

High-speed, high-precision small machining center, installing FANUC standard CNC

# FANUC ROBODRILL

$\alpha$ -D21SiA5/D21MiA5/D21LiA5  
 $\alpha$ -D14SiA5/D14MiA5/D14LiA5



# High-speed, high-precision small machining center, **FANUC ROBODRILL $\alpha$ -DiA series**

## High-Speed and High-Efficiency

Standard CNC 31*i*-B5

Wide Variety of Spindle

**DDR/DDR-T**



※1

## High-Reliability

Smart Trouble Shooting Function

Leakage Detection Function

Conformity to Safety Standards

## High-Precision

AI Thermal Displacement Compensation

AI Contour Control

Machining Mode Setting

# installing FANUC standard CNC

## High-Speed and High-Efficiency

Standard CNC 31i-B5 providing shortening machining time  
Wide Variety of Spindle suitable for various machining  
DDR/DDR-T providing high speed indexing

## High-Precision

AI Thermal Displacement Compensation targeting high precision compensation  
AI Contour Control providing high precision machining  
Machining Mode Setting to select suitable control

## High-Reliability

Smart Trouble Shooting Function providing enhanced maintenance  
Leakage Detection Function providing preventive maintenance  
Conformity to Safety Standards for various regions



α-D21SiA5  
α-D14SiA5



α-D21MiA5  
α-D14MiA5



α-D21LiA5  
α-D14LiA5

※1 Photo when DDR mounted

# High-Speed and High-Efficiency

## Shortening cycle time with the latest standard CNC 31i-B5

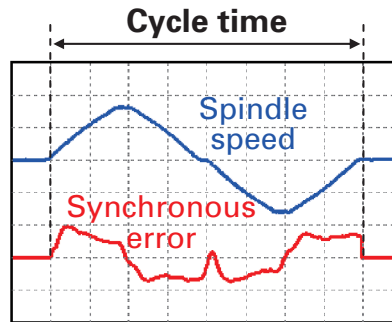
### FSSB high-speed rigid tapping

- Achieving high speed rigid tapping by FSSB communication between servo and spindle amplifiers



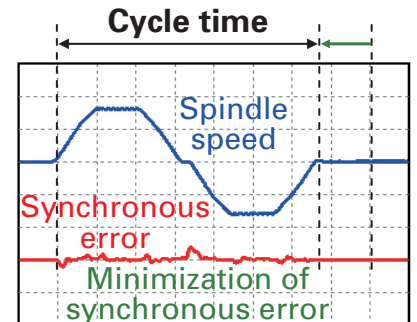
Sample

#### Previous rigid tapping



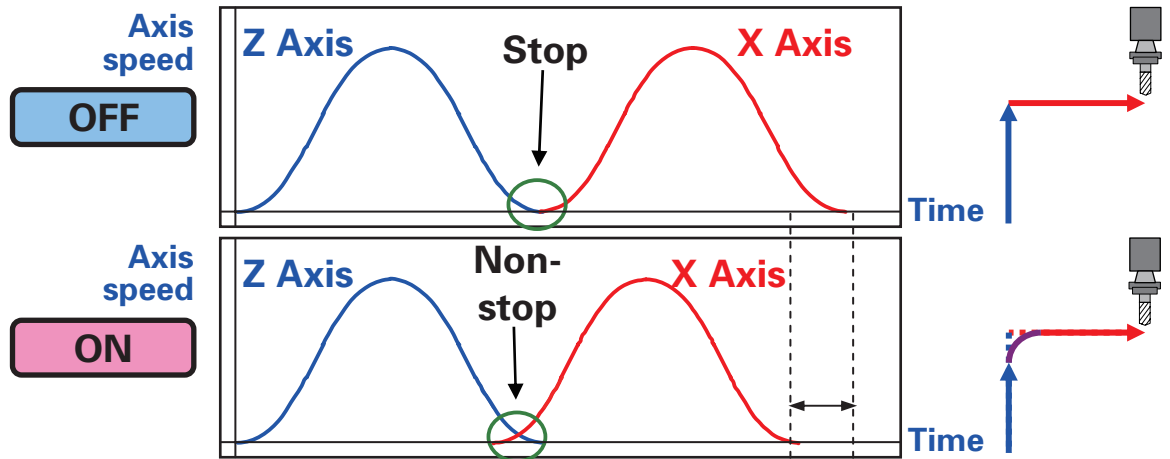
#### FSSB high-speed rigid tapping

##### Reducing cycle time



### Rapid traverse block overlap

- Shortening cycle time by continuing to operate without stopping motor, between rapid traverse blocks

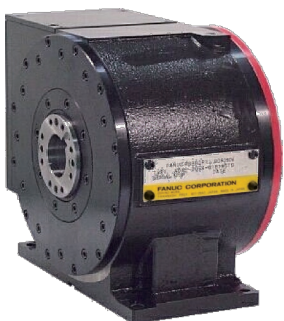


## DDR/DDR-T providing high-speed indexing

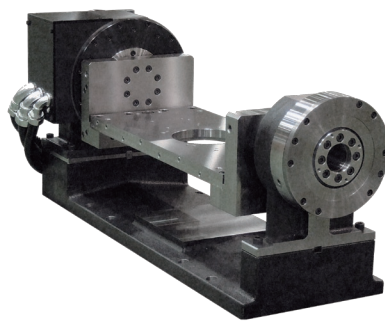
- Additional 1-axis rotary table with Synchronous built-in servo motor and  $\alpha$ ICZ SENSOR
- Direct drive and non-backlash structure enabling high speed and high precision machining

### DDR specifications

Items	Specification
Drive system	Direct drive
Maximum torque	260N·m
Maximum speed	200min <sup>-1</sup>
Feed rate	1~30,000°/min
Least input increment	0.001°
Index accuracy	±0.0028° (±10'')
Clamp system	Pneumatic cylinder and spring
Clamp torque	500N·m (at 0.5MPa)
Max. loading capacity	100kg
Allowable moment load	Projecting distance x Load = 600N·m
Center height	150mm
Machine weight	66kg



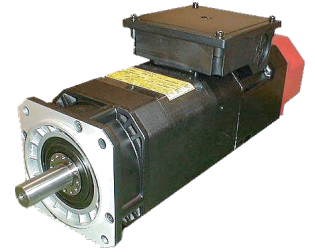
DDR



DDR-T

# Optimum spindle selectable according to application

- Center through available for all spindle specification
- Using high speed and high precision ball bearings for high speed spindle
- Spindle output enhanced
  - High torque spindle: 1min. rated torque 70N•m → 78N•m
  - High speed spindle: 1min. rated output 11kW → 26kW

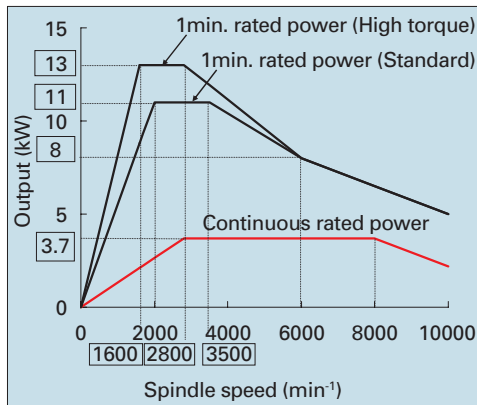


**Spindle motor**

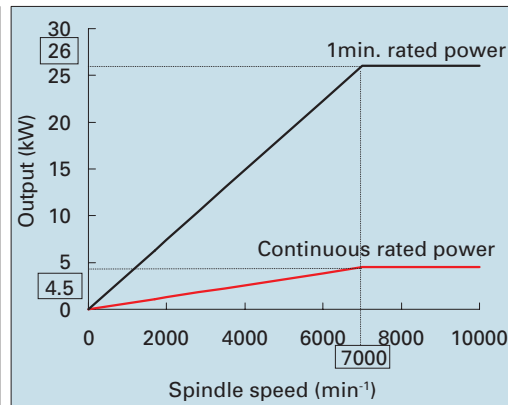
## Wide variety of spindle

Spindle spec.	Spindle max. speed	BT tooling	DIN tooling	NC5 tooling	BIG-PLUS tooling
Standard spindle	10,000 min <sup>-1</sup>	Possible (BT30)	Possible (DIN69871-A30)	Possible (NC5-46)	Possible (BBT30)
High torque spindle	10,000 min <sup>-1</sup>				
High acceleration spindle	10,000 min <sup>-1</sup>				
High speed spindle	24,000 min <sup>-1</sup>	Possible (BT30)	Possible (DIN69871-A30)	Impossible	Possible (BBT30)

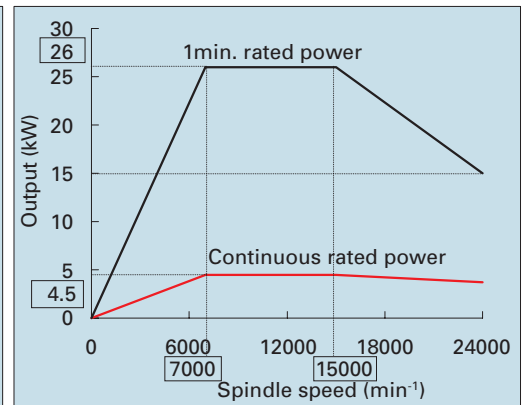
## Standard spindle and High torque spindle



## High Acceleration spindle



## High speed spindle



## Machining sample (\*1)

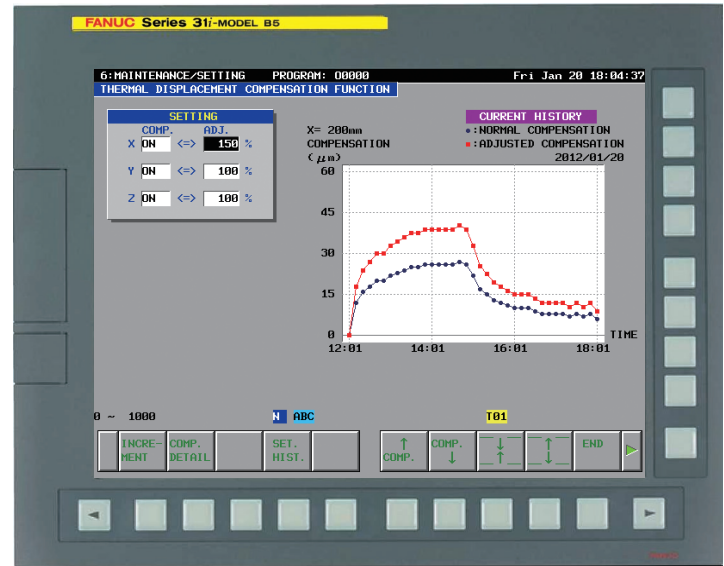
Spindle spec.		Standard spindle		High torque spindle		High acceleration and High speed spindle	
Machining		Drilling Tool dia.(mm) x Feed(mm/rev)	Tapping Tap size x Tap pitch(mm)	Drilling Tool dia.(mm) x Feed(mm/rev)	Tapping Tap size x Tap pitch(mm)	Drilling Tool dia.(mm) x Feed(mm/rev)	Tapping Tap size x Tap pitch(mm)
Material	S45C	Dia.30 x 0.10	M20 x 2.5	Dia.30 x 0.15	M20 x 2.5	Dia.20 x 0.10	M16 x 2.0
	FC200	Dia.30 x 0.25	M27 x 3.0	Dia.30 x 0.30	M27 x 3.0		
	ADC12	Dia.32 x 0.35	M30 x 3.5	Dia.32 x 0.40	M30 x 3.5	Dia.22 x 0.25	M24 x 3.0

(\*1) These data may vary with machining conditions

# High-Precision

## AI thermal displacement compensation targeting high precision compensation

- Estimating the thermal displacement along each axis based on the operation status of the spindle and feed axes with using no external sensor
- Possible to adjust the effect of compensation easily by graphic display
- \* The precision of compensation varies with the operating conditions.
- \* An effect of ambient temperature and coolant temperature is not considered.



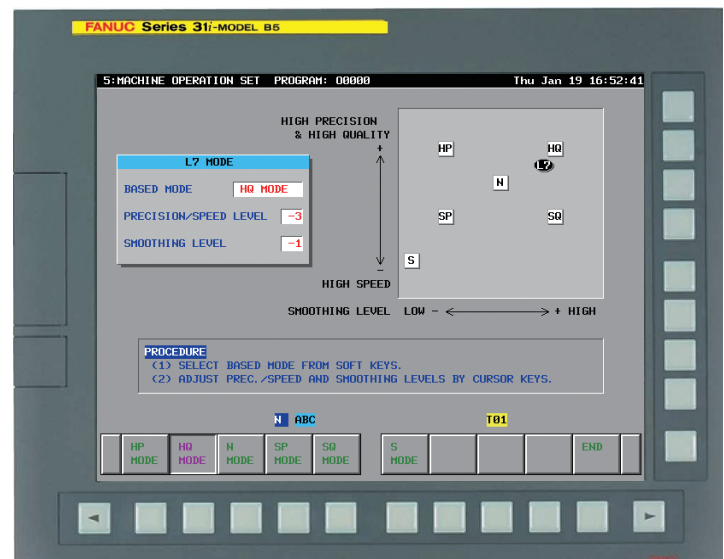
AI thermal displacement compensation Screen

## AI contour control providing high precision machining

- Enables high-precision machining and reduction of the machining cycle time by AI contour control I capable of reading up to 30 blocks in advance (standard)
- Enables high-speed, high-precision machining of a sophisticated curved surface specified in continuous blocks consisting of minute line segments by AI contour control II capable of reading up to 200 blocks in advance (option)
- Possible to increase the number of blocks to be read in advance up to 1000 (option)

## Machining mode setting to select suitable control

- Setting the machining mode according to the machining to be made on the screen or with the command in a program
- Enables the desired work surface quality and productivity
- Possible to add customer-specific machining modes

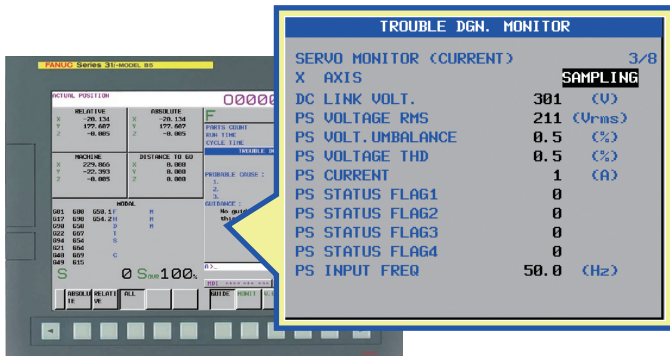


Machining mode setting Screen

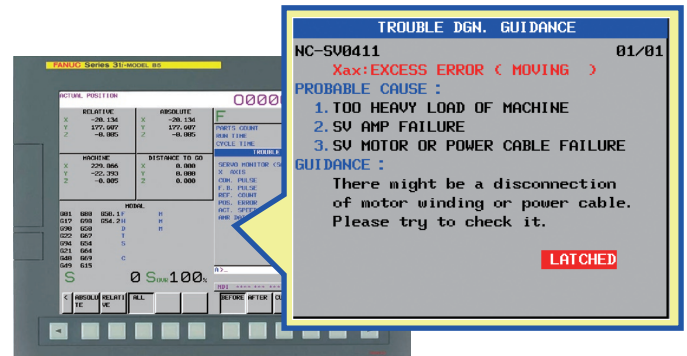
# High-Reliability

## Maintainability Improvement by Smart Trouble Shooting Function

- Providing diagnosis at the alarm on Trouble Diagnosis Monitor Screen
- Quick finding of each alarm cause and defective parts by Trouble Diagnosis Guidance Screen



Trouble Diagnosis Monitor Screen



Trouble Diagnosis Guidance Screen

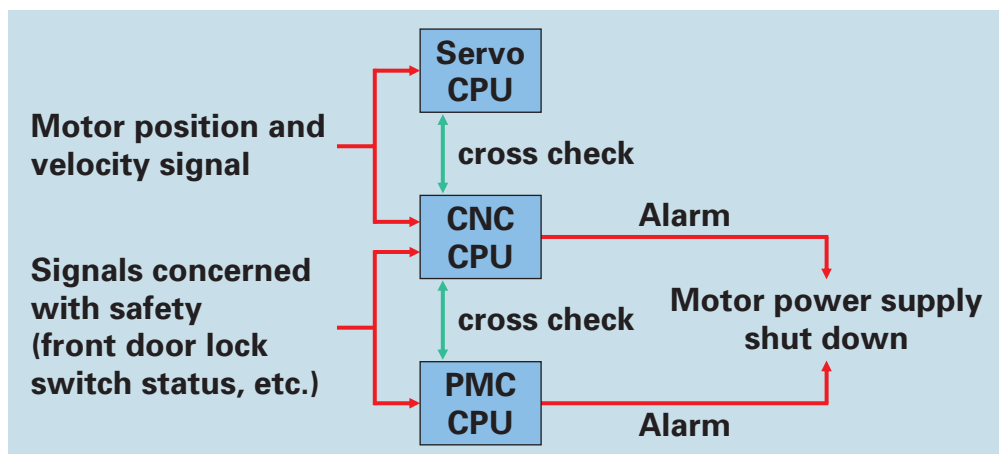
## Leakage Detection Function for Preventive Maintenance

- Automatic measurement of each motor insulation resistance with Leakage Detection Function (installed on servo amplifiers)
- Allows preventive maintenance by informing leakage degradation



## Conformity to Safety Standards

- Conformed with Performance Level d (defined on ISO 13849-1) by Dual Check Safety function
- Allows conformity to each safety standard (CE mark, National standards of the P.R.C., etc.)



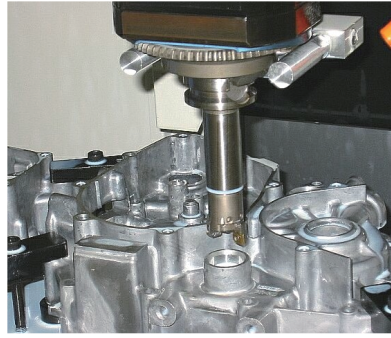
Note) concerned options required

Dual Check Safety function

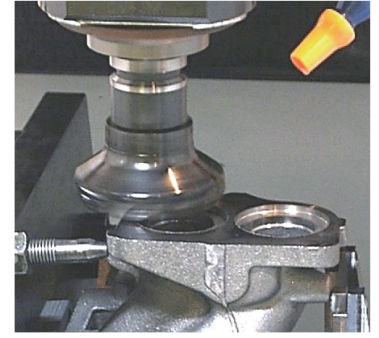
# Versatile Applications for Wide-variety of Machining Needs

## Automobile parts machining

- Highly rigid mechanism achieve heavy machining
- Efficient milling, boring and side cutting is possible
- Multi-face machining and contouring is possible



Crank case



Exhaust manifold (FCD450)

## Electrical parts and small parts

- Shortening cycle time by optimum servo control
- Suitable for high-speed machining of electrical parts and small parts



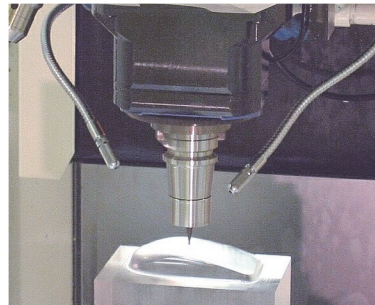
2.5" HDD frame



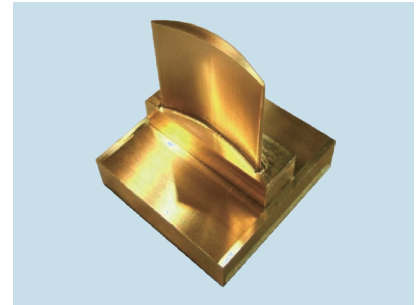
Stainless steel parts

## Three-dimensional machining

- High speed processing achieve high-speed and high-precision machining for 3D shape parts
- Possible to machine smooth surface by using latest CNC technology



Resin model



Copper electrode

## Rotation axis machining

- Using **DDR** or additional 2-axis rotary table achieve high-speed and high-precision machining of Impeller (component of a turbo car) or camera tube



Impeller for automobile  
(Aluminum alloy)



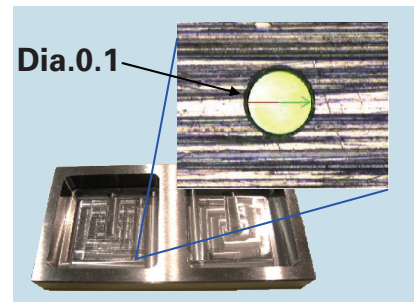
Camera tube  
(Aluminum alloy)

## Deep and small hole drilling

- Possible to drill deep hole (over 30 times deeper than the hole diameter) and small hole (diameter 0.1mm)



Deep hole drilling(section)  
Dia.3.3x96mm (Stainless)



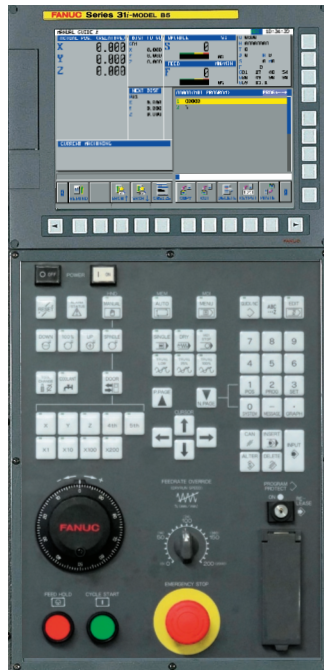
Dia.0.1  
Dia.0.1X1.0mm  
(Prehardened steel)



# Intelligent Control, Robotization

## 10.4" Color LCD and compact operator's panel

- Provides CNC with 10.4" color LCD and compact operator's panel
- Allows all operations by the least key push
- Also allows machine control by vertical softkeys on the right side of LCD
- USB port newly added on the left side of LCD, in addition to conventional memory card slot



Operator's panel (standard)



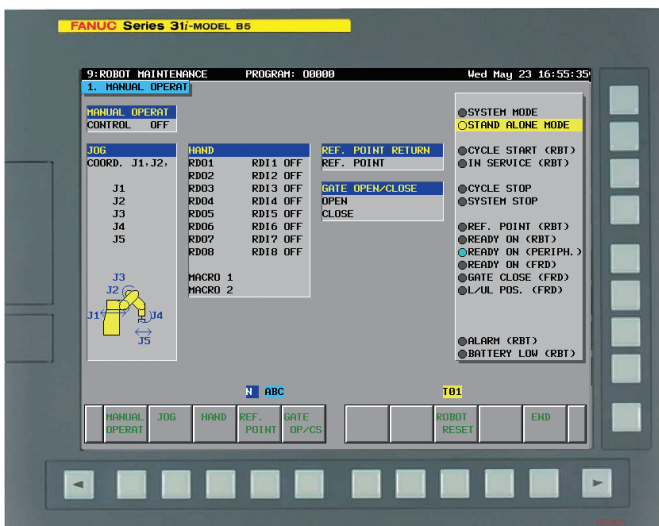
Operator's panel with alphabet keys (option)

## Robotization

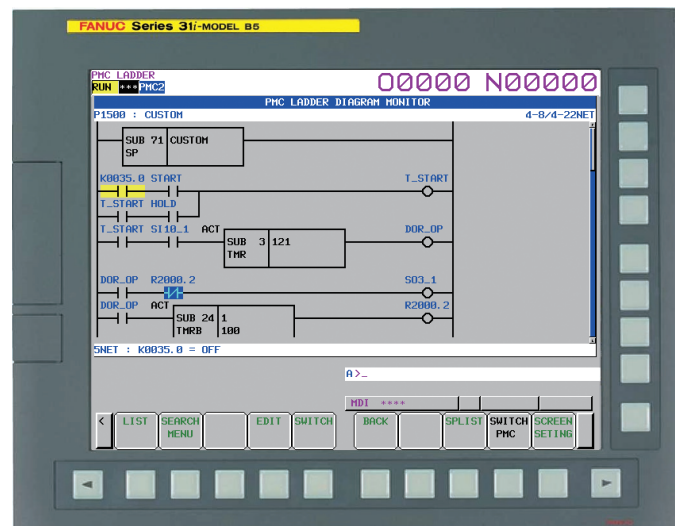
- Possible to configure machining systems easily using robots
- Provides a built-in interlock function with consideration given to safety
- Enables robot operation and system status display on the robot operation screen

## Custom PMC

- Possible to create the ladder program for control of peripheral devices easily on a screen
- Possible to read or write only ladder programs for peripheral devices

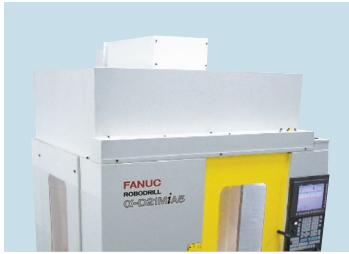


Robot manual operation Screen



Ladder diagram monitor Screen

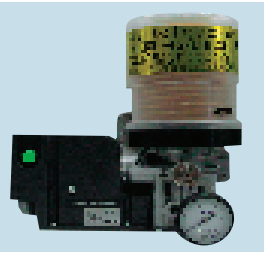
# Available Options



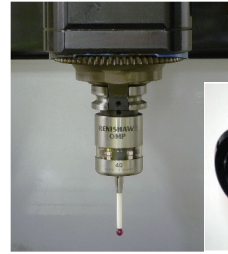
Top cover



Automatic Oil Lubricating System



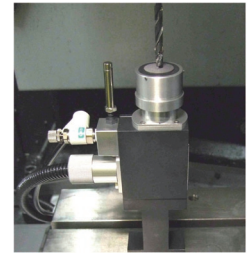
Automatic Grease Lubricating System (LHL Liquid Grease)



Probe  
Touch probe



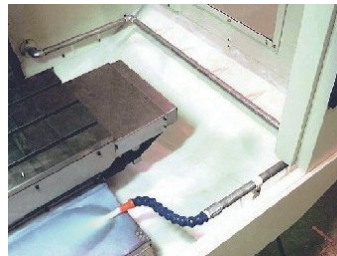
Receiver



Tool length switch for automatic measurement



Coolant unit (tank)



Coolant unit with chip flush (spot gun provided)



LED Illumination



Automatic fire extinguisher (Note)

**(Note)**

- If machining "combustible materials" such as resin and magnesium or using a water-immiscible cutting fluid, select an automatic fire extinguishing system because of fire hazards. For information on the objects that can be extinguished by an automatic fire extinguishing system, contact your ROBODRILL sales representative.
- The machine life may be shortened depending on the workpiece, tool, coolant, or lubricant to be used.

# Maintenance and Customer Support

## Worldwide customer service and support

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 training center

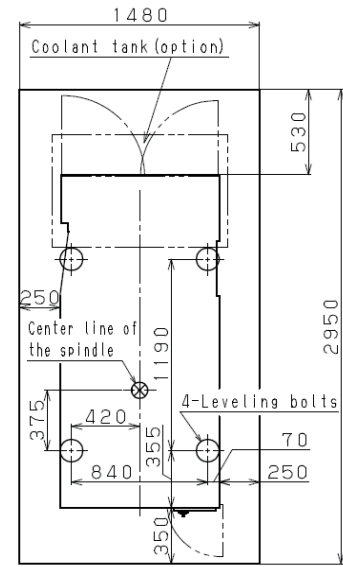
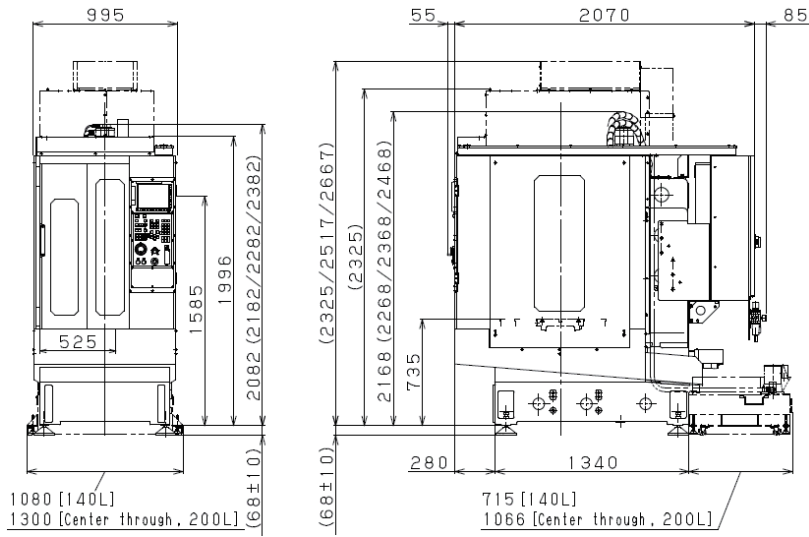
FANUC Training Center operates training programs on FANUC ROBODRILL which focus on practical operations and programming with machining know how and maintenance.



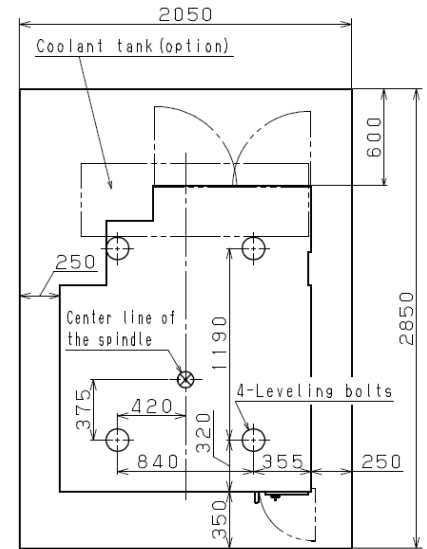
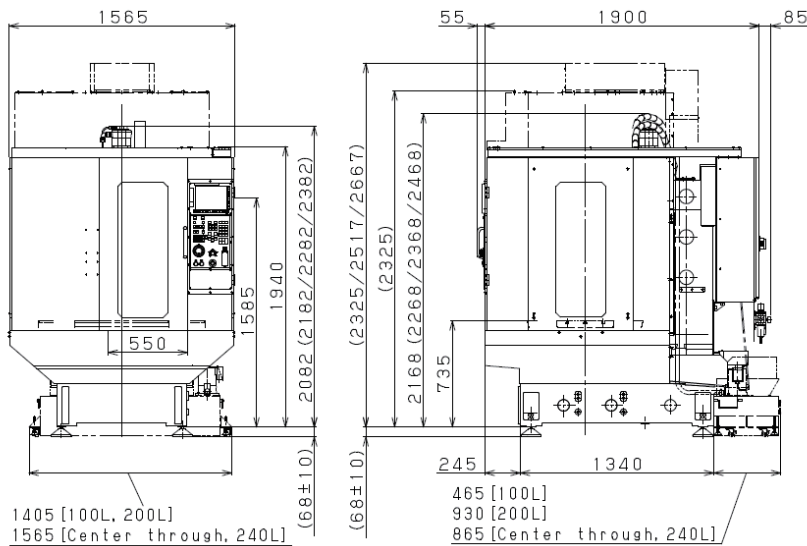
Inquiries : Yamanakako-mura,  
Yamanashi, Japan 401-0501  
Phone : 81-555-84-6030 Fax : 81-555-84-5540

# Outer Dimensions and Floor Plan

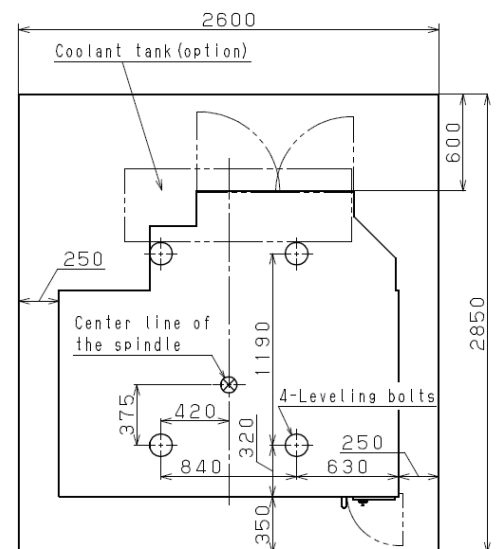
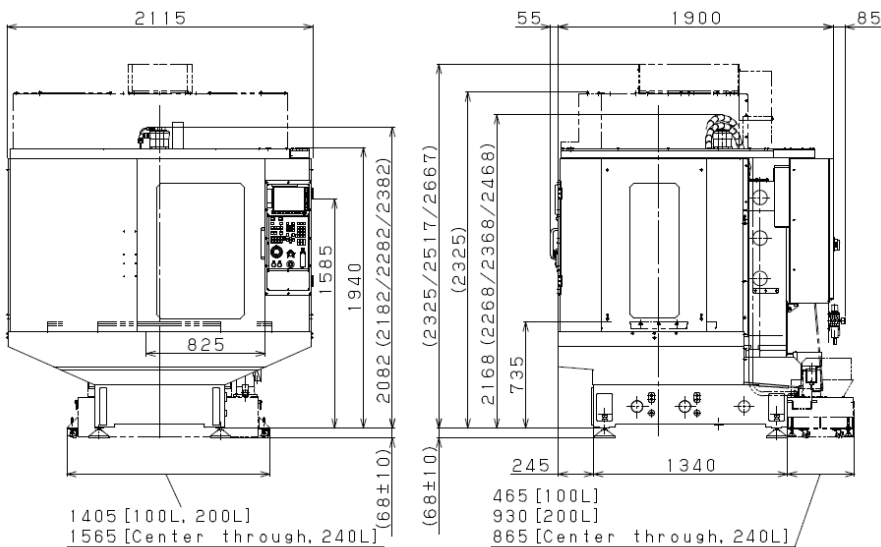
## $\alpha$ -D21SiA5/D14SiA5



## $\alpha$ -D21MiA5/D14MiA5



## $\alpha$ -D21LiA5/D14LiA5



# Specification

item		$\alpha$ -D21SiA5 $\alpha$ -D14SiA5	$\alpha$ -D21MiA5 $\alpha$ -D14MiA5	$\alpha$ -D21LiA5 $\alpha$ -D14LiA5
Machine(Standard)				
Capacity	X-axis-travel (Longitudinal movement of table)	300mm	500mm	700mm
	Y-axis travel (Cross movement of saddle)	300mm + 100mm	400mm	
	Z-axis travel (Vertical movement of saddle)	330mm		
	Distance from table surface to spindle gage plane	150 to 480mm (When no high column is specified)		
Table	Working space(X-axis×Y-axis)	630×330mm	650×400mm	850×410mm
	Capacity of workpiece mass	200kg (uniform load)	300kg (uniform load)	
	Working surface configuration	3T-slots size 14mm pitch 125mm		
Spindle	Speed range	100 to 10,000min <sup>-1</sup>		
	Spindle gage (Call number)	7/24 taper No.30 (with air blow)		
Feedrate	Rapid traverse rate	54m/min (X,Y,Z)		
	Feedrate	1 to 30,000mm/min		
Turret	Tool change system	Turret type		
	Type of tooling	JIS B 6339-1998 BT30, MAS 403-1982 P30T-1 (45°)		
	Tool storage capacity	21tools : $\alpha$ -D21SiA5/D21MiA5/D21LiA5 14tools : $\alpha$ -D14SiA5/D14MiA5/D14LiA5		
	Maximum tool diameter	80mm		
	Maximum tool length	200mm : $\alpha$ -D14SiA5 190mm (Changed by specifications) : $\alpha$ -D21SiA5	250mm (Changed by specifications)	
	Method of tool selection	Random shortest path		
	Maximum tool mass	2kg/tool (total mass 23kg)/3kg/tool (total mass 33kg) : $\alpha$ -D21SiA5/D21MiA5/D21LiA5 2kg/tool (total mass 15kg)/3kg/tool (total mass 22kg) : $\alpha$ -D14SiA5/D14MiA5/D14LiA5		
	Tool changing time (Cut to Cut)	1.4 s : $\alpha$ -D14SiA5/D14MiA5/D14LiA5 (When 2kg/tool is specified) 1.6 s : $\alpha$ -D21SiA5/D21MiA5/D21LiA5 (When 2kg/tool is specified)		
Motors	Spindle drive motor	11.0kW (1min rating)/3.7kW(continuous rating)		
Accuracy *1	Bidirectional accuracy of positioning of an axis (ISO230-2:1997, 2006)	0.006mm		
	Bidirectional repeatability of positioning of an axis (ISO230-2:1997, 2006)	0.004mm		
Sound pressure level	Less than 70dB *2			
Control unit	<b>FANUC Series 31i-B5</b>			
Installations	(Note)Please make sure to comply with installation conditions specified by FANUC when installing ROBODRILL *3			
Power source	Power supply	200 to 220 Va.c. +10 to -15% 3-phase, 50/60Hz±1Hz 10kVA *4		
	Compressed air supply	0.35 to 0.55MPa (0.5MPa is recommend) (gage pressure) 0.15m <sup>3</sup> /min (at atmospheric pressure) *5		
Machine size	Machine height	2,236±10mm (When no high column is specified)		
	Floor space	995mm×2,210mm	1,565mm×2,040mm	2,115mm×2,040mm
	Mass of machine	Approx. 1,950kg	Approx. 2,000kg	Approx. 2,100kg

\*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 8mm<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, 0.4 MPa compressed air supply or more is required.

## FANUC CORPORATION

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