WELDING ROBOTICS

# TURIN arc welding robot Training Manual



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# Statement

This manual gives a comprehensive description of the composition and operation of the arc welding robot. Please be sure to operate the robot on the basis of careful reading and full understanding.

- The diagrams in the maintenance manual, in order to explain the details, remove the cover or safety cover for drawing, when operating such parts, it is necessary to restore the cover or safety cover according to the regulations, and then operate according to the requirements of the manual.
- The drawings and photos in the manual are representative examples, which may be different from the products purchased.
- Sometimes the instruction manual is modified appropriately due to product improvement, specification change, and the convenience of the instruction itself.



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# **I.System safety**

Because the robot system is complex and dangerous, during the practice, any operation of the robot must pay attention to safety. No matter when entering the working range of the robot, serious injury may be caused. Only trained and certified personnel can enter the area.

The following safety rules must be observed:

- > In case of fire, please use carbon dioxide fire extinguisher.
- > The emergency stop switch shall not be short circuited.
- > When the robot is in automatic mode, no one is allowed to enter the area where it moves.
- > In any case, do not use the original starting disk of the robot, use the copy disk.
- > When the robot stops, there should be no objects on the fixture, and the machine must be empty.
- In case of accident or abnormal operation, e-stop can be used to stop the robot.
- In the automatic state, even if the running speed of the robot is very low, its momentum is still very large, so when programming, testing and maintenance work, the robot must be placed in the manual mode.
- The pressure in the air circuit system can reach 0.6mp, and the air source shall be cut off for any relevant maintenance.
- > Debug the robot in manual mode, and release the enable in time if the mobile robot is not needed.
- When the debugging personnel enter the robot working area, they must take the teaching device with them to prevent others from misoperation.
- Switch off the main power supply and air supply of the robot in advance when receiving the power outage notice.
- After power failure, turn off the main power switch of the robot in advance before calling, and remove the workpiece on the fixture in time.
- The maintenance personnel must keep the key of the robot. Unauthorized personnel are forbidden to enter the robot software system in manual mode and read or modify the program and parameters at will.



# **II.Robot installation requirements**

- The robot has been adjusted before leaving the factory. Please do not change the data that has been set up at will. If adjustment is really necessary, it shall be operated by qualified professionals or in accordance with the instruction manual.
- During the installation of the lifting robot, it must be carried out by qualified professionals under the command of professionals, and the lifting appliances must be safe and reliable. The lifting operation must comply with the lifting safety regulations. A level meter must be used on the mounting base to keep the upper plane of the base level.
- After the installation or maintenance of the robot, the tools, workpieces and sundries must be carefully checked and cleaned in time to prevent accidents.
- After installation, it is forbidden to open the power distribution box or operation box to operate the machine, so as to avoid the electric shock caused by the dust entering the electrical components and the operator accidentally touching the live components.

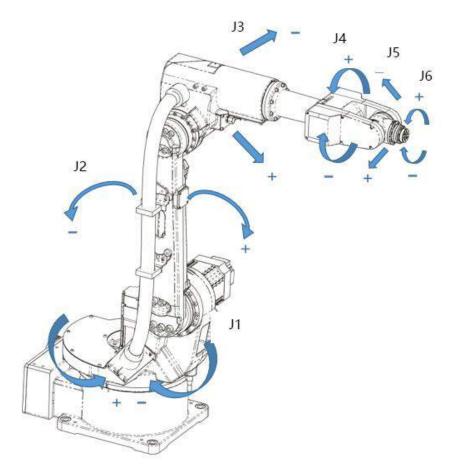


# **III.Robot components**

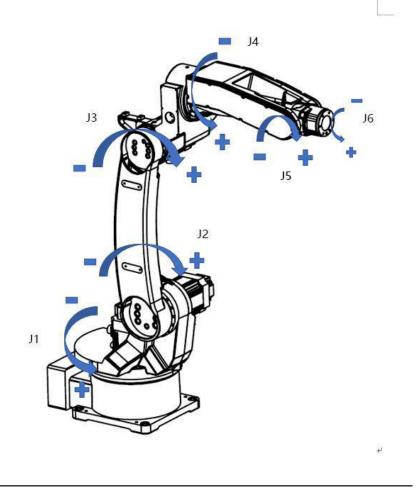
Arc welding robot system is a robot welding workstation including welding device, which is generally composed of robot body, control system, positioner, welding system and safety protection equipment.

# 3.1 Robot body introduction

In the process of arc welding, it is required that the welding gun moves in strict accordance with the track of the welding seams and continuously fills the welding wire. The movement track of the welding torch nozzle, the gesture of the welding torch and the welding relues all require precise control. Therefore, in the process of robot motion, the stability of speed and the accuracy of trajectory are very important and must well met indexes. There are six axes on the body of arc welding robot, which can reach the designated position with high position accuracy and the best path



3.1.1 TKB1400 robot body and motion diagram of each axis



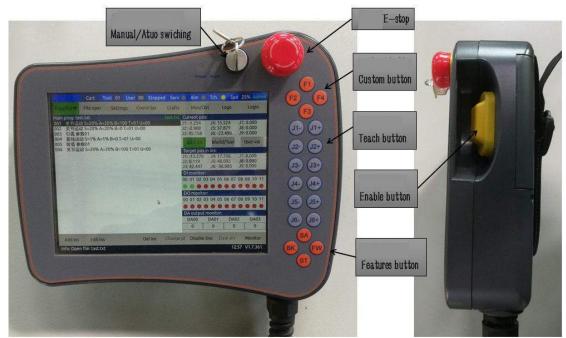
3.1.2 TKB1520 robot body and motion diagram of each axis

# **3.2 Teaching Pendant**

#### 3.2.1 Appearance of teaching pedant

The teaching device is a personal computer interaction device. Through it, the operator can operate the robot movement, complete the teaching programming, realize the system setting, fault diagnosis and so on. The front includes the emergency stop switch, touch screen display and touch buttons. The enable switch is on the right side of the teaching device, which is convenient for the operator to hold during operation





3.2.1 Appearance of teaching device

# 3.2.2 Key function description

Кеу	Definition
F1	Wire inspection (can check whether the wire feeder is
	feeding, can adjust the length of welding wire)
F2	Check the air (check whether there is protective air, whether
	the solenoid valve works, and adjust the wire feeding flow
	through the air supply solenoid valve)
F3	Wire withdrawal. (check whether the wire feeder is rewiring
	and adjust the length of welding wire)
F4	Remove anti-collision (when the anti-collision is turned on,
	the anti-collision alarm can be released when the welding gun
	touches the workpiece) 1-4. For details on how to define its
	functions, see the section "key settings" in the manual $_{\circ}$
J1-	The joint moves in the negative direction or in the negative
	direction of the x-axis
J1+	The joint moves in a positive direction or X-axis
J2-	Joint moves in two negative directions or in Y-axis negative
	direction
J2+	The joint moves in the two-way positive direction or in the
	y-axis positive direction
J3-	The joint moves in three negative directions or in z-axis
	negative direction
J3+	The joint moves in the three-way positive direction or the
	z-axis positive direction
J4-	The joint moves in four negative directions or RX negative
	directions



J4+	The joint moves in four directions or RX directions
J5-	Joint movement in five negative directions or in ry negative
	directions
J5+	The joint moves in five directions or ry directions
J6-	Joint movement in six negative directions or RZ negative
	directions
J6+	The joint moves in six directions or RZ directions
SA	Start button, automatic (playback) mode to start the
	program; Manual (Teaching) mode to start the single step
	operation
ВК	Return to zero button, press and hold the robot joint
	movement to zero position, release and stop the movement
ST	Stop button, automatic (reproduction) mode stop program
	execution
FW	Clear drive alarm button

#### 3.2.3Touch screen interface layout

The display adopts 8-inch 1024 \* 768 LCD, and the touch screen adopts resistance touch screen. The screen is divided into the following sections.

- The top line, from left to right, is: coordinate system selection during manual operation, tool coordinate selection, user coordinate selection; then the operation status, servo status, alarm status, teaching status and other information; the right side is manual operation speed selection.
- > The second line is the main menu, including eight main menu selections
- The middle right side is the joint real-time coordinate display value and command position value from top to bottom, and the lower half is the IO state real-time display
- > At the bottom is the operation key area under each menu
- The bottom is the real-time status and alarm information display column



ł		Joint	Tool	05	User	04	Stopped	Serv	۲	Alm	۲	Err		Spd	25%	Admin
Prog	/Run •	File oper		Setting	s	Coor	d Sys	Crafts		Moi	n/Ctrl		Logs		Lo	gin
Aain pr	og: posions	ync.txt							Posi	tion In	fo:					
001 M	loveJ S=109	% T=05 U=04							Curr	ent po	s:					
002 A	rc start, par	am 01						$\wedge$	J1:0	.000		J4: 0.000	D	J7:	0.000	
003 W	leave start,	param 01						1	J2:0			J5: 0.000			0.000	
04 S	et positione	r sync mode	Link w	ith J8					J3: 0	.000		J6: 0.000	0	19:	0.000	
005 M	loveC S=10	% T=05 U=04						~								
06 M	loveC S=10	% T=05 U=04						1	J1:0	et pos	in ins	J4: 0.000	•	17.	0.000	
007 M	loveC S=10	% T=05 U=04	1						J2:0			J4: 0.000			0.000	
008 M	loveC S=10	% T=05 U=04						~	J3: 0	.000		J6: 0.000	0	J9:	0.000	
09 S	et positione	r sync mode	Close					1			-	_				
10 W	leave end									loint va	il	World	l/Tool		User vi	at
011 A	rc end, para	m 01						0	WO	status:	-		_		-	-
12 M	loveJ S=109	% T=05 U=04						U								
									Inpu	it statu	s:					
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3.2.3 touch screen page layout

## 3.3 Control cabinet

#### 3.3.1 Appearance of control cabinet

The front panel of the robot control cabinet is equipped with power switch, emergency stop switch, door lock and power indicator light of the control cabinet. The teaching indicator is hung above the door of the control cabinet, and the side of the control cabinet is equipped with interconnection cable interface.



3.3.1 Control cabinet.



#### 3.3.2Introduction to button / indicator



3.3.2 Control cabinet button / indicator light

#### Power indicator

This light indicates that the industrial robot control cabinet is connected to 220V power supply.

Emergency stop

When the button is pressed, the power and electricity of servo drive and motor are immediately cut off. If the robot is moving, it will stop moving immediately, and there is no deceleration process when it stops; rotating or pulling the button can release the emergency stop. If the robot is running, please first press the teaching device pause button, do not directly turn off the power or press the emergency stop during the robot movement, so as to avoid impact damage to the machinery.

Power switch

Power on switch of industrial robot

External interface (side)

The control cabinet provides VGA and USB ports, or 485 or 232 interfaces as required by customers.



# **IV Teaching on startup**

## 4.1 Boot up

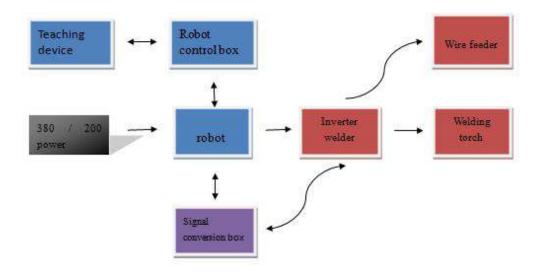
- > First, check whether the equipment starts normally, and check the gas, welding wire and welding gun
- Switch on the welding machine → turn on the robot control cabinet → turn on the power supply of other equipment.
- ➢ Robot teaching device display → enter the system → click "login and logout" → click "operator login" → input password "33333333" → click "confirm"
- Click "file operation" → select the program folder to be run → open → click the first line 001 of the command (if the program command before shutdown is still running after startup, this step is unnecessary)
- Turn the key to online mode and press the button "Sa" on the teaching pendant or the green button on the control cabinet
- If there is a button box, the button box can be operated. Pay attention to the start button corresponding to the station to be welded
- If the key is in (online mode) before shutdown and the workpiece to be welded remains unchanged, press the start button directly after startup

# 4.2 Manual teaching

Press the "enable button" with the right hand (half of the key range, the lower part of the display will display "enable on")  $\rightarrow$  select the operation mode (joint, right angle, tool)  $\rightarrow$  generally select "right angle"  $\rightarrow$  adjust the teaching speed (the upper right corner of the display, generally select 5%, fine-tuning select 1%)



Robot arc welding package consists of robot body, controller, teaching device, power transformer, welding power supply, wire feeder and welding gun.



# **VI Introduction of welding positioner**

Positioner is an important part of arc welding robot system. Its function is to translate or rotate the parts to the best welding position. Generally, the positioner is used to clamp and locate the workpiece through the fixture. The load capacity and movement mode of the positioner can be selected according to the characteristics of the workpiece to be welded.

Specific functions of positioner:

- Improve the accessibility of welds
- > It can make the weld in the best position of flat welding
- > Can improve welding or cutting speed
- > Two sets of workbenches can be used to improve efficiency
- > Protect the operator from radiation and splashing
- Reduce repetitive positioning of robot
- > Friendly human-machine interface



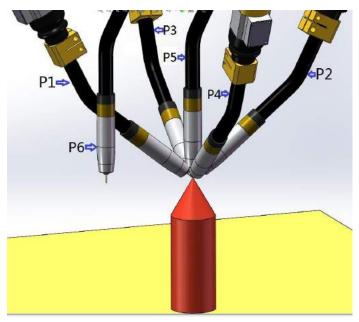
# **VII Robot coordinate system**

## 7.1Tool coordinate system

	Joint	Tool	05 L	lser 0	4 Sto	opped	Serv	<u> </u>	lm 🔘	Tch	0	Spd	25% Adr
Prog/Run	File oper	5	Settings	Co	ord Sys*		Crafts	,	Mon/Ctrl		Log	IS	Login
oord sys list	То	ol coord	l sys >> To	ol 01									
Tool coord sys		Curren	it tool parar	n:									
Tool 00		<b>x</b> :	449.13	5 mm	1	Y: [	-4.07	mm	<b>z</b> :		4.768	mm	
Tool 01				_				=				Ξ.	
Tool 02		RX :	3.085	deg	)	RY :	0.785	deg	RZ		0.039	deg	
Tool 03		Seres er an											
Tool 04			ated tool pa 0.500.0.00		000 0 000	0.000	0 000 0 0	00.0.000	0.000				
Tool 05		2: 900	0.500,0.00	0,1188.0	000,0.000	,0.000,	0.000,0.0	00,0.000,	0.000				
Tool 06		4: 757	7.195,302	665,107	2.672,-1.	331,1.1	80,1.349,	0.000,0.0	00,0.000				
Tool 07		6: 900	0.500,0.00	0,1188.0	000,0.000	,0.000,	0.000,0.0	00,0.000,	0.000				
Tool 08											Rec	Calc	
Tool 09													
Tool 10													
User coord sys													
External axis										-			-
Laser track										Save		0.5	Canc

7.1.1 Tool coordinates

For tool calibration, 6 different postures need to be taught based on the control point. According to these six data, the tool size is calculated automatically. After taking a point, click the corresponding "record point" button. Take points as follows:



7.1.2 Tool coordinate calibration

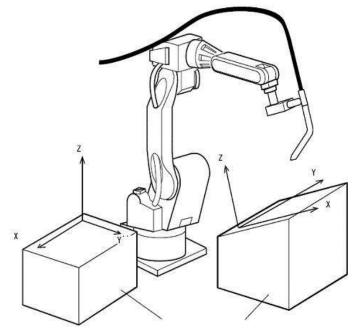
Note: as shown in the figure above, the attitude change of point 1-p4 should be as large as possible. In point

P5, the welding wire (the straight part at the end of the welding gun) must be kept in a straight line with the calibration rod. Point P6 is used to determine the X direction of the tool coordinate, that is, the line between point P5 and P6 is the X direction of the tool coordinate.

Note: for tool coordinate calibration, the fixed plane of the industrial robot should have the same levelness as the plane where the gun calibrator is placed!

### 7.2 Establish user coordinate system

The user coordinate system is established to facilitate the programming during teaching and programming. As shown in the figure below, several user coordinate systems need to be set for several tooling surfaces.



7.2.1 User coordinate calibration

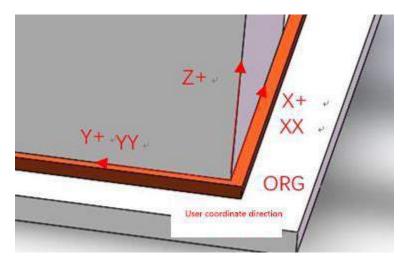
The steps for setting up the user coordinate system are as follows:

Set user coordinate system in user coordinate system setting interface of coordinate system (as shown below)



😣 🔵 🗊 🛛 Turin Robo	ot													
	Joint	Tool	05	User	02	Stopped	Serv	•	Alm 🔘	Err	۲	Spd	25%	Admin
Prog/Run	File oper		Setting	gs	Coord	d Sys*	Crafts		Mon/Ctrl		Log	IS	Le	ogin
Coord sys list	U	ser соог	d sys >:	> User (	)2	2							-	
Tool coord sys		Currer	nt user p	oaram: —										
User coord sys		<b>x</b> :	1090	0.148	mm	<b>Y</b> :	-210.666	mm	<b>Z</b> :	3	12.908	mm	n	
User 00						l	6							
User 01		Α:	(	D	deg	<b>B</b> :	0	deg	<b>C</b> :		0	deg	3	
User 02		Calad												
User 03		1:	lated use	er param:										
User 04		2: 3:												
User 05														
User 06														
User 07										R	ec	Calc		
User 08														
User 09														
User 10														
External axis														
Laser track										Save			Canc	
Info: User coordin	ate config sa	wed suc	cessful	lly								16	:00 V3.	2.20

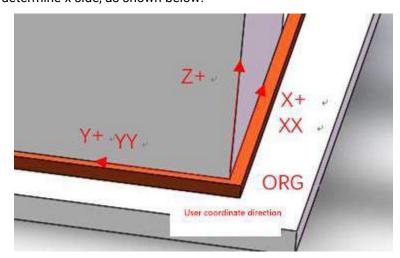
7.2.2 User coordinate calibration interface



7.2.3 User coordinate calibration diagram



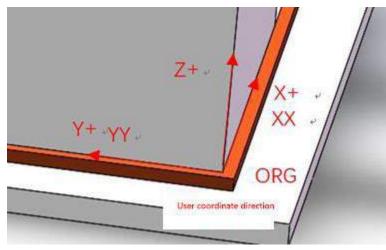
In the above interface, first set the origin of the user (workpiece) coordinate system, that is, the robot's non end point (with the welding wire on the welding gun) goes to the end of an angle of the workpiece. Then press "record point 1" to record the origin of user (workpiece) coordinate. Select "XX direction" to determine x side, as shown below.



7.2.4 User coordinate calibration diagram

In the interface above, set the X direction of the user (workpiece) coordinate system, that is, the robot's non tip point goes to the edge of one side of the workpiece. Then press "record point 2" to record the XX direction of user (workpiece) coordinate.

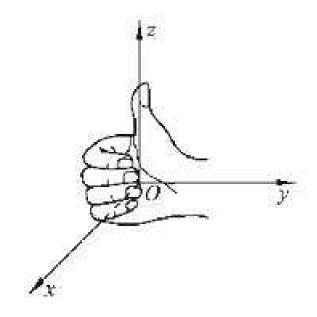
Select "YY direction" to determine y side, as shown below.

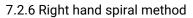


7.2.5 User coordinate calibration diagram

In the interface above, set the Y direction of the user (workpiece) coordinate system, that is, the robot's non tip point goes to the edge of the other side of the workpiece. Then press "record point 3" to record the YY direction of user (workpiece) coordinate.

After confirming the origin, XX direction and YY direction, press the "calculate" key in the figure above, the system will automatically complete the calculation of the user (workpiece) coordinate, and determine the coordinate system and direction on the workpiece, so as to facilitate the coordinate setting during stacking.





Note: the user's coordinate system is established by referring to the right hand spiral rule (as shown in the above figure). The positive direction of Z is in the thumb direction of X-Y rotation. When establishing the workpiece coordinate, the positive direction of Z is usually far away from the workpiece. Therefore, when establishing the workpiece coordinate, it is necessary to consider which user coordinate system is the edge of X and Y direction respectively, and then switch to the user system to verify whether it is the desired workpiece coordinate direction. After verification, press cancel to exit.



# VIII.Robot and welding machine configuration

The robot and welding machine can be controlled by analog communication and digital communication. The digital communication includes DeviceNet, can and other buses. The arc striking and arc stopping, wire inspection and gas detection of welding machine are controlled by robot control system. Welding system includes welding gun, wire feeder, positive and negative electrode ground wire, etc. Welding consumables such as welding wire and conductive nozzle shall be equipped separately.



# **IX.welding instructions**

## 9.1Condition of arc welding

- Arc welding conditions are defined in advance. The arc welding instruction in the procedure specifies the arc welding condition number, which shall be executed according to the arc welding condition number.
- Command value voltage

The voltage command value specifies the command value (V) of the welding voltage.

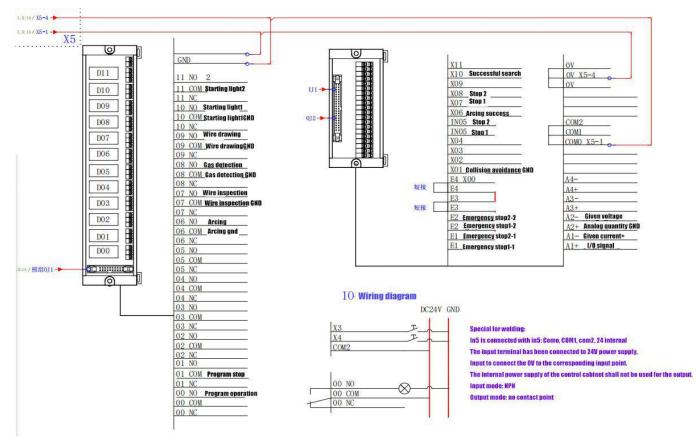
- > Command value current or command value welding (wire feeding) speed
- > Current command value specifies the command value (a) of welding current.
- > The wire feeding speed command value specifies the wire feeding speed (M / sec).

# 9.2 Switch input and output

In the I / O input / output screen, you can perform the following operations:

- > Confirm the status of welding input signal and welding output signal (on / off)
- Simulation input output and forced output of signal
- Welding I / O is carried out automatically when selecting the welding device. Generally, it is not necessary to change the type and number of welding input and output signals.
- The output signals of welding I / O include arc strike signal (I / O output 06), wire detection signal (I / O output 07), gas detection signal (I / O output 08), wire withdrawal signal (I / O output 09), etc. the input signals of I / O include arc strike success signal (I / O input 06), etc. If the switching signal of welding power supply needs to be active, it needs to be connected to the switching power supply of robot control cabinet (see the specification of welding power supply for the specific wiring definitio





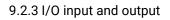
9.2.1 Welding machine and control cabinet wiring

		Joint	Tool	05	User	04	Stopped	Serv	۲	Alm 🌘	Err		Spd	25%	Admir
Pro	og/Run▼	File oper		Setting	s	Coor	d Sys	Crafts		Mon/C	trl	Log	s	Le	ogin
ain p	prog: 预约4.tx	t			_				Posi	tion Info:				-	
)1	Arc track star	t, param 01						_	Curr	ent pos:					
)2	Arc track star	t, param 01						1	J1:0.		J4: 0.	000	J	7:0.000	
)3	Arc track sam	pling, param	01 sta	rt cycle	0 end c	ycle 0		1	J2: 0.		J5: 0.			8: 0.000	
)4	Turnback star	t, foward dis	st Omm	backw	ard dist	0mm			J3: 0.	000	J6: 0.	000	J	9: 0.000	
)5	Walst search	end, save res	sult to r	egister	01			2	Tara	et pos in i					
06	Laser tracker	param set, L	aser vis	sion ON				$\sim$	larg	et pos in i	ns.				
07	Laser tracker	operation, c	thar 1 co	ode 1											
8	Laser track er	nd						$\wedge$							
										oint val	W	orld/Too	bl	User	val
								$\bigcirc$	1/0 s	tatus:					
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9.2.2 I / O input and output monitoring



Prog/Run	File oper	Settings Co	ord Sys		Crafts	Mon/Ctrl+	Logs	Login
Mon/Con list	Input/Output >	-> I/O control						
Input/Output	DI	Notes selection:	General		-	DO		
I/O control		Emergency stop status signal			Program runnin			
DA control	00	Anti collision switch signal	00	-	Program stop p			
Encoder				-	Program scop p	rompe		
Variables	02	Reproduction / automatic sign	02	-				
User config	03	Hand press down signal	03	-				
Background prog	04	Program start signal	04	-				
Welding status	05 🔴	Program stop signal	05	•				
Laser track	06 🥚	Arcing success signal	06	•	Start and stop a	rc switch		
Comm monitor	07 🔴		07	•				
contan monitor	08 🔴		08	•				
	09 🔴		09	•				
	10 🔴		10	•				
	11		11					



Motion		oint	Тоо	L 0!	5	User	02	Stopp	ed Ser	v 🔘	Alm	۲	Err		Spd	25%	Adn
Coord System	+	le oper		Set	ings		Coor	d Sys	Craft	s	Мо	n/Ctrl		Log	s	L	ogin
Point	•	txt							-	Pos	ition In	Fo:	-	_	_		_
Pallet	٠	ram 01 T=05 U=	:04						~	J1:	rent po 0. <mark>00</mark> 0	is:	J4: 0.(			7: 0.000	1
Input/Output		Digi	tal ou	tput							0.000 0.000		J5: 0.0 J6: 0.0			8: 0.000 9: 0.000	
Welding	۲	Wai	t for D	I					$\sim$	Tar	get pos	in ins	:				
Dispensing		IF DI	goto						~								
Screw lock	۲	Mar	k								Joint v	al	Wo	rld/Too	ol	User	val
Soldering	٠	Ana	log ou	tput			nplete	f.	0		status: ut statu						
Punch	•	Trig	ger du	ıring n	notio	n				•		•	•		•	• •	•
Vision	۲	Mov	e unti	ι					$\sim$	-	::				•	•••	:
Follow	٠	Load	d user	config	9		e leng	th: 0 byt	es 📎	DO	monito	or:					-
General	۲	Save	e user	config	1												-
Logical	۲	ce enter	s follo	w are	a, sav	e res	ult to V	10	$\geq$		•		•		•	••	•
Add ins*	I	dit ins		Ente	r sub		De	l ins	Update	pos	Disa	ble lin	e	Clear	err	M	onitor

9.2.4 I/O instruction



## 9.3Analog output

The number of analog input and output signals that can be used is two channels. DA1 corresponds to the welding current control of the welding power supply, DA2 corresponds to the welding voltage control of the welding power supply. It can be manually filled in the output of numerical detection analog quantity

	Joint	Tool	05	User	02	Stop	oped	Serv	۲	Alm	۲	Err		Spd	25%	Adm
Prog/Run	File oper	S	ettings		Coord	l Sys		Crafts		Mo	n/Ctrl∗		Log	IS	L	ogin
Mon/Con list	ļ	nput/Out	out >> [	DA cont	rol											
Input/Output		DA out	out													
I/O control																
DA control				DA0	•		DA	01			DA02			DA03		
Encoder			ſ	DAU	<b>.</b>								_	and the second	_	
Variables		C	n.	0			0				0			0		
User config		Tg	at [	0			0			ſ	0		ſ	0		
Background prog	l			-										-		
Welding status				Enab	le		Ena	DIE		E	nable			Enable		
Laser track																
Comm monitor																
				q	31	Anal	log ol	itnut								
N.							. e g e .									
			-	_				=								
				-				П					OV OV X	5-4		
•		12	Г	n		۰							OV			
	0	, 		i												_
		0	E	T									COM2	0		
													COM1	l		
		0	hime										COMO	Х5-1	1	
		0	Ľ				P									_
•			ŧ			۰							A8 A	4-		-
			Ē	- 8				11					A7 A	4+		
			f										A6 A A5 A			_
		<b>   *   </b>		0									A4 A	2- Give 2+ anal	n volta	10+
	TT	0		0										2+ 1- Gi		
	<u>u_u</u>	<u>u</u> u	<u>u</u>	للم										1+ IO		
0	0	0	0	0	C	<u> </u>									Do	
11																

9.3.2 Analog output wiring



## 9.4Welding process settings

Before the robot control system can control the welding machine, it needs to make corresponding settings according to the basic characteristics of the welding machine and the connection circuit between the welding machine and the control cabinet.

In the main menu, select **Craft** and then select **welding** to set welding process parameters. Any modification can take effect only after clicking save. Including: basic setting, arc striking (welding) and arc striking, arc swinging setting, voltage matching table and current matching table, etc.

Basic settings: including welding trial run and anti-collision detection.

Welding trial run: after the verification of track run, it is necessary to run the program automatically without arc striking to verify whether the actual speed of welding and arc swing are correct.

Pay special attention to the following items, otherwise life accident or equipment failure may occur:

1. Make sure there are no people around the robot before running the program.

2. Before running the program, make sure that there is no interference around the robot.

Anti collision detection: selective detection with anti-collision welding gun. If the welding gun collides and the anti-collision sensor acts, the system will give an alarm. The detection function can be cancelled and the alarm can be released. At this time, the robot can be operated. After the welding gun leaves the collision point, check the anti-collision detection, and the anti-collision detection function can be used continuously.

😸 🖨 🗇 TurinRobo	ot Joint	Tool	05	User	02	Stopped	Serv		Alm		Err		Spd	25%	Admin
Prog/Run	File oper		Setting	s	Coord	l Sys	Crafts*		Моп	/Ctrl		Log	s	Lo	ogin
Craft list	N	/elding :	>> Gene	ral											
Welding		Weldi	ng sim	1	ON	)									
General				2											
Arc start		Collisi	on det	(	OF	F									
Restart		Weldi	ng mach	ine ty		Analog	welding n	Ţ							
Arc end			-				-								
Re-arcstart		Voltag	e mode	of digi	tal welc	Unified		J							
Scratch start		Worki	ng mode	e of dia	ital	Consta	nt	Ţ							
Wire stick			-					J							
V mapping															
A mapping															
Weaving															
Spot welding															
Arc search															
Arc track											Save			Canc	
Pallet											Save			Canc	
Info: Admin logge	d in success	fully											16	:09 V3.	2.20

#### 9.4.1 Global settings

**Arc start:** it can set the arc striking time, arc striking current voltage, welding current voltage, arc striking current voltage and arc striking time. In the figure "parameter selection" (range 01-09), a number corresponds to a group of welding parameters.

Note:

a) arc start V and start C are used when it is difficult to strike an arc, and they are used for convenience.

b)**Voltage and Current** are the values set during normal welding, which are based on the field work Art settings.

c)**Arc start time:** set the holding time of arc striking voltage and current. After receiving the arc striking signal, the welding power supply feeds back the successful arc striking signal. If the arc striking has not been carried out beyond this time, an alarm of arc striking failure will appear.

	Joint	Tool 05	User 02	Stopped	Serv 🌑	Alm	Err	Sp(	d 25% Adm
Prog/Run	File oper	Setting	s Coo	ord Sys	Crafts*	Mon/	Ctrl	Logs	Login
Fraft list	Pal	llet >> Pallet s	etting						
Welding		<u></u>		-					
Pallet		Config Nc		J					
Pallet setting		Row n:	1	Col n:	-		Layer n:	1	
Dispensing		KOW II.		Corn.			Layer II.		
Screw locking		Origin poi	nt coord:						
Punch		<b>X</b> :	0) 1	1: 0	<b>z</b> :	0	וו	Use cu	ir pos
Soldering		Coord of		w 1/last colun			2		
Visual		_							
Remote/Reserv		<b>X</b> : [	0	/:[0	Z : [	0		Use cu	ir pos
		Coord of p	ot layer 1/co	lumn 1/last ro	w:				
		<b>X</b> :	0	/: 0	<b>z</b> :	0		Use cu	ir pos
		Coord of p	ot row 1/colu	ımn 1/last lay	er:				
		<b>x</b> :	0	(: 0	z: [	0		Use cu	ir pos
							-		
							Save		Canc

#### 9.4.2 Arcing setting

**Restart:** in the welding process, arc striking can be performed again in case of arc breaking. Nine sets of parameters (01-09) can be set, and notes can be given, with selection mode, restart times, overlapping times of welding gun, speed of returning to arc breaking point, voltage and current moving to arc striking point, and whether to use re arc striking and scraping arc striking can be selected.



	Joint	Tool	05	User	02	Stop	ped	Serv		Alm		Err	۲	Spd	25%	Admi
Prog/Run	File oper		Setting	s	Coord	d Sys	C	afts•		Mon	/Ctrl		Log	s	L	ogin
raft list	Ĩ	/elding >	> Resta	rt												
Welding		Param	No.	6	02 •											
General		Notes		ĺ	<u></u>	J										
Arc start		Notes		l												
Restart		Restar	t mode		Restart	automa	tic: •									
Arc end		Restar	t times	ſ	3	t	imes									
Re-arcstart		Overla	n dist	ſ	0	,	nm		Retre	at spee	d		10	mm	n/s	
Scratch start					A.8	$\equiv$						_		$\exists$		
Wire stick		Move t	o Start	V (	0	<u> </u>	1		Move	to star	tC		0	A		
V mapping		Re-Arc	start		ON	)			Re-Ar	c paran	n	01	·			
A mapping		Scratch	h start	(	OF	FF			Scrato	h start	paran	r 01	-			
Weaving																
Spot welding																
Arc search																
Arc track												Caur		1	C	
Pallet												Save			Canc	

#### 9.4.3 Restart settings

**Arc end:** at the end of welding, adjust the arc stopping parameters, which are generally used for workpieces with high weld quality requirements, and will also affect the next arc striking. Generally, the arc stopping current and voltage will be smaller than the value at the time of welding. Nine sets of parameters (01-09) can be set and comments can be given. The arc stopping time is set as the holding time of arc stopping voltage and current. If the value is too small, there will be weld crater at the end of the weld. The reflow time affects the remaining length of welding wire at the end of welding. The longer the time is, the shorter the remaining welding wire is. In addition, the reflow voltage and current can be set. In order to avoid wire sticking, it is optional to enable wire sticking detection.



					12.11	1.0		. 11				105		Uran
Prog/Run	File oper		Setting	s	Coord	1 Sys	Crafts		Mon/Ct	rl	Lo	gs	L	ogin
Craft list	W	elding >	>> Arc sl	art		-1								
Welding		Param	No.		01 -	·								
General		Notes		ſ										
Arc start		Arclos	s detec	• (	2	s		Shool	t thickness	6	.6			
Restart		AICIOS	s detec	• (	2	*		Shee	L CHICKHESS		.0			
Arc end		Gas pro	eflow ti	me	2	s		Arc sl	tart durati	on	2	s		
Re-arcstart		Arc sta	art V	(	30	v		Arc sl	tart C		140	A		
Scratch start		Runnin	ng rise u	P	0.9	s		Arc d	etect time	ſ	0.6	s		
Wire stick		Voltag		ſ	33			Curre	t	ſ	120			
V mapping		voltag	e					curre	inc.		120	_^		
A mapping		Weldin	ng speed	1	10	m	m/s	Sim s	peed	L	1000	mn	n/s	
Weaving		Re-Arc	start		ON			Re-A	rc param	0	1 -			
Spot welding		Scratch	h start		OF	F		Scrat	ch start pa	ran 0	1 -			
Arc search		Restar			OF			Dech	urb a server	6				
Arc track		Rescar						Resta	art param	0	<u>'</u>			
Pallet										Sav	/e		Canc	

#### 9.4.4 Setting of arcing parameters

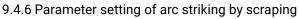
**Scratch start:** if the arc striking fails at the beginning of welding, it will return to the starting point for re arc striking. Nine groups of parameters (01-09) can be set and comments can be given. The number of restart times can be set. If the welding wire is too long, the return time can be set. If the arc striking point cannot meet the arc striking conditions, the welding gun can be moved forward for a certain distance.

	Joint	Tool	05	User	02	Stopped	Serv	۲	Alm	۲	Err	۲	Spd	25%	Admi
Prog/Run	File oper		Setting	IS	Coor	d Sys	Crafts		Mor	n/Ctrl		Log	ļs	U	ogin
Craft list	Ņ	/elding >	> Re-ai	rcstart											
Welding		Param	No.	0	01	J									
General		Notes				_									ר
Arc start		Notes													J
Restart		Re-arc:	start tii	mes	3	time	es								
Arc end		Wire b	ack tim	e	0.2	2 s									
Re-arcstart		Total b	ack dis	t [	20	mm		Mov	e speed		$\left[ \right]$	10	mn	n/s	
Scratch start		Back V		ſ	25	v		Back				70	۲,		
Wire stick		Back V		L	35	V		Back				70	A		
V mapping															
A mapping															
Weaving															
Spot welding															
Arc search															
Arc track										1	Save			Canc	
Pallet															

#### 9.4.5 Setting of re striking parameters

**Scratch start:** with the use of restart arc striking, when the welding wire scraps the workpiece, the probability of arc striking is increased. Nine sets of parameters (01-09) can be set and comments can be given. The moving distance, moving speed, arcing voltage and current can be given.

	Joint	Tool	05	User	02	Stopped	Serv	/ ())	Alm		Err	۲	Spd	25%	Adn
Prog/Run	File oper		Setting	js	Coor	d Sys	Crafts	1	Mon	/Ctrl		Log	ļs	L	ogin
Craft list	Ĩ	/elding >	>> Scral	tch start											
Welding		Param	No.	[	01	•									
General		Notes				J									ר
Arc start		Notes									_		_		J
Restart		Distan	ice	l	0	mm		Move	speed			0	mm	n/s	
Arc end		Arc sta	art V	ſ	0	v		Arc st	art C			0	A		
Re-arcstart				C											
Scratch start															
Wire stick															
V mapping															
A mapping															
Weaving															
Spot welding															
Arc search															
Arc track											Save		1	Canc	
Pallet											Jave			conc	
fo: Punch templa	te online c	ommuni	cation	onnecto	ad succ	essfully						_	16	:07 V3	2 20



**Wire stick:** during welding and arc stopping, the welding wire may stick to the weld. It is necessary to burn off the welding wire, that is to remove the wire sticking. Nine sets of parameters (01-09) can be set and comments can be given. It can set the detection time of wire sticking, whether to enable wire sticking or not, the number of times to remove, the voltage and current at each time to remove, and the number of times to remove.

	Joint	Tool	05	User	02	Stopped	Serv	0	Alm		Err		Spd	25%	Admin
Prog/Run	File oper		Setting	IS	Coor	d Sys	Crafts		Mor	/Ctrl		Log	s	L	ogin
Craft list	W	elding >	> Wire	stick											
Welding General		Param	No.		01	•									
Arc start		Notes													
Restart		Wire st	ick det	time	0	s									
Arc end		Remov	e wire	stick (	0	FF									
Re-arcstart		Proces	s times	. [	0	time	s								
Scratch start		Proces	- V	ſ	0			Proce				0	A		
Wire stick		FIOCES	5 V	Ļ	V			FIUC	ess C			v	_^		
V mapping		Proces	s time	l	0	s									
A mapping															
Weaving															
Spot welding															
Arc search															
Arc track											Save			Canc	
Pallet											5070			conc	
Info: Punch templat	e online co	mmunic	ation c	onnecte	ed succ	essfully							16	:08 V3	2.20

#### 9.4.7 Wire sticking parameter setting

A and V mapping table:matching table of welding machine voltage and current: that is, the two analog voltages (0-10V) output by the controller are matched with the voltage and current displayed on the welding machine, so that the voltage value required by the controller can be calculated according to the operating voltage and current of the welding machine during welding. Click effective to make the controller output the corresponding voltage value. At this time, fill in the voltage or current value displayed on the welding machine, and click save after inputting all 20 gears.

	Joint	Tool	05	User	02	Stopped	Serv 🌑	Alm (	Err	Spd Spd	25% Ac
Prog/Run	File oper	5	Setting	js	Coord	l Sys	Crafts▼	Mon/C	Ctrl	Logs	Login
raft list	Ţw	/elding >>	> V ma	pping							
Welding		No.	C	Output	Ор	er Mac	hine	No.	Output	Oper	Machine
General		V 01		0.5	En	ıb 0.	.4	V 11	5.5	Enb	5.8
Arc start		V 02		1	En	ib 0	.9	V 12	6	Enb	5.8
Restart		V 03		1.5	En	ıb 1	.4	V 13	6.5	Enb	<mark>6.3</mark>
Arc end Re-arcstart		V 04		2	En	ıb 1	.9	V 14	7	Enb	<u>6.8</u>
Scratch start		V 05		2.5	En	ıb 2	.4	V 15	7.5	Enb	7.3
Wire stick		V 06		3	En	ıb 2	.9	V 16	8	Enb	7.8
V mapping		V 07		3.5	En	ib 3	.3	V 17	8.5	Enb	8.2
A mapping Weaving		V 08		4	En	ıb <u>3</u>	.8	V 18	9	Enb	8.7
Spot welding		V 09		4.5	En	ıb 4	.3	V 19	9.5	Enb	9.2
Arc search		V 10		5	En	ıb 4	.8	V 20	10	Enb	9.6
Arc track			L					L			
Pallet									Save		Canc

#### 9.4.8 Voltage matching table

Prog/Run	File oper	S	ettings	Coord Sys	Crafts▼	Mon/	Ctrl	Logs	Login
aft list	W	elding >>	V mapping						
Welding		No.	Output	Oper	Machine	No.	Output	Oper	Machine
General		V 01	0.5	Enb	0.4	V 11	5.5	Enb	5.8
Arc start		V 02	1	Enb	0.9	V 12	6	Enb	5.8
Restart		V 03	1.5	Enb	1.4	V 13	6.5	Enb	6.3
Arc end Re-arcstart		V 04	2	Enb	1.9	V 14	7	Enb	6.8
Scratch start		V 05	2.5	Enb	2.4	V 15	7.5	Enb	7.3
Wire stick		V 06	3	Enb	2.9	V 16	8	Enb	7.8
V mapping		V 07	3.5	Enb	3.3	V 17	8.5	Enb	8.2
A mapping Weaving		V 08	4	Enb	3.8	V 18	9	Enb	8.7
Spot welding		V 09	4.5	Enb	4.3	V 19	9.5	Enb	9.2
Arc search		V 10	5	Enb	4.8	V 20	10	Enb	9.6
Arc track			<u> </u>						
Pallet							Save		Canc

#### 9.4.9 Ammeter

**Weaving:** during the welding process, the robot can swing the welding gun, realize special welding process requirements, and optimize the weld forming, as shown in the following figure:

	Joint	Tool	05	User	02	Stopped	Serv 🔘	Alm (	Err	🔴 Sp	d 25% Adm
Prog/Run	F <mark>ile ope</mark> r		Setting	js	Coor	d Sys	Crafts	Mon/C	Strl	Logs	Login
Craft list	W	elding >	> Wea	ving							
Welding		No.		01	-						
General		N		Ē							
Arc start		Notes									
Restart		Metho	d	Sin	usoid	<u> </u>					
Arc end		Freq		2		HZ					
Re-arcstart		Amp1		3		mm					
Scratch start											
Wire stick		Amp2		3		mm					
V mapping		Left dy	well	0		s					
A mapping		Middle	dwell	0		s					
Weaving		Right o	dwell	o		s					
Spot welding											
Arc search											
Arc track									Save		Canc
Pallet											
nfo: Punch template	online.co	mmuni	ation	onnecte	d succ	essfully	_	_	_		16:10 V3.2.20

#### 9.4.10 Arc setting

Enter the values of "swing mode", "swing frequency", "swing amplitude", "left dwell time" and "right dwell time" in the "swing arc setting" column, and press save to exit.

- Method: used to set the swing mode, such as "sine swing".
- > **Freq:** set the number of swings per second.
- Swing amplitude: set the single swing distance.
- > **Left dwell:** set the dwell time when swinging to the left vertex
- **Right dwell**: set the dwell time when swinging to the right vertex

Note: after the swing parameter is set, it is stored in the form of document number. When it is used, it is good to call the corresponding parameter number. Multiple groups of welding swing parameters can be used in a program.

**Spot welding:** spot welding in straight line or curve motion. Nine sets of parameters (01-09) can be set and comments can be given. Arc striking conditions use arc striking parameters, arc striking conditions use arc striking parameters, set dwell time, forward movement specific and movingspeed.

	Joint	Tool	05	User	02	Stopped	Serv	۲	Alm	۲	Err	۲	Spd	25%	Admir
Prog/Run	File oper		Setting	s	Coor	d Sys	Crafts		Мог	/Ctrl		Log	IS	L	ogin
Craft list	W	/elding >	>> Spot	welding	)	4								-	
Welding		Spot p	aram		06	7									
General				ſ		J									ר
Arc start		Notes													
Restart		Arc sta	art para	m	06	J									
Arc end		Arc en	d paran	n (	01	7									
Re-arcstart		Dwell	time	ſ	0.5	s									
Scratch start					1.000						_				
Wire stick		Distan	ce	l	4	mm		Move	e speed			80	m	m/s	
V mapping															
A mapping															
Weaving															
Spot welding															
Arc search															
Arc track										1	Save			Canc	
Pallet											Save			Canc	
info: Punch templai	te online co	ommuni	cation c	onnecto	ed succ	essfully							1(	5:10 V3.	2 20

#### 9.4.11 Spot welding settings

Arc search: robot and welding machine with position finding signal realize position finding detection, which can correct the deviation of welding track caused by workpiece weld. Nine sets of parameters (01-09) can be set and comments can be given. In the position seeking mode, the system energizes the nozzle or welding wire with low voltage, and the workpiece is grounded. In the process of robot moving along the searching track, once the nozzle or welding wire contacts with the workpiece, it will generate a contact signal, and the robot stops moving. The deviation between the current position and the program set position is used to correct the path, so as to get the real target position. There must be no rust, oxide layer, paint or other insulating coating on the surface of the workpiece. Before positioning, the gun must be cleaned and the wire must be cut. When using the water-cooled welding gun, distilled water or other non-conductive coolant is recommended. Impure water (such as salty mineral water) will reduce the sensitivity of location finding or the voltage of location finding.

	Joint	Tool	05	User	02	Stopped	Serv		Alm	۲	Err	۲	Spd	25%	Admir
Prog/Run	File oper		Setting	IS	Coor	d Sys	Crafts		Mon	/Ctrl		Log	IS	L	ogin
raft list	Ŵ	/elding >	»> Агс s	earch											
Welding		Search	param		01	•									
General		Notes													ר
Arc start		Notes		l											J
Restart		Search	refere	nce	ON	)									
Arc end		Search	mode	ſ	1 dimer	nsion -	·								
Re-arcstart		Rot dir	r.		Z	,									
Scratch start						L L									
Wire stick		User co	oord		01	<u> </u>							_		
V mapping		Max se	earch di	st	100	) mm	8 8	Search	speed			1	mm/	s	
A mapping		Auto r	eturn		ON	)									
Weaving		Мах ге	eturn di	st	100	) mm	0 0	Return	speed			1	mm/	s	
Spot welding				l								M	ر		
Arc search															
Arc track											Save			Canc	
											Jave			Canc	

9.4.12 Location setting



# X. Program instruction

## **10.1Welding procedure instruction**

Arc command is a command to indicate to robot when and how to conduct arc welding. The arc welding is carried out during the execution of the action command shown between the arc welding start command and the arc welding end command.

Arc striking: multiple arc striking methods can be selected for welding arc striking, as shown in the following figure, which is set as "arc striking parameter 1".

The arc striking command can be used in combination with the arc striking command by setting the parameters of the arc striking and the parameters of the arc striking through the program setting interface to the "welding process".

		Joint	Tool	05	User	02	Stopped	Serv	۲	Alm	۲	Err		Spd	25%	Admin
P	rog/Run∗	File oper		Setting	s	Coor	d Sys	Crafts		Mor	n/Ctrl		Lo	gs	L	ogin
Main	prog: posionsy	ync.txt						S. Maranananananan	Posi	tion In	fo:					
001	Set screw loc	k param 01							Curr	ent po	s:					
002	Screw lock m	ove T=05 U=	04						J1: 0			J4: 0.0		j,	7: 0.000	
003	Set soldering	param 01							J2:0 J3:0			J5: 0.0			18: 0.000 19: 0.000	
004	Soldering mo	ve point T=C	05 U=04					~	33:0	.000		JO: 0.0	000	2	19: 0.000	
005	Soldering mo	and the second se						$\sim$	Tara	et pos	in inc					
006	Spot welding	New ArcSI	tart					$\sim$	Tary	er pos						
007	MoveJ S=10															
008	Arc start, par							$\wedge$								
009	Weave start,	A	rc Start	P	oaram	01	-		-		-				-	
010	Set positione			<u></u>					1	oint va	it i	Wo	rld/To	ol	User	val
011	MoveC S=10							0	1/0	tatus:	_					
012	Punch auxilia			ſ				Q		t statu						
013	Punch auxilia				New	Ca	anc		mpu		s.	-				
014	Visual open,			L				51	•			•			••	••
015	Visual close,							$\sim$	•	• •		•			••	
016	Visual trigger			ness-stores (m								-				
017	Visual recv po		Sile and					$\sim$	-	nonito		-			•••	
018	Receive visua	Part of the second	n 01, sa	ve to SO	), receiv	e leng	th: 0 bytes	V	001	nomico			_			
019	Follow init, p								•			•			••	• •
020	Set follow po		6.11			<b>1.</b> 2. 0. 1		$\sim$ 2	•			•				
021	Check if work	· Provide the distribution of	s follow	area, sa	ave resi	ult to V	0	$\sim$				-				
022	Start follow s	ync								•••						
	Add ins	Edit ins	1	Enter su	ıb	Del	ins	Update po	os	Disat	ole line	e	Clear	rerr	Mo	nitor
Info	: Punch templa	ate online co	mmunia	ration c	onnect	ed succ	essfully							_1	6:13 V3.	2 20

10.1.1 Arcing instruction

Arc stop: select this command to stop the welding machine.



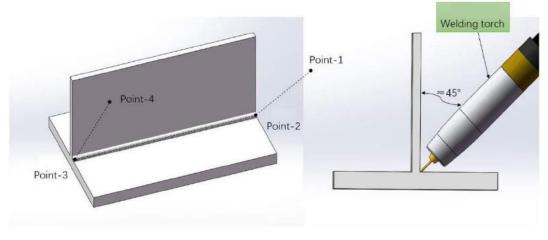
		Joint	Tool	05	User	04	Stopped	Serv		Alm	Err	۲	Spd	25%	Admin
Pr	og/Run∗	File oper		Setting	s	Coor	d Sys	Crafts		Mon/Cl	rl	Log	IS	Lo	ogin
ain	prog: 预约4.tx	t							Positi	on Info:					
01	Arc track star	rt, param 01							Curre	nt pos:					
02	Arc track star	rt, param 01						~	J1: 0.0	000	J4: 0.	000	J	7:0.000	
03	Arc track sam	pling, param	01 star	t cycle	0 end c	ycle 0		/ /	J2: 0.0		J5: 0.			3: 0.000	
04	Turnback sta	rt, foward dis	t Omm,	backw	ard dist	0mm		~	J3: 0.0	00	J6: 0.	000	1:	9: 0.000	
05	Walst search			egister	01			$\sim$	Taraa	t pos in i	DC'				
06	Laser tracker	New ArcEn	ıd					$\sim$	large	c pos in i	113.				
07	Laser tracker														
	Laser track e							$\sim$							
09	关节运动 S=1	Ar	rc end	ŗ	baram	01	-	1	-						_
10	关节运动 S=1							-	Jo	int val	W	orld/Too	ol	User	val
11	关节运动 S=1							$(\bigcirc)$	I/O st	atus:					
				ſ				S	1	status:					
					New	Ca	inc								
						_		$\sim$							
	8								•						
								5 1	•			• •			• •
								$\sim$	DO m	onitor:					
								$\sim$					H H	中ッ°,	简徽:
								$\sim$							
								-	•			• •	•		• •
ų	Add ins	Edit ins	-	Enter su	ıb	Del	inc I	Jpdate po	2	Disable I		Clear	10.00		nitor

10.1.2 Arc suppression instruction

Welding instruction definition:

- Arc starting point: the movement instruction in front of the arc starting instruction is the arc starting point (point-1)
- Arc starting safety point: the command in front of the arc starting point is the arc starting safety point (point-2)
- > Arc stopping point: the movement command before arc stopping is arc stopping point (point-3)
- Arc stopping safety point: the command after the arc stopping instruction is the arc stopping safety point (point-4)

Welding example: angle welding is the most common welding method, with high requirements for the angle of welding gun, as picture:



10.1.3 Fillet weld

# 10.2Welding speed command

The welding speed command can set the welding speed in the welding conditions. Welding voltage, current and speed can be managed together as welding conditions. The robot can operate according to the specified welding speed, which should be set according to its weld forming. As shown in the figure below, in the online mode, when the overall operation is at 100%, the speed 1 is 1% of 1000mm / s, which is 10 mm/s.



10.2.1 Linear speed command

Follow these rules:

- > Joint motion or linear motion is used in the command to move to the start of arc welding.
- In the movement towards the end of welding, joint movement mode cannot be used.
- > Adjust the direction of welding gun to an appropriate angle when facing the welding workpiece.
- > Use appropriate welding conditions.

## 10.3Motion command mode

The motion command is the trajectory of the robot between the execution teaching points. Robots generally support three types of motion: joint motion, linear motion, arc motion, etc. The robot welding can be realized by adding the command of arc striking and arc striking to the corresponding position. Generally, robots can realize straight line welding, arc welding, full circle welding and single point welding. Other auxiliary functions are arc welding.



Shortcut	2	art	Тоо	L 09	)	User	00	Stopped	Serv		Alm		Tch	0	Spd	10%	Admi
Motion	•	Joi	nt		•		Coor	d Sys	Crafts		Mor	n/Ctrl		Logs	5	Ŀ	ogin
Coord System	•	Syn	nchroni	zation						Posit	ion Inl	fo:			_	-	
Point		Lin	ear		•				~	Curre	ent po 184		J4: 5.0	84	7ل	2: 0.000	
Pallet	•	Cir	cle		•	21			$\sim$	J2: -3 J3: 24	8.228 4.006		J5: 0.0 J6: -49			3: 0.000 9: 0.000	
Input/Output	•	Ful	l Circle		•				$\wedge$	Targ	et pos	in ins:					
Welding	•	Del	lta						~								
Dispensing	•						5		~ `	- 1	oint va	l.	Wo	rld/Too	ι	User	val
Screw lock	•								$\bigcirc$	( Accessed	tatus:						_
Soldering	•									Inpu	t statu	s:	•		•		• •
Vision	•								$\sim$	•		•	•		•		• •
Follow	•								$\leq$	DOn	<b>nonito</b>	0 <b>•</b>	•	••	•	••	•••
General	•								$\sim$	•	•	•	•		•		•
Logical	•								$\leq$								
Add ins*	Ec	dit ins		Ente	r sut		Del	ins	Jpdate po	5	Disab	le line		Clear	err	Mo	nitor

10.3.1 Motion command

Motion	N.												
Motion	oint	Тос	ol 05	User	02	Stopped	Serv		Alm 💿	Err	🔴 Sp	od 25%	A
Coord System	le op	ег	Settin	gs	Coor	d Sys	Crafts		Mon/Ctr	i	Logs		.ogir
Point	• txt	Ť						Posil	tion Info:			-	
Pallet	aram							the second	ent pos:				
Input/Output	ram T=05 am 0	U=04						J1: 0. J2: 0. J3: 0.	000	J4: 0.00 J5: 0.00 J6: 0.00	0	J7: 0.000 J8: 0.000 J9: 0.000	
Welding	•	General v	velding	•			$\sim$	Targ	et pos in ins	5:			
Dispensing	• •	Weaving											
Screw lock	+ <u>s</u>	opot weld	ling	•				J	oint val	Wor	d/Tool	User	val
Soldering	•	ſ <mark>urnbac</mark> k	move	•			$\bigcirc$	0.2	tatus:				
Punch	+ 9	earch		+ <sup>x</sup>	omplete			Inpu	t status:				•
Vision	• /	Arc track		ł			$\vee$	•	•••			•••	•
Follow	• 1	aser trad	k weldir	ng ≯			$\leq$	DOn	nonitor:				-
General	ta, pa n 01	aram 01,	save to S	50, recei	ve leng	th: 0 bytes			•••				
Logical	>0 ce en	ters follo	ow area,	save res	sult to V	0	$\leq$	•			•		•
Add ins*	Edit i	ns	Enters	sub	Del	ins	Update po	os	Disable lin	ne	Clear err	м	onit

#### 10.3.2 Welding instruction

Straight line welding instruction: the diagram shows the programming of single straight line welding

instruction. When it is necessary to weld multiple continuous straight lines, the starting point of the second straight line is the ending point of the first straight line. The second straight-line motion needs to be smoothed.

			Joint	Tool	01	User	00	Stopped	Serv	0	Alm	۲	Tch	0	Spd	25%	Admi
Prog/Run♥	File oper	Settings		Coord Sy	s		Crafts		Mon/	Ctrl			Logs			Logi	n
lain prog: Example of li	near i					-				Pos	ition In	fa:					
001 Mark 0					_				-	Curi	rent po	s:					- 49
002 MoveL S=10% T=0	21										.642 33.236 .000		J4: 0.0 J5: 0.0 J6: -1	000	JS	1: 0.000 1: 0.000 1: 0.000	
									$\wedge$	Targ	jet pos	in ins:					
										J1: 3 J2: -: J3: 0	33.236		J4: 0.0 J5: 0.0 J6: -1	000	JS	: 0.000 : 0.000 : 0.000	
									-		Joint va	i.	Wo	rld/Too	st	User	val

10.3.3 Linear welding motion command

Arc welding command: the starting point of arc is the arc striking point (line or joint command), the middle point of arc (also known as arc auxiliary point) is the first arc motion command after the arc striking command, and the ending point of arc is the second arc motion. When it is necessary to weld multiple continuous arcs, the end point of the first arc is the starting point of the second arc.

				Cart	Tool	01	User	00	Stopped	Serv	0.1	Alm 🥥	Tch 📀	Spd	25%	Adm
	Prog/Run*	File oper	Settings		Coord Sy	s		Crafts		Mon/0	tri		Logs		Login	
ain	prog: yuan.txt	N.									Positio	n Info:				
)1	MoveJ S=30% B=100	T=01									Curren	t pos:				
2	MoveJ S=30% T=01									~	J1: 0.00	0	J4: 0.000		7:0.000	
13	Arc start, param 01									~ `	J2: 0.00 J3: 0.00		J5: 0.000 J6: 0.000		8:0.000 9:0.000	
4	MoveC S=1% T=01										33: 0.00	U	36: 0.000		9: 0.000	
)5	MoveC S=1% T=01							Acres 4112-4		1	Tarnet	pos in ins				
	Arc end, param 01									1	J1: 0.00		J4: 0.000		7:0.000	
7	MoveJ S=30% T=01										J2: 0.00	0	J5: 0.000	1	8:0.000	
										$\wedge$	J3: 0.00	0	J6: 0.000	1	9:0.000	
											Join	nt val	World/T	ool	User va	at
										$\bigcirc$	I/O stal	tus:				
										$\bigcirc$	Input s	tatus:				
																٥
										$\sim$						2
																-
										11	••				•••	•
										S.	DO mo	nitor:				
										~						
										2.2						5
										$\leq$						
	Add ins	Edit ins	Enter sub		Del ins		U	pdate po	s	Disable	line		Clear err		Monito	c
	: Open file: yuan.txt			-		_	-					-			7:19 V3.2.	20

#### 10.3.4 Arc welding motion command

Circular welding instruction: the welding circle can be regarded as welding multi-section arc, at least two sections arc. Take a circle divided into two arcs as an example: the starting point of the circle is the starting point of the arc, the middle point of the first arc (also known as the auxiliary point of the circle) is the first arc movement instruction after the arc striking instruction, the ending point of the arc is the second arc movement, the starting point of the second arc is the ending point of the first arc, the middle point of the arc is the third arc movement instruction, and the ending point of the circle is the fourth arc movement instructions.



				Cart	Tool	01	User	00	Stopped	Serv	$\bigcirc$	Alm	🔵 Tch	0	Spd	25%	Adm
	Prog/Run*	File oper	Settings		Coord Sy	s		Crafts		Mon/	Ctrl		Log			Logir	•
ain	prog: yuan.txt	-									Posit	ion Info	:				
01	MoveJ S=30% B=100	T=01									Curre	nt pos:					
02	MoveJ S=30% T=01										J1: 0.0		J4: 0			7:0.000	
3	Arc start, param 01										J2: 0.0 J3: 0.0		J5: 0 J6: 0			3: 0.000 9: 0.000	
04	MoveC S=1% T=01										33: 0.0	000	10:0	000	- 33	. 0.000	
05	MoveC S=1% T=01							or second second		100	Tarne	t pos ir	ins				
06	Arc end, param 01									1	J1: 0.0		J4: 0	000	17	: 0.000	
07	MoveJ S=30% T=01										J2: 0.0	000	J5: 0	000	JE	3: 0.000	
										$\wedge$	J3: 0.0	000	J6: 0	000	19	0.000	
											Je	int val	W	orld/Too	ol	User v	al
										$\bigcirc$	1/0 st	atus:					
										$\smile$	Input	status:					
										$\sim$	-						-
																	-
										12	•		••	••	•		•
										S	DO m	onitor:					
										~							
										$\leq$							•
	Add ins	Edit ins	Enter sub		Del ins		U	pdate po	5	Disable	line		Clear	err		Monito	or
fo	: Open file: yuan.txt											-			17	:19 V3.2	2.20

#### 10.3.4 Arc welding motion command

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			Cart Tool 01	User 00 Stopp	ed Serv 😑 Alm	Tch O	Spd 25% Adi
Prog/Run*	File oper	Settings	Coord Sys	Crafts	Mon/Ctrl	Logs	Login
in prog: yuan.txt		8	-	9 <sup>-</sup>	Position Info	0:	
1 MoveJ S=30% B=10	00 T=01				Current pos	:	
2 MoveJ S=30% T=01					J1: 0.000	J4: 0.000	J7: 0.000
3 Arc start, param 01					J2: 0.000 J3: 0.000	J5: 0.000 J6: 0.000	J8: 0.000 J9: 0.000
4 MoveC S=1% B=100	0 T=01				33: 0.000	30: 0.000	39: 0.000
5 MoveC S=1% B=100	0 T=01				Target pos i	n ine:	
6 MoveC S=1% T=01					J1: 0.000	J4: 0.000	J7: 0.000
7 MoveC S=1% T=01					J2: 0.000	J5: 0.000	J8: 0.000
8 Arc end, param 01					J3: 0.000	J6: 0.000	J9: 0.000
MoveJ S=30% T=01						-	
					Joint val	World/Tool	User val
					I/O status:	+	
					Input status		
					DO monitor		
Add ins	Edit ins	Enter sub	Del ins	Update pos	Disable line	Clear err	Monitor
fo: Open file: yuan.txt							17:20 V3.2.20

#### 10.3.5 Circular welding motion command

Arc swing welding instruction: there are start and end of arc swing in arc swing welding. The start of arc swing is added after the command of arc striking, and the parameters of arc swing can be selected. In the corresponding process, the setting parameters of arc swing are 01-09. The end of the arc is added before the arc is stopped. Swing arc welding can be used in line welding and arc welding.

Note: when the arc swinging function is to be realized, the welding wire shall be perpendicular to the welding forming surface.

Motion	۲	oint Tool	05	Use	02	Stoppe	d Serv		Alm	6	Err		Spd	25%	Ad
Coord System	٠	le oper	Setting	s	Coor	d Sys	Crafts		Mon/	Ctrl		Logs		Lo	ogin
Point	٠	txt		~	-		-	Posi	tion Info	):	-	1.000			
Pallet		aram 01 ram 01						J1: 0.		1	J4: 0.0			: 0.000	
Input/Output		T=05 U=04 am 01					~	J2: 0. J3: 0.			J5: 0.00 J6: 0.00			: 0.000 : 0.000	
Welding	•	General we	lding	•			$\sim$	Targ	et <mark>pos i</mark> n	n ins:					
Dispensing	P	Weaving		٠			~								
Screw lock	•	Spot weldin	g	•				I 🗖	oint val		Wor	ld/Tool		User v	al
Soldering	٠	Turnback m	ove	•			$(\bigcirc)$		tatus:						
Punch	٠	Search		+	omplete			Inpu	t status:	•			• •		•
Vision	٠	Arc track		•			$\sim$	•	••	•	•		•		•
Follow		Laser track	welding	×			$\leq$	DOr	nonitor:	-	•••		•	••	-
General	- <b>b</b> -1	ta, param 01, sa n 01	ve to SO	, rece	ive leng	t <mark>h: 0 by</mark> tes	Ň	•	••	•					•
Logical		20 ce enters follow	/ area, sa	ve re	sult to V	/0	$\geq$	•	••	•					•
Add ins*		ditins	Enter su		De	lins	Update po		Disable	. U		Clear e	2		nito

10.3.6 Arc swinging instruction

		Joint	Tool	05	User	02	Stopped	Serv	0	Alm		Err		Spd	25%	Adm
Pr	og/Run <b>∗</b>	File oper		Setting	s	Coord	l Sys	Crafts		Мог	n/Ctrl		Log	s	L	ogin
1ain	prog: posion	sync.txt							Posi	tion Inl	fo:					
001	Arc track sta	art, param 01							Curr	ent po	s:					
002	Set screw lo	ck param 01						$\wedge$	J1:0			J4: 0.0			7:0.000	
003	Screw lock n	nove T=05 U=	:04						J2:0 J3:0			J5: 0.0			8: 0.000	
04	Set solderin	g param 01							35:0	.000		JO: U.(	000	J	9.0.000	
005	Soldering m	ove point T=0	05 U=04					$\langle \rangle$	Tara	et pos		3				
06	Soldering m	ove end T=05	U=04					$\sim$	Tary	ler hos	111 1115					
07	Spot weldin	g start, paran	n 01													
80	MoveJ S=10	)% T=05 U=04	1					$\wedge$								
09	Arc start, pa	ram 01										1.2		_		
10	Weave start	, param 01								Joint va	il 👘	Wo	rld/Too	ol	User	val
11	Weave start	, param 01						6	110	deres-	-	-				_
12	Set position	er sync mode	Link wi	th J8				U		status:						
13	MoveC S=1	0% T=05 U=04	4						Inpu	it statu	s:					
14	Punch auxili	ary instructio	n 1. Wa	it for pu	inch co	mplete				00				•		•
15	Punch auxili	ary instructio	n 2. Pur	hch actio	n			$\sim$								
16	Visual open	param 01														
17	Visual close	, param 01						× /	•			•				•
18	Visual trigge	er, param 01						$\sim$	DO	monito	г:					
19	Visual recv p	point, param (	01, save	to P0				$\sim$	•					•		
20	Receive visu	ial data, parai	m 01, sa	ve to SC	, receiv	e lengt	h: 0 bytes	2 30	-							
21	Follow init,	param 01						$\sim$	-			-		-		
22	Set follow p	oint P0							•	• •		•		•	••	•
,	Add ins	Edit ins		Enter su	ıb	Del	ins	Update po	5	Disab	le lin	e	Clear	егг	Mo	nitor
- 5-0	Punch temp	late online co	mmuni	cation c	oppect	od succe	ecfully							1	5:35 V3.	2 20

#### 10.3.7 Motion command of arc linear welding

Single point welding instruction: single point welding can be realized only by adding delay time between arc striking and arc stopping, or by using spot welding procedure, and the size of welding point is set according



#### to the required process.

		Joint	Tool	05	User	02	Stopped	d Serv		Alm	۲	Err		Spd	25%	Adm
Pr	og/Run*	File oper		Setting	s	Coord	d Sys	Crafts		Mor	n/Ctrl		Log	s	L	ogin
Main	prog: posion	sync.txt						9	Posi	tion Inl	fo:					
001	Arc track st.	art, param 01							Curr	ent po	s:					
002	Set screw lo	ock param 01						~	J1:0.	.000		J4: 0.0	000	1	7: 0.000	
003	Screw lock	move T=05 U=	04					1	J2:0.			J5: 0.0			8: 0.000	
004	Set solderin	ng param 01							J3: 0.	.000		J6: 0.0	000	-	9:0.000	
005	Soldering m	ove point T=0	5 U=04					$\sim$	-							
006	Soldering m	ove end T=05	U=04					$\sim$	larg	et pos	in ins					
007	Spot weldin	ig start, param	n 01													
008	MoveJ S=1	0% T=05 U=04						~								
009	Arc start, pa	aram 01						1								
010	Weave start	t, param 01							J	oint va	d	Wo	rld/Too	ol	User	val
011	Weave start	t, param 01						6	-		_	-	_			
012	Spot weldin	ig start, param	n 01	Contract lines					11-24	tatus:						
013	Set position	er sync mode	Link wi	th JB					Inpu	t statu	s:					
014	MoveC S=1	0% T=05 U=04	1					1.1.1	•	• •				•		
015	Punch auxil	iary instructio	n 1. Wa	it for pu	nch co	mplete		$\sim$								
016	Punch auxil	iary instructio	n 2. Pur	hch actio	n										11	
017	Visual open	, param 01						11	•			•		•	••	•
018	Visual close	, param 01						$\sim$	DOr	nonito	r:					
019	Visual trigg	er, param 01						~	•					•		
020	Visual recv	point, param (	)1, save	to PO												
021	Receive visu	ual data, parar	n 01, sa	ve to SO	, receiv	e lengt	h: 0 bytes	$\sim$	-							
022	Follow init,	param 01							•	• •		•		•	••	•
	Add ins	Edit ins		Enter su	h	Del	inc	Update po		Disah	ole lin		Clear	orr	M	nitor

10.3.8 Spot welding instruction

Shortcut	*								
Motion	oint	Tool	05 Use	r 02 Stopp	oed Serv	Alr	n 🌑	Err 🔴 S	pd 25% Ac
Coord System	le oper	Se	ettings	Coord Sys	Crafts	м	on/Ctrl	Logs	Login
Point	bit					Position	info:	-	
Pallet	aram 01 ram 01				~	Current p		4: 0.000	J7: 0.000
Input/Output	T=05 U=0	)4			$\sim$	J2: 0.000 J3: 0.000		5: 0.000 5: 0.000	J8: 0.000 J9: 0.000
Welding	nd T=05				$\sim$	Target po	os in <mark>i</mark> ns:		
Dispensing	rt, param :05 U=04				~				
Screw lock	)1 )m 01					Joint	val	World/Tool	User val
Soldering	im 01 rt, param	01			$\bigcirc$	I/O statu	s:		
Punch	nc mode =05 U=04	Link with	8L			Input sta	tus:		
Vision	, istruction		for punch c h action	omplete	$\sim$	••			
Follow	, m 01	peration			$\leq$	DO moni	tor:		
General	Sleep	5			~	::			
Logical	Note	s	0, rece	ive length: 0 byt	es 🗹	••			
Add ins*	Ope	n excel	ub	Del ins	Update po	os Dis	able line	Clear err	r Monito
o: Punch templai	te	excel	connec	ted successfully		16.8			16:39 V3.2.20

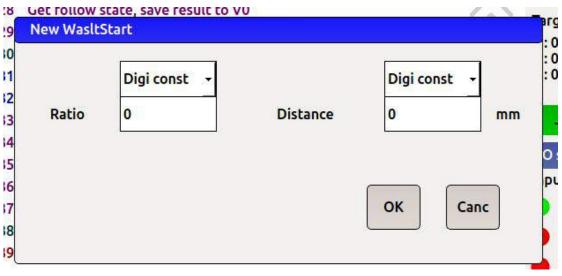
10.3.9 Delay instruction



Turn back welding instruction: turn back welding starts and ends. Turn back start is added after arc striking command, and forward and backward distance can be set.



10.3.10 Turn back welding instruction



10.3.11 Turn back welding instruction



# **XI.Other functions**

# 11.0 Subprogram Call

Open the program or create a new blank program file, and then add the call subroutine command in the program. In the program command, you can select the name of the program file to call, and add the program end command in the last line of the subroutine.

Shortcut	×													
Motion	oint	Tool	05	User	02	Stopped	Serv		Alm		Err	Sp	d 25	% Ad
Coord System	le oper		Setting	5	Coord	Sys	Crafts		Mon	/Ctrl		Logs		Login
Point	txt		_											
Pallet	ce ente	rs follow	area, sa	ve resu	lt to V0	1	$\overline{\sim}$	Targ J1:0 J2:0		n ins:	J4: 0.00 J5: 0.00		J7: 0.0 J8: 0.0	
Input/Output	save re	sult to V	0					J3: 0	.000		J6: 0.00	00	J9: 0.0	00
Welding		sult to V bord, use					$\wedge$		loint va		Worl	ld/Tool	U	ser val
Dispensing	N 57	运行提示 状态信号	-					100	status: It status	5:				
Screw lock	to mark T=05 U	: 0 (急停) =04	状态信号	)				•	•••					
Soldering	and the second second second	am 1 lat 01, send		ongi coo	ef O lat o	offset 0 lo	ngi offs	•	••	•	•			••
Punch		, save res s, param						DO	monitor					
Vision	■F (程序 ■05 U=0	运行提示 14	) Flip On	ns			$\sim$	•	• •	•	•		•	
Follow	=05 U=0 =05 U=0	4					$\leq$	DA	output r	nonit	or:			
General	+ Cor	ndition	,						A00		DA01	DA0	2	DA03
Logical	Wh	ile	•				$\geq$		0	)	0	0		0
Add ins*	Wa	it	¥	2	Del i	ns	Update po	os	Disab	le line	( )	Clear err		Monito
o: Punch templat	e Got	81	ļ	nnecte	d succe	ssfully		-					16:42	V3.2.20

calling	subroutine		
Call	zuo.txt	·	File
		New	Cancel

11.0.2 Program call file selection



			Cart	Tool	01 User	00	Stopped	Serv	0.	Alm (	🔵 Tch	0	Spd	25%	Adn
Prog/Run*	File oper	Settings	Coord Sys			Crafts Mo		Mon/	ı/Ctrl		Logs	Logs		Login	
n prog: 1.txt									Positi	on Info:	8				
Call sub program z	uo							-	100000	nt pos:					
								$^{\sim}$	J1: 0.0 J2: 0.0 J3: 0.0	00	J4: 0. J5: 0. J6: 0.	000	8L	: 0.000 : 0.000 : 0.000	
								$\sim$		t posin		000		. 0.000	
								$\cap$	Jo	int val	W	orld/Too	4	User v	ral
								$\bigcirc$	I/O st						
									Input	status:					•
								$\sim$							
								$\leq$	DO m	onitor:					
								~	•	•	••	••			•
								$\leq$			•••				•
Add ins	Edit ins	Enter sub	D	el ins	(	Jpdate p	05	Disable	line		Cleare	rr		Monit	or
: Open file: 1.txt	_	_									_		17	12 V3.	2.20

11.0.3 Blank file program call

## **11.1Instruction editor**

Editing instructions include editing, editing, and modifying parameters in the selected row. Both copy and cut can select the number of rows or the range of rows. Paste to paste into the current file click the next line of the current line or another file. Delete to select the current row or row number range.

	Joint	Tool	05	User	02	Stopped	Serv		Alm		Err		Spd	25%	Admi		
Prog/Run File oper		Settings Coord Sys		Crafts	Mon/Ctrl		Logs		Login								
1ain prog: posior	Edit					-											
010 Weave star 011 Weave star	Batch ed	it					$\overline{}$	Target pos in ins:									
012 Spot weldir 013 Set position	Сору		th J8														
14 MoveC S=1 15 Punch auxil	Cut		it for punch complete ich action				$\sim$		oint va	i	Wo	rld/Too	ol	User	val		
016 Punch auxil 017 Visual oper	Paste						~	11- Acres	tatus: t statu	s:							
018 Visual close 019 Visual trigg	Delete						•••••										
20 Visual recv 21 Receive vis	Update p	os	to P0 ve to S0	), receiv	e lengt	h: 0 bytes	$\bigcirc$	•	• •	•	•				•		
22 Follow init, 23 Set follow p	Edit pos		area, save result to V0 0					DO monitor:									
024 Check if wo 025 Start follov	Disable li	ine					$\sim$	•	• •	•	•		•	••	•		
26 Stop follow 27 Get follow	Clear err	ог					$\leq$	DA output monitor:									
28 Get follow 29 Update foll	Edit char	9.	0 r=04						A00		DA01		DA02	D	A03		
030 I/O output 031 Wait for DI	Calibrate	1	) ;)				$\leq$		0	L	0	L	0		0		
Add ins	Edit ins*		Enter su	ıb	Del	ins	Update po	os	Disab	le line	0	Clear	err	Mo	nitor		
nfo: Punch templ	ate online co	ommuni	ication c	onnech	ed succ	essfully			_	_		_	16	:46 V3.	2.20		

**Calibration:** the correction instruction is to correct the number of lines from the first point to the last point to be corrected after the welding gun collides or the workpiece moves, and then click the correction instruction



after manually teaching to the correct position. Click the confirmation to complete the correction, but the correction instruction is only valid for the straight line movement and arc movement instruction, and is invalid for the joint movement.