

VL1100A/D VMC Introduction



Version No.: TRJG-2018-A1



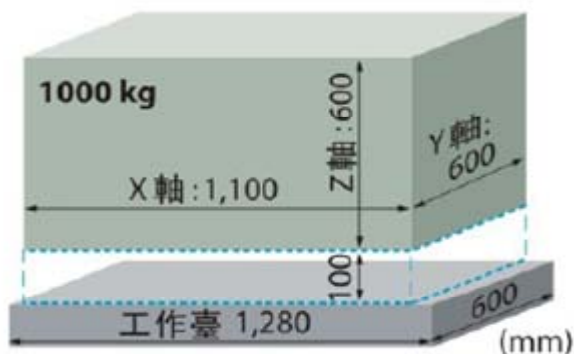
**Use our wisdom to
supply you the
best solution**

**Sky Master-Kraft
China-Germany
Investment**

VL1100A/D technical parameter

“VL” means Vertical machining center
 “1100” means X travel is 1100mm
 “A” means 40# spindle ,
 “D” means 50#

Spindle



※ We reserve the right to change technical parameter for improvement of our products without giving notice to customers.

Item			Unit	VL1100A	VL1100D
Standard controller				FANUC 0i MF	FANUC 0i MF
Travel	X axis travel (work-table)		mm	1100	1100
	Y axis travel (saddle)		mm	600	600
	Z axis travel (spindle head)		mm	600	600
	Distance from spindle nose to table		mm	100-700	60-660
	Distance from spindle center to column cover		mm	630	630
Work table	Table size (length×width)		mm	1280×600	1280×600
	Max. table load		kg	1000	1000
	T slot size (width×distance×quantity)		mm	18×100×5	18×100×5
Spindle	Spindle taper			BT40	BT50
	Max. spindle speed		rpm	10000 (direct driven)	6000 (direct driven)
	Spindle motor power (continual/30mins)		kW	11/15	11/15
	Spindle torque		N.m	52.5/95.5	52.5/95.5
X/Y/Z	Rapid traverse X/Y		mm/min	36000	36000
	Rapid traverse Z		mm/min	30000	30000
	Cutting feed rate on X/Y/Z		mm/min	1-10000	1-10000
ATC	ATC type			Arm type	Arm type
	Tool capacity		把	24	24
	Max. tool diameter		mm	φ80/φ130	φ110/φ220
	Max. tool length		mm	350	350
	Max. tool weight		kg	8	15
Travel	VDI/DGQ3441	Full travel positioning	mm	P0.010	P0.010
		Repeatability accuracy	mm	Ps0.008	Ps0.008
Air pressure			MPa	0.6-0.8	0.6-0.8
Supply voltage & frequency				3 /PE , AC380V , 50Hz	
Power requirement			kVA	30	30
Machine size (length/width/height)			mm	4080×3510×2850	
Machine weight			kg	7250	7250

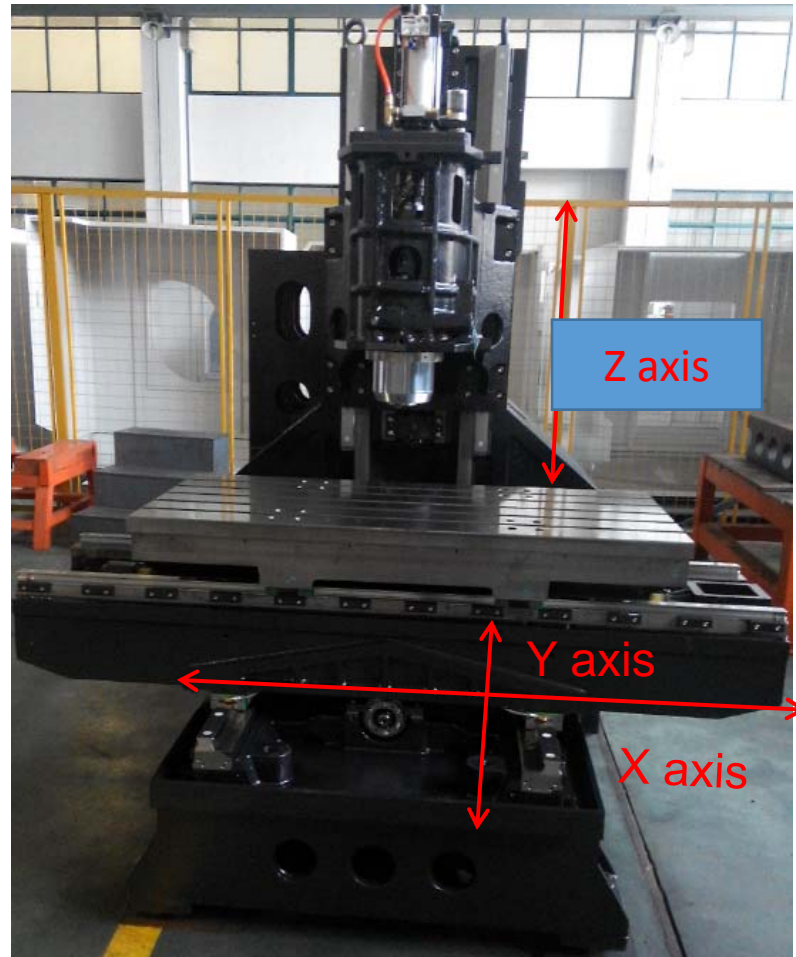
Machine feature – Whole machine



Mainly use for machining high precision mould or non ferrous metal high speed machining, fulfill the concept of the high speed Machining center :

- ◆ High Rotate Speed—**direct connected spindle 10000rpm,6000rpm**
- ◆ High Feeding Speed—maximum moving speed is 36m/min (48m/min optional),
- ◆ Fast Reaction—all three axis equip with large torque servo motor, the maximum acceleration can reach 0.8G

Machine Structure -Frame



Worktable movement in left and right ---X axis
Saddle movement in front and back -----Y axis
Spindle movement in up and down --Z axis

- ◆ Use cross-shaped saddle in VMC structure
- ◆ One-piece integrated die-cast iron column with invert 'Y' shape
- ◆ Reasonable arrangement for whole machine ,convenient operation
- ◆ Easy to handle with chip remove and drainage

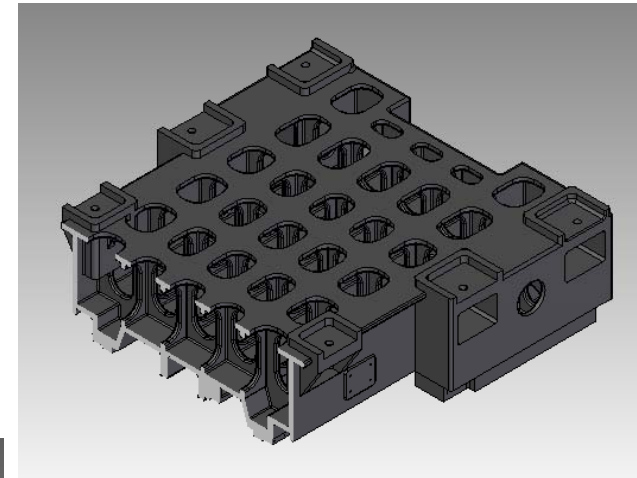
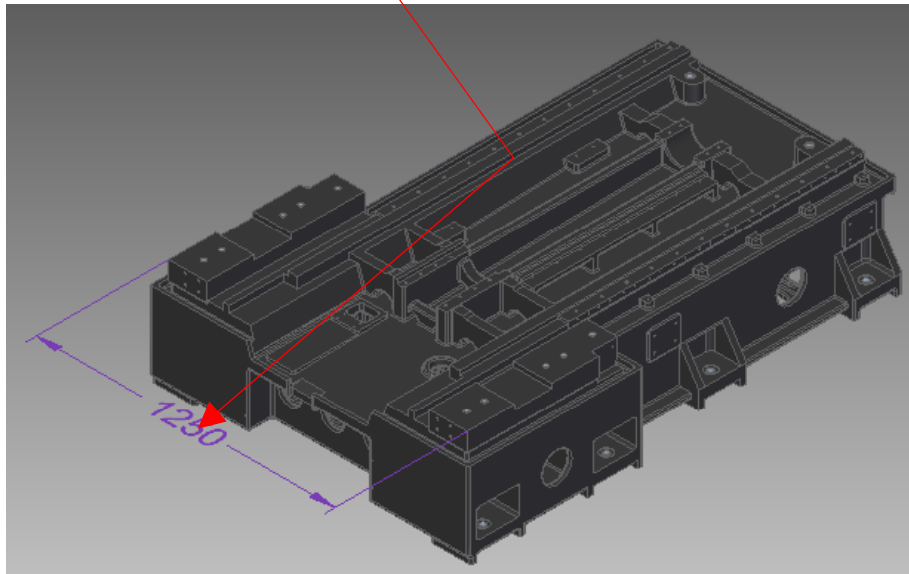
★The casting material is from Germany with unique composition ratio ,which is **30% higher than domestic cost**

★ Every casting part have a test bar which can analyze the real material character

★ FEM analysis to optimize the rigidity for machine

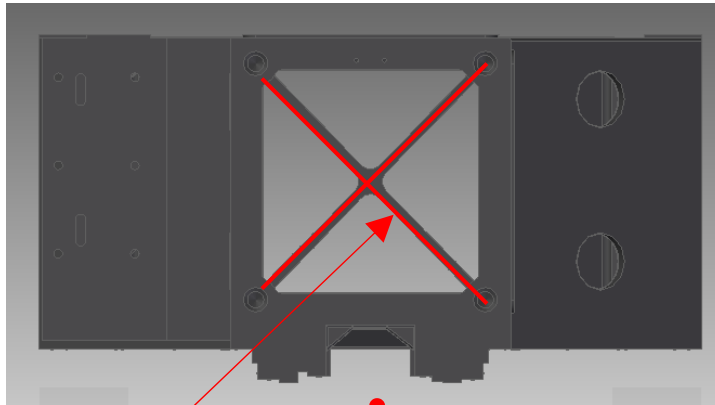
Structure feature – machine bed

The large connect surface between bed and column which enhance the whole machine's stability



Many reinforcing plate designed in the machine bed ,stable loading , high resistance to deformation, long rigidity keeping

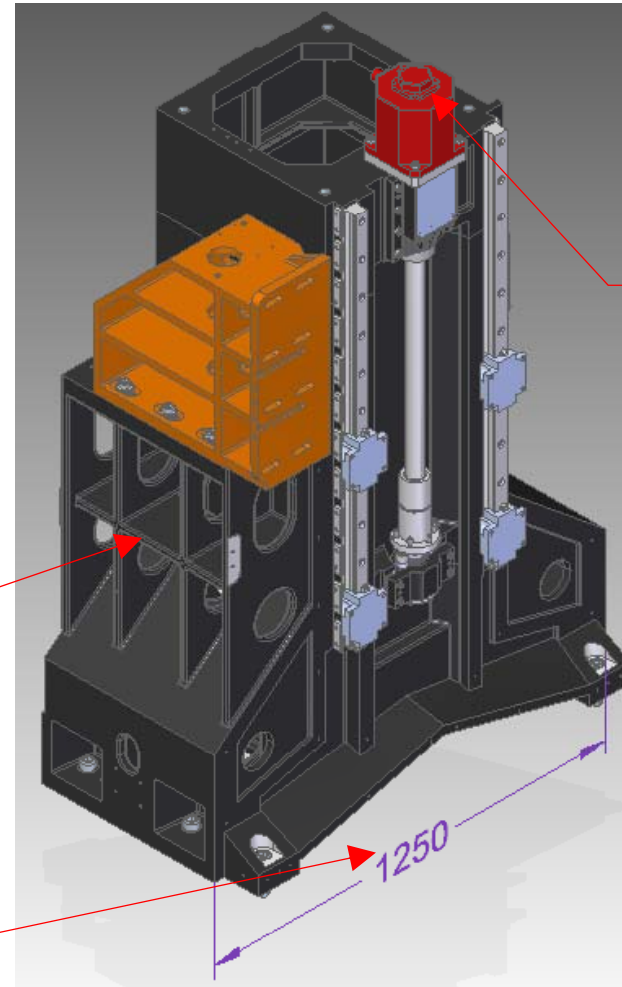
Structure feature-Column



The cross ribs in column improve the torsion rigidity and stability

One-piece integrated casting for column and ATC interface seat, the shoulder carry design is patented, keep the machine with stable accuracy in long time.

The invert Y shaped column with large span keep excellent rigidity

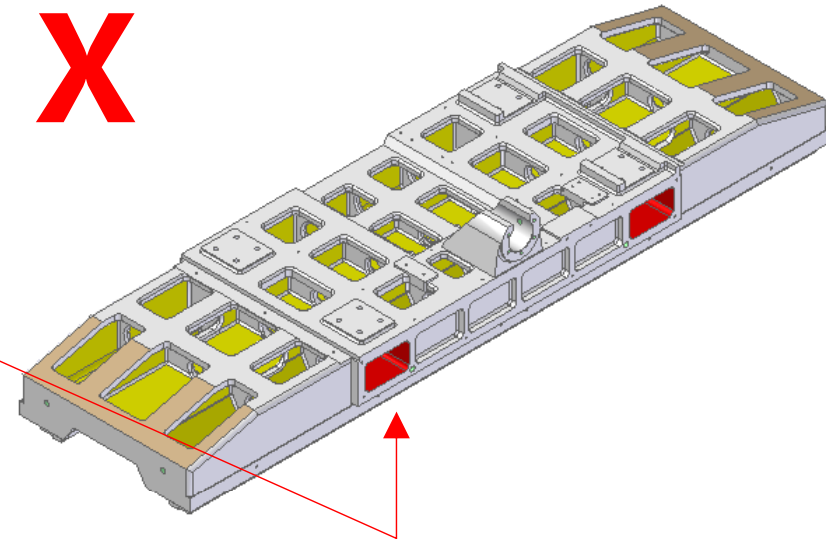


Z axis is driven by big power motor(torque 45Nm), compare with mechanical balance system, the cost increase 10%,but improve the 3 axis response speed and circular profile accuracy in direction changing obviously

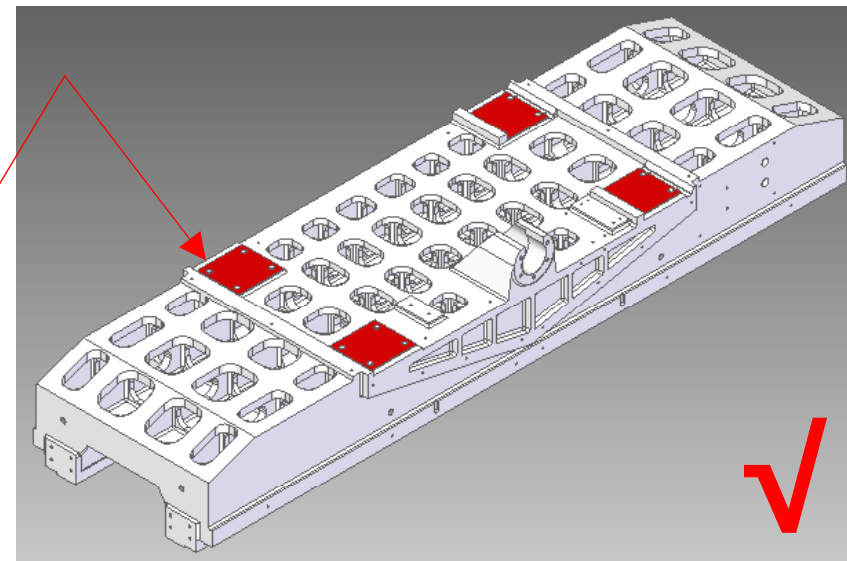
Structure feature-Saddle

The traditional saddle has a square hole for the convenience of slide block installation, but this design will reduce the torsion rigidity of saddle greatly.

X



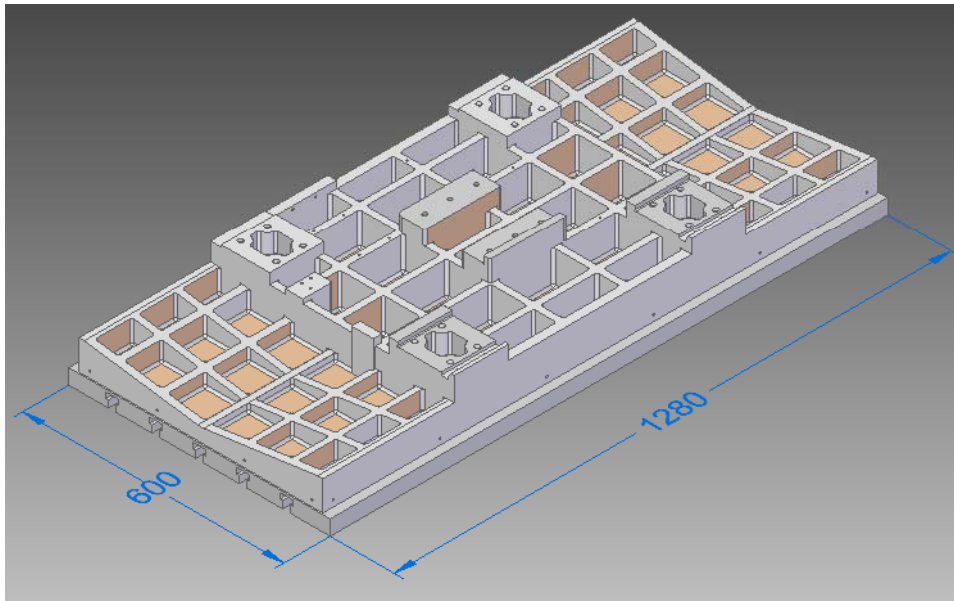
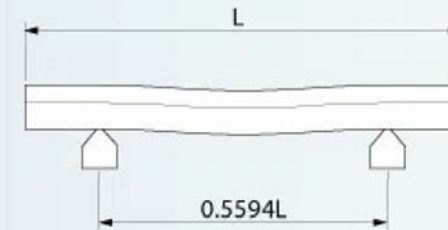
The VL1100A/D is designed with many stronger ribs at the bottom of saddle, the place for slide block installation is enhanced, this design improve 40% torsion ability although it adds the additional difficulty.



Structure feature –Work table

Bessel optimized
supporting point design
Stable loading, high torsion
rigidity

贝塞尔 (BESSEL POINTS) 最佳支点

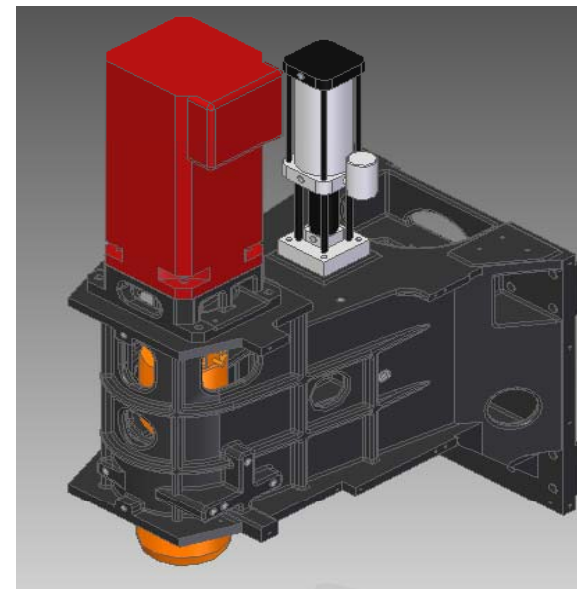
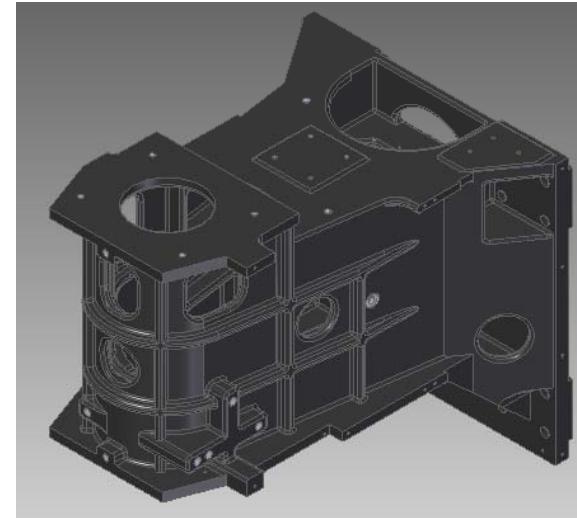


Worktable loading : **1000kg**

T slot size $5 \times 18 \times 100\text{mm}$

Structure feature-Spindle head

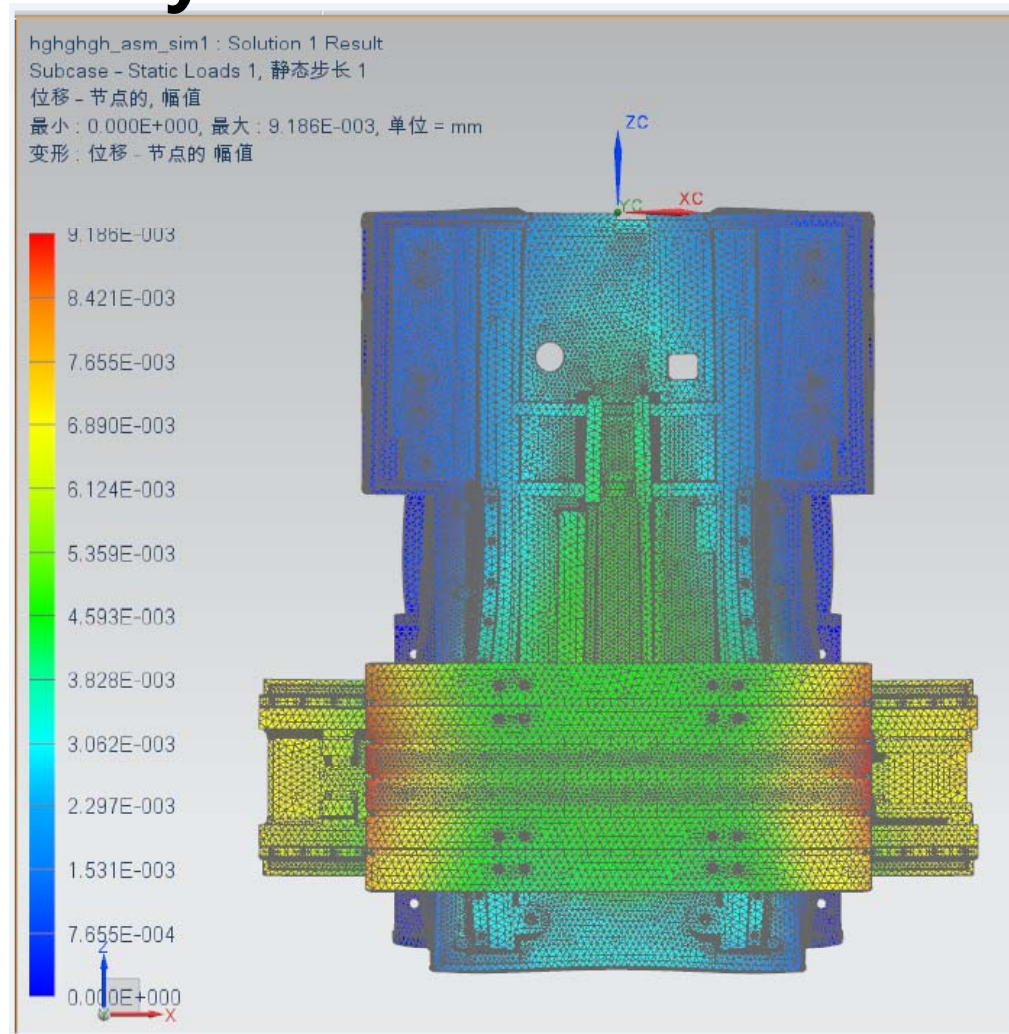
- ◆ The spindle head structure is from Germany Kraft craft and design experience combines with FEM to ensure the rigidity.
- ◆ Max spindle speed :10000rpm, 、6000rpm
- ◆ Tool shank BT40, BT50
- ◆ The spindle head is designed in thin-wall(15mm thickness only) but with many enhance ribs, compare with other factory, this light-weight design can save 50kgs and as well as the dynamic improvement.



Analysis and optimization

Worktable stress analysis diagram

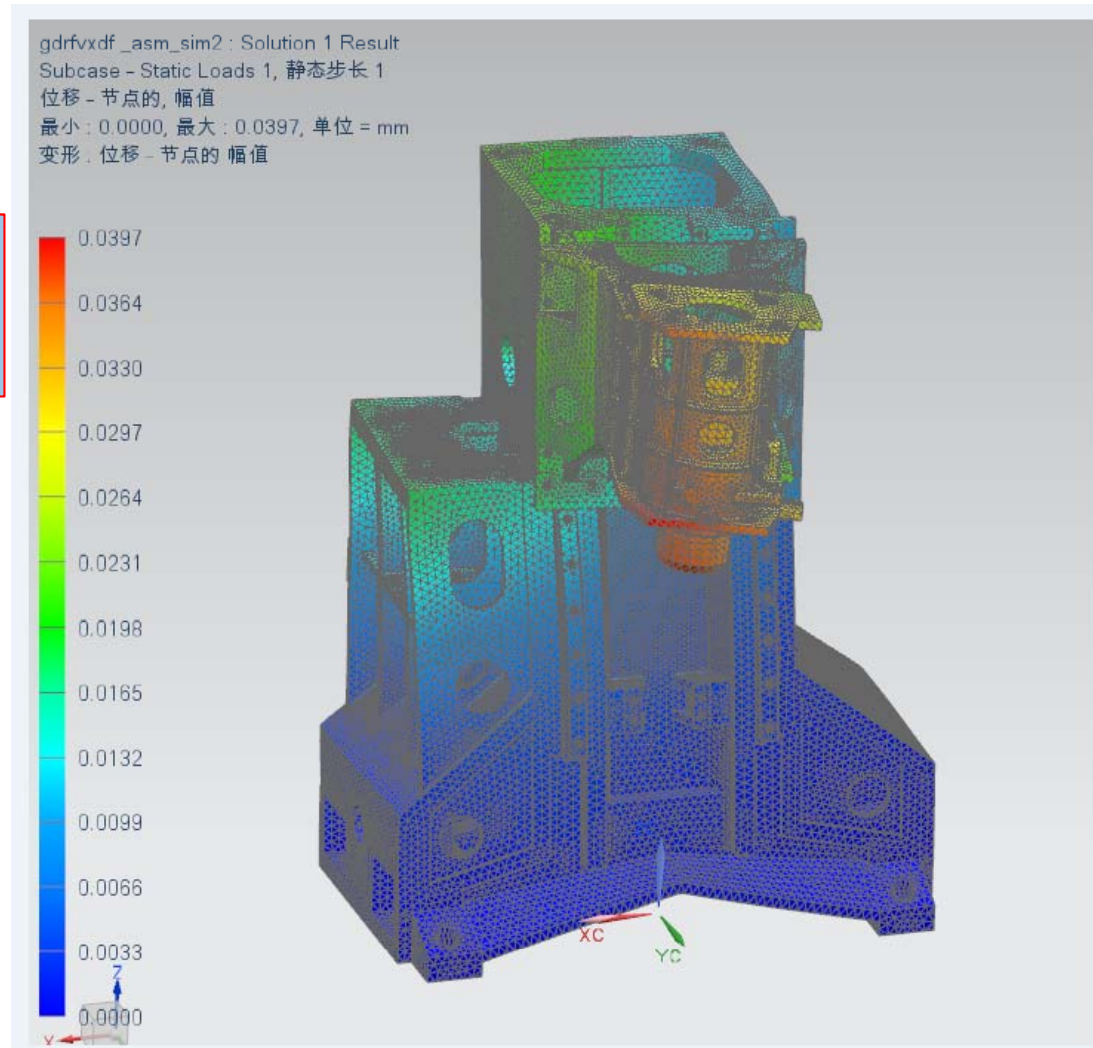
	Rated	Test
Loading	1T	2T
Deformation	< 0.005mm	< 0.010mm



Analysis and optimization -Column, spindle head stress analysis diagram

Analysis condition :
Spindle head move to the top,
Stress at the side of spindle

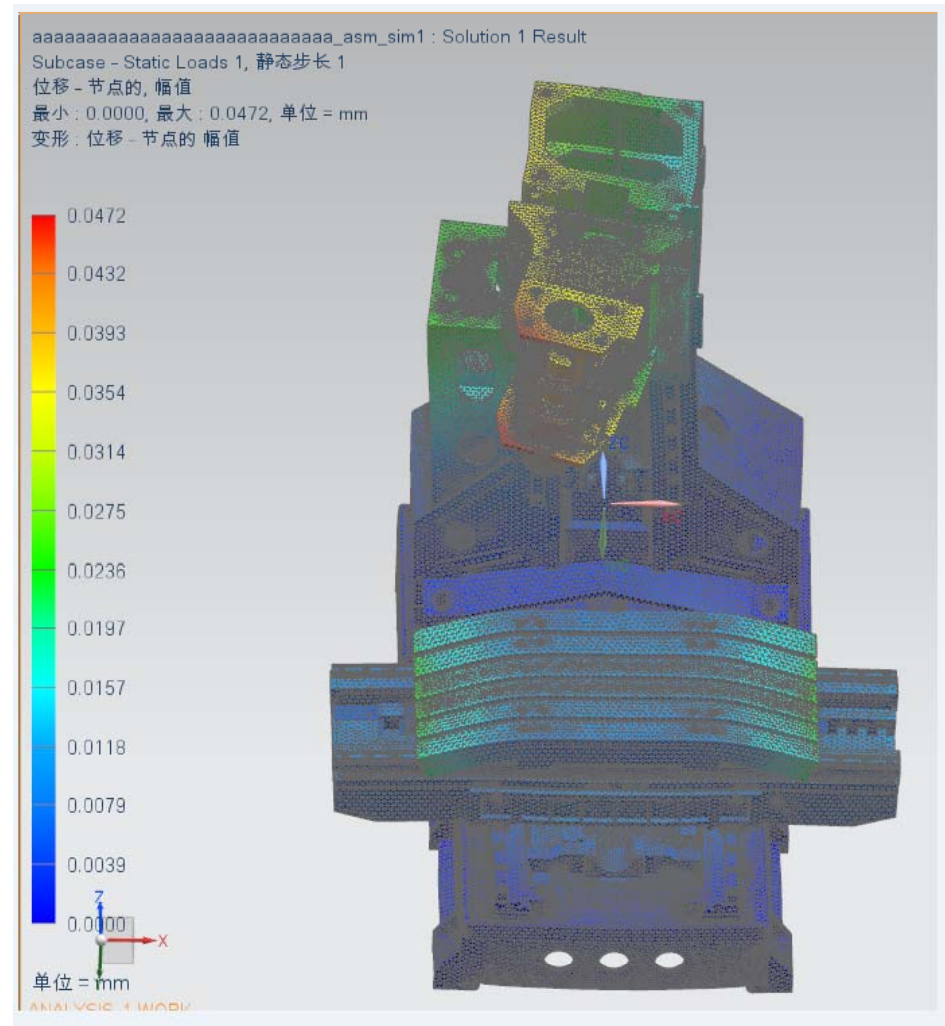
	Rated	Test
loading	279kgf	1000kgf
Deformation	< 0.012mm	< 0.040mm



Analysis and optimization- Whole machine Stress analysis diagram

Analysis condition :
Worktable loading 2 tons, spindle
move to the top, stress at the side
of spindle

	Rated	Test
Loading	310kgf	1000kgf
Deformation	0.015mm	0.047mm



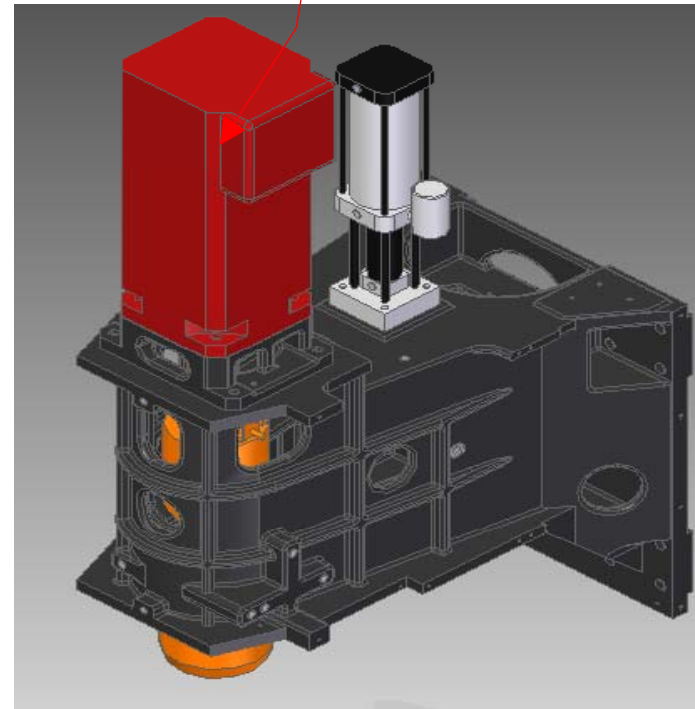
USA SETCO Direct driven spindle

VL1100A
standard

Direct driven spindle with modular design in order to match with different controller system

★ Setco is an USA company who focus on designing ,manufacturing high performance and high precision spindle ,they have products line on precise spindle series

★ Direct driven , Max.speed 10000rpm,the spindle motor direct driven the spindle, the simplified structure with lower vibration and high rotation accuracy and rapid response speed



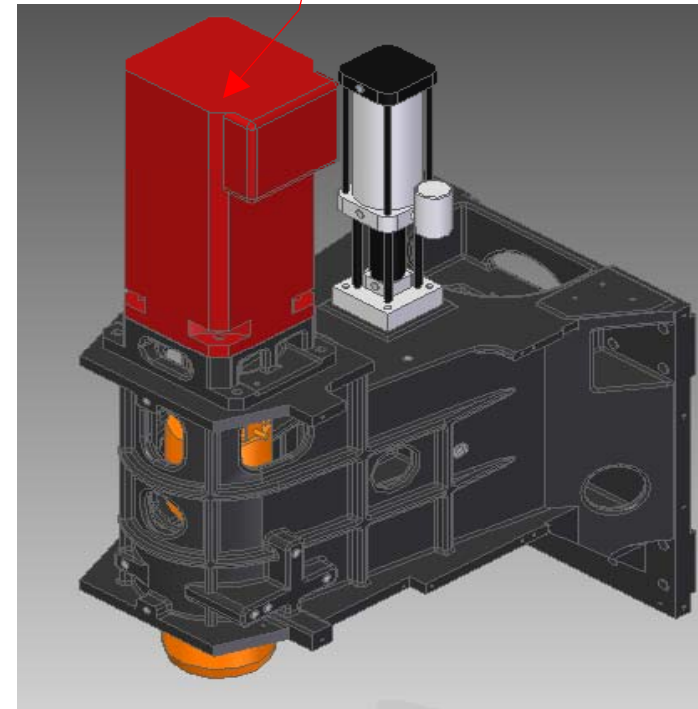
Taiwan VOLIS BT50 direct drive spindle

VL1100D
standard

Modular design of direct drive spindle head to meet various CNC controller

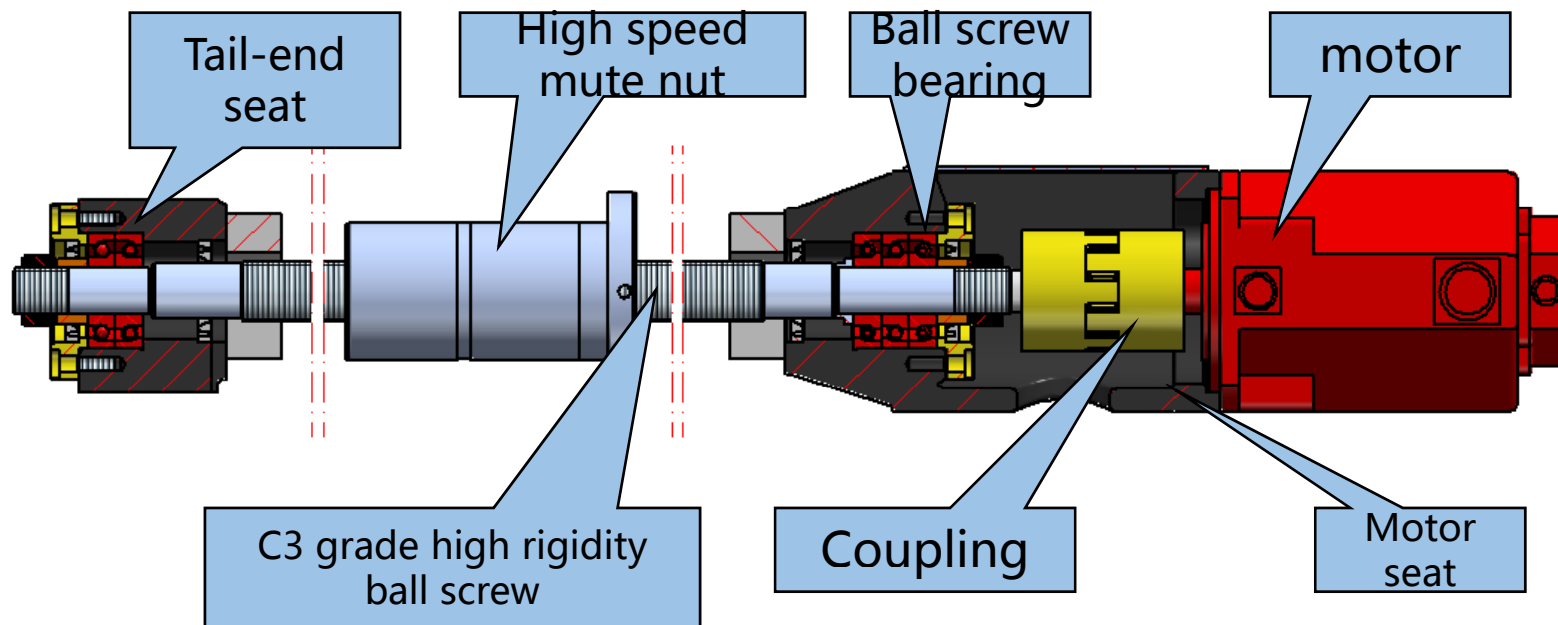
★ Taiwan VOLIS company focuses on the design and manufacture of the precision spindle of the tool machine. The whole process has strict QC control. Each spindle has a detailed quality file to make the product more stable.

★ Direct drive spindle with max. 6000rpm, it reduces the middle link, the vibration is suppressed, so the spindle rotating accuracy and rapid response are improved.



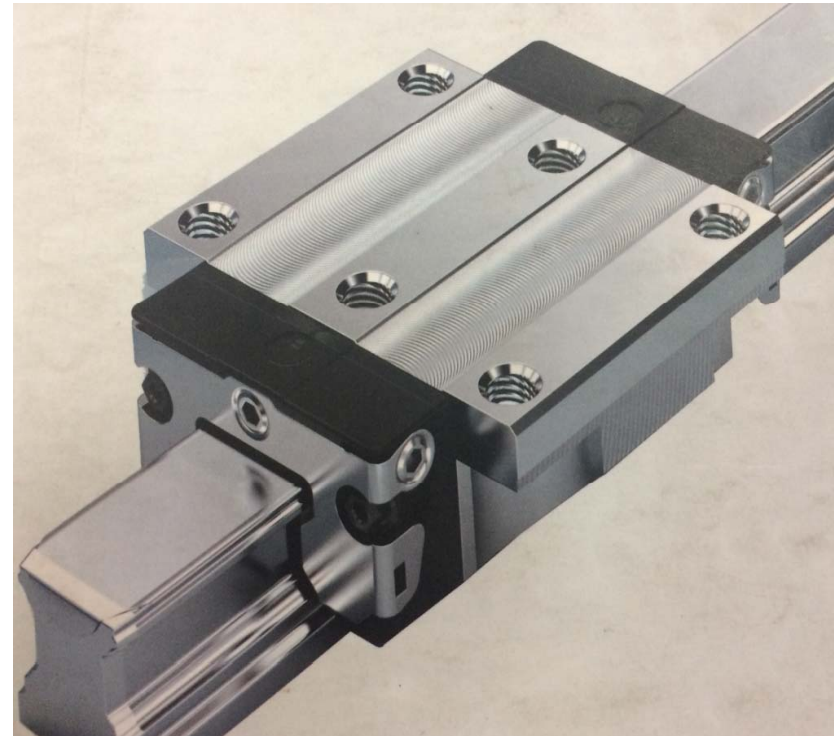
PMI Ball screw

The 3 axis servo motor direct connect with the ball screw through gapless elastic coupling and with special pre-stretching which can prevent thermal deformation to keep ball screw with stable accuracy and rigidity as well as the running precision



Japan THK\Germany Rexroth linear guide way

All three axis use German Rexroth or Japanese THK linear guide has features of high rigidity, large loading, low abrasion and can bear the load of cross-section from any direction .



Japan SHOWA lubrication system

The full set of SHOWA lubrication system is imported from Japan(including electric lubricate pump, oil pipe , joint , oiler and so on) ,feed the oil to the slide block and other parts need lubrication with Self-timing and quantitative ,the lube system has the measurement switch of liquid level and pressure in order to keep the system with long and stable working.



Light for spindle head

The strip-type light is on the top of the splash guard, and there is an extra LED lamp with big power on the spindle head for convenience observing



Japan SMC pneumatic system

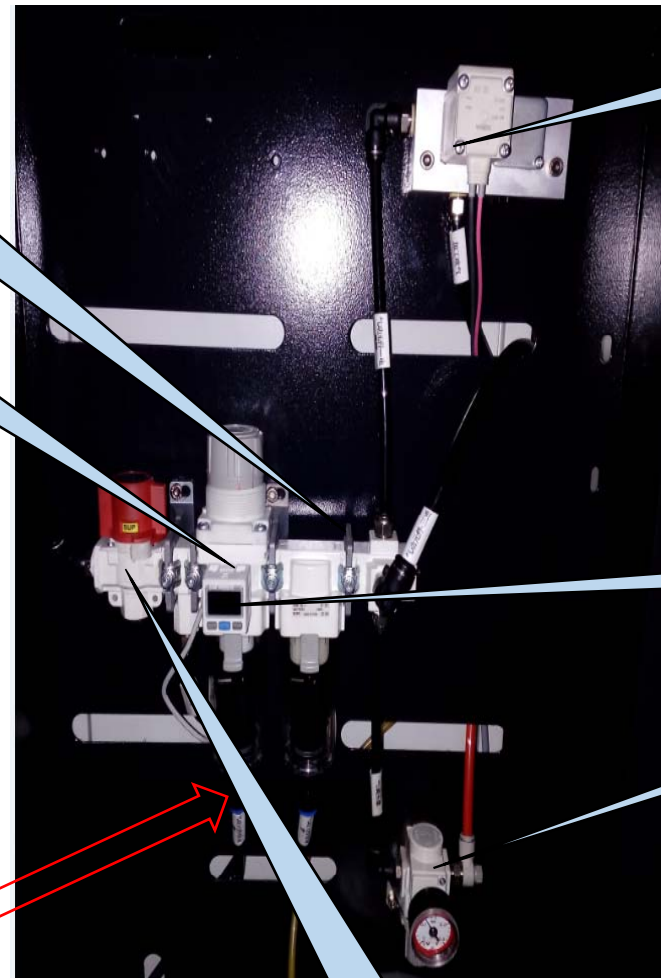
Oil mist separator

Arrow Pneumatics

1. The whole set of SMC pneumatic system is imported from Japan
2. Ensure the air supply with clean and dry
3. Prolong the lifetime for pneumatic components .
4. The integral layout for pneumatic system is reasonable and elegant
5. Convenience for observe and maintenance .

Phoenix labeling

Each self-made wire or cables are labeling in two side for convenience production and maintenance



Solenoid valve

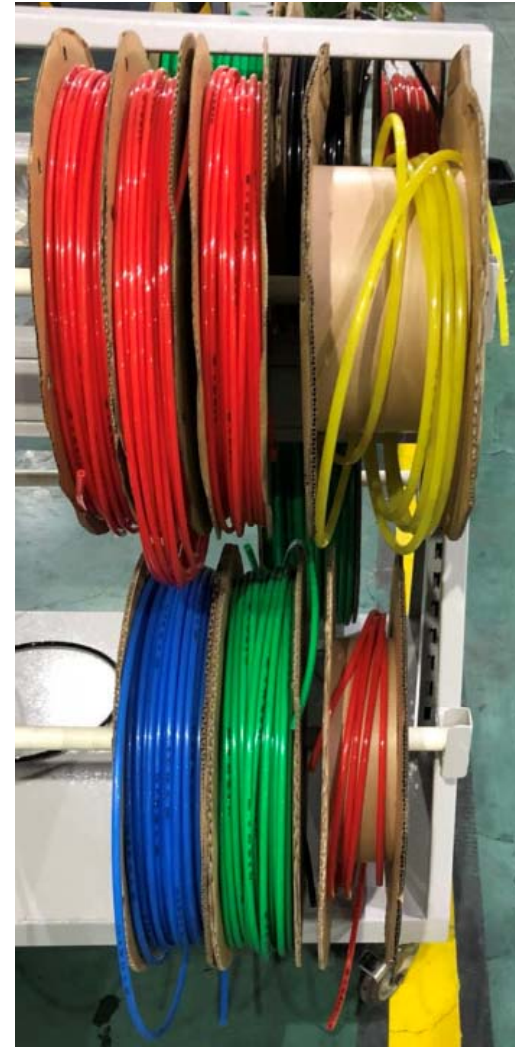
Digit pressure gauge

Pressure regulating valve

Residual pressure relief valve

Japanese SMC and French LEGRIS air tube

1. With high quality Japanese SMC and French LEGRIS air tube
2. Different functions with different colors, it's convenient for assembly and maintenance



TNP spindle chiller

Spindle chiller is standard accessory, 1kW cooling capacity, spindle temperature rise is only 2°C which can force the spindle with circulating cooling ,remove heat rapidly to prevent the spindle from thermal expansion ,improve machining accuracy and the surface quality for workpiece .

Temperature sensor is fixed on the casting part of main machine , sensing the real temperature to ensure the cooling result

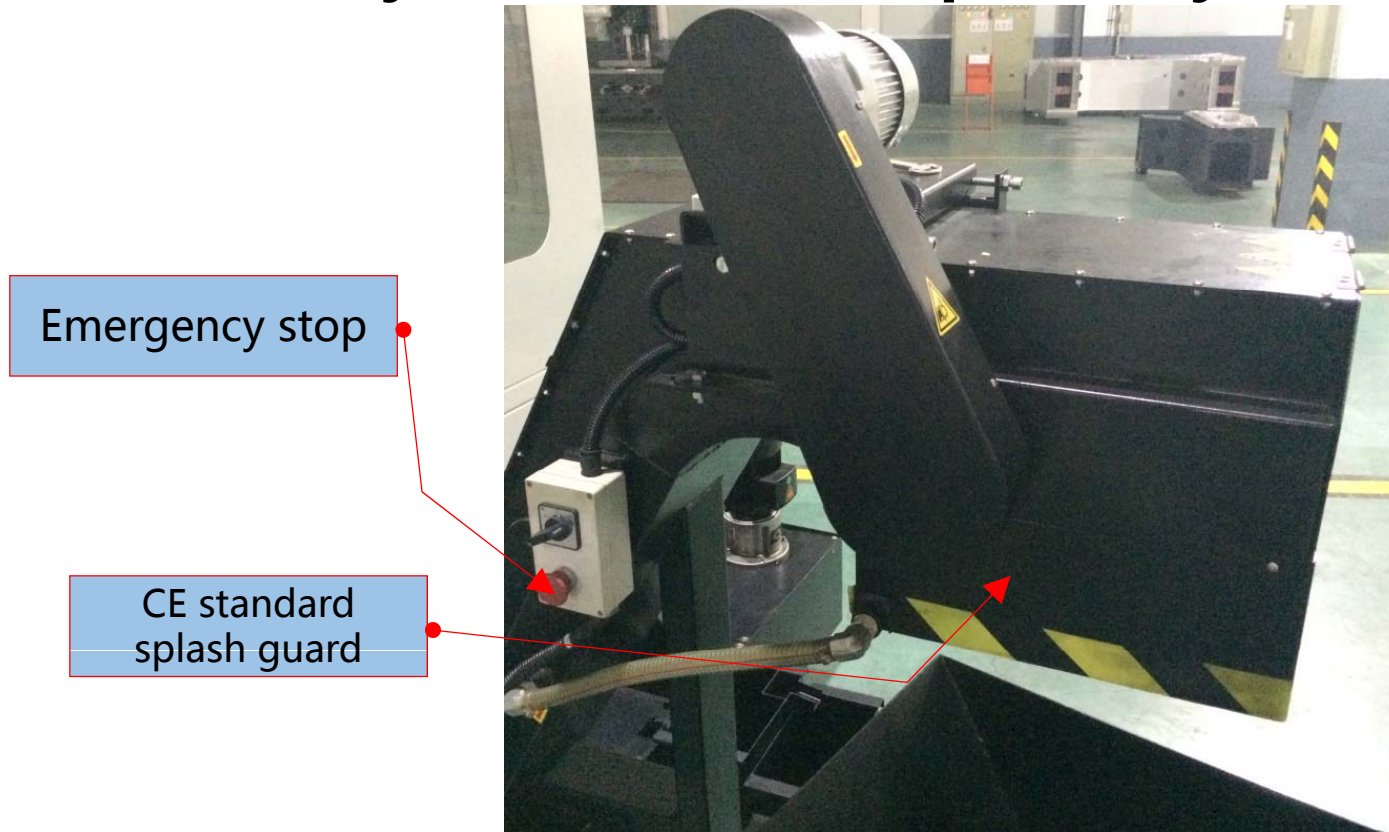
Temperature sensor



Spindle chiller



Taiwan Key Arrow chain chip conveyor



Chain type chip conveyor is standard , remove the chips safely and effectively

★ the chip output port is equipped with protection guard and alarm label to protect the operator.

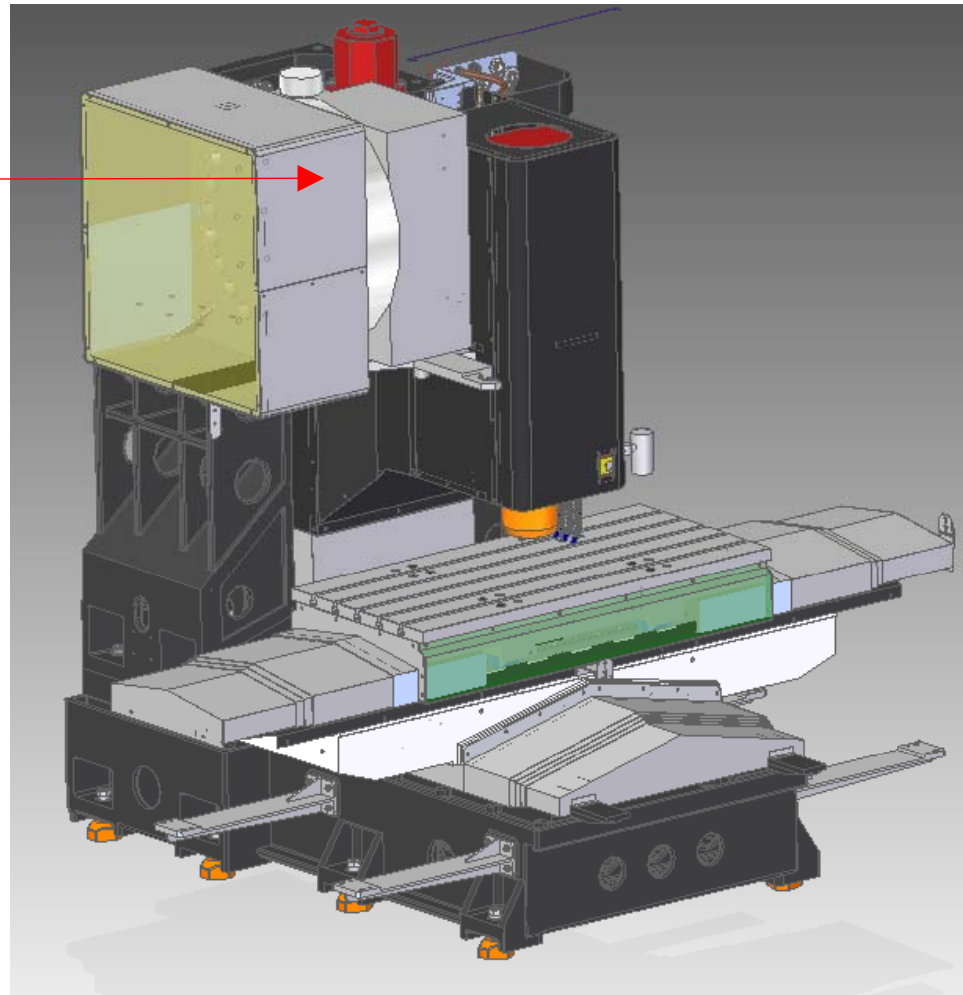
★ There is an emergency stop button on the chain chip conveyor ,it' s convenience for operator to press it under the emergency situation .

(Certified by Germany Tuv and got the CE already)

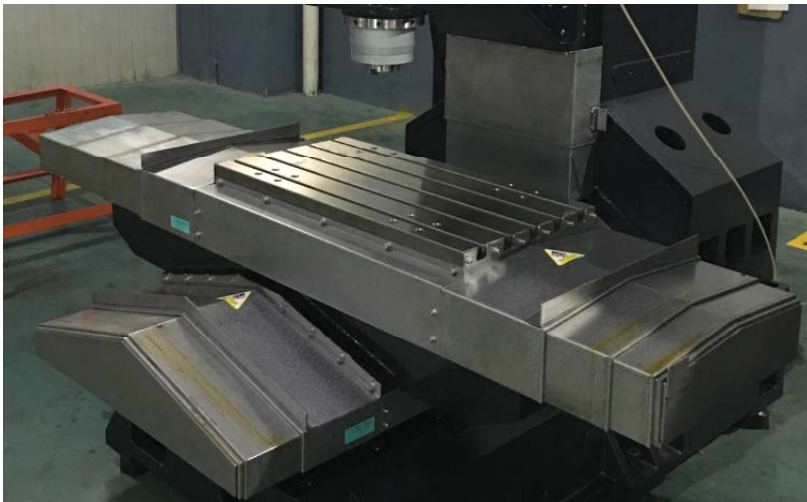
GIFU ATC

GIFU BT40-24 ARM
TYPE

Imported from Taiwan, ATC
capacity 24pcs , Arm type,
fast speed for tool exchanging
with full-closed splash guard
to prevent the chips



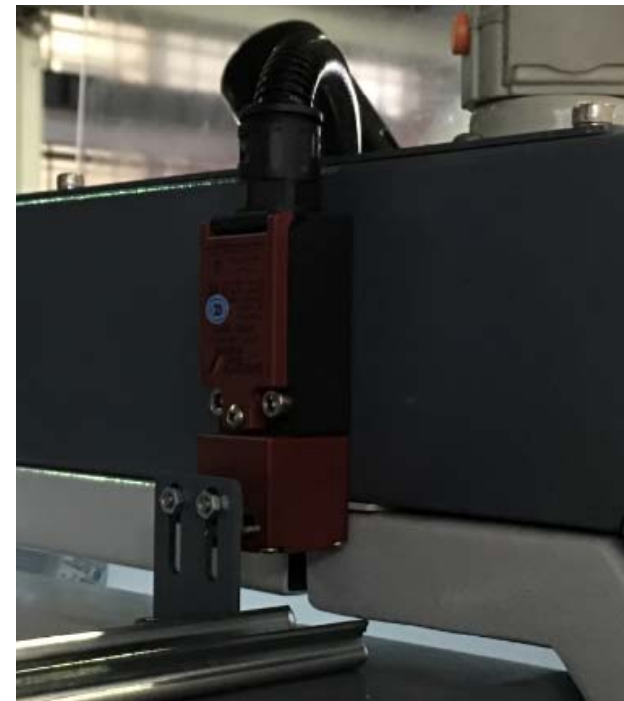
Japan NAJEC telescope cover



- ★ 3 axis telescope with high tolerance matching and with imported scraping strip to protect the ball screw and liner guide way as well as good dustproof ability .
- ★ Anti-collision design , lower voice in fast running .
- ★ the accuracy difference is less than **2um** with our without the telescope cover ,which can guarantee the good running accuracy and stability

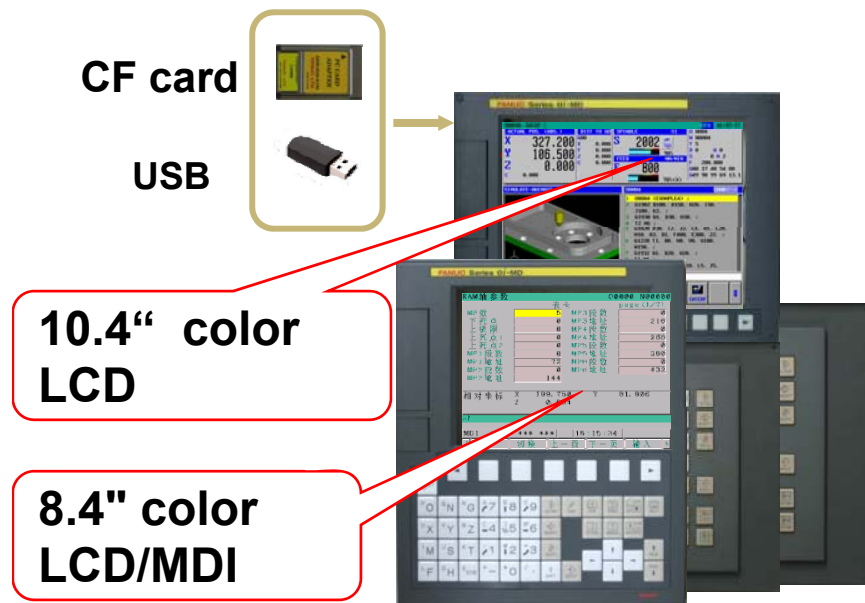
CE safety door switch

All machine equip with safety door interlock according to CE standard, protect the operator effectively



FANUC NEW SERIES— **0i-MODEL F** SYSTEM

➤ SKY MASTER-KRAFT standard configure 0i-MODEL F **TYPE 1**



- 8.4" LCD screen as standard
- Servo HRV⁺ control
- FSSB high speed rigid tapping
- Machining preparation support[☆]
- Support various industrial field bus
- Integrated Servo Guide Mate
- High quality machining software package

FANUC NEW SERIES— **0i-MODEL F** SYSTEM

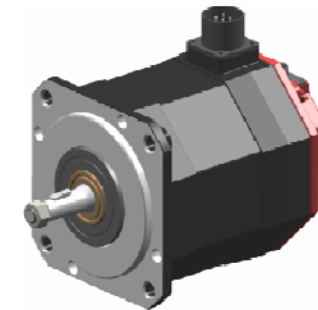
Servo control accuracy improvement

	Old	New
αi -B	αi A1000 1,000,000/rev	αi A4000 4,000,000/rev.
	αi A16000 16,000,000/rev	αi A32000 32,000,000/rev.
βi -B	βi A128 128,000/rev.	βi A1000 1,000,000/rev.



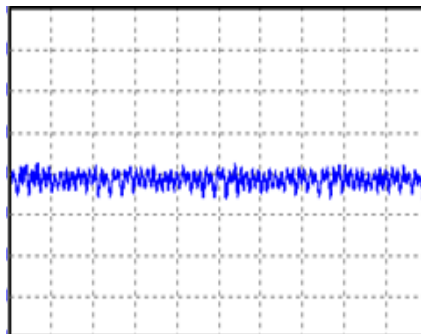
Electromagnet loop optimized

(αi S-B, βi S-B)



0.1 μ m control
is available

αi S/ βi S motor

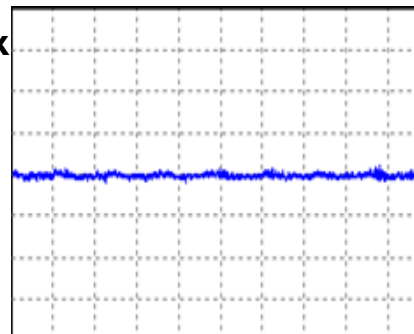


Approx

1/3



αi S-B/ βi S-B motor



300%

FANUC NEW SERIES— **0i-MODEL F** SYSTEM

FSSB HIGH SPEED RIGID TAPPING

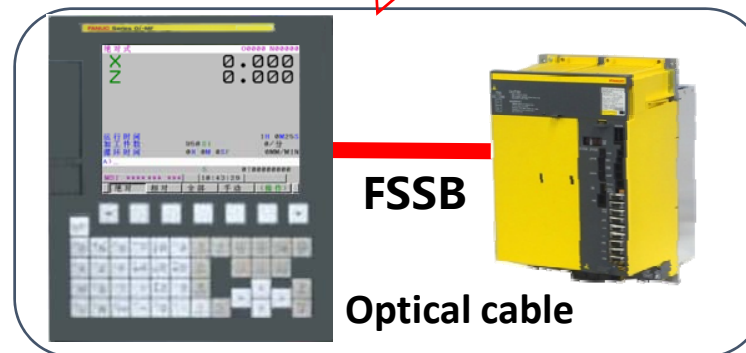
Advanced digital servo technology

23%

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STANDARD**

Efficiency 1

**Theoretical
error display**

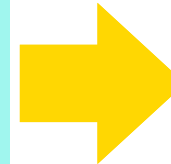


E.g : S3000 20mm Pitch 1mm tap

Normal rigid tapping

Error : 60pulse

1 cycle : 1815ms



**FSSB high speed
rigid tapping**

Error: 50pulse

1 cycle : 1392ms

**Cycle time
save 23%**

FANUC NEW SERIES— **0i-MODEL F** SYSTEM

Spindle intelligent rigid tapping

Advanced digital servo technology

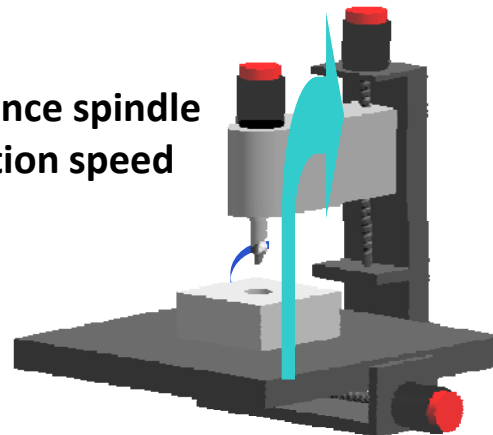
26%

E.g.: Pitch 1mm, 25 circle thread,
S5000
Apply FSSB high speed rigid tapping

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Apply FSSB optical
transmission

Enhance spindle
reaction speed

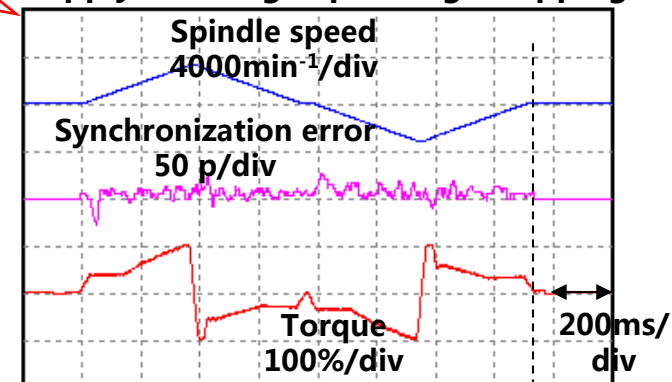


Efficiency 2

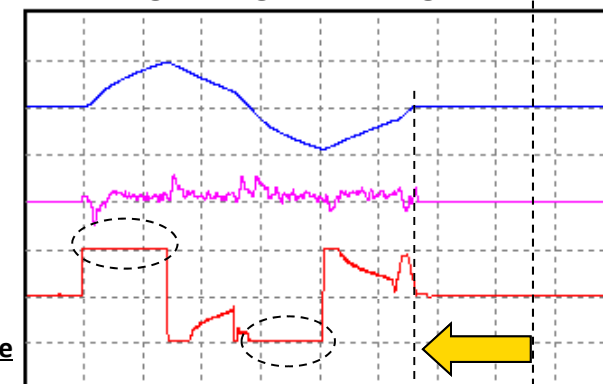
Theoretical
error display

- Fully perform the spindle acceleration /deceleration capacity
- Reduce cycle time significantly
- No need to adjust

Use the max. torque



Intelligent rigid tapping



FANUC NEW SERIES— **0i-MODEL F** SYSTEM

High quality machining package

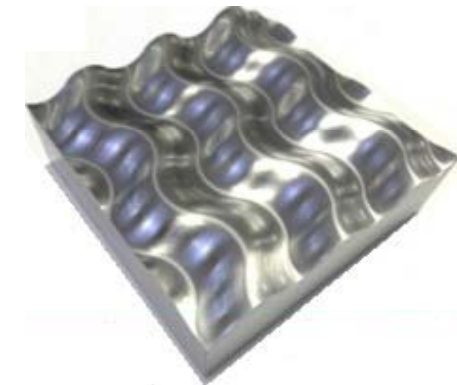
**SKY
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Micro-line blocks processing ability
enhances 200%

Accuracy

AI contour control II
Jerk control
Smooth tolerance control
Machining quality level
adjustment function

Packaging function , especially
for mould machining

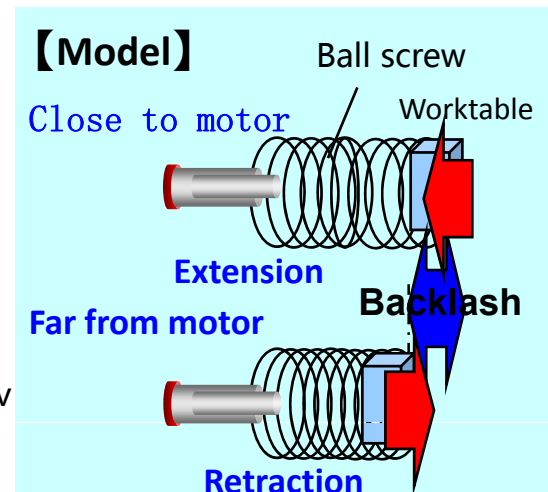
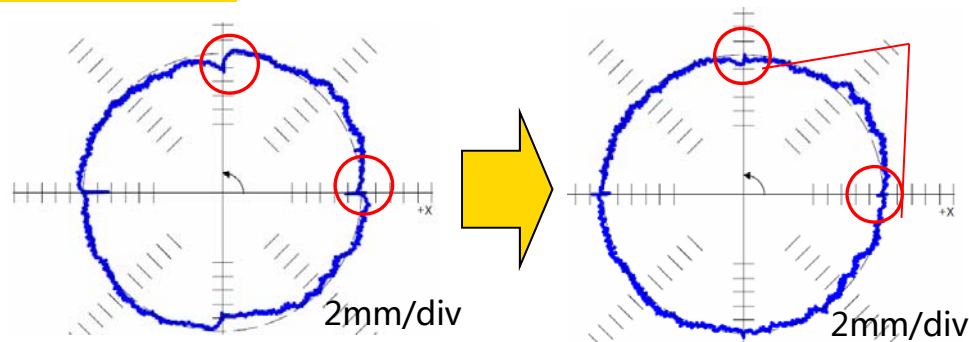
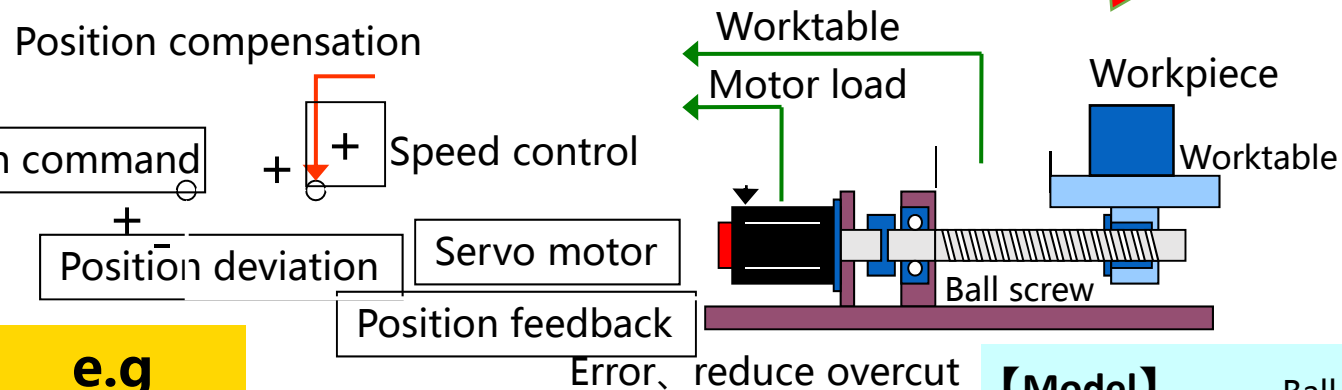


FANUC NEW SERIES— 0i-MODEL F SYSTEM

Intelligent backlash
Further optimize system function

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STANDARD**

SMART



Normal backlash compensation

Intelligent backlash compensation

FANUC NEW SERIES— **0i-MODEL F** SYSTEM

Smooth tolerance control

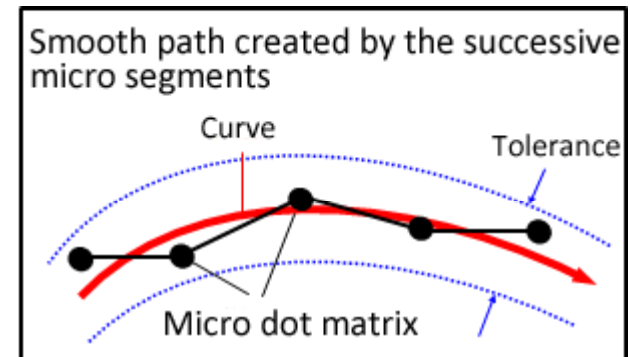
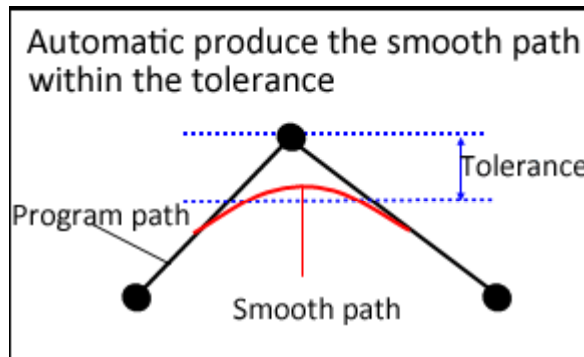
**SKY
MASTER
STANDARD**

Reduce the accuracy adjusting time and steps

Achieve the high accuracy machining.

- Automatic recognize the optimum machining speed.
- Reduce the mechanical shock during the processing of micro line blocks.
- Easy to adjust

Accuracy



FANUC NEW SERIES— **0i-MODEL F SYSTEM**

HRV+control

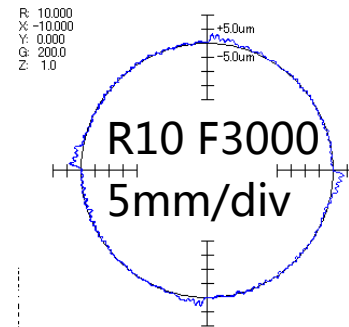
Advanced digit servo technology



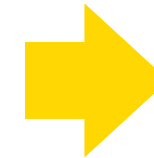
- Servo HRV⁺, optimize current loop control to achieve high respond
- Nanoscale high speed and high accuracy machining
- 0iF system, HRV⁺ control can also be applied on the β i-B servo motor



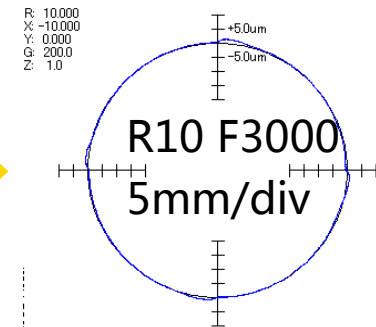
Servo HRV3 control



High gain



Servo HRV3⁺control



HRV3

HRV3⁺

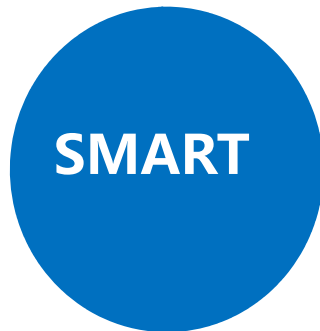


Iron F1000, 45deg

FANUC NEW SERIES— 0i-MODEL F SYSTEM

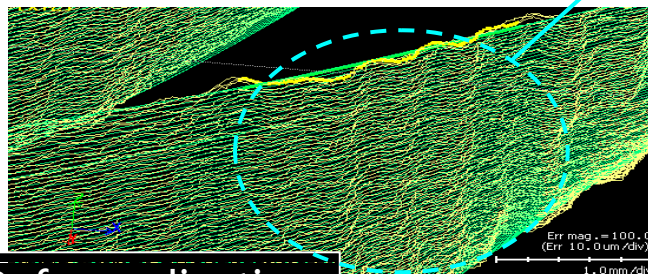
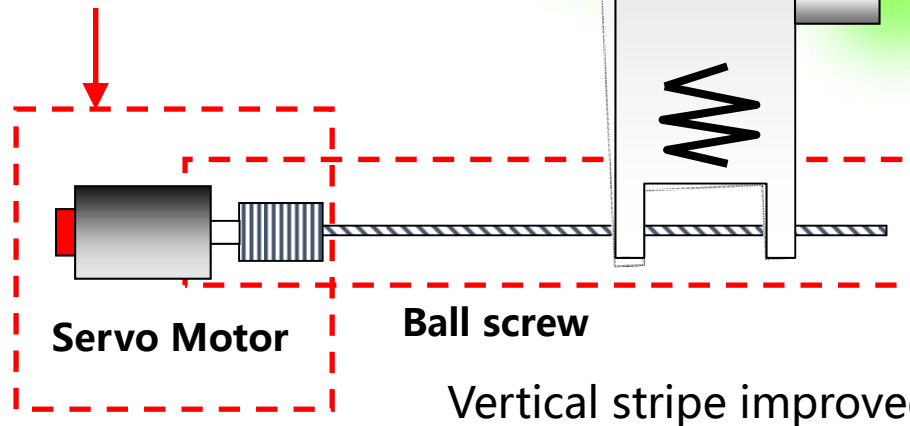
Smart front control

Further optimize system function

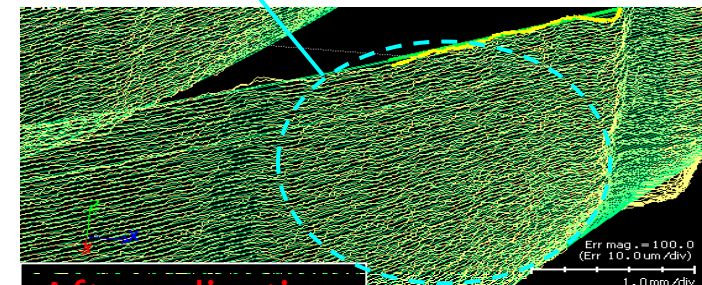


Suppress machine vibration

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Before adjusting



After adjusting

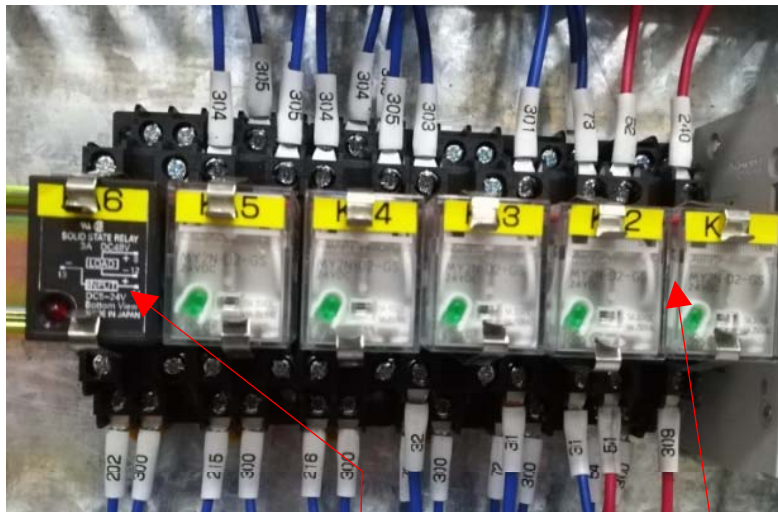
FANUC NEW SERIES— **0i-MODEL F** SYSTEM



**Special
OPTION**

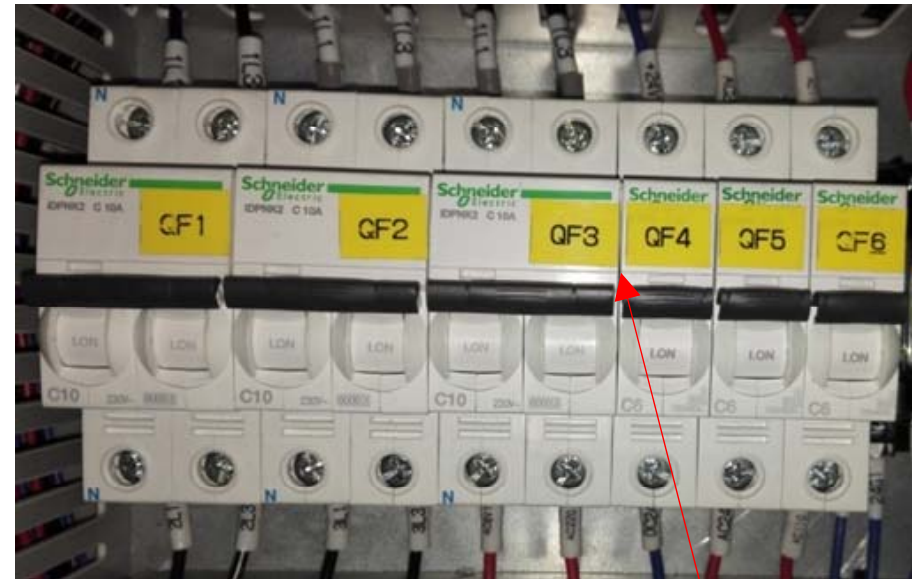
MANUAL GUIDE(operation guide)0i	MANUAL GUIDE(operation guide)i
PICTURE function	Dynamic graph display
Data server	Program storage capacity 2M
3-dimensional coordinate system conversion, handle interruption	AICC 2 (Max. preview blocks 400)
Machine alarm messages diagnosis	Nano smooth
Remote diagnosis	Interpolated straightness compensation 3027 points
CNC status informing function	Interpolation type pitch error compensation
CNC double display screen function	Optimum torque acceleration/deceleration
Quick macro call	5 axes system
Addition of custom macro common variables 1000	8 grades data protection
Addition of workpiece coordinate system 300	Handwheel feed retract

Main electrical components in electric cabinet



Japan OMRON Solid-State relay (SSR), specially used for Z axis brake, will reduce the reaction time and prevent the Z axis from suddenly falling down during power failure.

OMRON
middle relay
from Japan



Schneider circuit breaker from France

Main electrical components in electric cabinet



**Schneider
thermal overload
relay from France**

**Schneider AC
contactor from
France**



**IDEC miniature
relay from Japan**

Main electrical components in electric cabinet

★ As the max. wire connection space has been reserved, the multi wires connection is convenient and available by using the spring connecting terminal.

★ The bridge pieces can connect any number of terminals, so that can achieve the multi position connection

In 1923, Phoenix electric was established in Essen, Germany (Essen). In 1928, the world's first combined wiring terminal was born in Phoenix electric.

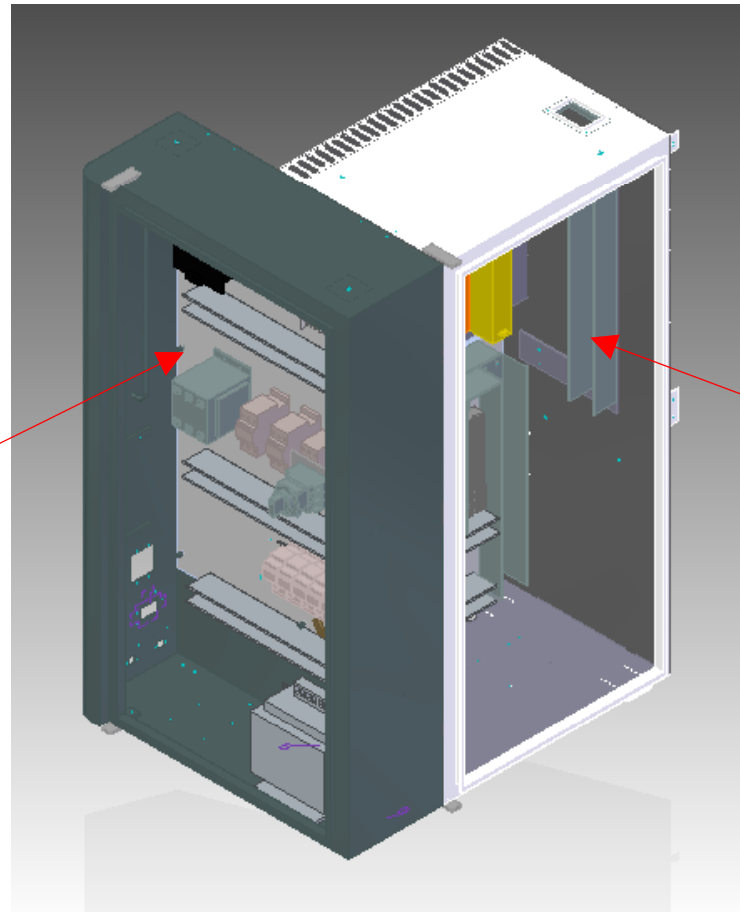


**German PHCENIX
terminal/bridge piece/sign
bar**

the price is 12-15
times than normal
terminal.

HIGH AND LOW VOLTAGE SEPARATED ELECTRICAL CABINET

High voltage control cabinet: reactor, AC contactor, transformer and spindle filter will produce strong electromagnetic field during the working process. To avoid the interference of the system, these components are isolated.



Low voltage cabinet is separated, with heat dissipation device which can take out the heat from driver to keep the stability of the components and long-life using

SKY MASTER stainless steel operation panel



The panel is designed to meet the national safety standards; stainless steel material is more resistant to oil, dirt; all the components on the panel are in line with the CE standard.

Portable MPG



The MPG with emergency stop and enable button complies with the national safety standard

IGUS cable from Germany



Apply IGUS cable
for electrical
assembling

Meet TUV European
standard , classified
according to the color.

Grey: control cable
Black: power cable
Orange: servo power
cable

Advantage configuration

No.	Name	Specification	Quant.	Remarks
1	Control system	FANUC 0i MF	1set	FANUC(Japan)
2	Angular contact ball bearing	30TAC62BSUC10PN7B	15sets	NSK(Japan)
3	X axis ball screw	Dia. 40mm , pitch 16mm , Precise grade	1set	PMI(Taiwan)
4	Y axis ball screw	Dia. 40mm , pitch 16mm , Precise grade	1set	PMI(Taiwan)
5	Z axis ball screw	Dia. 40mm , pitch 16mm , Precise grade	1set	PMI(Taiwan)
6	Spindle system	Direct driven BT40-10000rpm	1set	SETCO(USA)
		Direct driven BT50-6000rpm	1set	VOLIS (Taiwan)
7	X axis linear guide way	35mm heavy loading ball type	1set	THK(Japan)/REXROTH(Germany)
8	Y axis linear guide way	45mm heavy loading ball type	1set	THK(Japan)/REXROTH(Germany)
9	Z axis linear guide way	45mm heavy loading ball type	1set	THK(Japan)/REXROTH(Germany)
10	ATC	24 pcs arm type	1set	GIFU(Taiwan)
11	Heat exchanger	TH-5R	2sets	TNP(外资)
12	Spindle chiller	TO-10PTB-215 220V 50/60HZ	1set	TNP(外资)
13	Pneumatic system	AW30-03D-Aand other accessories	1set	SMC(Japan)
14	Lubrication system	LCB45111R-CH (including accessories)	1set	SHOWA(Japan)
15	Three axes telescope cover		3set	NAJEC (Japan)
16	Miniature circuit breaker	DPNK10A2P	2pcs	SCHNEIDER(法国)
17	Alternating current contactor	LC1D09M7C	7pcs	SCHNEIDER(法国)
18	Intermediate relay	MY2N-D2-J 24VDC	3pcs	OMRON(Japan)
19	Miniature relay	RJ2V-C-D24 8A	17pcs	IDEC(Japan)

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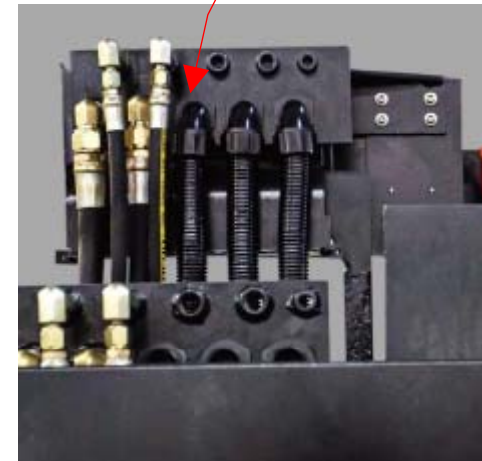
Protection guard feature



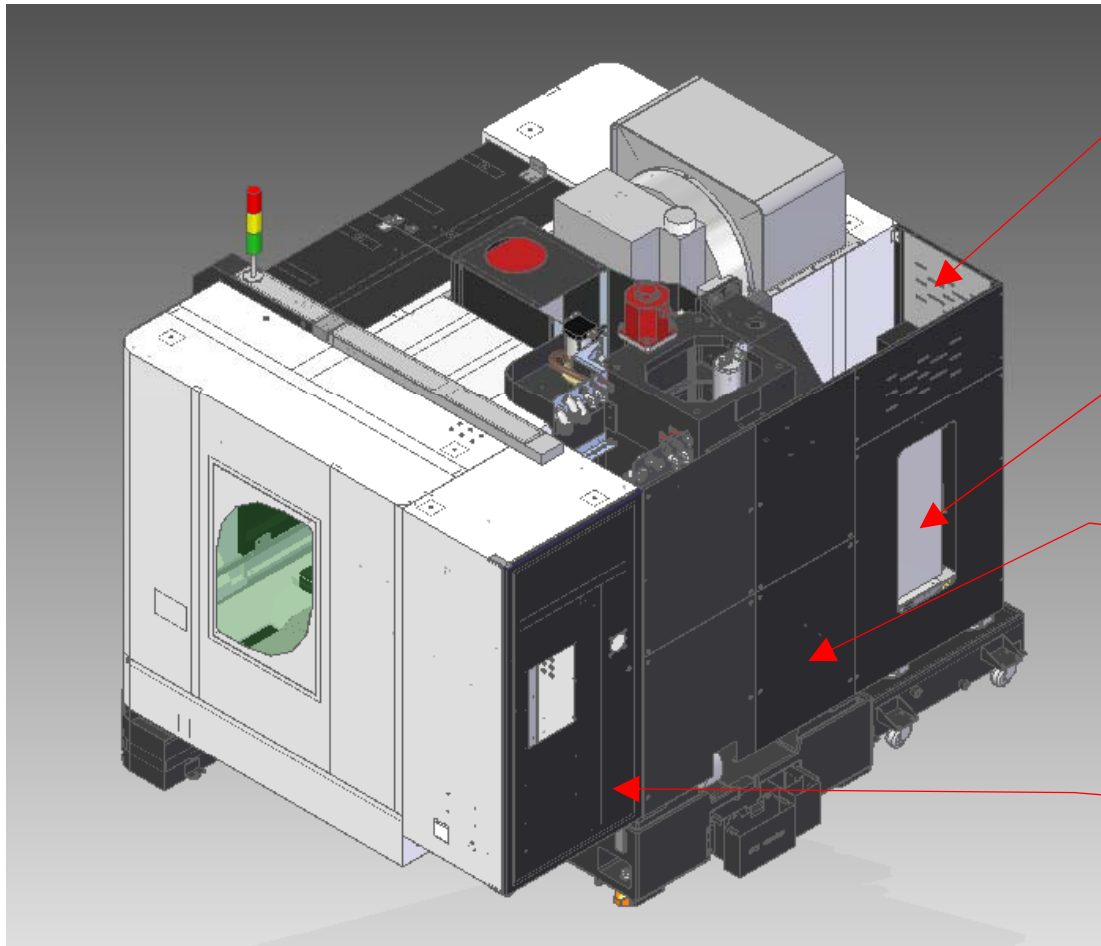
Equip with full-enclosed splash guard

- ◆ Safety
- ◆ Elegant
- ◆ Convenient and speedy operation

Z axis without drag chain ,easy to maintenance



Protection guard feature



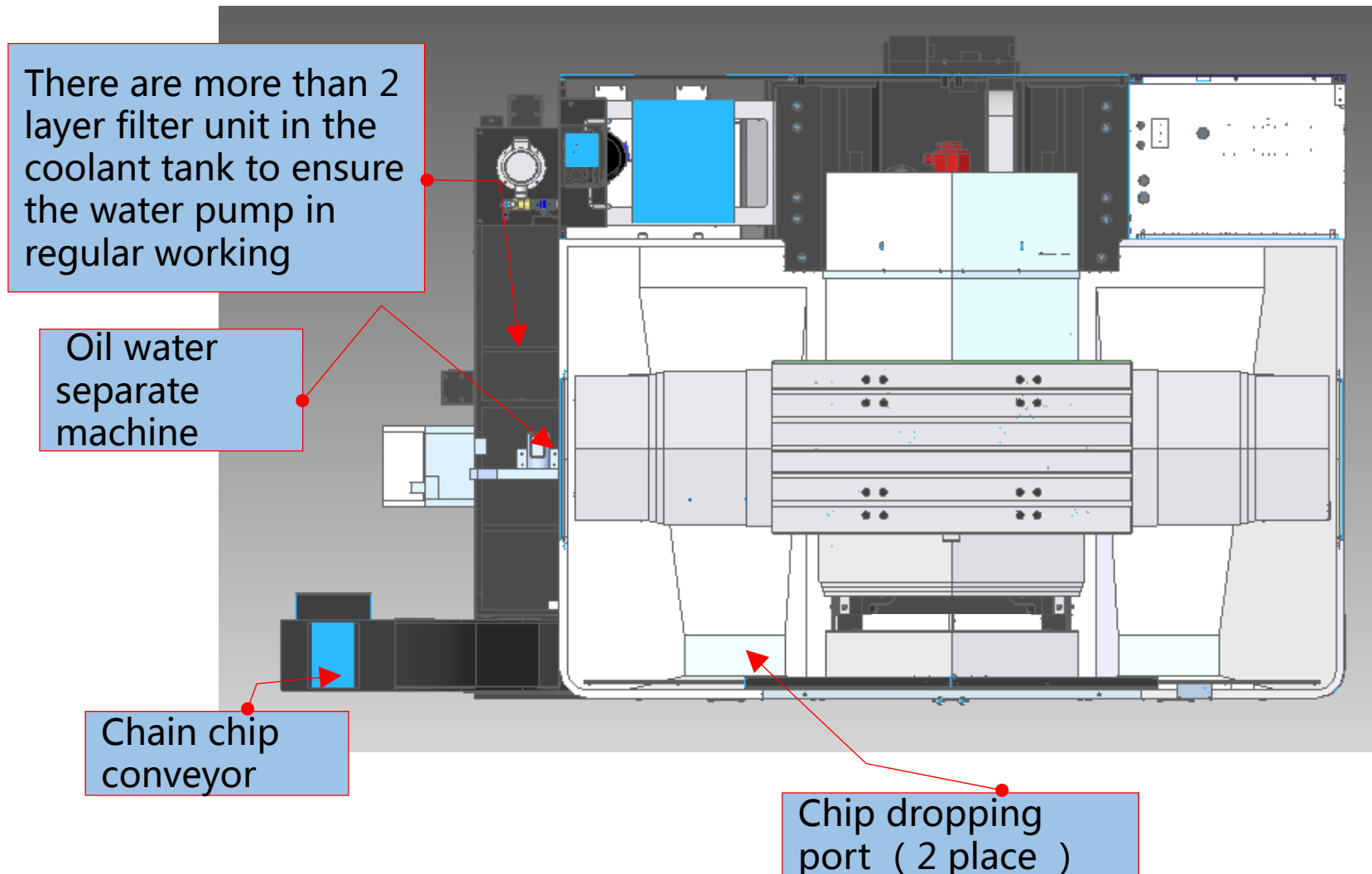
Pneumatic and lubrication unit ,easy to observe and maintenance

Spindle chiller is installed at the back left of machine with a fixed supporting shelf

The machine back side is designed with full-enclosed structure, elegant appearance

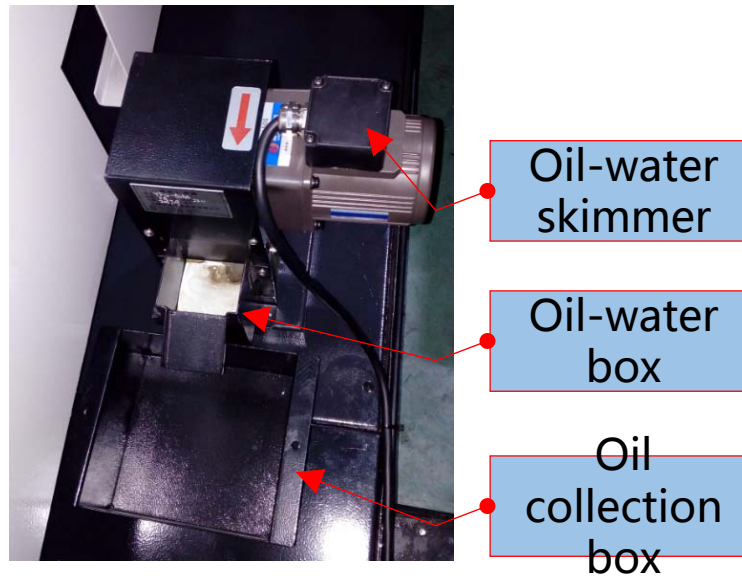
Electric cabinet is installed at the back right of machine, convenient wiring

Protection guard feature



Option-Wobang oil skimmer

The oil skimmer can separate the oil from the coolant tank which can prolong the life time of cutting liquid.



Option-Measuring accessory



German Blum
Contact type tool set
can measure tool
length and diameter

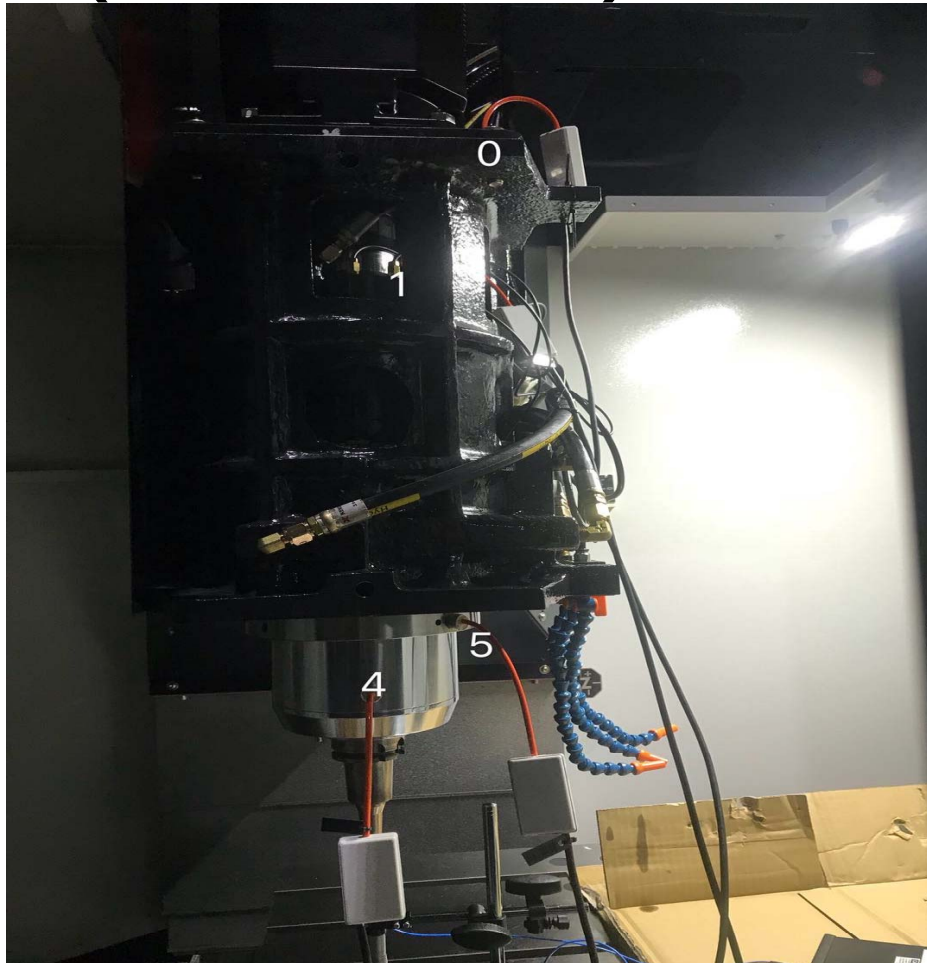


Japan Metrol contact
type tool set
can measure tool length
and diameter



German Blum laser tool
setter can measure tool
length and diameter

Optional intelligent spindle compensation (FANUC/MIT)



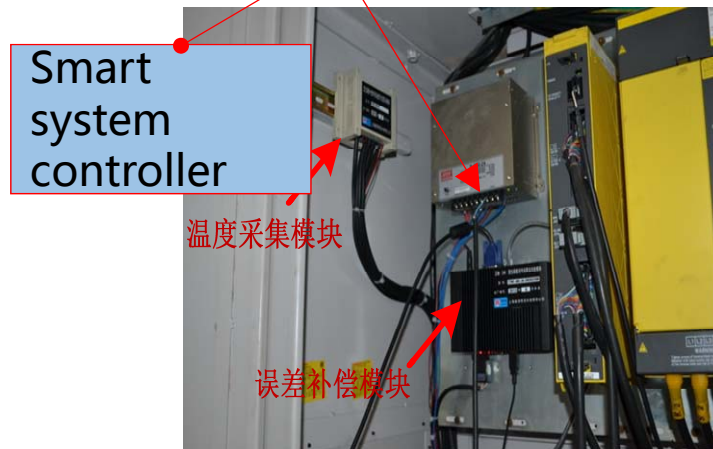
Sensor placement

Sensor placement (testing process)

0. Spindle motor
1. Interface between motor and spindle
4. Spindle down bearing
5. Outer of spindle flange

Using the capacitance sensor to record the data of the spindle thermal deformation, after compensation, it can greatly shorten the time of spindle warm-up, the user can change the different cutting tools (corresponding to different rotational speeds) in the process of machining, and it is no need to reheat the machine. Not only the machining efficiency is improved, but also the stability of the spindle accuracy and the profile precision of the workpiece can also be greatly improved.

Option- Smart 3 axis temperature compensation(FANUC / Mitsubishi)



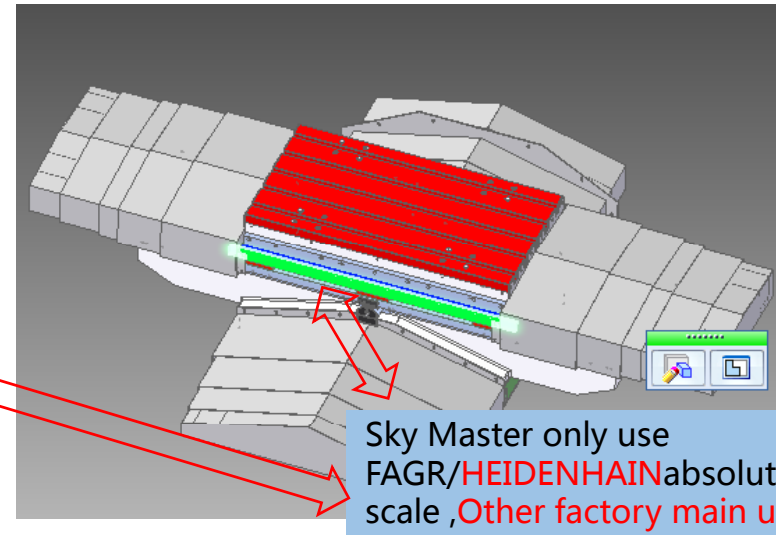
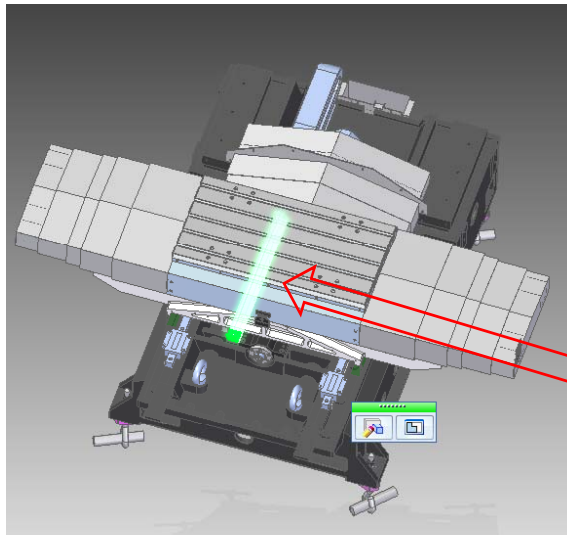
Installation Place



Comparison before and after using

Error parameter (unit : μm)	before	after	Accuracy improvement percentage
4 holes distance	16	9	43.75%
Square step width	15	10	33.33%

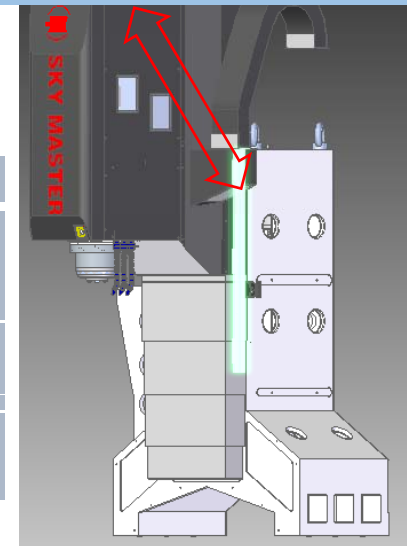
Option-FAGR/HEIDENHAIN linear scale



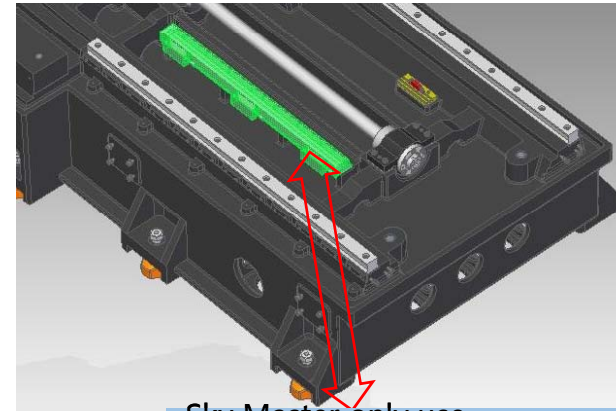
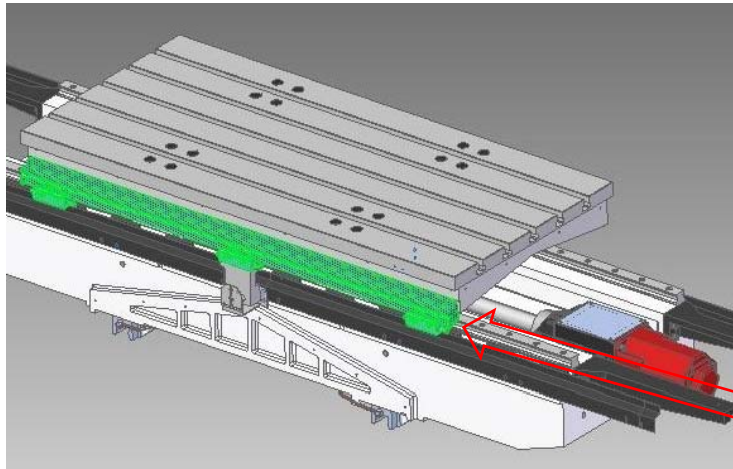
Sky Master only use FAGR/HEIDENHAIN absolute linear scale ,Other factory main use Fagor and with Incremental type

All three axis can equip with absolute linear scale , the minimum resolution is only $0.05\mu\text{m}$, real-time monitor the moving parts to ensure the accuracy for positioning accuracy and repeatability accuracy.

Comparison	Absolute	Incremental
1	Get the position data immediately ,no need to make the moving axis back to reference point	Must execute the moving axis back home position every time
2	The reading head use two couple seal side by side with good protection	The reading head is protected by single seal
3	Transmission by digit signal which has excellent anti-interference ability	Transmission by sine waves which is easy to be interference

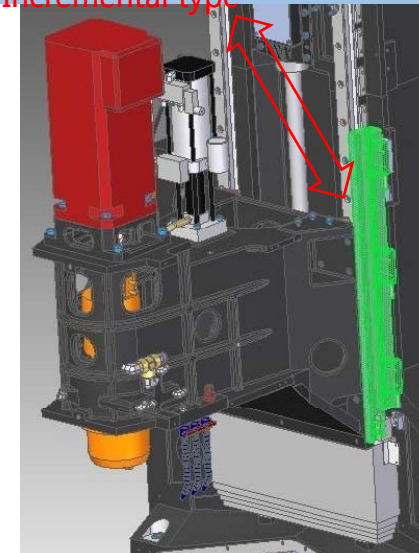


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VL1100A standard

FANUC 0i-MF absolute type 1	Copper transformer
Automatically power off	3 colors warning light
Working area light	Portable MPG
Door interlock	Spindle chiller
Spindle direct driven 10000rpm BT40	Lube/Pneumatic unit
Spindle air sealing	Rigid tapping
Air blowing device	Coolant unit
Coolant surround spindle	Full enclosed splash guard
Arm type ATC 24PCS	Adjustment bolt and foundation block
Water gun/air gun with flushing function	Tool box
electric cabinet with heat exchanger	Chain chip conveyor
High quality machining package (AICC II, jerk control, smooth tolerance control, machining quality level adjustment function)	

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Option

Mitsubishi M80A ,15"LCD touch type
SIEMENS 828D
FANUC 15"LCD
HEIDENHAIN/FAGOR absolute type linear scale
Tool/workpiece measuring system
Column heightened by 200/300mm
BF/GTP gear box
CTS (20、 30、 70bar)
Disc type ATC with 30 tools
Chain type ATC with 32 tools
A/C for electric cabinet
Flushing function with large flow
Drawer type water tank
Oil and water separator
Automatic door open/close
Intelligent spindle thermal compensation (FANUC/MIT)
Voltage stabilizer
Intelligent three axes thermal compensation (FANUC/MIT)
Extend one year of warranty

VL1100D standard

FANUC 0i-MF absolute, type 1	Transformer
Automatic power off	Three-color warning light
Working lamp	Portable MPG
Safety door switch	Spindle oil cooler
Direct drive type spindle 6000rpm BT50	Lubrication/pneumatic unit
Spindle air-seal	Rigid tapping
Disc ATC 24 tools	Coolant unit
Air blowing	Full enclosed splash guard
Air/water gun for flushing	Tool box
Heat exchanger	Adjustable level bolts and foundation blocks
Chain chip conveyor	Fine quality machining package: AICC II , jerk control, smooth tolerance control, machining quality level adjustment function

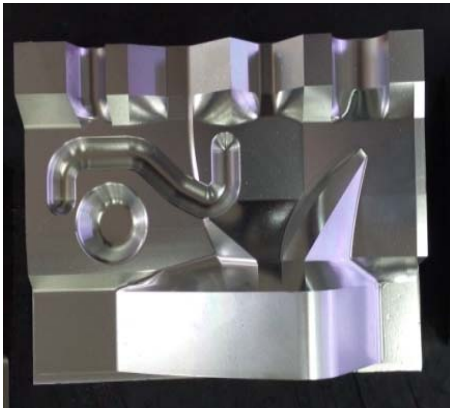
Option

MITSUBISHI M80A 15`` touch screen
SIEMENS 828D system
FANUC 15`` screen
HEIDENHAIN/FAGOR absolute type linear scale
Tool/workpiece measuring system
Column heightened by 200/300mm
BF/GTP gear box
CTS (20、 30、 70bar)
Spindle 8000rpm BT50
Spindle 10000rpm BT50
A/C for electric cabinet
Flushing function with large flow
Drawer type water tank
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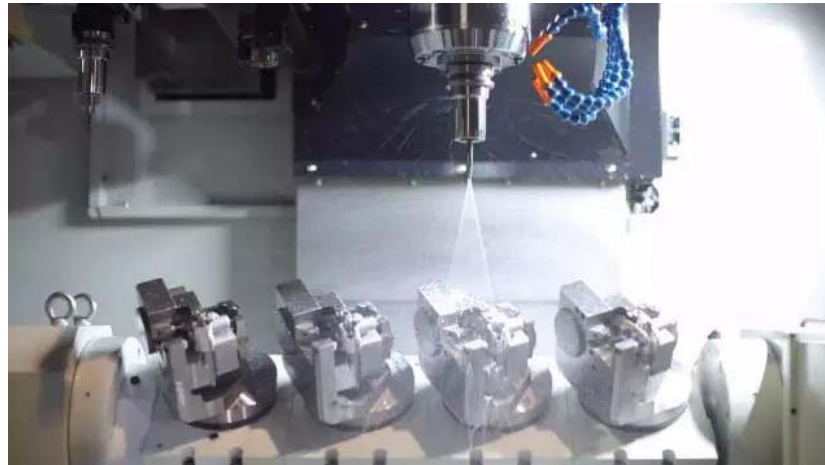
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Application field

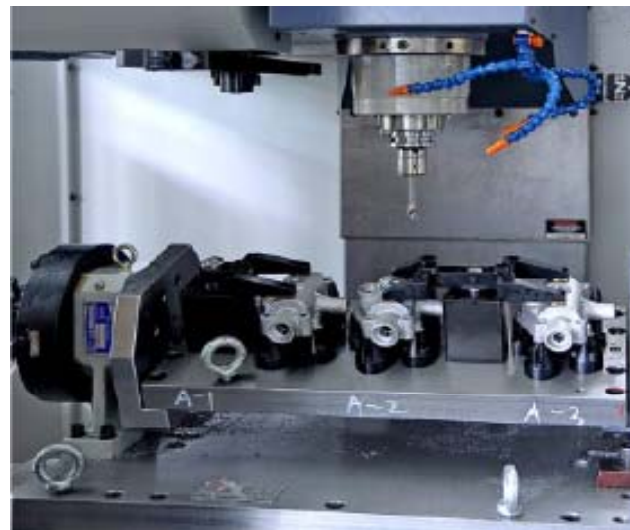
Widely used in all kinds of components and parts, mould and special production machining



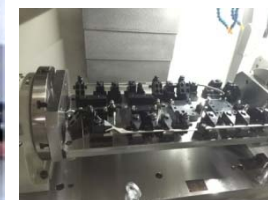
Benz testing part : Inspect the all kinds of accuracy indication and dynamic precision



Motor engine box : Bearing hole pitch and the roundness error of hole are the key accuracy



4th 5th axis machining : can equip with the rotation table to achieve 4th 5th axis machining, expand the processing scope , one-time machining for the products need high requirements of the relative position and angle change, at same time, ensure the position accuracy of each processing step .



One end-user's factory



THANKS

SKY MASTER- KRAFT



Many thanks for your time for SKYMASTER
PPT introduction

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