

TOYODA

FH SERIES

Horizontal Spindle Machining Centers

FH630SX-i

JTEKT



<http://www.jtekt.co.jp>

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Type of Machinery: Machining Center
Model Number: FH630SX-i

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Koyo TOYODA



Supporting all forms of monozukuri
with rigidity and speed

Transportation machinery, agricultural machinery, construction machinery, energy-related, general machinery

Achieving top level machining of medium and large parts across all industries.

FH630SX-i is a machining center like no other which achieves both high speed performance and high rigidity machining.

■ Workpiece range,
the largest in the class

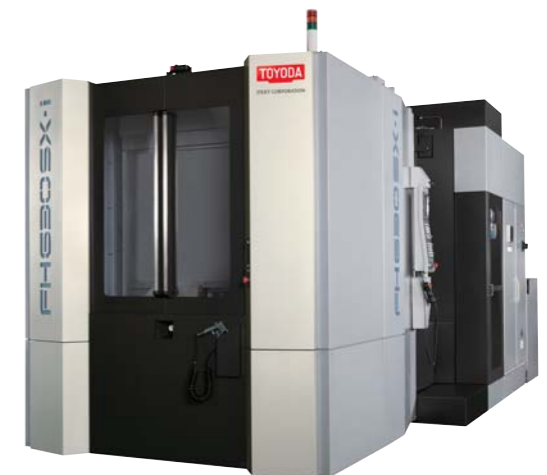
Maximum workpiece swing, maximum workpiece height and maximum stroke are realized to be the largest in the class.

■ Highest cutting performance
in its class

High-torque main spindle capable of highly effective machining of large-size parts of every material is equipped.

■ Best spindle accessibility
in its class.

The significant improvement in the degree to which the spindle can be accessed has made it possible to perform machining requiring rigidity with shorter tools.



FH630SX-i



	Maximum workpiece range	Maximum load on pallet	Stroke (X×Y×Z)
FH630SX-i	φ1,170mm×1,250mm	1,500Kg (op)	1,050mm×900mm×1,050mm



	Rapid feed rate	Tool changing time (C-C)
FH630SX-i	60m/min	3.6秒



**The newest and largest
New world of machining center**

In recent years, various responses are being advanced to solve the global environmental issues best represented by global warming. Amidst this, there is also a higher demand to make passenger vehicles (trucks), construction machinery, agricultural machinery and so on capable of equipping environmentally-responsive diesel engines and compact jets with good fuel efficiency. Moreover, against a backdrop of reusable energy, such as wind power, being promoted, the demand for equipment in petroleum and natural gas plants is expanding. In order to produce the medium/large parts of this equipment at high efficiency, machine tools with a wider machining range and high productivity than ever before are required.



**Boasting the best speed performance
in the class while maintaining rigidity**

In regards to the feed of FH630SX-I, column mass has been increased through extending the axis stroke and the pallet load has also been increased however we were still able to achieve the same rapid feedrate of 60m/min for all axis as the conventional models. Also, regarding the Y and Z axes which bear a large cutting load, the same dual drive configured from 2 ball screws is adopted however the bed, column, table and other major components which support these axes are in optimal rib arrangement through CAE in order to achieve sufficient rigidity. Moreover, the number of Y axis linear guide blocks was increased from the standard 4 to 6 and optimal arrange of the linear guide resulted in increasing rigidity of the Y axis main unit and shortening the distance between the table center and spindle endface, securing a large spindle protrusion amount.





The performance of the machining center depends on the Spindle.

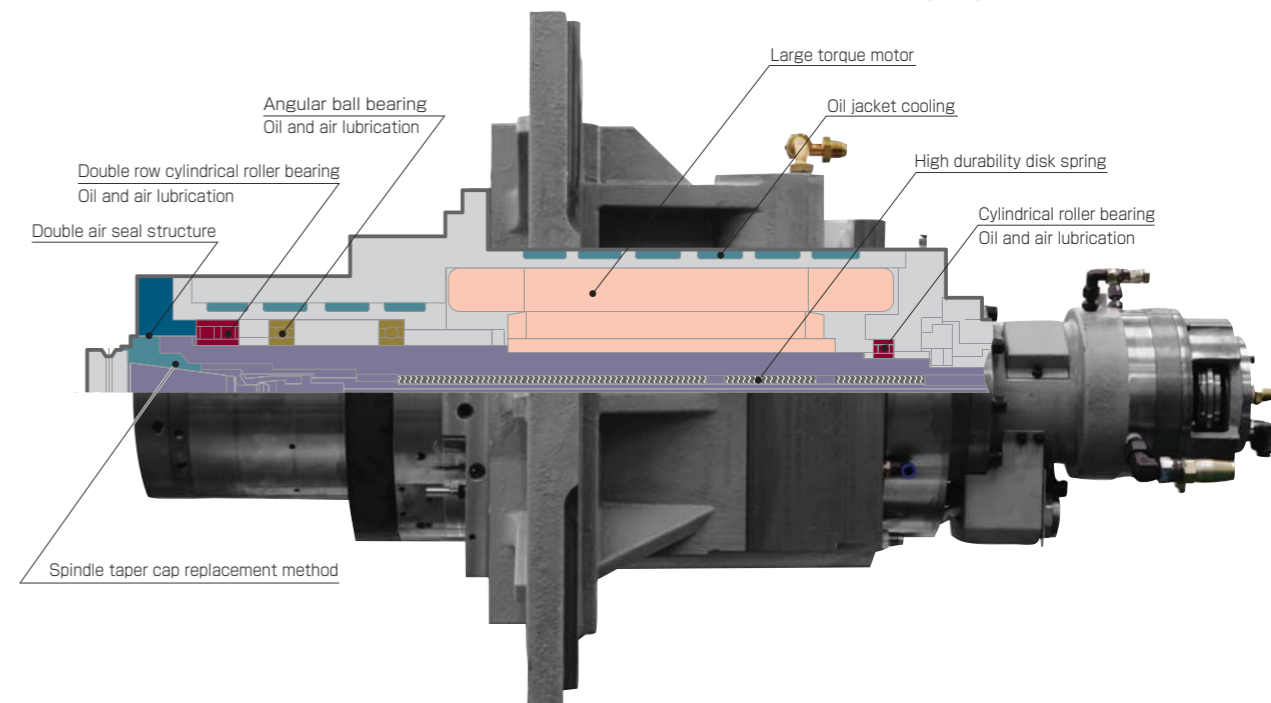
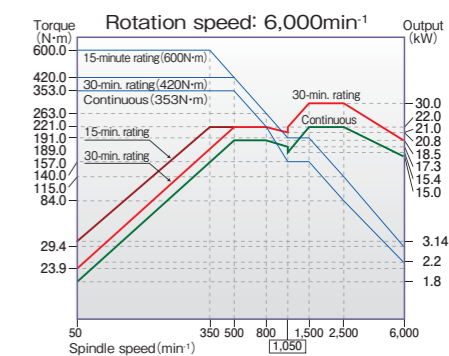
The spindle serves as a core of the machining center. JTEKT sticks to the spindle, which is important because it is located nearest the cutting point, to keep stable cutting accuracy.

Each and every spindle is backed by its own specific type of outstanding technology.

Standard spindle optimum for machining of iron and cast metals

- [Spindle speed] 6,000min⁻¹
- [Spindle nose shape] BT No.50
- [Spindle motor (short-time/continuous)] 30/22kW
- [Max. torque] 600N·m
- [Spindle diameter (front bearing bore)] φ110mm

Both axial and radial rigidity is sought after in spindles operating with large cutters. To satisfy both requirements, the 6,000min⁻¹ spindle is equipped with a double row cylindrical roller bearing on its front. This bearing has a large radial load capacity and is therefore able to withstand heavy duty loads and impacting loads.



High efficiency cutting of iron and cast metals

■ Elevator parts

[Workpiece material] FCD450

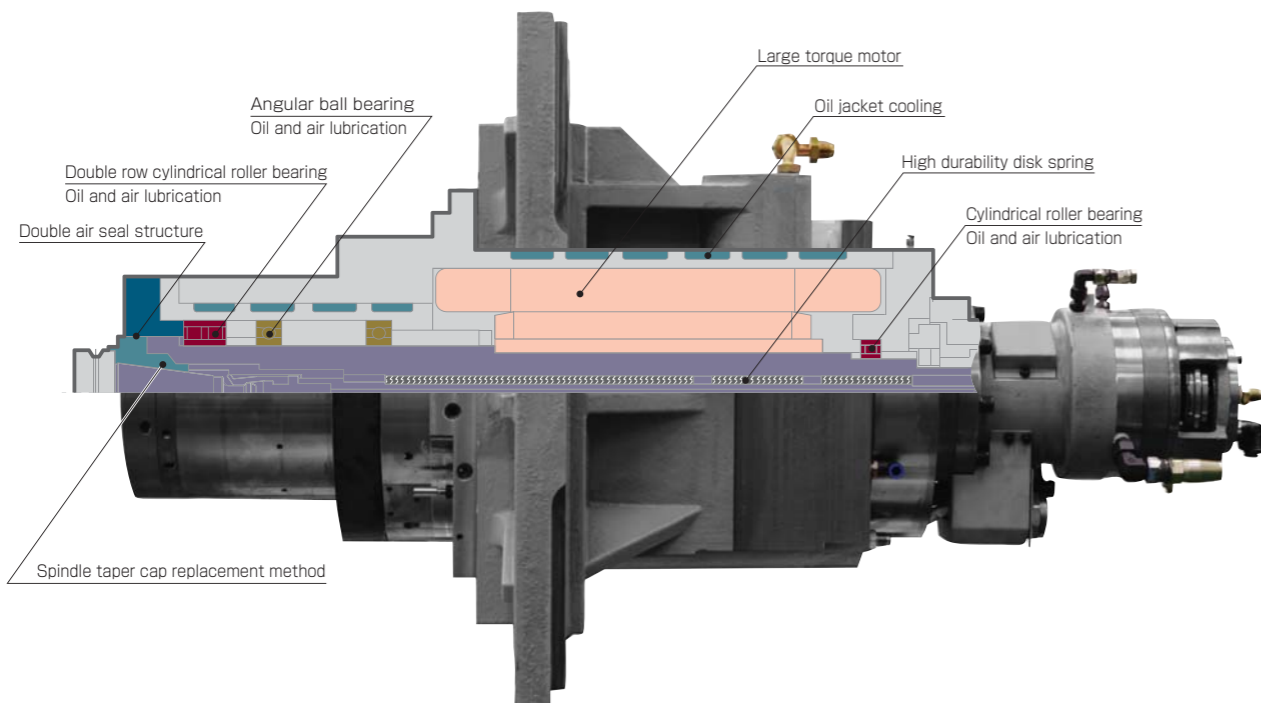
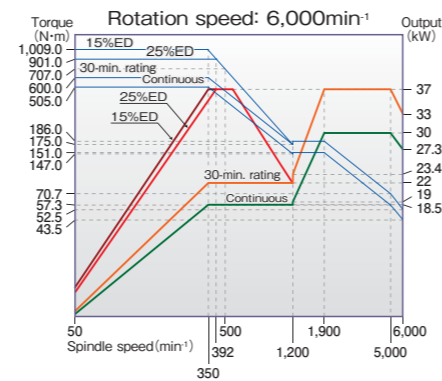
Milling
 [Tool] φ125 face mill
 [Spindle speed] 640min⁻¹
 [Cutting feed rate] 1,400mm/min

Boring
 [Tool] φ400 boring
 [Spindle speed] 80min⁻¹
 [Cutting feed rate] 30mm/min



Large torque spindle achieving the best performance in its class Option

Both axial and radial rigidity is sought after in spindles operating with large cutters. To satisfy both requirements, the 6,000min⁻¹ spindle is equipped with a double row cylindrical roller bearing on its front. This bearing has a large radial load capacity and is therefore able to withstand heavy duty loads and impacting loads. The spindle of 1009N·m high torque specification exercises its power in the large diameter face milling, large diameter boring and large diameter drilling & tapping of difficult-to-cut materials and large parts.



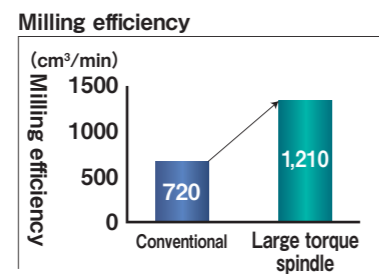
Best cutting performance in its class with a 1,009N·m large torque spindle

Model piece

[Workpiece material] S48C

Milling

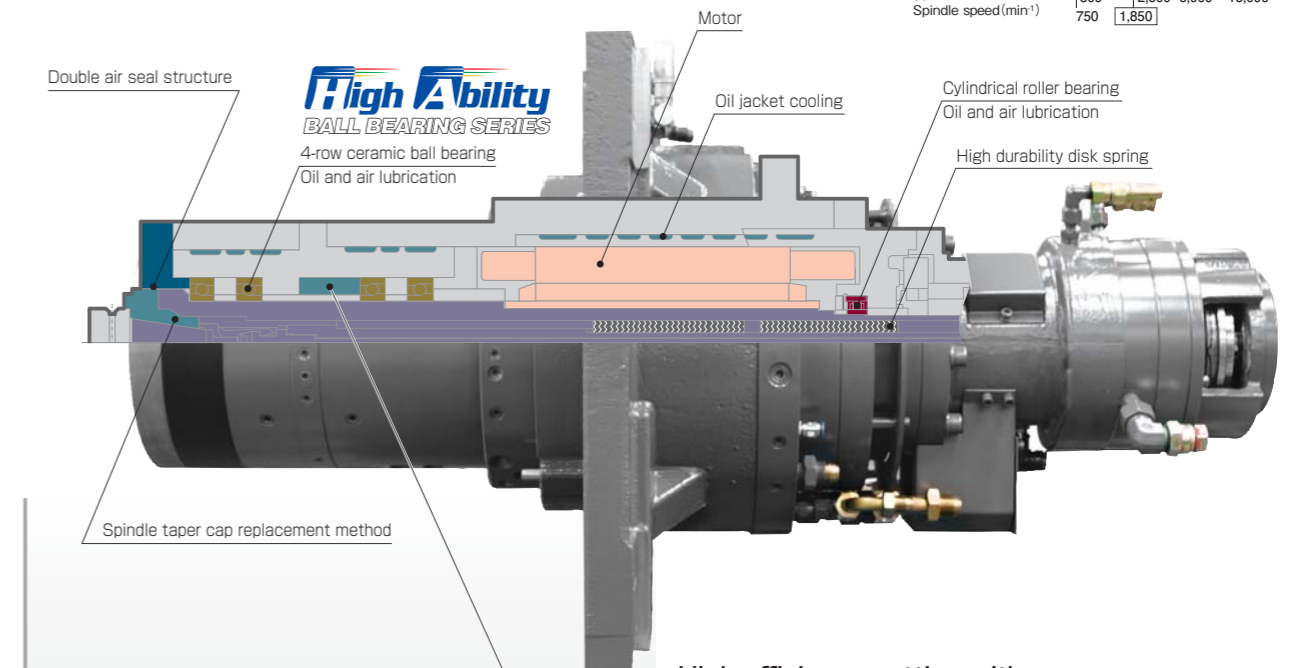
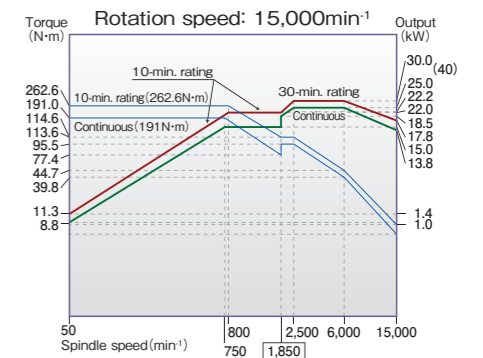
[Tool] φ125 face mill
 [Spindle speed] 600min⁻¹
 [Feed rate] 2,016mm/min
 [Depth of cut/width] 6/100mm



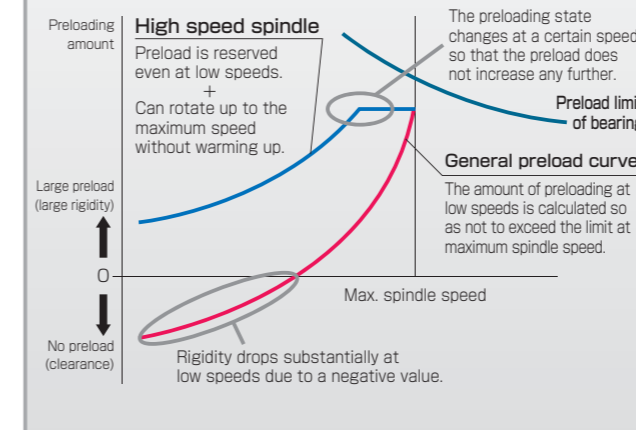
Wide-range spindle prided for high rigidity and rotation accuracy within a wide range of low to high speeds Option

[Spindle speed] 15,000min⁻¹
 [Spindle nose shape] BT No.50
 [Spindle motor (short-time/continuous)] 30/25kW
 [Max. torque] 262.6N·m
 [Spindle diameter (front bearing bore)] φ100mm

A wide-range spindle boasting high rigidity and rotation accuracy, covering a wide range of low to high-speed cutting. Supports a wide range of functions, from machining of raw materials to ball end mill finishing.



Variable switching preloading mechanism



High efficiency cutting with wide-range spindle

Cranksaft mold

[Workpiece material] SKD61 (45HRC)

Rough cutting

End milling
 [Tool] φ52 face mill
 [Spindle speed] 550min⁻¹
 [Cutting feed rate] 1,000mm/min

End milling
 [Tool] φ8 ball end mill
 [Spindle speed] 1,600min⁻¹
 [Cutting feed rate] 7,000mm/min

Finish cutting

End milling
 [Tool] φ8 ball end mill
 [Spindle speed] 5,000min⁻¹
 [Cutting feed rate] 500mm/min



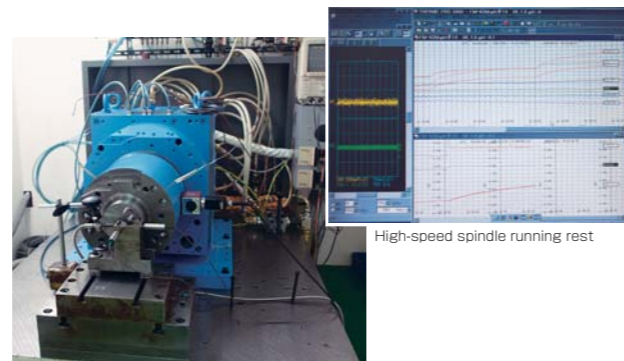
JTEKT's spindle promises assurance over a long period and takes maintenance into consideration.

JTEKT's dedicated spindle manufacturing

The spindle is the heart of the machining center, and as such it is manufactured under strict accuracy control. Confirmation checks look at dynamic balance, vibration, noise, and so forth, and, after ensuring all allowable limits have been maintained, the spindle is installed in the machine.



Dynamic balance measurement



High-speed spindle running test

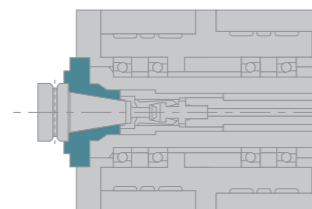
Basic design particularly focusing on low vibration.

A spindle vibration within 2 microns* has been accomplished (measurement with a 15,000min⁻¹ spindle).

We have developed a low vibration, high speed spindle which suppresses vibration and runout across the entire range up to the maximum speed. This feature contributes not only to the improvement of cutting accuracy but also to the extension of tool life.

The spindle taper cap replacement method takes ease of maintenance into consideration.

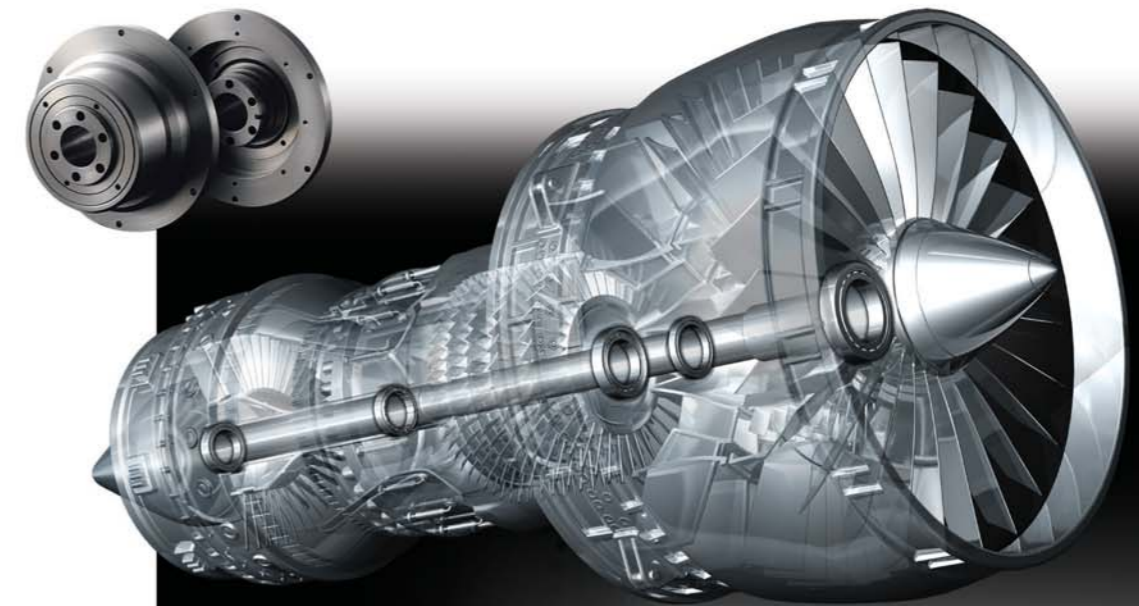
Even in the rare chance that a failure does occur, a replacement spindle cartridge that has been checked at JTEKT for operation and quality can be installed in its place, keeping restoration time down to a minimum. Furthermore, the separate spindle taper makes individual cap replacement possible as it is integrated with the taper, even in the event of taper damage caused by accidental interference.



* Not a guaranteed value

Technologies which have continuously supported the aerospace industry down through time are materialized in our machining center bearings.

We have been supporting the aircraft and aerospace industry for 30 plus years and our bearings are used in many of the jet engines manufactured in Japan. By providing the latest technology, we keep satisfying every rotation technology need from the ground to outer space. The technology cultivated over this period has been materialized in machining center bearings.



High Ability
BALL BEARING SERIES

High speed limit performance - 1.5 fold
Temperature increase - 30% reduction

In 1984, JTEKT were the first in the world to succeed in the practical use of ceramic bearings. Over the years since, we have gradually built up the processes such as design technology, precision and high-efficiency machining technology and mass production needed to use ceramic materials in roller bearings, and consequently now meet those factors such as speed, reliability and price demanded of machining center spindles.

The High Ability bearing is adopted in the 15,000min⁻¹ BT No.50 spindle.



A rigid **Platform** incomparable to any others assures stable production over a long period.

JTEKT's basic approach towards machine design is to minimize displacement caused by external forces that may impact on cutting accuracy. The rigid bed of the FH Series provides the answer towards withstanding large cutting resistance as well as inertial forces of feed acceleration and deceleration. --The immobile bed is placed as a solid stationary matter and moving bodies such as the column is light-weight but at the same time rigid-simple, yet requiring high level analysis techniques and material technology.

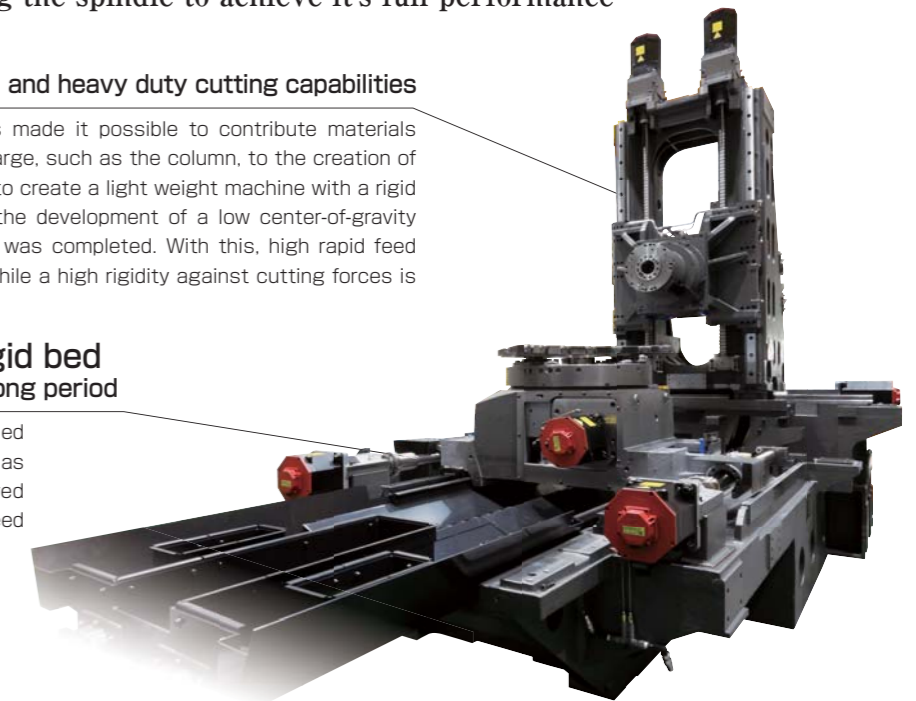
Unrivaled rigid platform allowing the spindle to achieve it's full performance

FCD600 column featuring both high speed performance and heavy duty cutting capabilities

JTEKT's original high casting technology has made it possible to contribute materials which are not only complex in shape but also large, such as the column, to the creation of the FCD600. As a result, it has been possible to create a light weight machine with a rigid column. Furthermore, using FEM technology, the development of a low center-of-gravity column with satisfactory moving performance was completed. With this, high rapid feed rate and high acceleration are accomplished while a high rigidity against cutting forces is maintained.

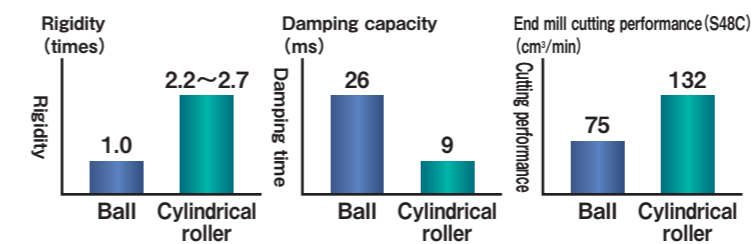
High grade cast iron high rigid bed keeping machine level stable over a long period

The bed supporting the moving body is designed using FEM analysis technology. And the bed has sufficient rigidity and substantially improved moving level. This feature makes stable axial feed possible with high speed and high acceleration.



A Rigid cylindrical roller slide able to withstand high speed, high acceleration travel while still maintaining rigidity is adopted

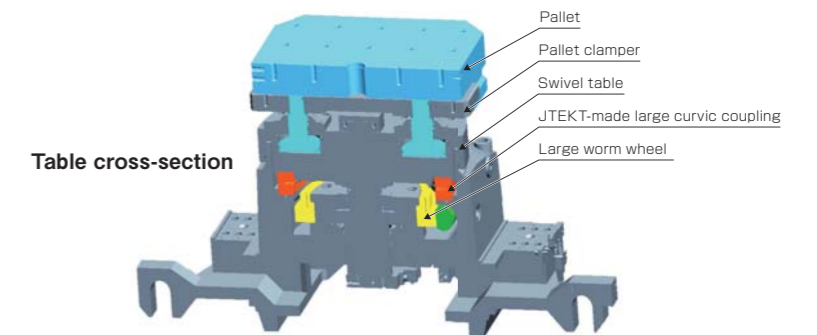
Compared to the ball guide, the cylindrical roller slide features less elastic deformation against loads and smaller displacement caused by load variation, as well as possesses superior vibration damping characteristics. This feature makes it possible to position quickly with smaller orientation changes 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.

High rigidity able to withstand weight of large parts, 1° table

Adopting JTEKT's internally manufactured large curvic coupling used on large machining centers a class higher. Achieves both a rigidity which can withstand a workpiece mass of 1,500kg (op) and an excellent indexing accuracy.



Unique Precision technology only achievable with the inside-out knowledge of the cutting field that JTEKT possess.

Various factors can effect cutting accuracy. The FH Series is packed with a number of precision technologies that only JTEKT have had the opportunity to cultivate down through the years with strong involvement in the mass production of automotive parts.

4 approaches for achieving precision cutting

Suppress heat generation

- [Wide-range spindle] Reduction of spindle temperature rise with a variable switching preloading mechanism **Option**
- [High Ability bearing] 30% reduction of bearing temperature rise
- [Spindle oil jacket cooling] Reduction of spindle temperature rise
- [Dual ball screw drive] Reduced heat generation through motor size reduction

Elimination of heat transmission

- [Center trough structure] Suppressing the effects of chips and coolant heat
- [Y-axis motor heat isolation coupling box cooling] Suppression of ball screw elongation

Heat effect control

- [Large heat capacity bed] Reducing the effect of thermal displacement
- [Thermally symmetrical structure] Reducing heat-related column twist
- [BTS (Ballscrew Thermo Stabilizer) function] Direct measurement and correction of ball screw elongation
- [Spindle Thermo Stabilizer function] Direct measurement and correction of spindle elongation **Option**
- [Scale feedback] **Option**
- [Touch sensor function] **Option**

Cool

- [Working oil cooling] **Option**
- [Coolant cooling] **Option**

Manufacturing technology for realizing precision cutting



Table reference face sheet scraping

Grinding of linear guide mounting face

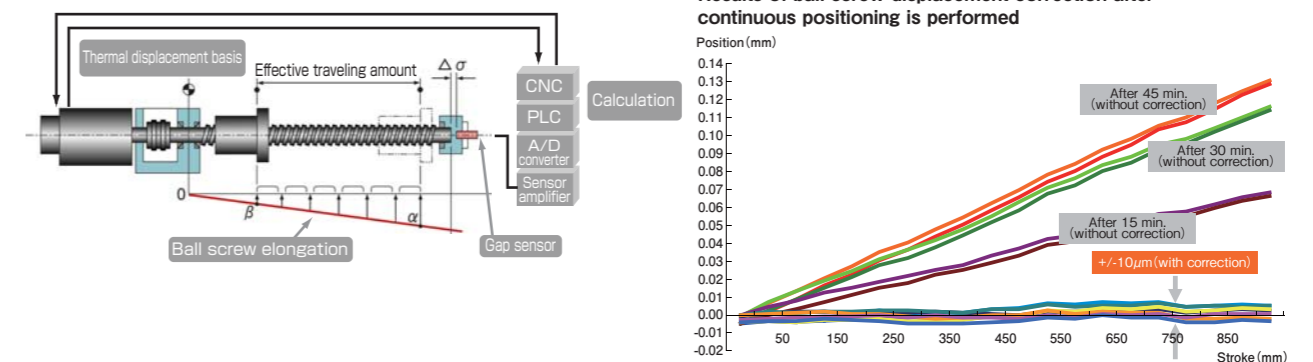
Spindle balancing

Precision assembling work

BTS (Ballscrew Thermo Stabilizer) function

Ball screw thermal displacement correction function stabilizing repetitive positioning accuracy

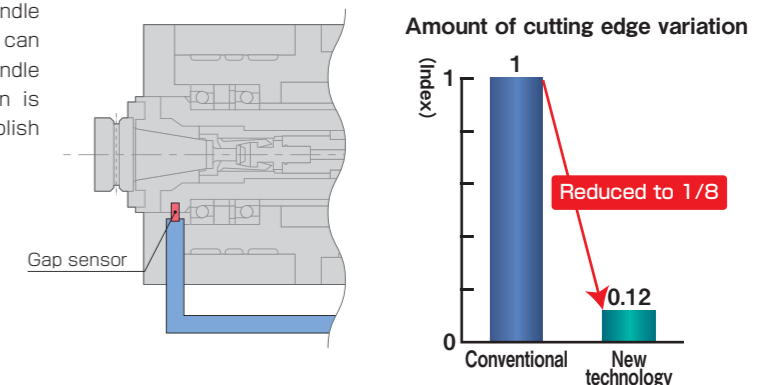
The BTS function is installed as a standard feature to stabilize the repetitive positioning accuracy in parts cutting. With the BTS function, the displacement sensor installed at the end of the ball screw measures the elongation of the entire screw, which is distributed into offsets for each stroke position to correct the positioning accuracy. With this function, accuracy can be stabilized without any costly accessories such as linear scales which require maintenance. Furthermore, continuous cutting operation over a long time becomes possible. In addition, the structure is simpler and the reliability is higher when compared with the ball screw shaft center cooling method, and the function is environmentally friendly.



Spindle Thermo Stabilizer function **Option**

Spindle thermal displacement correction function used to correct spindle elongation formed after an extended period of operation

A displacement sensor installed at the end of the spindle is used to directly detect spindle edge position, which can be easily displaced by heat generated inside the spindle during extended operation. Z-axis direction deviation is suppressed as much as possible in order to accomplish precision cutting.



Scale feedback (X, Y and Z axes) **Option**

An optical scale makes lasting precision positioning possible.



Touch sensor function **Option**

The touch sensor is used to align the workpiece.



Reliability starts with chip disposal. The design of a Center trough that makes it possible to deal with chip disposal directly beneath the cutting point.



1 Center trough

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



3 External nozzle coolant

The nozzle installed at the spindle nose supplies coolant to the cutting point.

2 Chip conveyor

By increasing the number of chip conveyors from 1 to 2, the overall length is extended to the front face of the pallet changer, thereby doubling the chip removal performance of conventional models.



4 Overhead shower coolant

The coolant nozzle installed in the ceiling discharges coolant, keeping chip accumulation inside the machine down to a minimum.

5 X-axis protective cover against chips

To prevent damage to the cover from chip entanglement, an aluminum cover is adopted which operates jointly with the X axis stroke so that chips don't become caught.



6 Spindle-through coolant 1MPa

Coolant is supplied through the spindle center to the cutting edge. It is effective for lubrication and cooling of the cutting point, chip disposal and extension of tool life. (Delivery pressure: 3MPa and 7MPa are options.)

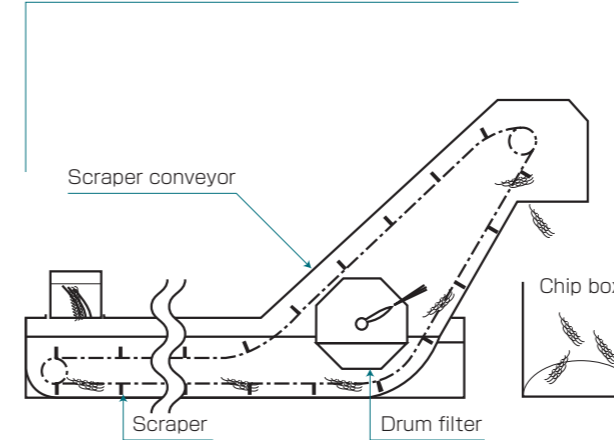


Spindle-through coolant 3MPa

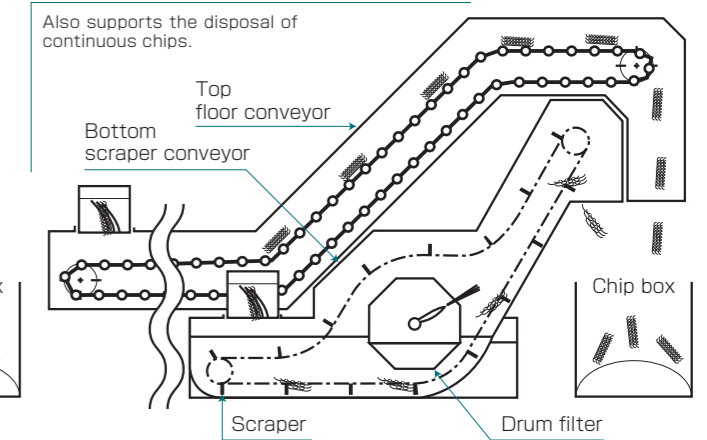
7 Coolant supply unit with take-up chip conveyor

Chips collected in the center trough are transported outside of the machine by the chip conveyor. Two types of chip conveyors are provided to choose from depending on chip shape and material.

Standard scraper type coolant supply unit



Option Two-tiered coolant supply unit



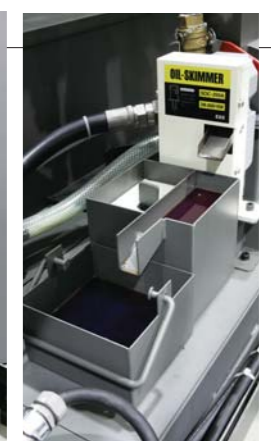
Splash gun

Option Optional parts

Coolant cooling, Oil skimmer, chip box, mist collector and other optional accessories can be added.



Coolant cooling



Oil skimmer



The pursuit of Reliability - one of JTEKT's starting points

Stable accuracy and an improved MTBF (mean time between failures) are both necessary in order for the customer to feel assured with reliability. The design of the FH Series pursues high quality, high performance and long life.



To provide the customer with assured operation, we work hard to make even the unseen portions of the machine more reliable.

Improved reliability in wiring and piping supporting higher speeds and acceleration

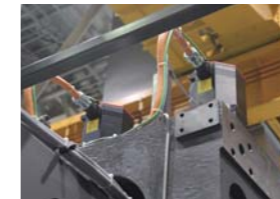
Axial feed speeds and acceleration rates have increased and consequently the reliability of piping and wiring cable has become very important. Cables rub against each other which may lead to oil leaks or broken wires in axial travel. In addition, the damage on brackets caused by the weight of the cable itself becomes more severe as speed increases.



Piping and wiring cables are tied to reduce sagging - a measure in response to higher speeds and acceleration.

The color of motor power cables and that of Signal line are differentiated to make maintenance work on the wiring routed to the spindle and Y-axis motor more simple. This feature also helps to reduce the time taken in pinpoint the cause of machine trouble.

Wiring to Y-axis motor



Concentrated device layout making daily maintenance easier

The central lubrication, hydraulic and pneumatic devices are arranged together for easier daily inspections.



Field bus system improving control system reliability

The field bus is the digital communication signal exchange of communication signals between devices and the controller. Compared with the earlier signal wiring method, it can send multiple signals on a single cable, contributing to the substantial reduction in the number of cables. Using this method, control system reliability is improved. Additional merits of digital communication include sophisticated trouble diagnosis functions.

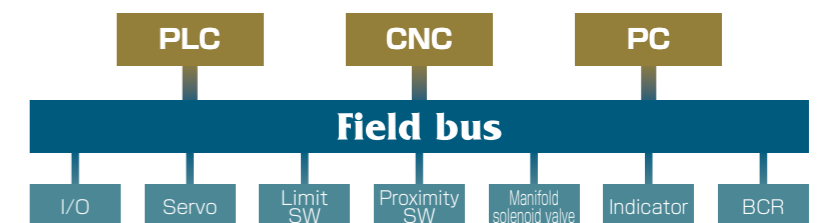
Field bus features

[Reduced wiring]

- Connection of devices with twisted pair cables including power cables
- Feeder branching connection possible

[Easy maintenance]

- Identification of trouble through sophisticated diagnosis functions





Workability

Aiming to perfect a production system both environmentally and people-orientated

At JTEKT, we never lose sight of our motto 'pursue technological dreams to deliver valuable innovations to you' and are always striving to achieve a style of manufacturing friendly to both people and the planet.

Securing accessibility and work space

Operation door with good workability.

By opening the operation door to the ceiling, the lighting has been improved when the door is opened and the operator is protected from chip fluid dripping down from the ceiling cover.



Door window with good visibility.

The windows in the operation door and APC door have been widened, improving internal visibility.



APC with good accessibility

The wide door opening makes loading/unloading of the workpiece much easier. The open-out ceiling design ensures the safe loading and unloading of large parts, fixtures and angle steels with the use of the crane.



Tool magazines with good accessibility

A sufficient opening is provided for the tool magazine door so that even heavy tools can be changed in a comfortable posture.



OP Supporter

JTEKT's machining centers feature an automation function which makes the automation of the machine possible and supports the operator's work.

The 3 supporting features of the OP Supporter

Tool control support

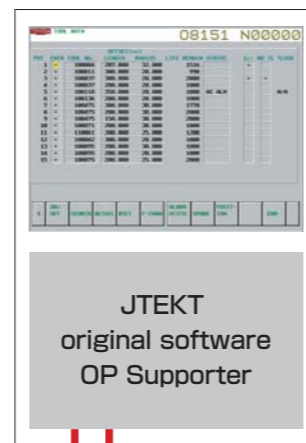
- Simple program ... Tool number conversion function
- Detailed control ... Tool life control function
- Direct tool setting capability ... Tool offset function
- Tool teaching ... Tool list display function
- Limiting arm speed according to tool weight ... ATC speed variation function
- Faulty tool indexing ... Replacement tool automatic indexing function
- Manual tool data entry not required ... Tool ID function

Pallet control support

- Automatic cutting program call ... APC control
- Omission of unnecessary cutting operations ... Multi-workpiece installation skip function
- Correction between pallets ... Pallet correction function

Maintenance control support

- Notification of control device condition and position ... Signal status display function
- Periodic inspection item reminder ... Periodic inspection display function
- Equipment fault recording ... Fault history function



FA control system

Attached function	●	Attached as a package
	□	Can be attached as an option
	×	Cannot be affixed.

- Other functions can be added to the package specification (OP20P/T/A).
- The * mark in the remarks column indicates the items for which devices and other options apart from the software are required. Please contact us for details.
- The ※ mark in the remarks column indicates those items which cannot be included with the FMS or pallet pool-connected machines.

Division	Function name	Model OP***				Remarks
		10i	20iP	20iT	20iA	
①Tool control	Tool number conversion function					
	Tool offset function					
	Tool life control function	×	□	●	●	a
	ATC speed variation function					
	Offset update function					
	AC function(condition control)			□	□	*
	Cutting condition setting function			□	□	*
	Replacement tool automatic indexing function			□	●	*
	Tool data update during installation and removal			□	●	* b
	Storage tool data saving function			□	□	*
	Tool ID function	×	□	□	□	*"b" is necessary
	2nd/3rd correction function			●	●	
	Faulty tool list display			●	●	Set with "a"
Spare tool list display			●	●		
Tool position display			□	□		
Tool list display			□	●		
②Pallet	APC control	□	□	□	●	※ c
	Pallet correction					
	Multi-workpiece installation	□	□	□	●	※ "c" is necessary.
③Miscellaneous	Function on/off switch	●	●	●	●	
	NC data configuration diagram	×	□	□	●	
	Measurement result display	×	□	□	□	*
④Maintenance	Signal status display	×	●	□	□	
	Periodic inspection display	×	●	□	●	
	Load monitor	×	□	□	□	
	Cycle time measurement	×	●	□	□	
	Counter	×	●	□	□	
Diagnosis data	×	●	●	●		
⑤DNC support function		×	□	□	□	
		×	□	□	□	
⑥Report	Fault history	●	●	●	●	
	Fault code-specific frequency	×	●	□	●	
	Machining result					
	Operation result	×	□	□	□	
Production result						

Tool control support

NC program creation is simple.

Tool number conversion function: When a tool-specific number is commanded, this is automatically converted to an ATC magazine pocket number so NC programs can be made without worrying about pocket numbers.

NC program

T10020025;
M6;
G43 H99 Z-100.0;

There is no need to worry about tool installation.

For tool number T10020025
→ Tool in pot 3 is indexed

Tool data

POT	ENTR	TOOL NO.	LENGTH	RADIUS
1	*	10155520	5.0000	3.0000
2	*	10200340	12.0000	2.5000
3	*	10020025	8.0000	3.0000
4	*	10100037	10.0000	0.8000

Simple registration of tool data

Tool ID function: The ID chip containing tool data(correction data, tool life, AC data, machining condition, etc.)eliminates the need for manual tool data entry, thus removing the human error factor.

Accurate tool life appraisal

Tool life control function:A counting method giving readings at 0.1 sec accuracy. A double-layered fault warning system provides peace of mind, first generating a warning that the actual error. Tool breakages, AC faults and so on are displayed in addition to tool life.



Tool list display function

Program tool check function: The tools used in the program are analyzed and any tool shortages are notified.

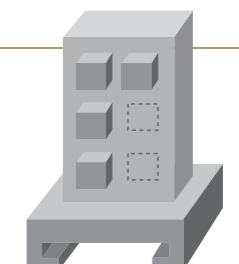
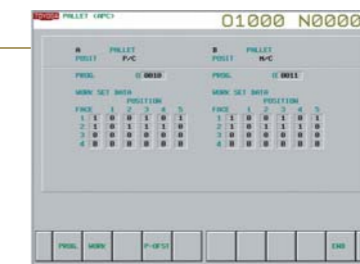


Pallet control support

Solid pallet control

Multi-workpiece installation function: Only registered mounting faces and/or processes are machined, therefore cycle time is significantly reduced.

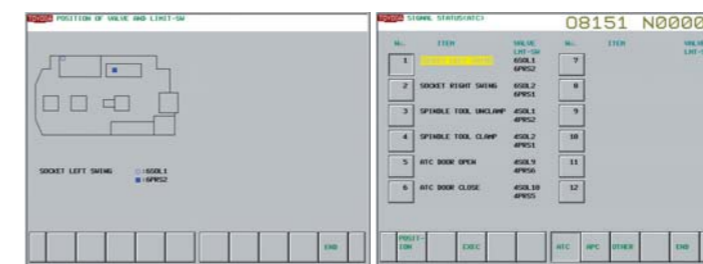
Pallet compensation function: Compensation data recorded for each pallet switches automatically.



Maintenance control support

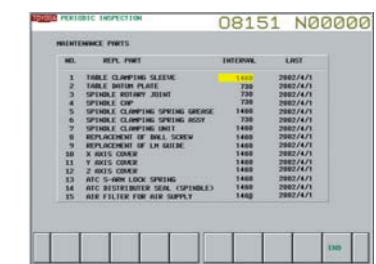
Visual status display

Signal status display function: The limit switch ON/OFF state is displayed in real time, thereby shortening maintenance time.



Straightforward inspection items

Periodic inspection display function: Displays regular inspection items and check completion status so regular inspection pre-checks can be performed. (preventative maintenance)

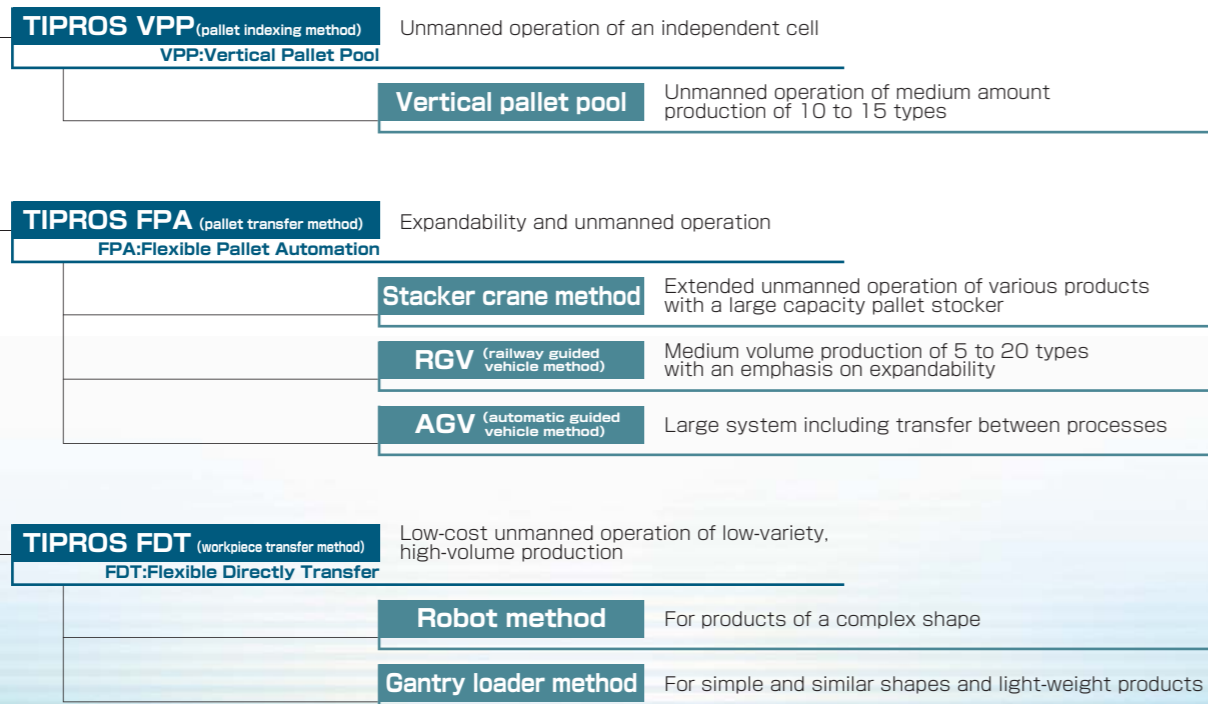


TIPROS

For the people. The **TOYODA** Integrated Production System continues to evolve.

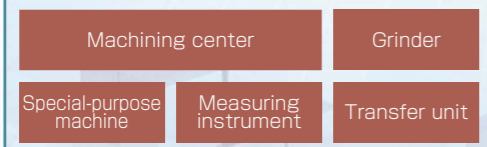
JTEKT has delivered many systems since the first FMS sold in 1972 and have come to be seen by both domestic and overseas customers as a company that offers high reliability and meets expectations, and as such indispensable in the FA era. We manufacture the best FMC/FMS to meet customer requirements, by a combination of our original thorough mechatronics technologies and software modules and numerous delivery records.

FMC/FMS We supply the best system to the customer with a wide selection of modules.



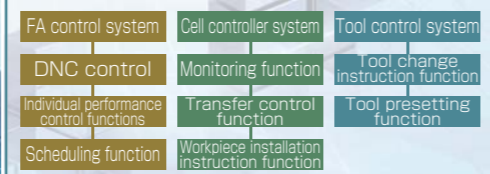
Hardware

- Flexible machine tool giving high speed, high efficiency and high precision
- Intelligent peripheral units



Software

- Flexible control functions
- Enriched unmanned operation support functions
- Superior control functions



TIPROS VPP

The FMC uses a vertical rack system which reduces the required installation space. Time loss during pallet change is kept at a minimum by combining this with a high speed APC. The pallet storage capacity is increased for unmanned operation at night and on holidays.



TIPROS FPA

Unmanned operation, more flexibility in the system and an improved level of control. A state-of-the-art production system that only JTEKT, with our grasp on key points of the FA, are able to provide. The module configuration can be easily expanded, so that any future additions of machines, racks, loading stations of the like can be carried out with ease.

Stacker crane method



TIPROS FPA

RGV (rail-guided vehicle) + stacker crane



TIPROS FDT

Robot method



This is an example of FH800SX-I and RGV (rail guided vehicle)

Easy operations and visualization of functions using FMS software

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

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

FMS software	PC type	Stacker crane method, carrier method		
		FMS Level1	FMS Level2	FMS Level3
[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
Click of the mouse

A visual part no. changeover setting

Drag & drop

Completion timing is decipherable

Scheduling by equipment

Scheduling by work

Easy fixture management

Abundant pallet types

Automatically deciding fixture replacement

The visualization of process operations with TOYOPUC (SFC* programming)

* Sequential Function Chart

We have significantly reduced the investigation time when equipment stops using SFC and chase monitoring.

Conventional (ladder circuit)

Automatic door closes

Automatic door opens

Clamper 1 clamps

Clamper 2 unclamps

Clamper 2 clamps

Clamper 2 unclamps

Complicated, making equipment operations difficult to decipher

Use words to describe the circuit (SFC circuit)

ST0000

ST0001 Automatic door closes

ST0002 Clamper 1 clamps

ST0003 Clamper 2 clamps

ST0004 Machining cycle

ST0005 Clamper 1 unclamps

ST0006 Clamper 2 unclamps

ST0007 Automatic door opens

Simple, making equipment operations easy to decipher

Visualization of equipment operation cycles using a flow chart. No need for experienced operators able to understand ladder circuits.

What is chase monitoring?

A function allowing faulty areas to be identified through simple touches of the screen

Investigation of the cause of equipment stops

Touch the step the machine has stopped on

The visualization of faulty areas

Touch the function block conditions

Investigation complete nice and easy without drawings!

Cause of stop is revealed

Investigation of the cause of equipment stops

Investigation time: Conventional 15min., SFC 3min.

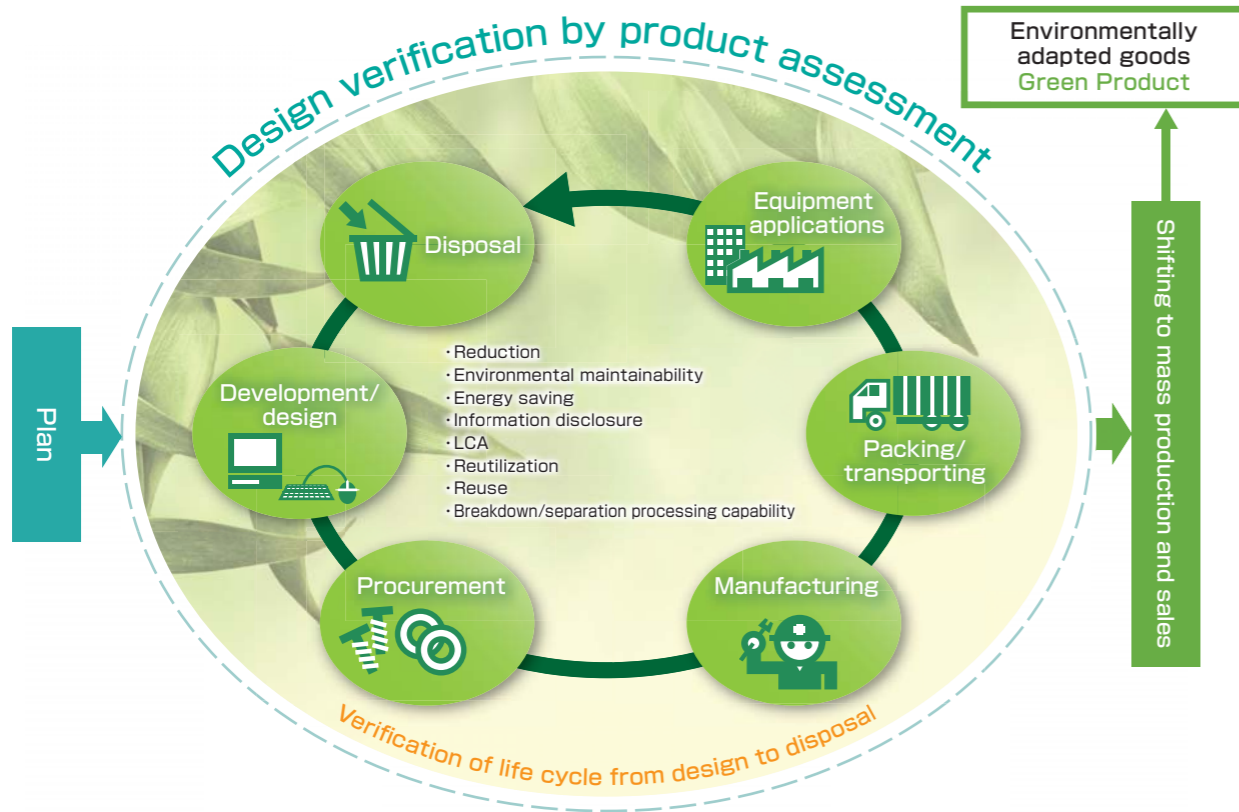
Time taken to check drawings: Conventional 15min., SFC 3min.

Able to pinpoint the faulty area straight away

Developing and supplying environmentally-friendly products (energy-saving, resource-saving)

Product development with minimal environmental burden through product assessments

1. JTEKT perform a product assessment which assesses and verifies the environmental load throughout a product's entire lifecycle, from the development and design stages.



2. In order to evaluate the environmental adaptability of each product we use a method that calculates the evaluation indicators throughout the target product's life cycle

Assessment items	Life cycle	Assessment points
Reduction	Manufacturing • packing/transportation • equipment application	Improved resource-conservation Yield Standardization Extraordinary long-life products
Environmental maintainability	Manufacturing • packing/transportation • equipment application • disposal • procurement	Toxic properties Hazardous properties Explosiveness Danger capacity
Energy saving	Equipment application/manufacturing	Energy saving Little wear Improved efficiency
Information disclosure	Equipment application/separation	Provision of handling information Provision of information at the time of product disposal

Eco-Scale

JTEKT perform our own Eco-Scale actions in order to more closely examine assessment indicators concerning the environment.



Eco-Scale
 Assessment indicator = Eco-scale (0 to 100). The smaller the number, the better.
52.7
 11% reduction
 Reduction percentage compared to the conventional product.

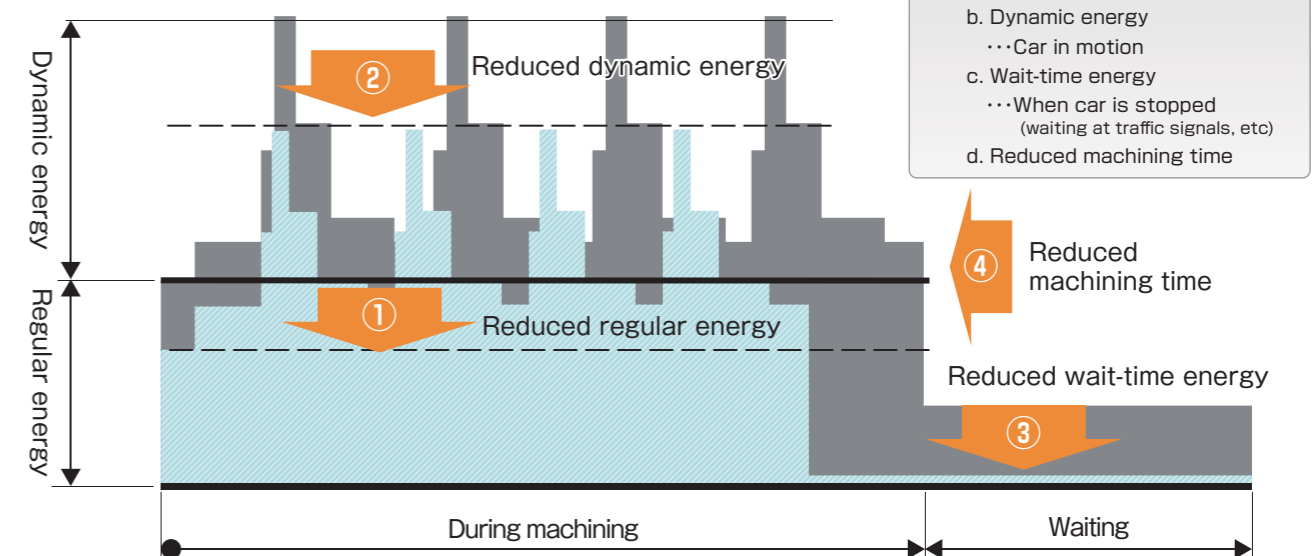
CO₂ 15.7% reduction
 JTEKT display the Eco-Scale as well as the CO₂ reduction percentage.

3. Environmental consideration in the product development stage (applicable model: FH80SX-i)

- Reduction in the number of parts** (20% reduction)
 The number of parts is reduced in order to save on resources. A simpler structure not only reduces the burden on the environment but also strengthens reliability because of a reduction in the breakdown ratio.
- Reduction of coolant consumption** (40% reduction)
 Chip disposal characteristics of the machine body play an important role in the reduction of the amount of fixed energies necessary for the supply of hydraulic pressure, lubricant, coolant, pneumatic pressure, etc. This is due to the fact that a great amount of coolant is needed to discharge chips. To solve the problem, the center trough method is adopted so that a chip disposal space is provided directly beneath the cutting point.
- Reduction of coolant pump power consumption** (50% reduction)
 The center trough method not only reduces the coolant consumption but also reduces the amount of power used by the coolant pump. In addition, optimization of coolant piping has contributed to a 10% reduction in pressure loss.
- Reduction of number of bolts** (15% reduction)
 The reduction of the number of bolts caused through optimization of the structure is also effective towards reducing the amount of energy used in parts cutting.
- Resource reduction through reduction of number of cables** (32% reduction)
 The field bus method is adopted for easier connection between PLC, sensors, SOL valves and other control devices. With this feature, the number of cables can be substantially reduced.

A model of energy reduction

Energy consumption during machining and waiting



Machine specifications

Item		Unit	FH630SX-i			
			Standard specifications		Special specifications	
Table & Pallet	Table dimensions (pallet dimensions)	mm	□630 (Pallet)			
	Rotary table indexing angle	°	1	0.001		
	Pallet height (from floor)	mm	1,250			
	Max load on pallet	kg	1,200	1,500		
	Table indexing time (90° indexing)	sec	2.5			
	Pallet change time	sec	18			
Stroke	X-axis	mm	1,050			
	Y-axis	mm	900			
	Z-axis	mm	1,050			
	Distance between spindle nose and table center	mm	50~1,100			
	Distance between spindle center and top of pallet	mm	100~1,000			
	Max. workpiece swing × Max. workpiece height	mm	φ1,170 × 1,250 ※1			
	Feeds	Rapid feed rate (X, Y and Z)	m/min	60		
Cutting feed rate (X, Y and Z)		m/min	0.001~30			
Rapid acceleration (X, Y and Z)		m/s ² (G)	6.86 (0.7)			
Ball screw diameter (X, Y and Z)		mm	φ50 (X), φ45 (Y,Z)			
Spindle		Spindle speed	min ⁻¹	50~6,000	50~15,000	50~6,000
	Spindle diameter (front bearing bore)	mm	φ110	φ100	φ110	
	Spindle nose shape		BT No.50	HSK		
	Spindle motor, short-time/continuous	kW	30/22	30 / 25	37 / 30	
	ATC	Tool holding capacity	tool	60	120 · 190 or more tools	
Tool selection			Absolute address			
Tool (dia. × length)		mm	φ120×600 ※2			
Tool mass		kg	27			
Tool change time (Tool-to-Tool)			sec	2.5 (~15kg) 2.8 (15~27kg)		
			sec	3.6 (~15kg) 4.0 (15~27kg)		
Tools Holder				MAS BT50		
		Pull stud		MAS P50T-1		
Dimensions & Weight	Floor space (width × depth)	mm	3,600 × 6,884 ※3			
	Machine height	mm	3,208 ※3			
	Machine weight	kg	19,600			
Various Capacities	Working oil	L	18			
	Slide lubricant	L	2.9			
	Spindle oil air	L	2.9			
	Table	L	1.5	3		
	Spindle coolant	L	35			
	Power supply capacity	kVA	43	46	49	
	Control voltage	V	DC24			
	Air source capacity	NL/min	800			
	Air source pressure	MPa	0.4~0.5			
	Capability & Performance	Positioning accuracy ※4	mm	±0.003	±0.002	
Repeatability ※4		mm	±0.0015	±0.001		
Table indexing accuracy ※4			sec	± 3	±7 (NC) ±3.5 (with NC encoder)	
			sec	± 3	±3.5 (NC) ±2 (with NC encoder)	

※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 details, refer to the layout plan. ※4 According to our inspection method

CNC unit FANUC 31i. ● Standard / □ Optional

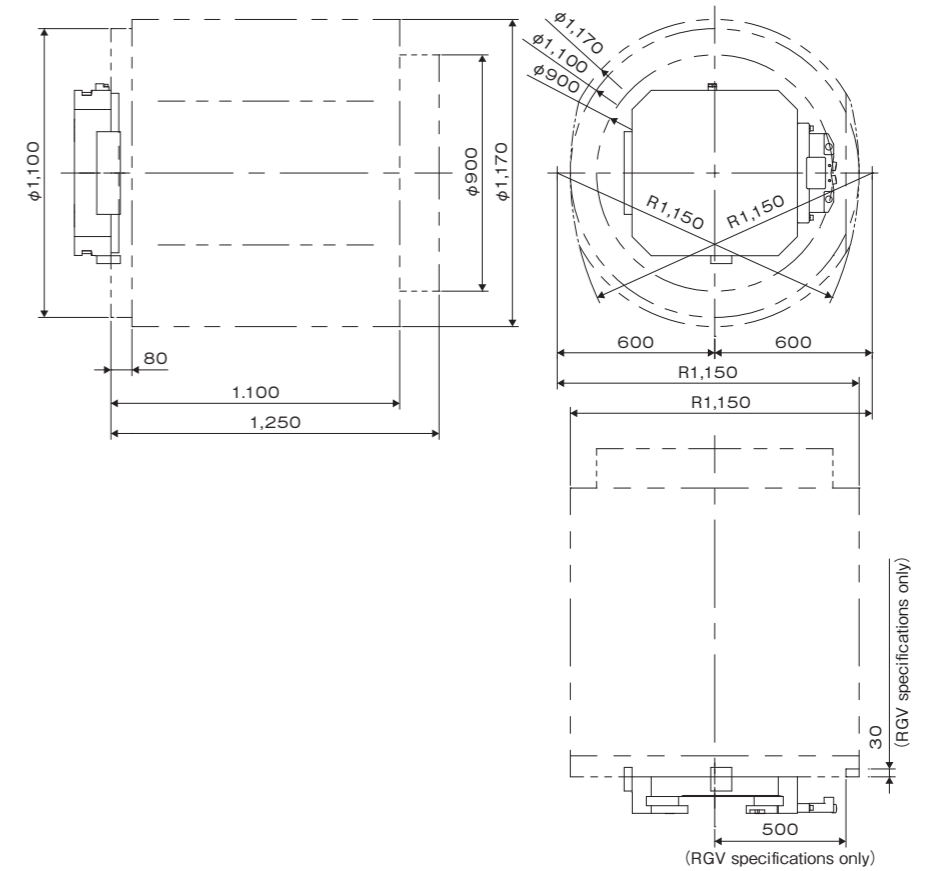
Division	Name	FH630SX-i	
Axis control	Min. input increment (0.001mm)	●	
	Machine lock	●	
	Absolute position detection	●	
	Inch/metric switch	□	
Operation	Dry run	●	
	Single block	●	
	Manual handle feed 1 unit	●	
	Program restart	□	
	Manual handle interrupt	□	
	Interpolation function	Nano interpolation	●
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		AI contour control I (pre-read 30 blocks)	●
	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 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	●	

FANUC is a registered trademark of FANUC LTD.

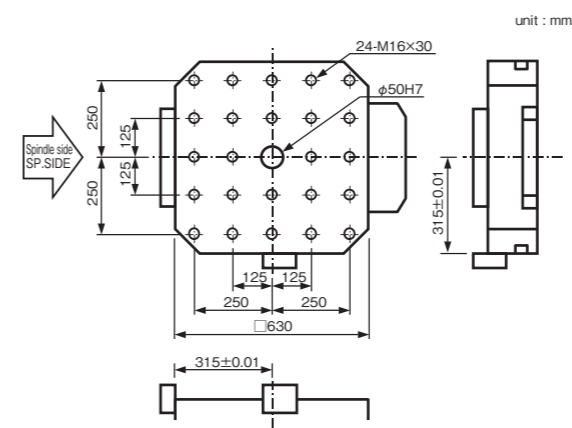
Accessories ● Standard accessories / □ Optional accessories

Item	Equipment name		FH630SX-i		
Table and pallet	Indexing table	1" indexing table	●		
		NC indexing table	□		
	Pallet	NC indexing table (with encoder)	□		
		Standard pallet screw hole	●		
		T-groove pallet	□		
Addition of pallet	Single piece screw hole	□			
	Single piece T-groove	□			
Spindle relations	Optional	1,500Kg pallet load spec	□		
		6,000min ⁻¹ BT No. 50 (30/22kW) spindle (with spindle-through coolant spec)	●		
		6,000min ⁻¹ BT No. 50 (37/30kW) large torque spindle (with spindle-through coolant spec)	□		
		15,000min ⁻¹ BT No. 50 (30/25kW) wide-range spindle (with spindle-through coolant spec)	□		
	Speed	Filler block for oil hole holder	□		
		Positioning block for angle head holder	□		
		HSK specifications	□		
		BIG PLUS specifications	□		
		Collet	MAS I	●	
			JIS	□	
Tool magazine	Tool capacity	MAS II	□		
		60 tools	●		
		121 tools	□		
Coolant relations	Coolant supply unit	190 or more tools	□		
		Coolant supply unit (water soluble/with take-up chip conveyor/scrapper type/spindle-through coolant spec/1MPa through pump)	●		
		Coolant supply unit (water soluble/with take-up chip conveyor/scrapper type/spindle-through coolant spec/3MPa through pump)	□		
		Coolant supply unit (water soluble/with take-up chip conveyor/scrapper type/spindle-through 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)	□		
	External nozzle coolant	Coolant supply unit (water soluble/with take-up chip conveyor/2-tank type/spindle-through coolant spec/7MPa through pump)	□		
		Overhead shower coolant	●		
		Chip flushing coolant	●		
		Internal screw conveyor	●		
		Coolant cooling	□		
		Oil skimmer	□		
		Oil skimmer	Belt type	□	
		Chip box	□		
		Splash gun (at APC)	●		
Splash guard	Enclosure guard	Mist collector	□		
		Air blower	□		
		External nozzle type	□		
		Door interlock at operating position	Electromagnetic lock type	●	
Operation control function, others	APC door interlock	Internal lighting	●		
		Ground fault interrupter	□		
		Cooler for control cabinet inside	□		
		Automatic fire extinguisher	□		
Labor saving function	Universal design cover	Universal design cover	□		
		Pallet changer (APC)	No pallet manual swivel function	●	
		With pallet manual swivel function	□		
Support for high accuracy	TIPROS VPP	7 pieces	□		
		10 pieces	□		
		14 pieces	□		
	Spindle cooling unit	Spindle thermo stabilizer function	BTS (Ballscrew Thermo Stabilizer) function	●	
			Scale feedback (X-, Y- and Z-axes)	If installation is requested, the BTS function is excluded.	□
			Touch sensor function	Optical type (without energization): with alignment and datum face correction functions	□
				Optical type (with energization): with alignment, datum face correction, gap elimination and tool breakage detection function	□
			Automatic tool length measurement function and datum face for measurement (interference area caused)	□	
			Automatic measurement function	□	
			Automatic measurement correction function	□	
Rotary coordinate system correction function	□				
Rotary coordinate axis correction function	□				
Operator support function	Package	Spindle thermo stabilizer function	□		
		OP10i basic model	●		
		OP20iP maintenance model	□		
		OP20iT tool control model	□		
	Tool control	OP20iA advanced tool control model	□		
		AC function (condition control)	□		
		Cutting condition setting function	□		
		Replacement tool automatic indexing function	□		
		Tool data update during installation and removal	□		
		Storage tool data saving function	□		
Pallet control	Tool ID function	Tool ID function	□		
		Tool list display	□		
		APC control	□		
Auxiliary function	Multi-workpiece installation	Multi-workpiece installation	□		
		NC data configuration diagram	□		
Maintenance function	Measurement result display	Measurement result display	□		
		Signal status display	□		
		Fault history	□		
		Fault code-specific frequency	□		
		Periodic inspection display	□		
Load maintior	Cycle time measurement	Cycle time measurement	□		
		Counter	□		
		Load maintior	□		

Maximum workpiece

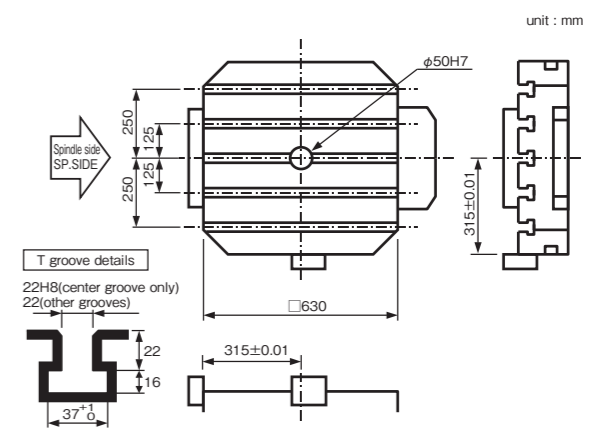


Threaded hole pallet



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

T-groove pallet



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

