ADT-CNC4220

CNC Lathe Control System User Manual

Operation&Test

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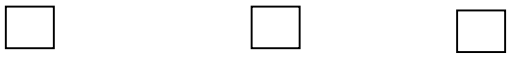
Version Upgrading Instruction

Program No.	Version Number	Modification Date	Instruction
XT20061225	9.0	2010/2/23	The Ninth Version

Remarks: the meanings of the three numbers in the version number are as follows:



Bank Main Version Number/ Bank Secondary Version Number/ Reservation

Notes:

1. This user manual is strictly emended and checked by ADTECH (SHENZHEN) CNC TECHNOLOGY CO., LTD, however, it is not guaranteed that the user manual has no any mistake or error.

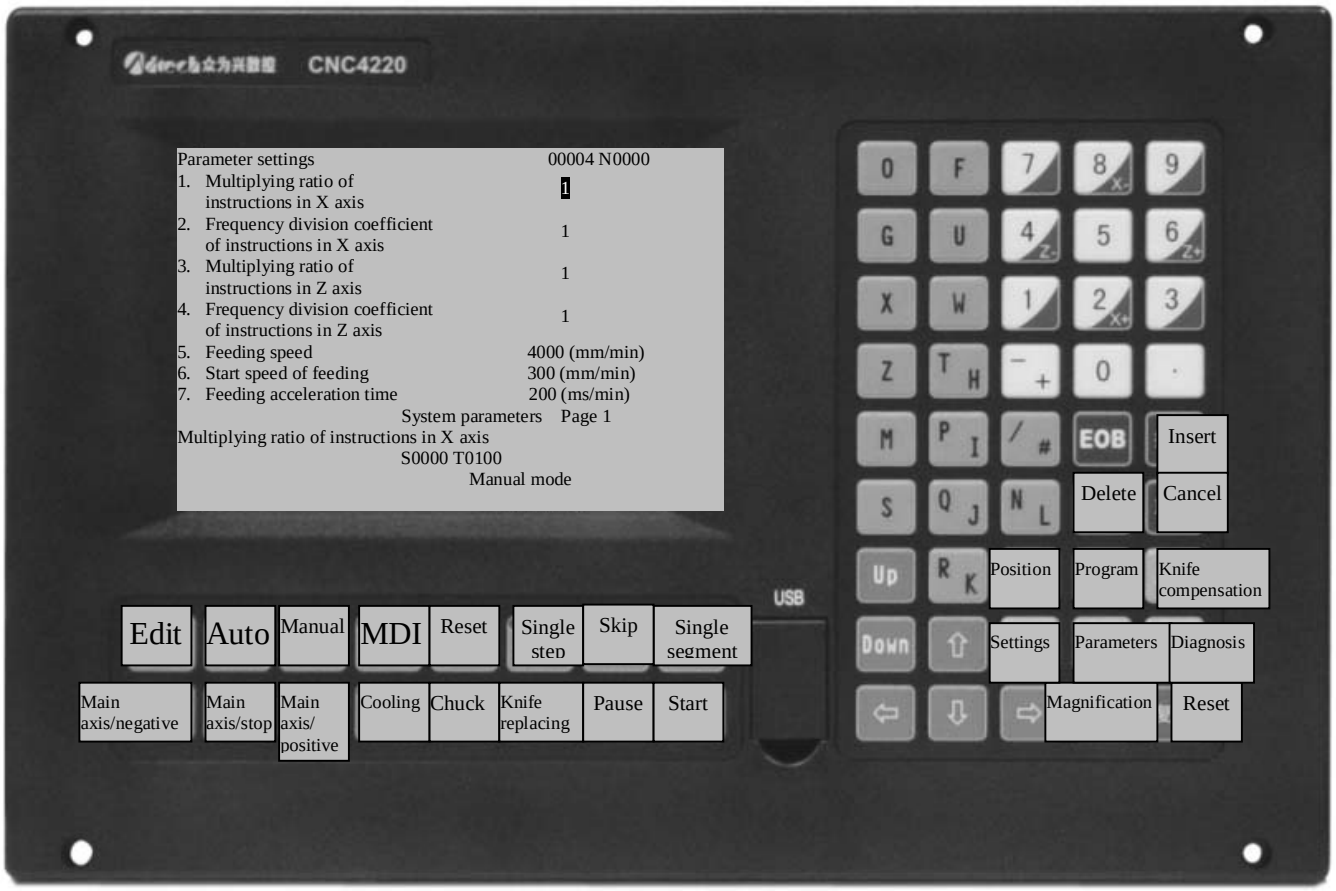
2. ADTECH (SHENZHEN) CNC TECHNOLOGY CO., LTD commits itself to improve the product functions and the service quality consistently. Therefore, the company reserves the right of changing any products as described, any software program, and the content of the user manual, without prior notice.

Contents

1. Operation modes and display interfaces

Product appearance

The appearance and deployment of the operation panel are shown below:

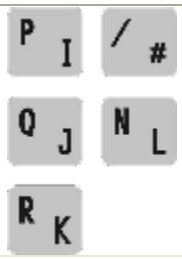
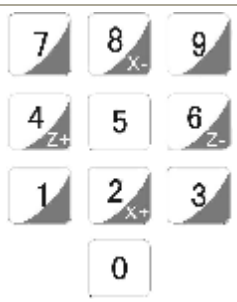


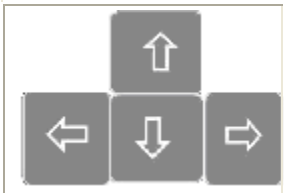
State indicators

Edit	To indicate the edit mode	Manual	To indicate the manual mode
Auto	To indicate the auto mode	Single step	To indicate the single step mode

Single segment	To indicate the single segment mode	Reset	To indicate the reset mode

1.1. Description of editing keypad

Keys	Name	Function description
Reset	Reset key	System reset, feeding, output stop, etc.
	Address keys	Input address
	Double address key	Press the keys repeatedly to switch between the letters
	Number keys	Input numbers The number keys 8, 2, 6 and 4 are X-, X+, Z- and Z+ in manual mode and single step mode respectively; the direction key 5 is the quick switch in manual mode
	Minus sign key	Input the minus sign
	Radix point	Input radix point
Cancel	Cancel key	Clear the contents in input line
Insert/Delete	Editing keys	Insert or delete programs or fields while editing

	EOB key	Input the end symbol of program segment, or edit the option
	Cursor moving keys	Control the moving of cursor in program editing mode and parameter interface Adjust the feeding and magnification quickly in auto mode Single step mode: Adjust the increment in single step
	Page turning keys	Turn pages in same display mode

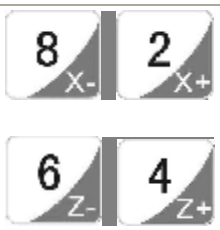
1.2. Display menus

Menu keys	Remark
Position	Enter the position interface, which consists of relative coordinate, absolute coordinate, comprehensive coordinate, and position/program.
Program	Enter the program interface, which consists of program, MDI and program directory.
Knife compensation	Enter knife bias interface, which includes knife compensation data and macro variable
Settings	Enter the setting interface and graph interface (press repeatedly to switch); the setting interface includes code setting and switch setting; the graph interface includes graph parameters and graph display
Parameters	Enter the parameter interface, display the system parameters
Diagnosis	View alarm info when there is alarm Enter the diagnosis interface and machine tool panel (press repeatedly to switch); the diagnosis interface and diagnosis parameters; the soft keypad operation can be performed on the machine tool panel

1.3. Machine tool panel

The keys are described in the table below:

Keys	Name	Function description
Pause	Feeding maintaining key	Pause program, MDI instruction running
Start	Loop start key	Start program, MDI instruction running

Magnification	Feeding rate / Rapid magnification / Main axis magnification switch key	Automatic or manual feeding speed / fast-moving magnification / Main axis speed regulation
Knife replacing	Manual knife replacing key	Replace the knife manually
Chuck	Switch key of lubricant	Lubricant on/off of the machine tool
Cooling	Switch key of cooling liquid	Cooling liquid on/off
Main axis/positive Main axis/stop Main axis/negative	Main axis control key	Forward rotating of main axis Main axis stops Reverse rotating of main axis
	Manual feeding key	X axis and Z axis move in positive/negative direction in manual and single step operation modes
	Quick switch	Switch quick/manual feeding speed
Single section	Single section switch	Switch running state between single section and continuous for the program; if single section is valid, the single section indicator is on.
Edit	Editing mode selection key	Enter editing mode
Auto	Auto mode selection key	Enter auto mode
MDI	Data input mode selection key	Enter MDI operation mode, enter program reset operation mode
Reset	Mechanical reset mode selection key	Enter mechanical reset mode
Single step	Single step/ handwheel mode selection key	Switch single step/ handwheel mode
Manual	Manual mode selection key	Enter manual operation mode

1.4. Operation modes

This system allows seven operation modes, which are edit, auto, MDI, mechanical reset, single step/handwheel, manual and program reset.

- Editing operation mod

  In editing mode, you can create, delete and modify the processing program.

- Auto operation mode

In auto mode, the program runs automatically

- MDI operation mode

  In MDI mode, input the parameters, and insert and execute instruction segment.

- Mechanical reset operation mode

  In mechanical reset mode, perform the mechanical reset operation for X axis and Z axis respectively

- Handwheel/single step operation mode

  In single step/handwheel feeding mode, the system moves in selected increment

- Manual operation mode

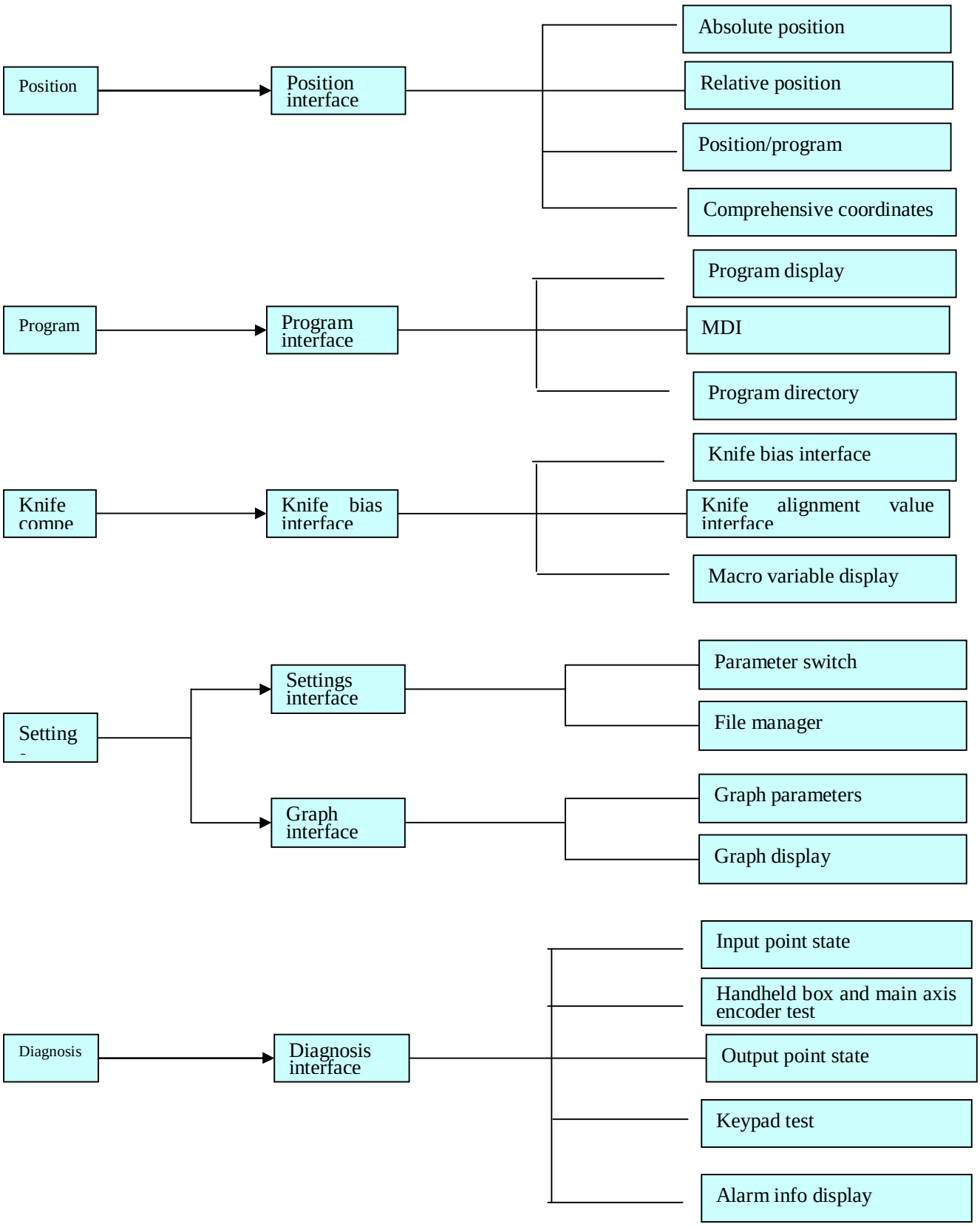
  In manual mode, perform the operations such as manual feeding, manual speed, feeding rate regulation, quick rate regulation, main axis start/stop, cooling liquid switch, lubricant switch and manual knife switch.

- Program reset operation mode

  In program reset mode, perform the program reset operation for X axis and Z axis respectively.

1.5. Display interface

This system contains six interfaces, including position and program. Each interface contains several pages. Press the display menu key to switch interfaces, and press the Up/Down key to turn pages. The interfaces (pages) are independent to the operation modes.



1.5.1 POSITION INTERFACE

Press the position key Position to enter the position interface, which consists of absolute, relative, comprehensive and position/program pages. You can press the Up/Down key Up Down to view.

Absolute coordinates

The X coordinate and Z coordinate are the absolute position of the knife in current work piece coordinates system, which is specified byG50.

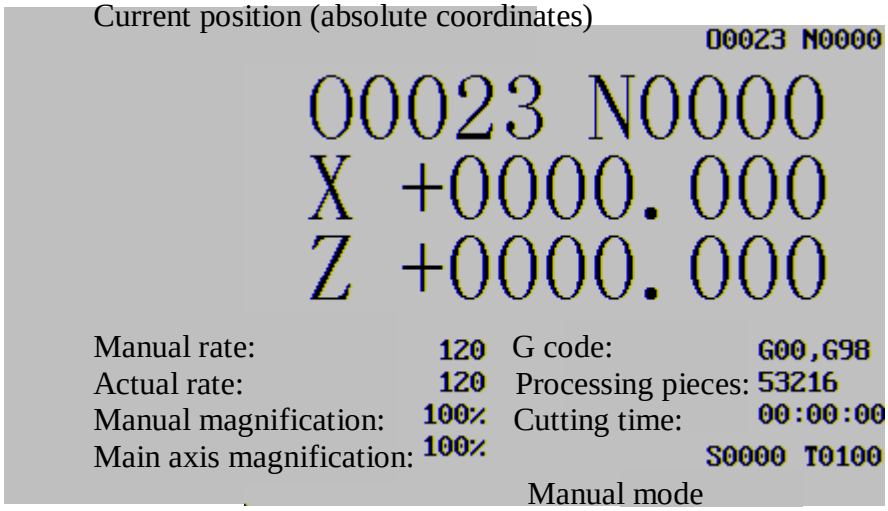


Fig. 1-3-1

Programming speed: the speed specified by F code in the program (unit: mm/min).
Actual speed: the actual processing speed (unit: mm/min) after the magnification has been adjusted in the actual processing.
Feeding magnification: the current feeding magnification
Quick magnification: the current quick magnification
G function code: current valid G code processing pieces in Group 01 and 03: when the program has executed M30, the processing pieces are increased by 1.
Cutting time: the cumulative time when the program and MDI are running; the time format is: Hour: Minute: Second. The cutting time is 0 when the system is electrified.
T: current tool number
S: current main axis rotation speed
Note: The main axis encoder is necessary to display the actual rotation of the main axis.

Relative coordinates

The U coordinate and W coordinate, which are 0 when the system is electrified, are the relative coordinates of current position relative to the reference point. In manual mode, press the letter key U or W, and the U or W flashes in the page; press the Cancel key Cancel to reset the U or W coordinate.

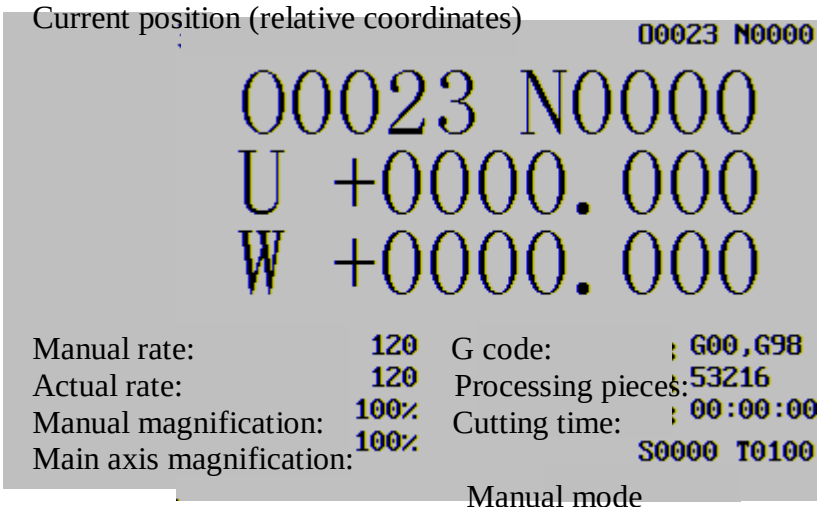


Fig. 1-3-2

Comprehensive coordinates

In comprehensive position page, relative coordinates, absolute coordinates, machine tool coordinates and remaining movement are displayed at the same time. The value of machine tool coordinates is the coordinates of current position in machine tool coordinates, which is created through mechanical reset. The remaining movement is the difference between the target coordinates of program section or MDI instruction and the current absolute coordinates.

The page follows:

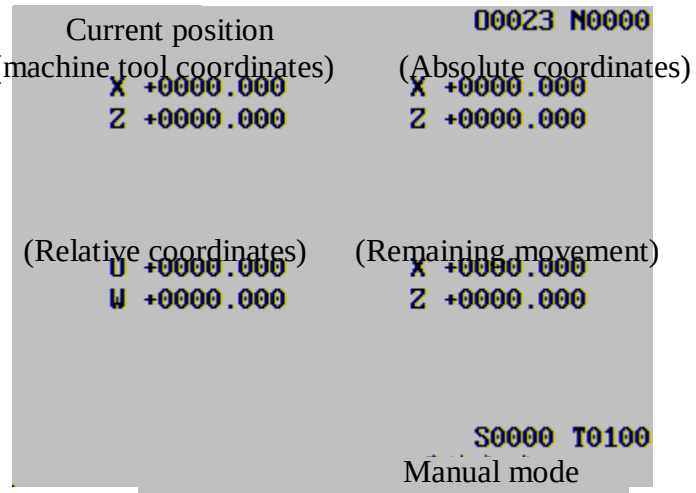


Fig. 1-3-3

Position/program

In position/program page, the absolute coordinates and relative coordinates of current position and program line of current program are displayed at the same time. When the program is running, the displayed program line refreshes dynamically.

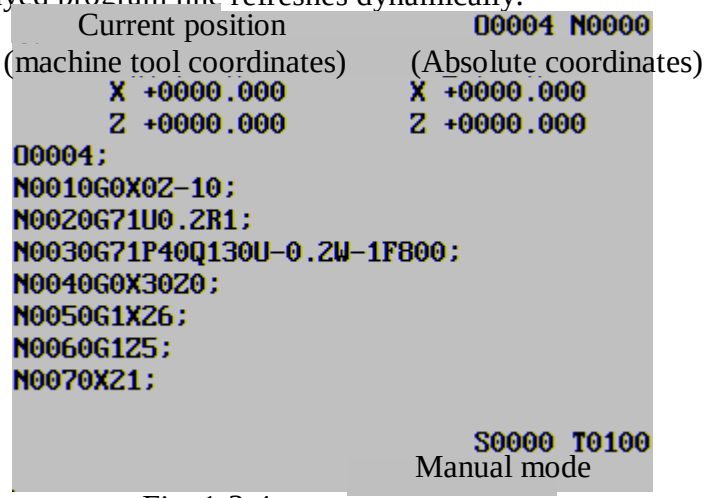


Fig. 1-3-4

Program interface

Press the Program key Program to enter the interface, which consists of program, MDI and program directory pages in non-editing operation mode. Press the Up/Down key Up Down to view.

1.5.2 PROGRAM DISPLAY

In the program page, display the contents of the program, including current program section. In editing mode, press the Up/Down key Up Down to view the contents of the program.

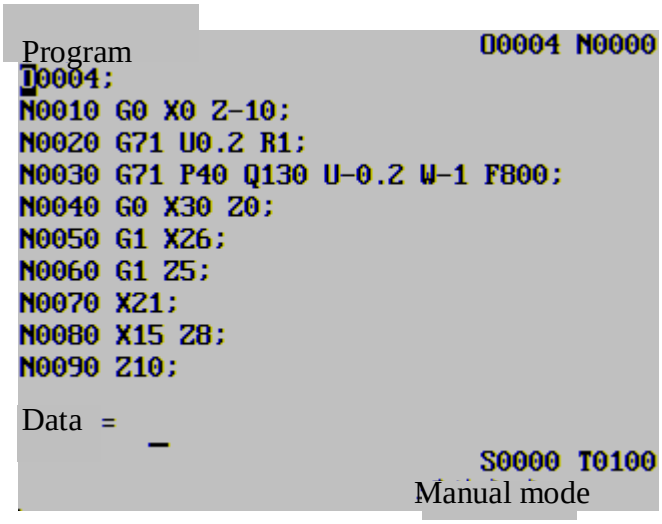


Fig. 1-3-5

1.5.3 MDI

InMDI page, display the current instruction states ofG, M, S, T and F, and display the contents of current program section in auto and MDI modes.

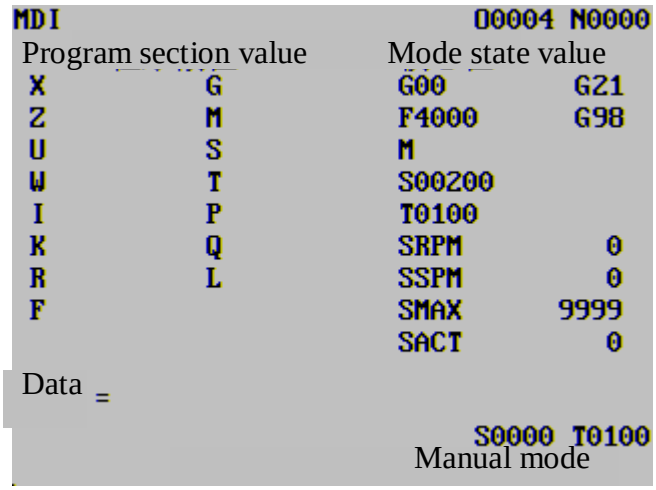


Fig. 1-3-6

1.5.4 PROGRAM DIRECTORY

The contents in program directory page:

(a) System version number: display the current version number of the system

(b) Saved programs: the saved programs number (including sub-programs); remaining: the programs number that still can be saved

(c) Occupied memory: the memory occupied by the saved programs; Remaining: available memory

(d) Program directory: display the numbers saved programs in sequence

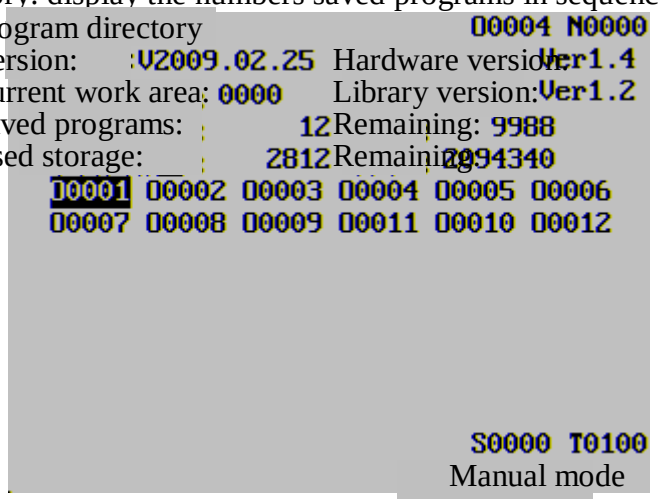
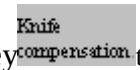


Fig. 1-3-7

1.5.5 KNIFE COMPENSATION INTERFACE

Press the Knife compensation key 

to enter the bias interface, and press the Up/Down key 

to display knife bias and macro variable.

Knife bias display

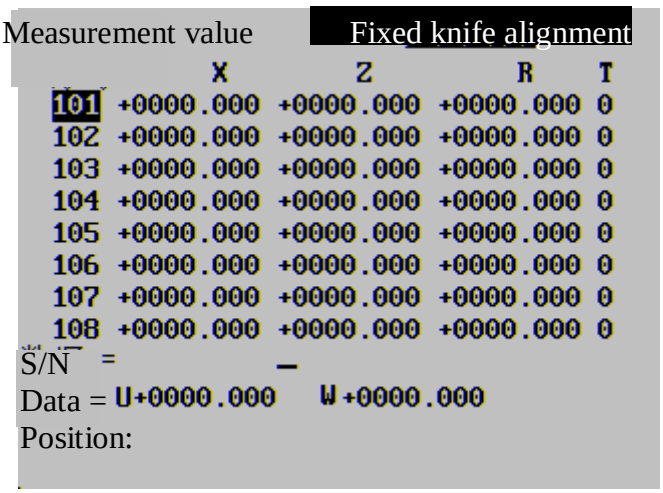


Fig. 1-3-8

1.5.6 ALARM INTERFACE

When the system alarms, press the Diagnosis key [Diagnosis] to enter the alarm interface and view the alarm information.

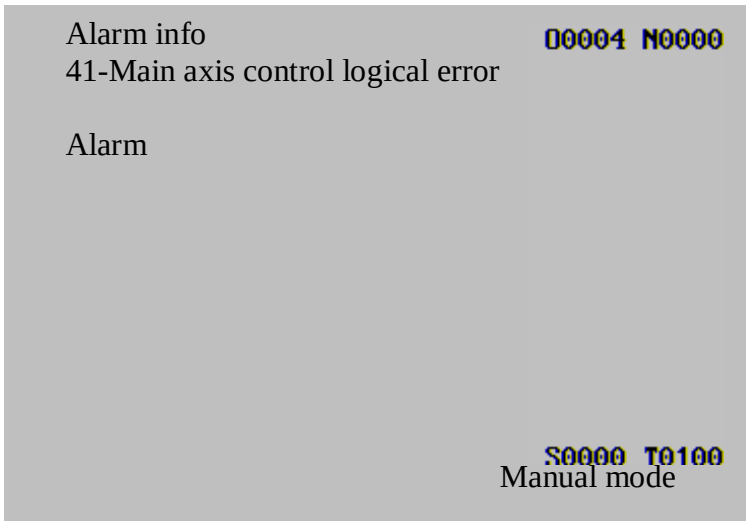


Fig. 1-3-10

Settings interface

The Setting key [Settings] is composite, and you can press it repeatedly to switch the setting/graph interface.

1.5.7 SETTINGS INTERFACE

The settings interface contains two pages, and you can press the Up/Down key [Up] [Down] to view.

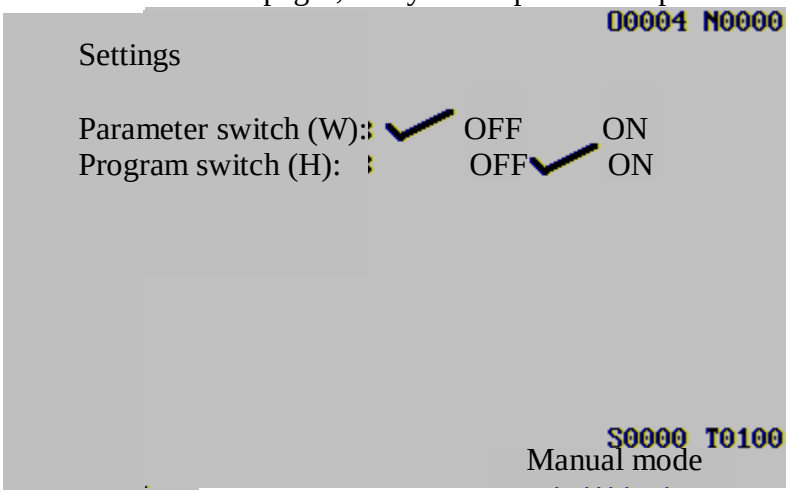


Fig. 1-3-12

Parameter switch: when the parameter switch is on, you can edit the parameters; when it is off, you can't edit; press the [W] key to switch the state in MDI mode

Program switch: when the program switch is on, you can edit the program; when it is off, you can't edit; press the [H] key to switch the state in MDI mode

1.5.8 GRAPH INTERFACE

The graph interface contains graph parameters and graph display pages, and you can press the Up/Down key Up Down to view.

1.5.9 GRAPH PARAMETERS

In graph parameters page, you can select coordinates system of graph, scaling and range.

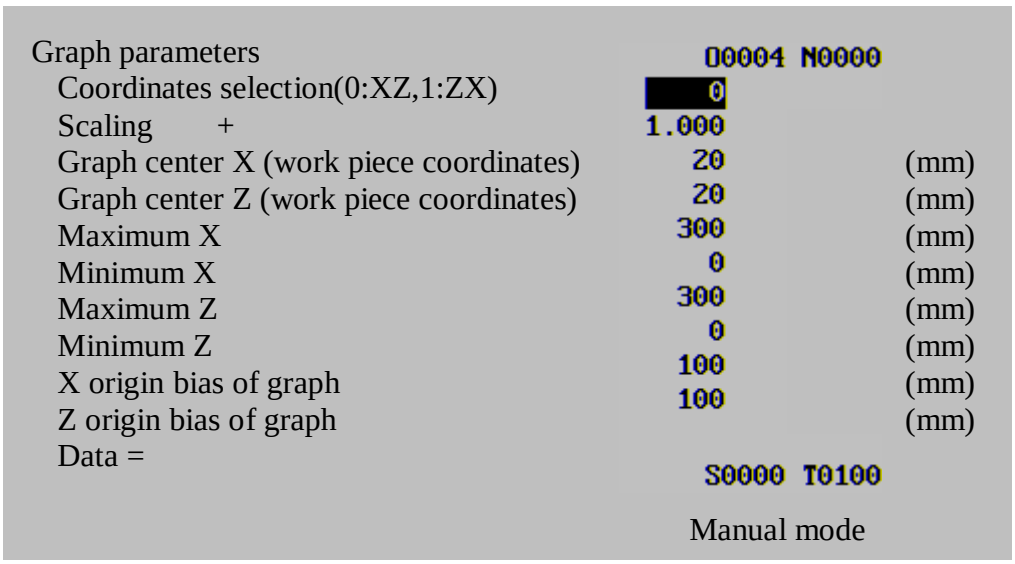


Fig. 1-3-13

1.5.10 GRAPH DISPLAY

In graph display page, the motion track (referring to absolute coordinates) of the processing program is displayed. Press the S key S in this page to start drawing, press the T key T to stop and press the R key R K to clear.

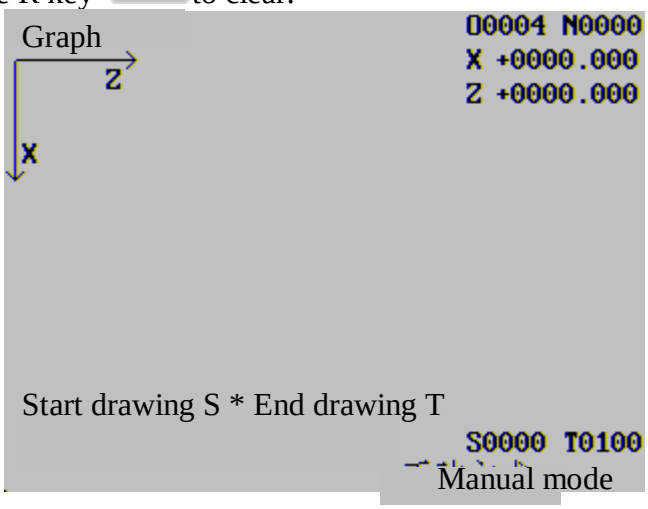


Fig. 1-3-14

1.5.11 PARAMETER INTERFACE

Press the Parameter key Parameters to enter the interface, which consists of system parameters and data parameters. You can press the Up/Down key Up Down to view. In parameters display page, the prompt line of parameter contents displays the contents of the parameter that the cursor points to. The parameters can be edited in MDI mode. Input the target parameter number and press the EOB key to go to the specified parameters.

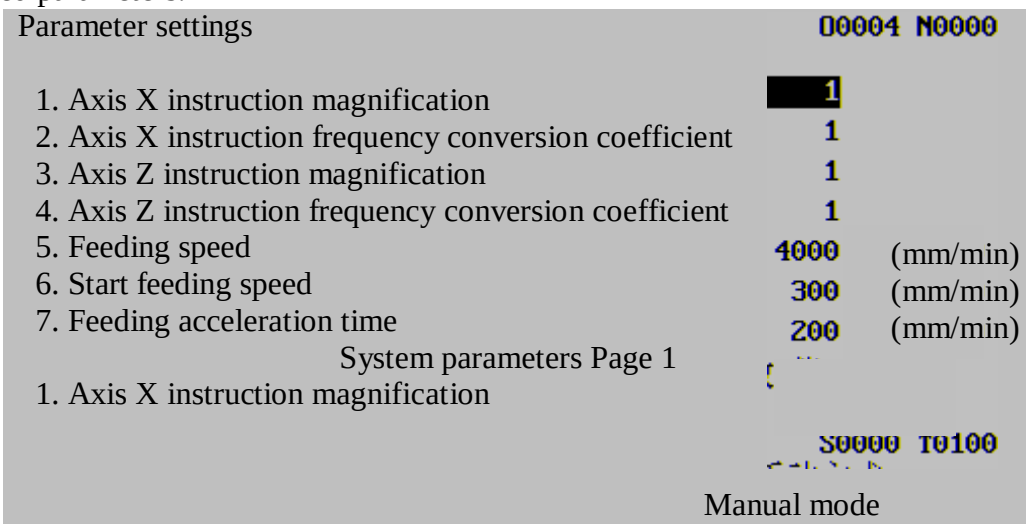


Fig. 1-3-15

1.5.12 DIAGNOSIS INTERFACE

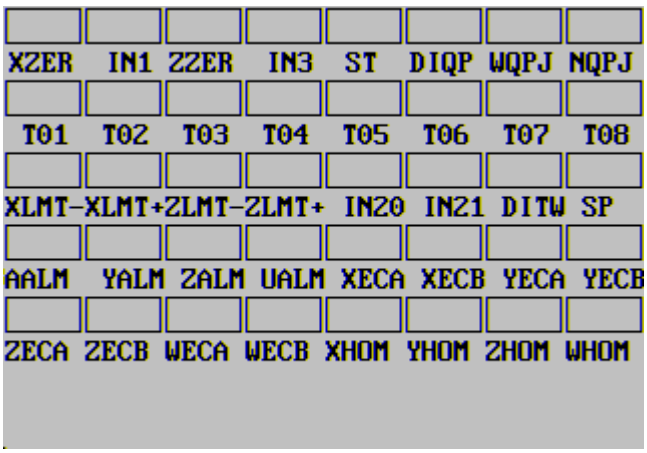
The Diagnosis key Diagnosis is composite, and you can press it repeatedly to switch between diagnosis interface and machine tool panel interface.

Diagnosis interface display

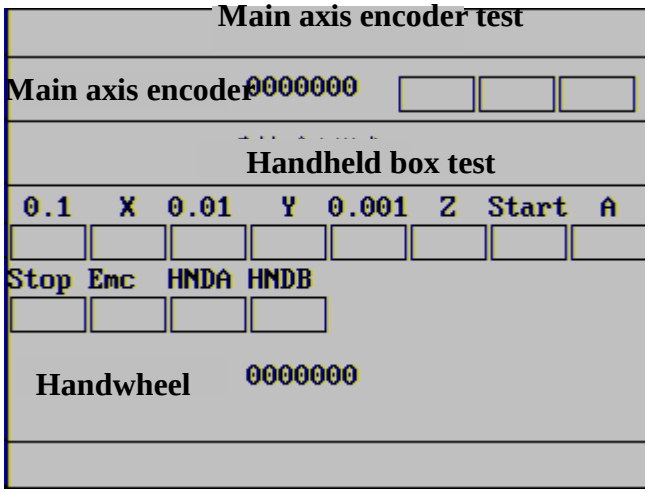
Press the Up/Down key Up Down to view the I/O signal state and system state of the diagnosis display system and machine tool

Input point status interface

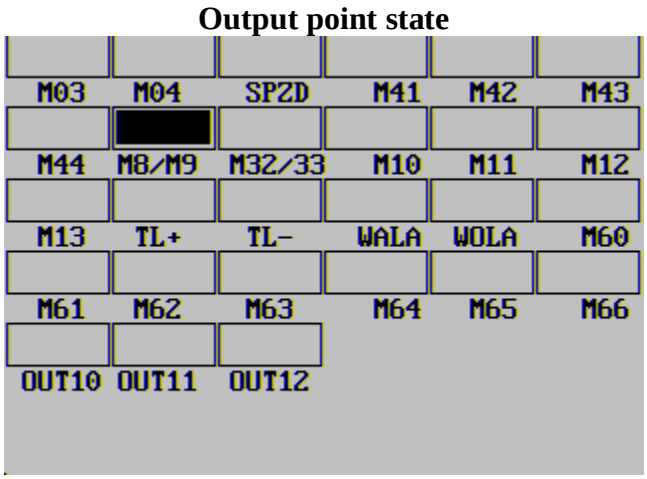
Input point state



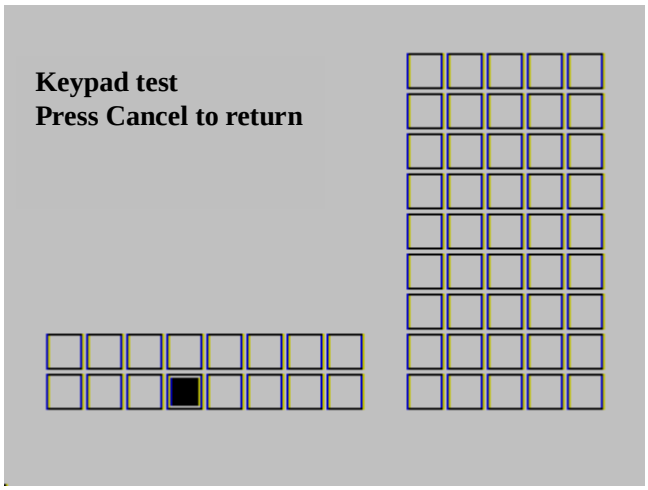
Main axis encoder and handheld box interface



Output point status interface



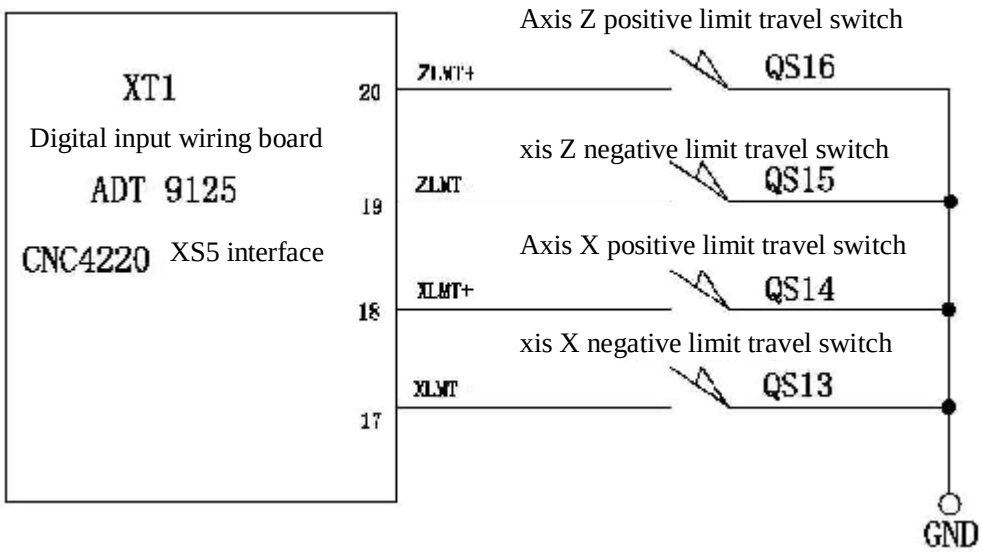
Keypad test interface



2. Safe operation

2.1 Hardware overtravel protection

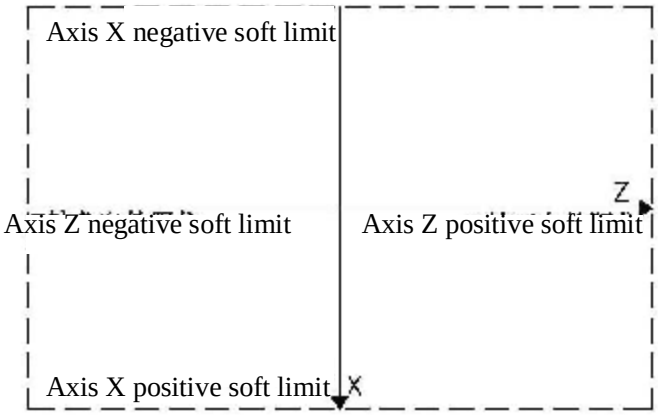
The overtravel protection is the necessary measure for the machine tool to prevent damage caused when the X axis and Z axis exceed the travel. The hardware overtravel protection function is enabled and controlled by system parameter 22 --- hard limit, which is enabled if the parameter is set to "1". The effective level of hardware limit is controlled by system parameter 23 --- effective level of hard limit. Set the above two parameters according to the actual connection of the machine tool to realize overtravel protection. Install travel limit switch in the position of maximum travel in positive and negative directions of axis X and axis Z respectively, and connect the wires according to the figure below. When overtravel occurs, the travel limit switch acts, and the system stops moving and displays the alarm of not ready. It indicates that the hard limit enable control parameter can only control the limit function of motion chip, and the limit response of the motion chip features high speed and low delay. The hard limit function is still valid in this system when the hard limit parameter is disabled. The software will execute the limit function instead. Comparing with the limit by the chip, the delay is increased, but the immunity is much better.



2.2 Software overtravel protection

The software limit function is enabled and controlled by system parameters --- software limit, which is enabled if the parameter is set to "1" and disabled if set to "0".

The software travel range is set by system parameters: positive soft limit in X axis, negative soft limit in X axis, positive soft limit in Z axis and negative soft limit in Z axis, and refers to the coordinates of the machine tool. As shown in the figure below, X and Z are two axes of the coordinates of the machine tool, 25 and 26 are the maximum travels of X axis in positive and negative directions, 27 and 28 are the maximum travels of Z axis in positive and negative directions, and the area inside the dashed frame is the range of software travel.



2.3 Emergency operation

During the processing, due to user programming, operation and product failures, certain unexpected events may occur. At this moment, please stop the system immediately. This section involves the treatment that the system can perform under emergency conditions. Please refer to the instructions of machine tool for the treatment that the machine tool can perform under emergency conditions.

2.4 Reset

When the system output or coordinates action is abnormal, press the Reset key to reset the system:

1. The motion of all axes stops;
2. M, S function output is invalid (it is possible to set whether disable main axis positive/negative rotation, lubricant and cooling signals automatically after pressing the Reset key);
3. Automatic running stops, and mode function and state maintain.

2.5 Emergency stop

When the machine tool is running, press the Emergency stop button (when external emergency stop signal is valid) if there is any danger or emergency, and the system will enter the emergency stop state immediately. At this moment, the machine tool stops moving immediately, and all outputs (e.g. rotation of main axis, cooling liquid, etc.) are off. Release the button to relieve the alarm, and then the system enters reset state.

Note 1: Please make sure that the failure has been eliminated before relieving the alarm;

Note 2: Before turning on/off the machine, press the emergency stop button to reduce the electric impact to the equipment;

Note 3: After relieving the alarm, please re-execute the mechanical reset operation to ensure the accuracy of the coordinates (if the machine tool doesn't have mechanical origin, do not perform this operation);

The emergency stop function is controlled by system parameters ---- emergency stop function. The function is valid only when the value is set to 1.

The level of emergency stop signal is controlled and set by system parameters ---- emergency stop signal level.

2.6 Feeding maintaining

When the machine tool is running, press the Pause key to hold the running. Please note that the running can't be stopped immediately during screw thread cutting and circle instruction running.

2.7 Cutting off power supply

If any danger or emergency occurs when the machine tool is running, please cut off the power supply immediately to prevent accidents. Please note that the system coordinates may be significantly different from the actual position when the power supply is cut off. Please align the knife again.

2.8 Turning off

Before turning off, please make sure:

1. Axis X and axis Z of machine tool are stopped;
2. The auxiliary functions (e.g. main axis, water pump, etc.) are disabled;
3. Please cut off the machine tool power supply and then the machine tool power supply
4. When the machine tool is electrified, the position is (X +00000.000, Z +00000.000), please perform the mechanical reset operation first.

3. Manual operation

Press the Manual key to enter the manual operation mode, in which you can perform operations like manual feeding and main axis control.

3.1 Manual feeding

Press the 8 X- or 2 X+ key to feed axis X in negative or positive direction, and release the key to stop the axis motion. At this moment, you can adjust the manual magnification to change the speed of manual feeding; press the 6 Z- or 4 Z+ key to feed axis Z in negative or positive direction, and release the key to stop the axis motion. At this moment, you can adjust the manual magnification to change the speed of manual feeding.

In manual feeding mode, press the 5 key to enter manual quick moving state.

Note: The manual feeding can be adjusted only in position interface and manual mode.

3.2 Quick moving

Press the 5 key, and then press the 6 Z- or 4 Z+ key to move the axis X in negative or positive direction quickly, release the key to stop the motion of the axis, and you can adjust the quick magnification to change the moving speed; press the 6 Z- or 4 Z+ key to move the axis Z in negative or positive direction quickly, release the key to stop the motion of the axis, and you can adjust the quick magnification to change the moving speed.

During manual quick moving, press the 5 key to disable the quick moving and move in manual feeding speed.

Note 1: The speed, time constant, acceleration/deceleration mode during quick moving are same to the quick moving (G00 orientation) of program instruction;

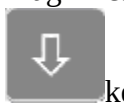
Note 2: Only one axis is valid in manual mode.

3.3 Manual magnification selection

In manual feeding and cutting, press the magnification key, and then press the / key when the quick magnification appears in the lower left corner of the position interface to decrease or increase the manual feeding magnification, which contains 16 levels and 10% each level.

3.4 Quick magnification selection

In manual quick moving state, press the magnification key to switch to the regulation

mode of quick moving magnification; when the quick magnification appears in the lower left corner of the position interface, press the  and  key to decrease or increase the manual quick moving magnification respectively, and switch among F0, 25%, 50% and 100%.

Press the  key once to increase the quick moving magnification by one grade, until 100%;

Press the  key once to decrease the quick moving magnification by one grade, until F0

Note 1: system parameters 10 and 11 set the quick moving speeds of axis X and axis Z respectively; actual quick moving speed of axis X = the value set by system parameter 10 * quick magnification; actual quick moving speed of axis Z = the value set by system parameter 11 * quick magnification

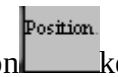
Note 2: the quick moving can be adjusted only in position interface and manual mode.

Note 3: the quick magnification is valid in the following conditions

(1) G00 orientation
(2) Quick moving in fixed circle
(3) Quick moving at G28
(4) Manual quick moving
(5) Quick moving of returning to mechanical origin manually: e.g. if the speed of quick moving is 6m/min and the magnification is 50%, then, the speed is 3m/min.

3.5 Coordinates reset

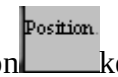
3.5.1 RELATIVE POSITION RESET

1) Press the Position  key (press the Up  key or  key if necessary) to enter the page of relative coordinates;

2) Press the  key to make the U flash in the page, and then press the Cancel key  to clear the relative coordinates of axis X;

3) Press the  key to make the W flash in the page, and then press the Cancel key  to clear the relative coordinates of axis Z;

3.5.2 MACHINE TOOL COORDINATES RESET

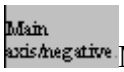
Press the Position  key (press the Up  key or  key if necessary) to enter the page of comprehensive coordinates,

Press the Cancel key  and then press  to clear the machine tool coordinates of axis X;

At the same time, press the Cancel key  and then press  to clear the machine tool coordinates of axis Z

3.6 Other manual operations

3.6.1 MAIN AXIS CONTROL

 Main axis/positive: In manual operation mode, press this key, and the main axis rotates in positive direction;

Main axis/stop: In manual operation mode, press this key, and the main axis stops rotating;

Main axis/reverse: In manual operation mode, press this key, and the main axis rotates in reverse direction.

3.6.2 COOLING LIQUID CONTROL

Cooling: In manual operation mode, press this key to switch the cooling liquid

3.6.3 CHUCK CONTROL

Chuck: In manual operation mode, press this key to switch the chuck of the machine tool

3.6.4 MANUALLY REPLACING KNIFE

Replace knife: In manual operation mode, press this key to replace the knife manually (if the first knife is being used, press this key to switch to the second knife; if it is the maximum knife value set by current parameters, press this key to switch to the first knife).

3.6.5 REGULATION OF MAIN AXIS MAGNIFICATION

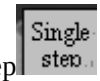
During automatic running, the analog voltage output can be used to control the speed of main axis.

Press the  or  key to adjust the magnification of the main axis and change the speed. The magnification of main axis has eight levels, which are from 50% to 120%.

4. Single step/handwheel operation

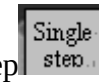
In single step/handwheel operation mode, the machine tool moves in the increment value set by the system.

The Single step 

key is the switch of single step and handwheel functions. Press the Single step 

key to enter single step mode, press it again to enter handwheel mode, and press it for another time to return to single step mode.

4.1. SINGLE STEP FEEDING

Press the Single step 

key to enter single step operation mode, which is shown in the figure below:

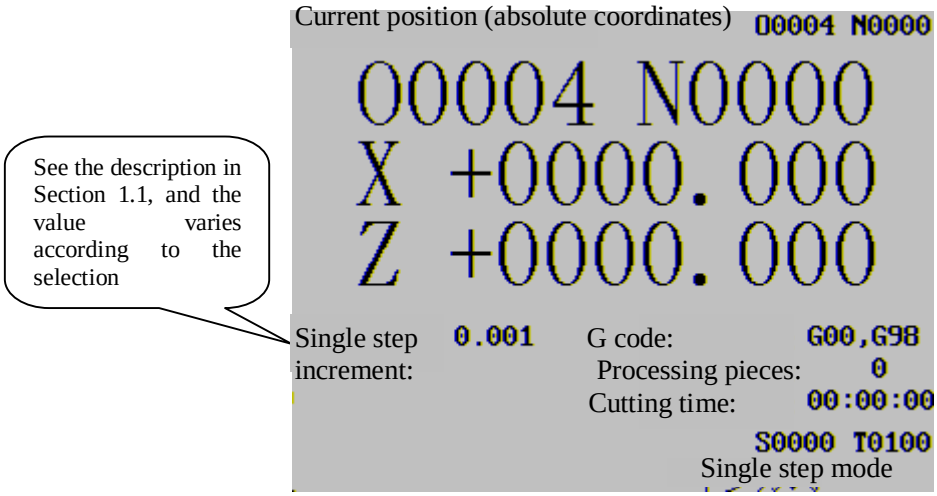


Fig. 4-1-1

4.2. Increment selection

Press the ⇧ ⇩ key to adjust the increment of single step: if the current increment is 0.01, press the ⇧ key to change the increment to 0.1, and press it again to change the increment to 1. To reduce the increment, press the ⇩ key.

4.3. Motion direction selection

Press the 8 X- or 2 X+ key once to feed once the axis X in single step increment in negative or positive direction; press the 6 Z- or 4 Z+ key once to feed once the axis Z in single step increment in negative or positive direction.

4.4. Handwheel feeding

Press the Single step key to enter handwheel operation mode, which is shown in the figure below:

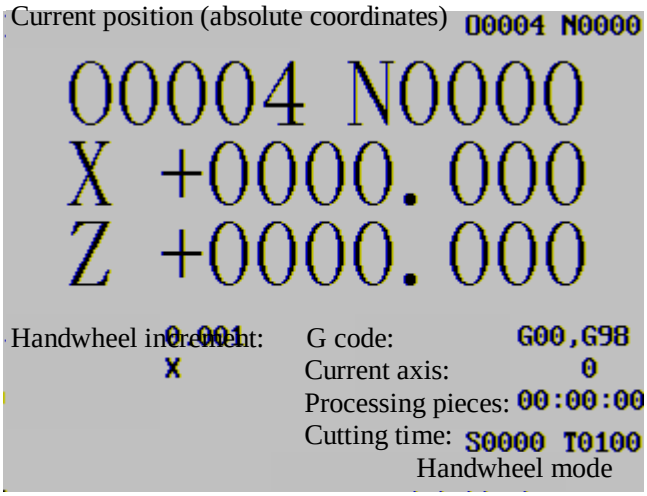


Fig. 4-1-2

4.5. Increment selection

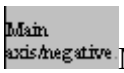
Move the increment selection lever on the handheld box to select desired increment.

If additional panel is used, please select the increment with the  key.

4.6. Motion axis and direction selection

Move the axis number selection lever on the handheld box to selected required motion axis. If additional panel is used, please select the axis number through key X and Z.

4.7. Other available operations in handwheel/single step mode

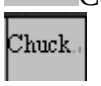


Main axis/positive: press this key to rotate the main axis in positive direction;

Main axis/stop: press this key to stop the rotation of the main axis;

Main axis/reverse: press this key to rotate the main axis in reverse direction.

Cooling: press this key to switch the cooling liquid.



Chuck: press this key to switch the chuck of the machine tool.

Replace knife: press this key to replace the knife manually

In addition, it is possible to regulate the magnification of main axis in handwheel/single step mode.

4.8. Description

1. See the table below for the relationship between handwheel scale and machine tool motion:

	Motion of every scale on the handwheel		
Handwheel increment	0.001	0.01	0.1
Specified value of coordinates	0.001mm	0.01mm	0.1mm

2. The rotation speed of the handwheel can't exceed 3r/s, or else, the scale and motion won't be consistent;

3. If the system uses step motor, the rotation speed of the handwheel shouldn't exceed 5r/s or the single step position that can disable 0.1mm and 1mm.

5. MDI operation

In MDI operation mode, you can set the parameters, input and execute instruction words.

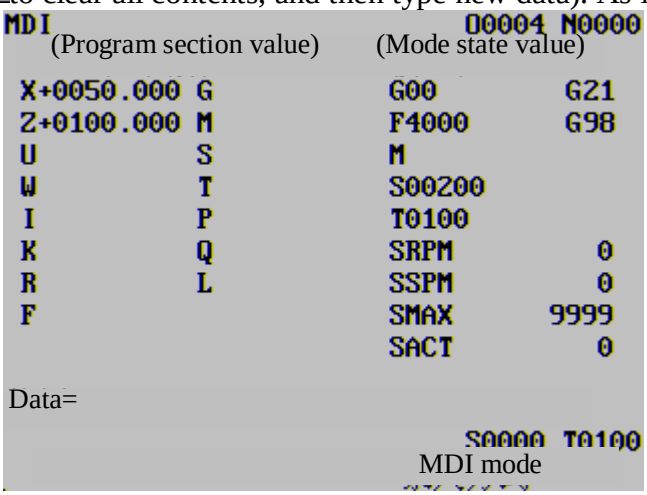
5.1. Input and execution of MDI instruction words

Select the MDI mode to enter the MDI page, input a program section G50 X50 Z100, and the operation follows:

A. Press the MDI [MDI] key to enter MDI operation mode;

B. Press the Program [Program] key (and then press the [Up] key or [Down] key if necessary) to enter the MDI page;

C. Type X50 in sequence and then press the Insert key, type G50 and press the Insert key, type Z100 and press the Insert key [Insert] (if any error appears when type the fields, please press the Reset key [Reset] to clear all contents, and then type new data). As in the figure below:



(Program section value) (Mode state value)

MDI mode

D. After inserting the instruction words, press the Start key [Start] to execute the MDI instruction words. During running, you can press the Pause [Pause] key, Reset key [Reset] and Emergency stop button to stop the running of MDI instruction words.

Note: Subroutine call instruction (M98P___ ;) and composite cutting cycle instruction (G70, G71, G72, G73, G74, G75, G76, etc.) are invalid in MDI.

5.2. Parameter editing and setting

You can edit and set the parameters only in MDI mode.

6. Program editing and management

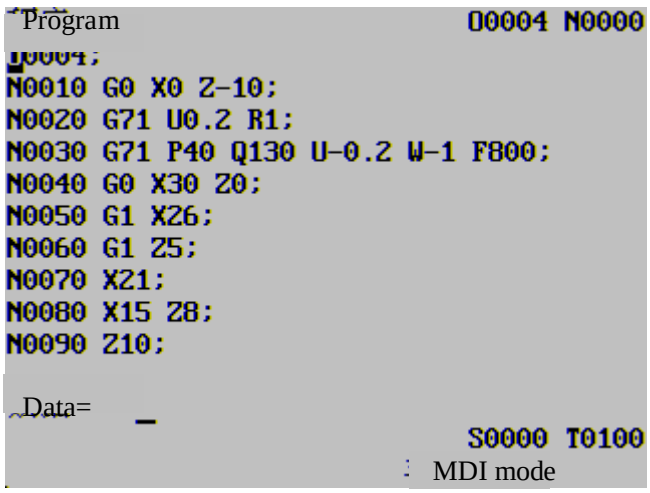
In the editing mode, you can create, select, edit and delete programs. To prevent the program from unexpected modification and deletion, the system integrates program switch. Before editing the program, please turn on the program switch.

6.1. Creating program

6.1.1 PROGRAM CONTENT INPUT

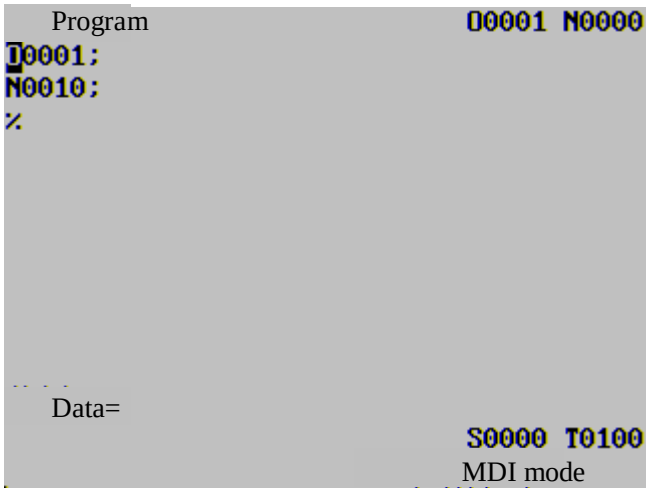
1) Press the Edit key [Edit] to enter the editing mode;

2) Press the Program [Program] key to enter the program page, and press the [Up] [Down] key to select program editing interface if necessary.



3) Type the address key O and number key 0001 in sequence (to create program O0001).

4) Press the Insert key [Insert] to create new program, as shown in the figure:



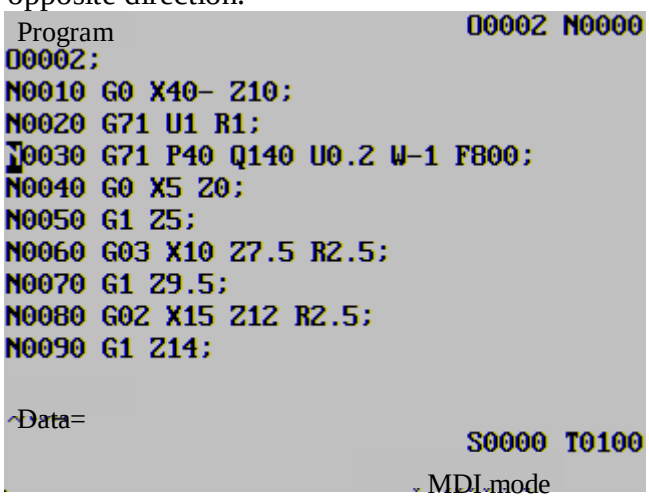
5) To edit the program content, please input the address and then the number (If the program section contains several instruction words, please input all instruction words in the above mentioned method), and then press the Insert key Insert to complete the input of the program section. (If the input buffer contains the input characters, press the EOB key at the line end to insert the data in buffer and start a new line. If it is in the line, please edit current instructions.) Press the EOB key and the cursor goes to the program section in next line.

6) Input other sections of the program in the method in step 5.

6.1.2 SEARCHING INSTRUCTIONS WORDS

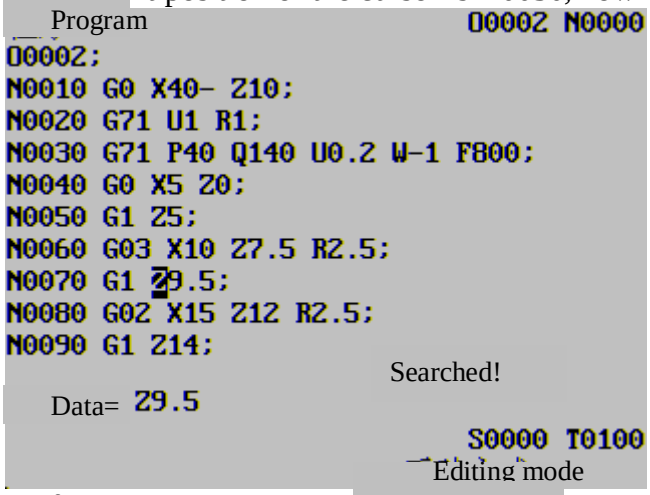
◆Scanning: the cursor scans every instruction word in sequence

1) Press the ⇧ ⇩ key, and the cursor moves upwards or downwards by instruction word. Press the ⇩ key once, the cursor moves to next instruction word; press and hold the ⇩ key, the cursor moves downwards by instruction word consecutively; press the Up/Down key, the cursor moves in opposite direction.



2) Press the Up key to display the previous page of the program (when the program is in the first page, the Up key is invalid), the cursor locates the start of previous page; press the Down key to display the next page of the program (when the program is in the first page, the Down key is invalid), the cursor locates the start of next page. Press and hold the Down key to turn pages consecutively.

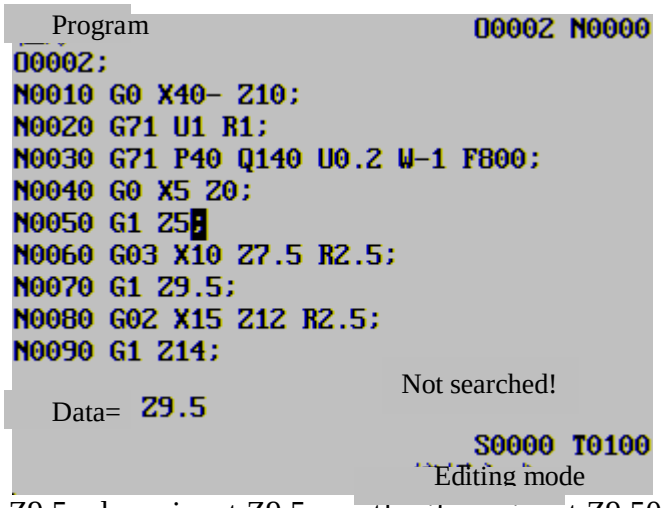
◆ Searching (instruction word): search for specified instruction word upwards or downwards from the cursor position. The current position of the cursor is N0030, now move the cursor to Z9.5;



The operation method follows:

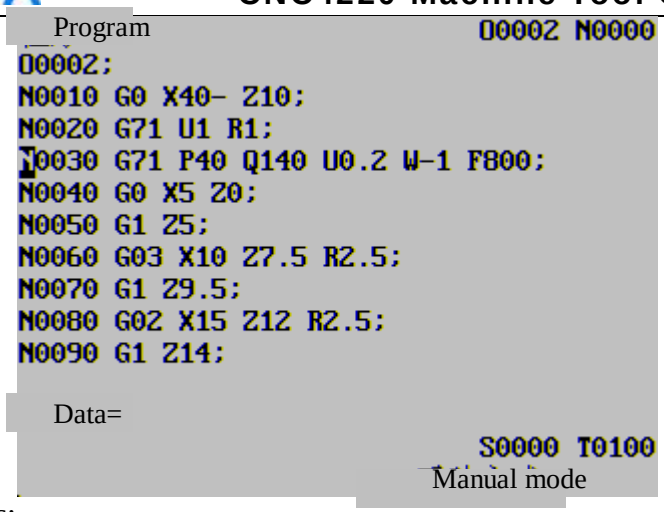
1) Press the address key S, number key 0 and 2 X+ in sequence;

2) Press the ⇩ key and the system starts searching downwards; after that, the cursor locates address Z9.5. If you press the ⇧ key to search upwards, the system can't find instruction word Z9.5, and alarms.



Note: to search for Z9.5, please input Z9.5 exactly; if you input Z9.50 only, the system can't find Z9.5.

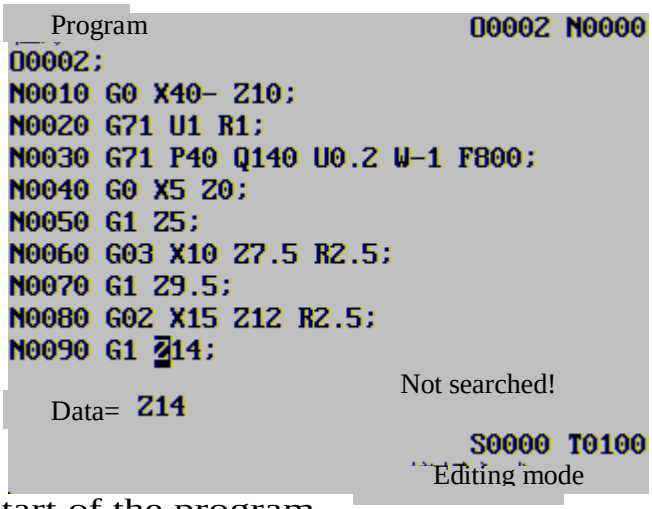
◆ Searching (address): search specified address upwards or downwards starting from current position. The current position of the cursor is N0030, now move the cursor to Z14;



The operation follows:

1) Input Z14.

2) Press the ⇩ key and the system starts searching downwards; after that, the cursor locates address Z. If you press the ⇧ key to search upwards, the system can't find instruction word Z14, and alarms.



◆To return to the start of the program

Method **1**

In editing mode and program display page, press the Reset key [Reset] and the cursor returns to the start of the program.

Method **2: Searching**

(a) Select the editing mode;

(b) Press the Program key [Program] to enter the program display interface;

(c) Type address key [0] and number key [0] [0] [0] [5] (the current program is number 5);

(d) Press the ⇩ key and the cursor returns to the start of the program

Method **3**: scanning

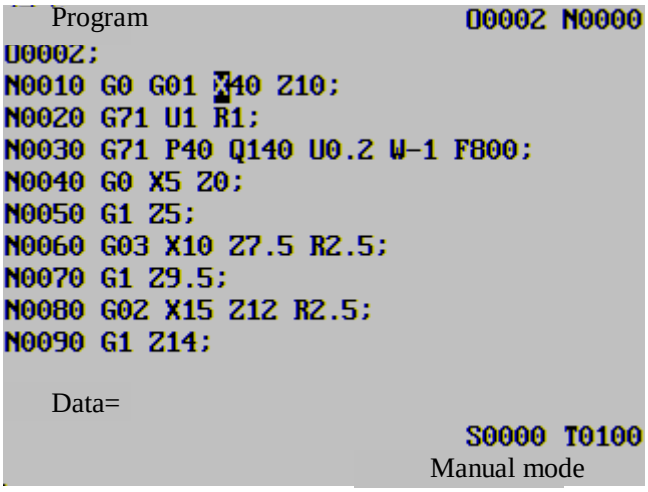
(1) Select the editing mode to enter the program display interface;

(2) Press the address key 0 and then the ⇧ key, and the cursor returns to the start of the program.

6.1.3 INSERTING INSTRUCTION WORD

Insert G01 instruction before address X40 in the steps below:

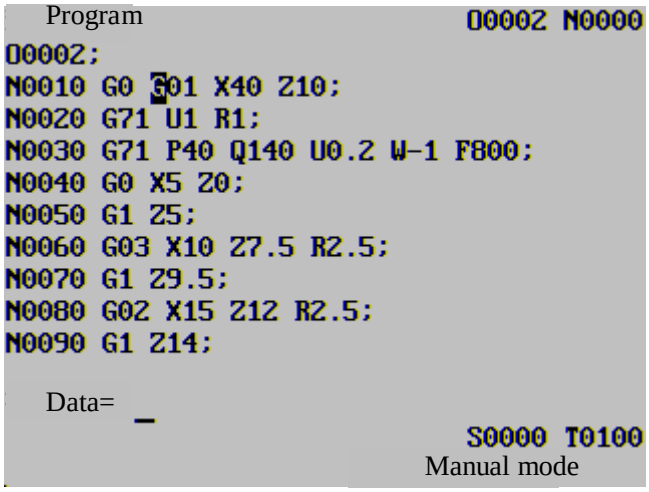
Locate the cursor at X40, type G01 and then press the Insert key Insert, as shown below:



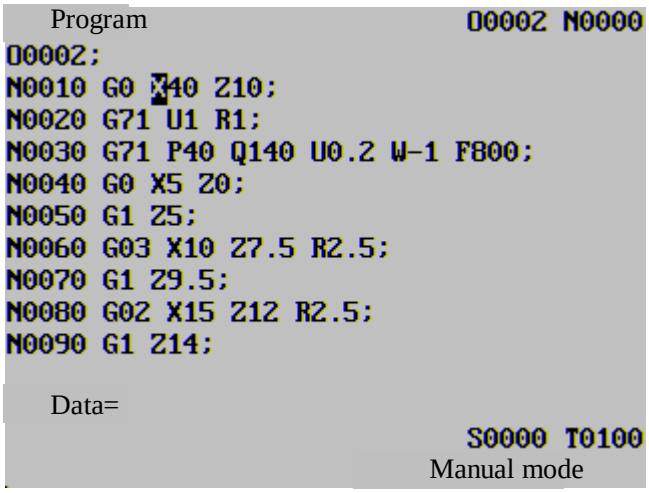
6.1.4 DELETING INSTRUCTION WORD

To delete instruction word G01:

1) Locate the cursor at G01



2) Press the Delete key Delete to delete G01 (the instruction word that current cursor points at), as shown below



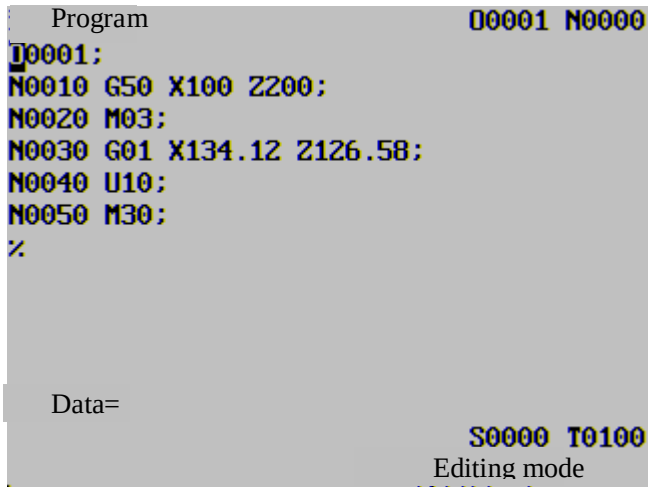
3) To delete the characters in input buffer: If X1000 has been input in the input buffer, press the Delete key to delete the last character, then, the character in the input buffer is X100, and press again to input X10.

6.2. Deleting program

6.2.1 DELETING SINGLE PROGRAM

The operation follows:

1) Select the editing mode to enter program page;



2) Type address key 

and number keys 

in sequence,

3) Press the Delete key 

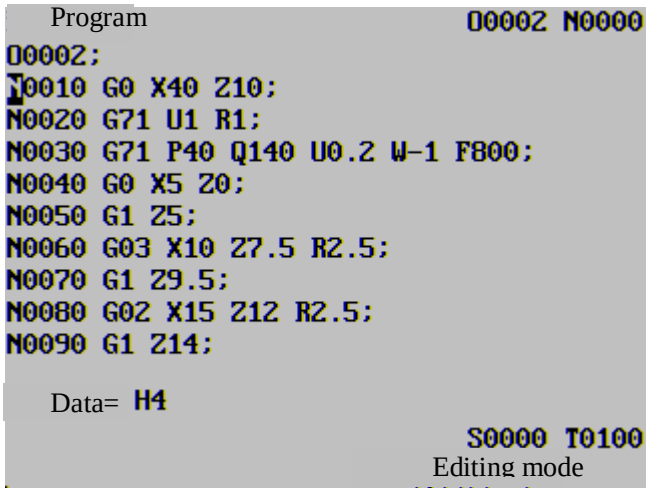
to delete program O0001.

6.2.2 DELETING LINES FROM THE PROGRAM

Delete from the character where the cursor locates to %semicolon. The operation is invalid if the cursor locates the name of current program.

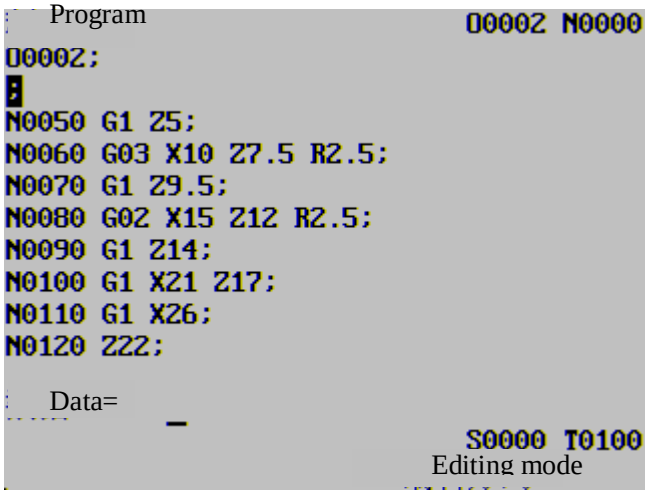
The operation follows:

1) Select the editing mode, and move the cursor to the start N character to delete



2) Input characters  and 

3) Press the Delete key  to delete from the cursor to the line end, as in the figure below:



6.2.3 DELETING ALL PROGRAMS

The operation follows:

1) Select the editing mode to enter the program page

2) Type the address key  , symbol key  , number keys  ,  ,  and  in sequence;

3) Press the Delete key  to delete all programs.

6.3. Program selection

If the system has several programs, you can select a program by searching.

6.3.1 SEARCHING

Take O0005 for an example,

(a) Select the editing mode;

(b) Press the Program key [Program] to enter program display interface;

(c) Type the address key [O] and number keys [0] [0] [0] [5] in sequence;

(d) Press the [⇩] key, and the searched programs appear on the LCD(the system alarms if the program doesn't exist).

6.3.2 SCANNING

(a) Select the editing mode;

(b) Press the Program [Program] key to enter the program display interface;

(c) Press the address key [O];

(d) Press the [⇩] key to display next program;

(e) Repeat step c and d to display the saved programs one by one.

6.3.3 CURSOR CONFIRMATION

1) Select the auto mode;

2) Press the Program key [Program PRG] to enter program directory page;

3) Press the [⇧], [⇩], [M] or [S] key to move the cursor to desired program name; press the [M] key to move cursor leftwards and press the [S] key to move rightwards;

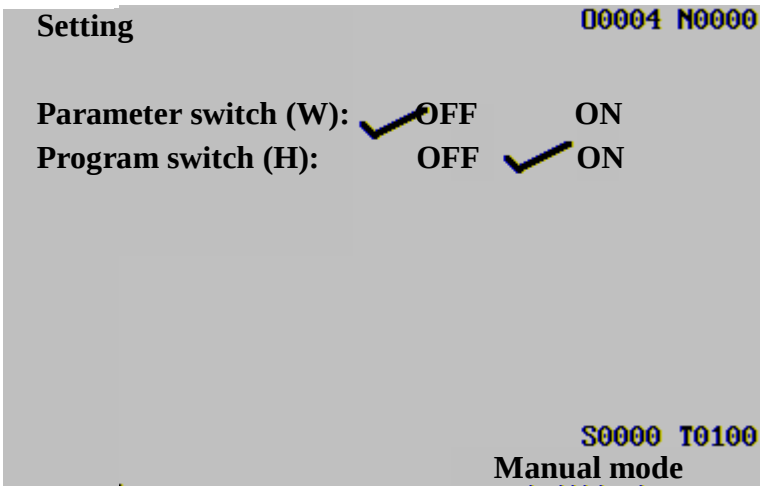
6.4. Program management

6.4.1 PROGRAM DIRECTORY

In non-editing mode, press the Program key [Program] (and then press [Up] [Down] if necessary) to enter program directory page. In this page, the saved program names in the system are displayed in directory; each page displays up to 36 program names; if the number of saved programs exceeds 36, press the [⇩] key to display other program names.

6.4.2 LOCKING PROGRAM

To prevent the program from unexpected modification and deletion, the system integrates program switch. After editing the program, please turn off the switch (see the figure below) to lock the program.



To set the program switch: Press Settings to switch to setting switch page, and press the 

key to switch the state to off.

7. Knife bias and alignment

7.1. Fixed knife alignment

The fixed knife alignment is valid if the system parameter 45 is 0. The operation follows:

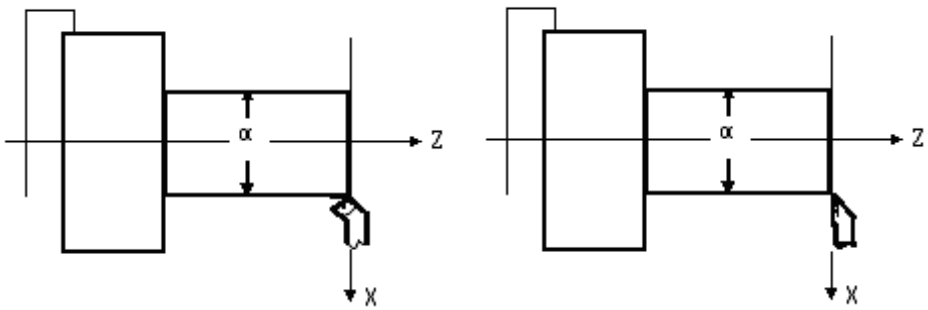


Fig. A Fig. B

1) Select a knife as the reference, and set the bias number in the knife to 0 (e.g. T0100, T0300);

2) Locate the tip of the reference knife to a point (the knife alignment point), and measure the diameter "α" (suppose α=10), as Fig. A;

3) Press the MDI key to enter the MDI mode, and press the Program key (press Up Down if necessary) to enter the MDI page; type G, 5, 0, X, 1, 0, Z, 0 and Insert key in sequence, and then press the Start key to set the actual values of axis X and Z to the value to work piece coordinates

4) Clear the relative coordinates (U, W) (press the Position → turn page to relative position → U → Cancel → W → Cancel);

4) Press the Knife compensation key to enter the bias interface, press the ⇧/⇩ key to move cursor to select the corresponding bias number of the reference knife;

5) Press the address key X, number key 0, and then press the Insert key to set the bias of axis X of reference knife to 0;

6) Press the address key Z, number key 0, and then press the Insert key to set the bias of axis Z of reference knife to 0;

7) Move the knife to safe position, select another knife (set the bias number in the knife to 0) and move to the alignment point, as Fig. B;

8) Press the knife compensation key, and move the cursor to select the corresponding bias number of the knife;

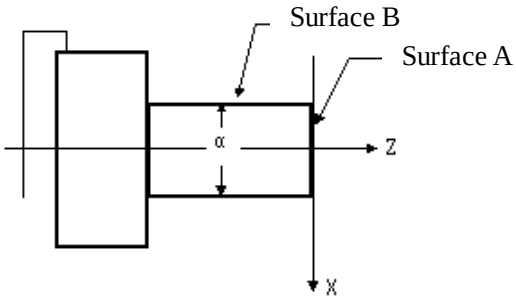
9) Press the address key X and then press the Insert key to set the knife compensation value of axis X to the corresponding bias number;

10) Press the address key Z and then press the Insert key to set the knife compensation value of axis Z to the corresponding bias number;

11) Repeat step 7~10 to align other knives.

7.2. Test cutting knife alignment

The test cutting knife alignment is valid if the system parameter 45 is 1. The operation follows (create work piece coordinates with surfaces of the work piece):



1) Select knife 1 as the reference to make the knife cut along surface A;

2) Take out the knife along axis X when axis Z is still, and stop the rotation of main axis;

3) Press the Knife compensation key Knife compensation to enter the bias interface, and press the ⇧ ⇩ key to move the cursor and select bias number (the bias number corresponding to this knife is 101);

4) Type the address key Z, number key 0 and Insert key to set the knife bias in direction Z to 0 and the current coordinates are Z0;

5) Cut along surface B with the knife;

6) Take out the knife along axis Z when axis X is still, and stop the rotation of main axis;

7) Measure the diameter "α" (suppose α=15;)

8) Press the Knife compensation key Knife compensation to enter the bias interface, and press the ⇧ ⇩ key to move the cursor and select bias number (the bias number corresponding to this knife is 101);

9) Type the address key X, number key 1, 5 and Insert key to set the knife bias in direction Z to 0 and the current coordinates are X15;

10) Move the knife to a safe position and change the knife;

11) Cut along the surface A in manual mode;

12) Take out the knife along axis X when axis Z is still, and stop the rotation of main axis;

13) Measure the distance "β ´ " between surface A and origin of work piece coordinates (suppose β ´ =1)

14) Press the Knife compensation key Knife compensation to enter the bias interface, and press the ⇧ ⇩ key to move the cursor and select bias number (the bias number corresponding to this knife is +100);

15) Press the address key Z, symbol key −/+, number key 1 and Insert key in sequence to set the knife bias of axis Z;

16) Cut along the surface B in manual mode;

17) Take out the knife along axis Z when axis X is still, and stop the rotation of main axis;

18) Measure distance "α ´ " (suppose α ´ =10;)

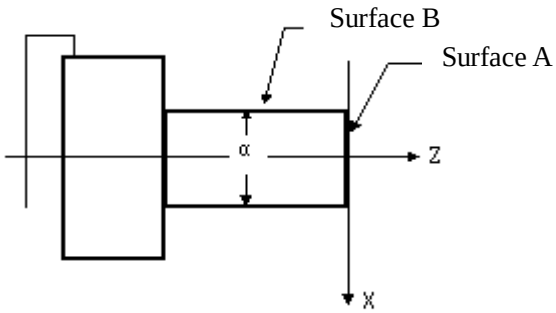
19) Press the knife compensation Knife compensation to enter the bias interface, and press the ⇧ and ⇩ key to move the cursor to select bias number (the bias number corresponding to this knife is +100);

20) Type the address key X, number key 1, 0 and Insert key in sequence to set the bias of axis X;

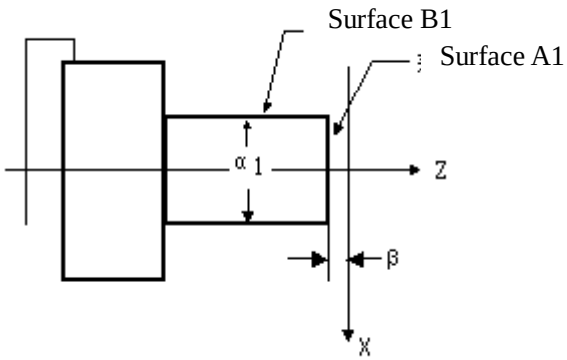
21) Repeat step 10-20 to align other knives.

7.3. Knife alignment in mechanical origin

The knife alignment in mechanical origin is valid when the system parameter 45 is 2. The operation follows:



1) Press the Reset key to enter mechanical reset mode and return the two axes to the mechanical origin;
2) Select a knife and set the bias number in the knife to 0 (e.g. T0100, T0300)
3) Cut along surface A with the knife;
4) Press the Knife compensation key to enter the bias interface, and press the ⇧ ⇩ key to move the cursor and select bias number;
5) Press the address key Z, number key 0 and Insert key to set the bias of axis Z;
6) Cut along surface B with the knife;
7) Take out the knife along axis Z when axis X is still, and stop the rotation of main axis;
8) Measure distance "α´" (suppose α´=15;)
9) Press the Knife compensation key to enter the bias interface, and press the ⇧ ⇩ key to move the cursor and select bias number;
10) Press the address key X, number key 1, 5 and Insert key to set the bias of axis X;
11) Move the knife to safe position;
12) Change another knife and set the bias number to 0(e.g.T0100, T0300;)



13) Cut along surface A1 with the knife;
14) Take out the knife along axis X when axis Z is still, and stop the rotation of main axis; measure the distance "β" (suppose=1) between surface A1 and work piece origin;

15) Press the knife compensation key Knife compensation to enter the bias interface, and then press the ⇧ ⇩ key to move the cursor and select bias number;

16) Press the address key Z, symbol key −/+, number key 1 and Insert key Insert to set the bias of axis Z;

17) Cut along surface B1 with the knife;

18) Take out the knife along axis Z when axis X is still, and stop the rotation of main axis;

19) Measure distance "α1" (suppose α1=10;)

20) Press the Knife compensation key Knife compensation to enter the bias interface, and then press the ⇧ ⇩ key to move cursor and select the bias number;

21) Press the address key X, number key 1, 0 and Insert Insert key to set the bias of axis X;

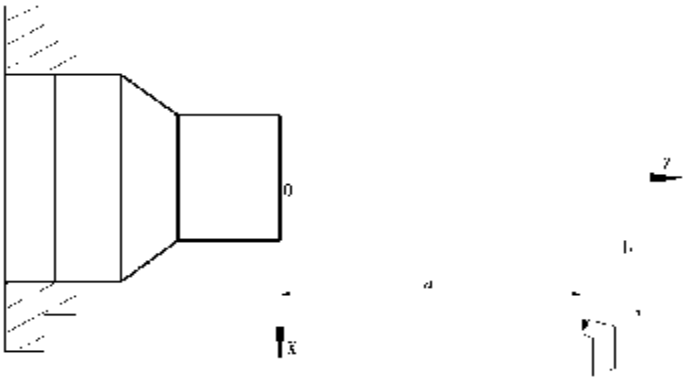
22) Move the knife to safe position;

23) Repeat step 14-22 to align other knives.

Note 1: the machine tool should have mechanical origin switch to perform the knife alignment operation in mechanical origin.

Note 2: after knife alignment in mechanical origin, it is not possible to execute the G50 instruction to set the coordinates of the work piece

As shown below:



7.4. Editing the bias value

Press the Knife compensation key Knife compensation to enter the bias interface, and then press the ⇧ ⇩ key to display bias 001~016

Knife compensation parameters Fixed knife alignment

S/N	X	Z	R	T
001	+0000.000	+0000.000	+0000.000	0
002	+0000.000	+0000.000	+0000.000	0
003	+0000.000	+0000.000	+0000.000	0
004	+0000.000	+0000.000	+0000.000	0
005	+0000.000	+0000.000	+0000.000	0
006	+0000.000	+0000.000	+0000.000	0
007	+0000.000	+0000.000	+0000.000	0
008	+0000.000	+0000.000	+0000.000	0

Data =

Position: U +0000.000 W +0000.000

7.4.1 ABSOLUTE VALUE INPUT OF KNIFE COMPENSATION

1. Enter the bias interface, move the cursor to the compensation number to edit the bias value and press the MDI MDI key to enter the MDI mode;

1 Press the address key X or Z, and then input the compensation value (allows radix point)

2 Press the EOB key to display the compensation on the LCD.

For example: Input -20 in the X value of bias number T0202, and the operation follows:

In the MDI mode, type X-20 and then press the EOB key to have the following page:

Knife compensation parameters Fixed knife alignment

S/N	X	Z	R	T
001	+0000.000	+0000.000	+0000.000	0
002	-0020.000	+0000.000	+0000.000	0
003	+0000.000	+0000.000	+0000.000	0
004	+0000.000	+0000.000	+0000.000	0
005	+0000.000	+0000.000	+0000.000	0
006	+0000.000	+0000.000	+0000.000	0
007	+0000.000	+0000.000	+0000.000	0
008	+0000.000	+0000.000	+0000.000	0

Data

Position U+0000.000 W+0000.000

MDI mode

7.4.2 INCREMENT INPUT OF KNIFE COMPENSATION

1. Enter the bias interface, move the cursor to the compensation number to edit the bias value and press the MDI MDI key to enter the MDI mode;

2. Press the address key X or Z, and then input the compensation value (allows radix point)

3. Press the EOB key to display the increased value of the increment.

8. Automatic operation

8.1 Automatic running

Select the program with searching or scanning method

- **Searching (**take searching program O0001 as an example)

  A. Select the Auto mode;

  B. Press the Program Program key to enter the program page;

  C. Press the address key O and number keys 0, 0, 0, 1 in sequence;

  D. Press the ⇩ key to display the searched programs on the LCD (the system alarms if the program doesn't exist).

- **Scanning**

A. Select the Auto mode;

B. Press the Program  key to enter the program display interface;

C. Press the address key  ;

D. Press the  key to display the next program;

E. Repeat step 3 and 4 to display the saved programs in sequence.

8.1.1 AUTOMATIC RUNNING START

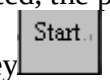
A. Press the Auto  key to enter the auto mode and select desired program;

B. Press the Reset  key and then press the Start  key or external start key to make the program run automatically.

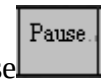
8.1.2 AUTOMATIC RUNNING STOP

During automatic running, it may be necessary to stop the running of the program due to certain reasons. This system provides several methods to stop the program.

l By instruction (M00)

When the program section that contain M00 is executed, the program stops automatic running, and saves all mode functions and states. Press the Start key  on the panel or external start key, the program resumes running.

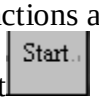
l By keys

A. During automatic running, press the Pause  key or external pause key, and the machine tool is in the following states:

(1) The machine tool feeding decelerates and stops;

(2) The timing pauses when the G04 instruction executes;

(3) The mode functions and states are saved;

(4) Press the Start  key to resume the running of the program.

B. Press the Reset key 

(1) The motion of all axes stops;

(2) The output of M and S function is invalid (may be set in the parameters that whether turn off main axis positive/negative rotation, lubrication and cooling signals after pressing the Reset key );

(3) The automatic running stops and the mode function and state maintain.

C. Press emergency stop button

When the machine tool is running, press the emergency stop button (if external emergency stop signal is valid) if there is any danger or emergency, and the system enters the emergency stop state immediately. At this moment, the machine tool stops moving immediately, and all outputs (e.g. main axis rotation, cooling liquid) are turned off. Release the button to relieve the alarm, and the system enters reset state.

Note 1: Please make sure that the failure has been eliminated before relieving the emergency stop alarm;

Note 2: Before turning on/off the machine, press the emergency stop button to reduce the electric impact to the equipment;

Note 3: After relieving the alarm, please re-execute the mechanical reset operation to ensure the accuracy of the coordinates (if the machine tool doesn't have mechanical origin, do not perform this operation);

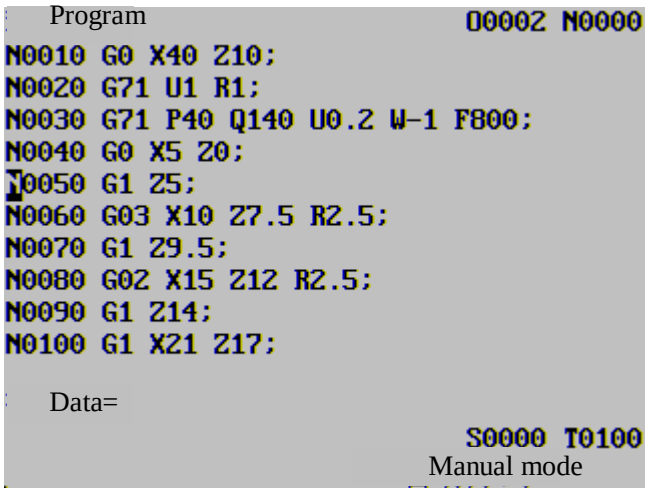
Note 4: The function is valid only when the value is set to 1.

8.1.3 AUTOMATIC RUNNING IN ANY SECTION

Under certain conditions, it is necessary to start running from a line in the processing program. This system allows starting running from any section of current program. The specific operation follows:

A. Press the Edit [Edit] key to enter the editing mode, press the Program key [Program] to enter the program display page, and then press the Auto key [Auto] to enter the auto mode;

B. Move the cursor to the program section to start running (for example, to start running from N0050, move the cursor to instruction word N0050);



C. Move the knife to the end position after the previous program section of the current program section has run.

D. If the current mode state isn't consistent to the mode state before running this program section, please perform the corresponding mode function and state;

E. Press the Start key [Start] to start the program.

8.1.4 FEEDING MAGNIFICATION REGULATION

During automatic running, you can change the running speed by regulating the feeding magnification in this system, and don't need to change the speed set in the program and parameters.

- Feeding magnification regulation

Press the Magnification key 

and the  or  key to adjust the feeding magnification in 16 levels.

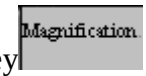
Press the  key once to increase the feeding magnification by one level, until 150%;

Press the  key once to decrease the feeding magnification by one level, until 0;

Note 1: the value specified by F in feeding magnification regulation program

Note 2: actual feeding speed = speed specified by F × feeding magnification

- Quick magnification regulation

During automatic running, press the magnification key 

to switch to quick magnification regulation mode. Press the  or  key to adjust the quick magnification in four levels.

Press the  key once to increase the feeding magnification by one level, until 100%;

Press the  key once to decrease the feeding magnification by one level, until F0.

8.1.5 MAIN AXIS SPEED REGULATION

During automatic running, if the main axis speed is controlled by analog voltage, you can adjust the speed of main axis.

Press the  or  key to adjust the magnification of main axis and change the speed. You can adjust the main axis magnification in eight levels (50%-120%)

Press the  key increase the feeding magnification by one level, until 120%; press the  key once to decrease the feeding magnification by one level, until 50%

Note: the maximum output value of analog voltage = specified maximum output value of analog voltage × main axis magnification

For example: set the system parameter 52 to 9999, execute the S9999 instruction, select 70% for main axis magnification, and then the actual analog voltage output ≈10×70%=7V

State during running

8.1.6 SINGLE SECTION RUNNING

If it is the first time to execute the program, please selection single section to avoid accidents by programming errors.

In auto mode, press the Single section key Single segment to light the single section running indicator in state area, indicating that the single section running is selected; or enter the diagnosis interface→ machine tool panel page, and press the number key 3 to select on for single program section.

During single section running, the system executes the current program section and then stops running; press the Start Start key, the system executes next program section and then stops running; repeat the operation until the running completes.

Note 1: for instruction G8, the single section stops in the center point;

Note 2: while execute fixed circle G90, G92, G94, G70~G76 instructions, refer to Programming Description for the state of single section

8.1.7 PROGRAM SECTION SKIP

In the program, if you don't want to execute certain program section but don't want to delete it, please select the program section skip. If the program section has the "/" symbol at the beginning of the section, press the Skip key Skip to turn on the skip indicator, and this program section is executed automatically during automatic running

8.1.8 OTHER OPERATIONS

Cooling Cooling: in auto mode, press this key to switch the state of cooling liquid

9. Origin operation

9.1. Program origin

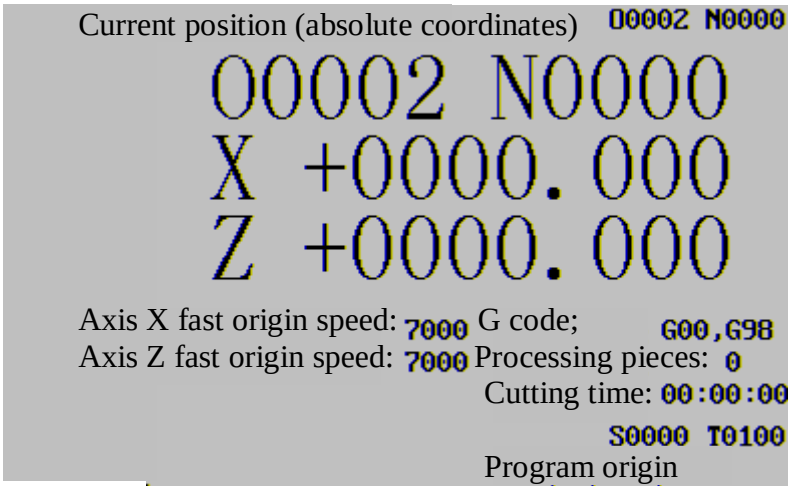
9.1.1 PROGRAM ORIGIN

When the part is installed on the machine tool, set the absolute coordinates of current position of the knife with instruction G50 according to the relative position between the knife and work piece, and thus the coordinates system of the work piece is created in the system. The current position of the knife is the program origin, and return to this position after the program origin operation.

If the system doesn't execute the program set by G50 after electrified, the system will send alarm when executing the program origin: the program origin isn't set with G50.

9.1.2 PROCEDURES OF PROGRAM ORIGIN

A. Press the Origin Reset key to switch to program origin mode, and the "Program origin" text appears in the bottom line of the page, as in the figure below:



3-9-1

B. Press the 2 X+ or 4 Z+ key to select the program origin of axis X or Z;

Note 1: the axis X and axis Z can't return to program origin at the same time;

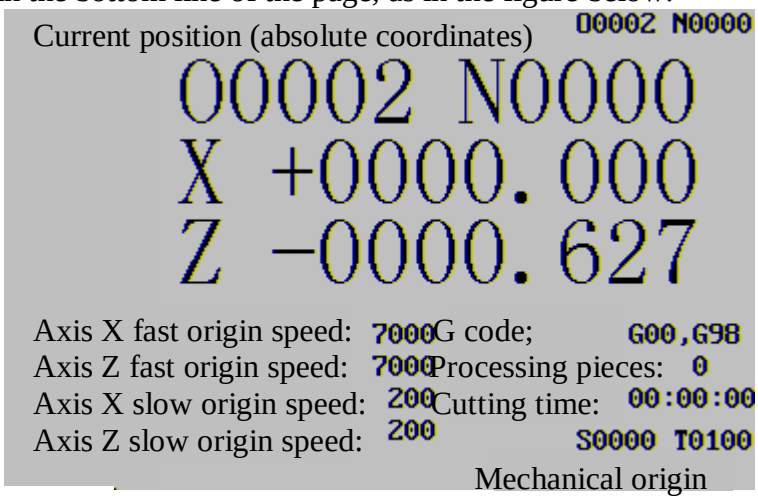
Note 2: after the program origin operation, the system cancels the knife length compensation.

9.2. Mechanical origin

The machine tool coordinates are the reference for the machine tool to calculate coordinates, which are the inherent coordinates of the machine tool. The origin of the machine tool coordinates is the mechanical origin (or mechanical reference point), which is determined by the origin switch on the machine tool. Generally, the origin switch is installed at the position of maximum travel in the positive direction of axis X and axis Z (the origin direction can be set by relating system parameters)

9.2.1 PROCEDURES OF MECHANICAL ORIGIN

A. Press the Origin Reset key to switch to mechanical origin mode, and the "Mechanical origin" text appears in the bottom line of the page, as in the figure below:



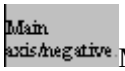
B. Press the 2 X+ or 4 Z+ key to select the mechanical origin of axis X or Z;

C. The machine tool moves in mechanical origin direction, returns to mechanical origin after signal test, and then the axis stops moving.

Note 1: If the machine tool doesn't have mechanical origin, do not perform the mechanical origin. To stop the axis motion in the origin process, press the Reset key Reset or emergency stop button.

Note 2: after the mechanical origin operation, the system cancels the knife length compensation.

9.2.2 OTHER OPERATIONS IN ORIGIN MODE



Main axis/positive: press this key and the main axis rotates in positive direction;

Main axis/stop: press this key and the main axis stops rotating;

Main axis/reverse: press this key and the main axis rotates in reverse direction;

Cooling: press this key to switch the state of cooling liquid.

Replace knife: press this key to replace the knife manually.

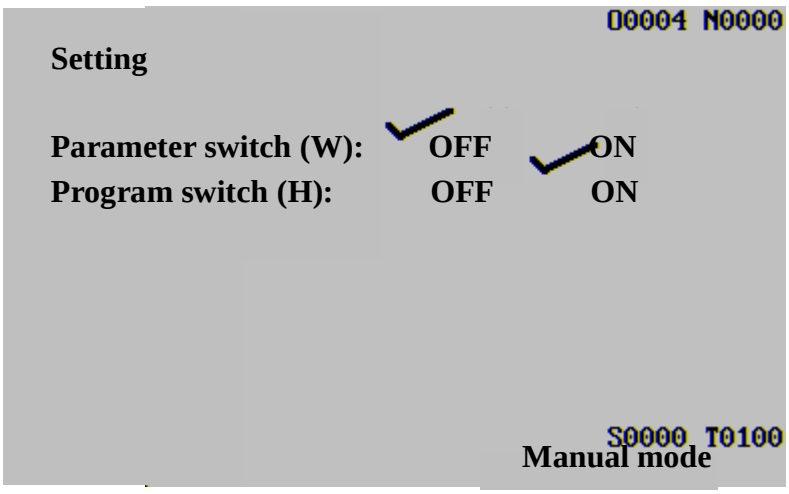
In addition, in program origin/mechanical origin, you can also adjust the main axis magnification, quick magnification and feeding magnification.

10. Data setting and saving

10.1. Data setting

10.1.1 OPTIONS IN SETTING INTERFACE

Setting page I (above figure):



A. Press the Setting 

key to enter the switch setting page;

B. Press the 

key to switch the parameter state, and press the 

key to switch the program state

Note: you can edit the parameters only when the parameter switch is on, and edit the programs only when the program switch is on.

10.1.2 SETTINGS IN GRAPH INTERFACE

Press the Setting key to enter the graph interface, and then press the or key to display the graph parameter interface.

Setting method:

A. In MDI mode, press the / key to move the cursor to specified parameters;

B. Type the corresponding value;

C. Press the key to complete the setting

10.1.3 SYSTEM/DIAGNOSIS PARAMETERS SETTING

Through the parameter setting, you can adjust the characteristics of the drive, machine tool, etc.

Setting method:

A. Turn on the parameter switch in the method described in Chapter 1.1;

B. Select the MDI mode, press the Parameter key to enter the parameter interface, press the / key to search for the page of required parameters;

C. Press the / key to select desired parameter number

D. Input new parameter value;

E. Press the key to input and display the parameter value;

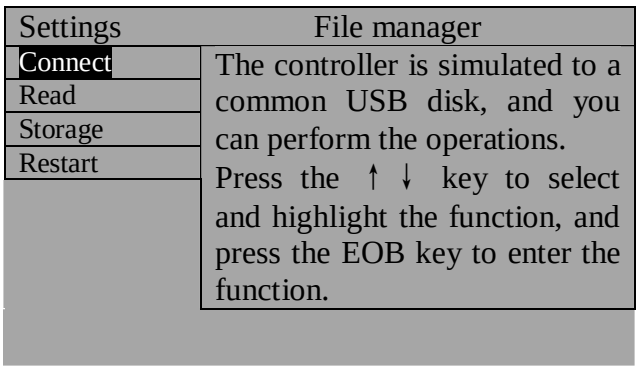
F. After setting all parameters, please turn off the parameter switch;

The setting method of diagnosis parameters is same to the setting of system parameters.

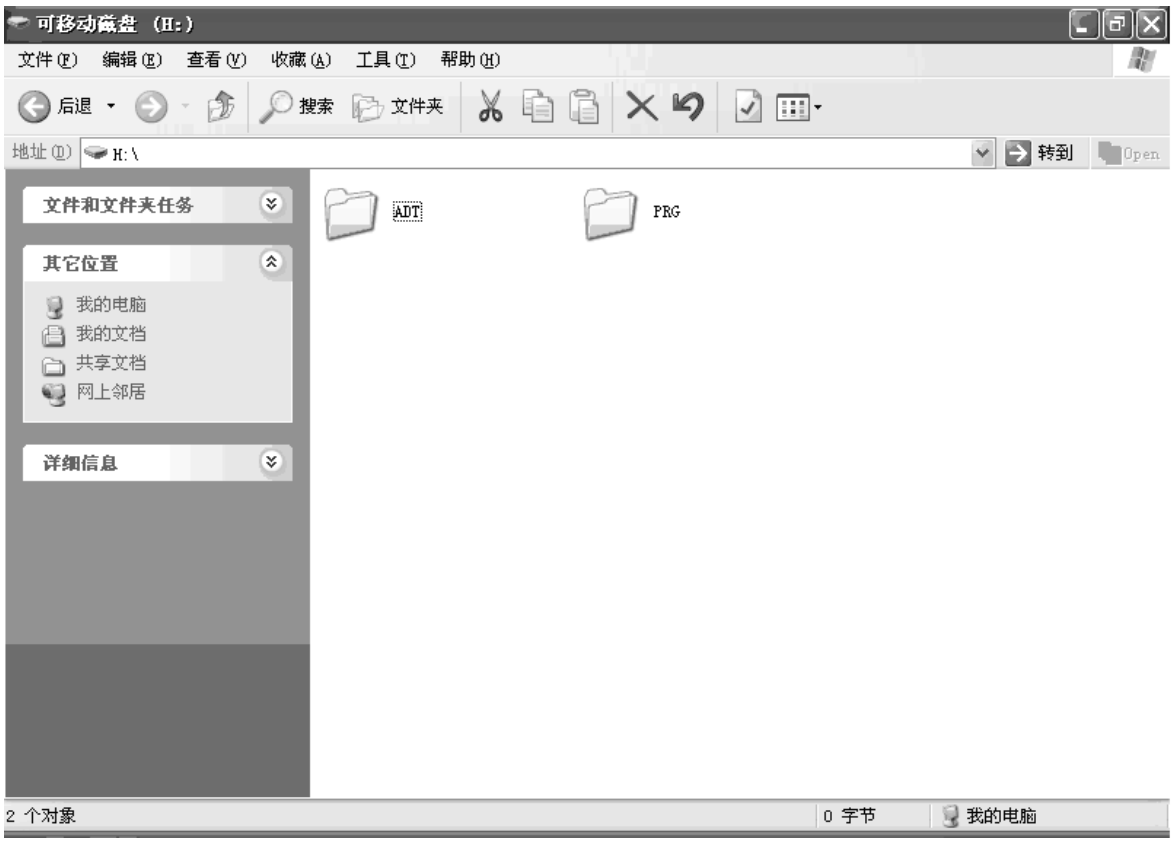
11. File Manager

11.1. Connecting USB disk to PC

Press the Setting key to switch to parameter/program switch interface, and then press the Up/Down key to switch to the File manager interface, as in the figure below:



Connecting USB disk to PC is selected by default, press the EOB to connect, and the USB connection icon appears in the system tray of the PC. Open the USB disk to have two folders: ADT and PRG, as in the figure below:



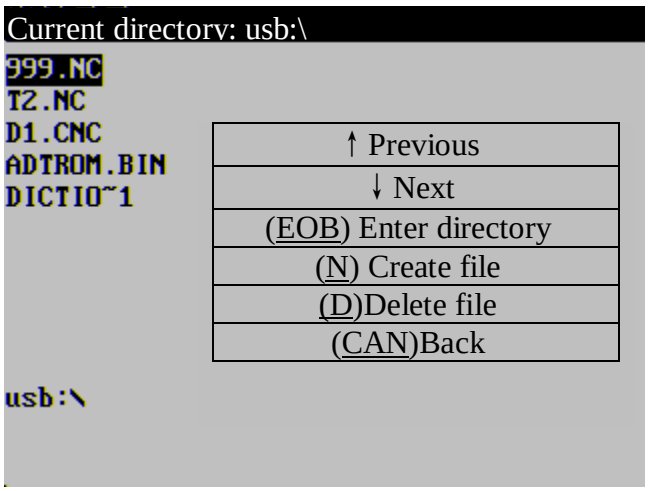
The ADT folder is used to save the update of machine tool. It is empty by default. To update, copy the program ADTROM.BIN to this folder and then select the update program in the BISO interface.

The PRG folder is used to save the processing file of the user (G code).

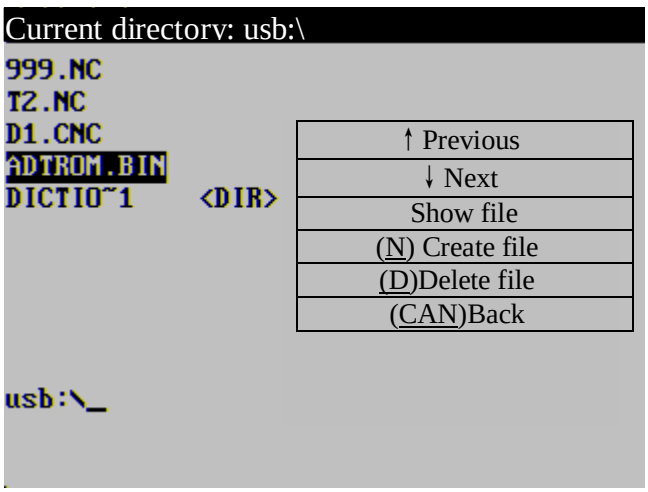
To update the system, press the direction keys in File manager interface to move to "Read external USB disk", insert the USB disk with the update program file, and then press the EOB key.

Settings	File manager
Connect USB disk to PC	The controller reads external USB disk. The controller is used as a PC to view the files in external USB disk. You can delete, copy and update the system, import/export processing files and parameter files, and back up system programs. Press the # key to switch the function menu.
Read external USB disk	
Storage IC test	
Restart system	

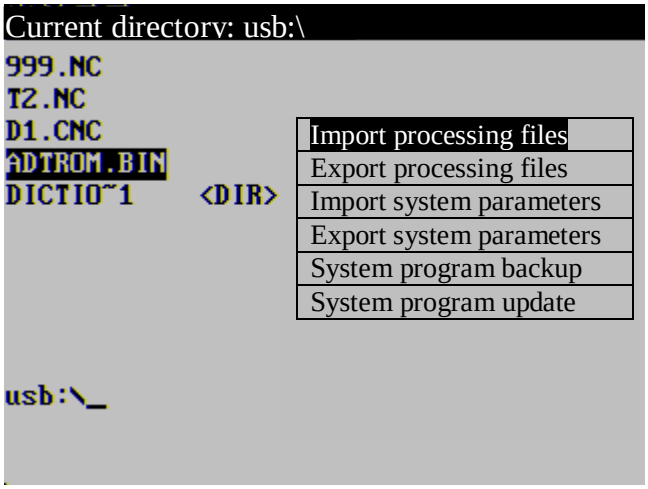
Open the USB disk to display the file names in the directory and the sub-directories, as in the figure below:



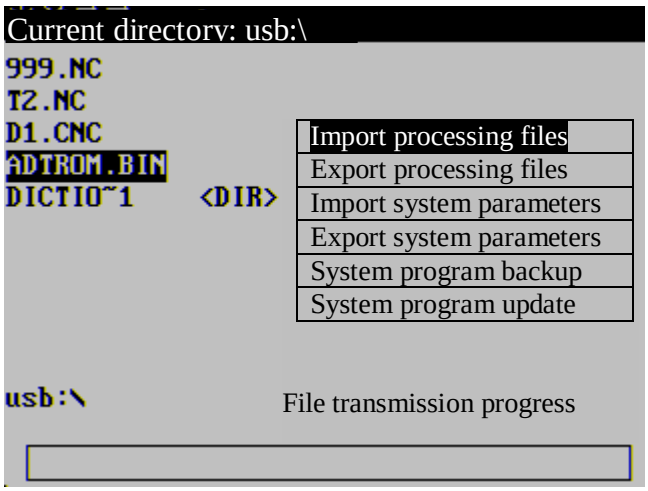
Press the Up/Down key to select files and sub-directory, for example, select ADTROM.BIN, press the Down key for three times, and the ADTROM.BIN is in reverse video, as in the figure below:



Press the "#" key to switch the menu, press the Up/Down key to select a function, and then press the EOB key to execute the function, as in the figure below:



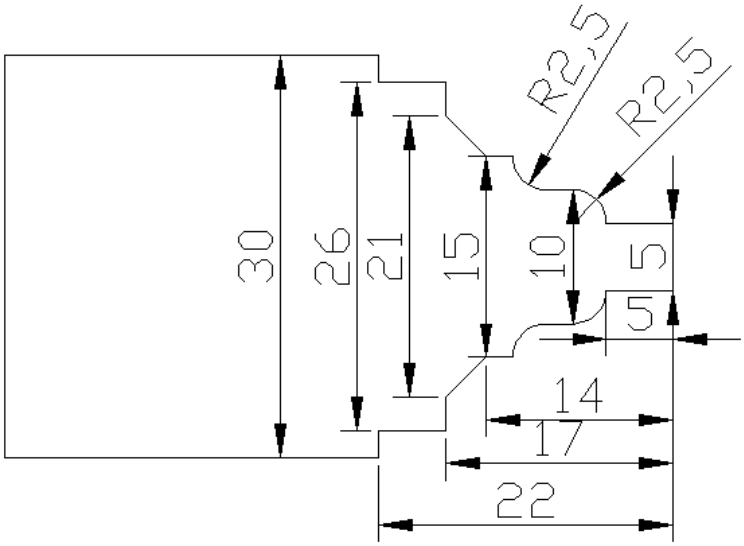
Press the Down key to move the cursor to System update, and press the EOB key to update the system program, as in the figure below:



The system restarts after transmitting the file; if the system is started with the USB disk, the new program is executed after restarted, otherwise, please update the program in BISO.

12. Processing examples

Process the work pieces shown in the figure below and the size of the material is Φ30×50 mm.



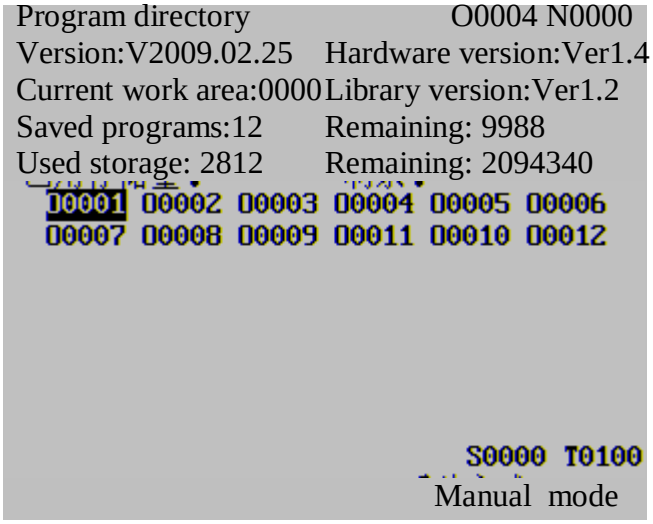
Programming

According to the mechanical processing and the instruction description in this manual, create a coordinates system of work piece as shown in Fig. 3-12-1, and the programming follows:

```
O0001
M03S2000
T0101
N0010G0X40Z10
N0020G71U1R1
N0030G71P40Q140U0.2W1F800
N0040G0X5Z0
N0050G1Z-5
N0060G02X10Z-7.5R2.5
N0070G1Z-9.5
N0080G03X15Z-12R2.5
N0090G1Z-14
N0100G1X21Z-17
N0110G1X26
N0120Z-22
N0130X30
N0140Z-27
T0202
G70P40Q140
M30
%
```

View saved programs

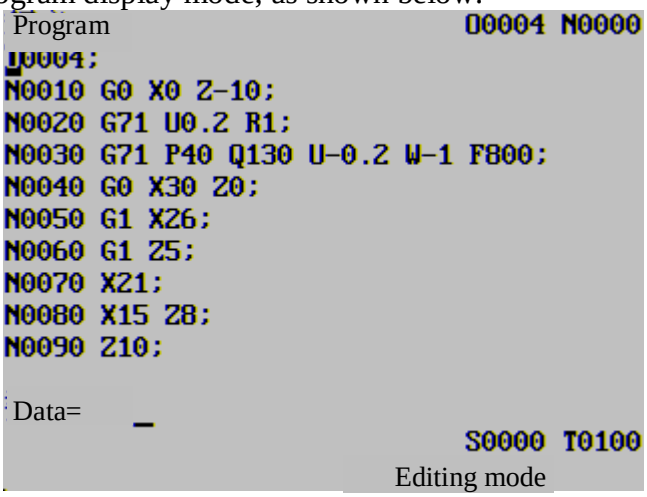
In non-editing mode, press the Program key Program to enter program page, and press the Up Down key to select program directory, as shown below:



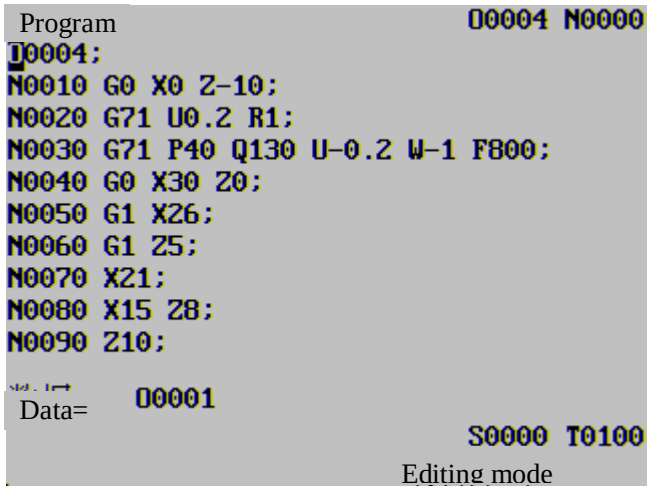
View software version, saved programs, storage space, program names, and select processing program.

12.1. Creating new programs

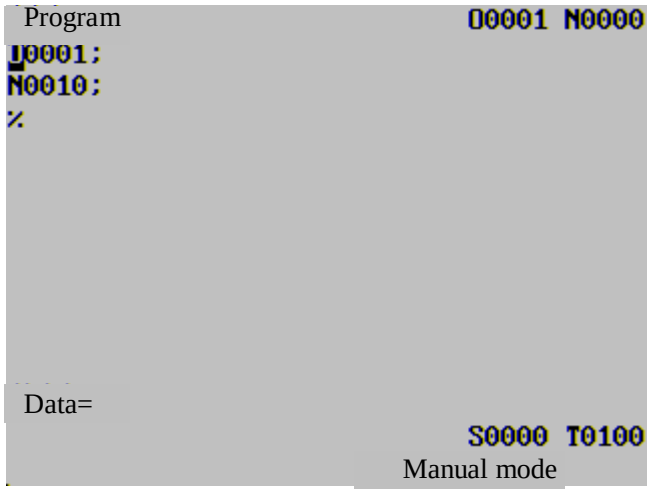
In editing mode, press the Program Program key to enter the program page and press the Up Down to select program display mode, as shown below:



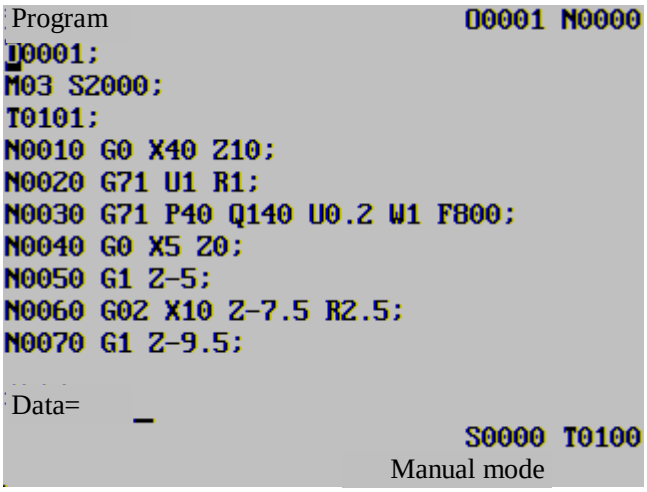
Press the number keys O0001 and the page is as follows:



Press the Insert key Insert INS to create a new program, as shown below:



Input according to the above program to edit the program, and the homepage of the program after editing follows:

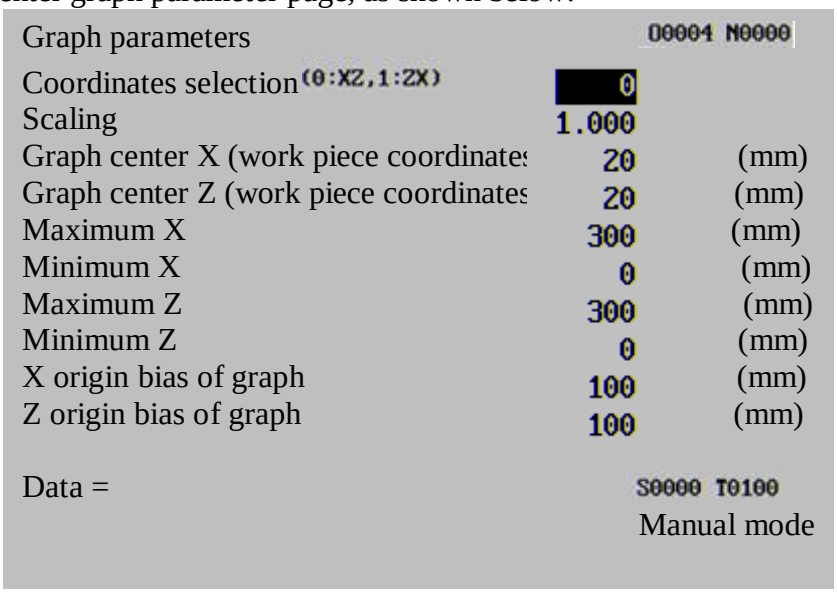


Press the Up or Down key to display other pages of the program.

12.2. Program verification

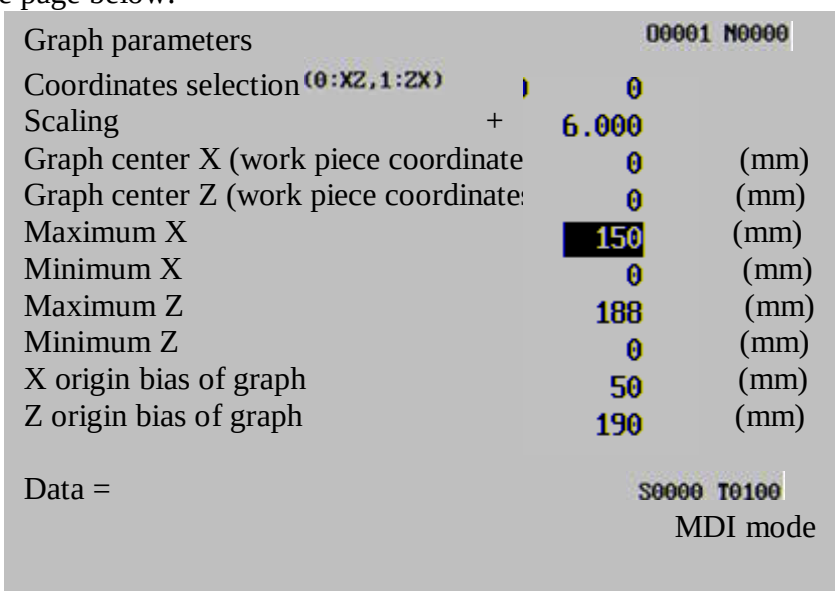
12.2.1 GRAPH PARAMETER SETTING

In MDI mode, press the setting key Settings to enter the graph interface, and press Up or Down key to enter graph parameter page, as shown below:



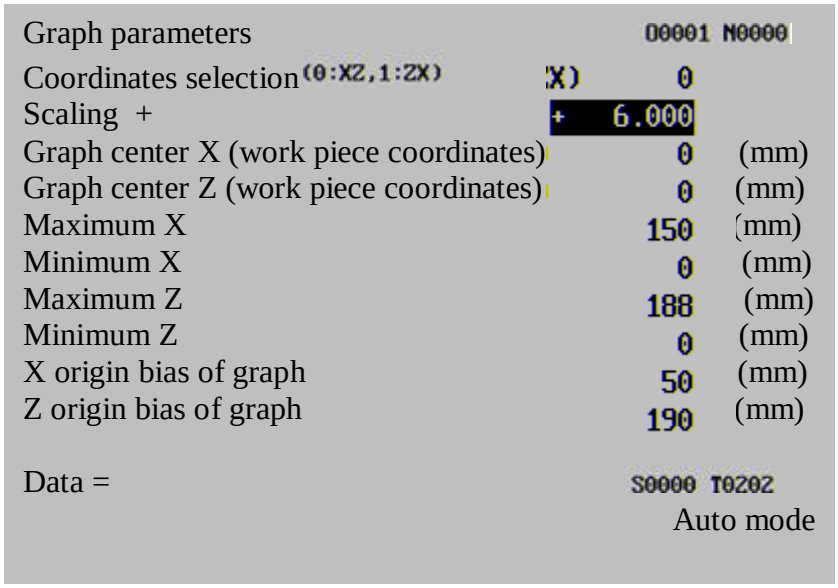
Press the ⇧ or ⇩ key to move the cursor and select desired options of graph parameters.

For example, to set "Maximum X", press the ⇧/⇩ key to move the cursor to parameter "Maximum X" (actual size of the semifinished product is 135mm and the input value should be higher than 135m; 150 is set here), type 1, 5, 0 in sequence and then press the EOB key to have the page below:



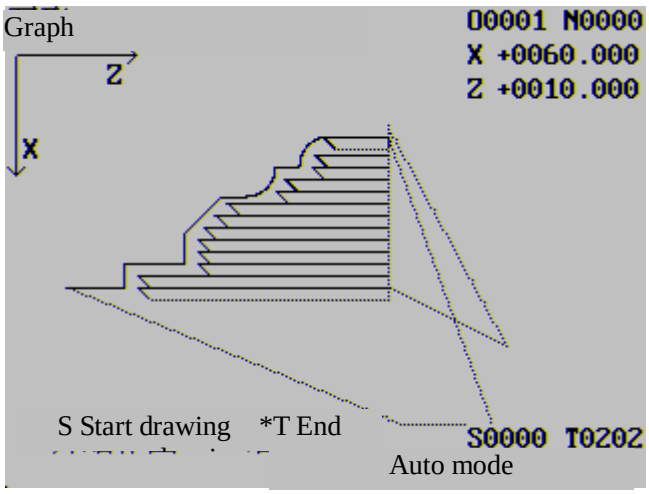
Graph parameters

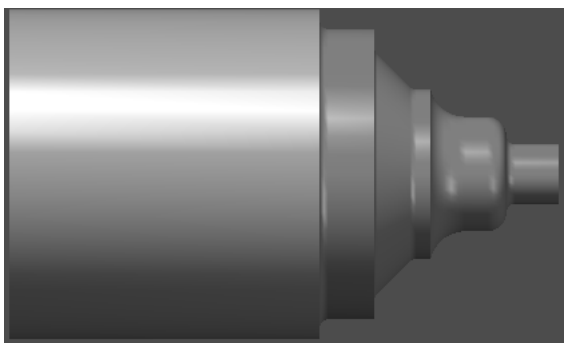
Set other data in the above method and the page after setting follows:



12.2.2 PROGRAM RUNNING

Press the Auto Auto key to enter the auto mode, press the Setting key, and then press Up or Down to turn to the graph track page, press S to start drawing, and press the Start key to make the program run automatically. You can verify the program by displaying the graph track, as shown below:

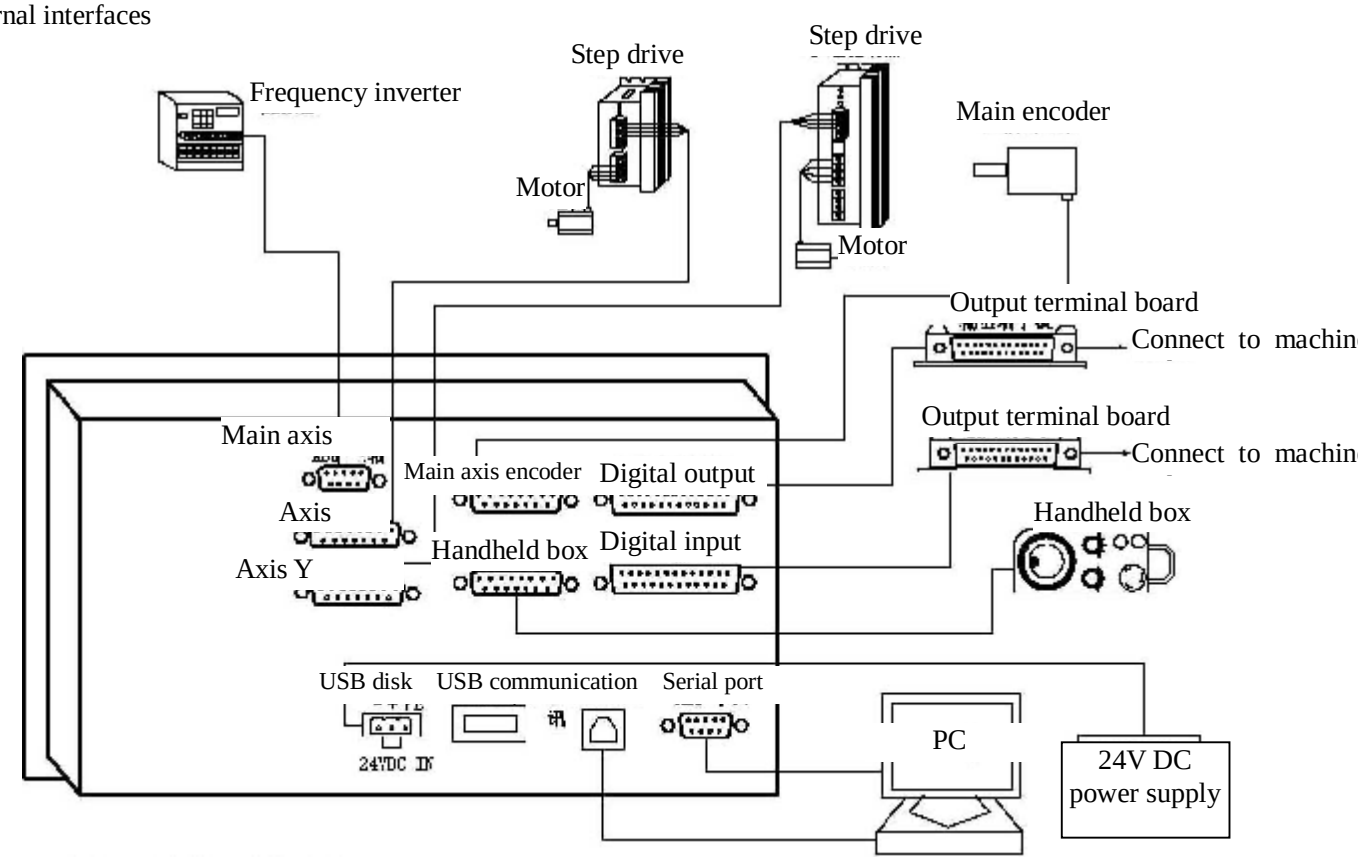




Processed entity figure

13. Connection test

External interfaces



Connection diagram of machine tool

XS1X axis: 15-core D-pin socket is connected to step motor drive or digital AC servo drive
XS2 Z axis: 15-core D-pin socket is connected to step motor drive or digital AC servo drive
XS3 USB communication updates software and transmits programs for the PC and CNC4220 controller
XS4 main axis encoder: 15-core D-pin socket is connected to main axis encoder.
XS5 input interface: 25-core D-pin socket limits each axis and input signals for other switching quantities.
XS6 output interface: 25-core D-pin socket outputs signals for switching quantities.
XS7 handheld box: 15-core D-pin socket is connected to the handheld box.
XS8 main axis: 9-core D-pin socket is connected to the main axis frequency inverter
XS9 serial port: 9-core D-pin socket can import/export processing files.
XS10 USB disk: external USB interface can import/export processing files, system configuration files, or update programs with external USB disk.
CNC4220 controller uses 24V DC power supply, and the internal power consumption is about 5W.

Installation precautions

Installation condition of electric cabinet

When design the electric cabinet, the distance between the rear cover and the case should be at least 20cm. It should be noted that the temperature difference between the inside and outside of the cabinet shouldn't exceed 10℃ when the temperature inside the electric cabinet rises.
The electric cabinet should be able to prevent the entering of dust, cooling liquid and organic solution.
The electric cabinet should be equipped with fan to ensure internal air circulation.
The display panel should be installed at the place that the cooling liquid can't spray on.

When design the electric cabinet, please reduce the external electrical interference to avoid affecting the system.

To avoid interference

When the system is designed, we have taken measures to shield space electromagnetism radiation, absorb impact current, filter power clutter and other measures to avoid interference. It can prevent the external interference to the system to a certain extent. To ensure that the system works stably, please take the following measures when install the system:

1: Keep the machine tool away from equipment that may cause interference (e.g. frequency inverter, AC contactor, static generator, high voltage generator and section device of power lines). At the same time, connect the switching power supply to the filter separately to improve the interference resistance of the machine tool (see Fig. 1-4).

2: To supply power for the system through isolation transformer, the machine tool installed with the system should be grounded, and machine tool and the drive should be connected to separate earth wire from the connection point.

3: Interference suppression: connect RC loop in parallel on both ends of AC coil (0.01μF, 100~200Ω, as in Fig. 1-5); approach to inductive load when install RC loop; install reverse parallel freewheeling diode on both ends of DC coil (Fig. 1-6); connect surge absorber in parallel at the winding end of the AC motor (Fig. 1-7).

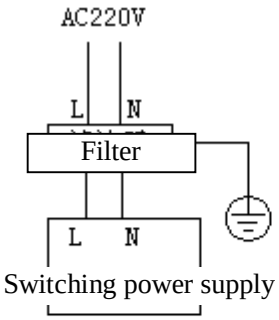


Fig. 1-4

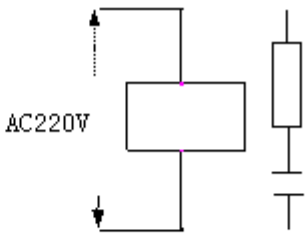


Fig. 1-5

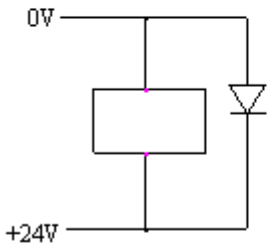


Fig. 16

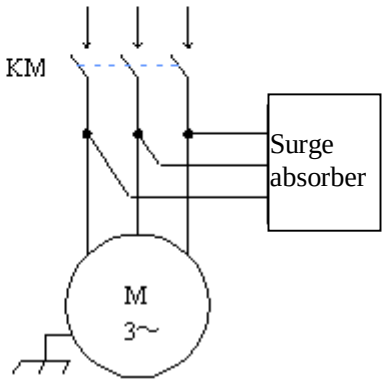


Fig. 1-7

Fig. 1-5

5: To reduce the interference between machine tool signal cable and strong electricity cable, please follow the rules below for wiring:

Group	Cable type	Wiring requirement
A	AC power cord	Bind cables in group A separately from those in group B and C, keep at least 10cm between each other, or shield the cables in group A
	AC coil	
	AC contactor	
B	DC coil (24VDC)	Bind cables in group B separately from those in group A, or shield the cables in group B; keep

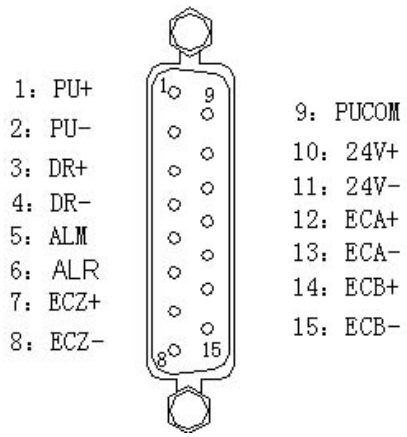
	DC relay (24VDC)	the cables in group B as far as possible from group C
	Cable between the system and strong electricity cabinet	
	Cable between the system and machine tool	
C	Cable between the system and servo drive	Bind cables in group C separately from those in group A, or shield the cables in group C; keep at least 10cm between the cables in group B and group C and use twisted pair cables
	Position feedback cable	
	Position encoder cable	
	Handwheel cable	
	Other cables for shielding	

13.1. Motor drive connection test

CNC4220 numerical control system integrates two step (or servo) motor drive interfaces (XS1 axis X and XS2 axis Z); control mode: direction + pulse (D+P); each interface pin has same function.

1. Function of drive interface pin

Definition of drive interfaces



XS1 and XS2 interface

Wire No.	Definition symbol	Function
1	PU+	Pulse signal +
2	PU-	Pulse signal -
3	DR+	Direction signal +
4	DR-	Direction signal -
5	ALM	Servo alarm signal axis X: IN34, axis Y: IN35
6	ALR	Alarm clearing axis X: OUT24, axis Y: OUT25
7	ECZ+	Encoder phase Z input +
8	ECZ-	Encoder phase Z input -
9	PUCOM	Positive end of internal 5V power supply; can't connect to external power supply (drive for single end input)
10	24V+	Internal 24V power supply, connected directly to the 24V power supply of the controller

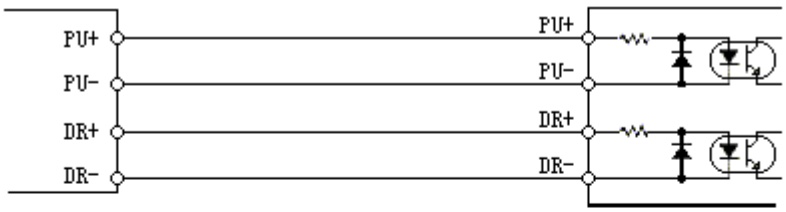
11	24V-	Internal 24V power supply, connected directly to the 24V power supply of the controller
12	ECA+	Encoder phase A input +
13	ECA-	Encoder phase A input -
14	ECB+	Encoder phase B input +
15	ECB-	Encoder phase B input -

13.1.1 CONNECTION OF MOTOR, DRIVE AND CONTROLLER

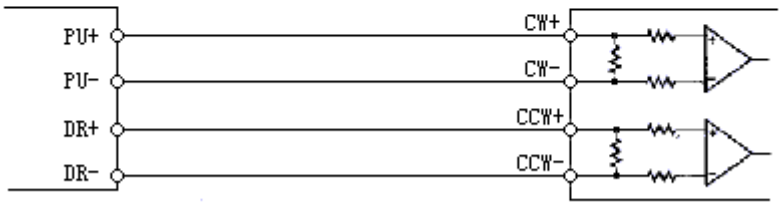
Since there are many types of drives, the definitions of interfaces are different, but they all have direction signal cables and pulse signal cables, as well as the control signal and drive enabling signal. Many drives don't have this signal, and it is possible to select the enabling mode by setting the drive parameters for some drives. The wiring mode of pulse output signals:

1. Differential mode:

This mode is suitable for step drives with independent pulse and direction input and most servo drives. Use this mode to get better anti-interference.



Step motor drive

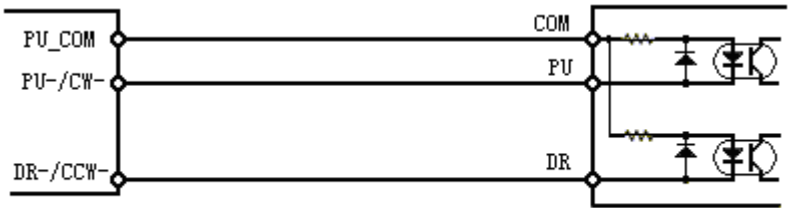


Servo motor drive

Note: Never connect any two of PU+, PU-, DR+ and DR-; otherwise, the pulse interface will be damaged.

2. Single end mode:

This mode is suitable for the step drives that the anodes of pulse and direction are connected together.



Step motor drive

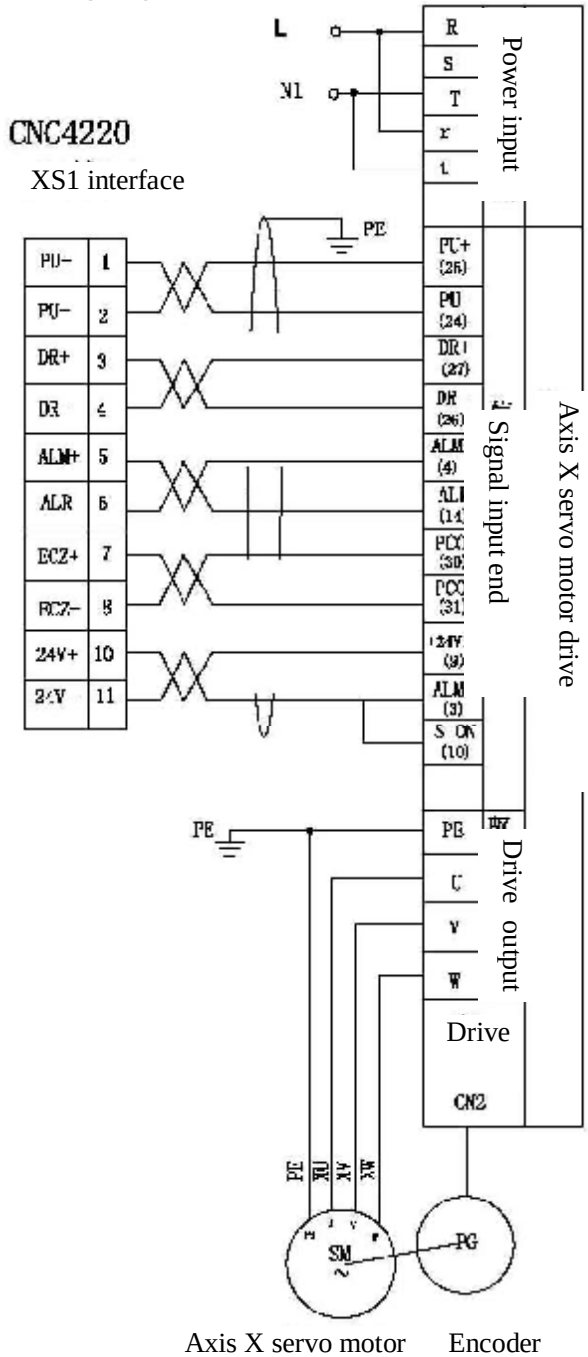
Note: It isn't suitable for the step drives that the cathodes of pulse and direction are connected together.

Certain drives connect the anodes of optical coupling input, i.e. the common anode connection. At this moment, connect the wires according to the figure below and do not connect PU+ and DR+ together; otherwise, the pulse interface will be damaged.

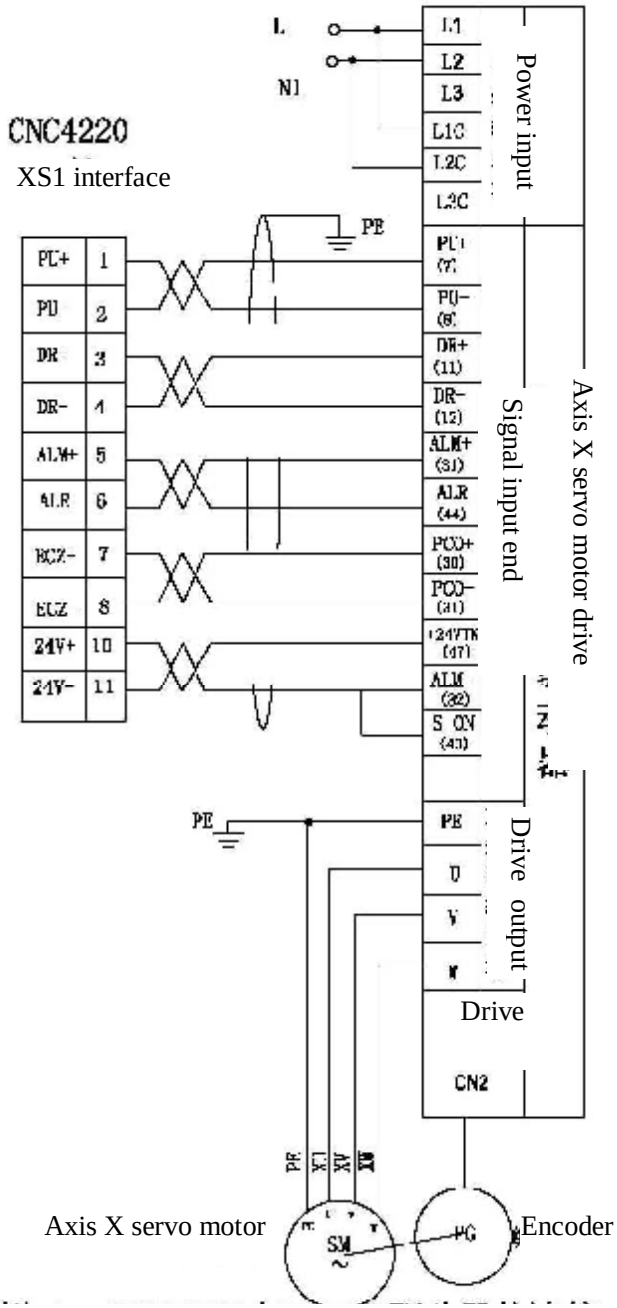
The common cathode connection, i.e. connecting the cathodes of optical coupling input together, isn't suitable for machine tool controller.

Please note that the PU_COM is only for the non-differential connection of the drive pulse; otherwise, the controller will be damaged.

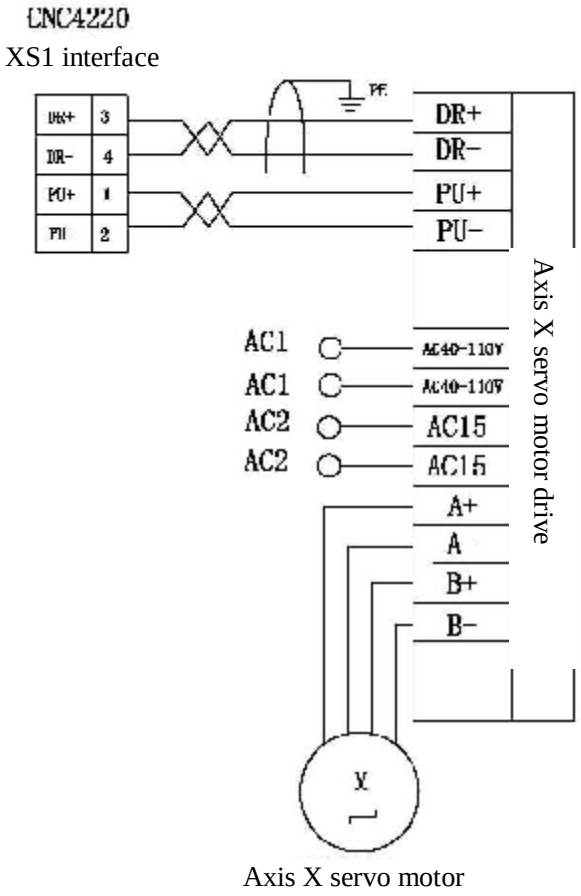
The wiring diagrams of some drives are shown below.



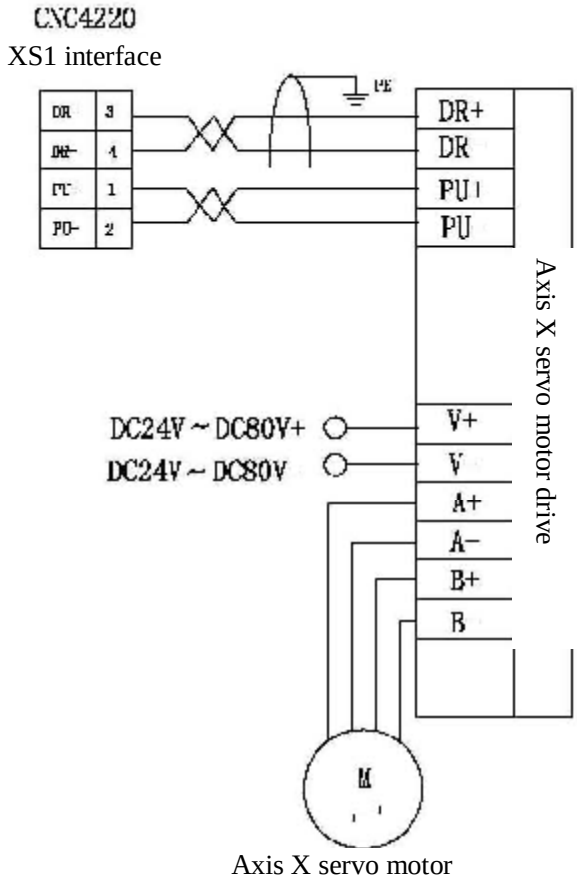
Example 1: Connection of CNC4220 and JaBao QS5 drive



Example 2: Connection of CNC4220 and SGDM drive



Example 3: Connection of CNC4220 and Q2BYG1106M step drive



Example 4: Connection of CNC4220 and Q2BYG808M step drive

Motor drive test

13.1.2 SETTING AND CALCULATION OF ELETRONIC GEAR RATIO

After connection, check again according to the wiring diagram. If the connection is proper, check the rated working voltage of the drive (this procedure is easy to be neglected, and thus cause severe damage and delay the test). If the supply voltage accords with the rated voltage, please set the drive in this method: First, set the parameters of the drive according to the rated parameters of the motor, such as rated rotation, torque and current. The objective of the test is to make the motor drives the work piece moving in specified instructions. We would like to introduce a new term, electronic gear ratio (similar to functional mechanical gearbox). Because the motors and mechanical transmission ratios are different, the unit pulse movements are different; therefore, it is necessary to select specific transmission ratio and motor during machinery manufacturing. The electronic gear ratio has solved this problem. The minimum instruction unit of this system is 0.001mm. A calculation formula follows:

$$\frac{CMR}{CMD} = \frac{\text{Pulses of every rotation of motor}}{\text{Motion distance of every rotation mm*1000}} \times \frac{\text{Gear at screw end}}{\text{Gear at motor end}}$$

CMR: Instruction magnification coefficient (system parameter 1 and 3)
CMD: Instruction frequency division coefficient (system parameter 2 and 4)
The movement of every rotation is the lead of the screw
Gears at screw end (indirect connection, has rotation ration)
Gears at motor end (indirect connection, has rotation ration)
If 403BM two-phase step drive and 56 two-phase motor, the screw lead is 4mm and the direct connection transmission ratio is 1:1
It is known from the manual of 403BM drive that the base working voltage is DC40V, and six coefficients are 2, 4, 8, 16, 32 and 64 respectively. The working current of the motor can be set. The step distance is 1.8° and the rated current is 3A. The drive uses 32 subdivisions and the current is set to 3A, and the electronic gear

ratio is 200*32/4*1000=7/5; and CMR=7, CMD=5.

If the numerator of the electronic gear ratio is larger than the denominator, the top speed that the system allows will drop.

If the numerator of the electronic gear ratio isn't equal to the denominator, the positioning accuracy of the system will drop.

To ensure the positioning accuracy and speed index of the system, if the digital servo with electronic gear ratio function is equipped, please set the electronic gear ratio to 1:1 and set the calculated electronic gear ratio into the digital servo.

If step drive is equipped, please use the drives that have step subdivision function, select reasonable mechanical transmission ratio, and set the electronic gear ratio of the system to 1:1 to avoid significant difference between the numerator and denominator of the electronic gear ratio.

13.1.3 ACCELERATION/DECELERATION FEATURES ADJUSTMENT

Adjust the system parameters according to the features of the drive and motor, as well as the load of the machine tool:

System parameters 10, 11: quick moving speed of axis X and axis Z;

System parameters 14, 15: linear acceleration/deceleration time constant when axis X and axis Z are moving in high speed;

System parameter 7: acceleration/deceleration time constant of cutting feeding and manual feeding;

System parameter 6: Start/stop speed of acceleration/deceleration of cutting feeding;

The larger the acceleration/deceleration time constant is, the slower the acceleration/deceleration is, the lower the impact of machine tool movement is and the lower the processing efficiency is; the smaller the acceleration/deceleration time constant is, the faster the acceleration/deceleration is, the higher the impact of machine tool movement is and the higher the processing efficiency is.

If the time constants of acceleration and deceleration are same, the higher the start/stop speed of the acceleration/deceleration is, the faster the acceleration/deceleration is, the higher the impact of machine tool movement is and the higher the processing efficiency is; the lower the start/stop speed of the acceleration/deceleration is, the slower the acceleration/deceleration is, the lower the impact of machine tool movement is and the lower the processing efficiency is.

The principle of acceleration/deceleration features adjustment is to reduce the acceleration/deceleration time constant and increase the start/stop speed of the acceleration/deceleration properly to improve the processing efficiency on the premise that the drive doesn't alarm, the motor doesn't desynchronize and the machine tool movement doesn't have obvious impact. If the time constant of the acceleration/deceleration is too low, or the start/stop speed of the acceleration/deceleration is too high, it is easy to cause drive alarm, motor desynchronization or machine tool vibration.

When the matched step motor drives the device, if the quick moving speed is too high, acceleration/ deceleration time constant is too low, and the start/stop speed of acceleration/deceleration is too high, the motor may be desynchronized.

If AC servo drive devices are equipped, please set the start/stop speed to a high value and set the acceleration/ deceleration time constant to a low value to improve the processing efficiency. To get the perfect acceleration/ deceleration features, please set the acceleration/ deceleration time constant to 0 and adjust the acceleration/ deceleration parameters of the AC servo.

Acceleration/deceleration control

System parameter 10: quick moving speed of axis X (unit: mm/min)

System parameter 11: quick moving speed of axis Z (unit: mm/min)

System parameter 14, 15: linear acceleration/ deceleration time constant when axis X and axis Z are moving in high speed

System parameter 9: top cutting feeding speed of axis X and axis Z (unit: mm/min)

System parameter 7: feeding acceleration time constant; if this value is 0, no acceleration is performed (unit: ms)

System parameter 6: start speed of acceleration and stop speed of deceleration during cutting feeding (unit: mm/min)

13.1.4 TROUBLESHOOTING FOR MOTOR DRIVE

I. The motor doesn't work, or stops soon, and accompanied with hum.

Analysis: The reasons may be:

A. The power supply or wiring of the motor has problem, for example, the pulse cable isn't connected properly. The drive enabling signal isn't connected properly.

B. The drive parameter setting has problem, such as the control mode (in position control mode), motor enabling mode, etc.

C. The motor stops soon and hums. The machine tool controller is still working normally, the coordinates still change according to the program instructions, this is because that the step motor and its load have inertia, and thus the motor

can't start and stop immediately during working, loses steps when it is started and exceeds steps when it is stopped. To solve the problem: through an acceleration and deceleration process, start with low speed, accelerate to a certain speed and then decelerate until stopped. The reasonable and smooth acceleration/deceleration control is the key to ensure the reliable, efficient and accurate running of the step driving system.

First, check whether the power supply of the drive is normal, and then check whether all the cables of the drive are connected. Refer to the drive instructions to check whether it is necessary to connect enabling signal. If yes, please follow the instructions (the drive interface of the system doesn't have dedicated enabling port, but 24V and 5V DC voltages are available). Then, check whether the working mode of the drive is **position control mode** and **direction + pulse** mode. Please select internal power enabling mode if servo is used. If the motor desynchronizes, please modify the start speed, quick moving, feeding speed, maximum feeding speed and acceleration time of axis X and axis Z.

II. The motor only runs in one direction

Analysis: This is because the direction signal can't be changed. Please check whether the direction signal DR is connected normally.

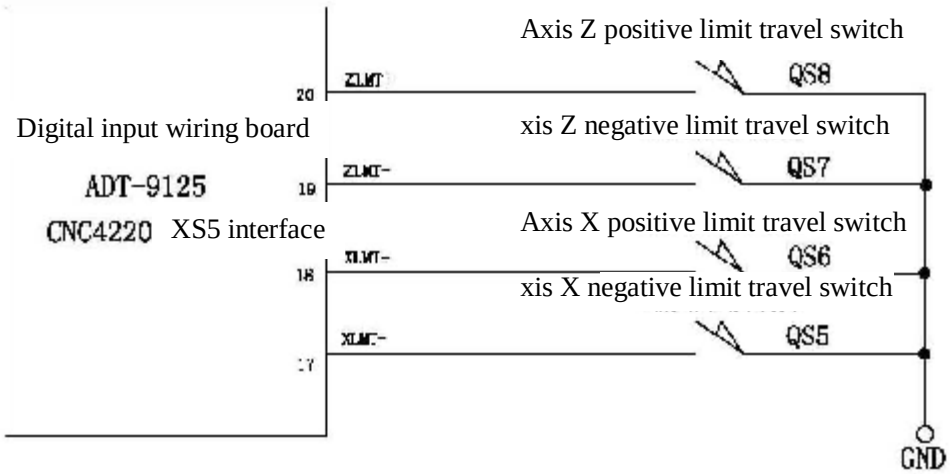
Method: Measure the DR+ and DR- voltage signals with a voltmeter and then press the positive/negative movement key of the axis, and the polarity of the voltage shall change. If the polarity doesn't change, the system has fault. Please contact the system manufacturer. If the polarity changes, the drive has fault.

III. Drive alarm

Please refer to the drive instructions to check the alarm reason, eliminate the fault and clear the alarm (the system drive has a drive alarm reset signal and you can press the Reset key to clear)

13.2. Hard limit function

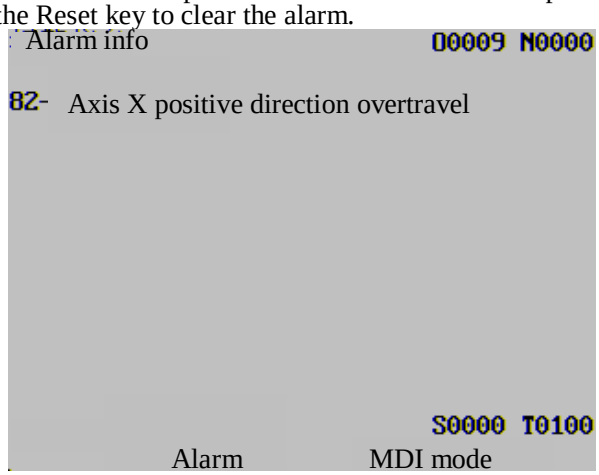
The hard limit function consists of two hard limit travel switches, which are positive limit and negative limit.



13.2.1 ENABLING HARD LIMIT FUNCTION

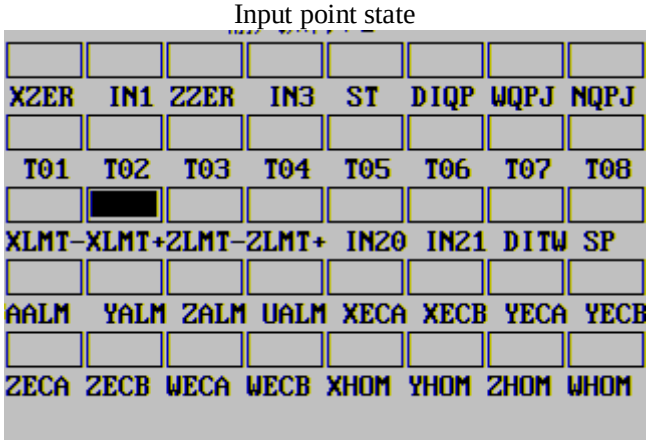
The hard limit function is controlled by system parameters. Set the system parameter 22 hard limit enabling to "1" to enable the hard limit function, or set to "0" to disable the function. The system parameter 23 is hard limit effective level. Set the value (NO: 0, NC: 1) according to the actually connected switch type (NO, NC). After setting the hard limit parameters, move to the limit switch of every axis in low speed manually and check whether the parameters are set properly.

To move to the positive limit switch of axis X, when the positive limit switch is enabled, axis X stops moving immediately and alarms, and won't move to the positive direction. To solve the problem, move to reverse direction to leave the limit switch, and press the Reset key to clear the alarm.



Alarm info display

Input point state



Input point state after positive limit of axis X

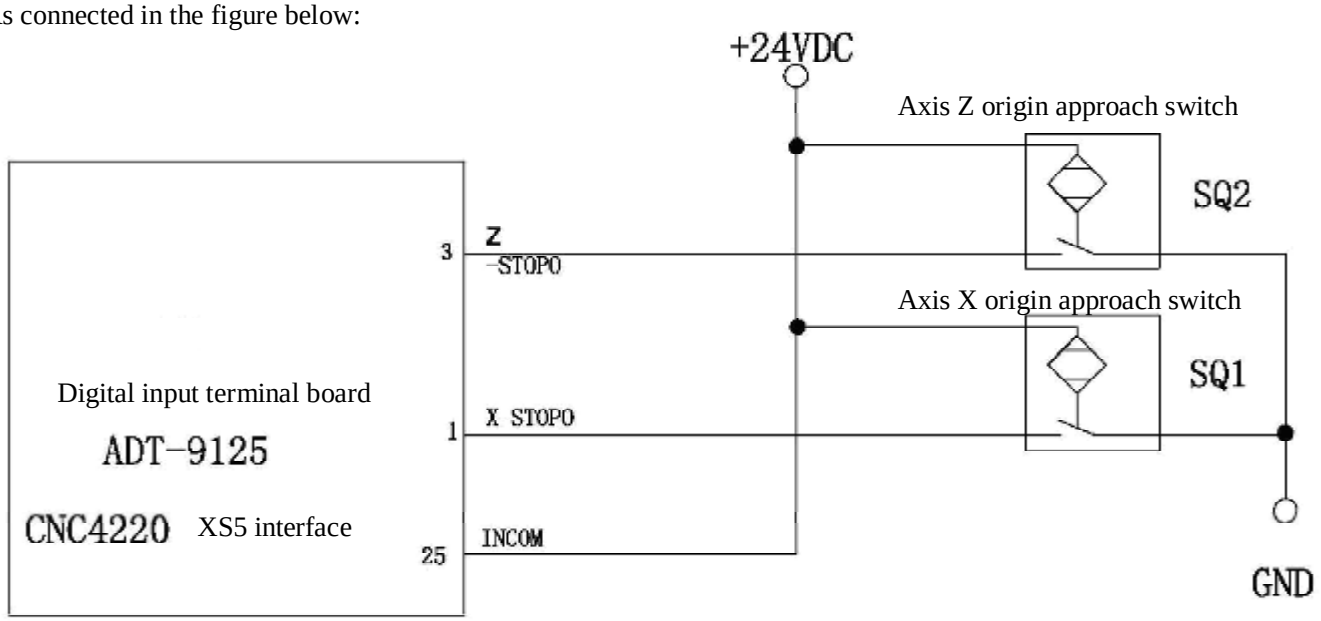
13.2.2 TROUBLESHOOTING FOR HARD LIMIT

A. Hard limit function is invalid: please check the system parameters ---- whether the hard limit enabling is set to 1; if it is 0, please select 1 to enable the hard limit function.

B. The limit of certain directions is invalid; the limit in one of the four directions is invalid. This means that the parameter settings are proper. Please check whether the cables in the invalid direction are connected and whether the switch is damaged. Please note that the hard limit levels of axis X and axis Z are set by two parameters separately, and thus the limit switches of same axis shall be in same type (NO or NC). Check whether the limit switch is connected. For your safety, please enable the hard limit function, move the axes to the center position manually and then switch to MDI mode. Switch to the input point interface, press the limit switch of every axis with hands, and the controller sends alarm tone. If there is no change, please check the corresponding external wiring. If the external wiring is proper, please check whether the machine tool input port is damaged. If yes, contact the system manufacturer.

13.3. Mechanical origin adjustment

As connected in the figure below:



Adjust the parameters according to the effective level of connection signal, origin mode and direction:

13.3.1 ORIGIN PARAMETER SETTING

System parameter 32: Origin mode

=0: Return to machine tool origin directly

=1: Single switch returns to mechanical origin

=2: Deceleration switch and servo origin return to mechanical origin

System parameter 33, 34: effective level of deceleration signal when return to mechanical origin

= 1: effective when disconnected from 0V

= 0: effective when connected to 0V

System parameter 41, 42: axis X and axis Z return to reference coordinates

System parameter 35, 36: select positive or negative for the origin direction of axis X and axis Z

System parameter 37, 38: high speed when axis X and axis Z return to origin

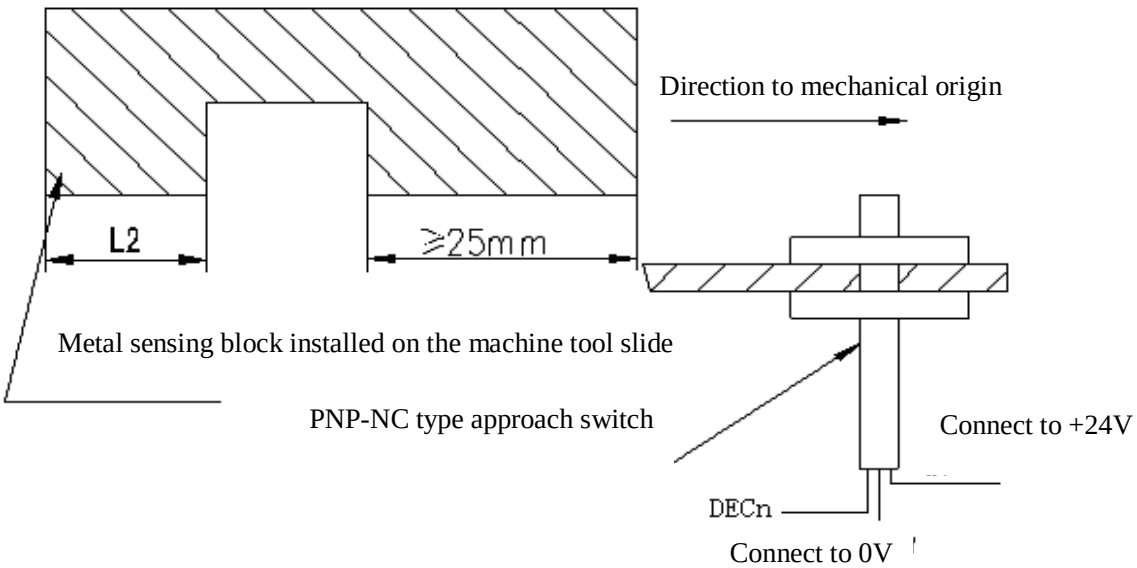
System parameter 39, 40: low speed when axis X and axis Z return to mechanical origin

After confirmed that the hard limit function and origin signal are effective, it is possible to perform the mechanical origin operation.

Check whether the origin switch is connected properly. For your safety, please move the axes to the center position manually and then switch to MDI mode. Switch to the input point interface, press the origin switch of every axis with hands, and the controller sends alarm tone. If there is no change, please check the corresponding external wiring. If the external wiring is proper, please check whether the machine tool input port is damaged. If yes, contact the system manufacturer. Perform the origin operation if the input signal is correct.

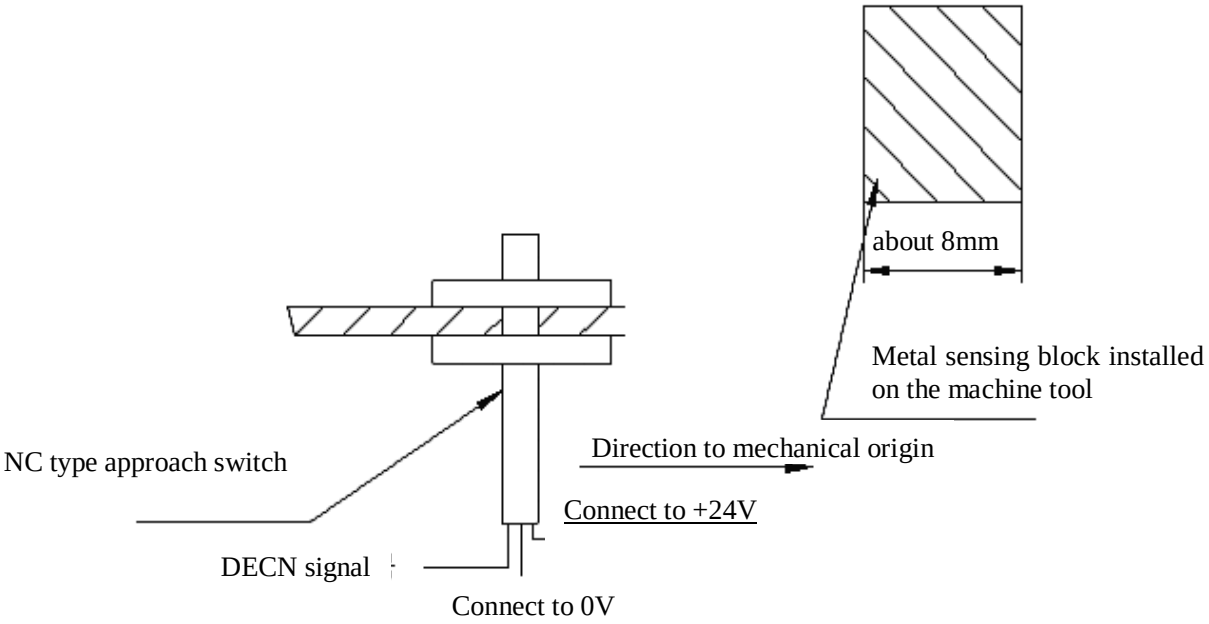
Generally, the mechanical origin is installed at the position of maximum travel. The effective travel of the origin block is at least 25mm. To ensure the accurate origin, please ensure sufficient deceleration distance, so that the speed can be reduced. The higher the mechanical origin speed is, the longer the origin block is. Otherwise, the origin accuracy will be affected because the system acceleration/deceleration and machine tool inertia make the mobile extension units cross the origin block and no sufficient deceleration distance is reserved.

The diagram that uses one approach switch as the deceleration and origin signal at the same time follows:



I. The mechanical origin when use one approach switch as the origin signal

① The diagram follows:



② Origin process

A: Select the mechanical origin mode, press the manual forward feeding key, and the corresponding axis moves to origin in high speed

B: When the approach switch detects the block for the first time, the speed drops immediately and runs in fixed low speed reversely

C: When the approach switch leaves the block, runs reversely in the decelerated speed, and starts checking the origin signal

D: When the approach switch detects the block for the second time, the origin signal is valid, the movement stops and the mechanical origin operation completes

II. Use one approach switch and servo origin as the mechanical origin of origin signal

A: Select the mechanical origin mode, press the manual forward feeding key, and the corresponding axis moves to origin in high speed

B: When the approach switch detects the block, the speed drops immediately and runs in fixed low speed, and starts checking the origin signal

C: When it detects the servo origin for the first time, it runs reversely in fixed low speed

D: If no servo origin signal is detected, it runs reversely in fixed low speed, and starts checking the servo origin signal (DEC). When it detects the servo origin signal for the second time, the origin signal is valid, the movement stops and the mechanical origin operation completes.

13.3.2 TROUBLESHOOTING FOR MECHANICAL ORIGIN

A. The origin direction is reversed: the parameter of origin direction is reversed; please modify the parameter.

B. The motor desynchronizes in the origin process: the origin speed is too high; please change it to appropriate value.

C. Overtravel occurs in the origin process: the origin switch is invalid; please check whether the origin switch and wiring are normal

13.4. Reverse clearance compensation

Measure with dial indicator, dial gauge or laser detector. The reverse clearance should be compensated accurately to improve the processing accuracy. Therefore, it isn't recommended to measure the reverse clearance of screw in handwheel or single step mode. Please measure the reverse clearance in the method below:

Edit program:

```
O0001;
N10 G01 W10 F800;
N20
W15;
N30
W1;
N40
W-1;
```

N50
M30.

Set the error compensation of reverse clearance to 0 before measuring;
For single section program, find measurement reference A after positioning for two time, record current data, run 1mm in same direction and then run 1mm to point B in reverse direction to read current data.

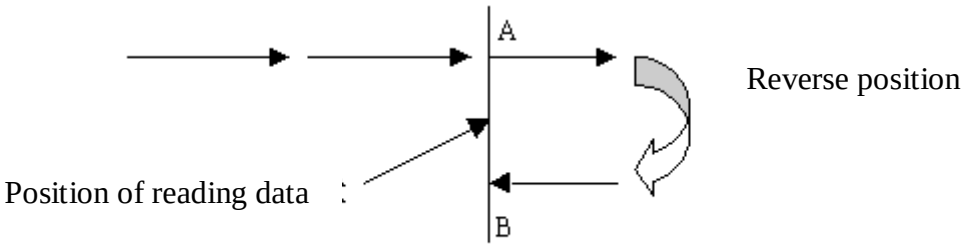


Diagram of reverse clearance measurement method

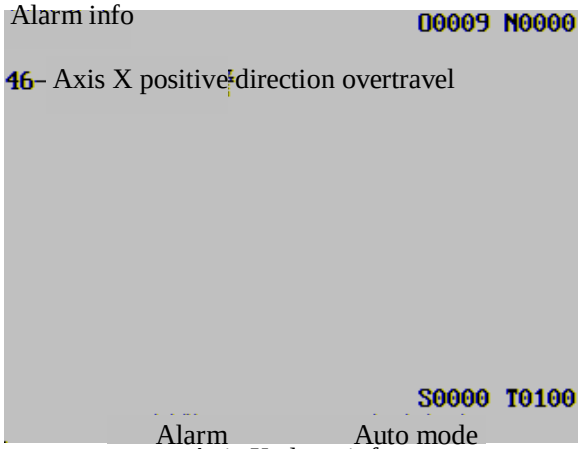
Error compensation of reverse clearance = | data recorded by point A-data recorded by point B |; if the clearance error isn't 0, please modify the values of parameter 43 and 44 (unit: pulse); if the clearance is too big, increase the values of parameter 43 and 44, or else decrease the values until the error compensation of reverse clearance is 0.

Note: Re-check the reverse clearance when the machine tool has been used for three months.

13.5. Drive protection settings and checking

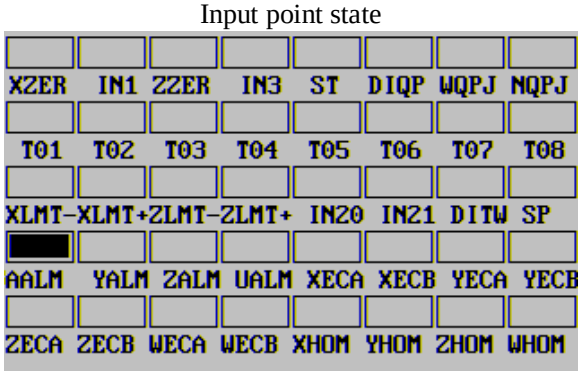
Drive alarm signal

The drive alarm function is always on and can't be disabled, but the alarm effective level can be set in the parameters. When the system is working and detects drive alarm signals, it compares with the effective level set by the parameters and displays the corresponding alarm signals if it accords with the parameter value. In auto mode, it stops running and sends alarm. Press the Diagnosis key to view the alarm info and check the reason of the alarm. When the fault is eliminated, press the Reset key to clear the alarm.



Axis X alarm info

Input point state



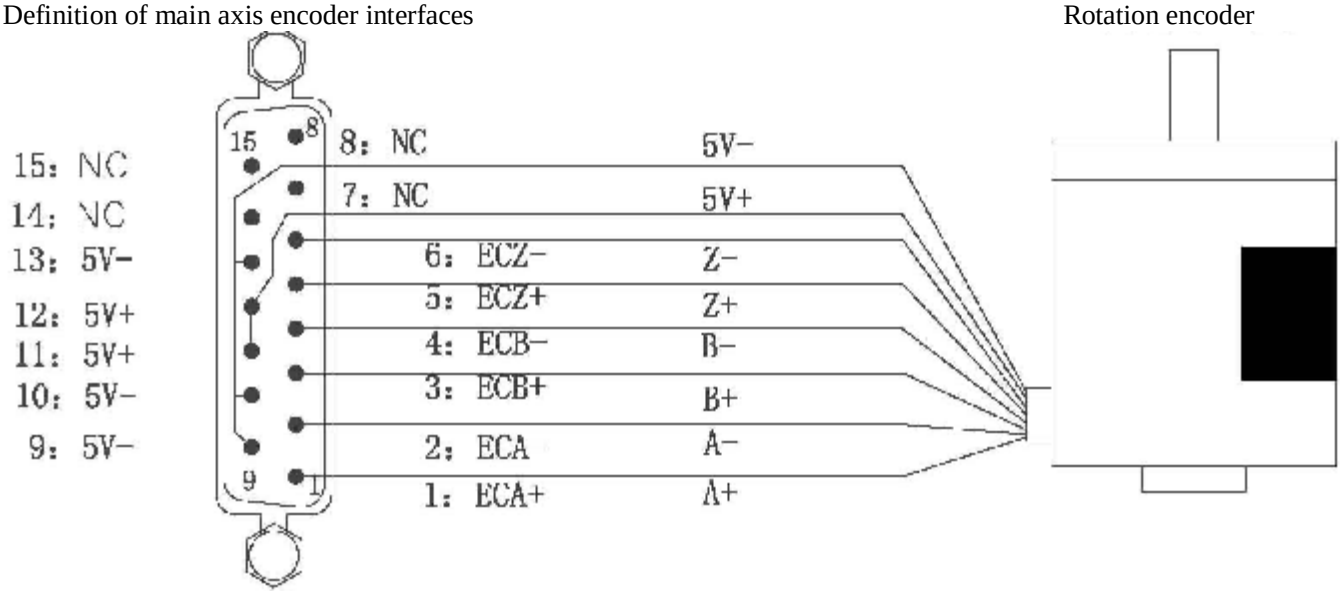
Axis X alarm signal AALM input valid

Parameters: system parameter 30 and 31, axis X and axis Z alarm level. Default: "0", low level is effective; if the alarm is high output level, please change this parameter to "1".

13.6. Main axis encoder

Wiring diagram of main axis encoder

Definition of main axis encoder interfaces



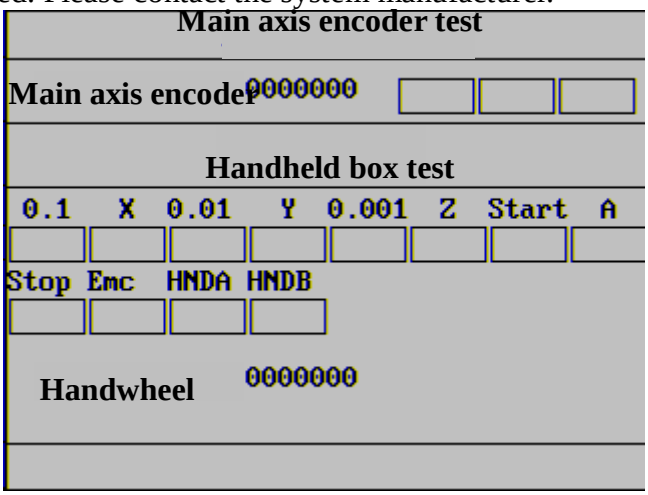
Rotation encoder

Parameters

System parameter 60: wire number of main axis encoder; please set according to the value marked on the encoder label.

13.6.1 TROUBLESHOOTING FOR MAIN AXIS ENCODER

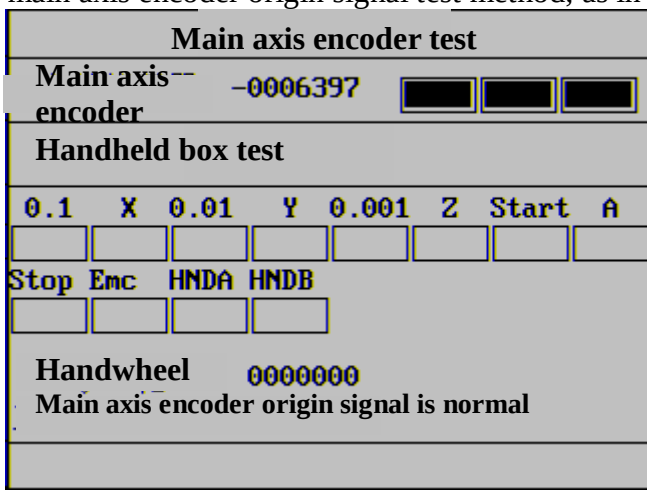
No main axis rotation display: Check whether the cable connection is normal; if yes, enter the main axis encoder test interface in the diagnosis interface. Rotate the main axis manually, the main axis encoder counter takes count in normal condition, and the stats of phase A and phase B flash. If there is no change, please check whether the power supply of the encoder interface is normal. If yes, check the differential output signal of phase A and phase B. During low speed rotation, the voltage changes a little. If the power supply is normal and the driving voltages of phase A and phase B change, the input port of machine tool may be damaged. Please contact the system manufacturer.



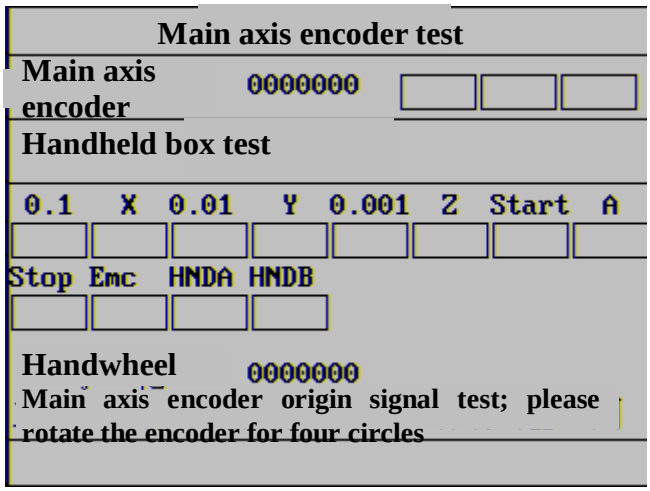
The system doesn't respond to any operation when running screw thread instruction

Reason: when lathing screw thread, system checks the signal of screw head (encoder axis Z signal). If the rising and falling of phase Z signal aren't detected, the program stays in circle detection state (because the phase Z signal of the encoder is very narrow) and doesn't respond to the key-pressing.

Please check whether the connection of phase Z signal is normal. In main axis encoder test interface, press the Z key to enter the main axis encoder origin signal test method, as in the picture below



Rotate the encoder for four circles in low speed manually and the information in the picture below appears in normal condition. If the prompt that main axis encoder origin signal is normal doesn't appear after four circles, the phase Z signal of the encoder or the controller may be damaged. Please change the encoder.

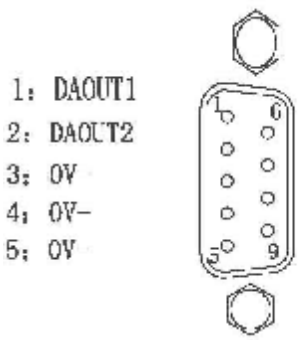


13.7. Main axis control

13.7.1 WIRING DIAGRAM

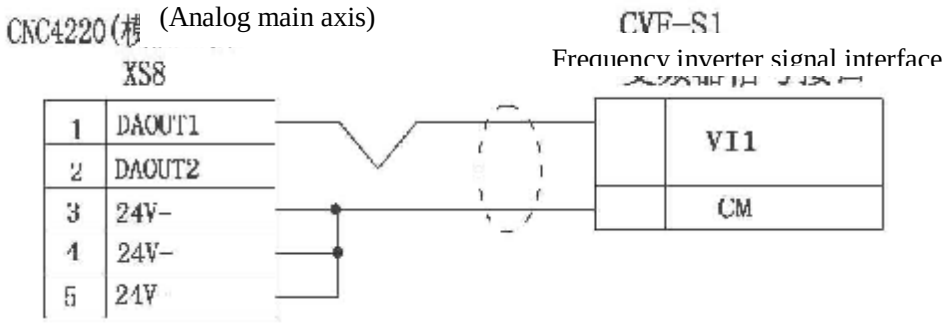
(Analog voltage, position, brake signal, positive/negative rotation control)

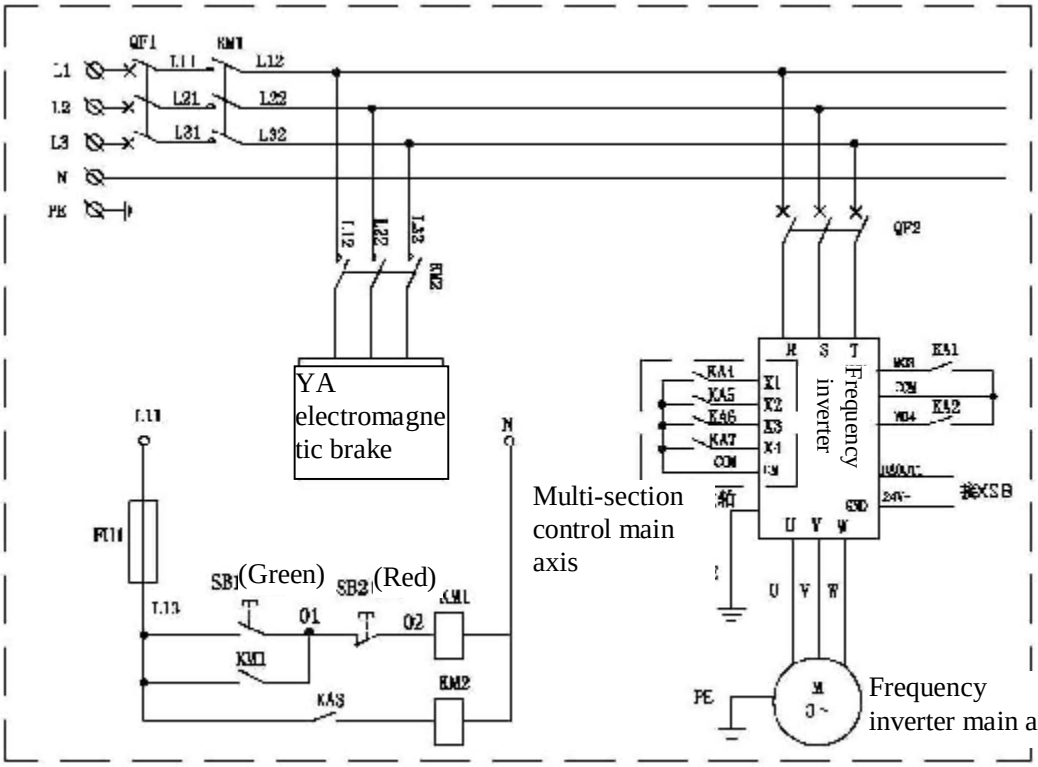
Definition of analog main axis interfaces

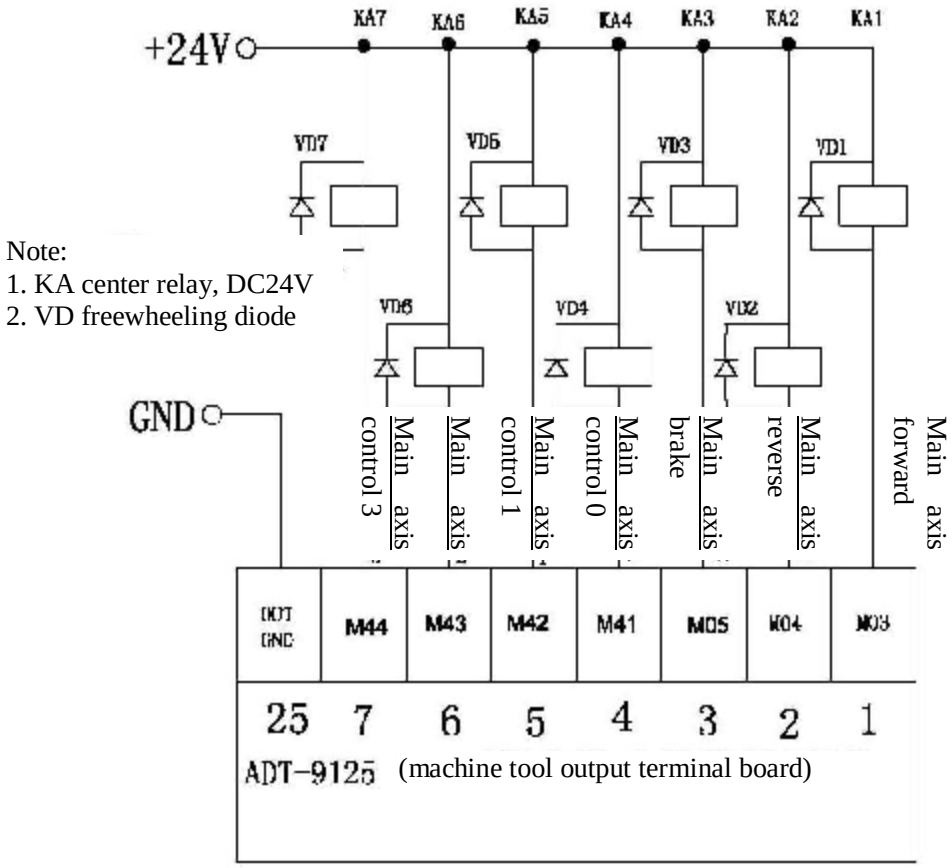


XS8 interface

Connection of CNC4220 frequency inverter (Analog main axis)







Note:
1. KA center relay, DC24V
2. VD freewheeling diode

13.7.2 MAIN AXIS PARAMETER SETTING

Main axis control mode (system parameter 58)

Multi-section speed control mode

Two modes are available:

A: Four sections direct output

B: BCD coding output (16-section speed)

Stepless speed regulation mode: analog voltage control mode

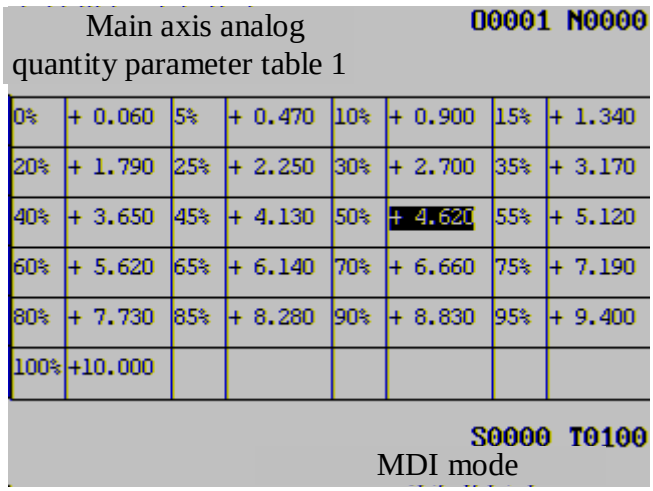
If the parameter value of main axis control mode is set to 0, it is controlled by four-section speed. If the value is set to 1, it is the stepless speed regulation controlled by analog quantity. If the value is 2, it is controlled by 16-section speed. If the value is 3 (DC drive main axis motor stepless speed regulation mode), M03 output terminal controls the positive/negative rotation of main DC motor (if the logical state is 0, the main axis rotates forwardly; if the logical state is 1, the main axis rotates reversely) and M04 terminal controls the start and stop of main axis. To make the motor rotate, give start signal to the signal in specified direction. If the output logic of M04 terminal is 1, the main axis is started; if it is 0, the main axis is stopped. See the table below for the control logic

Function	M03 connection end	M04 connection end
Main axis forward rotation M03	1	1
Main axis reverse rotation M04	0	1
Main axis reverse rotation M05	Z	0

Maximum rotation of main axis (system parameter 59) ---- the maximum rotation (r/min) of the main axis in analog voltage control mode; this parameter shall match the actual value to get the perfect V/S linearity.

13.7.3 CALIBRATION OF ANALOG VOLTAGE

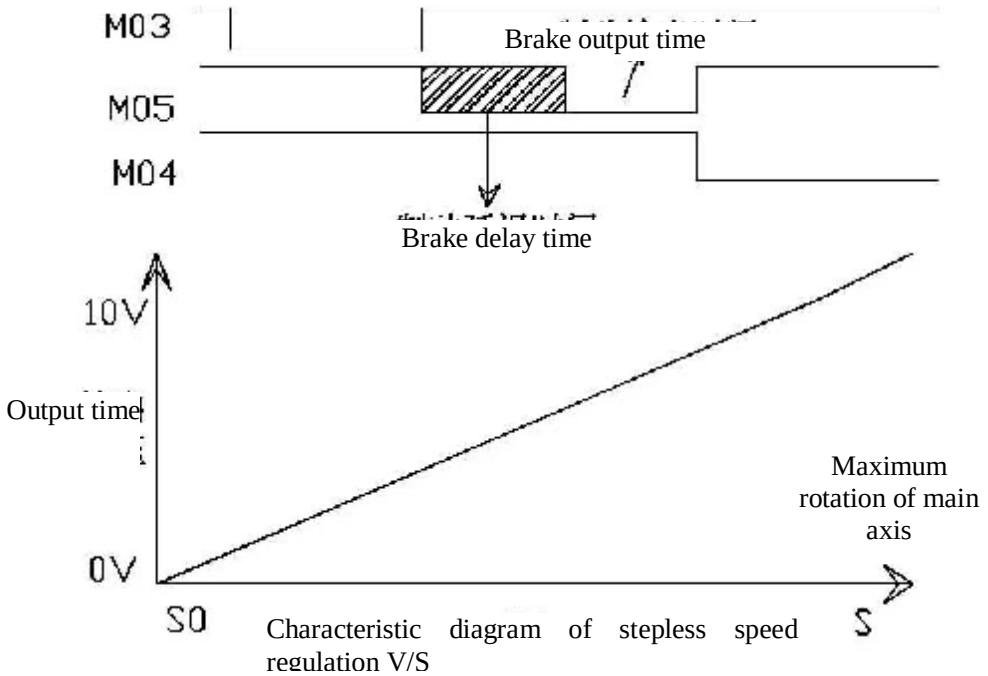
Set the regulation value of system parameter 97 main axis analog voltage to 1, and then press the parameter key to enter the parameter table of main axis analog quantity, and then switch to MDI mode and stopped state.



The percentages in the table represent the ratio of theory output voltage and maximum voltage. Press the direction keys to select a percentage, use a multimeter to record the corresponding voltage and output to the table in the right. As in the figure above, press the direction key to select 50%, and the voltage measured with the multimeter is 4.62V. If it is same to the value in the table, it is not necessary to change. If not, input the measured value into the cell corresponding to 50%.

The system shares two lines of analog voltage, and there are also two calibration parameter tables. Press the Up/Down key to switch the tables. If the parameters are in disorder, press the Reset key in MDI mode and stopped state to restore the default values. After the voltage calibration, set parameter 97 to 0.

13.7.4 TIME SEQUENCE AND V/S CHARACTERISTIC DIAGRAM



Characteristic diagram of stepless speed regulation V/S

13.7.5 TABLE OF MULTI-SECTION SPEED REGULATION STATES

Control mode	Speed	Output port state			
Four-section speed control	Position	M41	M42	M43	M44
	S0	0	0	0	0
	S1	0	0	0	1
	S2	0	0	1	0
	S3	0	1	0	0
	S4	1	0	0	0
16-section speed control	S0	0	0	0	0
	S1	0	0	0	1
	S2	0	0	1	0
	S3	0	0	1	1
	S4	0	1	0	0
	S5	0	1	0	1
	S6	0	1	1	0
	S7	0	1	1	1
	S8	1	0	0	0
	S9	1	0	0	1
	S10	1	0	1	0

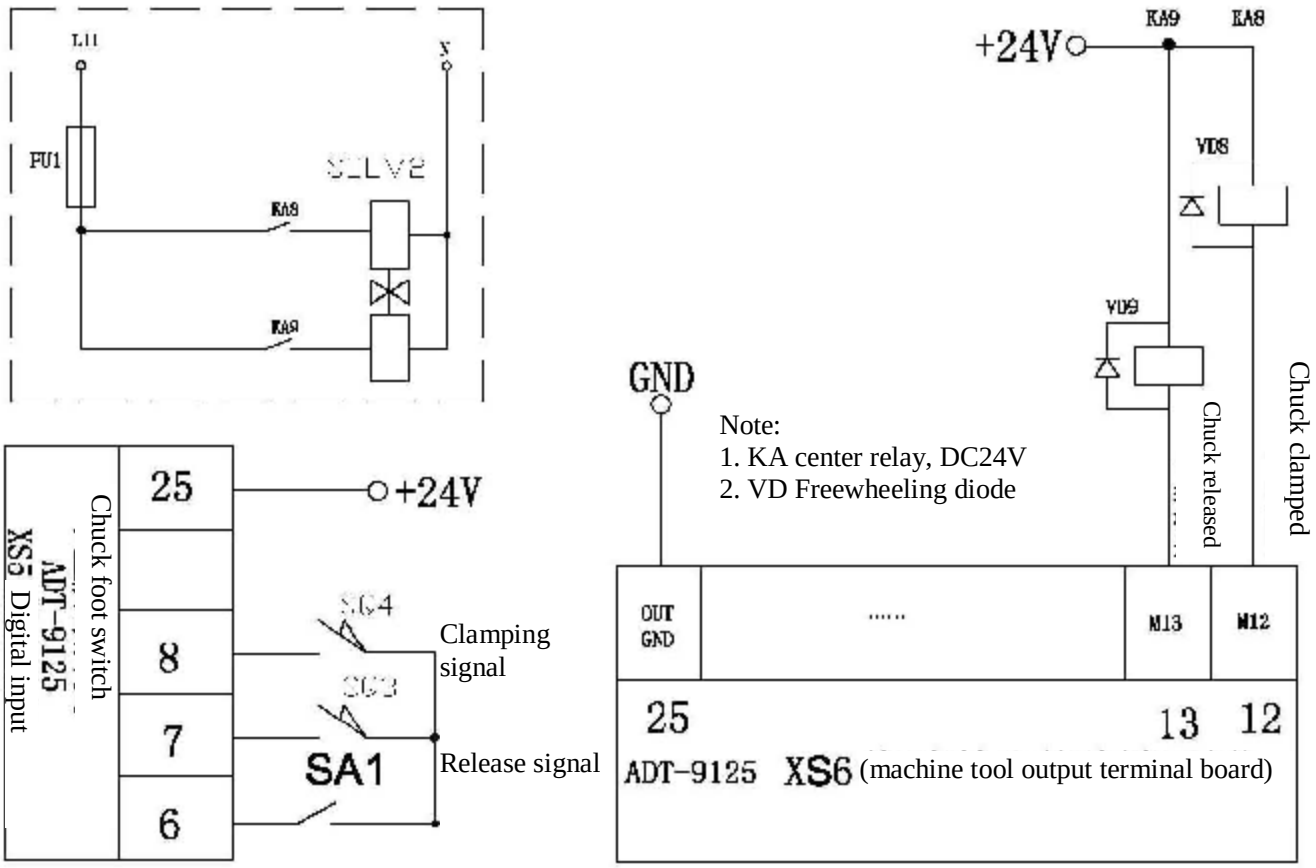
	S11	1	0	1	1
	S12	1	1	0	0
	S13	1	1	0	1
	S14	1	1	1	0
	S15	1	1	1	1

13.7.6 TROUBLESHOOTING FOR MAIN AXIS CONTROL

This part mainly involves the settings of frequency inverter, few involves the parameter setting of machine tool control, and except the analog voltage, the state change of output signals of machine tool controller can be checked in output point state interface.

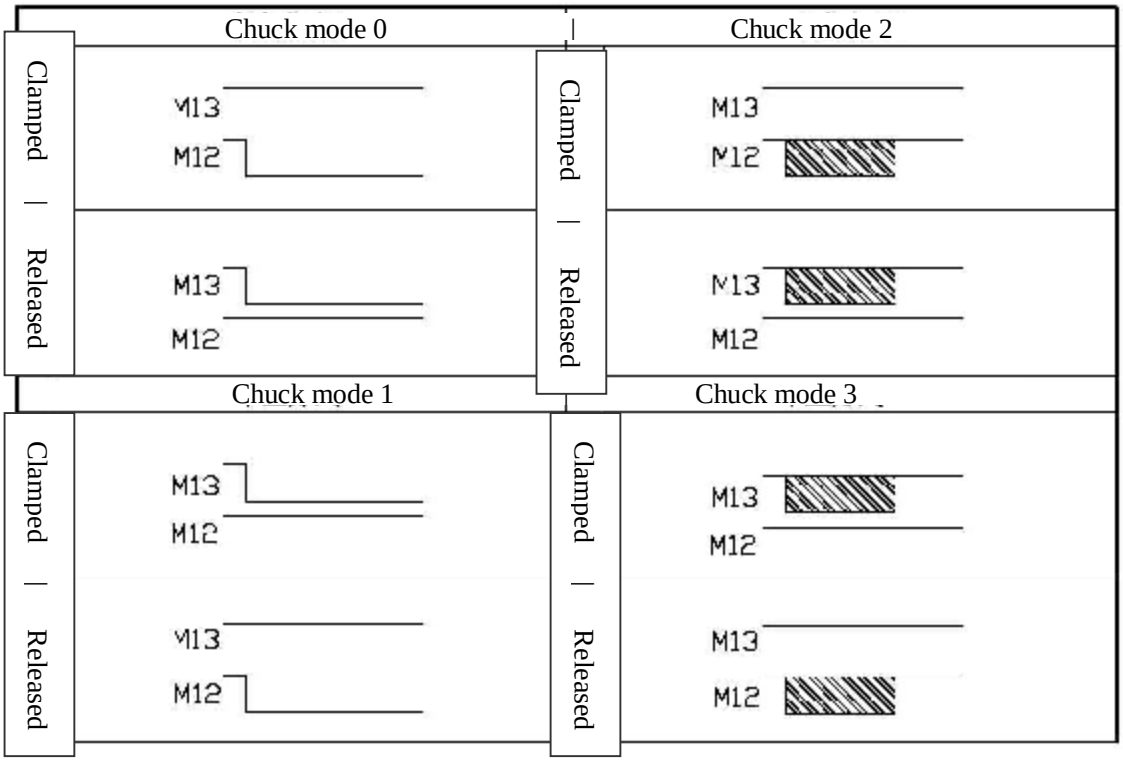
13.8. Chuck control

13.8.1 WIRING DIAGRAM



13.8.2 CHUCK PARAMETER SETTING

Check the clamping setting of chuck is “0” or “2” (do not check the clamp in position signal). The shadow part is the chuck clamping time and controlled by the parameters. The output time sequence is shown in the figure below.



Chuck mode “0”: continuous output control mode of internal chuck; chuck mode “1”: continuous output control mode of external chuck; chuck mode “2”: inching output control mode of internal chuck; chuck mode “3”: inching output control mode of external chuck

The difference between “0” and “2” of chuck clamping settings: **if “2” is selected, main axis and chuck are interlocked.**

If the chuck clamping setting is “1”, check the clamping in position signal. The principle of the four working mode follows:

Chuck mode 0: while executing clamping instruction M12, open XS6-12 port and close XS6-13 port, and check the clamping in position signal pin XS5-8. If the clamping signal is detected in the clamping time of the chuck, the M12 instruction is executed; otherwise, send alarm info “chuck clamping overtime”.

Chuck mode 1: while executing clamping instruction M12, open XS6-13 port and close XS6-12 port, and check the clamping in position signal pin XS5-7. If the clamping signal is detected in the clamping time of the chuck, the M12 instruction is executed; otherwise, send alarm info “chuck clamping overtime”.

Chuck mode 2: while executing clamping instruction M12, open XS6-12 port and close XS6-13 port, delay chuck clamping time and then clock the XS6-12 port, and check the clamping in position signal pin XS5-8. If the signal is valid, the M12 instruction is executed; otherwise, send alarm info “chuck clamping overtime”.

Chuck mode 3: while executing clamping instruction M12, open XS6-13 port and close XS6-12 port, delay chuck clamping time and then clock the XS6-13 port, and check the clamping in position signal pin XS5-7. If the signal is valid, the M12 instruction is executed; otherwise, send alarm info “chuck clamping overtime”.

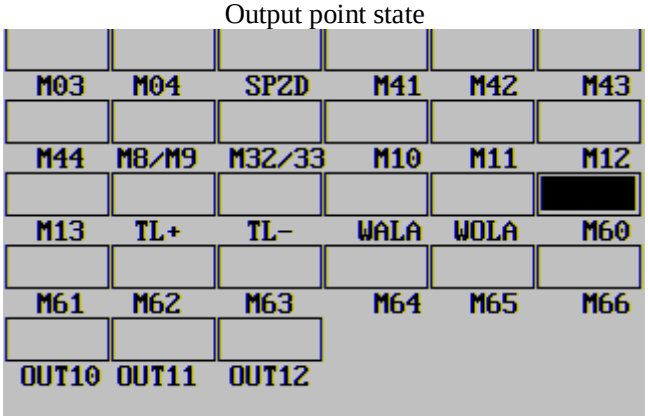
Note: when check the chuck clamping parameter settings: 0- do not check, do not interlock with main axis, 1- check the clamping signal and interlock with main axis, 2- do not check the clamping signal but interlock with main axis, 3- check the clamping signal but do not interlock with main axis

13.8.3 TROUBLESHOOTING FOR CHUCK CONTROL

The chuck control is comparatively simple and its main I/O signals can be checked in the diagnosis interface. Please check the relating signal if any fault occurs.

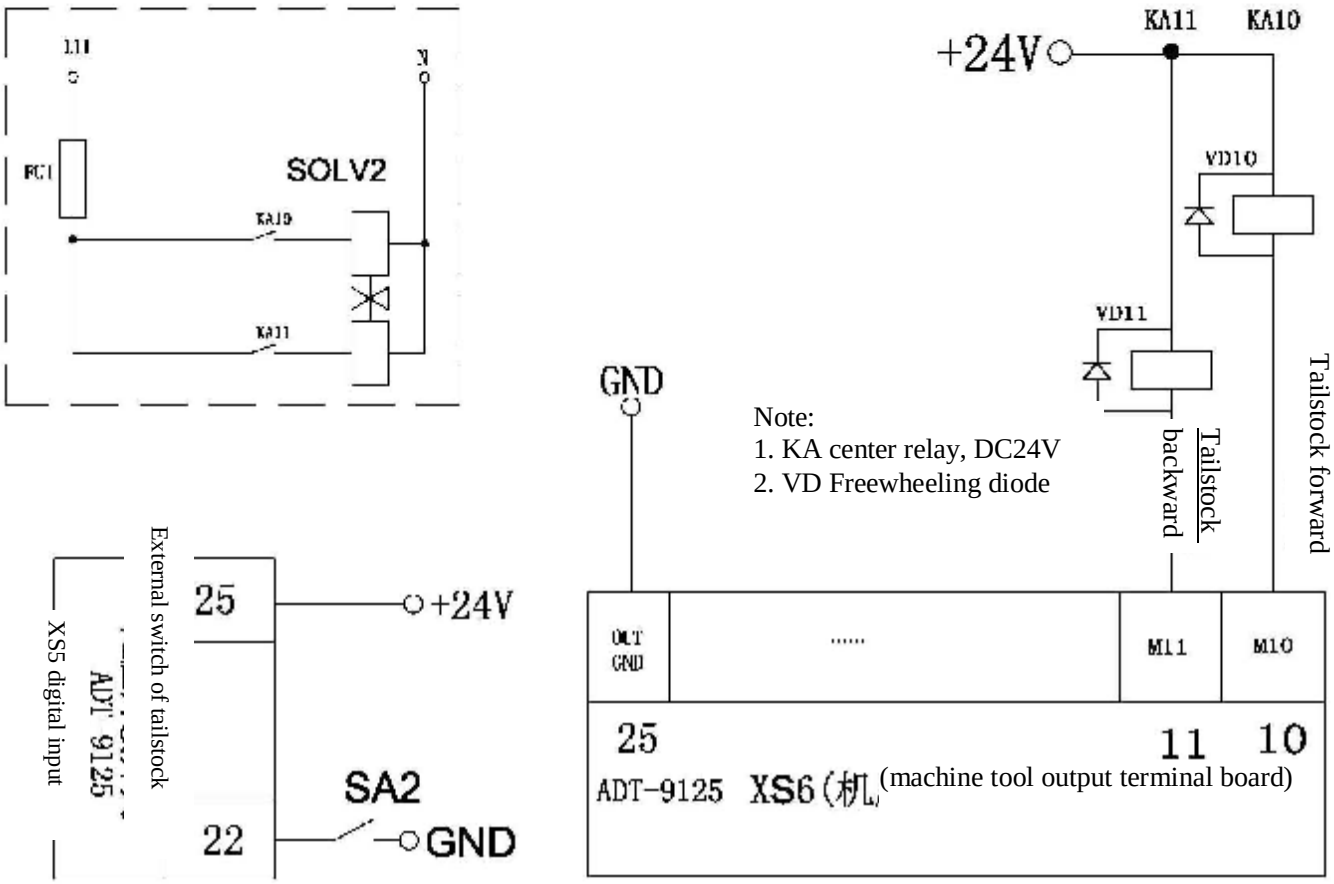
The output point state of M12 is shown below.

Output point state



13.9. Tailstock control

13.9.1 TAILSTOCK WIRING DIAGRAM



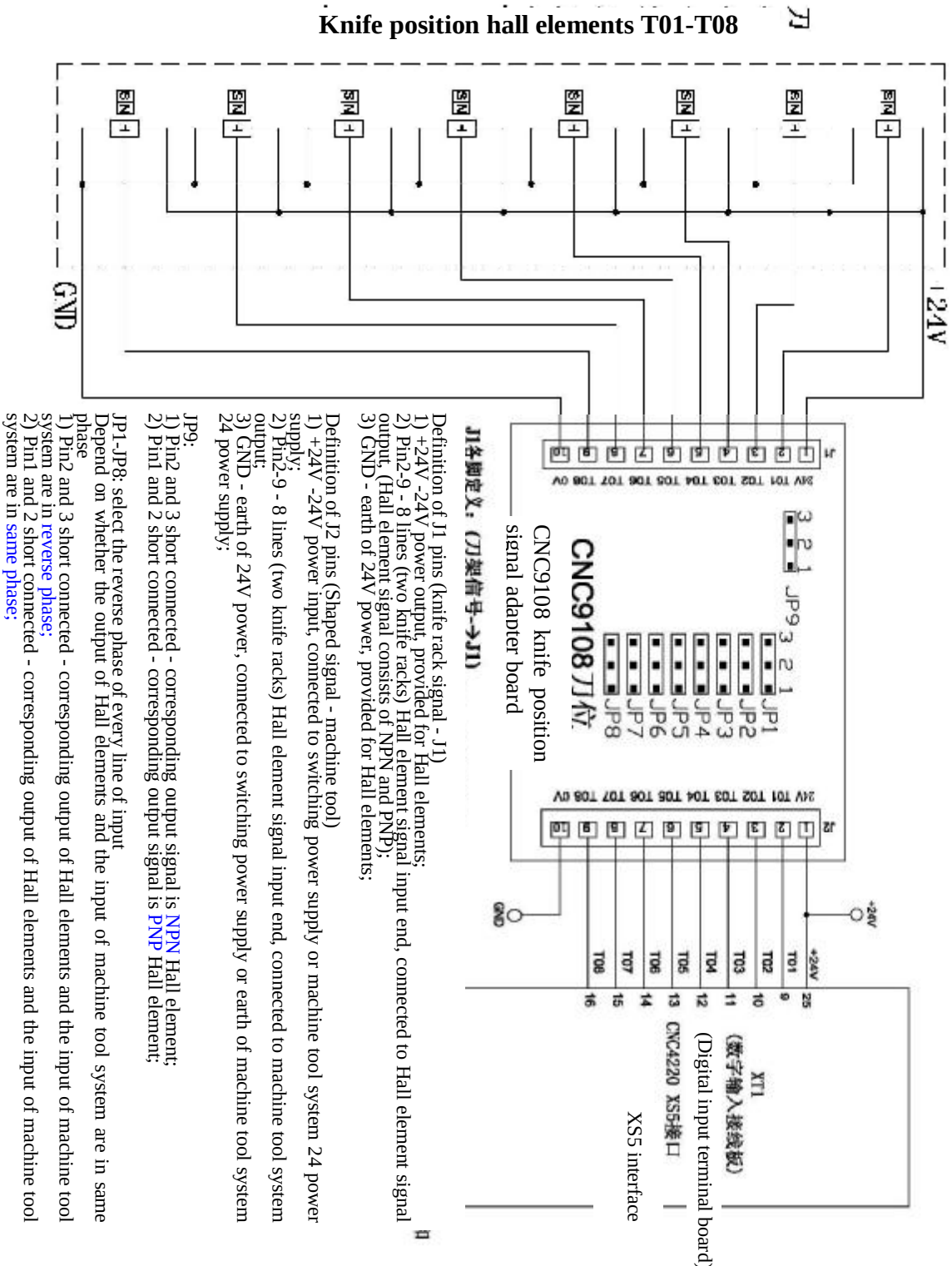
Time sequence figure

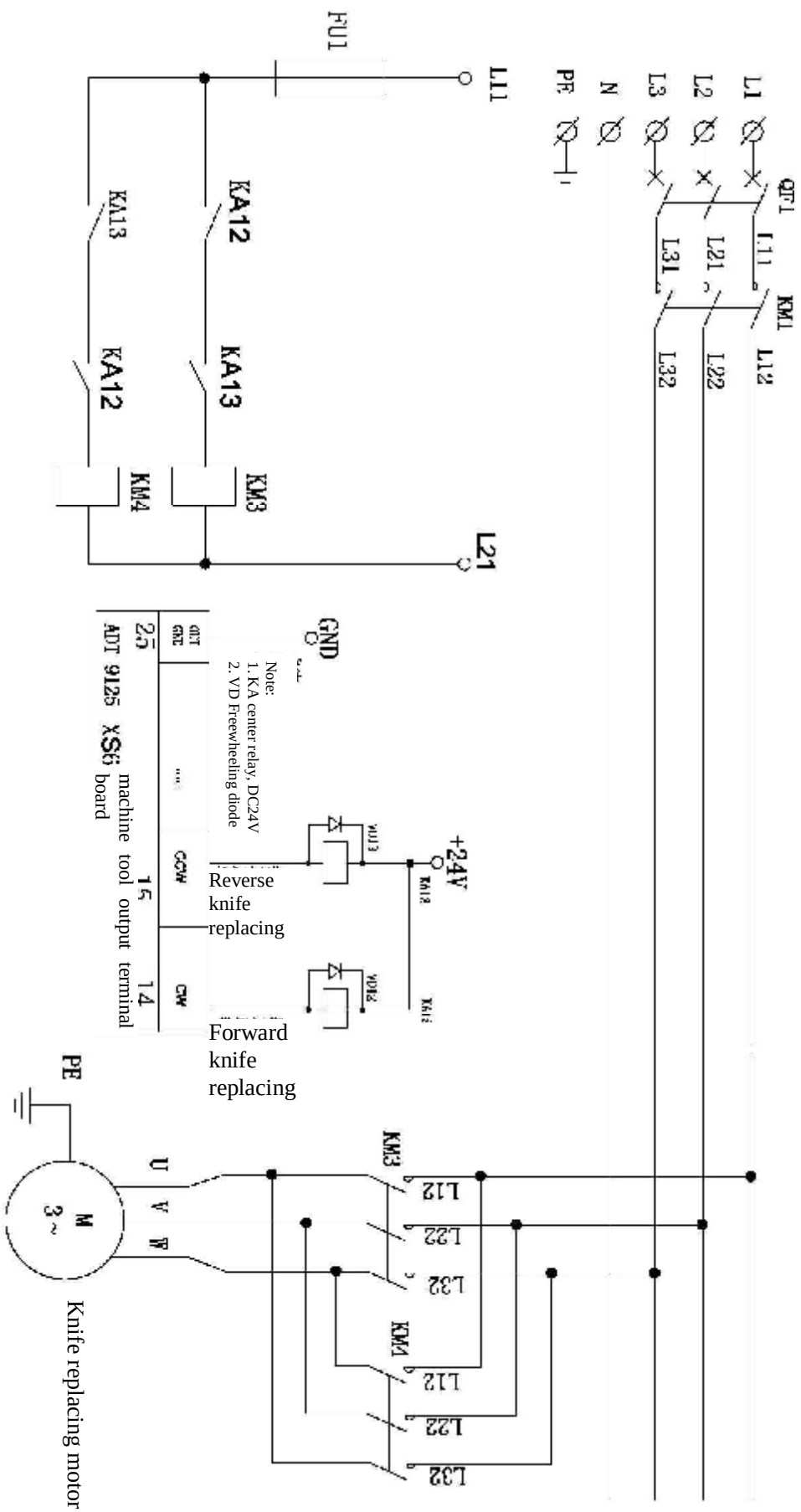
13.9.2 PARAMETER SETTINGS

Set the tailstock control to “1” to activate the tailstock function, or set it to “0” to deactivate the function.
Note: Do not push the tailstock forward/backward when the main axis is rotating, or else the alarm occurs.

13.10. Knife replacing control

13.10.1 WIRING DIAGRAM OF ELECTRIC KNIFE RACK

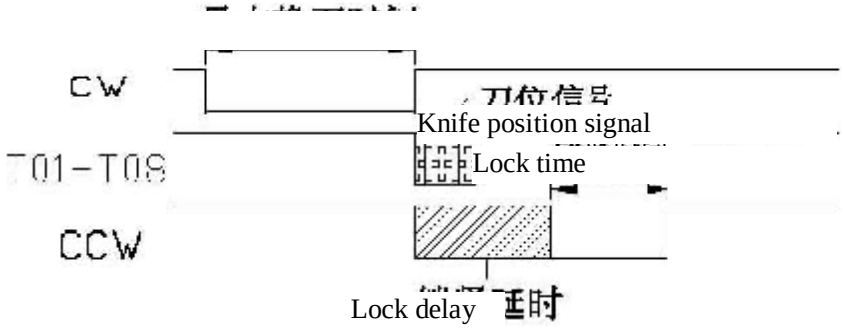




13.10.2 KNIFE REPLACING PARAMETER SETTING

A. No. 46 system knives – Knife station (knife position) number for mechanical turret. Please select "0" for line knife structure.
B. No. 47 knife position signal level – the effective level of knife position sensor when the knife is in position
C. No. 48 knife rack lock level – select knife in positive rotation and lock in reverse rotation; the effective level of lock sensor
D. No. 49 maximum knife replacing time – the time that normal knife rack rotates one circle
E. No. 50 lock delay time – the delay time from the completion of knife selection in positive rotation to the start of reverse lock
F. No. 51 knife rack reverse lock time – the time required to lock the knife rack
Note: the above parameters are effective to electric knife rack and the line knife doesn't require the setting.

Time sequence figure

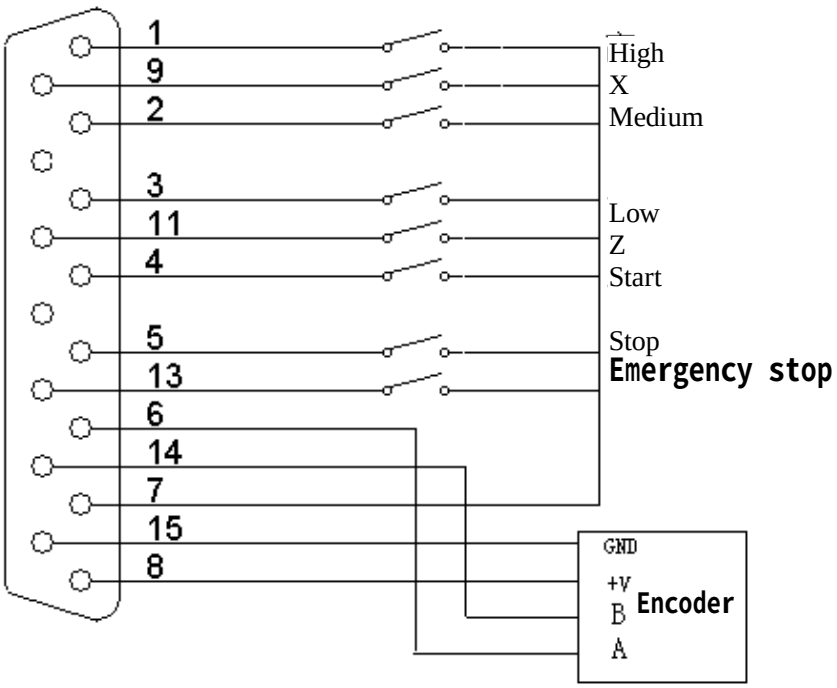


13.10.3 TROUBLESHOOTING FOR KNIFE REPLACING

When the system uses electric turret knife rack, the knife replacing will fail if the parameter setting isn't proper, for example, can't replace the knife. Please check whether the knife number is set to 0, whether the maximum knife replacing time is reasonable, and whether the settings of connection and jumper of knife rack signal conversion board are proper. These settings can be checked in the diagnosis interface. Please reduce the range to eliminate the fault.

13.11. Handheld box and additional panel interface XS7

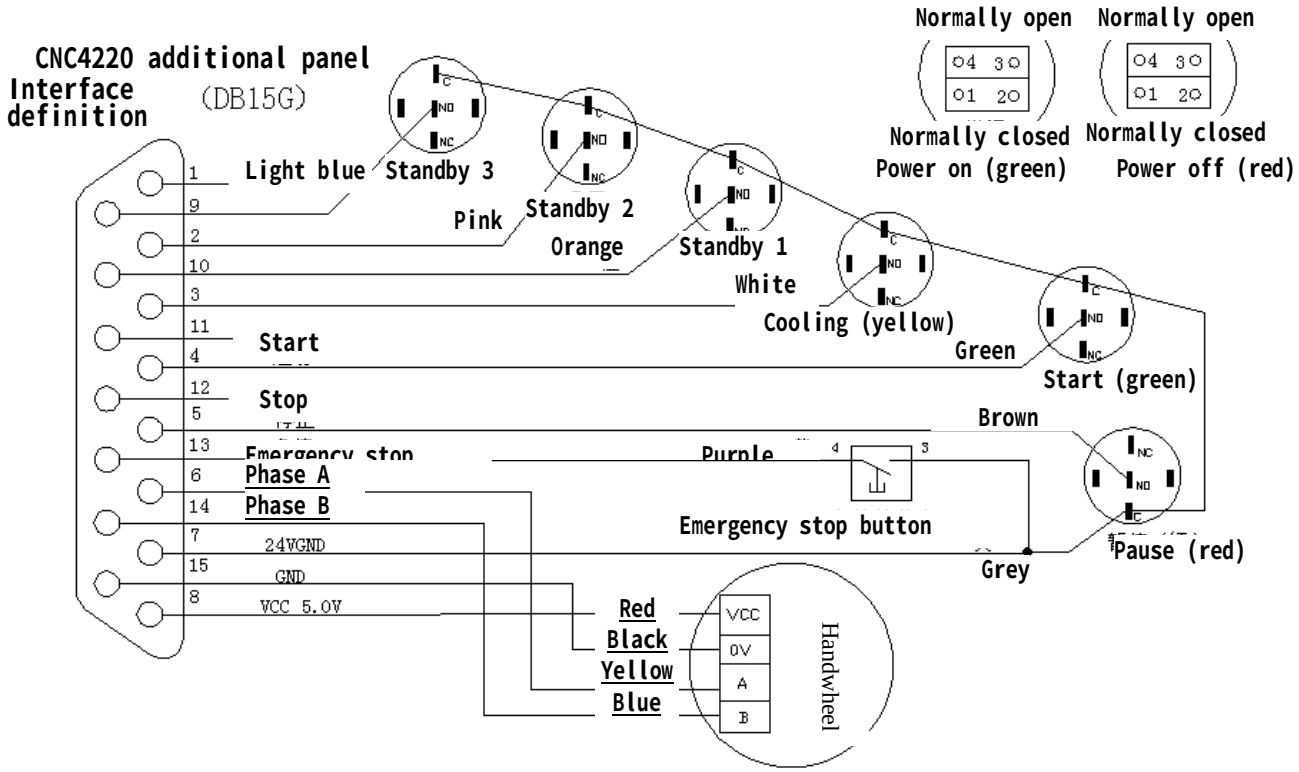
13.11.1 INTERNAL WIRING DIAGRAM OF THE HANDHELD BOX



13.11.2 PIN FUNCTION OF HANDHELD BOX INTERFACES

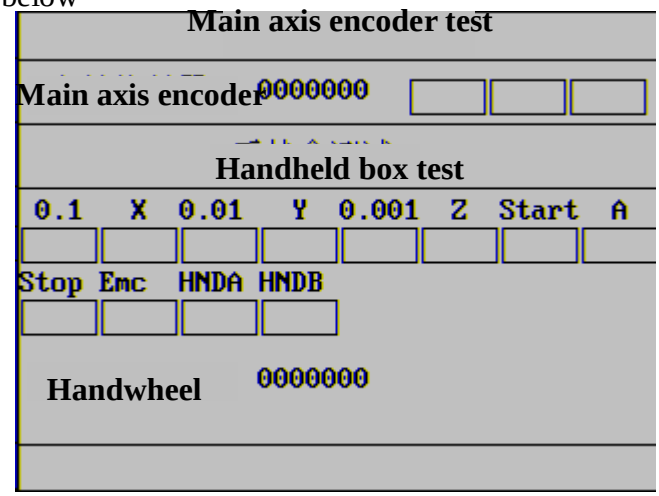
Wire No.	Definition	Function
1	Position switch (IN24)	Position 0.1 --- High speed
2	Position switch (IN26)	Position 0.01--- Medium-speed
3	Position switch (IN28)	Position 0.001--- Low speed
4	Button (IN30)	Loop start
5	Button (IN32)	Pause
6	HA	Phase A input signal for hand encoder
7	24V-	Cathode of internal 24V power supply
8	5V+	Anode of internal 24V power supply
9	Axis selection (IN25)	Axis X
10	Axis selection (IN27)	Axis Y
11	Axis selection (IN29)	Axis Z
12	Axis selection (IN31)	Axis A
13	Button (IN33)	Emergency stop
14	HB	Phase B input signal for hand encoder
15	5V-	Cathode of internal 24V power supply

13.11.3 WIRING DIAGRAM OF ADDITIONAL PANEL



13.11.4 PRECAUTIONS AND PARAMETER SETTING FOR HANDHELD BOX

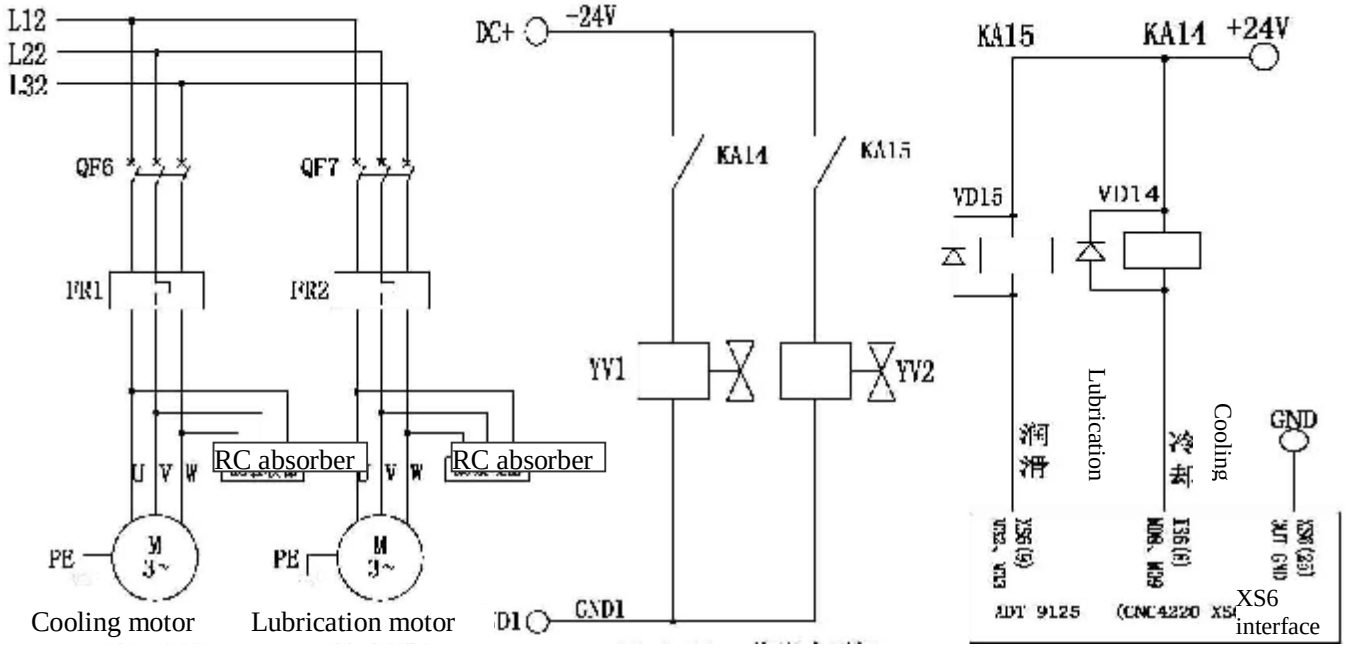
The handheld box and additional panel share the interface XS7, and thus they can use only one function at the same time. Select the handheld box or additional panel through system parameter 86: if parameter 86 = 0, the handheld box is selected; if parameter 86 = 1, the additional panel is selected.
The output signals of handheld box and additional panel have corresponding diagnosis signals on the controller, as in the figure below



13.11.5 TROUBLESHOOTING FOR HANDHELD BOX

When any fault occurs, please set the operation mode to MDI, press the Diagnosis key to enter the diagnosis interface, and press the Up/Down key to switch to handheld box test interface, as in the figure above. Then, rotate and press the corresponding switch, and the corresponding diagnosis signal changes; otherwise, this signal has fault. Please check the connection of the signal wire and the switch. If normal, the input interface of the controller has internal fault. Please contact the manufacturer. When the handwheel is rotating, the counter shows the received pulses, and HNDA and HNDB signals change alternatively. If there is no counting, and HNDA and HNDB signals have no change, please check the wire connection and whether the 5V power supply of the handwheel is normal. If the connection is normal, but the handwheel doesn't have 5V power supply, the internal power supply of the controller has fault. Please contact the system manufacturer. Note: the 5V power supply is only for the handwheel.

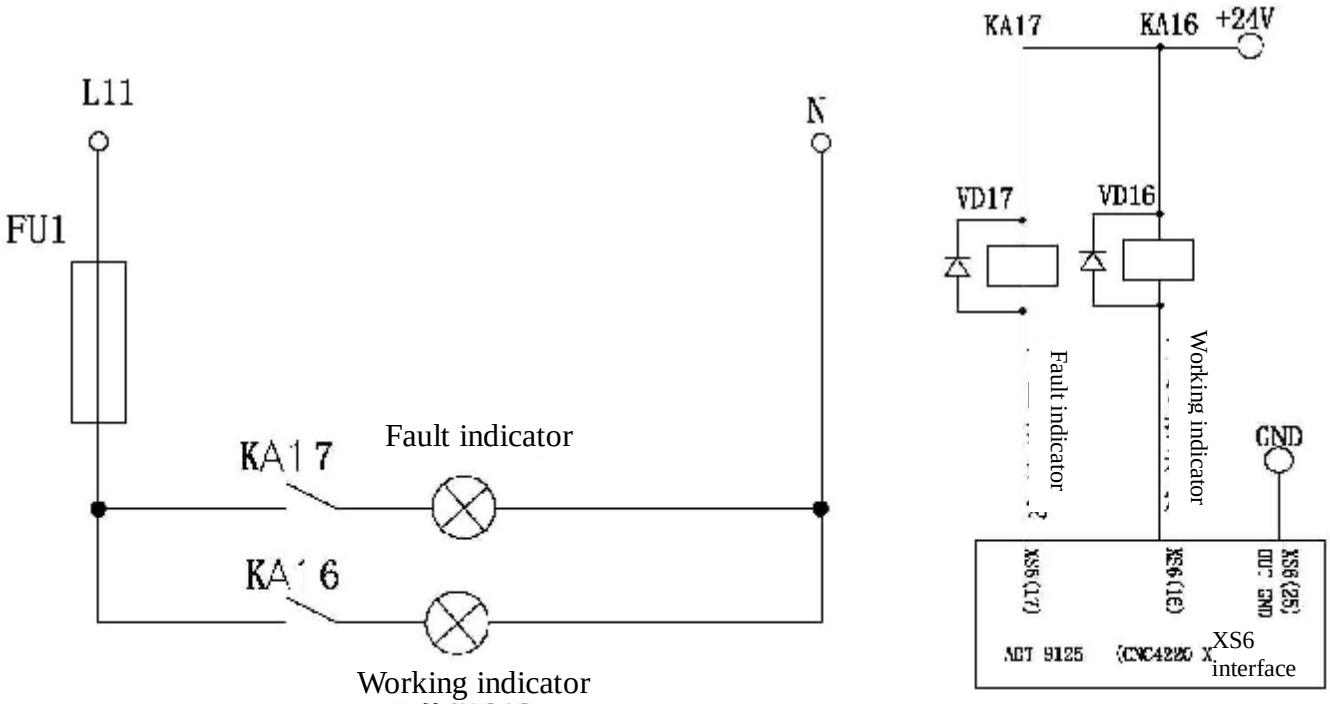
13.12. Wiring diagram of cooling and lubrication control



Cooling motor Lubrication motor

Cooling electromagnetic valve/lubrication electromagnetic valve

13.13. Wiring diagram of working indicators

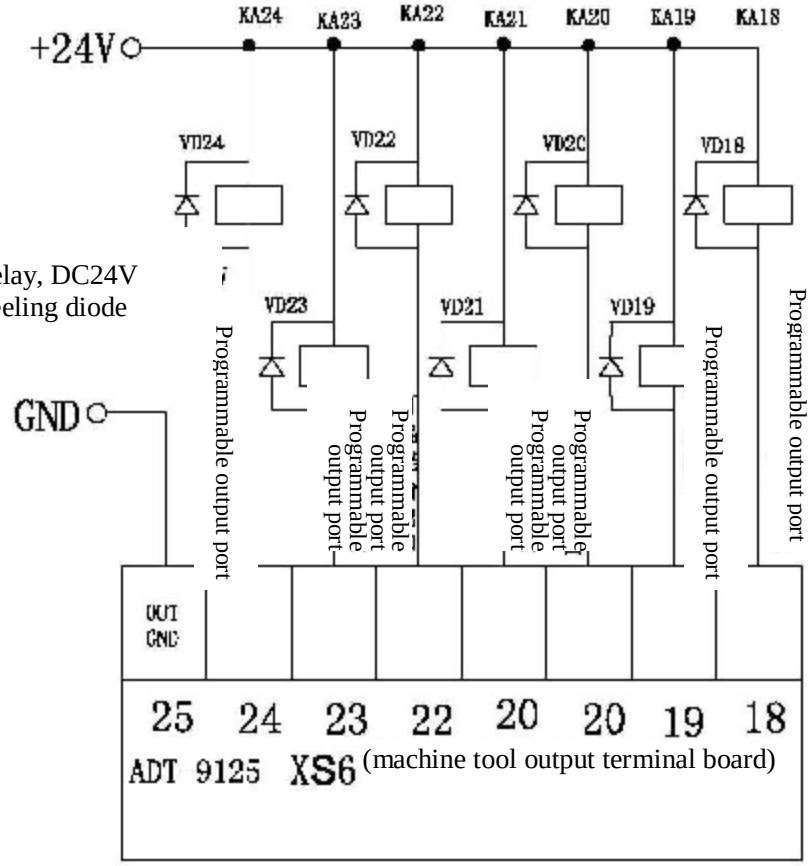


Working indicator

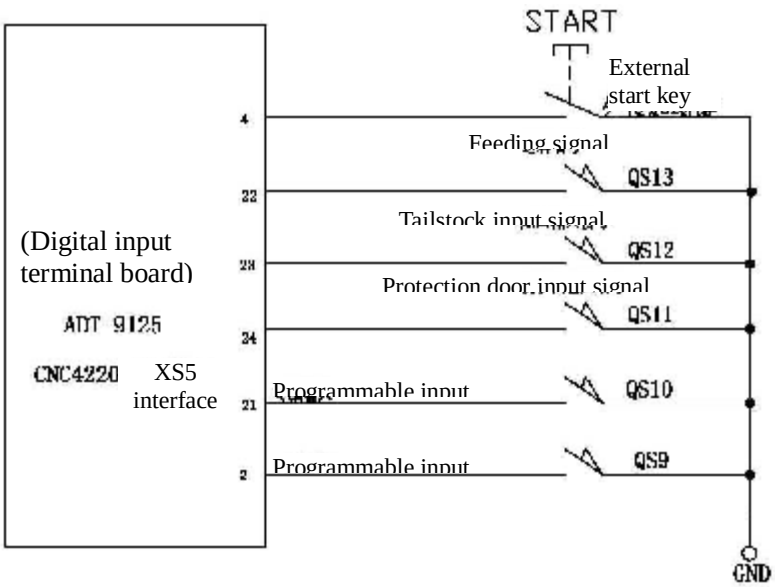
13.14. Programmable I/O port

13.14.1 WIRING DIAGRAM OF PROGRAMABLE I/O PORT

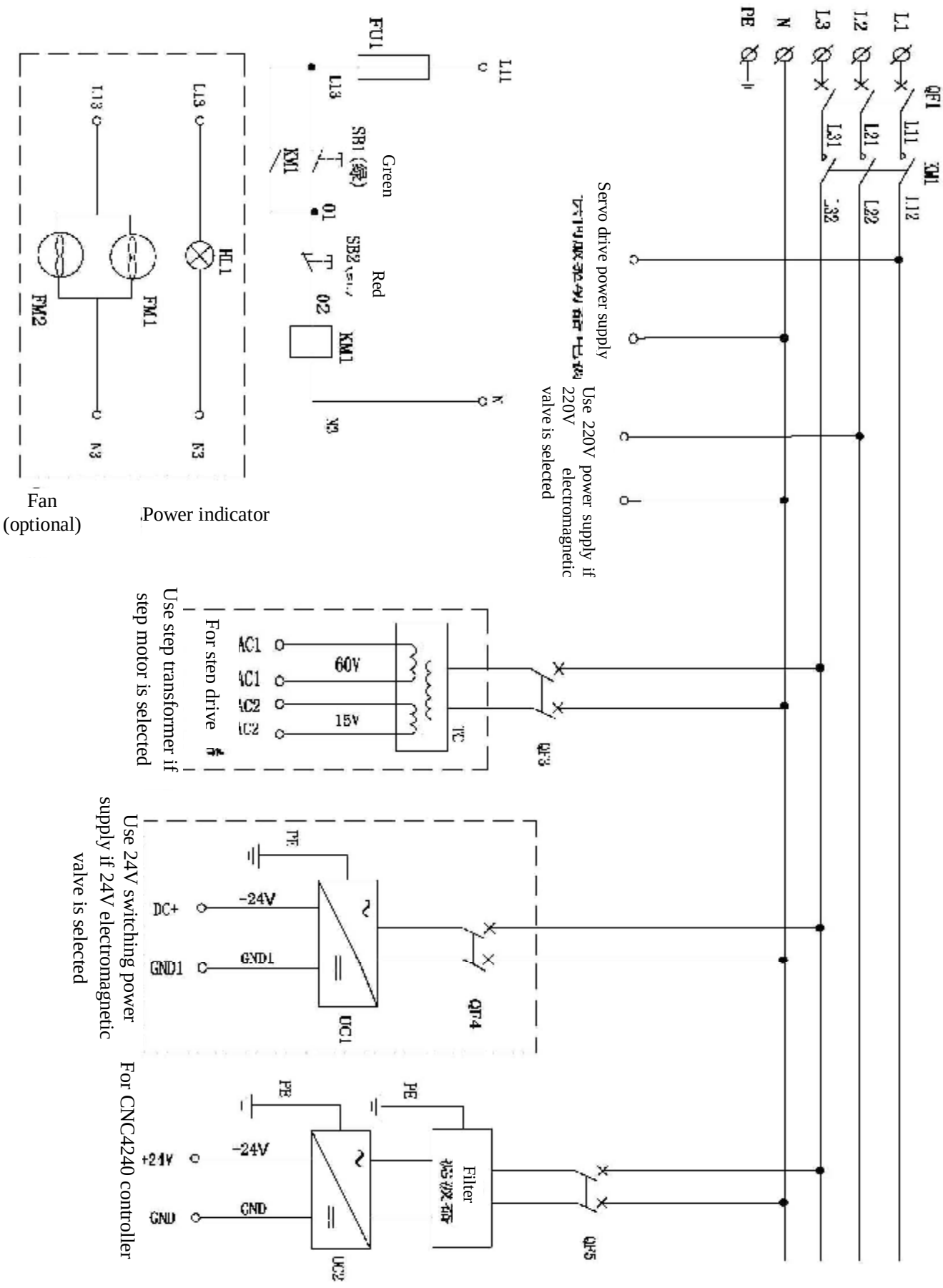
Note:
1. KA center relay, DC24V
2. VD Freewheeling diode



13.14.2 WIRING DIAGRAM OF PROGRAMABLE INPUT AND CERTAIN CONTROL PORTS



13.15. Wiring diagram of main power supply



13.16. System parameters table

No.	Function	Range	Default	Unit	Remark
1	Frequency division coefficient of axis X instruction (CMD)	1~255	1		
2	Magnification coefficient of axis X instruction (CMR)	1~255	1		
3	Frequency division coefficient of axis Z instruction (CMD)	1~255	1		
4	Magnification coefficient of axis Z instruction (CMR)	1~255	1		
5	Feeding speed	1-9999	4000	mm/min	
6	Feeding start speed	1-9999	300	mm/min	
7	Feeding acceleration time	1-9999	200	ms	
8	Manual speed	1-9999	120	mm/min	
9	Maximum feeding speed	1-9999	700	mm/min	
10	Quick moving speed of axis X	1-9999	3000	mm/min	
11	Quick moving speed of axis Z	1-9999	3000	mm/min	
12	Start speed of axis X	1-9999	300	mm/min	
13	Start speed of axis Z	1-9999	300	mm/min	
14	Acceleration time of axis X	1-9999	100	ms	
15	Acceleration time of axis Z	1-9999	100	ms	
16	Coordinate X of second reference point	9999- (-9999)	0	mm	
17	Coordinate Z of second reference point	9999- (-9999)	0	mm	
18	Error range of arc radius	0-9999		mm	
19	Feeding amount of arc interpolation	0-9999	0.02	mm	
20	Interpolation speed mode	0-1	0		
21	Acceleration of arc interpolation	0-9999	50	mm/min	
22	Hardware limit enable	0-1	1		
23	Effective level of hardware limit	0-1	0		
24	Software limit enable	0-1	1		If “1” is selected, the values of parameter 25-28 are effective
25	Positive soft limit of axis X	0-9999.999	0-9999.999	mm	
26	Negative soft limit of axis X	0-(-9999.999)	-9999.999	mm	
27	Positive soft limit of axis Z	0-9999.999	0-9999.999	mm	
28	Negative soft limit of axis Z	0-(-9999.999)	-9999.999	mm	
29	Manual start speed	1-9999	60	mm/min	
30	Alarm level of axis X	0-1	0	High/low	“0”: low, “1”: high
31	Alarm level of axis Z	0-1	0	High/low	“0”: low, “1”: high
32	Origin mode	0-2	1		Origin mode =0: return to machine tool origin directly and do not check the origin switch Origin mode=1: deceleration switch origin Origin mode =2: deceleration switch and servo origin signal
33	Effective level of axis X	0-1	0		

	origin				
34	Effective level of axis Z origin	0-1	0		
35	Origin direction of axis X	0-1	0		0: origin in negative direction; 1: origin in positive direction
36	Origin direction of axis Z	0-1	0		0: origin in negative direction; 1: origin in positive direction
37	High speed of axis X origin	1-9999.99	7000	mm/min	
38	High speed of axis Z origin	1-9999.99	7000	mm/min	
39	Low speed of axis X origin	1-9999.99	200	mm/min	
40	Low speed of axis Z origin	1-9999.99	200	mm/min	
41	Axis X reference point coordinates	-9999.999-9999.999	0.000	mm	
42	Axis Z reference point coordinates	-9999.999-9999.999	0.00.000	mm	
43	Axis X reverse clearance compensation	0-2 000	0	Pulse	
44	Axis Z reverse clearance compensation	0-2 000	0	Pulse	
45	Knife alignment mode	0-2	0		Alignment mode=0: fixed alignment mode Alignment mode =1: test cutting mode Alignment mode =2: mechanical origin mode
46	System knives	0-32	4		
47	Knife position signal level	0-1	1		
48	Knife rack lock signal level	0-1	1		
49	Maximum knife replacing time	1-65536	40000	ms	
50	Knife replacing delay	1-65535	200	ms	
51	Reverse lock time of knife rack	1-65535	4000	ms	
No.	Function	Range	Default	Unit	Remark
52	Effective control position of chuck function	0-1	0		0: ineffective 1: effective
53	Chuck mode	0-3	0		0: continuous output of external chuck signal 1: continuous output of internal chuck signal 2: pulse output of external chuck signal 3: pulse output of internal chuck signal
54	Check chuck clamping	0-3	0		1: check releasing and clamping signals; 0: do not check releasing and clamping signals; 2: check clamping signal; 3: check releasing signal
55	Chuck in position signal level	0-1	0		
56	Chuck clamping time	1-65536	1000	ms	
57	Tailstock function control	0-1	0		
58	Main axis control mode	0-2	1		1: analog speed regulation 0: speed regulation for

					switching quantity position 2: speed regulation for BCD encoder position
59	Maximum rotation of main axis	0-9999	6000	r/min	
60	Wire number of main axis encoder	1-9999	1024	pulse/r	
61	Brake delay time	0-65535	0	ms	
62	Brake output time	0-65535	0	ms	
63	Waiting time of M code	1-9999	200	ms	
64	Waiting time of S code	1-9999	200	ms	
65	Diameter/radium programming	0-1	1		
66	Coordinates storage	0-1	0		
67	Cursor returns to program switch automatically	0-1	0		
68	Reset switch auxiliary output	0-1	1		
69	Program end symbol	0-1	0		
70	Automatic program section number increment	1-9999	10		
71	Emergency stop function	0-1	0		
72	Emergency stop signal level	0-1	0		
73	Protective door checking	0-1	0		
74	Protective door signal level	0-1	0		
75	External loop start	0-1	0		
76	Loop start signal level	0-1	0		
77	External pause	0-1	0		
78	External pause signal level	0-1	0		
79	Feeding signal enable	0-1	1		
80	Feeding signal level	0-1	0		
81	Parameter switch	0-1	0		
82	Program switch	0-1	0		
83	Auto screen saver	0-1	1		
84	Waiting time of screen saver		48		
85	Parameter password control	0-1	0		
86	Handheld box and additional panel selection	0-1	0		
87	Handwheel speed	0-9999	5000	mm/min	
88	Axis X direction logic	0-1			
89	Axis X pulse logic	0-1			
90	Axis Z direction logic	0-1			
91	Axis Z pulse logic	0-1			
92	Lubrication enable and period	0-9999	0	h	
93	Lubrication mode	0-1	0		0: lubricate when the program is running; 1: lubricate when the system is electrified
94	Lubrication output effective time	0-9999	0	s	
95	Screw tail axis X speed ratio	0-65535	0		May be changed in the program
96	Screw tail axis Z speed ratio	0-65535	0		May be changed in the program
97	Regulation symbol of main axis analog quantity	0	0		

98	Device ID	1-255	1		
99	Serial port baud rate	115200	115200		
100	G74 axial knife backward	-9999-9999	0		
101	G74 radial offset	-9999-9999	0		
102	G74 axial knife forward	-9999-9999	0		
103	G74 radial knife backward	-9999-9999	0		
104	G75 radial knife backward	-9999-9999	0		
105	G75 axial offset	-9999-9999	0		
106	G75 radial knife forward	-9999-9999	0		
107	G75 axial knife backward	-9999-9999	0		
108	G71 rough knife forward	-9999-9999	0		
109	G71 rough knife backward	-9999-9999	0		
110	G71 axis X fine allowance	-9999-9999	0		
111	G71 axis Z fine allowance	-9999-9999	0		
112	G72 rough knife forward	-9999-9999	0		
113	G72 rough knife backward	-9999-9999	0		
114	G72 axis X fine allowance	-9999-9999	0		
115	G72 axis Z fine allowance	-9999-9999	0		
116	G73 axis X rough allowance	-9999-9999	0		
117	G73 axis Z rough allowance	-9999-9999	0		
118	G73 axis X fine allowance	-9999-9999	0		
119	G73 axis Z fine allowance	-9999-9999	0		
120	G73 cycles	1-9999	0		
121	System language	1-255	1		
122	Screw thread acceleration/ deceleration mode	0-1	0		

13.17. Alarm info reference table

Alarm code	Content	Solution
1000	Please reset	Press the Reset key
1001	File format error occurs when copying files	Check the file format and modify the file
1002	Serial communication: memory is full	Delete some files
1003	Serial communication: data overlength	Check whether the file size exceeds the device memory
1004	Serial communication: no filename	Check the file format and modify the file
1005	Serial communication: no file end	Check the file format and modify the file
1006	Serial communication: system data is full	Delete some files
1007	Serial communication: data receiving successfully	
1008	Serial communication: file of same name exists	Send in another file name
1009	Serial communication: file saved	
1010	Files exceed 9999 in the system	Delete some files
1011	File of same name exists	Copy in another file name
1012	File copy successfully	
1013	Parameter switch ON	
1014	Program switch OFF	Turn on program switch
1015	Parameter switch OFF	Turn on parameter switch
1016	Parameter switch disabled	Modify system parameter ——parameter switch
1017	Program switch disabled	Modify system parameter ——program switch
1018	The numerator or denominator of the electronic gear ratio exceeds 9999	Modify the numerator or denominator of the electronic gear ratio
1019	MDI running doesn't support G code	Modify the program
1020	MDI running doesn't support M code	Modify the program
1021	Password error	Please enter the password below
1022	Didn't set the program origin with G50	Please set and return to program origin

1023	Knife replacing fails	Check the parameters and lines
1024	The top limit is eight-station knife rack	The top limit of the electric turret is eight stations
1025	The knife replacing exceeds the limit	Modify the knife limit of the program
1026	Main axis control logic error	Modify the program
1027	Main axis I/O point control: the system doesn't support the S code	Modify the program
1028	Tailstock function is disabled when the main axis is turned on	Please turn off the main axis and then execute the tailstock
1029	Chuck function disabled	Open the parameter control position of the chuck
1030	Tailstock function disabled	Open the parameter control position of the tailstock
1031	Lubrication function disabled	
1032	Chuck isn't clamped	Check the parameter setting and lines of the chuck
1033	Chuck clamping overtime	Check the parameter setting and lines of the chuck
1034	Please change materials	Change materials
1035	Can't execute tailstock chuck instruction when main axis is running	Modify the program
1036	M98 instruction format error	Modify the program
1200	No enter symbol at the data end	Modify the program
1201	Characters in one line exceeds 255	Modify the program
1202	Illegal character beginning	Modify the program
1203	G code/M code format error	Modify the program
1204	Doesn't support the G code	Modify the program
1205	Doesn't support the M code	Modify the program
Alarm code	Content	Solution
1206	No figures after characters	Modify the program
1207	Code repeats	Modify the program
1208	Subprogram number error	Check the format of subprogram number
1209	Subprogram number or line number not found	Check the subprogram number and M98 format
1210	The subprogram transfer exceeds 9 layers	Modify the program and reduce the subprogram transfer to lower than 9 layers
1213	The system doesn't support the G code	Check and modify the program
1215	Screw thread lead is lower than or equal to 0	Check and modify the program
1216	Arc radius not specified	Check and modify the program
1217	Arc radius error	Check and modify the program
1223	G70 G71 G72 G73 circles haven't specified start and end line number	Check and modify the program
1224	G7X profile description code section error	Check and modify the program
1225	G71, G72 or G73 start program section contains incompatible G code	Check and modify the program
1226	G7X circle doesn't support subprogram transfer	Check and modify the program
1227	Haven't specified screw thread pitch	Check and modify the program
1228	G7X end line number not found	Check and modify the program
1229	G70 processing start is described by G00	Check and modify the program
1230	G7X profile description doesn't support the G code	Check and modify the program
1231	G7X motion calculation error, system overflow	Check and modify the program
1232	G71, G72 or G73 profile describes the non-monotonicity	Check and modify the program
1233	G7X profile description error	Check and modify the program
1234	G7X circles exceed 2000, please modify the program	Modify the knife forward to reduce the circles
1235	G7X circle is 0, please modify the program	Check and modify the program

1236	G73 circle is 0	Haven't specified the circles
1237	G76 screw thread fine processing circles exceed 2000	Check and modify the program to reduce the circles
1238	G76 circle processing start is lower than the end position of the screw thread	Please modify the start position of circle processing
1239	The arc radius exceeds allowable error	Check and modify the program
1240	G94 hasn't specified axis X coordinates	Check and modify the program
1244	T code format error	Check and modify the program
1245	S code format error	Check and modify the program
1246	Exceed IO port number	Check and modify the program
1247	M88/M89 hasn't specified port number	Check and modify the program
1248	G71 rough circle knife forward error	Check and modify the program
1249	G71, G72 or G73 profile description contains incompatible G code or M code	Check and modify the program
1250	G72 rough circle knife forward error	Check and modify the program
1251	G73 axis X rough reserve volume is negative	Check and modify the program
1252	G73 axis Z rough reserve volume is negative	Check and modify the program
1253	G74- axis Z end isn't specified or movement is 0	Check and modify the program
1254	G74- axis Z knife forward is 0 or exceeds allowable range	Check and modify the program
1255	G74- radial offset exceeds allowable range	Check and modify the program
1256	G74- radial knife backward exceeds allowable range	Check and modify the program
1257	G75 axis X end isn't specified or movement is 0	Check and modify the program
Alarm code	Content	Solution
1258	G75 - axis Z offset exceeds allowable range	Check and modify the program
1259	G75 - radial knife forward is 0 or exceeds allowable range	Check and modify the program
1260	G75 - axial knife backward exceeds allowable range	Check and modify the program
1261	G76 minimum rough knife forward is 0	Check and modify the program
1262	G76 circle doesn't specify the end coordinates of screw thread	Check and modify the program
1263	G76 circle doesn't specify the height of screw thread	Check and modify the program
1264	G76 circle doesn't specify the pitch of screw thread	Check and modify the program
1265	G90, G92, G94 program error, R value exceeds allowable range	Check and modify the program
1266	G28 instruction format error	Check and modify the program
1267	G7X start line number isn't found	Check and modify the program
1268	G7X code format error or emergency stop during motion	Check and modify the program
1270	G7X circle doesn't support auxiliary function	Check and modify the program
1271	The first program section of G7X profile description is arc	Check and modify the program
1272	One program section doesn't support multiple M codes	Check and modify the program
1273	G71 G72 G73 start position error	Check and modify the program
1274	G71 G72 fine allowance can't exceed rough knife forward	Check and modify the program

1275	Screw thread speed exceeds maximum feeding speed	Reduce the main axis rotation
1276	Screw thread pitch instruction repeat	Check and modify the program
1277	G90G92 hasn't specified axis Z coordinates	Check and modify the program
1278	G76 screw thread taper R value exceeds allowable range	Check and modify the program
1279	Input point check overtime	Check the program parameters and corresponding lines
1280	G96 format error	Check and modify the program
1281	T code repeat	Check and modify the program
1282	Address value exceeds the data range	Check whether the instruction value is in specified instruction range
1283	The screw thread function doesn't support constant line speed mode	Check and modify the program
1284	Reference point coordinates error or machine tool positioning error too large	Check whether the reference point switch is loose and the lines
1286	Screw thread offset angle doesn't match	The main axis rotates for five circles when specifying the angle and the angle can't match. Please modify the program or change high speed wire main axis encoder.
1287	Screw thread interpolation speed is abnormal	Main axis rotation fluctuates; check the lines
1288	G90, G92 axis Z increment is 0	Check and modify the program
1289	G94 axis X increment is 0	Check and modify the program
1290	The system hasn't returned to the reference point	Execute mechanical origin for the machine tool
1291	Didn't specify the position of center point	Check and modify the program
1292	G30 didn't specify the position of center point	Check and modify the program
1293	M89 format error	Check and modify the program
B001	No memory chip or chip damaged	Replace the memory chip
B002	"Memory chip is normal"	
C000	System emergency stop	Eliminate the fault and clear the emergency stop alarm
C001	Axis X drive alarm	Eliminate the fault and clear the alarm
C003	Axis Z drive alarm	Eliminate the fault and clear the alarm
C005	Axis X positive limit	Modify the program to run in soft limit range
Alarm code	Content	Solution
C006	Axis X negative limit	Modify the program to run in soft limit range
C009	Axis Z positive limit	Modify the program to run in soft limit range
C010	Axis Z negative limit	Modify the program to run in soft limit range
C013	Axis X positive overtravel	Find the reason of overtravel, eliminate the fault and clear the alarm
C014	Axis X negative overtravel	Find the reason of overtravel, eliminate the fault and clear the alarm
C017	Axis Z positive overtravel	Find the reason of overtravel, eliminate the fault and clear the alarm
C018	Axis Z negative overtravel	Find the reason of overtravel, eliminate the fault and clear the alarm

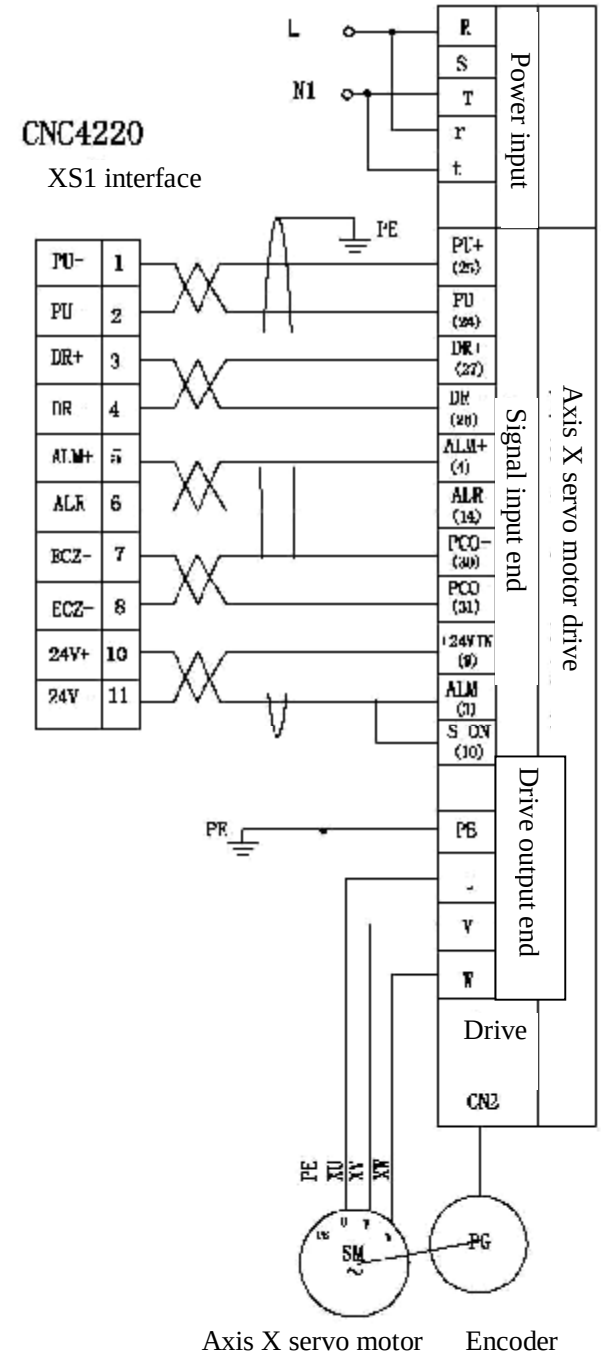
13.18. Main functions and parameters reference table

Control function name	System parameter No.	System parameter name	Value	Remark
Main axis control	58	Main axis control mode	Four-section speed: "0"	
			16-section speed: "2"	
			Stepless speed regulation: "1"	

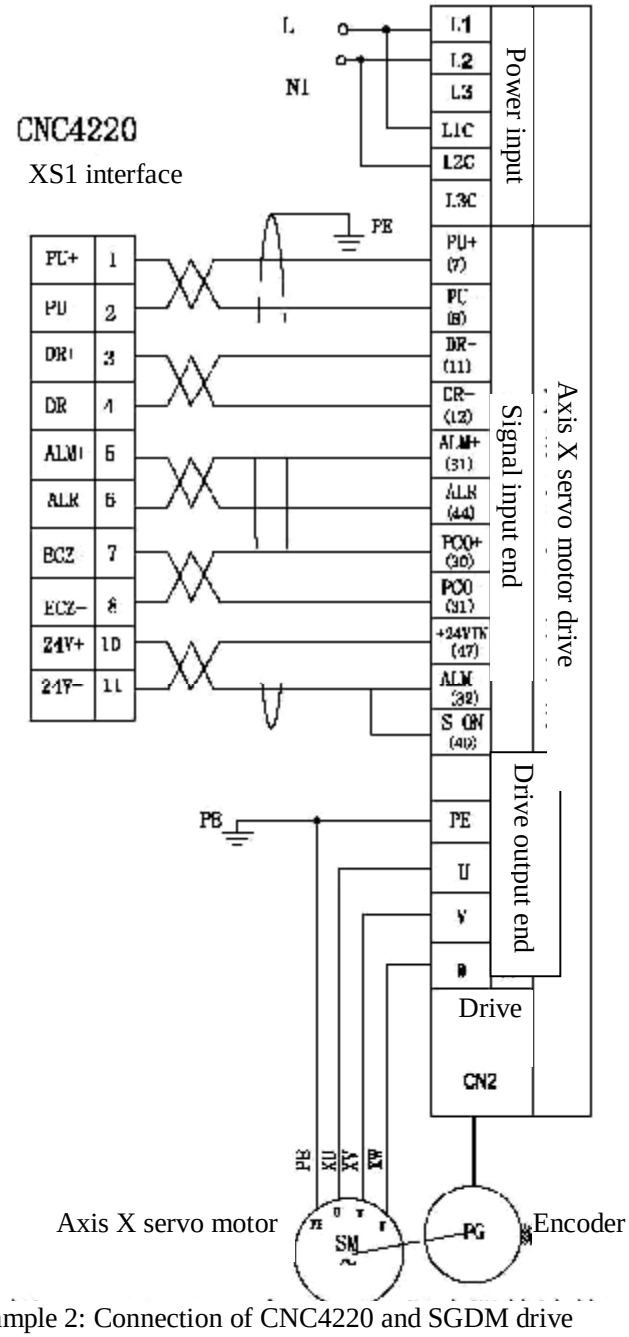
			DC driving motor stepless speed regulation: “3”	
Knife replacing control	46	System knives	Select “0” for line knife Set the actual knives if turret knives are used	
	47	Knife position signal level	High level effective: “1” Low level effective: “0”	
	48	Knife rack lock level	High level effective: “1” Low level effective: “0”	
	49	Maximum knife replacing time	The time that the electric knife rack rotates one circle (unit: ms); set according to actual value	
	50	Lock delay time	The time from completion of positive knife selection to reverse lock delay; please set accordingly	
	51	Knife reverse lock time	The time of the reverse lock of the turret; please set accordingly	
Chuck control	52	Chuck function effective control position	Chuck function on: “1” Chuck function off: “0”	
	53	Chuck mode	Internal chuck continuous output signal: “0” External chuck continuous output signal: “1” Internal chuck pulse output signal: “2” External chuck pulse output signal: “3”	
	54	Check the chuck clamping	Do not check clamping signal: “0” Check clamping signal: “1” Check clamping signal and interlock with main axis: “2”	
	55	Chuck in position signal level	High level effective: “1” Low level effective: “0”	
	56	Chuck clamping time	The time of chuck clamping; please set accordingly	
Tailstock control	57	Tailstock function control	Tailstock function on: “1” Tailstock function off: “0”	
Hard limit	22	Hard limit enabled	Hard limit on: “1” Hard limit off: “0”	Only for the hard limit of the chip
Hard limit level	23	Hard limit effective level	High level effective: “1” Low level effective: “0”	

13.19. SYSTEM WIRING DIAGRAMS

13.19.1 SERVO DRIVE WIRING DIAGRAM

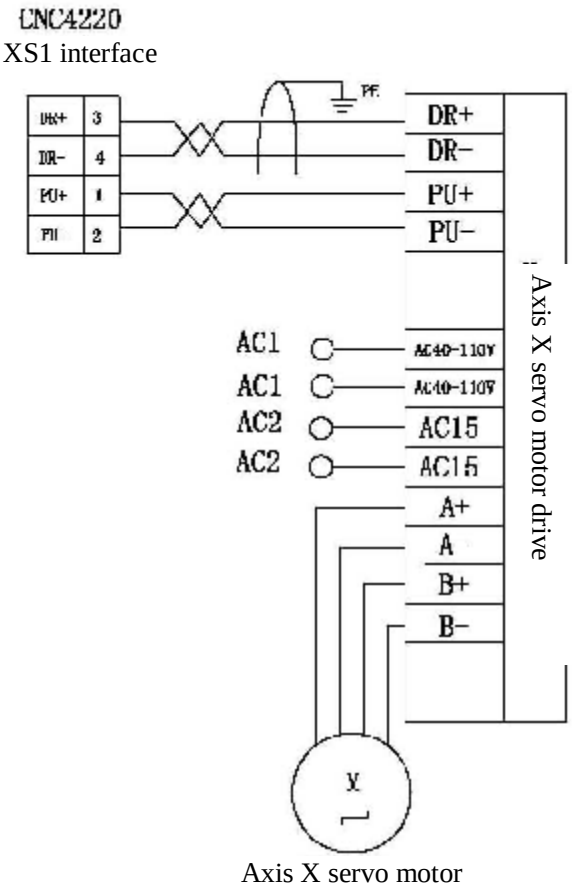


Example 1: Connection of CNC4220 and JaBao QS5 drive

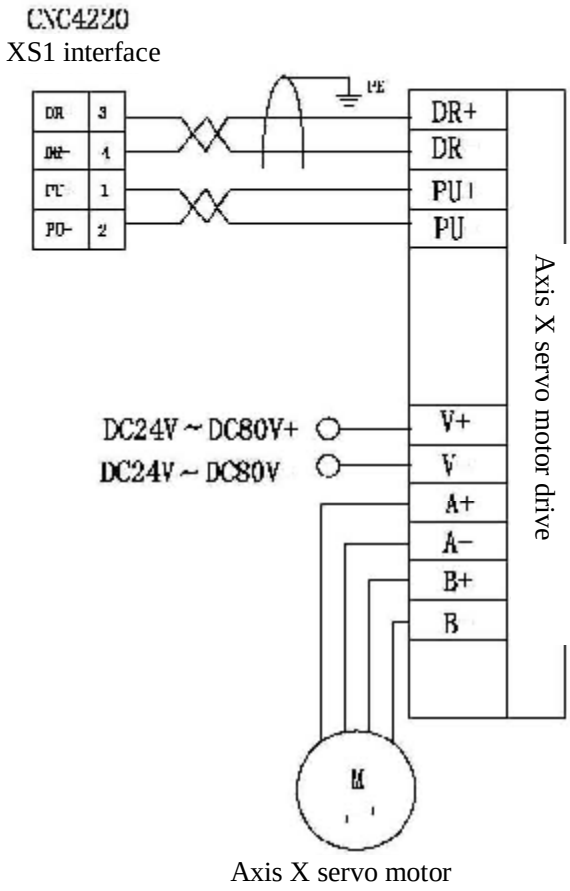


Example 2: Connection of CNC4220 and SGDM drive

13.19.2 STEP DRIVE WIRING DIAGRAM



Example 3: Connection of CNC4220 and Q2BYG1106M step drive

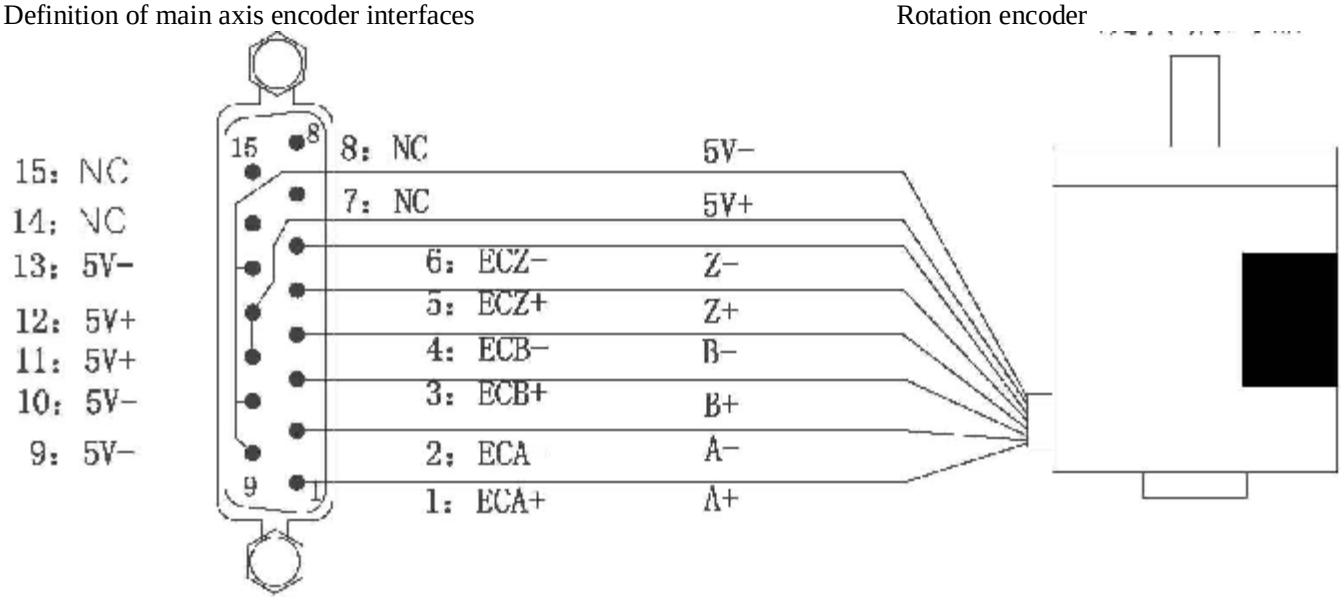


Example 4: Connection of CNC4220 and Q2BYG808M step drive

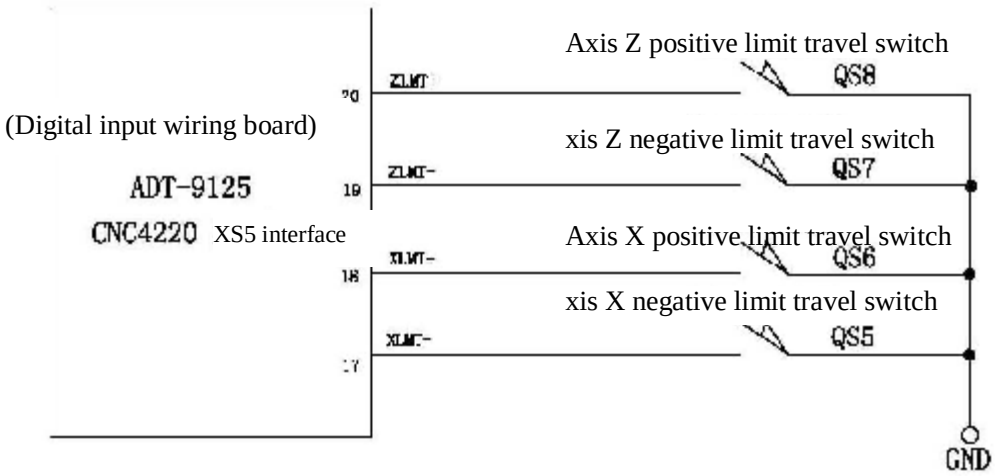
13.19.3 MAIN AXIS ENCODER WIRING DIAGRAM

Definition of main axis encoder interfaces

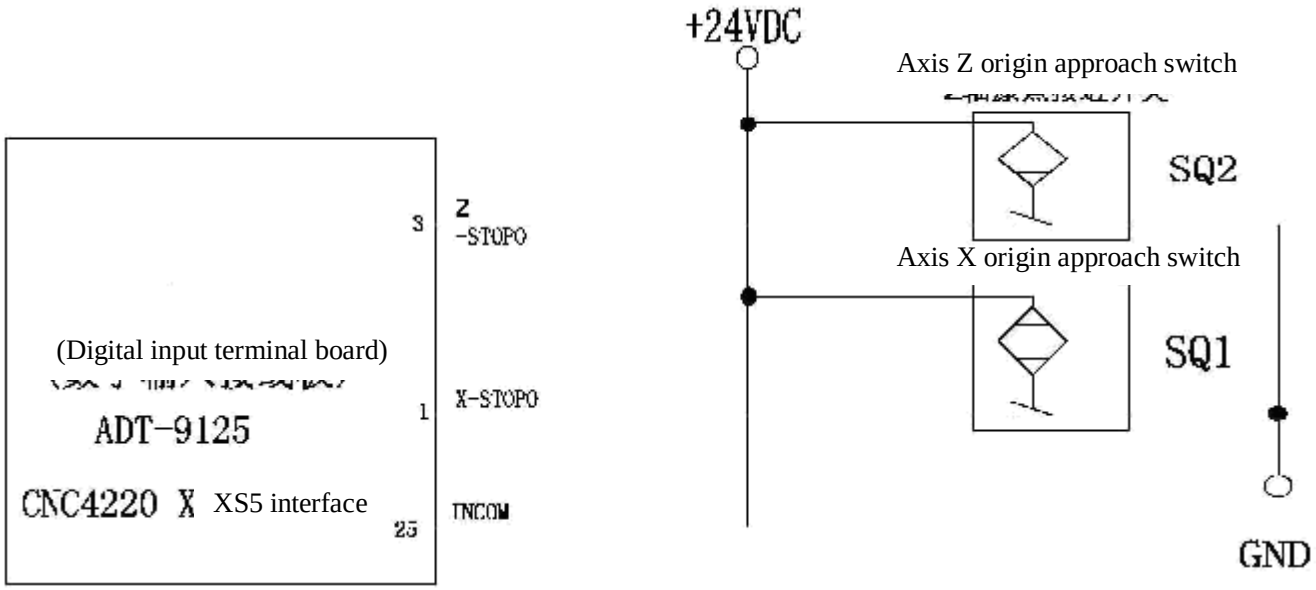
Rotation encoder



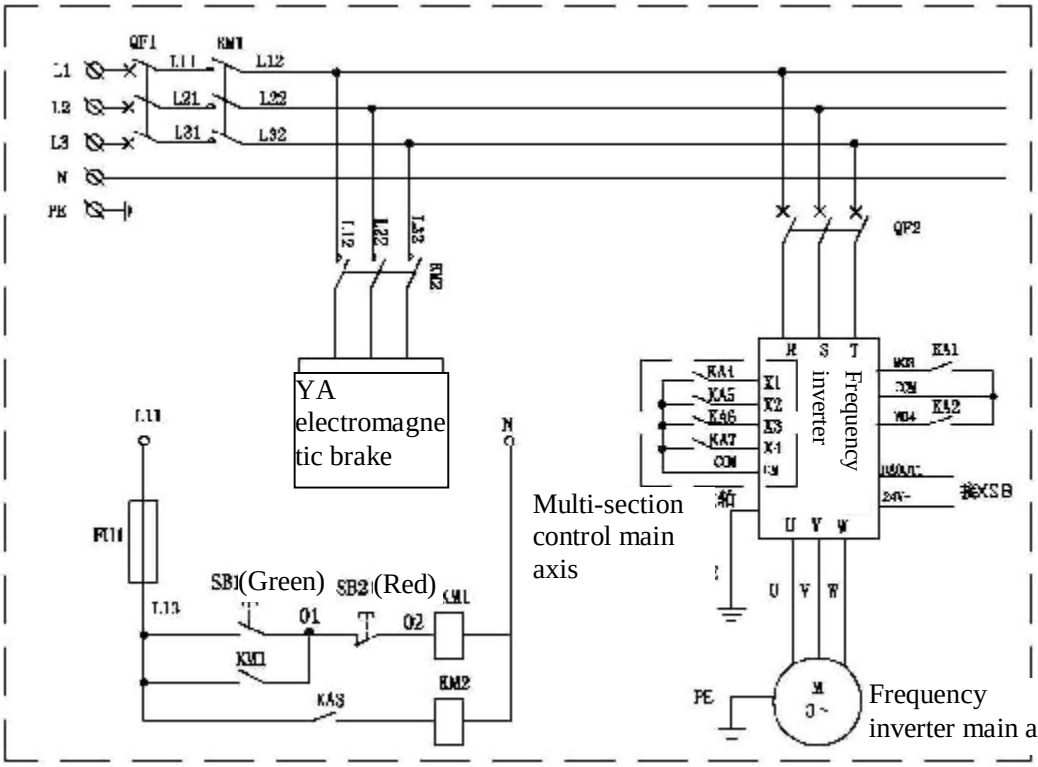
13.19.4 HARD LIMIT WIRING DIAGRAM

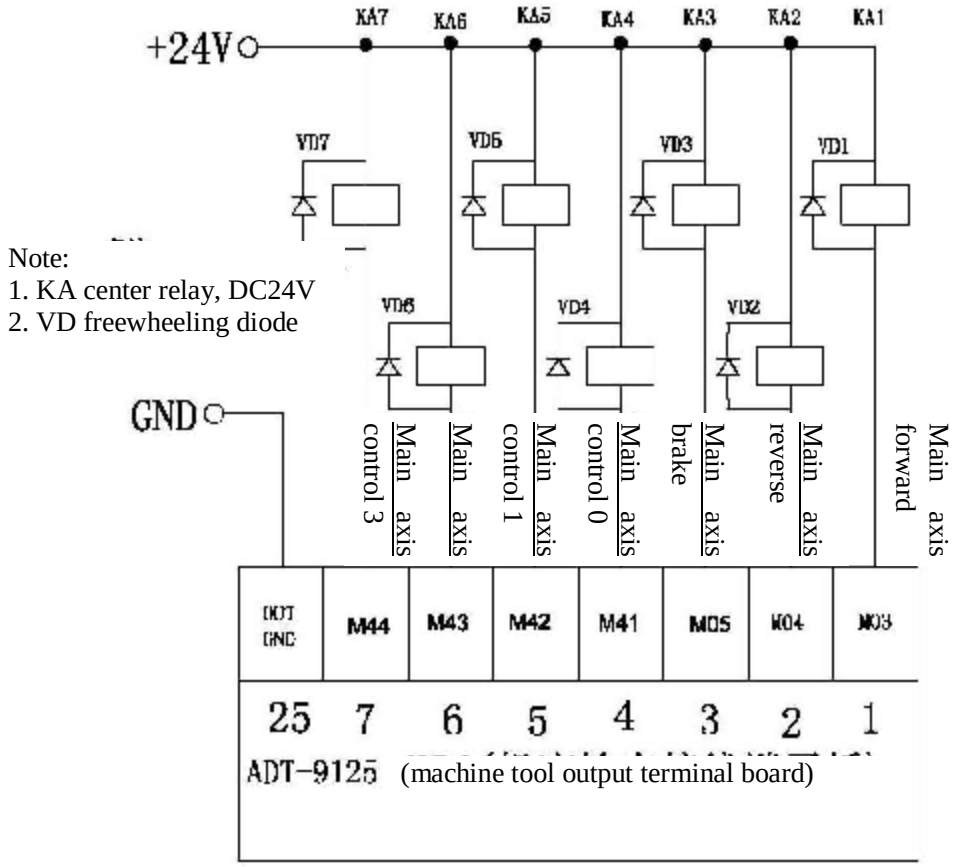


13.19.5 MECHANICAL ORIGIN WIRING DIAGRAM



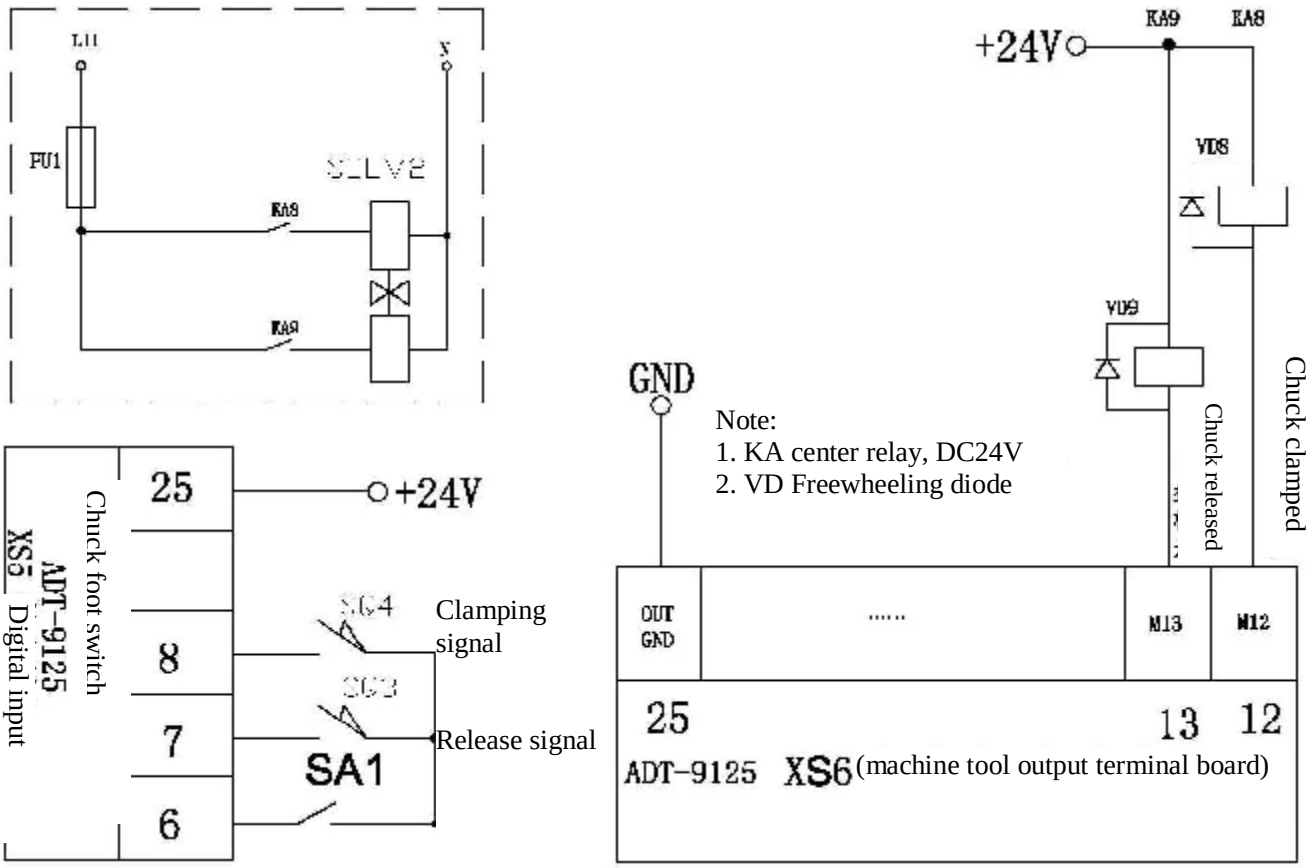
13.19.6 MAIN AXIS CONTROL WIRING DIAGRAM



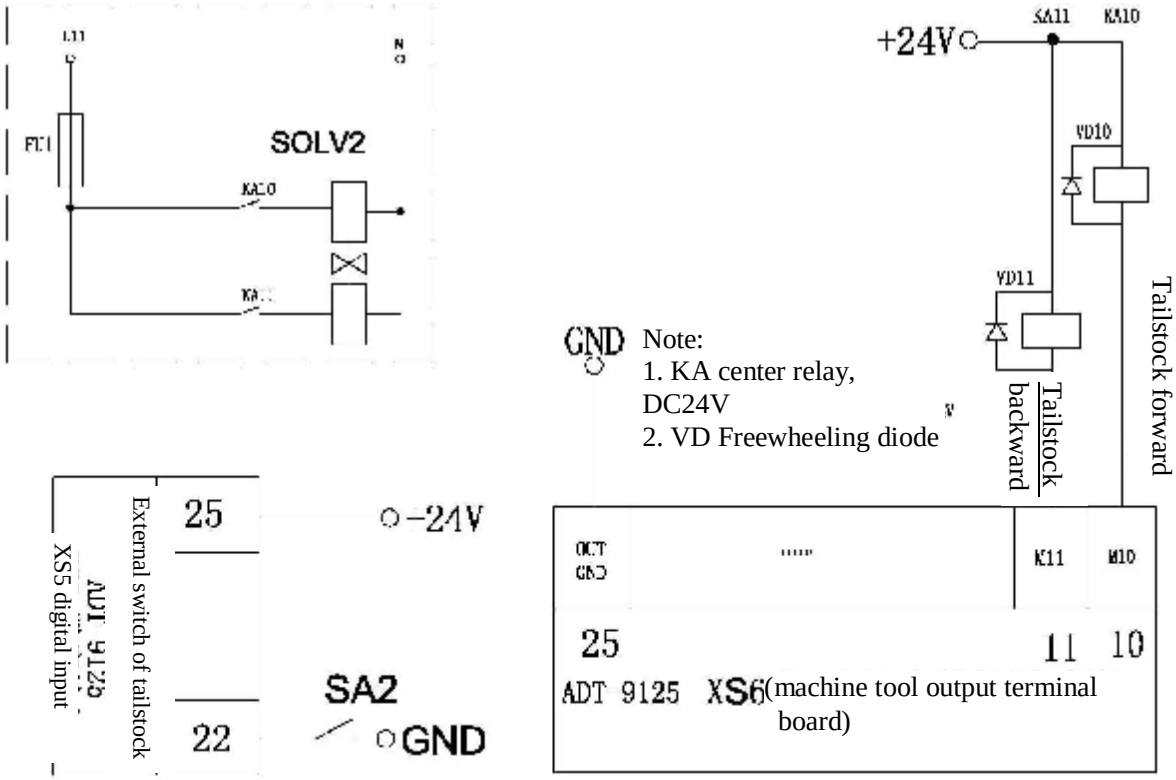


Note:
1. KA center relay, DC24V
2. VD freewheeling diode

13.19.7 CHUCK CONTROL WIRING DIAGRAM

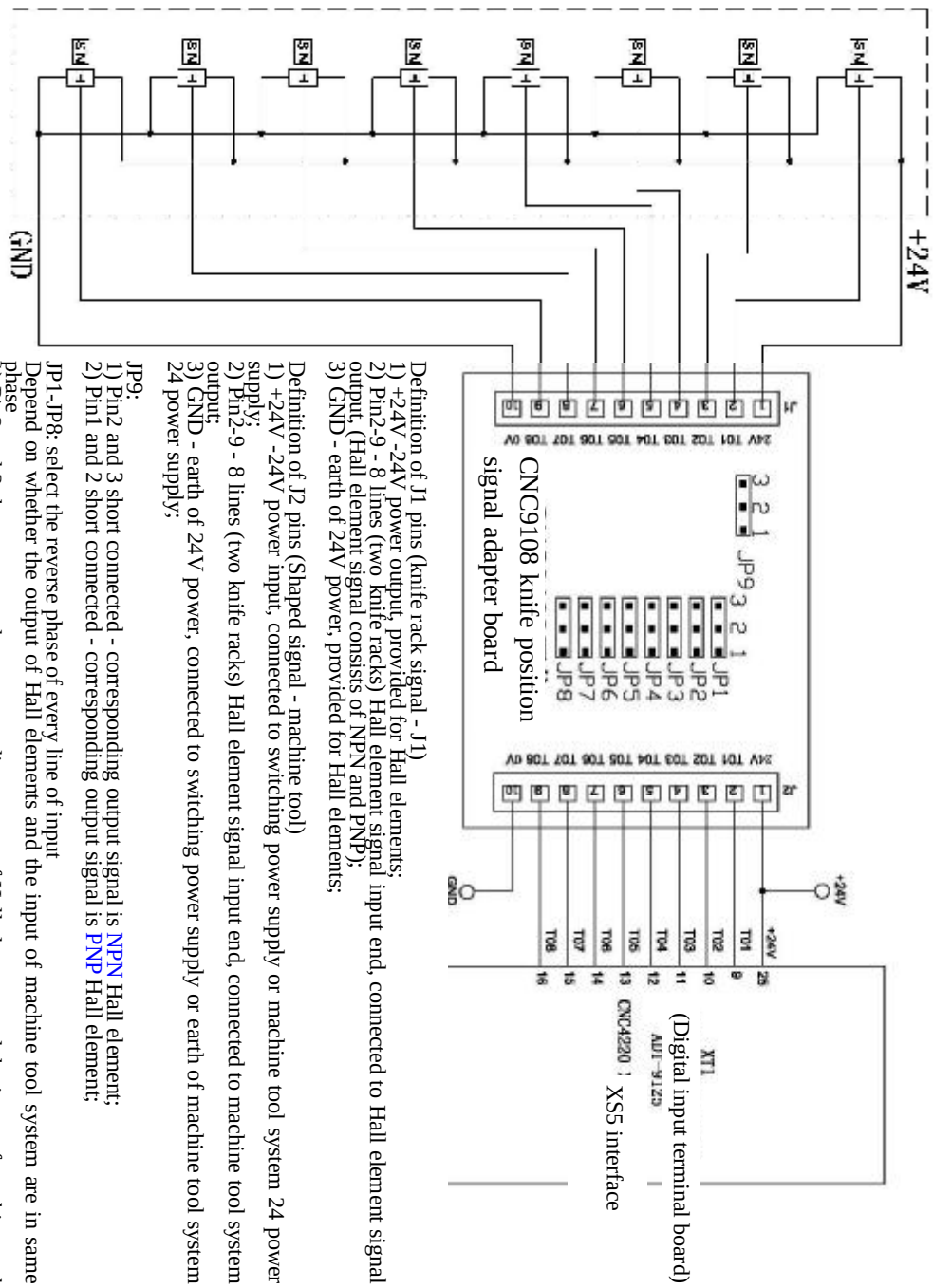


13.19.8 TAILSTOCK CONTROL WIRING DIAGRAM



13.19.9 ELECTRIC KNIFE RACK WIRING DIAGRAM

Knife position hall elements T01-T08

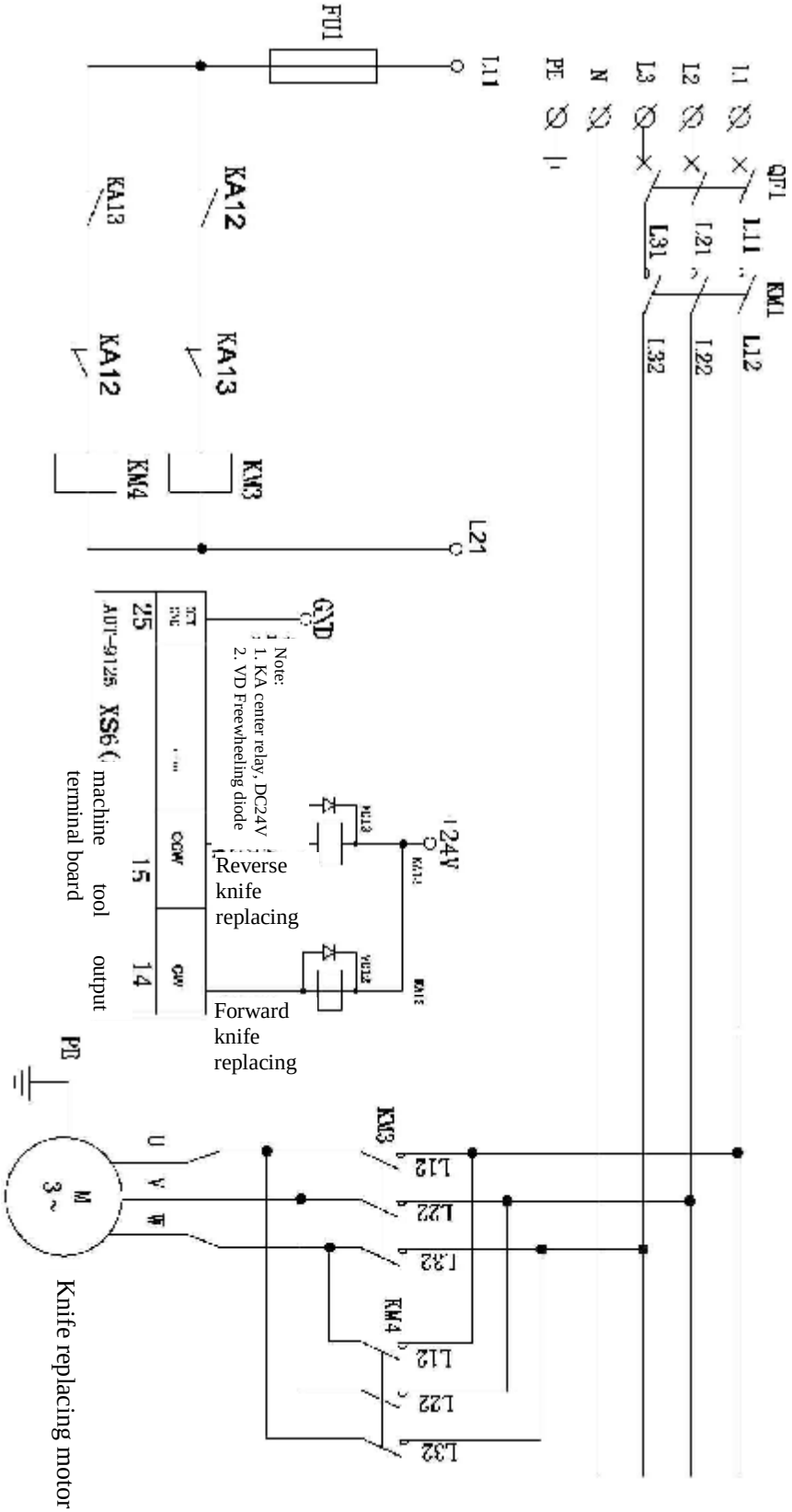


Definition of J1 pins (knife rack signal - J1)
1) +24V -24V power output, provided for Hall elements;
2) Pin2-9 - 8 lines (two knife racks) Hall element signal input end, connected to Hall element signal output, (Hall element signal consists of NPN and PNP);
3) GND - earth of 24V power, provided for Hall elements;

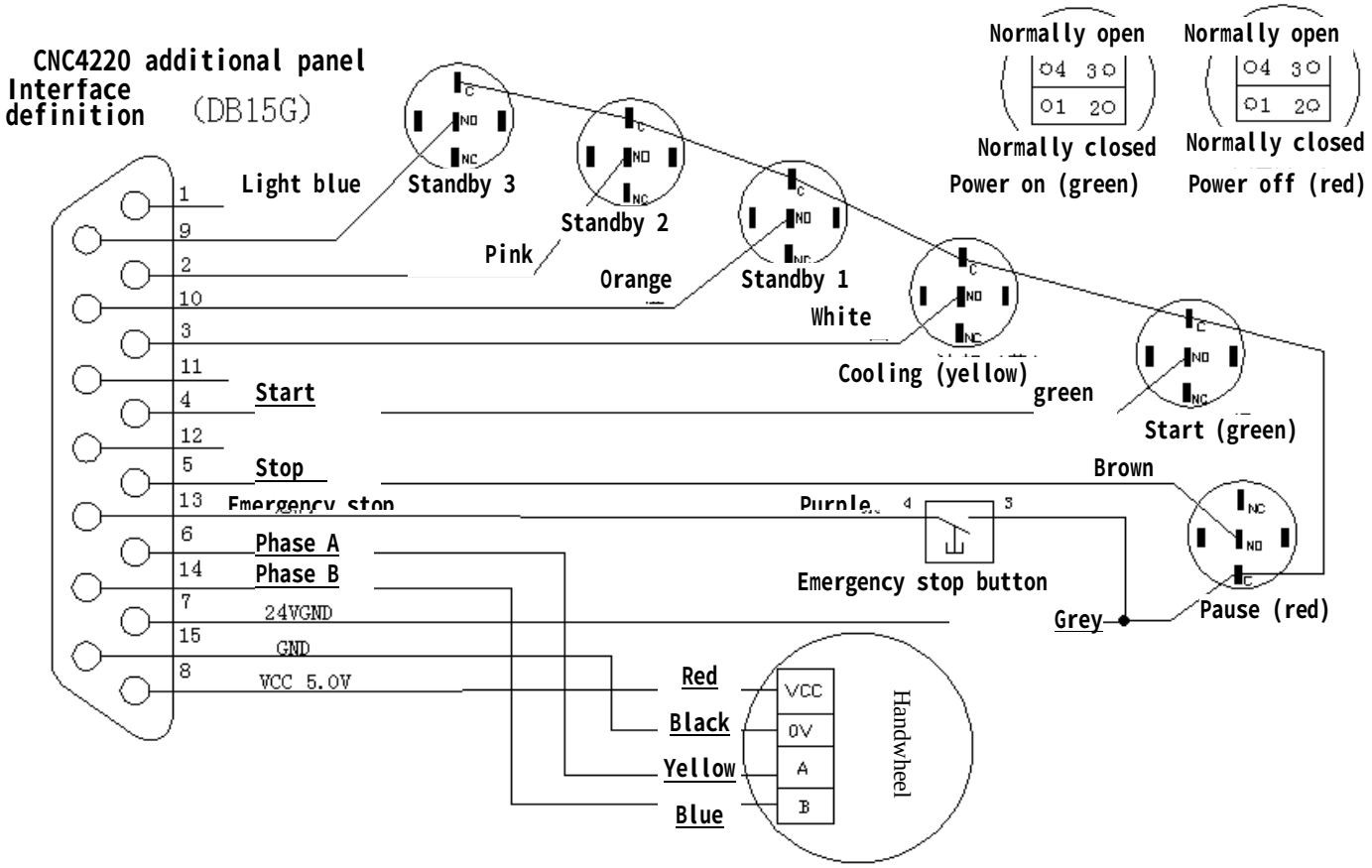
Definition of J2 pins (Shaped signal - machine tool)
1) +24V -24V power input, connected to switching power supply or machine tool system 24 power supply;
2) Pin2-9 - 8 lines (two knife racks) Hall element signal input end, connected to machine tool system output;
3) GND - earth of 24V power, connected to switching power supply or earth of machine tool system 24 power supply;

JP9:
1) Pin2 and 3 short connected - corresponding output signal is NPN Hall element;
2) Pin1 and 2 short connected - corresponding output signal is PNP Hall element;

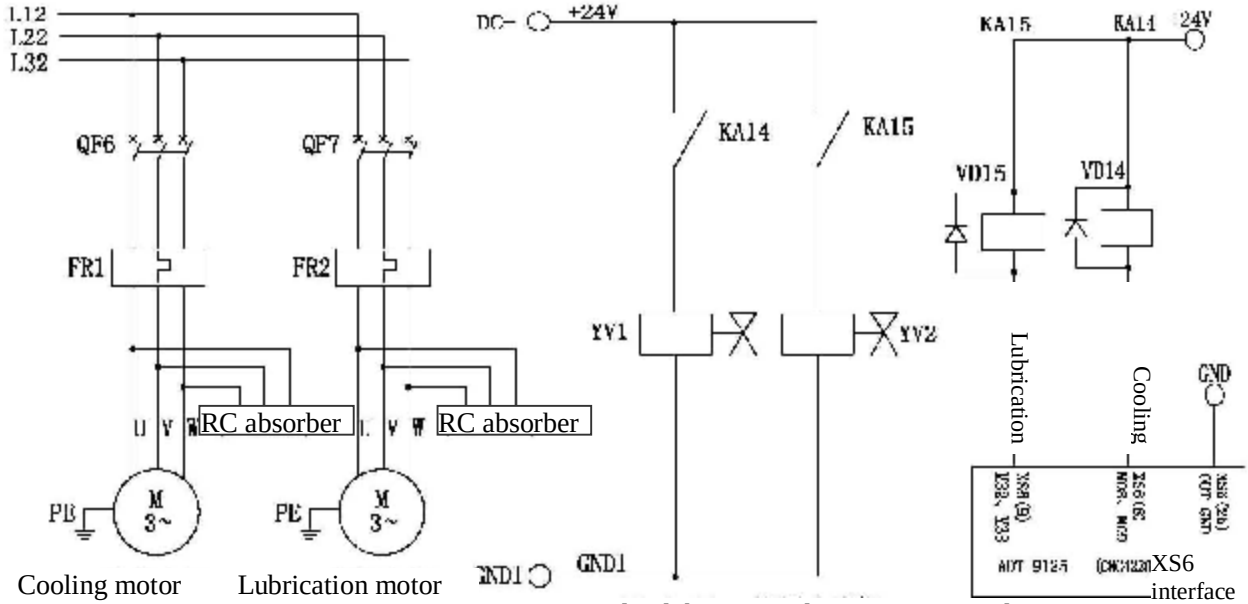
JP1-JP8: select the reverse phase of every line of input
Depend on whether the output of Hall elements and the input of machine tool system are in same phase
1) Pin2 and 3 short connected - corresponding output of Hall elements and the input of machine tool system are in reverse phase;
2) Pin1 and 2 short connected - corresponding output of Hall elements and the input of machine tool system are in same phase;



13.19.10 ADDITIONAL PANEL WIRING DIAGRAM



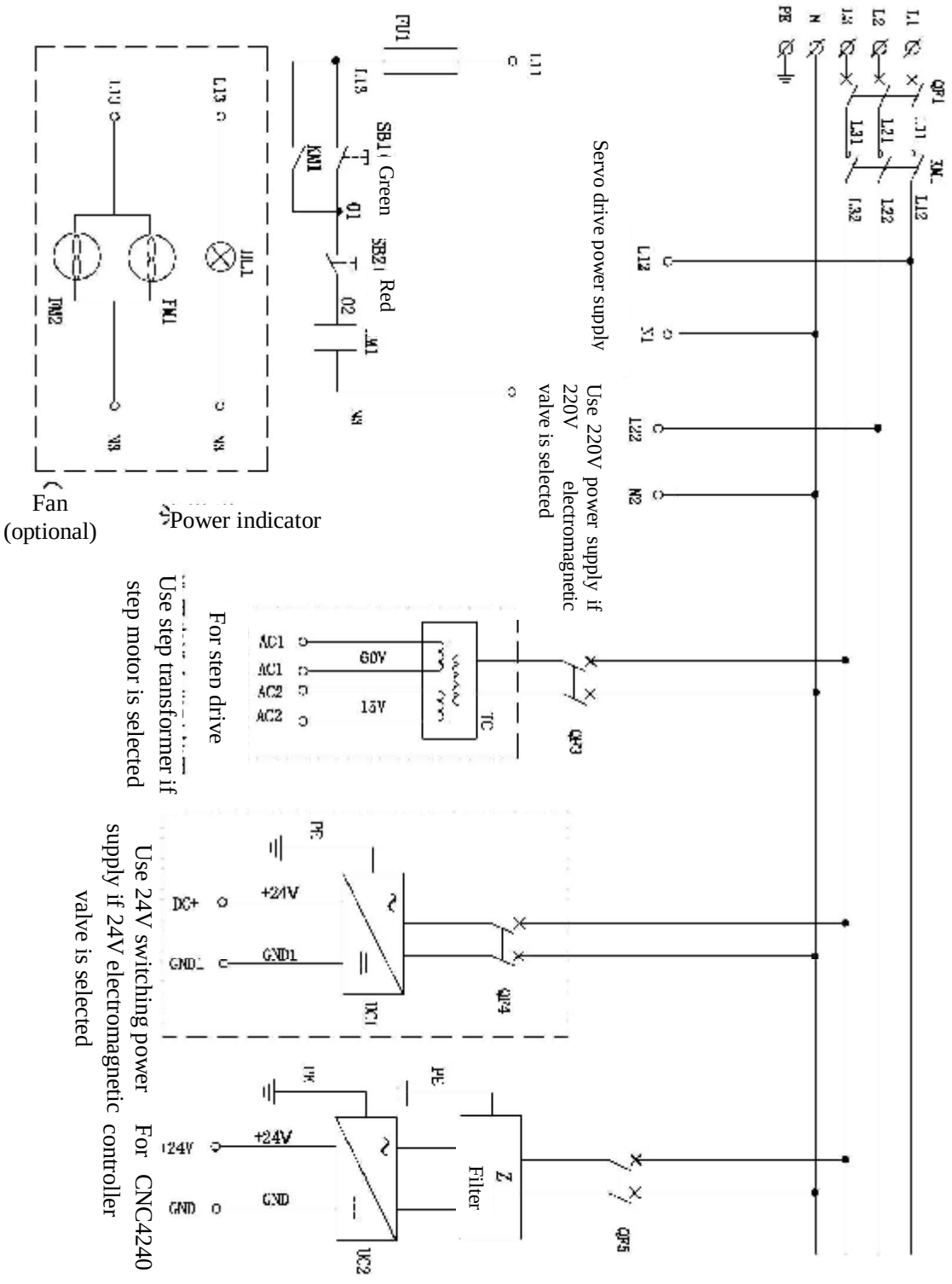
13.19.11 COOLING AND LUBRICATION WIRING DIAGRAM



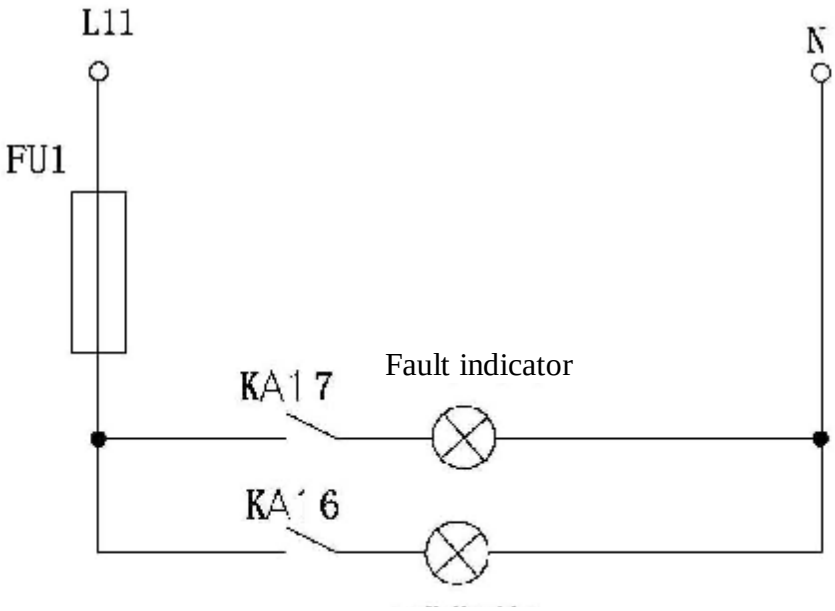
Cooling motor Lubrication motor interface

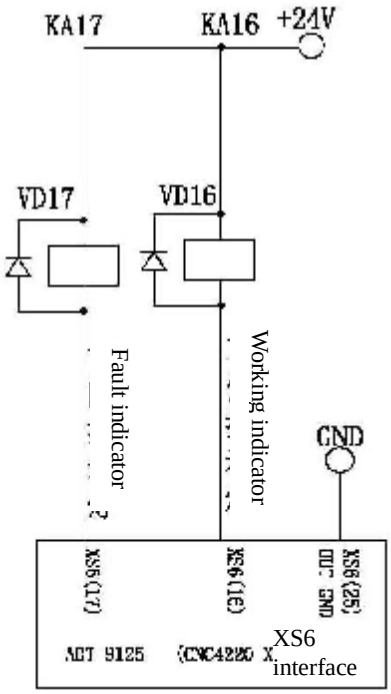
Cooling electromagnetic valve/lubrication electromagnetic valve

13.19.12 POWER SUPPLY WIRING DIAGRAM



13.19.13 INDICATOR WIRING DIAGRAM





13.19.14 INSTALLATION DIMENSIONS