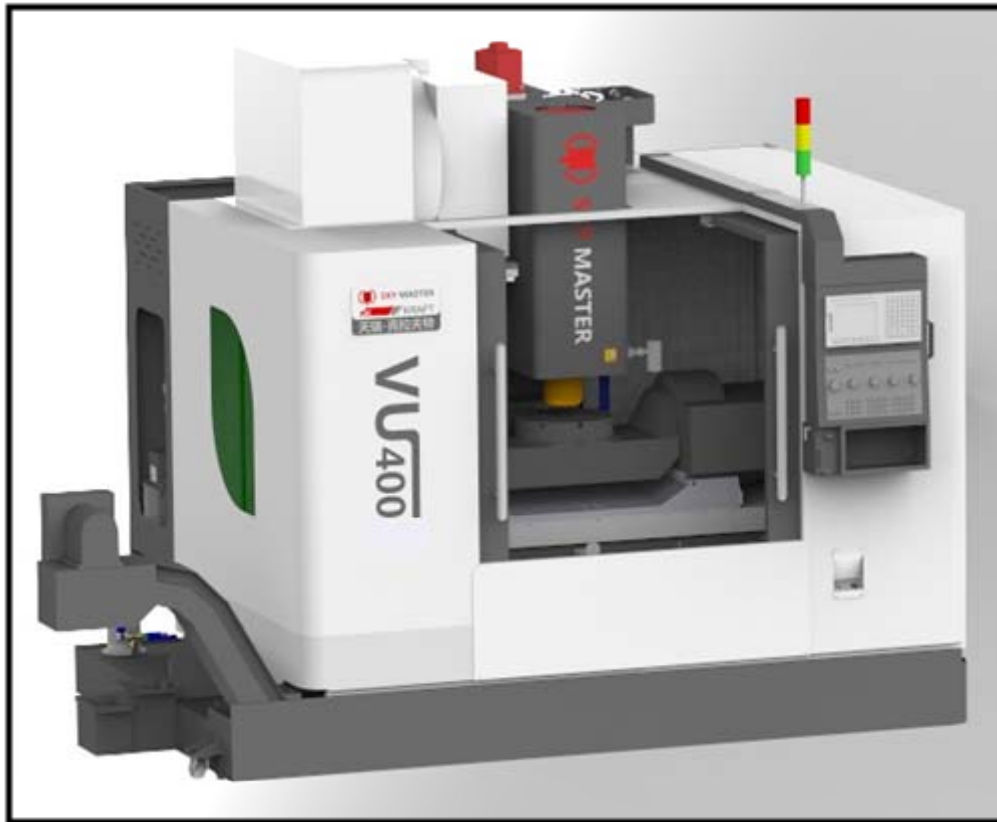


VU400 vertical 5 axis cnc machine center



Version No.: TRJG-2018-A1



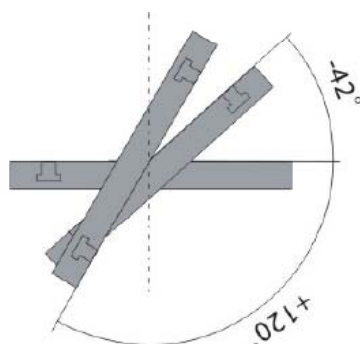
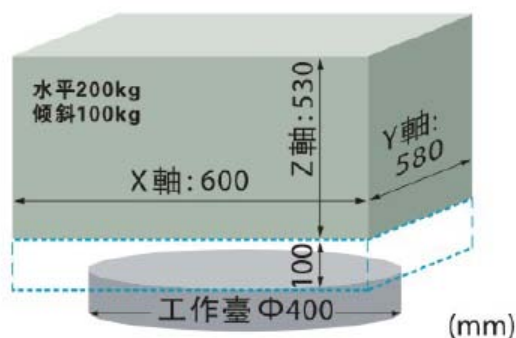
**Use our wisdom to
supply you the best
solution**

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

VU400 Technical Parameter

"VU" means "vertical 5 axis CNC machine center"

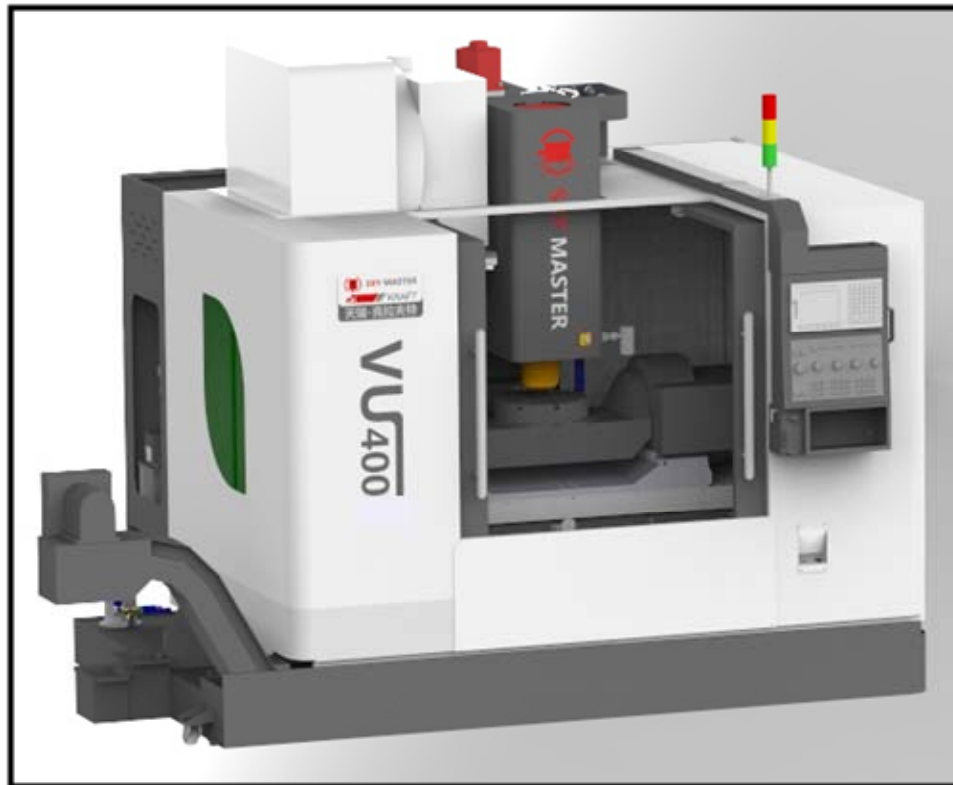
"400" means "table diameter 400mm"



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

Item			Unit	VU400
Standard controller				FANUC 0i MF (any 4 axis in synchronization)
Travel	X axis travel (work table)		mm	600
	Y axis travel (saddle)		mm	580
	Z axis travel (spindle head)		mm	530
	Distance from spindle nose to table		mm	100-630
	Distance from spindle center to column cover		mm	630
Work table	Table diameter		mm	φ400
	T slot diameter (quantity×width)		mm	8×12
	Max. table load		kg	150
	Rotation angle	A axis		+120 ⁰ —-42 ⁰
		C axis		360 ⁰
	Max. speed	A axis	rpm	13.3
C axis		rpm	22.2	
Spindle	Spindle taper			BT40
	Max. spindle speed		rpm	10000 (direct driven)
	Spindle motor power (continual working/30mins)		kW	11/15
	Spindle torque		N.m	52.5/95.5
X/Y/Z	Rapid traverse (X/Y)		mm/min	36000
	Rapid traverse (Z)		mm/min	24000
	Cutting feed rate on (X/Y/Z)		mm/min	1-10000
ATC	ATC type			Arm type
	Tool capacity		pcs	24
	Max. tool diameter		mm	φ80/φ130
	Max. tool length		mm	350
	Max. tool weight		kg	8
Accuracy	VDI/DGQ3441	Full travel positioning accuracy	mm	P0.010
		Repeatability accuracy	mm	Ps0.008
Air pressure			MPa	0.6-0.8
Supply voltage & frequency				3 /PE , AC380V , 50Hz
Power requirement			kVA	30
Machine size (Length/width/height)			mm	4080×3510×3170
Machine weight			kg	7650

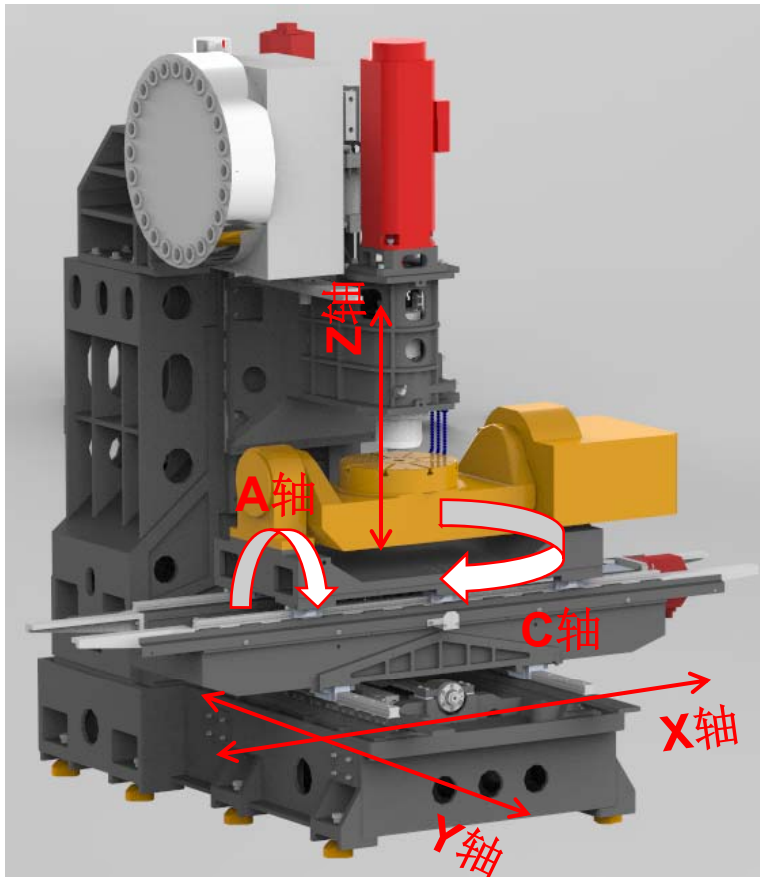
Machine feature –Whole machine



Mainly for machining 5-axes products or complex mould. Great structure, good rigidity, good loading performance, large use range

- ◆ High rpm—direct connected spindle 10000rpm, optional direct connected spindle 15000rpm、**build in spindle 18000rpm.**
- ◆ High feed—maximum cutting speed 10m/min
- ◆ Fast reaction—All three axis directly connected with large torque servo electric motor. The maximum acceleration can reach up to 0.8G
- ◆ High accuracy—three axes position accuracy **0.006mm** , repeat accuracy **0.004mm** (VDI/DGQ3441)

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 Turntable rotate around X-axis—A axis
Turntable rotate around Z-axis—C 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

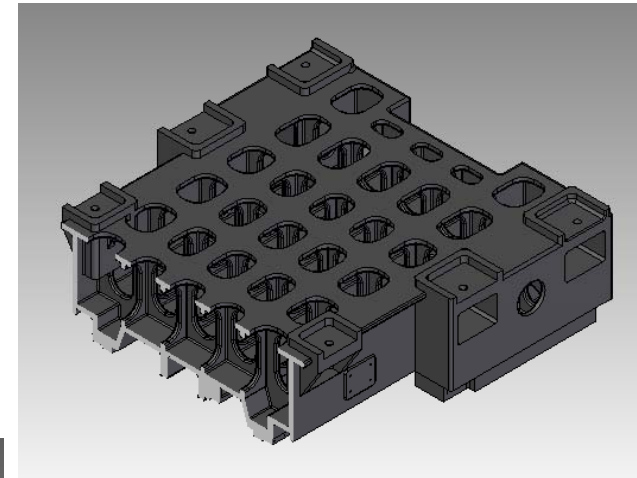
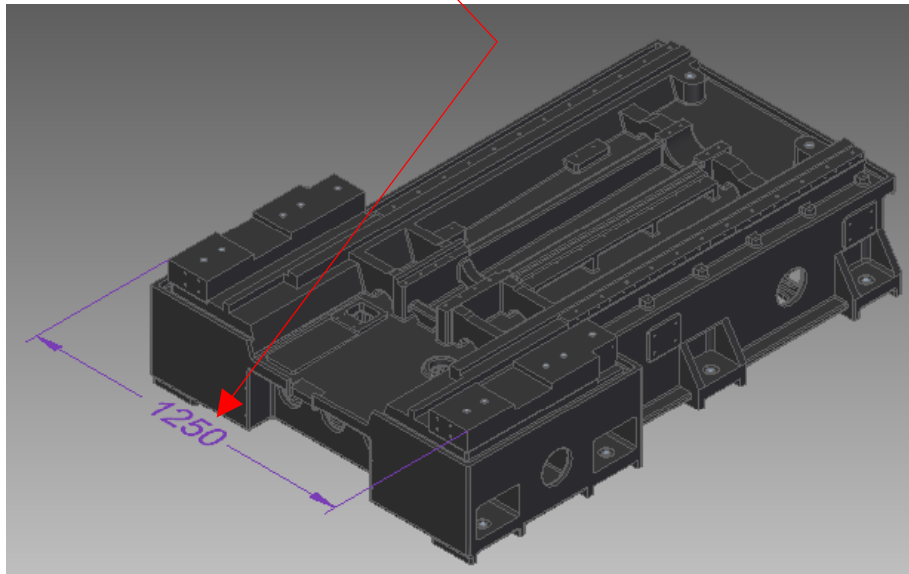
★The casting material is from Germany with unique composition ratio ,which is **30% higher than domestic cost**

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

★ FEM analysis to optimize the rigidity for machine

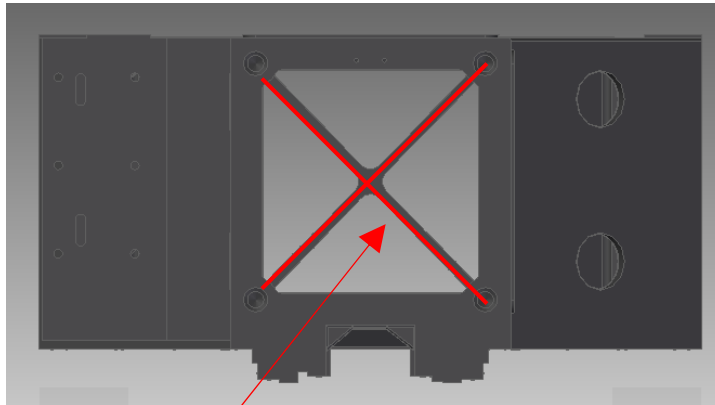
Structure feature – machine bed

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



The inside of the machine bed use multi-layered rib design. The cross-section of the linear guide way and the stand column use three layers of strengthening rib, it provide good stability and deformation ability

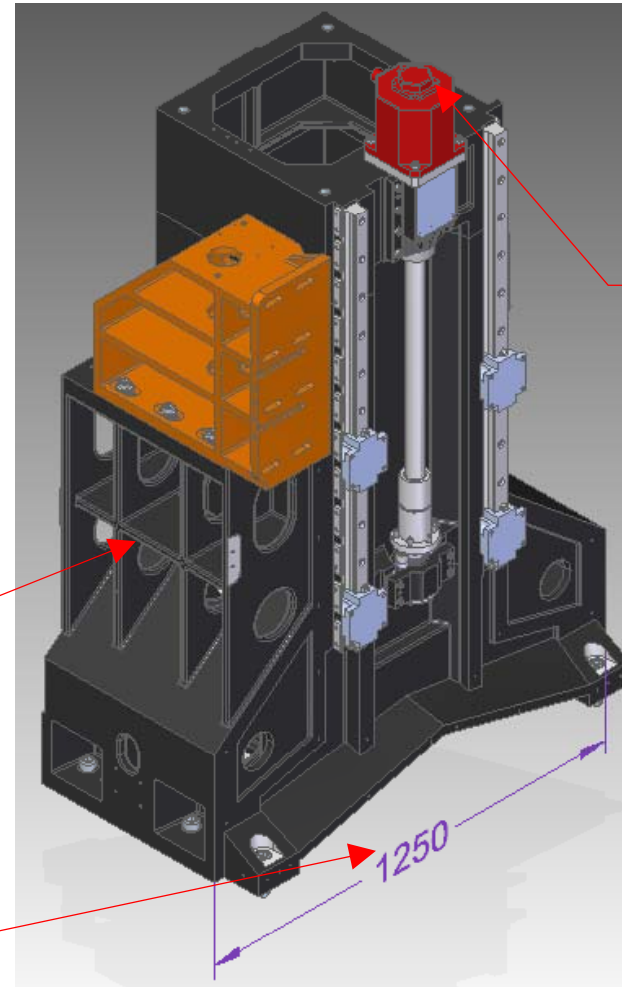
Structure feature-Column



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

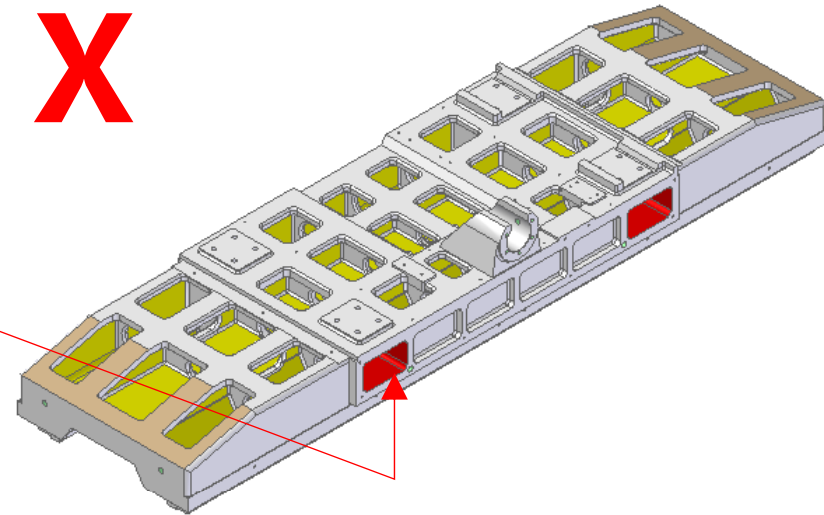


Z axis is driven by big power motor(torque 45Nm), compare with mechanical balance system, the cost increase 10%,but improve the 3 axis response speed and circular profile accuracy in direction changing obviously

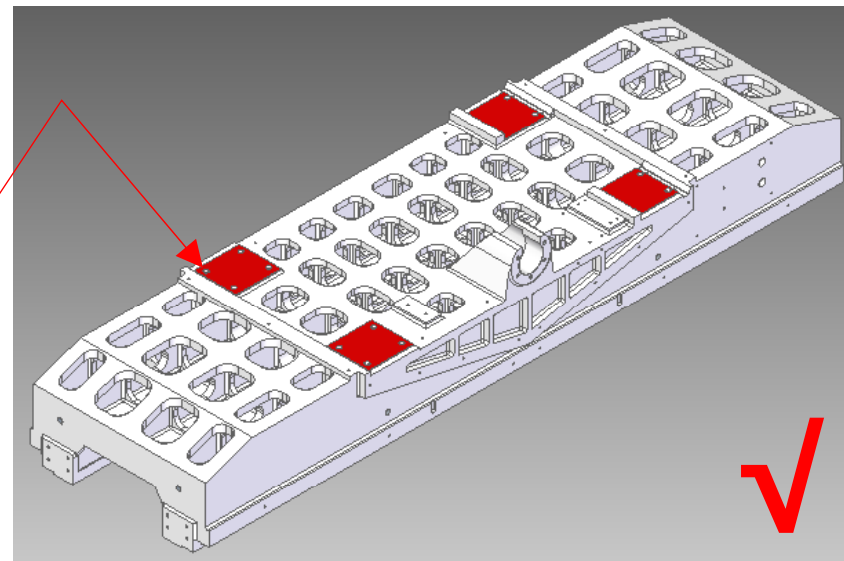
Structure feature- Saddle

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.

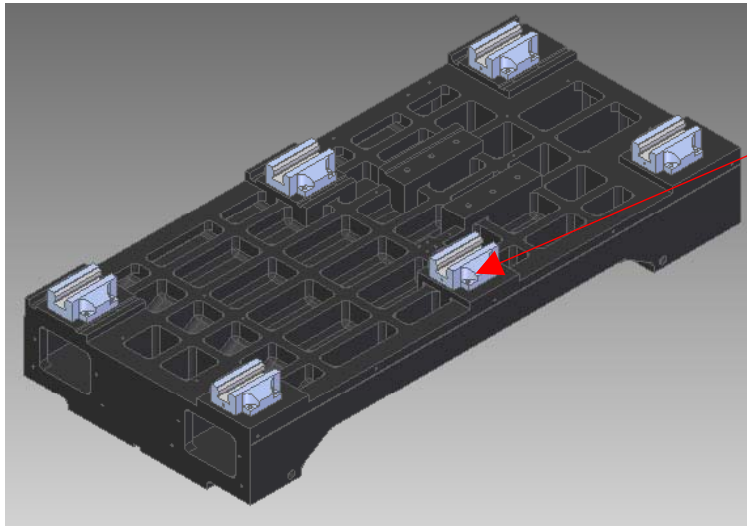
X



The VU400 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.

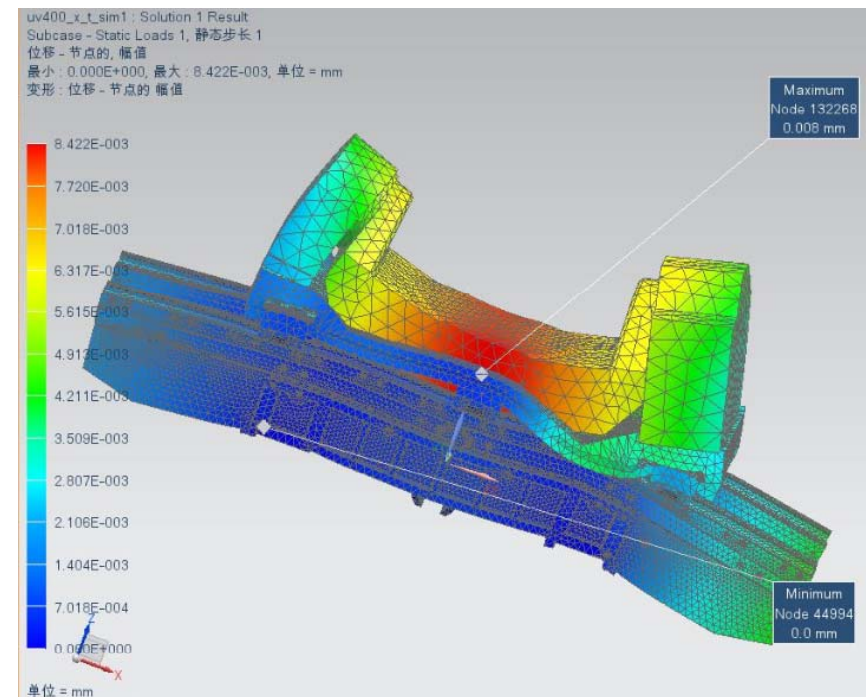


Structure feature -saddle



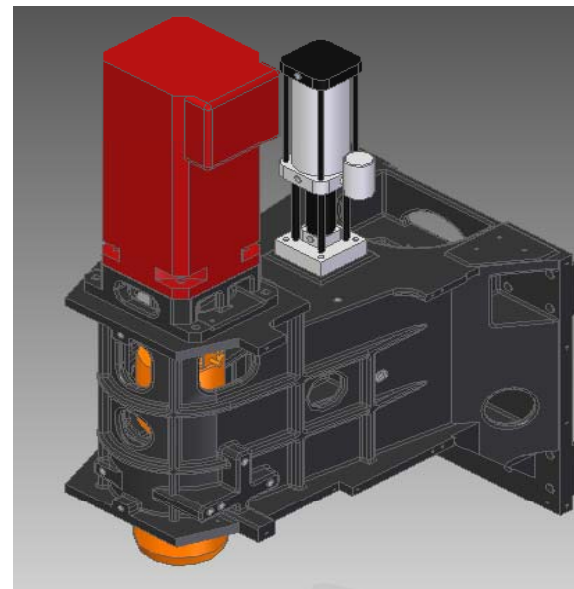
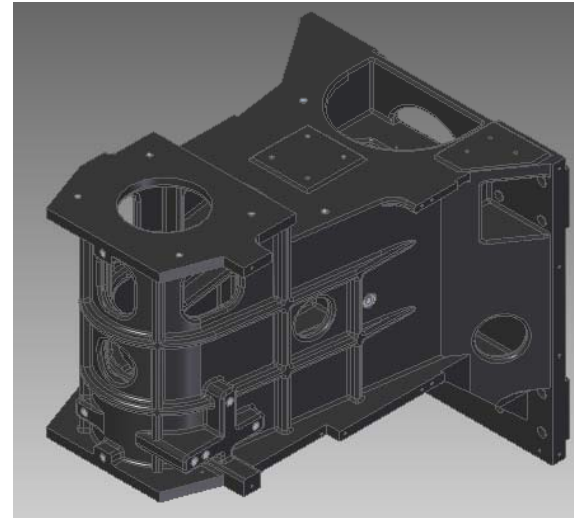
The saddle has 6 heavy load sliding block for prime load weight distribution,

The maximum deformation is 0.008mm when under 500kg of load. The maximum deformation is 0.03mm when under 150kg of load.



Structure feature- Spindle head

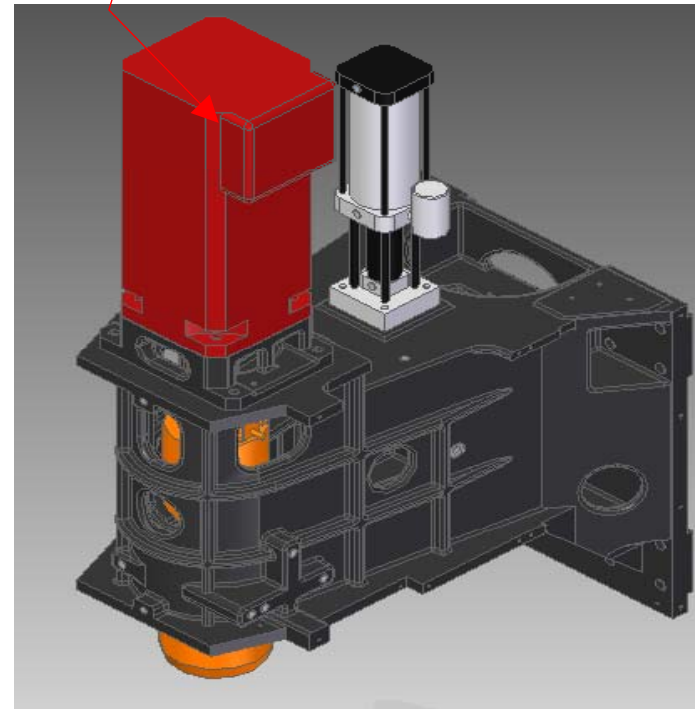
- ◆ The spindle head structure is from Germany Kraft craft and design experience combines with FEM to ensure the rigidity.
- ◆ Max spindle speed :**10000rpm**;
- ◆ Tool shank BT40 ;
- ◆ The spindle head is designed in thin-wall(15mm thickness only) but with many enhance ribs, compare with other factory,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



USA SETCO Direct driven spindle

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



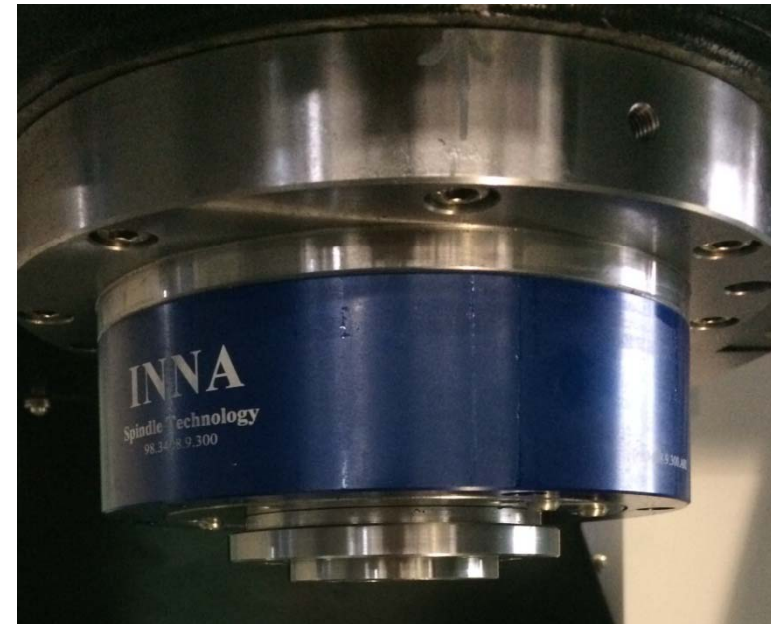
INNA (German) electric spindle

Option

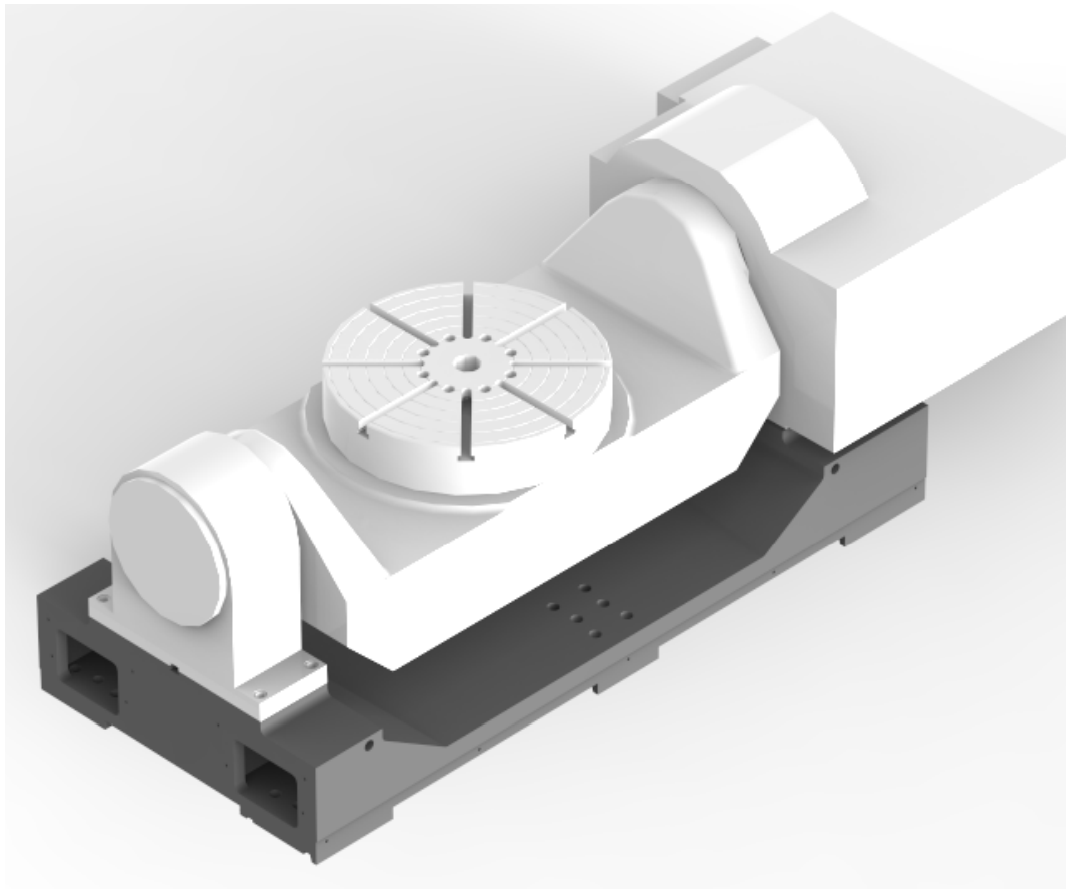
★ INNA (German) build in spindle's components use world know manufacturer's products, from component to finish product need to past hundreds of inspections, make products without default.

★ Compare to belt type spindle and direct connected spindle, build in spindle has many advantages: :

1. The Spindle and the electric motor has a compacted structure, easy to install, also save space ;
2. No power transfer type of design made the spindle run smoother, no outside force. Smaller load on the spindle bearing, kept the precision as long as possible. Quick reaction, no vibration
3. achieve higher speed, made better dynamic accuracy and more stable
4. Because lacking of the traditional electric motor, the weight of Z-axis is 80kg lighter, increase the dynamic performance by 15%



PARKSON (Taiwan) 5th axis turntable



★ The 5th axis turntable system was imported directly from PARKSON (Taiwan). Advanced manufacture technology and quality inspection, ensure the perfect quality of every product.

★ A axis' s position accuracy :

45arc-sec (0.0125 degree)

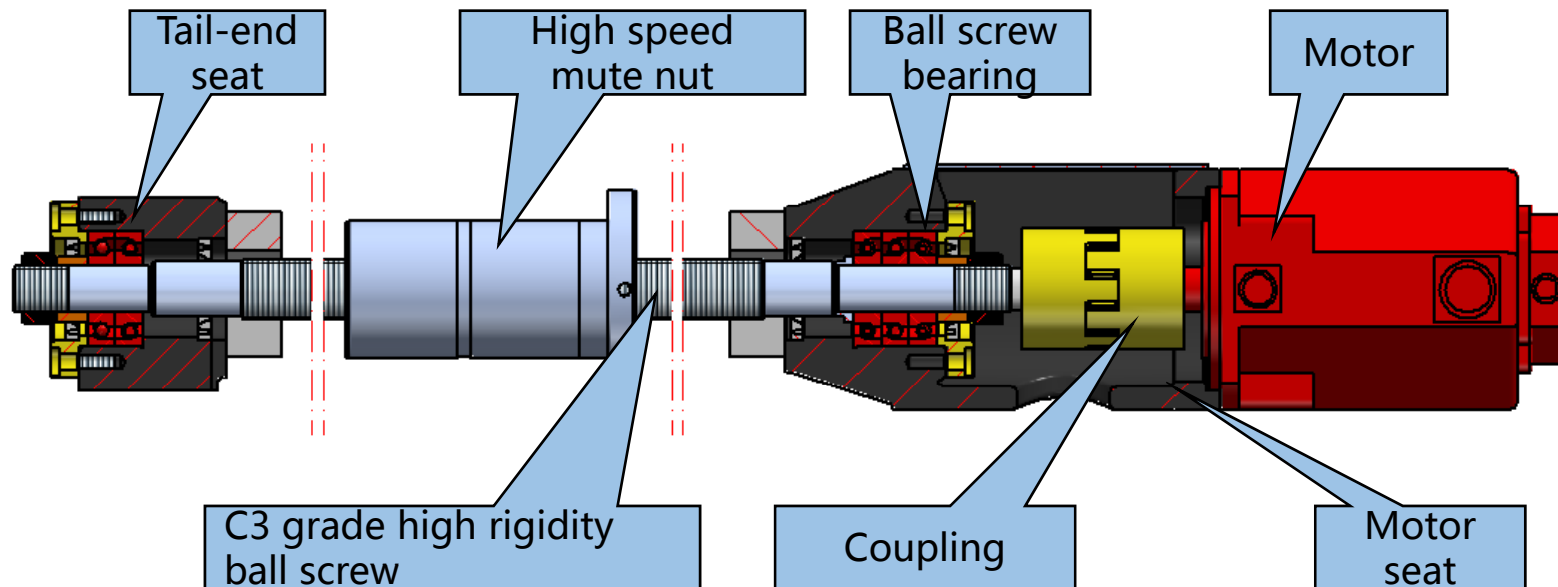
C axis' s position accuracy

15arc-sec (0.0042 degree)

★High precision circular guide scale is optional for A/C axis, it increases machining accuracy and work piece finishing quality.

PMI Ball screw

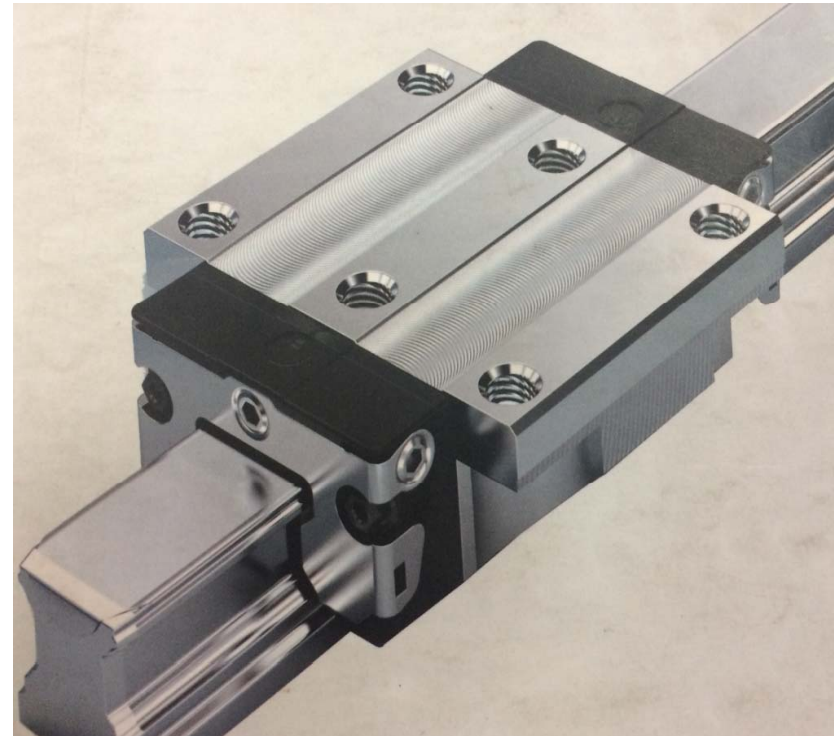
The 3 axis servo motor direct connect with the ball screw through gapless elastic coupling and with special pre-stretching which can prevent thermal deformation to keep ball screw with stable accuracy and rigidity as well as the running precision



Rexroth/THK (German/Japan) linear guide way

All three axis uses Rexroth / THK high rigidity P grade ball type linear guide way, which features high carrying capacity, low wear & high precision. It also can bear load from all direction

Rexroth linear guide way & slider were produced by using high precision machining technology, either one of the guide way can be use for positioning, therefore each components are interchangeable, because they can be assembled in any combination. Other linear guide brands use single positioning technology, which makes the repairment inconveniently.



CHIBA (Taiwan) Lubrication system

The CHIBA (Taiwan) lubrication system was imported as a whole including electric lubrication pump, oil tube, joint, oil ejector, etc), can delivery lubrication oil to needed parts in quantitative time and quantity. It also has liquid level & pressure sensor, ensures lubrication system's long term stable usage.



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

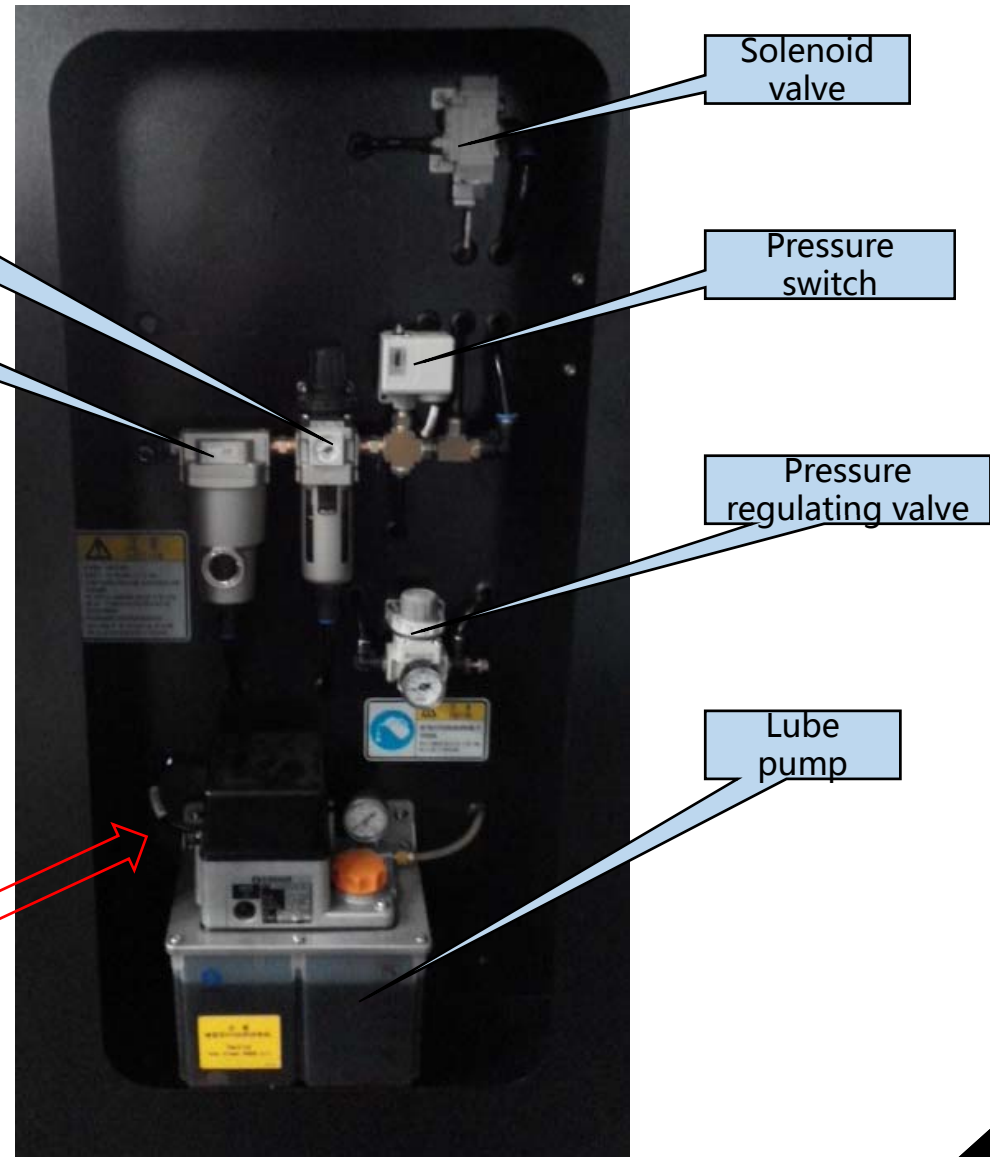


Japan SMC pneumatic system

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

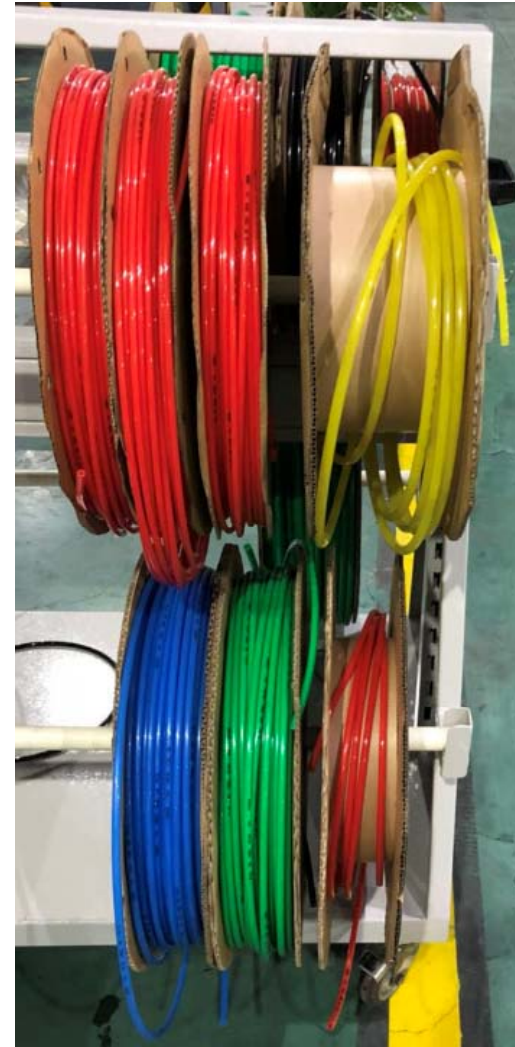
Phoenix labeling

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



SMC(Japan)/LEGRIS (France) air tube

1. Imported **SMC(Japan)/**
LEGRIS(France) air tube ;
2. Differentiate the tube color
according to its function; easier for
future installation and maintenance.
3. The air tube can bear dramatic
temperature change, keeps oil &
dust corrosion away, no fatigue
after long use, **no maintenance or**
replace needed for life.



COLD STAR (Italy) /TNP (Taiwan) oil cooling machine

Direct connected **15000rpm spindle uses** high precision 1.5kw cooling machine, pair with **cooling fluid specially for the spindle**, the fluid temperature can be controlled within **0.2°C**, controls the spindle's heat extension, **increases machining accuracy and surface finishing quality**

The temperature sensor was placed on the body casting to give a true temperature reading, ensures the accuracy of the cooling.

Temperature
sensor



Oil cooling
machine



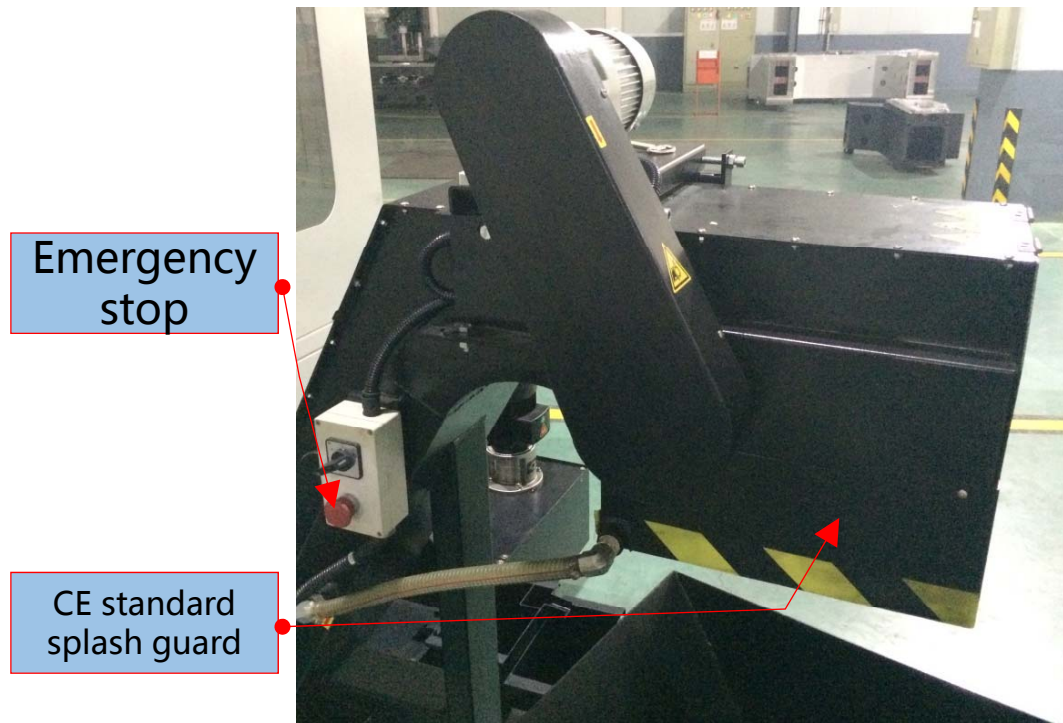
COLD STAR (Italy) /TNP (Taiwan) Fluid cooling machine

Build in type 18000rpm、 24000rpm
spindle uses high precision 6kw cooling
machine, pair with cooling fluid
specially for the spindle, the fluid
temperature can be controlled within
0.2°C, controls the spindle' s heat
extension, increases machining
accuracy and surface finishing quality

Fluid
cooling
machine



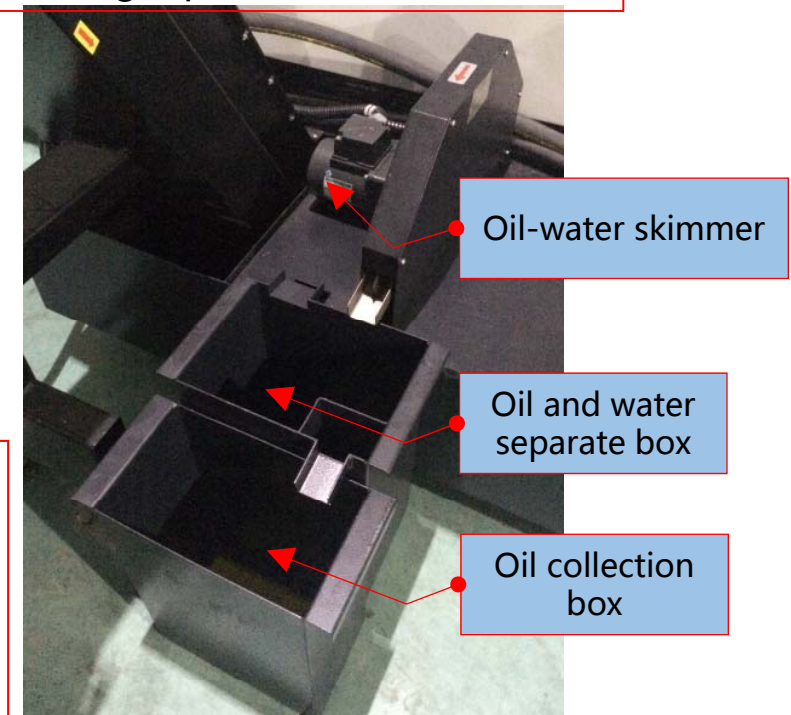
Taiwan Key Arrow chain chip conveyor



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)

Wobang oil skimmer

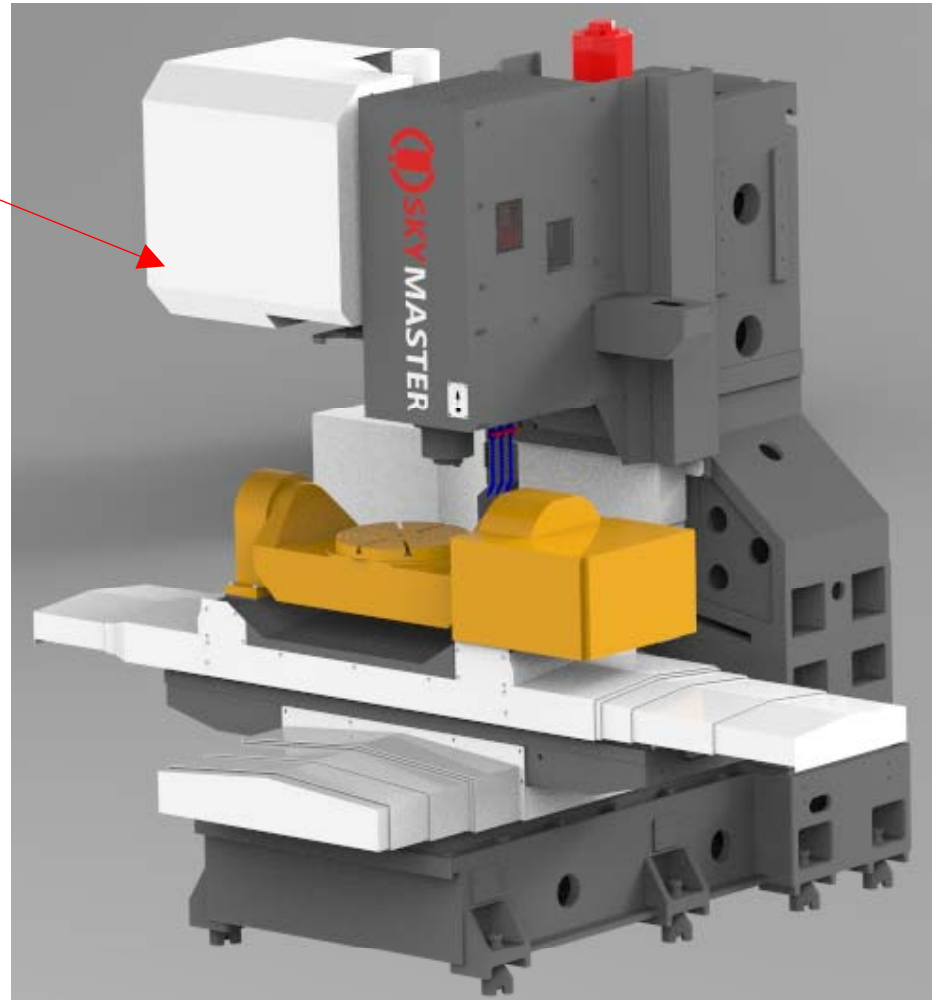
The oil skimmer can separate the oil from the coolant tank which can prolong the life time of cutting liquid.



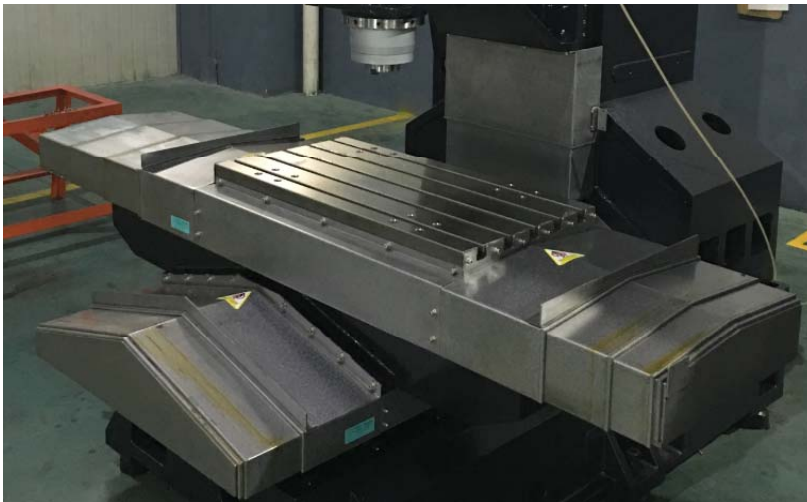
SJ-ATC (Taiwan) Tool magazine

SJ BT40-24 tool
capacity tool magazine

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



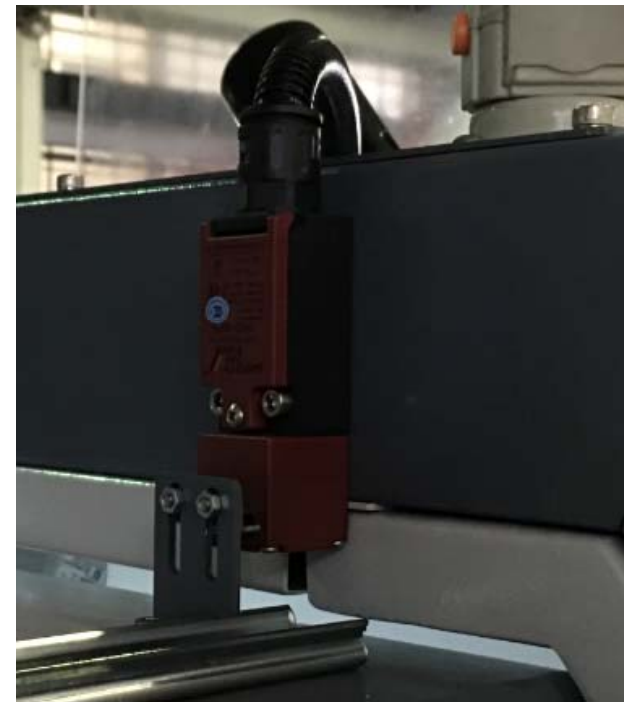
Japan NAJEC telescope cover



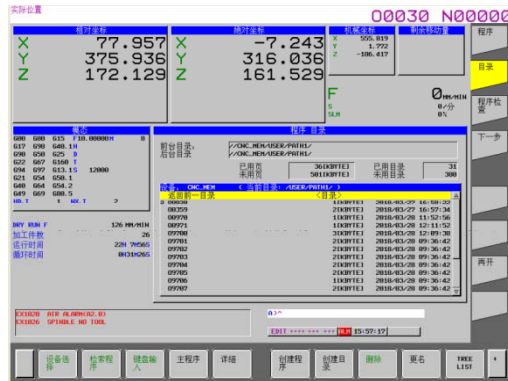
- ★ 3 axis telescope with high tolerance matching and with imported scraping strip to protect the ball screw and liner guide way as well as good dustproof ability .
- ★ Anti-collision design , lower voice in fast running .
- ★ the accuracy difference is less than **2um** with our without the telescope 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 全新产品 — 0i-MODEL F 系统



FANUC 15" display and full keyboard which is convenient for operating by the multi-picture display; compared with the original 8.4" and 10.4" display, the hardware has greatly improved. The motherboard is the same as FANUC 31i, and the pre-read of the program can be increased to 400 segments.

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

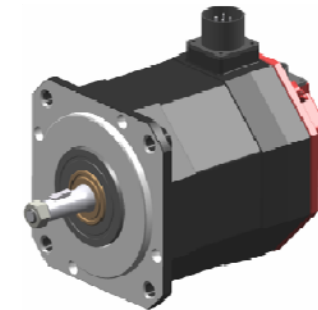
Servo control accuracy improvement

	Old	New
αi -B	$\alpha iA1000$ 1,000,000/rev	$\alpha iA4000$ 4,000,000/rev.
	$\alpha iA16000$ 16,000,000/rev	$\alpha iA32000$ 32,000,000/rev.
βi -B	$\beta iA128$ 128,000/rev.	$\beta iA1000$ 1,000,000/rev.



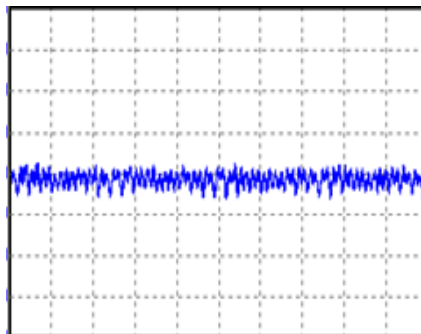
Electromagnet loop optimized

(αiS -B, βiS -B)



0.1 μ m control is available

$\alpha iS/\beta iS$ motor

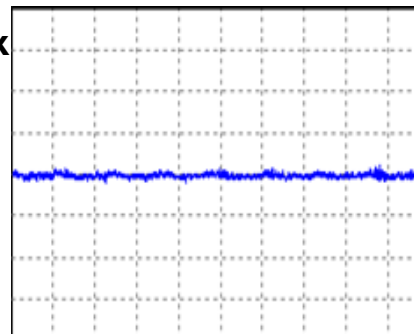


Approx

1/3



αiS -B/ βiS -B motor



300%

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

FSSB HIGH SPEED RIGID TAPPING

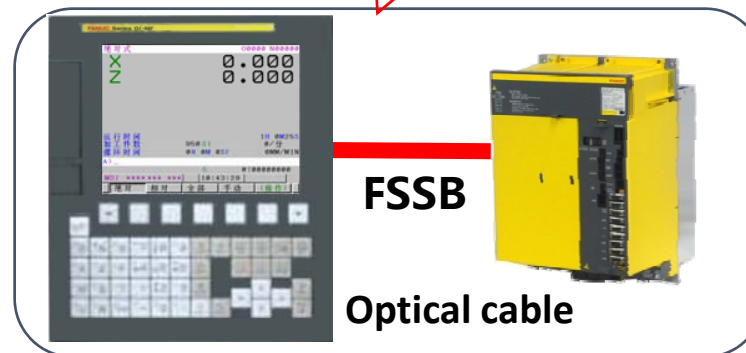
Advanced digital servo technology

23%

**SKY
MASTER
STANDARD**

Efficiency 1

**Theoretical
error display**

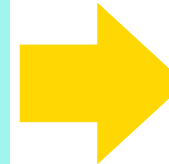


E.g : S3000 20mm Pitch 1mm tap

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

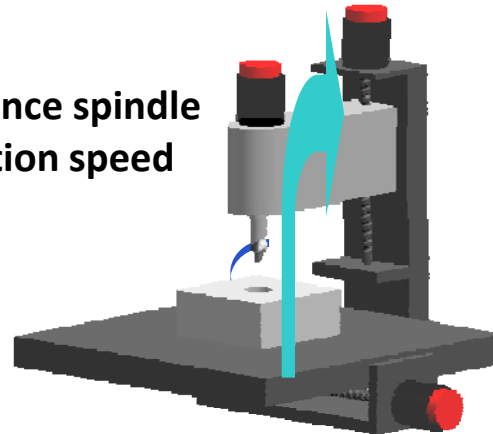
26%

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

**SKY
MASTER
STANDARD**

Apply FSSB optical
transmission

Enhance spindle
reaction speed

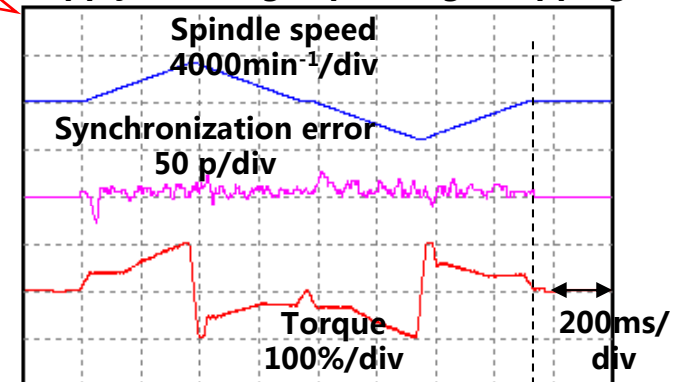


Efficiency 2

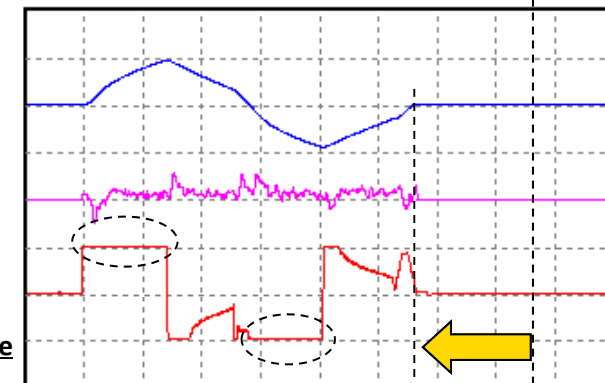
Theoretical
error display

- 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

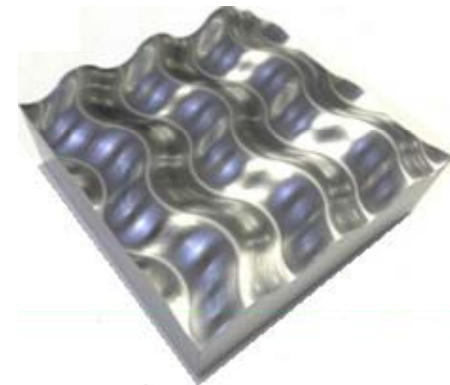
Accuracy

Micro-line blocks processing ability
enhances 200%

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

Packaging function , especially
for mould machining

**SKY
MASTER
STANDARD**

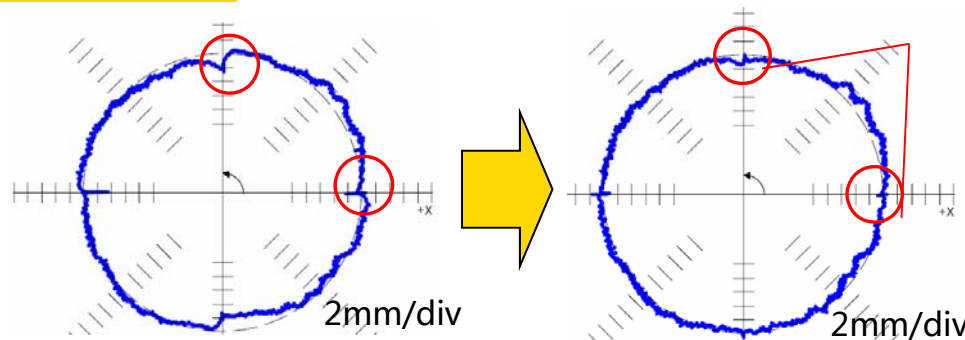
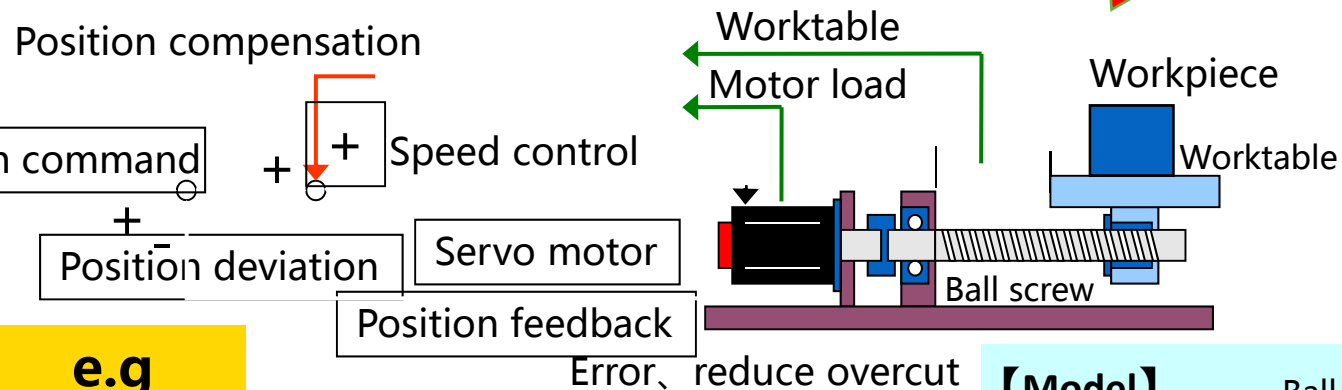


FANUC NEW SERIES— 0i-MODEL F SYSTEM

Intelligent backlash
Further optimize system function

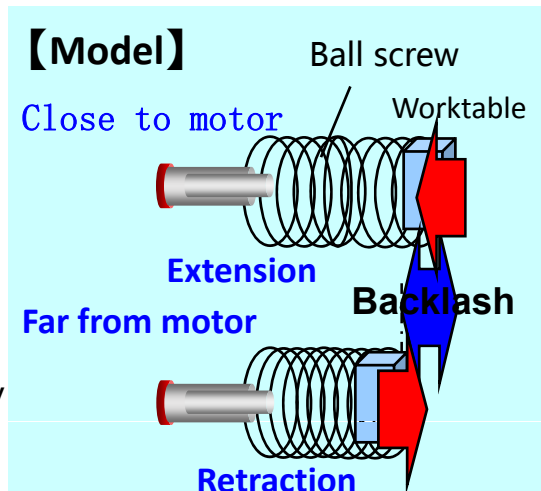
**SKY
MASTER
STANDARD**

SMART



Normal backlash compensation

Intelligent backlash compensation



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

Smooth tolerance control

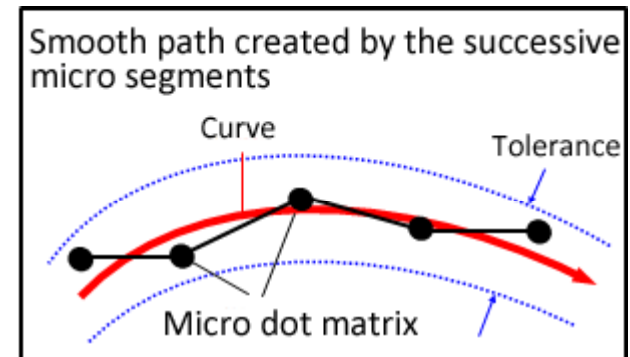
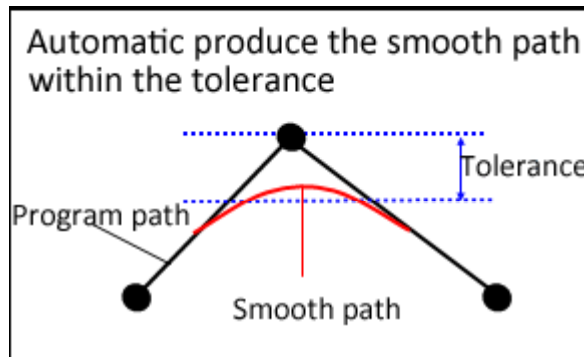
**SKY
MASTER
STANDARD**

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

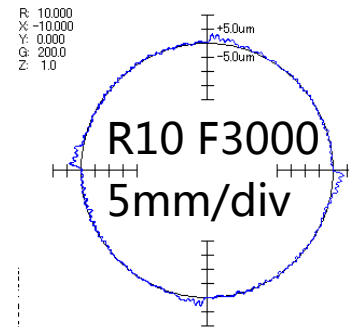
Advanced digit servo technology

Accuracy

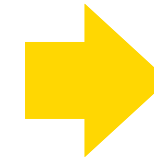
- Servo HRV⁺, optimize current loop control to achieve high respond
- Nanoscale high speed and high accuracy machining
- 0iF system, HRV⁺ control can also be applied on the β i-B servo motor

OPTION

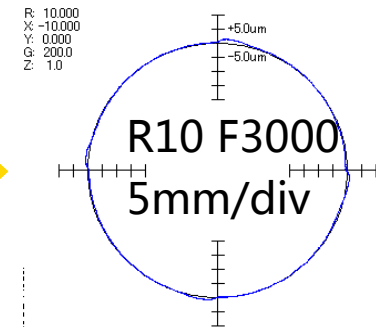
Servo HRV3 control



High gain



Servo HRV3⁺control



HRV3

HRV3⁺



Iron F1000, 45deg

FANUC NEW SERIES— 0i-MODEL F SYSTEM

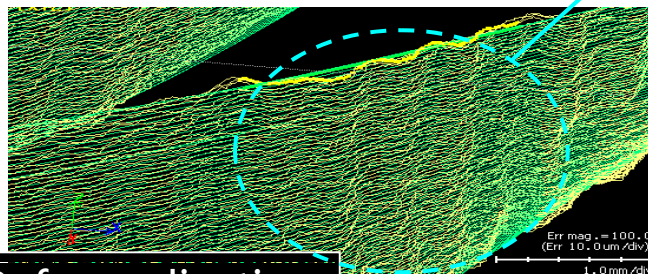
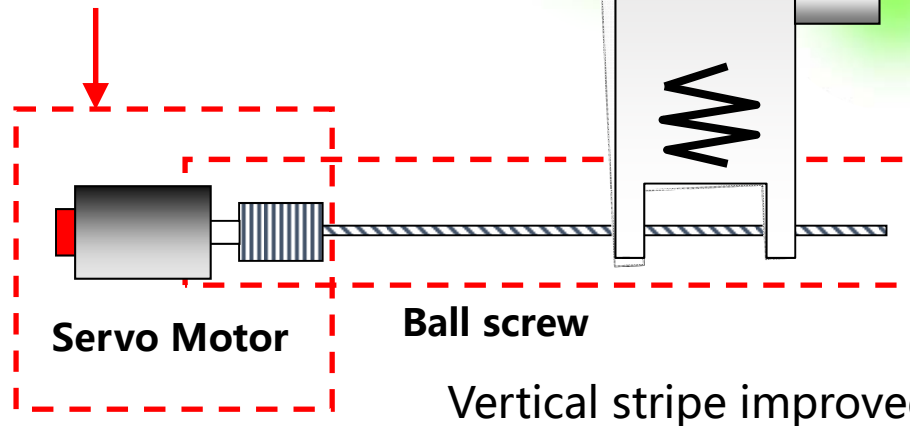
Smart front control

Further optimize system function

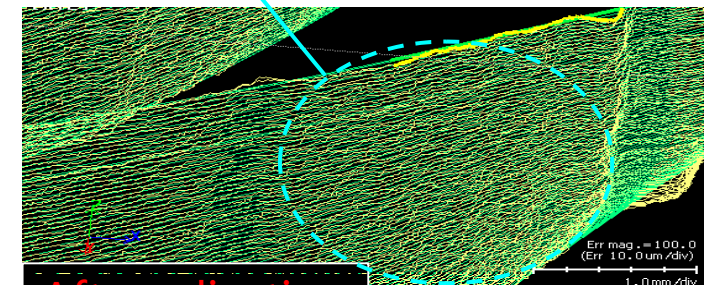
SMART

Suppress machine vibration

**SKY
MASTER
STANDARD**



Before adjusting



After adjusting

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

OPTION

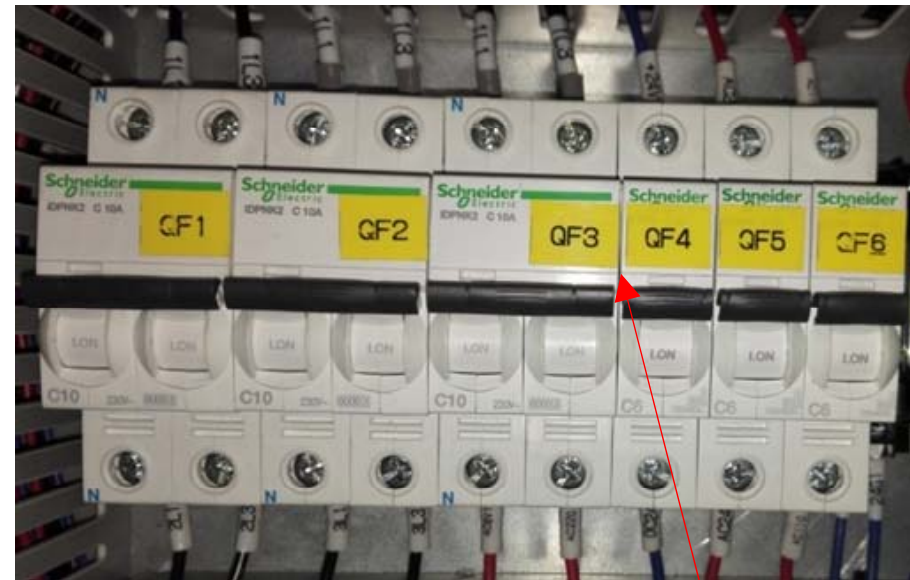
MANUAL GUIDE(operation guide)0i	MANUAL GUIDE(operation guide)i
PICTURE function	Dynamic graph display
Data server	Program storage capacity 2M
3-dimensional coordinate system conversion, handle interruption	AICC 2 (Max. preview blocks 400)
Machine alarm messages diagnosis	Nano smooth
Remote diagnosis	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



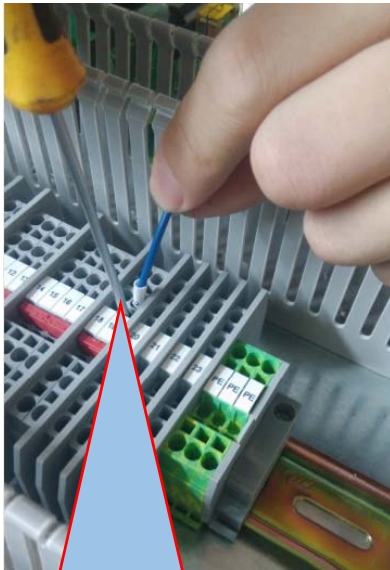
**Schneider
thermal overload
relay from France**

**Schneider AC
contactor from
France**

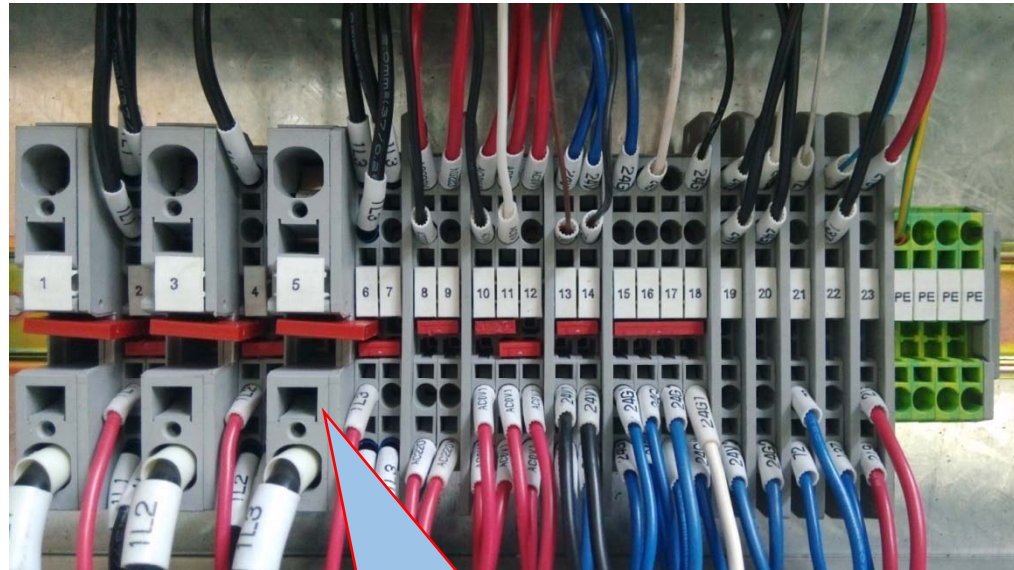


**IDEC miniature
relay from Japan**

PHOENIX terminal blocks



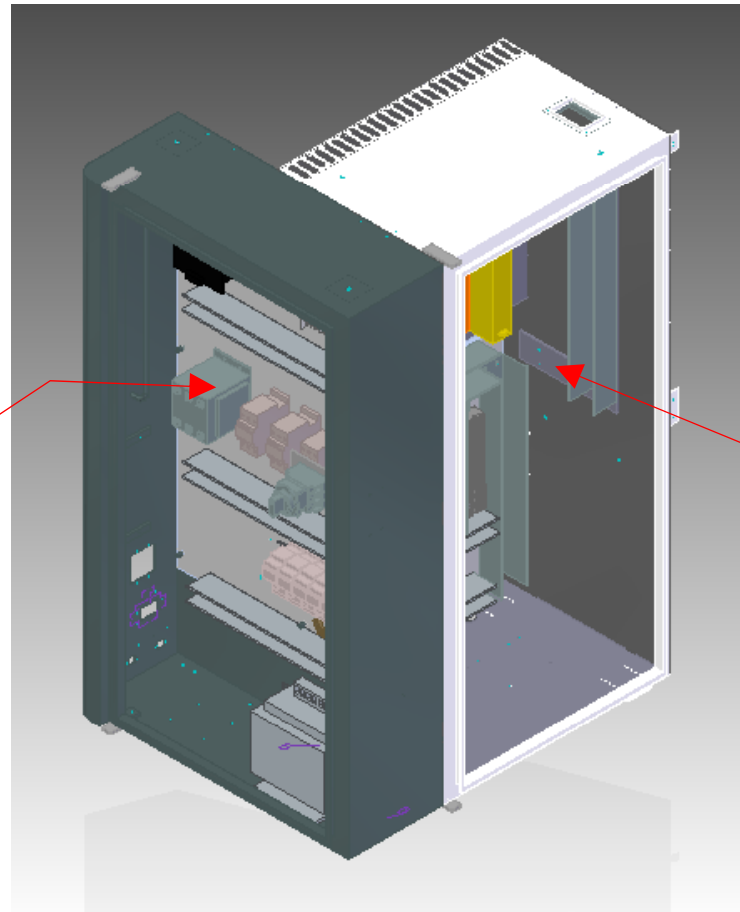
Only using a standard screwdriver to open the wire contactor and insert wire into it. The high-density blocks reduce wiring time, minimize troubleshooting, and perform in severe conditions.



Spring-clamp terminal blocks offer screwless termination technology, a fast and practical solution for secure and durable connections. The price is ten times more than the ordinary terminal blocks.

High/low voltage separated electrical cabinet

Strong electric control cabinet: Components like reactor, AC contactor, transformer and spindle filter will produce strong electromagnetic field during working process. To avoid interference from the system, these components are isolated separately.



Weak electric control cabinet: Isolation design with heat sink, can take away a great deal of heat generated by the drive, without affecting the service life and stability of the system components.

Skymaster all new stainless steel operation panel



The Operation panel follows CE standard; the stainless steel is more durable, ensures long life span

MPG



The MPG follows CE standard; with emergency & able button

IGUS cable from Germany



Apply IGUS cable
for electrical
assembling

Meet TUV European
standard , classified
according to the color.

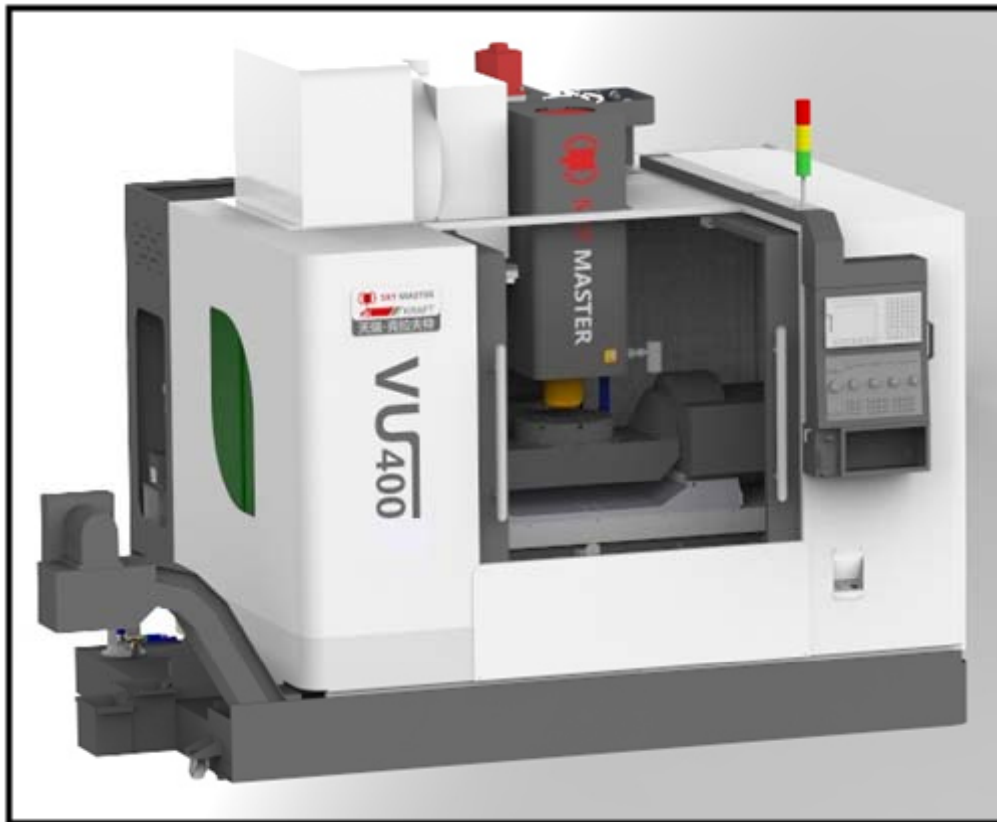
Grey: control cable
Black: power cable
Orange: servo power
cable

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)
		Built-in HSK A63-18000rpm	1set	INNA(Germany)
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	24pcs arm type	1set	GIFU(Taiwan)
11	5 axis	PARS-403BR	1set	PARKSON(Taiwan)
12	A/C for electric cabinet	PAC1000L 220V 50/60HZ	1set	COLDSTAR(Italy)
13	Spindle chiller	TO-10PTB-215 220V 50/60HZ	1set	TNP(Foreign investment)
14	Pneumatic system	AW30-03D-A and other accessories	1set	SMC(Japan)
15	Lubrication system	MSK-102WL and other accessories	1set	CHIBA(Taiwan)
16	Three axes telescope cover		3sets	NAJEC (Japan)
17	Alternating current contactor	LC1D09M7C	8pcs	SCHNEIDER(France)
18	Intermediate relay	MY2NGSDC24V	3pcs	OMRON(Japan)
19	Miniature relay	RJ2V-C-D24 8A	20pcs	IDEC (Japan)

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

Protection guard feature



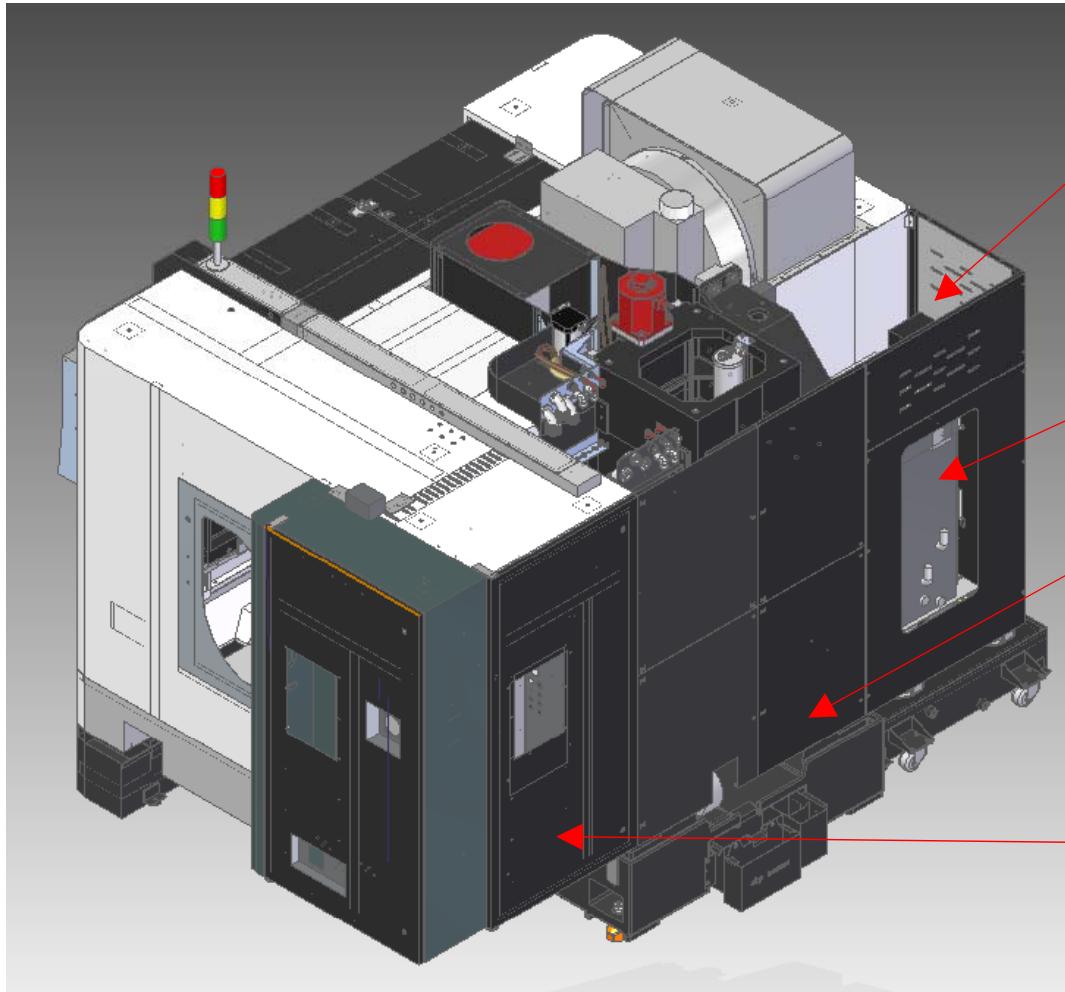
Equip with full-enclosed splash guard

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

No drag chain use on Z axis, increase Z axis' s space, easier for oil, air & electric route' s installation and maintenance.



Protection guard feature



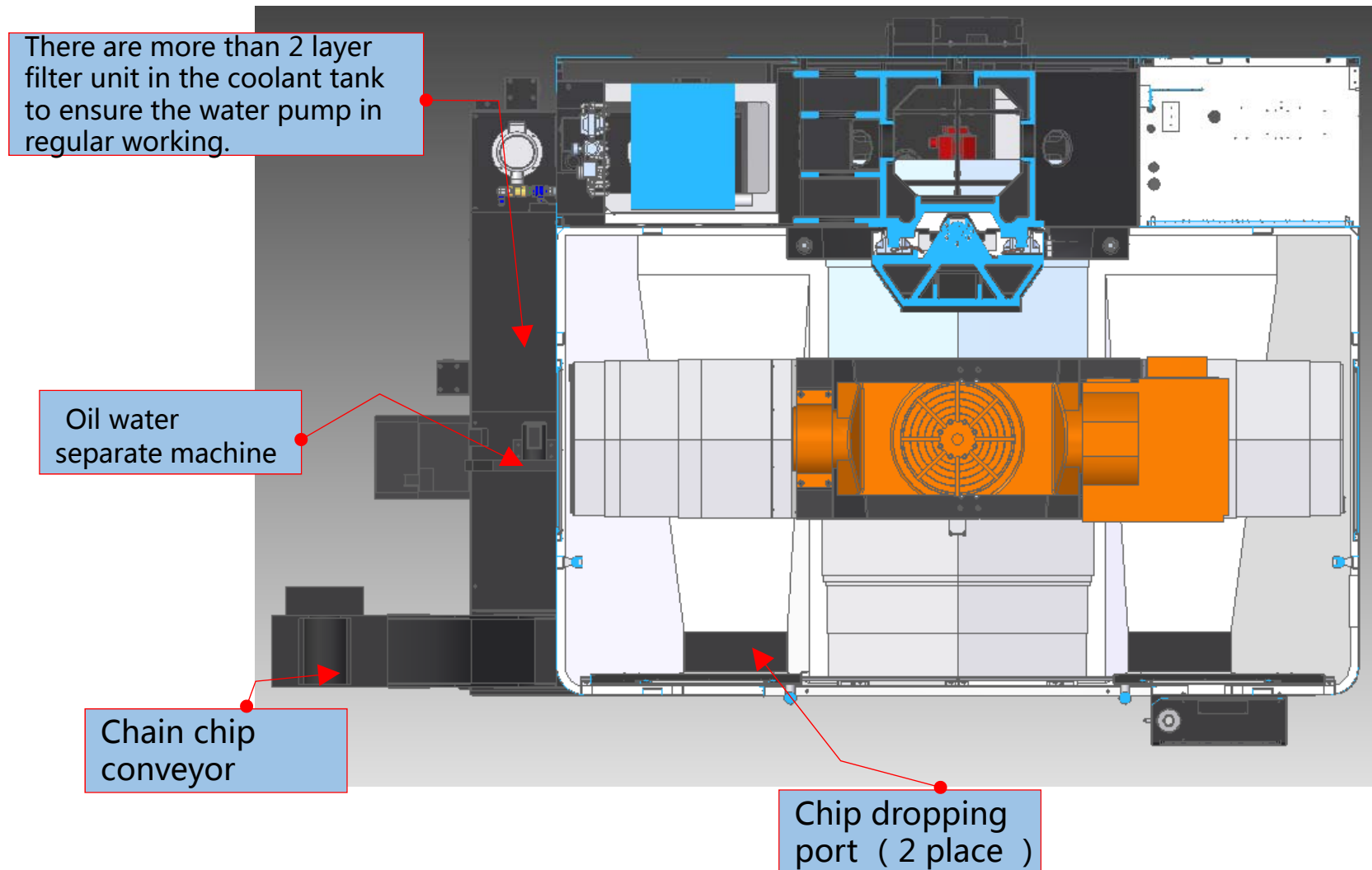
Pneumatic and lubrication unit ,easy to observe and maintain

The oil cooler was installed on the supporting rack , left side back of the machine

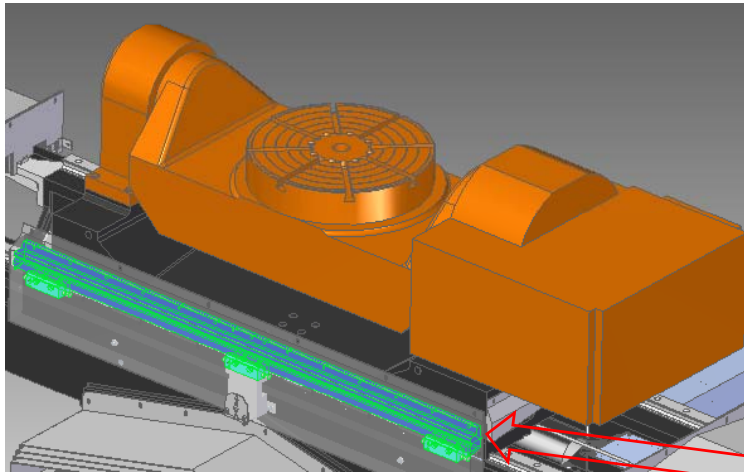
The machine back side is designed with full-enclosed structure, elegant appearance

The electric cabinet was installed at the right side back of the machine, easy for cable management

Protection guard feature



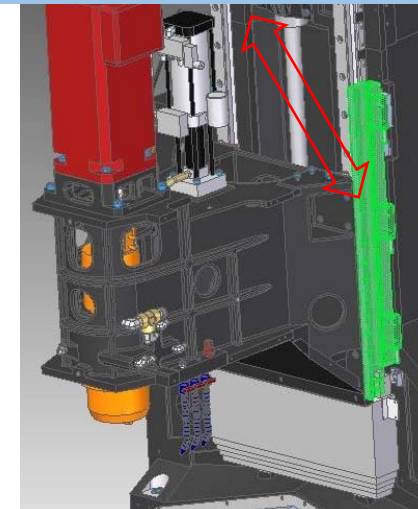
Optional-FAGOR (Spain) /HEIDENHAIN (German) Linear guide scale



Skymaster use Heidenhain absolute type linear guide scale only.

The Heidenhain / Fagor absolute type linear guide scale came as standard for all three axis, the minimum resolution is 0.05μm, can monitor all moving parts in real time, ensures positioning accuracy and repeatability accuracy.

	Absolute type	Incremental type
1	Get the positioning data immediately, no need to make the moving axis back to reference point	Must moving axis must move back to home position every time
2	The reading head use two couple seal side by side with good protection	The reading head use single seal only
3	Transmission by digital signal which has excellent anti-interference ability	Transmission by sine wave which is easier to interfere



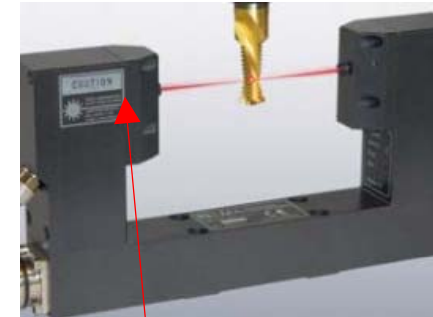
Option-Measuring accessory



BLUM (German) touch type tool setter can examine tool length & diameter

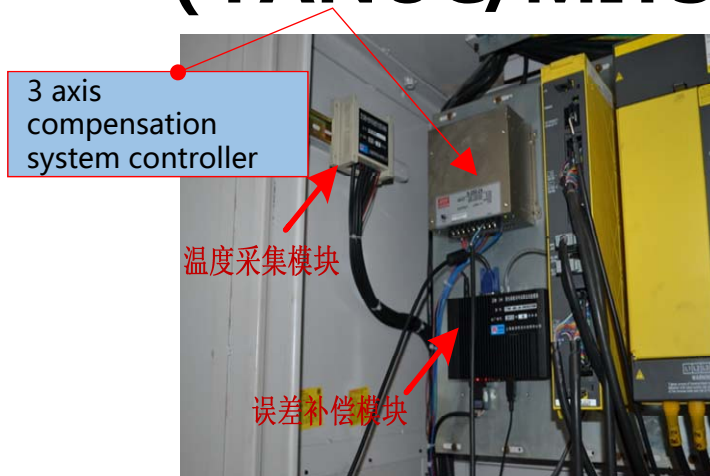


Metrol (Japan) touch type tool setter, can examine tool length



BLUM (German) laser type tool setter can examine tool length & diameter

Option-Intelligent X/Y/Z compensation (FANUC/MITSUBISHI)



Real work piece comparison

Error parameter (unit : μm)	Before	After	Accuracy increased percentage
4 holes distance	16	9	43.75%
Square stair width	15	10	33.33%

Spindle thermal error intelligent compensation

- Dramatic spindle accuracy and stability increase after compensation
- Machined surface quality still great after compensation
- Work piece profile tolerance increased after compensation
- Compensation technology advantages:
No warm-up needed (or minimum warm-up required), maintain accuracy after machine been stored away, no need to re warm up after tool change (for different speed) during machining.



Sensor location diagram

Standard

FANUC 0i MF absolute type controller 15inch display	
Controller special function: three dimensional coordinate transformation; inclined plane machining; 3D manual feed.	
Automatically power off	3 colors warning light
Working area light	Portable MPG
Door interlock	Transformer
Direct connect 10000rpm BT40	Spindle chiller
Spindle air sealing	Lubrication/Pneumatic unit
Spindle cooling by external pipe	Rigid tapping
Air blowing device	Tool coolant system
24 pc arm type ATC	Water gun/air gun with flushing function
A/C for electric cabinet	Oil and water separator machine
Full enclosed splash guard	Adjustable level bolts and foundation blocks
Chain ship conveyor	Tool box
Operation manual	Grease lubrication

Option

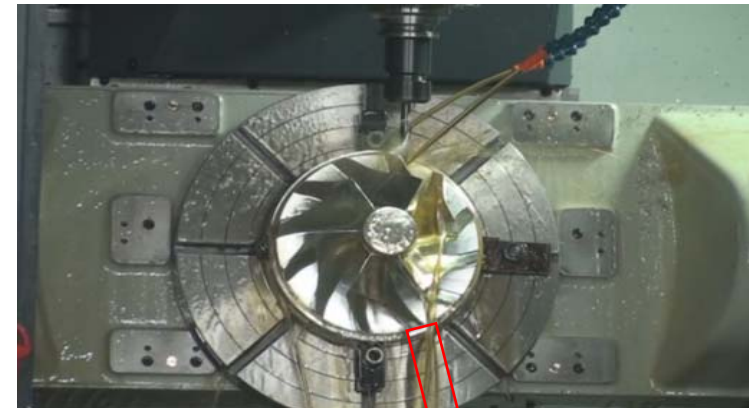
HEIDENHAIN TNC620 system
Tool/ Work piece measuring system
Fagor/ Heidenhain absolute type linear guide scale
Voltage stabilizer
Direct connected , 15000rpm , BBT40
Direct connected , 15000rpm , HSK-A63
Build in , 18000rpm , HSK-A63 (INNA)
Coolant through spindle center
3 axes intelligent compensation function (FANUC/Mitsubishi)
Ball bar automatic compensation device (hardware/software)
Drawer type water tank
Roof spraying system
Machine crash protection function
Oil mist recycle machine (LOSMA)
Air dryer
Fully enclosed iron box package
Warranty prolong 1 year

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Application field

Applied for special curve surface product and products with 5-axis characters

Drill : multiple machining surface, the tooth part must finish with 5-axis machining



impeller : typical 5-axes product, the blade made by multi curved surfaces, test a machine' s consistency.



One end-user's factory



THANKS

SKY MASTER- KRAFT



Many thanks for your time for SKYMASTER
PPT introduction

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