

TOYODA

FH SERIES

Horizontal Spindle Machining Centers

FH1000SX
FH1250SX
FH1250SW

JTEKT



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

Information presented in this brochure is subject to change without prior notice.
Available machines or machines shown may vary depending on optional equipment or periodic design changes.
The export of products defined as restricted commodities (or technologies) under Japan's "Foreign Exchange and Foreign Trade Act" requires an export license issued by the Japanese Government. Furthermore, similar licenses may be required for re-transfer, re-sale or re-export of such products, therefore please do not fail to contact JTEKT in advance.
In order to observe laws and regulations and prevent inappropriate export, re-sale and relocation, JTEKT has equipped all of our NC machine tools with devices that detect relocation. If this device is activated, the machine will cease operation and will not restart until it has been checked by JTEKT. JTEKT may refuse to restart the machine should it be deemed that such an action would amount to the inappropriate export of a commodity or technology, or violate export regulations. In such a case, JTEKT will not be liable for any damages arising from the refusal to restart machine operation and do not bear any liability to perform services pertaining to product warranty. Please contact your JTEKT representative for details. Always read manuals carefully before using any machinery to ensure safe and proper use.

Type of Machinery: Machining Center
Model Number: FH1000SX, FH1250SX, FH1250SW

©JTEKT CORPORATION 2008, 2013
Cat. No. M2088-2E

Printed in Japan 131008U
This publication was made using recycled paper for the protection of forests.

JTEKT
JTEKT CORPORATION

JTEKT
Koyo TOYODA



Supporting
environmental age

Energy-related industry, aerospace industry, construction machine and transport machine

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.

FH1000SX, FH1250SX and FH1250SW are super-large-size horizontal machining centers which can realize high-quality, increased production efficiency and 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.

■ Rapid feed rate, the fastest in the class

More than double speed performance is realized compared with large-size machine tools such as horizontal boring and milling machine and 5-face machining center.

■ Cutting ability, the strongest in the class

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



FH1000SX / FH1250SX / FH1250SW

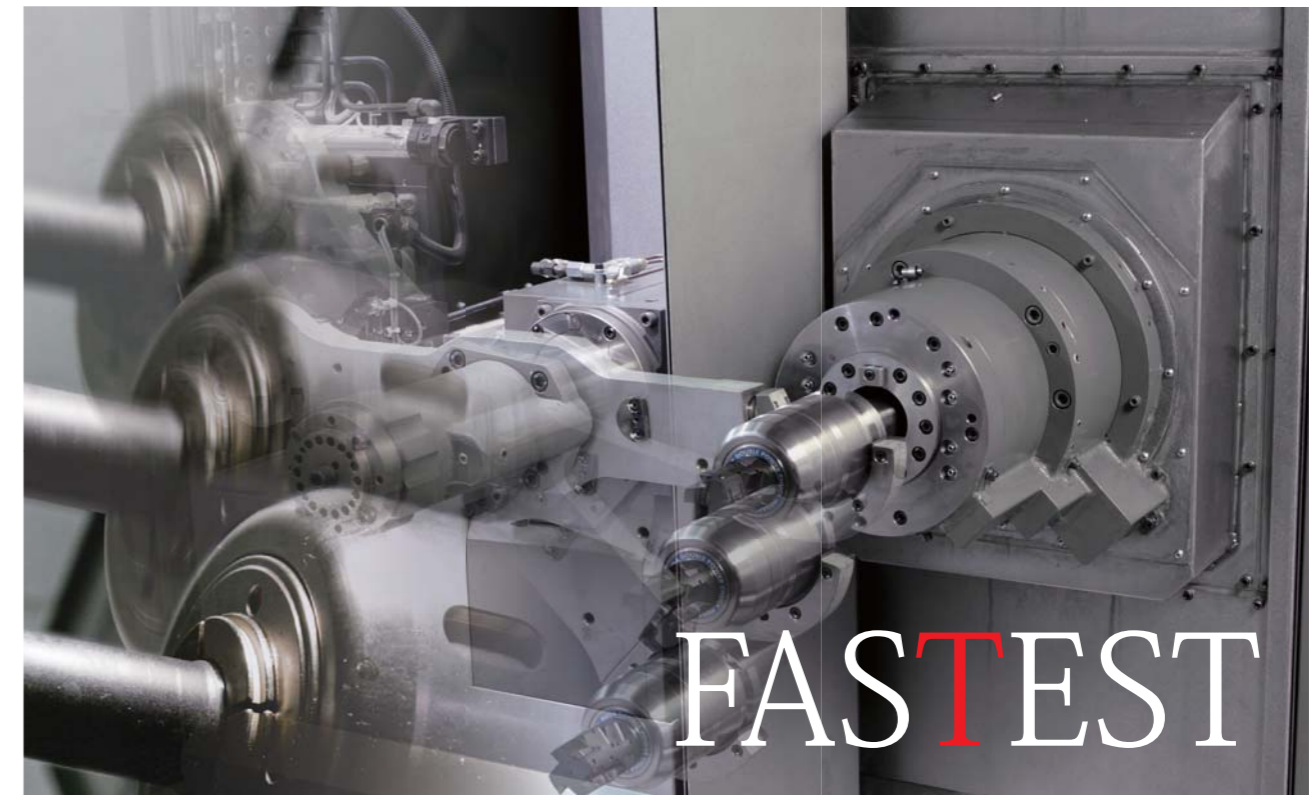
maximum & fastest

MAXIMUM



	Maximum workpiece range	Maximum load on pallet	Stroke (X×Y×Z)
FH1000SX	□1,800mm×1,600mm	3,000Kg	1,600mm×1,400mm×1,850mm
FH1250SX	□2,400mm×1,800mm	5,000Kg	2,200mm×1,600mm×1,850mm
FH1250SW	□2,400mm×1,800mm	5,000Kg	2,200mm×1,500mm×1,850mm

FASTEST

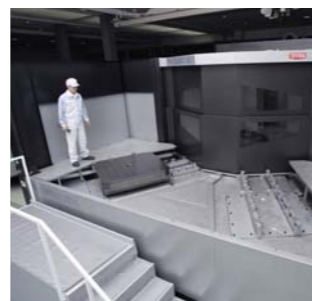


	Rapid feed rate	Tool changing time (C-C)	Table indexing time (90 degrees)
FH1000SX	54m/min	4.4 sec.	4.0 sec.
FH1250SX	42m/min	4.4 sec.	5.6 sec.
FH1250SW	42m/min (Z-axis)	6.0 sec.	5.6 sec.



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. FH1250SX has necessary and sufficient machine strokes capable of mounting a workpiece of maximum workpiece swing of 2400mm dia. and 5000Kg maximum load, allowing the largest workpieces for the machines of this class. This machine also has the biggest Z axis stroke for this class so as to prevent interference with APC & ATC at the maximum workpiece range. It should also be noted that the shortest accessible distance from the table center to the main spindle end face is 200mm by which it is possible to machine workpieces with short tools.



Boasts the highest speed of the class without sacrificing 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 FH1250SX, thereby both high-speed performance and high rigidity are achieved. Rapid feed rate is as high as 42m/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.

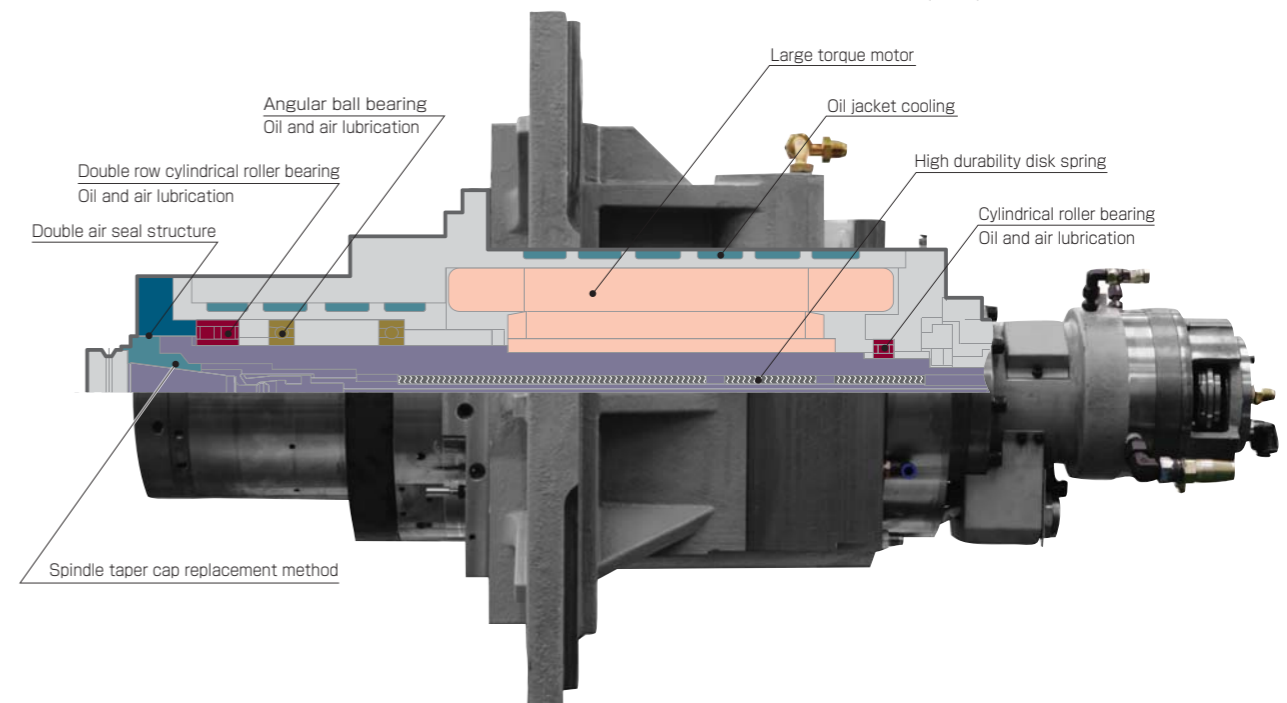
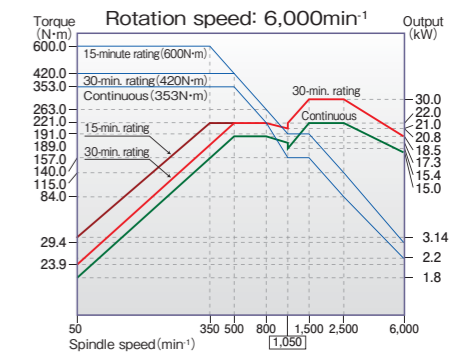
Standard spindle optimum for machining of iron and cast metals

FH1000SX

FH1250SX

- [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

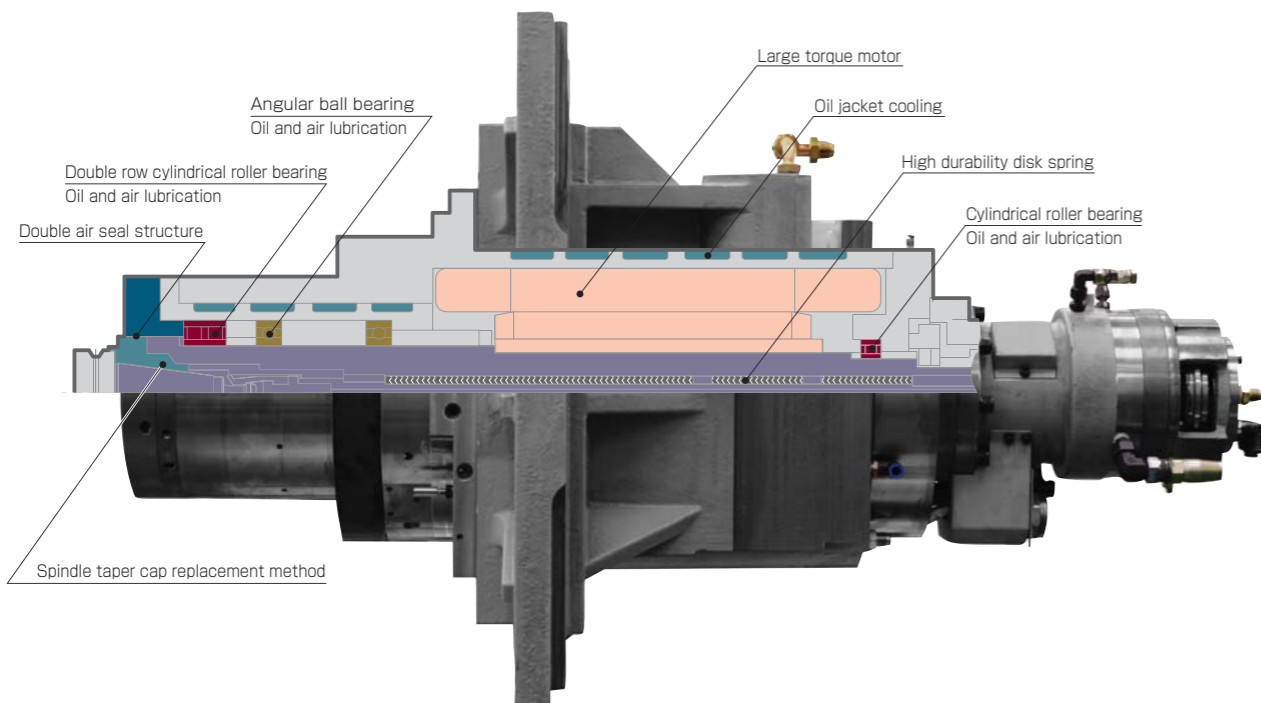
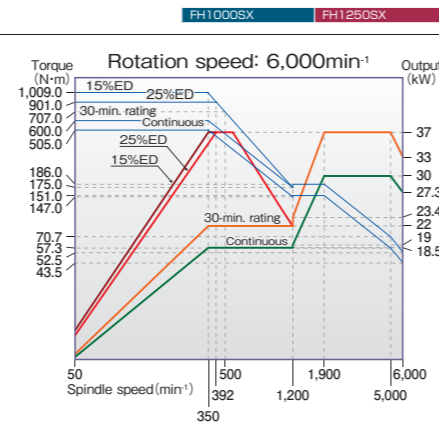
Boring
 [Tool] φ400 boring
 [Spindle speed] 80min⁻¹
 [Cutting feed rate] 30mm/min



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.

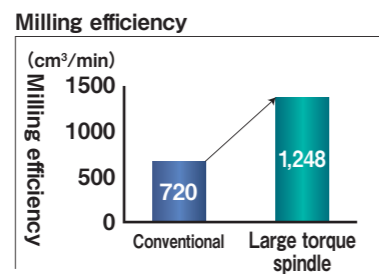


Best cutting performance in its class with a 1,009N·m large torque spindle

■ 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

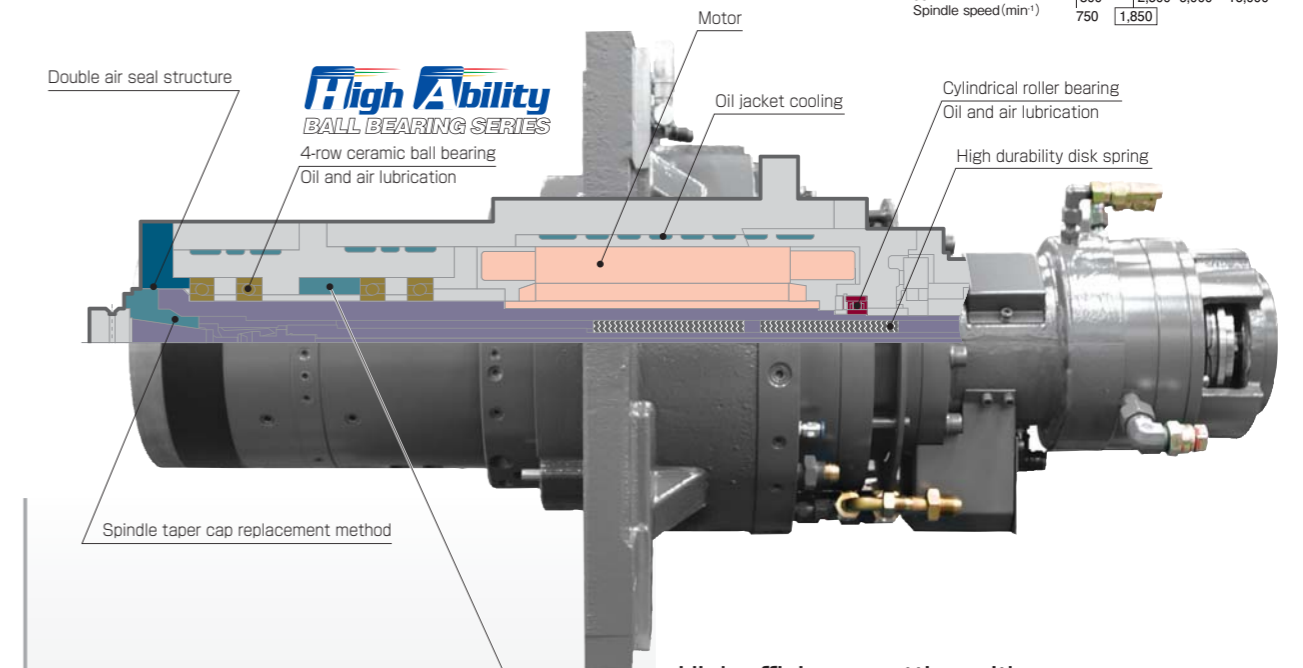
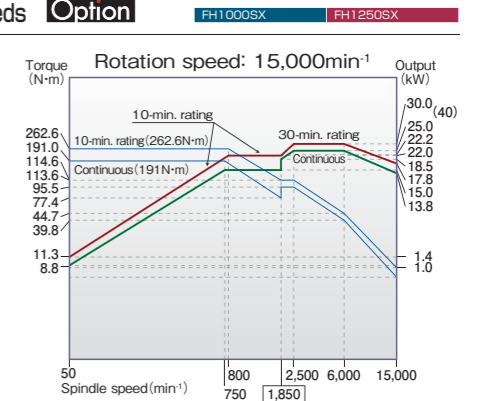


- Boring
 - [Tool] φ92 boring
 - [Spindle speed] 500min⁻¹
 - [Feed rate] 200mm/min

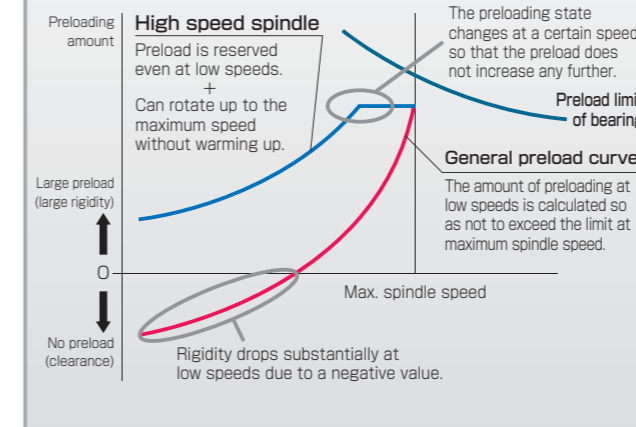
Wide-range spindle prided for high rigidity and rotation accuracy within a wide range of low to high speeds **Option**

- [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

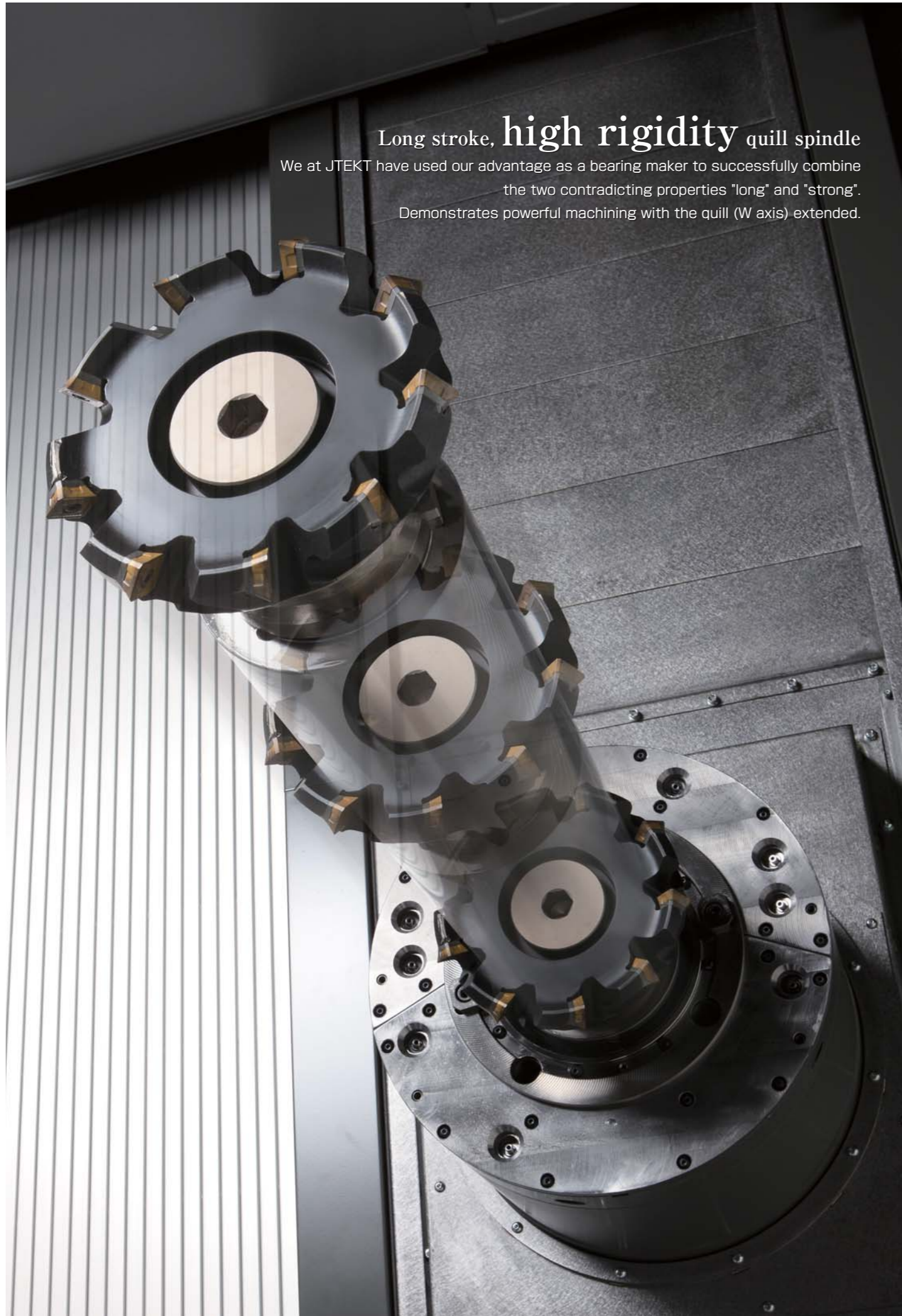
Finish cutting

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



Long stroke, high rigidity quill spindle

We at JTEKT have used our advantage as a bearing maker to successfully combine the two contradicting properties "long" and "strong". Demonstrates powerful machining with the quill (W axis) extended.

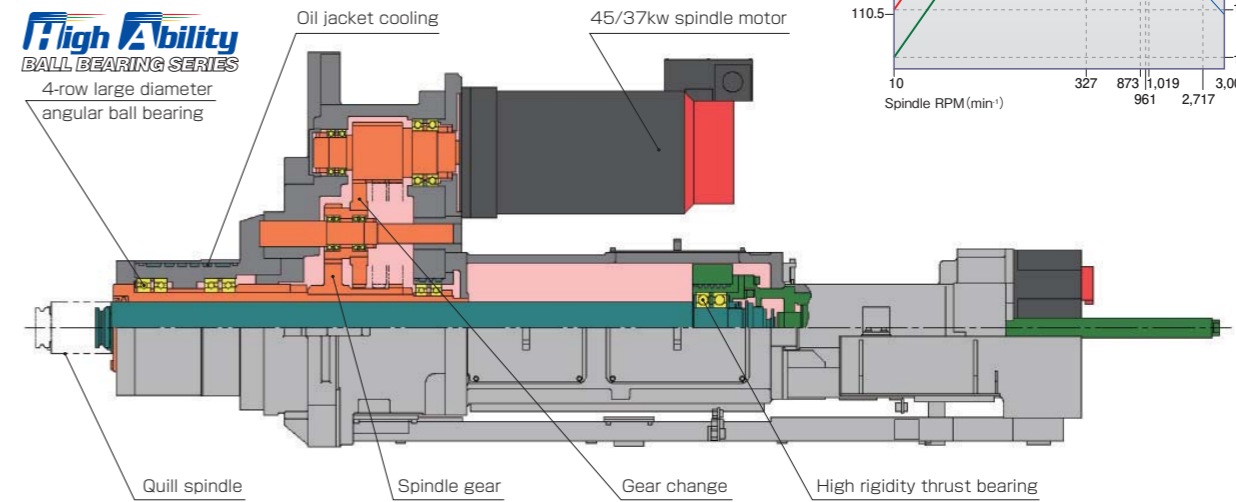
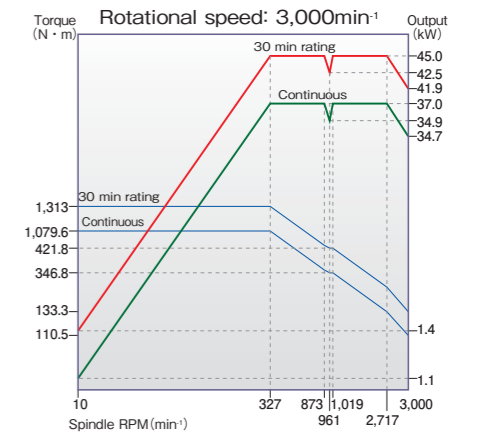


A high rigidity Quill-axis (W-axis) with the longest stroke in its class.

FH12503W

- [Spindle speed] 3,000min⁻¹
- [Spindle nose shape] BT No.50
- [Spindle motor (short-time/continuous)] 45/37kW
- [Max. torque] 1,313N·m
- [Spindle diameter (front bearing bore)] φ180mm

A newly developed gear drive quill spindle with a maximum torque of 1,313N·m and maximum RPM of 3,000 min⁻¹, ideal for cutting steel and casting parts. Demonstrates power in large dia. deep drilling and boring. Quill spindle stroke (W axis travel amount) of 550mm, ideal for machining large workpieces.



Achieved high efficiency machining with process integration

Placing importance on rigidity, the quill diameter is made φ130mm, able to accommodate a cutting thrust load of up to 20,000N. Also, the drilling of large diameter holes, conventionally divided between several processes, can now be done in one go with a large diameter drill.



Best cutting performance in its class with a 1,313N·m large torque spindle

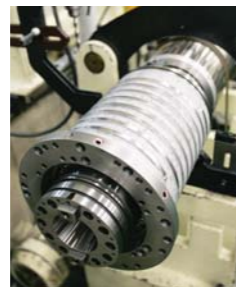
Milling example [1] (w=0)	End milling example [2] (w=0)	Drilling example [3]
Chip discharge: 1,248 cm ³ /min	Chip discharge: 366cm ³ /min	Chip discharge: 918cm ³ /min
[Material] S48C	[Material] S48C	[Material] S48C
[Tool used] φ160	[Tool used] φ40 Throw away	[Tool used] φ150
[Spindle rotation speed] 400min ⁻¹	[Spindle rotation speed] 1,590min ⁻¹	[Spindle rotation speed] 297min ⁻¹
[Cutting width] 130mm	[Cutting width] 20mm	[Cutting feedrate] 52mm/min
[Cutting depth] 6mm	[Cutting depth] 32mm	
[Cutting feedrate] 1,600mm/min	[Cutting feedrate] 572mm/min	

Tool longevity and cutting accuracy to be discussed separately.

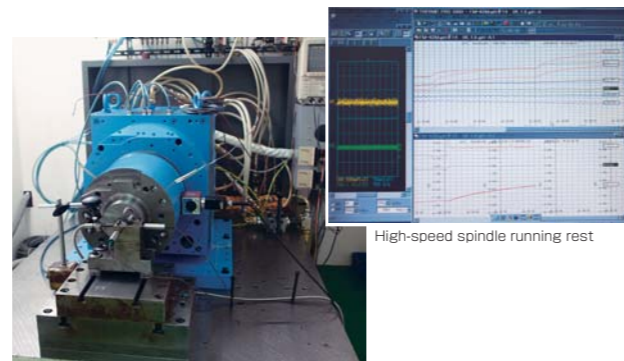
JTEKT's spindle promises assurance over a long period and takes maintenance into consideration.

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

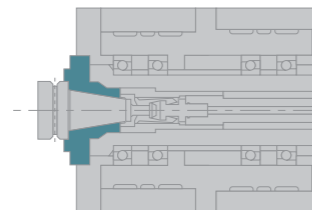
Basic design particularly focusing on low vibration.

A spindle vibration within 2 microns* has been accomplished (measurement with a 15,000min⁻¹ spindle). FH1000SX FH1250SX

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. FH1000SX FH1250SX

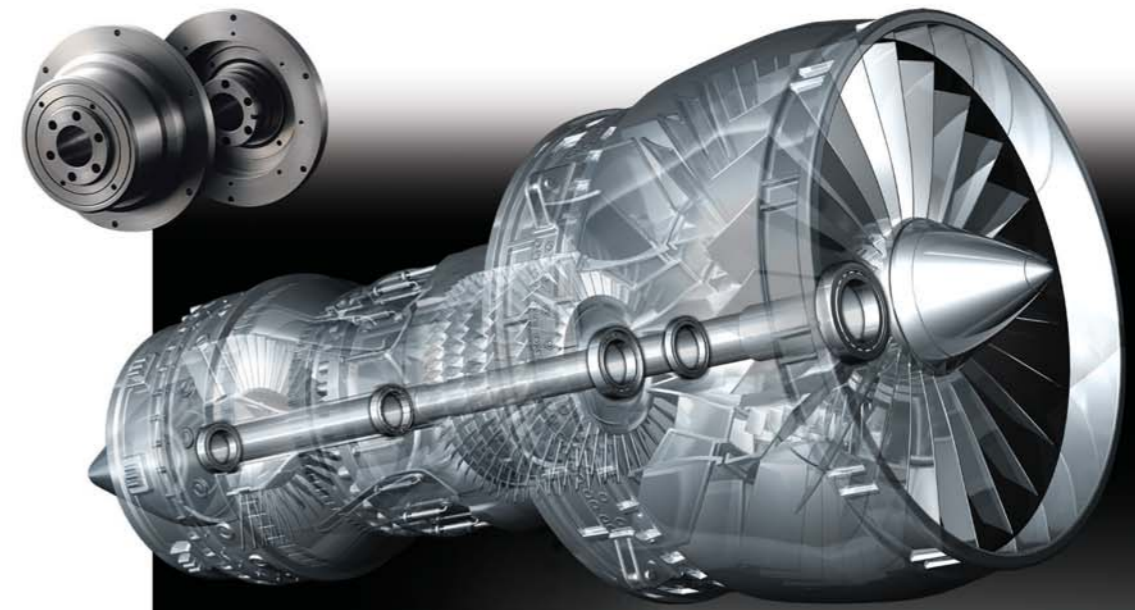
Even in the rare chance that a failure does occur, a replacement spindle cartridge that has been checked at JTEKT for operation and quality can be installed in its place, keeping restoration time down to a minimum. Furthermore, the separate spindle taper makes individual cap replacement possible as it 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, 3,000min⁻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.

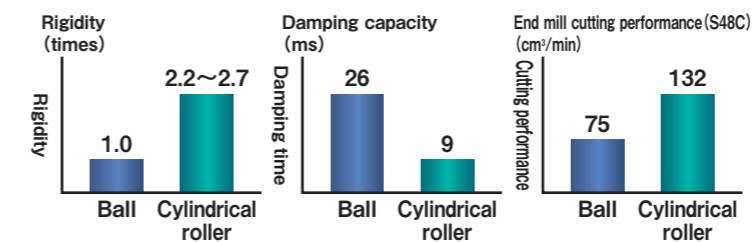
High grade cast iron high rigid bed keeping machine level stable over a long period

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

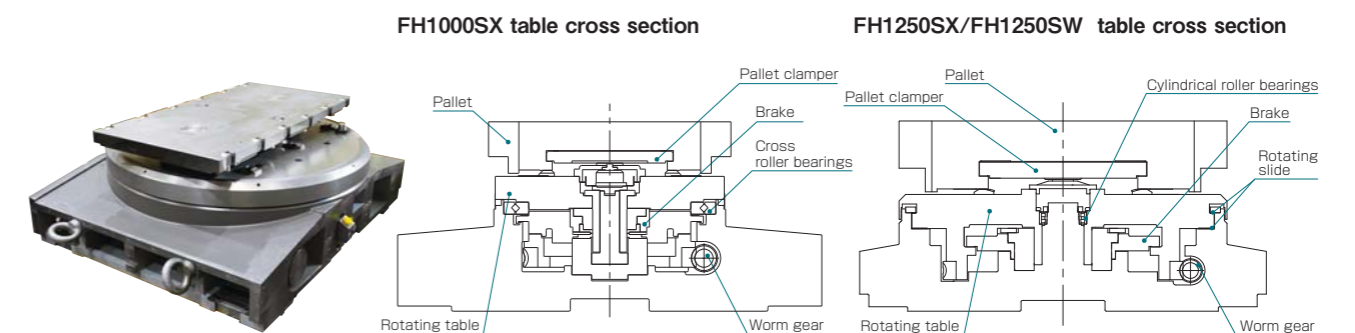
Compared to the ball guide, the cylindrical roller slide features less elastic deformation against loads and smaller displacement caused by load variation, as well as possesses superior vibration damping characteristics. This feature makes it possible to position quickly with smaller orientation changes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

The NC index table is indexed in 0.001° units. The high rigidity and high accuracy cross roller bearings of the FH1000SX and the large diameter slide on the table periphery of the FH1250SX each 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.



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
- [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

- [Triple 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

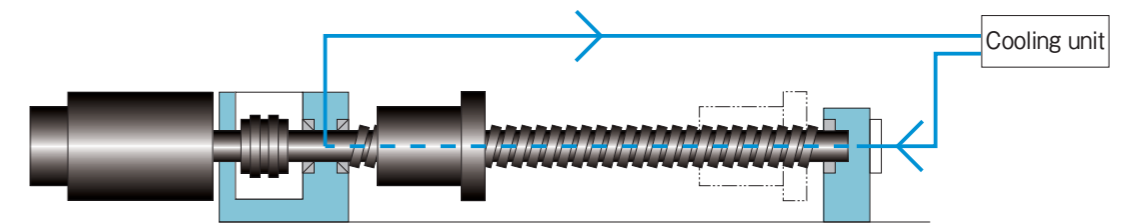
Spindle balancing

Precision assembling work

Ball screw shaft cooling

Spindle core cooling performing stable and high accuracy machining

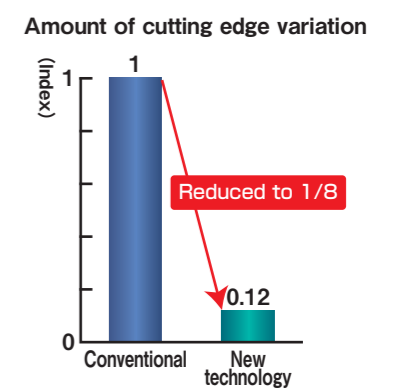
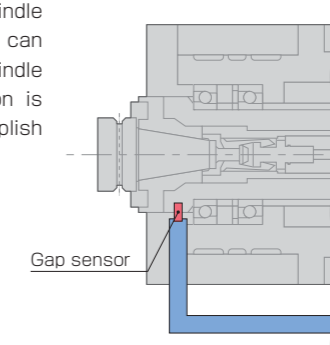
Heat displacement is restrained and stable and high accuracy machining is performed by always discharging the controlled cooling oil to the spindle core of ball screw which has core empty structure in order to follow the bed temperature. Furthermore, this machine is of highly reliable design in which 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.

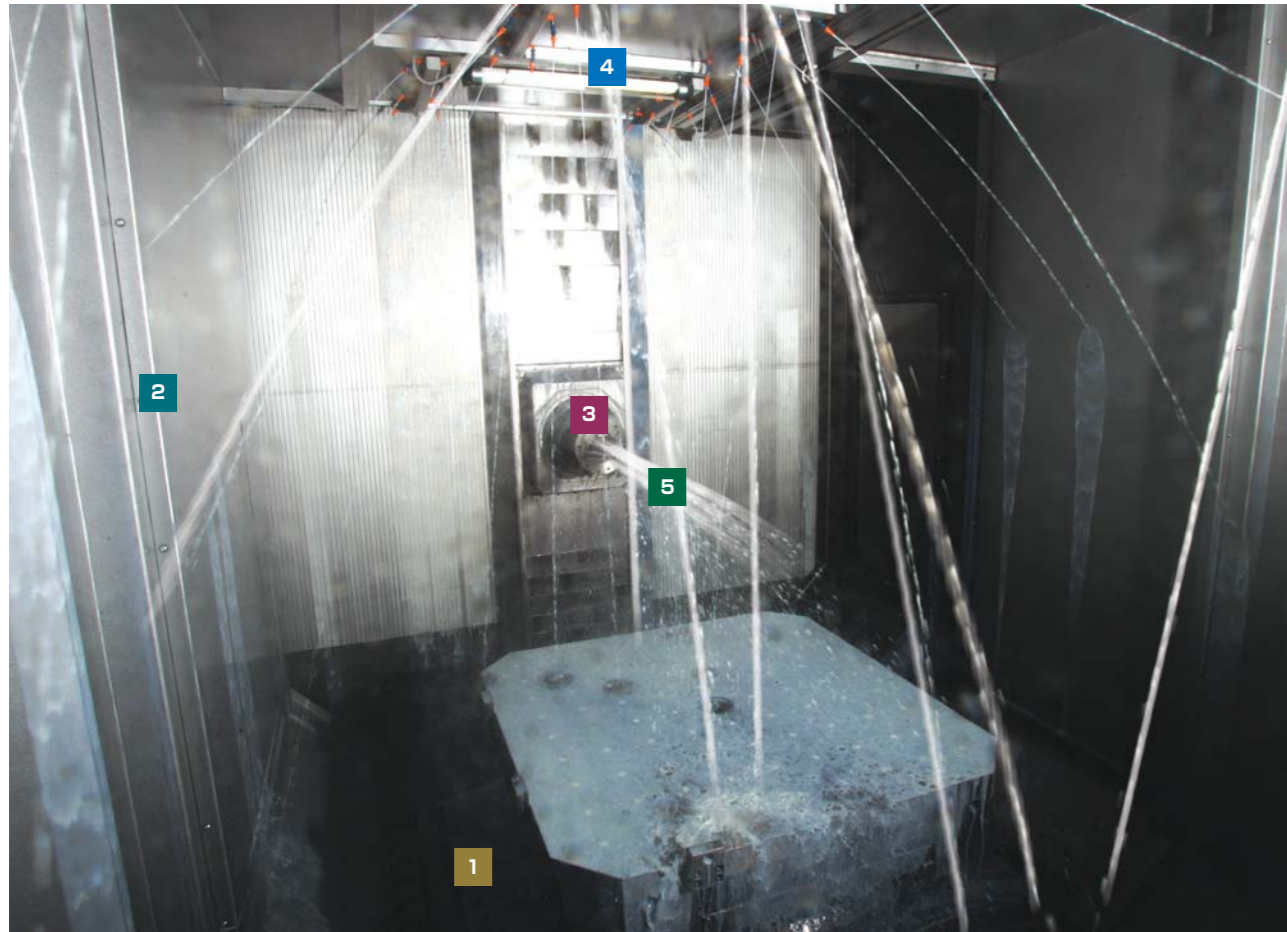


Touch sensor function **Option**

The touch sensor is used to align the workpiece.



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



1 Triple trough

Three screws are provided on the bed top face to make chip processing smoother.



3 External nozzle coolant

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

2 Vertical cover

Chips are processed efficiently by constructing the machining chamber interior from vertical covers. Furthermore, chip accumulation at the work position is prevented by an operation door with a shape that has been carefully designed.



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.)

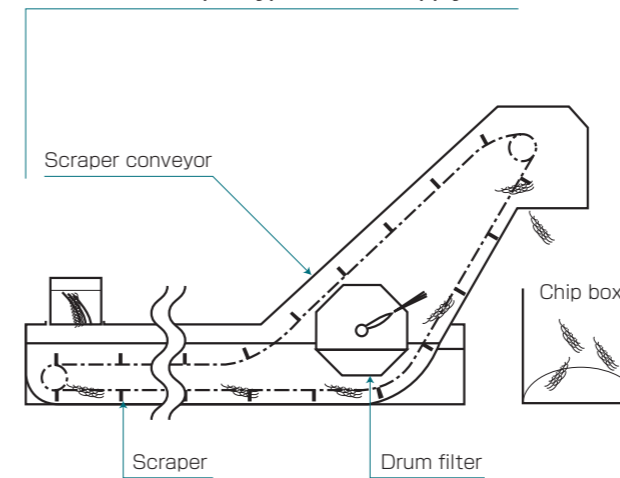


Spindle-through coolant 3MPa

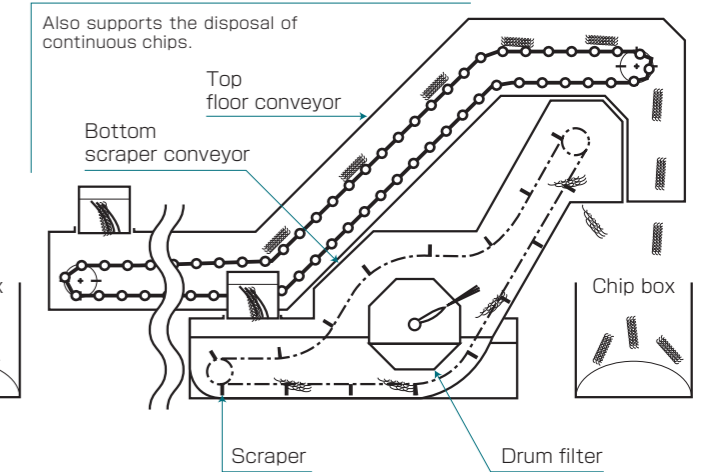
Coolant supply unit with take-up chip conveyor

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.

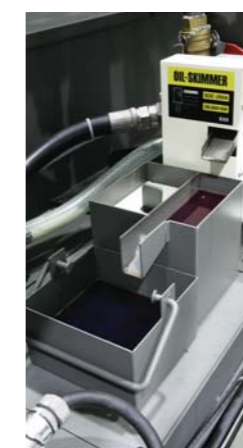
Standard scraper type coolant supply unit



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

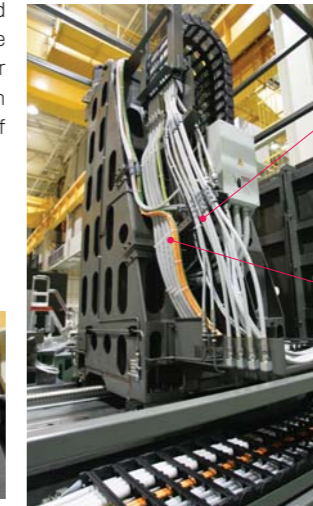
Stable accuracy and an improved MTBF (mean time between failures) are both necessary in order for the customer to feel assured with reliability. The design of the FH Series pursues high quality, high performance and long life.



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.



This photo shows FH1250SX.

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.

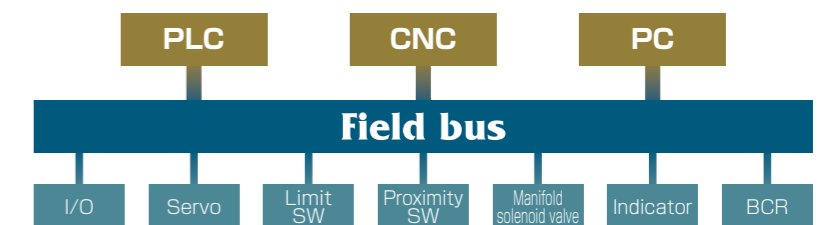
Field bus features

[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

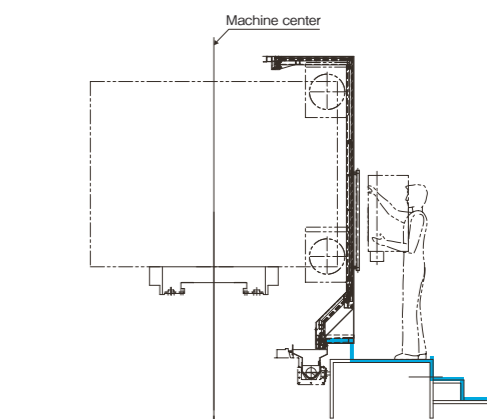
Accessible operation door

By positioning the operation panel on the left-hand side of the machine, we have created a wide opening and reduced the amount of eye travel required. This in turn reduces the physical strain on the operator by not demanding a constrained physical posture.



A step providing easy access to the spindle

By bending the bottom portion of the operation door into the inside and installing a work step, the operator is able to stand close to the spindle and work can be performed safely.



The FH1000SX step is two steps high.



This photo shows FH1250SX.

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.



This photo shows FH1000SX.

OP SupporterII

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

The 4 supporting features of the OP SupporterII

Program control support

- Required information can be obtained without opening multiple pages ... Program check & edit
- Command to machine can be executed with using cycles of eight drilling patterns--NC program edit
- The state of tools can be displayed by using NC program list (so as to check the state of tools before machining) ...List of use tool
- The configuration of sub programs can be displayed by using NC program list (so that time to edit can be reduced) ...NC program configuration diagram

Tool control support


- Simple program ... Tool number conversion function
- Direct tool setting capability ... Tool correction function
- Detailed control ... Tool life control function
- Limiting arm speed according to tool weight ... ATC control function
- Feedrate and rotation speed can be set in each tool...Machining condition setting function
- Faulty tool indexing ... Automatic magazine indexing function
- Storing the removed tool data and reusing it...Stored tool data storing function
- Setting the max. rotation speed in each tool and checking S-command...Limit rotation speed setting function
- Compensation value can be set till 3 sets in each tool...Second/third compensation function

Pallet control support

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

Maintenance control support

- Equipment fault recording ... Alarm history function
- Periodic inspection item reminder ... Periodic inspection function
- Maintenance work of ATC unit is made easy...Unit maintenance function



- Equipment fault recording ... Alarm history function
- Periodic inspection item reminder ... Periodic inspection function
- Maintenance work of ATC unit is made easy...Unit maintenance function


Attached functions: Item marked with [●] is attached.
Item with [□] can be attached as option.

Classification	Function name	Accessories	Remarks	
① Operation state	Current position display	●		
	Modal information display	●		
② Program control	Program check & edit	●		
	List of using tool	●		
	NC program structure	●		
③ Help	M code	●		
	Operation manual	●		
④ Tool management	Tool number conversion function	●		
	Tool offset function	●		
	Tool life managing function	●		
	ATC speed override function	●		
	compensation value update function	●		
	AC function (condition control)	□	*	
	Machining condition setting function	□	*	
	Automatic index function of tool requiring replacement	●		
	Data update function at tool clamp/unclamp	●		
	Storing tool data storage function	□	*	
	Tool ID function	□	*	
	Limit rotation speed setting function	●		
	second/third compensation function	●		
	⑤ Display function	Trouble tool list display	●	
		Spare tool list display	●	
Tool position display		●		
Image list display		●		
Using tool list display		●		
⑥ Pallet	APC control	□	*	
	Pallet compensation	□	*	
	Multi-parts mounting	□	*	
⑥ Auxiliary	Function ON/OFF switch	●		
	Lamp display	●		
	Measurement result display	□	*	
⑦ Maintenance	Alarm history	●		
	Periodic inspection display	●		
	Load monitor	●		
	Periodic measurement display	●		
	Unit maintenance	●		
	Operation history display	●		
⑧ Function for DNC	Parameter setting	●		
	Diagnostic data	●		
		□	*	
⑧ Report	Accumulated hours	●		
	Machining result	●		
	Operation result	●		

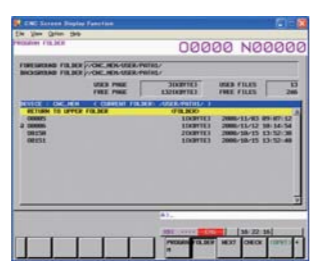
1. The function marked with * in the field of remarks requires addition such as option and device other than software. Please contact us separately for the details.
2. The function marked with ※ in the field of remarks can not be equipped to the machine connecting to FMS.

Operation state

- Program check & edit
Able to view necessary data without having to jump through several screens.



Able to check tool information and remaining stroke on the program check screen.

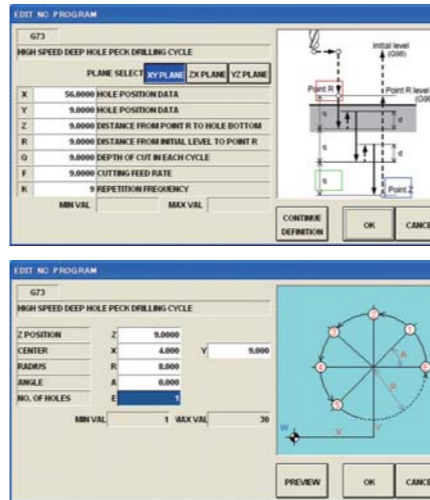


Able to view program content, tool status, sub-program structure in an NC program list.

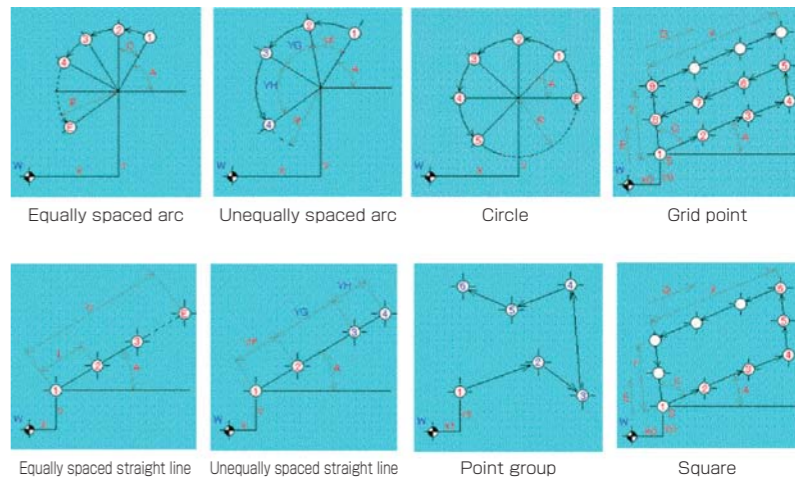


Program control

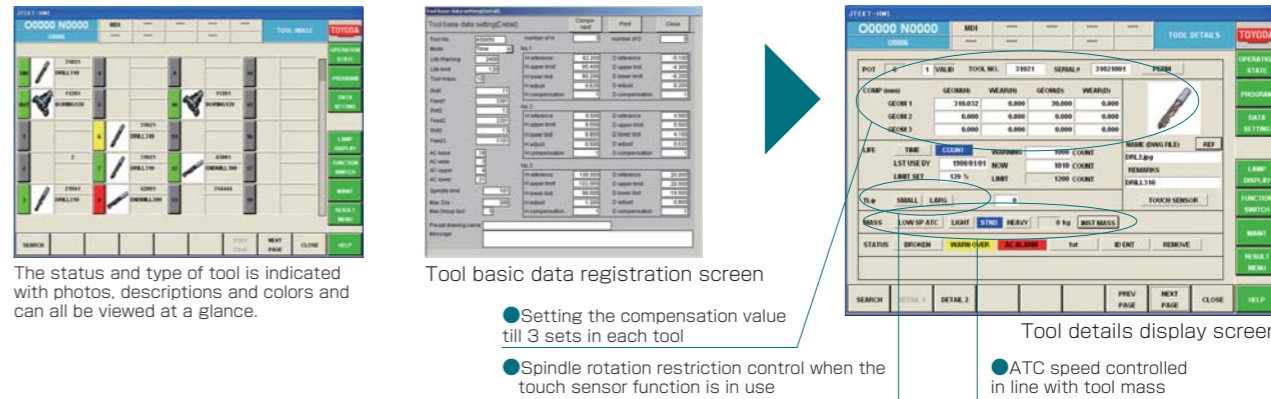
- NC program edit...Able to specify bore opening pattern machining while looking at the explanation diagram without looking at the manual.



8 continuous definition pattern cycles



- List of use tool...Prevents interference caused by tool data entry errors. (A separate tool management system is necessary)

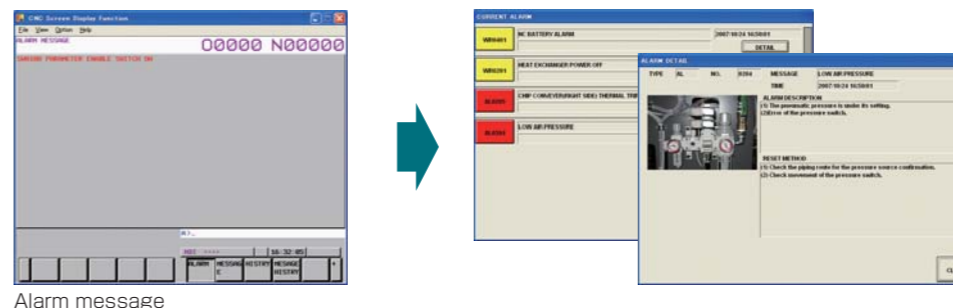


The status and type of tool is indicated with photos, descriptions and colors and can all be viewed at a glance.

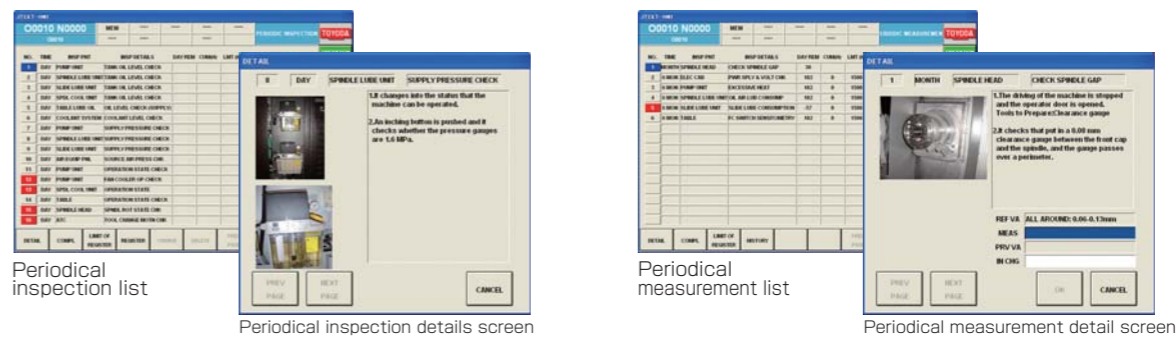
- Setting the compensation value till 3 sets in each tool
- Spindle rotation restriction control when the touch sensor function is in use
- ATC speed controlled in line with tool mass

Maintenance control

- Alarm history...The details of trouble is shown by using illustration and photo.



- Periodical inspection instruction...The details of periodical inspections and measurement items are shown using diagrams and photos.



Taking the global environment, society and our customers into consideration, we at JTEKT promote the production of products which are both people and planet-friendly.

JTEKT undertakes development activities with the belief that by reducing power consumption and conserving resources it is possible to slow down global warming, something essential to the protection of the global environment. The environmental impact of our products from production to disposal is assessed, so that those products which are less of a burden on the environment can be supplied to the customer.

The formation of an environment management system

JTEKT operates an environment management system in consistency with our business concept and environment policy. In this system, a PDCA(Plan > Do > Check > Action) cycle is used to constantly strive for better environmental preservation. Effectiveness of the system, environmental performance and compliance with laws and regulations are checked in periodic internal and external audits, and concise adjustments made to ensure activities are promoted systematically and sustainably.

Environment management system audits

External inspections

We have established an integral company-wide environment management system to promote systematical environmental preservation activities.

JTEKT will continue to further improve environmental management activities.

Internal environmental audits

Mutual auditing amongst operating departments ensures quality internal auditing and any improvements made applied across the board.

Also, results of our internal environmental audit are reported to all relevant management levels through a Planet Environment Preservation Committee.

Windmill power generator
Contains JTEKT bearings in the primary shaft and generator.

Obtaining ISO14001 certification

Domestic offices

Beginning with the 18 JTEKT Group companies participating in our environmental report committee, we are promoting accreditation and the development of environmental activities.

Overseas offices

As a company taking our business global, it is important for us that the entire group becomes assertively involved in environmental preservation. In order to actively promote environmental preservation activities on a consolidated basis, we have constructed a Global JTEKT Group environmental report committee, and are developing environmental activities.

Environmental consideration in the product development stage (applicable model: FH1250SX)

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.

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.

Recycled magazine socket

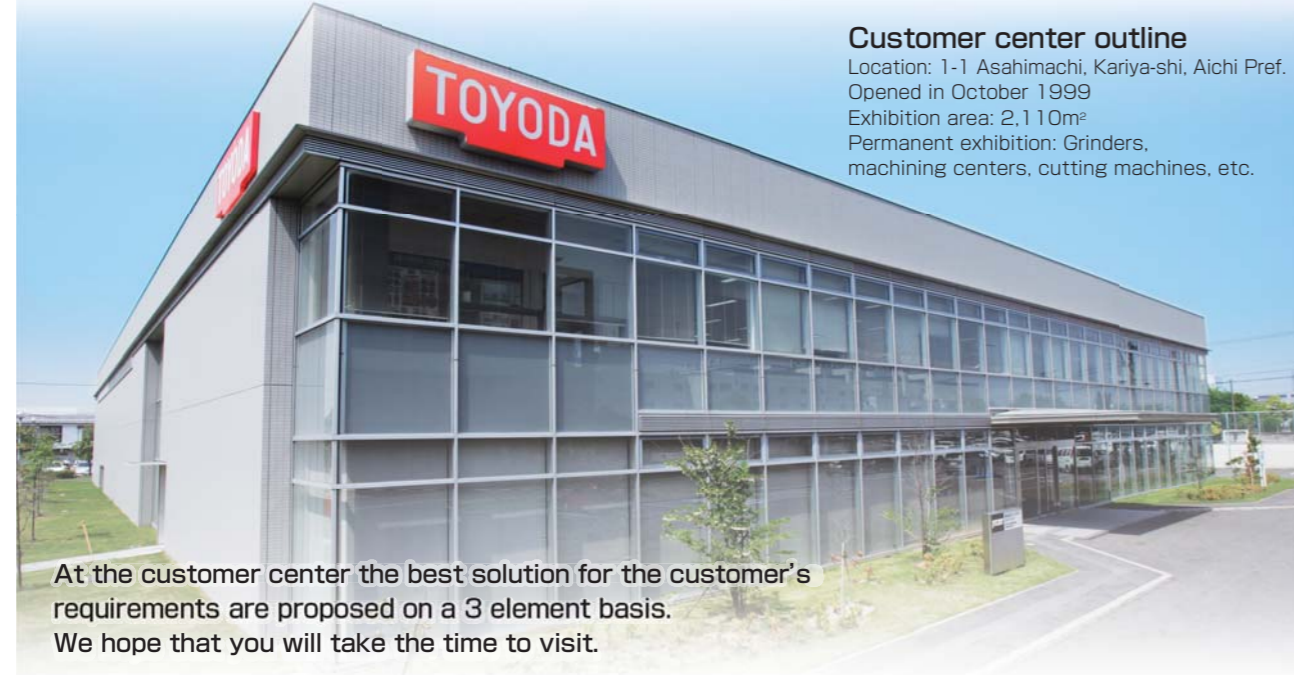
4.8t
reduction

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 convincing before-after sales system centered on a permanent exhibition site

JTEKT's Customer Center was opened in Kariya, Aichi Pref. in 1999 as one of the largest permanent exhibition sites in Japan. The sales, before-sales and after-sales service and training school divisions accepting direct contact with customers are integrally located in this center so that the best solution to meet customer's requirements can be found.



Customer center outline
 Location: 1-1 Asahimachi, Kariya-shi, Aichi Pref.
 Opened in October 1999
 Exhibition area: 2,110m²
 Permanent exhibition: Grinders, machining centers, cutting machines, etc.

At the customer center the best solution for the customer's requirements are proposed on a 3 element basis. We hope that you will take the time to visit.

Observe

Exhibition

- Exhibition of cells/machines most suited to the customer
- Introduction to leading edge technologies
- Exhibition of total engineering potentials including those of group companies

Machining center corner

Work display corner according to the industry

Technical introduction by digital display

Touch and confirm

Confirm

- Confirmation of technology by carrying out before-sales service tests
- Education of SFC, personnel training
- Operation training at the training school

Processing technology corner

Training room

SFC*Dojo (training place)

*SFC (Sequential Function Chart)

Have discussions

Consultation

- Technical exchange meeting by DE* utilization
- Exchange of the latest information through events
- Machining consultation before the machines

Digital engineering room

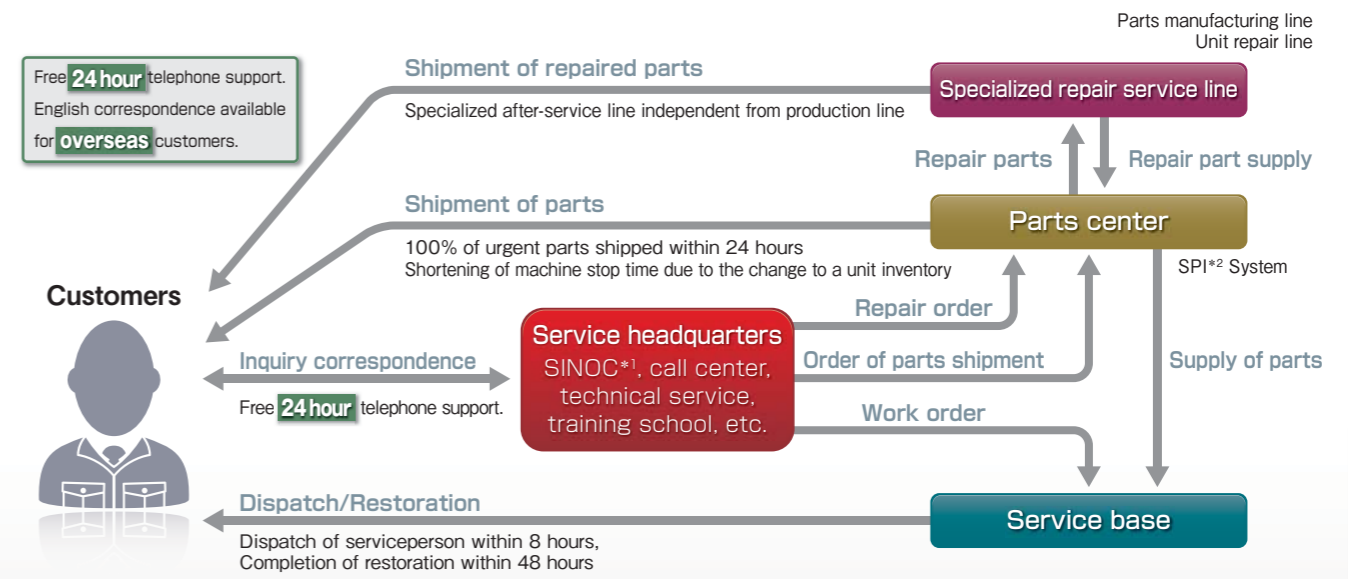
Event scenery

Processing consultation

*DE (Digital Engineering)

Speedy and precise customer correspondence.

We have established Service Headquarters in Kariya to consolidate the management of customer equipment information, and have arranged a system where call centers allow direct correspondence with customers, and parts can be supplied quickly.



- Information management using SINOC*1 *1: SINOC (Service Information Network Operation Center)
- Dispatch of serviceperson within 8 hours Completion of repairs within 48 hours
- Shipment of urgent parts within 24 hours
- Global parts management by SPI*2 System *2: SPI (Service Parts Inquiry)
- Specialized repair service line
 - Parts manufacturing line
Flexible correspondence to express orders through specialized service parts manufacturing lines. Able to manufacture parts of older equipment.
 - Unit repair line
We provide swift response to sudden breakdowns of machining center spindles/ATCs/tables, grinder workheads/wheel spindles/tailstocks, etc. with our independent, specialized after-service line.
- Training school
Attend training courses on machine operation, programming, maintenance and so on using actual machines for each training curriculum.

Machine specifications

Item	Unit	FH1000SX			FH1250SX		
		Standard specifications	Special specifications		Standard specifications	Special specifications	
Table & Pallet	Table dimensions(pallet dimensions)	mm	800×1,000 □800 (Pallet)		□1250 (Pallet)		1,250×1,600
	Rotary table indexing angle	°	0.001° (NC)		1°		0.001° (NC) 1°
	Pallet height(from floor)	mm	1,300		1,500		
	Max load on pallet	kg	3,000		5,000		
	Table indexing time(90°indexing)	sec	4.0		3.7		5.6 5.3
	Pallet change time	sec	70		85		
	Stroke	X-axis	mm	1,600		2,200	
Y-axis		mm	1,400		1,600		
Z-axis		mm	1,850		1,850		
Distance between spindle nose and table center		mm	50~1,900		200~2,050		
Distance between spindle center and top of pallet		mm	100~1,500		100~1,700		
Max. workpiece swing × Max. workpiece height		mm	φ1,800×1,600 ※1		φ2,400×1,800 ※1		
Feeds		Rapid feed rate(X, Y and Z)	m/min	54		42	
	Cutting feed rate(X, Y and Z)	m/min	0.001~30		0.001~30		
	Rapid acceleration(X, Y and Z)	m/s ² (G)	4.9(0.5)		2.94(0.3)		
	Ball screw diameter(X, Y and Z)	mm	φ50		φ63(X), φ50(Y, Z)		
Spindle	Spindle speed	min ⁻¹	50~6,000	50~6,000	50~15,000	50~6,000	50~6,000 50~15,000
	Spindle diameter(front bearing bore)	mm	φ110	φ110	φ100	φ110	φ110 φ100
	Spindle nose shape		BT No.50		HSK		BT No.50 HSK
	Spindle motor, short-time/continuous	kW	30/22	37/30	30/25	30/22	37/30 30/25
ATC	Tool holding capacity	tool	60		121,180,240,330 ※2		60 121,180,240,330 ※2
	Tool selection		Absolute address		Absolute address		
	Tool(dia. × length)	mm	φ120×800 ※3		φ120×800 ※3		
	Tool mass	kg	35		35		
	Tool change time(Tool-to-Tool)	sec	2.7(15kg) 3.2(15~35kg)		2.7(15kg) 3.2(15~35kg)		
	Tool change time(Chip-to-Chip)	sec	4.4(15kg) 5.0(15~35kg)		4.4(15kg) 5.0(15~35kg)		
	Tools Holder Pull stud		MAS BT50 MAS P50T-1		MAS BT50 MAS P50T-1		
Dimensions & Weight	Floor space(width × depth)	mm	5,900×9,350 ※4		6,200×9,900 ※4		
	Machine height	mm	4,051		4,520		
	Machine weight	kg	31,000		48,000		
Various Capacities	Working oil	L	63		63		
	Slide lubricant	L	5.5		5.5		
	Spindle oil air	L	2.9		2.9		
	Table	L	4		4		
	Spindle coolant	L	20		20		
	Power supply capacity	kVA	59	63	59	59	63 59
	Control voltage	V	AC100 DC24		AC100 DC24		
	Air source capacity	NL/min	900		900		
	Air source pressure	MPa	0.4~0.5		0.4~0.5		
	Capability & Performance	Positioning accuracy ※5	mm	±0.003		±0.002	
Repeatability ※5		mm	± 0.0015		±0.001		±0.0015 ±0.001
Table indexing accuracy ※5		sec	± 7		±3.5(with NC encoder)		±7 ±3.5(with NC encoder)
Table indexing repeatability ※5		sec	± 3.5		±2(with NC encoder)		±3.5 ±2(with NC encoder)

※1 For detail shape, refer to the tooling data. ※2 The matrix magazine is used for 180-tools or more ※3 For detail shape, refer to the tooling data.
 ※4 For details, refer to the layout plan. ※5 According to our inspection method

Item	Unit	FH1250SW			
		Standard specifications	Special specifications		
Table & Pallet	Table dimensions(pallet dimensions)	mm	□1250 (Pallet)	1,250×1,600	
	Rotary table indexing angle	°	0.001° (NC) 1°		
	Pallet height(from floor)	mm	1,500		
	Max load on pallet	kg	5,000		
	Table indexing time(90°indexing)	sec	5.6 5.3		
	Pallet change time	sec	85		
	Stroke	X-axis	mm	2,200	
Y-axis		mm	1,500		
Z-axis		mm	1,850		
W-axis		mm	550		
Distance between spindle nose and table center		mm	260~2,110		
Distance between spindle center and top of pallet		mm	200~1,700		
Max. workpiece swing × Max. workpiece height		mm	φ2,400×1,800 ※1		
Feeds		Rapid feed rate	m/min	32(X, Y), 42(Z), 5(W)	
		Cutting feed rate	m/min	0.001~30(X, Y, Z), 0.001~5(W)	
	Rapid acceleration(X, Y and Z)	m/s ² (G)	2.25(0.23G)		
	Ball screw diameter(X, Y and Z)	mm	φ63(X), φ50(Y, Z, W)		
Spindle	Spindle speed	min ⁻¹	10~3,000		
	Spindle diameter(front bearing bore)	mm	φ180		
	W-axis quill dia.	mm	φ130		
	Spindle nose shape		BT No.50		
	Spindle motor, short-time/continuous	kW	45/37		
ATC	Tool holding capacity	tool	60		121, 180, 240, 330 ※2
	Tool selection		Absolute address		
	Tool(dia. × length)	mm	φ120×800 ※3		
	Tool mass	kg	35		
	Tool change time(Tool-to-Tool)	sec	2.7(15kg) 3.2(15~35kg)		
	Tool change time(Chip-to-Chip)	sec	6.0(15kg) 6.5(15~35kg)		
	Tools Holder Pull stud		MAS BT50 MAS P50T-1		
Dimensions & Weight	Floor space(width × depth)	mm	7,450×9,900 ※4		
	Machine height	mm	4,520		
	Machine weight	kg	49,500		
Various Capacities	Working oil	L	63		
	Slide lubricant	L	5.5		
	Table	L	4		
	Spindle coolant	L	70		
	Power supply capacity	kVA	69		
	Control voltage	V	AC100 DC24		
	Air source capacity	NL/min	900		
	Air source pressure	MPa	0.4~0.5		
Capability & Performance	Positioning accuracy ※5	mm	±0.003		±0.002(X, Y, Z)
	Repeatability ※5	mm	±0.0015		±0.001(X, Y, Z)
	Table indexing accuracy ※5	sec	±7		±3.5(with NC encoder)
	Table indexing repeatability ※5	sec	±3.5		±2(with NC encoder)

※1 For detail shape, refer to the tooling data. ※2 The matrix magazine is used for 180-tools or more ※3 For detail shape, refer to the tooling data.
 ※4 For details, refer to the layout plan. ※5 According to our inspection method

CNC unit FANUC 31i ● Standard / □ Optional

Division	Name	FH1000SX	FH1250SX	FH1250SW
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 controlI(pre-read 30 blocks)	●	●
F1-digit feed		□	□	□
AI contour controlII(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 correction function	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	12,1" color LCD	●	●	●

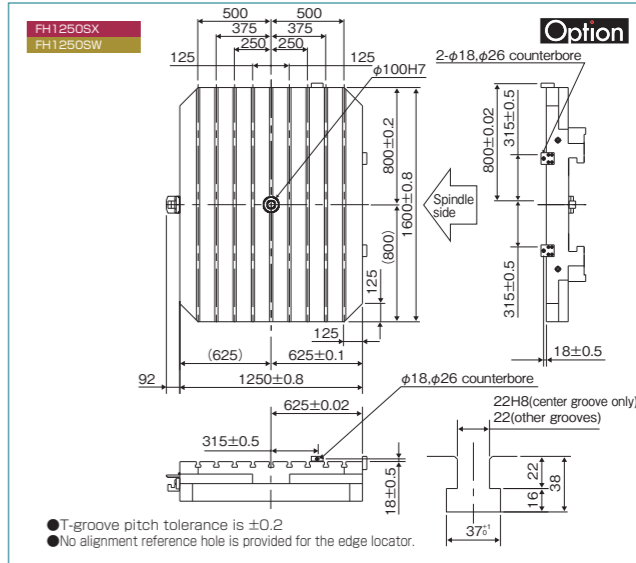
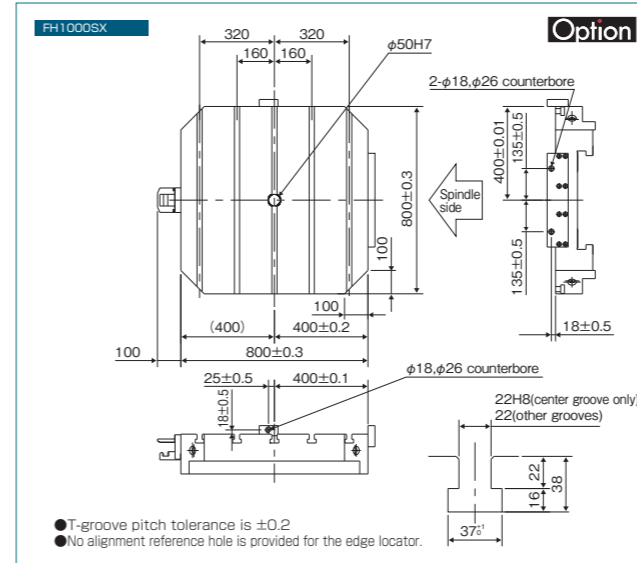
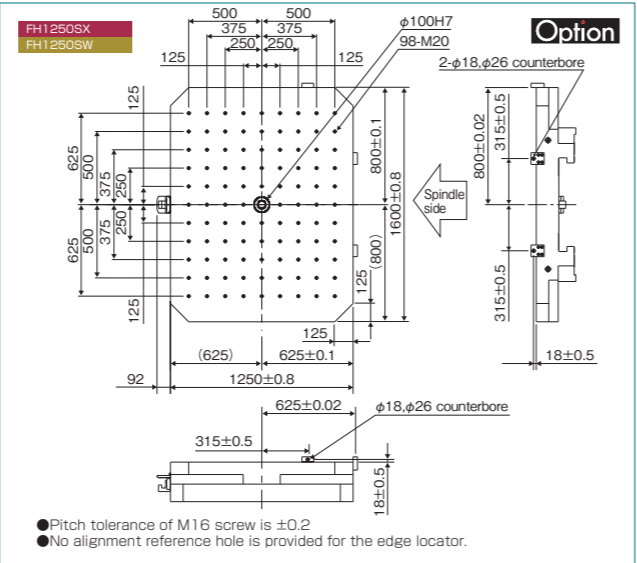
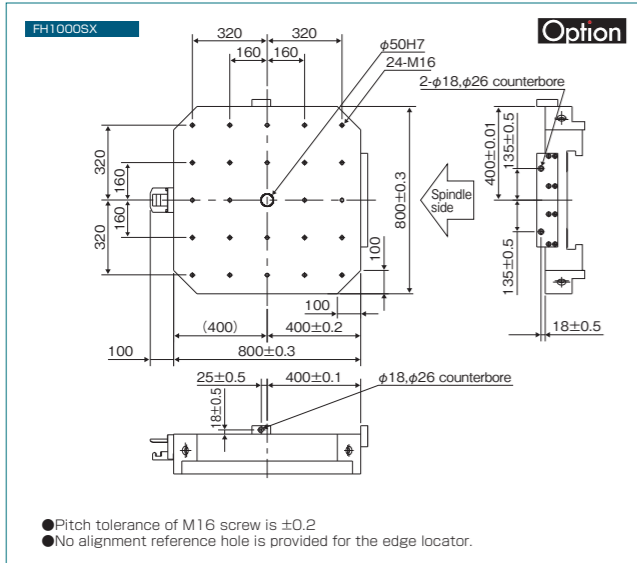
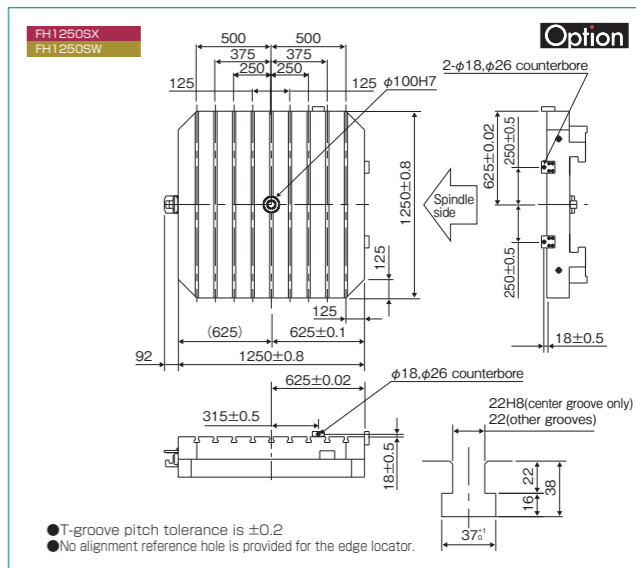
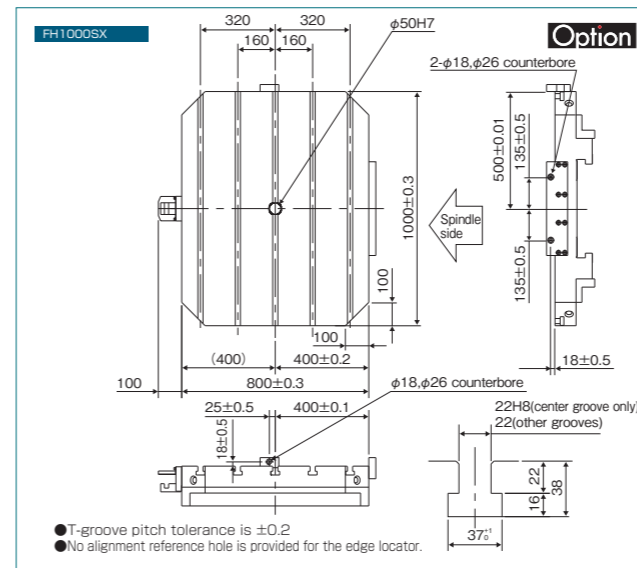
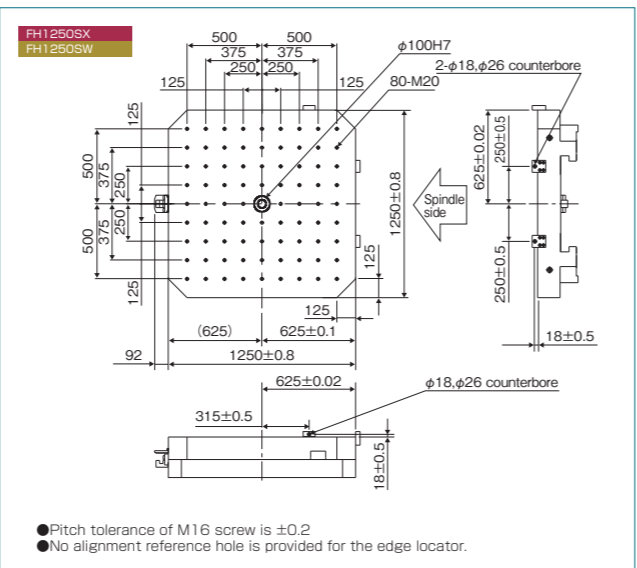
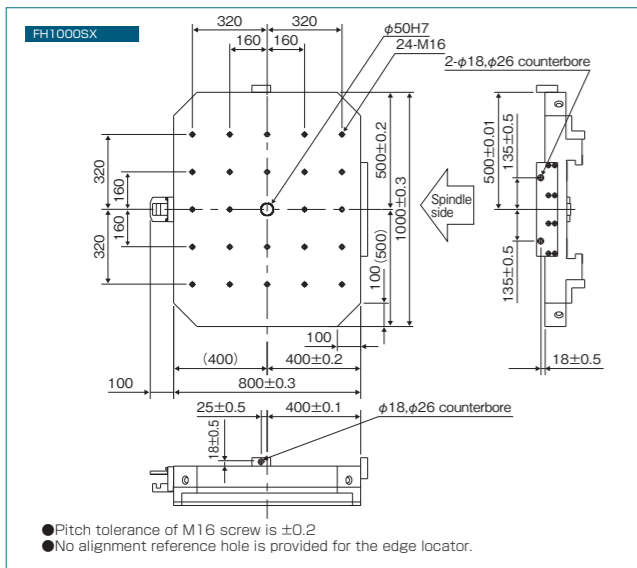
FANUC is a registered trademark of FANUC LTD.

Accessories ● Standard accessories / □ Optional accessories

Item	Equipment name	FH1000SX	FH1250SX	FH1250SW			
Table and pallet	Indexing table	NC indexing table	●	●			
		1" indexing table	□	□			
		NC indexing table(with encoder)	□	□			
Pallet	Standard pallet screw hole	800×1,000/□1,250/□1,250	●	●			
		800×1,000/□1,250/□1,250	□	□			
	Pallet screw hole	□800	□	□			
		□800	□	□			
	Rectangular pallet screw hole	1,250×1,600	□	□			
		1,250×1,600	□	□			
Addition of 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)	□	□			
		3,000min ⁻¹ BT No.50(45/37kW) 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	□	□			
		180 tools	□	□			
		240 tools	□	□			
		330 tools	□	□			
Coolant relations	Coolant supply unit	Coolant supply unit(water soluble/with take-up chip conveyor/scraper type/spindle-through coolant spec/1MPa through pump/with oil skimmer)	●	●			
		Coolant supply unit(water soluble/with take-up chip conveyor/scraper type/spindle-through coolant spec/3MPa through pump/with oil skimmer)	□	□			
		Coolant supply unit(water soluble/with take-up chip conveyor/scraper type/spindle-through coolant spec/7MPa through pump/with oil skimmer)	□	□			
		Coolant supply unit(water soluble/with take-up chip conveyor/2-tank type/spindle-through coolant spec/1MPa through pump/with oil skimmer)	□	□			
		Coolant supply unit(water soluble/with take-up chip conveyor/2-tank type/spindle-through coolant spec/3MPa through pump/with oil skimmer)	□	□			
		Coolant supply unit(water soluble/with take-up chip conveyor/2-tank type/spindle-through coolant spec/7MPa through pump/with oil skimmer)	□	□			
	External nozzle coolant	Overhead shower coolant	●	●			
		Chip flushing coolant	●	●			
		Internal triple trough conveyor	●	●			
		Coolant cooling	□	□			
		Chip box	□	□			
		Splash gun(at APC)	●	●			
		Mist collector	□	□			
		Air blower	□	□			
Splash guard	Enclosure guard	External nozzle type	□	□			
		External holder type	□	□			
		Door interlock at operating position	●	●			
		APC door interlock	●	●			
Operation control function, others	Cooler for control cabinet inside	Electromagnetic lock type	●	●			
		Area sensor	●	●			
		Internal lighting	●	●			
Labor saving function	Pallet changer(APC)	Shift type, with 2 pallets	●	●			
		Spindle cooling unit	●	●			
Support for high accuracy	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	□	□		
	Spindle Thermo Stabilizer function	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	□	□		
			OP supporterII	●	●		
			Operator support function	Program management	NC program edit	●	●
					Tool list display	●	●
NC program configuration diagram	●	●					
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	□	□			
		APC control	□	□			
Auxiliary function	Measurement result display	Multi-workpiece installation	□	□			
		Maintenance function	Alarm history(512 cases)	●	●		
Maintenance function	Alarm history(512 cases)	Periodic inspection display(without customer's special specification)	●	●			
		Periodic measurement display(without customer's special specification)	●	●			
		Unit maintenance	●	●			
		Operation history	●	●			

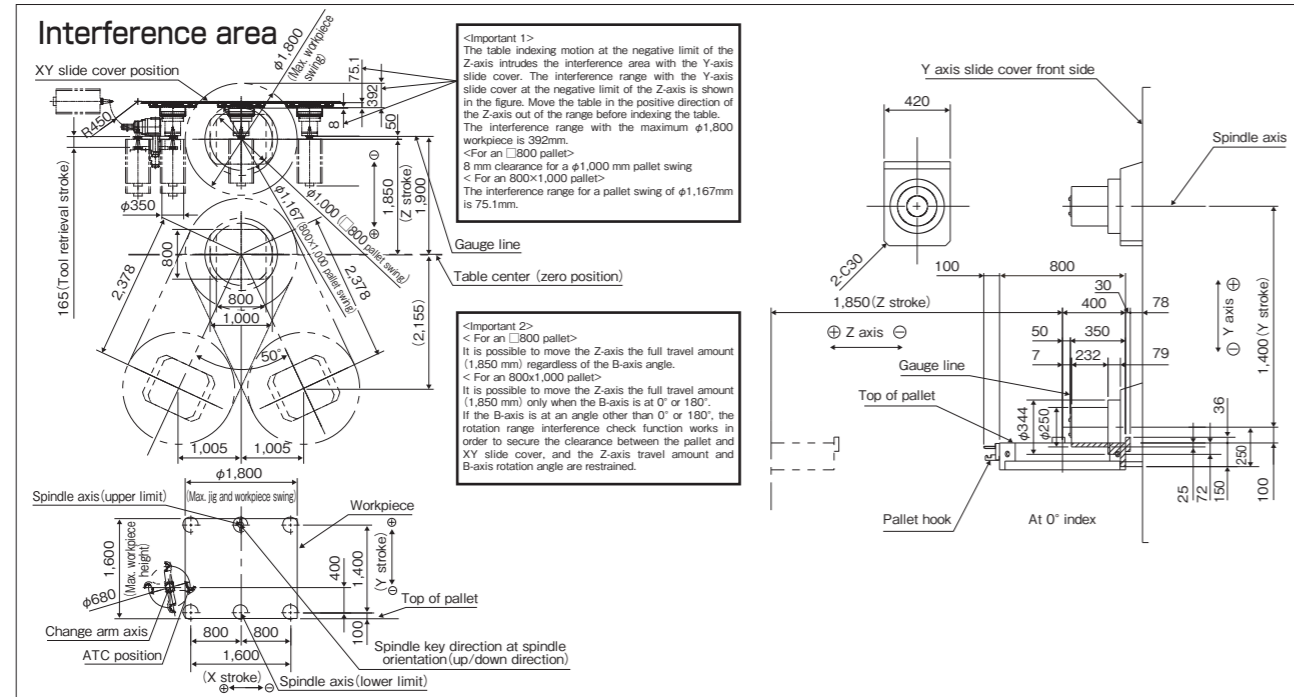
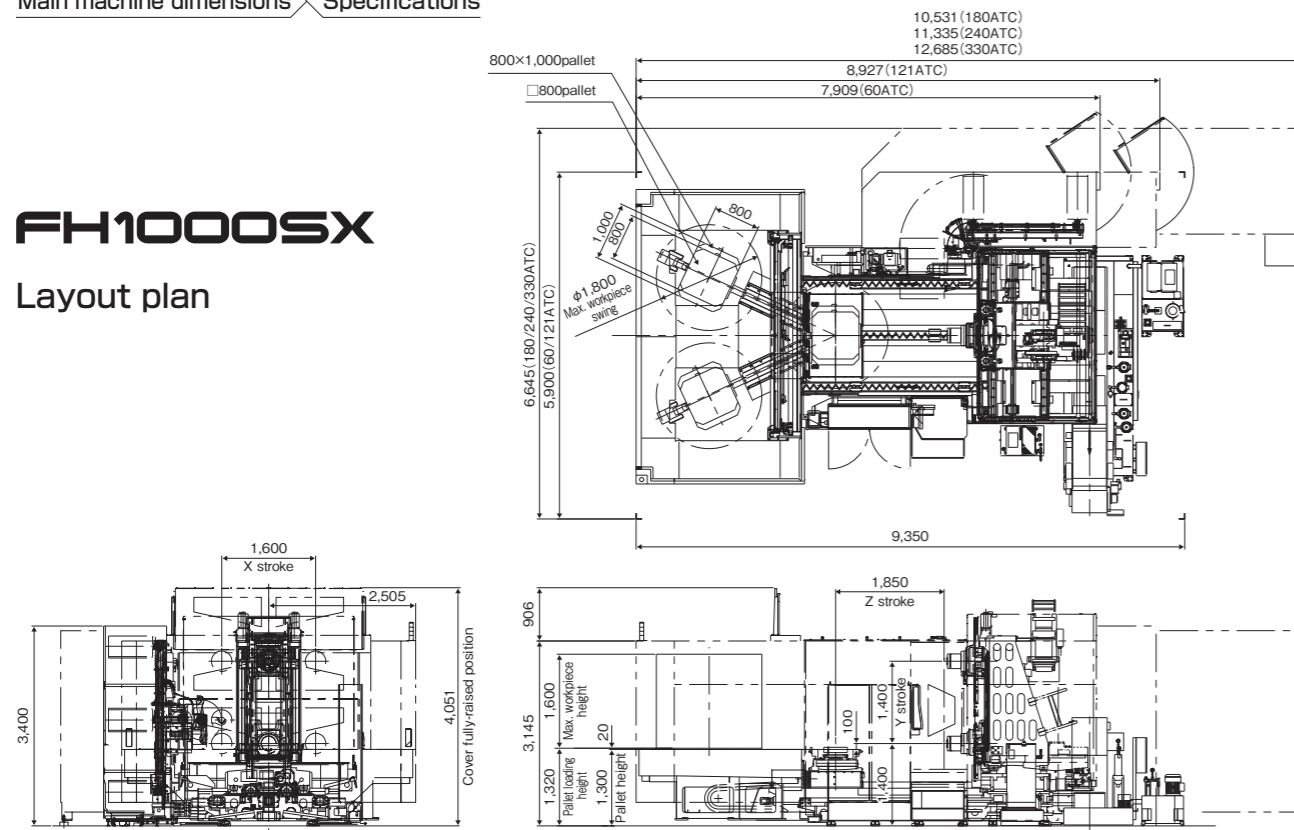
Threaded hole pallet

T-groove pallet



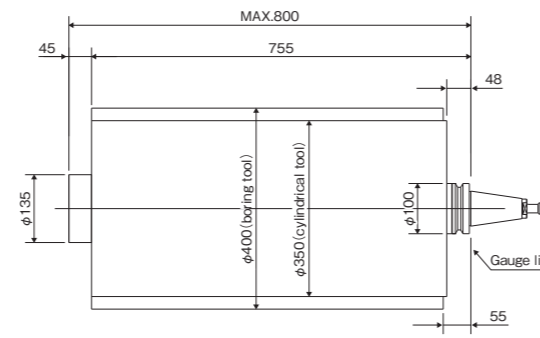
FH1000SX

Layout plan



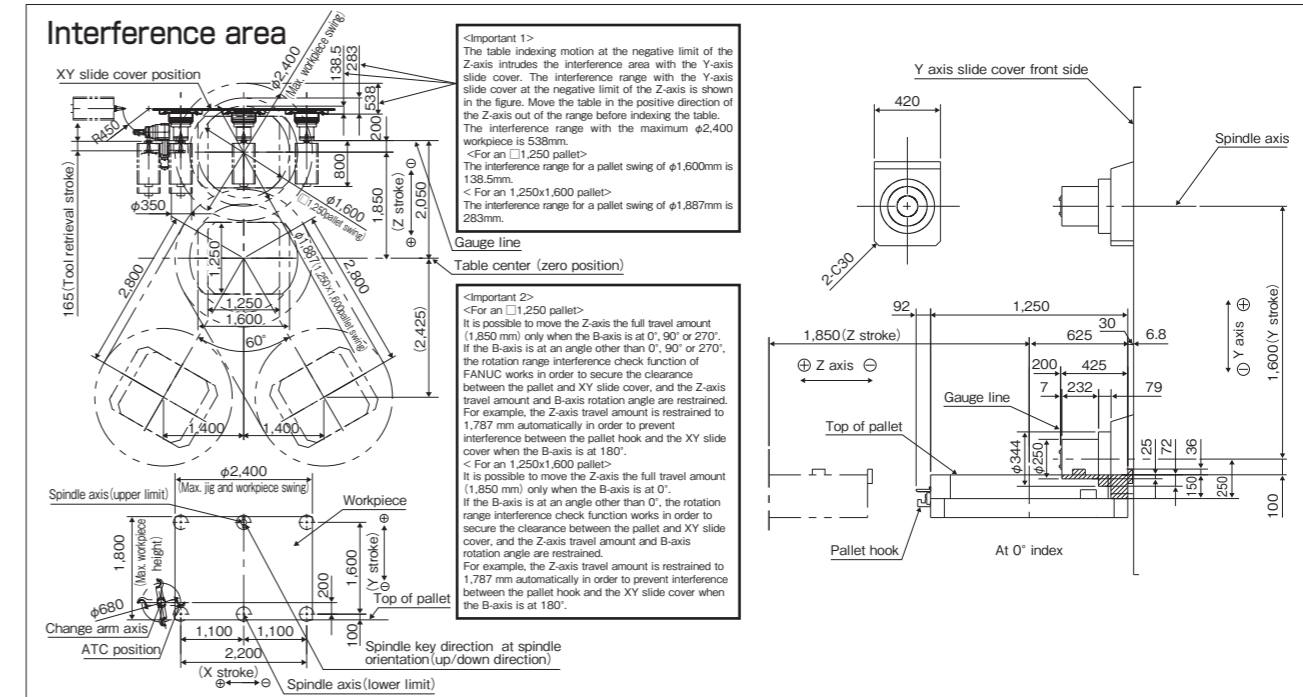
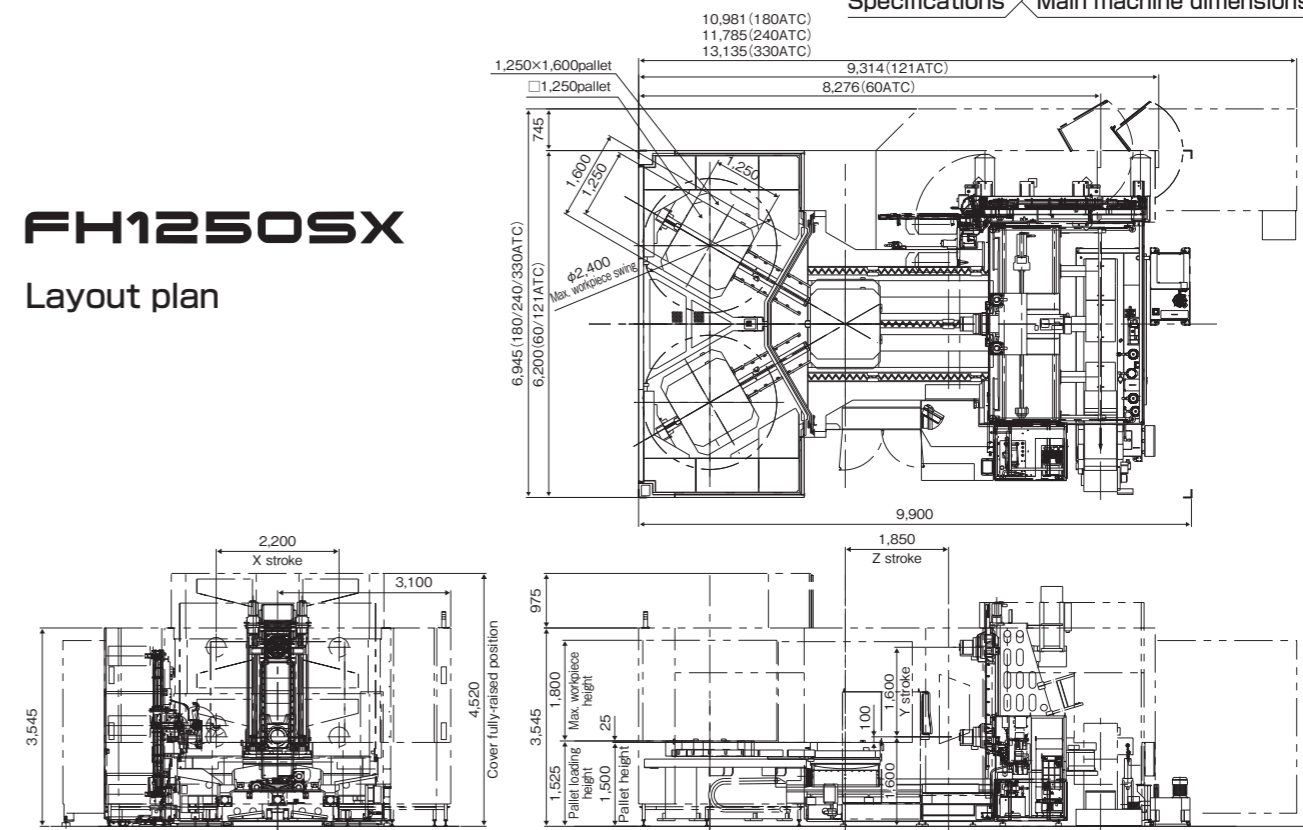
Limitations in tool holder shape (JIS·CAT·DIN BT No.50)

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.



FH1250SX

Layout plan

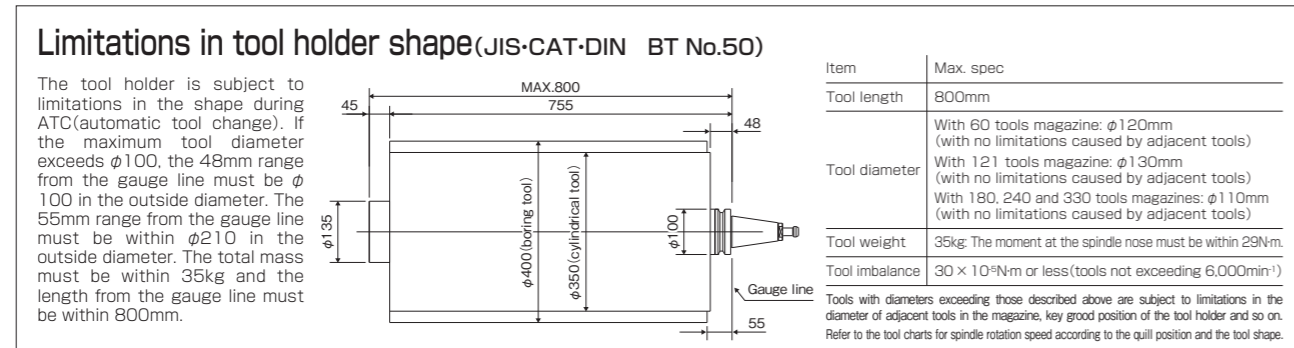
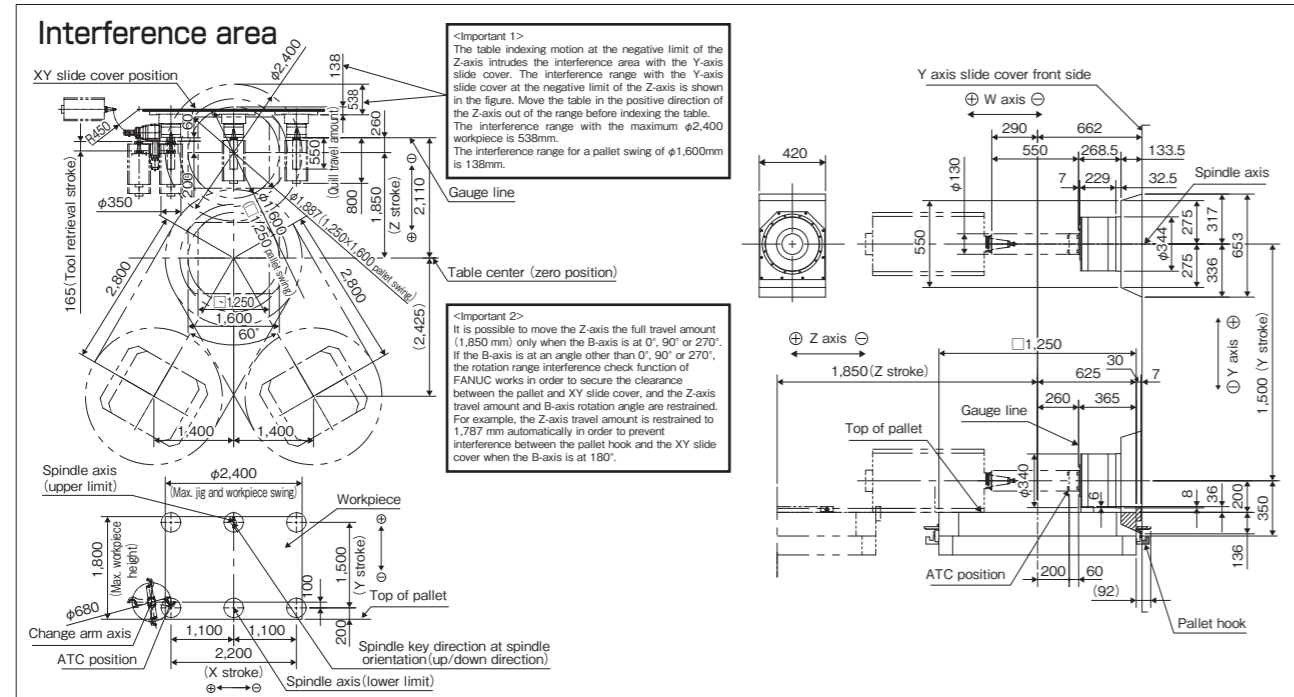
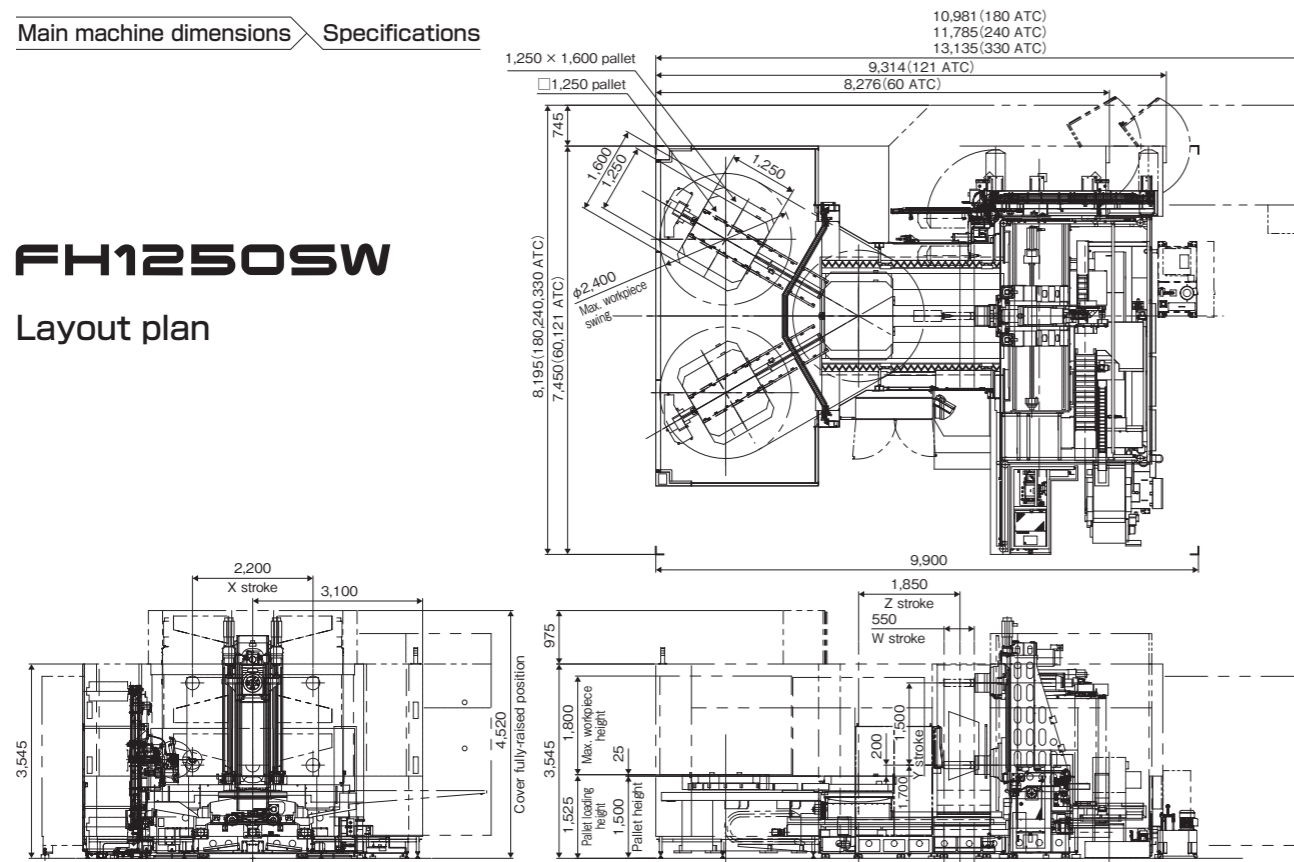


Item	Max. spec
Tool length	800mm
Tool diameter	With 60 tools magazine: $\phi 120$ mm (with no limitations caused by adjacent tools) With 121 tools magazine: $\phi 130$ mm (with no limitations caused by adjacent tools) With 180, 240 and 330 tools magazines: $\phi 110$ mm (with no limitations caused by 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 good position of the tool holder and so on.

FH1250SW

Layout plan



JTEKT JTEKT CORPORATION

NAGOYA HEAD OFFICE

No. 7-1, Meieki 4-chome, Nakamura-ku, Nagoya, Aichi Pref., 450-8515, JAPAN TEL: (81)52-527-1900 FAX: (81)52-527-1911

OSAKA HEAD OFFICE

No. 5-8, Minamisemba 3-chome, Chuo-ku, Osaka, 542-8502, JAPAN TEL: (81)6-6271-8451 FAX: (81)6-6245-3712

SALES & MARKETING HEADQUARTERS

No. 5-8, Minamisemba 3-chome, Chuo-ku, Osaka, 542-8502, JAPAN TEL: (81)6-6245-6087 FAX: (81)6-6244-9007

— GLOBAL NETWORK —

MACHINE TOOLS & MECHATRONICS BUSINESS OPERATIONS

MACHINE TOOLS & MECHATRONICS OVERSEAS SALES DEPT.

1, Asahimachi 1-chome, Kariya, Aichi Pref., 448-8652, JAPAN
TEL: (81)566-25-5171 FAX: (81)566-25-5467

OVERSEAS AFFILIATED COMPANIES

TOYODA MACHINERY USA CORP. HEADQUARTERS

316 W. University Drive,
Arlington Heights, IL 60004
U.S.A.
TEL: (1)847-253-0340
FAX: (1)847-577-4680

TOYODA MACHINERY USA CORP. AUTOMOTIVE PRODUCTS & SPECIAL MACHINES DIVISION

51300 W. Pontiac Trail
Wixom, MI. 48393-1003
U.S.A.
TEL: (1)248-624-5755
FAX: (1)248-624-8597

TOYODA MACHINERY AND ENGINEERING EUROPE SAS

2 Grande Allee P.A des Petits Carreaux
94380 Bonneuil sur Marne, FRANCE
TEL: (33)1-49.56.85.80
FAX: (33)1-43.77.47.50

TOYODA MACHINERY EUROPE GmbH HEADQUARTERS

Bischofstr. 118 47809 Krefeld GERMANY
TEL: (49)2151-5188-300
FAX: (49)2151-5188-333

TOYODA MACHINERY (DALIAN) CO., LTD. HEADQUARTERS

46 Developing Zone In DaLian, 116600 China
Dalian, CHINA
TEL: (86)-411-8733-4601
FAX: (86)-411-8733-4602

TOYODA MACHINERY (DALIAN) CO., LTD. BEIJING OFFICE

Room 1017, Fortune Building No.5 Dong San Huan North Road Chaoyang, Beijing, 100004 CHINA
TEL: (86)-10-6590-9356~58
FAX: (86)-10-6590-9359

TOYODA MACHINERY (DALIAN) CO., LTD. SHANGHAI OFFICE

Room 25B3, V-Capital Building 333 Xianxia Road Changning District, Shanghai, 200336 CHINA
TEL: (86)-21-5178-1088
FAX: (86)-21-5178-1099

TOYODA MACHINERY (DALIAN) CO., LTD. FOSHAN OFFICE

2 Wushaxinhui Road, Daliang Street Shunde District, Foshan, Guangdong, 52833 CHINA
TEL: (86)-757-2232-6651~58
FAX: (86)-757-2232-6650

TOYODA MACHINERY (DALIAN) CO., LTD. CHONGQING OFFICE

701 Lanmei Dadao (Lanmei Avenue) Hi-Tech Zone, Chongqing, 400039 CHINA
TEL: (86)-23-6171-1133
FAX: (86)-23-6171-1133

TPA ENGINEERING CORP.

84BL-19Lot,
Namdong Industrial Complex,
675-18, Gojan-Dong, Namdong-ku,
Incheon, KOREA
TEL: (82)-032-822-0305
FAX: (82)-032-822-0306

TOYODA MACHINERY S.E. ASIA CO., LTD.

313, Bangna-Trad Road, KM.1
Kwang Bangna, Khet Bangna,
Bangkok, 10260 THAILAND
TEL: (66-2)361-8250~1
FAX: (66-2)361-8252

PT.JTEKT INDONESIA

MM2100 Industrial Town
Jl. Halmahera Block DD-3
Cikarang Barat, Bekasi 17520 INDONESIA
TEL: (62)21-8998 3275
FAX: (62)21-8998 3274

TOYODA KOKI DO BRASIL INDUSTRIA E COMERCIO DE MAQUINAS, LTDA.

Rua Rego Barros 1319,
Vila Antonieta, Sao Paulo-SP, BRASIL
TEL: (55)11-6724-5711
FAX: (55)11-6727-3450

TOYODA MICROMATIC MACHINERY INDIA LIMITED

Plot No.550-E, 2nd Floor
Place City-II, Sector-37, Gurgaon 122 001
INDIA
TEL: (91)-124-4264601/02/03
FAX: (91)-124-4288355