Higher accuracy produces greater profitability

YASDA CNC JIGBORER

YBMvi40

MOLD & DIE MILLER
Thermal Distortion Stabilizing System
High-performance Spindle with Preload Self-adjusting System

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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

The demand for high precision 5-axis machining of complicated shape components and high hardness/high surface quality molds is increasing.
The “YBM V40 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.
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.

Index 5-axis machining
By tilting workplace, cutter length is minimized thus surface quality is improved and machining time is reduced.

Machining time is reduced to approximately one-fifth

Productivity largely increased

Application examples
By adopting the basic structure of the existing 3-axis machine, YBM V40 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

C-Series work-piece presses for automobiles

Construction of YBM V40 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 mounted on Y-axis, minimizing weight differences in movable bodies of each axis, and setting the heavy movable bodies to lower center of gravity.

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.

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 5A type)

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 coaxially 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 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 lead 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 V440 Ver.II
Thermal distortion stabilizing system

- X-axis saddle cooling (Standard)
- Y-axis saddle cooling (Standard)
- Bridge cooling (Option)

Dedicated temperature control unit for B/C-axis (Standard)
To reduce thermal displacement by movement of the rotational axes, dedicated temperature control unit is incorporated for B/C-axis.

Temperature-controlled heat exchange fluid is also circulated at both sides of the Y-axis to reduce influence from heat generation and high-temperature cutting chips as much as possible.
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 (W360 to H300) 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.

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 servowave 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

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<td>Repeatability (μm)</td>
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Indexing accuracy of B/C-axis

B-axis indexing accuracy : ±0.50μm (measured value) Variation : ±0.50μm

C-axis indexing accuracy : ±0.20μm (measured value) Variation : ±0.50μm

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 (YBM95DV) 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 work-piece coordinate (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.

Center of rotating axis (C-axis)  Center of tilting axis (B-axis)
### 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 at B=0 100~550mm

2. **Rotary table (B/C-axis)**
   - Table working surface: Ø400mm
   - Table loading capacity: 200kg
   - Table surface configuration: 444127rpm
   - Table rotating axis travel (B-axis): 360°deg
   - Table tilting axis travel (B-axis): ±110°deg
   - Distance between the center of tilting axis and circle table: 9mm

3. **Spindle**
   - Spindle type: SA40-2400/1.85 (Biased self-adjusting spindle)
   - Spindle speed range: 100~24,000rpm
   - Spindle drive motor: AC185/22KW (Continuous/15min)
   - Spindle taper: 7/24 taper No.45
   - Spindle end face configuration: B16 plus spindle

4. **Feed rate**
   - Rapid traverse rate: (x,y,z-axis) 20,000mm/min (C-axis Max 100°/min) (B-axis Max 20°/min)
   - Cutting feed rate: (x,y,z-axis) 5,000mm/min (Standard) (C-axis Max 100°/min) (B-axis Max 20°/min)
   - Least input increment: 0.001mm (deg)

5. **Automatic tool changer**
   - Tool shank type: MAS BT40
   - Pulley type: JR 86339-40P
   - Tool storage capacity: 60
   - Maximum tool diameter / length / mass: Ø70mm / 250mm / 7kg

6. **Mass of machine**
   - Approx. 15,000kg

7. **Electric power capacity**
   - 39kVA

8. **NC unit**
   - FANUC A16B

### 3. CNC standard options

- Least input / travel increment: 0.001mm
- Display: 15” LCD touch panel with 4000
- Program storage length: 1280 m (512 KB)
- Custom macro: Common variable: 600
- Number of registrable programs: 1000
- Automatic corner override
- Tool offset points: 84 points
- Tool offset memory: C memory
- Run hour and parts count display
- Extended part program editing
- Background editing
- High speed smooth TCP
- Tilted working plane indexing command
- Memory card/USB memory interface
- Data input/output

### YASDA Options

1. **Part program storage**
   - Total: 1MB - 2MB - 4MB - 8MB

2. **Extensional number of registrable programs**
   - Total: 2,000 - 4,000

3. **Background editing**

4. **Helical interpolation**
   - G02 - G03

5. **Cylindrical / spiral interpolation**
   - G02 - G03 (Helical Interpolation is required)

6. **Torch / Remote conversion**
   - G00 - G01

7. **Scaling**
   - G50 - G51

8. **Coordinate system rotation**
   - G68 - G69

9. **Programmable mirror image**
   - G50.1 - G51.1

10. **Rigid tap**
    - M239/M48 (G74)

11. **Optional block skip**
    - Total: 9

12. **Tool offset points**
    - 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. **C3 contouring control**

18. **Three-dimensional coordinate conversion**
    - G68 - G69

19. **Inverse time feed**
    - G93

20. **Ethernet function**
    - FOCAS / Ethernet function

21. **Data server function**
    - Fast data server, Capacity: 108,208,408