



**topone**

# FS SERIES

# Double column 5-Face CNC Machining Center

**Reliable accuracy and efficiency tailored solutions**

- Exceptional performance
- Advanced milling head



**Perfectly Designed to optimize machine rigidity**  
**Outstanding accurate manufacturing process**  
**Complete with High Standard Universal Milling Head**



TOP-ONE Double Column 5-Face CNC Machining Centers exhibit outstanding rigidity , precision ,high quality , reliable and performance. Each one is designed for heaving duty cutting and install the high torque auto-dividing universal mill head , and creates the accuracy and high efficiency you've come to expect. To meet customers' specific machining requirements , custom specifications are available.



Energy Sector



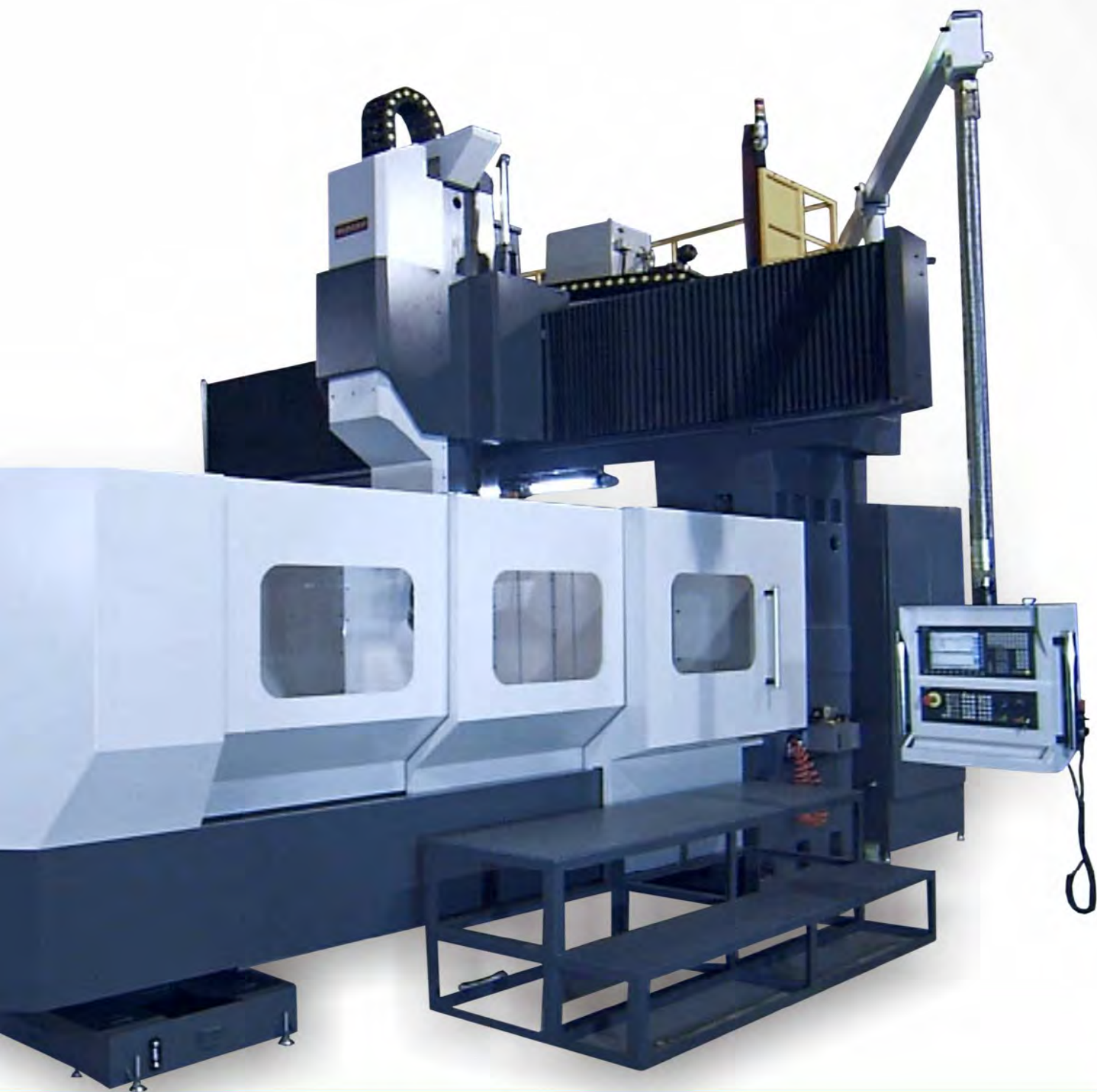
Wind Turbine



Electricity Generation Equipment



is manufactured with the tradition of Top-One's quality excellence.



Heat Exchanger



Automotive Industry



Ship Building Industry

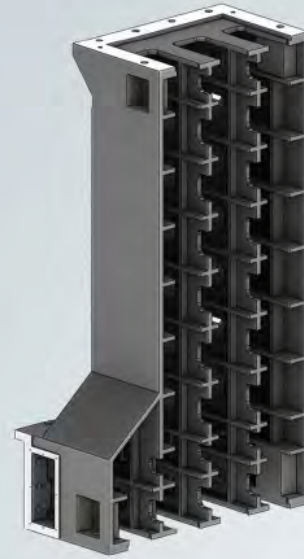
# RUGGED! STABLE!

## What you can expect from Top-One's machine structure!

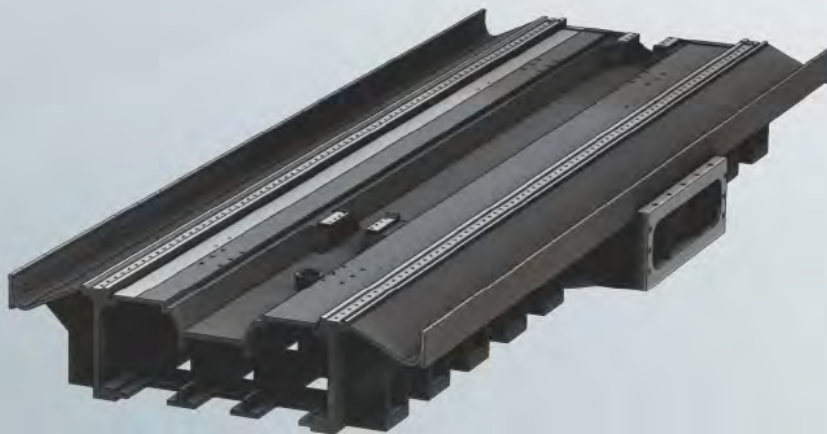
- Exceptionally high dynamic accuracy
- Minimized thermal displacement
- Can handle heavy cutting
- Deformation free
- Improved surface finish

### SCIENTIFIC RIB REINFORCEMENT

All structural parts of Top-One's double column machining centers are internally reinforced with comprehensive heavy ribs to resist flex and minimize vibrations.

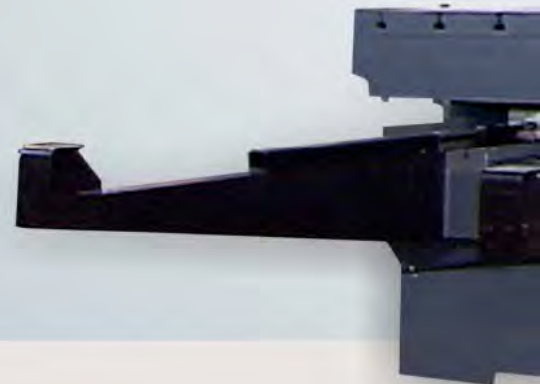


The transverse & vertical reinforced ribbed for columns is constructed by inner and core boxes comes with thick wall design to have high rigidity, high stiffness, anti-bending and steady support on the cross beam



### MASSIVE, STABLE BASE

- The base is manufactured from high quality Meehanite cast iron, tempered and stress relieved to ensure material stability without deformation year after year.
- Scientific rib reinforcement in combination with a greater span between linear ways provides solid support for heavy loads.







Optimal reinforce ribbed bracket design for cross beam is capable for heavy load, high stiffness, anit-bending, and high accuracy.







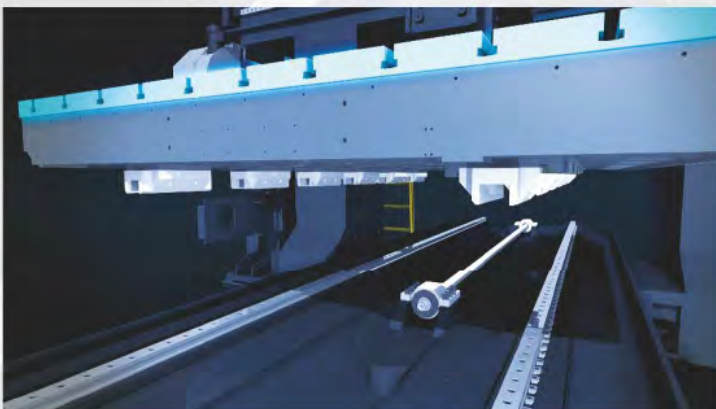
### TWO CHIP AUGERS ON BASE

Two chip augers are provided at the left and right side of the base, which deliver chips to the chip conveyor. The chip augers maintain machine cleanliness at all times.



### DOUBLE V SLIDE WAY FOR X-AXIS (Optional)

The double V is an optional choice which designed to use Hydrostatic pressure system to hold the extremely heavy work-piece on the work table.



### LARGE DIAMETER BALL SCREWS

- The 3 axes traverses are driven by high performance servo motors, which drive the ball screws, feature minimum backlash and long life.
- Ball screws are pre-tensioned to assure high-transmission accuracy at all times.



## LADDER TYPE LINEAR WAYS ON BEAM

- The linear ways on the beam are supported by a ladder structure that upgrades stability of the spindle head.
- The heavy duty roller type linear ways combined with three slide blocks on each linear way guarantee greater rigidity on the y-axis.



## LARGE INTERNAL SPACE

The extra wide distance between columns in combination with extra long travel allows the machine to accommodate large workpieces.

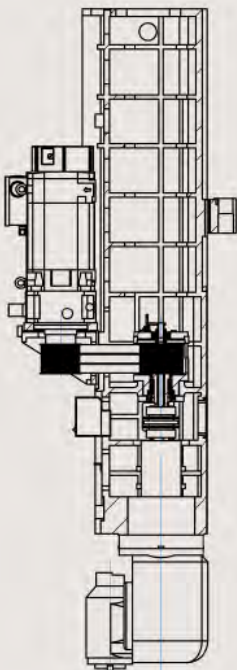




**UDG**

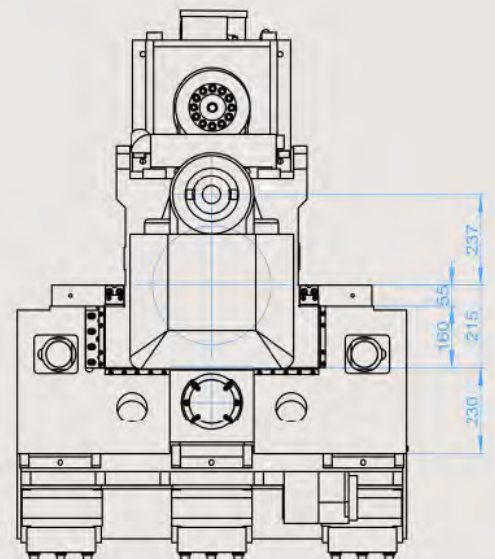
## Specification

ITEM	UDG	UAG
B & C AXIS POSITIONING INDEXING	2.5°	
C AXIS INDEX	±360°	
B AXIS INDEX	±360°	±120°
Spindle taper	ISO50 · (Opt.)BT-50	
Pull stud	DIN 69872A	
SPINDLE NOSE BEARING INNER DIA	100mm	
Max. torque	1150Nm	
B/C axis position locking & unlocking	Hirth coupling to position, locking by platinum spring, unlocking by Hydraulic system	
B/C axis position locking pressure	22000kg / 70bar	
Tool clamping force	1500kg / 70bar/ locking by platinum spring	
Lubrication	all gears with grease	
Accuracy of position for turning	≤ ±3"	
Accuracy of repeatability for turning	≤ ±2"	



### TWO-STEP SPEED GEARBOX

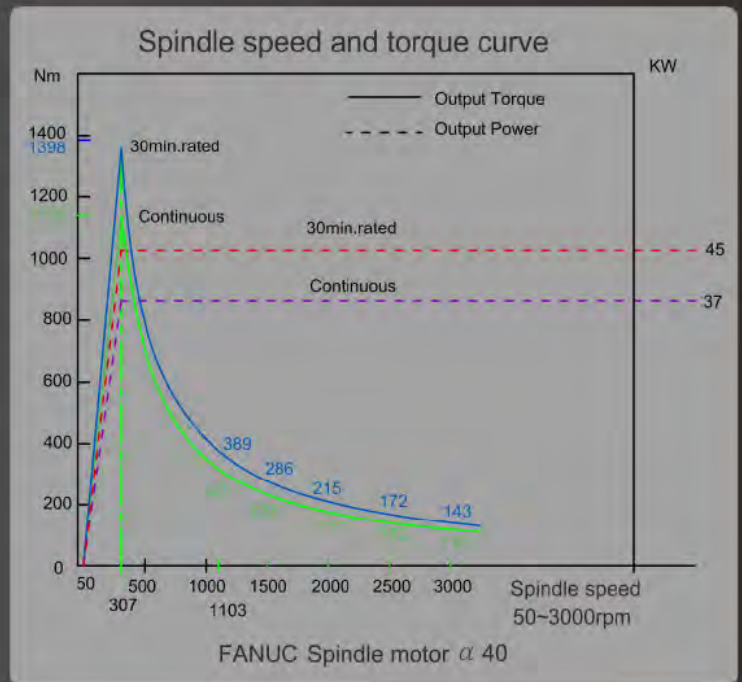
- The spindle running is transmitted through a gearbox, providing high/low speed changes.
- The low speed range gives great torque output, making the machine excellent for heavy cutting. The high speed range is ideal for fine cutting with outstanding surface finish effects.
- All gears in the gearbox are carburized and precision ground for quiet running.







# UAG



## Application

Auto-Index Universal milling head has high rigidity, high torque and high speed. The head's B/C axis with accuracy indexing positions of  $2.5 \times 2.5$  degrees is capable for large work-piece, precision and complicated mold. This machine can accomplish 5 face and multi face machining work at one-time work-piece setup which can increase accuracy and efficiency of machining. It would be your best investment for increase production capability.

## OPTIMAL SPINDLE HEAD LAYOUT

The spindle center line closes to z-axis slideways, greatly reducing the possibility of thermal displacement and bending deformation due to side cutting torque.

- Driven by a powerful motor, the spindle head is ideal for various complicated machining with ultra-high accuracy.
- Spindle gearbox is designed as rectangular in cross-section and its structure is symmetrical closed. It ensures the spindle gear box symmetrical heat conduction and preventing thermal distortion and minimizing deflection.



## HYDRAULIC & NITROGEN GAS DUAL COUNTER-BALANCING SYSTEM

- The nitrogen gas counter-balancing system is equipped with an accumulator, and no additional power unit is required.
- Features no noise and no vibration.
- It ensures extra smooth movement of the spindle head for increased machining accuracy.



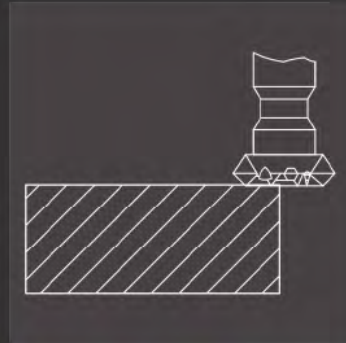
# EXTRAORDINARY CUTTING CAPABILITY

TOP-ONE double column machining centers will dramatically increase your productivity. Let our cutting tests prove it!



Cutting capacity  
YOU'VE COME TO EXPECT!

## Cutting Test Report



### FACE MILLING

Cutting tool:  $\text{Ø}125 \times 8\text{t}$

Tangential speed: **295.35 m/min**

Cutting width: **120 mm**

Cutting depth: **4 mm**

Cutting feed rate: **140 mm/min**

Cutting amount per tooth: **0.27 mm**

Material removal rate: **756 mm**

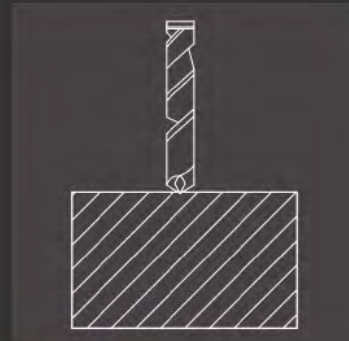
Workpiece material: **S45C**

Spindle load: **80 %**





## Cutting Test Report



### DRILLING

Tool diameter: **Ø90 mm**

Tool material: **Tungsten Carbide**

Cutting depth: **100 mm**

Cutting feed rate: **5 mm/min**

Workpiece material: **SUS304**

Spindle load: **48%**

## Cutting Test Report



### END MILLING

Cutting tool: **Ø32 x 8t**

Tangential speed: **158.6 m/min**

Cutting width: **6 mm**

Cutting depth: **20 mm**

Cutting feed rate: **120 mm/min**

Cutting amount per tooth: **0.21 mm**

Material removal rate: **187 c.c/min**

Workpiece material: **Ø125 x 8t**

Spindle load: **65%**

Note: The above cutting test values are for reference only. The values may vary with customers cutting conditions.



# SPECIALTY OF THE HEAVING-DUTY CUTTING & OVERLOAD



1



3



5



2



4



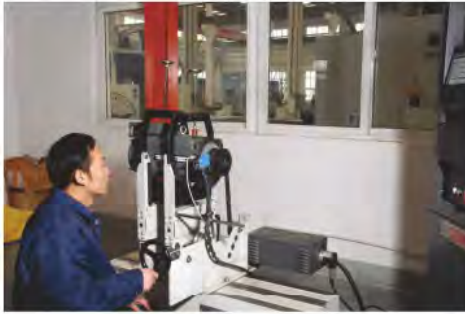
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- 1 Top-One is specialty in design and manufacture the heavy-duty and overload double column machining center. All main castings are designed for high rigidity capability and made by high grade cast irons, no welding metal been used. Heavy table load models are using the double V slide way on X axis travel and adhesive Anti-deforming Turcite B on the slide way provide extended machine life and movement.
- 2 Use zero backlash gear driven on X-axis over 7 meters travel. The driven is more powerful, high efficiency and better accuracy in movement.
- 3 4 All of the contact surfaces with the box way are hand scrapping by our extraordinary scrapping craftsmanship to achieve the accuracy of the each machine. Micro alignment by hand scrapping can make the machine stronger foundation and higher level of accuracy.
- 5 6 Table V slide way distribute thu oil to X axis box way to ensure the X-axis has sufficient and steady oil lubricate. And Individual lubricated system can be filter the lube oil and recycle.



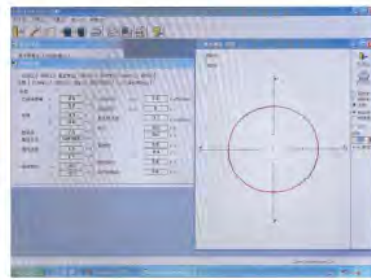
## DYNAMIC BALANCE CALIBRATION

All spindle motors and spindles are subject to dynamic balance calibration before assembly. With the dynamic balance calibration, the spindle vibration is minimized during high speed running. This also results in high machining accuracy.



# QUALITY ASSURANCE

TOP-ONE's reputation for quality excellence results from rigorous and thorough quality control.



## BALL BAR TESTING

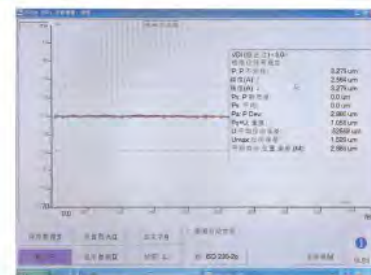
After assembly, each machine is tested by using the latest ball bar testing equipment. With ball bar testing, we can calibrate circularity and the machine's geometrical accuracy.

Circular cutting tests are also performed to ensure the 3D cutting accuracy and the circular smoothness.



## LASER INSPECTION ON THREE AXES

Each machine is inspected using an advanced laser unit for calibration. The laser unit is applied for inspecting and calibrating the screw pitch error, backlash, positioning accuracy and repeatability. The precision inspection may ensure the dynamic and static ability of the machine and its machining accuracy.





# STANDARD ACCESSORIES

## CNC CONTROLLER



FANUC 0i-MF



MITSUBISHI M70V



SIEMENS 828D



## PENDENT ARM TYPE FOR CONSOLE

360 degree swivel for the Console, easy use for the operator, the pendent arm can left/right any angle movement, up/down movement.

Full guarding enclosure, over 5 meter in X-axis travel.



## SPINDLE OIL COOLER

- The spindle oil cooler can be adjusted as desired to control the spindle temperature.
- It provides an outstanding cooling effect that reduces gear temperature, ensures consistent spindle accuracy and extends service life of spindle and gearbox.



## HIGH PRESSURE AUTOMATIC LUBRICATOR

- The high pressure forced automatic lubricator employs an oil distributor. Once pressure reaches its peak, all lubrication points are released.
- The oil circuit features pressure detection and feed back. It can detect oil circuit jamming and leaks. This allows all lubrication points to be properly lubricated at all times, and ensures a longer service life and accuracy of the machine.



# OPTIONAL ACCESSORIES

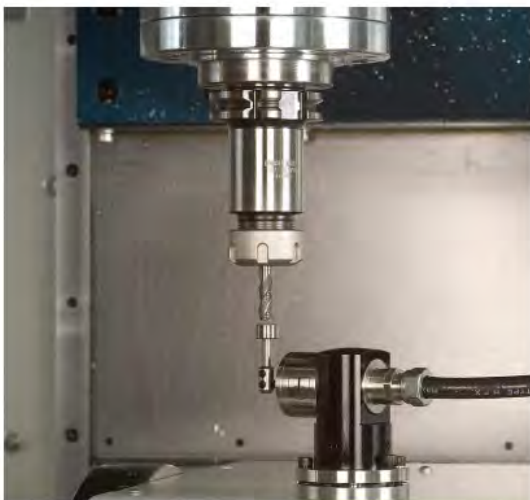


COOLANT THROUGH SPINDLE:  
(20bar/50 bar/70bar)



CHAIN-TYPE MAGAZINE (OPTIONAL)  
40, 60 TOOLS

- The tool magazine accepts BT50 tool shanks.
- The tool magazine is side mounted to prevent contamination from chips or coolant.
- Customize tool magazine capacity



RENISHAW TS-27R  
AUTOMATIC TOOL LENGTH  
AND TOOL DIAMETER  
MEASURING DEVICE

RENISHAW RMP-60  
AUTOMATIC WORKPIECE  
CENTER MEASURING DEVICE



4TH AXIS ROTARY TABLE



LINEAR SCALE



OIL WATER SEPARATING TANK

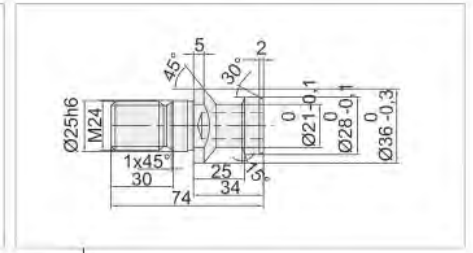
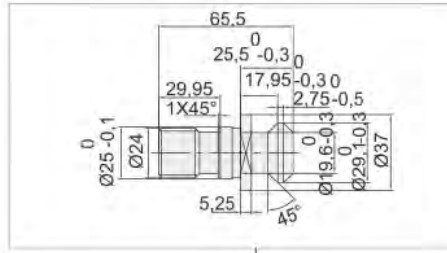
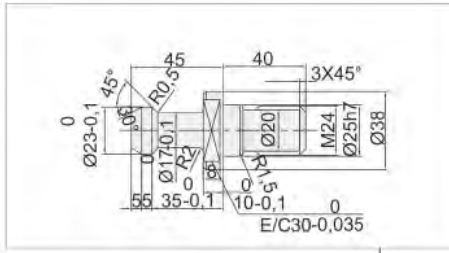
# TOOL SHANK SIZE

Unit:mm

MAS 403-P50T-1

ISO 7388/2-B,PS-CAT50

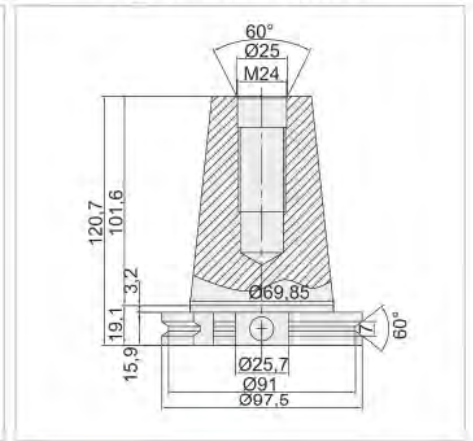
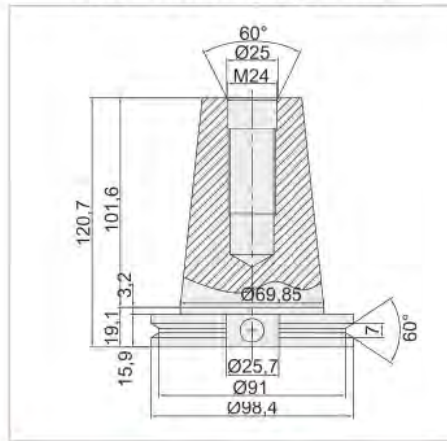
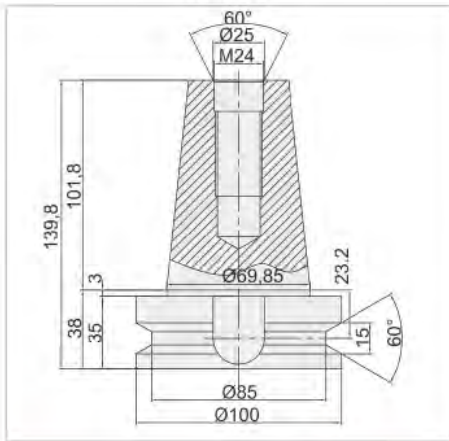
DIN 69872 TYPE A



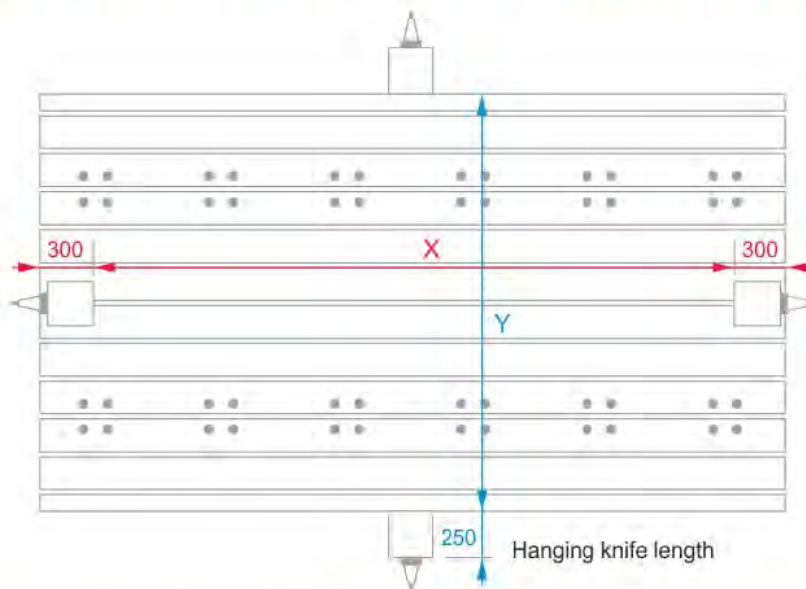
BT-50

ISO 7388/1-50,CAT-50

DIN 69871 Form A



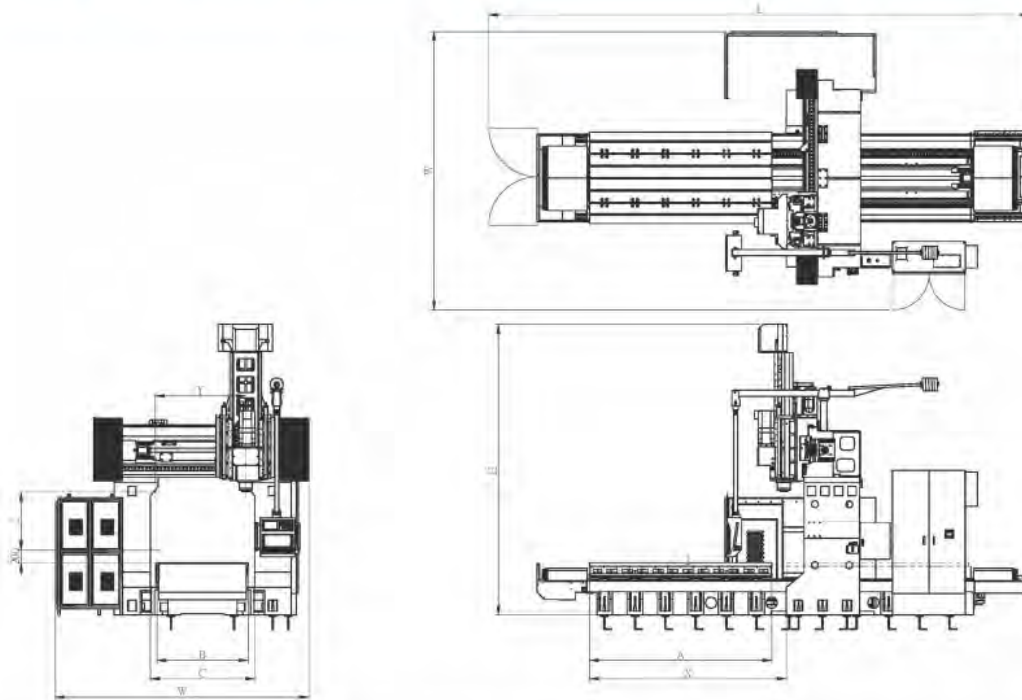
The size of the head can be processed



Machine Dimension														Unit : mm
MODEL	FS-2203	FS-2204	FS-2205	FS-2206	FS-2703	FS-2704	FS-2705	FS-2706	FS-3204	FS-3205	FS-3206	FS-3704	FS-3705	FS-3706
L	3000	4000	5000	6000	3000	4000	5000	6000	4000	5000	6000	4000	5000	6000
W	1800	1800	1800	1800	2200	2200	2200	2200	2700	2700	2700	3200	3200	3200
pcs	9	9	9	9	11	11	11	11	13	13	13	15	15	15
SIZE	22	22	22	22	22	22	22	22	28	28	28	28	28	28
H	100	100	100	100	100	100	100	100	150	150	150	200	200	200

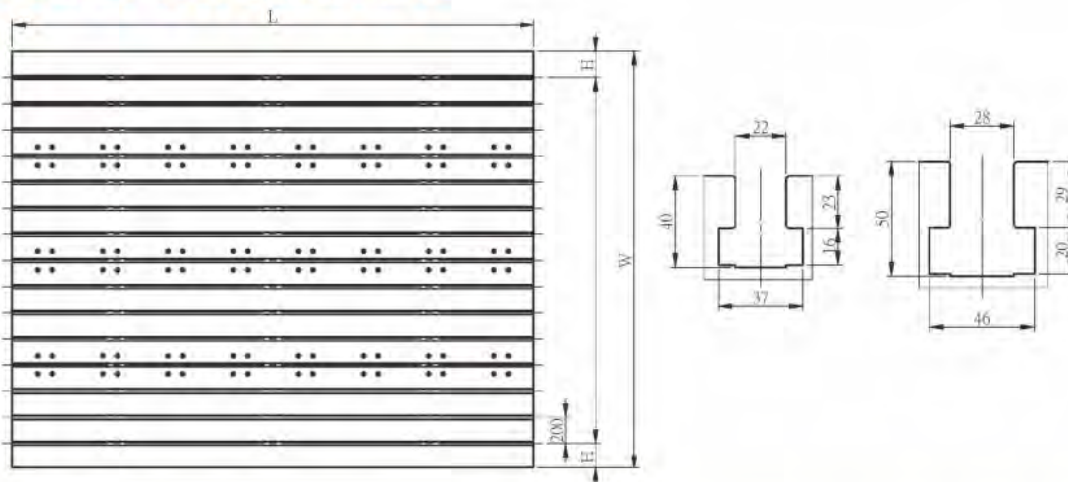


# Machine Dimension



Machine Dimension														Unit : mm
MODEL	FS-2203	FS-2204	FS-2205	FS-2206	FS-2703	FS-2704	FS-2705	FS-2706	FS-3204	FS-3205	FS-3206	FS-3704	FS-3705	FS-3706
L	10000	12000	14000	16000	10000	12000	14000	16000	12000	14000	16000	12000	14000	16000
W	5500	5500	5500	5500	6000	6000	6000	6000	6500	6500	6500	7000	7000	7000
H (Z ST:1200)	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500
H (Z ST:1400)	6200	6200	6200	6200	6200	6200	6200	6200	6200	6200	6200	6200	6200	6200
X	3000	4000	5000	6000	3000	4000	5000	6000	4000	5000	6000	4000	5000	6000
Y	2100	2100	2100	2100	2600	2600	2600	2600	3100	3100	3100	3600	3600	3600
Z	1200 (1400)													
A	3000	4000	5000	6000	3000	4000	5000	6000	4000	5000	6000	4000	5000	6000
B	1800	1800	1800	1800	2200	2200	2200	2200	2700	2700	2700	3200	3200	3200
C	2200	2200	2200	2200	2700	2700	2700	2700	3200	3200	3200	3700	3700	3700

# Table Dimension



Machine Dimension														Unit : mm
MODEL	FS-2203	FS-2204	FS-2205	FS-2206	FS-2703	FS-2704	FS-2705	FS-2706	FS-3204	FS-3205	FS-3206	FS-3704	FS-3705	FS-3706
L	3000	4000	5000	6000	3000	4000	5000	6000	4000	5000	6000	4000	5000	6000
W	1800	1800	1800	1800	2200	2200	2200	2200	2700	2700	2700	3200	3200	3200
pcs	9	9	9	9	11	11	11	11	13	13	13	15	15	15
SIZE	22	22	22	22	22	22	22	22	28	28	28	28	28	28
H	100	100	100	100	100	100	100	100	150	150	150	200	200	200

# Specification

Model	Unit	FS-2203	FS-2204	FS-2205	FS-2206	FS-2703	FS-2704
Item							
X travel	mm	3000	4000	5000	6000	3000	4000
Y travel	mm	2100	2100	2100	2100	2600	2600
Z travel	mm	1200 (1400)					
Table size	mm	1800x3000	1800x4000	1800x5000	1800x6000	2200x3000	2200x4000
T-slot (num.-size x W)	mm	9-22*200	9-22*200	9-22*200	9-22*200	11-22*200	11-22*200
Num of linear guide way and block		2/6	2/8	2/10	2/12	2/6	2/8
Max. table load / Linear Ways	t	8	10	13	16	10	13
Distance between columns	mm	2200	2200	2200	2200	2700	2700
Distance from spindle nose to table	mm	200~1400 (200~1600)					
X travel for 250mm face mill	mm	2400	3400	4400	5400	2400	3400
Y travel for 250mm face mill	mm	1800	1800	1800	1800	2200	2200
Spindle taper		ISO NO.50 BT-50 / DIN 69872 A					
Spindle speed	rpm	60~3000					
Spindle motor	KW	45KW / 37KW					
Max. torque	Nm	1150Nm					
B & C axis positioning indexing	degree	B/C axis 2.5°x2.5°					
B & C axis index	degree	B axis. ± 360° / ± 120° / C axis. ± 360°					
XYZ servo motor	KW	7kw/7kw/7kw	7kw/7kw/7kw	6kw/7kw/7kw	9kw/7kw/7kw	7kw/7kw/7kw	6kw/7kw/7kw
Rapid feedrate X axis	mm/min	12000	10000	10000	8000	12000	10000
Rapid feedrate Y axis	mm/min	12000	12000	12000	12000	12000	12000
Rapid feedrate Z axis	mm/min	10000	10000	10000	10000	10000	10000
Cutting feedrate	mm/min	6000					
Min cutting feed	mm/min	0.001					
Tool magazine capacity	tools	32 / 40 / 60					
Tools exchange time	sec	8 sec. (for Arm type)					
Max. tool dia (adj. pocket empty)	mm	Ø125 / Ø210					
Max. tool length	mm	350					
Max. tool weight	kgs	12/25					
Positioning accuracy	mm	JIS B6338 : ± 0.01/300 / VDI3441 : P0.035					
Repeatability	mm	JIS B6338 : ± 0.003 / VD13441 : Ps0.03					
Controller		FANUC / SIEMENS / HEIDENHAIN					
Power requirement	KVA	60	60	60	60	60	60
Machine Weight	t	40	47	55	62	44	51

\* All specifications, design, and characteristics show in this catalog are subject of change without notice.

\* Custom specification are available upon request.



FS-2705	FS-2706	FS-3204	FS-3205	FS-3206	FS-3704	FS-3705	FS-3706
5000	6000	4000	5000	6000	4000	5000	6000
2600	2600	3100	3100	3100	3600	3600	3600
1200 (1400)							
2200x5000	2200x6000	2700x4000	2700x5000	2700x6000	3200x4000	3200x5000	3200x6000
11-22*200	11-22*200	13-28*200	13-28*200	13-28*200	15-28*200	15-28*200	15-28*200
2/10	2/12	2/8	2/10	2/12	3/8	3/10	3/12
16	19	16	20	24	18	23	28
2700	2700	3200	3200	3200	3700	3700	3700
200~1400 (200~1600)							
4400	5400	3400	4400	5400	3400	4400	5400
2200	2200	2700	2700	2700	3200	3200	3200
ISO NO.50 BT-50 / DIN 69872 A							
60~3000							
45KW / 37KW							
1150Nm							
B/C axis 2.5°x2.5°							
B axis. ± 360° / ± 120° / C axis. ± 360°							
9kw/7kw/7kw	9kw/7kw/7kw	9kw/7kw/7kw	9kw/7kw/7kw	14kw/7kw/7kw	9kw/7kw/7kw	14kw/7kw/7kw	14kw/7kw/7kw
10000	8000	10000	10000	8000	10000	10000	8000
12000	12000	12000	12000	12000	12000	12000	12000
10000	10000	10000	10000	10000	10000	10000	10000
6000							
0.001							
32 / 40 / 60							
8 sec. (for Arm type)							
Ø125 / Ø250							
350							
12/25							
JIS B6338 : ± 0.01/300 / VDI3441 : P0.035							
JIS B6338 : ± 0.003 / VD13441 : Ps0.03							
FANUC / SIEMENS / HEIDENHAIN							
60	60	60	60	65	60	65	65
58	65	56	63	70	61	69	77

## Standard Accessories

- Fanuc controller
- Semi full enclosure
- Auto lubrication system
- Screw type chip conveyor
- Coolant System
- Spindle oil cooler
- Nitrogen gas counter balance system
- Z-axis hydraulic counter balance system
- Spindle air blast

- Alarm Lamp
- RS-232 interface
- Leveling bolts & pads
- Tools & tool box
- Operation Manual

## Optional Accessories

- 4th axis rotary table
- Auto tool length measurement
- Auto work-piece measurement
- Linear scale feedback
- Coolant Through Spindle (70/bar)
- Oil water separating tank

## KEEPING OUR CUSTOMERS IN THE LEAD

Top-One Machinery Co., Ltd. is an internationally recognized manufacturer of vertical machining centers and double column machining centers. Based on our outstanding R & D capabilities, company structure and experience, we are capable of both the design and manufacture of machining centers that feature greater machining capacity, higher accuracy and minimum trouble. Our objective is to offer the best possible machining centers to help customers stay competitive.



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