High-Reliability and High-Performance Compact Machining Center

# FANUC ROBODRILL &-DIB series



# High-Reliability and High-Performance Compact Machining Center FANUC ROBODRILL © DIB series



# **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 Photo when **DDR***i* mounted

3

# **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
  - : Applicable to smooth surface machining



High power spindle motor

Continuous rated powe

6000

8000

10000

• High speed spindle

			Tool tap	er spec.	
Spindle spec.	Max. speed	<b>ВТ</b> (втзо)	BIG-PLUS (BBT30)	<b>DIN</b> (DIN69871-A30)	NC5 (NC5-46)
Standard					
High torque	10000 min <sup>-1</sup>	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$
High acceleration					
High speed	24000 min <sup>-1</sup>	$\checkmark$	$\checkmark$	$\checkmark$	

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

#### High torque spindle





### High speed spindle

2000

Standard spindle

1 min. rated powe

4000

Spindle speed [min-1]

15 11

10 [KW] 8 Power 5

> 3.7 0 Ο



### FANUC ROBODRILL DDRIB

- High-speed and high-precision additional 1-axis rotary table **DDR***i* **B** (option) •
- Synchronous built-in servo motor and  $\alpha i CZ$  sensor provide non-backlash. high-speed and high-precision machining
- High-rigidity trunnion unit with DDRi**DDR-T***i* **(option)**
- · Easy to develop indexing fixture making the best use of ROBODRILL's working space





DDR-T1B

DDRIB specifications	
Items	Specifications
Drive system	Direct drive
Maximum torque	275 N∙m
Maximum speed	200 min <sup>-1</sup> (300 min <sup>-1</sup> *)
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
Allowable moment 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<sup>2</sup>

#### 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

 Overlap of the ATC and table motion
 Achieving cycle time reduction by overlapping Z-axis ascent/descent and other axes motion during tool change



#### High precision and fine surface machining

- Latest CNC and Servo functions
- SERVO HRV<sup>+</sup> 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  $\mu$ m (IS-C) Addition of setting for least unit 0.1  $\mu$ m for program command

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



SERVO HRV<sup>+</sup> control





#### Stable machining

- Al 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.



Al thermal displacement compensation

# **Minimizing Down Time**

#### Excellent chip countermeasure

- X-axis telescopic cover with 3 pieces (option)
   Enhanced covering against chips and coolant by improved shape of telescopic cover
- Reduction of the impact against telescopic cover by 3 pieces structure enhances durability of cover and cushion rubber

• 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

#### Complete operation management

#### **) ROBODRILL-LINKi** (PC software)

- 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
- Operation achievement data for each machine are collected and displayed in the graph
- The system can be built with general PC and no server PC is required
- Collecting ROBODRILL's additional information such as periodical maintenance data, tool life, etc.
- NC program can be transferred to multiple ROBODRILLs simultaneously

#### High maintainability

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



Condition overlook screen



Simultaneous file transfer function



Information center



Identify the failure cause and point

Failure occurs on I/O device

#### 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

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



### Ease of Use

#### The latest CNC of FANUC

- 10.4" Color LCD with iHMI
- $\cdot$  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
- $\cdot$  Unity design with CNC display unit



- 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

#### $\cdot$ Restoration screen

Particular maintenance of ROBODRILL such as turret restoration or motor reference position recovery can be performed easily

- 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





**CNC** operation



Machine operation setting



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

#### 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)

#### 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









Robot manual

Machine operation screen



External interface function



PMC ladder screen

#### Conformity of safety standards

Conformity of each country's safety standard (option)



operation screen



# Machining Capability

			<b>U</b> · · · · · · · · · · · · · · · · · · ·			
Spindle spec.	Standard	d spindle	High torq	ue spindle	High acceler High spea	ation spindle ed spindle
Machining	Drilling	Tapping	Drilling	Tapping	Drilling	Tapping
	Tool dia.(mm) x	Tap size x	Tool dia.(mm) x	Tap size x	Tool dia.(mm) x	Tap size x
Material	Feed(mm/rev)	Tap pitch(mm)	Feed(mm/rev)	Tap pitch(mm)	Feed(mm/rev)	Tap pitch(mm)
Carbon Steel C45	ф30 x 0.10	M20 x 2.5	ф30 x 0.15	M20 x 2.5	φ20 x 0.10	M16 x 2.0
Grey Cast Iron	ф30 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

#### Machining sample (These data may change by machining conditions)

## **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.



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### Outer Dimensions and Floor Plan

#### 







### Q-D21MiB/D14MiB \*1







### $\alpha$ -d21LiB/d14LiB \*1







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

### Specification

	Item	∝-D21S <b>1</b> B ∝-D14-S <b>1</b> B	01-021M1B 01-014M1B	∝-D21L <b>1</b> B ∝-D14L <b>1</b> B		
Machine (Star	ndard)		•			
	X-axis-travel (longitudinal movement of table)	300 mm	500 mm	700 mm		
Ossasitu	Y-axis travel (cross movement of saddle)	300 mm + 100 mm	400 mm			
Capacity	Z-axis travel (vertical movement of spindle head)	330 mm				
	Distance from table surface to spindle gage plane	150 mm to 480 mm (wh	nen no high column is spe	cified)		
	Working space (X-axis×Y-axis)	630 mm×330 mm	650 mm×400 mm	850 mm×410 mm		
Table	Capacity of workpiece mass	200 kg (uniform load)	300 kg (uniform load)			
	Working surface configuration	3×T-slots size 14 mm p	hitch 125 mm			
Chindle	Speed range	100 min <sup>-1</sup> to 10000 mir	n <sup>-1</sup> / 240 min <sup>-1</sup> to 24000 m	nin <sup>-1</sup> (option)		
Spinule	Spindle gage (call number)	7/24 taper No.30 (with	air blow)			
Foodrata	Rapid traverse rate	48 m/min (X,Y,Z)				
reeulate	Feedrate	1 mm/min to 30000 mr	n/min			
	Tool change system	Turret type				
	Type of tooling	JIS B 6339-2011 BT30	), MAS 403-1982 P30T-1	(45°)		
	Tool storage capacity	21 tools : $\alpha$ -D21S $i$ B/D2 14 tools : $\alpha$ -D14S $i$ B/D1	21M <i>i</i> B/D21L <i>i</i> B 4M <i>i</i> B/D14L <i>i</i> B			
	Maximum tool diameter	80 mm				
Turret	Maximum tool length	200 mm : $\alpha$ -D14S <i>i</i> B 190 mm (changed by specifications) : $\alpha$ -D21S <i>i</i> B	250 mm (changed by sp	pecifications)		
	Method of tool selection	Random shortest path	•			
	Maximum tool mass	2 kg/tool (total mass 23 kg), 2 kg/tool (total mass 15 kg),	/3 kg/tool (total mass 33 kg) : /3 kg/tool (total mass 22 kg) :	α-D21SiB/D21MiB/D21LiB α-D14SiB/D14MiB/D14LiB		
	Tool changing time (Cut to Cut)	1.4 s : α-D14S <b>i</b> B/D14M 1.6 s : α-D21S <b>i</b> B/D21M	1 <i>i</i> B/D14L <i>i</i> B (when 2 kg/t 1 <i>i</i> B/D21L <i>i</i> B (when 2 kg/t	ool is specified) ool is specified)		
Motors	Spindle drive motor	11.0 kW (1minute rating)/	(3.7 kW(continuous rating) (	changed by specifications)		
Acouroov *1	Bidirectional accuracy of positioning of an axis (ISO230-2:1988)	0.006 mm to 0.020 mm	1			
Accuracy	Bidirectional repeatability of positioning of an axis (ISO230-2:1997, 2006)	Less than 0.004 mm				
Sound pressu	re level	Less than 70 dB *2				
Control unit	Model	FANUC Series 31 <i>1</i> -B	}			
Control unit	Simultaneously controlled axes	Max.4 axes				
Installations	(note)Please make sure to comply with	installation conditions sp	ecified by FANUC when in	stalling ROBODRILL *3		
Power course	Power supply	200 Va.c. to 220 Va.c., -15 % to +10 %, 3-phase, 50 Hz $\pm 1$ Hz or 60 Hz $\pm 1$ Hz 10 kVA $^{*}4$				
	Compressed air supply	0.35 MPa to 0.55 MPa (0.5 MPa is	recommend) (gage pressure) , 0.15	m <sup>3</sup> /min (at atmospheric pressure) *5		
	Machine height	2236 mm ±10 mm (wh	en no high column is spec	ified)		
Machine size	Floor space	995 mm×2210 mm	1615 mm×2040 mm	2165 mm×2040 mm		
	Mass of machine	Approx. 1950 kg	Approx. 2000 kg	Approx. 2100 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. A cable with 10mm<sup>2</sup> or more should be used at primary power connection.

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

# FANUC CORPORATION

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