

TOYODA

FH SERIES

Horizontal Spindle Machining Centers

FH800SX-i

JTEKT



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

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Type of Machinery: Machining Center
Model Number: FH800SX-i

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Koyo TOYODA



A Machining Center with Prestige

Construction machine, transport machine, energy-related industry and aerospace industry

Top-level performance in machining large-size parts of every industry

Top-level performance in three features of "Large", "Fast", and "Strong".

Additionally, building comfortable and safe machine is sought by improving accessibility to workpiece and visibility.

FH800SX-i is a large horizontal machining center which secures quality, improves production efficiency and achieves high cost performance.

■ 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.

■ Best speed performance in its class

Achieving over twice the speed of the horizontal boring machine and 5-face fabrication machine which are the representatives of large machine tools.

■ Highest cutting performance in its class

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



FH800SX-i

maximum & fastest

MAXIMUM

	Maximum workpiece range	Maximum load on pallet	Stroke (X×Y×Z)
FH800SX-i	φ1,500mm×1,500mm	2,500Kg	1,450mm×1,250mm×1,550mm

FASTEST

	Rapid feed rate	Tool changing time (C-C)	Table indexing time (90 degrees)
FH800SX-i	54m/min	4.4 sec.	4.0 sec.

maximum

The newest and largest New world of machining center

How we cope with environmental problems on a global scale, represented by global warming, has been a big topic of the day. In a framework of such a subject, developments of new-type diesel engines of large displacement for big trucks, construction and agricultural machines have been in rush. Also, with a background of recent skyrocketing oil prices, the demands for energy-efficient small jet planes, so-called regional jets and for oil plant equipment are on the increase. Especially in Europe, where inclination towards environmental protection and reduction of fossil fuel by means of wind power generation is strong, demands are increasing for environment protection-related equipment. For this type of equipment, machines with wider machining range and higher productivity are in demand. FH800SX-i has necessary and sufficient machine strokes capable of mounting a workpiece of maximum workpiece swing of 1,500mm dia. and 2,500Kg maximum load, allowing the largest workpieces for the machines of this class. Featuring the largest Z axis stroke in its class which prevents interference during APC & ATC even for the largest tools and workpieces. It should also be noted that the shortest accessible distance from the table center to the main spindle end face is 100mm by which it is possible to machine workpieces with short tools.

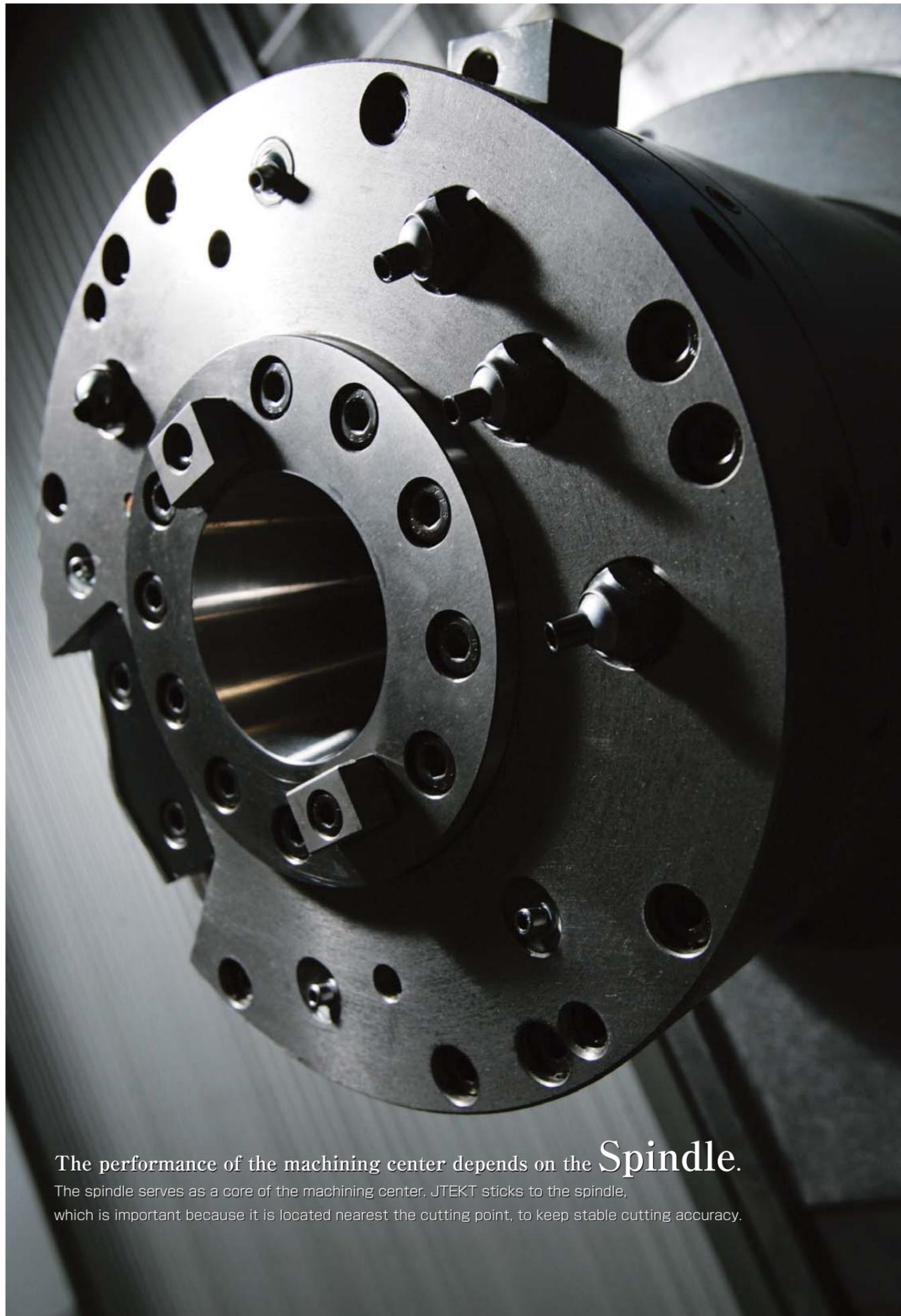


fastest

Boasting the best speed performance in the class while maintaining rigidity

In the past, square slide machines with high damping performance well sustainable for high-load production were widely used for machining large-size parts. Recently, however, demands for higher productivity resulted from higher speed are growing stronger even in large machining centers. For this purpose, it has been required to have high-speed performance on a level of smaller machines while increasing rigidity at machining. A linear guide of cylindrical roller type is used for the feed mechanism of FH800SX-i, thereby both high-speed performance and high rigidity are achieved. Rapid feed rate is as high as 54m/min. in all axis directions. Y and Z axes, which are most susceptible to machining load, have a dual-drive system which is made up of two ball screws. Major components supporting the axes, such as bed, column, and table, are designed by CAE to have the optimal layout of rib, thereby to give sufficient rigidity. Furthermore, the number of liner guide block in use has been increased from four, which is usual, to six. The linear guide and ball screws have been optimally positioned, a combination of which has resulted in higher rigidity of Y axis itself and shorter distance from the table center to main spindle end face by increasing the extrusion of the main spindle.





The performance of the machining center depends on the Spindle.

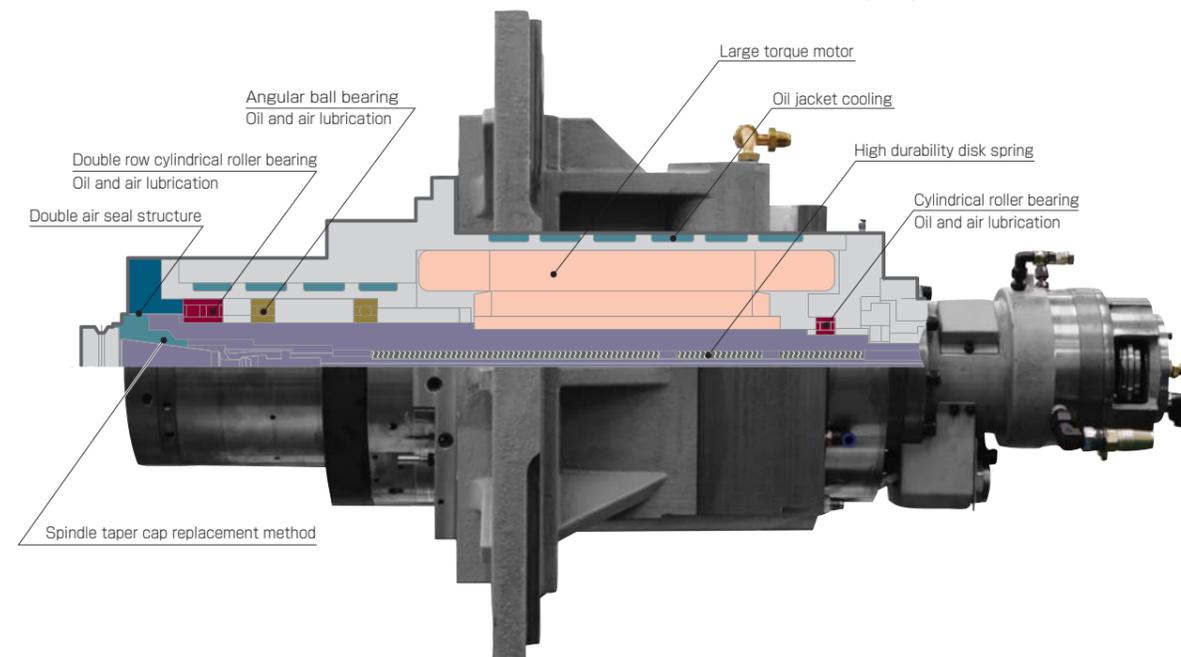
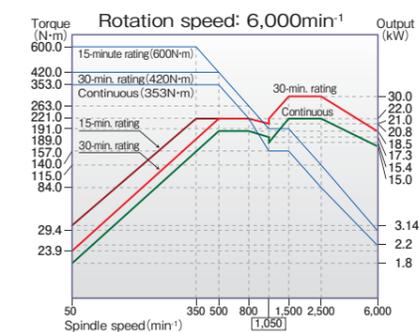
The spindle serves as a core of the machining center. JTEKT sticks to the spindle, which is important because it is located nearest the cutting point, to keep stable cutting accuracy.

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

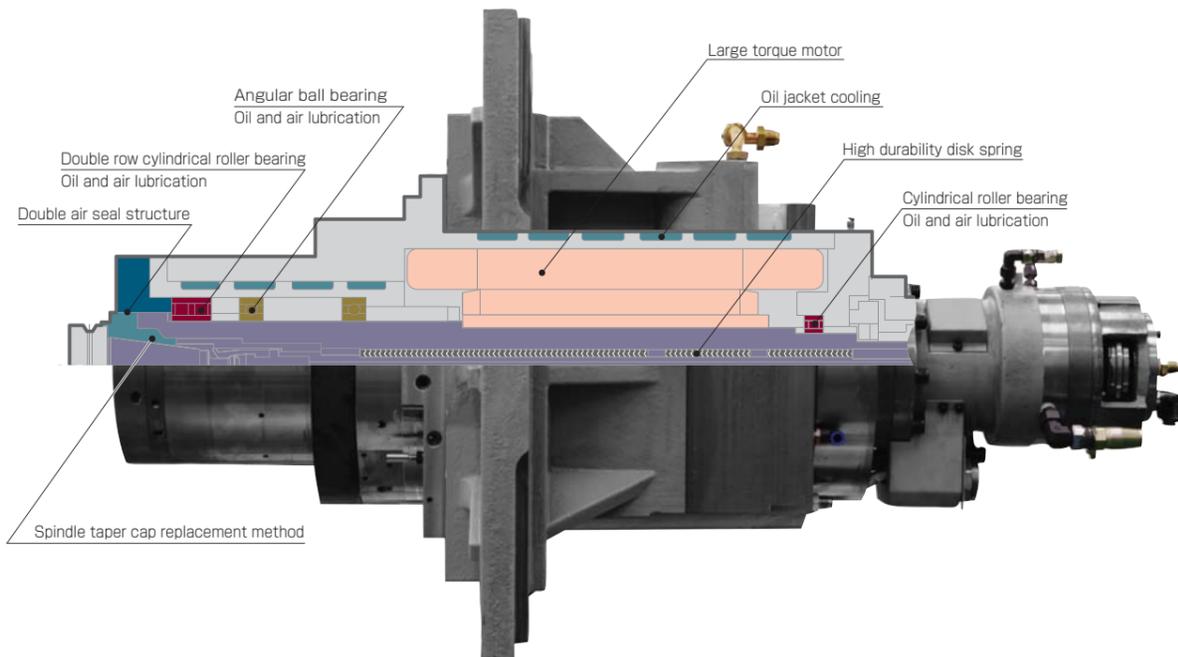
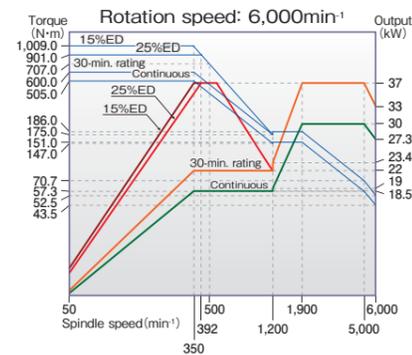
Boring
 [Tool] φ400 boring
 [Spindle speed] 80min⁻¹
 [Cutting feed rate] 30mm/min



Large torque spindle achieving the best performance in its class Option

- [Spindle speed] 6,000min⁻¹
- [Spindle nose shape] BT No.50
- [Spindle motor (short-time/continuous)] 37/30kW
- [Max. torque] 1,009N·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. 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

■ Cylinder block (model piece)

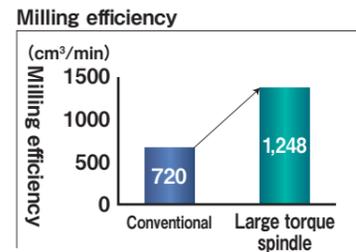
[Workpiece material] HPM7

■ Milling

- [Tool] φ160 face mill
- [Spindle speed] 400min⁻¹
- [Feed rate] 1,600mm/min
- [Depth of cut/width] 6/130mm

■ Boring

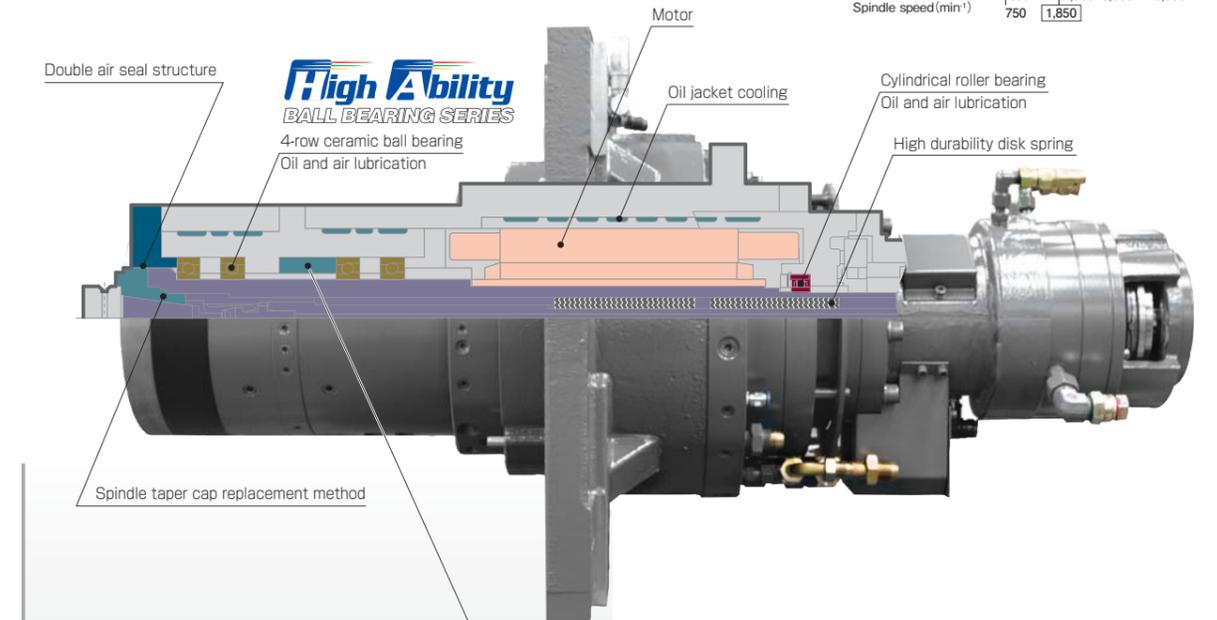
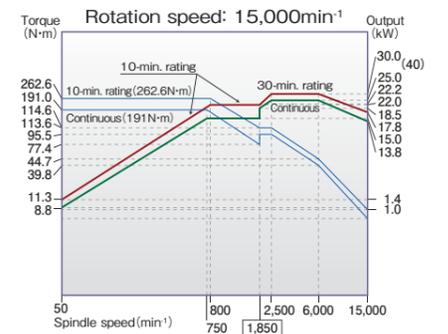
- [Tool] φ92 boring
- [Spindle speed] 500min⁻¹
- [Feed rate] 200mm/min



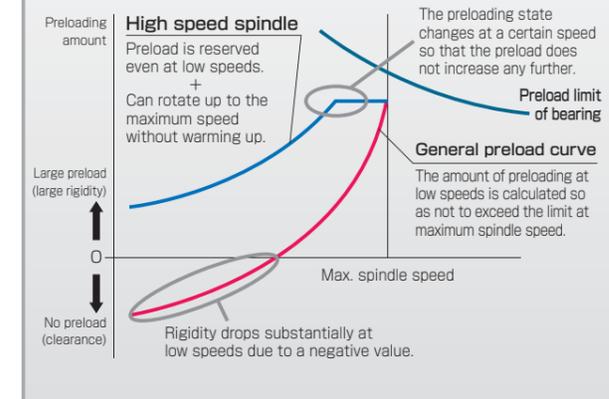
Wide-range spindle prided for high rigidity and rotation accuracy within a wide range of low to high speeds Option

- [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

■ Crankshaft 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



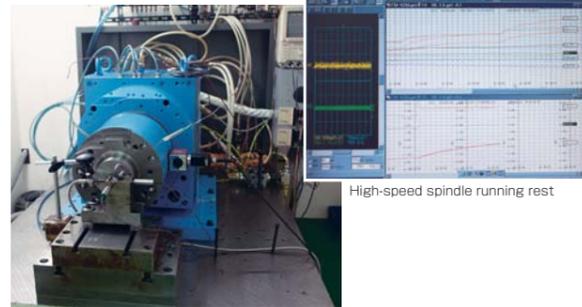
JTEKT's spindle promises assurance over a long period and takes maintenance into consideration.

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

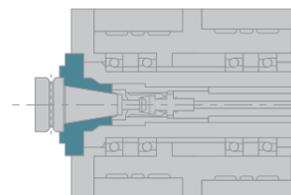
Basic design particularly focusing on low vibration.

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.

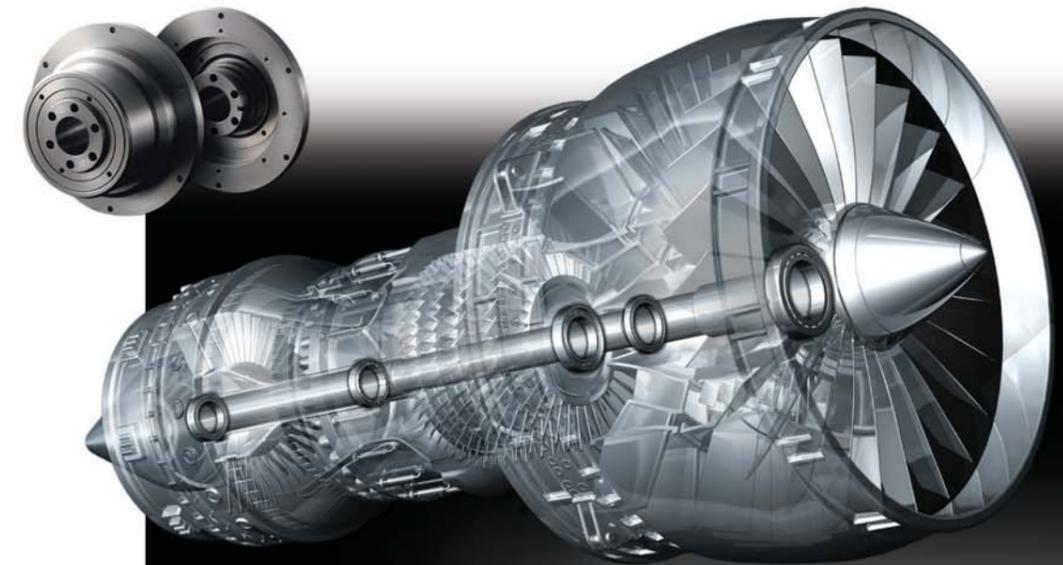
Even in the rare chance that a failure does occur, a replacement spindle cartridge that has been checked at JTEKT for operation and quality can be installed in its place, keeping restoration time down to a minimum. Furthermore, the separate spindle taper makes individual cap replacement possible as it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

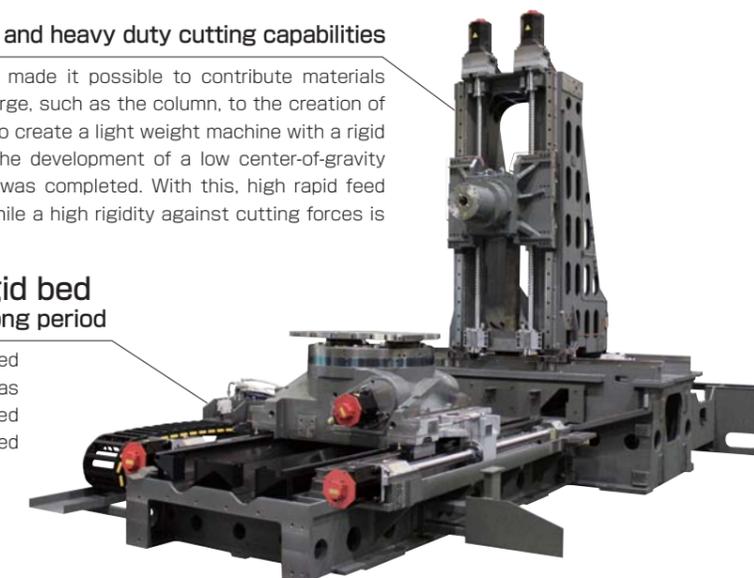
Unrivaled rigid platform allowing the spindle to achieve it's full performance

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.

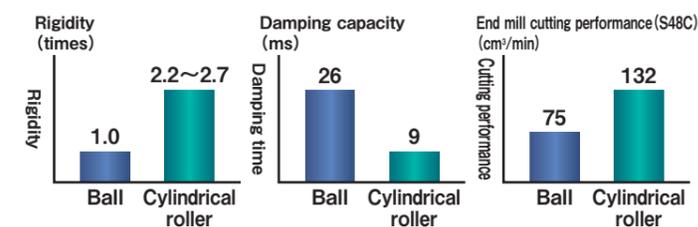
High grade cast iron high rigid bed keeping machine level stable over a long period

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.

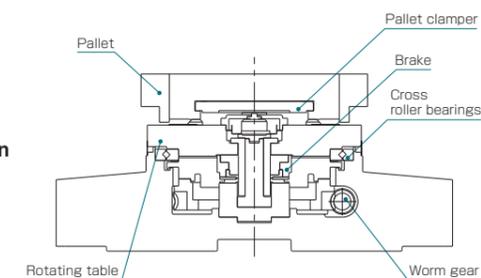


Because of JTEKT's assembling technology which allows for strict mounting face accuracies, the rigid cylindrical roller slide offers the best rapid feed rate and acceleration in it's class.

High rigidity and high accuracy table able to endure the weight of large workpieces **Option**

The NC index table is indexed in 0.001° units. The high rigidity and high accuracy cross roller bearings of the FH800SX-i ensure that a load can be firmly supported, and provide a support rigidity corresponding to the weight of large workpieces. The NC table suppresses pallet top face run out even if it is subjected to an eccentric load or a cutting load, making highly accurate machining possible.

FH800SX-i table cross section



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

- [Ball screw shaft cooling] Reduction of heat by cooling the spindle core
- [High speed 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 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
- [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

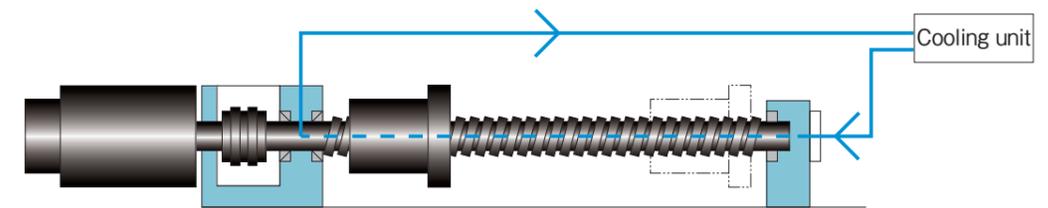
Spindle balancing

Precision assembling work

Ball screw shaft cooling

Spindle core cooling performing stable and high accuracy machining

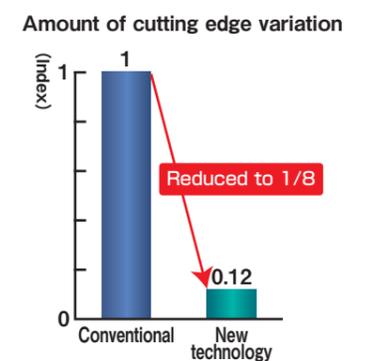
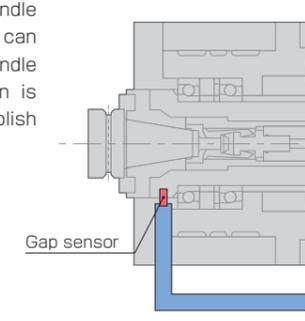
Heat displacement is restrained and stable and high accuracy machining is performed by always discharging the controlled cooling oil to the spindle core of ball screw which has core empty structure in order to follow the bed temperature. Furthermore, this machine is of highly reliable design in which excessive load due to thermal expansion of ball screw is not given against the support bearing restrained by means of double anchor method.



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

In order to process chips smoothly, a chip discharge outlet 35% larger than conventional machines has been positioned in the bed center.

2 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.



3 External nozzle coolant

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



4 Overhead shower coolant

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

5 Spindle-through coolant

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.)

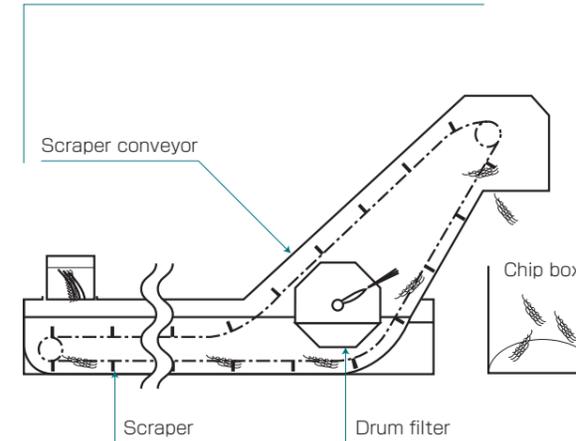


Spindle-through coolant 3MPa

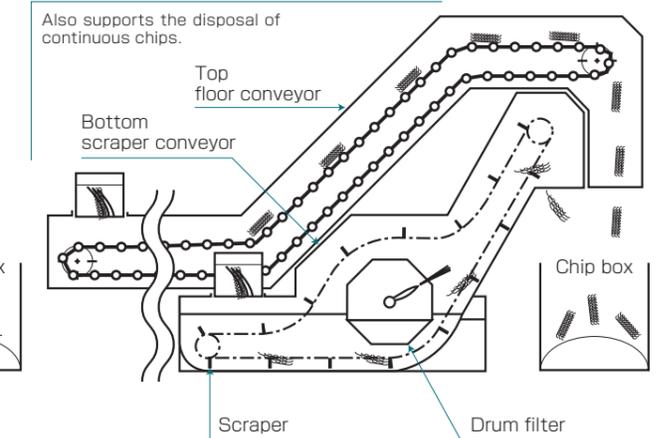
Coolant supply unit with take-up chip conveyor

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.

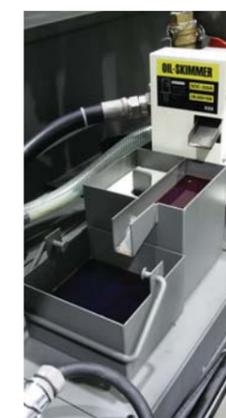
Standard scraper type coolant supply unit



Option Two-tiered coolant supply unit



Splash gun



Oil skimmer

Option Optional parts

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



Coolant cooling



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

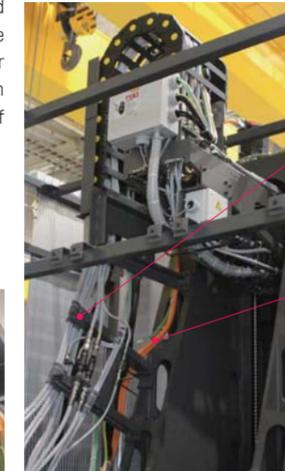
Stable accuracy and an improved MTBF (mean time between failures) are both necessary in order for the customer to feel assured with reliability. The design of the FH Series pursues high quality, high performance and long life.



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

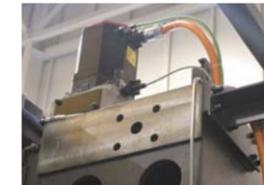
Axial feed speeds and acceleration rates have increased and consequently the reliability of piping and wiring cable has become very important. Cables rub against each other which may lead to oil leaks or broken wires in axial travel. In addition, the damage on brackets caused by the weight of the cable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

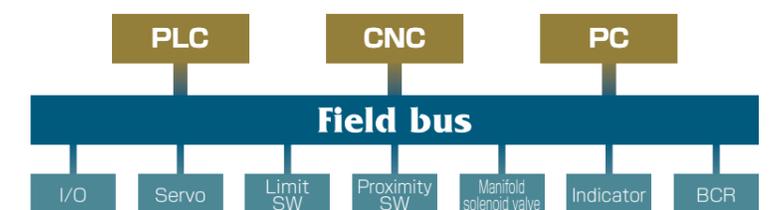
Field bus features

[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

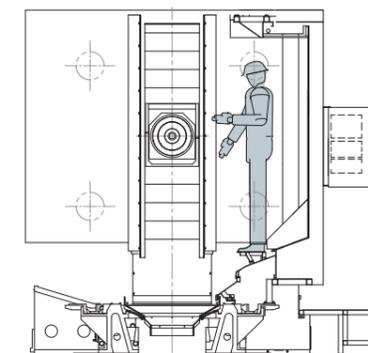
Accessible operation door

The bottom of the operating door is folded inwards, making it possible to work from a closer proximity. Also, the left-hand side operation panel means there is minimal movement with the wide opening and the viewing point, alleviating physical load on the operator.



Machining chamber step making for easy access to the spindle.

At the same time as adopting a center trough design, by providing a work step on the inside of the operation door, we have made it possible to stand close to the spindle and workpiece inside the machining chamber and work safely.



APC door with good accessibility

In make for easy loading\unloading of large workpieces a platform has been provided at the top of the APC. It is possible to stand close to the pallet and work can be carried out safely.



* Execute pallet change after checking that the operator is out of the machine and the door is closed.

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



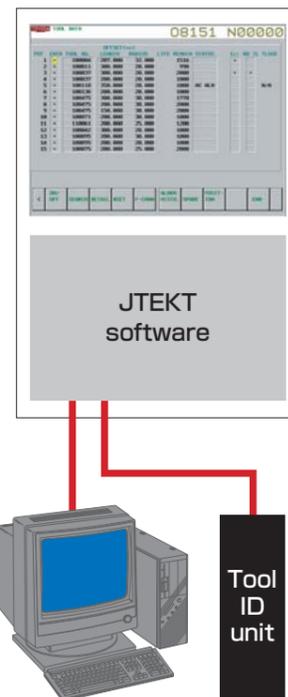
Pallet control support

- 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

Division	Function name	Model OP***			Remarks	
		20iP	20iT	20iA		
①Tool control	Tool number conversion function		●	●	a	
	Tool offset function		●	●		
	Tool life control function		●	●		
	ATC speed variation function		●	●		
	Offset update function		●	●		
	AC function(condition control)		□	□		*
	Cutting condition setting function		□	□		*
	Replacement tool automatic indexing function		□	●		*b
	Tool data update during installation and removal		□	□		*
	Storage tool data saving function		□	□		*
	Tool ID function	□ necessary for attachments.	□	□		*b is necessary
	2nd/3rd correction function		●	●		
	Tool list display		□	●		
	Display function	Faulty tool list display		●		●
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	●	●	●		
	Fault history	●	●	●		
	Fault code-specific frequency	●	□	●		
	Periodic inspection display	●	□	●		
	Load monitor	□	□	□		
	Cycle time measurement	●	□	□		
	Counter	●	□	□		
	Diagnosis data	●	●	●		
⑤DNC support function	Fault history	□	□	□		
	Machining result	□	□	□		
⑥Report	Operation result	□	□	□		
	Production result	□	□	□		



FA control system

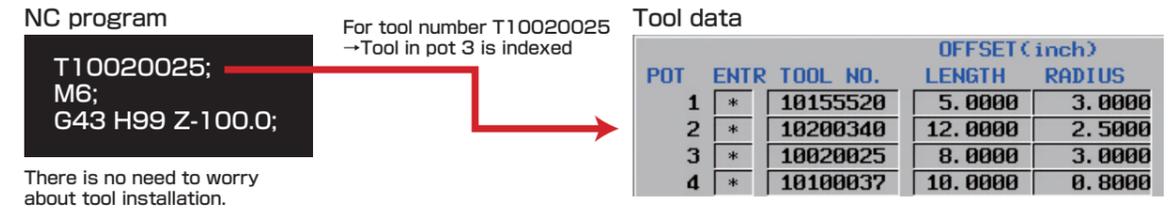
- Attached function: ● Attached as a package
- Can be attached as an option

1. Other functions can be added to the package specification (OP20P/T/A).
 2. 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.
 3. The * mark in the remarks column indicates those items which cannot be included with the FMS or pallet pool-connected machines.

Tool control support

NC program creation is simple.

Tool number conversion function: The tool identification number is automatically converted into the ATC magazine pot number, eliminating command errors.



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.

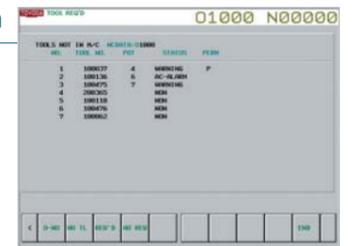
Accurate tool life appraisal

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

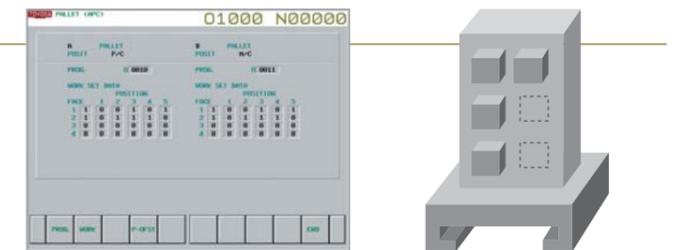
Program tool check function: The tools used in the program are analyzed and any tool shortages are notified.



Pallet control support

Solid pallet control

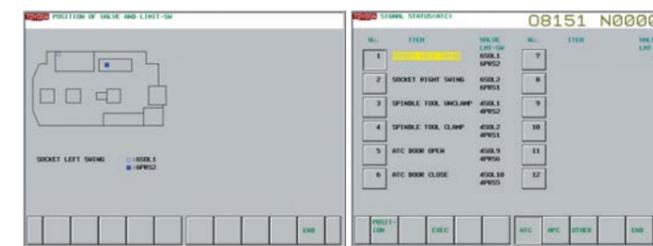
Multi-workpiece installation function: Only registered mounting faces and/or processes are machined, therefore cycle time is significantly reduced.



Maintenance control support

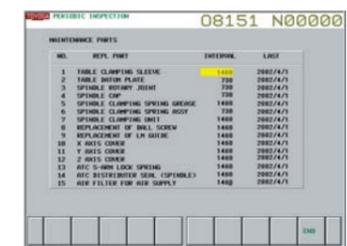
Visual status display

Signal status display function: Limit switch ON/OFF status is given in real-time.



Straightforward inspection items

Periodic inspection display function: Periodic inspection items and completion status are displayed.

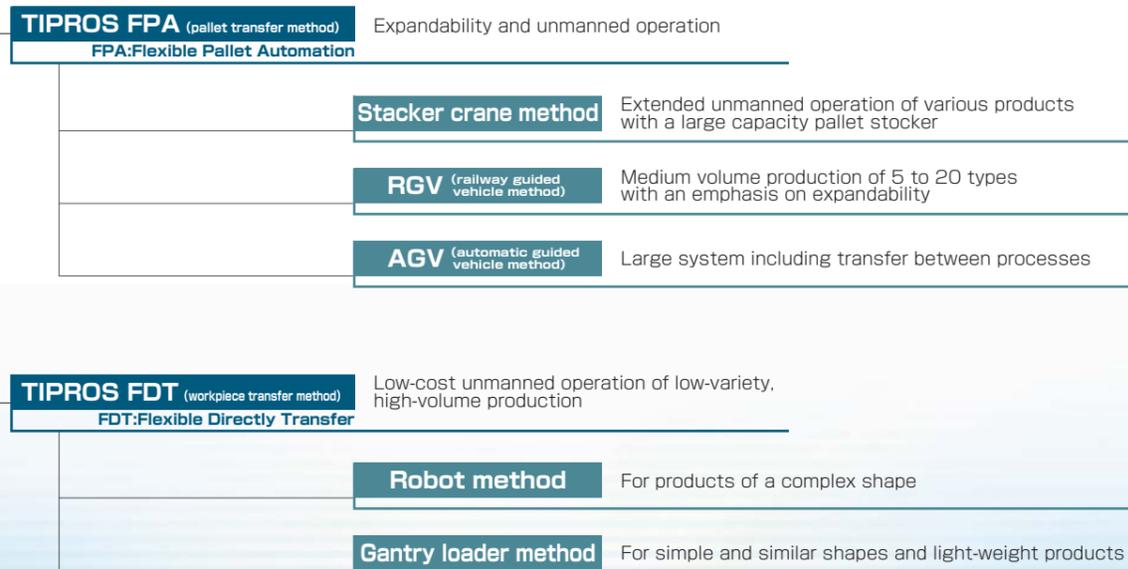


TIPROS

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.



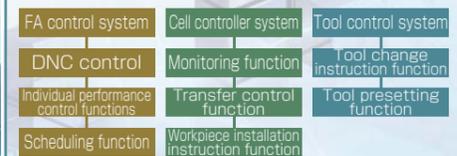
Hardware

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



Software

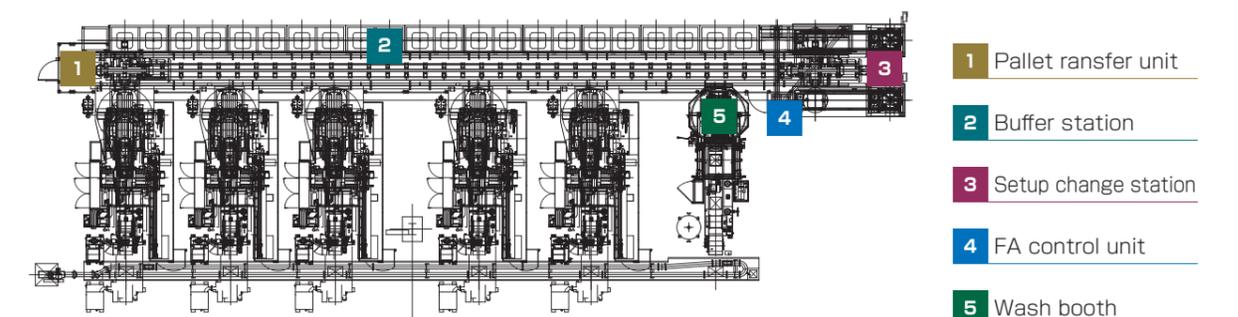
- Flexible control functions
- Enriched unmanned operation support functions
- Superior control functions



TIPROS 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

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)

Complicated, making equipment operations difficult to decipher

Use words to describe the circuit (SFC circuit)

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.

Investigation of the cause of equipment stops

Able to pinpoint the faulty area straight away

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

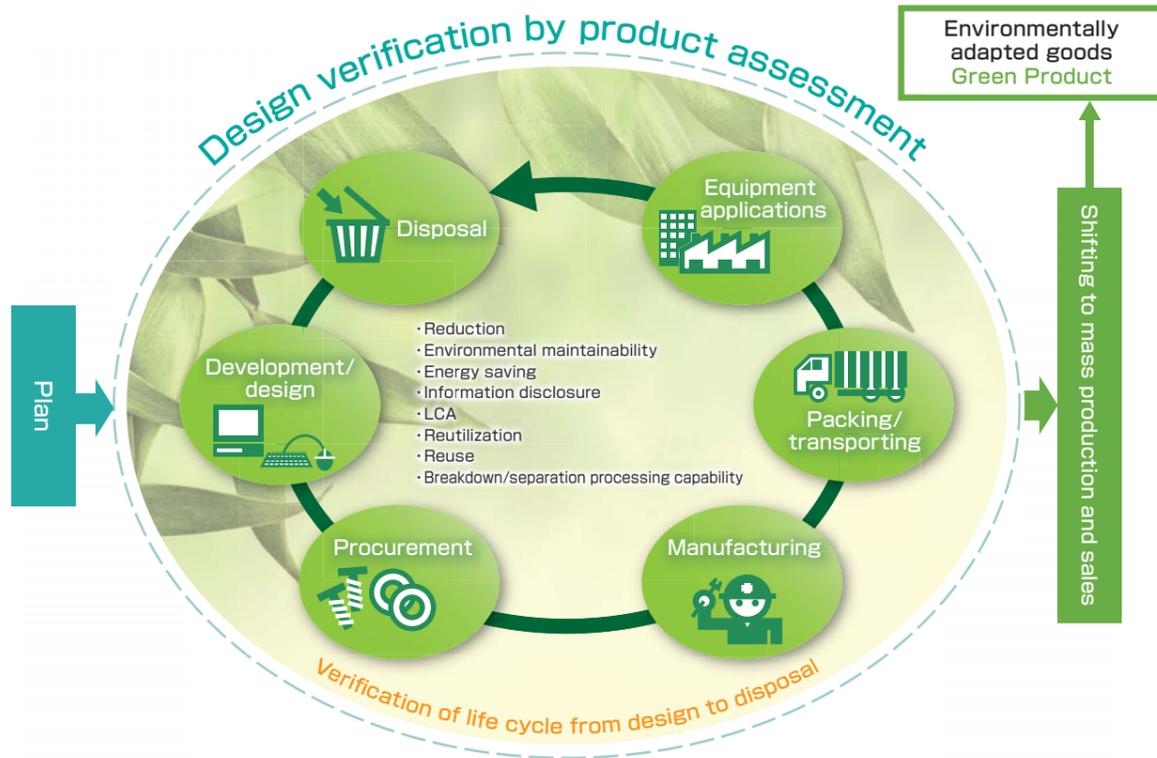
Investigation time comparison:

- Conventional: 15 min. (Time taken to check drawings)
- SFC: 3 min.

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.

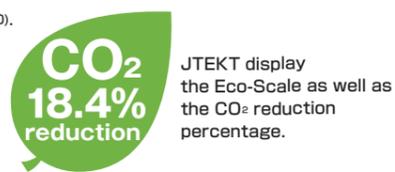
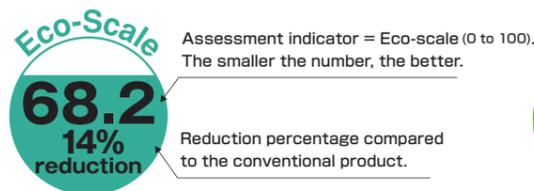


2. In order to evaluate the environmental adaptability of each product we use a method that calculates the evaluation indicators throughout the target product's life cycle

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.



3. Environmental consideration in the product development stage (applicable model: FH800SX-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 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.

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.

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.

Reduction of coolant pump power consumption 50% reduction

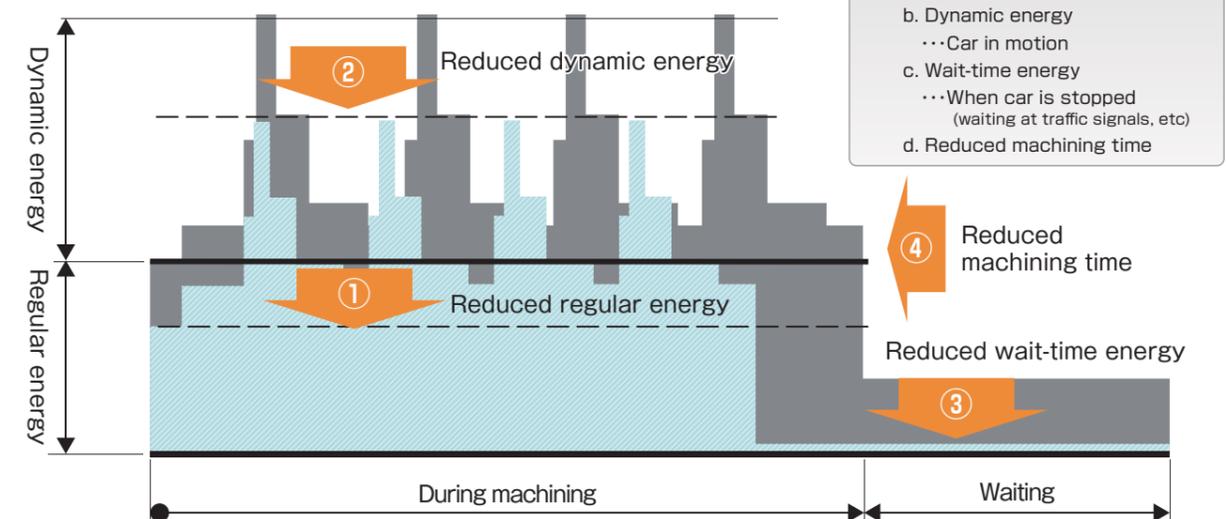
The center trough method not only reduces the coolant consumption but also reduces the amount of power used by the coolant pump. In addition, optimization of coolant piping has contributed to a 10% reduction in pressure loss.

Recycled magazine socket 4.8t reduction

The material of the magazine socket used for the machining center was changed from phenol resin to 66 nylon which is able to be recycled, contributing to the annual reduction of waste by 4.8 ton. This is to improve the recycling property of the product in the disposal stage.

A model of energy reduction

Energy consumption during machining and waiting



Machine specifications

Item		Unit	FH800SX-i			
			Standard specifications		Special specifications	
Table & Pallet	Table dimensions (pallet dimensions)	mm	□800 (Pallet)			
	Rotary table indexing angle	°	1°	0.001° (NC)		
	Pallet height (from floor)	mm	1,320			
	Max load on pallet	kg	2,500			
	Table indexing time (90° indexing)	sec	4.0	4.0		
	Pallet change time	sec	20			
Stroke	X-axis	mm	1,450			
	Y-axis	mm	1,250			
	Z-axis	mm	1,550			
	Distance between spindle nose and table center	mm	100~1,650			
	Distance between spindle center and top of pallet	mm	100~1,350			
	Max. workpiece swing × Max. workpiece height	mm	φ1,500 × 1,500 ※1			
	Feeds	Rapid feed rate (X, Y and Z)	m/min	54		
Cutting feed rate (X, Y and Z)		m/min	0.001~30			
Rapid acceleration (X, Y and Z)		m/s ² (G)	4.9 (0.5)			
Ball screw diameter (X, Y and Z)		mm	φ50			
Spindle		Spindle speed	min ⁻¹	50~6,000	50~6,000	50~15,000
	Spindle diameter (front bearing bore)	mm	φ110	φ110	φ100	
	Spindle nose shape		BT No.50	HSK		
	Spindle motor, short-time/continuous	kW	30 / 22	37 / 30	30 / 25	
	ATC	Tool holding capacity	tool	60	121	
Tool selection			Absolute address			
Tool (dia. x length)		mm	φ120 × 800 ※2			
Tool mass		kg	35			
Tool change time (Tool-to-Tool)			sec	2.7 (15kg) 3.2 (15~35kg)		
			sec	4.4 (15kg) 5.0 (15~35kg)		
Tool change time (Chip-to-Chip)			sec	4.4 (15kg) 5.0 (15~35kg)		
		Tools Holder		MAS BT50		
Pull stud		MAS P50T-1				
Dimensions & Weight	Floor space (width × depth)	mm	4,680 × 7,710 ※3			
	Machine height	mm	3,680			
	Machine weight	kg	28,000			
Various Capacities	Working oil	L	18			
	Slide lubricant	L	2.9			
	Spindle oil air	L	2.9			
	Table	L	5.5			
	Spindle coolant	L	20			
	Power supply capacity	kVA	53	59	55	
	Control voltage	V	AC100 DC24			
	Air source capacity	NL/min	900			
	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)	
Table indexing repeatability ※4		sec	± 3	±3.5 (NC) ±2 (with NC encoder)		

※1 For detail shape, refer to the tooling data. ※2 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

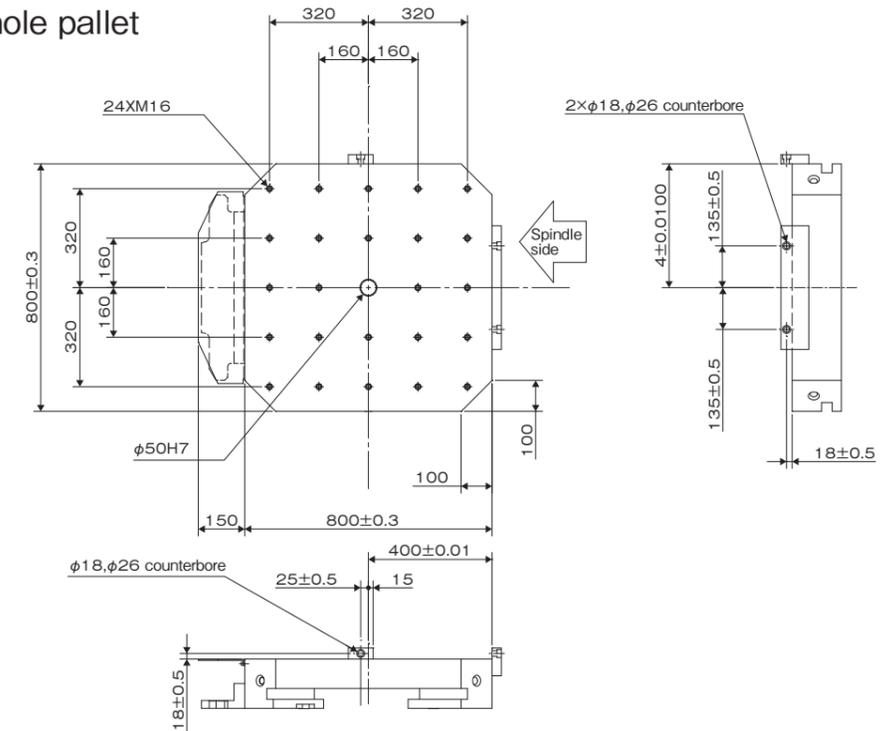
Division	Name	FH800SX-i	
Axis control	Min. input increment (0.001mm)	●	
	Machine lock	●	
	Absolute position detection	●	
	Inch/metric switch	□	
Operation	Dry run	●	
	Single block	●	
	Manual handle feed 1 unit	●	
	Program restart	□	
	Manual handle interrupt	□	
	Interpolation function	Nano interpolation	●
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	●	

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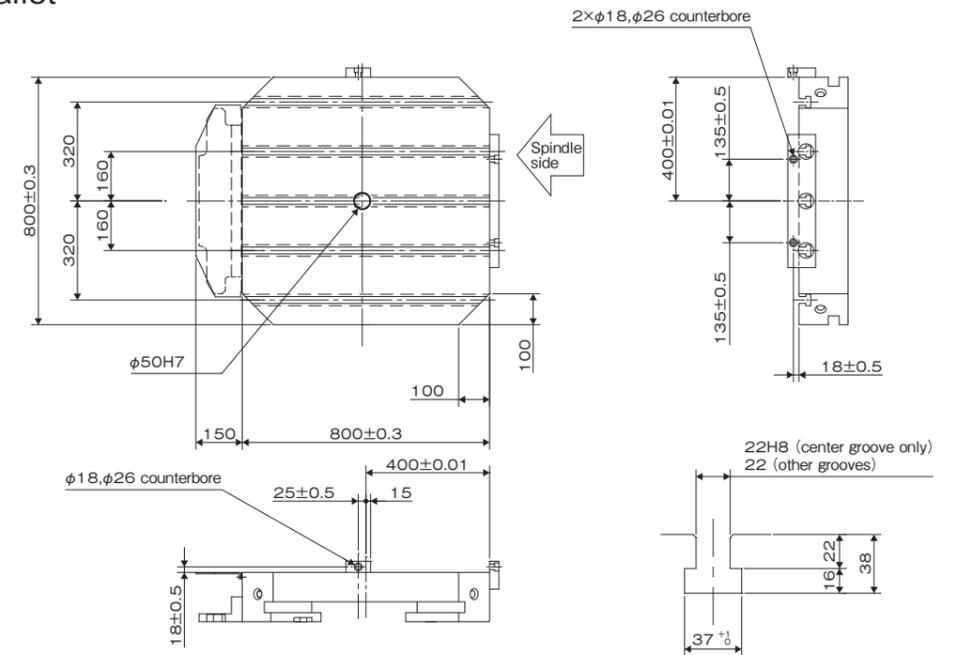
Accessories ● Standard accessories / □ Optional accessories

Item	Equipment name		FH800SX-i			
Table and pallet	Indexing table	1" indexing table	●			
		NC indexing table	□			
		NC indexing table (with encoder)	□			
Pallet	Standard pallet screw hole	T-groove pallet	□			
		Single piece screw hole	□			
		Single piece T-groove	□			
Spindle relations	Speed	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)	□			
		Filler block for oil hole holder	□			
		Positioning block for angle head holder	□			
		HSK specifications	□			
		BIG PLUS specifications	□			
Collet	MAS I	JIS	□			
		MAS II	□			
			□			
Tool magazine	Tool capacity	60 tools	●			
		121 tools	□			
Coolant relations	Coolant supply unit	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)	□			
		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	●			
		Chip flushing coolant	●			
		Internal screw conveyor	●			
		Coolant cooling	□			
		Oil skimmer	Belt type	□		
		Chip box		□		
		Splash gun (at APC)		●		
		Mist collector		□		
Splash guard	Air blower	External nozzle type	□			
		Enclosure guard	●			
		Door interlock at operating position	Electromagnetic lock type	●		
		APC door interlock	Electromagnetic lock type	●		
Operation control function, others	Internal lighting		●			
		Ground fault interrupter	□			
		Cooler for control cabinet inside	□			
		Automatic fire extinguisher	□			
		Universal design cover	□			
		Labor saving function	Pallet changer (APC)		●	
					□	
Support for high accuracy	Spindle cooling unit		●			
		Ball screw shaft cooling	●			
		Scale feedback (X-, Y- and Z-axes)	□			
		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	Spindle thermo stabilizer function		□			
			□			
			□			
	Package	OP20IP maintenance model	●			
		OP20IT tool control model	□			
		OP20IA advanced tool control model	□			
	Tool control	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	□		
			Tool ID function	□		
			Tool list display	□		
			Pallet control	APC control		□
					Multi-workpiece installation	□
	Auxiliary function	NC data configuration diagram		□		
Measurement result display			□			
Maintenance function	Signal status display	Signal status display	□			
		Fault history	□			
		Fault code-specific frequency	□			
		Periodic inspection display	□			
		Cycle time measurement	●			
		Counter	●			
		Load monitor	□			

Threaded hole pallet

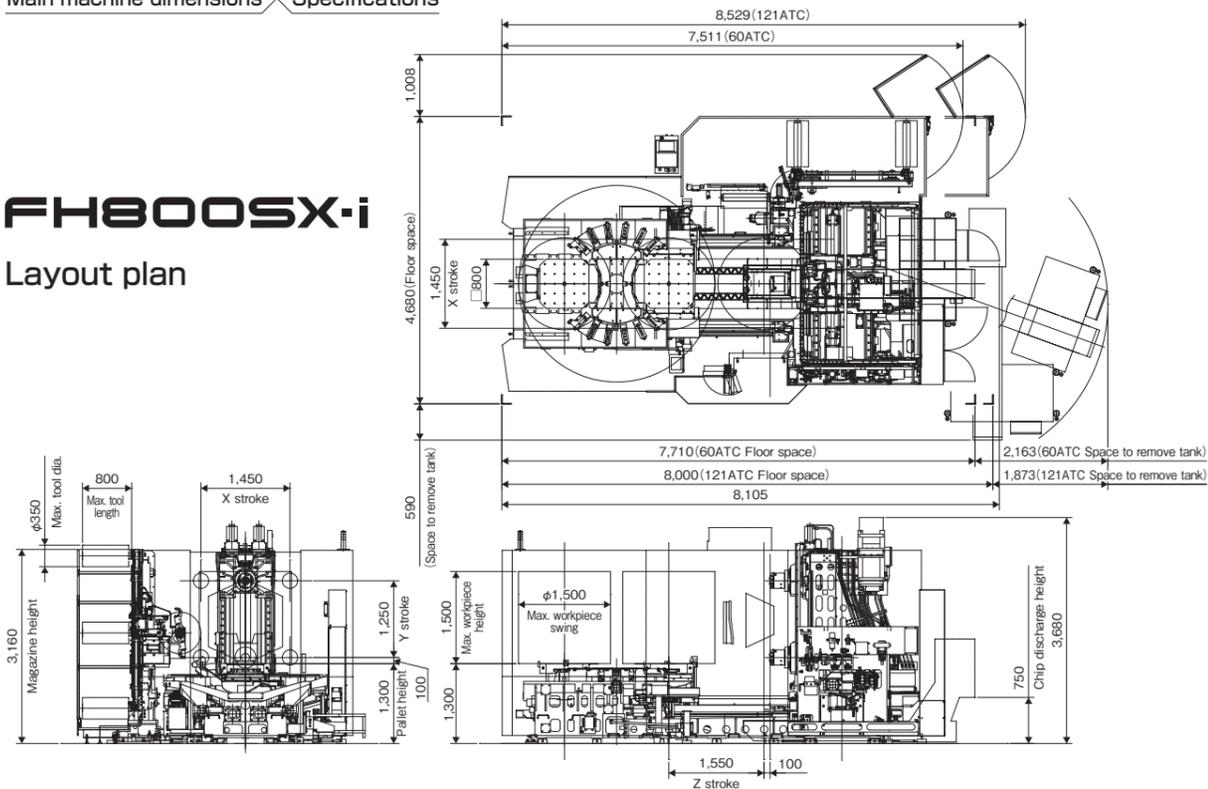


T-groove pallet



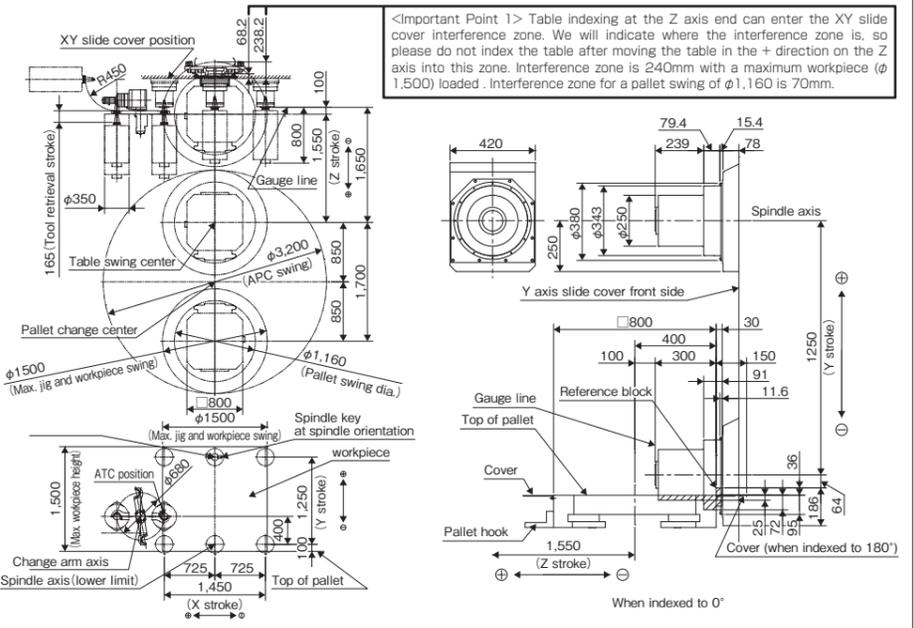
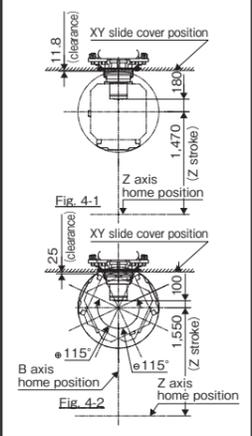
FH800SX-i

Layout plan



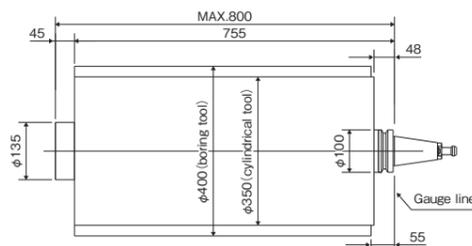
Interference area

<Important Point 2> The table can swing $\pm 180^\circ$ from the B axis home position when it is 1,470mm from the Z axis home position. (See Fig. 4-1). When the Z axis is at a stroke between 1,470 and 1,550mm, B axis can swing $\pm 115^\circ$.



<Important Point 1> Table indexing at the Z axis end can enter the XY slide cover interference zone. We will indicate where the interference zone is, so please do not index the table after moving the table in the + direction on the Z axis into this zone. Interference zone is 240mm with a maximum workpiece ($\phi 1,500$) loaded. Interference zone for a pallet swing of $\phi 1,160$ is 70mm.

Limitations in tool holder shape (JIS,CAT,DIN,Big+BT No.50)



The tool holder is subject to limitations in the shape during ATC(automatic tool change). If the maximum tool diameter exceeds $\phi 100$, the 48mm range from the gauge line must be $\phi 100$ in the outside diameter. The 55mm range from the gauge line must be within $\phi 210$ in the outside diameter. The total mass must be within 35kg and the length from the gauge line must be within 800mm.

Item	Max. spec
Tool length	800mm
Tool diameter	With 60 tools magazine: $\phi 120$ mm (with no limitations caused by adjacent tools) With 121 tools magazine: $\phi 130$ mm (with no limitations caused by adjacent tools)
Tool weight	35kg: 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 groove position of the tool holder and so on.

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