High-Reliability and High-Performance
Compact Machining Center

FANUC

ROBODRILL α-D*i*B5ADV series

Advanced version

High-Reliability and High-Performance
Compact Machining Center

FANUC ROBODRILL α-DiB5ADV series

High Performance of Machining

- High speed, High precision, High power
- Stable machining
- Wide range of application

Applying the latest FANUC CNC & Servo technology

Good combination with FANUC Robot

*1

Minimizing Down Time

- High reliability
- Preventive maintenance function
- High maintainability

Ease of Use

- Excellent user-Interface
- High expandability
- Simple integration with FANUC Robot

High Performance of Machining

Achieving high productivity by high speed, high precision and high power

Achieving high yield of workpiece by stable machining

Utilization in various areas by wide range of application

Minimizing Down Time

Achieving long operation life by high reliability

Prevention of trouble by preventive maintenance function

Minimizing down time by high maintainability

Ease of Use

Easy utilization of high function by excellent user-Interface

Easy operation of peripheral equipment by high expandability

Realizing simple integration with FANUC Robot by automation support function

＊1

α-D21S*i*B5ADV
α-D14S*i*B5ADV

＊1

α-D21M*i*B5ADV
α-D14M*i*B5ADV

＊1
＊2

α-D21L*i*B5ADV
α-D14L*i*B5ADV

＊1 Photo when **DDR***i*B mounted
＊2 Photo when 2 front doors option mounted

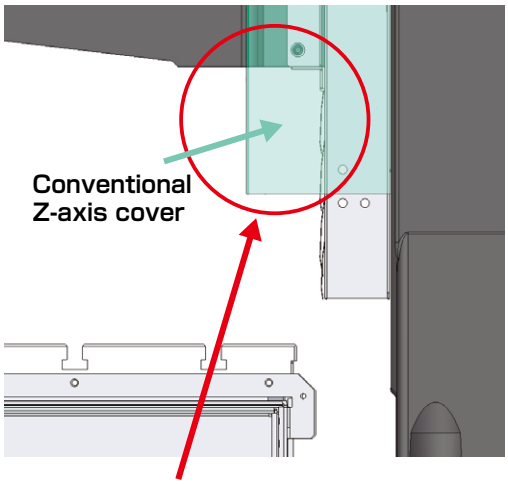
Features of Advanced version

Expanding application range

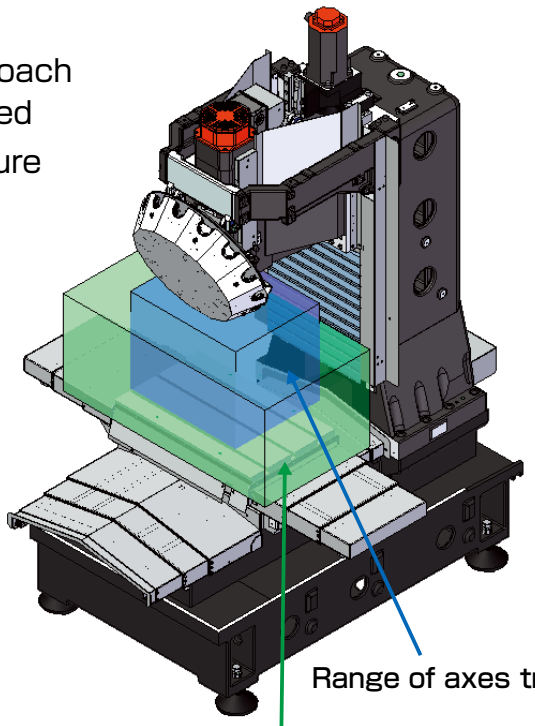
● Expanding machining area

・Z-axis stroke expansion to 400mm improves approach to the machining point when indexing fixture is used

・Less interference of Z-axis cover for the large fixture



Reduction of interference between table area and column



Item	α-D14S*i*B5ADV α-D21S*i*B5ADV	α-D14M*i*B5ADV α-D21M*i*B5ADV	α-D14L*i*B5ADV α-D21L*i*B5ADV
X-axis travel	300 mm	500 mm	700 mm
Y-axis travel	300 mm + 100 mm	400 mm	400 mm
Z-axis travel	400 mm		
Max. fixture size(X)*	640 mm	1050 mm	1400 mm
Max. fixture size(Y)*	520 mm	620 mm	620 mm

* Maximum size without interference in full stroke of the axis. Piping and cables of the fixture are included.
When the fixture is equipped on the table, following points must be kept.
・The fixture load must be put uniformly on the entire table surface
・Heavy unit must be kept inside of table area

● Table load capacity 400kg *

・Max. table load capacity is enhanced

・Applicable to large fixture and workpiece with the expansion of machining area

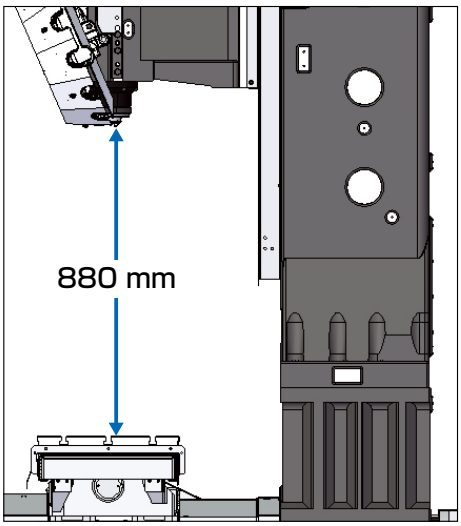
* Max 200kg for α-D14S*i*B5ADV/D21S*i*B5ADV

● High column (option) *

・Column raising depends on fixture is applicable

・Available up to 400mm for wide range of application

* Max 200mm for α-D14S*i*B5ADV/D21S*i*B5ADV



High column 400mm spec.

Excellent chip countermeasure

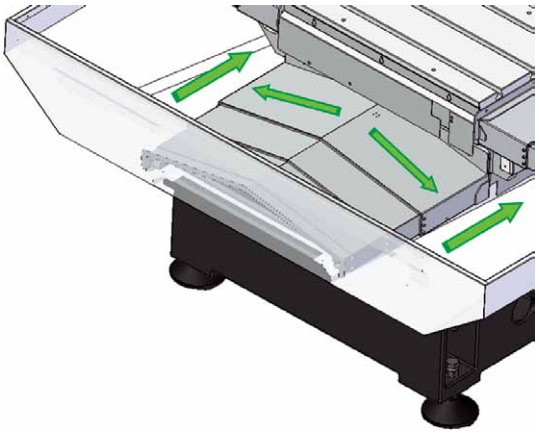
● Y-axis front mountain-shaped telescopic cover *
- Smooth coolant flow improves chip evacuation
- Enhanced covering against chips and coolant

* Except for α-D14S*i*B5$_{ADV}$/D21S*i*B5$_{ADV}$

● X-axis telescopic cover with 3 pieces *
- 3 pieces cover is applied as standard
- Reduction of the impact by 3 pieces structure enhances durability of cover and cushion rubber

* Except for α-D14S*i*B5$_{ADV}$/D21S*i*B5$_{ADV}$

● Z-axis metal cover
- High durability metal cover is applied as standard
- Exclusive design for advanced version achieved less interference

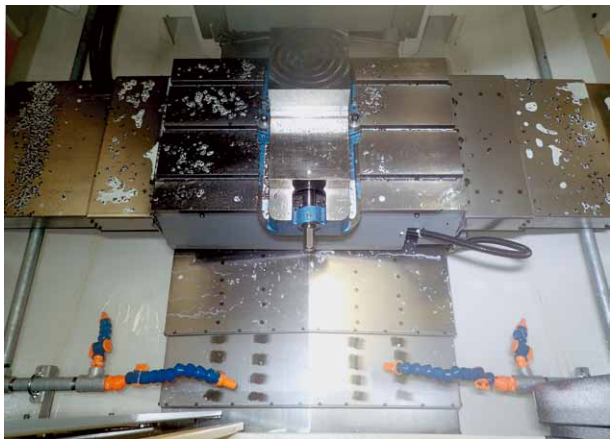


Y-axis front mountain-shaped telescopic cover

Chip evacuation comparison (700cc block machining) *1

Block material	Amount of remaining chips	
	Standard version *2 (α-D21M*i*B5)	Advanced version *3 (α-D21M*i*B5$_{ADV}$)
Aluminum	140 g	10 g (−93%)
Steel	1240 g	1 g (−99.9%)

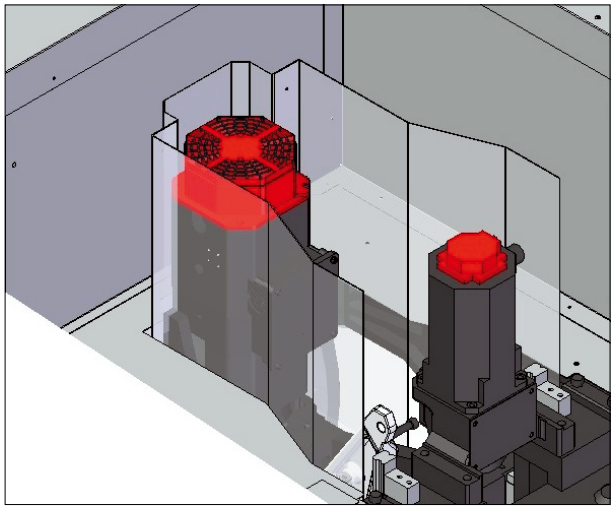
*1 Test result under FANUC's test condition
*2 with normal flood coolant (option)
*3 with high power flood coolant with wall flush (option)



Remaining chips after machining test (Steel)

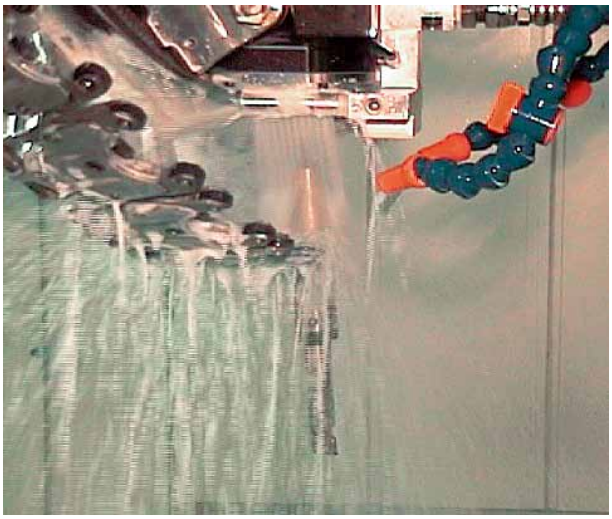
● Enhanced cover around spindle motor (option)*
- Certain separation of spindle mechanism from machining area protects intrusion of chips and coolant and achieves high sustainability

＊Basic top cover (option) is necessary



Enhanced cover around spindle motor

● Cleaning unit for tool taper shank (option)
- Flushing the tool taper shank by coolant during tool change to prevent catching chips on the spindle taper
- Stable machining accuracy can be maintained



Cleaning tool taper shank

Features of Advanced version

Cycle time reduction

● Servo turret

・Tool change time reduction and reliability enhancement by applying new indexing unit driven by servo motor

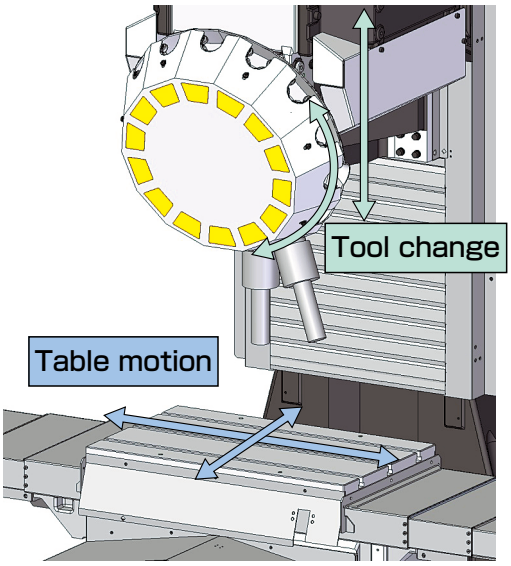
・Fastest tool change time 0.7s (Tool to Tool) Shorter than ROBODRILL D*i*A series by 0.2s

・Max. tool weight 4kg setting enables larger cutting tool application

Tool change time (Tool to Tool / Cut to Cut)		
2 kg setting	3 kg setting	4 kg setting
0.7s / 1.3s	0.9s / 1.5s	1.1s / 1.7s

● Overlap of the ATC and table motion

・Achieving cycle time reduction by overlapping tool change motion and table positioning



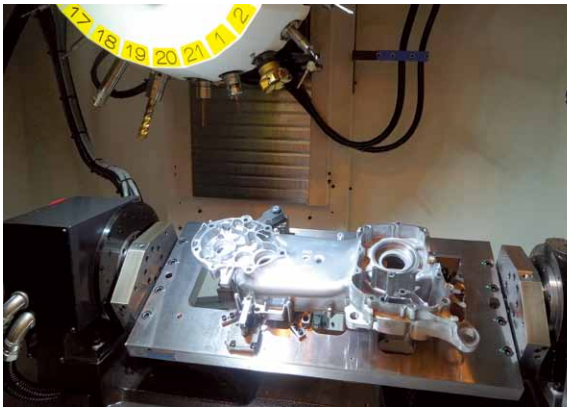
Tool change time comparison (Tool change + Table positioning) *

	2 kg setting	3 kg setting	4 kg setting
without overlap	1.3s	1.5s	1.8s
with overlap	0.7s	0.9s	1.1s

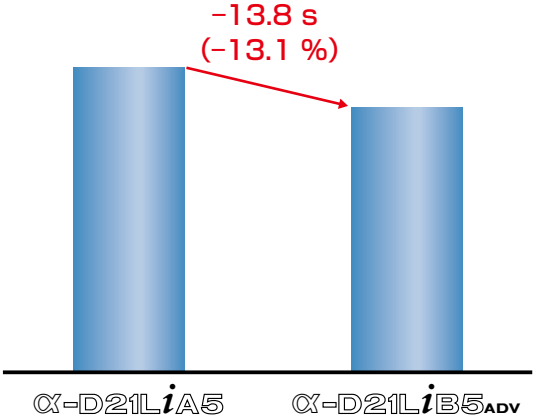
* Test result with table motion 500mm
Tool change time is tool to tool

● Application example of cycle time reduction

・Enhancing the speed performance of ROBODRILL by the combination of servo turret, overlapping functions and **DDR*i*B**



Example of indexing application by **DDR-T*i*B**



FANUC ROBODRILL DDR*i*B

● High-speed and high-precision additional 1-axis rotary table **DDR*i*B** (option)

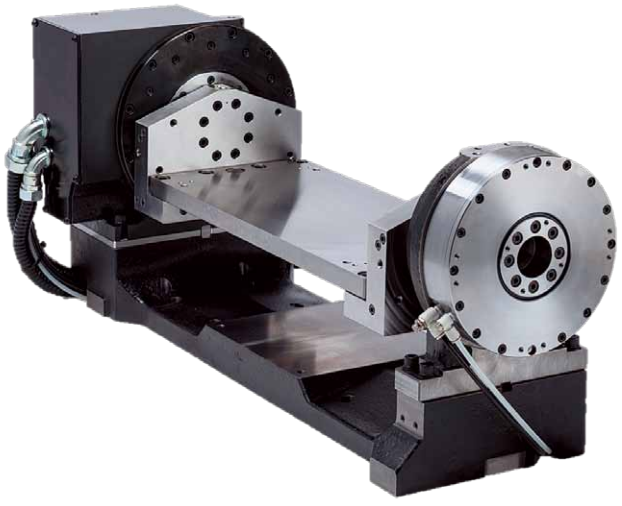
- Synchronous built-in servo motor and αiCZ sensor provide non-backlash, high-speed and high-precision machining
- Rigidity enhancement by optimizing the shape of casting body
- Achieving quicker action and higher clamp torque by new clamp mechanism

Items	Specifications
Drive system	Direct drive
Maximum torque	275 N・m
Maximum speed	200 min^{-1} (300 min^{-1} *)
Feedrate	1°/min to 30000°/min
Least input increment	0.001° (IS-C : 0.0001°)
Index accuracy	±0.0028° (±10″)
Clamp system	Pneumatic cylinder and spring
Clamp torque	700 N・m (at 0.5 MPa)
Max. loading capacity	100 kg
Allowable moment load	Projecting distance x Load = 600 N・m
Center height	150 mm
Mass of unit	80 kg

* When loading capacity less than 25kg and loading inertia less than 0.25 kg・m^2

● Trunnion unit with **DDR*i*B** and support spindle for quick setup of indexing fixture **DDR-T*i*B** (option)

- Making the best use of ROBODRILL's working space
- Enhancing rigidity and loading capacity by optimizing the shape of casting body
- Achieving higher clamp torque by new clamp mechanism of support spindle



Items	Specifications		
	DDR-TS*i*B	**DDR-TM*i*B**	**DDR-TL*i*B**
Max. loading capacity	45 kg	200 kg	
Center height	200 mm	260 mm	
Max. turning diameter	Ø310 mm	Ø410 mm	
Clamp torque	1100 N・m (at 0.5 MPa)		

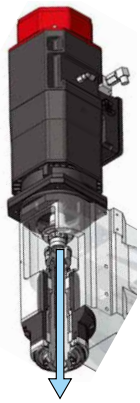
High Performance of Machining

Wide variety of high speed and high power spindle

● High speed and high power spindle
- High rigidity mechanism and outstanding rigidity of main spindle enabling excellent ability in milling in addition to drilling and tapping

● Optimum spindle selectable according to application
- Standard spindle : Applicable to wide range machining use
- High torque spindle : Applicable to heavy machining of steel parts
- High acceleration spindle: Applicable to high speed and high efficiency machining of aluminum parts
- High speed spindle : Applicable to smooth surface machining

High power spindle motor

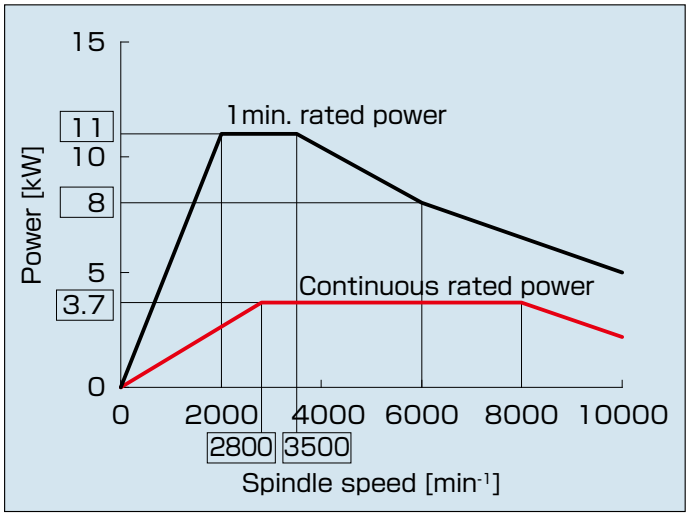


Center through spindle

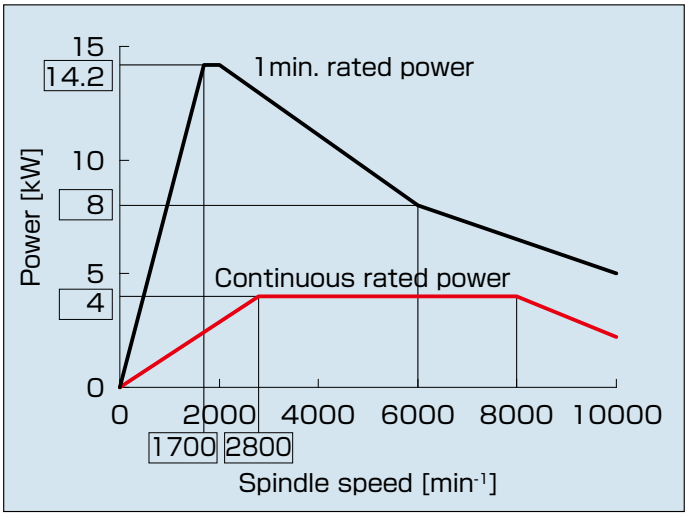
Spindle spec.	Max. speed	Tool taper spec.			
		BT (BT30)	BIG-PLUS (BBT30)	DIN (DIN69871-A30)	NC5 (NC5-46)
Standard	10000 min^{-1}	✓	✓	✓	✓
High torque					
High acceleration					
High speed	24000 min^{-1}	✓	✓	✓	

*Center through coolant option is available for all spindle spec.
Withstand pressure: 7MPa (NC5: 5MPa)

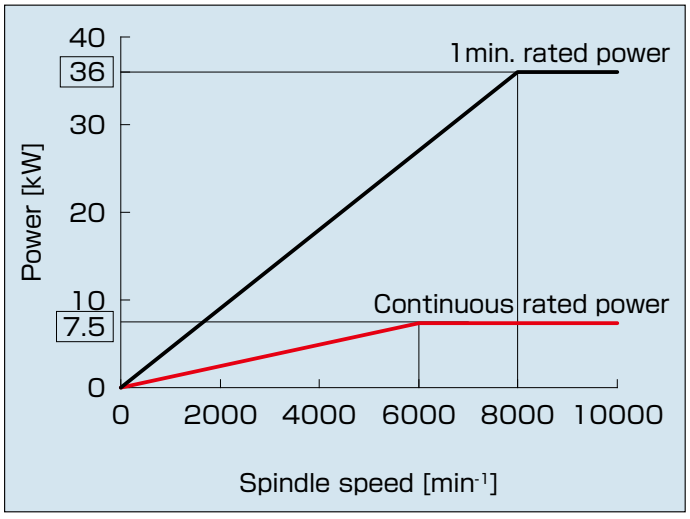
Standard spindle



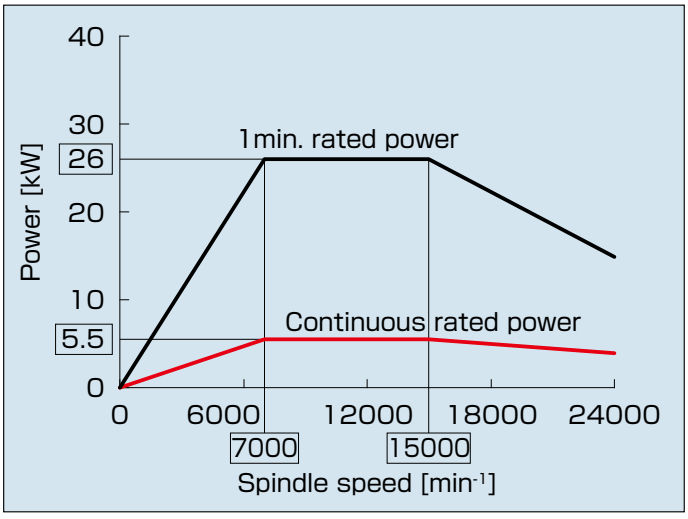
High torque spindle



High acceleration spindle



High speed spindle

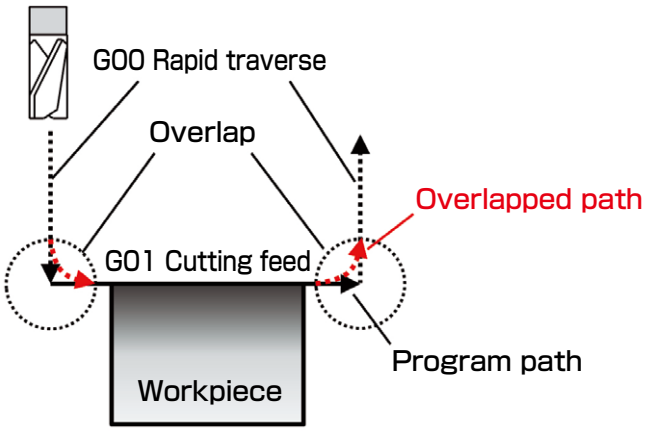


High speed machining

● Smart overlap function

・Achieving cycle time reduction by overlapping on the transition between rapid traverse and cutting feed

・Easy setting by selecting ON/OFF on the screen



High precision and fine surface machining

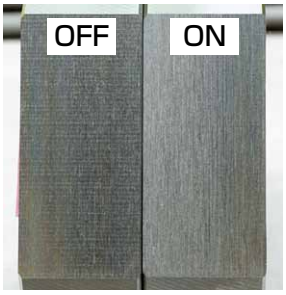
● Latest CNC and Servo functions

・SERVO HRV+ control
Achieving high responsiveness by optimized electrical control

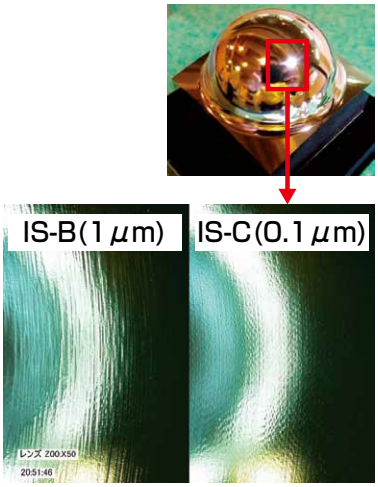
・Latest AC Servo Motor
Applying the latest AC Servo Motor which provides more smoother feed

・Least input increment 0.1 μm (IS-C)
Addition of setting for least unit 0.1 μm for program command

Achieving higher surface quality and improvement of circularity and so on, by applying each function



SERVO HRV+ control



Least input increment
(Machining example by program command 0.1 μm)

Stable machining

● AI thermal displacement compensation function

・Real time compensation by estimating the thermal displacement along each axis based on the operation status of the spindle and feed axes

・By using touch probe (option), compensation effect adjustment can be performed automatically from the measurement result

・By using temperature sensors (option), more accurate compensation can be achieved.

・Even if some of sensors got trouble, sensor check function will keep proper compensation.

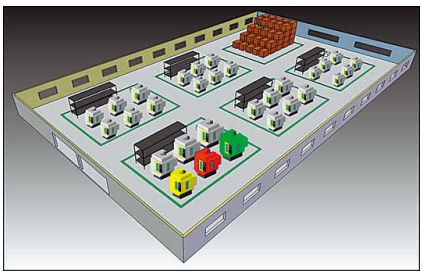
AI thermal displacement compensation

Minimizing Down Time

Complete operation management

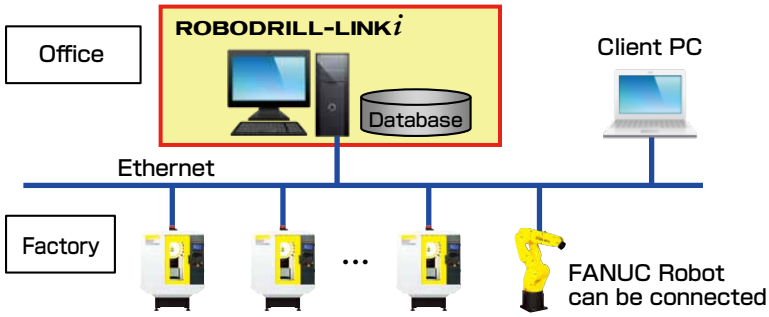
ROBODRILL-LINK*i* (PC software)

- Operation condition monitoring system
  - Real time display of the entire production area helps to understand the condition of each machine at once
  - Supporting improvement of machine utilization by collecting and visualizing each machine's information
- Automatic collection of achievement and history
  - Operation achievement data for each machine are collected and displayed in the graph
- Easy introduction
  - The system can be built with general PC and no server PC is required
- Useful tools for management of ROBODRILLs
  - Collecting ROBODRILL's additional information such as periodical maintenance data, tool life, etc.
  - NC program can be transferred to multiple ROBODRILLs simultaneously

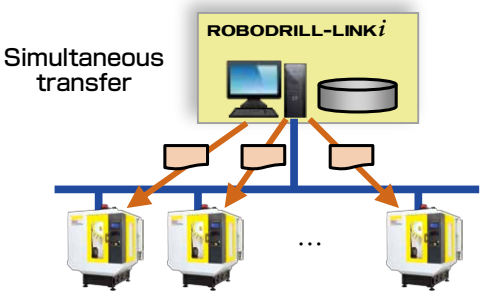


Condition overlook screen

Individual machine operation achievement



Connection example



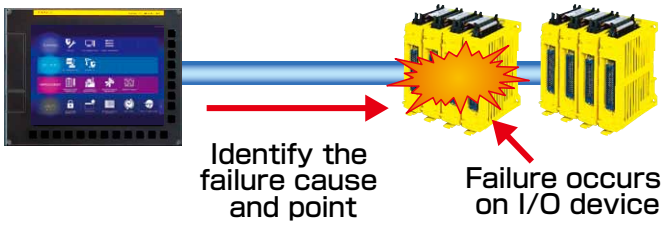
Simultaneous file transfer function

High maintainability

- Information center
  - Alarm messages and their detailed information are displayed
  - Cause of alarm can be identified from the detailed information

Information center

- Improvement of maintainability for I/O device
  - Cause and point of the failure of I/O devices (disconnection, earth fault etc.) are identified
  - The facility availability ratio is improved due to the reduction of down time



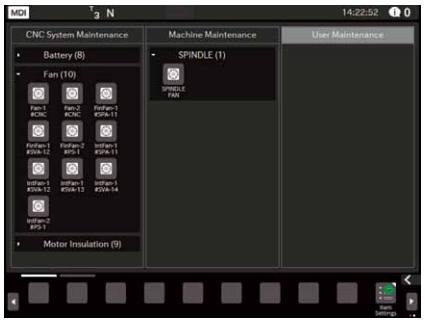
High reliability

- Abundant track records at FANUC in-house factory
  - Using ROBODRILLs for both steel and aluminum parts machining at FANUC in-house factory
- Applying maintenance data of FANUC in-house factory
  - Accumulating maintenance data of ROBODRILL obtained at FANUC in-house factory
  - Achieving high reliability by returning the maintenance data to ROBODRILL design

FANUC in-house factory

Complete preventive maintenance

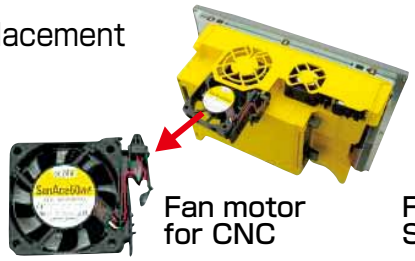
- Maintenance information management
  - Monitoring the condition of maintenance items and announcing the abnormality or maintenance timing to support effective periodical maintenance
  - Possible to set customized maintenance items (Max. to 10)
- Leakage Detection Function
  - Early detection of insulation resistance drop of each motor and motor power cable
  - Enable preventive maintenance before breakdown
- Fan Monitor Function
  - Monitoring cooling fans of CNC, Servo Amplifiers, Spindle Amplifier and Power Supply
  - Announcing before failure when the rotation speed of the cooling fans is dropping
  - Easy to detect the abnormal fan



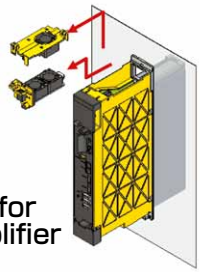
Maintenance Information Management

Leakage Detection Function

- Machine configuration to improve parts replacement
  - New fan motor units are applied for easy parts replacement
  - The facility availability ratio is improved due to the reduction of maintenance time



Fan motor for CNC



Fan motor for Servo Amplifier

- RECHARGEABLE BATTERY UNIT (option)
  - Supplying backup power both CNC and PULSECODER instead of disposable battery
  - Automatically recharged while ROBODRILL power ON
  - Battery maintenance free

RECHARGEABLE BATTERY UNIT

Ease of Use

The latest CNC of FANUC

● 10.4” Color LCD with **iHMI**

- Intuitive and operable interface by **iHMI**
- Easy operation on programming, setup and machining
- Seamless flat display unit achieves tolerance to coolant oil resistant and designability

● Operator’s panel

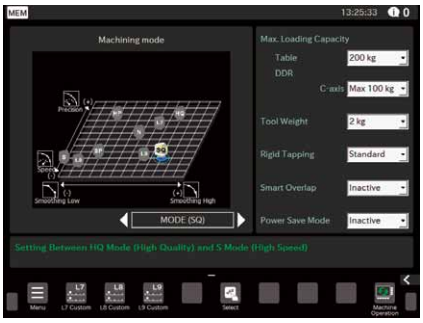
- Improving operability and visibility by renewing key layout and indicators
- Unity design with CNC display unit

High usability

● Easy to use screens from programming to maintenance

- CNC operation screen
  Operable screen structure arranged by operation steps of “programming”, “setup” and “machining”
  Graphical display enhances visibility
- Machine operation setting screen
  Parameters related with work load, machining mode and energy saving can be switched easily according to applications
- Restoration screen
  Particular maintenance of ROBODRILL such as turret restoration or motor reference position recovery can be performed easily

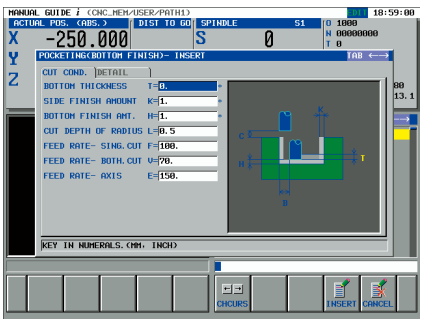
CNC operation



Machine operation setting

● Integrated operation, programming guidance (**MANUAL GUIDE i**)

- Easy to program and operate machining on one screen
- Easy to program with G code through graphic guide
- Simple machining simulation of solid model

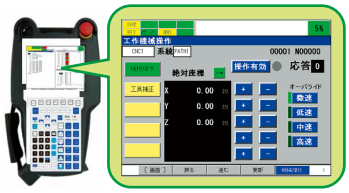


Machining cycle input

Automation application

- Quick and Simple Startup of Robotization (QSSR) (option)
  - Useful package of robot, robot base, auto side door, connecting cables, sample programs, easy setting function etc.
  - Easy to introduce robot system
- Robot interface 2 (option)
  - Reducing cables and keeping safety by FL-net function
  - Robot manual operation is available on the ROBODRILL screen
  - ROBODRILL manual operation is available on the Robot teach pendant

Robot manual operation screen

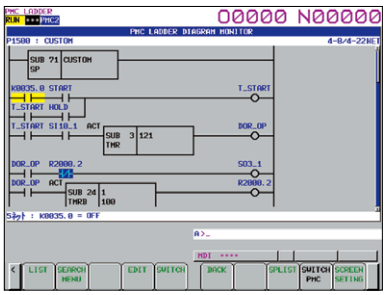


Machine operation screen

High expandability

- External interface function
  - General I/O signals such as external start are ready to use only by selecting settings
  - Lighting conditions of signal lamps can be set on the screen
- Custom control panel
  - On screen switches (ON/OFF or pulse) and indication lamps can be created
  - Peripheral devices are operated without integrating control panel hardware
  - Flexible and cost saving solution for simple system integration
- Custom PMC function
  - LADDER program to control peripheral devices can be created and monitored on screen
  - Number of I/O signals can be expanded
    Standard: Input 16 / Output 16
    Max: Input 1024 / Output 1024 (option)

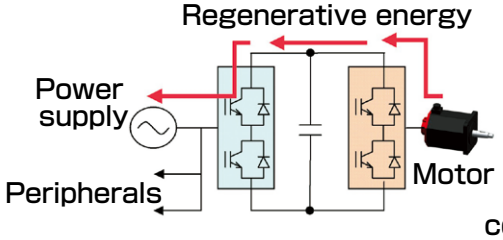
External interface function



PMC ladder screen

Technology for power saving

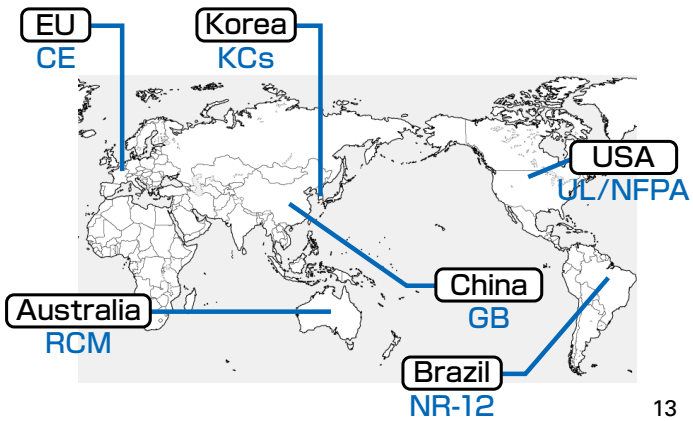
- Proven power regeneration function
  - The power regeneration function that use regenerating energy occurred on deceleration of motors has been adopted since 1994.



Electric power consumption monitor

Conformity of safety standards

- Conformity of each country's safety standard (option)



Machining Capability

Machining sample (These data may change by machining conditions)

Spindle spec.	Standard spindle		High torque spindle		High acceleration spindle High speed spindle	
Machining / Material	Drilling Tool dia.(mm) x Feed(mm/rev)	Tapping Tap size x Tap pitch(mm)	Drilling Tool dia.(mm) x Feed(mm/rev)	Tapping Tap size x Tap pitch(mm)	Drilling Tool dia.(mm) x Feed(mm/rev)	Tapping Tap size x Tap pitch(mm)
Carbon Steel C45	ϕ30 x 0.10	M20 x 2.5	ϕ30 x 0.15	M20 x 2.5	ϕ20 x 0.10	M16 x 2.0
Grey Cast Iron	ϕ30 x 0.25	M27 x 3.0	ϕ30 x 0.30	M27 x 3.0		
Aluminum Alloy Die Casting	ϕ32 x 0.35	M30 x 3.5	ϕ32 x 0.40	M30 x 3.5	ϕ22 x 0.25	M24 x 3.0

Available Options

Top cover

Coolant unit (tank)

LED Illumination

Tool length switch for automatic measurement

Coolant unit with chip flush (spot gun provided)

Automatic Grease Lubricating System (LHL Liquid Grease)

Automatic Oil Lubricating System

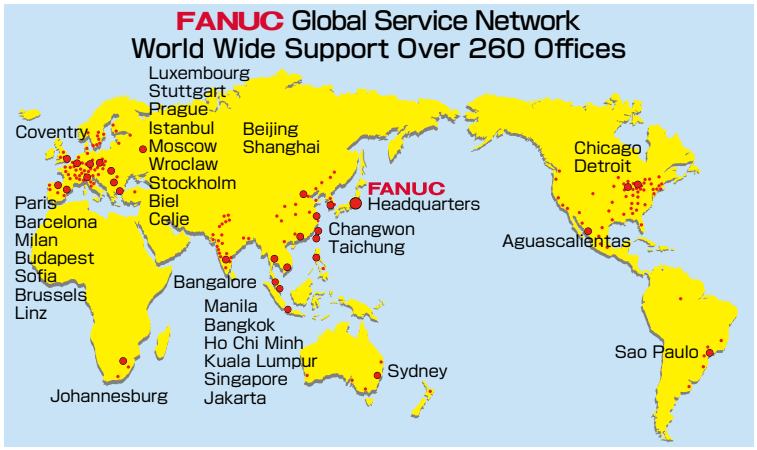
Touch probe

(Note)
・The machine life may be shortened depending on the workpiece, tool, coolant, or lubricant to be used.

Maintenance and Customer Support

Worldwide Customer Support and Service

FANUC operates customer service and support system anywhere in the world through subsidiaries, affiliates and distributor partners. FANUC provides the highest quality service with the quickest response at the location nearest you.



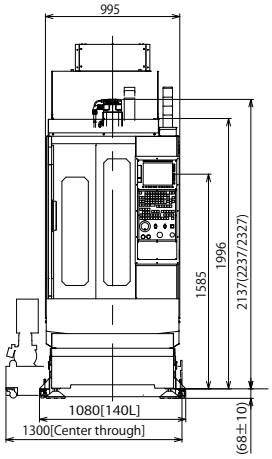
FANUC ACADEMY

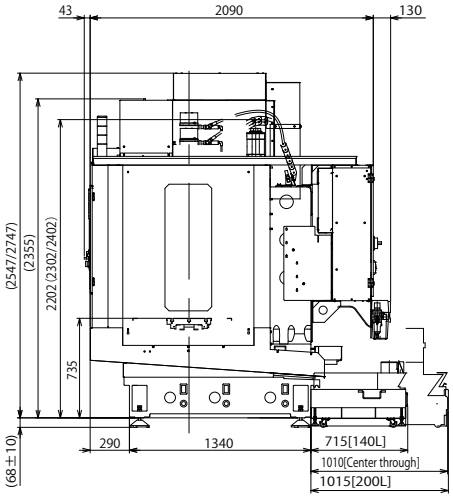
FANUC ACADEMY operates training programs on FANUC ROBODRILL which focus on practical operations and programming with machining know how and maintenance.

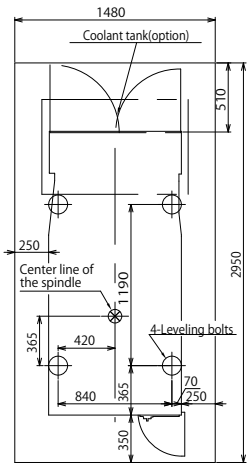
Inquiries : Oshino-mura,
Yamanashi, Japan 401-0597
Phone : 81-555-84-6030 Fax : 81-555-84-5540

Outer Dimensions and Floor Plan

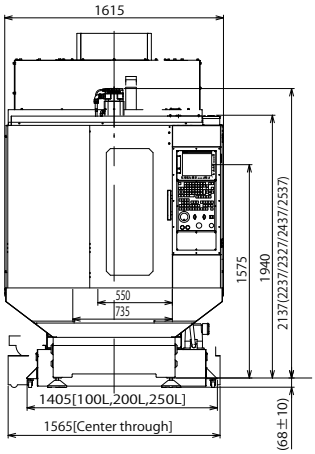
α-D21SiB5ADV/D14SiB5ADV *1

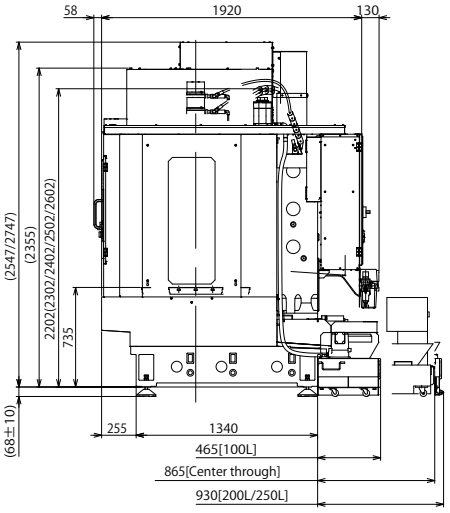


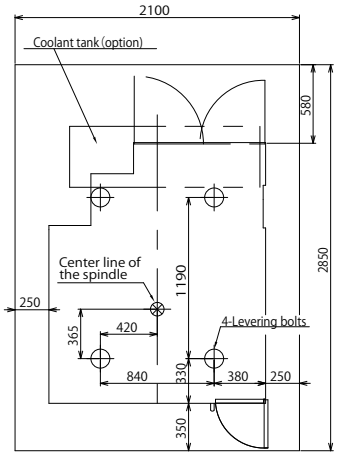




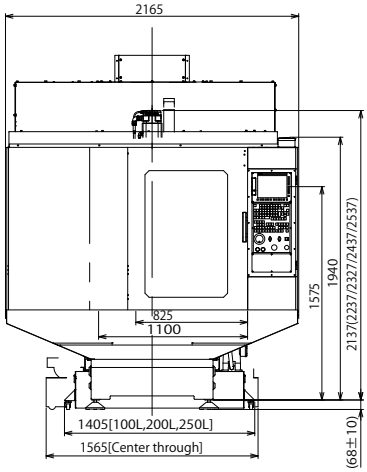
α-D21MiB5ADV/D14MiB5ADV *1

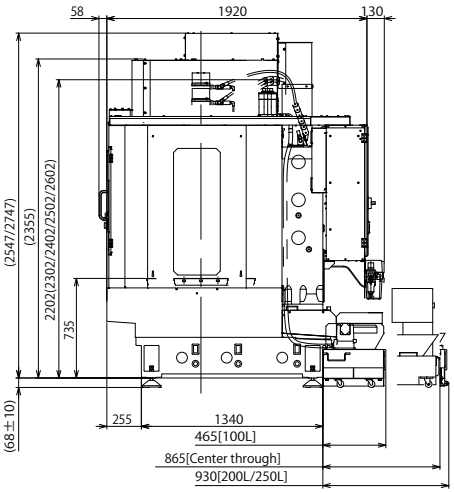


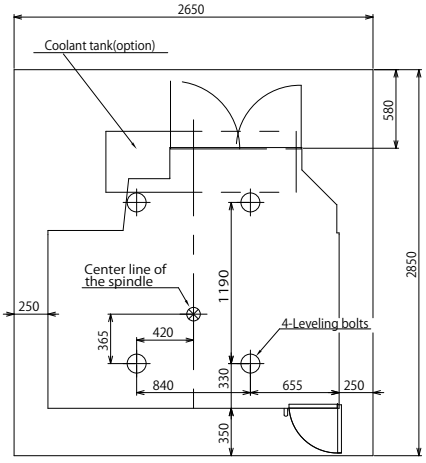




α-D21LiB5ADV/D14LiB5ADV *1







*1 These dimensions may vary on some options. (For further details, please contact FANUC.)

Specification

Item		α-D21S*i*B5ADV α-D14S*i*B5ADV	α-D21M*i*B5ADV α-D14M*i*B5ADV	α-D21L*i*B5ADV α-D14L*i*B5ADV
Machine (Standard)				
Capacity	X-axis-travel (longitudinal movement of table)	300 mm	500 mm	700 mm
	Y-axis travel (cross movement of saddle)	300 mm + 100 mm	400 mm	
	Z-axis travel (vertical movement of spindle head)	400 mm		
	Distance from table surface to spindle gage plane	80 mm to 480 mm (when no high column is specified)		
Table	Working space (X-axis×Y-axis)	630 mm×330 mm	650 mm×400 mm	850 mm×410 mm
	Capacity of workpiece mass	200 kg (uniform load)	400 kg (uniform load)	
	Working surface configuration	3×T-slots size 14 mm pitch 125 mm		
Spindle	Speed range	100 min^{-1} to 10000 min^{-1}/ 240 min^{-1} to 24000 min^{-1} (option)		
	Spindle gage (call number)	7/24 taper No.30 (with air blow)		
Feedrate	Rapid traverse rate	54 m/min (X,Y,Z)		
	Feedrate	1 mm/min to 30000 mm/min		
Turret	Tool change system	Turret type		
	Type of tooling	JIS B 6339-2011 BT30, MAS 403-1982 P30T-1 (45°)		
	Tool storage capacity	21 tools : α-D21S*i*B5ADV/D21M*i*B5ADV/D21L*i*B5ADV 14 tools : α-D14S*i*B5ADV/D14M*i*B5ADV/D14L*i*B5ADV		
	Maximum tool diameter	80 mm		
	Maximum tool length	200 mm : α-D14S*i*B5ADV 190 mm (changed by specifications) : α-D21S*i*B5ADV	250 mm	
	Method of tool selection	Random shortest path		
	Maximum tool mass	2 kg/tool (total mass 23 kg) / 3 kg/tool (total mass 33 kg) / 4 kg/tool (total mass 46 kg) : 21 tools 2 kg/tool (total mass 15 kg) / 3 kg/tool (total mass 22 kg) / 4 kg/tool (total mass 30 kg) : 14 tools		
	Tool changing time (Tool to Tool) (Cut to Cut)	0.7 s (2 kg/tool) / 0.9 s (3 kg/tool) / 1.1 s (4 kg/tool) 1.3 s (2 kg/tool) / 1.5 s (3 kg/tool) / 1.7 s (4 kg/tool)		
Motors	Spindle drive motor	11.0 kW (1minute rating)/3.7 kW(continuous rating)(changed by specifications)		
Accuracy *1	Bidirectional accuracy of positioning of an axis (ISO230-2:1988)	Less than 0.006 mm		
	Bidirectional repeatability of positioning of an axis (ISO230-2:1997, 2006)	Less than 0.004 mm		
Sound pressure level		Less than 70 dB *2		
Control unit	Model	**FANUC Series 31*i*-B5**		
	Simultaneously controlled axes	Max.5 axes		
Installations (note)Please make sure to comply with installation conditions specified by FANUC when installing ROBODRILL *3				
Power source	Power supply	200 Va.c. to 220 Va.c., -15 % to +10 %, 3-phase, 50 Hz±1 Hz or 60 Hz±1 Hz 10 kVA *4		
	Compressed air supply	0.35 MPa to 0.55 MPa (0.5 MPa is recommend) (gage pressure) , 0.15 m^3/min (at atmospheric pressure) *5		
Machine size	Machine height	2236 mm ±10 mm (when no high column is specified)		
	Floor space	995 mm×2220 mm	1615 mm×2050 mm	2165 mm×2050 mm
	Mass of machine	Approx. 2150 kg	Approx. 2200 kg	Approx. 2300 kg

*1 Positioning accuracy is the adjusted and measured value in compliance with applicable standard at FANUC's factory. Depending on an influence of JIG & workpiece mass on table, the use conditions and installation environment, there may be a case where the accuracy shown in this catalog can not be achieved.

*2 Sound pressure level is measured in compliance with FANUC's own regulation. Depending on the use conditions and installation environment, there may be a case where the sound pressure level shown in this catalog can not be achieved.

*3 Fastening the machine to the floor (mounting anchors) may be required depending on the use conditions and installation environment, or to prevent the machine from toppling over due to an earthquake.

*4 In case of center through coolant and cleaning unit for tool taper shank, additional + 1kVA is required respectively. In case of additional 1 axis, additional maximum + 1.5kVA is required. In case of additional 2 axes, additional maximum + 3kVA is required. A cable with 10mm^2 or more should be used at primary power connection.

*5 In case of center through coolant, additional + 0.05m^3/min is required. In case of air blow for chips, additional + 0.2m^3/min is required. In case of side automatic door, 0.4MPa compressed air supply or more is required.

FANUC CORPORATION

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