

# PART 1 PROGRAMMING

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**Chapter1: Programming**

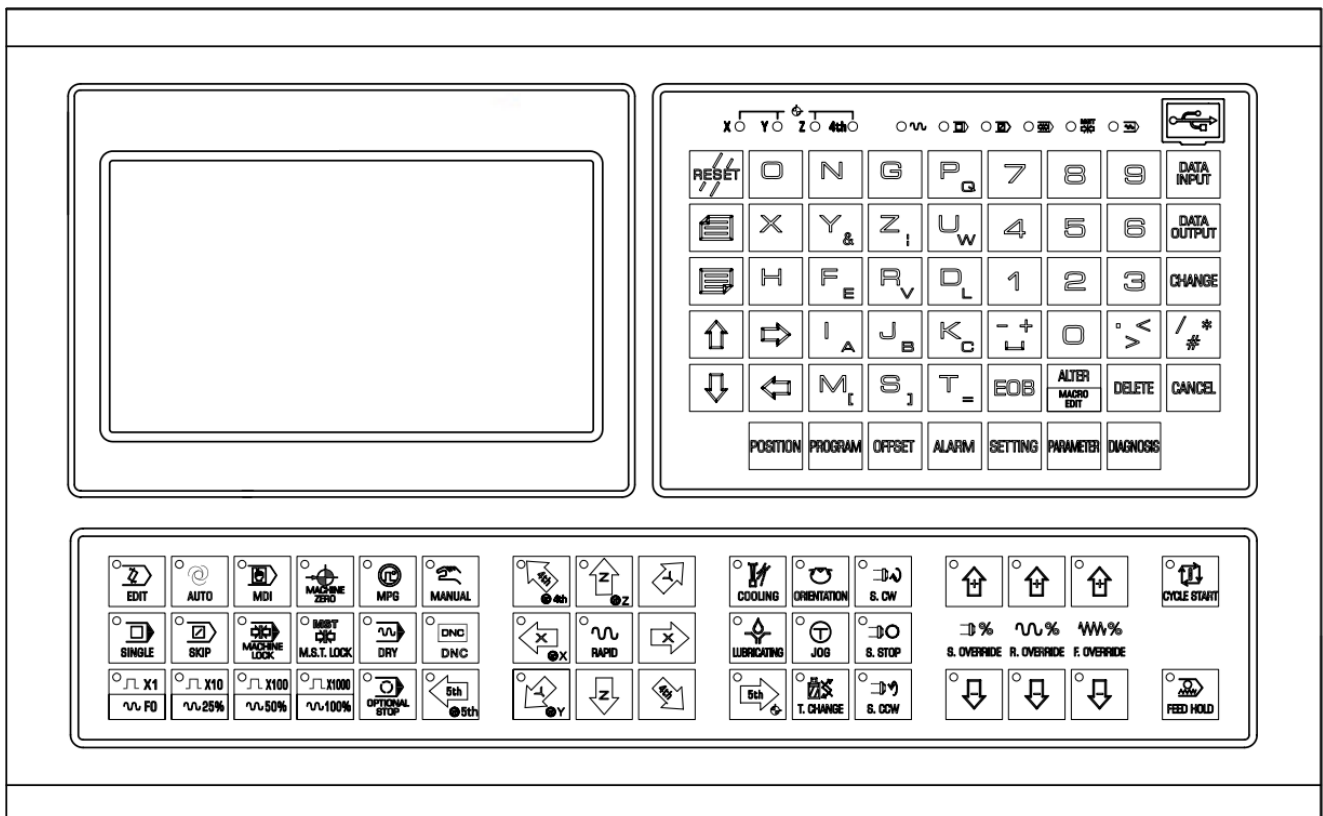
**Chapter2: MSFT command**

**Chapter3:G code**

**Chapter4:Tool nose radius compensation**

# CNCmakers

[www.CNCmakers.com](http://www.CNCmakers.com)  
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## Technical Characters of Product:

- ✓ five controllable axes X, Y, Z ,4th and 5th, three linked axes X, Y and Z, 0.001mm interpolation precision, maximum speed 30m/min. The 4th and 5th not only can be chose to be the beeline axes or the rolling axes,but also can use to be the CS axes control.
- ✓ The minimum command unit 0.001mm, the electronic gear ratio of command (1~32767) / (1~32767)
- ✓ Compensation functions for screw-pitch error, backlash, tool abrasion,tool length and tool nose radius.
- ✓ The PLC is built-in that it can achieve various controls of automatic tool post and the spindle automatic gear shift. The ladder diagram can be edited, uploaded and downloaded.
- ✓ DNC function supports Real-time machining in communication.
- ✓ G command of GSK980MC、GSK928MA、GSK980MD is compatible. It contain about 26 types functions of fastness circle machining.Such as the functions for rough-milling of the round groove and rectangle

groove, and also the functions of finish-milling of the whole circle and rectangle inside and outside, and the functions of beeline, rectangle and arc series bore and so on.

- ✓ Tapping function supports the optional function to check the Spindle encoder tapping and rigidity tapping to obtain the high precision machining.
- ✓ Metric and inch systems conversion. Automatic chamfering functions and Tool life management functions.
- ✓ Integrated Chinese, English, Russian and Spanish display interface chosen by the parameter.
- ✓ Full screen parts program editing, 40MB program capacity and up to 40000 of part programs can be stored.
- ✓ By the USB port, the CNC software can be upgraded with the U disk, the CNC can read the part programs from the U disk and bidirectional communication between CNC and U disk.
- ✓ Multilevel operation password function and alarm log function convenient for the equipment administration.
- ✓ Bidirectional communication between CNC and CNC, CNC and PC; the CNC software and the PLC program can be upgraded by communication.
- ✓ The installation dimensions and the electric ports are the same of GSK980MD、GSK980MC.

**The Technical Specification Table**

|                          |  |
|--------------------------|--|
| <b>Operation control</b> | Controllable axes: five axes (X,Y,Z,4th and 5th); The 4th and 5th not only can be chose to be the beeline axes or the rolling axes, but also can use to be the CS axes control.  |
|                          | Interpolation functions: X,Y,Z,4th and 5th axes linear; X, Y and Z axes helical and optional two axes circular interpolation.  |
|                          | Position command range: -9999.999 ~ 9999.999mm; minimum command unit: 0.001mm  |
|                          | Electronic gear ratio: command multiplier 1 ~ 32767, command frequency divisor 1 ~ 32767   |
|                          | Rapid traverse speed: maximum 30000mm/min<br>Rapid override: F0, 25%, 50%, 100% four levels real-time adjustment.  |
|                          | Cutting feedrate: maximum 15000mm/min or 500mm/rev. (feed per revolution)<br>Feedrate override: 0 ~ 150% sixteen-level real-time adjustment  |
|                          | Manual feedrate: 0 ~ 1260mm/min sixteen-level real-time adjustment   |
|                          | MPG feed: 0.001, 0.010, 0.100, 1.000mm four gears.   |
|                          | Acceleration or deceleration: the rapid traverse by S acceleration or deceleration, the cutting feed by exponential acceleration or deceleration.  |
|                          | The automatic chamfering function  |
| <b>G Code</b>            | 65 kinds of G codes: G00、G01、G02、G03、G04、G10、G11、G17、G18、G19、G20、G21、G28、G29、G30、G31、G40、G41、G42、G43、G44、G49、G54、G55、G56、G57、G58、G59、G65、G66、G67、G73、G74、G80、G81、G82、G83、G84、G85、G86、G88、G89、G90、G91、G92、G94、G95、G98、G99、G110、G111、G112、G113、G114、G115、G134、G135、G136、G137、G138、G139、G140、G141、G142、G143 。 |
| <b>macro command</b>     | 31 kinds of arithmetic, logical operation and skip can be achieved by macro command G65  |
|                          | Sentence macro command. eg: IF, WHILE, GOTO and so on.   |

|                               |  |
|-------------------------------|--|
| <b>Operation mode</b>         | Seven operation modes: Edit, Auto, MDI, DNC, machine zero return, MPG/increment and Manual operation.  |
| <b>Tapping</b>                | Tapping function; pitch: 0.001~500mm or 0.06~25400 teeth/inch  |
|                               | Spindle encoder: encoder linear number can be set (0~5000p/r), if the encoder linear number is 0, the CNC will not check the encoder.  |
|                               | Rigidity tapping: can use the rolling axes to tap.   |
|                               | The drive ratio between encoder and spindle: (1~255): (1~255)  |
| <b>Precision compensation</b> | Backlash compensation: 0~2.000mm   |
|                               | Pitch error compensation: each of them have 255 compensation points, the compensation amount of each point: -0.255~0.255mm.  |
|                               | Tool compensation: 32 groups tool length compensation, tool abrasion compensation, tool nose radius compensation (compensation type C)   |
| <b>M command</b>              | Special M commands (redefinition is not allowed): M02, M29, M30, M98, M99, M9000~M9999.  |
|                               | Other M □□ commands are defined or disposed by PLC program.  |
|                               | M commands defined by standard PLC program: M00, M03, M04, M05, M08, M09, M10, M11, M32, M33   |
| <b>T command</b>              | Up to 32 tool number (T01~T32), manual-tool change or auto-tool change chosen by the parameter. The tool change time sequence is achieved by PLC program.  |
|                               | Tool life management function, most 32   |
| <b>Spindle speed control</b>  | The control mode of speed switching value: S □□ command is defined or disposed by PLC program; the standard PLC programs S1, S2, S3 and S4 directly output; The output of S1, S2, S3, and S4 are closed by S0.   |
|                               | The control mode of speed analog voltage: the spindle speed per minute is commanded by S code, output 0~10V voltage to spindle converter, the spindle stepless shift supporting 4 gears spindle mechanical gear.   |
| <b>PLC function</b>           | 9 kinds of basic command and 23 kinds of function command, 2-level PLC program that has 5000 steps and the processing time is 2μs for each step. The first level program refresh cycle is 8ms; it can offer the edit software for the ladder and PLC program communication download. |
|                               | Integrated machine panel: 44 points input (key), 44 points output (LED)  |
|                               | Basic I/O: 32 points input/ 32 points output   |
| <b>Display interface</b>      | Display: 480×234 lattice, 7" mono-color LCD, CCFL back light   |
|                               | Display mode: multilingual interface set by parameters, which can display the machining path.  |
| <b>Program edit</b>           | program capacity: 40MB, up to 40000 of part programs can be stored. it supports the calling of the user macro, and the subprogram 4 level nesting.   |
|                               | Edit mode: full-screen editing, support the relative, absolute and mixed coordinates.  |
| <b>USB</b>                    | By the USB port, the CNC software can be upgraded with the U disk.   |
|                               | The CNC can read the part programs from the U disk to machining.   |
|                               | bidirectional communication between CNC and U disk. (such as the programs, parameter, backup and restore PLC and so on)  |
| <b>Clock display</b>          | Clock, date and week display.  |
| <b>Communication</b>          | Bilateral program, parameter and tool compensation transmission between CNC and PC, CNC and CNC, supports the system software and the download upgrade of the PLC program serial port, DNC communication between CNC and PC  |
| <b>Suited drive</b>           | DA98 series digital AC servo or DY3 series step drive equipment by using the pulse+direction signal input.   |

G Command Table

| G code | Command function                      | G code | Command function                              |
|--------|---------------------------------------|--------|---|
| G00    | Positioning (rapid traverse)          | *G80   | Canned cycle cancellation                     |
| *G01   | Linear interpolation (cutting feed)   | G81    | Drilling cycle (point-drilling cycle)         |
| G02    | circular/helical interpolation by CW  | G82    | Drilling cycle (counterbore cycle)            |
| G03    | circular/helical interpolation by CCW | G83    | Peck drill cycle                              |
| G04    | dwell, exact stop                     | G84    | Tapping cycle                                 |
| G10    | offset setting                        | G85    | Boring cycle                                  |
| G11    | tool life setting complete            | G86    | Drilling cycle                                |
| *G17   | XY plane selection                    | G88    | Boring cycle                                  |
| G18    | ZX plane selection                    | G89    | Boring cycle                                  |
| G19    | YZ plane selection                    | *G90   | Absolute programming                          |
| G20    | Inch input                            | G91    | Incremental programming                       |
| G21    | Metric input                          | G92    | Coordinate system setting                     |
| G28    | Reference point return                | G94    | Feeding per minute                            |
| G29    | Return from reference point           | G95    | Feeding per revolution                        |
| G30    | Return from reference point (the 2nd, | G98    | Return to the initial plane in canned cycle   |
| G31    | Skip function                         | G99    | Return to the R (point) plane in canned cycle |
| *G40   | Tool radius compensation cancellation | G110   | Round groove inner rough mill in CCW          |
| G41    | Tool radius compensation left         | G111   | Round groove inner rough mill in CW           |
| G42    | Tool radius compensation right        | G112   | Whole-circle inner finish mill in CCW         |
| G43    | Tool length offset positively         | G113   | Whole-circle inner finish mill in CW          |
| G44    | Tool length offset negatively         | G114   | Excircle finish mill in CCW                   |
| *G49   | Tool length offset cancellation       | G115   | Excircle finish mill in CW                    |
| *G54   | Workpiece coordinate 1                | G134   | Rectangle groove rough mill in CCW            |
| G55    | Workpiece coordinate 2                | G135   | Rectangle groove rough mill in CW             |
| G56    | Workpiece coordinate 3                | G136   | Rectangle groove inner finish mill in CCW     |
| G57    | Workpiece coordinate 4                | G137   | Rectangle groove inner finish mill in CW      |
| G58    | Workpiece coordinate 5                | G138   | Rectangle outer finish mill in CCW            |
| G59    | Workpiece coordinate 6                | G139   | Rectangle outer finish mill in CW             |
| G65    | Macro                                 | G140   | Rectangle path series punch in CW             |
| G66    | Macro program call                    | G141   | Rectangle path series punch in CCW            |
| *G67   | Cancel macro program call             | G142   | Circular path series punch in CW              |
| G73    | High-speed peck drill cycle           | G143   | Circular path series punch in CCW             |
| G74    | Left-hand tapping cycle               |        |   |

Note: The G command with “\*” means that G command is the first G model command.

PLC Command Table


| Basic command | Function | Function command | Function |
|---------------|----------|------------------|----------|
|---------------|----------|------------------|----------|




|                         |   |      |                                 |
|-------------------------|---|------|---------------------------------|
| LD                      | Read normally open contact                      | TMRB | Timer                           |
| LDI                     | Read normally closed contact                    | CODB | Binary system (Bit) transfer    |
| OUT                     | Output loop                                     | ROTB | Binary system(Bit) spin control |
| AND                     | Normally open contact series connection         | MOVN | Data copy                       |
| ANI                     | Normally closed contact series connection       | DECB | Binary system(Bit) decoding     |
| OR                      | Normally open contact parallel connection       | JMPB | Program skip                    |
| ORI                     | Normally closed contact parallel connection     | SP   | Subprogram numbering            |
| ORB                     | Parallel connection of the series circuit block | SPE  | Subprogram end                  |
| ANB                     | Series connection of the parallel circuit block | ADDB | Binary (Bit) data addition      |
|                         |   | SUBB | Binary (Bit) data subtraction   |
| <b>Function command</b> | <b>Function</b>                                 | ALT  | Alternative output              |
| END1                    | First level program ending                      | DIFU | Up setting                      |
| END2                    | Second program ending                           | DIFD | Down setting                    |
| SET                     | Setting   | MOVE | Logical AND                     |
| RST                     | Resetting                                       | PARI | Parity check                    |
| CMP                     | Comparison setting                              | LBL  | Program skip numbering          |
| CTRC                    | Counter   | CALL | Subprogram call                 |




## 1.2 Execution of the Program

### 1.2.1 Order of the program execution

The GSK980MDa can not open two or more programs at the same time; it can run the current opened program in Auto mode. So, the GSK980MDa can perform only one program at any time. The cursor is located at the beginning of the row of the first block when a program is opened, and the cursor can be moved in Edit mode. Start the execution

of the program from the block the current cursor is located at by using the cycle start signal ( key on the panel or external cycle start key) in the halt state of Auto mode, usually, the blocks are executed one by one in the order of the blocks editing, and the execution is stopped till the M02 or M03 code is executed. The cursor is moved along with the program execution. The program execution sequence or state will be changed in the following conditions:

- The program execution will be stopped if the  key or the Emergency Stop button is pressed;  
The program execution will be stopped if the CNC alarm or PLC alarm is generated;
- The operation mode is switched to the MDI or Edit mode when the program is being executed; or the program is started from the block the cursor is located at when switching to Auto mode by single block stop (The program pauses after the current block executed), and then the  key is pressed or external cycle start signal is ON;
- The operation mode is switched to Manual, MPG, Step and Machine zero mode when the program being executed. The program is held on, then switching to Auto mode, and then the communication is switched on when the  key is pressed or external cycle start signal is ON, the program is operated from the halt position;

- The program pauses when pressing  key or external pause signal is cut off, the program is operated from stopped position when pressing  key or external cycle start signal is ON;
- The program pauses after each block is executed when the single block switch is opened, pressing  key or switching on external cycle start signal is needed, program is executed continuously from the next block;
- The skip switch of the block is opened which it is skipped or inexecuted when the “/” is in front of the block;
- The skip object block is turned to when the G65 skip command is executed;
- When M98 or M9000~M9999 command is performed, to call corresponding subprogram or macro run; the subprogram or macro run is ended, when the M99 command is to be performed, to call the next block run as returning to the mainprogram (If M99 command specifies the return object block number, then run by skipping to object block);
- When the M99 command is performed in main program (its run is not started up because others program calls), then returning to the program first stage to continue run, so the current program will be run circularly.

### 1.2.2 Execution order of command word within block

R, M, S and T, most command words M, S and T are explained by NC before sending to PLC for processing, the other command words are processed by NC directly. M98, M99, M9000~M9999, as well as S command word for spindle speed by rev/min, m/min units are all processed by NC directly.

When G command shares a same block with M00, M01, M02 and M30, the NC performs M command after finishing G command, and then sending the corresponding M signal to PLC for processing.

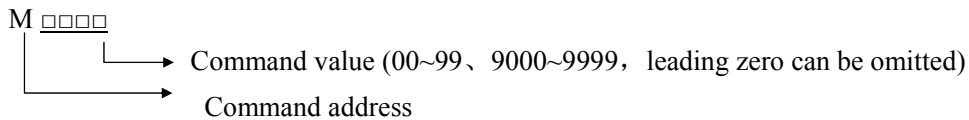
When the G command shares a same block with the M98, M99, M9000~M9999, these M command words are performed by NC after it finishes the G command (the M signal not sent to PLC).

As the M, S and T command words processed by PLC and the G command words are sharing the same block, the M, S and T command words are performed with the G command words at the same time which they are determined by PLC program (ladder diagram), or the M, S and T command words are performed after the G command is finished. As for the performance order of the command words, refer to the explanation of the machine tool manufacturer.

## CHAPTER 2 MSTF COMMAND

### 2.1 M COMMAND

The M command word composed by command address M and 1~2 or 4 digits after the command M is used for controlling the program execution or outputting M code to PLC.



M98, M99 and M9000~M9999 are independently processed by NC, and the M code is not output to PLC. The function of M29 is fixed, it gives the M code to PLC.

The M02 and M03 are defined as program END command by NC, at the same time it also gives the M code to PLC for using the I/O control (close spindle, close cooling etc.).

The PLC program can not change the meaning of the above-mentioned commands when the M98, M99 and M9000~M9999 are regarded as program CALL commands and the M02 and M30 are regarded as program END commands. The codes of other M commands are all given to PLC program for specifying the command function; please refer to the manual issued by machine tool manufacturer.

One block only has one M command. The CNC alarm occurs when two or more M commands are displayed in one block.

Table 2-1 M command table for program execution

| Commands    | Functions   |
|-------------|---|
| M02         | End-of-Run  |
| M29         | Rigid tapping   |
| M30         | End-of-Run  |
| M98         | Subprogram call   |
| M99         | Return from the subprogram; the program will be circularly executed if the command M99 is used for main program ending (namely, the current |
| M9000~M9999 | Call macro program (Program No. more than 9000)   |

#### 2.1.1 End of program (M02)

Format: M02

Command function: The M02 command is executed in the Auto mode. The automatic run is ended when the other commands of current block are executed; now in order to not return to the program beginning, the cursor is stop at block which the M02 located. If the program is executed again the cursor should be stopped at the beginning of the program.

The function of command M02 also can be defined by the PLC ladder diagram other than the abovementioned functions which are processed by NC. The standard ladder diagram can be defined as: the current input state of CNC



is not change after the command M02 is executed.

### 2.1.2 Rigid tapping command M29

Format: M29

Command function: In Auto mode, after excuting M29, G74、G84 will excute with rigid tapping function in the following program,

### 2.1.3 End of run (M30)

Format: M30

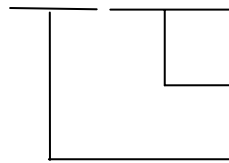
Command function: If M30 command is executed in the Auto mode, the automatic run is ended when the other commands of current block are executed; the system cancels the nose radius compensation and the cursor returns to the beginning of the prgram when the machine pieces number is added by 1 (It is up to parameter if the cursor returns to the beginning).

The cursor is not return to the beginning of the program when the BIT4 of parameter No.005 is set to 0 in CNC; when it is set to 1, the prgram is finished, so the cursor returns to the beginning of the program at once.

The function of command M30 can be defined by the PLC ladder diagram other than the abovementioned functions processed by NC. The standard ladder diagram can be defined as: to close the M03, M04 or M08 signal output after the M30 command is executed, at the same time the M05 signal is given.

### 2.1.4 Subprogram call M98

Format: M98 P○○○○□□□□



The called subprogram No. (0000~9999) .The leading zero of subprogram can be omitted when the call frequency are not given; the subprogramNo. should be 4 digits when the calling frequency is given;

Calling frequency (1-9999) calling for once, the input can be omitted

Command function: when the M98 command is executed in the Auto mode, CNC calls and executes the subprogram specified by P, which can be performed 9999 times at most, when the other commands of current block are executed. The M98 command is disabled in MDI.

### 2.1.5 Return from subprogram (M99)

Format: M99 P○○○○



The block No. (0000 ~ 9999) to be executed when a mainprogram is returned, the leading zero can be omitted.

Command function: (in subprogram) as the other commands of current block are executed, the block specified by P is performed continuously when the main program is returned. The next block is performed continuously by calling current subprogram of M98 command when returning to the mainprogram; because of the P is not given. If the main program is ended by using the M99 (namely, the current program is not called by other programs for

execution), the current program will be run circularly. So, the M99 command is disabled in MDI.

Example: Fig. 2-1 shows that the execution route of the subprogram is called (the P command within M99). Fig. 2-2 shows that the execution route of the subprogram is called (the P command is not in M99).

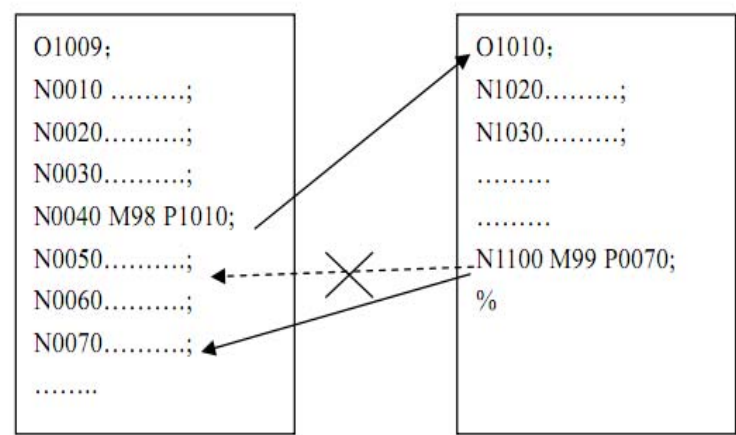


Fig. 2-1

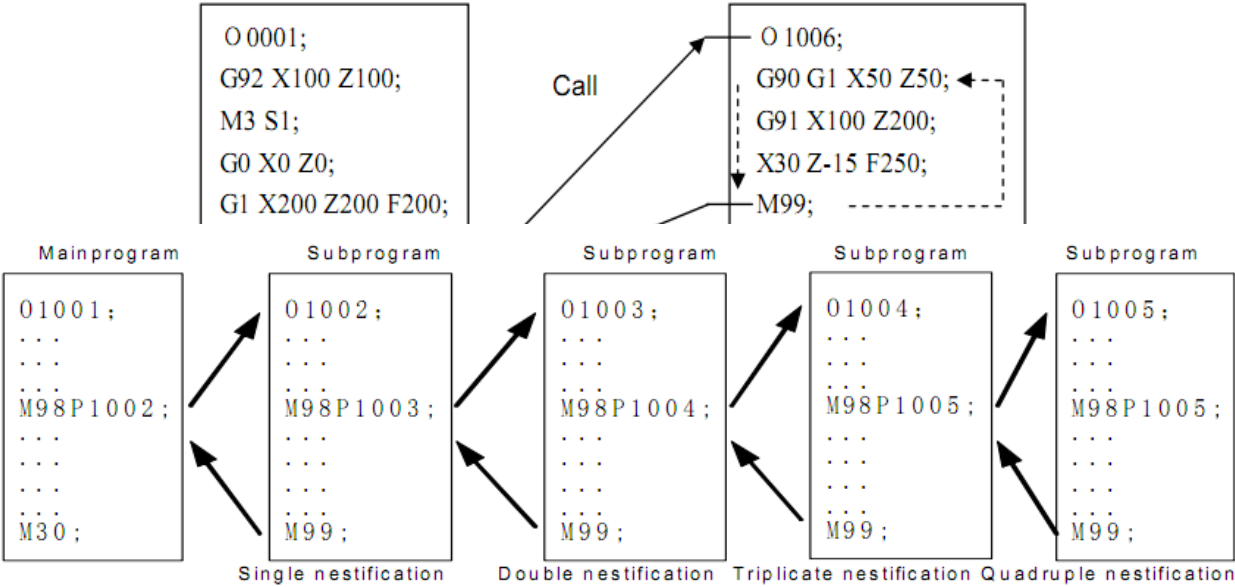


Fig. 2-3 Subprogram nestifications

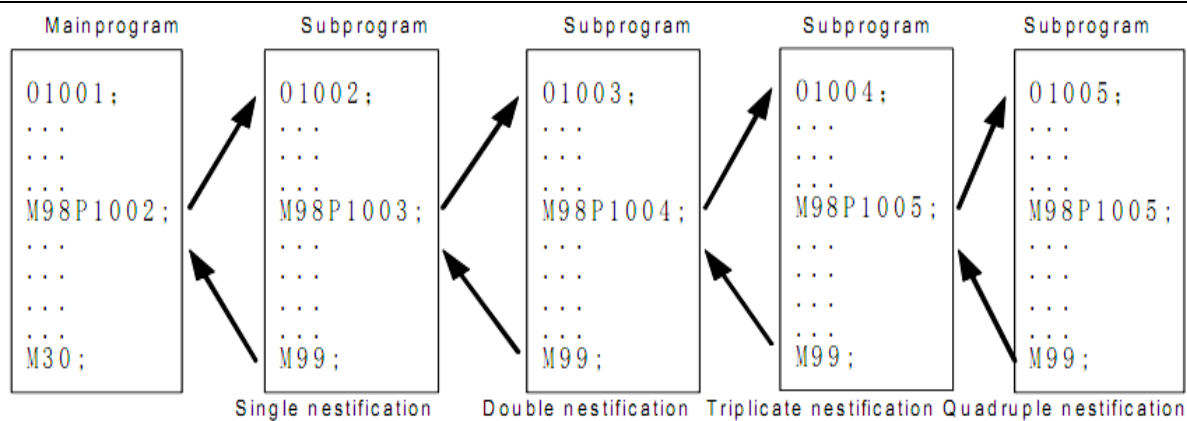


Fig. 2-3 Subprogram nestifications

### 2.1.6 Macro program call (M9000~M9999)

Format : M□□□□  
                    └── 9000~9999

Command function: Call the macro program which is corresponded by the command value (O9000~O9999).

Macro program: Program 09000~09999 is special space obligated for the machine tool manufacturer for using editing and achieving special function subprogram, which is called macro program. Two-level operation authority is needed when editing the program 09000~09999, the user can not modify or run the macro program but the macro calling command if his authority is 3~5 level. So the M9000~M9999 commands are invalid in MDI mode.

### 2.1.7 M command defined by standard PLC ladder diagram

The M commands other than the abovementioned commands (M02, M30, M98, M99, M9000~M9999) are defined by PLC. The M commands are defined by standard PLC hereinafter. This GSK980MDa milling machine is used for machine control. About the function, meaning, control time sequence and logic etc. of the M command, refer to the manual issued by the machine tool builder.

M command specified by standard PLC ladder diagram

| Command | Function        | Remark                            |
|---------|-----------------|-----------------------------------|
| M00     | Program pause   |                                   |
| M03     | Spindle CCW     | Function interlock,<br>state hold |
| M04     | Spindle CW      |                                   |
| *M05    | Spindle stop    |                                   |
| M08     | Coolant on      | Function interlock,<br>state hold |
| *M09    | Coolant off     |                                   |
| M32     | Lubrication on  | Function interlock,<br>state hold |
| *M33    | Lubrication off |                                   |

**Note:** The command with “\*” specified by standard PLC is valid when the power is turned on.

### 2.1.8 Program stop M00

Format: M00

Command function: the program is stopped after executing the M00 command, the “pause” is

displayed; the program will continue when the key of Cycle Start is pressed.

### 2.1.9 Spindle CCW, CW, stop control(M03, M04 and M05)

Format: M03;

M04;

M05;

Command function: M03: spindle forward rotation (CCW);

M04: spindle reverse rotation (CW);

M05: spindle stop.

**Note:** The control time sequence and logic of M03, M04 and M05 are specified by standard PLC program, refer to the Appendix of this manual.

### 2.1.10 Coolant control (M08, M09)

Format: M08;

M09;

Command function: M08: cooling on;

M09: cooling off.

**Note:** The control time sequence and logic of M08 and M09 are specified by standard PLC program, refer to the Appendix of this manual.

### 2.1.11 Lubricant control (M32,M33)

Format: M32;

M33;

Command function: M32: lubrication on;

M33: lubrication

off.

**Note:** The control time sequence and logic of M08 and M09 are specified by standard PLC program, refer to the Appendix of this manual.

## 2.2 Spindle Function

The spindle speed is controlled by S command, there are two ways to control spindle speed for GSK980MDa.

Spindle speed switching value control mode: the S□□ (2-digit command value) command is processed by PLC

program for exporting the switching value signal to machine, so that the step speed change of the spindle is achieved.

Spindle speed analog voltage control mode: the actual spindle speed is specified by

the S□□□ (4-digit command value), the NC outputs the 0~10V analog voltage signal to the spindle servo device or transducer for achieving the stepless speed regulating of the spindle.

### 2.2.1 spindle speed switch value control

The spindle speed is on switching value control when the BIT4 of bit parameter NO.001 is set to 0. One block only has one S command. The CNC alarm occurs when there are two or more S commands displayed in block.

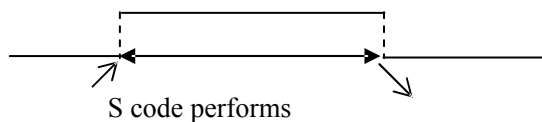
When the S command shares the same block with the command word, the performance sequence is defined by PLC program. For details, refer to the manual issued by the machine tool builder.

This GSK980MDa milling machine is used for machining control when the spindle speed switching value is controlled. The time sequence and logic for S command should be referred by the manual issued by the machine tool builder. The following S command is defined by GSK980MDa standard PLC, for reference only.

Command format: S□□

└─ 00~04 (the leading zero can be omitted): 1~4 gears spindle speed switching value control.

In spindle speed switching value control mode, the FIN signal is returned after the set time is delayed after the code signal of S command is sent to PLC. Now the time is called execution time of S code.



Delay time

Subsequent command word or block performs

The S01, S02, S03 and S04 output states are invariable when the CNC is reset.

The S1~S4 commands are ineffective output when the CNC is switched on. An arbitrary command is performed from S01, S02, S03 and S04, the corresponding S signal output is effective and held on, at the same time the other 3 S signal output are cancelled. The S1~S4 output are cancelled when performing the S00 command, only one of S1~S4 is effective in the meantime.

### 2.2.2 Spindle speed analog voltage control

The spindle speed is analog voltage control when the BIT4 of current bit parameter is set to 1

Format: S OOOO

└─ 0000~9999 (leading zero can be omitted): Spindle speed analog voltage control

Command function: The CNC outputs 0~10V analog voltage to control the spindle servo or transducer for achieving the stepless speed regulating of the spindle when the spindle speed is set. The S command value is not memorized when the power is turned off; and then the parameter recovers to 0 when the power is turned on.

The CNC owns four mechanical spindle shifts function. Counting the corresponding analog voltage value specified by the speed based upon the current set value (corresponding to data parameter No.101~No.104) of the top speed (output analog voltage is 10V) of the spindle shift when the S command is performed, then output the voltage value to spindle servo or transducer, so that the consistency of actual speed and required speed of the spindle are controlled.

The analog voltage output is 0V when the CNC is switched on. The output analog voltage value is invariable (Unless the cutting feed in constant linear speed control and the absolute value of X axis absolute coordinate value are changed) after the S command is executed. The analog voltage output is 0V when the command S0 is executed. And the analog voltage output value is invariable when the CNC is reset or at emergent stop.

The parameter related to spindle speed analog voltage control:

Data parameter No.099: the output voltage offset for spindle top speed (the output analog voltage is 0V);

Data parameter No.100: the voltage offset for the zero spindle speed (the output analog voltage is 10V);

Data parameter No.101~No.104: The top speed for spindle 1~4 shifts (the output analog voltage is 10V);

### 2.2.3 Spindle override

The spindle actual speed can be modified by using spindle override when the spindle speed analog voltage control is effective, the actual speed modified by spindle override is limited by the top speed of current spindle shift, and also it is controlled by the lowest spindle limitation value and the top spindle limitation value in constant linear speed control mode.

This NC offers 8-level spindle override (50%~120%, the change is 10% per level). The actual level and the modificative mode of the spindle override are defined by PLC ladder diagram. Refer to the manual issued by the machine tool builder when attempting to use it. The following description is GSK980MDa standard PLC ladder diagram function, for reference only.

The spindle override defined by GSK980MDa standard PLC ladder diagram has 8 levels. The spindle actual real-time speed can be adjusted by using the spindle override key in the command speed range of 50%~120%, the spindle override will be memorized when the power is turned off. Refer to the OPERATION of this manual for modification operation of the spindle override.

## 2.3 Tool Function

There is no tool function in this CNC system.

## 2.4 Feeding Function

### 2.4.1 Cutting feed (G94/G95, F command)

Format: G94F\_; (F0001~F8000, leading zero can be omitted, for feedrate per minute, mm/min)

Command function: The cutting feedrate is specified by mm/min, G94 is modal G command.

If the current mode is G94 that it needs no G94 any more.

Format: G95F\_; (F0.0001~F500, leading zero can be omitted)

Command function: The cutting feedrate is offered by the unit of mm/rev., G95 is modal G command. The G95 command can be omitted if the current mode is G95. When the CNC performs G95 F\_, the cutting feedrate is controlled by feedrate command based on the multiplication of F command value (mm/rev) and current spindle speed (rev/min). The actual feedrate varies with the spindle speed. The spindle cutting feedrate per revolution is specified by G95 F\_, the even cutting line can be formed on the face of workpiece. It is necessary to install spindle encoder when the G95 mode is operated.

The G94 and G95 are modal G commands at the same group, one of them is available only. The G94 is initial state G command, so, it defaults the G94 when the CNC is switched on. The following below shows the conversion formula of feed value per rev. and feed value per min:

$$F_m = F_r \times S$$

Thereinto:  $F_m$ : feed value per minute (mm/min);

$F_r$ : feed value per revolution (mm/r);

$S$ : spindle speed (r/min).

The feedrate value is set by the CNC Data parameter No.172 when the CNC is switched on, the  $F$  value is invariable after the F command is executed. The feedrate is 0 after F0 is executed. The  $F$  value is invariable when CNC is reset or at emergent stop.

**Note: In G95 mode, the cutting feedrate will be uneven when the spindle speed is less than 1 rev.**

**/min. The following error will exist in the actual feedrate when the spindle speed vibration occurs.**

**To guarantee the machine quality, it is recommended that the spindle speed selected in machining is not less than the lowest speed of available torque exported by spindle servo or transducer.**

Cutting feed: The CNC makes tool movement path and the path (linear or circular arc) defined by command into consistency (The circular interpolation can be performed by two axis in selected plane when it is circular arc, the helical interpolation is formed by the third axis linear interpolation linkage), by which, the CNC controls three directions movement for X axis, Y axis, Z axis, 4th axis and 5th axis at the same time. The instantaneous speed of movement path in a tangential direction is consistent with the F command value, so this is called CUTTING FEED or INTERPOLATION. The cutting feedrate is supplied by F command, which it is disassembled to each interpolation axis according to the programming path when the CNC performs the interpolation command (cutting feed).

Linear interpolation: The CNC can control the instantaneous speed in the directions of X axis, Y axis, Z axis, 4th

axis and 5th axis, so the vector resultant speed in these five directions are equal to the F command value.

$$f_x = \frac{d_x}{\sqrt{d_x^2 + d_y^2 + d_z^2 + d_4^2 + d_5^2}} \bullet F$$

$$f_y = \frac{d_y}{\sqrt{d_x^2 + d_y^2 + d_z^2 + d_4^2 + d_5^2}} \bullet F$$

$$f_z = \frac{d_z}{\sqrt{d_x^2 + d_y^2 + d_z^2 + d_4^2 + d_5^2}} \bullet F$$

$$f_4 = \frac{d_4}{\sqrt{d_x^2 + d_y^2 + d_z^2 + d_4^2 + d_5^2}} \bullet F$$

$$f_5 = \frac{d_5}{\sqrt{d_x^2 + d_y^2 + d_z^2 + d_4^2 + d_5^2}} \bullet F$$

F is vector resultant speed for the instantaneous speed in X, Y and Z axis directions

The  $d_x$  is instantaneous increment of the X axis, the  $f_x$  is instantaneous speed of X axis.

The  $d_y$  is instantaneous increment of Y axis, the  $f_y$  is instantaneous speed of Y axis.

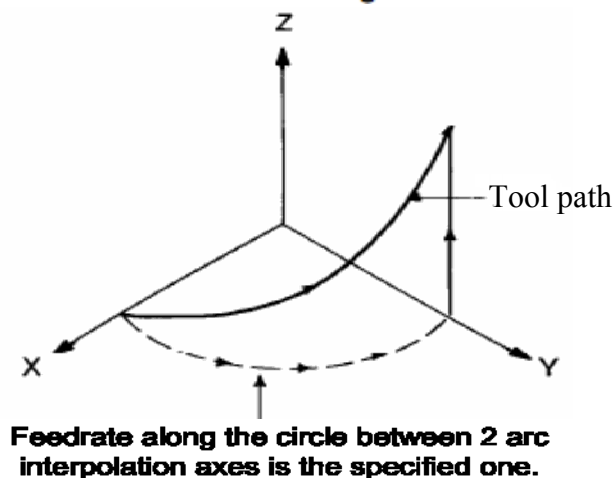
The  $d_z$  is instantaneous increment of Z axis, the  $f_z$  is instantaneous speed of Z axis.

The  $d_4$  is instantaneous increment of 4th axis, the  $f_4$  is instantaneous speed of 4th axis.

The  $d_5$  is instantaneous increment of 5th axis, the  $f_5$  is instantaneous speed of 5th axis.

Circular interpolation (helical interpolation): Performing the arc interpolation in selected plane, the third axis performs linear interpolation, so the F value is circular interpolation speed. An interpolation of linear and circular arc has the following relation when the linear interpolation speed is f:

$$f = F \times \frac{\text{linear axis length}}{\text{circular arc length}}$$



There are 16 levels feedrate override (0~150%, 10% per level) are offered by NC. The actual feedrate series, the memory performed or not when the power is turned off and the method of overriding are defined by PLC ladder diagram. Refer to the manual issued by the machine tool builder. The function description of



GSK980MDa standard PLC ladder diagram is as follows, for reference only.

By using the feedrate override key of the machine panel or external override switch it can performs real-time modification for the cutting feedrate. The actual cutting feedrate can be adjusted in the range of command speed 0~150%, here, the feedrate is memorized when the power is turned off. How to operate the cutting feedrate adjustment, refer to Chapter 3 OPERATION of this manual.

Related parameter:

Data parameter No. 070: the upper limit value (X axis, Y axis, Z axis ,4th axis and 5th axis are same) of the cutting feedrate.

Data parameter No.071: the initial (terminal) speed of exponential acceleration or deceleration for cutting feed.

Data parameter No.072: for exponential acceleration or deceleration time constant of cutting feed.

Data parameter No.073: for initial or terminal speed of exponential acceleration or deceleration in manual feed.

Data parameter No.074: for exponential acceleration or deceleration time constant of manual feed.

## 2.4.2 Manual feed

Manual feed: This GSK980MDa can perform positive/negative movement of X, Y, Z,4th or 5th axis by the current manual feedrate in the Manual mode. X axis, Y axis , Z axis ,4th axis and 5th axis can be moved at one time.

This NC offers 16 levels (0~150%, 10% each time) manual feedrate (override), see the following table 2-2. The actual feedrate series and modification mode or the like in manual feeding, are defined by PLC ladder diagram. Refer to the manual issued by the machine tool builder. The function description of GSK980MDa standard PLC ladder diagram is as follows, for reference only.

Table 2-2

| Feedrate<br>override(%)        | 0 | 10  | 20  | 30  | 40  | 50   | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150  |
|--------------------------------|---|-----|-----|-----|-----|------|----|----|----|----|-----|-----|-----|-----|-----|------|
| Manual<br>feedrate<br>(mm/min) | 0 | 2.0 | 3.2 | 5.0 | 7.9 | 12.6 | 20 | 32 | 50 | 79 | 126 | 200 | 320 | 500 | 790 | 1260 |

**Note: The manual feedrate of X axis is diameter variation per minute; the feedrate defined by GSK980MDa standard PLC ladder diagram is memorized when the power is turned off.**

Related parameter: Data parameter No.073: for speed lower limit of acceleration or deceleration in manual feed.

Data parameter No.074: for exponential acceleration or deceleration time constant in manual feed.

## 2.4.3 MPG/ Step feed

MPG feed: This GSK980MDa can move positively or negatively in X, Y, Z ,4th or 5th axis by current increment in the MPG mode. Only one of the axis can be moved at one time.

Step feed: This GSK 980MD can move positively or negatively for X, Y, Z ,4th or 5th axis by current

increment in the Step mode. One of the axis can be moved only at one time.

Only one mode is effective for the MPG or step mode at one time, it is up to Bit3 of CNC bit parameter No.001.

This NC offers 4 steps (0.001mm, 0.01mm, 0.1mm and 1mm) MPG/ step increment. The actual MPG/ step increment series, the selection of increment and current effective axis or the like, are defined by PLC ladder diagram. Refere to the manual issued by the machine tool builder.

Related parameter: Data parameter No.073: for initial or terminal speed of exponential acceleration or deceleration in manual feed.

Data parameter No.074: for exponential acceleration or deceleration time constant of manual feed.

## 2.4.4 Automatic acceleration or deceleration

This GSK980MDa performs automatically acceleration or deceleration in order to achieve the smooth transition of the speed at the beginning of the axis movement or before the movement stops; this will diminish the impact when the movement is start or stop. This GSK980MDa adopts kinds of acceleration or deceleration as follows:

Rapid traverse: linear type front acceleration or deceleration Cutting

feed: exponential type rear acceleration or deceleration Manual feed:

exponential type rear acceleration or deceleration MPG feed:

exponential type rear acceleration or deceleration Step feed:

exponential type rear acceleration or deceleration

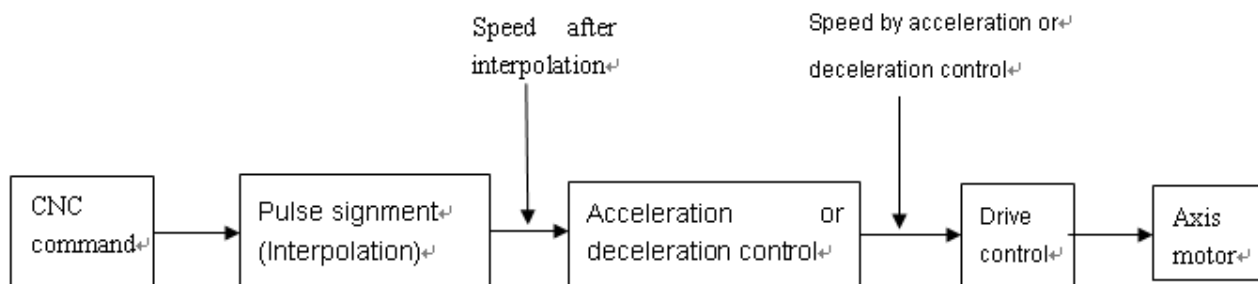


Fig. 2.9

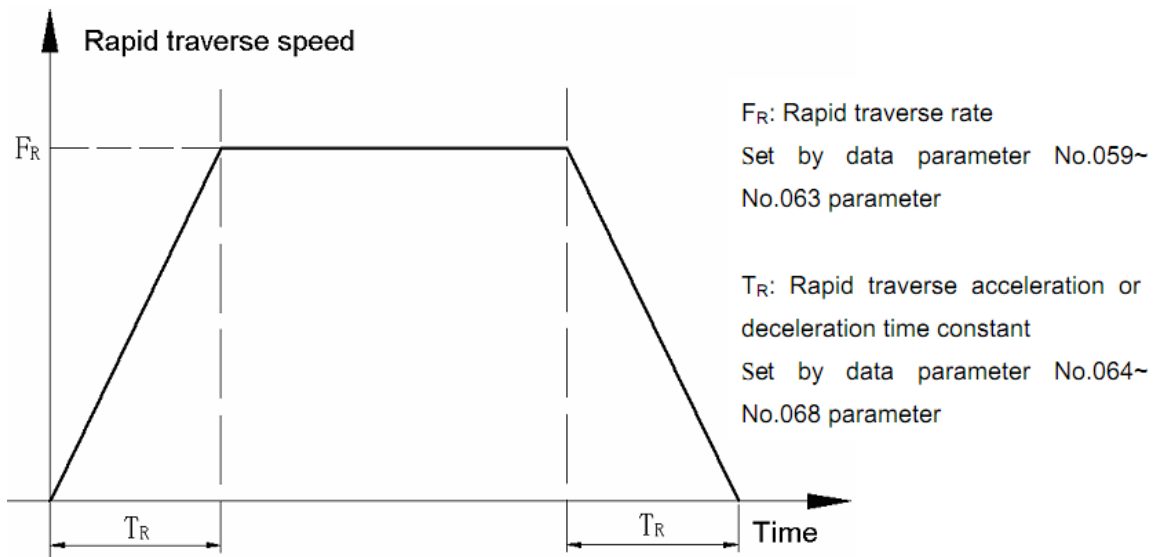


Fig. 2-10 Curve for rapid traverse

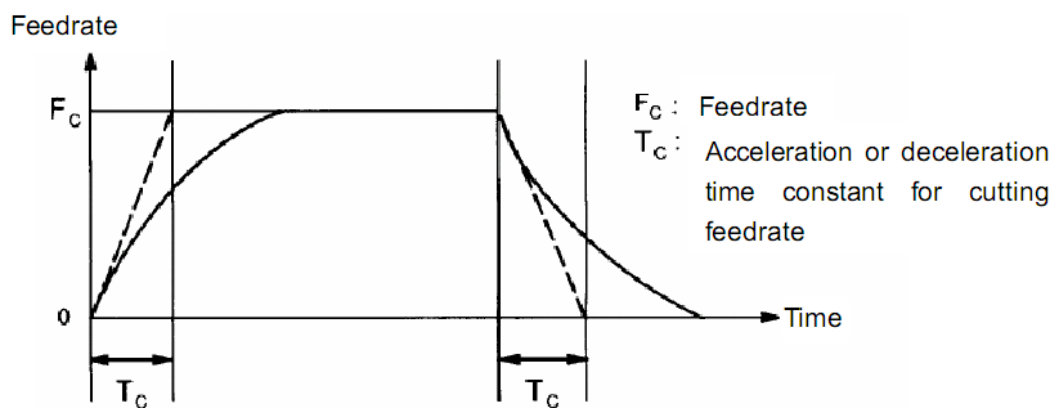
 $F_C$ : feedrate $T_C$ : The acceleration or deceleration time constant of cutting feedrate  
(Data parameter No.072 and No.074)

Fig. 2-11 Curves for cutting and manual feedrate

When the cutting feed is performed, this GSK980MDa adopts exponential rear acceleration or deceleration, an arc transition will be formed for the acceleration or deceleration at the meeting point of the path for the adjacent two cutting feed blocks, when the BIT5 of the bit parameter No.007 is set to 0. A contour error exists between the actual tool path and the programmed path when the positioning is not enough accurate at the meeting point of the two paths.

In order to avoid this kind of error, the exact stop command (G04;) can be inserted between the two blocks or the BIT5 of the CNC bit parameter No.007 is set to 1. Now, the previous block is decelerated to zero speed and it is positioned to the end of the block, and then the next cutting feed block is performed. The following block can be performed because each block is accelerating from the initial speed and then decelerating to

zero at last. If the program time is increasing, it may cause the lower machining efficiency.

The SMZ of bit parameter No.007 is set to 0, the transition between two adjacent blocks is processed according to the table 2-3.

Table 2-3

| Previous block<br>Next block | Rapid<br>Position | Cutting<br>feed | Without<br>move |
|------------------------------|-------------------|-----------------|-----------------|
| Rapid positioning            | X                 | X               | X               |
| Cutting feed                 | X                 | O               | X               |
| Without move                 | X                 | X               | X               |

**Note: X:** The subsequent block is performed after the previous block is accurately positioned at the end of the block.

**O:** Each axis speed is transitted according to the acceleration or deceleration between the adjacent blocks; an arc transition is formed at the meeting point of the tool path.

(Inaccurate positioning)

Example (The BIT3 of the bit parameter is set to 0)

G91 G01\*-100; (X axis move negatively)  
 Z-200; (Z axis move negatively)  
 Y-300; (Y axis move negatively)

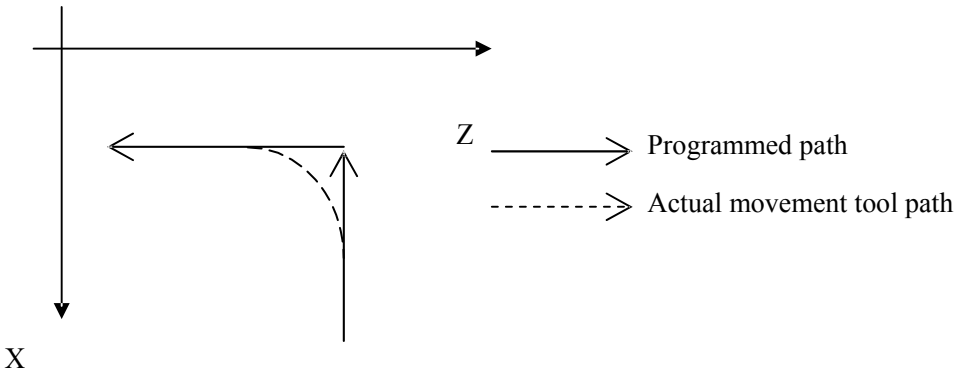


Fig.2-12

## Chapter 4 ADDITIONAL AXIS OPERATION

### 4.1 Brief

Depends on the structural of machine tools, sometimes must have an additional axis, For example swing table, rotary table and so on. The axis can be designed into a straight axis, but also a rotary axis. basic number of 980MDa is 3-axis, largest 5-axis (including Cs axis). Namely, add two additional axes on the original basic – 4th and 5th-axis, for which to complete related functions of additional linear axis and rotary axis

### 4.2 name of axis

name of three basic axes are X, Y, and Z. name of additional axis can be defined as A, B or C by setting data parameters № 202 and № 203

- general axis name  
when axis name is not setted, generally called additional 4<sup>th</sup> axis as A and 5<sup>th</sup> axis as C.
- Repeat-axis name  
Additional 4th axis and 5th axis are setted as the same name, resulting P / S alarm.

### 4.3 Axis showing

When additional axes is rotation axis, third data of decimal display as unit, because the smallest unit of rotation axis is 0.01 ° (degrees),

If it is a linear axis, shows as basic 3-axis (X, Y, Z axis). The following shows 'relative coordinates' and 'coordinates & programs' interface-axis display when set 4-axis as linear axis and 5-axis as rotation axis.

|              |  |                     |  |
|--------------|--|---------------------|--|
| RELATIVE POS |  | 00000 N00000        |  |
| 00000 N00000 |  | G00 G17 G90 G54     |  |
| X 0.0000     |  | G21 G40 G49 G94 G98 |  |
| Y 0.0000     |  | F0100 S 00 M30      |  |
| Z 0.0000     |  | PRG. F: 100         |  |
| A 0.0000     |  | ACT. F: 0           |  |
| C 0.0000°    |  | FED OVRI: 150%      |  |
|              |  | RAP OVRI: 100%      |  |
|              |  | SPI OVRI: 100%      |  |
|              |  | PART CNT: 0         |  |
|              |  | CUT TIME: 0:00:00   |  |
| MDI          |  | S0000 T00 H00       |  |

| POS & PRG      |        |            | 00000 N00000  |   |        |
|----------------|--------|------------|---------------|---|--------|
| (RELATIVE)     |        | (ABSOLUTE) | (MACHINE)     |   |        |
| X              | 0.000  | X          | 0.000         | X | 0.000  |
| Y              | 0.000  | Y          | 0.000         | Y | 0.000  |
| Z              | 0.000  | Z          | 0.000         | Z | 0.000  |
| A              | 0.000  | A          | 0.000         | A | 0.000  |
| C              | 0.000° | C          | 0.000°        | C | 0.000° |
| 00000 (00000); |        |            |               |   |        |
| %              |        |            |               |   |        |
| EDIT           |        |            | S0000 T00 H00 |   |        |

#### 4.4 Axis Enable

Separately setting State parameters № 026 and № 028's Bit1 (ROSx) and Bit0 (ROTx) to enable 4-axis and 5-axis as linear axis or rotation axis. Parameter setting is as follows:

| ROS | ROT | content   |
|-----|-----|---|
| 0   | 0   | linear axis<br>1、can be changed betweenInch and metric.<br>2、All coordinate values are linear axis type;<br>3、Storage-type pitch error compensation is linear axis type.  |
| 0   | 1   | rotation Axis (A type)<br>1、can not be changed betweenInch and metric.<br>2、Machine Coordinate is recycling according to the value of data parameters № 189 / № 190. absolute coordinates and relative coordinates are cycling or not is set by state parameters № 027 / № 029 .<br>3、Storage-type pitch error compensation is rotation axis type.<br>4、Return to reference point (G28,G30) , move distance will not exceed one turn. |
| 1   | 0   | set invalid(forbid to use)  |
| 1   | 1   | rotation axis (B type)<br>1、can not be changed betweenInch and metric.<br>2、Machine coordinate is linear axis type; absolute coordinates and relative coordinates are cycling or not is set by state parameters № 027 / № 029 .<br>3、Storage-type pitch error compensation is linear axis type.   |

Remarks: only when roration axis is valid (ROTx=1) ,Cs axis (spindle act as rotation axis) can be start. Even then you can set state parameter №026 or №028's Bit5 (RCSx) to choose Cs axis function is valid or not.

#### 4.5 additional axis is linear axis

Additional axis (4th,5<sup>th</sup> axis) is linear axis, their function is the same as basic three axis.

- operation can be realized

- 1、rapid move(location): G90/91 G00 X\_ Y\_ Z\_ A\_;
- 2、Cutting feed: G90/91 G01 X\_ Y\_ Z\_ A\_ F\_;
- 3、skip function: G90/91 G31 X\_ Y\_ Z\_ A\_ F\_;
- 4、return to reference point: G28/29/30 X\_ Y\_ Z\_ A\_ F\_;
- 5、G92 set coordinate: G92 X\_ Y\_ Z\_ A\_;
- 6、Manual/single step/handwheel feed, manual machine zero

Note: if there is no special note in following content, additional linear axis will be written as A axis.

#### relative remarks

- 1、When additional linear axis rapid move (G00) or process(G28,G29,G30), they can be Simultaneously specified with any X,Y,Z axis. Each axis will rapid move at its own speed.
- 2、When additional axis is processing G01 or skip function G31, they can be Simultaneously specified with any X,Y,Z axis. At this time, linear axis do not have Independent speed, their speed depends on specified axis at the same time. And start and end with specified axis at the same time. Namely, additional axis is linkage with basic three axis.
- 3、Additional linear axis can not process arc cutting command (G02/03) , or else P/S alarm.
- 4、Function of additional linear axis 's pitch error and backlash compensation is the same as basic three axis.

## 4.6 additional axis is rotation axis

### ● input unit

the minimum input pulse-equivalent unit of 980MDa rotation axis is 0.01 ° (degrees);  
max Output pulse frequency is 500K. When choose to output pulse+direction signal, output maximum speed of  $n = 60 * f / 36000 = 833.33$  (r / min).

### ● rotation axis speed

Rotation axis feed speed 's instruction unit is degree/ min. When linear axis X.Y.Z and rotation axis processing linear interpolation, speed of F(mm/min) instruction is synthetic feed rate of X, Y, Z and rotation axis .  
Calculation of Feed Rate: First, calculate the time to the finish position; Then, transform rotation axis 's feed unit to degrees / minutes.

for example: G91 G01 X20.0 C40.0 F300.0;

C-axis unit transform from 40.0-degreeto metric 40mm. the time move to the end

$$\frac{\sqrt{20^2 + 40^2}}{300} = 0.14907 \text{ (min)}$$

speed of C axis:

$$\frac{40}{0.14907} = 0268.3 \text{ (degree/min)}$$

Note: if there is no special note in following content, additional rotation axis will be written as C axis.

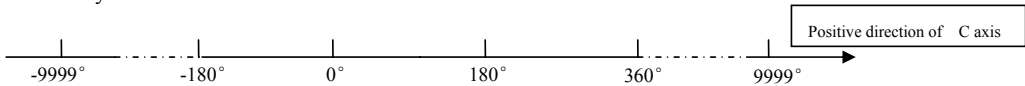
### ● circulatory function of rotation axis

Setting rotation of additional axis 's coordinates is valid, which can avoid overflow of rotation axis coordinates. Coordinate value will recycle as data parameters № 189 / № 190 (rotation axis move value per turn).

when Setting rotation of additional axis 's coordinates is invalid, coordinate will change as linear axis format. Programming instructions and rules are the same as linear axes;

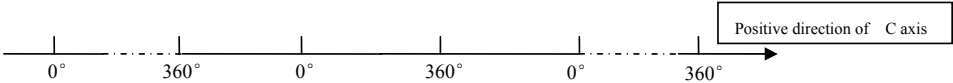
detailed description of coordinate changes in both cases are as following.

(1) coordinate cycle invalid



Reason lead to above situation:

- (a) machine coordinates of rotation axis (B type)
  - (b) absolute coordinates when State parameters № 027 ROAx = 0 ( absolute coordinates cycle is invalid).
  - (c) relative coordinates when State parameters № 027 RRLx=0 ( relative coordinates cycle is invalid).
- (2) coordinate cycle valid



Reason lead to above situation:

- (1) machine coordinates of rotation axis (A type)
- (2) absolute coordinates when State parameters № 027 ROAx = 0 ( absolute coordinates cycle is valid).
- (3) relative coordinates when State parameters № 027 RRLx=0 ( relative coordinates cycle is valid).

Remark 1: parameters of additional axis are listed in "installation connection" part of "Chapter III parameter description."

Remark 2: Note: if there is no special note in following content, transfer distance per turn all explain as 360°.

带格式的: 项目符号和编号

● pitch error compensation of rotation axis

When additional axis is linear axis or rotation axis (B type), pitch error compensation is the same as general linear axis. Following examples showing pitch error compensation when additional axes is rotation axis (A type).

- transfer distance per turn: 360°
- location interval of pitch error: 45°
- compensation location numbers of reference point: 60

after setting above parameters, farthest compensation location numbers in rotation axis 's negative direction is equal to compensation position number of reference point;

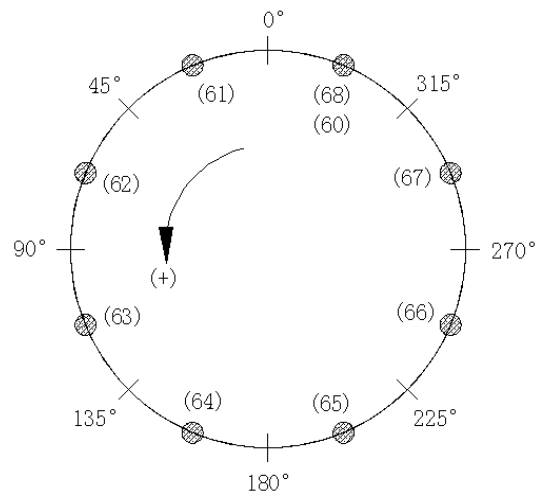
farthest compensation numbers in positive direction as follows:

reference compensation location numbers+(feed distance per turn/ compensation inter value)= 60 + 360/45 = 68;

compensation position number of reference point+(transfer distance per turn/ compensation location interval)=

relation ship of machine Coordinate with compensation position number is as follows:



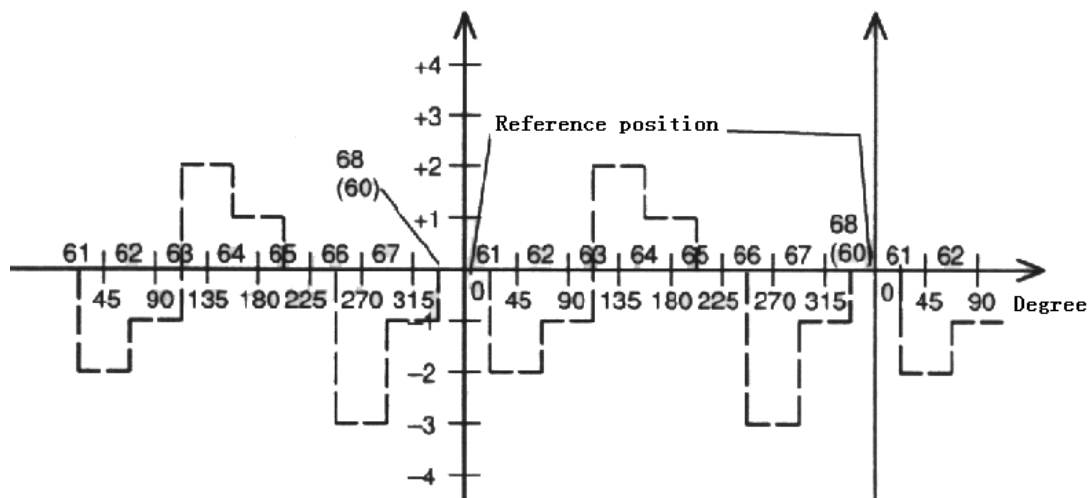


If sum compensation value of 61 ~ 68 is not 0, will generate position deviation; must set same value in position 60 and 68(because 60 and 68 are the same location on the circumference);

The following are examples of compensation:

| NO.          | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 |
|--------------|----|----|----|----|----|----|----|----|----|
| compensation | 1  | -2 | 1  | 3  | -1 | -1 | -3 | 2  | 1  |

Pitch error compensation  
value (absolute value)



- **rotation axis backlash** compensation function

Either as linear axis or rotation axis, backlash compensation is the same, just as rotation axis's compensation unit is  $0.01^\circ$  (deg), while linear axis compensation unit is 0.001 (mm);

Spindle act as servo feed axis, realize rotate and position function through position move instruction.

Move speed is degree/ min. It can interpolate with other feed axis and process contour curve.

Increment system min input increment: 0.01deg

Min instruction increment: 0.01deg

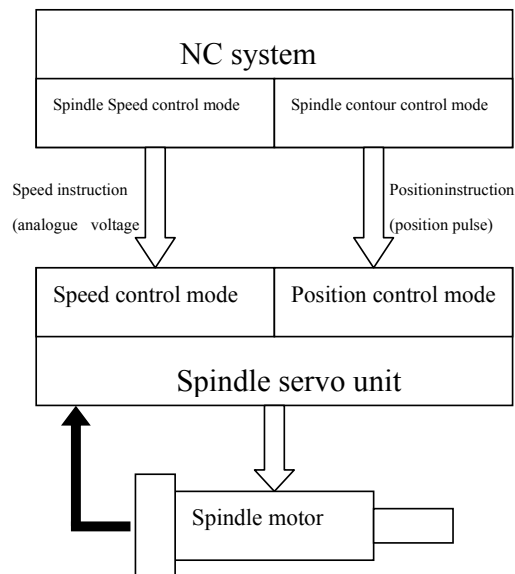
Feed speed max speed of pulse+direction type output signal is 833.33(turn/min)

Remark :.NC has two spindle control mode

- Spindle speed control mode. Through speed instruction ( analogue voltage) to control spindle speed.
- Spindle contour control mode ( Cs contour control), trough position instruction ( position pulse) to control spindle speed.

So, NC requests spindle servo unit has two control mode to control spindle motor.

- When NC is in speed control mode, spindle servo unit can receive NC speed instruction to control spindle speed.
- When NC is in contour control mode, spindle servo unit also can receive NC position instruction to control motor to move to pointed position.



#### define Cs contour control axis

In 980MDa system, only additional axis (4<sup>th</sup>, 5<sup>th</sup> axis) can be defined as Cs contour control axis. But you can define two Cs axis at same time. Before set to be Cs axis, you should set it to be rotation axis. Or else, Cs axis is invalid.

|   |   |   |
|---|---|---|
| 0 | 2 | 6 |
|---|---|---|

|     |     |      |     |     |     |      |      |
|-----|-----|------|-----|-----|-----|------|------|
| *** | *** | RCS4 | *** | *** | *** | ROS4 | ROT4 |
|-----|-----|------|-----|-----|-----|------|------|

RCS4=1: Cs axis of 4<sup>th</sup> axis is valid

=0: Cs axis of 4<sup>th</sup> axis is invalid

ROS4、ROT4: define type of 4<sup>th</sup> axis

|      | Linear axis | rotation axis(A type) | Rotation axis (B type) | invalid |
|------|-------------|-----------------------|------------------------|---------|
| ROT4 | 0           | 1                     | 1                      | 0       |
| ROS4 | 0           | 0                     | 1                      | 1       |

0 2 8

\*\*\*

\*\*\*

RCS5

\*\*\*

\*\*\*

\*\*\*

ROS5

ROT5

RCS5=1: Cs axis of 5<sup>th</sup> axis is valid=0: Cs axis of 5<sup>th</sup> axis is validROS5、ROT5:; define type of 5<sup>th</sup> axis

|      | Linear<br>axis | rotation<br>axis(A type) | Rotation axis<br>(B type) | invalid |
|------|----------------|--------------------------|---------------------------|---------|
| ROT5 | 0              | 1                        | 1                         | 0       |
| ROS5 | 0              | 0                        | 1                         | 1       |

**spindle speed control****Cs contour control shift**

NC use PLC CON signal to shift spindle control mode.

In NC's Cs contour control mode, Cs contour control axis can be operated by manual or auto, just like general servo axis.

- shift from spindle speed control to Cs contour control  
Set CON (G027#7) to 1, make spindle working in Cs contour control mode. If shift for rotating spindle, then spindle stop and excute shift.
- shift from Cs contour control to spindle speed control  
Set CON (G027#7) to 0, make spindle working in spindle speed control mode. Should confirm that spindle move instructions have stopped before shifting. Or else, system alarms.  
If shift for rotating spindle, then spindle stop and excute shift.

**return to Cs contour control axis reference position**

When spindle shift from speed control mode to Cs contour control mode, current position is uncertain. So spindle should return to reference position.

**Cs contour control axis return to reference position**

- **return to reference position by manual**  
When spindle is in Cs contour mode, shift to machine zero mode. Starting Cs axis returning zero motion by opening feed axis and direction selection signal +Jn(G100 or -Jn(G102).
- **auto mode**  
When spindle is in Cs contour mode, shift to machine zero mode, command G28, spindle move to middle position, then return to reference position. After that, ZPn(F094) change to be 1.

**run of Cs contour control axis****(manual/auto)**

If Cs contour control axis has returned to reference position, Cs axis runs like general NC axis.

Under spindle speed control mode, Cs contour control axis can not run. Or else, system alarms.

So, under spindle speed control mode, forbid operate Cs axis by manual in PLC ladder.

**spindle contour control shift signal****COIN(G027#7)**

[type] input signal

[function] This signal is used in shifting between spindle speed control mode and Cs contour control mode.

This signal =1, spindle shift from speed control mode to Cs contour control mode.

This signal =0, spindle shift from Cs contour control mode to speed control mode

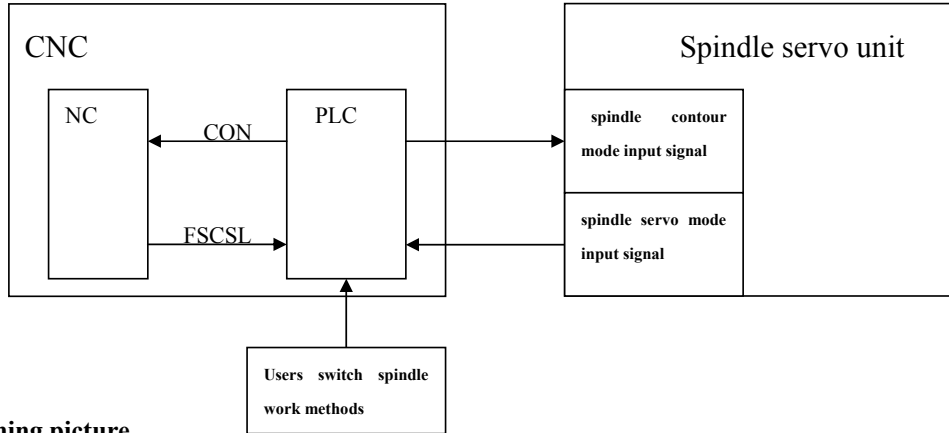
**spindle contour control shift end signal**

**FSCSL(F044#1)**

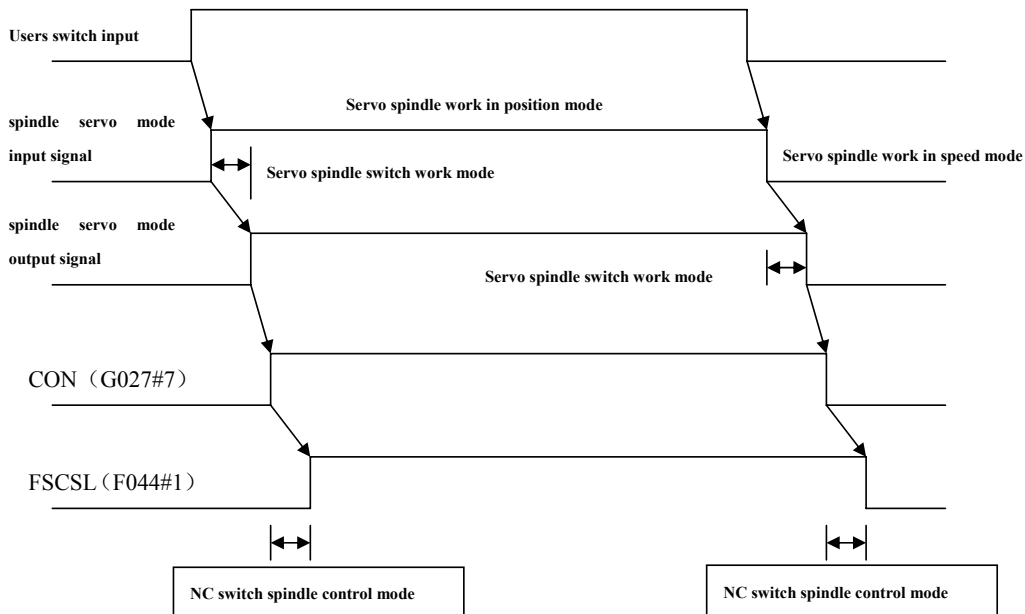
- [type] output signal  
 [function] This signal shows that controlled axis has been controlled in Cs contour mode.  
 [output condition] spindle speed control mode—> 0  
 Cs contour control mode—>

**CNC and spindle servo unit**

signal relation ship with spindle work method shift



**Timing picture**



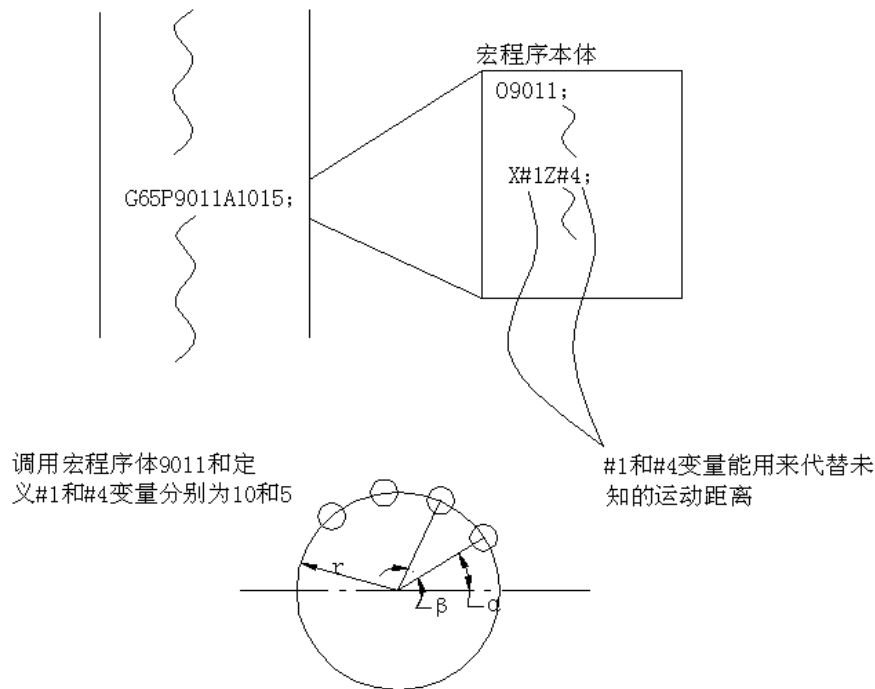
**relative parameter**

|                                      |   |
|--------------------------------------|---|
| <b>0 7 7</b>                         | CS axis Acceleration and deceleration start speed         |
| settiing range: 0~5000(unit:deg/min) |   |
| <b>0 7 8</b>                         | CS axis Acceleration and deceleration constant time value |
| settiing range: 10~4000 (unit:ms)    |   |

## CHAPTER 5 CUSTOM MACRO

GSK980MDa offer macro instruction similar to high-class language. Custom macro can realize variable evaluation, arithmetic, logical judgments and conditions transfer, which will help process special workpiece, reducing tedious numerical calculation in manyal programming, streamline user program.

User Macro programs are similar to subroutines, but user macro allows to use variables, arithmetic, logical operations and conditions o transfer, so it is more convenient to makes machining operations easier



It is easy to process above ring distribution screw holes

After program and record macro program for ring distribution screw holes, it can work if NC has a circular hole machining function .

So as through following instruction, programmer recall ring distribution holes function.

G65 PpRrAaBbKk;

p: ring distribution holes macro unnumber

r: radius

a: start angle of hole

b: angle between holes

k: number of holes

So that user can improve NC performance by himself. Macro program can be provide by machine tool manufacture or user itself.

### 5.1 recall macro program

difference between macro program recall and subprogram recall is as following:

1、 Using G65.G66 to point independent variable data and transfer to macro program.but M98 is without this function.

2、When M98 including another NC instruction ( such as G01 X100.0 M98 P\_), you can recall macro program P\_ only finishing G01 process. opposition, G65 can recall P\_ unconditionally.

3、When M98 including another NC instruction ( such as G01 X100.0 M98 P\_), in single program mode, machine stop; opposition, G65, machine do not stop

4、G65, G66 can change level of part variable, but M98 can not.

### ● Simple call(G65)

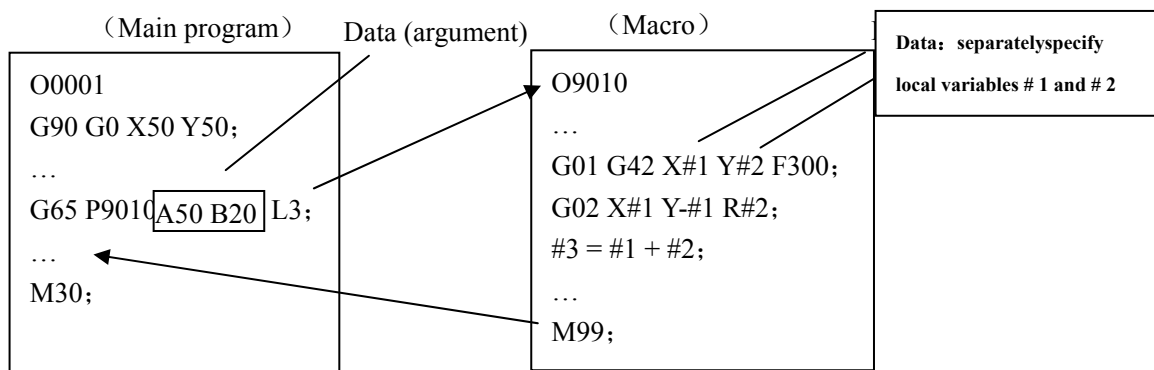
When G65 is specified, the custom macro specified at address P is called. Data (argument) can be passed to the custom macro program.

**Format:** G65 P\_ L\_ <argument-specification>;

**Explanations:** P —— Number of the program to call

L —— Repetition count ( 1 by default)

<Argument> —— Data passed to the macro



**Argument specification:** Two types of argument specification are available.

Argument specification I uses letters other than G, L, O, N, and P once each.

### Argument specification I

| Address | Variable number | Address | Variable number | Address | Variable number |
|---------|-----------------|---------|-----------------|---------|-----------------|
| A       | #1              | I       | #4              | T       | #20             |
| B       | #2              | J       | #5              | U       | #21             |
| C       | #3              | K       | #6              | V       | #22             |
| D       | #7              | M       | #13             | W       | #23             |
| E       | #8              | Q       | #17             | X       | #24             |
| F       | #9              | R       | #18             | Y       | #25             |
| H       | #11             | S       | #19             | Z       | #26             |

Note: no need to be specified address can be omitted, local variable witch omit address will be set to blank (Null).

Argument specification II uses A, B, and C once each and also uses I, J, and K up to ten times. The type of argument specification is determined automatically according to the letters used.

### Argument specification II

| Address        | Variable number | Address        | Variable number | Address         | Variable number |
|----------------|-----------------|----------------|-----------------|-----------------|-----------------|
| A              | #1              | K <sub>3</sub> | #12             | J <sub>7</sub>  | #23             |
| B              | #2              | I <sub>4</sub> | #13             | K <sub>7</sub>  | #24             |
| C              | #3              | J <sub>4</sub> | #14             | I <sub>8</sub>  | #25             |
| I <sub>1</sub> | #4              | K <sub>4</sub> | #15             | J <sub>8</sub>  | #26             |
| J <sub>1</sub> | #5              | I <sub>5</sub> | #16             | K <sub>8</sub>  | #27             |
| K <sub>1</sub> | #6              | J <sub>5</sub> | #17             | I <sub>9</sub>  | #28             |
| I <sub>2</sub> | #7              | K <sub>5</sub> | #18             | J <sub>9</sub>  | #29             |
| J <sub>2</sub> | #8              | I <sub>6</sub> | #19             | K <sub>9</sub>  | #30             |
| K <sub>2</sub> | #9              | J <sub>6</sub> | #20             | I <sub>10</sub> | #31             |
| I <sub>3</sub> | #10             | K <sub>6</sub> | #21             | J <sub>10</sub> | #32             |
| J <sub>3</sub> | #11             | I <sub>7</sub> | #22             | K <sub>10</sub> | #33             |

Note 1: subscript of I, J, K in the table is used to determine independent variables 's order , it will not write in actual programming.

Note 2: In mode II, variables I, J, K can be written in independent order. system will identify corresponding variables number by the order. for example the program block has: G65 P9010 A1 B2 C3 I14 J15 I6 J7 K9 K11 K12 J30; variables passed as follows, **I14→#4, J15→#5, I6→#7, J7→#8, K9→#6, K11→#9, K12→#12, J30→#11;**

**Format:** G65 must be specified before any argument.

**Mixture of argument specifications I and II:** The CNC internally identifies argument specification I and argument specification II. If a mixture of argument specification I and argument specification II is specified, the type of argument specification specified later takes precedence.

Example:

G65 P9001 A1.2 B2.0 I-3.3 I4 D5;

<Variables>

#1: 1.2

#2: 2.0

#3: Null

#4: -3.3

#5: Null

#6: Null

#7: ~~4~~

5

When both the I4.0 and D5.0 argument are commanded for Variable #7 in this example, the latter, D5.0, is valid.

#### ● Modal Call (G66)

Once G66 is issued to specify a modal call a macro is called after a block specifying movement along axes is executed. This continues until G67 is issued to cancel a modal call.

Note: format, functions and independent variables specified of G66 instruction and G65 (non-modal call) are exactly the same. (Specification refer to relevant G65 instructions).

Mode recall nested: during mode recall, specifying another G66 code, and can be nested mode recall.

Mode recall instructions

1, specified G66 program block, not execute mode recall macro. only transmit self-variable.

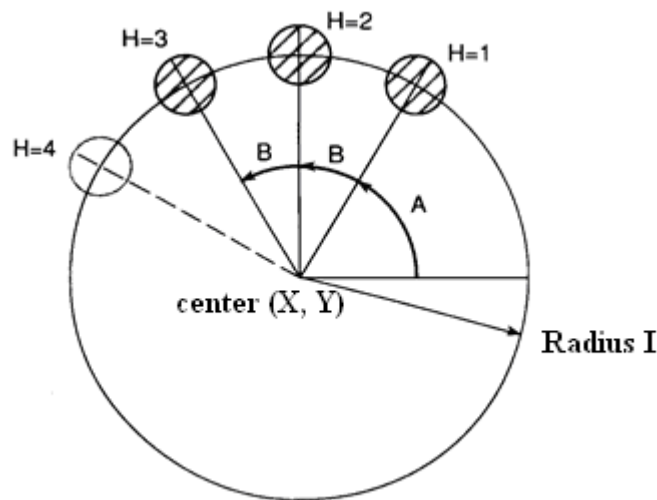


- 2, recall mode macro program, when there are move command (G00, G01, G02, G03) in the program.
- 3, only In auxiliary functions, or without moving program block can not recall macro mode.
- 4, can not specify G65 and G66 together.
- 5, In G66 program block, can not recall several macro program.
- 6, G66 should be specified before self-variable and P, just like G65.

- **Sample program**

- **G65 call (bolt hole circle)**

A macro is created which drills H holes at intervals of B degrees after a start angle of A degrees along the periphery of a circle with radius I. The center of the circle is (X, Y). Commands can be specified in either the absolute or incremental mode. To drill in the clockwise direction, specify a negative value for B.



**Calling format:** G65 P9100 Xx Yy Zz Rr Ii Aa Bb Hh;

- X: X coordinate of the center of the circle (absolute or incremental specification) (#24)
- Y: Y coordinate of the center of the circle (absolute or incremental specification) (#25)
- Z: Hole depth(#26)
- R: Coordinates of an approach point(#18)
- F: Cutting feedrate(#9)
- I: Radius of the circle(#4)
- A: Drilling start angle(#1)
- B: Incremental angle (clockwise when a negative value is specified) (#2)
- H: Number of holes (#11)

**Program calling a macro program:**

```
O0002
G90 G00 X0 Y0 Z100;
G65 P9100 X100 Y50 R30 Z-50 F500 I100 A45 B30 H5;
M30;
```

**Macro program (called program):**

```
O9100
#3=#4003 ... .. Stores G code of group 3
IF[#3 EQ 90]GOTO 1; ... .. Branches to N1 in the G90 mode
#24=#5001+#24; ... .. Calculates the X coordinate of the center
#25=#5002+#25; ... .. Calculates the Y coordinate of the center
N1 WHILE[#11 GT 0]DO 1; ... .. Until the number of remaining holes
```

reaches 0

```
#5=#24+#4*COS[#1]; ... ..Calculates a drilling position on the x-axis
#6=#25+#4*SIN[#1]; ... .. Calculates a drilling position on the y-axis
G90 G81 X#5 Y#6 Z#26 R#18 F#9; ... .. Drilling cycle
#1=#1+#2; ... .. Updates the angle
#11=#11-1; ... .. Decrements the number of holes
END 1;
G#3 G80; ... .. Returns the G code to the original state
M99;
```

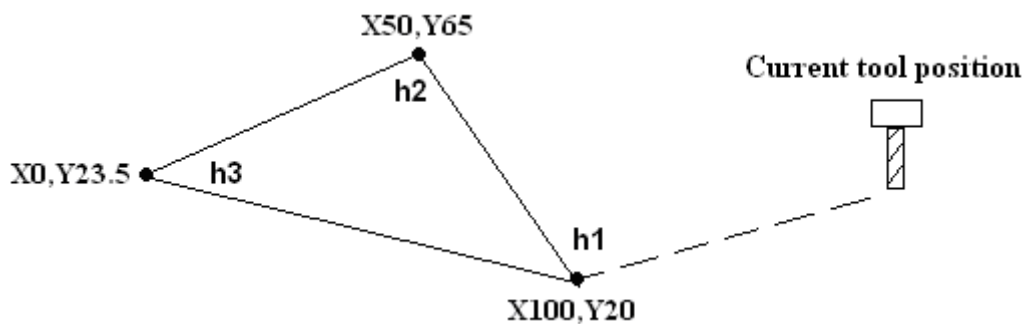
**Meaning of variables:** #3: Stores the G code of group 3

#5: X coordinate of the next hole to drill

#6: Y coordinate of the next hole to drill

#### ➤ Modal Call G66

As shown below, processing three holes (holes h1, h2, h3).



**Calling format:** independent variables in this example is assumed

#### Program calling a macro program:

```
O0001
G90 G17 G00 Xx Yy Zz;
G00 X150 Y20; ... .. positioning
G66 P9201 Aa Bb Cc; ... .. Transmitting self-variable..ready to process holes.
G00 X100 Y20; ... ..Positioning to h1 hole location, recall macro program (hole processing).
X50 Y65; ... ..Positioning to h2 hole location, recall macro program (hole processing).
M09; ... ..Non-mobile instructions, do not recall macro program.
X0 Y23.5; ... ..Positioning to h3 hole location, recall macro program (hole processing).
G67 G00 X150 Z20; ... ..Cancel recall macro mode,return
M30;
```

#### Macro program (called program):

```
O9201(hole process program)
Program omit.
```

## 5.2 VARIABLES

An ordinary machining program specifies a G code and the travel distance directly with a numeric value;

examples are G01 and X100.0. With a custom macro, numeric values can be specified directly or using a variable number; examples are G#101 X#102. When a variable number is used, the variable value can be changed by a program or using operation on the MDI panel.

variable representation and use way

Variable is different from self-variables (data), variables can be regarded as data carriers, such as # 1, # 101 ... is called variable; A100, B200 ... known as the self-variables; self-variable A100, B200's data 100,200 will be transmitted to variable # 1 and # 2.

Value in using user macro program or writing user macro program can be directly specified (such as G01, X100, etc.). you can also use variables (such as G # 01, X # 07, etc.) to specify, when using variable, variable value can be altered in program or on operation panel.

1. Using variable to specify user macro program's address value. Variable value can be assigned by main program settings, or be assigned by calculated values when executing user macro. You can use multiple variables, which are distinguished by variable number.
2. (1) Variables indication

Using follow-up variables number with # sign to show a variable, format is as follows:

#i (i = 1, 2, 3, 4 .....). For example: #5, #109, #1005

(3) omit of radix point

When variable value is defined in the program, decimal point can be omitted. For example: When defining # 1 = 123, actual value of variable # 1 is 123.000.

(2) Variable citation

Address data can be replaced by variable values.

If there is <address>#i or <address> -#i, it means that value of a variable, or negative value of variable value is defined as address. For example: Z-#110...when #110 = 250, it is the same as Z-250. G#130... when #130 = 3, it is the same as G3.

(3) variable replace variable number

When using variable to replace variable number, it is no need to describe ##100, only write #9100. Namely "9" following # is variable number, following is examples of replacement of variable number.

Example : when #100 = 105, it means #105 = 500.

X#9100 and X500 is the same. Namely X#9100 → X##100, X#105 → X500.

X-#9100 and X-500 is the same.

Note: The program number O, sequence number N and the optional program block skip symbol '/' can not use variable. Example: O # 1, / # 2, N # 3.

#### ● Variable display

- 1、When the value of a variable is 'Null', the variable is null. Not be define.
- 2、Value of public variable (# 100 ~ # 199, # 500 ~ # 999) can be displayed in macro variables page. You can input data to evaluate public variable in this page.
- 3、Part variables (# 1 ~ # 33) and value of system variable do not have display interface. For view of Part variables or system variable values, they can be assigned as public variables to display in indirect way.

4、The range of variable: integer: -2147483648 to 2147483647, float:  $-10^{47}$  to  $-10^{-29}$ , or, 0, or,  $10^{-29}$  to  $10^{47}$ .

● **Types of variables**

Variables are classified into four types by variable number.

| Variable number | Type of variable | Function  | Range of variable values           | Remark             |
|-----------------|------------------|---|------------------------------------|--------------------|
| #0              | Always null      | This variable is always null. No value can be assigned to this variable.  | Null                               |                    |
| #1~#33          | Local variables  | Local variables can only be used within a macro to hold data such as the results of operations. When the power is turned off, local variables are initialized to null. When a macro is called, arguments are assigned to local variables. |                                    |                    |
| #100~#199       | Common variables | Public variable has the same meaning in different macro programs  | Power off Initialization is empty  | Read/Write/Display |
| #500~#999       |                  |   | data has been saved when power off |                    |
| #1000~#1015     | System variables | G54、G55 state output.   | 0 or,1<br>Process by PLC.          | Only read          |
| #1032           |                  | Store G54、G55, Read all 16 bits of a signal at one time.  |                                    |                    |
| #1100~#1115     |                  | G54、G55 state input.  |                                    | Read/Write         |
| #1132           |                  | Store G54、G55, Write all 16 bits of a signal at one time.   |                                    |                    |
| #1133           |                  | Store G56~G59, Write all 32 bits of a signal at one time.   |                                    |                    |
| #2001~#2032     | System variables | Tool length compensation wear   | -9999.999 to 9999.999              | Read/Write         |
| #2201~#2232     |                  | Tool length compensation geometric  | -9999.999 to 9999.999              | Read/Write         |
| #2401~#2432     |                  | Cutter compensation wear  | -9999.999 to 9999.999              | Read/Write         |
| #2601~#2632     |                  | Cutter compensation geometric   | -9999.999 to 9999.999              | Read/Write         |
| #3003~#3004     |                  | Automatic operation control —#3003  | 0, 1, 2, 3                         | Read/Write         |
|                 |                  | Automatic operation control —#3004  | 0 to 7                             | Read/Write         |
| #3901           |                  | Number of machined parts  | 0 to 99999999                      | Read/Write         |
| #4001           |                  | G00、G01、G02、G03、G73、G74、G80、G81、G82、G83、G84、G85、G86、G88、G89、G110、G111、G112、G113、G114、G115、G134、G135、G136、G137、G138、   | Group 01 G code                    | Only read          |

|             |                 |  |                       |            |
|-------------|-----------------|--|-----------------------|------------|
|             |                 | G139   |                       |            |
| #4002~#4003 |                 | G17、G18、G19—#4002  | Group 02 G code       | Only read  |
|             |                 | G90、G91—#4003  | Group 03 G code       | Only read  |
| #4005~#4007 |                 | G94、G95—#4005  | Group 05 G code       | Only read  |
|             |                 | G20、G21—#4006  | Group 06 G code       | Only read  |
|             |                 | G40、G41、G42—#4007  | Group 07 G code       | Only read  |
| #4008       |                 | G43、G44、G49  | Group 08 G code       | Only read  |
| #4010       |                 | G98、G99  | Group 10 G code       | Only read  |
| #4014       |                 | G54~G59  | Group 14 G code       | Only read  |
| #4107       |                 | D code   | 0 to 32               | Only read  |
| #4109       |                 | F code   | 0 to 15000            | Only read  |
| #4111       |                 | H code   | 0 to 32               | Only read  |
| #4113~#4115 |                 | M code—#4113   | 0 to 99               | Only read  |
|             |                 | Sequence number —#4114   | 0 to 99999            | Only read  |
|             |                 | Program number —#4115  | 0 to 9999             | Only read  |
| #4119~#4120 |                 | S code —#4119  | 0 to 9999             | Only read  |
|             |                 | T code —#4120  | 0 to 32               | Only read  |
| #5001~5005  | System variable | Workpiece coordinate system, block end point, not included tool compensation value.  | -9999.999 to 9999.999 | Only read  |
| #5021~5025  |                 | Machine coordinate system, current position, included tool compensation value.       | -9999.999 to 9999.999 | Only read  |
| #5041~5045  |                 | Workpiece coordinate system, current position, included tool compensation value.     | -9999.999 to 9999.999 | Only read  |
| #5061~5065  |                 | Workpiece coordinate system, skip signal position, included tool compensation value. | -9999.999 to 9999.999 | Only read  |
| #5081~5085  |                 | Tool length offset value.  | -9999.999 to 9999.999 | Only read  |
| #5201~5205  |                 | 1~5 axis external workpiece zero point offset value                                  | -9999.999 to 9999.999 | Read/Write |
| #5221~5225  |                 | 1~5 axis G54 workpiece zero point offset value                                       | -9999.999 to 9999.999 | Read/Write |
| #5241~5245  |                 | 1~5 axis G55 workpiece zero point offset value                                       | -9999.999 to 9999.999 | Read/Write |
| #5261~5265  |                 | 1~5 axis G56 workpiece zero point offset value                                       | -9999.999 to 9999.999 | Read/Write |
| #5281~5285  |                 | 1~5 axis G57 workpiece zero point offset value                                       | -9999.999 to 9999.999 | Read/Write |
| #5301~5305  |                 | 1~5 axis G58 workpiece zero point offset value                                       | -9999.999 to 9999.999 | Read/Write |
| #5321~5325  |                 | 1~5 axis G59 workpiece zero point offset value                                       | -9999.999 to 9999.999 | Read/Write |

### 5.2.1 Undefined variable

When the value of a variable is not defined, such a variable is referred to as a “null” variable. Variable #0 is always a null variable. It cannot be written to, but is can be read.

## a、Quotation

When an undefined variable is quoted, the address itself is also ignored.

**When #1 = <vacant>**

G90 X100 Y#1 Equivalent G90 X100

**When #1 = 0**

G90 X100 Y#1 Equivalent G90 X100 Y0

## b、Operation

<vacant> is the same as 0 except when replaced by <vacant>

**When #1 = <vacant>**

#2=#1 (Definition)

Result: #2 = <vacant>

#2=#1 \* 5

Result: #2 = 0

#2=#1+#1

Result: #2 = 0

**When #1 = 0**

#2=#1

Result: #2 = 0

#2=#1 \* 5

Result: #2 = 0

#2=#1+#1

Result: #2 = 0

## c、Conditional expressions

<vacant> differs from 0 only for EQ and NE.

**When #1 = <vacant>**

#1 EQ #0

↓

Established

#1 NE #0

↓

Established

#1 GE #0

↓

Established

#1 GT #0

↓

Not established

**When #1 = 0**

#1 EQ #0

↓

Not established

#1 NE #0

↓

Not established

#1 GE #0

↓

Established

#1 GT #0

↓

Not established

## 5.2.2 Local variable

Local macro variables are internal variables in program , which is only valid in this program. Namely that can only be used in this program , you can not use these variables outside of this program.

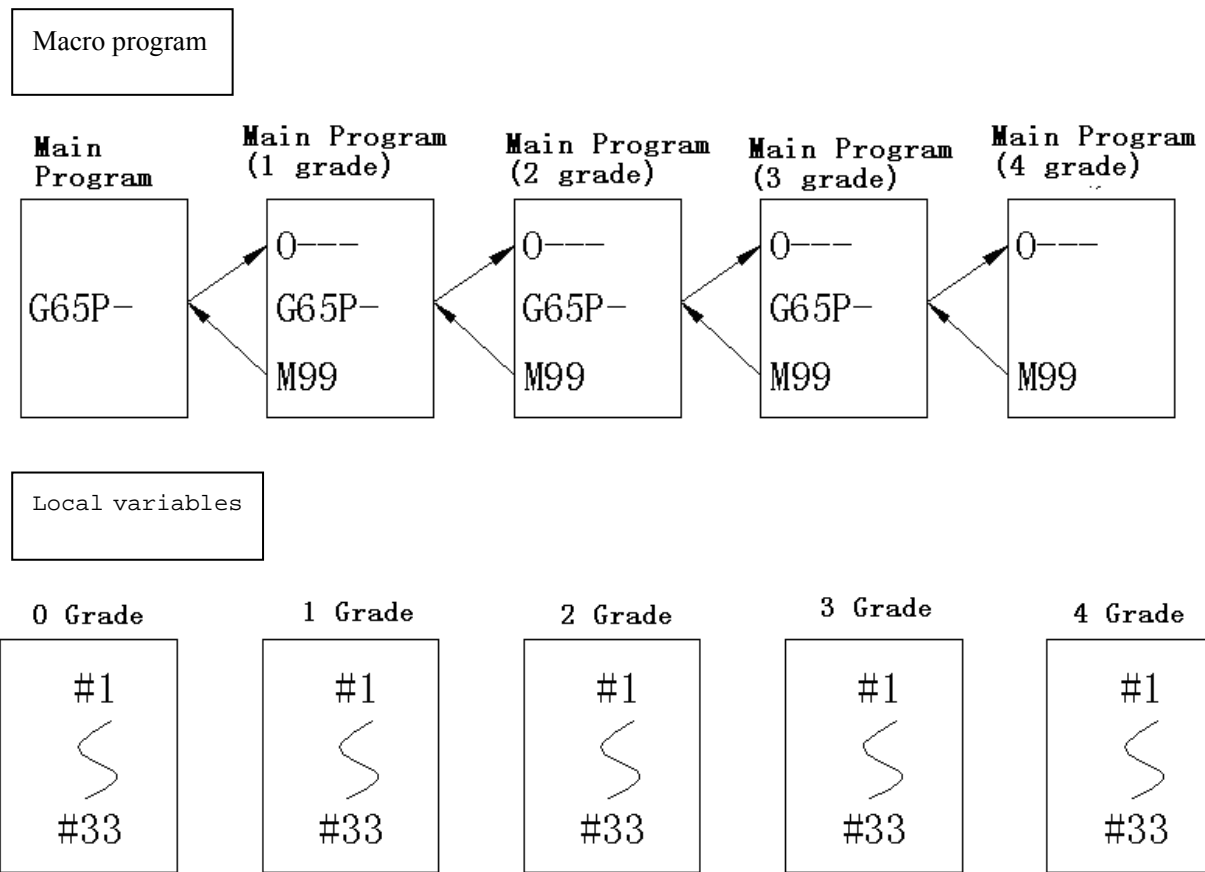
At a certain moment, Local variable #1 in recalling macro program and #1 calling macro program at another time is different (regardless macro program is the same or not). Thus, when recalling program B from macro program , such as nesting, local variable in macro program A can not be mistaken using for macro program B, or else wreck its variable values.

Local variables are generally used for receiving value passed from self-variable , corresponding relationships between variables and address refers to "list of self-variable addresses and corresponding variable numbers ". Before defining of local variables (ie, evaluation) ,its original state is empty (Null), so user should use with care.

- User Macro nesting and local variables

When recalling macro program, its nesting layers (levels) in macro program increases 1, and level of corresponding local variables also increase 1.

Macro program recall and relationship between local variables as shown below:



● Instructions

1、Providing # 1 ~ # 33 local variables (0 grade)in main program ;

2、When recall macro program by G65(1 grade), local variables (0 grade) in main program is saved. New local variable # 1 ~ # 33 (1 grade) in new macro programs has been prepared, replacement of self-variables is possible (③ is the same.)

3、Each macro programs (2,3,4-level) is recalled, each local variable (1,2,3 grade) are saved, the new local variable (2,3,4 grade) are prepared.

4、When using M99 to return from macro program, local variables (0,1,2,3 grade) are saved in ②, ③ items are restored as they are stored.

### 5.2.3 Public variable

Public variables are global variables defined in the system, which can be recalled by any program. That is, # 101 used in some macro program is the same as using in one macro program. So, computing results of one public variable in macro program can be used in another macro program.

There is no special regulation of public variable in this system. Users can use them freely. # 100 ~ # 199 public variable is not remembered when power-off, namely, turn off the power will clear the data; While # 500 ~ # 999 public variable are remembered when power-off, namely, turn off the power also retain data.

### 5.2.4 System variable

System variables can be used to read and write internal NC data such as tool compensation values and current

position data. Note, however, that some system variables can only be read. System variables are essential for automation and general-purpose program development.

- **Interface signals**

Signals can be exchanged between the programmable machine controller (PMC) and custom macros.

| Variable number | Function   |
|-----------------|--|
| #1000~#1015     | A 16-bit signal can be sent from the PMC to a custom macro. Used to read a signal bit by bit.  |
| #1032           | A 16-bit signal can be sent from the PMC to a custom macro. Used to read all 16 bits of a signal at one time.  |
| #1100~#1115     | A 16-bit signal can be sent from a custom macro to the PMC. Used to write a signal bit by bit.   |
| #1132           | A 16-bit signal can be sent from a custom macro to the PMC. Used to write all 16 bits of a signal at one time.   |
| #1133           | Variable #1133 is used to write all 32 bits of a signal at one time from a custom macro to the PMC. Note, that values from -99999999 to +99999999 can be used for #1133. |

Note: corresponding relationship of all variables and F, G signal is seen in "GSK980TD Series PLC User's Guide

- **Tool compensation values** Tool compensation values can be read and written using system variables.

| Number | Tool length compensation(H) |       | Cutter compensation(D) |       |
|--------|-----------------------------|-------|------------------------|-------|
|        | Geometric                   | Wear  | Geometric              | Wear  |
| 01     | #2201                       | #2001 | #2601                  | #2401 |
| 02     | #2202                       | #2002 | #2602                  | #2402 |
| 03     | #2203                       | #2003 | #2603                  | #2403 |
| .....  |                             |       |                        |       |
| 31     | #2231                       | #2031 | #2631                  | #2431 |
| 32     | #2232                       | #2032 | #2632                  | #2432 |

- **Automatic operation control** The control state of automatic operation can be changed.

| Number | Value | Single block | Completion of an auxiliary function |
|--------|-------|--------------|-------------------------------------|
| #3003  | 0     | Enabled      | To be awaited                       |
|        | 1     | Disabled     | To be awaited                       |
|        | 2     | Enabled      | Not to be awaited                   |
|        | 3     | Disabled     | Not to be awaited                   |

**Note 1** When the power is turned on, the value of this variable is 0.

**Note 2** When single block stop is enabled(G46.1=1), State of # 3003 can change the stop implementation in single program block.

**Note 3** When single block stop is disabled(G46.1=0), single block stop operation is not performed even if the single block switch is set to ON.

**Note 4** When a wait for the completion of auxiliary functions (M,S, and T functions) is not specified, program execution proceeds to the next block before completion of auxiliary functions. Also, distribution completion



signal DEN is not output.

| Number | Value | Feed hold | Feedrate Override | Exact stop |
|--------|-------|-----------|-------------------|------------|
| #3004  | 0     | Enabled   | Enabled           | Enabled    |
|        | 1     | Disabled  | Enabled           | Enabled    |
|        | 2     | Enabled   | Disabled          | Enabled    |
|        | 3     | Disabled  | Disabled          | Enabled    |
|        | 4     | Enabled   | Enabled           | Disabled   |
|        | 5     | Disabled  | Enabled           | Disabled   |
|        | 6     | Enabled   | Disabled          | Disabled   |
|        | 7     | Disabled  | Disabled          | Disabled   |

**Note 1** When the power is turned on, the value of this variable is 0.

**Note 2** When feed hold is disabled and the feed hold button is held down, the machine stops in the single block stop mode. However, single block stop operation is not performed when the single block mode is disabled with variable #3003.

**Note 3** When feed hold is disabled and the feed hold button is pressed then released, the feed hold lamp comes on, but the machine does not stop; program execution continues and the machine stops at the first block where feed hold is enabled.

**Note 4** When feedrate override is disabled, an override of 100% is always applied regardless of the setting of the feedrate override switch on the machine operator's panel.

**Note 5** When exact stop check is disabled, no exact stop check (position check) is made even in blocks including those which do not perform cutting.

- **Number of machined parts** The completion number of machined parts can be read and written.

| Number | Function                            |
|--------|-------------------------------------|
| #3901  | Completion number of machined parts |

- **Modal information** Modal information specified in blocks up to the immediately preceding block can be read.

| Number | Function   |
|--------|--|
| #4001  | Group<br>01(G00,G01,G02,G03,G73,G74,G80,G81,G82,G83,G84,G85,G86,G88,G89,G110,G111,G112,G113,G114,G115,G134,G135,G136,G137,G138,G139) |
| #4002  | Group 02(G17,G18,G19)  |
| #4003  | Group 03(G90,G91)  |
| #4005  | Group 05(G94,G95)  |
| #4006  | Group 06(G20,G21)  |
| #4007  | Group 07(G40,G41,G42)  |
| #4008  | Group 08(G43,G44,G49)  |
| #4010  | Group 10(G98,G99)  |

|       |                                   |
|-------|-----------------------------------|
| #4014 | Group 14(G54,G55,G56,G57,G58,G59) |
| #4107 | D code                            |
| #4109 | F code                            |
| #4111 | H code                            |
| #4113 | M code                            |
| #4114 | Sequence number                   |
| #4115 | Program number (name)             |
| #4119 | S code                            |
| #4120 | T code                            |

- **Current position**

Position information cannot be written but can be read.

| Number          | Function   | Read operation during movement |
|-----------------|--|--------------------------------|
| #5001~<br>#5005 | Workpiece coordinate system, block end point, not included tool compensation value.  | Enabled                        |
| #5021~<br>#5025 | Machine coordinate system, current position, included tool compensation value.       | Disabled                       |
| #5041~<br>#5045 | Workpiece coordinate system, current position, included tool compensation value.     | Disabled                       |
| #5061~<br>#5065 | Workpiece coordinate system, skip signal position, included tool compensation value. | Enabled                        |
| #5081~<br>#5085 | Tool length offset value.  | Disabled                       |

**Note 1** The first digit (from 1 to 5) represents an axis number.

**Note 2** The tool length offset value currently used for execution rather than the immediately preceding tool offset value is held in variables #5081 to #5088.

- **Workpiece coordinate System compensation value** Workpiece zero point offset values can be read and write.

| Number        | Function  |
|---------------|---|
| #5201 ~ #5205 | 1~5 axis external workpiece zero point offset value |
| #5221 ~ #5225 | 1~5 axis G54 workpiece zero point offset value      |
| #5241 ~ #5245 | 1~5 axis G55 workpiece zero point offset value      |
| #5261 ~ #5265 | 1~5 axis G56 workpiece zero point offset value      |
| #5281 ~ #5285 | 1~5 axis G57 workpiece zero point offset value      |
| #5301 ~ #5305 | 1~5 axis G58 workpiece zero point offset value      |
| #5321 ~ #5325 | 1~5 axis G59 workpiece zero point offset value      |

## 5.3 Arithmetic and logic operations

List of Arithmetic and logic operations

| FUNCTION                        | FORMAT                           | FORMAT (G65 H)      | REMARK  |
|---------------------------------|----------------------------------|---------------------|---|
| Definition                      | $\#i = \#j$                      | G65 H1 P#i Q#j      |   |
| Sum                             | $\#i = \#j + \#k$                | G65 H2 P#i Q#j R#k  |   |
| Difference                      | $\#i = \#j - \#k$                | G65 H3 P#i Q#j R#k  |   |
| Product                         | $\#i = \#j * \#k$                | G65 H4 P#i Q#j R#k  |   |
| Quotient                        | $\#i = \#j / \#k$                | G65 H5 P#i Q#j R#k  |   |
| OR                              | $\#i = \#j \text{ OR } \#k$      | G65 H11 P#i Q#j R#k | A logical operation is performed on binary numbers bit by bit.  |
| AND                             | $\#i = \#j \text{ AND } \#k$     | G65 H12 P#i Q#j R#k |   |
| XOR                             | $\#i = \#j \text{ XOR } \#k$     | G65 H13 P#i Q#j R#k |   |
| Square root                     | $\#i = \text{SQRT}[\#j]$         | G65 H21 P#i Q#j     |   |
| absolute value                  | $\#i = \text{ABS}[\#j]$          | G65 H22 P#i Q#j     |   |
| Rounding off                    | $\#i = \text{ROUND}[\#j]$        | G65 H23 P#i Q#j     |   |
| Rounding up                     | $\#i = \text{FUP}[\#j]$          | G65 H24 P#i Q#j     |   |
| Rounding down                   | $\#i = \text{FIX}[\#j]$          | G65 H25 P#i Q#j     |   |
| Natural logarithm               | $\#i = \text{LN}[\#j]$           | G65 H26 P#i Q#j     |   |
| Exponential function            | $\#i = \text{EXP}[\#j]$          | G65 H27 P#i Q#j     |   |
| Sine                            | $\#i = \text{SIN}[\#j]$          | G65 H31 P#i Q#j     | An angle is specified in degrees. 90 degrees and 30 minutes is represented as 90.5 degrees.   |
| Arcsine                         | $\#i = \text{ASIN}[\#j] / [\#k]$ | G65 H32 P#i Q#j     |   |
| Cosine                          | $\#i = \text{COS}[\#j]$          | G65 H33 P#i Q#j     |   |
| Arccosine                       | $\#i = \text{ACOS}[\#j]$         | G65 H34 P#i Q#j     |   |
| Tangent                         | $\#i = \text{TAN}[\#j]$          | G65 H35 P#i Q#j     |   |
| Arctangent                      | $\#i = \text{ATAN}[\#j] / [\#k]$ | G65 H36 P#i Q#j R#k |   |
| BCD to BIN                      | $\#i = \text{BIN}[\#j]$          | G65 H41 P#i Q#j     | Used for signal exchange to and from the PMC  |
| BIN to BCD                      | $\#i = \text{BCD}[\#j]$          | G65 H42 P#i Q#j     |   |
| Unconditional Branch            | GOTO #i                          | G65 H80 P#i         | Pay attention to the difference of transfer label about these two macro expression format. IN the variable format, "#K" is the transfer label, but "P#i" is transfer label in "G65" format. |
| Equal to Branch                 | IF (#i EQ #j) GOTO #k            | G65 H81 P#i Q#j R#k |   |
| Not equal to Branch             | IF (#i NE #j) GOTO #k            | G65 H82 P#i Q#j R#k |   |
| Greater than Branch             | IF (#i GT #j) GOTO #k            | G65 H83 P#i Q#j R#k |   |
| Greater than or equal to Branch | IF (#i LT #j) GOTO #k            | G65 H84 P#i Q#j R#k |   |
| Less than Branch                | IF (#i GE #j) GOTO #k            | G65 H85 P#i Q#j R#k |   |
| Less than or equal to Branch    | IF (#i LE #j) GOTO #k            | G65 H86 P#i Q#j R#k |   |
| Custom Alarm                    | null                             | G65 H99 P#i         | $0 \leq P < 200$  |

### 5.3.1 Traditional macro format

If you use traditional macros format of G65 H, you can only carry out a limited operation and transfer command through designating G65 H. Currently, there are max. three computing operations, so obtain required corresponding variable (or constant) to complete computing operations in a program block.

#### General format:

G65 Hm P#i Q#j R#k;

**Where:** m: Indicates an operation command function or a transfer command function.

#i: Indicates the variable name with operation result.

#j: Indicates the variable name 1 for operation, or a constant.

#k: Indicates the variable name 2 for operation, or a constant.

**Command meaning:** #i = #j O #k

Operation sign, decided by Hm

For example:

P#100 Q#101 R#102.....#100 = #101 O #102;

P#100 Q#101 R15....#100 = #101 O 15;

P#100 Q-100 R#102.....#100 = -100 O #102;

Note 1: Before using operation or transfer command functions, you must specify G65 H, otherwise alarm.

Note 2: If firstly designating P instruction in the G65 block, then G65 P is for recalling macro, in which the meaning of H is self-variables without operations or transfer.

Note 3: system constants of decimal in Macro program is up to take four to rounding; interface shows three significant digits.

### Command function description

(1) Variable assignment: #I = #J

**G65 H01 P#I Q#J;**

(Example) G65 H01 P#101 Q125; (#101 = 125)

G65 H01 P#101 Q#110; (#101 = #110)

G65 H01 P#101 Q-#102; (#101 = -#102)

(2) Decimal addition operation: #I = #J + #K

**G65 H02 P#I Q#J R#K;**

(Example) G65 H02 P#101 Q#102 R15; (#101 = #102 + 15)

G65 H02 P#101 Q#110 R#102; (#101 = #110 + #102)

(3) Decimal subtraction operation: #I = #J - #K

**G65 H03 P#I Q#J R#K;**

(Example) G65 H03 P#101 Q#102 R#103; (#101 = #102 - #103)

(4) Decimal multiplication operation: #I = #J × #K

**G65 H04 P#I Q#J R#K;**

(Example) G65 H04 P#101 Q#102 R#103; (#101 = #102 × #103)

(5) Decimal division operation: #I = #J ÷ #K

**G65 H05 P#I Q#J R#K;**

(Example) G65 H05 P#101 Q#102 R#103; (#101 = #102 ÷ #103)

Note: The divisor #K can not be zero, otherwise alarm.

(6) Binary logic addition (OR): #I = #J OR #K

**G65 H11 P#I Q#J R#K;**

(Example) G65 H11 P#101 Q#102 R#103; (#101 = #102 OR #103)

(7) Binary logic multiplication (AND): #I = #J AND #K

**G65 H12 P#I Q#J R#K;**

(Example) G65 H12 P#101 Q#102 R#103; (#101 = #102 AND #103)

(8) Binary XOR: #I = #J XOR #K

**G65 H13 P#I Q#J R#K;**

(Example) G65 H13 P#101 Q#102 R#103; (#101 = #102 XOR #103)

- (9) Decimal square rooting:  $\#I = \sqrt{\#J}$

**G65 H21 P#I Q#J;**

(Example) G65 H21 P#101 Q#102; (#101 =  $\sqrt{\#102}$ )

Note: The square root of # J can not be negative, otherwise alarm.

- (10) Absolute value for the decimal:  $\#I = |\#J|$

**G65 H22 P#I Q#J;**

(Example) G65 H22 P#101 Q-102; (#101 =  $|-102|$  #101,result is 02)

- (11) Rounding off  $\#I = \text{ROUND}[\#J]$  (ROUND in the first one decimal place rounding operation)

**G65 H23 P#I Q#J;**

(Example) G65 H23 P#101 Q1.2359; (#101 = 1.2359 #101result is 1)

- (12) Rounding up  $\#I = \text{FUP}[\#J]$

**G65 H24 P#I Q#J;**

- (13) Rounding down  $\#I = \text{FIX}[\#J]$

**G65 H25 P#I Q#J;**

With CNC, when the absolute value of the integer produced by an operation on a number is greater than the absolute value of the original number, such an operation is referred to as rounding up to an integer. Conversely, when the absolute value of the integer produced by an operation on a number is less than the absolute value of the original number, such an operation is referred to as rounding down to an integer. Be particularly careful when handling negative numbers.

(Example) Suppose that #1=1.2, and #2= -1.2

When #3=FUP[#1] is executed, 2.0 is assigned to #3.

When #3=FIX[#1] is executed, 1.0 is assigned to #3.

When #3=FUP[#2] is executed, -2.0 is assigned to #3.

When #3=FIX[#2] is executed, -1.0 is assigned to #3.

- (14) Taking the natural logarithm  $\#I = \text{LN}[\#J]$

**G65 H26 P#I Q#J;**

(Example) G65 H26 P#101 Q#102; (#101 = LN[#102])

Note: The anti-log # J can not be less or equal to 0, otherwise alarm.

- (15) Exponential demand  $\#I = \text{EXP}[\#J]$

**G65 H27 P#I Q#J;**

(Example) G65 H27 P#101 Q#102; (#101 = EXP [#102])

- (16) Demand sine  $\#I = \text{SIN}[\#J]$  (unit:degree)

**G65 H31 P#I Q#J;**

(Example) G65 H31 P#101 Q#103; (#101=SIN[#103])

- (17) arcsine values  $\#I = \text{ASIN}[\#J]$

**G65 H32 P#I Q#J;**

(Example) G65 H32 P#101 Q#103; (#101=ASIN[#103])

Note 1: When state parameter № 015 Bit6 NAT-bit set to 0, output range is  $270^{\circ} \sim 90^{\circ}$

When state parameter № 015 Bit6 NAT-bit set to 1, output range is  $-90^{\circ} \sim 90^{\circ}$

Note 2: In any case J can not exceed range of -1 to 1, otherwise alarm.

(18) Cosine value #I = COS[#J] (unit:degree)

**G65 H33 P#I Q#J;**

(Example) G65 H33 P#101 Q#103; (#101=COS [#103])

(19) Anti-cosine value #I = ACOS[#J]

**G65 H34 P#I Q#J;**

(Example) G65 H34 P#101 Q#103; (#101=ACOS [#103])

Note: In any case J can not exceed range of -1 to 1, otherwise alarm.

(20) tangent value #I = TAN[#J] (unit:degree)

**G65 H35 P#I Q#J;**

(Example) G65 H35 P#101 Q#103; (#101=TAN [#103])

Note: # J can not be equal to  $K\pi + \pi / 2$  ( $K = 0, \pm 1, \pm 2, \pm 3 \dots$ ), otherwise calculation error ( $K\pi + \pi / 2$  for the infinite value).

(21) arctangent value #I = ATAN [#J] / [#K] (unit:degree)

**G65 H36 P#I Q#J R#K;**

(Example) G65 H36 P#101 Q#103 R3; (#101=ATAN [#103] / [3])

Note 1: When state parameter № 015 Bit6 NAT-bit set to 0, output range is  $0^{\circ} \sim 360^{\circ}$

When state parameter № 015 Bit6 NAT-bit set to 1, output range is  $-180^{\circ} \sim 180^{\circ}$

(22) Decimal to binary #I = BIN[#J]

**G65 H41 P#I Q#J;**

(Example) G65 H41 P#101 Q#102; (#101 = BIN[#102])

(23) binary to Decimal #I = BCD[#J]

**G65 H42 P#I Q#J;**

(Example) G65 H42 P#101 Q#102; (#101 = BCD[#102])

(24) Unconditional transfer

G65 H80 Pn; Pn: Sequence number

(Example) G65 H80 P120; (Go to N120 program block)

(25) Equal to conditional transfer

**G65 H81 Q#I R#J Pn;** Pn:sequence number, can be variable

(Example) G65 H81 Q#101 R#102 P1000;

When #101=#102, transfer to N1000 program block. Otherwise, program excute sequentially.

(26) Not equal to conditional transfer

G65 H82 Q#I R#J Pn; Pn:sequence number,can be variable

(Example) G65 H82 #101 #102 C1000;

When #101 is not equal to #102, transfer to N1000 program block. Otherwise, program excute sequentially.

(27) Greater than condition transfer

G65 H83 Q#I R#J Pn; Pn:sequence number,can be variable

(Example) G65 H83 Q#101 R#102 P1000;

When #101 is bigger than #102, transfer to N1000 program block. Otherwise, program excute sequentially.

(28) Less than condition transfer

G65 H84 Q#I R#J Pn; Pn:sequence number,can be variable

(Example) G65 H84 Q#101 R#102 P1000;

When #101 is less than #102, transfer to N1000 program block. Otherwise, program excute sequentially.

(29) Greater than or equal conditions transfer 搜

G65 H85 Q#I R#J Pn; Pn:sequence number,can be variable

(Example) G65 H85 Q#101 R#102 P1000;

When #101 is greater than or equalto #102, transfer to N1000 program block. Otherwise, program excute sequentially.

(30) Less than or equal to condition transfer

G65 H86 Q#I R#J Pn; Pn:sequence number,can be variable

(Example) G65 H86 Q#101 R#102 P1000;

When #101 is less than or equalto #102, transfer to N1000 program block. Otherwise, program excute sequentially.

(31) P/S alarm is generated

G65 H99 Pn; Pn:sequence number,can be variable(alarm number=n +500)

(Example) G65 H99 P15;

Place P / S users alarm 515

### 5.3.2 Sentence-style macro

Operation listed in the "List of arithmetic and logical operations," can be excuted in the program. expression in the right operator can contain constants, and (or) variables.composed of function or operator. variables # j and # k can be specified as constants, left side of variables (first variables) can also be specified by expression assignment.The use of sentence-style macro will be more intuitive,convenient and flexible. And sentence-style macro can use complex computing and multi-nested.Sometimes one sentence-style macro is equivalent to several block traditional paragraphs in G65 H format.

#### ● general form

Please refer to "sentence-type format," in "List of arithmetic and logical operations" content.

#### Macro instruction editing



In program content page editing mode or program status page mode,press key, you can swift insert and macro edit state.

|                               |                        |                      |                       |
|-------------------------------|------------------------|----------------------|-----------------------|
| difference between two states | Auto Space             | deal of letter 'O'   | Input special symbols |
| Insert state                  | When editing program , | input 'O' to switch, | Can not input special |

|                  |  |                                 |                           |
|------------------|--|---------------------------------|---------------------------|
|                  | automatically add a space to distinguish the instruction word. | copy, delete program and so on. | symbols                   |
| Macro edit state | Do not automatically add a space                               | Input as a letter 'O'           | Can input special symbols |

- Instructions

- 1、Angle unit

Angle unit of function SIN,COS,ASIN,ACOS,TAN and ATAN is degree. For example,  $90^{\circ}30'$  is showed as 90.5 degree.

- 2、ARCSIN #i=ASIN[#j]

- i、result output range as follows:

when state parameter No.015 Bit6 NAT is setted as 0,  $270^{\circ} \sim 90^{\circ}$

when state parameter No.015 Bit6 NAT is setted as 1,  $-90^{\circ} \sim 90^{\circ}$

- ii、When #j exceeds range from -1 to 1, output P/S alarm.

- iii、constant can replace variable #j .

- 3、ARCCOS #i=ACOS[#j]

- i、result output range is  $180^{\circ} \sim 0^{\circ}$

- ii、When #j exceeds range from -1 to 1, output P/S alarm.

- iii、constant can replace variable #j .

- 4、ARCTAN #i=ATAN[#j]/[#k]

Specified length of two verge, and divide them using '/' symbol.

- i、value range as follows,

when state parameter No.015 Bit6 NAT is setted to 0,  $0^{\circ} \sim 360^{\circ}$

[Example] When specify #1=ATAN[-1]/[-1], #1=225°

when state parameter No.015 Bit6 NAT is setted to 1,  $-180^{\circ} \sim 180^{\circ}$

[Example] When specify #1=ATAN[-1]/[-1], #1=45.0

- ii、constant can replace variable #j .

- 5、Natural logarithm #i=LN[#j]

- i、note, relative error may be greater than  $10^{-8}$ .

- ii、When Antilog #j is 0 or less than 0, issue P / S alarm.

- iii、constant can replace variable #j

- 6、Exponential function #i=EXP[#j]

- i、note, relative error may be greater than  $10^{-8}$ .

- ii、when computing result exceeds  $3.65 \times 10^{47}$  (j is about 10), issue Overflow and alarm.

- iii、constant can replace variable #j.

- 7、ROUND rounding function

When ROUND function is included in the arithmetic or logic operations command IF or WHILE, ROUND function round value at the first decimal place.

**For example:**

When executing #1=ROUND[#2], #2=1.2345, variable 1 is 1.0.

When using ROUND function in NC sentence addresses, function round specified value according to smallest specified unit.

- 8、Rounding up and rounding down



With CNC, when the absolute value of the integer produced by an operation on a number is greater than the absolute value of the original number, such an operation is referred to as rounding up to an integer. Conversely, when the absolute value of the integer produced by an operation on a number is less than the absolute value of the original number, such an operation is referred to as rounding down to an integer. Be particularly careful when handling negative numbers.

(Example) Suppose that #1=1.2, and #2= -1.2

When #3=FUP[#1] is executed, 2.0 is assigned to #3.

When #3=FIX[#1] is executed, 1.0 is assigned to #3.

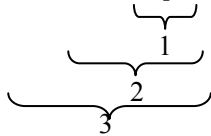
When #3=FUP[#2] is executed, -2.0 is assigned to #3.

When #3=FIX[#2] is executed, -1.0 is assigned to #3.

### 5.3.3 Priority of operations

- 1、Functions
- 2、Operations such as multiplication and division(\*、 /、 AND)
- 3、Operations such as addition and subtraction(+、 -、 OR、 XOR)

Example: #1 = #2 + #3 \* SIN [ #4 ];



Note: 1,2,3 indicate the order of operations.

### 5.3.4 Bracket nesting

Brackets are used to change the order of operations.

Note ,square brackets [,] is used for closure of expression; parentheses (,)is used for comment. Uncertain priority, it is recommended to close in square brackets.

## 5.4 BRANCH AND REPETITION

In a program, the flow of control can be changed using the GOTO statement and IF statement. Three types of branch and repetition operations are used:

- 1、GOTO statement (unconditional branch)
- 2、IF statement (conditional branch: if..., then...)
- 3、WHILE statement (repetition while ...)

#### 5.4.1 Unconditional Branch (GOTO Statement)

A branch to sequence number n occurs. When a sequence number outside of the range 1 to 99999 is specified, P/S alarm occurs. A sequence number can also be specified using an expression.

**Format:** GOTO n; n: Sequence number(1 to 99999)

**Example:** GOTO 1; GOTO #101;

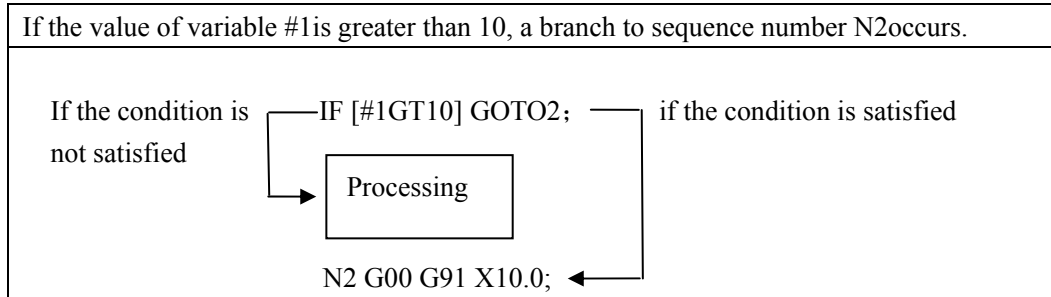
#### 5.4.2 Conditional Branch (IF Statement)

Specify a conditional expression after IF.

**GOTO Format:** IF [conditional expression] GOTO n;

If the specified conditional expression is satisfied, a branch to sequence number n occurs, If the specified condition is not satisfied, the next block is executed.

**Example:**



**THEN Format:** IF [Conditional expression] THEN<macro statement>;

If the specified conditional expression is satisfied, a predetermined macro statement is executed. Only a single macro statement is executed.

**Example:**

IF[#1 EQ #2] THEN #3=0;

If the values #1 and #2 are the same, 0 is assigned to #3.

**5.4.3 Explanations**

**Conditional expression:** A conditional expression must include an operator inserted between two variables or between a variable and constant, and must be enclosed in brackets([, ]). An expression can be used instead of a variable.

**Operators:** 980MDa system can use two operator instructions in the following table to compare two values to determine that they are equal or a value less than or greater than another value.

| Operatot     | Meaning                     |
|--------------|-----------------------------|
| 'EQ' or '='  | Equal to(=)                 |
| 'NE' or '<>' | Not equal to(≠)             |
| 'GT' or '>'  | Greater than(>)             |
| 'GE' or '>=' | Greater than or equal to(≥) |
| 'LT' or '<'  | Less than(<)                |
| 'LE' or '<=' | Less than or equal to(≤)    |

**Example:** IF [3<>2] GOTO 2; Meaning: If 3 not equal to 2,, a branch to sequence number N2 occurs.

IF [#101>=7.22] THEN #101=SIN30; Meaning:If #101Greater than or equal to 7.22, After excuting of THEN expression.,specify sine of 30 degrees to # 101.

**Sample program:** The sample program below finds the total of numbers 1 to 10.

```

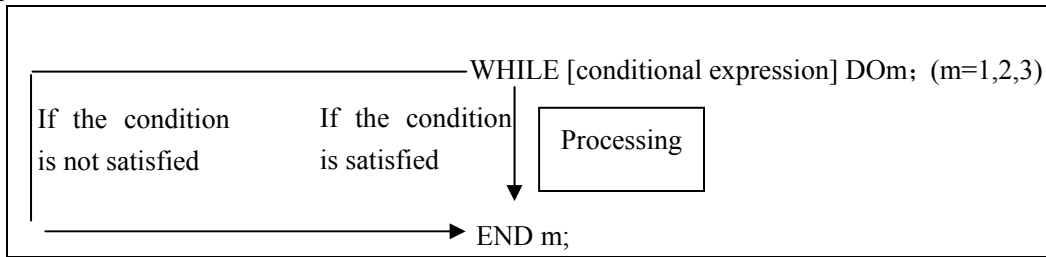
O9500
#101=0 ... .. Initial value of the variable to hold the sum
#102=1 ... .. Initial value of the variable as an addend
N1 IF[#102 GT 10]GOTO 2 ... .. Branch to N2 when the addend is
                                greater than 10
#101= #101+#102 ... .. Calculation to find the sum
#102= #102+1 ... .. Next addend
GOTO 1 ... .. Branch to N1
    
```

**5.4.4 Repetition(WHILE Statement)**

Specify a conditional expression after WHILE. While the specified condition is satisfied, the program from DO

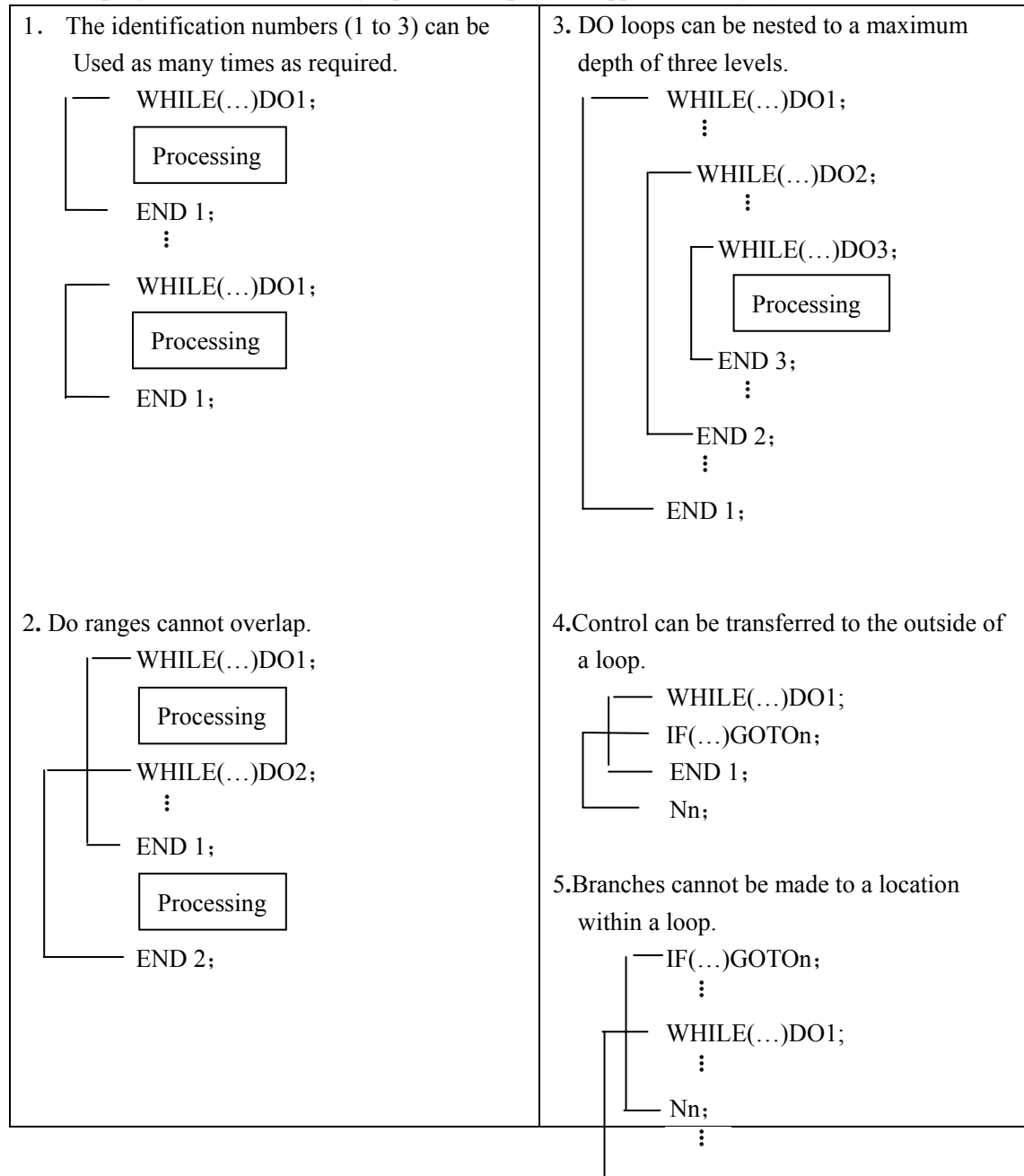
to END is executed. If the specified condition is not satisfied, program execution proceeds to the block after END.

### Example:



**Explanations:** While the specified condition is satisfied, the program from DO to END after WHILE is executed. If the specified condition is not satisfied, program execution proceeds to the block after END. The same format as for the IF statement applies. A number after DO and a number after END are identification numbers for specifying the range of execution. The numbers 1,2,and 4 can be used. When a number other than 1,2,and 3 is used, P/S alarm occurs.

**Nesting:** The identification numbers (1 to 3) in a DO-END loop can be used as many times as desired. Note, however, when a program includes crossing repetition loops (overlapped DO ranges), P/S alarm occurs.



END 1;

## 5.5 MACRO STATEMENTS AND NC STATEMENTS

The following blocks are referred to as macro statements:

- Blocks containing an arithmetic or logic operation (=);
- Blocks containing a control statement (such as GOTO, DO, END);
- Blocks containing a macro call command (G65, G66, G67);

Any block other than a macro statement is referred to as an NC statement.

### 5.5.1 REGISTERING CUSTOM MACRO PROGRAM

One macro program is just one kind of subprogram. Format of macro program body's edit, save, using is the same as subprogram and storage space is shared with subprogram. M98 (recall subprogram command) is also used in recalling user macro program., only can not transfer self-variable.

Macro program is always offered by machine tool factory. Users can also make macro program by themselves. Users only need to remember recall macro program command, it is no need to remember macro program body's command.

### 5.5.2 limit

- **macro sentence process in tool radius compensation C mode.**
- **In tool radius compensation C mode (G41, G42), NC will pre-read next program to calculate transfer point.** So process method is a little different from general NC sentence.

When run a single program block in macro program, this statement is considered that not contain mobile command. In some cases, it can not perform correct compensation (strictly speaking, the program block has been designated as 0 distance mobile).

- Skip to (GOTO, DO, END)  
In radius compensation C mode, if point skip command (GOTO, DO, END), appear P/S alarm.
- Move command take variable value

In radius compensation C mode, if specifying mobile command (eg, G01 X # 101) as variable value, there will be P / S alarm. Because C mode is pre-reading program block, it is need to know the end of next program block and calculate current transit point position. Specify X # 101, X # 101 as unknown data, it is unable to calculate correctly current switching point.

- **single stepper run (MDI mode)**

In MDI mode, can point macro instruction, but can not recall macro program.

- **skip symbol**

when '/' symbol among <expression> place is enclosed in brackets [] at the right side of arithmetic expression, it is considered as division operator, not as optional program block skip instruction.

- **reset**

Reset operation will cancel recall of user macro program and subprogram and target return to the head of main program.

## CHAPTER 6 TOOL NOSE RADIUS COMPENSATION

### 6.1 Application for Cutter Radius Compensation

#### 6.1.1 Brief

Generally, the parts machining process is programmed according to parts drawing in one point on a tool. As for the tool used actually, because of the processing or other requirement, the tool is not an ideal point, but an arc only. The position offset exists between actual cutting point and ideal point when the cutting feed is performed. It may cause over cut or undercut, so the part accuracy will be affected. So, the cutter radius compensation can be used to improve the part accuracy in machining.

The path of part figure can be shifted by a cutter radius, which this method is called B type tool compensation; this is a simply method but the movement path of next block can be processed only after a block is performed, so the phenomenon as over cutting will be generated at the intersection point of two blocks.

In order to settle the above issues and eliminate the error, the Tool compensation C should be setup. When a block is read in, the tool compensation C is not performed immediately but the next block is read in again. Corresponding movement path is calculated according to the point of intersection of two blocks (conjunction vector). The tool compensation C performs more accurate compensation in figure because two blocks are read for processing in advance. See the Fig. 6-1.

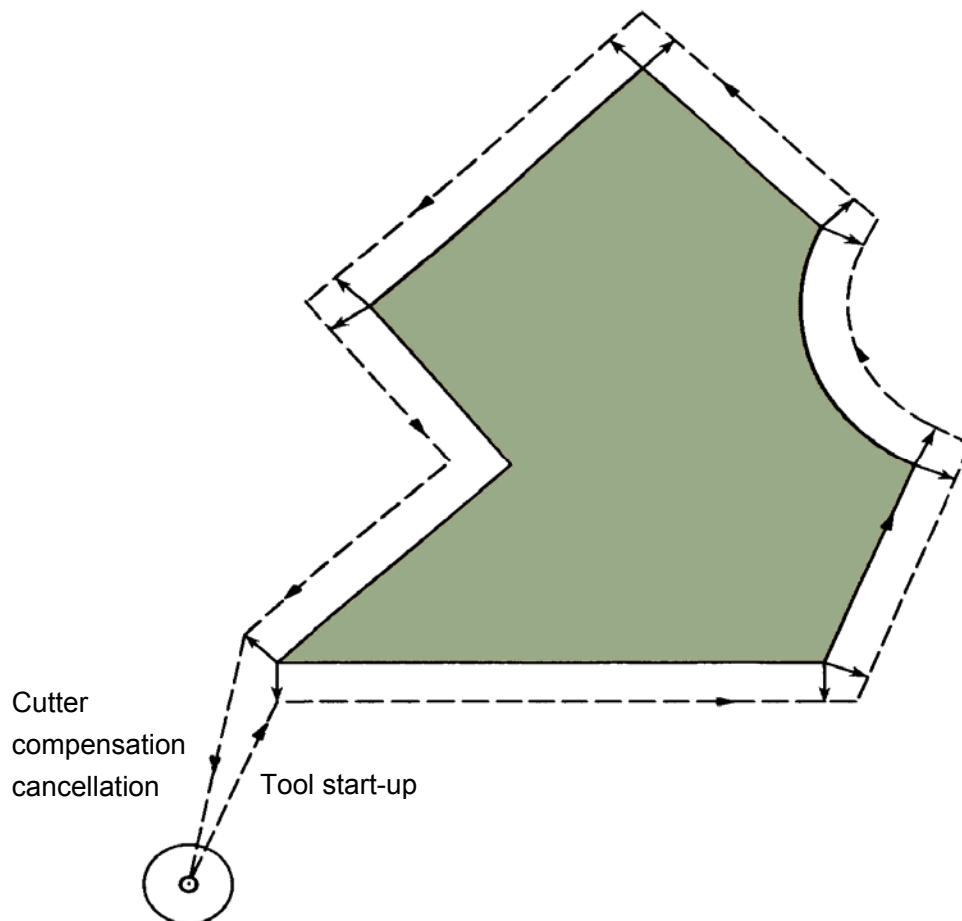


Fig.6-1 C type cutter radius compensation

### 6.1.2 Compensation value setting

The radius value of each tool should be set before tool compensation C is applied. Tool radius compensation value is set in the OFFSET page (table 6-1), this page contains tool geometric radius and tool radius wear. There into, D is the tool compensation value, when the bit 1 of bit parameter No.003 is 1, the D is compensation value input by diameter. If the bit 1 of bit parameter No.003 is 0, the D is compensation value input by radius. The following explanations are all indicated in radius compensation value if not especially pointed out.

Table 6-1 Display page for CNC cutter radius compensation value

| No. | Geometric (H) | Wearing (H) | Geometric (D) | Wearing (D) |
|-----|---------------|-------------|---------------|-------------|
| 001 | 20.020        | 0.030       | 5.000         | 0.020       |
| 002 | 10.020        | 0.123       | 0.500         | 0.030       |
| ... | ...           | ...         | ...           | ...         |
| 032 | 10.050        | 0.038       | 2.300         | 0.160       |

### 6.1.3 Command format

$$\left\{ \begin{matrix} G17 \\ G18 \\ G19 \end{matrix} \right\} \left\{ \begin{matrix} G40 \\ G41 \\ G42 \end{matrix} \right\} \left\{ \begin{matrix} G00 \\ G01 \end{matrix} \right\} X\_ Y\_ Z\_ D\_ ;$$

| Commands | Explanation  | Remarks         |
|----------|--|-----------------|
| G17      | Offset plane selection command (XY plane)                  | See the Fig.6-2 |
| G18      | Offset plane selection command (XZ plane)                  |                 |
| G19      | Offset plane selection command (YZ plane)                  |                 |
| G40      | Cutter radius compensation cancellation                    |                 |
| G41      | Cutter radius compensation left along advancing direction  |                 |
| G42      | Cutter radius compensation right along advancing direction |                 |

### 6.1.4 Compensation direction

Tool compensation direction is determined according to the relative position of tool with work piece, when the cutter radius compensation is applied. See the Fig.6-2.

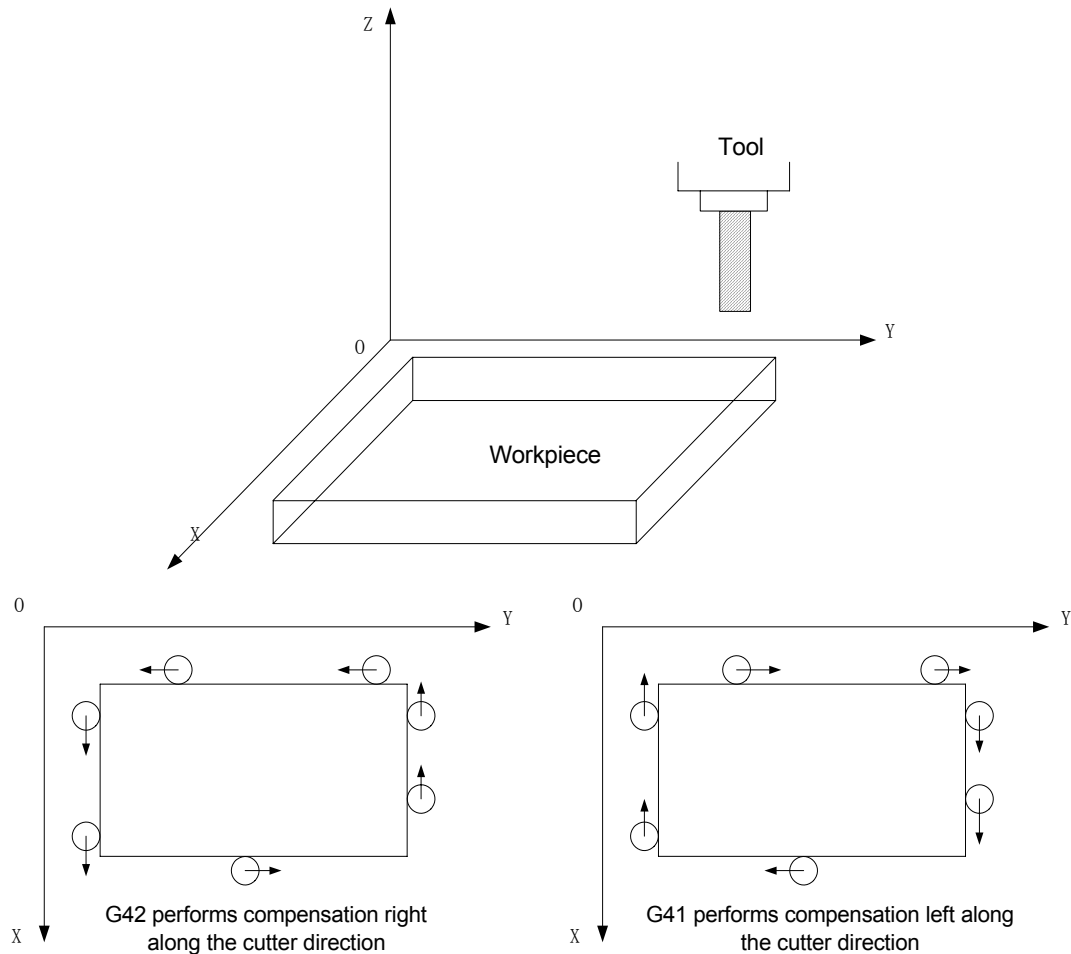


Table 6-2 Compensation direction (G17 plane)

## 6.1.5 Caution

- In initial status CNC is in cutter radius compensation cancellation mode. CNC sets cutter radius compensation offset mode when the G41 or G42 command is executed. At the beginning of the compensation, the CNC reads two blocks in advance, the next block is stored in the cutter radius compensation buffer memory when a block is performed. When in Single mode, two blocks are read, after the end point of the 1<sup>st</sup> block is performed, it is stopped. Two blocks are read in advance in successive performance. So, there are a block being performed and two blocks behind it in CNC.
- Neither setup nor cancellation of the Tool compensation C can be performed in the MDI mode.
- The cutter radius compensation value can not be a negative, normally, the wearing value is negative (negative value indicates for wearing)
- Instead of G02 or G03, the setting or cancellation of cutter radius compensation can be commanded only by using G00 or G01, or the alarm occurs.
- CNC will cancel Tool compensation C mode when you press RESET key.
- Corresponding offset should be specified while the G40, G41 or G42 is specified in the block, or the alarm occurs.
- When cutter radius compensation is employed in main program and subprogram, the CNC should cancel compensation mode before calling or exiting sub-program (namely, before M98 or M99 is performed), or the alarm occurs.
- Cancel the compensation mode temporarily when G54-59, G28-31 and canned cycle command are executed. Restore the cutter radius compensation mode when the above commands are finished.

### 6.1.6 Example for application

The parts are machined in the coordinate system in Fig. 6-3. The tool compensation number D07 is employed, tool geometric radius is 2mm and the tool radius wearing is 0.

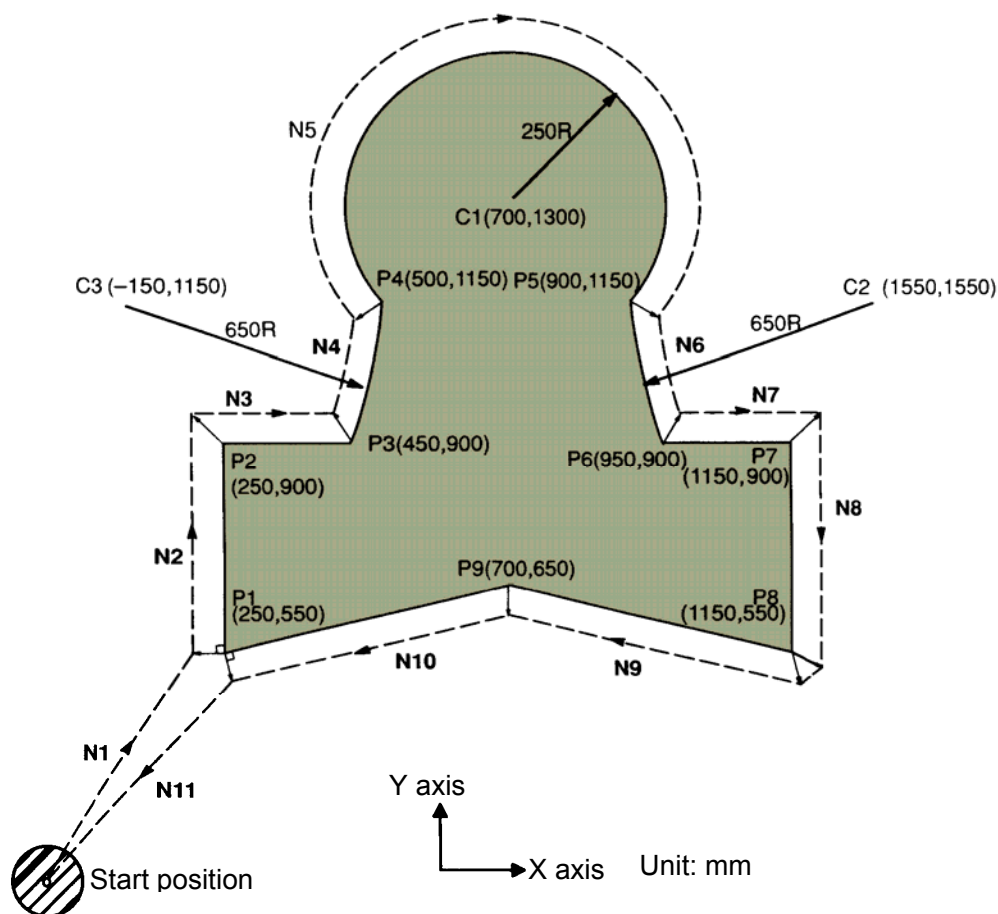


Fig.6-3

Perform tool setting in the mode of offset cancellation, after finishing the tool setting, and set the tool radius D in OFFSET page.

Table 6-2

| No. | Geometric (H) | Wearing (H) | Geometric (D) | Wearing (D) |
|-----|---------------|-------------|---------------|-------------|
| 01  | ...           | ...         | ...           | ...         |
| ... | ...           | ...         | ...           | ...         |
| 07  | ...           | ...         | 2.000         | 0.000       |
| 08  | ...           | ...         | ...           | ...         |
| ... | ...           | ...         | ...           | ...         |
| 32  | ...           | ...         | ...           | ...         |

Programs:

N0 G92 X0 Y0 Z0; Tool are positioned at start position X0, Y0 and Z0 when the absolute coordinate system is specified

N1 G90 G17 G00 G41 D07 X250.0 Y550.0; Start-up cutter, the tool is shifted to the tool path by the distance specified in D07, geometric radius of D07 is set to 2.0mm, tool wearing 0, then the tool radius is 2mm.

N2 G01 Y900.0 F150; Specifies machining from P1 to P2

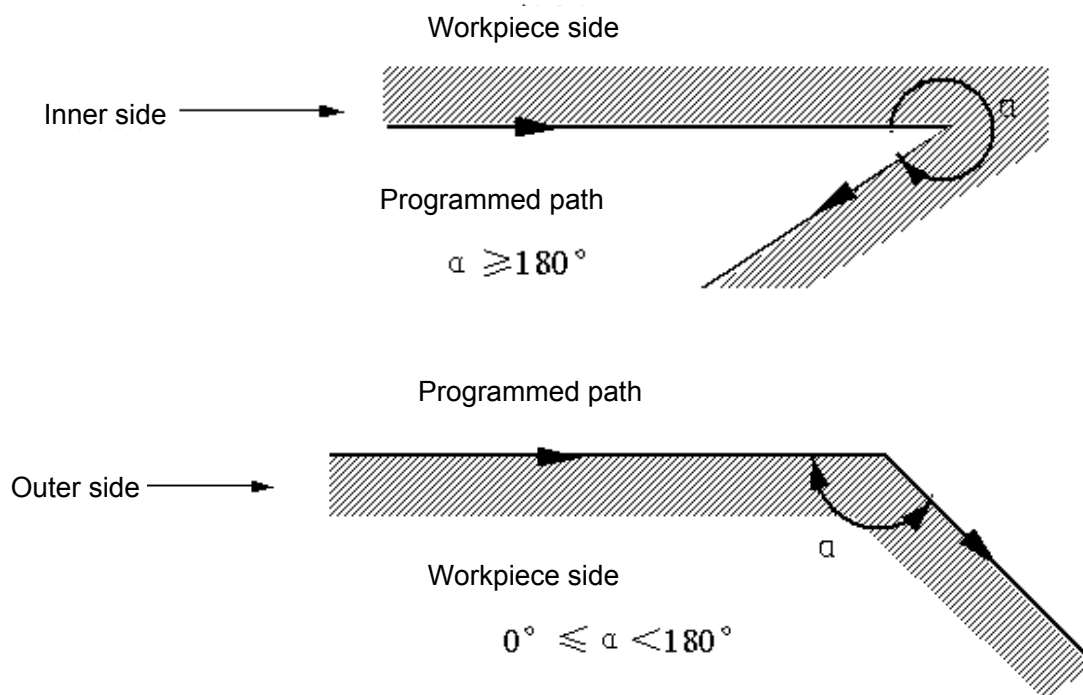


|                               |  |
|-------------------------------|--|
| N3 X450.0;                    | Specifies machining from P2 to P3  |
| N4 G03 X500.0 Y1150.0 R650.0; | Specifies machining from P3 to P4  |
| N5 G02 X900.0 R-250.0;        | Specifies machining from P4 to P5  |
| N6 G03 X950.0 Y900.0 R650.0;  | Specifies machining from P5 to P6  |
| N7 G01 X1150.0;               | Specifies machining from P6 to P7  |
| N8 Y550.0;                    | Specifies machining from P7 to P8  |
| N9 X700.0 Y650.0;             | Specifies machining from P8 to P9  |
| N10 X250.0 Y550.0;            | Specifies machining from P9 to P1  |
| N11 G00 G40 X0 Y0;            | Cancels the offset mode, the tool is returned to the start position (X0, Y0) |

## 6.2 Offset Path Explanation for Cutter Radius Compensation

### 6.2.1 Conception for inner side or outer side

“Inner side” and “outer side” will be employed in the following explanations. When an angle of intersection created by tool paths specified by move commands for two blocks is over or equal to  $180^\circ$ , it is referred to as “inner side”. When the angle is between  $0^\circ$  and  $180^\circ$ , it is referred to as “outer side”.



### 6.2.2 Tool movement in start-up

There are 3 steps should be performed for cutter radius compensation: establishment, performing and cancellation.

The tool movement performed from offset cancellation mode to G41 or G42 command establishment is called tool compensation establishment (also called start-up)

**Note For S, L and C labeled in the following figures, if not especially described, they should be regarded as the following meaning:**

- S----Single block stop point;
- L----Linear;
- C---Circular arc.

**(a) Tool movement along an inner side of a corner ( $\alpha \geq 180^\circ$ )**

## 1) Linear to linear

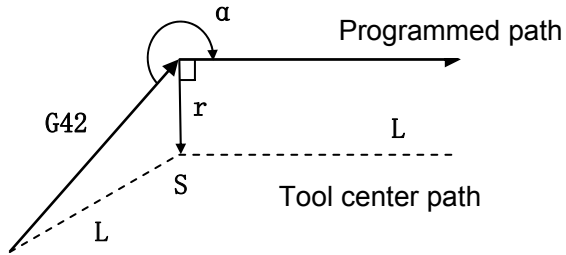


Fig.6-4a Linear to linear (start-up from inner side)

## 2) Linear to circular

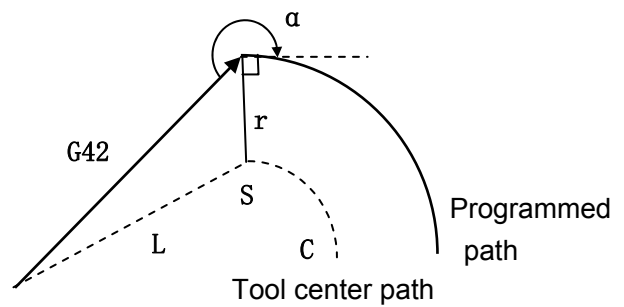


Fig.6-4b Linear to circular (start-up from inner side)

**(b) Tool movement along the outside of a corner at an obtuse angle ( $180^\circ > \alpha \geq 90^\circ$ )**

## 1) Linear to linear

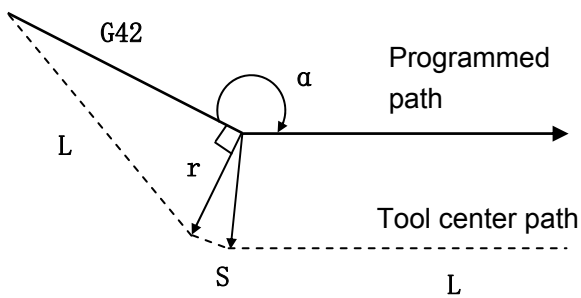


Fig.6-5a Linear to linear (start-up outside)

## 2) Linear to circular

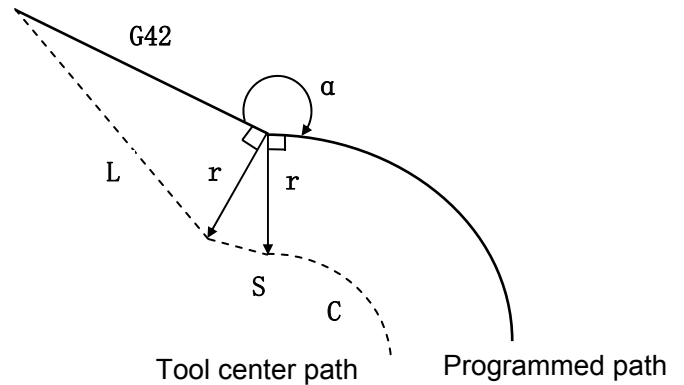


Fig.6-5b Linear to circular (Start-up outside)

**(c) Tool movement along the outer side of a corner at an acute angle ( $\alpha < 90^\circ$ )**

## 1) Linear to Linear

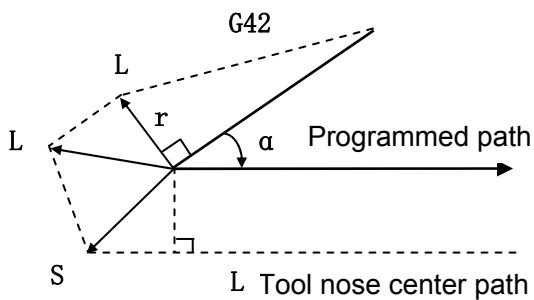


Fig.6-6a Linear to linear (start-up from outer side)

## 2) Linear to circular

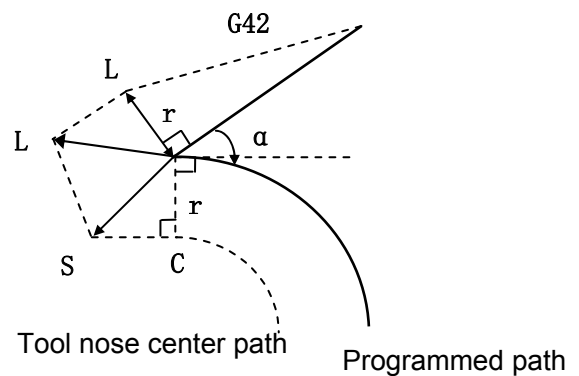


Fig.6-6b Linear to circular (start-up from outer side)

(d) Tool movement along the outside linear to linear at an acute angle less than 1 degree ( $\alpha \leq 1^\circ$ )

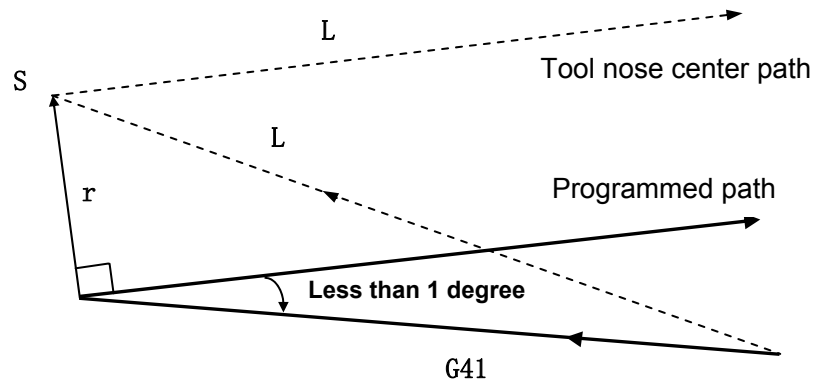


Fig.6-7 Linear to linear (the corner is less than 1 degree, start-up from outer side)

### 6.2.3 Tool movement in offset mode

The mode after setting the cutter radius compensation and before canceling the cutter radius compensation is called offset mode.

#### ● Offset path of invariable compensation direction in compensation mode

(a) Tool movement along the inside of a corner ( $\alpha \geq 180^\circ$ )

1) Linear to linear

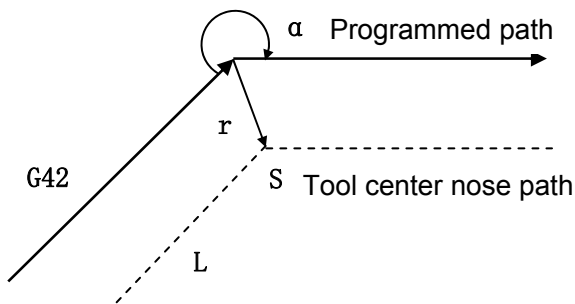


Fig.6-8a Linear to linear (inside movement)

2) Linear to circular

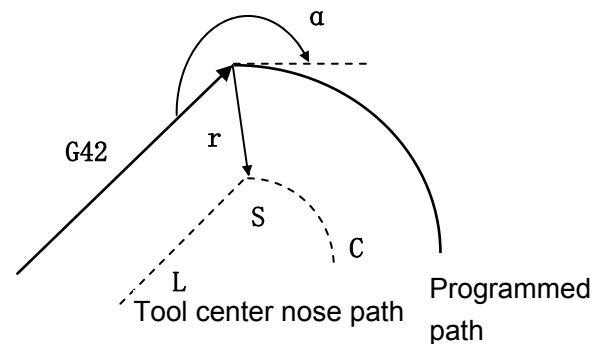


Fig.6-8b Linear to circular (inside movement)

3) Circular to linear

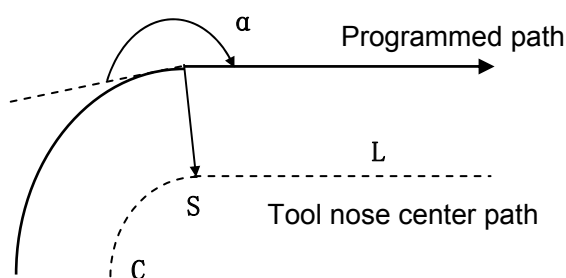


Fig.6-8c Circular to linear (inside movement)

4) Circular to circular

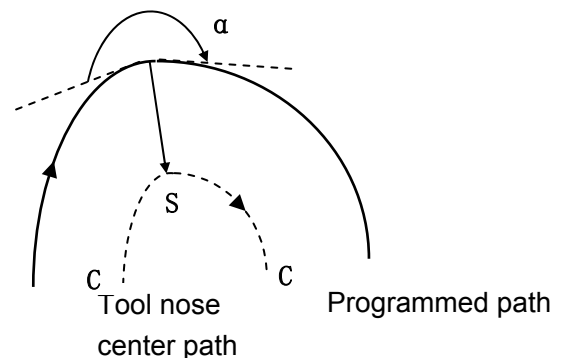


Fig.6-8d Circular to circular (inside movement)

## 5) Inner side machining less than 1 degree and compensation vector amplification

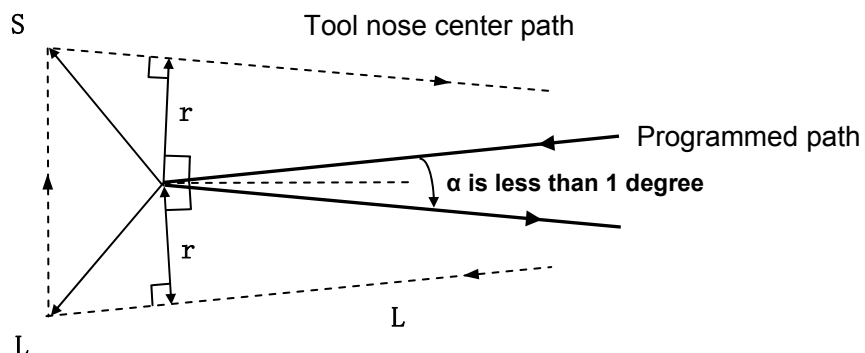


Fig.6-8e Linear to linear (corner is less than 1 degree, inside movement)

(b) Tool movement along the outside of a corner at an obtuse angle ( $180^\circ > \alpha \geq 90^\circ$ )

## 1) Linear to linear

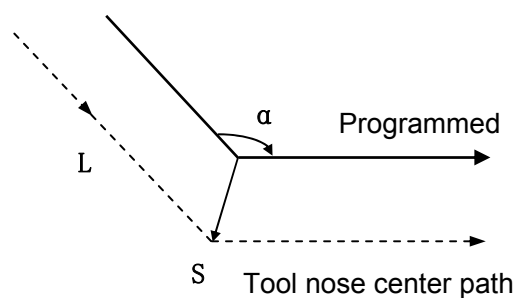


Fig.6-9a Linear to linear (obtuse angle, outside movement)

## 2) Linear to circular

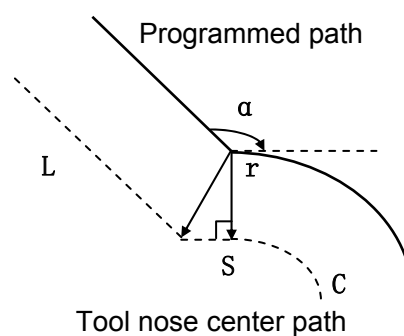


Fig.6-9b Linear to circular (obtuse, outside movement)

## 3) Linear to linear

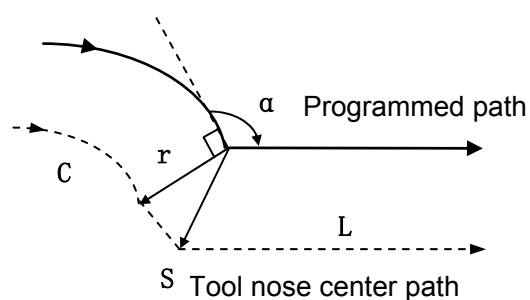


Fig.6-9c Circular to linear (obtuse angle, outside movement)

## 4) Circular to circular

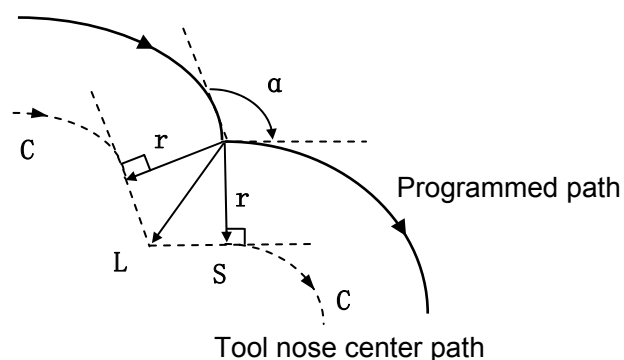


Fig.6-9d Circular to circular (obtuse angle, outside movement)

## (c) Tool movement along the outside of a corner at an acute angle ( $\alpha < 90^\circ$ )

### 1) Linear to linear

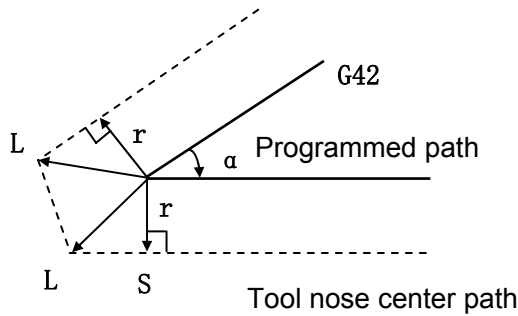


Fig.6-10a Linear to linear (acute, movement outside)

### 2) Linear to circular

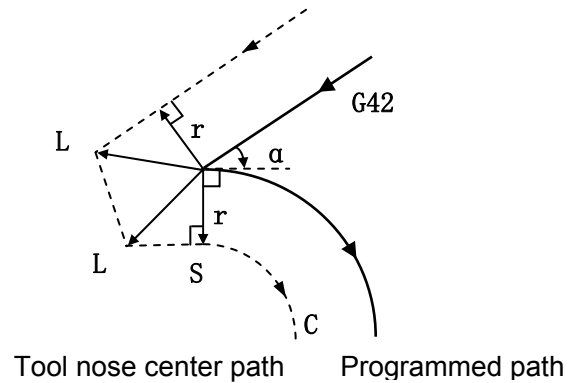


Fig.6-10b Linear to circular (acute, movement outside)

### 3) Circular to linear

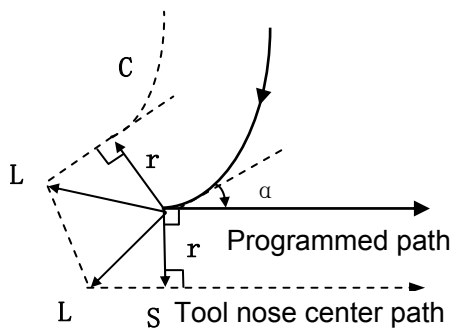


Fig.6-10c Circular to linear (acute, movement outside)

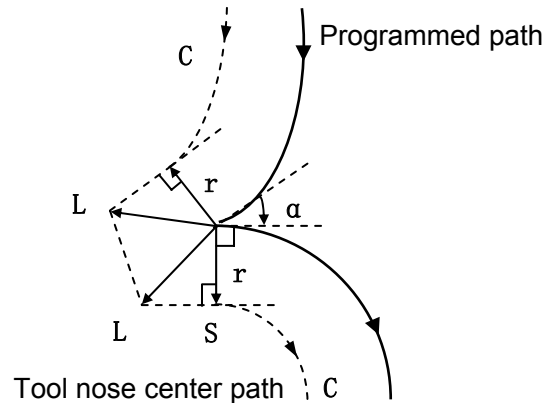
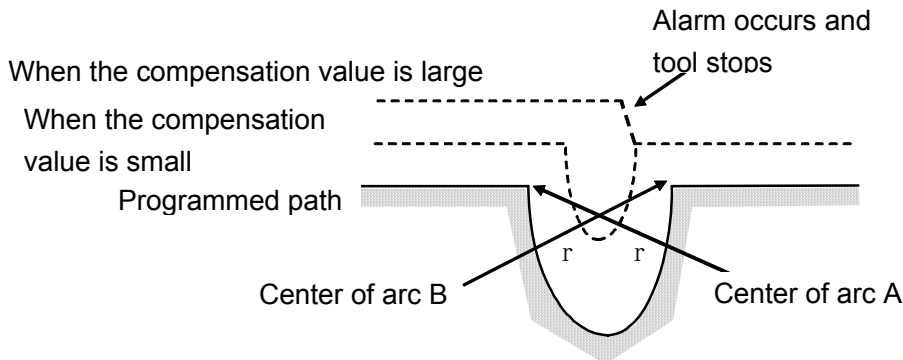


Fig.6-10d Circular to circular (acute, movement outside)

## (d) When it is exceptional

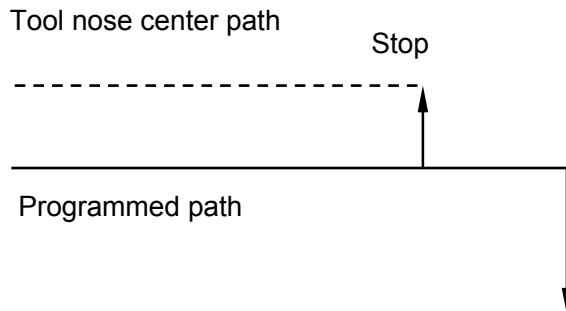
### 1) There is no intersection



When the tool radius value is small, there is an intersection for the arc compensation, when the radius is bigger, the intersection may not exist, the tool stops at the end of previous block, and then the alarm occurs.

Fig.6-11 Exceptional -----There is no intersection after the path offset

- 2) The arc center is consistent to the start point or end point



The alarm will be generated by the following issues

(G41)

N5 G91 G01 Z20;

N6 G02 Z10 K0;

N7 G03 X-10 I-10;

Fig.6-12 Center of arc is consistent to the start point or end point

### ● Offset path with the compensation direction changed in compensation mode

The compensation direction can be changed in special occasion, but it cannot be changed at the beginning and the following block. There are no inner side and outer side for the full compensation.

- 1) Linear to linear

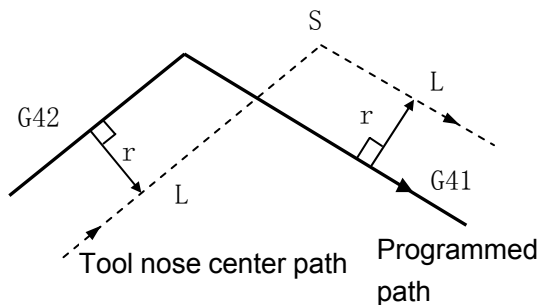


Fig.6-13a Linear to linear (compensation direction changed)

- 2) Linear to circular

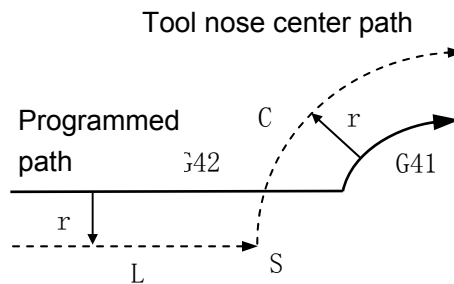


Fig.6-13b Linear to circular (compensation direction changed)

- 3) Circular to linear

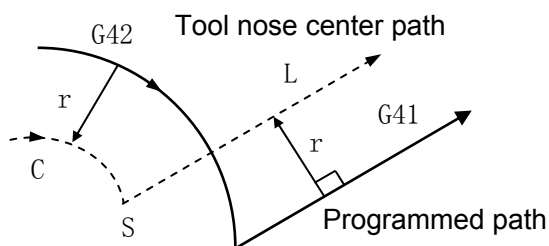


Fig.6-13c Circular to linear (compensation direction changed)

- 4) Circular to circular

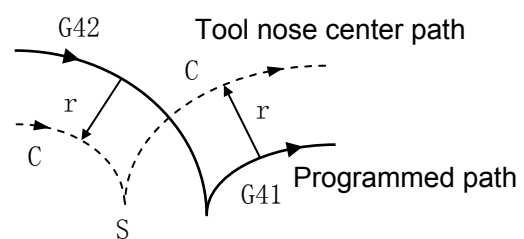


Fig.6-13d Circular to circular (compensation direction changed)

- 5) When there is no intersection if the compensation is normally performed.

When changing the offset direction from block A to block B using G41 and G42, if the intersection of the offset path is not required, create the vector vertical to block B at the start point of block B.

## i) Linear to linear

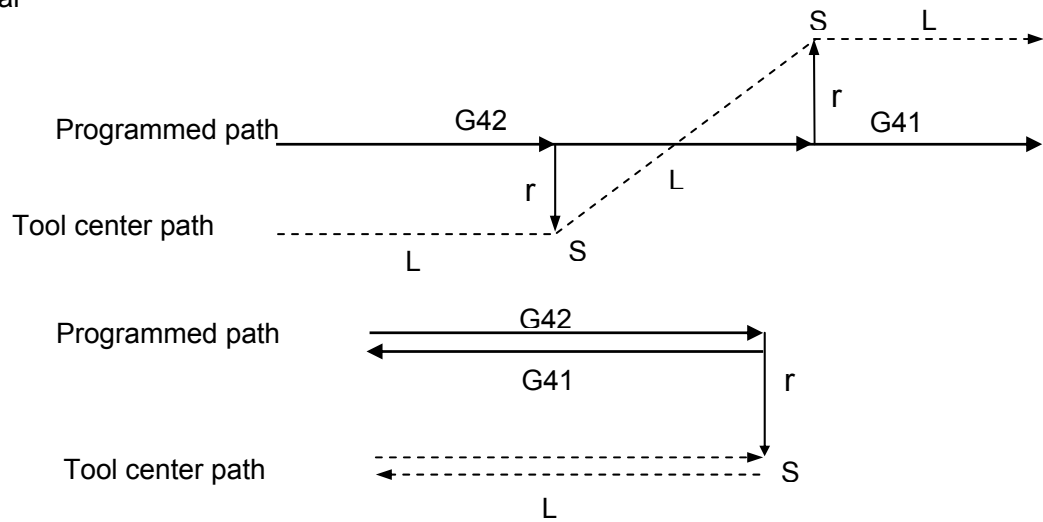


Fig.6-14a Linear to linear, there is no intersection  
(Compensation direction changed)

## ii) Linear to circular

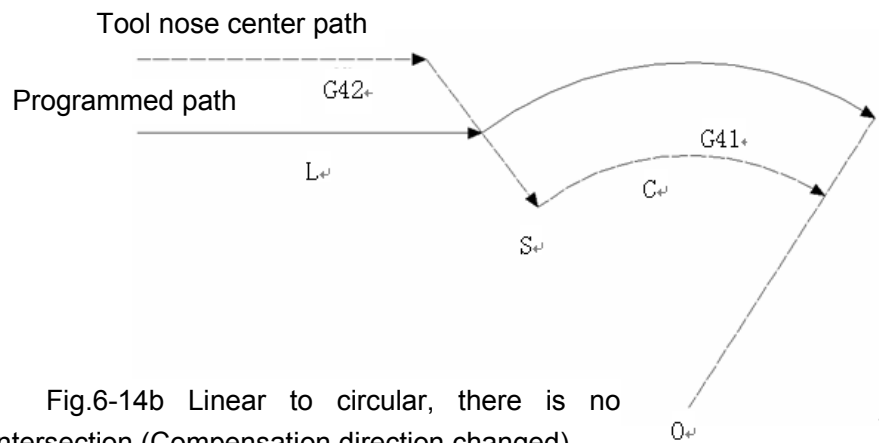


Fig.6-14b Linear to circular, there is no intersection  
(Compensation direction changed)

## iii) Circular to circular

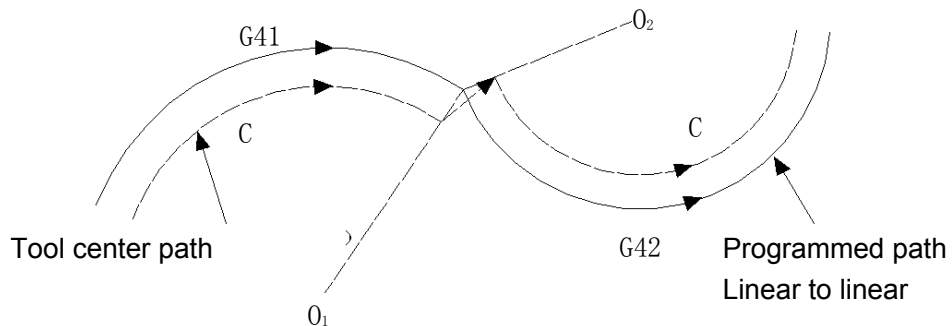


Fig.6-14c Circular to circular, there is no intersection  
(Compensation direction changed)

6.2.4 Tool operation in offset cancellation mode

When the G40 command is employed in block in compensation mode, the CNC enters the compensation cancellation mode. This is called compensation cancellation.

The circular arc command (G02 and G03) can not be employed when the cutter radius compensation C is cancelled. If they are commanded, alarm is generated and the operation is stopped

It controls and performs this block and the blocks in the cutter radius compensation buffer memory in the compensation cancellation mode. If the single block switch is turned on, it stops after executing a block. The next block is executed instead of reading it when the start key is pressed again.

(a) Tool movement along an inner side of a corner ( $\alpha \geq 180^\circ$ )

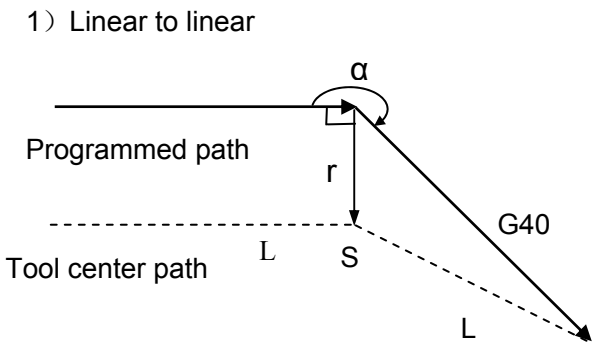


Fig.6-15a Linear to linear (inner side, offset cancellation)

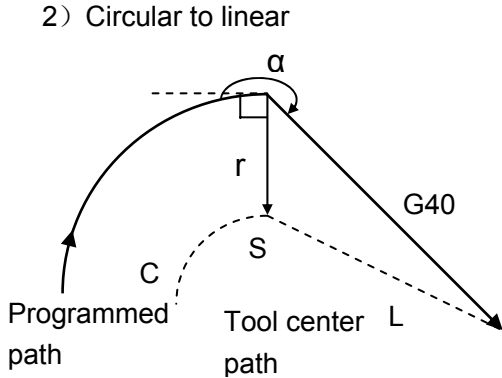


Fig.6-15b Circular to linear (inner side, offset cancellation)

(b) Tool movement along the outside of a corner at an obtuse angle ( $180^\circ > \alpha \geq 90^\circ$ )

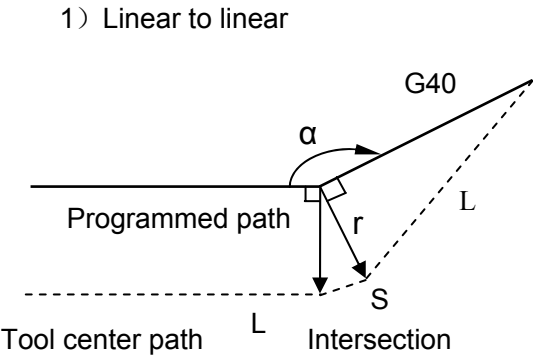


Fig.6-16a Circular to linear (obtuse, outside, offset cancellation)

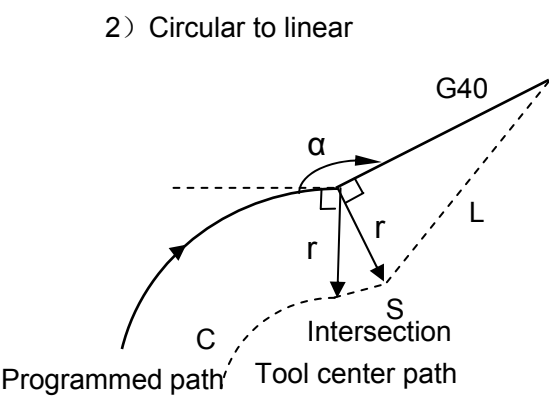


Fig.6-16b Circular to linear (obtuse, outside, offset cancellation)



(c) Tool movement along the outside of a corner at an acute angle ( $180^\circ > \alpha \geq 90^\circ$ )

1) Linear to linear

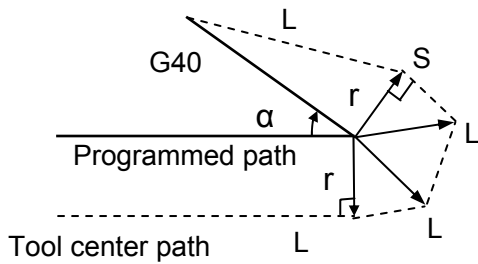


Fig.6-17a Linear to linear (acute angle, outside, offset cancellation)

2) Circular to linear

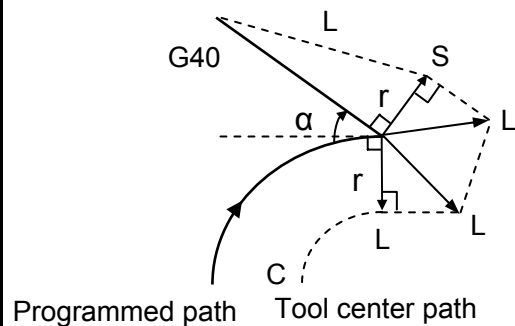


Fig.6-17b Linear to linear (acute angle, outside, offset cancellation)

(d) Tool movement along the corner outside at an acute angle less than 1 degree: linear to linear ( $\alpha < 1^\circ$ )

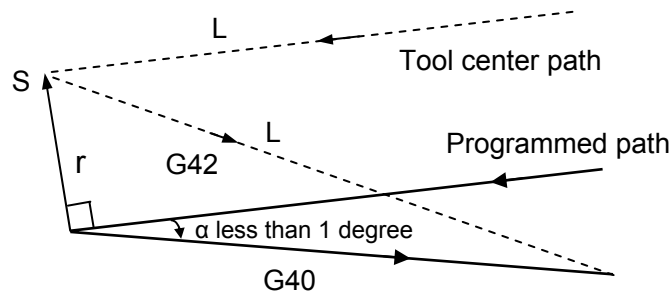


Fig.6-18 Linear to linear (the included angle less than 1 degree, outside, offset cancellation)

### 6.2.5 Interference check

Tool over cutting is called “interference”. The interference check function can check tool over cutting in advance. This interference check is performed even if the over cutting does not occur. However, all interference can not be checked by this function.

#### (1) Conditions for the interference

- 1) The direction of the tool path is different from that of the programmed path. (90 degrees to 270 degrees between these paths)
- 2) In addition to the condition above, the angle between the start point and end point of the tool center path is quite different from that between the start point and end point of the programmed path in circular machining (more than 180 degrees).

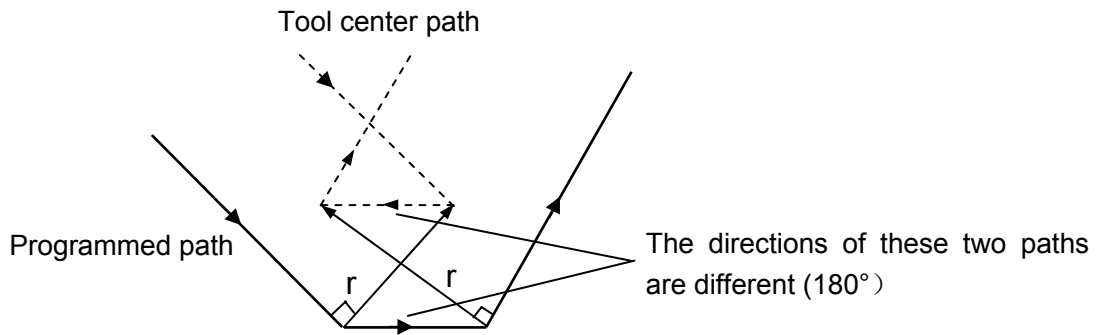
**Example: Linear machining**

Fig.6-19a Machining interference (1)

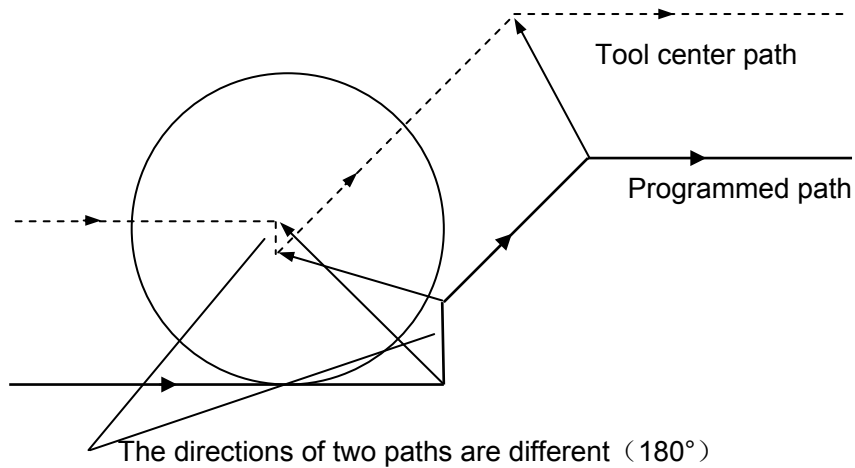


Fig.6-19b Machining interference (2)

**(2) If there is no interference actually, but it is treated as interference.**

- 1) The groove depth less than the compensation value

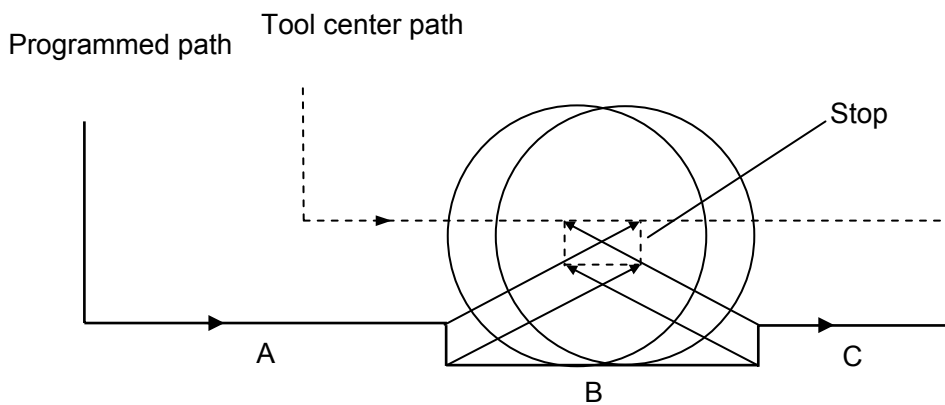


Fig.6-20 Exceptional case (1) treated as interference

There is no interference actually, but program direction in block B is opposite to the cutter radius compensation path. The cutter stops, and the alarm occurs.

2) The groove depth less than compensation value

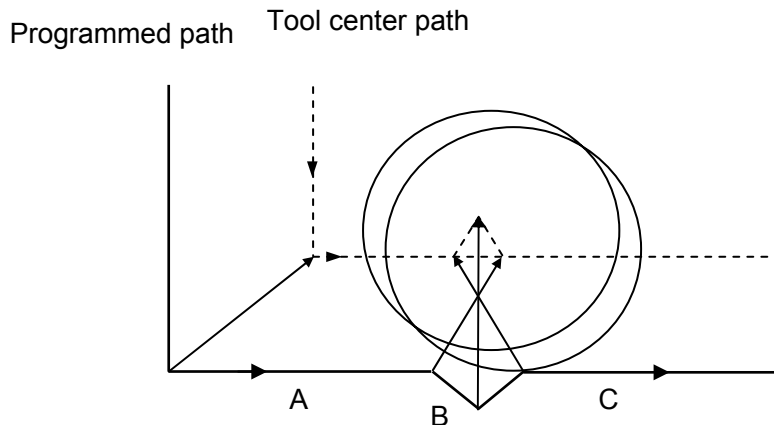


Fig.6-21 Exceptional case (2) treated as interference

There is no interference actually, but program direction in block B is opposite to the cutter radius compensation path. The cutter stops, and the alarm occurs.

## 6.2.6 Command of compensation vector cancel temporarily

If the following commands G92, G28, G29, coordinate command selection G54~G59 and canned cycle are specified in compensation mode, the compensation vector is temporarily cancelled and then automatically restored after these commands are executed. Now, the temporary compensation vector cancellation is different to the compensation cancellation mode, tool is moved to the specified point by compensation vector cancellation from the intersection. And the tool moves to the intersection directly when the compensation mode restores.

### ● Coordinate system setting command G92 and coordinate system selection command G54~G59

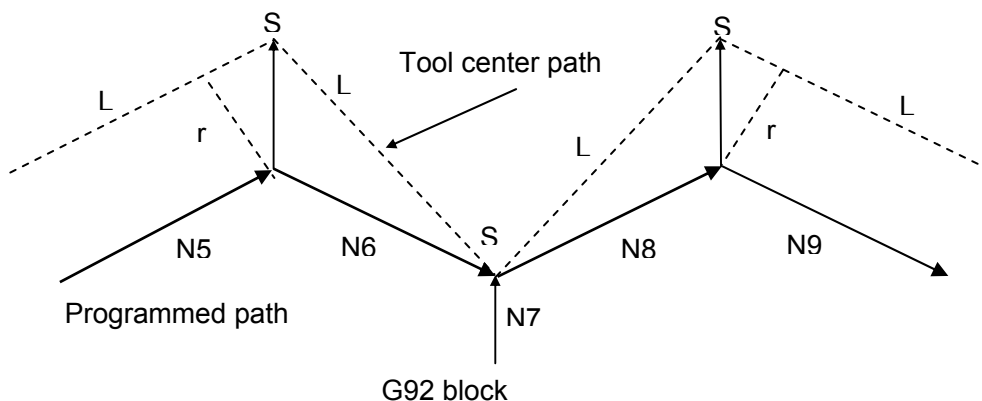


Fig.6-22 Temporary compensation vector by G92

**Note:** SS is indicated as the point stopped for twice in Single block mode.

### ● Automatic return to the reference point G28

If G28 is specified in compensation mode, the compensation will be cancelled at an intermediate position. The compensation mode is automatically restored after the reference point is returned.

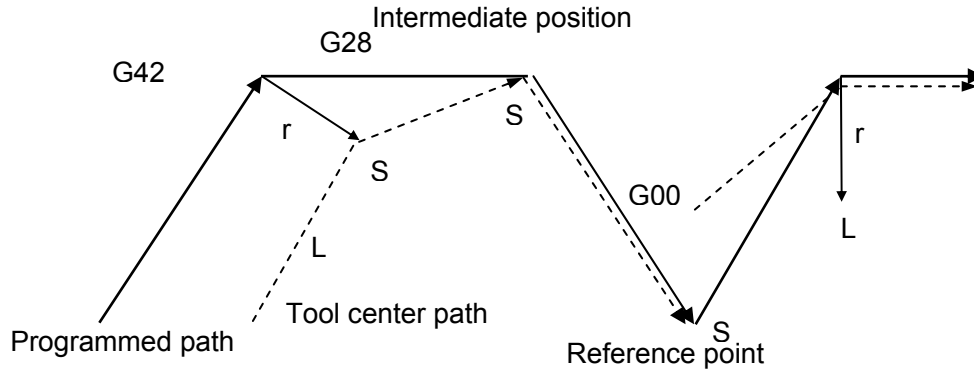


Fig.6-23 Temporarily cancel compensation vector by G28

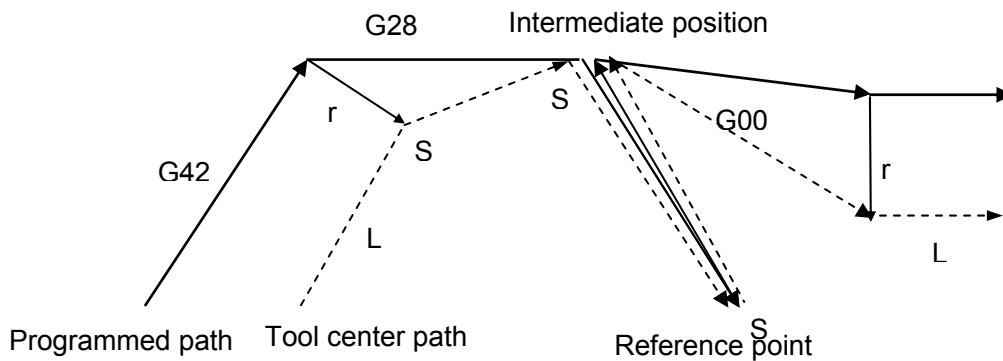


Fig. 6-24 G29 temporarily cancel compensation vector

- **Canned cycle**

If the canned cycle command is specified in compensation mode, the compensation will be temporarily cancelled in the canned cycle operation 1. The compensation mode is automatically restored after the canned cycle is terminated.

### 6.2.7 Exceptional case

- **When the inner corner machining is less than tool radius**

When the inner corner machining is less than tool radius, the inner offset of a tool will cause over cut. The tool stops and alarm occurs after moving at the beginning or at the corner in previous block. But if the switch of “Single block” is ON, the tool will be stopped at the end of the previous block.

- **When a groove less than the tool diameter is machined**

When the tool center moves opposite to the direction of programmed path, the over cutting will be generated by the cutter radius compensation. Tool stops and alarm appears after moving at the beginning of previous block or at the corner.

- **When a step less than the tool radius is machined**

When a program contains a step which is an arc and less than tool radius, tool center path may form a opposite movement direction to the programmed path. So the first vector is ignored and it moves to the end of the second

vector along a straight line. The program will be stopped for Single block mode, the cycle continues if it is not single block mode. The compensation will be executed correctly and no alarm will be generated if the step is a straight line. (But the uncut part is reserved.)

## ● When the sub-program is contained in G code

CNC should be in compensation cancellation mode before calling the sub-program (namely, before the G98 is performed). Offset can be applied after entering the sub-program, but the compensation cancellation should be applied before returning to the main-program (before M99), or the alarm occurs.

## ● When compensation value is changed

(a) Usually, the compensation value is changed when the tool change is performed in compensation cancellation mode. If the compensation value is changed in compensation mode, the new one is ineffective which is effective till the program is executed again.

(b) If different compensation values are commanded in different blocks of a program, different compensation value will be compensated to the corresponding block. But if it is an arc, the alarm will be generated. For details, refer to the following explanation.

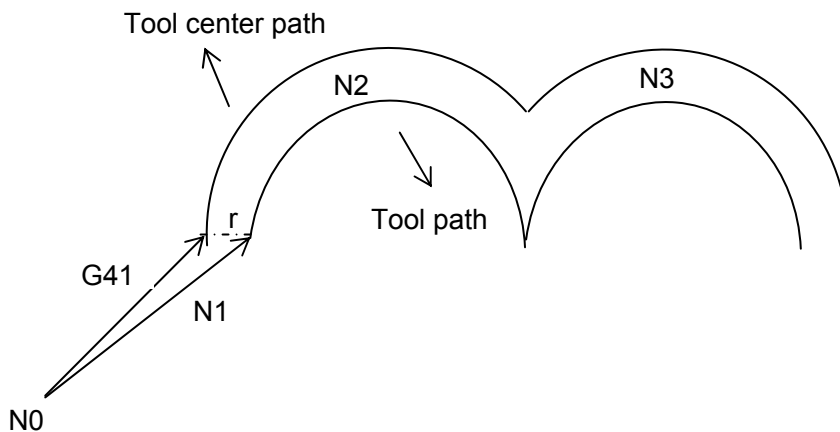
(c) about “arc data error in C type cutter radius compensation”.

## ● When the end point for the programming arc is not on the arc

When the end point for the programming arc is not on the arc, the tool stops and the alarm information shows “end point is not on the arc”.

## ● The related alarms explanation about “the arc data error in C type cutter radius compensation”

In the calculation of C type cutter radius compensation, if the compensation radius D is changed, the alarm will be generated.



Examples:

N0 G90 G00 X-50 Y-50 Z30

N1 G01 G41 X0 Y0 D1 F800

N2 G02 X50 R25

N3 G02 X100 R25

Programmed path and tool center path are performed for the above program, see the left figure.

If the compensation radius D is changed in N3 block, for example, the D2 is commanded in N3 block ( $D2 \neq D1$ ), Because C compensation(tool radius nose compensation) transit point calculation causes overcut or cut miss, for GSK980MDa CNC System, its compensation value(D value) must not be changed in the course of arc interpolation in the radius compensation mode, otherwise, P/S alarms-"specified arc data error (or specified compensation mode is mistaken)

# PART 2 OPERATION

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**Chapter1: Operation and Display**

**Chapter2:Power on/off and Protection**

**Chapter3: Manual Operation**

**Chapter4:MPG step Operation**

**Chapter5: MDI Operation**

**Chapter6: Program Edit and Management**

**Chapter7: AUTO Operation**

**Chapter8.Machine Zero Operation**

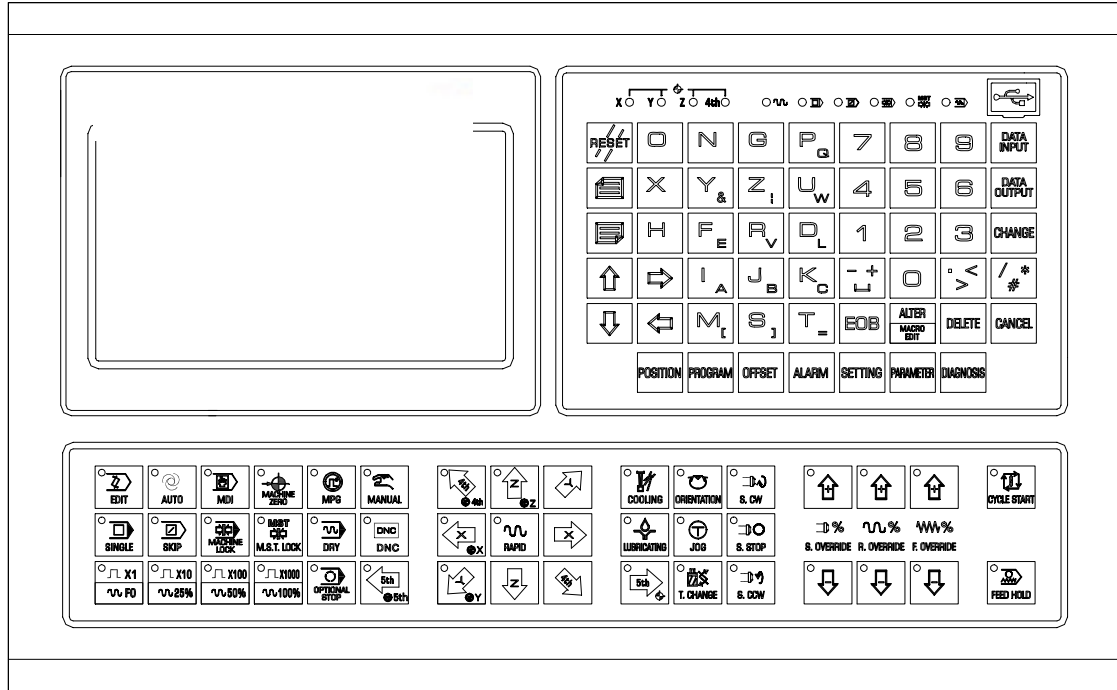
**Chapter9: Data Setting, Backup and Restore**

**Chapter10: Advanced Operation (USB Function)**

**Chapter11: USB Flash Disc Operation**

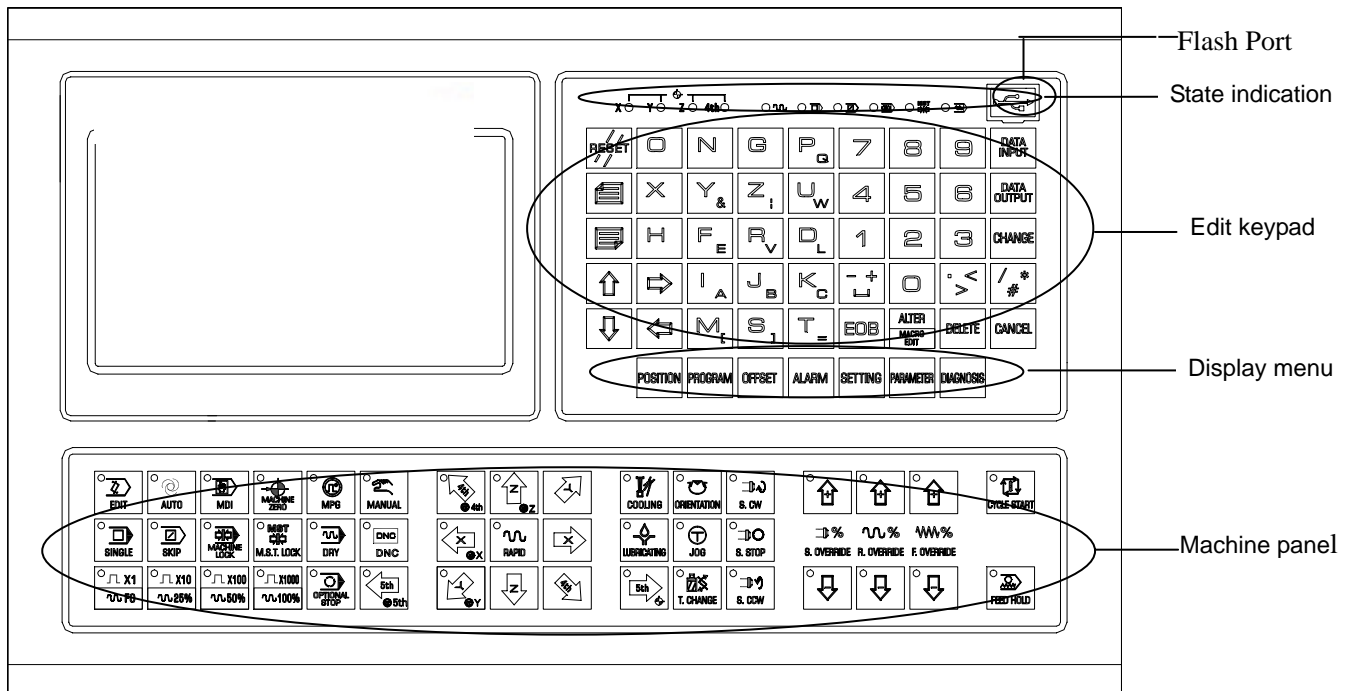
## CHAPTER1 OPERATION AND DISPLAY

This GSK980MDa system is employed with an aluminum alloy solid operator panel, the panel outline is shown as following:

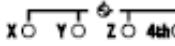


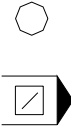
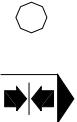

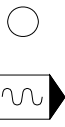


### 1.1 Panel Division


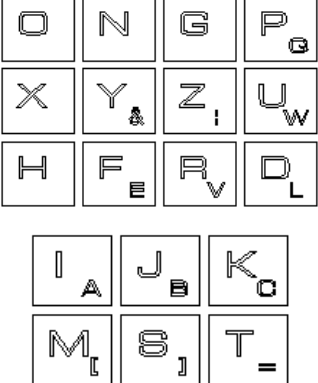
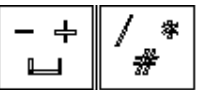
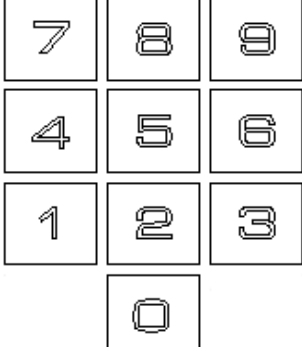
This GSK980MDa is employed with an integrated panel, which is divided as following:










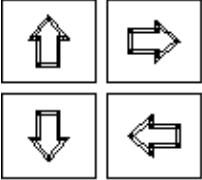

## 1. 1. 1 State indication

|   |                               |   |                      |
|---|-------------------------------|---|----------------------|
|  | machine zero finish indicator |  | Rapid indicator      |
|  | Single block indicator        |  | Block Skip indicator |
|  | Machine Lock indicator        |  | MST Lock indicator   |
|  | Dry Run indicator             |   |                      |






## 1. 1. 2 Edit keypad



| Key   | Name          | Function  |
|---|---------------|---|
|  | RESET key     | For CNC reset, feed, stop output etc.                                       |
|  | Address key   | Address input   |
|   |               | Double address key, switching between two sides by pressing repeatedly      |
|  | Sign key      | Double address key, switching between two characters by pressing repeatedly |
|  | Numerical key | For digit input   |



| Key   | Name               | Function  |
|---|--------------------|---|
|    | Decimal point      | For decimal point input   |
|    | Input key          | For confirmation of parameters, offset values input   |
|    | Output key         | For start communication output  |
|    | Change key         | For switching of message, display   |
|    | Edit key           | For insertion, modification, deletion of programs, words in editing(  is a compound key, switching between two functions by pressing repeatedly ) |
|   | EOB key            | For block end sign input  |
|  | Cursor moving keys | For cursor moving control   |
|  | Page key           | Page switching in a same interface  |

### 1. 1. 3 Menu display




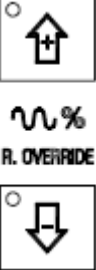
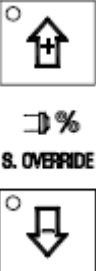

| Menu key  | Remark  |
|---|---|
|  | To enter position interface. There are RELATIVE POS, ABSOLUTE POS, INTEGRATED POS, POS&PRG pages in this interface.   |
|  | To enter program interface. There are PRG CONTENT, PRG LIST, PRG STATE pages in this interface.   |
|  | To enter TOOL OFFSET, MARRO interface (switching between two interfaces by pressing it repeatedly). OFFSET interface displays offset values; MARRO for CNC macro variables.                               |
|  | To enter alarm interface. There are CNC, PLC ALARM pages in this interface.   |
|  | To enter Setting, Graphic interface (switching between two interfaces by pressing repeatedly). There are SWITCH, PARM OPERATION, and PASSWORD SETTING in setting interface; there are GRAGH SET and TRACK |

|   |   |
|---|---|
|   | pages in Graphic interface.   |
|  | To enter BIT PARAMETER, DATA PARAMETER, SCREW-PITCH COMP interfaces (switching between each interface by pressing repeatedly).  |
|  | To enter CNC DIAGNOSIS, PLC STATE, PLC VALUE, machine software panel, VERSION MESSAGE interfaces (switching between each interfaces by pressing the key repeatedly). CNC DIAGNOSIS, PLC STATE, PLC VALUE interfaces display CNC internal signal state, PLC addresses, data message; machine software panel is used for machine soft keypad operation; the VERSION MESSAGE interface displays CNC software, hardware and PLC version No. |



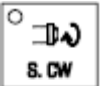
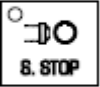
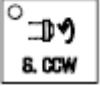

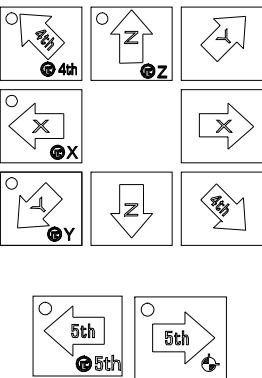
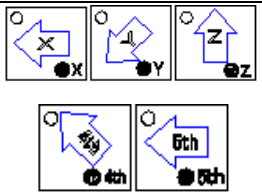


#### 1.1.4 Machine panel











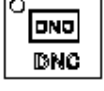
The keys function in GSK980MDa machine panel is defined by PLC program (ladder), see their function significance in the machine builder's manual.

The functions of the machine panel keys defined by standard PLC program are shown as following table:

| Key   | Name                   | Function explanation  | Function mode   |
|---|------------------------|---|---|
|    | Feed Hold key          | Dwell commanded by program, MDI                             | Auto mode, MDI mode   |
|   | Cycle Start key        | Cycle start commanded by program, MDI                       | Auto mode, MDI mode   |
|  | Feedrate Override keys | For adjustment of the feedrate                              | Auto mode, MDI mode, Edit mode, Machine zero mode, MPG mode, Step mode, MANUAL mode, Program zero |
|  | Rapid override keys    | For adjustment of rapid traverse                            | Auto mode, MDI mode, Machine zero mode, MANUAL mode, Program zero                                 |
|  | Spindle override keys  | For spindle speed adjustment (spindle analog control valid) | Auto mode, edit mode, MDI mode, Machine zero mode, MANUAL mode, Step mode, MPG mode, Program zero |
|  | JOG key                | For spindle Jog ON/OFF                                      | Machine zero mode, MANUAL mode, Step mode, MPG mode,  |

# CHAPTER1 OPERATION AND DISPLAY

| Key   | Name  | Function explanation   | Function mode   |
|---|---|--|---|
|   |   |  | Program zero  |
|    | Lubricating key                                     | For machine lubrication ON/OFF   | Machine zero mode, MANUAL mode, Step mode, MPG mode, Program zero                                 |
|    | Cooling key   | For coolant ON/OFF   | Auto mode, Edit mode, MDI mode, Machine zero mode, MANUAL mode, Step mode, MPG mode, Program zero |
| <br><br> | Spindle control keys                                | Spindle CCW<br>Spindle stop<br>Spindle CW  | Machine zero mode, MANUAL mode, Step mode, MPG mode, Program zero                                 |
|   | Rapid traverse key                                  | For rapid traverse /feedrate switching   | Auto mode, MDI mode, Machine zero mode, MANUAL mode, Program zero                                 |
|    | Manual feed key                                     | For positive/negative moving of X, Y, Z axis in Manual, Step mode                            | Machine zero mode, MANUAL mode, Program zero, Step mode   |
|    | Handwheel axis selection key                        | For X, Y, Z axis selection in MPG mode   | MPG mode  |
|    | MPG/Step increment and Rapid override selection key | Move amount per handwheel scale 0.001/0.01/0.1 mm<br>Move amount per step 0.001/0.01/0.1 mm  | Auto mode, MDI mode, Machine zero mode, MANUAL mode, Step mode, MPG mode, Program zero            |
|    | Single Block key                                    | For switching of block/blocks execution, Single block lamp lights up if Single mode is valid | Auto mode, MDI mode   |

| Key   | Name                  | Function explanation  | Function mode   |
|---|-----------------------|---|---|
|    | Block Skip key        | For skipping of block headed with "/" sign, if its switch is set for ON, the Block Skip indicator lights up | Auto mode, MDI mode   |
|    | Machine Lock key      | If the machine is locked, its lamp lights up, and X, Z axis output is invalid.                              | Auto mode, MDI mode, Edit mode, Machine zero mode, MANUAL mode, Step mode, MPG mode, Program zero |
|    | M.S.T. Lock key       | If the miscellaneous function is locked, its lamp lights up and M, S, T function output is invalid.         | Auto mode, MDI mode   |
|    | Dry Run key           | If dry run is valid, the Dry run lamp lights up. Dry run for program/MDI blocks command                     | Auto mode, MDI mode   |
|    | Edit mode key         | To enter Edit mode  | Auto mode, MDI mode, Machine zero mode, MANUAL mode, Step mode, MPG mode, Program zero            |
|  | Auto mode key         | To enter Auto mode  | MDI mode, Edit mode, Machine zero mode, MANUAL mode, Step mode, MPG mode, Program zero            |
|  | MDI mode key          | To enter MDI mode   | Auto mode, Edit mode, Machine zero mode, MANUAL mode, Step mode, MPG mode, Program zero           |
|  | Machine zero mode key | To enter Machine zero mode  | Auto mode, MDI mode, Edit mode, MANUAL mode, Step mode, MPG mode, Program zero                    |
|  | Step/MPG mode key     | To enter Step or MPG mode (one mode by parameter)   | Auto mode, MDI mode, Edit mode, Machine zero mode, MANUAL mode, Program zero                      |
|  | Manual mode key       | To enter Manual mode  | Auto mode, MDI mode, Edit mode, Machine zero mode, Step mode, MPG mode, Program zero              |
|  | DNC mode key          | To enter DNC mode   | To enter DNC mode by pressing this key in Auto mode   |


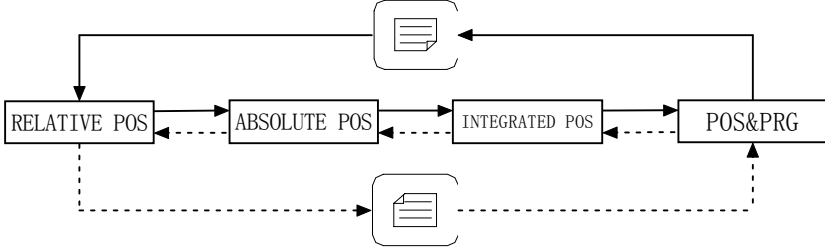





# 1.2 Summary of Operation Mode

There are 7 modes that include Edit, Auto, MDI, Machine zero, Step/MPG, Manual, Program Zero modes in this GSK980MDa.


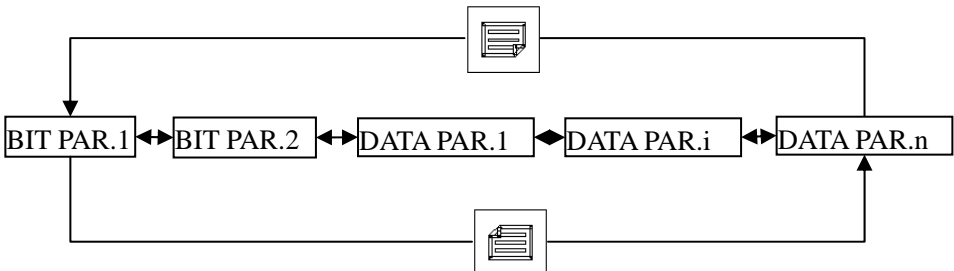
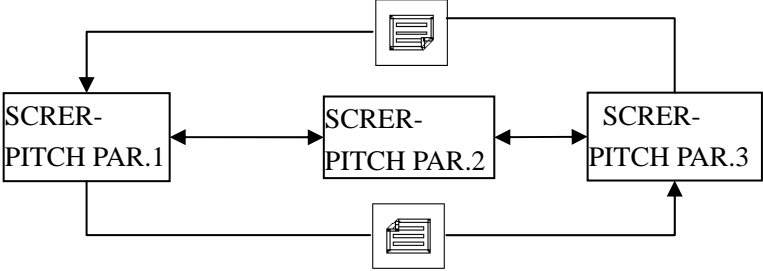

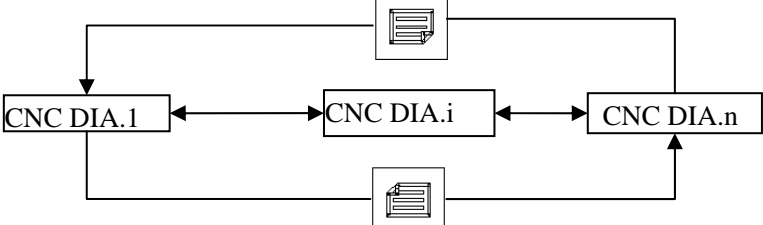
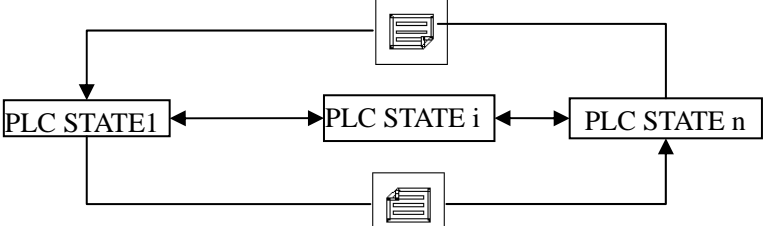
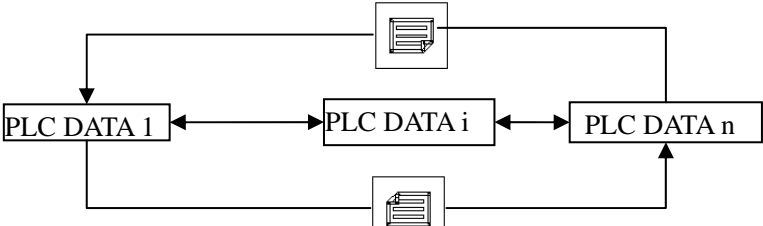
- **Edit mode**  
In this mode, the operation of part program setup, deletion and modification can be performed.
- **Auto mode**  
In this mode, the program is executed automatically.
- **MDI mode**  
In this mode, the operation of parameter input, command blocks input and execution can be performed.
- **Machine zero mode**  
In this mode, the operation of X,Y, Z axis machine zero return can be performed separately.
- **MPG / Step mode**  
In the Step/MPG feed mode, the moving is performed by an increment selected by CNC system.
- **Manual mode**  
In this mode, the operation of Manual feed, Manual Rapid, feedrate override adjustment, Rapid override adjustment and spindle ON/OFF, cooling ON/OFF, Lubrication ON/OFF, spindle jog, manual tool change can be performed.
- **DNC mode**  
In this mode, the program is run by DNC mode.

# 1.3 Display Interface


There are 7 interfaces such as Position, Program etc., and there are multiple pages in each interface. Each interface (page) is separated with the operation mode. See the following figures for the display menu, display interface and page layers:



| Menu key  | Display interface  | Display page   |
|---|--------------------|--|
|  | Position interface |  |
|  | Program content    |  |
|   | Program state      |  |
|   | Program Preview    |  |
|   | Program list       |  |

| Menu key | Display interface     | Display page   |
|----------|-----------------------|--|
| OFFSET   | TOOL OFFSET interface | <pre> graph TD     Menu1[Menu Icon] --&gt; T1[Tool Offset 1]     T1 --&gt; Ti[Tool Offset i]     Ti --&gt; T5[Tool Offset 5]     T5 --&gt; Menu1 </pre>      |
|          | MACRO interface       | <pre> graph TD     Menu2[Menu Icon] --&gt; M1[MACRO 1]     M1 --&gt; Mi[MACRO i]     Mi --&gt; M4[MACRO 4]     M4 --&gt; Menu2 </pre>                        |
|          | Tool life interface   | <pre> graph TD     Menu3[Menu Icon] --&gt; TL1[Tool Life 1]     TL1 --&gt; TLi[Tool Life i]     TLi --&gt; TLn[Tool Life n]     TLn --&gt; Menu3 </pre>      |
| ALARM    | CNC alarm             | CNC ALARM  |
|          | PLC alarm/warn        | PLC ALARM/WARN   |
|          | Alarm log             | ALARM LOG  |
| SETTING  | Setting interface     | <pre> graph TD     Menu4[Menu Icon] --&gt; SS[SWITCH SETTING]     SS --&gt; TD[Time &amp; DATE]     TD --&gt; AO[AUTH. OPERATION]     AO --&gt; Menu4 </pre> |
|          | G54 setting           | SET(G54~G59)   |
|          | Graphic interface     | <pre> graph TD     Menu5[Menu Icon] --&gt; GS[GRAPH SET]     GS --&gt; GT[GRAPH TRACK]     GT --&gt; Menu5 </pre>  |

| Menu key  | Display interface     | Display page   |
|---|-----------------------|--|
|    | Bit parameter         |    |
|   | Data parameter        |  |
|   | Screw-pitch parameter |    |
|  | CNC diagnosis         |   |
|   | PLC state             |  |
|   | PLC data              |  |
|   | Version message       | VERSION MESSAGE  |

### 1. 3. 1 Position interface

Press  to enter Position interface, which has four interfaces such as ABSOLUTE POS, RELATIVE

POS, INTEGRATED POS and POS&PRG, and they can be viewed by  or  keys.

#### 1) ABSOLUTE POS **display** interface

The X, Y, Z coordinates displayed are the absolute position of the tool in current workpiece coordinate system, as CNC power on, these coordinates are held on and the workpiece coordinate system is specified by G92.

|              |  |  |
|--------------|--|--|
| ABSOLUTE POS |  | 00000 N00000                           |
| 00000 N00000 |  | G00 G17 G90 G54<br>G21 G40 G49 G94 G98 |
| X 0.000      |  | F0100 S 00 M30                         |
| Y 0.000      |  | PRG. F: 100                            |
| Z 0.000      |  | ACT. F: 0                              |
|              |  | FED OVRI: 150%                         |
|              |  | RAP OVRI: 100%                         |
|              |  | SPI OVRI: 100%                         |
|              |  | PART CNT: 0                            |
|              |  | CUT TIME: 0:00:00                      |
| MDI          |  | S0000 T00 H00                          |

PRG. F: a rate specified by F code in program

**Note: It displays “PRG. F” In Auto, MDI mode; “JOG F. in Machine zero,Manual mode”;“HNDL INC”in MPG mode; “STEP INC”in Step mode.**

ACT. F: actual speed after feedrate override in a machining.

FED OVRI: an override by feedrate override switch.

G CODE: modal value of 01 group G code and 03 group G code

PART CNT: part number plusing 1 when M30 (or M99 in the main program) is executed

CUT TIME: Time counting starts if Auto run starts, time units are hour, minute and second

The parts counting and the cut time are memorized at power-down and the clearing ways for them are as following:

PART CNT clearing: press  key then press  key.

CUT TIME clearing: press  key then press  key.

S0000: Feedback spindle speed of spindle encoder, and spindle encoder is a must.

T0100: Current tool No. and tool offset No.



## 2) RELATIVE POS display page



The X, Y, Z axis coordinates displayed are the current position relative to the relative reference point, and they are held on at CNC power on. They can be cleared at any time. If X, Y, Z axis relative coordinates are cleared, the current position will be the relative reference point. When CNC parameter No.005 Bit1=1, as the absolute coordinates are set by G92 code, X, Y, Z axis relative coordinates are identical with the set absolute coordinates.



|              |  |  |
|--------------|--|--|
| RELATIVE POS |  | 00000 N00000                           |
| 00000 N00000 |  | G00 G17 G90 G54<br>G21 G40 G49 G94 G98 |
| X 0.000      |  | F0100 S 00 M30                         |
| Y 0.000      |  | PRG. F: 100                            |
| Z 0.000      |  | ACT. F: 0                              |
|              |  | FED OVRI: 150%                         |
|              |  | RAP OVRI: 100%                         |
|              |  | SPI OVRI: 100%                         |
|              |  | PART CNT: 0                            |
|              |  | CUT TIME: 0:00:00                      |
| MDI          |  | S0000 T00 H00                          |





The clearing steps of X, Y, Z axis relative coordinates:



In RELATIVE POS page, press and hold  key till the “X” in the page blinks, press  key to clear X coordinate;



In RELATIVE POS page, press and hold  key till the “Y” in the page blinks, press  key to clear Y coordinate;

In RELATIVE POS page, press and hold  key till the “Z” in the page blinks, press  key to clear Z coordinate;

The method for X, Y, Z axis relative coordinates divided by 2:

In RELATIVE POS page, press and hold  key till the “X” in the page blinks, press  key, X coordinate will be divided by 2;

In RELATIVE POS page, press and hold  key till the “Y” in the page blinks, press  key, Y coordinate will be divided by 2;

In RELATIVE POS page, press and hold  key till the “Z” in the page blinks, press  key, Z coordinate will be divided by 2;

## 3) INTEGRATED POS display page

In INTEGRATED POS page, the RELATIVE, ABSOLUTE, MACHINE coordinate, DIST TO GO (only in Auto and MDI mode) are displayed together.

The displayed value of MACHINE coordinate is the current position in the machine coordinate system which is set up according to the machine zero.

DIST TO GO is the difference of the target position by block or MDI command to the current position.

The display page is as following:

| INTEGRATED POS |       |              |       | 00000 N00000        |  |  |  |
|----------------|-------|--------------|-------|---------------------|--|--|--|
| (RELATIVE)     |       | (ABSOLUTE)   |       | G00 G17 G90 G54     |  |  |  |
| X              | 0.000 | X            | 0.000 | G21 G40 G49 G94 G98 |  |  |  |
| Y              | 0.000 | Y            | 0.000 | F0100 S 00 M30      |  |  |  |
| Z              | 0.000 | Z            | 0.000 | PRG. F: 100         |  |  |  |
| (MACHINE)      |       | (DIST TO GO) |       | ACT. F: 0           |  |  |  |
| X              | 0.000 | X            | 0.000 | FED OVRI: 150%      |  |  |  |
| Y              | 0.000 | Y            | 0.000 | RAP OVRI: 100%      |  |  |  |
| Z              | 0.000 | Z            | 0.000 | SPI OVRI: 100%      |  |  |  |
|                |       |              |       | PART CNT: 0         |  |  |  |
|                |       |              |       | CUT TIME: 0:00:00   |  |  |  |
| MDI            |       |              |       | S0000 T00 H00       |  |  |  |

## 4) POS&PRG display page

In this page, it displays ABSOLUTE, RELATIVE of the current position (ABSOLUTE, DIST TO GO of current position will be displayed if BIT0 of bit parameter No.180 is set to 1) and 5 blocks of current program together.

During the program execution, the blocks displayed are refreshed dynamically and the cursor is located in the block being executed.

| POS & PRG      |       |            | O0000 N00000  |       |  |
|----------------|-------|------------|---------------|-------|--|
| (RELATIVE)     |       | (ABSOLUTE) | (MACHINE)     |       |  |
| X              | 0.000 | X 0.000    | X             | 0.000 |  |
| Y              | 0.000 | Y 0.000    | Y             | 0.000 |  |
| Z              | 0.000 | Z 0.000    | Z             | 0.000 |  |
| O0000 (O0000); |       |            |               |       |  |
| █              |       |            |               |       |  |
| %              |       |            |               |       |  |
| MDI            |       |            | S0000 T00 H00 |       |  |

### 1.3.2 Program interface

#### 1) program content page



is a Composite key. First press



key enter program content interface. In

EDITmode, press  and  to show present program content.

| PRG CONTENT    |  | SEG1          | COL:1 | C:/O0000.CNC |
|----------------|--|---------------|-------|--------------|
| O0000 (O0000); |  |               |       |              |
| █              |  |               |       |              |
| %              |  |               |       |              |
| MDI            |  | S0000 T00 H00 |       |              |

#### 2) program state page




In program content page, press

G, M, S, T, F instruction and relative program state in this page. It can also realise MDI movement in this page.

|                    |       |                       |   |                   |     |     |     |
|--------------------|-------|-----------------------|---|-------------------|-----|-----|-----|
| PRG STATE          |       |                       |   | 00000 N00000      |     |     |     |
| (ABSOLUTE)         |       | (Mode of fixed cycle) |   | G00               | G17 | G90 | G54 |
| X                  | 0.000 | X                     | V | G21               | G40 | G49 | G94 |
| Y                  | 0.000 | Y                     | W | F0100             | S   | 00  | M30 |
| Z                  | 0.000 | Z                     | P | PRG. F: 100       |     |     |     |
| INPUT PRG SEGMENT: |       |                       |   | ACT. F: 0         |     |     |     |
|                    |       |                       |   | FED OVRI: 150%    |     |     |     |
|                    |       |                       |   | RAP OVRI: 100%    |     |     |     |
|                    |       |                       |   | SPI OVRI: 100%    |     |     |     |
|                    |       |                       |   | PART CNT: 0       |     |     |     |
|                    |       |                       |   | CUT TIME: 0:00:00 |     |     |     |
| MDI                |       |                       |   | S0000 T00 H00     |     |     |     |

3) program preview page



In program content page, pressing  key to enter program preview page. Listing all program in this page. In order to make it more convenient to search program, system shows first 5 lines of current program. Users can press EO key to specify program to process. User can also press DEL key to delete program.

Content in program preview page:

- (a) storage capacity: display max. CNC storage capacity;
- (b) used capacity: capacity of stored work piece programs;
- (c) program number : showing total number of CNC stored work piece programs(including subprogram)) ;
- (d) program size: Size of current program,which target is pointing at. unit: byte (B) ;
- (e) program list: Showing stored work piece program number according to list of program name.

|                         |  |  |  |                  |  |  |  |
|-------------------------|--|--|--|------------------|--|--|--|
| PRG PREVIEW             |  |  |  | 00003 N00000     |  |  |  |
| 00000 00001 00002 00003 |  |  |  | MEM SIZE: 40.0MB |  |  |  |
|                         |  |  |  | MEM USED: 100KB  |  |  |  |
|                         |  |  |  | PRG AMOT: 4      |  |  |  |
|                         |  |  |  | PRG SIZE: 17B    |  |  |  |
| 00000 (00000);          |  |  |  |                  |  |  |  |
| ;                       |  |  |  |                  |  |  |  |
| %                       |  |  |  |                  |  |  |  |
| EDIT                    |  |  |  | S0000 T00 H00    |  |  |  |


4) document catalogue page

GSK980MDa supports USB interface, so CN provides CNC→USB and USB→CNC bi-direction document operation in this page. You can check CNC and USB (insert USB) document catalogue and document and open, copy, delete document conveniently in this page.

| FILE LIST   |                   | 00003 N00000  |
|---|-------------------|---------------|
| C:/   | U:/               |               |
| 00000.CNC   | G50G51 Design-new |               |
| 00001.CNC   | MZRDataProc       |               |
| 00002.CNC   | 2009-4~1          |               |
| 00003.CNC   | ly                |               |
| INPUT: FILE INFO 17B 2009-12-28 10:10:31              |                   |               |
| NOTE:[CHG]:C/U SHIFT [EOB]:OPEN [OUT]:COPY TO U FLASH |                   |               |
| EDIT  |                   | S0000 T00 H00 |

### 1. 3. 3 Tool offset, macro variable and tool life management interface





is a compound key, press  key once in other page, it enters the TOOL OFFSET page, press



key again, it enters the MACRO interface.

#### 1、OFFSET interface



There are 4 tool offset pages in this interface, and 32 offset No. (No.001~No.032) available for user, which

can be shown as following by pressing  or  keys.

| TOOL OFFSET |        |         |        |         | 00003 N00000  |
|-------------|--------|---------|--------|---------|---------------|
| NO.         | Geo(H) | Wear(H) | Geo(D) | Wear(D) | (RELATIVE)    |
| 01          | 0.000  | 0.000   | 0.000  | 0.000   | X 0.000       |
| 02          | 0.000  | 0.000   | 0.000  | 0.000   | Y 0.000       |
| 03          | 0.000  | 0.000   | 0.000  | 0.000   | Z 0.000       |
| 04          | 0.000  | 0.000   | 0.000  | 0.000   | (ABSOLUTE)    |
| 05          | 0.000  | 0.000   | 0.000  | 0.000   | X 0.000       |
| 06          | 0.000  | 0.000   | 0.000  | 0.000   | Y 0.000       |
| 07          | 0.000  | 0.000   | 0.000  | 0.000   | Z 0.000       |
| 08          | 0.000  | 0.000   | 0.000  | 0.000   |               |
| NO. 001     |        |         |        |         |               |
| EDIT        |        |         |        |         | S0000 T00 H00 |

#### 2、macro Variable page



There are 25 pages in this interface, which can be shown by pressing  or  keys. In Macro page there are 600 (No.100~No.199 and No.500~No.999) macro variables which can be specified by macro command or set by keypad.

| MACRO   |      |     |      | 00003 N00000  |      |
|---------|------|-----|------|---------------|------|
| NO.     | DATA | NO. | DATA | NO.           | DATA |
| 100     | Null | 108 | Null | 116           | Null |
| 101     | Null | 109 | Null | 117           | Null |
| 102     | Null | 110 | Null | 118           | Null |
| 103     | Null | 111 | Null | 119           | Null |
| 104     | Null | 112 | Null | 120           | Null |
| 105     | Null | 113 | Null | 121           | Null |
| 106     | Null | 114 | Null | 122           | Null |
| 107     | Null | 115 | Null | 123           | Null |
| NO. 100 |      |     |      |               |      |
| EDIT    |      |     |      | S0000 T00 H00 |      |

### 3、Tool life management

**Note:** The tool change signal TLCH: F064#0 should be added for PLC when using this function.


**Ladder example:**




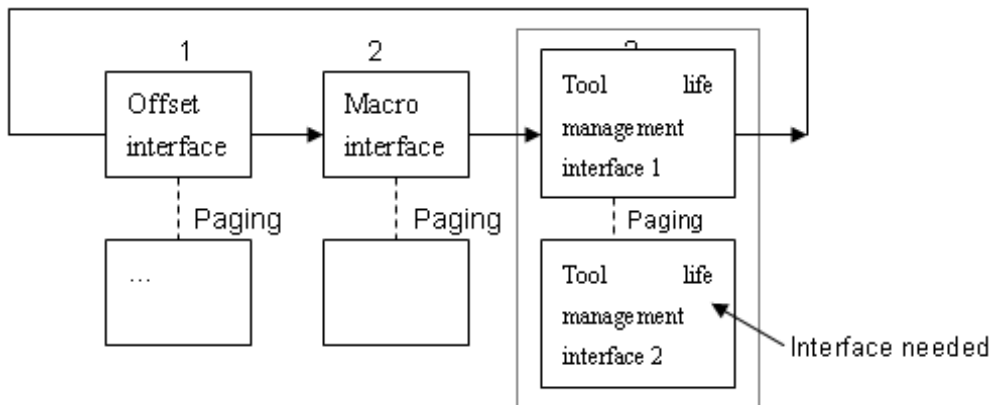
- **Using of tool life management function**

Parameter (No.002#0) is used as the symbol for tool life management function (0—unused, 1—used); if the function is not used, the relevant tool life management page is not shown.

- **Tool life management display interface**

The tool life management is controlled by  key, which is displayed in the third sub-interface, and it is composed by 2 pages (paging by page keys).

Interface shown by pressing  key repeatedly



**Tool life management display (1<sup>st</sup> page)**

The 1<sup>st</sup> page for tool life management interface displays the life data of the current tool and the tool group list that has been defined. This page is mainly used for monitoring the tool life data by group units. The data monitoring of each tool in a group, group number setting and tool life management data are displayed in the next page.

|               |       |      |      |      |       |               |
|---------------|-------|------|------|------|-------|---------------|
| T-LIFE MANAG. |       |      |      |      |       | 00003 N00000  |
| Cur. T State: |       |      |      |      |       |               |
| Tool          | Group | Life | Used | Mode | State |               |
| Defi. Group:  |       |      |      |      |       |               |
| —             |       |      |      |      |       |               |
| MDI           |       |      |      |      |       | S0000 T00 H00 |

## i . Display explanation



<Current Tool State>: It displays the life data of the current tool being used.

Mode: It displays the counting unit of life data. ( 0: minute/1: times)

State: It displays the tool status. ( 0—Unused, 1—Using, 2—Over, 3—Skip)

< Defined Group >: It only displays the group numbers which have been defined, and the undefined are not shown. The group number with the backlight means that all the tool life in that group has expired.

## ii . Deletion of all data defined

In that page, press  +  keys, it may delete all the data which have been defined (including group number, group tool numbers and life values, etc. )

**Tool life management interface (the 2nd page)**

The 2<sup>nd</sup> page is used to set and display the life data of a group which are displayed by order 1~8.

|                |        |      |      |      |       |               |
|----------------|--------|------|------|------|-------|---------------|
| T-LIFE MANAG.  |        |      |      |      |       | 00003 N00000  |
| Tool Group: 01 |        |      |      |      |       |               |
| No.            | Offset | Life | Used | Mode | State |               |
|                |        |      |      |      |       |               |
|                |        |      |      |      |       |               |
|                |        |      |      |      |       |               |
|                |        |      |      |      |       |               |
|                |        |      |      |      |       |               |
|                |        |      |      |      |       |               |
| Group          |        |      |      |      |       | _____         |
| MDI            |        |      |      |      |       | S0000 T00 H00 |

There are 3 display types for tool group selection:

- Directly input the group number in the “Tool Group ”of the 2<sup>nd</sup> page, it displays the tool life data. If the group does not exist, the number input will be taken as a new group number.

The new group number: 22, and the 1<sup>st</sup> tool will be defined by system automatically:

|                |        |      |      |      |       |               |
|----------------|--------|------|------|------|-------|---------------|
| T-LIFE MANAG.  |        |      |      |      |       | 00003 N00000  |
| Tool Group: 01 |        |      |      |      |       |               |
| No.            | Offset | Life | Used | Mode | State |               |
|                |        |      |      |      |       |               |
|                |        |      |      |      |       |               |
| Group          |        |      |      |      |       |               |
| MDI            |        |      |      |      |       | S0000 T00 H00 |

- ii. Move the cursor to select the group number in the “Defined Group”of the 1<sup>st</sup> page, and it displays the group content as paging for the 2<sup>nd</sup> page.
- iii. As the current group number content is displayed in the 2<sup>nd</sup> page, it continues to display the following group number content when paging next page.

### 1. 3. 4 Alarm interface



Press key to enter Alarm interface, there are CNC ALARM, PLC ALARM pages in this interface.



which can be viewed by or key.

1) PLC ALARM: It displays the numbers of CNC alarm, PLC alarm, and the current PLC alarm No., as well as PLC warning and warning No.. It may display 24 PLC alarm or warning No. together. The details for the respective alarm No. may be viewed by moving the cursor. If there are 2 alarms in current page, it displays as following:


|                                 |              |              |               |
|---------------------------------|--------------|--------------|---------------|
| PLC ALARM /WARN                 |              |              | 00003 N00000  |
| CNC ALM : 0.                    | PLC ALM: 1 . | PLC WARN: 0. |               |
|                                 |              |              |               |
|                                 |              |              |               |
| ALM NO:1000 BIT ADDRES: A0000.0 |              |              |               |
| Illegal M code                  |              |              |               |
|                                 |              |              |               |
| MDI                             |              |              | S0000 T00 H00 |

Page as the cursor locates at the alarm No.1000

2) CNC ALARM: It displays the numbers of CNC alarm, PLC alarm, and the current CNC alarm No.. It may display 24 CNC alarm No. together. The details for the respective alarm No. may be viewed by moving the cursor.

|                            |              |               |
|----------------------------|--------------|---------------|
| CNC ALARM                  |              | 00003 N00000  |
| CNC ALM : 2.               | PLC ALM: 0 . | PLC WARN: 0.  |
| 431                        |              |               |
| CTR WARN:432               |              |               |
| Y axis driver is not ready |              |               |
| MDI                        | ALM          | S0000 T00 H00 |



Page as the cursor locates at the alarm No.432



3) WARN LOG: Press  key to enter Alarm interface, then press it again to enter the WARN LOG page, which records the latest history alarm message including alarm date, alarm time, alarm No. and alarm content. 200

pieces warn log message can be viewed by  or  key.

|                            |      |        |                 |
|----------------------------|------|--------|-----------------|
| WARN LOG                   |      | PAGE:1 | 00003 N00000    |
| 2009/12/28 10:52:54        | 432# | 1      | 00003.CNC N0000 |
| Y axis driver is not ready |      |        |                 |
| 2009/12/28 10:52:54        | 431# | 1      | 00003.CNC N0000 |
| X axis driver is not ready |      |        |                 |
| 2009/12/28 10:52:38        | 431# | 1      | 00003.CNC N0000 |
| X axis driver is not ready |      |        |                 |
| MDI                        |      |        | S0000 T00 H00   |

① Warn log order: the latest alarm log ranks at the head of the 1<sup>st</sup> page, following by others. If the alarm log exceeds 200, the last history log will be cleared.

② Alarm log manual clearing: under the 2 level authority, press  +  key, it may clear all the warn logs.

4) Alarm clearing: If multiple alarms are issued, only one alarm where the cursor locates could be cleared by pressing  key each time (In alarm interface, it clears all alarms and warnings by pressing  and

 keys).





|                            |              |               |
|----------------------------|--------------|---------------|
| CNC ALARM                  |              | 00003 N00000  |
| CNC ALM : 3.               | PLC ALM: 0 . | PLC WARN: 0.  |
| 000 432                    |              |               |
| CTR WARN:431               |              |               |
| X axis driver is not ready |              |               |
| MDI                        | ESP. ALM     | S0000 T00 H00 |

Current page

|                            |              |               |
|----------------------------|--------------|---------------|
| CNC ALARM                  |              | 00003 N00000  |
| CNC ALM : 2.               | PLC ALM: 0 . | PLC WARN: 0.  |
| 431                        |              |               |
| CTR WARN:432               |              |               |
| Y axis driver is not ready |              |               |
| MDI                        |              | S0000 T00 H00 |

Page after pressing RESET key




5) Clearing PLC warning: If multiple warnings are issued, only one warning where the cursor locates could be

cleared by pressing  or  key each time (In Alarm interface, it clears all alarms and warnings by



pressing  and  keys).

3)

### 1. 3. 5 Setting interface

 is a compound key, press  key in other page, it enters Setting interface, press it again, it enters the Graphic interface. Press  key repeatedly, it switches between Setting and Graphic interfaces.

#### 1、 Setting interface

There are 3 pages in this interface, which can be viewed by  and  keys.

1) SWITCH SETTING: It is used for the parameter, program, auto sequence No. on-off state.

PARM SWT: when it is turned for ON, the parameters are allowed to be modified; it is turned for OFF, the parameters are unallowed to be modified.

PROG SWT: when it is turned for ON, the programs are allowed to be edited; it is turned for OFF, the programs are unallowed to be edited.

AUTO SEG: when it is turned for ON, the block No. is created automatically; it is turned for OFF, the block No. is not created automatically, but manually if needed.

|  |               |              |
|--|---------------|--------------|
| SWITCH SETTING   |               | 00003 N00000 |
| <p>▶ PARM SWT: OFF *ON</p> <p>PROG SWT: OFF *ON</p> <p>AUTO SEG: *OFF ON</p> |               |              |
| MDI  | S0000 T00 H00 |              |

2) data copy: In this page, you can copy and restore CNC data (state parameter , data parameter, thread parameter ,tool parameter and etc).

Data copy (user): being used for users to copy( save) CNC data.

restore backup (user): being used for users to restore (read) user data.

Restore standard parameter 1(test): being used for users to read CNC testing original parameter data

Restore standard parameter2 (tepper): being used for users to read matched stepper driver original parameter data.

Restore standard parameter3 (servo): being used for users to read matched servo driver original parameter data.

|   |  |              |
|---|--|--------------|
| AUTH. OPERATION   |  | 00003 N00000 |
| <p>CURRENT LEVEL: 3</p> <p>SET LOWER LEVEL</p> <p>▶ INPUT PASSWORD:_____</p> <p>UPDATE PASS. :_____</p> | <p>Backup PAR. (User)</p> <p>Resume PAR. (User)</p> <p>Resume PAR. 1 (Test)</p> <p>Resume PAR. 2 (Step)</p> <p>Resume PAR. 3 (Servo)</p> |              |
| Modify parameter and edit program   |  |              |
| MDI   | S0000 T00 H00  |              |

3、4、5 grade user display page

|                                      |  |               |         |
|--------------------------------------|--|---------------|---------|
| AUTH. OPERATION                      |  | 00003 N00000  |         |
| CURRENT LEVEL: 2                     |  | Backup PAR.   | (Mach.) |
| SET LOWER LEVEL                      |  | Resume PAR.   | (Mach.) |
| ▶ INPUT PASSWORD: _____              |  | Resume PAR.1  | (Test)  |
| UPDATE PASS. : _____                 |  | Resume PAR. 2 | (Step)  |
| PASSWORD PASSED                      |  | Resume PAR. 3 | (Servo) |
| Can modify scrw comp&macro prog, PLC |  |               |         |
| MDI                                  |  | S0000 T00 H00 |         |

2 grade user showing interface

3) authority limit: display, set user operation grade

GSK980MDa password is divided into 4 grades, they are machine tool factory (2 grade)、equipment management (3 grade)、technology worker (4 grade)、operator (5 grade) from high level to low level.

Machine tool factory level: allow to alter CNC state parameter, data parameter, thread compensation parameter, tool compensation, edit work piece program(including macro program), edit and alter PLC ladder、download and upload ladder;



Equipment management level: original password is 12345, allow to alter CNC state parameter、data parameter、thread paramter、tool compensation data、program edit;

Technical worker level: original password is 1234, allow to alter tool compensation data (tool setting operation)、macro variables and edit work piece program, but not allow to alter CNC state parameter、data parameter and thread parameter.

Operator level: without password level, allow to operate machine operation panel, not allow to alter tool compensation data, CNC state parameter、data parameter, thread compensation parameter and choose work piece program and edit program.

|                                   |  |               |         |
|-----------------------------------|--|---------------|---------|
| AUTH. OPERATION                   |  | 00003 N00000  |         |
| CURRENT LEVEL: 3                  |  | Backup PAR.   | (User)  |
| SET LOWER LEVEL                   |  | Resume PAR.   | (User)  |
| ▶ INPUT PASSWORD: _____           |  | Resume PAR.1  | (Test)  |
| UPDATE PASS. : _____              |  | Resume PAR. 2 | (Step)  |
|                                   |  | Resume PAR. 3 | (Servo) |
| Modify parameter and edit program |  |               |         |
| MDI                               |  | S0000 T00 H00 |         |

2、Setting page of G54~G59 Page location

Under the Setting interface, press  key twice, this page is displayed. (The graphic page if pressing  key twice)

| SET (G54~G59)    |       | 00003 N00000     |            |
|------------------|-------|------------------|------------|
| (EXT OFFSET)     |       | (G54 COORDINATE) | (ABSOLUTE) |
| X                | 0.000 | X 0.000          | X 0.000    |
| Y                | 0.000 | Y 0.000          | Y 0.000    |
| Z                | 0.000 | Z 0.000          | Z 0.000    |
| (G55 COORDINATE) |       | (G56 COORDINATE) | (MACHINE)  |
| X                | 0.000 | X 0.000          | X 0.000    |
| Y                | 0.000 | Y 0.000          | Y 0.000    |
| Z                | 0.000 | Z 0.000          | Z 0.000    |
| DATA             |       |                  |            |
| MDI              |       | S0000 T00 H00    |            |

| SET (G54~G59)    |       | 00003 N00000        |            |
|------------------|-------|---------------------|------------|
| (G57 COORDINATE) |       | (G58 COORDINATE)    | (ABSOLUTE) |
| X                | 0.000 | X 0.000             | X 0.000    |
| Y                | 0.000 | Y 0.000             | Y 0.000    |
| Z                | 0.000 | Z 0.000             | Z 0.000    |
| (G59 COORDINATE) |       | (COORDINATE OFFSET) | (MACHINE)  |
| X                | 0.000 | X 0.000             | X 0.000    |
| Y                | 0.000 | Y 0.000             | Y 0.000    |
| Z                | 0.000 | Z 0.000             | Z 0.000    |
| DATA             |       |                     |            |
| MDI              |       | S0000 T00 H00       |            |

The zero of the coordinate system: workpiece coordinate system zero offset, G54, G55, G56, G57, G58, G59


#### ➤ Moving of the cursor

The cursor moves at the data of each coordinate system axis. And the data where the cursor locates are backlighted.

The cursor supports up and down, left and right moving, and the corresponding data are backlighted.


By pressing Page key, the 1<sup>st</sup> group X axis data on the corresponding interface where the cursor locates are backlighted.

#### ➤ Absolute data input






After “data+ key” is keyed in by user, the data where the cursor locates is changed for the “data” input by user.

The validity judgement of user input data is the same as that of 980TD coordinate data input in MDI mode.

#### ➤ Relative data input

After “data+ key” is keyed in by user, the original data where the cursor locates is changed by the sum of “data” input by user pulsing that original data.

#### ➤ Auto measurement input

After “ (or , ) +  +  key” is keyed in by user, the original data where the cursor locates is changed by the system current “X (or Z, Y) axis machine coordinate”.

3、Graphic interface



There are GRAPH SET, GRAPH TRACK pages in this interface, which can be viewed by



keys.

1) GRAPH SET page

In this page, the coordinate system, scaling and scope for graphic display can be selected.

|             |                                      |               |
|-------------|--------------------------------------|---------------|
| GRAPH SET   |                                      | 00003 N00000  |
| ► COOR OPT= | 0 0XY 1YX 2ZX 3XYZ 4YZ 5ZY 6XZ 7XZY) |               |
| SCALE       | = 100%                               |               |
| CENTER      | = 0.000 (X axis value)               |               |
| CENTER      | = 0.000 (Y axis value)               |               |
| CENTER      | = 0.000 (Z axis value)               |               |
| X MAX.      | = 120.000                            |               |
| Y MAX.      | = 120.000                            |               |
| Z MAX.      | = 120.000                            |               |
| X MIN.      | = -120.000                           |               |
| Y MIN.      | = -120.000                           |               |
| Z MIN.      | = -120.000                           |               |
| MDI         |                                      | S0000 T00 H00 |

2) GRAPH TRACK page

In this page, it displays the path within the parameters range (referred by absolute coordinate) of GRAPH SET page.

|             |  |               |
|-------------|--|---------------|
| GRAPH TRACK |  | 00003 N00000  |
| (ABSOLUTE)  |  |               |
| X 62.827    |  |               |
| Y 10.133    |  |               |
| Z -573.547  |  |               |
| S: STARTI   |  |               |
| T: STOP     |  |               |
| R: CLEAR    |  |               |
| K: SFT VIEW |  |               |
| J: MEDIACY  |  |               |
| IM: IN/OUT  |  |               |
| JOG         |  | S0000 T00 H00 |

1. 3. 6 BIT PARAMETER, DATA PARAMETER, SCREW-PITCH COMP interface





is a compound key, it enters BIT PARAMETER, DATA PARAMETER and SCREW-PITCH COMP interfaces by pressing this key repeatedly.



1、BIT PARAMETER interface



Press key, it enters BIT PARAMETER interface, there are 30 bit parameters which are displayed by 2



pages in this interface, and they can be viewed or modified by pressing  or  key to enter the corresponding page. It is shown as following:

As is shown in this page, there are 2 parameter rows at the page bottom, the 1<sup>st</sup> row shows the meaning of a bit of a parameter where the cursor locates, the bit to be displayed can be positioned by pressing  or  key. The 2nd row shows the abbreviation of all the bits of a parameter where the cursor locates.



| BIT PARAMETER                |           |     |           | 00003 N00000  |           |
|------------------------------|-----------|-----|-----------|---------------|-----------|
| NO.                          | DATA      | NO. | DATA      | NO.           | DATA      |
| 001                          | 000000000 | 009 | 000000000 | 017           | 00101000  |
| 002                          | 000000011 | 010 | 00011111  | 018           | 000000000 |
| 003                          | 000000000 | 011 | 000000000 | 019           | 100000000 |
| 004                          | 010000000 | 012 | 00010011  | 020           | 000000000 |
| 005                          | 00010001  | 013 | 10000011  | 021           | 000000000 |
| 006                          | 000000000 | 014 | 00011111  | 022           | 000000000 |
| 007                          | 000000000 | 015 | 100000000 | 023           | 000000000 |
| 008                          | 00011111  | 016 | 000000000 | 024           | 000000000 |
| *** **                       |           |     |           |               |           |
| *** ALM5 ALM4 ALMZ ALMY ALMX |           |     |           |               |           |
| bit7:1/0:Unused              |           |     |           |               |           |
| NO. 009                      |           |     |           |               |           |
| JOG                          |           |     |           | S0000 T00 H00 |           |

## 2、DATA PARAMETER interface



Press  key repeatedly (  key if in BIT PARAMETER interface), it enters DATA PARAMETER interface, there are 110 data parameters which are displayed by 7 pages in this interface, and they can be viewed or





modified by pressing  or  key to enter the corresponding page. It is shown as following:

As is shown in this page, there is a cue line at the page bottom, it displays the meaning of the parameter where the cursor locates.

| DATA PARAMETER                 |      |     |      | 00003 N00000  |      |
|--------------------------------|------|-----|------|---------------|------|
| NO.                            | DATA | NO. | DATA | NO.           | DATA |
| 049                            | 1    | 057 | 1    | 065           | 100  |
| 050                            | 1    | 058 | 1    | 066           | 100  |
| 051                            | 1    | 059 | 7600 | 067           | 100  |
| 052                            | 1    | 060 | 7600 | 068           | 100  |
| 053                            | 1    | 061 | 7600 | 069           | 400  |
| 054                            | 1    | 062 | 7600 | 070           | 8000 |
| 055                            | 1    | 063 | 7600 | 071           | 50   |
| 056                            | 1    | 064 | 100  | 072           | 100  |
| Command multiplier for X axis. |      |     |      |               |      |
| NO. 049                        |      |     |      |               |      |
| JOG                            |      |     |      | S0000 T00 H00 |      |


## 3、SCREW-PITCH COMP interface

Press  key repeatedly, it enters SCREW-PITCH COMP interface, there are 256 screw-pitch parameters


which are displayed by 16 pages in this interface, and they can be viewed by pressing  or  key.


| SCREW-PITCH PARAMETER |   |   |   |   | O0000 N00000  |   |   |   |   |
|-----------------------|---|---|---|---|---------------|---|---|---|---|
| NO.                   | X | Y | Z | C | NO.           | X | Y | Z | C |
| 000                   | 0 | 0 | 0 | 0 | 008           | 0 | 0 | 0 | 0 |
| 001                   | 0 | 0 | 0 | 0 | 009           | 0 | 0 | 0 | 0 |
| 002                   | 0 | 0 | 0 | 0 | 010           | 0 | 0 | 0 | 0 |
| 003                   | 0 | 0 | 0 | 0 | 011           | 0 | 0 | 0 | 0 |
| 004                   | 0 | 0 | 0 | 0 | 012           | 0 | 0 | 0 | 0 |
| 005                   | 0 | 0 | 0 | 0 | 013           | 0 | 0 | 0 | 0 |
| 006                   | 0 | 0 | 0 | 0 | 014           | 0 | 0 | 0 | 0 |
| 007                   | 0 | 0 | 0 | 0 | 015           | 0 | 0 | 0 | 0 |
| NO. = XYZC(0.001mm)   |   |   |   |   |               |   |   |   |   |
| NO. 000               |   |   |   |   |               |   |   |   |   |
| MDI                   |   |   |   |   | S0000 T00 H00 |   |   |   |   |


1.3.7 CNC DIAGNOSIS, PLC STATE, PLC VALUE, machine soft panel, VERSION MESSAGE interface


 is a compound key, it enters CNC DIAGNOSIS, PLC STATE, PLC VALUE, machine soft panel, VERSION MESSAGE interfaces by pressing this key repeatedly.

1、CNC DIAGNOSIS interface CNC

The input/output signal state between CNC and machine, the transmission signal state between CNC and PLC, PLC internal data and CNC internal state can all be displayed via diagnosis. Press  key it enters CNC DIAGNOSIS interface, the keypad diagnosis, state diagnosis and miscellaneous function parameters etc. can be

shown in this interface, which can be viewed by pressing  or  key.

In CNC DIAGNOSIS page, there are 2 diagnosis No. rows at the page bottom, the 1<sup>st</sup> row shows the meaning of a diagnosis No. bit where the cursor locates, the bit to be displayed can be positioned by pressing  or


 key. The 2nd row shows the abbreviation of all the diaosgnis No. bits where the cursor locates.

| CNC DIAGNOSIS                       |          |     |          | 00003 N00000  |          |
|-------------------------------------|----------|-----|----------|---------------|----------|
| NO.                                 | DATA     | NO. | DATA     | NO.           | DATA     |
| 000                                 | 00000000 | 008 | 00011111 | 016           | 00000000 |
| 001                                 | 00000000 | 009 | 00011111 | 017           | 00000000 |
| 002                                 | 00000000 | 010 | 00000000 | 018           | 00000000 |
| 003                                 | 00001111 | 011 | 00000000 | 019           | 00000000 |
| 004                                 | 00000000 | 012 | 00000000 | 020           | 00000000 |
| 005                                 | 00000000 | 013 | 00000000 | 021           | 00000000 |
| 006                                 | 00011000 | 014 | 00000000 | 022           | 00000000 |
| 007                                 | 00000000 | 015 | 00000000 | 023           | 00000000 |
| ESP *** ** DEC5 DEC4 DECZ DECY DECX |          |     |          |               |          |
| bit7:ESP signal(X0.5)               |          |     |          |               |          |
| NO. 000                             |          |     |          |               |          |
| JOG                                 |          |     |          | S0000 T00 H00 |          |



## 2、PLC STATE interface

In the page of this interface, it orderly displays the state of address X0000~X0029, Y0000~Y0019, F0000~F0255, G0000~G0255, A0000~A0024, K0000~K0039, R0000~R0999 etc.. And it enters PLC STATE

interface by pressing  key repeatedly. The signal state of PLC addresses can be viewed by pressing


or  key.



In PLC STATE page, there are 2 rows at the page bottom; the 1<sup>st</sup> row shows the meaning of a bit of an address

where the cursor locates, the bit to be displayed can be positioned by pressing  or  key. The 2nd row shows the abbreviation of all the bits of an address where the cursor locates.

| PLC STATE                      |          |       |          | 00003 N00000  |          |
|--------------------------------|----------|-------|----------|---------------|----------|
| NO.                            | DATA     | NO.   | DATA     | NO.           | DATA     |
| X0000                          | 00000000 | X0008 | 00000000 | X0016         | 00000000 |
| X0001                          | 00000000 | X0009 | 00000000 | X0017         | 00000000 |
| X0002                          | 00000000 | X0010 | 00000000 | X0018         | 00000000 |
| X0003                          | 00000000 | X0011 | 00000000 | X0019         | 00000000 |
| X0004                          | 00000000 | X0012 | 00000000 | X0020         | 00000000 |
| X0005                          | 00000000 | X0013 | 00000000 | X0021         | 00000000 |
| X0006                          | 00000000 | X0014 | 00000000 | X0022         | 00000000 |
| X0007                          | 00000000 | X0015 | 00000000 | X0023         | 00000000 |
| *** ** DEC5 DEC4 DECY *** ** * |          |       |          |               |          |
| bit7:Unused                    |          |       |          |               |          |
| NO. X0002                      |          |       |          |               |          |
| JOG                            |          |       |          | S0000 T00 H00 |          |

## 3、PLC VALUE interface

In the page of this interface, it orderly displays the values in the registers of T0000~T0099,D0000~D0999,C0000~C0099,DT000~DT099,DC000~DC099 etc.. By pressing  key repeatedly it enters PLC

VALUE interface. The data values of PLC can be viewed by pressing  or  key.




In this PLC VALUE page, there is a cue line at the page bottom, it displays the meaning of the parameter where the cursor locates. As is shown in the following figure:

| PLC DATA  |      |       |      | 00003 N00000  |      |
|-----------|------|-------|------|---------------|------|
| NO.       | DATA | NO.   | DATA | NO.           | DATA |
| DT000     | 0    | DT008 | 0    | DT016         | 0    |
| DT001     | 0    | DT009 | 0    | DT017         | 0    |
| DT002     | 0    | DT010 | 0    | DT018         | 0    |
| DT003     | 0    | DT011 | 0    | DT019         | 100  |
| DT004     | 0    | DT012 | 0    | DT020         | 500  |
| DT005     | 0    | DT013 | 0    | DT021         | 500  |
| DT006     | 0    | DT014 | 0    | DT022         | 100  |
| DT007     | 0    | DT015 | 0    | DT023         | 500  |
| Reserved  |      |       |      |               |      |
| NO. DT000 |      |       |      |               |      |
| JOG       |      |       |      | S0000 T00 H00 |      |

#### 4、VERSION MESSAGE interface



It enters VERSION MESSAGE interface by pressing  key repeatedly. The software, hardware, and PLC version message can be shown in this interface. As is shown in the following figure:

|   |  |               |  |
|---|--|---------------|--|
| VERSION MESSAGE   |  | 00000 N00000  |  |
| PRODUCT TYPE : GSK980MDa<br>SOFTWARE VER. : V2.00-manu<br>HARDWARE VER. : 3.01.002--08.07.21<br>SYSTEM ID: 0<br><br>LADDER DESIGN: GSK<br>LADDER VER. : 09.01.15-839C<br>LADDER VERIFY: 839C<br>LADDER NOTE : GSK980MDa |  |               |  |
| MDI   |  | S0000 T00 H00 |  |

## CHAPTER 2 POWER ON/OFF AND PROTECTION

### 2.1 System Power On

Before this GSK980MDa is powered on, the following should be confirmed:

1. The machine is in a normal state.
2. The power voltage conforms to the requirement of the machine.
3. The connection is correct and secure.

The following page is displayed after GSK980MDa is powered on:



The current position (RELATIVE POS) page is displayed after system auto detection and initiation are finished.

| RELATIVE POS |               | 00000 N00000        |
|--------------|---------------|---------------------|
| <b>00000</b> | <b>N00000</b> | G00 G17 G90 G54     |
|              |               | G21 G40 G49 G94 G98 |
| <b>X</b>     | <b>0.000</b>  | F0100 S 00 M30      |
| <b>Y</b>     | <b>13.776</b> | JOG. F: 1260        |
| <b>Z</b>     | <b>-1.344</b> | ACT. F: 0           |
|              |               | FED OVRI: 150%      |
|              |               | RAP OVRI: 100%      |
|              |               | SPI OVRI: 100%      |
|              |               | PART CNT: 0         |
|              |               | CUT TIME: 0:00:00   |
| JOG          |               | S0000 T00 H00       |

### 2.2 System Power Off

Before power is off, ensure that:

- 1 The axes of the CNC are at halt;
- 2 Miscellaneous functions (spindle, pump etc.) are off;
- 3 Cut off CNC power prior to machine power cutting off.

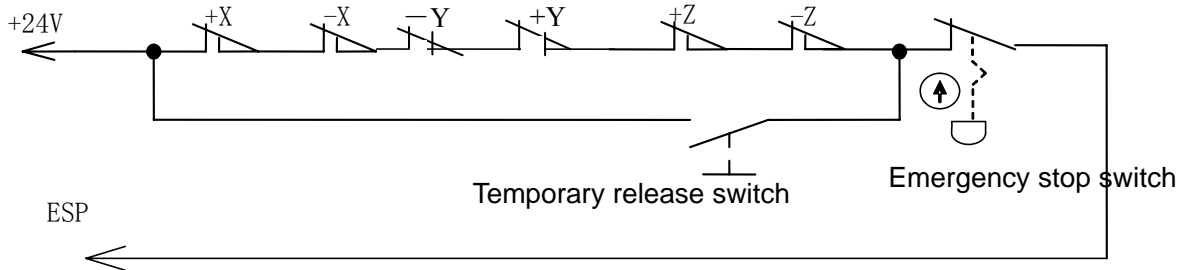
**Note:** Please see the machine builder's manual for the machine power cut-off operation.

## 2.3 Overtravel Protection

Overtravel protection should be employed to prevent the damage to the machine due to the overtravel of the axes.

### 2.3.1 Hardware overtravel protection

The stroke switches are fixed at the positive and negative maximum travel of the machine axes respectively, they are connected by the following figure. And the “MESP” of bit parameter No.017 must be set to 0. If the overtravel occurs, the stroke switch acts to make the machine stop, and the emergency alarm is issued.



When the hardware overtravel occurs, there will be an “emergency stop” alarm. The steps to eliminate this alarm is press the OVERTRAVEL button to reversely move the table to detach the stroke switch (for positive overtravel, move negatively; vice versa).

### 2.3.2 Software overtravel protection

When the “MOT” of bit parameter No.17 is set to 0, the software limit is valid.

The software travel strokes are set by data parameter NO.135~ NO.144, they refer to machine coordinate. No.135~No.139 are for axes positive max.overtravel, No.140~No.144 are for negative max.overtravel.

If the machine position (coordinate) exceeds the setting range, overtravel alarm will be issued. The steps to eliminate this alarm is press RESET key to clear the alarm, then moves reversely (for positive overtravel, move out negatively; vice versa)

## 2.4 Emergency Operation

During the machining, some unexpected incidents may occur because of the user programming, operation and product fault. So this GSK980MDa should be stopped immediately for these incidents. This section mainly describes the resolutions that this GSK980MDa are capable of under the emergency situation. Please see the relative explanation on these resolutions under the emergency by machine builder.

### 2.4.1 Reset



Press key to reset this GSK980MDa system if there are abnormal outputs and axis actions in it:

- 1 All axes movement stops;
- 2 M, S function output is invalid (which can be set whether automatically cut off signals such as spindle

CCW/CW, lubrication, cooling by pressing key, defined by PLC ladder);

- 3 Auto run ends, modal function and state are held on.

### 2.4.2 Emergency stop

During machine running, if the emergency button is pressed under the dangerous or emergent situation, the CNC system enters into emergency status and the machine movement is stopped immediately. All the outputs such as the spindle running, coolant are cut off. If the emergency button is released, the emergency alarm is cancelled and the CNC resets. Its circuit wiring is shown in section 2.2.1 of this chapter.

**Note 1** Ensure the fault is eliminated before the emergency alarm is cancelled.

**Note 2** pressing down the Emergency button prior to power on or off may alleviate the electric shock to the machine system.

**Note 3** Reperform the machine zero return operation to ensure the correct position coordinate after the emergency alarm is cancelled (machine zero return operation is unallowed if there is no machine zero on the machine.).

**Note 4** only the MESP of the bit parameter No.017 is set to 0, is the external emergency stop valid.

### 2.4.3 Feed hold




Key can be pressed during the machine running to make the running pause. But in threading, cycle running, this function can not stop the running immediately.

### 2.4.4 Power off

Under the dangerous or emergency situations during the machine running, the machine power should be cut off immediately to avoid the accidents. But it should be noted that there may be a big error between the CNC displayed coordinate and the actual position. So the tool setting operation should be performed again.

## CHAPTER3 MANUAL OPERATION



Press  key, it enters Manual mode. In this mode, the manual feed, spindle control, override adjustment operations can be performed.

### Note !

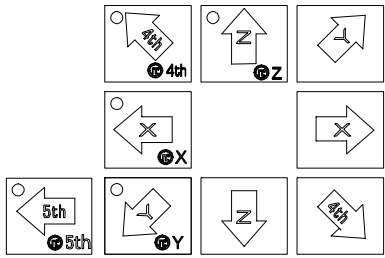
The keys functions of this 980MDa machine panel are defined by Ladder; please refer to the respective materials by the machine builder for the function significance.

Please note that the following function introduction is described based on the 980MDa standard PLC programs!

### 3.1 Coordinate axis moving

In Manual mode, the coordinate axis can be moved manually for feeding and rapid traverse.

#### 3.1.1 Manual feed




Press feed axis and axis direction key in the direction selection area

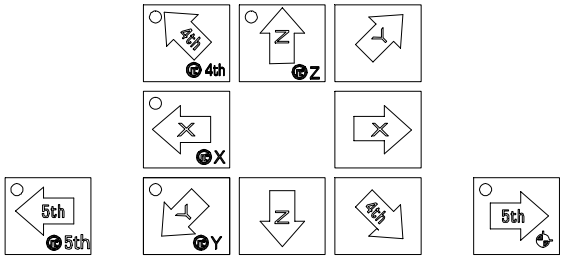



the corresponding axis may be moved positively or negatively, and the axis stops moving if releasing these two keys;

#### 3.1.2 Manual rapid traverse




First press  key till the rapid traverse indicator in the State area lights up.and Press feed axis and axis



direction key in the direction selection area  ,The corresponding axis can be rapidly moved positively or negatively, and the axis stops moving if releasing the key;



In Manual rapid mode, press  key to make the indicator go out, and the rapid traverse is invalid, it enters the Manual feed mode.

**Note 1** before machine zero return, the validity of Manual rapid traverse is setted by the “ISOT” of the bit parameter No.012.






**Note 2** In Edit or MPG mode,  key is invalid.

### 3.1.3 Manual feedrate override adjustment



Wavy line %  
F. OVERRIDE



In Manual mode, the  or  key in  can be pressed to modify the Manual feedrate override, and the override has 16 levels. The relation of the feedrate override and the feedrate is as following table:

| Feedrate override (%) | Feedrate (mm/min) |
|-----------------------|-------------------|
| 0                     | 0                 |
| 10                    | 2.0               |
| 20                    | 3.2               |
| 30                    | 5.0               |
| 40                    | 7.9               |
| 50                    | 12.6              |
| 60                    | 20                |
| 70                    | 32                |
| 80                    | 50                |
| 90                    | 79                |
| 100                   | 126               |
| 110                   | 200               |
| 120                   | 320               |
| 130                   | 500               |
| 140                   | 790               |
| 150                   | 1260              |






**Note:** There is about 2% fluctuating error for the data in the table.

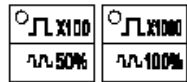
### 3.1.4 Manual rapid override adjustment



Wavy line %  
R. OVERRIDE






In the manual rapid traverse, it can press  or  key in  (also by  





key with the respective override F0, 25%,50%, 100%)to modify the Manual rapid override, and there are 4 gears of F0, 25%, 50%, 100% for the override.(F0 set by data parameter No.069)

3.1.5 Relative coordinate clearing

1) Press  key to enter Position interface, then press  or  key to select the RELATIVE POS page;

|              |        |  |                   |
|--------------|--------|--|-------------------|
| RELATIVE POS |        | 00000 N00000                           |                   |
| 00000 N00000 |        | G00 G17 G90 G54<br>G21 G40 G49 G94 G98 |                   |
| X            | 1.680  |  | F0100 S 00 M30    |
|              |        |  | JOG. F: 1260      |
|              |        |  | ACT. F: 0         |
|              |        |  | FED OVRI: 150%    |
| Y            | 13.776 |  | RAP OVRI: 100%    |
|              |        |  | SPI OVRI: 100%    |
| Z            | -1.344 |  | PART CNT: 0       |
|              |        |  | CUT TIME: 0:00:00 |
| JOG          |        | S0000 T00 H00                          |                   |

2) Press  key to make the “X”in the page to blink,then press  key;

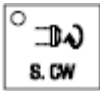
|              |        |  |                   |
|--------------|--------|--|-------------------|
| RELATIVE POS |        | 00000 N00000                           |                   |
| 00000 N00000 |        | G00 G17 G90 G54<br>G21 G40 G49 G94 G98 |                   |
| X            | 0.000  |  | F0100 S 00 M30    |
|              |        |  | JOG. F: 1260      |
|              |        |  | ACT. F: 0         |
|              |        |  | FED OVRI: 150%    |
| Y            | 13.776 |  | RAP OVRI: 100%    |
|              |        |  | SPI OVRI: 100%    |
| Z            | -1.344 |  | PART CNT: 0       |
|              |        |  | CUT TIME: 0:00:00 |
| JOG          |        | S0000 T00 H00                          |                   |

3) The clearing operations of other coordinates are the same as above.

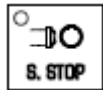
3.2 Other Manual operations

Note: The following operations are also valid in Machine zero, MPG/Step mode.

3.2.1 Spindle CCW, CW, stop control



: In Manual mode, the spindle rotates forward if pressing this key;;




: In Manual mode, the spindle stops if pressing this key;



: In Manual mode, the spindle rotates backward if pressing this key;

### 3.2.2 Spindle Jog



Press and hold  key, the spindle rotates forward, release it, the spindle stops.

### 3.2.3 Cooling control



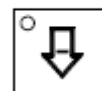
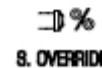
: In Manual mode, press this key, the coolant is switched on/off.。




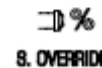
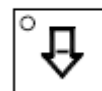
### 3.2.4 Lubrication control

See details in Appendix for its function.

### 3.2.5 Spindle override adjustment

In Manual mode, if the spindle speed is controlled by analog voltage output, the spindle speed may be overridden.



By pressing the  or  key in Spindle Override keys   , the spindle speed can be changed by real-time adjusting of the spindle override that has 8 levels of 50%~120%.



CHAPTER 4 MPG/STEP OPERATION

In MPG/Step mode, the machine moves by a specified increment.

Note !

The keys functions of this 980MDa machine panel are defined by Ladder; please refer to the respective materials by the machine builder for the function significance.

Please note that the following function introduction is described based on the 980MDa standard PLC programs!

4.1 Step Feed



Set the BIT3 of the bit parameter No.001 to 0, and press key to enter the Step mode, it displays as follows:

|              |  |                     |  |
|--------------|--|---------------------|--|
| RELATIVE POS |  | 00000 N00000        |  |
| 00000 N00000 |  | G00 G17 G90 G54     |  |
| X 0.000      |  | G21 G40 G49 G94 G98 |  |
| Y 0.000      |  | F0100 S 00 M30      |  |
| Z 0.000      |  | STEP INC: 0.001     |  |
|              |  | ACT. F: 0           |  |
|              |  | FED OVRI: 150%      |  |
|              |  | RAP OVRI: 100%      |  |
|              |  | SPI OVRI: 100%      |  |
|              |  | PART CNT: 2         |  |
|              |  | CUT TIME: 0:00:02   |  |
| STEP         |  | S0000 T01 H00       |  |

4.1.1 Increment selection

Press key to select the move increment, the increment will be shown in the page..

Note: In the EDIT or REF modes,the is invalid,In the AUTO or MDI modes ,these keys are valid.But in the JOG mode,only is selected, these keys are valid,Otherwise ttese are invalid..


4.1.2 Moving direction selection

Press or key once, X axis can be moved negatively or positively by a step increment,

other axes are the same.

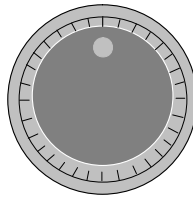
## 4.2 MPG (Handwheel) Feed



Set the BIT3 of the bit parameter No.001 to 1, and press  key to enter the MPG mode, it displays as following:

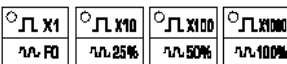
|              |  |  |
|--------------|--|--|
| RELATIVE POS |  | 00000 N00000                           |
| 00000 N00000 |  | G00 G17 G90 G54<br>G21 G40 G49 G94 G98 |
| X 0.000      |  | F0100 S 00 M30                         |
| Y 0.000      |  | HNDL INC: 0.001                        |
| Z 0.000      |  | ACT. F: 0                              |
|              |  | FED OVRI: 150%                         |
|              |  | RAP OVRI: 100%                         |
|              |  | SPI OVRI: 100%                         |
|              |  | PART CNT: 2                            |
|              |  | CUT TIME: 0:00:02                      |
| HNDL         |  | S0000 T01 H00                          |

The handwheel figure is as following:



The handwheel figure


### 4.2.1 increment choice

Press  key to select the move increment, the increment will be shown in the page:

|              |  |  |
|--------------|--|--|
| RELATIVE POS |  | 00000 N00000                           |
| 00000 N00000 |  | G00 G17 G90 G54<br>G21 G40 G49 G94 G98 |
| X 0.000      |  | F0100 S 00 M30                         |
| Y 0.000      |  | HNDL INC: 0.001                        |
| Z 0.000      |  | ACT. F: 0                              |
|              |  | FED OVRI: 150%                         |
|              |  | RAP OVRI: 100%                         |
|              |  | SPI OVRI: 100%                         |
|              |  | PART CNT: 2                            |
|              |  | CUT TIME: 0:00:02                      |
| HNDL         |  | S0000 T01 H00                          |

### 4.2.2 Moving axis and direction selection

In MPG mode, press , the corresponding axis will be selected.

For example, to press  key, the page is shown as following (Other axes are the same):

|              |  |  |  |
|--------------|--|--|--|
| RELATIVE POS |  | 00000 N00000                           |  |
| 00000 N00000 |  | G00 G17 G90 G54<br>G21 G40 G49 G94 G98 |  |
| X 0.000      |  | F0100 S 00 M30                         |  |
| Y 0.000      |  | HNDL INC: 0.001                        |  |
| Z 0.000      |  | ACT. F: 0                              |  |
|              |  | FED OVRI: 150%                         |  |
|              |  | RAP OVRI: 100%                         |  |
|              |  | SPI OVRI: 100%                         |  |
|              |  | PART CNT: 2                            |  |
|              |  | CUT TIME: 0:00:02                      |  |
| HNDL X AXIS  |  | S0000 T01 H00                          |  |

The handwheel feed direction is defined by its rotation direction. Generally, the handwheel CW is for positive feed, and CCW is for negative feed. In case of that handwheel CW is for negative feed, CCW for positive feed, it may exchange the A, B signals of the handwheel terminals,also you can modify the HNGX、HNGY、HNGZ、HNG4、HNG5 of the bit parameter №019.

4.2.3 Explanation items

1、 The correspondence of the handwheel scale to the machine moving amount is as following table:

|                            |                                       |         |         |         |
|----------------------------|---------------------------------------|---------|---------|---------|
|                            | Moving amount of each handwheel scale |         |         |         |
| Handwheel increment        | 0.001                                 | 0.0100  | 0.100   | 1.000   |
| Specified coordinate value | 0.001mm                               | 0.010mm | 0.100mm | 1.000mm |

2、 The rotation speed of the handwheel should be less than 5 r/s, if it is over that, the scale may be not coincide with the moving amount

3、 The , , , ,  keys are only valid in the MPG mode.

# CHAPTER 5 MDI OPERATION

In MDI mode, the operations of parameter setting, words input and execution can be performed.

## Note !

The keys functions of this 980MDa machine panel are defined by Ladder; please refer to the respective materials by the machine builder for the function significance.

Please note that the following function introduction is described based on the 980MDa standard PLC programs!

## 5.1 Words Input

Select MDI mode to enter the PRG STATE page, to input an block “G00 X50 Z100”, the steps are as follows:



1、Press MDI key to enter MDI mode;




2、Press PROGRAM key to enter PRG STATE page:

| PRG STATE          |       |                       |   | 00000 N00000        |  |  |  |
|--------------------|-------|-----------------------|---|---------------------|--|--|--|
| (ABSOLUTE)         |       | (Mode of fixed cycle) |   | G00 G17 G90 G54     |  |  |  |
| X                  | 0.000 | X                     | V | G21 G40 G49 G94 G98 |  |  |  |
| Y                  | 0.000 | Y                     | W | F0100 S 00 M30      |  |  |  |
| Z                  | 0.000 | Z                     | P | PRG. F: 100         |  |  |  |
|                    |       | R                     | Q | ACT. F: 0           |  |  |  |
| INPUT PRG SEGMENT: |       |                       |   | FED OVRI: 150%      |  |  |  |
|                    |       |                       |   | RAP OVRI: 100%      |  |  |  |
|                    |       |                       |   | SPI OVRI: 100%      |  |  |  |
|                    |       |                       |   | PART CNT: 2         |  |  |  |
|                    |       |                       |   | CUT TIME: 0:00:02   |  |  |  |
| MDI                |       |                       |   | S0000 T01 H00       |  |  |  |


3、Input 、、、、、、、、、、、、 by sequence, the page is shown as following:

| PRG STATE          |       |                       |   | 00000 N00000        |  |  |  |
|--------------------|-------|-----------------------|---|---------------------|--|--|--|
| (ABSOLUTE)         |       | (Mode of fixed cycle) |   | G00 G17 G90 G54     |  |  |  |
| X                  | 0.000 | X                     | V | G21 G40 G49 G94 G98 |  |  |  |
| Y                  | 0.000 | Y                     | W | F0100 S 00 M30      |  |  |  |
| Z                  | 0.000 | Z                     | P | PRG. F: 100         |  |  |  |
|                    |       | R                     | Q | ACT. F: 0           |  |  |  |
| INPUT PRG SEGMENT: |       |                       |   | FED OVRI: 150%      |  |  |  |
| G00 X50 Y50 Z100 _ |       |                       |   | RAP OVRI: 100%      |  |  |  |
|                    |       |                       |   | SPI OVRI: 100%      |  |  |  |
|                    |       |                       |   | PART CNT: 2         |  |  |  |
|                    |       |                       |   | CUT TIME: 0:00:02   |  |  |  |
| MDI                |       |                       |   | S0000 T01 H00       |  |  |  |



4、Press , the page is shown as following:

|                    |       |                       |   |                     |  |  |  |
|--------------------|-------|-----------------------|---|---------------------|--|--|--|
| PRG STATE          |       |                       |   | 00000 N00000        |  |  |  |
| (ABSOLUTE)         |       | (Mode of fixed cycle) |   | G00 G17 G90 G54     |  |  |  |
| X                  | 0.000 | X                     | V | G21 G40 G49 G94 G98 |  |  |  |
| Y                  | 0.000 | Y                     | W | F0100 S 00 M30      |  |  |  |
| Z                  | 0.000 | Z                     | P | PRG. F: 100         |  |  |  |
|                    |       | R                     | Q | ACT. F: 0           |  |  |  |
| INPUT PRG SEGMENT: |       |                       |   | FED OVRI: 150%      |  |  |  |
| G00 X50 Y50 Z100   |       |                       |   | RAP OVRI: 100%      |  |  |  |
|                    |       |                       |   | SPI OVRI: 100%      |  |  |  |
|                    |       |                       |   | PART CNT: 2         |  |  |  |
|                    |       |                       |   | CUT TIME: 0:00:02   |  |  |  |
| MDI                |       |                       |   | S0000 T01 H00       |  |  |  |

## 5.2 Words Execution

After the words are inputted, and press , the background color of program segment becomes

white, these MDI words are executed after the  key is pressed. During the execution, Press ,


 and Emergency Stop button may be pressed to terminate the MDI words execution. If  key is pressed, the background color of program segment will become black, then words can be inputted again.


**Note:** The subprogram call command (M98 P ; etc.) is invalid in MDI mode.


## 5.3 Parameter Setting

In MDI mode, the parameter value can be modified after entering the parameter interface. See details in Chapter 9 of this part.


## 5.4 Data Modification

In the PRG STATE page of MDI mode, before the inputted words will be executed, if there is an error in inputted words, you can press , the background color of program segment will become black, then






program segment can be modified, also it may press  key to clear all the words, then reinput the correct words; for example, "Z1000" will be inputted to replace Z100 in Section 5.1 of this chapter, the steps are as follow.

1、press  key, the page is shown as following:

|                    |       |                       |   |                     |  |  |  |
|--------------------|-------|-----------------------|---|---------------------|--|--|--|
| PRG STATE          |       |                       |   | O0000 N00000        |  |  |  |
| (ABSOLUTE)         |       | (Mode of fixed cycle) |   | G00 G17 G90 G54     |  |  |  |
| X                  | 0.000 | X                     | V | G21 G40 G49 G94 G98 |  |  |  |
| Y                  | 0.000 | Y                     | W | F0100 S 00 M30      |  |  |  |
| Z                  | 0.000 | Z                     | P | PRG. F: 100         |  |  |  |
|                    |       | R                     | Q | ACT. F: 0           |  |  |  |
| INPUT PRG SEGMENT: |       |                       |   | FED OVRI: 150%      |  |  |  |
| G00 X50 Y50 Z100 _ |       |                       |   | RAP OVRI: 100%      |  |  |  |
|                    |       |                       |   | SPI OVRI: 100%      |  |  |  |
|                    |       |                       |   | PART CNT: 2         |  |  |  |
|                    |       |                       |   | CUT TIME: 0:00:02   |  |  |  |
| MDI                |       |                       |   | S0000 T01 H00       |  |  |  |

2、press  key again, the cursor will be back, the page is shown as following:

|               |       |           |   |                     |  |  |  |
|---------------|-------|-----------|---|---------------------|--|--|--|
| 程序状态          |       |           |   | O0000 N00000        |  |  |  |
| (绝对坐标)        |       | (固定循环模态值) |   | G00 G17 G90 G54     |  |  |  |
| X             | 0.000 | X         | V | G21 G40 G49 G94 G98 |  |  |  |
| Y             | 0.000 | Y         | W | F0100 S 00 M30      |  |  |  |
| Z             | 0.000 | Z         | P | 编程速率: 100           |  |  |  |
|               |       | R         | Q | 实际速率: 0             |  |  |  |
| 输入程序段:        |       |           |   | 进给倍率: 150%          |  |  |  |
| G00 X50 Y50 _ |       |           |   | 快速倍率: 100%          |  |  |  |
|               |       |           |   | 主轴倍率: 100%          |  |  |  |
|               |       |           |   | 加工件数: 1             |  |  |  |
|               |       |           |   | 切削时间: 0:00:29       |  |  |  |
| 录入            |       |           |   | S0000 T01 H00       |  |  |  |

3、press 、、、、 by sequence, the page is shown as following:

|                     |       |                       |   |                     |  |  |  |
|---------------------|-------|-----------------------|---|---------------------|--|--|--|
| PRG STATE           |       |                       |   | O0000 N00000        |  |  |  |
| (ABSOLUTE)          |       | (Mode of fixed cycle) |   | G00 G17 G90 G54     |  |  |  |
| X                   | 0.000 | X                     | V | G21 G40 G49 G94 G98 |  |  |  |
| Y                   | 0.000 | Y                     | W | F0100 S 00 M30      |  |  |  |
| Z                   | 0.000 | Z                     | P | PRG. F: 100         |  |  |  |
|                     |       | R                     | Q | ACT. F: 0           |  |  |  |
| INPUT PRG SEGMENT:  |       |                       |   | FED OVRI: 150%      |  |  |  |
| G00 X50 Y50 Z1000 _ |       |                       |   | RAP OVRI: 100%      |  |  |  |
|                     |       |                       |   | SPI OVRI: 100%      |  |  |  |
|                     |       |                       |   | PART CNT: 2         |  |  |  |
|                     |       |                       |   | CUT TIME: 0:00:02   |  |  |  |
| MDI                 |       |                       |   | S0000 T01 H00       |  |  |  |





4、 at last ,press , the page is shown as following:

|                    |       |                       |   |                     |  |  |  |
|--------------------|-------|-----------------------|---|---------------------|--|--|--|
| PRG STATE          |       |                       |   | 00000 N00000        |  |  |  |
| (ABSOLUTE)         |       | (Mode of fixed cycle) |   | G00 G17 G90 G54     |  |  |  |
| X                  | 0.000 | X                     | V | G21 G40 G49 G94 G98 |  |  |  |
| Y                  | 0.000 | Y                     | W | F0100 S 00 M30      |  |  |  |
| Z                  | 0.000 | Z                     | P | PRG. F: 100         |  |  |  |
|                    |       | R                     | Q | ACT. F: 0           |  |  |  |
| INPUT PRG SEGMENT: |       |                       |   | FED OVRI: 150%      |  |  |  |
| G00 X50 Y50 Z1000_ |       |                       |   | RAP OVRI: 100%      |  |  |  |
|                    |       |                       |   | SPI OVRI: 100%      |  |  |  |
|                    |       |                       |   | PART CNT: 2         |  |  |  |
|                    |       |                       |   | CUT TIME: 0:00:02   |  |  |  |
| MDI                |       |                       |   | S0000 T01 H00       |  |  |  |

## 5.5 OUT Key Start

When the “OUTR” of the K parameter K0010 is set to 1, the current words inputted may be executed by

pressing  key in MDI mode. It is the same as .

## CHAPTER 6 PROGRAM EDIT AND MANAGEMENT


In Edit mode, the program can be created, selected, modified, copied and deleted, and the bidirectional communication between CNC and CNC, or CNC and PC can also be achieved. To prevent the program to be modified or deleted accidentally, a program switch is set for this GSK980MD system. And it must be turned on before program editing. Also 3 level user authority is set in this GSK980MD system to facilitate the management. Only the operation authority is above 4 level (4 or 3 level etc.) can the program switch be opened for program editing.

### 6.1 Program Creation

#### 6.1.1 Creation of the block number


In the program, the block number can be added or not, the program is executed by the block numbered sequence (except the calling). When the “AUTO SEG” switch in setting page is OFF, CNC doesn’t generate the block number automatically, but the blocks may be numbered manually.


When switch setting page “auto series number” is on, CNC generate program block number

automatically. When edit it, press  key to generate following program block number automatically. Program block number increment value is set by CNC data parameters № 216.

|  |               |
|--|---------------|
| SWITCH SETTING   | 00000 N00000  |
| <p>▶ PARM SWT: *OFF ON</p> <p>PROG SWT: OFF *ON</p> <p>AUTO SEG: *OFF ON</p> |               |
| MDI  | S0000 T00 H00 |

#### 6.1.2 Input of the program content

1 Press  key to enter the Edit mode;

2 Press  key to enter the Program interface, select the PRG CONTENT page by




pressing  or  key

| PRG CONTENT   | SEG1 | COL:1 | C:/00000.CNC  |
|---|------|-------|---------------|
| 00000 (00000);<br>G0 G54 G90 X0 Y0 Z0;<br>X10 Y10;<br>X-10 Y-10;<br>M99;<br>% |      |       |               |
| EDIT  |      |       | S0000 T00 H00 |

3 Key in address key , numerical key , ,  and  key by sequence (example by program O0001 creation);

| PRG CONTENT   | SEG1 | COL:1 | C:/00000.CNC  |
|---|------|-------|---------------|
| 00000 (00000);<br>G0 G54 G90 X0 Y0 Z0;<br>X10 Y10;<br>X-10 Y-10;<br>M99;<br>% |      |       |               |
| 00001   |      |       |               |
| EDIT  |      |       | S0000 T00 H00 |

4 Press  key to setup the new program;

| PRG CONTENT    | SEG1 | COL:1 | C:/00001.CNC  |
|----------------|------|-------|---------------|
| 00001 (00001); |      |       |               |
| .              |      |       |               |
| %              |      |       |               |
| EDIT           |      |       | S0000 T00 H00 |

- 5 Input the edited part program one by one, the character will be displayed on the screen immediately as it





input(as for compound key, press this key repeatedly for alternate input),after a block is finished, press


to terminate it.


- 6 Other blocks input may be finished by step 5 above.


### 6.1.3 Search of the character


#### 1、 Scanning: To scan the character one by one by cursor


Press  key to enter the Edit mode, then press  key to enter the PRG CONTENT page;

1) Press  key, the cursor shifts a line upward; if the number of the column where the cursor locates is over

the total columns of the previous line, the cursor moves to the previous block end (at“;”sign) after  key is pressed;

2) Press  key, the cursor shifts a line downward; if the number of the column where the cursor locates is over the total columns of the next line, the cursor moves to the next block end (at“;”sign) after the

 key is pressed;

3) Press  key, the cursor shifts a column to the right; if the cursor locates at the line end, it moves to the head of the next block;



4) Press key, the cursor shifts a column to the left; if the cursor locates at the line head, it moves to the end of the next block;



5) Press key to page upward, the cursor moves to the 1<sup>st</sup> line and 1<sup>st</sup> column of the previous page, if it pages to the head of the program, the cursor moves to the 2<sup>nd</sup> line and 1<sup>st</sup> column;



6) Press key to page downward, the cursor moves to the 1<sup>st</sup> line and 1<sup>st</sup> column of the next page, if it

pages to the end of the program, the cursor moves to the last line and 1<sup>st</sup> column of the program;

## 2、Searching: To search for the specified character upward or downward from the cursor current location

The steps of searching is as following:



1) Press key to enter Edit mode;



2) Press key to enter the PRG CONTENT page;



3) Press key to enter Search mode, input the characters to be searched with max. 10 bytes, the character over 10 bit will cover the 10<sup>th</sup> bit. e.g. to move the cursor to G2, it displays as following:

| PRG CONTENT          | ITOR SEG8 | COL:1 | C:/00008.CNC  |
|----------------------|-----------|-------|---------------|
| 00008 (CNC PROGRAM); |           |       |               |
| G40 G49 G80;         |           |       |               |
| G0 G90 G54 X0 Y0 Z0; |           |       |               |
| Z50;                 |           |       |               |
| G1 X20 Z20 F1500;    |           |       |               |
| G2 I-20;             |           |       |               |
| G3 I-20;             |           |       |               |
| G4 X5;               |           |       |               |
| G1 X0 Y20 Z0 F1000;  |           |       |               |
| X-20 Y0;             |           |       |               |
| FIND G2              |           |       |               |
| EDIT                 |           |       | S0000 T00 H00 |



4) Press key ( or by the location relation of the character to be

searched and the character where the cursor locates), it displays as following:

| PRG CONTENT  | ITOR SEG8 | COL:1 | C:/00008.CNC  |
|--|-----------|-------|---------------|
| 00008 (CNC PROGRAM);<br>G40 G49 G80;<br>G0 G90 G54 X0 Y0 Z0;<br>Z50;<br>G1 X20 Z20 F1500;<br>G2 I-20;<br>G3 I-20;<br>G4 X5;<br>G1 X0 Y20 Z0 F1000;<br>X-20 Y0;<br>FIND G2_ |           |       |               |
| EDIT   |           |       | S0000 T00 H00 |



or



5) After the searching, the CNC system is still in searching state, press



character can be searched. Or press

6) If the character is not found, the cue of "Srch fail" will be displayed.

**Note: During the searching, it doesn't search the characters in the called subprogram**

3、Method to return to the program head



1) In the Program page of the Edit mode, press

2) Search the program head character by the methods in Section 6.1.3 of this part.

#### 6.1.4 Insertion of the character

Steps:

1) Select the PRG CONTENT page in Edit mode;

| PRG CONTENT  | SEG5 | COL:1 | C:/00008.CNC  |
|--|------|-------|---------------|
| 00008 (CNC PROGRAM);<br>G40 G49 G80;<br>G0 G90 G54 X0 Y0 Z0;<br>Z50;<br>G1 X20 Z20 F1500;<br>G2 I-20;<br>G3 I-20;<br>G4 X5;<br>G1 X0 Y20 Z0 F1000;<br>X-20 Y0; |      |       |               |
| EDIT   |      |       | S0000 T00 H00 |

2) Input the character to be inserted(as G98 code before G2 in the above figure, input



.,

| PRG CONTENT  | SEG5 | COL:5 | C:/00008.CNC  |
|--|------|-------|---------------|
| 00008 (CNC PROGRAM);<br>G40 G49 G80;<br>G0 G90 G54 X0 Y0 Z0;<br>Z50;<br>G1 X20 Z20 F1500;<br>G98 G2 I-20;<br>G3 I-20;<br>G4 X5;<br>G1 X0 Y20 Z0 F1000;<br>X-20 Y0;<br> |      |       |               |
| EDIT   |      |       | S0000 T00 H00 |

**Note 1:** In the Insert mode, if the cursor is not located at the line head, a space will be automatically generated when inserting the command address; if the cursor is located at the line head, the space will not be generated, and it should be inserted manually.



**Note 2:** In program edit mode or program state MDI page, press key, you can swift insert and macro edit mode.

In macro edit mode, you can input following symbol: '[', ']', '=', '+', '>', '<', '/', '&', '|'. Above symbols are usually used in macro program.

| Difference between two mode | Automatic space  | deal of letter 'O'  | Input special symbols         |
|-----------------------------|--|---|-------------------------------|
| Insert mode                 | When editing program, add a space to distinguish the instruction word automatically. | press 'O' the conduct of proceedings of swift, copy, delete, etc. | Can not inout special symbols |
| Macro edit mode             | Do not add space automaticly.  | Act as letter 'O'.  | Can input special symbols     |

### 6.1.5 Deletion of the character

Steps

- 1) Select the PRG CONTENT page in Edit mode;



- 2) Press key to delete the character before the cursor; press key to delete the character where the cursor locates.



### 6.1.6 Modification of the character


Cancel or delete the character and reenter

### 6.1.7 Deletion of a single block

This function is only applied to the block which has a block No. and the block No. is headed the line or there is only space before the block No

Steps:

1) Select the PRG CONTENT page in Edit mode;

2) Move the cursor to the head of the block to be deleted (column 1), then press  key

**Note** If the block has no block No., key in "N" at the head of the block, and move the cursor to "N",

then press  key


### 6.1.8 Deletion of the blocks

It deletes all the content (including the specified block) from the current character where the cursor locates to the block with the specified No. (retrieving downward), and the specified block must have a block No..


| PRG CONTENT  | SEG5 | COL:5 | C:/00008.CNC  |
|--|------|-------|---------------|
| 00008 (CNC PROGRAM);<br>G40 G49 G80;<br>G0 G90 G54 X0 Y0 Z0;<br>Z50;<br>G1 X20 Z20 F1500;<br>N10 G98 G2 I-20;<br>G3 I-20;<br>G4 X5;<br>G1 X0 Y20 Z0 F1000;<br>X-20 Y0; |      |       |               |
| EDIT   |      |       | S0000 T00 H00 |

#### Steps

1) Select the PRG CONTENT page in Edit mode;

2) Press  key to enter the FIND state, and key in the block No

| PRG CONTENT  | SEG2 | COL:1 | C:/00008.CNC  |
|--|------|-------|---------------|
| 00008 (CNC PROGRAM);<br>G40 G49 G80;<br>G0 G90 G54 X0 Y0 Z0;<br>Z50;<br>G1 X20 Z20 F1500;<br>N10 G98 G2 I-20;<br>G3 I-20;<br>G4 X5;<br>G1 X0 Y20 Z0 F1000;<br>X-20 Y0;<br>FIND N10 |      |       |               |
| EDIT   |      |       | S0000 T00 H00 |

3) Press  key, it displays as following

| PRG CONTENT   | SEG2 | COL:1 | C:/00008.CNC  |
|---|------|-------|---------------|
| 00008 (CNC PROGRAM);<br>G40 G49 G80;<br>G3 I-20;<br>G4 X5;<br>G1 X0 Y20 Z0 F1000;<br>X-20 Y0;<br>X0 Y-20 Z-10;<br>X20 Y0 Z-20;<br>X5 Y5 Z-50;<br>M99;<br> |      |       |               |
| EDIT  |      |       | S0000 T00 H00 |

### 6.1.9 Segment deletion

It deletes the content downward from the current character where the cursor locates to the word specified.

| PRG CONTENT   | SEG2 | COL:4 | C:/00008.CNC  |
|---|------|-------|---------------|
| 00008 (CNC PROGRAM);<br>G40 G49 G80;<br>G3 I-20;<br>G4 X5;<br>G1 X0 Y20 Z0 F1000;<br>X-20 Y0;<br>X0 Y-20 Z-10;<br>X20 Y0 Z-20;<br>X5 Y5 Z-50;<br>M99;<br> |      |       |               |
| EDIT  |      |       | S0000 T00 H00 |

#### Steps


- 1) Select the PRG CONTENT page in Edit mode

CANCEL

- 2) Press  key to enter the FIND state, and key in the characters

| PRG CONTENT   | SEG2 | COL:4 | C:/00008.CNC  |
|---|------|-------|---------------|
| 00008 (CNC PROGRAM);<br>G40 G49 G80;<br>G3 I-20;<br>G4 X5;<br>G1 X0 Y20 Z0 F1000;<br>X-20 Y0;<br>X0 Y-20 Z-10;<br>X20 Y0 Z-20;<br>X5 Y5 Z-50;<br>M99;<br>FIND F1000<br> |      |       |               |
| EDIT  |      |       | S0000 T00 H00 |

DELETE

- 3) Press  key, it displays as following

| PRG CONTENT  | SEG2 | COL:5 | C:/00008.CNC  |
|--|------|-------|---------------|
| 00008 (CNC PROGRAM);<br>G40 G49 G80;<br>G3 Z;<br>X-20 Y0;<br>X0 Y-20 Z-10;<br>X20 Y0 Z-20;<br>X5 Y5 Z-50;<br>M99;<br>% |      |       |               |
| EDIT   |      |       | S0000 T00 H00 |

**Note 1:** If the specified character is not found or the specified character is located before the current cursor, the cue of “Srch fail” will be displayed. If there are multiple same characters specified downward, it defaults the nearest one to the current cursor.

**Note 2:** If the command address is input, both the address and the command value behind it are Deleted.

## 6.2 program explanation

In order to make it more convenient for users to search 、management and edit program, system provide program name and program block explanation function.

### 6.2.1 program name axplanation

**Program** note description can be added in brackets after the program name. Such as program 00005 is used to process bolt hole, then **program** note description can be created as follows

1) choose edit operation method, get into program content page.



2) press **CHANGE** key, then bottom left of screen shows FIND, display page as follows:

| PRG CONTENT   | SEG1 | COL:1 | C:/00005.CNC  |
|---|------|-------|---------------|
| 00005 (00005);<br>G90 G00 X0 Y0 Z0;<br>(I:cir r,A:first hole angle,B:angle inc,H:hole number);<br>G65 P9020 X100 Y50 R30 Z-50 F1800 I100 A45 B30 H5;<br>M30;<br>% |      |       |               |
| FIND  |      |       |               |
| EDIT  |      |       | S0000 T00 H00 |



3) Input note after FIND position (up to 50 characters can be entered in , except brackets) . As we input BOLT PROC (bolt hole processing), display page as follows:

| PRG CONTENT   | SEG1 | COL:1 | C:/00005.CNC  |
|---|------|-------|---------------|
| 00005 (00005);<br>G90 G00 X0 Y0 Z0;<br>(I:cir r,A:first hole angle,B:angle inc,H:hole number);<br>G65 P9020 X100 Y50 R30 Z-50 F1800 I100 A45 B30 H5;<br>M30;<br>% |      |       |               |
| FIND BOLT PROC  |      |       |               |
| EDIT  |      |       | S0000 T00 H00 |



4) press **DATA INPUT** key, notes establishment of program is completed, display page as follows:

| PRG CONTENT   | SEG1 | COL:1 | C:/00005.CNC  |
|---|------|-------|---------------|
| 00005 (BOLT PROC);<br>G90 G00 X0 Y0 Z0;<br>(I:cir r,A:first hole angle,B:angle inc,H:hole number);<br>G65 P9020 X100 Y50 R30 Z-50 F1800 I100 A45 B30 H5;<br>M30;<br>% |      |       |               |
| EDIT  |      |       | S0000 T00 H00 |

### 6.2.2 program block note

Program note can be displayed as closed contents in brackets '(' and ') at any position of program, and distinguish as green colour characters. Show page as follows:

| PRG CONTENT  | SEG1 | COL:1 | C:/00005.CNC  |
|--|------|-------|---------------|
| O0005 (BOLT PROC());<br>G90 G00 X0 Y0 Z0;<br>(I:cir r,A:first hole angle,B:angle inc,H:hole number);<br>G65 P9020 X100 Y50 R30 Z-50 F1800 I100 A45 B30 H5;<br>G04 X3(pause 3 sec.);<br>M30;<br>% |      |       |               |
| EDIT   |      |       | S0000 T00 H00 |

**Relative note:**

1) Because system does not provide symbols '(' and ')' to input, it can not input program block note in edit mode at system side. You can only edit note in PC computer and download to CNC through communication software to add program note.

2) Do not support Chinese characters. If have edited Chinese characters on PC computer and downloaded to CNC, system will display as spaces.

**Note 1** Program is established, if have not added program name note, then CNC program default program name as program name notes.

**Note 2:** Add program note in CNC can only be in English, but CNC support to display Chinese notes (except Chinese decimal point). Add Chinese comments as follows: edit Chinese notes in the PC, you can be downloaded to CNC through the communications software.

### 6.2.3 alter of program note






Operation steps is the same as steps listed in Chapter 6.2.1- establish program name.

## 6.3 Deletion of the Program

### 6.3.1 Deletion a single program

Steps:

1) Select the PRG CONTENT page in Edit mode;







2) Key in address key  numerical key , , ,  by sequence( by program O0001);

3) Press key, program O0001 will be deleted

### 6.3.2 Deletion of all programs

Steps

1) Select the PRG CONTENT page in Edit mode

2) Key in address key  symbol key  numerical key , , , 

by sequence



3) Press key, all the programs will be deleted.

## 6.4 Selection of the Program

When there are multiple programs in CNC system, a program can be selected by the following 4 methods:

### 6.4.1 Search method

1) Select Edit or Auto mode;

2) Press key to enter the PRG CONTENT page;

3) Press address key and key in the program No.;

4) Press or key, the retrieved program will be displayed. If the program does not exist, an alarm will be issued.

**Note** In step 4, if the program does not exist, a new program will be created by CNC system after key is pressed.

### 6.4.2 Scanning method

1) Select Edit or Auto mode;

2) Press key to enter the PRG CONTENT page;

3) Press address key

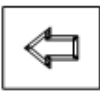
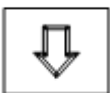
4) Press or key to display the next or previous program;

5) Repeat step 3 and 4 to display the saved programs one by one.

### 6.4.3 Cursor method

1) Select Auto mode (must be in non-running state);

|  |       |       |       |       |       |               |        |
|--|-------|-------|-------|-------|-------|---------------|--------|
| PRG PREVIEW  |       |       |       |       |       | 00214 N00000  |        |
| 00000  | 00001 | 00003 | 00005 | 00008 | 00020 | MEM SIZE:     | 40.0MB |
| 00125  | 00214 | 00254 | 01212 | 01234 | 02036 | MEM USED:     | 222KB  |
| 02589  | 03654 |       |       |       |       | PRG AMOT:     | 14     |
|  |       |       |       |       |       | PRG SIZE:     | 61B    |
| 00000 (00000);<br>G0 G54 G90 X0 Y0 Z0;<br>X10 Y10;<br>X-10 Y-10;<br>M99; |       |       |       |       |       |               |        |
| EDIT   |       |       |       |       |       | S0000 T00 H00 |        |



2) Press , , , key to enter the PRG LIST page;

6.4.4 Select file using file list

1) in file list page (operation mode is edit mode)

|                                |  |  |               |     |                     |
|--------------------------------|--|--|---------------|-----|---------------------|
| FILE LIST                      |  |  | 00005 N00000  |     |                     |
| C:/                            |  |  |               |     |                     |
| 00000.CNC                      |  |  |               |     |                     |
| 00001.CNC                      |  |  |               |     |                     |
| 00002.CNC                      |  |  |               |     |                     |
| 00003.CNC                      |  |  |               |     |                     |
| 00005.CNC                      |  |  |               |     |                     |
| INPUT:                         |  |  | FILE INFO     | 17B | 2009-12-28 10:10:31 |
| NOTE:[CHG]:SEEK USB [EOB]:OPEN |  |  |               |     |                     |
| EDIT                           |  |  | S0000 T00 H00 |     |                     |



2) press key or key, Choose need to open program;



4) press key, open program.

6.5 Execution of the Program

After the program to be executed is selected by the method in Section 6.4 of this part, select the Auto



mode, then press key , the program will be executed automatically.

6.6 Rename of the Program

1) Select the PRG CONTENT page in Edit mode;





2) Press address key and key in the new program name;



3) Press key.

6.7 Copy of the Program

To save the current program to a location:

- 1) Select the PRG CONTENT page in Edit mode;
- 2) Press address key  and key in the new program No
- 3) Press  key.




6.8 程序的定位

- **TO** 可定位到上次加工的断点处  
利用 **TO** 可以查找程序上次执行的断点。选择编辑操作方式，进入程序内容页面后按转换键，左下角显示查找，然后输入 **TO**，按向下键或向上键，则显示查找定位中，此时光标移到上次执行的停止位置。
- **TO+num** 可定位到指定程序段（num 为用户指定的段的数字，如 **TO10000** 为定位到第 1 万段）  
在程序内容页面可以输入输入 **TO** 段号，定位到指定的段。进入程序内容页面后，按转换键后，左下角显示查找，输入 **TO** 段号，按向下键或向上键，可以定位到指定的程序段。

6.9 preview program



非编辑操作方式下，按 键进入程序预览显示页面。在此页面中，以目录列表形式显示CNC已存的

程序名，一页最多只能显示36个程序名，当已存程序的数量超过36个，可按    键显示其它页的程序。

|                  |       |       |       |       |       |               |        |
|------------------|-------|-------|-------|-------|-------|---------------|--------|
| PRG PREVIEW      |       |       |       |       |       | O0214 N00000  |        |
| O0000            | O0001 | O0003 | O0005 | O0008 | O0020 | MEM SIZE:     | 40.0MB |
| O0125            | O0214 | O0254 | O1212 | O1234 | O2036 | MEM USED:     | 222KB  |
| O2589            | O3654 |       |       |       |       | PRG AMOT:     | 14     |
|                  |       |       |       |       |       | PRG SIZE:     | 117B   |
| O0003 (O0003);   |       |       |       |       |       |               |        |
| G0 G90 X0 Y0 Z0; |       |       |       |       |       |               |        |
| G1 X50 Y50;      |       |       |       |       |       |               |        |
| X100 Y0;         |       |       |       |       |       |               |        |
| X50 Y-50;        |       |       |       |       |       |               |        |
| EDIT             |       |       |       |       |       | S0000 T00 H00 |        |

- 程序容量的显示：

在右上窗口栏中，“存储容量”显示 CNC 可以存储程序的最大容量。“已用容量”显示 CNC 存储的程序容量，“程序个数”显示 CNC 已经存储的程序个数，“程序大小”显示当前打开预览的程序容量大小。

➤ 程序预览的选择：

在左上窗口中当前处于预览状态的程序名会以白底蓝字显示，右上窗口的程序大小显示当前预览的程序大小。下面窗口的显示当前预览的程序，显示 5 行程序。

➤ 光标键和转换键的使用：

在程序列表区中选择程序时，可以按 MDI 面板光标移动键选择需要预览的程序，当存储的容量很多时，程序列表区最多只能显示 36 个程序名，此时可以按下右移动键选择程序，或直接按转换键，翻页显示程序列表，然后移动 MDI 面板的光标移动键选择

➤ open program

在编辑、自动、录入方式下，当需要在程序预览窗口打开预览的程序时，可以按 MDI 面板 EOB 键打开程序，此时页面右上角会显示当前打开的程序名称。

➤ Delete program

Move target to program which will be deleted, press delete key, Choose Y or N in 在出现的复选菜单中，按 Y 键或是 N 键选择是否删除。

|                  |       |       |       |       |       |               |        |
|------------------|-------|-------|-------|-------|-------|---------------|--------|
| PRG PREVIEW      |       |       |       |       |       | 00214 N00000  |        |
| 00000            | 00001 | 00003 | 00005 | 00008 | 00020 | MEM SIZE:     | 40.0MB |
| 00125            | 00214 | 00254 | 01212 | 01234 | 02036 | MEM USED:     | 222KB  |
| 02589            | 03654 |       |       |       |       | PRG AMOT:     | 14     |
|                  |       |       |       |       |       | PRG SIZE:     | 117B   |
| 00003 (00003);   |       |       |       |       |       |               |        |
| G0 G90 X0 Y0 Z0; |       |       |       |       |       |               |        |
| G1 X50 Y50;      |       |       |       |       |       |               |        |
| X100 Y0;         |       |       |       |       |       |               |        |
| X50 Y-50;        |       |       |       |       |       |               |        |
| EDIT             |       |       |       |       |       | S0000 T00 H00 |        |

## CHAPTER 7 AUTO OPERATION


**Note !**

The keys functions of this 980MDa machine panel are defined by Ladder; please refer to the respective materials by the machine builder for the function significance.



Please note that the following function introduction is described based on the 980MDa standard PLC programs!

**7.1 Auto Run****7.1.1 Selection of the program to be run****1 Search method**

- 1) Select the Edit or Auto mode;

- 2) Press  key to enter the PRG CONTENT page;


- 3) Press the address key  and key in the program No.


- 4) Press  or  key, the program retrieved will be shown on the screen, if the program doesn't exist an alarm will be issued



**Note** In step 4, if the program to be retrieved does not exist, a new program will be setup by CNC system after pressing key.

**2 Scanning method**

- 1) Select the Edit or Auto mode

- 2) Press  key to enter the PRG CONTENT page


- 3) Press the address key 





- 4) Press the  or  key to display the next or previous program;

- 5) Repeat the step 3, 4 above to display the saved program one by one.

**3 Cursor method**

- a) Select the Auto mode (must in non-run state)

- b) Press  key to enter the PRG LIST page;





c) Press  ,  ,  ,  key to move the cursor to the name of the program to be selected;


d) Press  key.

#### 4、open directly


choose edit or auto operation;


1) Press  key twice, get into document catalogue page;

2) Press  ,  ,  ,  key and move target to choosed documnt


3) Press  key and open choosed document.

### 7.1.2 Program start

1、 Press  key to select the Auto mode

2、 Press  key to start the program, and the program execution begins


**Note** Since the program execution begins from the block where the cursor

locates, before pressing the  key, make a check whether the cursor is located at the block to be executed.


### 7.1.3 Stop of the auto run

#### ● Stop by command(M00)


the block containing M00 is executed, the auto run is stopped. So the modal function and state are all reserved.

Press the key  or the external Run key, the program execution continues.

#### ● Stop by a relevant key

- 1 In Auto run, by pressing key  or external dwell key, the machine remains at the following state:
  - (1) The machine feed slows down to stop;
  - (2) During the execution of the dwell command (G04), it pauses after G04 command execution is finished.
  - (3) The modal function and state are saved;



(4) The program execution continues after pressing the  key

## 2 Stop by Reset key



(1) All axes movement is stopped.

(2) M, S function output is invalid (the automatic cut-off of signals such as spindle CCW/CW, lubrication,



cooling by pressing  key can be set by the parameters)

(3) Modal function and state is held on after the auto run.

## 3 Stop by Emergency stop button

If the external emergency button (external emergency signal valid) is pressed under the dangerous or emergent situation during the machine running, the CNC system enters into emergency state, and the machine moving is stopped immediately, all the output (such as spindle rotation, coolant) are cut off. If the Emergency button is released the alarm is cancelled and CNC system enters into reset mode.

## 4 Mode switching

When the Auto mode is switched to the Machine zero, MPG/Step, Manual, Program zero mode, the current block “dwells” immediately; when the Auto mode is switched to the Edit, MDI mode, the “dwell” is not displayed till the current block is executed.

**Note 1** Ensure that the fault has been resolved before cancelling the emergency alarm.



**Note 2** The electric shock to the device may be decreased by pressing the Emergency button before power on and off.

**Note 3** The Machine zero return operation should be performed again after the emergency alarm is cancelled to ensure the the coordinate correctness.

**Note 4** Only the BIT3 (ESP) of the bit parameter No.017 is set to 0, could the external emergency stop be valid.

### 7.1.4 Auto run from an arbitrary block



1. Press  key to enter the Edit mode, press  key to enter the Program





interface, then press  or  key to select the PRG CONTENT page:



2. Move the cursor to the block to be executed (for example, move the cursor to the 4th line head if it executes from the 4th line);

| PRG CONTENT  | SEG3 | COL:1 | C:/00000.CNC  |
|--|------|-------|---------------|
| 00000 (00000);<br>G0 G54 G90 X0 Y0 Z0 G49;<br>G01 X100 Y100 F500;<br>G02 I20;<br>G01 X52 Z01;<br>G91 X2 Z-6.3;<br>G00 X0 Y0 Z0;<br>M30;<br>% |      |       |               |
| EDIT   |      |       | S0000 T00 H00 |




3. If the mode (G, M, T, F command) of the current block where the cursor locates is defaulted and inconsistent with the running mode, only the corresponding modal function is executed, could next step be continued.


4. Press  key to enter the Auto mode, then press  key to start the program.


### 7.1.5 Adjustment of the feedrate override, rapid override

In Auto mode, the running speed can be altered by adjusting the feedrate override, rapid override with no need to change the settings of the program and parameter.

- Adjustment of the feedrate override

Press the  or  key in  it can realize 16-level real time feedrate adjustment.

Press the  key each time, the feedrate override ascends a gear level till 150%

Press the  key each time, the feedrate override decends a gear level till 0;

**Note 1** The actual feedrate value is specified by F in program feedrate override adjustment;




**Note 2** Actual feedrate= value specified by F× feedrate override


- Adjustment of rapid override




 %  
R. OVERRIDE



It can realize the 4-level real time rapid override adjustment by pressing the  or  key in 

Press the  key each time, the rapid override ascends a gear level till 100%;

Press the  key each time, the rapid override decends a gear level till F0

**Note 1** The max. rapid traverse speeds of X, Y, Z axis are set by bit parameter No.059, No.060 No.061 respectively;

X axis actual rapid traverse feedrate = value set by parameter No.059×rapid override

Y axis actual rapid traverse feedrate = value set by parameter No.060×rapid override

Z axis actual rapid traverse feedrate = value set by parameter No.061×rapid override

**Note 2** When the rapid override is F0, the rapid traverse feedrate is set by bit parameter No.069.




### 7.1.6 Spindle override adjustment

While the spindle speed is controlled by the analog voltage output in Auto mode, it can be adjusted by spindle override.




 %  
S. OVERRIDE



Press the  or  key in  to adjust the spindle override for the spindle speed, it can realize 8-level real-time override adjustment between 50%~120%

Press the  key each time, the feedrate override ascends a gear level till 120%

Press the  key each time, the rapid override decends a gear level till 50%.



**Note 1** The actual output analog voltage=analog voltage by parameter×spindle override

Example: When the bit parameter No.101 is set for 9999, No.100 for 645, to execute S9999 command to select the spindle override 70%, the actual output analog voltage≈10×70%=7V

## 7.2 DNC running

This CNC system has a DNC function, by the connection of the DNC communication software with this system, the high speed, high capacity program can be run in this system.



In Auto mode, press the  key, it enters the DNC mode. Then press the  key to start the program DNC machining under the condition that the PC is get ready  
Please see it for details in the DNC communication software



## 7.3 State on Running

### 7.3.1 Single block execution

When the program is to be executed for the 1<sup>st</sup> time, to avoid the programming errors, it may select Single block mode to execute the program.


In Auto mode, the valid single block function is as following



Press the  key to make the single block indicator  in State area to light up, it means that the single block function is selected

In Single block mode, when the current block execution is finished , the CNC system stops; if next



block is to be executed, it needs to press the  key


**Note** Even at the mid point, the single block stop is valid in G28, G29, G30 commands

### 7.3.2 Dry run

Before the program is to be executed, in order to avoid the programming errors, it may select the Dry run mode to check the program. And the machine runs by a constant speed other than the speed specified by the program.

In Auto mode, the valid dry run function is as following





Press the  key to make the dry run indicator in State area to light up, it means that the dry run function is selected

The rapid traverse by manual feedrate or rapid feedrate is set by the DATA parameter No.174

### 7.3.3 Machine lock

In Auto mode, the valid machine lock function is as following



Press the  key to make the machine lock indicator  in State area to light up, it means that the machine lock function is selected

While in the machine lock mode



1 The machine carriage doesn't move, the "MACHINE" in the INTEGRATED POS page of the POSITION interface doesn't vary too. The RELATIVE POS and ABSOLUTE POS, DIST TO GO are refreshed normally

2 M, S, T commands can be executed normally

### 7.3.4 MST lock

In Auto mode, the valid MST lock function is as following



Press the  key to make the MST lock indicator  in State area to light up, it means that the MST lock function is selected. And the carriage move is not performed by M, S, T commands



**Note** When the MST lock is valid, the execution of M00, M30, M98, M99 command is not affected by it.

### 7.3.5 Block skip

If a block in program is not needed to be executed and not to be deleted, this block skip function can be used. When the block is headed with "/" sign and Block skip function is valid, this block is skipped without execution in Auto mode

In Auto mode, the valid block skip function is as following

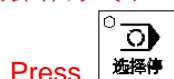


Press the  key to make the block skip indicator  in State area to light up, it means that the block skip function is selected

**Note** While the block skip function is invalid, the blocks headed with "/" signs are executed normally in Auto mode.

### 7.3.6 选择停 chosen stop

自动操作方式下，使选择停有效的方法如下：



Press  键使选择停按钮指示灯亮，则表示进入选择停状态；



此时程序运行到M01指令时，将被“暂停”。需再次按  键，程序才继续往下执行。

## 7.4 断电记忆

### 7.4.1 非 DNC 的自动运行下程序中断：

操作方法 1（手动操作）：

- 1、重新上电后在“程序内容，编辑方式”页面下，按转换键→按字母“T”+字母“O”→上、下移动键，执行定位操作到上次执行中断的程序段；
- 2、切换到“坐标&程序，机械回零”页面下；
- 3、执行机械回零操作，等待机械回零完成后进入下一步；
- 4、切换到手动方式或录入方式，定位到上次执行中断的程序段；（此时需要确认是否处于 G40、G49、G54 状态下，且要注意定位过程中刀具应确保处于安全范围内。）
- 5、切换到手动方式，按转换键，提示“确认已定位到上次执行中断的程序段，然后恢复断电前的模式（Y/N）”
- 6、按 Y，恢复断电前的模式。

7、切换到自动方式，按循环启动键，则可以在上次执行中断的程序段处继续运行。

操作方法 2（自动操作）：

- 1、重新上电后在“程序内容，编辑方式”页面下，按转换键→按字母“T”+字母“O”→上、下移动键，执行定位操作到上次执行中断的程序段；
- 2、切换到“坐标&程序，机械回零”页面下；
- 3、执行机械回零操作
- 4、机械回零完成后，按转换键，屏幕下方提示“自动定位到上次执行中断的程序段，然后恢复断电前的模态（Y/N）”，输入 Y（此时需要确保刀具移动轨迹处于安全区域内），坐标开始移动，且定位到上次执行中断的程序段后，自动恢复断电前的模态。
- 5、切换到自动方式，按循环启动键，则可以在上次执行中断的程序段处继续运行。

#### 7.4.2 DNC 的自动运行下掉电中断

操作方法（自动操作）：

- 1、重新上电，切换到“坐标程序，机械回零”页面下；
- 2、执行机械回零操作
- 3、机械回零完成后，按转换键，屏幕下方提示“自动定位到上次执行中断的程序段，然后恢复断电前的模态（Y/N）”，输入 Y（此时需要确保刀具移动轨迹处于安全区域内），坐标开始移动，且定位到上次执行中断的程序段后，自动恢复断电前的模态。
- 4、切换到 DNC 方式，此时反白显示掉电时执行的程序段。
- 5、在 DNC 传输软件中，从掉电的程序段开始传输，按循环启动键继续运行。

#### 7.4.3 specical remaks

在固定循环的连续钻孔过程中，断电，恢复坐标后，在重新执行断电后的程序段时，将以当前恢复的坐标位置为起点重新计算连续钻孔的孔距。Continuous drilling process in fixed cycle,

In fixed cycle, mode value of fixed cycle can not be restored.


## CHAPTER 8 MACHINE ZERO OPERATION

### 8.1 Machine Zero




The machine coordinate system is a basic coordinate system for CNC coordinate calculation. It is an inherent coordinate system of the machine. The origin of the machine coordinate system is called machine zero (or mechanical reference point). It is defined by the zero return switches fixed on the machine. Usually the switch is fixed on the positive max. Strokes of X, Y, Z axes

### 8.2 Machine Zero Return Steps

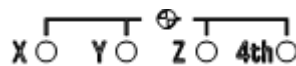


1 Press  key, it enters the Machine zero mode, the bottom line of the screen page shows “REF”, as following figure shows

|              |  |                     |  |
|--------------|--|---------------------|--|
| RELATIVE POS |  | 00000 N00000        |  |
| 00000 N00000 |  | G00 G17 G90 G54     |  |
|              |  | G21 G40 G49 G94 G98 |  |
| X            |  | 0.000               |  |
| Y            |  | 0.000               |  |
| Z            |  | 0.000               |  |
| REF          |  | S0000 T00 H00       |  |

2 Press  or  or  key to select the machine zero of X, Y or Z axis

3 The machine moves along the machine zero direction, and returns to the machine zero via the deceleration signal, zero signal detection. And the axis stops with the machine zero finish indicator lighting up.



Machine zero finish indicators

**Note1:** If the machine zero is not fixed on the machine, machine zero operation B/C/D is unallowed.

**Note2:** While the coordinate is moved out from the machine zero, the machine zero finish indicators are gone out.

**Note3:** After the machine zero operation, the cancellation of the tool length offset for the CNC is set by the BIT7 of the bit parameter No.22

**Note4:** See details in the 3rd part INSTALLATION AND CONNECTION for the

parameters concerning with the machine zero.

注 5: 机械回零时, 轴运动键是否自锁由状态参数№011 的 ZNIK 决定;

注 6: 旋转轴只能采用机械回零方式 D。

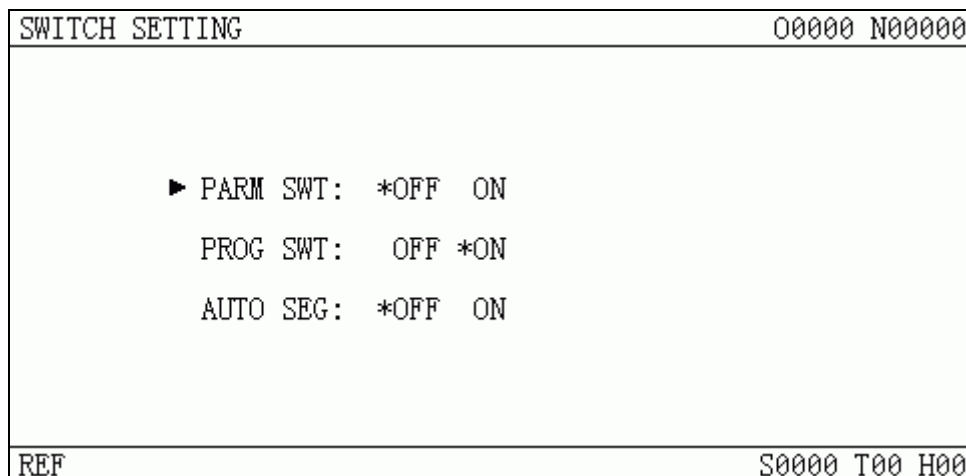













## CHAPTER 9 DATA SETTING, BACKUP AND RESTORE

## 9.1 Data Setting

## 9.1.1 Switch setting



In SWITCH SETTING page, the ON-OFF state of PARM SWT (parameter switch), PROG SWT (program switch), AUTO SEG (auto sequence No.) can be displayed and set, as is shown in following figure






- 1 Press  key to enter the Setting interface, then press  or  key to enter SETTING page the SWITCH
- 2 Press  or  key to move the cursor to the item to be set
- 3 Press  and  key to shift the ON-OFF state press  or  key, “\*” moves to the left to set the switch for OFF, Press  or  key, “\*” moves to the right to set the switch for ON.

Only the PARM SWT is set for ON, could the parameter be altered; so are PROG SWT and AUTO SEG

**Note** 1When the PARM SWT is shifted from “OFF”to “ON”, an alarm will be issued by CNC



system.By pressing the  、  key together, the alarm can be cancelled. If the PARM SWT is shifted again, no alarm is issued. For security it should set the PARM SWT for “OFF” after the parameter alteration is finished.

## 9.1.2 图形设置

按  键进入图形界面，按  或  键显示如下图形参数页面。

|            |                                      |                      |
|------------|--------------------------------------|----------------------|
| GRAPH SET  |                                      | 00000 N00000         |
| COORD OPT= | 0 0XY 1YX 2ZX 3XYZ 4YZ 5ZY 6XZ 7XZY) |                      |
| SCALE      | =                                    | 100%                 |
| CENTER     | =                                    | 0.000 (X axis value) |
| CENTER     | =                                    | 0.000 (Y axis value) |
| CENTER     | =                                    | 0.000 (Z axis value) |
| ► X MAX.   | =                                    | 120.000              |
| Y MAX.     | =                                    | 120.000              |
| Z MAX.     | =                                    | 120.000              |
| X MIN.     | =                                    | -120.000             |
| Y MIN.     | =                                    | -120.000             |
| Z MIN.     | =                                    | -120.000             |
| REF        | S0000 T00 H00                        |                      |

#### A: 图形参数的设置方法

- 1、在录入操作方式下，按  键、 键移动光标到需要设定的参数上；
- 2、键入相应的数值；



- 3、按  键，完成设置。

#### B: 图形参数的意义

坐标选择：可以通过设置不同的值来选择图形轨迹的显示视角，0~7 对应的坐标系如图所示。

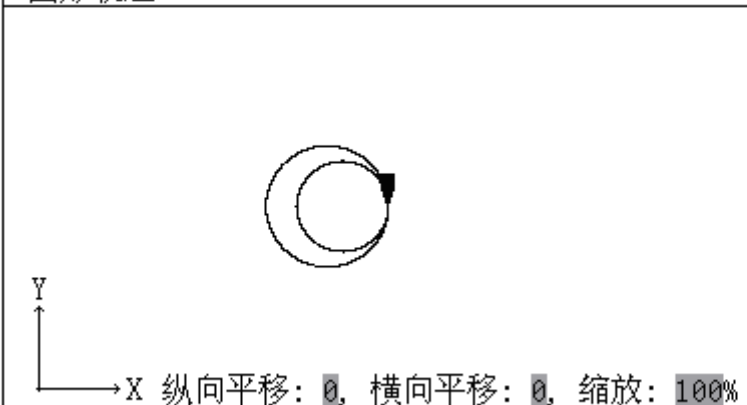
缩放倍率：显示当前图形轨迹放大缩小的倍率。

图形中心：显示各轴的中心点位置。

最大值、最小值：设置各轴可以显示的最大、最小范围。

#### C: 图形轨迹的操作

图形轨迹页面如下：

|  |  |                |
|--|--|----------------|
| 图形轨迹   |  | 00001 N00000   |
|  |  | (绝对坐标)         |
|  |  | X 0.000        |
|  |  | Y 0.000        |
|  |  | Z 0.000        |
| 纵向平移: 0, 横向平移: 0, 缩放: 100%   |  | <b>S</b> :开始作图 |
|  |  | T :停止作图        |
|  |  | R :清除轨迹        |
|  |  | K :切换视角        |
|  |  | J :居中显示        |
| 自动 单段  |  | MI:缩放轨迹        |
|  |  | S0000 T01 H00  |

纵向平移：显示图形的上下平移的位置。

横向平移：显示图形的左右平移的位置。

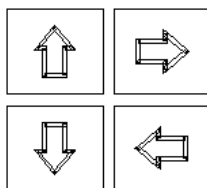
缩放：显示当前图形的缩放倍率。

绝对坐标：显示程序的绝对坐标值。

**S**：开始作图，当按下 **S** 键时，**S** 反白显示。开始显示作图轨迹；

**T**：停止作图，当按下 **T** 时，**T** 反白显示，停止显示作图轨迹；

- R:** 清除轨迹，清除以前显示的图形轨迹；
- K:** 切换视角，即每按下一次 **K** 键，坐标选择值在 0~7 之间切换；
- J:** 图形居中显示，即，纵向平移量和横向平移都是 0；
- I:** 放大轨迹，每按下一次 **I** 键，图形放大 2 倍；
- M:** 缩小轨迹，每按下一次 **M** 键，图形缩小 2 倍；






: 图形上下左右平移显示。

## 9.1.3 Parameter setting

By the parameter setting, the characteristics of the driver and machine can be adjusted. See Appendix 1 for their significance









Press  key to enter the Parameter interface, then press  or  key to switch the parameter page, as is shown in the following figure


| BIT PARAMETER                            |          |     |          | 00000 N00000  |          |
|--|----------|-----|----------|---------------|----------|
| NO.                                      | DATA     | NO. | DATA     | NO.           | DATA     |
| 001                                      | 00000000 | 009 | 00011111 | 017           | 00101000 |
| 002                                      | 00000010 | 010 | 00011111 | 018           | 00000000 |
| 003                                      | 00000000 | 011 | 00000000 | 019           | 10000000 |
| 004                                      | 01000000 | 012 | 00010011 | 020           | 00000000 |
| 005                                      | 00010001 | 013 | 10000011 | 021           | 00000000 |
| 006                                      | 00000000 | 014 | 00011111 | 022           | 00000000 |
| 007                                      | 00000000 | 015 | 10000000 | 023           | 00000000 |
| 008                                      | 00011111 | 016 | 00000000 | 024           | 00000000 |
| *** ** ACS HWL *** **                    |          |     |          |               |          |
| bit4:1/0:Analog vol./switch ctrl spindle |          |     |          |               |          |
| NO. 001                                  |          |     |          |               |          |
| AUTO SBK                                 |          |     |          | S0000 T00 H00 |          |

### A Alteration of the bit parameter

- 1 Byte alteration
  - 1) Turn on the parameter switch
  - 2) Enter the MDI mode
  - 3) Move the cursor to the parameter No. to be set

Method 1: Press  or  key to enter the page containing the parameter to be set, press  or  key to move the cursor to the No. of the parameter to be set;

Method 2: Press address key  key in parameter No, then press  key.

- 4) Key in the new parameter value
- 5) Press  key, the parameter value is entered and displayed
- 6) After all parameters setting is finished, the PARM SWT needs to be set for OFF for security

**Example:**

Set the BIT5 (DECI) of the bit parameter No.004 to 1, and the other bits unchanged.

Move the cursor to No.004, key in 01100000 by sequence in the cue line, as is shown in following figure:

| BIT PARAMETER                         |          |     |          | 00000 N00000  |          |
|---------------------------------------|----------|-----|----------|---------------|----------|
| NO.                                   | DATA     | NO. | DATA     | NO.           | DATA     |
| 001                                   | 00000000 | 009 | 00011111 | 017           | 00101000 |
| 002                                   | 00000010 | 010 | 00011111 | 018           | 00000000 |
| 003                                   | 00000000 | 011 | 00000000 | 019           | 10000000 |
| 004                                   | 00100000 | 012 | 00010011 | 020           | 00000000 |
| 005                                   | 00010001 | 013 | 10000011 | 021           | 00000000 |
| 006                                   | 00000000 | 014 | 00011111 | 022           | 00000000 |
| 007                                   | 00000000 | 015 | 10000000 | 023           | 00000000 |
| 008                                   | 00011111 | 016 | 00000000 | 024           | 00000000 |
| *** RDRN DECI *** PROD *** *** SCW    |          |     |          |               |          |
| bit5:1/0:DEC signal is low/high level |          |     |          |               |          |
| NO. 004 = 01100000                    |          |     |          |               |          |
| MDI                                   |          |     |          | S0000 T00 H00 |          |

DATA  
INPUT

press key to finish the parameter alteration. The page is shown as following:

| BIT PARAMETER                         |          |     |          | 00000 N00000  |          |
|---------------------------------------|----------|-----|----------|---------------|----------|
| NO.                                   | DATA     | NO. | DATA     | NO.           | DATA     |
| 001                                   | 00000000 | 009 | 00011111 | 017           | 00101000 |
| 002                                   | 00000010 | 010 | 00011111 | 018           | 00000000 |
| 003                                   | 00000000 | 011 | 00000000 | 019           | 10000000 |
| 004                                   | 01100000 | 012 | 00010011 | 020           | 00000000 |
| 005                                   | 00010001 | 013 | 10000011 | 021           | 00000000 |
| 006                                   | 00000000 | 014 | 00011111 | 022           | 00000000 |
| 007                                   | 00000000 | 015 | 10000000 | 023           | 00000000 |
| 008                                   | 00011111 | 016 | 00000000 | 024           | 00000000 |
| *** RDRN DECI *** PROD *** *** SCW    |          |     |          |               |          |
| bit5:1/0:DEC signal is low/high level |          |     |          |               |          |
| NO. 004 =                             |          |     |          |               |          |
| MDI                                   |          |     |          | S0000 T00 H00 |          |

## 2 Bit alteration

- 1) Turn on the parameter switch
- 2) Enter the MDI mode
- 3) Move the cursor to the No. of the parameter to be set

Method 1: Press



or



key to enter the page of the parameter to be set, press

key to move the cursor to the No. of the parameter to be set

Method 2: Press address key





key in parameter No., then press





key



- 4) Press and hold key for 2 seconds or press key to skip to a bit of the parameter, and the bit is backlighted. Press or key to move the cursor to the bit to be altered, then key in 0 or 1
- 5) After all parameters setting is finished, the PARM SWT needs to be set for OFF for security

**Note** After entering a bit of the parameter, press and hold  key for 2 seconds or press  key, it may skip out of the bit and back to the parameter No.

**Example:**

Set the BIT5 (DECI) of the bit parameter No.004 to 0, and the other bits unchanged Move the cursor to “No.004” by the steps above, press and hold  key for 2 seconds or press  key to skip to a bit of the parameter, as is shown in the following figure;

| BIT PARAMETER                      |          |     |          | 00000 N00000  |          |
|------------------------------------|----------|-----|----------|---------------|----------|
| NO.                                | DATA     | NO. | DATA     | NO.           | DATA     |
| 001                                | 00000000 | 009 | 00011111 | 017           | 00101000 |
| 002                                | 00000010 | 010 | 00011111 | 018           | 00000000 |
| 003                                | 00000000 | 011 | 00000000 | 019           | 10000000 |
| 004                                | 01100000 | 012 | 00010011 | 020           | 00000000 |
| 005                                | 00010001 | 013 | 10000011 | 021           | 00000000 |
| 006                                | 00000000 | 014 | 00011111 | 022           | 00000000 |
| 007                                | 00000000 | 015 | 10000000 | 023           | 00000000 |
| 008                                | 00011111 | 016 | 00000000 | 024           | 00000000 |
| *** RDRN DECI *** PROD *** *** SCW |          |     |          |               |          |
| bit7:1/0:Unused                    |          |     |          |               |          |
| NO. 004                            |          |     |          |               |          |
| MDI                                |          |     |          | S0000 T00 H00 |          |

Move the cursor to “BIT5” by pressing  or  key, as is shown in the following figure

| BIT PARAMETER                         |          |     |          | 00000 N00000  |          |
|---------------------------------------|----------|-----|----------|---------------|----------|
| NO.                                   | DATA     | NO. | DATA     | NO.           | DATA     |
| 001                                   | 00000000 | 009 | 00011111 | 017           | 00101000 |
| 002                                   | 00000010 | 010 | 00011111 | 018           | 00000000 |
| 003                                   | 00000000 | 011 | 00000000 | 019           | 10000000 |
| 004                                   | 01000000 | 012 | 00010011 | 020           | 00000000 |
| 005                                   | 00010001 | 013 | 10000011 | 021           | 00000000 |
| 006                                   | 00000000 | 014 | 00011111 | 022           | 00000000 |
| 007                                   | 00000000 | 015 | 10000000 | 023           | 00000000 |
| 008                                   | 00011111 | 016 | 00000000 | 024           | 00000000 |
| *** RDRN DECI *** PROD *** *** SCW    |          |     |          |               |          |
| bit5:1/0:DEC signal is low/high level |          |     |          |               |          |
| NO. 004                               |          |     |          |               |          |
| MDI                                   |          |     |          | S0000 T00 H00 |          |

Key in “1” to finish the alteration


| BIT PARAMETER                         |          |     |          | 00000 N00000  |          |
|---------------------------------------|----------|-----|----------|---------------|----------|
| NO.                                   | DATA     | NO. | DATA     | NO.           | DATA     |
| 001                                   | 00000000 | 009 | 00011111 | 017           | 00101000 |
| 002                                   | 00000010 | 010 | 00011111 | 018           | 00000000 |
| 003                                   | 00000000 | 011 | 00000000 | 019           | 10000000 |
| 004                                   | 01000000 | 012 | 00010011 | 020           | 00000000 |
| 005                                   | 00010001 | 013 | 10000011 | 021           | 00000000 |
| 006                                   | 00000000 | 014 | 00011111 | 022           | 00000000 |
| 007                                   | 00000000 | 015 | 10000000 | 023           | 00000000 |
| 008                                   | 00011111 | 016 | 00000000 | 024           | 00000000 |
| *** RDRN DECI *** PROD *** *** SCW    |          |     |          |               |          |
| bit5:1/0:DEC signal is low/high level |          |     |          |               |          |
| NO. 004                               |          |     |          |               |          |
| MDI                                   |          |     |          | S0000 T00 H00 |          |

### Alteration of the data parameter, screw-pitch data

#### 1 Data parameter alteration

- 1) Turn on the parameter switch;
- 2) Enter the MDI mode
- 3) Move the cursor to the No. of the parameter to be set
- 4) Key in the new parameter value



- 5) Press  key, the value is entered and displayed
- 6) After all parameters setting is finished, the PARM SWT needs to be set for OFF for security

Example 1: to set the data parameter No.022 to 4000.

Move the cursor to “No.022” by the steps above, key in “4000” by sequence in the cue line, as is shown in the following figure;

| DATA PARAMETER                            |      |     |      | 00000 N00000  |      |
|---|------|-----|------|---------------|------|
| NO.                                       | DATA | NO. | DATA | NO.           | DATA |
| 049                                       | 1    | 057 | 1    | 065           | 100  |
| 050                                       | 1    | 058 | 1    | 066           | 100  |
| 051                                       | 1    | 059 | 7600 | 067           | 100  |
| 052                                       | 1    | 060 | 7600 | 068           | 100  |
| 053                                       | 1    | 061 | 7600 | 069           | 400  |
| 054                                       | 1    | 062 | 7600 | 070           | 8000 |
| 055                                       | 1    | 063 | 7600 | 071           | 50   |
| 056                                       | 1    | 064 | 100  | 072           | 100  |
| Max. speed of rapid locating in X(mm/min) |      |     |      |               |      |
| NO. 059 4000                              |      |     |      |               |      |
| MDI                                       |      |     |      | S0000 T00 H00 |      |



Press  key to finish the alteration. The page is shown as following

| DATA PARAMETER                            |      |     |      | 00000 N00000  |      |
|---|------|-----|------|---------------|------|
| NO.                                       | DATA | NO. | DATA | NO.           | DATA |
| 049                                       | 1    | 057 | 1    | 065           | 100  |
| 050                                       | 1    | 058 | 1    | 066           | 100  |
| 051                                       | 1    | 059 | 4000 | 067           | 100  |
| 052                                       | 1    | 060 | 7600 | 068           | 100  |
| 053                                       | 1    | 061 | 7600 | 069           | 400  |
| 054                                       | 1    | 062 | 7600 | 070           | 8000 |
| 055                                       | 1    | 063 | 7600 | 071           | 50   |
| 056                                       | 1    | 064 | 100  | 072           | 100  |
| Max. speed of rapid locating in X(mm/min) |      |     |      |               |      |
| NO. 059                                   |      |     |      |               |      |
| MDI                                       |      |     |      | S0000 T00 H00 |      |

Example 2: to set the X axis value of the screw-pitch data No.000 to 12, Z axis value of that to 30

Move the cursor to screw-pitch data No.000 by the steps above, key in “X12” by sequence in the cue line, as is shown in the following figure;

| SCREW-PITCH PARAMETER |   |   |   |   |     |   |   |   |   | 00000 N00000  |  |
|-----------------------|---|---|---|---|-----|---|---|---|---|---------------|--|
| NO.                   | X | Y | Z | C | NO. | X | Y | Z | C |               |  |
| 000                   | 0 | 0 | 0 | 0 | 008 | 0 | 0 | 0 | 0 |               |  |
| 001                   | 0 | 0 | 0 | 0 | 009 | 0 | 0 | 0 | 0 |               |  |
| 002                   | 0 | 0 | 0 | 0 | 010 | 0 | 0 | 0 | 0 |               |  |
| 003                   | 0 | 0 | 0 | 0 | 011 | 0 | 0 | 0 | 0 |               |  |
| 004                   | 0 | 0 | 0 | 0 | 012 | 0 | 0 | 0 | 0 |               |  |
| 005                   | 0 | 0 | 0 | 0 | 013 | 0 | 0 | 0 | 0 |               |  |
| 006                   | 0 | 0 | 0 | 0 | 014 | 0 | 0 | 0 | 0 |               |  |
| 007                   | 0 | 0 | 0 | 0 | 015 | 0 | 0 | 0 | 0 |               |  |
| UNIT:0.001 (mm)       |   |   |   |   |     |   |   |   |   |               |  |
| NO. 000 X 12_         |   |   |   |   |     |   |   |   |   |               |  |
| MDI                   |   |   |   |   |     |   |   |   |   | S0000 T00 H00 |  |

DATA  
INPUT

Pres key to finish the alteration. The page is shown as following:

| SCREW-PITCH PARAMETER |    |   |   |   |     |   |   |   |   | 00000 N00000  |  |
|-----------------------|----|---|---|---|-----|---|---|---|---|---------------|--|
| NO.                   | X  | Y | Z | C | NO. | X | Y | Z | C |               |  |
| 000                   | 12 | 0 | 0 | 0 | 008 | 0 | 0 | 0 | 0 |               |  |
| 001                   | 0  | 0 | 0 | 0 | 009 | 0 | 0 | 0 | 0 |               |  |
| 002                   | 0  | 0 | 0 | 0 | 010 | 0 | 0 | 0 | 0 |               |  |
| 003                   | 0  | 0 | 0 | 0 | 011 | 0 | 0 | 0 | 0 |               |  |
| 004                   | 0  | 0 | 0 | 0 | 012 | 0 | 0 | 0 | 0 |               |  |
| 005                   | 0  | 0 | 0 | 0 | 013 | 0 | 0 | 0 | 0 |               |  |
| 006                   | 0  | 0 | 0 | 0 | 014 | 0 | 0 | 0 | 0 |               |  |
| 007                   | 0  | 0 | 0 | 0 | 015 | 0 | 0 | 0 | 0 |               |  |
| UNIT:0.001 (mm)       |    |   |   |   |     |   |   |   |   |               |  |
| NO. 000               |    |   |   |   |     |   |   |   |   |               |  |
| MDI                   |    |   |   |   |     |   |   |   |   | S0000 T00 H00 |  |

DATA  
INPUT

The same as above, key in “Z30”by sequence in the cue line, press key to finish the alteration. The page is as following:

| SCREW-PITCH PARAMETER |    |   |    |   | 00000 N00000 |   |   |   |   |
|-----------------------|----|---|----|---|--------------|---|---|---|---|
| NO.                   | X  | Y | Z  | C | NO.          | X | Y | Z | C |
| 000                   | 12 | 0 | 30 | 0 | 008          | 0 | 0 | 0 | 0 |
| 001                   | 0  | 0 | 0  | 0 | 009          | 0 | 0 | 0 | 0 |
| 002                   | 0  | 0 | 0  | 0 | 010          | 0 | 0 | 0 | 0 |
| 003                   | 0  | 0 | 0  | 0 | 011          | 0 | 0 | 0 | 0 |
| 004                   | 0  | 0 | 0  | 0 | 012          | 0 | 0 | 0 | 0 |
| 005                   | 0  | 0 | 0  | 0 | 013          | 0 | 0 | 0 | 0 |
| 006                   | 0  | 0 | 0  | 0 | 014          | 0 | 0 | 0 | 0 |
| 007                   | 0  | 0 | 0  | 0 | 015          | 0 | 0 | 0 | 0 |

UNIT:0.001 (mm)  
NO. 000  
MDI

S0000 T00 H00

## 9.2 The Password Setting and Alteration

To protect the part programs, CNC parameters from malignant alteration, this GSK980MD provides an authority setting function that is graded for 4 levels. By decending sequence, they are machine builder (2<sup>nd</sup>) level, equipment management (3<sup>rd</sup>) level, technician (4<sup>th</sup>) level, machining operation (5<sup>th</sup>) level

- 2<sup>n</sup> level: the CNC bit parameter, data parameter, screw-pitch data, tool offset data, part program edit, PLC ladder transmission etc. are allowed
- 3<sup>rd</sup> level: initial password 12345, the CNC bit parameter, data parameter, tool offset data, part program edit operations are allowed;
- 4<sup>t</sup> level: initial password 1234, tool offset data (for tool setting), macro variables, part program edit operations are allowed; but the CNC bit parameter, data parameter, screw-pitch data operations are unallowed.
- 5<sup>th</sup> level: no password. Only the machine panel operation is allowed, and the operations of part program edit and selection, the alteration operations of CNC bit parameter, data parameter, screw-pitch data, tool offset data are unallowed

| AUTH. OPERATION                   |  | 00000 N00000  |         |
|-----------------------------------|--|---------------|---------|
| CURRENT LEVEL: 3                  |  | Backup PAR.   | (User)) |
| SET LOWER LEVEL                   |  | Resume PAR.   | (User)) |
| ▶ INPUT PASSWORD: _____           |  | Resume PAR. 1 | (Test)  |
| UPDATE PASS. : _____              |  | Resume PAR. 2 | (Step)  |
|                                   |  | Resume PAR. 3 | (Servo) |
| Modify parameter and edit program |  |               |         |
| MDI                               |  | S0000 T00 H00 |         |

After entering the authority setting page, the cursor locates at the “INPUT PASSWORD:”line. It may press the





or



key to move the cursor to the corresponding item.


- a) Press key once, the cursor shifts a line upward. If the current cursor locates at the “SET LOWER LEVEL”line (1<sup>st</sup> line) , press key, the cursor shifts to the “UPDATE PASS:”line (end line)



- b) Press  key once, the cursor shifts a line downward. If the current cursor locates at the end line, by pressing  key once, the cursor moves to the 1st line.

### 9.2.1 Entry of the operation level

- 1 After entering the PASSWORD SETTING page, move the cursor to the “INPUT PASSWORD:”line;
- 2 Key in the password (an “\*”sign added each time inputting a character)


- 3 Press  key to finish the inputting, and it will enter the corresponding password level.

**Note** The length of this GSK980MD system password corresponds to the operation level, which can't be added or decreased by user at will.

| Operation | Password length | Initial |
|-----------|-----------------|---------|
| 3rd       | 5 bits          | 12345   |
| 4th       | 4 bits          | 1234    |
| 5th       | No              | No      |

Example: The current CNC level is 4<sup>th</sup> level, as the following page shows. The 3<sup>rd</sup> level password of CNC is 12345, please alter the current level to 3<sup>rd</sup> level.

|   |   |               |
|---|---|---------------|
| AUTH. OPERATION   |   | 00000 N00000  |
| <p>CURRENT LEVEL: 4</p> <p>SET LOWER LEVEL</p> <p>► INPUT PASSWORD:*****</p> <p>UPDATE PASS. :_____</p> | <p>Backup PAR. (User))</p> <p>Resume PAR. (User))</p> <p>Resume PAR.1 (Test)</p> <p>Resume PAR.2 (Step)</p> <p>Resume PAR.3 (Servo)</p> |               |
| Can edit prog,input macro var&offset  |   |               |
| MDI   |   | S0000 T00 H00 |

Move the cursor to the “INPUT PASSWORD:”line, key in 12345, then press the  key, the CNC prompts “Modify parameter and edit program”, “Password passed”, and the current level is the 3<sup>rd</sup> level. The page is shown as following:

| AUTH. OPERATION                   |               | 00000 N00000  |  |
|-----------------------------------|---------------|---------------|--|
| CURRENT LEVEL: 3                  | Backup PAR.   | (User))       |  |
| SET LOWER LEVEL                   | Resume PAR.   | (User))       |  |
| ▶ INPUT PASSWORD: _____           | Resume PAR. 1 | (Test)        |  |
| UPDATE PASS. : _____              | Resume PAR. 2 | (Step)        |  |
|                                   | Resume PAR. 3 | (Servo)       |  |
| Modify parameter and edit program |               |               |  |
| MDI                               | IMAGE STORED  | S0000 T00 H00 |  |


**Note** When current operation authority is lower than or equal to the 3<sup>rd</sup> level (3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup> level) the password level is not changed if repower the CNC system. If previous level is higher than the 3<sup>rd</sup> level (0, 1<sup>st</sup>, or 2<sup>nd</sup> level), it defaults the 3<sup>rd</sup> level.

### 10.2.2 Alteration of the password

Steps for password alteration:

- 1 After entering the PASSWORD SETTING page, enter the password by the methods in Section 10.3.2;
- 2 Move the cursor to the "ALTER PASSWORD:" line;




- 3 Key in the new password, and press  key
- 4 The CNC system prompts "PLEASE INPUT USER PASSWORD AGAIN", the page is shown as

following:

| AUTH. OPERATION                   |               | 00000 N00000  |  |
|-----------------------------------|---------------|---------------|--|
| CURRENT LEVEL: 3                  | Backup PAR.   | (User))       |  |
| SET LOWER LEVEL                   | Resume PAR.   | (User))       |  |
| ▶ INPUT PASSWORD: _____           | Resume PAR. 1 | (Test)        |  |
| UPDATE PASS. : _____              | Resume PAR. 2 | (Step)        |  |
|                                   | Resume PAR. 3 | (Servo)       |  |
| Modify parameter and edit program |               |               |  |
| MDI                               | IMAGE STORED  | S0000 T00 H00 |  |



- 5 After reinputting the password, press  key, if the two passwords input are identical, CNC prompts "PASSWORD UPDATED.". So the password alteration is successful.

|                                   |  |               |         |
|-----------------------------------|--|---------------|---------|
| AUTH. OPERATION                   |  | O0000 N00000  |         |
| CURRENT LEVEL: 3                  |  | Backup PAR.   | (User)) |
| SET LOWER LEVEL                   |  | Resume PAR.   | (User)) |
| INPUT PASSWORD:_____              |  | Resume PAR. 1 | (Test)  |
| ▶ UPDATE PASS. :_____             |  | Resume PAR. 2 | (Step)  |
| PASSWORD UPDATED.                 |  | Resume PAR. 3 | (Servo) |
| Modify parameter and edit program |  |               |         |
| MDI                               |  | S0000 T00 H00 |         |

6 If the two passwords input are not identical, CNC prompts “PASSWORD CHECKOUT ERROR.”, the page is as following:

|                                   |  |               |         |
|-----------------------------------|--|---------------|---------|
| AUTH. OPERATION                   |  | O0000 N00000  |         |
| CURRENT LEVEL: 3                  |  | Backup PAR.   | (User)) |
| SET LOWER LEVEL                   |  | Resume PAR.   | (User)) |
| INPUT PASSWORD:_____              |  | Resume PAR. 1 | (Test)  |
| ▶ UPDATE PASS. :_____             |  | Resume PAR. 2 | (Step)  |
| PASSWORD CHECKOUT ERROR.          |  | Resume PAR. 3 | (Servo) |
| Modify parameter and edit program |  |               |         |
| MDI                               |  | S0000 T00 H00 |         |

### 9.2.3 Lower level set

The demotion of the operation level is used to enter a lower level from a higher level, the steps are as follows:

- 1 After entering the PASSWORD SETTING page, key in the password by the method in Section 10.3.2
- 2 Move the cursor to the“SET LOWER LEVEL”line, if the current CNC operation is the 3<sup>rd</sup> level, the page is as following:

|                                   |  |               |         |
|-----------------------------------|--|---------------|---------|
| AUTH. OPERATION                   |  | O0000 N00000  |         |
| CURRENT LEVEL: 3                  |  | Backup PAR.   | (User)) |
| ▶ SET LOWER LEVEL                 |  | Resume PAR.   | (User)) |
| INPUT PASSWORD:_____              |  | Resume PAR. 1 | (Test)  |
| UPDATE PASS. :_____               |  | Resume PAR. 2 | (Step)  |
|                                   |  | Resume PAR. 3 | (Servo) |
| Modify parameter and edit program |  |               |         |
| MDI                               |  | S0000 T00 H00 |         |




- 3 Press  key, the CNC prompts “CURRENT LEVEL TO 4, MAKE SURE? ”;

the page is as following

|                                   |  |                       |  |
|-----------------------------------|--|-----------------------|--|
| AUTH. OPERATION                   |  | 00000 N00000          |  |
| CURRENT LEVEL: 3                  |  | Backup PAR. (User))   |  |
| ▶ SET LOWER LEVEL                 |  | Resume PAR. (User))   |  |
| INPUT PASSWORD: _____             |  | Resume PAR. 1 (Test)  |  |
| UPDATE PASS. : _____              |  | Resume PAR. 2 (Step)  |  |
| CURRENT LEVEL TO4, MAKE SURE?     |  | Resume PAR. 3 (Servo) |  |
| Modify parameter and edit program |  |                       |  |
| MDI                               |  | S0000 T00 H00         |  |



- 4 Press  key again, if the demotion is successful, the page is as following

|                                       |  |                       |  |
|---------------------------------------|--|-----------------------|--|
| AUTH. OPERATION                       |  | 00000 N00000          |  |
| CURRENT LEVEL: 4                      |  | Backup PAR. (User))   |  |
| ▶ SET LOWER LEVEL                     |  | Resume PAR. (User))   |  |
| INPUT PASSWORD: _____                 |  | Resume PAR. 1 (Test)  |  |
| UPDATE PASS. : _____                  |  | Resume PAR. 2 (Step)  |  |
|                                       |  | Resume PAR. 3 (Servo) |  |
| Can edit prog, input macro var&offset |  |                       |  |
| MDI                                   |  | S0000 T00 H00         |  |





**Note** If the current level is the 5<sup>th</sup> level, the demotion operation is unallowed.



## 9.3 Data Restore and Backup

The user data (such as bit parameter, data parameter, tool offset and screw-pitch data) can be backup (saved) and restored (read) in this GSK980MD system. It doesn't affect the part programs stored in the CNC system while backuping and restoring these data. The backup page is shown as following:

|   |  |               |
|---|--|---------------|
| DATA BACKUP   |  | 00000 N00000  |
| <p>CURRENT LEVEL: 3</p> <p>SET LOWER LEVEL</p> <p>INPUT PASSWORD: _____</p> <p>UPDATE PASS. : _____</p> | <p>► Backup PAR. (User)</p> <p>Resume PAR. (User)</p> <p>Resume PAR. 1 (Test)</p> <p>Resume PAR. 2 (Step)</p> <p>Resume PAR. 3 (Servo)</p> |               |
| PRESS [IN]+[P] TO CONFIRM (POWER ON)  |  |               |
| MDI   |  | S0000 T00 H00 |

1. Turn on the parameter switch

2. Press  key to enter the MDI mode, then press  key ( or  key if necessary) to enter Backup PAR. page;
3. Move the cursor to the desired item;

4. Press  ,  keys together.

**Note 1** Don't cut off the power in the backup and restore operation of the data, and no other operation is suggested to be performed before the aforesaid operation is prompted to be finished.

**Note 2** The backup and restore data are different depending on the current password level: the 3<sup>rd</sup>, 4<sup>th</sup> , 5<sup>th</sup> password level user can performed the backup and restore operation of the bit



parameter, data parameter but the screw-pitch parameter; the 2<sup>nd</sup> password level user can perform that of the bit parameter, data parameter and screw-pitch parameter.

Example: to restore the CNC parameter to servo standard parameter, the steps are as follows:

Turn on the parameter switch, and enter the Backup PAR. page of MDI mode, move the cursor to "Resume Default PAR. 2 (Step)", as following figure shows:

|   |  |               |
|---|--|---------------|
| DATA BACKUP   |  | 00000 N00000  |
| <p>CURRENT LEVEL: 3</p> <p>SET LOWER LEVEL</p> <p>INPUT PASSWORD: _____</p> <p>UPDATE PASS. : _____</p> | <p>Backup PAR. (User)</p> <p>Resume PAR. (User)</p> <p>Resume PAR. 1 (Test)</p> <p>Resume PAR. 2 (Step)</p> <p>► Resume PAR. 3 (Servo)</p> |               |
| SUCCEEDING IN RECOVERING SERVO PAR (POWER ON)   |  |               |
| MDI   |  | S0000 T00 H00 |



Press   keys together, the CNC system prompts “SERVO PAR BACKUP RECOVERED(POWER ON)”

CHAPTER 10 ADVANCED OPERATION

Advanced operation page of GSK980MDa is showed as following. You can 启动 advaced operation page only when USB disc is inserted in CNC. In this page, you can communicate between CNC and USB , upgrade system and ect operation。 Its transfer speed is much faster than traditional seris communication. Besides USB disc is more comfortable to carry and use,which support 热插拔，即插即用。启动

| ADVANCED OPERATION                         |   | 00000 N00000                     |                                 |
|--|---|----------------------------------|---------------------------------|
| <b>BACKUP</b>                              |   |                                  |                                 |
| <input type="checkbox"/> ALL               | <input type="checkbox"/> PAR                      | <input type="checkbox"/> PROGRAM | <input type="checkbox"/> LADDER |
| <input type="checkbox"/> EXECUTE           |   |                                  |                                 |
| <b>RECOVER</b>                             |   |                                  |                                 |
| <input type="checkbox"/> ALL               | <input type="checkbox"/> PAR                      | <input type="checkbox"/> PROGRAM | <input type="checkbox"/> LADDER |
| <b>SOFTWARE UPGRADE</b>                    |   |                                  |                                 |
| <input type="checkbox"/> UPGRADE CNC SOFT. | <input type="checkbox"/> resUPGRADE BOOT SOFTWARE |                                  |                                 |
| <input type="checkbox"/> FORMAT            |   |                                  |                                 |
| NOTE:BACKUP PAR, PROGRAM, PLC TO S.        |   |                                  |                                 |
| EDIT                                       |   | S0000 T00 H00                    |                                 |

10.1 operation routine

980MDa 对 USB 高级操作，都以系统自带的编号，在 U 盘上搜索和建立目标目录。So advanced operation list in U disc is different according to different system code.

For example: code of system A is CT1010MDa， advanced operation list in U disc is showed as following:



Code of system B is CT2138MDa， advanced operation list in U disc is showed as following:



If there is no system code, advanced operation list iin U disc is showed as following:



**Note:** system code can checked in dignosis mode verion information page.

Following conent is all described as gsk980mda\_backup list routine.

➤ **Routine instruction:**

| 路径文件夹 routine |       | instruction          |
|---------------|-------|----------------------|
| user\         |       | 参数及 PLC 文件备份与恢复的目标位置 |
|               | prog\ | 加工程序文件备份与恢复的目标位置     |

➤ **Document instruction**

|                    | document name       | 扩展名  | note  |
|--------------------|---------------------|------|-------|
| Parameter document | Para1, Para2, Para3 | .par | 区分大小写 |
| Process program    | O0000 ~ O9999       | .CNC | 区分大小写 |
| PLC document       | plc ~ plc7          | .ldx | 区分大小写 |






➤ **Operation authority**


|      |                 |  |
|------|-----------------|--|
| 备份操作 | Parameter       | Higher than 3 grade (including 3 grade) password authority |
|      | Process program | Higher than 3 grade (including 3 grade) password authority |
|      | Ladder          | 3 级以上 (包括 3 级) 密码权限  |
| 恢复操作 | Parameter       | 3 级以上 (包括 3 级) 密码权限  |
|      | Process program | 3 级以上 (包括 3 级) 密码权限  |
|      | ladder          | 2 级以上 (包括 2 级) 密码权限  |


**Note :** 大于等于 9000 号以上的加工程序的操作, 需 2 级以上 (包括 2 级) 密码权限。

## 10.2 operation instruction


➤ **Key instruction**


Target movement: press direction key      to realize target movement.

Chosen menu: if excute operatioin which target is pointing at,press  key.

Cancel menu: if cancel operation which target is pointing at,press  key.

exctue operation: if want to excute pointed operation, press  key.

Confirm operaioin: you should confirm excuting of operationm press  key to confirm operaioin or

press  key to cancel operation。



### ➤ Restore of parame 参数的备份恢复

参数的备份是将当前系统的所有参数状态及数值（其中包括状态参数，数据参数，螺补参数）以文件 Para1.par, Para2.par, Para3.par 的形式复制拷贝至 USB 设备存储器下的 U:\gsk980MDa\_backup\user\ 目录下。如无上述目录或文件，则自动创建；如已存在上述目录或文件，则覆盖已存在的目录和文件。

参数的恢复则是将备份在 USB 设备存储器 U:\gsk980MDa\_backup\user\ 目录下的参数文件复制拷贝回 CNC 系统，以完成系统参数的恢复。移动或修改了上述路径或重命名不符合格式的文件名，将不能完成恢复操作。

**Note: after succeed in downloading parameter, CNC should power on again.**

### ➤ 加工程序的备份恢复

加工程序的备份是将当前系统的所有加工程序，以文件.CNC 的形式备份至 USB 设备存储器下的 U:\gsk980MDa\_backup\user\prog\ 目录下。如无上述目录或文件，则自动创建；如已存在上述目录或文件，则覆盖已存在的目录和文件。

加工程序的恢复则是将备份在 USB 设备存储器 U:\gsk980MDa\_backup\user\prog\ 目录下的所有加工程序文件，复制拷贝回 CNC 系统，以完成加工程序的恢复。移动或修改上述路径或重命名不符合格式的程序名将不能恢复。

### ➤ 梯形图（PLC）的备份恢复

梯形图的备份是将当前系统的所有梯形图文件（.ldx 文件）备份至 USB 设备存储器下的 U:\gsk980MDa\_backup\user\ 目录下。如无上述目录或文件，则自动创建；如已存在上述目录或文件，则覆盖相应目录及文件。

梯形图的恢复则是将备份在 USB 设备存储器 U:\gsk980MDa\_backup\user\ 目录下的所有梯形图文件，复制拷贝回 CNC 系统，以完成梯形图的恢复。修改上述路径或重命名不符合格式的梯形图文件名将不能恢复。

**Note : after succeed in restoring ladder, CNC should power on again.**

## 10.3 Note










- **Special note:** 进行备份时，如果目标路径下已存在所要备份的同名文件及目录，系统将自动覆盖替换。所以，如有文件或目录不想被覆盖替换时，请另行拷贝存放。
- When excuting advanced operation, it is forbidden to do any other operation; Once excuting operation, besides finish this operation and it will not stop.
- 如果备份或恢复的文件较大，可能进行的操作时间较长，这时，请耐心等待。
- If there is any strange situation, please pull out USB disc and try to connect again.

## CHAPTER 11 USB FLASH DISK OPERATION

## 11.1、File list page



















Press  or  key and choose [录入] or [edit] operation mode. Then press 

key to enter [file list] page, which showing file list, as following:

|   |           |               |                         |
|---|-----------|---------------|-------------------------|
| FILE LIST   |           | 00006 N00000  |                         |
| C:/user   |           |               |                         |
|  | 00000.CNC |               |                         |
|  | 00001.CNC |               |                         |
|  | 00002.CNC |               |                         |
|  | 00003.CNC |               |                         |
|  | 00004.CNC |               |                         |
|  | 00005.CNC |               |                         |
|  | 00006.CNC |               |                         |
|  | 00007.CNC |               |                         |
|  | 00008.CNC |               |                         |
| INPUT:  |           | FILE INFO     | 17B 2009-05-07 17:14:21 |
| NOTE:[CHG]:SEEK USB [EOB]:OPEN [←]:RETURN   |           |               |                         |
| EDIT  |           | S0000 T00 H00 |                         |

In edit or 录入 mode, press  to distinguish U disc.

If fail, it shows that “connecting USB disc fail”. If succeed, it shows file list in U disc. As following:

|   |           |   |                          |
|---|-----------|---|--------------------------|
| FILE LIST   |           | 00000 N00000  |                          |
| C:/user   |           | U:/   |                          |
|  | 00000.CNC |  | 00001.CNC                |
|  | 00001.CNC |  | 00002.CNC                |
|  | 00002.CNC |  | 00003.CNC                |
|  | 00003.CNC |  | 00004.CNC                |
|  | 00004.CNC |  | 00005.CNC                |
|  | 00005.CNC |  | 00006.CNC                |
|  | 00006.CNC |  | 00007.CNC                |
|  | 00007.CNC |  | 00008.CNC                |
|  | 00008.CNC |  | 00009.CNC                |
| INPUT:  |           | FILE INFO   | 108B 2009-04-02 09:34:42 |
| NOTE:[CHG]:C/U SHIFT [EOB]:OPEN [OUT]:COPY TO C DISK                                |           |   |                          |
| EDIT  |           | S0000 T00 H00   |                          |

It shows CNC file list in the left side of page and USB disc file list in right side of page. If distinguish U disc fail, there is no any information in right side and it shows 页面下端显示字符输入框、文件属性信息和用户操作提示。

Special note:

- 1、 It only shows currently opened file list information in current file list page.
- 2、 In edit or 录入 mode, you can also distinguish U disc.
- 3、 It is unable to read big Chinese letters.
- 4、 暂时不支持中文长文件名，对长文件名文件只显示前三位汉字+“~1”；

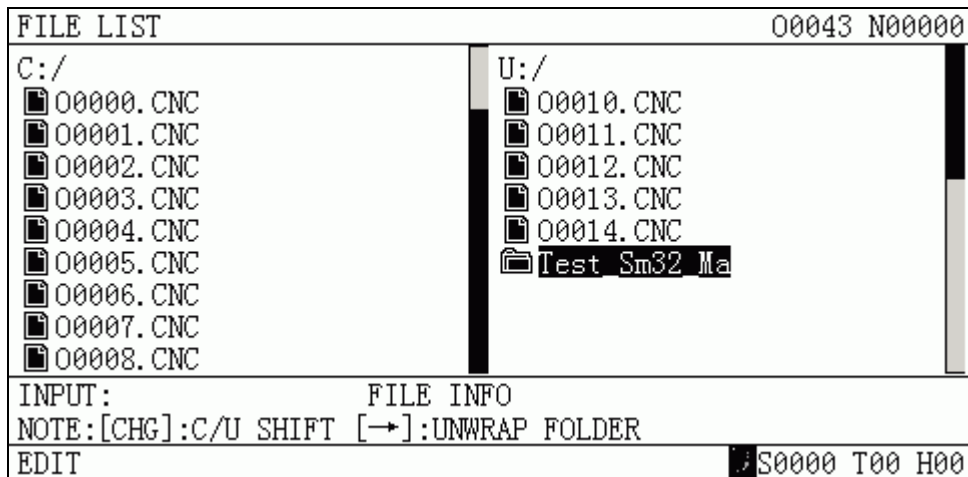
- 5、It can not show document which is not CNC format in C disc and U disc.

Note: CNC format document's name is made up of "O" + "4 位数字" + ".CNC". 组成

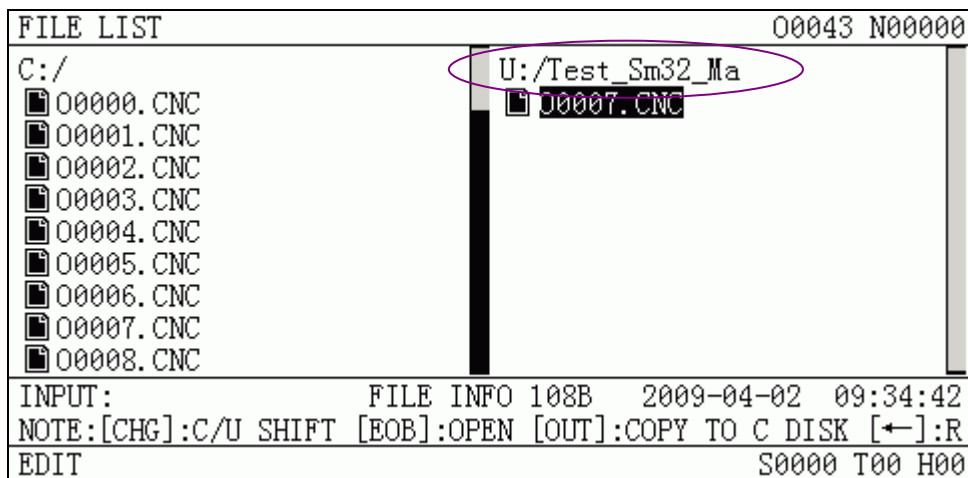
## 11.2、Common document operation function

### 11.2.1 unfold and fold document

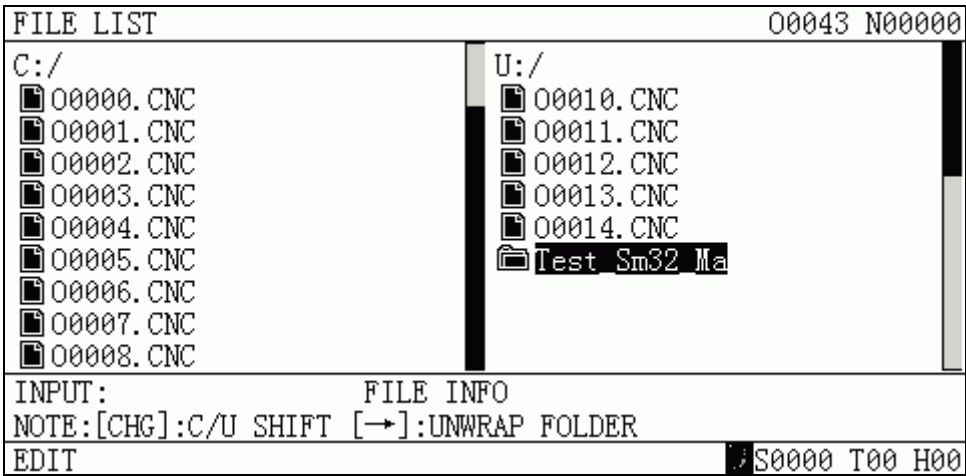
把光标移动到所需打开的文件夹上 move target to document which is going to be opened




Press key to unfold document. File list is showed in the first line (长目录滚动显示)。



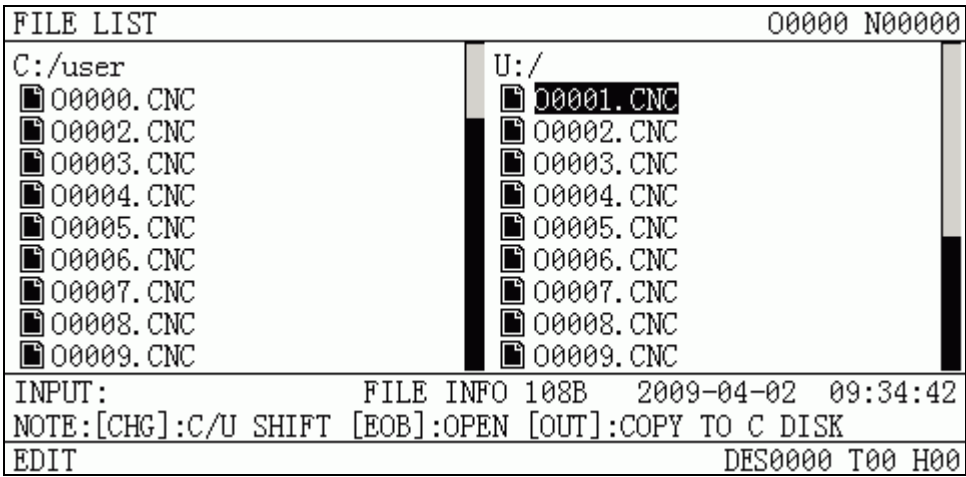
Press key to fold document, return to 返回上一级目录



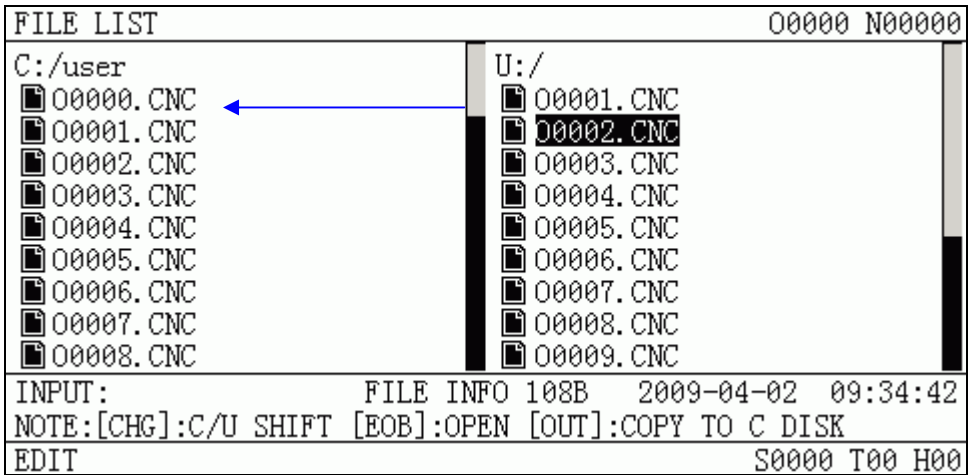
11.2.2 one key to copy document(current file list in C disc↔current file list in U disc)

In “edit” mode, choose CNC format document, press  key to copy document. As following:

① Choose CNC document, press  ;



② 成功复制后，当前目录下，当前光标指向下一个文件；另一则目录立即刷新。



Special note: 5 grade authority can not cope document.

## 11.2.3 searching CNC document

In “edit” and “auto” mode, input program number in 在输入栏输入目标程序号后, press



or



to search for this program.

| FILE LIST  |           | 00000 N00000  |
|--|-----------|---------------|
| C:/user  | U:/       |               |
| 00000.CNC  | 00001.CNC |               |
| 00001.CNC  | 00002.CNC |               |
| 00002.CNC  | 00003.CNC |               |
| 00003.CNC  | 00004.CNC |               |
| 00004.CNC  | 00005.CNC |               |
| 00005.CNC  | 00006.CNC |               |
| 00006.CNC  | 00007.CNC |               |
| 00007.CNC  | 00008.CNC |               |
| 00008.CNC  | 00009.CNC |               |
| INPUT: FILE INFO 17B 2009-05-07 17:14:21                   |           |               |
| NOTE:[CHG]:C/U SHIFT [EOB]:OPEN [OUT]:COPY TO U FLASH [←]: |           |               |
| EDIT   |           | S0000 T00 H00 |

For example: input “O5”, 搜索成功, 光标指向目标程序。若搜索不到该程序, 则在信息提示栏显示 “文件不存在”


| FILE LIST  |           | 00000 N00000  |
|--|-----------|---------------|
| C:/user  | U:/       |               |
| 00005.CNC  | 00001.CNC |               |
| 00006.CNC  | 00002.CNC |               |
| 00007.CNC  | 00003.CNC |               |
| 00008.CNC  | 00004.CNC |               |
| 00009.CNC  | 00005.CNC |               |
| 00010.CNC  | 00006.CNC |               |
| 00011.CNC  | 00007.CNC |               |
| 00012.CNC  | 00008.CNC |               |
| 00013.CNC  | 00009.CNC |               |
| INPUT: FILE INFO 17B 2009-04-09 11:35:46                   |           |               |
| NOTE:[CHG]:C/U SHIFT [EOB]:OPEN [OUT]:COPY TO U FLASH [←]: |           |               |
| EDIT   |           | S0000 T00 H00 |

## 11.2.4 open CNC document

1、In “edit” and “auto” mode, choose CNC format document when there is no program is running.

| FILE LIST  |           | 00006 N00000  |
|--|-----------|---------------|
| C:/user  | U:/       |               |
| 00005.CNC  | 00001.CNC |               |
| 00006.CNC  | 00002.CNC |               |
| 00007.CNC  | 00003.CNC |               |
| 00008.CNC  | 00004.CNC |               |
| 00009.CNC  | 00005.CNC |               |
| 00010.CNC  | 00006.CNC |               |
| 00011.CNC  | 00007.CNC |               |
| 00012.CNC  | 00008.CNC |               |
| 00013.CNC  | 00009.CNC |               |
| INPUT: FILE INFO 104B 2009-04-10 10:15:20            |           |               |
| NOTE:[CHG]:C/U SHIFT [EOB]:OPEN [OUT]:COPY TO C DISK |           |               |
| EDIT   |           | S0000 T00 H00 |



- 2、Press  to open document. When succeed in opeing document, current page is swifted to [program content] page.

| PRG CONTENT   | SEG1 | COL:1 | U:/O0006.CNC  |
|---|------|-------|---------------|
| O0006 (O0006);<br>G54 G90 G0 X0 Y0 Z0;<br>G43 H1;<br>g81 r-2 z-10 f150;<br>G44 H2;<br>Y30;<br>G80;<br>G49;<br>X0 Y0 Z0;<br>M30; |      |       |               |
| EDIT  |      |       | S0000 T00 H00 |

Special note:

- 1、3 grade and lower than 3 grade authority can not open program which number is bigger than 9000.;
- 2、5 grade authority can not open program document.

Note:

- 1、In “ program content “ page, it is forbidden to do any operation on U disc documents., including establish, copy, rename, delete, edit,save and etc. program operation. You can only process and read program in this page.
- 2、Recall subprogram in auto mode, subprogram should in the same grade file list as main program. 在自动模式下调用子程序，应该跟主程序在同级目录内。
- 3、After read U disc document , then pull out U disc. When system alrms “ can not connect to U disc”,



you can insert U disc and press  to test U disc again in MDI mode document file list page. Or




press  and  to clear alarm.

# PART 3 INSTALLATION

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**Chapter 1.Installation layout**

**Chapter 2.Definition &Connection of Interface Signals**

**Chapter3. Parameter**

**Chapter4. Machine Debugging Methods and Teps**

**Chapter 5.Dignosis Message**

**Chapter6.Memorizing      Screw-Pitch      Error      Compensation**

**Function**

## CHAPTER 1 INSTALLATION LAYOUT

### 1.1 GSK980MDa Connection

#### 1.1.1 GSK980MDa back cover interface layout

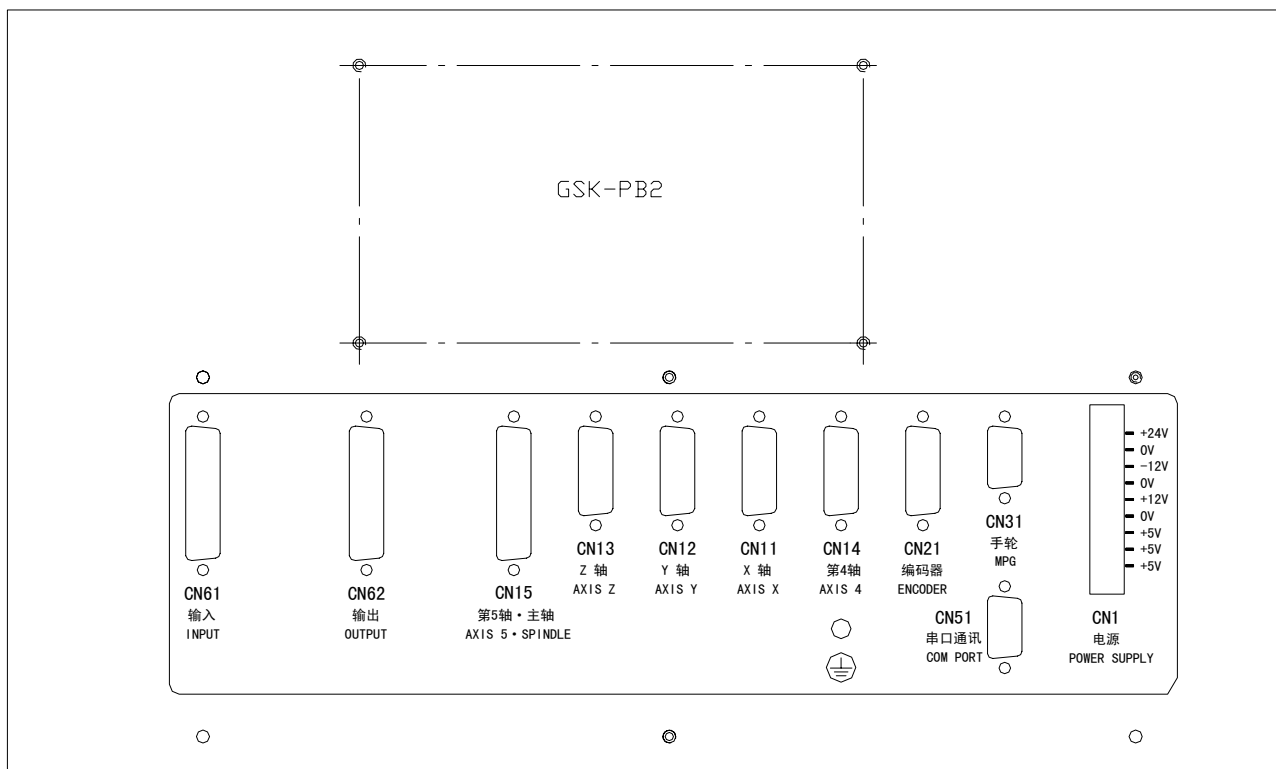


Fig 1-1 GSK980MDa back cover interface layout

#### 1.1.2 Interface explanation

- Power box: GSK-PB2, for +5V, +24V, +12V, -12V, GND power supply
- CN11: X axis, 15-core DB female socket, for connecting X axis driver
- CN12: Y axis, 15-core DB female socket, for connecting Y axis driver
- CN13: Z axis, 15-core DB female socket, for connecting Z axis driver
- CN14: 4th axis, 15-core DB female socket, for connecting 4th axis driver
- CN21: coder, 15-core DB female socket, for connecting Encoder
- CN51: transducer, 9-core DB male socket, for connecting pc RS232 interface
- CN15: 5th axis&spindle port, 25-core DB male socket, for connecting transducer& 5th axis
- CN31: handwheel, 26-core 3 line female socket, for connecting handwheel;
- CN62: output, 44-core 3 lines female socket, for sending the signal of CNC to machine
- CN61: input, 44-core 3 line male socket, for sending the signal of machine to CNC

### 1.2 GSK980MDa Installation

#### 1.2.1 GSK980MDa external dimensions



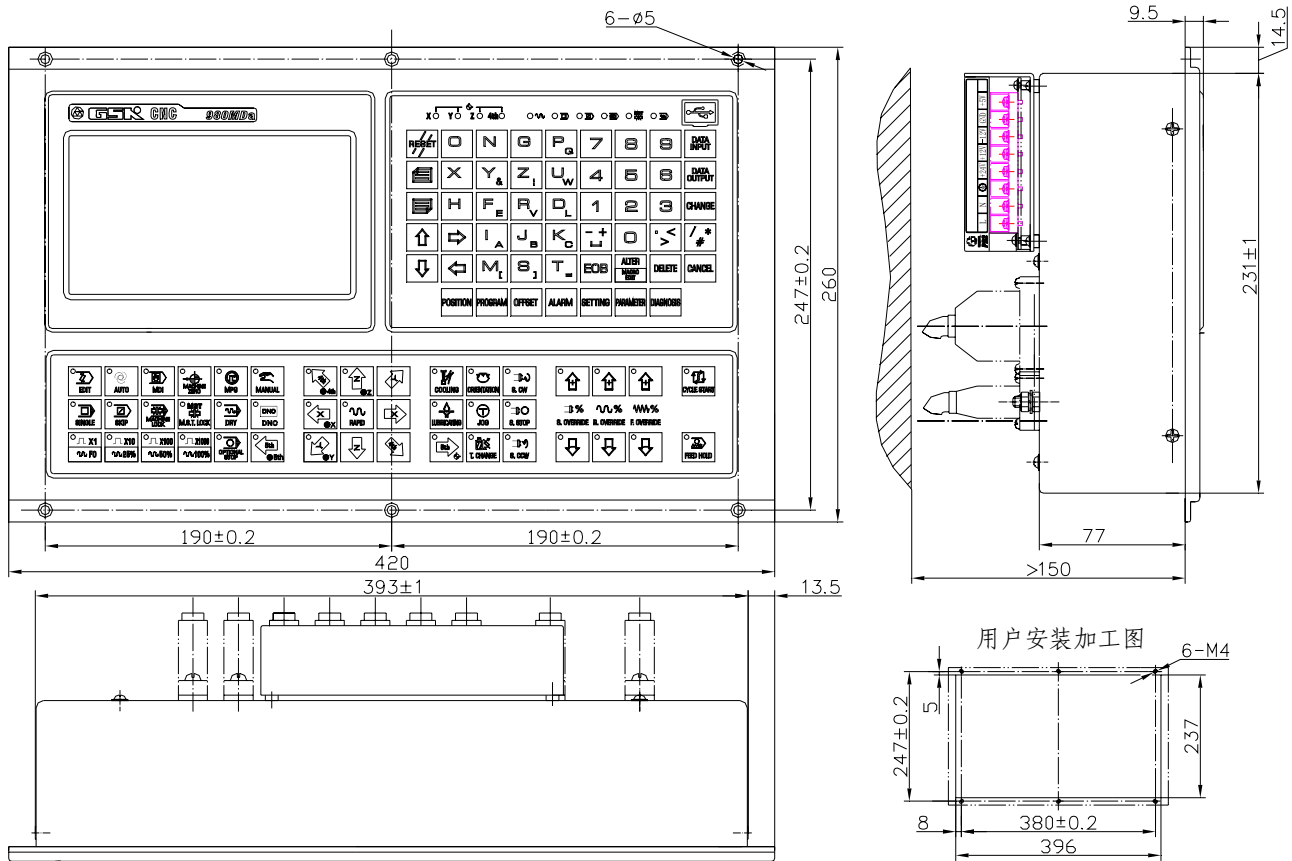


Fig. 1—2 GSK980MDa external dimension

### 1.2.2 Installation conditions of the cabinet

- The dust, cooling liquid and organic resolution should be effectively prevented from entering the cabinet;
- The designed distance between the CNC back cover and the cabinet should be not less than 20cm, the inside and outside temperature difference of the cabinet should be no less than 10°C temperature rises when the cabinet inside temperature rises;
- Fans can be fixed in the cabinet to ventilate it;
- The panel should be installed in a place where the coolant can't splash;
- The external electrical interference should be taken into consideration in cabinet design to prevent it from transferring to CNC system.

### 1.2.3 Protection methods against interference

In order to ensure the CNC stable working, the anti-interference technology such as space electromagnetic radiation shielding, impact current absorbing, power mixed wave filtering are employed in CNC design. And the following measures are necessary during CNC connection:

1. Make CNC far from the interference devices (transducer, AC contactor, static generator, high-pressure generator and powered sectional devices etc.);
2. To supply the CNC via an isolation transformer with the machine grounded, the CNC and driver should
3. To suppress interference: connect parallel RC circuit at both ends of AC coil (Fig. 1-4), RC circuit should approach to inductive loading as close as possible; reversely connect parallel freewheeling diode at both ends of DC coil (Fig. 1-5); connect parallel surge absorber at the ends of AC motor coil (Fig. 1-6);

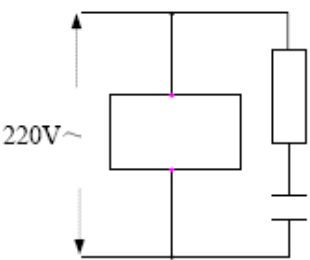


Fig. 1-4

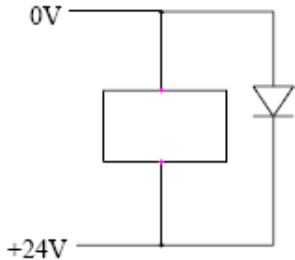


Fig. 1-5

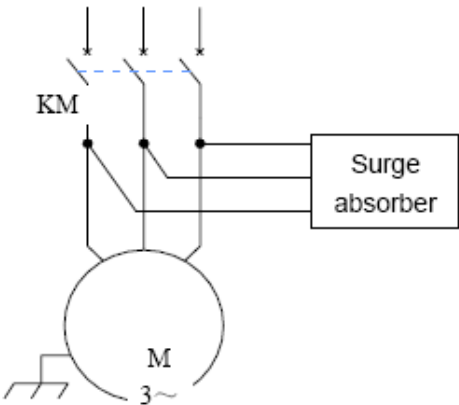


Fig. 1-6

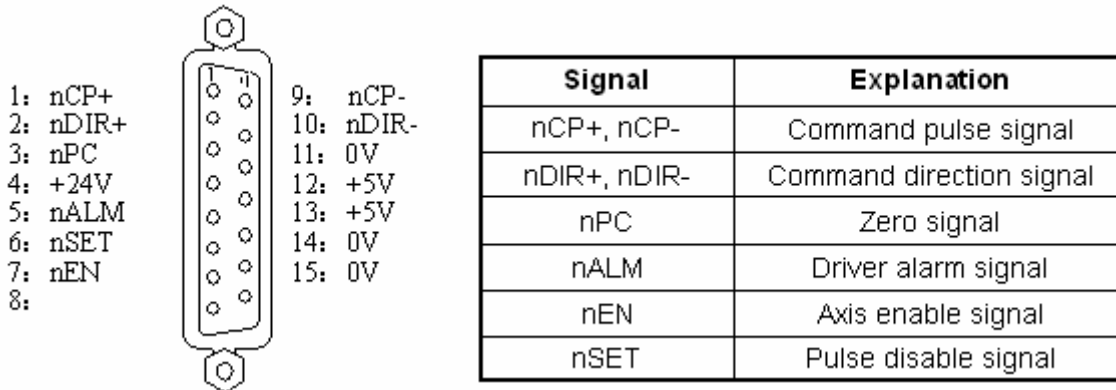
4. To employ with twisted shield cable or shield cable for the leadout cable of CNC, the cable shield tier is grounded by single end at CNC side, signal cable should be as short as possible;
5. In order to decrease the mutual interference between CNC cables or CNC cables with strong-power cables,the wiring should comply to the following principles:

| Group | Cable type                                  | Wiring requirement   |
|-------|---|--|
| A     | AC power line                               | Tie up A group cables with a clearance at least 10cm from that of B, C groups, or shield A group cables from   |
|       | AC  |  |
|       | AC contactor                                |  |
| B     | DC coil (24VDC)                             | Tie up B and A group cables separately or shield B group cables; and the further B group cables are from that of C group, the better it is                             |
|       | DC relay (24VDC)                            |  |
|       | Cables between CNC and strong-power cabinet |  |
|       | Cables between CNC and machine              |  |
| C     | Cables between CNC and servo driver         | Tie up C and A group cables separately, or shield C group cables; and the cable distance between C group and B group is at least 10cm with twisted pair cable applied. |
|       | Position feedback cable                     |  |
|       | Position encoder cable                      |  |
|       | MPG cable                                   |  |
|       | Other cables for shield                     |  |

## CHAPTER 2 DEFINITION&CONNECTION OF INTERFACE SIGNALS

### 2.1 Connection to Driver

#### 2.1.1 Drive interface definition



**Note:** n stands for X, Z, or Y, the same is the following

#### 2.1.2 Command pulse and direction signals

nCP+, nCP- are command pulse signals, nDIR+, nDIR- are command direction signals. These two group signals are both difference output (AM26LS31), the interior circuit for them is shown as Fig. 2-2:

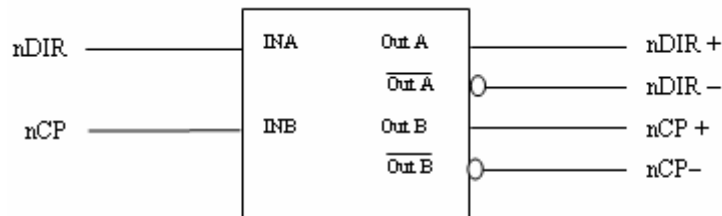


Fig. 2-2 Interior circuit of command pulse and direction signals

#### 2.1.3 Driver alarm signal

The low or high level of the driver alarm level is set by the CNC bit parameter No.009 BIT0~BIT4, whose interior circuit is as Fig. 2-3:

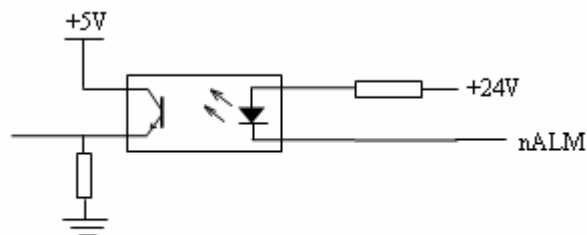


Fig. 2-3 Interior circuit of driver alarm signal

This input circuit requires that the driver transmits signal by the following types in Fig. 2-4:

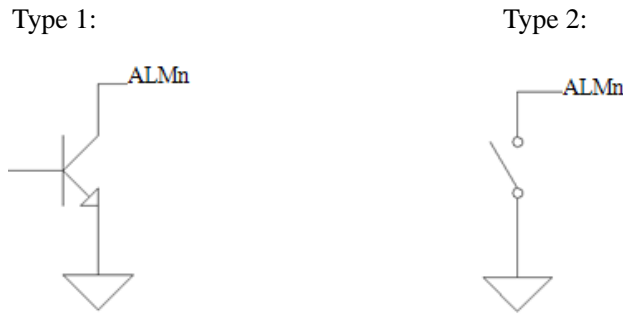


Fig. 2-4 Signal types of driver

### 2.1.4 Axis enable signal ENn

nEN signal output is valid as CNC works normally (nEN signal to 0V); when the driver alarm or emergency alarm occurs, CNC cuts off nEN signal output (nEN signal off 0V). The interior interface circuit is shown as Fig. 2-5:

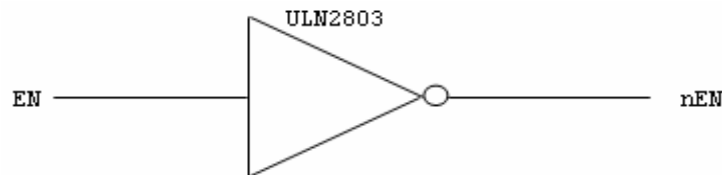


Fig. 2-5 Interior interface circuit for axis enable signal

### 2.1.5 Pulse disable signal SETn

nSET signal is used to control servo input disable which can enhance the anti-disturbance capability between CNC and driver. This signal is at low level if there is pulse output from CNC, high resistance if not. The interior interface circuit of it is shown as Fig. 2-6:

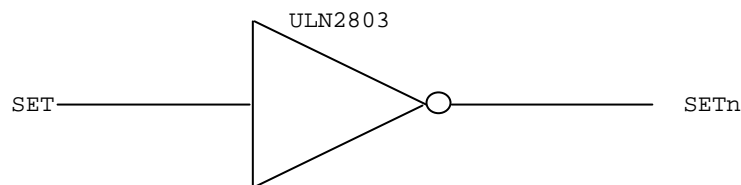


Fig 2-6 Interior interface circuit for pulse disable signal

### 2.1.6 Zero signal nPC

The one-turn or approach switch signal is taken as zero signal for machine zero return. It's interior connection circuit is as Fig.2-7.

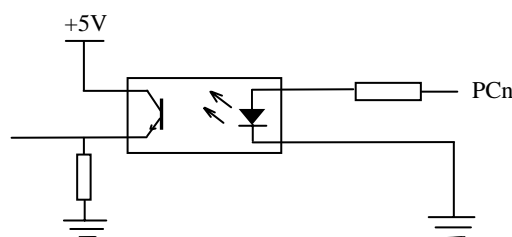


Fig 2-7 Zero signal circuit

**Note: nPC signal uses +24V level.**

a) The connection for NPN Hall elements taken as both deceleration signal and zero signal is as Fig. 2-8:

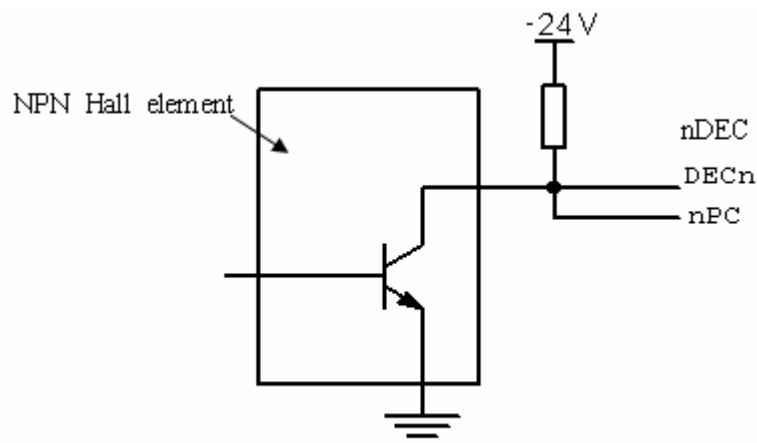


Fig. 2-8 Connection using NPN Hall elements

b) The connection for PNP Hall elements taken as both deceleration signal and zero signal is as Fig. 2-9:

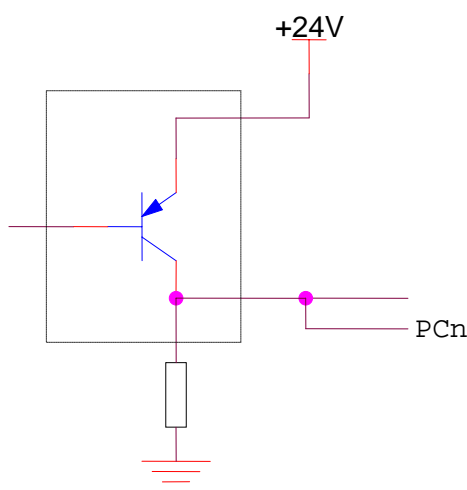
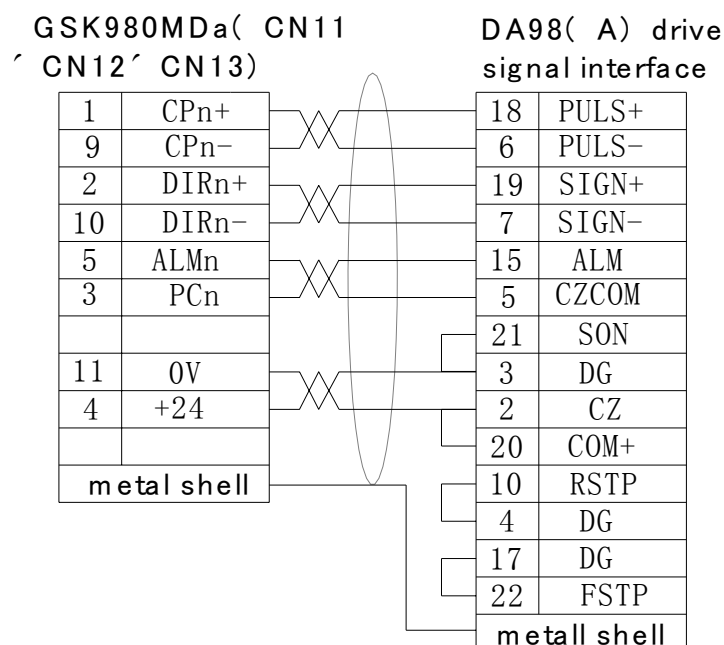


Fig 2-9 Connection using PNP Hall elements

### 2.1.7 Connection to driver

The connection of GSK 980MDa to GSK driver is shown as Fig. 2-10:



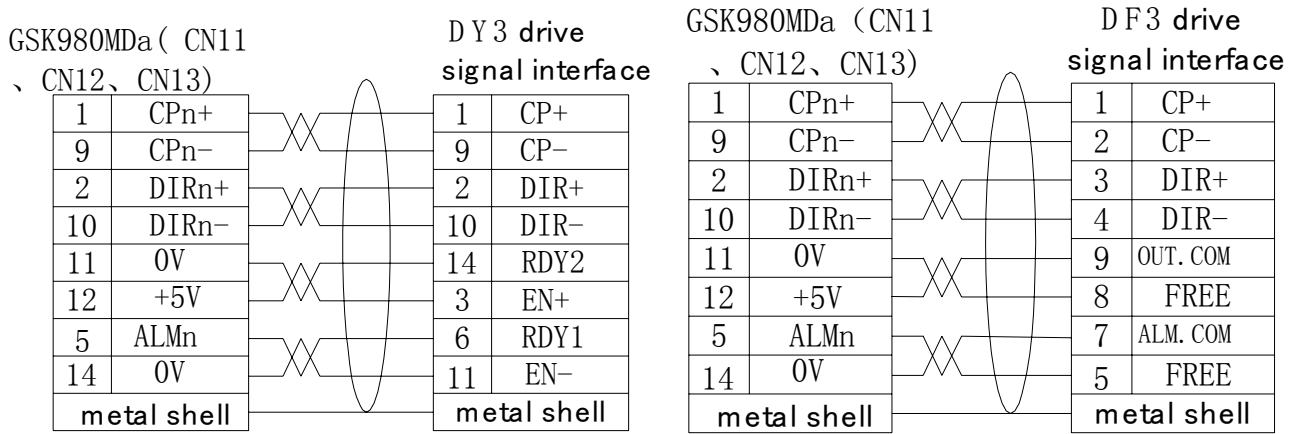
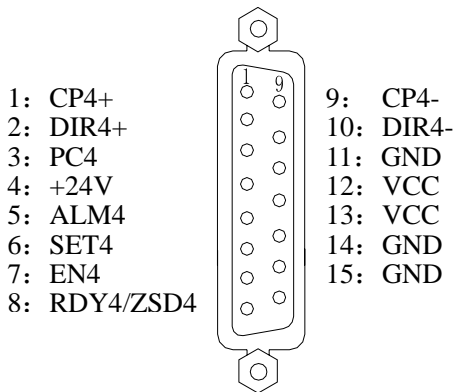


Fig.2-10 Connection of GSK980MDa to a driver

## 2.2 Connection of 4th axis

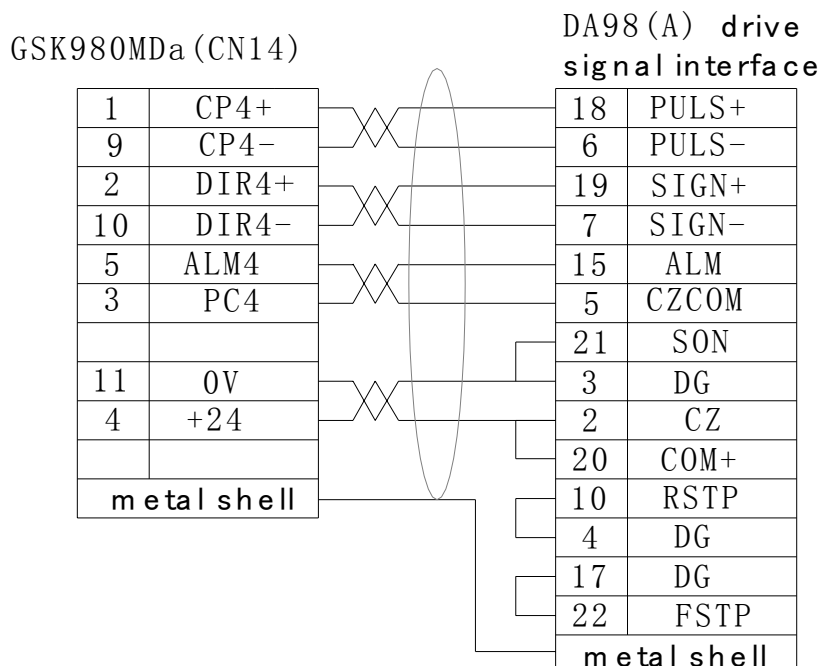
### 2.2.1 4th axis interface definition

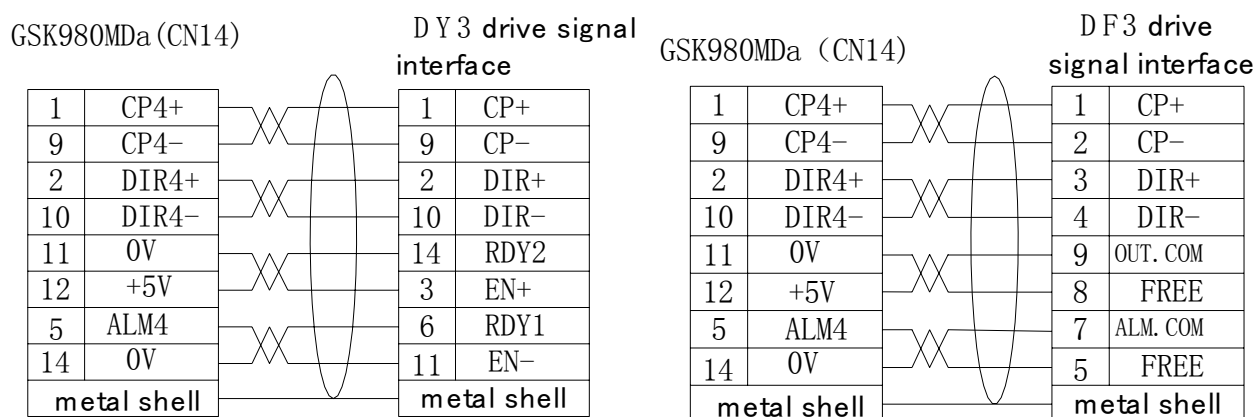


| Signal       | explanation              |
|--------------|--------------------------|
| CP4+、 CP4-   | Command pulse signal     |
| DIR4+、 DIR4- | Command direction signal |
| PC4          | Zero signal              |
| ALM4         | Drive alarm signal       |
| EN4          | Axis enable signal       |
| SET4         | Pulse disable signal     |

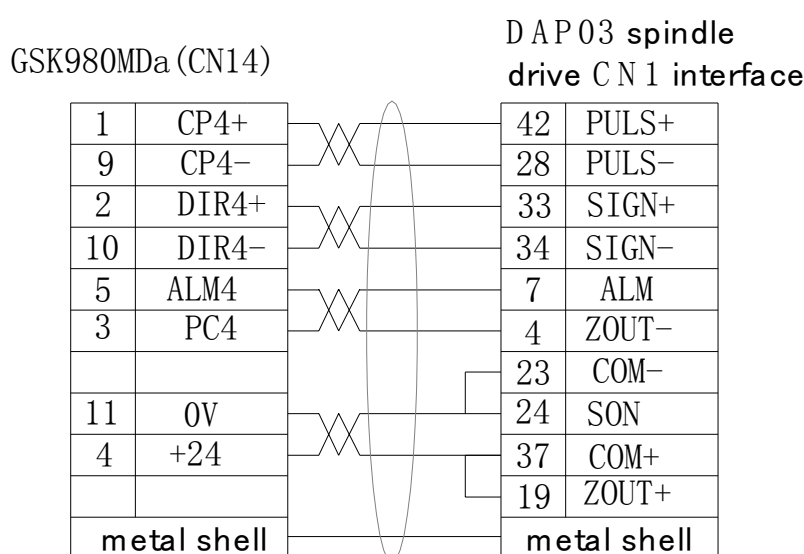
Fig.2-11 Interface CN14 (15-core DB male socket)

### 2.2.2 Linear axis



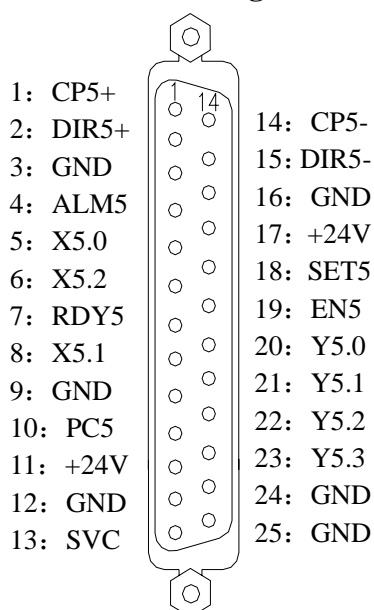
Fig.2-12 Connection of 4<sup>th</sup> axis interface to driver

## 2.2.3 Rotary axis

Fig.2-13 Connection of 4<sup>th</sup> axis interface to spindle driver

## 2.3 Connectiong of spindle port

### 2.3.1 Definition of signal



|              |   |
|--------------|---|
| CP5+, CP5-   | Spindle pulse signal                              |
| DIR5+, DIR5- | Spindle direction signal                          |
| ALM5         | Spindle alarm signal                              |
| RDY5         | Spindle is ready                                  |
| PC5          | Spindle zero signal                               |
| SVC          | Output of voltage                                 |
| SET5         | Spindle disable signal                            |
| EN5          | Spindle enable signal                             |
| X5.0~X5.2    | PLC Address,only For these,Lower voltage is valid |
| Y5.0~Y5.3    | PLC address                                       |

Fig2-14 CN15 Spindle Prot

### 2.3.2 Linear axis

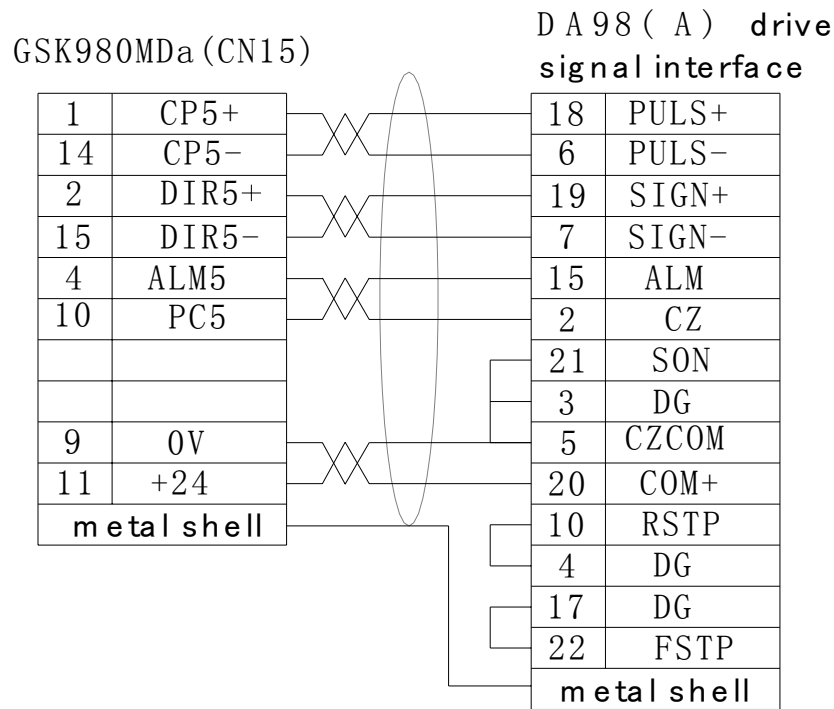


Fig.2-15 Connection of spindle interface to driver

### 2.3.3 Connected with transducer

The connection of GSK980MDa with convertor is as Fig. 2-16:

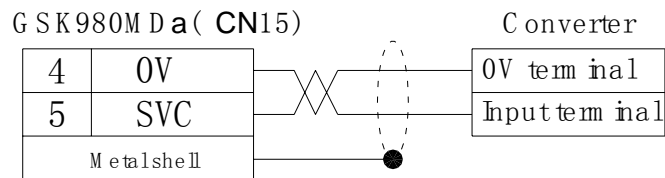


Fig.2-16 Connection of GSK980MDa to convertor

### 2.3.4 Rotary axis

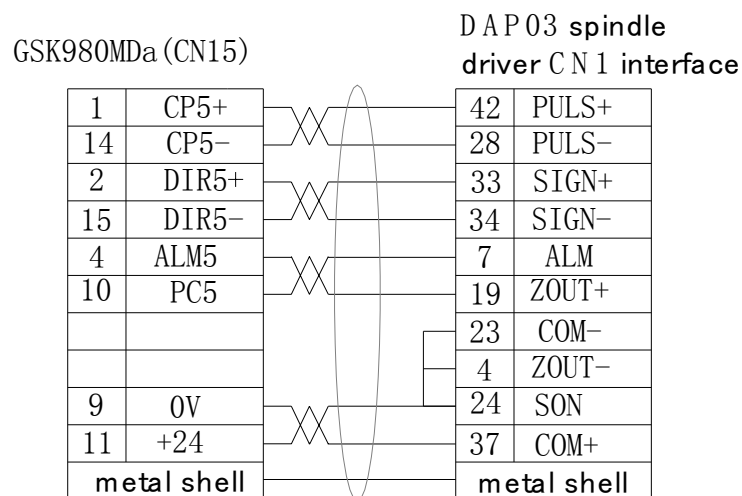


Fig.2-17 Connection of spindle to DAP03



### 2.3.5 “CS” axis

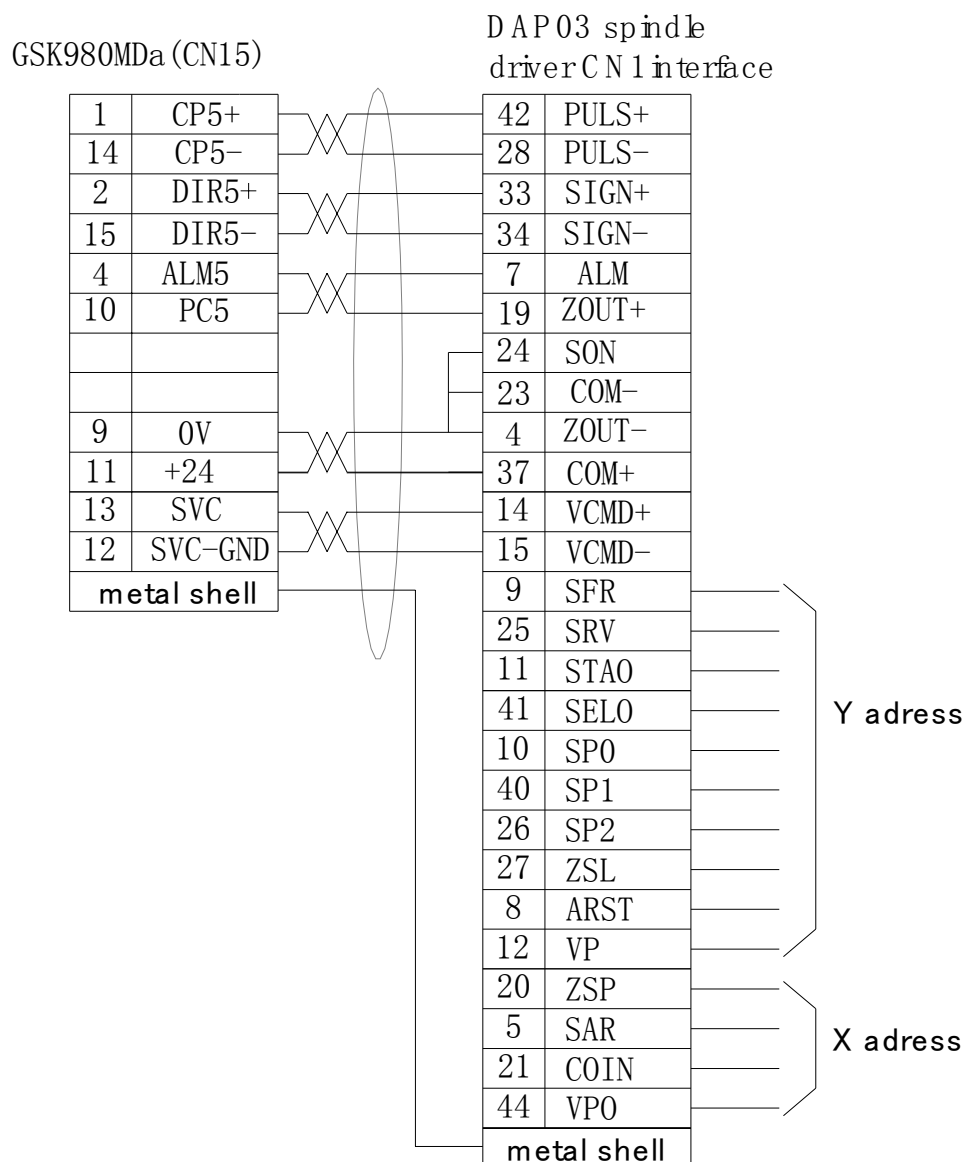


Fig.2-18 Connection of spindle to DAP03

### 2.3.6 SVC Signal explanation

The analog spindle interface SVC can output 0~10V voltage, its interior signal circuit is as Fig. 2-19:

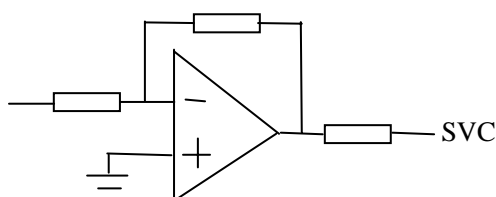


Fig 2-19 SVC Signal circuit

## 2.4 Connection to Spindle Encoder

### 2.4.1 Spindle encoder interface definition

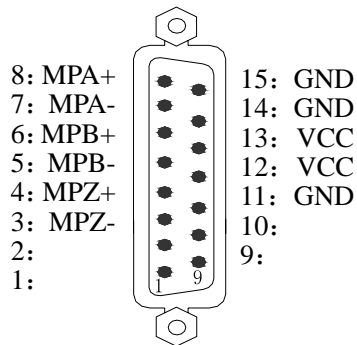


Fig.2-20 CN21 Encode interface

| Name      | Explanation          |
|-----------|----------------------|
| MPA-/MPA+ | Encode A phase pulse |
| MPB-/MPB+ | Encode B phase pulse |
| MPZ-/MPZ+ | Encode Z phase pulse |

### 2.4.2 Signal Explanation

MPZ-/MPZ+, MPB-/MPB+, MPA-/MPA+ are the encoder Z, B, A phase differential input signals respectively, which are received by 26LS32; MPB-/MPB+, MPA-/MPA+ are normal square wave of phase shift 90° with the maximum signal frequency less than 1MHz; the encoder pulses for GSK980MDa are set by data parameter No.109, whose range is from 100 to 5000.

Its interior connection circuit is as Fig. 2-21: (n=A, B, C)

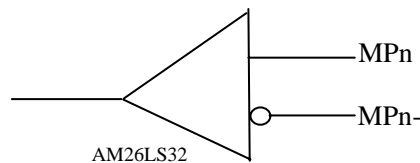


Fig 2-21 Encode singnal circuit

### 2.4.3 Connection of spindle encoder interface

The connection of GSK980MDa to spindle encoder is shown as Fig. 2-22, use twisted pair cables for connection

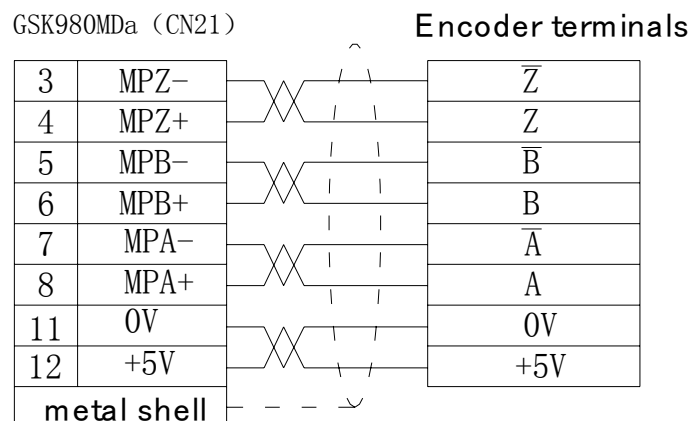


Fig.2-22 Connection of GSK980MDa to encoder

## 2.5 Connection to Handwheel

### 2.5.1 Handwheel interface definition

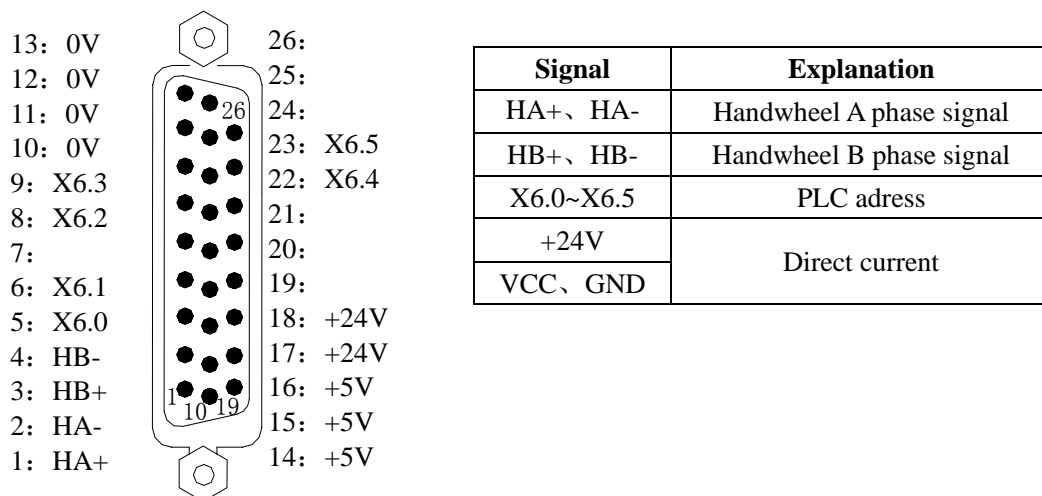


图 2-23 CN31 handwheel interface  
(3 line 26-core DB male socket)

### 2.5.2 Signal explanation

“HA+”、“HA-”、“HB+”、“HB-” are the input singals of handwheel A and B。Its interior connection circuit is as Fig. 2-24:

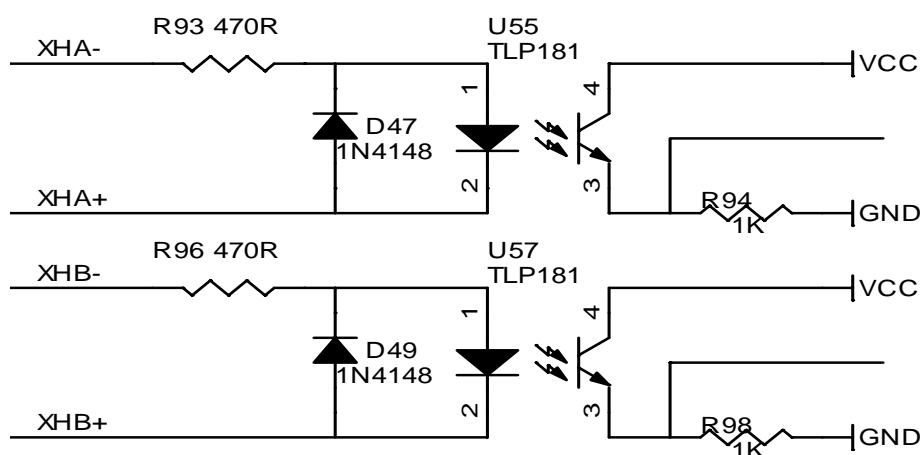


Fig.2-24 Handwheel signal circuit

The connection of GSK980MDa to handwheel is shown as Fig. 2-25,

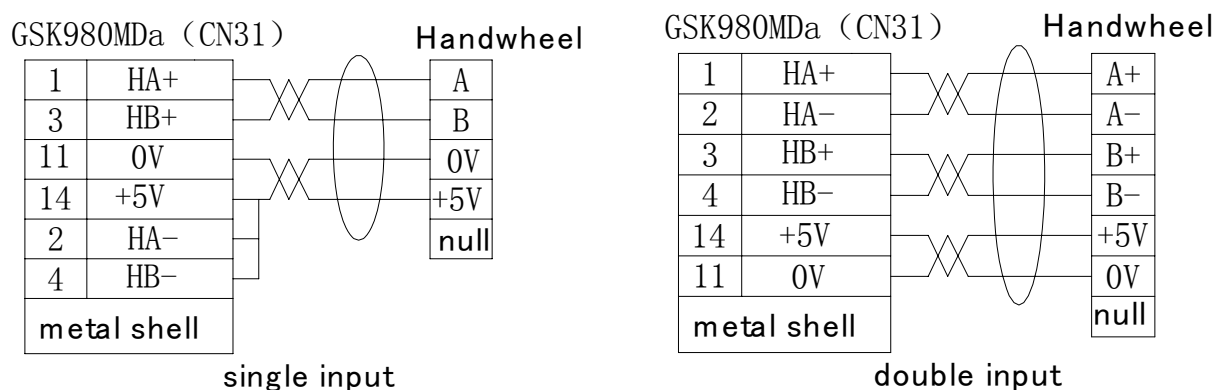
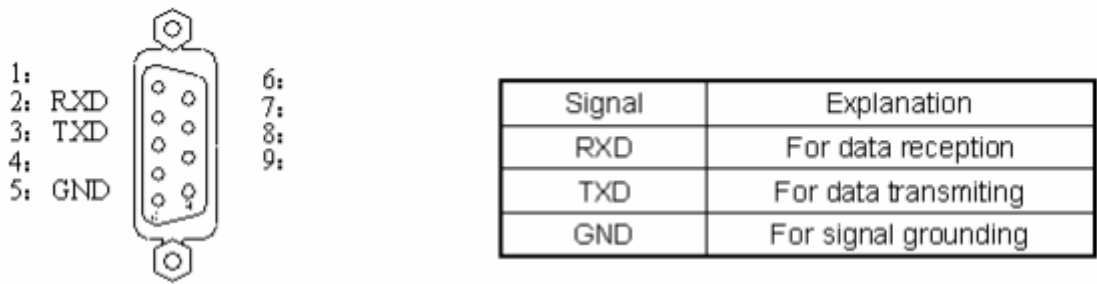


Fig.2-25 Connection of GSK980MDa to handwheel

2.6 Connection of GSK980MDa to PC

2.6.1 Communication interface definition



2.6.2 Communication interface connection

The communication between GSK980MDa and PC can be done via RS232 interface (GSK980MDa communication software needed), The connection of them is shown as Fig.2-27:

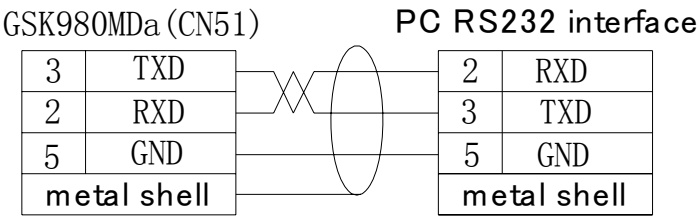


Fig.2-27 Connection of GSK980MDa to PC

The communication of a GSK980MDa to another GSK980MDa can be made via their XS36 interfaces, and the connection of them is shown as Fig.2-28:

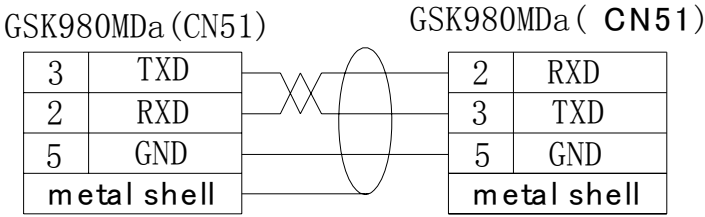


Fig.2-28 Communication connection of GSK980MDa to GSK980MDa

2.7 Connection of Power Interface

GSK-PB2 power box is applied in this GSK980MDa, which involves 4 groups of voltage: +5V(3A,) +12V(1A,) -12V (0.5A) , +24V (0.5A) , and its commom terminal is COM (0V) . The connection of GSK-PB2 power box to GSK980MDa CN1 interface has been done for its supply, and the user only need to connect it to a 220V AC power for use:

The interface definition of GSK980MDa CN1 is as following:

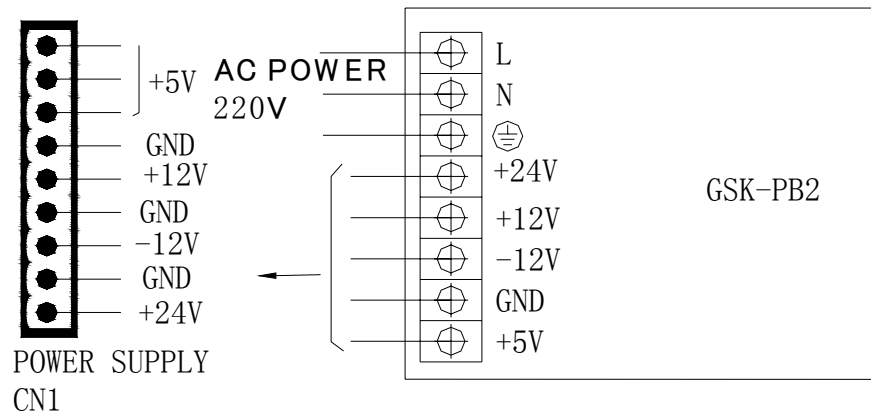


Fig.2-29

## 2.8 I/O Interface Definition:

CN61: 44-core 3 line male socket

| NO. | ADDRESS    | NO. | ADDRESS     | NO. | ADDRESS     | NO. | ADDRESS     |
|-----|------------|-----|-------------|-----|-------------|-----|-------------|
| 1   | X0.0       | 12  | X1.3 (DECZ) | 23  | 0V          | 34  | X2.5(DEC5)  |
| 2   | X0.1       | 13  | X1.4        | 24  | 0V          | 35  | X2.6        |
| 3   | X0.2       | 14  | X1.5        | 25  |             | 36  | X2.7        |
| 4   | X0.3(DECX) | 15  | X1.6        | 26  |             | 37  | X3.0        |
| 5   | X0.4       | 16  | X1.7        | 27  |             | 38  | X3.1        |
| 6   | X0.5 (ESP) | 17  |             | 28  |             | 39  | X3.2        |
| 7   | X0.6       | 18  |             | 29  | X2.0        | 40  | X3.3        |
| 8   | X0.7       | 19  |             | 30  | X2.1        | 41  | X3.4        |
| 9   | X1.0       | 20  |             | 31  | X2.2        | 42  | X3.5 (SKIP) |
| 10  | X1.1       | 21  | 0V          | 32  | X2.3(DECY)  | 43  | X3.6        |
| 11  | X1.2       | 22  | 0V          | 33  | X2.4 (DEC4) | 44  | X3.7        |

CN62: 44-core 3 line female socket

| NO. | ADDRESS | NO. | ADDRESS | NO. | ADDRESS | NO. | ADDRESS |
|-----|---------|-----|---------|-----|---------|-----|---------|
| 1   | Y0.0    | 12  | Y1.3    | 23  | +24V    | 34  | Y2.5    |
| 2   | Y0.1    | 13  | Y1.4    | 24  | +24V    | 35  | Y2.6    |
| 3   | Y0.2    | 14  | Y1.5    | 25  | +24V    | 36  | Y2.7    |
| 4   | Y0.3    | 15  | Y1.6    | 26  | GND     | 37  | Y3.0    |
| 5   | Y0.4    | 16  | Y1.7    | 27  | GND     | 38  | Y3.1    |
| 6   | Y0.5    | 17  | GND     | 28  | GND     | 39  | Y3.2    |
| 7   | Y0.6    | 18  | GND     | 29  | Y2.0    | 40  | Y3.3    |
| 8   | Y0.7    | 19  | GND     | 30  | Y2.1    | 41  | Y3.4    |
| 9   | Y1.0    | 20  | +24V    | 31  | Y2.2    | 42  | Y3.5    |
| 10  | Y1.1    | 21  | +24V    | 32  | Y2.3    | 43  | Y3.6    |
| 11  | Y1.2    | 22  | +24V    | 33  | Y2.4    | 44  | Y3.7    |

**Note 1:** The I/O function of GSK980MDa milling CNC is defined by ladder ;

**Note 2:** If output function is valid, the output signal is on to 0V. If output function is invalid, the output

signal is cut off by high impedance;

**Note 3:** If input function is valid, the input signal is on to 24V. If input function is invalid, the input signal is cut off with it;

**Note 4:** The effectiveness of +24V, 0V is equal to GSK980MD power box terminals that have the same name;

**Note 5:** XDEC, YDEC, ZDEC, DEC4, DEC5, ESP, SKIP are fixed signals that can't be altered.

### 2.8.1 Input Signal

Input signal means the signal from machine to CNC, when this signal is on with +24V, the input is valid; when it is off with +24V, the input is invalid. The trigger point of input signal on machine should meet the following conditions:

The capacity of the trigger point: DC30V, 16mA above Leakage current between trigger points in open circuit: 1mA below Voltage drop between trigger points in close circuit: 2V below (current 8.5mA, including cable voltage drop)

There are two external input types for input signals: one type is input by trigger point switch which is used by the keys on machine, stroke switch and trigger point of relay, as is shown in Fig 2-30

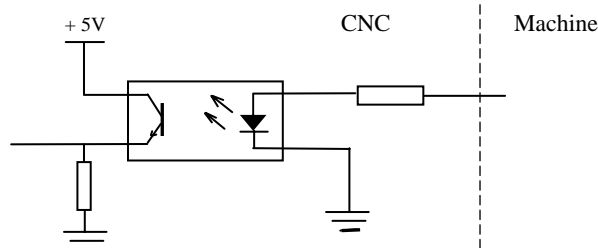


Fig. 2-30

The other type is input by switch with no trigger point (transistor), as is shown in Fig. 2-31, 2-32

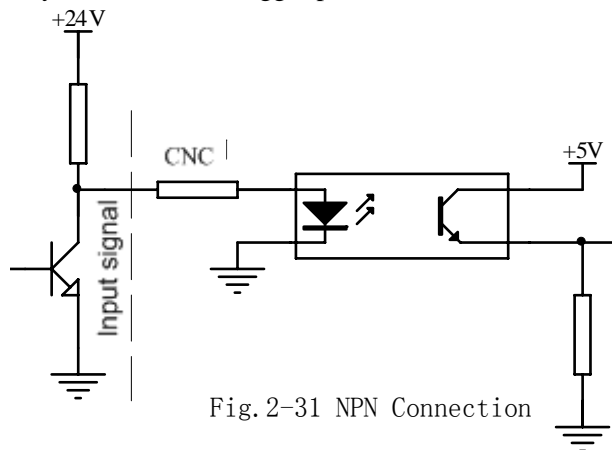


Fig. 2-31 NPN Connection

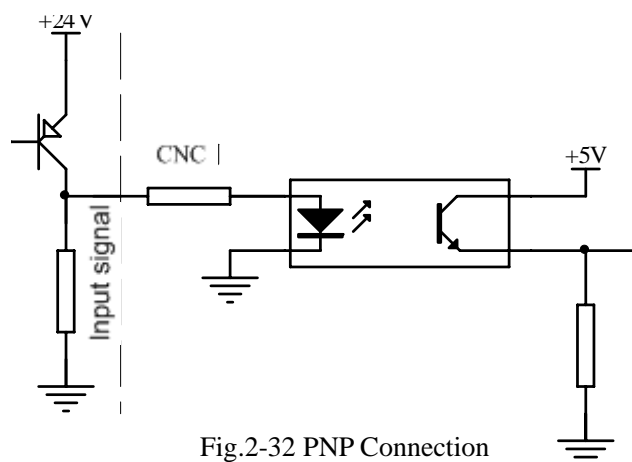


Fig. 2-32 PNP Connection

### 2.8.2 Output signal

The output signal is used for the machine relay and indicator, if it is on with 0V, the output function is valid; if it is off with 0V, the output function is invalid. There are total 36 digital volume outputs in I/O interface that they all have the same structure as is shown in Fig.2-33

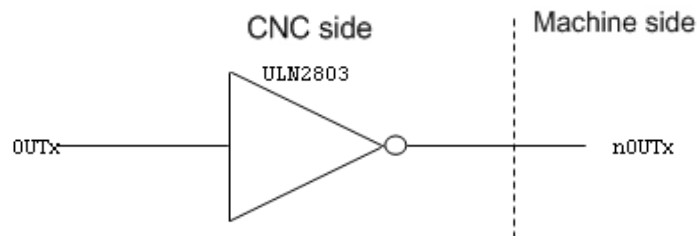


Fig.2-33 Circuit for digital volume output module

The logic signal OUTx output from the main board is sent to the input terminal of inverter (ULN2803) via a connector. And there are 2 output types for nOUTx: output with 0V, or high impedance. Its typical application is as follows:

- To drive LED

A series resistance is needed to limit the current (usually 10mA) that goes through the LED by using ULN2803 output to drive LED, which is shown in Fig.2-34

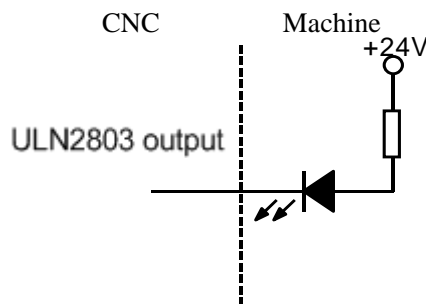


Fig.2-34

- To drive filament indicator

An external preheat resistance is needed to decrease the current impact at power on by using ULN2803 output to drive filament indicator, and this resistance value should be within a range that the indicator can't light up. It is shown in Fig.2-35

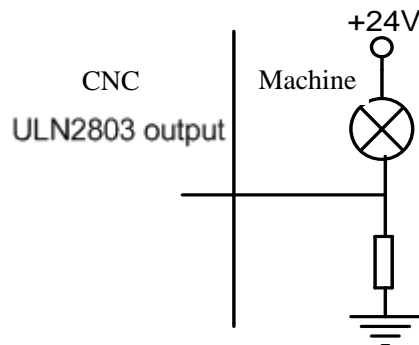
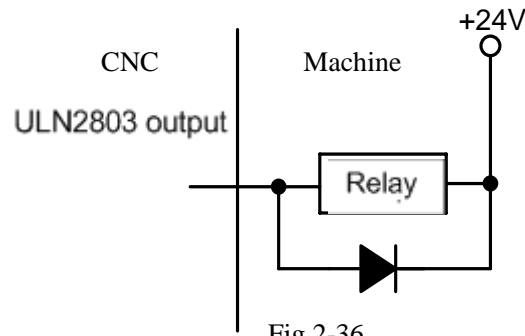


Fig.2-35

- To drive inductive load (relay etc.)

To use ULN2803 output to drive an inductive load, it requires to connect a freewheeling diode near the coil to protect output circuit and deduce interference. It is shown in Fig.2-36



## 2.9 Machine Zero

### ● Relative signal

|      |  |     |                                  |
|------|--|-----|----------------------------------|
| DECX | X axis deceleration signal               | PCX | X axis zero signal               |
| DECY | Y axis deceleration signal               | PCY | Y axis zero signal               |
| DECZ | Z axis deceleration signal               | PCZ | Z axis zero signal               |
| DEC4 | 4 <sup>th</sup> axis deceleration signal | PC4 | 4 <sup>th</sup> axis zero signal |
| DEC5 | 5 <sup>th</sup> axis deceleration signal | PC5 | 5 <sup>th</sup> axis zero signal |

### ● CNC diagnosis

|                       |  |  |  |         |         |         |         |        |
|-----------------------|--|--|--|---------|---------|---------|---------|--------|
| 0 0 0                 |  |  |  | DEC5    | DEC4    | DECZ    | DECY    | DECX   |
| Corresponding pin-out |  |  |  | CN61.34 | CN61.33 | CN61.12 | CN61.32 | CN61.4 |
| PLC address           |  |  |  | X2.5    | X24     | X1.3    | X23     | X0.3   |

|                       |  |  |  |         |        |        |        |        |
|-----------------------|--|--|--|---------|--------|--------|--------|--------|
| 0 0 8                 |  |  |  | PC5     | PC4    | PCZ    | PCY    | PCX    |
| Corresponding pin-out |  |  |  | CN15.10 | CN14.3 | CN13.3 | CN12.3 | CN11.3 |

### ● Bit parameter

|       |  |  |      |  |  |  |  |  |
|-------|--|--|------|--|--|--|--|--|
| 0 0 4 |  |  | DECI |  |  |  |  |  |
|-------|--|--|------|--|--|--|--|--|

DECI =1: Deceleration signal is on with 24V for deceleration when machine zero return is performed

=0: Deceleration signal is off 24V for deceleration when machine zero return is performed

|       |  |  |  |     |     |     |     |     |
|-------|--|--|--|-----|-----|-----|-----|-----|
| 0 0 6 |  |  |  | ZM5 | ZM4 | ZMZ | ZMY | ZMX |
|-------|--|--|--|-----|-----|-----|-----|-----|

ZMX =1: X axis machine zero return type C;

=0: X axis machine zero return type B。

ZMY =1: Y axis machine zero return type C;

=0: Y axis machine zero return type B。

ZMZ =1: Z axis machine zero return type C;

=0: Z axis machine zero return type B。

ZM4 =1: 4th axis machine zero return type C;

=0: 4th axis machine zero return type B。

ZM5 =1: 5th axis machine zero return type C;

=0: 5th axis machine zero return type B。



|   |   |   |  |  |  |     |     |     |     |     |
|---|---|---|--|--|--|-----|-----|-----|-----|-----|
| 0 | 0 | 7 |  |  |  | ZC5 | ZC4 | ZCZ | ZCY | ZCX |
|---|---|---|--|--|--|-----|-----|-----|-----|-----|

ZCX =1: The deceleration signal (DECX) and one-turn signal (PCX) of X axis are parallel for machine zero return ( an approach switch acting as both the deceleration signal and zero signal );

=0: The deceleration signal (DECX) and one-turn signal (PCX) of X axis are separated for machine zero return ( the deceleration signal and zero signal are separated) 。

ZCY =1: The deceleration signal (DECY) and one-turn signal (PCY) of Y axis are parallel for machine zero return ( an approach switch acting as both the deceleration signal and zero signal );

=0: The deceleration signal (DECY) and one-turn signal (PCY) of Y axis are separated for machine zero return (the deceleration signal and zero signal are separated) 。

ZCZ =1: The deceleration signal (DECZ) and one-turn signal (PCZ) of Z axis are parallel for machine zero return ( an approach switch acting as both the deceleration signal and zero signal );

=0: The deceleration signal (DECZ) and one-turn signal (PCZ) of Z axis are separated for machine zero return ( the deceleration signal and zero signal are separated) 。


ZC4 =1: The deceleration signal (DEC4) and one-turn signal (PC4) of 4th axis are parallel for machine zero return ( an approach switch acting as both the deceleration signal and zero signal );

=0: The deceleration signal (DEC4) and one-turn signal (PC4) of 4th axis are separated for machine zero return ( the deceleration signal and zero signal are separated) 。

ZC5 =1: The deceleration signal (DEC5) and one-turn signal (PC5) of 5th axis are parallel for machine zero return ( an approach switch acting as both the deceleration signal and zero signal );

=0: The deceleration signal (DEC5) and one-turn signal (PCZ) of 5th axis are separated for machine zero return ( the deceleration signal and zero signal are separated) 。

|   |   |   |  |  |  |  |  |      |  |  |
|---|---|---|--|--|--|--|--|------|--|--|
| 0 | 1 | 1 |  |  |  |  |  | ZNIK |  |  |
|---|---|---|--|--|--|--|--|------|--|--|

ZNLK =1: The direction keys are locked as machine zero return is performed,by pressing the direction key once,it moves to the machine zero automatically and stops,By pressing the  key at the machine zero return,the motion stops immediately;

=0: The direction keys are not locked as machine zero return is performed, but the direction keys should be pressed and held on 。

|   |   |   |  |  |  |  |  |  |  |      |
|---|---|---|--|--|--|--|--|--|--|------|
| 0 | 1 | 2 |  |  |  |  |  |  |  | ISOT |
|---|---|---|--|--|--|--|--|--|--|------|

ISOT =1: Manual rapid traverse valid prior to machine zero return after power on;

=0: Manual rapid traverse invalid prior to machine zero return after power on。

|   |   |   |  |  |  |      |      |      |      |      |
|---|---|---|--|--|--|------|------|------|------|------|
| 0 | 1 | 4 |  |  |  | ZRS5 | ZRS4 | ZRSZ | ZRSY | ZRSX |
|---|---|---|--|--|--|------|------|------|------|------|

ZRSZ、ZRSX、ZRSY、ZRS4、ZRS5 =1: To select machine zero return type B, C, which have machine zero, it needs to detect deceleration and zero signals as machine zero return is performed;

=0: To select machine zero return type A, which has no machine zero, it directly

returns to machine zero without detecting deceleration and zero signals as machine zero return is performed。

|   |   |   |  |  |  |      |      |      |      |      |
|---|---|---|--|--|--|------|------|------|------|------|
| 0 | 2 | 2 |  |  |  | MZR5 | MZR4 | MZRZ | MZRY | MZRX |
|---|---|---|--|--|--|------|------|------|------|------|

MZRX、MZRZ、MZRY、MZR4、MZR5 =1: To select negative zero return of X, Z, Y ,4<sup>th</sup>,5<sup>th</sup> axes;

=0: To select positive zero return of X, Z, Y,4<sup>th</sup> ,5<sup>th</sup> axes 。

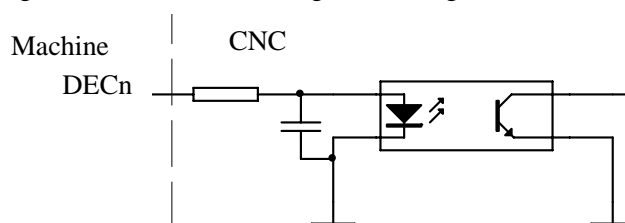
● Date parameter

|     |  |
|-----|--|
| 089 | Low speed of machine zero return of X axis |
| 090 | Low speed of machine zero return of Y axis |

|     |   |
|-----|---|
| 091 | Low speed of machine zero return of Z axis                                      |
| 092 | Low speed of machine zero return of 4 <sup>th</sup> axis                        |
| 093 | Low speed of machine zero return of 5 <sup>th</sup> axis                        |
| 094 | High speed of machine zero return of X axis                                     |
| 095 | High speed of machine zero return of Y axis                                     |
| 096 | High speed of machine zero return of Z axis                                     |
| 097 | High speed of machine zero return of 4 <sup>th</sup> axis                       |
| 098 | High speed of machine zero return of 5 <sup>th</sup> axis                       |
| 130 | X axis machine zero offset (0.001)  |
| 131 | Y axis machine zero offset (0.001)  |
| 132 | Z axis machine zero offset (0.001)  |
| 133 | 4 <sup>th</sup> axis machine zero offset (0.001)                                |
| 134 | 5 <sup>th</sup> axis machine zero offset (0.001)                                |
| 145 | X machine coordinate of 1 <sup>st</sup> reference point (0.001mm)               |
| 146 | Y machine coordinate of 1 <sup>st</sup> reference point (0.001mm)               |
| 147 | Z machine coordinate of 1 <sup>st</sup> reference point (0.001mm)               |
| 148 | 4 <sup>th</sup> machine coordinate of 1 <sup>st</sup> reference point (0.001mm) |
| 149 | 5 <sup>th</sup> machine coordinate of 1 <sup>st</sup> reference point (0.001mm) |
| 150 | X machine coordinate of 2 <sup>nd</sup> reference point (0.001mm)               |
| 151 | Y machine coordinate of 2 <sup>nd</sup> reference point (0.001mm)               |
| 152 | Z machine coordinate of 2 <sup>nd</sup> reference point (0.001mm)               |
| 153 | 4 <sup>th</sup> machine coordinate of 2 <sup>nd</sup> reference point (0.001mm) |
| 154 | 5 <sup>th</sup> machine coordinate of 2 <sup>nd</sup> reference point (0.001mm) |
| 155 | X machine coordinate of 3rd reference point (0.001mm)                           |
| 156 | Y machine coordinate of 3rd reference point (0.001mm)                           |
| 157 | Z machine coordinate of 3rd reference point (0.001mm)                           |
| 158 | 4 <sup>th</sup> machine coordinate of 3rd reference point (0.001mm)             |
| 159 | 5 <sup>th</sup> machine coordinate of 3rd reference point (0.001mm)             |
| 160 | X machine coordinate of 4th reference point (0.001mm)                           |
| 161 | Y machine coordinate of 4th reference point (0.001mm)                           |
| 162 | Z machine coordinate of 4th reference point (0.001mm)                           |
| 163 | 4 <sup>th</sup> machine coordinate of 4th reference point (0.001mm)             |
| 164 | 5 <sup>th</sup> machine coordinate of 4th reference point (0.001mm)             |

### ● Signal connection

The interior wiring circuit of deceleration signal is as Fig.2-37



● Machine zero return type B by regarding servo motor one-turn signal as zero signal

① Its sketch map is as follows:

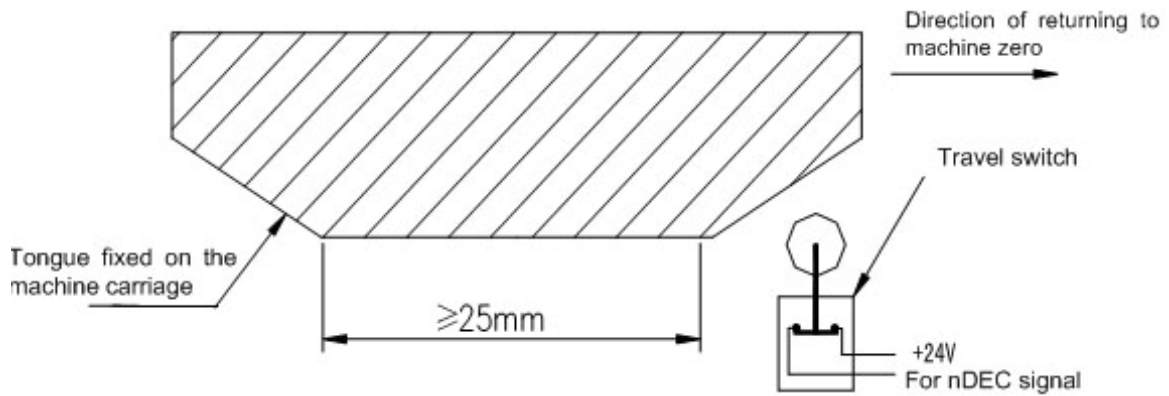


Fig.2-38

② The circuit of deceleration signal (for three axes)

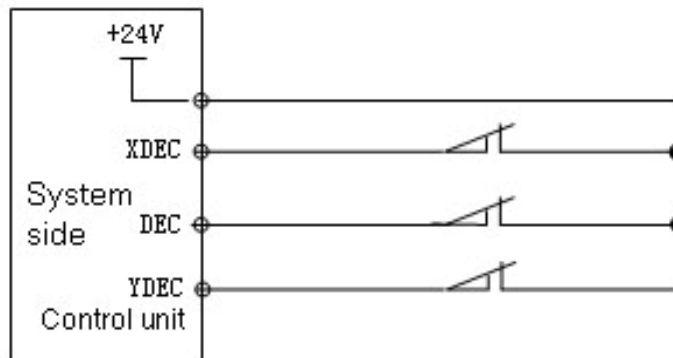


Fig.2-39

③ Action time sequence of machine zero return

When ZMn(n is X,Y,Z,4<sup>th</sup>,5<sup>th</sup> axis) of the bit parameter No.006 are all set for 0, and the BIT5 (DECI) of the bit parameter No.004 is set for 0, and the deceleration signal low level is valid. The action time sequence of machine zero return is shown as follows

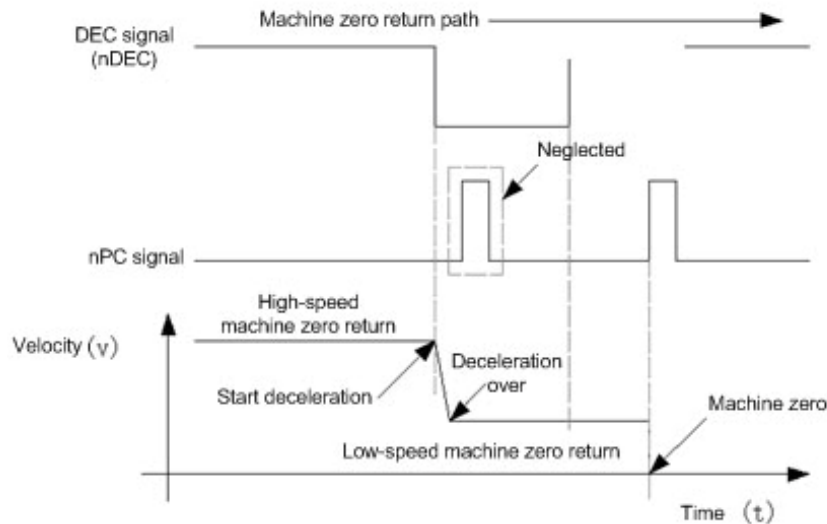


Fig.2-40

## ④ Machine zero return process

A: For machine zero return mode, press the manual positive or negative feed key(machine zero return direction set by bit parameter No.022), the corresponding axis moves to the machine zero by a rapid traverse speed. As the axis press down the deceleration switch to cut off deceleration signal, the feed slows down immediately, and it continues to run in a fixed low speed

B: When the deceleration switch is released, the deceleration signal trigger point is closed again. And CNC begins to detect the encoder one-turn signal (PC), if this signal level changes, the motion will be stopped. And the corresponding zero indicator on the operator panel lights up for machine zero return completion

## ● Machine zero return type B as an approach switch is taken as both deceleration and zero signals

## ① Its sketch map is as following:

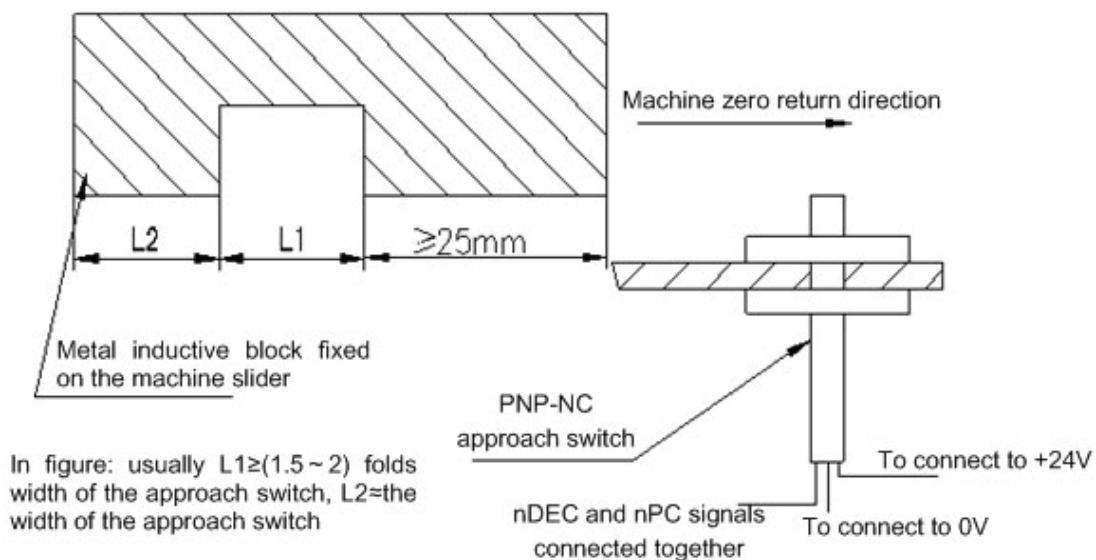


Fig.2-41

## ② Wiring of the deceleration signal

See details in Section 2.1.6 of this chapter

## ③ Action time sequence of machine zero return

When  $ZMn$  ( $n$  is X,Y,Z,4<sup>th</sup>,5<sup>th</sup> axis) of the bit parameter No.006 are all set for 0,  $ZCn$  ( $n$  is X,Y,Z,4<sup>th</sup>,5<sup>th</sup> axis) of

the bit parameter No.007 are set for 1, the BIT5 (DECI) of the bit parameter No.004 is 0, and the deceleration signal low level is valid, the action time sequence of zero return is shown as following figure

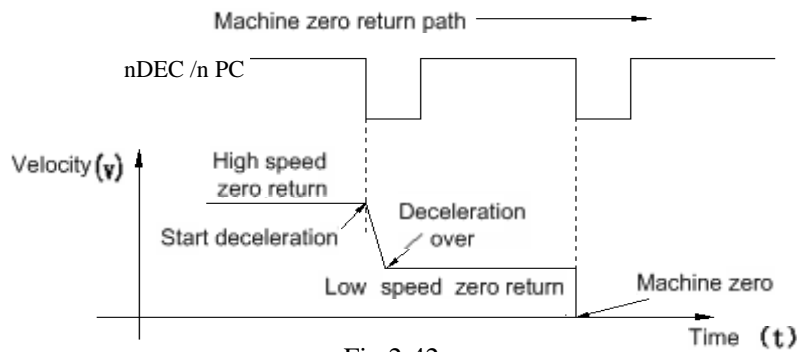


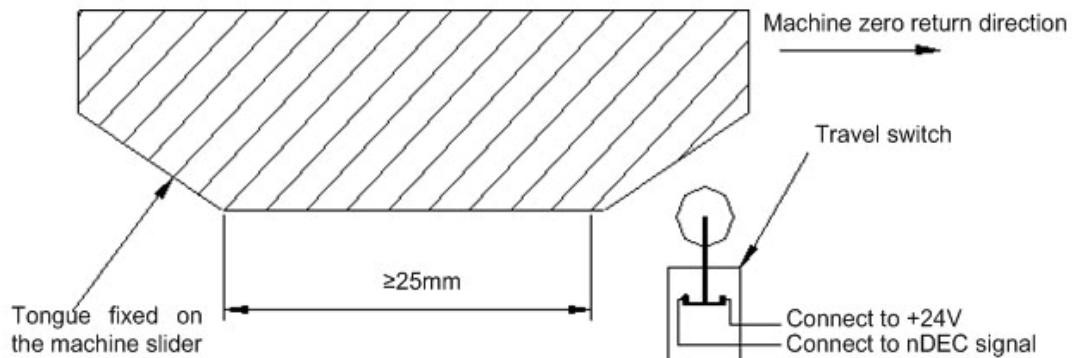
Fig.2-42

#### ④ Machine zero returns process

- A: Select the Machine Zero mode, press manual positive or negative (zero return direction set by bit parameter No.183) feed key, the corresponding axis will move to the zero at a traverse speed.
- B: As the approach switch touches the tongue for the first time, the deceleration signal is valid and it slows down immediately to run in a low speed.
- C: As the approach switch detaches the tongue, the deceleration signal is invalid, it moves at a fixed low speed after deceleration and starts to detect zero signal (PC).
- D: As the approach switch touches the tongue for the second time, the zero signal is valid and the movement stops. The indicator for zero return on the panel lights up.

#### ● Machine zero return type C as servo motor one-turn signal taken as zero signal

##### ① Its sketch map is as following:



##### ② Circuit of the deceleration signal

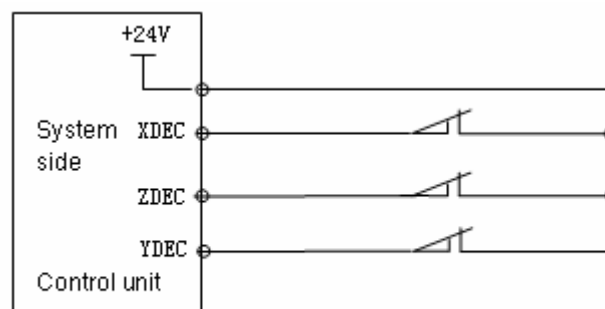


Fig. 2-38

##### ③ Action time sequence of machine zero return

When ZMn (n is X,Y,Z,4<sup>th</sup>,5<sup>th</sup> axis) of the bit parameter No.006 are all set for 1, ZCn (n is X,Y,Z,4<sup>th</sup>,5<sup>th</sup> axis) of the bit parameter No.007 are all set for 0, the BIT5 (DECI) of the bit parameter No.004 is set for 0, and the deceleration signal low level is valid. The action time sequence of machine zero return is shown as follows:

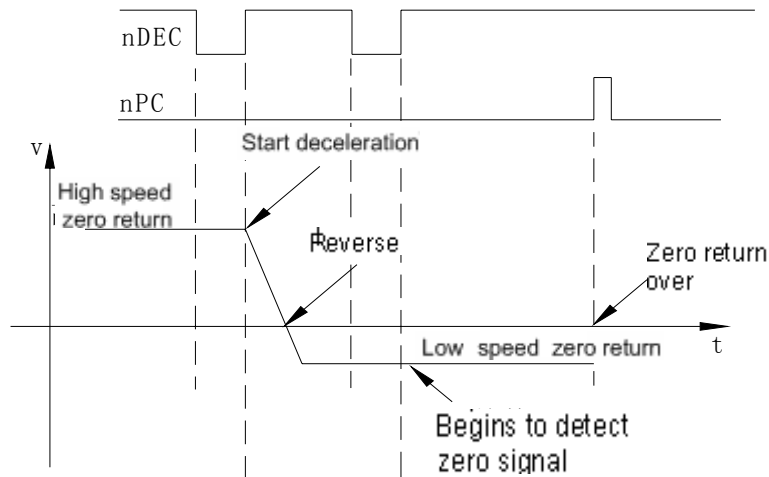


Fig. 2-45

## ④ Machine zero return process

A: Select the Machine Zero mode, press manual positive or negative (zero return direction set by bit parameter No.183) feed key, the corresponding axis will move to the machine zero at a traverse speed.

Then it touches the tongue and presses down the deceleration switch, and moves forward. When the tongue detaches the deceleration switch, the axis slows down to zero, then moves reversely and accelerates to a fixed low speed for continuous moving

B: As the tongue touches the deceleration switch for the second time, it moves on till the tongue detaches the deceleration switch. And it begins to detect the zero signals. If the zero signal level changes, the movement stops. Then zero return indicator for the corresponding axis on the panel lights up and machine zero operation finishes

## ● Machine zero return type C as an approach switch is taken as both deceleration and zero signals

## ① Its sketch map is as following:

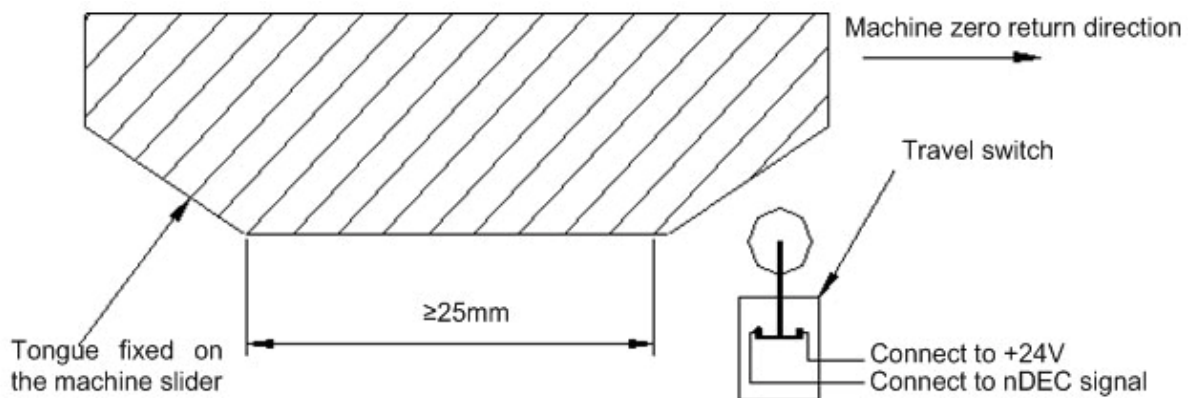


Fig.2-46

## ② Circuit of the deceleration signal

See details in Section 2.1.6 of this chapter

## ③ Action time sequence of machine zero return

When ZMn (n is X,Y,Z,4<sup>th</sup>,5<sup>th</sup> axis) of the bit parameter No.006 are all set for 1, ZCn (n is X,Y,Z,4<sup>th</sup>,5<sup>th</sup> axis) of the bit parameter No.007 are all set for 1, the BIT5 (DECI) of the bit parameter No.004 is set for 0, and the deceleration signal low level is valid. The action time sequence of machine zero return is shown as follows:

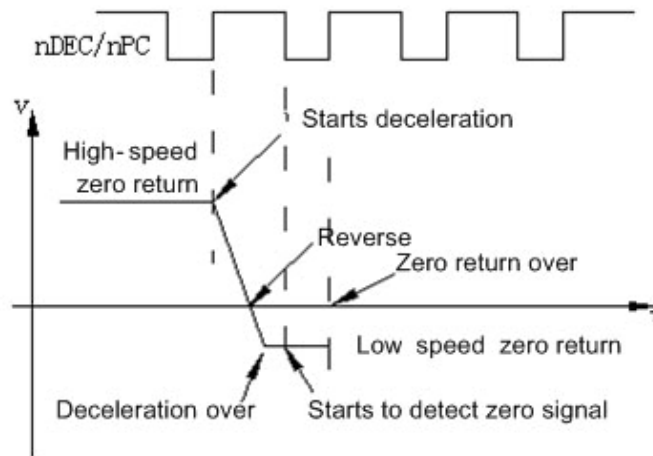


Fig.2-47

#### ④ Machine zero returns process

- A: Select the Machine Zero mode, press manual positive or negative (zero return direction set by bit parameter No.183) feed key, the corresponding axis will move to the machine zero at a traverse speed. Then it touches the tongue and presses down the deceleration switch, and moves forward. When the tongue detaches the deceleration switch, the axis slows down to zero speed, then moves reversely and accelerates to a fixed low speed for continuous moving
- B: As the tongue touches the deceleration switch for the second time, it begins to detect the zero signal. It moves on till the tongue detaches the deceleration switch, the movement stops immediately. Then zero return indicator for the corresponding axis on the panel lights up and machine zero return operation finishes.

## CHAPTER 3 PARAMETER

In this chapter the CNC bit and data parameters are introduced, by these parameters various functions can be set.

### 3.1 Parameter Description (by sequence)

#### 3.1.1 Bit parameter

The bit parameter is expressed as following:

|               |      |      |      |      |      |      |      |      |
|---------------|------|------|------|------|------|------|------|------|
| Parameter No. | BIT7 | BIT6 | BIT5 | BIT4 | BIT3 | BIT2 | BIT1 | BIT0 |
| 0 0 1         | ***  | ***  | ***  | ACS  | HWL  | ***  | ***  | ***  |

ACS =1: Analog voltage control of spindle speed;

=0: Switching volume control of spindle speed.

HWL =1: MPG mode;

=0: Step mode.

|       |     |     |     |      |       |      |     |      |
|-------|-----|-----|-----|------|-------|------|-----|------|
| 0 0 2 | *** | *** | *** | LIFJ | MDITL | LIFC | NRC | TLIF |
|-------|-----|-----|-----|------|-------|------|-----|------|

LIFJ =1: Tool life management group skip valid;

=0: Tool life management group skip invalid.

MDITL =1: Tool life management valid in MDI mode;

=0: Tool life management invalid in MDI mode.

LIFC =1: Tool life counting type 2 by times;

=0: Tool life counting type 1 by times.

NRC =1: Tool nose radius compensation valid;

=0: Tool nose radius compensation invalid.

TLIF =1: Tool life management valid;

=0: Tool life management invalid.

|       |     |     |       |     |     |     |     |     |
|-------|-----|-----|-------|-----|-----|-----|-----|-----|
| 0 0 3 | *** | *** | PCOMP | *** | *** | *** | D/R | *** |
|-------|-----|-----|-------|-----|-----|-----|-----|-----|

PCOMP =1: Screw-pitch error compensation valid;

=0: Screw-pitch error compensation invalid.

D/R =1: Tool offset D diameter input;

=0: Tool offset D radius input.

|       |     |      |      |     |      |     |     |     |
|-------|-----|------|------|-----|------|-----|-----|-----|
| 0 0 4 | *** | RDRN | DECI | *** | PROD | *** | *** | SCW |
|-------|-----|------|------|-----|------|-----|-----|-----|

RDRN =1: G0 rapid traverse speed in dry run mode;

=0: G0 manual feedrate in dry run mode.

DECI =1: Deceleration signal high level for machine zero return;

=0: Deceleration signal low level for machine zero return.

PROD =1: Relative programming position display in POSITION page;

=0: Relative position display involving tool offset in POSITION page.

SCW =1: Inch output(inch system)valid after repower;



=0: Metric output(metric system)valid after repower。

### Metric and Inch function

There are two kinds of CNC system input and output unit: metric unit, (mm) and inch unit, (inch) .

GSK980MDa output increment unit through state parameter №004 Bit0 (SCW) , SCW=0 means system output min increment unit is metric. Unit of parameter and thread compensation is also metric; SCW=1 means system output min increment unit is inch. Unit of parameter and thread compensation is also inch. This parameter is decided by machine.

G Code: G20/G21 instruction is used to define min input increment unit is inch or metric. Executing G21 instruction means min input increment unit is metric; Executing G20 instruction means min input increment unit is inch.

Note:

( speed type, coordinate type, increment type) Parameter and tread compensation is decided by №004 Bit0(SCW). Inputing G20,G21 can not alter parameter , value of thread compensation and unit.

|   |   |   |     |     |      |     |     |     |     |      |
|---|---|---|-----|-----|------|-----|-----|-----|-----|------|
| 0 | 0 | 5 | *** | *** | SMAL | M30 | *** | *** | PPD | PCMD |
|---|---|---|-----|-----|------|-----|-----|-----|-----|------|

SMAL =1: Spindle manual gear shift for S command;

=0: Spindle auto gear shift for S command。

M30 =1: Cursor to beginning after M30 execution;

=0: Cursor not to beginning after M30 execution。

PPD =1: Relative coordinate set by G92;

=0: Relative coordinate not set by G92。

PCMD =1: Axial output wave form is pulse;

=0: Axial output wave form is square。



Square output, max. output frequency 266KPPS



Pulse output, max. output frequency 266KPPS,  
Pulse width 1 μs.

|   |   |   |     |     |     |     |     |     |     |     |
|---|---|---|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | 0 | 6 | *** | *** | *** | ZM5 | ZM4 | ZMZ | ZMY | ZMX |
|---|---|---|-----|-----|-----|-----|-----|-----|-----|-----|

ZM5 =1: 5th zero return type C;

=0: 5th zero return type B。

ZM4 =1: 4th zero return type C;

=0: 4th zero return type B。

ZMZ =1: Z zero return type C;

=0: Z zero return type B。

ZMY =1: Y zero return type C;

=0: Y zero return type B。

ZMX =1: X zero return type C;

=0: X zero return type B。

|   |   |   |      |     |     |     |     |     |     |     |
|---|---|---|------|-----|-----|-----|-----|-----|-----|-----|
| 0 | 0 | 7 | AVGL | *** | SMZ | ZC5 | ZC4 | ZCZ | ZCY | ZCX |
|---|---|---|------|-----|-----|-----|-----|-----|-----|-----|

AVGL =1: Linear smoothing valid when SMZ=0,i.e. smoothing transition valid between blocks;

=0: Linear smoothing invalid。

On the condition that blocks smoothing transition is valid, more smooth velocity link and better machining quality will be obtained during the path transition from line to line or from line to arc by properly

changing the linear feedrate.

So the actual output speed may be different to the programming speed when using this function. And it may also differ as regard to the linear segment with the same programming speed. The deviation is not more than 15mm/min between the actual output speed and the programming speed on the condition that the programming speed F is less than 1200mm/min

SMZ =1: To execute next block till all moving blocks executed;

=0: For smooth transition between blocks.

ZC5 =1: Deceleration signal (DEC5) and one-turn signal (PC5) of 5<sup>th</sup> axis parallel (DEC5 and zero signals together by an approach switch) during machine zero return;

=0: Deceleration signal (DEC5) and one-turn signal (PC5) of 5<sup>th</sup> axis separate (separate DEC5 and zero signal) during machine zero return.

ZC4 =1: Deceleration signal (DEC4) and one-turn signal (PC4) of 4<sup>th</sup> axis parallel (DEC4 and zero signals together by an approach switch) during machine zero return;

=0: Deceleration signal (DEC4) and one-turn signal (PC4) of 4<sup>th</sup> axis separate (separate DEC4 and zero signal) during machine zero return.

ZCZ =1: Deceleration signal (DECZ) and one-turn signal (PCZ) of Z axis parallel (DECZ and zero signals together by an approach switch) during machine zero return;

=0: Deceleration signal (DECZ) and one-turn signal (PCZ) of Z axis separate (separate DECZ and zero signal) during machine zero return.

ZCY =1: Deceleration signal (DECY) and one-turn signal (PCY) of Y axis parallel (DECY and zero signals together by an approach switch) during machine zero return;

=0: Deceleration signal (DECY) and one-turn signal (PCY) of Y axis separate (separate DECY and zero signal) during machine zero return.

ZCX =1: Deceleration signal (DECX) and one-turn signal (PCX) of X axis parallel (DECX and zero signals together by an approach switch) during machine zero return;

=0: Deceleration signal (DECX) and one-turn signal (PCX) of X axis separate (separate DECX and zero signal) during machine zero return.

|   |   |   |
|---|---|---|
| 0 | 0 | 8 |
|---|---|---|

|      |     |     |      |      |      |      |      |
|------|-----|-----|------|------|------|------|------|
| DISP | *** | *** | DIR5 | DIR4 | DIRZ | DIRY | DIRX |
|------|-----|-----|------|------|------|------|------|

DISP =1: Enter absolute page after power on;

=0: Enter relative page after power on.

DIR5 =1: Direction signal (DIR) is high level as 5<sup>th</sup> axis moves positively;

=0: Direction signal (DIR) is low level as 5<sup>th</sup> axis moves negatively.

DIR4 =1: Direction signal (DIR) is high level as 4<sup>th</sup> axis moves positively;

=0: Direction signal (DIR) is low level as 4<sup>th</sup> axis moves negatively.

DIRZ =1: Direction signal (DIR) is high level as Z axis moves positively;

=0: Direction signal (DIR) is low level as Z axis moves negatively.

DIRY =1: Direction signal (DIR) is high level as Y axis moves positively;

=0: Direction signal (DIR) is low level as Y axis moves negatively.

DIRX =1: Direction signal (DIR) is high level as X axis moves positively;

=0: Direction signal (DIR) is low level as X axis moves negatively.

|   |   |   |
|---|---|---|
| 0 | 0 | 9 |
|---|---|---|

|     |     |     |      |      |      |      |      |
|-----|-----|-----|------|------|------|------|------|
| *** | *** | *** | ALM5 | ALM4 | ALMZ | ALMY | ALMX |
|-----|-----|-----|------|------|------|------|------|

ALM5 =1: 5<sup>th</sup> axis low level alarm signal (ALM5);

=0: 5<sup>th</sup> axis high level alarm signal (ALM5).

ALM4 =1: 4<sup>th</sup> axis low level alarm signal (ALM4);

=0: 4<sup>th</sup> axis high level alarm signal (ALM4).

ALMZ =1: Z axis low level alarm signal (ALMZ);

=0: Z axis high level alarm signal (ALMZ)。

ALMY =1: Y axis low level alarm signal (ALMY);

=0: Y axis high level alarm signal (ALMY)。

ALMX =1: X axis low level alarm signal (ALMX);

=0: X axis high level alarm signal (ALMX)。

|   |   |   |      |      |      |      |      |      |      |      |
|---|---|---|------|------|------|------|------|------|------|------|
| 0 | 1 | 0 | CPF7 | CPF6 | CPF5 | CPF4 | CPF3 | CPF2 | CPF1 | CPF0 |
|---|---|---|------|------|------|------|------|------|------|------|

CPF0~CPF7: Setting values of backlash compensation pulse frequency。

The set frequency =  $(2^7 \times \text{CPF7} + 2^6 \times \text{CPF6} + 2^5 \times \text{CPF5} + 2^4 \times \text{CPF4} + 2^3 \times \text{CPF3} + 2^2 \times \text{CPF2} + 2^1 \times \text{CPF1} + \text{CPF0}) \text{ Kpps}$

|   |   |   |      |     |     |     |     |      |     |     |
|---|---|---|------|-----|-----|-----|-----|------|-----|-----|
| 0 | 1 | 1 | BDEC | BD8 | *** | *** | *** | ZNIK | *** | *** |
|---|---|---|------|-----|-----|-----|-----|------|-----|-----|

BDEC =1: Backlash compensation type B, the compensation data are output by ascending or decending type and the set frequency is invalid.;

=0: Backlash compensation type A, the compensation data are output by the set frequency (by bit parameter No.010) or 1/8 of it。

BD8 =1: Backlash compensation is done by the 1/8 of the set frequency;

=0: Backlash compensation is done by the set frequency。

ZNIK =1: Direction keys locked during zero return, homing continues to end by pressing direction key once;

=0: Direction keys unlocked but should be held on during zero return。

|   |   |   |     |     |     |       |     |     |      |      |
|---|---|---|-----|-----|-----|-------|-----|-----|------|------|
| 0 | 1 | 2 | *** | *** | *** | TMANL | *** | *** | EBCL | ISOT |
|---|---|---|-----|-----|-----|-------|-----|-----|------|------|

TMANL=1: Manual tool change for T code;

=0: Auto tool change for T code。

EBCL =1: Program end sign EOB displays “;”(semicolon);

=0: Program end sign EOB displays “\*” (asterisk)。

ISOT =1: Prior to machine zero return after power on, manual rapid traverse valid;

=0: Prior to machine zero return after power on, manual rapid traverse invalid。

|   |   |   |      |     |      |     |     |     |      |      |
|---|---|---|------|-----|------|-----|-----|-----|------|------|
| 0 | 1 | 3 | SCRD | G01 | RSCD | *** | *** | *** | SKPI | G31P |
|---|---|---|------|-----|------|-----|-----|-----|------|------|

SCRD =1: Coordinate system holding on at power down;

=0: Coordinate system power down not holding, power on for G54 coordinate system.

G01 =1: G01 status when power on;

=0: G00 status when power on。

RSCD =1: G54 coordinate system when reset 4;

=0: Coordinate system not changed when reset。

SKPI =1: High level valid for skip signal;

=0: Low level valid for skip signal。

G31P =1: G31 immediately stops when skip signal is valid;

=0: G31 slows down to stop when skip signal is valid。

|   |   |   |     |     |     |      |      |      |      |      |
|---|---|---|-----|-----|-----|------|------|------|------|------|
| 0 | 1 | 4 | *** | *** | *** | ZRS5 | ZRS4 | ZRSZ | ZRSY | ZRSX |
|---|---|---|-----|-----|-----|------|------|------|------|------|

ZRS5 =1: There are machine zeroes in 5<sup>th</sup> axis, it detects deceleration signal and zero signal when performing machine zero return;

=0: There are no machine zeroes in 5<sup>th</sup> axis, it returns to machine zero without detecting deceleration signal and zero signal when performing machine zero return。

ZRS4 =1: There are machine zeroes in 4<sup>th</sup> axis, it detects deceleration signal and zero signal when performing machine zero return;

=0: There are no machine zeroes in 4<sup>th</sup> axis, it returns to machine zero without detecting deceleration signal and zero signal when performing machine zero return。

ZRSZ =1: There are machine zeroes in Z axis, it detects deceleration signal and zero signal when performing machine zero return;

=0: There are no machine zeroes in Z axis, it returns to machine zero without detecting deceleration signal and zero signal when performing machine zero return。

ZRSY =1: There are machine zeroes in Y axis, it detects deceleration signal and zero signal when performing machine zero return;

=0: There are no machine zeroes in Y axis, it returns to machine zero without detecting deceleration signal and zero signal when performing machine zero return。

ZRSX =1: There are machine zeroes in X axis, it detects deceleration signal and zero signal when performing machine zero return;

=0: There are no machine zeroes in X axis, it returns to machine zero without detecting deceleration signal and zero signal when performing machine zero return。

|   |   |   |      |     |     |     |     |     |     |     |
|---|---|---|------|-----|-----|-----|-----|-----|-----|-----|
| 0 | 1 | 5 | LPTK | NAT | *** | *** | *** | *** | *** | *** |
|---|---|---|------|-----|-----|-----|-----|-----|-----|-----|

LPTK =1: Serial holes positioning is performed by cutting path(G01~03);

=0: Serial holes positioning is performed by rapid traverse path (G00)。

NAT =1: specify point result range of user macro program asin and atan function.;

=0: do not specify result range of user macro program and tan function.

|   |   |   |     |     |     |     |      |     |     |     |
|---|---|---|-----|-----|-----|-----|------|-----|-----|-----|
| 0 | 1 | 7 | *** | MST | MSP | MOT | MESP | *** | *** | *** |
|---|---|---|-----|-----|-----|-----|------|-----|-----|-----|

MST =1: External cycle start signal (ST) invalid,

=0: External cycle start signal (ST) valid。

MSP =1: External stop signal (SP) invalid,

=0: External stop signal (SP) valid with external stop switch connected, otherwise CNC shows “stop” 。

MOT =1: Not detect software stroke limit;

=0: Detect software stroke limit。

MESP=1: Emergency stop invalid;

=0: Emergency stop valid。

|   |   |   |     |     |     |      |     |     |     |     |
|---|---|---|-----|-----|-----|------|-----|-----|-----|-----|
| 0 | 1 | 8 | *** | *** | *** | ESCD | *** | *** | *** | *** |
|---|---|---|-----|-----|-----|------|-----|-----|-----|-----|

ESCD=1: S code off at emergency stop;

=0: S code not off at emergency stop。

|   |   |   |      |     |     |      |      |      |      |      |
|---|---|---|------|-----|-----|------|------|------|------|------|
| 0 | 1 | 9 | KEY1 | *** | *** | HNG5 | HNG4 | HNGZ | HNGY | HNGX |
|---|---|---|------|-----|-----|------|------|------|------|------|

KEY1 =1: Program switch is “ON”as power on;

=0: Program switch is “OFF”as power on。

HNG5 =1: 5<sup>th</sup> axis handwheel reverse is +、 forward is-;

=0: 5<sup>th</sup> axis handwheel reverse is -、 forward is +。

HNG4 =1: 4<sup>th</sup> axis handwheel reverse is +、 forward is -;

=0: 4<sup>th</sup> axis handwheel reverse is -、 forward is +。

HNGZ =1: Z axis handwheel reverse is +、 forward is -;

=0: Z axis handwheel reverse is -、 forward is +。

HNGY=1: Y axis handwheel reverse is +、forward is -;  
 =0: Y axis handwheel reverse is -、forward is +。  
 HNGX=1: X axis handwheel reverse is +、forward is -;  
 =0: X axis handwheel reverse is -、forward is +。

|   |   |   |      |     |      |      |      |      |      |      |
|---|---|---|------|-----|------|------|------|------|------|------|
| 0 | 2 | 0 | SPFD | SAR | THDA | VAL5 | VAL4 | VALZ | VALY | VALX |
|---|---|---|------|-----|------|------|------|------|------|------|

SPFD=1: feeding stops if spindle stops;  
 =0: feeding not stop after spindle stop。  
 SAR =1: Detect spindle SAR signal prior to cutting;  
 =0: Not detect spindle SAR signal prior to cutting。  
 THDA=1: Threading is exponential acceleration and deceleration;  
 =0: Threading is linear acceleration and deceleration。  
 VAL5=1: For 5<sup>th</sup> axis move key,↑ is positive, ↓ is negative;  
 =0: For 5<sup>th</sup> axis move key, ↓ is positive, ↑ is negative。  
 VAL4=1: For 4<sup>th</sup> axis move key,↑ is positive, ↓ is negative;  
 =0: For 4<sup>th</sup> axis move key, ↓ is positive, ↑ is negative。  
 VALZ=1: For Z axis move key,↑ is positive, ↓ is negative;  
 =0: For Z axis move key, ↓ is positive, ↑ is negative。  
 VALY=1: For Y axis move key,↑ is positive, ↓ is negative;  
 =0: For Y axis move key, ↓ is positive, ↑ is negative。  
 VALX=1: For X axis move key, → is positive, ← is negative;  
 =0: For X axis move key, ← is positive, → is negative

|   |   |   |      |     |     |      |      |      |      |      |
|---|---|---|------|-----|-----|------|------|------|------|------|
| 0 | 2 | 2 | CALH | SOT | *** | MZR5 | MZR4 | MZRZ | MZRY | MZRX |
|---|---|---|------|-----|-----|------|------|------|------|------|

CALH=1: Length offset not cancel in reference point return;  
 =0: Length offset cancel in reference point return。  
 SOT =1: Software limit valid after zero return at power on;  
 =0: Software limit valid after power on。  
 MZR5=1: Machine zero return in negative 5<sup>th</sup> axis;  
 =0: Machine zero return in positive 5<sup>th</sup> axis。  
 MZR4=1: Machine zero return in negative 4<sup>th</sup> axis;  
 =0: Machine zero return in positive 4<sup>th</sup> axis。  
 MZRZ=1: Machine zero return in negative Z axis;  
 =0: Machine zero return in positive Z axis。  
 MZRY=1: Machine zero return in negative Y axis;  
 =0: Machine zero return in positive Y axis。  
 MZRX=1: Machine zero return in positive X axis;  
 =0: Machine zero return in negative X axis。

|   |   |   |       |     |       |     |     |       |     |     |
|---|---|---|-------|-----|-------|-----|-----|-------|-----|-----|
| 0 | 2 | 5 | RTORI | *** | RTPCP | *** | *** | RTCRG | *** | *** |
|---|---|---|-------|-----|-------|-----|-----|-------|-----|-----|

RTORI=1: when excuting M29, spindle return to zero point by machine.  
 =0: when excuting M29, spindle do not return to zero point by machine。  
 RTPCP=1: Rigid tapping is hegh speed deep hole cycle (G73 type);  
 =0: Rigid tapping is high speed deep hole cycle (G83 type).  
 RTCRG=1: when cancel rigid taping, excuting following program block after G61.0 changed to be 1;  
 =0: when cancel rigid tapping, excutiing following progam block after G61.0 changed to be 1.

## CHAPTER 3 PARAMETER

|   |   |   |     |     |     |      |     |     |      |      |
|---|---|---|-----|-----|-----|------|-----|-----|------|------|
| 0 | 2 | 6 | *** | *** | *** | RCS4 | *** | *** | ROS4 | ROT4 |
|---|---|---|-----|-----|-----|------|-----|-----|------|------|

RCS4 =1: Cs function of 4<sup>th</sup> axis is valid;

=0: Cs function of 4<sup>th</sup> axis is invalid.

**Note: Only when rotation axis function is valid (ROT4=1), you can set RCS4 to be valid.**

ROS4、ROT4: Defining 4<sup>th</sup> axis type:

|      | Linear axis | Rotation axis A type | Rotation axis B type | invalid |
|------|-------------|----------------------|----------------------|---------|
| ROT4 | 0           | 1                    | 1                    | 0       |
| ROS4 | 0           | 0                    | 1                    | 1       |

|   |   |   |     |      |     |     |     |      |      |      |
|---|---|---|-----|------|-----|-----|-----|------|------|------|
| 0 | 2 | 7 | *** | RRT4 | *** | *** | *** | RRL4 | RAB4 | ROA4 |
|---|---|---|-----|------|-----|-----|-----|------|------|------|

RRT4 =1: Returning to zero point method of 4<sup>th</sup> rotation axis is D type;

=0: Returning to zero point method of 4<sup>th</sup> rotation axis is A.B.C type.

RRL4=1: Relative coordinate cycle function of 4<sup>th</sup> rotation axis is valid;

=0: Relative coordinate cycle function of 4<sup>th</sup> rotation axis is invalid.

RAB4=1: 4<sup>th</sup> axis is rotating according to symol direction;

=0: 4<sup>th</sup> axis is rotating at nearest position .

ROA4=1: Absolute coordinate cycle of 4<sup>th</sup> rotation axis is valid;

=0: Absolute coordinate cycle of 4<sup>th</sup> rotation axis is invalid。

**Note 1: Parameter ROA4 is only valid in rotation axis (when ROT4=1);**

**Note 2: Only when paramer ROA4 is “1”, RAB4 is valid;**

**Note 3: Only when parameter ROA4 is “1”, RRL4 is valid。**

|   |   |   |     |     |     |      |     |     |      |      |
|---|---|---|-----|-----|-----|------|-----|-----|------|------|
| 0 | 2 | 8 | *** | *** | *** | RCS5 | *** | *** | ROS5 | ROT5 |
|---|---|---|-----|-----|-----|------|-----|-----|------|------|

RCS5=1: Cs axis function of 5<sup>th</sup> axis is valid;

=0: Cs axis function of 5<sup>th</sup> axis is invalid。

**Note: Only when rotation axis is valid (ROT5=1) , defining RCS5 is valid。**

ROS5、ROT5: Defining type of 5<sup>th</sup> axis;

|      | Linear axis | Rotation axis A type | Rotation axis B type | invalid |
|------|-------------|----------------------|----------------------|---------|
| ROT5 | 0           | 1                    | 1                    | 0       |
| ROS5 | 0           | 0                    | 1                    | 1       |

|   |   |   |     |      |     |     |     |      |      |      |
|---|---|---|-----|------|-----|-----|-----|------|------|------|
| 0 | 2 | 9 | *** | RRT5 | *** | *** | *** | RRL5 | RAB5 | ROA5 |
|---|---|---|-----|------|-----|-----|-----|------|------|------|

RRT5 =1: Returing to zero point method of 5<sup>th</sup> rotation axis is D type;

=0: Returing to zero point method of 5<sup>th</sup> rotation axis is A.B.C type;

RRL5=1: Relative coordinate cycle function of 5<sup>th</sup> rotation axis is valid;

=0: Relative coordinate cycle function of 4<sup>5h</sup> rotation axis is valid; 。

RAB5=1: 5<sup>th</sup> axis is rotating according to symol direction;

=0: 5<sup>th</sup> axis is rotating at nearest position .

ROA5=1: Absolute coordinate cycle of 5<sup>th</sup> rotation axis is valid;

=0: Absolute coordinate cycle of 5<sup>th</sup> rotation axis is invalid。

**Note 1: Paramter ROA5 is only valid for rotation axis (ROT5=1);**

**Note 2: Only when parameter ROA5 is “1”, RAB5 is valid ;**

**Note 3: Only when parameter ROA5 is “1”, RRL5 is valid。**

|   |   |   |       |     |     |     |     |    |    |    |
|---|---|---|-------|-----|-----|-----|-----|----|----|----|
| 0 | 4 | 0 | PTEST | *** | *** | *** | *** | L2 | L1 | L0 |
|---|---|---|-------|-----|-----|-----|-----|----|----|----|

PTEST=1: Interface auto detection valid (CNC repower needed);

=0: Interface auto detection invalid。

L2、L1、L0: Interface language selection;

| Language | L2 | L1 | L0 |
|----------|----|----|----|
| Chinese  | 0  | 0  | 0  |
| English  | 0  | 0  | 1  |
| Frencce  | 0  | 1  | 0  |
| Spanish  | 0  | 1  | 1  |
| Germen   | 1  | 0  | 0  |
| Italian  | 1  | 0  | 1  |
| Russian  | 1  | 1  | 0  |
| Korean   | 1  | 1  | 1  |

### 3.1.2 Data parameter

|   |   |   |   |
|---|---|---|---|
| 0 | 4 | 9 | CMRX: X axis multiplier coefficient               |
| 0 | 5 | 0 | CMRY: Y axis multiplier coefficient               |
| 0 | 5 | 1 | CMRZ: Z axis multiplier coefficient               |
| 0 | 5 | 2 | CMR4: 4 <sup>th</sup> axis multiplier coefficient |
| 0 | 5 | 3 | CMR5: 5 <sup>th</sup> axis multiplier coefficient |

Setting range: 1~32767

|   |   |   |   |
|---|---|---|---|
| 0 | 5 | 4 | CMDX: X axis frequency division coefficient               |
| 0 | 5 | 5 | CMDY: Y axis frequency division coefficient               |
| 0 | 5 | 6 | CMDZ: Z axis frequency division coefficient               |
| 0 | 5 | 7 | CMD4: 4 <sup>th</sup> axis frequency division coefficient |
| 0 | 5 | 8 | CMD5: 5 <sup>th</sup> axis frequency division coefficient |

Setting range: 1~32767

Electronic gear ratio formula: 
$$\frac{CMR}{CMD} = \frac{S \times 360}{\alpha \times L} \times \frac{Z_M}{Z_D}$$

S: min. command output unit

$Z_M$ : belt wheel teeth of lead screw

$\alpha$ : motor rotation angle for a pulse

$Z_D$ : Wheel teeth of motor belt

L: Screw lead

|   |   |   |  |
|---|---|---|--|
| 0 | 5 | 9 | X axis max. rapid traverse speed               |
| 0 | 6 | 0 | Y axis max. rapid traverse speed               |
| 0 | 6 | 1 | Z axis max. rapid traverse speed               |
| 0 | 6 | 2 | 4 <sup>th</sup> axis max. rapid traverse speed |
| 0 | 6 | 3 | 5 <sup>th</sup> axis max. rapid traverse speed |

Setting range: 10~99999999 (unit: mm/min)

## CHAPTER 3 PARAMETER

|   |   |   |   |
|---|---|---|---|
| 0 | 6 | 4 | Acceleration&deceleration time constant of X axis rapid traverse (ms)   |
| 0 | 6 | 5 | Acceleration&deceleration time constant of Y axis rapid traverse (ms)   |
| 0 | 6 | 6 | Acceleration&deceleration time constant of Z axis rapid traverse (ms)   |
| 0 | 6 | 7 | Acceleration&deceleration time constant of 4th axis rapid traverse (ms) |
| 0 | 6 | 8 | Acceleration&deceleration time constant of 5th axis rapid traverse (ms) |

Setting range: 10~4000(unit: ms)

|   |   |   |  |
|---|---|---|--|
| 0 | 6 | 9 | Rapid traverse speed when rapid override is F0 |
|---|---|---|--|

Setting range: 6~4000 (unit: mm/min)

|   |   |   |                              |
|---|---|---|------------------------------|
| 0 | 7 | 0 | Axes top feedrate of cutting |
|---|---|---|------------------------------|

Setting range: 10~15000 (unit:mm/min)

|   |   |   |   |
|---|---|---|---|
| 0 | 7 | 1 | Exponential acceleration start speed and deceleration end speed in cutting feed |
|---|---|---|---|

Setting range: 0~8000 (unit:mm/min)

|   |   |   |  |
|---|---|---|--|
| 0 | 7 | 2 | Exponential acceleration&deceleration time constant of cutting |
|---|---|---|--|

Setting range: 10~4000 (unit: ms)

|   |   |   |                                      |
|---|---|---|--------------------------------------|
| 0 | 7 | 3 | initial speed when feeding by manual |
|---|---|---|--------------------------------------|

Setting range: 0~8000 (unit:mm/min)

|   |   |   |  |
|---|---|---|--|
| 0 | 7 | 4 | Exponential acceleration&deceleration time constant of manual feed |
|---|---|---|--|

Setting range: 10~4000 (unit: ms)

|   |   |   |                            |
|---|---|---|----------------------------|
| 0 | 7 | 5 | Threading axes start speed |
|---|---|---|----------------------------|

Setting range: 6~8000 (unit:mm/min)

|   |   |   |   |
|---|---|---|---|
| 0 | 7 | 7 | CS axis acceleration and deceleration initial speed |
|---|---|---|---|

Setting range: 0~5000 (unit:deg/min)

|   |   |   |   |
|---|---|---|---|
| 0 | 7 | 8 | CS axis acceleration and deceleration time constant |
|---|---|---|---|

Setting range: 10~10000 (unit:ms)

|   |   |   |   |
|---|---|---|---|
| 0 | 8 | 1 | linear acceleration and deceleration initial speed in Rigid tapping mode. |
|---|---|---|---|

Setting range: 0~5000 (unit:mm/min)

|   |   |   |   |
|---|---|---|---|
| 0 | 8 | 2 | linear acceleration and deceleration time constant in rigid tapping tool feed mode. |
|---|---|---|---|

Setting range: 10~10000 (unit:ms)



|   |   |   |
|---|---|---|
| 0 | 8 | 3 |
|---|---|---|

linear acceleration and deceleration time constant in rigid tapping tool retrack mode.

Setting range: 0~4000 (unit:ms), when specified to be 0, using value of data parameter 082.

|   |   |   |
|---|---|---|
| 0 | 8 | 4 |
|---|---|---|

Tool retrack rate in rigid tapping mode

Setting range: 0~200, when specified to be 0, rate is fixed at 100%

|   |   |   |
|---|---|---|
| 0 | 8 | 5 |
|---|---|---|

Tool retrack value d in (high speed、standard)deep hole rigid tapping mode

Setting range: 0~32767000, (unit:0.001mm)

|   |   |   |
|---|---|---|
| 0 | 8 | 6 |
|---|---|---|

Allowed maximum spindle speed in rigid tapping

Setting range: 1~1600, (unit:rpm)

|   |   |   |
|---|---|---|
| 0 | 8 | 9 |
| 0 | 9 | 0 |
| 0 | 9 | 1 |
| 0 | 9 | 2 |
| 0 | 9 | 3 |

Low speed of X axis machine zero return

Low speed of Y axis machine zero return

Low speed of Z axis machine zero return

Low speed of 4th axis machine zero return

Low speed of 5th axis machine zero return

Setting range: 10~1000 (unit: mm/min)

|   |   |   |
|---|---|---|
| 0 | 9 | 4 |
| 0 | 9 | 5 |
| 0 | 9 | 6 |
| 0 | 9 | 7 |
| 0 | 9 | 8 |

High speed of X axis machine zero return

High speed of Y axis machine zero return

High speed of Z axis machine zero return

High speed of 4th axis machine zero return

High speed of 5th axis machine zero return

Setting range: 10~921571875 (mm/min)

|   |   |   |
|---|---|---|
| 0 | 9 | 9 |
|---|---|---|

Voltage compensation for 0V analog voltage output

Setting range: -1000~1000 (unit:mV)

|   |   |   |
|---|---|---|
| 1 | 0 | 0 |
|---|---|---|

Voltage offset value when spindle max. speed analog voltage 10V output

Setting range: -2000~2000 (unit: mV)

|   |   |   |
|---|---|---|
| 1 | 0 | 1 |
| 1 | 0 | 2 |
| 1 | 0 | 3 |
| 1 | 0 | 4 |

Max spindle speed of 1<sup>st</sup> gear when analog voltage output is 10V

Max.spindle speed of 2<sup>nd</sup> gear when analog voltage output is 10V

Max.spindle speed of 3<sup>rd</sup> gear when analog voltage output is 10V

Max.spindle speed of 4<sup>th</sup> gear when analog voltage output is 10V

Setting range: 10~9999 (unit:r/min)

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|   |   |   |
|---|---|---|
| 1 | 0 | 7 |
|---|---|---|

Delay of spindle speed in-position signal detection

Setting range: 0~4080 (unit:ms)

|   |   |   |
|---|---|---|
| 1 | 0 | 8 |
|---|---|---|

Max. spindle speed fluctuation allowed by system

Setting range: 50~1000 (r/min)

|   |   |   |
|---|---|---|
| 1 | 0 | 9 |
|---|---|---|

spindle encoder pulses/rev

Setting range: 0~5000 (unit: p/r)

0: Not detect spindle encoder in G74, G84 tapping。

|   |   |   |
|---|---|---|
| 1 | 1 | 0 |
| 1 | 1 | 1 |

Transmission ratio of encoder and spindle- spindle gear teeth

Transmission ratio of encoder and spindle- encoder gear teeth

Setting range: 1~255

|   |   |   |
|---|---|---|
| 1 | 1 | 5 |
| 1 | 1 | 6 |
| 1 | 1 | 7 |
| 1 | 1 | 8 |
| 1 | 1 | 9 |

X axis backlash offset

Y axis backlash offset

Z axis backlash offset

4<sup>th</sup> axis backlash offset

5<sup>th</sup> axis backlash offset

Setting range: 0~2000 (unit:0.001mm)

|   |   |   |
|---|---|---|
| 1 | 2 | 0 |
| 1 | 2 | 1 |
| 1 | 2 | 2 |
| 1 | 2 | 3 |
| 1 | 2 | 4 |

Interval of X axis screw-pitch error compensation

Interval of Y axis screw-pitch error compensation

Interval of Z axis screw-pitch error compensation

Interval of 4<sup>th</sup> axis screw-pitch error compensation

Interval of 5<sup>th</sup> axis screw-pitch error compensation

Setting range: 10000~999999 (unit: 0.001mm )

|   |   |   |
|---|---|---|
| 1 | 2 | 5 |
| 1 | 2 | 6 |
| 1 | 2 | 7 |
| 1 | 2 | 8 |
| 1 | 2 | 9 |

Screw-pitch error compensation number of X axis machine zero

Screw-pitch error compensation number of Y axis machine zero

Screw-pitch error compensation number of Z axis machine zero

Screw-pitch error compensation number of 4<sup>th</sup> axis machine zero

Screw-pitch error compensation number of 5<sup>th</sup> axis machine zero

Setting range: 0~255

|   |   |   |
|---|---|---|
| 1 | 3 | 0 |
| 1 | 3 | 1 |
| 1 | 3 | 2 |

X axis machine zero offset

Y axis machine zero offset

Z axis machine zero offset

|   |   |   |  |
|---|---|---|--|
| 1 | 3 | 3 | 4 <sup>th</sup> axis machine zero offset |
| 1 | 3 | 4 | 5 <sup>th</sup> axis machine zero offset |

Setting range: -99999~99999(unit: 0.001mm)

|   |   |   |   |
|---|---|---|---|
| 1 | 3 | 5 | Max. X coordinate value of software limit               |
| 1 | 3 | 6 | Max. Y coordinate value of software limit               |
| 1 | 3 | 7 | Max. Z coordinate value of software limit               |
| 1 | 3 | 8 | Max. 4 <sup>th</sup> coordinate value of software limit |
| 1 | 3 | 9 | Max. 5 <sup>th</sup> coordinate value of software limit |
| 1 | 4 | 0 | Min. X coordinate value of software limit               |
| 1 | 4 | 1 | Min. Y coordinate value of software limit               |
| 1 | 4 | 2 | Min. Z coordinate value of software limit               |
| 1 | 4 | 3 | Min. 4 <sup>th</sup> coordinate value of software limit |
| 1 | 4 | 4 | Min. 5 <sup>th</sup> coordinate value of software limit |

Setting range: -9999999~+9999999 (unit: 0.001mm)

|   |   |   |   |
|---|---|---|---|
| 1 | 4 | 5 | X machine coordinate of 1 <sup>st</sup> reference point               |
| 1 | 4 | 6 | Y machine coordinate of 1 <sup>st</sup> reference point               |
| 1 | 4 | 7 | Z machine coordinate of 1 <sup>st</sup> reference point               |
| 1 | 4 | 8 | 4 <sup>th</sup> machine coordinate of 1 <sup>st</sup> reference point |
| 1 | 4 | 9 | 5 <sup>th</sup> machine coordinate of 1 <sup>st</sup> reference point |
| 1 | 5 | 0 | X machine coordinate of 2nd reference point                           |
| 1 | 5 | 1 | Y machine coordinate of 2nd reference point                           |
| 1 | 5 | 2 | Z machine coordinate of 2nd reference point                           |
| 1 | 5 | 3 | 4 <sup>th</sup> machine coordinate of 2nd reference point             |
| 1 | 5 | 4 | 5 <sup>th</sup> machine coordinate of 2nd reference point             |
| 1 | 5 | 5 | X machine coordinate of 3rd reference point                           |
| 1 | 5 | 6 | Y machine coordinate of 3rd reference point                           |
| 1 | 5 | 7 | Z machine coordinate of 3rd reference point                           |
| 1 | 5 | 8 | 4 <sup>th</sup> machine coordinate of 3rd reference point             |
| 1 | 5 | 9 | 5 <sup>th</sup> machine coordinate of 3rd reference point             |
| 1 | 6 | 0 | X machine coordinate of 4th reference point                           |
| 1 | 6 | 1 | Y machine coordinate of 4th reference point                           |
| 1 | 6 | 2 | Z machine coordinate of 4th reference point                           |
| 1 | 6 | 3 | 4 <sup>th</sup> machine coordinate of 4th reference point             |
| 1 | 6 | 4 | 5 <sup>th</sup> machine coordinate of 4th reference point             |

Setting range: -99999999~99999999 (0.001mm)

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|   |   |   |
|---|---|---|
| 1 | 7 | 2 |
|---|---|---|

Initial value of cutting feedrate when power on

Setting range: 10~15000 (unit:mm/min)

|   |   |   |
|---|---|---|
| 1 | 7 | 4 |
|---|---|---|

dry run speed

Setting range: 10~99999999 (unit:mm/min)

|   |   |   |
|---|---|---|
| 1 | 7 | 5 |
|---|---|---|

Arc radius error limit

Setting range: 0~1000 (unit:0.001mm) , In the circular command (G02,G03) , it is the travel limit of the difference of the start point radius and end point radius.If error exceeds this value, alarm is issued.

|   |   |   |
|---|---|---|
| 1 | 7 | 6 |
|---|---|---|

Retraction amount of G73 high speed peck drilling cycle

Setting range: 0~32767000 (unit 0.001mm)

|   |   |   |
|---|---|---|
| 1 | 7 | 7 |
|---|---|---|

Start point of G83 high speed peck drilling cycle

Setting range: 0~32767000 (unit 0.001mm)

|   |   |   |
|---|---|---|
| 1 | 7 | 8 |
|---|---|---|

G110,G111,G134,G135 Lead of helical cutting

Setting range: 0~999999 (unit 0.001mm)

If setting value is less than 10, helical feeding is invalid for rough milling command G110, G111, G134, G135, and it feeds by linear type.

If setting value is more than or equal to 10, it feeds by helical type for rough milling command G110, G111, G134, G135.

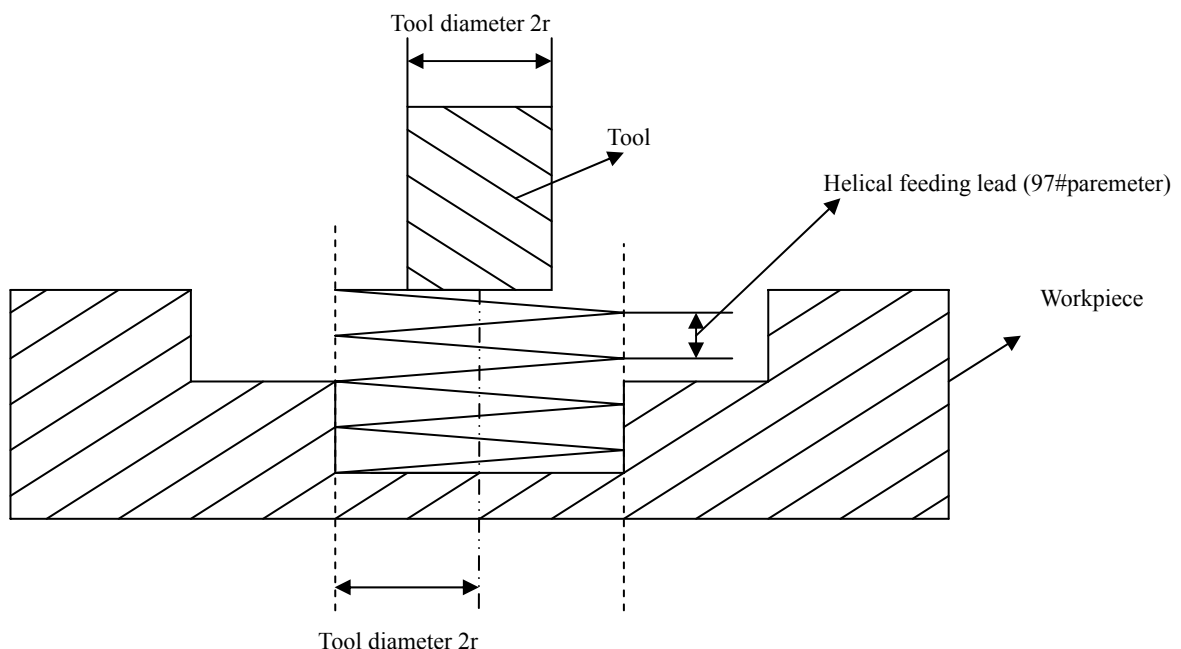
Rough milling command (G110,G111,134,G135) helical feed function:

Namely, for Z axis depth cutting of rough milling command G110, G111, 134, G135, the tool feeds not by linear type, but by helical type. So the workpiece with no groove may be rough milled directly.

**Note 1** when the Z axis cutting depth is less than 10 $\mu$ m each time, the helical feeding is invalid.

**Note 2** when the tool radius is less than 1mm, the helical feeding is also invalid.

The helical feeding path is as following:



|   |   |   |
|---|---|---|
| 1 | 8 | 9 |
| 1 | 9 | 0 |

movement amount of 4th axis's each transfer

movement amount of 5th axis's each transfer

Setting range: 1~9999999 (unit :0.001deg)

|   |   |   |
|---|---|---|
| 2 | 0 | 1 |
|---|---|---|

Key number valid at the same time

Setting range:2~5

|   |   |   |
|---|---|---|
| 2 | 0 | 2 |
| 2 | 0 | 3 |

4<sup>th</sup> axis Name5<sup>th</sup> axis Name

Setting range:65~67 65-A, 66-B, 67-C

|   |   |   |
|---|---|---|
| 2 | 1 | 3 |
|---|---|---|

Total tool number selection

设定量: 1~32

|   |   |   |
|---|---|---|
| 2 | 1 | 4 |
|---|---|---|

Reset output time

Setting range: 16~4080 (unit: ms)

|   |   |   |
|---|---|---|
| 2 | 1 | 5 |
|---|---|---|

Serial communication baudrate

Setting range: 1200、2400、4800、9600、19200、38400、57600、115200 (unit:bit/s)

|   |   |   |
|---|---|---|
| 2 | 1 | 6 |
|---|---|---|

Block No. increment for block No.auto insertion

Setting range: 1~100

## 3.2 Parameter description (by function sequence)

### 3.2.1 Axis control logic

|   |   |   |
|---|---|---|
| 0 | 0 | 8 |
|---|---|---|

DISP

\*\*\*

\*\*\*

DIR5

DIR4

DIRZ

DIRY

DIRX

DIR5 =1: Direction signal (DIR)is high level as 5<sup>th</sup> axis moves positively;=0: Direction signal (DIR)is low level as 5<sup>th</sup> axis moves negatively。DIR4 =1: Direction signal (DIR)is high level as 4<sup>th</sup> axis moves positively;=0: Direction signal (DIR)is low level as 4<sup>th</sup> axis moves negatively。

DIRZ =1: Direction signal (DIR)is high level as Z axis moves positively;

=0: Direction signal (DIR)is low level as Z axis moves negatively。

DIRY =1: Direction signal (DIR)is high level as Y axis moves positively;

=0: Direction signal (DIR)is low level as Y axis moves negatively。

DIRX =1: Direction signal (DIR)is high level as X axis moves positively;

=0: Direction signal (DIR)is low level as X axis moves negatively。

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|   |   |   |     |     |     |      |      |      |      |      |
|---|---|---|-----|-----|-----|------|------|------|------|------|
| 0 | 0 | 9 | *** | *** | *** | ALM5 | ALM4 | ALMZ | ALMY | ALMX |
|---|---|---|-----|-----|-----|------|------|------|------|------|

ALM5 =1: 5<sup>th</sup> axis low level alarm signal (ALM5);

=0: 5<sup>th</sup> axis high level alarm signal (ALM5)。

ALM4 =1: 4<sup>th</sup> axis low level alarm signal (ALM4);

=0: 4<sup>th</sup> axis high level alarm signal (ALM4)。

ALMZ =1: Z axis low level alarm signal (ALMZ);

=0: Z axis high level alarm signal (ALMZ)。

ALMY =1: Y axis low level alarm signal (ALMY);

=0: Y axis high level alarm signal (ALMY)。

ALMX =1: X axis low level alarm signal (ALMX);

=0: X axis high level alarm signal (ALMX)。

|   |   |   |      |     |     |      |      |      |      |      |
|---|---|---|------|-----|-----|------|------|------|------|------|
| 0 | 1 | 9 | KEY1 | *** | *** | HNG5 | HNG4 | HNGZ | HNGY | HNGX |
|---|---|---|------|-----|-----|------|------|------|------|------|

HNG5 =1: 5<sup>th</sup> axis handwheel reverse is +、reverse is -;

=0: 5<sup>th</sup> axis handwheel reverse is -、reverse is +。

HNG4 =1: 4<sup>th</sup> axis handwheel reverse is +、reverse is -;

=0: 4<sup>th</sup> axis handwheel reverse is -、reverse is +。

HNGZ =1: Z axis handwheel reverse is +、reverse is -;

=0: Z axis handwheel reverse is -、reverse is +。

HNGY =1: Y axis handwheel reverse is +、reverse is -;

=0: Y axis handwheel reverse is -、reverse is +。

HNGX =1: X axis handwheel reverse is +、reverse is -;

=0: X axis handwheel reverse is -、reverse is +。

|   |   |   |      |     |      |      |      |      |      |      |
|---|---|---|------|-----|------|------|------|------|------|------|
| 0 | 2 | 0 | SPFD | SAR | THDA | VAL5 | VAL4 | VALZ | VALY | VALX |
|---|---|---|------|-----|------|------|------|------|------|------|

VAL5 =1: For 5<sup>th</sup> axis move key, ↑ is positive, ↓ is negative;

=0: For 5<sup>th</sup> axis move key, ↓ is positive, ↑ is negative。

VAL4 =1: For 4<sup>th</sup> axis move key, ↑ is positive, ↓ is negative;

=0: For 4<sup>th</sup> axis move key, ↓ is positive, ↑ is negative。

VALZ =1: For Z axis move key, ↑ is positive, ↓ is negative;

=0: For Z axis move key, ↓ is positive, ↑ is negative。

VALY =1: For Y axis move key, ↑ is positive, ↓ is negative;

=0: For Y axis move key, ↓ is positive, ↑ is negative。

VALX =1: For X axis move key, → is positive, ← is negative;

=0: For X axis move key, ← is positive, → is negative

|   |   |   |
|---|---|---|
| 0 | 4 | 9 |
| 0 | 5 | 0 |
| 0 | 5 | 1 |
| 0 | 5 | 2 |
| 0 | 5 | 3 |

|   |
|---|
| CMRX: X axis multiplier coefficient               |
| CMRY: Y axis multiplier coefficient               |
| CMRZ: Z axis multiplier coefficient               |
| CMR4: 4 <sup>th</sup> axis multiplier coefficient |
| CMR5: 5 <sup>th</sup> axis multiplier coefficient |

Setting range为: 1~32767

|   |   |   |
|---|---|---|
| 0 | 5 | 4 |
| 0 | 5 | 5 |
| 0 | 5 | 6 |

|   |
|---|
| CMDX: X axis frequency division coefficient |
| CMDY: Y axis frequency division coefficient |
| CMDZ: Z axis frequency division coefficient |

|   |   |   |
|---|---|---|
| 0 | 5 | 7 |
| 0 | 5 | 8 |

|   |
|---|
| CMD4: 4 <sup>th</sup> axis frequency division coefficient |
| CMD5: 5 <sup>th</sup> axis frequency division coefficient |

Setting range为: 1~32767

Electronic gear ratio formula:  $\frac{CMR}{CMD} = \frac{S \times 360}{\alpha \times L} \times \frac{Z_M}{Z_D}$

S: Min. command output unit

$Z_M$ : belt wheel teeth of lead screw

$\alpha$ : motor rotation angle for a pulse

$Z_D$ : Wheel teeth of motor belt

L: Screw lead

### 3.2.2 Acceleration&deceleration control

|   |   |   |
|---|---|---|
| 0 | 0 | 4 |
|---|---|---|

|     |             |      |     |      |     |     |     |
|-----|-------------|------|-----|------|-----|-----|-----|
| *** | <b>RDRN</b> | DECI | *** | PROD | *** | *** | SCW |
|-----|-------------|------|-----|------|-----|-----|-----|

RDRN =1: G0 rapid traverse speed in dry run mode;

=0: G0 manual feedrate in dry run mode.

|   |   |   |
|---|---|---|
| 0 | 1 | 2 |
|---|---|---|

|     |     |     |       |     |     |      |             |
|-----|-----|-----|-------|-----|-----|------|-------------|
| *** | *** | *** | TMANL | *** | *** | EBCL | <b>ISOT</b> |
|-----|-----|-----|-------|-----|-----|------|-------------|

ISOT =1: Prior to machine zero return after power on, manual rapid traverse valid;

=0: Prior to machine zero return after power on, manual rapid traverse invalid.

|   |   |   |
|---|---|---|
| 0 | 5 | 9 |
| 0 | 6 | 0 |
| 0 | 6 | 1 |
| 0 | 6 | 2 |
| 0 | 6 | 3 |

|  |
|--|
| X axis max. rapid traverse speed               |
| Y axis max. rapid traverse speed               |
| Z axis max. rapid traverse speed               |
| 4 <sup>th</sup> axis max. rapid traverse speed |
| 5 <sup>th</sup> axis max. rapid traverse speed |

Setting range: 10~1843143750 (unit: mm/min)

|   |   |   |
|---|---|---|
| 0 | 6 | 4 |
| 0 | 6 | 5 |
| 0 | 6 | 6 |
| 0 | 6 | 7 |
| 0 | 6 | 8 |

|   |
|---|
| Acceleration&deceleration time constant of X axis rapid traverse (ms)   |
| Acceleration&deceleration time constant of Y axis rapid traverse (ms)   |
| Acceleration&deceleration time constant of Z axis rapid traverse (ms)   |
| Acceleration&deceleration time constant of 4th axis rapid traverse (ms) |
| Acceleration&deceleration time constant of 5th axis rapid traverse (ms) |

Setting range: 10~4000(unit: ms)

|   |   |   |
|---|---|---|
| 0 | 6 | 9 |
|---|---|---|

|  |
|--|
| Rapid traverse speed when rapid override is F0 |
|--|

Setting range: 6~4000 (unit: mm/min)

|   |   |   |
|---|---|---|
| 0 | 7 | 0 |
|---|---|---|

|                              |
|------------------------------|
| Axes top feedrate of cutting |
|------------------------------|

Setting range: 10~15000 (unit:mm/min)

|   |   |   |
|---|---|---|
| 0 | 7 | 1 |
|---|---|---|

|   |
|---|
| Exponential acceleration start speed and deceleration end speed in cutting feed |
|---|

Setting range: 0~8000 (unit:mm/min)

|   |   |   |
|---|---|---|
| 0 | 7 | 2 |
|---|---|---|

Exponential acceleration&deceleration time constant of cutting

Setting range: 10~4000 (unit: ms)

|   |   |   |
|---|---|---|
| 0 | 7 | 3 |
|---|---|---|

Initial speed of manual feed mode

Setting range: 0~8000 (unit:mm/min)

|   |   |   |
|---|---|---|
| 0 | 7 | 4 |
|---|---|---|

Exponential acceleration&deceleration time constant of manual feed

Setting range: 10~4000 (unit: ms)

### 3.2.3 Machine protection

|   |   |   |
|---|---|---|
| 0 | 1 | 7 |
|---|---|---|

|     |     |     |     |      |     |     |     |
|-----|-----|-----|-----|------|-----|-----|-----|
| *** | MST | MSP | MOT | MESP | *** | *** | *** |
|-----|-----|-----|-----|------|-----|-----|-----|

MST =1: External cycle start signal (ST) invalid,

=0: External cycle start signal (ST) valid.

MSP =1: External stop signal (SP) invalid,

=0: External stop signal (SP) valid with external stop switch connected, otherwise CNC shows “stop” .

MOT =1: Not detect software stroke limit;

=0: Detect software stroke limit.

MESP=1: Emergency stop invalid;

=0: Emergency stop valid.

|   |   |   |
|---|---|---|
| 0 | 1 | 8 |
|---|---|---|

|     |     |     |      |     |     |     |     |
|-----|-----|-----|------|-----|-----|-----|-----|
| *** | *** | *** | ESCD | *** | *** | *** | *** |
|-----|-----|-----|------|-----|-----|-----|-----|

ESCD=1: S code off at emergency stop;

=0: S code not off at emergency stop.

|   |   |   |
|---|---|---|
| 0 | 2 | 2 |
|---|---|---|

|      |     |     |      |      |      |      |      |
|------|-----|-----|------|------|------|------|------|
| CALH | SOT | *** | MZR5 | MZR4 | MZRZ | MZRY | MZRZ |
|------|-----|-----|------|------|------|------|------|

SOT =1: Software limit valid after zero return at power on;

=0: Software limit valid after power on.

|   |   |   |
|---|---|---|
| 1 | 3 | 5 |
| 1 | 3 | 6 |
| 1 | 3 | 7 |
| 1 | 3 | 8 |
| 1 | 3 | 9 |
| 1 | 4 | 0 |
| 1 | 4 | 1 |
| 1 | 4 | 2 |
| 1 | 4 | 3 |
| 1 | 4 | 4 |

Max. X coordinate value of software limit

Max. Y coordinate value of software limit

Max. Z coordinate value of software limit

Max. 4<sup>th</sup> coordinate value of software limit

Max. 5<sup>th</sup> coordinate value of software limit

Min. X coordinate value of software limit

Min. Y coordinate value of software limit

Min.Z coordinate value of software limit

Min. 4<sup>th</sup> coordinate value of software limit

Min. 5<sup>th</sup> coordinate value of software limit

Setting range: -9999999~+9999999 (unit: 0.001mm)

### 3.2.4 Thread function



|   |   |   |      |     |      |      |      |      |      |      |
|---|---|---|------|-----|------|------|------|------|------|------|
| 0 | 2 | 0 | SPFD | SAR | THDA | VAL5 | VAL4 | VALZ | VALY | VALX |
|---|---|---|------|-----|------|------|------|------|------|------|

THDA =1: Threading is exponential acceleration and deceleration;

=0: Threading is linear acceleration and deceleration.

|   |   |   |                            |
|---|---|---|----------------------------|
| 0 | 7 | 5 | Threading axes start speed |
|---|---|---|----------------------------|

Setting range: 6~8000 (unit:mm/min)

### 3.2.5 Spindle control

|   |   |   |     |     |     |     |     |     |     |     |
|---|---|---|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | 0 | 1 | *** | *** | *** | ACS | HWL | *** | *** | *** |
|---|---|---|-----|-----|-----|-----|-----|-----|-----|-----|

ACS =1: Analog voltage control of spindle speed;

=0: Switching volume control of spindle speed.

|   |   |   |   |
|---|---|---|---|
| 0 | 9 | 9 | Voltage compensation for 0V analog voltage output |
|---|---|---|---|

Setting range: -1000~1000 (unit:mV)

|   |   |   |  |
|---|---|---|--|
| 1 | 0 | 0 | Voltage offset value when spindle max. speed analog voltage 10V output |
|---|---|---|--|

Setting range: -2000~2000 (unit: mV)

|   |   |   |   |
|---|---|---|---|
| 1 | 0 | 1 | Max spindle speed of 1 <sup>st</sup> gear when analog voltage output is 10V |
| 1 | 0 | 2 | Max.spindle speed of 2 <sup>nd</sup> gear when analog voltage output is 10V |
| 1 | 0 | 3 | Max.spindle speed of 3 <sup>rd</sup> gear when analog voltage output is 10V |
| 1 | 0 | 4 | Max.spindle speed of 4 <sup>th</sup> gear when analog voltage output is 10V |

Setting range: 10~9999 (unit:r/min)

|   |   |   |   |
|---|---|---|---|
| 1 | 0 | 7 | Delay of spindle speed in-position signal detection |
|---|---|---|---|

Setting range: 0~4080 (unit:ms)

|   |   |   |  |
|---|---|---|--|
| 1 | 0 | 8 | Max. spindle speed fluctuation allowed by system |
|---|---|---|--|

Setting range: 50~1000 (r/min)

|   |   |   |                            |
|---|---|---|----------------------------|
| 1 | 0 | 9 | spindle encoder pulses/rev |
|---|---|---|----------------------------|

Setting range: 0~5000 (unit: p/r)

0: Not detect spindle encoder in G74, G84 tapping.

|   |   |   |   |
|---|---|---|---|
| 1 | 1 | 0 | Transmission ratio of encoder and spindle- spindle gear teeth |
| 1 | 1 | 1 | Transmission ratio of encoder and spindle- encoder gear teeth |

Setting range: 1~255

### 3.2.6 Tool function

|   |   |   |     |     |     |      |       |      |     |      |
|---|---|---|-----|-----|-----|------|-------|------|-----|------|
| 0 | 0 | 2 | *** | *** | *** | LIFJ | MDITL | LIFC | NRC | TLIF |
|---|---|---|-----|-----|-----|------|-------|------|-----|------|

LIFJ =1: Tool life management group skip valid;

=0: Tool life management group skip invalid。

MDITL=1: Tool life management valid in MDI mode;

=0: Tool life management invalid in MDI mode。

LIFC =1: Tool life counting type 2 by times;

=0: Tool life counting type 1 by times。

NRC =1: Tool nose radius compensation valid;

=0: Tool nose radius compensation invalid。

TLIF =1: Tool life management valid;

=0: Tool life management invalid。

|   |   |   |     |     |     |       |     |     |      |      |
|---|---|---|-----|-----|-----|-------|-----|-----|------|------|
| 0 | 1 | 2 | *** | *** | *** | TMANL | *** | *** | EBCL | ISOT |
|---|---|---|-----|-----|-----|-------|-----|-----|------|------|

TMANL=1: Manual tool change for T code;

=0: Auto tool change for T code。

|   |   |   |                             |  |  |  |  |  |  |  |
|---|---|---|-----------------------------|--|--|--|--|--|--|--|
| 2 | 1 | 3 | Total tool number selection |  |  |  |  |  |  |  |
|---|---|---|-----------------------------|--|--|--|--|--|--|--|

Setting range: 1~32

### 3.2.7 Edit and Display

|   |   |   |     |      |      |     |      |     |     |     |
|---|---|---|-----|------|------|-----|------|-----|-----|-----|
| 0 | 0 | 4 | *** | RDRN | DECI | *** | PROD | *** | *** | SCW |
|---|---|---|-----|------|------|-----|------|-----|-----|-----|

PROD =1: Relative programming position display in POSITION page;

=0: Relative position display involving tool offset in POSITION page。

|   |   |   |      |     |     |      |      |      |      |      |
|---|---|---|------|-----|-----|------|------|------|------|------|
| 0 | 0 | 8 | DISP | *** | *** | DIR5 | DIR4 | DIRZ | DIRY | DIRX |
|---|---|---|------|-----|-----|------|------|------|------|------|

DISP =1: Enter absolute page after power on;

=0: Enter relative page after power on。

|   |   |   |     |     |     |       |     |     |      |      |
|---|---|---|-----|-----|-----|-------|-----|-----|------|------|
| 0 | 1 | 2 | *** | *** | *** | TMANL | *** | *** | EBCL | ISOT |
|---|---|---|-----|-----|-----|-------|-----|-----|------|------|

EBCL =1: Program end sign EOB displays “;”(semicolon);

=0: Program end sign EOB displays “\*””(asterisk)。

|   |   |   |       |     |     |     |     |    |    |    |
|---|---|---|-------|-----|-----|-----|-----|----|----|----|
| 0 | 4 | 0 | PTEST | *** | *** | *** | *** | L2 | L1 | L0 |
|---|---|---|-------|-----|-----|-----|-----|----|----|----|

L2、L1、L0: Interface language selection;

| Language | L2 | L1 | L0 |
|----------|----|----|----|
| Chinese  | 0  | 0  | 0  |
| English  | 0  | 0  | 1  |
| Frence   | 0  | 1  | 0  |
| Spalish  | 0  | 1  | 1  |
| Germen   | 1  | 0  | 0  |
| Ttalian  | 1  | 0  | 1  |
| Russian  | 1  | 1  | 0  |
| Korean   | 1  | 1  | 1  |

|   |   |   |
|---|---|---|
| 2 | 1 | 6 |
|---|---|---|

Block No. increment for block No.auto insertion

Setting range: 1~100

### 3.2.8 Precision compensation

|   |   |   |
|---|---|---|
| 0 | 0 | 3 |
|---|---|---|

|     |     |       |     |     |     |     |     |
|-----|-----|-------|-----|-----|-----|-----|-----|
| *** | *** | PCOMP | *** | *** | *** | D/R | *** |
|-----|-----|-------|-----|-----|-----|-----|-----|

PCOMP=1: Screw-pitch error compensation valid;

=0: Screw-pitch error compensation invalid.

D/R =1: Tool offset D diameter input;

=0: Tool offset D radius input.

|   |   |   |
|---|---|---|
| 0 | 1 | 0 |
|---|---|---|

|      |      |      |      |      |      |      |      |
|------|------|------|------|------|------|------|------|
| CPF7 | CPF6 | CPF5 | CPF4 | CPF3 | CPF2 | CPF1 | CPF0 |
|------|------|------|------|------|------|------|------|

CPF0~CPF7: Setting values of backlash compensation pulse frequency.

The set frequency =  $(2^7 \times \text{CPF7} + 2^6 \times \text{CPF6} + 2^5 \times \text{CPF5} + 2^4 \times \text{CPF4} + 2^3 \times \text{CPF3} + 2^2 \times \text{CPF2} + 2^1 \times \text{CPF1} + \text{CPF0})$  Kpps

|   |   |   |
|---|---|---|
| 0 | 1 | 1 |
|---|---|---|

|      |     |     |     |     |      |     |     |
|------|-----|-----|-----|-----|------|-----|-----|
| BDEC | BD8 | *** | *** | *** | ZNIK | *** | *** |
|------|-----|-----|-----|-----|------|-----|-----|

BDEC =1: Backlash compensation type B, the compensation data are output by ascending or decending type and the set frequency is invalid.;

=0: Backlash compensation type A, the compensation data are output by the set frequency (by bit parameter No.010) or 1/8 of it.

BD8 =1: Backlash compensation is done by the 1/8 of the set frequency;

=0: Backlash compensation is done by the set frequency.

|   |   |   |
|---|---|---|
| 0 | 2 | 2 |
|---|---|---|

|      |     |     |      |      |      |      |      |
|------|-----|-----|------|------|------|------|------|
| CALH | SOT | *** | MZR5 | MZR4 | MZRZ | MZRY | MZRX |
|------|-----|-----|------|------|------|------|------|

CALH=1: Length offset not cancel in reference point return;

=0: Length offset cancel in reference point return.

|   |   |   |
|---|---|---|
| 1 | 1 | 5 |
| 1 | 1 | 6 |
| 1 | 1 | 7 |
| 1 | 1 | 8 |
| 1 | 1 | 9 |

|                                      |
|--------------------------------------|
| X axis backlash offset               |
| Y axis backlash offset               |
| Z axis backlash offset               |
| 4 <sup>th</sup> axis backlash offset |
| 5 <sup>th</sup> axis backlash offset |

Setting range: 0~2000 (unit:0.001mm)

|   |   |   |
|---|---|---|
| 1 | 2 | 0 |
| 1 | 2 | 1 |
| 1 | 2 | 2 |
| 1 | 2 | 3 |
| 1 | 2 | 4 |

|   |
|---|
| Interval of X axis screw-pitch error compensation               |
| Interval of Y axis screw-pitch error compensation               |
| Interval of Z axis screw-pitch error compensation               |
| Interval of 4 <sup>th</sup> axis screw-pitch error compensation |
| Interval of 5 <sup>th</sup> axis screw-pitch error compensation |

Setting range: 1000~999999 (unit: 0.001mm )

|   |   |   |
|---|---|---|
| 1 | 2 | 5 |
|---|---|---|

Screw-pitch error compensation number of X axis machine zero

|   |   |   |  |
|---|---|---|--|
| 1 | 2 | 6 | Screw-pitch error compensation number of Y axis machine zero               |
| 1 | 2 | 7 | Screw-pitch error compensation number of Z axis machine zero               |
| 1 | 2 | 8 | Screw-pitch error compensation number of 4 <sup>th</sup> axis machine zero |
| 1 | 2 | 9 | Screw-pitch error compensation number of 5 <sup>th</sup> axis machine zero |

Setting range: 0~255

### 3.2.9 Communication setting

|   |   |   |                               |
|---|---|---|-------------------------------|
| 2 | 1 | 5 | Serial communication baudrate |
|---|---|---|-------------------------------|

Setting range: 1200、2400、4800、9600、19200、38400、57600、115200 (unit:bit/s)

### 3.2.10 Machine zero return

|   |   |   |     |      |      |     |      |     |     |     |
|---|---|---|-----|------|------|-----|------|-----|-----|-----|
| 0 | 0 | 4 | *** | RDRN | DECI | *** | PROD | *** | *** | SCW |
|---|---|---|-----|------|------|-----|------|-----|-----|-----|

DECI =1: Deceleration signal high level for machine zero return;

=0: Deceleration signal low level for machine zero return。

|   |   |   |      |     |     |     |     |      |     |     |
|---|---|---|------|-----|-----|-----|-----|------|-----|-----|
| 0 | 1 | 1 | BDEC | BD8 | *** | *** | *** | ZNIK | *** | *** |
|---|---|---|------|-----|-----|-----|-----|------|-----|-----|

ZNIK =1: Direction keys locked during zero return, homing continues to end by pressing direction key once;

=0: Direction keys unlocked but should be held on during zero return。

|   |   |   |     |     |     |     |     |     |     |     |
|---|---|---|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | 0 | 6 | *** | *** | *** | ZM5 | ZM4 | ZMZ | ZMY | ZMX |
|---|---|---|-----|-----|-----|-----|-----|-----|-----|-----|

ZM5 =1: 5th zero return type C;

=0: 5th zero return type B。

ZM4 =1: 4th zero return type C;

=0: 4th zero return type B。

ZMZ =1: Z zero return type C;

=0: Z zero return type B。

ZMY =1: Y zero return type C;

=0: Y zero return type B。

ZMX =1: X zero return type C;

=0: X zero return type B。

|   |   |   |      |     |     |     |     |     |     |     |
|---|---|---|------|-----|-----|-----|-----|-----|-----|-----|
| 0 | 0 | 7 | AVGL | *** | SMZ | ZC5 | ZC4 | ZCZ | ZCY | ZCX |
|---|---|---|------|-----|-----|-----|-----|-----|-----|-----|

ZC5 =1: Deceleration signal (DEC5)and one-turn signal (PC5) of 5<sup>th</sup> axis parallel (DEC5 and zero signals together by an approach switch) during machine zero return;

=0: Deceleration signal (DEC5) and one-turn signal (PC5) of 5<sup>th</sup> axis separate (separate DEC5 and zero signal) during machine zero return。

ZC4 =1: Deceleration signal (DEC4)and one-turn signal (PC4) of 4<sup>th</sup> axis parallel (DEC4 and zero signals together by an approach switch) during machine zero return;

=0: Deceleration signal (DEC4) and one-turn signal (PC4) of 4<sup>th</sup> axis separate (separate DEC4 and zero signal) during machine zero return。

ZCZ =1: Deceleration signal (DECZ) and one-turn signal (PCZ) of Z axis parallel (DECZ and zero signals together by an approach switch) during machine zero return;

=0: Deceleration signal (DECZ) and one-turn signal (PCZ) of Z axis separate (separate DECZ and zero signal)

during machine zero return.

ZCY =1: Deceleration signal (DECY) and one-turn signal (PCY) of Y axis parallel (DECY and zero signals together by an approach switch) during machine zero return;

=0: Deceleration signal (DECY) and one-turn signal (PCY) of Y axis separate (separate DECY and zero signal) during machine zero return.

ZCX =1: Deceleration signal (DECX) and one-turn signal (PCX) of X axis parallel (DECZ and zero signals together by an approach switch) during machine zero return;

=0: Deceleration signal (DECX) and one-turn signal (PCX) of X axis separate (separate DECX and zero signal) during machine zero return.

|   |   |   |     |     |     |      |      |      |      |      |
|---|---|---|-----|-----|-----|------|------|------|------|------|
| 0 | 1 | 4 | *** | *** | *** | ZRS5 | ZRS4 | ZRSZ | ZRSY | ZRSX |
|---|---|---|-----|-----|-----|------|------|------|------|------|

ZRS5 =1: There are machine zeroes in 5<sup>th</sup> axis, it detects deceleration signal and zero signal when performing machine zero return;

=0: There are no machine zeroes in 5<sup>th</sup> axis, it returns to machine zero without detecting deceleration signal and zero signal when performing machine zero return.

ZRS4 =1: There are machine zeroes in 4<sup>th</sup> axis, it detects deceleration signal and zero signal when performing machine zero return;

=0: There are no machine zeroes in 4<sup>th</sup> axis, it returns to machine zero without detecting deceleration signal and zero signal when performing machine zero return.

ZRSZ =1: There are machine zeroes in Z axis, it detects deceleration signal and zero signal when performing machine zero return;

=0: There are no machine zeroes in Z axis, it returns to machine zero without detecting deceleration signal and zero signal when performing machine zero return.

ZRSY =1: There are machine zeroes in Y axis, it detects deceleration signal and zero signal when performing machine zero return;

=0: There are no machine zeroes in Y axis, it returns to machine zero without detecting deceleration signal and zero signal when performing machine zero return.

ZRSX =1: There are machine zeroes in X axis, it detects deceleration signal and zero signal when performing machine zero return;

=0: There are no machine zeroes in X axis, it returns to machine zero without detecting deceleration signal and zero signal when performing machine zero return.

|   |   |   |      |     |     |      |      |      |      |      |
|---|---|---|------|-----|-----|------|------|------|------|------|
| 0 | 2 | 2 | CALH | SOT | *** | MZR5 | MZR4 | MZRZ | MZRY | MZRX |
|---|---|---|------|-----|-----|------|------|------|------|------|

CALH=1: Length offset not cancel in reference point return;

=0: Length offset cancel in reference point return.

MZR5=1: Machine zero return in negative 5<sup>th</sup> axis;

=0: Machine zero return in positive 5<sup>th</sup> axis.

MZR4=1: Machine zero return in negative 4<sup>th</sup> axis;

=0: Machine zero return in positive 4<sup>th</sup> axis.

MZRZ=1: Machine zero return in negative Z axis;

=0: Machine zero return in positive Z axis.

MZRY=1: Machine zero return in negative Y axis;

=0: Machine zero return in positive Y axis.

MZRX=1: Machine zero return in positive X axis;

=0: Machine zero return in negative X axis.

## CHAPTER 3 PARAMETER

|   |   |   |
|---|---|---|
| 0 | 8 | 9 |
| 0 | 9 | 0 |
| 0 | 9 | 1 |
| 0 | 9 | 2 |
| 0 | 9 | 3 |

|   |
|---|
| Low speed of X axis machine zero return   |
| Low speed of Y axis machine zero return   |
| Low speed of Z axis machine zero return   |
| Low speed of 4th axis machine zero return |
| Low speed of 5th axis machine zero return |

Setting range: 10~1000 (unit: mm/min)

|   |   |   |
|---|---|---|
| 0 | 9 | 4 |
| 0 | 9 | 5 |
| 0 | 9 | 6 |
| 0 | 9 | 7 |
| 0 | 9 | 8 |

|  |
|--|
| High speed of X axis machine zero return   |
| High speed of Y axis machine zero return   |
| High speed of Z axis machine zero return   |
| High speed of 4th axis machine zero return |
| High speed of 5th axis machine zero return |

Setting range: 10~921571875 (mm/min)

|   |   |   |
|---|---|---|
| 1 | 3 | 0 |
| 1 | 3 | 1 |
| 1 | 3 | 2 |
| 1 | 3 | 3 |
| 1 | 3 | 4 |

|  |
|--|
| X axis machine zero offset               |
| Y axis machine zero offset               |
| Z axis machine zero offset               |
| 4 <sup>th</sup> axis machine zero offset |
| 5 <sup>th</sup> axis machine zero offset |

Setting range: -99999~99999(unit: 0.001mm)

|   |   |   |
|---|---|---|
| 1 | 4 | 5 |
| 1 | 4 | 6 |
| 1 | 4 | 7 |
| 1 | 4 | 8 |
| 1 | 4 | 9 |
| 1 | 5 | 0 |
| 1 | 5 | 1 |
| 1 | 5 | 2 |
| 1 | 5 | 3 |
| 1 | 5 | 4 |
| 1 | 5 | 5 |
| 1 | 5 | 6 |
| 1 | 5 | 7 |
| 1 | 5 | 8 |
| 1 | 5 | 9 |
| 1 | 6 | 0 |
| 1 | 6 | 1 |

|   |
|---|
| X machine coordinate of 1 <sup>st</sup> reference point               |
| Y machine coordinate of 1 <sup>st</sup> reference point               |
| Z machine coordinate of 1 <sup>st</sup> reference point               |
| 4 <sup>th</sup> machine coordinate of 1 <sup>st</sup> reference point |
| 5 <sup>th</sup> machine coordinate of 1 <sup>st</sup> reference point |
| X machine coordinate of 2nd reference point                           |
| Y machine coordinate of 2nd reference point                           |
| Z machine coordinate of 2nd reference point                           |
| 4 <sup>th</sup> machine coordinate of 2nd reference point             |
| 5 <sup>th</sup> machine coordinate of 2nd reference point             |
| X machine coordinate of 3rd reference point                           |
| Y machine coordinate of 3rd reference point                           |
| Z machine coordinate of 3rd reference point                           |
| 4 <sup>th</sup> machine coordinate of 3rd reference point             |
| 5 <sup>th</sup> machine coordinate of 3rd reference point             |
| X machine coordinate of 4th reference point                           |
| Y machine coordinate of 4th reference point                           |

|   |   |   |   |
|---|---|---|---|
| 1 | 6 | 2 | Z machine coordinate of 4th reference point               |
| 1 | 6 | 3 | 4 <sup>th</sup> machine coordinate of 4th reference point |
| 1 | 6 | 4 | 5 <sup>th</sup> machine coordinate of 4th reference point |

Setting range: -99999999~99999999 (0.001mm)

### 3.2.11 Rotation axis function

|   |   |   |       |     |       |     |     |       |     |     |
|---|---|---|-------|-----|-------|-----|-----|-------|-----|-----|
| 0 | 2 | 5 | RTORI | *** | RTPCP | *** | *** | RTCRG | *** | *** |
|---|---|---|-------|-----|-------|-----|-----|-------|-----|-----|

RTORI=1: when excuting M29, spindle returns to machine zero point;

=0: when excuting M29, spindle will not returns to machine zero point; 。

RTPCP=1: rigid tapping is high speed deep hole cycle (G73 type);

=0: rigid tapping is high speed deep hole cycle (G83 type)。

RTCRG=1: when cangle rigid tapping command , implementation of following program does not wait for G61.0 becoming 1;

=0: when cangle rigid tapping command , implementation of following program should wait for G61.0 becoming 1;

|   |   |   |     |     |     |      |     |     |      |      |
|---|---|---|-----|-----|-----|------|-----|-----|------|------|
| 0 | 2 | 6 | *** | *** | *** | RCS4 | *** | *** | ROS4 | ROT4 |
|---|---|---|-----|-----|-----|------|-----|-----|------|------|

RCS4=1: Cs axis function of 4<sup>th</sup> axis is valid;

=0: Cs axis function of 4<sup>th</sup> axis is valid。

ROS4、ROT4: type of 4<sup>th</sup> axis;

|      | Linear axis | Rotation axis A type | Rotation axis B type | invalid |
|------|-------------|----------------------|----------------------|---------|
| ROT4 | 0           | 1                    | 1                    | 0       |
| ROS4 | 0           | 0                    | 1                    | 1       |

|   |   |   |     |      |     |     |     |      |      |      |
|---|---|---|-----|------|-----|-----|-----|------|------|------|
| 0 | 2 | 7 | *** | RRT4 | *** | *** | *** | RRL4 | RAB4 | ROA4 |
|---|---|---|-----|------|-----|-----|-----|------|------|------|

RRT4 =1: 4<sup>th</sup> rotation axis zero return type D

=0: 4<sup>th</sup> rotation axis zero return type A,B,C。

RRL4=1: relative coordinate of 4th rotation axis circulatory function is valid;

=0: relative coordinate of 4th rotation axis circulatory function is invalid;

RAB4=1: 4th rotation axis rotate by symbol direction;

=0: 4<sup>th</sup> rotation axis rotate at nearest place.

ROA4=1: absolute coordinates circulatory function of 4th rotation axis is valid;

=0: absolute coordinates circulatory function of 4th rotation axis is invalid;

|   |   |   |     |     |     |      |     |     |      |      |
|---|---|---|-----|-----|-----|------|-----|-----|------|------|
| 0 | 2 | 8 | *** | *** | *** | RCS5 | *** | *** | ROS5 | ROT5 |
|---|---|---|-----|-----|-----|------|-----|-----|------|------|

RCS5=1: Cs axis function of 5<sup>th</sup> axis is valid;

=0: Cs axis function of 5<sup>th</sup> axis is invalid。

ROS5、ROT5: type of 5<sup>th</sup> axis;

|      | Linear axis | Rotation axis A type | Rotation axis B type | invalid |
|------|-------------|----------------------|----------------------|---------|
| ROT5 | 0           | 1                    | 1                    | 0       |
| ROS5 | 0           | 0                    | 1                    | 1       |

|   |   |   |
|---|---|---|
| 0 | 2 | 9 |
|---|---|---|

|     |      |     |     |     |      |      |      |
|-----|------|-----|-----|-----|------|------|------|
| *** | RRT5 | *** | *** | *** | RRL5 | RAB5 | ROA5 |
|-----|------|-----|-----|-----|------|------|------|

RRT5 =1: 5<sup>th</sup> rotation axis zero point return type D;

=0: 5<sup>th</sup> rotation axis zero point return type A,B,C.

RRL5=1: relative coordinates circulatory function of 5th rotation axis is valid;

=0: relative coordinates circulatory function of 5th rotation axis is invalid;

RAB5=1: 5th rotation axis rotate by symbol direction;

=0: 5<sup>th</sup> rotation axis rotate at nearest place.

ROA5 =1: absolute coordinates circulatory function of 5th rotation axis is valid;

=0: absolute coordinates circulatory function of 5th rotation axis is invalid;

|   |   |   |
|---|---|---|
| 0 | 7 | 7 |
|---|---|---|

|  |
|--|
| acceleration and deceleration initial speed of CS-axis |
|--|

Setting range: 0~5000 (unit:deg/min)

|   |   |   |
|---|---|---|
| 0 | 7 | 8 |
|---|---|---|

|  |
|--|
| Time constant initial speed of CS-axis |
|--|

Setting range: 10~10000 (unit:ms)

|   |   |   |
|---|---|---|
| 0 | 8 | 1 |
|---|---|---|

|  |
|--|
| Linear acceleration and deceleration initial speed in rigid tapping mode |
|--|

Setting range: 0~5000 (unit:mm/min)

|   |   |   |
|---|---|---|
| 0 | 8 | 2 |
|---|---|---|

|  |
|--|
| Linear acceleration and deceleration time constant in rigid tapping tool feed mode |
|--|

Setting range: 10~10000 (unit:ms)

|   |   |   |
|---|---|---|
| 0 | 8 | 3 |
|---|---|---|

|   |
|---|
| Linear acceleration and deceleration time constant in rigid tapping tool retract mode |
|---|

Setting range: 0~4000 (unit:ms), when it is setted to be 0, using value of data parameter 082

|   |   |   |
|---|---|---|
| 0 | 8 | 4 |
|---|---|---|

|   |
|---|
| Rate in rigid tapping tool retract mode |
|---|

Setting range: 0~200, when specified to be 0,rate is fixed in 100%

|   |   |   |
|---|---|---|
| 0 | 8 | 5 |
|---|---|---|

|   |
|---|
| Tool retract value d in(high speed、standard) deep hole rigid tapping mode |
|---|

Setting range: 0~32767000, (unit:0.001mm)

|   |   |   |
|---|---|---|
| 0 | 8 | 6 |
|---|---|---|

|  |
|--|
| Allowed maxium spindle speed in rigid tapping mode |
|--|

Setting range: 1~1600, (unit:rpm)

|   |   |   |
|---|---|---|
| 1 | 8 | 9 |
| 1 | 9 | 0 |

|  |
|--|
| movement amount of 4th rotation axis each transfer |
| movement amount of 5th rotation axis each transfer |

Setting range: 1~9999999 (unit:0.001deg)

|   |   |   |
|---|---|---|
| 2 | 0 | 1 |
|---|---|---|

|                                   |
|-----------------------------------|
| Key number valid at the same time |
|-----------------------------------|

Setting range: 2~5



|   |   |   |
|---|---|---|
| 2 | 0 | 2 |
| 2 | 0 | 3 |

Definition of 4<sup>th</sup> axis nameDefinition of 5<sup>th</sup> axis name

Setting range:65~67 65-A, 66-B, 67-C

## CHAPTER 4 MACHINE DEBUGGING METHODS AND STEPS

The trial run methods and steps at initial power on for this GSK980MDa are described in this chapter. The corresponding operation can be performed after the debugging by the following steps.

### 4.1 Emergency Stop and Stroke Limit

This GSK980MDa system has software limit function, it is suggested that the stroke limit switches are fixed in the positive or negative axes for hardware limit. Their connection is shown as following: (The chart is designed for X、Y、Z axes)

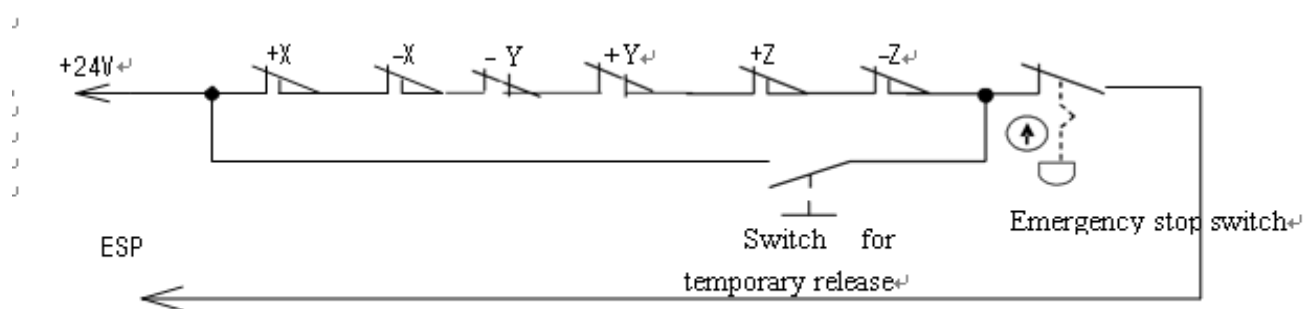


Fig.4-1

So the BIT3 (ESP) of bit parameter No.17 should be set to 0.

And the diagnostic message DGN.000 can monitor the emergency stop input signal.

In Manual or MPG mode, slowly move the axes to testify the validity of stroke limit switch, correctness of alarm display, validity of overtravel release button. When the overtravel occurs or Emergency Stop button is pressed, "emergency stop" alarm will be issued by CNC system. The alarm can be cancelled by pressing down the Overtravel button for reverse moving.

### 4.2 Driver Configuration

The BIT4~BIT0 of bit parameter No.009 for our driver are all set for 1 according to the BIT4~BIT0 of alarm logic level bit parameter No.009 for driver.

If the machine moving direction is not consistent with the moving command, modify the BIT4~BIT0 of bit parameter No.008, bit0 of bit parameter No.019, BIT4~BIT0 of bit parameter No.20.

### 4.3 Gear Ratio Adjustment

The data parameter No.049~No.058 can be modified for electronic gear ratio adjustment to meet the different mechanical transmission ratio if the machine travel distance is not consistent with the displacement distance displayed by the CNC.

Calculation formula:

$$\frac{CMR}{CMD} = \frac{\delta \times 360}{\alpha \times L} \times \frac{Z_M}{Z_D}$$

CMR: command multiplier coefficient (data parameter №049、№050、№051、№052、№053)

CMD: command frequency division coefficient (data parameter №054、№055、№056、№057、№058)

$\alpha$  :: pulse volume, motor rotation angle for a pulse

L: lead

$\delta$ : min. input command unit of CNC (0.0001 for all axes of GSK980MDa)

ZM: gear teeth of lead screw

ZD: gear teeth of motor

If the electronic gear ratio numerator is more than the denominator, the allowed CNC max. speed will decrease.

For example: the data parameter No.051 (CMRZ) =2, №056 (CMDZ) =1, so the allowed Z axis max. speed is 8000mm/min.

If the electronic gear ratio numerator is not equal to the denominator, the allowed CNC positioning precision will decrease. For example: the data parameter No.051 (CMRZ) =1, №056 (CMDZ) =5, so the pulse is not output as the input increment is 0.004, but a pulse is output if the input increment is 0.005.

In order to ensure the CNC positioning precision and speed index, it is suggested that the CNC electronic gear ratio is set for 1:1 or the electronic gear ratio calculated is set to the digital servo matched with the CNC system.

When matching with the step drive, choose the driver with step division function as far as possible, and properly select mechanical transmission ratio. The 1:1 electronic gear ratio should be ensured to avoid the too large difference between the numerator and the denominator of this CNC gear ratio.

For example:

If GSK980MDa is matched with DA98B, taking X-axis as example, firstly setting X-axis instruction multiplying coefficient, instructions sub-frequency coefficients to be 1, then the following calculation:

CNC side:

$$\alpha = \frac{\delta \times 360}{L} \times \frac{Z_M}{Z_D} \text{ (degree/pulse)}$$

You can get following result from above function:

$$\frac{CMR}{CMD} = \frac{\delta \times 360}{\alpha \times L} \times \frac{Z_M}{Z_D} = \frac{1}{1}$$

Driver side

Drives parameters NO.12, NO.13 are separately corresponding position instruction pulse Crossover molecular and position instruction pulse Crossover Denominator. Formula of drive gear ratio is as follows:

$$P \times G = 4 \times N \times C$$

Among, P: required number of pulses in motor rotating circle (360 degrees), and correspondence between CNC side is as follows:  $P = 360/\alpha$

G: Electronic gear ratio,

G= position instruction pulse Crossover molecular/ position instruction pulse Crossover Denominator

N: coil number of motor, specified to be 1

C: line number of feedback encoder, DA98B is 2500p/r.

then you can get:

$$G = \frac{4 \times N \times C}{P} = 4 \times N \times C \times \frac{\alpha}{360} = \frac{4 \times N \times C}{360} \times \frac{\delta \times 360}{L} \times \frac{Z_M}{Z_D} =$$

$$= \frac{10 \times Z_M}{L \times Z_D}$$

Setting molecular and denominator separately to drive parameter number 12, 13.

## 4.4 Acceleration&deceleration Characteristic Adjustment

Adjust the relative CNC parameters according to the factors such as the driver, motor characteristic and machining load:

Data parameter №059~№063: X、Y、Z、4th、5th axis rapid speed;

Data parameter №064~№068: linear acceleration&deceleration time constant of X、Y、Z、4th、5th axis rapid speed;

Data parameter №069: rapid traverse speed when rapid override is F0

Data parameter №070: upper limit of axes cutting feedrate;

Data parameter №071: Exponential acceleration&deceleration start/end speed in cutting feeding;

Data parameter №072: Exponential acceleration&deceleration time constant of cutting and manual feeding;

**Data parameter №073:** exponent acceleration and deceleration initial / termination speed in Hand Wheel / Single step mode;

**Data parameter №074:** exponent acceleration and deceleration time constant in Hand Wheel / Single step mode;

**Data parameter №075:** each axis's initial / termination speed in tapping cutting mode;

**Data parameter №077:** acceleration and deceleration initial speed of CS axis;

**Data parameter №078:** acceleration and deceleration time constant of CS axis;

**Data parameter №081:** linear acceleration and deceleration initial speed in rigid tapping mode;

**Data parameter №082:** acceleration and deceleration time constant in rigid tapping tool feed mode;

**Data parameter №083:** linear acceleration and deceleration initial speed in rigid tapping tool retract mode;

**Data parameter №084:** tool retract rate in rigid tapping mode;

**Data parameter №172:** feed speed when power on;

**Data parameter №174:** speed in dry run mode;

SMZ of bit parameter №007: for validity of smoothing transition between blocks

The larger the acceleration&deceleration time constant is, the slower the acceleration&deceleration is, the smaller the machine movement impact and the lower the machining efficiency is. And vice versa.

If acceleration&deceleration time constants are equal, the higher the acceleration&deceleration start/end speed is, the faster the acceleration&deceleration is, the bigger the machine movement impact and the higher the machining

efficiency is. And vice versa.

The principle for acceleration&deceleration characteristic adjustment is to properly reduce the acceleration&deceleration time constant and increase the acceleration&deceleration start/end speed to improve the machining efficiency. If the acceleration&deceleration time constant is set too small, and the start/end speed is set too large, it is easily to cause driver alarm, motor out-of-step or machine vibration.

When the bit parameter №007 BIT3 ( SMZ ) =1, the feedrate drops to the start speed of the acceleration&deceleration at the cutting path intersection, then it accelerates to the specified speed of the next block to obtain an accurate positioning at the path intersection, but this will reduce the machining efficiency. When BIT3=0, the adjacent cutting path transits smoothly by the acceleration&deceleration. The feedrate does not always drop to the start speed when the previous path is finished and a circular transition (non-accurate positioning) will be formed at the path intersection. The machining surface by this path transition has a good finish and a higher machining efficiency. When the stepper motor driver is applied, the BIT3 of the bit parameter №007 should be set to 1 to avoid the out-of-step.

When the stepper motor driver is applied, the out-of-step may occur if rapid traverse speed is too large, acceleration&deceleration time constant is too small, acceleration&deceleration start/end speed is too large. The suggested parameter setting is as follows (the electronic gear ratio 1:1):

Data parameter №059~№063≤5000    Data parameter №064~№068≥350    Data parameter №071≤50

Data parameter №072≥150    Data parameter №073≤50    Data parameter №074≥150

Data parameter №075≤100

When mactched with AC servo drives, you can set higher initial speed and smaller acceleration and deceleration time constant to improve processing efficiency. If you want to get best acceleration and deceleration characteristics, you can try to set acceleration and deceleration time constant to be 0, by adjusting AC servo parameters. Suggest parameter setting as follows (electric electronic gear ratio is 1:1):

Set Data parameter №059~№063 **a little higher**

Data parameter №064~№068≤60    Data parameter №071≥50

Data parameter №059~№063    Data parameter №064~№068≤60    Data parameter №071≥50

Data parameter №072≤50    Data parameter №073≥50    Data parameter №074≤50

Data parameter №075≤500

The parameter setting above is recommended for use, refer to the actual conditions of the driver, motor characteristic and motor load for its proper setting.

## 4.5 Machine Zero Adjustment

Adjust the relevant parameters based on the valid level of the connection signal, zero return type or direction applied:

(DECI) of the bit parameter №004: valid level of deceleration signal as machine zero return

(ZM5~ZMX) of the bit parameter №006: return and initial backlash direction of: X、Y、Z, 4th、5th axes machine zeroes at deceleration

(ZC5~ZCX) of the bit parameter №007: X、Y、Z、4th、5th for an approach switch taken as both deceleration and zero signals

(ZNLK) of the bit parameter №011: for direction keys lock when performing zero return

(ZRSCX, ZRSCY, ZRSCZ) of the bit parameter №014: for deceleration and zero signals detection of X, Y, Z axes

(MZR5~MZRZ) of the bit parameter №22: for positive or negative zero turn of X、Y、Z、4th、5th axes

Data parameter №089~№093: low speeds of X、Y、Z、4th、5th axes machine zero return

Data parameter №094~№098: high speeds of X、Y、Z、4th、5th axes machine zero return

4<sup>th</sup> and 5<sup>th</sup> axis zero point return method is separately specified by State parameter №027 RRT and №029 PRT5.

After confirming exceed limit switch is valid, you can execute machine zero point return. Basic axis(X,Y,Z) can choose method of zero point return. A,B,C and additional axis(4<sup>th</sup> axis,5<sup>th</sup> axis) can choose method of zero point return:A.B.C.D mode.

The machine zero is usually fixed at the max. travel point, and the effective stroke of the zero return touch block should be more than 25mm to ensure a sufficient deceleration distance for accurate zero return. The more rapid the machine zero return is, the longer the zero return touch block should be. Or the moving carriage will rush through the block which may influence the zero return precision because of the insufficient deceleration distance.

Usually there are 2 types of machine zero return connection:

1 The suited AC servo motor connection : connection schematic diagram using a travel switch or a servo motor revolution signal respectively

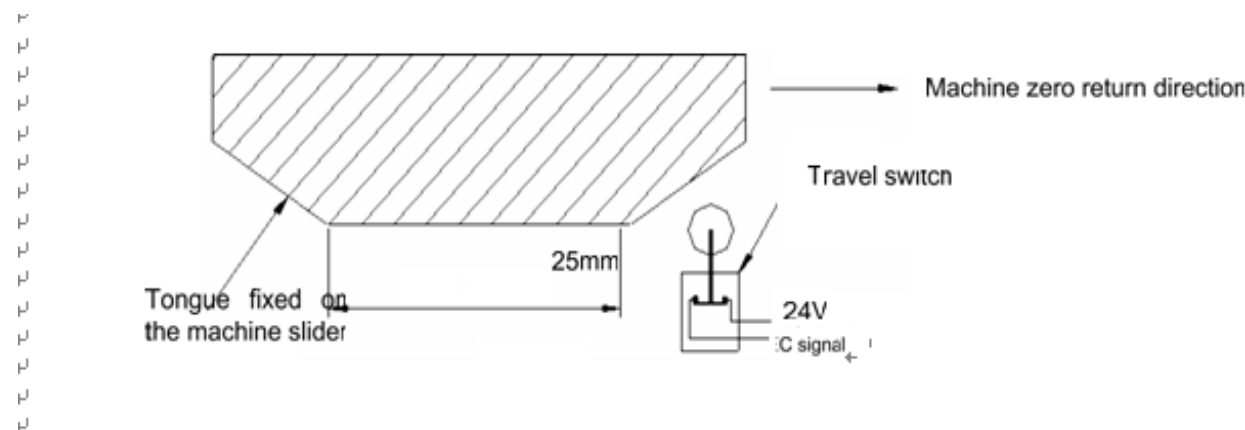


Fig. 4-2

By this connection type, when the deceleration switch is released in machine zero return, the one-turn signal of encoder should be avoided to be at a critical point after the travel switch is released. In order to improve the zero return precision, it should be ensured the motor reaches the one-turn signal of encoder after it rotates for half circle. And the moving distance for motor half circle rotation is the motor gear teeth/(2×lead screw gear teeth)

2 The connection for suited stepper motor: the schematic diagram using an approach switch taken as both deceleration signal and zero signal

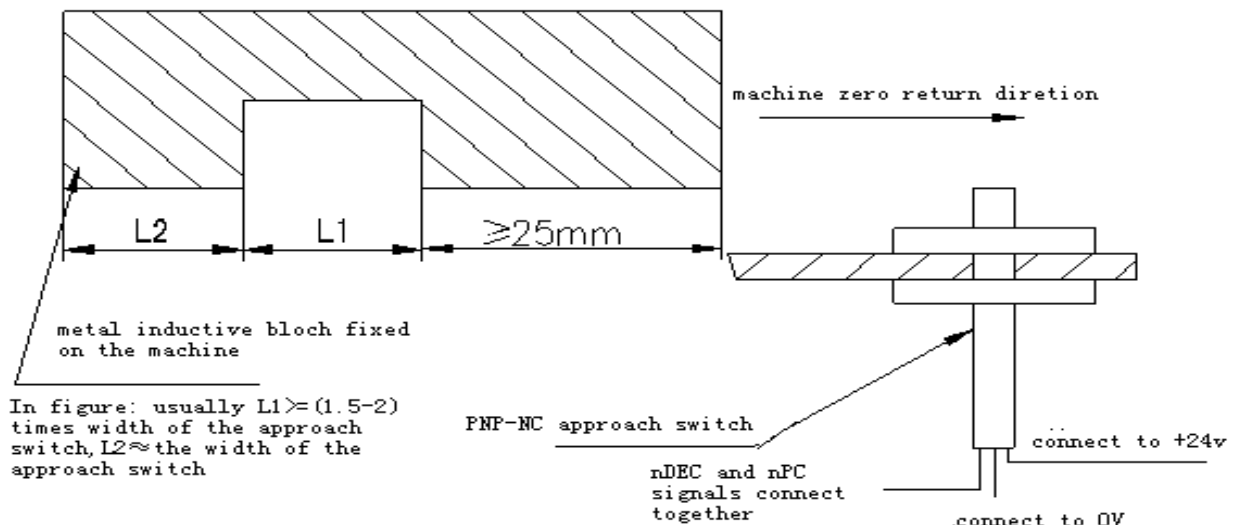


Fig 4-3

## 4.6 Spindle Adjustment

### 4.6.1 Spindle encoder

Encoder with the linear number 100~5000p/r is needed to be installed on the machine for threading. The linear number is set by data parameter No.109. The transmission ratio(spindle gears/encoder gears) between encoder and spindle is 1/255~255. The spindle gears are set by CNC data parameter No.110, and the encoder gears by data parameter No.111. Synchronous belt transmission should be applied for it (no sliding transmission).

The DGN.011 and DNG.012 of diagnosis message are used to check the validity of threading signal from the spindle encoder.

### 4.6.2 Spindle brake

After M05 code is executed, proper spindle brake time should be set to stop the spindle promptly in order to enhance the machining efficiency. If the brake is employed with energy consumption type, too long braking time may damage the motor. So the brake time is set by PLC.

### 4.6.3 Switch volume control for spindle speed

When mult-speed motor are used in machine, motor speed instruction  $S_{\_\_}$  can be defined by ladder. Relative paramte is showed as follows:

State parameter №001 ACS=0: choose spindle switch value control mode;

### 4.6.4 Analog voltage control for spindle speed

This function can be obtained by the parameter setting of CNC. By interface outputting 0V~10V analog voltage to control transducer, the stepless shift can be obtained. And the relative parameters are needed to be adjusted:

Bit parameter №001 ACS=1: for spindle speed analog voltage control;

Data parameter №099: offset value as spindle speed command voltage is 0V;

Data parameter №0100: offset value as spindle speed command voltage is 10V;

Data parameter №101 ~ №104: highest speed limit of 1~4 grade spindle speed; when CNC power on, spindle speed is tacitly approved at first grade.

Basic parameters needed to be adjusted for transducer (refer to the relevant transducer manual for the adjustment) CCW or CW command mode selection: by common terminal VF;

If the speed by programming is not consistent with that detected by the encoder, it can be adjusted to be consistent with the actual one by adjusting the data parameter №101~№104.

Speed adjustment method: select the spindle first gear, input S9999 code in MDI mode to run the spindle, view the spindle speed shown on the right bottom of the screen, then reinput the speed value displayed into the parameter №037. The other spindle gear adjustment is identical with this.

When entering S9999 code, the voltage should be 10V, S0 for 0V. If there is an voltage error, adjust bit parameter №099 and №100 to correct the voltage offset value (corrected by manufacturer, usually not needed).

When the current gear is the max. speed, if the analog voltage output by CNC is higher than 10V, set a smaller value for data parameter №100; when the S00 code is entered, if there is still slow rotation in the spindle, it means the analog voltage output by CNC is higher than 0V, so set a smaller value for data parameter №099.

If the machine is not fixed with an encoder, the spindle speed can be detected by a speed sensor, input S9999 in MDI mode to set the speed value displayed by sensor to the data parameter №101.

## 4.7 Backlash Offset

The backlash offset is input by diameter value with the unit 0.001mm, which is irrelevant to the programming by diameter or by radius. It can be measured by a dial indicator, a micrometer or a laser detector. Because the backlash offset can improve the machining precision only by accurate compensation, the backlash offset is not recommended to be measured in the MPG or Step mode, but the following method is suggested:

- Program editing

```
O0001;
N10 G01 Z10 F800 G91 ;
N20 Z15 ;
N30 Z1 ;
N40 Z-1 ;
N50 M30 。
```

- Set the backlash error offset for 0 before measuring:
- Run the program by single blocks, search the measuring benchmark after 2 positioning operations, record the current data, move 1mm in the same direction, then move 1mm reversely to point B, read the current data.



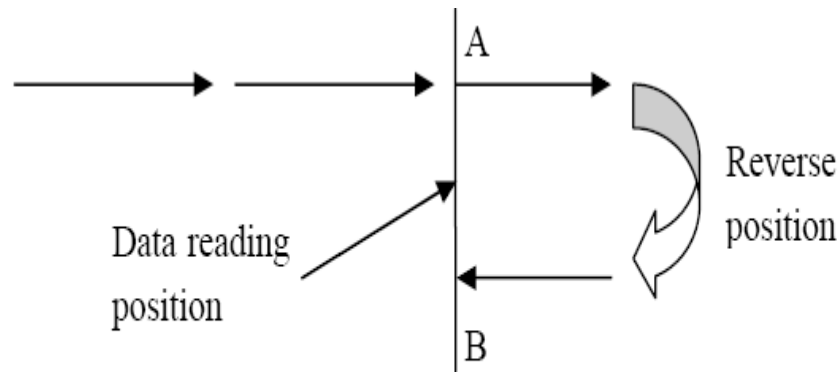


Fig. 4-4 Schematic map of backlash measuring methods

- Backlash error compensation value = | recorded data at A point – recorded data at B point| ; input counted result into CNC data parameter №115~№119. Other axis are the same.

Data A: dial meter data at point A

Data B: dial meter data at point B

Note 1 The backlash offset mode and frequency can be set by DEC and BD8 of CNC parameter №011.

**Note 2:** To ensure machine precision, users can re-testing backlash depending on circumstances from time to time .

## 4.8 Step/MPG adjustment

The key on the panel can be used to select the Step mode or MPG mode, which is set by the HWL of bit parameter №001.

HWL=1: MPG mode valid, Step mode invalid;

=0: Step mode valid, MPG mode invalid;

The direction of handwheel can be adjusted by parameter:

|   |   |   |     |     |     |      |      |      |      |      |
|---|---|---|-----|-----|-----|------|------|------|------|------|
| 0 | 1 | 9 | *** | *** | *** | HNG5 | HNG4 | HNGZ | HNGY | HNGX |
|---|---|---|-----|-----|-----|------|------|------|------|------|

HNG5=1: 5th handwheel: ccw: +, cw: -;

=0: 5th handwheel: ccw: -, cw: +.

HNG4=1: 4th handwheel: ccw: +, cw: -;

=0: 4th handwheel: ccw: -, cw: +

HNGZ=1: Z handwheel: ccw: +, cw: -;

=0: Z handwheel: ccw: -, cw: +.

HNGY=1: Y handwheel: ccw: +, cw: -;

=0: Y handwheel: ccw: -, cw: +.

HNGX=1: X handwheel: ccw: +, cw: -;

=0: X handwheel: ccw: -, cw: +.

## 4.9 Other Adjustment

|   |   |   |     |     |     |     |      |     |     |     |
|---|---|---|-----|-----|-----|-----|------|-----|-----|-----|
| 0 | 1 | 7 | *** | MST | MSP | MOT | MESP | *** | *** | *** |
|---|---|---|-----|-----|-----|-----|------|-----|-----|-----|

MST =1: External Cycle Start (ST) signal invalid.

- =0: External Cycle Start(ST) signal valid;
- MSP =1: External Dwell (SP) signal invalid.
- =0: External Stop (SP) signal valid.
- MOT =1: Not check software limit.
- =0: Check software limit;
- MESP=1: Not check external ESP signal;
- =0: Check external ESP signal.

|   |   |   |     |     |     |      |     |     |     |     |
|---|---|---|-----|-----|-----|------|-----|-----|-----|-----|
| 0 | 1 | 8 | *** | *** | *** | ESCD | *** | *** | *** | *** |
|---|---|---|-----|-----|-----|------|-----|-----|-----|-----|

- ESCD =1: S code off in emergency stop;
- =0: S code not off in emergency stop.

## CHAPTER 5 DIAGNOSIS MESSAGE

### 5.1 CNC Diagnosis

This diagnosis section is used to check the CNC interface and internal running state that it can't be modified.

#### 5.1.1 Signal diagnosis from machine to CNC

|                   |        |  |  |         |         |         |         |        |
|-------------------|--------|--|--|---------|---------|---------|---------|--------|
| 0 0 0             | ESP    |  |  | DEC5    | DEC4    | DECZ    | DECY    | DECX   |
| Pin-out           | CN61.6 |  |  | CN61.34 | CN61.33 | CN61.12 | CN61.32 | CN61.4 |
| PLC fixed address | X0.5   |  |  | X2.5    | X24     | X1.3    | X23     | X0.3   |

ESP: Emergency signal

XDEC, YDEC, ZDEC, DEC4, DEC5: Deceleration signal of X, Y, Z, 4th, 5th axes reference return

|                   |  |  |  |  |  |  |         |
|-------------------|--|--|--|--|--|--|---------|
| 0 0 1             |  |  |  |  |  |  | SKIP    |
| Pin-out           |  |  |  |  |  |  | CN61.42 |
| PLC fixed address |  |  |  |  |  |  | X3.5    |

SKIP: Skip signal

#### 5.1.2 Axes moving state and data diagnosis of CNC

|       |  |  |  |      |      |      |      |      |
|-------|--|--|--|------|------|------|------|------|
| 0 0 3 |  |  |  | RDY5 | RDY4 | RDYZ | RDYY | RDYX |
|-------|--|--|--|------|------|------|------|------|

RDYX~RDY5: The signal that( X、Y、Z、4th、5th) axis is ready

|       |     |     |     |     |     |     |     |     |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 0 4 | *** | *** | *** | EN5 | EN4 | ENZ | ENY | ENX |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|

ENX~EN5: The signal that ( X、Y、Z、4th、5th) axis is enabled

|       |     |     |     |      |      |      |      |      |
|-------|-----|-----|-----|------|------|------|------|------|
| 0 0 5 | *** | *** | *** | SET5 | SET4 | SETZ | SETY | SETX |
|-------|-----|-----|-----|------|------|------|------|------|

SETX~SET5: the signal of that impulse of( X、Y、Z、4th、5th) axis don't output

|       |     |     |     |      |      |      |      |      |
|-------|-----|-----|-----|------|------|------|------|------|
| 0 0 6 | *** | *** | *** | DRO5 | DRO4 | DROZ | DROY | DROX |
|-------|-----|-----|-----|------|------|------|------|------|

DROX~DRO5: Direction of ( X、Y、Z、4th、5th) axis inpluse

|       |     |     |     |      |      |      |      |      |
|-------|-----|-----|-----|------|------|------|------|------|
| 0 0 7 | *** | *** | *** | TDR5 | TDR4 | TDRZ | TDRY | TDRX |
|-------|-----|-----|-----|------|------|------|------|------|

TDRX~TDR5: Direction of ( X、Y、Z、4th、5th) track(1:juse; 0:bear)

|       |     |     |     |     |     |     |     |     |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 0 8 | *** | *** | *** | PC5 | PC4 | PCZ | PCY | PCX |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|

PCX~PC5: Point signal in ( X、Y、Z、4th、5th) Direction

|       |     |     |     |      |      |      |      |      |
|-------|-----|-----|-----|------|------|------|------|------|
| 0 0 9 | *** | *** | *** | ALM5 | ALM4 | ALMZ | ALMY | ALMX |
|-------|-----|-----|-----|------|------|------|------|------|

ALMX~ALM5: ALam signal of ( X、Y、Z、4th、5th) axis

|   |   |   |                               |
|---|---|---|-------------------------------|
| 0 | 1 | 0 | Handwheel speed data          |
| 0 | 1 | 1 | Spindle feedback data         |
| 0 | 1 | 2 | Spindle feedback data         |
| 0 | 1 | 3 | Spindle analog voltage output |
| 0 | 1 | 4 | Spindle analog voltage output |

### 5.1.3 Keys diagnosis

DGN.016~DGN.022 are the diagnosis messages of edit keypad keys; When pressing a key in the operation panel, the corresponding bit displays “1”, and “0” after releasing this key. If it displays reversely, it means there is a fault in the keypad circuit.

|   |   |   |                   |     |     |     |       |     |       |         |       |
|---|---|---|-------------------|-----|-----|-----|-------|-----|-------|---------|-------|
| 0 | 1 | 6 | Corresponding key | RST | O   | N   | G     | P/Q | 7     | 8       | 9     |
|   |   |   |                   |     |     |     |       |     |       |         |       |
| 0 | 1 | 7 | Corresponding key | PGU | X   | Y/& | Z/    | U/W | 4     | 5       | 6     |
|   |   |   |                   |     |     |     |       |     |       |         |       |
| 0 | 1 | 8 | Corresponding key | PGD | H   | F/E | R/V   | D/L | 1     | 2       | 3     |
|   |   |   |                   |     |     |     |       |     |       |         |       |
| 0 | 1 | 9 | Corresponding key |     |     | I/A | J/B   | K/C | -/+/_ | 0       | ./</> |
|   |   |   |                   |     |     |     |       |     |       |         |       |
| 0 | 2 | 0 | Corresponding key |     |     | M/[ | S/]   | T/= | EOB   | ALT/MAC | DEL   |
|   |   |   |                   |     |     |     |       |     |       |         |       |
| 0 | 2 | 1 | Corresponding key |     | POS | PRG | OFT   | ALM | SET   | PAR     | DGN   |
|   |   |   |                   |     |     |     |       |     |       |         |       |
| 0 | 2 | 2 | Corresponding key | IN  | OUT | CHG | //*/# | CAN |       |         |       |
|   |   |   |                   |     |     |     |       |     |       |         |       |

### 5.1.4 CNC internal state

During the CNC auto run, the current CNC running state can be viewed by DGN.064~DGN.110 diagnosis

## CHAPTER 5 DIAGNOSIS MESSAGE

messages if there is no alarm and moving.

|   |   |   |
|---|---|---|
| 0 | 7 | 8 |
| 0 | 7 | 9 |
| 0 | 8 | 0 |
| 0 | 8 | 1 |
| 0 | 8 | 2 |

|  |
|--|
| As power fail,X start posion of executing segment(0.001mm)   |
| As power fail,Y start posion of executing segment(0.001mm)   |
| As power fail,Z start posion of executing segment(0.001mm)   |
| As power fail,4th start posion of executing segment(0.001mm) |
| As power fail,5th start posion of executing segment(0.001mm) |

|   |   |   |
|---|---|---|
| 0 | 8 | 3 |
| 0 | 8 | 4 |
| 0 | 8 | 5 |
| 0 | 8 | 6 |
| 0 | 8 | 7 |
| 0 | 8 | 8 |
| 0 | 8 | 9 |
| 0 | 9 | 0 |
| 0 | 9 | 1 |
| 0 | 9 | 2 |
| 0 | 9 | 3 |
| 0 | 9 | 4 |
| 0 | 9 | 5 |

|  |
|--|
| When the power fail, the G mode belongs to group1(G00~G03)   |
| When the power fail, the G mode belongs to group2(G17~G19)   |
| When the power fail, the G mode belongs to group3(G90、 G91)  |
| When the power fail, the G mode belongs to group5(G94、 G95)  |
| When the power fail, the G mode belongs to group6(G20、 G21)  |
| When the power fail, the G mode belongs to group7(G40~G42)   |
| When the power fail, the G mode belongs to group8(G43/44/49) |
| When the power fail, the G mode belongs to group10(G98、 G99) |
| When the power fail, the G mode belongs to group14(G54~G59)  |
| The value of F when the power fail.                          |
| The value of S when the power fail.                          |
| The value of H when the power fail.                          |
| The value of D when the power fail.                          |

|   |   |   |
|---|---|---|
| 1 | 0 | 7 |
| 1 | 0 | 8 |
| 1 | 0 | 9 |
| 1 | 1 | 0 |
| 1 | 1 | 1 |

|   |
|---|
| Counts of X impulse from checking PC to receving PC in Ref.   |
| Counts of Y impulse from checking PC to receving PC in Ref.   |
| Counts of Z impulse from checking PC to receving PC in Ref.   |
| Counts of 4th impulse from checking PC to receving PC in Ref. |
| Counts of 5th impulse from checking PC to receving PC in Ref. |

|   |   |   |
|---|---|---|
| 1 | 1 | 2 |
|---|---|---|

|  |
|--|
| The impulse counts of sampling encoder |
|--|

|   |   |   |
|---|---|---|
| 1 | 1 | 3 |
|---|---|---|

|  |
|--|
| The impulse counts of sampling hanswheel |
|--|

Note: In fixed cycle program, №079~№082 means the current section's start position, but not the program segment's start position, when power fails.

### 5.2 PLC state

This part of diagnosis is used to detect the signal state of machine→PLC (X), PLC→machine (Y), CNC→PLC (F), PLC→CNC (G) and alarm address A, which can't be modified. See the relative PLC manual for address F, G significance, and the signal significance of address A is defined by user himself.

#### 5.2.1 X address (others are defined by PLC except the following fixed addresses)

|       |  |  |     |  |      |  |  |  |
|-------|--|--|-----|--|------|--|--|--|
| X0000 |  |  | ESP |  | DECX |  |  |  |
|-------|--|--|-----|--|------|--|--|--|

ESP: Emergency stop signal

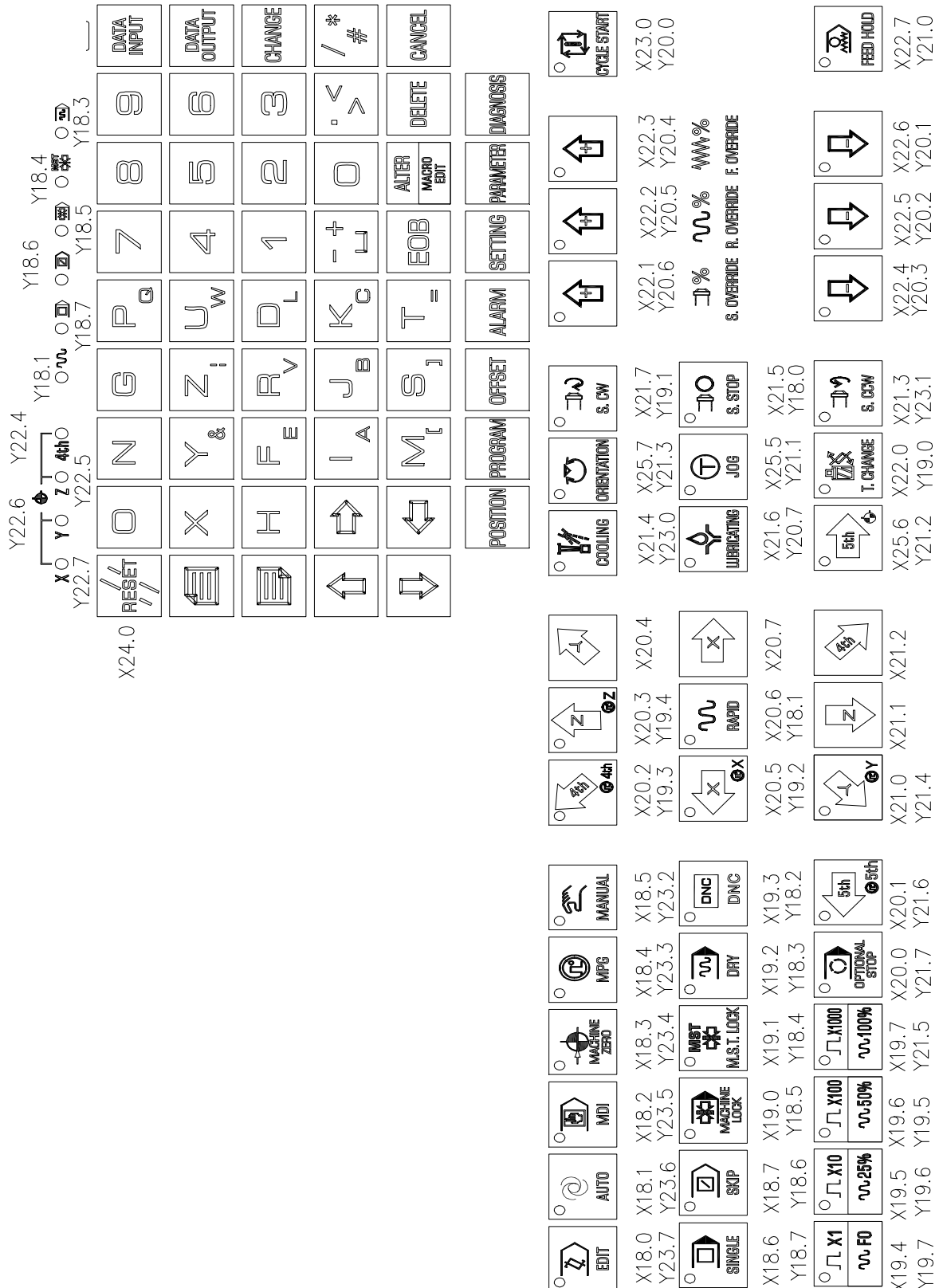
DECX: Deceleration signal of X axis

|       |  |  |      |      |      |  |  |  |
|-------|--|--|------|------|------|--|--|--|
| X0001 |  |  |      |      | DECZ |  |  |  |
| X0002 |  |  | DEC5 | DEC4 | DECY |  |  |  |
| X0003 |  |  | SKIP |      |      |  |  |  |

SKIP: Skip signal

DECY~DEC5: Deceleration signal of (Y、Z、4th、5th) axis

the correspondence of X fixed address to the machine panel is as belowe chart:



### **5.2.2 Y address (others are defined by PLC except the following fixed addresses)**

the correspondence of Y fixed address to the machine panel is as above chart:

### **5.3 PLC Data**

The PLC data includes T, C, DT, DC, D, their significance is defined by user requirement.

## CHAPTER6 MEMORIZING SCREW-PITCH ERROR COMPENSATION FUNCTION

### 6.1 Function Explanation

There are more or less precision errors in the screw-pitch of machine axes lead screw, it will definitely affect the parts machining precision. This GSK980MD has the screw-pitch error compensation memorizing function that it can accurately compensate the screw-pitch error.

### 6.2 Specification

1 The offset is concerned with the offset origin, offset clearances, offset point, mechanical moving direction etc.;

2 After performing the machine zero return, take this reference point as the offset origin, and set the offset value to be compensated in the parameters on the basis of the axes offset clearances;

3 Points to be compensated: 256 points for each axis

4 Axis compensated: X, Y, Z, 4th, 5th axis Part 3 Installation and Connection

5 Offset range:  $-255 \sim +255 \mu\text{m}$  for each offset point

6 Offset clearance:  $1000 \sim 9999999 \mu\text{m}$ ;

7 Offset of point N(N=0,1,2,3,...255) is determined by the N, N-1 mechanical error;

8 Actual offset clearance: set an appropriate value in the range above according to the max. offset range and mechanical travel;

9 The setting is identical with the CNC parameters input, see the explanation in the relative operation.

### 6.3 Parameter Setting

#### 6.3.1 Screw-pitch compensation

|   |   |   |
|---|---|---|
| 0 | 0 | 3 |
|---|---|---|

|     |     |       |     |     |     |     |     |
|-----|-----|-------|-----|-----|-----|-----|-----|
| *** | *** | PCOMP | *** | *** | *** | D/R | *** |
|-----|-----|-------|-----|-----|-----|-----|-----|

PCOMP=1: Screw-pitch error compensation valid;

=0: Screw-pitch error compensation invalid.

#### 6.3.2 Screw-pitch error origin

That the screw-pitch error compensation start from a position No. in the offset list, which is determined by the machine zero, is called screw-pitch error offset origin (original point). Each axis may be set in any position from 0 to 255, which is set by data parameter №125~№129 depending on the mechanical requirement.

|   |   |   |
|---|---|---|
| 1 | 2 | 5 |
| 1 | 2 | 6 |
| 1 | 2 | 7 |
| 1 | 2 | 8 |

|  |
|--|
| Screw-pitch error offset No. of X machine zero   |
| Screw-pitch error offset No. of Y machine zero   |
| Screw-pitch error offset No. of Z machine zero   |
| Screw-pitch error offset No. of 4th machine zero |



|   |   |   |
|---|---|---|
| 1 | 2 | 9 |
|---|---|---|

Screw-pitch error offset No. of 5th machine zero

### 6.3.3 Offset clearance

|   |   |   |  |
|---|---|---|--|
| 1 | 2 | 0 | Clearance of X axis screw-pitch offset   |
| 1 | 2 | 1 | Clearance of Y axis screw-pitch offset   |
| 1 | 2 | 2 | Clearance of Z axis screw-pitch offset   |
| 1 | 2 | 3 | Clearance of 4th axis screw-pitch offset |
| 1 | 2 | 4 | Clearance of 5th axis screw-pitch offset |

Setting range: 1000~9999999. (Input unit: 0.001mm ;)

### 6.3.4 Offset value

The axes screw-pitch offset values are set according to the parameter No. In the following table..The offset value is input by diameter with the unit 0.001mm,which is irrelevant to the programming by diameter or by radius. (The chart is designed for X、Y、Z axes)

| Offset No. | X   | Y   | Z   |
|------------|-----|-----|-----|
| 000        | ... | ... | ... |
| 001        | 5   | -2  | 3   |
| 002        | -3  | 4   | -1  |
| ...        | ... | ... | ... |
| 255        | ... | ... | ... |

## 6.4 Cautions of Offset Setting

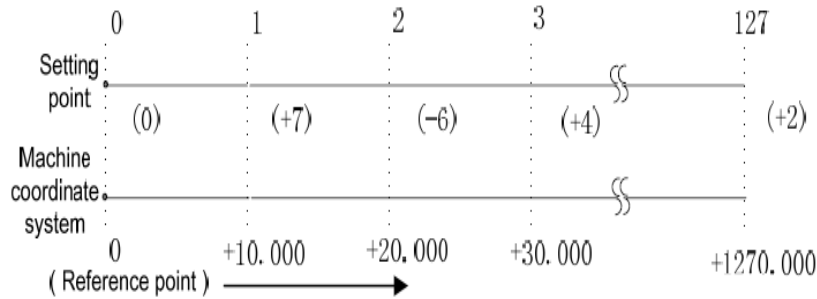
- ①The setting and modification of screw-pitch offset can only be done on the condition that the operation authority is 2nd level password.
- ②Offset is not allowed if the offset clearance entered is 0
- ③After the parameter of screw-pitch offset is set, only the machine zero is returned could the compensation be done.

## 6.5 Setting Examples of Offset Parameters

① parameter №125 (screw-pitch error origin)=0, Data parameter №120 (screw-pitch offset clearance)=0,

When the screw-pitch error origin is set to 0: The offset value for the 1<sup>st</sup> section is set by the position №001 in the offset table, the offset value for the 2<sup>nd</sup> section is set by the position №002 in the offset table, and the offset value for the Nth section is set by the position №000+N in the offset table.

The machine zero is regarded as the reference point of screw-pitch error origin, it begins to compensate the position №001 in the offset table from the machine zero. So the screw-pitch error compensation can only be performed in the positive moving of the machine zero coordinate system.



The position No.000 in the offset table corresponds to the reference point(i.e screw-pitch error origin 0),the offset point 1 corresponds to a point 10.000 positive moving from this reference point, and an following offset point from this point every 10.000 distance. The 127th offset point is the offset at 1270.000 position. Therefore, at offset point 1, set an offset value moving from 0 to 10.000, at offset point 2, set an offset value moving from 10.000 to 20.000. At offset point N, set an offset value moving from  $(N-1) \times (\text{offset clearance})$  to  $N \times (\text{offset clearance})$ .

Above is the example of following offset clearance error

| Offset clearance | Offset value |
|------------------|--------------|
| 0~10.000         | +7           |
| 10.000~20.000    | -6           |
| 20.000~30.000    | +4           |

| Machine coordinate system | Offset parameter No. | Offset value | Driver current command pulses before offsetting | Driver current command pulses after offsetting |
|---------------------------|----------------------|--------------|---|--|
| Reference point 0         | 000                  | 000          | 00000   | 00000  |
| 10.000                    | 001                  | 7            | 10000   | 10007  |
| 20.000                    | 002                  | -6           | 20000   | 20001  |
| 30.000                    | 003                  | 4            | 30000   | 30005  |
| .....                     | 004                  | ...          |   |  |

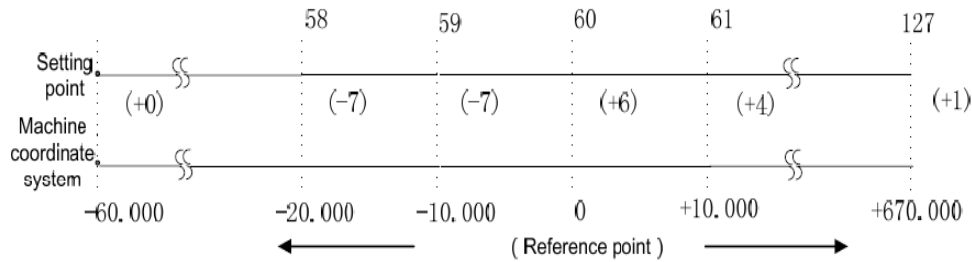
Actually the machine moves from the reference point to the point of +30.000, the screw-pitch offset is:  $(+7)+(-6)+(+4)=+5$

Data② parameter №125 (screw-pitch error origin) =60, №0120 (Offset clearance) =10.000

When the screw-pitch error origin is set to 60: For the positive moving,the 1<sup>st</sup> section error offset is set by position №061 in the offset table, the 2<sup>nd</sup> section by position №062. The Nth section error offset is set by position №060+N in the offset table.

For the negative moving,the 1<sup>st</sup> section error offset is set by position №060 in the offset table, the 2<sup>nd</sup> section by position №059. The Nth section error offset is set by position №060+N in the offset table.

By taking the machine zero as the reference point,the screw-pitch error origin moves from the positive coordinate system of machine zero to compensate the corresponding position No.061 in the offset table, and from the negative coordinate system to compensate the position No.060. Therefore the screw-pitch offset can be performed during the moving in both the positive and the negative coordinate system of machine zero.



The position No.060 in the offset table corresponds to the reference point (60), offset point 61 to a point positive 10.000 from origin. So there is an offset point every 10.000 from point 61, the 127th offset point corresponds to the offset at +670.000 positions. While the offset point 59 corresponds to the negative 10.000 point from reference point. Also there is an offset point every 10.000 from point 59; the offset point 0 corresponds to the offset at -600.000 position. Therefore the point N is set by the offset from  $(N-61) \times (\text{offset clearance})$  to  $(N-60) \times (\text{offset clearance})$ .

Above is the example of following offset clearance error

| Offset clearance | Offset value |
|------------------|--------------|
| 0~10.000         | +4           |
| -10.000~0        | +6           |
| -20.000~-10.000  | -7           |
| -30.000~-20.000  | -7           |

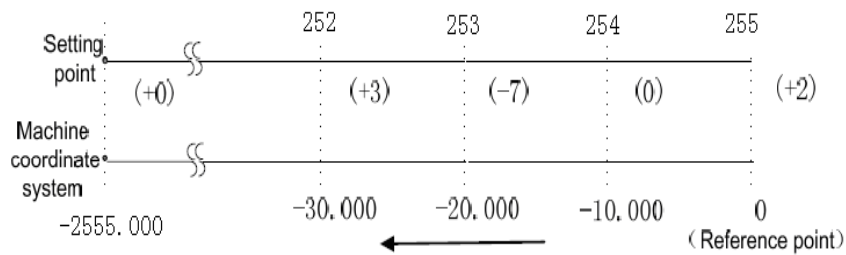
| Machine coordinate system | Offset parameter No. | Offset value | Driver current command pulses before offsetting | Driver current command pulses after offsetting |
|---------------------------|----------------------|--------------|---|--|
| -30.000                   | 058                  | -7           | -30000  | -29992   |
| -20.000                   | 059                  | -7           | -20000  | -19999   |
| -10.000                   | 060                  | +6           | -10000  | -10006   |
| Reference point 0         |                      |              | 0   | 0  |
| 10.000                    | 061                  | +4           | 10000   | 10004  |
| .....                     | 062                  | ...          |   |  |

Actually the machine moves from -30.000 point to the point of +10.000, the screw-pitch offset is:  $(-7)+(-7)+(6)+(4)=(-4)$

Data③ parameter №125 (screw-pitch error origin) =127, №120 (offset clearance) =10000

When the screw-pitch error origin is set to 255: The offset value for the 1<sup>st</sup> section is set by the position №255 in the offset table, the offset value for the 2<sup>nd</sup> section is set by the position №254 in the offset table, and the offset value for the Nth section is set by the position №256-N in the offset table.

The machine zero is regarded as the reference point of screw-pitch error origin, it begins to compensate the position №255 in the offset table from the machine zero. So the screw-pitch error compensation can only be performed in the negative moving of the machine zero coordinate system.



The offset point 254 corresponds to a point 10.000 negative moving from this reference point, and an following offset point from this point every -10.000 distance. The 1st offset point is the offset at -1260.000 position. Therefore, at offset point 255, set an offset value moving from 0 to -10.000, at offset point 126, set an offset value moving from -10.000 to -20.000. At offset point N, set an offset value moving from  $(N-256) \times (\text{offset clearance})$  to  $(N-255) \times (\text{offset clearance})$ .

Above is the example of following offset clearance error

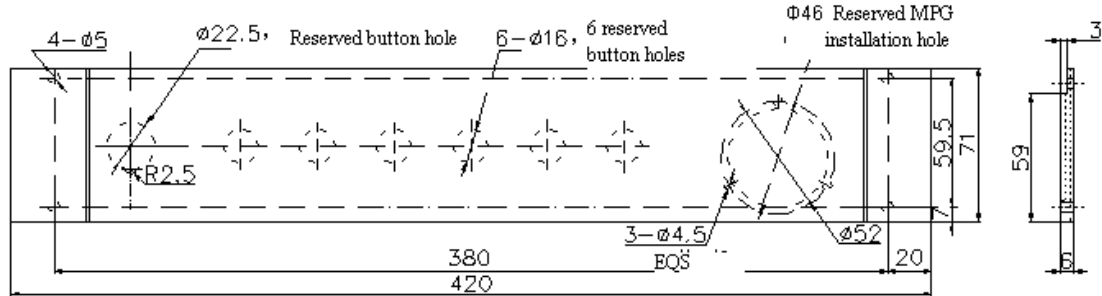
| Offset clearance  | Offset value |
|-------------------|--------------|
| 0 ~ -10.000       | +2           |
| -20.000 ~ -10.000 | 0            |
| -30.000 ~ -20.000 | -7           |
| -40.000 ~ -30.000 | +3           |

| Machine coordinate system | Offset parameter No. | Offset value | Driver current command pulses before offsetting | Driver current command pulses after offsetting |
|---------------------------|----------------------|--------------|---|--|
| Reference point 0         |                      |              | 0   | 0  |
| -10.000                   | 255                  | 2            | 10000   | 10002  |
| -20.000                   | 254                  | 0            | 20000   | 20002  |
| -30.000                   | 253                  | -7           | 30000   | 29995  |
| -40.000                   | 252                  | 3            | 40000   | 39998  |

Actually the machine moves from the point of -40.000 to the reference point, the screw-pitch offset is:  $(+3) + (-7) + (0) + (+2) = (-2)$

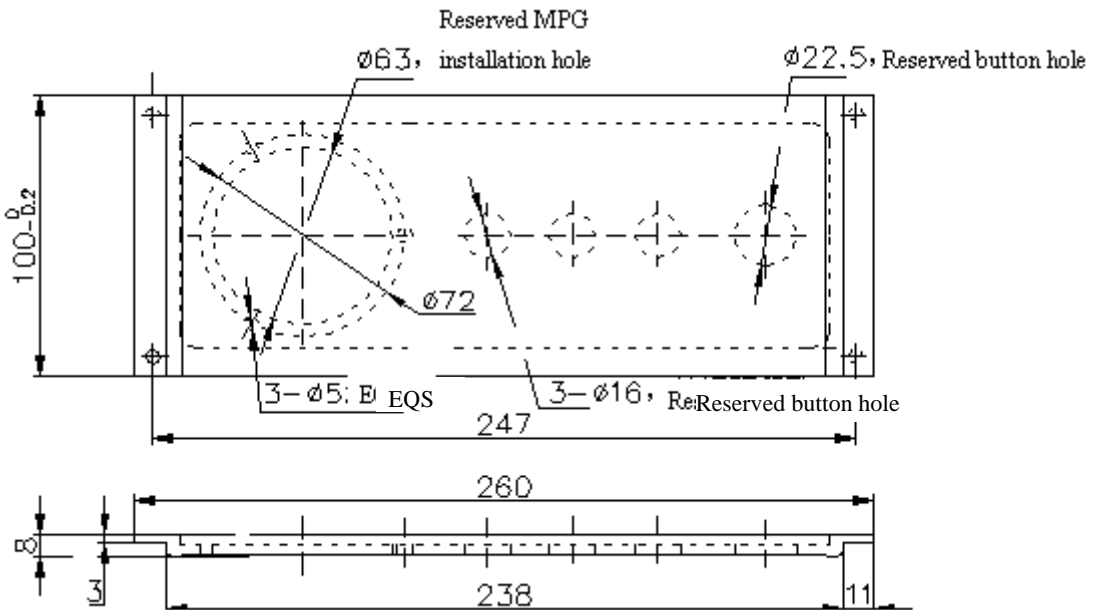
## Appendix 1 Size for Additional Panel AP01

AP01: Aluminum alloy 420×71 (mm), it can be spliced below the panel, its figure and installation size are as follows:



## Appendix 2 Size for Additional Panel AP02

AP02: Aluminum alloy 100×260(mm), it can be spliced to the side of panel, its figure and installation size are as follows:.



## Appendix 3 Function Configuration of GSK980MDa Standard Ladder Diagram

### 3.1 INFORMATION OF LADDER DIAGRAM

#### 3.1.1 Usage

Usage range: Configuration for standard ladder diagram (Compatible for GSK980MA/MB/MC)

Software version: Standard

#### 3.1.2 Information of Current Version

Designer of ladder diagram: GSK

Version number for ladder diagram: 09.03.20-E439

Verification of ladder diagram: E439

Remark for ladder diagram: GSK980MDa standard ladder diagram

### 3.2 ADDRESS DEFINITION

| CN61 | PLC address | Address sign | Function for standard PLC address definition | Remark        |
|------|-------------|--------------|--|---------------|
| 1    | X0.0        |              |  |               |
| 2    | X0.1        | SP           | External dwell signal                        |               |
| 3    | X0.2        |              |  |               |
| 4    | X0.3        | DECX         | X axis deceleration signal                   | Fixed address |
| 5    | X0.4        |              |  |               |
| 6    | X0.5        | ESP          | External urgent stop signal                  | Fixed address |
| 7    | X0.6        |              |  |               |
| 8    | X0.7        |              |  |               |
| 9    | X1.0        |              |  |               |
| 10   | X1.1        |              |  |               |
| 11   | X1.2        |              |  |               |
| 12   | X1.3        | DECZ         | Z axis deceleration signal                   | Fixed address |
| 13   | X1.4        | ST           | External cycle start signal                  |               |
| 14   | X1.5        |              |  |               |
| 15   | X1.6        | SPAL         | Spindle alarm signal                         |               |
| 16   | X1.7        |              |  |               |
| 29   | X2.0        |              |  |               |
| 30   | X2.1        |              |  |               |
| 31   | X2.2        |              |  |               |
| 32   | X2.3        | DECY         | Y axis deceleration signal                   | Fixed address |
| 33   | X2.4        | DEC4         | 4 <sup>th</sup> axis deceleration signal     | Fixed address |
| 34   | X2.5        | DEC5         | 5 <sup>th</sup> axis deceleration signal     | Fixed address |
| 35   | X2.6        |              |  |               |
| 36   | X2.7        |              |  |               |
| 37   | X3.0        |              |  |               |
| 38   | X3.1        |              |  |               |
| 39   | X3.2        |              |  |               |
| 40   | X3.3        |              |  |               |
| 41   | X3.4        |              |  |               |
| 42   | X3.5        | SKIP         | Skip signal                                  | Fixed address |
| 43   | X3.6        |              |  |               |
| 44   | X3.7        |              |  |               |

## APPENDIX

| CN62 | PLC address | Address sign | Function for address definition  | Remark |
|------|-------------|--------------|----------------------------------|--------|
| 1    | Y0.0        | COOL         | Cooling signal                   |        |
| 2    | Y0.1        | LUBR         | Lubricating output signal        |        |
| 3    | Y0.2        |              |                                  |        |
| 4    | Y0.3        | SFR          | Spindle CCW signal               |        |
| 5    | Y0.4        | SRV          | Spindle CW signal                |        |
| 6    | Y0.5        | SSTP         | Spindle stop signal              |        |
| 7    | Y0.6        | ENB          | Spindle enable signal            |        |
| 8    | Y0.7        | SPZD         | Spindle braking signal           |        |
| 9    | Y1.0        | GEAR1        | Spindle mechanical gear signal 1 |        |
| 10   | Y1.1        | GEAR2        | Spindle mechanical gear signal 2 |        |
| 11   | Y1.2        | GEAR3        | Spindle mechanical gear signal 3 |        |
| 12   | Y1.3        | GEAR4        | Spindle mechanical gear signal 4 |        |
| 13   | Y1.4        |              |                                  |        |
| 14   | Y1.5        |              |                                  |        |
| 15   | Y1.6        |              |                                  |        |
| 16   | Y1.7        |              |                                  |        |
| 29   | Y2.0        |              |                                  |        |
| 30   | Y2.1        |              |                                  |        |
| 31   | Y2.2        | CLPY         | Yellow light                     |        |
| 32   | Y2.3        | CLPG         | Green light                      |        |
| 33   | Y2.4        | CLPR         | Red light                        |        |
| 34   | Y2.5        |              |                                  |        |
| 35   | Y2.6        |              |                                  |        |
| 36   | Y2.7        | ALTO         | ALT. output signal               |        |
| 37   | Y3.0        |              |                                  |        |
| 38   | Y3.1        |              |                                  |        |
| 39   | Y3.2        |              |                                  |        |
| 40   | Y3.3        |              |                                  |        |
| 41   | Y3.4        |              |                                  |        |
| 42   | Y3.5        |              |                                  |        |
| 43   | Y3.6        |              |                                  |        |
| 44   | Y3.7        |              |                                  |        |

| CN31 | PLC address | Address sign | Function for address definition     | Remark |
|------|-------------|--------------|-------------------------------------|--------|
| 5    | X6.0        | EHDX         | External handwheel X axis selection |        |
| 6    | X6.1        | EHDY         | External handwheel Y axis selection |        |

|    |      |      |                                     |  |
|----|------|------|-------------------------------------|--|
| 8  | X6.2 | EHDZ | External handwheel Z axis selection |  |
| 9  | X6.3 | EMP0 | External X1 rate                    |  |
| 22 | X6.4 | EMP1 | External X10 rate                   |  |
| 23 | X6.5 | EMP2 | External X100 rate                  |  |

| CN15 | PLC address | Address sign | Function for address definition            | Remark |
|------|-------------|--------------|--|--------|
| 5    | X5.0        |              |  |        |
| 6    | X5.1        | VP           | Spindle speed/position state Output signal |        |
| 8    | X5.2        |              |  |        |
|      |             |              |  |        |
| 20   | Y5.0        | VPO          | Spindle speed/position swift signal        |        |
| 21   | Y5.1        |              |  |        |
| 22   | Y5.2        |              |  |        |
| 23   | Y5.3        |              |  |        |

Panel press key、panel Indicator address refer to Part 3 Chapter 5- diagnosis information.

### 3.3 FUNCTION CONFIGURATION

#### 3.3.1 Spindle CCW and CW Control

Related signals

| Signal type   | Signal sign | Signal signification                        | Corresponding pin-out | PLC state | CNC diagnosis |
|---------------|-------------|---|-----------------------|-----------|---------------|
| Input signal  |             | The CCW key on the machine panel            |                       | X21.7     |               |
|               |             | The CW key on the machine panel             |                       | X21.3     |               |
|               |             | The Stop key on the machine panel           |                       | X21.5     |               |
|               | SPAL        | Spindle alarm signal                        | CN61.15               | X1.6      |               |
| Output signal | ENB         | Spindle enable signal                       | CN62.7                | Y0.6      |               |
|               | SFR         | Spindle CCW signal                          | CN62.4                | Y0.3      |               |
|               | SRV         | Spindle CW signal                           | CN62.5                | Y0.4      |               |
|               | SSTP        | Spindle stop signal                         | CN62.6                | Y0.5      |               |
|               | SPZD        | Spindle brake signal                        | CN62.8                | Y0.7      |               |
|               |             | Spindle CCW indicator on the machine panel  |                       | Y23.1     |               |
|               |             | Spindle CW indicator on the machine panel   |                       | Y19.1     |               |
|               |             | Spindle stop indicator on the machine panel |                       | Y18.0     |               |
| Command input | M03         | Command signal for spindle CCW              |                       |           |               |
|               | M04         | Command signal for spindle CW               |                       |           |               |
|               | M05         | Command signal for spindle stop             |                       |           |               |

#### ● Control parameter

|       |  |  |  |  |  |  |      |  |
|-------|--|--|--|--|--|--|------|--|
| K0010 |  |  |  |  |  |  | RSJG |  |
|-------|--|--|--|--|--|--|------|--|

RSJG =1: CNC not close M03, M04, M08 and M32 output signals when resetting。



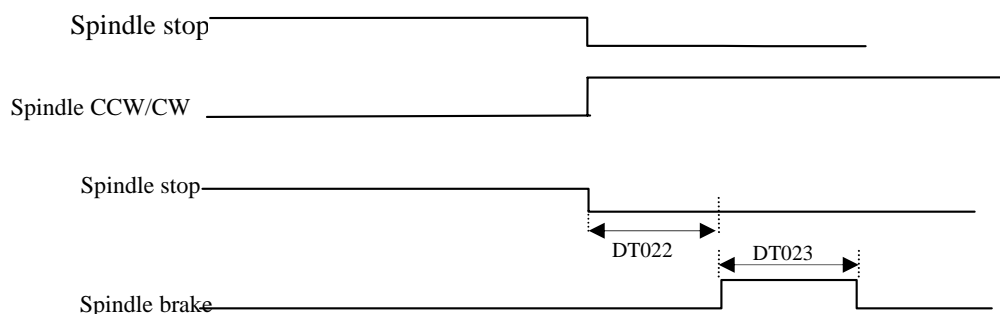
## APPENDIX

=0: CNC close M03, M04, M08 and M32 output signals when resetting.

|        |  |
|--------|--|
| DT0021 | M code execution time                        |
| DT0022 | Delay time of spindle stop to braking output |
| DT0023 | Spindle braking output time                  |

### ● Time sequence for operation

Spindle operation time sequence is as follows:



**Note:** DT022 is the delay time from the spindle stop signal issued to spindle brake signal issued; DT023 is spindle brake hold time.

### ● Logic control

SSTP output is enabled after the CNC is power on. As SSTP output is enabled, the SFR or SRV output is valid and held on when they are executed, and the SSTP output is closed in the meantime; the M05 is executed when SFR or SRV output is enabled, and the SFR or SRV output is then closed, SSTP output is enabled and held. Spindle braking signal SPZD output delay is set by data DT022 of PLC (The delay time between the spindle stop command output and braking signal SPZD output). The time for braking signal hold-on is set by data DT023 of PLC (Spindle brake output time).

If the spindle is in CCW or CW, the alarm A4.2: M03 or M04 code error is generated if the M04 or M03 is performed

**Note 1:** When the CNC external emergency stop or spindle alarm is issued, it closes the spindle rotation output signal, and the SSTP signal is output in the meantime

**Note2:** When CNC is reset, SFR or SRV output is cancelled is determined upon the BIT1 of PLC state parameter No.K0010:

When Bit1 is set to 0, SFR or SRV output is closed while the CNC is reset.

When Bit1 is set to 1, SFR or SRV output state is invariable while the CNC is reset

**Note 3:** The alarm A0.1 (spindle alarm) is generated after the spindle alarm signal X1.6 is detected by PLC

**Note 4:** In the spindle analog volume control, if the output voltage is more than 0; the spindle enable signal is enabled

### 3.3.2 Spindle JOG

#### ● Related signals

| Signal type  | Signal sign | Signal signification                        | Corresponding pin-out | PLC state | CNC diagnosis |
|--------------|-------------|---|-----------------------|-----------|---------------|
| Input signal |             | Signal for spindle JOG key on machine panel |                       | X25.5     |               |

|               |  |   |  |       |  |
|---------------|--|---|--|-------|--|
| Output signal |  | Indicator for spindle JOG start-up on machine panel |  | Y21.1 |  |
|---------------|--|---|--|-------|--|

- Control parameter**

|       |  |  |  |      |  |  |  |  |
|-------|--|--|--|------|--|--|--|--|
| K0010 |  |  |  | JSPD |  |  |  |  |
|-------|--|--|--|------|--|--|--|--|

JSPD =0 : Spindle JOG is enabled only by manual。

=1 : Spindle JOG is enabled in any mode。

- Function description**

The spindle rotates positively (CCW) when pressing and holding the Spindle JOG key on the machine panel, and the spindle is stopped immediately if releasing it。

### 3.3.3 Switch Value Control for Spindle Speed

- Related signals**

| Signal type   | Signal sign | Signal signification                                | Pin-out | PLC state | CNC diagnosis |
|---------------|-------------|---|---------|-----------|---------------|
| Output signal | GEAR1       | Output signal for spindle gear signal 1             | CN62.9  | Y1.0      |               |
|               | GEAR 2      | Output signal for spindle gear signal 2             | CN62.10 | Y1.1      |               |
|               | GEAR 3      | Output signal for spindle gear signal 3             | CN62.11 | Y1.2      |               |
|               | GEAR 4      | Output signal for spindle gear signal 4             | CN62.12 | Y1.3      |               |
| Command input | S01         | Command signal for spindle gear signal 1            |         |           |               |
|               | S02         | Command signal for spindle gear signal 2            |         |           |               |
|               | S03         | Command signal for spindle gear signal 3            |         |           |               |
|               | S04         | Command signal for spindle gear signal 4            |         |           |               |
|               | S00         | Command signal for spindle gear signal cancellation |         |           |               |

- Control parameter**

|                        |   |   |  |  |  |        |  |  |  |  |
|------------------------|---|---|--|--|--|--------|--|--|--|--|
| 0                      | 0 | 1 |  |  |  | ACS    |  |  |  |  |
| Corresponding F signal |   |   |  |  |  | F200.4 |  |  |  |  |

ACS =1: Analog voltage control for spindle speed;

=0: Switch value control for spindle speed。

|                        |   |   |  |  |  |        |  |  |  |  |
|------------------------|---|---|--|--|--|--------|--|--|--|--|
| 0                      | 1 | 8 |  |  |  | ESCD   |  |  |  |  |
| Corresponding F signal |   |   |  |  |  | F211.4 |  |  |  |  |

ESCD =0: The S code not closed when stopping urgently;

=1: The S code closed when stopping urgently。

## APPENDIX

|        |                                   |
|--------|-----------------------------------|
| DT0019 | S code performance time           |
| DT0024 | Delay time for spindle gear shift |

### ● Logic control

The S1~S4 output are disabled when CNC is power on. Any command is performed among S01, S02, S03 and S04, the corresponding S signal is output and held on, and the rest 3 S signals output is cancelled at the same time. When the S00 command is executed, the S1~S4 output are cancelled, and only one of them is enabled at the same time

### 3.3.4 Cycle Start and Feed Hold

#### ● Related signals

| Signal type   | Signal sign | Signal signification                        | Pin-out | PLC state | CNC diagnosis |
|---------------|-------------|---|---------|-----------|---------------|
| Input signal  | ST          | External cycle start signal                 | CN61.13 | X1.4      |               |
|               | SP          | Feed hold signal in external                | CN61.2  | X0.1      |               |
|               |             | Cycle Start key signal on the machine panel |         | X23.0     |               |
|               |             | Feed Hold key signal on the machine panel   |         | X22.7     |               |
|               |             | OUT cycle start signal on MDI panel         |         | F197.1    |               |
| Output signal |             | Cycle start indicator on machine panel      |         | Y20.0     |               |
|               |             | Feed hold indicator on machine panel        |         | Y21.0     |               |
| Command input | M00         | Feed hold signal                            |         | F9.7      |               |

#### ● Control Parameter

|                        |   |   |  |        |        |  |  |  |  |
|------------------------|---|---|--|--------|--------|--|--|--|--|
| 0                      | 1 | 7 |  | MST    | MSP    |  |  |  |  |
| Corresponding F signal |   |   |  | F210.6 | F210.5 |  |  |  |  |

MST =1: External cycle start signal disabled;

=0: External cycle start signal enabled;

MSP =1: External feed hold signal disabled;

=0: External feed hold signal enabled, and external dwell switch needed, or CNC “dwell” alarm occurs;

|       |  |  |  |  |      |  |  |
|-------|--|--|--|--|------|--|--|
| K0010 |  |  |  |  | OUTR |  |  |
|-------|--|--|--|--|------|--|--|

OUTR =1: Program run by OUT key on the MDI panel in MDI mode;

=0: Program run by OUT key on the MDI panel disabled in MDI mode。

### 3.3.5 Cooling Control

#### ● Related signals

| Signal type   | Signal sign | Signal signification                  | Pin-out | PLC state | CNC diagnosis |
|---------------|-------------|---------------------------------------|---------|-----------|---------------|
| Input signal  |             | Cooling key signal on machine panel   |         | X21.4     |               |
| Output signal |             | Cooling on indicator on machine panel |         | Y23.0     |               |
|               | COOL        | Cooling output signal                 | CN62.1  | Y0.0      |               |
| Command input | M08         | Command signal for cooling on         |         |           |               |
|               | M09         | Command signal for cooling off        |         |           |               |

- **Control parameter**

|       |  |  |  |  |  |  |      |  |
|-------|--|--|--|--|--|--|------|--|
| K0010 |  |  |  |  |  |  | RSJG |  |
|-------|--|--|--|--|--|--|------|--|

RSJG =1: CNC not close M03, M04, M08 and M32 output signal when reset.

=0: CNC close M03, M04, M08 and M32 output signal when reset.

- **Function description**

Cool is effective (i.e. M08 ineffective) after CNC power on, M08 output is effective for cooling pump on when it is executed; Cool output is cancelled if M09 is executed, and the cooling pump is off.

**Note 1: Cooling output off or not is defined by the RSJG of the PLC state parameter No.K0010 when CNC is reset**

**Note 2: If M09 has no corresponding output signal, the output of M08 is cancelled as M09 is executed**

**Note 3: The cooling output is off when M30 is executed**

### 3.3.6 Lubricating control

- **Related signal**

| Signal type   | Signal sign | Signal signification                        | Pin-out | PLC state | CNC diagnosis |
|---------------|-------------|---|---------|-----------|---------------|
| Input signal  |             | Lubricating key signal on the machine panel |         | X21.6     |               |
| Output signal |             | Lubricating on indicator on machine panel   |         | Y20.7     |               |
|               | LUBR        | Lubricating output signal                   | CN62.2  | Y0.1      |               |
| Command input | M32         | Lubricating on command signal               |         |           |               |
|               | M33         | Lubricating off command signal              |         |           |               |

- **Control parameter**

|        |  |
|--------|--|
| DT0016 | Auto-lubrication interval time   |
| DT0017 | 0: not Auto-lubrication; >0: Auto-lubrication output time                                |
| DT0018 | When it is not Auto-lubrication, 0: Flip Lubrication; >0 regular lubrication Output time |

- **Function description**

There are two lubricating functions defined by GSK980MD standard PLC program: non-automatic lubricating and automatic lubricating, they are set by PLC data.

DT017 =0: For non-automatic lubricating

>0: For automatic lubricating, lubricating time DT017 and lubricating interval time DT016 can be set.

DT018 =0: For non-automatic lubricating, lubricating reverse.

>1: For non-automatic, timing lubricating.

### 1. Non-automatic lubricating function

When PLC data DT018 is equal to 0, it is lubricating reverse output. Lubricating output is performed when pressing the Lubricating key on the machine panel; lubricating is cancelled if pressing the key again. When M32 is performed and the lubricating is output, then performing the M33, the lubricating output is cancelled.

When the PLC data DT018 is equal to 0, it is lubricating timing output, the lubricating output is performed when the Lubricating key on the machine panel is pressed. The lubricating output is cancelled after the time set by PLC data DT018. So, M32 is performed for the lubrication output, it is cancelled after the time set by PLC data DT018. If the time set by DT018 has not be reached, M33 is performed then the lubricating output is cancelled

### 2. Automatic lubrication

Lubricating function is applied for the time set by DT017 after the system is power on, then the output is stopped. After the time set by DT016, lubrication is output again, and then it cycles in turn. The M32, M33 commands and the Lubricating key on the machine panel are all ineffective when the automatic lubrication is applied.

### 3.3.7 Optional Block Skip

The optional block skip function can be applied when one block is neither performed nor deleted in a program. When the “/” is at the head of a block and the optional block skip switch is on (the Block Skip key on machine panel or external output for optional block skip is enabled), this block is not run in automatic operation

#### ● Related Signals

| Signal type   | Signal sign | Signal signification                            | Pin-out | PLC state | CNC diagnosis |
|---------------|-------------|---|---------|-----------|---------------|
| Input signal  |             | optional block skip key signal on machine panel |         | X18.7     |               |
| Output signal |             | Optional block skip indicator on machine panel  |         | Y18.6     |               |

#### ● Function description

1. When optional block skip signal is effective, a block headed with “/” is not performed.
2. The optional block skip function is enabled only in the modes of Auto, MDI and DNC

### 3.3.8 Machine Lock

#### ● Related signals

| Signal type   | Signal sign | Signal signification                         | Pin-out | PLC state | CNC diagnosis |
|---------------|-------------|--|---------|-----------|---------------|
| Input signal  |             | Machine lock key signal on the machine panel |         | X19.0     |               |
| Output signal |             | Machine lock indicator on the machine panel  |         | Y18.5     |               |

#### ● Function description

1. Machine locks are enabled in any mode.
2. The machine lock state can not be shifted when program is being run.

### 3.3.9 MST Lock

- **Related signals**

| Signal type   | Signal sign | Signal signification                     | Pin-out | PLC state | CNC diagnosis |
|---------------|-------------|--|---------|-----------|---------------|
| Input signal  |             | MST lock key signal on the machine panel |         | X19.1     |               |
| Output signal |             | MST lock indicator on machine panel      |         | Y18.4     |               |

- **Function description**

MST lock is enabled in the mode of Auto, MDI or DNC;

### 3.3.10 Single Block

- **Related signal**

| Signal type   | Signal sign | Signal signification               | Pin-out | PLC state | CNC diagnosis |
|---------------|-------------|------------------------------------|---------|-----------|---------------|
| Input signal  |             | Single key signal on machine panel |         | X18.6     |               |
| Output signal |             | Single indicator on machine panel  |         | Y18.7     |               |

- **Function description**

Single block is enabled in the mode of Auto, MDI or DNC;

### 3.3.11 Dry Run

- **Related signals**

| Signal type   | Signal sign | Signal signification                | Pin-out | PLC state | CNC diagnosis |
|---------------|-------------|-------------------------------------|---------|-----------|---------------|
| Input signal  |             | Dry run key signal on machine panel |         | X19.2     |               |
| Output signal |             | Dry run indicator on machine panel  |         | Y18.3     |               |

- **Function description**

1. Dry run for program is enabled in the mode of Auto, MDI or DNC.
2. Dry run state can not be switched during the program execution。


### 3.3.12 chosen stop

- **Related signal**


| Signal type   | Signal sign | Signal signification                   | Pin-out | PLC state | CNC diagnosis |
|---------------|-------------|--|---------|-----------|---------------|
| Input signal  |             | Machine panel selection stop button    |         | X20.0     |               |
| Command input | M01         | selection stop instruction             |         | F9.6      |               |
| Output signal |             | Machine panel selection stop Indicator |         | Y21.7     |               |

- **Function description**



In Auto、MDI、DNC operation mode, press  key to Stop button to make selection indicator light is on, then get into selection stop mode.



In this mode, when program is running M01 instruction, it will be pause. You need to press  key again to run following program.

### 3.3.13 Stroke Limit and Emergency Stop

#### ● Related Signal

| Signal type  | Signal sign | Signal signification           | Pin-out | PLC state | CNC diagnosis |
|--------------|-------------|--------------------------------|---------|-----------|---------------|
| Input signal | ESP         | External Emergency Stop signal | CN61.6  | X0.5      |               |

#### ● Control parameter

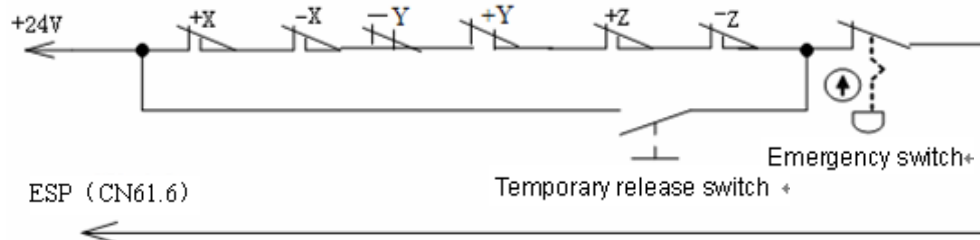
|                        |   |   |  |  |  |  |  |        |  |  |  |  |
|------------------------|---|---|--|--|--|--|--|--------|--|--|--|--|
| 0                      | 1 | 7 |  |  |  |  |  | MESP   |  |  |  |  |
| Corresponding F signal |   |   |  |  |  |  |  | F210.3 |  |  |  |  |

MESP =0: The external emergency stop function active。

=1: The external emergency stop function is inactive。

#### ● External connection for machine

External emergency stop and travel switch connection is as follows (three axes):



#### ● Logic control

When the contact of emergency stop switch is off, the ESP signal to +24V are cut off, and the CNC emergency stop alarm is generated. Now the CNC EN signal is disabled and the pulse output is stopped. In the emergency stop alarm, other functions can be defined by PLC other than above functions by NC。

### 3.3.14 three colour light

#### ● Relative signal

| Signal type   | Signal sign | Signal signification            | Pin-out | PLC state | CNC diagnosis |
|---------------|-------------|---------------------------------|---------|-----------|---------------|
| Output signal | CLPY        | Three colour light-yellow light | CN62.31 | Y2.2      |               |
|               | CLPG        | Three colour light-green light  | CN62.32 | Y2.3      |               |
|               | CLPR        | Three colour light-red light    | CN62.33 | Y2.4      |               |

#### ● Function instruction

Yellow light (common state, no alarm when no run), green light (auto mode), yellow light (system alarm)

### 3.3.15 Reset and cursor returns

Relative signal

| Signal type  | Signal sign | Signal signification | Pin-out | PLC state | CNC diagnosis |
|--------------|-------------|----------------------|---------|-----------|---------------|
| Input signal |             | MDIpanel resset key  |         | X24.0     |               |

- Control parameter

|       |  |  |  |  |  |  |      |
|-------|--|--|--|--|--|--|------|
| K0010 |  |  |  |  |  |  | RESB |
|-------|--|--|--|--|--|--|------|

RESB =1: reset and cusor returns function is valid;  
=0: reset and cusor returns function is invalid

- Function instruction

When K10 RESB is setted to be 1, press reset key in auto mode (when X26.0, System reset and cursor return to the beginning of program.)

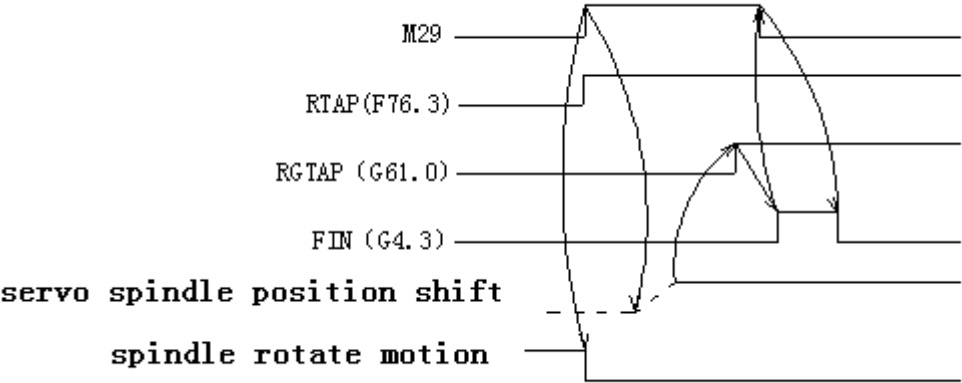
3.3.16 Rigid tapping

- relative signal

| Signal type       | Signal sign | Signal signification                       | Pin-out | PLC state | CNC diagnosis |
|-------------------|-------------|--|---------|-----------|---------------|
| Input signal      | VP          | Spindle speed/position state Output signal | CN15.6  | X5.1      |               |
| Input instruction | M29         | Rigid tapping pointed signal               |         |           |               |
| Output signal     | VPO         | Spindle speed/positioin swift signal       | CN15.20 | Y5.0      |               |

- function instruction

when excuting M29, output VP signal, servo spindle will swift from speed mode to position mode.when finnish swifiting, servo spindle output VPO signal, PLC receive this signal, set G61.0to be1, then M29 excuting is over. Time sequence is as following::





### 3.3.17 spindle quasi-Stop

- relative signal

| Signal type   | Signal sign | Signal signification         | Pin-out | PLC state | CNC diagnosis |
|---------------|-------------|------------------------------|---------|-----------|---------------|
| Input signal  |             | Spindle quasi-Stop key       |         | X25.7     |               |
| Output signal |             | Spindle quasi-Stop Indicator |         | Y21.3     |               |

- function instruction

when 4<sup>th</sup> axis or 5<sup>th</sup> axis is valid and state parameter RCS4/RCS5 is 1, pressing spindle stop key in edit, machine zero、handwheel/singla step、 manual mode, you can swift to CS control mode (G27.7 is 1)。

### 3.3.18 external handwheel control

- relative signal

| Signal type  | Signal sign | Signal signification               | Pin-out | PLC state | CNC diagnosis |
|--------------|-------------|------------------------------------|---------|-----------|---------------|
| Input signal | EHDX        | External handwheel X axis options  | CN31.5  | X6.0      |               |
|              | EHDY        | External handwheel Y axis options  | CN31.6  | X6.1      |               |
|              | EHDZ        | External handwheel Z axis options  | CN31.8  | X6.2      |               |
|              | EMP0        | External handwheel/increment 0.001 | CN31.9  | X6.3      |               |
|              | EMP1        | External handwheel/increment 0.01  | CN31.22 | X6.4      |               |
|              | EMP2        | External handwheel/increment 0.1   | CN31.23 | X6.5      |               |

- function instruction

Standard ladder supports 3 axis (X、Y、Z) external handwheel, you can use PSG-100-05E / L and ZSSY2080 handwheels. Specific connection please refer to relevant information of hand wheel.

## Appendix 4 GSKCOMM Communication Software

### 4.1 GSKComm Brief

GSKComm is specially designed communications management software for user,which can realize document download and upload between PC and CNC;DNC communication; CNC parametet edit; workpiece program management; examining of tool compensation, thread compensation ,ladder edit and etc. It is simple operation and with higher communication efficiency and reliability.

- PC computer requests of GSKComm

Hardware:General PC with RS232 interface and serial communication cable cable (three-wire system).

Operatipn system: Microsoft Windows 98/2000/XP/2003

- Request of GSKComm software

Firstly setup PLC edit software GSKLadder.

- Difference between GSKComm-M and GSKComm-U

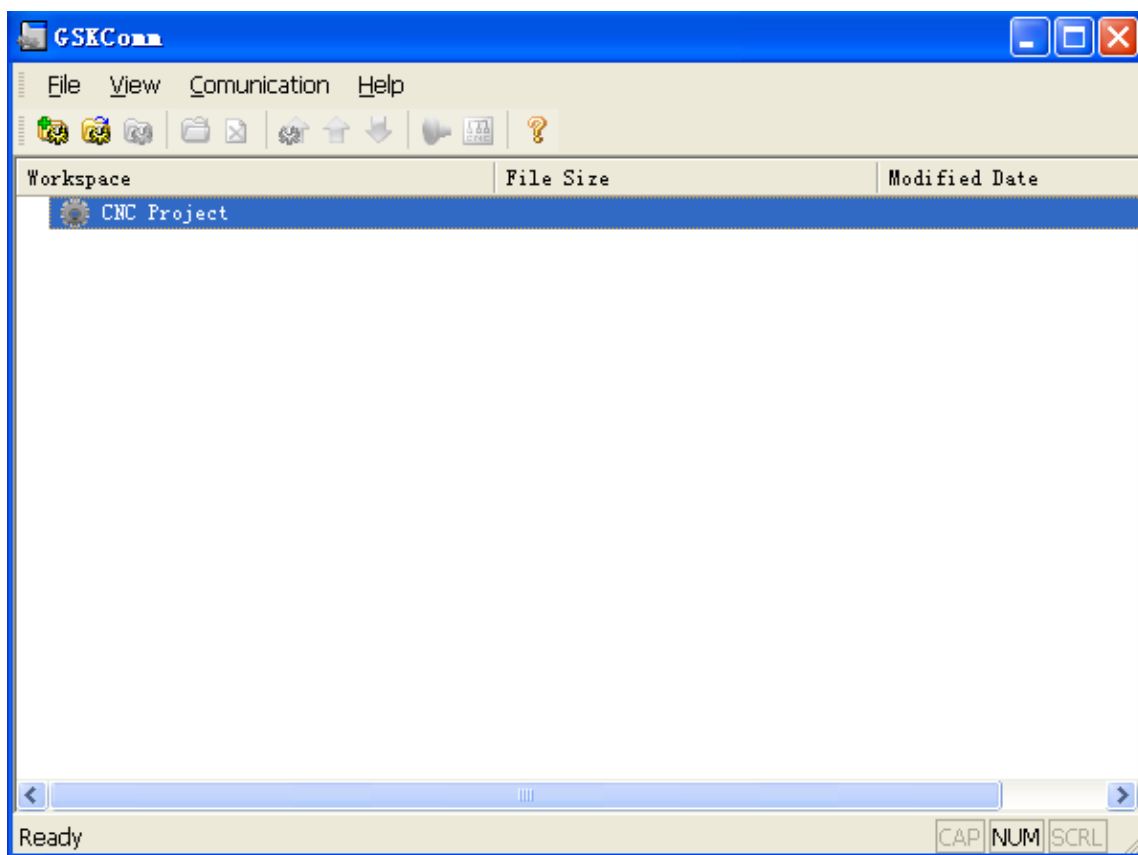
GSKCOMM-M communication software is specially provided to machine tool factory.

GSKCOMM-U communication software is specifically provided to user.

| Function  | GSKComm-U  | GSKComm-M |
|---|------------|-----------|
| Workpiece transfer, edit  | able       | Able      |
| DNC communication   | Able       | Able      |
| workpiece management  | Able       | Able      |
| Transfer system document (tool compensation, thread compensation, parameter, PLC program) | able       | Able      |
| Check tool compensation and thread compensation   | 不可以 inable | Able      |
| Parameter edit  | 不可以 inable | able      |
| PLC program edit  | 不可以        | 可以        |

- Software interface

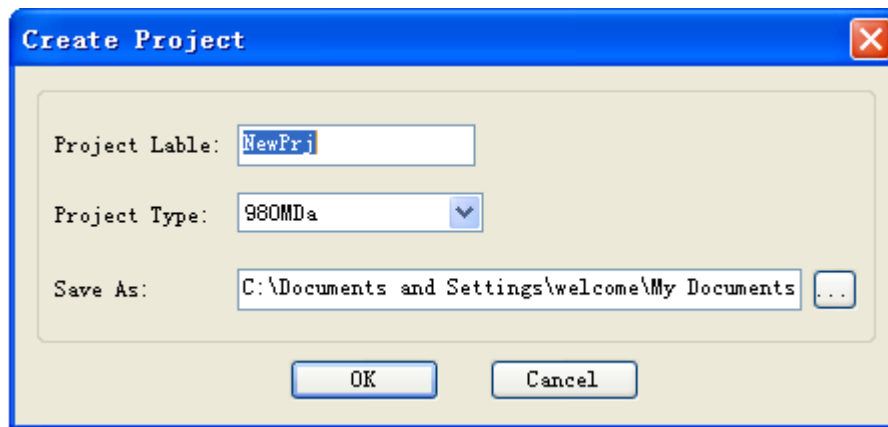
GSKComm-software interface, following shows runned software interface:



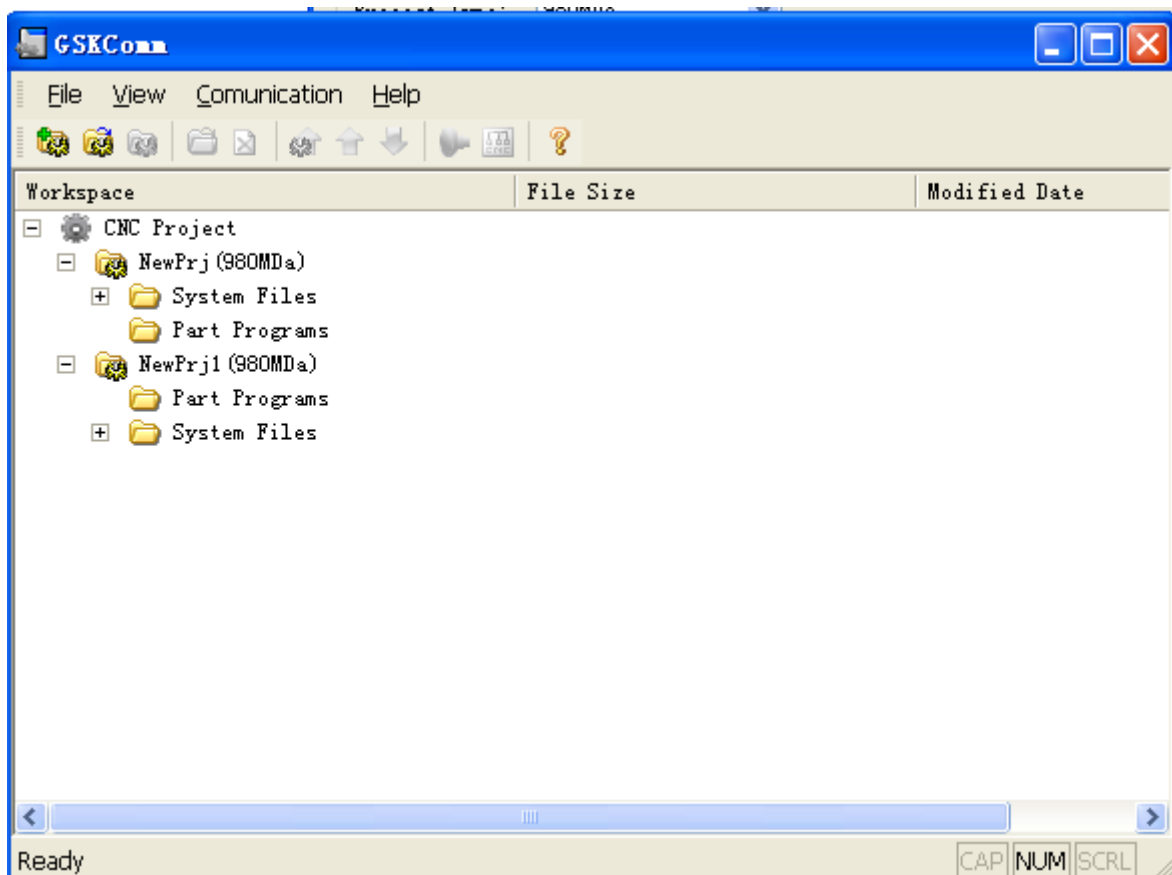
## 4.2 Establishment ,download and remove project

### 4.2.1 Establishment project

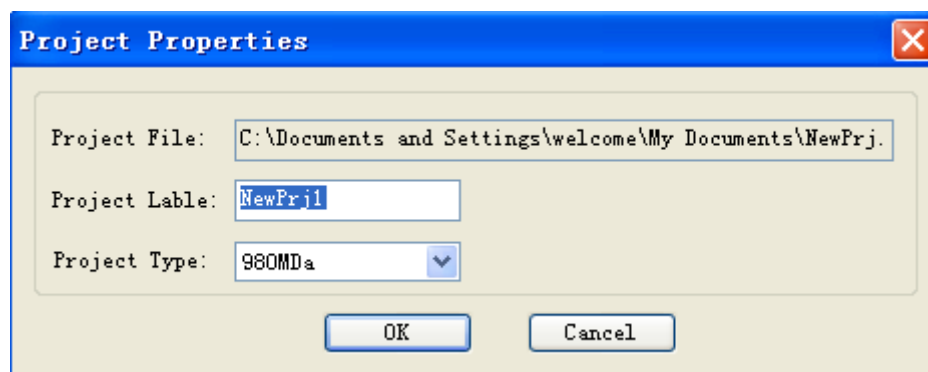
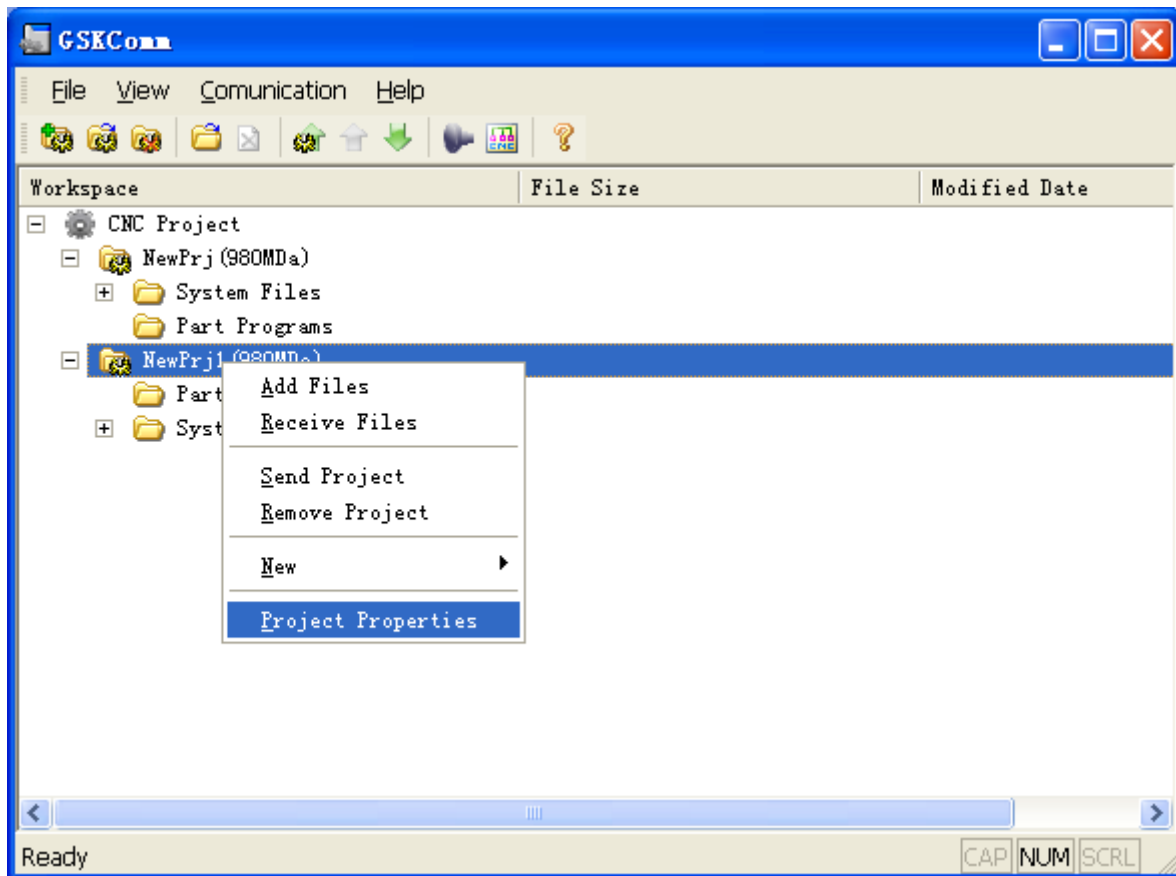
Click  key or choose "File—>Create Project" to establish a new project.



GSKComm can establish several projects, so each project should be distinguished with “ mark”.




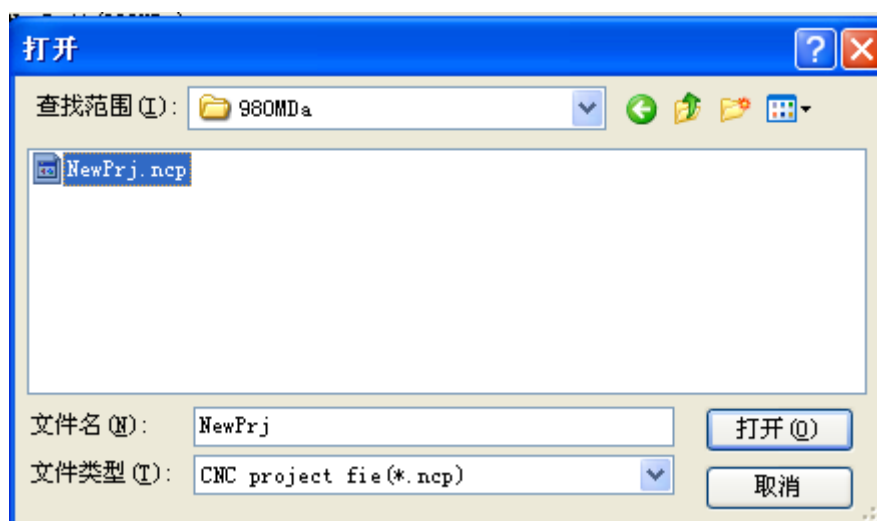
You can modify project name, project type in drop-down project properties of project name item .



#### 4.2.2 Download project

If project document already exists, no need to establish project again.


click  key or choose "File —> Import project" to download project.

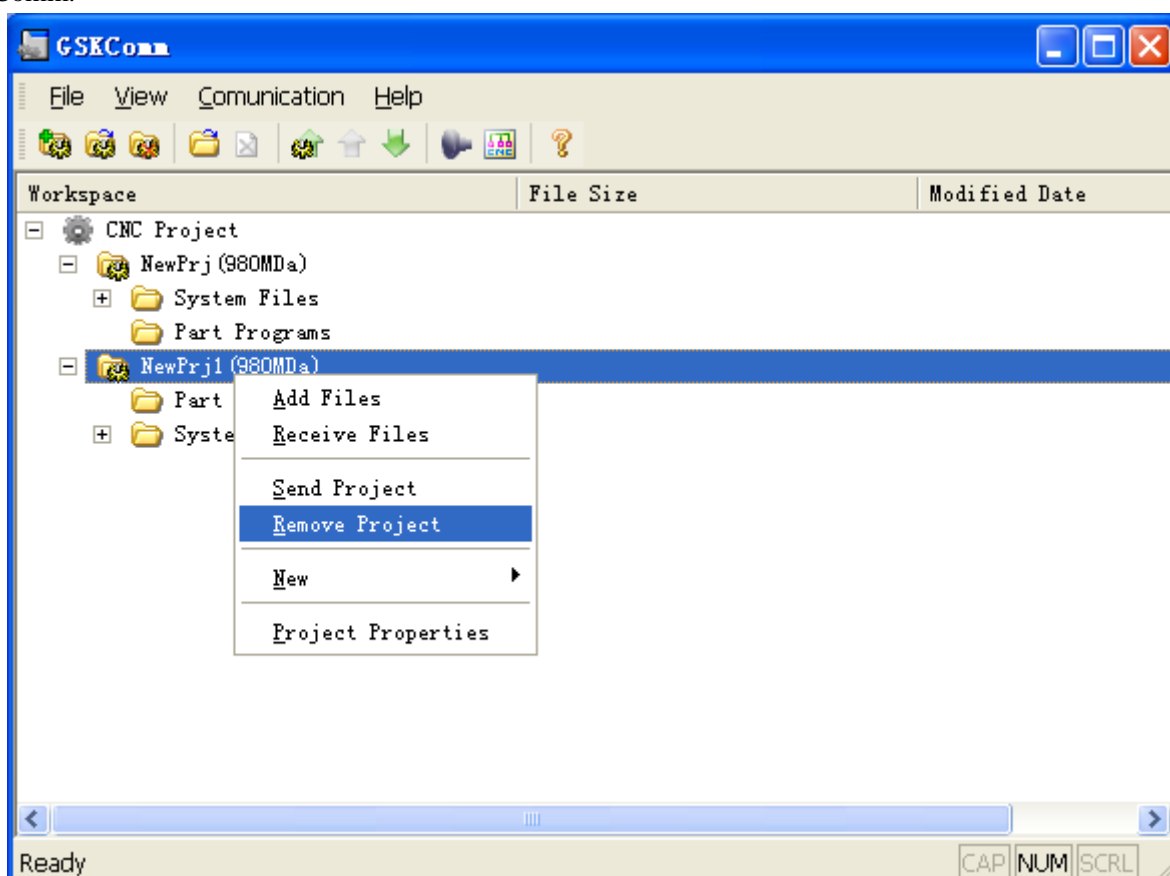


### 4.2.3 Remove project

If do not want to edit one project in GSKComm , select this project and remove it from GSKComm.

Firstly , select the project you want to remove;

Then, click  key or click right-click to chose“remove project”, so that you can remove this project in GSKComm.



**Note:** Remove project do not mean to delete project.Removed project still exists. You can download it into GSKComm again through“Import project”.

### 4.3 Establishment, download, remove and edit document

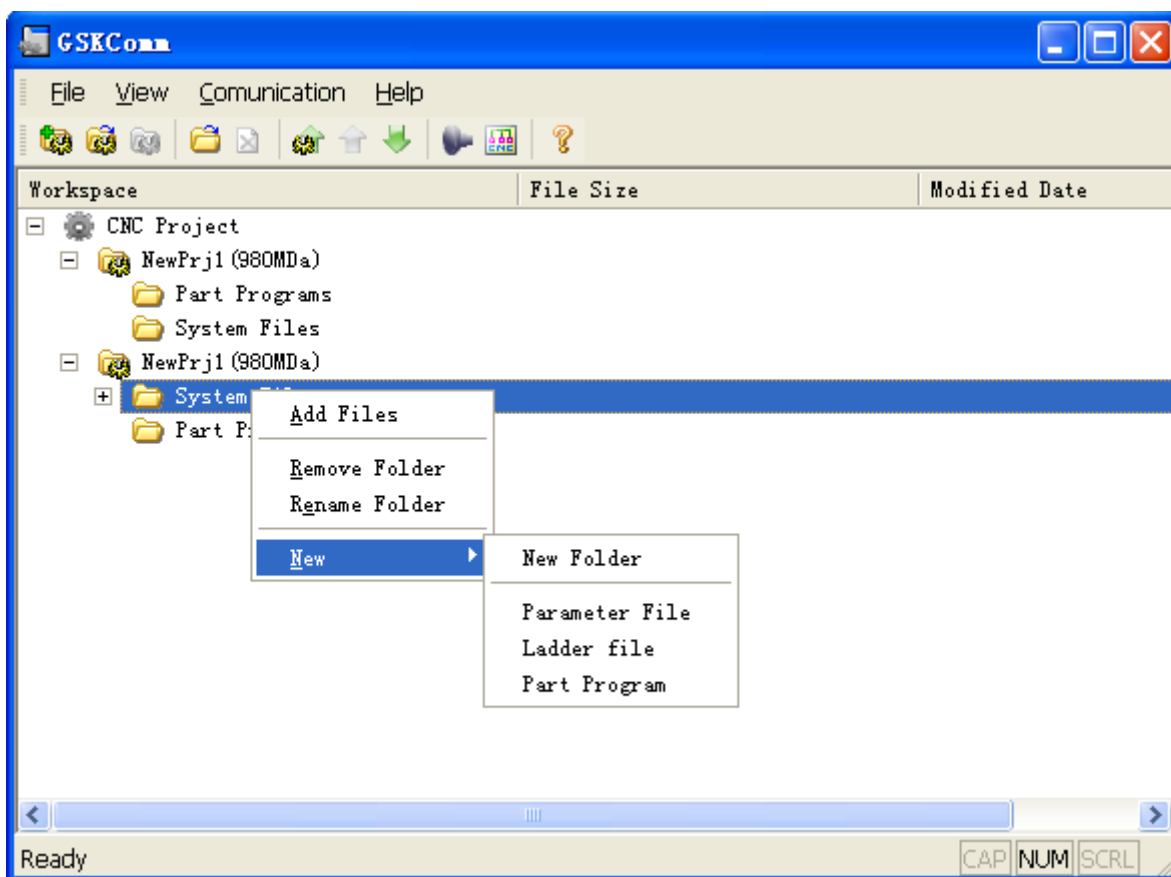
You can establish, edit new work piece program, parameter document and PLC program in project. You can also download existed document or remove no use document.

#### 4.3.1 Establish document

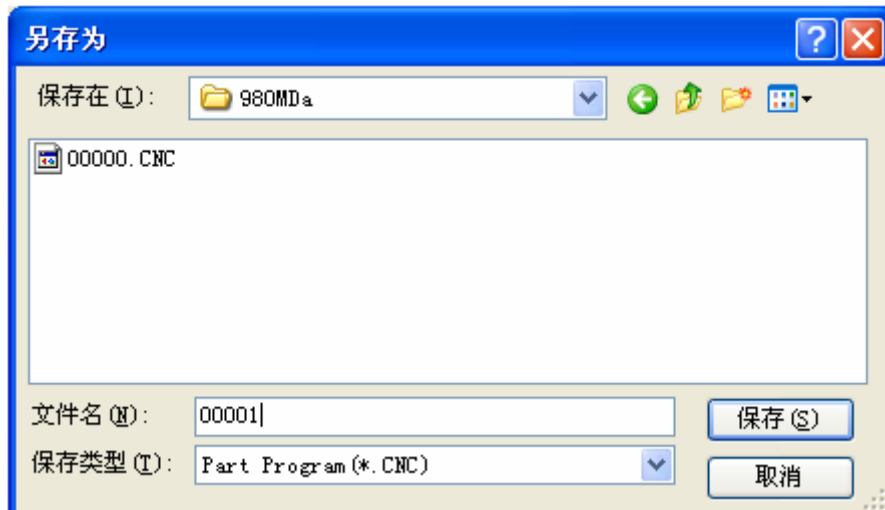
You can establish workpiece program, parameter document and PLC diagram in project. Take establishing workpiece program as example to explain process of establishing new program. Process of establishing other documents are the same.

Firstly, choose relative project

Then click right-click and choose “New—>Part Program”, then a new wrkpiece program has been established.

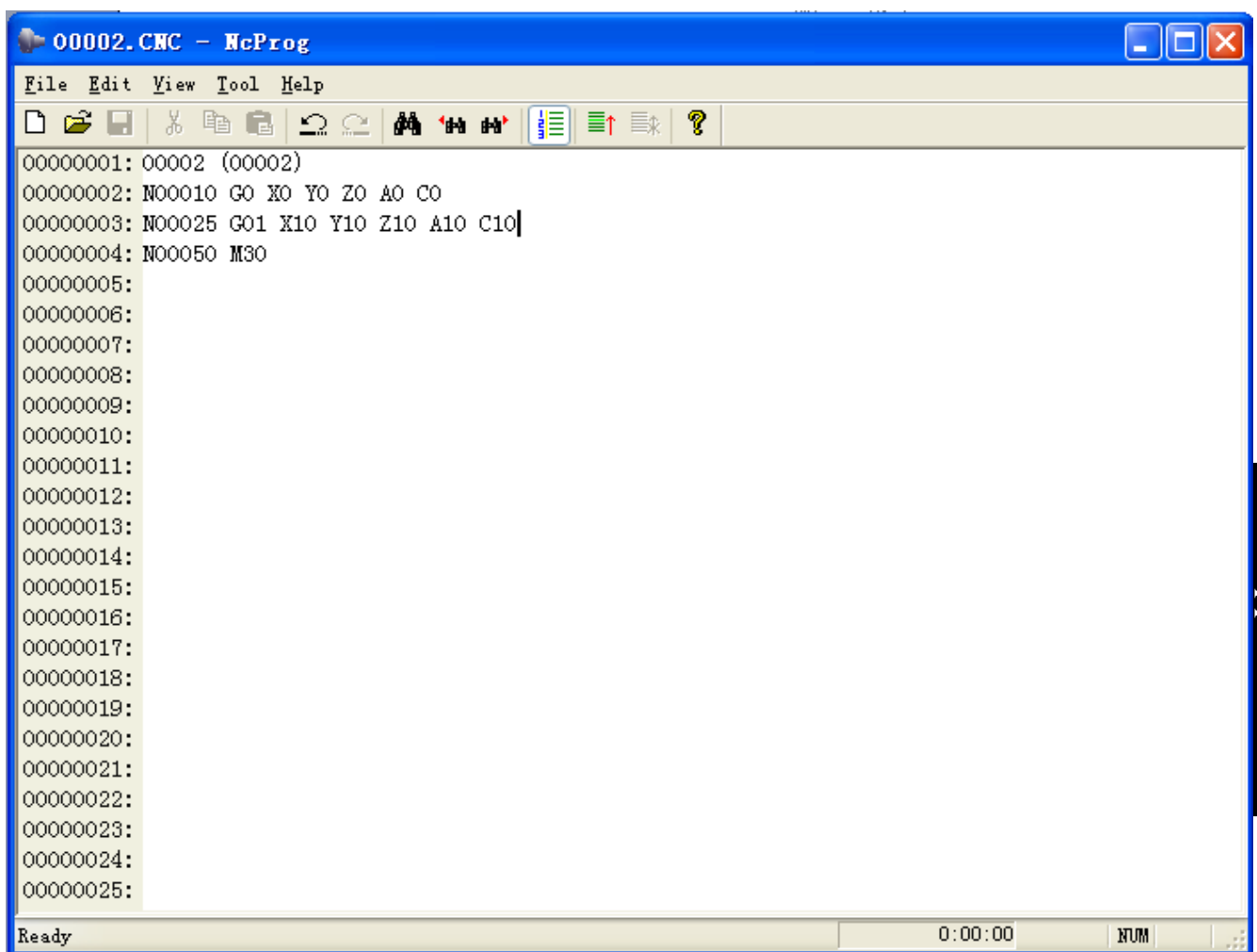


You can modify workpiece program file name and save routine in pop-up dialog box.



#### 4.3.2 Edit document

Just double-click program ,parameter document and PLC program is to be edited, corresponding editing interface will pop up. program editing interface:



Parameter document editing interface:

Param.par - McParam (980MDa)

File Edit View Help

0001 ACS HWL

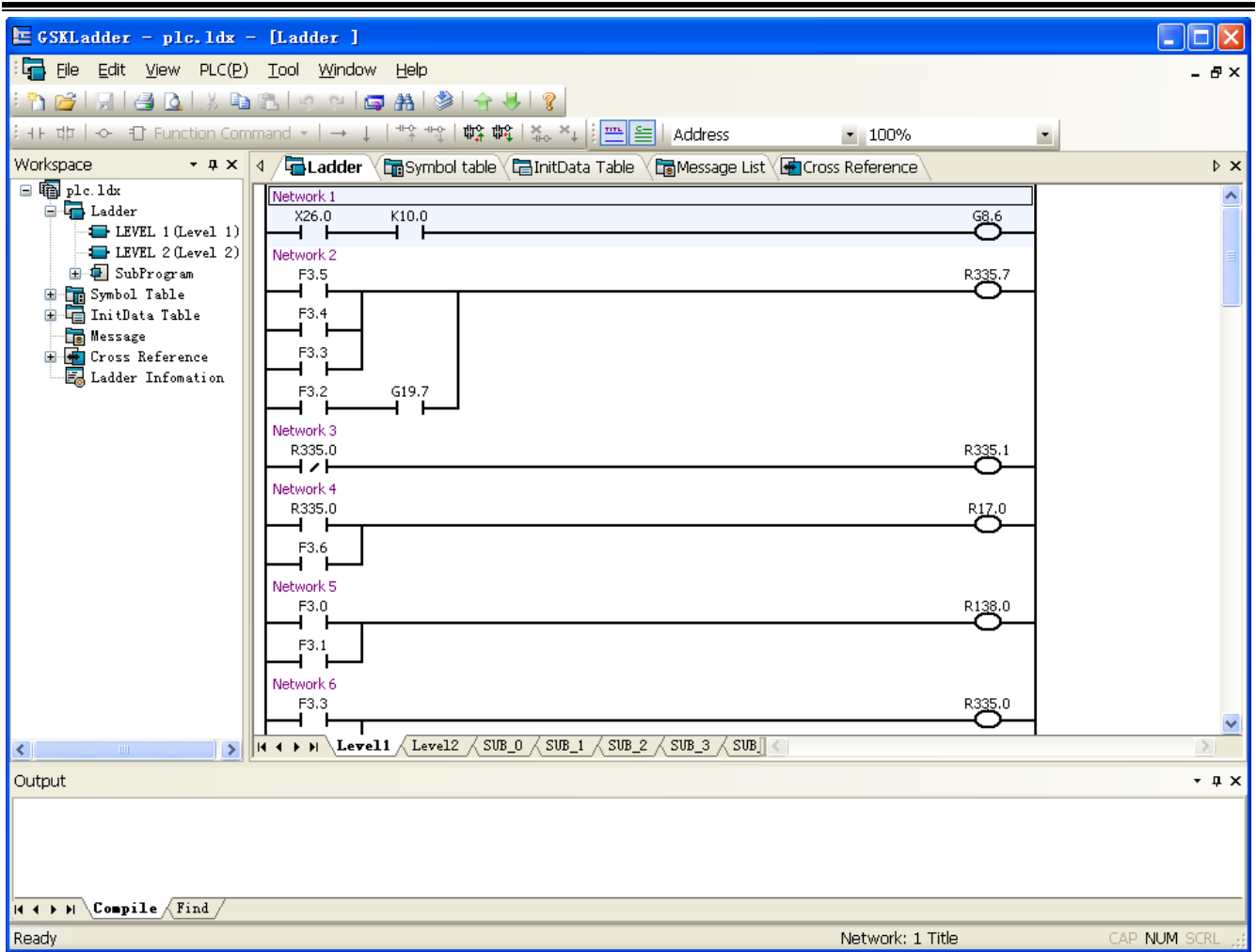
|      |       |       |      |      |      |      |      |   |
|------|-------|-------|------|------|------|------|------|---|
| 0    | 0     | 0     | 0    | 0    | 0    | 0    | 0    | 0 |
| 0002 | LIFJ  | MDITL | LIFC | NRC  | TLIF |      |      |   |
| 0    | 0     | 0     | 0    | 1    | 0    |      |      |   |
| 0003 | PCOMP |       |      | D/R  |      |      |      |   |
| 0    | 0     | 0     | 0    | 0    | 0    |      |      |   |
| 0004 | RDRN  | DECI  | PROD |      | SCW  |      |      |   |
| 0    | 1     | 0     | 0    | 0    | 0    |      |      |   |
| 0005 | SMAL  | M30   |      | PPD  | PCMD |      |      |   |
| 0    | 0     | 0     | 1    | 0    | 0    |      |      |   |
| 0006 |       | ZM5   | ZM4  | ZMZ  | ZMY  | ZMX  |      |   |
| 0    | 0     | 0     | 0    | 0    | 0    | 0    |      |   |
| 0007 | AVGL  | SMZ   | ZC5  | ZC4  | ZCZ  | ZCY  | ZCX  |   |
| 0    | 0     | 0     | 0    | 0    | 0    | 0    | 0    |   |
| 0008 | DISP  |       | DIR5 | DIR4 | DIRZ | DIRY | DIRX |   |
| 0    | 0     | 0     | 1    | 1    | 1    | 1    | 1    |   |

0001 \*\*\*\*\* ACS HWL \*\*\*\*\*

Ready CAP NUM SCRL

Diagram editing interface




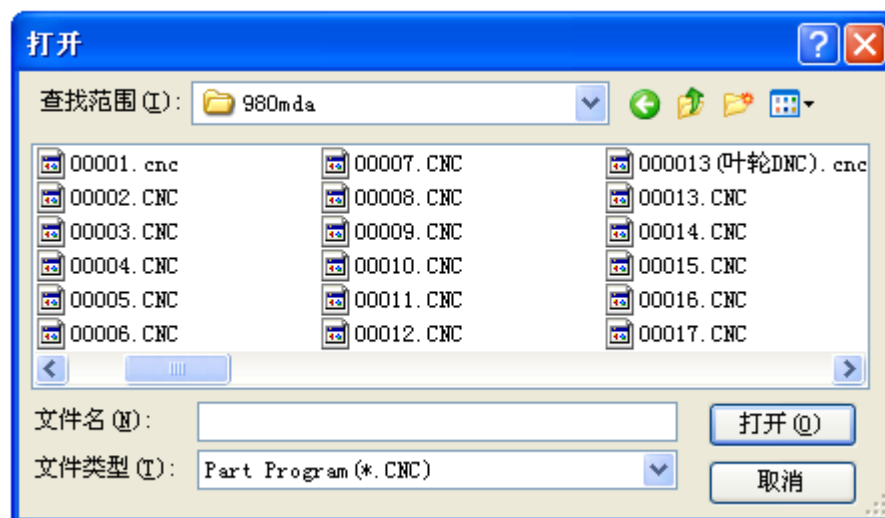


In editing interface, you can edit and modify corresponding document. After editing, click “Save” to save current document.

### 4.3.3 Add file


If you want to edit existed files, you should add this document to project firstly.

Click  key or click right-click, choose “add file” and pop-up adding file dialog box



Select the file you want to add in the dialog box.

### 4.3.4 Remove file

If one file is no use, you can remove it in the project. Choose the file to be removed, then click  key or click right-click, choose "Remove project" to remove this project.

**Note:** remove file do not mean delete this file. Removed file still exist. Through "Add files", you can add this to GSKComm.

## 4.4 Download file (PC→CNC)

GSKComm can transfer all the files to CNC at one time, can also transfer single file to CNC. Before download file, you need to set CNC according to following table. Otherwise, can not download the file.

| PC downloaded data   | CNC work mode | CNC authority             | note                |
|--|---------------|---------------------------|---------------------|
| Work piece program ( Program name is less than 9000)         |               | 4grade 、 3grade or 2grade | Open program switch |
| Macro program (Program name is bigger than or equal to 9000) | Edit mode     | 2grade                    | Open program switch |
| tool offset value  | Edit mode     | 4grade 、 3grade or 2grade |                     |
| parameter  | Edit mode     | 3grade or 2grade          | Open program switch |
| Thread compensation data                                     | Edit mode     | 2grade                    | Open program switch |
| PLC file   |               | 2grade                    |                     |

Note 1: Transfer file from PC to CNC, you can only cancel the file transfer using communication software in PC.

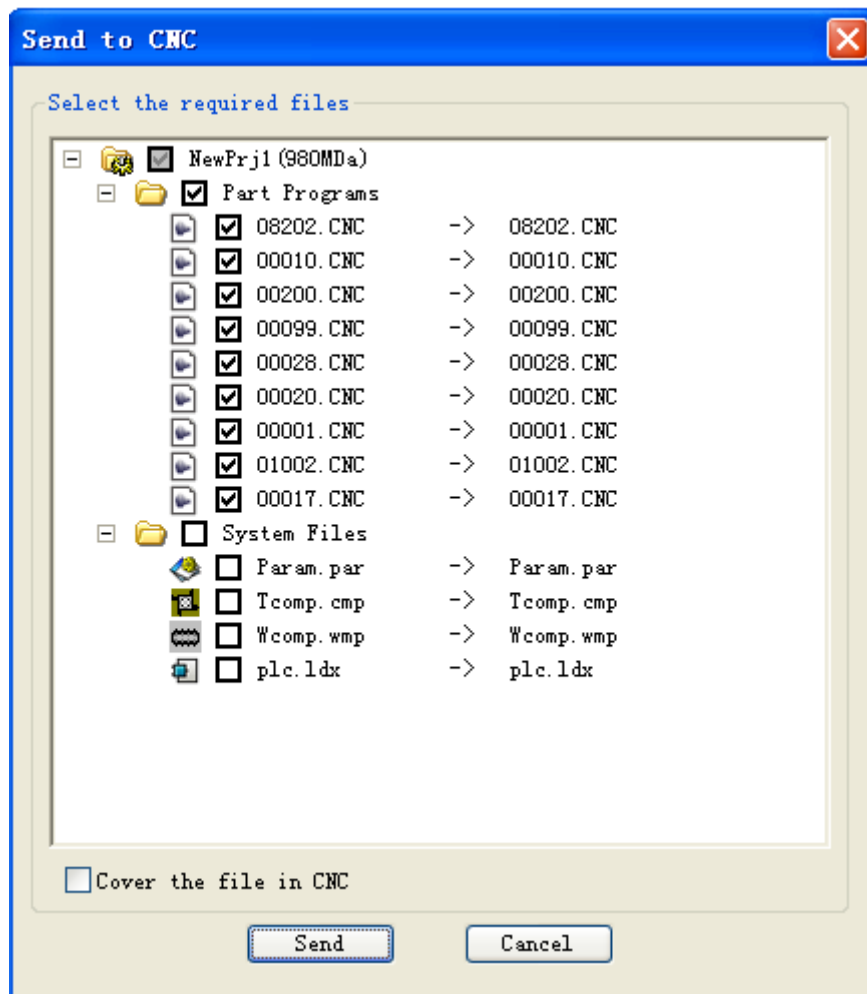
Note 2: CNC can receive processing program from PC at any mode. Download job will not affect system processing. Recommends downloading stops processing

Note 3: In DNC mode, during downloading process program to CNC, if you press cycle-start key, which will 下载 stop transfer job and system alarm

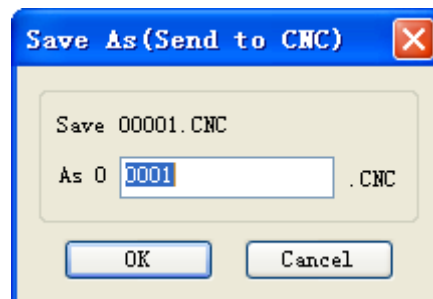
### 4.4.1 Download all files in the project

Firstly, select project will be transmitted;

Then click  key or right-click to select "Biography Project to CNC", then will pop-up sending files to CNC dialog box.



In dialog box, click options at the left of file name to select files which will be transferred..  
file name "-" means the file name will be saved to CNC .Double-click, can modify the saved file name.



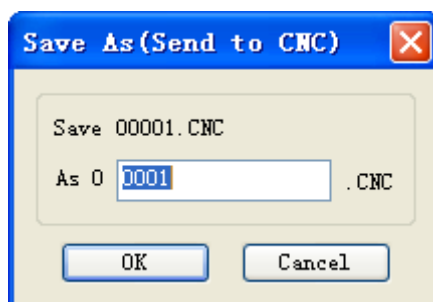
click"Send", you can send choosen document to CNC and save as crossponding file name in CNC .

Note:

Param.par; Tcomp.cmp; Wcomp.wmp; plc.ldx ,there four system file names are fixed,which can not be altered.

#### 4.4.2 download signal document


Select the file will be downloaded, then click  button or right-click to select "Send files", which will pop up dialog box:

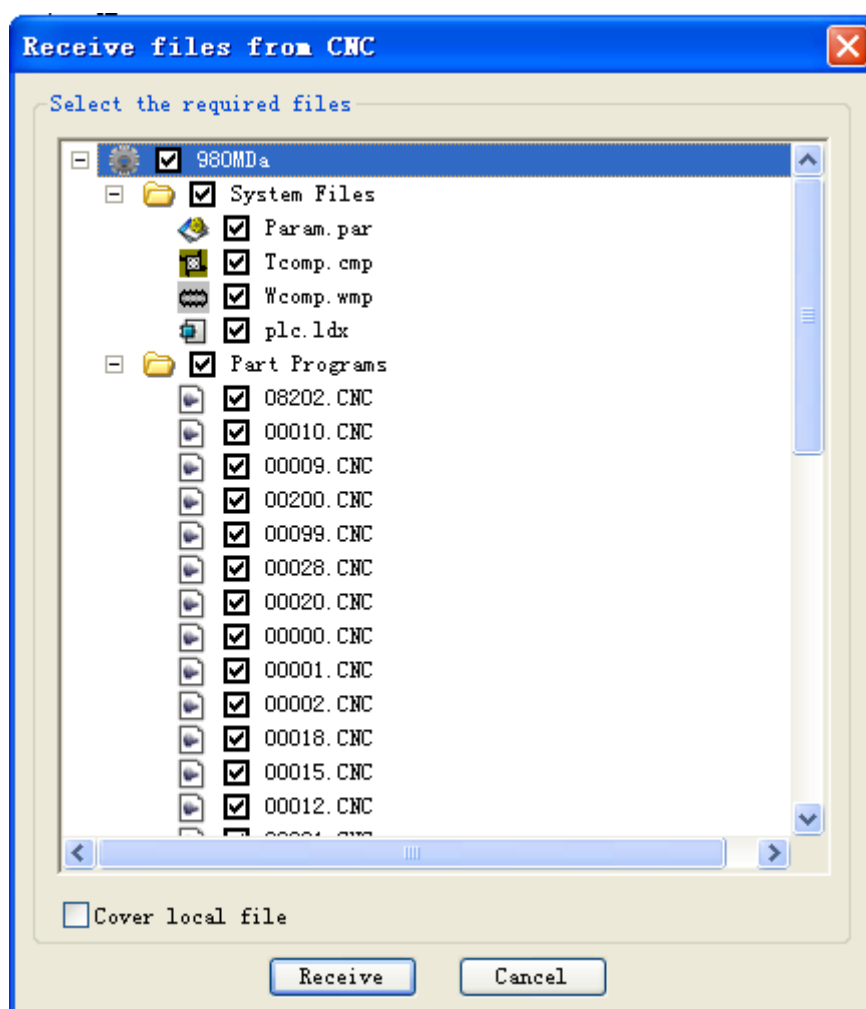


You Can modify and save to CNC file . Click "OK" to start transferring files to CNC.

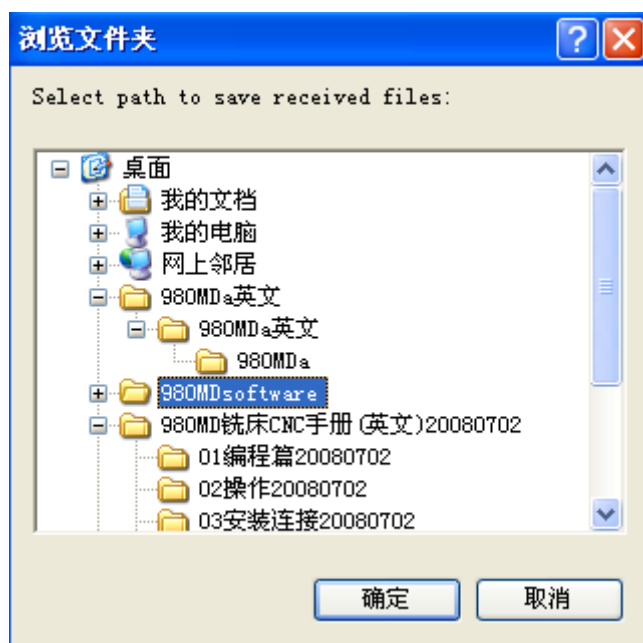
#### 4.4.3 Upload document (CNC→PC)

Firstly,choose one project;

Then click  key or select menu“communication—>Receive files”, will pop-up “Receive files from CNC” dialog box::



Select desired file to be uploaded, then click "Receive" button, will pop-up "Browse for folder" dialog box:



Choose upload file will be saved in which folder.  
click“YES”key, then begin to upload selected file from CNC.

## 4.5 Check tool compensation and thread compensation

Tcomp.cmp(tool compensation document) and Wcomp.wmp (thread compensation document) can not be edited,only be checked.

Double-click corresponding file, you can open and check it.

Tool compensation file check page

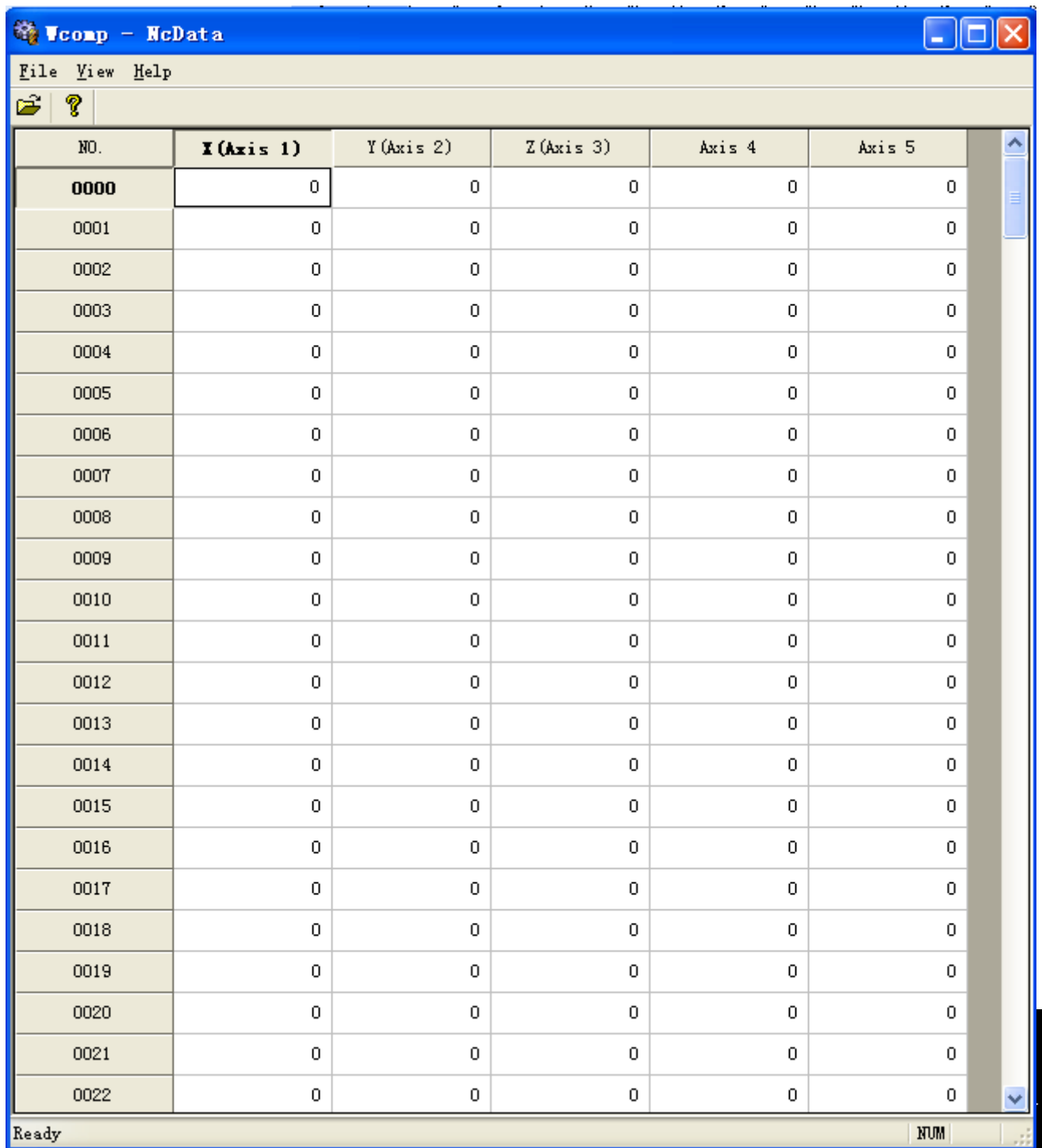


Tcomp.cmp - McData

File View Help

| NO.  |        | H     | D     |
|------|--------|-------|-------|
| 0000 | Offset | 0.000 | 0.000 |
|      | Wear   | 0.000 | 0.000 |
| 0001 | Offset | 0.000 | 0.000 |
|      | Wear   | 0.000 | 0.000 |
| 0002 | Offset | 0.000 | 0.000 |
|      | Wear   | 0.000 | 0.000 |
| 0003 | Offset | 0.000 | 0.000 |
|      | Wear   | 0.000 | 0.000 |
| 0004 | Offset | 0.000 | 0.000 |
|      | Wear   | 0.000 | 0.000 |
| 0005 | Offset | 0.000 | 0.000 |
|      | Wear   | 0.000 | 0.000 |
| 0006 | Offset | 0.000 | 0.000 |
|      | Wear   | 0.000 | 0.000 |
| 0007 | Offset | 0.000 | 0.000 |
|      | Wear   | 0.000 | 0.000 |
| 0008 | Offset | 0.000 | 0.000 |
|      | Wear   | 0.000 | 0.000 |
| 0009 | Offset | 0.000 | 0.000 |
|      | Wear   | 0.000 | 0.000 |
| 0010 | Offset | 0.000 | 0.000 |
|      | Wear   | 0.000 | 0.000 |
| 0011 | Offset | 0.000 | 0.000 |

Ready NUM




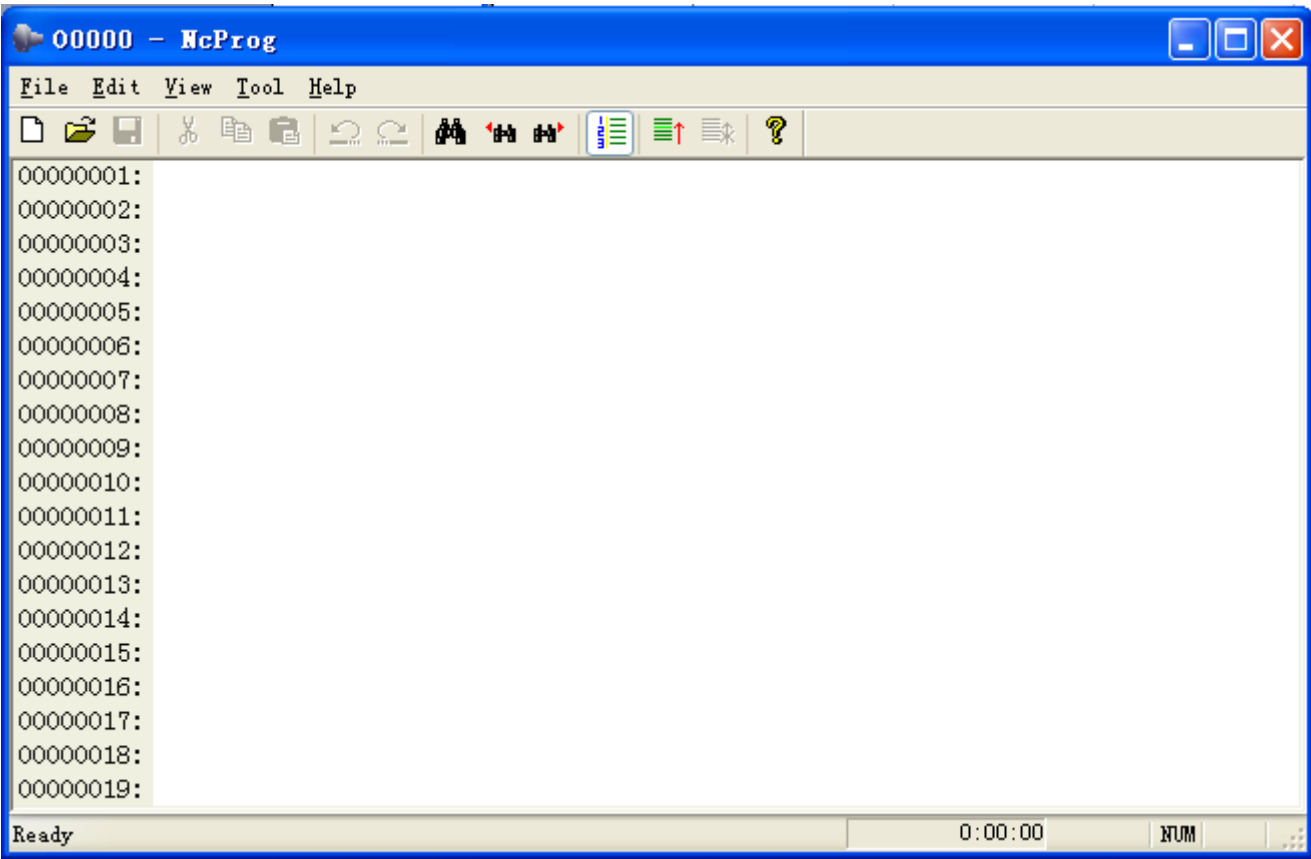
The screenshot shows a software window titled "Vcomp - McData" with a menu bar (File, View, Help) and a toolbar. The main area contains a table with the following data:

| NO.  | X (Axis 1) | Y (Axis 2) | Z (Axis 3) | Axis 4 | Axis 5 |
|------|------------|------------|------------|--------|--------|
| 0000 | 0          | 0          | 0          | 0      | 0      |
| 0001 | 0          | 0          | 0          | 0      | 0      |
| 0002 | 0          | 0          | 0          | 0      | 0      |
| 0003 | 0          | 0          | 0          | 0      | 0      |
| 0004 | 0          | 0          | 0          | 0      | 0      |
| 0005 | 0          | 0          | 0          | 0      | 0      |
| 0006 | 0          | 0          | 0          | 0      | 0      |
| 0007 | 0          | 0          | 0          | 0      | 0      |
| 0008 | 0          | 0          | 0          | 0      | 0      |
| 0009 | 0          | 0          | 0          | 0      | 0      |
| 0010 | 0          | 0          | 0          | 0      | 0      |
| 0011 | 0          | 0          | 0          | 0      | 0      |
| 0012 | 0          | 0          | 0          | 0      | 0      |
| 0013 | 0          | 0          | 0          | 0      | 0      |
| 0014 | 0          | 0          | 0          | 0      | 0      |
| 0015 | 0          | 0          | 0          | 0      | 0      |
| 0016 | 0          | 0          | 0          | 0      | 0      |
| 0017 | 0          | 0          | 0          | 0      | 0      |
| 0018 | 0          | 0          | 0          | 0      | 0      |
| 0019 | 0          | 0          | 0          | 0      | 0      |
| 0020 | 0          | 0          | 0          | 0      | 0      |
| 0021 | 0          | 0          | 0          | 0      | 0      |
| 0022 | 0          | 0          | 0          | 0      | 0      |

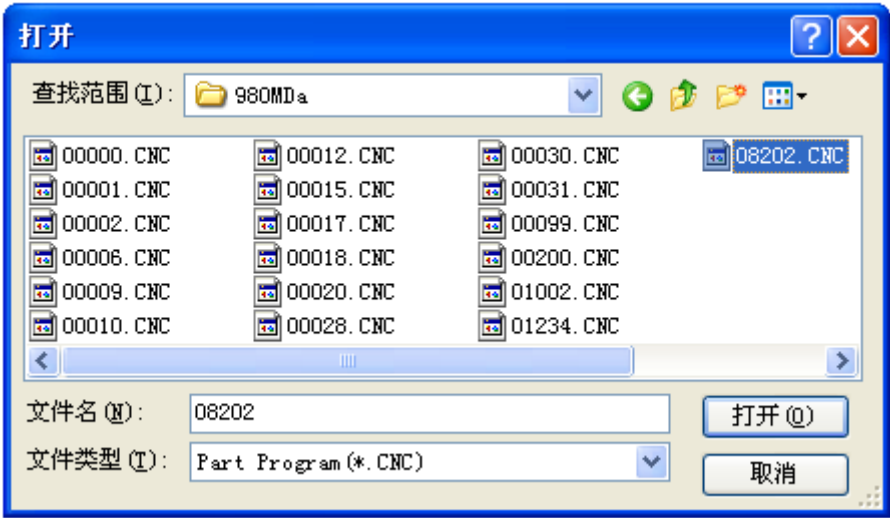
The status bar at the bottom shows "Ready" and "NUM".


## 4.6 DNC communication

Click  key or select menu "Communication—>DNC communication", will pop up DNC communication interface:

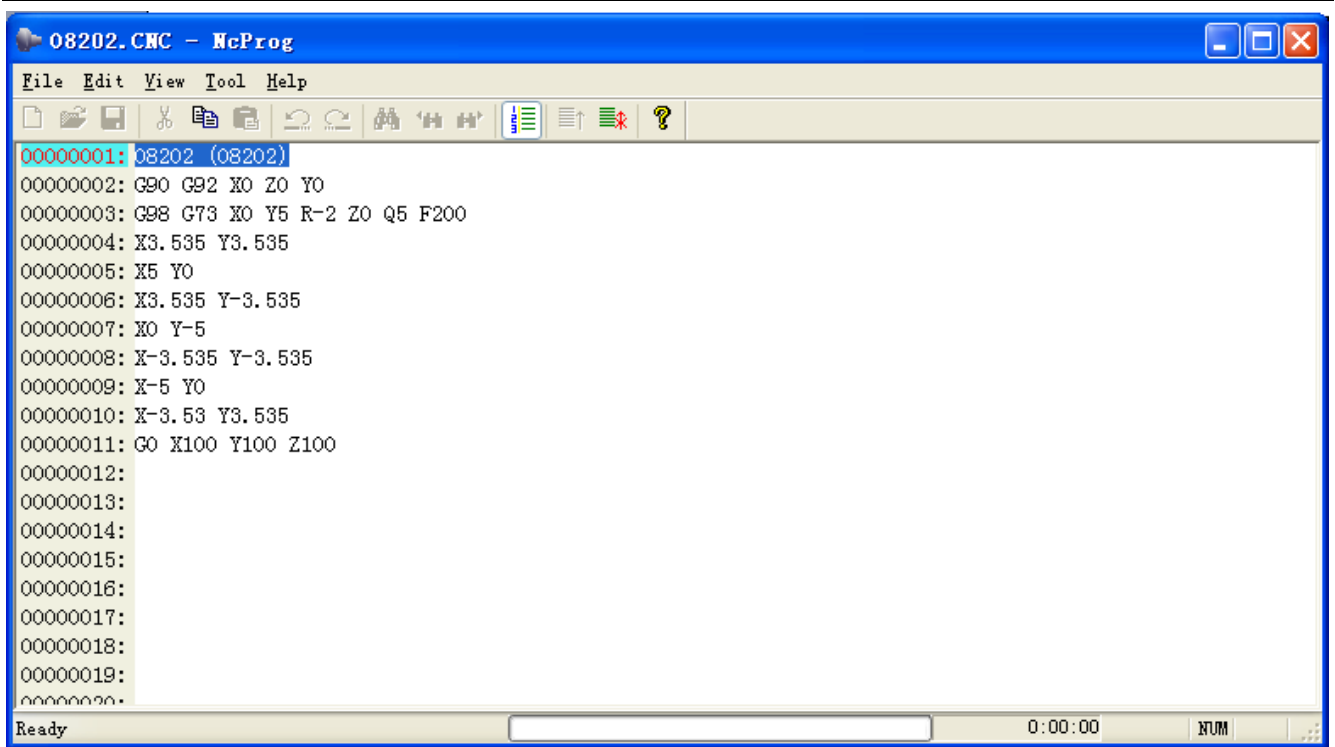


Click “Open” key to choose work piece program which will be processed.



Then, move cursor to first line of program, and then click  button or select menu "Tool-> DNC", to complete transmission of DNC preparations:




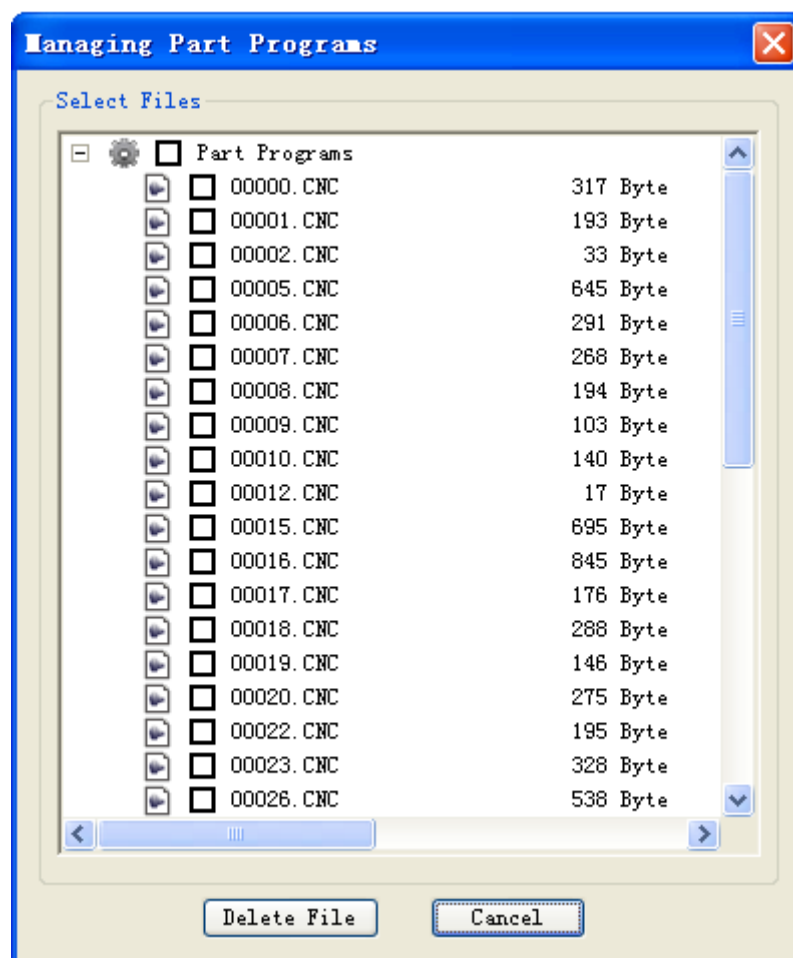


Finally, switch CNC work in DNC mode, and then press "cycle start" button, you can conduct DNC communications processing.

## 4.7 CNC work piece program management

CNC work piece program management function is used to check current CNC work piece program list and remove work piece program.

Click  button or select menu "Communication-> Manage Part Programs", will pop up "Managing Part Program" page



This page will list all current CNC work piece program. User select corresponding program, click "Delete File" button, you can delete the file.

## 4.8 preparatory work before Communication

- 1、 PC and CNC in power-off mode, connect communication cable:

PC connect with CNC: DB9-pin plug CNC-XS36 communication interface, DB9 hole plugs into PC-9-pin serial ports (COM0 or COM1);

CNC connect with CNC: two DB9-pin separately plug into CNC XS36 communication interface.

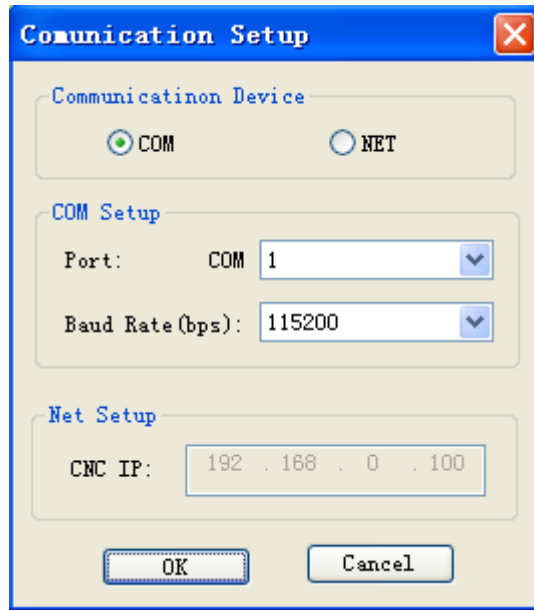
- 2、 setting communications baud rate, so that PC and CNC, CNC and CNC communication baud rate are the same:

- CNC baud rate setting:

GSK980MDa drilling-milling CNC serial communication baud rate is setted by data parameter No.215, setting range is 50 ~ 115200 (unit: bps), if data transmitting between CNC and PC, setting value should be no less than 4800. Standard factory setting: 115200

- PC baud rate setting:



Running communication software, mouse left-click menu, select "Communication-> Communication Setup", interface shown below:



Port Selection: Select communications port (COM1、COM2、COM3、COM4)

baud rate: select communication baud rate (4800、9600、19200、38400、57600、115200 (unit: bps))

Note 1: If you need to transfer processing program, you need to open program switch; If you need to transmit parameters, tool compensation value and etc, we need to open parameter switch. If there is

alarm after opening parameter, please press  key and  key at the same time to cancel alarm. Then close parameter and open again, system will not appear alarm;

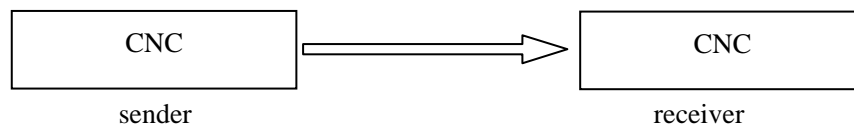
Note 2: In order to ensure stable and reliable communication, if CNC is processing now, please stop processing first. When CNC actively sends data file, Please shift operation mode to edit mode first.

Note 3: When stop transmit, press  key;

Note 4: During data transfer process, please do not cut power suddenly, or may cause data transmission errors.

## 4.9 Communication between CNC and CNC

For convenience of users, GSK980MDa allows to transfer data between two CNC. Sending data CNC called sender; receiving data CNC called receiver. To indicate as following figure:



Note of transferring data between two CNC:

1, Communication baud rate between sender and receiver is the same. Namely, two CNC's data parameter No.215 are set to the same value;

2, sender and receiver are both in edit mode;







3, The sender must enter the page where data will be sent (for example, to transfer state parameters, you must enter state parameters page);

4, The recipient must enter corresponding authority operation and open corresponding

switch(parameter switch,program switch)as follows:

| Received data  | authority                 | remark                |
|--|---------------------------|-----------------------|
| Work piece program ( Program name is less than 9000 )        | 4 grade、3grade or 2 grade | Open program switch   |
| Macro program (Program name is bigger than or equal to 9000) | 2 grade                   | Open program switch   |
| Tool offset value  | 4 grade、3grade or 2 grade |                       |
| Status parameter   | 3grade or 2 grade         | Open parameter switch |
| Data parameter   | 3grade or 2 grade         | Open parameter switch |
| Thread compensation data                                     | 2 grade                   | Open parameter switch |

6. sender output data operation:

| Sent data                | Sender page                    | Sender operation  |
|--------------------------|--------------------------------|---|
| Work piece program       | Program content page           | O program +  key |
| All work piece program   | Program content page           | O-999 +  key     |
| Tool offset value        | Tool offset page               |  key             |
| Status parameter         | Status parameter page          |  key             |
| Data parameter           | Data parameter page            |  key             |
| Thread compensation data | Thread compensation value page |  key             |

Transmission starts, GSK980MDa drilling-milling machine CNC display “OUT” words at lower right corner of page.