

FANUC

ROBODRILL

*i*F SERIES



α-T21iF

The FANUC philosophy

„Technology has a history – but engineers have no past: They have to constantly invent new things.“ Due to this principle, a continuous stream of new solutions for industrial high-tech products is constantly being developed at FANUC’s 1.2 million m2 company headquarters.

Experience in the development and manufacture of production centers

Proven quality components, built-in high reliability and good design – a formula for success that has made FANUC, one of the leading suppliers of advanced technology and dependable products with low maintenance.



FANUC JAPAN

The FANUC headquarters for all activities in Europe were established in 1991. It is home to a technology center for all FANUC products, but after-sales service and spare parts supplies are also coordinated from here.

Other service centers in Europe.



FANUC EUROPE, Neuhausen location



ROBODRILL history since 1970

Tape Drill Model C



Tape Drill Model E



Tape Drill Model T



1970

ROBODRILL α-T10A



ROBODRILL α-T14iD



ROBODRILL α-T21iF



2007

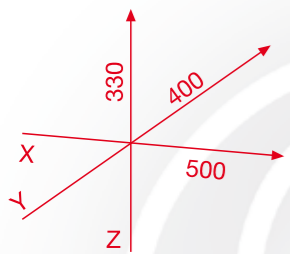
ROBODRILL production



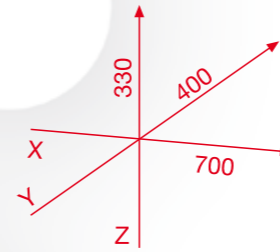
ROBODRILL production line at Tsukuba factory

Intelligent High Speed CNC production center with versatility

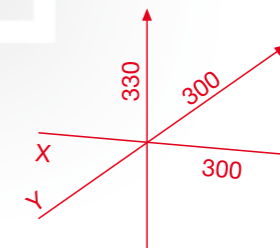
FANUC ROBODRILL α -iF series is a high speed versatile AI CNC production center with spindle taper size No. 30 for high precision and high efficiency production.



X-axis travel = 500
Y-axis travel = 400
Z-axis travel = 330



X-axis travel = 700
Y-axis travel = 400
Z-axis travel = 330



X-axis travel = 300
Y-axis travel = 300 (+100)
Z-axis travel = 330

High speed and high reliable tool change

- Simple and reliable proprietary tool turret mechanism
- Tool changing time (cut to cut): 1.6 sec.
- Models for 21 tools



Compact operator's panel and 10.4" color LCD

Standard display with 10.4" color LCD integrated with the operator panel features ease of use with least key stroke operations. A memory card slot located at the side of the display unit provides simpler handling of memory cards.



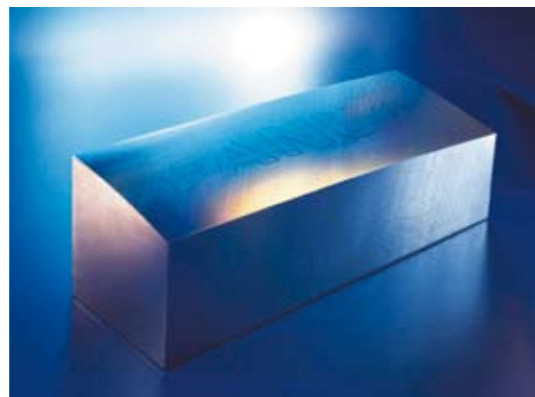
Latest technology of FANUC Servo drives and motors



Servo Motors ai with 16,000,000 pulse/rev.

AI contour control

Acceleration/deceleration is controlled by reading 30 blocks in the AI contour control mode in advance to implement high-speed, high-precision machining. The number of look ahead blocks can be increased by option up to 1000.



Production control and tool counter

Two production monitoring counters and two accumulation counters are applicable for recognition of scheduled parts production, status display, termination of machining and so on. These counters are indispensable for production. The use status of tools with the tool life management function can also be checked using the tool counter on the same screen.



Setup file

Initial setting information up to 30 sets can be stored such as parts coordinate system, offsets values, program identification and so on. Automated initialization for operation is available simply by calling a set of information for ease of use.



Quick editor

Quick Editor used to create or edit a program is an easy-to-use full-screen editor, which can perform copy, move, search, cursor jump, and other operations like an editor for PCs. The guidance input function for G codes or M codes allows you to edit a program efficiently. Effective edit of programming is also possible through on-screen selection of G and M codes with guidance.



Limiting spindle rotation function

The possibility to limit the spindle speed for each tool on presetted values, can prevent the damage of tools by programming mistake.



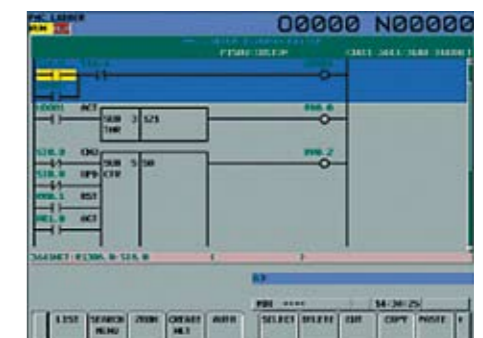
Periodical maintenance function

Simple maintenance screen shows the actual status of the consumable parts and inform about the expected maintenance work.



Custom PMC

The custom PMC function which allows simple control of peripheral devices is installed as standard. A sequence program can be created and edited easily on a screen with symbols. This function provides 16 input and 16 output signals as basic features and also available up to 1024 input and output signals in total as optional features.



Machine standard	Item	α -T21iFs	α -T21iF	α -T21iFL
Capacity	X-axis travel	300 mm	500 mm	700 mm
	Y-axis travel	300 mm + 100 mm	400 mm	400 mm
	Z-axis travel	330 mm	330 mm	330 mm
	Maximum tool length	190 mm	250 mm	250 mm
Table	Working space (X-axis x Y-axis)	630 x 330 mm	650 x 400 mm	850 x 410 mm
	Capacity of workpiece mass	200 kg (uniform load)	300 kg (uniform load)	300 kg (uniform load)
	distance from table surface to spindle gage plane		250 to 580 mm	
Spindle	Working surface configuration		3T-slots, size 14 mm pitch 125 mm	
	Speed range		100~10,000 / 24,000 min ⁻¹	
	Spindle gage (call number)		7/24 taper No.30 (with air blow)	
Feedrate	Rapid traverse rate		54 m/min (X,Y,Z)	
	Feedrate		1 to 30,000 mm/min	
Turret	Tool change system		Turret type	
	Type of tooling		SK 30 DIN 69871 A or JIS B 6339-1998 BT30, MAS 403-1982 P30T-1 (45°)	
	Tool storage capacity		21 Tools	
	Method of tool selection		random shortest path	
	Maximum tool mass		2 kg/tool (total mass: 22 kg) / 3 kg/tool (total mass: 33 kg)	
Motors	Tool changing time (cut to cut)		1,6 sec. (when 2 kg/tool is specified)	
	Spindle drive motor		5,5kw / 3,7kw	
Accuracy	Spindle direction positioning accuracy		0,006/300 mm	
	position repeatability +/-		0,002	
Standards	Control unit FANUC series 31i-A5	16 additional I/O	Retraction for rigid tapping	
	Basic controlled axes 3axes (X,Y,Z)	Multi language display	Sub programm call (M98/M198/M99)	
Options	Simultaneously controlled axes (3 axes)	Compensation of thermal displacement (XYZ-axis)	Custom macro B (G65,G66/G67)	
	Dual check safety	Background editing	Canned cycles for drilling (G73,74,76,81~G89/G80)	
	HRV control / High speed HRV control	Extended part program editing	Coordinate system rotation (G68/69)	
	Rapid traverse bell-shaped acceleration/deceleration	Coordinate system selection (G92)	Circular interpolation by R programming	
	Optimum torque acceleration/decceleration	Workpiece coordinate system (G52-G59)	AI contour control I G05.1	
	Manual handle feed	Addition of workpiece coordinate system 48 pairs (G54.1)	Helical Interpolation	
	Part program storage length 1280 m (512 Kbyte)	Return to reference point (G28)	Skip function(G31)	
	Control unit incorporated type display unit with 10.4" color LCD	Playback	Multi- step skip (G31 P1~4)	
	Dynamic graphic display	Quick editor	Stroke limit check before move	
	Ethernet interface	Setup file	Stored stroke check 1	
	Memory card slot	Production control counter	Stored stroke check 2 (G22/G23)	
	RS232 Interface	Parameter back up function	Custom PMC	
	Directory display of Floppy disc or Memory card	Tool compensation memory C,D/H code, Tool geometry/wear)	Real time custom macro	
	Number of registerable programs (1000)	Rigid tapping M29	Manual Guide <i>i</i>	
	automatic intermitted lubrication			
	High column 100mm			
	Illumination			
	Center through coolant	Part program storage length 5120m (2048 Kbyte)	Interruption type custom macro (M96/97)	
	DIN tooling (DIN 69871-A30)	Single direction positioning	NANO smoothing	
	Double contact tooling BBT	Full keyboard (with alphabet key)	Programmable mirror image (G51.1/G50.1)	
High column 0/200/300 mm	Fast ATA Data server (1GB)	Scale and mirror function (G51,G50)		
High speed spindle 24,000min ⁻¹	cylindrical Interpolation (G07.1)	Polar coordinate command (G16/G15)		
Signal lamp (3 lamps)	NURBS Interpolation (G06.2)	AI contour control II		
Splashguard wide opening door: 730mm (α -T21iF)	conical/spiral interpolation	look ahead blocks expansion		
Splashguard wide opening door: 1100mm (α -T21iFL)	Multi language display	Tool length automatic measurement (G37)		
Automatic front door	Inverse time feed (G93)	High speed skip (G31)		
Automatic side door	Tool position offset (G45~G48)	Measurement cycle for manual guide		
Basic Top cover	Addition of wrkpiec coordinate system 300 pair	Additional I/O unit		
Full-closed Top cover	3-dimensional coordinate conversion (G68/G69)	Back up function for power failure		
Coolant unit (100 l/200 l)	Figure copy (G72.1,G72.2)			
Coolant unit with chip flush (100 l/200 l)	Additional controlled 1 or 2 axes			
Cleaning unit for tool taper shank	(simultaneously controlled 4/5 axes)			
Air blow for chips	5 axis function TWP and TCP (G68.2 and additional)			
Tool pot cover	Memory card	additional control options on request		
	Fast Ethernet board			
Installations				
Power source	Power supply	200VAC+10 to 15% 3-phase,50/60Hz+-1Hz or 220VAC+10 to -15% 3-phase,60Hz+-1Hz 10kVA		
	Compressed air supply	0,35 to 0,5 Mpa (0,5 Mpa is recommended)(gage pressure) 0,13m ³ /min(at atmospheric pressure)		
Machine size	Machine height	2,336+-10mm (if 100mm HC is specified)		
	Floor space	995 x 2,207 mm	1,565 mm x 2,027 mm	2,115 mmx2,027 mm
		Approx 1,950 Kg	Approx 2,000 Kg	Approx 2,100 Kg

High Speed control

Functions such as bell-shaped acceleration/deceleration, inposition width switching for rapid traverse/cutting feed, and rapid traverse overlapping optimize axis motion and reduce machining cycle time.

Optimal acceleration/deceleration

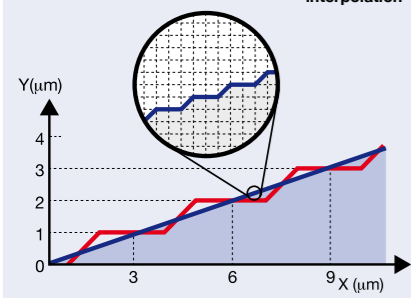
During positioning, acceleration/deceleration is optimally controlled according to the torque and speed characteristics of the motor. Making full use of the motor characteristics at a low speed reduces positioning (rapid traverse) time, resulting in reduction in machining cycle time.

HRV control

The latest and quick response servo motor a is series with an ultra-precision pulse coder of 16,000,000pulse/rev resolution is adopted. And a combination of HRV control, which are leading-edge digital servo/spindle control technologies, reduces possible servo delay and allows the least tracking error on high-speed machining.

Nano interpolation

1div=1nm



Nano-interpolation is ultra-precision interpolation which calculates a position command to be transmitted to the digital servo in nanometers (nm) even when the unit used for the command in the program is μm . Together with nano-feedback by the ultra-precision pulse coder with a resolution of 16,000,000 pulses/rev., nano-interpolation implements very smooth movement to improve the precision of machined surfaces.

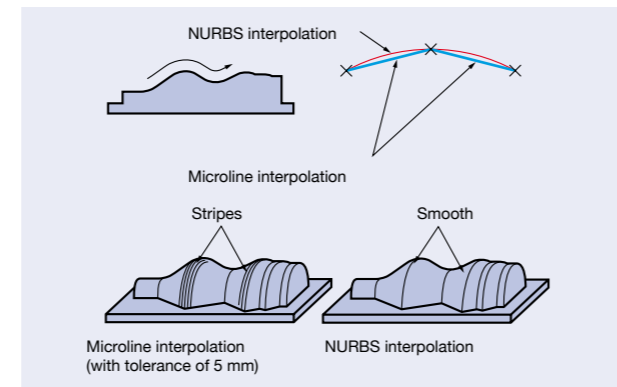
AI contour control II (option)

AI contour control II implements high-speed, high-precision machining by reading 200 blocks in advance for acceleration/deceleration control. The number of blocks to be read in advance can be increased, thereby enabling up to 1,000 blocks to be read in advance for acceleration/deceleration control. This enables high-speed, high-precision machining without feed-rate variations even for a program consisting of super-minute line segments. Nano-interpolation can be used to obtain smooth machined surfaces requiring little finishing.

NURBS interpolation (option)

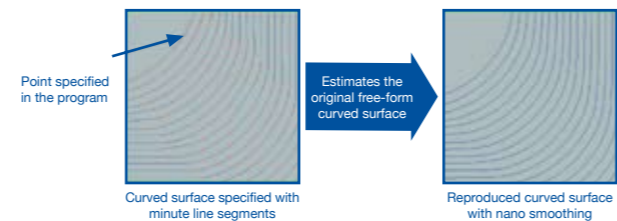
NURBS curves, which have become widespread as a method of representing free curves, can be specified in a program. High-precision interpolation is performed on each NURBS curve so that a smooth machined surface very close to the designed profile can be obtained. The size of a program can also be reduced as compared with that of a program consisting of minute straight line commands.

Note) CAM system for programming is required to support the NURBS interpolation



Nano Smoothing (option)

Nano-smoothing (option) From a program consisting of minute line segments created with a CAD/CAM system, the original curved surface is estimated as NURBS curves. The generated NURBS curves are interpolated in nanometers, so that a smooth machined surface close to the designed profile can be obtained, thereby reducing the number of hand finishing process steps.

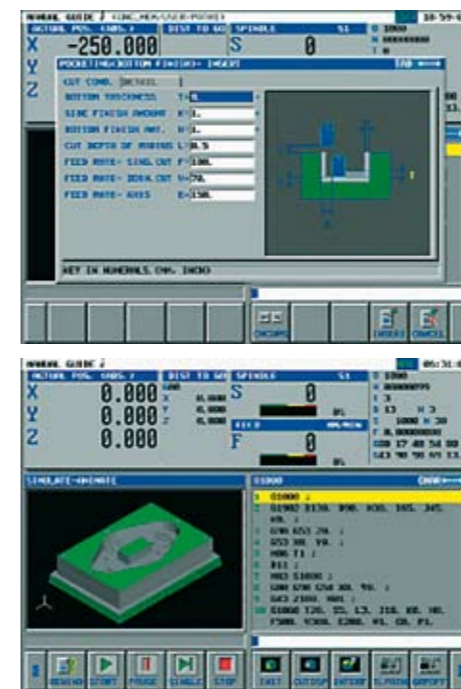


Fast data server (option)

The fast data server stores a huge machining program such as that for three-dimensional machining into ATA flash memory for high-speed machining. A program can be transferred simply using FTP communication. **CNC Programs stored on the ATA flash card can be edited.**

MANUAL GUIDE i

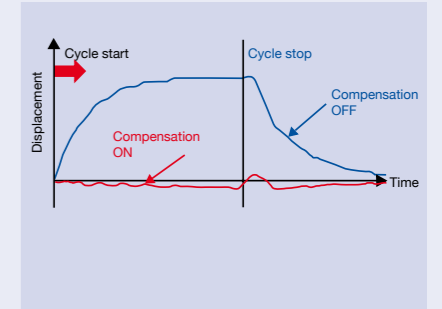
MANUAL GUIDE i can be used to perform all operations from creation of a program to machining on one screen simply. A conventional program using G codes can be created simply using a graphical menu guide. Hole position specification and pocketing can be entered simply without calculations. High-speed real animated simulation with a solid model allows simple machining simulation.



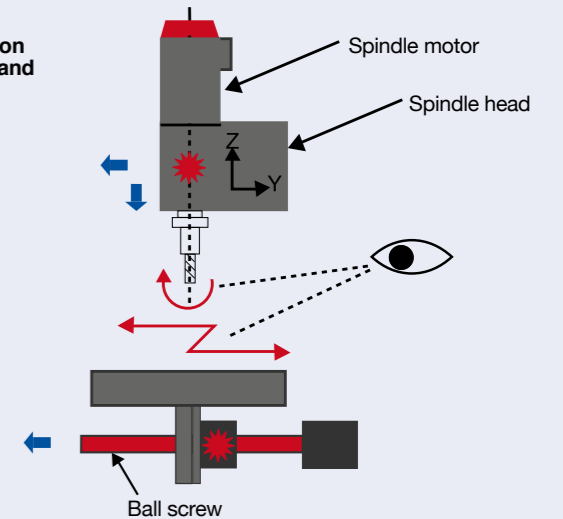
Measurement cycle for touch probe (standard)

AI thermal displacement compensation

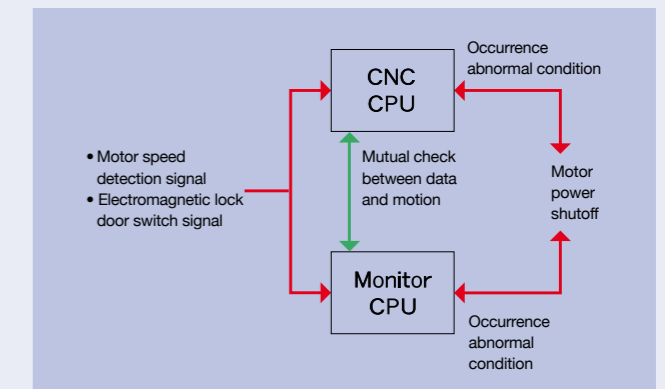
Compensation for thermal displacement is carried out at real time by monitoring the operation status of the spindle and feed axis and estimating an elongation along each axes. (The precision of compensation varies with the operating conditions.)



Monitor the operation status of the X-, Y-, and Z-axes and spindle



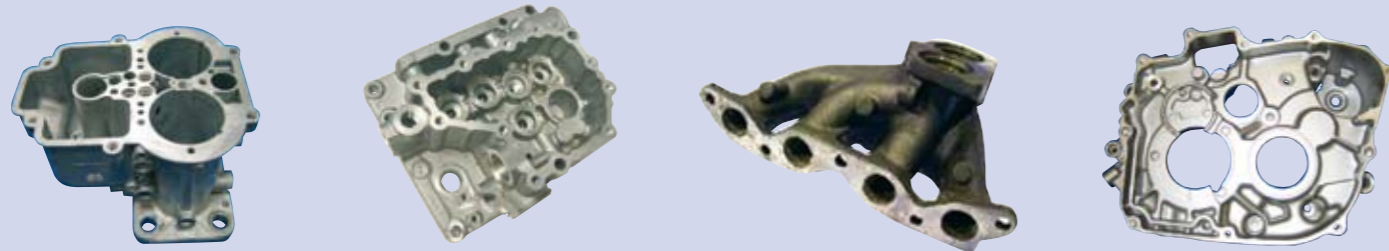
Safety



A dual check safety function is installed, which doubly monitors feedrate, position, and safety signals using two CPUs. Neither special operation nor waiting time for safety check is required. Together with the electromagnetic lock mechanism on each door, this function ensures the safety of the operators without reducing efficiency. The category-3 safety level defined in ISO 13849-1 is ensured.

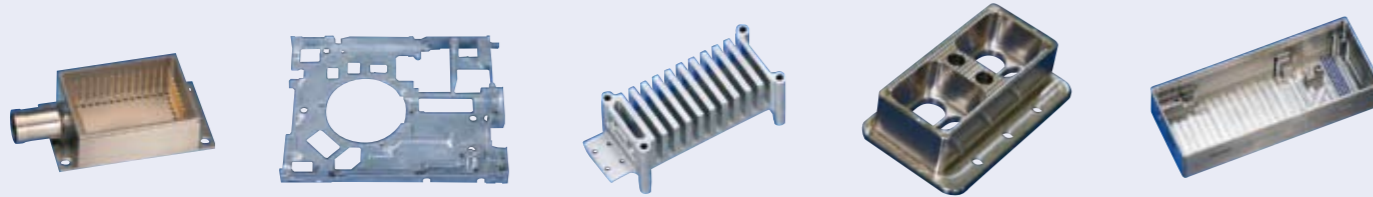
Auto parts machining

Highly rigid mechanism achieves heavy machining efficiently in milling, boring and side cutting. Multi-face machining and contouring makes auto parts machining easier.



Electrical parts and small parts

High speed axis feed, high speed spindle operation and optimal acceleration and deceleration control provides efficiency of machining and reduced cycle time. This series is also suitable for machining of electrical and small parts, from high-speed cutting of light metal such as aluminum to cutting of stainless steel.



3D-machining

High-speed and high-precision machining for resin models, electrodes, moulds and precision parts is possible with FANUC Series 16i high speed processing. NURBS interpolation NANO smoothing and super-minute line segment program provides smooth machined surfaces requiring little finishing, in a short time.



Watches, jewellery and medicine technology

Due to our precise high speed contouring and position repeatability the Robodrill is a well known machine in the watch and jewellery industry as well as in the medicine industry.



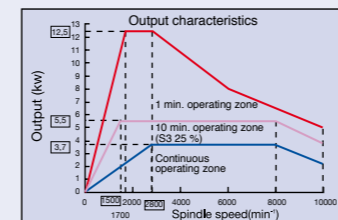
High-precision

High-precision indexing is made possible by using a close loop

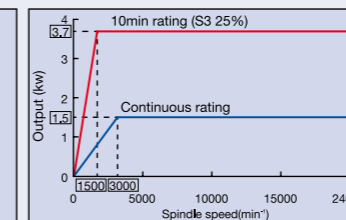
High speed and high power spindle

- Spindle is directly coupled with its motor.
- Least maintenance due to grease sealed bearings.
- The high speed and high precision ball bearing is used for the high-speed spindle. (Some of touch switches may not be used according to the type of it.)
- Output torque in the lower speed range that is effective for steel workpieces and/or large size hole drilling is enhanced by 32 % .

Spindle output (10,000 min⁻¹)



Spindle output (24,000 min⁻¹)



Spindle organization

Spindle	Coolant	BT tooling	DIN tooling	BIG-PLUS tooling
10,000 min ⁻¹	External coolant	Possible (BT30)	Possible (DIN69871-A30)	Possible (BBT30)
	Center through coolant			
24,000 min ⁻¹	External coolant	Possible (BT30)	Possible (DIN69871-A30)	Possible (BBT30)
	Center through coolant			

High speed rigid tapping

- Max tapping up to 8,000 min⁻¹ (at 24,000 min⁻¹ spindle) / 5,000 min⁻¹ (at 10,000 min⁻¹ spindle)
- Reduced tapping cycle time by quick extraction with override up to 20 times.

Superior performance for machining

Versatile machining is possible including drilling, tapping, milling and profiling.

A machining sample with 10,000 min⁻¹ spindle (*1)

Workpiece	Medium carbon steel	Aluminium alloy	Workpiece	Medium carbon steel	Aluminium alloy
Drill diameter	25 dia. HSS	30 dia. HSS	Tap size	M20 2,5	M27 3
Drill material			Tap pitch		
Spindle Speed S	318	637	Spindle Speed S	240	590
Feedrate F (*2)	80	319	Feedrate F (*2)	600	1770
Coolant	Water-immiscible cutting fluid	Emulsion type water-miscible cutting fluid	Coolant	Water-immiscible cutting fluid	Emulsion type water-miscible cutting fluid
Load meter %	175	180	Load meter %	6	

*1) Output torque in the lower speed range that is effective for steel workpieces and/or large size hole drilling is enhanced by 32%

Additional devices



Additional devices like measurement equipment can be easily configured due to the standard I/O device.

Simultaneous 4-/5-axis machining

- Additional 1-/2-axis control can be added to enable simultaneous contour control of up to 4 or 5 axes.
- High-precision indexing is made possible by using a closed loop.
- With the FANUC series 31i-MB, one or two additional axes can be added.
- An index table can be used to enable multi-surface machining.



Four-face machining using an additional axis



Three-dimensional contouring using two additional axes

Enhanced high speed and high acceleration spindle reduces machining cycle time significantly.

A machining sample with 24,000 min⁻¹ spindle (*1)

Workpiece	Medium carbon steel	Aluminium alloy	Workpiece	Medium carbon steel	Aluminium alloy
Drill diameter	20 dia. HSS	22 dia. HSS	Tap size	M16 2	M24 3
Drill material			Tap pitch		
Spindle Speed S	396	1012	Spindle Speed S	298	219
Feedrate F (*2)	40	253	Feedrate F (*2)	596	657
Coolant	Water-immiscible cutting fluid	Emulsion type water-miscible cutting fluid	Coolant	Water-immiscible cutting fluid	Emulsion type water-miscible cutting fluid
Load meter %	140	125	Load meter %	6	

(*1) Sample data may vary on machining conditions

(*2) Unit: mm/min

Robot solutions

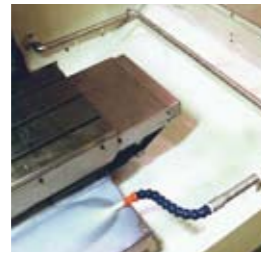
- With the robot operation screen of the ROBODRILL, you can operate a robot, open and close a robot hand, open and close an automatic side door and view the system status.
- Interlocking with safety consideration is incorporated in ROBODRILL.



Equipment for system configuration



Air blow for chips



Coolant unit with chip flush (spot gun provided)



Top cover



Coolant unit (tank)



Center through coolant



Rotary axes FANUC DDR 260i (direct drive)

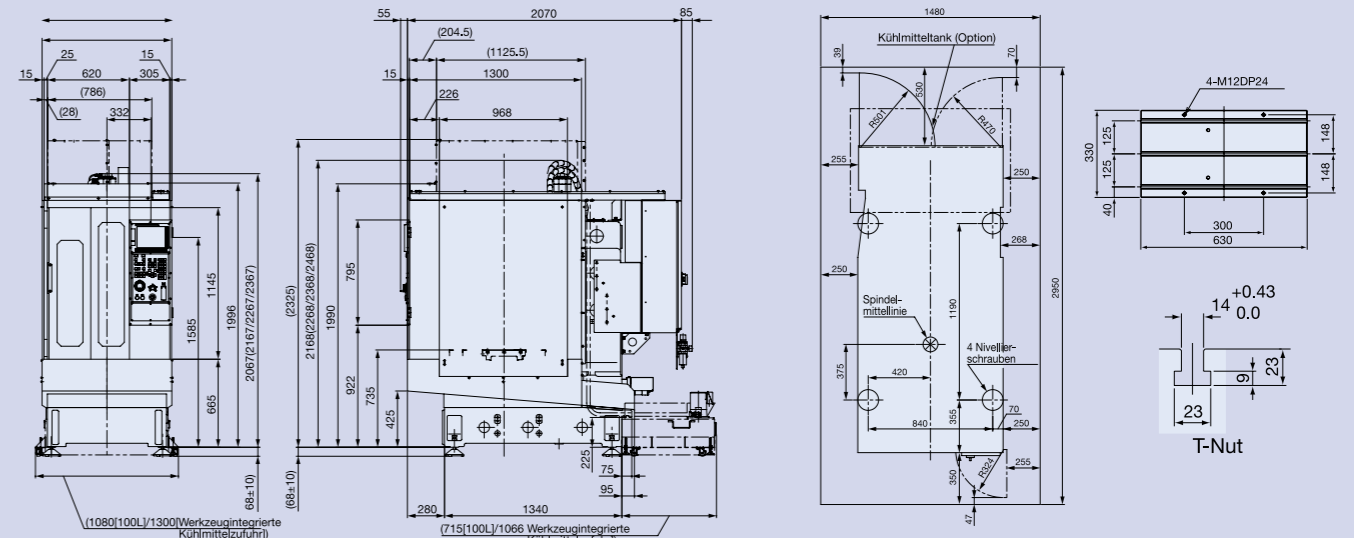


Signal Lamp

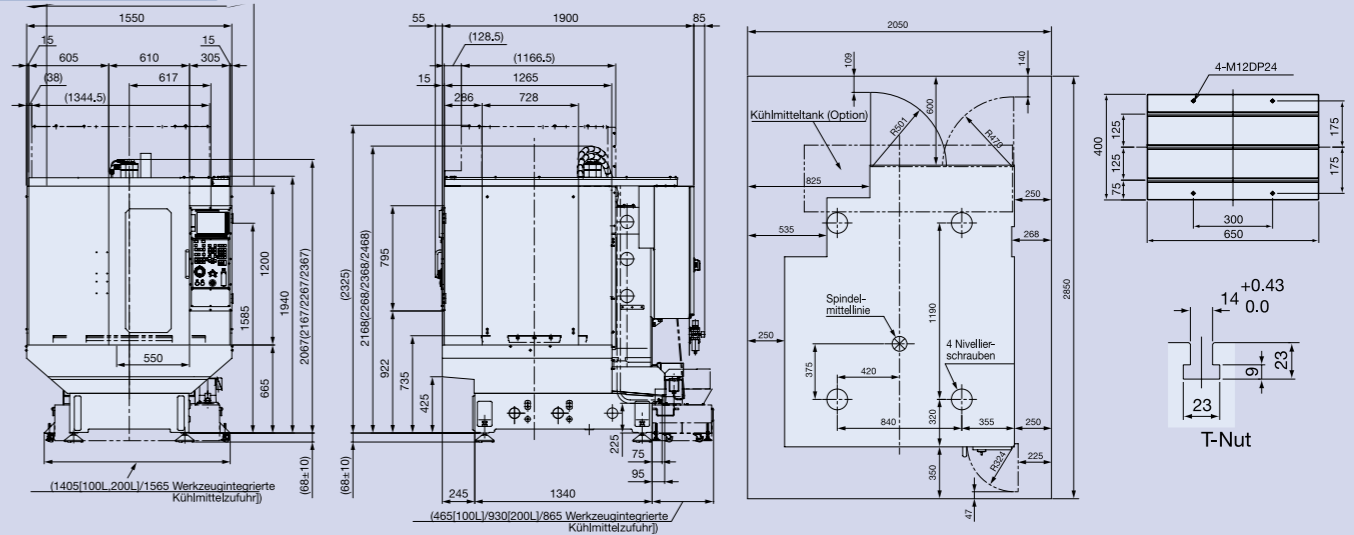


Automatic palletchanger for T21iF and T21iFL (palletsize 500(700)x390)

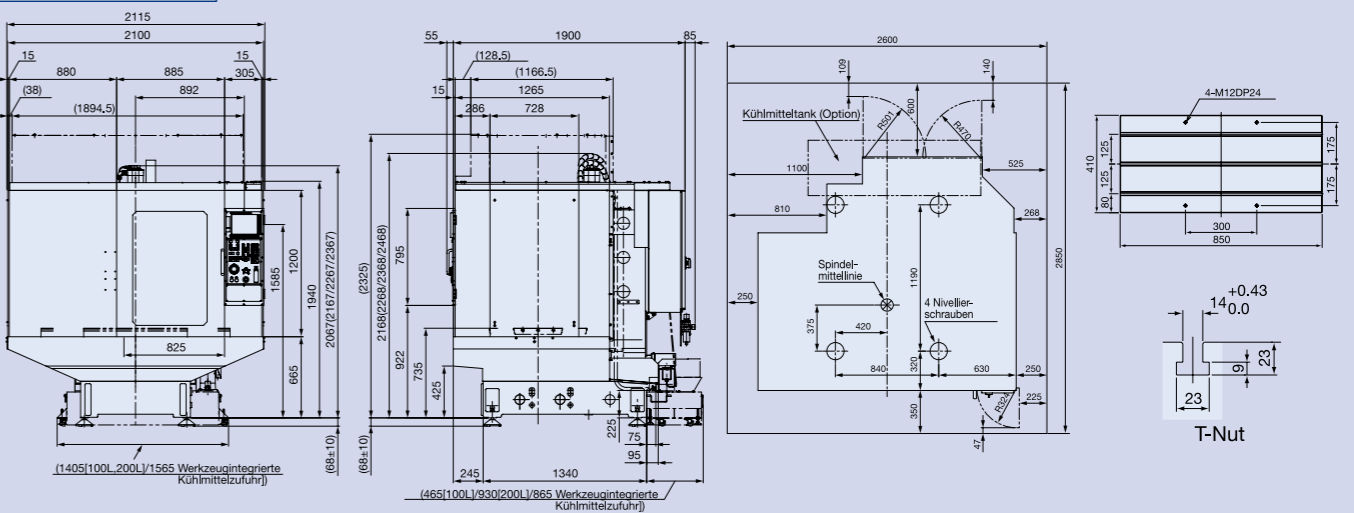
α-T21iFs



α-T21iF



α-T21iFL



FANUC

ROBODRILL

FANUC Robodrill sales service and support network

FANUC provides european after-sales service and support. Through subsidiaries, associated companies and sales partners. FANUC offers top-quality service with the fastest possible response from its nearest location.



FANUC ROBOMACHINE EUROPE GmbH

Bernhäuser Straße 22
73765 Neuhausen a.d.F.
Germany

Phone: +49 (0) 71 58-18 77 00

Fax: +49 (0) 71 58-18 77 10

www.fanucrobomachine.eu

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