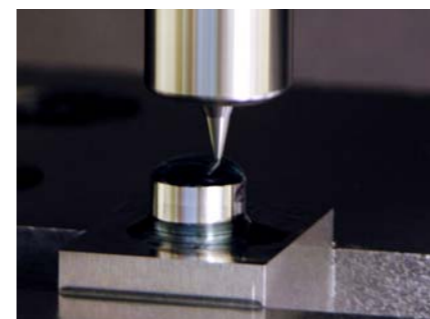**YASDA**

Higher accuracy produces greater profitability

YASDA MICRO CENTER

YMC 430 Ver.III

Linear Motor Drive

New technologies for micro high speed machining
targeting sub-micron accuracy
Reliable spindle and construction to avoid thermal distortion

YASDA

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YMC 430 Ver.III E

YASDA

Excellent high quality surface finish and superior high accuracy machining achieved

The best solution for the next generation of more sophisticated and diversified machining needs

EZ Operation

Self Diagnosis

OpeNe
Version 2.0

EdgeComputing

YMC 430
Ver.III

YASDA Micro Center YMC430 is the state-of-the-art high-end machine that answers the demand for ultra-high precision and high quality in the always advancing "high precision micro machining" fields. All-axis (X, Y, Z) controlled high-speed linear motor drives and highly rigid symmetrical frame structure as well as a thermal distortion stabilizing system that achieves consistent high-precision machining in long cycle time operation -- Ensuring unsurpassed, extremely high accuracy, the YMC430 provides the best solution that the times demand.

Beautiful high quality surface
Always consistent positioning accuracy
Submicron accuracy backed by years of accumulated technology
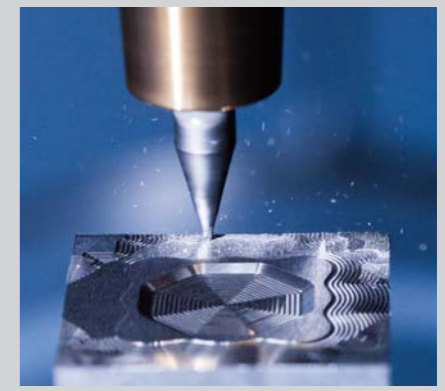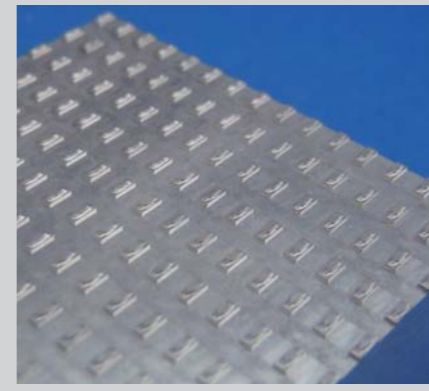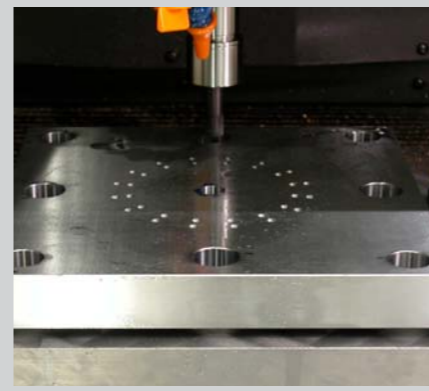
Symmetrical frame design offers high rigidity

High rigidity based on four-direction symmetrical H-shaped column and stability based on low center of gravity structure

Symmetrical H-shaped column

The highly rigid frame structure is representative of the YASDA machining center series. YMC430 adopts an innovative H-shaped column analogous to a double column design.
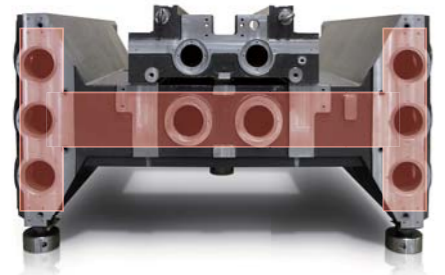
Symmetrically cylindrical spindle head

The spindle head adopts a cylindrical shape, symmetrical in the longitudinal and horizontal directions. This makes the spindle head less vulnerable to thermal deformation in the X- and Y-axis directions providing a greater degree of mechanical rigidity. Synchronized with the machine temperature, cooling fluid is circulated in the spindle head, allowing stable high-precision machining to be sustained over a longer period of time.
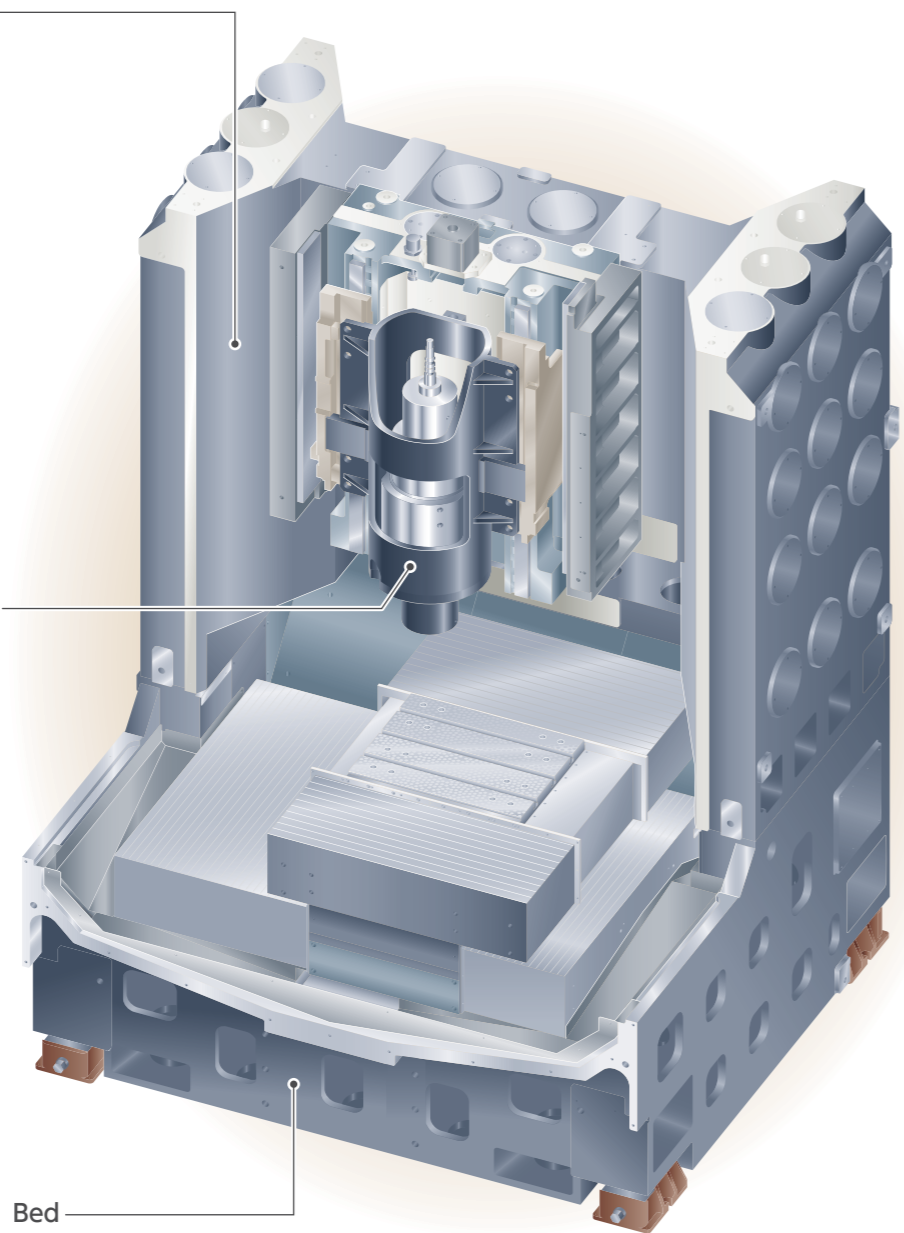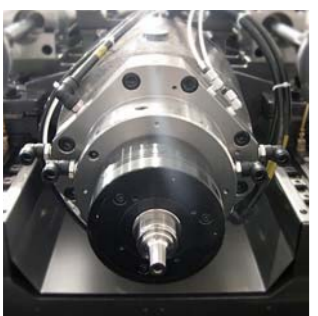
Bed

The sides of the bed are raised allowing for sufficient thickness. The integrated design with the column ensures further rigidity.

"Low Vibration" and "High Accuracy" achieved by the X-Y table

YASDA's pursuit for "infinitely flat" and "infinitely square" as well as adoption of linear motor drives has led to the development of the high-precision X-Y table

X-Y table

The moving element is mounted at a lower position of the bed center, and the light weight and low center of gravity design minimizes vibration caused by the reaction force during high-speed feeding. These mechanisms also contribute to high precision machining.

Ultra-precision linear guides

Adoption of ultra-precision linear guides significantly minimizes the effects from waving and improves assembly accuracy. Combined-adoption of these linear guides and linear motor drives realizes a high level of straightness and smoothness during axis feeding.

High-precision positioning

Two feedback scales mounted at the same height prevent any influence from temperature differences at the upper and lower level environment to accomplish high configuration accuracy.
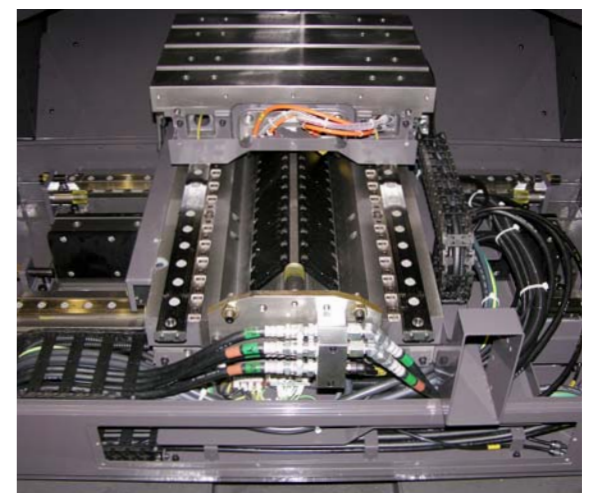
Straightness (Measured value)

	X	Y	Z
Horizontal direction	0.448μm	0.220μm	0.373μm
Vertical direction	0.124μm	0.088μm	0.464μm

* Measurement by a 100 mm optical flat

X axis Straightness in vertical direction（EZX） 0.124μm / 100mm

Y axis Straightness in vertical direction（EZY） 0.088μm / 100mm
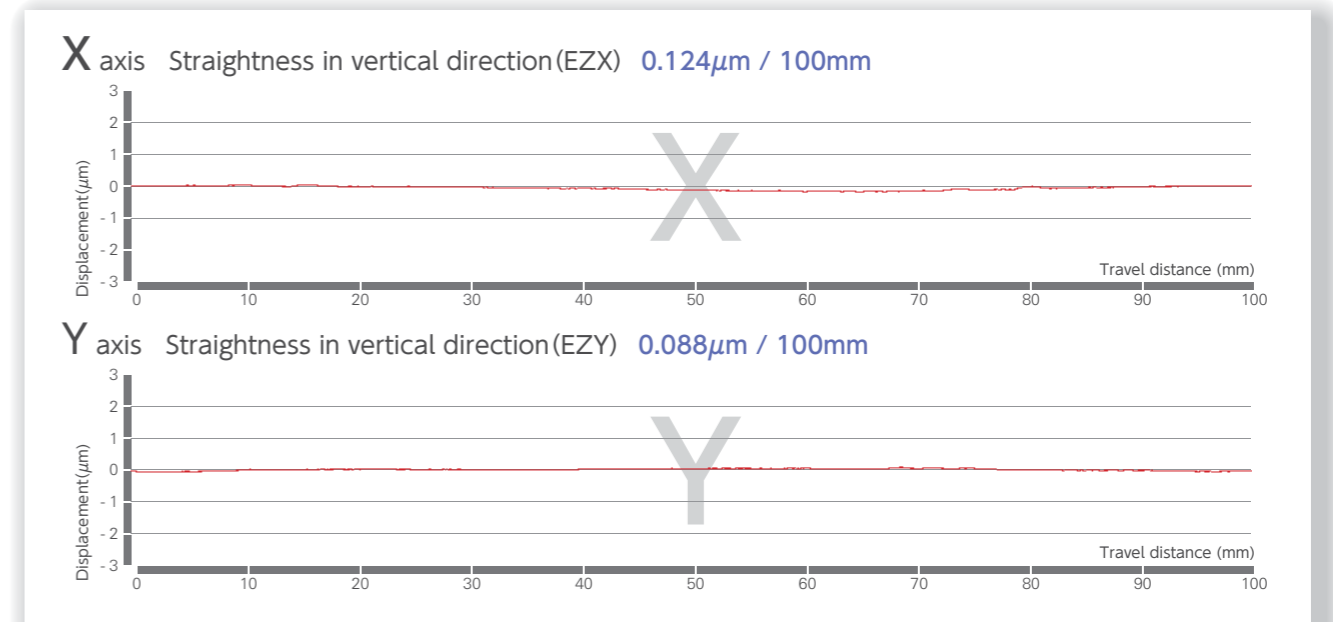
Spindle that produces high accuracy and high quality

Irrespective of the tool type or rotation speed, YASDA's spindle accomplishes stable, high-precision machining for longer periods of time

High stability

YASDA's 40,000 min⁻¹ spindle, developed to achieve low vibration and high reliability, has been assembled with high accuracy to accomplish constant, high-precision machining for long periods of time.
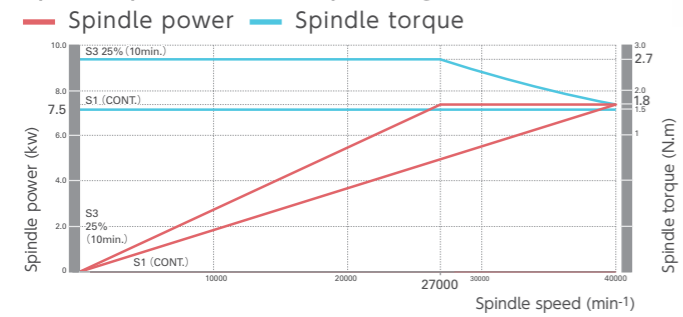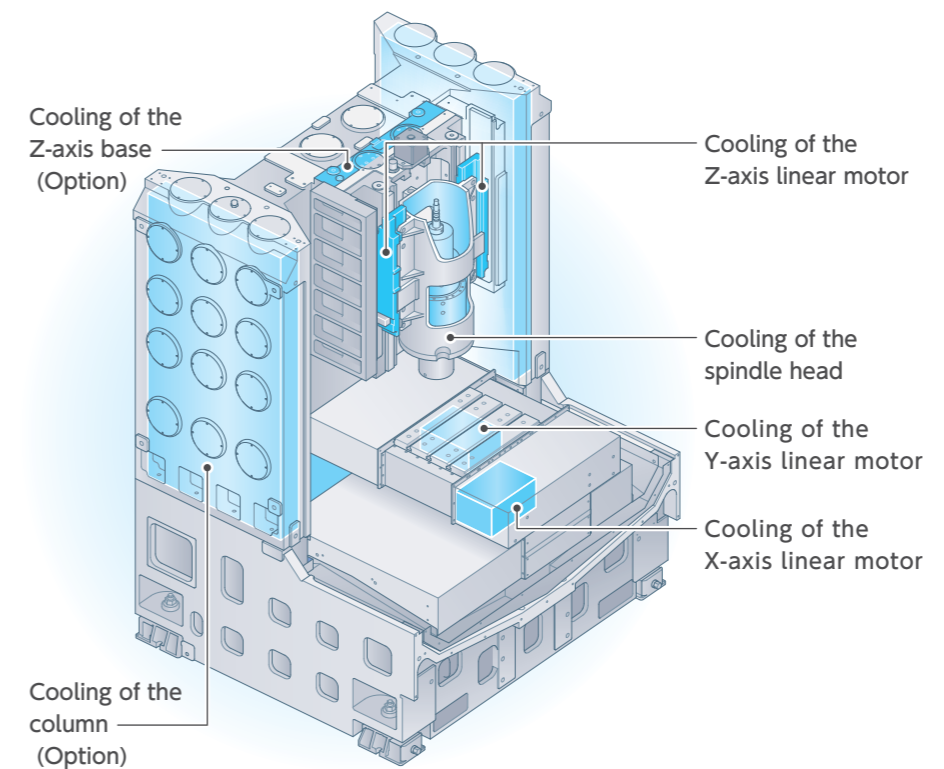
Spindle specification

Spindle speed range	200 ~ 40,000min⁻¹	Spindle drive motor	7.5kW (continuous)
Tool shank type	HSK-E32	Torque	1.8Nm (continuous)

Spindle power and torque diagram

— Spindle power　— Spindle torque

Positioning accuracy and circularity (Actual value)

Positioning accuracy

ISO 230-2 (1988)　　　　　　　　　　　unit (mm)

Accuracy : A	X	Y	Z
	0.0006	0.0009	0.0006

ISO 230-2 (2014)　　　　　　　　　　　unit (mm)

	X	Y	Z
Accuracy : A	0.0005	0.0006	0.0004
	X	Y	Z
Repeatability : R	0.0001	0.0001	0.0001

X-axis bidirectional positioning accuracy and repeatability

Motion performance data (X-Y axis)

Circularity: 0.60 μm

Advanced thermal distortion stabilizing measures cultivated from experience and technology

YMC430's thermal distortion stabilizing system for sustaining stable high-precision machining

Cooling of the Z-axis base (Option)

Cooling of the Z-axis linear motor

Cooling of the spindle head

Cooling of the Y-axis linear motor

Cooling of the X-axis linear motor

Cooling of the column (Option)

YMC430's thermal distortion stabilizing system

By circulating temperature-controlled heat exchange liquid through inside of the column and spindle head, the X-Y table, etc., YMC430 regulates thermal distortion of each axis for stable high-precision machining.

In particular, the column, due to the horizontally and vertically symmetrical H-shaped design, controls distortion caused by temperature change.

X- and Y-axis thermal distortion measurement　Measured value in full rotation range (~40,000 min⁻¹)

Thermal distortion offset invalid

Thermal distortion offset valid
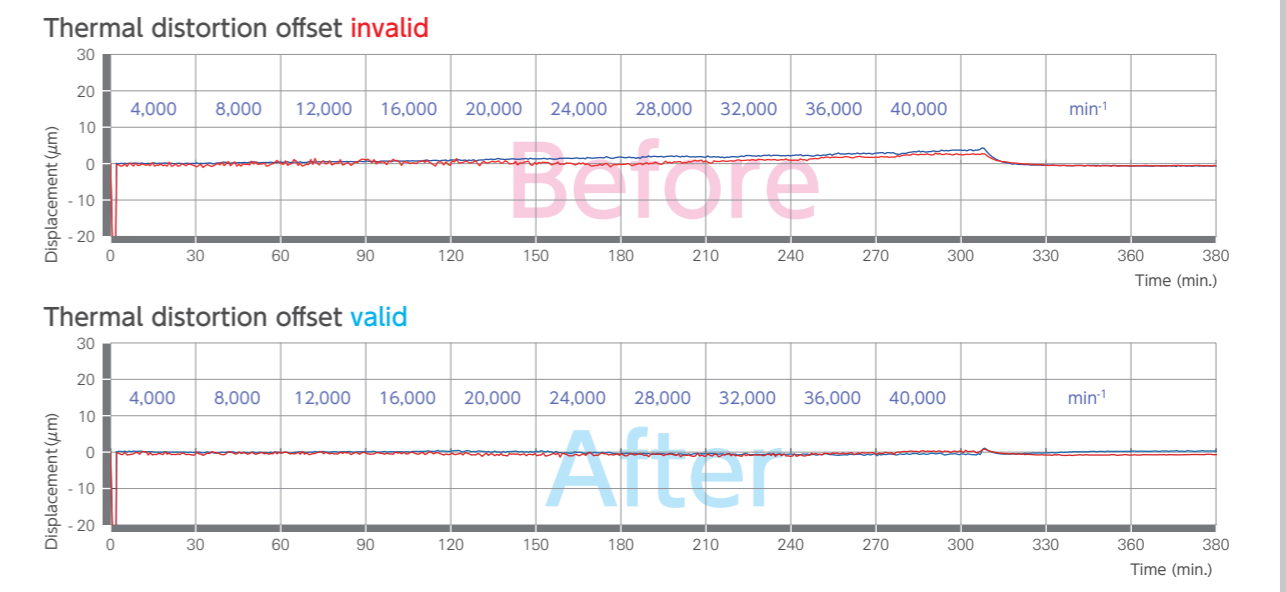
Easier User Interface

Operation and functionality are improved by new FANUC iHMI.

Touch-panel type 15-inch display mounted with FANUC iHMI

A large-sized display with touch panel and the OpeNe Version 2.0 provides intuitive operation.
The manual viewer makes the FANUC instruction manual and machine user manual appear on the display.

HAS-4 realizes higher speed and higher precision machining

YASDA's high-precision machining function HAS-4, essential for machining molds, has 5 basic modes (M300 to M304) including rough machining and finish machining.
It is possible to reduce machining time and improve machining accuracy by changing parameters such as acceleration/deceleration and tolerance according to machining purpose.
On the machining assist screen, it is possible to select from 5 basic machining modes and to finely adjust machining parameters for each mode according to machining conditions. It is also possible to select smoothing and other functions on the screen, thus allowing optimal conditions to be established according to each type of machining including 3D-shaped mold machining and 5-axis machining.
For HAS-4, machining time is reduced by eliminating the stop time between blocks and surface quality is improved by more finely controlling servo-control feedback signals.
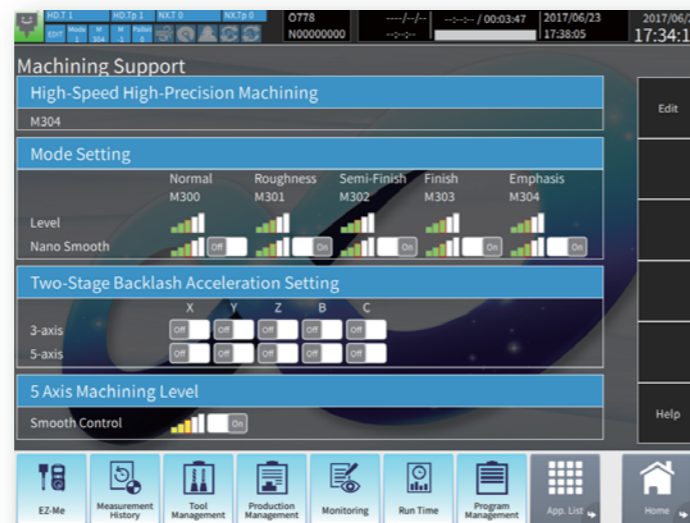
OpeNe serves as an intermediary between human and machine

Each function of OpeNe Version 2.0 provides the operator with complete details of the machine.

Edge Computing   Self Diagnosis

EZ Operation

Tool Information Management

On this screen, not only basic tool information but also associated tool information such as machining load and measurement history are collectively managed.
It is also possible to monitor spindle load in real time in comparison with past record data and check changes in same tool length and diameter.
It is also possible to set a tool selected on the screen into the spindle (tool change) and tool measurement operation in interactive mode from the screen without program instructions.

Production Control

On this screen, not only machine running information but also mechanical information such as load on each axis while running, workpiece coordinates and tool compensation values are displayed. It is possible, in case of machining failure, to carry out a follow-up check because various types of mechanical information are displayed on the same time axis as that of program progress graph. It is also possible to graphically display actual machine running status on a daily, weekly and monthly basis. Machine running status data can be utilized in Excel format.

Maintenance Management

On this screen, various data such as number of operations and running status of peripherals are automatically acquired and saved. Use of acquired data allows for planned and efficient maintenance and predictive maintenance on equipment. A check if current machine status is appropriate or not is carried out automatically by acquiring servo wave data and comparing it with past data.

Program Management

On this screen, machining time for any registered program can be easily calculated by simulation even while the machine is operating.
Knowing machining end time with accuracy enables optimal utilization of equipment and smooth production.

YASDA's machine option design details

Highly reliable automatic tool changer (ATC) unit
Comfortable operability with excellent usability
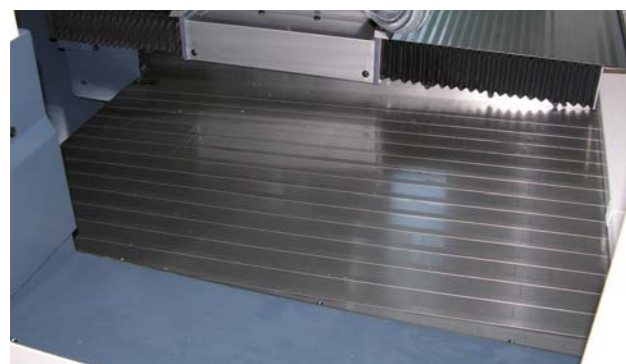
Armless automatic tool changer (ATC)

The ATC unit adopts an armless type automatic tool changer that exchanges tools by the tool magazine moving along its stroke. Since a large capacity, compact 90-tool ATC (option) that can contain as many as 90 tools occupies the same installation space as that for a standard ATC unit, it can be installed without expanding machine space.
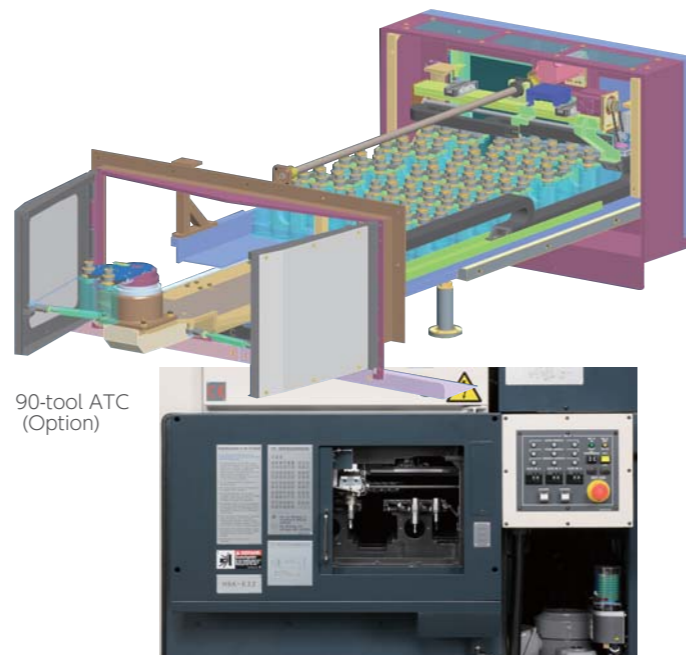
90-tool ATC (Option)

EZ-Me (Equipped with auto measuring system)

The EZ-Me easily performs work centering with the use of a manual pulse generator (MPG). The measurement accuracy is the same as the one obtained by automatic measurement.

Flat checker (Equipped with tool length/radius compensation and breakage sensor)

The flat checker is a system that performs repeated tool length measurement during high-speed spindle rotation, checks that there is no displacement in the Z-axis direction and automatically starts machining.

Improvement in maintainability

A tilted slide cover to improve cutting chip discharge capacity as well as a standard-equipped washing gun helps maintain a clean work environment. An automatic slideway lubrication system is also equipped as standard to improve maintainability.

Washing gun

Automatic slideway lubrication system

Spindle for advanced high surface quality machining Option

YASDA's all-new 80,000min^{-1} spindle realizes
an even higher level of micro and high surface quality machining.

Supreme Rotation Accuracy

The 80,000min^{-1} spindle adopts an aerostatic bearing with less heat generation and vibration. Compared to a high rotation spindle with ball bearing, the rotation accuracy of the new spindle is increased by 50%. This realizes a higher surface quality.

Specifications

Rotation Speed	1,500〜80,000mm^{-1}
Tool Holder Type	HSK-E25
Spindle Drive Motor	2.3kW
Spindle Torque	0.3N·m

Reduced Thermal Distortion

Thermal distortion in the X and Y-axis directions caused by heat generation during high-speed rotation is one of the biggest factors in micro machining errors. Compared to existing spindles, the spindle construction that reduces thermal distortion by one-third and proven compensation software provided for this new spindle are adopted. By combining these two features, the new 80,000min^{-1} spindle realizes stable high accuracy machining.

※Consider the following points when choosing this option
· We recommend using a shrink type holder with high balance that can rotate at high speed when machining with this spindle.
· This spindle requires high quality compressed air of the grade 4.6.3. (JIS B 8392-1:2003/ISO 8573-1:2001)

YASDA's original runout controlling function

Even a small imbalance of the tool holder may cause vibration of the spindle and lead to amplification of tool runout during high speed rotation. This amplified tool runout may degrade surface quality. YASDA has created a new function for the tool length and radius measurement device "Dyna-Line" that reduces tool runout by arranging the phase of the holder in order to automatically minimize the imbalance caused by the spindle and holder. By minimizing the tool runout with this runout controlling function, YASDA's new spindle realizes high surface quality and longer tool life. (Patent pending)

Laser measurement of tool length and diameter
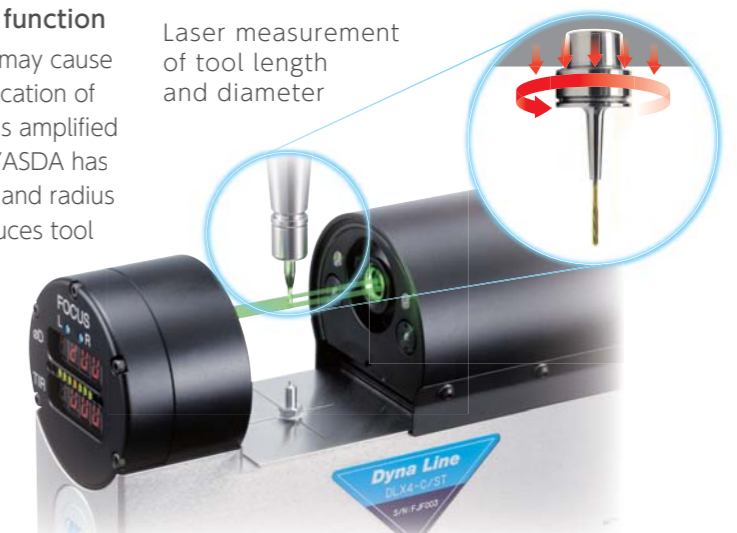
## Mounted tilting rotary table supports 5-axis machining `Option`

YASDA's tilting rotary table realizes highly accurate 5-axis machining.

RT10

The high-precision, micro machining center YMC430 is equipped with a DD (Direct Drive) motor-driven, high-precision tilting rotary table. This combination enables multi-face indexing/machining as well as simultaneous 5-axis machining which requires high traceability, without re-chucking. Adoption of a DD motor to a tilted axis and a rotary axis has also realized backlash-free, high-speed, high-precision positioning.
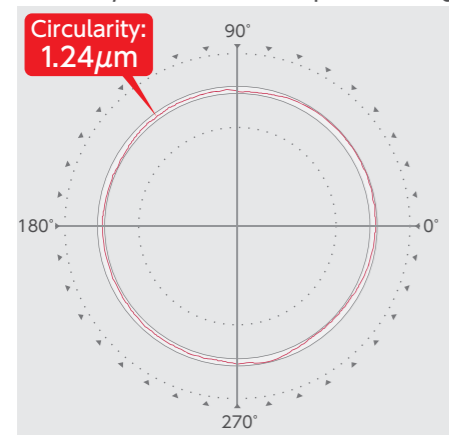

Helical gears of DIN grade 4 achieved.
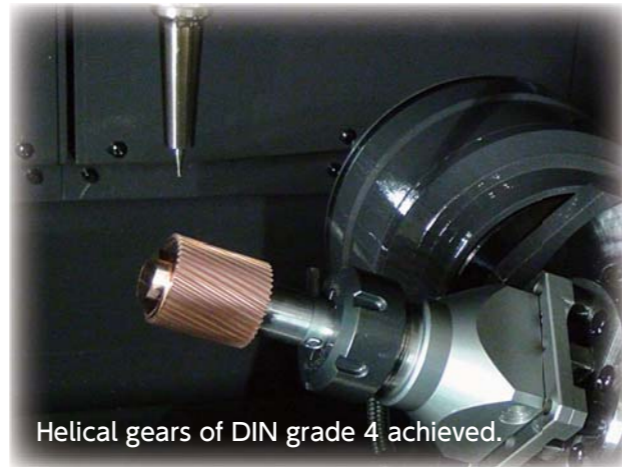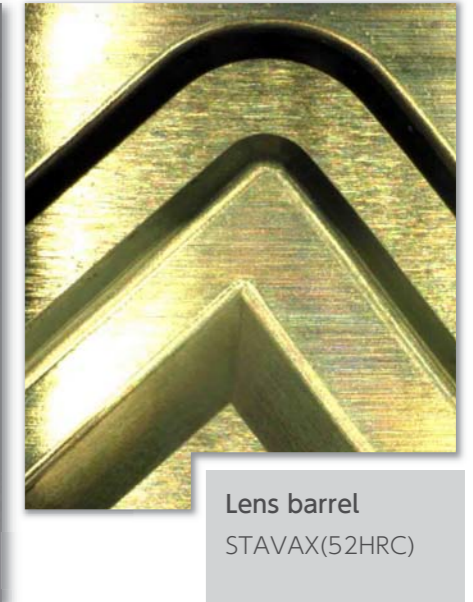
Rotary axis indexing accuracy

(Measured value)
ISO 230-2(1997)

Accuracy : A	B	C
	0.95 sec	1.19 sec

Circularity of tilted cone shape machining

Circularity: 1.24μm

C-axis bidirectional positioning and repeatability

Error (sec) vs Machine position (deg.)
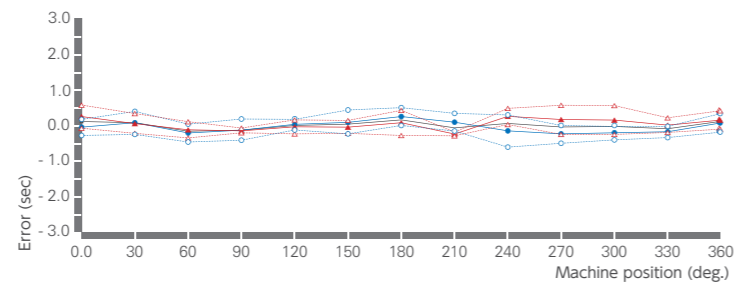
Various chucking systems

System 3R macro chuck

EROWA ITS-100 chuck
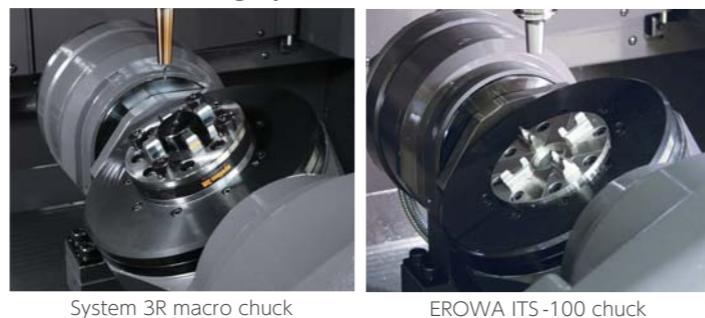
i-CAL rotation center calibration function (Equipped with RT10 and auto measuring system)

With the use of the "YASDA auto measuring system," the i-CAL rotation center calibration function calculates the table rotation center coordinates, feeds the coordinates back to the NC, and promotes further high-precision 5-axis machining.

Machining sample

Lens barrel
STAVAX(52HRC)

Punch
HAP(60HRC)

Pull-top (punch die)
CEMENTED CARBIDE (85HRA)

YMC 430 Ver.Ⅲ SPECIFICATIONS
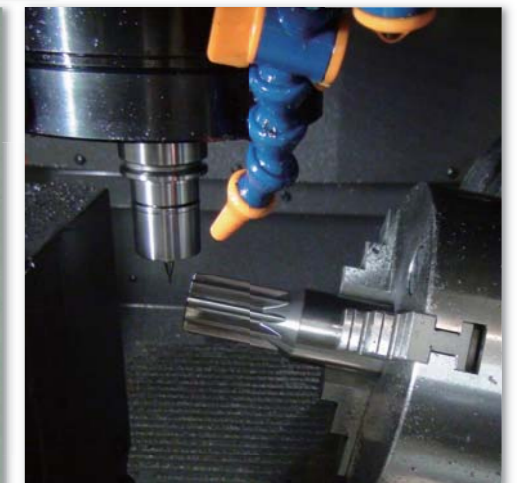
1. Base machine specifications

1) Travel	X-axis travel (Cross movement of table)	420mm
	Y-axis travel (Longitudinal movement of table)	300mm
	Z-axis travel (Vertical movement of spindle head)	250mm
	Distance from table surface to spindle nose face	
		150~400mm
2) Spindle	Spindle speed range	200~40,000min⁻¹
	Spindle drive motor	7.5 kW AC (Continuous)
	Spindle taper	HSK-E32
3) Table	Table working surface	600mm×350mm
	Table loading capacity	100kg
	Table surface configuration	3T-slots, width 14 mm H7,
		pitch 100 mm
4) Feed rate	Rapid traverse rate	20,000mm/min
	Cutting feed rate	Max. 5,000 mm/min
	Least input increment	0.0001mm
5) ATC	Tool shank type	HSK-E32
	Tool storage capacity	32tools
	Maximum tool dia. / length / mass	φ50mm /120mm /500g
6) Mass of machine		Approx. 8,000kg
7) Electric power requirement		26kVA
8) CNC unit		FANUC 31i-B5

2. Standard equipment

1) Optical scale feed back	0.0001 mm
2) Washing gun	1 (Operator position),
	Standard tank capacity: 110 L
3) Splash guard	Manual door with roof and one LED light
4) Spindle thermal displacement compensation	Standard data
5) OpeNe Version 2.0	

3. CNC standard options

1) Least input/travel increment	0.0001mm
2) Display	15"LCD touch panel with iHMI
3) Program storage length	1280 m (512 KB)
4) Custom macro	Common variable: 600
5) Number of registerable programs	1000
6) Automatic corner override	
7) Tool offset pairs	64 pairs
8) Tool offset memory	Memory C
9) Extended part program editing	
10) Memory card/USB memory interface	Data input/output
11) Background editing	

4. Optional equipment

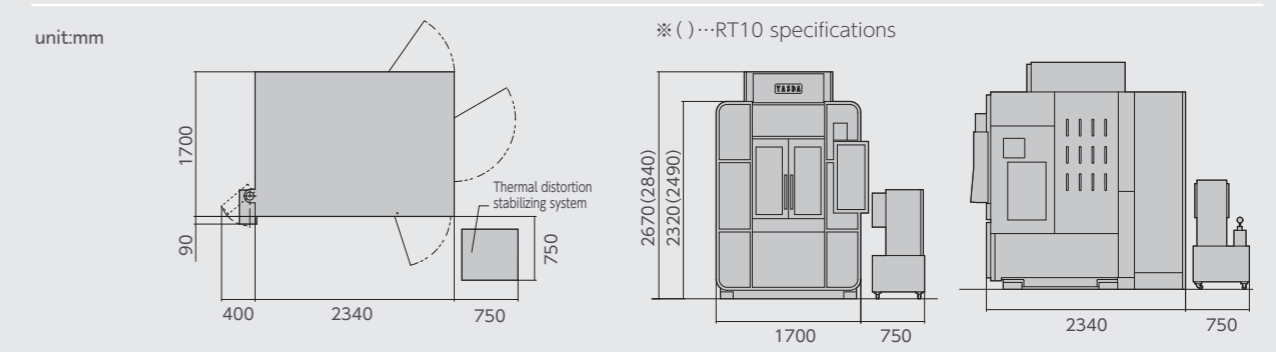|	
1) Spindle speed range, Spindle taper hole	1,500~80,000mm⁻¹(HSK-E25)
2) Number of additional stored tools	90 tools
3) Signal tower (Multilayer signal lamp)	Red, yellow, green (Flashing)
4) Cutting liquid temperature control unit	
5) External mist coolant	Manufactured by Bluebe / 2 nozzles
6) Oil skimmer	Oil Pure
7) Cutting oil unit (AA type)	2 nozzles
8) Mist collector	Mistresa
9) Automatic tool length compensation and tool breakage sensor Manufactured by BLUM/NT-H type	
10) Automatic tool length compensation and tool breakage sensor Manufactured by BIG Daishowa / Dyna Vision Pro	
11) Automatic tool length compensation and tool breakage sensor Manufactured by BIG Daishowa / Dyna Line	
12) Automatic measuring system Manufactured by Renishaw / Touch probe OMP400	
13) High-speed machining function (YASDA HAS-4 system) Maximum feed rate 12,000 mm/min	
14) Thermal distortion stabilizing system	With weekly timer
15) Weekly timer	
16) Spindle thermal displacement compensation	Individual data
17) AWC door	
18) Robot interface	Compatible with System 3R and EROWA

5. CNC Options

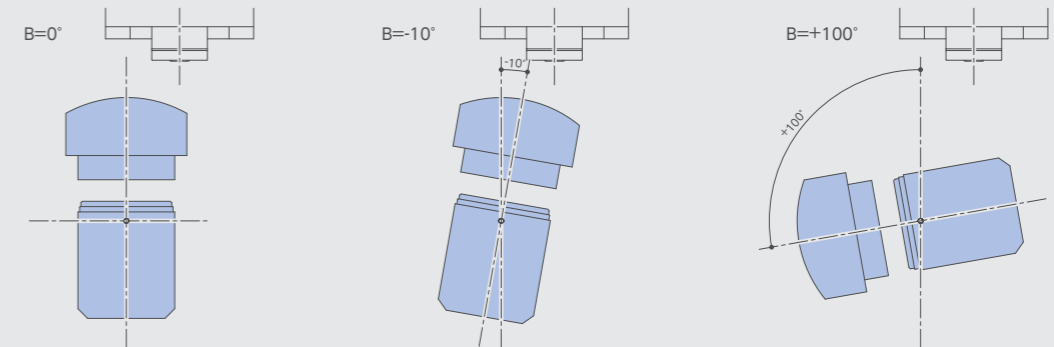|	
1) Part program storage	Total: 1 MB, 2 MB, 4 MB, 8 MB
2) Extensional number of registerable programs	Total: 2,000, 4,000
3) Helical interpolation	G02, G03
4) Conical/spiral interpolation G02, G03 (Helical interpolation is required.)	
5) Inch/metric conversion	G20, G21
6) Scaling	G50, G51
7) Coordinate rotation	G68, G69
8) Programmable mirror image	G50.1, G51.1
9) Rigid tap	M29 (G84, G74)
10) Optional block skip	Total: 9
11) Tool offset pairs	Total: 99, 200, 400, 499, 999 sets
12) Addition of workpiece coordinate	48 sets, 300 sets
13) Tool management	
14) Normal direction control	G40.1, G41.1, G42.1
15) Cs contouring control	
16) High-speed smooth TCP	G43.4, G43.5
17) Tilted working plane command with guidance	G68.2, G69, G53.1
18) Work setting error compensation	G54.4 Pn
19) Ethernet function	FOCAS2/Ethernet
20) Data server function	Fast data server, Capacity: 1GB, 2GB, 4GB, 16GB

RT 10 SPECIFICATIONS

YASDA

RT10 main specifications

1) Table rotational axis travel (C-axis)	360 deg. (Continuous)
2) Table tilting axis travel (B-axis)	−10~100deg.
3) Distance from tilting axis center to spindle nose face	80~330mm
4) B-axis maximum rotation speed	100min⁻¹
5) C-axis maximum rotation speed	200min⁻¹
6) Chucking system	System 3R macro chuck EROWA ITS-100 chuck
7) Table loading capacity	15kg (20Nm)
8) Maximum swing diameter	φ250mm
9) Least input increment	0.0001deg.

YMC430 Ver.III OUTLINE

unit:mm

※( )…RT10 specifications

Thermal distortion stabilizing system

RT10 DIMENSION

B-axis tilting range

B=0° B=−10° B=+100°

Maximum workpiece dimensions

Machine zero point (Y=+175)
Machine zero point (Z=0)
Y-axis travel
Z-axis travel
Pallet (Example)
(Left) System 3R: 3R-601.7E-P
(Right) EROWA: ER-008519
Workpiece weight Up to 15 kg (20 Nm)
Table surface