SYNTEC

NEXT GENERATION CNC

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SYNTEC PROFILE

Trusted Electric control Technical Service.

SYNTEC has been devoted to the machine tool industry with 100% owned controller technologies cultivated to be innovated in both hardware and software. In addition to the well known reputation in machine tool controllers, SYNTEC extended our businesses to servo products, drive, motors, and encoder in oder to provide not only higher servo products performance but also one-stop solution service of tool machine. SYNTEC has earned our customer trust by comprehensive after-sales service and has become one of the most influential and development potential brand in the Asia-Pacific market. SYNTEC now is taking "Industry 4.0" as the main goal of technological development.

SYNTEC
TECHNOLOGY CO.,LTD.

「Trusted Electric control Technical Service.」

Next Generation Controller

The Latest Design, advanced communication control and powerful performance.

Brand new design-Next Generation Controller

- Fully-flat screen with attractive appearance
- Provides touch screen option to make operations easier
- Two screen sizes 10.4" and 15" are provided
- Right row button added in 15'' controller for user friendly operating shortcut
- 10" screen controller is compatible to classic model 8" screen controller.
- Improves the reliability and stability by enhances the oil-proofness ,dust-proofness, and heat dissipation
- Applies to 5-axis machine, vertical machining center, and turn-mill machine
- Modular hardware design and auto backup system that could improve maintenance efficiency and make it easy to repair

Powerful and Diversified Communication Interfaces.

Serial connect, high speed and high reliability

MECHATROLINK

EtherCAT

Universal CNC Controller

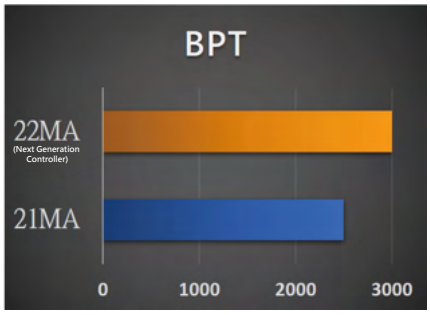
Support various serial communication interfaces, such as Mechtrolink-III, EtherCAT and RTEX

Factory Cloud Connected

With dual RJ-45, connect to cloud and tune on-site in the meantime.

Syntec SRI Interface

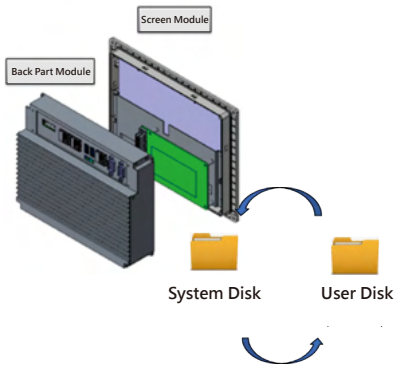
Unique SRI PROTOCOL (Syntec Remote Interface) for extra IO(max:4096), AD, DA, and support modbus RS-485 to connect with Inverter or PLC module.



Higher Performance

Higher performance due to both hardware and software being upgraded.

- CPU promoted, BPT elevated 20%, fluent HMI.



Special design for 24-hour factory

High reliability and considerated repairing design can solve controller breakdown and restore system datas immediately by changing module.

- Module design to remove damaged module only.
- AB backup to restore datas quickly after repairing.

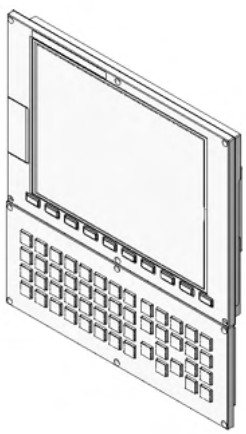
Best Partner : Syntec Servo : Syntec Servo Porduct

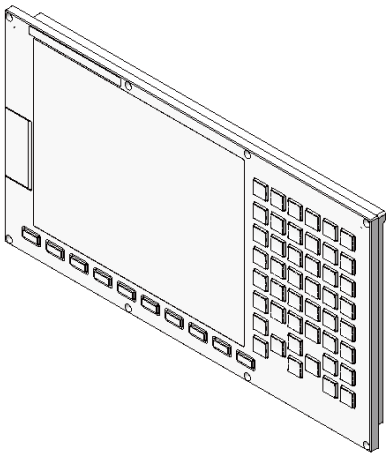
Diverse servo products for tool machine.

- Collaborated with well-known manufacturers,offer diverse servo products.
- Professional tuning and service, Syntec is your best partner.

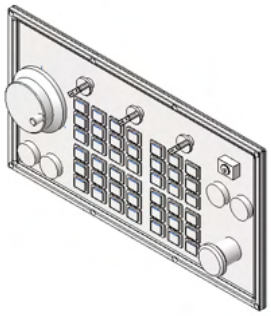
Ethernet

Next Generation Controller



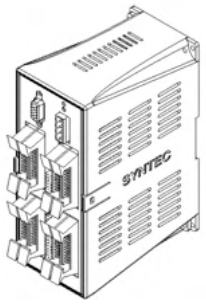


Serial Panel



RIO-BASIC I/O Module

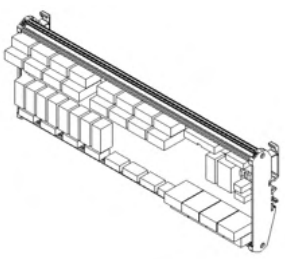
OptionA



Pulse MPG

iTB I/O Module

OptionB



Software

SYNTEC Analytics
- Servo Tuning
- Machining Analysis
- Scope

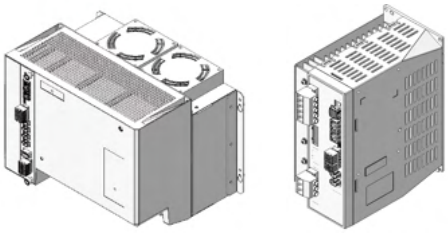
SYNTEC IDE
- EHMI
- PLC EDITOR
- SIMULATOR
- OP Log
- Parameter Editor

Cloud

SynFactory
SynMachine
公有雲方案/私有雲方案

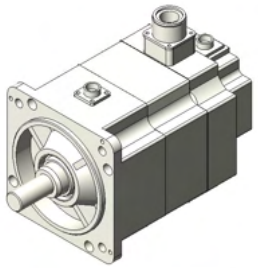
SYNTEC Servo

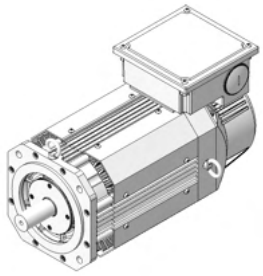
SPD Spindle Drive
SVD Servo Drive
SMD
Multi-axis servo drive



Motor Solutions

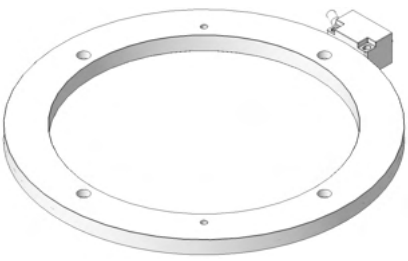
Syntec Servo Motor
α series Spindle Motor
β series Spindle Motor
C series Spindle Motor
H series Spindle Motor





Encoder and Expansion Module

Magnetic Encoder
Gear Encoder
Option Module

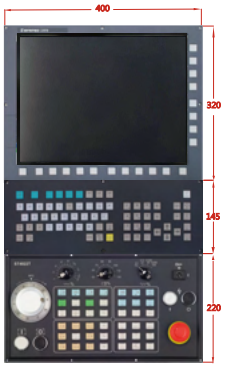


Panel Layout

SYNTEC Lathe Controller

The SYNTEC controller is well designed and integrated, significantly reducing wiring and space requirements. With latest M3 serial communication, SYNTEC controller provides better performance and integration to CNC machines.

15 inches Lathe Controller



Keyboard: VK15
Panel: ST4022T

10 inches Lathe Controller

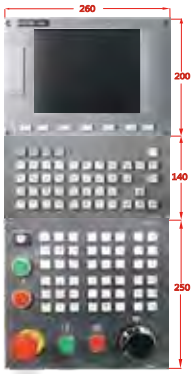
Panel: ST4022T

Keyboard: VK10
Panel: 3025T

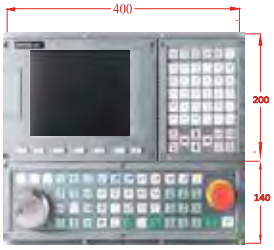
Keyboard: HK
Panel: 4425T2

8 inches Lathe Controller

Panel: 4018T3



Keyboard: VK8
Panel: 2625T



Panel: 4012T2

Controller type		Standard	Turn-Mill Machine				Multi-Path Turn-Mill Machine			
		6TA-E	21TA-E	21TB-E	22TA	22TB	210TB-E	210TB-E5	220TB	220TB-5
Axis no.		3(5)	4	6(8)	4	6(8)	12(18)		12(18)	
DA		2	2		-		2		-	
I/O	RIO	-	64/64				64/64			
	SRI	○								
	Direct I/O	32/32	32/32		-		32/32		-	
Type and Size	With Panel	8"	8"/10.4"		8"/10.4"/15		8"/10.4"	10.4"	10.4"/15	-
	With Panel (Flat)	-	-		10.4"/15"		-		10.4"/15"	
	Stand Alone	-	○		-		○	-	-	
Servo		M3/ECAT/RTEX								
VGA		-	○*		-		○*	-	-	
Connection		Ethernet/RS485/SRI								
Multi-Path		1	2				4			
Storage		4GB								
Tilted Working Plane		-	△				△			
RTCP		-	-				△			

*VGA is only provided for the stand alone
○: Standard Function/ △: Optional Function/ -: Not Available Function

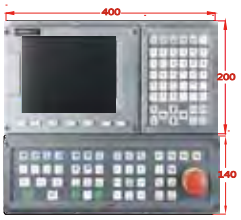
SYNTEC Milling Controller

The SYNTEC controller is well designed and integrated, significantly reducing wiring and space requirements. With latest M3 serial communication, SYNTEC controller provides better performance and integration to CNC machines.

15 inches Milling Controller

Keyboard: VK15
Panel: ST4022M

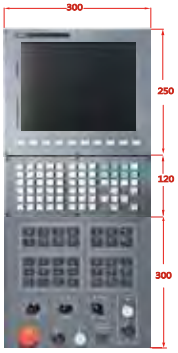
8 inches Milling Controller



Panel: 4012M

10 inches Milling Controller

Keyboard: VK10
Panel: 3030M5



Keyboard: VK
Panel: 3030M3

Panel: 4025M

Keyboard: VK10
Panel: 3025M

Panel: SK6M

Keyboard: HK
Panel: 4421M2

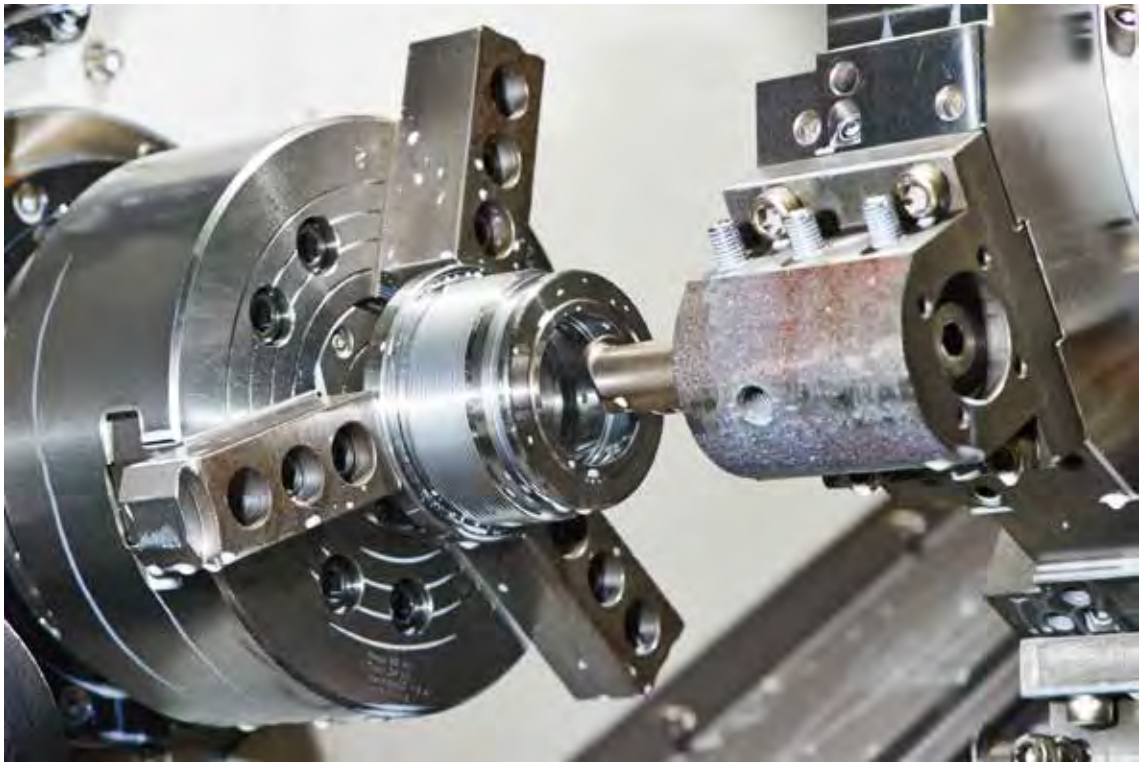
Controller type		Standard		Multi-Function Milling		Composite Milling				Five-Axis			
		6MA-E	6MB-E	21MA-E	22MA	210MA-E	210MB-E	220MA	220MB	210MA-E5	210MB-E5	220MA-5	220MB-5
Axis no.		3	4(5)	6	6	8(9)	12(18)	8(9)	12(18)	8(9)	12(18)	8(9)	12(18)
DA		2		2	-	2		-		2		-	
I/O	RIO	64/64											
	SRI	○											
	Direct	32/32	32/32	32/32	-	32/32	32/32	-		32/32	32/32	-	
Type and Size	With Panel	8"		8"/10.4"/15"	8"/10.4"/15"	10.4"		10.4"/15"		10.4"		10.4"/15"	
	With Panel (Flat)	-		-	10.4" /15"	-		10.4"/15"		-		10.4"/15"	
	Stand Alone	-		○	-	○		-		○		-	
Servo		M3/ECAT/RTEX											
VGA		-		○*	-	○*		-		○*		-	
Connection		Ethernet/RS485/SRI											
Multi-Path		2		2		4		4		4		4	
Storage		4GB											
RTCP		-		-		-				Δ			
4-Axis RTCP		-		Δ		Δ				Δ			
Tilted Working Plane Machining		-		Δ		Δ				Δ			
HPCC		-		○		○				○			

*VGA is only provided for the stand alone
○: Standard Function/ Δ: Optional Function/ -: Not Available Function

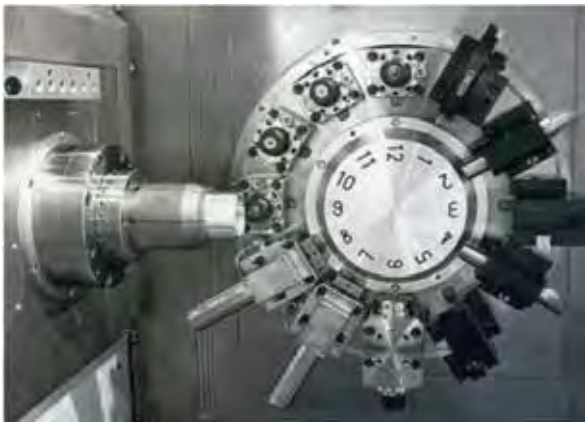
*SYNTEC have the right to modify

Lathe Controller

The most trusted controller with advanced turning functions.

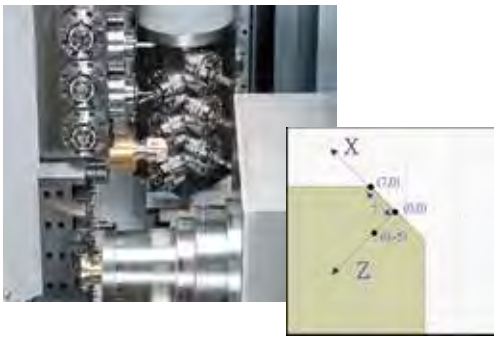


- Complete ISO G code ,corresponds to turning and milling application.
- Friendly insertion of canned cycles provides easy programming guidance for customers.
- Powerful MPG simulation allows user to control feedrate in dry run process by using MPG.
- Suitable for all types of lathe, such as turn-mill lathe, CNC precision automatic lathe, multi-path turning center and even five-axis turn-mill lathes.



ROT Servo Turrent

- Provide dedicated PLC component.
- Features：
  –Replace IO cable with communication cable.
  –Backup all related informations at system.
  –Do not need additional system NC path.
  –Support non-synchronous motion control.
- Support SYNTEC and YASKAWA servo drive.



Tilted Working Plane Machining

- Intuitive to program NC by rotary absolute coordinate.
- Easy to program NC without using complex CAD/CAM processing.

New Multi-Program Interface

- Up to four paths display simultaneously.
- Support coordinate display and graphic simulation in each path.
- Optional extension-path function can assign arbitrary plural paths to machine or not.
- Execute independently in each channel to reach optimized efficiency.

Before Compensation

After Compensation

Friction Compensation

- Reduce friction caused by direction reversal.
- Tuning the parameters automatically.
- Compensation various automatically from different radius and feedrate, at most 5 sets of R/F.velocity.

Tool Life Management Function

- Succinct interface with whole tool informations.
- Completed functions including tool life count(time and count), tool life count of multi-group path, tool group, life-end alarm setting, tool-in-formations arrangement...etc.

Milling Controller

High performance Milling controller with multiple high speed and high precision functions.

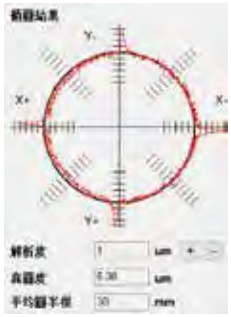
- Powerful computing performance with the ability to process 3000 blocks per time(BPT).
- High speed and high precision functions include servo lag compensation, high precision contour control, machining conditions selection, which increase machining quality effectively.
- Flexible axis quantity selection with maximum 18 axes, which provides the best solution for maching center, tapping center, 5-axis maching center and multi-path milling machine.

New Milling machine functions

Servo motor automatic tool changer

Makes tool stable with shorter time

- Servo magazine is controlled by ROT axis, and servo ATC is controlled by ATC axis, both of these specific axis don't occupy system axis.
- Release and clamp tools in advance in order to save tools changing time.
- The system plans smooth motion to reduce impact and extend machine life.
- The rotation speed can be specified according to tool size and weight, which makes tool change steady and stable.
- Tool arm position can be controlled by MPG easily, no need to restore position by handling mechanism.
- The function contains diagnose screen which provides useful and clear information.



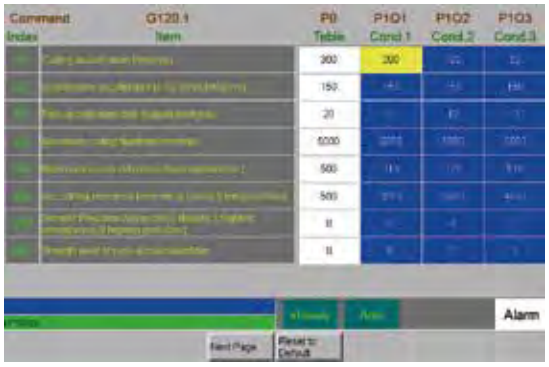
Reversal spike with compensation : 5um

Reversal spike without compensation : 2um

Friction compensation

Improves surface finish quality under axis reversal condition

- Convenient Ballbar Tuning interface with auto tuning functions.
- Different compensation mode can meet different maching conditions.

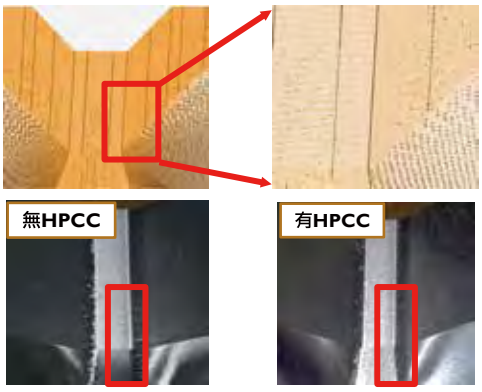


Machining conditions selection

Optimize parameters case by case under various machining conditions

- 9 groups of parameter, satisfy all kinds of machining situations.
- Select corresponding parameters by G-code.

High Precision Contour Control(HPCC)



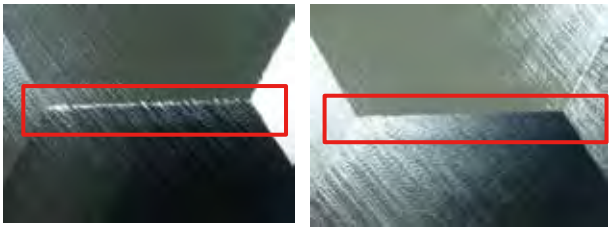
Solve machining problems caused by discontinuous small blocks which generated by CAD/CAM

- The HPCC function fits small blocks to continuous curve, which makes motion plan smoother and avoids unwanted velocity ripple.
- Reduces machine vibration, extends machine life, and allows higher cutting feedrate.
- The parameters are simplified which makes it easier for the user to tune before machining.

The Smooth Precision Advance function 2.0(SPA 2.0)

Turn off Smooth Precision Advance (SPA)

Turn on Smooth Precision Advance (SPA)



Solve workpiece size problem caused by servo lag

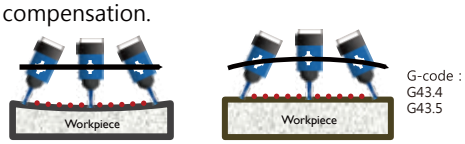
- Enhance machining precision and reduce machining overcut.
- Increase arc path accuracy under high speed machining.
- Higher machining efficiency with same quality.

5-Axis CNC Solution (Optional)

Rotation Tool Center Point

Scenario:
Workpieces with curvature, 5 axis CNC machine centers, 5 axis CNC woodworking machine ,5 axis CNC saw machine etc.

Instruction:
The RTCP (Rotation Tool Center Point) function provides high machining precision and efficiency by transferring the controlled target from tool holder to tool tip through five-axis compensation.

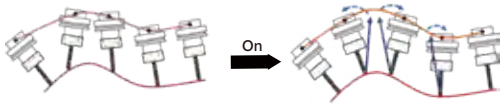


RTCP (Off) RTCP (On)

Smooth Tool Vector

Scenario:
Machining problems caused by unexpected block variations of tool vector, which is generated by CAM.

Instruction:
The controller can adjust the orientation of tool and smooth the path of tool tip generated by CAM to improve quality and to reduce the jerk of tool tip.

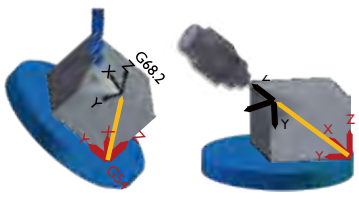


Feature Coordinate

Scenario:
Machining on workpiece of characteristic coordinate system.

Instruction:
Characteristic coordinate system, which is also called tilted working plane coordinate, can be applied to machine on any working plane without using complicated CAM.

G-code :
G68.2 X_ Y_ Z_ I_ J_ K_;
G68.3 X_ Y_ Z_ R_
G68.3 P1 X_ Y_ Z_



Measurement function

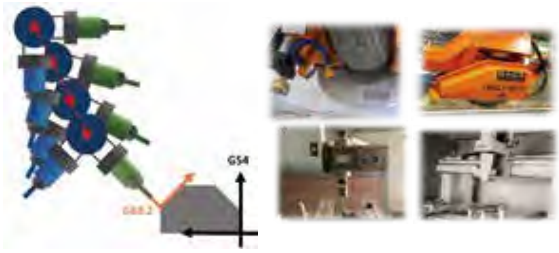
Available scenario:
Measure and compensate the rotation axis of five-axis machine with RTCP function.

Instruction:
The controller integrates the automatic measurement function which can reduce the difficulty of calibration through GUI, and achieve high precision requirements.
SYNTEC CNC controller is an open platform that supports several measurement products, such as AxiSet(RENISHAW), HEXAGON, Ishin,
ICheck(SYNTEC), to provide customers with various choices.

Multi-kinematic Chain

Scenario:
Cross head mechanism, stone machine, and machines with multiple mechanism chains.

Instruction:
A five-axis machine with multiple mechanism types can set Multi-kinematic chain parameters that user can switch and activate the RTCP function according to the mechanism.



Intelligent Peripheral Products

Syntec Servo Solutions

SVD/SPD Single-Axis Servo Driver

- Various serial communications of encoder are supported.
- Completed electromechanical integration.
- Power: 1~30(KW).

SMD/SMH Multi-Axis Servo Driver

- Suitable for machine tool.
- Maximum 3+1 axial control.
- Compact and easy wiring.
- Complete electromechanical integration, such as tool auto retract function, friction compensation, etc.
- Axial power:1~3(KW);Spindle power:7.5~18.5(KW).

Axis Motor

- IP67 for high-level waterproof and dustproof protection.
- Support power:0.1~7.5(KW).
- Maximum torque:0.32~120.9(NM).
- Maximum speed:2,000~6,000(RPM).

Spindle Motor

- With SYNTEC high resolution encoder, SYNTEC spindle motor is more precise and stable.
- IP54 for high-level waterproof and dustproof protection.
- Support power:5.5~37.5(KW).
- Maximum torque:10.4~355(NM).
- Maximum speed:6,000~24,000(RPM).

Syntec Encoder

- Support side and top connection.
- High precision, high resolution and available in harsh enivironment.
- Resolution:262,144~1,335,296(Pluse).
- Ploes:64, 82, 102, 124, 162, 242, 326.

Integated Controller and Drive

Syntec provides a series of integrated functions for Syntec controller and servo. Servo information can synchronously display in controller by Mechatrolink-3 communication, in order to make the integrated solution more intelligent.

Intelligent power failure decision

- The drive will decelerate and pull-up gravity axis while in power failure, which can prevent machine and workpiece from unexpected collision.
- Controller only decelerates motors to zero speed as tapping and other special motions, in order to prevent machine damage.

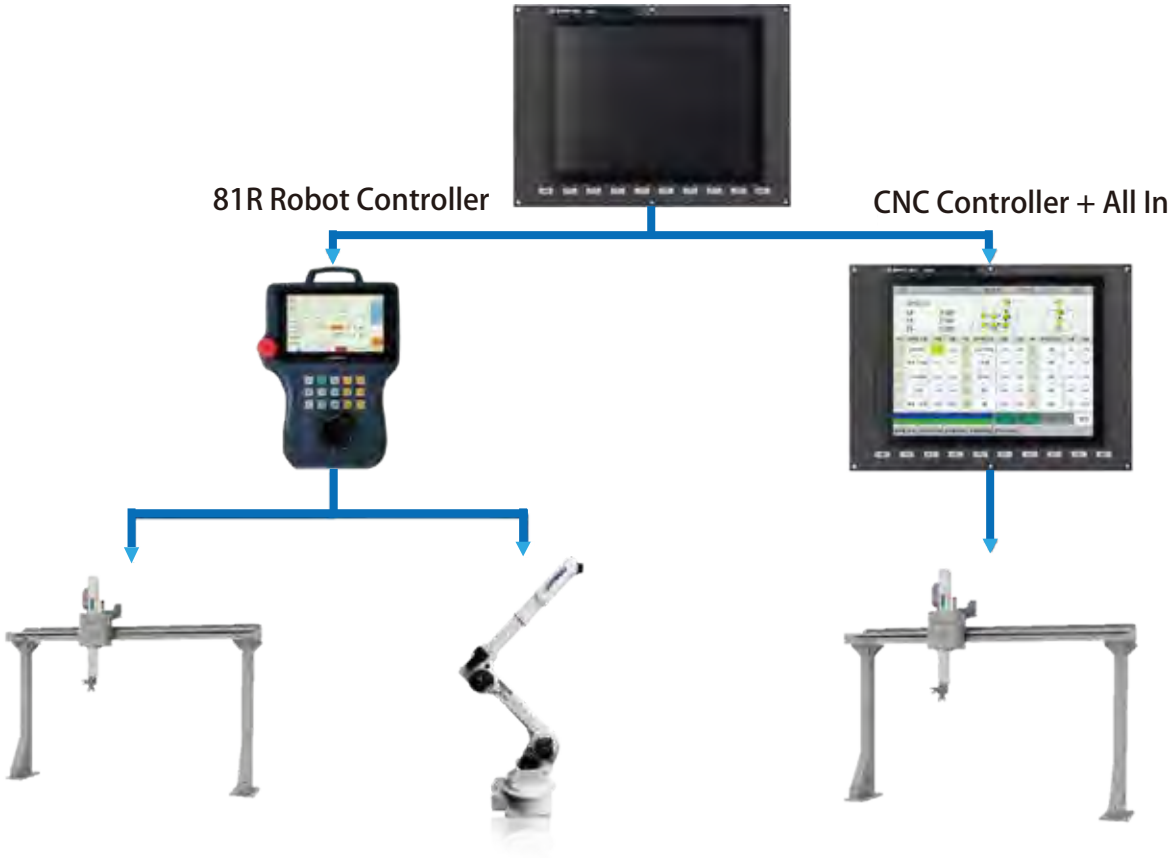
High-speed G31

- SYNTEC drive can latch the signal of probe or tool checker directly, which achieves faster response than general I/O scanning.
- Application: With SYNTEC drive and high-speed G31 function, users can increase feedrate of tool length measurement without losing accuracy, which improves efficiency.

Syntec servo tunning(one step tunning)

- Tuning is simple and fast. Servo tuning can be done directly through the controller HMI, without connecting computer.
- Functions：Inertia ratio, resonance suppression, velocity loop gain tuning.

Syntec Robot Solution



	81R Robot Controller
Feature	■ Easy point-teaching with handheld controller ■ Friendly tray setting interface ■ Suitable for complicated pick and place conditions
Applicable model	■ Robot arm for complicated movements ■ Any length of stroke ■ Robot arm attached to lathe

	All In One
Feature	■ Control by G-code, M-code ■ Connected to CNC directly, decrease the usage of external signal ■ Easy to customize
Applicable model	■ Gantry attached to machine ■ Short stroke gantry

Feature Introduction

- Highly integrated machine and arms
- Friendly setting and programming GUI
- One controller could complete picking and placing and lathe processing simultaneously.
- Support safety zone setting, reference point setting, etc.

Measurement Integration

SYNTEC cooperated with RENISHAW to develop inspection GUIs, which simplifies the process of probing and helps users to improve efficiency and yields of manufacturing.

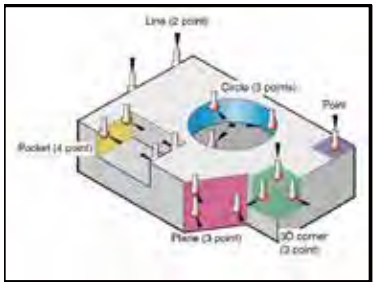
Multi-Axis Machine Tool Calibration
(AxiSet™ Check-Up)

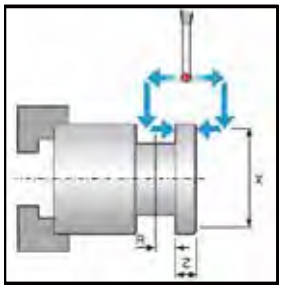
Probing systems on CNC machining
(Inspection Plus)

Contact tool setter

Non-contact tool setter

Probing systems Solution





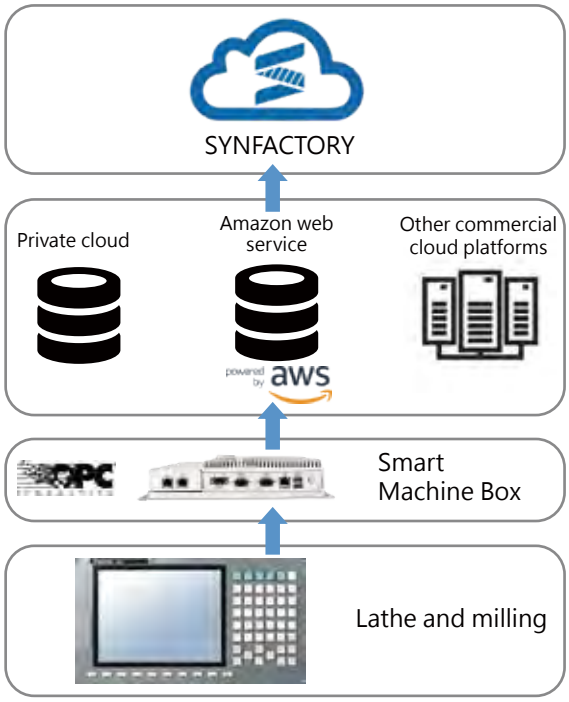
Multi-Axis Machine Tool Calibration

Tool setting solution

Intelligent Manufacturing Cloud

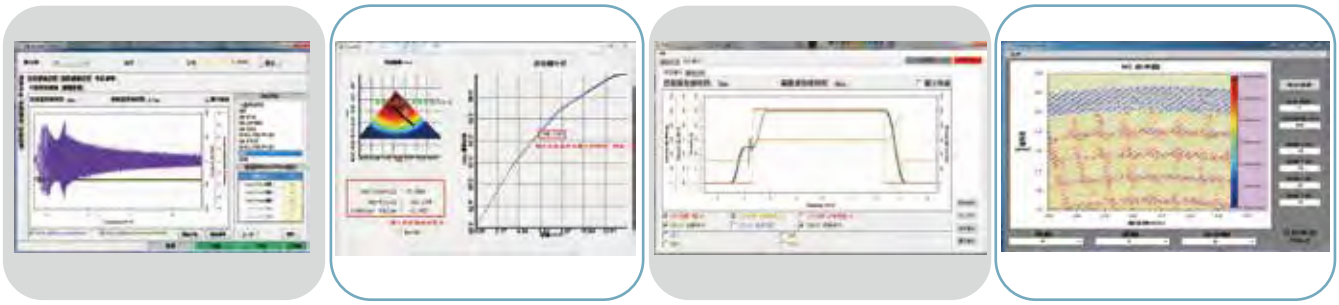
SYNFACTORY SYNTEC Cloud Service Platform

The SYNFACTORY is a cloud service and data storage solution for intelligent manufacturing, included services like: equipment status dashboard, work order management, machine healthy maintenance.



Mechatronics analysis platform

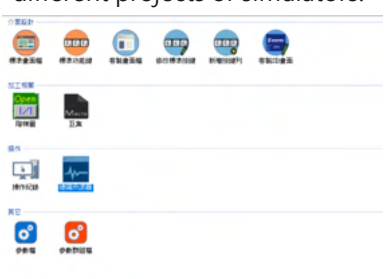
SYNTEC provides analysis software which is useful for servo tuning and CNC visualization, helping machine builders to develop and diagnose effectively.



Servo tuning functions | Adjacent paths analysis | PLC signal scopesequence | 3D curvature analysis

SYNTEC IDE

Syntec integrated developing environment (SYNTEC IDE) can automatically download and install application tools required for customization. With friendly project management, developers can easily switch between different projects or simulators.



Integrated development tools such as HMI, PLC, simulator

Automatically update development tools and environment

Perfectly integrated with simulator, improve development efficiency

*SYNTEC have the right to modify

					Serial									
					6 Series	21 Series		22 Series		210 Series		220 Series	
Category	Items		Units	Remark	6TA-E	21TA-E	21TB-E	22TA	22TB	210TB-E	210TB-E5	220TB	220TB-5
Product Specification	Max. Controlled Paths		path		1	2		2		4		4	
	Max. Controlled Paths		path		1	1		1		3		3	
	Standard Axis		Axis		3	4	6	4	6	12		12	
	Max. Axis (Optional)		Axis		5	4	8	4	8	18		18	
	Max. Spindle		Axis		3	2	4	2	4	6		6	
	Max. Simultaneous Axis Control		Axis		3	4	4	4	4	4	5	4	5
	Min. Control -mm				0.0001	0.0001		0.0001		0.0001		0.0001	
	Max. number of program coordinate		Set		100	100		100		100		100	
	Max. Number of Table Tools		Set		32	96	96	96	96	96	96	96	96
	Multi-Channel Function Group		Set		4	4	4	4	4	4	4	4	4
	Block Processing Time				300	500	500	1000	1000	1000		1000	
Hardware Specification	Storage(DISKA)		MB		4096	4096		4096		4096		4096	
	I/O	RIO	Point		–	64/64				64/64			
		SRI			O	O		O		O		O	
		Direct I/O	Point		32/32	32/32		–		32/32		–	
	DA		Set		2	2		–		2		–	
	Type and Size	All-in-One Machine	Inch		8"	8"/10.4"		8"/10.4"/15"		8"/10.4"	10.4"	10.4"/15"	
		Full-Plane All-in-One Machine	Inch		–	–		10.4"/15"		–		10.4"/15"	
		Back Half Machine			–	O		–		O	–	–	
	USB		Set		2	2		2		2		2	
	RJ-45		Set		1	1		2		1		2	
	VGA Output		Set		–	1*		–		1*	–	–	
	RS-485		Set	Back side	1	1		1		1		1	
	USB		Set		–	0		2		–		2	
	SRI		Set		1	1		1		1		1	
Servo Control	Mechatrolink III / EtherCat / RTEX				O	O		O		O		O	
Category	Items		Remark	Software Function	6 Series	21 Series		22 Series		210 Series		220 Series	
Compensation	Backlash Compensation				O	O		O		O		O	
	Pitch Error Compensation				O	O		O		O		O	
	Angular Error Compensation				O	O		O		O		O	
	Temperature Error Compensation				O	O		O		O		O	
	2D Error Compensation				O	O		O		O		O	
Operation	MPG Simulation				O	O		O		O		O	
	Dry Run				O	O		O		O		O	
	Optional Stop				O	O		O		O		O	
	Single Block				O	O		O		O		O	
	Virtual MPG				O	O		O		O		O	
	Restart at Feedhold				O	O		O		O		O	
	Restart at Break Point				O	O		O		O		O	
	Tool Return				–	–		–		–		–	
	Fixture Offsets				O	O		O		O		O	
	MPG Offsets				–	–		–		–		–	
Programming	Optional Skip				O	O		O		O		O	
	B–stop/Terminator Program				O	O		O		O		O	
	Absolute Zero Point Coordinate		G92/G92.1		O	O		O		O		O	
	Interrupt Macro		M96/M97		O	O		O		O		O	
	M198 call Subroutines				O	O		O		O		O	
	Expandable G Code				O	O		O		O		O	
HSHP	Constant Jerk Control				O	O		O		O		O	
	Multiblocks S-curve motion plan				O	O		O		O		O	
	Auto declaration in Corner				O	O		O		O		O	
	Speed Limit for Round Radius				O	O		O		O		O	
	Multiple Sets of HSHP Parameters				–	–		–		–		–	
	Quick Parameter Setup				–	–		–		–		–	
	SPA Feature				–	O		O		O		O	
	Virtual Radius Funciton				O	O		O		O		O	
	HSHP Control Mode I		G05.1Q1		–	–		–		–		–	
	HSHP Control Mode II		G05P10000	OP11	–	–		–		–		–	
	NURBS Interpolation Ability				–	–		–		–		–	

Remark：
*VGA Only in the Back Half
**Only Support Driven Tool Application
○: Standard Function/ △: Optional Function/ -: Not Available Function

				Serial									
				6 Series	21 Series		22 Series		210 Series		220 Series	
Category	Items	Remark	Software Function	6TA-E	21TA-E	21TB-E	22TA	22TB	210TB-E	210TB-E5	220TB	220TB-5
Tool Management	Auto Tool Measuring			–	–	–	–		–		–	
	Auto Tool Management	Works with Renishaw hardware only		O	O	O	O		O		O	
	Tool Life Management			O	O	O	O		O		O	
Tool Magazine	ROT Servo Turret	PLC Element	OP32	O	O	O	O		O		O	
Spindle	Support Syntec Spindle			– (**)	O	O	O		O		O	
Facilitating Functions	Machine Lock (R bit)			O	O	O	O		O		O	
	Software Limit			O	O	O	O		O		O	
	Spindle Speed Arrival Check			O	O	O	O		O		O	
	Axis Synchronize Feature			O	O	O	O		O		O	
	Dynamic Axis Synchronize Feature			O	O	O	O		O		O	
	Feedback Synchronize Feature			O	O	O	O		O		O	
	Rapid Retraction for Rigid Tapping			O	O	O	O		O		O	
	Virtual Axis Feature			O	O	O	O		O		O	
	Axis Change Feature			O	O	O	O		O		O	
	Axial Torque Limit			O	O	O	O		O		O	
	Serial Bus Setting Feature(CNC Axis)			O	O	O	O		O		O	
	Driver Information Display(CNC Axis)			O	O	O	O		O		O	
	Spindle Application Feature(CNC Axis)			O	O	O	O		O		O	
	Serial Bus PLC Axis			O	O	O	O		O		O	
	High-speed Spindle Positioning	Support Syntec Spindle		O	O	O	O		O		O	
	Dipole Front and Back System			–	O	O	O		O		O	
	Data Backup Recovery	Maker Backup		O	O	O	O		O		O	
	Customized Opening Screen			O	O	O	O		O		O	
	My Favorites	Only eight key system supports		O	O	O	O		O		O	
	Project Protection Feature			O	O	O	O		O		O	
	Limit Access Manager			O	O	O	O		O		O	
	RemoteAP Monitor			O	O	O	O		O		O	
	Right-Angle All In One		OP20	Δ	Δ	Δ	Δ		Δ		Δ	
	3D-Arc Interpolation		OP19	–	–	–	–		–		–	
Program Edit	Background Edit			O	O	O	O		O		O	
	Edit Protection			O	O	O	O		O		O	
	Immediate Grammar Check			O	O	O	O		O		O	
PLC	PLC Diagnosis Feature(FORCE I Point)			O	O	O	O		O		O	
Data Transfer	NETWORK			O	O	O	O		O		O	
	FTP			O	O	O	O		O		O	
	RS-485			O	O	O	O		O		O	
	DNC(Network)			O	O	O	O		O		O	
	DNC(USB)			O	O	O	O		O		O	
Information Display	Operation CV Display			O	O	O	O		O		O	
	Graphic Simulation			O	O	O	O		O		O	
	Partial Graphic Simulation			O	O	O	O		O		O	
	Dynamic Multi-Language Switch			O	O	O	O		O		O	
5 Axis Feature	Feature Coordinate System(Inclined Plane Processing)	G68.2、G68.3	OP13	–	–	Δ	Δ		Δ		Δ	
	The Second Axis Group supports Feature Coordinate System		OP28	–	–	Δ	Δ		Δ		Δ	
	5 Axis RTCP	G43.4、G43.5	OP12	–	–	–	–		Δ		Δ	
	4 Axis RTCP		OP29	–	–	–	–		–		–	
	Multiple Mechanism-Chain	G10 L5000 P_ Q _	OP27	–	–	Δ	Δ		Δ		Δ	
	Five-Axis Mechanism Chain Measurement	RENISHAW、SYNTEC		–	–	–	–		–		–	
G Code Command	Spiral Interpolation	G02/G03		–	O	O	O		O		O	
	Elliptical Cutting(clockwise)	G02.1		O	O	O	O		O		O	
	Parabolic Cutting(clockwise)	G02.2		O	O	O	O		O		O	
	Cylindrical Interpolation	G07.1		O	O	O	O		O		O	
	Start Polar Coordinate Interpolation	G12.1		O	O	O	O		O		O	
	Outer diameter/Inner Diameter Turning Cycle	G20		O	O	O	O		O		O	
	Thread Turning Cycle	G21		O	O	O	O		O		O	
	Thread Turning Middle Feed Cycle	G21.2		O	O	O	O		O		O	
	End-Face Turning Cycle	G24		O	O	O	O		O		O	
	Jumping Function	G31		O	O	O	O		O		O	
	Thread Cutting	G33		O	O	O	O		O		O	
	Variable-Pitch Thread Cutting	G34		O	O	O	O		O		O	
	Polygon Cutting	G51.2		O	O	O	O		O		O	
	Work Coordinate System Setting	G54~G59.9		O	O	O	O		O		O	
	Mirror Function(Lathe)	G68		O	O	O	O		O		O	
	Duplex Cutting Cycle	G72~G78		O	O	O	O		O		O	
	Drilling Fixed Cycle	G80、G83~G89		O	O	O	O		O		O	
	Absolute Zero Coordinate System Preset	G92.1		O	O	O	O		O		O	
	Inverse Time Feed	G93		–	–	–	–		–		–	
	Constant Surface Cutting Speed	G96		O	O	O	O		O		O	
	Spindle Synchronization Function	G114.1		–	O	O	O		O		O	
	Spindle Bearing Function	G114.3		–	O	O	O		O		O	

Remark :
*VGA Only in the Back Half
**Only Support Driven Tool Application
○: Standard Function/ Δ: Optional Function/ -: Not Available Function

				Standard Milling Machine		Functional Milling Machine		Compound Milling Machine							
				6 Series		21 Series	22 Series	210 Series				220 Series			
Category	Items	Units	Remark	6MA-E	6MB-E	21MA-E	22MA	210MA-E	210MA-E5	210MB-E	210MB-E5	220MA	220MA-5	220MB	220MB-5
Product Specification	Max. Controlled Paths	path		2	2	2	2	4				4			
	Max. PLC Controlled Paths	path		1	1	1	1	3				3			
	Standard Axis	axis		3	4	6	6	8		12		8		12	
	Max. Axis (Optional)	axis		3	5	6	6	9		18		9		18	
	Max. Spindle	axis		3	5	4	4	6				6			
	Max. Simultaneous Axis Control	axis		3	4	4	4	4	5	4	5	4	5	4	5
	Min. Control -mm			0.0001		0.0001	0.0001	0.0001				0.0001			
	Max. number of program coordinate	Set		100		100	100	100				100			
	Max. Number of Table Tools	Set		96		96	96	96				96			
	Multi-Channel Function Group	Set		4		4	4	4				4			
	Block Processing Time			600		2500	3000	3000	4000	3000	4000	3000	4000	3000	4000
Hardware Specification	Storage(DISKA)	MB		4096		4096	4096	4096				4096			
	I/O RIO	Point		—		64/64	64/64	64/64				64/64			
	I/O SRI			O		O	O	O				O			
	I/O Direct I/O	Point		32/32		32/32	—	32/32				—			
	DA	Set		2		2	—	2				—			
	Screen All-in-One Machine	Inch		8"		8"/10.4"/15"	8"/10.4"/15"	10.4"				10.4"/15"			
	Screen Full-Plane All-in-One Machine	Inch		—		—	10.4"/15"	—				10.4"/15"			
	Screen Back Half Machine			—		O	—	O				—			
	CF Card	Set	Front Side	—		—	—	—				—			
	USB	Set	Front Side	2		2	2	2				2			
	CF Card	Set	Back Side	—		—	—	—				—			
	RJ-45	Set	Back Side	1		1	2	1				2			
	VGA Output	Set	Back Side	—		1*	—	1*				—			
	RS-485	Set	Back Side	1		1	1	1				1			
	USB	Set	Back Side	—		—	2	—				2			
	SRI	Set	Back Side	1		1	1	1				1			
Servo Control	Mechatrolink III / EtherCat / RTEX			O		O	O	O				O			
Category	Items	Remark	Software Function	6 Series		21 Series	22 Series	210 Series				220 Series			
Compensation	Backlash Compensation			O		O	O	O				O			
	Pitch Error Compensation			O		O	O	O				O			
	Angular Error Compensation			O		O	O	O				O			
	Temperature Error Compensation			O		O	O	O				O			
	2D Error Compensation			O		O	O	O				O			
Operation	MPG Simulation			O		O	O	O				O			
	Dry Run			O		O	O	O				O			
	Optional Stop			O		O	O	O				O			
	Single Block			O		O	O	O				O			
	Virtual MPG			O		O	O	O				O			
	Restart at Feedhold			O		O	O	O				O			
	Restart at Break Point			O		O	O	O				O			
	Tool Return			O		O	O	O				O			
	Fixture Offsets			O		O	O	O				O			
	MPG Offsets			O		O	O	O				O			
Programming	Optional Skip			O		O	O	O				O			
	B—stop/Terminator Program			O		O	O	O				O			
	Absolute Zero Point Coordinate	G92/G92.1		O		O	O	O				O			
	Interrupt Macro	M96/M97		O		O	O	O				O			
	M198 call Subroutines			O		O	O	O				O			
	Expandable G Code			O		O	O	O				O			
HSHP	Constant Jerk Control			O		O	O	O				O			
	Multiblocks S-curve motion plan			—		O	O	O				O			
	Auto declaration in Corner			O		O	O	O				O			
	Speed Limit for Round Radius			O		O	O	O				O			
	Multiple Sets of HSHP Parameters			—		O	O	O				O			
	Quick Parameter Setup			—		O	O	O				O			
	SPA Feature			O		O	O	O				O			
	Virtual Radius Funciton			O		O	O	O				O			
	HSHP Control Mode I	G05.1Q1		—		O	O	O				O			
	HSHP Control Mode II	G05P10000	OP11	—		O	O	O				O			
	NURBS Interpolation Ability			—		O	O	O				O			

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**Only Support Driven Tool Application
○: Standard Function/ △: Optional Function/ -: Not Available Function

				Standard Milling Machine		Functional Milling Machine		Compound Milling Machine							
				6 Series		21 Series	22 Series	210 Series				220 Series			
Category	Items	Remark	Software Function	6MA-E	6MB-E	21MA-E	22MA	210MA-E	210MA-E5	210MB-E	210MB-E5	220MA	220MA-5	220MB	220MB-5
Tool Management	Auto Tool Measuring			O		O	O	O				O			
	Auto Tool Management	Works with Renishaw hardware only		O		O	O	O				O			
	Tool Life Management			O		O	O	O				O			
Tool Magazine	ROT Servo Turret	PLC Element	OP32	Δ		Δ	Δ	Δ				Δ			
	ATC Automatic tool change			–		O	O	O				O			
Spindle	Support Syntec Spindle			–		O	O	O				O			
Facilitating Functions	Machine Lock (R bit)			O		O	O	O				O			
	Software Limit			O		O	O	O				O			
	Spindle Speed Arrival Check			O		O	O	O				O			
	Axis Synchronize Feature			O		O	O	O				O			
	Dynamic Axis Synchronize Feature			O		O	O	O				O			
	Feedback Synchronize Feature			O		O	O	O				O			
	Rapid Retraction for Rigid Tapping			O		O	O	O				O			
	Virtual Axis Feature			O		O	O	O				O			
	Axis Change Feature			O		O	O	O				O			
	Axial Torque Limit			O		O	O	O				O			
	Serial Bus Setting Feature(CNC Axis)			O		O	O	O				O			
	Driver Information Display(CNC Axis)			O		O	O	O				O			
	Spindle Application Feature(CNC Axis)			O		O	O	O				O			
	Serial Bus PLC Axis			O		O	O	O				O			
	Dipole Front and Back System			–		O	O	O				O			
	Data Backup Recovery	Maker Backup		O		O	O	O				O			
	Customized Opening Screen	Only eight key system supports		O		O	O	O				O			
	My Favorites			–		O	O	O				O			
	Project Protection Feature			O		O	O	O				O			
	Limit Access Manager			O		O	O	O				O			
	RemoteAP Monitor			O		O	O	O				O			
	Right-Angle All In One		OP20	Δ		Δ	Δ	Δ				Δ			
	3D-Arc Interpolation		OP19	–		Δ	Δ	Δ				Δ			
Program Edit	Background Edit			O		O	O	O				O			
	Edit Protection			O		O	O	O				O			
	Immediate Grammar Check			O		O	O	O				O			
PLC	PLC Diagnosis Feature(FORCE I Point)			O		O	O	O				O			
Data Transfer	NETWORK			O		O	O	O				O			
	FTP			O		O	O	O				O			
	RS-485			O		O	O	O				O			
	DNC(Network)			O		O	O	O				O			
	DNC(USB)			O		O	O	O				O			
Information Display	Operation CV Display			O		O	O	O				O			
	Graphic Simulation			O		O	O	O				O			
	Partial Graphic Simulation			O		O	O	O				O			
	Dynamic Multi-Language Switch			O		O	O	O				O			
5 Axis Feature	Feature Coordinate System(Inclined Plane Processing)	G68.2 · G68.3	OP13	–		Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
	The Second Axis Group supports Feature Coordinate System		OP28	–		Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
	5 Axis RTCP	G43.4 · G43.5	OP12	–		–	–	–	Δ	–	Δ	–	Δ	–	Δ
	4 Axis RTCP		OP29	–		Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
	Multiple Mechanism-Chain	G10 L5000 P_ Q _	OP27	–		Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
	Five-Axis Mechanism Chain Measurement	RENISHAW · SYNTEC		–		–	–	–	Δ	–	Δ	–	Δ	–	Δ
G code command	Spiral/Cone interpolation	G02/G03		–		O	O	O				O			
	Spatial arc interpolation	G02.4/G03.4	OP19	–		O	O	O				O			
	High Precision Locus Control Mode	G05 P10000	OP11	–		O	O	O				O			
	Smoothing Path Mode	G05.1		–		O	O	O				O			
	NURBS Interpolation	G06.2		–		O	O	O				O			
	Thread Cutting	G33		O		O	O	O				O			
	Auto Tool Measurement	G37		O		O	O	O				O			
	Tool Offsets	G45~G48		O		O	O	O				O			
	High Speed Peck Drilling Cycle	G73		O		O	O	O				O			
	Left Handed Tapping	G74		O		O	O	O				O			
	High Precision Boring Cycle	G76		O		O	O	O				O			
	Drilling cycling	G81		O		O	O	O				O			
	Chopping	G81.1	OP44	–		O	O	O				O			
	Bottom Feed Hold Drilling Cycle	G82		O		O	O	O				O			
	Peck Drilling Cycle	G83		O		O	O	O				O			
	Tapping Cycle	G84		O		O	O	O				O			
	Boring Cycle	G85		O		O	O	O				O			
	High Speed Boring Cycle	G86		O		O	O	O				O			
	Back Boring Cycle	G87		O		O	O	O				O			
	Semi Automatic Finishing Boring Cycle	G88		O		O	O	O				O			
	Bottom Feed Hold Boring Cycle	G89		O		O	O	O				O			
	Multi-Group HSHP Parameter	G120.1		O		O	O	O				O			

Remark :
*VGA Only in the Back Half
**Only Support Driven Tool Application
○: Standard Function/ Δ: Optional Function/ -: Not Available Function