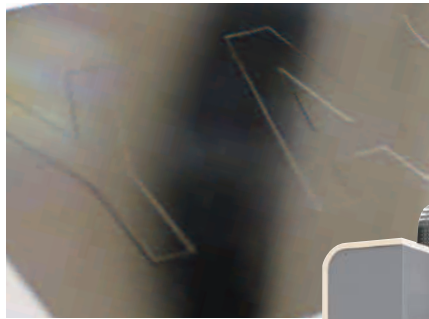
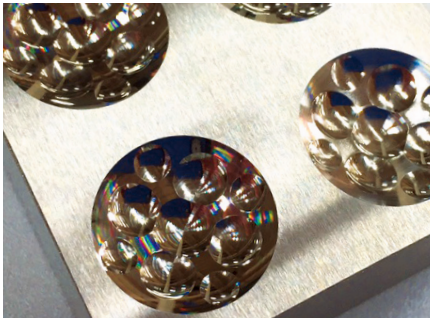


Higher accuracy produces greater profitability

YASDA MICRO CENTER

YMC 650



Linear Motor Drive

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



YMC 650

Renewed human machine interface (HMI) and OpeNe Version2.0 software connect human and machine, adaptable to a wide range of micro and high precision machining.

New human machine interface (HMI) and upgraded OpeNe Version2.0 software connect human and machine, adaptable to a wide range of micro and high precision machining.

YASDA Micro Center YMC650 is a cutting edge high-end machine which allows a wide range of high accuracy and surface quality machining. It inherits the features of YASDA's bestselling machine YMC430 and at the same time, has expanded strokes. To deliver highly accurate and long hour machining, all necessary elements such as the linear drive on all axes and measures against thermal displacement are implemented on a highly rigid machine body. In addition, upgraded YASDA OpeNe software provides intuitive control, self-diagnosis and analysis in a simple format. YMC650 will open a new field of micro and high precision machining.



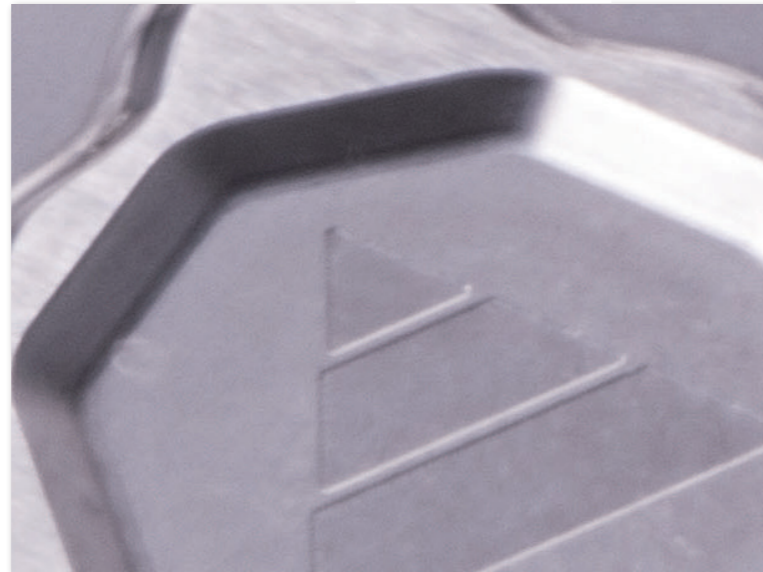
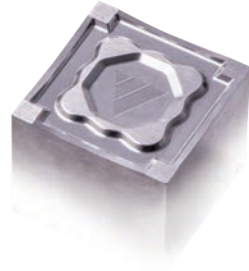
Dimples

Mirror Finish
STAVAX(52HRC)



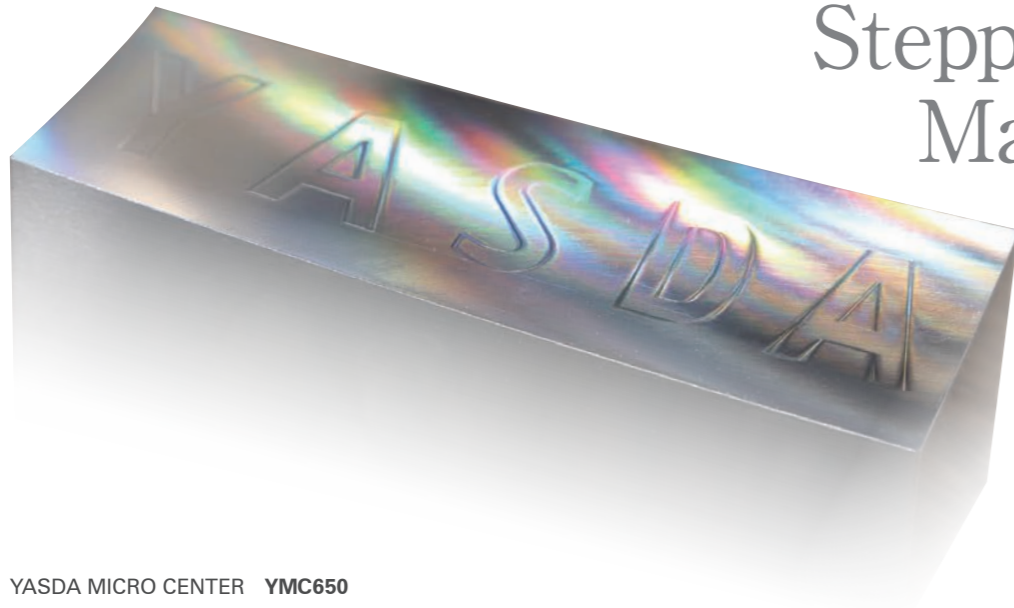
Indexable Tool

CARBIDE(93HRA)



Stepped level Machining

Mirror Finish
STAVAX(52HRC)



A new-generation high-end machine moving forward with the times

Outstanding performance raising high-precision micromachining to the next stage with improved usability



OpeNe
Version 2.0

A newly-designed HMI (Human Machine Interface) provides not only improved visibility, but the adoption of a touch panel realizes intuitive operational feel comparable to a smartphone with data selection, etc., reducing the burden on the operator.

Edge Computing



OpeNe Version 2.0 integrates correction information, measurement information, axis specific information, etc., during operation. Appropriate sharing of this information by operators, administrators and higher-order equipment allows on-site interoperability to be improved.

Self Diagnosis

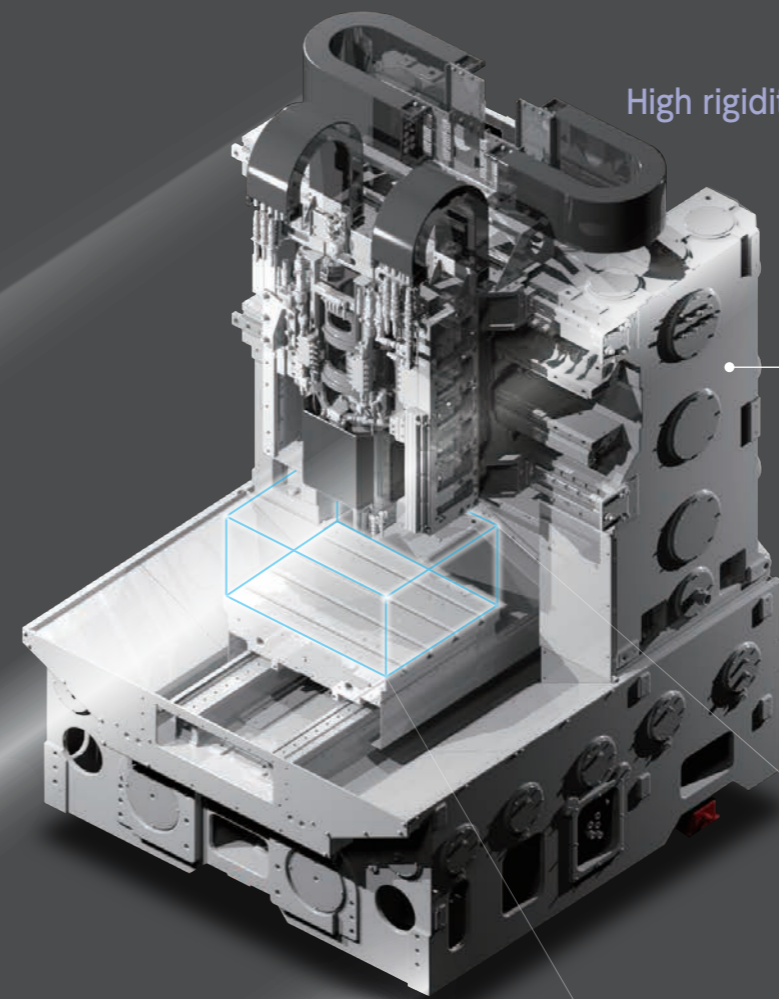


Further advanced self-diagnosis function closely monitors any change in running status and axis information. This function generates cautions and warnings based on efficient and appropriate diagnosis results using YASDA's original monitoring algorithm, not by relying on add-on equipment.



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



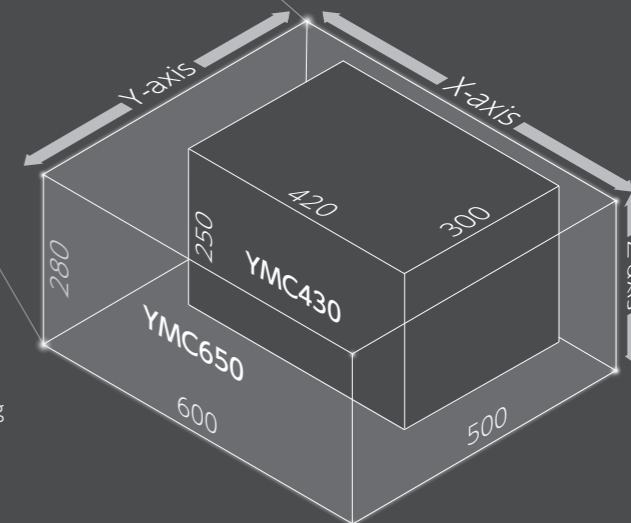
Super rigid machine structure

High rigidity is necessary even for a machine specializing in micro machining. This super rigid machine structure allows high servo gain and highly responsive control of the machine by increasing resonant frequency.

The super rigid machine frame is composed of a rigid box shaped column and bed which are thoroughly analyzed by FEM and firmly assembled on carefully hand scraped mating faces.

Supporting the need for larger workpieces in micromachining

Inheriting the higher micromachining capabilities already achieved with the YMC430 while enlarging the working area.

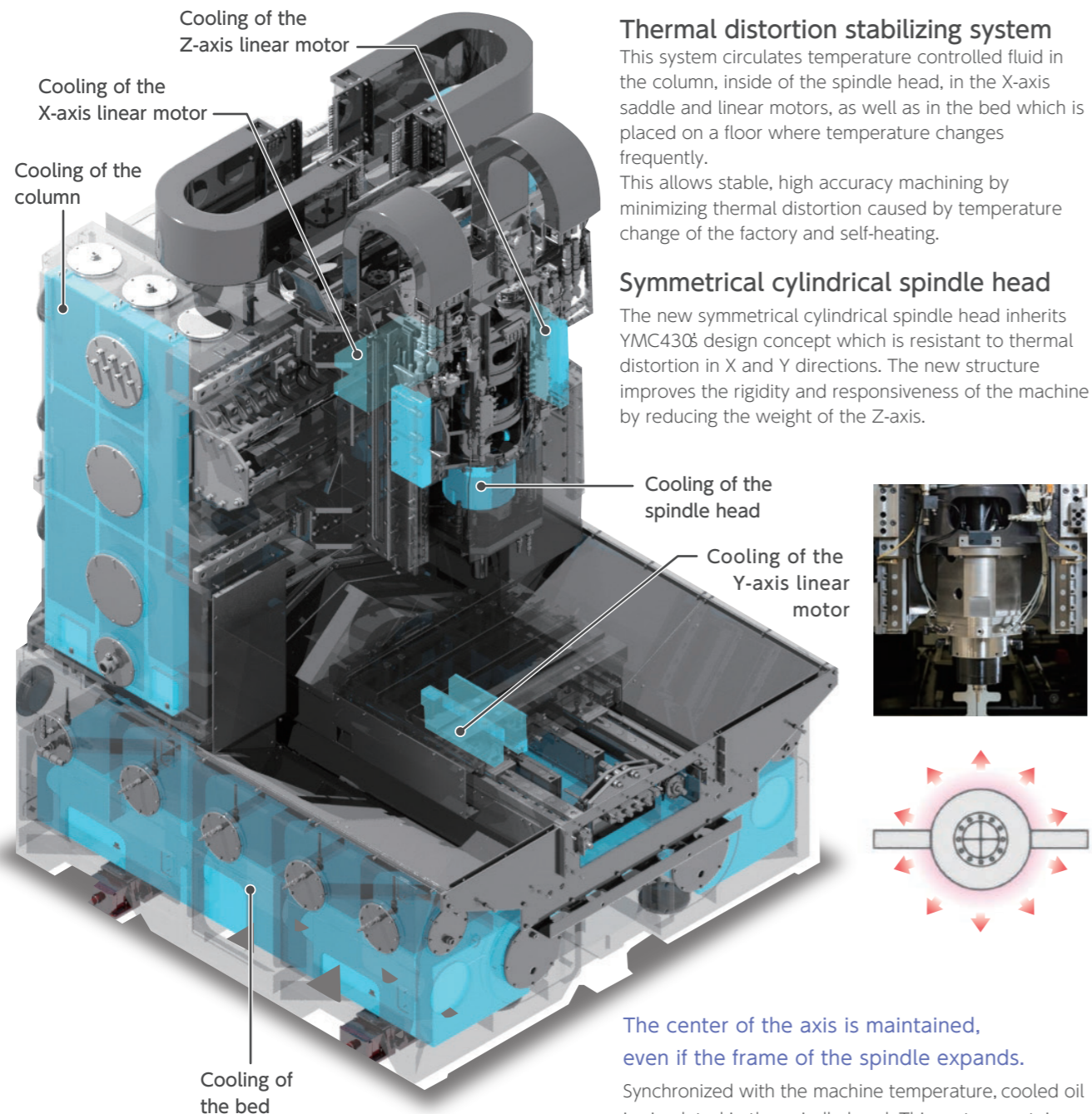


Machine specification

Travel (X/Y/Z)	600/500/280mm	Cutting feed rate	12,000mm/min
Table working surface	700x550mm	Drive system	All axes controlled by linear motor drives.
Table loading capacity	200kg	Least input increment	0.01 μm
Rapid traverse rate	20,000mm/min	Scale feedback of all axes	0.001 μm

Advanced thermal distortion stabilizing measures cultivated from experience and technology

YMC650's thermal distortion stabilizing system for sustaining stable high-precision machining



Thermal distortion stabilizing system
 This system circulates temperature controlled fluid in the column, inside of the spindle head, in the X-axis saddle and linear motors, as well as in the bed which is placed on a floor where temperature changes frequently. This allows stable, high accuracy machining by minimizing thermal distortion caused by temperature change of the factory and self-heating.

Symmetrical cylindrical spindle head
 The new symmetrical cylindrical spindle head inherits YMC430's design concept which is resistant to thermal distortion in X and Y directions. The new structure improves the rigidity and responsiveness of the machine by reducing the weight of the Z-axis.

The center of the axis is maintained, even if the frame of the spindle expands. Synchronized with the machine temperature, cooled oil is circulated in the spindle head. This system sustains high precision machining over a long period.

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

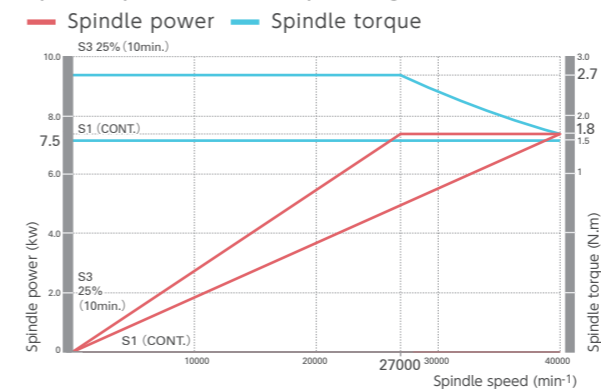
High stability

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.

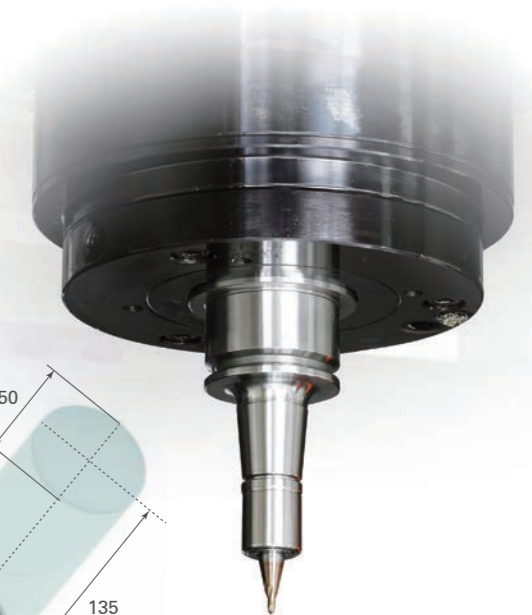
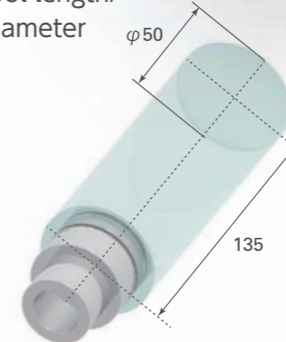
Spindle specification

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

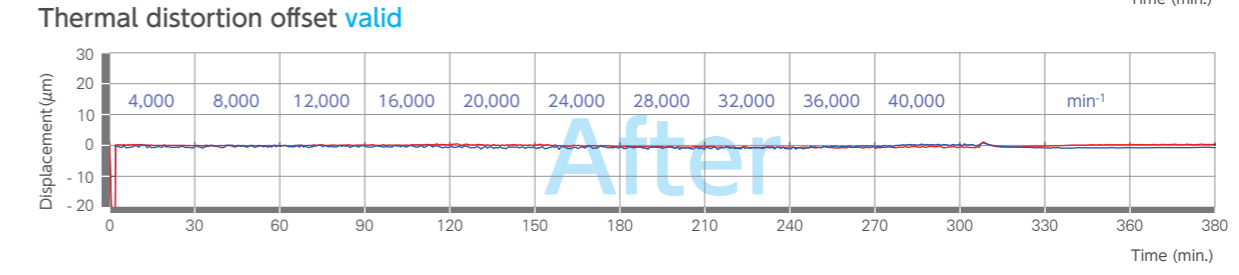
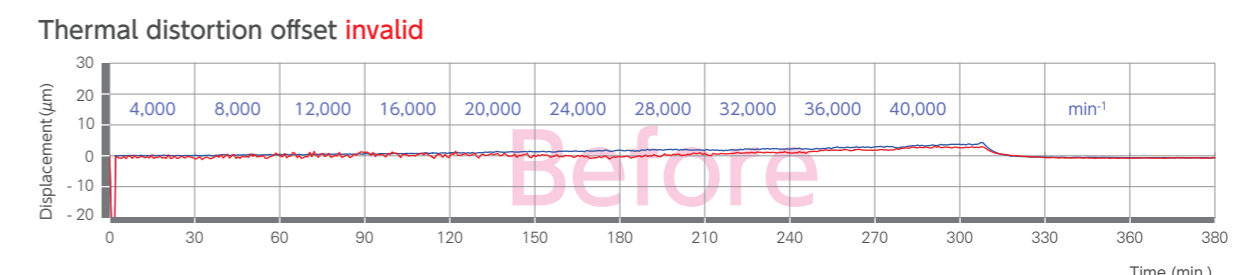
Spindle power and torque diagram



Maximum tool length/diameter



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



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 OpenNe Version 2.0 provides intuitive operation. The manual viewer makes the FANUC instruction manual and machine user manual appear on the display.

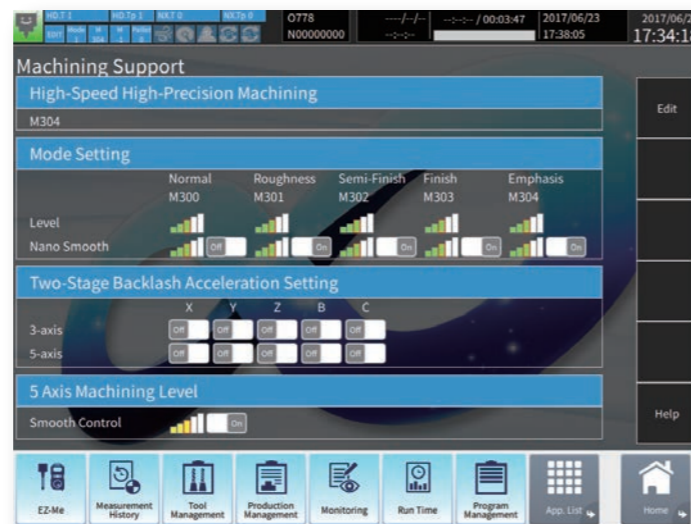


HAS-4 realizes higher speed and higher precision machining

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.



High stability achieved by all-axis controlled linear motor drives

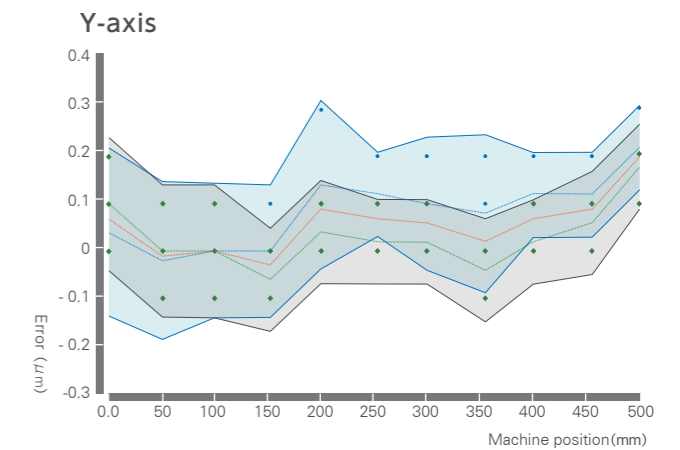
YASDA's pursuit for "infinitely flat" and "infinitely square"

High-precision positioning

ISO 230-2 (1988)		unit (mm)		
Accuracy : A	X	Y	Z	
	0.0009	0.0007	0.0005	

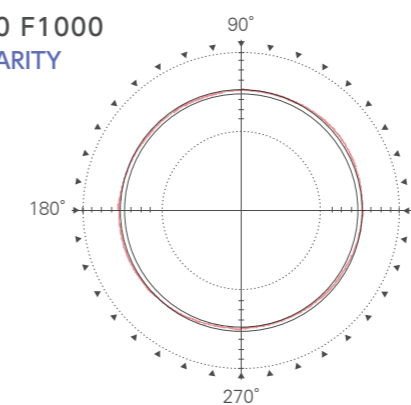
ISO 230-2 (2014)		unit (mm)		
Accuracy : A	X	Y	Z	
	0.0008	0.0006	0.0004	
Repeatability : R	X	Y	Z	
	0.0002	0.0003	0.0003	

Positioning accuracy



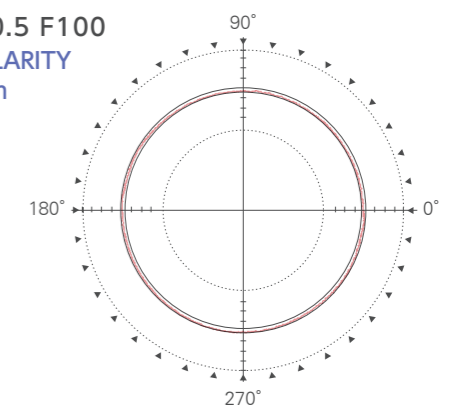
Motion performance data (X-Y axis)

X-Y R50 F1000
CIRCULARITY
0.98 μ m

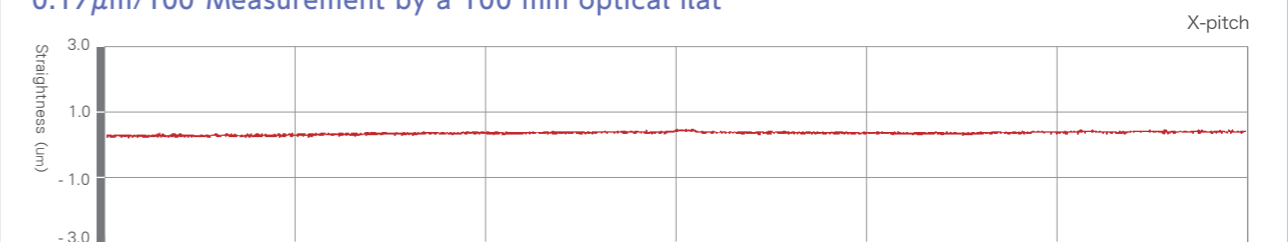


KGM Grid Encoders

X-Z R0.5 F100
CIRCULARITY
0.55 μ m



X axis Straightness in vertical direction (EXZ) 0.17 μ m/100 Measurement by a 100 mm optical flat



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.



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.

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.

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.

Program Management



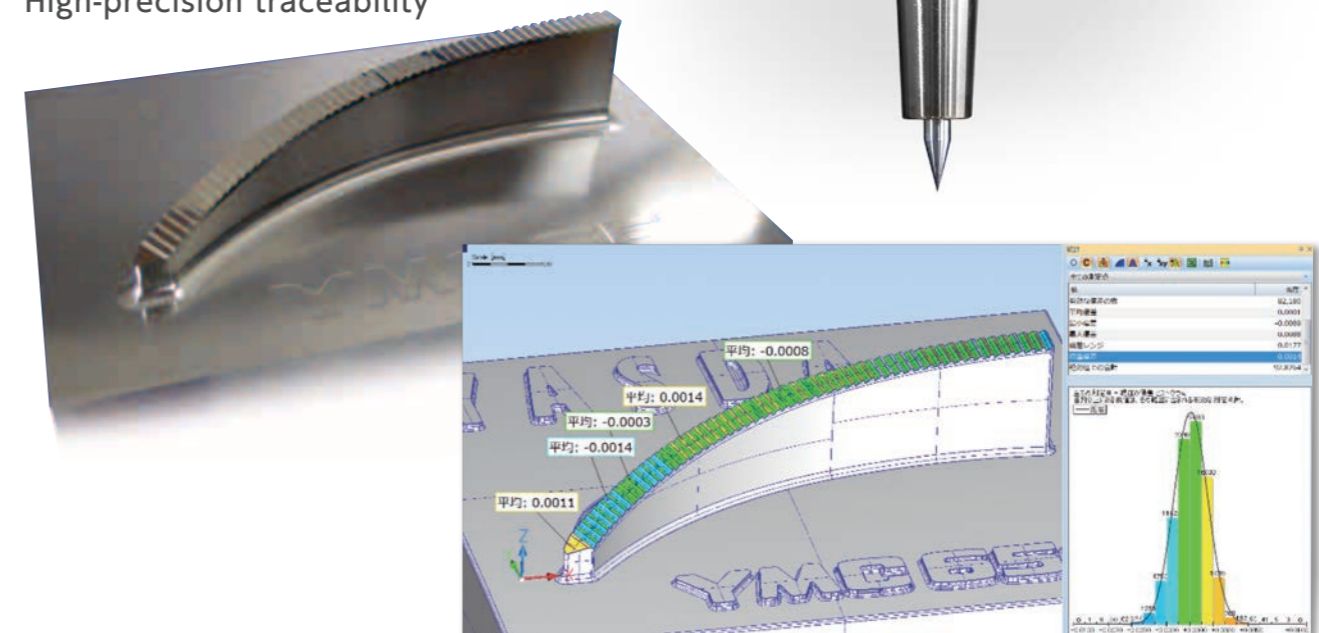
On this screen, machining time for any registered program can be easily calculated by simulation even while the machine is operating. Knowing machining end time with accuracy enables optimal utilization of equipment and smooth production.

High Precision Application

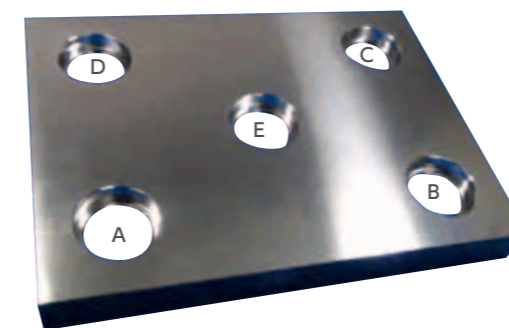
Handles various types of machining from 3D micro machining to high precision parts machining



High-precision traceability



Excellent positioning accuracy



Measuring point	X coordinate value (error)	Y coordinate value (error)	Pitch accuracy (error)
A	-70.0003 (-0.0003)	-45.0000 (+0.0000)	A-B 140.0009(+0.0009)
B	70.0006 (+0.0006)	-45.0000 (+0.0000)	C-D 140.0011(+0.0011)
C	70.0008 (+0.0008)	45.0001 (+0.0001)	A-D 90.0002(+0.0002)
D	-70.0003 (-0.0003)	45.0002 (+0.0002)	B-C 90.0001(+0.0001)
E	0	0	

Additional 2 axis supports precise 5-axis machining Option

YASDA's tilting rotary table, realizing highly accurate 5-axis micro machining of larger work.

RT20

- The high precision micro machining center, YMC650 equipped with a DD(Direct Drive) motor-driven high precision tilting rotary table.
- By having a new larger table surface, RT20 can hold a workpiece up to $\phi 330\text{mm}$

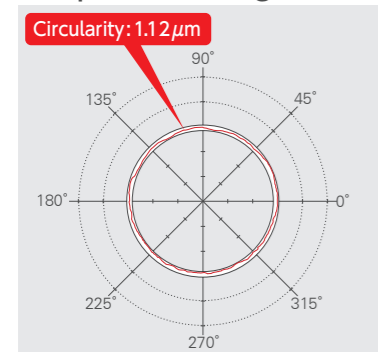
Rotary axis indexing accuracy

ISO 230-2 (1997) unit(sec)

Accuracy : A	B	C
	1.20	1.12



Circularity of tilted cone shape machining



RT20 main specifications

Table tilting(B-axis)	-10 ~ 100deg
Table rotation(C-axis)	360deg (Continuous)
Distance from tilting axis center to spindle nose face	175 ~ 455mm
B/C-axis maximum rotation speed	100min ⁻¹
Pallet loading capacity	35kg (including pallet)
Minimum input increment	0.00001 deg
Chucking system	EROWA power chuck(ER-029436) system 3R macro magnum(3R-SP26712)



EROWA power chuck P

Additional 1 axis supports precise 4-axis machining Option

YASDA's 1 axis rotary table realizes highly accurate 4-axis machining.

RS20

- Adoption of a DD (Direct Drive) motor offers high speed and high-precision positioning.
- Enables multi-face indexing machining as well as highly accurate simultaneous 4-axis machining.

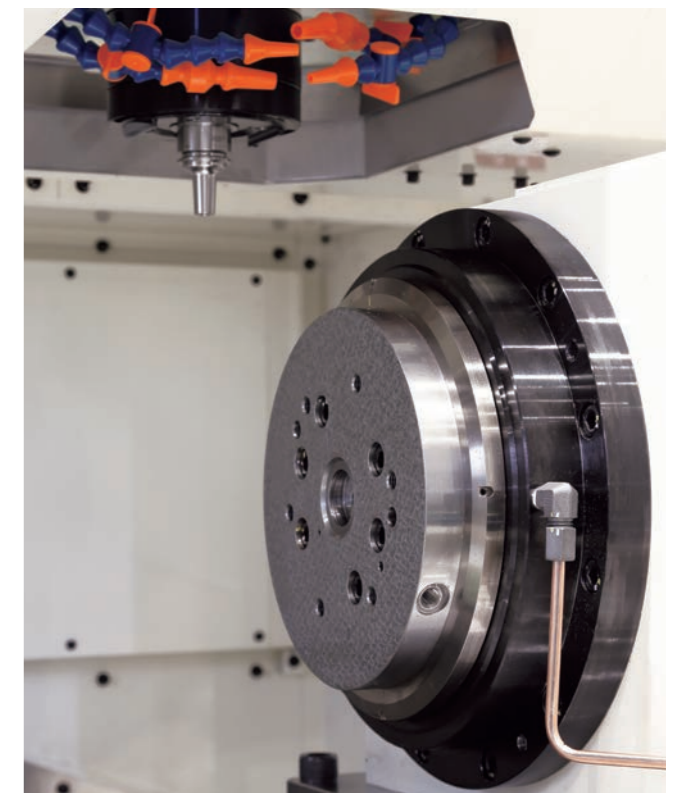
Rotary axis indexing accuracy

(Measured value)
ISO 230-2(1997)

Accuracy : A	0.99sec
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RS20 specifications

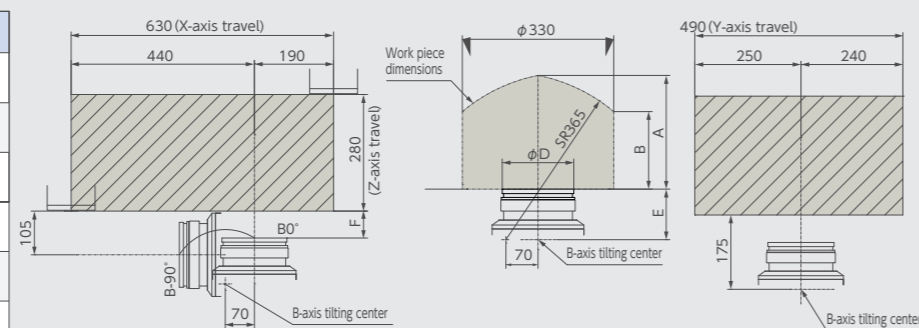
Table diameter	$\phi 200\text{mm}$
Table surface configuration	4 T-slots x 90 degree pitch Slot width:12mm H8 (standard)
Table center hole diameter	$\phi 30\text{mmH7}$ (Depth:10mm)
Table rotational axis travel	360° (Continuous)
Rotary table Max. rapid feed rate	150min ⁻¹
Loading capacity	40kg
Min.input	0.00001 deg
Height up to table center	200mm



DIMENSION

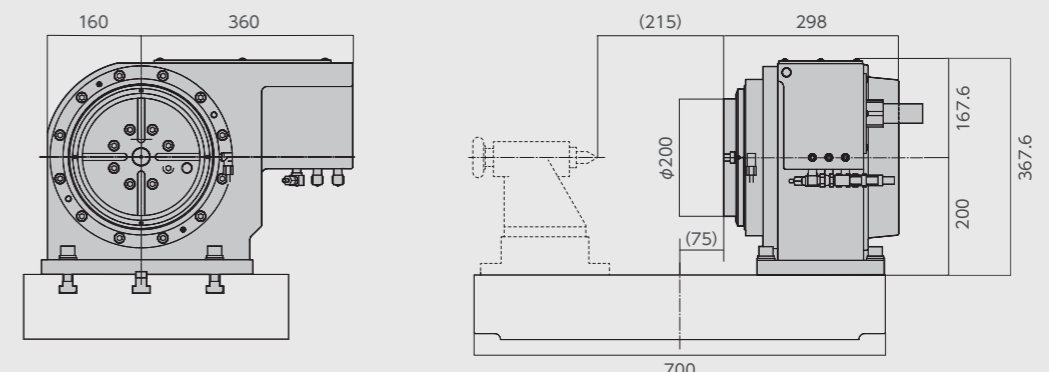
Each chacking system's dimensions

	EROWA	system 3R
Workpiece dimensions	Pallet	ER-041912 3R-681,156-A
	A	242 247
	B	163 168
Table dimensions	ϕD	148 156
	E	116 110.3
	F	59 64.7



OUTLINE

unit:mm

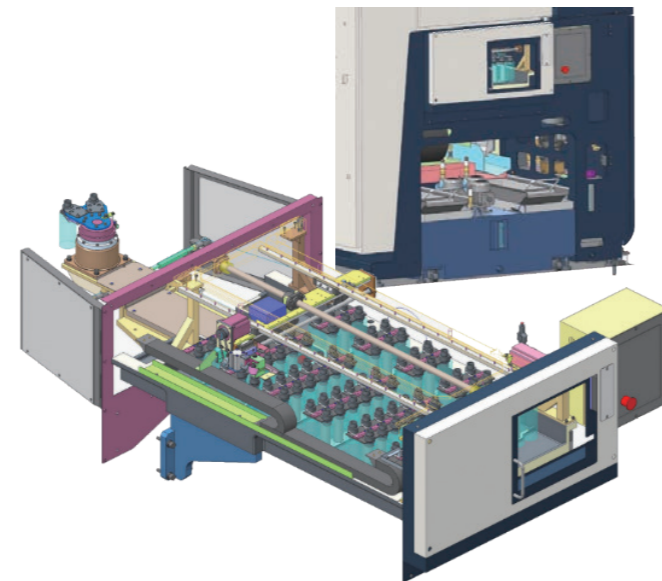


32 tool-ATC (standard)

The ATC unit adopts an armless type automatic tool changer that directly changes tools by tool magazine moving along its stroke. A 90-tool ATC (optional), which has a larger capacity, requires virtually the same installation space as the 30-tool ATC. Therefore, the 90-tool ATC can be installed without increasing the machine space.

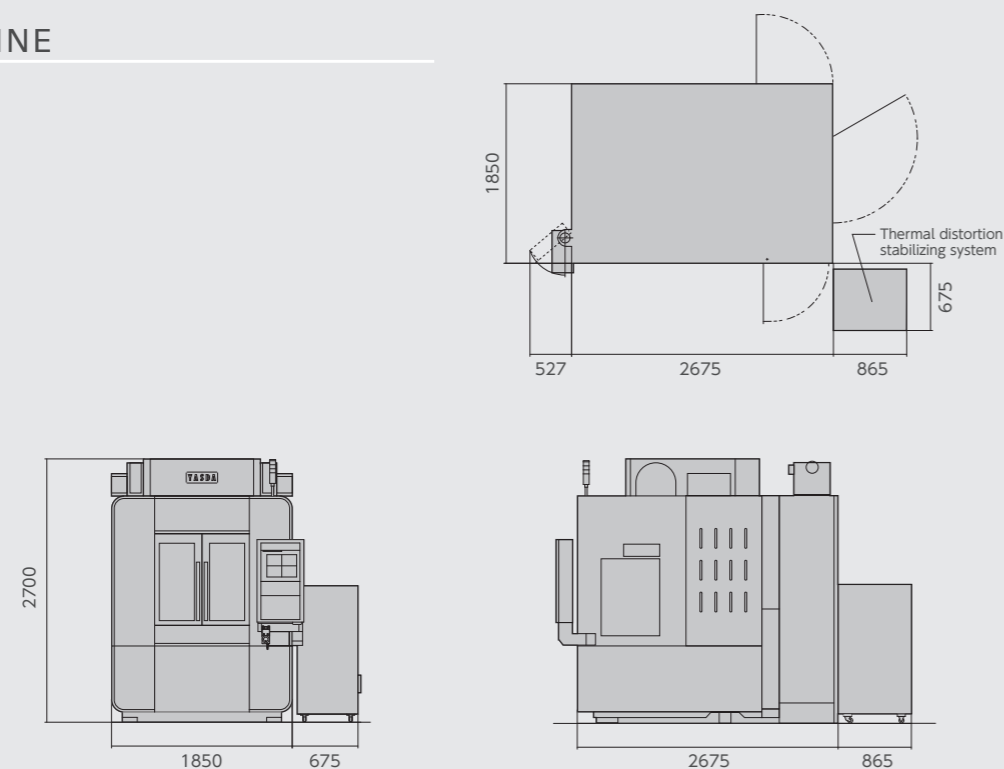


90 tool-ATC (optional)



OUTLINE

unit:mm



1. Base machine specifications

1) Travel	X-axis travel	600mm
	Y-axis travel	500mm
	Z-axis travel	280mm
	Table to spindle nose distance	135~415mm
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 size	700mm×550mm
	Loading capacity	200kg
	Table surface configuration	4T-slots, width 18 mm H8, pitch 125 mm
	Table surface configuration	4T-slots, width 18 mm H8, pitch 125 mm
4) Feed rate	Rapid feed rate	20,000mm/min
	Cutting feed rate	Max. 5,000 mm/min
	Min. input increment	0.00001mm(0.01μm)
	Min. input increment	0.00001mm(0.01μm)
5) ATC	Tool shank type	HSK-E32
	Tool storage capacity	32tools
	Maximum tool dia. / length / mass	φ50mm / 135mm / 500g
6) Mass of machine	Approx. 9,000kg	
7) Electric power capacity	30kVA	
8) NC unit	FANUC 31i-B5	

2. Standard equipment

1) Optical scale feed back X-,Y-,Z-axes	0.000001mm(0.001μm) command compliant
2) Washing gun	1 (Operator position), Standard tank capacity: 200 L
3) Splash guard	Manual slide door with ceiling cover, 1 LED light
4) Compensation for spindle thermal displacement	Standard data
5) OpeNe Version 2.0	

3. CNC standard options

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

4. Optional equipment

1) Number of additional stored tools	90tools
2) Signal tower (Multilayer signal lamp)	Red,yellow,green(Flashing)
3) Coolant temperature controller	
4) External mist coolant	Manufactured by Bluebe / 2 nozzles
5) Oil skimmer	Oil Pure
6) Coolant unit (AA type)	2 nozzles
7) Mist collector	Mistresa
8) Tool measurement & Tool breakage detection system	NT-H(by BLUM)
9) Tool measurement & Tool breakage detection system	Dyna Vision Pro(by BIG Daishowa)
10) Tool measurement & Tool breakage detection system	Dyna Line(by BIG Daishowa)
11) Automatic workpiece measuring system	Touch prove OMP400(by Renishaw)
12) High-speed machining function (YASDA HAS-4 system)	Max.12,000mm/min
13) Thermal distortion stabilizing system	With weekly timer
14) Weekly timer	
15) Compensation for spindle thermal displacement	Individual data
16) AWC door	
17) 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) 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 pairs
12) Addition of workpiece coordinate pair	48pairs,300pairs
13) Tool management function	
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



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