Vertical Machining Center VMC1300II

(FANUC-0i MF- β×8000rpm)

（Version：20220825）

Technical File

宁波海天精工股份有限公司

NINGBO HAITIAN PRECISION MACHINERY CO., LTD.

Content

Technology Agreement including the followings：

A. Main Features

（notice: the picture only for reference）

VMC1300II is one of the series products of the vertical machining center of Haitian Precision, the machining center is a single column fixed, the worktable mobile structure, the whole compact structure, little floor size. It completes milling, boring, drilling, tapping and so on in one clamping Sequence. Standard 8000r/min belt type spindle, using 1:1 deceleration, suitable for general machinery, automotive, aerospace, Instrumentation, textile machinery and other industries of small and medium-sized mechanical parts of high speed precision processing. Optional 4th axis rotary table, realizes multi - faceted processing.

Typical applications such as mold and Board category, plates, small shell complex parts of high-speed precision adding.

- **Machine Bed & Main structure**

  The machine bed and the main structure of the machine are cast in the form of gray cast iron, which has good rigidity and shock absorption.

  The interior of the bed is arranged with reinforcing ribs, and the structure of the bed is heavy.

  The transverse sliding table and working table are cast in gray iron. Lateral sliding platform adopts large span structure design, effectively increase the stability of the machine tool.

  The bottom surface of the column which adopts the herringbone structure is fixed on the bed by scraping and grinding. column internal use of "米" word reinforcement structure, the stiffness and good shock

resistance, the bottom is designed into the "A" type structure, effectively increased the rigidity of the column, reduce the forward tilt caused by the headstock.

The headstock which is located in the middle of the A column and the two roller rails along the column sit in the Z axis up and down in the direction of the mark is made of high strength cast iron with stable structure.

- **Feed mechanism**

  The feed mechanism of X/Y/Z axis adopts AC servo motor, and the elastic coupling without backlash is directly connected with the lead screw to directly drive the ball lead screw to rotate. The reciprocating motion of each axis is realized, and the lead screw support adopts the pretension structure fixed at both ends.

- **Linear guideway**

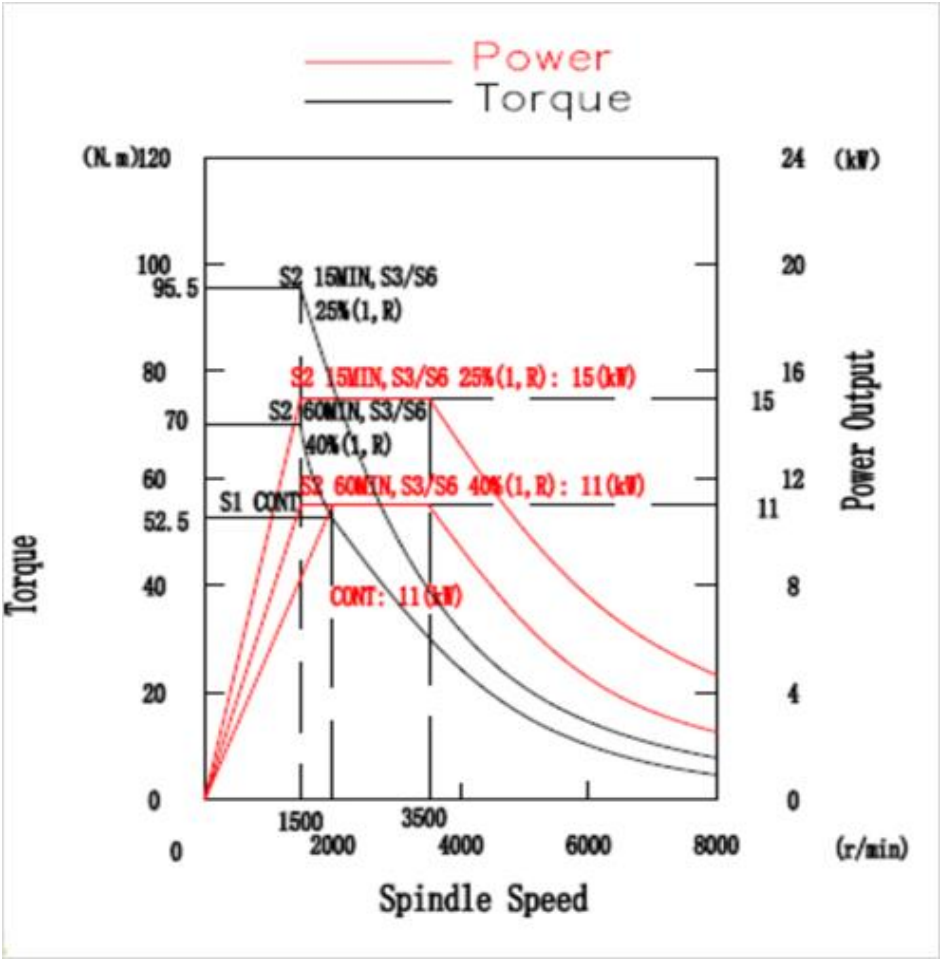
  X/Y axis guideway adopts imported linear guide rail.

  Z-axis guideway is supported by imported heavy-duty roller guideway, which has strong rigidity and good stability, so that the machine tool can obtain high rigidity and long-term stability accuracy

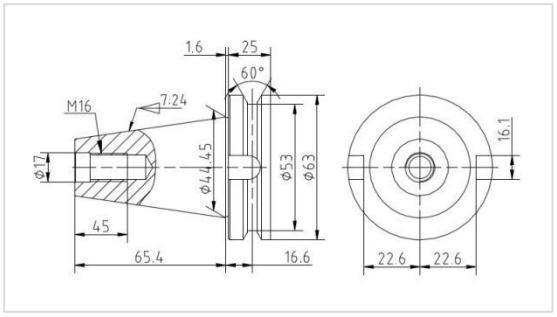
- **Spindle**

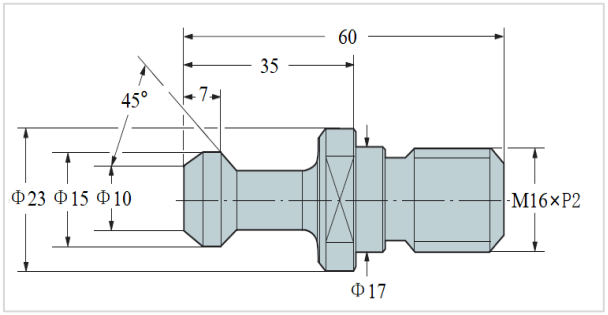
  Imported spindle unit is selected to realize continuous variable speed and positive and negative rotation of spindle, optional spindle oil chiller, Maximum spindle speed of 8000r/min, the maximum torque is 95.5Nm. Spindle nose with air seal, using BT40 tool.

- **Power & Torque**



- **Tool shank & Pull stud**





- **Lubrication**

  The linear and ball screw of the machine adopt a quantitative lubrication system, which can adjust the oil supply cycle and oil supply quantity of each lubrication point. System control realizes fully automatic centralized lubrication

- **Cooling**

  The spindle can be equipped with spindle coolant.

  Standard with large-capacity water tank, equipped with immersed multi-stage stainless steel centrifugal pump for fully cooling tools and components, and equipped with flexible nozzle.

- **Others**

  1. The working area is equipped with LED lights

  2. The machine tool is equipped with three-color lights, prompting three kinds of information: program operation, completion of work cycle and fault alarm.

  3. X/Y/Z axis linear guides are all covered with steel guard.

- **Installation conditions**

  1. Temperature

  Working temperature: 17℃~25℃, ±2℃

  If the requirements of the processed parts are not so precision, the ambient temperature range could be relaxed to10℃ – 40℃.

  When storing and transporting: -30℃~50℃

  2. Humidity

  Continuous: Under 75%(No condensation)

  Short time: Under 95%(No condensation)

  3. Installation site conditions

  1). Not affected by external vibration and electrical interference

  2). Avoid direct sunlight to the machine tool

  3). Avoid direct contact with outside wind, air, and temperature-adjusted cold and hot air

  4). Avoid setting up heating and other heat sources near the machine tool

  5). The concentration of dust in the air shall not be greater than 10mg/m^3 , and should not contain acid, salt and other corrosive gases.

  6). Avoid water leakage and flooding

B. Main technical parameters

Item			Parameters
Machining scope	X travel	mm	1300
	Y travel	mm	650
	Z travel	mm	650
	Spindle nose to table surface	mm	150-800
Table	Table size	mm	1500×650
	Max. Load	kg	1200
	T slot	mm	5×18×125
Spindle	Drive type		Belt drive
	Max. speed	rpm	8,000
	Power(cont/Max)	kW	11/15
	Torque(cont/Max)	N.m	52.5/95.5
	Taper	--	BT40
	Pull stud	--	MAS P40T-I(45º)
Feed	Rapid feed X/Y/Z	m/min	30/30/30
	Cutting feed X/Y/Z	m/min	12/12/10
Tool magazine	Capacity		24T
	Type		Arm type
	Tool shank		BT40
	Max. tool（Full/adjacent vacant）	mm	Φ80/Φ150
	Max. tool length	mm	300
	Max. tool weight	Kg	8
	Indexing(tool to tool)	sec	2.5
Positioning Accuracy (GB/T 20957.4-2007)	X axis	mm	0.008
	Y axis	mm	0.006
	Z axis	mm	0.006
Repeatability Accuracy (GB/T 20957.4-2007)	X axis	mm	0.005
	Y axis	mm	0.004
	Z axis	mm	0.004
Controller			FANUC 0i-MF(β)
Air pressure		MPa	0.5～0.7
Machine weight		t	9
Machine size(L×W×H)		mm	3350×3700×2950

C. Machine configuration

Standard configuration

1	Controller：FANUC 0i-MF	6	Pneumatic, lubrication
2	8,000rpm belt spindle	7	Air gun
3	24T Arm Type ATC	8	Full enclosure with top cover
4	Internal and rear flushing	9	3-color signal lamp and Working light
5	Spindle outside coolant	10	Standard accessories

Standard accessories

1	Allen wrench 14(M16)	8	Single head open wrench 30(M20)
2	Allen wrench 3(M4)	9	Single head open wrench 50(M33)
3	Allen wrench 4(M5)	10	Screwdriver 6 inch
4	Allen wrench 5(M6)	11	Flat screwdriver 2 inch
5	Allen wrench 6(M8)	12	U plate(2GB)
6	Allen wrench 8(M10)	13	Adjustable wrench 12 inch
7	Allen wrench 10(M12)	14	

D. Purchased Components list

No.	NAME	Manufacturer
1	NC system	FANUC
2	Ball screw	PMI etc.
3	Linear guide way	PMI etc.
4	Ball screw bearing	NSK/ SKF
5	Main electronic components	(FR)SCHNEIDER
6	Main components of pneumatic system	SMC/AIRTAC
7	Towline	IGUS
8	24T arm type magazine	Taiwan Brand

Note: According to delivery/technical improvement and other reasons, the suppliers reserve the right to change brands.

E. Installation Preparation Form

No	Item	Request
Machine Basic Requirements		
1	Machine Tool Foundation	The concrete layer is about 350mm thick on hard ground
		No vibration source around the foundation
		No cracks and depressions, no need for additional foundation and grouting
2	Incoming Power Supply Preparation	3-phase 380V; 50±1 Hz, 30kVA(Standard) The user provides the power cord from the power supply to the machine tool
3	Compressed air connection preparation (Air gun, trachea)	Compressed air: 0.5~0.7MPa, ≥200L/min (ANR) The user provides a Ø10 air pipe from the air source to the machine; the dew point temperature: below -17°C (atmospheric pressure); the air supply source should be cleaned with less moisture and oil
4	Quick-drying cement for secondary grouting	The user prepares the secondary grouting cement and tools
5	Cleaning oil	10L of gasoline or kerosene, some cotton rags
6	Lubricating oil and cutting fluid	Read " Recommended Oil and Grease" for details.
*** Machine tools need to be confirmed before leaving the factor ***		
7	Transport condition confirmation	Confirm the mode of transportation according to the plant and surrounding road conditions
8	Factory door size	Satisfy the net transport size of the largest part of the machine
9	Factory height	Confirm the lifting method according to the actual height of the plant
10	Spreader preparation	Read the list for details
11	Forklift size	Require a forklift of more than 10 tons
12	Unpacking installation assistant	The customer packs box removal and inventory
13	Measuring tool preparation	Check in accordance with the preparation checklist agreed in the contract
14	Acceptance test preparation	Check in accordance with the preparation checklist agreed in the contract
*** Customer-supplied spreader list ***		
15	20mm diameter,8m length wire rope	2 sets

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F. Recommended Oil and Grease Tables

Lubrication part		Name	Capacity	Viscosity	Note
Spindle oil chiller (Opt)	Spindle oil chiller	Hydraulic oil	32L	ISO VG2	first time/1000h After that, 1 time/5000h
	Recommended Brand	Mobil Velocite NO.3			
Triaxial, ball screw lubrication	Thin oil lubrication	Rail oil	3L	ISO VG68	Supply according to the oil level alarm signal set by the machine tool
	Recommended Brand(Any choice)	HNK-2#			
		Mobil Vactra NO.2			
		Shell Tonna S2 M 68			
Pneumatic booster cylinder lubrication	Booster cylinder oil cup	Hydraulic oil	0.1L	ISO VG46	1 time/5000h
	Recommended Brand(Any choice)	HNK-1#			
		Shell Tellus S2 MX 46			
		Mobil DTE 25 UT			
Hydraulic for 4th rotary table (Opt)	Hydraulic station(Opt)	Hydraulic oil	20L	ISO VG32	1th time/1000h After that, 1 time/5000h
	Recommended Brand(Any choice)	HNK-10#			
		Mobil DTE 24 UT			
		Shell Tellus S2 MX 32			
Thin oil lubrication for tool magazine	Oil pool in the tool magazine	Gear oil	5L	ISO VG150	1th time/1000h After that, 1 time/5000h
	Recommended Brand(Any choice)	HNK-Hp5#			
		Mobil Gear 600 XP 150			
		Shell Omala S2 G 150			
Butter lubrication for tool magazine	Claw of the tool changer arm, the tip of the top tool claw and the slide of the inverted tool	Butter lubrication	150cc	---------	1 time/5000h
	Recommended Brand(Any choice)	Shell ALVANIA EP R0			
		Extreme pressure lithium grease 0#			

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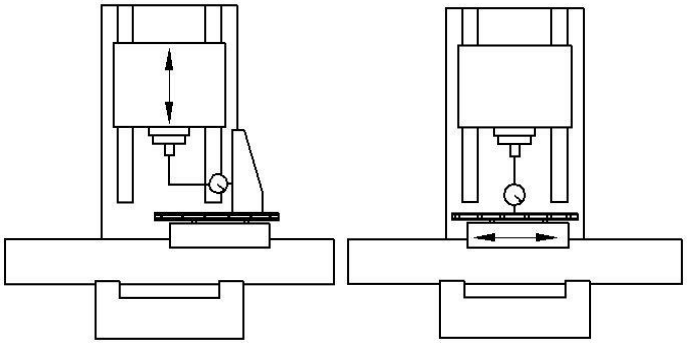
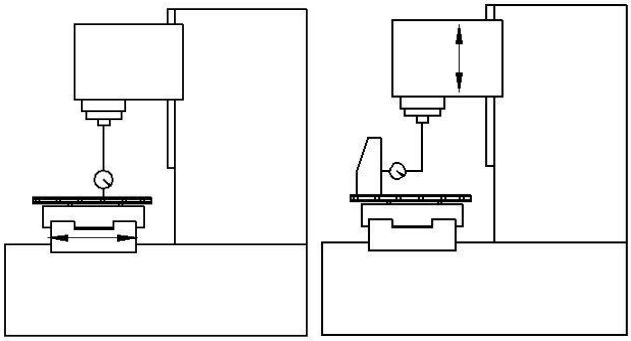
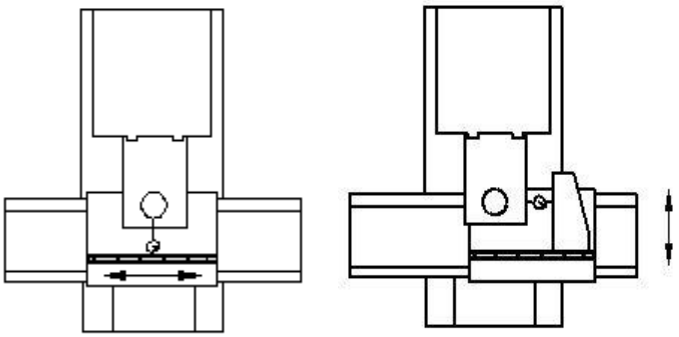
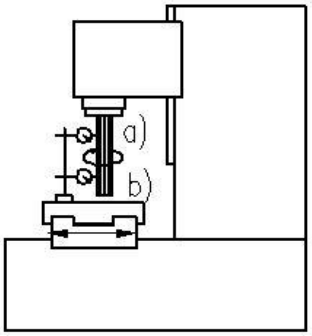
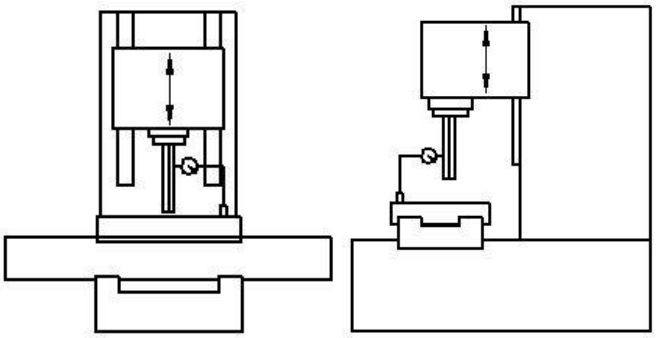
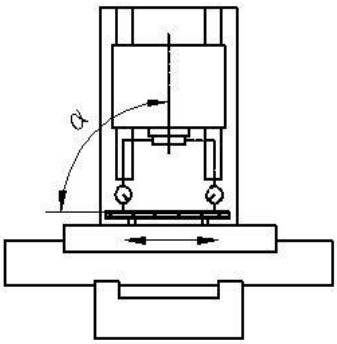
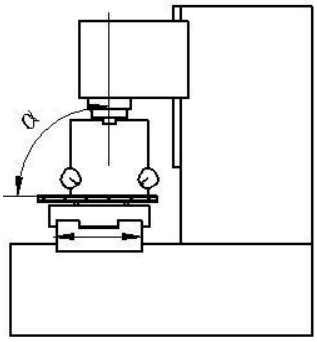
G. Acceptance accuracy table

NO	Items	Schematic diagram	Allowable error
1	Verticality between Z-axis movement and X-axis movement		0.014/500
2	Perpendicularity between Z-axis movement and Y-axis movement		0.014/500
3	Perpendicularity between Y-axis movement and X-axis movement		0.012/500
4	Radial runout of spindle shaft hole: a) Near the end of the spindle. b) 200mm away from the end of the spindle.		a）0.005 b）0.012

G. Acceptance accuracy table

NO	Items	Schematic diagram	Allowable error
5	Parallelism between spindle axis and Z axis movement: a) In the XZ vertical plane parallel to the X axis. a) b) In the ZY vertical plane parallel to the Y axis		a）0.010/300 b）0.010/300
6	Verticality between spindle axis and X axis movement		0.012/300
7	Verticality between spindle axis and Y axis movement		0.012/300

Vertical Machining Center VMC1000II

(FANUC-0i MF-β×8000rpm)

（Version：20220825）

Technical File

宁波海天精工股份有限公司

NINGBO HAITIAN PRECISION MACHINERY CO., LTD.

Content

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H. Main Features

（notice: the picture only for reference）

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Typical applications such as mold and Board category, plates, small shell complex parts of high-speed precision adding.

- **Machine Bed & Main structure**

  The machine bed and the main structure of the machine are cast in the form of gray cast iron, which has good rigidity and shock absorption.

  The interior of the bed is arranged with reinforcing ribs, and the structure of the bed is heavy.

  The transverse sliding table and working table are cast in gray iron. Lateral sliding platform adopts large span structure design, effectively increase the stability of the machine tool.

  The bottom surface of the column which adopts the herringbone structure is fixed on the bed by scraping and grinding. column internal use of "米" word reinforcement structure, the stiffness and good shock resistance, the bottom is designed into the "A" type structure, effectively increased the rigidity of the column, reduce the forward tilt caused by the headstock.

  The headstock which is located in the middle of the A column and the two roller rails along the column

sit in the Z axis up and down in the direction of the mark is made of high strength cast iron with stable structure.

- **Feed mechanism**

  The feed mechanism of X/Y/Z axis adopts AC servo motor, and the elastic coupling without backlash is directly connected with the lead screw to directly drive the ball lead screw to rotate. The reciprocating motion of each axis is realized, and the lead screw support adopts the pretension structure fixed at both ends.

- **Linear guideway**

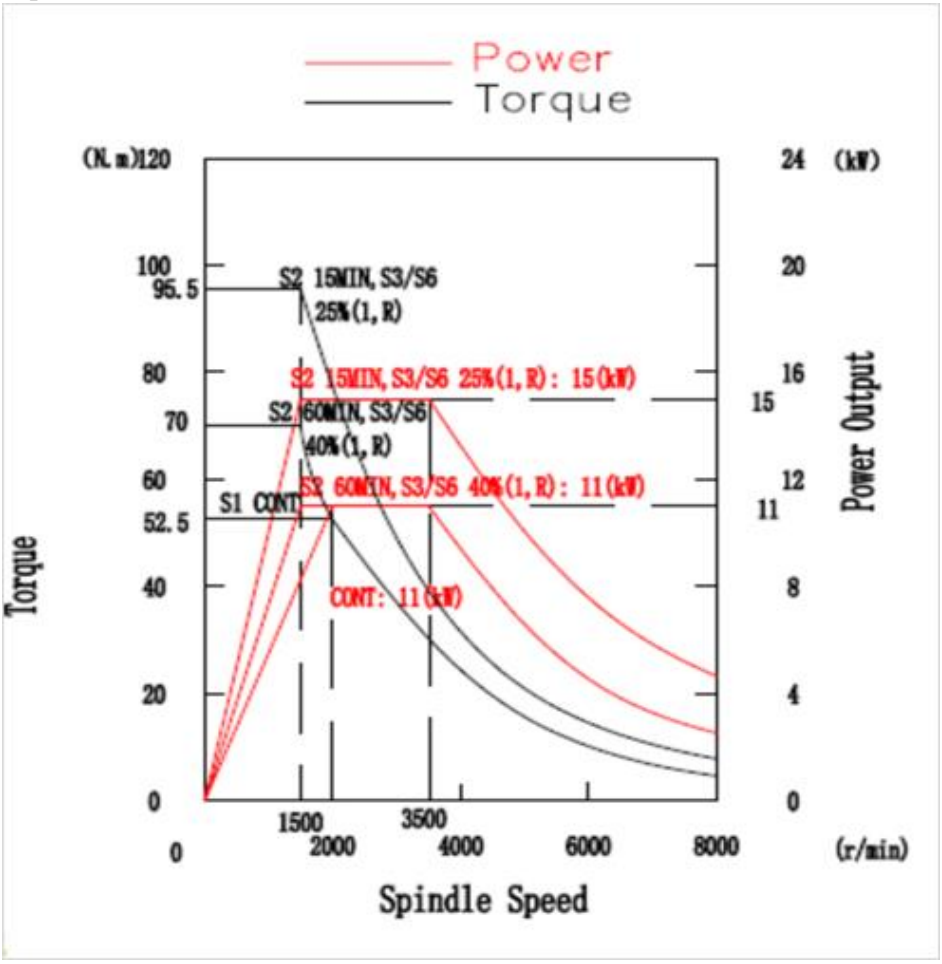
  X/Y axis guideway adopts imported linear guide rail.

  Z-axis guideway is supported by imported heavy-duty roller guideway, which has strong rigidity and good stability, so that the machine tool can obtain high rigidity and long-term stability accuracy

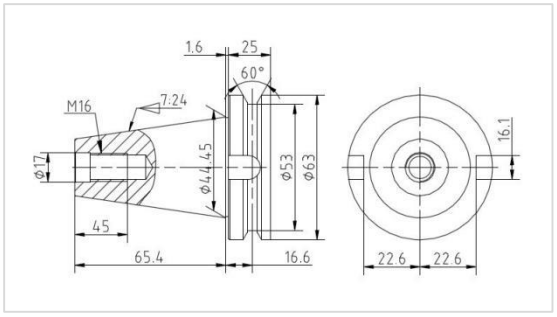
- **Spindle**

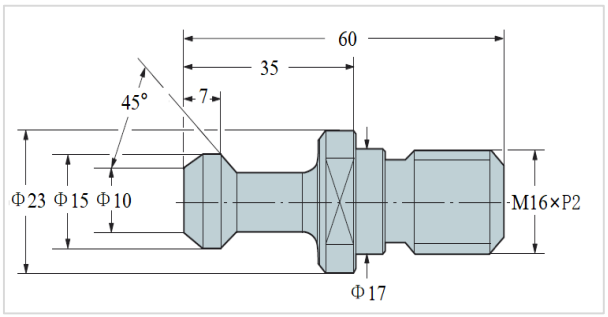
  Imported spindle unit is selected to realize continuous variable speed and positive and negative rotation of spindle, optional spindle oil chiller, Maximum spindle speed of 8000r/min, the maximum torque is 95.5Nm. Spindle nose with air seal, using BT40 tool.

- **Power & Torque**



- **Tool shank & Pull stud**





- **Lubrication**

  The linear and ball screw of the machine adopt a quantitative lubrication system, which can adjust the oil supply cycle and oil supply quantity of each lubrication point. System control realizes fully automatic centralized lubrication

- **Cooling**

  The spindle can be equipped with spindle coolant.

  Standard with large-capacity water tank, equipped with immersed multi-stage stainless steel centrifugal pump for fully cooling tools and components, and equipped with flexible nozzle.

- **Others**

  1. The working area is equipped with LED lights

  2. The machine tool is equipped with three-color lights, prompting three kinds of information: program operation, completion of work cycle and fault alarm.

  3. X/Y/Z axis linear guides are all covered with steel guard.

- **Installation conditions**

  1. Temperature

  Working temperature: 17℃~25℃, ±2℃

  If the requirements of the processed parts are not so precision, the ambient temperature range could be relaxed to10℃ – 40℃.

  When storing and transporting: -30℃~50℃

  2. Humidity

  Continuous: Under 75%(No condensation)

  Short time: Under 95%(No condensation)

  3. Installation site conditions

  1). Not affected by external vibration and electrical interference

  2). Avoid direct sunlight to the machine tool

  3). Avoid direct contact with outside wind, air, and temperature-adjusted cold and hot air

  4). Avoid setting up heating and other heat sources near the machine tool

  5). The concentration of dust in the air shall not be greater than 10mg/m^3 , and should not contain acid, salt and other corrosive gases.

  6). Avoid water leakage and flooding

I. Main technical parameters

Item			Parameters
Machining scope	X travel	mm	1000
	Y travel	mm	600
	Z travel	mm	600
	Spindle nose to table surface	mm	150-750
Table	Table size	mm	1200×600
	Max. Load	kg	800
	T slot	mm	5×18×100
Spindle	Drive type		Belt drive
	Max. speed	rpm	8,000
	Power(cont/Max)	kW	11/15
	Torque(cont/Max)	N.m	52.5/95.5
	Taper	--	BT40
	Pull stud	--	MAS P40T-I(45º)
Feed	Rapid feed X/Y/Z	m/min	36/36/36
	Cutting feed X/Y/Z	m/min	15/15/15
Tool magazine	Capacity		24T
	Type		Arm type
	Tool shank		BT40
	Max. tool（Full/adjacent vacant）	mm	Φ80/Φ150
	Max. tool length	mm	300
	Max. tool weight	Kg	8
	Indexing(tool to tool)	sec	2.5
Positioning Accuracy (GB/T 20957.4-2007)	X axis	mm	0.008
	Y axis	mm	0.006
	Z axis	mm	0.006
Repeatability Accuracy (GB/T 20957.4-2007)	X axis	mm	0.005
	Y axis	mm	0.004
	Z axis	mm	0.004
Controller			FANUC 0i-MF(β)
Air pressure		MPa	0.5～0.7
Machine weight		t	6.5
Machine size(L×W×H)		mm	2800×3550×2650

J. Machine configuration

Standard configuration

1	Controller：FANUC 0i-MF	6	Pneumatic, lubrication
2	8,000rpm belt spindle	7	Air gun
3	24T Arm Type ATC	8	Full enclosure with top cover
4	Internal and rear flushing	9	3-color signal lamp and Working light
5	Spindle outside coolant	10	Standard accessories

Standard accessories

1	Allen wrench 14(M16)	8	Single head open wrench 30(M20)
2	Allen wrench 3(M4)	9	Single head open wrench 50(M33)
3	Allen wrench 4(M5)	10	Screwdriver 6 inch
4	Allen wrench 5(M6)	11	Flat screwdriver 2 inch
5	Allen wrench 6(M8)	12	U plate(2GB)
6	Allen wrench 8(M10)	13	Adjustable wrench 12 inch
7	Allen wrench 10(M12)	14	

K. Purchased Components list

No.	NAME	Manufacturer
1	NC system	FANUC
2	Ball screw	PMI etc.
3	Linear guide way	PMI etc.
4	Ball screw bearing	NSK/ SKF
5	Main electronic components	(FR)SCHNEIDER
6	Main components of pneumatic system	SMC/AIRTAC
7	Towline	IGUS
8	24T arm type magazine	Taiwan Brand

Note: According to delivery/technical improvement and other reasons, the suppliers reserve the right to change brands.

L. Installation Preparation Form

No	Item	Request
Machine Basic Requirements		
1	Machine Tool Foundation	The concrete layer is about 350mm thick on hard ground
		No vibration source around the foundation
		No cracks and depressions, no need for additional foundation and grouting
2	Incoming Power Supply Preparation	3-phase 380V; 50±1 Hz,30kVA(Standard) The user provides the power cord from the power supply to the machine tool
3	Compressed air connection preparation (Air gun, trachea)	Compressed air: 0.5~0.7MPa, ≥200L/min (ANR) The user provides a Ø10 air pipe from the air source to the machine; the dew point temperature: below -17°C (atmospheric pressure); the air supply source should be cleaned with less moisture and oil
4	Quick-drying cement for secondary grouting	The user prepares the secondary grouting cement and tools
5	Cleaning oil	10L of gasoline or kerosene, some cotton rags
6	Lubricating oil and cutting fluid	Read " Recommended Oil and Grease" for details.
*** Machine tools need to be confirmed before leaving the factor ***		
7	Transport condition confirmation	Confirm the mode of transportation according to the plant and surrounding road conditions
8	Factory door size	Satisfy the net transport size of the largest part of the machine
9	Factory height	Confirm the lifting method according to the actual height of the plant
10	Spreader preparation	Read the list for details
11	Forklift size	Require a forklift of more than 10 tons
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14	Acceptance test preparation	Check in accordance with the preparation checklist agreed in the contract
*** Customer-supplied spreader list ***		
15	20mm diameter,8m length wire rope	2 sets

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M. Recommended Oil and Grease Tables

Lubrication part		Name	Capacity	Viscosity	Note
Spindle oil chiller (Opt)	Spindle oil chiller	Hydraulic oil	32L	ISO VG2	first time/1000h After that, 1 time/5000h
	Recommended Brand	Mobil Velocite NO.3			
Triaxial, ball screw lubrication	Thin oil lubrication	Rail oil	3L	ISO VG68	Supply according to the oil level alarm signal set by the machine tool
	Recommended Brand(Any choice)	HNK-2#			
		Mobil Vactra NO.2			
		Shell Tonna S2 M 68			
Pneumatic booster cylinder lubrication	Booster cylinder oil cup	Hydraulic oil	0.1L	ISO VG46	1 time/5000h
	Recommended Brand(Any choice)	HNK-1#			
		Shell Tellus S2 MX 46			
		Mobil DTE 25 UT			
Hydraulic for 4th rotary table (Opt)	Hydraulic station(Opt)	Hydraulic oil	20L	ISO VG32	1th time/1000h After that, 1 time/5000h
	Recommended Brand(Any choice)	HNK-10#			
		Mobil DTE 24 UT			
		Shell Tellus S2 MX 32			
Thin oil lubrication for tool magazine	Oil pool in the tool magazine	Gear oil	5L	ISO VG150	1th time/1000h After that, 1 time/5000h
	Recommended Brand(Any choice)	HNK-Hp5#			
		Mobil Gear 600 XP 150			
		Shell Omala S2 G 150			
Butter lubrication for tool magazine	Claw of the tool changer arm, the tip of the top tool claw and the slide of the inverted tool	Butter lubrication	150cc	---------	1 time/5000h
	Recommended Brand(Any choice)	Shell ALVANIA EP R0			
		Extreme pressure lithium grease 0#			

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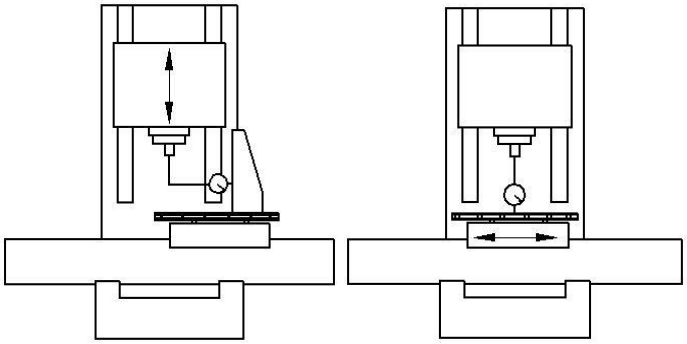
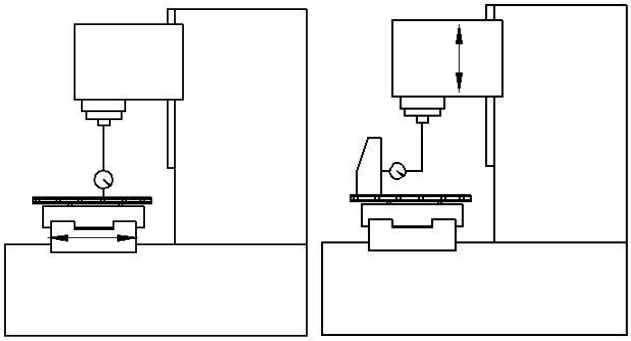
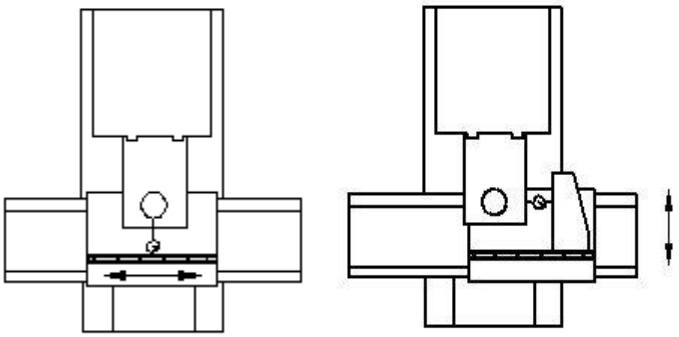
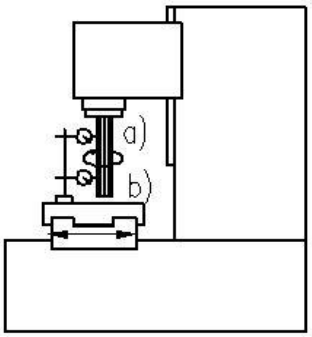
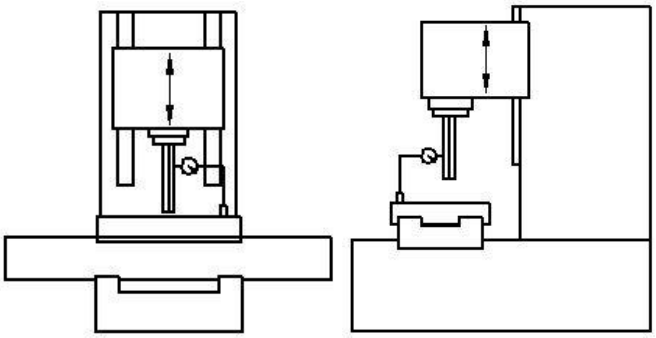
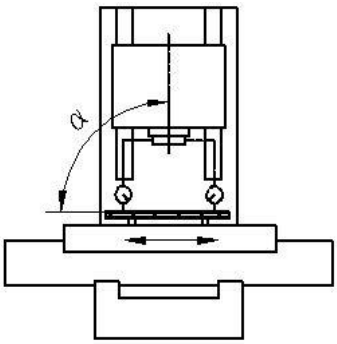
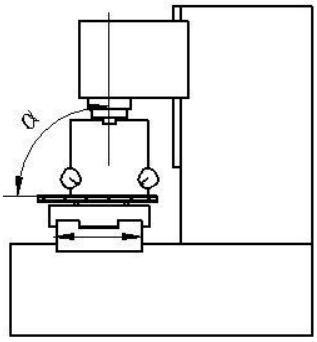
N. Acceptance accuracy table

NO	Items	Schematic diagram	Allowable error
1	Verticality between Z-axis movement and X-axis movement		0.014/500
2	Perpendicularity between Z-axis movement and Y-axis movement		0.014/500
3	Perpendicularity between Y-axis movement and X-axis movement		0.012/500
4	Radial runout of spindle shaft hole: a) Near the end of the spindle. b) 200mm away from the end of the spindle.		a）0.005 b）0.012

N. Acceptance accuracy table

NO	Items	Schematic diagram	Allowable error
5	Parallelism between spindle axis and Z axis movement: a) In the XZ vertical plane parallel to the X axis. b) b) In the ZY vertical plane parallel to the Y axis		a）0.010/300 b）0.010/300
6	Verticality between spindle axis and X axis movement		0.012/300
7	Verticality between spindle axis and Y axis movement		0.012/300