

VF68 Vertical high speed Introduction



Version No :TRJG-2018-A1

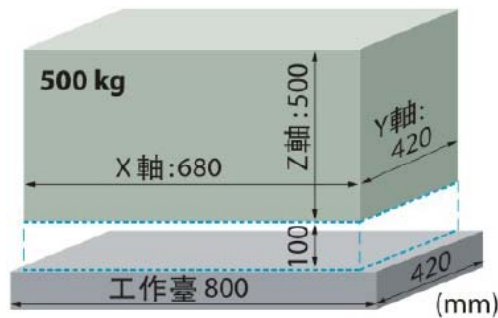


**Use our wisdom to
supply you the best
solution**

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

VF68 Technical Parameter

“VF” means “vertical high speed”
 “68” means “X axis travel is 680mm”



Item			Unit	VF68
Standard controller			/	FANUC 0i MF
Travel	X axis travel (work-table)		mm	680
	Y axis travel (saddle)		mm	420
	Z axis travel (spindle head)		mm	500
	Distance from spindle nose to table		mm	100-600
	Distance from spindle center to column cover		mm	480
Work table	Table size (length×width)		mm	800×420
	Max. table load		kg	500
	T slot size (width×distance×quantity)		mm	14×80×5
Spindle	Spindle taper			HSK-A63
	Max. spindle speed		rpm	15000 (direct driven)
	Spindle motor power (continual working/30mins)		kW	9/15
	Spindle torque		N.m	57.3/120
X/Y/Z	Rapid traverse X/Y		mm/min	40000
	Rapid traverse Z		mm/min	32000
	Cutting feed rate on X/Y/Z		mm/min	1-10000
ATC (option)	ATC type			Arm type (option)
	Tool capacity		pcs	24
	Max. tool diameter		mm	φ80/φ130
	Max. tool length		mm	350
	Max. tool weight		kg	8
Accuracy	VDI/DGQ344 1	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	3300×2700×2700
Machine weight			kg	4500

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

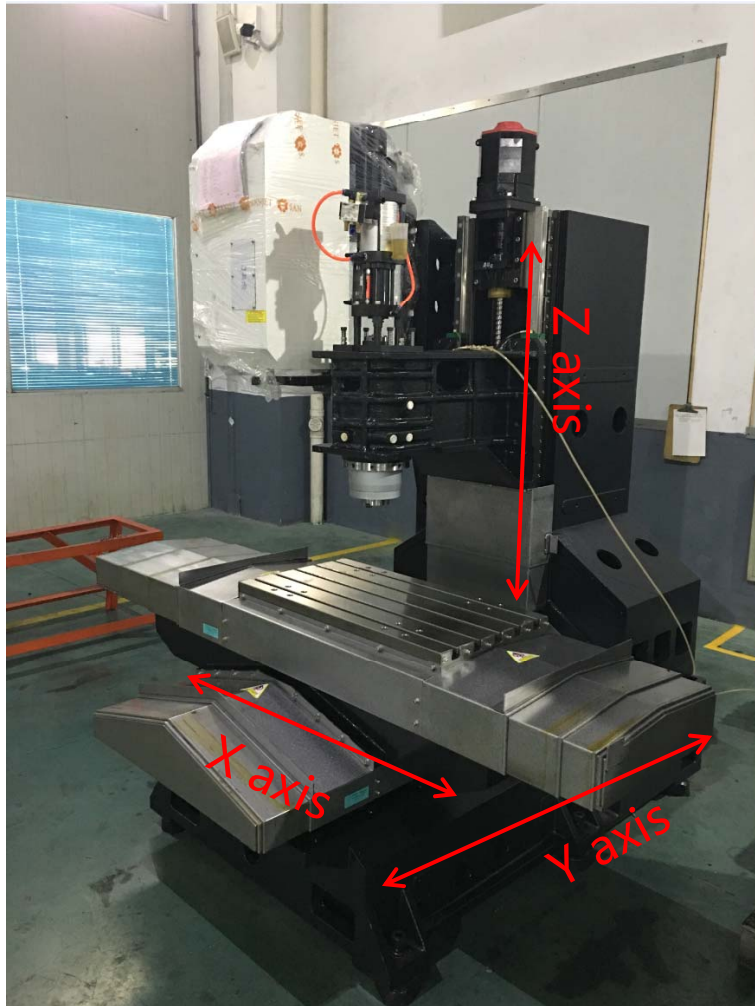
Machine feature – Whole machine



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 15000rpm**
- ◆ High Feeding Speed—maximum moving speed is 40m/min (48m/min optional), maximum cutting speed is **10m/min**
- ◆ Fast Reaction—all three axes equip with large torque servo motor, the maximum acceleration can reach 0.7G, the X-axis' s acceleration can reach 0.5G when under 500kg of load.
- ◆ High accuracy—all three axe's position accuracy is **0.006mm** , the repeat accuracy is **0.004mm**

Machine Structure -Frame



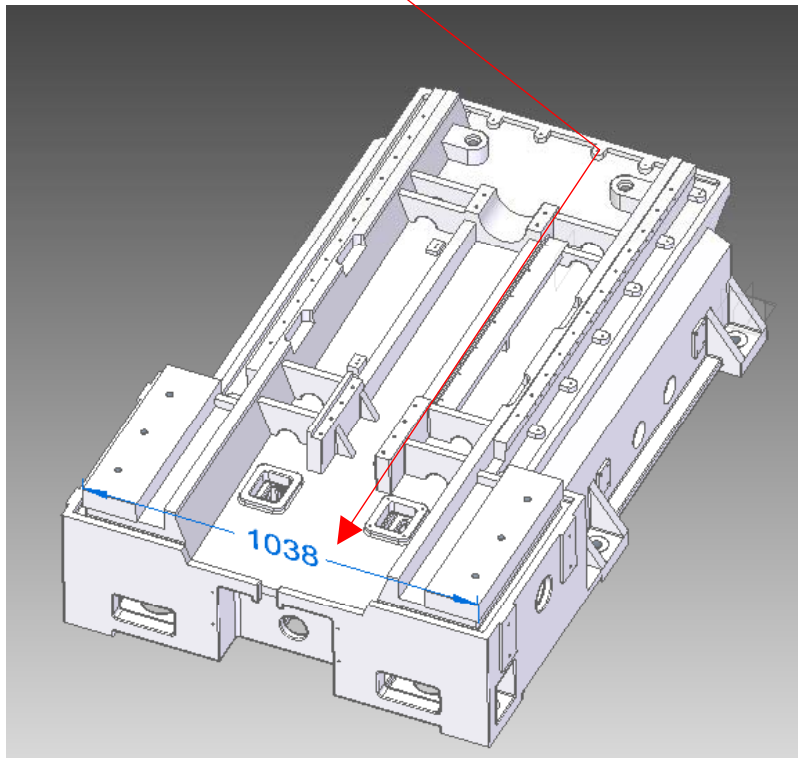
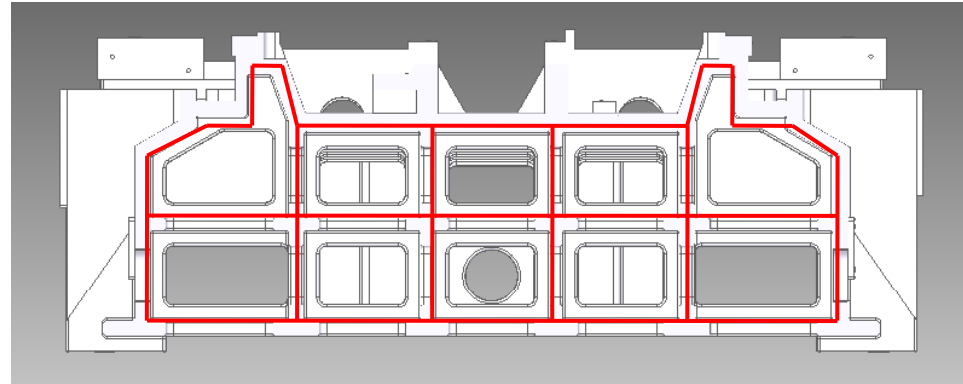
Worktable movement in left and right ---X axis
Saddle movement in front and back -----Y axis
Spindle movement in up and down ---Z axis

- ◆ 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

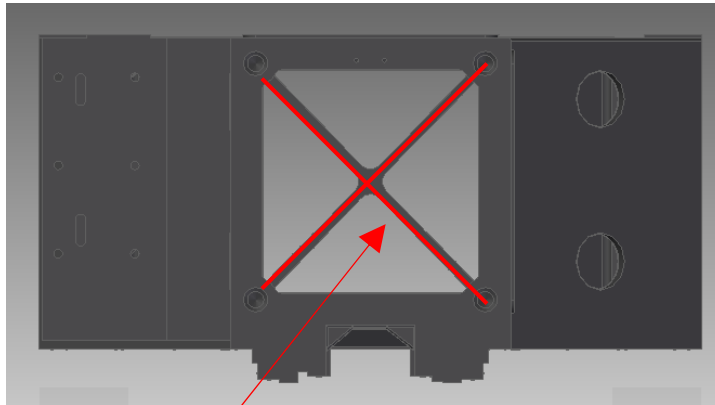
Structure feature – machine bed

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



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

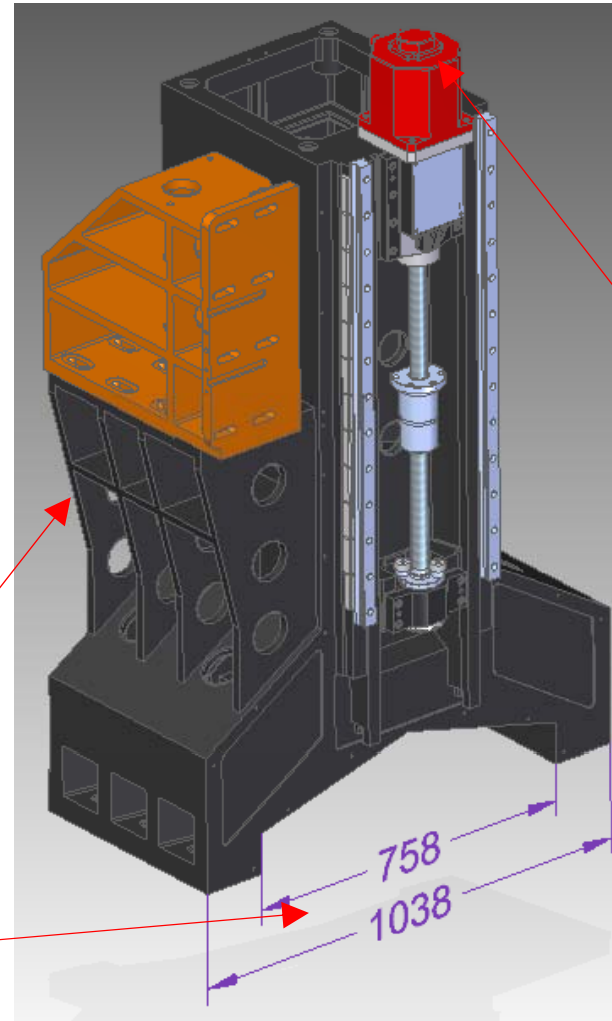
Structure feature-Column



The cross ribs in column improve the torsional 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

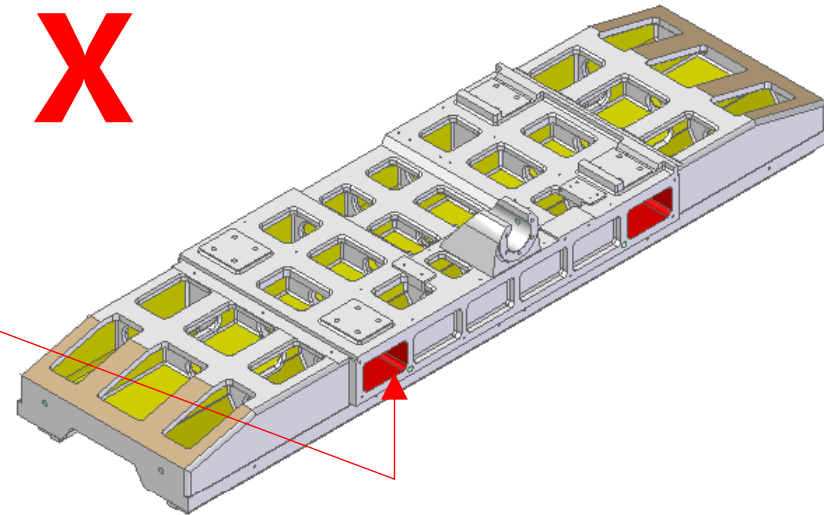


Z axis is driven by big power motor(torque 45Nm), compare with mechanical balance system, the cost increase 10%,but improve the 3 axis response speed and circular profile accuracy in direction changing obviously

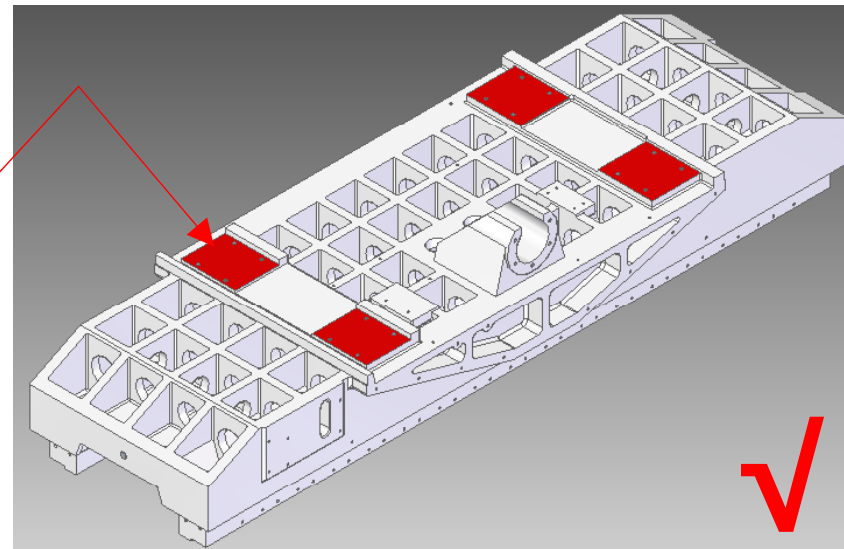
Structure feature-Saddle

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



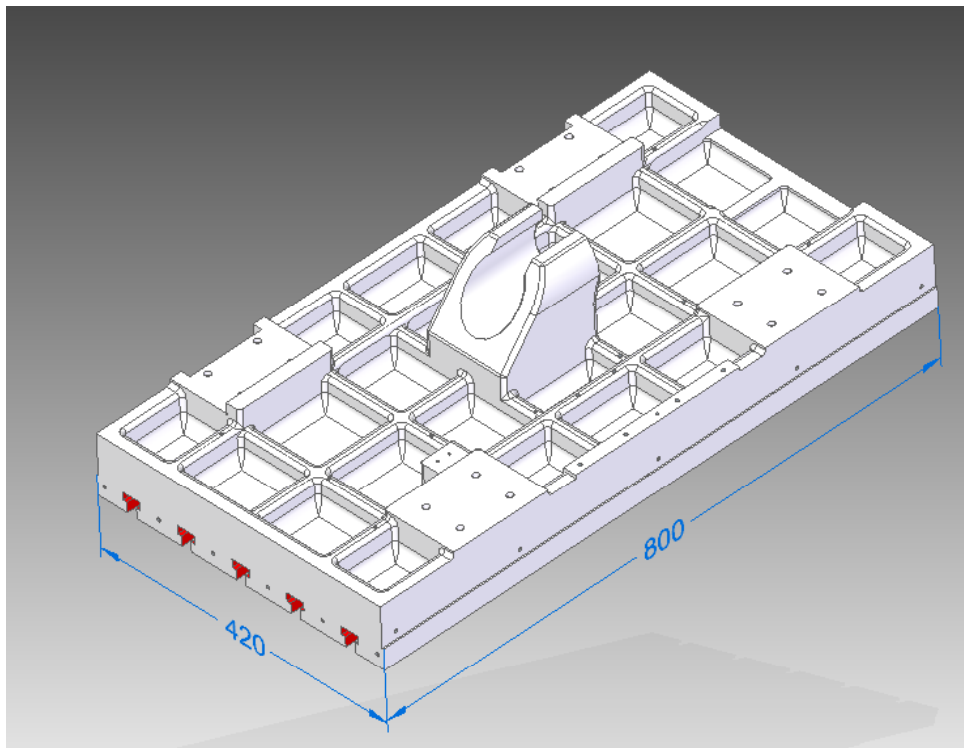
The VF68 is designed with many stronger ribs at the bottom of saddle, the place for slide block installation is enhanced, this design improve 40% torsion ability although it adds the additional difficulty.



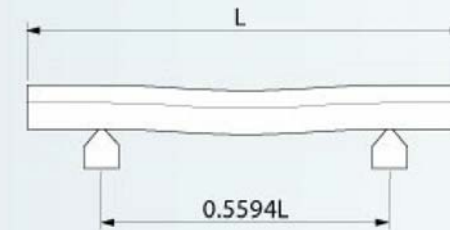
✓

Structure feature –Work table

Bessel optimized supporting
point design
Stable loading, high torsion
rigidity



贝塞尔 (BESSEL POINTS) 最佳支点

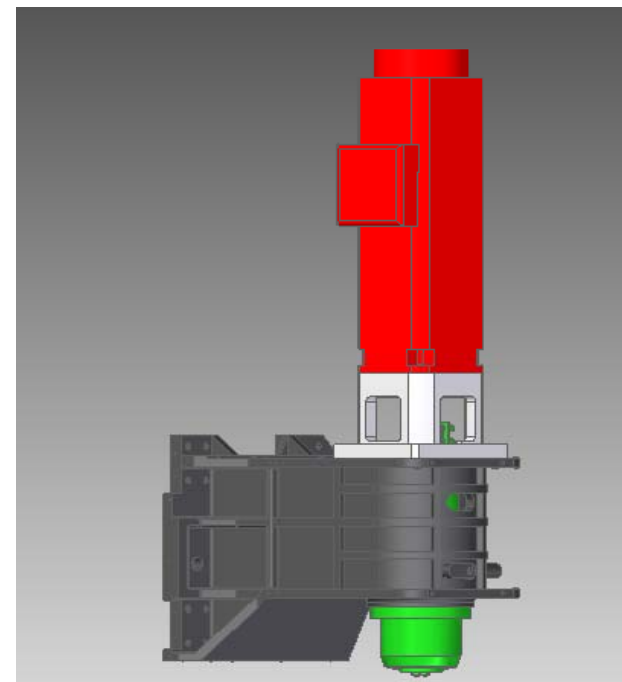
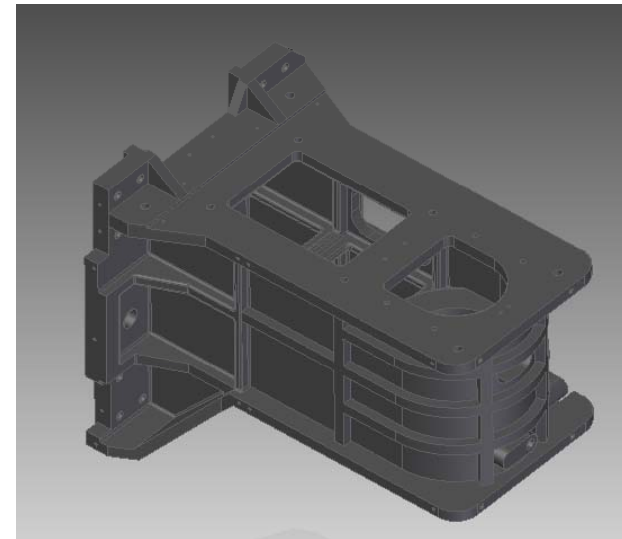


Worktable loading : **500kg**

T slot size $5 \times 14 \times 80\text{mm}$

Structure feature-Spindle head

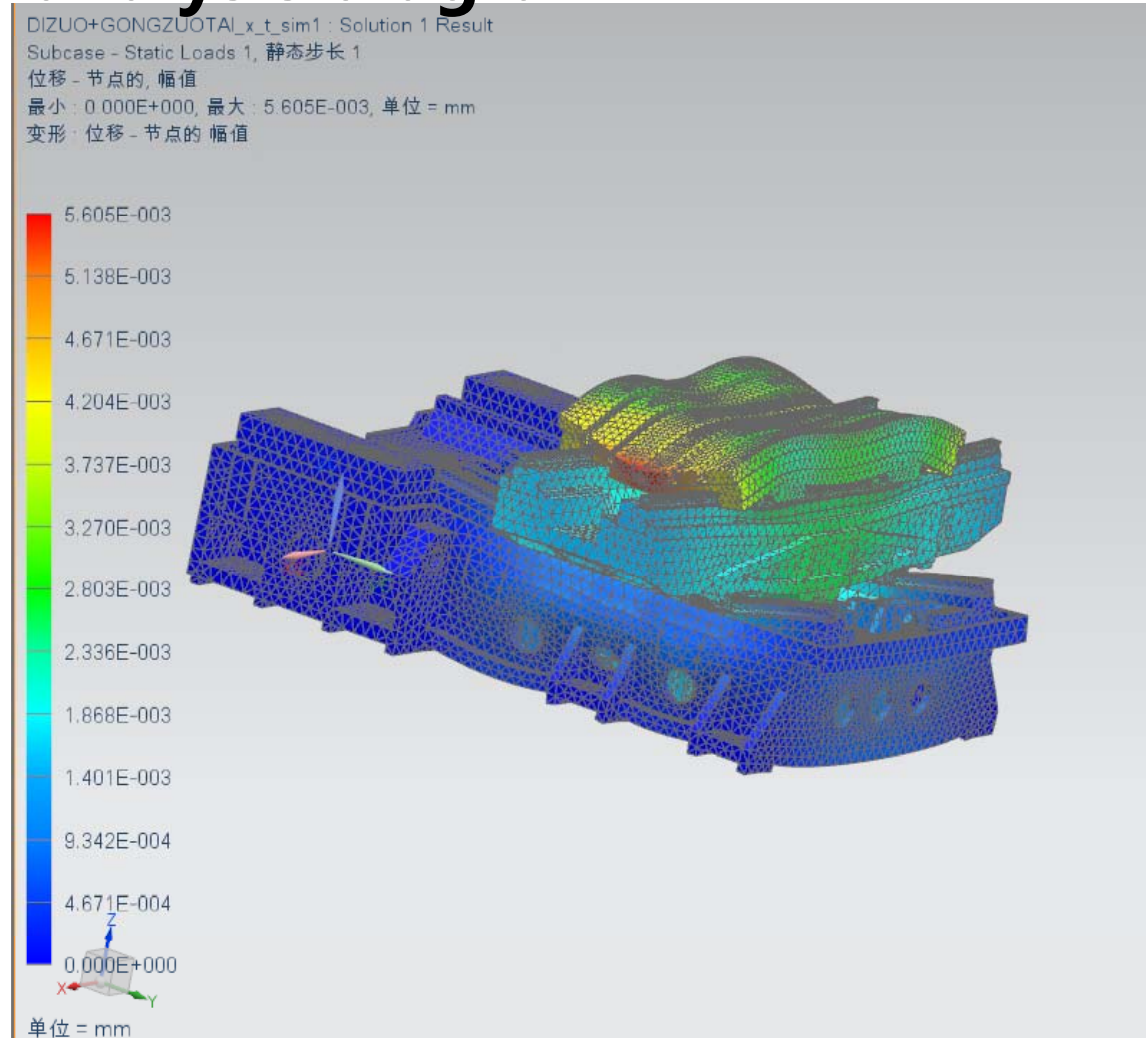
- ◆ The spindle head structure is from Germany Kraft craft and design experience combines with FEM to ensure the rigidity .
- ◆ Max spindle speed : **15000rpm** ;
- ◆ Tool shank HSK-A63、BBT40 ;
- ◆ The spindle head is designed in thin-wall(15mm thickness only) but with many enhance ribs, compare with other factory,this light-weight design can save 50kgs and as well as the dynamic improvement.



Analysis and optimization

Worktable stress analysis diagram

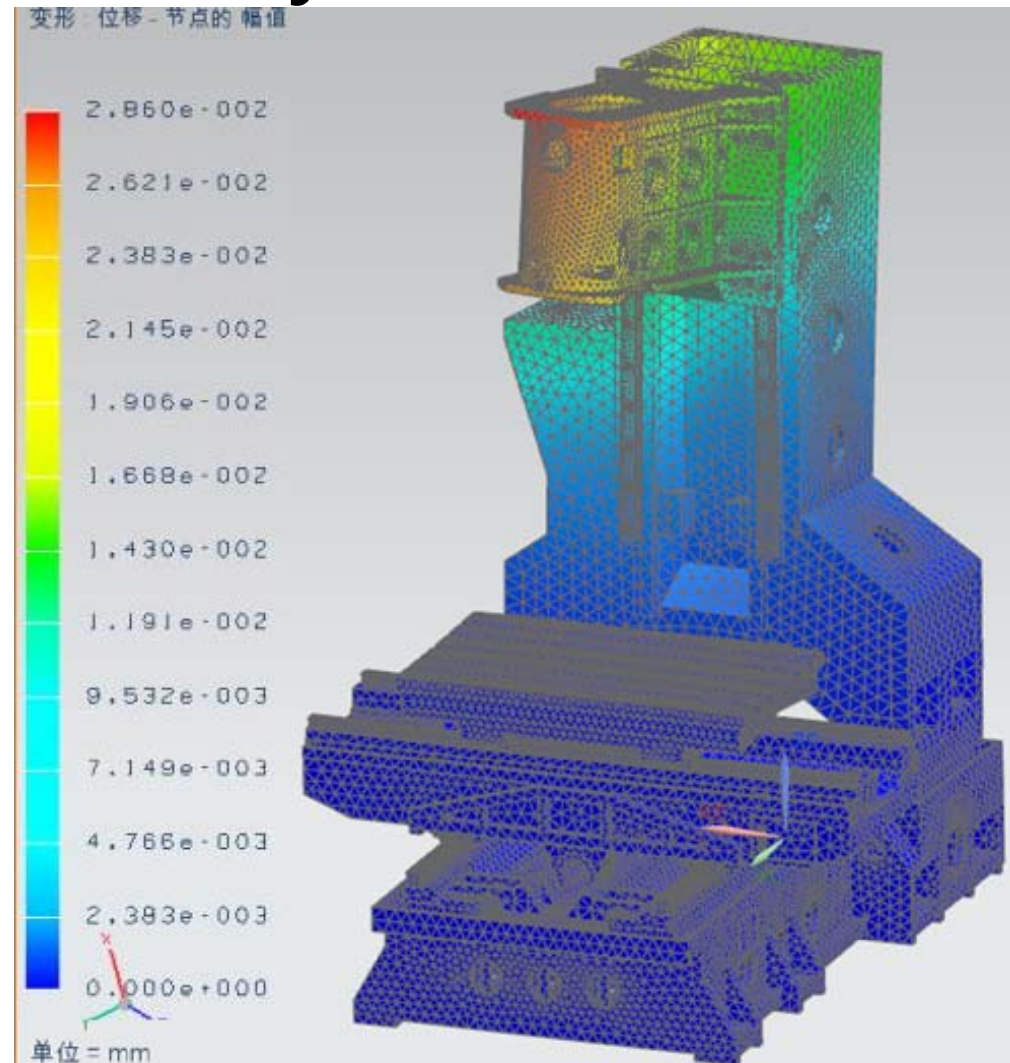
	Rated	Test
Loading	500kg	1T
Deformation	< 0.003mm	< 0.006mm



Analysis and optimization -whole machine 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	0.028mm



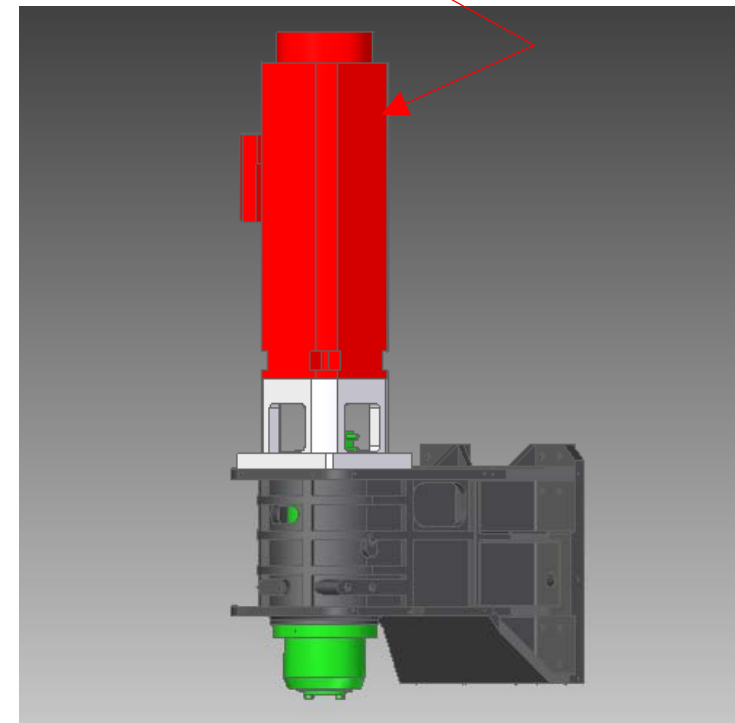
USA SETCO Direct driven spindle

★ American SETCO is a company focus on designing and manufacturing high performance and high precision spindle.

★ The maximum rotate speed is 15000rpm, the spindle use ceramic rolling parts and grease lubrication. The maximum rotate speed is 20000rpm; ensure the spindle works well overtime

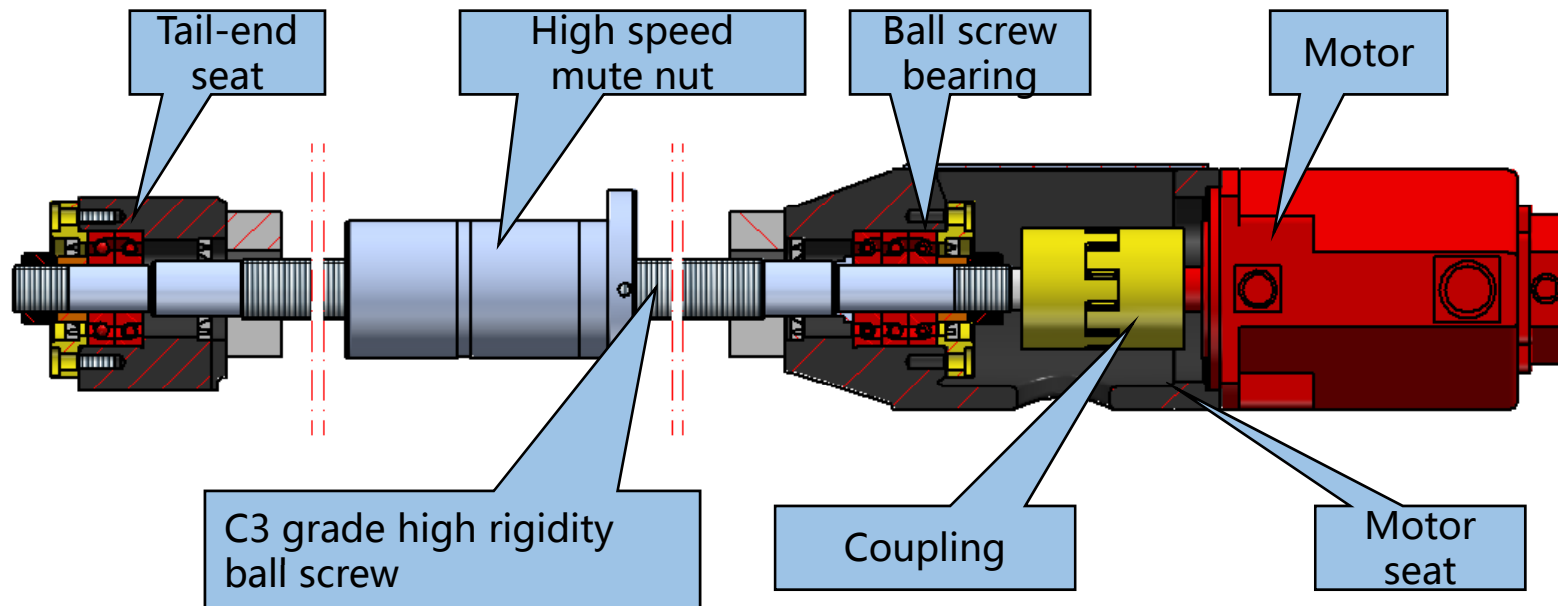
★ The spindle motor is directly connected to the spindle, eliminated the middle part, decrease vibration, increase the rotate accuracy and reaction time of the spindle.

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



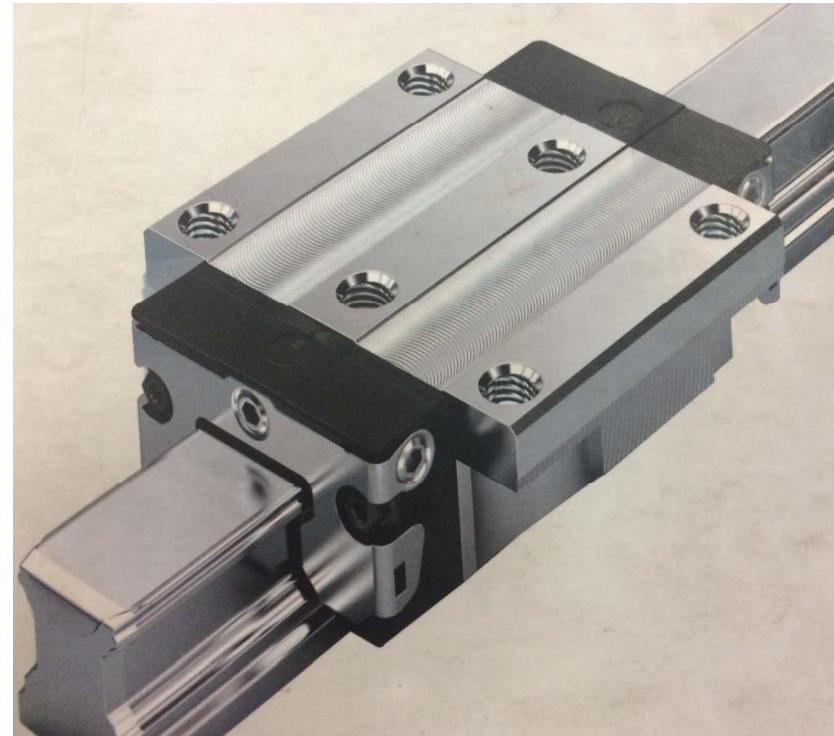
PMI Ball screw

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 .



Imported CHIBA lubrication system

CHIBA whole lubrication system (including electric lubricating pump, oil pipe, joint, oil injector, etc.), can automatic timing and quantificationally supply lubricating parts such as lubricating oil parts, including liquid level and pressure detection switch, to ensure the long-term stability of the lubrication system.



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

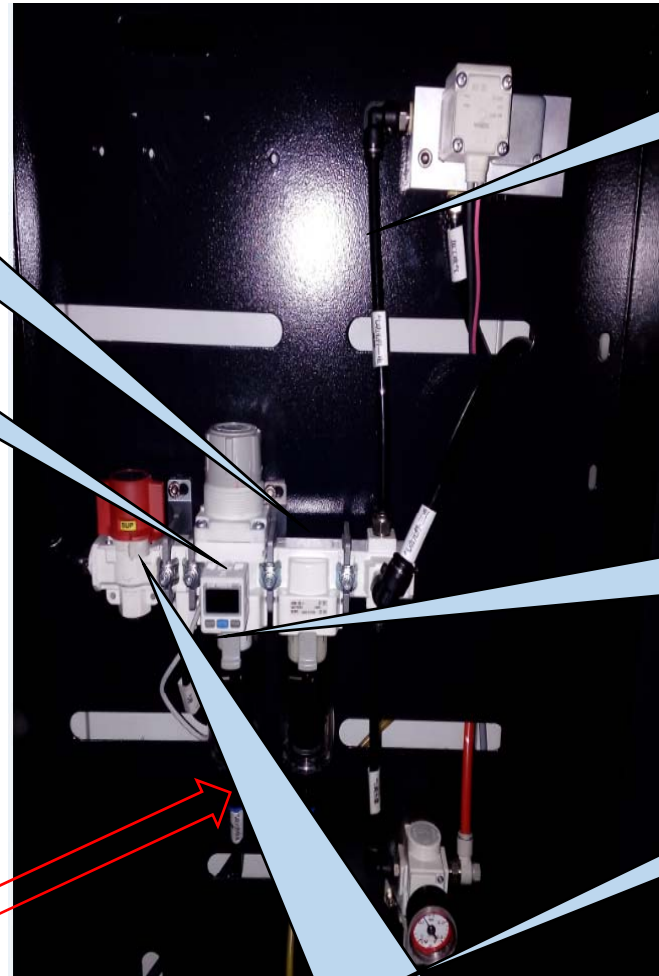
Oil mist separator

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

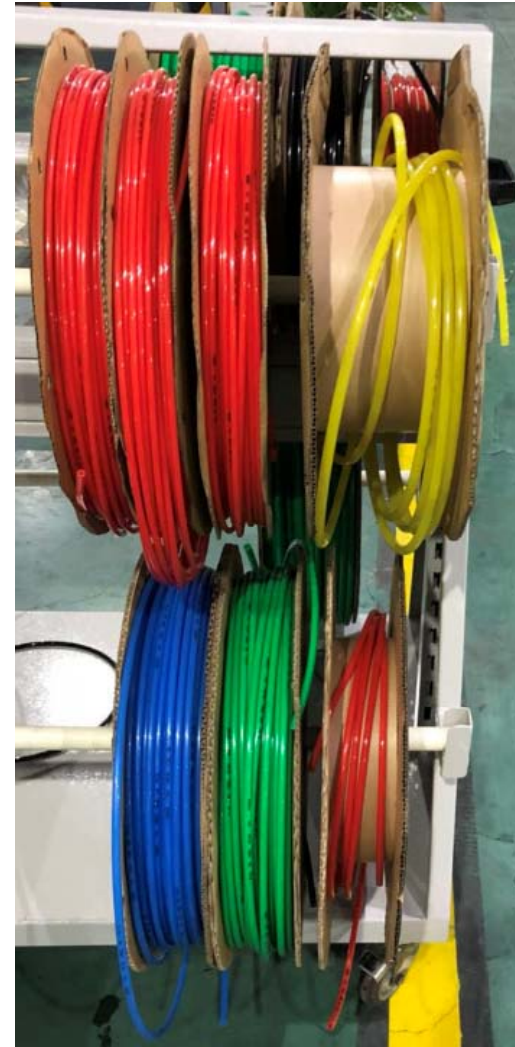
Digit pressure gauge

pressure reg
ulating 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



Cold Star (Italy) oil cooler

Direct-drive spindle with 15000rpm is equipped with 3.5kw oil cooler as standard, the spindle temperature rise is only $\pm 0.1^{\circ}\text{C}$, it can suppress the spindle thermal extension and improve the machining precision and stability.

Oil cooler



TNP spindle chiller

Spindle chiller is standard accessory, 1kW cooling capacity, spindle temperature rise is only $\pm 0.1^{\circ}\text{C}$ 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

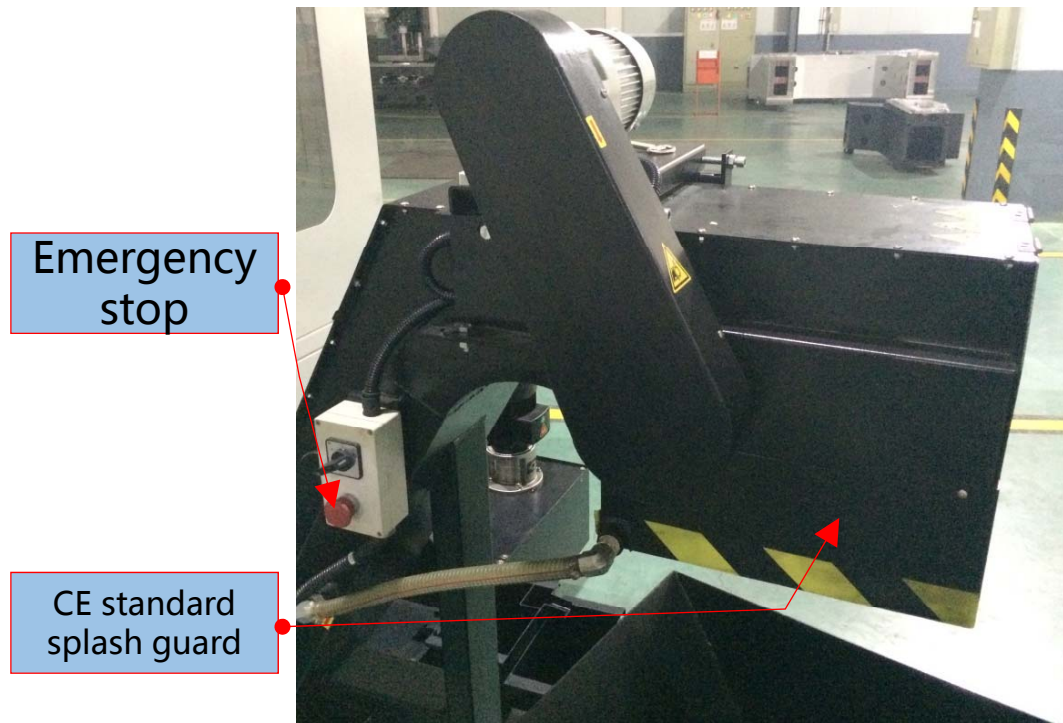
Temperature sensor



Spindle chiller



Taiwan Key Arrow chain chip conveyor

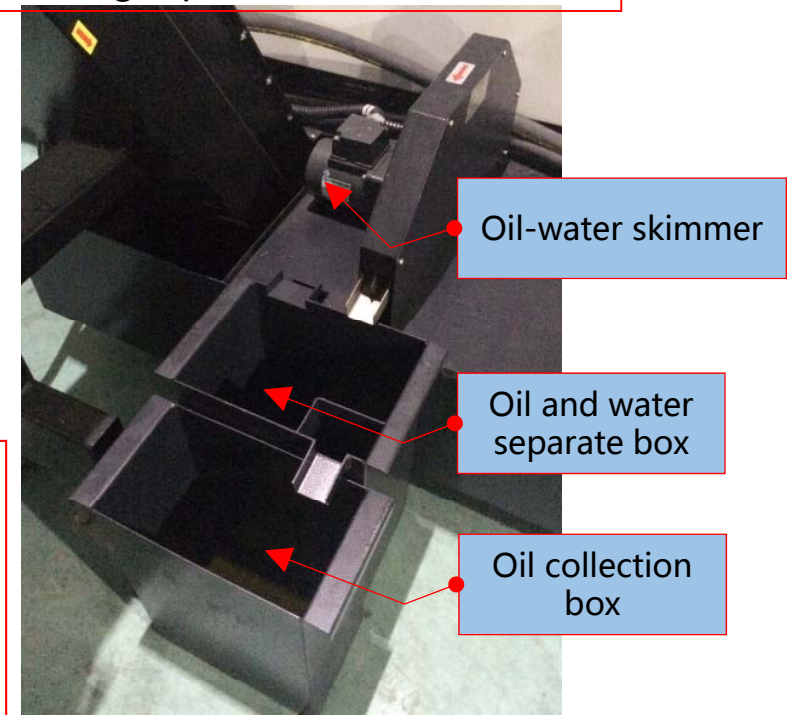


Chain type chip conveyor is standard , remove the chips safely and effectively
★ the chip output port is equipped with protection guard and alarm label to protect the operator.
★ There is an emergency stop button on the chain chip conveyor ,it' s convenience for operator to press it under the emergency situation .

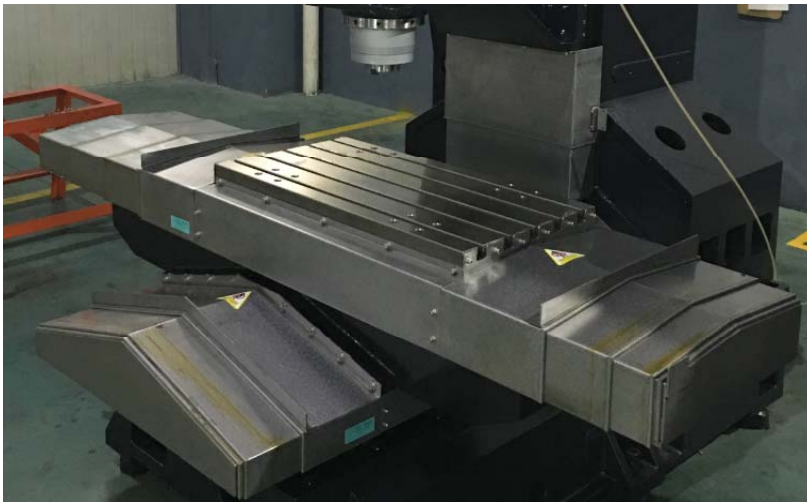
(Certified by Germany Tuv and got the CE already)

Wobang oil skimmer

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



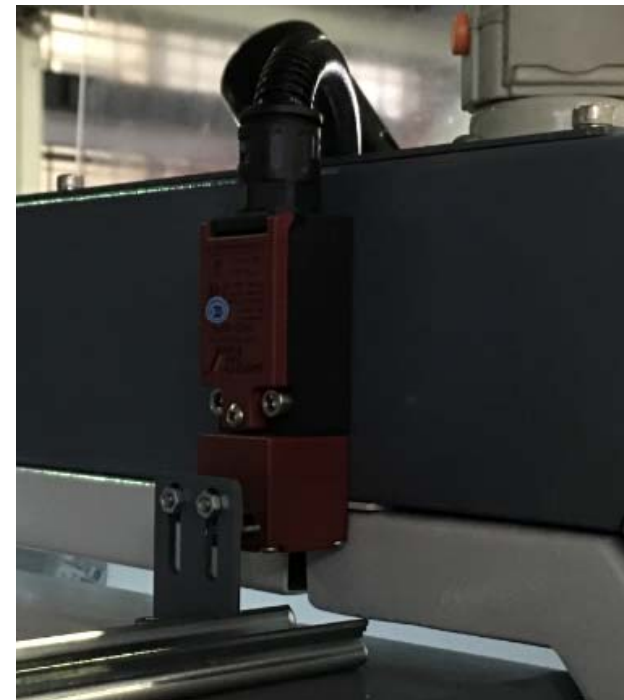
Japan NAJEC telescope cover



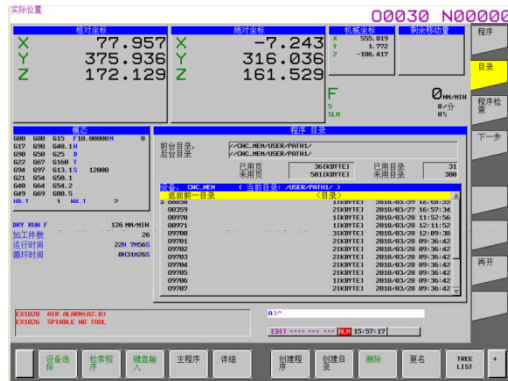
- ★ 3 axis telescope with high tolerance matching and with imported scraping strip to protect the ball screw and liner guide way as well as good dustproof ability .
- ★ Anti-collision design , lower voice in fast running .
- ★ the accuracy difference is less than **2um** with our without the telescope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



FANUC's new 15 inch display screen and full keyboard, multi-screen can be displayed at the same time, it's easy to operate. Compared with the original 8.4 inch and 10.4 inch display, the hardware is greatly improved, the main board is the same as the FANUC 31I, and the read-ahead program blocks are increased to 400 segments.



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

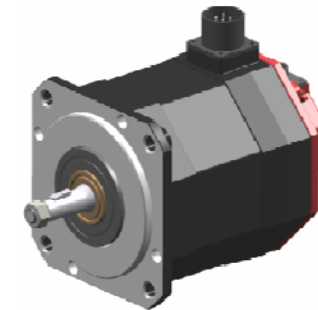
Servo control accuracy improvement

	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.



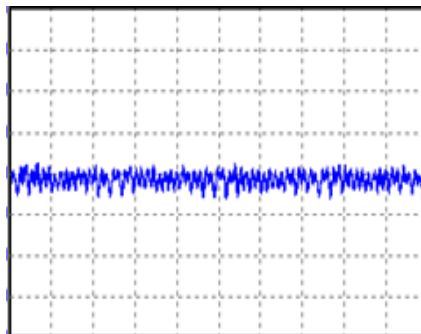
Electromagnet loop optimized

(αiS -B, βiS -B)



0.1 μ m control is available

$\alpha iS/\beta iS$ motor

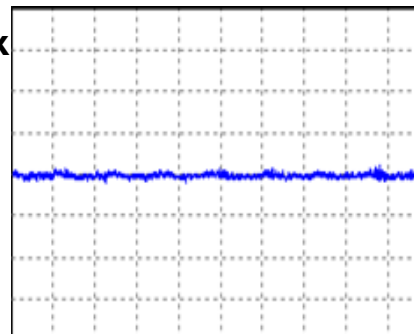


Approx

1/3



αiS -B/ βiS -B motor



300%

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

FSSB HIGH SPEED RIGID TAPPING

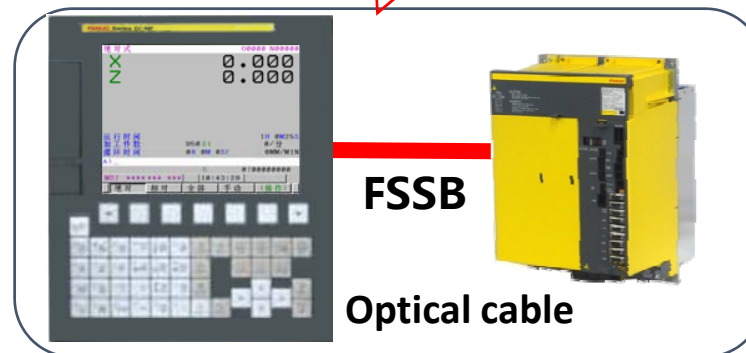
Advanced digital servo technology

23%

**SKY
MASTER
STANDARD**

Efficiency 1

**Theoretical
error display**

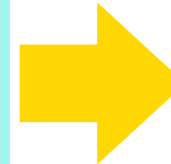


E.g : S3000 20mm Pitch 1mm tap

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

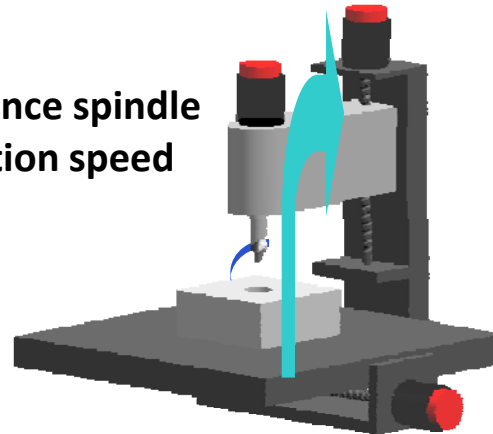
26%

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

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Apply FSSB optical
transmission

Enhance spindle
reaction speed

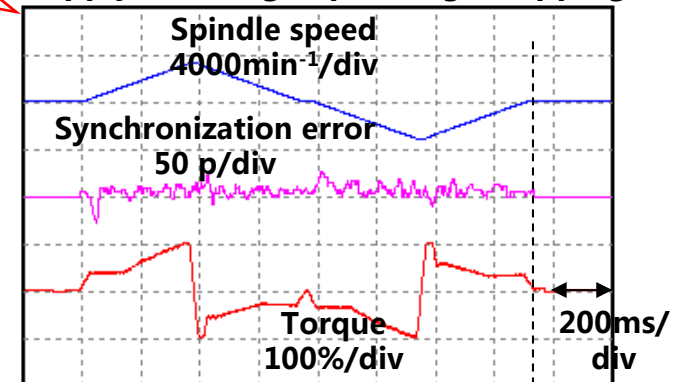


Efficiency 2

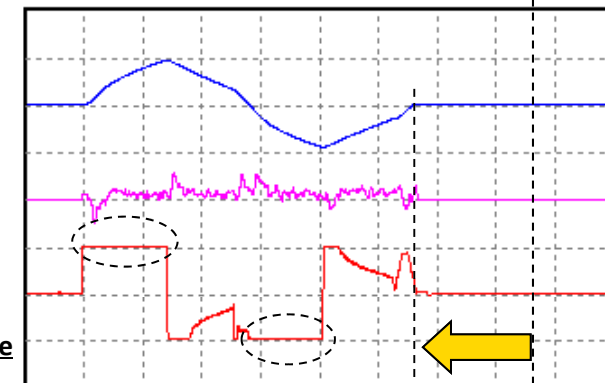
Theoretical
error display

- 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

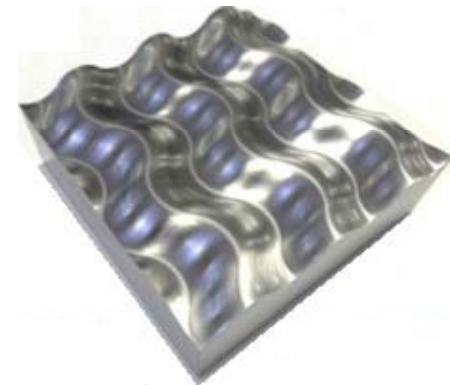
Accuracy

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**

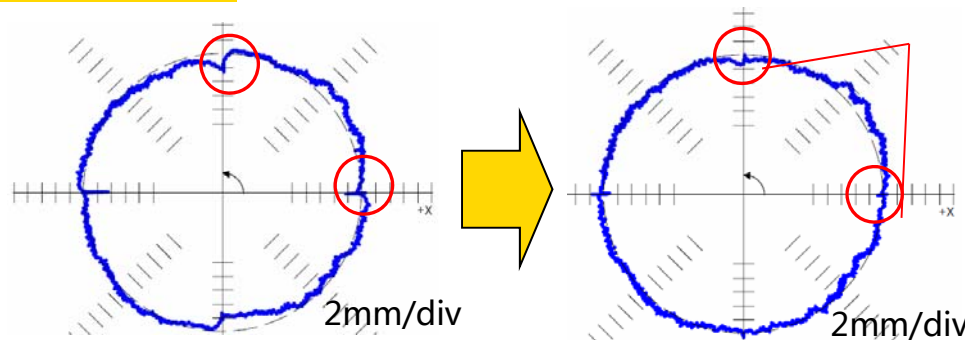
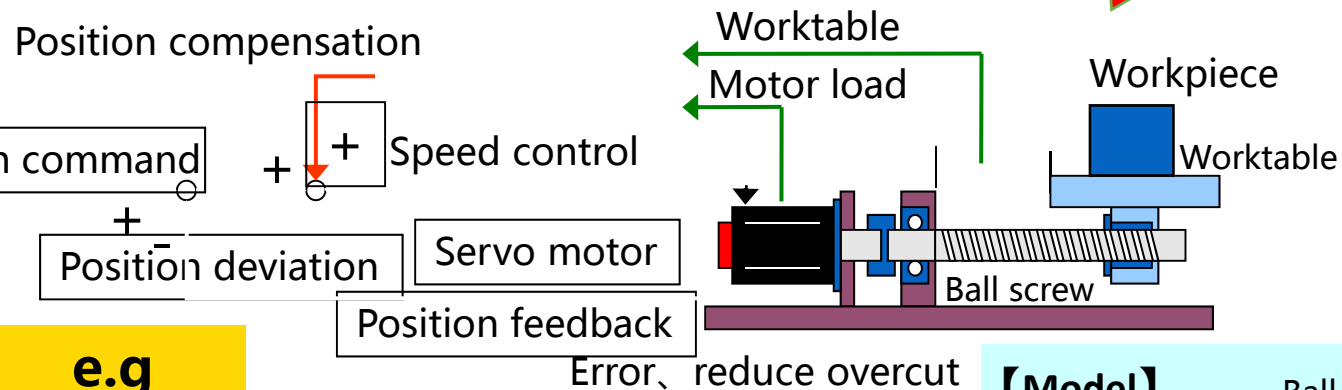


FANUC NEW SERIES— 0i-MODEL F SYSTEM

Intelligent backlash
Further optimize system function

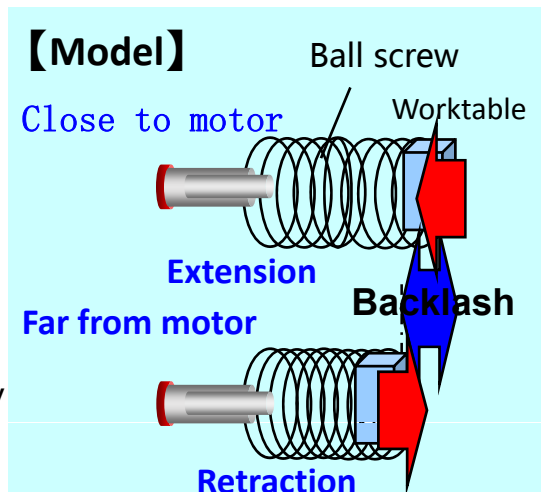
**SKY
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STANDARD**

SMART



Normal backlash compensation

Intelligent backlash compensation



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

Smooth tolerance control

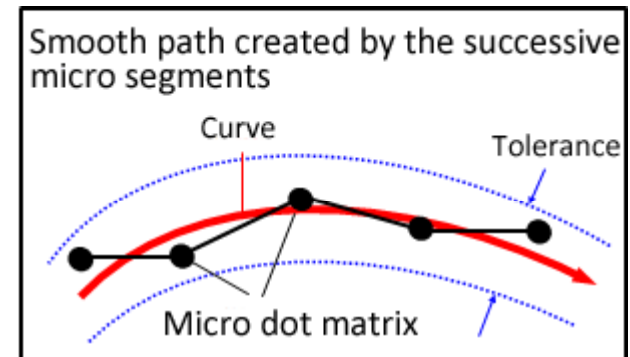
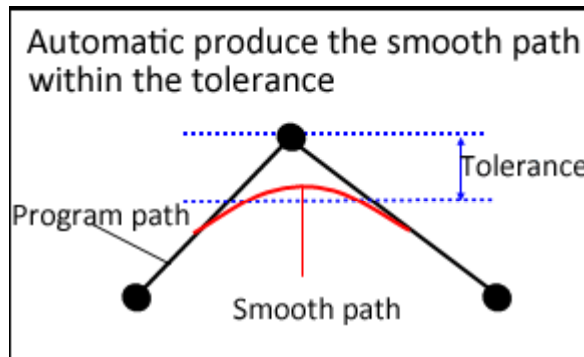
**SKY
MASTER
STANDARD**

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

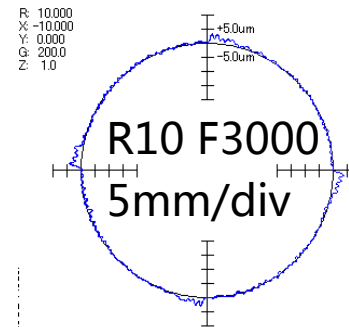
Advanced digit servo technology

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

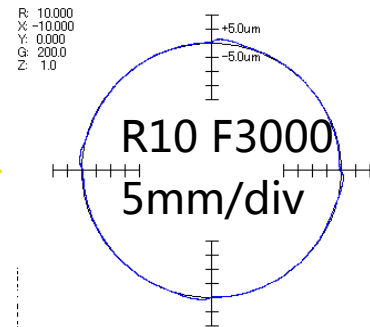
standard

Servo HRV3 control



High gain

Servo HRV3⁺control



HRV3

HRV3⁺



Iron F1000, 45deg

FANUC NEW SERIES— 0i-MODEL F SYSTEM

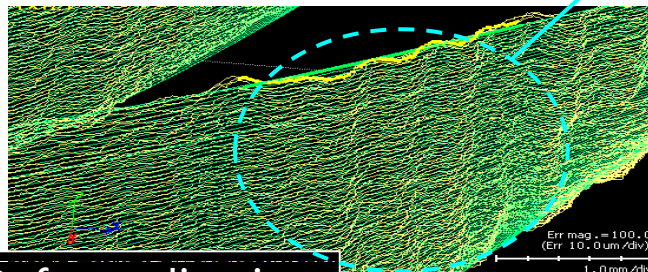
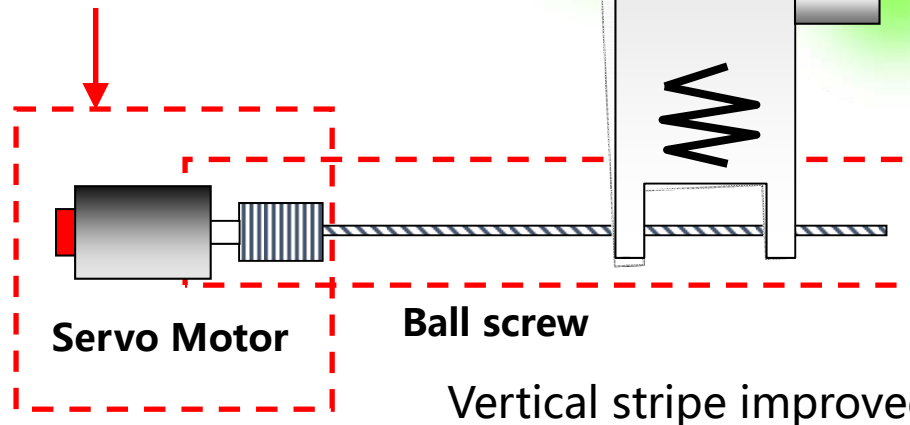
Smart front control

Further optimize system function

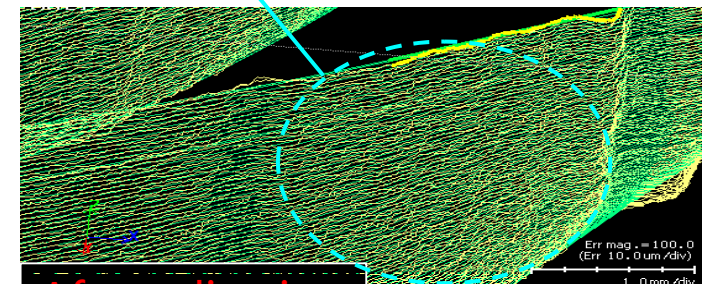
SMART

Suppress machine vibration

**SKY
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STANDARD**



Before adjusting



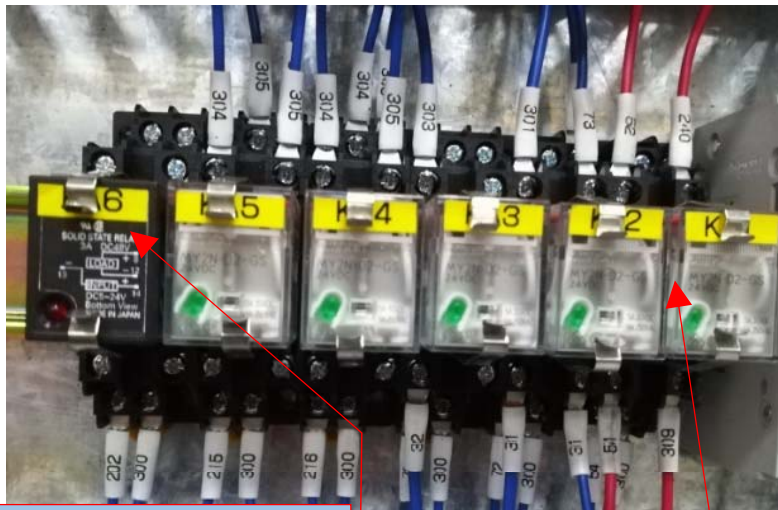
After adjusting

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

OPTION

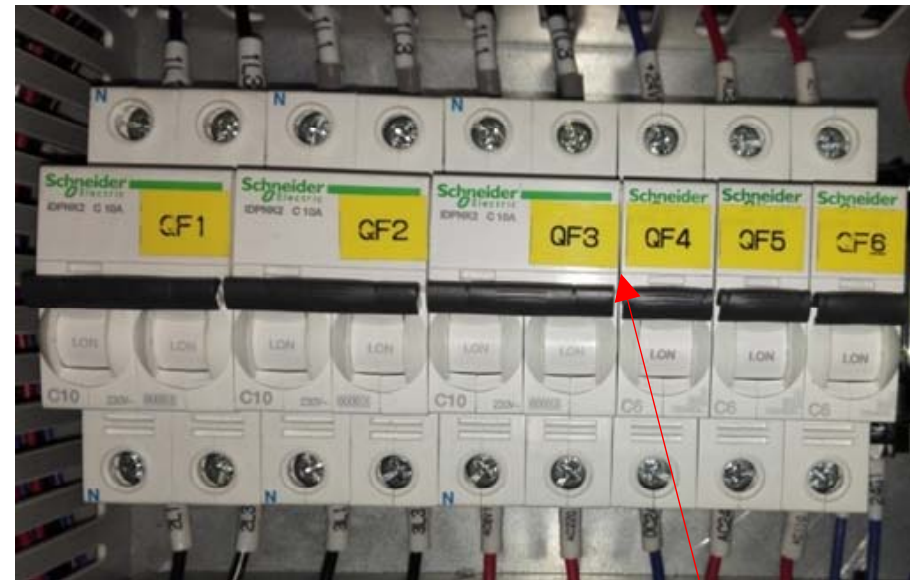
MANUAL GUIDE(operation guide)0i	MANUAL GUIDE(operation guide)i
PICTURE function	Dynamic graph display
Data server	Program storage capacity 2M
3-dimensional coordinate system conversion, handle interruption	AICC 2 (Max. preview blocks 400)
Machine alarm messages diagnosis	Nano smooth
Remote diagnosis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



Main electrical components in electric cabinet

★ 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.

★ use mark label at the middle of terminal easy to recognize

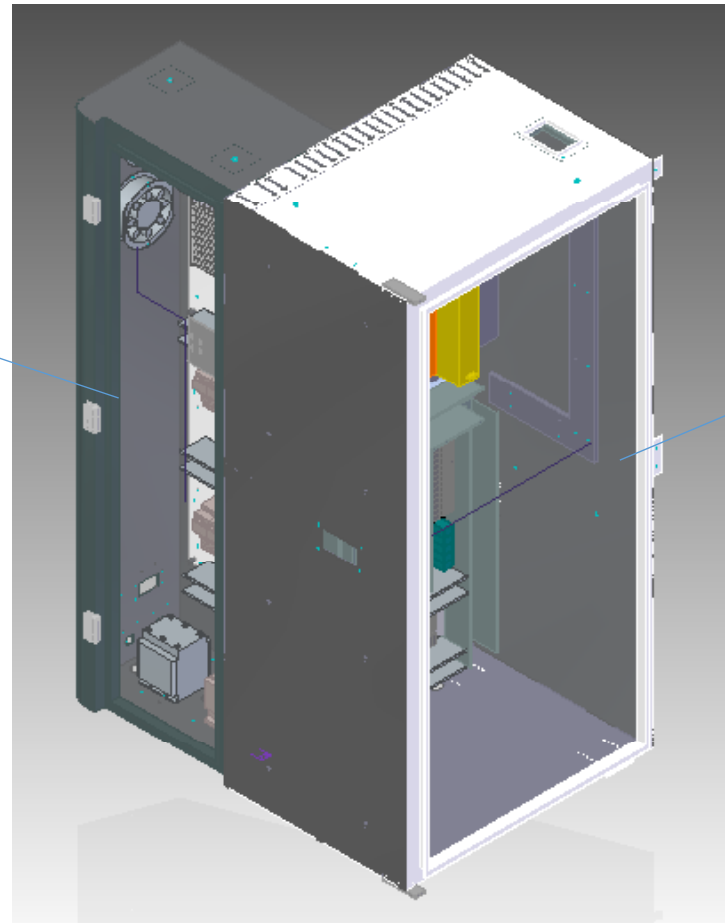
★ The bridge pieces can connect any number of terminals, so that can achieve the multi position connection



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

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.

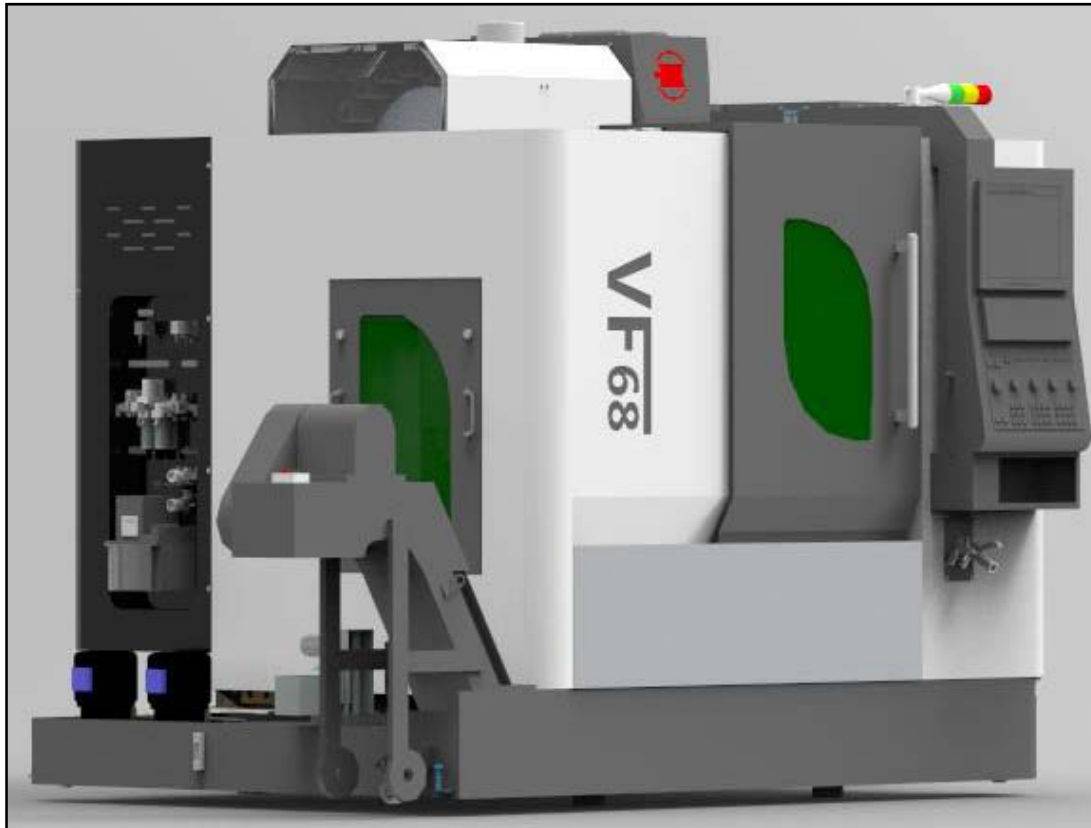
Grey: control cable
Black: power cable
Orange: servo power
cable

Advantage configuration

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

No.	Name	Specification	Quant.	Remarks
1	Controller	FANUC 0i MF	1sets	FANUC(Japan)
2	Angular contact bearing	25TAC62BSUC10PN7B	15sets	NSK(Japan)
3	X ball screw	Dia.32mm , pitch16mm	1set	PMI(Taiwan)
4	Y ball screw	Dia.32mm , pitch16mm ,	1set	PMI(Taiwan)
5	Z ball screw	Dia.32mm , pitch16mm ,	1set	PMI(Taiwan)
6	Spindle unit	Direct driven HSK A63-15000rpm	1set	SETCO(USA)
7	X linear guide way	35 heavy loading ball type	1 pair	REXROTH(Germany)
8	Y linear guide way	35heavy loading ball type	1pair	REXROTH(Germany)
9	Z linear guide way	35heavy loading ball type	1pair	REXROTH(Germany)
10	ATC	24 arm type	1pair	SJ-ATC(Taiwan)
11	AC	PAC1000L 220V 50/60HZ	1 set	COLDSTAR(Italy)
12	Spindle chiller	ACO-015PTH-PID (High accuracy $\pm 0.1^{\circ}$) 1.5KW 3/220	1set	COLDSTAR(Italy)
13	Pneumatic unit	AW30-03D-A with accessory	1set	SMC(Japan)
14	Lube unit	LCB45111R-CH with accessory	1set	SHOWA(Japan)
15	3 axis telescope cover		3set	NAJEC (Japan)
16	Miniature circuit breaker	DPNK10A2P	3pcs	SCHNEIDER(France)
17	A.C. contactor	LC1D09M7C	5pcs	SCHNEIDER(France)
18	Intermediate relay	MY2N-D2-J 24VDC	3pcs	OMRON(Japan)
19	Miniature relay	RJ2V-C-D24 8A	14pcs	IDEC(Japan)

Protection guard feature

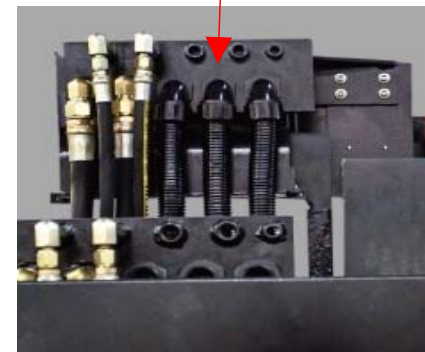


Equip with full-enclosed splash guard

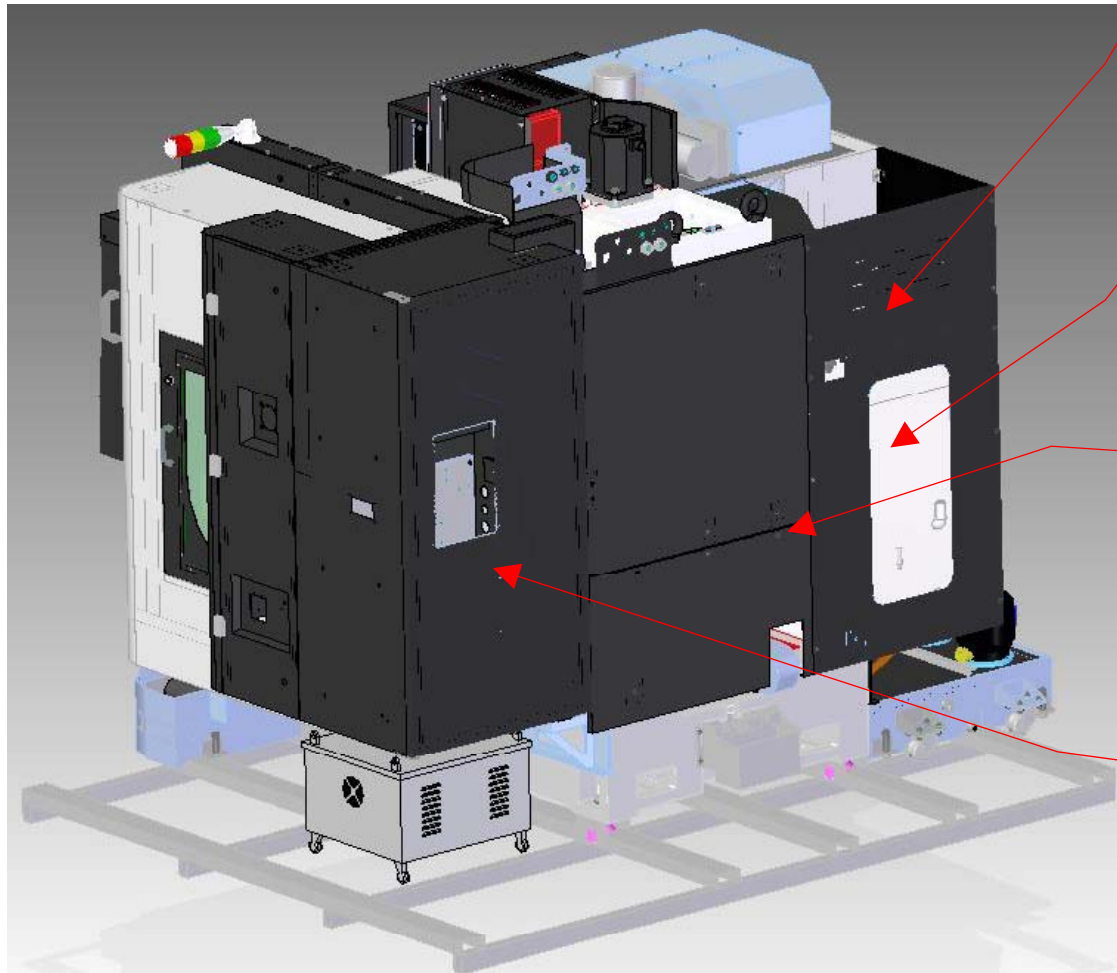
- ◆ Safety
- ◆ Elegant
- ◆ Convenient and speedy operation

Fully closed protection panel, make the surrounding environment better

Z axis without drag chain easy for maintenance



Protection guard feature



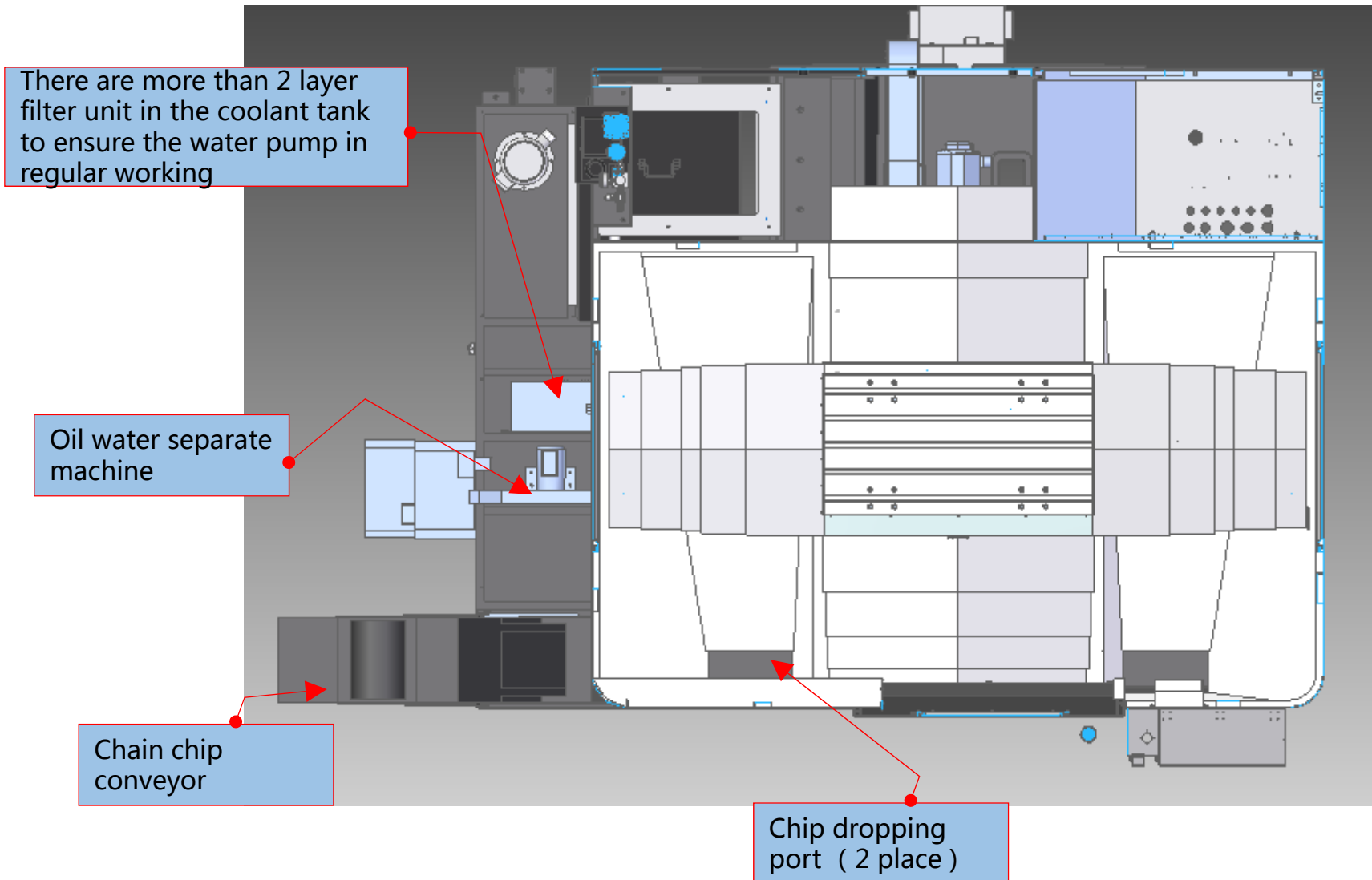
Air and lube unit is equipped here for convenience observe and maintenance

Spindle chiller is equipped on rear-left shelf

Full enclosure guard design with elegant outline

Electric cabinet is equipped at the rear-right side easy for cable connecting

Protection guard feature



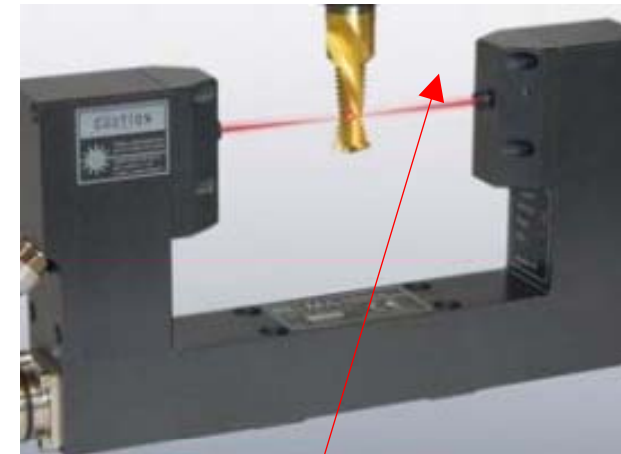
Option-Measuring accessory



German Blum
Contact type tool set



Japan Metrol contact
type tool set



German Blum laser tool
setter can measure tool
length and diameter

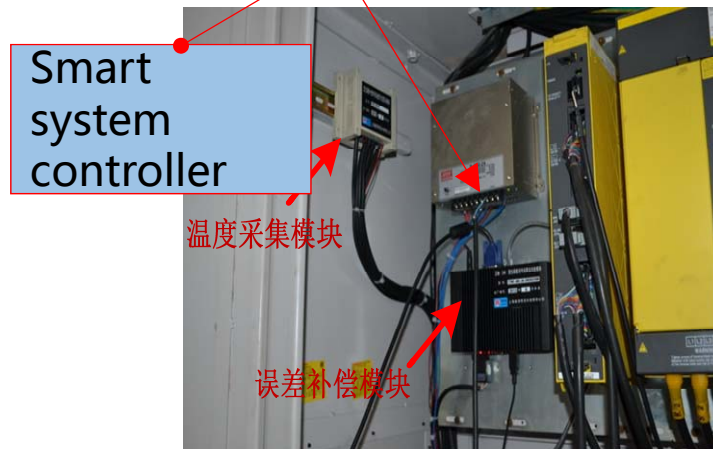
Option-SJ-ATC/ GIFU tool magazine

SJ/GIFU HSK A63-24
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



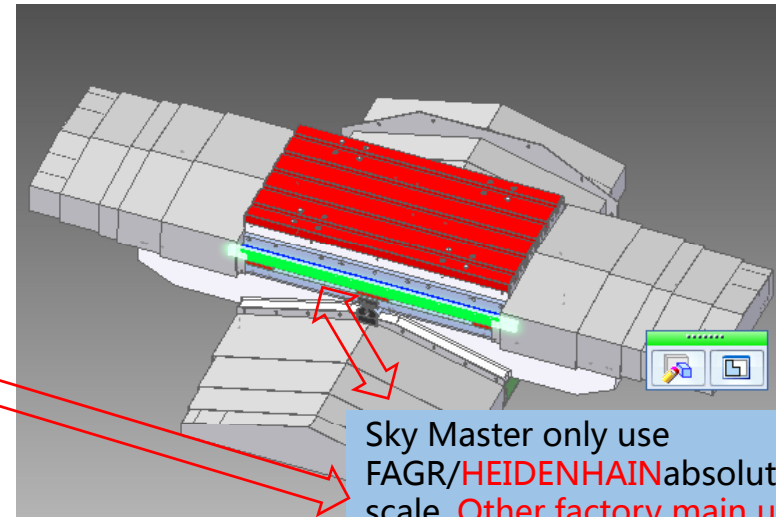
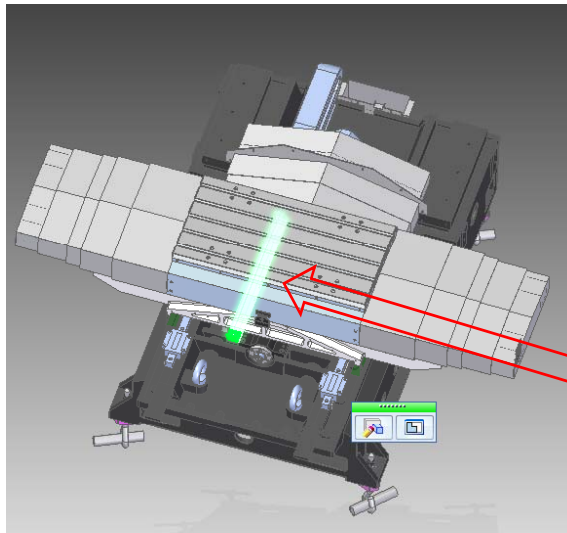
Option- Smart 3 axis temperature compensation(FANUC / Mitsubishi)



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%

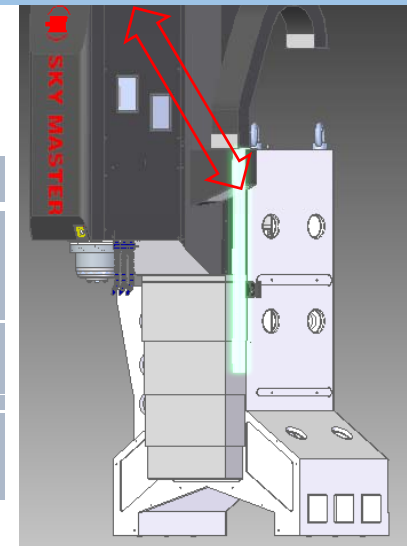
Option-FAGR/HEIDENHAIN linear scale



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



Spindle thermal compensation system (Standard)

- The precision and stability of the spindle are greatly improved after compensation
- The surface quality of the workpiece remains smooth and clean
- the contour of the workpiece is obviously improved
- The machine is still able to maintain high precision without any warm-up operation.



Sensor layout

Standard

FANUC 0i-MF absolute type 1	Copper transformer
High quality machining package (AICC II,jerk control,smooth tolerance control, machining quality level adjustment function)	
Automatically power off Grease lubrication system	3 colors warning light Smart spindle temperature compensation
Working area light	Portable MPG
Door interlock	Rotation operation box
Spindle direct driven 15000rpm HSK-A63	Spindle chiller
Air blowing device	Lube/Pneumatic unit
Coolant surround spindle	Rigid tapping
Spindle air sealing	Coolant unit
Water gun/air gun with flushing function	Full enclosed splash guard
Low and high power separated electric cabinet with AC	Oil and water separate machine
Chain chip conveyor ,grease lube device	Adjustment bolt and foundation block
Operation manual	Tool box

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

Option

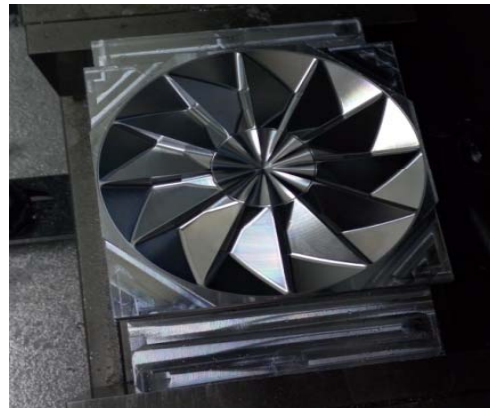
Voltage stabilizer
Linear scale
Tool/workpiece measuring device
Direct driven spindle , 15000rpm , BBT40
Mitsubishi M80A ,15"LCD touch type
Coolant through spindle center
Arm type ATC 24 PCS
spray system from machine top
Mass flow chip flushing for workpiece
Drawer type water tank
Cutting view window
Oil-mist collection machine(Italy LOSMA)
Air dryer
Enclosed iron package for delivery by flat rack
Warranty prolong 1 year for whole machine
Collision avoidance device

Application field

wildly applied for different small & precise component, high precision mould machining



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



Testing part:
Computerized
control function
testing part, inspect
system' s different
accuracy and
quality comparison



Testing mould: show the
perfect connecting
between deep slot curve
surface and side wall, also
shows the precise &
smooth transition of the
tool path

Application field

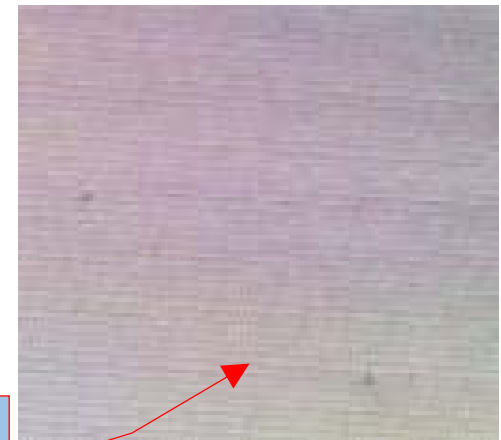
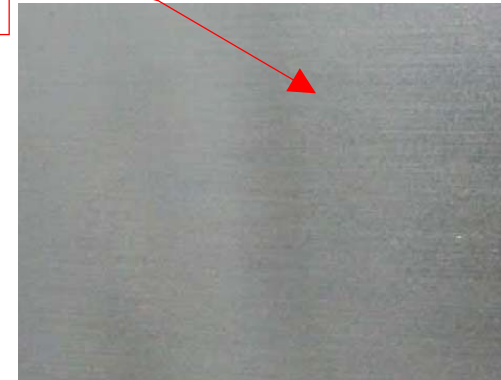
the surface of the mould is blurry and the grains are not clear when use regular cutting fluid

SkyMaster strongly recommend BLASER from Switzerland s the cutting fluid for our high speed VF series

- ◆ BLASER cutting fluid can improve the surface smoothness of the mould ;
- ◆ BLASER cutting fluid can extend the service time of the cutting tool ;
- ◆ BLASER cutting fluid is the most suitable cutting fluid for our machine.

We recommend Swiss BLASER brand cutting fluid for precision molding customers

The mould 's surface is shiner, grains are beater when Swiss BLASER brand cutting fluid being used



THANKS

SKY MASTER- KRAFT



Many thanks for your time for SKYMASTER
PPT introduction

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