YASDA

Higher accuracy produces greater profitability

YASDA CNC JIGBORER

YBMVi40 Ver.II

MOLD & DIE MILLER

Thermal Distortion Stabilizing System
High-performance Spindle with Preload Self-adjusting System

YASDA

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Catalog No.YBMVi40 V2 E-01
Printed in Japan **.Dec.2017

YBMVi40 Ver.II E

Aiming to be the top in the vertical 5-axis machine market

Unrivaled high precision machining capability for high hardness/
high surface quality molds
Our flagship machine bundled with new software advances us to the next stage

YBM Vi40 Ver.II

The demand for high precision 5-axis machining of complicated shape components and high hardness/high surface quality molds is increasing.
The “YBM Vi40 Ver. II” equipped with high rigidity and high precision BC axis on the Y-axis realizes excellent controllability and damping performance by minimizing differences in mass of movable bodies on each axis as much as possible and sets movable bodies with a large mass to a lower center of gravity.
This demonstrates tremendous machining capability that complements YASDA’s flagship vertical 5-axis machine.

EZ Operation

HMI (Human Machine Interface) creates an intuitive operational feeling just like a smartphone.

OpeNe Version 2.0

Self Diagnosis

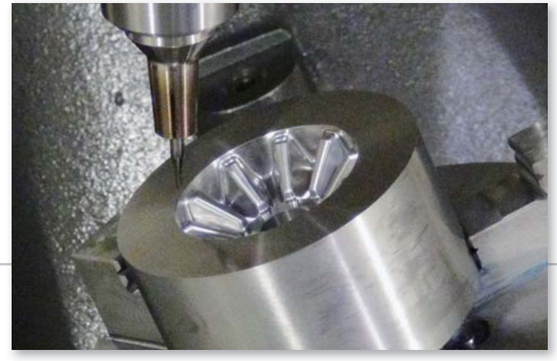
Proprietary monitoring algorithms ensure appropriate diagnosis results without inefficiency or waste of time.

EdgeComputing

Collects a variety of information during operation.
Realizes advanced interoperability.

The Highest Accuracy

YASDA’s 5Axis CNC JIGBORER

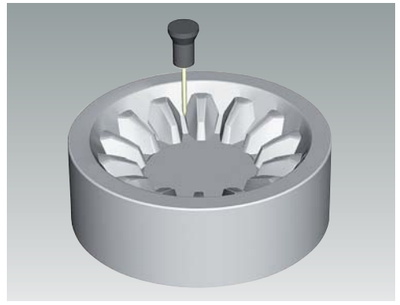


Advantage of 5-axis machining and Applications
Realizing high-precision and high surface quality required for die and mold manufacturing field by use of 5-axis machining technology

- 3+2 axes machining
  （3 axes simultaneous machining by fixing the index angles of B/C-axes.）
- 4+1 axes machining
  （4 axes simultaneous machining by fixing the index angle of B-axis.）

General 3-axis machining

Longer machining time due to longer cutter length to the bottom of workpiece and more delicate in cutting conditions to achieve high surface quality.



R1 ball end mill for finishing

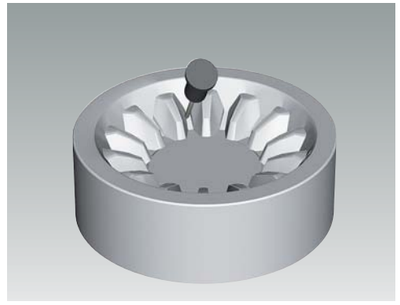
- Required under neck length is 25mm.
- Required projection length from holder is 35mm.
- Cutting feed rate: 400mm/min or less
- Surface roughness: Ra 0.90μm

Machining time is reduced to approximately one-fifth

Productivity largely increased

Index 5-axis machining

By tilting workpiece, cutter length is minimized thus surface quality is improved and machining time is reduced.



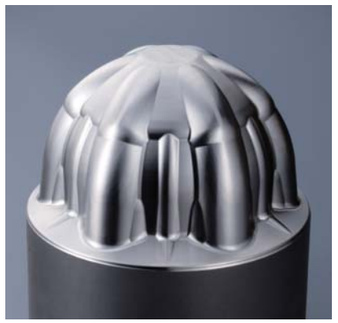
R1 Ball end mill for finishing

- Required under neck length is 5mm only.
- Required projection length from holder is 19mm only.
- Cutting feed rate: 2000mm/min
- Surface roughness: Ra 0.25μm

Application examples

By adopting the basic structure of the existing 3-axis machine, YBM Vi40 Ver.II offers the same level of cutting performance.
In combination with 5-axis machining, this machine also demonstrates superior milling performance of high hardness materials with complicated shapes which are difficult to machine by 3-axis machines.

Bevel gear forging die for trucks



CVJ(Constant-velocity joint) punch for automobiles

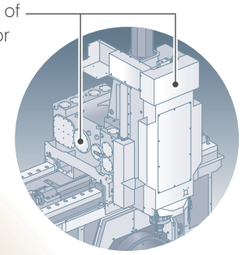
Construction of YBM Vi40 Ver.II

Framework structured in highly rigid symmetric bridge type

The highly rigid integrated bridge structure dominates the field of ultrahigh precision and heavy cutting

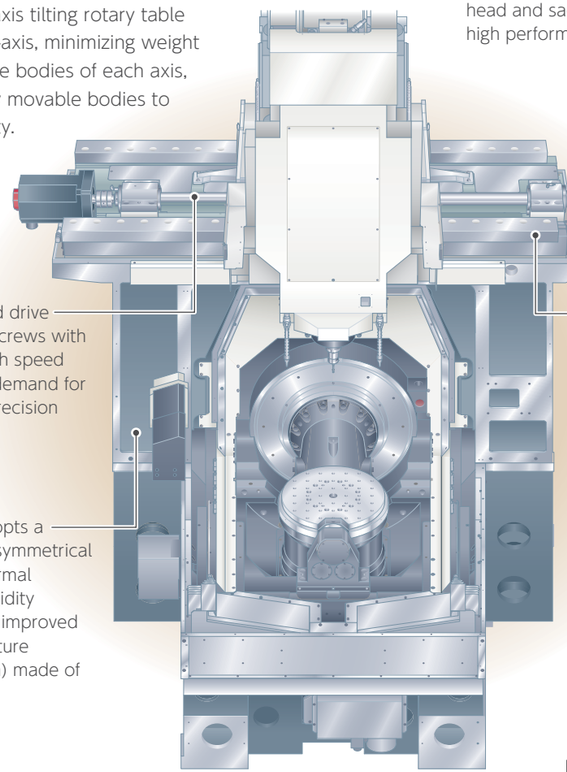
Equipped with a highly rigid and high-precision B / C-axis tilting rotary table unit is mounted on Y-axis, minimizing weight differences in movable bodies of each axis, and setting the heavy movable bodies to lower center of gravity.

Optimized weights of head and saddle for high performance.



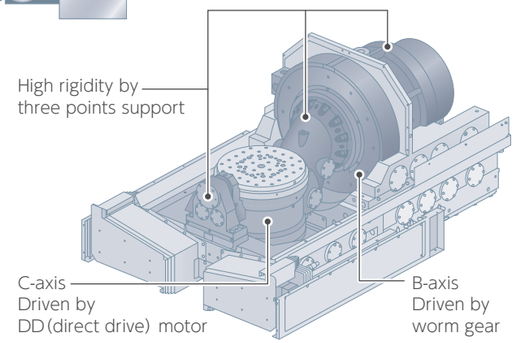
With a highly rigid feed drive system adopting ball screws with large diameter and high speed interpolation control, demand for high-speed and high-precision machining is fulfilled.

Highly precise guide ways fastened with straightness of 2μm or less.



The machine body adopts a bridge type thermally symmetrical structure with less thermal displacement. High rigidity performance is further improved by a single-piece structure (column and top beam) made of high grade cast-iron.

The in-house built highly rigid worm gear mechanism with high reduction ratio is used for tilting B-axis, which stabilizes the machine against tremendous changes in tilting moments depending on the position and heavy cutting loads. The B-axis is supported by bearings in 3 points, especially front side of the main support uses dia.400 mm of cross taper roller bearing, and helps improve control performance in reverse motion.
Direct drive motor is used for rotary C-axis, which is less influenced by disturbance and cutting force. By using DD (Direct Drive) motor in C-axis, highly accurate positioning without mechanical backlash is achieved.

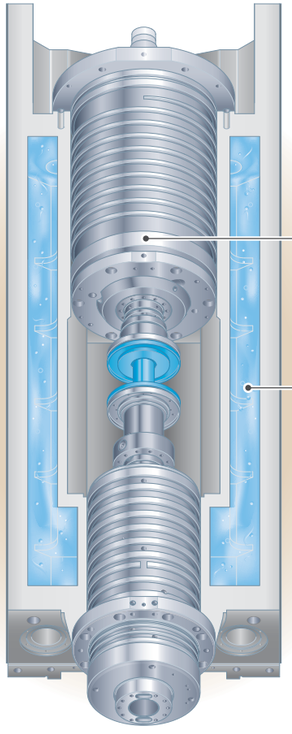


YASDA's original mechanism enabling stable high quality machining

The preload self-adjusting spindle that machines at high degree of accuracy through whole speed range

(MODEL:SAtype)

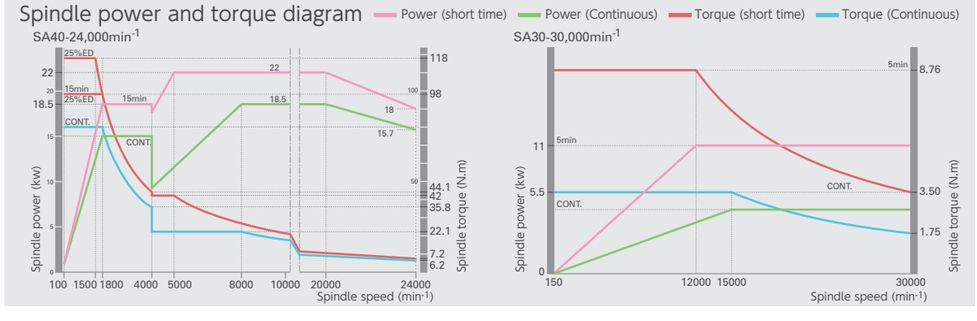
With a conventional fixed-position preload type spindle, as preload increases along with heat generation of the bearing by high speed spindle rotation, the initial preload is set very low. This method, however does not satisfy the requirement for spindle rigidity.
The "preload self-adjusting spindle" developed by YASDA is equipped with a mechanism that applies a large preload at low speed rotation, and the preload is adjusted in accordance with the amount of heat generation of the spindle bearing at high speed rotation. Accordingly compatibility during heavy-duty cutting within a low-speed range with low heat generation and high-precision rotation within a high-speed range can be achieved.
With this function, heavy-duty cutting, high-speed cutting of highly hardened steel and machining by a helical end mill that generates a thrust-reversing force can be performed with high precision.



Direct Drive System
The preload self-adjusting spindle and the spindle drive motor are connected co-axially by a diaphragm coupling, in order to achieve high precision rotation of the spindle throughout the full speed range of the spindle.

Spindle motor
YASDA spindle motor employs a two coil changeover type winding, and helps high torque drive at both of high and low spindle speeds.

Spindle head
Thermal distortion stabilizing system
The spindle head and saddle of the machine contain the largest heat generating parts such as spindle, spindle motor and feed motor.
This is why machining centers suffer from thermal distortion which can easily result in inconsistent machining accuracy.
YASDA' s design prevents such distortion by circulating heat exchange fluid throughout the spindle head, controlling the temperature of spindle head following the sensor for reference room temperature.

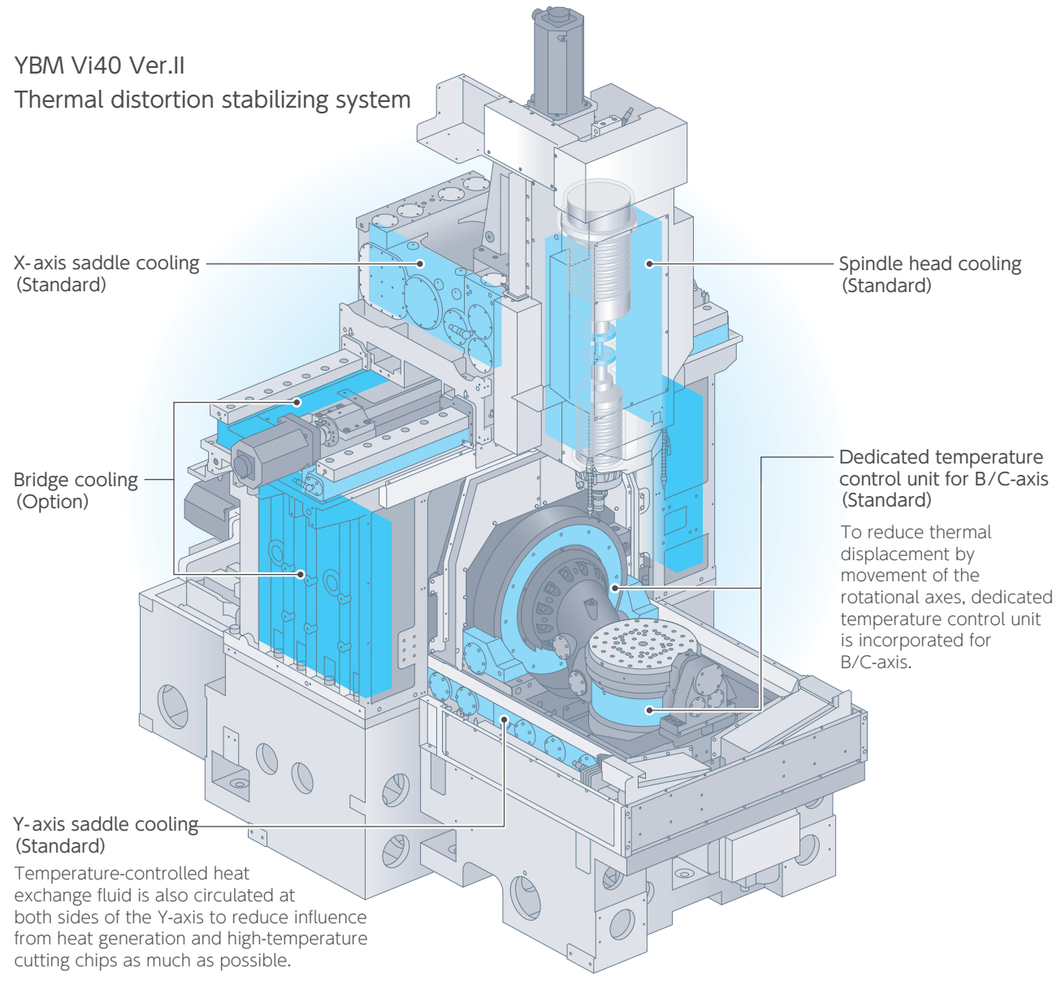


Advanced measures against thermal displacement

Thermal distortion stabilizing system that helps assure highest accuracy during a long time running

To achieve high-precision 5-axis machining, having center positions of two rotational axes constantly at a fixed position in air is very important.
By circulating temperature-controlled oil through machine body, thermal displacement of each axis is minimized thus stable high-precision machining is realized.

YBM Vi40 Ver.II
Thermal distortion stabilizing system



Easier User Interface

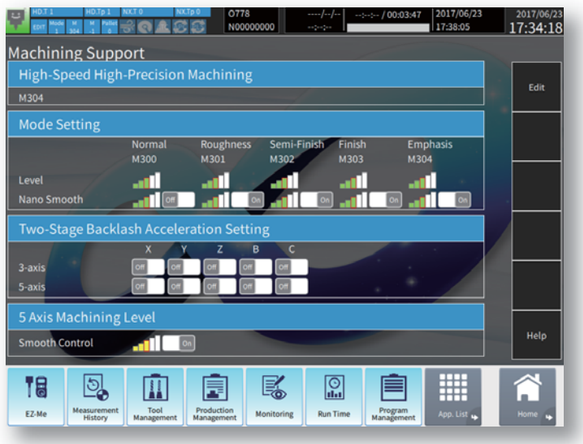
Operation and functionality are improved by new FANUC iHMI

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.

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

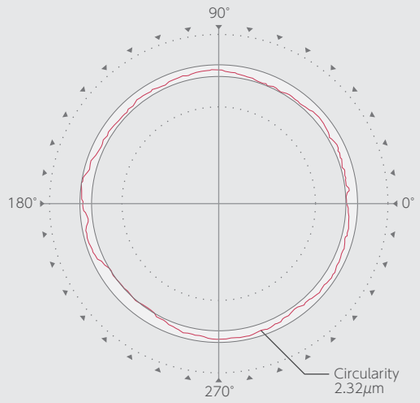
On this screen, machining time for any registered program can be easily calculated by simulation even while the machine is operating.
Knowing machining end time with accuracy enables optimal utilization of equipment and smooth production.

Outstanding Accuracy

Simultaneous 5-axis cone machining circularity 2.32μm (Measured value)

This machine achieved 2.32μm of circularity (measured value) in a tilted cone machining test according to NAS979 standard.

Measured circularity data of the cone shape machining



Positioning accuracy (measured value)

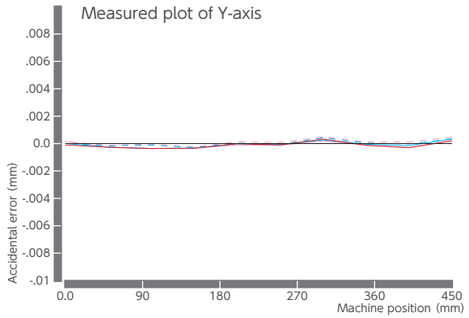
ISO 230-2(1988) unit(mm)

	X	Y	Z
Accuracy : A	0.0027	0.0014	0.0025

ISO 230-2(2014) unit(mm)

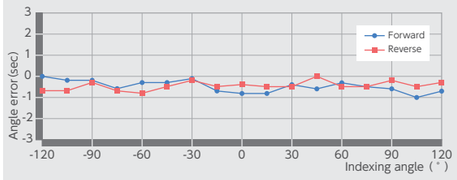
	X	Y	Z
Accuracy : A	0.0022	0.0011	0.0020
Repeatability : R	0.0008	0.0003	0.0008

Measured plot of Y-axis

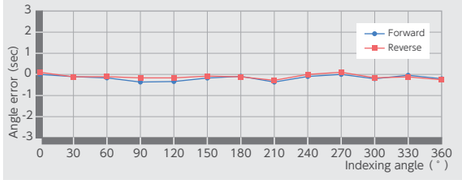


Indexing accuracy of B/C-axis

B-axis indexing accuracy : ±0.50sec (measured value) Tolerance: ±3sec



C-axis indexing accuracy : ±0.20sec (measured value) Tolerance: ±1.5sec

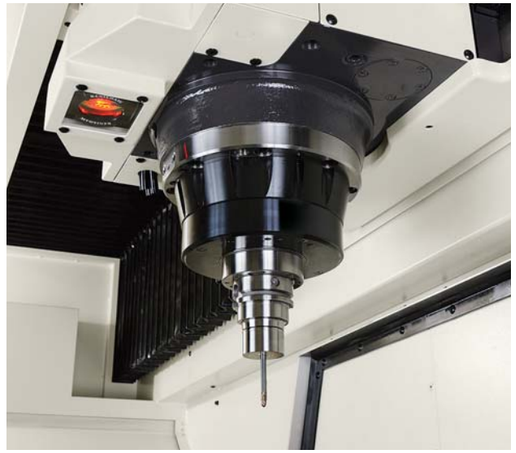


Designed for high precision 5-axis operation

The distances between spindle and workpiece and between operator and machining point have been made closer to improve operability and workability

Operator-friendly design

Operators can approach the machining point not only from the front side but also from the right side, allowing a greater degree of accessibility and improved workability.



Extended spindle nose

The spindle nose is extended by 50mm longer than a conventional machine (YBM950V) to reduce the interference zone.

Incorporated Standard 5-axis functions

Variety of supporting functions for 5-axis machining are equipped as standard so that simultaneous 5-axis machining and indexing 5-axis machining are performed easier thus operator's burden is reduced.

- High-speed smooth TCP
- Tilted working plane indexing command
- Automatic setting function of workpiece coordinates (YASDA)

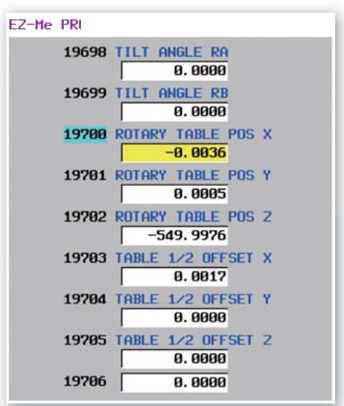
5Axis i-CAL

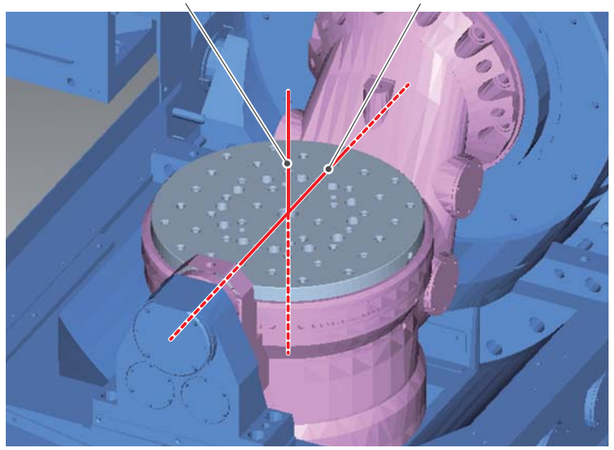
Automatically and accurately sets the center coordinates of the tilting axis and rotating axis. Realizes high-precision 5-axis machining

i-CAL uses touch probe and reference gauge to automatically set the center coordinates of the tilting axis and rotating axis by macro-program.

In 5-axis machining, errors in the rotation center significantly impact machining accuracy. Therefore, high-precision 5-axis machining is realized by performing i-CAL.

The parameters set by i-CAL are effective when using tool center point control and tilted work plane machining.



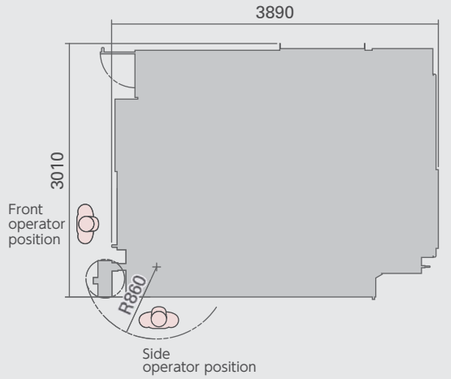


OUTLINE

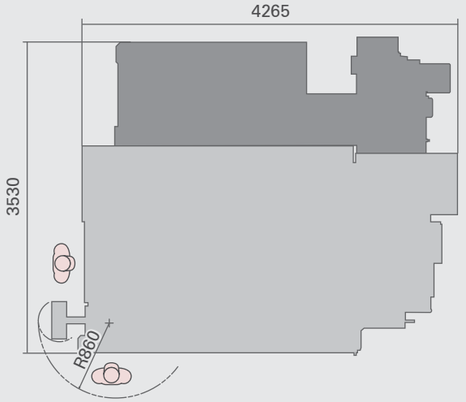
YBM Vi40 Ver.II

unit:mm

M/C Height : 3515mm(~F.L.)

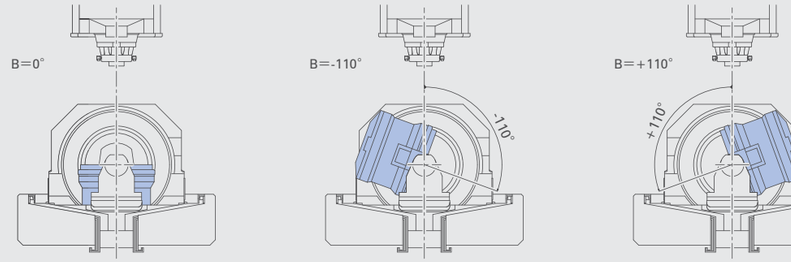


100 tools ATC (Option)

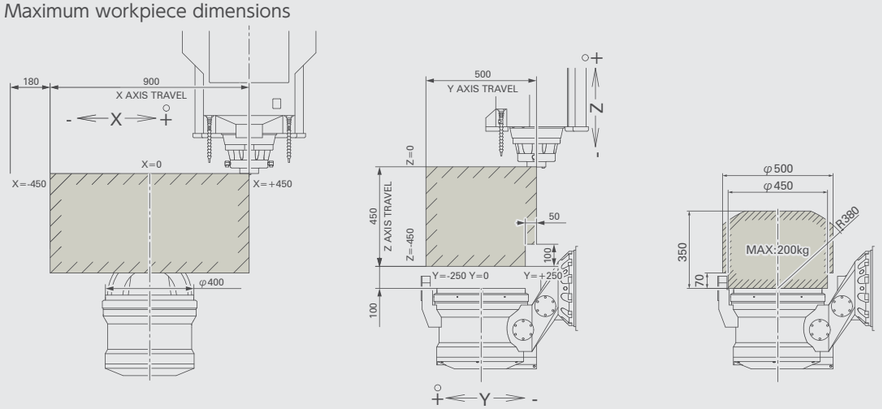


DIMENSION

B-axis tilting range



Maximum workpiece dimensions



YBM Vi40 Ver.II SPECIFICATIONS

1. Specifications of base machine

1) Travel	X-axis travel (Cross movement of spindle head)	900mm
	Y-axis travel (Longitudinal movement of table)	500mm (With limitation)
	Z-axis travel (Vertical movement of spindle head)	450mm
	Distance from table surface to spindle nose face (B=0°)	100～550mm
2) Rotary table (B / C-axis)	Table working surface	ϕ400mm
	Table loading capacity	200kg
	Table surface configuration	44-M12Tap
	Table rotating axis travel (C-axis)	360deg.
	Table tilting axis travel (B-axis)	±110deg.
	Distance between the center of tilting axis and circle table	0mm
3) Spindle	Spindle type	SA40-24000-18.5 (Preload self-adjusting spindle)
	Spindle speed range	100～24,000min^{-1}
	Spindle drive motor	AC18.5 / 22kW (Continuous/15min)
	Spindle taper hole	7/24 taper No.40
	Spindle end face configuration	BIG plus spindle
4) Feed rate	Rapid traverse rate	(X-,Y-,Z- axis) 20,000mm/min (C-axis) Max100min^{-1} (B-axis) Max20min^{-1}
	Cutting feed rate	(X-,Y-,Z- axis) 5,000mm/min (Standard) (C-axis) Max100min^{-1} (B-axis) Max20min^{-1}
	Least input increment	0.0001mm (deg)
5) Automatic tool changer	Tool shank type	MAS BT40
	Pull-stud type	JIS B6339-40P
	Tool storage capacity	60
	Maximum tool diameter / length / mass	ϕ70mm / 250mm / 7kg
6) Mass of machine		Approx. 15,000kg
7) Electric power capacity		39kVA
8) NC unit		FANUC 31i-B5

2. Standard equipment

1) Optical scale feed back	X-,Y-,Z-,B-and C-axes 0.0001mm (deg) command compliant
2) Cutting oil unit (AA type)	2 Flood nozzles, standard tank capacity 300L
3) Splash guard	Manual door with top cover, Two LED light at one position
4) Chip conveyor	Screw conveyor in the machine
5) Thermal distortion stabilized system	Spindle head, saddle, Y-axis and B/C-axis
6) Thermal displacement compensation for spindle	Standard data

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	C memory
9) Run hour and parts count display	
10) Extended part program editing	
11) Background editing	
12) High-speed smooth TCP	
13) Tilted working plane indexing command	
14) Memory card/USB memory interface	Data input/output

1. Optional equipment

1) Spindle nose face configuration	HSK-A63
2) High-speed spindle (BT30)	AC5.5/11kW (Continuous / 5min)、150～30,000min^{-1}
3) Maximum tool storage capacity	Total : 100
4) Signal tower (Multilayer signal lamp)	Red, yellow, green (Flashing)
5) Spindle center through air coolant	Micro fog coolant unit
6) Spindle center through flood coolant	3.5/6MPa (With cutting fluid temperature control unit)
7) External lift-up chip conveyor	
8) Cutting fluid temperature control unit	
9) External mist coolant	Manufactured by Bluebe / 2 nozzles
10) Oil skimmer	Oil Pure or belt type
11) Mist collector	1 unit
12) Automatic tool length compensation and tool breakage sensor	Manufactured by BLUM/NT type
13) Automatic tool length compensation and tool breakage sensor	Manufactured by BIG Daishowa / Dyna Vision Pro
14) Automatic tool length compensation and tool breakage sensor	Manufactured by BIG Daishowa / Dyna Line
15) Automatic measuring system	
16) High-speed machining function (YASDA HAS-4 system)	Maximum feed rate12,000mm/min
17) Thermal distortion stabilized system	With weekly timer
18) Weekly timer	
19) Thermal displacement compensation for spindle	Individual data
20) AWC door	
21) Robot interface	Compatible with System 3R and EROWA
22) Washing gun	
23) Cutting liquid unit level switch	
24) Automatic fire-exthiguishing equipment interface	

2. CNC Options

1) Part program storage	Total : 1MB・2MB・4MB・8MB
2) Extensional number of registerable programs	Total : 2,000・4,000
3) Background editing	
4) Helical interpolation	G02・G03
5) Conical / spiral interpolation	G02・G03 (Helical interpolation is required)
6) Inch / Metric conversion	G20・G21
7) Scaling	G50・G51
8) Coordinate system rotation	G68・G69
9) Programmable mirror image	G50.1・G51.1
10) Rigid tap	M29 (G84・G74)
11) Optional block skip	Total : 9
12) Tool offset pairs	Total : 99sets・200sets・400sets・499sets・999sets
13) Custom macro common variable	Total : 600
14) Addition of workpiece coordinate	48sets・300sets
15) Tool management	
16) Normal direction control	G40.1・G41.1・G42.1
17) Cs contouring control	
18) Three-dimensional coordinate conversion	G68・G69
19) Inverse time feed	G93
20) Ethernet function	FOCAS2 / Ethernet function
21) Data server function	Fast data server, Capacity 1GB,2GB,4GB