

TOYODA

FH SERIES

Horizontal Spindle Machining Centers

FH550S
FH550SX

JTEKT

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

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Type of Machinery: Machining Center
Model Number: FH550S, FH550SX

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JTEKT CORPORATION

JTEKT
Koyo TOYODA



Best value for the Customer By focusing on the starting point, we aim for the summit

A solid line-up covering all types of manufacturing.

FH550S

Basic model applicable to a wide-range of purposes

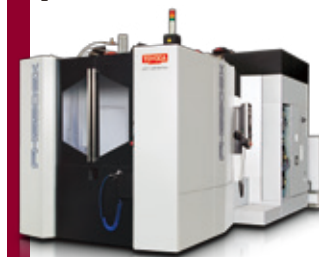


| FH550S | |
|---------------------|----------------|
| Pallet size | mm □550(□500) |
| Stroke(X×Y×Z) | mm 750×800×850 |
| Max. workpiece size | mm φ850×1,000 |
| Pallet load | kg 800 |

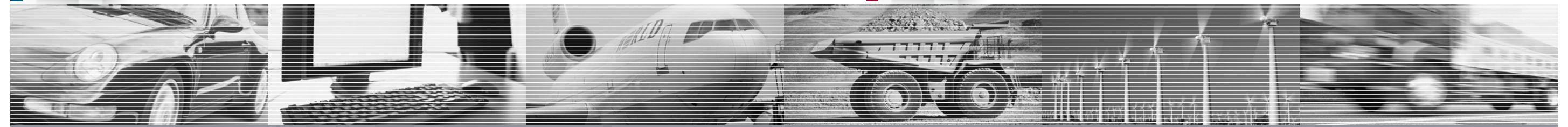
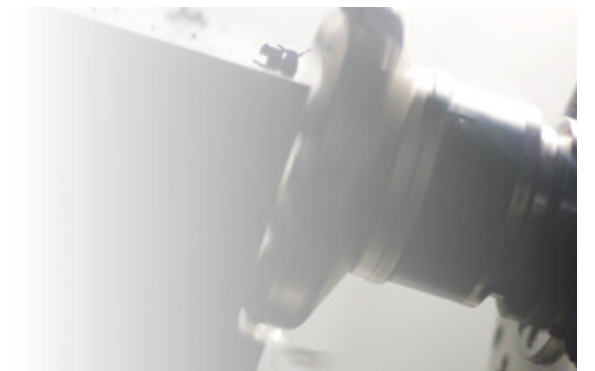


FH550SX

Premium model boasting the best cutting performance in it's class



| FH550SX | |
|---------------------|----------------|
| Pallet size | mm □550(□500) |
| Stroke(X×Y×Z) | mm 750×800×850 |
| Max. workpiece size | mm φ850×1,000 |
| Pallet load | kg 800 |



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Performance a step above the rest
A utility machine suitable for all
manufacturing requirements

FH550S

Basic model applicable to a wide-range of purposes

X-/Y-/Z-axis rapid feed rate **[60m/min]**

X-/Y-/Z-axis rapid acceleration **[1.0G]**

Tool change time (C-C) **[2.7S]**
BT No.40

Table indexing time(90°) **[2.0S]**

Table indexing time(90°) **[0.7S]**
Optional DD table

Spindle startup time **[1.0S]**
BT No. 40 15,000min⁻¹ spindle (0 to 10,000min⁻¹)

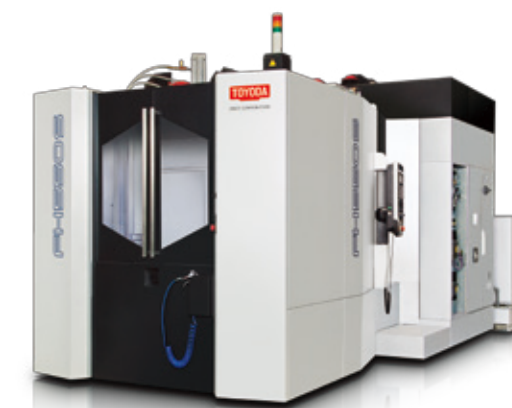
3-point support bed

Z-axis dual ball screw drive

Cylindrical roller slide

Completely open center trough

Field Bus



| FH550S | | |
|---------------------|----|-------------|
| Pallet size | mm | □550(□500) |
| Stroke(X×Y×Z) | mm | 750×800×850 |
| Max. workpiece size | mm | φ850×1,000 |
| Pallet load | kg | 800 |

Photo features equipment with optional specifications.

Features **FH550S**

4 spindle types selected according to machining operation

- [BT No.40 15,000min⁻¹] Ideal for the mass production of aluminum and castings Standard
- [BT No.40 8,000min⁻¹] Ideal for the efficient production of castings
- [HSK A63 20,000min⁻¹] Ideal for form cutting
- [BT No.50 15,000min⁻¹] Ideal for the production of various materials ranging from aluminum to iron



Advanced performance with ultimate speed

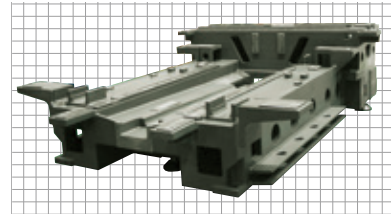
- [Rapid feed rate] 60m/min (X, Y and Z-axes)
- [Table indexing time] 2.0s/90°
- [Rapid acceleration] 9.8m/s² (1G) (X, Y and Z-axes)
- [Table indexing time] 0.7s/90° (Optional DD table)
- [Tool change time (chip-to-chip)] 2.7s (BT No.40)
- [Pallet change time] 9.5s



A rigid platform helping to achieve the best possible performance

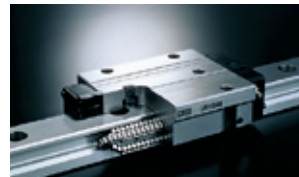
High grade cast iron 3-point support bed

Large parts such as the bed and column are cast in our foundry so that quality high grade cast iron can be obtained. In addition, latest structure analysis technologies are added to achieve both rigidity and light-weight objectives, supporting the fastest speed performance and the highest cutting performance in its class.



Rigid cylindrical roller slide

The cylindrical roller slide is an ideal slide method incorporating both the rigidity of the angular slide and the speed offered by the linear guide. Compared with the ball guide, rigidity is double and improved damping capacity reduces vibration to 1/3, thus rigidity is assured. In addition, the preloading feature eliminates the gap factor found in friction slides.

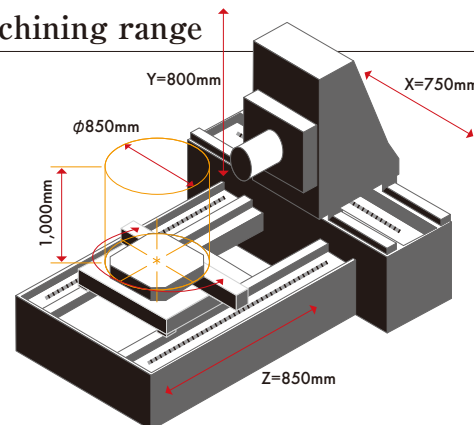


Dual ball screw drive

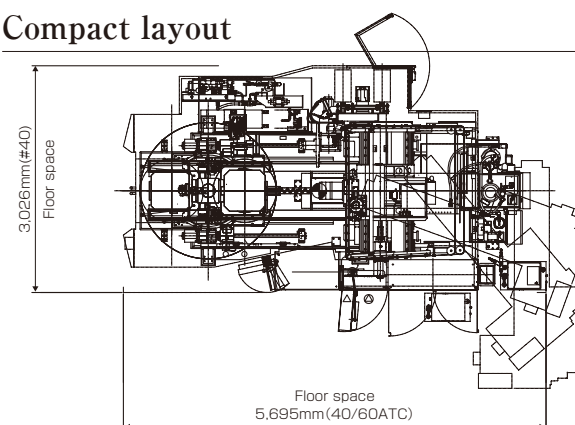
A dual ball screw drive is adopted to drive the heavy Z-axis table. This structure has the ball screw located outside the machining chamber with an ideal chip-discharging center trough. Furthermore, the driving force is distributed to two shafts while motor size is reduced, thus providing an effective means for heat reduction.



Wide machining range



Compact layout



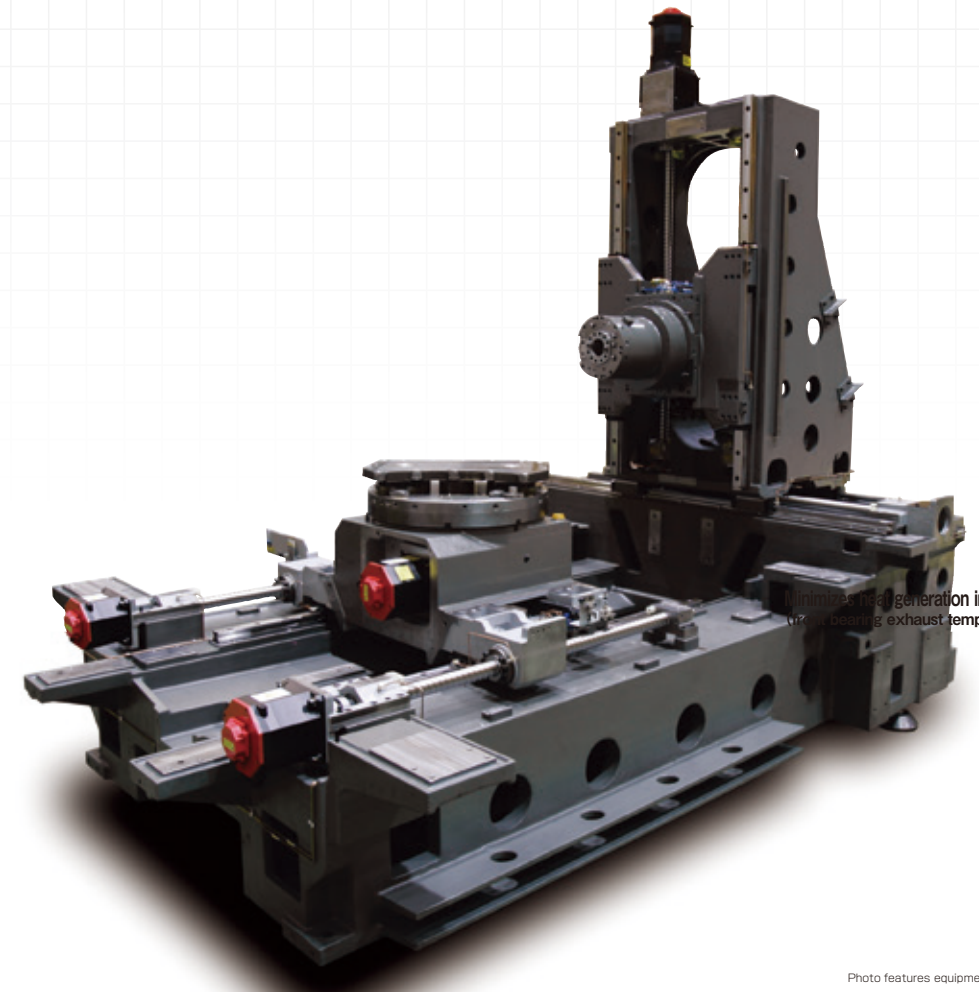
FH550S



Front view



Side view



Minimum noise generation in the high speed ranges (with cooling exhaust temperature)

Photo features equipment with optional specifications.

Its rigidity has set a new benchmark
for machining centers.

A premium model with condensed
high performance in a compact body

FH550SX

Premium model boasting the best cutting performance in its class

X-/Y-/Z-axis rapid feed rate **[60m/min]**

Rapid acceleration **[XY=0.7G Z=1.0G]**

Tool change time (C-C) **[3.6S]**

Table indexing time (90°) **[2.0S]**

Table indexing time (90°) **[0.7S]**
Optional DD table

6,000min⁻¹ spindle output **[30/22kW]**

6,000min⁻¹ spindle output **[37/30kW]**
Optional large torque spindle

3-point support bed

Y-/Z-axis dual ball screw drive

Cylindrical roller slide

Completely open center trough

Field Bus



| | | FH550SX |
|---------------------|----|-------------|
| Pallet size | mm | □550(□500) |
| Stroke (X×Y×Z) | mm | 750×800×850 |
| Max. workpiece size | mm | φ850×1,000 |
| Pallet load | kg | 800 |

Photo features equipment with optional specifications.

Features **FH550SX**

3 spindle types selected according to machining operation

- [BT No.50 6,000min⁻¹] Ideal for the heavy duty cutting of iron parts Standard
- [BT No.50 15,000min⁻¹] Offers high speed and torque, making it ideal for a wide variety of products (530N·m Large torque)
- [BT No.50 6,000min⁻¹] Ideal for heavy duty cutting at low speeds with large diameter cutters (1,009N·m high torque)



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

Face milling 1,250cc/min¹

- [Workpiece material] S48C
- [Tool] ϕ 160 face mill
- [Spindle speed] 400min⁻¹
- [Feed rate] 1,600mm/min
- [Depth of cut/width] 6/130mm



Side face end milling 740cc/min¹

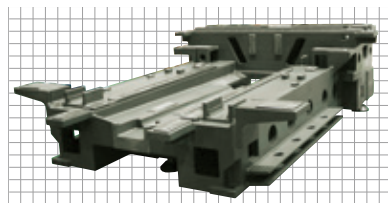
- [Workpiece material] S48C
- [Tool] ϕ 50 roughing end mill
- [Spindle speed] 1,020min⁻¹
- [Feed rate] 1,224mm/min
- [Depth of cut/width] 40/15mm



A rigid platform helping to achieve the best possible performance

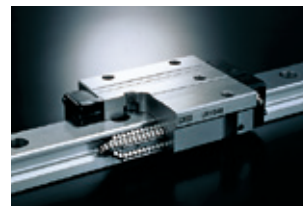
High grade cast iron 3-point support bed

Large parts such as the bed and column are cast in our foundry so that quality high grade cast iron can be obtained. In addition, latest structure analysis technologies are added to achieve both rigidity and light-weight objectives, supporting the fastest speed performance and the highest cutting performance in its class.



Rigid cylindrical roller slide

A rigid, long-type cylindrical roller slide is adopted for the Y-axis to meet the requirements of heavy duty cutting. This helps to substantially increase resistance against cutting forces.

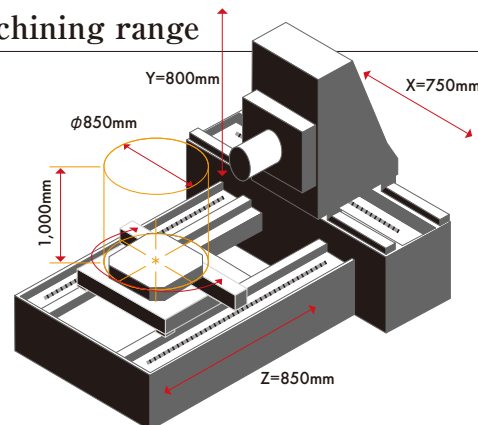


Dual ball screw drive

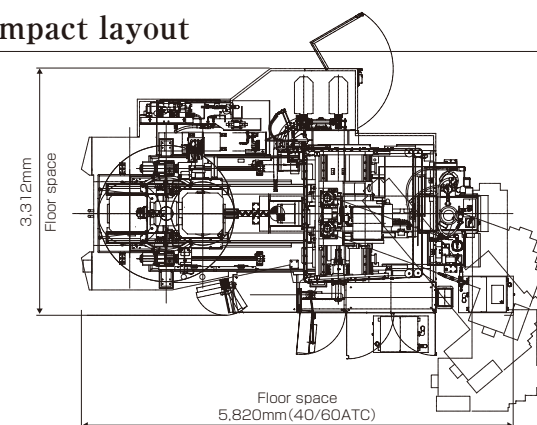
A dual ball screw drive is adopted for the Y-axis to suppress rolling and vibration in heavy duty cutting, thereby substantially improving cutting performance.



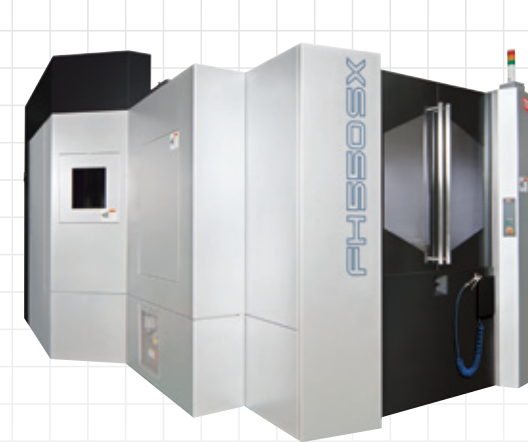
Wide machining range



Compact layout



FH550SX



Front view



Rear view

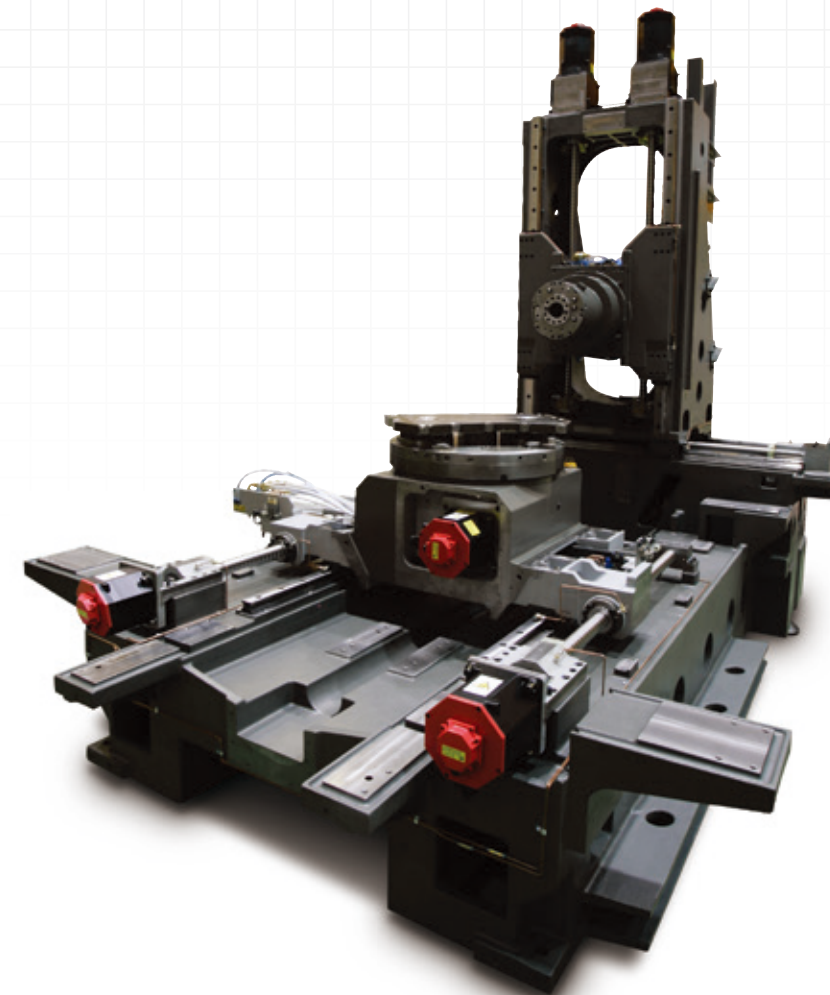
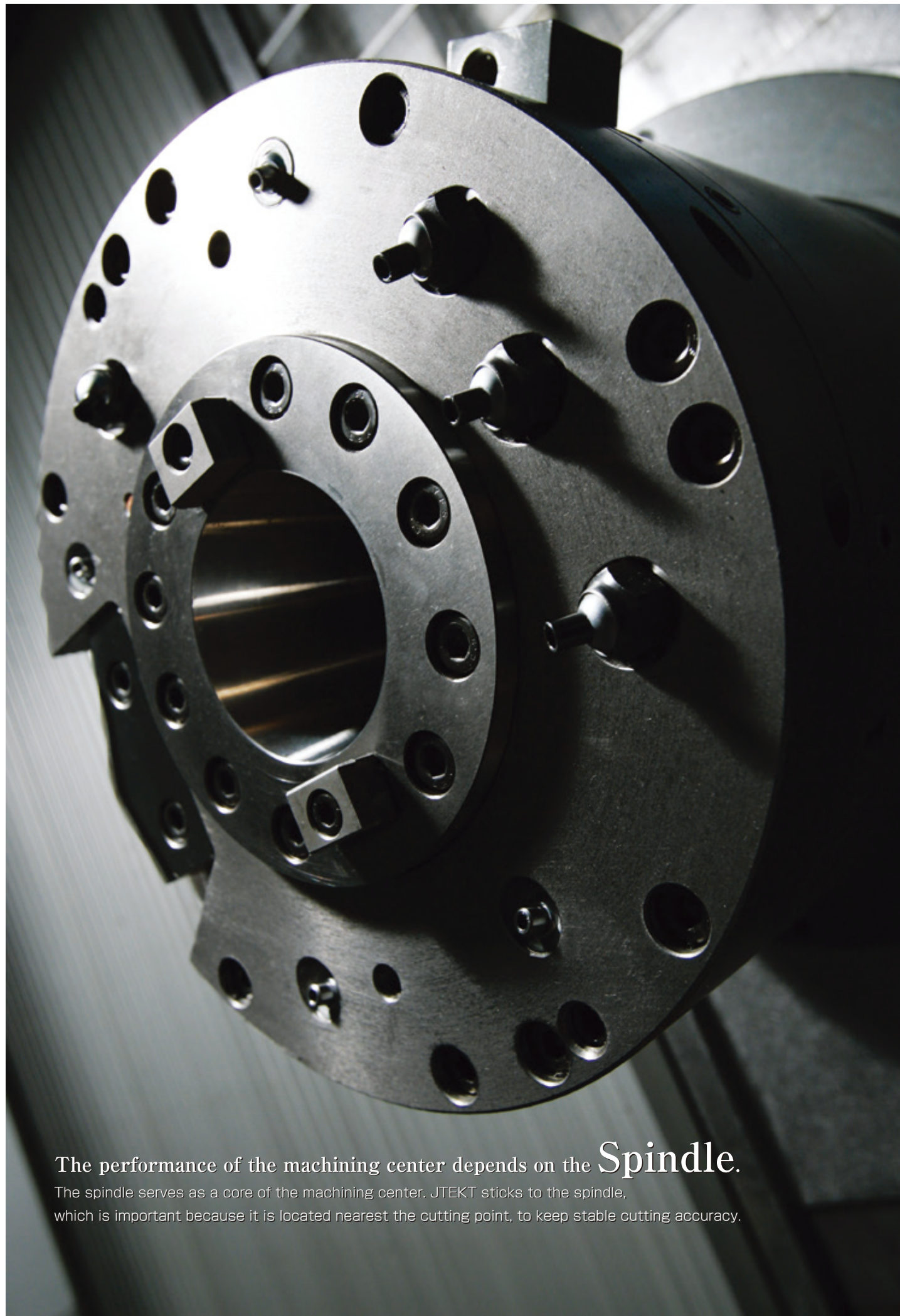


Photo features equipment with optional specifications.



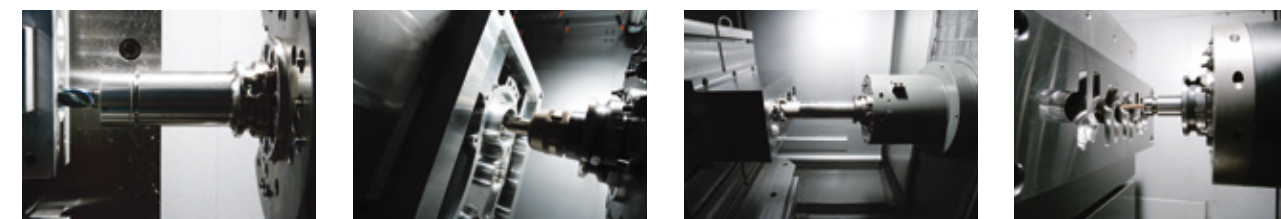
The spindle lineup fits all manufacturing needs ranging from high speed cutting to heavy duty cutting.

JTEKT's machining center realizes fast, rigid and stable cutting operation based on a fine balance between the spindle and the machine. Backed by experience of support of manufacture of the cutting line of mass production parts starting at automotive parts, we also take care of reduction of the spindle maintenance cost. The spindle lineup including seven variations starting at the rigid spindle manufactured under long-period aging tests and rigidity analyses will surely impress you.

Selection from seven spindle variations according to cutting operation

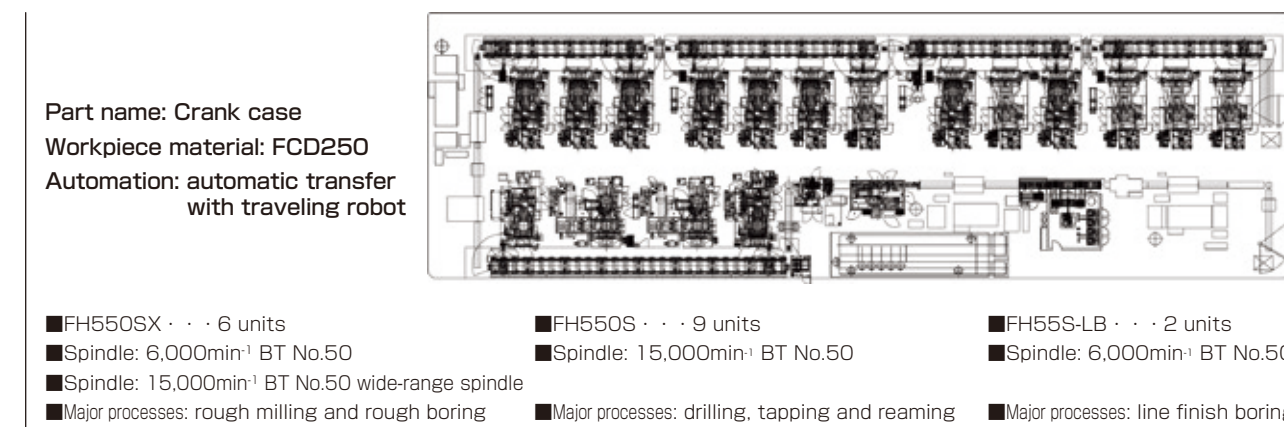
| Application | Spindle speed | Spindle nose shape | Spindle motor (short-time/continuous) | Spindle diameter (front bearing bore) | Max. torque | Acceleration time | Deceleration time | Applicable models |
|--|--|--------------------|---------------------------------------|---------------------------------------|-------------|---------------------------------|---------------------------------|-------------------|
| Best for form cutting such as shaving | 20,000min ⁻¹ | HSK A63 | 22/18.5kW | φ70mm | 117.8N·m | 2.4sec | 3.0sec | FH550S |
| Best for mass production of products ranging from aluminum to castings | 15,000min ⁻¹ | BT No.40 HSK A63 | 22/18.5kW | φ80mm | 166.7N·m | 1.0sec* ^{#1} 1.9sec | 1.7sec* ^{#2} 2.3sec | FH550S |
| Best for high-efficiency cutting of cast parts | 8,000min ⁻¹ | BT No.40 HSK A63 | 17.7/15kW | φ80mm | 165.5N·m | 1.9sec | 2.8sec | FH550S |
| Best for a wide variety of products ranging from aluminum to iron | 15,000min ⁻¹ | BT No.50 HSK A100 | 22/18.5kW | φ90mm | 166.7N·m | 1.4sec* ^{#1} 2.6sec | 1.9sec* ^{#2} 3.2sec | FH550S |
| Best for a wide variety of products with high speeds and large torques | 15,000min ⁻¹ (Large torque) | BT No.50 HSK A100 | 37/30kW | φ120mm | 530N·m | 2.9sec* ^{#1} 5.3sec | 3.3sec* ^{#2} 7.2sec | FH550SX |
| Best for heavy duty cutting of iron parts | 6,000min ⁻¹ | BT No.50 HSK A100 | 30/22kW | φ110mm | 600N·m | 1.9sec | 2.9sec | FH550SX |
| Best for heavy duty cutting at low speeds with large diameter cutters | 6,000min ⁻¹ (Large torque) | BT No.50 HSK A100 | 37/30kW | φ110mm | 1,009N·m | 2.0sec | 2.9sec | FH550SX |

*1: Acceleration time to 10,000min⁻¹ *2: Deceleration time from 10,000min⁻¹



The best production line can be configured with the machine and spindle selected according to the cutting processes.

From rough cutting to finish cutting, realized with three types machining centers and three spindle types.



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.

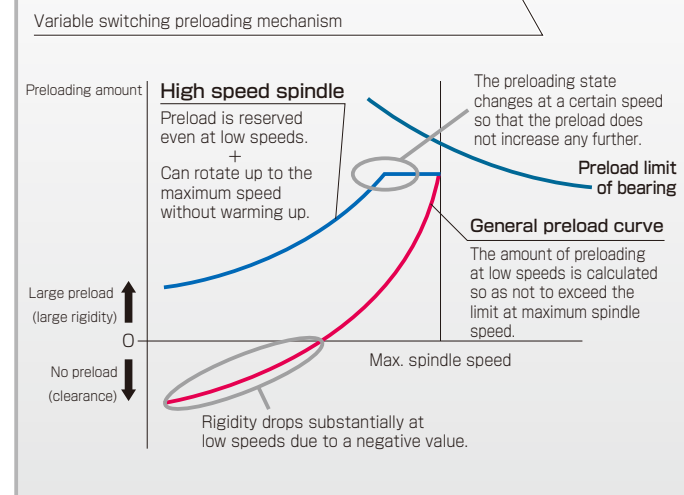
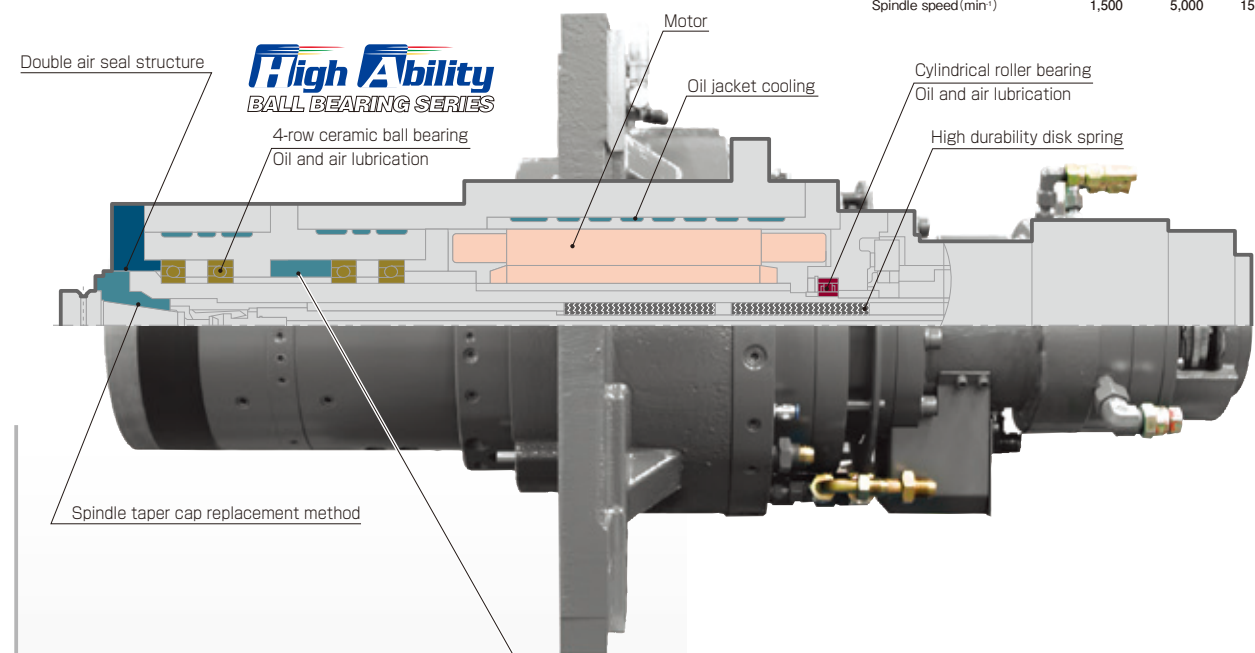
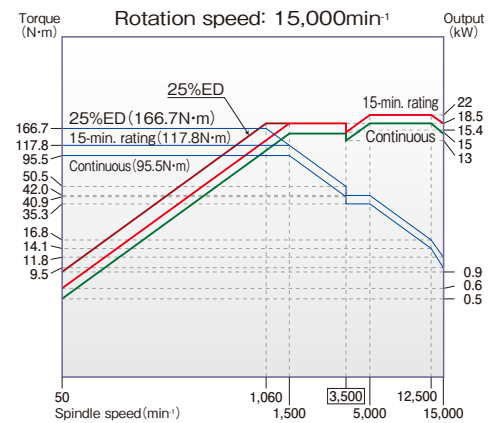
Each and every spindle is backed by its own specific type of outstanding technology.

High speed spindle

boasting superior rigidity and rotation accuracy in all zones ranging from low to high speeds **FH550S**

- [Spindle speed] 15,000min⁻¹
- [Spindle nose shape] BT No.40
- [Spindle motor (short-time/continuous)] 22/18.5kW
- [Max. torque] 166.7N·m
- [Spindle diameter (front bearing bore)] φ80mm

A high speed spindle covering all areas from the low speed cutting of cast irons to the high speed precision cutting of aluminum. A JTEKT-manufactured ceramic ball bearing suitable for high speed rotation is used to substantially reduce friction heat generation inside the bearing rotating at a high speed. An original variable changing preloading mechanism which keeps the spindle bearing preload at the optimum level suppresses heat generation and extends the service life.



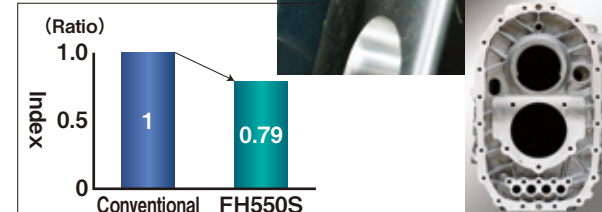
High-efficiency cutting with high speed spindle

■ Transmission case

[Workpiece material] ADC12

[Model FH550S]
15,000min⁻¹
HSK A63 spindle

Cutting time

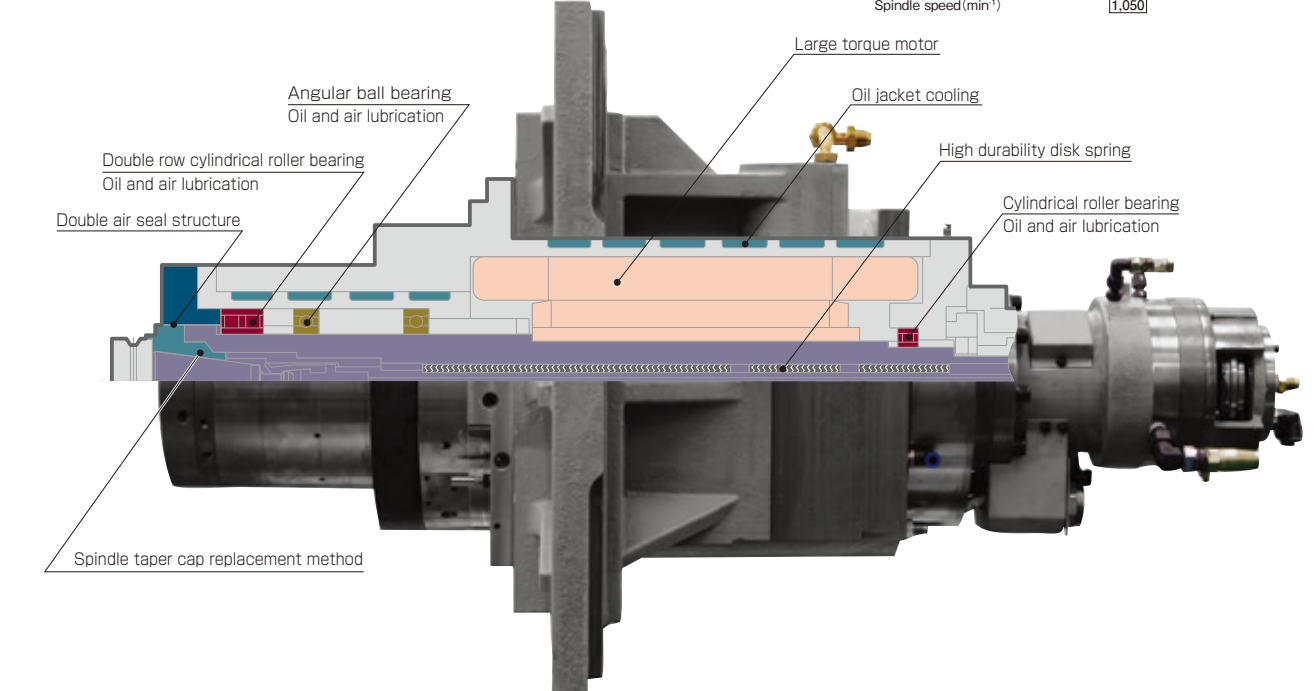
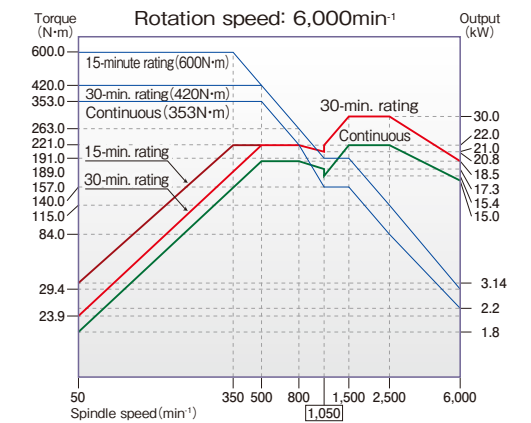


Standard spindle optimum for machining of iron and cast metals

FH550SX

- [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

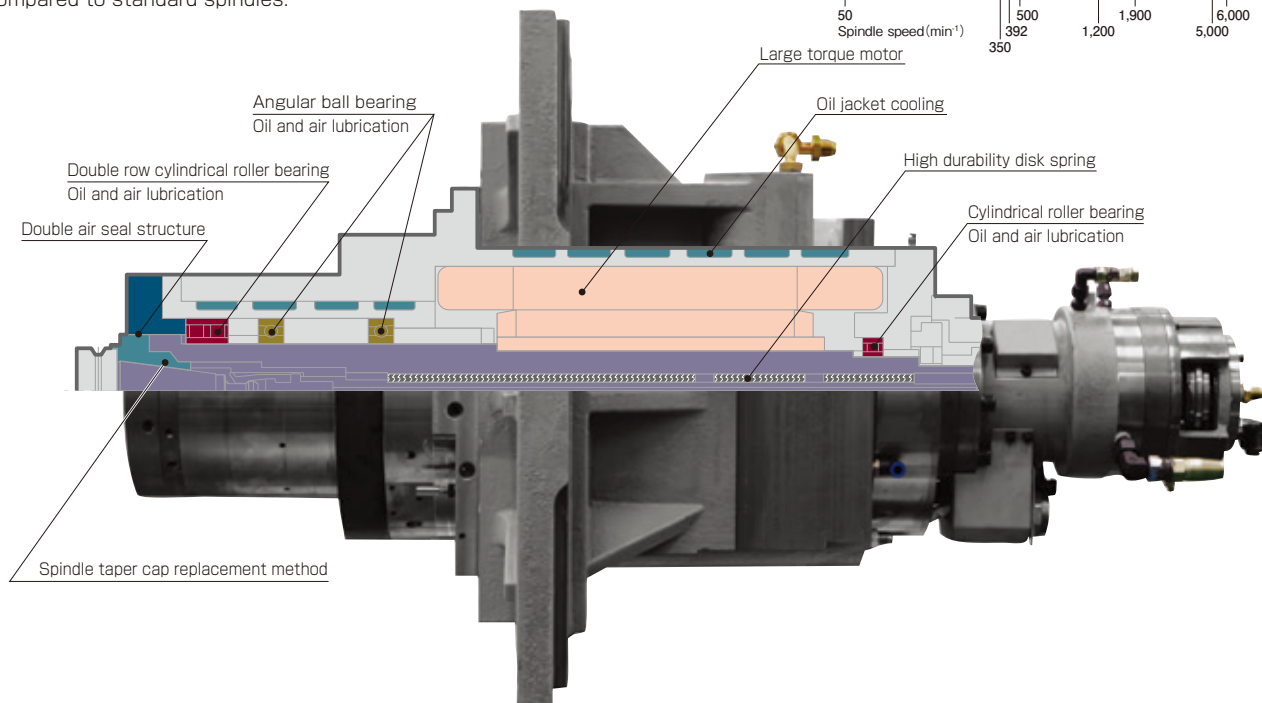
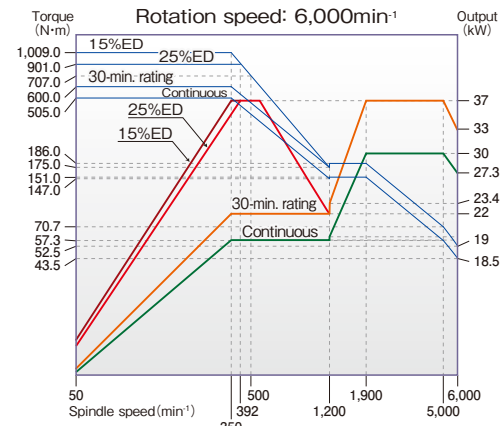
Milling
[Tool] φ125 face mill
[Spindle speed] 640min⁻¹
[Cutting feed rate] 1,400mm/min



Large torque 6,000min⁻¹ spindle achieving the best performance in its class Option FH550SX

[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. This machine has a high-torque spindle of 1,009 Nm, with double the cutting ability in low speed ranges (under 500 min⁻¹) compared to standard spindles.

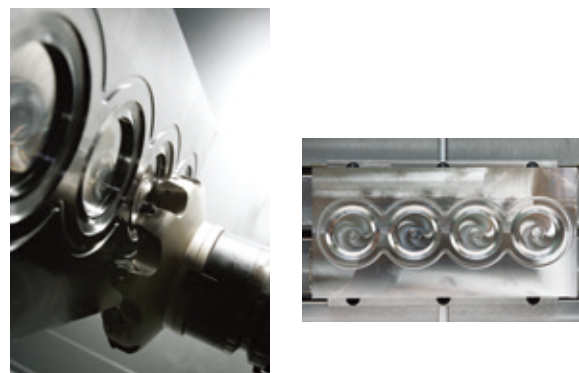
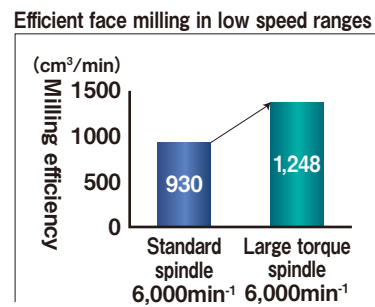


Best cutting performance in its class with a 1,009N·m large torque spindle

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

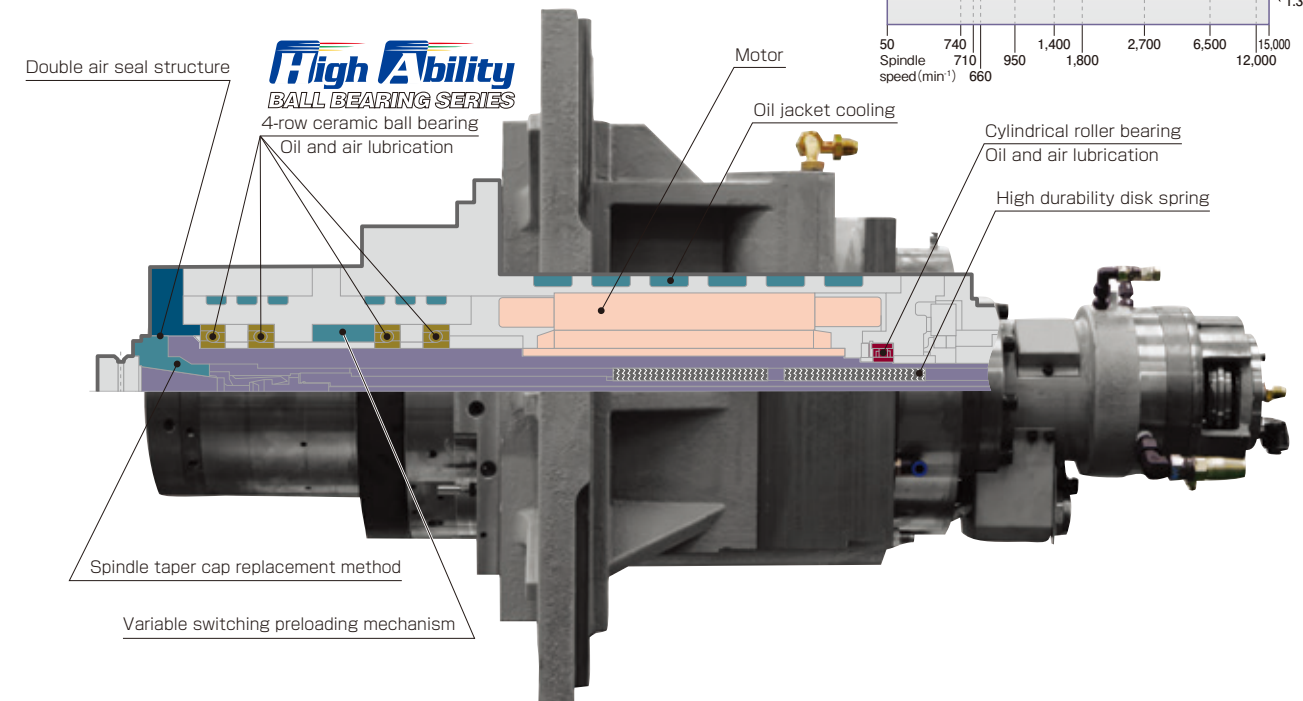
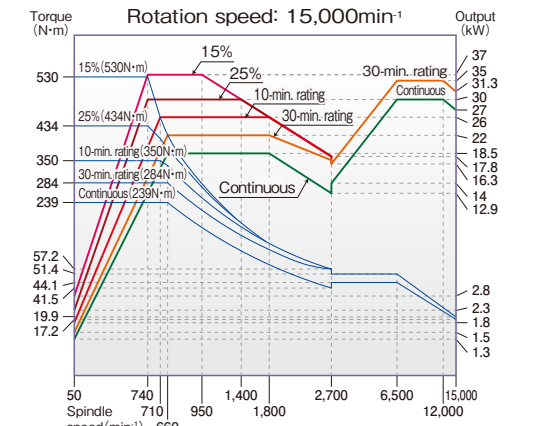
Bore hole machining
 [Tool] φ92 Boring
 [Spindle speed] 500min⁻¹
 [Feed rate] 200mm/min



Large torque 15,000min⁻¹ spindle Multi-use spindle that achieves 530N·m in low speed ranges, even with a high-speed spindle Option FH550SX

[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

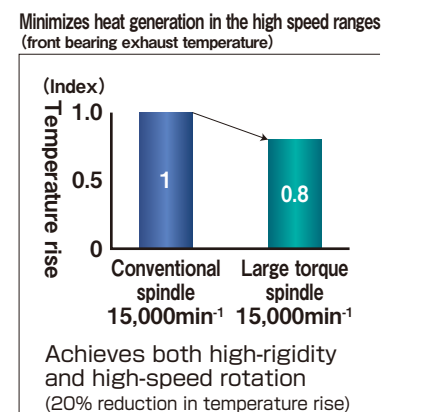
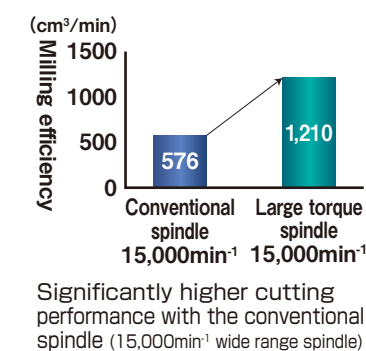
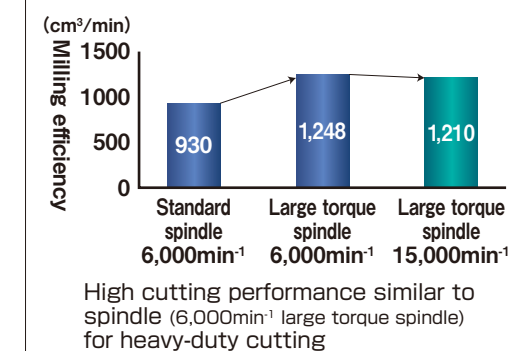
This is a multi-use type spindle that boasts high rigidity and rotational accuracy, enabling the machining of a wide range of workpieces, from the slow cutting of steel to the fast cutting of aluminum. This spindle utilizes a newly developed preloading adjustment mechanism that stabilizes high torque 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 ■ Milling [Tool] φ125 face mill [Spindle speed] 800min⁻¹
 [Workpiece material] S45C [Feed rate] 2,688mm/min [Depth of cut/width] 4.5/100mm

Efficient face milling in low speed ranges



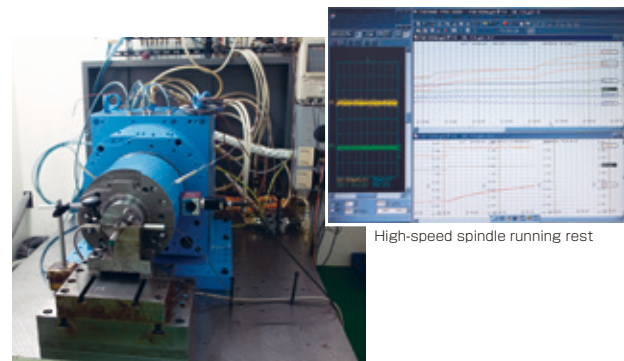
JTEKT's spindle promises assurance over a long period and takes maintenance into consideration.

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

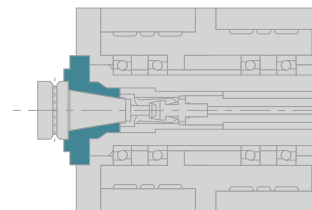
Basic design particularly focusing on low vibration.

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

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

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

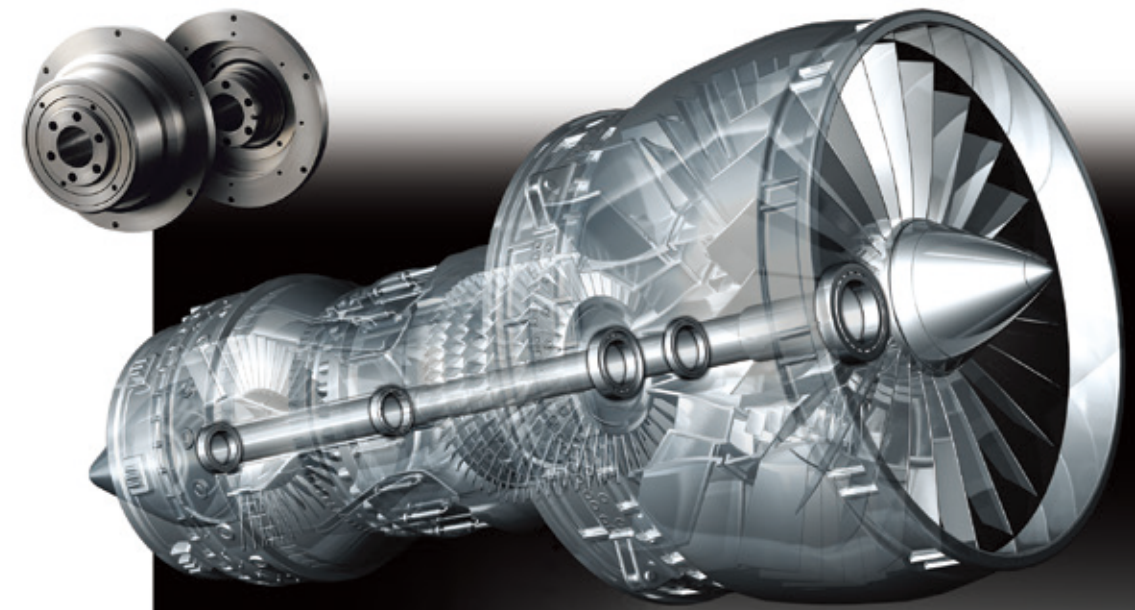
Even in the rare chance that a failure does occur, a replacement spindle cartridge that has been checked at JTEKT for operation and quality can be installed in its place, keeping restoration time down to a minimum. Furthermore, the separate spindle taper makes individual cap replacement possible as it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



*Not a guaranteed value

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

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



High Ability
BALL BEARING SERIES

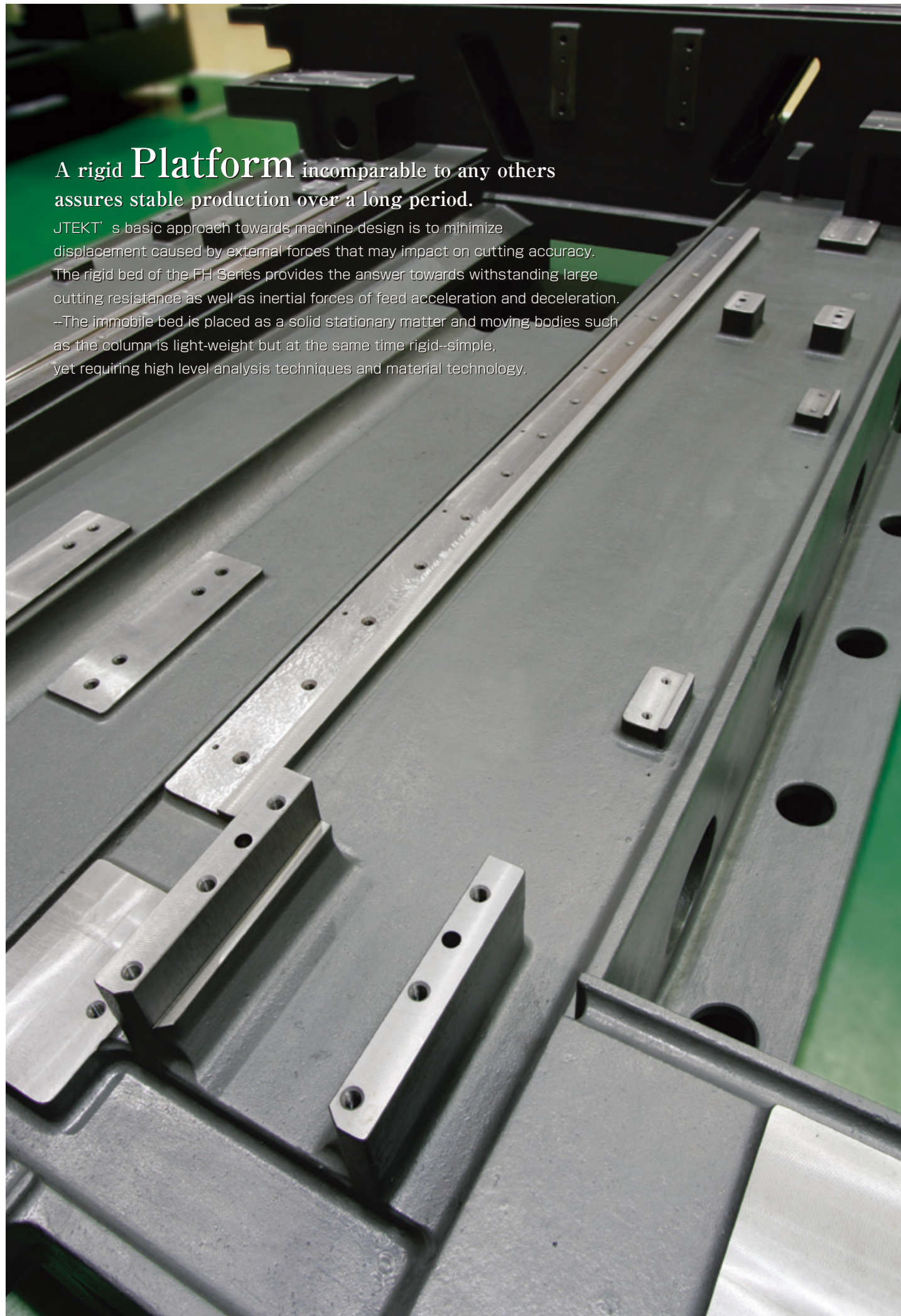
High speed limit performance - 1.5 fold
Temperature increase - 30% reduction

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

The High Ability bearing is adopted in the 15,000min⁻¹ BT No. 40 spindle and 15,000min⁻¹ BT No. 50 Large torque spindle.

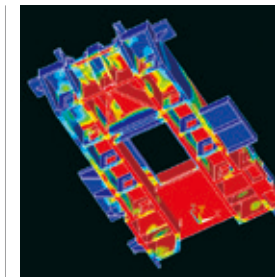
A rigid Platform incomparable to any others assures stable production over a long period.

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.



Unrivalled rigid platform allowing the spindle to achieve its full performance High grade cast iron 3-point support bed keeping machine level stable over a long period

Because the bed supporting the moving body is designed with FEM analysis technology, it has sufficient rigidity. It also has a 3-point support structure which provides for easy level adjustments. All of these features result in stable machining accuracy despite a change of foundations.



Bed strength is strictly monitored from the design stage. Force transmission and rigidity are simulated in the pursuit of a sturdy bed structure.

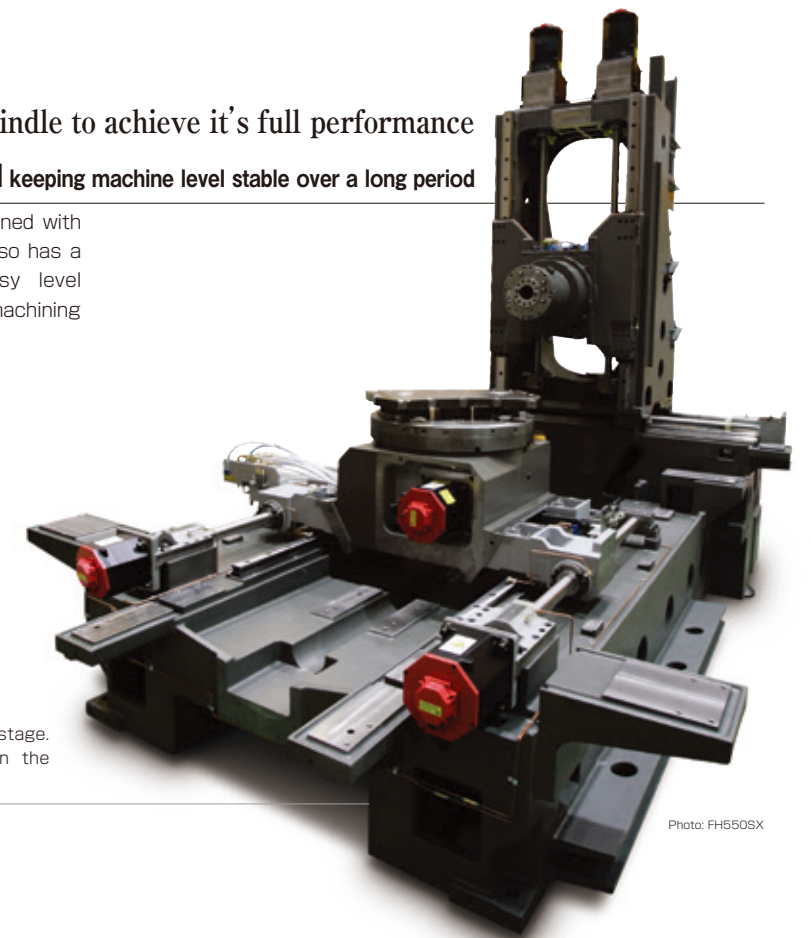
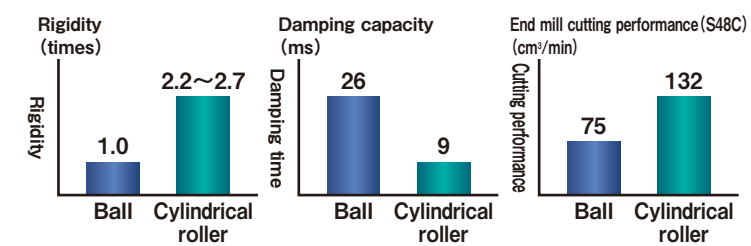
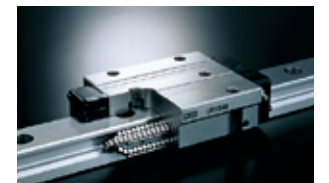


Photo: FH550SX

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

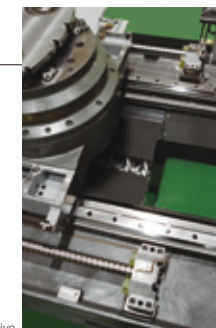
Compared to the ball guide, the cylindrical roller slide features less elastic deformation against loads and possesses superior vibration damping characteristics. This feature makes it possible to position quickly with smaller orientation changes upon sudden acceleration or stoppages, contributing to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



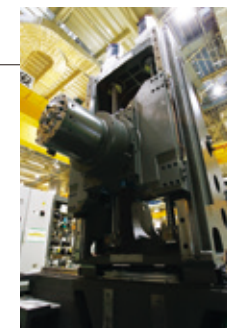
Because of JTEKT's assembling technology which allows for strict mounting face accuracies, the rigid cylindrical roller slide offers the best rapid feed rate and acceleration in its class.

Dual ball screw driving technology boasting a delivery record of 5,000 plus

JTEKT's dual ball screw drive technology is used in fields ranging from mass production parts cutting, which is represented by automotive parts, to high speed profile cutting such as molds. There are more than 5,000 cutting machines using the dual ball screw driving technology operating through-out the world.



Z-axis dual ball screw drive



Y-axis dual ball screw drive, adopted in FH550SX.



“Material”
as the starting point

Casting technology perfected over time

JTEKT (former Toyoda Machine Works) separated from Toyota Motor Corporation in 1941 and has operated independently since. The casting division was established at the time of company establishment and with the objective of supplying cast irons appropriate for the performance of superior machine tools. Casting technology, nurtured and enriched over the years since company establishment, is materialized in the manufacture of high grade machining centers.



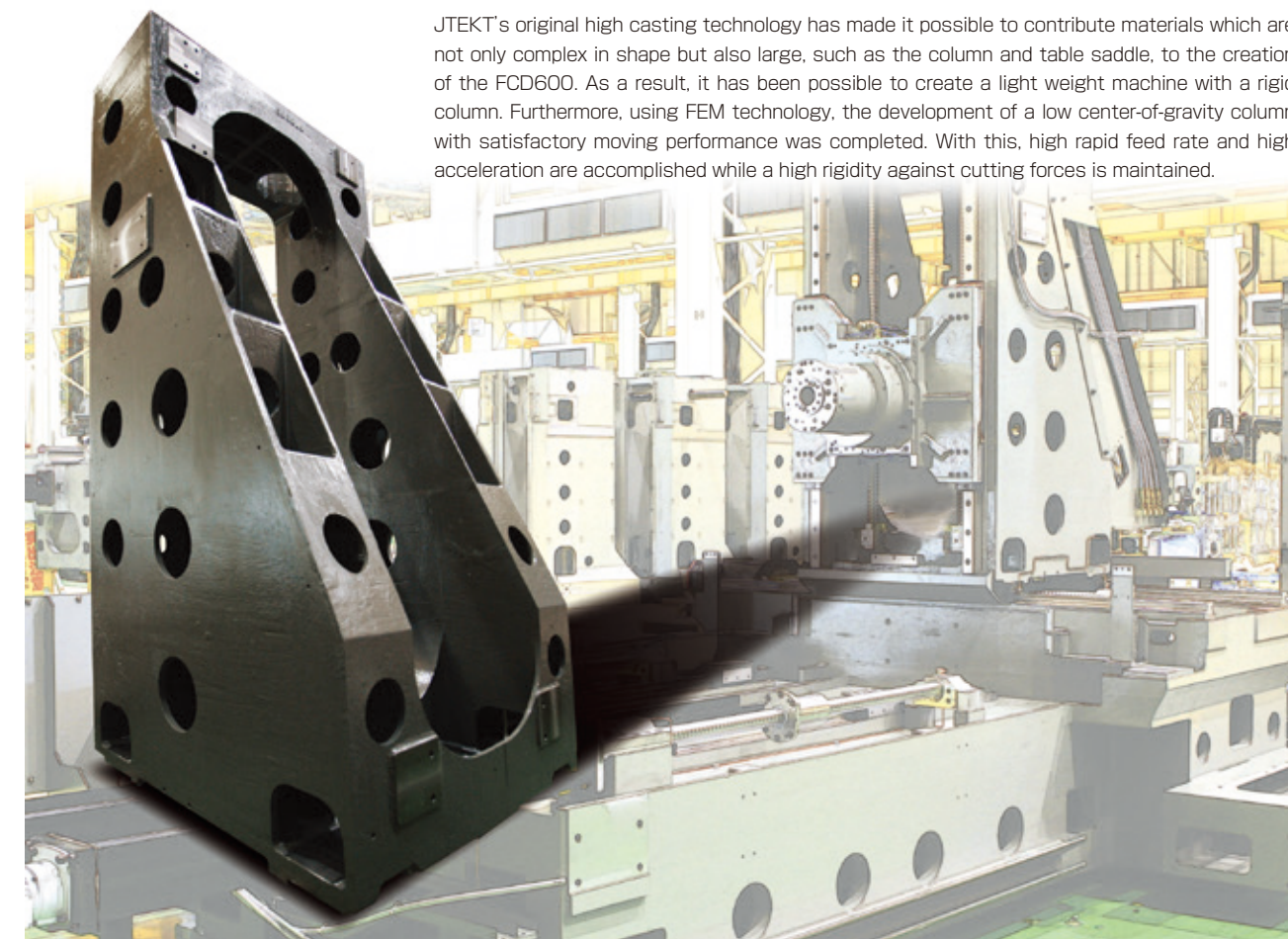
Okazaki plant



Kariya plant in 1952

Unrivaled rigid platform allowing the spindle to achieve its full performance

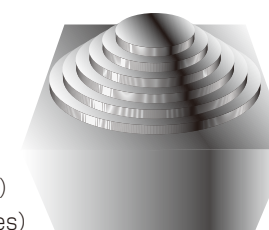
FCD600 column featuring both high speed performance and heavy duty cutting capabilities



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 and table saddle, 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.

Potential of the light-weight, low center-of-gravity column

- Circular cutting evaluation test[1]
[Workpiece material] Aluminum
[Cutting diameter] $\phi 40\text{mm}$, $\phi 50\text{mm}$, $\phi 60\text{mm}$, $\phi 70\text{mm}$, $\phi 80\text{mm}$, $\phi 90\text{mm}$
[Spindle speed] $15,000\text{min}^{-1}$
[Feed rate] $5,000\text{mm}/\text{min}$ (command value)
[Tool diameter] $\phi 10\text{mm}$ (square EN 4 blades)
[Model] FH550S $15,000\text{min}^{-1}$ BT No.40

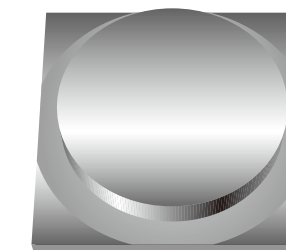


Because the weight of the moving body is reduced while rigidity is maintained, good follow-up performance of CNC commands is made possible. Observe the results of the circular cutting tests with various diameters. You will be convinced.

| Cutting diameter [mm] | $\phi 40$ | $\phi 50$ | $\phi 60$ | $\phi 70$ | $\phi 80$ | $\phi 90$ |
|-------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| Circularity [μm] | 5.5 | 4.3 | 4.7 | 3.9 | 3.7 | 3.7 |
| Actual feed rate [m/min] | 4.77 | 4.85 | 4.89 | 4.95 | 4.93 | 4.95 |

Not guaranteed.

- Circular cutting evaluation test[2]
[Workpiece material] Aluminum
[Cutting diameter] $\phi 100\text{mm}$
[Spindle speed] $6,700\text{min}^{-1}$
[Feed rate] $10,000\text{mm}/\text{min}$
[Tool diameter] $\phi 16\text{mm}$
[Model] FH550S $15,000\text{min}^{-1}$ BT No.40



[Circularity]
 $1.95\mu\text{m}$

Not guaranteed.

Highest speed potential in class while keeping rigidity

Rapid feed rate

| | X-axis | Y-axis | Z-axis |
|---------|---------|---------|---------|
| FH550S | 60m/min | 60m/min | 60m/min |
| FH550SX | 60m/min | 60m/min | 60m/min |



Rapid acceleration

| | X-axis | Y-axis | Z-axis | Pallet load |
|---------|--------|--------|--------|-------------|
| FH550S | 1.0G | 1.0G | 1.0G | 800kg |
| FH550SX | 0.7G | 0.7G | 1.0G | 800kg |

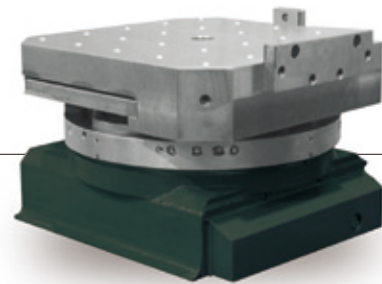
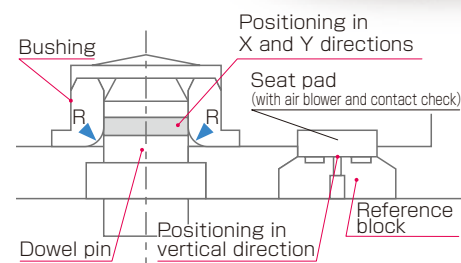


Table indexing time(90°indexing)

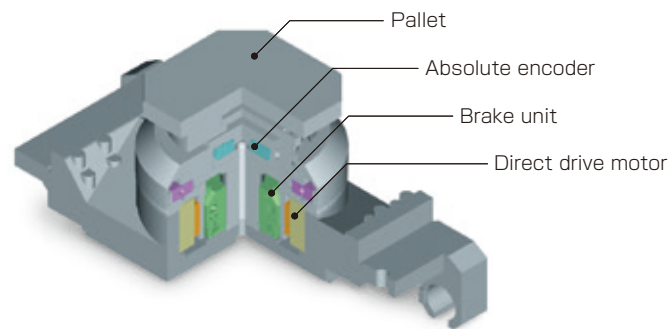
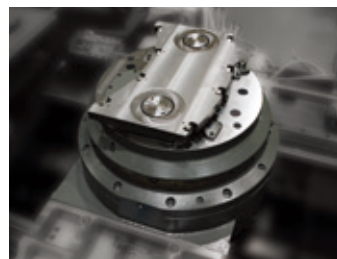
| | 1° | 0.001° Option | DD Option |
|---------|--------|----------------------|------------------|
| FH550S | 2.0sec | 2.0sec | 0.7sec |
| FH550SX | 2.0sec | 2.0sec | 0.7sec |

The six-face restriction pallet clamp method realized with two positioning pins and four seat pads not only realizes high positioning accuracy and large clamping rigidity but also blocks adherence of chips.



DD table

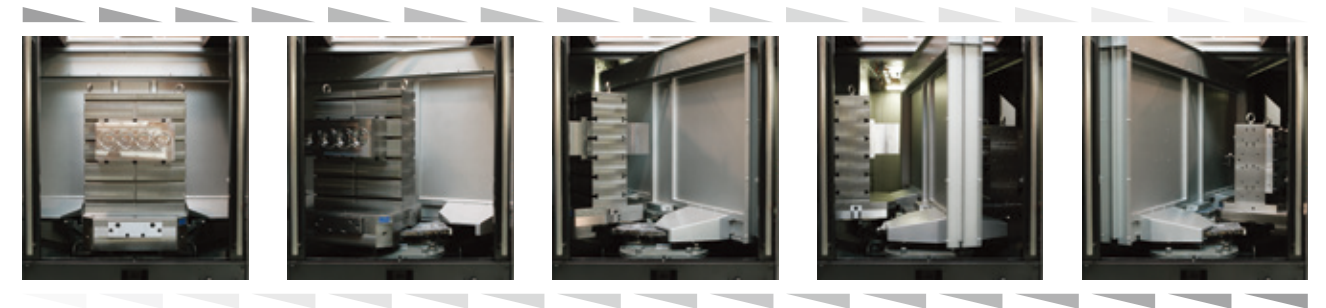
The direct drive(DD) table driven with a built-in large torque motor has realized fast indexing operation.



Option

Pallet change time

| | Pallet size | Max. workpiece swing | Max. workpiece height | Pallet change time |
|---------|-------------|----------------------|-----------------------|--------------------|
| FH550S | 550mm×550mm | φ850mm | 1,000mm | 9.5sec |
| FH550SX | 550mm×550mm | φ850mm | 1,000mm | 9.5sec |

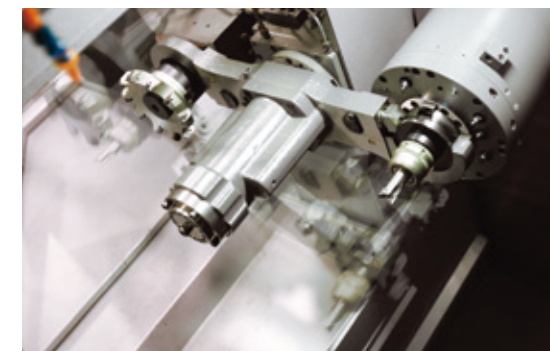


Tool change time

| | Tool change time(Tool-to-Tool) | Tool change time(Chip-to-Chip) | Max. tool mass |
|------------------|------------------------------------|------------------------------------|----------------|
| FH550S(BT No.40) | 1.6sec(~8kg) | 2.7sec(~8kg) | 8kg |
| FH550S(BT No.50) | 2.4sec(~15kg) 2.7sec(15kg~27kg) | 3.6sec(~15kg) 3.9sec(15kg~27kg) | 27kg |
| FH550SX | 2.4sec(~15kg) 2.7sec(15kg~27kg) | 3.6sec(~15kg) 3.9sec(15kg~27kg) | 27kg |



Tool storage capacity: 121. Model: FH550SX



Tool storage capacity: 60. Model: FH550SX

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.

3 approaches for achieving precision cutting

Suppress heat generation

- [15,000min⁻¹ spindle] Reduction of spindle temperature rise with a variable switching preloading mechanism*
- [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
- [Working oil cooling] **Option**
- [Coolant cooling] **Option**

Elimination of heat transmission

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

Heat effect control

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

* 15,000min⁻¹ BT No. 50 spindle is optional.

Manufacturing technology for realizing precision cutting



Table reference face sheet scraping

Accuracy machining of linear guide mounting face

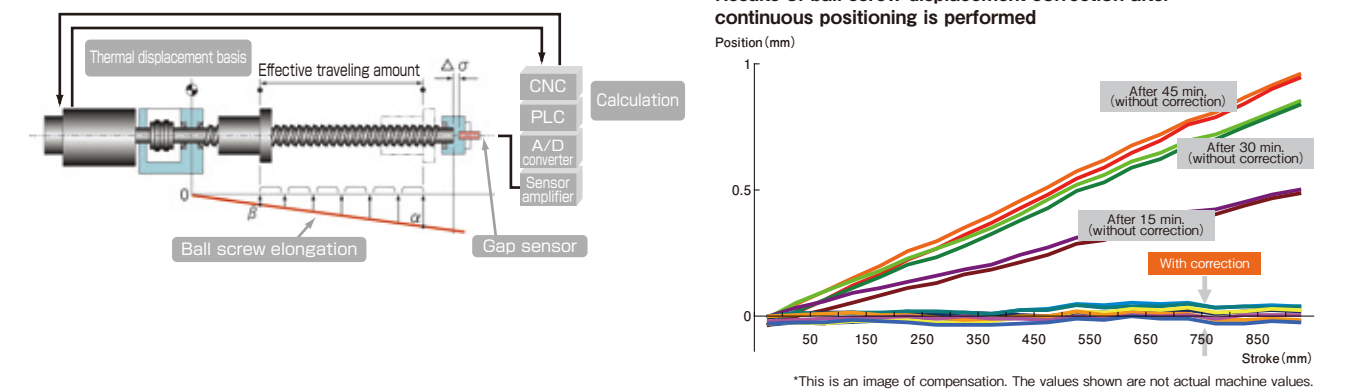
Spindle balancing

Precision assembling work

BTS (Ballscrew Thermo Stabilizer) function

Ball screw thermal displacement correction function stabilizing repetitive positioning accuracy

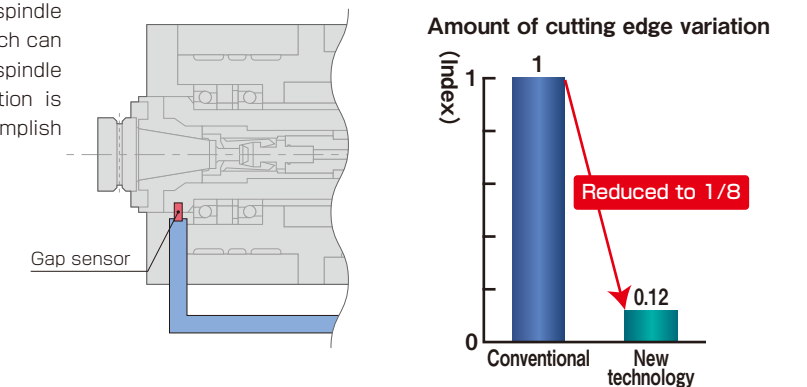
The BTS function is installed as a standard feature to stabilize the repetitive positioning accuracy in parts cutting. With the BTS function, the displacement sensor installed at the end of the ball screw measures the elongation of the entire screw, which is distributed into offsets for each stroke position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



Spindle thermo stabilizer function **Option**

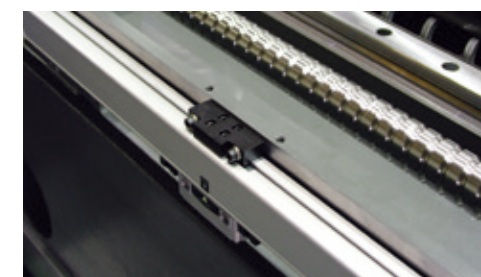
Spindle thermal displacement correction function used to correct spindle elongation formed after an extended period of operation

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



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

An optical scale makes lasting precision positioning possible.



Touch sensor function **Option**

The touch sensor is used to align the workpiece.





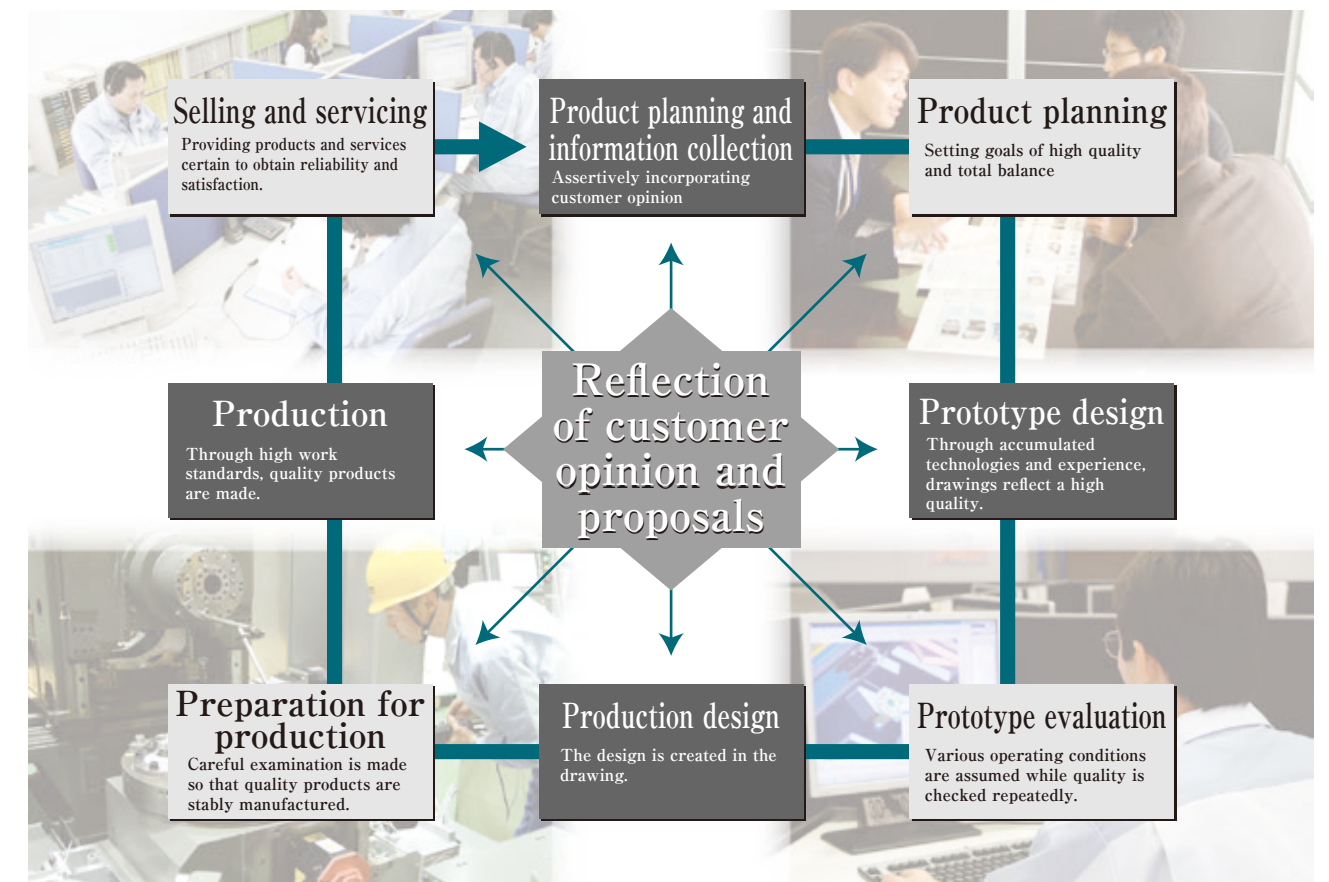
The pursuit of Reliability - one of JTEKT's starting points

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.



JTEKT don't take quality and performance as a given - we work for it.

When manufacturing a machine, JTEKT begin with understanding various customer needs and establishing a total control system, starting with a product design based on dedicated R&D activities through to a rigid quality control processes that ensure stable production.



JTEKT's leading edge technical development strength. This strength is supported by fundamental technologies ranging across various fields such as tripology, nano technology, material development and cutting technologies, heat treatment, control technology and much more.

Creating a feeling of assurance through the accumulation of material technology: Professionals majoring in material technology use cutting edge equipment to analyze and evaluate.

Research and development center in Kariya, Aichi Pref.



Material Technology Research Div., Research and Development Center



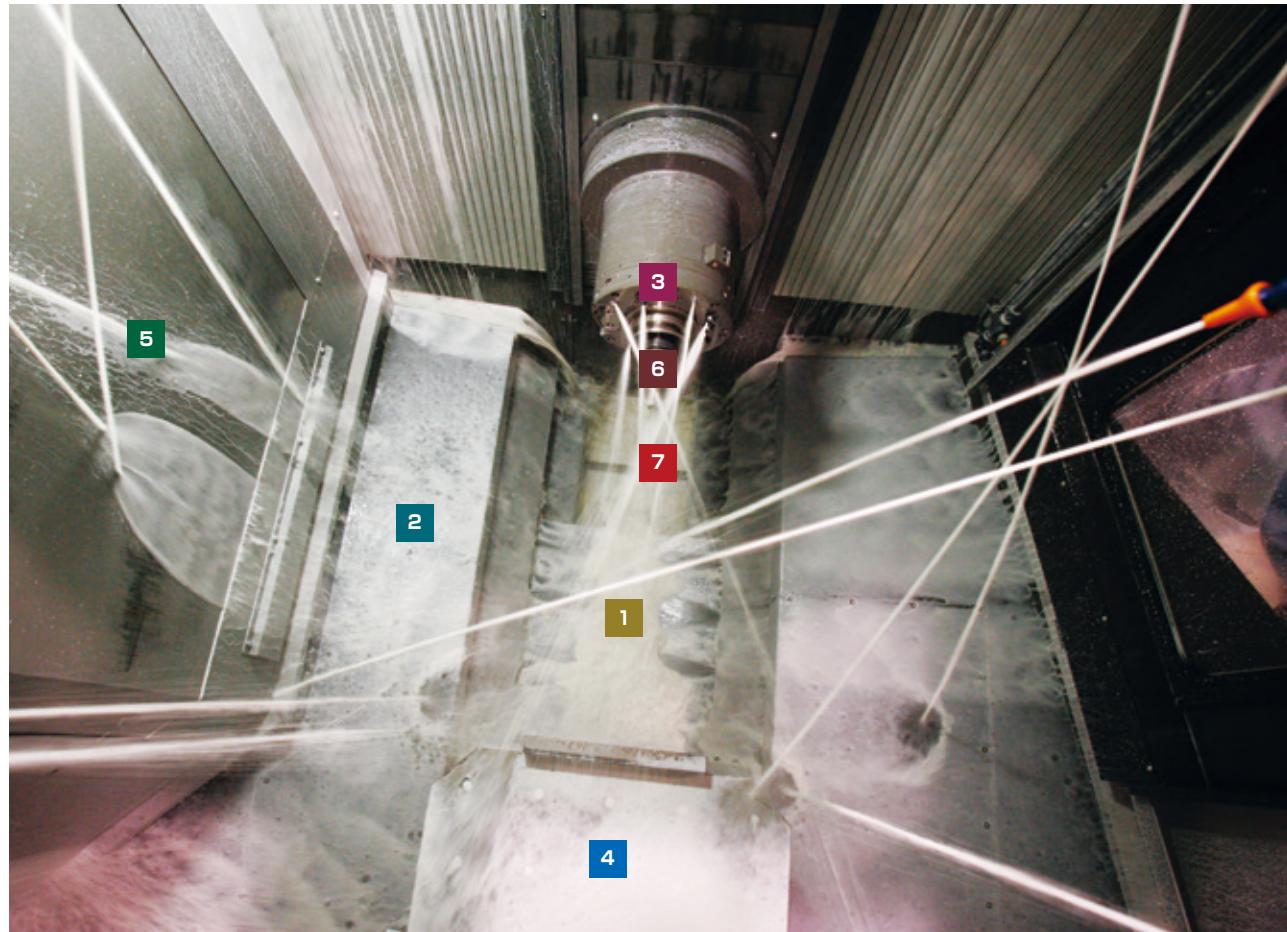
Using X-ray photoelectron spectroscopy to analysis fine matter adhered to a machined surface



Using a transmission electron microscope to survey metal structure

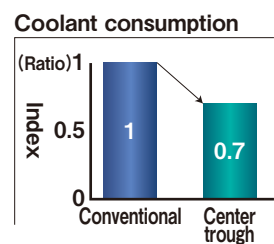
- Machined surface analysis (ultra precision field)
- Machining stress measurement
- Paint evaluation ● Coolant immersion evaluation
- Material mixture evaluation, etc.

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



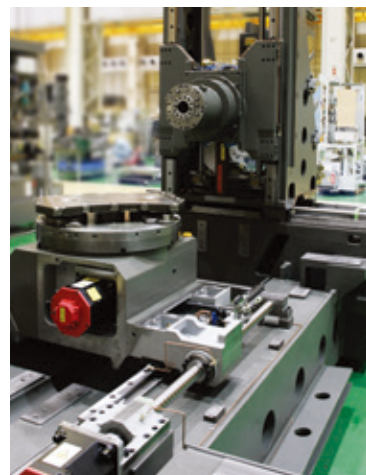
1 Center trough

Chip disposal plays a critical role in machine operation efficiency. A chip disposal port located in the center of the bed makes for a chip disposal capacity 6 times greater than that of earlier methods. Furthermore, coolant consumption is substantially reduced, helping to make the equipment more environmentally friendly.



4 Ultimate table motor positioning

The table motor is installed not beneath the cutting point on the spindle side but on the APC side, avoiding coolant penetration into the table motor and chip accumulation on the motor cover.



2 Slant cover

The slant internal cover keeps the accumulation of chips to a minimum.

3 External nozzle coolant

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

5 Overhead shower coolant

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

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

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.

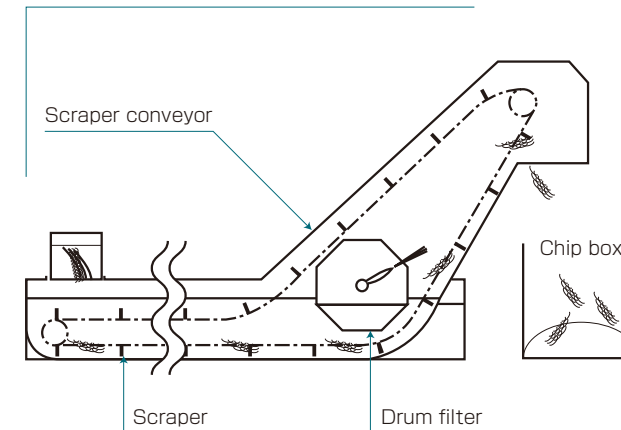


Spindle-through coolant 3MPa

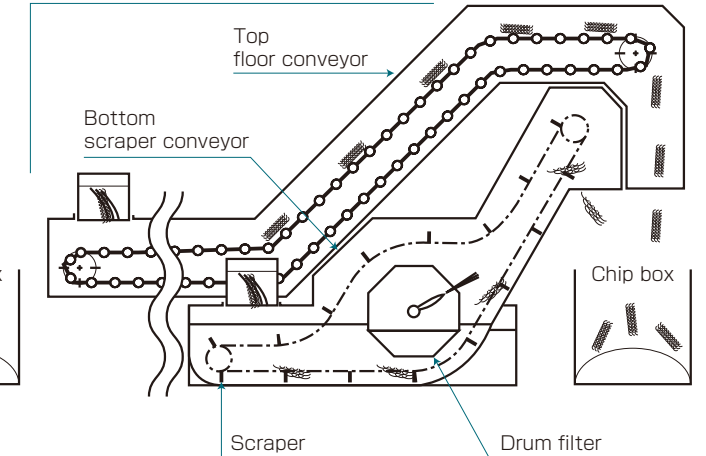
7 Coolant supply unit with take-up chip conveyor

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

Standard scraper type coolant supply unit*



Option Two-tiered coolant supply unit



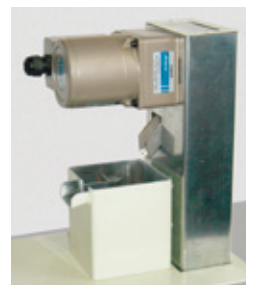
Splash gun

Option Peripheral equipment

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



Coolant cooling



Oil skimmer



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.



APC with good accessibility

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



Photo: FH550SX

Rotary operation panel



Manual pulse generator (handheld type)

Operator platform



Tool magazine with good accessibility

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



TOYOPUC-Touch

HMI in the IoE* era
Simple, safe and connectable



Renewed operability

J-Operate

Realization of simple operation

J-Navigate

Visualization of equipment status

J-Support

Batch management of equipment information

J-Manage

Equipment diagnosis utilizing IoE

J-Care

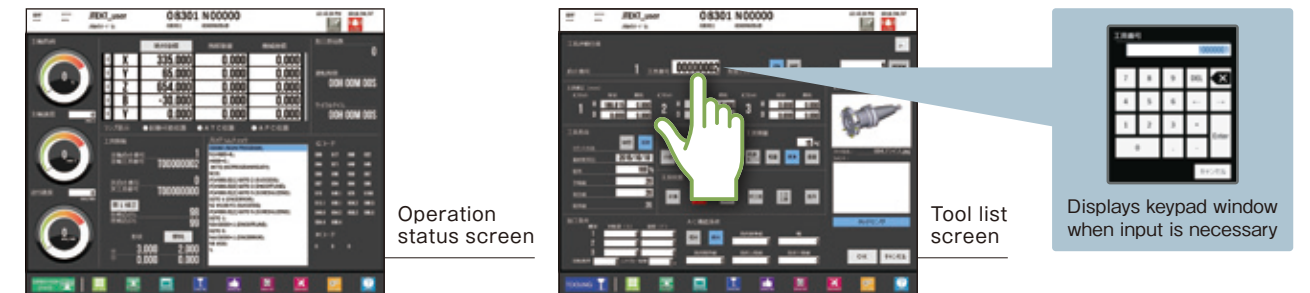
*Rather than "IoT", JTEKT utilizes "IoE" ("Internet of Everything"), in which people, objects, information, and services are interconnected.

Renewed operability

J-Operate

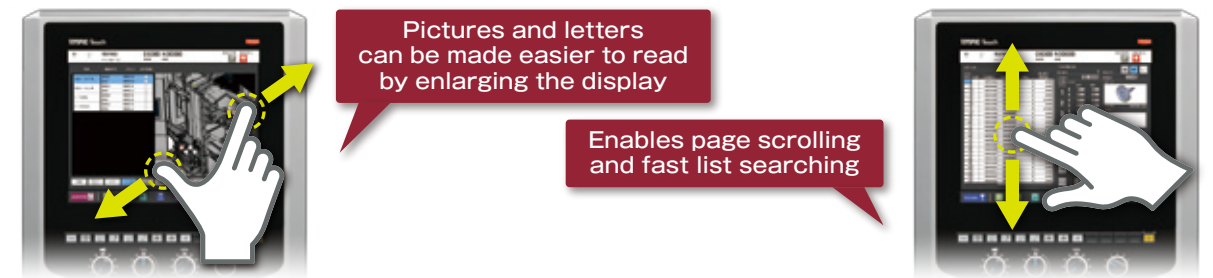
Visible and effective operation thanks to batch data display

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



Pictures and letters can be made easier to read by enlarging the display

Enables page scrolling and fast list searching

Realization of simple operation

J-Navigate

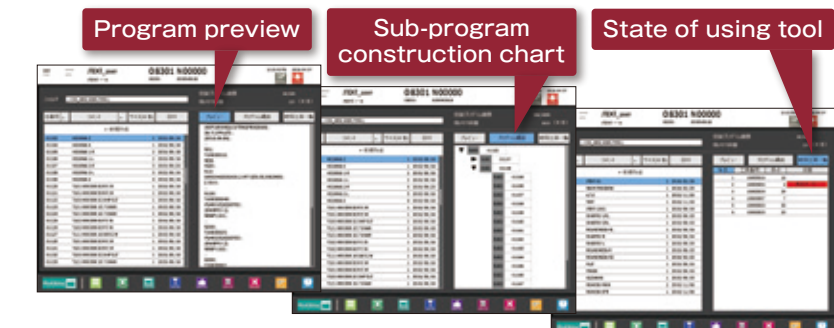
Minimal number of screen calling operations

Iconized menu enables screen calling from any screen in a maximum of two operations



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

~Longevity management function~

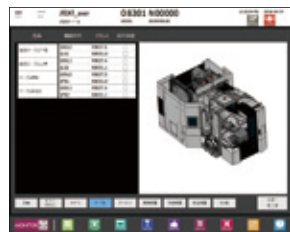


Supports planned maintenance through notifications of when life is almost over

- 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 monitor~

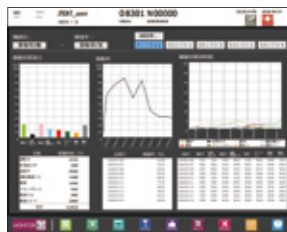


Supports maintenance by allowing on-screen assessment of equipment status

- 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 energy

~Energy monitoring~



Supports energy saving activities by visualizing energy usage

- Energy usage can be viewed easily on graphs and tables, and data entry is also possible
- Current energy usage can be compared with past energy usage of the selected period
- Effects of enabling/disabling energy saving settings can be viewed

Renewed operability

J-Manage

Batch management of tool/pallet information



Tool management function

- Allows automatic indexing of the selected tool 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



Additional functions of TOYOPUC-Touch

●: Standard / □: Optional

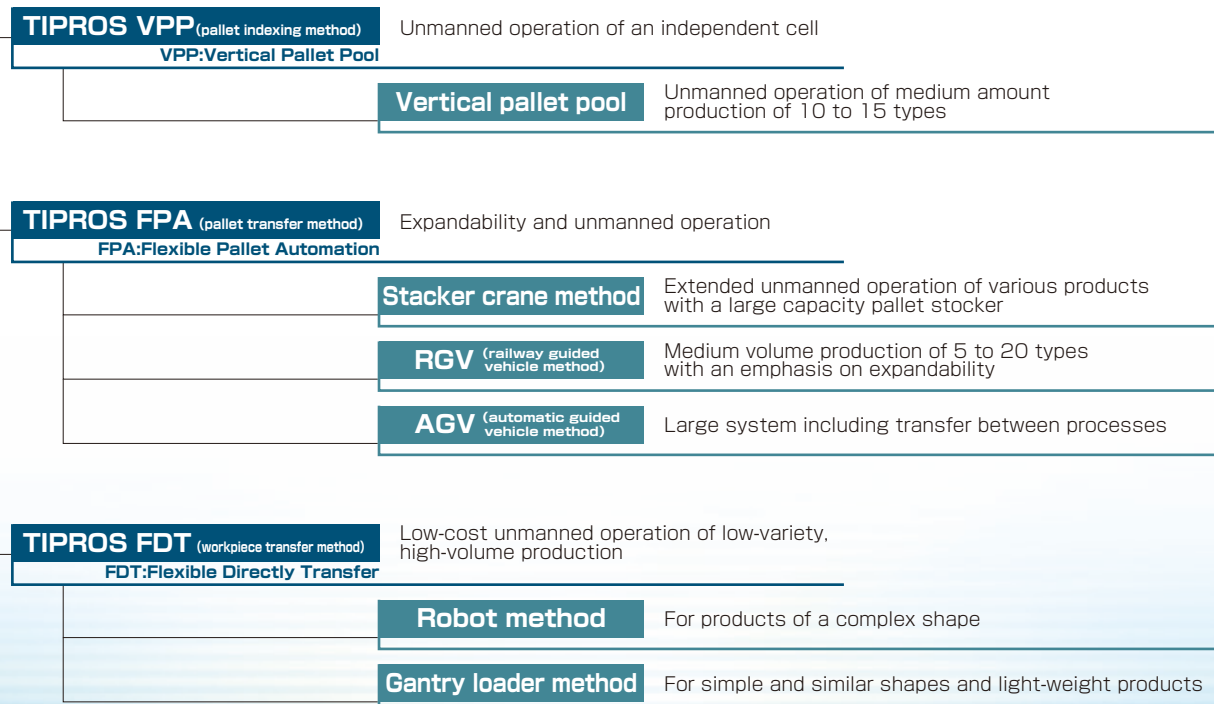
| Classification | | Function name | Included | |
|----------------|------------------------------|---|---|---|
| J-Navigate | Basic functions | Running status display | ● | |
| | | Program list display | ● | |
| | | Program edit | ● | |
| | | Command list display | ● | |
| | | Macro list display | ● | |
| | | Workpiece coordinate display | ● | |
| | | Operation guidance function | ● | |
| | | Parameter settings | ● | |
| | | Message board | ● | |
| J-Support | Basic functions | Document browsing | ● | |
| | | Fault list display | ● | |
| | | Fault history | ● | |
| | | Operation history | ● | |
| | | Signal status display | ● | |
| | | System management | ● | |
| | | Backup function | ● | |
| | Production support functions | Operation monitor | Machining performance | ● |
| | | | Operation performance | ● |
| | | Cycle time measurement | ● | |
| | Energy saving functions | Energy saving settings | ● | |
| | | Energy usage monitoring | □ | |
| | Servicing functions | Periodic inspection function | ● | |
| | | Longevity management function | ● | |
| | Maintenance functions | Equipment monitor | ● | |
| | | Unit maintenance (Easy recovery 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 condition setting function | ● | |
| | | Machining condition setting function | ● | |
| | | Stored tool data save function | ● | |
| | | Abnormal tool list display | ● | |
| | | Spare tool list display | ● | |
| | | Tool position display | ● | |
| | | Tools in use list 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 management functions | APC management | ● |
| | | | Pallet compensation | ● |
| | Multiple workpiece mounting | | ● | |
| | J-Care | Remote support | Diagnosis data collection function | ● |
| | | | Remote diagnosis function | □ |

TIPROS

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

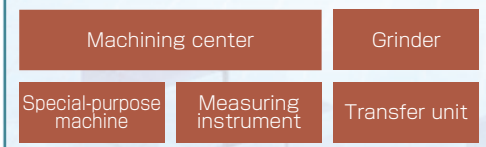
JTEKT has delivered many systems since the first FMS sold in 1972 and have come to be seen by both domestic and overseas customers as a company that offers high reliability and meets expectations, and as such indispensable in the FA era. We manufacture the best FMC/FMS to meet customer requirements,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

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



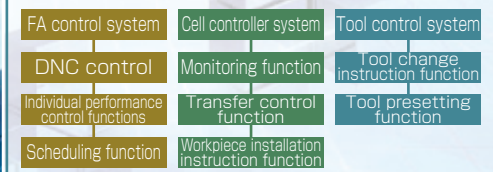
Hardware

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



Software

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



TIPROS VPP

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



TIPROS FPA

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

Stacker crane method



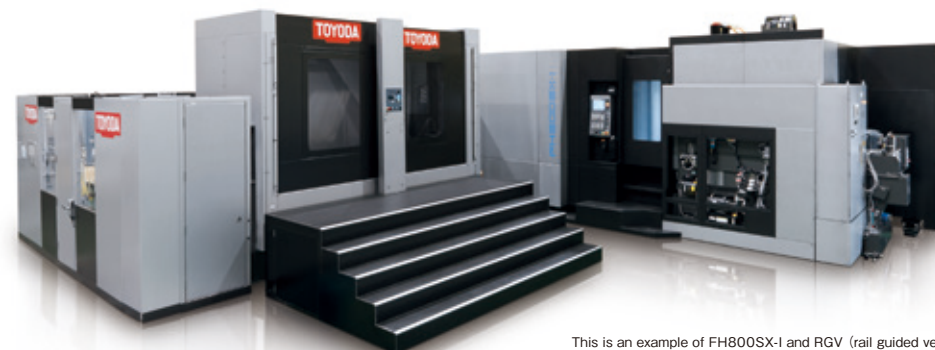
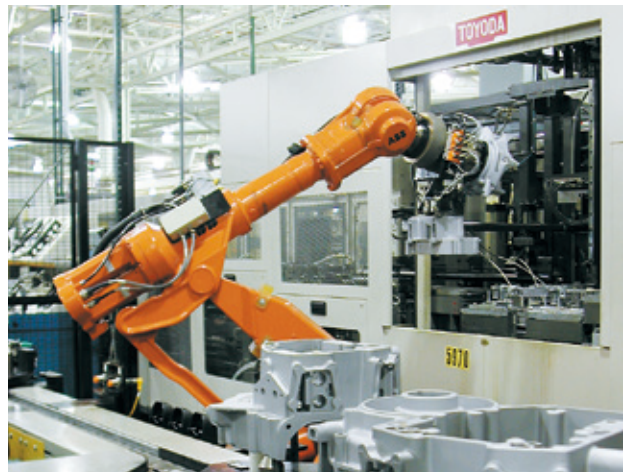
TIPROS FPA

RGV (rail-guided vehicle) + stacker crane



TIPROS FDT

Robot method



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

Easy operations and visualization of functions using FMS software

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

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

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

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

Intuitive and easy to use

Directly specifying what is to be set

Click of the mouse

A visual part no. changeover setting

Drag & drop

Completion timing is decipherable

Scheduling by equipment

Scheduling by work

Easy fixture management

Abundant pallet types

Automatically deciding fixture replacement

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

* Sequential Function Chart

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

Conventional (ladder circuit)

Complicated, making equipment operations difficult to decipher

Use words to describe the circuit (SFC circuit)

Simple, making equipment operations easy to decipher

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

Investigation of the cause of equipment stops

Able to pinpoint the faulty area straight away

What is chase monitoring?

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

Investigation of the cause of equipment stops

Touch the step the machine has stopped on

The visualization of faulty areas

Touch the function block conditions

Investigation complete nice and easy without drawings!

Cause of stop is revealed

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

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

Machine specifications

| Item | Unit | FH550S | | FH550S | | FH550SX | | |
|--------------------------|---|-------------------------|------------------------|------------------------------|------------------------|------------------------------|------------------------|------------------------------|
| | | FH550S4 | | FH550S5 | | FH550SX | | |
| | | Standard specifications | Special specifications | Standard specifications | Special specifications | Standard specifications | Special specifications | |
| Table & Pallet | Table dimensions (pallet dimensions) | mm | □550 (Pallet) | □500 (Pallet) | □550 (Pallet) | □500 (Pallet) | □550 (Pallet) | □500 (Pallet) |
| | Rotary table indexing angle | ° | 1 | 0.001 | 1 | 0.001 | 1 | 0.001 |
| | Pallet height (from floor) | mm | 1,200 | | 1,200 | | 1,200 | |
| | Max load on pallet | kg | 800 | | 800 | | 800 | |
| | Table indexing time (90° indexing) | sec | 2 | 0.7*1 | 2 | 0.7*1 | 2 | 0.7*1 |
| | Pallet change time | sec | 9.5 | | 9.5 | | 9.5 | |
| Stroke | X-axis | mm | 750 | | 750 | | 750 | |
| | Y-axis | mm | 800 | | 800 | | 800 | |
| | Z-axis | mm | 850 | | 850 | | 850 | |
| | Distance between spindle nose and table center | mm | 150~1,000 | | 150~1,000 | | 150~1,000 | |
| | Distance between spindle center and top of pallet | mm | 100~900 | | 100~900 | | 100~900 | |
| | Max. workpiece swing x Max. workpiece height | mm | φ850×1,000*2 | | φ850×1,000*2 | | φ850×1,000*2 | |
| Feeds | Rapid feed rate (X, Y and Z) | m/min | 60 | | 60 | | 60 | |
| | Cutting feed rate (X, Y and Z) | m/min | 0.001~30 | | 0.001~30 | | 0.001~30 | |
| | Rapid acceleration (X, Y and Z) | m/s²(G) | 9.8 (1.0) | | 9.8 (1.0) | | XY=6.86(0.7)Z=9.8(1) | |
| | Ball screw diameter (X, Y and Z) | mm | φ45 | | φ45 | | φ45 | |
| Spindle | Spindle speed | min ⁻¹ | 50~15,000 | 50~20,000*3 50~8,000 | 50~15,000 | | 50~6,000 | 50~6,000 50~15,000 |
| | Spindle diameter (front bearing bore) | mm | φ80 | φ70 φ80 | φ90 | | φ110 | φ110 φ120 |
| | Spindle nose shape | | BT No.40 | HSK A63 | BT No.50 | HSK A100 | BT No.50 | HSK A100 |
| | Spindle motor, short-time/continuous | kW | 22/18.5 | 22/18.5 17.7/15 | 22/18.5 | | 30/22 | 37/30 |
| ATC | Tool holding capacity | tool | 40 | 60 · 121 · 190 or over | 40 | 60 · 121 · 190 or over | 40 | 60 · 121 · 190 or over |
| | Tool selection | | Absolute address | | Absolute address | | Absolute address | |
| | Tool (dia. x length) | mm | φ75×470*4 | | φ120×470*4 | | φ120×545*4 | |
| | Tool mass | kg | 8 | | 27 | | 27 | |
| | Tool change time (Tool-to-Tool) | sec | 1.6 (~8kg) | | 2.4(~15kg)2.7(15~27kg) | | 2.4(~15kg)2.7(15~27kg) | |
| | Tool change time (Chip-to-Chip) | sec | 2.7 (~8kg) | | 3.6(~15kg)3.9(15~27kg) | | 3.6(~15kg)3.9(15~27kg) | |
| | Tools Holder | | MAS BT40 | HSK | MAS BT50 | HSK | MAS BT50 | HSK |
| Dimensions & Weight | Floor space (width × depth) | mm | 3,026×5,695*5 | | 3,182×5,695*5 | | 3,312×5,695*5 | |
| | Machine height | mm | 3,100*5 | | 3,160*5 | | 3,200*5 | |
| | Machine weight | kg | 16,000 | | 16,000 | | 16,100 | |
| Various Capacities | Working oil | L | 18 | | 18 | | 18 | |
| | Slide lubricant | L | 2.9 | | 2.9 | | 2.9 | |
| | Spindle oil air | L | 2.9 | | 2.9 | | 2.9 | |
| | Table | L | 1.5 | 3 | 1.5 | 3 | 1.5 | 3 |
| | Spindle coolant | L | 20 | | 20 | | 20 | |
| | Power supply capacity | kVA | 52 | 52 | 52 | 52 | 54 | 64 54 |
| | Control voltage | V | DC24 | | DC24 | | DC24 | |
| | Air source capacity | NL/min | 800 | | 800 | | 800 | |
| | Air source pressure | MPa | 0.4~0.5 | | 0.4~0.5 | | 0.4~0.5 | |
| Capability & Performance | Positioning accuracy*6 | mm | ±0.003 | ±0.002 | ±0.003 | ±0.002 | ±0.003 | ±0.002 |
| | Repeatability*6 | mm | ±0.0015 | ±0.001 | ±0.0015 | ±0.001 | ±0.0015 | ±0.001 |
| | Table indexing accuracy*6 | sec | ±3 | ±7(NC) ±3.5(with NC encoder) | ±3 | ±7(NC) ±3.5(with NC encoder) | ±3 | ±7(NC) ±3.5(with NC encoder) |
| | Table indexing repeatability*6 | sec | ±3 | ±3.5(NC) ±2(with NC encoder) | ±3 | ±3.5(NC) ±2(with NC encoder) | ±3 | ±3.5(NC) ±2(with NC encoder) |

*1 System with DD table *2 The workpiece swing is subject to limitations if used in conjunction with an RG. For details, refer to the tooling data.
 *3 20,000min⁻¹ spindle is only HSK specifications. *4 For detail shape, refer to the tooling data. *5 For details, refer to the layout plan.
 *6 According to our inspection method

CNC unit FANUC 31i. ● Standard / □ Optional

| Division | Name | FH550S | FH550SX |
|---|--|--------|---------|
| 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 feed 1 unit | □ | □ |
| | | | |
| Interpolation function | Nano interpolation | ● | ● |
| | Positioning (G00) | ● | ● |
| | Exact stop mode (G61) | ● | ● |
| | Tapping mode (G63) | ● | ● |
| | Cutting mode (G64) | ● | ● |
| | Exact stop (G09) | ● | ● |
| | Linear interpolation (G01) | ● | ● |
| | Arc interpolation (G02, G03) | ● | ● |
| | Dwell (G04) | ● | ● |
| | Helical interpolation | ● | ● |
| | Reference point return (G28, G29) | ● | ● |
| | Second reference point return (G30) | ● | ● |
| | Third and fourth reference point return (G30) | ● | ● |
| | | | |
| Feed function | AI contour control I (pre-read 30 blocks) | ● | ● |
| | F1-digit feed | □ | □ |
| | AI contour control II (pre-read 200 blocks) | □ | □ |
| Program entry | Local coordinate system (G52) | ● | ● |
| | Machine coordinate system (G53) | ● | ● |
| | Workpiece coordinate system (G54 to G59) | ● | ● |
| | Additional workpiece coordinate systems (48 sets) | □ | □ |
| | Additional workpiece coordinate systems (300 sets) | □ | □ |
| | Custom macro | ● | ● |
| | Additional custom macro common variables (#100 to #199, #500 to #999) | ● | ● |
| | Fixed drilling cycle (G73, G74, G76, G80 to G89, G98 and G99) | ● | ● |
| | Additional optional block skip (9 pieces) | □ | □ |
| | Automatic corner override | □ | □ |
| | | | |
| Spindle function | Rigid tap | ● | ● |
| Tool function | Tool corrections (99) | ● | ● |
| Tool correction function | Tool corrections (200) | □ | □ |
| | Tool corrections (400) | □ | □ |
| | Tool corrections (499) | □ | □ |
| | Tool corrections (999) | □ | □ |
| | Tool position offset | ● | ● |
| | Tool diameter and cutter radius compensation | ● | ● |
| Tool length compensation (G43, G44 and G49) | ● | ● | |
| Editing operation | Program storage capacity (128K bytes) | ● | ● |
| | Program storage capacity (256K bytes) | □ | □ |
| | Program storage capacity (512K bytes) | □ | □ |
| | Program storage capacity (1M byte) | □ | □ |
| | Program storage capacity (2M bytes) | □ | □ |
| | Program storage capacity (4M bytes) | □ | □ |
| | Program storage capacity (8M bytes) | □ | □ |
| | Number of registered programs (250) | ● | ● |
| | Number of registered programs (500) ※Storage capacity 256K bytes compulsory | □ | □ |
| | Number of registered programs (1000) ※Storage capacity 512K bytes compulsory | □ | □ |
| | Number of registered programs (2000) ※Storage capacity 1M bytes compulsory | □ | □ |
| | Number of registered programs (4000) ※Storage capacity 2M bytes compulsory | □ | □ |
| | Simultaneous multi-program editing (incl. background editing) | ● | ● |
| Data entry/display | Touch panel control | ● | ● |
| Communication function | Built-in Ethernet | ● | ● |

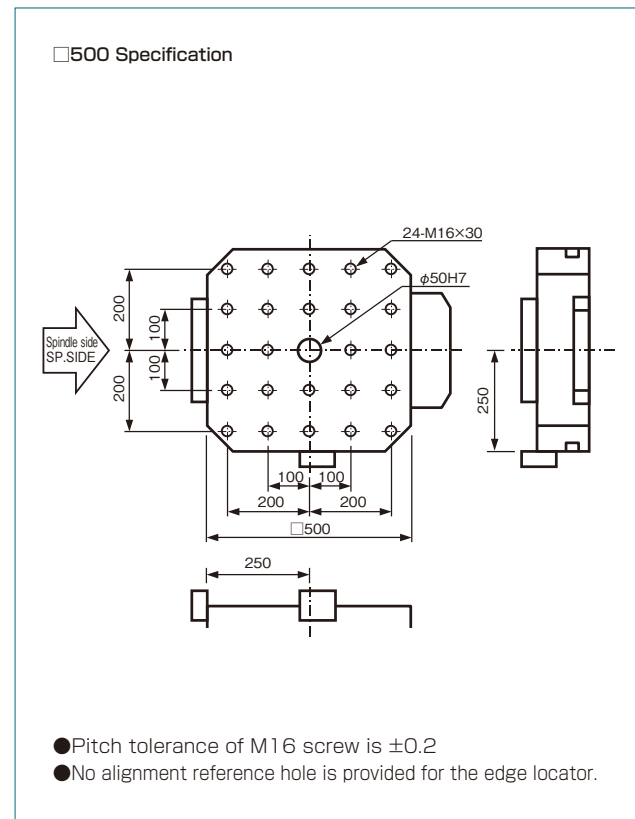
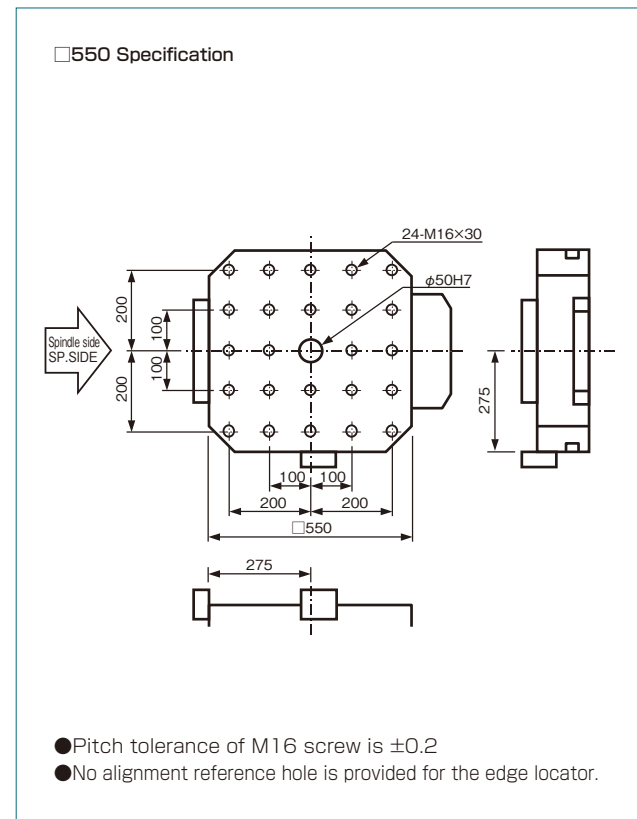
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Accessories ●Standard accessories / □ Optional accessories

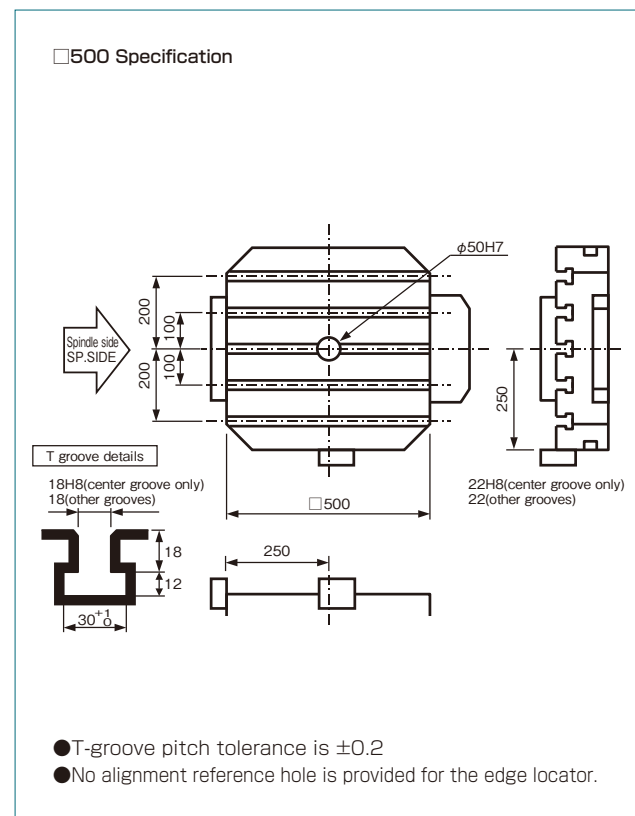
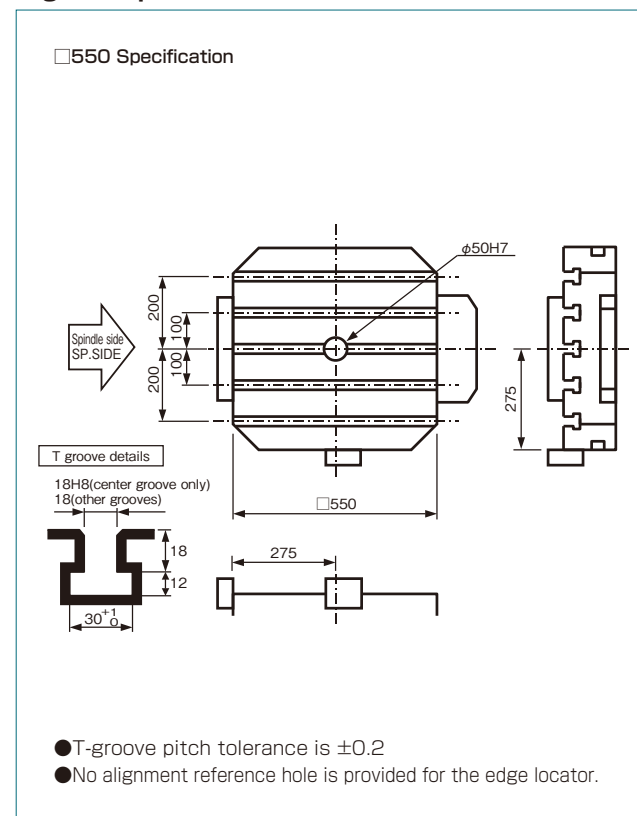
| Item | Equipment name | FH550S | FH550SX | | |
|------------------------------------|--|---|---|------------------|---|
| Table and pallet | Indexing table | 1° indexing table | ● | ● | |
| | | NC indexing table | □ | □ | |
| | | NC indexing table (with encoder) | □ | □ | |
| | | DD table (with encoder) | □ | □ | |
| Pallet | Standard pallet screw hole | | ● | ● | |
| | | T-groove pallet | □ | □ | |
| Addition of pallet | Single piece screw hole | | □ | □ | |
| | | Single piece T-groove | □ | □ | |
| Spindle relations | Speed | 15,000min ⁻¹ No. 40 (22/18.5kW) spindle (with spindle-through coolant spec) | ● | □ | |
| | | 20,000min ⁻¹ No. 40 (22/18.5kW) spindle (with spindle-through coolant spec) | □ | □ | |
| | | 8,000min ⁻¹ No. 40 (17.7/15kW) spindle (with spindle-through coolant spec) | □ | □ | |
| | | 15,000min ⁻¹ No. 50 (22/18.5kW) spindle (with spindle-through coolant spec) | □ | □ | |
| | | 6,000min ⁻¹ No. 50 (30/22kW) spindle (with spindle-through coolant spec) | □ | ● | |
| | | 6,000min ⁻¹ No. 50 (37/30kW) large torque spindle (with spindle-through coolant spec) | □ | □ | |
| | | 15,000min ⁻¹ No. 50 (37/30kW) large torque spindle (with spindle-through coolant spec) | □ | □ | |
| | | Filter 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 | 40 tools | ● | ● | |
| | | 60 tools | □ | □ | |
| | | 121 tools | □ | □ | |
| | | 190 or more tools | □ | □ | |
| Coolant relations | Coolant supply unit | Coolant supply unit (water soluble/with take-up chip conveyor/scrapper type/without spindle-through coolant spec) | ● | ● | |
| | | Coolant supply unit (water soluble/with take-up chip conveyor/scrapper type/spindle-through coolant spec/1MPa through pump) | □ | □ | |
| | | Coolant supply unit (water soluble/with take-up chip conveyor/scrapper type/spindle-through coolant spec/3MPa through pump) | □ | □ | |
| | | Coolant supply unit (water soluble/with take-up chip conveyor/scrapper type/spindle-through coolant spec/7MPa through pump) | □ | □ | |
| | | Coolant supply unit (water soluble/with take-up chip conveyor/2-tank type/spindle-through coolant spec/1MPa through pump) | □ | □ | |
| | | Coolant supply unit (water soluble/with take-up chip conveyor/2-tank type/spindle-through coolant spec/3MPa through pump) | □ | □ | |
| | | Coolant supply unit (water soluble/with take-up chip conveyor/2-tank type/spindle-through coolant spec/7MPa through pump) | □ | □ | |
| | | External nozzle coolant | ● | ● | |
| | | Overhead shower coolant | ● | ● | |
| | | Internal chip flushing coolant | ● | ● | |
| | | Chip flow coolant in pallet changer | □ | □ | |
| Internal screw conveyor | ● | ● | | | |
| Coolant cooling | □ | □ | | | |
| Oil skimmer | Belt type | □ | □ | | |
| Chip box | | □ | □ | | |
| Splash gun (at APC) | | ● | ● | | |
| Mist collector | | □ | □ | | |
| Air blower | External nozzle type | □ | □ | | |
| Splash guard | Enclosure guard | | ● | ● | |
| | | Door interlock at operating position | Electromagnetic lock type | ● | ● |
| | | APC door interlock | Electromagnetic lock type | ● | ● |
| | | Internal lighting | | ● | ● |
| Operation control function, others | Ground fault interrupter | | □ | □ | |
| | | Cooler for control cabinet inside | | □ | □ |
| | | Automatic fire extinguisher | | □ | □ |
| | | Universal design cover | | □ | □ |
| Support for high accuracy | Pallet changer (APC) | | ● | ● | |
| | | TIPROS VPP | | □ | |
| | | 7 pieces | □ | □ | |
| | | 10 pieces | □ | □ | |
| | | 14 pieces | □ | □ | |
| Operator support function | Spindle cooling unit | | ● | ● | |
| | | BTS (Ball screw Thermo Stabilizer) function | ● | ● | |
| | | Scale feedback (X-, Y- and Z-axes) | If installation is requested, the BTS function is excluded. | □ | □ |
| | | Touch sensor function | Optical type (without energization); with alignment and datum face correction functions | □ | □ |
| | | | Optical type (with energization); with alignment, datum face correction, gap elimination and tool breakage detection function | □ | □ |
| | | | Automatic tool length measurement function and datum face for measurement (interference area caused) | □ | □ |
| | | | Automatic measurement function | □ | □ |
| | | | Automatic measurement correction function | □ | □ |
| | | | Rotary coordinate system correction function | □ | □ |
| | | | Rotary coordinate axis correction function | □ | □ |
| | | | Automatic tool length measurement function | Fixed table type | □ |
| | Tool breakage detection unit inside the magazine | Touch switch type | □ | | |
| | Spindle thermo stabilizer function | | □ | | |

When the scale feedback is equipped, the model name becomes FH550S4-L, FH550S5-L, and FH550SX5-L.

Threaded hole pallet

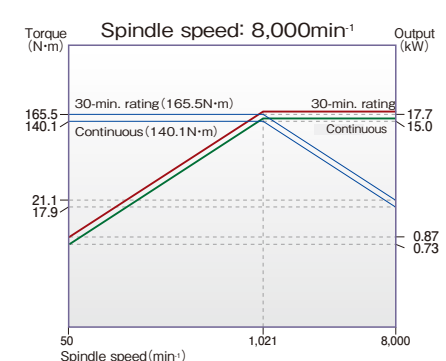
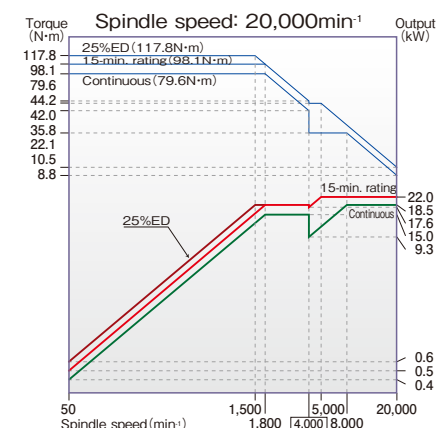
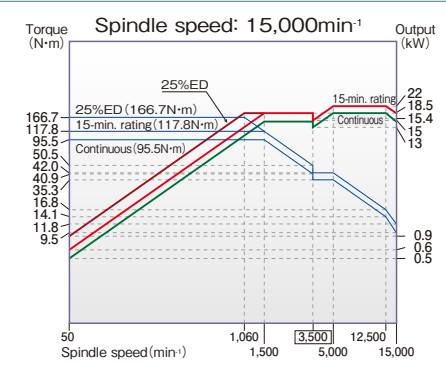


T-groove pallet

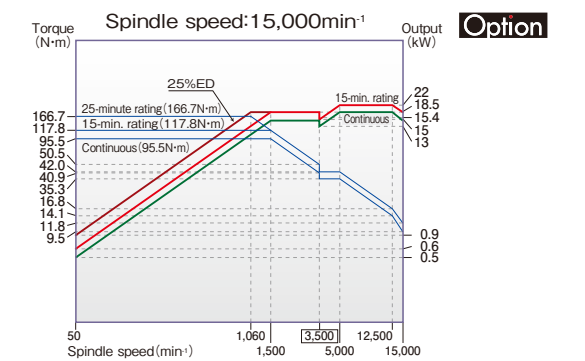


Output and torque diagram of 7 spindles

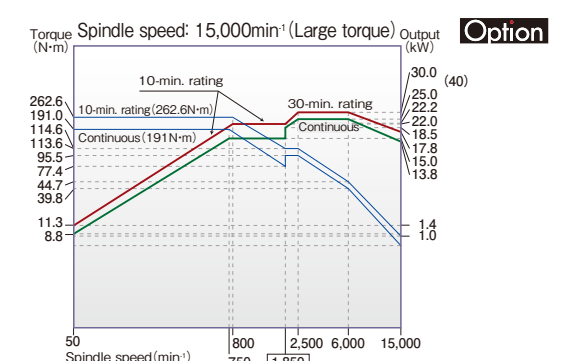
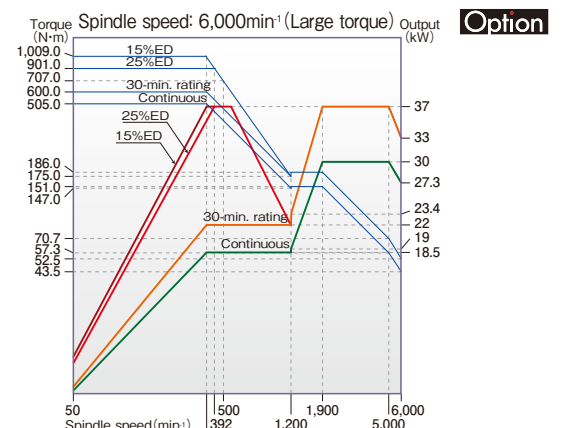
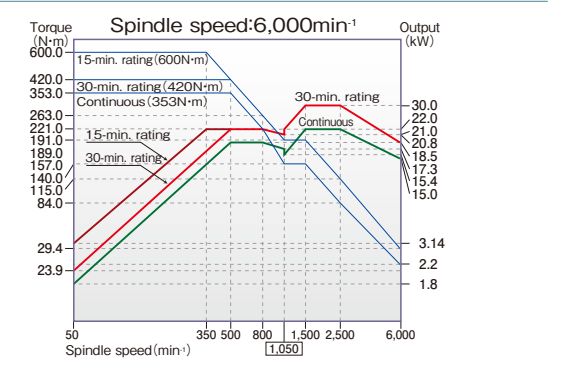
BT No.40



BT No.50



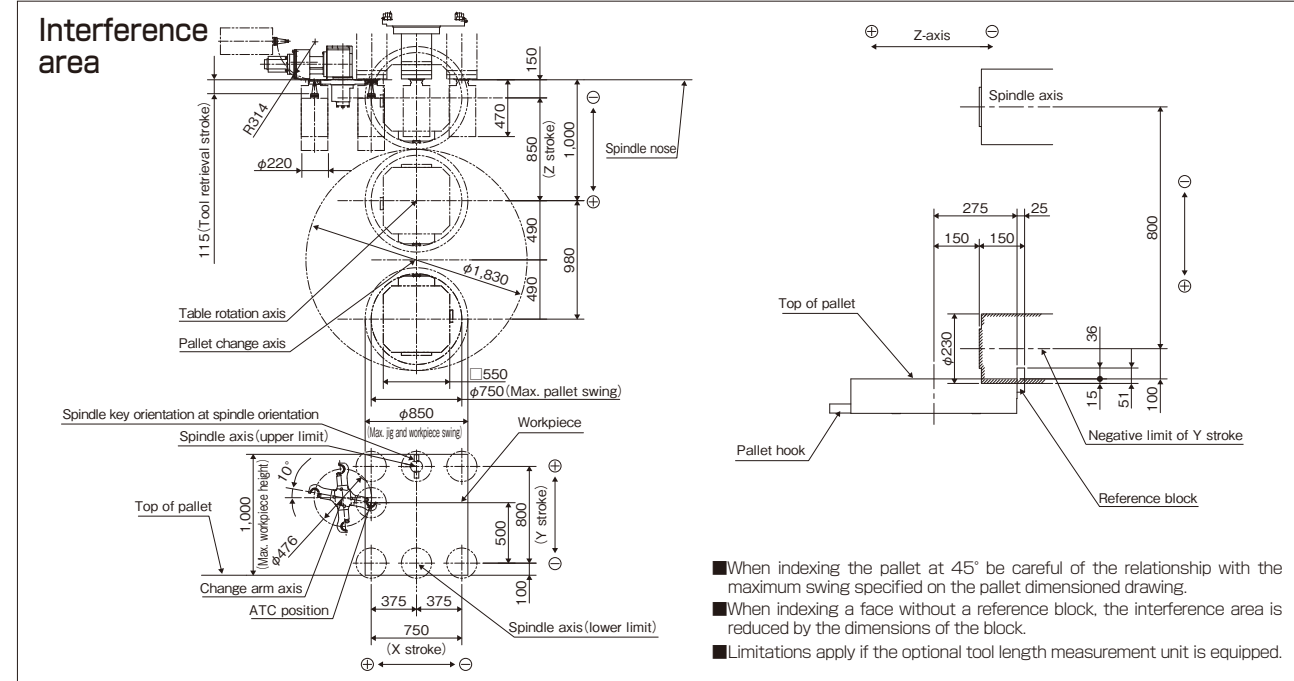
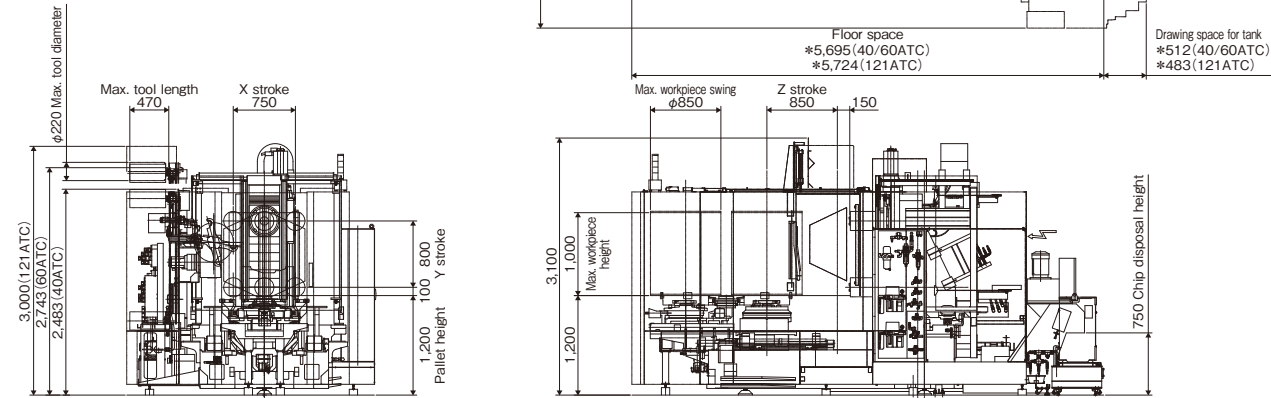
BT No.50



FH550S BT No.40

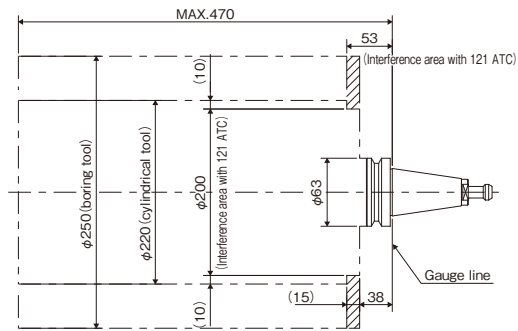
Layout plan

unit : mm
* indicates dimensions with the standard coolant supply unit.
Dimension * may change according to specifications.



Limitations in tool holder shape (JIS-CAT-DIN BT No.40)

40/60/121 tools



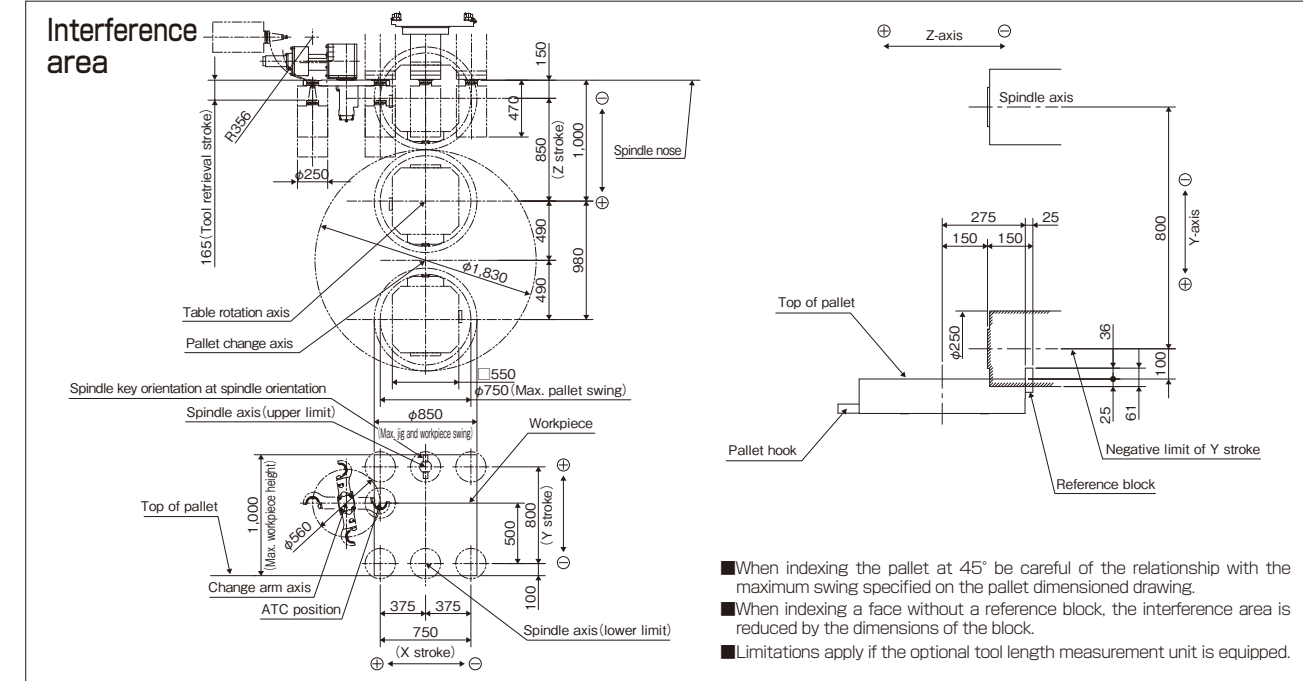
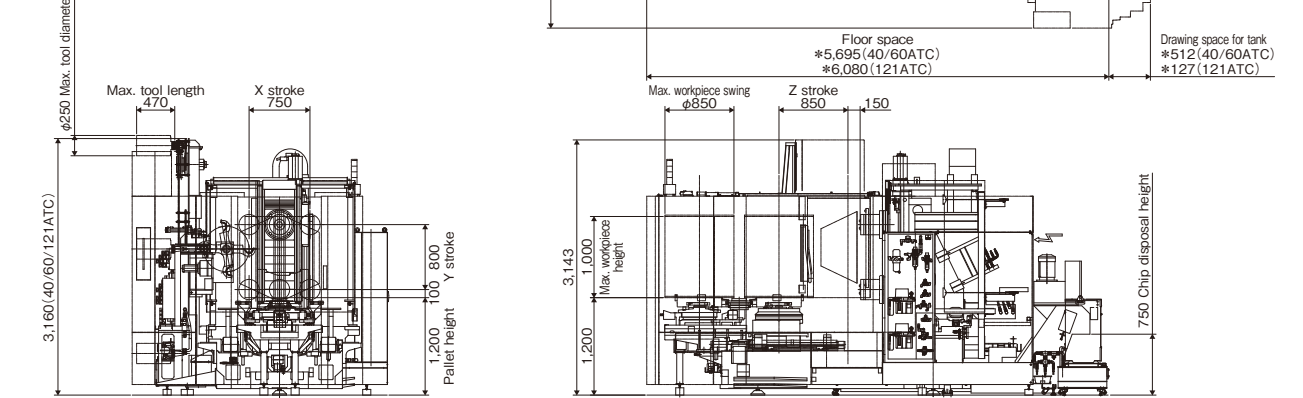
| Item | Max. spec |
|----------------|--|
| Tool length | 470mm |
| Tool diameter | With 40 and 60 tools magazines: $\phi 75$ mm (without limitations of adjacent tools) With 121 tools magazine: $\phi 110$ mm (without limitations of adjacent tools) |
| Tool weight | 8kg: The moment at the spindle nose is supposed to be within 12N·m. |
| Tool imbalance | Within 30×10^{-4} N·m (tools of 6,000min ⁻¹ or lower speeds) Within 10×10^{-4} N·m (tools of speeds > 6,000min ⁻¹ , $\leq 8,000$ min ⁻¹) Within 3×10^{-4} N·m (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.

FH550S BT No.50

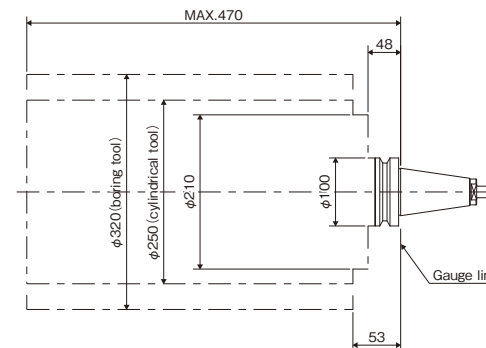
Layout plan

unit : mm
* indicates dimensions with the standard coolant supply unit.
Dimension * may change according to specifications.



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

40/60/121 tools



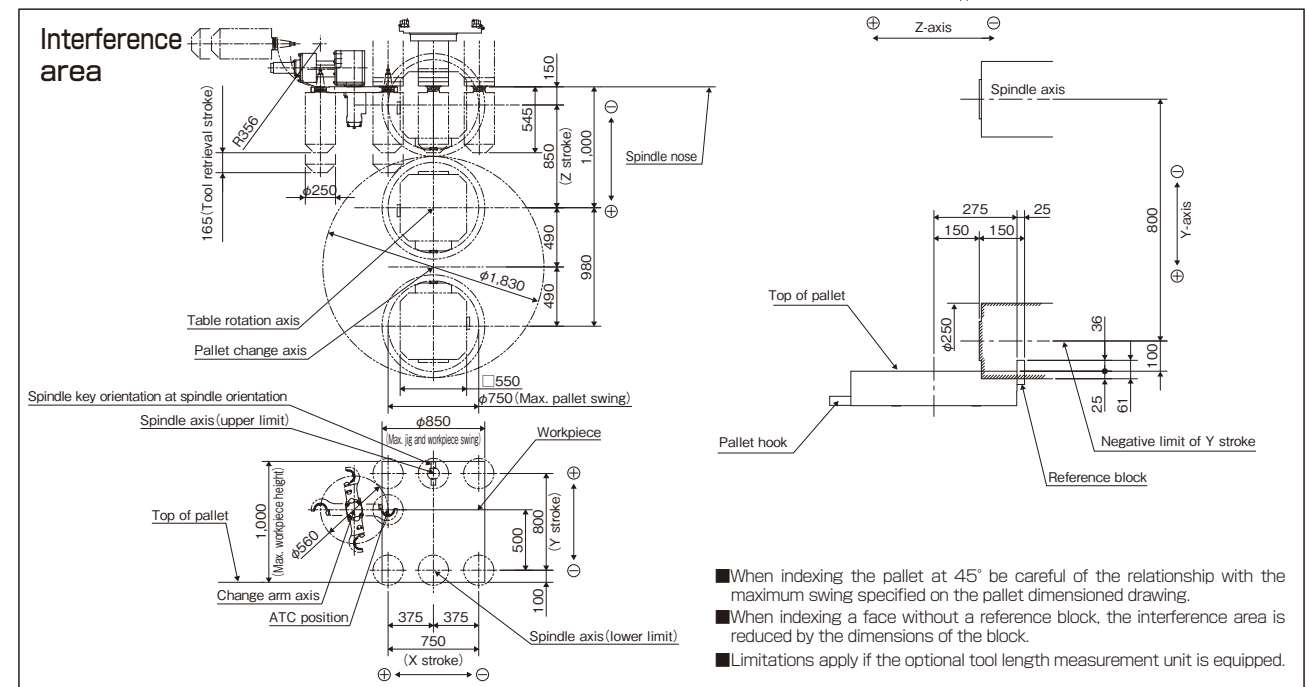
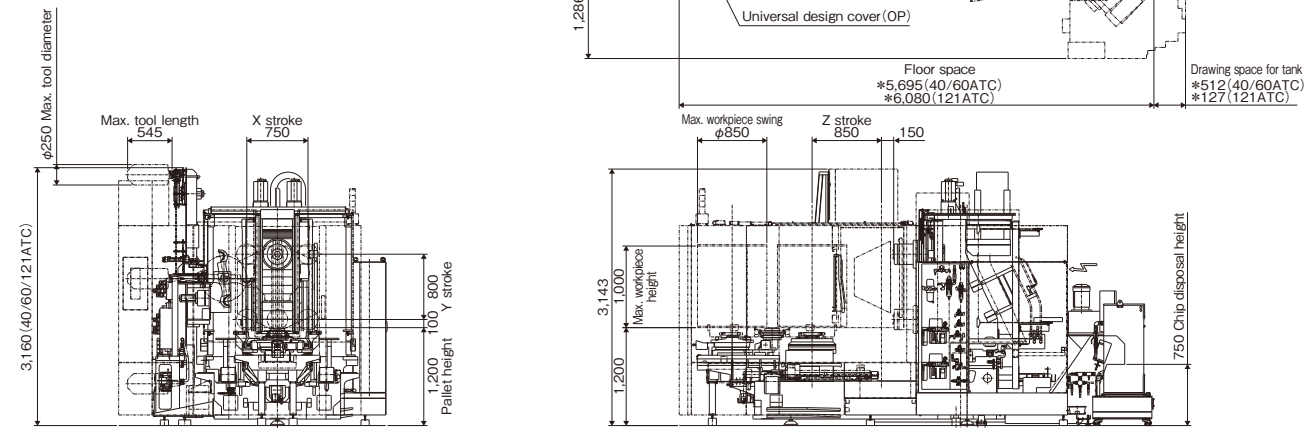
| Item | Max. spec |
|----------------|--|
| Tool length | 470mm |
| Tool diameter | With 40 and 60 tools magazines: $\phi 120$ mm (without limitations of adjacent tools) With 121 tools magazine: $\phi 130$ mm (without limitations of adjacent tools) |
| Tool weight | 27kg: Spindle nose moment must be within 29N·m. |
| Tool imbalance | Within 30×10^{-4} N·m (tools of 6,000min ⁻¹ or lower speeds) Within 10×10^{-4} N·m (tools of speeds > 6,000min ⁻¹ , $\leq 8,000$ min ⁻¹) Within 3×10^{-4} N·m (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.

FH550SX

Layout plan

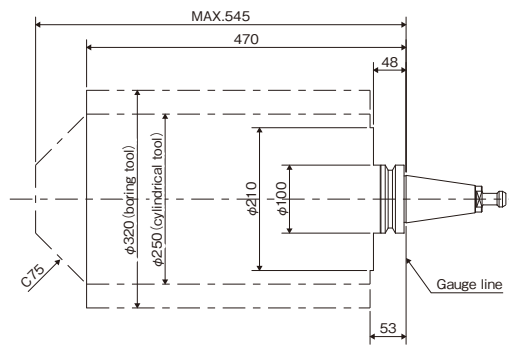
unit : mm
 * indicates dimensions with the standard coolant supply unit.
 Dimension * may change according to specifications.



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

The tool holder is subject to limitations in the shape due to the ATC (automatic tool change) cycle. Tools having ϕ 100 or larger diameters must be within ϕ 100mm in the outside diameter within the 48mm range from the gauge line. The area within 53mm from the gauge line must be within ϕ 210 in the outside diameter. The total mass must be within 27kg and the length from the gauge line must be within 545mm.

40/60/121 tools



| Item | Max. spec |
|----------------|---|
| Tool length | 545mm |
| Tool diameter | With 40 and 60 tools magazines: ϕ 120mm (without limitations of adjacent tools) With 121 tools magazine: ϕ 130mm (without limitations of adjacent tools) |
| Tool weight | 27kg: Spindle nose moment must be within 29N·m. |
| Tool imbalance | Within 30x10 ⁻⁴ N·m (tools of 6,000min ⁻¹ or lower speeds) Within 10x10 ⁻⁴ N·m (tools of speeds > 6,000min ⁻¹ , \leq 8,000min ⁻¹) Within 3x10 ⁻⁴ N·m (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.

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