Just for your best

TOYODA

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— GLOBAL NETWORK —

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JTEKT | JTEKT CORPORATION https://www.jtekt.co.jp

Type of Machinery: Machining Center
Model Number: FH1000SX, FH12500SX5-i, FH12500SW5-i, FH1600SW5i

Cat. No. M2088-4E Printed in Japan 210205U

TOYODA

Horizontal Spindle Machining Centers

FH SERIES

FH1000SX
FH12500SX5-i
FH12500SW5-i
FH1600SW5i

JTEKT
JTEKT CORPORATION

Energy-related industry, aerospace industry, construction machine, transport machine and semiconductor manufacturing equipment

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

Large size horizontal machining center

The FH1000SX / FH12500SX5-i contains a spindle that enables the user to choose from high-speed machining to heavy-duty cutting to suit customer needs.

FH1000SX / FH12500SX5-i

A large-size horizontal machining center with a high-rigidity and large torque quill spindle

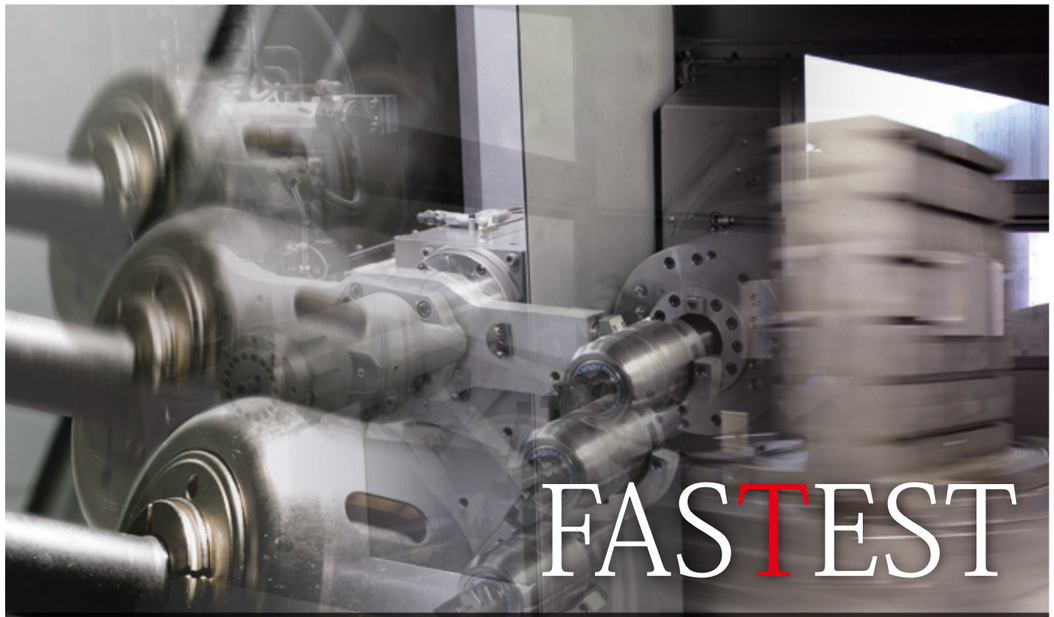
The FH12500SW5-i and FH1600SW5i have achieved a high level of productivity through an original JTEKT high-rigidity quill spindle. They have integrated machining processes which in the past would have required a bridge-type machining center as well as a horizontal boring machine.

FH12500SW5-i / FH1600SW5i

MAXIMUM

	Maximum workpiece range	Maximum load on pallet	Stroke (X×Y×Z)
FH1000SX	ϕ1,800mm×1,600mm	3,000kg	1,600mm×1,400mm×1,850mm
FH12500SX5-i	ϕ2,400mm×2,000mm	5,000kg	2,400mm×1,800mm*×1,850mm
FH12500SW5-i	ϕ2,400mm×2,000mm	5,000kg	2,400mm×1,600mm×1,850mm
FH1600SW5i	ϕ3,200mm×2,200mm	8,000kg	3,000mm×1,900mm×2,100mm

* Built-in motor spindle (1,600 mm for gear spindle)



FASTEST

	Rapid feed rate	Tool changing time (C-C)	Table indexing time (90°indexing)
FH1000SX	54m/min	4.4 sec.	4.0 sec.
FH12500SX5-i	42m/min	4.4 sec.*1	4.3 sec.
FH12500SW5-i	42m/min	6.5 sec.	4.3 sec.
FH1600SW5i	40m/min (Y, Z-axis)	23.2 sec.*2	6.0 sec.

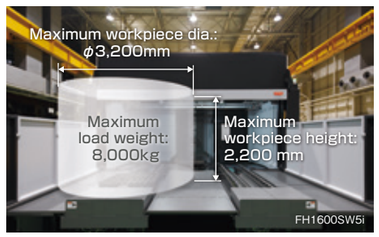
*1 Built-in spindle (6.5 seconds for gear spindle) *2 Includes time for main arm shift.

maximum

The largest in the class Responding to the demand for a wide range of large parts in all industries

Recent advances in IoT, AI, and high-speed communication technologies have led to rapid growth in the global information and communications equipment market, and increased demand for large parts such as beds in semiconductor manufacturing equipment. Also, in fields related to energy, trucks, construction and agricultural machinery, and those related to the aircraft industry, energy efficiency has been improved to address environmental problems such as global warming, and larger components are becoming a trend. Processing machines with a wider machining range and higher productivity are required to produce these larger parts more efficiently.

For the FH12500SX5-i, the maximum workpiece swing is ϕ2,400 mm, and the maximum load mass is 5,000 kg. For the FH1600SW5i, the maximum workpiece swing is ϕ3,200 mm, and the maximum load mass is 8,000 kg. These machines can load workpieces that are among the largest in this machine class, without compromising the necessary machine stroke. Moreover, the quill axis of the FH12500SW5-i and FH1600SW5i provides improved accessibility to machining sites within the machine, making it suitable for a wide range of large parts in all industries.

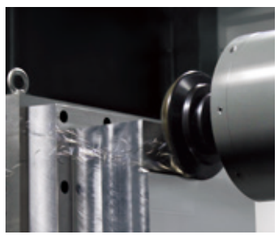


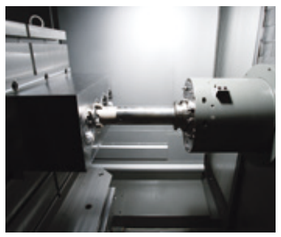
fastest

Boasting the best speed performance in the class while maintaining rigidity

In recent years, there is a strong demand for high-speed performance in large machining centers, too, in order to improve productivity. Machining centers are now required to achieve a high machining speed that is as fast as that of small machines while increasing rigidity against cutting.

For feeding, a cylindrical roller type linear guide is used to achieve both high speed and high rigidity. In addition, the Y and Z axes, which are subject to high cutting loads, are dual-driven, consisting of two ball screws. The CAE has been optimized for optimal rib placement so that the main components including the bed, column, and table, which support the Y and Z axes are sufficiently rigid. Moreover, six linear guide blocks with the Y-axis are used to maintain high rigidity, and optimal placement of the linear guide and ball screws makes the spindle protrusion larger and reduces the distance from the center of the table to the end surface of the spindle while maintaining both rigidity at the Y-axis main unit and the best speed performance in its class.





The performance of the machining center depends on the Spindle.

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

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.

List of spindles

Application	Recommended spindle	Holder compatibility	Spindle motor (short-time/continuous)	Spindle diameter (front bearing bore)	Max. torque	Quill spindle stroke	Applicable
Optimal for heavy duty cutting of difficult-to-cut materials and iron/cast metal parts	6,000min^{-1} large torque gear spindle	BT50 BBT50 HSK-A100* CAT50 DIN50	55/37kW	ϕ110mm	2,200 N·m	—	FH12500SX5-i
Best for high-efficiency cutting of cast parts	6,000min^{-1} spindle		30/22kW	ϕ110mm	600 N·m	—	FH1000SX
Best for heavy duty cutting at low speeds with large diameter cutters	6,000min^{-1} large torque spindle		55/37kW	ϕ110mm	1,202 N·m	—	FH1000SX FH12500SX5-i
Best for a wide variety of products with high speeds and large torques	15,000min^{-1} large torque spindle		37/30kW	ϕ120mm	530 N·m	—	
Quill spindle enables optimal deep large-diameter hole grinding and boring of iron/cast metal parts	4,000min^{-1} high-rigidity and large torque quill spindle		55/37kW	ϕ180mm	2,200 N·m	560mm	FH12500SW5-i
				ϕ200mm	2,115 N·m	750mm	FH1600SW5i

* Gear spindle and quill spindle are not included.

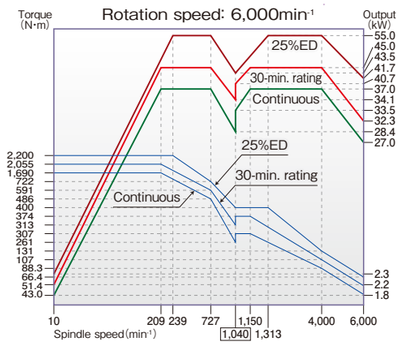
Optimal for heavy duty cutting of difficult-to-cut materials and iron/cast metal parts

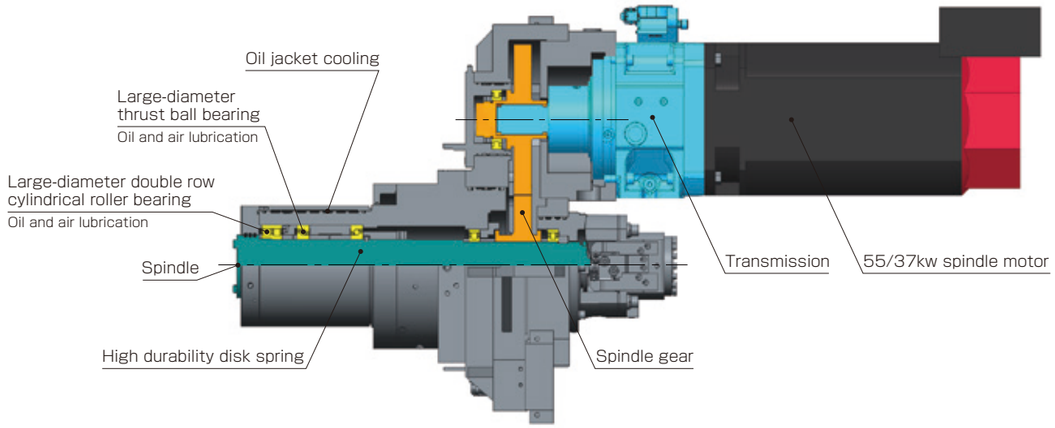
6,000 min^{-1} Gear-driven large torque spindle

FH12500SX5-i

[Spindle speed] 6,000min^{-1}
[Spindle nose shape] BT No.50
[Spindle motor (short-time/continuous)] 55/37kW
[Max. torque] 2,200N·m
[Spindle diameter (front bearing bore)] ϕ110mm

Best cutting performance for heavy-duty cutting of difficult-to-cut materials and iron/cast metal parts. This spindle is equipped with a double row cylindrical roller bearing with a high radial load capacity and a thrust angular ball bearing with a high thrust load capacity on its front. These in-house bearings can withstand heavy-duty cutting.





Tool clamping force (Boosting mechanism adopted) 26kN

Maximum milling amount increased by 1.5 times (Compared to previous model)

Best cutting performance in its class with a 2,200 N·m large torque gear driven spindle

Test piece
[Workpiece material] S48C

Milling example Chip discharge: 1,830cm^3/min
[Tool] ϕ160mm face mill
[Spindle speed] 400min^{-1}
[Feed rate] 1,600mn/min
[Cutting width] 130mm
[Cutting depth] 8.8mm

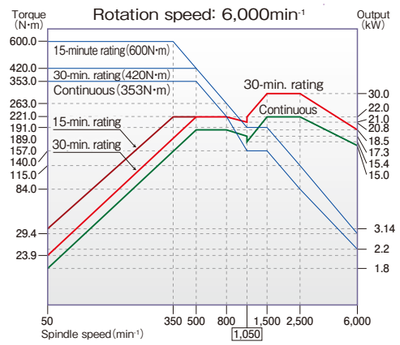
End milling example Chip discharge: 407cm^3/min
[Tool] ϕ39mm Throw away (Number of blades: 2)
[Spindle speed] 1,590min^{-1}
[Feed rate] 636mn/min
[Cutting width] 20mm
[Cutting depth] 32mm

Optimal for cutting cast and iron metal 6,000 min^{-1} spindle

FH1000SX

[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 impact loads.

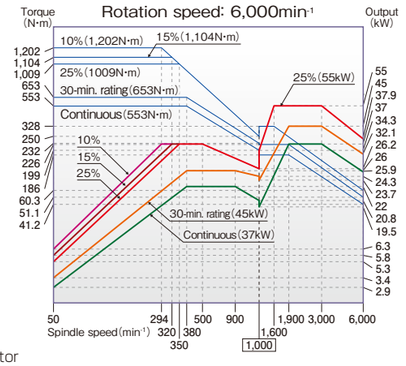


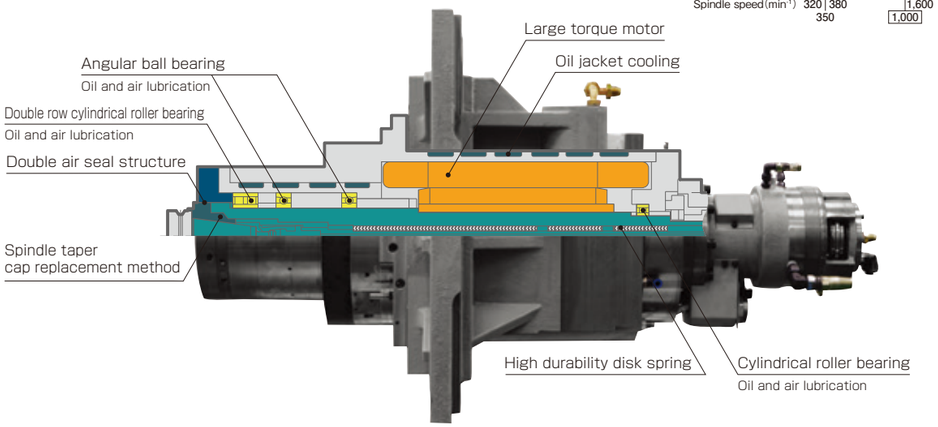
Large torque 6,000min^{-1} spindle achieving the best performance in its class

Option FH1000SX FH12500SX5-i

[Spindle speed] 6,000min^{-1}
[Spindle nose shape] BT No.50
[Spindle motor (short-time/continuous)] 55 / 45 / 37kW
[Max. torque] 1,202N·m
[Spindle diameter (front bearing bore)] ϕ110mm

Both axial and radial rigidity is sought after in spindles oper ating 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 impact loads. This machine has a high-torque spindle of 1,202 N · m, with double the cutting ability in low-speed ranges (under 500 min^{-1}) compared to standard spindles.





Best cutting performance in its class with a 1,202N·m large torque spindle

■ Cylinder block (Model piece)
[Workpiece material] HPM7

■ Milling example Chip discharge: 1,248cm^3/min
[Tool] ϕ160mm face mill [Feed rate] 1,600mm/min [Cutting depth] 6mm
[Spindle speed] 400min^{-1} [Cutting width] 130mm

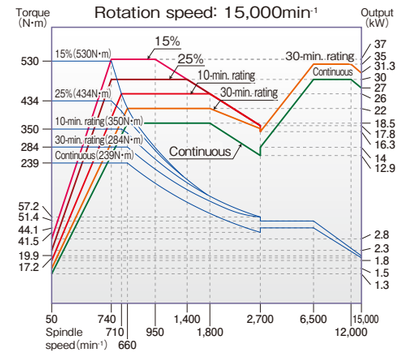
Large torque 15,000min^{-1} spindle

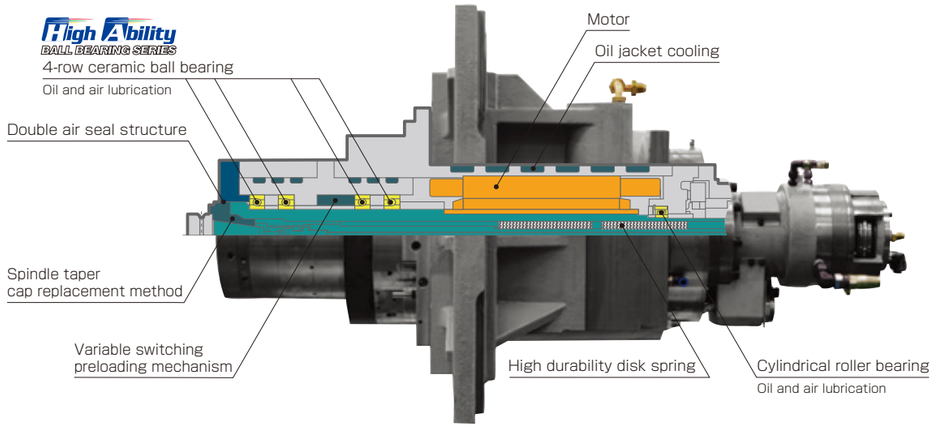
Multi-use spindle that achieves 530N·m in low speed ranges, even with a high-speed spindle

Option FH1000SX FH12500SX5-i

[Spindle speed] 15,000min^{-1}
[Spindle nose shape] BT No.50
[Spindle motor (short-time/continuous)] 37/30kW
[Max. torque] 530N·m
[Spindle diameter (front bearing bore)] ϕ120mm

This is a multi-use type spindle that boasts high rigidity and rotational accuracy, enabling the machining of a wide range of workpieces, from the slow cutting of steel to the fast cutting of aluminum. This spindle utilizes a newly developed preloading adjustment mechanism that stabilizes high torque in low speed ranges and accuracy in high-speed ranges.





High-efficiency and high-accuracy machining with 15,000min^{-1} large torque spindle

■ Test piece
[Workpiece material] S45C

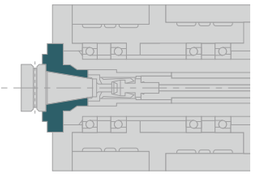
■ Milling example Chip discharge: 1,210cm^3/min
[Tool] ϕ125mm face mill [Feed rate] 2,688mm/min [Cutting depth] 4.5mm
[Spindle speed] 800min^{-1} [Cutting width] 100mm

The spindle taper cap replacement method

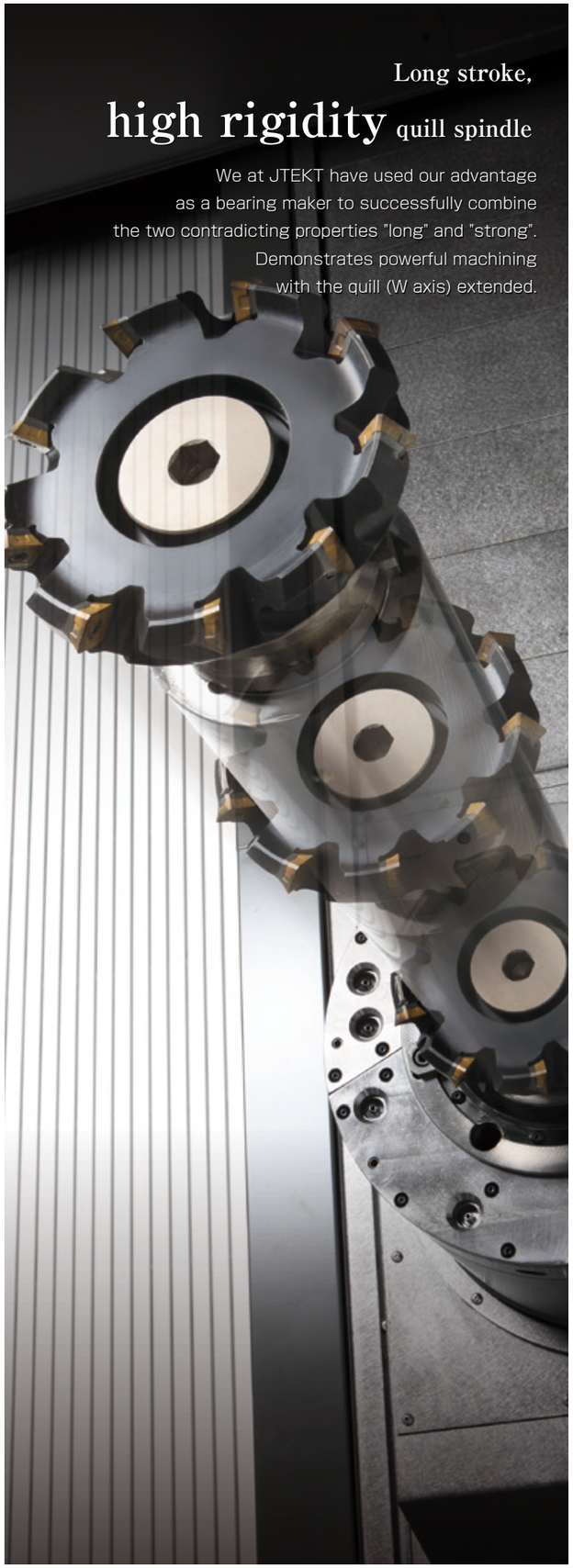
takes ease of maintenance into consideration.

FH1000SX FH12500SX5-i*

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.



* Gear spindle is not included.



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.

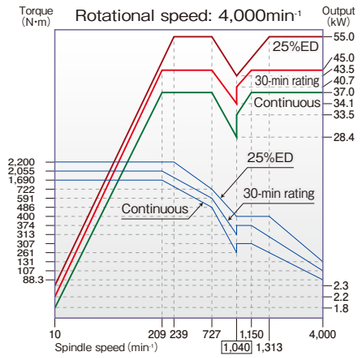
A high rigidity Quill-axis (W-axis) with the longest stroke in its class.

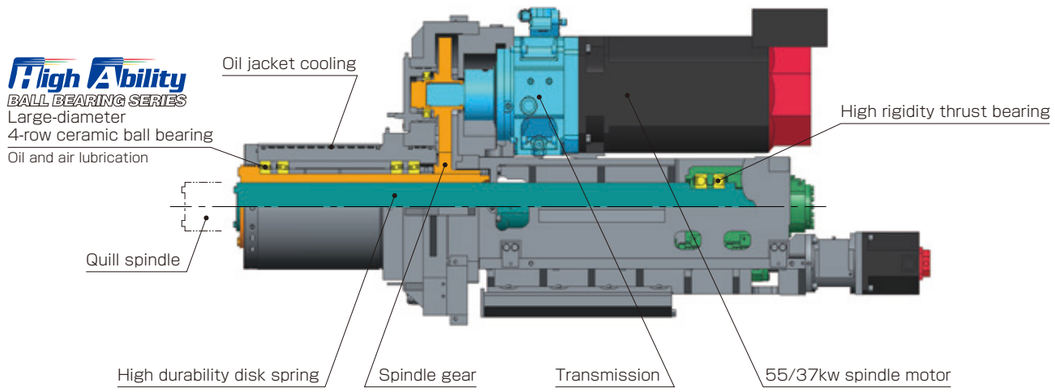
This newly developed gear-driven quill spindle is optimal for cutting iron and cast metal parts, and exhibits powerful deep large-diameter hole drilling and boring.

FH12500SW5-i

FH12500SW5-i

[Spindle speed] 4,000min^{-1}
[Spindle nose shape] BT No.50
[Spindle motor (short-time/continuous)] 55/37kW
[Max. torque] 2,200N·m
[Spindle diameter (front bearing bore)] φ180mm
[Quill spindle stroke (W axis travel amount)] 560mm



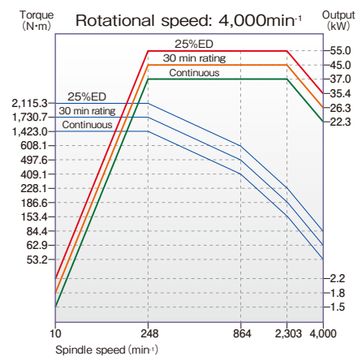


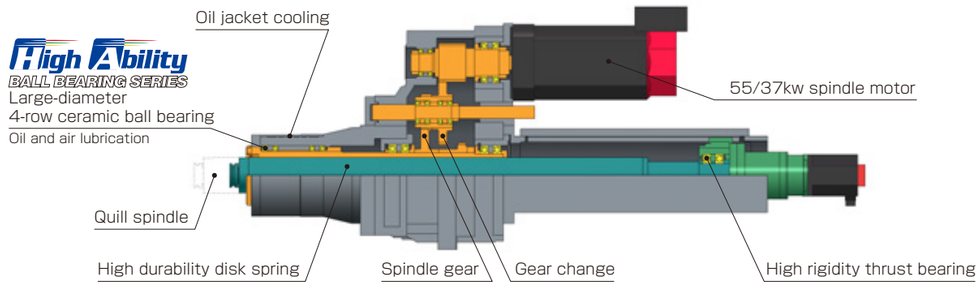
Tool clamping force (Boosting mechanism adopted) **26kN**

FH1600SW5i

FH1600SW5i

[Spindle speed] 4,000min^{-1}
[Spindle nose shape] BT No.50
[Spindle motor (short-time/continuous)] 55/37kW
[Max. torque] 2,115N·m
[Spindle diameter (front bearing bore)] φ200mm
[Quill spindle stroke (W axis travel amount)] 750mm





Best cutting performance in its class with a 2,115N·m large torque spindle

Milling example] (w=0)
Chip discharge: 1,568cm³/min

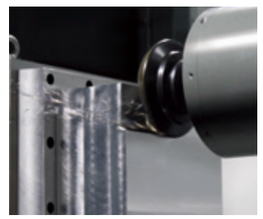
[Material] S48C
[Tool] φ200mm
[Spindle speed] 310min^{-1}
[Cutting width] 140mm
[Cutting depth] 16mm
[Cutting feedrate] 700mm/min

Drilling example
Chip discharge: 997cm³/min

[Material] S48C
[Tool] φ101.6mm
[Spindle speed]280min^{-1}
[Cutting feedrate]123mm/min

Example of boring
Chip discharge: 337cm³/min

[Material] S48C
[Tool] φ230mm
[Spindle speed] 69min^{-1}
[Cutting depth (radius)] 13mm
[Cutting feedrate] 38mm/min

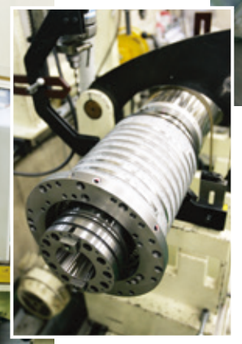


Tool longevity and cutting accuracy to be discussed separately.

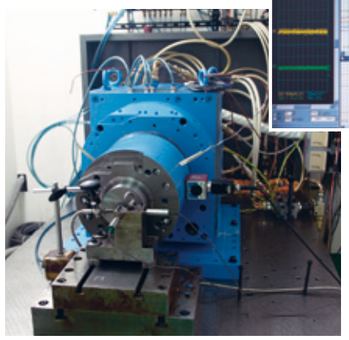
JTEKT's spindle promises assurance over a long period and takes maintenance into consideration.

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, temperature, 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 rest

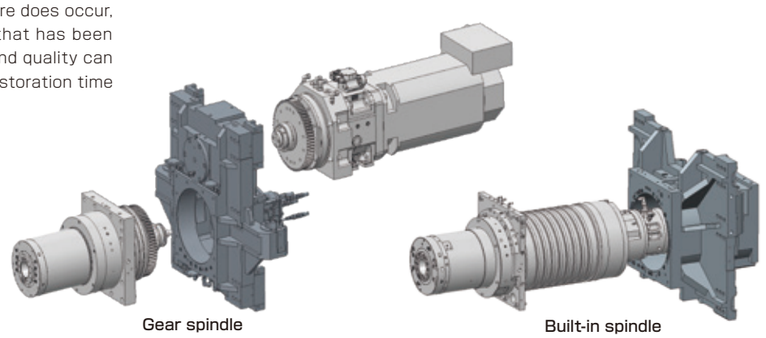
Basic design particularly focusing on low vibration.

A spindle vibration within 2 microns* has been accomplished (measurement with a 15,000min^{-1} spindle). FH1000SX FH12500SX5-i

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.

Adopting a spindle cartridge replacement system with maintainability in mind FH1000SX FH12500SX5-i

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.



Gear spindle　　Built-in spindle

* 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.

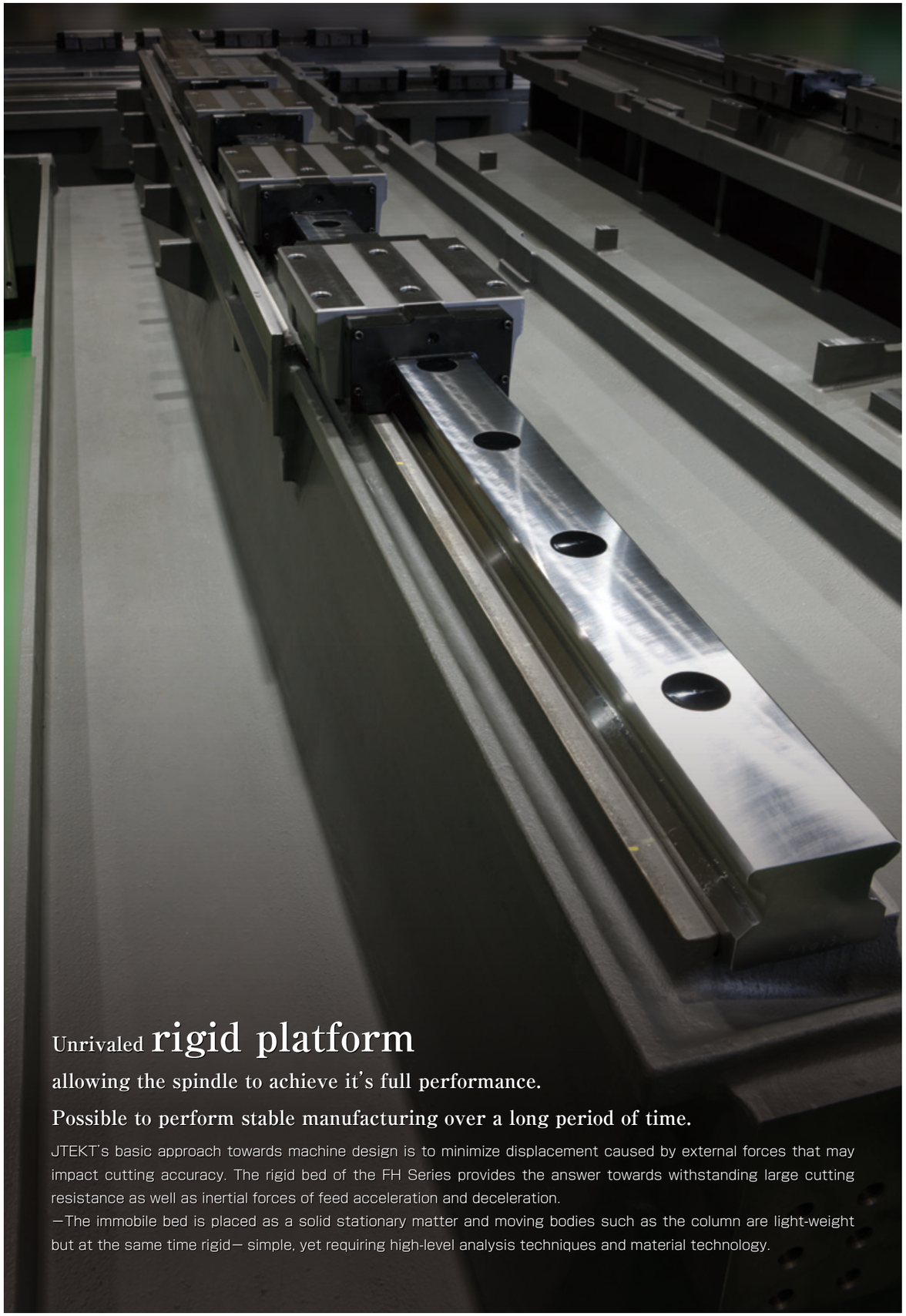
High Ability BALL BEARING SERIES

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}, 4,000min^{-1} BT No.50 spindle.

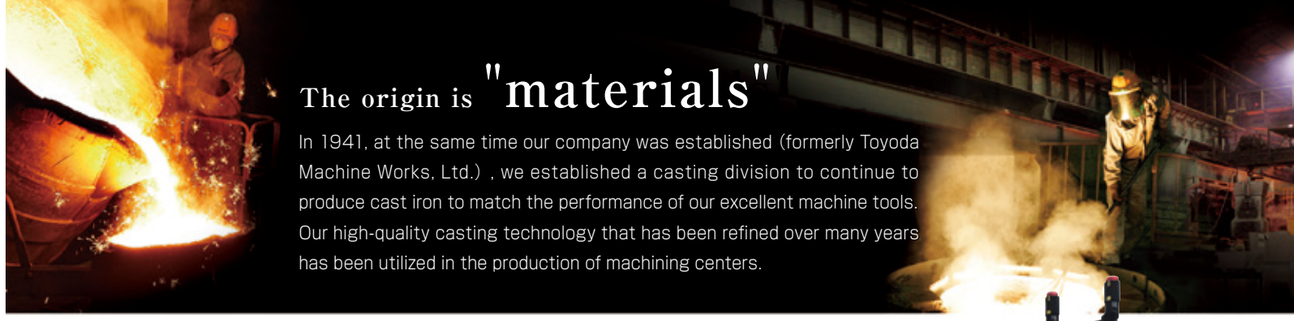


Unrivaled rigid platform

allowing the spindle to achieve it's full performance.

Possible to perform stable manufacturing over a long period of time.

JTEKT's basic approach towards machine design is to minimize displacement caused by external forces that may impact 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 are light-weight but at the same time rigid— simple, yet requiring high-level analysis techniques and material technology.



The origin is "materials"

In 1941, at the same time our company was established (formerly Toyoda Machine Works, Ltd.) , we established a casting division to continue to produce cast iron to match the performance of our excellent machine tools. Our high-quality casting technology that has been refined over many years has been utilized in the production of machining centers.

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

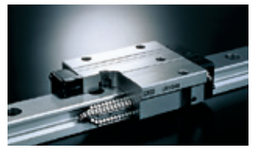
keeping machine level stable over a long period

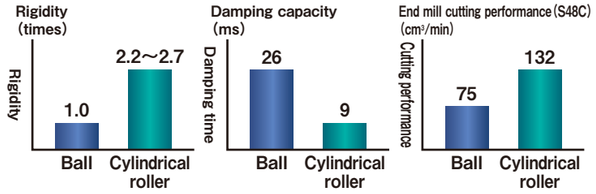
The bed supporting the moving body is designed using FEM analysis technology. And the bed has sufficient rigidity and a substantially improved moving level. This feature makes stable axial feed possible with high speed and high acceleration.

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.





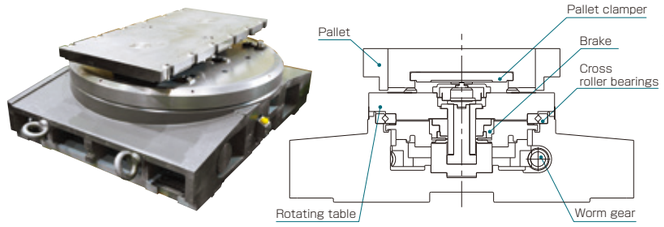
Because of JTEKT's assembling technology which allows for strict mounting face accuracies, the rigid cylindrical roller slide offers the best rapid feed rate and acceleration in it's class.

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

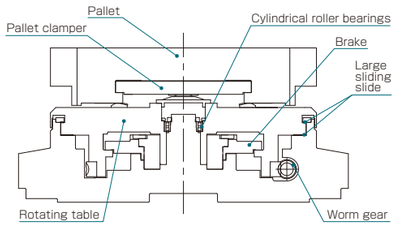
The NC indexing table conducts table indexing in units of 0.001° even with a heavy workpiece loaded onto the pallet. The high-rigidity and high-accuracy cross-roller bearing on the FH1000SX and the large sliding slide on the table periphery of the FH12500SX5-i, FH12500SW5-i, and FH1600SW5i secure the load and counterbalance the weight of large workpieces with suitable support rigidity. These mechanisms minimize vibration on the pallet and enable accurate machining, even with unbalanced load weights and cutting loads.

	FH1000SX	FH12500SX5-i / FH12500SW5-i	FH1600SW5i
Maximum load on pallet	3,000kg	5,000kg	8,000kg

FH1000SX table cross section



FH12500SX5-i / FH12500SW5-i / FH1600SW5i table cross section



	NC indexing table	NC indexing table (with NC encoder) op	1° indexing table op *1
Table indexing accuracy	±7sec	±3.5sec	±3sec
Table indexing repeatability	±3.5sec	±2sec	—

op is a special specification.

* 1° indexing table can be included in FH1000SX only.

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

Various factors can effect cutting accuracy. The product is packed with JTEKT's proprietary high-precision technologies that have been developed through its long-standing experience in the mass-production machining field for automotive parts.

3 approaches for achieving precision cutting

Suppress heat generation

[Ball screw shaft cooling] Reduction of heat by cooling the spindle core
[Spindle oil jacket cooling] Reduction of spindle temperature rise
[Dual ball screw drive] Reduced heat generation through motor size reduction
[1,500min^{-1} large torque spindle] Reduction of spindle temperature rise with a multi switching preloading mechanism Option
[High Ability bearing] 30% reduction of bearing temperature rise Option
[Working oil cooling] Option
[Coolant cooling] Option

Elimination of heat transmission

[Multi 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

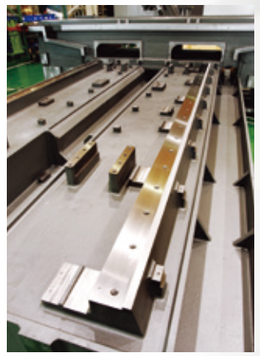
[Large heat capacity bed] Reducing the effect of thermal displacement
[Thermally symmetrical structure] Reducing heat-related column twist
[Spindle Thermo Stabilizer function] Direct measurement and correction of spindle elongation Option
[Scale feedback] Option

Accuracy	FH1000SX	FH12500SX5-i	FH12500SW5-i	FH1600SW5i
Positioning accuracy (X, Y, Z)	±0.002	±0.002	±0.002	±0.003
Repeatability (X, Y, Z)	±0.001	±0.001	±0.001	±0.0015
Table indexing accuracy(B)	±3.5	±3.5	±3.5	±3.5
Table indexing repeatability(B)	±2	±2	±2	±2

[Touch sensor function] Option

Manufacturing technology for realizing precision cutting


Table reference face sheet scraping

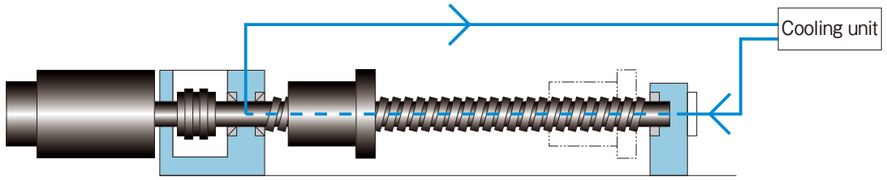

Accuracy machining of linear guide mounting face


Spindle balancing


Precision assembling work

Ball screw shaft core cooling to realize stable, high-precision machining

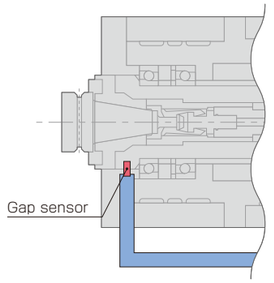
Heat displacement is restrained and stable and high accuracy machining is performed by always discharging the controlled cooling oil to the spindle core of ball screw which has core empty structure in order to follow the bed temperature. Furthermore, this machine is of highly reliable design in which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



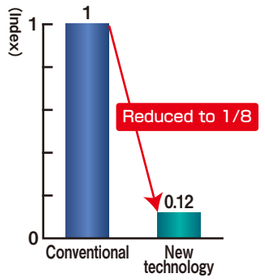
Spindle thermal displacement correction function used to correct spindle elongation formed after an extended period of operation

Option FH1000SX FH12500SX5-i*

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.



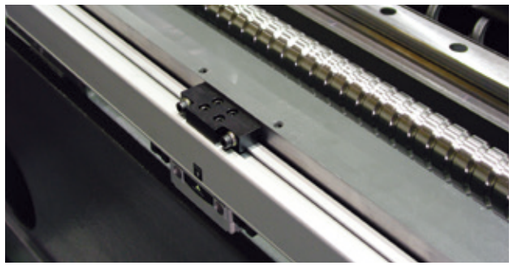
Amount of cutting edge variation



* Gear spindle is not included.

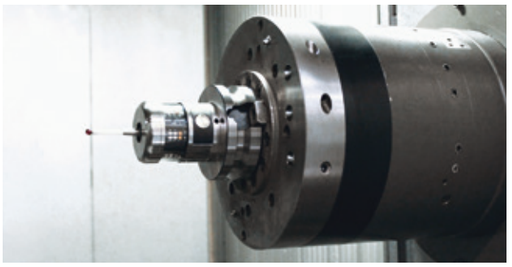
Scale feedback (X, Y and Z axes) Option

An optical scale makes lasting precision positioning possible.



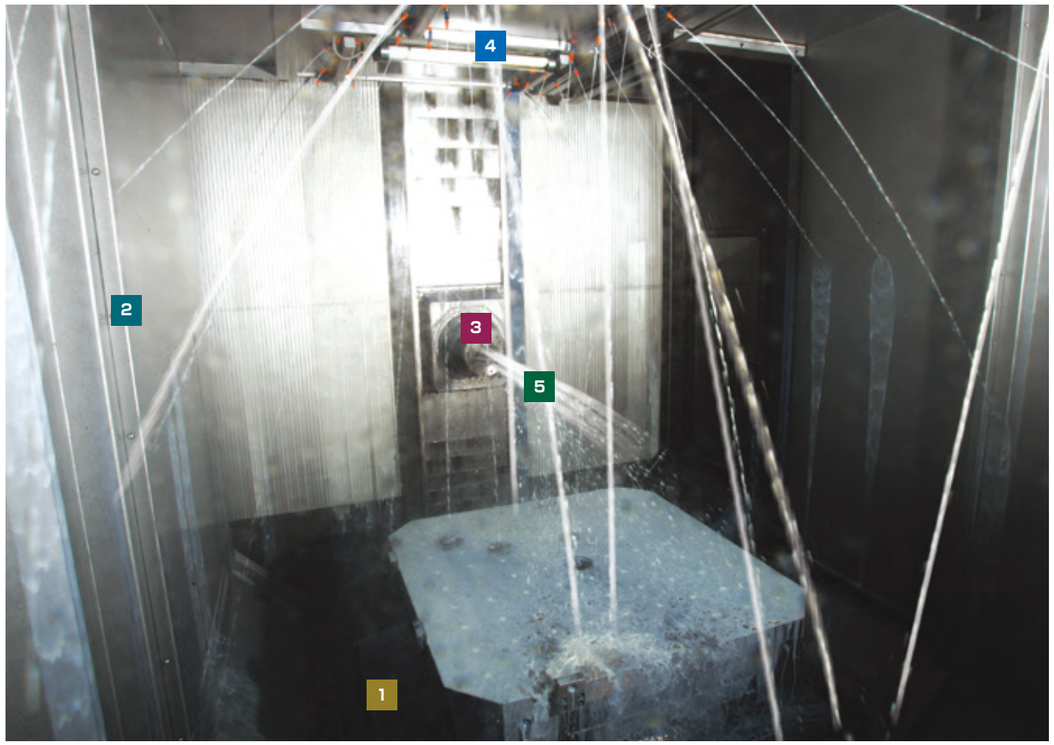
Touch sensor function Option

The touch sensor is used to align the workpiece.



Reliability starts with chip disposal. The design of a multi trough that makes

it possible to deal with chip disposal directly beneath the cutting point.



1 Multi-trough double chip conveyor

To enable smooth processing of chips, three coil conveyors are installed on the FH1000SX, FH12500SX5-i, and FH12500SW5-i, and four coil conveyors are installed on the FH1600SW5i.

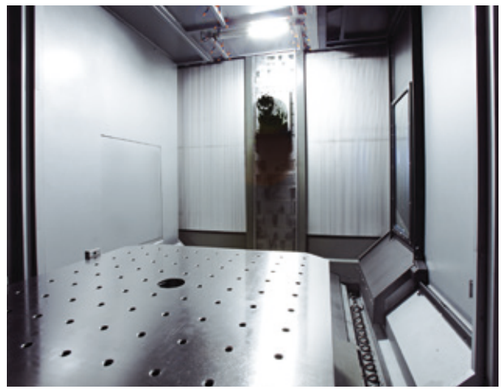
This photo shows FH12500SX5-i.

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. Futhermore, 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

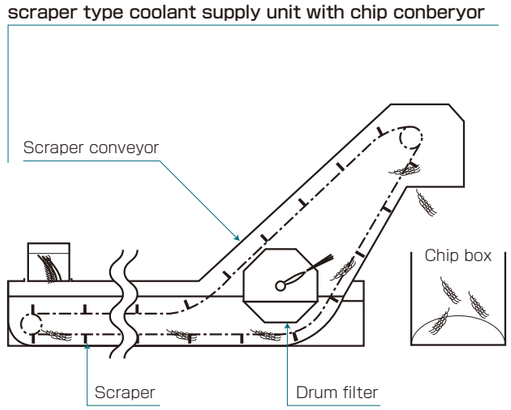
Coolant is supplied through the spindle center to the cutting edge. It is effective for lubrication and cooling of the cutting point, chip disposal and extension of tool life. (Delivery pressure: 3MPa and 7MPa are options.)

Spindle-through coolant 3MPa

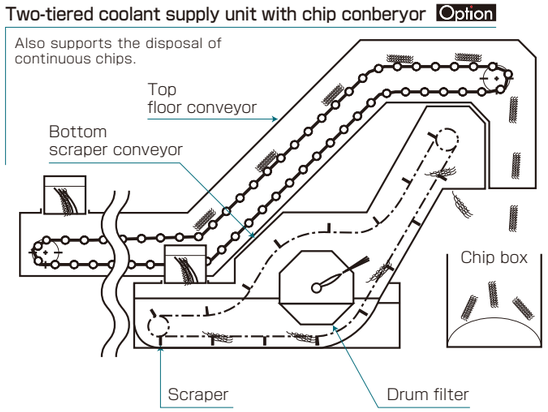
Coolant supply unit with take-up chip conveyor

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.

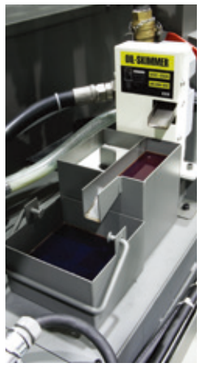
Standard
scraper type coolant supply unit with chip conberyor



Two-tiered coolant supply unit with chip conberyor Option



Splash gun



Oil skimmer

Optional parts Option

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

Coolant cooling

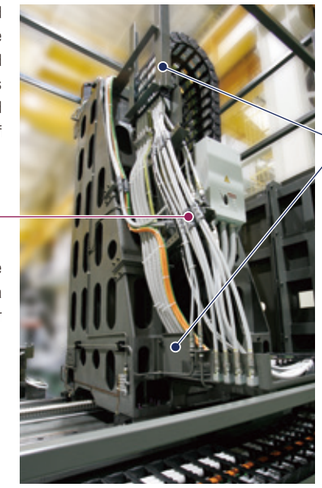
The pursuit of Reliability - one of JTEKT's starting points

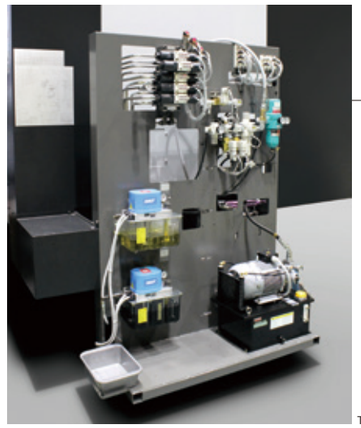
Stable accuracy and an improved MTBF (mean time between failures)
are both necessary in order for the customer to feel assured with reliability.
The design of the FH Series pursues high quality, high performance and long life.

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

The speed and acceleration of axial feed have increased, and consequently the reliability of hoses and wire cables has become very important. As hoses and cables rub against each other, and since the damage to brackets increases, we design machines with careful consideration to the layout of hoses and cables and their wiring and routing, and to the strength and maintainability of brackets.





This photo shows FH1250SX5-i.

Concentrated device layout making daily maintenance easier

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

Wire-saving unit improves electric-system maintenance workability

A substantial decrease in the number of wires and thus less wiring problems have been achieved through the utilization of a wire-saving unit for the wiring of devices that are configured centrally. This wire-saving unit improves maintenance workability by displaying connection status and enabling easy installation and removal of wires and cables.

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.

This photo shows FH12500SX5-i.

Securing accessibility and work space

Accessible operation door

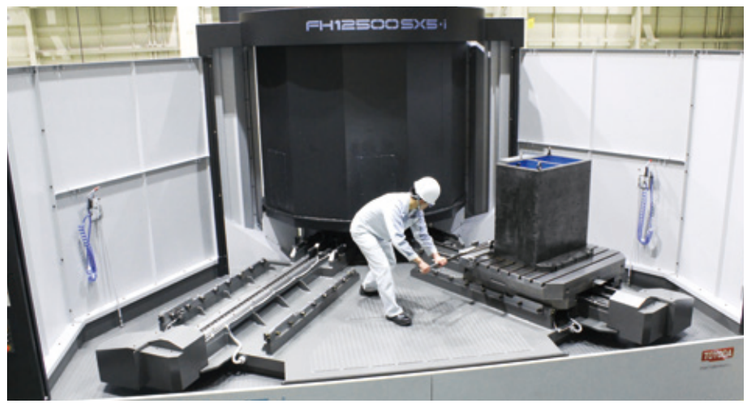
By positioning the operation panel on the left-hand side of the machine, we have created a wide opening and reduced the amount of eye travel required. This in turn reduces the physical strain on the operator by not demanding a constrained physical posture.

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.

APC with good accessibility and workability

To 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.



The bottom of the APC door is equipped with a chip outlet.

This photo shows FH12500SX5-i.

TOYOPUC-Touch

HMI in the IoE* era
Simple, safe and connectable

* JTEKT supports the IoE (Internet of Everything) that connects people, things, information, and services.

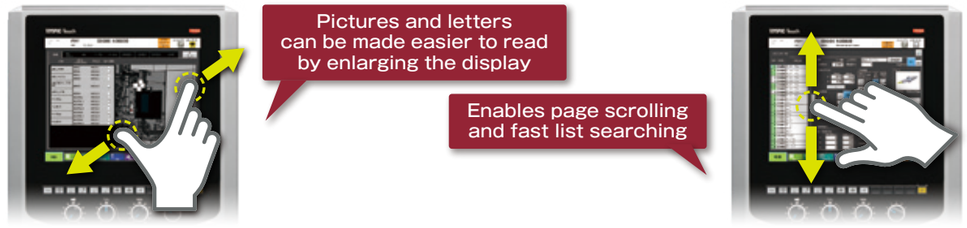
Renewed operability — J-Operate

Visible and effective operation thanks to batch data display

Consolidates information onto a single large-size display screen, and displays a keypad window when necessary

Realization of inspirational operation

Screen swiping and pinching in/out mimics the operability of a smart phone, making the TOYOPUC-Touch easy to use and easy to learn



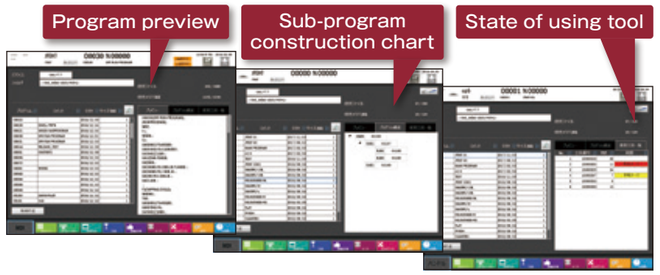
Realization of simple operation — J-Navigate

Minimal number of screen calling operations

With the itemized menu lists, a screen can be called up in a maximum of two steps from any screen.

Easy program status check before starting machining

Details, subprogram construction, and tool status can all be checked before starting machining just by selecting a program from the program list screen



Visualization of equipment status

J-Support

Supports operations performed at customer work sites with functions that visualize equipment status

Visualization of inspection ~Periodic inspection function~

Notifies the user of inspection periods and provides reliable inspection support

- Notification of inspection periods via messages
- Inspection areas and inspection procedures can be viewed without consulting a manual
- Registration of completed past inspections/measurement results

Visualization of longevity ~Management function for replacement parts service life~

Supports planned maintenance through notifications of when life is almost over

- Notifies the user of inspections for parts that are nearing the end of their lives
- Minimizes machine stop time through preventive inspection/part preparation
- Inspection areas and inspection procedures can be viewed without consulting a manual

Visualization of status ~Equipment diagnosis~

Supports maintenance by allowing on-screen assessment of equipment status

- ON/OFF status of devices can be viewed without having to check devices directly
- Device locations can be identified easily through image enlargement
- Internal ladder circuits can also be viewed easily

Visualization of performance ~Operation monitor~

Supports production control and improvement via graphs showing past operation performance/machining performance

- Performance can be viewed easily on graphs and tables, and data entry is also possible
- Current performance can be compared with past performance of the selected period
- Performance can be viewed easily by shift

Visualization of fault ~Fault analysis function~

Displaying error records through graphs for fault analysis

- Displays analysis results in graphs and tables making them easy to understand, and enables data output
- Displays analysis results for a specified period. The number of errors that occurred can be monitored for each of the alarms.
- Helps gain an understanding regarding trends in occurrence for each of the past alarms

Renewed operability

J-Manage

Batch management of tool/pallet information

Tool management function

- Allows automatic indexing of the selected pot without having to know the tool installation position
- Protects tools by using ATC speed commands suited to each tool
- Enables prior assessment of abnormal or insufficient tooling

Pallet management function

- Automatically calls the machining programs set for each pallet
- Enables the setting of compensation values for each pallet
- Enables omission of unnecessary machining

Equipment diagnosis utilizing IoE

J-Care

Shortens error recovery time thanks to quick support

Support provided whenever required by the customer

Information on ID/Password

Remote access

Connects to equipment in real time

Additional functions of TOYOPUC-Touch

●: Standard ／□: Optional

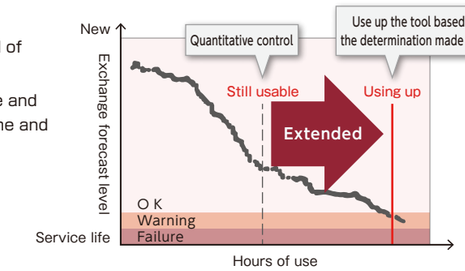
Classification		Function name		Included
J-Navigate	Basic functions	Running status display		●
		Program list display/editing		●
		Command list display		●
		Macro variables list display/editing		●
		Workpiece coordinate system offset display/editing		●
		Operation guidance function		●
		Parameter settings		●
		User registration		●
		Message board		●
		Function switch		●
J-Support	Basic functions	Document browsing		●
		Fault list display		●
		Fault history		●
		Operation history		●
		Signal status		●
		System information		●
		Backup		●
	Production support functions	Operation monitor	Machining performance	●
			Operation performance	●
		Cycle time measurement		●
	Energy saving functions	Energy monitoring		□
		Energy saving settings		●
	Servicing functions	Periodic inspection function		●
		Management function for replacement parts service life		●
	Maintenance functions	Equipment diagnosis		●
		Manual ATC recovery (easy-to-recover function)		●
		Software diagnosis function		●
		Fault analysis function		●
J-Manage	Tool management functions	Tool number conversion function		●
		Tool offset function		●
		Tool longevity management function		●
		ATC variable speed function		●
		Offset updating function		●
		AC function		●
		Machining condition setting function		●
		Stored tool data save function		●
		Tool position display		●
		Tool display in magazine		●
		Abnormal tool list display		●
		Spare tool list display		●
		Tools scheduled to be used		●
		Tools not used for a long period of time display		●
		High-performance magazine operation panel	Automatic indexing function for tools that require change	□
			Data updating function at tool mounting/removal	□
			Tool ID function	□
	Pallet information management functions	APC management		●
		Pallet compensation		●
		Multiple workpiece mounting		●
J-Care	Remote support	Diagnosis data collection function		●
		Remote diagnosis function (using Team Viewer)		□

Using up tools to the end of their service life

Option

Proprietary AI which has memorized the accumulated data determines the tool service life based on data collected in real time.

- Reduces tool costs by using up tools to the end of their service life
- Detects signs of tool failure and reduces equipment downtime and quality defects



20% extended life by using up the tool
(Conventional quantitative control ratio)

* Results may vary depending on your operating conditions.

TIPROS·i Toyoda Integrated PROduction System

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

JTEKT has delivered many systems since the first FMS sold in 1972 and has come to be seen by both domestic and overseas customers as an innovative company offering high reliability while exceeding industry expectations, and as such, indispensable in the FA era.
Based on an optimum combination of mechatronics technology and software modules developed in-house, and our extensive delivery experience, we produce production systems that meet customer needs.

Hardware

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

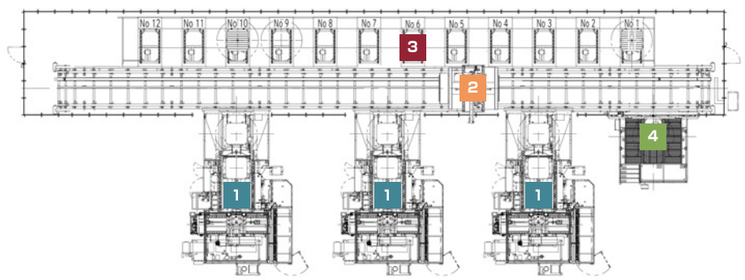
Software

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

Pallet transfer method FMS

Expandability and unmanned operation

RGV (rail-guided vehicle)



1. FH12500SX5-i
2. Pallet conveyance equipment
3. Buffer station
4. Setup station

TIPROS·i JTEKT-made FMS software

JTEKT's unique software manages pallet transfers, programs, tools and schedules to support your efficient operations.

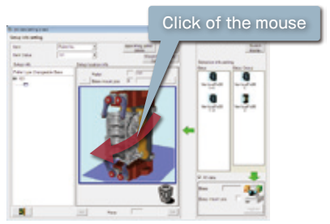
FMC software	PC type		Stacker crane method, carrier method		
			FMS Level1	FMS Level2	FMS Level3
		Transfer control	●	●	●
		DNC control		●	●
		Tool control			●
		Production instructions (optional)		○	○

Optional: Mounting many pieces, database, etc.

Intuitive and easy to use

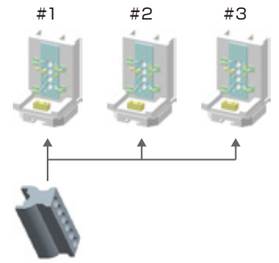
Directly specifying what is to be set

A visual part no. changeover setting

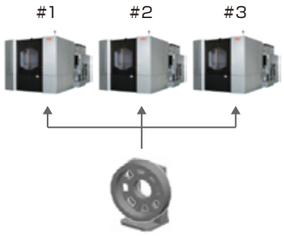


Stable machining accuracy

Correction of differences in the workpiece mounting positions

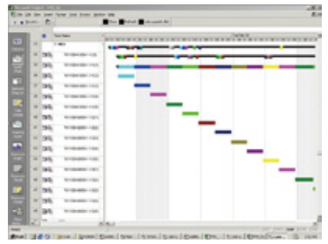


Correction of differences in pallet positions

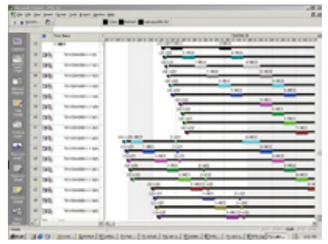


Completion timing is decipherable

Scheduling by equipment



Scheduling by work



Machine specifications

Item		Unit	FH1000SX			FH12500SX5-i		
			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)		
	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		4.3		
	Pallet change time	sec	70			85		
Stroke	X-axis	mm	1,600			2,400		
	Y-axis	mm	1,400			1,600	1,800 *2	
	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			200~1,800	100~1,900 *2	
	Max. workpiece swing × Max. workpiece height	mm	ϕ1,800 × 1,600 *1			ϕ2,400 × 2,000 *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/s² (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	ϕ120	ϕ110	ϕ110	ϕ120
	Spindle nose shape		BT No.50	HSK		BT No.50	HSK *2	
	Spindle motor, short-time/continuous	kW	30/22	55/37	37/30	55/37	55/37	37/30
ATC	Tool holding capacity	tool	60	121, 180, 240, 330 *3		60	121, 180, 240, 330 *3	
	Tool selection		Absolute address			Absolute address		
	Tool (dia. × length)	mm	ϕ120 × 800 *1			ϕ120 × 800 *1		
	Tool mass	kg	35			35		
	Tool change time (Tool-to-Tool)	sec	2.7 (~15kg) 3.2 (15~35kg)			2.8 (~15kg) 3.2 (15~35kg)		
	Tool change time (Chip-to-Chip)	sec	4.4 (~15kg) 5.0 (15~35kg)			6.5 (~15kg) 7.1 (15~35kg)	3.7 (~15kg) 4.3 (15~35kg) *2	
	Tools Holder		MAS BT50			MAS BT50		
	Pull stud		MAS P50T-1			MAS P50T-1		
Dimensions & Weight	Floor space (width × depth)	mm	5,900 × 9,350 *4			6,350 × 10,040 *4		
	Machine height	mm	4,051			4,526		
	Machine weight	kg	31,000			50,000		
Various Capacities	Working oil	L	63			18		
	Slide lubricant	L	5.5			4.0		
	Spindle oil air	L	2.9			4.0		
	Table	L	4			5.9		
	Spindle coolant	L	20			35	20 (15,000min⁻¹ spindle)	
	Ballscrew coolant	L	Also used as spindle coolant			Also used as spindle coolant		
	Power supply capacity	kVA	59	63	59	71	65	60
	Control voltage	V	AC100 DC24			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		±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 : Gear spindle is not included. *3: The matrix magazine is used for 180-tools or more. *4: For details, refer to the layout plan.
*5: According to our inspection method

Item		Unit	FH12500SW5-i		FH1600SW5i	
			Standard specifications	Special specifications	Standard specifications	Special specifications
Table & Pallet	Table dimensions (pallet dimensions)	mm	□1250 (Pallet)	1,250×1,600	1,600 × 1,250	
	Rotary table indexing angle	°	0.001 (NC)		0.001 (NC)	
	Pallet height (from floor)	mm	1,500		1,450	
	Max load on pallet	kg	5,000		8,000	
	Table indexing time (90°indexing)	sec	4.3		6.0	
	Pallet change time	sec	85		200	
Stroke	X-axis	mm	2,400		3,000	
	Y-axis	mm	1,500		1,900	
	Z-axis	mm	1,850		2,100	
	W-axis	mm	560		750	
	Distance between spindle nose and table center	mm	205~2,055		400~2,500	
	Distance between spindle center and top of pallet	mm	200~1,800		100~2,000	
	Max. workpiece swing × Max. workpiece height	mm	ϕ2,400 × 2,000 *1		ϕ3,200 × 2,200 *2	
Feeds	Rapid feed rate	m/min	42 (X, Y, Z), 20 (W)		35 (X), 40 (Y, Z), 20 (W)	
	Cutting feed rate	m/min	0.001~30 (X, Y, Z), 0.001~10 (W)		0.001~20	
	Rapid acceleration (X, Y and Z)	m/s² (G)	2.94 (0.3)		1.96 (0.2G)	
	Ball screw diameter (X, Y and Z)	mm	ϕ63 (X), ϕ50 (Y, Z, W)		ϕ80 (X), ϕ63 (Y, Z), ϕ50 (W)	
Spindle	Spindle speed	min⁻¹	10~4,000		10~4,000	
	Spindle diameter (front bearing bore)	mm	ϕ180		ϕ200	
	W-axis quill dia.	mm	ϕ130		ϕ150	
	Spindle nose shape		BT No.50		BT No.50	
	Spindle motor, short-time/continuous	kW	55/37		55/37	
ATC	Tool holding capacity	tool	60	121, 180, 240, 330 *3	120 *1	240, 330 *3
	Tool selection		Absolute address		Absolute address	
	Tool (dia. × length)	mm	ϕ120 × 800 *1		ϕ125 × 800 *1	
	Tool mass	kg	35		35	
	Tool change time (Tool-to-Tool)	sec	2.8 (~15kg) 3.2 (15~35kg)			
	Tool change time (Chip-to-Chip)	sec	6.5 (~15kg) 7.1 (15~35kg)		23.2 (~8kg) 25.4 (8~15kg) 30.8 (15~35kg)	
	Tools Holder		MAS BT50		CAT50	MAS BT50
	Pull stud		MAS P50T-1		MAS P50T-1	
Dimensions & Weight	Floor space (width × depth)	mm	6,350 × 10,040 *4		10,100 × 14,600 *4	
	Machine height	mm	4,526		5,600 (APC door open) *4	
	Machine weight	kg	50,000		75,000	
Various Capacities	Working oil	L	18		100	
	Slide lubricant	L	4.0		16	
	Spindle oil air	L	4.0		2.9	
	Table	L	5.9		7.5	
	Spindle coolant	L	35		35	
	Ballscrew coolant	L	Also used as spindle coolant		20	
	Power supply capacity	kVA	71		104	
	Control voltage	V	DC24		AC100 DC24	
	Air source capacity	NL/min	900		1,000	
	Air source pressure	MPa	0.4~0.5		0.4~0.5	
Capability & Performance	Positioning accuracy *5	mm	±0.003	±0.002 (X, Y, Z)	±0.005	±0.003 (X, Y, Z)
	Repeatability *5	mm	±0.0015	±0.001 (X, Y, Z)	±0.003	±0.0015 (X, Y, Z)
	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: Workpiece swing is limited to 2,950 mm in the X-axis direction. Please refer to the tooling date.
*3: The matrix magazine is used for 180-tools or more *4: For details, refer to the layout plan. *5: According to our inspection method

CNC unit FANUC 31i ● Standard／□ Optional

Division	Name	FH1000SX	FH12500SX5-i	FH12500SW5-i	FH1600SW5i
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 correction 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 bytes)	□	□	□	□
	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	●	●	●	●

FANUC is a registered trademark of FANUC LTD.

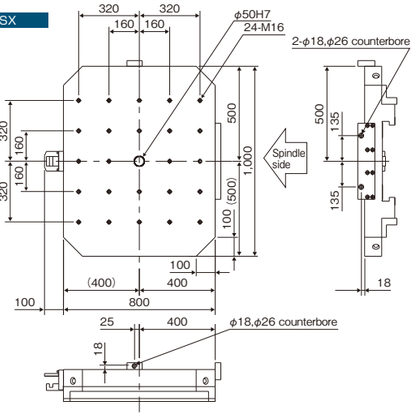
Accessories ● Standard accessories／□ Optional accessories

Item	Equipment name			FH1000SX	FH12500SX5-i	FH12500SW5-i	FH1600SW5i
Table and pallet	Indexing table	NC indexing table		●	●	●	●
		NC indexing table(with encoder)		□	□	□	□
		1°indexing table		□			
	Pallet	Standard pallet	screw hole	800×1,000/□1,250/□1,250	●	□	□	
		Standard pallet	T-groove	800×1,000/□1,250/□1,250	□	●	●	
		Pallet	screw hole	□800	□			
		Pallet	T-groove	□800	□			
		Rectangular pallet	screw hole	1,250 × 1,600		□	□	
		Rectangular pallet	T-groove	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(55/37kW)	large torque spindle(with spindle-through coolant spec)	□	□		
		15,000min⁻¹	BT No.50(37/30kW)	large torque spindle(with spindle-through coolant spec)	□	□		
		6,000min⁻¹	BT No.50(55/37kW)	large torque gear driven spindle(with spindle-through coolant spec)		●		
		4,000min⁻¹	BT No.50(55/37kW)	quill spindle(with spindle-through coolant spec)W-axis stroke 550mm			●	
		4,000min⁻¹	BT No.50(55/37kW)	quill spindle(with spindle-through coolant spec)W-axis stroke 750mm				●
		Filler block for oil hole holder			□	□		
		Positioning block for angle head holder			□	□		
		HSK specifications			□	□ *1		
		BIG PLUS specifications			□	●	●	●
	Collet	MAS Ⅰ			●	●	●	●
		JIS			□	□	□	
		MAS Ⅱ			□	□	□	
Tool magazine	Tool capacity	60 tools			●	●	●	
		120 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-thorugh coolant spec/1MPa through pump/with oil skimmer)			●	●	●	□
		Coolant supply unit(water soluble/with take-up chip conveyor/scraper type/spindle-thorugh coolant spec/3MPa through pump/with oil skimmer)			□	□	□	□
		Coolant supply unit(water soluble/with take-up chip conveyor/scraper type/spindle-thorugh 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/2MPa 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 multi trough				●	●	●	●
	Coolant cooling				□	□	□	□
	Chip box				□	□	□	□
	Splash gun(at APC)				●	●	●	●
	Mist collector				□	□	□	□
	Air blower	External nozzle type			□	□		
		Holder type			□	□	□	□
Splash guard	Enclosure guard				●	●	●	●
	Door interlock at operating position	Electromagnetic lock type			●	●	●	●
	APC door interlock	Light curtain			●	●	●	●
	Internal lighting				●	●	●	●
Operation control function, others	Ground fault interrupter				□	□	□	□
	Cooler for control cabinet inside				□	□	□	□
Labor saving function	Pallet changer(APC)	Shift type, with 2 pallets			●	●	●	●
Support for high accuracy	Spindle cooling				●	●	●	●
	Ball screw shaft cooling				●	●	●	●
	Scale feedback (X-, Y- and Z-axes)				□	□	□	□
	Touch sensor function	Wireless type (without energization): with alignment and datum face correction functions			□	□	□	●
		Wire type: with alignment, datum face correction, gap elimination, and tool breakage detection functions			□	□		
		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			□	□	□	□
	Spindle Thermo Stabilizer function				□	□ *1		

*1: Gear spindle is not included.

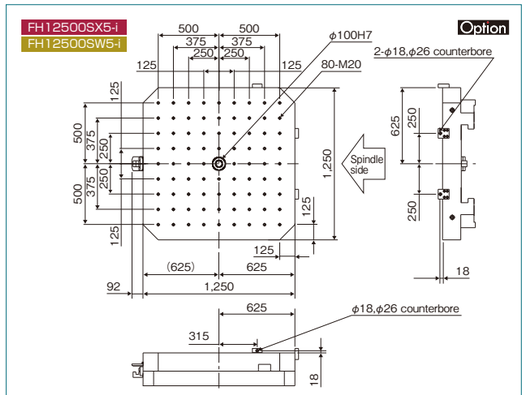
Threaded hole pallet

FH1000SX



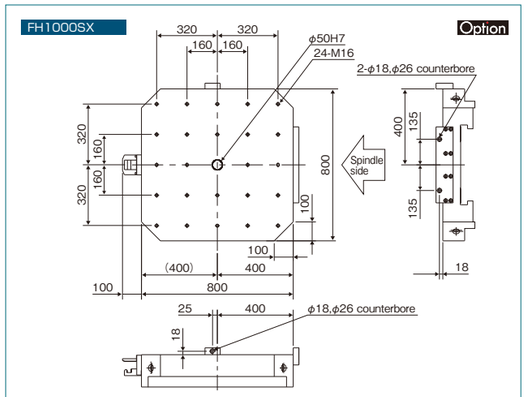
●No alignment reference hole is provided for the edge locator.

FH12500SX5-i
FH12500SW5-i
Option



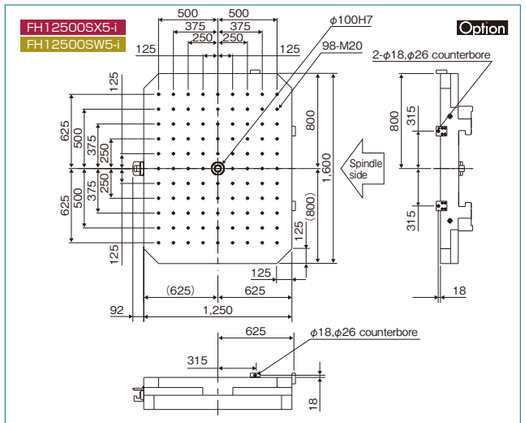
●No alignment reference hole is provided for the edge locator.

FH1000SX
Option



●No alignment reference hole is provided for the edge locator.

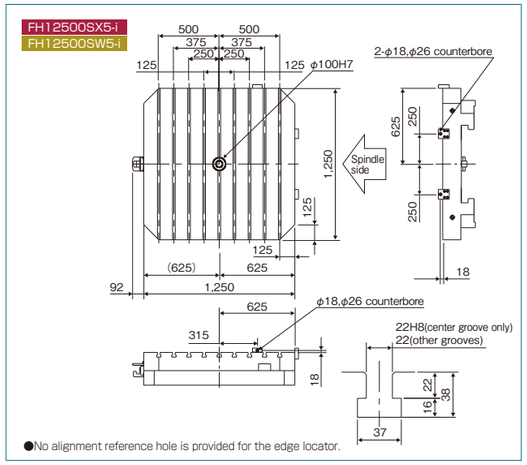
FH12500SX5-i
FH12500SW5-i
Option



●No alignment reference hole is provided for the edge locator.

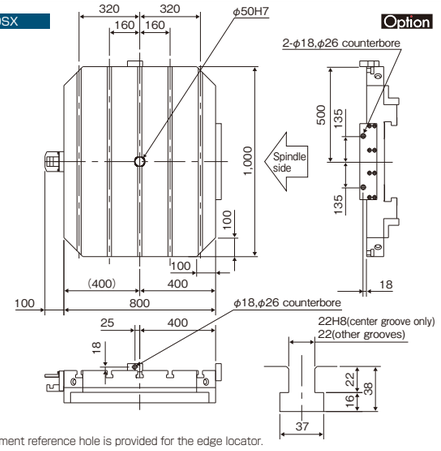
T-groove pallet

FH12500SX5-i
FH12500SW5-i



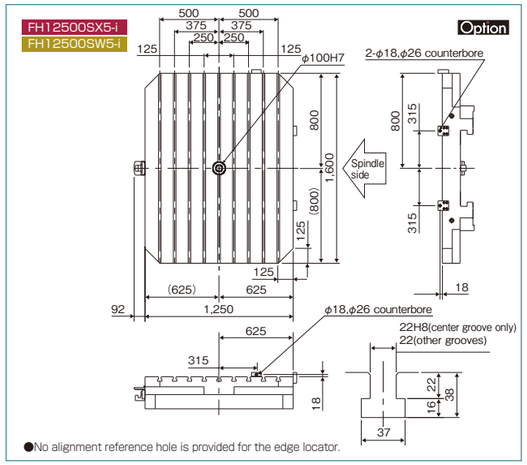
●No alignment reference hole is provided for the edge locator.

FH1000SX
Option



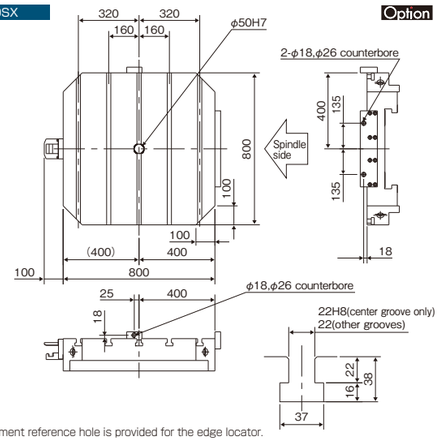
●No alignment reference hole is provided for the edge locator.

FH12500SX5-i
FH12500SW5-i
Option



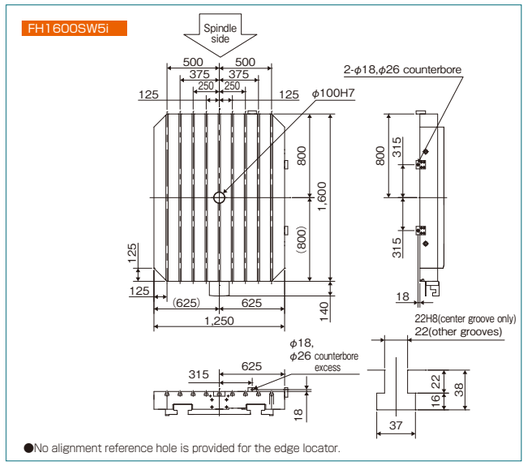
●No alignment reference hole is provided for the edge locator.

FH1000SX
Option



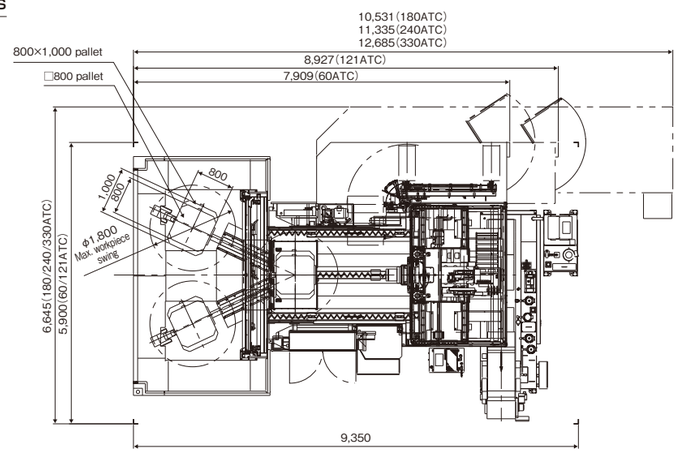
●No alignment reference hole is provided for the edge locator.

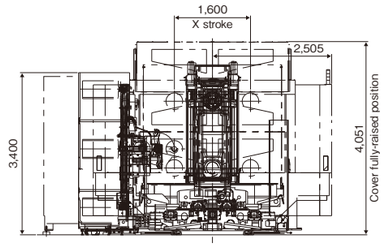
FH1600SW5i

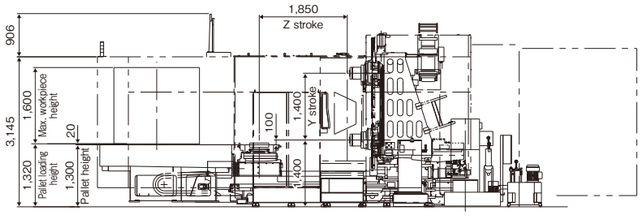


●No alignment reference hole is provided for the edge locator.

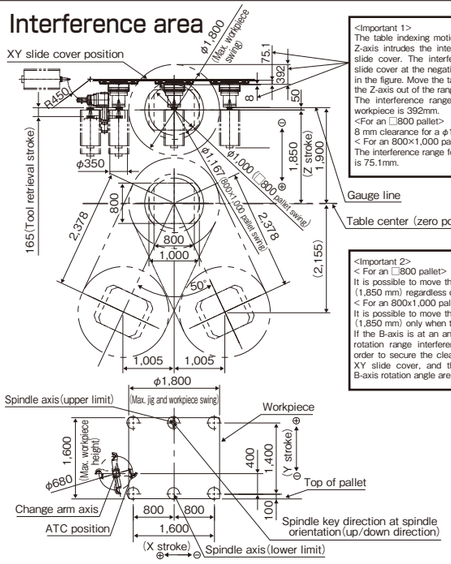
FH10000SX
Layout plan





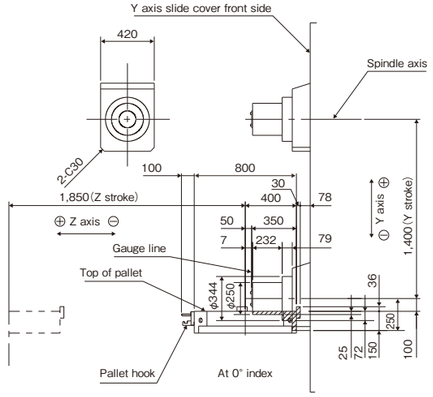


Interference area

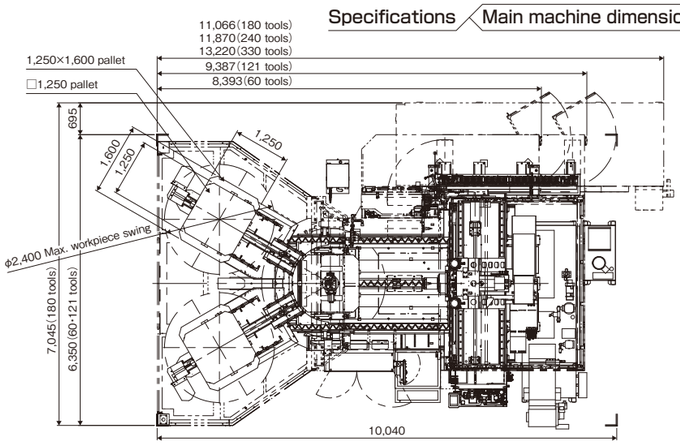


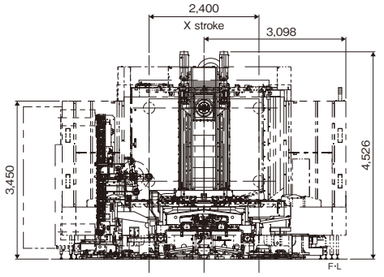
<Important 1>
The table indexing motion at the negative limit of the Z-axis intrudes the interference area with the Y-axis slide cover. The interference range with the Y-axis slide cover at the negative limit of the Z-axis is shown in the figure. Move the table in the positive direction of the Z-axis out of the range before indexing the table.
The interference range with the maximum φ1,800 workpiece is 392mm.
<For an □800 pallet>
8 mm clearance for a φ1,000 mm pallet swing
< For an 800×1,000 pallet>
The interference range for a pallet swing of φ1,167mm is 75.1mm.

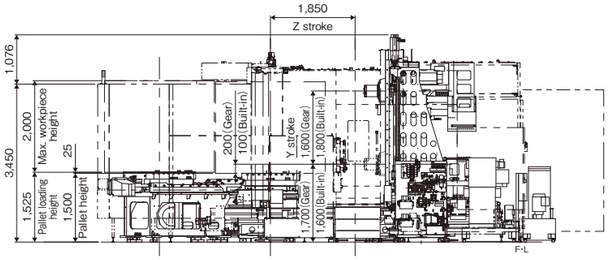
<Important 2>
< For an □800 pallet>
It is possible to move the Z-axis the full travel amount (1,850 mm) regardless of the B-axis angle.
< For an 800x1,000 pallet>
It is possible to move the Z-axis the full travel amount (1,850 mm) only when the B-axis is at 0° or 180°.
If the B-axis is at an angle other than 0° or 180°, the rotation range interference check function works in order to secure the clearance between the pallet and XY slide cover, and the Z-axis travel amount and B-axis rotation angle are restrained.



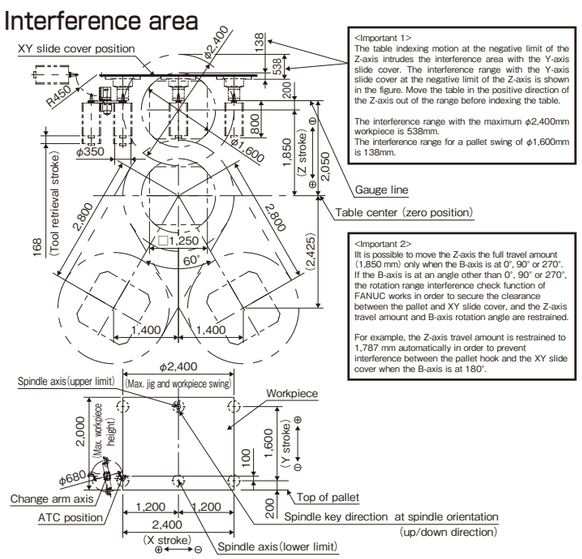
FH12500SX 5-i
Layout plan







Interference area



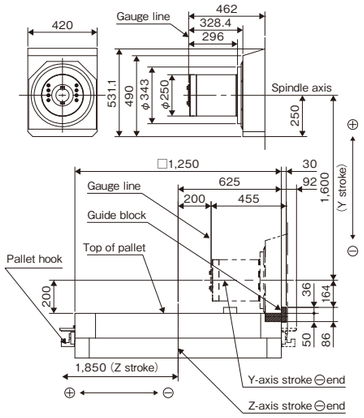
<Important 1>
The table indexing motion at the negative limit of the Z-axis intrudes the interference area with the Y-axis slide cover. The interference range with the Y-axis slide cover at the negative limit of the Z-axis is shown in the figure. Move the table in the positive direction of the Z-axis out of the range before indexing the table.

The interference range with the maximum φ2,400mm workpiece is 538mm.
The interference range for a pallet swing of φ1,600mm is 138mm.

<Important 2>
It is possible to move the Z-axis the full travel amount (1,850 mm) only when the B-axis is at 0°, 90° or 270°.
If the B-axis is at an angle other than 0°, 90° or 270°, the rotation range interference check function of FANUC works in order to secure the clearance between the pallet and XY slide cover, and the Z-axis travel amount and B-axis rotation angle are restrained.

For example, the Z-axis travel amount is restrained to 1,787 mm automatically in order to prevent interference between the pallet hook and the XY slide cover when the B-axis is at 180°.

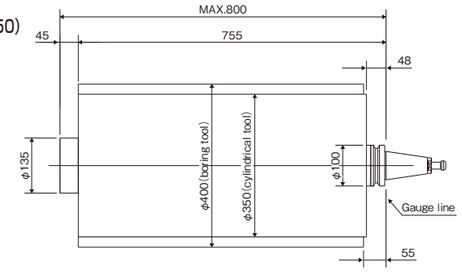
For gear spindles (standard)



<Useful tips>
- When you are indexing the pallet at a 45° direction, pay attention to the maximum workpiece swing in the pallet dimension drawing.
- When you are indexing on a side without a guide block, the interference area gets smaller in proportion to the size of guide block.

Applicable range of tool holder size/weight (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 φ100, the 48mm range from the gauge line must be φ100 in the outside diameter. The 55mm range from the gauge line must be within φ210 in the outside diameter. The total mass must be within 35kg and the length from the gauge line must be within 800mm.

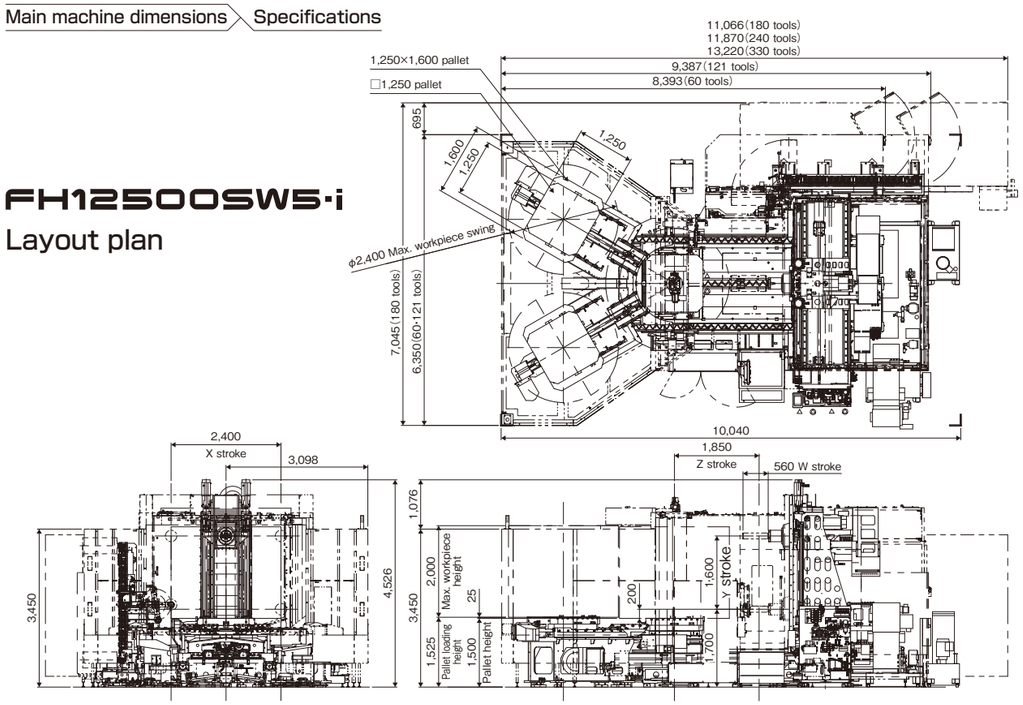


Item	Max. spec
Tool length	800mm
Tool diameter	With 60 tools magazine: φ120mm(with no limitations caused by adjacent tools) With 121 tools magazine: φ130mm(with no limitations caused by adjacent tools) With 180, 240 and 330 tools magazines: φ110mm(with no limitations caused by adjacent tools)
Tool weight	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 grood position of the tool holder and so on.

FH12500SW5-i

Layout plan



Interference area

<Important 1>
The table indexing motion at the negative limit of the Z-axis intrudes the interference area with the Y-axis slide cover. The interference range with the Y-axis slide cover at the negative limit of the Z-axis is shown in the figure. Move the table in the positive direction of the Z-axis out of the range before indexing the table.

The interference range with the maximum φ2,400mm workpiece is 538mm.
The interference range for a pallet swing of φ1,600mm is 138mm.

<Important 2>
It is possible to move the Z-axis the full travel amount (1,850 mm) only when the B-axis is at 0°, 90° or 270°. If the B-axis is at an angle other than 0°, 90° or 270°, the rotation range interference check function of FANUC works in order to secure the clearance between the pallet and XY slide cover, and the Z-axis travel amount and B-axis rotation angle are restrained.

For example, the Z-axis travel amount is restrained to 1,787 mm automatically in order to prevent interference between the pallet hook and the XY slide cover when the B-axis is at 180°.

<Useful tips>
- When you are indexing the pallet at a 45° direction, pay attention to the maximum workpiece swing in the pallet dimension drawing.
- When you are indexing on a side without a guide block, the interference area gets smaller in proportion to the size of guide block.

Applicable range of tool holder size/weight

(JIS･CAT･DIN BT No.50)

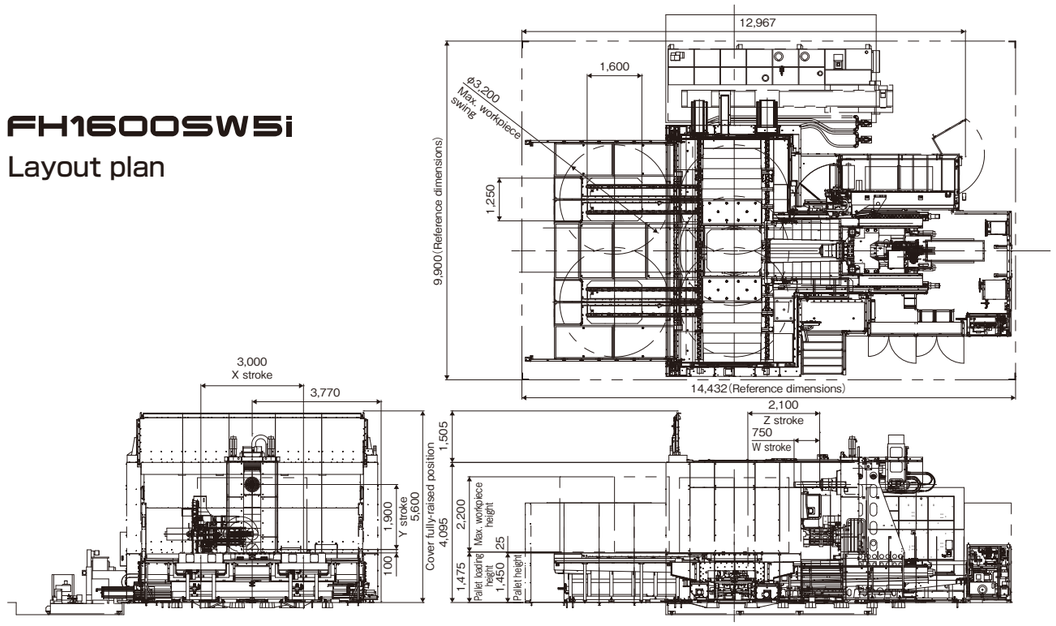
The tool holder is subject to limitations in the shape during ATC(automatic tool change). If the maximum tool diameter exceeds φ100, the 48mm range from the gauge line must be φ100 in the outside diameter. The 55mm range from the gauge line must be within φ210 in the outside diameter. The total mass 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: φ120mm (with no limitations caused by adjacent tools) With 121 tools magazine: φ130mm (with no limitations caused by adjacent tools) With 180, 240 and 330 tools magazines: φ110mm (with no limitations caused by adjacent tools)
Tool weight	35kg: The moment at the spindle nose must be within 29N･m.
Tool imbalance	30×10⁻⁶N･m or less

Tools with diameters exceeding those described above are subject to limitations in the diameter of adjacent tools in the magazine, key grood position of the tool holder and so on.
Refer to the tool charts for spindle rotation speed according to the quill position and the tool shape.

FH1600SW5i

Layout plan



Interference area

Applicable range of tool holder size/weight

(MAS,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 φ100, the 48mm range from the gauge line must be φ100 in the outside diameter. The 68mm range from the gauge line must be within φ290 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 120 tools magazine: φ125mm (with no limitations caused by adjacent tools)
Tool weight	35kg: The moment at the spindle nose must be within 29N･m. Only 10 special chain sockets are compatible with 50 N･m
Tool imbalance	30×10⁻⁶N･m or less

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