High-Reliability and High-Performance
Compact Machining Center

FANUC

ROBODRILL α-D*i*A series

High-Reliability and High-Performance Compact Machining Center

FANUC ROBODRILL α-D*i*A series

High Performance of Machining

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

Applying the latest FANUC CNC & Servo motor technology

※1

Good combination with FANUC Robot

High Sustainability

- 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 work piece by stable machining

Utilization in various areas by wide range of application

High Sustainability

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 equipments by high expandability

Realizing simple integration with FANUC Robot by supporting automation

α-D21S*i*A
α-D14S*i*A

α-D21M*i*A
α-D14M*i*A

α-D21L*i*A
α-D14L*i*A

※1 Photo when DDR mounted

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

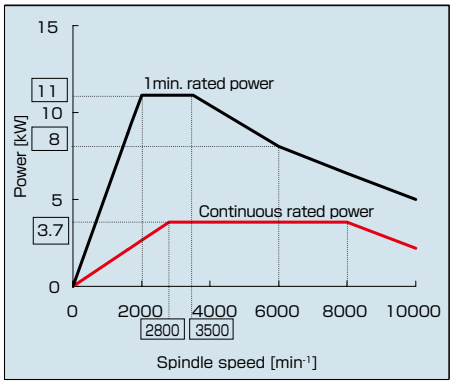
● Optimum spindle selectable according to application
- Standard spindle : Applicable to wide range machining use
- High torque spindle : Applicable to heavy machining of iron parts
- High acceleration spindle: Applicable to high speed, high efficiency machining of aluminum parts
- High speed spindle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

High power spindle motor

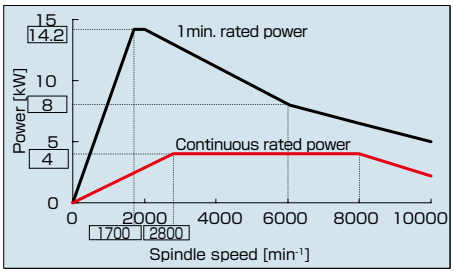
Spindle spec.	Spindle max. speed	BT tooling	DIN tooling	NC5 tooling	BIG-PLUS tooling
Standard spindle	10000 min^{-1}	Possible (BT30)	Possible (DIN69871 -A30)	Possible (NC5-46)	Possible (BBT30)
High torque spindle					
High acceleration spindle					
High speed spindle	24000 min^{-1}	Possible (BT30)	Possible (DIN69871 -A30)	Impossible	Possible (BBT30)

*Center through coolant option available (7 MPa withstand pressure)

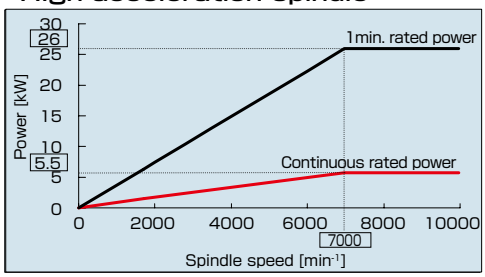
Standard spindle



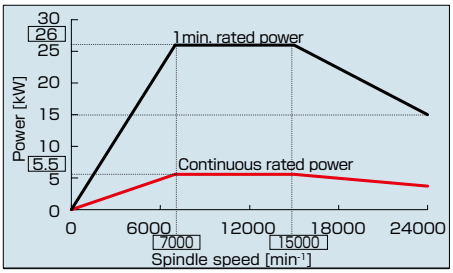
High torque spindle



High acceleration spindle



High speed spindle



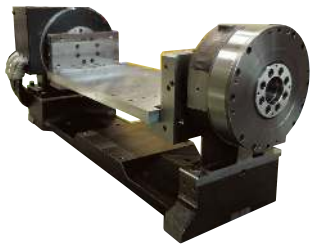
DDR with direct drive motor

● Direct drive rotary table providing high-speed indexing **DDR**
- Additional 1-axis rotary table with Synchronous built-in servo motor and αiCZ SENSOR
- Direct drive and non-backlash structure enabling high speed and high precision machining

● Possible to make cradle type jig easily

DDR-T

DDR



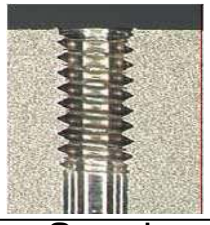
DDR-T

DDR specifications

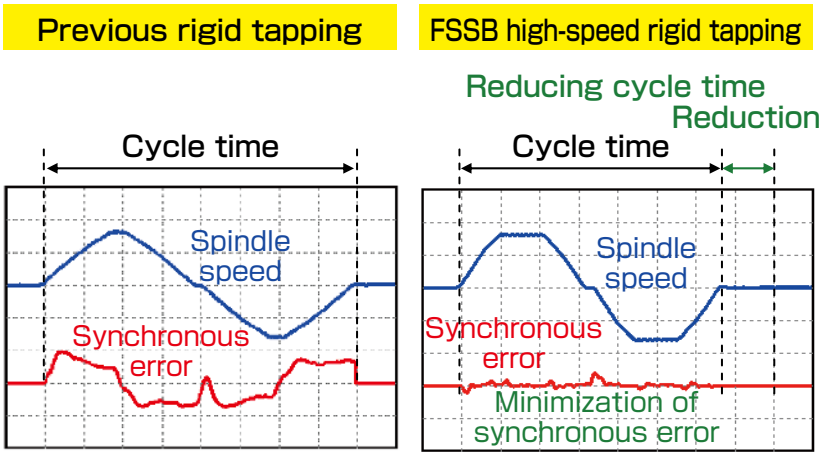
Items	Specification
Drive system	Direct drive
Maximum torque	260 N・m
Maximum speed	200 min^{-1}
Feed rate	1°/min to 30000°/min
Least input increment	0.0001°
Index accuracy	±0.0028° (±10″)
Clamp system	Pneumatic cylinder and spring
Clamp torque	500 N・m (at 0.5 MPa)
Max. loading capacity	100 kg
Allowable moment load	Projecting distance x Load = 600 N・m
Center height	150 mm
Machine weight	66 kg

High speed machining

● FSSB high speed rigid tapping
・Achieving High speed rigid tapping by FSSB communication between servo and spindle amplifiers
・Achieving both high speed & high precision by using maximum acceleration power of spindle motor



Sample

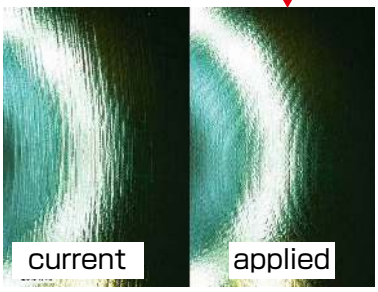


Higher axis feed accuracy

● Higher axis feed accuracy by the latest CNC and Servo functions
・SERVO HRV+ control ：
Achieving high responsibility by optimized electrical control
・Latest AC Servo Motor ：
Applying latest AC Servo Motor which achieves more smooth feed
・Input increment 0.1 μm ：
Addition of the mode in which feed can be commanded with the least 0.1 μm
・Achieving high quality machining (ex. Higher surface quality and circularity improved) by each function

Higher surface quality

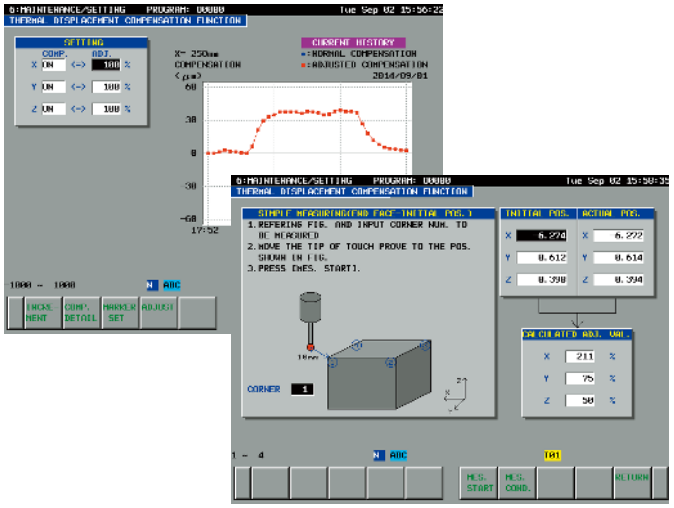
current applied



Stable machining

● High precision compensation of thermal displacement without external sensor
・Estimating the thermal displacement along each axis based on the operation status of the spindle and feed axes

●Automatic optimization by the touch probe
・Adjust value optimized automatically with measuring result by the touch probe (option)



AI Thermal Displacement Compensation Screen

High Sustainability

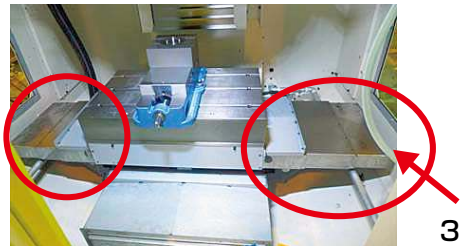
Excellent chip evacuation

● Excellent chip evacuation (Option)
- Chip evacuation ability enhanced on the condition of much quantity of chips
- Maintenance and cleaning cycle can be extended

Standard Version

A case of enhancement chips evacuation

● X-axis telescopic cover with 3 pieces (Option)
- Covering against chip and coolant enhanced by improved shape of telescopic cover
- Reduction of the load to telescopic cover and enhanced cover and cushion gum by 3 pieces structure



3 pieces

● Cleaning unit for tool taper shank (Option)
- Flushing the tool taper shank by the coolant to prevent catching cut chips during tool change
- The stable cutting accuracy can be maintained

Cleaning tool taper shank

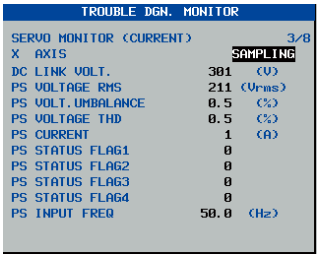
●Tool run-out detection function (Option)
- Run-out measurement sensor can detect tool run-out before cutting
- When the amount of run-out becomes excessive, it is possible to remove the cut-chips by the retry function
- Measurement time is 0.4 s or less

Run-out measurement sensor

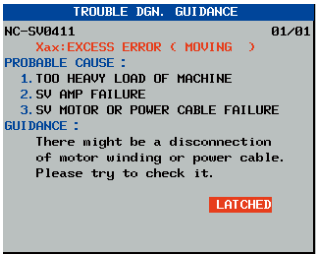
High maintainability

● SMART TROUBLE SHOOTING FUNCTION
- The Trouble diagnosis monitor screen displays useful information to make decisions at the occurrence of alarms
- An alarm cause and how to handle it are identified according to the failure diagnosis flow displayed in the Trouble diagnosis guidance screen
- The facility availability ratio are improved due to a reduction of down time

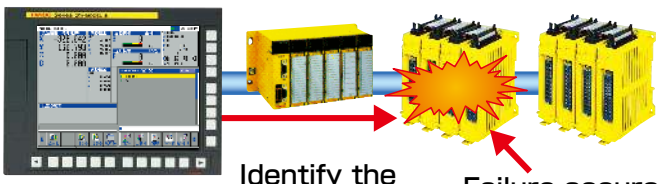
● Improvement of maintainability for I/O device
- The cause and point the failure of I/O devices (disconnection, earth fault etc) are identified
- The facility availability ratio are improved due to a reduction of down time



Trouble diagnosis monitor screen



Trouble diagnosis guidance screen



Identify the failure cause and point

Failure occurs on I/O device

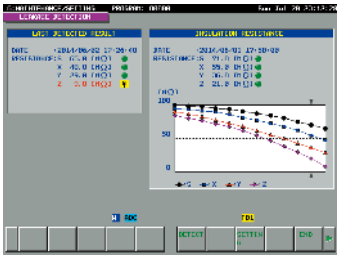
High reliability

- 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 gotten at FANUC in-house factory
    Achieving high reliability by returning the maintenance data to ROBODRILL design

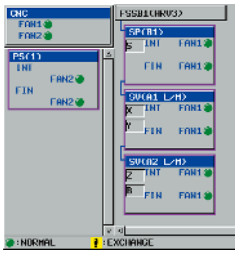
FANUC in-house factory

Complete preventive maintenance

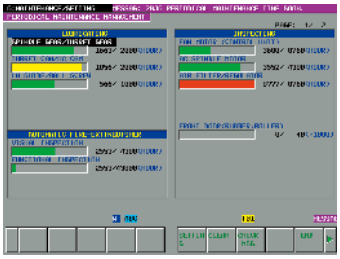
- Leakage Detection Function
  - Early detection of insulation resistance drop of each motor and motor power cable
  - Enable preventive maintenance before breakdown
- Fan Monitor Function
  - Monitoring cooling fans of CNC, Servo Amplifiers, Spindle Amplifier and Power Supply
  - Make announcement when the cooling fans rotation is under standard value
  - Easy to detect the abnormal fan
- PERIODICAL MAINTENANCE
  - Make announcement for the necessary items by schedule
  - Possible to make announcement it the maintenance time is approaching
  - Possible to set customized maintenance items (Max. to 8)



Leakage Detection



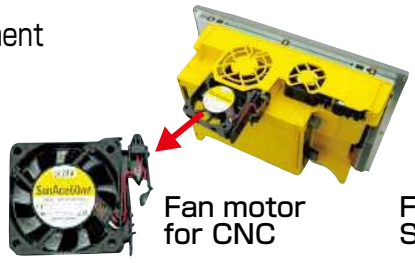
Fan Monitor



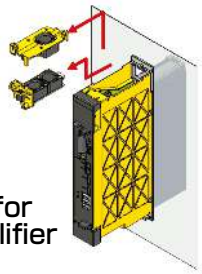
Periodical maintenance

Periodical maintenance customize Window

- Machine configuration to improve parts replacement
  - Improved new fan unit is adopted for easy parts replacement
  - The facility availability ratio are improved due to a reduction of down time
- RECHARGEABLE BATTERY UNIT (Option)
  - Rechargeable battery and charging circuit integrated
  - Automatically recharged while ROBODRILL power ON
  - Supplying backup power both CNC and PULSE-CODER instead of disposable battery
  - Battery maintenance time and disposal of used batteries reduced



Fan motor for CNC



Fan motor for Servo Amplifier

Ease of Use

The latest CNC of FANUC

● 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

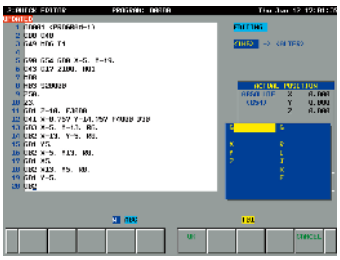
Operator’s panel (standard)

Operator’s panel with alphabet keys (option)

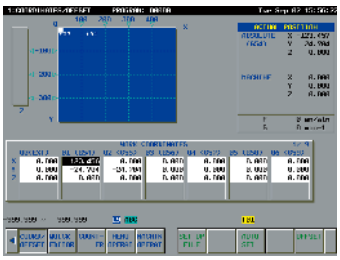
High usability

● Easy operation on ROBODRILL exclusive screen (Quick Screen), including programming, maintenance, etc.
- Quick editor
  CNC program editor that possible to edit character
  Minimum operation to input G code and M code by program input guidance
- Coordinate/Tool Compensation
  Possible to set work coordinate and tool compensation on one screen
  Possible to protect or restore the prepare data such as work coordinate, tool compensation and program
- Machine operation setting
  Possible to set the optimized machining mode and energy save mode according to the program
- Maintenance/Setting
  Easy to operate ROBODRILL maintenance such as turret restoration, motor reference position return, AI Thermal Displacement Compensation

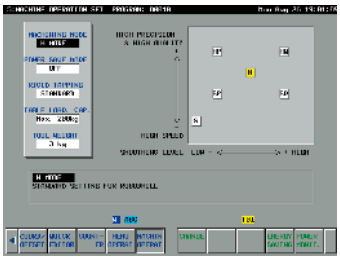
● Integrated operation, programming guidance (MANUAL GUIDE *i*)
- Easy to program and operate machining on one screen
- Easy to program with G code through graphic guide
- No need to calculate drill position or pocket machining, simple command
- Simple machining simulation of solid model



Quick editor

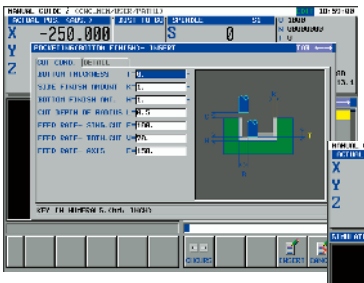


Coordinate/Tool compensation

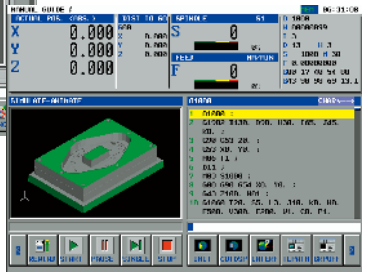


Machine operation setting

Maintenance/Setting



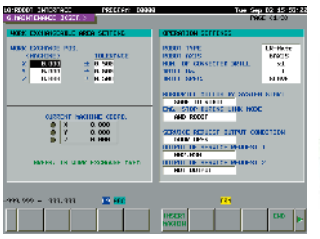
Cycle program input



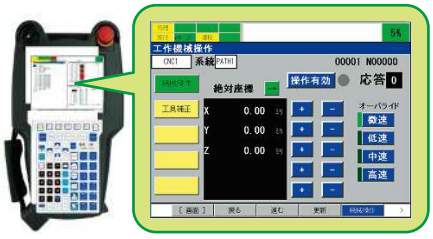
Machining simulation

Automation application

● ROBOT interface 2
- Easy and inexpensive construction of Machining Cell with safety issue
- Enable to connect four ROBODRILLs and one ROBOT
- No system controller (Control software included in ROBODRILL PMC)
- Support for side Servo door control by ROBOT controller



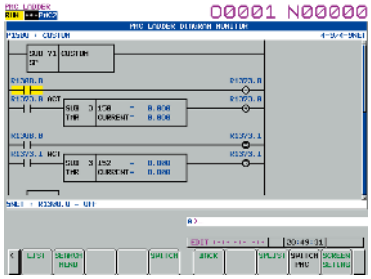
ROBOT interface 2 setting screen



Machine operation screen

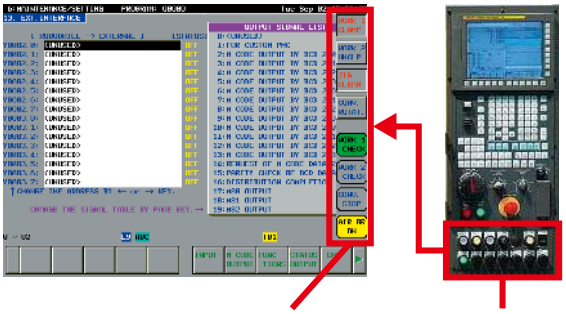
High expandability

● Custom PMC
- Easy to create LADDER program in order to control peripheral devices
- Possible to set LADDER program I/O only for peripheral devices
- Customize I/O signals (Standard: Input 16/Output 16 Max: Input 1024/Output 1024)



LADDER graphic

● Custom control panel
- Possible to monitoring peripheral devices status
- Control machining program ON/OFF by switch
- Possible to create switch of lamp, ON/OFF switch, pulse switch
- Easy and inexpensive construction of peripheral devices with perfect maintainability

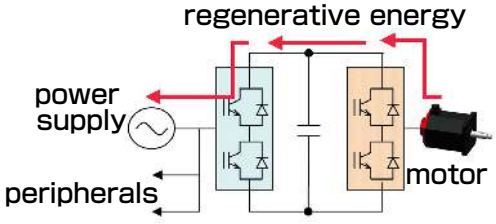


Custom control panel

Peripheral device control panel

Technology for power saving

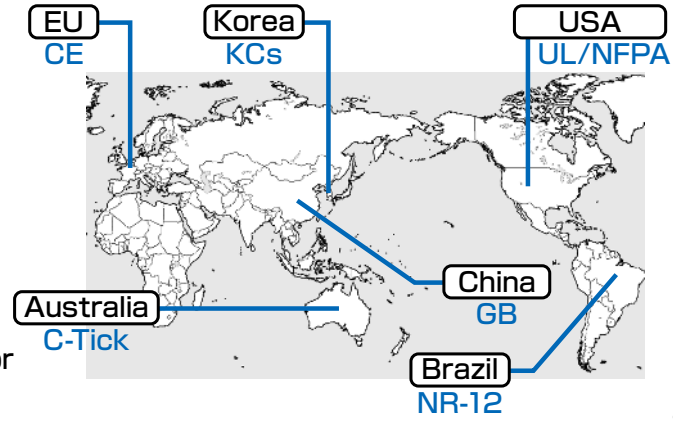
● Proven power regeneration function
- The power regeneration function that use regenerating energy occurred on deceleration of motors has been adopted since 1994.



Electric power consumption monitor

Conformity of safety standards (Option)

● Conformity of each country's safety standard



Machining Capability

Machining sample (*1)

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)
Cabon Steel C45	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
Grey Cast Iron	Dia.30 x 0.25	M27 x 3.0	Dia.30 x 0.30	M27 x 3.0		
Aluminum Alloy Die Casting	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) Sample data may vary on machining conditions

Available Options

Top cover

Coolant unit (tank)

Tool length switch for automatic measurement

Touch probe

LED Illumination

Coolant unit with chip flush (spot gun provided)

Automatic Grease Lubricating System (LHL Liquid Grease)

Automatic Oil Lubricating System

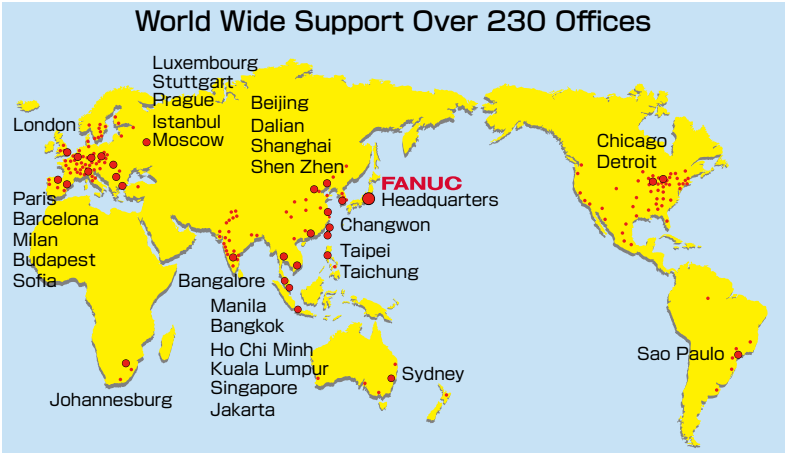
Automatic fire extinguisher (Note)

(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 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.



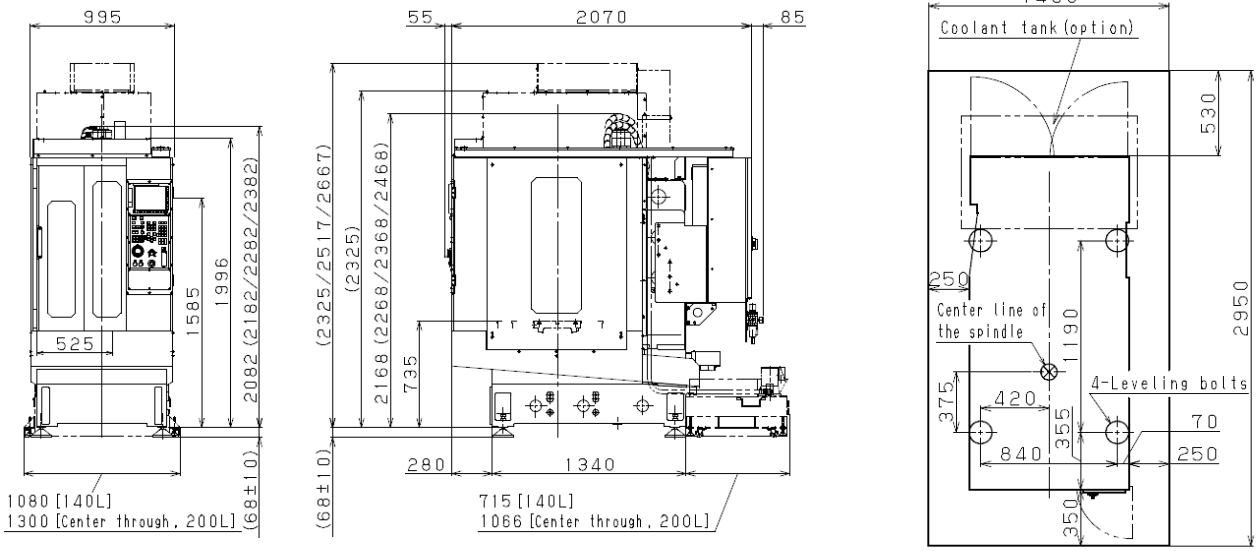
FANUC Training Center

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

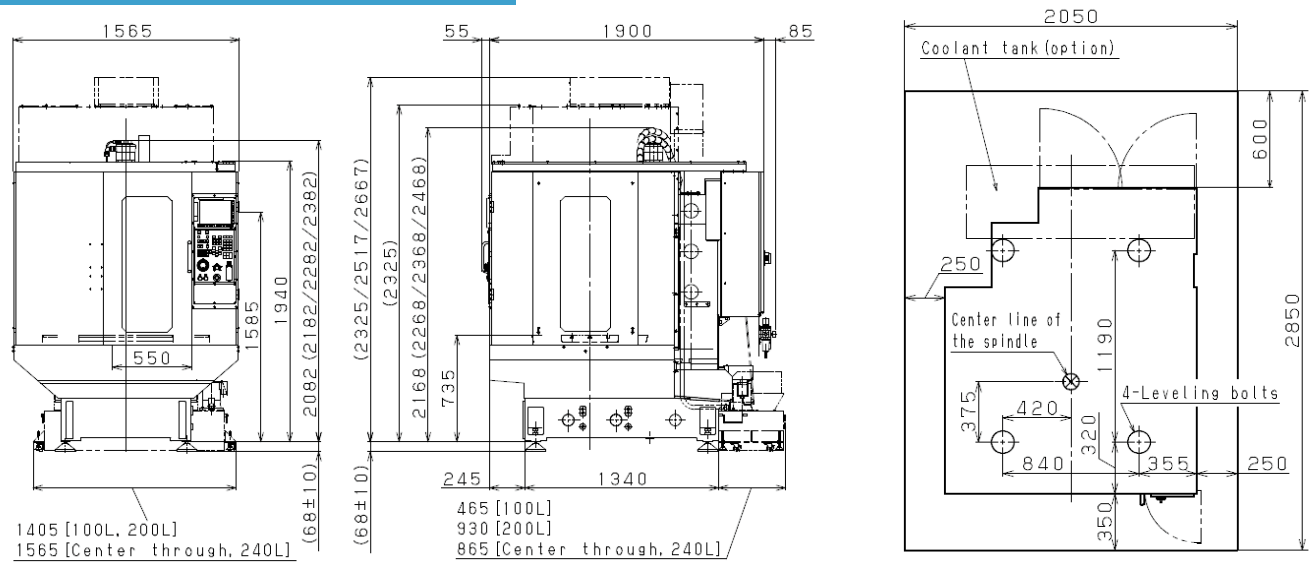
Inquiries : Yamanakako-mura,
Yamanashi, Japan 401-0501
Phone : 81-555-84-6030 Fax : 81-555-84-5540

Outer Dimensions and Floor Plan

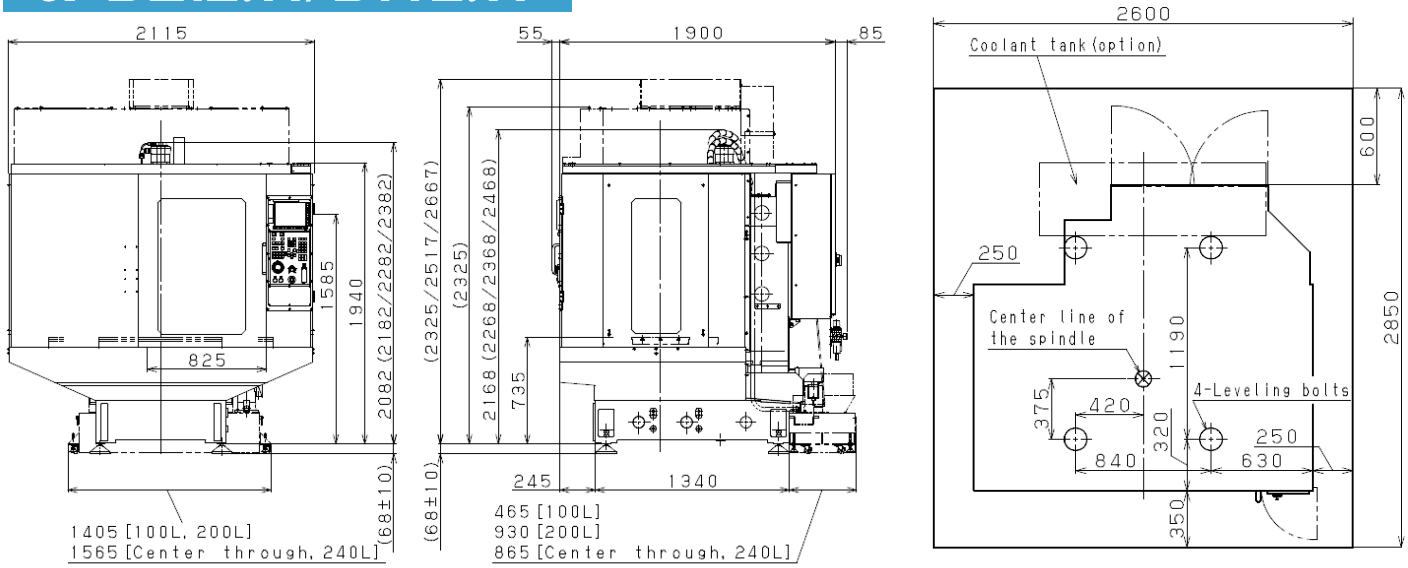
α-D21SiA/D14SiA *1



α-D21MiA/D14MiA *1



α-D21LiA/D14LiA *1



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

Specification

item		α-D21S*i*A α-D14S*i*A	α-D21M*i*A α-D14M*i*A	α-D21L*i*A α-D14L*i*A
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)	330 mm		
	Distance from table surface to spindle gage plane	150 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)	300 kg (uniform load)	
	Working surface configuration	3T-slots size 14 mm pitch 125 mm		
Spindle	Speed range	100 min^{-1} to 10000 min^{-1}		
	Spindle gage (Call number)	7/24 taper No.30 (with air blow)		
Feedrate	Rapid traverse rate	48 m/min (X,Y,Z)		
	Feedrate	1 mm/min to 30000 mm/min		
Turret	Tool change system	Turret type		
	Type of tooling	JIS B 6339-1998 BT30, MAS 403-1982 P30T-1 (45°)		
	Tool storage capacity	21 tools : α-D21S*i*A/D21M*i*A/D21L*i*A 14 tools : α-D14S*i*A/D14M*i*A/D14L*i*A		
	Maximum tool diameter	80 mm		
	Maximum tool length	200 mm : α-D14S*i*A 190 mm (Changed by specifications) : α-D21S*i*A	250 mm (Changed by specifications)	
	Method of tool selection	Random shortest path		
	Maximum tool mass	2 kg/tool (total mass 23 kg)/3 kg/tool (total mass 33 kg) : α-D21S*i*A/D21M*i*A/D21L*i*A 2 kg/tool (total mass 15 kg)/3 kg/tool (total mass 22 kg) : α-D14S*i*A/D14M*i*A/D14L*i*A		
	Tool changing time (Cut to Cut)	1.4 s : α-D14S*i*A/D14M*i*A/D14L*i*A (When 2kg/tool is specified) 1.6 s : α-D21S*i*A/D21M*i*A/D21L*i*A (When 2kg/tool is specified)		
Motors	Spindle drive motor	11.0 kW (1minute rating)/3.7 kW(continuous rating)		
Accuracy *1	Bidirectional accuracy of positioning of an axis (ISO230-2:1988)	0.006 mm to 0.020 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*-B**		
	Simultaneously controlled axes	Max.4 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×2210 mm	1565 mm×2040 mm	2115 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 + 1 kVA is required respectively. In case of additional 1 axis, additional maximum + 1.5 kVA is required. A cable with 8 mm^2 or more should be used at primary power connection.

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

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