

User Manual Robot Controller -A8- V1.1



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Chapter 1 Safety

Pay attention:

Before using the controller (Including install,work,transportation,maintain,detection), please read this manual carefully, after knowing all knowledge about safety.



Danger

Dangerous, could be injured or death !



Attention

Note, could be injured!



Forced

Must follow the noticed !



Forbid

Must forbid doing !

Even some places without “Attention” or “Danger”,but also need to be Note and very carefully.



Danger

- Before operating, press the Emergency button on the upper right corner.



- Before remove Emergency, need to solve the accident.



- Before using teach function in the motion range of robot, please follow the steps:

- Keeping in the front to watch the robot.
- Follow the steps.
- Please be careful in case of robot move to you.
- Please make sure the safe place in case of accident.
- Must make sure there is no person in the motion range of robot, the operator should be in safe place:
- When powering up the robot
- Using teach function
- Try to run

Please press emergency if somebody get in the motion range of robot or some accident happens.



Attention

Must be sure when operating

The operator knows how to operate.

Knows how it works.

Knows how dangerous it is.

★Need detect before using teach function.

The motion of robot is no abnormalities.

The original point is right or not.

The external accessory equipment is no abnormalities.

★The controller need to take care and put it to the fixed place after using
If the controller is falling down, it will cause robot motion to damage equipment or get somebody injury.



Forced

Safety operation

1 All operators need to know all function of robot and the safety operation.

2 Make sure there is no dangerous before running.

3 Must press emergency and power off when in the motion area.

4 Should watch and be careful when programming in case of press emergency in time.

5 No gloves when using teach function or move in manual, make sure it is in low speed.

6 Must know the function and how to stop the external accessory equipment.

7 Never trust the robot is stop, it maybe wait the signal to work the next program.

Chapter 2 Summary

SZGH-A8 robot controller use the international embedded bus type,the controlling circuit use the newest industrial high speed ARM CPU , Mass programming FPGA technology, multilayer PCB, the whole machine adopts high integration chip and surface mount element, the structure is more compact and reasonable, and better ensure the reliability and stability of the system.The software is module designed, to suit the different structure, industrial application requirements.The robot controller can realize vertical multi joint robot,vertical articulated parallelogram robot, vertical multi joint robot, L wrist shaped vertical multi joint robot, spherical wrist robot, Delta robot ,pole coordinate robot and so many kinds. It is widely used and could be worked in handling, welding, spraying, palletizing, cutting, polishing,welding and so on. The controller adopts bus structure with absolute motors, simple structure, practical and reliable.Use 800X600 TFT LCD technology, LED got uniform brightness and long service life.

2.1 Functional Characteristics

- 1) Structure optimization algorithm, adapt to the various kinds of robot;
- 2) Modular functions, to adapt to a variety of applications;
- 3) 8 axis control, could realize the auxiliary axis(walking axis, position control);
- 4) Adapt multi loop absolute motor;
- 5) Embedded bus type, easy and expand function;
- 6) 48x32 input and output points,edit PLC online;
- 7) all kinds of robot process function, simplify the programming and operation;
- 8) TCP function, tracking function of weld seam;
- 9) Security module structure, strong practicability, high reliability.

2.2 Technical Parameter

Axis	6 axis robot + 2 axis accessory axis
Controller	8 inch TFT-LCD, touch, mode switch, safe switch, emergency
Motor	Bus absolute type
Connection	1)48x32 input and output points; 2)2 ways for analog 0-10V output; 3)1 way for quadrature input of encoder; 4)6 ways for output of brake motor; 5)The special terminal for robot connection;
Operation	Teach,Reappear,Remote;
Programme	Keyboard,Teach,Technique;
Motion	Point to point,Straight,Arc;

Instruction	Motion,Logic,Calculation,Technique,alsocouldusethecode of CNC controller;
Coordinate system	JointCoordinate,UserCoordinate,ToolCoordinate,World Coordinate
PLC	Laddergraph,8000steps;
Alarm	Emergency,Driveralarm,Safetymaintenance,Arcing abnormal,coordinate system abnormal;
Type of robot	1) verticalmultijointserialrobot; 2) verticalarticulatedparallelogramrobot; 3) verticalmultijointLshapewristrobot;Polecoordinate robot; 4) SCARArobot 5) Deltarobot; 6) Specialrobot;
Application	Handling, welding, spraying, palletizing, cutting, polishing, forging, casting and so on



Attention

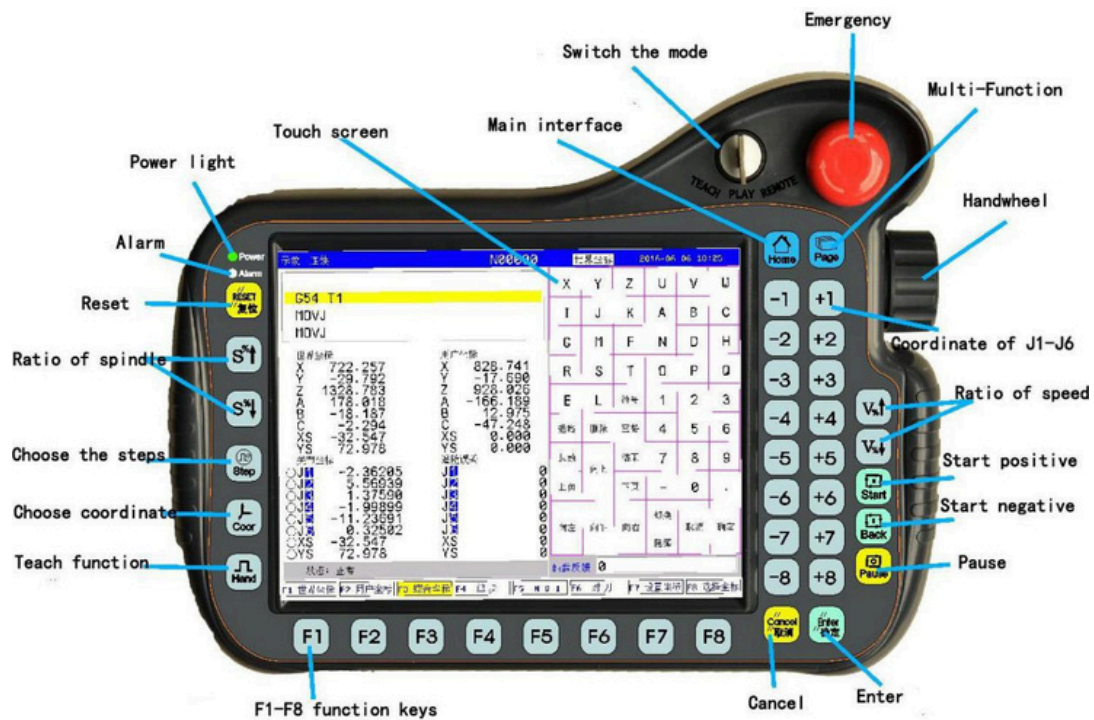
If the operation is wrong with our controller to cause some accident, read the manual and operate carefully, must follow the steps from manual, otherwise the result is no relations with our company!!!

Chapter 3 Operation

3.1 Summary

Knowing the parameter of controller, edit program, teach function, reappear function will be easy to use robot.

3.2 Controller



3.3 Function

3.3.1 Emergency



Note: Usage for emergency need match with the circuit, must be safe and reliable, otherwise it can't stop.

3.3.2 Switch the mode

Switch the mode



Usage for choosing the mode of operating the robot, total 3 kind of mode: Teach function, reappear, remote.

3.3.3 Safety switch

Safety switch



Safety switch is on back of controller, when the switch is pressed in the middle, the robot could move in Teach mode; If press it hard or loose it, the robot will stop, the controller will stop giving the signal.

Note: The switch got total 3 gears, the outermost and the innermost could stop the robot, only middle gear could let robot move.

Note: The person can't be in the motion range of robot, the robot will move when the press is in the middle, in case of accident.

3.3.4 Handwheel

Handwheel



There are 3 gears could be chosen, 0.001, 0.01, 0.1, chosen by

The handwheel also could be used in program, it means use handwheel to run the program, move handwheel positive, the program will run forward, move handwheel negative, the program will run back.

3.3.5 Function Key



Reset, to stop program;

Note: Reset may close some output (Related with PLC), be careful!

KEY	Function Explanation	KEY	Function Explanation
	Enter		Cancel
	Main interface;		Multi Function, could choose "program" "parameter" "compensation" "diagnosis"
	Choose the incremental value in teach function or handwheel mode;		Select the coordinate system in teach function, could choose "Joint" "User" "Tool" "World"
			F1-F8 Function Key
	The program will start forward in reappear mode;		The program will start backward in reappear mode;
	Pause, the program will pause when pressing this button.		
	To choose each axis of robot in teach function.		

Note: The robot will move when press Start. Must be carefully.

3.3.6 Adjust the ratio

(1) Ratio of rapid

Use VJ= to specify the ratio of rapid. For example, VJ=90, but the ratio can't be over 100%.

(2) Ratio of feeding



Total 16 gears in 0%~150%.

(1) Ratio of spindle



Total 16 gears in 5%~150%, it is set effectively for the first spindle S.

3.4 Teach operation

Switch the key into position of TEACH, press in the middle of safety switch, then could move each axis.

Be noticed when operating:

- 1)Keep watching in front of robot
- 2)Must follow the steps;
- 3)Think a plan in case of the robot will run to person to get injury;
- 4)Make sure the safety place;
- 5)The wrong operation may get somebody injury;

The controller use the first level operation, easy and fast, got full of information.

The controller is power up and enter the main interface, or press"Home" to enter main interface.

Tch Con		N00000		Joint		2018-02-05 11:26	
G54 T1 MOVJ VJ= 80.0 MOVL V= 50.0				Program 111 Progress G54 T01 D0 TrueFeed V0.000 M05 M09 M10 M78 M33 M70 MOVJ X 80% V180 X150% A3000 V1000			
Word X 819.556 Y 42.051 Z 1285.182 A -105.407 B -13.895 C -65.655 XS -12.918 YS -5.640		User X 19.556 Y 42.051 Z -4.818 A -105.407 B -13.895 C -65.655 XS -12.918 YS -5.640		Machine Coord X 819.556 A -105.407 Y 42.051 B -13.895 Z 1285.182 C -65.655 XS -12.918 YS -5.640 PartTime 0:0 PartNo 135 Encode 0			
Joint J1 2.93721 J2 -1.87226 J3 1.44314 J4 49.36526 J5 -67.33028 J6 23.84839 XS -12.918 YS -5.640		Feed Error J1 0 J2 -1 J3 -1 J4 -1 J5 -1 J6 -1 XS 0 YS 0					
No Alarm							
F1 Word		F2 User		F3 All		F4 STEP	
				F5 M D I		F6 Tool	
				F7 SetCo		F8 ChoCo	

Tch Con		N00000	Joint		2018-02-05 11:27		
1,The establish mode of rad	0	X	Y	Z	U	V	W
2,The cancel mode of radius	0	I	J	K	A	B	C
3,The program run need the	0	G	M	F	N	D	H
4,The running times of M20:	-1	R	S	T	O	P	Q
5,The counts of workpiece u	1	E	L	Symb	1	2	3
6,The delay time of feeding	0	Back	Del	Spac	4	5	6
7,The delay time of segment	0	Home	Up	End	7	8	9
8,Delay time of G00 (ms) [>1	0	PgUp		PgDn	-	0	.
9,Continuous motion is work	1	Left	Down	Right	Alt	Esc	OK
10,M03/M04/S is detecting s	1				Hide		
11,The number of pulse of e	10000	Encode 0					
12,The alarm value of spind	1						
13,Detect the feedback posi	1						

No Alarm

Encode 0

F1 Process
F2 Speed
F3 Axis
F4 Technics
F5 Other
F6 Coord
F7 PASSWD
F8 CANCEL

Press right side of screen,it will shows the touch keyboard.

Press “Page” to enter the program management, could edit, modify,search, delete, copy and so on.

Press “Page” again to enter parameter management, could modify and check parameter.

The Teach function is used for adjust the coordinate of robot and the motion of accessory axis to programme.

Adjust position of touch screen:If the position of button is wrong,you can press”6” or “Pause”in code parameter and press enter, then restart the power.

3.4.1 Button in Teach function

- (1)“F” or “V”:Set the feeding speed of Joint;
 - (2)“Step” or “Hand”:Switch “Continuous”,“ Incremental”,“Handwheel”.
 - (3)“S” or “A” : Set the speed of the first spindle (The first analog output), the max value is up to the No.43 parameter in speed parameter.
 - (4)“I”:Modify the value of I in Step mod.
 - (5)“T” : Set the number of the current tool and TCP point in world Coordinate as the base point of tool set.
 - (6)“V↑” : The ratio of feeding speed will increase 10% if press once, total 16 gears in 0—150%.
 - (7)“V↓” : The ratio of feeding speed will decrease 10% if press once, total 16 gears in 0—150%.
 - (8)“S↑”:The ratio of spindle speed will increase 10% if press once, total 16 gears in 5—150%.
 - (9)“S↓”:The ratio of spindle speed will decrease 10% if press once, total 16 gears in 5—150%.
 - (10)“R”: The current user coordinate backs to zero point, input “XYZABC78” correspond to “XYZABCXsYs” go back to zero point,if input “0”, then all axis go back.
 - (11)“Set coordinate F7”:In user coordinate system(G54.1-G54.48/G54-G59) to set the value of(G54.1-G54.48/G54-G59), update the value of coordinate system; Use “MDI” or F8 to set the user coordinate system(G54.1-G54.48/G54-G59).
- 3-points method to set user coordinate system: P1 as original point O, P2 as the direction of +X,

P3 as the direction of +Y.

(12) Feed coordinate: Press "+1,-1,+2,-2,+3,-3,+4,-4,+5,-5,+6,-6,+7,-7,+8,-8" correspond to J1-J6,Xs,Ys to move + or -.

(13) In the mode of teaching function, first press "Home" + "S↑" output M03, press "Home" + "S↓" output M04, it will stops the motion when not press.

(14) "Tool set F6" or "H", use for making sure the coordinate in tool coordinate system.
Two methods to set tool coordinate of 6 axis robot: 3-points and 5-points.

(A) 3-points: P1P2P3 for changing the motion of robot and keep the TCP point to be the same position, the motion of 3-points tool coordinate is the same as motion of electrical connection coordinate system. (The coordinate system of the 6th axis flange of robot wrist).

(B) 5-points: P1P2P3 are the same as 3-points, but the motion of tool coordinate system is settled by P3P4P5. P3 means the original position, P4 means the direction of +X, P5 means the direction of +Z.

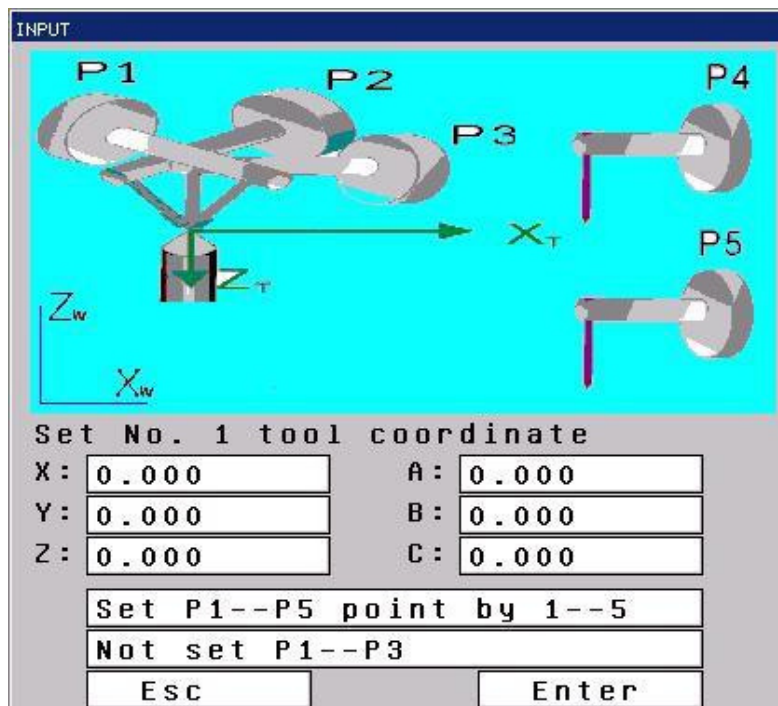
Press "Start" in the set process, the statues will show "O", then press "12345" to adjust the speed to back to the point set the last time, easy to modify. After once operation, this function will be closed automatically.

The posture of P3P4P5 in 5-points need to be the same (Value of ABC in world coordinate should be the same) [The interface needs to be without N letter]. So it is necessary to convert into the world coordinate system after setting of P3, then move the robot to set P4 in the direction of X axis and P5 in the direction of Z axis.

After input P1P2P3 3 points in tool set, the controller will calculate the position and posture of tool coordinate in world coordinate, if 3 points is too near, then it can't be exist P1P2P3, the controller can't calculate the value, it will delete P2P3 automatically.

XYZ of tool set mean the original point of tool coordinate in world coordinate, ABC mean the 3 axis posture in space (position and direction) of tool coordinate in world coordinate.

Note: P1P2P3 in 3-points need be different posture; But the tool posture of P3P4P5 in 5-points need to be on the same straight line (It is fine if it isn't straight line, just the direction of Z axis in tool coordinate is not on the same straight line with weld gun)



3.4.2 Flush function of robot

Press "-" or "," on controller, it will flush according to the MOVL mode, the speed is the

speed in teach.

Press “.” or “J” on controller, it will flush according to the MOVL mode, the speed is the rapid speed of each joint.

Flush function is let the tool coordinate system parallel or perpendicular to user coordinate system or world coordinate system.

3.4.3 Switch feed mode of wrist joint

The world coordinate or user coordinate in teach mode, press “N” in main interface could switch the feeding mode of wrist joint.

When the interface shows N letter, it means move XYZ is the motion of J1J2J3 of world coordinate or user coordinate in teach mode, the J4J5J6 will not move, it means not consider the change of robot posture in the end, just consider the flange position of robot in the end. In the same time, interface of user coordinate show the flange of robot in user coordinate. In the same time, interface of world coordinate show the flange of robot in world coordinate.

When the interface didn't show N letter, it means when it is world coordinate or user coordinate in teach mode, the end posture of robot will be keep the current status when move XYZ, the end position of robot will be keep the current position when move ABC. The interface of user coordinate will show tool TCP of robot in user coordinate. The interface of world coordinate will show tool TCP of robot in world coordinate.

3.4.4 Calibration or tool set of robot, the easy operation when locating

Firstly, move J4J5J6 in joint coordinate, or move A or B or C of world coordinate in wrist feeding mode to modify the posture (Only J4J5J6 move, J1J2J3 will not move). The posture of P1 is more important when tool setting, the axis of weld gun need perpendicular to workpiece. Move X or Y or Z to the target point in world coordinate in wrist feeding mode (only J1J2J3 move, J4J5J6 will not move).

3.4.5 Choose coordinate system



Press  to choose the coordinate system, in the teach mode, could choose “Joint coordinate” “User coordinate” “Tool coordinate” “World coordinate”;

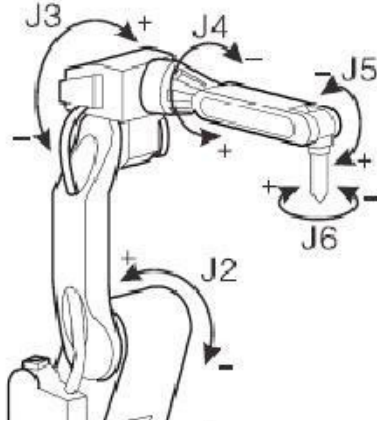
1) Joint coordinate system

The robot move along the each axis line, all used coordinate system named joint coordinate system.

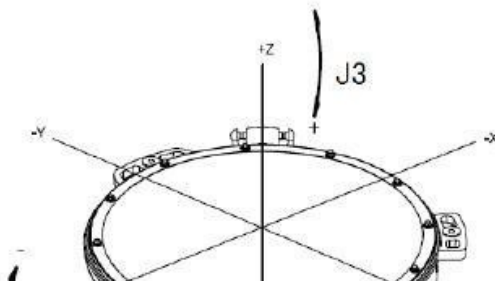
The joint coordinate system is settled down when robot is settled down, can't change.

The controller can support many kinds of robot, please look up to the definition of robot to make sure the motion direction of each joint coordinate system, example:

A. Six axis serial joint robot



B. 4axis Delta robot



C.4 axis rotary joint palletizing robot



2) World coordinate system

World coordinate of robot, named right angle coordinate, also named ground coordinate, the same as robot coordinate in cnc controller. Different kind of robot correspond to different direction of right angle coordinate, the different right angle coordinate correspond to different original position.

After setting the relative parameter of robot, the zero point and direction can be made sure, can't modify the right angle coordinate if not to modify the parameter.

Wherever the robot, it can along X axis, Y axis, Z axis move parallelly. For 6 axis robot, it also could rotate A, B, C, A axis rotate around X axis, B axis around Y axis, C axis rotate around Z axis, according to the right-hand rule.

3) Tool coordinate system

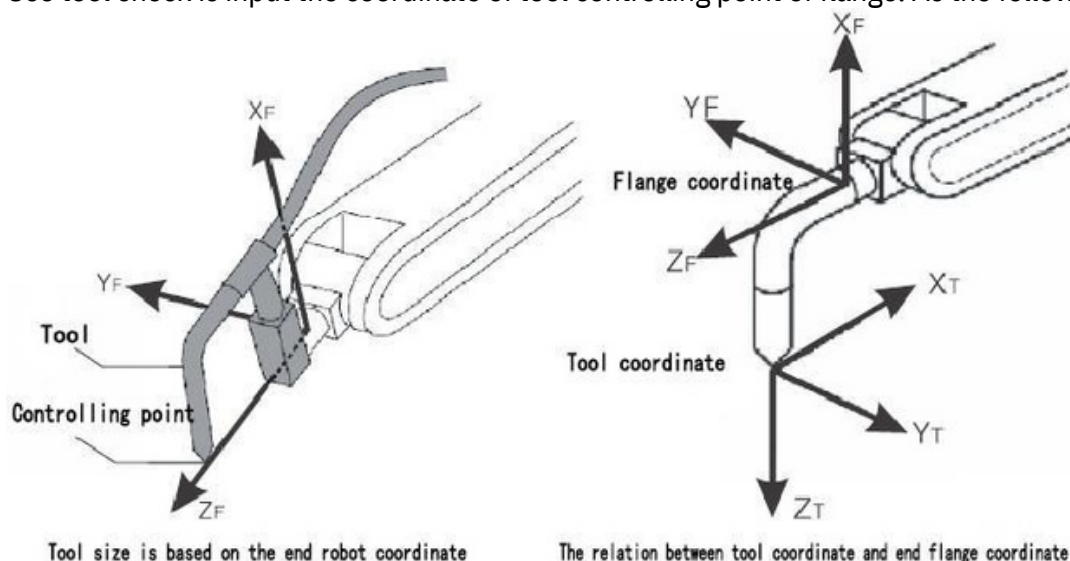
The tool coordinate is the same as tool set coordinate in cnc controller, tool coordinate make the effect direction of the tool in flange of robot wrist as Z axis, and define the coordinate as the tip point of tool. No.0 tool coordinate is the base tool coordinate, can't be modified.

So the direction of tool coordinate is changing when the wrist is moving.

The tool coordinate move according to the direction of tool, no relative with position of robot or posture, so it is better to move parallelly so that not to change the posture of tool.

The robot carries out the straight line interpolation, the circular interpolation and so on interpolation movement need to input the right size information of tool, position of definition controlling point. Build tool coordinate is by the different data of 6 groups of end robot, the controller will calculate the position of tool controlling point.

Use tool check is input the coordinate of tool controlling point of flange. As the following:

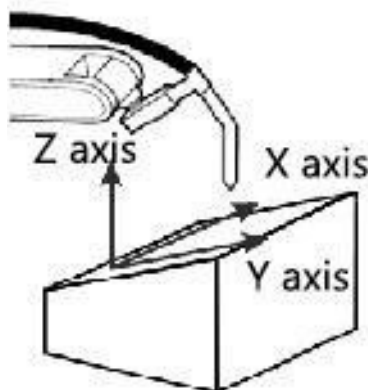


1) User coordinate system

The robot move parallel to the specified each axis in user coordinate. User coordinate is the same as workpiece coordinate in CNC controller.

In other coordinate system except joint coordinate, all could just change the posture of tool, no need to change the position of tip point tool(controlling point), named invariant movement of controlling point.

G53 user coordinate is the base, can't be modified, the same as right angle coordinate. User coordinate could be set by G54/G55/G56/G57/G58/G59/ G54.1-G54.48



The usage for joint and world coordinate, use the switch for changing the mode, and then use +/- to move the robot or programme.

User and tool coordinate need 2 conditions, use the suitable coordinate number, change into suitable coordinate system. After these conditions, you can use Teach function to programme in this coordinate.

Note: The coordinate you choose will be taken into the teach program when editing in the teach mode, so need to make sure the coordinate system.

3.5 Reappear(PLAY) operation

Switch the mode into reappear (PLAY) position.

PLAY mean reappear the current editing or teaching program. The controller could work in any point, from any line to work. If work from any point or any line, then need edit with absolute coordinate. Reappear function can't work with teach.

Select the running program: Press “↑” “↓” to select the program and press “C”.
To change to coordinate: Press “F1” “F2” “F3” to change “world coordinate” “User coordinate” “comprehensive coordinate”.

3.5.1 Start

Choose “Single or continuous”: Press “F4 single” to switch.

“Continuous” means after pressing “start”, the program will run until to the end or stop instruction.

“Single” means only run the current segment of program, press “start” again to run the next segment.

3.5.2 Start from any line

A Start from real line

Press “-” to input the number of line in reappear mode, press Enter to make sure, or Press “↑, ↓” to select the program line in status of reappear coordinate, this line will be the start line. It will start from the input line when press “start”.

Note:

1. This line is the real line of the program, not the line is specified by N.
2. Start from the real line, the default line is the line when pause the program, so that user could operate easily.

B Start from marked line

The controller could start the program from the marked line. Press “N” in reappear mode and input the number of line which be marked, press enter to make sure. It will start from the number of line you enter when pressing start.

3.5.3 Program start

First change into reappear (PLAY) position, there are two ways.

(1) Press “Start” on panel or connect external “RUN” signal.

(2) Press “Back”, the program goes back (No.14 parameter in other parameter need to be 40).

3.5.4 Program stop

Program stop:

- (1) Instructions M00, M01, M02, M30, M20;
- (2) Press “Single” to move a segment and stop;
- (3) Connect external “HALF” signal, the program will pause;
- (4) Press “Reset” to stop all motion of robot.

3.5.5 Real-time control in reappear

- (1) Modify rapidly: By VJ instruction;
- (2) Feeding speed: Press “V ↑” “V ↓”. changed by 10%.
- (3) Spindle speed: Press “S ↑” “S ↓”. changed by 10%.
- (4) Stop in process: Press “Single” in continuous mode, it will finish the current segment and wait for the next signal.
- (5) Pause: Press “Pause” or connect external “HALT” to pause. Press “Run” or “Start”, it

will continue; Press “Reset”, it will quit the status of reappear, at the same time, the program will go back to the first line.

- (6) Keepfeeding:Whenitispause(externalHALT,press“Pause”or“Single”),change the mode into “Teach”, keep feeding in reappear, could adjust the coordinate, change the mode into “PLAY” mode, press “Start”, it will move to the point of pause and continue to work.

- (7) Quitprocess:Press“Reset”.

3.5.6 MDI

Press “F5 MDI” to enter MDI mode in “Teach” or “PLAY”. “MDI” mode is input segment of program, run segment of program, press “Back” in the process to quit, press “Start” to run.

3.5.7 Handwheel

Press “Hand” in “PLAY”, it will goes in handwheel process mode, the program will run by handwheel. F speed and ratio of feeding according to the speed of handwheel rotate. Usually this method is used to try to work with program.

3.6 REMOTE Operation

Remote mode: Many robots connect together to control remotely.

“Start”“Back”“Pause” on panel are no effective in remote code, only use “RUN” and “HALF” signal to control.

The “start”, “back”, “pause” on the panel are disabled in remote mode, only remote control by signal RUN and signal HALT.

3.7 Safety operation and alarm

3.7.1 Emergency stop

The controller will stop all motion of robot when pressing this button, the controllers show emergency and wait for pressing up the button. M67 output the effective signal when No.19 parameter in other parameter set as effective.

It is the best to run “M500” to read the position of motor again if press this button when robot is working, because it maybe cause the position change.

3.7.2 Reset

The controller will stop all operation when pressing this button.

3.7.3 Alarm

The screen will show the tip of alarm, the light will be red, the movement and program will stop, need to make detection to clear. No.19 parameter in other parameter to set M67.

3.8 Parameter

Press “Page” to enter. The parameter includes “Processing” “Speed” “Axis” “Technique” “Other parameter” “Coordinate” “Code”.

Note: The instruction of controller contains parameter of CNC controller, so there is some parameter about CNC.

Tch Con		N00000	Joint						2018-02-05 11:27	
1, The establish mode of rad	0		X	Y	Z	U	V	W		
2, The cancel mode of radius	0		I	J	K	A	B	C		
3, The program run need the	0		G	M	F	N	D	H		
4, The running times of M20:	-1		R	S	T	O	P	Q		
5, The counts of workpiece u	1		E	L	Symb	1	2	3		
6, The delay time of feeding	0		Back	Del	Spac	4	5	6		
7, The delay time of segment	0		Home	Up	End	7	8	9		
8, Delay time of G00 (ns) [>1	0		PgUp		PgDn	-	0	.		
9, Continuous motion is work	1		Left	Down	Right	Alt	Esc	OK		
10, M03/M04/S is detecting s	1					Hide				
11, The number of pulse of e	10000									
12, The alarm value of spind	1									
13, Detect the feedback posi	1									

No Alarm Encode 0

F1 Process
F2 Speed
F3 Axis
F4 Technics
F5 Other
F6 Coord
F7 PASSWD
F8 CANCEL

3.8.1 Processing parameter

★1, The establish mode of radius C compensation

The establish mode of radius C compensation in G41/G42, 0 means A type, 1 means B type.

★2, The cancel mode of radius C compensation

Set the cancel mode of radius C compensation in G41/G42, 0 means A type, B means B type.

★3, The program run need the spindle rotate [1 means Yes, 0 means No]

For interlock between program and spindle, to set if detect rotation of spindle or not while program running. If set as 1, the spindle needs rotate when program running (Need detect the encoder rotation when it is M03); Set as 0, then no need to detect.

★4, The running times of M20

The loop times of M20 in program, infinite loop when it is minus.

★5, The counts of workpiece will be counted automatically [1 means Yes, 0 means No]

Reappear counts of program, if it is 1, the count of workpiece will add by one automatically when running M30, M20, M02.

- ★6, The delay time of feeding axis to go reversal(ms) Set it as 0 when it is highly requirement.
- ★7, The delay time of segment in G01/G02/G03(ms)(>100 effective) This parameter solves the overcut problem in the corner.
- ★8, Delay time of G00(ms)(>100 effective)
- ★9, Continuous motion is worked in G00[16 means Yes, 1 means No] If set as 16, then it will not reduce, continuous work.
- ★ 10, Instruction M03/M04/S is detecting the rotation speed of spindle to the requirement(0 means detect M69 relay, 8 means detect the feedback of encoder)

When setting as effective, must detect the rotation speed of spindle and wait for the speed to the requirement and run the next segment of program.

- ★ 11, The number of pulse of each round of spindle encoder.(4 times the number of encoder)
- ★12, The alarm value of spindle encoder(Diagnosis value)[>10 effective] Set it as the same as the diagnosis value.
- ★13, Detect the feedback position of spindle(1 means Yes, 0 means No)

Set it whether to detect the feedback signal of spindle position, the spindle encoder signal. 1 means to detect, 0 means not to detect.

The parameter applies to functions about speed of spindle such as real rotate speed and feeding value. Precondition of these function is feedback signal of spindle encoder matching with spindle by transmission ratio of one to one.

- ★14, Set the error of encoder feedback detection(rpm)

The error range between the real speed and the set speed.

- ★15, Detect the overcut in G41/G42 tool compensation or not(2131970 means detect strictly, 34818 means not to detect, 6326274 means read ahead rapidly)
- ★16, From the end of the last segment program if start from the middle line.[8 means Yes, 0 means No]

Set as 8, it will starts from the end of the last segment program.

- ★17, Start the program by the input point [D2-D7(+4...+128) correspond to X26-X31, D8-D15(+256...+32768) correspond to X16-X23]

Set as +4+8=12, when X26 or X27 is effective to choose the program HIDEFILEX26 or X26 or HIDEFILEX27 or X27.

- ★18, The protection time of screen(minutes)(<2 not to protect)

3.8.2 Speed parameter

★1-6, The speed of J1-J6 MOVJ(degree/s)

The most speed of J1-J6 MOVJ in rapidly speed instruction

★7,8, G00 speed of Xs,Ys axis(mm/min) The max speed G00 of XsYs axis

★9, The max feeding speed in teach(mm/min)

Note: Set as 50% to make sure the safety.

★10, The max feeding speed in PLAY(mm/min) The max is 30000

To make sure the efficiency, could set this to bigger than G00.

★11, Default speed of MOVL/MOVC(mm/min)

If the first interpolation not specifies the speed, this will be the speed in PLAY.

★12, The speed of idle running(mm/min)

★13, Feeding speed in teach(mm/min) The range: The max feeding speed in teach

Note: Press F or V to set in teach, it will refresh this value

★14, The rotation speed of spindle in teach(rpm)

Note: Press S or A to set in teach, it will refresh this value

★15, The initial speed of feeding axis(mm/min)

If the running speed of feeding axis is lower than this, it will reach to the speed directly, if the running speed of feeding axis is higher than this, the start speed with this and reach to the set speed.

Note: This value is relative to the equipment of robot, not suitable will cause accident or fault.

★16, The max variety value in the moment of feeding axis(mm/min)

In case that speed of feeding axis changed when setting interpolation of multi-axis consecutive track, to insure the max variety of all axis speed while interpolating resultant speed. It means if increment of variety over the value, it will accelerates (or decelerates), if less than the value, it will reach directly. The value applies for contributing consistency of multi-axis consecutive track interpolation.

★17, Limit the speed of G1G2G3[1 mean Yes, 0 means No]

To limit the max speed of all joints during interpolation. 1 refers to limited, 0 refers to unlimited.

★18-25, The max speed of XYZABCXsYs axis in G1G2G3(mm/min)

★26, The acceleration and deceleration constant in PLAY[>=500]

Normally not to set this parameter, it just needs to be set when there is a big difference between PLAY and teach.

★27, The speed when handwheel is stop(mm/min)[>18] The bigger value is, the sooner it will be stop.

★28, The acceleration and deceleration constant of handwheel[500--30000] The bigger value, the sooner will be faster and slower.

★ 29, The acceleration and deceleration constant of handwheel runs program [>500]

The range is 500-32000, the bigger value is, the sooner it elevates and decreases.

Note: Invalid when lower than 500, each axis will work according to the normal.

★30, The speed of handwheel in G00(mm/min)[>10] The speed of handwheel in idle running.

Note: Invalid when lower than 500, each axis will work in G00 according to the normal.

★31, The type of acceleration and deceleration[0 means straight line, 8 means curve line(S type)]

Note: The set is relative with driver, normally, step type use curve, servo use straight line.

★32, The initial acceleration and deceleration constant in curve type[>=10] The bigger value is, the sooner it accelerates.

Note: Effective bigger than 10.

★33, Quadratic constant of acceleration and deceleration in curve[>=10] The bigger value is, the sooner it accelerates

Note: Effective bigger than 10.

★34, The max acceleration and deceleration constant in curve[>=500] The bigger value is, the sooner it accelerates

Note: It is effective when bigger than 500, otherwise only use straight line.

★35-42, The speed backs to reference point of XYZABCXsYs axis (mm/min) [>1]

★43-47, The max rotation speed of spindle in high gear(rpm)

Set the rotation speed which 10V instruction is specified.

Note: The first spindle use S or AA, the second spindle use SS or VV.

★48-51, Interpolation compensation in Arc(+1 means length compensation +2 means fixed loop compensation is specified by G17G18G19, +4 means from center of circle to the end point which is IJK, +8 means the compensation way B of interpolation is specified by parameter)

When D3=0, A type: When interpolation compensation of arc reversal, the speed of compensation is effective with reversal interpolation value, the bigger value, the faster speed to make sure tool will not pause, but the compensation speed can't over 10000mm/min;

+8(D3 bit), B mode: When interpolation compensation of arc reversal, the compensation speed is specified by No.49-No.51 parameter.

+1(D0 bit): Length compensation mode is B mode, otherwise is A mode. A mode is always compensating in Z axis, B mode is specified by G17/G18/G19, G17 compensate Z, G18 compensate Y, G19 compensate X.

+2(D1 bit): The fixed loop mode is B mode, otherwise is A mode. A mode is always compensate in Z axis, B mode is specified by G17/G18/G19, G17 compensate Z, G18 compensate Y, G19 compensate X.

+4(D2 bit): IJK is coordinate from the end point to centre of circle in arc programme, plus 4 means the IJK is to the end point in G02 G03, otherwise is to start point.

★52, The start reduce speed in hard limit(mm/min) Servo needn't reduce, set as 1 normally.

★53,Active speed pre-treatment function[1 means Yes, 0 means No] Set as 1 to active, set as 0 not to active.

★ 54-58,Start the smooth function(+4 means teach;+8 means handwheel;+16 means program in PLAY)

The range is 50-100, smaller value corresponds the faster reduce, but bigger vibration. The time constant is set by No.55-No.58.

★100-105,The max speed of J1-J6 in teach when not in joint coordinate system(deg/min)[>1]
Not in joint coordinate means world coordinate or user coordinate.

★106-111,The max speed of robot J1-J6(deg/min)[>1]

★112-115,The additional ratio of robot handwheel in world, user, tool coordinate[1-10]

Maybe the robot work discordant for nonlinearity, set this value will be better, No.113-No.115 have the same function.

★116-123,The starting speed of robot J1-J6 XsYs(deg/min)[>=1]

Set initial speed when J1-J6 XsYs starting to work, also the end speed when reduce the speed. If the running speed of feed axis is lower than this value, there is no process to raise or reduce speed, if over the value, acceleration start from the value.

★124-131,The max variety value of robot J1-J6 XsYs(deg/min)[>1]

Mainly set this to insure max variety increment of all axis during interpolating resultant speed in case of speed change in continuous track interpolation. Applies to coherence of multi-axis interpolating continuously.

★132-146,The acceleration and deceleration constant of robot J1-J6 XsYsXYZABC(deg/min)/s)

[>1] The range: 1-99999.

Note: The value is relative with robot equipment; wrong set will cause some fault or accident. Usually, the more heavy, the smaller value.

3.8.3 Axis parameter

★1,Soft limit [D2 means X axis;D3 means Y axis;D4 means Z axis;D5 means A axis;D6 means B axis;D9 means C axis;D10 means Xs axis;D11 means Ys axis;1 means not limit;D12 means MOVE;D14 means no limit in changing tool]

Set each axis in each bit. 1 means valid soft limit in corresponding bit, 0 means invalid.

Format: D15D14.....D1D0.

Example: If set soft limit of X axis, then set as:00000100

★ 2-17, The max movement in positive and negative direction of XYZABCXsYs axis(mm)

This value is based on the world coordinate system.

★18-29,The max movement in positive and negative direction of J1-J6(deg) The value is based on the joint coordinate system.

★30-37,Reversal interpolation compensation of J1-J6 Xs Ys(um)

To set the reversal interpolation of transmission gear when axis move reversal.

System will invoke the value to compensate when reversal movement of the axis.

★38-42,The direction signal of J1-J5[1 means normal, 0 means reversal]

If the value is 0, the joint will move to reversal direction from instruction. Otherwise if it is 1, the direction is the same to instruction.

★43,The reversal direction signal of J6 Xs Ys(+2 means J6,+4 means Xs axis,+8 means Ys axis)

Set as 0 means reversal direction, set as 1 means the same as direction is specified.

★44,Close the electrical gear of feeding axis[1 means Yes, 0 means No]

★45-56,The numerator and denominator of electrical gear of J1-J6(1-999999) numerator=10000 x Reduce ratio;denominator =36000000;

★57-60,The numerator and denominator of Xs Ys axis(1-999999) numerator =10 x Reduce ratio; denominator=Screw pitch;

★61,The requirement for feeding axis back to zero point [1 means no need, 0 means prompt, 8 means force, 9 means super force]

Set as 0 means no need, system will not prompt and limit when power on.

Set as 1 means prompt, system will prompt but no limit when power on.

Set as 8 means force, system will prompt when power on, and if no operation of back reference point, it will refuse to execute program.

Set as 9 means super force, motion system of feeding axis will prompt when power on, and if no operation of back reference point, it will refuse to execute motion.

★61-1,The type of feeding axis back to zero point[0 means detect zero point reversal; 1 means not detect zero point reversal; 2 means]

Few methods for setting detection switch and zero pulse signal of motor encoder when each axis is backing to zero point:

Set as 0: When backing to zero point, crush to the reference switch, running reversal after the switch is off, then detect the zero pulse signal of motor encoder.

Set as 1: When backing to zero point, crush to the reference switch, running reversal after switch is off.

Set as 2: When backing to zero point, crush to the reference switch, continue to run after the switch is off, then detect the zero pulse signal of motor encoder.

Set as others:When backing to zero point, crush to the reference switch, continue to run after the switch is off.

According to the circuit to set, normally suggest to set as 0 or 2, if not to detect the zero pulse signal of motor encoder, the accuracy will be worse, it only base on switch of reference point.

★61-2, Bit parameter of the direction of backing to zero point[D2 means X; D3 means C(Y); D4 means Z; D5 means A; D6 means B; D7 means B; D8 means C; D9 means Xs; D10 means Ys] 1 means negative, 0 means positive Exclusive setting of direction and sequence for every axis.

Example: If X axis need back to zero point negative, set as: 000000100

★61-3, Normal close bit parameter of the switch of backing to zero point D0 means X, D1 means Y, D2 means Z, D3 means A, D4 means B, 1 means normal close, 0 means normal open.

Example: If X, Y, Z axis are all always close switch, set as:000000111

★61-4/61-9, The offset after X/Y/Z/A/B/C is backing to zero point(10um)

★61-11/61-16, The coordinate after J1-J6 is backing to zero point(Degree)

★62, Floating zero point [D3 means X axis; D4 means Y axis; D5 means Z axis; D6 means A axis; D7 means B axis; D8 means C axis; D9 means Xs axis; D10 means Ys axis; 1 means floating zero point, 0 means mechanical zero switch]

★63-70, Set the floating zero point in world coordinate system of XYZABCXsYs axis

Set this parameter as the current coordinate of XYZABCXsYs axis, each axis goes back to zero point to here. If no mechanical zero point, set it as floating zero point. System will locate the zero point rapidly in operation of back to zero point.

★71-76, Function of XsYs axis[0 means straight line, 1 means rotation]

★214, Follow the axis(7/8/9, 17/18/19, 27/28/29/D5..D13=1/ means A axis follow X/Y/Z, C axis follow X/Y/Z, B axis follow X/Y/Z)

★220, Full pulse controlling channel of the first spindle(Positive 81-86 correspond to XYZABC axis, Negative 91-96 correspond to XYZABC axis)

★221, The number of the first spindle pulse in each circle

★222, Increasing and decreasing speed of the first spindle which is full pulse control

★223, Full pulse controlling channel of the second spindle(Positive 81-86 correspond to XYZABC axis, Negative 91-96 correspond to XYZABC axis)

★224, The number of the second spindle pulse in each circle

★225, Increasing and decreasing speed of the second spindle which is full pulse control

★290, Controlling mode(4000-4099 means etherCAT, 6000 means Modbus, 6001 means 1-6 axis use Modbus, 6002 means 3 axis use Modbus)

★300, The number of bus bits of bus motor encoder. If the encoder is 17bits bus absolute encoder, set as 17.

★511, No.8 parameter of drive which is J1, the proportion plus of current loop. The bigger, the bigger current.

★512, No.9 parameter of drive which is J1, the proportion plus of speed loop. The smaller, the sound

smaller ★ 513, No.10 parameter of drive which is J1, the plus of position feed forward. The bigger, the bigger vibration

★514, No.11 parameter of drive which is J1, the proportion plus of position loop. The bigger, the stronger rigidity

★ 515, No.32 parameter of drive which is J1, The rated current of motor($\times 0.1A$) ★ 516, No.33 parameter of drive which is J1, The rated torque of motor($\times 0.1Nm$) ★ 517, No.44 parameter of drive which is J1, the plus of position following. The smaller, the stronger following

★518, No.30 parameter of drive which is J1, M133 mode(0 means constant speed, 1 means reciprocate, 2 means fixed distance)

★ 518-1, No.40 parameter of drive which is J1, The swing distance of M133 (low 16 bits) ★ 518-2, No.41 parameter of drive which is J1, The swing distance of M133 (high 16 bits) ★ 518-3, No.46 parameter of drive which is J1, The pause time in swing of M133(ms)

511-518/521-528/531-538/541-548/551-558/561-568/571-578/581-598 correspond to the drive parameter of J1-J6/Xs/Ys axis(Press “7” to refresh the parameter in parameter interface).

3.8.4 Technique parameter

★1-0, The basic technique parameter in welding[0-9] Arc weld instruction AS* to be invoked parameter group.

★1-1, Basic technique group: Open the function of “Back” or not[8 means open, other means closed]

Set as 8 means, press “Back” got the back function when it is pause.

★1-2, Basic technique group: The back distance of restart(um)

★1-3, Basic technique group: The speed of restart(mm/min)

★1-4, Basic technique group: The detection times of cladding

★1-5, Basic technique group: weld mode [1:MIG-VA, 2:MIG-VW, 3:TIG-A, 4: TIG-AW]

1. MIG-VA: Use AA to specify the current of weld, also could use S. Use VV to specify the voltage of weld, also could use SS. AA and VV could be in the same instruction, bus S and SS can't

2. MIG-VW: Use AA to specify the speed of feed and back guide wire Use VV to specify the voltage of weld, also could use SS. AA and VV could be in the same instruction, bus S and SS can't

3. TIG-A: Use AA to specify the current of weld, also could use S.

4. TIG-AW: Use AA to specify the speed of feed and back guide wire Use VV to specify the current of weld, also could use SS. AA and VV could be in the same instruction, bus S and SS can't

★1-6, Basic technique group: Open the scrape function or not[8 means open, others mean closed]

Scrap function open means, after execution of AS*, keep running for a distance to ensure arc strike when output of arc starting is effective. If arc strike succeeds in scrape range, then back to start point and execute welding; if arc strike fails then alarm and quit. Scrap function close means, after execution of AS*, when output of arc starting is effective, wait for a period to check if arc strike succeeds or not, if succeed then weld, if fail then alarm and quit.

★1-7, Basic technique group: The scrape distance in weld(um)

★1-8, Basic technique group: The backing speed of scrape in weld(mm/min)

★1-9, Basic technique group: Starting of arc and arc extinction: +2 means the starting of arc is specified; +4 means arc extinction is specified.

Starting of arc means the progress of instruction AS*, arc extinction means the progress of instruction AE*.

When setting as user-defined, the basic technique No.1-10 and No.1-25 are useless, the progress of Starting of arc is controlled by ProgramUser0, the progress of arc extinction is controlled by ProgramUser1, edited by user.

If it isn't user-defined, the progress of starting of arc: Process of arc starting defined in software:

1>, Output of huff is valid

2>, The output voltage of starting of arc is specified by basic technique group No.1-10

The output current of starting of arc is specified by basic technique group No.1-11

3>,Waiting time of air clean is specified by basic technique group No.1-16(ms) 4>,Waiting time of feeding air is specified by basic technique group No.1-17(ms) 5>,Output of starting of arc is valid 6>,Waiting time of electrical arc detection is specified by basic technique group No.1-No.18(ms) 7>,If not open the scrape function, it will check the strike arc is success or not, it will quit if not success. If open the scrape function, it will ignore this step.

8>,Restore the output voltage and current of user programme. 9>,Output of feeding solder wire is valid[M03/Y18]. Execute progress of welding automatically.

The progress of arc extinction:

1>,Close output of feeding solder wire[M05]

2> , The voltage of output weld treatment is specified by basic technique group No.1-12

The current of output weld treatment is specified by basic technique group No.1-13

3> , Waiting time of weld treatment is specified by basic technique group No.1-21(ms)

4>, The voltage of after treatment is specified by basic technique group No.1-14 5>,(A)Set the mode of welding control to be MIG-VW and TIG-AW:

The backing speed of after treatment for solder wire is specified by basic technique group No.1-15; The output of backing solder wire is effective, the feeding output of feeding solder wire is invalid; Waiting time of after treatment is specified by basic technique group No.1-22(ms); Stop backing solder wire, output of backing and feeding are both invalid, the speed is 0.

(B)Set the mode of welding control as MIG-VA and TIG-A: The output analog current of weld will be 0; Waiting time of after treatment is specified by basic technique group No.1-22.

6>,Stop arc, output of starting arc is invalid.

7>,If output of huff is valid, then execute operation as below:

Waiting time of after huff is specified by basic technique group No.1-20.

Close output of hull.

8>,If the detection of cladding is bigger than 0, then operation as below: Set the output analog voltage as 0; Delay the waiting time of cladding detection is specified by basic technique group No.1-23; Output of cladding detection is valid[M73/Y21];

Delay the waiting time of cladding detection is specified by basic technique group No.1-24 ,set should over parameter 105;

(A) Check remove cladding is successful or not[X03], the operation as below if successful:

Waiting time of cladding detection is specified by basic technique group No.1-25(ms);

Close output of cladding detection

(B) If remove cladding is failed, then operation as below Close output of cladding detection

If the frequency of cladding detection is over the value of parameter, it will alarm and quit, otherwise output of starting arc is valid. Back to execute 4>step;

9>, Restore the output voltage and current of user program.

Then execute the next steps of program.

★1-10,Basic technique group: The voltage of starting of arc

★1-11,Basic technique group: The current of starting of arc

★1-12,Basic technique group: The voltage of welding port treatment

★1-13,Basic technique group: The current of welding port treatment

★1-14,Basic technique group: The voltage of after treatment

★1-15,Basic technique group: The speed of solder wire go back(mm/min)

★1-16,Basic technique group:The time of gas purge(ms)

★1-17,Basic technique group: The present time of delivery gas(ms)

- ★1-18,Basic technique group: The detection time of electrical arc(ms)
- ★1-19,Basic technique group: Starting time(ms)
- ★1-20,Basic technique group: Time of behind delivery gas(ms)
- ★1-21,Basic technique group: Time of welding port treatment(ms)
- ★1-22,Basic technique group: Time of behind treatment(ms)
- ★1-23,Basic technique group: Delay time of cladding detection instruction(ms)
- ★1-24,Basic technique group: Delay time of cladding detection (ms)
- ★1-25,Basic technique group: Time of cladding detection(ms)
- ★1-26,Basic technique group: Reserve

Auxiliary relay of controlling arc starting: Valid M56 means starting of arc, otherwise it means arc extinction.

Programmable instruction: M71 refers to starting of arc, M70 refers to arc extinction. Output point of arc starting: Y09

Auxiliary relay of controlling huff: Valid M50 means huff starting; otherwise it means huff closing.

Programmable instruction: M59 refers to huff starting, M58 refers to huff closing.

Output point of huff: Y20.

Auxiliary relay of output of cladding detection: valid M57 means open, otherwise it means close.

Programmable instruction: M73 refers to open, M72 refers to close. Output point of cladding detection: Y21.

Auxiliary relay of input of cladding detection: valid M72 means successful cladding, otherwise it means failed cladding.

Definition of cladding: to consolidate workpieces through melted metal wire Input of arc starting detection: X00

Malfunction detection of welding machine: X01 Input of cladding detection: X03

Detection of cooling anomaly: X04 Detection of lubrication alarm: X05 Detection of arc depletion alarm: X06 Detection of gas depletion alarm: X07 Detection of metal wire depletion: X46 Detection of power anomaly: X47

Auxiliary relay of manual feeding solder wire: M53 Auxiliary relay of manual back solder wire: M54 Auxiliary relay of stopping feeding/back: M55

Programmable instruction: M3—Feed solder wire; M4—Back solder wire; M5—Stop feeding or backing.

Output point: Y18—Feed solder wire; Y19—Back solder wire; Y12—Stop feeding or backing.

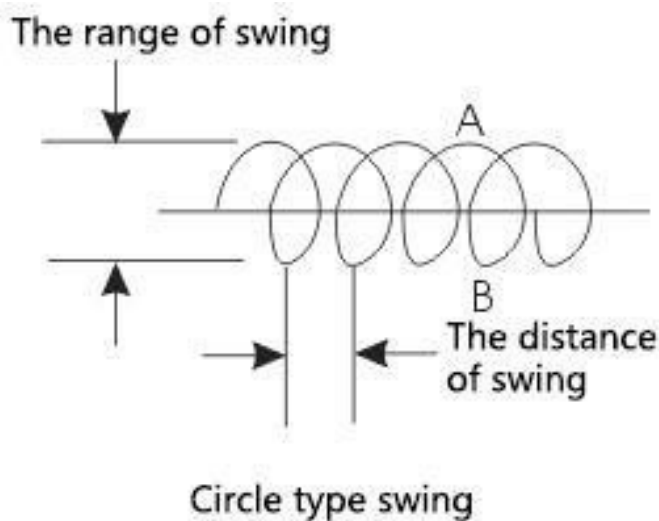
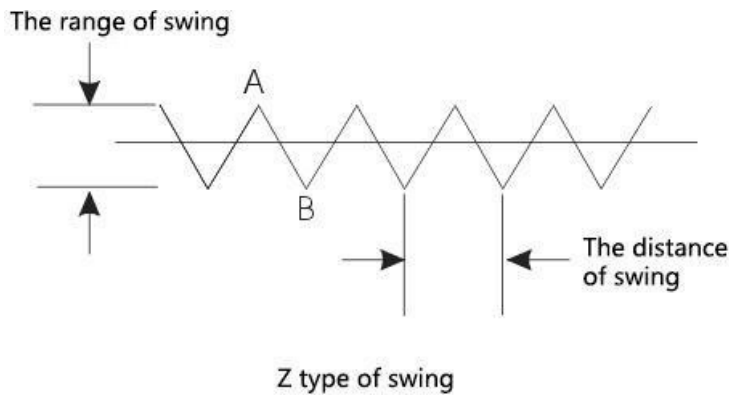
If the seam is wider, weaving weld is applied. Just program the instruction WS* of starting weld in the next line of instruction AS*. The parameter of weaving weld contains 10 groups from 0 to 9, specifying by WS*, to close weaving weld by WE before the line of AE*.

- ★2-0,The group number of weaving in weld[0--9]

Starting instruction WS* invokes parameter groups from 0 to 9.

- ★2-1,Weaving mode[1 mean Z type; 2 means circle type]

The types of weaving weld, 1 refers to weaving in the shape of “Z”, 2 refers to circular weaving. If weaving plane is vertical on Z axis of tool coordinate system, direction of Z axis corresponds to direction of welding gun during the setting of tool coordinates. If only set P1, P2, P3, the direction of welding gun P3 signifies Z axis in tool coordinate. If set P4, P5, the direction from P3 to P4 signifies X axis, and direction from P4 to P5 signifies Z axis in tool coordinate system.



★2-2,Distance of weaving(um)

Distance between every two weaving segments.

★2-3,Extent of weaving(um)

Distance between two weaving points from A to B.

★2-4,The pause time at A point(ms)

Weave weld to A point and the pause time(ms).

★ 2-5,The pause time at B point(ms)(ms) Weave weld to B point and the pause time(ms).

Search Function:

In this mode, the workpiece is grounded while nozzle or solder wire is electrified with low voltage. During the motion of robot along searching track, if nozzle or wire contacts with workpiece, dip of electric level will generate signal of contacting, then robot stops moving and records contacting position, and rectifies path through offset value between current and specified position to calculate position of real target. Search starting instruction: ST* P*

The number after ST specifies group number of searching [0—9] The number after P specifies number of value data from searching result[0—99], the data corresponding to number will be deleted automatically while executing the instruction P.

Search stopping instruction: SE Searching instruction in straight running: SX search in the direction of X axis; SY search in the direction of Y axis; SZ search in the direction of Z axis; The number behind SX/SY/SZ means the repeat times, controller will calculate

the average, the most times is 9, only once if no number. For example, SX5; SY6; SZ4; SY; SX.

Example:

G54 T1; Specify the user coordinate system and tool number MOVJ ;Locate to the starting point of search

ST2 P3; Start searching, invoke parameter group 2, it will be saved into data number 3 of transition data

MOVL; Locate to the starting point of search

MOVL SX ; Search in the direction of X axis, the MOVL point of this line is resultant point of calibrated workpiece, system will orient according to this point and starting point.

MOVL; Locate to another starting point of search

MOVL SX ; Search in the direction of X axis, the MOVL point of this line is resultant point of calibrated workpiece, system will orient according to this point and starting point.

MOVL; Locate to another starting point of search

MOVL SY3 ; Search in the direction of Y axis(Repeat 3 times), the MOVL point of this line is resultant point of calibrated workpiece, system will orient according to this point and starting point.

SE ; End searching

MOVJ ; Locate to the middle point

SN3 ; Specify the number 3 of position offset data AS4 ; Start arc welding

MOVL ; Execute straight line weld, according to teach point of calibrated workpiece.

MOVL ; Execute straight line weld, according to teach point of calibrated workpiece.

AE4 ; End arc welding

SF ; Close position offset

★3-0,Search technique group[0--9]

★3-1,Search technique group: Mode and type

To set mode and type of search. 1 means one-dimensional search; 2 mean two-dimensional search; 3 mean three-dimensional search; 4 means one-dimensional and rotary search; 5 means two-dimensional and rotary search; 6 means three-dimensional and rotary search; 7 means circumcentre search.

One-dimensional search: to search a point in the direction of X or Y or Z.

Two-dimensional search: to search a point in the direction of XY or YZ or XZ respectively.

Three-dimensional search: to search a point in the direction of XYZ respectively. One-dimensional and rotary search:to search two points in the direction of X and Y;

Two-dimensional and rotary search:to search two points in the direction of X and Y respectively;

Three-dimensional and rotary search:to search two points in the direction of X and Y respectively, and search one point in the direction of Z;

Circumcenter search: to search two points in the direction of X and one point in the direction of Z; or to search two points in the direction of Y and one point in the direction of X. To calculate the center of circle according to the three points through circumcenter. Then conclude offset value by comparing the calculated center with the center of calibrated workpiece.

★3-2,Search technique group: The distance of search(um)

★3-3,Search technique group: The speed of search(mm/min)

★3-4,Search technique group: The back speed of search(mm/min)

★ 3-5,Search technique group: Input point of searching detection (+1000 signifies waiting valid jump. +2000 signifies waiting invalid jump)

To set Input point of searching detection by parameter 3-5. For instance, X12 is set as 1012,

denotes that if X12 is valid, searching is finished. ★ 4-0. The group number of arc tracking parameter in weld[0--4] ★ 4-1. Arc tracking technique group: type(+4 means start compensation

left and

right, +8 means start compensation up and down)

★4-2. Arc tracking technique group:detect address of IN1(1000+number X of input point)

★4-3. Arc tracking technique group:detect address of IN2(1000+number X of input point)

★4-4. Arc tracking technique group:detect address of IN3(1000+number X of input point)

★4-5. Arc tracking technique group:detect address of IN4(1000+number X of input point)

★4-6. Arc tracking technique group: the value of compensation left and right, if detect result as 01.(um)

★4-7. Arc tracking technique group: the value of compensation left and right, if detect result as 10.(um)

★4-8. Arc tracking technique group:the value of compensation up and down, if detect result as 01.(um)

★4-9. Arc tracking technique group:the value of compensation up and down, if detect result as 10.(um)

★4-10.Arc tracking technique group:accelerated speed of compensation[compensate value per 2ms](um).

★101. Open interruption of wire feeding or not(M03)[0 means open, 1 means close] ★102. Total period(unit:10ms) ★ 103.Wire feeding time(unit:10ms) ★ 104. Detecting time of successful arc

starting[X0 valid](unit:10ms)

Over the time means successful arc starting.

★105.Detecting time of successful arc extinction[X0 invalid](unit:10ms) Over the time means successful arc extinction.

★501,Check the data of position point

Read data of position, invoke number 0—499 of parameter

★502,Adjust the data of position point

Adjust data of position, invoke number 0—499 of parameter

★503,Save the data of the current position point[Note to the current tool number and user coordinate system]

Save data of position, invoke number 0—499 of parameter

Note: The current tool number and user coordinate system.

★504, Check the data of movement value

Check movement refers to SN* invokes data of parameter group, “*” denotes invoke number 0—99.

★505, Modify the data of movement value

Modify movement refers to SN* invokes data of parameter group, “*” denotes invoke number 0—99.

★506, Calculate the data of movement value according to the two position point [Note to the current tool number and user coordinate system]

Modify the data is specified by SN*. According to No.501-No.503 to calculate moving value and save in parameter group.

The parameter of robot depalletizing

★601, The basic parameter of depalletizing

★602, The teach for piling point of depalletizing

★603, The teach for approach and back point of depalletizing

★604, The special set for each floor layout number of depalletizing

★605, The special set for each floor height of depalletizing

★606, The set or teach for special regular layout data of depalletizing

★607, The set or teach for special ruleless layout data of depalletizing

★608, The set or teach for special floor with special approach and back point

★609, Copy data of some number depalletizing

★610, Copy data of some number layout mode

★611, Delete the data of some number depalletizing

★612, Delete the data of some number layout mode

★613, The M instruction before depalletizing(880--889)

★614, The M instruction when depalletizing to point 1(880--889)

★615, The M instruction when depalletizing approach to the summing point to offset(880--889)

★616, The M instruction when depalletizing approach to the summing point(880--889)

★617, The M instruction when depalletizing back to the overlap point to offset(880--889)

★618, The M instruction when depalletizing back to point 1(880--889)

These are parameter of depalletizing, includes 3 files to save palletbase.txt and palletlayout.txt and palletcurr.txt, if need to delete these 3 files, then input PALLET and enter in No.15 other parameter. Note for files:

The basic parameter of file palletbase.txt (The range is 1--99)

The parameters:

The number of depalletizing;

The type is palletizing or depalletizing;

The operation sequence of line and column of depalletizing (This parameter is only effective when the layout type set as 0);

The number of line, column and layer.

The distance between the line or column of depalletizing; Note: If not specify or 0, it will be useless, it will calculate according to the end point of teach and number of line and column.

Approach point (2 points in the most);

The number of back points(2 points in the most); The approach speed;
The back speed;
Reach with low speed and the offset distance of leave the overlap points; Reach with low speed and the offset speed of leave the overlap points;
The layout type:
0 means generate layout type of each layer automatically(The posture is the teach posture of basic point).
1 means every layer is the first layout mode of teach.
2 means the layout type according to the parity layer(Odd layer correspond to the first kind of layout mode, even layer correspond to the second layout mode).
3 means definition of set, every layer need specify the corresponding the layout mode.
The coordinate of 4 teach points;
The coordinate of approach point and back point;
The layout number of every layer, 0 means the default;
The special set for height of every layer, 0 means the default;
The logic control for loose and tight is user-defined instruction M880--M889, set by parameter.
Format of file, six parts:

BaseParam: Basic parameter
RCLcharac: Characteristic points of pile
ApprRtret: Point of approach and back
NumLayout: Special set for layout number of each layer
LayHeight: Special set for height of every layer
ApRtSpecl: Teach of back point and special approach in special layer
BaseParam: Includes these parts:

The first data means the current number of depalletizing (1--99)

B-Type: Type
B-Sers: Sequence
B-Rnum: Number of line
B-Cnum: Number of column
B-Lnum: Number of layer
B-Rdst: Distance of line
B-Cdst: Distance of column
B-Ldst: Distance of layer
B-ApPt: Number of approach points
B-RtPt: Number of back points
B-ApFd: Approach speed
B-RtFd: Back speed
B-LowD: Distance of slow move
B-LowF: Speed of slow move
B-Lout: Layout format
RCLcharac: Includes these parts:

The first data means the current number of depalletizing(1--99)

R-OrgX: X of original
R-OrgY: Y of original
R-OrgZ: Z of original
R-OrgC: C of original
R-RowX: X of line end point
R-RowY: Y of line end point
R-RowZ: Z of line end point
R-RowC: C of line end point
R-ColX: X of column end point

R-ColY: Y of column end point R-
 ColZ: Z of column end point R-ColC:
 C of column end point R-LayX: X of
 layer end point R-LayY: Y of layer
 end point R-LayZ: Z of layer end
 point layer R-LayC: C of layer end
 point

Note: Also need to set original point and layer end point, needn't set the line end point and column end point.

ApprRtret: Includes these parts:

The first data means the current number of depalletizing(1--99)

A-Ap2X: X of approach point 2

A-Ap2Y: Y of approach point 2

A-Ap2Z: Z of approach point 2

A-Ap2C: C of approach point 2

A-Ap1X: X of approach point 1

A-Ap1Y: Y of approach point 1

A-Ap1Z: Z of approach point 1

A-Ap1C: C of approach point 1

A-Rt1X: X of back point 1

A-Rt1Y: Y of back point 1

A-Rt1Z: Z of back point 1

A-Rt1C: C of back point 1

A-Rt2X: X of back point 2

A-Rt2Y: Y of back point 2

A-Rt2Z: Z of back point 2

A-Rt2C: C of back point 2

NumLayout: Includes these parts:

The first data means the current number of depalletizing(1--99)

One by one to arrange every layer which correspond to layout number.

LayHeight: Includes these parts:

The first data means the current number of depalletizing(1--99)

One by one to arrange every layer height which correspond to layout

This height means from the bottom to this layer, unit:mm

ApRtSpec: Includes these parts:

The first data is consist of 6 bis number:

The highest 2bits mean the current number of depalletizing(1-99)

The middle 2bits mean the current layer number of depalletizing

The lowest 2bits mean the current layer point number of depalletizing(1--99)

A-Ap2X: X of approach point 2;

A-Ap2Y: Y of approach point 2;

A-Ap2Z: Z of approach point 2;

A-Ap2C: C of approach point 2;

A-Ap1X: X of approach point 1;

A-Ap1Y: Y of approach point 1;

A-Ap1Z: Z of approach point 1;

A-Ap1C: C of approach point 1;

A-Rt1X: X of back point 1;

A-Rt1Y: Y of back point 1;

A-Rt1Z: Z of back point 1;

A-Rt1C: C of back point 1;

A-Rt2X: X of back point 2;

A-Rt2Y: Y of back point 2;
A-Rt2Z: Z of back point 2;
A-Rt2C: C of back point 2;

(2) paltlayout.txt save the data of layout(The range is 1--99).

Includes these parameters:

The number of line, column and 3 characteristic points with regular layout;

Coordinate of each point with irregular.

Note: In the same number of layout, it only to be regular or irregular, can't be together in the same number.

The teach for regular or irregular layout is from the bottom.

Format:

PallLayout: Regular or irregular

The first data means the current number of depalletizing(Regular is marked as with Y, irregular is marked with N);

Layout for regular:

P-OrigX: X of the original point ;

P-OrigY: Y of the original point ;

P-OrigZ: Z of the original point ;

P-OrigC: C of the original point ;

P-RowX: X of the line end point ;

P-RowY: Y of the line end point ;

P-RowZ: Z of the line end point ;

P-RowC: C of the line end point ;

P-ColX: X of the column end point ;

P-ColY: Y of the column end point ;

P-ColZ: Z of the column end point ;

P-ColC: C of the column end point ;

P-Rnum: Number of line ;

P-Cnum: Number of column ;

The fixed operation sequence of line and column are RCL with these conditions.

Layout for irregular:

P-***N: Specify the number of every stack, for example:P-002N: P-012N: P-006N:

Arrange every XYZC coordinate which correspond to every stack one by one.

If there is N in coordinate, it means there is no set for this stack.

(3) palletcurr.txt to save the current status of depalletizing (The current stage will be saved when power off)

Format:

Palltcode:

The data behind is: The number;

The times of stack been executed[Start from 0 to count];

The number of the current layer[Start from 0 to count] (If palletizing then count from bottom to top, if depalletizing then count from top to bottom);

The current line number [Start from 0 to count] (The meaning of palletizing is the same as depalletizing);

The current column number [Start from 0 to count] (The meaning of palletizing is the same as depalletizing);

The number of the stack in the current layer [Start from 0 to count].

★650,DH parameter of robot

★651,Dialog box 1 of integrated parameter

★652,Dialog box 2 of integrated parameter

★653,Dialog box 3 of integrated parameter

It's an example for dialog box of integrated parameter, it's easier to operate and set parameter, the file need to be modified, for example:

BeginIntegraP20005 ;Means start

0,20,80,420,300, please input DH parameter of robot <F1-Clear, F8-Clear to 0> ;Four data mean the dialog l/t/w/h, the behind mean the prompt information of dialog.

4,3,3,280,190,fillpict5.bmp ;File name of picture

1,282,10,60,25,P1: ; The first data means type of control, the 4 data behind mean l/t/w/h, the last mean the macro number or prompt information.

3,330,10,85,25,800,I; Correspond to macro #800, and it is the integer.(I means integer, no specification means floating point)

1,282,40,60,25,P2:

3,330,40,85,25,802,; Correspond to macro #802, and it is type of floating point

1,282,70,60,25,P3:

3,330,70,85,25,840,I

1,282,100,60,25,P4:

3,330,100,85,25,850,

1,282,130,60,25,P5:

3,330,130,85,25,6122,

1,200,195,100,25,P6:

3,300,195,90,25,845,

1,200,223,100,25,P7:

3,300,223,90,25,825,

2,30,253,100,26, Make sure

2,240,253,100,26, Cancel

EndIntegraP ; Means the equipment end

Type of control: 0 means the dialog box; 1 means user-defined static text; 2 means user-defined button; 3 means user-defined edit dialog; 4 means picture; 8 means user-defined static text with small letters; 5 means static text of MiniGUI; 6 means the button of MiniGUI; 7 means the edition box of MiniGUI.[Note: Useless when type of control is 5,6,7].

The file name of picture:fillpict1, fillpict2, fillpict3 and must be 16 colors(4 bits) or 256

colors(8 bits) or 16 bits or 24bits bmp picture.

Note: Better to use 16 colors(4bits) or 256 colors(8bits) to save the room.

3.8.5 Other parameter

★1, Filter constant of input signal [+256+512+1024 correspond to X0-X7, the filter is 2/4/8ms, +2048+4096+8192 correspond to the filter 2/4/8ms of other signal]

Filter for input points, for example: input 256 correspond to X0-X7 filter 2ms, input 2304 correspond to all input point filter 2ms.

★2, The band switch of feeding axis[1 means yes, no means no] Reserve, this controller must set as 0.

★3, The band switch of spindle[1 means yes, no means no] Reserve, this controller must set as 0.

★4, The type of handwheel[1 means held, 0 means panel] Reserve, this controller must set as 0.

★5, Lubrication automatically 0 means effective, 1 means invalid

Note: This is set according to the running time

★ 6, The time of lubrication(10ms) M32 to keep the effective time. Unit: 10ms.

★7, The interval time of lubrication(s) The valid interval time between two M32 (s)

★ 8, Detection of door switch(X29)[0 means not detect, 1 means detect]

Note: 1. X29 to realize the function.

2. After setting as detect, when X29 is effective, coordinate could move in teach function, but program will be pause in PLAY.

★ 9, Door switch[0 means always open, 1 means always close]

★ 10, Bit parameter

D1=1 clear to 0; D2=1 space; D5=0 close spindle; D6 speed; D8=1 save M10 when power on; D10=1 arrange; D12=1 skip is invalid; D13=1 back to 0 is invalid

The format: D15D14.....D1D0.

D0 bit: Default as 1, can't change.

D1 bit: Set as 1 means the number of workpiece clear automatically when power on, set as 0 means keep.

D2 bit: Set as 1 means insert space into letters automatically when editing the program, set as 0 means not insert.

D3 bit: Default as 0, can't change. D4 bit: Default as 0, can't change.

D5 bit: Set as 1 means not stop spindle rotation and cooling when pressing RESET, 0 means stop, default is 0.

D6 bit: Set as 1 means each axis work according to own speed, work with nonlinear trajectory when executing G00, 0 means simultaneous, reach at the same time. Default is 1.

D7 bit: Default as 0, can't change.

D8 bit: Set as 1 means save the status M10/M11 of spindle loose or tight when power off, recover this status when power on again. Set as 0 means spindle will be tight automatically when power on. Default is 1.

D9 bit: Default as 1, can't change.

D10 bit: Set as 1 means the number of line is arranged automatically when programming.

D11 bit: Set as 1, the output analog of the first spindle is the same time from the first, second spindle channel, the function of the second spindle is valid.

D12 bit : Set as 1, shield the skip function, “/” in front of the segment means invalid. D13 bit:Default as 0, can’t change. D14 bit:Default as 0, can’t change. D15 bit : Set as 1, the tool set show the relative value, otherwise it shows the absolute value.

Note: This parameter includes the bit which can’t be changed. If change this bit, it will cause some problems with controller.

★ 11,The incremental value of editing number

★ 12,The operation mode of delete[0 means delete the behind,1 means delete the forward]

★ 13,Teach mode[0 means MOVJ/MOVL/MOVC,1 means G0/G1/G6]

★ 14,Back function of running program[+8 means the handwheel, +32 means the back button of panel]

To set handwheel reappear mode as the way of executing program, if D3=1,
+8 means handwheel enabled, positive rotating means run program forward, negative rotating means run program backward; +32 means panel button enabled, otherwise run forward and backward identically.

★ 15,The inner parameter of system[6 means automatically,7 means press, 8 means allow import,9 means clear]

If input PALLET, then delete the depalletizing file palletbase.txt, palletlayout.txt, palletcurr.txt.

★16,Emergency alarm[0 means always open,1 means always close] Set the input point X209 of emergency button.

★17,Lubrication alarm[0 means always open,1 means always close] Set the input point X09 of lubrication alarm.

★18,Output of running(M69 runs,M65 stop)[0 means invalid,1 means valid]

Note: This signal could be the status of robot according to the equipment of robot.

★19,Alarm output(M67)[0 means invalid, 1 means valid]

Note: This signal could be the status or protection of robot according to the equipment of robot.

★20,The brake time of spindle(10ms)

The time of M05, the less time the faster to brake, the longer time the slow to brake.Unit:10ms.

★21,Long signal of spindle brake[0 means long signal, 1 means short signal]

★22,The interlock between spindle rotation and chuck[1 means Yes,0 means No]

1 will be safer.

Consi
der
for
safety,
set as

★ 23, The brake of motor is work or not [1 means check the X40 when motor with brake, 0 means without brake]

If without brake, then set as 0 (X40 could be used for other function); If set as 1, then motor with brake, controller check the X40 signal, it means the circuit is normal, otherwise there is some problems, please check the problem and solve.

★ 30, Language of controller [1 means Chinese, 0 means English]

★ 31, Logical of robot I/O [1 means start, 0 means stop]

Set the status of inner PLC, 1 means start (100ms), 0 means stop, the total of PLC is 8000 steps at the most.

Note: This parameter usually be test parameter, set as 1 in actual use, otherwise the motion of robot could be wrong.

★ 32, Logical of robot high speed I/O [0 means stop, 18 means start with high speed, 28 means super speed]

Super speed means 2ms, high speed means 8ms.

Note: This parameter usually be test parameter, set as 1 in actual use, otherwise the motion of robot could be wrong.

★ 35, Soft limit is effective in teach when no back to zero [1 means Yes, 0 means No]

Note: The set of parameter is relative with safe operation.

★ 36, Time [Year-Month-Day-Hour-Minute]

For example: 6:06 AM 6th, June, 2016, then input 2016-06-06-06-06

★ 37, Communication speed of serial port

Baud rate : 0=7200; 1=9600; 2=14400; 3=19200; 4=38400; 5=57600; 6=115200

Attention: 1 The bigger, the faster, but more unstable.

2 The baud rate of each side of communication must be the same.

★ 38, ModBus station number of serial port in OPC function [odd parity

10000+ station number, even parity 20000+ station number, no parity 30000+ station number]

Communication protocol adopts RTU mode in industry standard ModBus protocol, the system will return the current parameter value, received request for transmission of parameter number from PC.

PC connects with CNC system by RS232 port. If RS232 is converted into RS485 by converter, the connection between one PC and multiple CNC controller could be realized, then each controller need setting station number to distinguish from each other. Details refer to manual of OPC function.

★ 39, 40, Special parameter

★ 41, Backup the current parameter

Note: Press this parameter twice to backup.

★ 42, Restore the parameter which is backup

Note: The parameter will be recover after set this parameter.

★ 200-204, The error of J1-J6/Xs/Ys axis between feedback pulse and running pulse, alarm when

pulse is [>1]

Bigger than 1 is valid. Press “G” to clear the feedback position ,clear position, clear the alarm.

★205-209,The tracking error of J1-J6/Xs/Ys alarm(pulse)[>1]

Bigger than 1 is valid.Press “G” to clear the feedback position ,clear position, clear the alarm.

★210-214,Numerator of electrical gear of J1-J6/Xs/Ys[automatic calculate: L screw(um) line number of M encoder]

When system is equipped with feedback function of axis position, the parameter is numerator of electrical gear, screw(um) and line number of encoder also could be input. For example: Screw pitch is 6mm, encoder is 2500 rate, then input: L6000M2500. P210/P211/P212/P213/P214 correspond to J1-J6/Xs/Ys.

Special attention:

- 1) First need to input electrical numerator and denominator of each axis according to LxxxxMxxxx mode;
- 2) Read the encoder data through the serial port must according to this mode.
- 3) This controller set as 10000

★215-219,Denominator of electrical gear of J1-J6/Xs/Ys[automatic calculate: L screw(um) line number of M encoder]

When system is equipped with feedback function of axis position, the parameter is denominator of electrical gear, screw(um) and line number of encoder also could be input. For example: Screw pitch is 6mm, encoder is 2500 rate, then input: L6000M2500. P215/P216/P217/P218/P219 correspond to J1-J6/Xs/Ys.

★ 290, Controlling mode(4000-4099 means etherCAT, 6000 means Modbus, 6001 means 1-6 axis use Modbus, 6002 means 3 axis use Modbus)

★300-303,Feeding axis with or without absolute motor

[J1-D2,J2-D3,J3-D4,J4-D5,J5-D6,J6-D7,Xs-D8,Ys-D9,0 means No, 1 means Yes]

P301 applies to motor whose absolute encoder is multicycle low l6 bits memory address(set as 92), P302 applies to motor whose absolute encoder is multicycle high l6 bits memory address(set as 91), P303 applies to motor whose absolute encoder is single cycle low l6 bits memory address (set as 90).

Special attention: The communication address:1-8 correspond to J1-J6/Xs/Ys axis.

★304-308,The number of each circle of absolute encoder of J1-J6/Xs/Ys axis When it is absolute motor, set it as 131072.

★ 309-313,The length correspond to each circle of absolute encoder in J1-J6/Xs/Ys axis(nm)

★314-318,The multi cycle offset of absolute encoder of J1-J6/Xs/Ys axis[Input E to clear]

★319,The current/speed/torque address of absolute driver(284/283/435) Press “F3” in main interface to show the load of driver.

★320-324, denominator of length correspond to each circle of absolute encoder of J1-J6/Xs/Ys axis For example: The reduce ratio of J1 is 121, then No.320=121.

★ 330,Function of controller and interface(11 means weld;12 means palletizing;13 means painting)

★351-366, The link rod of robot parameter 1-16(um)

★367, Reversal calculate the inner coordinate of robot(+4;+8;+16:32;+64;+128)

D2=1 then +4 reversal calculate coordinate of J1 ; D3=1 then +8 reversal calculate coordinate of J2; D4=1 then +16 reversal calculate coordinate of J3; D5=1 then +32 reversal calculate coordinate of J4 ; D6=1 then +64 reversal calculate coordinate of J5; D7=1 then +128 reversal calculate coordinate of J6.

★368-373, The inner calculate offset of robot J1-J6 coordinate(1/1000 degree)

★374, The coordinate of robot J1-J6 reduction(+4;+8;+16:32;+64;+128)

D2=1 then +4 correspond to J1 to reduction; D3=1 then +8 correspond to J2 to reduction; D4=1 then +16 correspond to J3 to reduction; D5=1 then +32 correspond to J4 to reduction ; D6=1 then +64 correspond to J5 to reduction ; D7=1 then +128 correspond to J6 to reduction.

★ 375-385, Coupling function of robot(+4 means J1J2; +8 means J3J4; +16 means J4J5; +32 means J5J6; +64 means J4J6)

D2=1 then +4 means J1J2 coupling , P376,P377 is the numerator and denominator;

D3=1 then +8 means J3J4 coupling , P378,P379 is the numerator and denominator;

D4=1 then +16 means J4J5 coupling , P380,P381 is the numerator and denominator;

D5=1 then +32 means J5J6 coupling , P382,P383 is the numerator and denominator;

D6=1 then +64 means J4J6 coupling , P384,P385 is the numerator and denominator;

★451, Controlling mode of robot(100--9999)

0 means the standard CNC controller, could control the feeding and unloading, also could be held engraving controller.

262: Means 2 axis SCARA;

363: Means 3 axis SCARA;

440: Means 4 axis rotating joint non parallelogram robot; 441: Means 4 axis rotating joint parallelogram robot;

442: Means 4 axis palletizing parallelogram robot, the same as RMD of GSK; 464: Means 4 axis SCARA;

480: Means 4 axis Delta robot;

550: Means B axis-tool and A axis-platform hybrid 5-axis cnc machine; 551: Means AC axis rotational tool 5-axis cnc machine;

552: Means AC axis rotational platform 5-axis cnc machine; 553: Means A axis-tool and C axis-platform hybrid 5-axis cnc machine; 554: Means A axis-tool and B axis-platform hybrid 5-axis cnc machine 565: Means 5 axis SCARA;

600/2600: Means 6 axis/8 axis serial joint robot; 601/2601: Means 6 axis/8 axis parallelogram robot;

602/2602: Means 6 axis/8 axis non-spherical wrist robot, J5 and J6 have offset distance d6;

603/2603: Means 6 axis/8 axis non-spherical wrist robot, J5 and J6 have offset distance e6;

604/2604: Means 6 axis/8 axis non-spherical wrist robot, J5 and J6 have offset distance d6 and e6; 608/2608: Means 6 axis/8 axis L shaped wrist robot,

666: Means 6 axis SCARA;

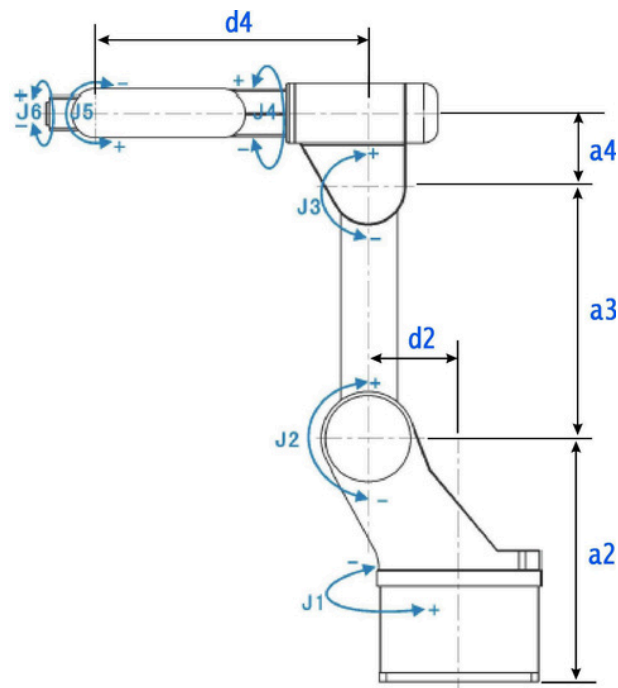
★460, Calibration robot

The zero point need very high accuracy, otherwise the error is big, need very precise to make the

right zero point, this is the regular method, it is the best to use professional equipment to measure.

★461-482 Connecting rod and the error compensation.

(1) Connecting rod of six degree of freedom joint and the error compensation

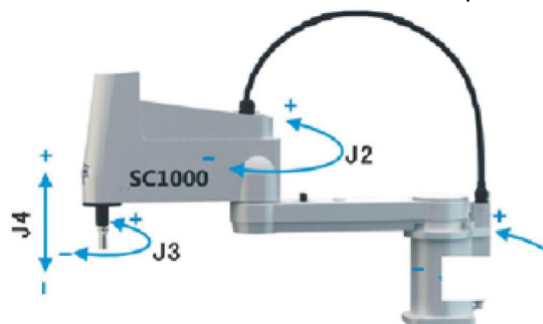


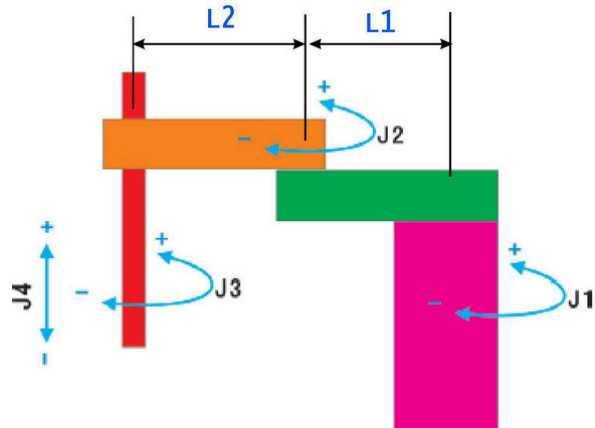
Six axis serial joint robot(No.451=600/602/2600/2602)

Note: a2 needn't to be set, e2 be set as 0; only if J5 and J6 have offset value, P360 should be set.

- ★ 351, Link rod parameter1(um)a2
- ★ 352, Link rod parameter2(um)a3
- ★ 353, Link rod parameter3(um)a4
- ★ 354, Link rod parameter4(um)d2
- ★ 355, Link rod parameter5(um)d4
- ★ 356, Link rod parameter6(um)e2
- ★ 360, Link rod parameter10(um)
- ★ 461, The error compensation of No.351(nm)a2
- ★ 462, The error compensation of No.352(nm)a3
- ★ 463, The error compensation of No.353(nm)a4
- ★ 464, The error compensation of No.354(nm)d2
- ★ 465, The error compensation of No.355(nm)d4
- ★ 466, The error compensation of No.356(nm)e2

(2) Connecting rod of four degree of freedom SCARA and the error compensation

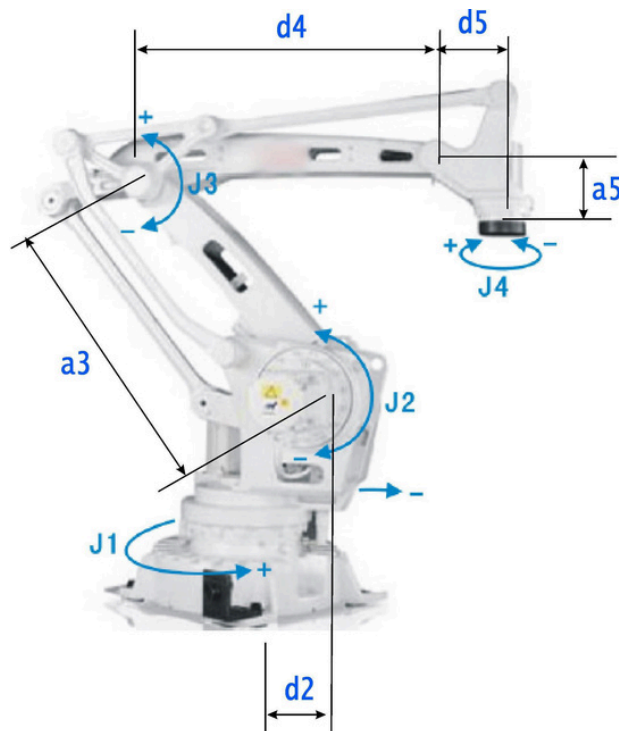




Four axis SCARA robot(P451=464)

- ★ 351, The connecting rod parameter 1(um)L1
- ★ 352, The connecting rod parameter 2(um)L2
- ★461, The error compensation of No.351(nm)L1
- ★462, The error compensation of No.352(nm)L2

(3) Connecting rod of four degree of freedom rotation joint palletizing and the error compensation

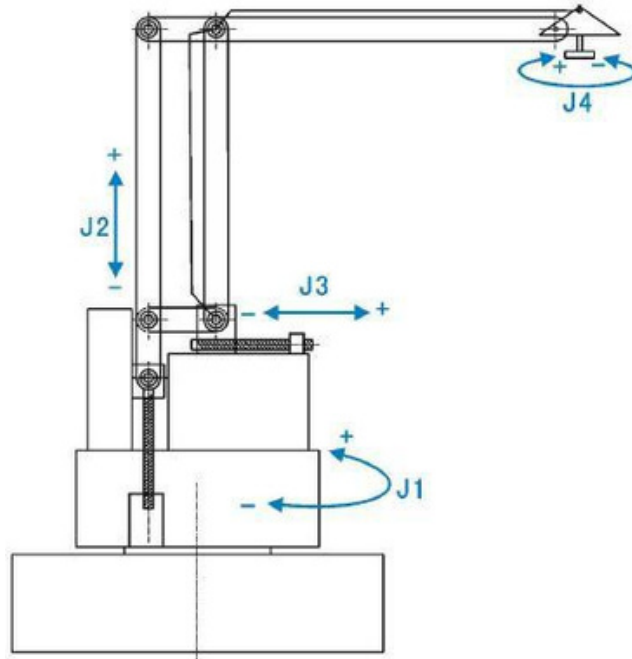


Four axis rotation joint palletizing robot(P451=441)

- ★352, The connecting rod parameter 2(um)a3
- ★354, The connecting rod parameter 4(um)d2
- ★355, The connecting rod parameter 5(um)d4
- ★357, The connecting rod parameter 7(um)a5
- ★358, The connecting rod parameter 8(um)d5

- ★462, The error compensation of No.352(nm)a3
- ★464, The error compensation of No.354(nm)d2
- ★465, The error compensation of No.355(nm)d4
- ★467, The error compensation of No.357(nm)a5
- ★468, The error compensation of No.358(nm)d5

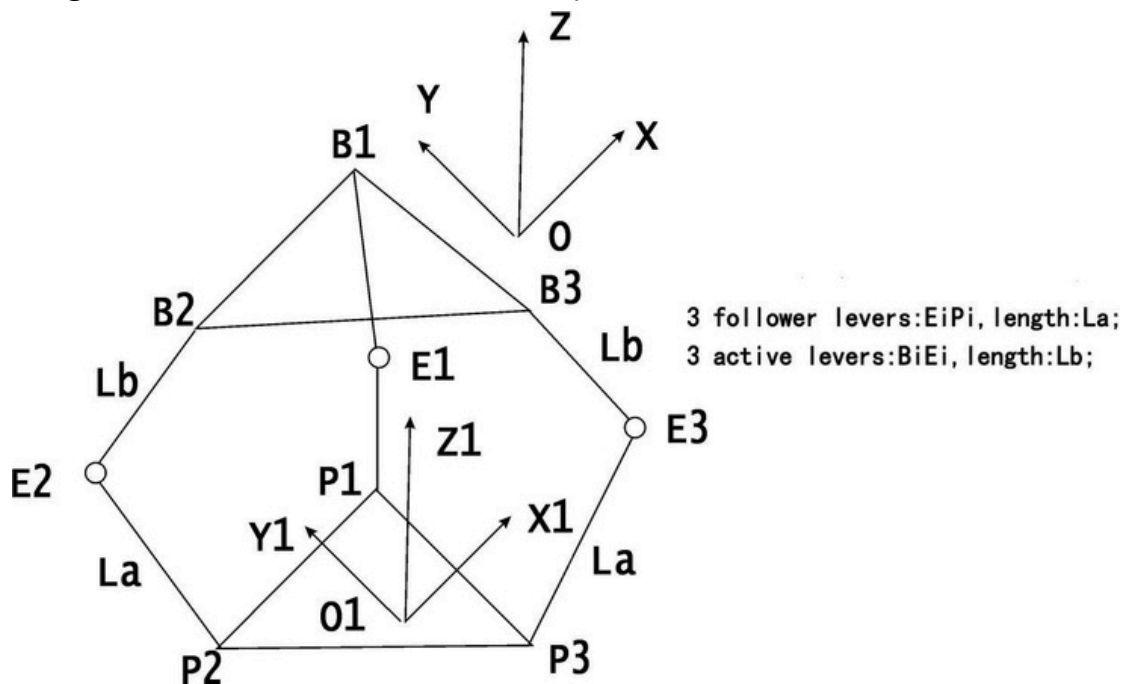
(4) Four axis connecting rod of palletizing parallelogram robot and the error compensation



Four axis connecting rod of palletizing parallelogram robot(P451=442)

- ★351, The connecting rod parameter 1(um)L1
- ★352, The connecting rod parameter 2(um)LEF
- ★353, The connecting rod parameter 3(um)LDE
- ★461, The error compensation of No.351(nm)L1
- ★462, The error compensation of No.352(nm)LEF
- ★463, The error compensation of No.353(nm)LDE

(5) Four degree of freedom Delta and the error compensation



Four axis Delta(P451=480)

La means the length of follower lever, Lb means the length of active lever; Rmax means the size of static platform(The centre of static platform to the vertex of equilateral triangle in static platform);

Rmax means the size of moving platform(The centre of moving platform to the vertex of equilateral triangle in moving platform).

- ★351, The connecting rod parameter 1(um)La
- ★352, The connecting rod parameter 2(um)Lb
- ★354, The connecting rod parameter 4(um)Rmax
- ★355, The connecting rod parameter 5(um)rmin
- ★461, The error compensation of No.351(nm)La
- ★462, The error compensation of No.352(nm)Lb
- ★464, The error compensation of No.354(nm)Rmax
- ★465, The error compensation of No.355(nm)rmin

(6) The error compensation of each joint

- ★477, The error compensation of robot J1 joint(1/1000000 degree)
- ★478, The error compensation of robot J2 joint(1/1000000 degree)
- ★479, The error compensation of robot J3 joint(1/1000000 degree)
- ★480, The error compensation of robot J4 joint(1/1000000 degree)
- ★481, The error compensation of robot J5 joint(1/1000000 degree)
- ★482, The error compensation of robot J6 joint(1/1000000 degree)

★489, Set coordinate system of positioner

When the robot is used to weld, the axis XS, YS are use to control motion of

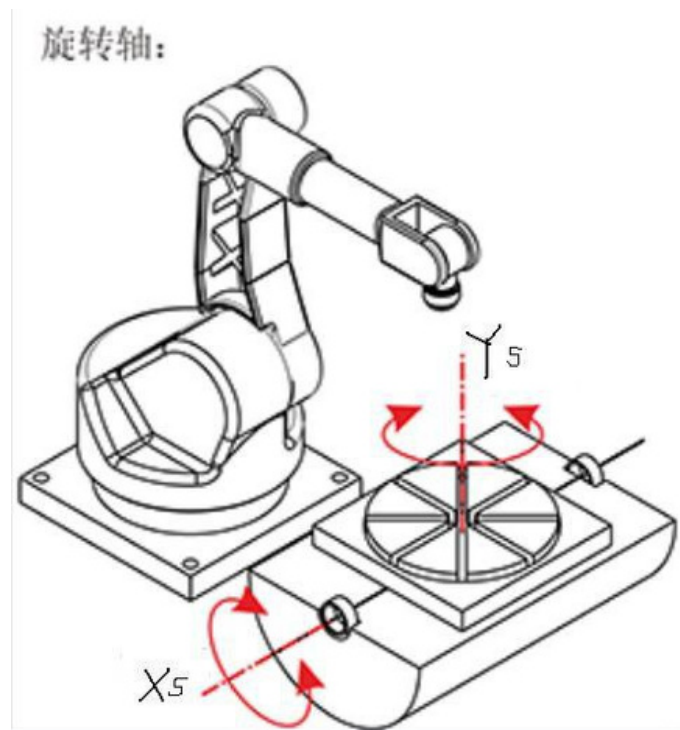
positioner.

Collaboration function of positioner:

Positioner coordinate system is convenient for user to run teach mode when the position is placed anywhere. Since the positioner coordinate system is set, robot will move around the specified positioner coordinate system.

Positioner coordinate refers to a specified coordinate system based on positioner.

Positioner coordinate system will rotate according to positioner, TCP tool is specified a position and a gesture. The Collaboration function of positioner makes robot move according to rotation of positioner and coordinate system, to keep the position and the gesture of TCP tool in coordinate system. In teach mode, the collaboration function makes teaching more convenient and ensure the best angle of welding gun during the welding. The instruction of collaboration function should be edited in program.



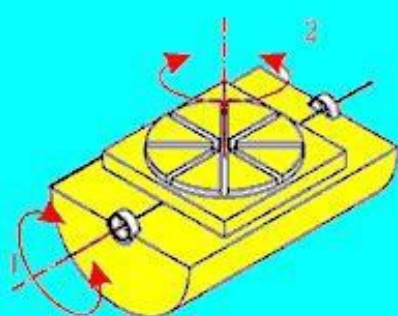
★ 490,Set the Xs world coordinate of positioner P3P4P5 point(um) ★ 491,X position of positioner(um) ★492,Y position of positioner(um) ★493,Z position of positioner(um) ★ 494,A gesture of positioner(degree) ★ 495,B gesture of positioner(degree) ★496,C gesture of positioner(degree)

★497,Reversal calculate the coordinate of positioner(Xs+6;Ys+8)

No.489 to set the coordinate, set as 3 with single positioner, set as 5 with double

positioner to generate No.490-No.496.

请输入-INPUT



< 1轴设P1-P3; 2轴设P1-P5 > F7清除全部点

X:	0.000	A:	0.000
Y:	0.000	B:	0.000
Z:	0.000	C:	0.000

数字键1--5分别对应设置P1--P5点

尚未设置P点

取消---Esc 确定-Enter

To find a reference point, and move the robot to make the TCP point of tool point at the reference point, then press the number button 1 to set the point as the P1; then rotate axis XS by a angle, move the robot, let the TCP point of tool point at the reference point, then press the number button 2 to set the point as P2; then rotate axis XS by a angle again, move the robot, let the TCP point of tool point at the reference point, then press the button 2 to set the point as P3. For single axis positioner, only the three points can finish positioner coordinate system.

For double axis positioner, after the setting of P3, keeping Axis XS, rotate Axis YS by a angle, then let the TCP point of tool point at reference point and press button 4 to set it as P4; then rotate Axis YS by another angle(keeping Axis XS), and move robot to point the TCP point at reference point, and press the number button 5 to set it as P5. Finally, the positioner coordinate system is set.

Press "Start" in the setting process, the status will show "O", and press "12345" to back to the last setting point with the current joint speed in manual, so that modify easier. Press "Start" to open or close this function, after finish once, this function will close automaticall.

After setting, use M601 or M602 to use the function of positioner, rotate XS axis to check it is the same as the move direction of robot or not, if not the same, then reversal calculate +6(D1, D2=1). Use M602 to rotate YS axis to check it is the same as the move direction of robot or not, if not the same, then reversal calculate +8(D3=1).

Note: If there are 2 positioners, XS and YS should be vertical intersection, YS should be rotation axis, XS should be trip axis.

Network Function of System

★500,Internet[0 means close, 1 means open, 8 means open automatically]

★501,IP address of gateway

Set as you want, it is better to keep first three numbers the same to address in LAN, for example: 192.168.1.1.

★502,IP address

It is better to keep first three numbers the same to address in LAN, for example: 192.168.1.103

★503,MAC address

Make sure every piece should be different address, for example:255:255:255:1

★504,IP address of internet service

The IP address of computer, It is better to keep first three numbers the same to address in LAN, for example: 192.168.1.13

Wi-Fi function of USB internet: The network card of USB use EP-N8508GS and BL-LW05-AR5, others cannot supported currently. The install steps as follows:

1. Install ES browser on Android phone;
2. Open internet of ES browser -->Remote manager-->Set;
3. Set the number of port to be 3721 or 2121 or 2221
4. Set the root directory and select the internal storage of the cellphone
5. Setting up a management account with anonymity
6. Set the code to be GBK mode
7. Open the remote manager (put the IP address shown into the parameter No.561)

If there isn't Wi-Fi signal, could use Hotspot of cellphone to form LAN:

1. OpeninternetofESbrowser-->Internetmanager-->Createinternethotspot
2. Usedefinedhotspot,settheusernameandcode
3. InputthenameandcodetoNo.562andNo.563parameter
4. Quitremotemanagerandenterremotemanager(puttheIPaddressshownintothe parameter No.561)

The operation method of entering the FTP server folder on the controller:

- 1 Press "N" in the program interface(or shift+N).

2 After entering the FTP server folder, press the "N" key (or F6 key) to exit the FTP server folder according to the same operation above.

The advantage of using FTP to transfer files is that you can see the contents of PC folder on the system, and you can freely choose the files you want to transfer, which is more convenient to use. You can use anonymous login FTP server (no need to set parameter P565, P566), you can also use FTP username and password, FTP username and password using the original wired network FTP username and password.

When the system is connected to the wireless WIFI and the wired Ethernet at the same time, when the FTP server is opened, the wireless WIFI is preferred, and the parameters in the system are as follows:

★561.The IP address of FTP server of the WiFi hot spot [based on the value of the FTP server in the cell phone, such as 192.168.2.206]

★562. Wifi username

★563. Wifi Password

★564. Wifi hot spot

★565. FTP username

★566. FTP password

★601,One key to set stepper type

Applies to case where the stepper equipment is installed in robot. To set the current parameters as parameter of factory default stepper motor. The parameter mainly adjusts the part

parameters of speed and motor's specification.

Attention: the parameter is usually used in robot debugging.

★602,One key to set servo type

Applies to case where the servo equipment is installed in robot. To set the current parameters as parameter of factory default servo motor. The parameter mainly adjusts the part parameters of speed and motor's specification.

Attention: the parameter is usually used in robot debugging.

3.8.6 Coordinate system

6 user coordinate system and 1 world coordinate system G53. 1 program could set 1 user coordinate system, also could set multi user coordinate systems, which could be changed by moving its original point.

Use G54 to G59 could set 54 coordinate system(G54 -G59,G54.1-G54.48), the original point of 54 user coordinate system could be changed in interface of setting coordinate system.

Overall modification of user coordinate system G54--59 could be finished in dialog box of coordinate system deviant in parameter:

- 1) InputAxxxmeanstheaxisofallcoordinatesystemdeviateoverall,forexample,inputA12.5 means the coordinate system of current modifying items deviates by 12.5 mm.
- 2) InputEmeansreset,inputExxxmeansinputabsolutedeviant.
- 3) InputEAmansresettheoverallaxisofallcoordinatesystem,inputEAxxxmeanstheaxisof all coordinate system input the deviant.
- 4) InarbitrarycoordinatesystemofXaxis,inputEALLmeansresetalldeviantofallaxisof coordinates.

★1-0,The current group of user coordinate system[G54-G59]

P1-1/P1-9 corresponds to coordinates in user coordinate system, for example, if set it as 54, then P1-1/P1-9 is specifying coordinate of G54.

★1-1/1-9, X of user coordinate system G54-G59(mm)[Input incremental, E means absolute]

★2-0,The current group of user coordinate system[G54.1-G54.48]

★2-1,X of user coordinate system G54.1-G54.48(mm)[Input incremental, E means absolute]

★1. X(mm) of user coordinate system G54 [Input incremental, E means absolute] P1-8 means XYZABCXsYs of user coordinate system G54(mm)

★11. X(mm) of user coordinate system G55 [Input incremental, E means absolute] P11-18 means XYZABCXsYs of user coordinate system G55(mm)

★21. X(mm) of user coordinate system G56 [Input incremental, E means absolute] P21-28 means XYZABCXsYs of user coordinate system G56(mm)

★31. X(mm) of user coordinate system G57 [Input incremental, E means absolute] P31-38 means XYZABCXsYs of user coordinate system G57(mm)

★41. X(mm) of user coordinate system G58 [Input incremental, E means absolute]

P41-48 means XYZABCXsYs of user coordinate system G58(mm)

★51. X(mm) of user coordinate system G59 [Input incremental, E means absolute] P51-58 means XYZABCXsYs of user coordinate system G59(mm)

★ 61. X(mm) of user coordinate system G54.1 [Input incremental, E means absolute]

P61-151 means XYZABCXsYs of user coordinate system G54.1-G54.10(mm) Operation:

1. Build the user coordinate system

Usually in status of teach:

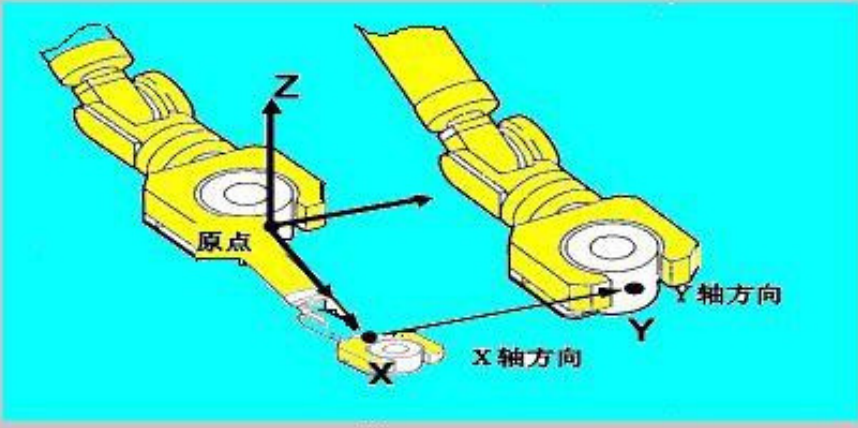
- a. Press“F8”or“F5”tochoosethecorrespondingusercoordinatesystem(G54-G59).
- b. Movecoordinate to the fixed position (so that to measure the position), measure the point

to the position of zero point in user coordinate system
 c. Press "F7", set P1 P2 P3 points (correspond to F4 F5 F6 keys).

3-points: P1 is original point, P2 is the direction of +X, P3 is the direction of +Y.
 Could press "Start" when setting, the status will show "0", then press F4 F5 F6 to back to the point the last time set, adjust easily. Press "Start" to open and close this function, it will be closed after operation.

After setting user coordinate system, the coordinate parameter will show the value, this value is the offset of zero point in user coordinate and world coordinate.

INPUT <F1-Clear, F8-Zero>



Set user coordinate G54

X:	800.000	A:	0.000
Y:	0.000	B:	0.000
Z:	1290.000	C:	0.000
XS	-12.918	YS	-5.640

F4-0; F5-X; F6-Y; F7-Zero

Esc Enter

2. Offset of user coordinate system

If still need adjust after setting:

Choose the corresponding axis in interface of coordinate system, press enter, input the offset (incremental, example: offset 10mm negative, then input -10), input E and absolute offset. Press enter to adjust.

Note:

1 After modifying the parameter, refresh the coordinate system.

2 The value in brackets is the offset so that operator to check and adjust easily.

3.8.7 Code

In case of the parameter can't be modified, the controller adopt the classified authority code. Including "CNC factory" "Machine factory" "User". "CNC" arrange inner parameter; "Machine" arrange the equipment and electrical parameter of robot; "User" arrange the technique, function and working.

Initial arrangement of authority is, "CNC" authorized, "Machine" and "user" unauthorized. If want to enable this function, need use initial code to open, and set the new code, the initial code will be invalid when setting the new code, must remember the code.

★1, The protection of "CNC"

Inner parameter, unable to operate.

★2, The protection of "Machine"

Since the parameter enabled, parameters about configuration of machinery will be under the shield. It cannot be operated till the parameter is disabled.

The initial code is "666666".

★3, The protection of "User"

Since the parameter enabled, parameters about processing will be under the shield.

It cannot be operated till the parameter is disabled.

The initial code is "888888".

★4, Change the code of "CNC"

★5, Change the code of "Machine"

★6, Change the code of "User"

Above the three parameter apply to change new code, change the new code again need to input old code first.

★7, Using time of controller

Starting using time of controller, unable to operate.

★8, Version of software

3.9 Parameter of tool compensation

Press “Page” to enter interface of tool set in any interface, including “Radius compensation” “Length” “Clear all value” “Clear current value” “Set tool” “Posit tool” “Set”, total 7 functions, correspond to press “F1-F7” to enter corresponding interface, press “Esc” to back the primary menu interface.

3.9.1 Radius compensation

Press “F1 radius compensation” in interface of tool set. Set the radius of tool, it’s compensation of CNC controller.

Method: Press “↑” “↓” to make cursor move to the corresponding tool and press “Enter” to popup a dialog box, import corresponding tool radius(Absolute value), press “Enter” at last.

3.9.2 Length compensation

Press “F2” to enter length of redeem interface. The parameter is used to modify the length which is adopt or reset the length.

Method: Press “↑” “↓” to make cursor move to the corresponding tool and press “Enter” to popup a dialog box, input the requested value.

Tch Con		N00000		Joint		2018-02-05 11:42	
Tool base set; No				X	Y	Z	U
T01	X: 0.000	Y: 0.000	Z: 0.000	A: 0.0	I	J	K
T02	X: 0.000	Y: 0.000	Z: 0.000	A: 0.0	A	B	C
T03	X: 0.000	Y: 0.000	Z: 0.000	A: 0.0	G	M	F
T04	X: 0.000	Y: 0.000	Z: 0.000	A: 0.0	N	D	H
T05	X: 0.000	Y: 0.000	Z: 0.000	A: 0.0	R	S	T
T06	X: 0.000	Y: 0.000	Z: 0.000	A: 0.0	O	P	Q
T07	X: 0.000	Y: 0.000	Z: 0.000	A: 0.0	E	L	Symb
T08	X: 0.000	Y: 0.000	Z: 0.000	A: 0.0	1	2	3
T09	X: 0.000	Y: 0.000	Z: 0.000	A: 0.0	Back	Del	Spac
T10	X: 0.000	Y: 0.000	Z: 0.000	A: 0.0	4	5	6
T11	X: 0.000	Y: 0.000	Z: 0.000	A: 0.0	Home	Up	End
T12	X: 0.000	Y: 0.000	Z: 0.000	A: 0.0	7	8	9
T13	X: 0.000	Y: 0.000	Z: 0.000	A: 0.0	PgUp	PgDn	-
					0	.	
					Alt	Esc	OK
					Left	Down	Right
					Hide		
No Alarm				Encode	0		
F1 Radius	F2 Length	F3 ACLEA	F4 CLEAR	F5 SetTool	F6 ToolSeat	F7 Set	F8 COOR

请输入-INPUT <F1-清空, F8-清零>

Input T 01:

X: 0.000	A: 0.000
Y: 0.000	B: 0.000
Z: 0.000	C: 0.000

取消---Esc 确定-Enter

Initialize the tool radius and the method of length compensation:
Press “F3”(Clear all to be 0), or “F4”(The current to be 0)

3.9.3 Tool set(Redeem)

To build and set the tool coordinate system. To ensure the position and posture of tool coordinate system in flange coordinate system by P1,P2P,P3,P4,P5. Fix an end effector on robot, move the robot to the same point according to dialog box by different posture as possible, then set P1, P2, P3. P1P2P3 specify the original point of tool coordinate system. P4 specifies direction of X axis, P5 specifies direction of Z axis.

Two methods of setting coordinate system of 6 freedom angle robot: 3-points and 5-points.

(A) 3-points:P1P2P3 to change the different posture of robot, the tool posit TPC point should be kept the same position, the posture in 3-points is the same as the posture of electrical connection. (The sixth flange coordinate of electrical wrist).

(B)5-points:P1P2P3 is the same as 3-points, but the posture of 5-points need P3P4P5 to make sure.P3 means the original position of tool coordinate posture, P4 means direction of +X tool coordinate posture, P5 means direction of +Z tool coordinate posture.

Press “Start” in the set process, the statues will show “O”, then press “12345” to adjust the speed to back to the point set the last time, easy to modify. After once operation, this function will be closed automatically.

The posture of P3P4P5 in 5-points need to be the same(Value of ABC in world coordinate should be the same) [The interface needs to be without N letter]. So it is necessary to convert into the world coordinate system after setting of P3, then move the robot to set P4 in the direction of X axis and P5 in the direction of Z axis.

After input P1P2P3 3 points in tool set, the controller will calculate the position and posture of tool coordinate in world coordinate, if 3 points is too near, then it can't be exist P1P2P3, the controller can't calculate the value, it will delete P2P3 automatically.

XYZ of tool set mean the original point of tool coordinate in world coordinate, ABC mean the 3 axis posture in space(position and direction) of tool coordinate in world coordinate.

Note:P1P2P3 in 3-points need be different posture;But the tool posture of P3P4P5 in 5-points need to be on the same straight line(It is fine if it isn't straight line, just the direction of Z axis in tool coordinate is not on the same straight line with weld gun)

INPUT

Set No. 1 tool coordinate

X:	0.000	A:	0.000
Y:	0.000	B:	0.000
Z:	0.000	C:	0.000

Set P1--P5 point by 1--5

Not set P1--P3

Esc Enter

3.9.4 Table for tool-case

Press “F6” in redeem interface. To set the tool-case type when radius of tool is compensating.
Method: Press “↑” “↓” to chose the number of tool and press “Enter”, input the type of tool-case will be fine.

Press “F1” to initialize the tool-case type of all tool.

Set the number of tool

Press “F7” in redeem interface, could set as 99 tools at the most.

3.10 Diagnosis

Press “Page” again to enter this interface under tool compensation.

User could check all input, output and alarm. Press “F2 I/O” and “page up” “page down” to check input and output. Press “F4” to check alarm.

1 means effective, 0 means invalid.

Tch Con		N00000		Joint		2018-02-05 11:42	
Input point-1							
0	0	0	0	0	0	0	0
X00	X01	X02	X03	X04	X05	X06	X07
起弧检测	焊机故障	变频报警	熔敷检测	冷却报警	润滑报警		
0	0	0	0	0	0	0	0
X08	X09	X10	X11	X12	X13	X14	X15
A0	-L	+L	Y0	X0	Z0		
0	0	0	0	0	0	0	0
X16	X17	X18	X19	X20	X21	X22	X23
				ALM	ALM1	ALM2	ALM3
0	0	0	0	0	0	0	0
X24	X25	X26	X27	X28	X29	X30	X31
KHALT	KRUN	M24/B0	M22/C0	M18	M12	M14	M16
0	0	0	0	0	0	0	0
X32	X33	X34	X35	X36	X37	X38	X39
1	0	0	0	0	0	0	0
X40	X41	X42	X43	X44	X45	X46	X47
松闸到位							
Program 111 Progress G54 T01 D0 TrueFeed V0.000 M05 M09 M10 M78 M33 M70 MOVJ X 80% V180 X150% A3000 V1000 Machine Coord X 819.567 A -105.408 Y 42.046 B -13.896 Z 1285.174 C -65.655 XS -12.918 YS -5.640 PartTime 0:0 PartNo 135 Encode 0							
No Alarm							
F2 I/O		F3 LAD		F4 ALARM		F5 EdLad	
F6 Reset		F7		F8 CANCEL			

Tch Con		N00000								Joint		2018-02-05 11:43	
Input point 2										Program 111			
0	0	0	0	0	0	0	0	0	0	Progress 			
X48	X49	X50	X51	X52	X53	X54	X55			G54			
1	0	0	0	0	0	0	0	0	0	T01 D0			
X56	X57	X58	X59	X60	X61	X62	X63			TrueFeed V0.000			
1	1	1	1	1	1	1	1	1	1	M05 M09 M10			
X64	X65	X66	X67	X68	X69	X70	X71			M78 M33 M70			
VDK0	VDK1	VDK2	VDK3	VDS0	VDS1	VDS2	VDS3						
0	1	1	1	1	1	1	1	1	1	MOVJ X 80%			
X72	X73	X74	X75	X76	X77	X78	X79			V180 X150%			
1	1	1	1	1	1	1	1	1	1	A3000 V1000			
X200	X201	X202	X203	X204	X205	X206	X207			Machine Coord			
0	1	1	0	0	0	0	0	1	0	X 819.567 A -105.408			
X208	X209	X210	X211	X212	X213	X214	X215			Y 42.046 B -13.896			
										Z 1285.174 C -65.655			
										XS -12.918 YS -5.640			
No Alarm										PartTime 0:0			
										PartNo 135			
										Encode 0			
F2 I/O										F3 LAD			
F4 ALARM										F5 EdLad			
F6 Reset										F8 CANCEL			

Tch Con		N00000								Joint		2018-02-05 11:43	
Output Point										Program 111			
0	0	0	0	0	1	0	0	0	0	Progress 			
Y00	Y01	Y02	Y03	Y04	Y05	Y06	Y07			G54			
M3330	M3331	M3332	M3333	M3334	松闸使能	M3336	M3337			T01 D0			
0	0	0	0	0	0	0	0	0	0	TrueFeed V0.000			
Y08	Y09	Y10	Y11	Y12	Y13	Y14	Y15			M05 M09 M10			
M32	焊接起弧	M10	M08	M05	M3343	M3344	M3345			M78 M33 M70			
1	0	0	0	0	0	0	0	0	0	MOVJ X 80%			
Y16	Y17	Y18	Y19	Y20	Y21	Y22	Y23			V180 X150%			
EN	INTH	M03	M04	M59	M73	M3352	M3353			A3000 V1000			
0	0	0	0	0	0	0	0			Machine Coord			
Y24	Y25	Y26	Y27	Y28	Y29	Y30	Y31			X 819.567 A -105.408			
M3354	M3355	M3356	M3357	M203	M204	M3360	M3361			Y 42.046 B -13.896			
										Z 1285.174 C -65.655			
										XS -12.918 YS -5.640			
No Alarm										PartTime 0:0			
										PartNo 135			
										Encode 0			
F2 I/O										F3 LAD			
F4 ALARM										F5 EdLad			
F6 Reset										F8 CANCEL			

Alarm information interface

The first line in this interface shows the number of spindle encoder, the number of

current and historical alarm information is record total 10, the superfluous part is clear automatically, only shows 10 alarm information recently.

Tch	Con	N00000	Joint	2018-02-05 11:43
Clear history press C key, Reset Alarm press				
Spindle encode check: 0				
1,[Curent Alarm]: NO				
2,[History Alarm]: NO				
			Program	111
			Progress	
			G54	
			T01 D0	
			TrueFeed	V0.000
			M05 M09 M10	
			M78 M33 M70	
			MOVJ X 80%	
			V180 X150%	
			A3000 V1000	
Machine Coord				
			X	819.567 A -105.408
			Y	42.046 B -13.896
			Z	1285.174 C -65.655
			XS	-12.918 YS -5.640
			PartTime	0: 0
			PartNo	135
			Encode	0
No Alarm				
		F2 I/O	F3 LAD	F4 ALARM
		F5 EdLad	F6 Reset	F8 CANCEL

Check and edit PLC

Press “F3” to check PLC, “F5” to edit, “S” to search. After finishing edit, please restart the controller.If immediate execution is unnecessary, press “R”.

Tch	Con	N00000	Joint	2018-02-05 11:43
K209 M04 1999 M999 X04 M44 X05 M47 X01 M90 X02 M39 X10 M200 M16 X09 M201 M17 X10 M202 M18 R---Reload ladder E-Stop M04 0000 OverCOP M44 0001 LackLub M47 0002 焊机故障 M90 0003 SP-Alarm M39 0004 X-PosL M16 0005 X-RevL M17 0006 Y-PosL M18 0007				
			Program	111
			Progress	
			G54	
			T01 D0	
			TrueFeed	V0.000
			M05 M09 M10	
			M78 M33 M70	
			MOVJ X 80%	
			V180 X150%	
			A3000 V1000	
Machine Coord				
			X	819.567 A -105.408
			Y	42.046 B -13.896
			Z	1285.174 C -65.655
			XS	-12.918 YS -5.640
			PartTime	0: 0
			PartNo	135
			Encode	0
No Alarm				
		F2 I/O	F3 LAD	F4 ALARM
		F5 EdLad	F6 Reset	F8 CANCEL

3.11 Operation of program

Press “Page” to choose the program.

Program management is the same as file management, the storage of the system is 128M(The max could be expand to 32G) bits to contain program and there is no limit for quantity of program. Programming adopts full screen operation.

Tch Con		N00000		Joint		2018-02-05 11:44	
File/File folde in system				X	Y	Z	U
CurDir: /NC				I	J	K	A
00				G	M	F	N
000				R	S	T	O
01				E	L	Symb	1
02				Back	Del	Spac	4
111				Home	Up	End	7
123				PgUp		PgDn	-
123456987.DXF							0
125				Left	Down	Right	Alt
213							Esc
222							OK
25							Hide
321							
Compile-P; Receive-R, Tansmit-T, DNC-L				Encode 0			
No Alarm							
F1 New/Sek		F2 COPY		F3 RENAM		F4 INFOR	
F5 LAST		F6 USBdisk		F7 EXEC		F8 CANCEL	

Center part of screen for program display,current program is showed by reverse display, press “PgUp”, “PgDn” to choose program, and then press“Enter”to edit current program. Functional keys“F1,F2,F3,F4,F5,F6,F7,F8” include:“new file/search”, “copy”, “rename”, “information”, “last grade”“USB disc”“, execute program”, “cancel”.

3.11.1 Editing

Select “New file/search” to popup a dialog box to import the name of program, if the name is existent, the quondam program is called up; If the name is nonexistent, the system will build a new file.

The name of program can be number, letter or mix, the length is 100 bits.

The system doesn’t allow the namesake, build a new program or select a program and press “Enter” to enter the editing interface.

coordinate of XYZABCXsYs.

the mode of teach could be divided into two methods by P13 parameter:one is generate MOVJ/MOVL/MOVC instruction ; Another is generate G0/G1/G6 instruction.

F2 :When in the first line, press this mean this line is the first line of PLAY, otherwise it will generate MOVJ or G0 instruction.

F3:Teach, be used to open and close the teach function.

F4 : Record the end point, be used to record the end point of straight line interpolation and arc interpolation, generate MOVL/MOVC instruction or G1/G6.

F5:The centre of arc, record the centre point of arc, after pressing this button, it will shows MOVC..... or G6 I**J**K** , to prompt user the next end point position of arc.

Note: (1)If use MOVJ/MOVL/MOVC instruction, press “F2” or “F4” to input VJ=or V= or PL=, press enter to not input.

(2) The beginning of program must use MOVJ or G0,otherwise if the starting point is not the same, the trajectory will be different.

Steps:

- (1) Press“F3”toopenteachfunction;
- (2) Press“F2”;
- (3) Movetothestartingpoint,Press“F2”;
- (4) Movetothepointaccordingtothetrajectoryandrequirement:

A)Rapid instruction:Press “F2” to input the rapid ratio and position level. It will generate rapid instruction MOVJ.



B)Straight line instruction:Press “F4” to input feeding speed, position level and position point, to generate straight line instruction MOVL.



C)Arc instruction:Press “F5” to record the centre of arc, move to the end point of arc, press “F4” to input feeding speed, position level and position point, it will generate arc line instruction MOVC.

For example:

Tch Con		N00000		User		2018-02-05 11:49	
Edit: /NC/000				X	Y	Z	U
G54 T1				I	J	K	A
MOVJ VJ= 100.0				G	M	F	N
MOVL				R	S	T	O
MOVL				E	L	Symb	1
MOVL				Back	Del	Spac	4
MOVJ V= 300.0 : PT3				Home	Up	End	7
				PgUp	PgDn	-	0
				Left	Down	Right	Alt
							Esc
							OK
							Hide
No.8 /Total15				Encode 0			
F1 COMPIL				F2 Fst/Fast			
F3 TeachIn				F4 SetEnd			
F5 ArcMid				F6 DelLine			
F7 > >				F8 CANCEL			

D,“F4”:Locate to the specified line.

E,“F5”:To input

input <F1-clear, F8-clear to 0>

input the corresponding number of instruction

3-Start transition SN; 4-Close transition

5-Start arc weld AS; 6-End arc weld AE; 7-Start swirl

instr

uetio

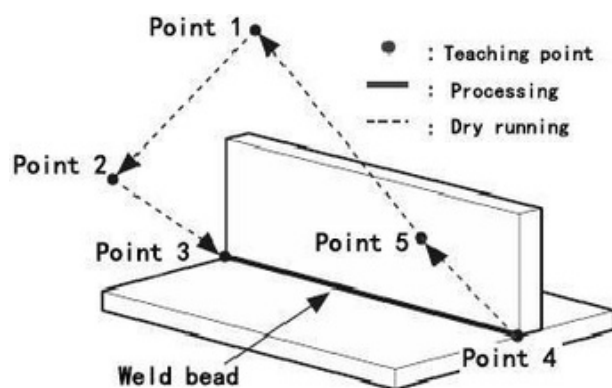
--Enter

--Esc

- 1) Input 3 to use translation instruction SN*, * means the number of group it will use in technique parameter 0-99. It can be checked and modified by No.501-No.506 technique parameter.
SN*, SF instruction can let robot generate translation motion, be used in palletizing and flitting, could make programme easier.
- 2) Input “4” to close the translation function SF.
- 3) Input “5” to execute instruction AS*, execute the corresponding program
ProgramUser0 (User could edit this file as they want). “*” means it will invoke 0-9 group of technique parameter, could be checked and modified by No.1-0/No.1-9 technique parameter.

- 4) Input "6" to the end of arc welding instruction AE*, execute the corresponding program Program User1 (User could edit this file as they want).
- 5) Input "7" to the start of swing welding instruction WS*, "*" means it will invoke 0-9 group of technique parameter, could be checked and modified by No.2-0/No.2-9 technique parameter.
WS*, WE instruction mean it will swing when execute MOV L and MOV C according to the parameter, used when weld bead is very wide.
- 6) Input "8" to the end of swing welding instruction AE*.
 - F: "F6": Delete the current line.
 - G: "F7": The first, second page to choose.
 - H: "F8": Change between Chinese and letters.
 The second page:
 - A: "F1": Delete segment of the program.
 - B: "F2": Copy the program.
 - C: "F3": Arrange the program.
 - D: "F4": Search the specified letters.
 - E: "F5": Replace the specified letters.
 - F: "F6": Replace the specified letters with all content.
 - G: "F7": Choose the first or second page.
 - H: "F8": Change between Chinese and letters.

3.11.2 Teach of welding programme



```
G54 T1 ;G54 user coordinate system, T1 tool coordinate system AA1000
;Welding current correspond to output analog 3.33V VV1500
;Welding voltage correspond to output analog 5V MOVJ VJ=80.0 PL=9.0 ;Smoothness
PL=9, 80% move rapidly to program point 1 MOVJ VJ=50.0 PL=9.0 ;Smoothness
PL=9, 50% move rapidly to program point 2 MOVJ VJ=25.0 PL=0 ;Smoothness PL=0,
25% move rapidly to program point 3
AS3 ;Start arc weld, the third group technique
MOVL V=100 PL=0 ;From program point 3 with arc weld to point 4, speed is 100mm/min
AE3 ;End of arc weld
MOVJ VJ=50.0 PL=9.0 ;Smoothness PL=9, 50% move rapidly to program point 5
MOVJ VJ=50.0 PL=9.0 ;Smoothness PL=9, 50% move rapidly to program point 1
M02 ;The end
```

3.11.3 Copy

Press "↑ ↓" in program main interface to select program which need to copy and press "F2" to popup a dialog box to import a new name of program, to copy which is the same content but different name so that to modify, rename and back-up copy.

3.11.4 Delete

Press “↑ ↓” in program main interface to select program which need to delete and press “Del” to delete the program.

Note : The operation of delete need to be careful, it can't be recovery after deleting.

3.11.5 Rename

Press “↑ ↓” in program main interface to select program which need to rename and press “F3” to popup a dialog box to import a new name.

3.11.6 Information

Press “↑ ↓” in program main interface to select program which need to check and press “F4” to popup a dialog box to check the size of program and the remainder space of the system.

3.11.7 Folder management

You can build a file in this system, Press “F1” in program main interface to import a file name and press “.” to build a folder and it will prompt a “folder” after the name.

Move the cursor to the file name and press “Enter” to open to build a new file or folder in it.

Press “F5” go to the last folder.

Move the cursor to the file name and press “Del” to delete the folder.

3.11.8 Select automatical program to run

Press “↑ ↓” in program main interface to select a program and press “F7” to select the program and switch into the last interface.

3.11.9 Program communication

The system could adopt the RS232 serial port to deliver files.

(1) Delivery (Transport)

Deliver the selected program in this system to another system or to PC to save. Press “↑ ↓” in program main interface to select program and press “T” to deliver, press “Reset” to interrupt in the deliver process.

(2) Reception

Receive the selected program in another system or PC (Must be text file form).

Press “R” to import a name of received program into the dialog box in program main interface, then press “Enter”. Press “Reset” to interrupt in the receive process.

Note: 1. Using the exclusive communication software to deliver program in User's PC.

2. The speed of deliver of PC must be the same as the speed of receive, defeat otherwise.

3. The length of RS232 can't over 10 meters.

4. The number of serial port must be the same as the system setting.

5. Editing program of PC must be text file form.

3.11.10 U-disk management

To exchange files of parameter or program with other system or PC by U-disk. It also can upgrade or back-up the software or parameter in system.

Note: The name of folder can't have space symbols.

Press “F6” to enter the U-disk management interface in program main interface when U-disk connects the USB port. Press “F6” again to back to the system interface.

A. The processing program management

Copy the files or folder of U-disk into system

After connecting the U-disk, press “F6” to enter the U-disk directory in program main interface. Press “↑ ↓” to move cursor to select file or folder to copy and press “F4” to popup a dialog box to import name, press “Enter” to confirm. If there is the same name of program in the system, it will popup a dialog box to ask if cover the file or folder or not.

Press “R” to copy all the program in USB into system.

Copy the files or folder of system into U-disk

Press “↑ ↓” to move cursor to select file or folder and press “F6”, press “F3” to popup a dialog box to import name in U-disk interface and press “Enter” to confirm.

If there is the same name of program in the system, it will popup a dialog box to ask if cover the file or folder or not.

Press “T” to copy all the program in system into USB.

Note: Before unplugging the U-disk must return to the display system of program files directory interface. (Exit U-disk interface) Otherwise the data which is copied just now will be lost.

The name of folder can't have space symbol when using U-disk.

B. Using U-disk to manage parameter and system software

The system could use U-disk to deliver files or system software to upgrade and update, back-up files and parameter, the method of operation is as follows:

Using U-disk to copy parameter and system software into system (Upgrade, update).

First U-disk inserts the USB port and press “Page” to enter the main interface, press “F6” to show the files in U-disk. Press “↑ ↓” to move the cursor to select a folder which is going to be copied into system and press “Enter” to open it, press “F2” to import code when appearing the files and press “Enter” to confirm, wait for seconds to copied the parameter successfully. Press “F6” to exit U-disk after copying successfully, restart the system, the system will reloads the new files to upgrade the parameter.

Note: The parameter is better to be derived into a separate folder in U-disk to defend from the error operation to destroy the system files.

To derive or back-up parameter files by U-disk

First U-disk inserts the USB port and press “Page” to enter the main interface, press “F6” to show the files in U-disk. Press “F1” to import the code and press “Enter” to confirm, wait for seconds to derive successfully. The parameter in system is already derived into U-disk. Press “F6” to exit U-disk.

Note: The U-disk is empty better to arrange the files (Parameter files is lots of about several dozens) so that derive parameter or create a folder on your computer first, open the folder before deriving to derive the parameters into the folder.

3.11.11 Change offline file into G code program

After send the offline file into controller, need add user coordinate system and the number of tool at the head of program, and the initial located point of each joint to make sure the posture of robot is the same. The operation: First move each joint to the initial located point of the offline file, choose the program in program interface and press “-” to popup the dialog, input the user coordinate system G and the number of tool T, VJ, PL, press “Enter”, it will generates the same name file which is RBT. If the file is .DXF or .dxf, it will be G code file.

3.11.12 The operation for folder of FTP server file

If the controller connect with Internet or Wi-Fi, could enter folder of FTP server.

1. Press “N” in program interface.

2. After entering folder of FTP server, press “N” (or F6) as the above operation to quit.

The advantage of FTP: You can see the contents of the PC folder on the controller, and you can choose the files you want to transfer freely, and it is more convenient to use it.

Chapter 4 Programming

Note: This robot controller could use the instruction of CNC milling controller, please check the instruction of CNC milling with milling controller manual.

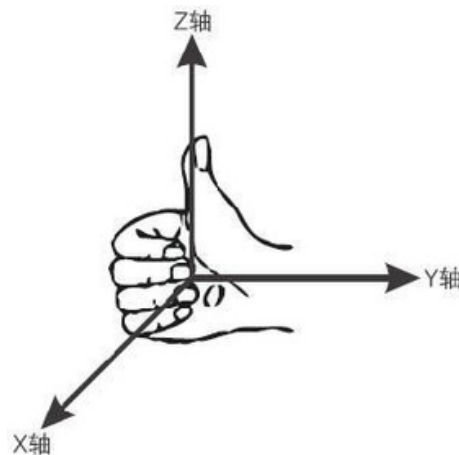
4.1 Basic conception

Segment: Made by the instruction and date.(Program line) Program: Run all program lines according to the logic.

User-coordinate system: The establishment of user coordinate system is based on the right-handed spiral rule. The Descartes rectangular coordinate system is used as the programming standard coordinate system (the following figure), and the positive direction of Z is in the thumb direction of X to Y rotation. When the workpiece coordinates are established, the positive direction of Z is usually far away from the workpiece, so it is necessary to consider the edge of the X and Y direction in the establishment of the workpiece coordinates.

Two methods to set user coordinate system:

1. Press “F8” in teach status;



2. Use G54/G54.1-G54.48/G55/G56/G57/G58/G59 instruction;

Must use these methods if use absolute value.

Programme with absolute coordinate : Absolute coordinate is relative to the original point of processing. Use G90 instruction, X, Y, Z, A, B, C, Xs, Ys.

For example:G00 G90 X200 Y200 Z300

Relative coordinate: Also named incremental coordinate, means the direction and direction from the end point to starting point.Relative coordinate means the motion position relative with the in front position, not relative to the fixed position.

Use G91, X, Y, Z, A, B, C, Xs, Ys.

For example:G00 G91 X200 Y200 Z300

The minimum unit:0.001mm.

Mode instruction : Means keep the status, not only work in this program, but also the behind program until the other mode instruction replace it.

Maybe there are multi mode instructions, such as M03, M04, M05 are mode, it is a mode group. Only be one of them in any time, because of the only status, the mode instruction invoked initially is called initial mode. such as M05.

Stop mode: Such as M30, it means end, back to the starting status, transfer all of mode instruction into initial mode.

Non-mode: Without keep function, only working in this program.

4.2 Programme instruction

4.2.1 Programme

- (1) Multiinstructions: Could be multiinstructions in one program line, but the same group instruction can't be in the same program line.
- (2) You can edit the sequence as you want
Example: M03 G01 X20 Y-30 Also could be: G01 Y-30 X20 M03
- (3) The same instruction cannot appear twice in one program line.
- (4) Can't be irrelevant data or parameter in the same program line.
- (5) 0 in front of the instruction could be omitted, example: G01 M03, also could be G1 M3.
- (6) Start from any point and any line, after changing tool, must use absolute program.
- (7) Non-mode instruction only works in the specified program line, example: G04.
- (8) Mode instruction is always working before the same group appear.

4.2.2 Instruction of robot controller

- ① Analog output AA/S, VV/SS
AA means welding current; S could be this meaning. VV means welding voltage; SS could be this meaning.
AA and VV could be edited in the same line, but S and SS can't be the same line. AA/S output the first analog 0~10V, VV/SS output the second analog 0~10V.
- ② Start arc welding AS*
Start arc welding: AS*. Execute the corresponding program ProgramUser0 (User could edit this file as they want).
“*” means invoke the group number 0-9 of technique parameter, correspond to No.1-0.
If execute this instruction, program will invoke the preset arc welding parameter.
Example:
AS1 ; Use group 1 technique parameter of arc welding technique to start
..... ; The route of arc welding
AE1 ; The end
Note: This instruction need to be one line, can't be with other instruction in one line.
- ③ The end instruction of arc welding AE*
Execute the corresponding program ProgramUser1 (User could edit this file as they want).
- ④ Start swing welding WS*, T.I.G Welding: WS99
Starting instruction of swing welding: WS*
“*” means the group number 0-9 of technique parameter, correspond to No.2-0.
If execute this instruction, program will invoke the preset swing welding parameter.
Example:
WS2 ; Use group 1 technique parameter of swing welding technique to start
..... ; The route of swing welding WE ; The end
T.I.G Welding: WS99
Format: P specifies the time of point weld (time:s); Q specifies the distance (unit:mm); R specify the distance with idle run. (unit:mm)
- ⑤ The end instruction of swing and T.I.G welding WE
WS*, WE swing according to the parameter when executing MOVL and MOV C, be used for wide weld bead.
- ⑥ Motion instruction of robot (Simple instruction and whole instruction)
a, Joint: MJ or MOVJ or G0.
b, Straight line: ML or MOVL or G1. c, Arc: MC or MOV C or G6.

Joint motion: MJ or MOVJ or G0 or ML or MOVL or or G1. Could be specified by joint coordinate value of each axis, incremental programme with G91, absolute programme with G90.Format: MOVEJ J1=*** J2=*** J3=*** J4=*** J5=*** J6=***. MJ or MOVJ can't be omitted with 6 axis robot.

Data of position is hidden when setting as robot mode(P13 parameter to be 0), but if set as other mode, then it will shows(P13 parameter to be 1).

Note:

- 1)30000 lines at the most if use MOVJ/L/C instruction in teach.
- 2) When a point set as to be the centre of circle arc, its posture will be ignored.
- 3)The first point of program must use MOVEJ to specify, if starting point dislocated at point coordinate, it will cause the configuration of controller is different in each time.

⑦ SpeedV/F

Use V= to specify the feeding speed. Unit is mm/s, example V=120. Also could use F to specify, the unit is mm/min.

Use V= in G0 or MJ or MOVJ, it will prompt error. If this is mode code, works all the time.

⑧ RapidOverrideofSpeedVJ

Use VJ= to specify the rapidly feeding ratio. Example VJ=90, but the ratio can't be over 100%. If not specify by VJ=, then it will work according to the ratio on controller. Use VJ= in G0

or MJ or MOVJ, it will prompt error.

This is non-mode code, only work in the current segment.

⑨ VariablePL

Use PL= to specify the continuous variable between the segments, the smaller the more accuracy, PL=0 means the speed is 0 to transition.

This instruction could be used in any segments.

This is non-mode code, only work in the current segment.

⑩ StarttranslationSN*

“*” means the group number 0-99 of technique, corresponding No.501-No.506 parameter.

⑪ EndtranslationSF

SN*,SF specify the robot to transit, flitting, palletizing.

⑫ StartsearchingpositionST*P*

The “*” behind ST means the group number of parameter in this research[0--9];

The “*” behind P means the data number of transition in this research[0--99];

It will clear the transition which is behind P when executing this code.

⑬ EndsearchingSE

⑭ Searchinstraightrunning

Instruction:

SX searchinthedirectionofXaxis

SY searchinthedirectionofYaxis;

SZ searchinthedirectionofZaxis;

The number behind SX/SY/SZ means the repeat times, controller will calculate the average, the most times is 9, only once if no number. For example, SX5; SY6; SZ4; SY; SX.

Example:

G54T1 ;Specifytheusercoordinatesystemandtoolnumber

MOVJ ;Locatetothestartingpointofsearch

ST2P3 ;Startsearching,invokeparametergroup2,itwillbesavedintodatanumber3of

transition data

MOVL ;Locatetothestartingpointofsearch

MOVL SX ; Search in the direction of X axis, the MOVL point of this line is resultant point of calibrated workpiece, system will orient according to this point and starting point.

MOVL ;Locatetoanotherstartingpointofsearch
 MOVL SX ; Search in the direction of X axis, the MOVL point of this line is resultant point of calibrated workpiece, system will orient according to this point and starting point.
 MOVL ;Locatetoanotherstartingpointofsearch
 MOVL SY3 ; Search in the direction of Y axis(Repeat 3 times), the MOVL point of this line is resultant point of calibrated workpiece, system will orient according to this point and starting point.

SE ;Endsearching
 MOVJ ;Locatetothemiddlepoint
 SN3 ;Specifythenumber3ofpositionoffsetdataAS4 ;Startarcwelding
 MOVL ;Executestraightlineweld,accordingtoteachpointofcalibratedworkpiece. MOVL ;Executestraightlineweld,accordingtoteachpointofcalibratedworkpiece.
 AE4 ;Endarcwelding
 SF ;Closepositionoffset

⑮ Starting arc tracking TS*

The “*” behind TS means the group number of parameter in this research[0--9].

⑯ End arc tracking TE

Example:

G54T1; specify user coordinate system and tool number.
 MOVJ; locate at the starting point.
 TS2; invoke user parameter group 2 to start arc tracking.
 MOVL; execute straight bead welding.
 MOVL; execute straight bead welding.
 TE; end arc tracking.

⑰ Read the current user coordinate PK***

Example: PK5 means set the current user coordinate position of robot as the data of fifth point in controller.

⑱ Calculate the translation according to number of two position

$PX^{***} = PT^{***} - PT^{***}$

Example: $PX3 = PT5 - PT6$ means the number 5 position of robot minus the number 6 position, the result as the number 3 transition data.

⑲ Plus and minus in translation $PX^{***} = PX^{***} + PX^{***}$ and $PX^{***} = PX^{***} - PX^{***}$

Example: $PX3 = PX3 + PX8$ means the number 3 position of robot plus the number 8 position, the result as the number 3 transition data.

$PX3 = PX5 - PX7$ means the number 5 position of robot minus the number 7 position, the result as the number 7 transition data.

⑳ Program for specified position

MOVJ or MJ PT*** means rapidly locate to the position specified by PT address according to the joint coordinate mode.

MOVL or ML PT*** means move to the position specified by PT address according to the straight line mode.

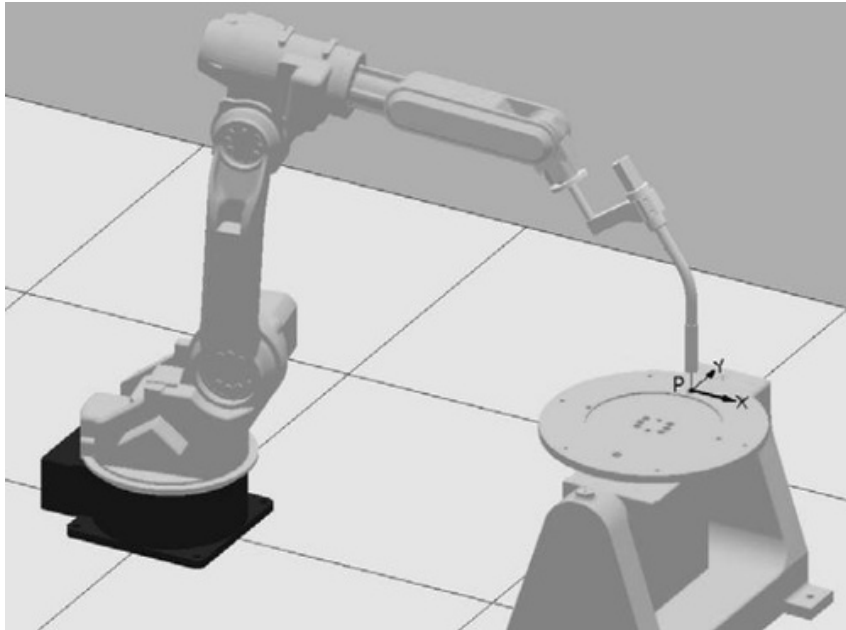
MOVC or MC PC*** PT*** means move to the position specified by PT address according to the circle arc mode, PC address specify the centre of circle arc.

Note: The tool number and user coordinate system is the same as the number tool and user coordinate system in program when reading the position data of robot.

㉑ Function of positioner

User instruction: M601 open a positioner axis function of XS.

User instruction: M602 open two positioner axis function of XS and YS. User instruction: M600 Closed the function of positioner.



Parameter:

489,Set coordinate system of positioner

490 , The world coordinate of XS when setting P3P4P5 coordinate of positioner (um)

491,The position of positioner in X(um)

492,The position of positioner in Y(um)

493,The position of positioner in Z(um)

494,The posture of positioner in A(degree)

495,The posture of positioner in B(degree)

496,The posture of positioner in C(degree)

497,Calculate reversal with coordinate of positioner(XS+6;YS+8)

By parameter“489,Set coordinate system of positioner”Set 3-points(single axis positioner) and 5-points(double axis positioner), it will regenerate the No.490-No.496 parameter.



To find a reference point, and move the robot to make the TCP point of tool point at the reference point, the press the number button 1 to set the point as the P1; then rotate axis XS by a angle, move the robot, let the TCP point of tool point at the reference point, then press the number button 2 to set the point as P2; then rotate axis XS by a angle again, move the robot, let the TCP point of tool point at the reference point, then press the button 2 to set the point as P3. For single axis positioner, only the three points can finish positioner coordinate system.

For double axis positioner, after the setting of P3, keeping Axis XS, rotate Axis YS by a angle, then let the TCP point of tool point at reference point and press button 4 to set it as P4; then rotate Axis YS by another angle(keeping Axis XS), and move robot to point the TCP point at reference point, and press the number button 5 to set it as P5. Finally, the positioner coordinate system is set.

Could press "Start" when setting, the status will show "O", then press "12345", it will back to the position which is set the last time with the current manual speed, press "Start" to open and close, it will be closed automatically after once.

After setting, use M601 or M602 to open the function of positioner, rotate XS axis to see the direction of robot is the same or not, if not the same, then the parameter of calculate reversal +6(D1, D2=1). Use M602 to open the function, rotate YS to see the direction of robot is the same or not, if not the same, then the parameter of calculate reversal+8(D3=1).

Note: If got two positioners, the axis line of Xs and Ys should be vertical intersection, Xs is flip axis, Ys is rotation axis.

②② Whole operation of depalletizing PW**

Before executing PW**, controller will execute PR** once automatically to reset the current value.

Note: 1. The macro variable of depalletizing #9001--#9099 correspond to total count of each number of depalletizing, all finished if it is negative number.

2. The macro variable of depalletizing #9101--#9199 correspond to the current layer number of each number of depalletizing.

②③ Reset the current value of depalletizing PR**

Note:

1) If the number is 9999, then controller finished the Reset;

2) The current value of depalletizing includes the current line, column, layer, stack, total stack;

②④ Whole operation of once depalletizing PA**

After finishing PA**, need to execute PR** to reset, then execute PA**.

②5 Chooseusercoordinatesystem(G54.1-G54.48/G54-G59)

G54 user coordinate system 1
G54.1/G54.48 user coordinate system
G54.1/G54.48 user coordinate system
G55 user coordinate system2 G56 user
coordinate system3 G57 user
coordinate system4 G58 user
coordinate system5 G59 user
coordinate system6

②6 Choosetoolcoordinatesystem(T01-T99)

T01 Number 1 tool coordinate system
T01 Number 2 tool coordinate system
..... T01 Number 99 tool coordinate
system

②7 Programmemode(G90/G91)

Two kinds of movement: Absolute and incremental. User G90 and G91 to specify, in absolute, it's coordinate of end point. In incremental, it's movement.

Note: Absolute programme of rotation axis is proximity to calculate, incremental programme is program to calculate.

②8 Rapidly locate(G00)

Format: G00 X-Y-Z-A-B-C-Xs-Ys-

Note: X, Y, Z, A, B, C, Xs, Ys, could use absolute or incremental to programme.

Point out value of movement and direction.

Each axis goes rapidly to the end point in G00 separately. Also could use linkage mode: through P10 parameter D6=0 to set.

The speed of G00 is set by speed parameter.

②9 Interpolation of straight line (G01)

Format: G01 X-Y-Z-A-B-C-Xs-Ys- F-

Note: X, Y, Z, A, B, C, Xs, Ys, could use incremental or absolute to programme. The speed is specified by F.

Feeding speed of G01 F could be modified by feeding ratio on panel, the range is 0%~150%.

G01 could be edited as G1.

③0 Circular arc in 3D space G06

Format: G06 X_ Y_ Z_ I_ J_ K_ F_

Function: If don't know the center and radius of circle arc in 3D space. But 3 points is known on arc, then could use G06, could make sure the direction of arc by the starting point, end point and the third point between them.

Note: G06 is mode code;

I: The coordinate from the middle point to the starting point of circle arc(X)(direction);

J: The coordinate from the middle point to the starting point of circle arc(Y)(direction);

K: The coordinate from the middle point to the starting point of circle arc(X) (direction).

Note: 1) Middle point: Point Between the starting point and the end point on circle arc;

2) If three points on the same line, it will alarm;

3) I=0, K=0 and J=0 when not specify; If not specify three points, it will alarm.

4) I, J, K like the I, J, K in G02/G03 which is from center to the starting point;

5) G06 can't be used in circle.

For example: G54

```
G0 X10 Y28 Z10
G06 X30 Y98 Z10 I5 J-6 K-5 F100
X130 Y198 Z120 I55 J-86 K-65 G0X0Z0
M02
```

③1 Delay(G04)

Applies to delaying for certain time before other motions during process.

Format: G04P-;or

G04 X_ ; or

G04 U_ ;

Function: Every axis is stop and mode instruction is still working when carry out this instruction, after delaying the specified time to carry out the next program segment.

Instruction introduction:

1.The unit of P delay time is ms(Millisecond)/

2.The unit of X and U delay time are S.

3.Example:

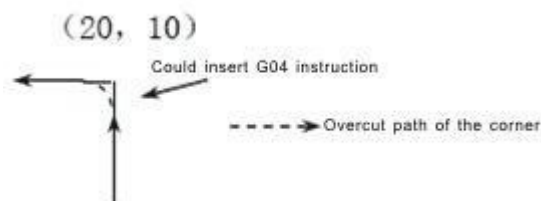
G04 X1; delay for 1s.

G04 P1000; delay for 1s.

G04 U1; delay for 1s.

Special application: G04 can be accurate stop instruction, such as processing corner kinds of workpiece, it appears over cutting sometimes, if use G04 instruction around the corner, it will eliminate the over cutting.

Example as follows:



Program:

```
N150 G01 X20 Z10 F100;
```

```
N160 G04 P150;(eliminate the over cutting) N170 G01 W-10;
```

.....

Note: Also could set P7 processing parameter to eliminate the over cutting.

③2 ReturnReference(G28/G281-G288/G301-G308)

G28 ;allaxisreturntoreference

G281 ;only X return to reference

G282 ;only Y return to reference

G283 ;only Z return to reference

G284 ;only A return to reference

G285 ;only B return to reference

G286 ;only C return to reference

G287 ;only Xsreturntoreference

G288 ;only Ysreturntoreference

G301 ;Xaxisreturntozero

G302 ;Yaxisreturntozero

G303 ;Zaxisreturntozero

G304 ;Aaxisreturntozero

G305 ;Baxisreturntozero G306 ;Caxisreturntozero G307 ;Xsaxisreturntozero G308 ;Ysaxisreturntozero If use incremental servo type motor and the back to zero point is mechanical way, then use

G281/G282/G283/G284/G285/G286 corresponds to J1/J2/J3/J4/J5/J6 (X0/Y0/Z0 /A0 /B0/C0) back to mechanical zero point..

③3 Programcirculationinstruction(G22--G800)

G22 is program circulation instruction; G800 is an instruction to end circulates. But G22 must be used with G800 for repeated processing. L means circulation times, the range is 1-99999. The circulation instruction can nest.

Format:G22L2 ;begin

:

: ;circulating

G800 ;end

③4 Gobackthestartingpointofprogram(G26/G261-G268)

Format : G26 ; ZXY all go back starting point.

G261 ;Xgobackstartingpoint.

G262 ;Ygobackstartingpoint.

G263 ;Zgobackstartingpoint.

G264 ;Agobackstartingpoint.

G265 ;Bgobackstartingpoint.

G266 ;Cgobackstartingpoint.

G267 ;Xsgobackstartingpoint.

G268 ;Ysgobackstartingpoint.

③5 Rememberthecurrentpoint(G25)

Format:G25; TorememberthecoordinateofXYZABCXsYs

③6 Returntothememorialpoint(G61/G611-G618)

Format: G61 ;ReturntoXYZofmemorialpoint

G611 ;ReturntoXofmemorialpoint G612

;Return to Y of memorial point G613

;ReturntoZofmemorialpoint G614

;ReturntoAofmemorialpoint G615

;ReturntoBofmemorialpoint G616

;ReturntoCofmemorialpoint G617

;ReturntoXsofmemorialpoint G618

;ReturntoYsofmemorialpoint

Note: G61 goes back with G00 speed to memorial point of G25.

③7 Detectskip(G31,G311)

Format:G31X_Y_Z_A_B_C_Xs_Ys_F_P_ ;ifnosignal,Noalarm

G311X_Y_Z_A_B_C_Xs_Ys_F_P_ ; if signal, alarm

Data behind P: Number of line+(X00/X39+1000 or 2000) , 1000 means availability and skip,2000 mean invalidation then skip.

For example:G31 X50 Z100 F100 P331022; if X22 availability then goes to N33. G311 X50 Z100 F100 P2021; if X21 invalidation then goes to next line. If X21 is always valid, it will alarm all the time. Note: Number X00-X47 could be checked on the diagnosis.

③8 MFunction

Y05:Output of motor with brake, X40 is the input to check brake;

M03:Feeding welding wire or spindle rotate CW, output Y18;

M04:Back welding wire or spindle rotate CCW, output Y19;

M05:Stop welding or spindle, output Y12;
 M203:The second spindle rotate CW, output Y28;
 M204:The second spindle rotate CCW, output Y29;
 M205:The second spindle stop, close Y28, Y29;
 M11/M10:Loosen/Tighten tool, output Y10;
 M08/M09:Cool switch, output Y11;
 M32/M33:Lubrication, output Y08;
 M59/M58:Huff, output Y20;
 M71/M70: welding start or end, output Y09; X00 is inputting of arc welding.
 M73/M72:Cladding switch, output Y21, input X02 to check;
 M3330/M4330:User-defined output 0, output Y00;
 M3331/M4331:User-defined output 1, output Y01;
 M3332/M4332:User-defined output 2, output Y02;
 M3333/M4333:User-defined output 3, output Y03;
 M3334/M4334:User-defined output 4, output Y04;
 M3336/M4336:User-defined output 6, output Y06;
 M3337/M4337:User-defined output 7, output Y07;
 M3343/M4343:User-defined output 13, output Y13;
 M3344/M4344:User-defined output 14, output Y14;
 M3345/M4345:User-defined output 15, output Y15;
 Enable signal of drive EN: Controller is ready for output Y16;
 Reset signal of drive INTH: Output Y17 when drive is reset;
 M3352/M4352:User-defined output 22, output Y22;
 M3353/M4353:User-defined output 23, output Y23;
 M3354/M4354:User-defined output 24, output Y24;
 M3355/M4355:User-defined output 25, output Y25;
 M3356/M4356:User-defined output 26, output Y26;
 M3357/M4357:User-defined output 27, output Y27;
 M3360/M4360:User-defined output 30, output Y30;
 M3361/M4361:User-defined output 31, output Y31;

Note: M3330-M3361, M4330-M4361 can't be in the same segment

M14/M15:(Pxxxx) Check X30 valid/invalid(Start from Nxxx line if there is P); M16/M17:
 (Pxxxx) Check X31 valid/invalid (Start from Nxxx line if there is P); M22/M23:(Pxxxx) Check
 X27 valid/invalid (Start from Nxxx line if there is P); M24/M25:(Pxxxx) Check X26 valid/invalid
 (Start from Nxxx line if there is P); M28/M29:(Pxxxx) Check X25 valid/invalid (Start from Nxxx
 line if there is P); WAT+/- :User defined input valid or invalid, X0-X47, total 48ways; M38xx:
 Set output point Yxx is valid, example: M3809 means output Y09 is valid; M48xx: Set output
 point Yxx is invalid, example: M4807 means output Y07 is invalid; M18xx: Wait input point
 Xxx is valid and run the next, example: M1809 means wait input

X09 is valid and run the next.

M28xx: Wait input point Xxx is invalid and run the next, example: M2807 means wait input X07 is valid and run the next.

M18xx Pxx: According to Xxx; Runs when valid; Skip to Pxx when invalid; example: M1809 P234 means input X09 is valid and run the next, skip to P234 when X09 is invalid.

M28xx Pxx: According to Xxx; Runs when invalid; Skip to Pxx when valid; example: M2807 P456 means input X07 is invalid and run the next, skip to P456 when X07 is valid.

M97:Program Pxxx skip and starts from Nxxx program line;

M98:Pxxx Lyyy to use sub program xxx, times is yyy;

M99:Back to use sub program;

M87: Numberofworkpieceplus1ifNo.5processingparametersetas0;M00:Pause

M01:Program could stop, input X41 and pause when execute M01;
M02:Program end;
M30:M05, M09 program end; M20:Repeat the program automatically;
M500:Read joint coordinate of absolute motor J1-J6 Xs Ys;
M501-M508:Read joint coordinate of the encoder of J1-J6XsYs separately; M312-
M319:Clear the current user coordinate of XsYsABCXYZ separately;
M412-M419:Clear the joint coordinate of J6XsYsJ4J5J1J2J3 respectively;

③9 UseprogramM97,M98,M99

Skip with none-condition

M97 Pxxx skip to the line number which is specified by P without addition;

Use sub program

In this controller the subroutine should be an independent program.

M98 Pxxx Lyyy unconditionally call subroutine instruction. P is to specify the name and path of subroutine call, L refers to the calling times for address of subroutine.

The M98 instruction can be omitted, format: PP file name, the file name can be hidden files, the first character of hidden files must be "HIDEFILE" at the beginning. Such as the file "HIDEFILE01", this program in the program area is not displayed, can use the instruction M98/G65 PHIDEFILE01 or M98/G65 P*01 or PP*01 or PPHIDEFILE01 when calling.

For example:

P sub/1390 means subroutine is tmp/NC/sub/1390

Note:

1. tmp/NC/ is the system's default path, sub is a folder for the following
2. The subroutine must be a independent program.
3. Method of the main program in USB calls the subroutine in USB: P[or P].

For example:

M98 P[A1234 means calling the subroutine A1234 in USB;

M98 P]SS12 means calling the subroutine SS12 in USB;

PP[FFDE means calling the subroutine FFDE in USB;

It needs to write the path of file if call the subroutine in folder of USB.

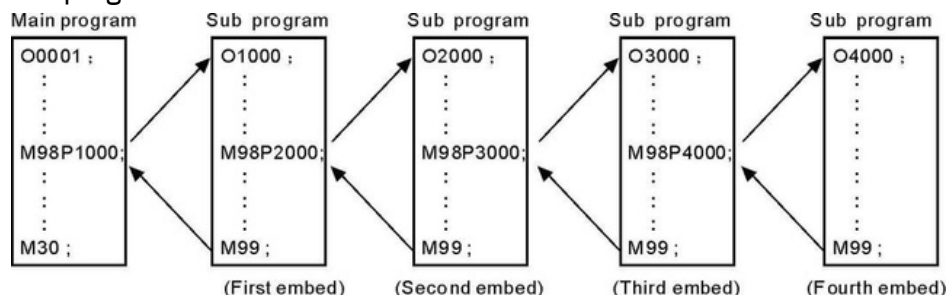
There must be space in front of L(Subroutine calling times). Return to the next program segment of main program when subroutine running to the end.If the program contains a fixed sequence or repeated pattern, then the sequence or pattern can be compiled to subroutine to save in memory storage in order to programme easily, the subroutine can be called by main program which is also can be called by another subroutine.

M99 is an instruction of ending subroutine return, must have this instruction to end the subroutine.

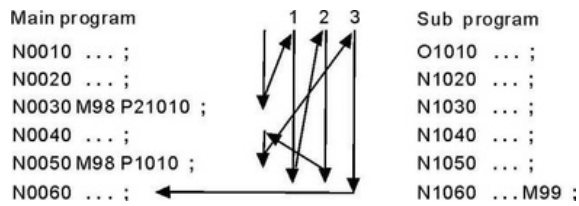
Note:

- 1) M99 in the main program is the same as M02;
- 2) M99 with P in the main program is the same as M97;
- 3) M99 returns to main program call in subroutine is in the next line;
- 4) M99 with P in the subroutine returns to P program line in main program;

The Sub-program can embedded call as follow :



For example:



The calling instruction can be used for 9999 times at the most.

④0 Macroprogram

1. Input instruction: WAT

Waiting for the input port X valid or invalid instruction Format: WAT+ (-) X

Note: "+" means the input is effective;

"-" means the input is invalid;

"X" means the input port X00-X47; see the I/O diagnosis;

2. The output instruction: OUT

Set the output port Y is valid or invalid instruction Format: OUT +(-)Y

Note: "+" means the output is effective;

"-" means the output is invalid;

"Y" means the output port Y00-Y31; see the I/O diagnosis;

3. Variable and assignment: =

1) #0--#20 local variable: local variables only can be used to store data in macro program, such as a result of operation, when power is off, the local variables are initialized to the empty. The argument assignment to the local variable when calling the macro program.

2) #21--#999 global variables: The meanings are the same in different macro program.

When power is off, the variable #21--#100 is initialized to zero, the variable #101--#999 data is saved not to lose even if the power is off.

3) #1000-- system variable: the system variables are used to change various data when reading the running CNC. For example, the current position and the compensation of tool.

Special note: macro variables #100--#155 and #190--#202 have been used by the system, users can not use.

The I/O variables:

#1800: X00-X07(D0-D7)

#1801: X08-X15(D0-D7)

#1802: X16-X23(D0-D7)

#1802: X16-X23(D0-D7)

#1803: X24-X31(D0-D7)

#1804: X32-X39(D0-D7)

#1805: X40-X47(D0-D7)

#1806: X60-X67(D0-D7)

#1808: Y00-Y15(D0-D15)

#1809: Y16-Y31(D0-D15)

Format: #i=Expression

4. The arithmetic and logic operation Table:

Function	Format	Note
Definition	#i=#j	
AdditionSubtraction	#i=#j+#k;	
Multiplication	#i=#j-#k;	
Division	#i=#j*#k;	
	#i=#j/#k;	

SinAsinCosAcosTan Atan	#i=SIN(#j); #i=ASIN(#j); #i=COS(#j); #i=ACOS(#j); #i = TAN(#j); #i = ATAN(#j);	90.5degreesmean90 degrees30minutes
SquarerootAbsolute valueRoundingoff RounddownRoundup Naturallogarithm Exponentialfunction	#i=SQRT(#j); #i=ABS(#j); #i=ROUND(#j); #i=FIX(#j); #i=FUP(#j); #i = LN(#j); #i = EXP(#j);	
OrExclusiveor And	#i=#jOR#k;#i =#jXOR#k; #i = #j AND #k ;	Executingwithbinary system

5. Unconditional transfer: GOTO N

Transfer to the program line with sequence number n, appears error when specifying beyond the 1-999999, could use expression to specify the sequence number.

For example: GOTO 5, GOTO #100

6. Conditional transfer: IF (Conditional expression) GOTO or THEN

If the conditional expression specified is met, execute this segment; if the conditional expression specified is not meet, execute the next segment.

For example: IF (#100 EQ 2) THEN #100=5

IF (#101 GT 2) GOTO 6

Operationmeaning:EQ equal

NE notequal

GT greaterthan>

GE greaterthanorequalLT lessthan<

LE lessthanorequal

7. Loop: WHILE (conditional expression) DO 1, 2, 3

Specifies a conditional expression in front of WHILE. When the specified conditions are met, execute the program between DO and END. Otherwise, turn to the program line after END. Cycle of the embed is 3 at the most.

For example:WHILE (#100 LT 3)DO 1

.....
WHILE (#103 EQ 5)DO 2

.....
WHILE (#200 GE 20)DO 3

.....
END3
..... END 2
..... END 1

8. Non-mode to call macro program:G65

Format: G65 P- L- <A-B-C-..... Argument passing data >

P is the name of macro program, L is the calling times,A B C are argument, the name of argument as follows:

#0->A, #1->B, #2->C, #3->D, #4->E, #5->F, #6->H, #7->I, #8->J, #9->K, #10->M, #11->Q, #12->R, #13->S, #14->T, #15->U, #16->V, #17->W, #18->X, #19->Y, #20->Z.

Special attention: The address G, L, N, Q, P can't be used in argument.

For example:

```
Main program:9000 G00 X0 Z0
G65 P8000 L1 A5 B6 G0 X0 Z0
M30
Macro program:8000 N1 #2=#0+#1
N2 IF (#2 EQ 10)GOTO 4
N3 G00 X#2
N4 G00 Z#1
N5M99          ;Return
```

9. Mode to call macro program:G66 G67

G67 instruction is to cancel G66 instruction.The format is the same as G65.

For example:

```
Main program:9000 G00 X0 Z0
G66 P8000 L2 A5 B6 A8 B1
A9 B10 G67 M30
Macro program:8000
N1 #2=#0+#1
N2 IF (#2 EQ 10)GOTO 4
N3 G00 X#2
N4 G00 Z#1
N5M99          ;Return
```

10. Prompt dialog

Format: MSG(parameter) or MSG[parameter]; if parameter is information string, pause.

Note:This instruction usually be used in NC program(not macro).

After prompting dialog, controller switch into pause status automatically.

Format : STAF(parameter) or STAF[parameter]; not pause if the parameter is information string.

④1 User-definedmacroprogram(G101—G170,M880—M889)

Must use PC to edit and copy into controller.

1. G101-G170 is macro program of G code, correspond to ProgramGxxx, use instruction of robot controller.

2. M880-M889 is inner macro program, correspond to macro ProgramUser0 - ProgramUser9, including inner macro programs of robot controller:

1)Output:OUT

Format:OUT+(-/A)Y(M)**+

Note: “+” means output effective;

“-” means output invalid;

“A” means output reversal(effective to invalid, invalid to effective);

For example:OUT+Y5-Y7+Y9+Y11-Y15

Mean:Y5,Y9,Y11 output effective; Y7,Y15 output invalid

For example:OUT+M12-M13+Y14+Y8-Y16 Mean:M12,Y14,Y8 output effective; M13,Y16 output invalid

2)Wait instruction:WAT

Wait X, Y, M effective or invalid

Format:WAT+(-)X(Y/M)**+(-)X**+(-)X**+(-)X**+(-)X**+(-)X**

Note:“+” wait for effective;

“-” wait for invalid;

Y or M only to be one or none, X could be used many times.

2.1 The longest time of WAT:MAXWAT Format:MAXWAT****

Note:The range is 0-99999, unit is ms.

Controller will alarm and quit the running program when time is over.
If value is 0 or MAXWAT instruction alone means the function is disabled, namely no limit in the longest time.

2.2 Hold time for meeting condition of WAT:HOLDWAT

Format:HOLDWAT****

Note:The range is 0-99999, unit is ms.

If value is 0 or HOLDWAT instruction alone means the function is disabled, namely no limit in the hold time.

2.3 The longest wait mode:MODWAT

This instruction work with MAXWAT

Format: MODWAT1/MODWAT2/MODWAT3/MODWAT4;

Default: MODWAT1

MODWAT1 the controller will alarm and quit when time is over;

MODWAT2 the controller will alarm and continue to run;

MODWAT3 not alarm and quit when time is over;

MODWAT4 not alarm and continue to run.

For example: Wait for 5 seconds to get X0 signal failed, it will alarm No.9

MODWAT4

MAXWAT5000

WAT+X0

IF (-X0) THEN

OUT+M89

ERREXIT

ENDIF

2.4 Delay: PAUS

Format:PAUS****

Note:The range is 0-99999, unit is ms.

2.5 Assignment:=

Assignment for variable

Format:=

Example: #251=890.34

2.6 Prompt dialog

Format:MESSAGEBOX(parameter 1);parameter 1 is information string.

Also could be abbreviated as MSG(parameter 1).

2.7 Information of changing tool

Format:STATUSINFO(parameter 1);parameter 1 is information string.

Also could be abbreviated as STAF(parameter 1).

Note: If only use STATUSINFO or STAF or STATUSINFO() or STAF() , it will close the current prompt.

2.8 Condition instruction: execute if meet condition, otherwise skip.

Format: IF(Relayorinputpointormacrovariable)THEN

ENDIF

+Mxx means relay is effective.

-Mxx means relay is invalid.

+Xxx means input point is effective.

-Xxx means input point is invalid.

+Yxx means output point is effective.

-Yxx means output point is invalid.

+ #xx means macro variable is not 0.

- #xx means macro variable is 0.

2.9 Move coordinate axis

Format : MOVE(parameter G, parameter F, parameter XYZABCXsYs,parameter W)

The first parameter is G90 or G91 to specify it is relative or absolute;

F to specify the speed, XYZABCXsYs to specify the coordinate of machine;

W to specify some input signal satisfy the condition, it will stop,

for example:W+5 means it will stop when X5 input point is effective.

2.10 Set the current user coordinate and save

Format: SETWK(parameter XYZABCXsYs);

2.11 Go to some line:GOTO xx

2.12 Return:RETURN

Chapter 5 User Technique

5.1 Technique for weld

Main introduction about operation, parameter and program path of welding. Setting: Including <Equipment> and <Main setting>.

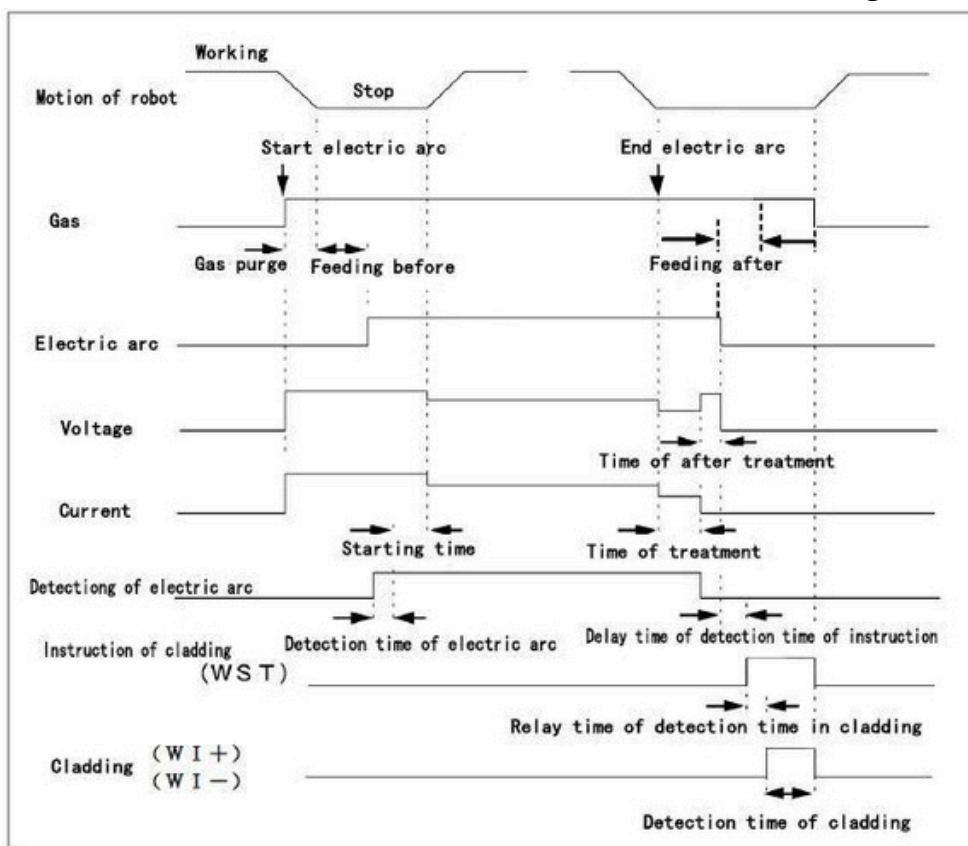
Equipment: Be used for <Swing weld>, <Parameter> and <Condition for points>. Main setting: Be used for <Setting for equipment> and <Main setting>.

It will work with tool coordinate and user coordinate.

5.1.1 Relative parameter

(1) Other parameter

★ 330, Interface and function of controller (11 Weld; 12 Palletizing; 13 Painting)



(2) Technique parameter (Please check 3.8.4 technique parameter)

5.1.2 Set for weld

(1) Output the weld current, set the max analog correspond to the max output current of welder.

No.43 speed parameter to set AA when output 10V. Example: P43=3000, AA1500, the controller output 5V; AA3000 the controller output 10V.

(2) Output weld voltage, set the max analog correspond to the max output current of welder.

No.47 speed parameter to set VV when output 10V. Example: P47=3000, VV1500 the controller output 5V to welder; VV3000 the controller output 10V to welder.

Note: Analog output use separator in case of interfere.

5.1.3 Instruction of robot controller

(1) Analog output AA/S, VV/SS

AA means welding current; S could be this meaning.

VV means welding voltage; SS could be this meaning.

AA and VV could be edited in the same line, but S and SS can't be the same line.

AA/S output the first analog 0~10V, VV/SS output the second analog 0~10V.

(2) Start arc welding AS*

Start arc welding: AS*. Execute the corresponding program ProgramUser0 (User could edit this file as they want).

“*” means the group number 0-9 of technique parameter, correspond to No.1-0.

The program will use the arc welding parameter.

Example:

```
AS1      ;Use group 1 technique parameter of arc welding technique to start
.....  ;The route of arc welding
AE1      ;The end
```

Note: This instruction needs to be one line, can't be with other instruction in one line.

(3) The end instruction of arc welding AE*

Execute the corresponding program ProgramUser1 (User could edit this file as they want).

(4) Start swing welding WS*, T.I.G Welding: WS99

“*” means the group number 0-9 of technique parameter, correspond to No.2-0.

The program will use the swing welding parameter. Example: WS2

```
.....
WE      ;Use group 1 technique parameter of swing welding technique to start
        ;The route of swing welding
        ;The end
```

T.I.G Welding: WS99

Format: P specifies the time of point weld (time: s); Q specifies the distance (unit: mm);
R specifies the distance with idle run. (unit: mm)

(5) The end instruction of swing and T.I.G welding WE

WS*, WE swing according to the parameter when executing MOVL and MOVC, be used for wide weld bead.

T. I.G welding refers to interrupted weld in welding area. You can save time in teaching at every welding point in this method.

Instruction: WS99

Format of instruction: WS99 P specifies time of spot welding (s); Q specifies distance (mm); R specifies idling distance (mm).

Specific motion: welding a distance Q, then running idling a distance R, and pausing for P, execute above loop.

End instruction: WE

Example for TIG, set Q as 4mm, and R as 6mm.



(6) Start translation SN*

“*” means the group number 0-99 of technique, corresponding No.501-No.506 parameter.

(7) End translation SF

SN*,SF specify the robot to transit, flitting, palletizing.

(8) Start searching position ST* P*

The “*” behind ST means the group number of parameter in this research[0--9];

The “*” behind P means the data number of transition in this research[0--99];

It will clear the transition which is behind P when executing this code

(9) End searching SE

(10) Search in straight running

SX search in the direction of X axis; SY

search in the direction of Y axis; SZ

search in the direction of Z axis;

(11) Start arc tracking TS*

* behind TS means the number of tracking parameter group[0--4]

(12) End arc tracking TE

(13) Output instruction

Feeding tin wire:M03, output Y18 effective;

Back tin wire:M04, output Y19 effective;

Close move tin wire:M05, output Y12 effective; Huff

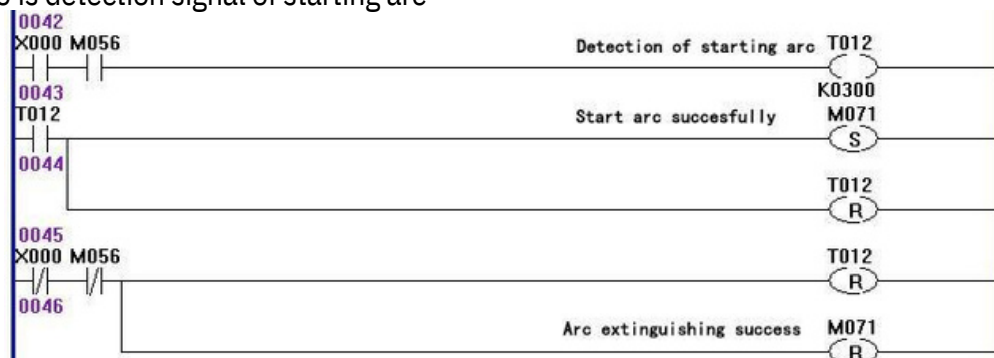
open/close:M59/M59, output Y20;

Arc starting/extinction: M71/M70, output Y09 Cladding:M73/M72,

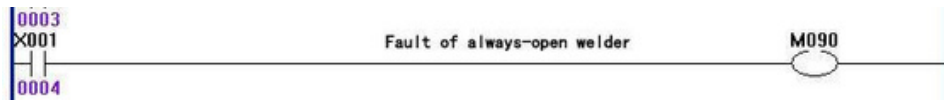
output Y21, X02 is detection of cladding;

5.1.4 I/OInputandoutput

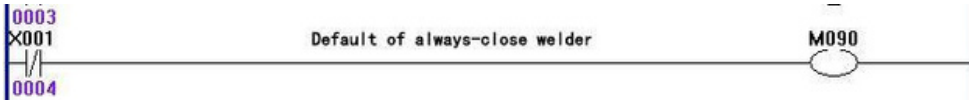
(1) X00 is detection signal of starting arc



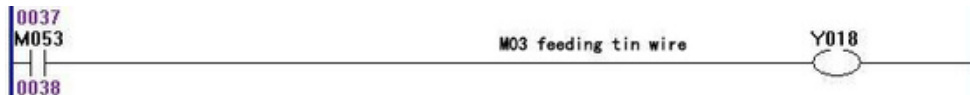
(2)X01 is alarm of welder, this is always-open PLC



If alarm of welder is always-closed signal, then PLC is:



(3) M03(Y18) is output signal of feeding tin wire



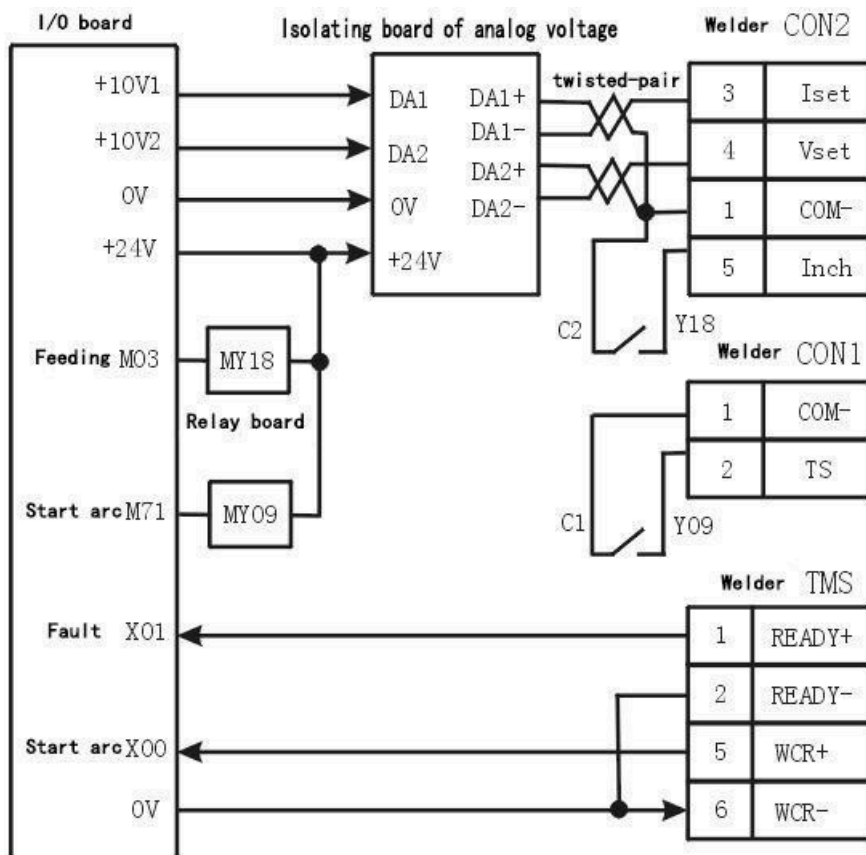
(4) M04(Y19) is output signal of back tin wire



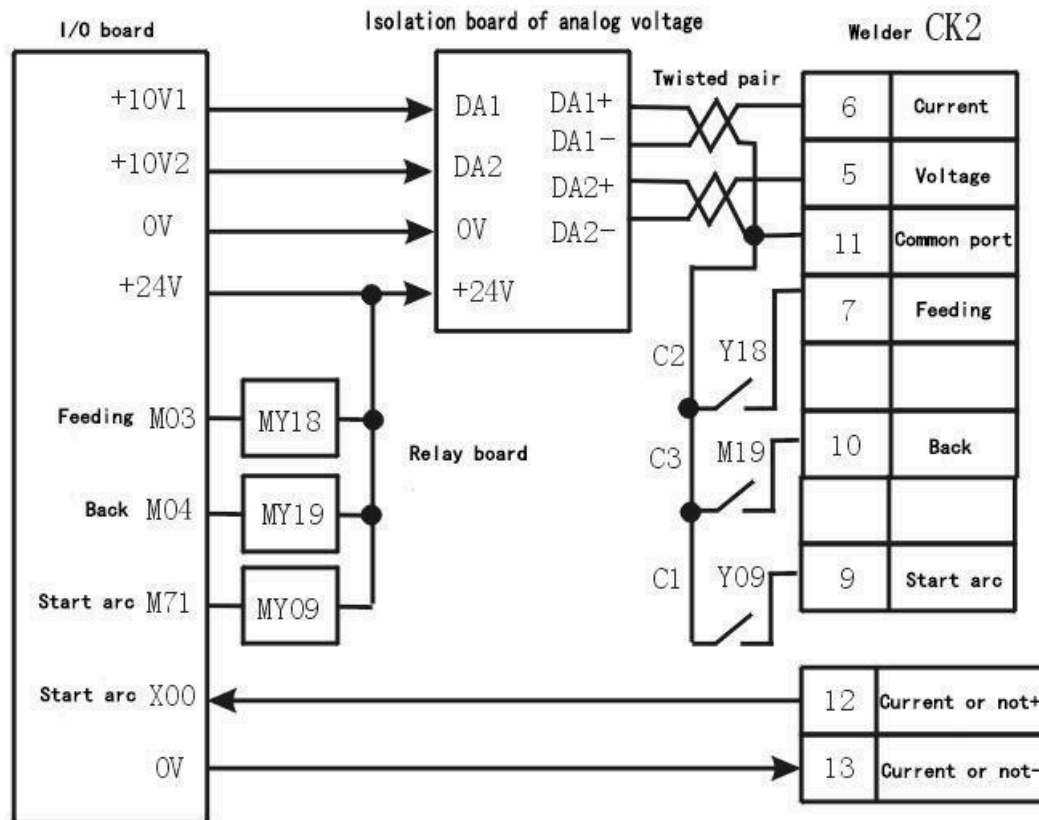
(5) Y09 is output signal of starting arc in weld



(6) The controller connect with welder OTC CPVE-500



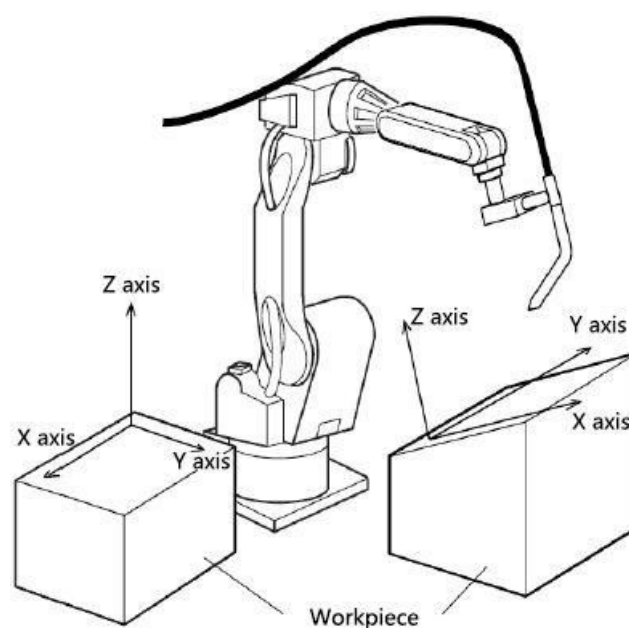
(7) The controller connect with welder MIG-350R



5.1.5 Stepsofsettingtechniqueinweld

5.1.5.1 Build user coordinate system

Build user coordinate system so that programme. As follow picture, the quantities of faces need quantities of user coordinate system(got 2pcs G54,G55).



Usually build user coordinate system with teaching status, steps as follow:

(a) Press “F8 choose coordinate” or “F5 MDI” to choose corresponding user coordinate system(G54-G59).

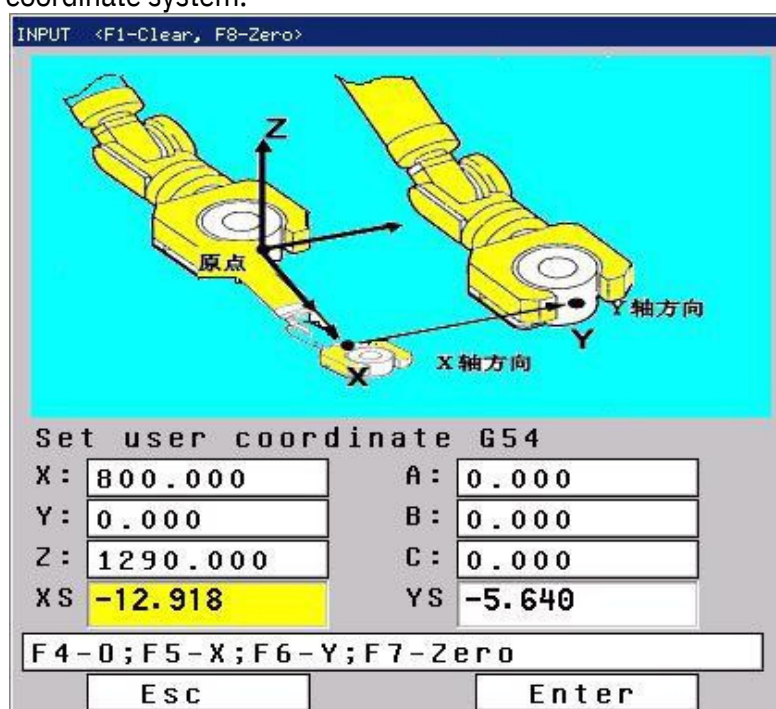
(b) Move axis to fixed position(The position is easy for measure), measure the distance from this point to the corresponding zero point of user coordinate system.

(c) Press “F7” to set P1 P2 P3 points(Corresponding to F4 F5 F6).

3-points: P1 is original point O, P2 is direction of +X, P3 is direction of +Y.

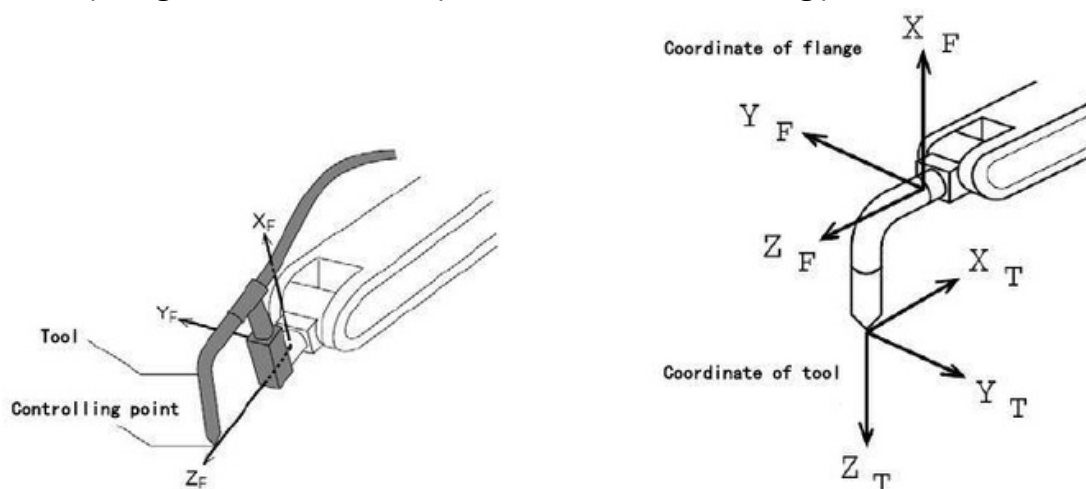
Press “Start”, the status will show “O”, then press F4 F5 F6 back to the last setting point with the current joint speed in manual so that modify. Press “Start” to open or close this function, after executing once operation, it will be closed automatically.

The user coordinate system has been set already. The corresponding value will be shown in the interface of coordinate system. The value is deviation value between user coordinate system and world coordinate system.



5.1.5.2 Build tool coordinate system

Build tool coordinate system is for making sure the interpolation of straight line, circle arc. Need to input right size of welder and position of defined controlling point. As follow:



The relation between tool coordinate and flange coordinate

(1) Choose number of tool coordinate system, example: User MDI to run tool coordinate system of “T01”;

(2) Press “F6” or “H” in main interface, or press “F5” in interface of tool set.

Usually, 3-points method applies to palletizing and machine, while 5-points method applies to welding.

To build and set the tool coordinate system. To ensure the position and posture of tool coordinate system in flange coordinate system by P1,P2P,P3,P4,P5. Fix an end effector on robot, move the robot to the same point according to dialog box by different posture as possible, then set P1, P2, P3. P1P2P3 specify the original point of tool coordinate system. P4 specifies direction of X axis, P5 specifies direction of Z axis.

(A)3-points:P1P2P3 to change the different posture of robot, the tool posit TPC point should be kept the same position, the posture in 3-points is the same as the posture of electrical connection. (The sixth flange coordinate of electrical wrist).

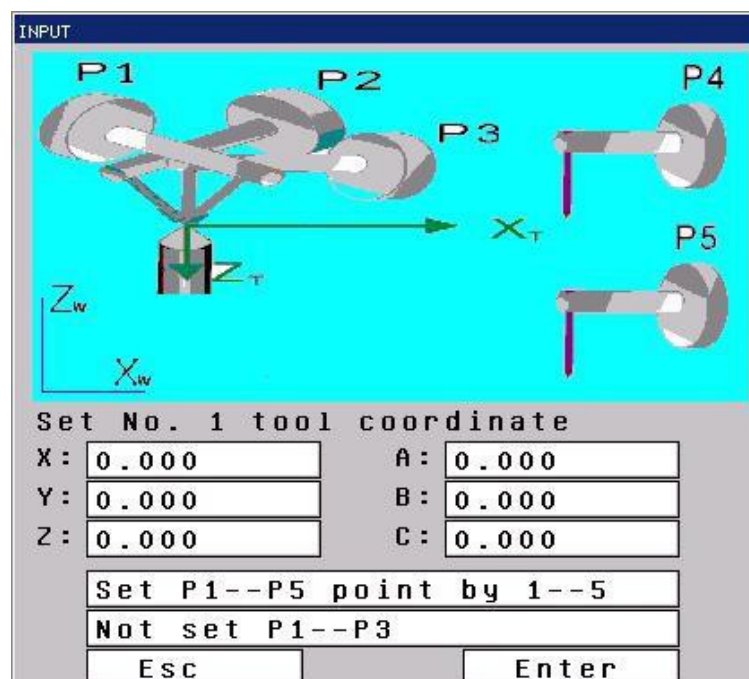
(B)5-points:P1P2P3 is the same as 3-points, but the posture of 5-points need P3P4P5 to make sure.P3 means the original position of tool coordinate posture, P4 means direction of +X tool coordinate posture, P5 means direction of +Z tool coordinate posture.

Press “Start” in the set process, the statues will show “O”, then press “12345” to adjust the speed to back to the point set the last time, easy to modify. After once operation, this function will be closed automatically.

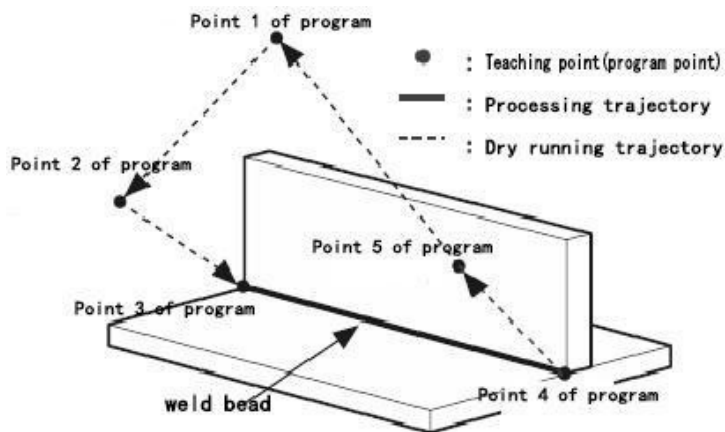
The posture of P3P4P5 in 5-points need to be the same(Value of ABC in world coordinate should be the same) [The interface needs to be without N letter]. So it is necessary to convert into the world coordinate system after setting of P3, then move the robot to set P4 in the direction of X axis and P5 in the direction of Z axis.

After input P1P2P3 3 points in tool set, the controller will calculate the position and posture of tool coordinate in world coordinate, if 3 points is too near, then it can't be exist P1P2P3, the controller can't calculate the value, it will delete P2P3 automatically.

XYZ of tool compensation set means the original point of tool coordinate in world coordinate, ABC mean the 3 axis posture in space(position and direction) of tool coordinate in world coordinate.
Note:P1P2P3 in 3-points need be different posture;But the tool posture of P3P4P5 in 5-points need to be on the same straight line(It is fine if it isn't straight line, just the direction of Z axis in tool coordinate is not on the same straight line with weld gun)



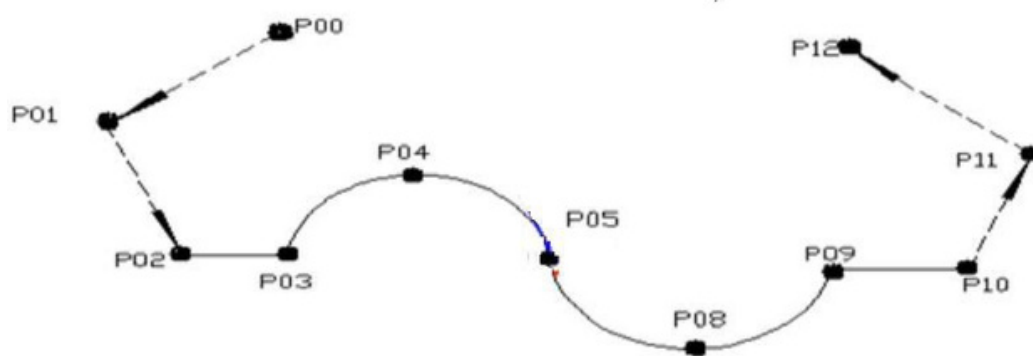
5.1.6 Example for weld



Teaching program:

```
G54T1 AA100G54U1500 ;invoketoolcoordinatesystemT1andusercoordinatesystemG54
MOVJVJ=80.0PL=0 ;alljointsmove rapidly to P00 standby
MOVJVJ=50.0PL=0 ;alljointsmove rapidly to P01 near start point
MOVJVJ=50.0PL=0 ;alljointsmove rapidly to P02 in straight way
;SmoothPL=9,80%rapidly speed to program point1
;SmoothPL=9,50%rapidly speed to program point2
MOVJ VJ=25.0 PL=0 ;Smooth PL=0,25% rapidly speed to program point3
AS3 ;Startarcweld,No.3techniqueparameter
WS3 ;Startswingweld,No.2techniqueparameter
MOVL V=100 PL=0 ; From program point 3 weld to program point 4 with 100mm/min
WE ;Endswingweld
AE3 ;Endarcweld
MOVJ VJ=50.0 PL=9.0 ;Smooth PL=, 50% rapidly speed to program point5
MOVJ VJ=50.0 PL=9.0 ;Smooth PL=9, 50% rapidly speed to program point1
M02 ;End
```

5.1.6 Sample for the successivedirect and inverse sear welding



```
G54T1 ;invoketoolcoordinatesystemT1andusercoordinatesystemG54
MOVJ ;alljointsmove rapidly to P00 standby
MOVJ ;alljointsmove rapidly to P01 near start point
MOVL V=50 ;movetostartpointP02in straight way
AS2 ;invokegroupNO.2basicparameter ofark strike
MOVL V=5 ;executeweldingin straight way till point P03
MOV C ;executeweldingin arc way, through P04 to P05
```

```

MOVC          ;executeweldinginarcway,throughP08toP09
MOVL          ;executeweldinginarcwaytillP10
AE2           ;invokegroupNO.2basicparameterofarcfailure,endweld
MOVL V=50 ;movetoendpointP11instraightway
MOVJ          ;alljointsrapidlymovetosafeposition
M02           ;programcompleted

```

5.2 Technique for palletizing

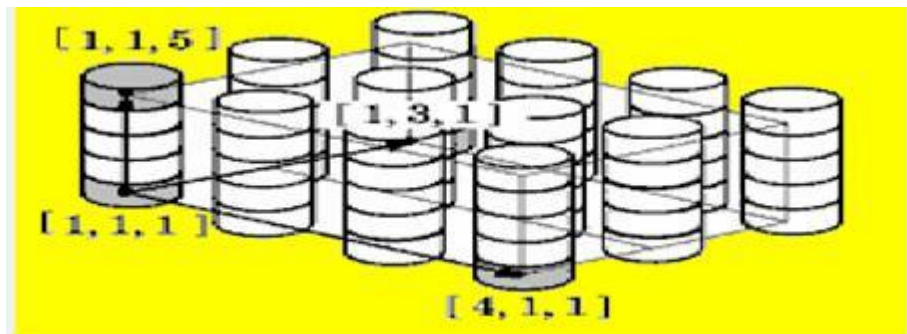
Palletizing is for arrange the product, interface of palletizing is for setting mode of arrangement, point and data.

Will use user coordinate in technique.

5.2.1 Relativeparameter

1. Relative parameter of depalletizing includes number 1--99 group, user can invoke any one of them to perform depalletizing function in program.

★ 601, The basic parameter of depalletizing



This parameter is used for basic parameter. To press Enter into dialog to input number [1—99] of depalletizing parameter including:

Type: palletize or depalletize, these two are reverse process.

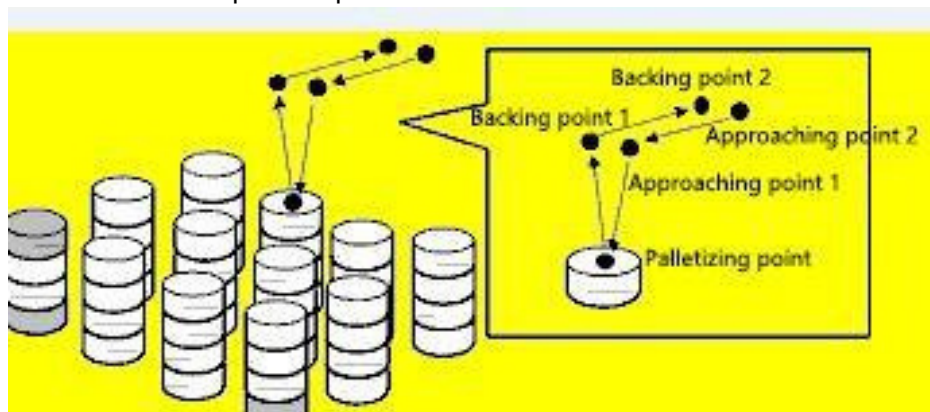
Sequence of line, column and layer(only when value is 0, is the sequence default valid): to set sequence of robot operating.

Number of line, column and layer: it refers to number you need. Distance between lines and columns;

Attention: if no specified or be specified to be 0, the parameter is invalid, it will be calculated automatically according to end of teach and number of lines, columns and layers.

Number of approach point: 2 point at most;

Number of back point: 2 point at most;



Approach speed: speed from approach point 2 to 1 to offset pilling point (mm/s).

Back speed: speed from offset pilling point to back point 1 to 2 (mm/s).

Offset distance between idling arrival and leaving from pilling point: distance between offset pilling point and pilling point (mm).

Speed between idling arrival and leaving from pilling point: speed between offset pilling point and pilling point (mm/s).

Type of layout:

0 means parameter setting generates the same layout in every layer (teach posture at datum point); 1 means setting each layer the same as first layer, if no setup, then quit; 2 means different layout in odd and even layer, odd layer correspond to first layer, even layer correspond to second layer. If no setup, then quit; 3 means customization. You need specify layouts of each layer.

- ★ 602, The teach for piling point of depalletizing
To record original point, line endpoints, column endpoint, layer endpoint in teach function.
- ★ 603, The teach for approach and back point of depalletizing
To record approach point 1, approach point 2, back point1, back point 2 in teach function.
- ★ 604, The special set for each floor layout number of depalletizing
If value is 0, the parameter is invalid;
If value is 1, you need to set layout of the first layer(606/607);
If value is 2, you need to set layout of the first and second layer(606/607);
If value is 3, you need to set layout of each layer(606/607).
- ★ 605, The special set for each floor height of depalletizing
Only when height of certain layer is special, is it valid. If without setting, the controller will calculate automatically according to parameters and teach points.
- ★ 608, The set or teach for special floor with special approach and back point
To teach approach point 1, approach point 2, back point1, back point 2 on special layer.
Add D before number to delete the setting according to prompt. For example, D5 means to delete special approach and back points in the fifth layer.

2. About setting of layout, there is 99 types of layouts including number 1--99. type of layout refers to layout pattern in one layer. If the layout type is 0, the layout type is set unnecessarily.

★ 606, The set or teach for special regular layout data of depalletizing
When layout is regular, this parameter is enabled. You need to teach original point, line endpoint, column endpoint, and number of lines and column. when the type of layout is 1 or 2 or 3, it is necessary to set parameter 604 and 606, or 607.

★ 607, The set or teach for special ruleless layout data of depalletizing
When layout is irregular, you need to teach the position of every workpiece, 10 workpieces are allowed at most now.

3. Posture of end effector

★ 613, Instruction M before movement of depalletizing (880—889)
Customer instruction M executed automatically before depalletizing. For example, 880 means system will execute M880 automatically. If don't have a need, set value as 0.

M880-M889 correspond to macro program ProgramUser0-programUser9, the input/output can be edited by WAT/OUT in program[refers to system instruction(41)User-defined macro program], import it into controller after finishing edition. Output instructions as follows, for example, OUT+M330, means output of Y00 is valid.

M330:Y00; M331:Y01; M332:Y02; M333:Y03; M334:Y04; M336:Y06;
M337:Y07; M51:Y08; M56:Y09; M49:Y10; M48:Y11; M343:Y13;
M344:Y14; M345:Y15; M53:Y18; M54:Y19; M50:Y20; M57:Y21;
M352:Y22; M353:Y23; M354:Y24; M355:Y25; M356:Y26; M357:Y27;
M231:Y28; M232:Y29; M360:Y30; M361:Y31;

★ 614, Instruction M at the approach point 1 (880—889)

Execute depalletizing motion at the approach point 1.

★ 615, Instruction M approach to the offset pilling point (880—889)

Execute depalletizing motion at the offset pilling point.

★ 616, Instruction M close to the pilling point (880—889)

Execute depalletizing motion close to the pilling point.

★ 617, Instruction M back to the offset pilling point (880—889)

Execute depalletizing motion back to the offset pilling point

★ 618, Instruction M at the backing point 1 (880—889)

Execute depalletizing motion at the backing point 1.

4. Copy and delete data

★ 609, Copy data of some number depalletizing

★ 610, Copy data of some number layout mode

★ 611, Delete data of some number depalletizing

★ 612, Delete data of some number layout mode

5.2.2 Palletizing instruction

(1) Whole operation of depalletizing PW**

Before executing PW**, controller will execute PR** once automatically to reset the current value.

Note:

- 1) The macro variable of depalletizing #9001--#9099 correspond to total number of each number of depalletizing, all finished if it is negative number.
- 2) The macro variable of depalletizing #9101--#9199 correspond to the current layer number of each number of depalletizing.

(2) Reset the current value of depalletizing PR**

Note:

- 1) If the number is 9999, then controller finished the Reset;
- 2) The current value of depalletizing includes the current line, column, layer, stack, total stack;

(3) Whole operation of once depalletizing PA**

After finishing PA**, need to execute PR** to reset, then execute PA**.

5.2.3 Depalletizing sample

1. Sample 1

```
PR5                ; reset the data of NO.5 depalletizing including number of
                   ; lines, columns, layer, stacks and count stacks.

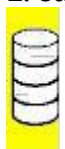
G54T2              ; invoke number of tool and user coordinate system
MOVJVJ=100.0        ; quickly locate to original point
WH[#9005GE0]DO1    ; if macro variable of stack sum greater than or equal to 0,
                   ; then loop. If not, then finished.

....               ; insert the program you need.
PA5                ; execute whole operation of once depalletizing
....               ; insert the program you need.
END1
```

2. Sample (for testing and debugging motion of depalletizing)

```
G54T2              invoke tool number and user coordinate system
MOVJVJ=100.0        quickly locate to original point
PW5                execute whole operation of depalletizing (for all workpieces)
```

1. Sample for single stack



It is enabled also to depalletize in another way that you can program by translation

instruction SN* instead of above manners. Firstly you need to set a translation value PX*, then accumulate or regress the value that all has been invoked. Although this method is complex to program, it is more accessible and flexible for user.

```
G54T1          ;invoketoolnumberandusercoordinatesystem
MOVJ           ;quicklylocateatoriginalpoint
PX3=PX2        ;initializePX3byPX2
#501=1         ;recordmacrovariableofworkpiece'squantity
WH [#501 LE 20] DO 1 ; loop statement
SN3 MOVL ..... SF      ;startinstructionPX3translation
PX3=PX3+PX2      ;motionofrobot
#501=#501+1
END1           ;endinstructionPX3translation
               ;accumulatePX2
               ;accumulatequantityofworkpiece
```

Chapter 6 PLC

6.1 Function of PLC

The control system enables PLC function. It can manage all I/O ports, online logic judgment of internal auxiliary relay and count through programmable I/O, auxiliary relay and timer to detect input port and control output port and data communication with core.

Edit PLC:

- ① Edit PLC on controller directly;
- ② Edit PLC on PC (Use the PLC software of SZGH CNC which is SZGHPLCS.EXE, open PLC.LAD file could be edited; After editing and saving, then lead into controller will be fine, there are 3 files: (PLC.LAD), (PLC.PLC), (PLC-NOTE). Then restart controller will be fine.

Execute instruction: Table of instruction Memory of program: 10000 steps

Execute cycle: Super high-speed is 2ms, high-speed is 8ms, low-speed is 100ms Mode:

Sequence①, Cycle②

Basic: Inner relay, Timer, Counter, Input relay X, Output relay Y

Note:

① Sequential execution refers to PLC execution perform the files of instruction table step by step.

② Loop execution refers to PLC execution from the start to the end of table. It will execute from the start of table again after finished table once.

Note:

1), Input X0-X47. X0-X7 and X40-X47 could be 0V effective, also could be 24V effective (Select by pin of connection board), X8-X39 is 0V effective.

2), Output Y0-Y31, 0V effective.

6.2 Inner relay M of PLC

	Code	Function	Note
1	M00	Forbid feeding	Forbid feeding of each axis (input) when this relay is effective
2	M01	Teach	When controller is in teaching status, this relay is effective (status)
3	M02	Just start	When controller just start, this relay is effective (status)
4	M03	Forbid PLAY	Forbid program PLAY when this relay is effective (input)
5	M04	Emergency	Emergency when it is effective (input)
6	M08	Feeding	The relay is effective when axis is feeding
7	M10	Open protection door	Protection door opens when this relay is effective (input)
8	M12	Alarm	This relay is effective when emergency or driver alarm or limited or user-defined (Input)
9	M22	Output run	The relay is effective when controller is in PLAY (output)

10	M23	Output alarm	The relay is effective when controller alarm(output)
11	M26	M01	When got M01, then this signal is pause effective(Input)
12	M32	Driver alarm of J1	Driver of J1 is alarm when this relay is effective.(Input)
13	M33	Driver alarm of J2	Driver of J2 is alarm when this relay is effective.(Input)
14	M34	Driver alarm of J3	Driver of J3 is alarm when this relay is effective.(Input)
15	M35	Driver alarm of J4	Driver of J4 is alarm when this relay is effective.(Input)
16	M36	Driver alarm of J5	Driver of J5 is alarm when this relay is effective.(Input)
17	M314	Driver alarm of J6	Driver of J6 is alarm when this relay is effective.(Input)
18	M315	Driver alarm of Xs	Driver of Xs is alarm when this relay is effective.(Input)
19	M316	Driver alarm of Ys	Driver of Ys is alarm when this relay is effective.(Input)
20	M38	Run()	In the progress of PLAY, it will execute the program in “()” when this relay is effective.(Input)
21	M39	Alarm of spindle	Spindle is alarm when this relay is effective.(Input)
22	M44	Cooling overload	Cooling overload of motor will be alarm when this relay is effective.(Input)
23	M45	Cooling liquid	Cooling liquid will be alarm when this relay is effective.(Input)
24	M46	Lubrication overload	Lubrication overload of motor will be alarm when this relay is effective.(Input)
25	M47	Lack of lubricating	Lack of lubricating will be alarm when this relay is effective.(Input)
26	M48	Cooling	Execute cooling when this relay is effective. (output, Use M08/M09 to control)

27	M51	Lubrication	Execute Lubrication when this relay is effective. (output, Use M32/M33 to control)
28	M53 M54 M55 M231 M232	Stop and rotate CW and CCW of the first spindle Rotate CW and CCW of the second spindle	Stop rotate CW Spindle rotate CW and CCW when this relay is effective. (output could use M04/M03/M05/M203/M204 to control)
29	M55	Spindle stop	Spindle rotate CW when this relay is effective. (output, could use M05/M03, M04 to control.)
30	M59	Output of user-defined	Correspond to M61/M60 (output)
31	M63	Output of user-defined	Correspond to M63/M62 (output)
32	M52	Output of user-defined	Correspond to M65/M64 (output)
33	M60	Output of user-defined	Correspond to M67/M66 (output)
3	M105	Output of user-defined	Correspond to M69/M68 (output)
4	M56	Output of user-defined	Correspond to M71/M70 (output)
36 5	M57	Output of user-defined	Correspond to M73/M72 (output)
37	M50	Output of user-defined	Correspond to M59/M58 (output)
38	M61	Output of user-defined	Correspond to M79/M78 (output)
39	M49	Output of user-defined	Correspond to M11/M10 (output)
40	M80-M95	User-defined No.0-No.15 alarm	The controller will be alarm correspond to PLC. (Input)
41	M114	Remote run	Run program when this relay is effective. (Input) Use external RUN button.

42	M115	Remote stop	Stop program when this relay is effective.(Input) Use external HALT button.
43	M122	Run program	Program will run automatically when this relay is effective(Status)
4	M123	Program pause	Program will be pause when this relay is effective(Status)
4	M128	Stop J1	Stop J1 when it is effective.(Input)
	M129	Stop J2	Stop J2 when it is effective.(Input)
4	M130	Stop J3	Stop J3 when it is effective.(Input)
5	M131	Stop J4	Stop J4 when it is effective.(Input)
4	M132	Stop J5	Stop J5 when it is effective.(Input)
6	M318	Stop J6	Stop J6 when it is effective.(Input)
4	M319	Stop Xs	Stop Xs when it is effective.(Input)
7	M320	Stop Ys	Stop Ys when it is effective.(Input)
4	M200	Running status	X move positive
8	M201	Running status	X move negative
4	M202	Running status	Y move positive
9	M203	Running status	Y move negative
5	M204	Running status	Z move positive
0	M205	Running status	Z move negative
5	M206	Running status	A move positive
1	M207	Running status	A move negative
5	M208	Running status	B move positive
2	M209	Running status	B move negative
5	M210	Running status	C move positive
3	M211	Running status	C move negative
5	M212	Running status	Xs move positive
4	M213	Running status	Xs move negative
5	M214	Running status	Ys move positive
5	M215	Running status	Ys move negative
5	M824	Status of	X backed to zero already
6		backed to zero	
5		Status of	
70	M825	backed to zero	Y backed to zero already
5		Status of	
81	M826	backed to zero	Z backed to zero already
5			

9

6

0

6

1

72	M827	Status of backed to zero	A backed to zero already
73	M828	Status of backed to zero	B backed to zero already
74	M829	Status of backed to zero	C backed to zero already
75	M830	Status of backed to zero	Xs backed to zero already
76	M831	Status of backed to zero	Ys backed to zero already
77	M265		Press Reset, M265 is effective, from NC layer to PLC layer, need use PLC to reset the relay.
78	M282--M289	Bus type connection	Connection status of number 1-8, normal when effective(Status)
79	M290-M297	User-defined	Execute corresponding motion when the relay is effective according to PLC (Input/Output)
80	M298--M313	User-defined	Execute corresponding motion when the relay is effective according to PLC, status could be saved after power off (Input/Output)
81	M317	Be ready	Effective when controller is ready(Status)
82	M321 M325 M329	User-defined	Execute corresponding motion when the relay is effective according to PLC (Input/Output)
83	M330--M377	User-defined	Use M3330/M4330-M3377/M4377 to control; Execute corresponding motion when the relay is effective according to PLC (Input/Output)
8	M999		High-speed or super high-speed of PLC before
4	M1014		Reset emergency, lower the speed
8	M1050		Automatically status when it is effective
5	M1069		Manual status when it is effective

5

8

6

8

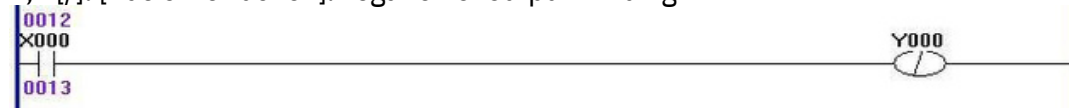
6.3 Function module of PLC

6.3.1 Account, timer

Total 16 account(C0-C15), 80 timer(T1-T79),normal 10ms timer is T0---3,T16---31 ; 10ms totalizer is T4---7 ,T32---47; normal 1s timer is T8---11 ,T48---63;1s totalizer is T12---15,T64---79.

6.3.2 Basic

1,--[/]: [Basic instruction]:Negation of output winding



Y00 output signal when X00 is invalid.

Y00 is invalid when X00 is effective.

2,--[U]: [Basic instruction]:Up along output winding



Output Y02 when X01 is invalid to effective.

3,--[D]: [Basic instruction]:Down along output winding



Output Y03 when X02 is effective to invalid.

4,--[US]: [Basic instruction]:Up along setting winding



Setting Y04 when X03 is invalid to effective.

5,--[DS]: [Basic instruction]:Down along setting winding



Setting Y05 when X04 is effective to invalid.

6,--[UR]: [Basic instruction]:Up along reset winding



Reset Y06 when X05 is invalid to effective.

7,--[DR]: [Basic instruction]:Down along reset winding



Reset Y07 when X06 is effective to invalid.

6.3.3 Definition of logic calculation

Note: 1, Parameter C is always address.

2, Range of constant is 0---255.

1, CMP: Comparison of data

Conditions:

0 means 8 bits data, parameter A and B are both address;

1 means 16 bits data, parameter A and B are both address;

2 means 8 bits data, parameter A is address, parameter B is constant;

3 means 16 bits data, parameter A is address, parameter B is constant;

4 means 8 bits data, parameter A is constant, parameter B is address;

5 means 16 bits data, parameter A is constant, parameter B is address;

8 means parameter A and B are both constant.

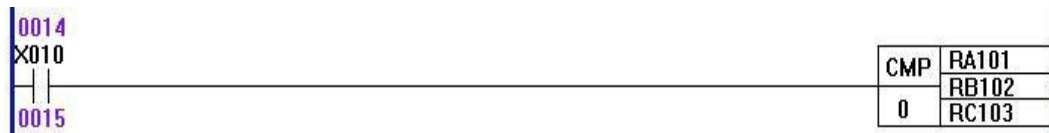
Rules:

When parameter $A > B$, evaluation C(low 3 bits) is 1;

When parameter $A = B$, evaluation C(low 3 bits) is 2;

When parameter $A < B$, evaluation C(low 3 bits) is 4.

Example 1:



When condition is 0, parameter A and B are both address.

When X10 is effective, parameter $A = 01000101$, parameter $B = 00010010$, $A > B$ and evaluate R103, if R103 is 0, then $R103 = 00000001$ after evaluating.

Example 2:

When condition is 1, parameter A and B are both address.

When X10 is effective, parameter $A = 000001011010000$, parameter $B = 000001011010000$, $A > B$ and evaluate R103, if R103 is 0, then $R103 = 0000000000000001$ after evaluating.

2, MOV: Movement for data

Conditions:

0 means 8 bits data, parameter A and B are both address;

1 means 16 bits data, parameter A and B are both address;

2 means 8 bits data, parameter A is address, parameter B is constant;

3 means 16 bits data, parameter A is address, parameter B is constant;

Rules:

Evaluate parameter B to A, parameter A is always address.



parameter A is address, parameter B is constant.

When X03 is effective, parameter $B = 7$, also 00000111 , then $R105 = 00000111$ of parameter A.

3, BIT: Bit calculation

Condition: Consist 2bits.

Left bit:

1 means and;

2 means or;

3 means exclusive or;

4 means not. Evaluate A not and to C, no relative with B.

5 means move left.

6 means move right.

Right bit:

0 means 8 bits data, parameter A and B are both address;

1 means 16 bits data, parameter A and B are both address;

2 means 8 bits data, parameter A is address, parameter B is constant;

3 means 16 bits data, parameter A is address, parameter B is constant;

4 means 8 bits data, parameter A is constant, parameter B is address;

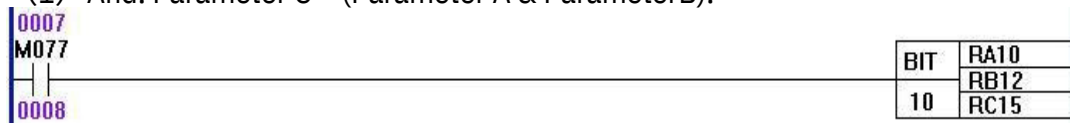
5 means 16 bits data, parameter A is constant, parameter B is address;

8 means parameter A and B are both constant.

Example : Condition is 305 means: 16bits data and exclusive or,A is constant, parameter B is address.

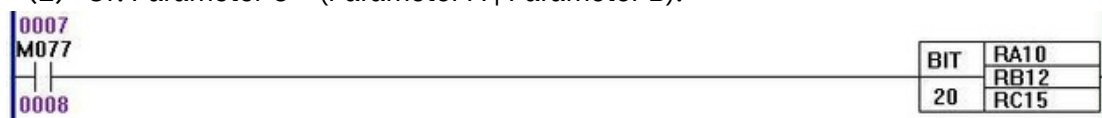
Rules:

(1) And: Parameter C = (Parameter A & ParameterB).



When M77 is effective, condition is 10, means and,parameter A and B are both address.
When address of parameter A 10=10000111, address of parameter B 12=01100001, address of parameter C 15=00000001.

(2) Or: Parameter C = (Parameter A | Parameter B).



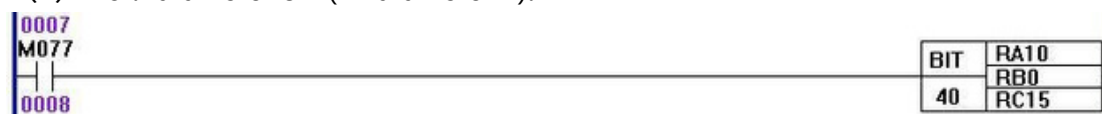
When M77 is effective, condition is 20, means or, parameter A and B are both address.
When address of parameter A 10=10000111, address of parameter B 12=01100001, address of parameter C 15=11100111.

(3) Exclusive or: Parameter C = (Parameter A ^ Parameter B).



When M77 is effective, condition is 30, means exclusive or, parameter A and B are both address. When address of parameter A 10=10000111, address of parameter B 12=01100001, address of parameter C 15=11100110.

(4) Not:Parameter C = (~ Parameter A).



When M77 is effective, condition is 40, means not, parameter A is address. When address of parameter A 10=10000111, address of parameter C 15=01111000.

(5) Move left: Parameter C = (Parameter A << Parameter B).(Parameter B specify the numbers of bits to move left).



When M77 is effective, condition is 50, means move left,parameter A and B are both address. When address of parameter A 10=10000111, address of parameter B 11=00000011, address of parameter C 15=00111000.

(6) Move right: Parameter C = (Parameter A >> Parameter B).(Parameter B specify

the numbers of bits to move right).



When M77 is effective, condition is 50, means move right, parameter A and B are both address. When address of parameter A 10=10000111, address of parameter B 11=00000011, address of parameter C 15=00010000.

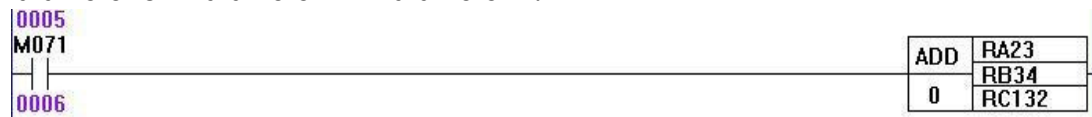
4, ADD: Data plus

Conditions:

0 means 8 bits data, parameter A and B are both address; 1 means 16 bits data, parameter A and B are both address; 2 means 8 bits data, parameter A is address, parameter B is constant; 3 means 16 bits data, parameter A is address, parameter B is constant; 4 means 8 bits data, parameter A is constant, parameter B is address; 5 means 16 bits data, parameter A is constant, parameter B is address; 8 means parameter A and B are both constant.

Rules:

Parameter C = Parameter A + Parameter B.



When M71 is effective, condition is 0, parameter A and B are both address. When address of parameter A 23=10000111, address of parameter B 34=01100001, address of parameter C 32=11101000. 5, SUB: Data minus

Conditions:

0 means 8 bits data, parameter A and B are both address; 1 means 16 bits data, parameter A and B are both address; 2 means 8 bits data, parameter A is address, parameter B is constant; 3 means 16 bits data, parameter A is address, parameter B is constant; 4 means 8 bits data, parameter A is constant, parameter B is address; 5 means 16 bits data, parameter A is constant, parameter B is address; 8 means parameter A and B are both constant.

Rules:

Parameter C = Parameter A - Parameter B.



When X22 is effective, condition is 0, parameter A and B are both address. When address of parameter A 30=10100000, address of parameter B 11=01100000, address of parameter C 45=01000000.

6, MUL: Data times

Conditions:

0 means 8 bits data, parameter A and B are both address;
1 means 16 bits data, parameter A and B are both address;
2 means 8 bits data, parameter A is address, parameter B is constant;
3 means 16 bits data, parameter A is address, parameter B is constant;
4 means 8 bits data, parameter A is constant, parameter B is address;

5 means 16 bits data, parameter A is constant, parameter B is address;
 8 means parameter A and B are both constant. Rules:
 Parameter C = Parameter A x Parameter B.



When M70 is effective, condition is 0, parameter A and B are both address. When address of parameter A 10=10100111, address of parameter B 20=00000101, address of parameter C 15=01000011.

7, DIV: Data divide

Conditions:

- 0 means 8 bits data, parameter A and B are both address;
- 1 means 16 bits data, parameter A and B are both address;
- 2 means 8 bits data, parameter A is address, parameter B is constant;
- 3 means 16 bits data, parameter A is address, parameter B is constant;
- 4 means 8 bits data, parameter A is constant, parameter B is address;
- 5 means 16 bits data, parameter A is constant, parameter B is address;
- 8 means parameter A and B are both constant.

Rules:

Parameter C = Parameter A/Parameter B.



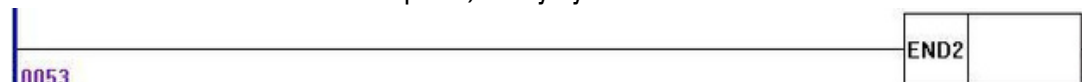
When X00 is effective, condition is 0, parameter A and B are both address. When address of parameter A 1=10100111, address of parameter B 2=00000101, address of parameter C 111=00100001.

6.3.4 Control the steps

1. END1 : [Control the steps] :The end of the first level
 END1 in front of PLC is high-speed, every cycle is 8ms.



2. END2 : [Control the steps] :The end of the second level
 END2 in front of PLC is low-speed, every cycle is 100ms.



3. LABL : [Control the steps] :Mark of position
 Specify a mark in the ladder, use JMPB to jump to this position, LABL mark.



LABL number 1-9999.

4. JUMP : [Control the steps]:With or without condition to jump

The program will jump to marked position to run. Could use the same mark in multi-jump;
 Can't jump over END1 or END2; Can't jump out of sub program; Could jump forward and backward.

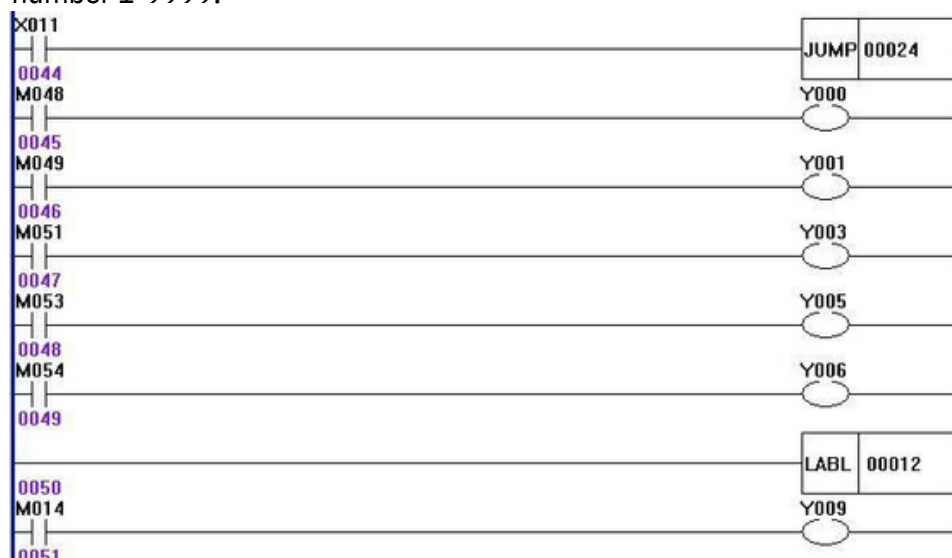


Condition:

Not jump when M78 is invalid, execute the next segment behind the JUMP.

Jump to the marked position when M78 is effective and execute the next segment.

JUMP number 1-9999.



Note: Jump over 45-49 lines and execute 51 line when X11 is effective.

Execute 45 line when X11 is invalid.

5. CALL : [Control the steps]: With or without to use sub program

Use sub program, could use multi call instruction in the same sub program; Call instruction could be nested; Can't be used in the first level program; Sub program must be edited behind END2.



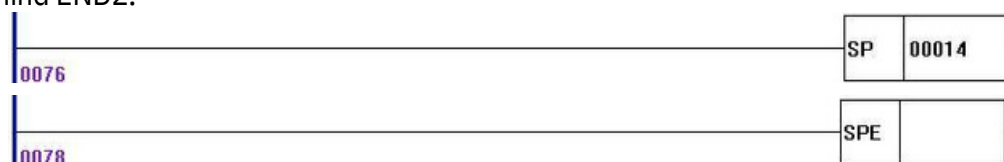
Note : Call and execute the specified sub program when M72 is effective (example CALL 16).

Execute the next instruction after executing CALL when M72 is invalid.

6. SP : [Control the steps] Start subprogram

7. SPE : [Control the steps] End subprogram

SP to generate a sub program, the number of sub program as the name of sub program, SPE is the mark of the end of sub program. When the instruction is executing, it will be back to the main program, SP and SPE to specify the range of sub program. The sub program must be edited behind END2.



SP16 sub program.



Note: Call sub program SP16 when M288 is effective.

8, RETN : [Control the steps] Return from sub program

When satisfying condition of call sub program and RETN, then back to the main program directly.

When satisfying condition of call sub program, but not RETN, then finish the sub program and then back to the main program.



Note: Execute sub program SP22 when X11 is effective; Condition of RETN is satisfied when M285 is effective, then back to the main program directly and execute 13 line.

Execute sub program SP22 when X11 is effective; Condition of RETN is not

satisfied when M285 is invalid, then execute 18 line of sub program to the end, then back to the main program.

6.3.5 Table of parameter address

1, Definition of input and output parameter address:

Definition of parameter address	Parameter
1	X0-X7
2	X8-X15
3	X16-X23
4	X24-X31
7	X50-X57
8	X58-X65
9	X66-X73
10	X74-X81
13	X151-X158
14	X159-X166
15	X167-X174
16	X175-X182
17	X183-X190
18	X191-X198
31	X200-X207
32	X208-X208
51	Y0-Y7
52	Y8-Y15
53	Y16-Y23
54	Y24-Y31
55	Y50-Y57
57	Y71-Y78
58	Y79-Y80

2, Definition of parameter address of relay:

Definition of parameter address	Parameter
101	M0--M7
102	M8--M15
103	M16--M23
104	M24--M31
105	M32--M39

10	M40--M47
6	M48--M55
10	M56--M63
7	M64--M71
10	M72--M79
8	M80--M87
10	M88--M95
9	M100--M107
11	M108--M115
0	M120--M127
11	M128--M135
1	M200--M207
11	M208--M215
2	M250--M257
11	M258--M265
3	M266--M273
11	M274--M281
4	M218--M225
11	M226--M233
5	M234--M241
11	M242--M249
6	M282--M289
11	M290--M297
7	M298--M305
11	M306--M313
8	M800--M807
11	M808--M815
9	Total of tool
12	The current number of tool-case
0	Number of target tool-case
12	

Note:

1. Odd address could use 8 bits parameter, also could use 16 bits parameter;
2. Even number only use 8 bits parameter, can't use 16 bits parameter;
3. For 16 bits odd address, including this odd address and a parameter of even number behind;
4. Constant could be 8 bits number at the most.

Chapter7 Connection

7.1 Character of robot controller

High performance industrial level 32 bits ARM+DSP+FPGA
128M(Could be expand to 32G) user storage 800x600 TFT LCD
touch screen USB connection Power supply of high anti-
interference Hand held 48x32 I/O 2 ways 0-10V analog output
1 way orthogonal input of encoder 6 ways output of motor with
brake

7.2 Technical index

Number of controlling axis:XYZABCXsYs 8 axis
Pulse value:0.001mm
The max speed:240m/min
Processing speed:0.01-30000mm/min
The minimum input unit:0.001mm
Range of programme size:± 99999.999mm
Programme code:ISO-840 international standard
Definition of programme coordinate system:ISO-841 international standard
Time of fault-free on average(MTBF):Bigger than 6000 hours

7.3 Using environment of controller:

Power:AC 220V (+10%,-15%), frequency 50Hz±1%
Torque of power≤150W
Power supply must use isolation transformer
Running temperature 5~45°C, relative humidity 40-80%
Temperature of storage and transportation 0 ~ 55°C, relative humidity less than
90%(40°C)
To avoid an oil mist and dust, corrosive gas, corrosion, good ventilation

7.4 Installation connection

Firstly check the controller, power, motor, electrical board is good or not.

Must save some space around, keep air circulation, the position of controller need to be easy to operate and avoid scalding when machine is working.

Leave away from strong electricity in case of interference, all input signal is the best not connect with controller directly; Must connect with ground.

Can't hot-plugging all cables when power on. Put controller into clean and fixed position.

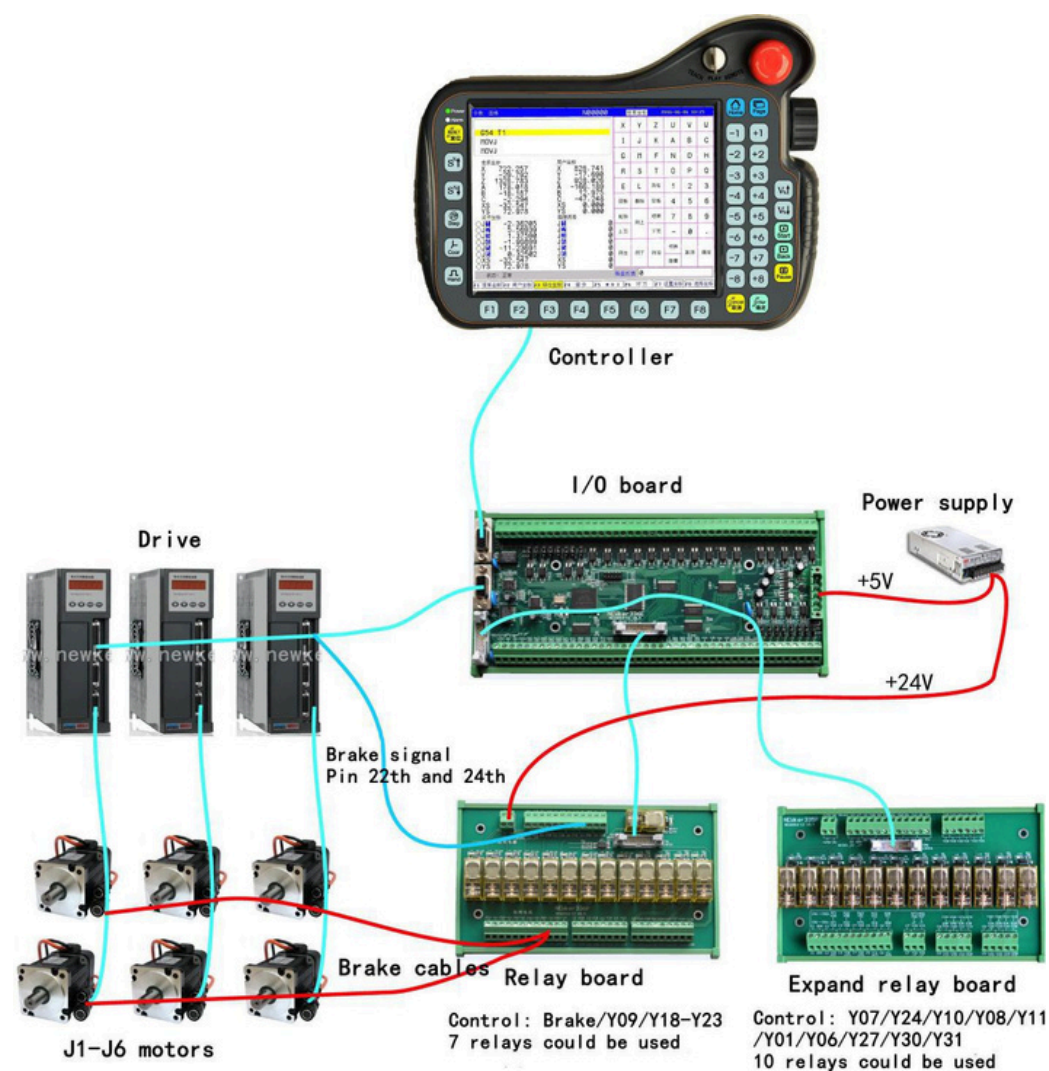
Note:

1, Controller need to install a place which got lightning-protection

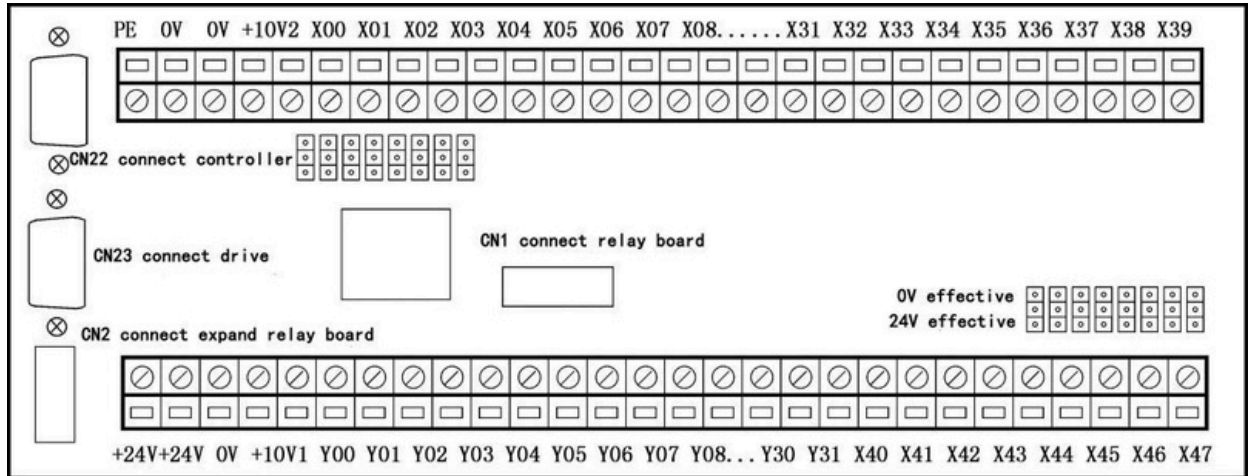
2, Controller must be a fixed place in case of vibration

3, Keep controller away from combustibile

7.4.1 Connection diagram



1. I/O board of input and output



- 1) CN22 connect with CN22 of controller.
- 2) CN23 connect with driver.
- 3) CN1 connect with CN1 of relay board, including:
 - 1 relay of controller output brake control;
 - 6 relays of brake of motor;
 - 7 relays of Y09, Y18, Y19, Y20, Y21, Y22, Y23;
- 4) CN2 connect with expand relay board CN1, including:
 - 1 relay of brake of motor;
 - 11 relays of Y07, Y24, Y10, Y08, Y11, Y01, Y05, Y06, Y27, Y30, Y31. Y05 is relay of controller output brake control, user can't use this in other way.
- 5) Input signal X00-X07, X40-X47 could choose +24V or 0V effective, chosen by pin. X40 is detection signal of brake, user cannot use this in other way.
- 6) PE connect terminal and ground in case of interfere.

Note:

1. X0 is detection of start arc, X01 is malfunction of welder, X02 is alarm of inverter, X04 is alarm of cooling, X05 is alarm of lubrication, X06 is alarm of no arc, X07 is alarm of no gas, X46 is alarm of no wire, X47 is alarm of power, X20 is alarm of driver ALM, X21 is external alarm ALM1, X22 is external alarm ALM2, X23 is external alarm ALM3, X17 is remote pause HALT, X18 is remote start RUN, X19 is remote emergency stop ESTOP, X40 is detection of motor brake.

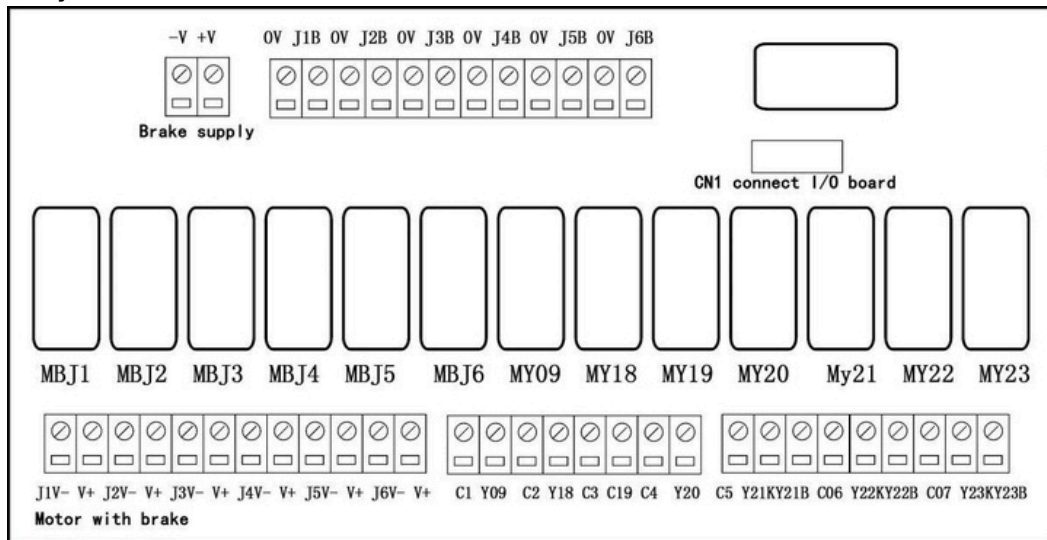
X09 is signal-L of negative limit switch, X10 is +L of positive limit switch, X08/X11/X12/X13/X26/X25 is return to zero signal AO/YO/XO/ZO/BO/CO of A/Y/X/Z/B/C axis.

So, user could use X14-X16, X24, X28-X39, X41-X45, total 21 input points

2. Y05 is relay of controller output brake control. Y16 is enable signal EN of driver, Y17 is alarm clear signal INTH of driver.

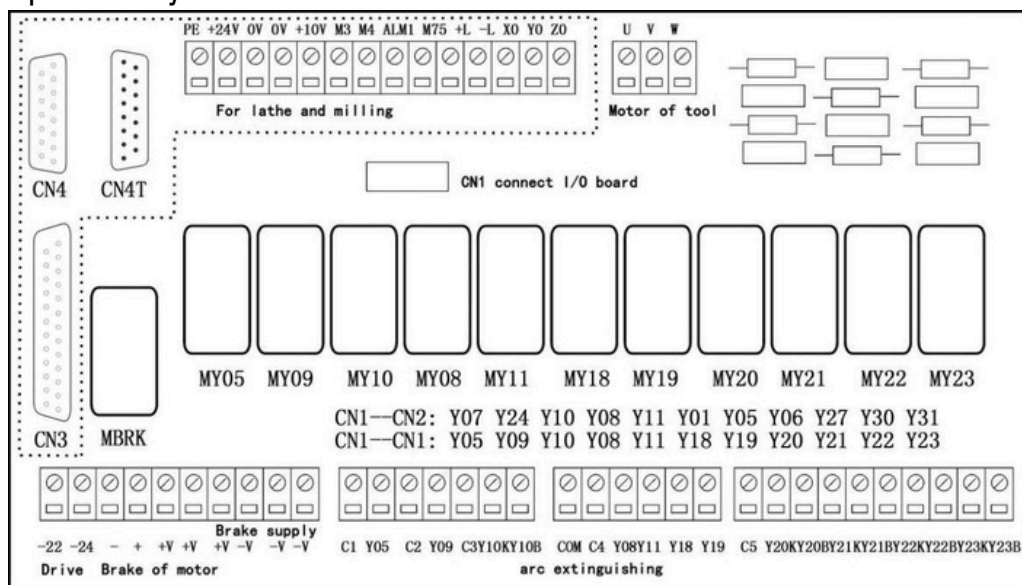
So, user could use Y00-Y04, Y06-Y15, Y18-Y31, total 29 output point.

2. Relay board of controller



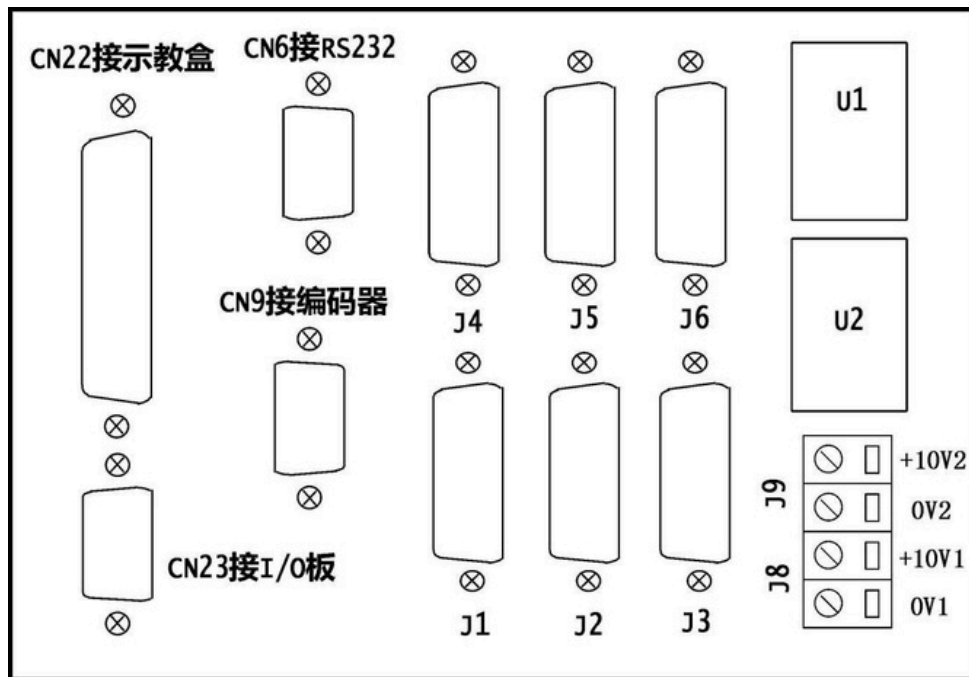
- 1, CN1 connect with CN1 of I/O electrical board, control output: Y09, Y18, Y19, Y20, Y21, Y22, Y23 user could use 7 relays.
- 2, 0V of brake connect CN3-22 pin of driver, J1B/J2B/J3B/J4B/J5B/J6B connect with CN3-24 pin of driver.
- 3, -V, +V connect with power of brake. 4, J1V-/J2V-/J3V-/J4V-/J5V-/J6V-, V+ connect with brake motor.

3. Expand relay board of controller



- This board is an option
- 1, CN1 connect with CN2 of I/O electrical board, control output: Y07, Y24, Y10, Y08, Y11, Y01, Y05, Y06, Y27, Y30, Y31, total 11 relays, Y05 is relay of controller output brake control, effective when brake of joint motor open, user can't use this in other ways. Total 10 relays could be used.
 - 2, 22 connect with CN3-22 pin of driver, 24 connect with CN3-24 pin of driver
 - 3, -, + connect with brake motor.
 - 4, -V, +V connect with brake power.

4. Pulse Board



1.CN22 connects with controller 2.CN23 connects with I/O board 3.CN9 connects with encoder 4.CN6 connects with computer RS232 5.J1-J6 connects with pulsed servo driver 6.U1, U2 is isolation chip of analog voltage. 7.J8, J9 isolated output of analog voltage +10V1, +10V2. connects with welder.

7.4.2 DB44connectingwithCN22ofcontroller'sbussocket

The socket connects to CN22 of driver's pinboard.

CN22 Bus Pulsed Signal DB44 Pin(22/10pairs)				CN23 Bus Signal DB15Pinhead (8pairs)
Signal	Pin	I/O	Function	Pin
+5V	1,2		Power Power B	11, 13 (4 pairs)
0V	3,4		axis pulse B axis	12,14 (4 pairs)
BCP+/BCP-	8/9	OUT	direction C axis	
BDIR+/BDIR-	10/11	OUT	pulse C axis	
CCP+/CCP-	12/13	OUT	direction B	
CDIR+/CDIR-	14/15	OUT	signal A signal A	
TXB+/TXB-	44/29	Individual shielded	axis pulse A axis	4/3 (1 pairs)
TXA+/TXA-	43/28		direction	2/1 (1 pairs)
ACP+/ACP-	42/27	OUT		
ADIR+/ADIR-	41/26	OUT		

XCP+/XCP-	40/25	OUT	Xaxispulse	
XDIR+/XDIR-	39/24	OUT	Xaxisdirection	
YCP+/YCP-	38/23	OUT	Yaxispulse	
YDIR+/YDIR-	37/22	OUT	Yaxisdirection	
ZCP+/ZCP-	36/21	OUT	Zaxispulse	
ZDIR+/ZDIR-	35/20	OUT	Zaxisdirection	
RS485+/RS485-	34/19		RS485 communication	
PC+/PC-	33/18			
PB+/PB-	32/17		EncoderCsignal	
PA+/PA-	31/16	IN	EncoderBsignal	
TXD/RXD		IN	EncoderAsignal	
		IN		
	6/7		RS232 communication	

Note:

1. DB44 pins corresponds to DB15: (10 pairs) welding
2. DB44 pins corresponds to DB44: (10 pairs) -- correspondingly welding with 1/2, 1/2, 3/4, 3/4, 33/18, 32/17, 31/16, 6/7. individual shield (44/29, 43/28), bus global function(bus driver, encoder, RS232);

3. Pin DB44 weld to Pin DB 44 of 22 pairs correspondingly, individual shield(44/29, 43/28), pulse global function(pulse driver, encoder, RS485, RS232).

7.4.3 DB15connectingwithCN22ofI/OBoard

The socket connects to driver's pinboard CN23

CN22 I/OBoardDB15Pins(8pairs)				
Signal	Pin	I/O	Function	Twisted pair
TXA+/TXA-	2/1		Asignal	Individual shield
TXB+/TXB-	4/3		Bsignal	
ALM	5	IN	Driveralarm	1 pair
+24V	6	OUT	24Vpower	
INTH	7	OUT	Removealarm	1 pair
EN	8	OUT	Enabledriver	
10V1	9	OUT	Firstanalog	1 pair
10V2	10	OUT	Secondanalog	
+5V	11,13	OUT	Power Power	1 pair
/0V	12,14	OUT		

7.4.4 DB15connectingwithJ1-J6ofpulsedriver

the socket connects to pulsed servo driver.

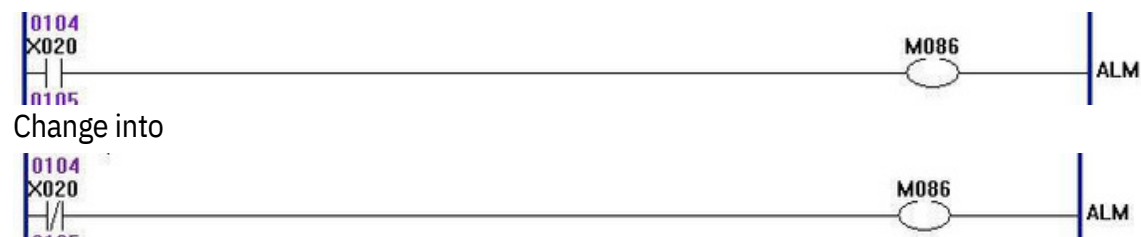
J1-J6pulsedriverDB15pin(6pairs)				301Hdriver	302Hdriver
Signal	Pin	I/O	Function	DB25 Pinhead	DB25 Pinhead
CP+/CP-	1/9		Pulsesignal		
DIR+/DIR-	2/10	OUT	Directionsignal	6/18	6/18
EN	3	OUT	Enabledriver	7/19	7/19
INTH	4	OUT		23	
+24V	5/11	OUT	Remove driver	10	
ALM		OUT	alarm	11	
OV		IN	24VPower	12	
	12	OUT	Driveralarm	13,21	12
	13		Groundofpower	1/25	13,25
RS485+/RS485-	15/8		485+/485-		5/17
` J1-J6 Pulsed Driver DB15 Pinhead(2 pairs)					
CP+/CP-	1/9	OUT	Pulsesignal		3/15
DIR+/DIR-	2/10	OUT	Directionsignal		4/16

RS485+/RS485-: connect to Modbus communication signal of driver, OV must connect to OV port of driver.

EN: enable driver when output OV

INTH: reset driver when output OV

ALM: Imputing OV means driver alarm, frequent on signal. If it is frequent off signal, ALM of all driver should be threaded together, then connect to one ALM signal of all, and X20 needs to changing into normal close in PLC.



7.4.5 DB9connectingwithCN23ofbusdriver

The socket connects to bus Ethernet port of servo driver.

CN23busEthernetsignalport			DB9Pinhead(2pairs)	
Signal	Pin	I/O	Function	Activelevel
TXA-/TXA+	1/2	IN	Asignal	5V
TXB-/TXB+	3/4	IN	Bsignal	5V

7.4.6 DB9connectingwithCN9ofspindleorthogonalencoder

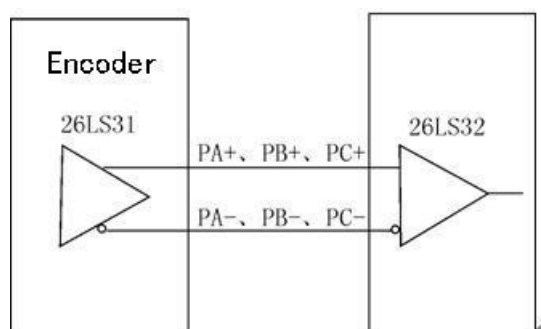
The socket connects to encoder on the device.

CN9 Signal of main spindle encoder DB9 Pinhead(4 pairs)				
Signal	Pin	I/O	Function	Activelevel
0V	4	OUT	Groundofpower	0V
+5V	1	OUT	5VPower	+5V
PA+/PA-	5/7	IN	Asignal	5V
PB+/PB-	3/6	IN	Bsignal	5V
PC+/PC-	2/8	IN	ZSynchronizationsignal	5V

Attention:

1. Signalofencoderoutputsinalong-wiremode,voltageis+5V.
2. Signalwiremustuseshieldedtistedpaircable,thelengthcan'tbeover20m.

Schematic diagram of input signal PA,PB,PC of encoder:

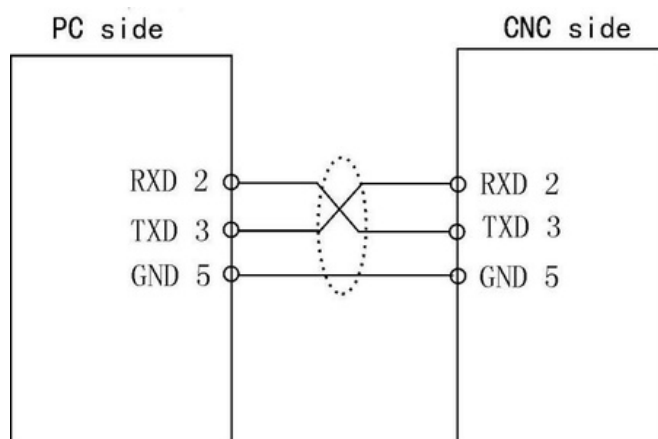


7.4.7 DB9connectingwithCN6ofcommunication

Communication signal DB9 Pinhead				
Signal	Pin	I/O	Function	Activelevel
0V	5	OUT	Groundofsignal	0V
RXD	2	IN	Receivedatasignal	
TXD	3	OUT	senddatasignal	

Attention: communication wire must use shielded twisted pair cable, the length can't be over 10m.

Signal connecting diagram between CN 6 and Computer:



Chapter 8 Debugging

8.1 Steps

1. Ready before debugging;
2. Set No.56 number of driver;
3. Modify PLC according to the requirement;
4. Test the motor when power on, no alarm;
5. Relative parameter of machine: Reduction ratio, Length of link rod, coupling relation, Reversal gap;
6. Set parameter of motor in controller: Absolute encoder;
7. Zero point of robot;
8. Soft limit of each joint;
9. Power on to check the joint coordinate;
10. Set error of location;
11. Accuracy of location;
12. Backup parameter;
13. Test for working;

8.2 Ready for working

Must check the connection before debugging.

- 1, Make sure the power supply is right (3 phase 380V, ground, sectional area of cable);
- 2, Make sure the power supply of driver and controller is right (Isolation, 220V, sectional area of cable);
- 3, Make sure the voltage of brake is right, and it's DC voltage;
- 4, Make sure all signal and connection are right (Driver, encoder use Shielded twisted pair wire, other signal use normal shielded wire)
- 5, Check all route of connection (Especially AC power, DC24V power, encoder use 5V power);
- 6, Try to power on: Level by level to power on.

8.3 Set parameter of driver

- 1, Code: P1=1 (Default);
- 2, Set No.56 parameter of driver in each joint, set as 1-8 correspond to J1-J6\Xs\Ys;
- 3, Save the parameters of servo driver;

Note: Restart power, the circle in front of coordinate need to be green, otherwise some problems with bus, please check the set and cable.

8.4 Set relative parameter of machine

8.4.1 Controlling type of controller

- 1) Type of robot, it is better to make sure the type of robot before ordering. No.330 other parameter to set robot, 11 means weld, 12 means palletizing, 13 means painting.
- 2) Controlling mode of robot, could control 20 kinds of robot, use No.451 other parameter to specify, only to check, can't be modified.
0 : Means the standard function of CNC controller, could control the robot of loading and unloading, also could be held controller of engraving machine.
262: Means 2 axis SCARA; 363: Means 3 axis SCARA;
440: Means 4 axis rotating joint non parallelogram robot; 441: Means 4 axis rotating joint

parallelogram robot;

442:Means 4 axis palletizing parallelogram robot, the same as RMD of GSK; 464:Means 4 axis SCARA;

480:Means 4 axis Delta robot;

550:Means B axis-tool and A axis-platform hybrid 5-axis cnc machine; 551:Means AC axis rotational tool 5-axis cnc machine;

552:Means AC axis rotational platform 5-axis cnc machine; 553:Means A axis-tool and C axis-platform hybrid 5-axis cnc machine; 554:Means A axis-tool and B axis-platform hybrid 5-axis cnc machine 565:Means 5 axis SCARA;

600/2600:Means 6 axis/8 axis serial joint robot; 601/2601:Means 6 axis/8 axis parallelogram robot;

602/2602:Means 6 axis/8 axis non-spherical wrist robot, J5 and J6 have offset distance d_6 ;

603/2603:Means 6 axis/8 axis non-spherical wrist robot, J5 and J6 have offset distance e_6 ;

604/2604:Means 6 axis/8 axis non-spherical wrist robot, J5 and J6 have offset distance d_6 and e_6 ;

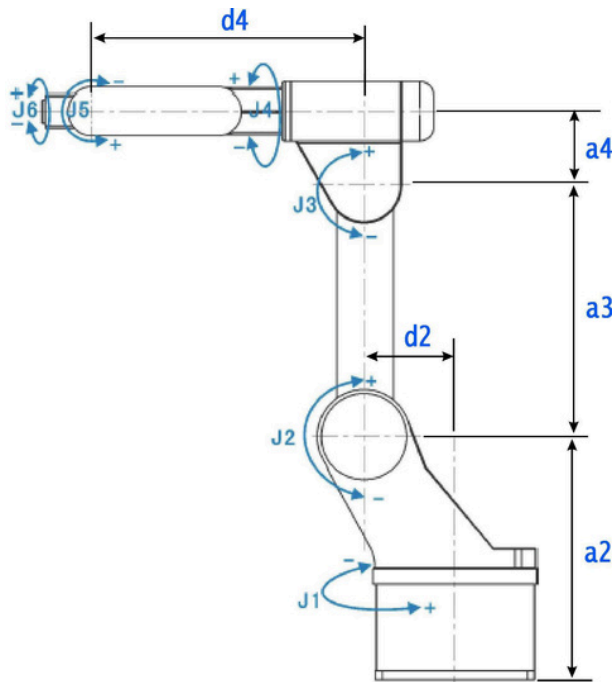
608/2608:Means 6 axis/8 axis L shaped wrist robot, 666:Means 6 axis SCARA;

8.4.2 Length of link rod

No.351-No.366 other parameter, No.461-No.376 for error compensation

Name for parameter : “a” means vertical distance between joint; “d” means horizontal distance between joint; “L” means length of link rod. a_3 means the vertical distance between zero point of J2 and zero point of J3; d_5 means the horizontal distance between zero point of J5 and zero point of J4; L_a means length of slave, L_b means length of active.

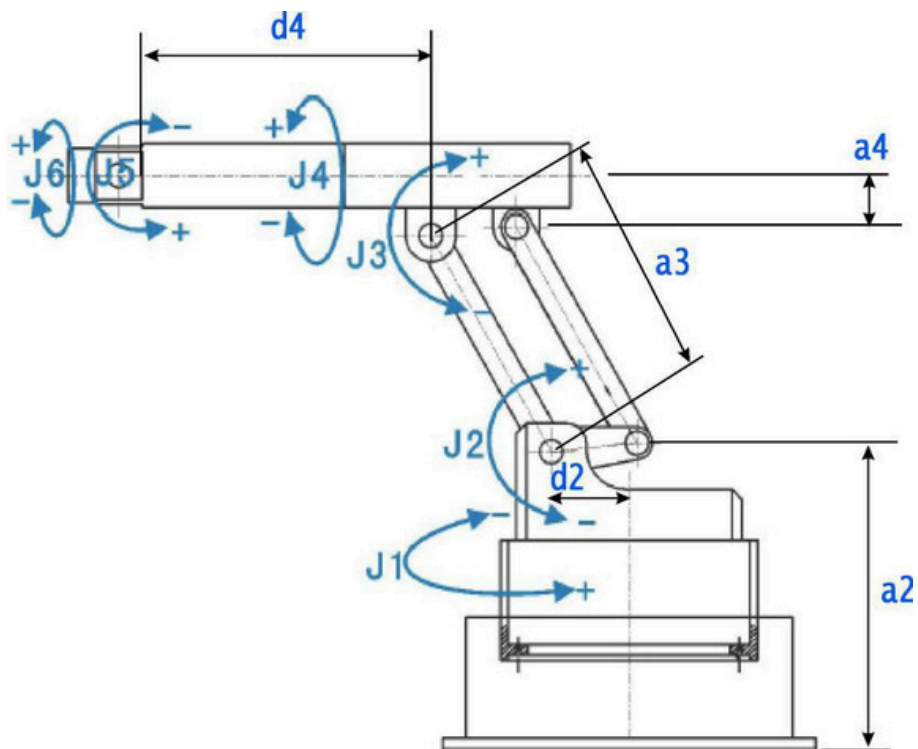
No.351-No.366 axis parameter to set link rod of each axis, No.461-No.476 parameter to set error compensation of link rod, parameter could be different according to different structure of machine.



Robot1 6 axis serial joint robot(P451=600/602/2600/2602)

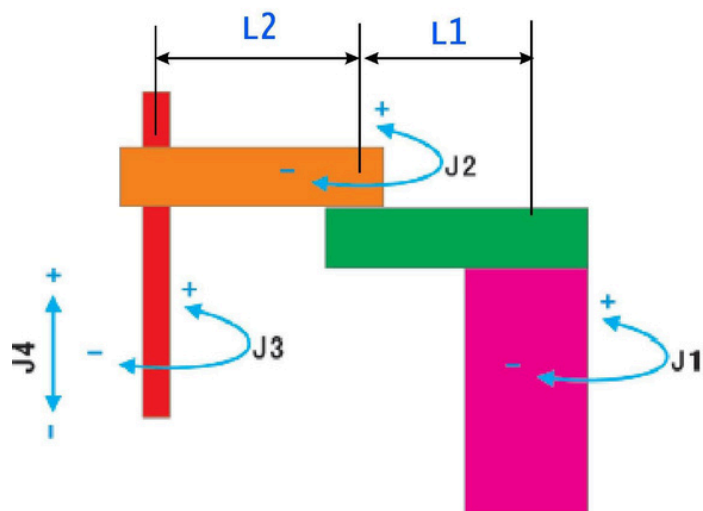
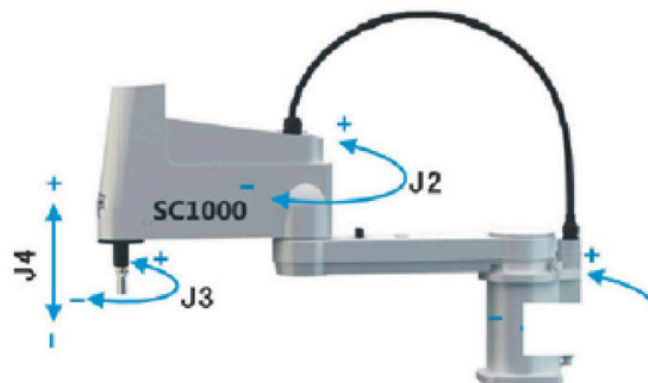
Note: a_2 could be not specified, e_2 could be 0

If J5 and J6 have offset value, P451=602 or 2602, the offset parameter P360 should be set.

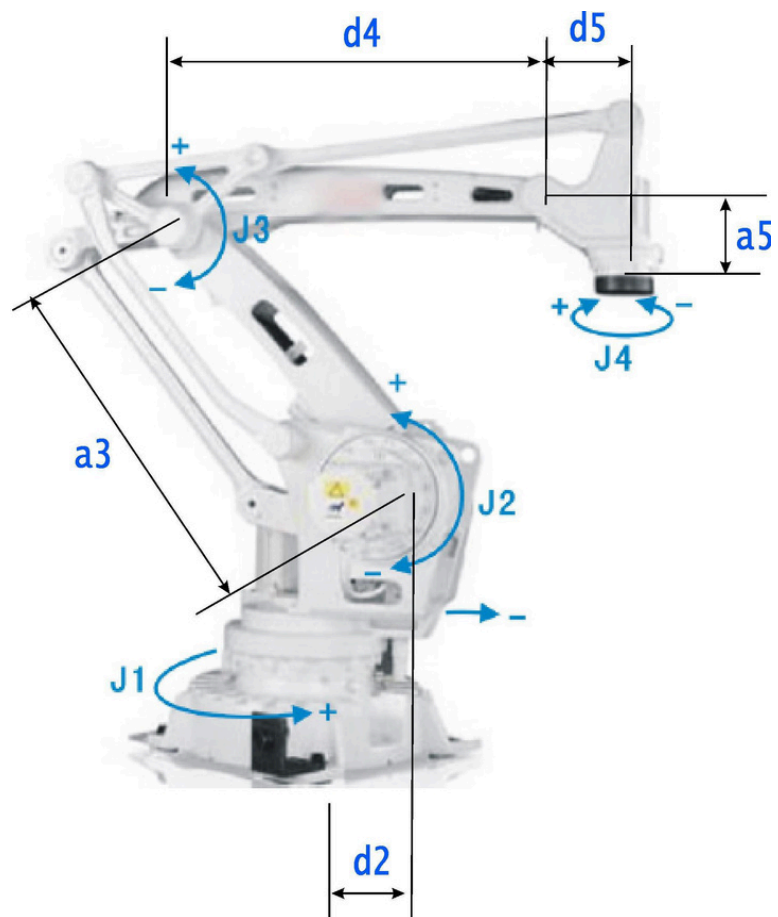


Robot2 Six axis parallelogram robot(P451=601/2601)

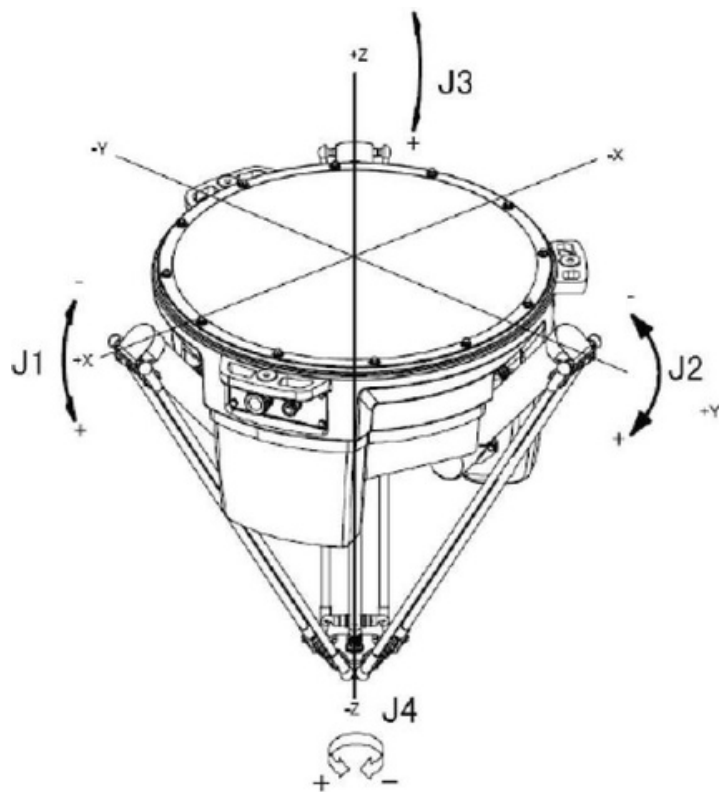
Note: a_2 could be not specified, e_2 could be 0



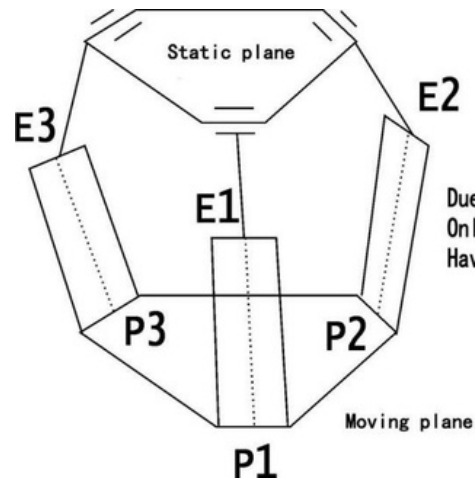
Robot3 4 axis SCARA(P451=464)



Robot4 4 axis rotary joint palletizing robot(P451=441)

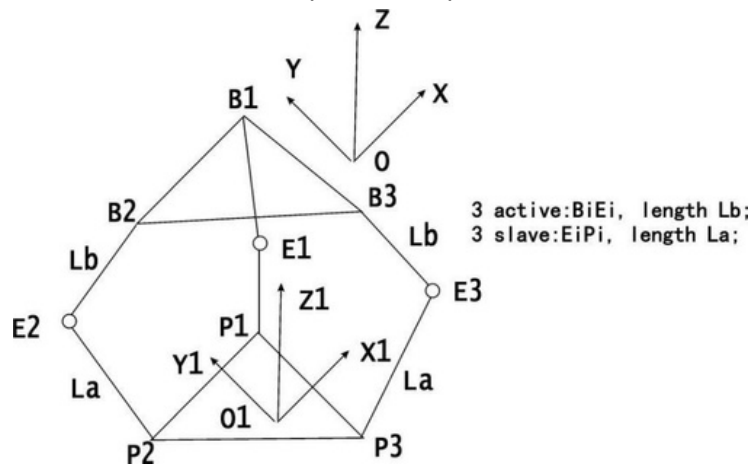


Robot5-1 4 axis Delta(P451=480)



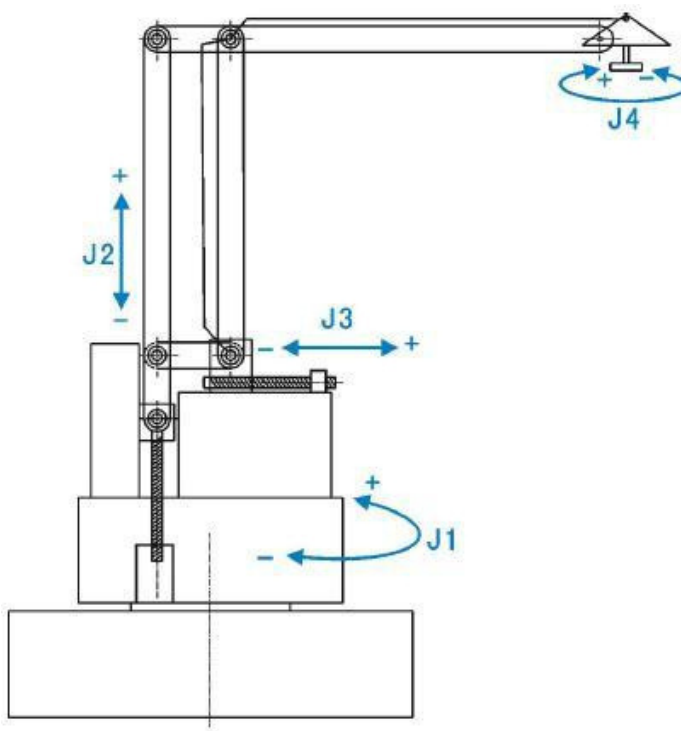
Due to the action of three parallelogram,
Only 3 direction(XYZ) move in moving plane,
Haven't got motion of rotation axis.

Robot5-2 4 axis Delta(P451=480)



Robot5-3 4 axis Delta(P451=480)

La means length of slave, Lb means length of active;
Rmax means size of static plane(Centre to vertices of equilateral triangle);
Rmax means size of moving plane(Centre to vertices of equilateral triangle).



Robot6 Four axis

palletizingparallelogram robot(P451=442)

8.4.3 Reduction ratio of machine, relative parameter No.44-No.60

1,Calculation of electrical gear of vertical multi-joint robot

1),P44=0;

2),Numerator of electrical gear:

J1-J6\Xs\Ys correspond to P45\P47\P49\P51\P53\P55\P57\P59,reduction ratio is x1000.

Example:Reduction ratio of J1 is 121,then No.45=1210000;

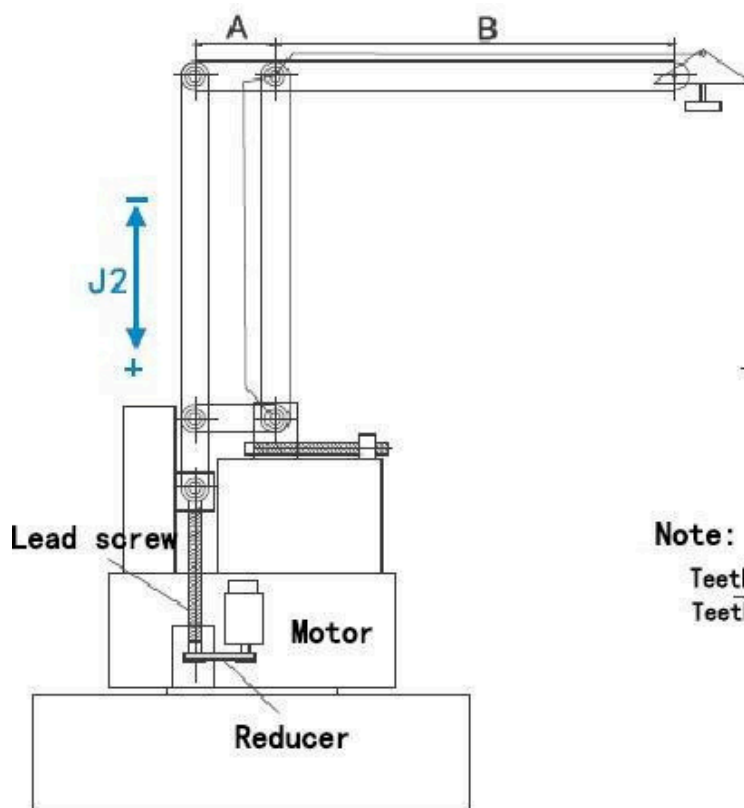
3),Denominator of electrical gear:

A,J1-J6 correspond to P46\P48\P50\P52\P54\P56,set as 36000000;

B,Xs\Ys correspond to P58\P60, if it is ration axis then set as 36000;If it is straight line axis, then set as 10000.

2,Calculation of electrical gear of palletizing robot

The setting way of J1,J4 axis is the same as robot 1-3.The set of reduction ratio of J2,J3 as follow:



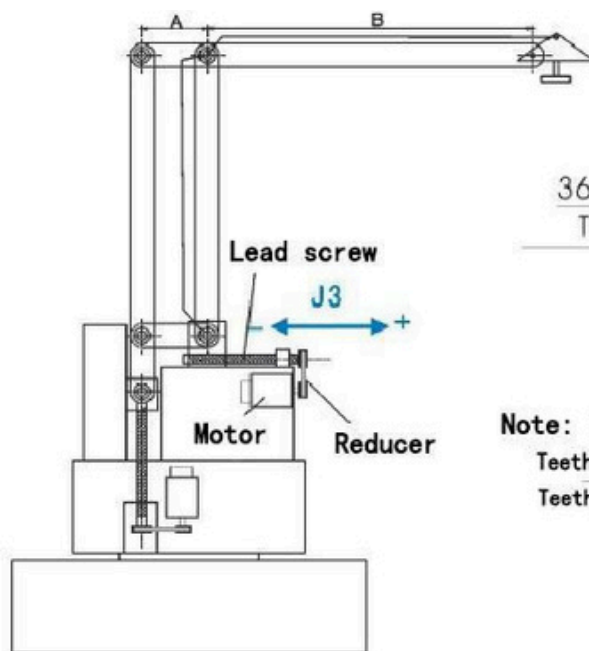
$$\frac{\frac{360}{T} \times \frac{\text{Teeth of screw}}{\text{Teeth of motor}}}{\frac{B}{A}}$$

Note: T is screw pitch, unit:mm

Teeth of screw

Teeth of motor : Reduction ratio of reducer

Calculation of reduction ratio J2 of robot 4



$$\frac{360}{T} \times \frac{\text{Teeth of screw}}{\text{Teeth of motor}} \times \frac{A+B}{A}$$

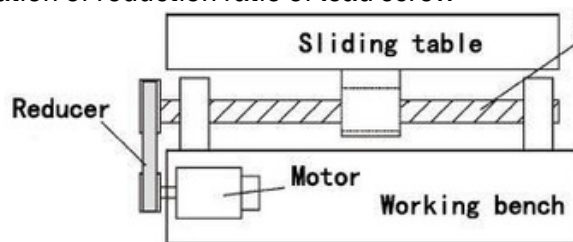
Note: T is screw pitch, unit:mm

Teeth of screw

Teeth of motor : Reduction ratio of reducer

Calculation of reduction ratio J3 of robot 4

3. Calculation of electrical gear in straight line axis 4 of robot: Straight line axis is different according to the structure, two kinds usually: Lead screw, gear drive(Synchronous pulley).
Calculation of reduction ratio of lead screw



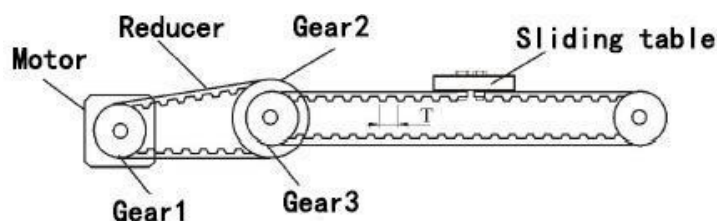
$$\frac{360}{T} \times \frac{\text{Teeth of screw}}{\text{Teeth of motor}}$$

Note:T is screw pitch,unit:mm

Teeth of screw

Teeth of motor : Reduction ratio of reducer

Calculation of reduction ratio of lead screw



Note:T is tooth pitch,unit:mm

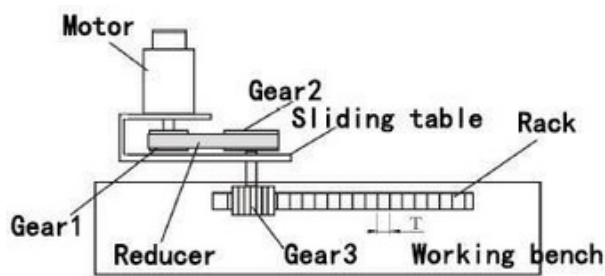
C1 is teeth number of gear1

C2 is teeth number of gear2

C3 is teeth number of gear3

$$\frac{360}{T \times C3} \times \frac{C2}{C1}$$

Calculation of reduction ratio of gear drive(Synchronous pulley)(1-3 axis of reciprocating machine is set as this)



Note: T is tooth pitch, unit: mm

$$\frac{360}{T \times C3} \times \frac{C2}{C1}$$

C1 is teeth number of gear1

C2 is teeth number of gear2

C3 is teeth number of gear3

Calculation of reduction ratio of rack drive

8.4.4 Coupling relation, relative other parameter No.375-No.385

Coupling relation of robot solve the structure problem, move an joint separately, the other joint will follow move with ratio relation, if need this joint not move, then it will give the compensation pulse to let it stay, example: J5J6 coupling, J6 moves when J5 moving, this movement is the distance of J5 times numerator and divide by denominator.

No.375 is parameter to set this function.

D2=1 +4 means J1J2 got coupling relation, No.376 and No.377 is numerator and denominator of coupling;

D3=1 +8 means J3J4 got coupling relation, No.378 and No.379 is numerator and denominator of coupling;

D4=1 +16 means J4J5 got coupling relation, No.380 and No.381 is numerator and denominator of coupling;

D5=1 +32 means J5J6 got coupling relation, No.382 and No.383 is numerator and denominator of coupling;

D6=1 +64 means J4J6 got coupling relation, No.384 and No.385 is numerator and denominator of coupling;

Example:

1, J5J6 got coupling relation in vertical multi joint serial robot, parallelogram robot;

2, J4J5 and J5J6 got coupling relation in Vertical multi-joint L wrist robot;

3, SCAR is composite lead screw, the reduction ratio is 360/T of lead screw;

4, Palletizing without coupling;

5, The 4th 5th axis got coupling in pole coordinate robot;

6, The 4th 5th axis got coupling in reciprocating machine1; 7, The 4th 5th axis got coupling in reciprocating machine2;

8.4.5 Reversal gap, relative axis parameter No.30-No.37

Use to set when J1-J6/Xs/Ys axis move reversal, the drive got reversal gap. When the axis involves reversal motions, system will invoke the value to compensate automatically. Unit: μm.

8.5 Each axis parameter of driver in controller

1, Direction of servo motor

No.38-No.43 axis parameter set the motor direction of J1-J6/Xs/Ys;

2, Mode of floating back to zero point

No.62=1111111011 in axis parameter to set each axis;

3, Bus absolute function

No.300=11111110 in other parameter, if it is absolute motor, then set as 1;

4, Address of absolute encoder
No.301=92, No.302=91, No.303=90 in other parameter;

5, Number of pulse when motor in each cycle
P304/P305/P306/P307/P308 in other parameter=131072, corresponding to J1-J6/Xs/Ys joint;

6, Coordinate distance when motor in each cycle
Set P309/P310/P311/P312/P313=360000000 in comprehensive parameter which correspond to J1-J6/Xs/Ys joint, set as 10000000 if it is straight line axis;

7, Denominator of coordinate distance when motor in each cycle
Set P320/P321/P322/P323/P324= reduction ratio in comprehensive parameter which correspond to J1-J6/Xs/Ys joint;

8, Direction and coordinate of machine:
1) Move J1-J6 in teach, remember the corresponding coordinate of joint;
2) In MDI to run M500, read the absolute coordinate to check if it is the same as before or not, if not the same, then change the symbol of P309/P310/P311/P312/P313 in comprehensive parameter, example: J1 is not the same, then P309=360000000, change it into P309=-360000000;
3) Repeat step 1) 2) two times until the coordinate is the same;
Note: The little circle should be green when using M500 to read, otherwise something wrong with the bus, please check the set and cables.

9, Zero point of robot joint
Move J1-J6/Xs/Ys near the zero point in teach mode, set P314/P315/ P316/P317/P318 in comprehensive parameter (correspond to J1-J6/Xs/Ys axis), press "Enter", then press "E" to clear, and set current position as the zero point of joint.

10, Set soft limit of each joint
P18-P29 axis parameter to set soft limit of each joint;

11, Set error of location and position
1) Error of location
If need make sure the location position, when PL=0 in program, controller will wait the motor until it reaches to the position; PL≠0, not to wait.
It will take time of program, this is about driver parameter, strong rigidity, reasonable, short time.
Set parameter of driver, No.511-No.588 correspond the relative parameter.
(1) P511/P521/P531/P541/P551/P561/571/P581 correspond to No.8 parameter of J1-J6/Xs/Ys. the bigger value, the bigger current;
(2) P512/P522/P532/P542/P552/P562/572/P582 correspond to No.9 J1-J6/Xs/Ys, the bigger value, the bigger noise;
(3) P513/P523/P533/P543/P553/P563/573/P583 correspond to No.10 J1-J6/Xs/Ys, the bigger value, the bigger vibration;
(4) P514/P524/P534/P544/P554/P564/574/P584 correspond to No.11 J1-J6/Xs/Ys, the bigger value, the stronger rigidity, more accuracy;
Attention:
Set error of position applies to requirement for accurate location. It will keep the robot in accurate place, while providing reference for parameter of servo driver.

2) The error of position
This error is in PLAY or remote mode, the error between ideal position and the real feedback position. It will be alarm when over the set range.
(1) Electrical gear of feedback
Comprehensive parameter P210-P214=10000, correspond to the numerator of J1-J6/Xs/Ys;
Comprehensive parameter P215-P219=131072, correspond to the denominator of J1-J6/Xs/Ys;
(2) The error of alarm

Could use this in highly requirement for accuracy, comprehensive parameter P200-P204 correspond to J1-J6/Xs/Ys joint, if the tracking error is over set inprogress, it will be alarm ; comprehensive parameter P205-P209 correspond to J1-J6/Xs/Ys, if the tracking error is over set when stopping, it will be alarm.

Note:

Error of position usually be used in case of circuit fault, wrong parameter, wrong driver to cause wrong motion, in case of crushing.

12,Set comprehensive parameter

P41 in controller, backup the current parameter.

No.42 to restore the parameter.

8.6 Calibration accuracy of location and repeat location of robot

1,First calibration

In teach mode, switch into world coordinate, move X Y Z to check it is straight or not, if not straight, then need to check electrical gear of driver, number of pulse in controller, reduction ratio, link rod parameter.

2,Accuracy calibration

Edit a segment to run straight, run the segment with a reference to see it is straight or not.Or use measure to check.

8.7 Continuous running test of robot

Teach edit program with different posture of robot, continuous to run and check the tracking error of each axis is changing or not, error can't be over 2 unit changes at the same position.