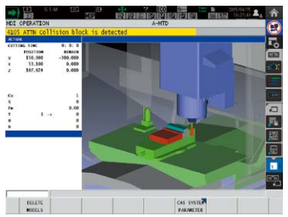
Maintains machining accuracy and surface quality Reversal Spike Auto Adjustment

Slide resistance changes with length of time machine tools are utilized, and discrepancies occur with the servo parameters that were the best when the machine was first installed. This may produce crease marks at motion reversals and affect machining accuracy (part surface quality).

SERVONAVI’s Reversal Spike Auto Adjustment maintains machining accuracy by switching servo parameters to the optimum values matched to changes in slide resistance.

Contributes to longer machine life Vibration Auto Adjustment

When aging changes machine performance, noise, vibration, crease marks, or fish scales may appear.
Vibration Auto Adjustment can quickly eliminate noise and vibration even from machines with years of operation.



Vertical Machining Centers

MILLAC 468V II

Thermo-Friendly Concept | Collision Avoidance System | Machining Navi | SERVONAVI

Machine Specifications

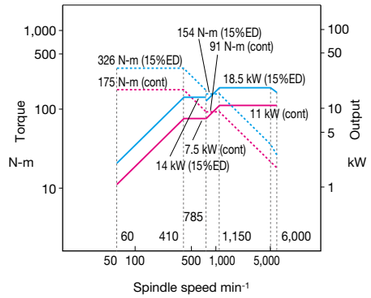
Photos shown in this brochure may also show optional equipment.

Item		Unit	MILLAC 468V II	
			No. 50 Specs	No. 40 Specs
Travels	X axis (table R/L)	mm (in.)	820 (32.28)	
	Y axis (table F/B)	mm (in.)	460 (18.11)	
	Z axis (spindle U/D)	mm (in.)	450 (17.72)	
	Table top to spindle nose	mm (in.)	150 to 600 (5.91 to 23.62)	
	Column to spindle center	mm (in.)	510 (20.08)	
Table	Work surface	mm (in.)	1,050 × 460 (41.34 x 18.11)	
	Floor to table top	mm (in.)	930 (36.61)	
	Max load capacity	kg (lb)	500 (1,100)	
Spindle	Spindle speed	min^{-1}	60 to 6,000	50 to 15,000
	Speed ranges		Stepless (integral motor/spindle)	
	Tapered bore		7/24 taper No. 50	7/24 taper No. 40
	Bearing dia	mm (in.)	ø90 (3.54)	ø70 (2.76)
Feedrate	Rapid traverse	m/min (fpm)	X-Y: 32, Z: 24 (X-Y: 105, Z: 79)	
	Cutting feedrate	mm/min (ipm)	X-Y-Z: 15,000 (591)	
Motors	Spindle	kW (hp)	OSP 18.5/11 (25/15) (15%ED/cont) FANUC 18.5/11 (25/15) (40%ED/cont)	OSP 26/18.5 (35/25) (10 min/cont) FANUC 22/18.5 (30/25) (15 min/cont)
ATC	Tool storage	tool	20 [30]	
	Max tool dia (w, w/o adj tool)	mm (in.)	ø120/ø150 (ø4.72/ø5.91)	
	Max tool length	mm (in.)	350 (13.78)	
	Max tool weight	kg (lb)	20 (44)	10 (22)
Machine size	Height	mm (in.)	2,790 (109.84)	
	Floor space	mm (in.)	OSP: 2,265 × 2,805 (89.17 x 110.43), FANUC: 2,200 × 2,780 (86.61 x 109.45)	
	Weight	kg (lb)	6,700 (14,740)	
Control			OSP-P300MA, FANUC 31i-B	

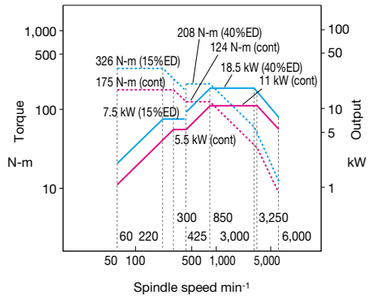
[ ] : Optional

Spindle torque/output graphs

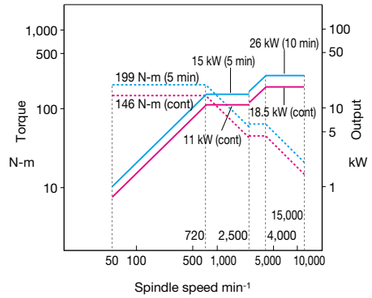
No. 50 6,000 min^{-1} spindle (OSP)
Maximum output: 18.5/11 kW (15%ED/cont)
Maximum torque: 326/175 N-m (15%ED/cont)



No. 50 6,000 min^{-1} spindle (FANUC)
Maximum output: 18.5/11 kW (40%ED/cont)
Maximum torque: 326/175 N-m (15%ED/cont)



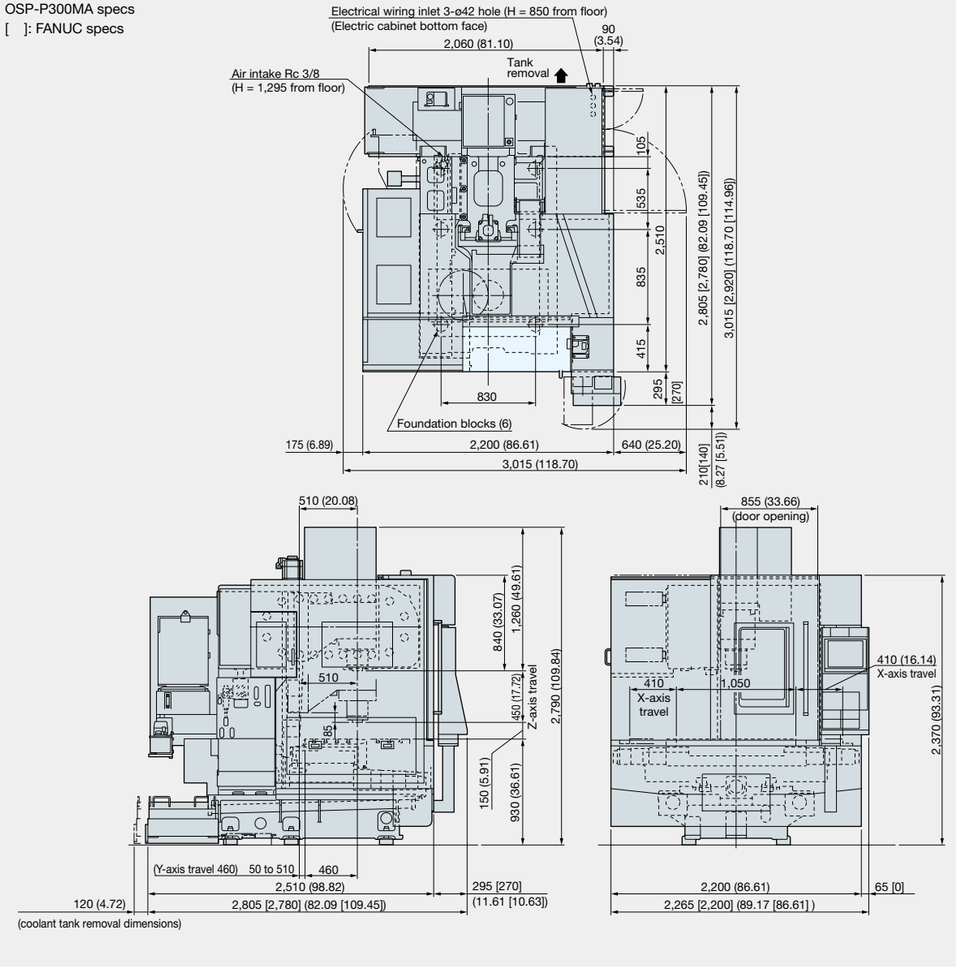
No. 40 15,000 min^{-1} spindle (OSP)
Maximum output: 26/18.5 kW (10 min/cont)
Maximum torque: 199/146 N-m (5 min/cont)



Dimensional drawing/Installation drawing

Unit: mm (in.)

No. 50 6,000 min^{-1},
OSP-P300MA specs
[ ]: FANUC specs



Machining Capacity (Material: S45C)

	Tool	Cutting Capacity (cm^3/min) (in^3/min)	Cutting Speed (m/min) (fpm)	Cutting Depth (mm) (in.)	Cutting Width (mm) (in.)	Feedrate (mm/min) (ipm)
No.50 Spindle 6,000 min^{-1} integral motor	ø125 face mill 8 blades	360 (21.98)	148 (485.59)	5 (0.20)	90 (3.54)	800 (31.50)

Note: The “actual data” referred to above for this brochure represent examples, and may not be obtained due to differences in specifications, tooling, cutting, and other conditions.

Standard Specifications · Accessories

Specifications	Remarks	Specifications	Remarks
CNC	OSP-P300MA	In-machine conveyor	Gutter: Coil type (1 each left and right)
	FANUC 31i-B	Chip pan	
Spindle speed	60 to 6,000 min^{-1} No. 50 Integral motor	Coolant supply system	Tank: 200 L, Pump motor: 180 W
	Spindle motor 18.5/11 kW	Coolant nozzle	3 flexible nozzles
	50 to 15,000 min^{-1} No. 40 Integral motor	Work lamp	LED
	Spindle motor 26/18.5 kW (OSP)	Spindle air curtain	
	22/18.5 kW (FANUC)	Air cleaner (filter)	Including regulator
Spindle nose constraint	BIG-PLUS® (No. 50)	Door interlock	
Spindle cooling system	Oil controller	Pulse handle	Single axis, switchable
ATC magazine	20 tools	Electronic buzzer	At operation end and alarm times
ATC air blower		Foundation blocks / Jack bolts	
Full-enclosure	With ceiling	Tool / Tool box	Hand tools
Slideway lubricating equipemnt		Tool release lever	

Optional Specifications · Options

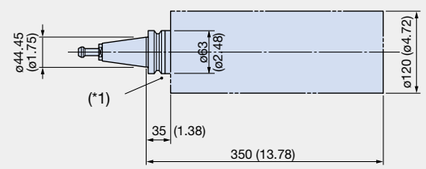
Specifications	Remarks	Specifications	Remarks
ATC magazine	30 tools (both No. 40, No. 50)	Reference tool	
Chip air blower	Nozzle type	Ring gauge	
Coolant pump	Pump motor 370 W	High column	+ 200 mm, including full enclosure
Coolant nozzle	Ring type		shielding for high columns
Semi-dry unit	Nozzle type, Thru-spindle type	Auto gauging, auto zero offset	Infrared communication type
Coolant level sensor		Auto tool lengh compensation/auto	Touch type
Coolant temperature regulator		tool breakage detection function	
Oil hole device	0.5 MPa, 1.5 MPa	Pulse handle	3-axis round handle, 3-axis round
Thru-spindle coolant	Okuma pull stud for 1.5 MPa, 1.5 MPa		handle + 1-axis mobile type switch
	large capacity, and 7 MPa required.	TAS-S: Thermo Active dimension	
Spindle nose constraint	BIG-PLUS® (No. 40)	Stabilizer – Spindle (OSP)	
In-machine chip discharge	Oil pan: chip flusher type	TAS-C: Thermo Active dimension	
Off-machine chip	Hinge conveyor, scraper conveyor	Stabilizer – Construction (OSP)	
discharge	See recommended chip conveyor	Spindle thermal deformation	
	specifications, P31.	compensation (FANUC)	
Chip bucket	Tilt with/without	Ambient thermal deformation	
Raised machine	20 mm	compensation (FANUC)	
Workpiece washing gun		AbsoScale detection (OSP)	X-Y-Z axis
Air gun mount		Scale feedback (FANUC)	X-Y-Z axis
Angle head preps		Status indicator	
Manual clamp fixture		Foundation bolt	
Hydraulic and pneumatic fixtures		Rotary 2-pallet APC	Forms set together with below options.
Oil skimmer	Belt type		High column 200 mm
Mist collector			Pallet size 820 × 460 mm
Auto open/close front cover			Tap pallet, T-slot pallet
Rotary table	NC, tilt, indexing		Full enclosure shielding for 2-pallet
Sub table	1,050 × 460 × 70 mm		rotary-shuttle APC

Maximum tool dimensions

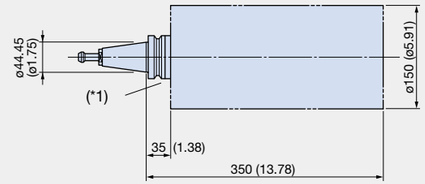
Unit: mm (in.)

No.40

Max tool size (adjacent tools)

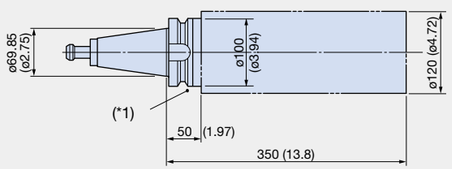


Maximum tools used (w/o adjacent tools)

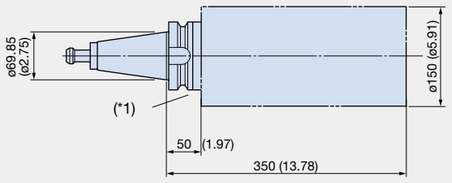


No.50

Max tool size (adjacent tools)



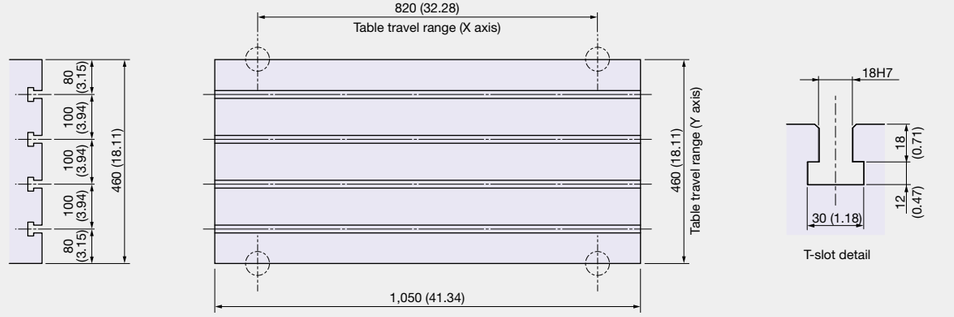
Maximum tools used (w/o adjacent tools)



(*1): Interference with outer part of ATC tool change arm and tooling may occur with commercially available milling chucks, etc. Always be sure to check dimensions in tooling catalogues or other literature.

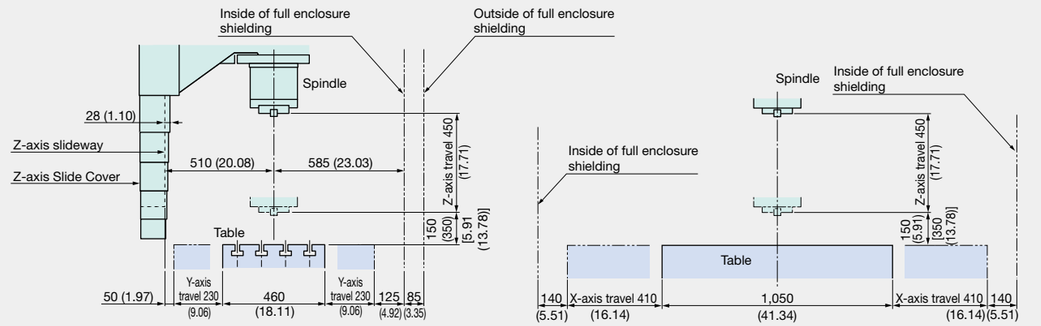
Table size

Unit: mm (in.)



Working range

Unit: mm (in.)



[ ]: High column specs

Vertical Machining Centers

MILLAC 561V II

Thermo-Friendly Concept | Collision Avoidance System | Machining Navi | SERVONAVI

Machine Specifications

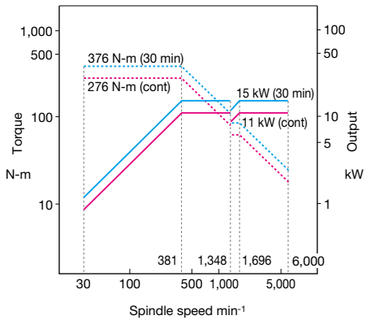
Photos shown in this brochure may also show optional equipment.

Item		Unit	MILLAC 561V II		
			No. 50 6,000 min-1	No. 50 10,000 min-1	No. 40 12,000 min-1
Travels	X axis (table R/L)	mm (in.)	1,050 (41.34)		
	Y axis (table F/B)	mm (in.)	560 (22.05)		
	Z axis (spindle U/D)	mm (in.)	520 (20.47)		
	Table top to spindle nose	mm (in.)	170 to 690 (6.69 to 27.17)		
	Column to spindle center	mm (in.)	590 (23.23)		
Table	Work surface	mm (in.)	1,350 × 560 (53.15 x 22.05)		
	Floor to table top	mm (in.)	950 (37.40)		
	Max load capacity	kg (lb)	1,000 (2,200)		
Spindle	Spindle speed	min-1	30 to 6,000	60 to 10,000	80 to 12,000
	Speed ranges		2-speed	Stepless (integral motor/spindle)	
	Tapered bore		7/24 taper No. 50		7/24 taper No. 40
	Bearing dia	mm (in.)	ø100 (3.94)		ø70 (2.76)
Feedrate	Rapid traverse	m/min (fpm)	X-Y: 32, Z: 24 (X-Y: 105, Z: 79)		
	Cutting feedrate	mm/min (ipm)	X-Y-Z: 15,000 (591)		
Motors	Spindle	kW (hp)	15/11 (20/15) (30 min/cont)	22/18.5 (30/25) (15 min/cont)	
ATC	Tool storage	tool	20 [30, 40]		20 [40]
	Max tool dia (w, w/o adj tool)	mm (in.)	ø120/ø150 (ø4.72/ø5.91)		ø90/ø115 (ø3.54/ø4.53)
	Max tool length	mm (in.)	350 (13.78)		300 (13.78)
	Max tool weight	kg (lb)	20 (44)		8 (11)
Machine size	Height	mm (in.)	2,755 (108.46)	2,930 (115.35)	2,825 (111.22)
	Floor space	mm (in.)	2,650 × 3,285 (104.33 × 129.33)		
	Weight	kg (lb)	9,100 (20,020)		
Control			OSP-P300MA, FANUC 31i-B		

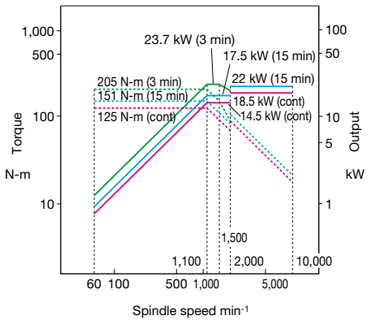
[ ] : Optional

Spindle torque/output graphs

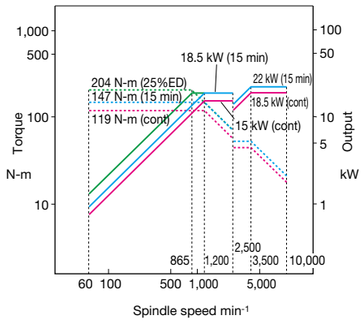
No. 50 6,000 min-1 spindle (OSP, FANUC)
Maximum output: 15/11 kW (30 min/cont)
Maximum torque: 376/276 N-m (30 min/cont)



No. 50 10,000 min-1 spindle (OSP)
Maximum output: 23.7/18.5 kW (3 min/cont)
Maximum torque: 205/125 N-m (3 min/cont)



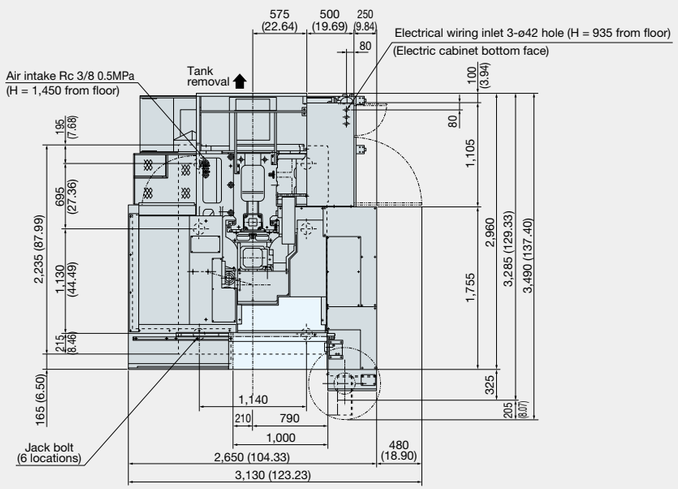
No. 50 10,000 min-1 spindle (FANUC)
Maximum output: 22/18.5 kW (15 min/cont)
Maximum torque: 204/119 N-m (25%ED/cont)

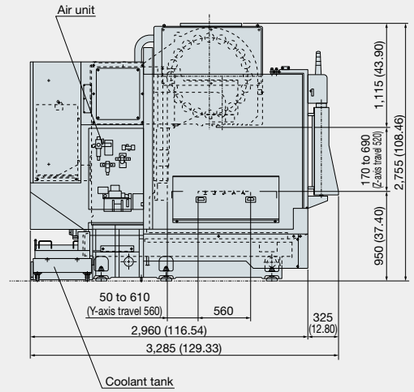


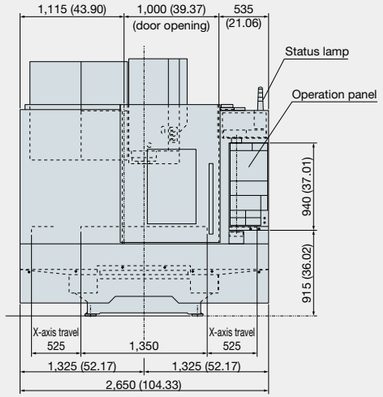
Dimensional drawing/Installation drawing

Unit: mm (in.)

No. 50 6,000 min-1 specs







Machining Capacity (Material: S45C)

	Tool	Cutting Capacity (cm^3/min) (in^3/min)	Cutting Speed (m/min) (fpm)	Cutting Depth (mm) (in.)	Cutting Width (mm) (in.)	Feedrate (mm/min) (ipm)
No. 50 spindle 6,000 min^{-1} 2-speed gear head	ø125 face mill, 6 blades	252 (15.38)	120 (393.72)	7 (0.28)	90 (3.54)	400 (15.75)
No.50 Spindle 10,000 min^{-1} integral motor (optional)	ø80 face mill, 6 blades	588 (35.90)	250 (820.25)	5 (0.20)	56 (2.20)	2,100 (82.68)
No.40 Spindle 12,000 min^{-1} integral motor (optional)	ø100 face mill, 5 blades	350 (21.37)	170 (557.77)	5 (0.20)	70 (2.76)	1,000 (39.37)

Note: The “actual data” referred to above for this brochure represent examples, and may not be obtained due to differences in specifications, tooling, cutting, and other conditions.

Standard Specifications · Accessories

Specifications	Remarks	Specifications	Remarks
CNC	OSP-P300MA	Chip pan	
	FANUC 31i-B	Coolant supply system	Tank: 200 L, Pump motor: 180 W
Spindle speed	6,000 min^{-1} No. 50	Coolant nozzle	3 flexible nozzles
	2-speed gear head spindle	Work lamp	LED
	Spindle motor 15/11 kW	Spindle air curtain	
Spindle nose constraint	BIG-PLUS®	Air cleaner (filter)	Including regulator
Spindle cooling system	Oil controller	Door interlock	
ATC magazine	20 tools	Pulse handle	Single axis, switchable
ATC air blower		Electronic buzzer	At operation end and alarm times
Full-enclosure	With ceiling	Foundation blocks / Jack bolts	
Slideway lubricating equipemnt		Tool / Tool box	Hand tools
In-machine conveyor	Gutter: chip flusher type	Tool release lever	

Optional Specifications · Options

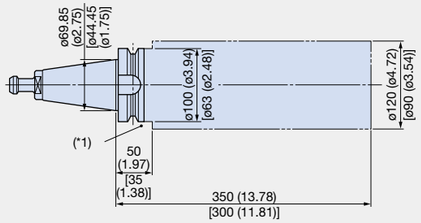
Specifications	Remarks	Specifications	Remarks
Spindle speed 10,000 min^{-1}	No. 50 integral motor/spindle 22/18.5 kW	Auto open/close front cover	
		Rotary table	NC, tilt, indexing
Spindle speed 12,000 min^{-1}	No. 40 integral motor/spindle 22/18.5 kW	Sub table	1,350 × 560 × 90 mm
		Reference tool	
ATC magazine	40 tools; 30 tools possible with No. 50 spindle only	Ring gauge	
Chip air blower	Nozzle type	High column	+200 mm
Coolant pump	Pump motor 370 W	Auto gauging, auto zero offset	Infrared communication type
Coolant nozzle	Ring type	Auto tool lengh compensation/auto tool breakage detection function	Touch type
Semi-dry unit	Nozzle type, Thru-spindle type		
Coolant level sensor		TAS-S: Thermo Active dimension Stabilizer – Spindle (OSP)	
Coolant temperature regulator			
Oil hole device	0.5 MPa, 1.5 MPa	TAS-C: Thermo Active dimension Stabilizer – Construction (OSP)	
Thru-spindle coolant	Okuma pull stud for 1.5 MPa, 1.5 MPa large capacity, and 7 MPa required.	Spindle thermal deformation compensation (FANUC)	
In-machine chip discharge	Oil pan: Chip flush Gutter: Coil type, 1 each left and right	Ambient thermal deformation compensation (FANUC)	
Off-machine chip discharge	Hinge conveyor, scraper conveyor See recommended chip conveyor specifications, P31.	AbsoScale detection (OSP)	X-Y-Z axis
		Scale feedback (FANUC)	X-Y-Z axis
Chip bucket	Tilt with/without	Status lamp	
Raised machine	50 mm	Foundation bolt	
Workpiece washing gun		Parallel 2-pallet APC	Forms set together with below options. High column 200 mm Pallet size 1,150 × 520 mm Tap pallet, T-slot pallet Hydraulic unit (APC drive)
Air gun mount			
Angle head preps			
Manual clamp fixture			
Hydraulic and pneumatic fixtures			
Oil skimmer	Belt type		
Mist collector			

Maximum tool dimensions

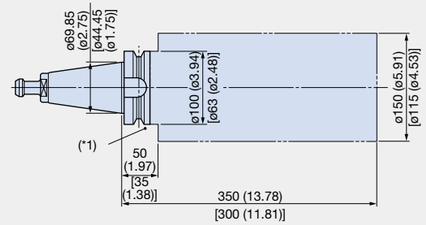
Unit: mm (in.)

No.50

■ Max tool size (adjacent tools)



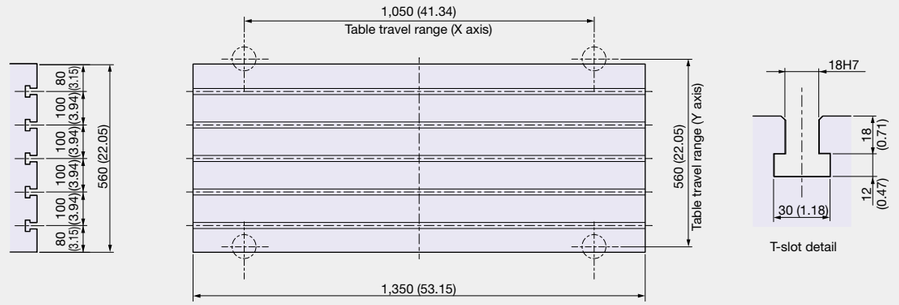
■ Maximum tools used (w/o adjacent tools)



[ ]: No. 40 (12,000 min^{-1} specs).
(*1): Interference with outer part of ATC tool change arm and tooling may occur with commercially available milling chucks, etc. Always be sure to check dimensions in tooling catalogues or other literature.

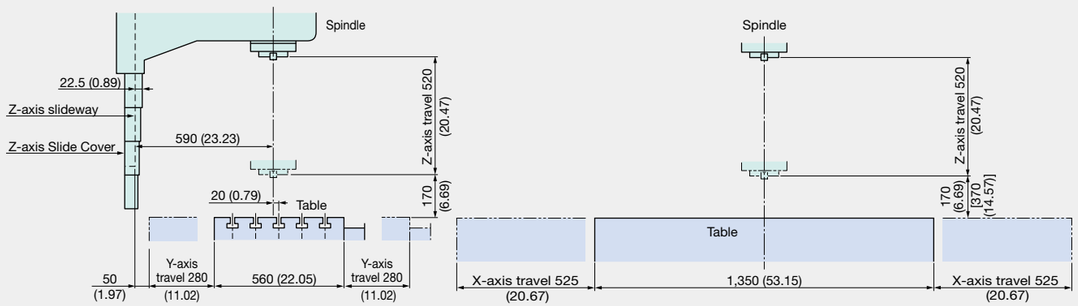
Table size

Unit: mm (in.)



Working range

Unit: mm (in.)



[ ]: High column specs

Vertical Machining Centers

MILLAC 611V II

Thermo-Friendly Concept | Collision Avoidance System | Machining Navi | SERVONAVI

This operation panel is standard.

Machine Specifications

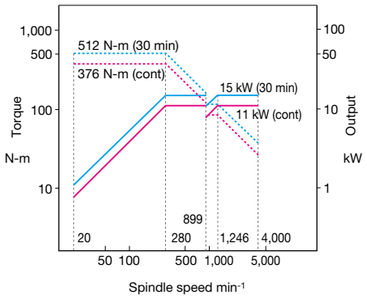
Photos shown in this brochure may also show optional equipment.

Item		Unit	MILLAC 611V II			
			No. 50 4,000 min^{-1}	No. 50 6,000 min^{-1}	No. 50 12,000 min^{-1}	No. 40 15,000 min^{-1}
Travels	X axis (table R/L)	mm (in.)	1,300 (51.18)			
	Y axis (table F/B)	mm (in.)	610 (24.02)			
	Z axis (spindle U/D)	mm (in.)	560 (22.05)			
	Table top to spindle nose	mm (in.)	200 to 760 (7.87 to 29.92)			
	Column to spindle center	mm (in.)	650 (25.59)			
Table	Work surface	mm (in.)	1,600 × 610 (62.99 × 24.02)			
	Floor to table top	mm (in.)	900 (35.43)			
	Max load capacity	kg (lb)	1,500 (3,300)			
Spindle	Spindle speed	min^{-1}	20 to 4,000	30 to 6,000	50 to 12,000	50 to 15,000
	Speed ranges		2-speed		Stepless (integral motor/spindle)	
	Tapered bore		7/24 taper No. 50			7/24 taper No. 40
	Bearing dia	mm (in.)	ø100 (3.94)		ø90 (3.54)	ø70 (2.76)
Feedrate	Rapid traverse	m/min (fpm)	X-Y: 20, Z: 16 (X-Y: 66, Z: 52)			
	Cutting feedrate	mm/min (ipm)	X-Y-Z: 10,000 (394)			
Motors	Spindle	kW (hp)	15/11 (20/15) (30 min/cont)		OSP:26/18.5 (35/25) (10 min/cont) FANUC:22/18.5 (30/25) (15 min/cont)	
ATC	Tool storage	tool	20 [30, 42]			
	Max tool dia (w, w/o adj tool)	mm (in.)	ø120/ø150 (ø4.72/ø5.91)			ø115/ø115 (ø4.53/ø4.53)
	Max tool length	mm (in.)	400 (15.75)			300 (11.81)
	Max tool weight	kg (lb)	20 (44)			8 (11)
Machine size	Height	mm (in.)	2,910 (114.57)			
	Floor space	mm (in.)	3,410 × 3,695 (134.25 x 145.47)		3,410 × 3,525 (134.25 x 138.78)	
	Weight	kg (lb)	11,000 (24,200)			
Control			OSP-P300MA, FANUC 31i-B			

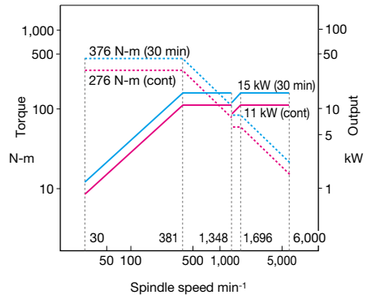
[ ] : Optional

Spindle torque/output graphs

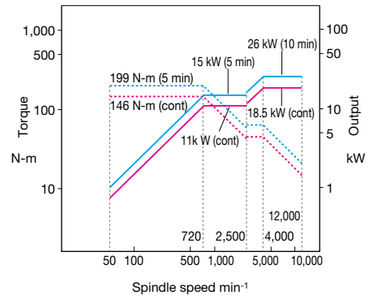
No. 50 4,000 min^{-1} spindle (OSP, FANUC)
Maximum output: 15/11 kW (30 min/cont)
Maximum torque: 512/376 N-m (30 min/cont)



No. 50 6,000 min^{-1} spindle (OSP, FANUC)
Maximum output: 15/11 kW (30 min/cont)
Maximum torque: 376/276 N-m (30 min/cont)



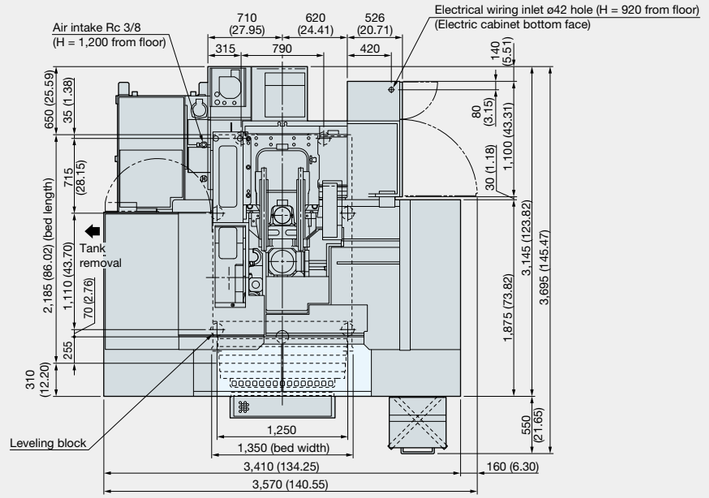
No. 50 12,000 min^{-1} spindle (OSP)
Maximum output: 26/18.5 kW (10 min/cont)
Maximum torque: 199/146 N-m (5 min/cont)

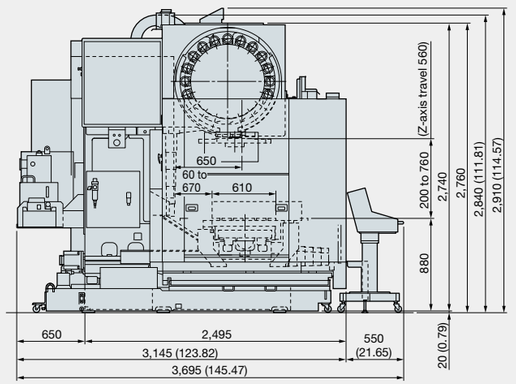


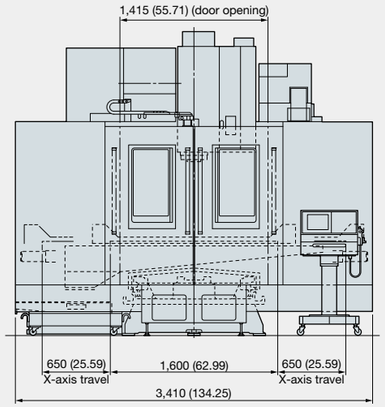
Dimensional drawing/Installation drawing

Unit: mm (in.)

No. 50 4,000/6,000 min^{-1} specs







Machining Capacity (Material: S45C)

	Tool	Cutting Capacity (cm^3/min) (in^3/min)	Cutting Speed (m/min) (fpm)	Cutting Depth (mm) (in.)	Cutting Width (mm) (in.)	Feedrate (mm/min) (ipm)
No. 50 spindle 4,000 min^{-1} 2-speed gear head	ø125 face mill, 6 blades	304 (18.56)	120 (393.72)	5 (0.20)	90 (3.54)	675 (26.57)

Note: The “actual data” referred to above for this brochure represent examples, and may not be obtained due to differences in specifications, tooling, cutting, and other conditions.

Standard Specifications · Accessories

Specifications	Remarks	Specifications	Remarks
CNC	OSP-P300MA	Spindle air curtain	
	FANUC 31i-B	Air cleaner (filter)	Including regulator
Spindle speed	4,000 min^{-1} No. 50	Door interlock	
	2-speed gear head spindle	Pulse handle	Single axis, switchable
	Spindle motor 15/11 kW	Electronic buzzer	At operation end and alarm times
Spindle nose constraint	BIG-PLUS®	Foundation blocks / Jack bolts	
	(No.50 4,000, 6,000 min^{-1} specs)	Tool / Tool box	Hand tools
Spindle cooling system	Oil controller	Tool release lever	
ATC magazine	20 tools	Bed-mounted operation panel	
ATC air blower		TAS-S: Thermo Active dimension Stabilizer – Spindle (OSP)	
Full-enclosure	With ceiling		
Slideway lubricating equipemnt		TAS-C: Thermo Active dimension Stabilizer – Construction (OSP)	
In-machine chip discharge	Table rear: Coil		
Chip pan		Spindle thermal deformation compensation (FANUC)	
Coolant supply system	Tank: 350 L, Pump motor: 180 W		
Coolant nozzle	3 flexible nozzles	Ambient thermal deformation compensation (FANUC)	
Work lamp	LED		

Optional Specifications · Options

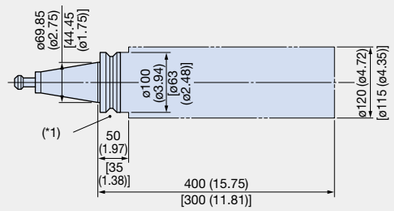
Specifications	Remarks	Specifications	Remarks
Spindle speed 6,000 min^{-1}	No. 50 2-speed gear head spindle 15/11 kW	Raised machine	100 mm
		Workpiece washing gun	
Spindle speed 12,000 min^{-1}	No. 50 integral motor/spindle 26/18.5 kW (OSP) 22/18.5 kW (FANUC)	Air gun mount	
		Angle head preps	
		Manual clamp fixture	
Spindle speed 15,000 min^{-1}	No. 40 integral motor/spindle 26/18.5 kW (OSP) 22/18.5 kW (FANUC)	Hydraulic and pneumatic fixtures	
		Oil skimmer	Belt type
		Mist collector	
ATC magazine	30 tools, 42 tools	Rotary table	NC, tilt, indexing
Chip air blower	Nozzle type	Sub table	1,600 × 610 × 90 mm
Coolant pump	Pump motor 370 W	Reference tool	
Coolant nozzle	Ring type	Ring gauge	
Semi-dry unit	Nozzle type, Thru-spindle type	High column	+200 mm
Coolant level sensor		Auto gauging, auto zero offset	Infrared communication type
Coolant temperature regulator		Auto tool lengh compensation/auto tool breakage detection function	Touch type
Oil hole device	0.5 MPa, 1.5 MPa		
Thru-spindle coolant	Okuma pull stud for 1.5 MPa, 1.5 MPa large capacity, and 7 MPa required.	Main operating panel pendant type	
Spindle nose constraint	BIG-PLUS® No. 50 12,000 min^{-1} No. 40 15,000 min^{-1}	AbsoScale detection (OSP)	X-Y-Z axis
		Scale feedback (FANUC)	X-Y-Z axis
		Status lamp	
In-machine chip discharge	Table rear: Coil chip conveyor Oil pan: Chip flush	Foundation bolt	
Off-machine chip discharge	Hinge conveyor, scraper conveyor See recommended chip conveyor specifications, P31.	Parallel 2-pallet APC	Forms set together with below options. High column 200 mm Pallet size 1,400 × 580 mm Tap pallet, T-slot pallet
Chip bucket	Tilt with/without		

Maximum tool dimensions

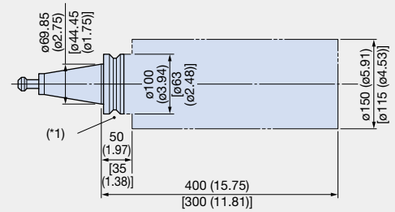
Unit: mm (in.)

No.50

■ Max tool size (adjacent tools)



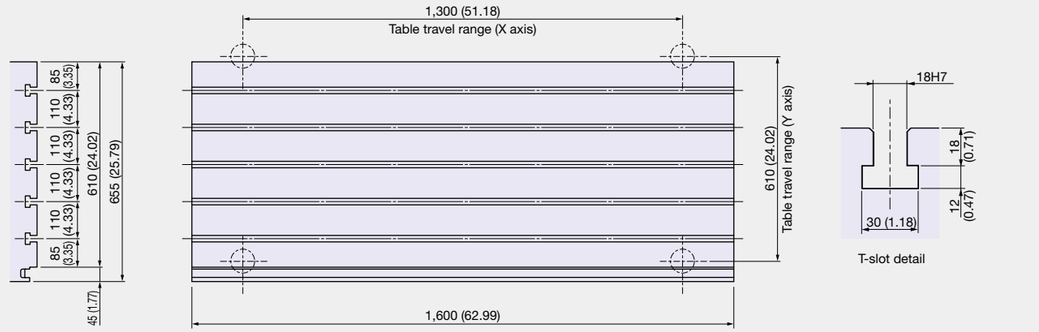
■ Maximum tools used (w/o adjacent tools)



[ ]: No. 40 (15,000 min^{-1} specs).
(*1): Interference with outer part of ATC tool change arm and tooling may occur with commercially available milling chucks, etc. Always be sure to check dimensions in tooling catalogues or other literature.

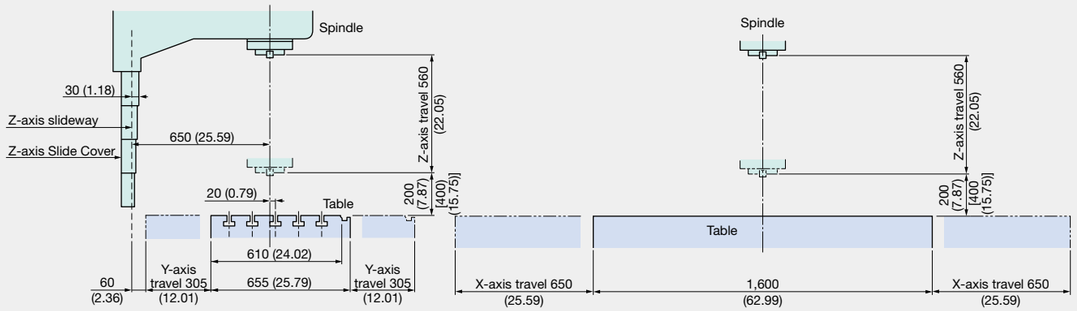
Table size

Unit: mm (in.)



Working range

Unit: mm (in.)



Vertical Machining Centers

MILLAC 761V Ⅱ

Thermo-Friendly Concept | Collision Avoidance System | Machining Navi | SERVONAVI

Machine Specifications

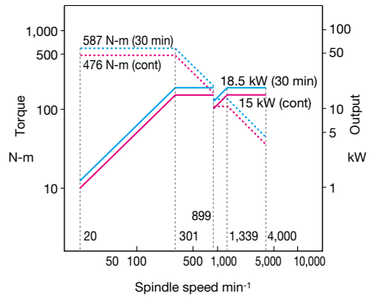
Photos shown in this brochure may also show optional equipment.

Item		Unit	MILLAC 761V Ⅱ			
			No. 50 4,000 min^{-1}	No. 50 6,000 min^{-1}	No. 50 12,000 min^{-1}	No. 40 15,000 min^{-1}
Travels	X axis (table R/L)	mm (in.)	1,540 (60.63)			
	Y axis (table F/B)	mm (in.)	760 (29.92)			
	Z axis (spindle U/D)	mm (in.)	660 (25.98)			
	Table top to spindle nose	mm (in.)	200 to 860 (7.87 to 33.86)			
	Column to spindle center	mm (in.)	800 (31.50)			
Table	Work surface	mm (in.)	1,800 × 720 (70.87 x 28.35)			
	Floor to table top	mm (in.)	1,030 (40.55)			
	Max load capacity	kg (lb)	2,000 (4,400)			
Spindle	Spindle speed	min^{-1}	20 to 4,000	30 to 6,000	50 to 12,000	50 to 15,000
	Speed ranges		2-speed		Stepless (integral motor/spindle)	
	Tapered bore		7/24 taper No. 50			7/24 taper No. 40
	Bearing dia	mm (in.)	ø100 (3.94)		ø90 (3.54)	ø70 (2.76)
Feedrate	Rapid traverse	m/min (fpm)	X-Y-Z: 16 (52)			
	Cutting feedrate	mm/min (ipm)	X-Y-Z: 10,000 (394)			
Motors	Spindle	kW (hp)	18.5/15 (25/20) (30 min/cont)		OSP:26/18.5 (35/25) (10 min/cont) FANUC:22/18.5 (30/25) (15 min/cont)	
ATC	Tool storage	tool	36 [54]			
	Max tool dia (w, w/o adj tool)	mm (in.)	ø120/ø200 (ø4.72/ø5.91)			ø115/ø115 (ø4.53/ø4.53)
	Max tool length	mm (in.)	400 (15.75)			300 (11.81)
	Max tool weight	kg (lb)	20 (44)			8 (11)
Machine size	Height	mm (in.)	3,230 (127.17)			
	Floor space	mm (in.)	4,300 × 4,060 (169.29 x 159.84)			
	Weight	kg (lb)	14,300 (31,460)			
Control			OSP-P300MA, FANUC 31i-B			

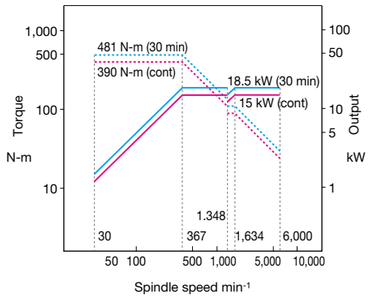
[ ] : Optional

Spindle torque/output graphs

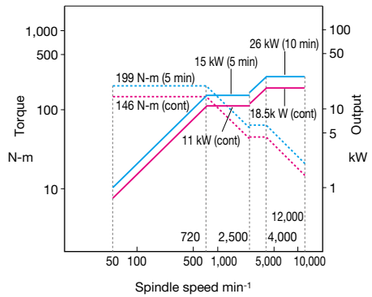
No. 50 4,000 min^{-1} spindle (OSP, FANUC)
Maximum output: 18.5/15 kW (30 min/cont)
Maximum torque: 587/476 N-m (30 min/cont)



No. 50 6,000 min^{-1} spindle (OSP, FANUC)
Maximum output: 18.5/15 kW (30 min/cont)
Maximum torque: 481/390 N-m (30 min/cont)



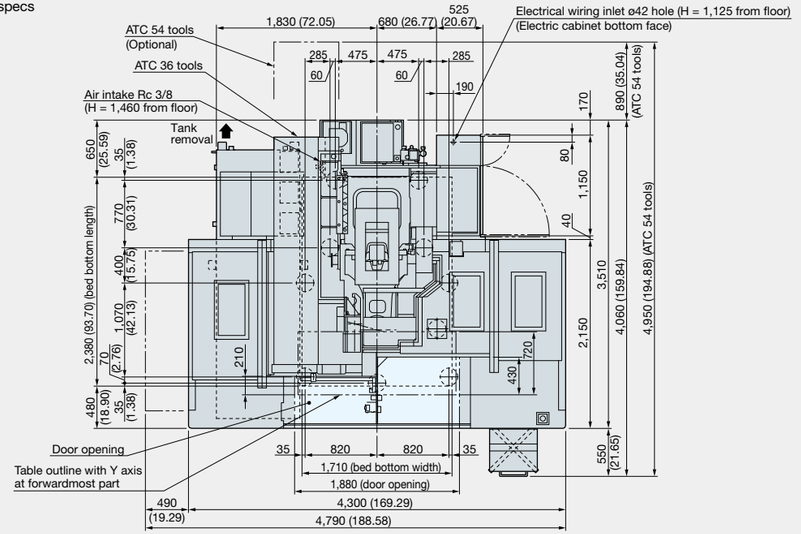
No. 50 12,000 min^{-1} spindle (OSP)
Maximum output: 26/18.5 kW (10 min/cont)
Maximum torque: 199/146 N-m (5 min/cont)

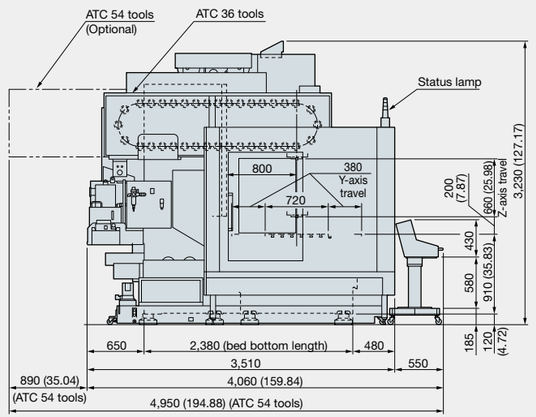


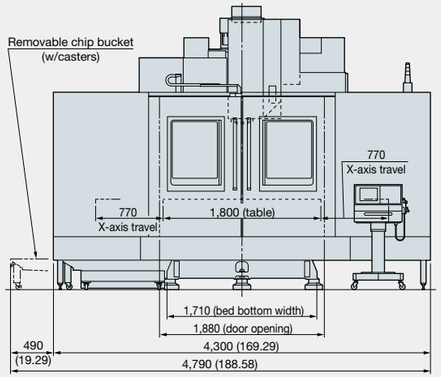
Dimensional drawing/Installation drawing

Unit: mm (in.)

No. 50 4,000/6,000 min^{-1} specs







Machining Capacity (Material: S45C)

	Tool	Cutting Capacity (cm^3/min) (in^3/min)	Cutting Speed (m/min) (fpm)	Cutting Depth (mm) (in.)	Cutting Width (mm) (in.)	Feedrate (mm/min) (ipm)
No. 50 spindle 4,000 min^{-1} 2-speed gear head	ø150 face mill 8 blades	540 (32.96)	165 (541.37)	5 (0.20)	90 (3.54)	1,200 (47.24)
		485 (29.61)	165 (541.37)	7 (0.28)	90 (3.54)	770 (30.31)
	ø40 roughing end mill	252 (15.38)	25 (82.03)	40 (1.57)	30 (1.18)	210 (8.27)
		252 (15.38)	25 (82.03)	30 (1.18)	40 (1.57)	210 (8.27)

Note: The “actual data” referred to above for this brochure represent examples, and may not be obtained due to differences in specifications, tooling, cutting, and other conditions.

Standard Specifications · Accessories

Specifications	Remarks	Specifications	Remarks
CNC	OSP-P300MA	Spindle air curtain	
	FANUC 31i-B	Air cleaner (filter)	Including regulator
Spindle speed	4,000 min^{-1} No. 50	Door interlock	
	2-speed gear head spindle	Pulse handle	Single axis, switchable
	Spindle motor 18.5/15 kW	Electronic buzzer	At operation end and alarm times
Spindle nose constraint	BIG-PLUS®	Foundation blocks / Jack bolts	
	(No. 50 4,000, 6,000 min^{-1} specs)	Tool / Tool box	Hand tools
Spindle cooling system	Oil controller	Tool release lever	
ATC magazine	36 tools	Bed-mounted operation panel	
ATC air blower		TAS-S: Thermo Active dimension Stabilizer – Spindle (OSP)	
Full-enclosure	With ceiling		
Slideway lubricating equipemnt		TAS-C: Thermo Active dimension Stabilizer – Construction (OSP)	
In-machine conveyor	Table rear: Coil		
Chip pan		Spindle thermal deformation compensation (FANUC)	
Coolant supply system	Tank: 400 L, Pump motor: 250 W		
Coolant nozzle	3 flexible nozzles	Ambient thermal deformation compensation (FANUC)	
Work lamp	LED		

Optional Specifications · Options

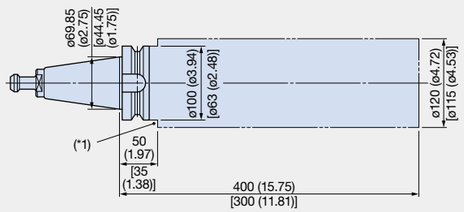
Specifications	Remarks	Specifications	Remarks
Spindle speed 6,000 min^{-1}	No. 50 2-speed gear head spindle 18.5/15 kW	Chip bucket	Tilt with/without
		Raised machine	100 mm
Spindle speed 12,000 min^{-1}	No. 50 integral motor/spindle 26/18.5 kW (OSP) 22/18.5 kW (FANUC)	Workpiece washing gun	
		Air gun mount	
		Angle head preps	
Spindle speed 15,000 min^{-1}	No. 40 integral motor/spindle 26/18.5 kW (OSP) 22/18.5 kW (FANUC)	Manual clamp fixture	
		Hydraulic and pneumatic fixtures	
		Oil skimmer	Belt type
ATC magazine	54 tools	Mist collector	
Chip air blower	Nozzle type	Rotary table	NC, tilt, indexing
Coolant pump	Pump motor: 550 W	Sub table	1,800 × 720 × 100 mm
Coolant nozzle	Ring type	Reference tool	
Semi-dry unit	Nozzle type, Thru-spindle type	Ring gauge	
Coolant level sensor		High column	+200 mm
Coolant temperature regulator		Auto gauging, auto zero offset	Infrared communication type
Oil hole device	0.5 MPa, 1.5 MPa	Auto tool lengh compensation/auto tool breakage detection function	Touch type
Thru-spindle coolant	Okuma pull stud for 1.5 MPa, 1.5 MPa large capacity, and 7 MPa required.		
Spindle nose constraint	BIG-PLUS® No. 50 12,000 min^{-1} No. 40 15,000 min^{-1}	AbsoScale detection (OSP)	X-Y-Z axis
		Scale feedback (FANUC)	X-Y-Z axis
		Status lamp	
		Foundation bolt	
In-machine chip discharge	Oil pan: Chip flush	Parallel 2-pallet APC	Forms set together with below options. High column 200 mm Pallet size 1,700 × 700 mm Tap pallet, T-slot pallet
Off-machine chip discharge	Hinge conveyor, scraper conveyor See recommended chip conveyor specifications, P31.		

Maximum tool dimensions

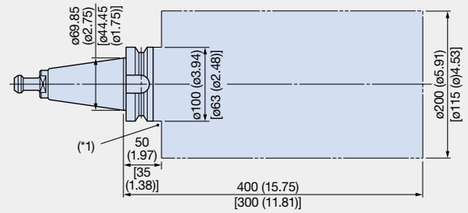
Unit: mm (in.)

No.50

■ Max tool size (adjacent tools)



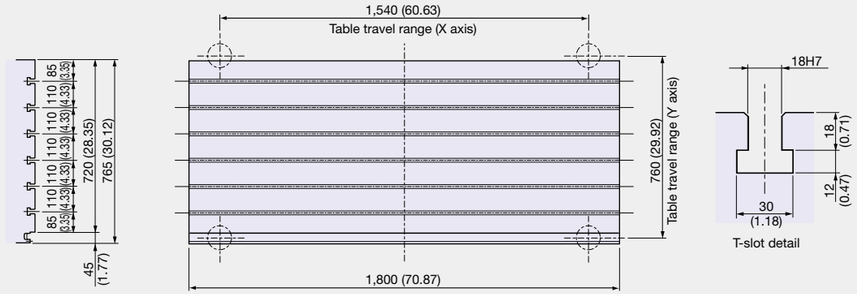
■ Maximum tools used (w/o adjacent tools)



[ ]: No. 40 (15,000 min^{-1} specs).
(*1): Interference with outer part of ATC tool change arm and tooling may occur with commercially available milling chucks, etc. Always be sure to check dimensions in tooling catalogues or other literature.

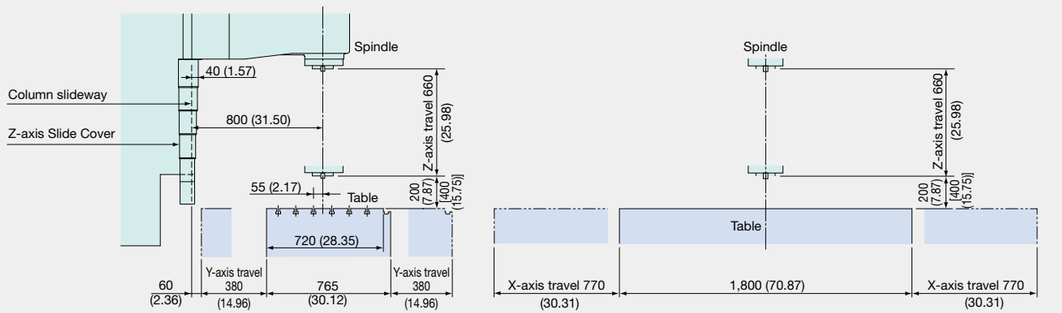
Table size

Unit: mm (in.)



Working range

Unit: mm (in.)



[ ]: High column specs

Vertical Machining Centers

MILLAC 852V II

Thermo-Friendly Concept | Collision Avoidance System | Machining Navi | SERVONAVI

Machine Specifications

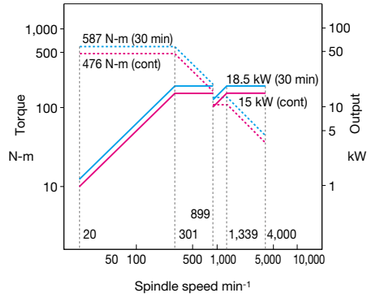
Photos shown in this brochure may also show optional equipment.

Item		Unit	MILLAC 852V II			
			No. 50 4,000 min-1	No. 50 6,000 min-1	No. 50 12,000 min-1	No. 40 15,000 min-1
Travels	X axis (table R/L)	mm (in.)	2,050 <3,050> (80.71 <120.08>)			
	Y axis (table F/B)	mm (in.)	850 (33.46)			
	Z axis (spindle U/D)	mm (in.)	750 (29.53)			
	Table top to spindle nose	mm (in.)	200 to 950 <160 to 910> (7.87 to 37.40 <6.30 to 35.83>			
	Column to spindle center	mm (in.)	900 (35.43)			
Table	Work surface	mm (in.)	2,200 <3,200> × 850 (86.61 <125.98> × 33.46)			
	Floor to table top	mm (in.)	1,060 <1,100> (41.73 <43.31>)			
	Max load capacity	kg (lb)	2,500 <3,800> (5,500 <8,360>			
Spindle	Spindle speed	min-1	20 to 4,000	30 to 6,000	50 to 12,000	50 to 15,000
	Speed ranges		2-speed		Stepless (integral motor/spindle)	
	Tapered bore		7/24 taper No. 50			7/24 taper No. 40
	Bearing dia	mm (in.)	ø100 (3.94)		ø90 (3.54)	ø70 (2.76)
Feedrate	Rapid traverse	m/min (fpm)	X-Y-Z: 16 <X-Y: 12, Z: 16> (X-Y-Z: 52 <X-Y: 39, Z: 52>)			
	Cutting feedrate	mm/min (ipm)	X-Y-Z: 10,000 (394)			
Motors	Spindle	kW (hp)	18.5/15 (25/20) (30 min/cont)		OSP:26/18.5 (35/25) (10 min/cont) FANUC:22/18.5 (30/25) (15 min/cont)	
ATC	Tool storage	tool	36 [54]			
	Max tool dia (w, w/o adj tool)	mm (in.)	ø120/ø200 (ø4.72/ø7.87)			ø115/ø115 (ø4.53/ø4.53)
	Max tool length	mm (in.)	400 (15.75)			300 (11.81)
	Max tool weight	kg (lb)	20 (44)			8 (11)
Machine size	Height	mm (in.)	3,350 (131.89)		3,320 (130.71)	
	Floor space	mm (in.)	5,460 × 4,445 <7,460 × 4,445> (214.96 × 175 <293.70 × 175>)			
	Weight	kg (lb)	20,500 <22,500> (45,100 <49,500>)			
Control			OSP-P300MA, FANUC 31i-B			

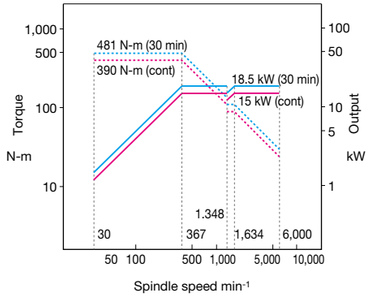
< >: X-axis travel 3,050 specs [ ] : Optional

Spindle torque/output graphs

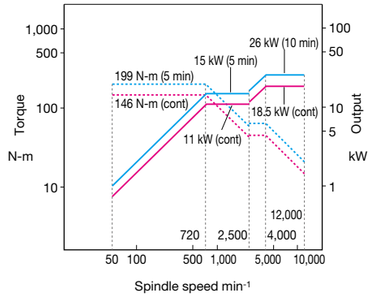
No. 50 4,000 min-1 spindle (OSP, FANUC)
Maximum output: 18.5/15 kW (30 min/cont)
Maximum torque: 587/476 N-m (30 min/cont)



No. 50 6,000 min-1 spindle (OSP, FANUC)
Maximum output: 18.5/15 kW (30 min/cont)
Maximum torque: 481/390 N-m (30 min/cont)



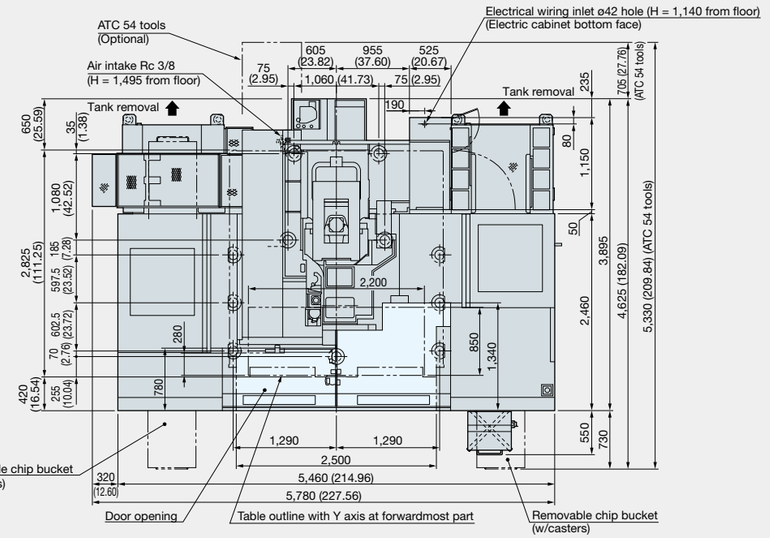
No. 50 12,000 min-1 spindle (OSP)
Maximum output: 26/18.5 kW (10 min/cont)
Maximum torque: 199/146 N-m (5 min/cont)

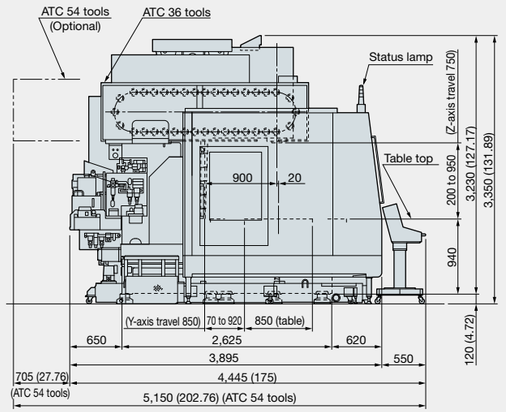


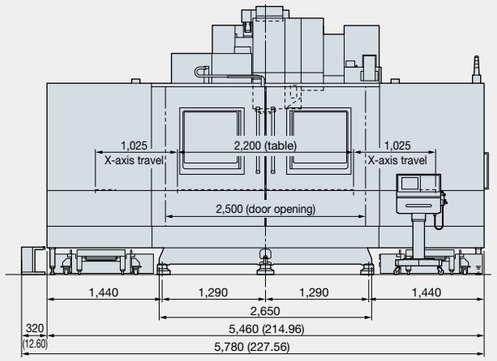
Dimensional drawing/Installation drawing

Unit: mm (in.)

No. 50 4,000/6,000 min-1,
X-axis travel 2,050 specs







Machining Capacity (Material: S45C)

	Tool	Cutting Capacity (cm^3/min) (in^3/min)	Cutting Speed (m/min) (fpm)	Cutting Depth (mm) (in.)	Cutting Width (mm) (in.)	Feedrate (mm/min) (ipm)
No. 50 spindle 4,000 min^{-1} 2-speed gear head	ø150 face mill 8 blades	540 (32.96)	165 (541.37)	5 (0.20)	90 (3.54)	1,200 (47.24)
		485 (29.61)	165 (541.37)	7 (0.28)	90 (3.54)	770 (30.31)
	ø40 roughing end mill	252 (15.38)	25 (82.03)	40 (1.57)	30 (1.18)	210 (8.27)
		252 (15.38)	25 (82.03)	30 (1.18)	40 (1.57)	210 (8.27)

Note: The “actual data” referred to above for this brochure represent examples, and may not be obtained due to differences in specifications, tooling, cutting, and other conditions.

Standard Specifications · Accessories

Specifications	Remarks	Specifications	Remarks
CNC	OSP-P300MA	Spindle air curtain	
	FANUC 31i-B	Air cleaner (filter)	Including regulator
Spindle speed	4,000 min^{-1} No. 50	Door interlock	
	2-speed gear head spindle	Pulse handle	Single axis, switchable
	Spindle motor 18.5/15 kW	Electronic buzzer	At operation end and alarm times
Spindle nose constraint	BIG-PLUS®	Foundation blocks / Jack bolts	
	(No. 50 4,000, 6,000 min^{-1} specs)	Tool / Tool box	Hand tools
Spindle cooling system	Oil controller	Tool release lever	
ATC magazine	36 tools	Bed-mounted operation panel	
ATC air blower		TAS-S: Thermo Active dimension Stabilizer – Spindle (OSP)	
Full-enclosure	With ceiling		
Slideway lubricating equipemnt		TAS-C: Thermo Active dimension Stabilizer – Construction (OSP)	
In-machine conveyor	Table rear: Coil		
Chip pan		Spindle thermal deformation compensation (FANUC)	
Coolant supply system	Tank: 900 L, Pump motor: 250 W		
Coolant nozzle	3 flexible nozzles	Ambient thermal deformation compensation (FANUC)	
Work lamp	LED		

Optional Specifications · Options

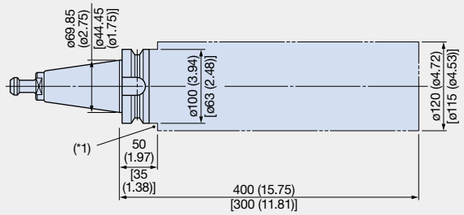
Specifications	Remarks	Specifications	Remarks
Spindle speed 6,000 min^{-1}	No. 50 2-speed gear head spindle 18.5/15 kW	Chip bucket	Tilt with/without
		Raised machine	100 mm
Spindle speed 12,000 min^{-1}	No. 50 integral motor/spindle 26/18.5 kW (OSP) 22/18.5 kW (FANUC)	Workpiece washing gun	
		Air gun mount	
		Angle head preps	
Spindle speed 15,000 min^{-1}	No. 40 integral motor/spindle 26/18.5 kW (OSP) 22/18.5 kW (FANUC)	Manual clamp fixture	
		Hydraulic and pneumatic fixtures	
		Oil skimmer	Belt type
ATC magazine	54 tools	Mist collector	
Chip air blower	Nozzle type	Rotary table	NC, tilt, indexing
Coolant pump	Pump motor : 550 W	Sub table	2,200 × 850 × 100 mm
Coolant nozzle	Ring type	Reference tool	
Semi-dry unit	Nozzle type, Thru-spindle type	Ring gauge	
Coolant level sensor		High column	+200 mm
Coolant temperature regulator		Auto gauging, auto zero offset	Infrared communication type
Oil hole device	0.5 MPa, 1.5 MPa	Auto tool lengh compensation/auto tool breakage detection function	Touch type
Thru-spindle coolant	Okuma pull stud for 1.5 MPa, 1.5 MPa large capacity, and 7 MPa required.		
		AbsoScale detection (OSP)	X-Y-Z axis
Spindle nose constraint	BIG-PLUS® No. 50 12,000 min^{-1} No. 40 15,000 min^{-1}	Scale feedback (FANUC)	X-Y-Z axis
		Status lamp	
		Foundation bolt	
In-machine chip discharge	Oil pan: Chip flush	Parallel 2-pallet APC (X-axis travel 2,050 mm specifications only)	Forms set together with below options. High column 200 mm Pallet size 2,200 × 820 mm Tap pallet, T-slot pallet
Off-machine chip discharge	Hinge conveyor, scraper conveyor See recommended chip conveyor specifications, P31.		

Maximum tool dimensions

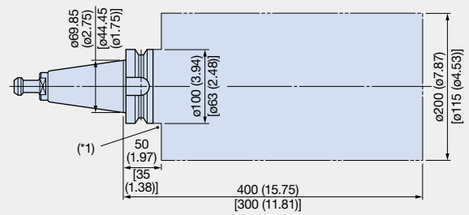
Unit: mm (in.)

No.50

Max tool size (adjacent tools)



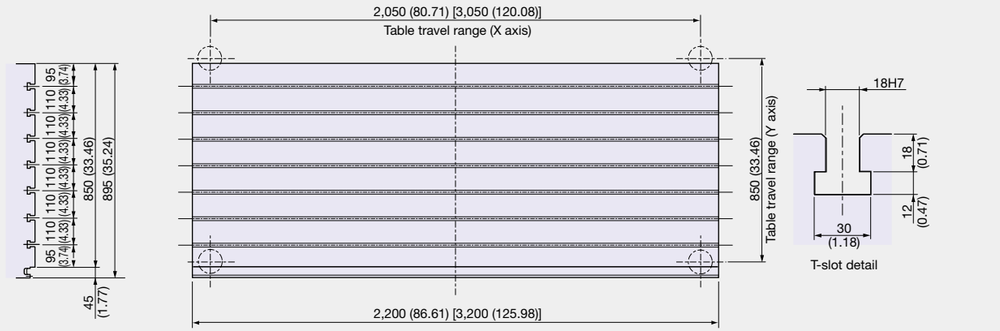
Maximum tools used (w/o adjacent tools)



[ ]: No. 40 (15,000 min^{-1} specs).
(*1): Interference with outer part of ATC tool change arm and tooling may occur with commercially available milling chucks, etc. Always be sure to check dimensions in tooling catalogues or other literature.

Table size

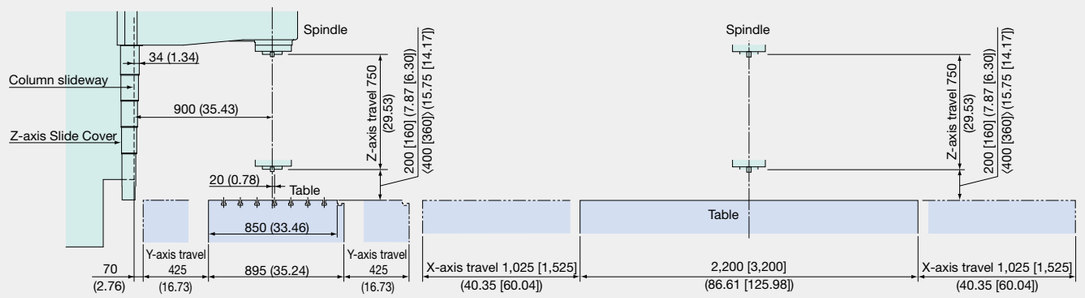
Unit: mm (in.)



[ ]: X-axis travel 3,050 mm (120.08 in.) specs

Working range

Unit: mm (in.)



〈 〉: High column specs [ ]: X-axis travel 3,050 mm (120.08 in.) specs

Vertical Machining Centers

MILLAC 1052V II

Thermo-Friendly Concept | Collision Avoidance System | Machining Navi | SERVONAVI

Machine Specifications

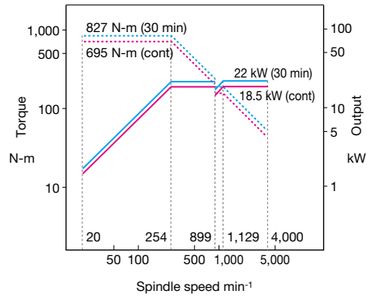
Photos shown in this brochure may also show optional equipment.

Item		Unit	MILLAC 1052V II			
			No. 50 4,000 min^{-1}	No. 50 6,000 min^{-1}	No. 50 12,000 min^{-1}	No. 40 15,000 min^{-1}
Travels	X axis (table R/L)	mm (in.)	2,050 <3,050> (80.71 <120.08>)			
	Y axis (table F/B)	mm (in.)	1,060 (41.73)			
	Z axis (spindle U/D)	mm (in.)	800 (31.50)			
	Table top to spindle nose	mm (in.)	200 to 1,000 <160 to 960> (7.87 to 39.37 <6.30 to 37.80>)			
	Column to spindle center	mm (in.)	1,100 (43.31)			
Table	Work surface	mm (in.)	2,200 <3,200> × 1,050 (86.61 <125.98> × 41.34)			
	Floor to table top	mm (in.)	1,060 <1,150> (41.73 <45.28>)			
	Max load capacity	kg (lb)	5,000 (11,000)			
Spindle	Spindle speed	min^{-1}	20 to 4,000	30 to 6,000	50 to 12,000	50 to 15,000
	Speed ranges		2-speed		Stepless (integral motor/spindle)	
	Tapered bore		7/24 taper No. 50			7/24 taper No. 40
	Bearing dia	mm (in.)	ø100 (3.94)		ø90 (3.54)	ø70 (2.76)
Feedrate	Rapid traverse	m/min (fpm)	X-Y-Z: 16 <X-Y: 12, Z: 16> (X-Y-Z: 52 <X-Y: 39, Z: 52>)			
	Cutting feedrate	mm/min (ipm)	X-Y-Z: 10,000 (394)			
Motors	Spindle	kW (hp)	22/18.5 (30/25) (30 min/cont)		OSP:26/18.5 (35/25) (10 min/cont) FANUC:22/18.5 (30/25) (15 min/cont)	
ATC	Tool storage	tool	36 [54]			
	Max tool dia (w, w/o adj tool)	mm (in.)	ø120/ø200 (ø4.72/ø7.87)			ø115/ø115 (ø4.53/ø4.53)
	Max tool length	mm (in.)	400 (15.75)			300 (11.81)
	Max tool weight	kg (lb)	20 (44)			8 (11)
Machine size	Height	mm (in.)	3,520 <3,570> (138.58 <140.55>)			
	Floor space	mm (in.)	6,760 × 4,470 <9,065 × 4,495> (266.14 × 175.98 <356.89 × 176.67>)			
	Weight	kg (lb)	25,200 <29,600> (55,440 <65,120>)			
Control			OSP-P300MA, FANUC 31i-B			

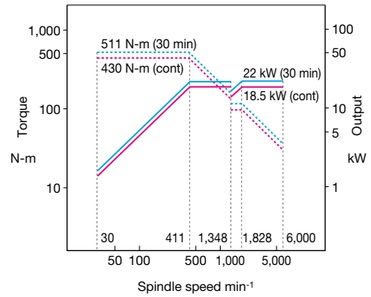
< >: X-axis travel 3,050 specs [ ] : Optional

Spindle torque/output graphs

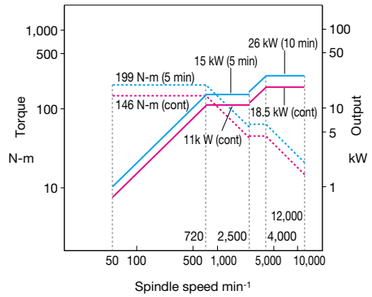
No. 50 4,000 min^{-1} spindle (OSP, FANUC)
Maximum output: 22/18.5 kW (30 min/cont)
Maximum torque: 827/695 N-m (30 min/cont)



No. 50 6,000 min^{-1} spindle (OSP, FANUC)
Maximum output: 22/18.5 kW (30 min/cont)
Maximum torque: 511/430 N-m (30 min/cont)



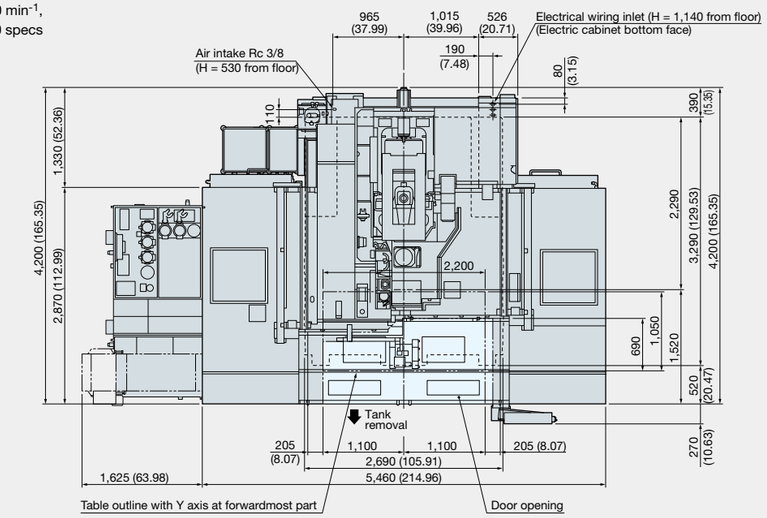
No. 50 12,000 min^{-1} spindle (OSP)
Maximum output: 26/18.5 kW (10 min/cont)
Maximum torque: 199/146 N-m (5 min/cont)



Dimensional drawing/Installation drawing

Unit: mm (in.)

No. 50 4,000/6,000 min^{-1},
X-axis travel 2,050 specs



Machining Capacity (Material: S45C)

	Tool	Cutting Capacity (cm^3/min) (in^3/min)	Cutting Speed (m/min) (fpm)	Cutting Depth (mm) (in.)	Cutting Width (mm) (in.)	Feedrate (mm/min) (ipm)
No. 50 spindle 4,000 min^{-1} 2-speed gear head	ø150 face mill 8 blades	720 (43.96)	165 (541.37)	5 (0.20)	90 (3.54)	1,600 (62.99)
		756 (46.15)	165 (541.37)	7 (0.28)	90 (3.54)	1,200 (47.24)
	ø40 roughing end mill	360 (21.98)	25 (82.03)	30 (1.18)	40 (1.57)	300 (11.81)

Note: The “actual data” referred to above for this brochure represent examples, and may not be obtained due to differences in specifications, tooling, cutting, and other conditions.

Standard Specifications · Accessories

Specifications	Remarks	Specifications	Remarks
CNC	OSP-P300MA	Work lamp	LED
	FANUC 31i-B	Spindle air curtain	
Spindle speed	4,000 min^{-1} No. 50	Air cleaner (filter)	Including regulator
	2-speed gear head spindle	Door interlock	
	Spindle motor 22/18.5 kW	Pulse handle	Single axis, switchable
Spindle nose constraint	BIG-PLUS®	Electronic buzzer	At operation end and alarm times
	(No. 50 4,000, 6,000 min^{-1} specs)	Foundation blocks / Jack bolts	
Spindle cooling system	Oil controller	Tool / Tool box	Hand tools
ATC magazine	36 tools	Tool release lever	
ATC air blower		TAS-S: Thermo Active dimension Stabilizer – Spindle (OSP)	
Full-enclosure	With ceiling		
Slideway lubricating equipemnt		TAS-C: Thermo Active dimension Stabilizer – Construction (OSP)	
In-machine conveyor	Table rear: Coil		
	Left: floor, right: pan	Spindle thermal deformation compensation (FANUC)	
Chip pan			
Coolant supply system	Tank: 750 L, Pump motor: 250 W	Ambient thermal deformation compensation (FANUC)	
Coolant nozzle	3 flexible nozzles		

Optional Specifications · Options

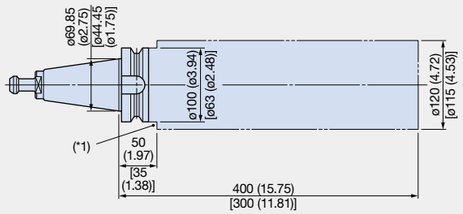
Specifications	Remarks	Specifications	Remarks
Spindle speed 6,000 min^{-1}	No. 50 2-speed gear head spindle 22/18.5 kW	Chip bucket	Tilt with/without (L-type, H-type)
		Raised machine	
Spindle speed 12,000 min^{-1}	No. 50 integral motor/spindle 26/18.5 kW (OSP) 22/18.5 kW (FANUC)	Workpiece washing gun	
		Air gun mount	
		Angle head preps	
Spindle speed 15,000 min^{-1}	No. 40 integral motor/spindle 26/18.5 kW (OSP) 22/18.5 kW (FANUC)	Manual clamp fixture	
		Hydraulic and pneumatic fixtures	
		Oil skimmer	Belt type
ATC magazine	54 tools	Mist collector	
Chip air blower	Nozzle type	Rotary table	NC, tilt, indexing
Coolant pump	Pump motor : 550 W	Sub table	2,200 × 1,050 × 100 mm
Coolant nozzle	Ring type	Reference tool	
Semi-dry unit	Nozzle type, Thru-spindle type	Ring gauge	
Coolant level sensor		High column	+150 mm
Coolant temperature regulator		Auto gauging, auto zero offset	Infrared communication type
Oil hole device	0.5 MPa, 1.5 MPa	Auto tool lengh compensation/auto tool breakage detection function	Touch type
Thru-spindle coolant	Okuma pull stud for 1.5 MPa, 1.5 MPa large capacity, and 7 MPa required.		
Spindle nose constraint	BIG-PLUS® No. 50 12,000 min^{-1} No. 40 15,000 min^{-1}	Pulse handle	3-axis mobile type
		AbsoScale detection (OSP)	X-Y-Z axis, X-Y axis
		Scale feedback (FANUC)	X-Y-Z axis, X-Y axis
		Status lamp	
In-machine chip discharge	Oil pan: Chip flush Left: floor, right: floor	Foundation bolt	
Off-machine chip discharge	Hinge conveyor, scraper conveyor Scraper type (with drum filter) conveyor See recommended chip conveyor specifications, P31.	Parallel 2-pallet APC (X-axis travel 2,050 mm specifications only)	Forms set together with below options. High column 150 mm Pallet size 2,200 × 1,020 mm Tap pallet, T-slot pallet

Maximum tool dimensions

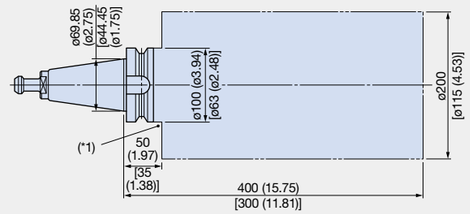
Unit: mm (in.)

No.50

Max tool size (adjacent tools)



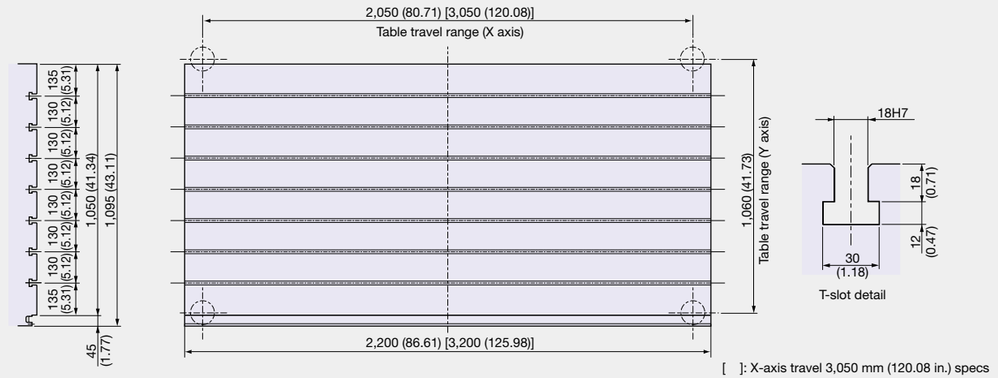
Max tool size (adjacent tools)



[ ]: No. 40 (15,000 min^{-1} specs).
(*1): Interference with outer part of ATC tool change arm and tooling may occur with commercially available milling chucks, etc. Always be sure to check dimensions in tooling catalogues or other literature.

Table size

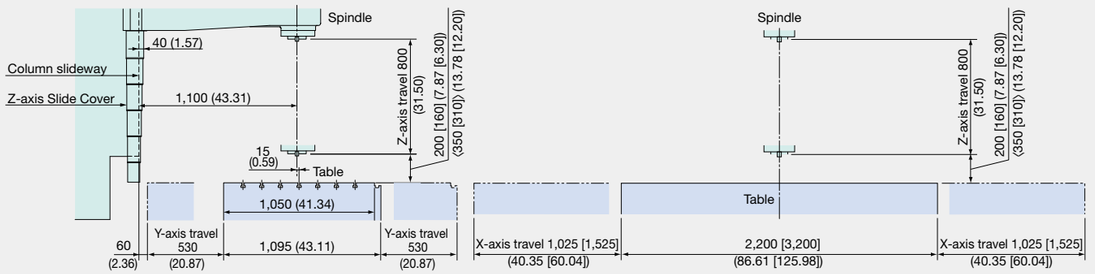
Unit: mm (in.)



[ ]: X-axis travel 3,050 mm (120.08 in.) specs

Working range

Unit: mm (in.)



〈 〉: High column specs [ ]: X-axis travel 3,050 mm (120.08 in.) specs

Smooth discharge of even large volumes of chips

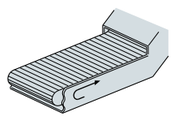
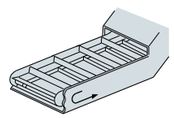
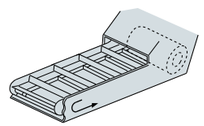
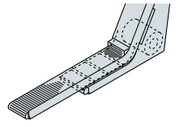
Recommended Chip Conveyors (Please contact an Okuma sales representative for details.)

○: Recommended
△: Recommended with conditions

Workpiece material		Steel	FC	Aluminum / Nonferrous	Mixed (general use)
Chip shape					
In-machine	Coil	○	○	○	○
Off-machine*	Hinge	○	—	—	△ (*4)
	Scraper	—	○ (Dry)	—	—
	Scraper (with drum filter)	—	○ (Wet) with magnet	△ (*3)	—
	Hinge + scraper (with drum filter)	△ (*1)	△ (Wet) (*2)	○	○

*1. When there are many fine chips *2. When chips are longer than 100 mm *3. When chips are shorter than 100 mm *4. When there are few fine chips
Note: Fire prevention measures are necessary, as use of oil-based coolant may cause fire.
*With the MILLAC 1052VII, a hinge conveyor with drum filter is attached when discharging chips off-machine.

Off-machine lift-up chip conveyors

Type	Hinge	Scraper	Scraper (with drum filter)	Hinge + scraper (with drum filter)
Shape				

Note: Evan if the conveyor has a drum filter, its coolant tank must be cleaned periodically.

In-machine chip discharge: Coil
MILLAC 468VII

In-machine chip discharge: Coil
MILLAC 611VII

Off-machine chip discharge: Lift-up conveyor (Optional)
MILLAC 761VII

The Next-Generation Intelligent CNC

OSP suite OSP-P300MA

With revamped operation and responsiveness—ease of use for machine shops first!

Smart factories implement advanced digitization and networking (IoT) in "Monozukuri," (manufacturing) achieving enhanced productivity and added value.
The OSP has evolved tremendously as CNC control suited to advanced intelligent technology. Okuma's new control uses the latest CPUs for a tremendous boost in operability, rendering performance, and processing speed.
The OSP suite also features a full range of useful apps that could only come from a machine-tool manufacturer, making smart manufacturing a reality.

Smooth, comfortable operation with the feeling of using a smart phone

Improved rendering performance and use of a multi-touch panel achieve intuitive graphical operation. Moving, enlarging, reducing, and rotating 3D models, as well as list views of tool data, programs, and other information can be accomplished through smooth, speedy operations with the same feel as using a smart phone.
The screen display layout on the operation screen can also be changed to suit operator tastes, and customized for needs from beginning to veteran operator.

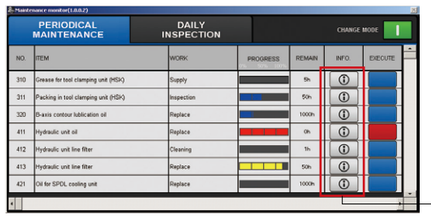
Note: Collision Avoidance System (Optional) shown above.

Features you wanted – loaded with OSP suite apps!

We made these real through the addition of Okuma's machining expertise based on requests we heard from customers in the machine shop. These are filled with intelligence that enhances the "strength in the field" that CNC control can accomplish because it's created by a machine-tool manufacturer.

Routine inspection support
Maintenance monitor

The Maintenance Monitor displays items for inspections before starting daily operation and regular inspections and the rough estimate of inspection timing. Touching the [INFO] button displays the PDF instruction manual file of relevant maintenance items.



[INFO] button

Increased productivity through visualization of motor power reserve
Spindle Output Monitor

Monitoring utilization status even when away from the machine
E-mail Notification

Comment display for greater ease of use and faster work
Common Variable Monitor

Automatic saving of recorded alarms
Screen Capture

Easy programing without keying in code
Scheduled Program Editor

Okuma Control OSP-P300MA

Standard Specifications

Basic specs	Control	X, Y, Z simultaneous 3-axis, spindle control (1 axis)
	Position feedback	OSP full range absolute position feedback (zero point return not required)
	Coordinate functions	Machine coordinate system (1 set), work coordinate system (20 sets)
	Min/max inputs	8 digits decimal, ±99999.999 to 0.001mm (±3937.0078 to 0.0001 in), 0.001° Decimals: 1 µm, 10 µm, 1 mm (0.0001, 1in) (1°, 0.01°, 0.001°) can be set
	Feed	Cutting feed override 0 to 200%, rapid traverse override 0 to 100%
	Spindle control	Direct spindle speed command, override 30 to 300%, multi-point indexing
	Tool compensation	No. of registered tools: Max 999 sets, tool length/radius compensation: 3 sets per tool
	Display	15-inch color LCD + multi-touch panel operations
	Self-diagnostics	Automatic diagnostics and display of program, operation, machine, and NC system faults
Programming	Program capacity	Program storage capacity: 4 GB; operation backup capacity: 2 MB
	Program operations	Program management, editing, multitasking, scheduled program, fixed cycle, G-/M-code macros, arithmetic, logic statements, math functions, variables, branch commands, coordinate calculate, area calculate, coordinate convert, programming help
Operations	"suite apps"	Applications to graphically visualize and digitize information needed on the shop floor
	"suite operation"	Highly reliable touch panel suited to shop floors. One-touch access to suite apps.
	Easy Operation	"Single-mode operation" to complete a series of operations, Advanced operation panel/graphics facilitate smooth machine control
	Machine operations	MDI, manual (rapid traverse, manual cutting feed, pulse handle), load meter, operation help, alarm help, sequence return, manual interrupt/auto return, pulse handle overlap, parameter I/O, PLC monitor
	MacMan	Machining management: machining results, machine utilization, fault data compile & report, external output
Communications / Networking		USB (2 ports), Ethernet
High speed/accuracy specs		Hi-cut Pro, pitch error compensaion, SERVONAVI, Machining Time Shortening Function TAS-S (Thermo Active Stabilizer—Spindle): MILLAC 611VⅡ, MILLAC 761VⅡ, MILLAC 852VⅡ, MILLAC 1052VⅡ TAS-C (Thermo Active Stabilizer—Construction): MILLAC 611VⅡ, MILLAC 761VⅡ, MILLAC 852VⅡ, MILLAC 1052VⅡ
Energy-saving	ECO suite	ECO Idling Stop*1, ECO Power Monitor*2

*1. Spindle cooler Idling Stop is used on TAS-S machines. *2. The power display shows estimated values. When precise electrical values are needed, select the wattmeter option.

Optional Specifications

Items \ Kit specs	NML E	NML D	3D E	3D D	AOT E	AOT D
Interactive functions						
Advanced One-Touch IGF-M (w/Real 3-D simulation)					●	●
Interactive MAP (I-MAP)			●	●		
Programming						
Auto scheduled program update	●	●	●	●	●	●
Common variables (Std: 200 pcs) 1,000 pcs						
Common variables (Std: 200 pcs) 2,000 pcs						
Program branch; 2 sets						
Program notes (MSG)		●		●		●
Coordinate system select (Std: 20 sets) 100 sets	●		●		●	
Coordinate system select (Std: 20 sets) 200 sets		●		●		●
Coordinate system select (Std: 20 sets) 400 sets						
Helical cutting (within 360˚)	●	●	●	●	●	●
3-D circular interpolation						
Synchronized TappingⅡ	●	●	●	●	●	●
Arbitrary angle chamfering	●	●	●	●	●	●
Cylindrical side facing						
Slope machining						
Tool maximum rotational speed setting						
F1-digit feed 4 sets, 8 sets, parameter						
Programmable travel limits (G22, G23)	●	●	●	●	●	●
Skip (G31)						
Additional G/M code macros						
3-D tool compensation						
Tool wear compensation		●		●		●
Drawing conversion Programmable mirror image (G62)		●		●		●
Drawing conversion Enlarge/reduce (G50, G51)		●		●		●
User task 2 I/O variables (16 each)						
Inverse time feed						
Monitoring						
Real 3-D simulation			●	●	●	●
Simple load monitor Spindle overload monitor	●	●	●	●	●	●
NC operation monitor Hour meter, work counter	●	●	●	●	●	●
Hour meters Power, spindle, NC, cutting						
Work counter With M02 and M30 commands						
MOP-TOOL Adaptive control, overload monitor						
Tool life management Hour meter, No. of workpieces	●	●	●	●	●	●

Note: NML: normal 3D: 3D simulation AOT: Advanced One-Touch IGF E: Economy D: Deluxe

*1. Harmonic Spindle Speed Control available only with Machining Navi M-*i* or M-*g*Ⅱ+ specifications.

*2. Machining Navi M-*i* or M-*g*Ⅱ+ are available with integral motor/spindles.

*3. Machining Navi M-*g*Ⅱ is available with gear spindles.

Items \ Kit specs	NML E	NML D	3D E	3D D	AOT E	AOT D
Gauging						
Auto gauging By touch probe (w/G31) Including auto gauging						
Tool breakage detection By touch sensor (w/G31) With tool compensation						
Gauging data printout File output						
Manual gauging (w/o sensor)	●	●	●	●	●	●
Interactive gauging (Touch sensor, touch probe required)						
External I/O communication						
RS-232-C interface						
DNC-B (232C-Ethernet transducer used on OSP side)						
DNC-DT						
Additional USB (Additional 2 ports, Std: 2 ports)						
Automation / untended operations						
Auto power shut-off M02 and END alarms Workpiece preps done OFF	●	●	●	●	●	●
Warm-up (calendar timer)						
External program selection Push button, rotary switch, digital switches, BCD (2-digit, 4-digit)						
Cycle time reduction (Reduced cycle time)	●	●	●	●	●	●
High-speed, High-precision						
AbsoScale detection X-, Y-, Z-axis						
Super-NURBS						
TAS-S (spindle) MILLAC 468VⅡ, MILLAC 561VⅡ						
TAS-C (construction) MILLAC 468VⅡ, MILLAC 561VⅡ						
ECO suite						
ECO Operation						
ECO Power Monitor Wattmeter						
Other						
Control cabinet lamp (inside)						
Circuit breaker						
Sequence operation Sequence stop	●	●	●	●	●	●
Upgraded sequence restart Mid-block return		●		●		●
Additional pulse handle						
Manual angle/arc						
Jog feed						
External M signals 4, 8 signals						
Collision Avoidance System						
Machining Navi*1 M-*i**2, M-*g*Ⅱ+*2, M-*g*Ⅱ*3 (cutting condition search)						
One-Touch Spreadsheet						
Block skip; 3 sets						
Additional axes A, B, C axes [preps/install specs]						
Fixture offset						
OSP-VPS (Virus protection system)						

FANUC 31i-B

Standard Specifications

Basic Specs	Control	Simultaneous X, Y, Z control, positioning, linear/circular interpolation
	Input increment	±999999.999 mm to 0.001 mm (±3937.0078 to 0.0001 in.), 0.001°
	Workpiece coordinates	G54 to G59 6 sets
	Feed	Direct F4 digit command, feed rate override 0 to 200%
	Spindle control	Direct S5 command, spindle override 50 to 150%
	Tool compensation	T4 digit command, tool compensation: 64 sets
	Display	10.4-inch LCD, English language display, graphic display
Programming	Program capacity	Program capacity 64 KB (160 m)
	Programming operations	63 registered programs, programmable data input
		Fixed cycle, tool length measurement
		Extended program editing, coordinate rotation, manual interaction
		Optional block skip (1)
Operations	Machine operations	Pulse handle, input/output interface, Self-diagnostics, alarm buzzer
Communications / Networking		USB (1 port), memory card interface, embedded Ethernet (FOCAS2/Ethernet)
High speed/accuracy specs		AI contour control I, bell-shaped acceleration/deceleration Spindle Thermal Growth Compensation: MILLAC 611VⅡ, MILLAC 761VⅡ, MILLAC 852VⅡ, MILLAC 1052VⅡ Construction Thermal Growth Compensation: MILLAC 611VⅡ, MILLAC 761VⅡ, MILLAC 852VⅡ, MILLAC 1052VⅡ

Optional Specifications

Items \ Kit specs	Soft-K	AI Contouring Control Ⅱ kit
Helical interpolation	●	●
Rigid tapping	●	●
Simultaneous editing of multiple programs (background)	●	●
Custom macros	●	●
Program memory capacity 512 KB (1,280 m)	●	●
Operating time/part No. display	●	●
Tool life management	●	●
Selection of five optional language	●	●
Inch/metric conversion	●	●
No. of tool compensations: 99 sets	●	●
Machining condition selecting function	●	●
Machining quality level adjustment		●
Tool compensation memory C		●
Jerk control		●
AI contour controlⅡ		●
Data server (including hard set) (1 GB)		●
High speed processing		●
Nano smoothing		●
Smooth TCP		●
Data server explorer connection		●

Programming	
Program memory capacities	128 KB (320 m), 256 KB (640 m), 512 KB (1,280 m), 1 MB (2,560 m), 2 MB (5,120 m), 4 MB (10,240 m), 8 MB (20,480 m)
Registered programs	Extension 1 (125, 250, 500, 1,000) Extension 2 (2,000, 4,000)
Helical interpolation	
Simultaneous editing of multiple programs (background)	
Custom macros	
Addition of custom macro common variables	Total 600
Display of machine utilization time / No. of parts	
Tool life management	
Rigid tapping	
No. of read-ahead blocks extension 600→1000	AI contour controlⅡ kit
Data server capacity (Complete hard set included)	1 GB, 4 GB
External M code	
F1-digit feed	9 sets (parameter)
Arbitrary angle chamfering corner R	
Programmable mirror image	
Addition of workpiece coordinate system	48 sets, 300 sets
Automatic corner override	
Scaling	
FS15 program format	
Nanosmoothing	
Cylindrical interpolation	
Polar coordinate interpolation	
Operations	
Program restart	
Fast skip	
Manual handle interrupt	
Tool compensations	99 sets, 200 sets, 400 sets , 499 sets, 999 sets
Tool max rotational speed setting function	
Tool offset	
Tool compensation memory	C
Warming up function	
Monitoring	
Power shutoff	
Hour meters	Power ON, Spindle run-time, NC ON time, Machining
Communication function	
Communication function	FL-net, CC-Link, EtherNet/IP, PROFIBUS, PROFINE I/O
RS232C interface	
High-speed / High accuracy	
Scale feedback	X-Y-Z axis
Spindle Thermal Growth Compensation	MILLAC 468VⅡ, MILLAC 561VⅡ
Construction Thermal Growth Compensation	MILLAC 468VⅡ, MILLAC 561VⅡ
Other	
Lamp in control box	
Circuit breaker	
CF card adaptor	
Program protection key switch	

MILLAC V II series

When using Okuma products, always read the safety precautions mentioned in the instruction manual and attached to the product.

⚠ Fire Safety Precautions

To protect your factory and equipment from fire and assure continued safe operation, observe the following fire safety precautions whenever you operate machinery.
Whenever possible, avoid the use of oil-based coolants for cutting operations.
Sparks caused by hot chips, tool friction, and grinding can cause fires.
Always observe the following safety measures to ensure safe operation when machining flammable materials or when performing dry machining.

1. Oil-based coolant
   (1) Use nonflammable cutting fluid coolant.
   (2) When the use of an oil-based coolant is unavoidable:
   - **Before** you begin machining, check cutting tools to make sure of their service life and the condition of the tool edge, and choose cutting conditions that will not cause a fire.
   - Periodically clean the coolant filter to maintain sufficient coolant discharge, and frequently verify that coolant is discharging normally.
   - Take measures to control the outbreak of fire: Place a fire extinguisher near the machine, have an operator constantly monitor operation, and install an automatic fire extinguishing system.
   - Do not place flammable materials near the machine.
   - Do not allow chips to over accumulate.
   - Periodically clean the inside of the machine and the area surrounding it.
   - Check that the machine is operating normally.
   - Never run the machine unattended.
   - Since an automatic fire extinguishing system and other peripherals are needed for grinding operations, please let us know as soon as possible if you plan to perform such operations.
2. Precautions regarding machining of potentially flammable materials
   Before machining any material designated by law as a flammable substance, e.g., plastic, rubber, wood, acquaint yourself with the special characteristics of the material in terms of fire prevention, and observe the precautions given in (2) above to ensure safe operation.
   Example: When machining magnesium, there is a danger that magnesium chips and water-soluble coolants will react to produce hydrogen gas, resulting in an explosive fire if any chip should ignite.
3. Dry machining
   Dry machining is a fire hazard because workpieces, tools, and chips are not cooled. To ensure safe operation, do not place any flammable objects near the machine and do not allow chips to over accumulate.
   In addition, be sure to check cutting tools to make sure of their service life and the condition of the tool edge, and observe the precautions regarding oil-based coolants given in (2) above.

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