



AF-4

High Performance Horizontal
Machining Center for High Productivity



Product Overview

High Performance Horizontal Machining Center for High Productivity

AF-4 is built with highly dynamic system for high productivity, and it has a small footprint. The spindle integrates the motor to limit vibration, noise, and power loss at high speed rotation. The jet of oil is injected directly onto the spindle bearing for effective cooling, and the motor and the spindle assembly are jacket-cooled to limit the displacement caused by heat.

Easy Maintenance

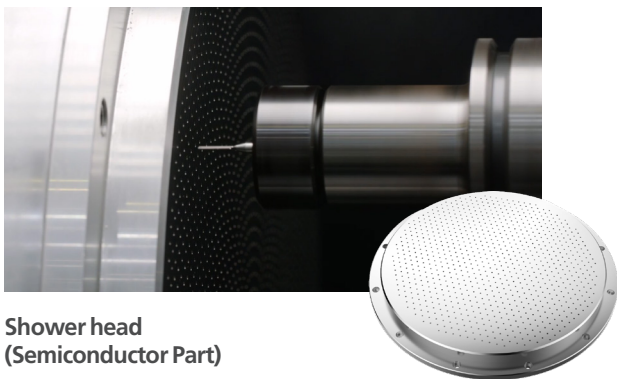


Units requiring regular maintenance are conveniently placed and are equipped with an automatic grease lubrication system as standard.



Exceptional productivity to minimize cycle times

Exhibits excellent performance in processing various machining parts and is capable of mass production, small to medium batch production, prototyping, and machining of automotive and aerospace industry parts.

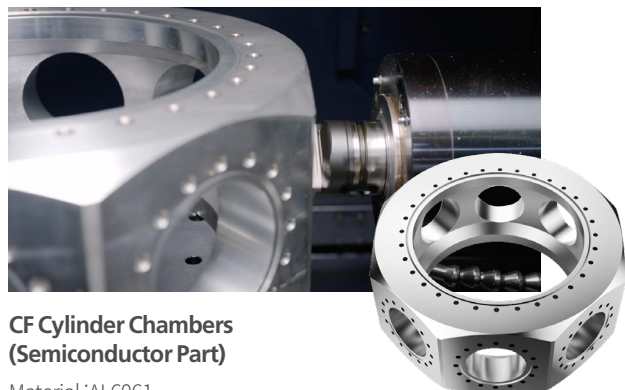


**Shower head
(Semiconductor Part)**

Material : AL6061

Size : D380mm (14.96 inch) x H30mm (1.18 inch)

Spindle: High Speed 20,000 rpm (221 Nm)



**CF Cylinder Chambers
(Semiconductor Part)**

Material : AL6061

Size : D465 mm (18.31 inch) x H180 mm (7.09 inch)

Spindle: High Speed 20,000 rpm (221 Nm)

Convenient setup station for operations.



When the rotary door of the setup station is opened, the crane can smoothly access fixtures and parts without obstacles.

Provides excellent internal accessibility.



The operator door enhances access to the spindle and tools, offering safe and efficient operational convenience.

Efficiently discharges a large volume of various-sized chips

Ceiling shower coolant system

The coolant from the spindle head and ceiling effectively washes away chips from the material and table, preventing accumulation.

- 12 ceiling nozzles for coolant spray.
- Coolant Through Spindle (Opt)



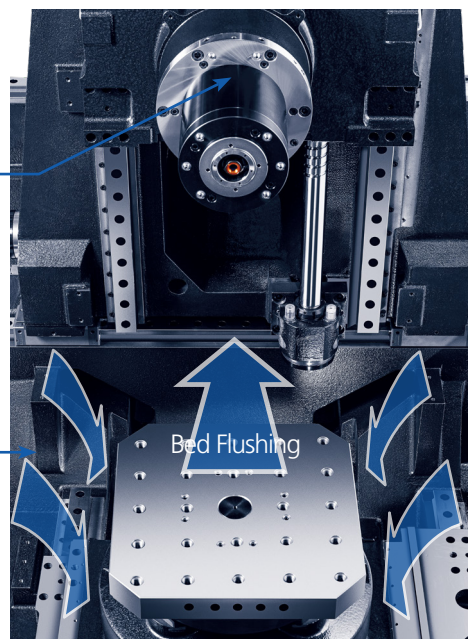
Convenient embedded control panel

The control panel is attached to the left of the operator's door and can rotate up to 90 degrees, providing an optimal view of tools, fixtures, and workpieces during process checks.



Excellent at preventing chip accumulation on the upper spindle

Two coolant nozzles on the top of the spindle prevent chips from entering the spindle taper during tool changes.



Excellent chip discharge capability

An inclined internal cover is applied to effectively remove and discharge a large volume of chips. The structure is designed with a discharge passage directly beneath the material, allowing rapid discharge.

Bed Flushing

Basic Information

Basic Structure

High-rigidity frame structure optimized for high-speed and 1G acceleration/deceleration

“Machining Stability Ensured”



- Stable base and column frame
- High-precision linear guides applied to all axes

"The transfer frame is light yet sturdy"

"The fixed frame is heavy and sturdy"

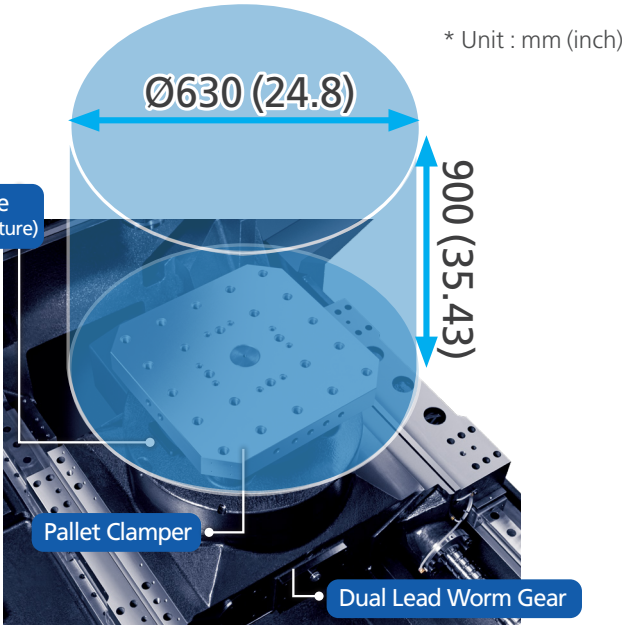
Stroke mm (inch)			Rapid Speed m/min (ipm)		
X-axis	Y-axis	Z-axis	X-axis	Y-axis	Z-axis
565 (22.2)	565 (22.2)	645 (25.4)	60 (2,362)	60 (2,362)	60 (2,362)

Table

"High-precision Index table"

- Minimum input unit of 0.0001°
- Hydraulic clamping system
- Application of hydraulic / pneumatic linesfor automation (OPT)

Pallet Size mm (inch)	Max Loading Capacity (kg, (lb.))	Minimum Index Angle (deg.)
□400 (15.7x15.7)	400 (882)	0.0001

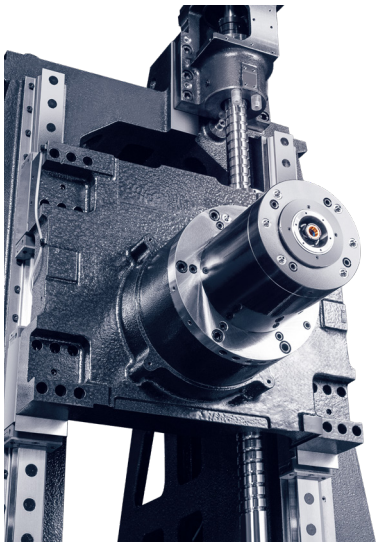


* Unit : mm (inch)

Spindle

Meeting the customer's machining purposes

"Various Specifications for Built-in motor Spindles"

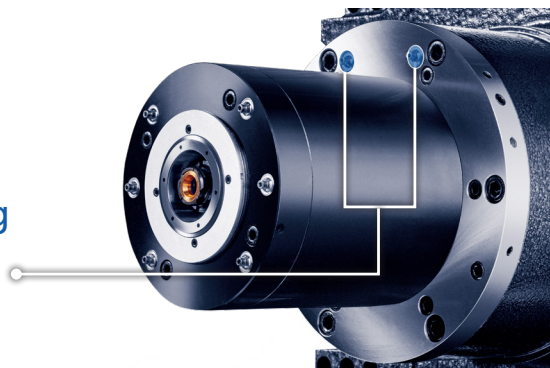


"High Rigid Spindle for Mass Production"

- 4-Bearings in front

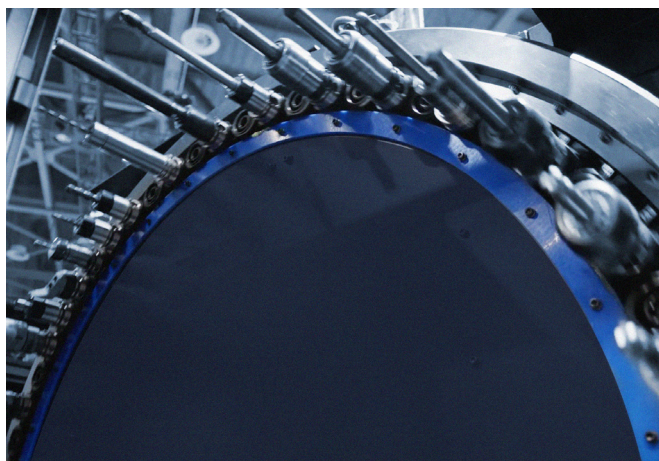
"Excellent at preventing chip accumulation"

- Coolant nozzle on spindle head



	Max. Spindle Speed rpm	Max. Spindle Power kW	Max. Spindle Torque Nm
Standard High Torque	15,000	37	303
High Speed (Opt)	20,000	37	221

Magazine



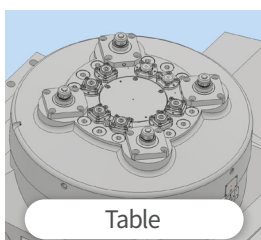
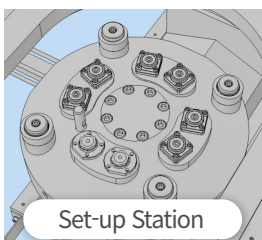
"High-speed ring magazine with various specifications"

Various specifications are available based on users' tool types.

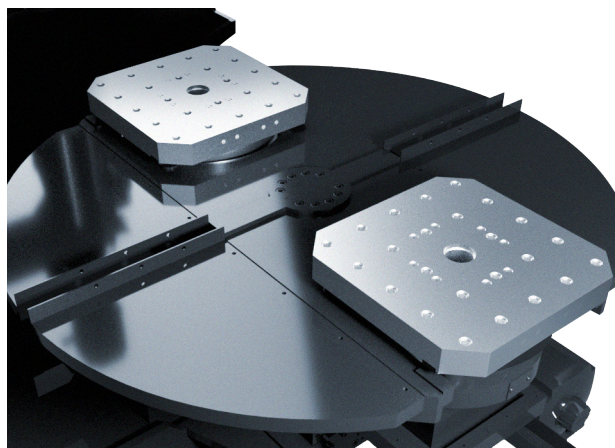
Item	Tool Shank	BBT-40 (Opt: CAT-40, HSK-A63, SK-40)
Magazine Type		Ring
Tool Storage Capacity		40ea (Opt: 60ea)
Tool Selection Method		Memory Random
Tool Change Type		Swing Arm

APC

"Automatic Pallet Changer"



No. of Pallet	2
Driving Method	Hydraulic
Max. Workpiece Weight kg, (lb.)	400 (881.85) x 2
Max. Workpiece Size mm (inch)	Ø630 (24.80) x H900 (35.43)
Fluid Line for Automation (Opt.)	Hydraulic line : 6 port / Pneumatic line : 2 port



Detailed Information

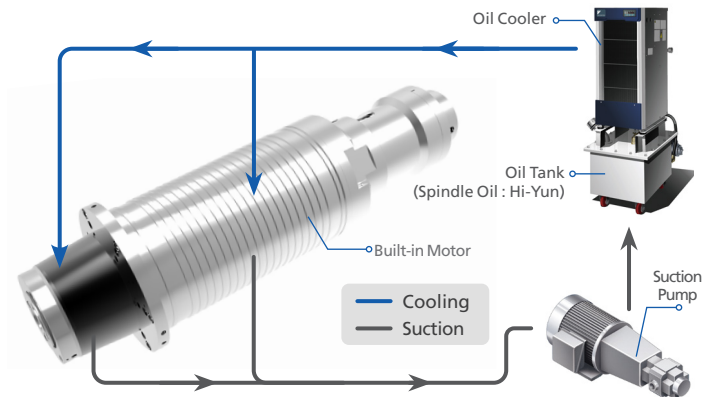
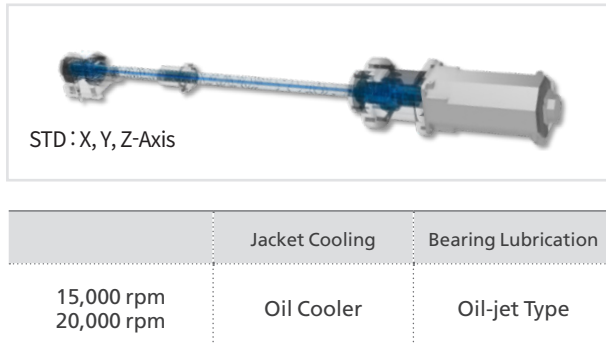
Standard / Optional Accessories Status

S : Standard O : Option

NO.	ITEM	DESCRIPTION			AF-4
1	Spindle	15,000	37 / 22 kW	303 Nm	S
2		20,000	37 / 18.5 kW	221 Nm	O
3	Magazine	40T			S
4		60T			O
5	Tool Shank	BBT-40			S
6		CAT-40, HSK-A63, SK-40			O
7	Table	Square Type	□400mm		S
8	NC Controller	Fanuc 0i-MF Plus	4 + 1Axis Control		S
9	Coolant Function	Head Coolant Pump	0.1 MPa (50Hz)	0.6 kW	S
10		Bed Coolant Pump	0.15 MPa (60Hz)		S
11		CTS Coolant Device	3 MPa	3 kW	O
12		(For 7 MPa, only water soluble coolants are available)	7 MPa	5.5 kW	O
13		CTS Supply Pump			O
14		Oil Mist (Semi dry cutting system)			O
15	Chip Removal Function	Air Blower			S
16		Air Gun			O
17		Coolant Gun			O
18		Lift-up Chip Conveyor	Hinge / Scraper / Mesh-drum Filter Type		O
19		Mist Collector (Separately Mounting)			O
20	Precision Machining Function	Linear Scale (X / Y / Z)			O
21		Hwacheon Efficient Contour Control System (HECC)			S
22		Hwacheon Thermal Displacement Control System (HTDC)			S
23		Table Hydraulic Clamping System			S
24		Spindle Cooler(Oil Jet + Jacket Cooling)	Oil Cooler Type		S
25		Hwacheon Artificial Intelligence Control System (HAI): 200 Block			S
26	Measuring & Automation Function	Hwacheon Artificial Intelligence Control System (HAI): 400Block			O
27		Tool Measuring System: Renishaw / Blum (Touch Type, Laser Type)			O
28		Workpiece Measuring System: Renishaw (Touch type)			O
29		Tool Life Management			O
30		Hwacheon Tool Load Detect System (HTLD)			S
31		Cutting Feed Optimization System (OPTIMA)			S
32	Convenient Functions	Hwacheon Real-time Geometric Compensation System (HRGC)			S
33		Ethernet Interface			S
34		MPG Handle (1ea)			S
35		Signal Lamp with 3 Color (R, G, Y)			S
36		Display Unit	15" Non Touch		S
37			15" Touch Screen (Fanuc i-HMI)		O
38		Tool Box			S
39		NC Cooler			O
40		Oil Skimmer			O
41		Air Dryer			S
42		Door Interlock			S
43		Workpiece Coordinate System	48 Pairs		S
44			300 Pairs		O
45		Perfect Base Around Splash Guard			S
46		Part Program Storage Length 5,120m (2MB)			S
47		Data Server (256MB, 1GB, 2GB, 4GB, 16GB, 32GB)			S
48		Data Server Interface			O
49		Manual Guide i			S
50		Energy Saving System			S
51		M-VISION Plus (Monitoring Solution of Real-time Operational Status)			O
52		M-VISION Pro (Operation Managing and Monitoring Solution of Real-time Operational Status)			O

"Minimization of thermal displacement through oil cooling"

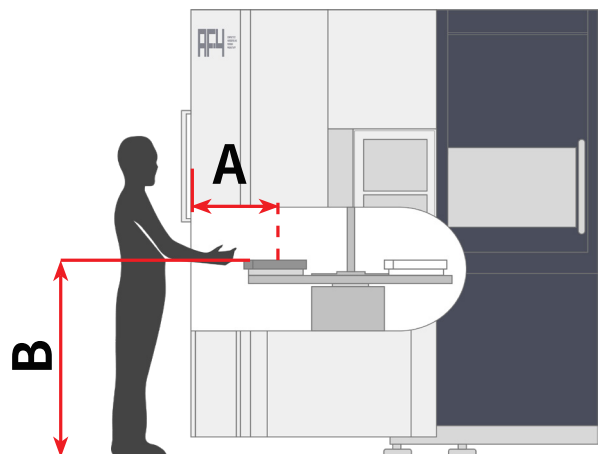
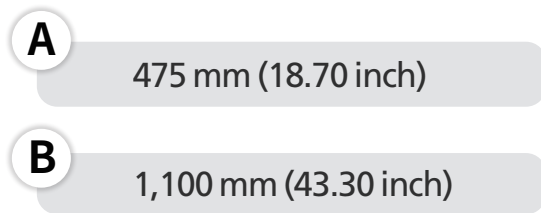
- Ballscrew core cooling applied to all axes.



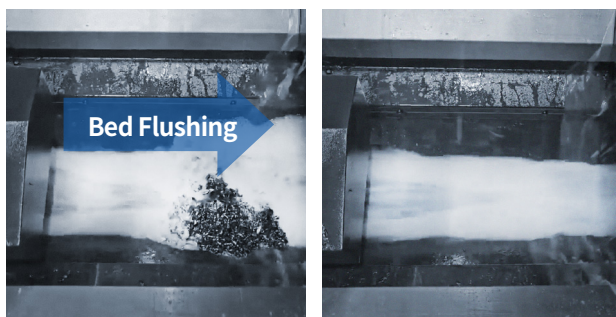
User Convenience

"Ergonomic design"

- Excellent pallet accessibility
- Wide door opening design



Coolant & Chip disposal



Powerful bed flushing system for high-volume chip removal

- Large-capacity coolant rapidly and effectively removes chips.

Optimal chip conveyor support accordingly to the machining material (Opt)

- Types of chip conveyors: hinged, mesh drum, scraper.



Can increase the chip outlet height to use a large chip cart and easily process large amounts of chips

Large-capacity coolant tank

Tank Capacity : 960ℓ
(253.6 gal)

- A large-capacity tank is positioned on the right side of the machine to facilitate coolant exchange, tank cleaning, and pump maintenance.

· Coolant Pump Specifications

Head Coolant Pump - Power : 0.6 kW
Coolant Gun Pump - Power : 1.1 kW
Shower Coolant Pump - Power : 1.8 kW
Bed Coolant Pump - Power : 1.8 kW

CTS Coolant Pump (Opt)
- Pressure : 3 MPa / 7 MPa
- Power : 3 kW / 5.5 kW

* For 7 MPa, only water soluble coolants are available

Hwacheon Software



Hwacheon Tool Load Detect System (HTLD)

HTLD constantly monitors the tool wear to prevent accidents and collisions that may result from worn or broken tools. It also helps to prevent the work piece from being damaged or scrapped.

Prevent processing defects

Prevention of the defective tool breakage

Able to quickly respond to wear and tear of tools

When tool breakage alarm



Hwacheon Efficient Contour Control System (HECC)

Workpiece and the desired mode selected depending on the need to shorten processing time / improve contour accuracy / enhanced tool life.

"Roughing quickly, finishing is precisely"

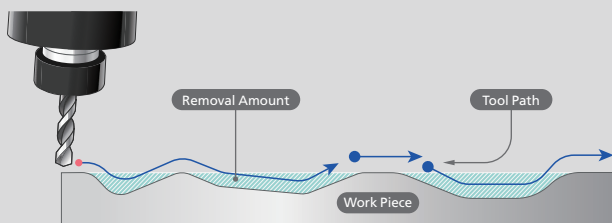
Level(R)	1.0	1.1	1.2	~	8.8	8.9	9.0
• Cutting time	Fast (1.5~3.0 Times)				Slow (1.0 Times)		
• Surface	No Good				Good		
• Process	Rough				Finish		
• Tool life	Good				No Good		



Cutting Feed Optimization System (OPTIMA)

Prevent damage to the tool in real time by automatically controlling the feed rate to maintain a constant cutting force during the machining process which typically results in reduced cycle times.

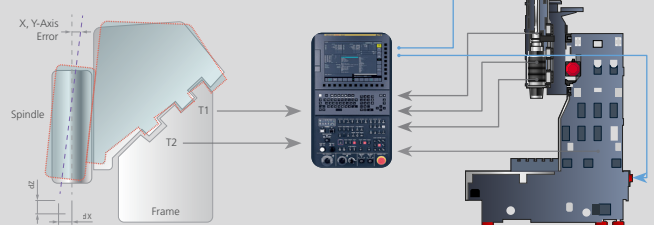
"Maximize your productivity with intelligent system"



Hwacheon Thermal Displacement Control System (HTDC)

The high sensitivity temperature sensors are installed at integral elements to capture and display real-time data while processing.

"Hwacheon Spindle Displacement Control System(HSDC)"
+
"Hwacheon Frame Displacement Control System(HFDC)"



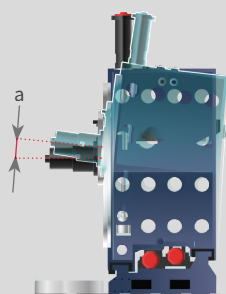
Hwacheon Real-time Geometric Compensation System (HRGC)

HRGC calibrates the feed orthogonality of machine tools in real time, which changes due to temperature variations and thermal impact of machining

"Orthogonal variation due to temperature variation of the structure"

Orthogonal variation is most prominent in Y-Z direction for horizontal machining centers, and calibrating it minimizes the orthogonal error caused by changes in the machining position.

- Enter temperature
- Calculate geometrical error
- Calculate distributed calibration amount
- Display Calibration amount



Monitoring Solution of Real-time Operational Status (M-VISION Plus / Pro)

Real-time operational status monitoring system for the User's factory machine management.

M-VISION Plus

- Monitoring of real-time operational status
- Mobile app supported
- Machining history saving, retrieving and statistics
- Statistics on operational efficiency and history by equipment



M-VISION Pro

- Real-time machine operation status monitoring
- Mobile app supported
- Saving machining/alarm history, retrieving and statistics
- Statistics on operational efficiency and history by equipment/by equipment in total, operator, and arbitrary set period
- Machining Management



Machine Size

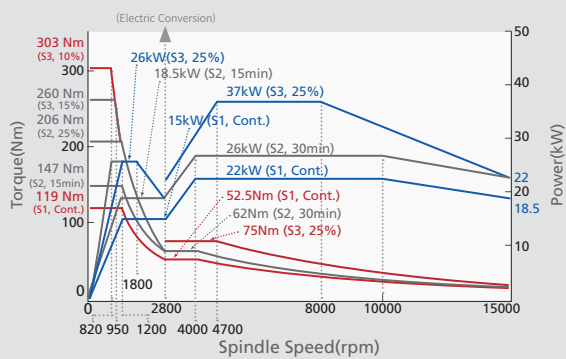
* Unit : mm (inch)



Spindle Power - Torque Diagram

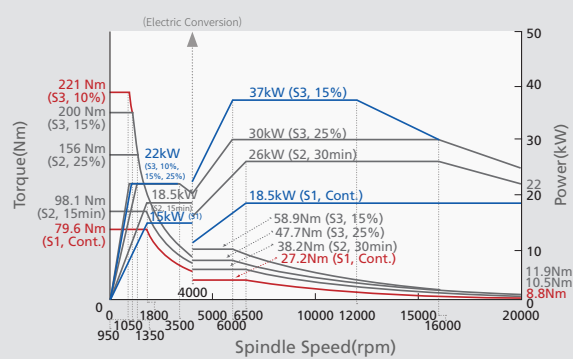
15,000 rpm (Std)

Max Power : 37 kW (50 HP) / Max Torque : 303 Nm

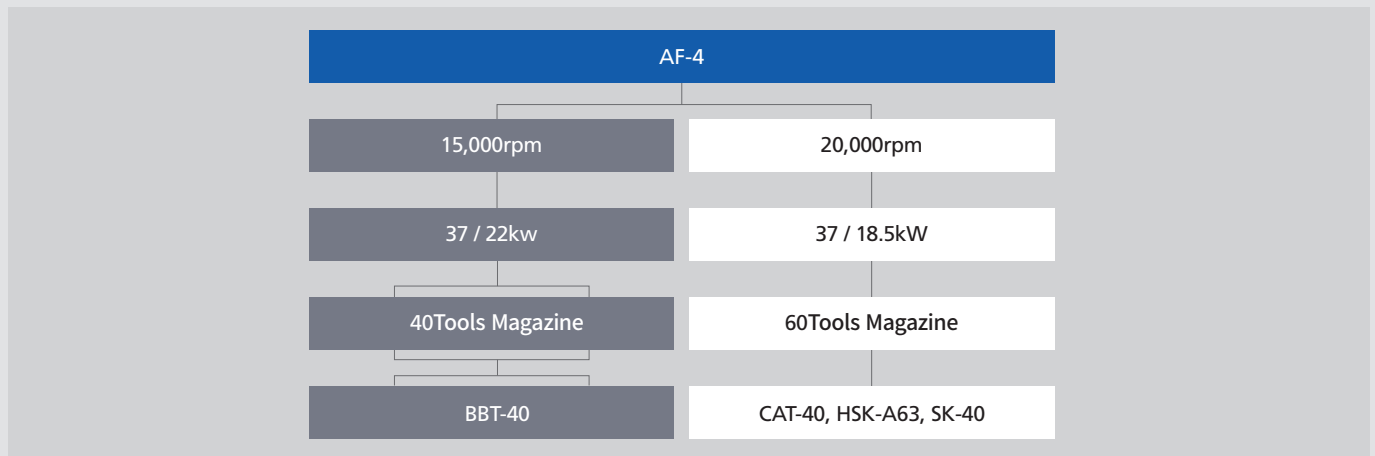


20,000 rpm (Opt)

Max Power : 37 kW (50 HP) / Max Torque : 221 Nm



Product Line-up



Machine Specifications

Item		AF-4	
Travel			
X-axis Stroke	mm (inch)	565 (22.24)	
Y-axis Stroke	mm (inch)	645 (25.39)	
Z-axis Stroke	mm (inch)	645 (25.39)	
Distance from Table Surface to Spindle Gauge Plane	mm (inch)	80 ~ 725 (3.15 ~ 28.54)	
Distance between Column to Spindle Center	mm (inch)	80 ~ 725 (3.15 ~ 28.54)	
Table			
Table Size	mm (inch)	□400	
Table Loading Capacity	kg, (lb _t)	400	
Minimum Rotation Angle	deg.	0.0001°	
Spindle			
Max Spindle Speed	rpm	15,000	20,000
Spindle Motor	kW (HP)	37 / 22 (50 / 30)	37 / 18.5 (50 / 25)
Spindle Torque	Nm	303	221
Type of Spindle Taper Hole	-	ISO#40, 7/24 Taper (BBT-40)	
Spindle Bearing Inner Diameter	mm (inch)	Ø70	
Method of Spindle Lubrication & Cooling	-	Oil Jet + Jacket Cooling	
Feedrate			
Rapid Traverse (X / Y / Z)	m/min (ipm)	60 / 60 / 60 (2,362 / 2 362 / 2,362)	
Rapid Traverse (B)	rpm	34	
ATC			
Tool Shank	-	BBT-40 (Opt: CAT-40, HSK-A63, SK-40)	
Type of Pull Stud	-	MAS P40T-1 (45°)	
Tool Storage Capacity	ea	40 (Opt: 60)	
Max Tool Diameter (With / Without Adjacent Tools)	mm (inch)	Ø75 / Ø170 (Ø2.95 / Ø6.69)	
Max Tool Length	mm (inch)	430 (16.93)	
Max Tool Weight	kg, (lb _t)	8 (26.5)	
Method of Tool Selection	-	Memory Random	
Method of Operation	-	Swing Arm Type	
Power Source			
Electric Power Supply	kVA	80	
Compressed Air Supply (Pressure x Consumption)	MPa	0.5 ~ 0.7 MPa x 690 Nℓ/min	
Tank Capacity			
Spindle Cooling / Grease Cartridge	ℓ (gal)	20 (5.3)	
Coolant	ℓ (gal)	960 (253.61)	
Machine Size			
Height	mm (inch)	2,674 (105.24)	
Floor Space (Length x Width)	mm (inch)	4,288 X 2,600 (168.83 X 102.36)	
Weight	kg, (lb _t)	9,280 (20,459)	
NC Controller		Fanuc 0i-MF Plus	

NC Specifications [Fanuc 0i-MF Plus]

※ S : Standard O : Option

ITEM	SPECIFICATION	
Controlled Axis		
Controlled Axis	4-axes	S
	5-axes (Max.)	O
Simultaneously Controlled Axes	3-axes	S
	4-axes (Max.)	O
Least Input Increment	0.001 mm, 0.001 deg, 0.000 1inch	S
Least Input Increment 1/10	0.0001 mm, 0.0001 deg, 0.0000 1inch	O
inch / metric Conversion	G20, G21	S
Stored Stroke Check 1		S
Stored Stroke Check 2		S
Mirror Image		S
Stored Pitch Error Compensation		S
Backlash Compensation		S
Operation		
Automatic & MDI Operation		S
DNC Operation by Memory Card	PCMCIA Card is Required	S
Program Number Search		S
Sequence Number Search		S
Dry Run, Single Block		S
Manual Handle Feed	1Unit	S
Manual Handle Feed Rate	x1, x10, x100	S
Handle Interruption		S
Interpolation Function		
Positioning	G00	S
Linear Interpolation	G01	S
Circular Interpolation	G02, G03	S
Dwell (Per Seconds)	G04	S
Cylindrical Interpolation	4-axis Interface Option is Required	S
Helical Interpolation	Circular interpolation plus max 2 axes linear interpolation	S
Reference Position Return Check	G27	S
Reference Position Return	G28,G29	S
2nd Reference Position Return	G30	S
Skip Function	G31	S
Feed Function		
Rapid Traverse Override	F0, F25, F50, F100	S
Feed Rate (mm/min)		S
Feed Rate Override	0 - 200 %	S
Jog Feed Override	0 - 6,000 mm/min	S
Override Cancel	M48, M49	S
Program Input		
Tape Code	EIA / ISO	S
Optional Block Skip	9ea	S
Program Number	O4 Digits (1 - 9999)	S
Sequence Number	N8 Digits	S
Decimal Point Programming		S
CCoordinate System Setting	G92	S
Workpiece Coordinate System	G54 - G59	S
Workpiece Coordinate System Preset		S
Additional Workpiece Coordinate Pairs	48ea	S
	300ea	O
Extend Program Edit Function	Copy / Move / Etc.	S
Manual Absolute ON and OFF		S
Chamfering / Corner R		S
Programmable Data Input	G10	S
Sub Program Call	10 Folds Nested	S
Custom Macro B		S
Addition of Custom Macro Common Variables	#100 - #199, #500 - #999	S
Canned Cycles for Drilling		S

ITEM	SPECIFICATION	
Program Input		
Automatic Corner Override		S
Feed Rate Clamp Based on Arc Radius		S
Scaling		S
Coordinate System Rotation		S
Polar Coordinate System		S
Programmable Mirror Image		S
Tape Format for Fanuc Series 10/11		S
Manual Guide i		S
Spindle Speed Function		
Spindle Serial Output		S
Spindle Override	50 - 150%	S
Spindle Orientation		S
Rigid Tapping		S
Tool Function / Compensation		
Tool Function	T4 Digits	S
Tool Offset Pairs	400ea	S
Tool Offset Memory C		S
Tool Length Compensation		S
Cutter Compensation C		S
Tool Life Management		O
Tool Length Measurement		S
Editing Operation		
Part Program Storage Length	5,120m (2MB)	S
Number of Register Able Programs	Max. 1,000ea	S
Background Editing		S
Extended Part Program Editing		S
Play Back		S
Setting and Display		
Clock Function		S
Self-Diagnosis Function		S
Alarm History Display		S
Help Function		S
Run Hour and Parts Count Display		S
Graphic Function		S
Multi-language Display	Chinese, English, French, German, Hungarian, Italian, Korean, Polish, Portuguese, Spanish, Swedish, Russian	S
Data Input / Output		
Data Server	256MB, 1GB, 2GB, 4GB, 16GB, 32GB	O
Data Server Interface		O
Ethernet Interface		S
Memory Card Interface		S
USB Card Interface		S
Others		
Display Unit	15" Non-Touch Display	S
Fanuc i-HMI	15" Touch Display	O
HWACHEON Software		
High Speed HRV3 [®] Function		S
Hwacheon Artificial Intelligence Control System (HAI): 200 Block		S
Hwacheon Artificial Intelligence Control System (HAI): 400 Block		O
Hwacheon Efficient Contour Control System (HECC)		S
Hwacheon Real-time Geometric Compensation System (HRGC)		S
Hwacheon Tool Load Detect System (HTLD)		S
Cutting Feed Optimization System (OPTIMA)		S
Hwacheon Thermal Displacement Control System (HTDC)		S
M-VISION Plus (Monitoring of Real-time Operational Status)		O
M-VISION Pro (Operation Managing and Monitoring of Real-time Operational Status)		O

Hwacheon Global Network

 Hwacheon Headquarters  Hwacheon Europe  Hwacheon Asia  Hwacheon America



Please contact us for product inquiries.

www.hwacheon.com

The product design and specifications may change without prior notice.
Read the operation manual carefully and thoroughly before operating the product,
and always follow the safety instructions and warnings labels attached on the surfaces of the machines.

HEAD OFFICE

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