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GSK25i CNC Milling System

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Product introduction

- GSK25i is a high-performance CNC system characterized by its powerful functions and simple operation. It is applicable to the multi-function machining centers, boring machines, milling machines and drilling machines with 3~5 axis linkage.
- GSK25i adopts a high-performance hardware platform and Linux operation system. It supports up to 8 axes with 5-axis linkage, and provides five-axis control functions, such as five-axis RTCP (tool center point control), inclined plane (3+2 positioning) machining and five-axis manual feeding. In addition, it supports the feed axis synchronization and PLC axis control as well.
- The system employs GSK-Link industrial Ethernet bus and servo real-time communication. When matched with GH series servo unit (high speed and high precision) and servo motor with a high-resolution absolute encoder, it can realize a positional precision of $0.1\ \mu\text{m}$; with the adoption of PID position closed loop, and featured by its advanced preview ability (preview up to 2000 blocks), path smoothing ability and 1ms interpolation cycle, the system realizes high-speed and high-precision machining for small line section as well as the machining for mold parts.
- Open PLC; support for PLC online editing, diagnosis, signal tracking functions; I/O points can be extended to 1024/1024 at most, thus satisfying the control of large-scale and complicated devices.
- GSK25i realizes DNC machining and data transmission through USB interface and network interface based on TCP/IP. By using the upper PC software, it realizes remote monitoring, remote diagnosis and remote maintenance, network, DNC function and three-dimension simulation running by G code.



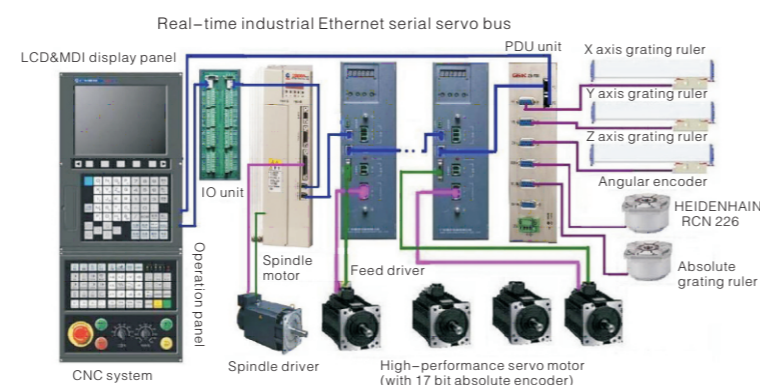
▲ GSK25iM-H (horizontal, 8.4 inch LCD)



▶ GSK25iM-V (vertical, 10.4 inch LCD)

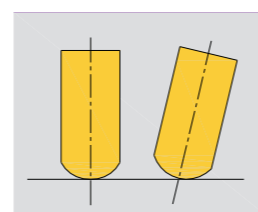
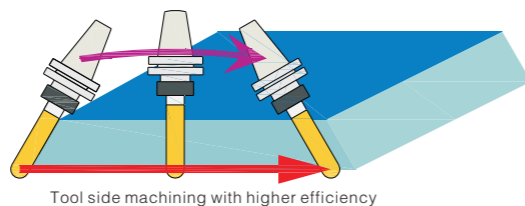
Advanced hardware

- High-performance and high-configuration hardware platform, which satisfies the demands for complicated operation and machining, such as five-axis linkage and high-speed and high-precision machining.
- GSK-Link real-time industrial Ethernet bus control, integrated cabinet, high-resolution LCD, small size and simple connection.
- Aluminum alloy front panel, stainless steel rear panel, firm and durable.



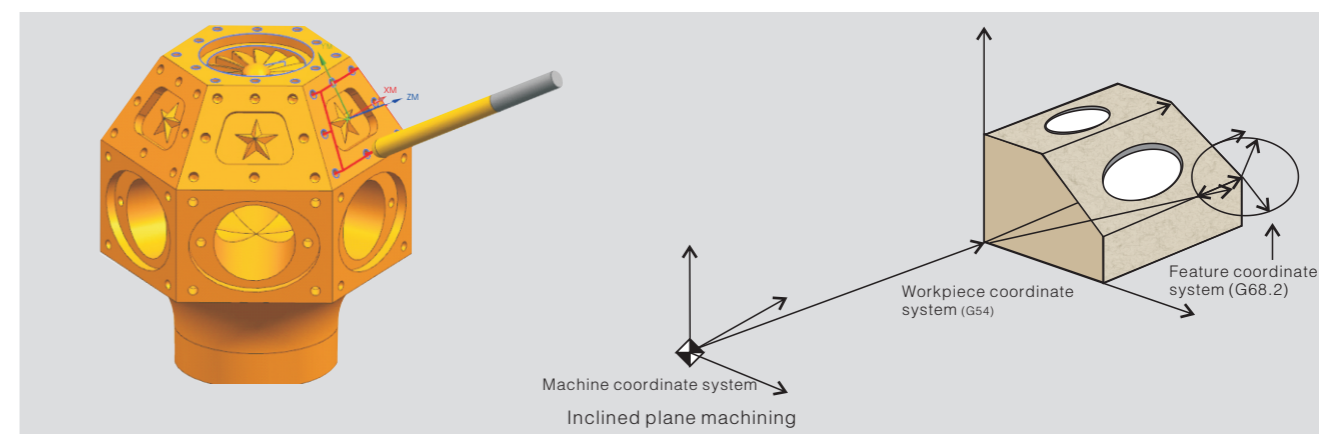
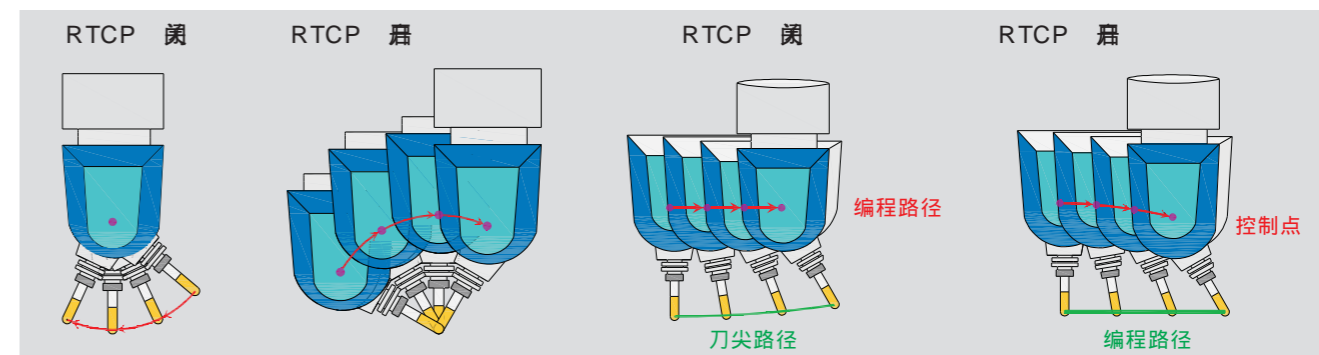
Five-axis machining function

- 8 controlled axes with 6-axis linkage
- Applicable to five-axis machines with worktable swinging, tool swinging or both.
- Five-axis RTCP (tool center point control)
- Inclined plane machining (3+2) positioning
- Five-axis manual feed



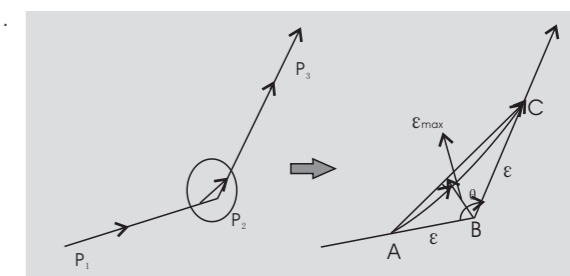
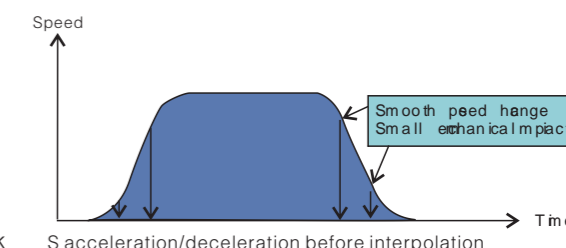
Preventing the cutting speed of the ball center becoming 0, leading to higher efficiency and smoothness

RTCP control



High-speed and high-precision machining

- Advanced preview control (up to 1000 blocks), linear acceleration/deceleration before interpolation, S acceleration/deceleration before interpolation
- Jerk control
- NUBRS interpolation
- Multiple on-line path smoothing modes, coordinating the work efficiency and surface quality in different types of machining.
- G05 P1 Broken line transition mode
- G05 P2 Bezier smoothing mode
- G05 P3 B spline smoothing mode



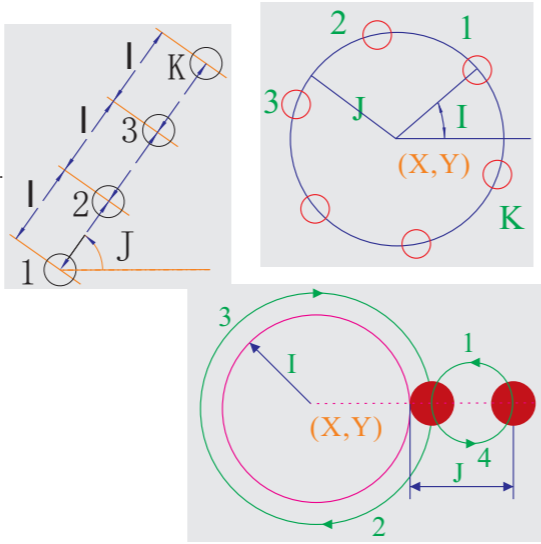
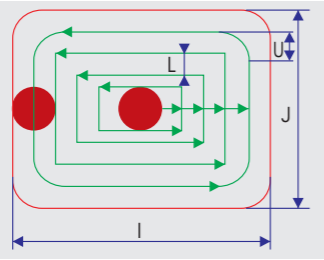
Smoothing for high-speed and high-precision machining

High-performance servo system

- High dynamic response servo motor, current loop cycle as short as $100\ \mu\text{s}$
- Servo parameter dynamic self-adjustment
- Servo motor equipped with a 17-bit (131072 lines) high-resolution absolute encoder, which improves the machining precision and surface quality to a new level.
- Absolute encoder. No need to return to the zero point each time the system is started up.

- Large-capacity memory, 240M standard configuration, which can be extended to 500M
- Operations for program editing: New, Modify, Copy, Cut, Paste, Search, Replace
- Plenty of macro commands and canned cycles, convenient for effectively completing complicated machining.
- Data transmission through U disc and network, DNC
- Simple debugging and maintenance, detailed alarm and diagnosis message
- Multi-level authority management
- User-defined interfaces for secondary development

19 common special canned cycles e.g. Equally spaced circle, arc fitting, cavity fitting, etc. added based on standard commands.



Special canned cycles

Message	Operation Resumes	01234.NC	N000001
OPTT	OPTNO.	ORGL	CHGVL
PAR	1000.0	0	1
PAR	1000.0	1	0
PAR	1687.0	0	1
PAR	1687.2	0	1
PAR	1687.1	0	1
PAR	1610.4	0	1
PAR	10	3.000000	4.000000
PAR	10	4.000000	3.000000

Operation history interface

Help [Operation]	01234.NC	N000001
25i Operations Guide		
POS Interface		
PRG Interface		
DET/SET Interface		

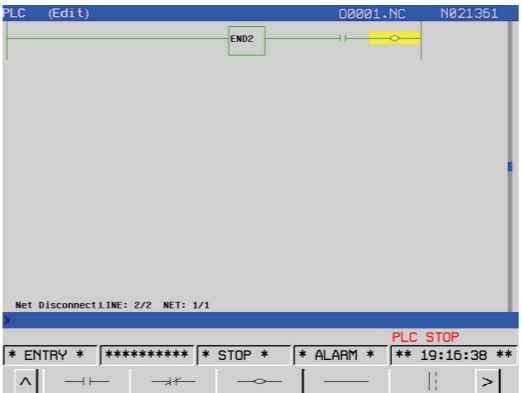
Help interface

OFT/SET [Password]	01234.NC	N000001	OFT/SET [Password]	00001.NC	N021361
CNC Adv Pwd	Modify:		Authority setting		
CNC Serv Pwd	Modify:		USER 1:	1	1
OEM Pwd	Modify:		USER 2:	1	1
Field Appli Pwd	Modify:		USER 3:	1	1
Superv Pwd	Modify:				
Opt #1 Pwd	Modify:				
Opt #2 Pwd	Modify:				
Opt #3 Pwd	Modify:				

Multiple-level authority management

PLC function

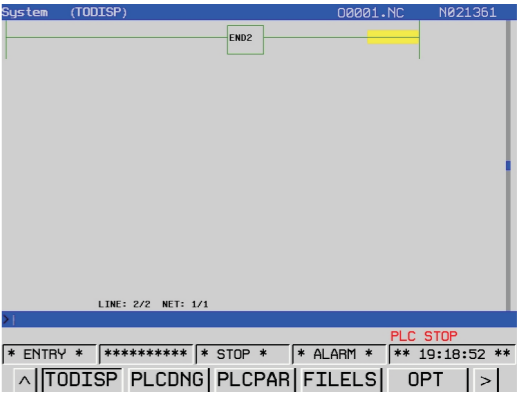
- Ladder diagram programming
- Basic command process time: 0.5 μs/step, program capacity: 12000 steps
- 10 basic commands, 49 function commands
- Open PLC, PLC program can be modified and edited on the system.
- Multiple PLC program select storage, run program selectable.
- PLC axis control function



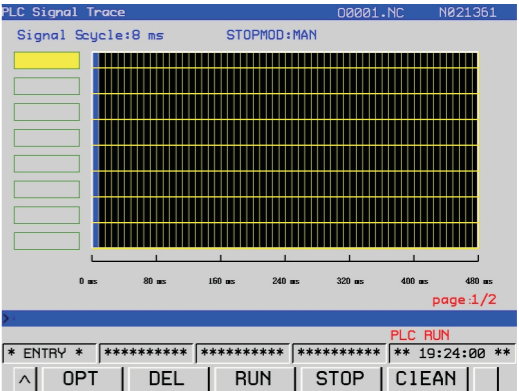
Ladder diagram editing

Network and upper PC function

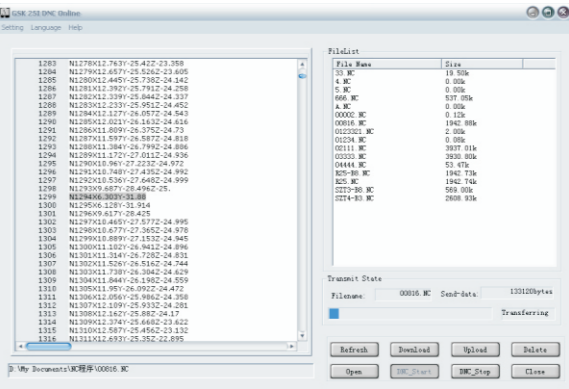
GSK25i system provides functions such as remote control, remote diagnosis, remote maintenance, network DNC function, PLC on-line editing, G command running simulation and software upgrade function, using an upper PC through the Ethernet interface based on TCP/IP.



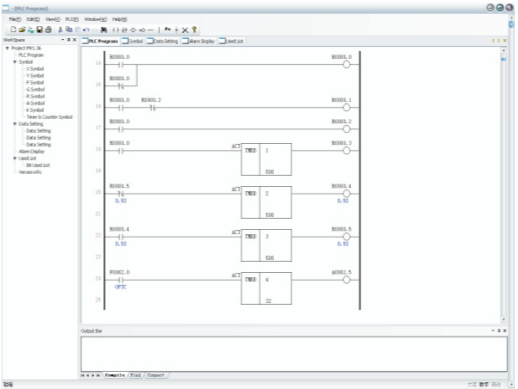
Ladder diagram



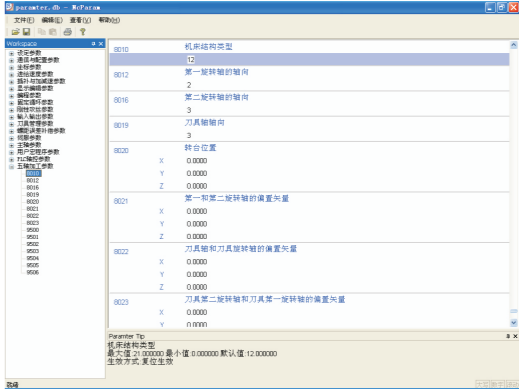
Signal tracking



PLC editing software

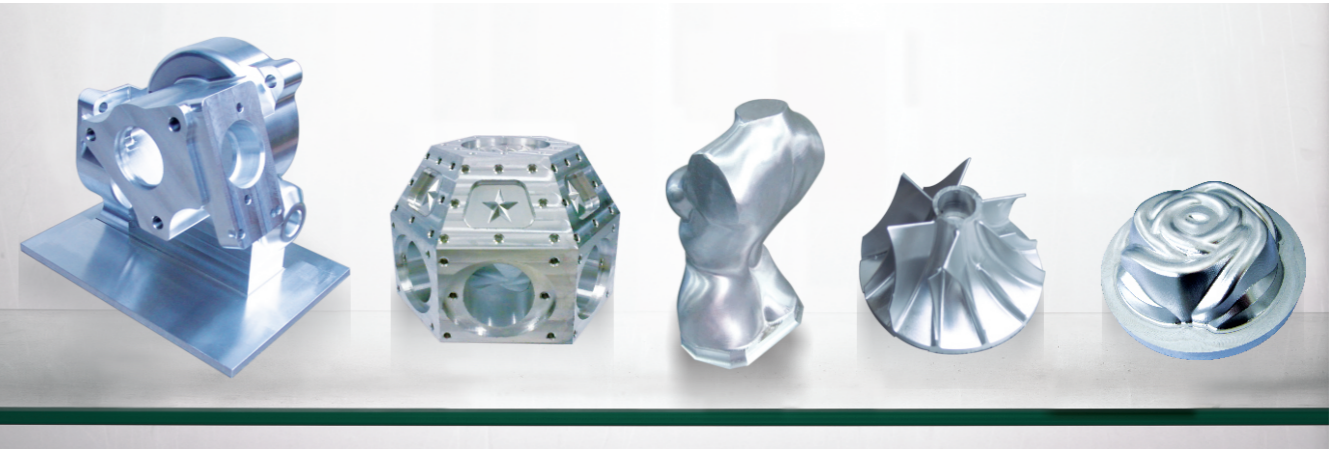


PLC editing software



System parameter editing software

GSK25i system matched with five-axis machine (partial typical structure) (Figure not shown)



Samples of machined parts (Figure not shown)



25i system specification

No.	Designation	Specification			
Axis control function					
1	Controlled axes	Up to 8 controlled axes plus 1 servo spindle			
2	Linkage axes	3-axis linkage			
		4-axis linkage			
		5-axis linkage			
3	PLC axis control controlled axes	Up to 4 axes			
4	Feed axis synchronous control	Up to 4 groups			
5	Position detection device	Pulse encoder (absolute), grating ruler (absolute)			
6	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°
7	Min. detection unit	Least command increment IS-B	0.001mm	0.0001inch	0.001°
		Least command increment IS-C	0.0001mm	0.00001inch	0.0001°
8	Max. command value	± 999999.9999mm ± 99999.9999inch ± 999999.9999°			
9	Max. feedrate	Maximum feedrate: 200m/min			
10	Automatic acceleration/deceleration	Linear, S curve acceleration/deceleration before interpolation, jerk control			
11	High-speed and high-precision machining	G05 advanced preview of high-speed small line section, path smoothing, up to 1000 blocks can be previewed and pre-read.			
Five-axis control function					
1	RTCP function	Tool center point control G43.4			
2	Inclined plane machining	Five-axis positioning (3+2) machining G68.2			
3	Five-axis manual feeding	Manual feed in tool axial direction, tool axis right-angle direction, or tool center point rotation direction			

Programming function		
1	Program format	ISO command standard, program name: O + 4 digits,Block number: N + 5 digits; G+ 3 digits; coordinate value Ip±6 digits before decimal and 4 digits behind decimal, S +5 digits, M + 3 digits, F + 6 digits before decimal and four digits behind decimal
2	Interpolation function	Positioning, linear interpolation, circular interpolation, helical interpolation, cylindrical interpolation, polar coordinate, spline curve interpolation.
3	Workpiece coordinate system	Basic coordinate systems: G52 ~ G59; additional extensive coordinate systems (G54.1) : 48 groups
4	Tool compensation	C tool compensation function, 400 groups of tool compensation
5	Programming function	More than 100 G commands in total, including 12 types of common canned cycle, 19 type of special canned cycle and compound cycle, face milling, coordinate System rotation, scaling, mirror image, automatic measurement of tool length, tool center point control, inclined plane machining command, four nesting levels of subprogram call, B type user macro program.
6	Program storage	Program storage capacity: 240M, which can be extended to 500M. Number of Programs storable:400
7	Reference point function	G27 Reference position return check; G28 Reference position return G29 Return from reference position; G30 2nd, 3rd, 4th reference point return
8	Skip function	G31 Skip function, used for measuring tool and workpiece
9	Programmable control function	Programmable stroke limit (G22, G23), programmable data input (G10)
Operation function and display function		
1	Operation mode select	AUTO, MDI, EDIT, MANUAL, MPG, ZERO RETURN, DNC
2	ON/OFF operation	Single block, block skip, machine lock, auxiliary function lock, optional stop, dry run, restart, emergency stop, overtravel release, cycle start, feed hold, manual continuous feed, step, rapid traverse, MPG, spindle override, feedrate override, rapid traverse override
3	Setting	Tool length compensation measurement input, workpiece offset measurement input, parameter setting help, servo parameter setting.
4	Program operation	New, edit, delete, rename, search, copy, paste, read, transmission, background editing, dynamic graph simulation
5	Help function	Alarm message explanation, operation description, parameter description, macro command description, G command description, PLC address description, counter
6	Display	10.4 inch LCD with resolution of 800×600, or 8.4 inch LCD with resolution of 640×480, Chinese/English display, dynamic graph, clock, process time, run time, part count, modal information, actual speed, hardware/software version, ladder diagram, alarm message, diagnosis message, alarm history, operation history.
Operation function and display function		
1	M function	M code with 3 bits, multiple M code command, M code for calling macro command or subprogram
2	T function	T code with three bits, tool life management
3	S function	± 10V analog voltage output from analog spindle interface, digital spindle, S code with five bits, spindle speed setting, multiple spindle control, spindle orientation, M type and T type gear shift, floating taping, rigid taping, spindle override, spindle speed fluctuation detection
Precision compensation function		
1	Backlash compensation	Separately compensates rapid traverse and cutting feedrate
2	Pitch compensation	Interpolation-type unidirection/bidirection pitch error compensation
Communication and data input/output interface function		
1	Data interface function	Ethernet, USB and RS232 interfaces on the front panel, through which data transmission, DNC and network function can be realized.
2	Data input/output	Input/output programs, NC parameters, compensation values, offset values, macro variable values, PLC programs, PLC parameters input/output through data interface, Ethernet, USB interface or DNC.
3	Network function	Ethernet communication, network DNC, remote monitor, remote diagnosis, remote maintenance

4	I/O interface	Terminal block type I/O DI/DO: 64/48	
		Flat cable type I/O DI/DO: 48/32 (2 group 24/16)	
		Flat cable analog I/O DI/DO: 24/16 AI/AO: 2/2, 12 bit DA 10V	
		Max. extension points DI/DO: 1024 points/1024 points	
5	Servo drive interface	GSK-Link Ethernet bus interface	
6	Interface of external position de- tection unit (for fully-closed loop)	Adaptive to HEIDENHAIN absolute grating ruler, angular encoder, Endat2.2 protocol, up to 6 axes.	
PLC function			
1	PLC specification	Built-in PLC, ladder diagram editing, command list programming compatible format; 10 basic commands, 49 function commands; Two level programs , scan period of first level program: 8ms, basic command execution time: 0.5us/step Max. program steps: 12000. The ladder diagram can be displayed and edited on line, and be uploaded and downloaded.	
		Intermediate relay (R)	1100 bytes (R0 to R1099)
		Data register (D)	1860 bytes (D0 to D1859)
		Counter (C)	400 bytes (C0 to C399) 100 PCS
		Timer (T)	200 bytes (T0 to T199) 100 PCS
		Message display request signal (A)	32 bytes (A0 to A31)
		Keep relay (K)	32 bytes (K0 to K31)
		Skip Label (L)	9999 (L1 ~ L9999)
		Subprogram (P)	512 (P1 ~ P512)
Safety and maintenance			
1	Safety function	Emergency stop, hard limit, 1st soft limit, 1st soft limit II , 2nd soft limit, multi- authority data protection, spindle safety speed, feed safety speed, NC alarm, PLC alarm, servo alarm, following error monitor, servo OFF, interlock.	
2	Maintenance function	Operation history, alarm history, machining history, CNC running state diagnosis, PLC interface diagnosis, data backup and recover for CNC and PLC data, speed wave form diagnosis, network diagnosis and maintenance, servo setting and servo load, state monitor and diagnosis.	

G code list

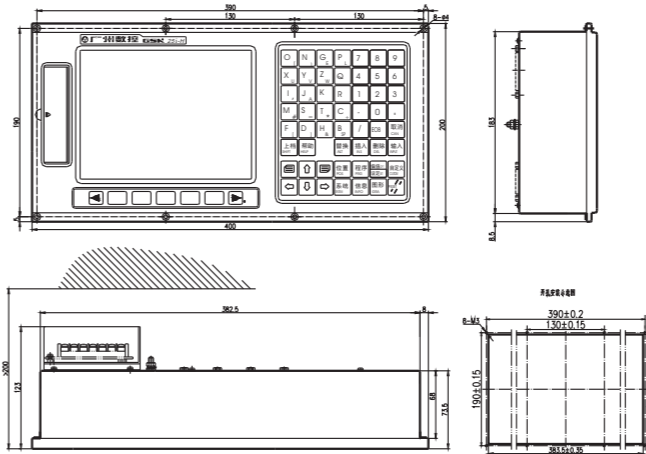
G code	Function
G00	Positioning
G01	Linear interpolation
G02	Circular interpolation/ helical interpolation CW
G03	Circular interpolation/ helical interpolation CCW
G04	Dwell
G05	High-speed and high-precision contour control
G06.2	NURBS interpolation
G07	Sine interpolation
G07.1	Cylindrical interpolation
G09	Exact stop
G10	Programmable data input
G11	Programmable data input cancel
G15	Polar coordinate command cancel
G16	Polar coordinate command
G17	XpYp plane selection
G18	ZpXp plane selection
G19	YpZp plane selection
G20	Input in inch
G21	Input in mm
G22	Stored stroke check ON
G23	Stored stroke check OFF
G27	Reference position return check
G28	Reference position return
G29	Return from reference position
G30	2nd, 3rd, 4th reference position return

G code	Function
G31	Skip function
G37	Automatic tool length measurement
G40	Cutter radius compensation cancel
G41	Cutter radius compensation left
G42	Cutter radius compensation right
G43	Tool length compensation positive direction
G43.4	Tool center point control
G44	Tool length compensation negative direction
G45	Tool offset increase
G46	Tool offset decrease
G47	Tool offset double increase
G48	Tool offset double decrease
G49	Tool length compensation cancel
G50	Scaling OFF
G51	Scaling ON
G50.1	Programmable mirror image OFF
G51.1	Programmable mirror image ON
G52	Local coordinate system setting
G53	Machine coordinate system selection
G54	Workpiece coordinate system 1 selection
G54.1	Additional Workpiece coordinate system selection
G55	Workpiece coordinate system 2 selection
G56	Workpiece coordinate system 3 selection
G57	Workpiece coordinate system 4 selection
G58	Workpiece coordinate system 5 selection

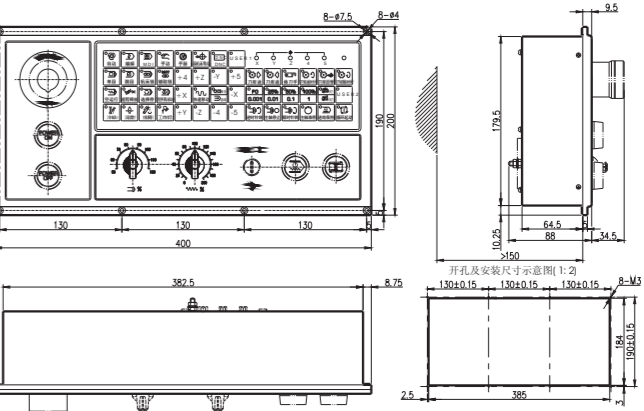
G code	Function
G59	Workpiece coordinate system 6 selection
G60	Single direction positioning
G61	Exact stop mode
G62	Automatic corner override
G63	Taping mode
G64	Cutting mode
G65	Macro program single call
G66	Macro program modal call
G67	Macro modal call cancel
G68	Coordinate system rotation
G68.2	Eigen-coordinate system selection
G69	Coordinate system rotation cancel
G73	High-speed peck drilling cycle
G74	Left-hand tapping cycle
G76	Fine boring cycle
G80	Canned cycle cancel
G81	Drilling cycle, spot boring cycle
G82	Drilling cycle or counter boring cycle
G83	Peck drilling cycle
G84	Right-hand tapping cycle
G85	Boring cycle
G86	Boring cycle
G87	Counter boring cycle
G88	Boring cycle
G89	Boring cycle
G90	Absolute programming

G code	Function
G91	Incremental programming
G92	Workpiece coordinate system setting
G94	Feed per minute
G95	Feed per rotation
G98	Return to initial plane in canned cycle
G99	Return to R point in canned cycle
G110	Inner circle groove roughing (CCW)
G111	Inner circle groove roughing (CW)
G112	Inner finishing cycle (CCW)
G113	Inner finishing cycle (CW)
G116	Outer circle finishing cycle (CCW)
G117	Outer circle finishing cycle (CW)
G130	Rectangular groove roughing (CCW)
G131	Rectangular groove roughing (CW)
G132	Rectangular groove inner finishing cycle (CCW)
G133	Rectangular groove inner finishing cycle (CW)
G136	Rectangular outer finishing cycle (CCW)
G137	Rectangular outer finishing cycle (CW)
G120	Bolt hole circle (Canned Cycle)
G121	Line at angle (Canned Cycle)
G122	Arc (Canned Cycle)
G123	Grid (Canned Cycle)
G124	Rectangular drilling (CW)
G125	Rectangular drilling (CCW)
G126	Round trip milling
G127	Single trip milling

Installation dimension of GSK25iM-H main body (horizontal 8.4 inch LCD)

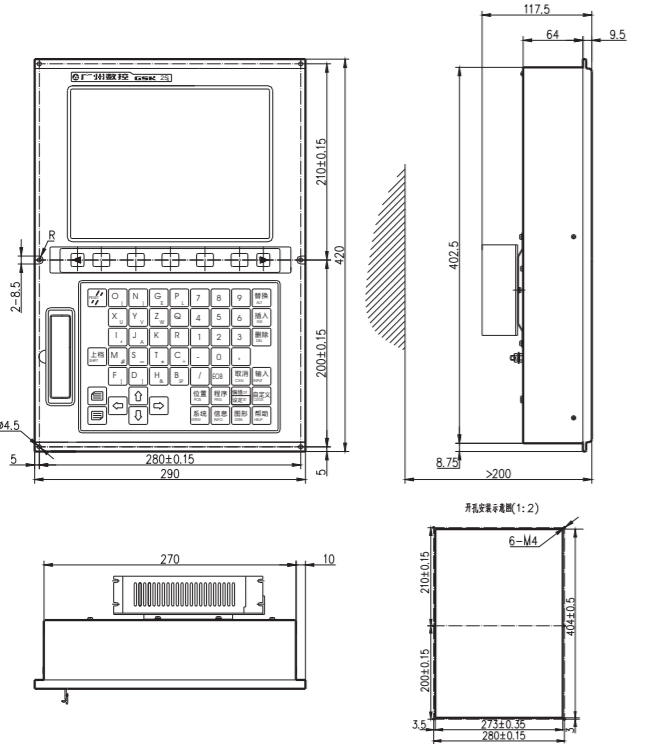


Installation dimension of GSK25iM-H operation panel (horizontal)

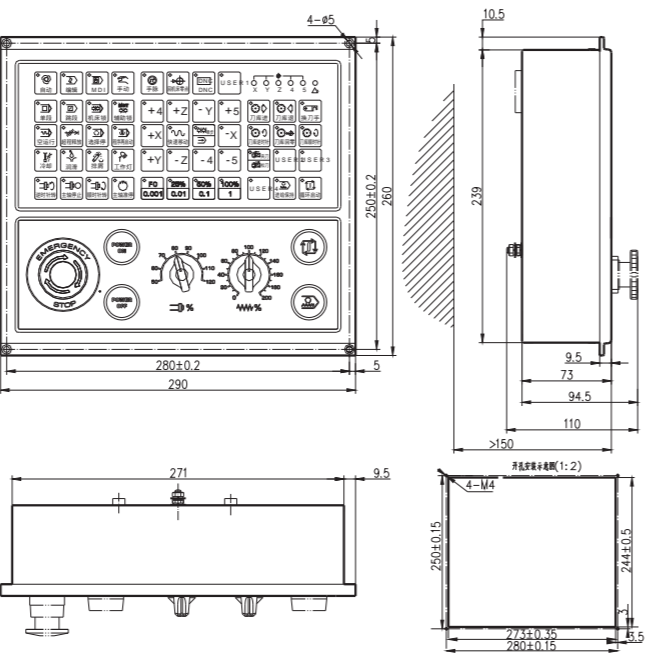


Installation dimension (unit: mm) of 25i CNC system

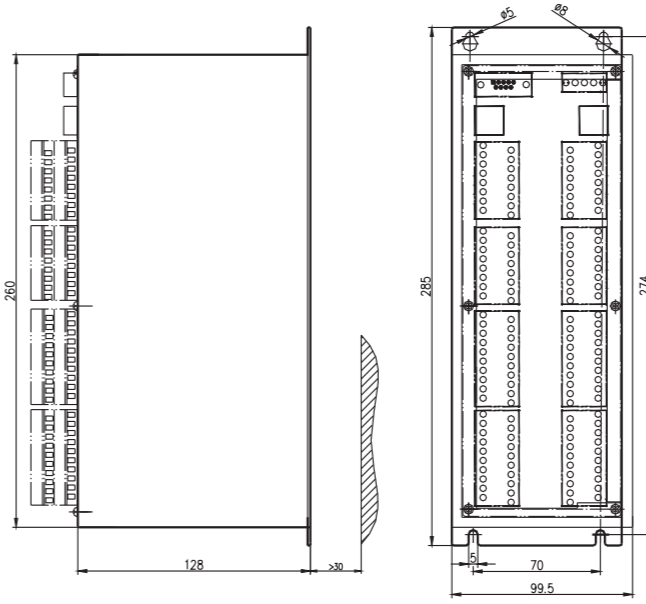
Installation dimension of GSK25iM-V main body (vertical 10.4 inch LCD)



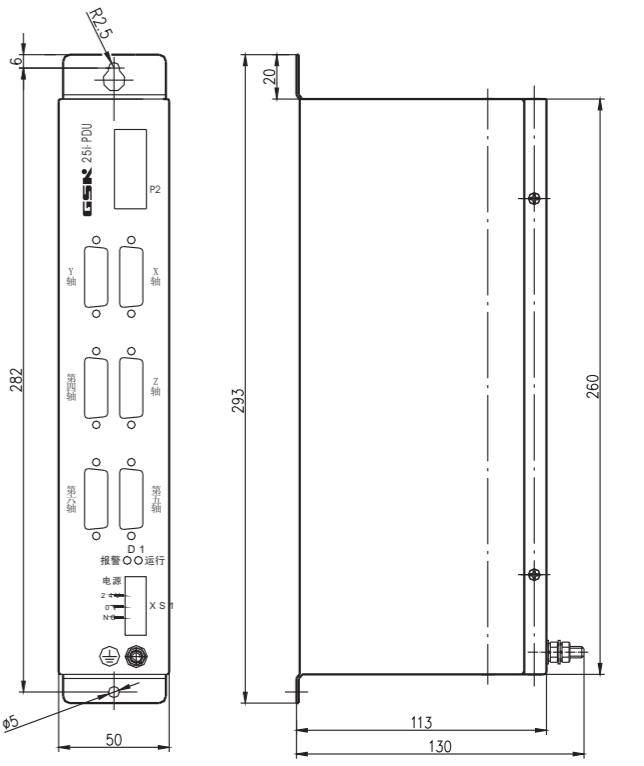
Installation dimension of GSK25iM-OPM operation panel (vertical)



Installation dimension of I/O unit



Installation dimension of GSK25i-PDU external position detection unit (for fully-closed loop)



Remarks: The installation dimension is subject to change without notice. Please refer to the actual product.