

CNCmakers



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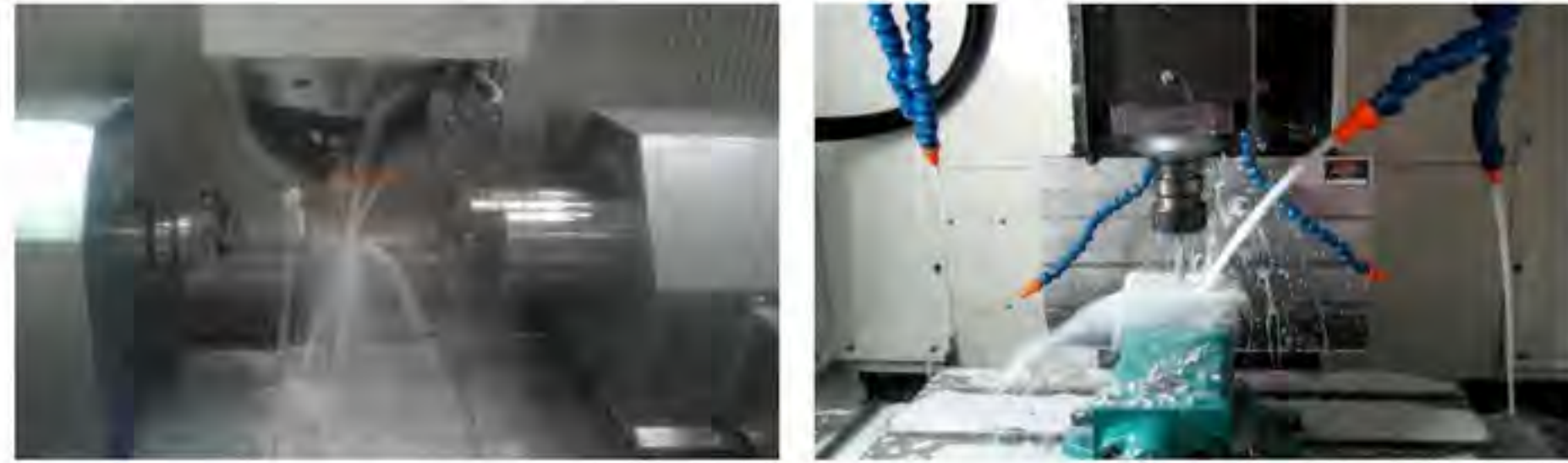


25i CNC Milling System

强劲的产品功能

CNC Controller of the New Generation

- Multi-axial linkage, bus control, high speed and high precision and the absolute encoder



- GSK25i CNC system adopts the advanced technology of the current CNC system field; and the product has already got CE (CONFORMITE EUROPEENNE) and TUV (Technischen Überwachungs Vereine) of Germany approved. The system function is powerful, the operation is convenient, maximum 2 channels, 8 feeding axes and 3 servo spindles are controlled, which applies to multi-functional machining center, the boring, milling, drilling, turning and grinding machines and controlling the complex machine tool and the automatic equipments.



▲ GSK25iRa (Handheld type 6.4" LCD)



▲ GSK25iM-H (Horizontal structure 8.4" LCD)
GSK25iT-H (Horizontal structure 8.4" LCD)



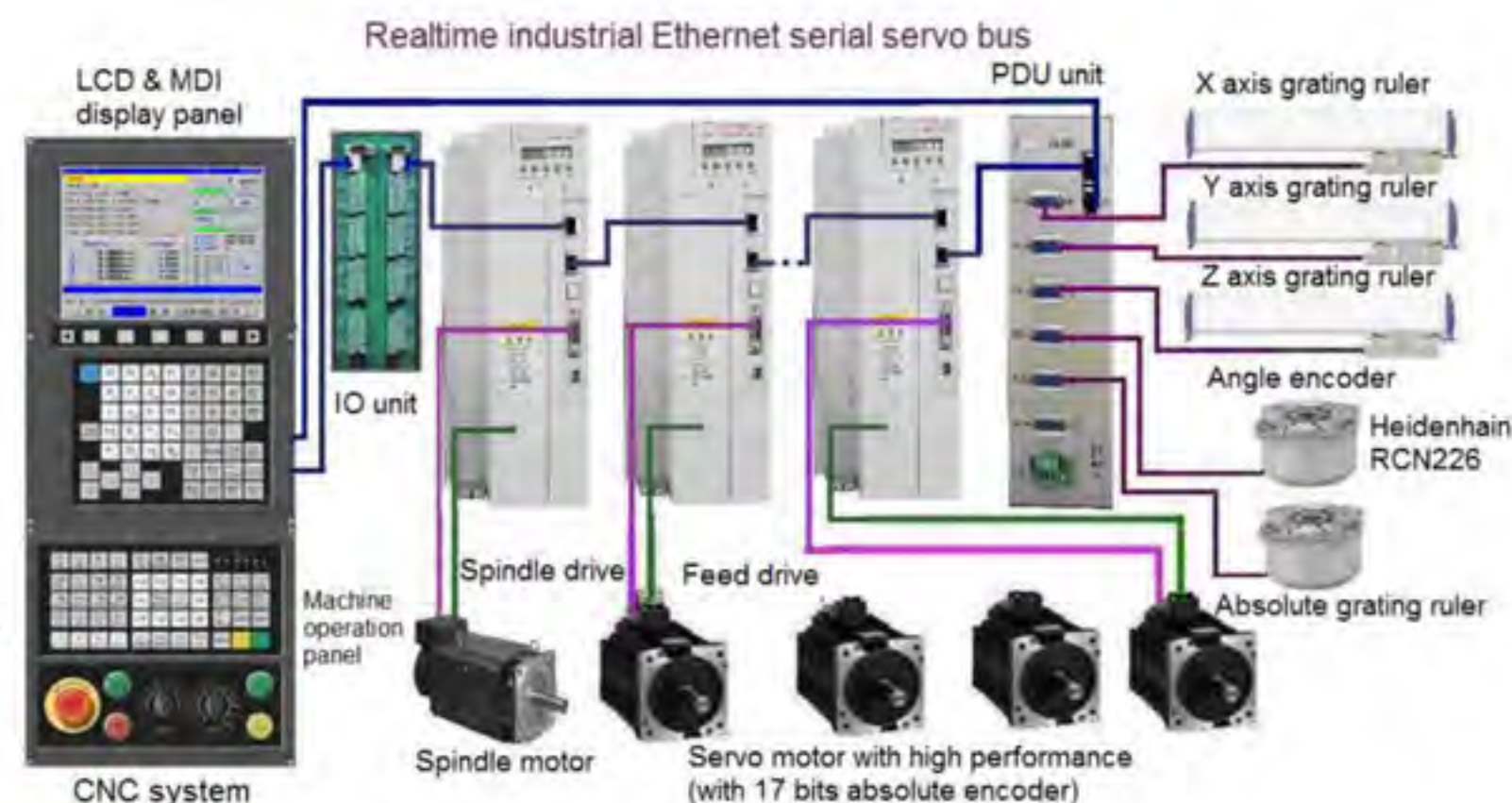
▶ GSK25iM-V (Vertical structure 10.4" LCD)
GSK25iT-V (Vertical structure 10.4" LCD)



The project of the national major science and technology programs
The dedicated CNC system for the five-axes competition in The Forth National CNC System Contest and used by the champion
The dedicated CNC system for the five-axes and the four-axes competitions in The Sixth National CNC System Contest and used by the champion

Advanced Hardware

- The hardware platform with high performance and high configuration can satisfy the requirements of five-axes linkage, high speed, high precision and combined machining, complex operation and machining, etc.
- GSK-Link real-time industry Ethernet bus control, the integrated case, high resolution display, small size and less connection.
- Low power consumption, maintenance free, all-metal structure, sturdy and durable



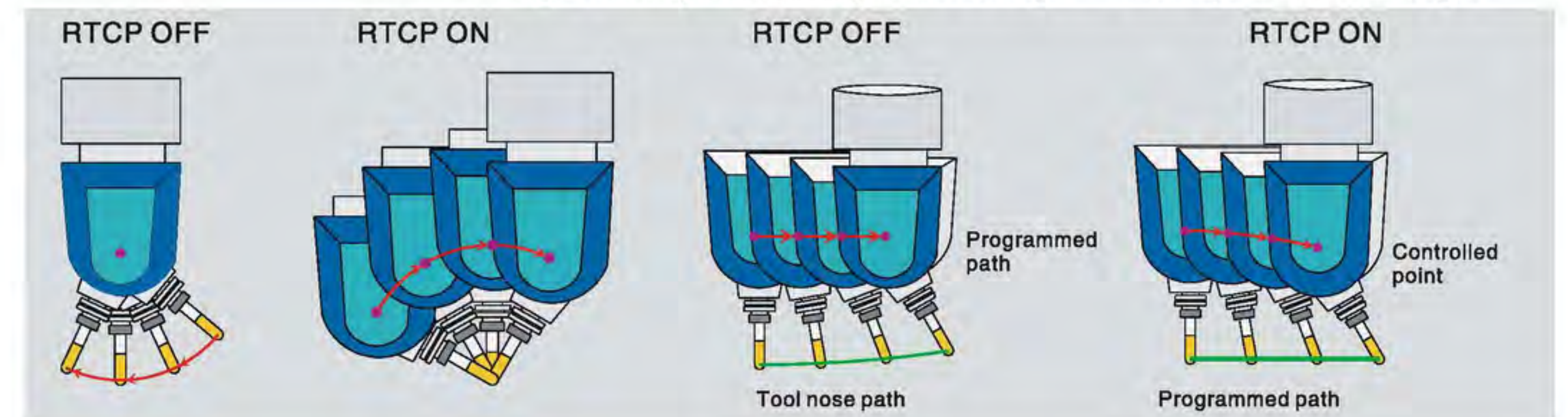
Powerful Five-axes Machining Function

- 8 axes, any five axes linkage
- Apply to the workpiece swing, the tool swing and the hybrid five-axes machine structure
- Five axes RTCP (tool center point control)
- The inclined plane (3+2 positioning) machining
- Insert five-axes MPG

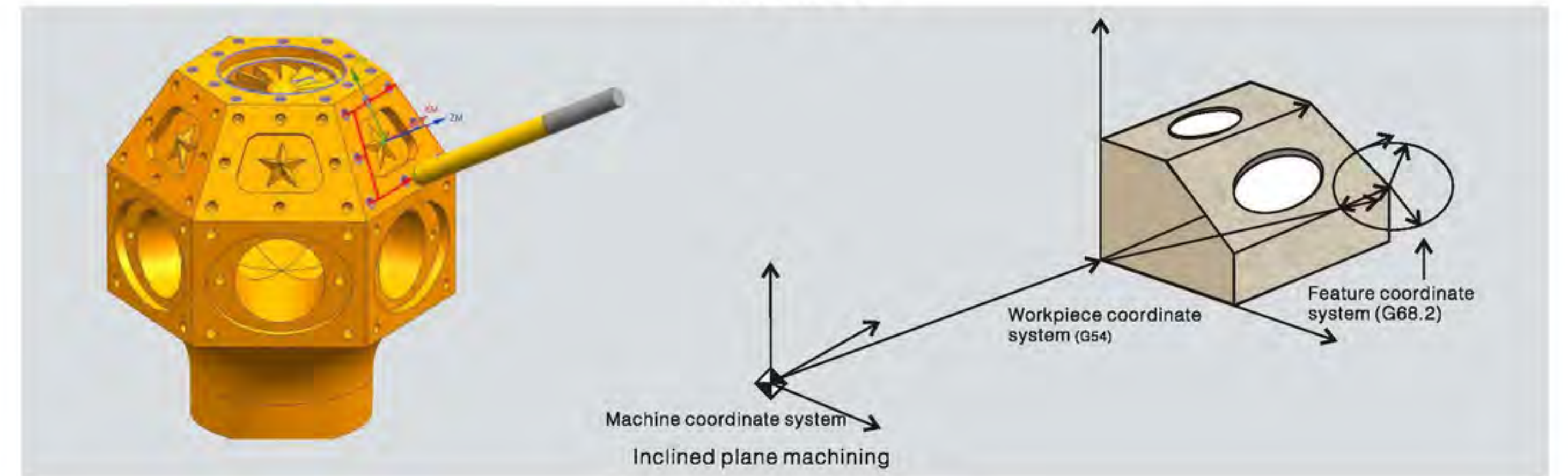


Higher efficiency when machining with tool side edge

Avoid the cutting feedrate of the sphere center is zero, higher efficiency and fineness can be got.



RTCP control

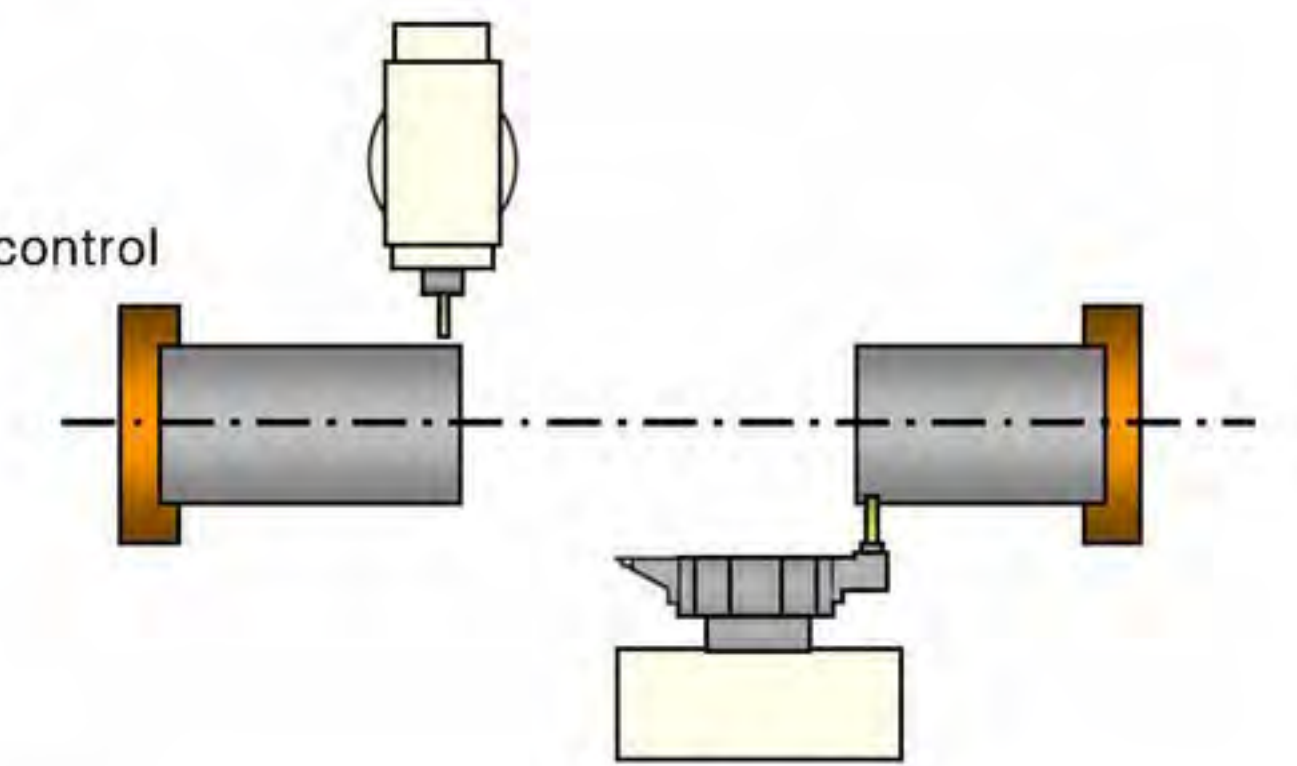


Inclined plane machining

The inclined plane machining

Dual-channel Control Function

- Control two channels meanwhile for milling or turning
- Support the waiting, synchronous, mixed, overlapped control among channels

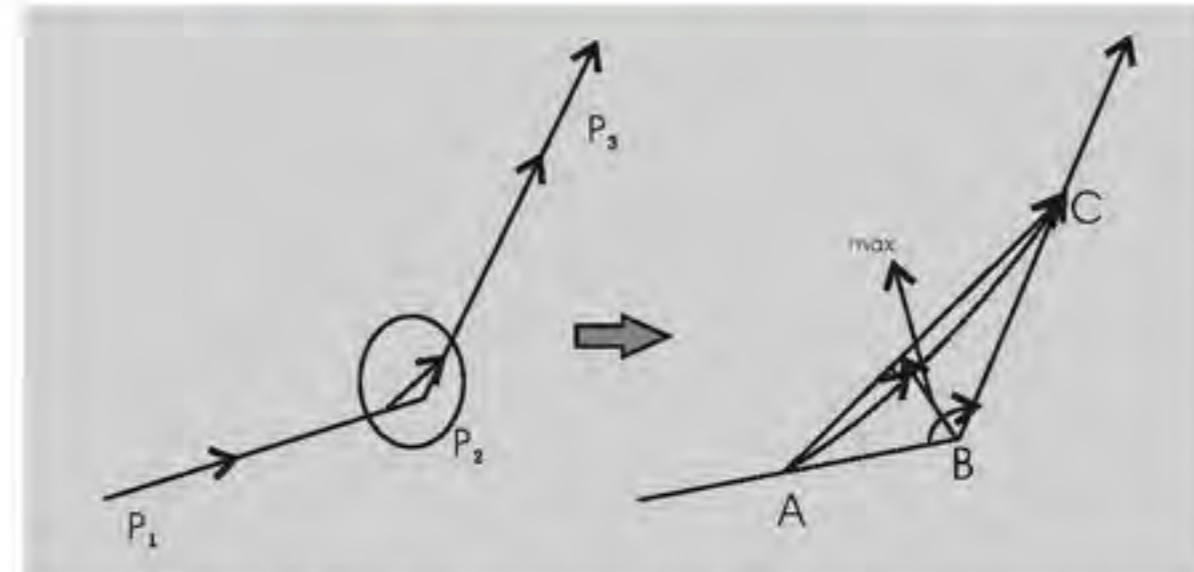
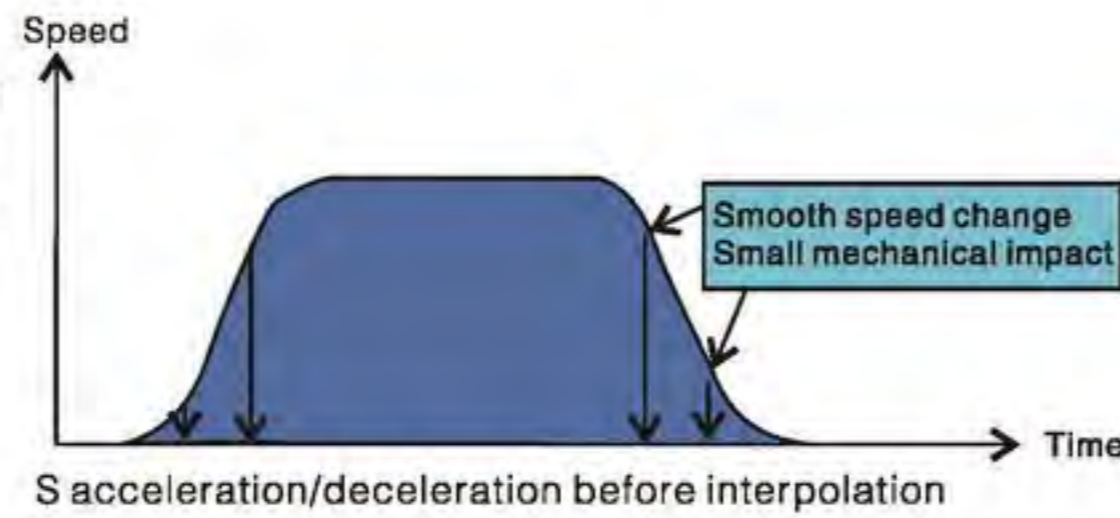


双通道控制

强劲的产品功能

High-speed and High-precision Machining

- **Advanced** preview for 1000 blocks, linear acceleration/deceleration before interpolation, acceleration/deceleration of S type before interpolation, acceleration/deceleration of S type after interpolation
- **Acceleration, jerk control** to realize the smooth feeding
- **Many on-line path fairing modes** can apply to the different machining efficiencies and the surface quality of different types:
 - G05 P1 Broken line transition mode
 - G05 P2 Bezier fairing mode
 - G05 P3 B-spline surface fairing mode



The Feeding Servo System of High Performance

- **High dynamic response** servo system and the current loop period lower to 100 μ s.
- **Intelligent** recognizing the motor, the servo parameters dynamic self-adjusting, the notch filter and the friction compensation function
- **The servo motor** is adopted 17 bits (131072 resolution), the absolute encoder of high resolution, the part machining precision greatly improved
- **Absolute encoder**, not required zero Return each time after power on



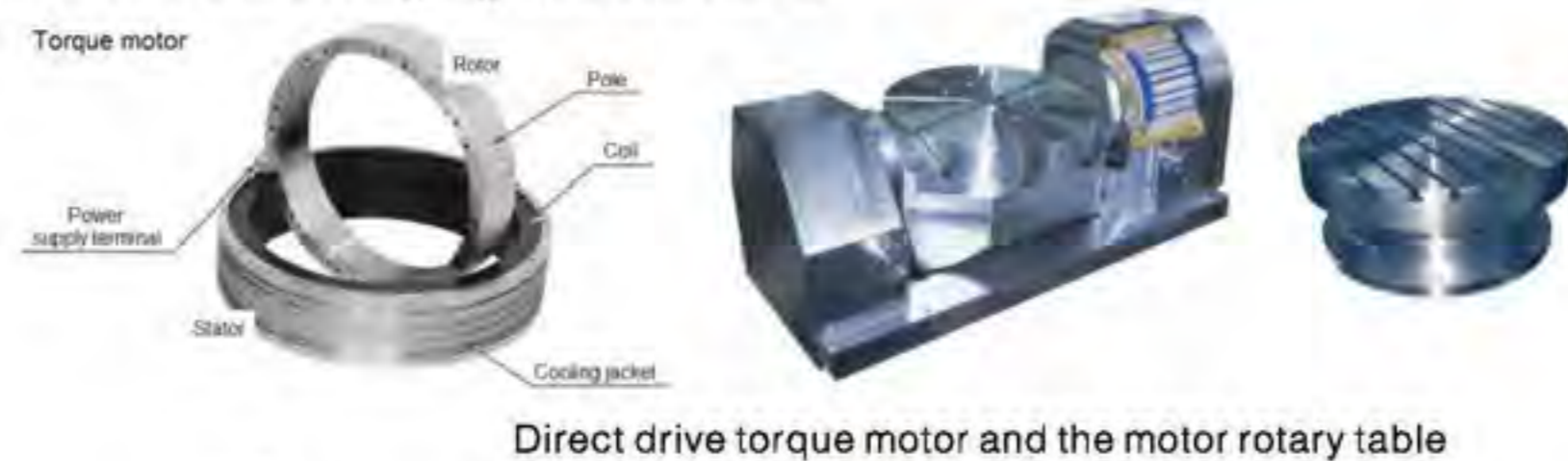
All-digital Servo Spindle

- **GD3000Y series** digit spindle drive of the bus type, the exact controlled speed and the convenient installation and debugging
- **Multi-spindle function**: Two digits and one analog spindle
- **Spindle positioning and Cs axis function**
- **High-speed positioning and high-speed rigid tapping**



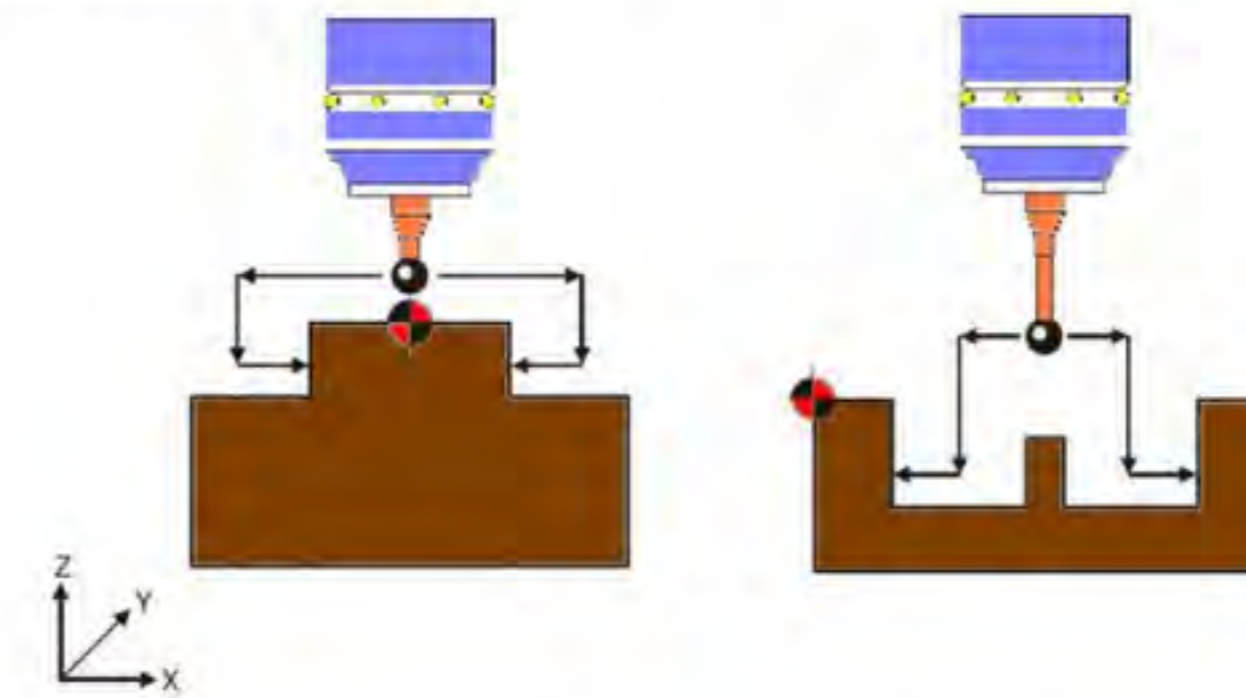
Support Direct Driven Torque Motor Control

- The torque motor is with fast response and high precision
- Zero clearance direct drive the CNC rotary table and the swinging spindle head



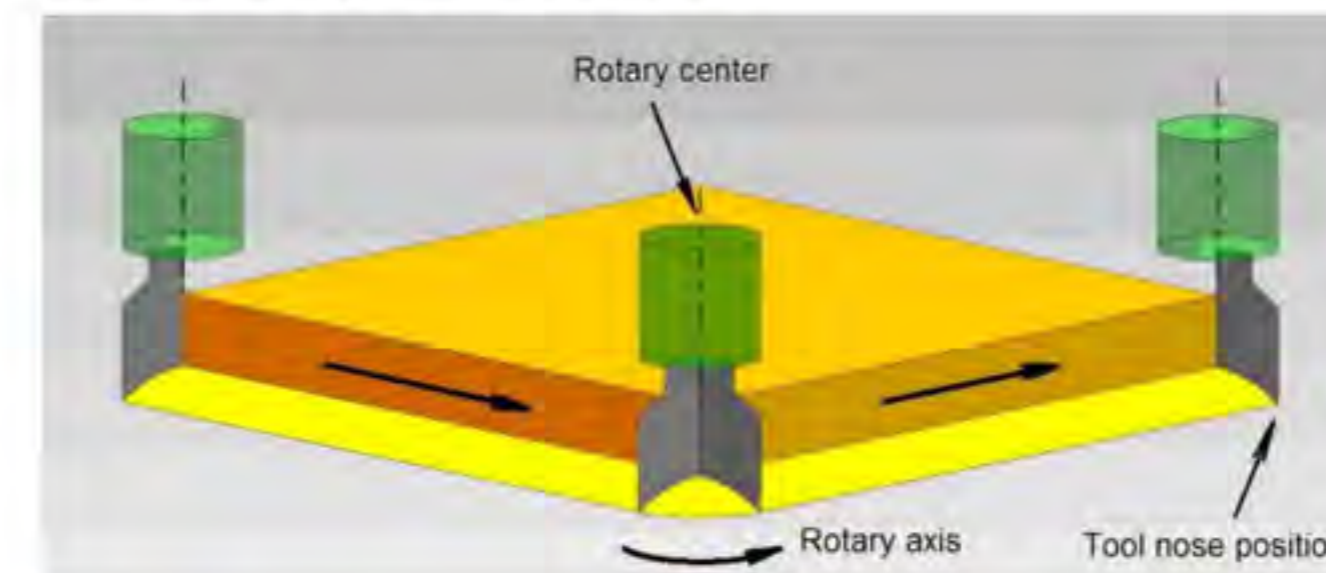
Automatic Measuring the Workpiece and the Tool

- The integrated Renishaw automatic measuring software
- Realize automatic adjusting the workpiece, automatic measuring the tool



Control Function in Normal Direction

- Based on the movement path of X and Y axes during cutting, the tool orientation should maintain in the path normal direction (the direction is vertical to the advanced direction of the tool), and the tool is controlled by the rotary axis.

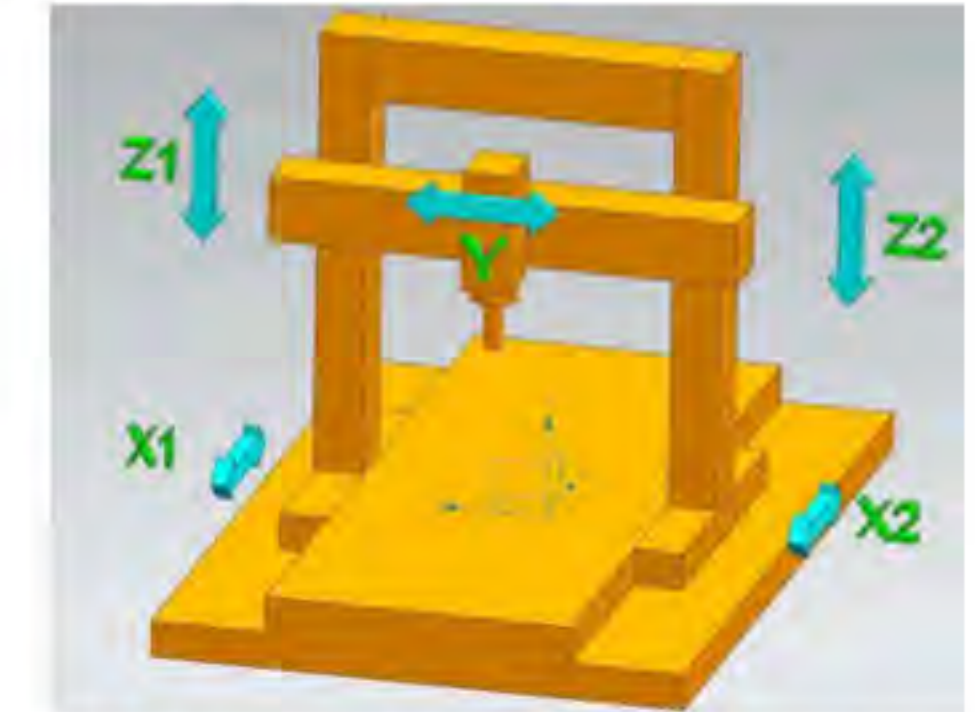


Programming and the Operation Performance

- **Big memory**, and the standard memory is 480M
- **The graph dialogue programming**
- **The program debugging function**
- **The program folder management**
- **The teaching programming**
- **The program can be created, saved as, rewritten, copied, cut, pasted, searched and replaced**
- **Many macros and the canned cycles** can resolve the complex machining task conveniently and effectively
- **The data transmission and DNC** can be realized by USB flash disc and the network
- **Simple debugging and maintenance** and the complete alarm and diagnosis information
- **Multi-level authority management function**
- **The user self-defined interface** can be re-developed.

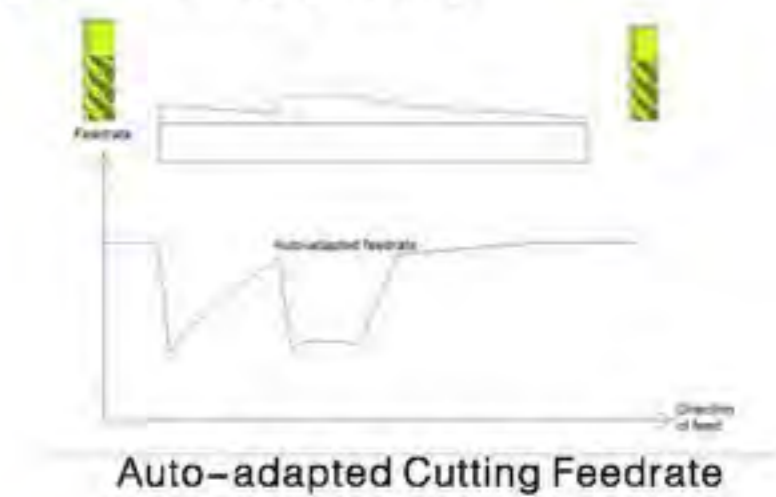
The Synchronous Axis Control

- Two or many motors are synchronous driven, the host motor and the slave one are running together and the slave axis follows the master axis.

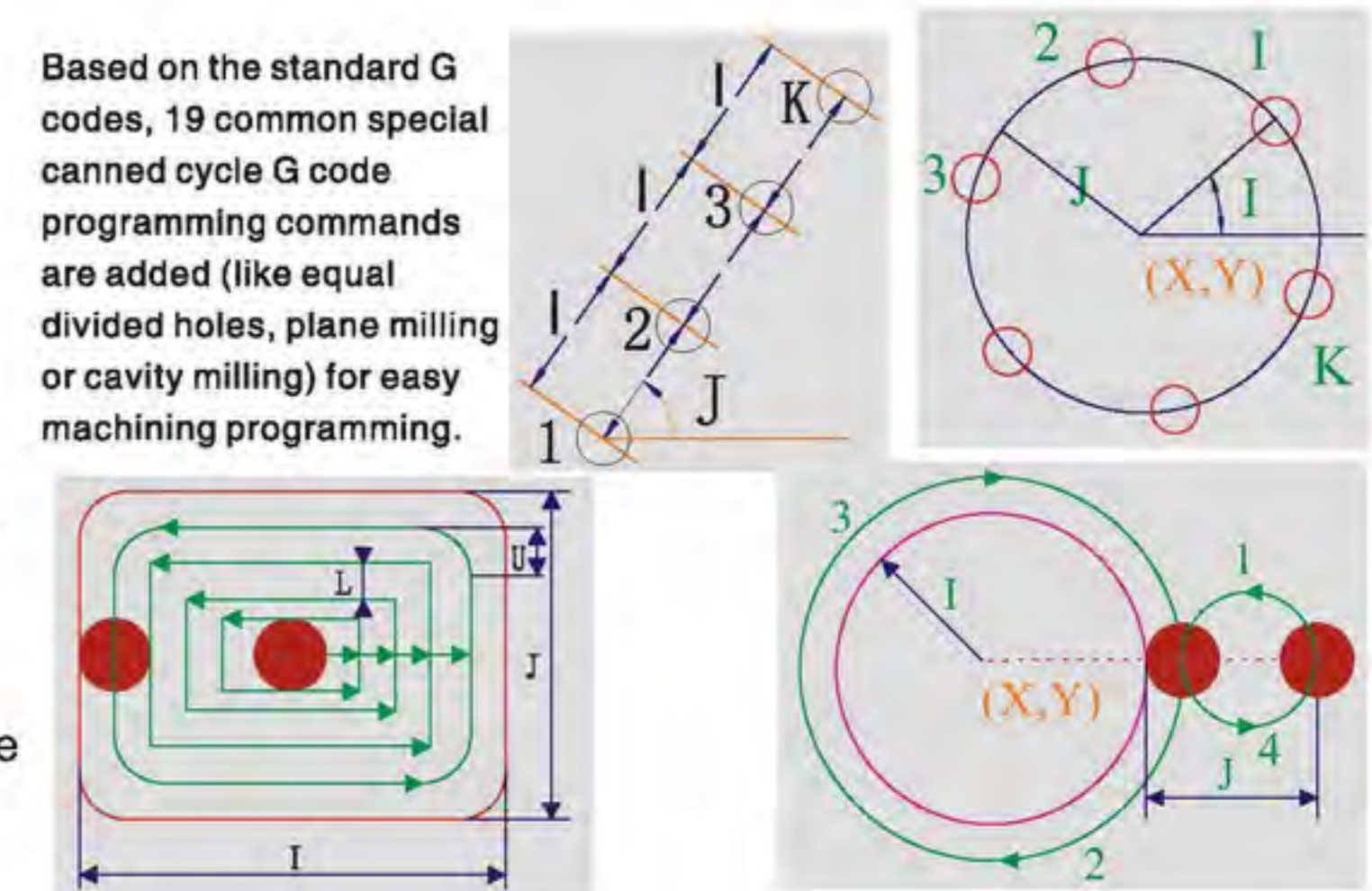


The Auto-adapted Cutting Feedrate Control Function

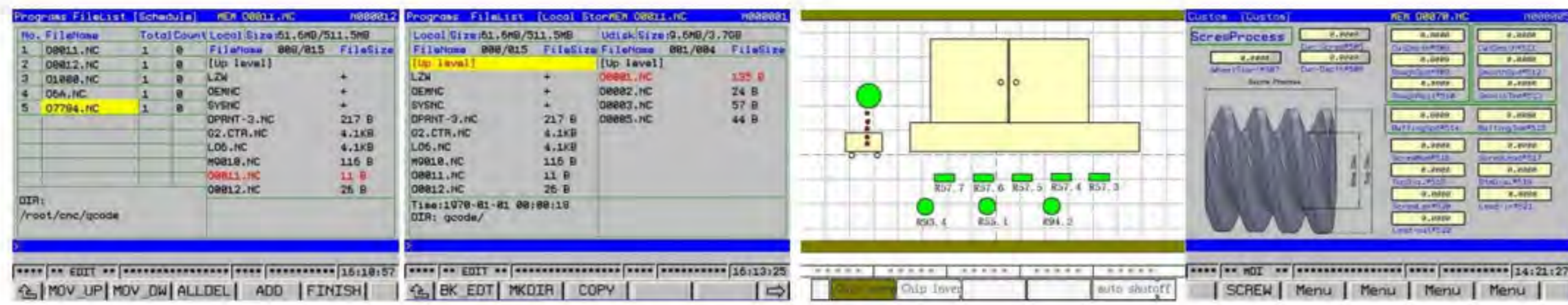
- During cutting, the feedrate is automatically adjusted based on the load. When the load is big, the feedrate is reduced; visa versa. Or machining is automatically stopped when the load exceeds the set range, so the function can protect the tool and the equipment from damaging and improve the machining efficiency greatly.



Based on the standard G codes, 19 common special canned cycle G code programming commands are added (like equal divided holes, plane milling or cavity milling) for easy machining programming.



强劲的产品功能



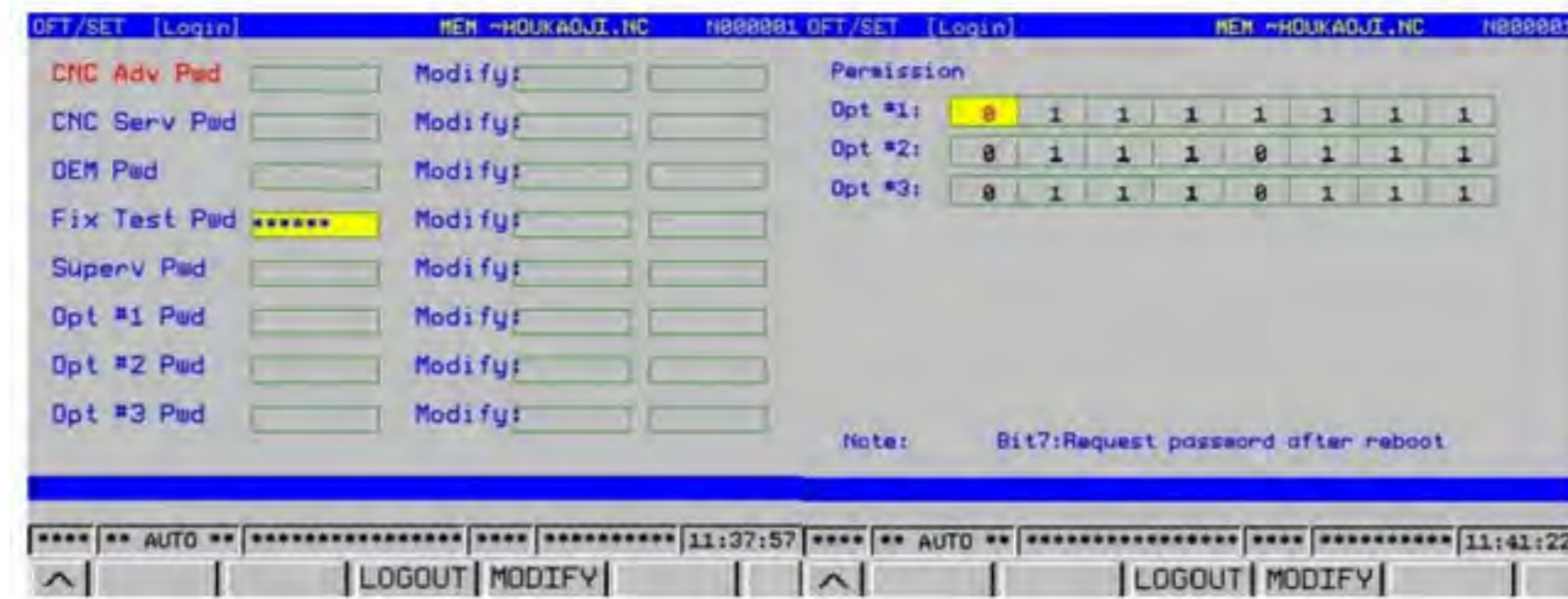
Program debugging operation

Program debugging operation

The machining program folder management



Self-defined interface



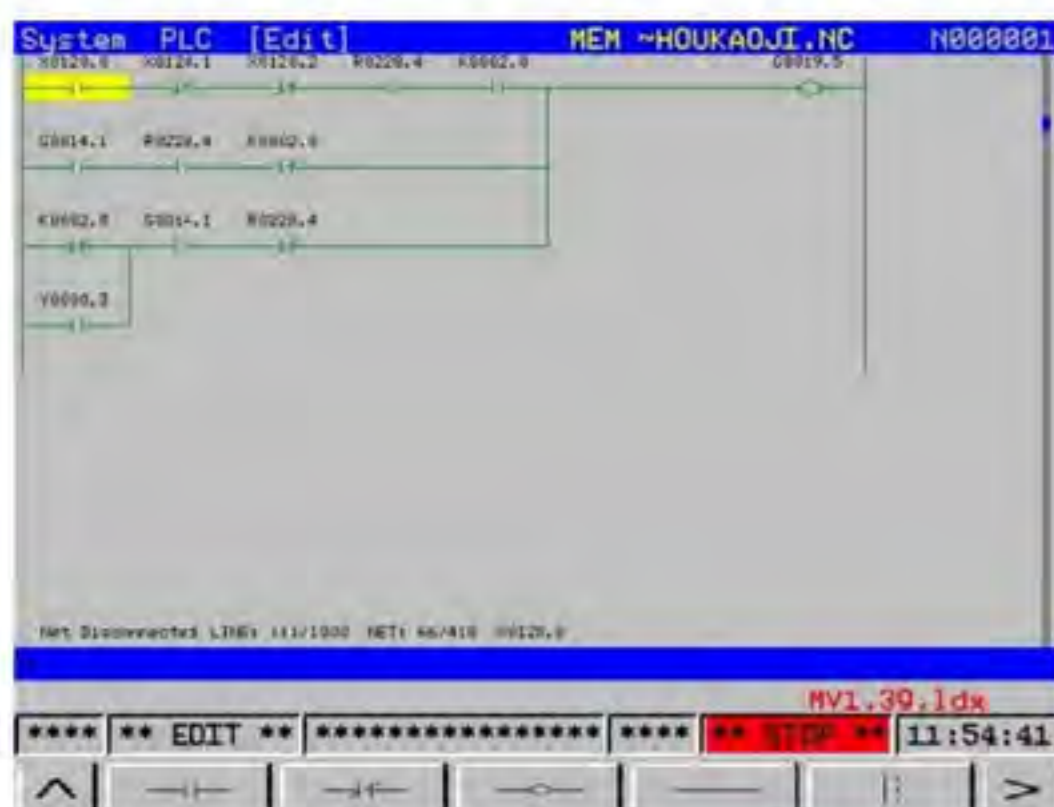
Help interface

PLC Function

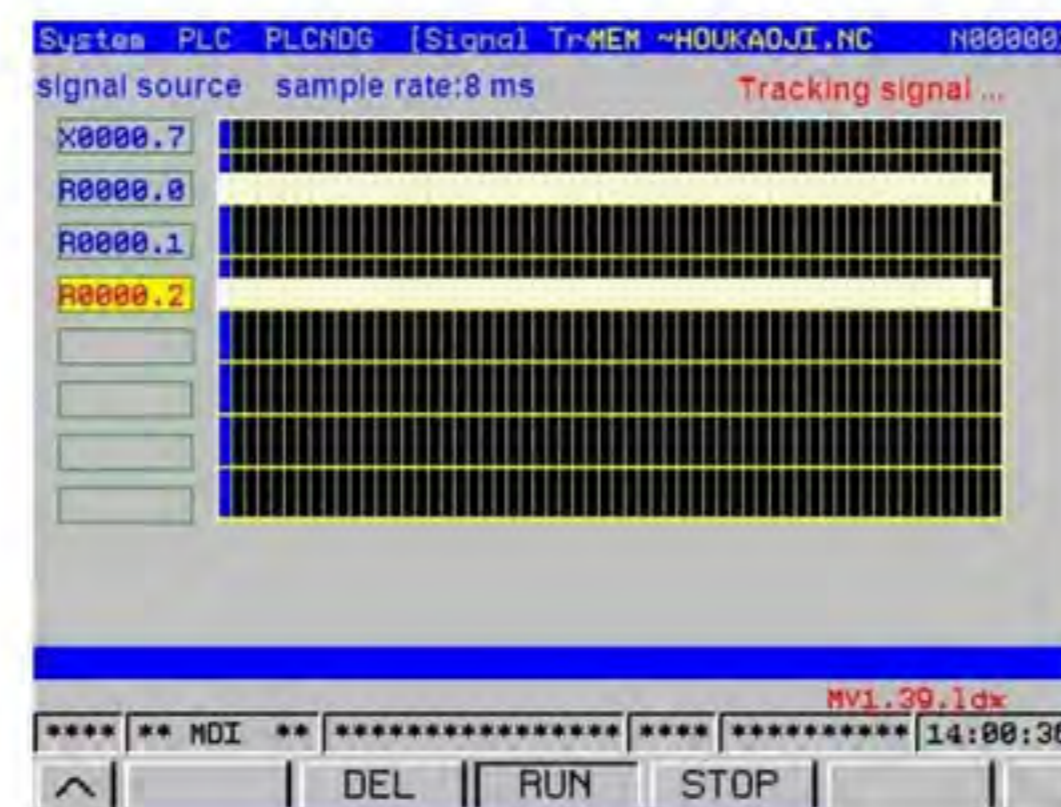
- The ladder diagram programming
- The basic command processing time: 0.5 μs/step, the program capacity: 12000 steps
- The number of basic commands: 10 the number of function commands: 49
- The open PLC, PLC program can be edited and rewritten on the system
- Many PLC programs can be saved as different names and the running program can be selected
- The window function and PLC axis control function
- Select the machining program, rewrite the cutter compensation values and the coordinate system values by PLC interface
- I/O points can be extended into 1024/1024 maximum, satisfying the control of the large and complex equipments.



Ladder diagram



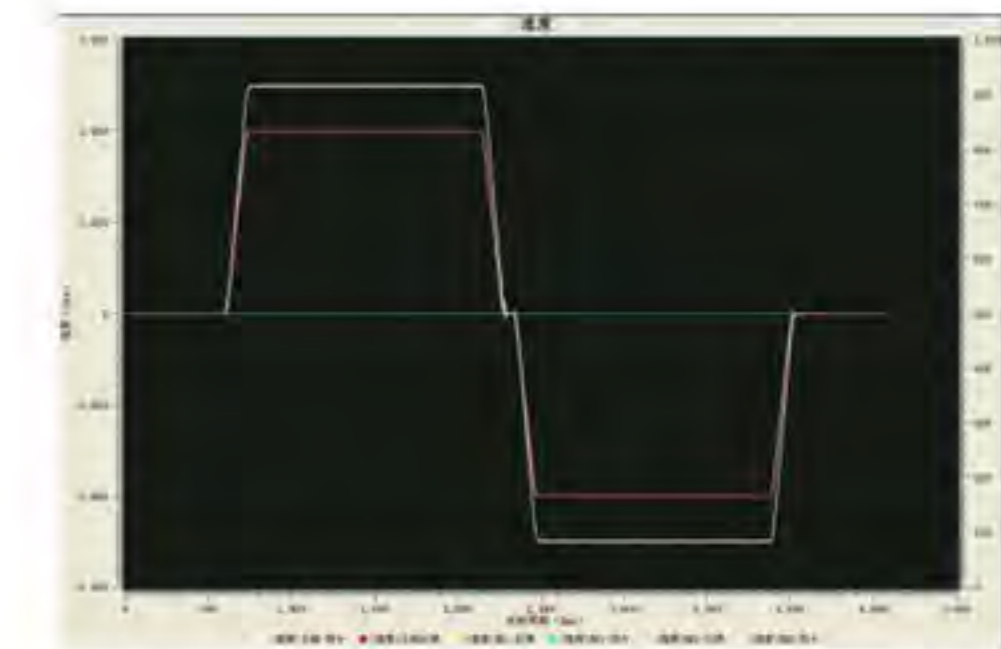
Editing the ladder diagram



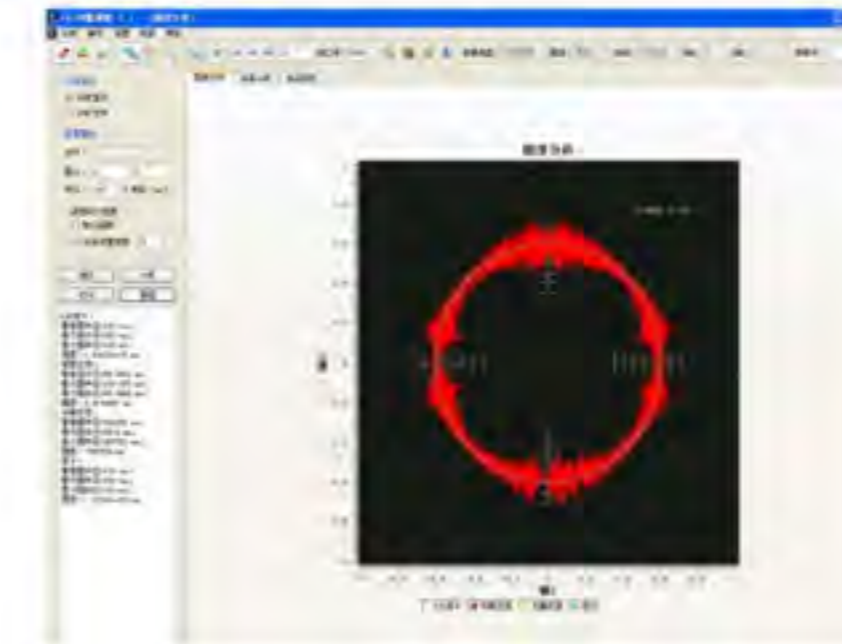
Signal track

Servo Debugging Tool

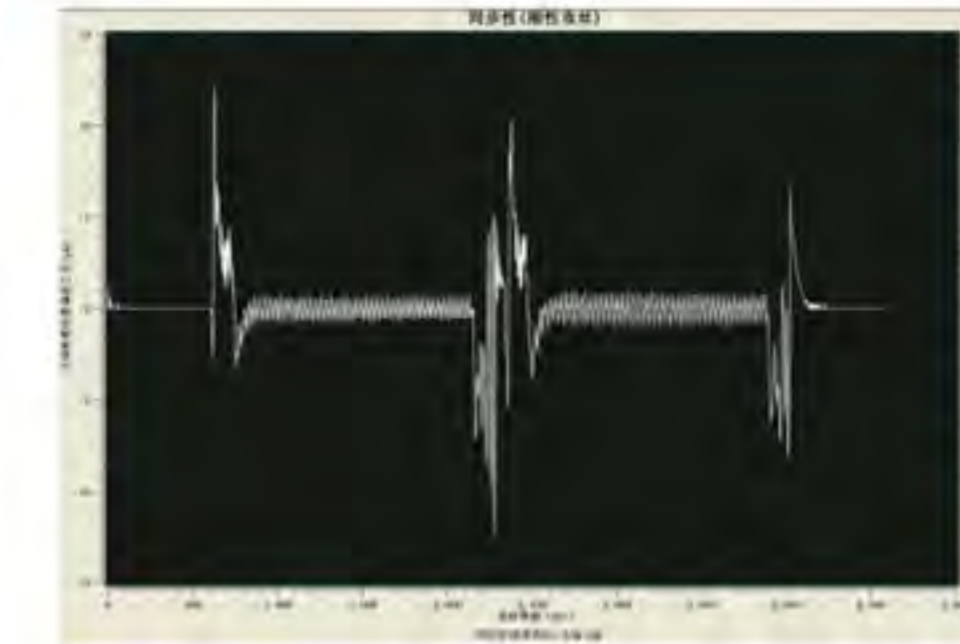
- The graphs like the speed, the current, the acceleration, the following error, the tapping synchronization, the circularity error can be displayed and analyzed with PC.
- Aid debugging, simplify the debugging steps.



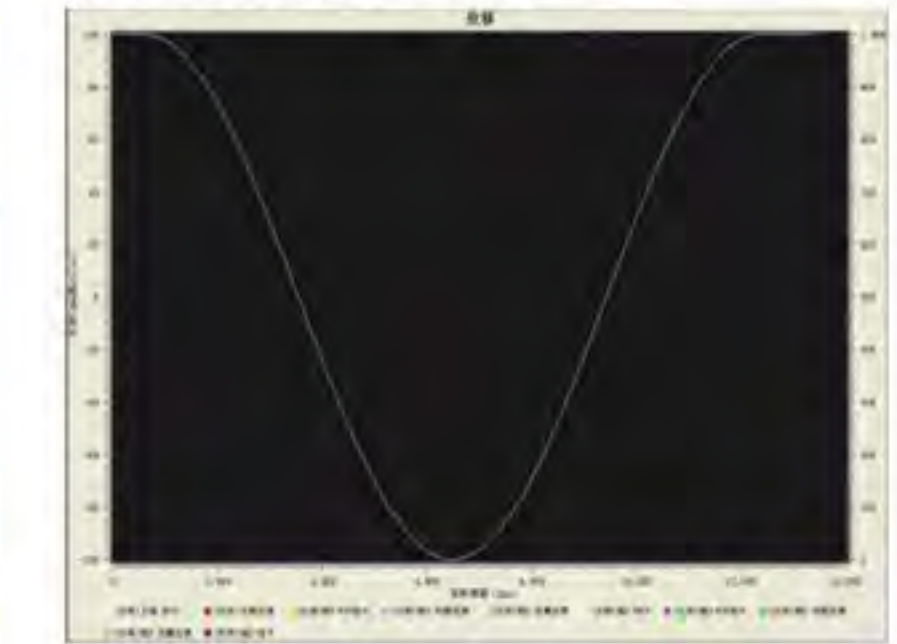
Speed waveform analysis



Circularity error analysis



Rigid tapping synchronous error analysis



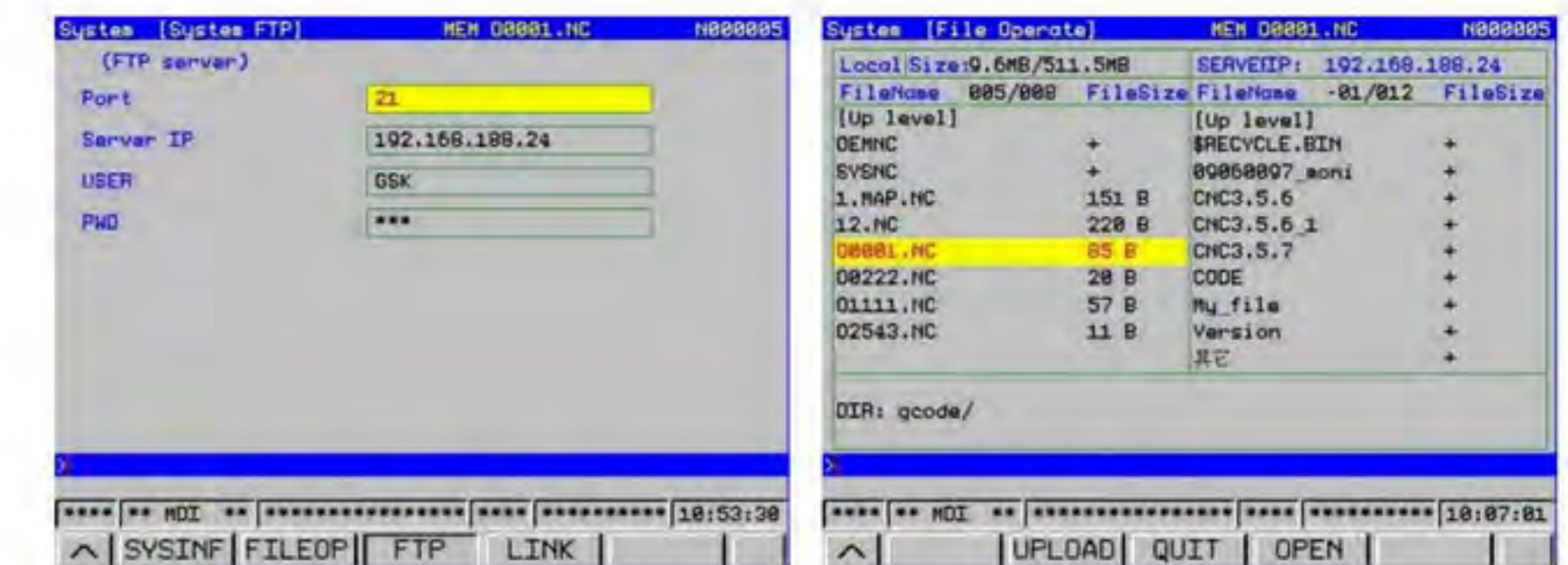
Displacement diagram analysis

Intelligent Factory Network and PC Software Function

- By connecting CNC with the network, the intelligent factory network system is built, CNC controllers on the production site can be managed, collecting the data, sending and receiving the files, the remote monitoring, troubleshooting and maintenance can be realized.

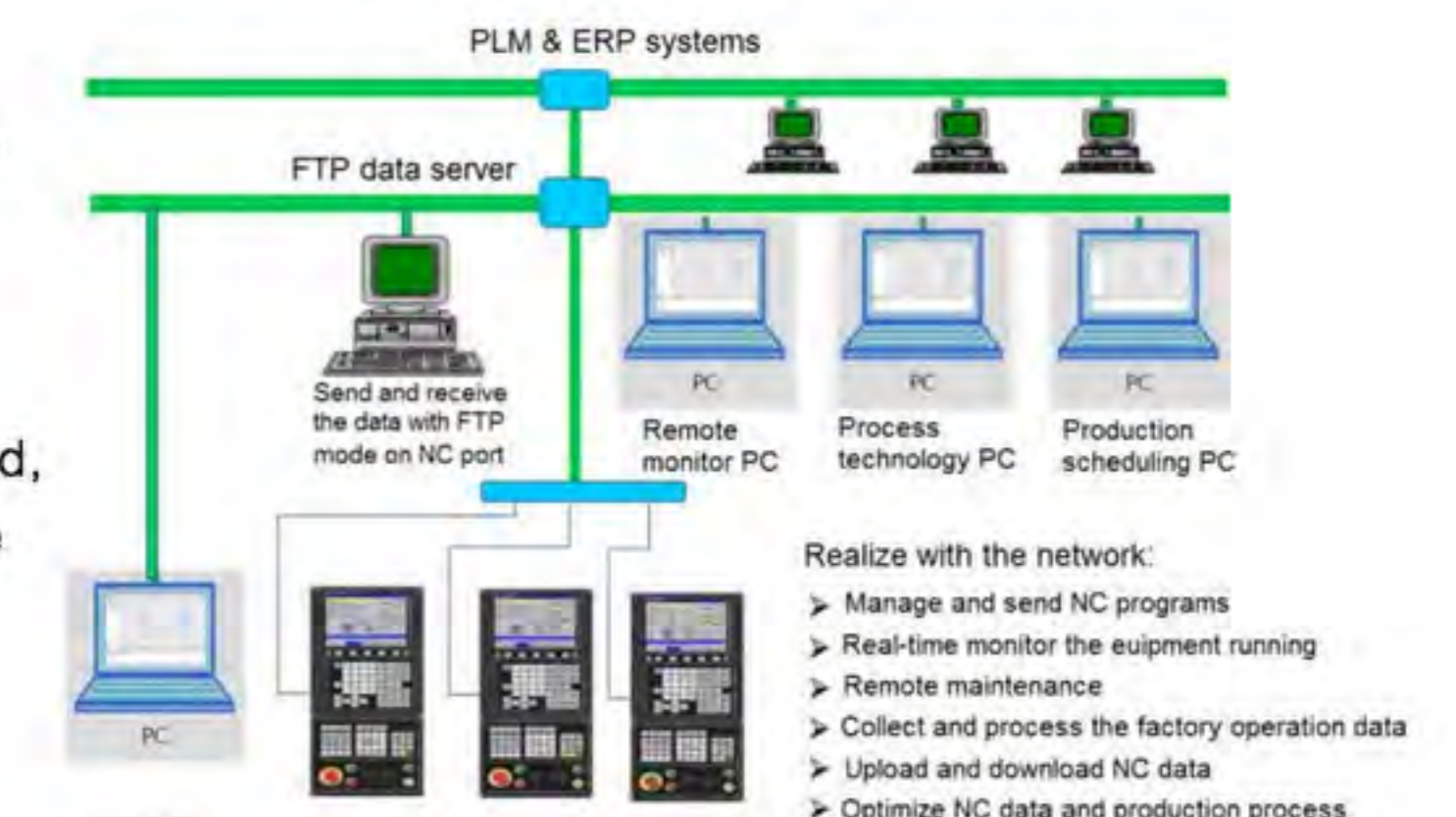
Intelligent Factory Network

- By FTP data server function, the machining programs can be directly uploaded and downloaded from the server at CNC end.



Setting and operating FTP server

GSK25i CNC system can build the network based on the Ethernet interface of TCP/IP with PC software, and the remote monitor, diagnosis and maintenance for CNC system can be realized, and the production and equipment information can be obtained at the remote end, and the data collection, process and management of the production information can be realized.

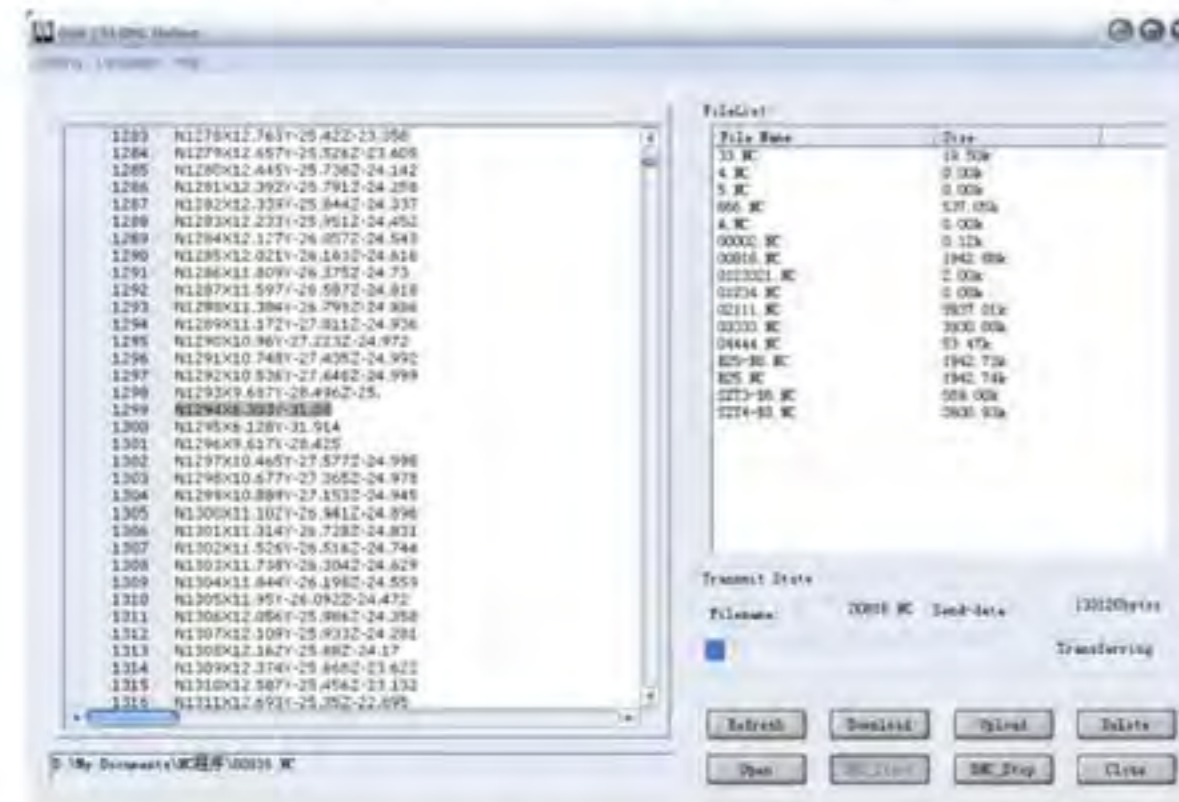


- GSK25i CNC system can realize the program transmission and DNC machining based on TCP/IP network. Compared with the traditional RS232 interface, the network access transmission is more convenient, the speed is faster, and the network is easy to get built.

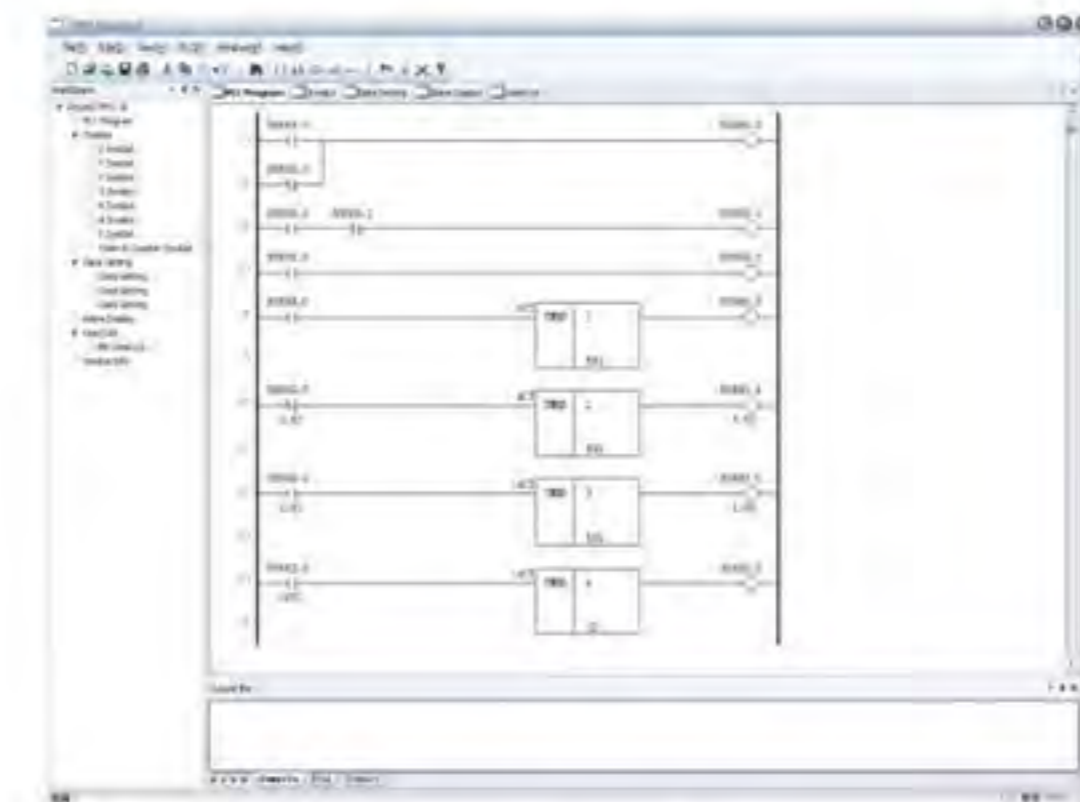


Remote monitor software

- GSK25i CNC system can realize the program transmission and DNC machining based on TCP/IP network. Compared with the traditional RS232 interface, the network access transmission is more convenient, the speed is faster, and the network is easy to get built.

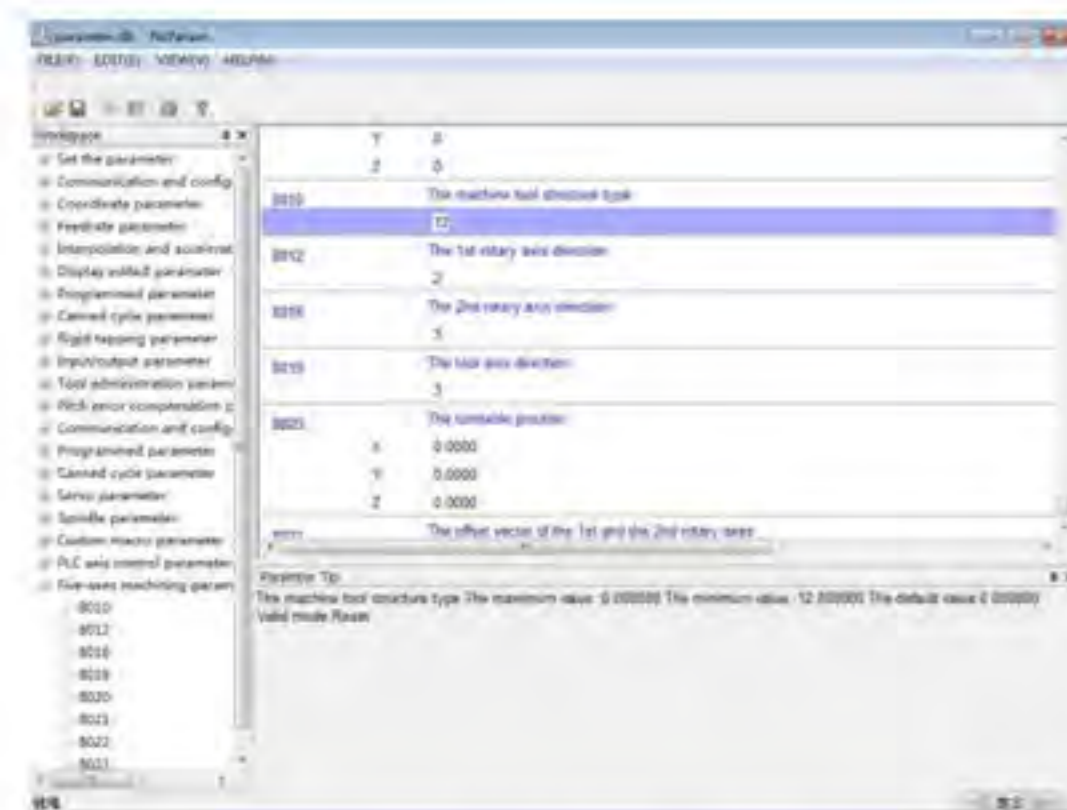


Network on-line transmission software



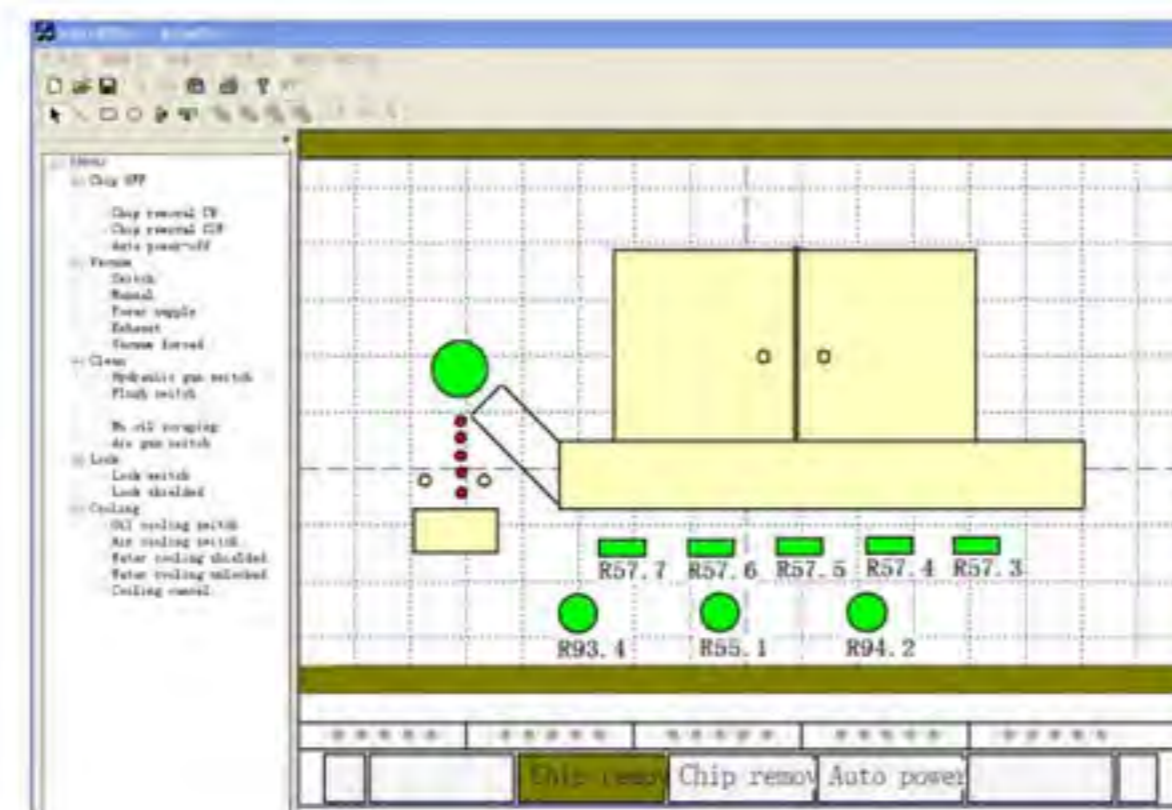
PLC editing software

- The remote debugging can be realized by setting or checking the parameters at PC end with the parameter editing software.



The system parameter editing software

- Design interface on PC with the self-defined interface editing software.



The self-defined interface design software

Five-axes Linkage Application:

GSK25i CNC system five-axes linkage system aims to the complex parts composed of the free form surface and the spatial features, etc and provides RTCP function to guarantee the accuracy control of the tool nose point and the tool axis vector, which avoids the overcutting and less cutting. With the advanced preview speed smooth process function, based on the tool path geometrical features (such as the sharp corner, the large curvature area, the cutter shaft swing violently, etc), the proper switching speed can be calculated in advance, so the auto-adapted acceleration/deceleration smooth control can be realized, and the optimal machining efficiency can be obtained based on the machining quality, which can apply to the multi-axial positioning and the linkage machining in the manufacturing industries, like the aviation, the aerospace, the ship, the source of energy and the automobile, etc.

Five-axes Function

- It supports five-axes RTCP, five-axes positioning machining
- and five-axes MPG insert;
- It supports many five-axes structures, like the tool swing, the workpiece swing, the hybrid and the non-orthogonal structures.



Tool swing structure



Workpiece swing structure



Non-orthogonal structure



Hybrid structure

Five-axes RTCP Tool Axis Fearing Optimization Function

- Eliminate the unnecessary jitter caused by RTCP machining program generated by CAM software, realize the optimization of the fairing of RTCP program, the total matching between the tool nose point and the tool axes and greatly improve the machined curve surface quality.

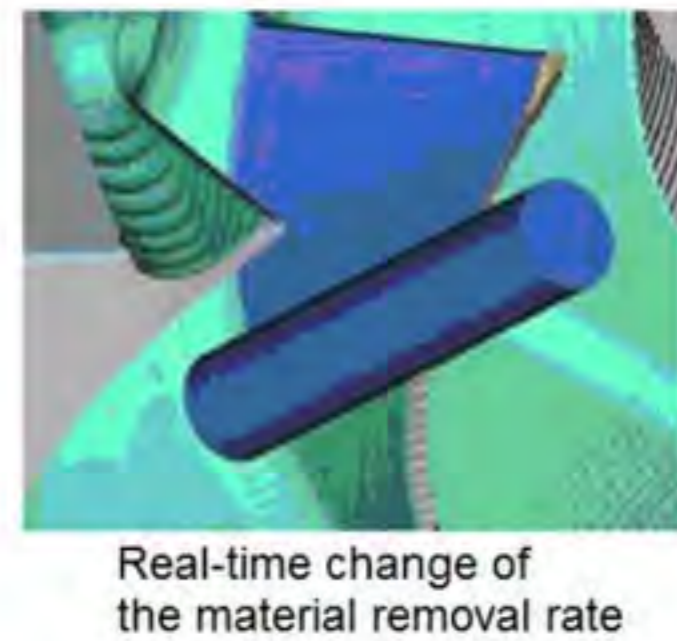
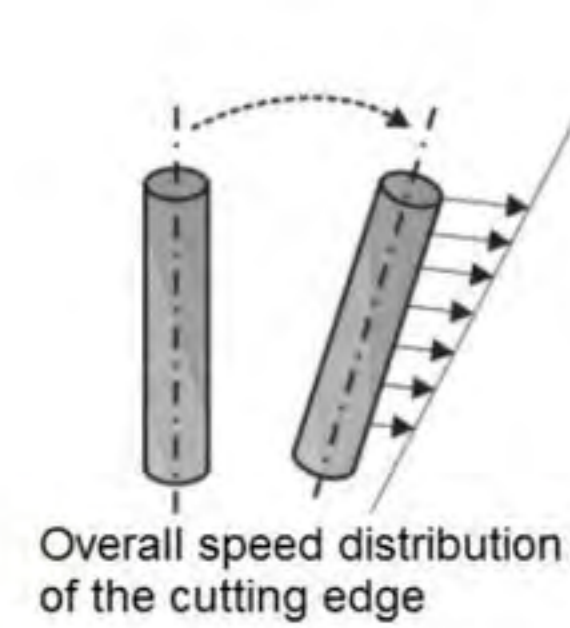


The surface quality with the tool axis fairing optimizing

典型机床应用

The Self-adapted Feedrate Control of Machining the Five-axes Side Edge

- The side edge machining of high efficiency applies to the impeller and the inside wall of the structural parts. Considered about the overall speed distribution of the cutting edge and the real-time change of the material removal rate, the feedrate can be self-adjusted, the cutting peak value can be limited, and the machining dynamic performance can be improved.



Five-axes positioning machining

- The user sets the feature coordinate system only with G codes, which is simple and conveniently, and the system can automatically transform the space coordinate system of the machined parts, position the machining plane with the rotary axis, and execute five-axes positioning for machining, which applies to the part machining of the plane coordinate transformation or that of the space coordinate transformation.



Five-axes positioning machined parts

VMC0656e Five-axes Machining Center

- The six-axes or five-axes linkage, AC axis of the cradle structure, Y1 and Y2 axes are synchronous driven together, the magazine of umbellate form, and the worktable diameter is $\phi 400$, suitable for machining the impeller, the leave tray, the cabinet and the mould.

The machine appearance:



HBC-U150 Five-axes Machining Center

- Five-axes linkage, the turret magazine, the dimension of the worktable is $\phi 150$, the motorized spindle of 24000 revolutions, suitable for machining the small impeller, the artificial skeleton, the false tooth, the mould and the crafts, etc.

The machine picture:



Typical Machine Application

XKH800Z Five-axes Blade Machining Center

- 8-axes and 5-axes linkage, two groups of Z1 and Z2 axes and A1 and A2 axes are synchronously driven, among them, A1 and A2 axes are torque motor, 54Kw motorized spindle, 20 servo magazines, suitable for machining the aero engine and the steamer blade.



XKR40 Five-axes Machining Center

- 6-axes and 5-axes linkage, AC axis of the cradle structure, Y1 and Y2 axes are synchronous driven together, full-closed loop control, the servo magazine, and the worktable diameter is $\phi 400$, suitable for machining the impeller, the leave tray, the cabinet and the mould.

The machine picture:



WN-5V320AC Five-axes Machining Center

- Five-axes linkage, the disc magazine, the dimension of the worktable is $\phi 320$, the spindle with big torque, suitable for machining the materials of high hardness, like tool itself.

The machine picture:



WN-5V320AC machining center

VMC-B50C Five-axes Machining Center

- Five-axes linkage, the hybrid structure, the disc magazine, the worktable dimension is $\phi 500$, the motorized spindle of 24000 revolution spindle, suitable for machining the complex parts of disc type, like the cabinet, the shoe mold and the tyre mould, etc.

The machine picture:



Typical Five-axes Machining Application:



The aeroengine and the steamer blade



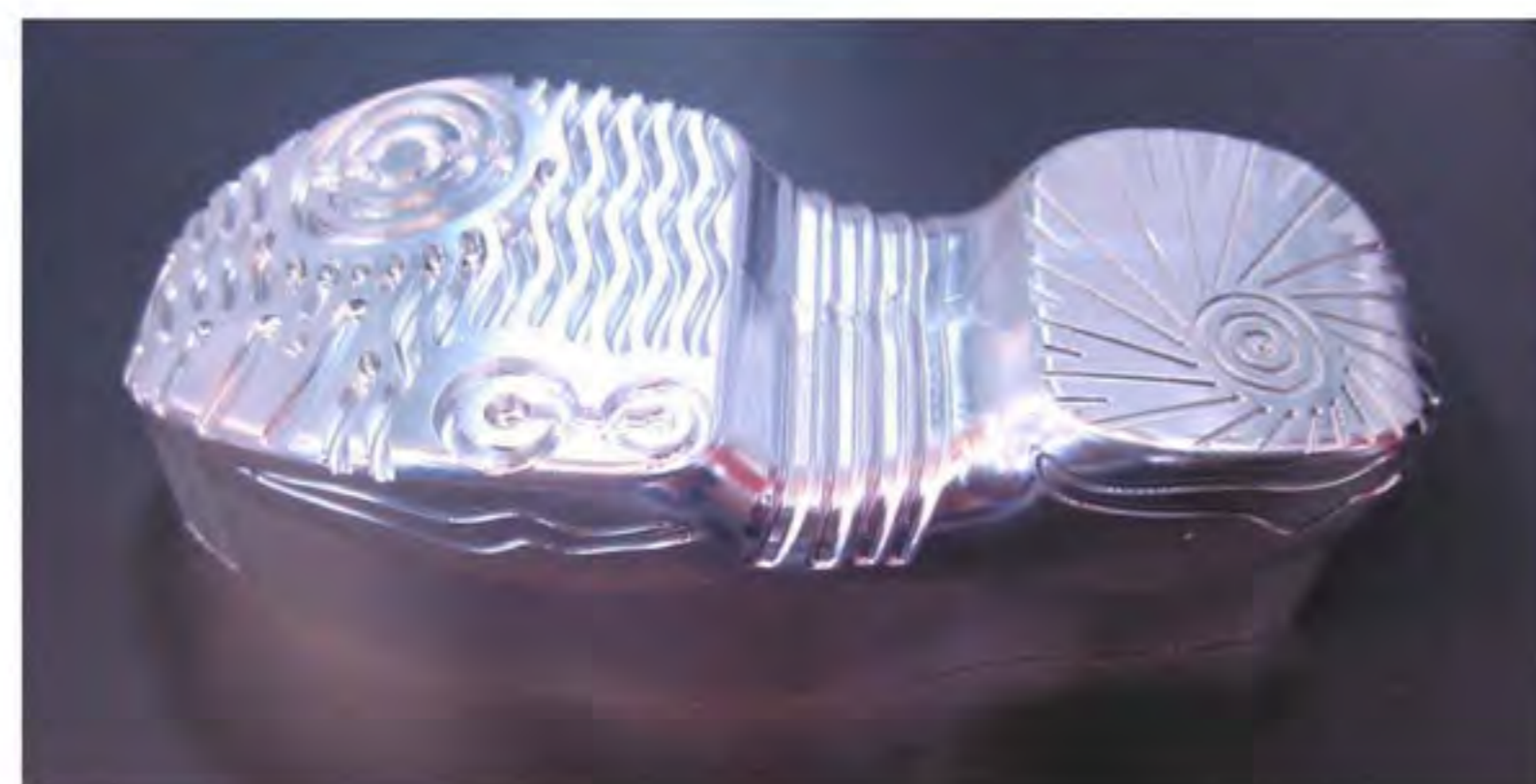
Parts



The supercharger blade



Bits



Mould

Milling Application

High-speed and high-precision curve-face machining



Machining mode	Common mode	G05 mode of high speed and high precision
Feedrate	Two hours and 19 minutes	F5000
Machining time	F5000	57 minutes



Without high-speed & high-precision machining



With high-speed & high-precision machining

Typical Application:



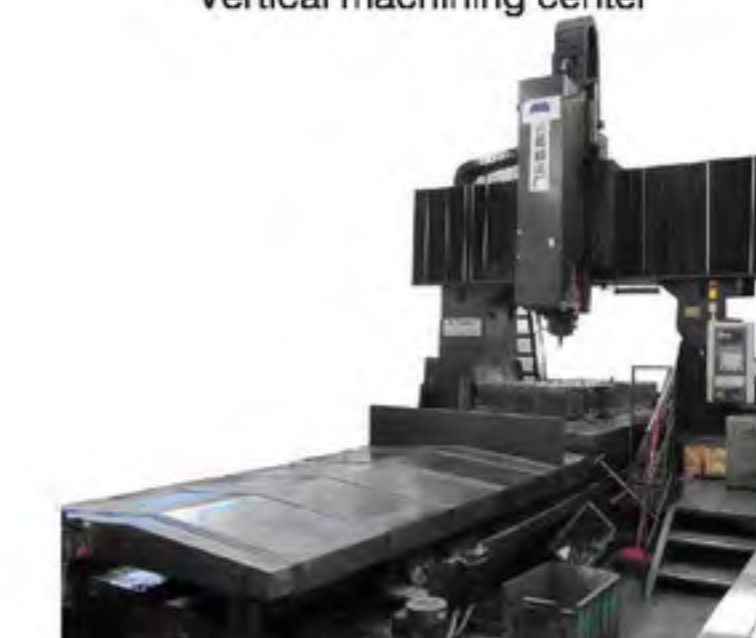
Vertical machining center



Horizontal machining center



CNC boring machine

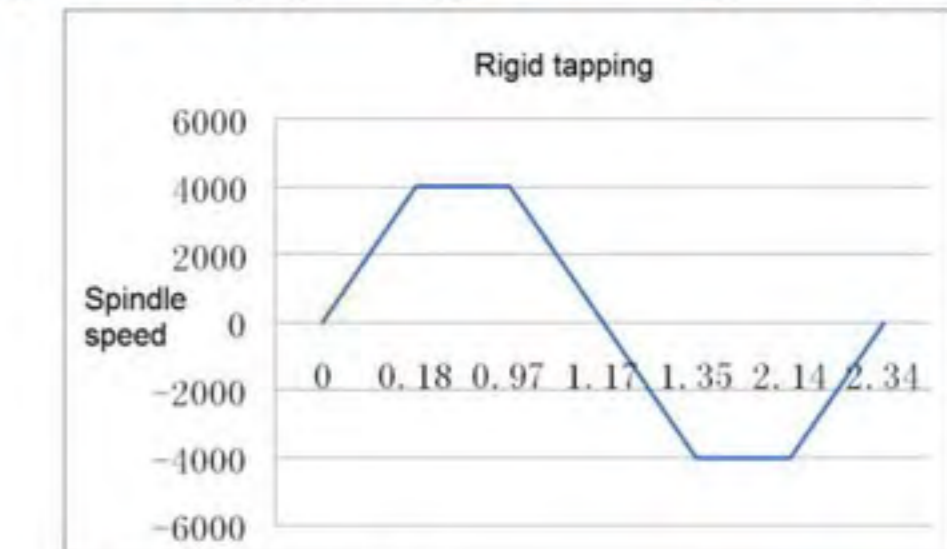


Gantry machining center



Tapping center

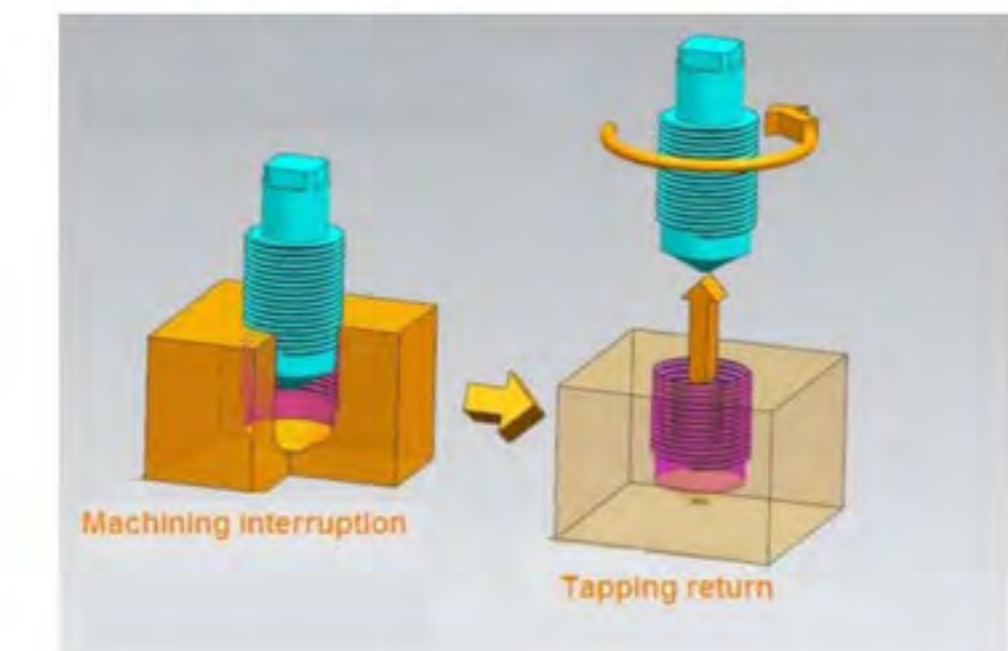
Rigid tapping at high speed



High-speed positioning

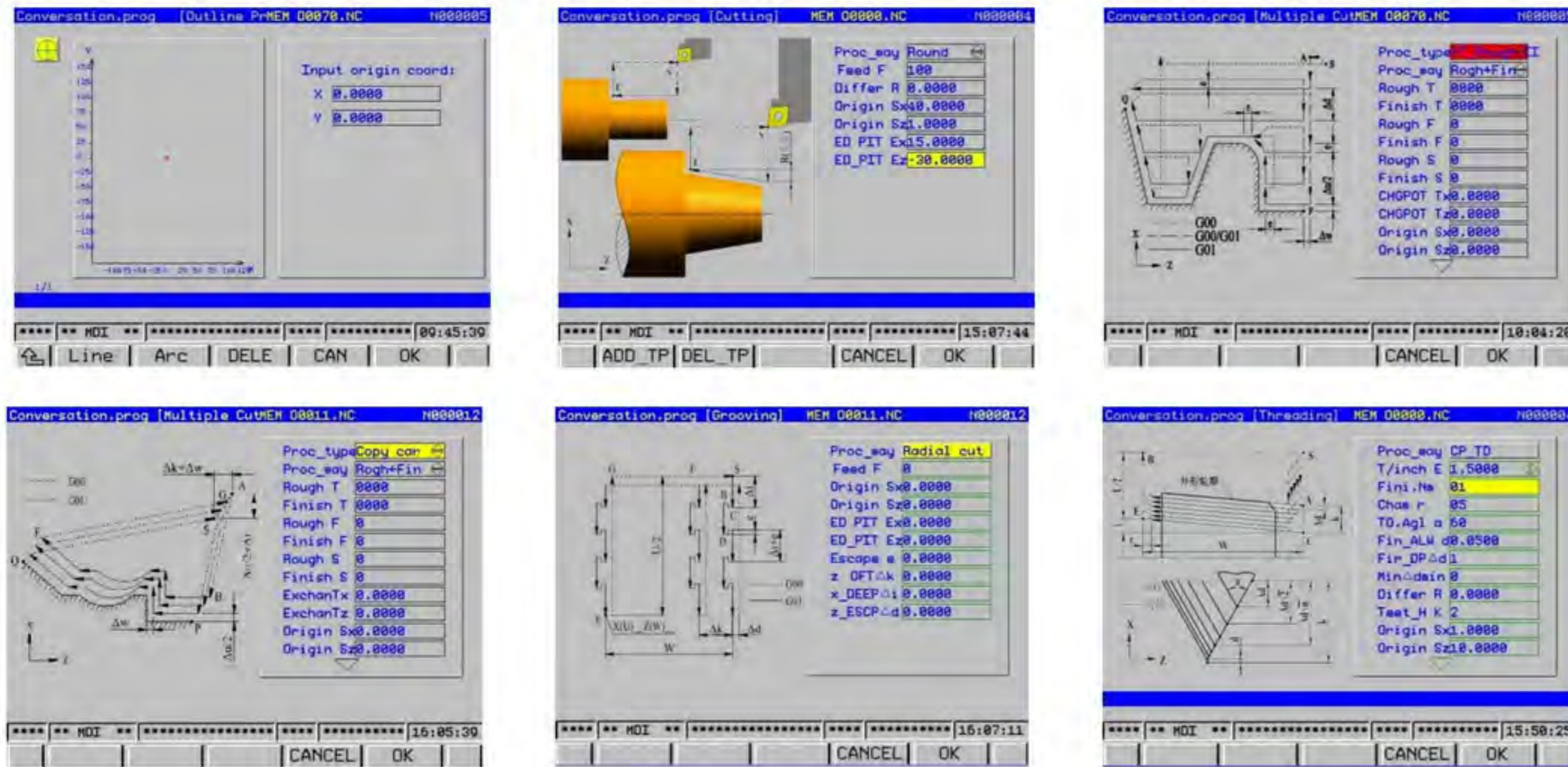


Rigid tapping retraction

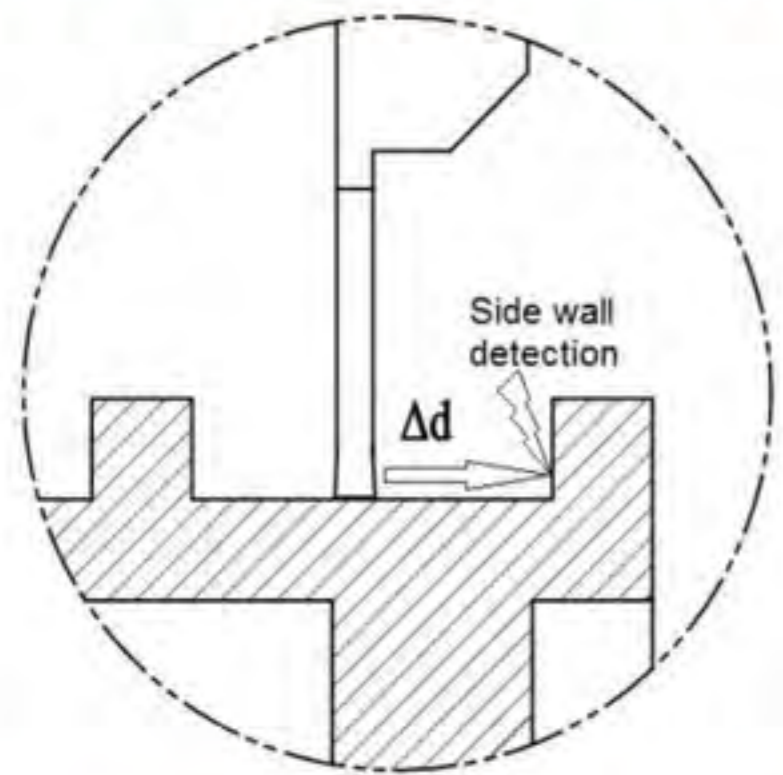


Turning Application

Graph Dialogue Programming



The canned cycle groove side wall anti-collision detection

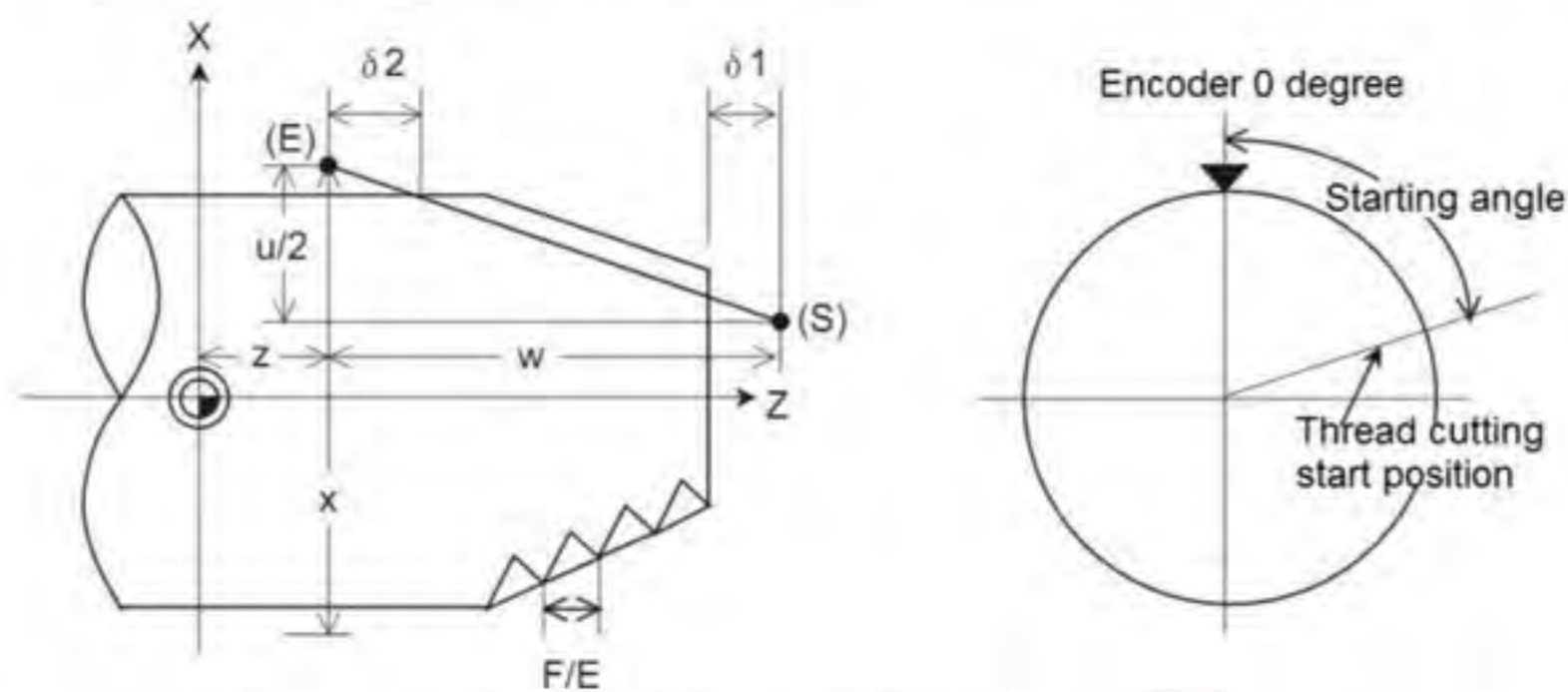


Simplify the programming of turning the multi-step thread of the thread canned cycle.

- The number of threads is input and the system divides the angle automatically.

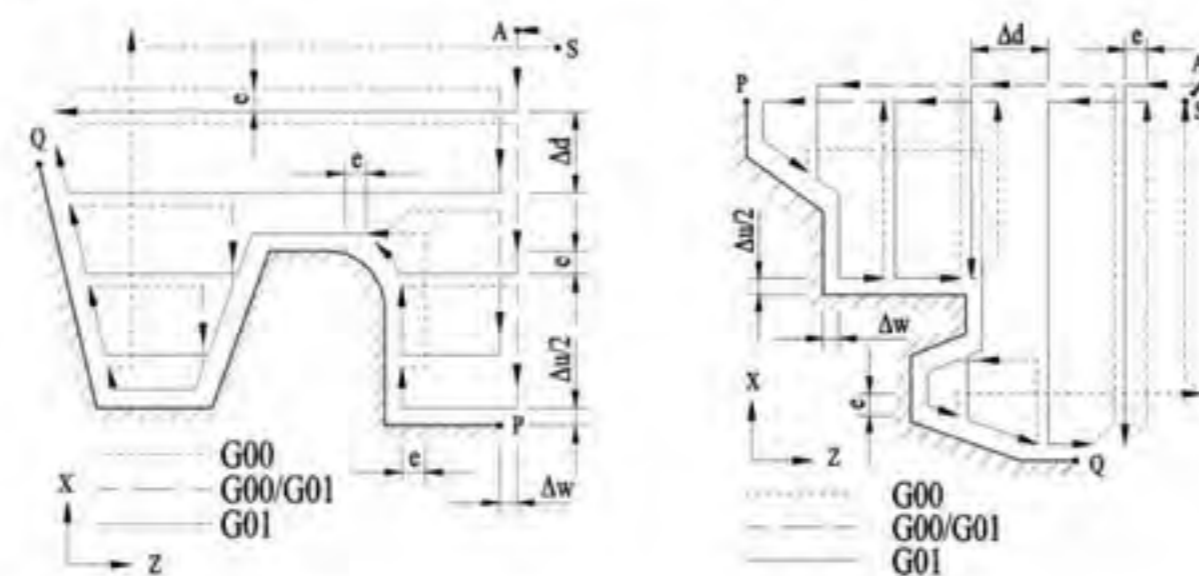


The Specified Thread Cutting Starting Angle



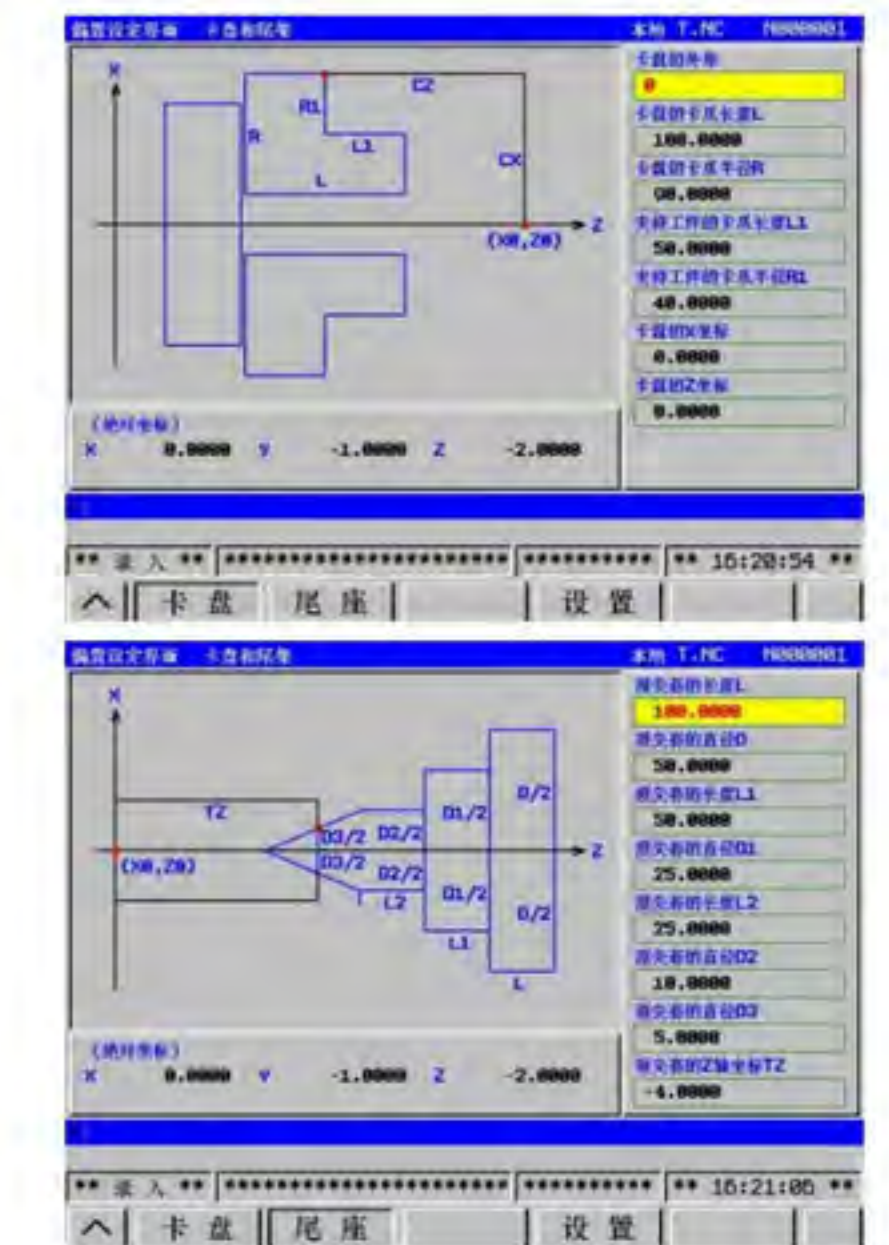
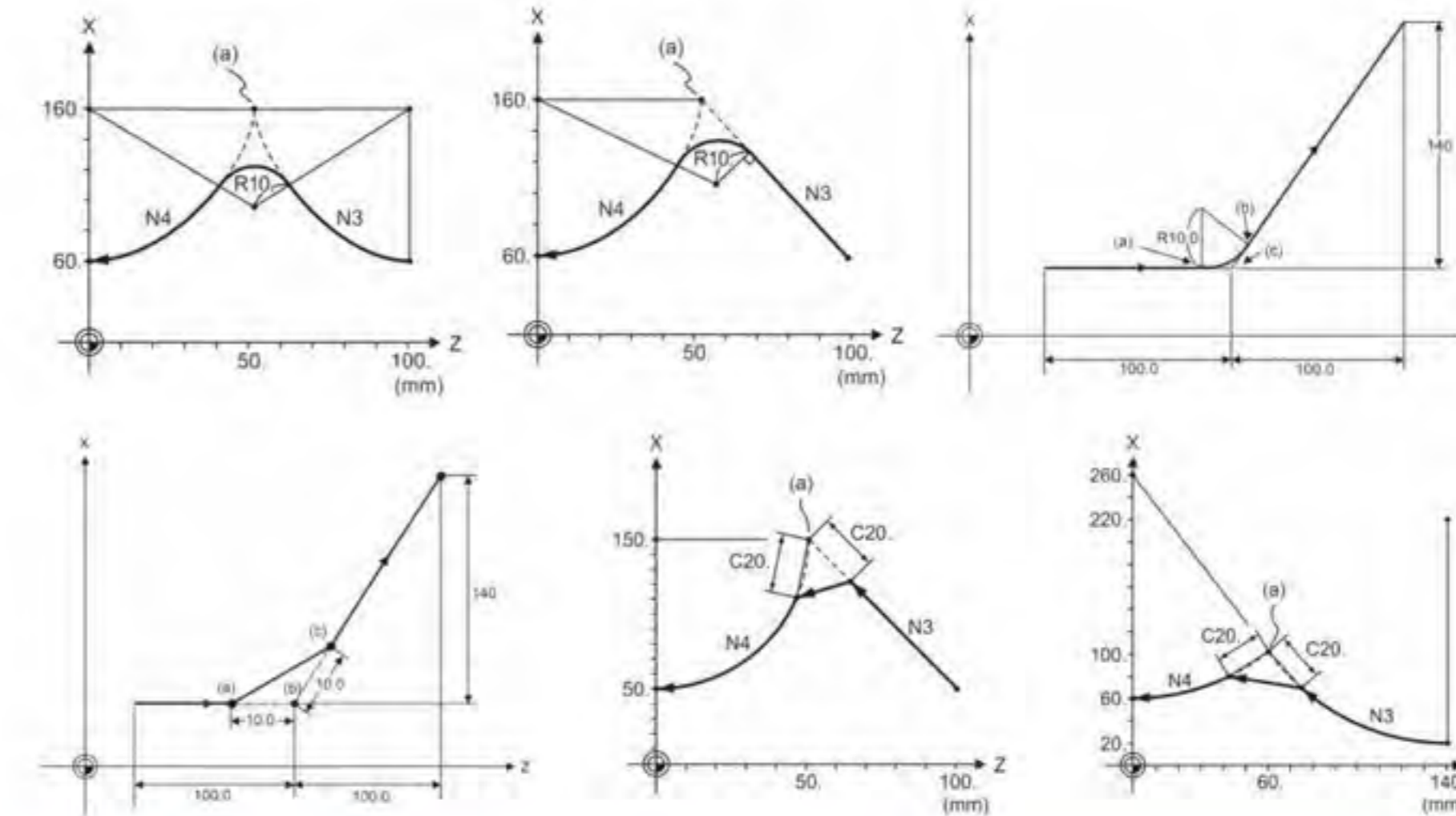
Vertical/horizontal roughing machining cycle

- Support non-monotonic contour



Optional angle chamfering/corner rounding Chuck tailstock barrier

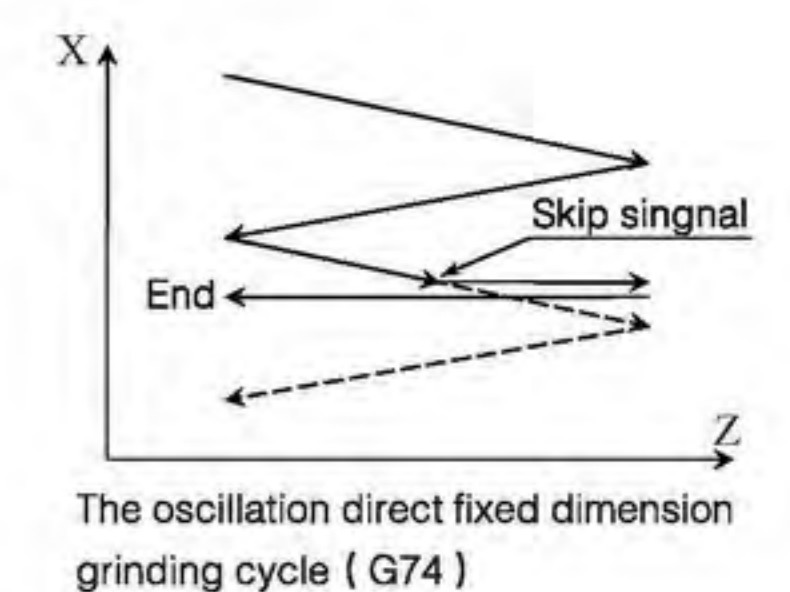
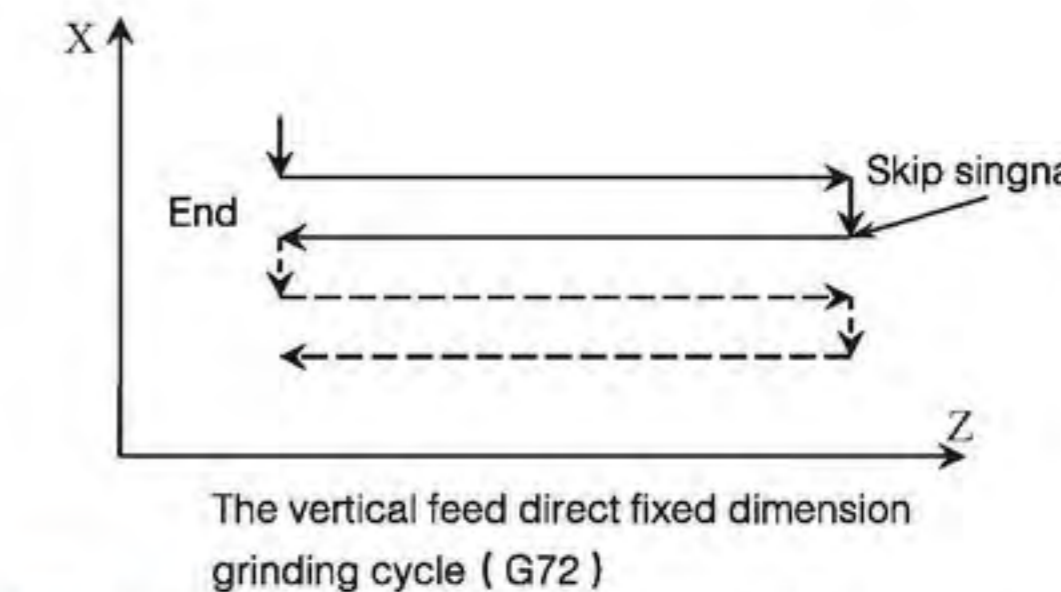
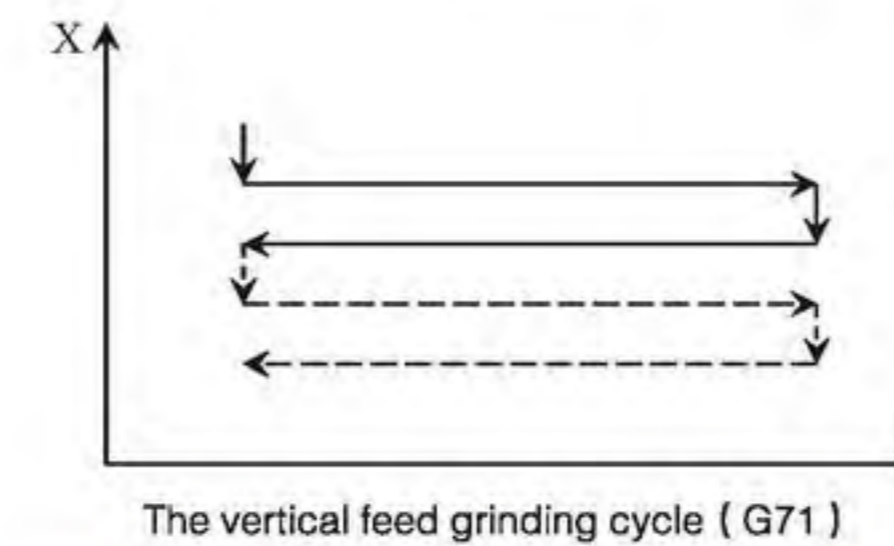
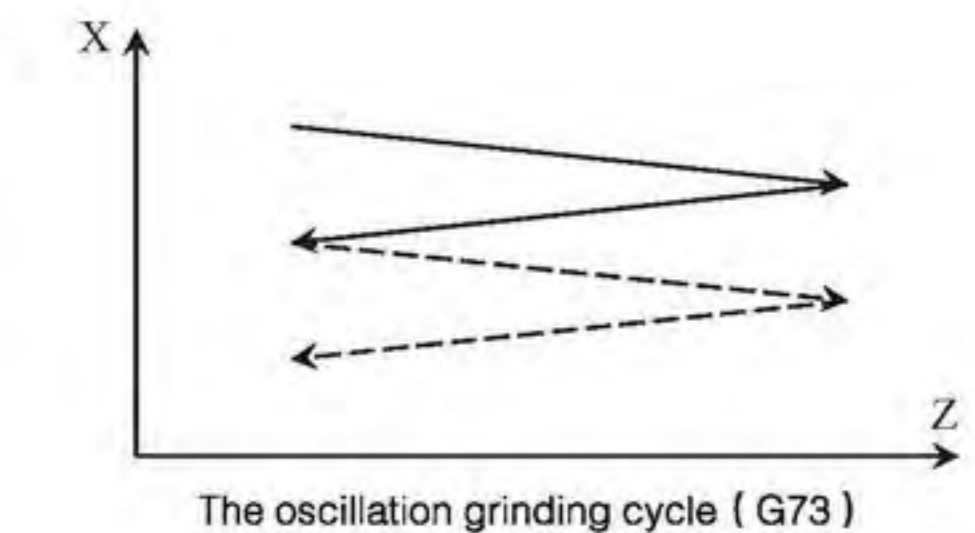
- Programming can be executed with the chamfering value or the corner R value on the drawing, and chamfering or corner R command can be inserted between the



Grinding Application

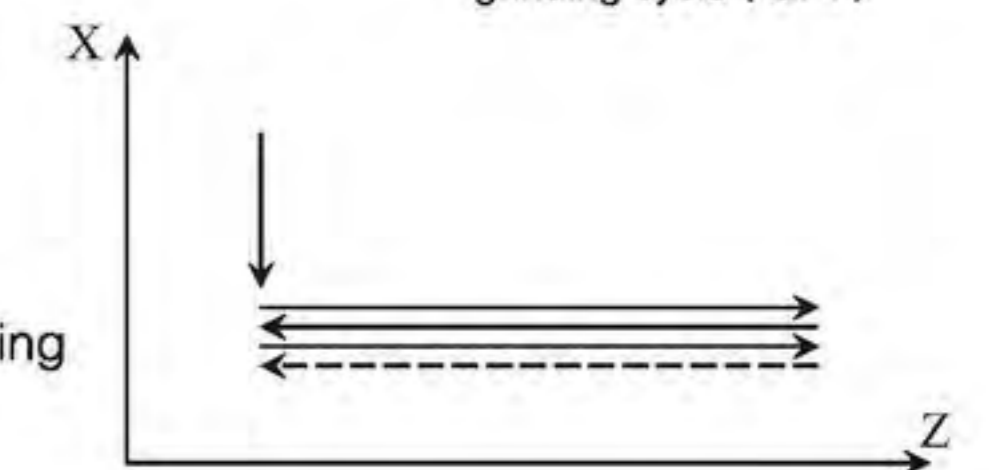
The grinding canned cycle

- The vertical feed grinding cycle (G71)
- The vertical feed direct fixed dimension grinding cycle (G72)
- The oscillation grinding cycle (G73)
- The oscillation direct fixed dimension grinding cycle (G74)
- The plunge grinding cycle (G75)
- The plunge direct constant dimension grinding cycle (G77)
- The continuous feeding surface grinding cycle (G78)
- The intermittent feeding surface grinding cycle (G79)
- The horizontal feeding control (G160, G161)



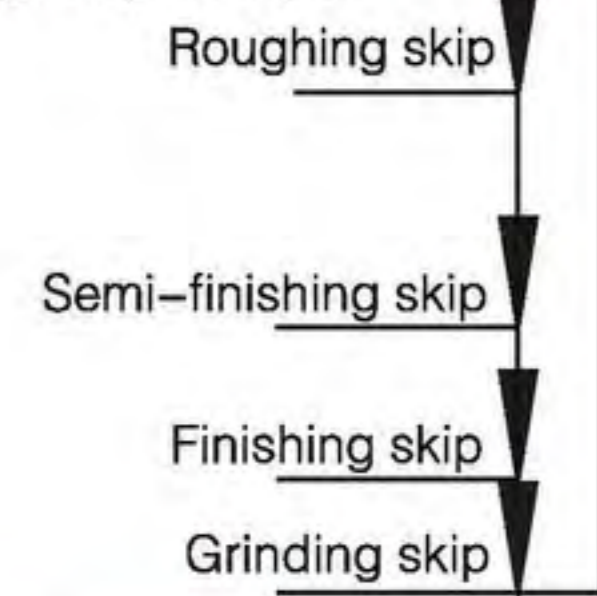
The Asynchronous Oscillation Grinding (G101)

- The asynchronous oscillation axis is oscillated at the given feedrate between two direction change points, and the oscillation and the feeding of the other axes don't have the interpolation relation.



Multi-step Skip

In the blocks specified by G31 P1 ~ G31 P4 commands, the distance to go can be skipped after the multi-step skip signals (four skip signals) are input.



Typical Application Modal

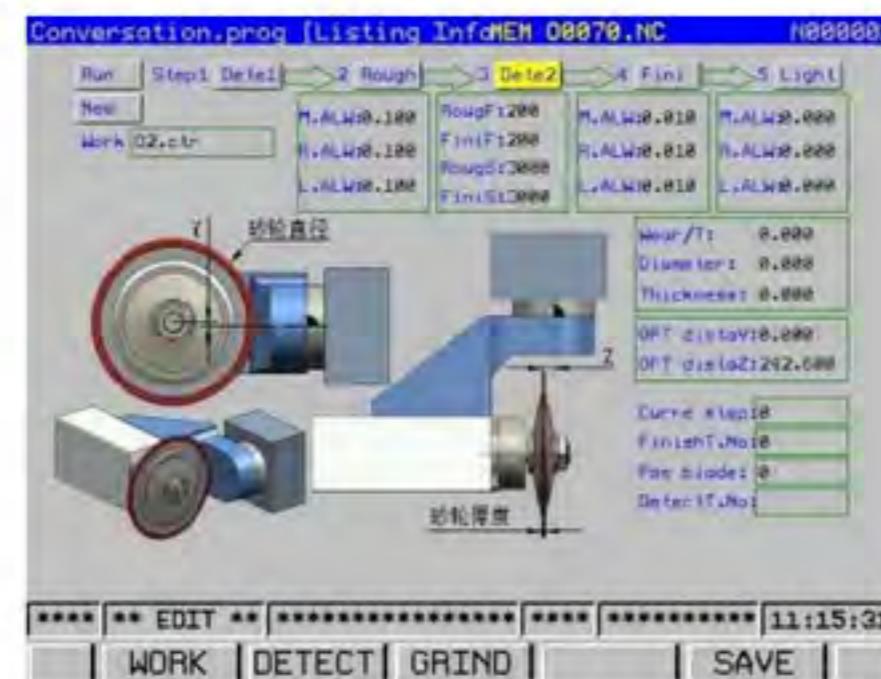
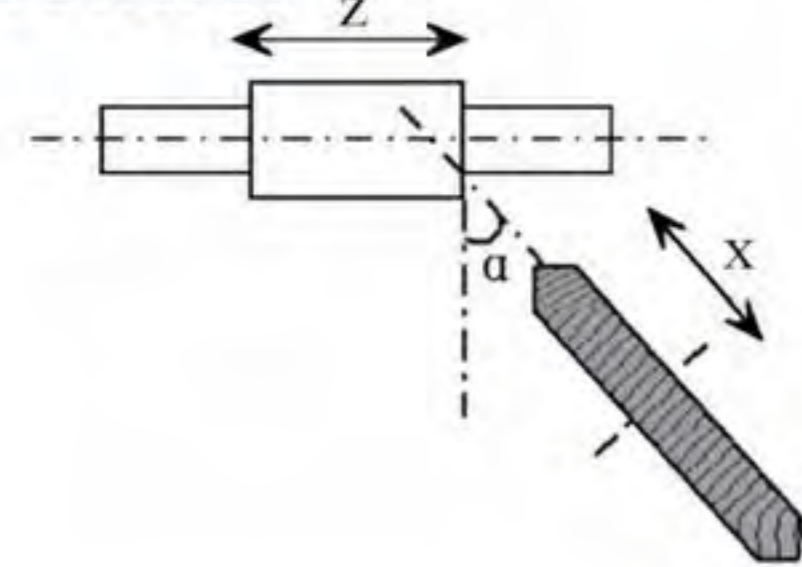


Slideway grinding machine

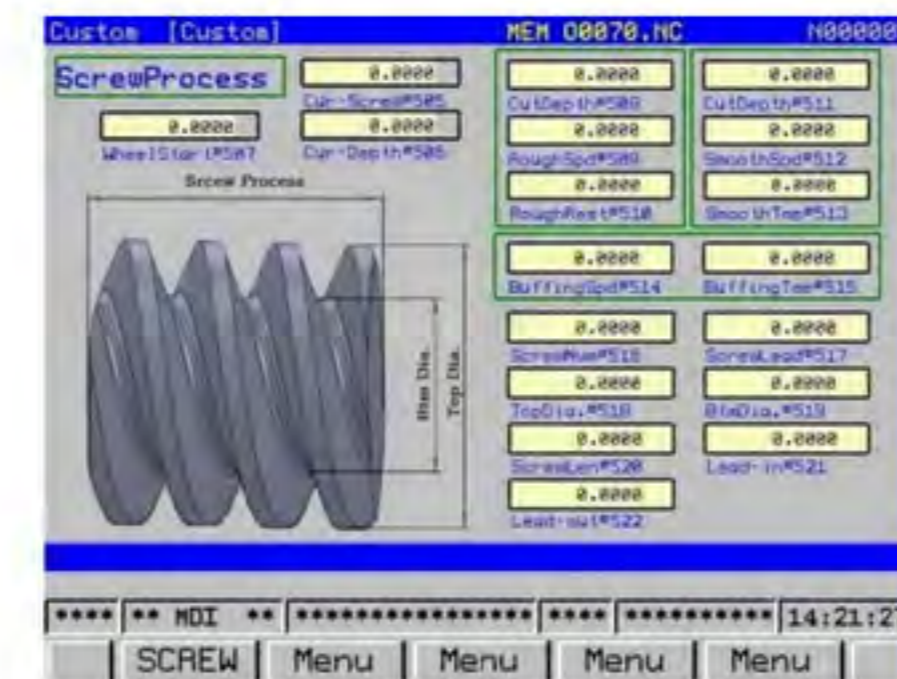


Cylindrical grinding machine

The Inclined Axis Control



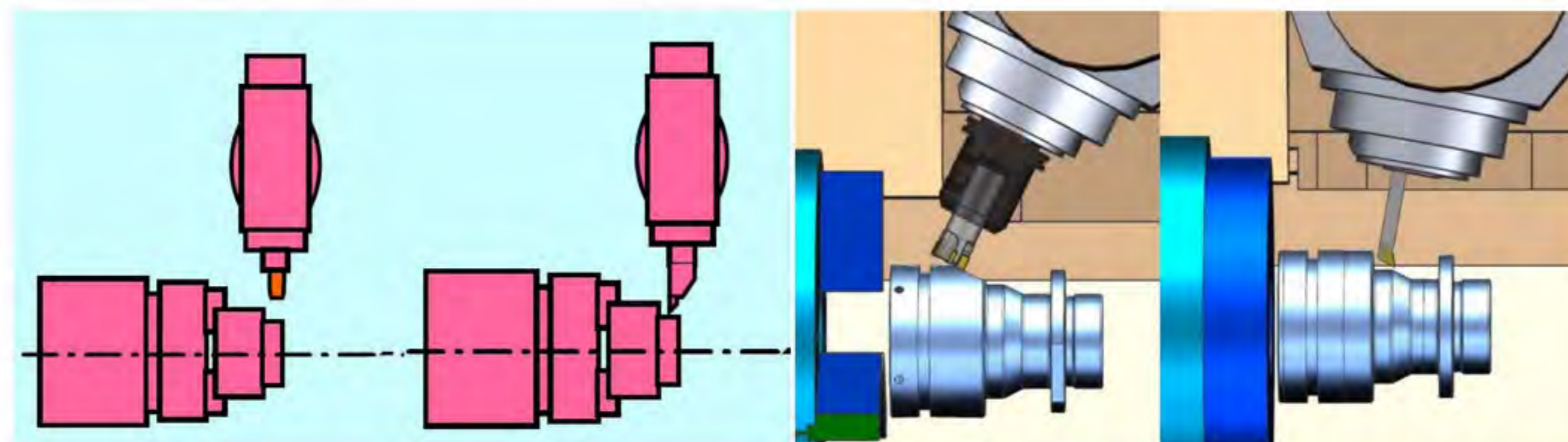
Tool grinding machine



Thread grinding machine

Compound Machining Application:

- In one system, the milling and turning systems can be free switched by M codes.



Milling system

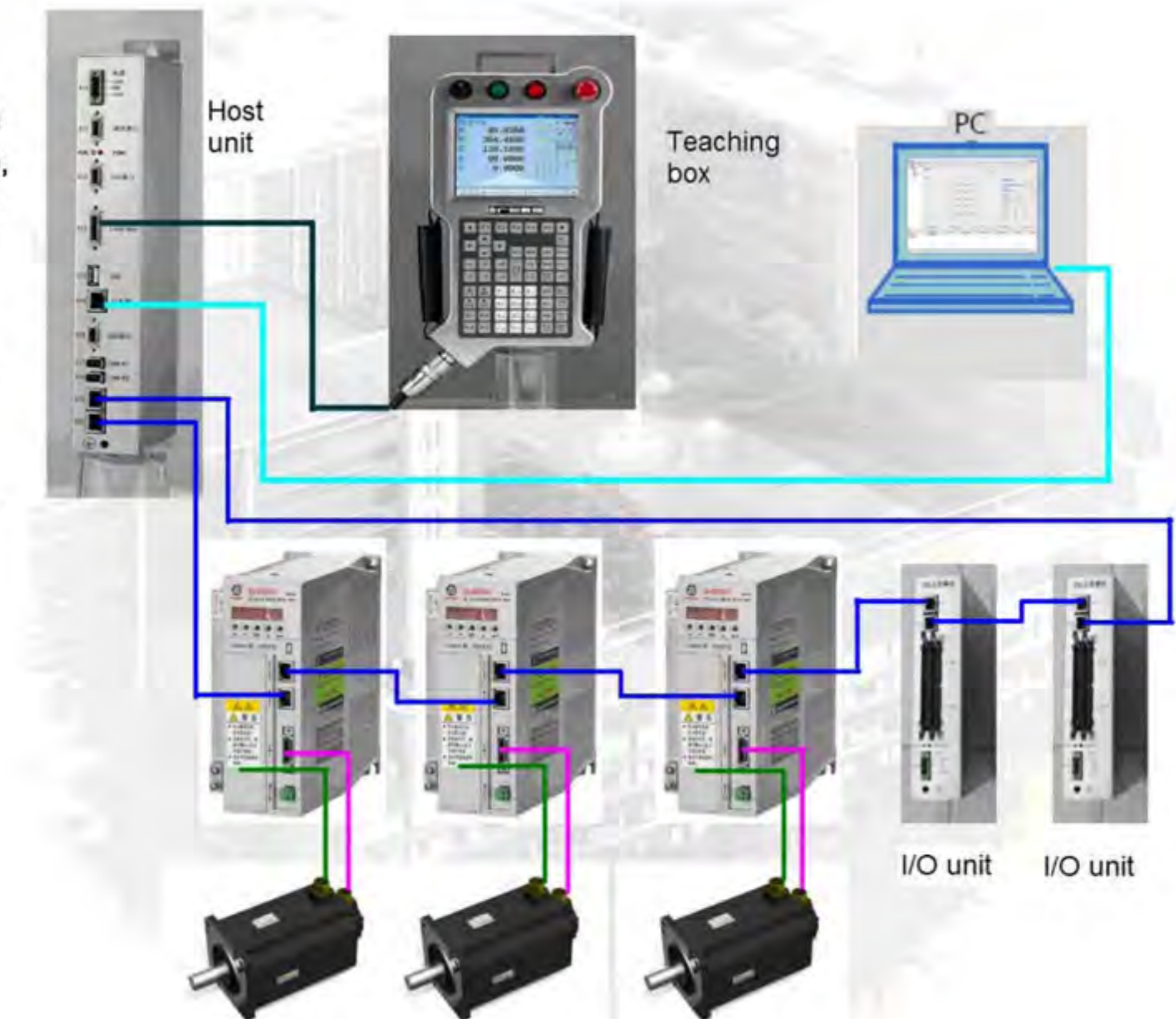
Turning system

Milling machining

Turning machining

Application of the Truss Robot

GSK25iRa controller adopts the interpolation arithmetic based on the Cartesian coordinate system and G code program and supports the custom macro, subprogram and teaching programming. And GSK25i CNC system is with the powerful PLC control and I/O extension capacities and the interface is with secondary development function, which can be widely used in the industrial automatic area, and the typical application is truss robots in the fields of the transportation, paint coating and storage, etc.



Composition of the truss robot system

- High speed, high efficiency**
The positioning speed can reach maximum 200m/min, and the acceleration rate can be more than 1g.
- Position switch**
32-point position switch is used to set the safety area and the forbidden area or used to start, stop the external operation.
- All limited rate**
When the external signal is triggered, the axis is executed at the safe speed set by the parameter, and it is used for the speed control in some specific area.
- The software limit control of many modes**
Except for the basic software limit function, it is also with the function of switching the software limit position by the external signal, which is used for anti-collision when two robots are moved into the cross area.



车削及磨削应用

25i system specification

No.	Name	Specification
Axis control function		
1	Number of controlled channels	Dual-channel
2	Maximum control axis number	8 feeding axes and 3 servo spindles
3	Linkage axis number	Three-axes linkage
		Four-axes linkage
		Five-axes linkage
4	PLC axis controlled axis number	Maximum 8 axes
5	Feeding axis synchronous control	Maximum 4 groups
6	Position detection device	Pulse encoder (absolute type), grating ruler (absolute type)
7	Least command increment	Least command increment IS-B 0.001mm 0.0001inch 0.001°
		Least command increment IS-C 0.0001mm 0.00001inch 0.0001°
8	Least detection increment	Least command increment IS-B 0.001mm 0.0001inch 0.001°
		Least command increment IS-C 0.0001mm 0.00001inch 0.0001°
9	Maximum command value	± 999999.9999mm ± 99999.9999inch ± 999999.9999°
10	Maximum feedrate	Maximum feedrate 200m/min
11	Automatic acceleration/Deceleration	Linear before interpolation, S curve acceleration/deceleration, jerk control
12	High-speed, high-precision machining	G05 high-speed small segment preview control, the path smooth process and the quantity of preview control and pre-reading blocks can reach 1000.
Five-axes control function		
1	RTCP function	The tool center point control G43.4
2	The inclined plane machining	Five-axes positioning (3+2) machining G68.2
3	Five-axes manual feeding	The tool axial direction, the tool axial right-angle direction, manual feeding at the tool center point rotation direction
Programming function		
1	Program format	ISO command standard, program name: 0+four digits, block number N+5 digits, G+3 digits, the coordinate value Ip ± six digits before the decimal point and four digits after the decimal point, S+5 digits, T+3 digits, M+3 digits, F + six digits before the decimal point and four digits after the decimal point
2	Interpolation function	Positioning, linear interpolation, arc interpolation, helical interpolation, cone interpolation, cylindrical surface interpolation, polar coordinate and spline curve interpolation
3	Workpiece coordinate system	The basic coordinate systems G52 ~ G59, the additional extension coordinate system (G54.1) 48 groups
4	Tool compensation	Cutter compensation function, tool compensation of 400 groups
5	Programming function	total more 100 G commands, including 12 common canned cycles, 19 special canned cycles and the combined cycles, plane milling, coordinate system rotation, scaling, mirror image, automatic measuring the tool length, tool center point control, the inclined plane machining command, 4 levels of the subprogram calling, the custom macro of B types
6	Program memory	The program memory capacity is 480M and the program memory quantity is 400.
7	Reference position function	G27 reference position return check; G28 reference position return; G29 return from the reference position; G30 return into the 2nd, the 3rd or the 4th reference position.
8	Skip function	G31 skip function for measuring the tool and the workpiece
9	Programmable control function	Programmable stroke limit (G22, G23) , programmable data input (G10)
Operation function and display function		
1	Operation mode selection	Auto, MDI, Edit, Manual, MPG, zero return, DNC
2	Switch operation	Single block, block skip, machine locked, M.S.T locked, optional stop, dry run, restart, emergency stop, overtravel release, cycle start, feed hold, manual continuous feeding, single step feeding, rapid feeding, rigid tapping retraction, MPG, spindle override, feedrate override, rapid override
3	Setting operation	The tool length compensation measuring input, the workpiece offset measuring input, the parameter setting help, the servo parameters set
4	Program operation	Create, edit, delete, rename, search, copy, paste, read-in, send, backstage edit, dynamic graph simulation

No.	Name	Specification																
Operation function and display function																		
5	Help function	The alarm information explanation, operation introduction, parameter introduction, macro introduction, G code command introduction, PLC address introduction, the calculator																
6	Display	10.4*800 × 600, 8.4*640 × 480 LCD monitor, display in Chinese and English, the status display, the dynamic graph, the clock, the machining time, the operation time, the number of the machined work pieces, the mould information, the actual speed, the versions of the hardware and the software, the ladder diagram, the alarm information, the diagnosis information, the alarm history, the operation history record																
Miscellaneous function																		
1	M function	The code of M3 digits, multiple M code commands, M code calling macro and the subprogram																
2	T function	T3 digits, tool lifetime management																
3	S function	Digit spindle, analog spindle interface Δ DV analog voltage output, spindle speed specified by S5 digits, multiple spindle control, Cs spindle, spindle positioning, M and T types gear change, floating tapping, rigid tapping, spindle override, spindle speed fluctuation detection																
Precision compensation function																		
1	Backlash compensation	Rapid feeding and cutting feeding are compensated respectively																
2	Screw pitch compensation	The uni-directional and dual-directional pitch error compensation of interpolation type																
Communication and data input/output interface function																		
1	Data interface function	The interface of the Ethernet, USB or RS232 is preset, the data transmission, DNC and the network function can be realized with the interface.																
2	Data input/output	The program, NC parameters, the compensation value, the offset value, the macro variable value, PLC program, PLC parameter can be input/output with the data interface, and DNC can be realized with the Ethernet or USB interface.																
3	Network function	The Ethernet communication, the network DNC, the remote monitor, diagnosis and maintenance																
4	I/O interface	Connection terminal type I/O DI/DO:64/48																
		Winding displacement plug-in type I/O DI/DO: 48/32 (2 groups 24/16)																
		Winding displacement plug-in type analog I/O DI/DO: 24/16 AI/AO: 2 routes/2 routes, 12 bits DA Δ DV																
5	Servo drive interface	GSK-Link Ethernet bus interface																
6	External position detection unit interface (full-closed loop)	Adapted with Heidenhain absolute grating ruler, the angle encoder, Endat2.2 protocol, adapted with Fagor absolute grating ruler, the angle encoder, FreeDat protocol																
PLC function																		
1	PLC specification	<p>The internal PLC, the ladder diagram programming, the command list programming compatible format, 10 basic commands, 49 function commands</p> <p>Two-level program, the 1st level program scanned period is 8ms, the basic command execution time is 0.5us/step, the number of the maximum program steps is 12000 and the ladder diagram can be on-line dynamic displayed, edited, uploaded and downloaded.</p> <table border="1"> <tr> <td>Intermediate relay (R)</td> <td>1100 bytes (from R0 to R1099)</td> </tr> <tr> <td>Data register (D)</td> <td>1860 bytes (from D0 to D1859)</td> </tr> <tr> <td>The counter (C)</td> <td>400 bytes (from C0 to C399) 100 bytes</td> </tr> <tr> <td>The timer (T)</td> <td>200 bytes (from T0 to T199) 100 bytes</td> </tr> <tr> <td>The information display request signal (A)</td> <td>32 bytes(from A0 to A31)</td> </tr> <tr> <td>The non-volatile relay (K)</td> <td>32 bytes(from K0 to K31)</td> </tr> <tr> <td>Skip label number (L)</td> <td>9999 (L1 ~ L9999)</td> </tr> <tr> <td>Subprogram label number (P)</td> <td>512 (P1 ~ P512)</td> </tr> </table>	Intermediate relay (R)	1100 bytes (from R0 to R1099)	Data register (D)	1860 bytes (from D0 to D1859)	The counter (C)	400 bytes (from C0 to C399) 100 bytes	The timer (T)	200 bytes (from T0 to T199) 100 bytes	The information display request signal (A)	32 bytes(from A0 to A31)	The non-volatile relay (K)	32 bytes(from K0 to K31)	Skip label number (L)	9999 (L1 ~ L9999)	Subprogram label number (P)	512 (P1 ~ P512)
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Skip label number (L)	9999 (L1 ~ L9999)																	
Subprogram label number (P)	512 (P1 ~ P512)																	
2	Safety function	Emergency stop, hardware limit, the 1st software limit, the 1st software limit II , the 2nd software limit, the multi-level authority data protection, the spindle safe speed, the safe feedrate, NC alarm, PLC alarm, the servo alarm and the following error monitor, the servo cut-off, the interlocked.																
3	Maintenance function	The operation record, the alarm record, the machining record, CNC running status diagnosis, PLC interface diagnosis, CNC and PLC data backup restore, the speed waveform diagnosis, the network diagnosis maintenance, the servo setting and the servo load and the status monitor and diagnosis.																



G code list

G code	Function
G00	Positioning
G01	Linear interpolation
G02	Arc interpolation / helical interpolation CW
G03	Arc interpolation / helical interpolation CCW
G04	Dwell
G05	High speed & high precision contour control
G06.2	NURBS interpolation
G07.1	Cylindrical interpolation
G09	Exact stop
G10	Input the programmable data
G11	Cancel the programmable data input mode
G15	Cancel the polar coordinate command
G16	Polar coordinate command
G17	Select XpYp plane
G18	Select ZpXp plane
G19	Select YpZp plane
G20	Inch input
G21	mm input
G22	Stored stroke detection function ON
G23	Stored stroke detection function OFF
G27	Reference position return detection
G28	Reference position return
G29	Return from the reference position
G30	Return to the 2nd, the 3rd and the 4th reference position
G31	Skip function
G37	Tool length automatic measure
G40	Cutter compensation cancel
G41	Cutter compensation left
G42	Cutter compensation right
G43	Positive tool length compensation
G43.4	Tool center point control
G44	Negative tool length compensation
G45	Increase the tool offset value
G46	Reduce the tool offset value
G47	Tool offset value of two times
G48	Tool offset value of 1/2 time
G49	Cancel tool length compensation
G50	Scaling cancel
G51	Scaling valid
G50.1	Cancel programmable mirror image
G51.1	Programmable mirror image valid
G52	Set the local coordinate system
G53	Select the machine coordinate system
G54	Select the workpiece coordinate system 1
G54.1	Select the additional workpiece coordinate system
G55	Select the workpiece coordinate system 2
G56	Select the workpiece coordinate system 3
G57	Select the workpiece coordinate system 4
G58	Select the workpiece coordinate system 5
G59	Select the workpiece coordinate system 6
G60	Uni-directional positioning

G code	Function
G61	Exact stop mode
G62	Automatic corner override
G63	Tapping mode
G64	Cutting mode
G65	Macro single calling
G66	Macro modal calling
G67	Cancel the macro modal calling
G68	Coordinate system rotation
G68.2	Select the feature coordinate system
G69	Cancel the coordinate system rotation
G73	High speed peck drilling cycle
G74	Left-handed tapping cycle
G76	Finish boring cycle
G80	Cancel the canned cycle
G81	Drilling cycle, counter boring cycle
G82	Drilling cycle or counter boring cycle
G83	Peck drilling cycle
G84	Right-handed tapping cycle
G85	Boring cycle
G86	Boring cycle
G87	Counter boring cycle
G88	Boring cycle
G89	Boring cycle
G90	Absolute programming
G91	Incremental programming
G92	Set the workpiece coordinate system
G94	Feeding per minute
G95	Feeding per revolution
G98	Canned cycle return to the initial point
G99	Canned cycle return to point R
G110	CCW circle groove roughing
G111	CW circle groove roughing
G112	CCW full circle finishing cycle
G113	CW full circle finishing cycle
G116	CCW excircle finishing cycle
G117	CW excircle finishing cycle
G130	CCW rectangle groove roughing
G131	CW rectangle groove roughing
G132	CCW rectangle groove finishing cycle
G133	CW rectangle groove finishing cycle
G136	CCW finishing cycle outside of the rectangle
G137	CW rectangle finishing cycle outside of the rectangle
G120	Circumference hole cycle
G121	Angle linear hole cycle
G122	Arc hole cycle
G123	Chess board hole cycle
G124	Rectangle CW drilling
G125	Rectangle CCW drilling
G126	Milling back and forth
G127	Uni-directional plane milling

List of G code function for turning system

G code	Function
G02	Arc interpolation/helical interpolation CW
G03	Arc interpolation/helical interpolation CCW
G04	Dwell
G07.1	Cylindrical interpolation
G10	Programmable data input
G11	Cancel the programmable data input mode
G12.1	Polar coordinate command
G13.1	Cancel the polar coordinate
G17	Select XpYp plane
G18	Select ZpXp plane
G19	Select YpZp plane
G20	Inch input
G21	mm input
G22	Stored stroke check function ON
G23	Stored stroke check function OFF
G25	Spindle speed fluctuation detection OFF
G26	Spindle speed fluctuation detection ON
G27	Reference position return detection
G28	Reference position return
G29	Return from the reference position
G30	Return to the 2nd, the 3rd or the 4th reference position
G31	Skip function
G32	Thread cutting
G34	Variable-lead thread cutting
G37	Tool length automatic measuring
G40	Cutter compensation cancel
G41	Left cutter compensation
G42	Right cutter compensation
G50	Set the coordinate system or the maximum speed
G50.3	Preset the workpiece coordinate system
G50.2	Cancel the polygonal turning
G51.2	Polygonal turning

G code	Function
G54	Select the workpiece coordinate system 1
G54.1	Select the additional workpiece coordinate system
G55	Select the workpiece coordinate system 2
G56	Select the workpiece coordinate system 3
G57	Select the workpiece coordinate system 4
G58	Select the workpiece coordinate system 5
G59	Select the workpiece coordinate system 6
G65	Macro single calling
G66	Macro modal calling
G67	Cancel the macro modal calling
G70	Finishing cycle
G71	Axial roughing cycle
G72	Radial roughing cycle
G73	Turning cycle of simulating the shape
G74	End face groove cycle
G75	Excircle groove cycle
G76	Multi-step thread cutting cycle
G80	Cancel canned cycle
G83	Drilling cycle
G84	Tapping cycle
G85	Front boring cycle
G87	Side drilling cycle
G88	Side tapping cycle
G89	Side boring cycle
G90	Inner/outer diameter turning single cycle
G92	Thread cutting single cycle
G94	End face turning single cycle
G96	Constant linear speed
G97	Number of revolution per minute
G98	Feeding per minute
G99	Feeding per revolution

List of G code function for turning system

G code	Function
G71	Vertical feed grinding cycle
G72	Vertical feed direct dimension grinding cycle
G75	The plunge grinding cycle
G78	Continuous feeding surface grinding cycle
G101	Asynchronous oscillation grinding cycle

G code	Function
G73	Oscillation grinding cycle
G74	Oscillation direct dimension grinding cycle
G77	The plunge direct constant dimension grinding cycle
G79	Intermittent feeding surface grinding cycle
G160, G161	Horizontal feeding control

