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https://www.jtekt.co.jp

Type of Machinery: Machining Center
Model Number: FH630SX-5A

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5-axis Machining Center

FH SERIES   FH630SX-5A

JTEKT JTEKT CORPORATION

Koyo TOYODA
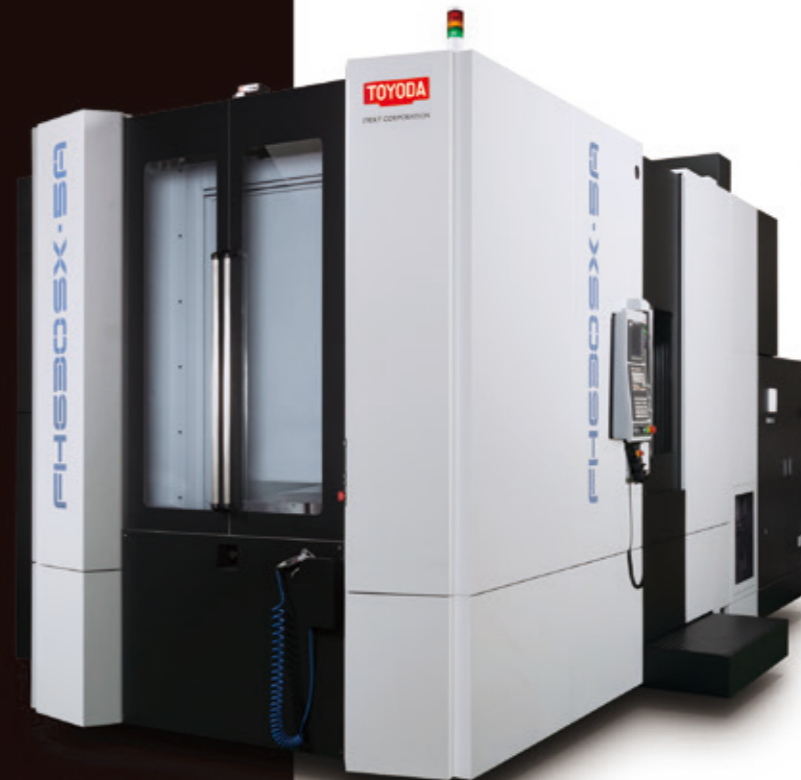
Supporting manufacturing with rigidity and size

Aerospace industry, energy-related industry, construction machine and transport machine

Top-level performance in machining medium-sized parts of every industry

This series performs simultaneous 5-axis machining - achieving complex shape parts and multi-surface processing all with one set-up.

This equates to reduced set-up time and shorter workpiece machining lead time.

The FH630SX-5A 5-axis machining center assures quality, improves production efficiency, and achieves high cost performance.

Highest level of workpiece loading capacity

Maximum workpiece swing, maximum workpiece height and maximum workpiece mass make this machine the largest in its class.

Cutting ability, the strongest in the class

From aluminum to titanium - the FH630SX-5A features a highly versatile 5 axis special-purpose spindle not limited to a single material.

"Bigger, More Rigid"

Achieving High-performance Processing of this versatile 5-axis Machine is

The Flexible Swivel Spindle
and the Highly Rigid, Supportive Platform

We adopted a tilting swivel motion for the spindle of the 5-axis processing machine. This spindle, which carries on the DNA of the JTEKT's unique highly rigid spindle, has enabled exceptionally efficient processing and achieved stable processing of large workpieces, thanks to the 5-axis structure that does not tilt the table.

Furthermore, the Platform, which supports this spindle, minimizes displacement from "external force" that affects processing accuracy. As a result, this is a strong, highly rigid Platform that can endure huge cutting forces in addition to the inertial force of feeding acceleration/deceleration.

An unmatched sturdy platform, utilizing the 5 axis function to the fullest.

Symmetric Y-axis movable body

With the Y-axis ball screw positioned on the center, the series features a symmetrically shaped Y-axis movable body, which reduces heat deformation due to temperature changes, and imbalance due to gravity - achieving stable feeding.

Back column system

By moving the X-axis with a saddle and sturdily supporting it with the stationary back column, the product has achieved excellent maneuverability thanks to a reduced weight of the movable body and high rigidity that can endure heavy cutting at the same time.
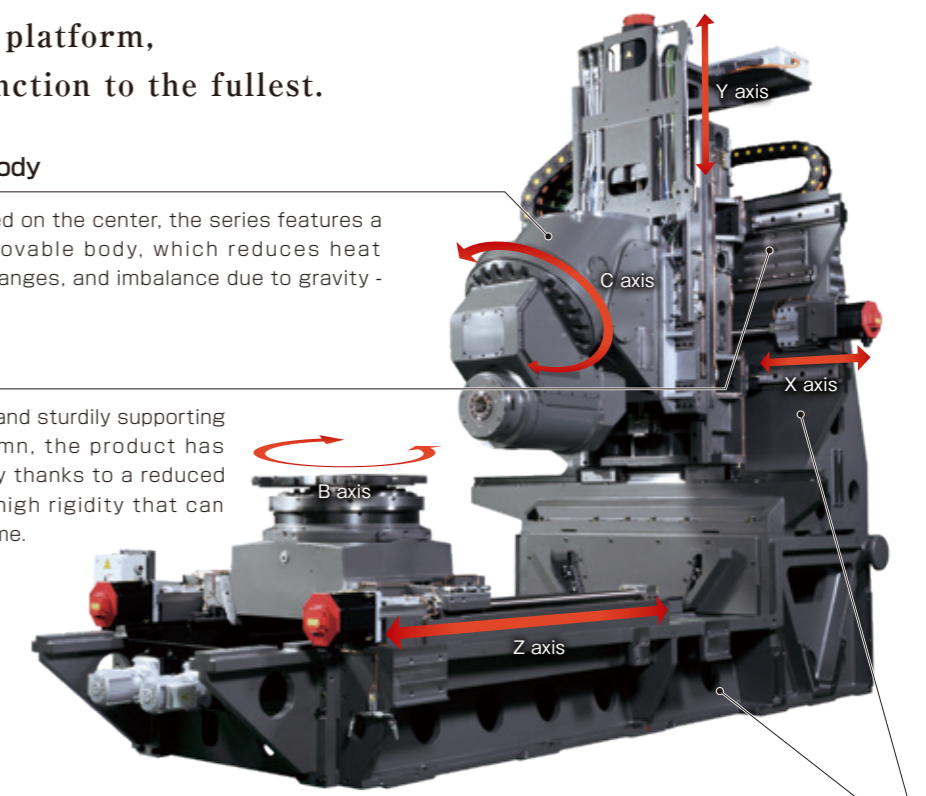
Highly rigid bed back column of high-class cast iron

The bed which supports movable bodies uses FEM analysis technology, securing sufficient rigidity and significantly enhancing the movable level. This has made stable axis feed possible.


Flexible Swivel Type spindle (C-axis unit)

With the adoption of the tilted swiveling spindle, large workpieces can be loaded on the pallet. The product has the swiveling axis (C-axis) on the spindle side, so the weight of workpiece does not affect it. Also, the inclined swiveling spindle, which rotates around the 100-mm tool length point, has the shortest travel distance of the straight axis associated with swiveling of the spindle. This allows for processing larger workpieces in one set-up.

-180°
-210°
C-axis swivel range: 230°
+20°
0°
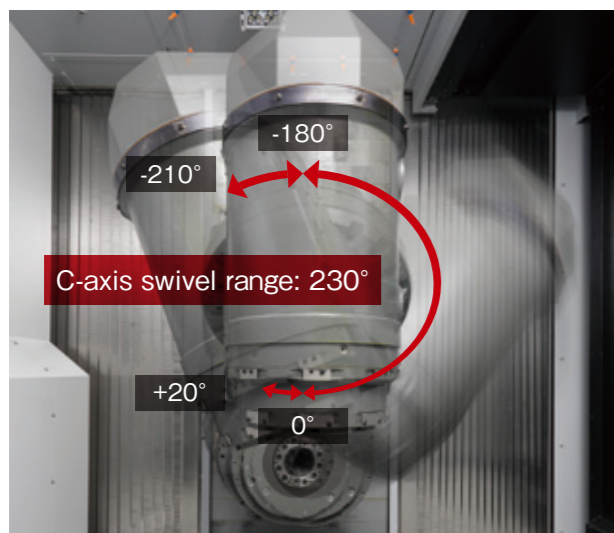
Excellent spindle accessibility

The product has excellent spindle accessibility with optimal axis positioning and sturdy machine rigidity. It can reach the position of 300 mm away from the center of the pallet when the spindle is in the vertical position, which provides a wide processing range.

Tool inclining range: 0° to 90°

200mm
300mm
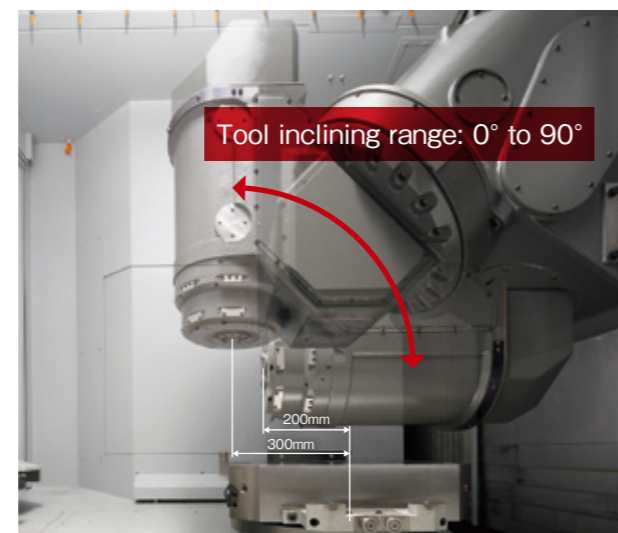
Workpiece maximum dimensions and mass

Φ1,170mm
Φ900mm
1,600mm
1,100mm
1,500kg
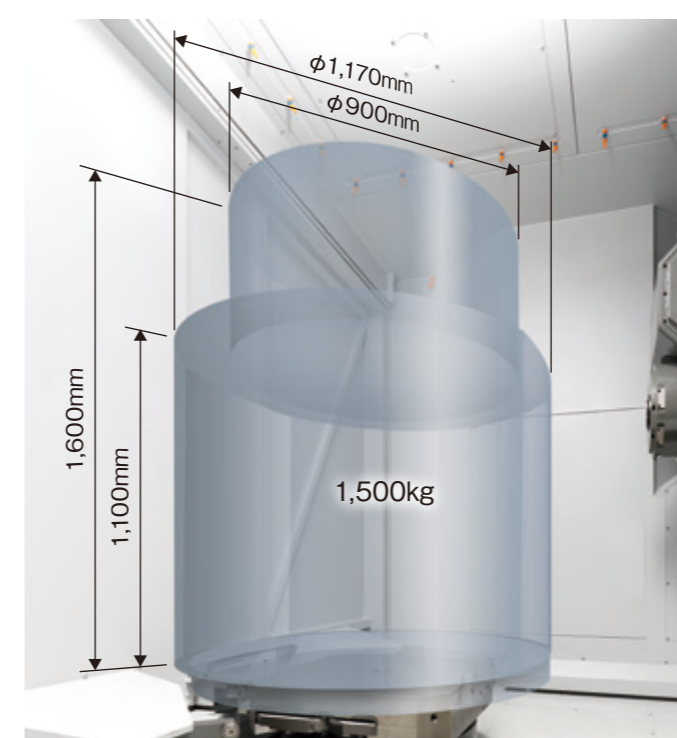
* The maximum dimensions of workpieces are partially limited. See the tooling document for details.

Rigid cylindrical roller slide

Compared to the ball guide, the cylindrical roller slide features less elastic deformation against loads and possesses superior vibration damping characteristics. This feature makes it possible to position quickly with smaller orientation changes upon sudden acceleration or stoppages, contributing to a higher level of production efficiency.

Because of JTEKT's assembling technology which allows for strict mounting face accuracies, the rigid cylindrical roller slide offers the best rapid feed rate and acceleration in it's class.

Rigidity

Improved by
2.2 to 2.7 times
(Comparison with ball guides)

■Damping capacity

(ms)

Good

	Ball	Cylindrical roller
Damping time	26	9

Y axis
C axis
X axis
B axis
Z axis
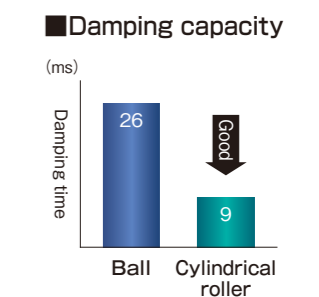
Each and every spindle is backed by its own specific type of outstanding technology.

Optimal for iron and cast metal machining 15,000min⁻¹ spindle [standard] / 8,000min⁻¹ spindle **Option**

[Spindle speed] 15,000min⁻¹ / 8,000min⁻¹

[Spindle nose shape] BT No. 50

[Spindle motor (short-time/continuous)] 55/37kW / 80/55kW

[Max. torque] 526N·m / 1,088N·m

[Spindle diameter (front bearing bore)] φ120mm

We offer the 15,000-min⁻¹ spindle, which is the high speed / high rigidity multi-use type covering a wide range from iron materials processed at low and medium speeds, to aluminum materials processed at high speeds and a high feed rate. We also provide the high torque 8,000-min⁻¹ spindle, which adopts large diameter ceramic ball bearings that can handle heavy cutting of difficult-to-cut materials with a high load capacity.

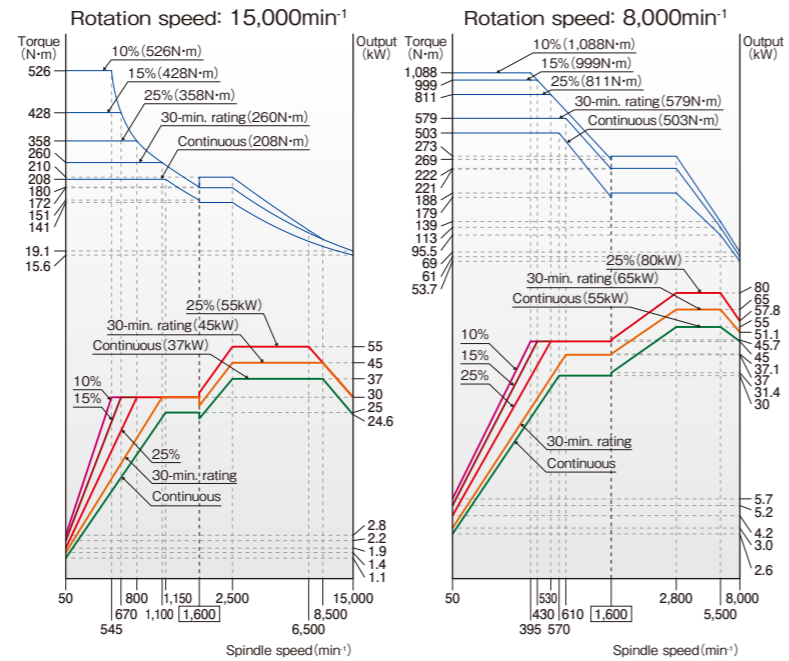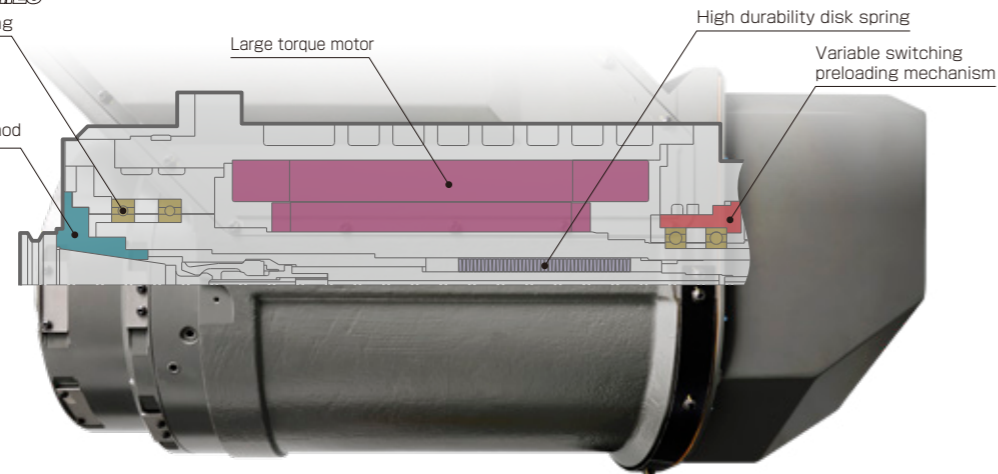**High Ability BALL BEARING SERIES**

4-row ceramic ball bearing (Front side, rear side)

Spindle taper cap replacement method

Large torque motor

High durability disk spring

Variable switching preloading mechanism

High-efficiency machining with 15,000min⁻¹ spindle

■Test piece

[Workpiece material] S45C

■Milling

[Tool] φ125 face mill

[Spindle speed] 800min⁻¹

[Feed rate] 2,240mm/min

[Depth of cut/width] 4.2/100mm

[Machining efficiency] 941cm³/min
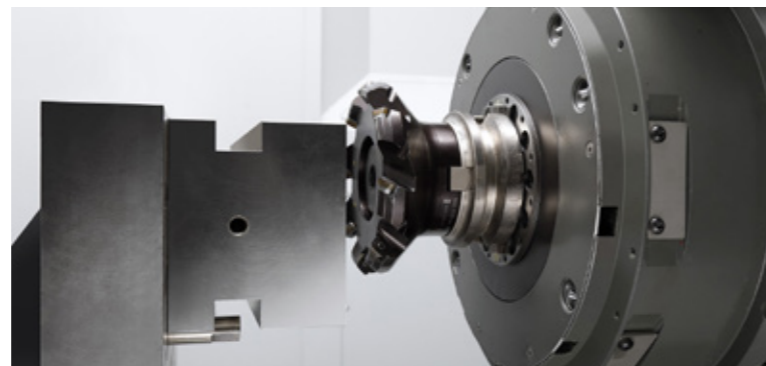
DD table

The high speed indexing and high precision machining, with the adoption of the high-torque DD (direct drive) motor, features no backlash and highly rigid cross roller bearings. The rotary encoder is included as a standard.

Pallet
Pallet clamper
Brake unit
Cross roller bearing
Direct drive motor

Table cross-section
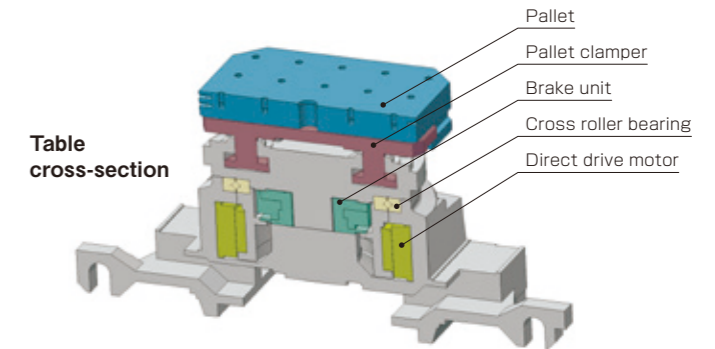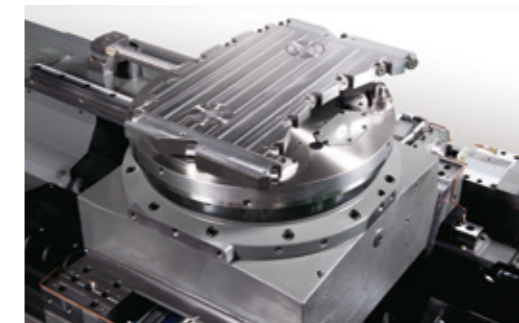
Reliability starts with chip disposal. The design of the Center trough makes it possible to effectively manage chip disposal directly beneath the cutting point.

2 Chip conveyor

3 External nozzle coolant

4 Overhead shower coolant

6 Spindle-through coolant 1MPa/3MPa/7MPa **Option**

7 Coolant supply unit with take-up chip conveyor

8 In-machine oil pan chip flow coolant

1 Center trough

Smoothly processing machining chips with a large chip discharge port in the bed center.

5 X-axis protective cover against chips

The bellow cover with the independent stainless steel plate on both left and right sides excels in maintainability and exchangeability while achieving high sealing performance and durability.
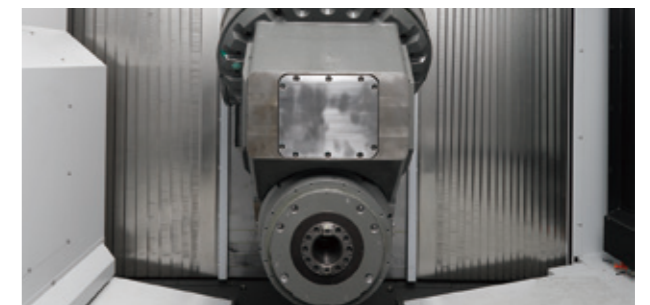
TIPROS

An easy to use, comprehensive production system that keeps on evolving.

JTEKT has delivered many systems since the first FMS sold in 1972 and has come to be seen by both domestic and overseas customers as an innovative company offering high reliability while exceeding industry expectations, and as such, indispensable in the FA era. At JTEKT, we manufacture the best FMC/FMS by combining our original thorough mechatronics technologies with cutting-edge software modules - delivering numerous records.

Hardware
■Flexible machine tool supports high speed, high efficiency and high precision
■Intelligent peripheral units

Software
■Flexible control functions ■Enriched unmanned operation support functions
■Superior control functions

FPA: Flexible Pallet Automation (pallet transfer method)
Expandability and unmanned operation

FDT: Flexible Directly Transfer (workpiece transfer method)
Low-cost unmanned operation of low-variety, high-volume production

RGV (rail-guided vehicle) + stacker crane

Robot method

The 5-axis machine shares the same system setup as that for the 4-axis machine

The pallets, pallet height, and workpiece restrictions (swing x height x mass) are common to the existing □ 630 (FH630SX-i). This allows for easy connection to the existing FMS. Flexible in compatibility for various production patterns.

1 FH630SX-5A
2 Existing □ 630 machine (FH630SX-i)
3 Pallet conveyance equipment
4 Buffer station
5 Setup station
6 FA control equipment

■FH630SX-5A · · · 1 unit
■FH630SX-i · · · 3 unit

FMS software for TIPROS FPA (CL30, MG30, TL30)

Data setting is possible with a simple click. Workpiece tshat are behind schedule are displayed in red. The machine automatically decides which fixtures in the line need replacing with the schedule.

		Stacker crane method, carrier method		
		FMS Level1 ▶	FMS Level2 ▶	FMS Level3
FMC software / PC type	[Transfer control] CL30	●	●	●
	[DNC control] MG30		●	●
	[Tool control] TL30			●

Option: Scheduling, preventive maintenance, multiple-parts loading, etc.

Intuitive and easy to use

Directly specifying what is to be set

Pallet setting screen

Drag & drop

A visual part no. changeover setting

Click of the mouse

Completion timing is decipherable

Scheduling by equipment

Scheduling by work

Easy fixture management

Abundant pallet types

Type 1 piece
Type 2 Multiple pieces
Type 3 4 faces, 1 piece
Type 4 4 faces, 2 areas
Type 5 4 faces, 4 areas
Type 6 Free
Type 7 Fixture replacement (fixed fixture base)
Type 8 Jig base change

Automatically deciding fixture replacement

Jig A   Jig B

Machine specifications

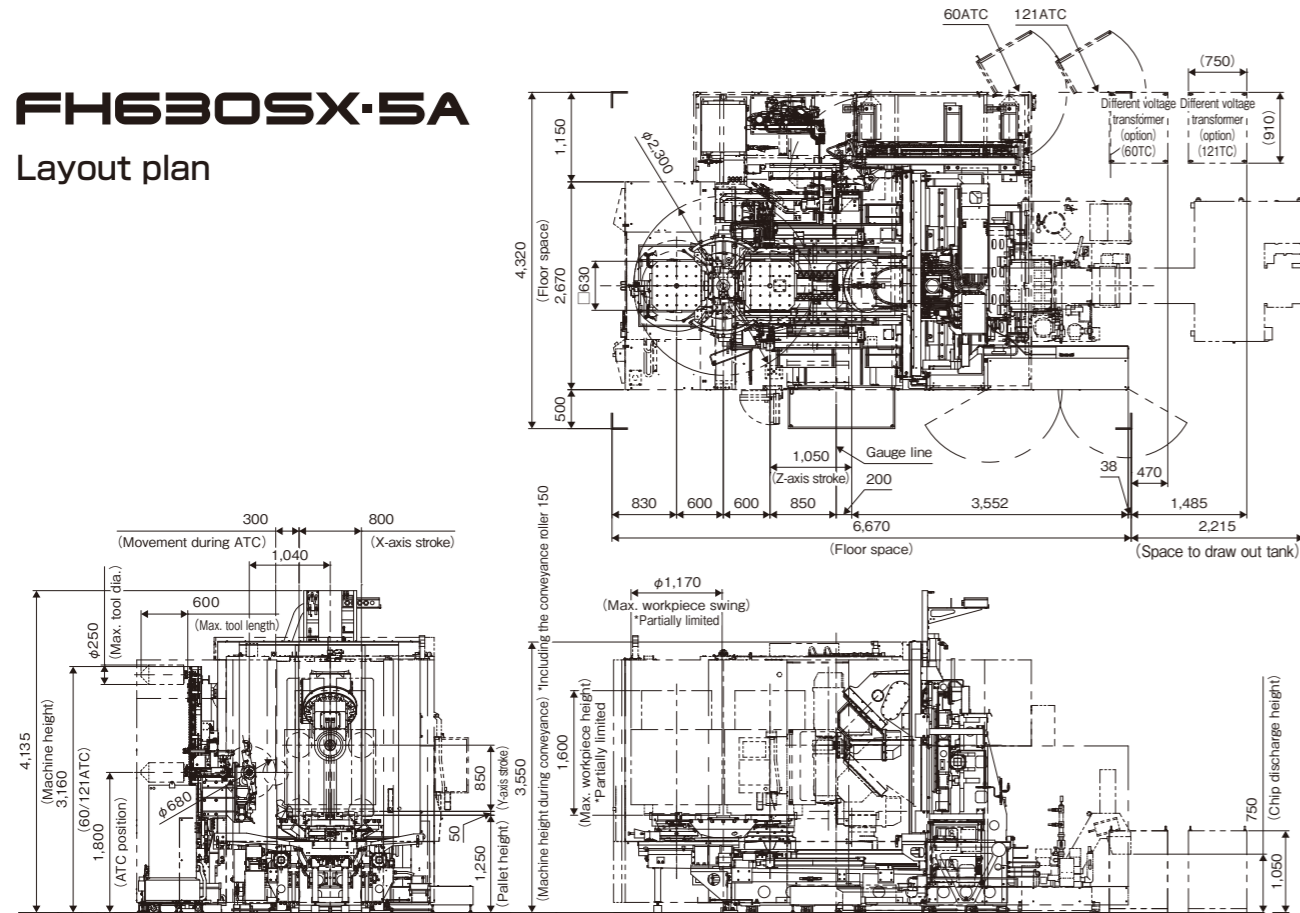| Item			Unit	FH630SX-5A	
				Standard specifications	Special specifications
Table (B-axis) & Pallet	Table dimensions (pallet dimensions)		mm	630 × 630	
	Rotary table indexing angle		°	0.0001	
	Pallet height (from floor)		mm	1,250	
	Loading mass on the pallet		kg	1,500	
	Table indexing time (90° indexing)		sec	1.0	
	Pallet change time		sec	20	
Spindle swiveling (C-axis)	C-axis indexing angle		°	0.0001	
	C-axis swiveling center tilted angle		°	45	
Stroke	X-axis		mm	800 (+300_ATC stroke)	
	Y-axis		mm	850	
	Z-axis		mm	1,050	
	C-axis		°	-210〜+20	
	Distance from spindle center to pallet upper face (When the spindle is horizontal)		mm	50〜900	
	Distance from spindle endface to pallet upper face (When the spindle is vertical)		mm	150〜1,000	
	Distance from spindle endface to table center (When the spindle is horizontal)		mm	-200〜+850	
	Distance from spindle center to table center (When the spindle is vertical)		mm	-300〜+750	
	Max. workpiece swing × Max. workpiece height		mm	φ1,170 × 1,600 *1	
Feeds	Rapid feed rate	X-, Y-, Z-axes	m/min	60	
		B-axis	°/min	14,400	
		C-axis	°/min	10,800	
	Cutting feed rate	X-, Y-, Z-axes	m/min	0.001〜30	
		B-axis	°/min	1〜14,400	
		C-axis	°/min	1〜10,800	
	Ball screw diameter		mm	φ45 (X, Z), φ50 (Y)	
Spindle	Spindle speed		min⁻¹	50〜15,000	50〜8,000
	Spindle diameter (front side bearing inner diameter)		mm	φ120	φ120
	Spindle nose shape			BT No.50 Big+	HSK-A100
	Spindle motor short time / continuous		kw	55/37	80/55
ATC	Tool holding capacity		tool	60	121
	Tool selection			Absolute address	
	Tool (dia. × length)		mm	φ120 × 600 *2	
	Tool mass		kg	27	
	Tool change time (Tool to Tool)		sec	3.1 (〜15kg), 3.5 (15〜27kg)	
	Tool change time (Chip to Chip)		sec	5.8 (〜15kg), 6.2 (15〜27kg) *3	
	Tools	Holder		MAS BT50 Big+	CAT#50 Big+ / HSK-A100
		Pull stud		MAS P50T-1	
Dimensions & Weight	Floor space (width × depth)		mm	6,670 × 4,320 *4	
	Machine height		mm	4,135	
	Machine weight (Main unit only)		kg	22,000	
Various Capacities	Working oil		L	18	
	Slide lubricant		L	5	
	Spindle oil air		L	5	
	ATC lubricant		L	7.5	
	C-axis lubricant		L	13	
	Spindle / table coolant		L	70	
	Power supply capacity		kVA	89	102
	Power voltage		V	400	200
	Control voltage		V	DC24	
	Air source capacity		NL/min	900	
	Air source pressure		MPa	0.4〜0.5	
Capability & Performance	Positioning accuracy *5	X-, Y-, Z-axes	mm	±0.002	
		B-axis	sec	±3.5	
		C-axis	sec	±3.5	
	Repeatability *5	X-, Y-, Z-axes	mm	±0.001	
		B-axis	sec	±2	
		C-axis	sec	±2	

*1 Partial limitations exist for Workpiece swing × Height. For detail shape, refer to the tooling data.   *2 Partial limitations exist for Tool (diameter × length). For detail shape, refer to the tooling data.
* 3 For the M06 Q1. command. See the operation manual for details.   *4 For details, refer to the layout plan.   *5 According to our inspection method

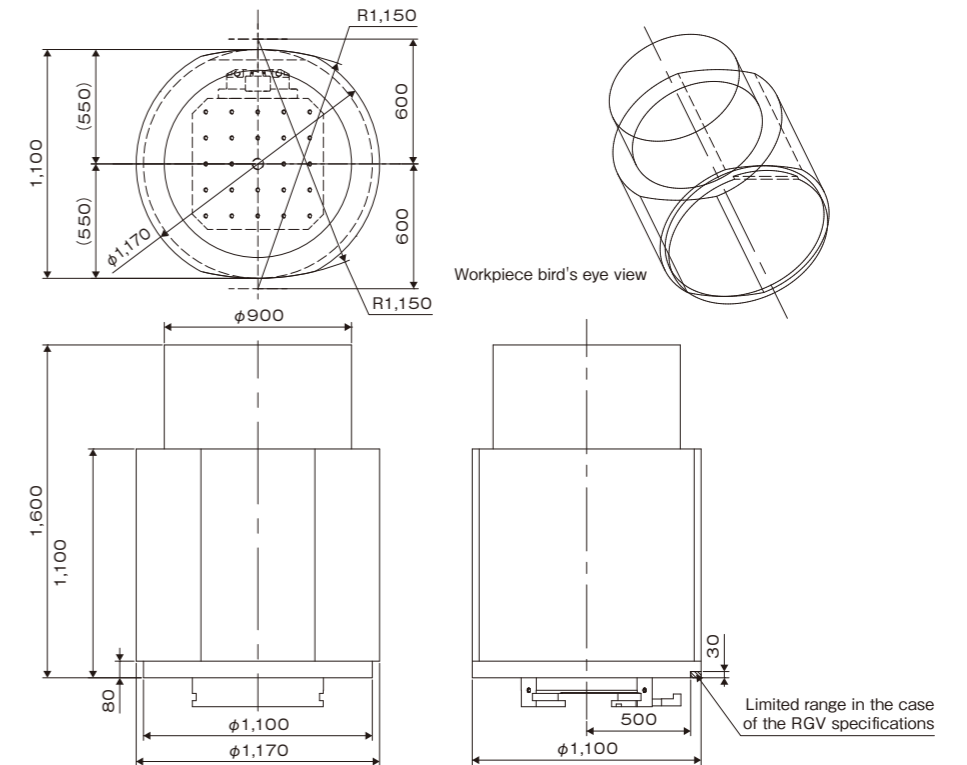## Accessories ● Standard accessories／□ Optional accessories

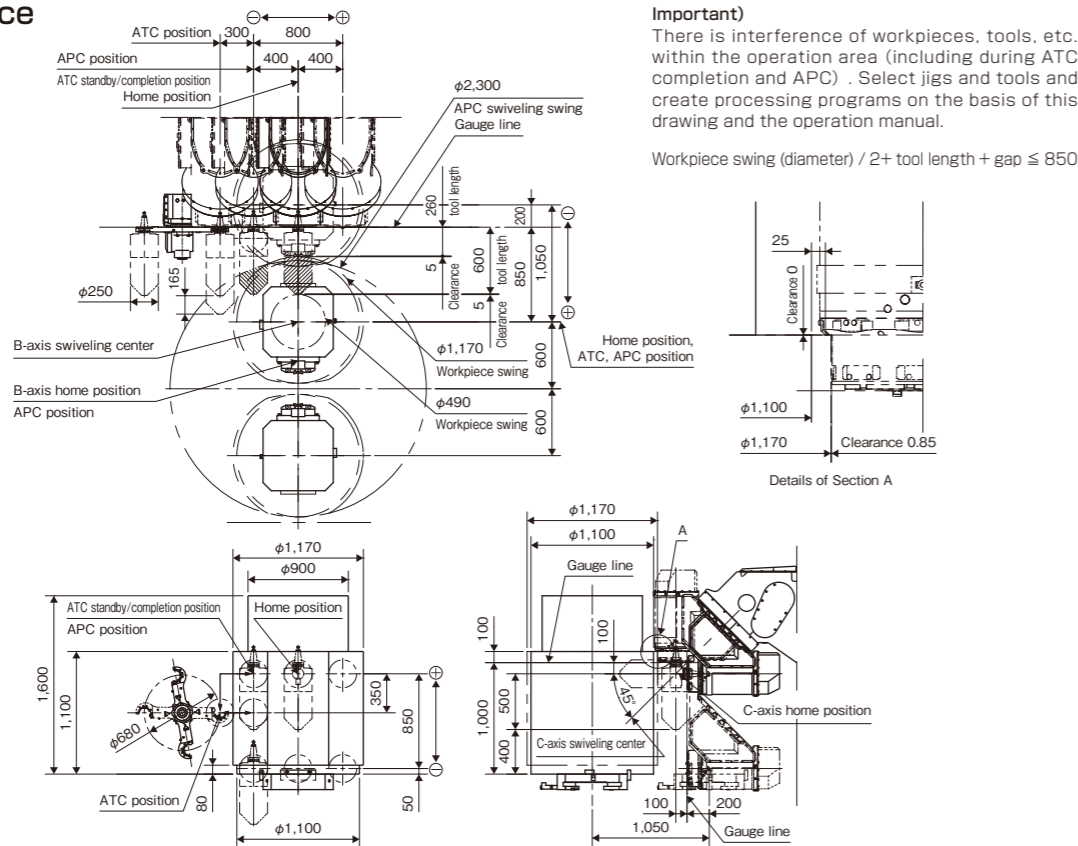| Item	Equipment name		Category
Table and pallet	Table	DD table (with encoder)	●
	Pallet	Standard pallet screw hole	●
		T-groove pallet	□
	Addition of pallet	Single piece screw hole	□
		Single piece T-groove	□
	Pallet changer (APC)	The pallet manual swiveling function is available	●
Spindle relations	Speed	15,000min⁻¹ BT50 Big+/CAT#50 Big+	●
		15,000min⁻¹ HSK-A100	□
		8,000min⁻¹ BT50 Big+/CAT#50 Big+	□
		8,000min⁻¹ HSK-A100	□
	Collet	MAS I	●
		MAS II	□
Spindle swiveling	Spindle swiveling equipment	Spindle swiveling equipment (with encoder)	●
Tool magazine	No of tools	60 tools	●
		121 tools	□
	Equipment for detecting broken tools in a magazine	Touch switch type	□
Coolant	Coolant supply unit	Coolant supply unit (water soluble/with take-up chip conveyor/scraper type/without spindle-thorugh coolant spec)	●
		Coolant supply unit (water soluble/with take-up chip conveyor/scraper type/spindle-thorugh coolant spec/1MPa through pump)	□
		Coolant supply unit (water soluble/with take-up chip conveyor/scraper type/spindle-thorugh coolant spec/3MPa through pump)	□
		Coolant supply unit (water soluble/with take-up chip conveyor/scraper type/spindle-thorugh coolant spec/7MPa through pump)	□
		Coolant supply unit (water soluble/with take-up chip conveyor/2-tank type/spindle-through coolant spec/1MPa through pump)	□
		Coolant supply unit (water soluble/with take-up chip conveyor/2-tank type/spindle-through coolant spec/3MPa through pump)	□
		Coolant supply unit (water soluble/with take-up chip conveyor/2-tank type/spindle-through coolant spec/7MPa through pump)	□
	External nozzle coolant		●
	Overhead shower coolant	External nozzle coolant and simultaneous discharge	●
		Individual discharge	□
	Internal chip flushing coolant		●
	Chip flow coolant in pallet changer		□
	Internal screw conveyor		●
	Coolant cooling		□
	Oil skimmer	Belt type	□
	Chip box		□
	Splash gun (at APC)		●
	Mist collector		□
	Air blower	Taper / center through air blow (spindle rotation not possible)	●
		Center through air blow (spindle rotation possible)	□
Splash guard	Enclosure guard		●
	Universal design cover		□
	Door interlock at operating position	Electromagnetic lock type	●
	APC door interlock	Electromagnetic lock type	●
	Magazine door interlock	Electromagnetic lock type	●
	Internal lighting		●
Electric control	Power voltage	400 V specification	●
		200 V specification (with 200 ⇒ 400 V step-up transformer)	□
	Cooler for control cabinet inside		□
	Ground fault interrupter		□
Support for high accuracy	Spindle / DD table chiller		●
	Scale feedback	X-, Y-, Z-, B-, and C-axes	●
Foundation	Anchor type	Chemical anchor * Please drill holes and purchase/place chemical anchors at the customer's premises.	●
		Drill anchor * Please drill holes and place drill anchors at the customer's premises. (We provide drill anchors.)	□

FH630SX·5A

Layout plan

60ATC 121ATC

Different voltage transformer (option) (60TC) Different voltage transformer (option) (121TC)

(750) (910)

1,150
φ2,300
4,320 (Floor space)
2,670
630
500

Gauge line
(Z-axis stroke)
1,050
200
830 600 600 850
6,670
3,552
38 470
1,485
2,215
(Floor space)
(Space to draw out tank)

300 800
(Movement during ATC) (X-axis stroke)
1,040
600
(Max. tool length)
φ250 (Max. tool dia.)
4,135 (Machine height) 3,160
(60/121ATC) 1,800
(ATC position)
φ680
850
50
1,250 (Pallet height)
3,550 (Y-axis stroke)

φ1,170 (Max. workpiece swing) *Partially limited
1,600 (Max. workpiece height) *Partially limited
(Machine height during conveyance) *Including the conveyance roller 150
750
1,050 (Chip discharge height)

Interference area

ATC position 300 800
APC position 400 400
ATC standby/completion position
Home position
φ2,300
APC swiveling swing
Gauge line

φ250
165
250 tool length 200
5 Clearance 5
600 tool length 850
1,050
B-axis swiveling center
φ1,170 Workpiece swing 600
B-axis home position
APC position
φ490 Workpiece swing 600

Home position, ATC, APC position

25
Clearance 0
φ1,100
φ1,170 Clearance 0.85

Details of Section A

φ1,170
φ1,100
φ900
ATC standby/completion position
Home position
APC position
1,600
1,100
φ680
350
850
ATC position
80
50
φ1,100

φ1,170
φ1,100
Gauge line
A
100
100
100
45
C-axis home position
1,000
500
400
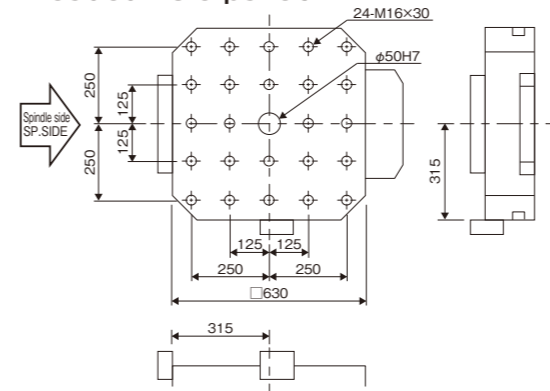C-axis swiveling center
100 200
1,050
Gauge line

Important)
There is interference of workpieces, tools, etc. within the operation area (including during ATC completion and APC). Select jigs and tools and create processing programs on the basis of this drawing and the operation manual.
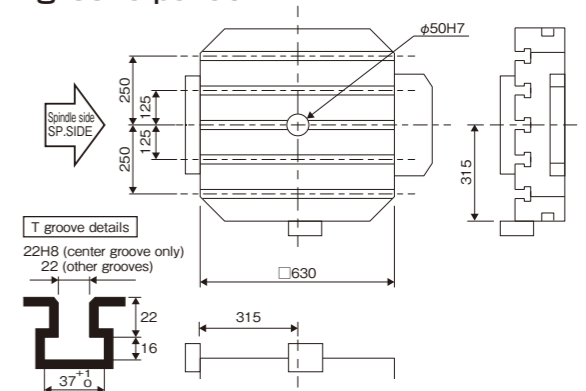
Workpiece swing (diameter) / 2+ tool length + gap ≦ 850

Maximum workpiece

R1,150
1,100
(550)
(550)
600
600
φ1,170
φ900
R1,150

Workpiece bird's eye view

1,600
1,100
80
30
φ1,100
φ1,170
500
φ1,100

Limited range in the case of the RGV specifications

●Additional limitations apply when the optional tool length measurement is added.

Threaded hole pallet

24-M16×30
φ50H7
250
125 125
Spindle side SP.SIDE
125 125
250
315
125 125
250 250
□630
315

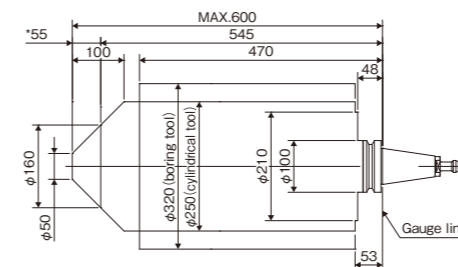●Pitch tolerance of M16 screw is ±0.2
●No alignment reference hole is provided for the edge locator.

T-groove pallet

φ50H7
250
125 125
Spindle side SP.SIDE
250
315
□630

T groove details
22H8 (center groove only)
22 (other grooves)
22
16
37 +1/0
315

●T-groove pitch tolerance is ±0.2
●No alignment reference hole is provided for the edge locator.

Limitations in tool holder shape
(JIS,CAT,DIN,Big+ #50)

*55
100
MAX.600
545
470
48
φ160
φ320 (boring tool)
φ250 (cylindrical tool)
φ210
φ100
φ50
100 200
53
Gauge line

● The tool holder is subject to shape limitations when performing ATC (Automatic Tool Change). Tools with a maximum diameter exceeding φ100 must have an outside diameter within φ100 of the 48 mm range from the gauge line. Within a 53 mm range from the gauge line, the outside diameter must by within φ210.
● The total mass must be 27 kg and the length from the gauge line must be within 600 mm.
  * Tool lengths of 545 mm or above are subject to limitations from the relation to the largest workpiece. Tool length must be as follows:
  (Largest workpiece swing (diameter))/2 + Tool length ≦ 1,130 mm

Item	Max. spec
Tool length	600mm
Tool diameter	With 40 or 60 tools magazine: φ120mm(with no limitations caused by adjacent tools)
	With 121 tools magazine: φ130mm(with no limitations caused by adjacent tools)
Tool weight	27kg: The moment at the spindle nose must be within 29N·m.
Tool imbalance	30 × 10^{-5}N·m or less (tools not exceeding 6,000min^{-1})
	10 × 10^{-5}N·m or less (tools between 6,000min^{-1} and 8,000min^{-1})
	3 × 10^{-5}N·m or less (tools exceeding 8,000min^{-1})

Tools with diameters exceeding those described above are subject to limitations in the diameter of adjacent tools in the magazine, key grood position of the tool holder and so on.

CNC unit FANUC 31i. ● Standard／□ Optional

Division	Name	FH630SX-5A
Axis control	Min. input increment（0.001mm）	●
	Machine lock	●
	Absolute position detection	●
	Inch/metric switch	●
Operation	Dry run	●
	Single block	●
	Manual handle feed 1 unit	●
	Program restart	●
	Manual handle interrupt	□
Interpolation function	Nano interpolation	●
	Positioning（G00）	●
	Exact stop mode（G61）	●
	Tapping mode（G63）	●
	Cutting mode（G64）	●
	Exact stop（G09）	●
	Linear interpolation（G01）	●
	Arc interpolation（G02, G03）	●
	Dwell（G04）	●
	Helical interpolation	●
	Reference point return（G28, G29）	●
	Second reference point return（G30）	●
	Third and fourth reference point return（G30）	●
Feed function	F1-digit feed	□
	AI contour control Ⅱ（pre-read 200 blocks）	●
Program entry	Local coordinate system（G52）	●
	Machine coordinate system（G53）	●
	Workpiece coordinate system（G54 to G59）	●
	Additional workpiece coordinate systems（48 sets）	●
	Additional workpiece coordinate systems（300 sets）	□
	Custom macro	●
	Additional custom macro common variables（#100 to #199, #500 to #999）	●
	Fixed drilling cycle（G73, G74, G76, G80 to G89, G98 and G99）	●
	Additional optional block skip（9 pieces）	□
	Automatic corner override	●
Spindle function	Rigid tap	●
Tool function	Tool corrections（99）	●
Tool correction function	Tool corrections（200）	□
	Tool corrections（400）	□
	Tool corrections（499）	□
	Tool corrections（999）	□
	Tool position offset	●
	Tool diameter and cutter radius compensation	●
	Tool length compensation（G43, G44 and G49）	●
Editing operation	Program storage capacity（128K bytes）	●
	Program storage capacity（256K bytes）	□
	Program storage capacity（512K bytes）	□
	Program storage capacity（1M byte）	□
	Program storage capacity（2M bytes）	□
	Program storage capacity（4M bytes）	□
	Program storage capacity（8M bytes）	□
	Number of registered programs（250）	●
	Number of registered programs（500）※Storage capacity 256K bytes compulsory	□
	Number of registered programs（1000）※Storage capacity 512K bytes compulsory	□
	Number of registered programs（2000）※Storage capacity 1M bytes compulsory	□
	Number of registered programs（4000）※Storage capacity 2M bytes compulsory	□
	Simultaneous multi-program editing（incl. background editing）	●
Data entry/display	Touch panel control	●
Communication function	Built-in Ethernet	●
Others	10.4" color LCD	●

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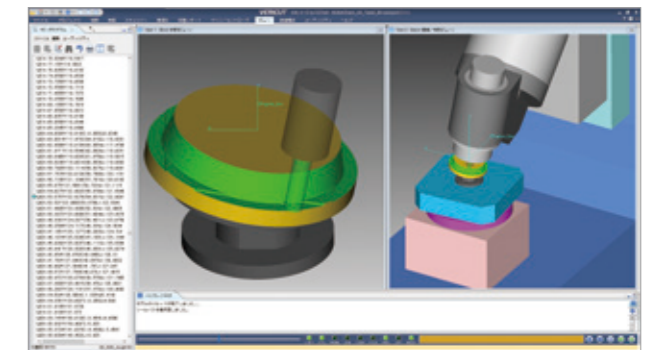
Program support

Mastercam
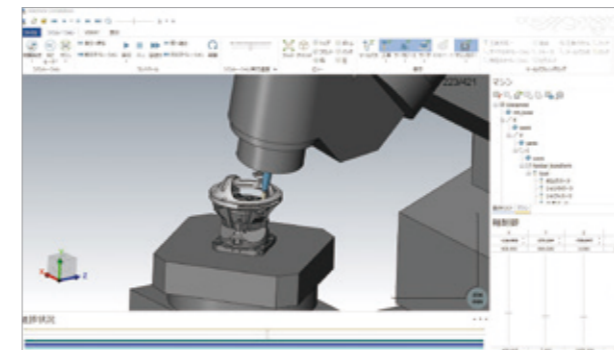
VERICUT

Creates a program by post processor development compatible with swivel spindle 5-axis machines.

Checks the program / interference in advance by means of simulation corresponding to spindle swiveling 5-axis machines.

Mastercam is the registered trademark of CNC Software, inc. in the U.S.

VERICUT is the registered trademark of CGTech.