Max Series Manual

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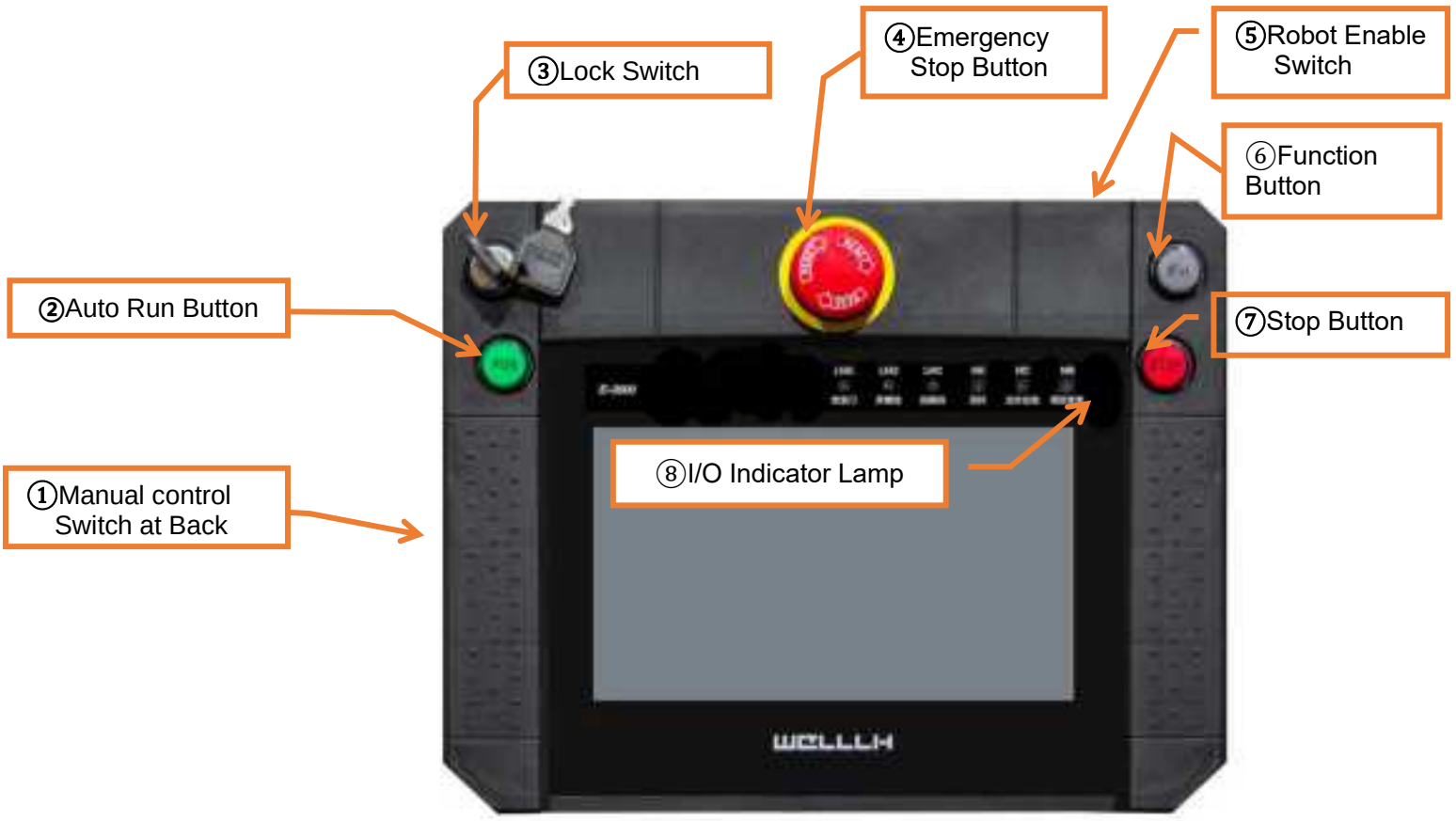
Table of Contents

1 Operation Manual

1.1 Appearance Introductions



(HMI)

1.2 Button & Switch Function Introduction

Manual Control Switch on Back of pendant (safety switch)

a. In Manual Mode (or Teach mode), hold the “Manual Control Switch.” Button will work in manual operating (or teaching).
b. Reset the alarm and STO while it is alarming.

(Safety switch)

(Reminder to press safety switch screen)

Auto Run 

a. Start button.
b. Click and hide the display box while the Alarm Prompt Box appears.

The Run Button is used to initiate the “Autorun” and “Testrun” operating modes. Robot is in “Testrun” or “Autorun” mode, when the Controller’s screen system prompts the following: 

Press down the green “Run Button” 

and the robot will start the “Autorun” or “Testrun” mode.

Lock Switch  :

Rotate the Lock Switch to the left and the user can operate the hand controller. Otherwise user cannot operate the hand controller.

Emergency Stop Button

When an abnormal condition occurs, press this button, the robot will immediately stop running and an alarm sounds to remind the Robot User that the robot is in alarm and an e-stop has been activated.

Robot Enable Switch

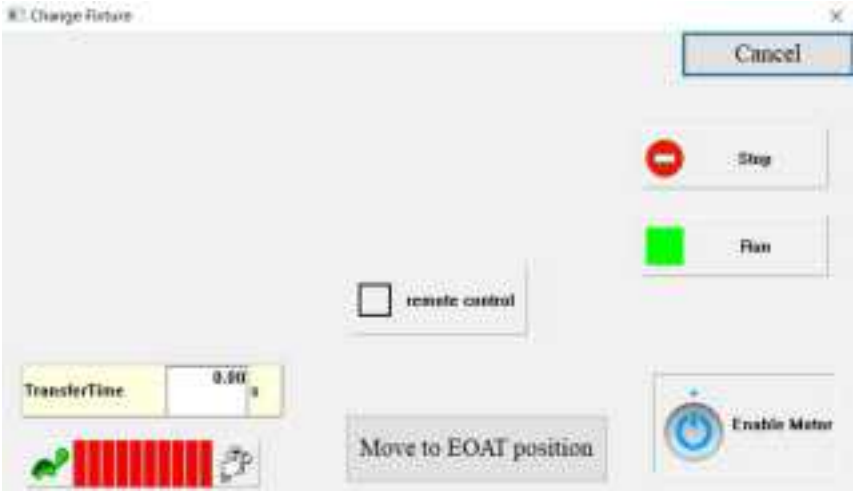
a. To disable the robot, ensure the robot is in a safe position (z-axis at 0.0 and/or x-axis is in part drop area). When the switch is in off position (0), the robot is disabled. When the Switch is flipped on (I), the robot is enabled and will function.

b. When the switch is flipped off, it will ignore the status of “Fence door open” to prevent triggering STO. (It will bypass all robot signals)

c. Function Button 

(Fn): has different functions in Standby Mode and Run Mode.

a. Standby mode



- Adjust Speed:  (1 bar represents 10% of full speed, speed increases by intervals of 10 with the number of bars.)
- Move to EOAT position: see the steps in [1.7.4.2 EOAT Position Set.](#)

- Motor Enable Function:
  - 

: Motor is disabled.
  - 

: Motor is enabled (Enable: allow signals)
- Cancel: Back to Fn Page.
- 

The Stop and Run buttons have the same function as the buttons on the hand controller.
- Remote Control

: By selecting Remote-Control service, it will attempt to start. If startup is selected, the remote object can connect to the GUS on the desktop. If cancel is selected, the remote service will be closed. This function operates with Remote Logon Tool. (currently for service level login)

- Transfer Time**:** This is how long the conveyor output will remain “ON”.

b. Auto Mode

- Stack set**:** This will open the Stack Set page to set the stack parameters while running.

Stop Button  :

a. Return to the previous page of the current page.
b. When there is a prompt dialog box, pressing the stop button will cancel it.
c. When in Auto Run Mode, press the Stop button and the program will stop running.
d. When in pause, press the Stop button, the program will exit from auto run
e. Pressing the Stop button for 10s will activate and open Screen Calibration. It automatically changes to Screen Calibration page. Click the Calibration Point in the screen to complete the Calibration.

I/O Indicator Lamp

Input	Output
LMD: Safety Door	ME: Enable Ejectors
LMO: Mold Opened	MC: Enable Mold Close
LMC: Mold Closed	MS: Enable Cycle

1.3 System Start and Stop

This System Start and Stop Section outlines and describes the starting and stopping of the automated system. To ensure proper safety precautions, make sure no personnel or obstacles are within the stroke range when starting the robot. The Robot User must follow these safety precautions:

⚠ WARNING

a. **Don't start system when there is someone or something in designated work area.**
b. **In the alarm state, if the alarm state has not been resolved, don't start the system.**
c. **When the system starts, if robot is functioning erratically, cut off the power immediately.**
d. **Failure to follow the operation manual may lead to a production accident, resulting in serious injury**
e. **Confirm that the stop button is open in the off state.**

Start system

Switch the breaker to "ON" position, then switch the power dial on the control cabinet to turn on the power, and the power indicator light will be "ON".

Disable robot

If not using the robot, confirm the robot is in a safe position.
a. **Change Robot Enable Switch to "OFF" position.**
b. **To lock the pendant, change Lock Switch to the locked position.**

Use robot

Shutdown system

a. **Open Lock Switch**
b. **Flip the Robot Enable Switch to "ON" status.**
c. **Click main interface User Level Key**  **, and input the password**
d. **Press Fn Function Button**  **to select Enable Motor.**

Shutdown system

a. **Ensure the robot is stopped and in start position.**
b. **Enter into system setting of function interface, click Shutdown System or flip power dial back to turn off power**

1.4 Emergency Stop and Release

This section outlines and describes the necessary steps to perform an emergency stop and emergency release. This function is an “Emergency State” function and is only to be used in a potentially dangerous situation. If the machine or robot is running normally, avoid using this function for routine stops.

WARNING

- **If a dangerous situation is about to occur or has already occcurred, use/press the emergency stop button to immediatedly stop the robot.**
- **Failure to heed these instructions may lead to product failure or serious injury.**

1.4.1 **Emergency Stop Operation Method**

- **This robot is equipped with an “Emergency Stop Button”, as pictured below. This button is to be pressed, in case of an emergency. The Emergency Stop button is located on the front of the HMI.**

Emergency Stop Button

When the “Emergency Stop Button” is pressed, an alarm will sound. All the motors will power down, and all vacuum and the cylinders will stop output.

WARNING

- **When the robot is in the movement of Traverse In or Traverse Out, pressing this button will cause a heavy load on the robot and cause a malfunction. Unless an Emergency is present, DO NOT press the Emergency Stop Button when the robot is moving.**
  - **After the emergency stop button has been cleared, the robot needs to be reset.**
- **Before resetting the robot, make sure the area is safe and all personnel are clear of the working area.**
- **Failure to follow these instructions may lead to injuries.**

1.4.2 **Emergency Stop Button Release**

Relieve the robot’s Emergency Stop situation by turning the E-stop button clockwise and pulling up as below picture:

Screen Description

The hand controller automatically enters the standby page, displaying as the following:

- Language: choose language.

After choosing the language, press **[Login]** on main screen:

① **Active state**

 : green means active state;  : yellow means the robot motors are off;  : red means inactive state.

② **Synch state**

 :means sync normal;  : means sync rate is low. Generally, it recovers automatically. Provided it doesn't recover within 2 min, check if the Background GRT program runs well or not. (GRT also called CPAC, is in the System Set. Press Background Parameter to check, see the CPAC for details. Only the Absolute Robot Service Engineers can check CPAC).

③ **Reset state**

 : No reset;  : robot resets successfully (Absolute value is invalid).

Set the Zero according to detailed steps in 1.7.1.2 Advanced Set-Zero Set

④ **User level**

 : means level 0, level 1, level 2, level 3, level S (administrator, Only for ARI Engineer).

⑤ **Current Program name:**

Displays the currently loaded robot command program

⑥ **Current working mode:**

 :Standby mode;  :Teach mode; 运行 :Testrun mode;  :Autorun mode.

 :Protection mode, Click to display unresolved alarm information.

 :Alarm mode, Click to display the current alarm information.

 :Manual mode, safety switch is not pressed;  :manual mode, safety switch is pressed;

⑦ **Robot state:**

:robot at stop state  :robot executing command in test to run or auto run

 :robot arm in pause state  :robot arm at reset state

⑧ **System time.**

Shows the current set time.

(**Note:** Time can be set in system settings. Refer to section 1.6.3)

⑨ **Robot System Message Display.**

current state or alarm message

(**Note:** Refer to alarm pages found later in this manual to troubleshoot alarm state.)

⑩ Production state:

Current count, production volume, cycle counting, sample drawing, mold test trying times, and NG (reject parts)

⑪ Program Display area:

All steps of the program are listed

⑫ Axis coordinate position display area:

Yellow indicates that the axis is enabled, **Gray** indicates that the axis has power, and **Green** indicates the axis is in the origin area, and the **Orange/Brown** indicates the axis is in the part placement area, and the **Red** indicates the axis 's has abnormal communication. When the axis is selected, the selected axis coordinates show an orange edge and are **highlighted**.

1.5 Teach Operation Method

1.5.1 **Create A New Program**

Method 1:

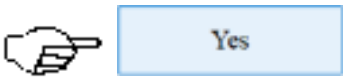
1. Click “**Function**” on main screen

2. Enter into function interface

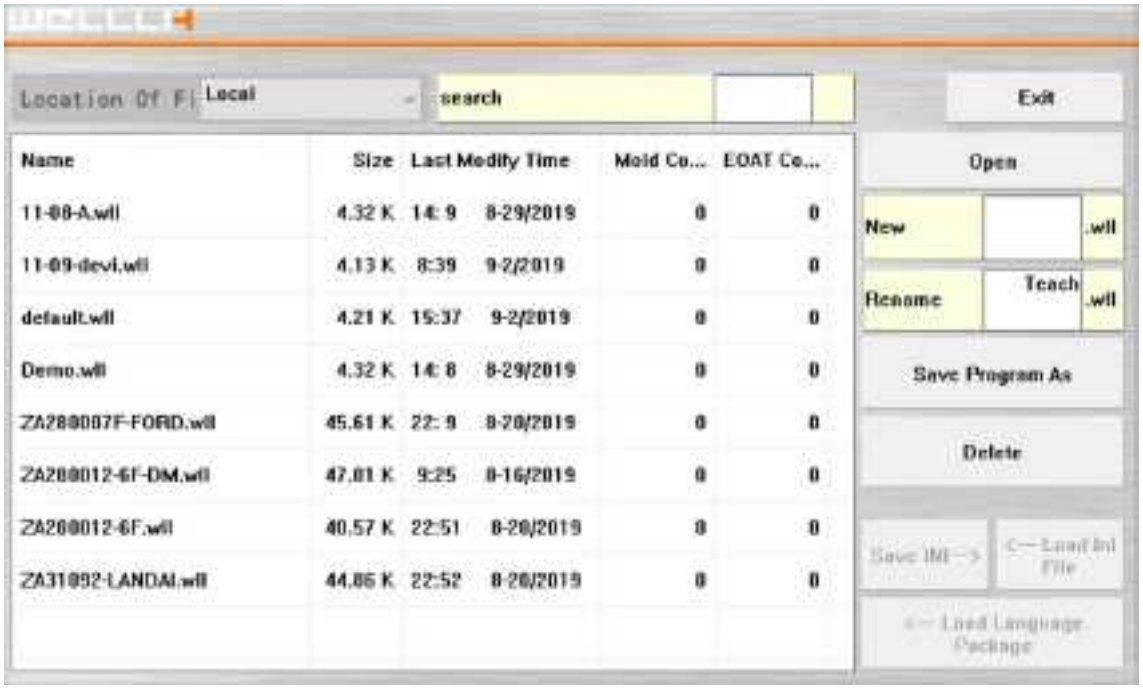
3. Click “**Teach**”

4. Choose to create a new program or not.

5. Click “**Yes**”.



6. Enter into the program selection interface



7. Click “**New**”.

8. Key in program name, for example: "Teach", then click “**OK**”.

9. Create new program and enter the program’s teach interface.

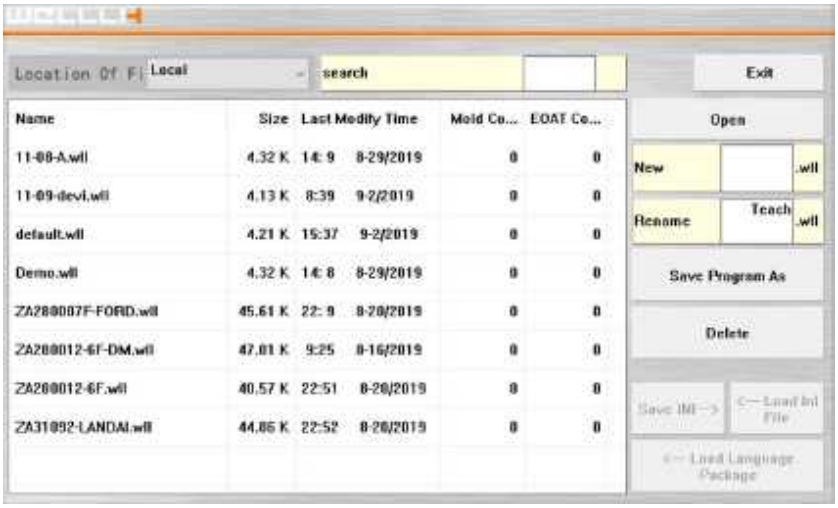
TIPS

- Creating a new program, [standby point] and [wait: LMO mold opened] are default action lines
- **Start point**: When the software starts this action line, it will automatically return to Start Point position. See the details in 1.7.4.1 Start Point Set.
- If “**Jmp Down**” or “**Jmp Up**” doesn’t appear. Click 1.7.1.2 Advanced Set-Factory Set-Modify in Teach choose to “Use” (only administrator level can see it)
- Delete or add a default action line according to actual needs.

Method 2:

1. Click “**Program**” in the main screen

2. Enter program selection screen.



3. Click “**New**”.

4. Key in program name example: "Teach" and click "**OK**".

5. Create a new program and enter the home page

1.5.2 **Teach Axis Motion**

Axis Motion: Insert an axis motion into the program.

Method as follows:

1. Enter the Teach interface.

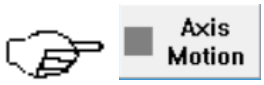
1. **Program motion area**: Shows the action lines of current program.
2. **Selection Display:** Shows the information of what is currently selected.
3. **Teach motion area**: Used to insert the motion/command line in Teach.
4. **Motion operation area**: Used to operate the current line in the Program motion area.
   - Modify: modify current motion
   - Delete: Delete current motion
   - Previous Step: Back to last step (initial state)
   - Next step: Operate current action as well as enter next action
5. **Auxiliary operation area:** Auxiliary teach program.
   - Monitor: Enter monitor interface (see the details in Chapter 1.9)
   - Jmp Down: move down through program without step execution (Only administrator level is permitted to see and operate).
   - Jmp Up: move up through program without step execution (Only administrator level is permitted to see and operate)

.

TIPS

- Enter the modify page by clicking the action line in the program motion area.
- Jmp Down and Jmp Up in the Aux operation area can be enabled/disabled in settings. (See section 1.7.1.2 for details found later in the manual)

2. Click Axis Motion.



3. Enter "**Axis Motion**" interface.

1. Target axis: select the target axis you would like to operate, or click the axis coordinate to enter quickly
2. Sync Axis: Sync two axes' movements in a command.
3. Distance: Input distance and hold down the Up, Down, Traverse In/Out axis motion (**note**: do not exceed the axis limits).
4. Moving speed bar: control speed of command
5. Waiting: delay before execution of command
6. Start Point: When selected, the command will prompt the robot to return to the set start point. (See section 1.7.4.1 for details on how to set start point)

7. More**:** For additional axis motion parameters, click/check the desired axis to display the parameter set page. (See image below)

⚠WARNING

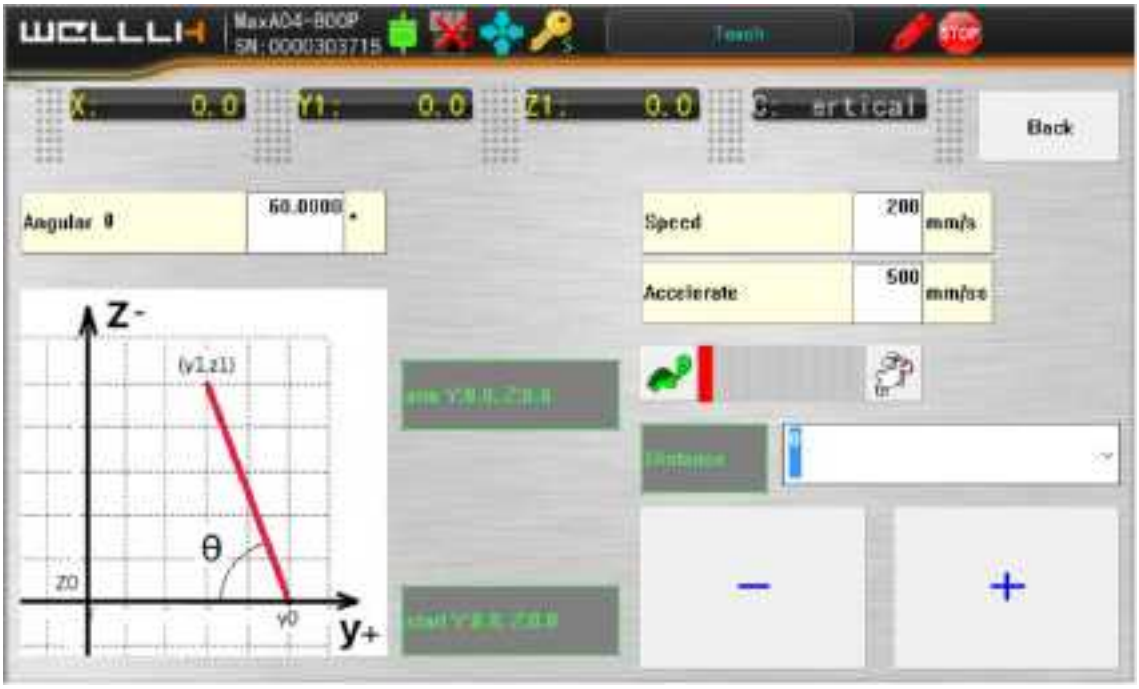
TIPS

If multiple axes need to be simultaneously moved, select [Sync Params] and set parameters on “More” page.

⚠WARNING

When using the Check Torsion Function, the selected axis's torsion output will not exceed the set “torsion threshold” in the uniform phase of the action, otherwise **the torsion output will be closed.** This is an advanced function, improper operation may cause mechanical damage, certain experience is needed for use. DON’T OPERATE WITHOUT AUTHORIZATION. IF THIS FUNCTION IS NEEDED, CONTACT ARI SUPPORT.

8. **Synchronization of axis parameters**: set the speed & acceleration, synchronization angle, distance of axis motion, and crosswise movement.



4. Select Axis [Z1] as target axis, key in distance [400], select moving speed, hold manual control button at back of hand controller, and press and hold [Down] to the targeted position (400).

TIPS

Clicking the axis coordinate will quick choose axes.

Click [save].

5. This will successfully insert axis motion command.

1.5.3 **Teach Vacuum & Grip**

Vacuum & Grip: Set Output signals or start the Subprogram (See the details in 1.7.7 Subprogram Set).

EXAMPLE *Take the SV1 Vacuum 1 output as an example:*

1. Enter the teach interface.

2. Click "**Vacuum Grip**" in the teach interface.

3. "**Teach Vacuum Grip**" interface will be entered.

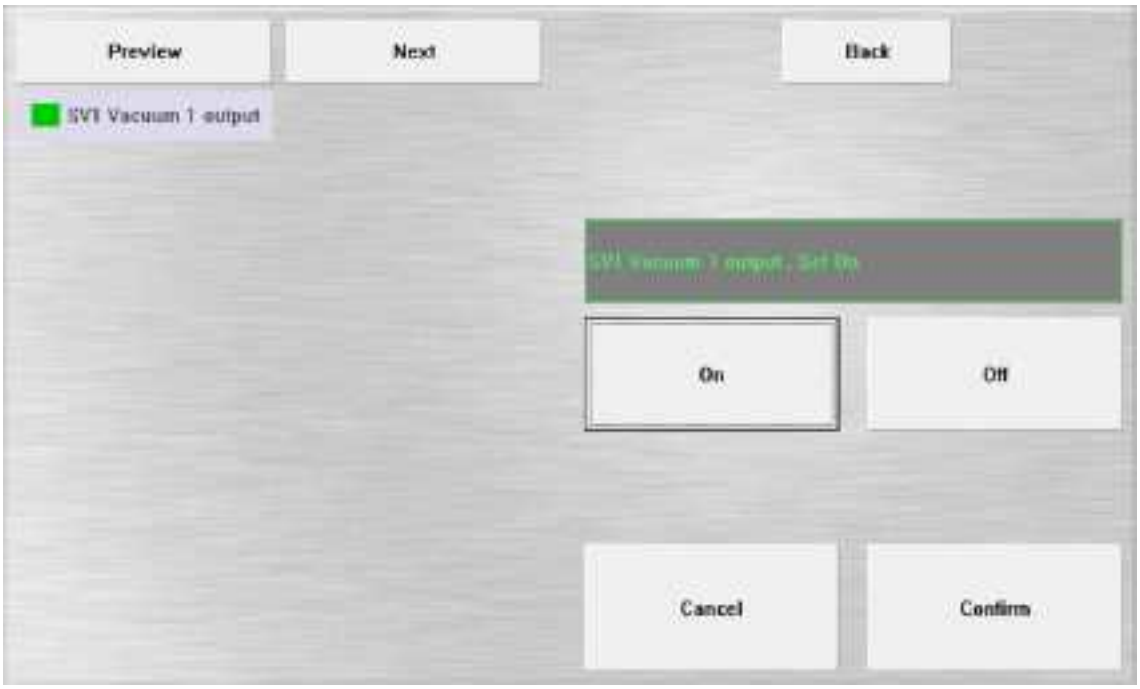
- Wait-time**:** Delay before vacuum/gripper action is executed.

4. Click “**+**”.

5. **“Output”** interface will be entered

6. Select [SV1 Vacuum 1 output].

7. Click “**On**” and “**Confirm**”



8. “SV1 Vacuum 1 output open” will appear in the first line.

9. Select **“Save”.**

10. This will successfully insert Vacuum Grip.

1.5.4 **Teach Stack Motion**

Stack motion: Insert a group stack instruction to achieve stack command.

EXAMPLE

In order to fully demonstrate a stack instruction, we will complete a set of simple actions to teach the stacking command. (See online video at support.absoluterobot.com)

We will complete stacking a set action of 3pcs in the X direction, 4 pcs in the Y axis direction, and 2pcs (2 levels) in the Z axis direction

1. Enter your stack parameters by clicking on the appropriate box. Refer to 1.7.2 stack parameter set:

According to stack parameter 1, suppose stack start position is X:1000, Y:100, Z:100, the stacking sequence will execute as follows:

1. X axis moves 3 rows in the positive direction, the starting position is 1000, the product size is 20mm, Y and Z coordinates don't change until X axis is stacked with 3pcs in the +X direction.
2. Y axis moves 4 columns in the positive direction, the starting position is 100, the product size is 20mm, the Y direction coordinates move one column, then the X direction is stacked again with 3 pcs. This is repeated for all 4 columns, Z coordinates don't change until X and Y are stacked with 3pc by 4pc grid
3. Z axis moves in the negative direction 2 layers, the starting position is 100, the product size is 20mm. Therefore, the Z axis moves in negative direction 20mm after X Y grid is complete to stack another level of parts.

Stacking Parameter one total parts: 3 x 4 x 2=24pcs

TIPS

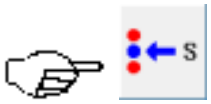
In the stacking parameters, the start position should be set in the part placement area.

2. Enter Teach Mode, insert Axis Motion, move the teach axis to the placement area.

3. Click Stack Motion.

4. Enter the “Stack Motion Teach interface,” select the set stack parameter, start stacking.

5. Select “Save” to start stack.



6. Click Axis Motion to teach axis motion in stack area.

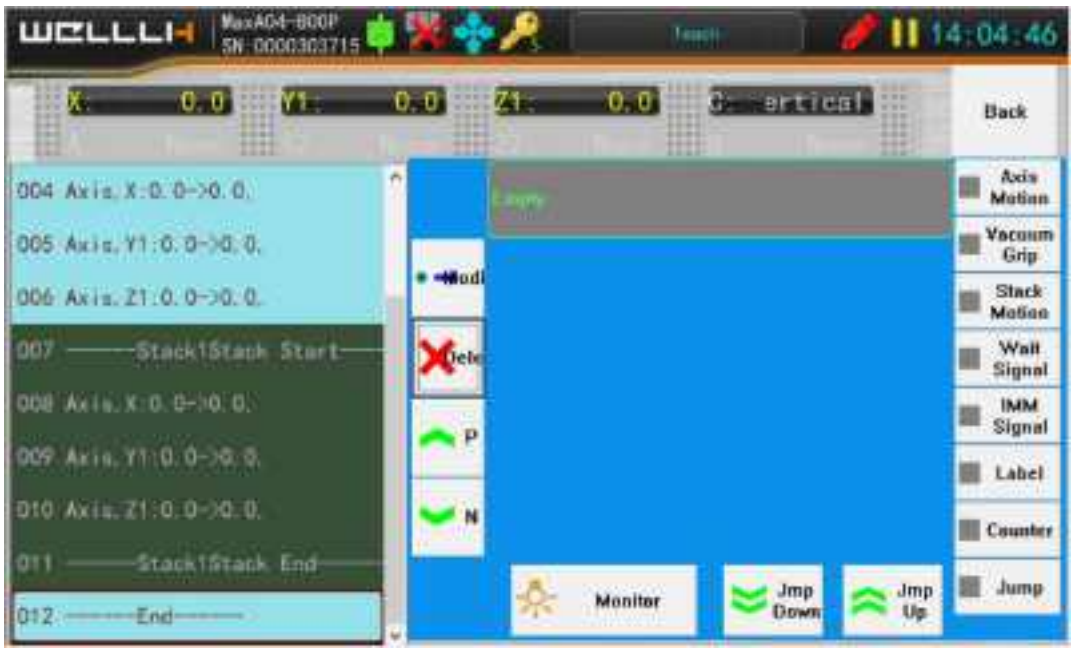
7. Insert the order of movement of the axes when stacked.

TIPS

The initial program will set where the stack starts and the sequence of robot motion. Once the stack begins, the positions will be driven by the parameters formatted under the stack set parameter menu.

8. Click [**Stack Motion**], enter the stack set interface, then click “save”, insert stack finish signal.

9. When the “insert stacking motion” is completed, axis motion is no longer tied into stacking.



10. Click [**Axis Motion**], and the axis coordinates can be moved to the next location, because axis motion is no longer tied to the stack command.

1.5.5 **Teach Wait Signal**

Wait signal: waiting for IMM signal or spare input signal by receiving the IO signal. The module will continue to carry out the next motion after the signal is received.

EXAMPLE *Insert wait signal "wait for LG1 Grip 1 to confirm signal open" example:*

1. Enter the teach interface.

2. Click [**Wait signal**].

3. This will enter "**Wait signal"** interface

- Spare input: **click on "**wait spare input**" to choose the signal. Click on "**C**" to cancel the current selected signal.**
- [Wait Sign On / Off]
  - 

: Waiting for the signal On
  - 

: Waiting for the signal Off
- [Wait-time]**: key in '0-1000s'in the [Wait-time], the system will alarm when wait-time is out.**

4. Select 'LG1 Gripper 1 Check' in [**Wait spare input**] and confirm [**Wait Sign On**] 

.

5. Click on "Confirm" to input the currently selected object. Click on another "**Wait spare input**" to choose more signals if needed. Then click save.

6. Wait signal is inserted successfully.

TIPS

When multiple waiting signals are selected and the conditions are satisfied at the same time, the wait signal is considered complete and the program will advance to the next step

1.5.6 **Teach IMM Signal**

Injection signal: create a signal so that injection molding machine executes an action

EXAMPLE *Inserting injection molding signal "MC-A Enable mold close" example:*

1. Enter Teach interface.

2. Click on the "**IMM signal**".

3. Enter “IMM signal” interface.

NOTE: Waiting: Delay before sending IMM signal

4. Click [**MC-A Enable mold close**]

5. Click [**MC-A Enable mold close**] “ ” means signal on, “ ” means signal off

6. Click “**Save**”.

7. **[IMM signal]** is inserted successfully.

1.5.7 **Teach Jump label**

The “**jump label**” is used in conjunction with the 1.5.9 Teach Jump function to identify the jump position of the program.

WARNING

- **Do not insert duplicate jump label numbers, otherwise "conditional jump" will jump to the first found label.**
- **Do not miss inserting label to jump to, otherwise "conditional jump" will continue to run downward when the jump label is not found.**

1. Click on “**Jump**”.

- Waiting**: not used.**

2. Input the number of the succeeding “**label**”, click Save.

3. The jump label is inserted successfully.

TIPS

No. 201-220 jump label is a "*custom tag*", Can be revised via *revise* in the language packages.

1.5.8 **Teach Counter**

Counter: Insert a counter to count parts, (Used to execute functions once the robot has picked set amount of parts. i.e. indexing a conveyor)

EXAMPLE *For Example, set the counter to No. 10 and increase by 1 each cycle, the operation is as follows:*

1. Enter teach interface

2. Click on "**counter**"

3. Enter “counter teach” interface

- Number**:** Set the counter number **(value range 0-100).**
- Operation type**: Null, Increase, Decrease, and Set as.**
- Count**:** Set the counter increase per shot **(value range 0-30000).**

4. After the counter motion is inserted successfully, counter number 10 increases by 1 every injection mold shot cycle.

5. Click “Save”.

6. The counter motion is inserted successfully.

1.5.9 **Teach Jump**

Conditional jump: In modular programs, instructions that change the order of execution according to logical judgment.

Comparison types of Conditional jump: IO port, Products count, Counter shown in picture below:

- IO port: Compare the input signal, input the corresponding number (0-127) in the "Main screen - Function - Function option - Advanced - Input list" to select the input condition to be judged,

"  " means that when the input signal is on, jump to appropriate label. "  " means that when the input signal is off, jump to appropriate label.

- Products count shown in picture below:

When the Products count is divided by 10, with remainder less than 2; that is, the Products count is 0, 1, 10, 11, 20, 21, 30, 31... the jump condition is satisfied. When the divisor is 0, this means that the remainder is equal to the yield count

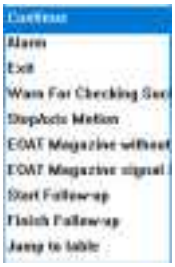
- Counter: show in picture below:

When the value of the counter number 100 is >50, the jump condition is satisfied and will continue to the appropriate label

- If Time Out

This is used to specify the role of the program when the jump condition is not satisfied.

Options are as follows:



If the jump condition is not satisfied

- **Continue**: The program will continue to run
- **Alarm**: The program will prompt the timeout alarm
- **Exit:** The program will pause and exit
- **Warn for Checking Vacuum or Grip**: Detect the Vacuum Signal or Grip Signal, and enter pause state
- **Stop Axis Motion:** Axis motion will stop
- **Start Follow-up**: Stop Y1 axis Free (Extra option only to be used by ARI service)
- **Finish Follow-up**: Open Y1 axis Free (Extra option only to be used by ARI service)
- **Jump to label**: Jump to another label

- Waiting**:**

Within a wait time with meeting the conditions of a jump, jump label will execute, otherwise action will time out.

EXAMPLE

For example, according to the Products count, when the Products count is within 50 and Y-axis moves to 100, beyond 50 and the Y-axis moves to 200, and the programming is as follows:

1. Insert jump label

2. Insert two conditional jump labels

3. Jump label 1 insert action “Y1 axis moves to 100”, Jump label 2 insert action “Y1 axis moves to 200”

4. Insert next label

5. Under line “**006 forward Y1:0.0->100.0”** Insert jump conditions with jump to label 3.

6. Final process as follows:

The current product count is called on line 004. If it is less than 50, the program jumps to label 1, otherwise the program jumps to label 2. When jumping to label 1, lines 005, 006, and 007 are executed and the jump to label 3 happens in line 007. When jumping to label 2, lines 008 and 009 are executed then the program continues to line 010 “jump label 3" downwards.

TIPS

1. The "jump label" must be present and unique in the program
2. If the production count is divided by 0, then the production count remains the same. Example: If the production count is 5: 5 divided by 0, the remainder will be 5.
3. To force a jump the most common method is to use the "<57> Emergency Stop Button [EMG]" IO conditional jump if true. This function is always on

1.5.10 **Modify in Teach**

Modify in teach: While using teach, commands can be modified to new parameters

Teach modify page

In teach, move to the command needed to be modified, then click on modify to enter the teach modify page. In the teach modify page, you can make modifications to command parameters.

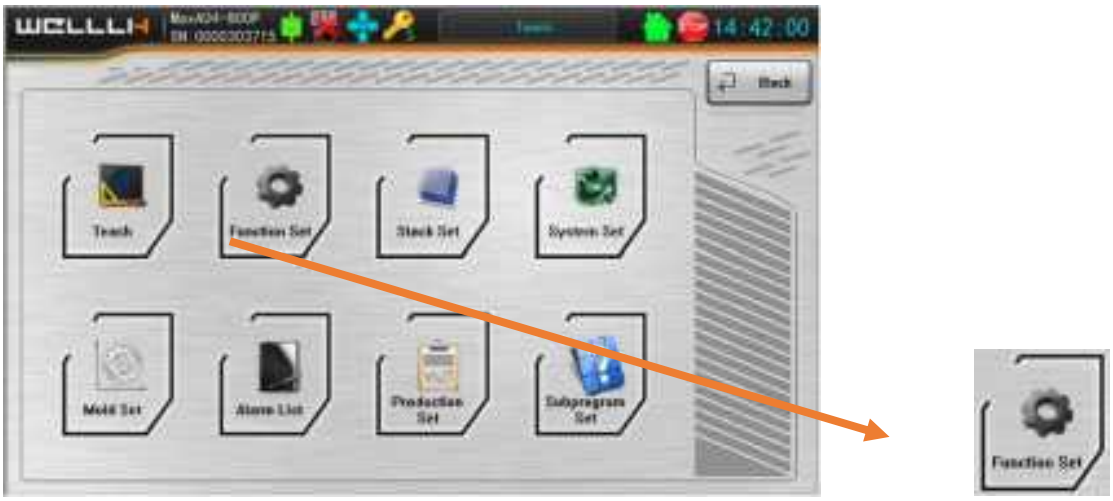
TIPS

- **Jump to line:** Move the current cursor to the highlighted line. Level S administrator permission is required.

1.6 Function Set

1.6.1 **Function Option**

Click "**Function Set"** to enter Function Set interface.



1.6.1.1 Common Option Set

a） IO check

IO Check: input check: ☑ check IO port, ☐ IO port won't be checked.

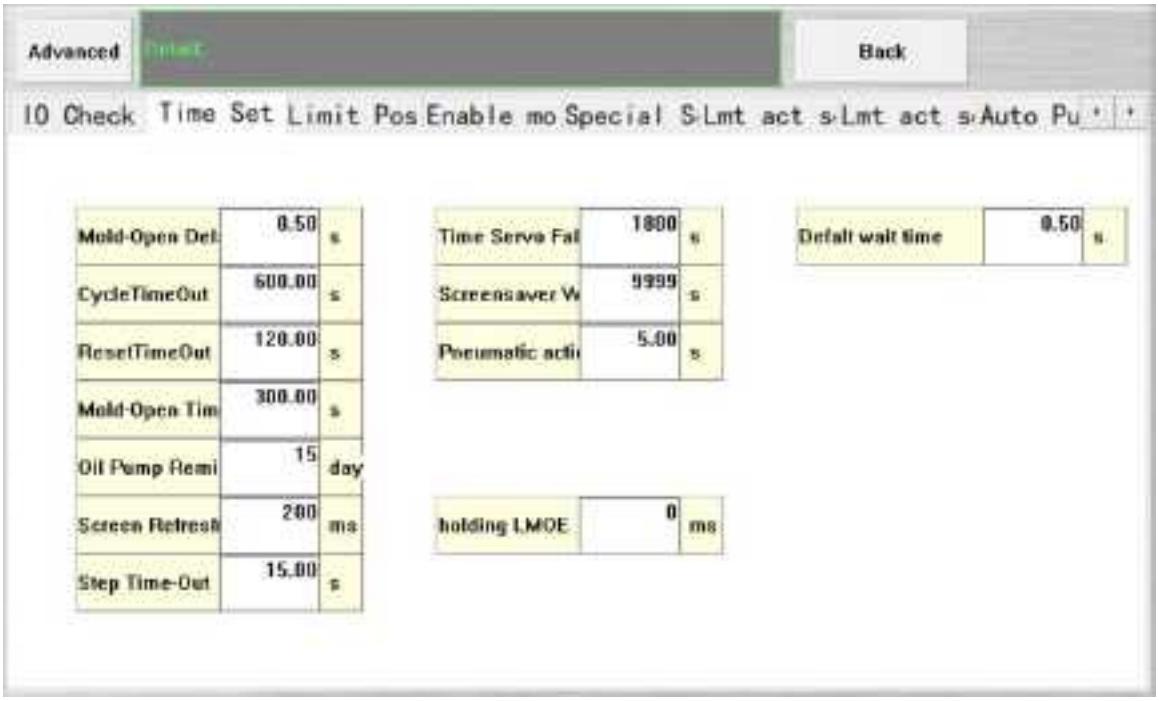
- IO check point (SignalCheck)**: The default is Origin.**
  - Origin: only check at the origin point

- Global: the whole process from the origin to releasing IO.
- Placed: Check in the placed area

- Check Grip and Vacuum in Test run
  - [Enable]: Grip and Vacuum IO ports will be checked in test run.
  - [Disable]: By default, Grip and Vacuum IO ports will only be checked in auto run.

- VI_Grip_R_Check: VI Grip check port address. Corresponding port address is located under Function-> Function Set->Advanced-Output List. Check in the Function-Manual-Vacuum Grip. (Only applies to dual arm robots)
- VO Grip ON Runner Arm: VO Grip output port address Corresponding port address is located under Function->Function Set->Advanced->Output List. Control in the Function->Manual->Vacuum Grip (Only applies to dual arm robots)

b） System Time



- Mold-Open Delay: The delay time set, before executing the next command, after receiving the open mold signal
- Cycle Time Out: The set time limit for the robot completes a full cycle operation, if the cycle time exceeds the set time, the system will alarm. Every time the program runs to the end command, it is considered a complete cycle, and production count will increase.
- Reset Time Out: The set time limit for the robot to complete a reset, if reset time exceeds the set time, the system will alarm
- Mold-Open Timeout: during auto run operation, the set time limit for the robot to receive a mold open signal (LMO) from the IMM. The waiting time must not exceed the setting time, otherwise the system

will alarm

- Oil Pump Reminder Cycle: Set the amount of time, in days, the system will remind user of scheduled lubrication and machine maintenance.
- Screen Refresh: Screen refresh rate, set in milliseconds
- Step time-out: The set time limit for a command to execute its action. If an instruction time exceeds the setting time, the system will alarm
- Time Servo Fall Asleep: Amount of time a servo drive can be non-operational before alarming out and disabling all motors and drives.
- Screensaver Waiting Time: Amount of time until the controller enters screensaver mode, after the last controller interaction.
- Pneumatic action timeout: The set time for a pneumatic action to execute. If position sensors are not met by the set time, the system will alarm.

WARNING

- Holding LMOE: The open mold halfway signal is for the arm to enter before the mold is fully open. This is instead of using the mold open signal. The IMM must be equipped with this functionality.

Using mold open halfway will increase the risk of crashing

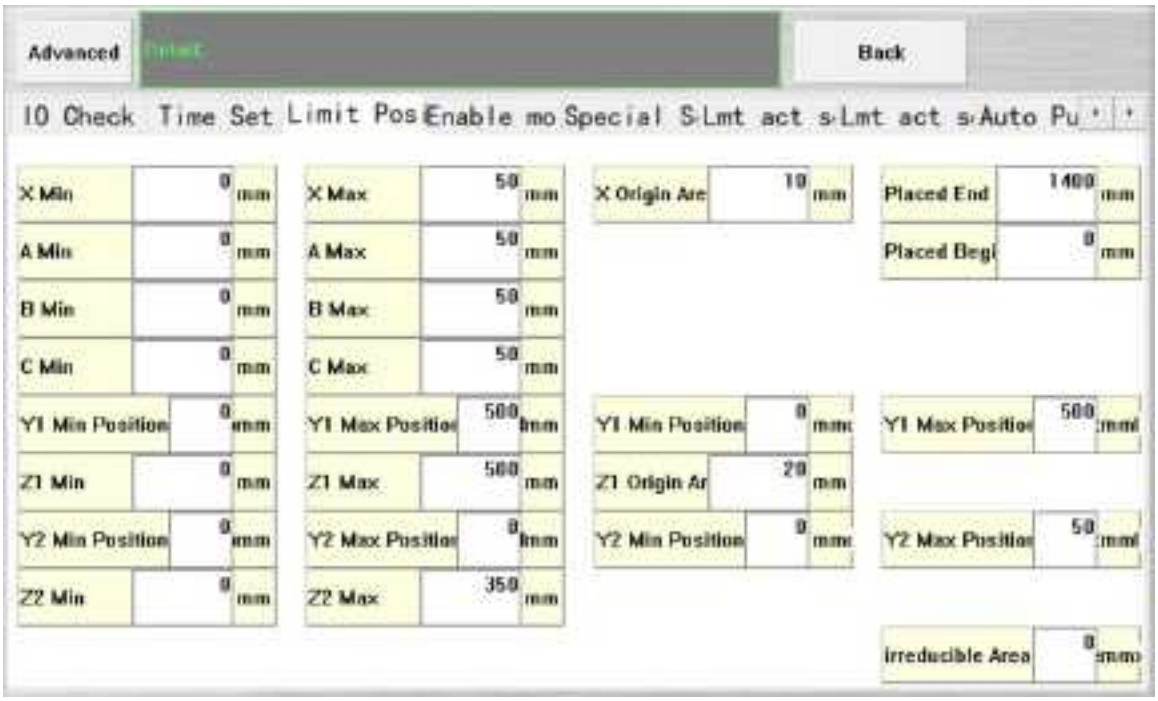
- Default wait time: The set default wait time when inserting a new command in teach mode.

TIPS

Holding LMOE (Euromap67 signal ZA8, Euromap12 signal 14)

Default wait time: Default wait time for each step in when creating a program

c） Limit Position



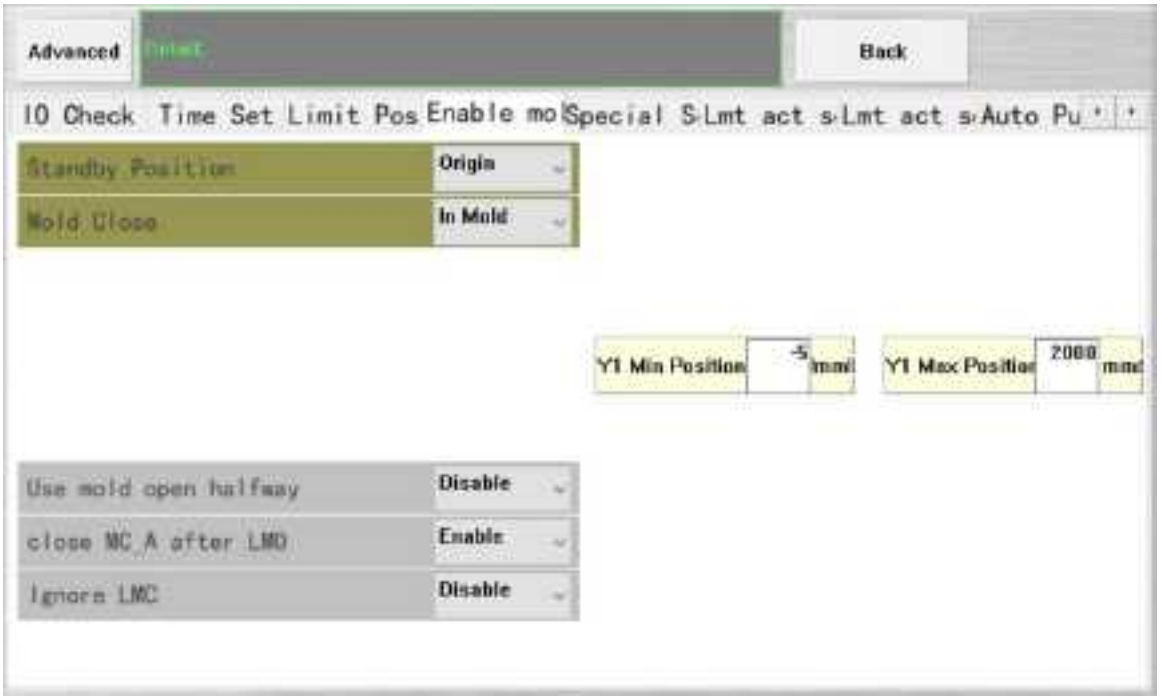
Limit Position Tab is the application limit setting, which is used for the soft limit setting of each axis and position

- Axis Min/Max: Limit positions of each axis's stroke.
- X Origin Area: The set origin area for the X Axis. (Based on the origin offset found in advanced settings)
- Placed Begin/End: The part placement area, set along the X Axis. (Based on the origin offset found in advanced settings) **NOTE:** If traversing in manual mode, the robot will stop at begin/end set positions and the traverse button must be released and pressed again to traverse in or out further
- Y1/Y2 Min/ Max Position in Mold: Y1/Y2 set limit positions when X axis is in set origin area.
- Y1/Y2 Min/ Max Position outside mold: Y1/Y2 set Limit positions when X axis is over the part placement flag.
- Z1 Origin Area: The set origin area for the Z1 Axis. (Based on the origin offset found in advanced settings)
- Irreducible Area: Space between Y axes. (Only applies to dual vertical arm robot

⚠ WARNING

- **"Limit Positions" cannot exceed the "machinery axis limits." Ensure the limit positions are set to a position before the machinery axis limit sensors reach their flags**
- **NOTE: the limit positions need to be adjusted when the origin offset is changed**

d） Enable Mold



- Standby Position: X Axis's standby position before auto run. Default [Origin]
  - ➢ Origin: X Axis is at origin standby before auto run.
  - ➢ Placed: X Axis is at part placement area standby before auto run. (**Note**: when module motion is finished, X Axis will be at placed area)
- Mold Close: Default [In mold].
  - ➢ In Mold: Enable mold close signal is transmitted when the X and Z axes are at the origin area position

If the X axis and Z axis move to the origin area position and the enable mold close signal is not received, check the below conditions:

a. Z position in the set origin area (limit position) or downward standby area (use downward standby function) and have origin signal.
b. C is at pneumatic axis at standby/start point position. (This can be set in "mold set" found in the function tab)
c. Y axis in the closure area (switch mold can be set).
d. X axis in the set origin area (limit position) and has the origin signal.
e. Vacuum check signals are being activated. The check on these signals can be activated/deactivated in Function Set>IO Check.

- ➢ Out of mold: When X Axis moves into part placement area the [enable mold close] signal will be transmitted (**NOTE**: When [Signal Check Position] is set for origin, the [enable mold close] signal will be sent at the origin initially, then the [enable mold close] signal will be transmitted at the part placement area).
- ➢ Manual: Transmits signal [enable mold close] when the command line is reached in the current

loaded program.

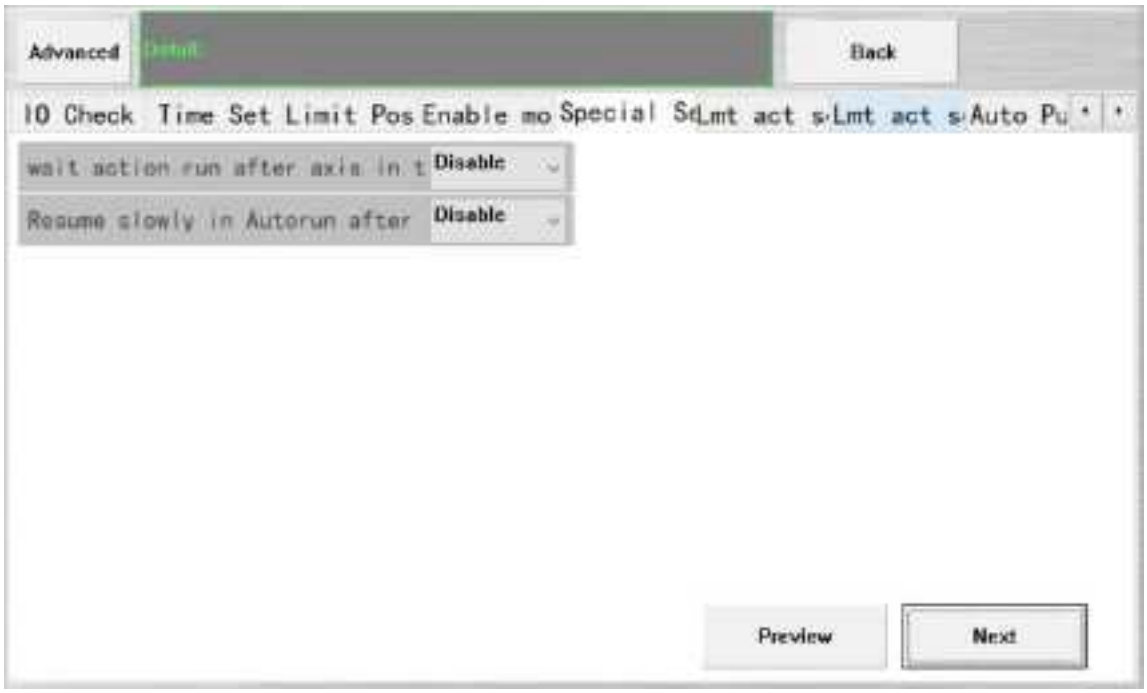
- Y1 Min Position, Y1 Max Position: At origin position, Y Axis enables mold close between Y1 Min Position and Y1 Max Position.
- Use mold open halfway:

➢ Enable: the mold open halfway function is in use the mold open halfway function is not used.

Using mold open halfway will increase the risk of crashing

- Close MC_A after LMO:
  - ➢ Enable: Enable mold close [MC-A] signal will be transmitted after mold open [LMO] signal is received.
  - ➢ Disable: Enable mold close [MC-A] signal will be transmitted immediately after mold close [LMC] signal is received.
- Ignore LMC: Disables the check of [LMC] signal. Open mold [LMO] signal will be received without first receiving the close mold signal [LMC]. *Special reason: some IMM cannot provide a close mold signal or can disable the close mold signal function. If open mold signals are off and time exceeds the set min mold close time, mold close function will activate*

e） **Special Set**



- Use the Stop Signal: Default: [Disable]
  - [Enable]: Module mid-axis action will have stop signal to interrupt movement (Low level trigger, 0V). The manipulator can be stopped immediately. Signal configuration number can be added before'-', to switch to normally open signal (high-level trigger stop, 24V). (Spare inputs or existing inputs can be placed within program steps to stop robot motion)
  - [Disable]: There is no stop signal function in the mid-axis action of the module.

- Resume from Stop Sign Manually: Default: [Disable]
  - [Enable]: After stop signal is received, operation must be activated manually.
  - [Disable]: Operation will continue automatically after stop signal is received
- Injection Signal: Default [Disable] *This is not used in the United States*
- Traverse in Mold: Default: [Disable]
  - [Enable]: X-axis can move in the origin area when Z-axis coordinates are not zero.
  - [Disable]: X-axis is not allowed to move in the origin area if the Z-axis coordinates are not at zero.
- Protection Detection: Default: [Disable].
  - [Enable]: Open the input signal of the detection protective door, stop operation and alarm in automatic mode when there is no signal of the protective door, and disconnect the power in standby mode.
  - [Disable]: The input signal of the protective door has no effect on the control system.

- Ejector Control: Default: [Disable]
  - [Enable]: In teach mode, if an IMM signal “ME Enable ejector forward” or “MK Enable ejector back” is used, the robot will output the signal to the IMM to call for ejector movement
  - [Disable]: The robot will not output signals to the IMM used to move ejectors

- Core Puller Control: Default: [Disable]
  - [Enable]: In teach mode, if an IMM signal “MT Enable Core forward” or “MG Enable Core back” is used for any core, the robot will output a signal to the IMM to move its core/s
  - [Disable]: The robot will not output signals to the IMM used to move cores
- Overmold Function: Default: [Disable]
  - [Enable]: When the X-axis is in the origin area, the Z-axis is not allowed to drop during the Vacuum & Grip Signal output.
  - [Disable]: When the X-axis is in the origin area, the output signal of the Vacuum & Grip Signal will not be detected when descending the Z-Axis

- Keep IO in Alarm: Default [Disable]
  - [Enable]: Alarm status will not stop robot IO outputs.
  - [Disable]: Alarm status stops robot IO outputs.

- Safety Button: Default: [Disable]
  - [Enable]: Ignores manual control button on back of pendant during test run, manual movement, or teaching.
  - [Disable]: Requires holding of manual control button on back of pendant for test run, manual movement, or teaching

- STOP no longer disconnects IO: Default: [Disable]
  - [Enable]: Pressing the Stop button will not stop robot IO outputs.
  - [Disable]: Pressing the Stop button will stop all robot IO output signals. The output signals of the injection molding machine will not be affected.

- Ignore Y-axis at Start Point: Default [Disable]
  - [Enable]: When running in automatic mode, a check is not done to see if the Y axis is at the set starting point, at the start of each cycle.
  - [Disable]: Before initiating, each cycle checks if the Y Axis is at the set start point. If the Y axis is not at the set start point position, the robot will alarm

- Reset Counter when starting Autorun: Default: [Disable]
  - [Enable]: When autorun/testrun is started, the operator will be prompted with a message to clear the current count of parts or to keep counting from the current count.
  - [Disable]: The counter is automatically cleared at the start of each testrun or autorun.

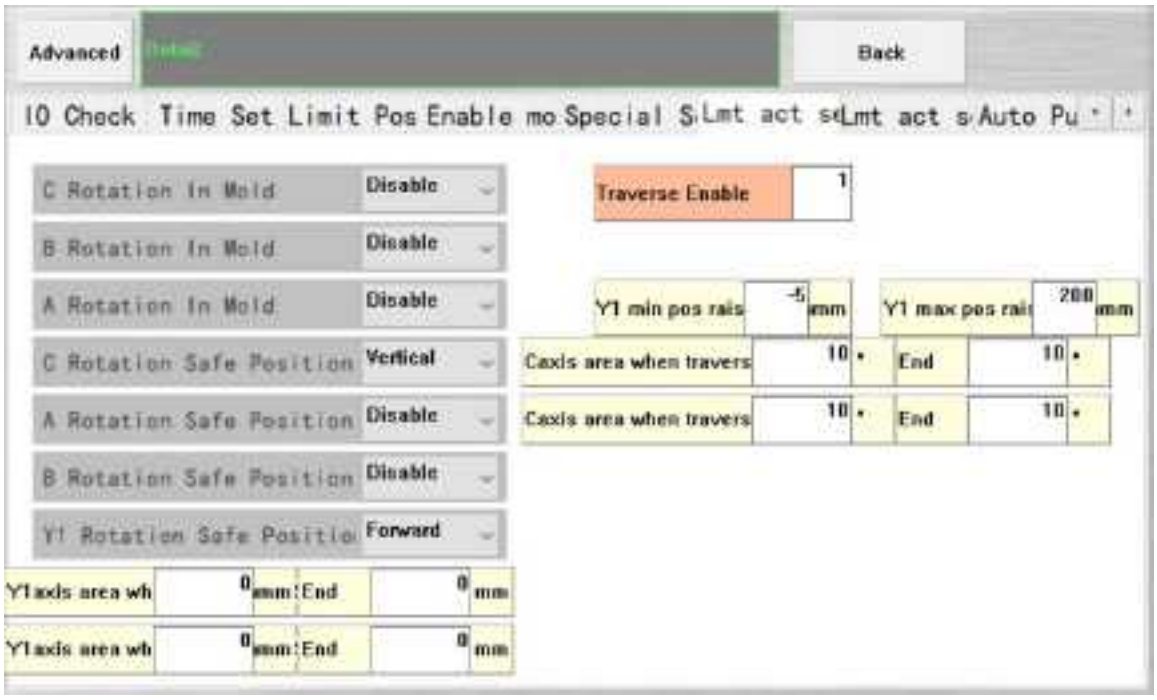
- Edit Products: Default: [Disable]
  - [Enable]: The product count number on the left-hand side of the main screen can be changed
  - [Disable]: The product count number cannot be changed
  -

- Manual Anti-collision: Default: [Disable]
  - [Enable]: In manual mode, open the anti-collision function test application. When used, the manual interface will have anti-collision function configuration and monitor the current torque percentage. (Refer to 1.9.1 axis action chapter)
  - [Disable]: Manual anti-collision configuration is not displayed on the "Manual-Axis Action" interface.

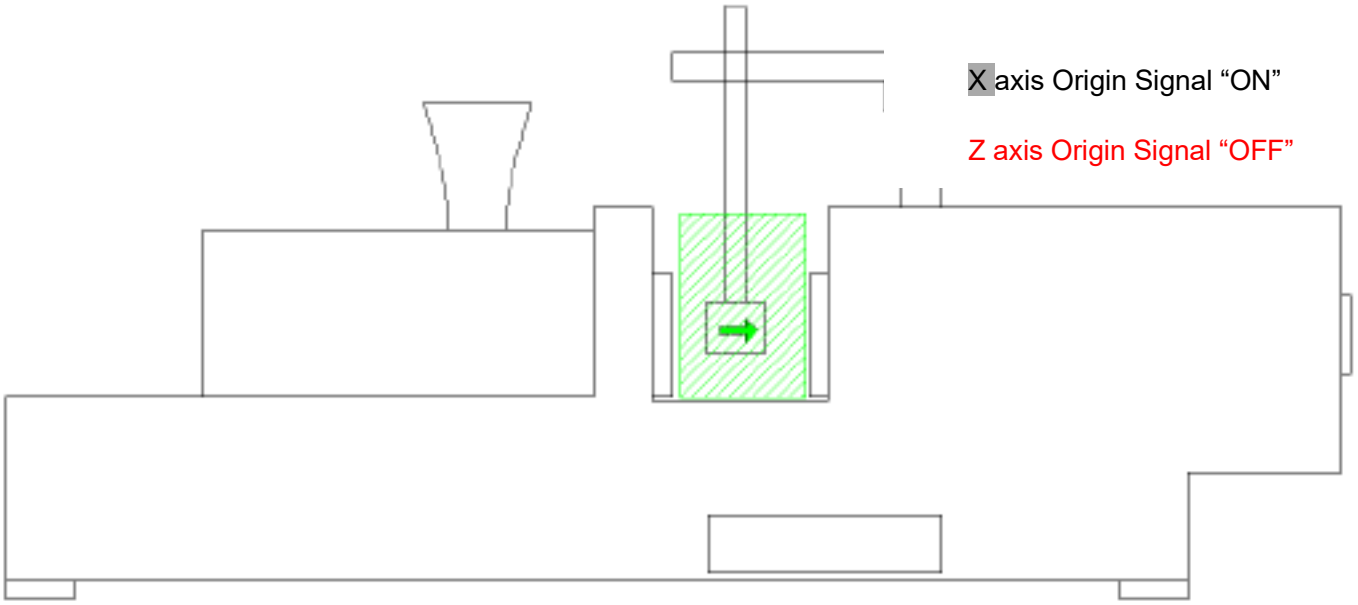
- Teach "Next Step" to Wait for Action Coherently: Default: [Disable]
  - [Enable]: If the current step is not completed, the next action test will start.
  - [Disable]: In teach mode, all the actions are run line by line according to the next step.

- Slow start after fully automatic interruption: In STO program, the automatic operation is interrupted by alarm and can resume operation. Default: [Disable]
  - [Enable]: For the first 3 seconds the speed will be reduced, then speed will be restored to normal after 3 seconds.
  - [Disable]: Restore operation, runs at normal speed immediately.

f） Limit Action Set 1



In mold: It's in the mold area of the IMM. i.e. When the robot is in X axis origin area and at the same time, is out of the Z-axis origin area, it is considered "In mold".



- C Rotation in mold: Default: [Disable]
  - [Enable]: C Rotation allowed in mold
  - [Disable].: C cannot Rotate in mold.

- B Rotation in mold: refer to C Rotation in mold, Default: [Disable].
- A Rotation in mold: refer to C Rotation in mold, Default: [Disable].

- C Rotation safe position to traverse: Horizontal action is allowed only at the special position of the C axis, otherwise the alarm will sound.
  - Vertical: When C-axis is pneumatic, the X-axis will only run when C axis is in the vertical state.
  - Horizontal: When C-axis is pneumatic, the X-axis will only run when C axis is in the horizontal state.
  - Disable: X axis transverse action will execute regardless of the state of C axis.

If C is a servo axis, there are two interval settings when choosing the vertical or horizontal position (as shown in the figure). This can only be crossed in the set position interval and cannot be crossed outside the interval.

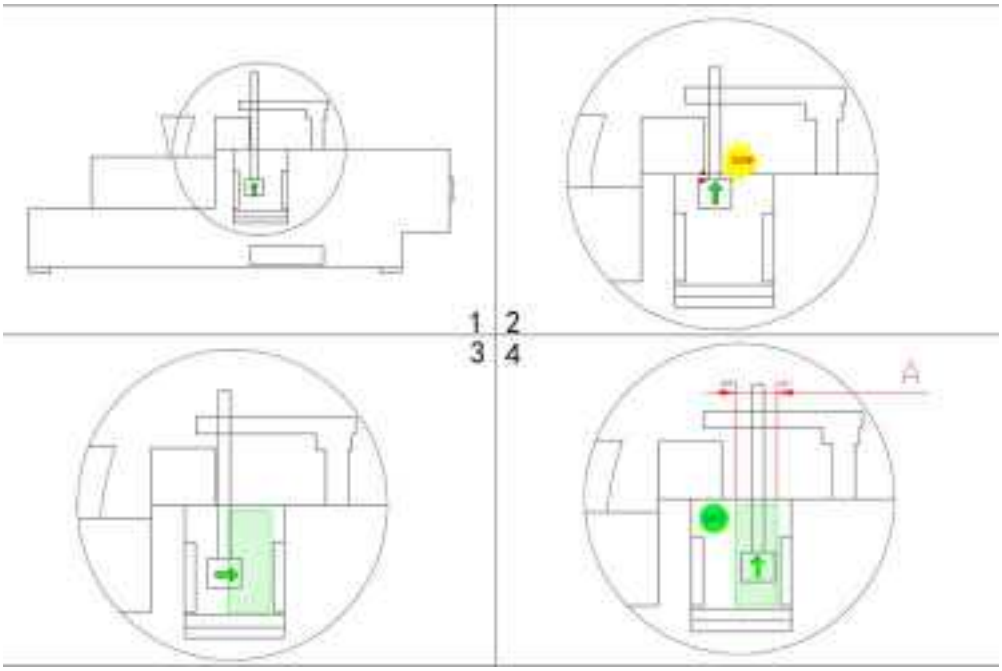
- A Rotation safe position to traverse refer: “C transverse output protection”.
- B Rotation safe position to traverse refer: “C transverse output protection”.
- Y1 Rotation safe position to traverse refer: “C transverse output protection”.
- Transverse allowed signal: the signal can run horizontally.

EXAMPLE *When operating in the working area of the manipulator, disconnecting the "crossing allowable signal" can prohibit crossing and avoid collision*

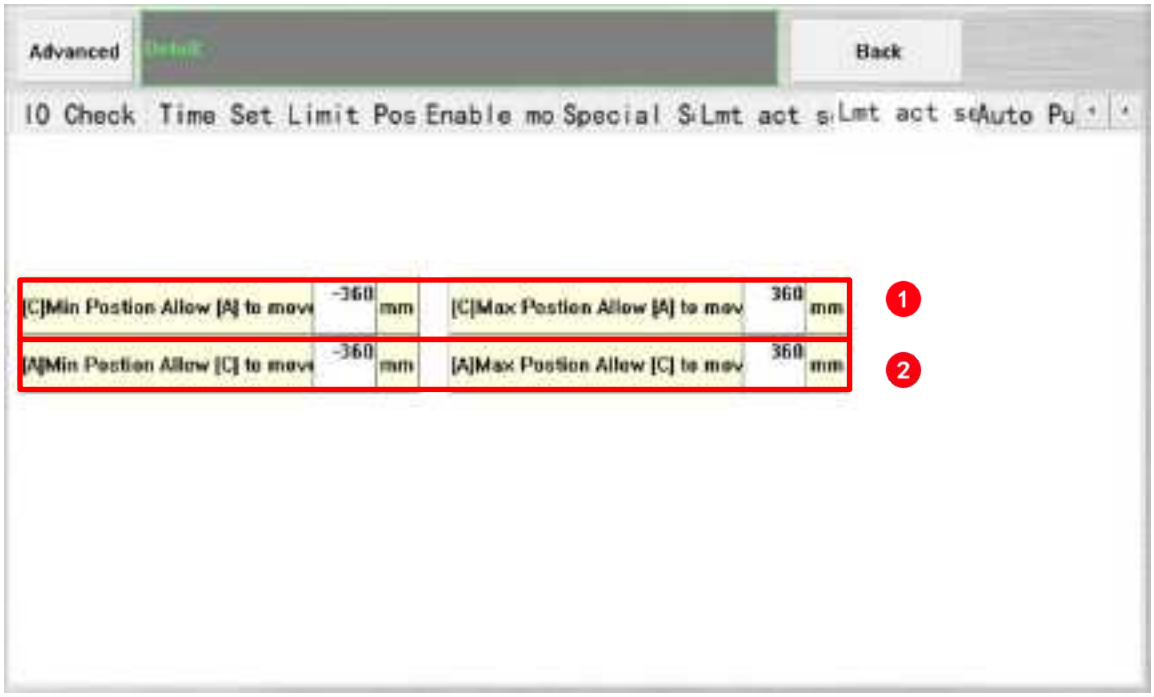
- Y1 min pos raise/ Y1 max pos raise: Z Axis in mold can ascend between Y1 min pos raise and Y1 max pos raise.

●

EXAMPLE *Figure 1/2 shows that if a collision occurs after the Z1 axis of the manipulator is lifted, then the "small rise in Y1 mode" corresponds to A - "large rise in Y1 mode" corresponds to A+, so the Y1 axis must first enter the safe area A before the arm can be lifted, as shown in Figure 3/4.*

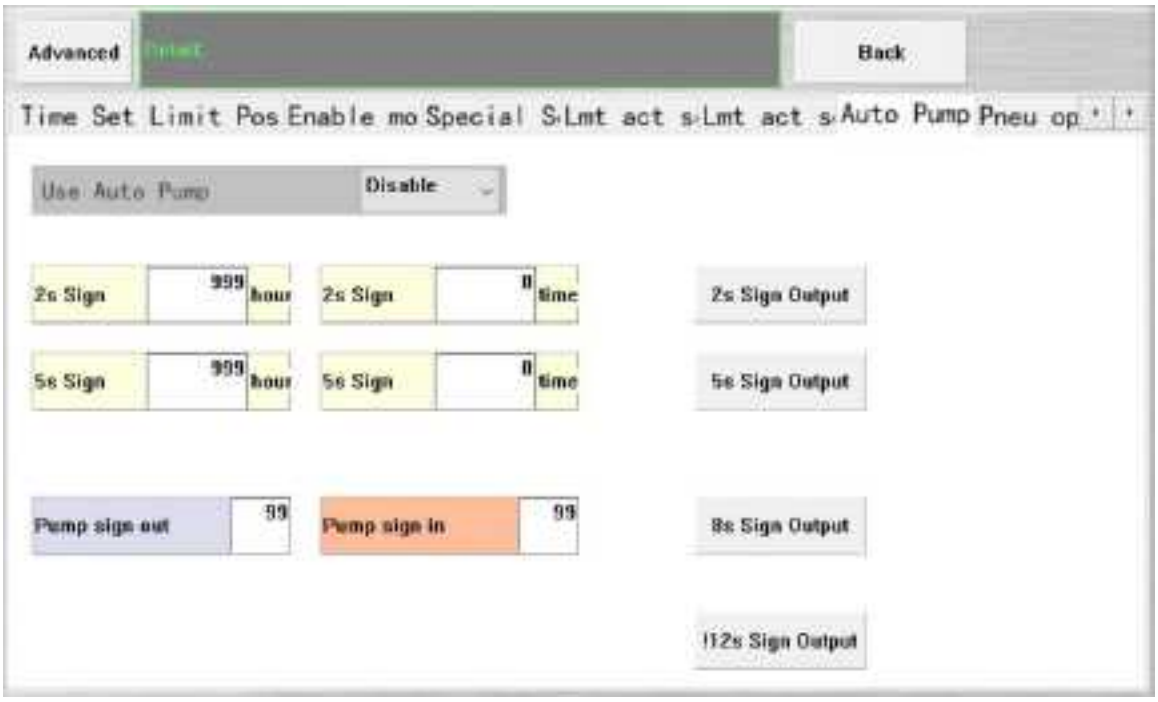


g） Limit Action Set 2



1. When the [C] axis is within the set interval, [A] can rotate
2. When the [A] axis is within the set interval, [C] can rotate

h） Auto Pump Option



Only Support DLS auto lubrication system.

[Enable] auto lubrication pump works. [Disable] auto lubrication pump does not work, and the pump does not output oil.

Define oil outlets 1.1 and 1.2 as group NO.1, and 2.2 as group NO.2; One motion represents an output oil alternatively once.

[2s sign output], group no. 1 outputs oil alternatively once

[5s sign output], group no. 2 outputs oil alternatively once

[8s sign output], group no. 1 and group no. 2, output oil alternatively twice

[12s sign output], group no. 1 and group no. 2, output oil alternatively twenty times in cycle. (to select carefully).

TIPS

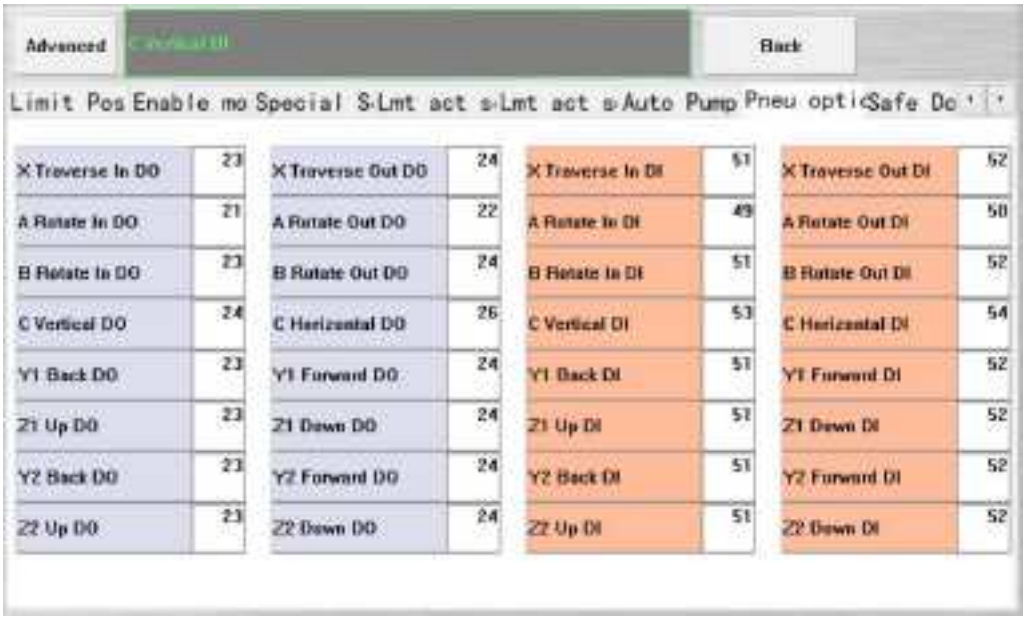
The button on the right side is for debugging and use. Details of the output signal function refer to the specification of the corresponding type of lubricating pump in the random appendix.

motion interval of Group No. 1 oil output (time in total only effective in autorun)

times of group No. 1 oil output

address setting of oil pump IO interface, no need to modify.

i) Pneumatic (Pneu) options



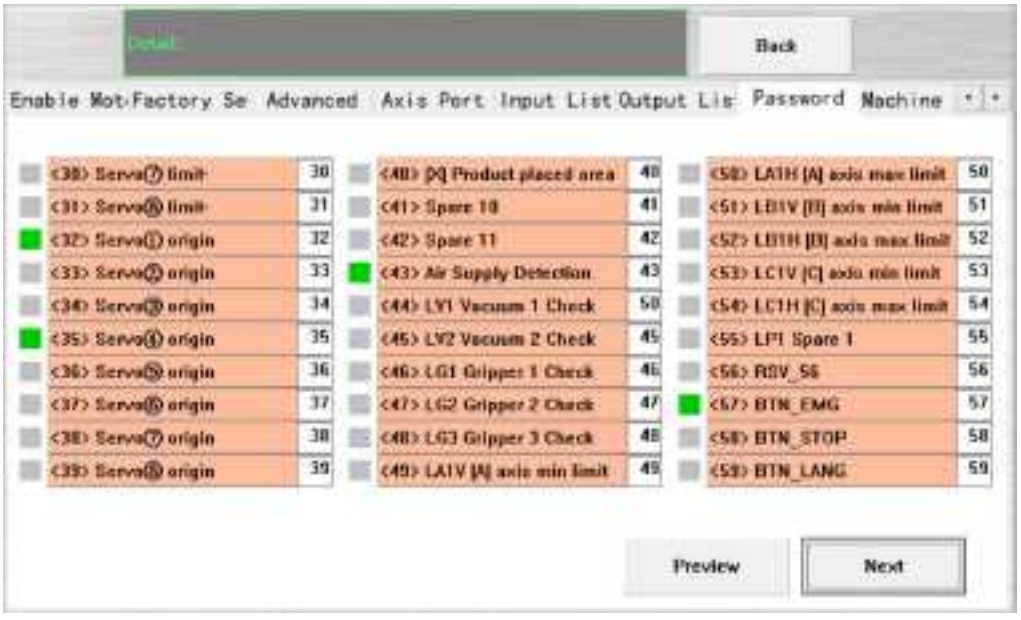
Used to configure signals of pneu axis:

Every pneumatic axis is normally configured with 4 signals:

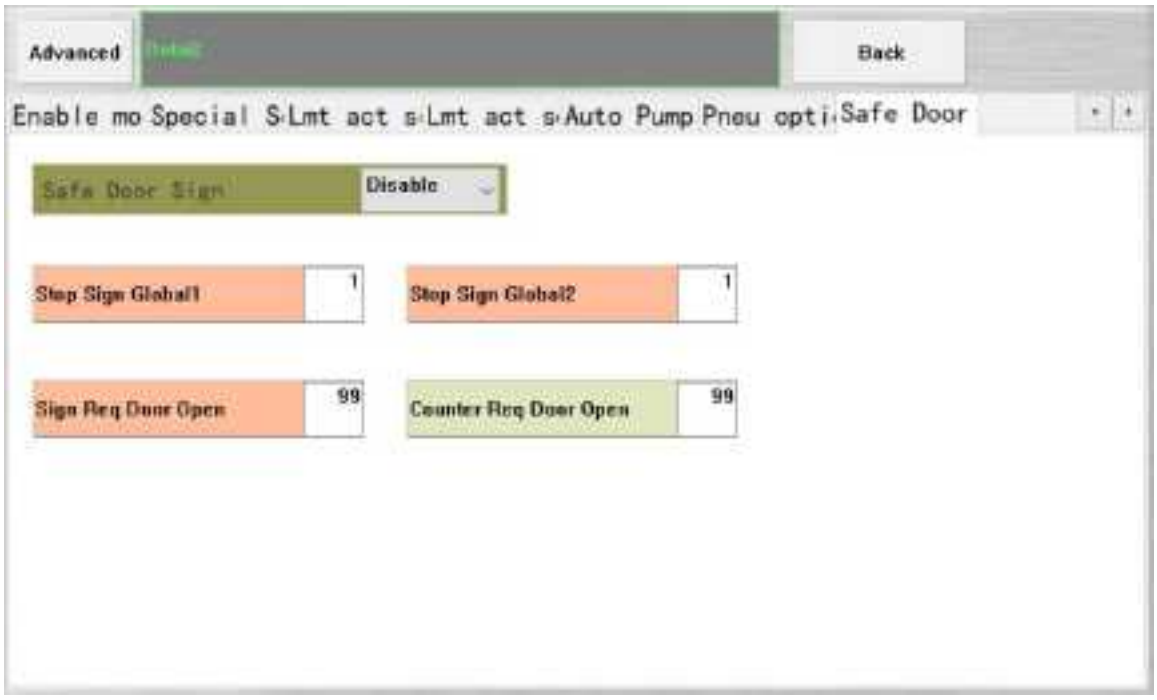
1. Input inspection switch signal in opposite direction: back, traverse in, up, rotate in, vertical.
2. Input inspection switch signal in positive direction: forward, traverse in, down, rotate in, horizontal.
3. Output solenoid valve signal in opposite direction.
4. Output solenoid valve signal in positive direction.

Provided there is no detailed configuration signal for some point, input 127.

TIPS All of them are assigned the corresponding numbers in the Input/ Output Port Table (Trigonometric symbols). As shown in Figure C, the vertical position signal is “<53>LC1V[C]over to limit”.



j） Safe Door



The function is divided into the following two parts:

- 

Stop Sign Global, during Autorun Mode, any “Stop Sign Signal" interrupt (signal "off" trigger), the robot will immediately stop the current action.

Note:

- This function needs to correspond with a missing signal to create a 'stop signal'.
- Difference from the 'stop signal' function: The 'stop signal' is valid only for the set action.
- Add the ‘-’ sign before the signal configuration number, switch to the Normally Open Signal, and the signal is “on”)

EXAMPLE *If “<3>LMD1 safety door 1” signal is set to the same signal as the 'Stop Sign Global’, when the safety door is opened in the automatic operation, the robot will exit auto cycle and enter manual mode. Set Stop Sign Global 1=3* 

The safety door signal is also on input 3.

- Each time the 'Sign Req Door Open’ signal is received, the 'request signal count' is set to 1, and the user can learn the change status of the 'open door request signal' through the counter, and further design the action.

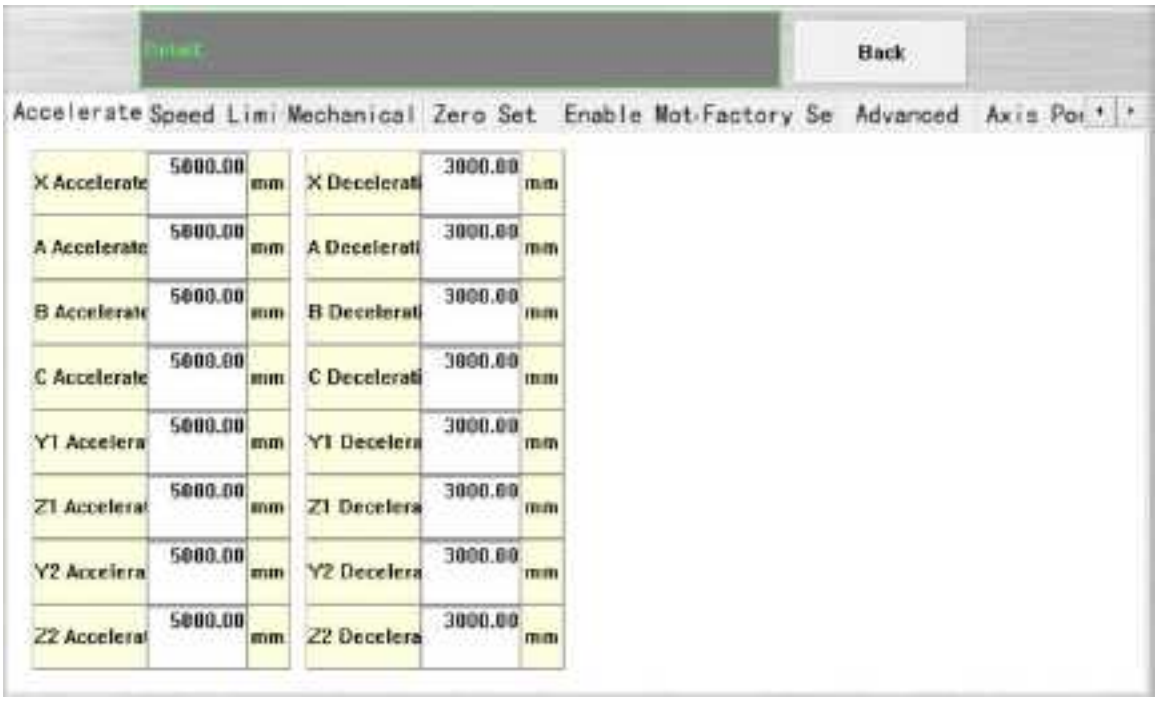
Port address set of “Sign Req Door Open”.

Counter number set of “Counter Req Door Open”.

1.6.1.2 Advanced Set

When the Robot User selects the Advanced Tab in the Function Set, the program will enter the Advanced interface.

a） Accelerate & Deceleration Set



The default acceleration and deceleration of the servo axis (unit: mm/s).

WARNING

If acceleration and deceleration speeds need to be changed, contact Absolute Robot's Service Department to confirm that it is modified to a safe setting. Do not change without prior authorization. Changing this may cause robot malfunction or cause the robot to crash.

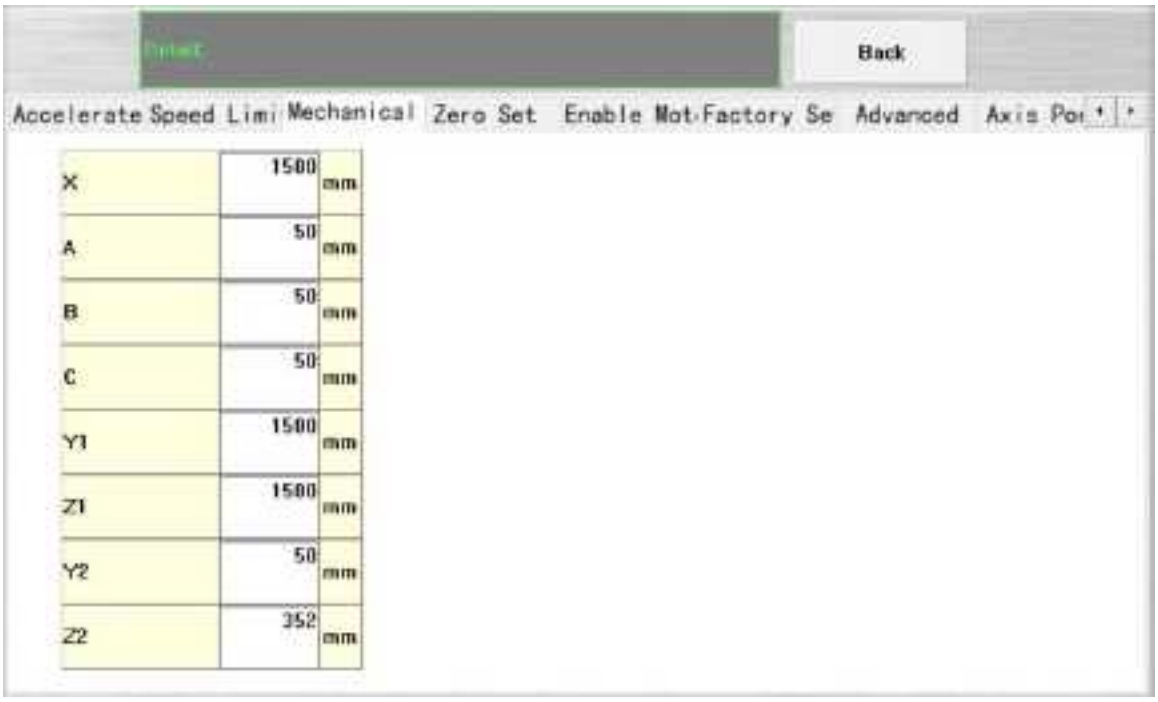
b） Speed Limit Set

Speed Limit Set: robot movement speed set, unit: mm/s. Max speed in Autorun Mode and Manual Mode are expressed as a percentage.

WARNING

If the Speed Limits need to be changed contact Absolute Robot Service to confirm that it is modified to a safe setting. Do not change without prior authorization.

c） Mechanical Limit Set



Mechanical Limit Set: Limits are set according to the actual axis length, unit: mm. These should always be greater than or equal to the limit positions on the limit positions tab in function set.

⚠ WARNING

The **Mechanical Limit Set** is set according to the actual axis length on the robot. **Do not change without prior authorization.** If a parameter is changed, review and test all the strokes in Manual Mode using the slowest speed setting. Increasing the limit above the actual axis length will cause an over torque alarm or damage to the robot.

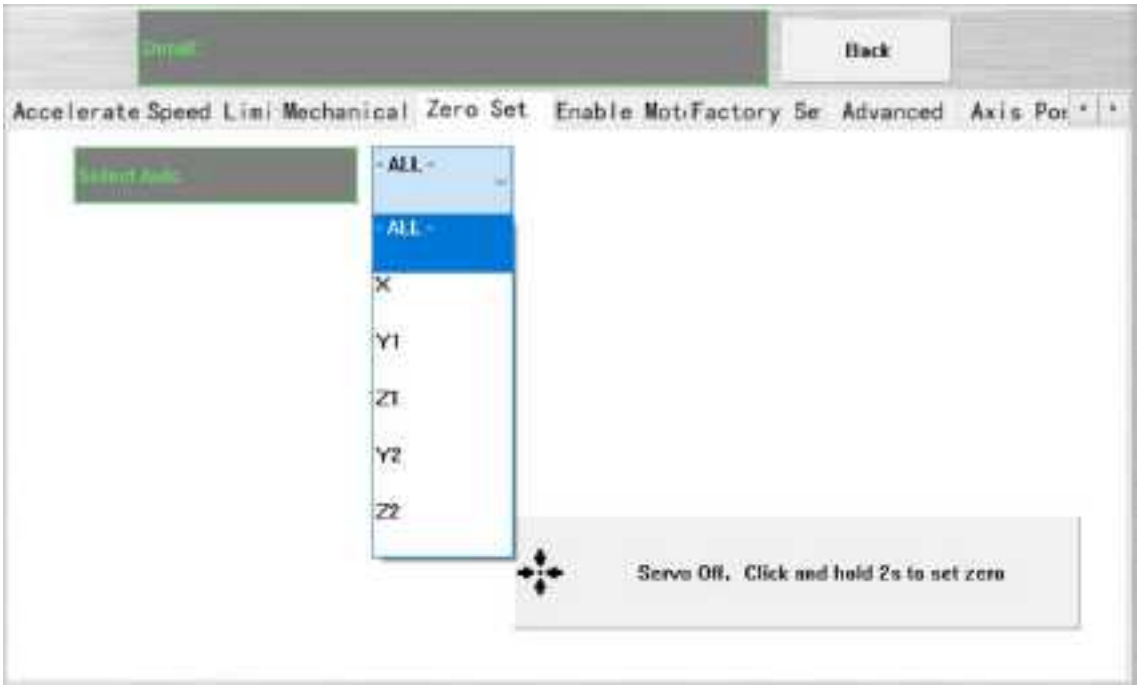
d） Zero Set

- Function description: Zero Set of Mechanical Axis
- Set steps:

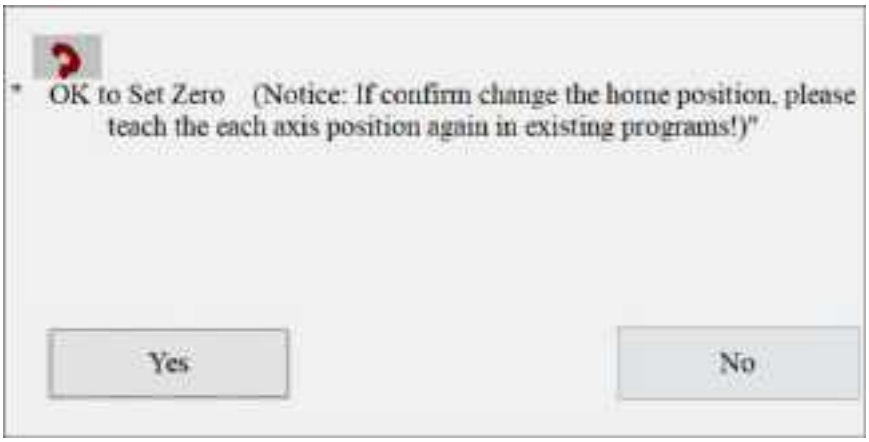
1st step: Manually calibrate the mechanical axis, zero-position according to the example below

NO Yes

2nd step: Servo Off. When the Zero Set is selected, the following display will appear on the HMI. “All” is to set **all** axes to zero, X/Y1/Z1/Y2/Z2 is set the related single axis.



3rd step: When clicking the ”Servo Off” button, Click and hold “set zero” for 2s, the below prompt box will appear on the HMI:



4th Step: Click “Yes” to finish Zero set.

WARNING

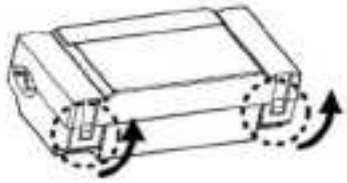
Before Zero Set, Turn Servo Off.

- Set Zero according to the Zero Mark on the robot.
- After Zero position is set, recheck all the parameters of Limit Position, Enable Mold, Limit Action Set, Advanced Set.
- After Zero is set, check all the related parameters of axis position in Mold Set, such as Axis Position, Stack, Offset, Relative Position.
- ZERO SET IN AN INCORRECT POSITION WILL LEAD TO COLLISION!

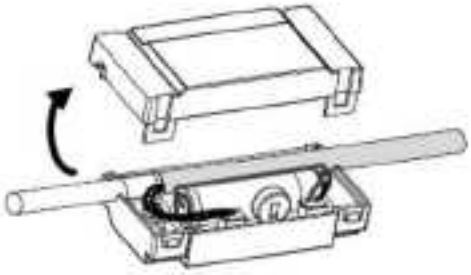
If the driver alarm shows AL060 or AL061, it means the battery voltage of the driver is too small. In order to prevent data loss, change the battery, and reset the “Zero” position.

Note: During the battery change, it is suggested to keep the driver power, or the absolute position will be lost.

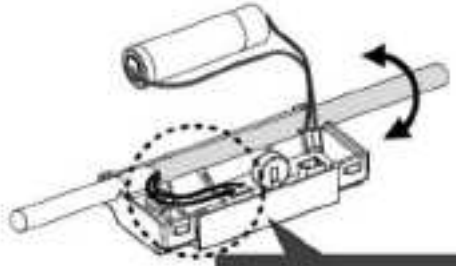
1. Loosen the mortises on both sides to open the battery lid



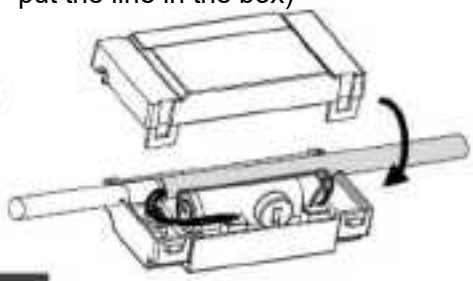
2. Fully remove the lid.



3. Disconnect the connector, and the old battery. Then connect the new battery to the connector.



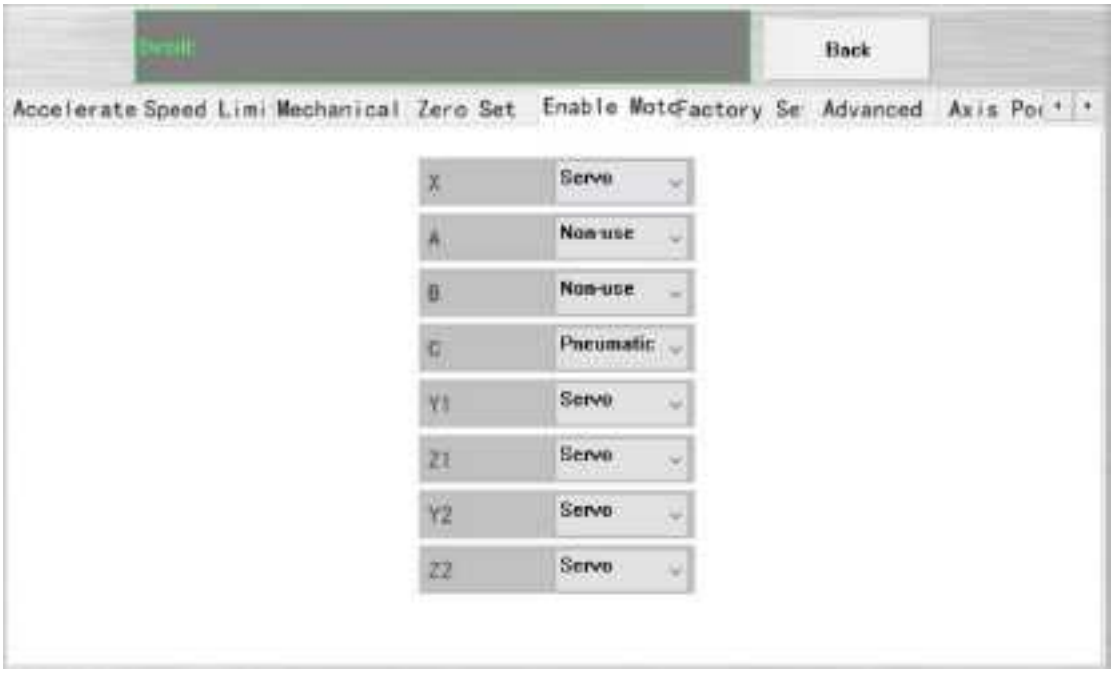
4. Close the battery (Do not forget to put the line in the box)



When changing the battery: If the driver power is cutoff, or the power line is removed, the data may be lost.

Name	Li/SOCl2 Cylindrical Battery
Type	ER14505
Model No.	ASD-CLBT0100
International standard size	AA
Standard Voltage	3.6V
Standard capacity	2700mAh
Maximum continuous discharge current	100 mA
Maximum pulse current	200 mA
Size (D x H)	14.5 x 50.5mm
Weight	about 19g
Operating temperature	-40~+85℃

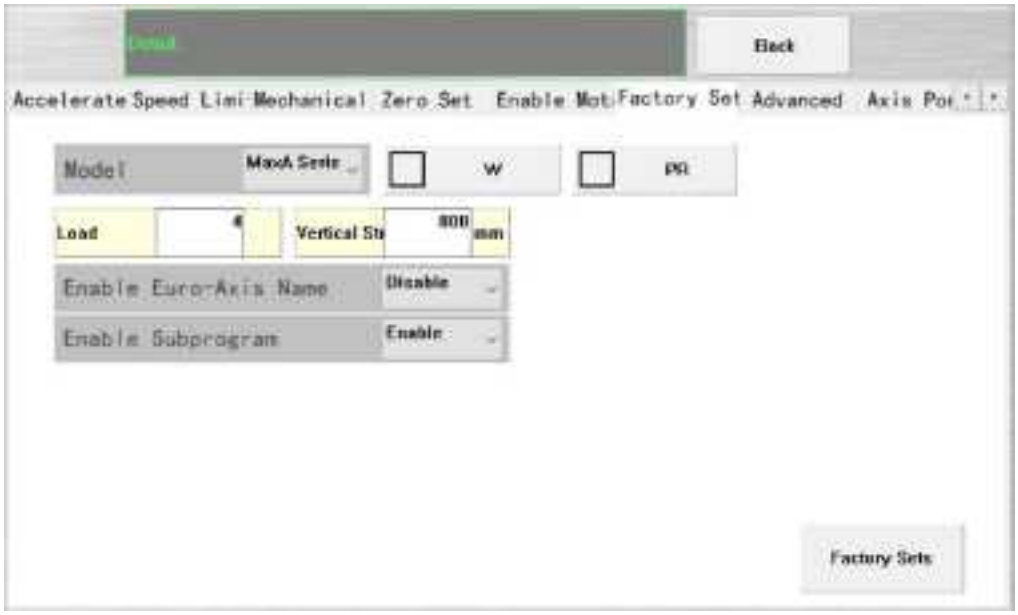
e） Enable Motor Set



Enable Motor: Select enable motor type of each axis 

.

f） Factory Set



Factory Sets as above picture (**Do not** change Factory Sets at will)

- **Model**: “Max A Series”, “Max B Series”, “Max C Series”.
- 

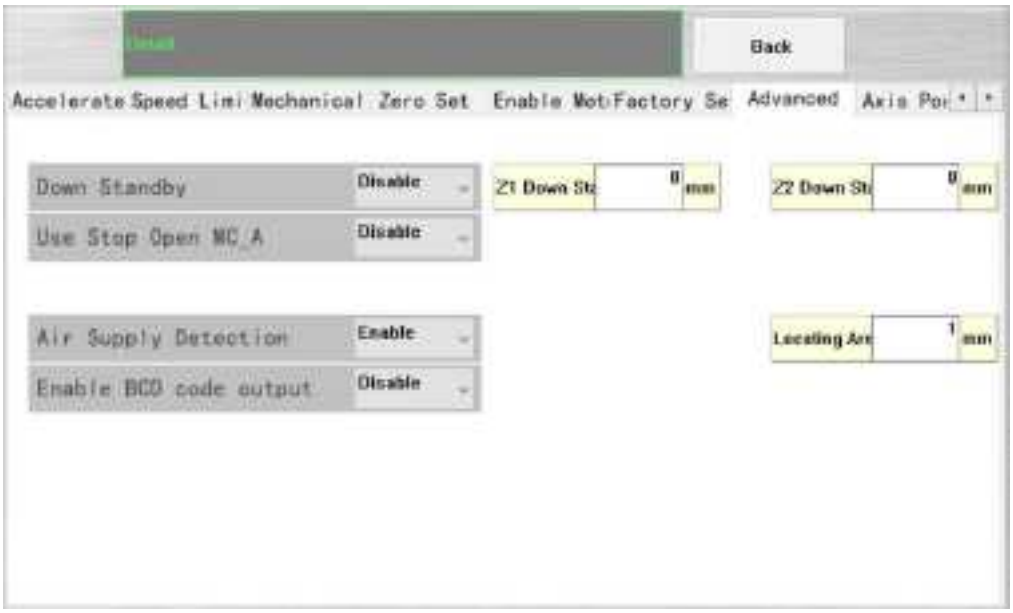
: “W” means Telescopic arm, “PR” means dual arm.
- **Load**: Unit is KG, this value identifies the model number. Do not change this setting to individual load size!

- 

: Vertical stroke.
- Enable Euro-Axis Name: Selecting [Disable] will use the current axis name. Selecting [Enable] will use Euro-Axis Name. Current X axis will change to Z axis, current Y axis changes be X axis, current Z axis changes to Y axis.
- **Enable Subprogram**: If [Enable] is selected, the Help function will change to Subprogram. See the details of this function in 1.7.7Help/Subprogram.

- Factory Sets: all the parameters will change back to Factory Sets, USE WITH CAUTION

g） Advanced Set



- **Down Standby**: Default is [Disable].
  Enable: Z-axis can descend to wait for Mold Open. Necessary conditions:

1) At the set Down Standby area (Z1 Down Standby or Z2 Down Standby).
2) Origin signals of Z1/Z2 are “ON”.

Disable: Z-axis only waits for Mold Open at origin area and can’t descend before Mold Open.

- Use Stop Open MC_A: 

button triggers “MC_A Enable Mold Close” signal. Default is [Disable].
Enable: at the Standby Mode or Manual Mode, it will trigger “MC_A Enable Mold Close” signal if operator presses the Stop button on HMI.
Disable: will not trigger “MC_A Enable Mold Close” signal if the Stop button is pressed on HMI.
- Air Supply Detection: Default is [Enable].
Enable: Always detect Air Supply Signal (<43>Air Supply Detection), When this signal is OFF, it will alert alarm.
Disable: will not detect Air Supply Detection signal.
- Enable BCD code output: Default is [Disable].
Enable: To verify the BCD code in the Mold Set.
Disable: Don’t verify the BCD code.
- 

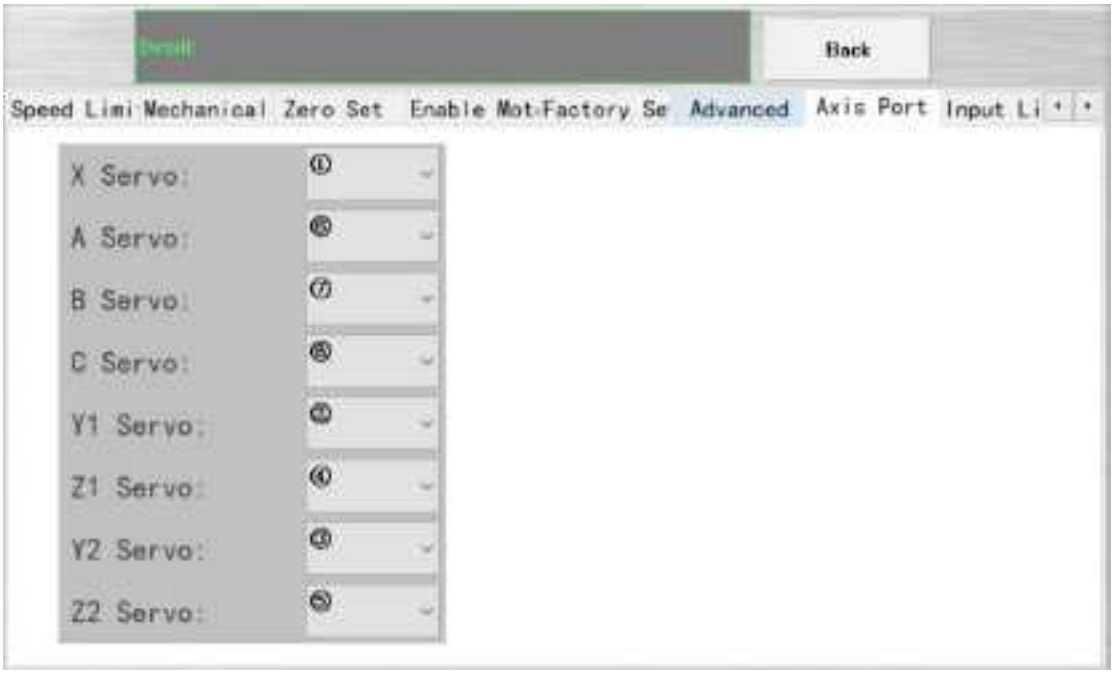
: Set the Down Standby position of Z1, Z2.
Notice: The Down Standby Position must be in the range of Z-axis origin’s metal bar sensor.
- 

: Location Area.
Location Area is a reference value. In Autorun Mode, when the distance between the real-time coordinate of the mechanical axis and the target position is less than the 'Location Area Value', the action is considered finished and the next action will start. Location Area default value is 1mm. The Robot User can change this parameter in “Modify”->” Advanced” according to the specific action.

WARNING

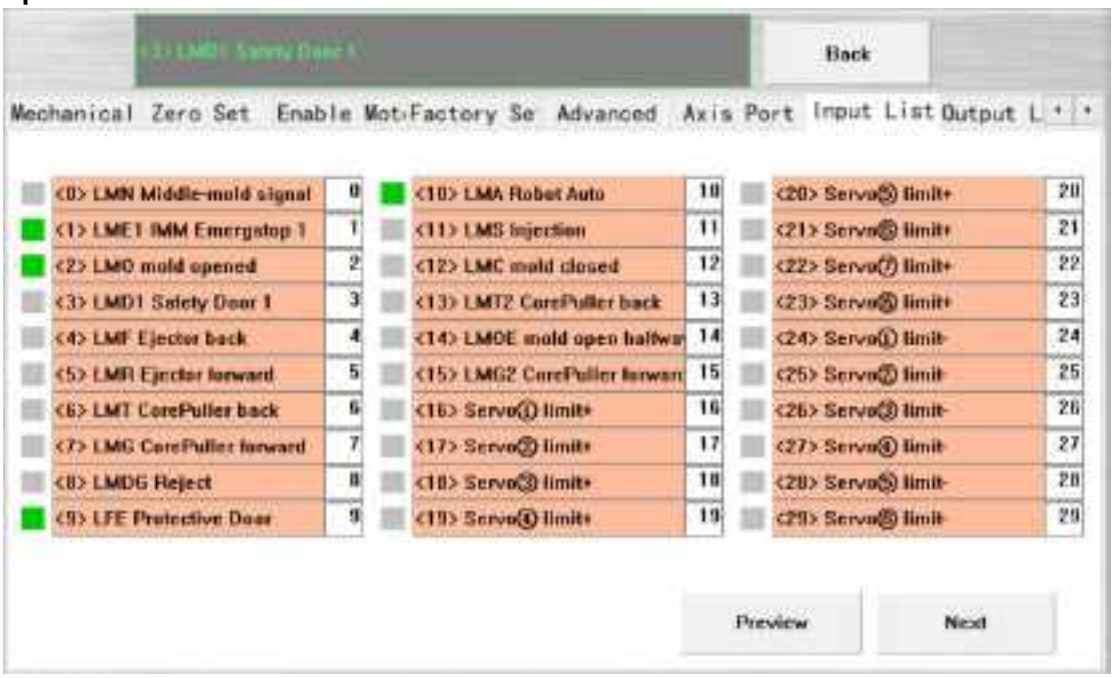
Reasonable use of the Location Area can reduce the action interval and save time. USE WITH CAUTION! UNREASONABLE SETTINGS WILL LEAD TO COLLISION (Parameters that are set too high), ESPECIALLY IN-MOLD MOVEMENT!

h） Axis Port Set



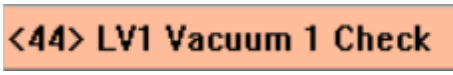
Axis Port Set: Each axis's port has a corresponding port number set in Delta servo drive, do not modify without authorization.

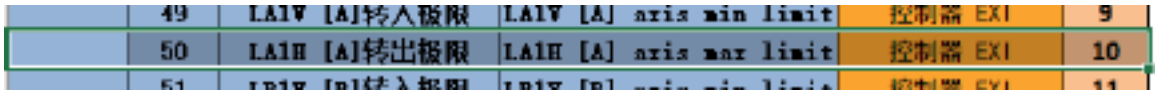
i） Input List Set



Input List: List of all names and serial numbers for Input Port. "■" means the port is ON, "■" means the port is OFF.

EXAMPLE





"<44>LV1 Vacuum 1 Check" is related and confirmed by 50 Physical Point (it's in the GUS Controller DI 10).

j） Output list

Output List: List of all names and serial numbers for Output Port. “ ” means the port is on, “ ” means the port is off.

k） Password Set

Password Set:

1.Select the Password Level.

2.Click New Password.

3.Key in new password and click “OK”.

4.The below interface appear on the HMI:

5.Click Repeat Password.

6.Key in new password and click “OK”.

7. The below interface appear on the HMI:

8.Click “**OK**”.

9. Click “Know”. Password is changed successfully.

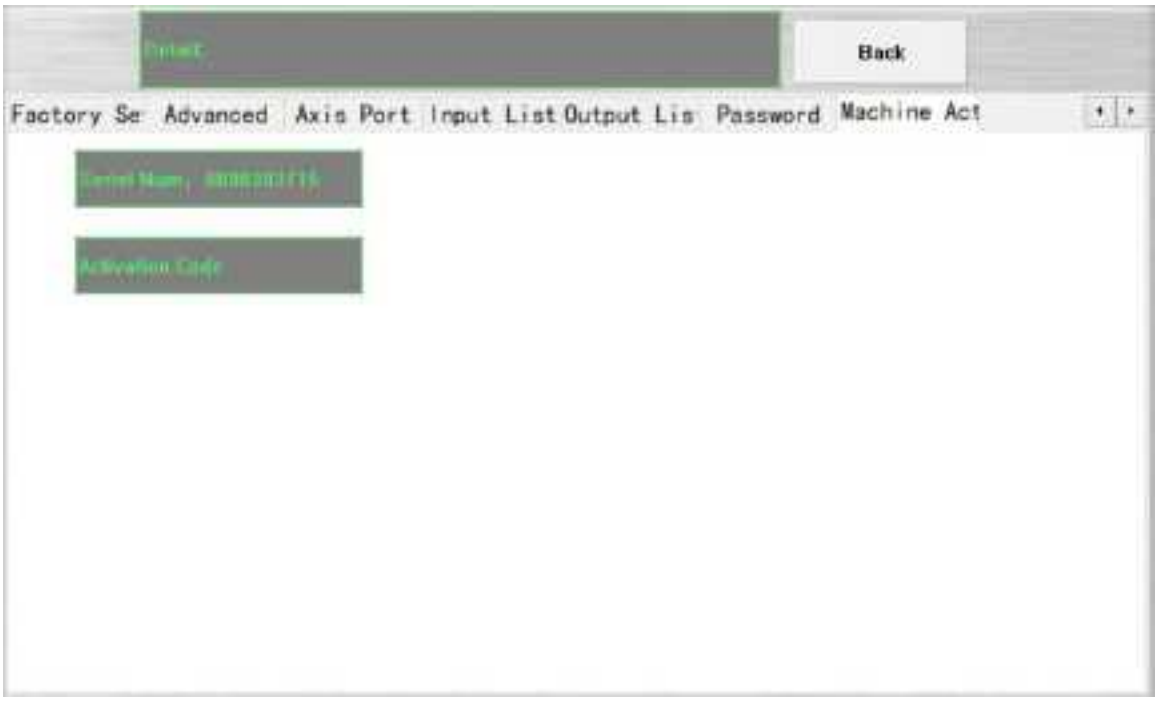
Restore Password (S level)

1. Click “Restore All Password”.

2. The below interface appears on the HMI, check if all passwords are restored according to Factory Set:

3. Click “OK” to restore all passwords successfully.

l） Machine Activation



Machine Activation page is set by the factory, do not modify without ARI authorization.

1.6.2 **Stack Set**

Parameter set for stacking actions. Refer to 1.6.4 Teach Stack Motion. Click “Stack Set” in the function interface to enter the stack set interface.

Stack parameter: parameters used to determine how products are stacked. “ ” means stack parameter is selected. “ ” means stack parameter is not selected.

Order: This is the order at which the axis will move. Click on the box of the corresponding axis to switch the order to be first/second/third.

Direction: Stack direction set. This is the direction in which the axis will move. X-axis: traverse out positive, traverse in negative. Y-axis: forward positive, back negative. Z-axis: down positive, up negative. You can change the direction by clicking on the corresponding box.

Start Position: This is stack position of the first product, the position where the stack will begin. You can manually move the robot in this page to the desired start position. Click on the corresponding axis box to move the robot manually.

Qty: The number of products being placed in each direction. The number of products that can be stacked is limited by the size of the placement area and the size of the product. Click the stack quantity column of the corresponding axis to enter the number of stacks in the direction.

Product Space: This is the distance (mm) that the products being stacked will be spaced apart.
Pile Check Signal: When entering the stack motion, first check if there is this signal. If it does not exist, it will not enter the stack and the robot will alarm out.

EXAMPLE How to set stack parameter

1. Click Stack Set to enter the below interface:

Start Position Set:

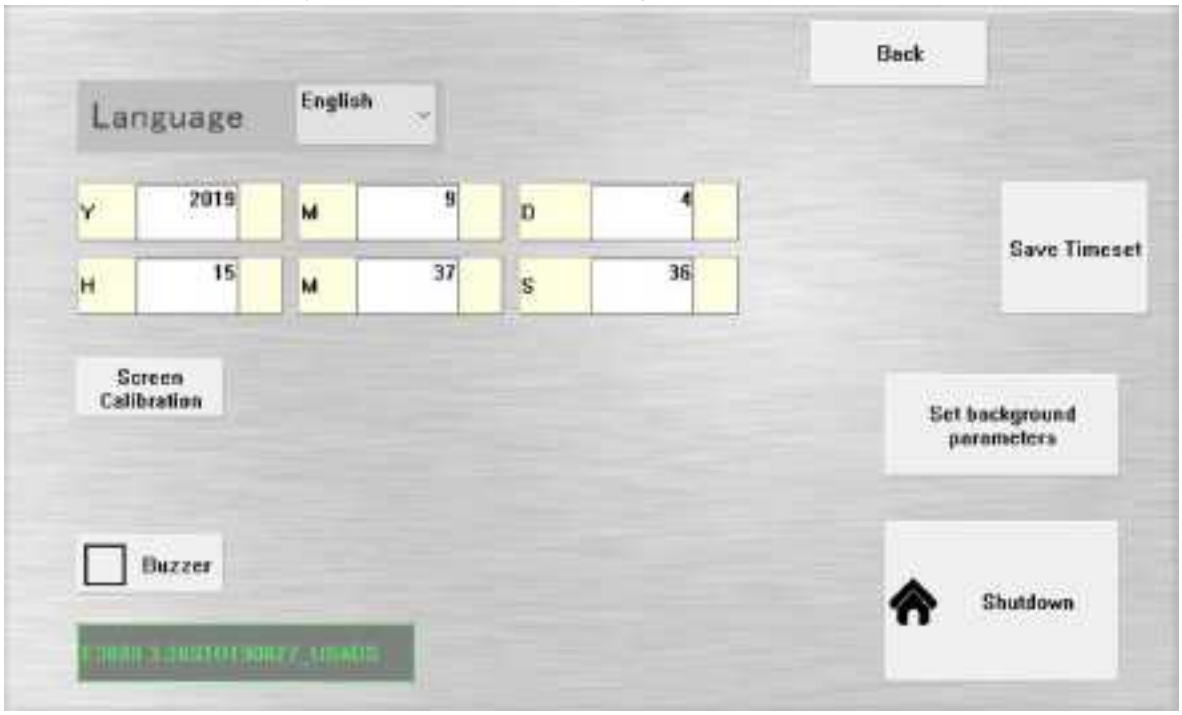
1) Click the corresponding start position bar of the X axis.
2) Press and hold "Traverse Out " to the target position (100) while holding down the manual control button on the lower left of the hand controller.
3) Click "Yes" to confirm.
4) In the Teach mode, insert the corresponding stacking motion.

Refer to Section 1.6.4 Stack Motion to complete the stack function.

1.6.3 System Set

The System Set Tab allows the Robot User to change the robot's time and date display, calibrate the HMI touch screen, enable Buzzer, set background parameters (enter into CPAC) and turn the alarm on/off, shut down the controller system etc.

Once the Robot User selects the System Set Tab, the following screen will appear.



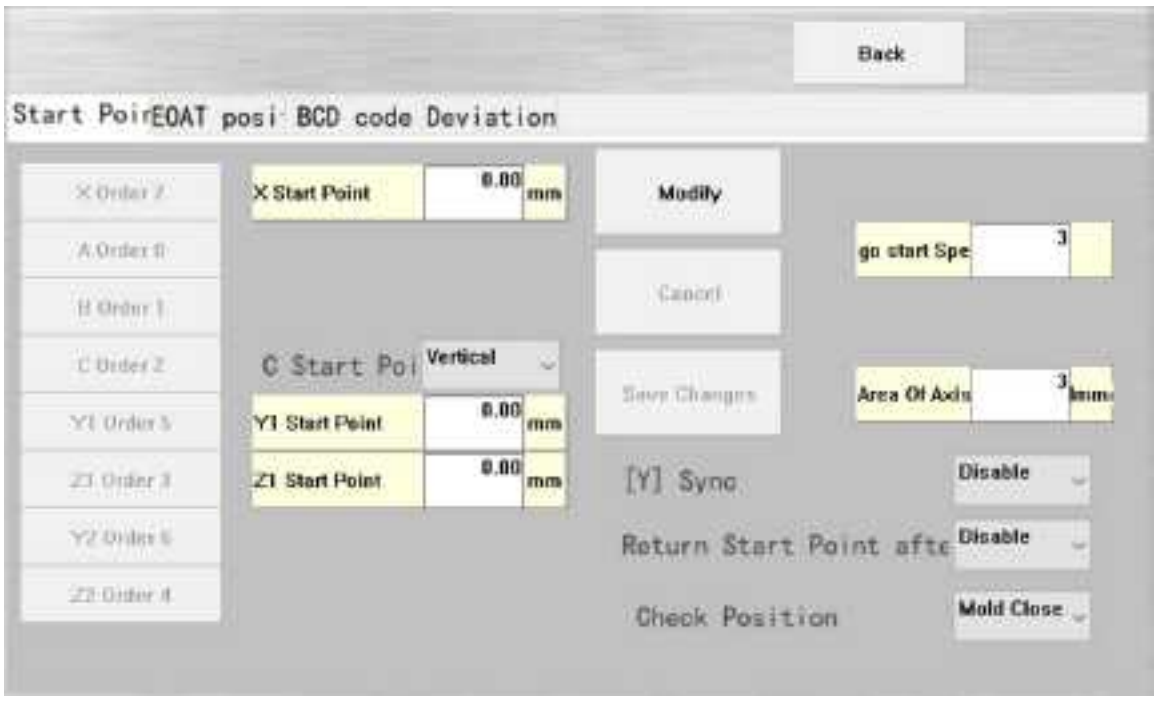
- Language Selection: When the showing language is not the Robot User's local language, it can switch the language here. The system will provide the Language Package; thus, the Robot User can customize the display language.
- Time Set: Here, the user may change the date and time setting (Do not forget to save).
- Screen Calibration: Calibrate the touch point. After entering the Screen Calibration interface, click the Cross Center to exit the interface according to the hint.

- Buzzer: If this function is selected, when the alarm appears, it will trigger the Buzzer to make a sound.
- Set background parameters (enter CPAC): Do not change without authorization! If the Robot User hopes to set the parameter, contact the supplier or manufacturer to confirm it is authorized.
-  : Current Software Version No.

1.6.4 **Mold Set**

This Mold Set Tab allows the Robot User to set Start point, EOAT position, BCD code function, Devi Position etc.

1.6.4.1 Start Point Set

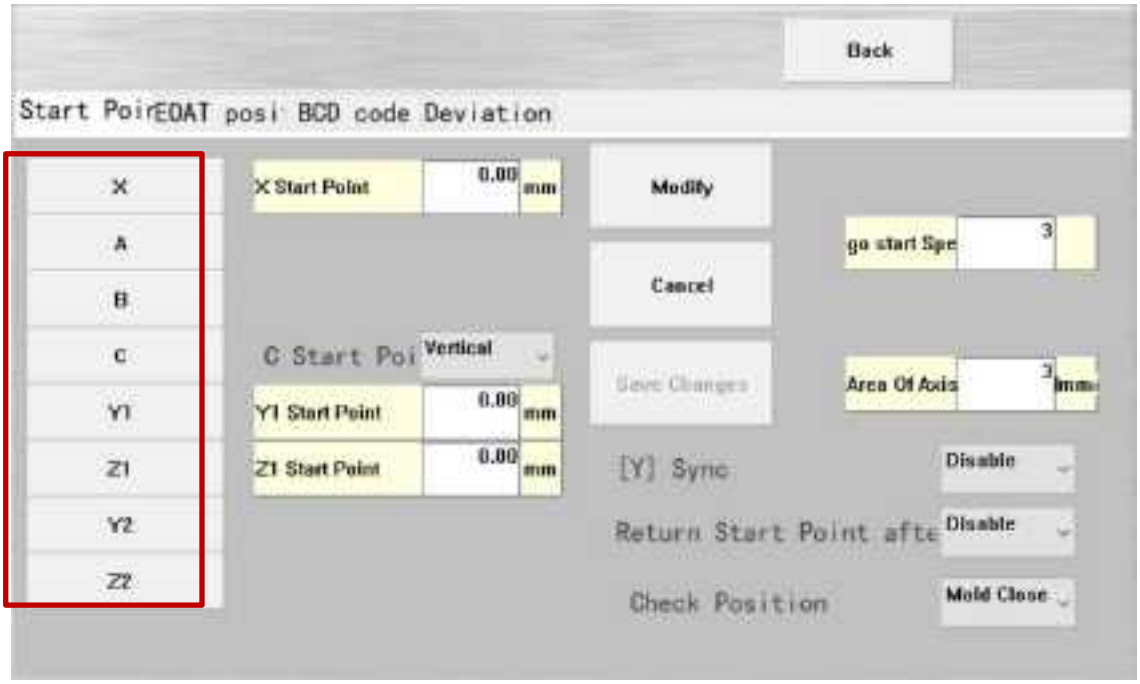


- **Start Point**: Set all axes' Start Point units: mm.
- **Go Start Speed**: Set the speed to go to the Start Point. (1-10)
- **Y Sync**: If the Y axis has dual arms, selecting this function can make the two axes move in the same direction, avoiding the alarm caused by the sequential action.
- **Auto Return Start Point**: When the user selects this function, after Reset, it will atomically return to Start Point.
- **Check Position:** Default is Mold Closed.
- **Mold Close:** If the Robot User selects Mold Closed, before the robot goes to Start Point, the robot will follow the status of Mold Closed.
- **Z Origin:** If the Robot User selects Mold Closed before the robot goes to Start Point, the robot must be at the Z Origin.
- **Area of Axis:** Set the allowable offset range of Y axis.
- **Modify:** Change the order of all axis to return. The smaller number, the faster the return to Start Point. In the picture above, A is 0, B is 1, X is 7, so A is the first axis to go to Start Point, Z is the last axis to go to Start Point.

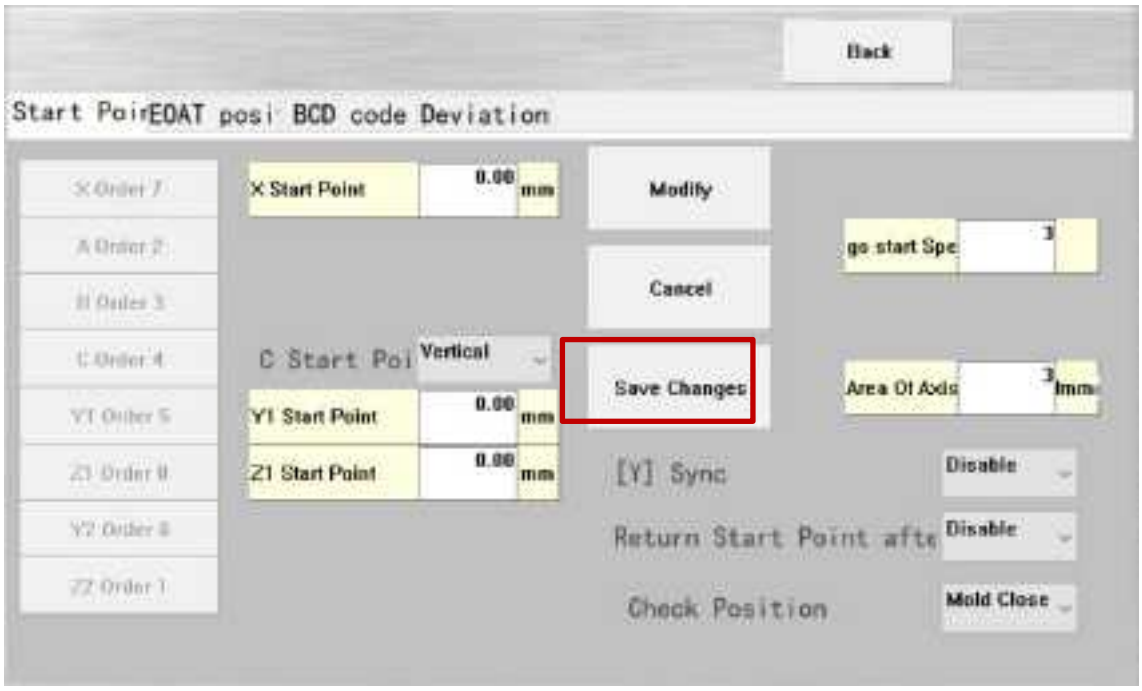
EXAMPLE The steps to modify the orders to go to Start Point:

1. Click “**Modify**”.

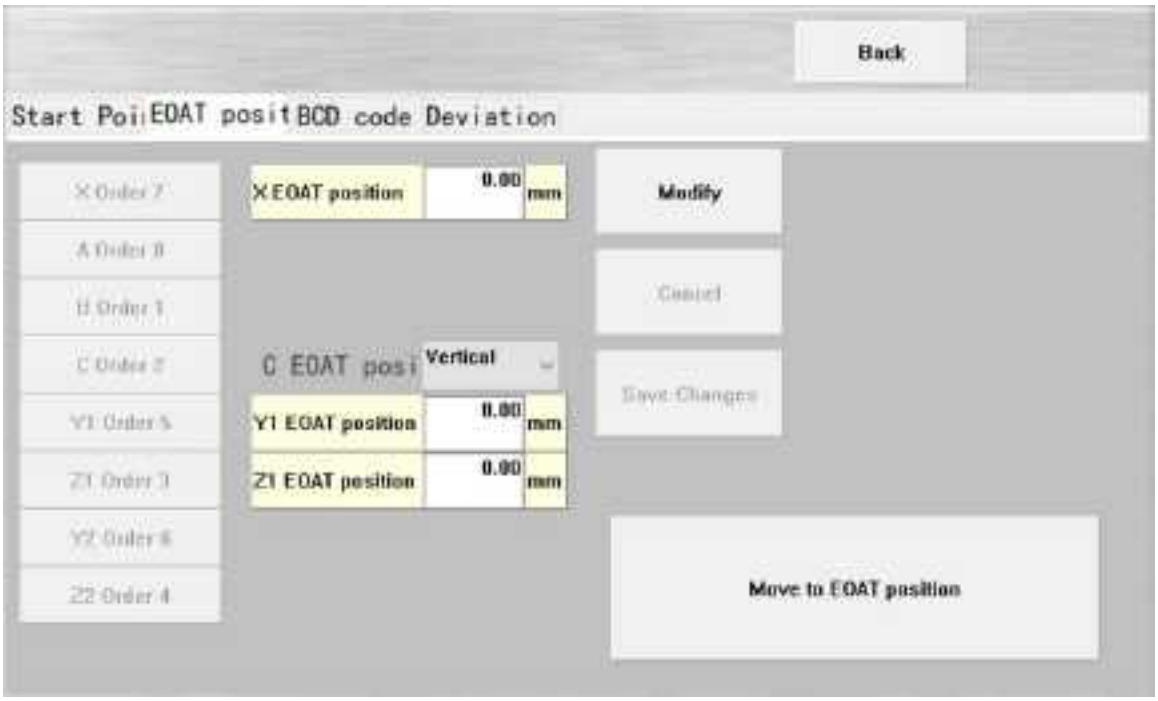
2. Click each axis according to Robot User’s requirement.



3. Click “**Save Changes**”.

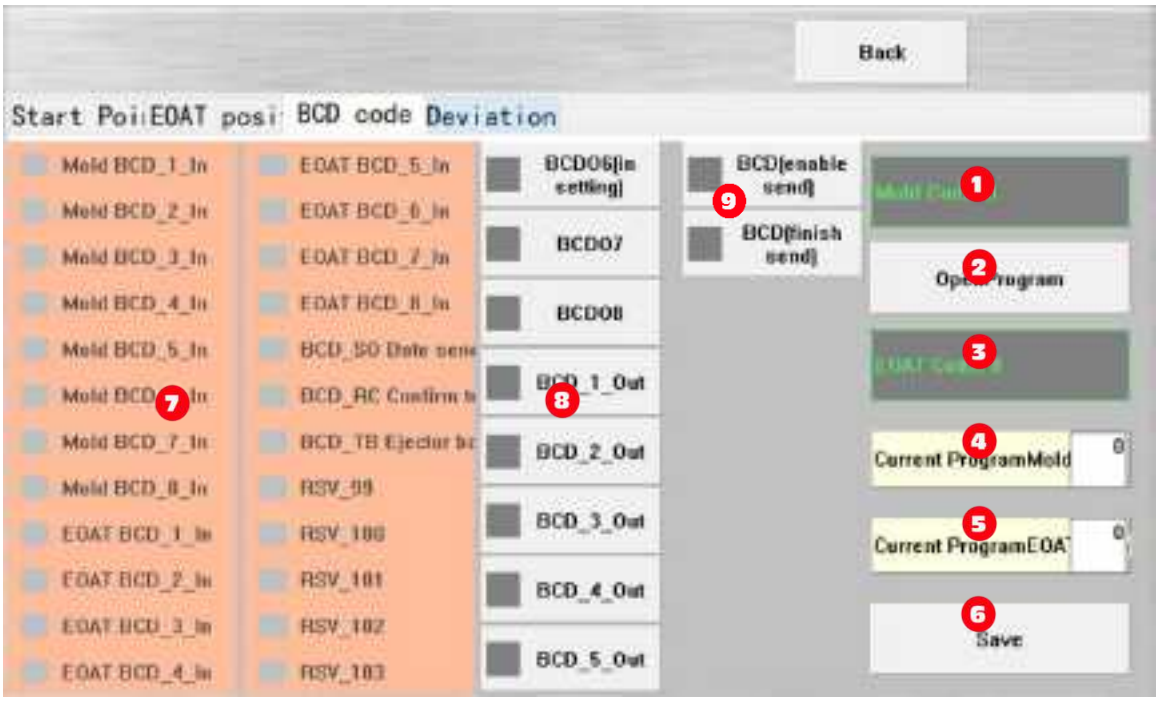


1.6.4.2 EOAT Position Set



- **EOAT position**: The EOAT position of each axis, unit: mm.
- **Modify:** Change the order of EOAT to return start point. Same method as Modify
- **Move to EOAT position**: Click this button, the robot will move to EOAT position.
- See reference set method in 1.7.4.1Start Point Set.

1.6.4.3 BCD Code Set



① Mold code of IMM.
② Click this button to open the Program corresponding to the mold code of IMM.
③ EOAT code currently equipped by the robot.
④ Set the mold code of the current program, click “**Save**”.
⑤ Set the mold code of the current EOAT, click “**Save**”.
⑥ Save the codes of ④ & ⑤.
⑦ Input signal of BCD code.
⑧ Signals which are output according to mold code of IMM.
⑨ Function signal of BCD.

1.6.4.4 Deviation Position Set

The deviation position (offset position) is referred to as "production count". In general, every action cycle "production count" increases once, plus 1 each time, we call it a new one.

In special condition, it is necessary to change the 'production count' in the Autorun process. It can be operated by counter number <100>, which has a built-in 'production count'.

- **Int Cnt**: Indicates that each **n** mold is offset.
- **Ret Cnt**: Indicates that after each **n** mold, it will return to the Start Position.
- **Tag Start**: Start coordinate position.
- **Devi Dis:** The value of each deviation(offset).

In the figure above, the relationship between the “production count” of No.1 and the position of the Axis Motion is as follows:

Mold no.	1	2	3	4	5	6	7	8	9	10
position	90	90	96	96	90	90	96	96	90	90

That is, the “Production count” is 1, the axis will move to 90, the “Production count” is 3, and the axis will move to 96. The specific usage is as follows:

EXAMPLE

This example demonstrates the combination of the 005Y axis motion in the following program with the No.1 in the above figure and a change to be the offset motion.

1. After inserting the Axis Motion program in Teach mode, go back to the main page and select modify. Go to the Modify page and click on “005 Axis” motion line.

2. Click Advanced, go to Advanced Set page, Click 

, display Y1 axis Advanced Set interface.

3. Devision Type: Select as picture 

4. Devi Tag: Set “1”. 

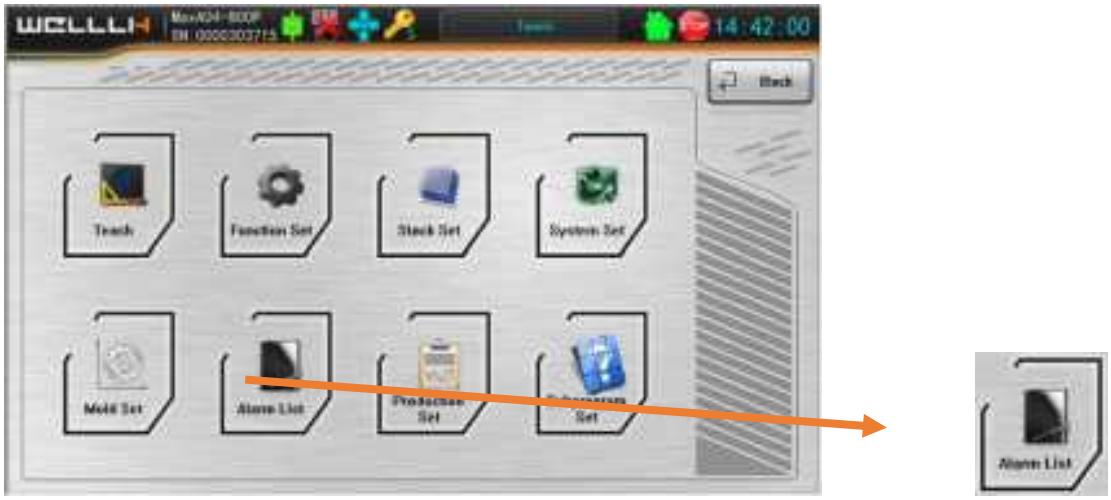
Click "Back" and click Save to confirm. The corresponding axis action line will be replaced with a green color.

The Y1 axis transverse movement target coordinate inserted at this time will refer to No.1 in the offset set page, and the Y1 axis motion will determine the moving target position based on the value of production.

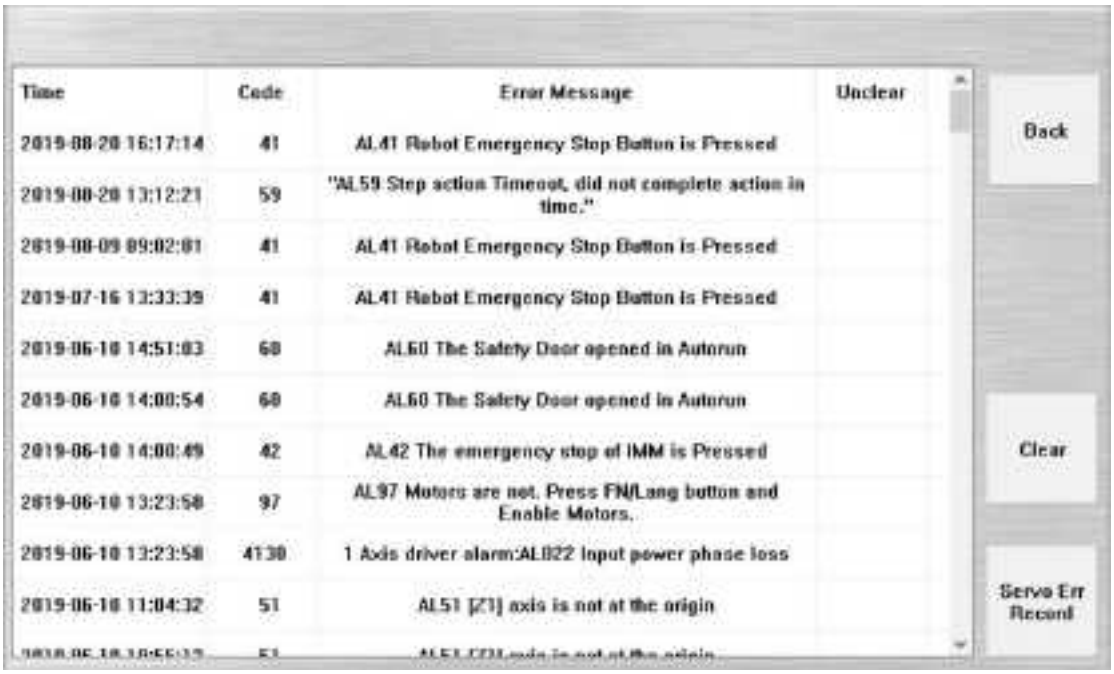
TIPS If the offset count is less than or equal to the reset count, there is no offset affect.

1.6.5 **Alarm List**

The Alarm List Tab allows the Robot User to view and clear robot alarm messages. This robot's alarm list can save up to 128 alarm messages. If the alarm is not clear, there will be a "*" in the Unclear item. The Robot User can only clear alarm messages if they are signed into level" S".



When the Alarm List Tab is selected, the following display will appear on the HMI.



1.6.6 Production Set

The Production Set Tab allows the Robot User to manage production planning tasks and control the conveyor output signal when a conveyor is interfaced with the robot.

When the Production Set Tab is selected, the following display will appear on the HMI.

- **Product Output**: Input a value to control the number of products being extracted. When the limit has been reached, the robot will automatically stop.
- **Transfer Qty**: The conveyor will index once the transfer quantity value has been met. If you are stacking parts on a conveyor, it is important to make sure the transfer quantity matches the amount of parts in that stack. To manually turn on the conveyor, select 

and the conveyor will move until the transfer time has been met.
- **Transfer Time**: This is how long the conveyor output will remain “ON”.
- **CNV Stop Sign**: When the CNV Stop Sign changes from “ON” to “OFF”, the conveyor will stop. If user adds a “-” before the number of CNV Stop Sign, when the CNV Stop Sign changes from “OFF” to “ON”.

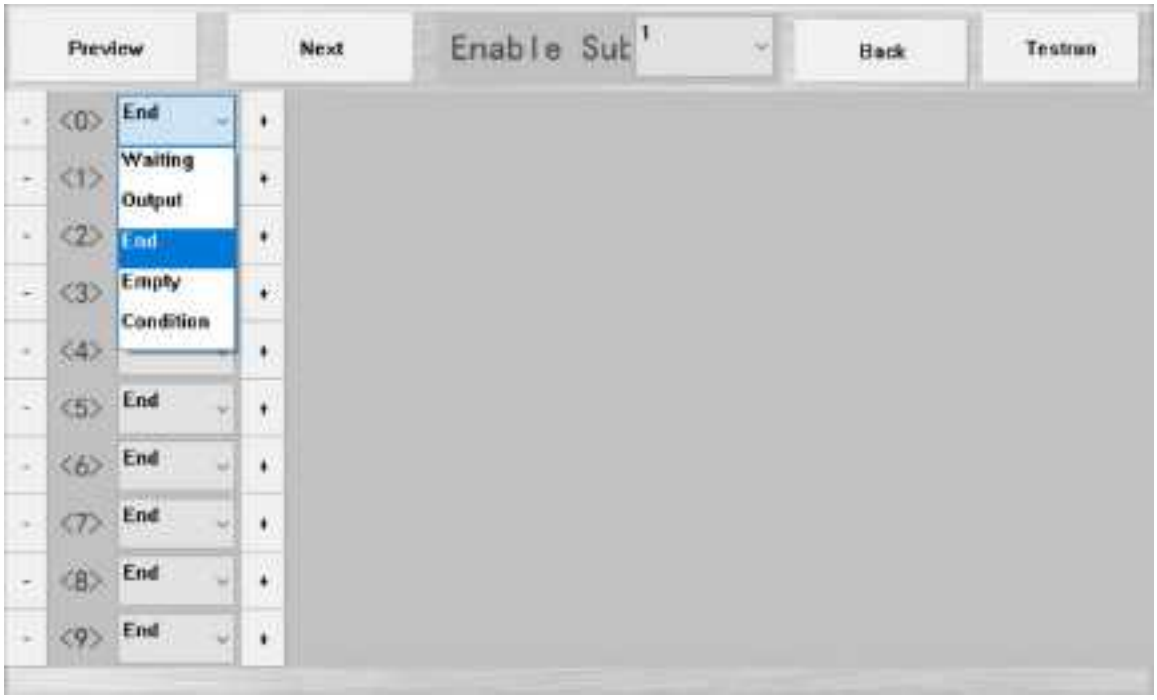
1.6.7 Help (Subprogram Set)

Help: display the help information.

Subprogram Set: This is an independent signal interaction program. If the Robot User need this function, he/she could open it in Factory Sets of Advanced Set, see the details of how to open it in 1.7.1.2.

1) Help

2) Subprogram



- **End**: End subprogram.
- **Output**: After the set Waiting time, output the related I/O signals.
- **Waiting**: Wait for the corresponding IO signal, if it does not receive the specified signal within the set delay period, time out alarm occurs.
- **Empty**: Wait set time
- **Condition**: After the input signal condition is met, jump to the specified line, otherwise continue
- **Test run button:** Click to start the Subprogram

EXAMPLE

Set the following action judgment in the subprogram

The specific actions of this subprogram are as follows:

1. Within 15s waiting time, when “<2>LMO mold open” and the “<6>LMT Core retracted to position” signal is off, continue to do the next motion line (<1>). If the condition is not met within 15s waiting time, the timed-out alarm occurs.
2. After 0.5s waiting time, SV3 Vacuum output signal, and the SV4 Vacuum outputs the signal and runs downward.
3. Wait for 0.5s
4. When SV3 Vacuum check the signal, jump to 0 line. When SV3 Vacuum doesn’t check the signal, it will continue to run downward.
5. When subprogram ends, the current motion line ends.
6. Teach start Subprogram in the motion line.
7. Insert Vacuum & Grip Motion according to below process: Teach-> Vacuum&Grip-> ‘{VacuumGrip: Trig_SubProgram1_Start}’

8. Start the Subprogram in Test run mode or Auto Mode.
9. Execute 004 line {Vacuum Grip: Trig_SubProgram1_Start}, the SubProgram1 starts, the main Program continues to run downward (The main Program won't wait for the Subprogram end).
10. If in next cycle, execute the 003 Line again, when the subprogram doesn't end, the alarm will alert subprogram hasn't end.

1.7 Monitor

The Monitor Tab is used for monitoring specific operational and automation signals.

1.7.1 I/O Signals of Monitor

When the Monitor Tab is selected, the following display will appear on the HMI.

Here the Robot User can view various I/O signals from the robot, IMM and any spare or auxiliary interfaced equipment. Robot outputs are shaded in grey and robot inputs are shaded in pink.

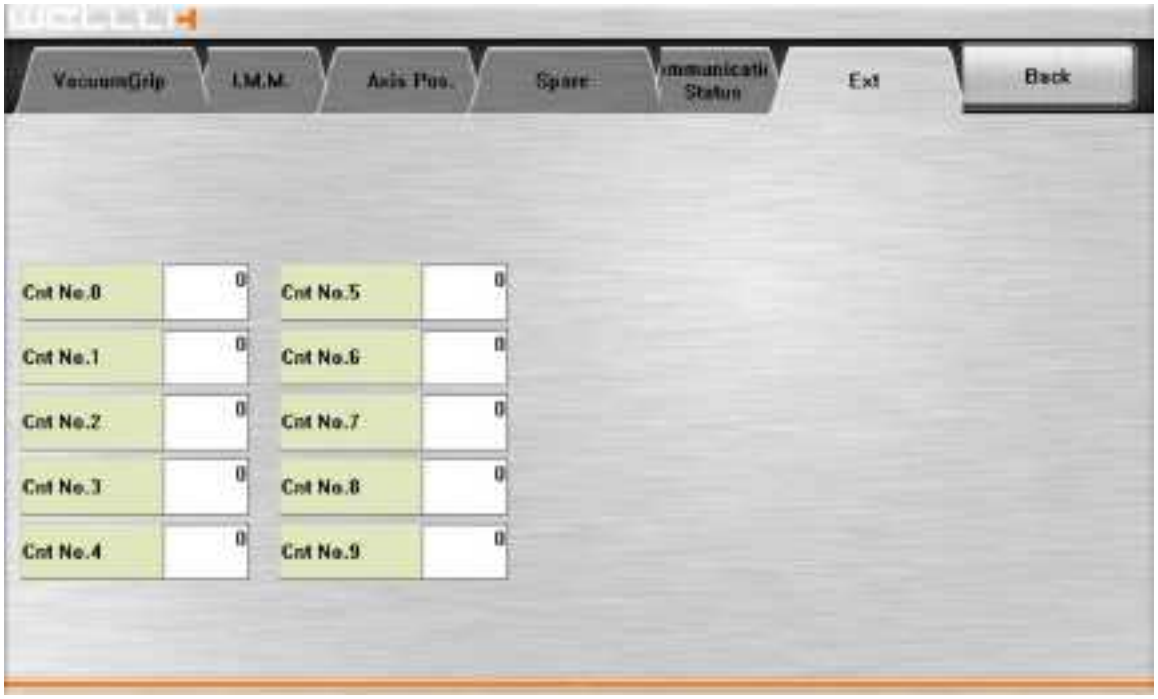
When a signal becomes activated, the grey square next to the signal will turn green.

TIPS In the control system, this color means input DI, this color means output DO

1.7.2 Communication Status

① Control-Snd: Represents the communication between the control system and CPAC, and FPS represents the stable state of communication.
② Pick Out: Time for the robot to pick out the product from the mold.
③ Cycle: cycle time, the total time for the module action list to be executed once in a loop.
④ Refresh: When Robot User selects update and the robot moves to next action line, the current "Module Action Display Area" always shows the current action line.
⑤ Run Time: The amount of time the robot has been running since last time is was started.
⑥ Motor working current: Servo motor's current ratio.
⑦ Motor working speed: Servo motor's current speed, unit: (r/min).

1.7.3 **Ext**



It is used to monitor and modify the counter value during runtime. The counter is used in Teach. See the Teach Counter details in 1.6.8.

1.8 Manual

The Manual Tab allows the Robot User to manually move all the robot's axis, turn on/off vacuum and gripper circuits, turn on/off any spare output signals, and allows the Robot User to clear over*stroke alarms.

When the Manual Tab is selected, the following display will appear on the HMI:

WARNING

- **Prior to arm down, confirm the arm is in the safety work area.**
- **Prior to operation, confirm nobody is in the robot work area.**
- **Failure to ensure these safety measures, may lead to production accident, and/or very serious injury. Operate with caution and only allow users who have completed safety and training to operate the equipment.**

1.8.1 Manual Axis Operation

For example, if the Robot User wants to make the X axis transverse out 100mm, the operation steps are as follows:

① Select Axis: Select the X Axis. Select the axis by clicking the axis coordinates.
② Distance: Input 100.
③ Speed Set: To set the speed for the running axis, look at the display screen to see an image like the above picture. Less red bars indicate a slower running axis, while the red bars indicate a faster running axis.
④ Traverse Out (“+”): Press the manual control key at the lower left of the hand controller and press "Traverse out" to the target position (100).

Manual Anti-collision: The “Manual Anti-collision” function needs to be turned on in Special Set of Function Set (the details in 1.7.1.1), and the output torque threshold is set appropriately according to the torque value displayed in real time. The smaller the Electromagnetic valve’s value, the more sensitive the anti-collision is. Turn this on to prevent excessive output torque during a collision.

WARNING

Manual Anti-collision does not prevent collisions, so use with caution.

1.8.2 Manual Vacuum & Grip Operation

① **Input Signals**: If an input is triggered, a green light will appear next to the respective signal in the pink input box on the left side of the HMI display.

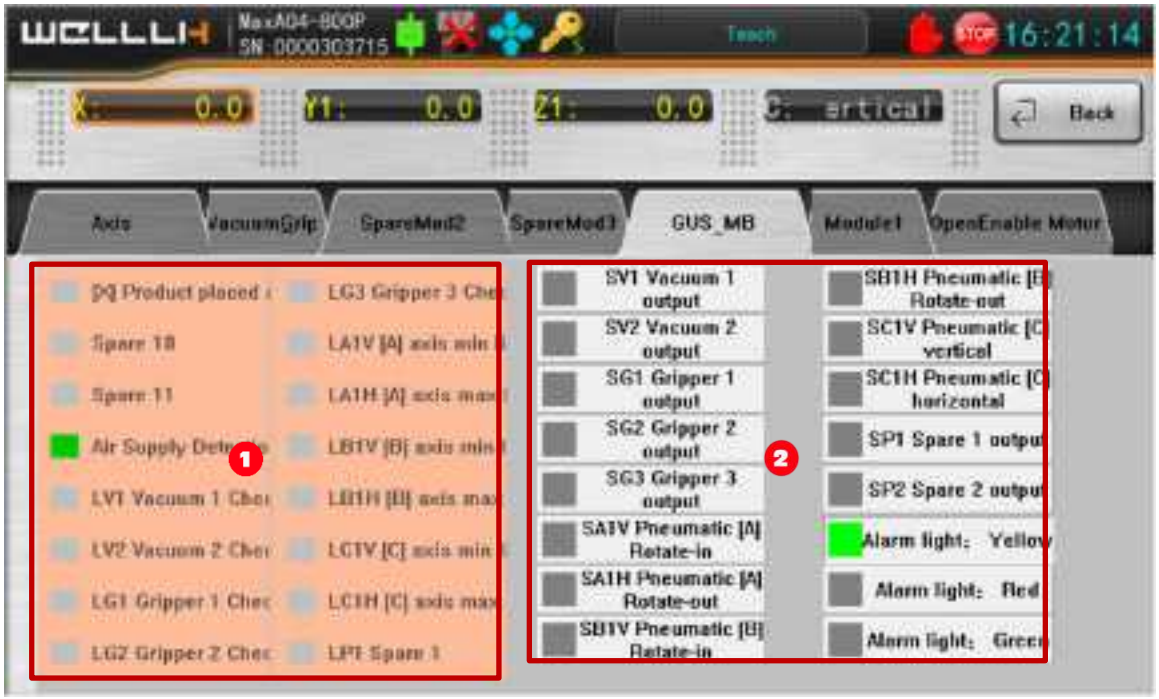
② **Output signals:** If an output is triggered, a red light will appear next to the respective signal in the white output box on the right side of the HMI display. Manually click the Vacuum or Gripper output signals to turn on/turn off the designated vacuum/gripper circuit.

1.8.3 Spare

① Input signal.
② Output signal.

"■" means the signal is on, "■" means the signal is off. Manually click the output signals to turn on/turn off the designated circuit.

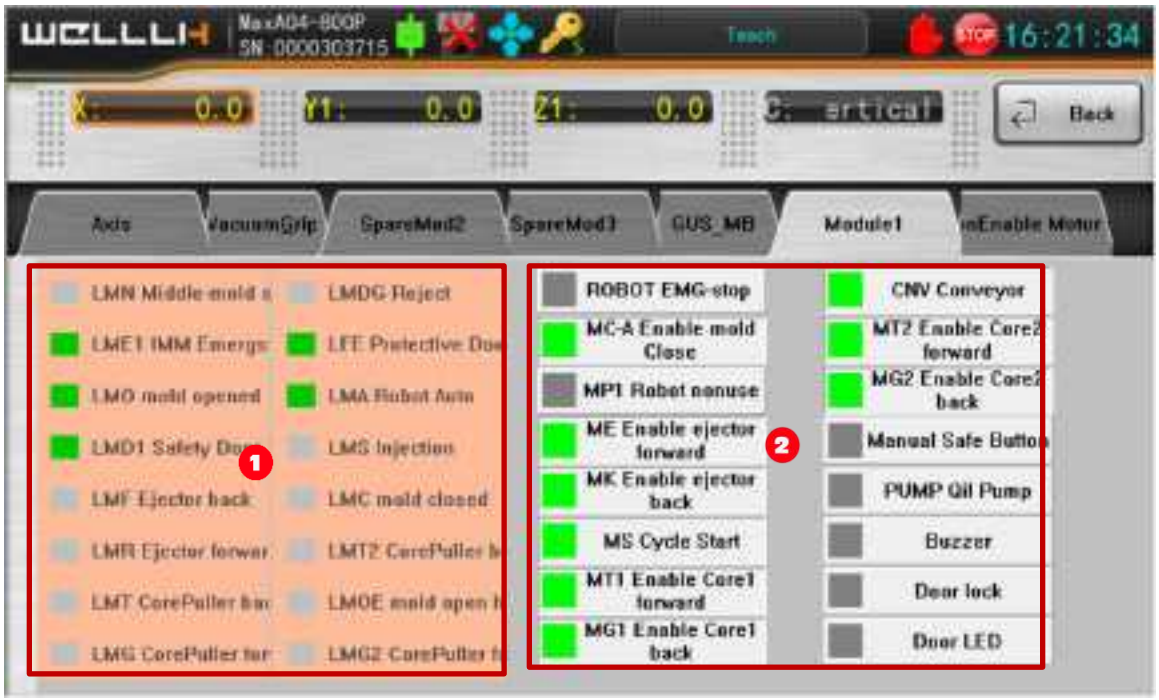
1.8.4 **UGS_MB (Controller Signal)**



① Input signal.
② Output signal.

"■" means the signal is on, "■" means the signal is off. Manually click the output signals to turn on/turn off the designated circuit.

1.8.5 Module1(I.M.M. Signal)



① Input signal (from I.M.M.).

② Output signal (from Robot).

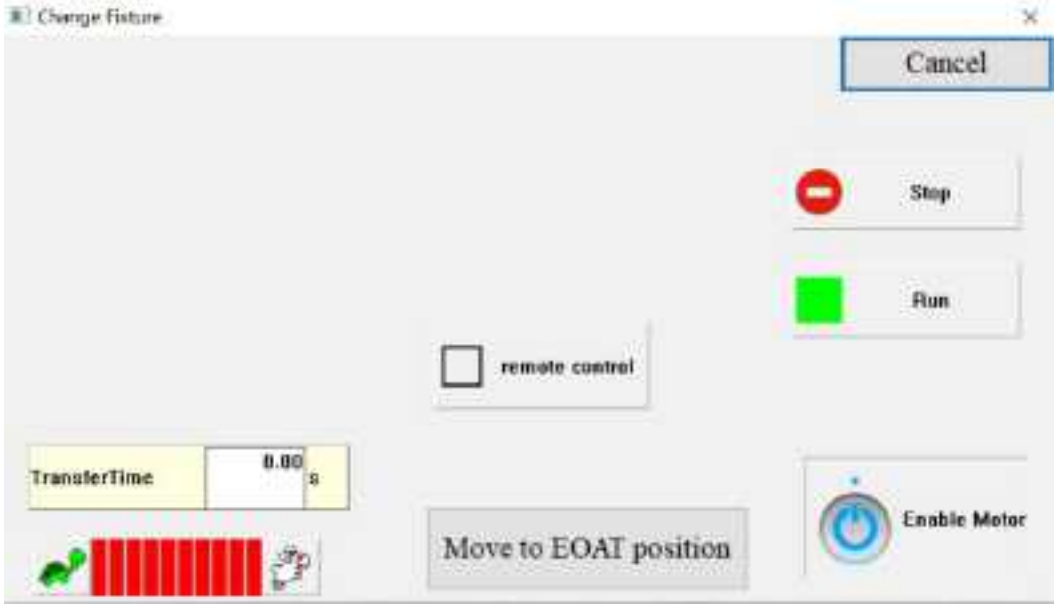
"■" means the signal is on, "■" means the signal is off. Manually click the output signals to turn on/turn off for the designated circuit.

1.8.6 Open Enable Motor Signal

Open Enable Motor: Press this button to enable motors on all axes.

Shut Down Enable Motor: Press this button to disable motor on all axes.

TIPS Press Fn button to trigger the Change Fixture page and can also enable all axes by selecting “Enable Motor” button.

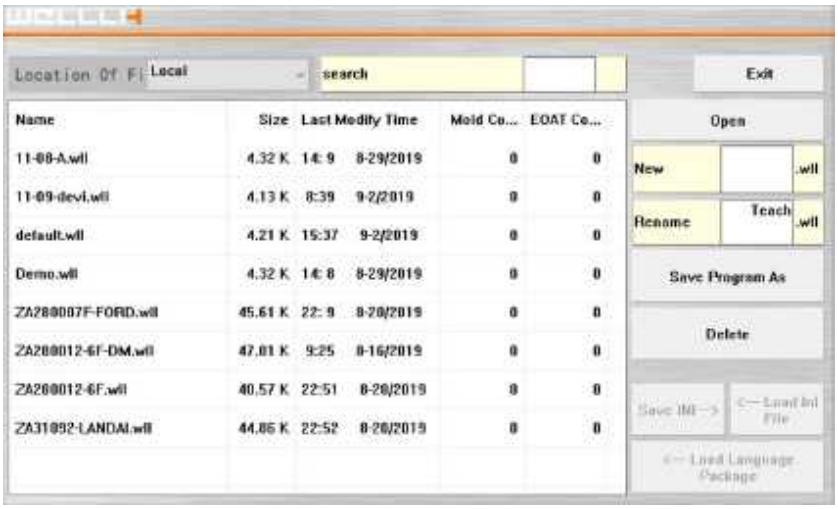


1.9 Program

The Program Tab allows the Robot User to open existing programs, copy, rename, and delete programs as well as upload and download programs to a USB drive.

TIPS **Program software: A set of instructions that enables a device to perform a set of actions.**

When the Program Tab is selected, the following display will appear on the HMI:



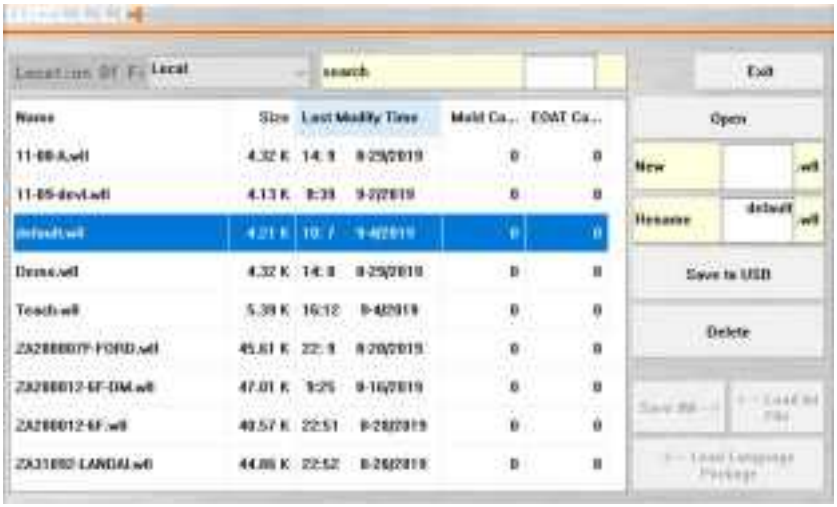
Program Location:

1)Local

2)USB

Open the selected program:

1. Select the required program (the user can use the Search function and input the key words)

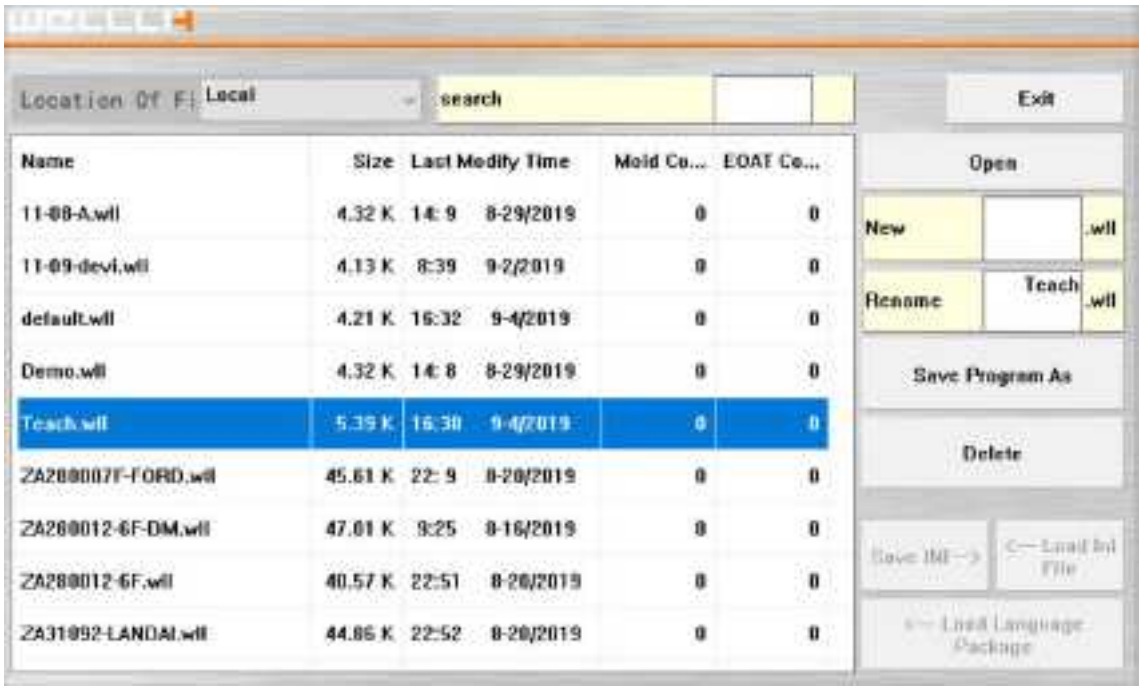


2. Click “Open”.

3. The following display will appear on the HMI:

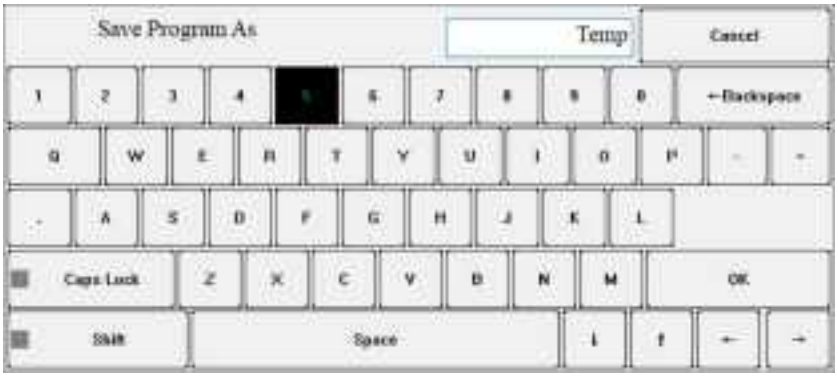
- **Create a new program**: see the operation details in 1.6.1.
- Save Program As:

1. Select the required program needed to be saved as another program

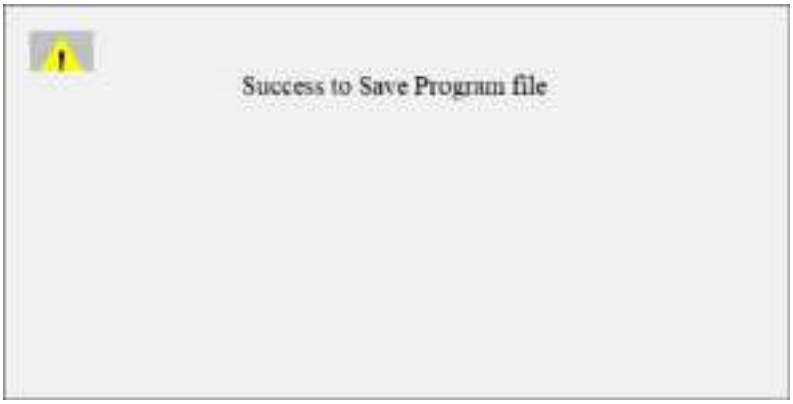


2. Click “Save Program As”.

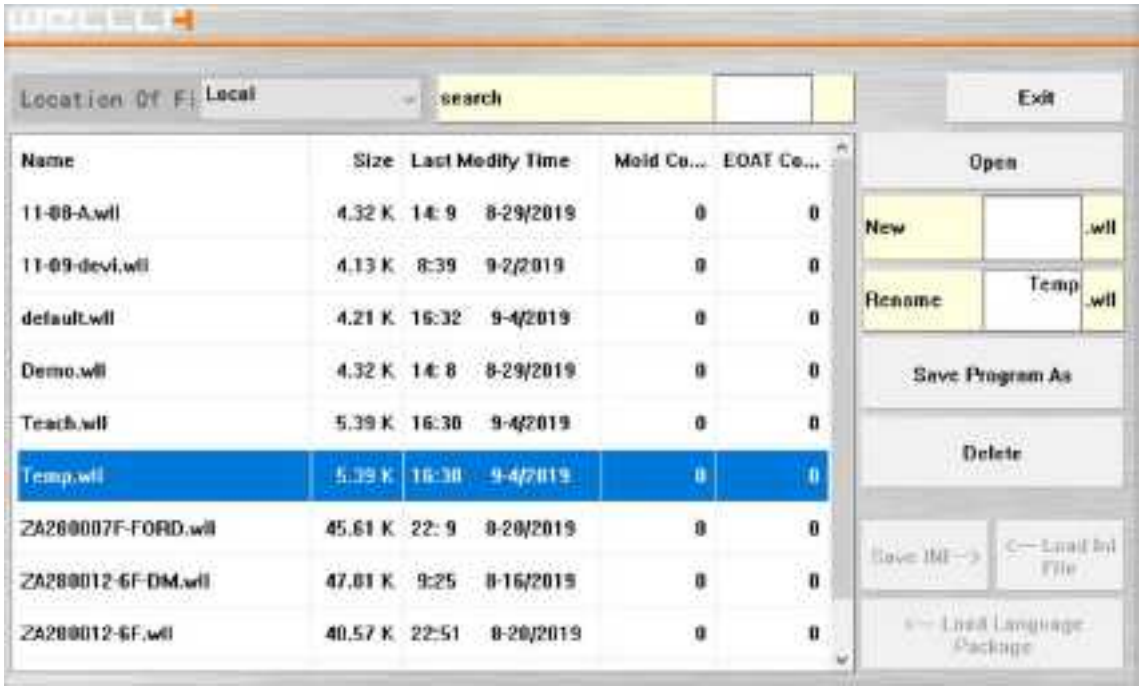
3. Input the Program name, such as “Temp”, click “OK”.



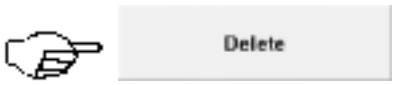
4. Successfully save the program. (Saving a new program won't delete the origin program)



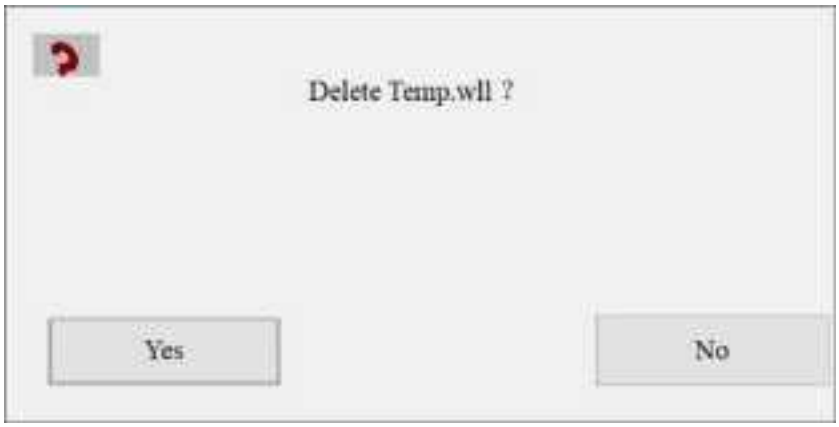
- Delete the Program:
  1. Select the desired program to be deleted.



2. Click "Delete"

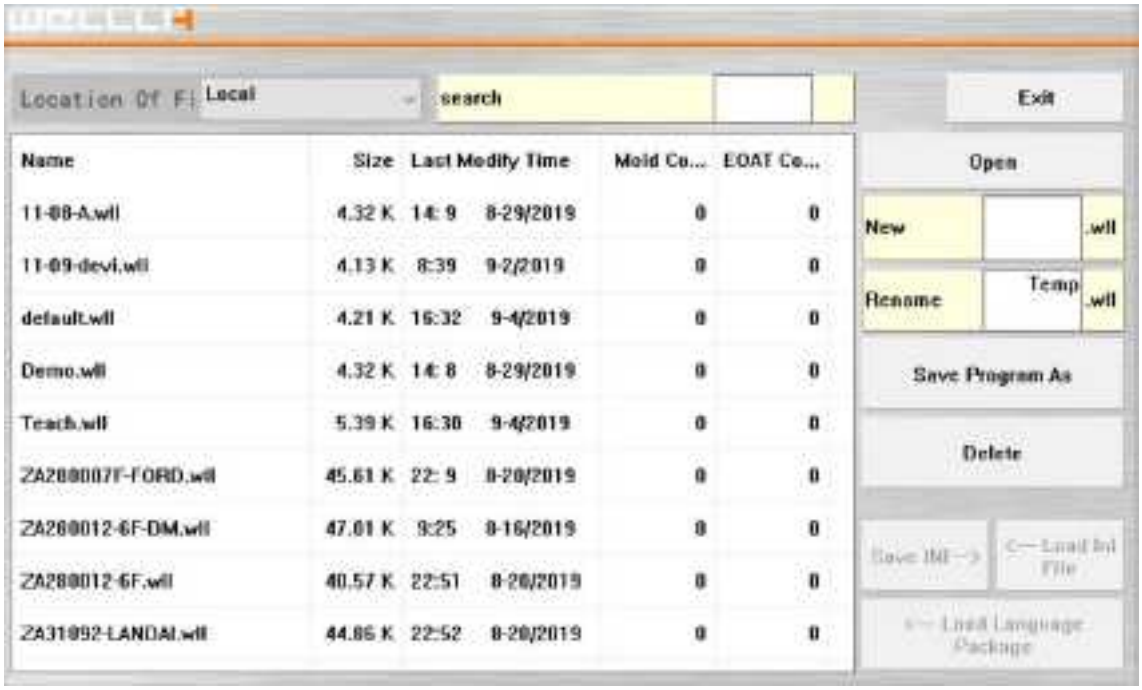


3. Confirm whether to delete the selected program.

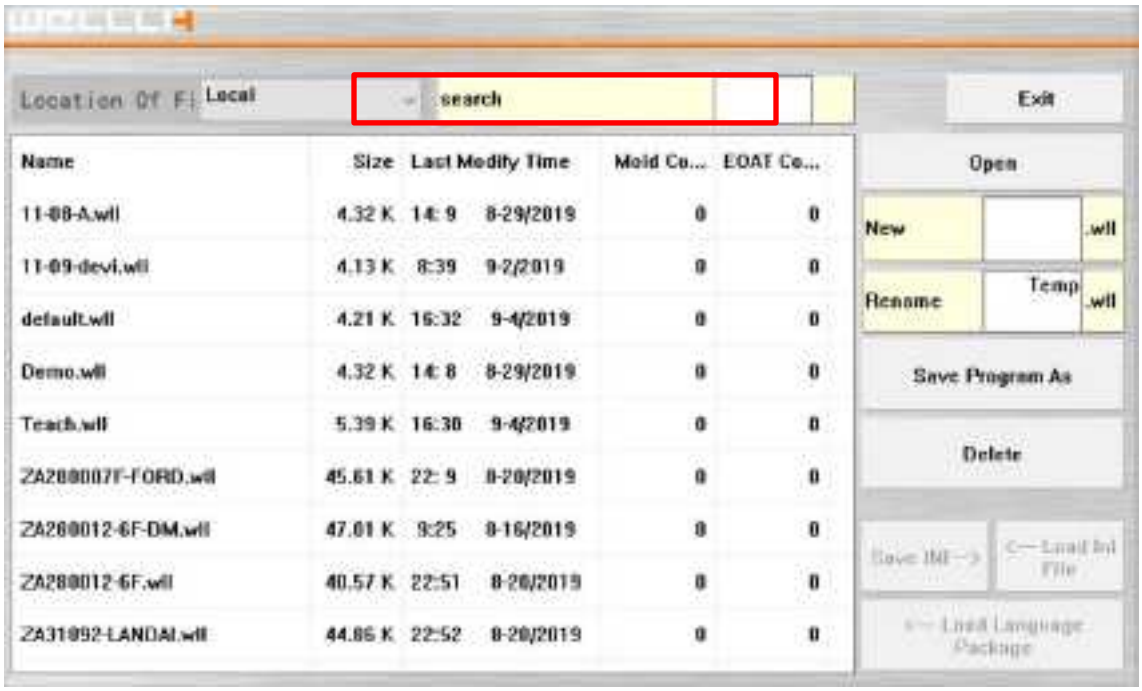


4. Click “OK”.

5. Successfully delete the program.

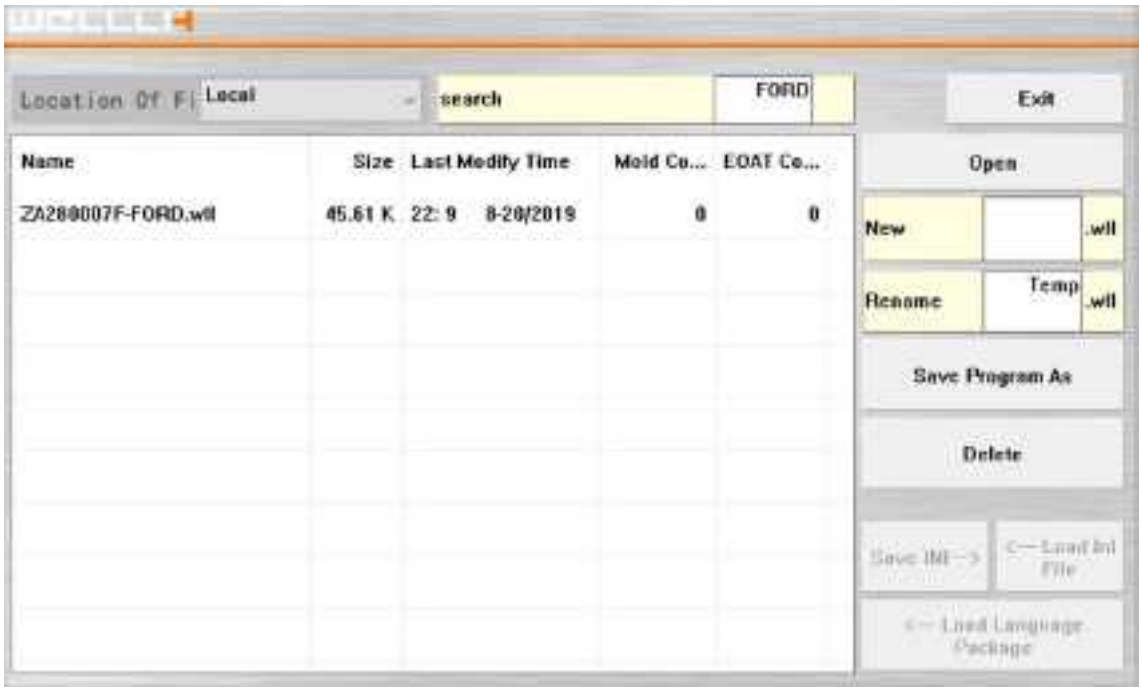


- Search the Program:
  1. Enter the Program Page, Click the “Search” dialog box.



  2. Input some key words of Program Name, click “OK”.

3. Select the desired program and open it.



4. If the user needs to stop searching, click “Exit”, then enter the Program.

1.10 Modify

Selecting the Modify Tab allows the Robot User to modify program lines of the current open program. The robot user can modify the program while the robot is stationary or in Autorun mode

When the Modify Tab is selected, the following display will appear on the HMI:

- **Simple Modify**

Simple Modify: It can change the waiting time, speed, axis position, stop signal and other parameters of the action line.

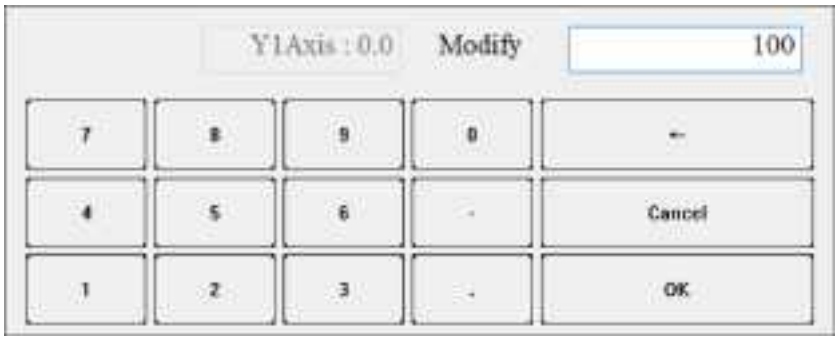
EXAMPLE

For example, if the Robot User must modify step “005”, change the Y forward distance from 0 to 100:

1. Select the “005 Axis, Y1: 0.0->0.0”.

2. Click and set the Y axis movement distance.

3. Input the distance 100, click “OK”.

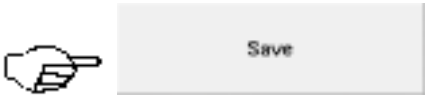


WARNING

Prior to modifying the movement distance, confirm the movement target position is in the safety area.

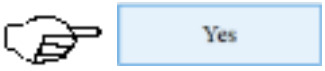
4. Back to Modify page.

5. Click “Save”.



6. Confirm whether to modify or not.

7. Click “Yes”.



8. Modify successfully.

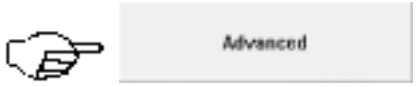
- **Advanced Modify**

When the current action line is “axis motion,” users can click "Advanced" to modify more axis motion parameters.

EXAMPLE

1. For example, if the Robot User needs to modify step “005”
2. Enter the Modify page, select the axis motion line “005 Forward, Y1: 0.0->100.0”

3. Click Advanced.



4. Enter the Advanced page, click 

, the page switches to Y1 Advanced page. Click other axis controls to switch the set parameters for other axes, after parameters are set, click Back.

- Speed/Accelerate/Deceleration: Limited to the corresponding limit set in the Function Set.
- **Deviation Distance**: Select it, 

appears, all the details in 1.7.4.4 Deviation Position Set.
- **Relative Position**: Select it, 

appears. The axis motion target will change to "Move specified distance from the current position", and the motion line will be marked after the set is saved. For example: Set the distance to 50 and the current motion line will change to 

.
Then, each time run this motion line, the Y axis will move forward 50mm.
- **Location Area**: When the distance between the real-time coordinate of the mechanical axis and the target position is less than the 'Location Area Value', the action is considered finished and the next action will start. The Location Area 1mm is default value.

WARNING

Reasonable use of the Location Area can reduce the action interval and save time but use with caution!

1.11 Go Start Point

Before the robot can begin operation, the robot must be at its start point. The robot must also be at its start point in order to enter the Teach Menu. To bring the robot to its start point, select the “Go to Start point” softkey.

TIPS 1.7.4.1 Start Point Set shows how to set all axes. When the User level is greater than level 1, it will automatically enable.

WARNING

Only allow users who have completed the Safety and Operation training to use the start point settings
Prohibit personnel from entering the range of robot movement before returning to the start point.

The steps are as follows:

1. After manually moving the robot to a safety position, click the "Go Start Point" button on the main page.

2. If the condition of the Start Point is met, the following prompt will pop up. If the condition of the start point is not met, change the conditions of the start point according to the prompt.

3. Select “Yes” to Go to Start Point.

1.12 Testrun Button

Testrun allows the Robot User to activate their robot program and operate at real-time production speeds without cycling to the IMM. The Test run function is useful because it allows the robot user to make changes in the “Modify” Tab, then those changes can be illustrated in the Testrun function.

TIPS

The “Testrun” mode cannot replace the “Autorun” mode.
Clicking “Testrun” will automatically open “Enable”.

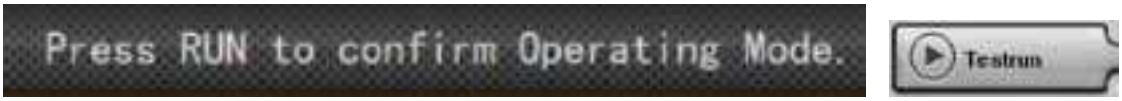
- Only allow users who have completed Safety and Operation training to use the Testrun
- Prohibit personnel from entering the range of robot movement before a Testrun
- Check I/O before Testrun and ensure that the robot is at Start Point
- Before Test run, reduce the global speed to ensure safe operation.

To Disable Function set > Special Set > "Safety Button” and click "Enable", and control low-speed operation through safety switch.

In case of an emergency, release the safety switch immediately **and** press the Emergency Stop Button to ensure the safety of personnel and equipment

Operation steps as below:

1. After “Go to Start Point”, click “Testrun”



2. If you get this message, press the Safety Switch.

3. Click “run” button 

to start Testrun.

1.13 Autorun Button

Autorun allows the Robot User to activate the robot's automatic cycle in conjunction with the IMM.

TIPS

Clicking "Autorun" will automatically open "Enable".

WARNING

- Only allow users who have completed Safety and Operation training to use the Autorun
- Check I/O before Autorun and ensure that the robot is at Start Point
- Before starting Autorun, reduce the global speed to ensure safe operation. Next, ensure the program is correct, then gradually increase the global speed. Ensure that the program is correct and run Testrun before Autorun
- Prohibit personnel from entering the range of robot movement before Autorun

Operation steps as below:

1. After "Go to Start Point", click "Autorun"

2. If user gets this message 

, press the Safety Switch.
3. Click "run" button 

to start Testrun.

1.14 Cycle Stop

Cycle Stop: When the robot takes out the last product, it won't output the "1 MC-A Enable mold close" Signal so the machine will not continue. The robot will place the last product on the Placement area, go to Start Point and automatically stop.

WARNING

If cycle stop does not immediately exit the Autorun mode, wait for it to stop running completely.

Operation steps as below:

After "Go to Start Point", click "Cycle Stop"

If user gets this popup message, click "Yes", the robot will exit "Autorun" after this cycle ends.

2 Robot Alarm

2.1 Robot Alarm Troubleshooting Guide

Alarm Number	Alarm Name	Alarm Reason	Solution
0	X: Z-axis is not at origin	When the function “Traverse in Mold” is enabled, X-axis can’t move out of origin area	Move X-axis back to origin
1	X: Z-axis is not at origin and forbidding Traverse in Program	When the axis is not at the origin, function of “Traverse in Mold” is Enabled. X-axis can’t move if z-axis is not at the origin	Disable the traverse in mold function or move z-axis to origin
2	X: No mold opened signal	When in standby, and out of mold, robot doesn’t allow X-axis to move if the mold signal is not received	1. Check with ARI service engineer 2. Manually force on inputs to check if signal is coming from IMM 3. Check IMM to see if the mold is fully open 4. Check euromap plug wiring
3	Z: C axis horizontal, forbid fall	When C action in Mold is disabled, robot forbids the z-axis to fall	Move C axis to vertical position or enable C action in Mold (no recommended unless completely necessary)
4	Z: Safety Door signal not present	When the robot does not receive the safety door signal from the IMM the robot is not allowed to move	1. Check if safety door is completely closed 2. Check safety door relay and replace if bad 3. Check pin 26 on euro map plug 4. Check if signal is coming from IMM
5	Z: X-axis position mistake, forbid fall	X-axis is not at origin or in part drop area. This prevent z axis from moving	Move the x-axis over the home flag or over the part drop flag. Adjust flag to make sure it is getting contact with sensor.

6	Z: No mold open signal, forbid fall	Robot does not receive the mold open signal from IMM, will not allow z-axis to drop in mold	1. Check with ARI service engineer 2. Manually force on inputs to check if signal is coming from IMM 3. Check IMM to see if the mold is fully open 4. Check euromap plug wiring
7	The target position is beyond range of travel	In manual / automatic mode, the target position of the axis action instruction exceeds the soft limit set. The robot overtravel.	Check the limit positions and reset the target position
8	The output of vacuum or gripper is not present, forbid fall	If the vacuum and gripper output is turned on and there is no part, the robot will not receive confirmation and will forbid z-axis from moving	Make sure vacuum or gripper check is enabled in function set. Make sure gripper confirmation is present. Check vacuum threshold and increase if necessary.
9	C-axis vertical: no mold open signal	Robot did not receive mold open signal	1. Check with ARI service engineer 2. Manually force on inputs to check if signal is coming from IMM 3. Check IMM to see if the mold is fully open 4. Check euromap plug wiring
10	Controller test failed to connect with main board	Controller is not getting a signal from the CPU	1. Check to see if fuse is bad 2. Check if signal is present 3. Contact ARI service engineer
11	Vacuum 1 no confirmation signal	No vacuum confirmation	1. Check for vacuum leaks 2. Check if part is too heavy for vacuum cups 3. Check if part is making full contact with vacuum cups
12	Vacuum 2 no confirmation signal	No vacuum confirmation	1. Check for vacuum leaks 2. Check if part is too heavy for vacuum cups 3. Check if part is making full contact with vacuum cups

13	Vacuum 3 no confirmation signal	No vacuum confirmation	1. Check for vacuum leaks 2. Check if part is too heavy for vacuum cups 3. Check if part is making full contact with vacuum cups
14	Vacuum 4 no confirmation signal	No vacuum confirmation	1. Check for vacuum leaks 2. Check if part is too heavy for vacuum cups 3. Check if part is making full contact with vacuum cups
15	Gripper 1 no confirmation signal	No gripper confirmation	1. Check if gripper grabbed part 2. Check if confirmation sensor is working 3. Check for gripper signal in robot inputs
16	Gripper 2 no confirmation signal	No gripper confirmation	1. Check if gripper grabbed part 2. Check if confirmation sensor is working 3. Check for gripper signal in robot inputs
17	Gripper 3 no confirmation signal	No gripper confirmation	1. Check if gripper grabbed part 2. Check if confirmation sensor is working 3. Check for gripper signal in robot inputs
18	Gripper 4 no confirmation signal	No gripper confirmation	1. Check if gripper grabbed part 2. Check if confirmation sensor is working 3. Check for gripper signal in robot inputs
19	Gripper 5 no confirmation signal	No gripper confirmation	1. Check if gripper grabbed part 2. Check if confirmation sensor is working 3. Check for gripper signal in robot inputs
20	Reservation	Reservation	Reservation

21	[X] Traverse Max Limit	X-axis exceeds max limit position	Move axis within limit position and check the limit switch signal
22	[A] Max Limit	A-axis exceeds max limit position	Move axis within limit position and check the limit switch signal
23	[B] Max Limit	B-axis exceeds max limit position	Move axis within limit position and check the limit switch signal
24	[C] axis horizontal limit	C-axis exceeds max limit position	Move axis within limit position and check the limit switch signal
25	[Y1] Axis forward limit	Y1-axis exceeds max limit position	Move axis within limit position and check the limit switch signal
26	[Z1] Axis down limit	Z1-axis exceeds max limit position	Move axis within limit position and check the limit switch signal
27	[Y2] Axis forward limit	Y2-axis exceeds max limit position	Move axis within limit position and check the limit switch signal
28	[Z2] Axis down limit	Z2-axis exceeds max limit position	Move axis within limit position and check the limit switch signal
29	[X] Traverse Min Limit	X-axis exceeds min limit position	Move axis within limit position and check the limit switch signal
30	[A] axis min limit	A-axis exceeds min limit position	Move axis within limit position and check the limit switch signal
31	[B] axis min limit	B-axis exceeds min limit position	Move axis within limit position and check the limit switch signal
32	[C] axis vertical limit	C-axis exceeds min limit position	Move axis within limit position and check the limit switch signal
33	[Y1] axis back limit	Y1-axis exceeds min limit position	Move axis within limit position and check the limit switch signal

34	[Z1] axis upon limit	Z1-axis exceeds min limit position	Move axis within limit position and check the limit switch signal
35	[Y2] axis back limit	Y2-axis exceeds min limit position	Move axis within limit position and check the limit switch signal
36	[Z2] axis back limit	Z2-axis exceeds min limit position	Move axis within limit position and check the limit switch signal
37	Reservation	Reservation	Reservation
38	Reservation	Reservation	Reservation
39	Reservation	Reservation	Reservation
40	Reservation	Reservation	Reservation
41	Robot emergency stop button is pressed	E-stop on pedant has been pressed	Reset e-stop on pendant, if not change check the robot safety circuit
42	Emergency stop pressed on IMM	IMM e-stop pressed	Reset e-stop on IMM, if not change check the robot safety circuit or signal from IMM
43	Wait timeout of mold open signal	Robot did not receive mold open signal within time constraints	1. Check with ARI service engineer 2. Manually force on inputs to check if signal is coming from IMM 3. Check IMM to see if the mold is fully open 4. Check euromap plug wiring
44	No injection signal	This function is not used is the United States	Call ARI Service Engineer

45	Discover the reject signal	The robot received a reject signal from the machine	Check the I.M.M reject signal to make sure it is enabled
46	Try to start motors without power-on	Motors not energized	Energize motors, turn on drives
47	Axis position abnormal	Position of one of the axes is wrong	Check axis positions, correct and reset robot
48	Pneumatic axis position abnormal	Pneumatic axis is in the wrong position	Move axis to correct position and check air supply. Make sure position sensors are working correctly.
49	Unable to reset, no mold open signal.	Robot did not receive mold open signal	1. Check with ARI service engineer 2. Manually force on inputs to check if signal is coming from IMM 3. Check IMM to see if the mold is fully open 4. Check euromap plug wiring
50	No robot automatic run signal	The robot did not receive an automatic signal from the machine	1. Make sure the robot is enabled on the IMM 2. Make sure the machine is put into automatic mode first and then the robot is put in autorun
51	[Z1] Axis not at the origin	Z1 axis out of position	Check whether the current position is at the origin position if not move to origin.
52	[Y1] Axis not at the origin	Y1 axis out of position	Check whether the current position is at the origin position if not move to origin.
53	[X] Axis not at standby position	X axis out of position	Check whether the current position is at the origin position if not move to origin. Check to make sure home flag is positioned correctly with sensor.
54	[Z2] Axis not at original point	Z2 axis out of position	Check whether the current position is at the origin position if not move to origin.

55	[Y2] Axis not at original point	Y2 axis out of position	Check whether the current position is at the origin position if not move to origin.
56	[C] Axis not at Standby position	C axis out of position	Check whether the current position is at the origin position if not move to origin.
57	Reset timeout	Robot timed out while resetting	1. adjust reset speed 2. lengthens the time of “reset timeout”
58	Cycle timeout	Cycle time is longer than the timer setpoint	1. adjust the autorun speed 2. extend the time of "cycle timeout" in “time set”
59	Step Action timeout	Step timeout is shorter than the time it takes for the robot to execute step	1. adjust the running speed 2. lengthen the time of "step timeout” in “time set”
60	The Safety Door opened in Autorun	The safety door was opened during autorun on IMM	Close safety door on the IMM and put robot back into autorun
61	Mold open signal interrupted	Mold did not completely open to send signal to robot	Check that the mold reached its fully open position
62	Ejector Back Timeout	IMM ejectors did not reach their back position	Check ejector retract timer
63	Disabled function of C action in mold	C action disabled, try to rotate in the mold	Enable C action in mold function
64	Reserved	Reserved	Reserved
65	There is no standby signal and Z-axis isn’t at origin	Robot is not at home position	Reset Robot or bring to home position
66	Reserved	Reserved	Reserved
67	Robot non-use	Robot “dummy switch” is toggled off	Switch robot “dummy switch” to use

68	Robot can only be disabled in the safety position and IMM safe	The robot is not in a safe position before flipping the “dummy switch” and disabling it. The z-axis is not in a safe position.	Move are to safe position and Toggle the “dummy switch” on top of the robot pendant. You may need to move z-axis to zero in manual mode.
69	[X] axis Start position signal is abnormal	X-axis is not in proper start position	1. Check home position flag 2. Make sure sensor is making contact
70	Pneumatic axis motion overtime	A or C axis did not move in time	Check to make sure the pneumatic cylinder moves freely and increase the Step-time if necessary
71	[X] axis product placed signal is abnormal	Robot is not getting product place signal	1. Check part drop flag position 2. Make sure sensor is making contact
72	[X] axis origin signal is abnormal	[X] axis origin signal is abnormal	1. Check home position flag 2. Make sure sensor is making contact
73	[Z] axis origin signal is abnormal	[Z] axis origin signal is abnormal	Confirm the origin signal, press stop to solve. Check sensor connections and make sure sensor is making contact.
74	Product placed and origin signal exist together on X-axis	The signal for part drop area and home position area exist at the same time	Check the wiring of both sensors to see if there is a short circuit or if it is mapped incorrectly
75	[C] axis horizontal signal interrupt	C axis did not receive the horizontal signal	1. Check to make sure there is air pressure 2. Check is the part being picked is too heavy 3. Adjust the speed of the c axis movement with the flow control valves 4. Check to see if the robot is receiving the input
76	[C] axis vertical signal interrupt	C axis did not receive the vertical signal	1. Check to make sure there is air pressure 2. Check is the part being picked is too heavy 3. Adjust the speed of the c axis movement with the flow

			control valves 4. Check to see if the robot is receiving the input
77	Stack number shouldn't be zero	Stack value has been set to zero	1. Check the robot stack settings to make sure they are correct 2. Check to make sure the robot does not have a fault
78	Reset unfinished, check the shake of axis.	Reset failure	Check which axis did not reset and adjust the reset timer or reset speed
79	No teach stack end mark	Missing command for the end of the stack	Add the end mark in the stack program
80	No teach check place product end mark	Missing command for the end of the stack	Add the end mark in the stack program
81	Teach check place product abnormal	The product drop area is not correct	1. Check the drop area settings so they are within the drop area limits 2. Check the sampling and test settings for proper x axis settings
82	Stack position does not locate product placed area	The product place area is outside the robot's limits	Reprogram the product place area value within the limits
83	Servo driver alarm	Servo drive has a fault	Check the servo drive fault code on front of servo drive and reference servo drive alarm list
84	Communication test fail with servo, Power on again	Controller sent the signal to the servo but did not receive the return signal	1. Check the communication signal 2. Check the servo address 0C00 3. Check the servo delay time
85	Not allow to down without middle—mold signal	Z not allowed to go down without the mid mold signal from the IMM	Check to make sure the signal is activated on the IMM and adjust the position of the sensor if need be
86	Not receive the mold closed signal	No mold close signal from IMM	Check for a circuit fault and make sure the mold closed signal is coming from the

			machine
87	The motion segments controlled by servo are full	Servo drive has a fault	Check servo drive for fault code
88	Mold opened and mold closed signal exist together	System received mold opened and closed signal at the same time. IMM signal shorted out	Check signal wiring on IMM
89	Subprogram in running, teach wait finish signal!	Trigger a subprogram command when the subprogram is running or wait for a subprogram in the teach	Wait subprogram finished
90	[X] axis Not in Product Placed Area when Standby out of mold.	X axis is not at the proper start position	Move the robot to the correct position when in standby. Product place or home position
91	Limit Distance set wrong	The limit position set beyond the mechanical limit	Check the limit position settings
92	Trying Dangerous Action or motor fault Reset Robot	The action is not safe to perform	Confirm robot position safety, reset robot
93	IMM signal output timeout	Robot did not receive return signal from IMM	Check the euromap plug and cable between robot and IMM
94	Low air pressure, check the air supply	Air pressure below 0.4 MPa	1. Check the air pressure threshold and adjust if need be on the flow control valve 2. Check to make sure the pressure sensor is working
95	Not allow to down when grip or vacuum is on	Do not use the insert function in mold, if have confirm signal, don't allow to drop	Check the sucker gripper signal
96	Motor position arrive limited data bit contact customer service	Driver reminds of motor position is abnormal	Contact ARI Service
97	Motor will not power on	Voltage too low to power on robot	Confirm axis parameter and CPAC parameter is correct Check the power to robot

98	Safety guarding door is open	Check protective door's status and input signal	1. Make sure the safety door is closed 2. Check to see if safety door sensor is working correctly
99	No safety gate signal when reset	There is no safety gate signal when reset	Make sure safety gate on IMM is closed and check if sensor is making contact
100	Control Card Alarm	Control card alarm	Reset power
101	The motor is not enabling when robot in autorun	In automatic operation mode, the motor enable disconnects automatically, (the driver alarm)	Check robot drives for alarms and reference alarm list
102	Reservation	Reservation	Reservation
103	Reservation	Reservation	Reservation
104	This cycle did reach the time of mold closed	The cycle action is completed, but not at the time the mold closes, the output closed mold permit	Check mold closed signal
105	[B] axis not in the standby position	[B] axis not in the standby point	1 check whether the current position is at [B] axis standby
106	[Z] axis is out of Origin stop C axis to vertical.	Reservation	Reservation
107	[C] axis is Horizontal stop [A] axis to rotate.	Reservation	Reservation
108	Lateral posture protection: current C position does not allow to cross	Use horizontal protection, C axis need to on the area, can allow X axis cross	check C axis cross area don't use C axis cross protection
109	Current gripper inconsistent	Fixture number does not match module verification	Check gripper number and mold
110	The protective door is opened	Check the protective door input signal	1. Check if protective door input signal has circuit short

111	Reservation	Reservation	Reservation
112	Reservation	Reservation	Reservation
113	In the servo process, cannot do the Axial motion action	Servo start to the end, cannot do the axis motion action	Adjust the teach action step
114	X and Z axis doesn't have signal together. robot stops immediately to protect	X axis doesn't have place origin signal, Z also doesn't have the origin signal	1.check the X axis origin place and Z axis origin signal 2.check if the action Cohesive location interval is too big
115	Cross prohibit or prohibit X, Z axis act together	Don't allow the X and Z axis act together	Adjust the teach action
116	[A] axis rotates out, prohibit drop	Don't use rotate in mold, cannot drop on the screw position	use rotates in mold adjust the [A] axis position to rotate in before drop
117	[B] axis rotate out, prohibit drop	Don't use rotate in mold, cannot drop on the screw position	use rotates in mold adjust the [B] axis position to rotate in before drop
118	not open the rotate function in mold	not use rotate in mold, try to screw in mold	Use rotates in mold
119	Z1 can't shut the mold on the safe position	When robot action run, Z1 axis not in the safe position, cannot shut the mold	1. check the Z1 teach action
120	Z2 can't shut the mold on the safe position	When robot action run, Z2 axis not in the safe position, cannot shut the mold	1. check the Z2 teach action
121	C can't shut the mold on the safe position	When robot action runs, C axis not in the safe position, cannot shut the mold	1. check the C teach action
122	IO check: suck gripper signal doesn't pass, cannot shut mold	Don't receive the suck gripper test confirm signal, cannot shut the mold	Check the suck gripper teaching action
123	Don't test LEF protect door input signal	Use protected door to test, lost the input signal	check protect door signal Don't use protect door to test

124	lubricant pump signal abnormal	lubricant pump input abnormal signal	Check the lubricant pump
125	lubricant pump oil starvation	lubricant pump input oil starvation signal	Check lubricant pump's oil level
126	[Y] Axes target too close	Y1 axis and Y2 axis are too close	Restart and remove [Y1], [Y2] axis by manual
127	Home Position not adjusted	Zero is not set	Manually book position, see 'set zero', 'Origin Offset', 'Advanced', 'Special set', 'Function'. Need to replace battery while driver is in low power
128	Reservation	Reservation	Reservation
129	External emergency stop, check input <109>	No external emergency stop signal received	Check input signal
130	Need cross allowed signal	When do the cross action, don't receive the signal of allowing to cross	check the allow to cross's signal set up allowed to cross signal is 1(not use)
131	Reservation	Reservation	Reservation
132	Stacking not valid, check sign in stack set function	When stacking the first part, if there is no confirmed signal then stacking is not allowed.	Set stack check signal
133	[A] is out of safe range, [C] cannot be moved, set in <Function Set>, <Lmt act set 2>	A-axis, C-axis are servo axes, action restrictions	<Function Set>, <Lmt act set 2>
134	[C] is out of safe range, [A] cannot be moved, set in <Function Set>, <Lmt act set 2>	A-axis, C-axis are servo axes, action restrictions	<Function Set>, <Lmt act set 2>
201	AL201 Card initialization failed"),	Card initialization failed	Restart the power supply of the robot If the 1st step can't solve the issue, reload the "CPAC". If the 2nd step can't solve the

			issue, change the new controller.
202~209	AL202~AL209 Command axis drive 1 alarm"),	Corresponding axis driving occurs alarm	Reboot controller after solving drive alarm
210~217	AL210~AL217 Axis movement error overrun")	Check parameter of driver and CPAC	1. If there is drive alarm, firstly solve drive alarm 2. Restart the controller after resetting parameter of driver and CPAC
218~225	AL218~AL225 Axis failure to back zero"),	Check parameter of driver and CPAC	1. If there is drive alarm, firstly solve drive alarm 2. Restart the controller after resetting parameter of driver and CPAC
226	AL226 Instruction execution failure"),	Controller abnormal error	Restart the controller
227	AL227 Can't enable Core Puller to forward and back at same time.	Reservation	If this alarm occurs, contact your distributor for assistance or contact factory
228	AL228 Can't enable Ejector to forward and back at same time.	Reservation	If this alarm occurs, contact your distributor for assistance or contact factory
229	AL229 Alarm lights output abnormal (signal superposition）.	Reservation	If this alarm occurs, contact your distributor for assistance or contact factory
230	AL230 Can't output the both moving signal of pneumatic [C] axis at same time.	Reservation	If this alarm occurs, contact your distributor for assistance or contact factory
231	AL231 Can't output the both moving signal of pneumatic [B] axis at same time.	Reservation	If this alarm occurs, contact your distributor for assistance or contact factory
232	AL232 Can't output the both moving signal of pneumatic [A] axis at same time.	Reservation	If this alarm occurs, contact your distributor for assistance or contact factory

233	AL233 Abnormal signal, both received mold opened and closed signal.	Reservation	If this alarm occurs, contact your distributor for assistance or contact factory
234	AL234 Abnormal signal, both received Core Puller forwarder and back signal.	Reservation	If this alarm occurs, contact your distributor for assistance or contact factory
235	AL235 Abnormal signal, both received Ejector forwarder and back signal.	Reservation	If this alarm occurs, contact your distributor for assistance or contact factory
242~249	AL242~AL249 Axis 1 Acceleration overload in collision	Motor acceleration exceeds the set threshold	Restart the controller after solving this alarm
250~257	AL250~AL257 Axis 1 Current overload in collision	Drive current exceeds set threshold	Restart the controller after solving this alarm
308	Wait LMNG Reject timeout		
380	Wait Mold BCD_1_In timeout		Troubleshoot BCD
381	Wait Mold BCD_2_In timeout		Troubleshoot BCD
382	Wait Mold BCD_3_In timeout		Troubleshoot BCD
383	Wait Mold BCD_4_In timeout		Troubleshoot BCD
384	Wait Mold BCD_5_In timeout		Troubleshoot BCD
385	Wait Mold BCD_6_In timeout		Troubleshoot BCD
386	Wait Mold BCD_7_In timeout		Troubleshoot BCD

387	Wait Mold BCD_8_In timeout		Troubleshoot BCD
388	Wait EOAT BCD_1_In		Troubleshoot BCD
389	Wait EOAT BCD_2_In		Troubleshoot BCD
390	Wait EOAT BCD_3_In		Troubleshoot BCD
391	Wait EOAT BCD_4_In		Troubleshoot BCD
392	Wait EOAT BCD_5_In		Troubleshoot BCD
393	Wait EOAT BCD_6_In		Troubleshoot BCD
394	Wait EOAT BCD_7_In		Troubleshoot BCD
395	Wait EOAT BCD_8_In		Troubleshoot BCD
396	Wait BCD_SR Data Send request timeout		Troubleshoot BCD
397	Wait BCD_SO Data send finish timeout		Troubleshoot BCD
398	Wait BCD_FA Validation success timeout		Troubleshoot BCD
399	Wait BCD_OK Validation success timeout		Troubleshoot BCD

400	Wait BCD_MC EOAT exchange timeout		Troubleshoot BCD
401	Wait BCD_MN Mold No. timeout		Troubleshoot BCD
402	Wait BCD_SB Start Set timeout		Troubleshoot BCD
403	Wait BCD_RA Robot enable timeout		Troubleshoot BCD
404	Wait BCD_ER Abnormal Reset timeout		Troubleshoot BCD
405	Wait BCD_CS1 cycle stop1		Troubleshoot BCD
406	Wait BCD_CS2 cycle stop2		Troubleshoot BCD
407	Wait BCD_CS3 cycle stop3		Troubleshoot BCD
408	Wait LMT5 CorePuller back timeout		
409	Wait LMG5 CorePuller forward timeout		
410	Wait LMT6 CorePuller back timeout		
411	Wait LMG6 CorePuller forward timeout		

2.2 Servo Drive Alarm List

Alarm No.	Alarm Name	Alarm Action	Indicate DO	Servo State Switch
AL001	Over current	Main circuit current is higher than 1.5 multiple of motor's instantaneous maximum current value.	ALM	Servo Off
AL002	Overvoltage	Main circuit voltage has exceeded its maximum allowable value.	ALM	Servo Off
AL003	Undervoltage	Main circuit voltage is below its minimum specified value.	WARN	Servo Off
AL004	Motor error	The motor does not match the drive. They are not correctly matched for size (power rating).	ALM	Servo Off
AL005	Regenerate error	Regeneration control operation is in error.	ALM	Servo Off
AL006	Overload	Servo motor and drive is overload	ALM	Servo Off
AL007	Overspeed	Motor's control speed exceeds the limit of normal speed.	ALM	Servo Off
AL008	Abnormal pulse control command	Input frequency of pulse command exceeds the limit of its allowable setting value.	ALM	Servo Off
AL009	Excessive deviation	Position control deviation value exceeds the limit of its allowable setting value.	ALM	Servo Off
AL011	Encoder error	Pulse signal is in error	ALM	Servo Off
AL012	Adjustment error	Adjusted value exceeds the limit of its allowable setting value when perform electrical adjustment.	ALM	Servo Off
AL013	Emergency stop activated	Emergency stop switch is activated	WARN	Servo Off
AL014	Reverse limit switch error	Reverse limit switch is activated	WARN	Servo On

AL015	Forward limit switch error	Forward limit switch is activated	WARN	Servo On
AL016	IGBT temperature error	The temperature of IGBT is over high.	ALM	Servo Off
AL017	Memory error	EEPROM write-in and read-out is in error.	ALM	Servo Off
AL018	Encoder output error	The encoder output exceeds the rated output frequency.	ALM	Servo Off
AL019	Serial communication error	RS-232/485 communication is in error.	ALM	Servo Off
AL020	Serial communication time out	RS-232/485 communication time out.	WARN	Servo On
AL022	Input power phase loss	RST power cable of main circuit might be loose, or it may have no power supply	WARN	Servo Off
AL023	Pre-overload warning	Pre-overload warning	WARN	Servo On
AL024	Encoder initial magnetic field error	UVW error of encoder magnetic field position	ALM	Servo Off
AL025	Encoder internal error	The internal memory of the encoder is in error. An internal counter error.	ALM	Servo Off
AL026	Encoder internal data error	An encoder data error is detected for three times.	ALM	Servo Off
AL027	Encoder data error	Abnormal reset of encoder chip	ALM	Servo Off
AL028	Encoder over voltage error or encoder internal error	The charge circuit of the servo drive has been removed and the voltage is higher than the specification (> 3.8V) or the signal of the encoder is in error.	ALM	Servo Off
AL029	Gray code error	Absolute position is in error	ALM	Servo Off

AL030	Motor crash error	When the motor hits the hard equipment, the setting time of the torque of P1-57 reaches the setting time of P1-58.	ALM	Servo Off
AL031	U, V, W wiring error	Motor Power Line U, V, W, GND wiring error or disconnection	ALM	Servo Off
AL034	Encoder internal communication error	1. Internal communication error of the absolute encoder 2. Internal error of other type of encoder	ALM	Servo Off
AL035	Temperature limit error	Encoder temperature beyond the limit	ALM	Servo Off
AL040	Full closed-loop position control error	The position control deviation value of full closed loop exceeds the specified limit.	ALM	Servo Off
AL041	Optical ruler error	Optical ruler communication disconnection	ALM	Servo Off
AL042	Analog input voltage error	The analog input voltage is higher than the value of P1-83.	ALM	Servo Off
AL044	Driver function usage error	When the drive motor control function exceeds the fixed usage rate, it will affect the motion control function, causing the PR or ECAM to operate abnormally.	WARN	Servo On
AL045	Electronic gear ratio setting error	When the electronic gear ratio is set outside the range (1/50~25600), an alarm will occur after power-on again.	ALM	Servo Off
AL060	Absolute position lost	Due to battery undervoltage or the failure of power supply, the encoder lost the internal record.	WARN	Servo On
AL061	Encoder under voltage	The voltage of the absolute encoder is lower than the specification value	WARN	Servo On
AL062	The multi-turn of absolute encoder overflows	The multi-turn of absolute encoder exceeds the maximum range: -32768 ~ +32767	WARN	Servo On

AL067	Temperature alarm	Encoder temperature beyond warning value, but within temperature protection limit	WARN	No
AL068	Absolute data transmitted via I/O error	The sequence is wrong when reading the absolute position via DIO.	WARN	Servo On
AL069	Wrong motor type	Incremental motor is not allowed to activate the absolute function.	ALM	Servo Off
AL06A	Absolute position uninitialized error	The absolute position is not initialized. It may be: 1. It is the first time use after leaving the factory. 2. The battery is dead, causing the absolute position to be lost, but the battery has been replaced.	WARN	Servo On
AL070	Encode unfinished disposal alarm	Encoder Barcode write or related action is not finished	WARN	Servo Off
AL072	Encoder overspeed error	Drive power supply: speed exceeds 8,800rpm. Battery power supply: speed exceeding 10,000 rpm	ALM	Servo Off
AL073	Encoder memory error	Encoder reading / writing EEPROM error	ALM	Servo Off
AL074	Encoder single-turn error	Encoder inside single turn position abnormal	ALM	Servo Off
AL075	Encoder absolute circle number error	The absolute circle number of encoder internal error	ALM	Servo Off
AL077	Encoder internal error	Encoder internal error (inside calculate error)	ALM	Servo Off
AL079	Encode parameter set up	When the parameter is written to the encoder, it will need to be repowered to make the parameter come into effect.	ALM	Servo Off
AL07A	Encoder Z phase position lost	Encoder Z phase position lost	ALM	Servo Off

AL07B	Encoder memory busy	The encoder has been in a busy state of memory	ALM	Servo Off
AL07C	The absolute position command is issued when the speed exceeds 200rpm.	The absolute position command is issued when the speed exceeds 200 rpm.	WARN	Servo On
AL07D	Reconnect to power after AL07C	When AL07C occurs, if the AL07C is not removed, the motor will be stopped	ALM	Servo Off
AL07E	Encoder clean program error	The encoder clears the program error, retry the number to reach the upper limit	ALM	Servo Off
AL083	Drive output current is too large	In general operation, if the output current of the driver exceeds the potential limit of the internal firmware, the ALE083 is triggered to protect the IGBT from burning over the excessive current	ALM	Servo Off
AL085	Retrograde abnormal	Retrograde control for abnormal movements	ALM	Servo Off
AL086	High input voltage	When the driver determines the quantity of no retrogradation, there are other energy (such as interference) recharge to the driver, or the input voltage of the power supply is higher than the rated allowable voltage value	ALM	Servo Off
AL095	External regenerative resistor	For models above 220V 5.5kW, if P1-53≠0 and no external regenerative resistor is connected, or the brake is disconnected, the alarm will pop up.	WARN	Servo On
AL099	DSP firmware upgrade	After the firmware version is upgraded, the EEPROM reconfiguration has not been performed. After P2-08=30, 28, reconnect the power	ALM	Servo Off

AL111	CANopen SDO receives buffer overflow	SDO Rx buffer overflow is detected (receive two or more SDO packets in 1ms).	ALM	Servo On
AL112	CANopen PDO receives buffer overflow	PDO Rx buffer overflow is detected (receive two or more PDO (same COBID) packets in 1ms).	ALM	Servo On
AL121	Index error occurs when accessing CANopen PDO	The specified Index in the message does not exist.	ALM	Servo On
AL122	Sub-index error occurs when accessing CANopen PDO	The specified Sub-index in the message does not exist.	ALM	Servo On
AL123	Data size error occurs when accessing CANopen PDO	The data length in the message does not match the specified object.	ALM	Servo On
AL124	Data range error occurs when accessing CANopen PDO	The data in the message has exceeded the data range of the specified object.	ALM	Servo On
AL125	CANopen PDO mapping object is read-only and write-protected	The specified object in the message is read-only and write-protected (cannot be changed).	ALM	Servo On
AL126	CANopen PDO object does not support PDO	The specified object in the message does not support PDO.	ALM	Servo On
AL127	CANopen PDO object is write-protected when Servo On.	The specified object in the message is write-protected (cannot be changed) when Servo On.	ALM	Servo On
AL128	Error occurs when reading CANopen PDO object from EEPROM	An error occurs when the initial value is loaded by the ROM at boot time, and all CAN objects automatically return to the initial value.	ALM	Servo On

AL129	Error occurs when writing CANopen PDO object into EEPROM	An error occurred while saving the current value in ROM	ALM	Servo On
AL130	EEPROM invalid address range	The amount of data in the ROM is beyond the space planned for the firmware. Perhaps the firmware version has been updated, and the data in the ROM is stored in the old version, so it cannot be used!	ALM	Servo On
AL131	EEPROM CRC error	Indicates that the data stored in the ROM has been corrupted, and all CAN objects automatically return to the initial values.	ALM	Servo On
AL132	CANopen PDO password error	When writing operating parameters with CAN, this parameter has been password protected and must be unlocked first!	ALM	Servo On
AL170	Disconnected Communication	Communication Disconnected	WARN	Servo On
AL180	Disconnected Communication	Communication Disconnected	ALM	Servo Off
AL185	Abnormal CAN Bus hardware	CAN Bus off or Error Rx/Tx Counter exceeds 128.	ALM	Servo On
AL186	CAN Bus off	CAN data transmission error	ALM	Servo On
AL201	CANopen data initialization error	An error occurs when loading data from EEPROM.	WARN	Servo On
AL207	PR demand group range error	The group of PR#8 command source, P_Grp exceeds the range.	WARN	Servo On
AL209	PR demand parameter number range error	The parameter number P_Idx of PR#8 command exceeds the range.	WARN	Servo On

AL213	PR demand parameter set error	Write parameter error occurs in PR mode: the setting value exceeds the limit of normal range.	WARN	Servo On
AL215	Write parameter error: read only.	Write parameter error occurs in PR mode: the parameter is read only.	WARN	Servo On
AL217	Write parameter error: parameter lock	Write parameter error occurs in PR mode: the parameter is write-protected (cannot be changed) when Servo On or the setting value is invalid	WARN	Servo On
AL231	PR demand code error	The setting of monitor item of PR#8, Sys_Var exceeds the range.	WARN	Servo On
AL235	PR order buffer overflow	Set the command counter overflow, and then execute the absolute addressing command	WARN	Servo On
AL237	Undefined indexing coordinate	Before the user operates the indexing function, the starting point of the indexing coordinates is not defined, and the indexing positioning command is directly executed. The driver generates the alarm because the indexing coordinate system is not clear.	WARN	Servo On
AL283	Forward software limit	Position command is greater than software forward limit	WARN	Servo On
AL285	Reverse software limit	Position command is less than software negative limit	WARN	Servo On
AL289	Position counter overflow	Overflow of position command counter	WARN	Servo On
AL291	Servo OFF error	Servo OFF when the path has not been completed yet	WARN	Servo On
AL301	CANopen SYNC failed	CANopen IP mode, the synchronization mechanism with the host computer is invalid!	WARN	Servo On
AL302	CANopen SYNC signal error	CANopen's SYNC signal is received too early	WARN	Servo On

AL303	CANopen SYNC time out	CANopen's SYNC signal is not received within time limit	WARN	Servo On
AL304	CANopen IP command failed	CANopen IP mode, the command cannot be sent!	WARN	Servo On
AL305	SYNC period error	CANopen 301 Obj 0x1006 Data Error!	WARN	Servo On
AL380	Offset alarm	See the details with the description of parameter P1-48. When “DO: MC_OK” is turned “ON”, “DO: TPOS” turns “OFF”, causing “DO: MC_OK” also turns “OFF”.	WARN	Servo On
AL3CF	CANopen communication error	CANopen communication error	WARN	Servo On
AL3E1	CANopen SYNC failed (Servo Off)	CANopen SYNC failed (Servo Off)	WARN	Servo On
AL3E2	CANopen SYNC signal error (Servo Off)	CANopen SYNC signal error (Servo Off)	WARN	Servo On
AL3E3	CANopen SYNC time out (Servo Off)	CANopen SYNC time out (Servo Off)	WARN	Servo On
AL3E4	CANopen IP command failed (Servo Off)	CANopen IP command failed (Servo Off)	WARN	Servo On
AL3E5	SYNC period error (Servo Off)	SYNC period error (Servo Off)	WARN	Servo On
AL400	Indexing coordinate error	P2-52 setting value is too small, resulting in incorrect indexing coordinates	ALM	Servo On
AL401	Receive NMT Reset demand when Servo On	Received NMT Reset command when Servo On	ALM	Servo On
AL404	PR filter set error	The value of the PR special filter (P1-22) is set too large, causing the internal cumulative position to be saturated.	ALM	Servo On

AL500	STO function is started	Safety function STO is started	ALM	Servo Off
AL501	STO_A lost (signal lost or error)	STO_A loses enable signal or STO_A loses synchronization with STO_B signal for more than 1 second	ALM	Servo Off
AL502	STO_B lost (signal lost or error)	STO_B loses enable signal or STO_B loses synchronization with STO_A signal for more than 1 second	ALM	Servo Off
AL503	STO_error	STO self-diagnosis error	ALM	Servo Off
AL555	System fault	Driver processor abnormal	None	None

2.3 Driver Alarm Troubleshooting Guide

Alarm No	Potential Cause	Checking Method	Corrective Actions
AL001 Over current	Short-circuit at drive output	1. Check the wiring connections between drive and motor 2. Check if the wire is short-circuited.	Replace the servo driver
	Motor wiring error	Check if the wiring steps are all correct when connecting motor to drive.	
	Control parameter setting error	Check if the setting value exceeds the factory default setting.	
	Control command setting error	Check if the control input command is unstable (too much fluctuation).	
AL002 Over voltage	The main circuit voltage has exceeded its maximum allowable value.	Use voltmeter to check whether the input voltage falls within the rated input voltage.	1. Check if the regenerative resistor is connected 2. Replace the servo driver
	Input power error (Incorrect power input)	Use voltmeter to check whether the input voltage is within the specified limit.	
	The hardware of the servo drive is damaged.	Use voltmeter to ensure that the main circuit input voltage falls within the specified limit,	
AL003 Under voltage	The main circuit voltage is below its minimum specified value.	Check whether the wiring of main circuit input voltage is normal.	1. Check if the main circuit RST input voltage is normal. 2. Replace the servo driver
	No input voltage at main circuit.	Use voltmeter to check whether input voltage at main circuit is normal.	
	Input power error (Incorrect power input)	Use voltmeter to check whether the input voltage is within the specified limit.	
AL004 Motor error	Encoder is damaged	Check the encoder for the damage	Replace the correct type of servo motor or servo driver
	Encoder is loose	Examine the encoder connector	
	The type of the servo motor is incorrect.	Check if the servo drive and servo motor are not correctly matched for	

		size (power rating	
AL005 Regeneration error	Regenerative resistor error	Check the regenerative resistor	Change resistor.
	The parameter set error	Confirm the regenerative resistance parameter (P1-52) setting value and the regenerative resistance capacity parameter (P1-53) setting	Set the correct parameter
AL006 Overload	The drive has exceeded its rated load during continuous operation.	Check if the drive is overloaded. The users can set parameter P0-02 (Drive Fault Code) to 11 and monitor if the value of the average torque [%] exceeds 100% always.	1. Check if the EOAT exceeds the load allowed by the robot. 2. Check if the gearbox is abnormal. 3. Check if the gear and linear rack are normal.
	The wiring of drive and encoder is in error.	Check the wiring of U, V, W and encoder	Ensure all wiring is correct
	Brake relay does not open	Check if the brake relay is open and the motor brake coil receives DC24V	1. Replace the brake relay 2.Replace the motor wire
AL007 Overspeed	Speed input command is not stable (too much fluctuation).	Use signal detector to detect if input signal is abnormal.	1. Check if the gearbox, gear, linear rack and linear rail are normal. 2. Check if the UVW wiring of the servo driver output is correct.
	Over-speed parameter setting is defective.	Check if the overspeed setting parameter P2-34 (overspeed warning condition) is too small	
AL008 Abnormal pulse control command	Pulse command frequency is higher than rated input frequency.	Use pulse wave frequency detector to detect whether the input frequency exceeds the rated input frequency	Replace the servo driver
AL009 Excessive deviation	Maximum deviation parameter setting is too small.	Confirm the maximum position error parameter P2-35 (position control error excessive warning condition) setting value	Increases the parameter setting value of P2-35.
	Gain value is too small	Check for proper gain value	Correctly adjust gain value
	Torque limit is too low	Check torque limit value	Correctly adjust torque limit value.

	There is an overload	Check for overload condition	Reduce external applied load or re-estimate the motor capacity
	Improper setting of electronic gear ratio	Check if the proportion of P1-44 and P1-45 is appropriate	Correctly setup electronic gear ratio
AL011 Encoder error	Encoder error	1. the encoder line is abnormal 2. the servo motor encoder is abnormal 3. the servo driver is abnormal	1. Check if the CN2 port on the servo driver and the encoder line is connected well. 2. Replace the servo motor 3. Replace the servo driver
AL012 Adjustment error	The analog input contact does not go back to zero.	Measure if the voltage of the analog input contact is the same as the voltage of the ground.	Correctly ground the analog input contact.
	The detection device is damaged.	Reset the power supply	If the error does not clear after resetting the power supply, contact your distributor for assistance or contact supplier
AL013 Emergency stop activated	Emergency stop switch is activated	Check if emergency stop switch is On or Off	Activate emergency stop switch
AL014 Reverse limit switch error	Reverse limit switch is activated.	1.Check if reverse limit switch is On or Off 2. Check if the servo driver input port is damaged.	1. Move the robot to a safe position in the manual mode 2.Replace the servo driver
AL015 Forward limit switch error	Forward limit switch is activated.	1.Check if reverse limit switch is On or Off 2. Check if the servo driver input port is damaged.	1. Move the robot to a safe position in the manual mode 2.Replace the servo driver
AL016 IGBT temperature error	The drive has exceeded its rated load during continuous operation	Check if there is overload or the motor current is too high.	Replace the servo driver
	Short-circuit at drive output.	Check the drive input wiring.	
AL017 Memory error	Parameter data error when writing	Press the panel SHIFT key to display EXGABX=1, 2, 3 G= parameter group code AB= parameter number 16 code. If E320A is displayed, it means	When it occurs during power transmission, it means that a certain parameter is out of

		P2-10; if E3610 is displayed, it means P6-16, check the parameters.	reasonable range. Can be re-powered after correction! Occurs in normal operation and represents an error when writing the pen parameter. Can be cleared with DI: ARST.
	Hidden parameter error	Press the panel SHIFT key to display the E100X	Occurs in the factory parameter reset, the drive type setting is wrong, set the correct type.
	Data corruption in ROM	Press the SHIFT key to display E0001	Occurs when the power is transmitted, usually the data in the ROM is damaged or there is no data in the ROM. Return it to the dealer or the factory for repair.
AL018 Encoder output error	Encoder itself or the wiring of encoder is in error.	Check if the recent fault records (P4-00 ~ P4-05) display on the drive keypad in accordance with the fault codes AL011, AL024, AL025 and AL026.	Perform the corrective actions as described in AL011, AL024, AL025 and AL026.
	Output pulse wave exceeds hardware tolerance	Check if the following conditions occur: P_1-76<$\frac{\text{Motor Speed}}{60} \times P_1 - 46 \times 4 > 19.8 \times 10^6$	Correctly set P1-76 and P1-46 and P1-46: P_1-76<$\frac{\text{Motor Speed}}{60} \times P_1 - 46 \times 4 > 19.8 \times 10^6$
AL019 Serial communication error	Communication parameter setting is defective.	Check the communication parameter setting.	Set the value correctly
	Communication address is incorrect	Check the communication address	Set the mailing address correctly
	Communication value is incorrect.	Check the communication value	Set the value correctly
AL020 Serial communication time out	Setting value in time out parameter is not correct.	Check communication time out parameter setting.	Set the value correctly
	Not receiving communication command for a long time.	Check whether communication cable is loose or broken.	Correct wiring

AL022 Input power phase loss	Abnormal main circuit power	Check if RST power cable of main circuit power is loose or has no power supply. The alarm occurs when three phases of 1.5kW (or under) servo drive has no power supply and when single phase of 2kW (or above) servo drive has no power supply.	1. Check if the RST input of the main circuit power supply of the servo drive is normal. 2. Replace the servo driver
AL023 Pre-overload warning	The drive is going to overload.	1. Check the load condition of the servo motor and drive. 2. Check the setting value of P1-56. Check whether the setting value of P1-56 is too small.	1. Refer to the correction actions of AL006. 2. Increase the setting value of P1-56 or set P1-56 to 100 and above.
AL024 Encoder initial magnetic field error	The magnetic field of the encoder U, V, W signal is in error.	1. Check if the motor ground is properly grounded. 2. Check if the encoder signal line is separated from the power supply or high current line to avoid the generation of interference sources. 3. Check if the wire of the position detector uses a segregation net	Replace the servo motor
AL025 Encoder internal error	The internal memory of the encoder is in error. An encoder counter error occurs	1. Check if the motor ground is properly grounded. 2. Check if the encoder signal line is separated from the power supply or high current line to avoid the generation of interference sources. 3. Check if the wire of the position detector uses a segregation net	Replace the servo motor
AL026 Encoder internal data error	An encoder data error occurs for three times	1. Check if the motor ground is properly grounded. 2. Check if the encoder signal line is separated from the power supply or high current line to avoid the generation of interference sources. 3. Check if the wire of the position detector uses a segregation net	Replace the servo motor
AL027 Encoder data error	Reset the encoder chip	1. Check if the signal cable of the encoder is poor contact 2. Check if the encoder power is stable 3. If the operation temperature of encoder is higher than 95 ℃	Replace the servo driver

AL028 Encoder over voltage error or encoder internal error	Overvoltage of the battery	1. Check if the servo drive has the charge circuit. 2. Check if the installation of the battery is correct. (the voltage is higher than 3.8V)	Replace the servo motor
	Internal error of the encoder	1. Check if it is the absolute encoder. 2. Check if the signal cable of the encoder is poor contact 3. Check if the encoder signal line is separated from the power supply or high current line to avoid the generation of interference sources. 4. Check if the wire of the position detector uses a segregation net	Replace the servo motor
AL029 Gray code error	Absolute position is in error	Re-power on to operate the motor and check if the alarm will occur again.	Replace the servo motor
AL030 Motor crash error	Motor collision error	1. Check if P1-57 is enabled. 2. Check if the setting values of P1-57 is too small, if the setting time of P1-58 is too short.	1. If it is accidentally opened, set P1-57 to 0. 2. According to the actual torque setting, if the setting is too low, it will malfunction, if the setting is too high, it will lose the protection function.
AL031 U, V, W wiring error	The wiring connections of U, V, W (for servo motor output) and GND (for grounding) are in error.	1. Check if the motor U, V, W wiring are disconnected. 2. Check if the motor U, V, W wiring are connected wrong.	1. Connect U, V, W according to the manual correctly and ground properly. 2. Replace the motor wire
AL034 Encoder internal communication error	Internal communication of the encoder is in error	Check if the battery wiring is connected correctly.	1.Replace the servo motor 2.Rreplace the encoder line
AL035 Temperature limit error	Encoder exceeds protection limit	Check the heat dissipation	Replace the servo motor
AL040 Full closed-loop position control error	Full closed loop position control error is too large	1.Check if the setting value of P1-73 is too small. 2.Check if all connections are loose and well- connected to the	1.Increases the parameter setting value of P1-73. 2.Ensure all connections are tight and well-connected

		mechanical equipment.	to the mechanical equipment.
AL041 Optical ruler error	Optical ruler disconnection	Check if communication circuit and wiring connections of optical ruler are correct.	Replace the servo motor
AL042 Analog input voltage error	The analog input voltage is higher than the value of P1-83 over 50ms.	Check if analog input voltage is too high.	Check all analog input voltages. Check if there is any question about the sources of analog speed commands.
AL044 Driver function usage error	Warning of servo driver function overload	N/A	Set P2-66 Bit4 to 1 can disable the display of this alarm.
AL045 Electronic gear ratio setting error	Electronic gear ratio setting error	Electronic gear ratio setting is out of range (1/50~25600), there will be an alarm after re-powering	Check if the P1-44 and P1-45 parameter settings are correct.
AL060 Absolute position lost	Battery undervoltage	Check if the voltage of the battery is lower than 2.8V.	1. Replace the battery 2. Re-position zero clear P2-08=271 P2-71=1
	Change the battery when the power is OFF which is controlled by the servo driver	Replacing the battery with the drive control power OFF will cause the encoder position to be lost 对不对	Conduct homing procedure again. Refer to the description of absolute coordinate initialization in Chapter 12.
	After activating the absolute function, the absolute coordinate initialization has not been completed.	1.Install the battery. 2.Check the wiring between the battery pack and the power cable of the servo drive. 3. Check the wiring of the encoder. 。	1. Do not replace the battery while the drive control power is ON. 对不对 2. How to replace the battery, refer to 1.7.1. Zero setting chapter
	Battery is not installed after the absolute function is activated	1. Check the wiring of the encoder. 2. Check the wiring between the battery pack and the power cable of the servo drive.	Reinstall the battery box, how to install the battery box, refer to 1.7.1. Zero setting chapter
AL061 Encoder under voltage	Battery under voltage	Check if the battery voltage is lower than 3.1 V	Replace the battery with the drive control power ON. The AL061 will automatically disappear after replacing

			the new battery.
AL062 The multi-turn of absolute encoder overflows	Exceeded range	Check if the number of motor revolutions is within the range of -32768 to +32767	Zero reset procedure. For how to initialize, refer to 1.7.1. Zero setting chapter
AL067 Temperature warning	Temperature warning	Encoder temperature exceeds the warning value, but is still within the upper limit of temperature protection	Handle heat issues and wait for cooling
AL068 Absolute data transmitted via I/O error	Sequence error	1. Switch OFF DI ABSQ should wait until DO ABSR is OFF. 2. Switch ON ABSQ should wait until DO ABSR is ON.	Correct the reading sequence of I/O
	Reading time out	Check if the time between switching ON DO ABSR and switching ON ABSQ exceeds 200ms.	After switching ON DO ABSR (the absolute position data is ready), read DO ABSD and switch ON DI ABSQ within 200ms so that to inform the servo drive data reading is completed.
AL069 Wrong motor type	Incremental motor is not allowed to activate the absolute function	1. Check if the motor is incremental or absolute encoder. 2. Check parameter P2-69.	If the user desires to use absolute function, choose absolute motor. If not, set parameter P2-69 to 0.
AL06A Absolute position uninitialized error	Absolute position uninitialized	The absolute position is not initialized. Potential Causes: 1. Robot's 1st use from the factory 2. The battery power supply has a momentary power failure (the battery box connector is loose, or the machine shake is too large). 3. Absolute motor abnormality 4. Encoder line damage	1. The absolute origin coordinate system needs to be re-established. For details, refer to 1.7.1. Zero setting chapter. 2. Check if there is any loose condition. If the confirmation is correct, replace the battery and re-position zero clearing. For details, refer to 1.7.1. Zero setting chapter 3. Replace the absolute motor 4. Replace the encoder line

AL070 Encode unfinished disposal alarm	Encoder disposal uncompleted warning	Incomplete when performing encoder Barcode write or related actions	Replace the servo driver or servo motor
AL072 Encoder overspeed	Encoder overspeed	Powered by the drive: the battery is powered by more than 8,800 rpm: the speed exceeds 10,000 rpm	Replace the servo driver or servo motor
AL073 Encoder memory error	Encoder memory error	Encoder read/write EEPROM error	Replace the servo driver or servo motor
AL074 Encoder single-turn error	Encoder single-turn error	Inside the encoder single turn position abnormal	Replace the servo driver or servo motor
AL075 Encoder absolute circle number error	Encoder absolute circle error	Encoder absolute circle number abnormal	Replace the servo driver or servo motor
AL077 Encoder internal error	Encoder internal error	Encoder internal error (Internal operation error)	Replace the servo driver or servo motor
AL079 Encode parameter set up	Encoder parameter setting	Write parameters to the encoder, it needs to power on again, in order to take effect	Replace the servo driver or servo motor
AL07A Encoder Z phase position lost	Encoder Z phase position missing	Encoder Z phase position missing	Replace the servo driver or servo motor
AL07B Encoder memory busy	Encoder memory is busy	The encoder has been in a busy state of memory	Replace the servo driver or servo motor
AL07C The absolute position command is issued when the speed	The absolute position command is issued when the speed exceeds 200 rpm.	The absolute position command is issued when the speed exceeds 200 rpm.	Replace the servo driver or servo motor

exceeds 200rpm.			
AL07D Reconnect to power after AL07C	Reconnect to power after AL07C	When AL07C occurs, if the AL07C is not removed, the motor will be stopped.	Replace the servo driver or servo motor
AL07E Encoder clean program error	Encoder scavenging program error	Encoder clearer error retry count reached the upper limit	Replace the servo driver or servo motor
AL083 Drive output current is too large	Drive output current too large	In general operation, if the output current of the driver exceeds the potential limit of the internal firmware, the ALE083 is triggered to protect the IGBT from burning over the excessive current.	Replace the servo driver or servo motor
AL085 Retrograde abnormal	Retrograde abnormal	When retrograde abnormal action	1. Check if the regenerative resistance is abnormal. 2. Check if the P1-52 and P1-53 parameter settings are correct.
AL086 High input voltage	Input voltage is too high	When the driver determines the quantity of no retrogradation, there are other energy (such as interference) recharge to the driver, or the input voltage of the power supply is higher than the rated allowable voltage value.	Replace the servo driver or servo motor
AL095 External regenerative resistor	Unanswered external retrograde resistance	For the above 220V 5.5kW, if the P1-53≠0 and no external retrogradation resistance is applied, or when the brake breaks, it will jump out of this abnormal alarm.	Replace the servo driver or servo motor
AL099 DSP firmware upgrade	DSP firmware upgrade	Is there a firmware upgrade?	After P2-08 = 30, 28, re-send the power.

AL111 CANopen SDO receives buffer overflow	SDO Rx buffer overflow is detected (receive two or more SDO packets in 1ms)	Check if the servo drive (Master) receives two or more SDO packets in 1ms.	Replace the servo driver or servo motor
AL112 CANopen PDO receives buffer overflow	PDO Rx buffer overflow is detected (receive two or more	Check if the servo drive (Master) receives two or more PDO (same COB-ID) packets in 1ms.	Replace the servo driver or servo motor
AL121 Index error occurs when accessing CANopen PDO	The specified Index in the message does not exist.	Check if the Entry index value in PDO Mappin is modified when PDO is sent! NMT: Reset node or 0x6040.Fault	Replace the servo driver or servo motor
AL122 Sub-index error occurs when accessing CANopen PDO	The specified Sub-index in the message does not exist.	Check if the Entry Sub-index value in PDO mapping is changed when accessing PDO object.	Replace the servo driver or servo motor
AL123 Data size error occurs when accessing CANopen PDO	The data length in the message does not match the specified object.	Check if the Entry data length in PDO mapping is changed when accessing PDO object.	Replace the servo driver or servo motor
AL124 Data range error occurs when accessing CANopen PDO	The data in the message has exceeded the data range of the specified object.	Check if the write-in data range in PDO mapping is not correct when accessing PDO object.	Replace the servo driver or servo motor
AL125 CANopen PDO mapping	The specified object in the message is read-only and write-protected (cannot be	Check if the specified object is set to read-only write-protected (cannot be changed) when accessing PDO object.	Replace the servo driver or servo motor

object is read-only and write-protected	changed).		
AL126 CANopen PDO object does not support PDO	The specified object in the message cannot support PDO.	Check if the specified object cannot support PDO when accessing PDO object.	Replace the servo driver or servo motor
AL127 CANopen PDO object is write-protected when Servo On.	The specified object in the message is write-protected (cannot be changed) when Servo On.	Check if the specified object in the message is write-protected (cannot be changed) while the servo drive is enabled (Servo On) when accessing PDO object.	Replace the servo driver or servo motor
AL128 Error occurs when reading CANopen PDO object from EEPROM	An error occurs when the initial value is loaded by the ROM at boot time, and all CAN objects automatically return to the initial value.	Check if it causes an error when the specified object reads EE-PROM when accessing PDO object.	Replace the servo driver or servo motor
AL129 Error occurs when writing CANopen PDO object into EEPROM	An error occurs when writing the current settings into ROM.	Check if it causes an error when the specified object writes EE-PROM when accessing PDO object.	Replace the servo driver or servo motor
AL130 EEPROM invalid address range	The amount of the data saved in ROM has exceeded the space determined by the firmware. Maybe the firmware version has been upgraded, and it causes that the data of old firmware version saved in ROM cannot be used.	Check if the specified object lets the address range of EE-PROM exceed the specification when accessing PDO object.	Replace the servo driver or servo motor

AL131 EEPROM CRC error	The data saved in ROM has been damaged and all CAN objects return to their default settings automatically	Check if the specified object results in the checksum error of EEPROM when accessing PDO object	Replace the servo driver or servo motor
AL132 CANopen PDO password error	The parameter is password protected when using CANopen communication to access the parameter	Check if the password for the specified object is invalid when accessing PDO object.	Replace the servo driver or servo motor
AL170 Communication Disconnected	Communication Disconnection error	Communication Disconnection error	Replace the servo driver or servo motor
AL 180 Communication Disconnected	Communication Disconnection error	Communication Disconnection error	Replace the servo driver or servo motor
AL185 Abnormal CAN Bus hardware	Abnormal CAN Bus hardware	1. Examine CAN Bus communication cable. 2. Check if the communication quality is good quality state. (It is recommended to use shielded cables and use common grounding.)	Replace the servo driver or servo motor
AL186 CAN Bus off	CAN Bus off	CAN data transmission error	Replace the servo driver or servo motor
AL201 CANopen data initialization error	CANopen data initial error	1. Restart the servo drive to check if the error can be cleared. 2. If the error cannot be cleared after restarting the servo drive, it indicates that the data in EEPROM is damaged and the users must do the following actions: a. If the users want to write default setting values, set P2-08 to 30 first and then 28 next, or use CANopen “0x1011” object to restore parameters from non-volatile memory. b. If the users want to write current setting values, use CANopen	DI: ARST, CANopen 0x1011 Restore default parameter

		“0x1010” object to save parameters in non-volatile memory.	
AL207 PR demand group range error	The parameter group of command source exceeds the range	Writing parameter via PR procedure: The parameter group of command source exceeds the range	DI: Alm Reset or P0-01 write 0
AL209 PR demand parameter number range error	The parameter number of command source exceeds the range	Writing parameter via PR procedure: The parameter number of command source exceeds the range	DI: Alm Reset or write 0 into P0-01
AL213 PR demand parameter set error	In PR mode, error occurs when using PR command TYPE=8 (write specified parameter)	Parameter exceeds the range	DI: Alm Reset or P0-01 write 0
AL214 An error occurs when writing parameter via	In PR mode, error occurs when using PR command TYPE=8 (write specified parameter)	Check if the parameter is read-only	DI: Alm Reset or P0-01 write 0
AL215 Write parameter error: read only	In PR mode, error occurs when using PR command TYPE=8 (write specified parameter)	Check if the parameter is read-only	DI: Alm Reset or P0-01 write 0
AL217 Write parameter error: parameter lock	In PR mode, error occurs when using PR command TYPE=8 (write specified parameter) r	Check if the parameter is write-protected when Servo On or the setting value is invalid.	Correct the PR command and parameter setting value.
AL231 PR demand code error	The monitor item of the command source exceeds the range	Writing parameter via PR procedure: The monitor item number of command source exceeds the range	DI: Alm Reset or P0-01 write 0
AL235 PR order buffer overflow	PR order abnormal	Incremental systems: PR mode keeps running in a single direction, which the Feedback Location Buffer (FB_PUU) overflow	Replace the servo driver or servo motor

		and causes the coordinate system to fail to reflect the correct position. This error occurs when the PR absolute addressing command is issued. Absolute system: When an absolute addressing command is issued in the following circumstances This error occurs: 1. Feedback Location Buffer (FB_PUU) overflow 2. Change P1.01.Z without returning to the origin Failure to execute origin program 3. After changing the ratio of electronic gears (P1-44, P1-45) The origin program has not been executed. 4. Trigger back to the origin and the program has not yet returned to the origin. 5. When AL060 and AL062 occur, use the oscilloscope to observe whether the feedback position is overflow, and check whether the above 1~4 conditions have occurred, and then execute the home position return program.	
AL237 Undefined indexing coordinate	Before the user operates the indexing function, the starting point of the indexing coordinates is not defined, and the indexing positioning command is directly executed. The driver generates the alarm because the indexing coordinate system is not clear.	The indexing coordinates are not defined, and then the indexing positioning command is executed.	1. Before operating the indexing function, must operate the origin position return action first to avoid this alarm. 2. When an alarm occurs, use “DI: Alm Reset” to clear the alarm or write o at “P0-01” to clear the alarm. 3. This alarm can also be cleared under Servo ON.

AL283 Forward software limit	Forward software limit	Forward software limit is judged according to the position command, not the actual feedback position, because the command always arrives first, and the feedback is backward. When the limit protection is applied, the actual position may not exceed the limit, and the appropriate deceleration time set can achieve the desired effect. Refer to the description of parameter P5-03.	Restart the servo
AL285 Reverse software limit	Reverse software limit	Reverse software limit is judged according to the position command, not the actual feedback position, because the command always arrives first, and the feedback is backward. When the limit protection is applied, the actual position may not exceed the limit, and the appropriate deceleration time is set. Can achieve the desired effect. Refer to the description of parameter P5-03.	Restart the servo
AL289 Position counter overflow	Position counter overflow	1. Set the appropriate gear ratio according to the actual application and the absolute running of total stroke to avoid feedback calculation overflow. 2. If P2-69. Z=1 is set (the indexing coordinate has no overflow function), set P2-70 bit 2 to 1	Restart the servo
AL291 Servo OFF error	Servo OFF abnormal	1. Check if the DI: SERVO ON wiring is normal. 2. Check if host computer turn SERVO ON too early 3. Check if the synchronization modify parameter P3-09 is set reasonably (Try to use the default value)	Restart the servo
AL301 CANopen SYNC failed	CANopen Synchronization failure	1. Check if the wires' communication quality is fine or not 2. Check if host computer sends out the SYNC signal 3. Check if the synchronization modify parameter P3-09 is set reasonably (Try to use the default value)	Restart the servo

AL302 CANopen SYNC signal error	CANopen Synchronization signal is too fast	1.Check if the synchronization period 0x1006 is consistent with the host computer setting 2.Check if the synchronization modify parameter P3-09 is set reasonably (Try to use the default value) 3. Check if the host compute's timing is inaccurate	Restart the servo
AL303 CANopen SYNC time out	CANopen SYNC time out	1. Check if the wires' communication quality is fine or not 2. Check if the synchronization period 0x1006 is consistent with the host computer setting 3. Check if the synchronization modify parameter P3-09 is set reasonably (Try to use the default value) 4. Check if the host compute's r timing is inaccurate	Restart the servo
AL304 CANopen IP command failed	CANopen IP command failed	The operation time of the IP mode is too long, turn off the USB monitor function	Restart the servo
AL305 SYNC period error	SYNC Period error	Check the data content of 0x1006. If it is less than or equal to 0, this error will be generated!	Restart the servo
AL380 Offset alarm	DO: MC_OK has turned ON and turned OFF again	See the details with the description of parameter P1-48. When "DO: MC_OK" is turned "ON", "DO: TPOS" turns "OFF", causing "DO: MC_OK" also turns "OFF". It may be that the external force is pushed to shift the position after the motor is positioned. This alarm can be turned off by P1-48. Y=0.	DI: Alm Reset or P0-01 input 0
AL3CF CANopen communication error	CANopen communication error	Check if the CANopen communication cable is connected correctly.	Check if the CANopen communication cable is connected correctly.

AL3E1 CANopen SYNC failed (Servo Off)	CANopen SYNC failed	CANopen SYNC failed	Replace the servo driver
AL3E2 CANopen SYNC signal error (Servo Off)	CANopen synchronization too fast	CANopen synchronization too fast	Replace the servo driver
AL3E3 CANopen SYNC time out (Servo Off)	CANopen SYNC time out	CANopen SYNC time out	Replace the servo driver
AL3E4 CANopen IP command failed (Servo Off)	AL3E4 CANopen IP command failed	AL3E4 CANopen IP command failed	Replace the servo driver
AL3E5 SYNC period error (Servo Off)	AL3E5 SYNC period error	AL3E5 SYNC period error	Replace the servo driver
AL400 Indexing coordinate error	P2-52 set error	Check if P2-52 is set in the range. If setting value is too small, resulting in incorrect indexing coordinates	Re-adjust P2-52 to the appropriate value
AL401 Receive NMT Reset demand when Servo On	Received NMT Reset command when Servo On	Check if Servo On is received when receiving the NMT Reset command	Restart the servo
AL404 PR filter set error	Internal position cumulative lag saturation	Check the setting of P1-22, if it is too large, it will easily lead to the accumulation of faster lag saturation.	Re-adjust P1-22 to the appropriate value

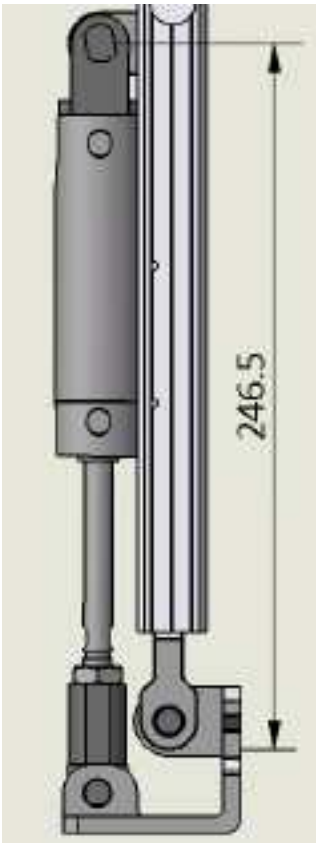
AL500 STO function is started	STO function is activated	1.Safety function STO is activated 2. Check whether the robot emergency stop is activated. 3. Check whether the emergency stop of the injection molding machine is activated. 4. Check whether the safety door of the injection molding machine is activated. 5. Check the fence door signal or external emergency stop signal	1. Check if the safety PLC input port I0, I1 has input 2. Check if the safety PLC input port I2, I3 has input 3. Check if the safety PLC input port I4, I5 has input 4. Check if the safety PLC input port I6, I7 has input 5. Check if the safety PLC output port O4 and O5 ports are normal.
AL501 STO_A lost (signal lost or error)	STO_A lost (signal lost or miss)	1.STO_A loses enable signal or STO_A loses synchronization with STO_B signal for more than 1 second. 2. Confirm if the STO input A channel is activated.	Check if the servo driver CN7 port STO_A and STO_A/ input are normal
AL502 STO_B lost (signal lost or error)	STO_B lost (signal lost or miss)	1.STO_B loses enable signal or STO_B loses synchronization with STO_A signal for more than 1 second. 2. Confirm if the STO input B channel is activated.	Check if the servo driver CN7 port STO_B and STO_B/ input are normal
AL503 STO_error	STO_error	1.STO Self-diagnosis error. 2. The STO circuit is abnormal. Contact the supplier.	Replace the servo driver
AL555 System fault	Driver processor abnormal	No	Replace the servo driver

3 EOAT Mounting Plate Information

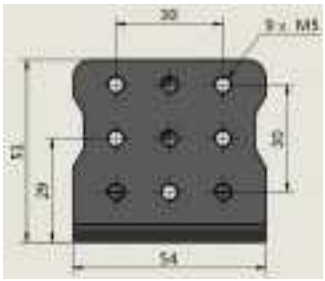
3.1 Standard Pneumatic C axis

3.1.1 **Suitable Model: MaxA02**

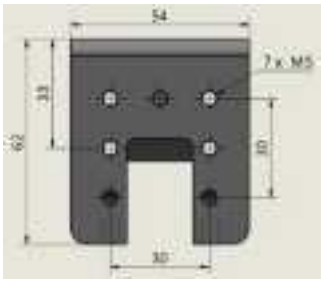
25# cylinder diameter, weight 1.0KG, rated torque 1.2 NM.



A direction



B direction

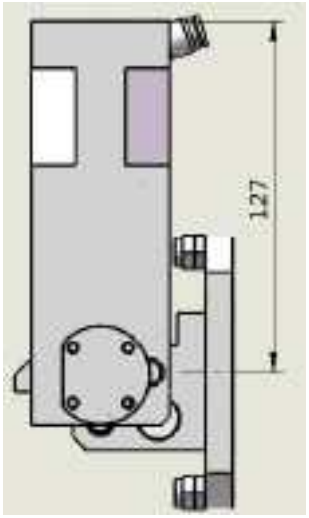


A direction

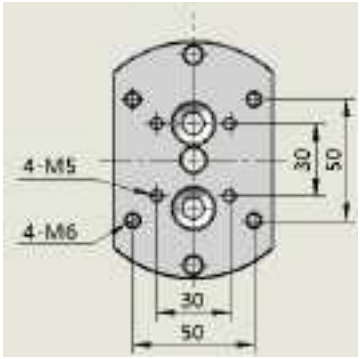
B direction

3.1.2 **Suitable Model: MaxA05/MaxAW05/MaxB08/MaxBW10/MaxC10/MaxCW10**

40# cylinder diameter, weight 1.0 KG, rated torque 12 N • m

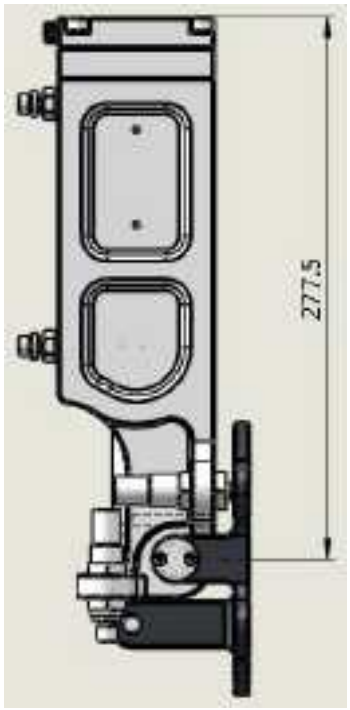


A direction

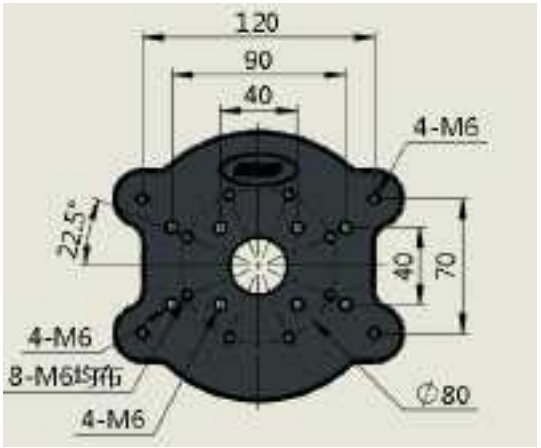


3.1.3 **Suitable Model: MaxBW15/MaxCW15**

50# cylinder diameter, weight 5.4 KG, rated torque 21.5 N • m

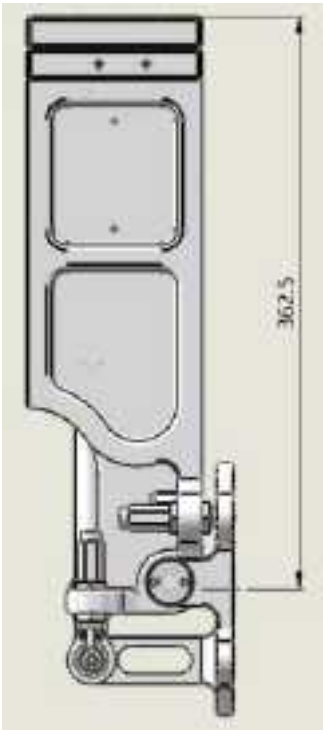


A direction



3.1.4 **Suitable Model: MaxBW25/MaxCW25**

63# cylinder diameter (single cylinder), weight 7.6 KG, rated torque 55.8 NM



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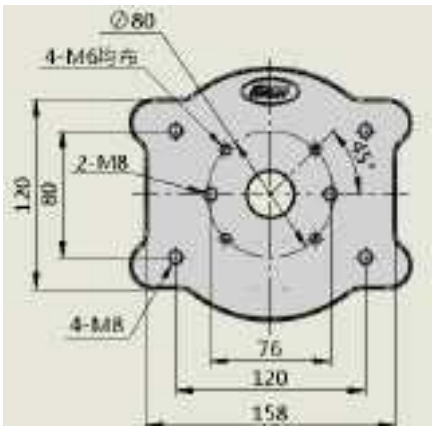
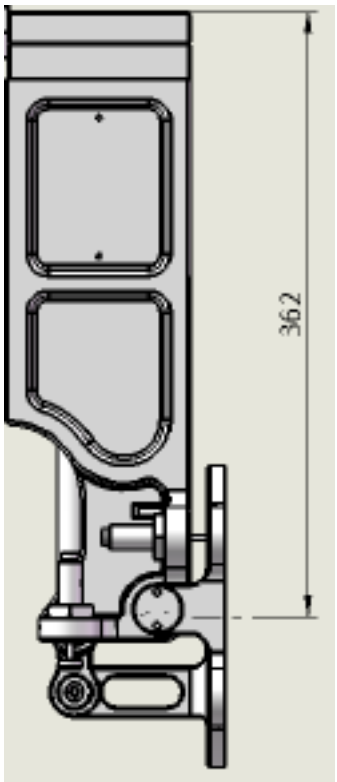


3.1.5 **Suitable Model: MaxCW35**

63# cylinder diameter (double cylinder), weight 13.8 KG, rated torque 111.6 NM



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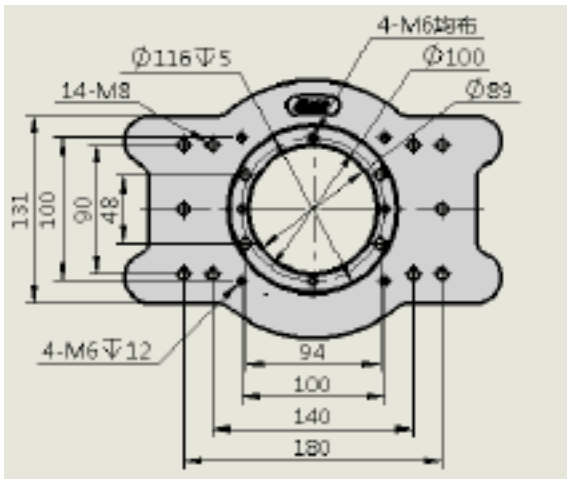
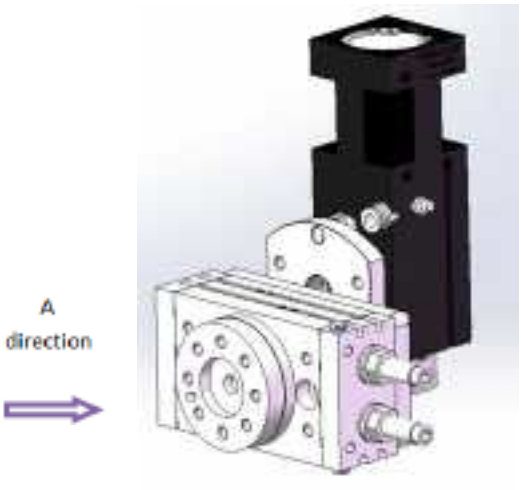


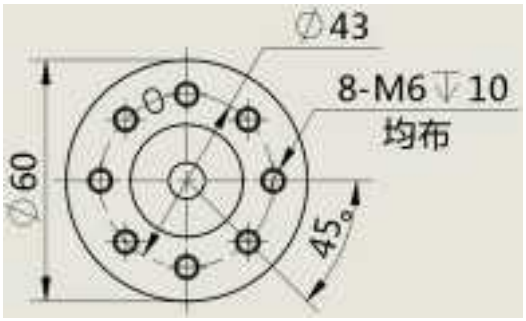
3.2 Standard Pneumatic A axis

3.2.1 **Suitable Model: MaxA05/MaxAW05**

20# cylinder diameter, weight 1.0 KG, rated torque 1.84 N • m, adjustable angle 0-190°

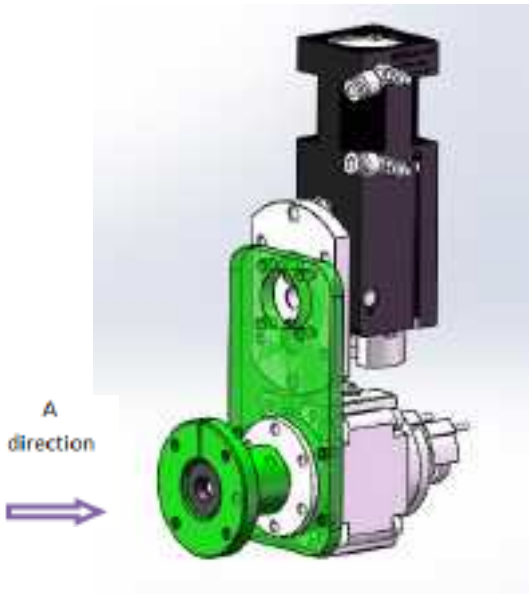


A direction

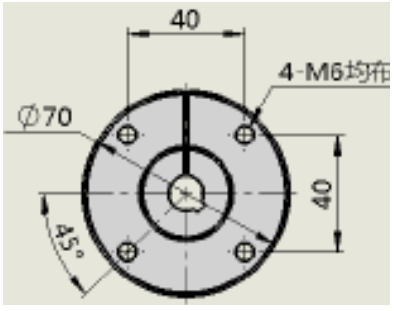


3.2.2 **Suitable Model: MaxB08/MaxBW10/MaxC10/MaxCW10**

50# cylinder diameter, weight 1.9 KG, rated torque 11.8 N • m, fixed angle 90°

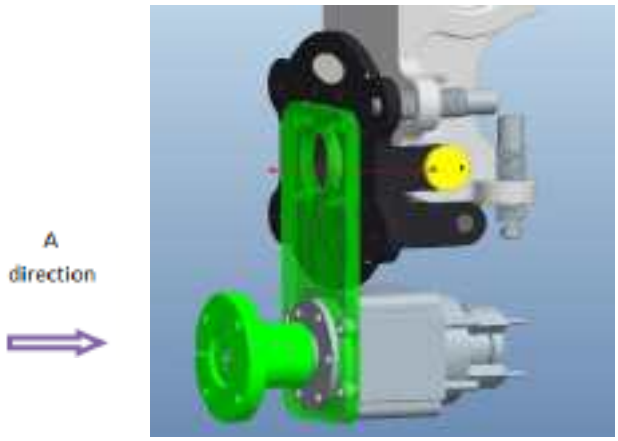


A direction

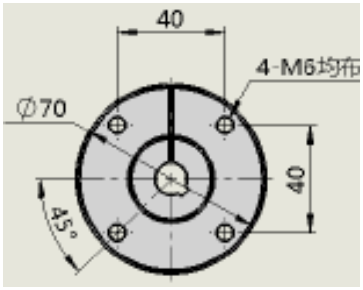


3.2.3 **Suitable Model: MaxBW15/MaxCW15**

63# cylinder diameter, weight 4 KG, rated torque 22.7 N • m, fixed angle 90°

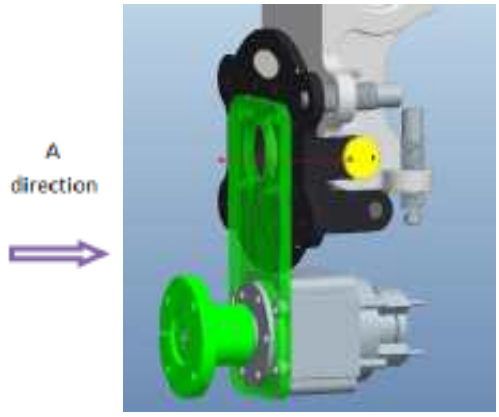


A direction

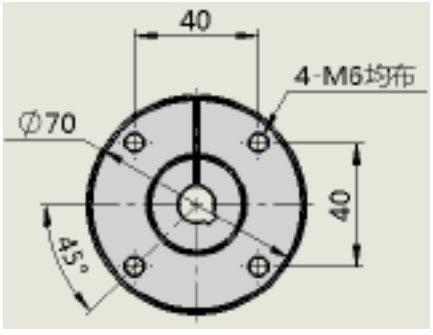


3.2.4 **Suitable Model: MaxBW25/MaxCW25**

80# cylinder diameter, weight 5.7 KG, rated torque 36.5 N • m, fixed angle 90°

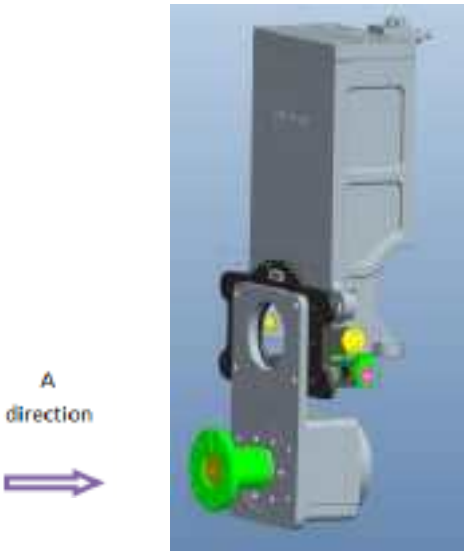


A direction

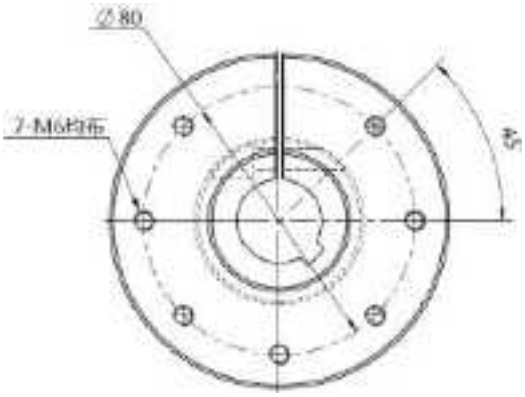


3.2.5 **Suitable Model: MaxCW35**

100# cylinder diameter, weight 8.7 KG, rated torque 72.6 N • m, fixed angle 90°



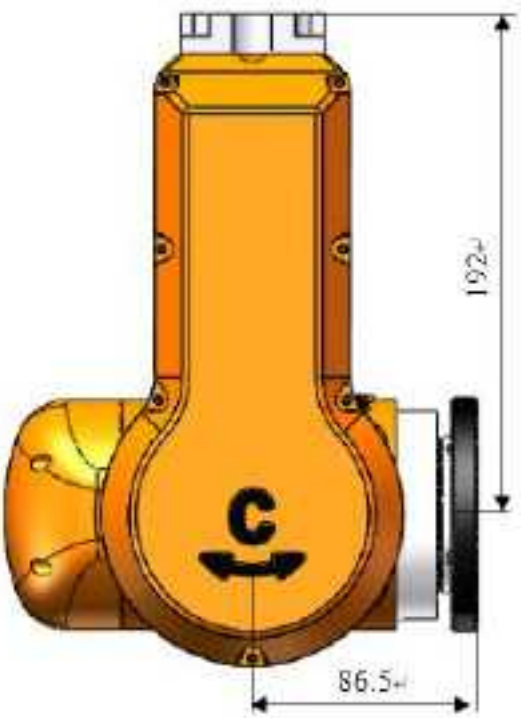
A direction

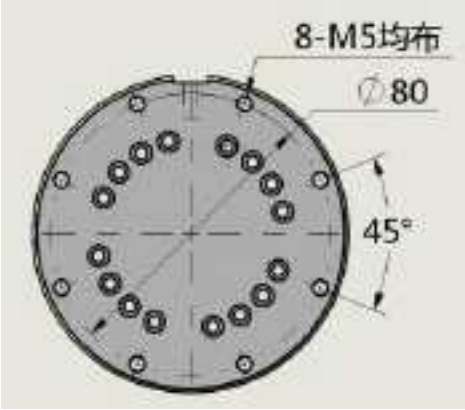


3.3 Standard Servo A+C(Absolute)

3.3.1 **Suitable Model: MaxB08/MaxBW10/MaxBW15/MaxC10/MaxCW10/MaxCW15**

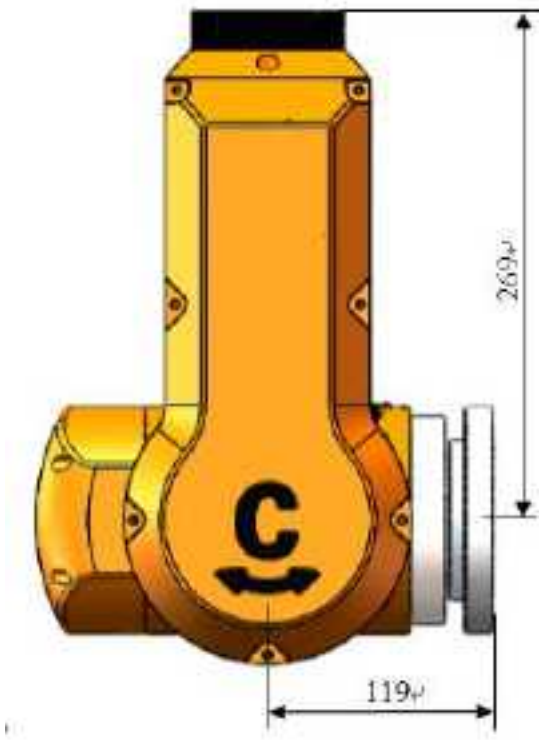
Servo A+C (100W, absolute）, H type, weight 4.8 Kg, rated torque: A axis: 28 N • m, C axis:45 N • m

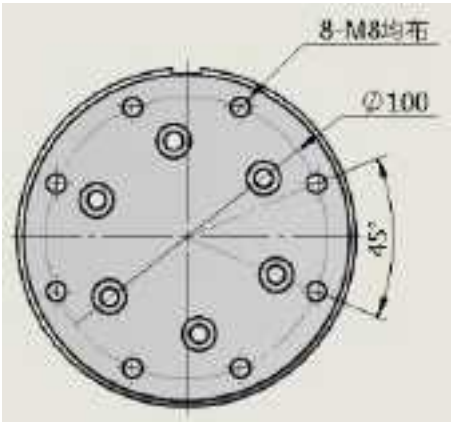




3.3.2 **Suitable Model: MaxBW25/MaxCW25**

Servo A+C（400W, absolute）, H type, weight,14.6 Kg, rated torque: A axis:103 N • m, C axis:100 N • m

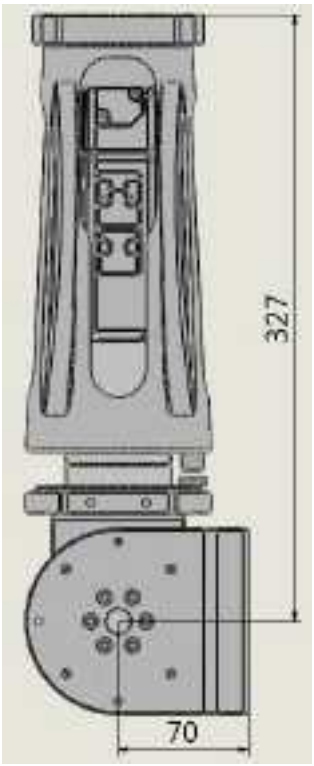




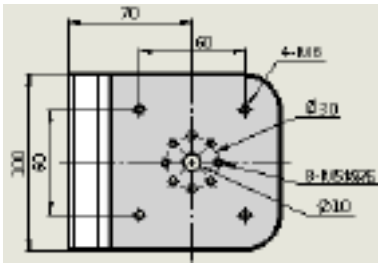
3.4 Standard Servo B+C

3.4.1 **Suitable Model: MaxB08/MaxBW10/MaxBW15/MaxC10/MaxCW10/MaxCW15**

Servo B+C（100W）, weight:7.9 Kg, rated torque: C axis:13 N • m



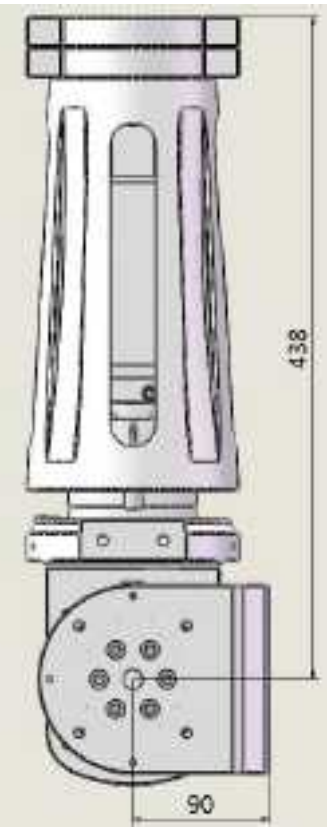
A direction



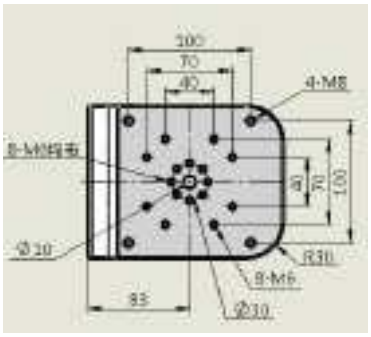
A
direction

3.4.2 **Suitable Model: MaxBW25/MaxCW25**

Servo B+C（400W）, weight: 20.2 Kg, rated torque ： C axis: 40.8 N • m



A direction

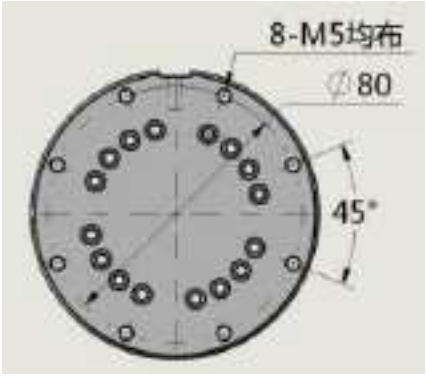


A
direction

3.5 Standard Servo A+B+C (Absolute)

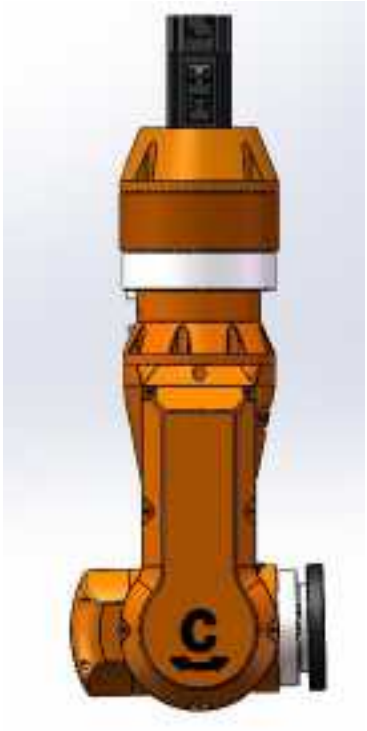
3.5.1 **Suitable Model: MaxB08/MaxBW10/MaxCW10/MaxBW15/MaxCW15**

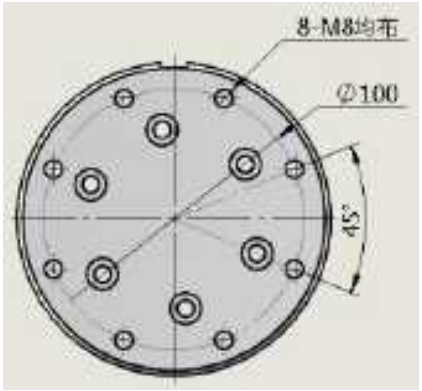
Servo A+B+C（100w, absolute）, weight：12 Kg, rated torque: A axis:28 N • m, B axis:23Nm, C axis:25 N • m



3.5.2 **Suitable Model: MaxBW25/ MaxCW25**

Servo A+B+C（400w, absolute）, weight: 23 Kg, rated torque: A axis:103 N·m, B axis :100Nm, C axis:100 N·m





4 Revision page

Version no.	Date of revision	Revised content and basis
V 1.0	8/30/2019	Whole manual
V2.0	4/8/2020	ARI full revision

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SUPPLEMENTAL SAFETY MANUAL

For Use with Absolute Robots

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Rev B. 4/26/2017

Table of Contents

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1.0 INTRODUCTION

The purpose of this SUPPLEMENTAL SAFETY MANUAL is to:

1. Explain the safety features that are included on the Well-Lih robots.

2. Explain the roles and responsibilities of the robot employer / workcell owner and the original equipment manufacturer.

3. Provide a simple checklist for use by OPERATORS, INSTALLATION / SETUP PERSONNEL, and MAINTENANCE PERSONNEL to confirm the robot safety features are functional and good safety practices are being used when operating, setting up and maintaining the robot.

4. Provide a recommendation for the frequency that the Safety Checklists should be performed.
   Provide other information and references that we recommend are considered or incorporated into your company safety program.

This SUPPLEMENTAL SAFETY MANUAL is not a substitute for the Well-Lih User Manual. It is the employer's responsibility to assure access to the full Well-Lih User Manual, and provide all necessary, safe, and proper training for each level of person in their employment as required by OSHA.

This manual assumes the Well-Lih Robot has been properly installed and started by qualified factory trained personnel. This manual also assumes that OPERATORS, INSTALLATION / SETUP PERSONNEL, AND MAINTENANCE PERSONNEL have been Certified, using objective criteria, to perform their assigned duties.

1.1 Roles and Responsibilities

The integration of a robot onto a horizontal injection molding machine creates a workcell. The design, installation, and verification of the safety for each workcell are the responsibilities of the "employer", i.e. the owner of the robot. The safeguarding of each

workcell is also the responsibility of the "employer." It is the "employer," in many cases, that purchases the HIMM, robot, mold, thermal controls, and combines the ancillary equipment to create a functional workcell. When combined, each individual piece of equipment must be properly installed, assuring safe operation, electrical installation, accessibility and guarding. Ref: Section 4.0 of ANSI/SPI B151.27 provides guidance for workcell responsibility & 29 CFR 1903.1 provides general workplace safety requirements.

Examples of Considerations for Employer Responsibility of a Workcell Include:

In general the safeguarding of a workcell should be based on the results of a Risk Assessment. Examples of considerations that should analyzed as part of the risk assessment include:

Energy:

- ✓ Electrical: Main connection, Power required when troubleshooting, Loss of power and when it's restored
- ✓ Pneumatics: Main connection, Pneumatics and power required when troubleshooting, Loss of pressure
- ✓ Emergency Stop Circuits: Contiguous circuit connecting primary equipment

Accessibility:

- ✓ Access for Programming
- ✓ Access for Preventative Maintenance
- ✓ Access for Set up / Lot Change Over
- ✓ Access for Good Part Retrieval
- ✓ Access for Quality Sample Retains

Once the Risk Assessment has been completed, means of mitigating the risks to an acceptable level can be addressed. Examples of these means include:

- ✓ Physical Barrier: Guarding, Gates and Access points
- ✓ Light Curtains: Operation, Safe Stopping Distance and Recovery after Breaching the Light Beam
- ✓ Safety Mats: Operation, Safe Stopping Distance and Recovery after Activating the Safety Mat

Additional references regarding methods for performing risk assessments can be found in the reference section of this supplemental safety manual.

2.0 ROBOT INSTALLATION & SET UP

The purpose of this section is to provide a review of safety features / practices that are used to install Well-Lih Robots. INSTALLATION / SETUP PERSONNEL should understand these are in place for their protection.

A convenient check list of items INSTALLATION / SETUP PERSONNEL should use to verify proper functioning of these features is included in this section. A recommended frequency of performing these checks is also provided.

1	**Certification**	➢ Your employer should certify you, showing written documentation that you have been trained on the safe and proper operation and set up of the Well-Lih Robot. If you have not been trained please do not proceed.
2	**Complete the Safety Checks**	➢ Test each of the Safety Function Checks listed in section 2.1
3	**Personnel Protective Gear**	**All Personal must have access to:** ➢ Eye Protection ➢ Hearing Protection ➢ Safety Shoes ➢ Gloves: for thermal, nicks, and cut protection ➢ Face Shield: for splash or spray protection ➢ Lockout and Tagout Set. These should be used in accordance with guidelines and standards referenced in **Section 6.4** of this manual.

4 Installation and Start Up

- There are many checks and steps to complete the safe/proper installation and startup of the Robot
- The intention of this section is to give reference to the documents that contain important information, that both the employer and employee, must be educated on.
- There are essentially four events that are necessary to complete the safe and proper installation and start up.

Read and refer to the Well-Lih User Manual to assure a safe and proper installation	
Event	***Reference and Instruction***
1. Mounting the Robot on the Horizontal Injection Molding Machine (HIMM)	➢ For safe and proper rigging of heavy items follow CFR 1910.178 and CFR 1910.179. Be sure to use properly load-rated rigging gear and lifting points.
2. Connect the Utilities	➢ All electrical connection shall meet NEC (National Electrical Code) requirements. ➢ All I/O or communication wiring is connected to the HIMM controller. ➢ Pneumatic line is connected to robot filter regulator port.
3. Mounting the End of Arm Tooling (EOAT)	➢ Assure the correct EOAT matches the mold. ➢ Assure all air and vacuum lines are connected.
4. Move Profile	➢ Use the Teach Pendent to create the move profile to capture molded parts from mold and place at discharge location

5	**Do not climb on machine**	➢ Do not use the injection unit as a step; do not use gates, guards or covers as a climbing tool. Use only appropriate step ladders, rolling stair ways or approved cat walks / scaffolding in accordance with CFR 1910 Labor Clause. ➢ Specific References: ▪ CFR 1910.66 Platforms and Lifts for Building Maintenance. ▪ CFR 1910.22 through 28, General Requirements (Ladders and Scaffolding).

Warning: When performing any of the checks in this document keep your hands and body clear of any pinch point or hazard. These checks can be completed at a safe distance from the hazards there is no need for any exposure to a hazard using the Look / Listen and Observe guidelines.

Robot Mounting Detail

1. When installing the robot do not substitute the fasteners provided by Absolute Robot
2. Use minimum Grade 8 SHCS (provided)
3. Clean and prepare threads using: Loctite® ODC-Free Cleaner & Degreaser, Loctite® 7649™ or Loctite® 7471™, and an appropriate thread locker, per the safety manual checklist procedure in section 2.1.
4. Clean and prepare the receiving threads on the top of the platen, per the safety manual checklist procedure in section 2.1.
5. Assure the tap depth is a minimum of twice the diameter of the threaded fastener provided.
6. Using an appropriate torque wrench and multiplier, torque the fasteners to the corresponding values provided by Absolute Robot. (See below)

Fastener Size SAE	Fastener Size Metric	Minimum Torque
3/8”-16-UNC minimum grade 8 SHCS	M10mm-1.5-UNC minimum grade 8 SHCS	33 ft-lbs
1/2”-13-UNC minimum grade 8 SHCS	M12mm-1.75-UNC minimum grade 8 SHCS	80 ft-lbs
5/8”-16-UNC minimum grade 8 SHCS	M16mm-2.0-UNC minimum grade 8 SHCS	150 ft-lbs
3/4”-10-UNC minimum grade 8 SHCS	M20mm-2.5 UNC minimum grade 8 SHCS	175 ft-lbs
N/A	M24mm-3.0-UNC minimum grade 8 SHCS	Consult Absolute Robot
N/A	M30mm-3.5-UNC minimum grade 8 SHCS	Consult Absolute Robot

2.1 Installation / Set Up Check List

This check list is only intended to confirm initial installation of the ROBOT and continued EOAT set up.

Requirement	Test	Confirm
Installation / Set Up Person Certification	Are you certified for installation and set up? **If not do not continue.**	☐ Have certification to install and set up robot
Protective Gear These should be used in accordance with guidelines and standards referenced in **Section 6.5** of this manual.	Verify the following protective gear is available to you	☐ Eye protection ☐ Hearing protection ☐ Safety shoes ☐ Gloves: thermal and nick and cuts ☐ Face Shield ☐ Lock & tag for LO/TO
Preparing and Installing the Robot ✓ For safe and proper rigging of heavy items follow: o CFR 1910.178 o CFR 1910.179 ✓ Be sure to use properly load-rated rigging gear.	Ensure the Robot is safely and securely mounted to the HIMM.	☐ Read the weight from the robot tag. ☐ Confirm hoist ring is rated for 3x robot wt. ☐ Confirm strap / chain is rated for 3x robot wt. ☐ Confirm crane is rated for 3x robot wt. ☐ Know torque of riser and robot fasteners. ☐ Clean the top of platen using 70% IPA and a shop cloth. ☐ If applicable, vacuum out existing taped holes. ☐ Inspect the quality of the tapped holes on the top of the platen; chase or correct any deformed threads. ☐ Prepare supplied fasteners using: Loctite® ODC-Free Cleaner & Degreaser and Loctite® 7649™ or Loctite® 7471™ Primer. ☐ Lift the robot into position using approved straps, chains, lifting rings, and crane. ☐ Apply threadlocker to each fastener. Be sure to completely fill the root of the threads at the area of assembly for 3-6 threads minimum. Refer to Robot Mounting Detail section. ☐ Install approved fasteners with a lock washer and a hard washer; tighten using minimal torque. ☐ Adjust the robot appropriately; assuring the Y-Axis is on the Center Line of the HIMM, assuring the X-Axis is perpendicular to the HIMM Center Line. ☐ Torque fasteners to the approved torque value using an appropriate torque wrench and multiplier. Refer to Robot Mounting Detail section. **Note:** Torque opposite fasteners in an alternating pattern, repeating each a minimum of two times. Using a paint pen, paint a tamper resistant mark from the socket headed cap screw to a visible position on the platen.

Requirement	Test	Confirm
Install and check safeguarding	Ensure the integrated safety features of the workcell after installation.	☐ All barrier guard panels are installed and anchored. ☐ Each access door/gate is equipped with an appropriate safety switch. ☐ Assure there are no areas a person can reach through, over, under, around, or be exposed to a hazard. ☐ With power on, the safety circuit enabled, all motion stops if an access point is breached or the access point may not be opened. ☐ Assure the emergency stop circuit stops the HIMM, robot and any primary ancillary equipment inside the workcell.
Installing the EOAT	Ensure the EOAT is safely and securely mounted to the chuck turn of the robot	☐ Fasteners are properly tightened. ☐ Confirm vacuum and pneumatic lines are connected. ☐ Confirm EOAT matches the mold & part. ☐ Confirm Robot program matches part.
Climbing on the HIMM to ✓ Service the Robot ✓ Install EOAT	Appropriate ladders / rolling stairs / catwalks.	☐ Confirm access to an approved step ladder / rolling stair set, or other device to reach elevated connections, control cabinet (all sides), fasteners, cables, hoses, material feeds etc. in compliance with CFR 1010.

3.0 OPERATOR SAFETY CHECKS

The purpose of this section is to provide an over view of safety features on Well-Lih Robot which **Operators** should understand are in place for their protection. A convenient check list of items operators should use to verify proper functioning of these features is included in this section. A recommended frequency of performing these checks is also provided.

1	**Operator Certification**	➢ Your employer should certify you, showing written documentation that you have been trained on the safe and proper operation of the Well-Lih Robot. If you have not been trained please do not proceed.
2	**Personnel Protective Gear**	**<u>All personal must have access to:</u>** ➢ Eye Protection ➢ Hearing Protection ➢ Safety Shoes ➢ Gloves: for thermal, nicks, and cut protection ➢ Face Shield: for splash or spray protection ➢ Lock and Tag Set. These should be used in accordance with guidelines and standards referenced in **<u>Section 6.4</u>** of this manual.

3	**Gates** ✓ HIMM Safety Gate 1 (operator side) ✓ HIMM Safety Gate 2 (non-operator side)	➢ Gates are electrically interlocked to the motion of the Robot and HIMM. ➢ Verify that all gates are securely mounted on the machine and that if a gate is open or ajar no machine motion is permitted.
4	**Guards** ✓ **Drive Components**	➢ Verify that all guards are securely mounted on the robot and that if a guard is open or ajar no machine motion is permitted.
5	**Electrical Interlocks** ✓ Safety Switches	➢ There are electrical interlocks between the Robot safe guarding and HIMM that will prevent any motion, if the HIMM safety interlocks are open. For example, if the supplemental perimeter guarding gate(s) are open, no motion shall be permitted. ➢ **Safety switches which are mounted on the machine, gates or guards should never be defeated** by physical or electrical jumpers. ➢ If any electrical interlock switch appears to be physically damaged do not operate the Robot until it has been reviewed by a trained and certified technician for operation.
6	**Mechanical Interlocks** ✓ X-Axis Limiting ✓ Brake on Z-Axis Only ✓ Electrical Cabinet Door	➢ The Well-Lih Robot is equipped with adjustable, mechanical stops that establish the restricted space around the robot. ➢ The Z-Axis is equipped with a servo brake that will lock when the emergency stop is activated or electrical power is lost. ➢ The electrical cabinet is equipped with a service disconnect. This disconnect has a location for lock out / tag out attachment and mechanically latches the panel door. Only a trained technician should open the control cabinet door.
7	**Pneumatic Interlocks** ✓ Valves ✓ Counter Balance	➢ The Well-Lih Robot is equipped with a blocking valve to prevent any movement of the EOAT and the chuck turn, if the emergency stop is activated. ➢ Some models are equipped with a pneumatic counter balance and will assist the Z-Axis servo brake to prevent any movement of the EOAT, if the emergency stop is activated.

8	**Software Interlocks and Messaging**	➢ The Well-Lih Robot is equipped with a "Human Machine Interface" (HMI) also known as the Teach Pendant. Messages from the controller are displayed on this unit. If a condition of the robot is not met, a descriptive message will be displayed. The situation will need to be corrected; the alarm or message must be acknowledged, so the robot will be ready for continued operation.
9	**Visual Inspection Prior to Operation**	➢ **Look:** Walk around the robot and verify that all gates, guards, and covers are in place, without physical damage to the robot, EOAT, controls, switches, or safety devices that may create an unsafe operation.
	Inspection of the Robot During Operation	➢ **Listen:** Walk around the robot listen for any abnormal sounds like metal on metal grinding, wearing or other anomalies, rattles, hum's, cyclical noises. ➢ **Observe:** Look over the robot for wearing or rubbing cables or parts getting hung up by an obstruction. If something just doesn't seem right call a trained technician immediately.
10	**Part Discharge**	➢ **Inspect the part discharge removal area** which may include; conveyor, chutes, automation, or robot. Assure all guards associated with these auxiliary devices are in place and functional. ➢ Assure the EOAT clears all guarding and unloads molded parts without damages to the tooling or parts. ➢ Assure that the parts are not accumulating, tangling, or otherwise creating a hazard or damage to the EOAT.

11	**Emergency Stop is Pressed**	➢ When you are starting the robot, if you find the emergency stop button has been pressed, rotated and locked in the **"no power"** position, do not reset it until a trained technician has cleared the machine as operational. Resetting requires the trained technician to power down the robot.
12	**Machine Fault**	➢ If the robot is in operation and a fault occurs, review the HMI for an error/status message display; correct the situation which should make the robot ready for continued operation. ➢ Note: faults are generally caused by a situation monitored electrically, by software, or mechanically that prevent operation, therefore there will likely be a physical reason as the cause.

Warning: When performing any of the checks in this document keep your hands and body clear of any pinch point or hazard. These checks can be completed at a safe distance from the hazards there is no need for any exposure to a hazard using the Look / Listen and Observe guidelines.

3.1 Operator Check List

Perform this check weekly or after maintenance.

Safety Function	Test	Confirm
Operator Certification	Are you certified to operate the Robot? **If not do not continue.**	☐ Have certification to operate robot
Protective Gear These should be used in accordance with guidelines and standards referenced in **Section 6.5** of this manual.	Verify the following protective gear is available to you	☐ Eye protection ☐ Hearing protection ☐ Safety shoes ☐ Gloves: thermal and nick and cuts ☐ Face Shield ☐ Lock & tag for LO/TO
Machine Settings	Place the Robot and HIMM in manual mode	☐ Robot is in manual mode ☐ HIMM is in manual mode
Operator Safety Gate	Open Gate	☐ Robot Motion is not permitted
Back Gate	Open Gate	☐ Robot Motion is not permitted
Electrical Interlocks	Inspect safety Switches	☐ All switches are properly attached and free of damage
Mechanical Interlocks	Inspect electrical cabinet door	☐ Verify the electrical cabinet door is latched closed and cannot be opened when the power is on
Mechanical Interlocks	Inspect mechanical stops on all axes	☐ All switches are properly attached and free of damage ☐ Assure all over travel bumpers are not visibly damaged
Inspection of Robot Prior to Operation	Visual Inspection	☐ Inspect gates, guards, and covers, all components are installed and present. ☐ Inspect for physical damage ☐ Inspect controls, switches, and safety devices for damage
Inspection of HIMM and Robot During Operation	Listen and Observe	☐ Listen for mechanical noises, or air leaks ☐ Listen for metal on metal grinding ☐ Observe part discharge ☐ Observe cables for abrasion
Emergency Stop Button – HMI	Press E-Stop Button	☐ Robot ceases all motions ☐ Alarm sounds ☐ No motion can occur without reset
Emergency Stop Button – Robot Safety Guard	Press E-Stop Button	☐ Robot ceases all motions ☐ Alarm sounds ☐ No motion can occur without reset
Machine Faults	View the HMI	☐ Check for fault conditions prior to starting robot
Note: In the event a safety function can not be confirmed do not put the Robot into cycle. Lock out the machine and notify a certified technician to correct the situation assuring safe and proper operation.		

4.0 MAINTENANCE SAFETY CHECKS

This section of the manual is aimed at educating the Robot maintenance personnel for the safety features for the Well-Lih Robot. A convenient check list of items that a maintenance technician should verify, in addition to those checks listed in section 2.0 and 3.0, is provided. Checks are completed prior to an operational run. More importantly each of these checks must also be completed after a repair or component replacement.

1	**Certification**	➢ Your employer should certify you, showing written documentation that you have been trained on the safe and proper operation, set up, maintenance and repair of the Well-Lih Robot. If you have not been trained please do not proceed.
2	**Personnel Protective Gear**	**All personal must have access to:** ➢ Eye Protection ➢ Hearing Protection ➢ Safety Shoes ➢ Gloves: for thermal, nicks, and cut protection ➢ Face Shield: for splash or spray protection ➢ Lockout and Tagout Set. These should be used in accordance with guidelines and standards referenced in **Section 6.4** of this manual.
3	**Complete the Installation / Set Up and Operators Checks**	➢ Complete each of the checks listed in section 2.0 and section 3.0. ➢ Reference section 6.5 for specific CFR requirements.

4 Interim Safeguards

Interim Safeguard Tools:

- Full Electrical lockout / tagout kit
- Pneumatic lockout / tagout kit
- Orange cones
- Safety signs
- Safety barriers
- Scaffolding /steps, lift, fall arrestor; when required
- When performing repairs, it may be the necessary to remove or replace safety devices. There may also be a need to check voltages, resistance, or amperage when the machine is energized and the electrical cabinet is open.

✓ **If overhead repairs are required, it is the responsibility of the employer to provide the necessary tools and education to execute such repairs safely.** It is critical to ensure the robot being repaired is clearly secured or identified as being in a "non-production state," preventing an inadvertent start up, permitting motion, or other inappropriate actions.

✓ Examples may include: An open control cabinet door should have an interim safeguard barrier protecting employees from falling into the cabinet, locking out a control cabinet preventing it from being powered up locking out a circuit breaker preventing voltage to a cabinet, or locking out pneumatic supply to assure a pneumatic device is not powered up. If a mechanical repair is under way cones and tape may be appropriate to assure a person does not wander into the work area.

5	**Risks Assessment**	Risk assessments should be performed by properly trained and capable personnel. A risk assessment has 7 components: 1.0 Requirements for the “User” 2.0 Task and Hazard Identification 3.0 Risk Estimation, (types of injury exposure) 4.0 Risk Reduction possibilities 5.0 Safeguard Selection 6.0 Frequency of exposure 7.0 Avoid-ability of the risk Permanent and interim safeguards may need to be installed, tested or repaired. After the work is completed, a Risk Assessment should be completed by a person who has subject matter expertise. There are many formats available including ANSI RIA 15.06, which include forms and instructions.

Warning: When performing any of the checks in this document keep your hands and body clear of any pinch point or hazard. These checks can be completed at a safe distance from the hazards there is no need for any exposure to a hazard using the Look / Listen and Observe guidelines.

4.1 Check List

Safety Function	Test	Confirm
Maintenance Person Certification	Are you certified to complete safety checks, maintenance, and repair of the Robot? **If not do not continue.**	☐ Have certification to operate , set up, and maintain, conduct safety checks, and repair the robot
Protective Gear	Verify the following protective gear is available to you	☐ Safety Glasses ☐ Hearing protection ☐ Safety shoes ☐ Face shield ☐ Thermal insulated gloves ☐ Gloves to protect from nicks & cuts ☐ Lock & tag for LO/TO
Verify the Operators and Set Up Safety Checks	Complete the safety check form in section 2.0 & 3.0	☐ If not complete do not continue
Interim Safeguards	Use appropriate safeguards and standards to assure safe and proper work is completed.	☐ During the repair lockout all unnecessary power. ☐ For multi-personnel repairs use multiple electrical lockout / tagout equipment. ☐ Hydraulic valve handle lockout / tagout, if applicable. ☐ Pneumatic valve handle lockout / tagout. ☐ Interim safeguard barrier is in place. ☐ Cones and caution tape surround the hazard area. ☐ Interim safeguarding signs are in place, machine status sign is in place showing out of service ☐ Approved lifts / ladders / scaffold, fall arrestor are being used, if applicable.
Risk Assessment: A documented process is in place, to ensure all risks and potential injury points have been considered and the risk to personnel addressed.	Risk assessment is available for review. The technician is to review the repairs vs. the risk assessment on file and execute any involved line items.	☐ An addendum has been completed after the repair to assure compliance and that it is documented, if applicable

5.0 OTHER PROCEDURES

1	**Certification**	Your employer should certify you, showing written documentation that you have been trained to the level of technology your position requires. This should be documented in the employee's personnel training records.
2	**Lock Out / Tag Out**	➢ **Lockout / tagout** procedures are required in CFR 1910.147. If there is energy that can injure a person working on the robot / HIMM, it must be locked out. The lock prevents the energy from being turned on; the tag identifies who placed it there and in some cases the reason. ➢ **Why?** To assure a co-worker cannot start the robot while a person is in the machine causing injury unknowingly. ➢ **Where do the locks or tags go?** A lock or tag goes on the switch, breaker, valve or other devices that provides energy that could potentially cause injury. ➢ **What is required?** Each employee must be trained on how, when, and where to use the LO/TO process, a kit of lockout devices must be available, and a "key scheme" must be determined. ➢ **Various methods exist to accomplish this**. In many locations, electrical supply stores / vendors will provide the training and certification, at no charge, when you purchase the LO/TO kits from them. It's fast, easy, smart, and the law.

3	**Confined Workspace**	➢ **Each employer is required to understand and train employees on "Confined Workspace" per paragraph CFR 1910.146**. Confined spaces on the HIMM can exist depending on tonnage under the HIMM, when the access panel is removed that conceals the hydraulic pump, and drive motor. It is the responsibility of the employer to assure their technicians and employees are trained, have "permits" in place, and appropriate signs are used to indicate use of Confined Workspace procedures.
4	**E Stop Z Axis**	➢ **Z-Axis must be supported before brake is released from control bypass circuit.** When the brake is released, the Z-Axis will drop, if not properly supported, and could result in injury or death.
5	**Risks Assessment**	➢ **Risk Assessments should be done on every workcell.** ➢ **A workcell** includes the Robot, Robot safe guarding, HIMM, mold, and its ancillary equipment such as beside the press automation. The risk assessment shall take in to account the stages of development of the workcell, the intended use, the anticipated skill and training of the operators, and additional risk exposures that may be present. Every risk assessment must include the following: 1. Requirements for the user 2. Task and hazard identification 3. Risk Estimation 4. Risk Reduction determination 5. Safeguard selection There are many format available for risk assessments, your company may have its own. There are forms and procedures available that may be adapted in ANSI-RIA 15.06. Osha.gov also has guidelines available on their site.

~~6~~ Safe Guarding Recommendations

Guarding:

- ✓ The employer of the robot / workcell can find guidance for safeguarding in ANSI/SPI B151.27. This manual is not a substitute for following the applicable industry standards or the required CFR.
- ✓ The most common cell guarding utilizes a fixed perimeter guard, anchored to the floor, with interlocked gates that safeguard the full work envelope of the robot and provides adequate safety clearances. The workcell must have safety signs / visual warnings that conform to ANSI Z535.4, instructing the user to follow proper procedure.
- ✓ Of primary importance is a contiguous emergency stop circuit where any one emergency stop button will cease all motion.
- ✓ Features such as access for attended programming robot points / verification, installing EOAT's, mold change park positions, finished goods exit ports, rejected goods collection area, robot maintenance, and auxiliary requirements such as static electricity control are all examples of items to consider when designing and installing robot safeguarding.

7	**Release Stored Energy**	**In many machines there is stored energy.** It can be in several forms in a HIMM workcell. ➢ Electrical ➢ Pneumatic ➢ Steel on steel under load ➢ Gravity of a device held by a mechanical brake ➢ Pneumatic Accumulator (for pneumatic drive robots) ➢ Capacitors (Use grounding probes) In some cases, each of these types of stored energy must be released prior to the start of a repair. It is the responsibility of the employer to assure procedures, equipment, tools, and training are provided to accomplish the tasks safely/correctly. If something goes wrong, a work around method should be provided to safely discharge the stored energy. **Note:** After the release of the stored energy, there should be a verification test, i.e. a pressure gage, showing no hydraulic or pneumatic pressure is present, or attempt to lift a robot arm that descended vertically under the control of a crane when the vertical brake is released. It is worth noting that the release of stored energy points should be identified in the plant, so that if an employee is caught in a machine, an emergency worker can easily identify the correct source to disconnect and lockout.

Warning: When performing any of the checks in this document keep your hands and body clear of any pinch point or hazard. These checks can be completed at a safe distance from the hazards there is no need for any exposure to a hazard using the Look / Listen and Observe guidelines.

6.0 OTHER SAFETY REQUIREMENTS

1	**Certification**	**Training Responsibility** ✓ Your employer should certify you, showing written documentation that you have been trained to the level of technology your position requires. In addition to the certification you must be given access to drawings / manuals that support the equipment as well as the right equipment and tools to do the job.
2	**Employer Responsibility** **The "employer" is the owner of the Robot.**	**Employer Responsibility** ✓ Provide a safe and clean work environment. ✓ Provide safe tools, organized & maintained to complete the operation. ✓ Machinery & Equipment is in good operational status. ✓ Well maintained equipment. ✓ Provide training for safe and proper operation, set up, maintenance, and repair. ✓ Easy and quick access to manuals, schematics, and documentation. ✓ Provide safety devices to guard against foreseen hazards. ✓ Protect operators, maintenance, and technicians from hazardous motion.

3	**Employee** **The "employee" is the operator, set up person or maintenance technician in charge of the ROBOT or other people involved in the operation of the ROBOT.**	**Employee Responsibility** ✓ Identify hazards to management. ✓ Understand the training requirements of their job and complete the training ✓ Demonstrate competence in completing the requirements of their job. ✓ Maintain the equipment to assure proper operations ✓ Understand documentation, know where to access it. ✓ Keep their work area and machines clean and neat.
4	**Protective Gear**	**Personnel should use all appropriate protective equipment while performing any job function.** Personnel Protective Equipment all gear must conform to CFR 1910.132 through 137, General Requirements Personnel Safety Devices. ✓ Safety Glasses o Comfortable o Conform to ANSI-Z87.1 o Prescription / non Prescription ✓ Safety Shoes o Comfortable o Conform to ANSI-Z41 per CFR 1910.136 ✓ Gloves o Sized appropriately o Thermal protection o Diminish risks of nicks and cuts ✓ Face Shield conforming to ANSI-Z87.1 ✓ Safety signs are in accordance with ANSI-Z535.4

5	**Inspection:**	**Visual Prior to Operation**	➢ **Look:** Walk around the robot a look for all gates, guards and covers are in place, no physical damage to the robot, EOAT, controls, switches or safety devices that may create an unsafe operation.
		During Operation	➢ **Listen:** Walk around the robot listen for any abnormal sounds like metal on metal grinding, wearing or other anomalies, rattles, hum's, cyclical noises. ➢ **Observe:** Look over the robot for wearing or rubbing cables, parts getting hung up by an obstruction. If something just doesn't seem right call a trained technician immediately.
6	**Grounding**		➢ All grounding must be in compliance with NFPA 79, NFPA 70 (National Electrical Code), CFR 1910.301 through 308 and SPI-B1-101. WARNING: Be sure to have a licensed electrician verify the installation for safe and proper application.
7	**Auxiliaries**		➢ Auxiliary equipment integral to the molding cell should be installed, operated, and maintained in accordance with their respective manuals and all applicable requirements. ➢ Follow all applicable requirements in CFR 1910 and industry standards.

8	**Potential Injuries**	**The purpose of this document, in conjunction with the User Manual, is to ensure safe and proper operation of the equipment throughout its useful life.** ➢ The Well-Lih robot is well safeguarded; it has redundant circuits in hardware, software and mechanical systems to safeguard the personnel working on the Robot and HIMM. It is difficult to anticipate every scenario or use, whether proper or improper. The user should be advised this type of machinery can cause the following injuries o Burns o Cuts o Electrical shock o Tripping o Falling o Slipping o Death and dismemberment **With care, knowledge, and the correct tools, injuries can be effectively avoided.**

Warning: When performing any of the checks in this document keep your hands and body clear of any pinch point or hazard. These checks can be completed at a safe distance from the hazards there is no need for any exposure to a hazard using the Look / Listen and Observe guidelines.

7.0 REFERENCES

These guidelines and references may be purchased electronically at the following web sites:

7.1 CFR 1910 OSHA General Duty Clause, www.osha.gov

7.2 NFPA 79 National Fire Protection Association, www.ansi.org

7.3 ANSI / SPI B151.27 Robot Used with Horizontal and Vertical Injection Molding Machines – Safety Requirements for the Integration, Care, and Use, www.ansi.org

7.4 ANSI / RIA R15.06 Industrial Robots and Robot Systems – Safety requirements, www.ansi.org

7.5 CAN / CSA-Z434-03 Industrial robots and robot systems – General safety requirements, www.csa.ca

7.6 ANSI / SPI B151.1 Society of Plastics Industry Safety, www.ansi.org

7.7 ANSI B11.19 Safeguarding for Machine Tool, www.ansi.org

7.8 NEC (National Electrical Code) www.ansi.org

Electrical Schematics

Doc #30009, V3: 4/8/2020

Absolute Robot Inc.

Address: 33 Southgate St. Worcester, MA 01610

Website: absoluterobot.com

Email (general): info@absoluterobot.com

Email (technical support): service@absoluterobot.com

Phone: 508-792-4305

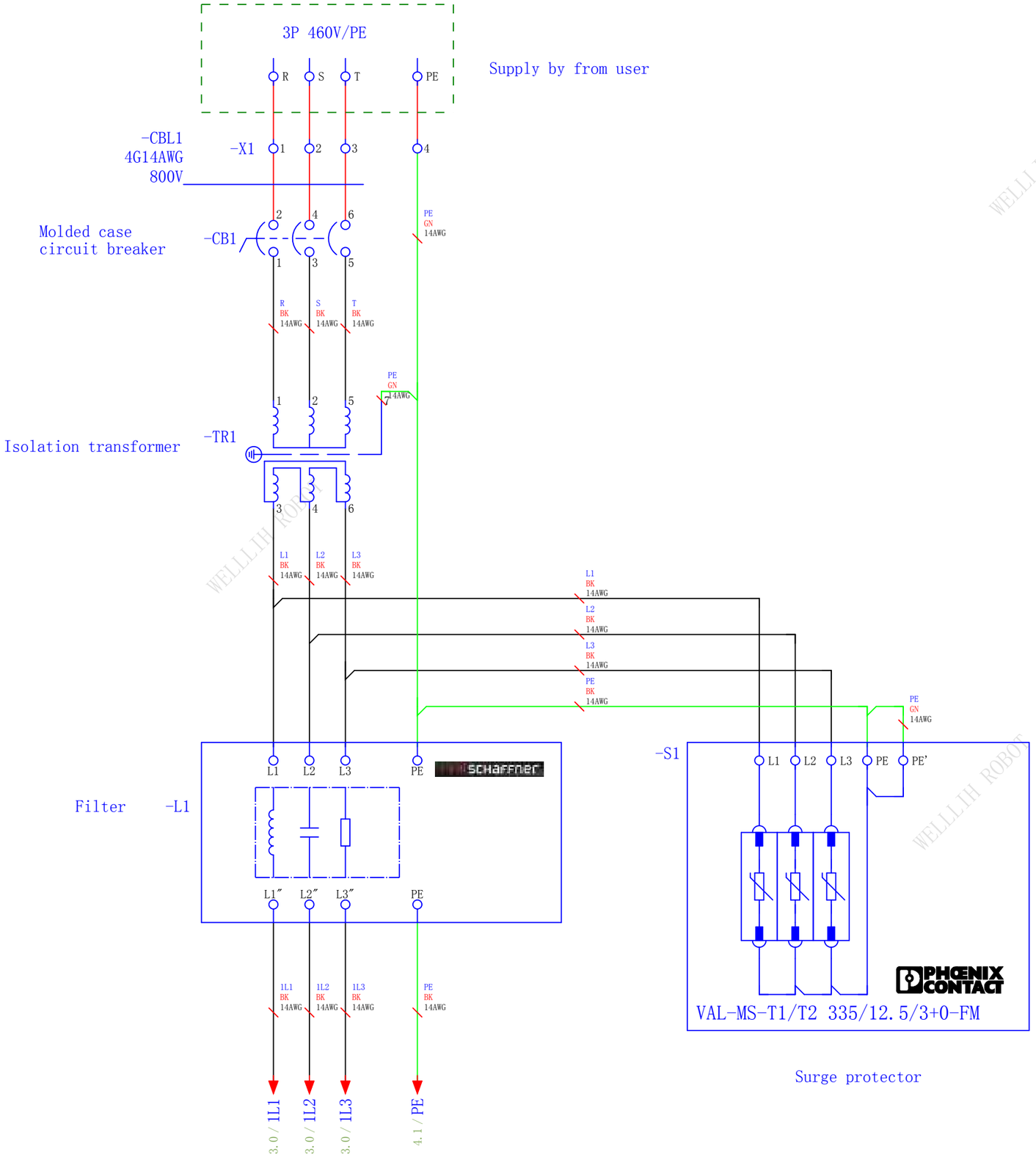
NINGBO WELL-LIH ROBOTS TECHNOLOGY CO.,LTD.
NO.48 Xiangqiao Road,Langxia Street,Yuyao City,Zhejiang 315480 P.R.China

Company / customer	
Project description	American Standard Electrical Schematic
Job number	WL-Max-GUS-A2-MN-001
Commission	
Manufacturer (company)	NINGBO WELL-LIH ROBOTS TECHNOLOGY CO.,LTD.
Path	
Project name	American Standard STO Electrical Schematic
Make	
Type	
Place of installation	
Responsible for project	
Part feature	

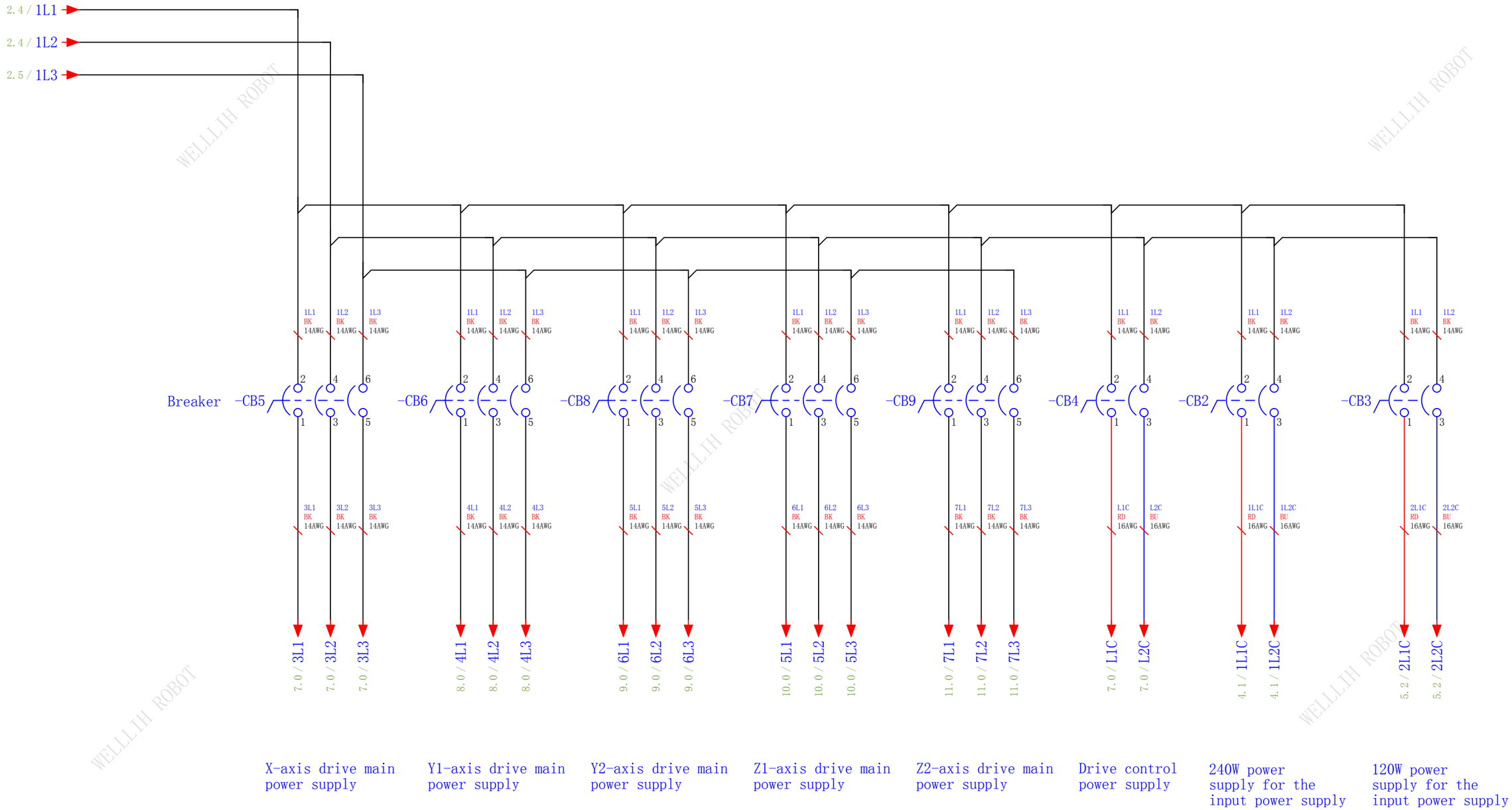
Created on 2019-03-30
Edit date 2019-05-28 by (short name) 10169 Number of pages 65

Be careful!

There will still be voltage after disconnecting the main switch



			Date	2019-05-27				=	
			Ed	10169				+	
			Appr		American Standard Electrical Schematic		Main circuit		
Modification	Date	Name	Original		Replacement of	Replaced by		460V/3P/PE	WL-Max-GUS-A2-MN-001



240W power supply

3.7 / 1L1C
3.7 / 1L2C
2.5 / PE
PE / 5.2

1L2C BU 16AWG
1L1C RD 16AWG
PE BK 14AWG

-G1

N L PE

AC 200V-240V

240W power supply

DC24V 10A

OUT+ OUT+ OUT- OUT-

1P24 BN 20AWG
1N24 BU 20AWG

1P24 / 6.0
1N24 / 6.0

3 5

			Date	2019-05-27					=	
			Ed	10169					+	
			Appr		American Standard Electrical Schematic		240W power supply			
Modification	Date	Name	Original		Replacement of	Replaced by		460V/3P/PE	WL-Max-GUS-A2-MN-001	Page 4 Page 4/65

120W power supply

			Date	2019-05-27			120W power supply		=
			Ed	10169					+
			Appr		American Standard Electrical Schematic			460V/3P/PE	WL-Max-GUS-A2-MN-001	Page 5
Modification	Date	Name	Original		Replacement of	Replaced by				Page 5/65

4.7 / 1P24

4.7 / 1N24

1P24 / 7.0

1N24 / 7.0

1P24
BN
20AWG

1N24
BU
20AWG

1P24
BN
20AWG

1N24
BU
20AWG

1P24
BN
20AWG

1N24
BU
20AWG

1P24
BN
20AWG

1N24
BU
20AWG

Cooling Fan

-FAN1

1 DC 2

Cooling Fan 1

-FAN2

1 DC 2

Cooling Fan 2

-FAN3

1 DC 2

Cooling Fan 3

-FAN4

1 DC 2

Cooling Fan 4

5

7

			Date	2019-05-27					=	
			Ed	10169					+	
			Appr		American Standard Electrical Schematic		Cooling fan			
Modification	Date	Name	Original		Replacement of	Replaced by		460V/3P/PE	WL-Max-GUS-A2-MN-001	Page 6 / Page 6/65

3.2 / 3L1
3.2 / 3L2
3.2 / 3L3
3.6 / L1C
3.7 / L2C
5.7 / PE
6.8 / 1P24
6.8 / 1N24

L1C / 8.0
L2C / 8.0
PE / 8.0
1P24 / 8.0
1N24 / 8.0
1P24J / 8.0
1P24K / 8.0

DI1- / 23.7
LX0 / 31.1

3L1 BK 14AWG
3L2 BK 14AWG
3L3 BK 14AWG
PE BK 14AWG
L1C RD 16AWG
L2C BU 16AWG
1P24 BN 20AWG
1N24 BU 20AWG
DI1- BU 20AWG
LX0 BU 20AWG
1P24J BN 20AWG
1N24 BU 20AWG
1P24K BN 20AWG
1N24 BU 20AWG

-ASDA1

R S T PE L1C L2C

Main circuit power input

Control circuit power input

CN1: VDD 5, COM+ 6, COM- 14, GND 16, NC 15, DI1- 7, DI2- 8, DI3- 9, DI4- 10, DI5- 11, DI6- 12, DI7- 13

Input signals

CN-STO: COM+ 1, STO_A 2, /STO_A 3, STO_B 4, /STO_B 5, FDBK_A 6, FDBK_B 7, COM- 8

Safe Torque Off

Motor connection

Regenerative resistor

Encoder

Full-closed control

Output signals

U V W FG P+ D C – CN2 CN5 CN5 CN1 1 DO1+ 2 DO1- 3 DO2+ 4 DO2- 25 DO3+ 26 DO3- 23 DO4+ 24 DO4- 17 OA 18 /OA 19 OB 20 /OB 21 OZ 22 /OZ

USB

CANopen

CN4 CN4 CN6 IN 1-8 CN6 OUT 9-16 CN3 1 GND 2 RS-232 TX 3 – 4 RS-232 RX 5 RS-485 (+) 6 RS-485 (-) CN8 1 BAT+ 2 BAT- 1' BAT+ 2' BAT-

-CBL2
4G18AWG
BK BK BK GNYE

-R1
x2 x1

-CBL3
3P22AWG

1 2 3 PE

-M1

U V W FG

Encoder

M
3～

Motor

X-axis servo drive

6 8

			Date	2019-05-27				=
			Ed	10169				+
			Appr		American Standard Electrical Schematic	WELLIH 伟立机器人	X-axis drive	
Modification	Date	Name	Original		Replacement of	Replaced by	460V/3P/PE	WL-Max-GUS-A2-MN-001

Page 7
Page 7/65

3.3 / 4L1
3.3 / 4L2
3.3 / 4L3
7.9 / L1C
7.9 / L2C
7.9 / PE
7.9 / 1P24
7.9 / 1N24
7.9 / 1P24J
7.9 / 1P24K

L1C / 9.0
L2C / 9.0
PE / 9.0
1P24 / 9.0
1N24 / 9.0
1P24J / 9.0
1P24K / 9.0

DI1- / 23.7
LY1- / 31.1

4L1 BK 14AWG
4L2 BK 14AWG
4L3 BK 14AWG
PE BK 14AWG
L1C RD 16AWG
L2C BU 16AWG
1P24 BN 20AWG
1N24 BU 20AWG
DI1- BU 20AWG
LY1- BU 20AWG
1P24J BN 20AWG
1N24 BU 20AWG
1P24K BN 20AWG
1N24 BU 20AWG

-ASDA2

R S T PE L1C L2C

Main circuit power input

Control circuit power input

CN1: VDD 5, COM+ 6, COM- 14, GND 16, NC 15, DI1- 7, DI2- 8, DI3- 9, DI4- 10, DI5- 11, DI6- 12, DI7- 13

Input signals

CN-STO: COM+ 1, STO_A 2, /STO_A 3, STO_B 4, /STO_B 5, FDBK_A 6, FDBK_B 7, COM- 8

Safe Torque Off

Motor connection

Regenerative resistor

Encoder

Full-closed control

Output signals

U V W FG P+ D C - CN2 CN5 CN5 CN1 1 DO1+ 2 DO1- 3 DO2+ 4 DO2- 25 DO3+ 26 DO3- 23 DO4+ 24 DO4- 17 OA 18 /OA 19 OB 20 /OB 21 OZ 22 /OZ

USB

CANopen

CN4 CN4 CN6 IN 1-8 CN6 OUT 9-16 CN3 1 GND 2 RS-232 TX 3 - 4 RS-232 RX 5 RS-485 (+) 6 RS-485 (-) CN8 1 BAT+ 2 BAT- 1' BAT+ 2' BAT-

-CBL4
4G18AWG
BK BK BK GNYE
1 2 3 PE

-R2
x2 x1

-CBL5
3P22AWG

-M2
U V W FG

Encoder

M
3～

Motor

Y1-axis servo drive

			Date	2019-05-27	American Standard Electrical Schematic	WELLLIH 伟立机器人	Y1-axis drive	=
			Ed	10169				+
			Appr				460V/3P/PE	WL-Max-GUS-A2-MN-001 Page 8
Modification	Date	Name	Original		Replacement of	Replaced by		Page 8/65

3.4 / 6L1
3.4 / 6L2
3.4 / 6L3
8.9 / L1C
8.9 / L2C
8.9 / PE
8.9 / 1P24
8.9 / 1N24
8.9 / 1P24J
8.9 / 1P24K

L1C / 10.0
L2C / 10.0
PE / 10.0
1P24 / 10.0
1N24 / 10.0
1P24J / 10.0
1P24K / 10.0

5L1 BK 14AWG
5L2 BK 14AWG
5L3 BK 14AWG
PE BK 14AWG
L1C RD 16AWG
L2C BU 16AWG
1P24 BN 20AWG
1N24 BU 20AWG
DI1- BU 20AWG
LY2- BU 20AWG
1P24J BN 20AWG
1N24 BU 20AWG
1P24K BN 20AWG
1N24 BU 20AWG

DI1- / 23.7
LY2- / 31.1

-ASDA3

R S T PE L1C L2C

Main circuit power input
Control circuit power input

CN1: VDD COM+ COM- GND NC DI1- DI2- DI3- DI4- DI5- DI6- DI7-
5 6 14 16 15 7 8 9 10 11 12 13

Input signals

CN-STO: COM+ STO_A /STO_A STO_B /STO_B FDBK_A FDBK_B COM-
1 2 3 4 5 6 7 8

Safe Torque Off

Motor connection
Regenerative resistor
Encoder
Full-closed control
Output signals

U V W FG P+ D C – CN2 CN5 CN5 CN1 1 2 3 4 25 26 23 24 17 18 19 20 21 22
DO1+ DO1- DO2+ DO2- DO3+ DO3- DO4+ DO4- OA /OA OB /OB OZ /OZ

USB
CANopen

CN4 CN4 CN6 IN 1-8 CN6 OUT 9-16 CN3 1 GND 2 RS-232 TX 3 – 4 RS-232 RX 5 RS-485 (+) 6 RS-485 (-) CN8 1 BAT+ 2 BAT- 1' BAT+ 2' BAT-

-CBL6
4G18AWG
BK BK BK GNYE
1 2 3 PE

-R3
x2 x1

-CBL7
3P22AWG

-M3
U V W FG
Encoder

M
3～
Motor

Y2-axis servo drive

8 10

			Date	2019-05-27	American Standard Electrical Schematic	WELLIH 伟立机器人	Y2-axis drive		=
			Ed	10169					+
			Appr					460V/3P/PE	WL-Max-GUS-A2-MN-001 Page 9
Modification	Date	Name	Original		Replacement of	Replaced by			Page 9/65

3.5 / 5L1
3.5 / 5L2
3.5 / 5L3
9.9 / L1C
9.9 / L2C
9.9 / PE
9.9 / 1P24
9.9 / 1N24
9.9 / 1P24J
9.9 / 1P24K

L1C / 11.0
L2C / 11.0
PE / 11.0
1P24 / 11.0
1N24 / 11.0
1P24J / 11.0
1P24K / 11.0

6L1 BK 14AWG
6L2 BK 14AWG
6L3 BK 14AWG
PE BK 14AWG
L1C RD 16AWG
L2C BU 16AWG
1P24 BN 20AWG
1N24 BU 20AWG
DI1- / 23.7
LZ10 / 31.1
LZ10 / 16.1
DI1- BU 20AWG
LZ10 BU 20AWG
1P24J BN 20AWG
1N24 BU 20AWG
1P24K BN 20AWG
1N24 BU 20AWG

-ASDA4

R S T PE L1C L2C

Main circuit power input

Control circuit power input

CN1: VDD 5, COM+ 6, COM- 14, GND 16, NC 15, DI1- 7, DI2- 8, DI3- 9, DI4- 10, DI5- 11, DI6- 12, DI7- 13

Input signals

CN-STO: COM+ 1, STO_A 2, /STO_A 3, STO_B 4, /STO_B 5, FDBK_A 6, FDBK_B 7, COM- 8

Safe Torque Off

Motor connection

Regenerative resistor

Encoder

Full-closed control

Output signals

USB

CANopen

U V W FG P+ D C - CN2 CN5 CN5 CN1 1 2 3 4 25 26 23 24 17 18 19 20 21 22

CN1: DO1+ 1, DO1- 2, DO2+ 3, DO2- 4, DO3+ 25, DO3- 26, DO4+ 23, DO4- 24, OA 17, /OA 18, OB 19, /OB 20, OZ 21, /OZ 22

CN4 CN6 IN CN6 OUT CN3 1 2 3 4 5 6 CN8 1 2 1' 2'

CN4: 1-8
CN6 OUT: 9-16
CN3: GND 1, RS-232 TX 2, - 3, RX 4, RS-485 (+) 5, RS-485 (-) 6
CN8: BAT+ 1, BAT- 2, BAT+ 1', BAT- 2'

-CBL8 4G18AWG BK BK BK GNYE
1 2 3 PE

-R4 x2 x1

-CBL9 3P22AWG

Z1-BK+ / 12.6
Z1-BK- / 12.7

Z1-DO3+ BU 20AWG
Z1-DO4+ BU 20AWG

Brake Signal
Z1-DO3+ / 12.1
Z1-DO4+ / 12.2

-M4

U V W FG BK1 BK2 Encoder

M 3~

Motor

Holding brake

Z1-axis servo drive

			Date	2019-05-27				=
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			Appr		American Standard Electrical Schematic		460V/3P/PE	WL-Max-GUS-A2-MN-001
Modification	Date	Name	Original		Replacement of	Replaced by		

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Z1-axis drive

Page 10
Page 10/65

3.6 / 7L1
3.6 / 7L2
3.6 / 7L3
10.9 / L1C
10.9 / L2C
10.9 / PE
10.9 / 1P24
10.9 / 1N24
10.9 / 1P24J
10.9 / 1P24K

PE / 14.0
1P24 / 12.0
1N24 / 12.0
1P24J / 22.6
1P24K / 22.6

7L1 BK 14AWG
7L2 BK 14AWG
7L3 BK 14AWG
PE BK 14AWG
L1C RD 16AWG
L2C BU 16AWG
1P24 BN 20AWG
1N24 BU 20AWG
DI1- / 23.7
LZ20 / 31.4
DI1- BU 20AWG
LZ20 BU 20AWG
1P24J BN 20AWG
1N24 BU 20AWG
1P24K BN 20AWG
1N24 BU 20AWG

-ASDA5

R S T PE L1C L2C

Main circuit power input

Control circuit power input

CN1: VDD 5, COM+ 6, COM- 14, GND 16, NC 15, DI1- 7, DI2- 8, DI3- 9, DI4- 10, DI5- 11, DI6- 12, DI7- 13

Input signals

CN-STO: COM+ 1, STO_A 2, /STO_A 3, STO_B 4, /STO_B 5, FDBK_A 6, FDBK_B 7, COM- 8

Safe Torque Off

Motor connection

Regenerative resistor

Encoder

Full-closed control

Output signals

U V W FG P+ D C - CN2 CN5 CN5 CN1 1 2 3 4 25 26 23 24 17 18 19 20 21 22

DO1+ DO1- DO2+ DO2- DO3+ DO3- DO4+ DO4- OA /OA OB /OB OZ /OZ

USB

CANopen

CN4 CN4 CN6 IN CN6 OUT CN3 1 2 3 4 5 6 CN8 1 2 1' 2'

1-8 9-16 GND RS-232 TX RS-232 RX RS-485 (+) RS-485 (-) BAT+ BAT- BAT+ BAT-

-CBL10
4G18AWG
BK BK BK GNYE
1 2 3 PE

-R5
x2 x1

-CBL11
3P22AWG

Z2-BK+ / 13.6

Z2-BK- / 13.7

Z2-DO3+
BU
20AWG

Z2-DO4+
BU
20AWG

Brake Signal

Z2-DO3+ / 13.1

Z2-DO4+ / 13.2

-M5

U V W FG BK1 BK2 Encoder

M
3～

Motor

Holding brake

Z2-axis servo drive

10

12

			Date	2019-05-27	American Standard Electrical Schematic		Z2-axis drive	=
			Ed	10169				+
			Appr				460V/3P/PE	WL-Max-GUS-A2-MN-001
Modification	Date	Name	Original		Replacement of	Replaced by		

WELLLIH 伟立机器人

11.9 / 1P24
11.9 / 1N24
5.7 / 2P24
5.7 / 2N24

1P24 / 13.0
1N24 / 13.0
2P24 / 13.0
2N24 / 13.0

Z1-DO4+ / 10.9

Z1 axis brake signal 2

1P24 BN 20AWG
Z1-DO4+ BU 20AWG
2N24 BU 20AWG

-CR31
13 A1
12 NC
11NO
42 NC
41NO
DRM
14 A2
14COM
44COM

200 / 63.3
201 / 63.4

1P24 BN 20AWG
200 BN 20AWG
2P24 BN 20AWG
201 BU 20AWG
2N24-1 BU 20AWG

-CR32
13 A1
12 NC
11NO
42 NC
41NO
DRM
14 A2
14COM
44COM

Z1-DO3+ BU 20AWG
Z1-DO4+ BU 20AWG
2N24-1 BU 20AWG
Z1-DO4+ BU 20AWG
Z1-DO4+ BU 20AWG
Z1-BK+ BU 20AWG
Z1-BK- BU 20AWG

10.9 / Z1-DO3+
10.1 / Z1-BK+
10.2 / Z1-BK-

Weidmüller intermediate relay

Z1 axis brake signal 1

Z1 axis brake coil

11

13

			Date	2019-05-27	American Standard Electrical Schematic	WELLIH 伟立机器人	Z1 axis brake circuit	=
			Ed	10169				+
			Appr				460V/3P/PE	WL-Max-GUS-A2-MN-001
Modification	Date	Name	Original		Replacement of	Replaced by		

Page 12
Page 12/65

12.8 / 1P24
12.8 / 1N24
12.8 / 2P24
12.8 / 2N24

1P24 / 14.0
1N24 / 14.0

Z2-DO4+ / 11.9

Z2 axis brake signal 2

1P24 BN 20AWG
Z2-DO4+ BU 20AWG
2N24 BU 20AWG

-CR33
13 A1
12 NC
11NO
42 NC
41NO
DRM

14 A2
14COM
44COM

Z2-DO3+ BU 20AWG
Z2-DO4+ BU 20AWG
2N24-2 BU 20AWG
Z2-DO4+ BU 20AWG

11.9 / Z2-DO3+

Z2 axis brake signal 1

300 / 63.4
301 / 63.5

1P24 BN 20AWG
300 BN 20AWG
2P24 BN 20AWG
301 BU 20AWG
2N24-2 BU 20AWG

-CR34
13 A1
12 NC
11NO
42 NC
41NO
DRM

14 A2
14COM
44COM

Z2-DO4+ BU 20AWG
Z2-BK+ BU 20AWG
Z2-BK- BU 20AWG

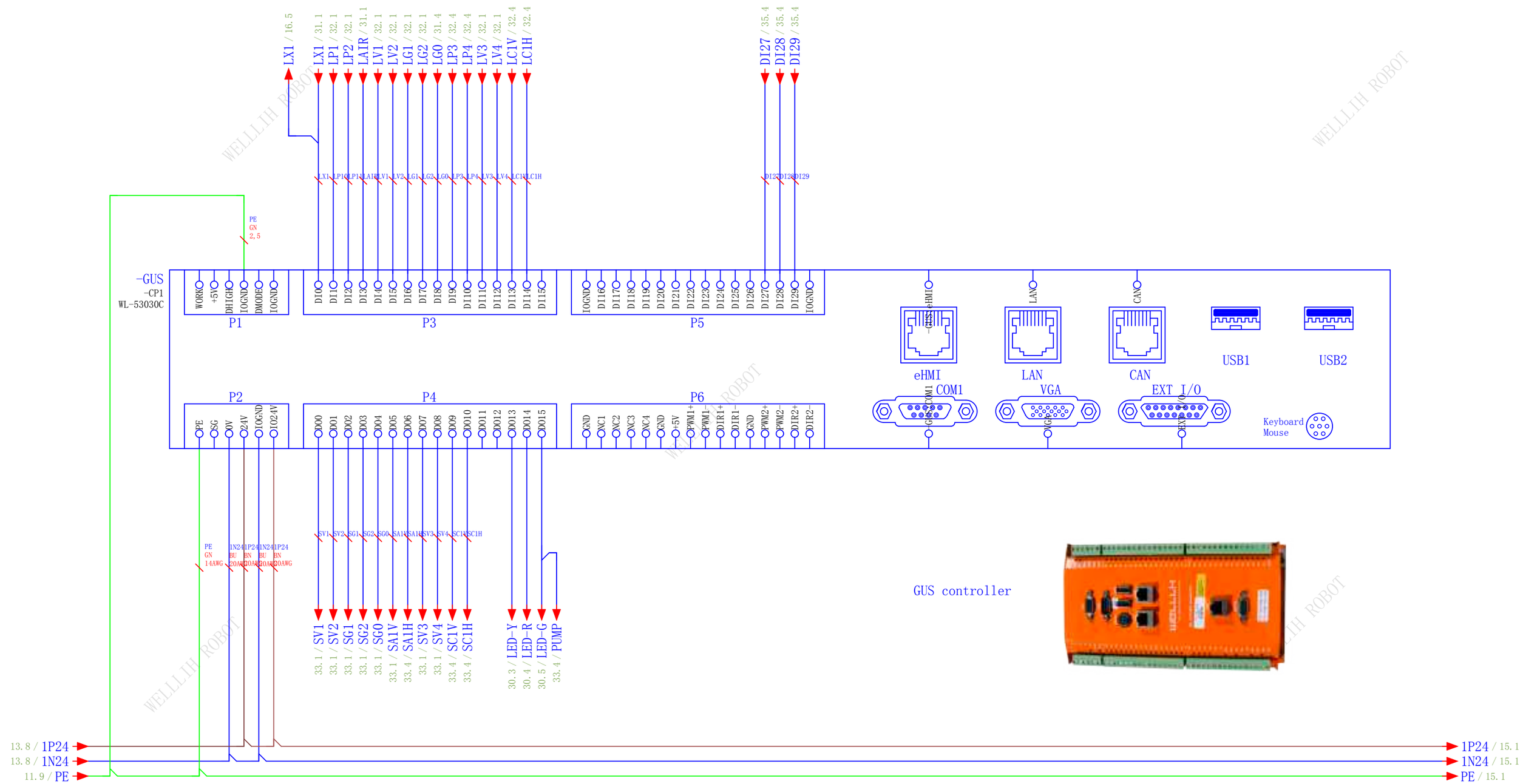
11.1 / Z2-BK+
11.2 / Z2-BK-

Weidmüller intermediate relay

Z2 axis brake coil

12 14

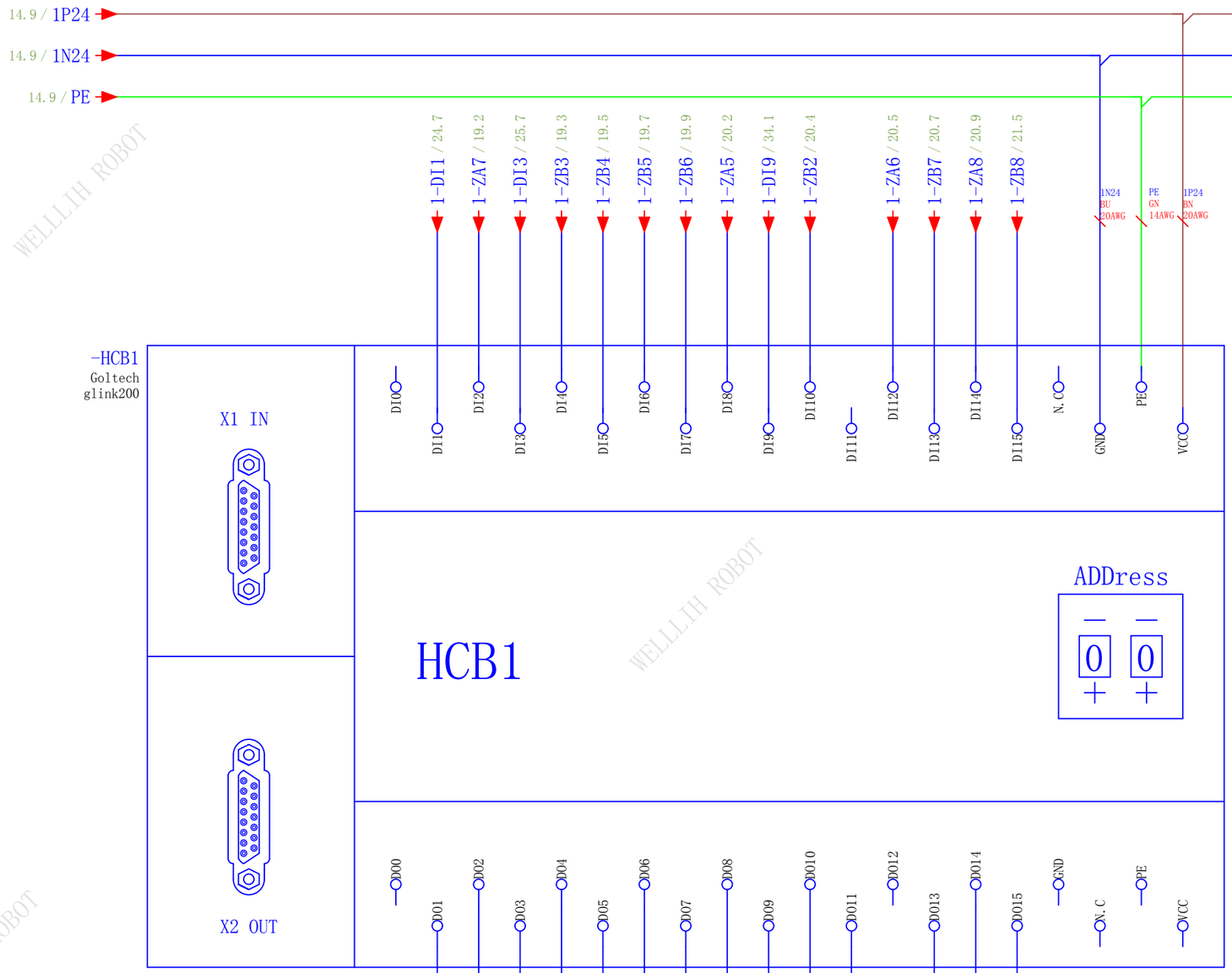
			Date	2019-05-27				=	
			Ed	10169				+	
			Appr		American Standard Electrical Schematic	WELLIH 伟立机器人	Z2 axis brake circuit		
Modification	Date	Name	Original		Replacement of	Replaced by		460V/3P/PE	WL-Max-GUS-A2-MN-001	Page 13 Page 13/65



13

15

			Date	2019-05-27			GUS controller	=	
			Ed	10169				+	
			Appr		American Standard Electrical Schematic				
Modification	Date	Name	Original		Replacement of	Replaced by		460V/3P/PE	WL-Max-GUS-A2-MN-001	Page 14
										Page 14/65



1-DI1：Emergency Stop

1-DI2：Mold Full Open

1-DI3： Movable Gates Close 1

1-DI4： Ejector Fully Retracted

1-DI5：Ejector Fully Forward

1-DI6：Core 1 Fully Set

1-DI7：Core 1 Fully Pulled

1-DI8：Rejected Parts

1-DI10：Fully Automatic

1-DI12： No Parts Available

1-DI13：Core 2 Fully Set

1-DI14：Intermediate mould opening position

1-DI15：Core 2 Fully Pulled

1-DO1：Permit Clamp Close

1-DO2：Robot No-Operational

1-DO3：Permit Ejector Forward

1-DO4：Permit Ejector Back

1-DO5： Permit Clamp Motion 1

1-DO6： Permit Neutron Forward

1-DO7： Permit Neutron Back

1-DO8：Conveyer belt

1-DO9：Permit Clamp Motion 2

1-DO10：Conveyer belt

1-DO11：Manual switch isolation relay

1-DO14：Fence door locking/unlocking

1-DO15：Fence door indicator

			Date	2019-05-27				=
			Ed	10169				+
			Appr		American Standard Electrical Schematic	WELLLIH 伟立机器人	Expansion module	
Modification	Date	Name	Original		Replacement of	Replaced by	460V/3P/PE	WL-Max-GUS-A2-MN-001

15.8 / 1P24

15.8 / 1N24

1P24 / 17.0

1N24 / 17.0

1-DO1.1 / 17.0

A6 / 61.7

1P24
BN
20AWG

1-DO1.1
BU
20AWG

A6
BU
20AWG

-CR29

13 A1 | 12 NC | 11NO | 42 NC | 41NO

DRM

14 A2 | 14COM | 44COM

-CR30

13 A1 | 12 NC | 11NO | 42 NC | 41NO

DRM

14 A2 | 14COM | 44COM

1-DO1.1
BU
20AWG

A6
BU
20AWG

1-DO1
BU
20AWG

A6-1
BU
20AWG

LZ10
BU
20AWG

1-DO1
BU
20AWG

A6-1
BU
20AWG

LX1
BU
20AWG

10.3 / LZ10

15.3 / 1-DO1

17.1 / A6-1

14.1 / LX1

Weidmüller intermediate relay

			Date	2019-05-27			Anti-collision mode circuit		=
			Ed	10169					+
			Appr		American Standard Electrical Schematic			460V/3P/PE	WL-Max-GUS-A2-MN-001	Page 16
Modification	Date	Name	Original		Replacement of	Replaced by				Page 16/65

16.9 / 1P24

16.9 / 1N24

1P24 / 18.0

1N24 / 18.0

1-DO1.1 / 16.2

1-DO2 / 15.3

1-DO3 / 15.3

1-DO4 / 15.4

1-DO5 / 15.4

1P24 BN 20AWG

1-DO1.1 BU 20AWG

1P24 BN 20AWG

1-DO2 BU 20AWG

1P24 BN 20AWG

1-DO3 BU 20AWG

1P24 BN 20AWG

1-DO4 BU 20AWG

1P24 BN 20AWG

1-DO5 BU 20AWG

-CR1

-CR2

-CR3

-CR4

-CR5

A1 A2 12 11 14

REL-MR- 24DC/21

A9 BU 20AWG

A6 BU 20AWG

A9 BU 20AWG

B2 BU 20AWG

A9 BU 20AWG

B4 BU 20AWG

A9 BU 20AWG

B3 BU 20AWG

A3 BU 20AWG

C3 BU 20AWG

16.4 / A6-1

61.7 / B2

61.7 / B4

18.1 / A9

61.7 / B3

61.7 / A3

61.7 / C3

Phoenix intermediate relay

16

18

			Date	2019-05-27			Euro signal output isolation	=	
			Ed	10169				+	
			Appr		American Standard Electrical Schematic				
Modification	Date	Name	Original		Replacement of	Replaced by		460V/3P/PE	WL-Max-GUS-A2-MN-001	Page 17
										Page 17/65

17.9 / 1P24

17.9 / 1N24

1P24 / 19.0

1N24 / 19.0

1-D06 / 15.4

1-D07 / 15.4

1-D08 / 15.4

1-D09 / 15.4

1-D010 / 15.5

1P24 BN 20AWG

1-D06 BU 20AWG

1-D07 BU 20AWG

1-D08 BU 20AWG

1-D09 BU 20AWG

1-D010 BU 20AWG

-CR6 -CR7 -CR8 -CR9 -CR10

A1 A2 12 11 14

REL-MR- 24DC/21

A9 BU 20AWG

B6 BU 20AWG

B5 BU 20AWG

CNV-A BU 20AWG

CNV-B BU 20AWG

B8 BU 20AWG

B7 BU 20AWG

17.6 / A9

61.7 / B6

61.7 / B5

62.4 / CNV-A

62.4 / CNV-B

61.7 / B8

61.7 / A9

61.7 / B7

Phoenix intermediate relay

17

19

			Date	2019-05-27	American Standard Electrical Schematic	WELLLIH 伟立机器人	Euro signal output isolation	=	
			Ed	10169				+	
			Appr				460V/3P/PE	WL-Max-GUS-A2-MN-001	Page 18
Modification	Date	Name	Original		Replacement of	Replaced by			Page 18/65

9 / 1P24 → 1P24 / 20.0

9 / 1N24 → 1N24 / 20.0

ZA7 / 60.6 — ZB3 / 60.6 — ZB4 / 60.6 — ZB5 / 60.6 — ZB6 / 60.6

	ZA7	ZB3	ZB4	ZB5	ZB6	1N24
	BU 20AWG	BU 20AWG	BU 20AWG	BU 20AWG	BU 20AWG	BU 20AWG

-CR11 -CR12 -CR13 -CR14 -CR15

REL-MR- 24DC/21

A1 A2 12 11 14

	1N24	1-ZA7	1-ZB3	1-ZB4	1-ZB5	1-ZB6
	BU 20AWG	BU 20AWG	BU 20AWG	BU 20AWG	BU 20AWG	BU 20AWG

1-ZA7 / 15.3 — 1-ZB3 / 15.4 — 1-ZB4 / 15.4 — 1-ZB5 / 15.4 — 1-ZB6 / 15.4

Phoenix intermediate relay

18 20

			Date	2019-05-27			=	
			Ed	10169			+	
			Appr		American Standard Electrical Schematic		460V/3P/PE	WL-Max-GUS-A2-MN-001
Modification	Date	Name	Original		Replacement of	Replaced by		

WELLLIH 伟立机器人

European signal input isolation

Page 19

Page 19/65

19.9 / 1P24 → 1P24 / 21.1

19.9 / 1N24 → 1N24 / 21.1

ZA5 / 60.6 — ZB2 / 60.6 — ZA6 / 60.6 — ZB7 / 60.6 — ZA8 / 60.6

ZA5 BU 20AWG	1N24 BU 20AWG	ZB2 BU 20AWG	1N24 BU 20AWG	ZA6 BU 20AWG	1N24 BU 20AWG	ZB7 BU 20AWG	1N24 BU 20AWG	ZA8 BU 20AWG	1N24 BU 20AWG

-CR16 -CR17 -CR18 -CR19 -CR20

A1 A2 12 11 14

REL-MR- 24DC/21

1N24 BU 20AWG	1-ZA5 BU 20AWG	1N24 BU 20AWG	1-ZB2 BU 20AWG	1N24 BU 20AWG	1-ZA6 BU 20AWG	1N24 BU 20AWG	1-ZB7 BU 20AWG	1N24 BU 20AWG	1-ZA8 BU 20AWG

15.4 / 1-ZA5 — 15.5 / 1-ZB2 — 15.5 / 1-ZA6 — 15.5 / 1-ZB7 — 15.5 / 1-ZA8

Phoenix intermediate relay

19 21

			Date	2019-05-27				=	
			Ed	10169				+	
			Appr		American Standard Electrical Schematic		European signal input isolation		
Modification	Date	Name	Original		Replacement of	Replaced by		460V/3P/PE	WL-Max-GUS-A2-MN-001	Page 20 / Page 20/65

20.9 / 1P24 → 1P24 / 22.0

20.9 / 1N24 → 1N24 / 22.0

ZB8 / 60.6

ZB8 BU 20AWG

1N24 BU 20AWG

-CR21

A1 A2

REL-MR- 24DC/21

12 11 14

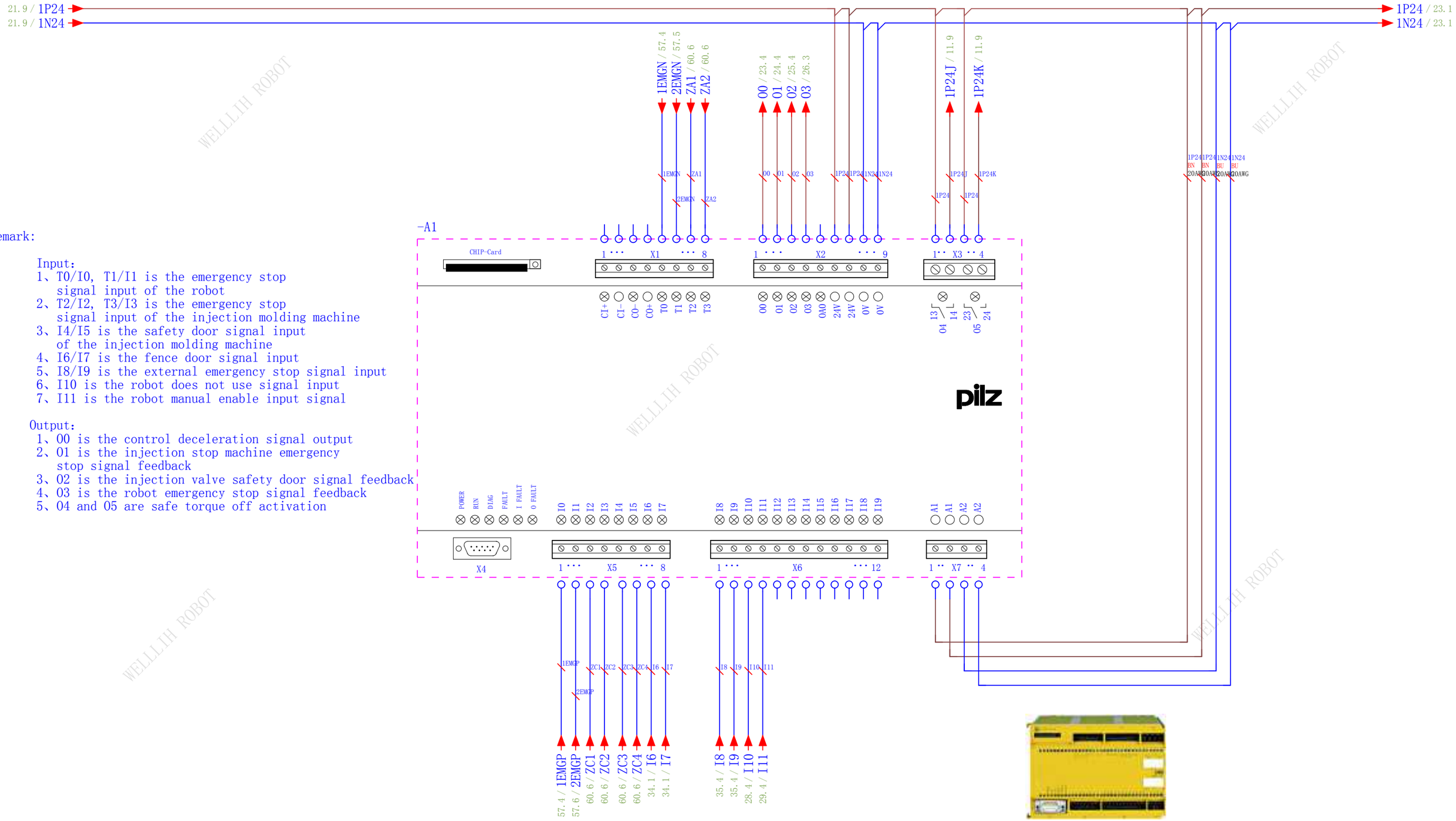
1N24 BU 20AWG

1-ZB8 BU 20AWG

15.6 / 1-ZB8

Phoenix intermediate relay

			Date	2019-05-27			European signal input isolation		=
			Ed	10169					+
			Appr		American Standard Electrical Schematic				
Modification	Date	Name	Original		Replacement of	Replaced by		460V/3P/PE	WL-Max-GUS-A2-MN-001	Page 21
										Page 21/65



Remark:

Input:
1、T0/I0, T1/I1 is the emergency stop signal input of the robot
2、T2/I2, T3/I3 is the emergency stop signal input of the injection molding machine
3、I4/I5 is the safety door signal input of the injection molding machine
4、I6/I7 is the fence door signal input
5、I8/I9 is the external emergency stop signal input
6、I10 is the robot does not use signal input
7、I11 is the robot manual enable input signal

Output:
1、O0 is the control deceleration signal output
2、O1 is the injection stop machine emergency stop signal feedback
3、O2 is the injection valve safety door signal feedback
4、O3 is the robot emergency stop signal feedback
5、O4 and O5 are safe torque off activation

			Date	2019-05-27				=
			Ed	10169				+
			Appr		American Standard Electrical Schematic		460V/3P/PE	WL-Max-GUS-A2-MN-001
Modification	Date	Name	Original		Replacement of	Replaced by		

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PILZ safety PLC

Phoenix intermediate relay

22.9 / 1P24 → 1P24 / 24.1

22.9 / 1N24 → 1N24 / 24.1

00 / 22.5

1N24 BU 20AWG

EMG BU 20AWG

1N24 BU 20AWG

-CR22

A1 A2 12 11 14

REL-MR- 24DC/21

-TB3

DI1- BU 20AWG	1	DI1- / 7.3
DI1- BU 20AWG	2	DI1- / 8.3
DI1- BU 20AWG	3	DI1- / 9.3
DI1- BU 20AWG	4	DI1- / 10.3
DI1- BU 20AWG	5	DI1- / 11.3

Control deceleration signal

			Date	2019-05-27				=	
			Ed	10169				+	
			Appr		American Standard Electrical Schematic		460V/3P/PE	WL-Max-GUS-A2-MN-001	Page 23
Modification	Date	Name	Original		Replacement of	Replaced by			Page 23/65

WELLLIH 伟立机器人

Control deceleration trigger circuit

23.8 / 1P24 → 1P24 / 25.1

23.8 / 1N24 → 1N24 / 25.1

01 / 22.5

1N24
BU
20AWG

00
BU
20AWG

1N24
BU
20AWG

-CR23

A1 A2 12 11 14

REL-MR- 24DC/21

1-DI1
BU
20AWG

1-DI1 / 15.3

Phoenix intermediate relay

Injection molding machine
emergency stop signal feedback

			Date	2019-05-27					=	
			Ed	10169					+	
			Appr		American Standard Electrical Schematic		Injection molding machine emergency stop signal feedback	460V/3P/PE	WL-Max-GUS-A2-MN-001	Page 24
Modification	Date	Name	Original		Replacement of	Replaced by				Page 24/65

24.8 / 1P24 → 1P24 / 26.1

24.8 / 1N24 → 1N24 / 26.1

02 / 22.5

1N24
BU
20AWG

02
BN
20AWG

1N24
BU
20AWG

-CR24

A1 A2 12 11 14

REL-MR- 24DC/21

1-DI3
BU
20AWG

1-DI3 / 15.3

Phoenix intermediate relay

Injection molding machine
safety door signal feedback

			Date	2019-05-27			Injection molding machine safety door signal feedback		=	
			Ed	10169					+	
			Appr		American Standard Electrical Schematic			460V/3P/PE	WL-Max-GUS-A2-MN-001	Page 25
Modification	Date	Name	Original		Replacement of	Replaced by				Page 25/65

25.8 / 1P24 → 1P24 / 27.1

25.8 / 1N24 → 1N24 / 27.1

1N24
BU
20AWG

A1 / 61.7

A1
BU
20AWG

A2 / 61.7

A2
BU
20AWG

-CR28

PILZ

A1 | 33 | 43 | 23/22 | 11

Strong breaking relay

A2 | 34 | 44 | 24/21 | 12

03
BN
20AWG

C1
BU
20AWG

C2
BU
20AWG

61.7 / C1

61.7 / C2

Robot emergency
stop signal feedback

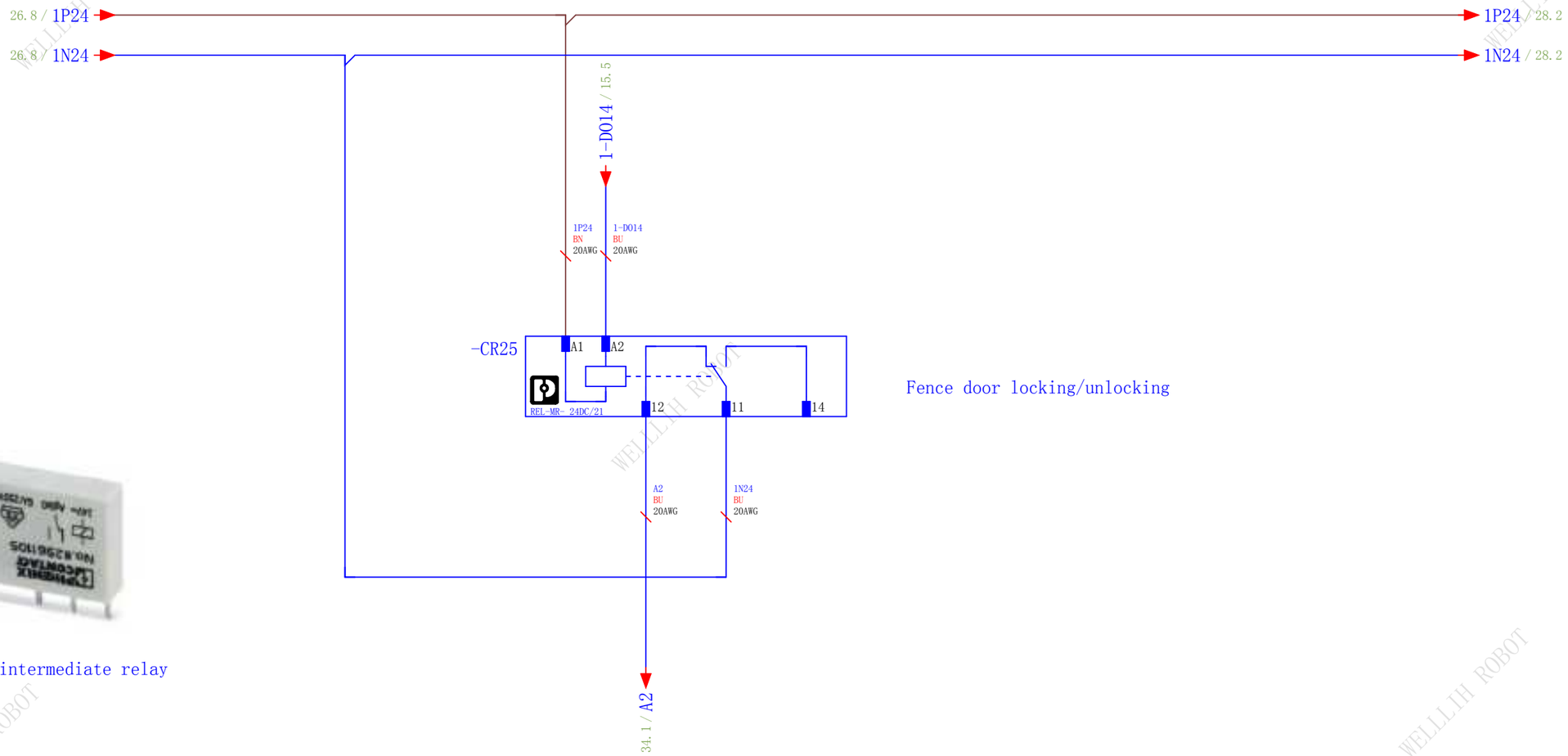
22.5 / 03

/26.4
/26.4
/26.5
/26.6

25

27

			Date	2019-05-27	American Standard Electrical Schematic	WELLLIH 伟立机器人	Robot emergency stop signal feedback		=
			Ed	10169					+
			Appr					460V/3P/PE	WL-Max-GUS-A2-MN-001	Page 26
Modification	Date	Name	Original		Replacement of	Replaced by				Page 26/65



Fence door locking/unlocking

Phoenix intermediate relay

			Date	2019-05-27			Fence door control relay		=
			Ed	10169					+
			Appr		American Standard Electrical Schematic				
Modification	Date	Name	Original		Replacement of	Replaced by		460V/3P/PE	WL-Max-GUS-A2-MN-001	Page 27
										Page 27/65

27.8 / 1P24

27.8 / 1N24

1P24 / 29.2

1N24 / 29.2

1-DO2 / 15.3

1P24
BN
20AWG

1-DO2
BU
20AWG

-CR26

A1

A2

12

11

14

REL-MR- 24DC/21

Robot No-Operational

I10
BU
20AWG

1P24
BN
20AWG

22.5 / I10

Phoenix intermediate relay

			Date	2019-05-27	American Standard Electrical Schematic		Robot No-Operational		=
			Ed	10169					+
			Appr					460V/3P/PE	WL-Max-GUS-A2-MN-001	Page 28
Modification	Date	Name	Original		Replacement of	Replaced by				Page 28/65

28.8 / 1P24 → 1P24 / 30.1

28.8 / 1N24 → 1N24 / 30.1

1-DO11 / 15.5

1P24 BN 20AWG

1-DO11 BU 20AWG

-CR27

A1 A2 12 11 14

REL-MR- 24DC/21

Manual switch isolation relay

Phoenix intermediate relay

I11 BU 20AWG

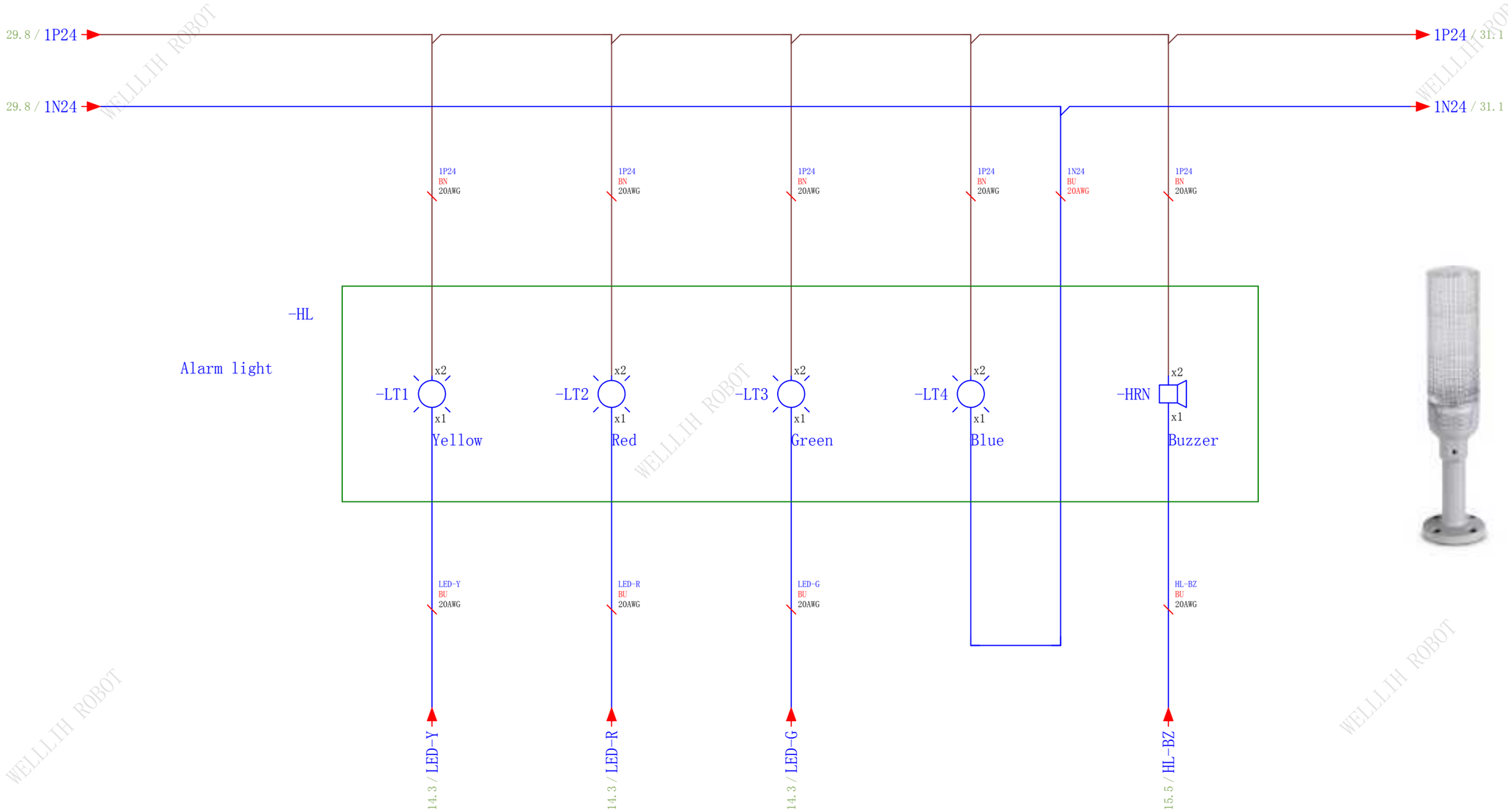
1P24 BN 20AWG

22.5 / I11

			Date	2019-05-27	American Standard Electrical Schematic		Manual switch isolation relay		=
			Ed	10169					+
			Appr					460V/3P/PE	WL-Max-GUS-A2-MN-001
Modification	Date	Name	Original		Replacement of	Replaced by			

Page 29

Page 29/65



29

31

			Date	2019-05-27				=	
			Ed	10169				+	
			Appr		American Standard Electrical Schematic				
Modification	Date	Name	Original		Replacement of	Replaced by	460V/3P/PE	WL-Max-GUS-A2-MN-001	Page 30 / Page 30/65

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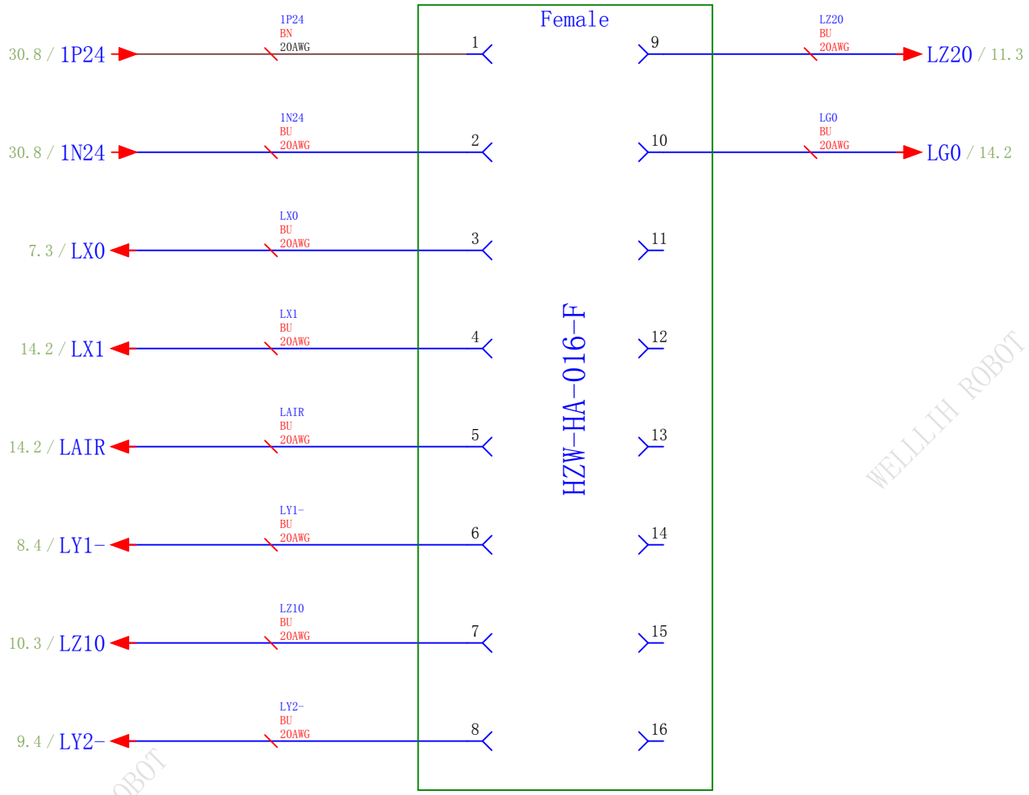
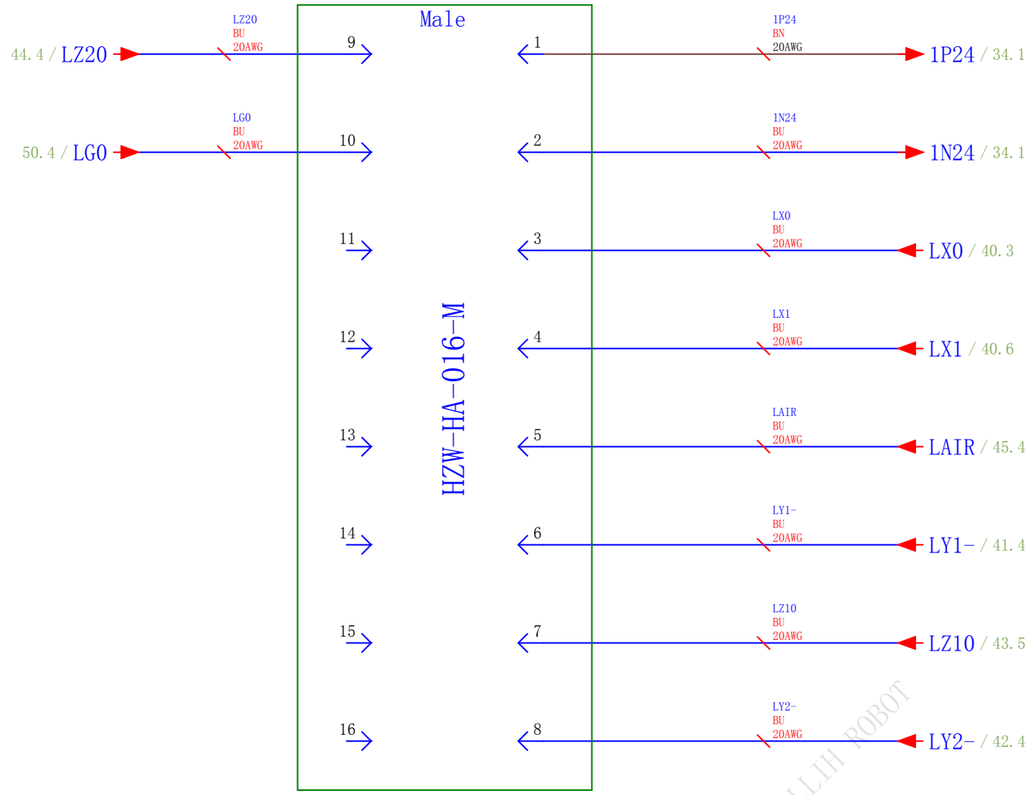
Alarm light and buzzer

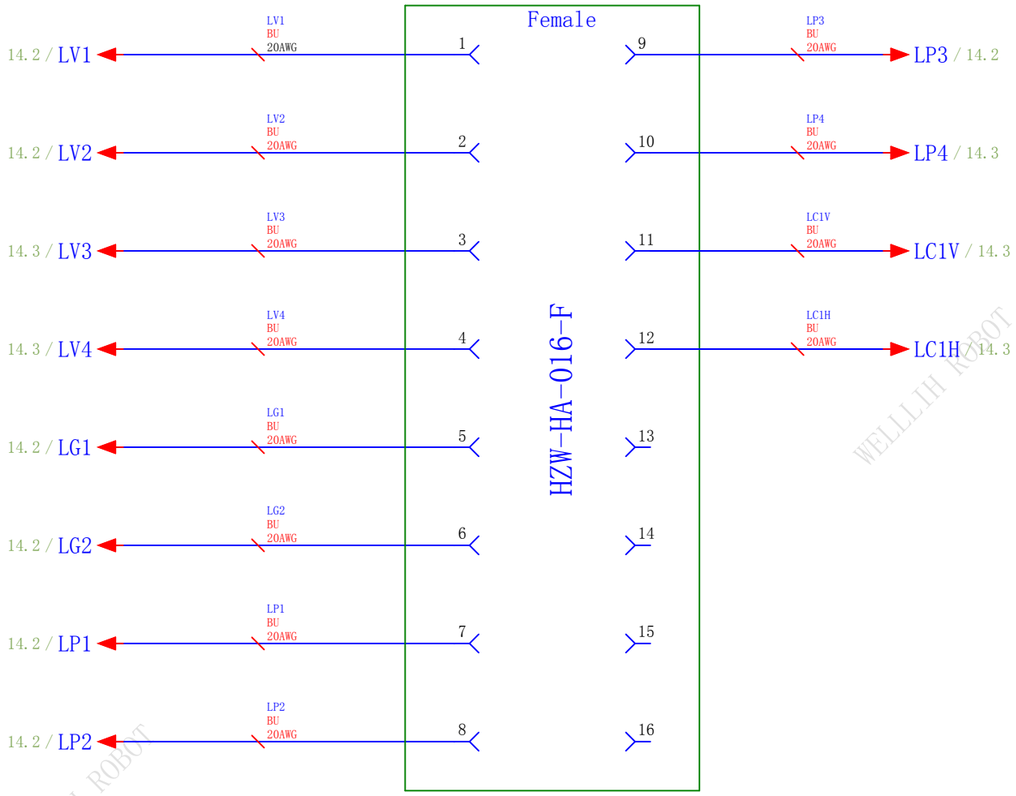
-PL1 =

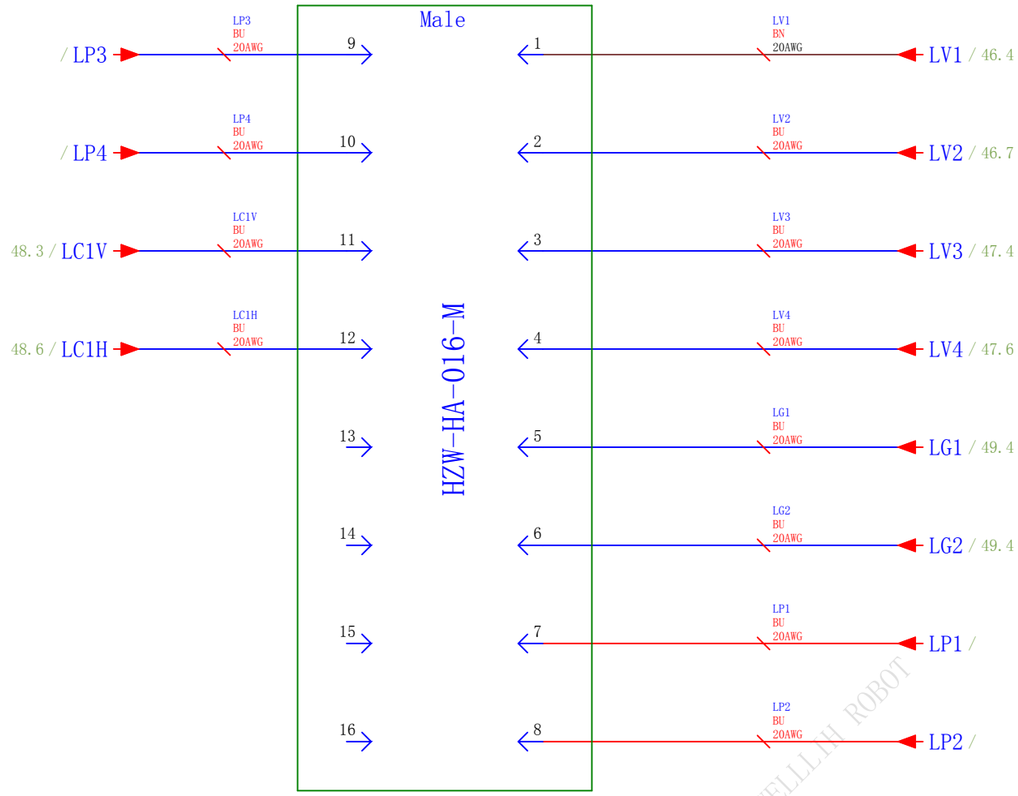




			Date	2019-05-27			-PL1 connector definition map	=	
			Ed	10169				+	
			Appr		American Standard Electrical Schematic			460V/3P/PE	WL-Max-GUS-A2-MN-001	Page 31
Modification	Date	Name	Original		Replacement of	Replaced by				Page 31/65

-PL2 =





31

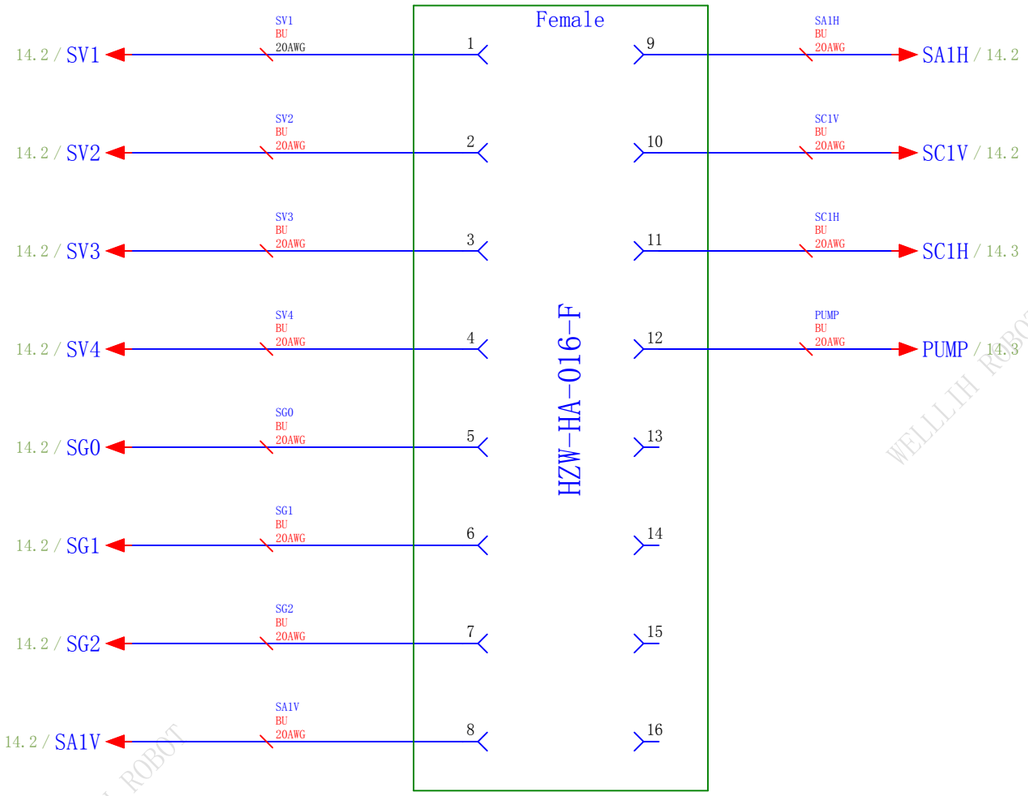
33

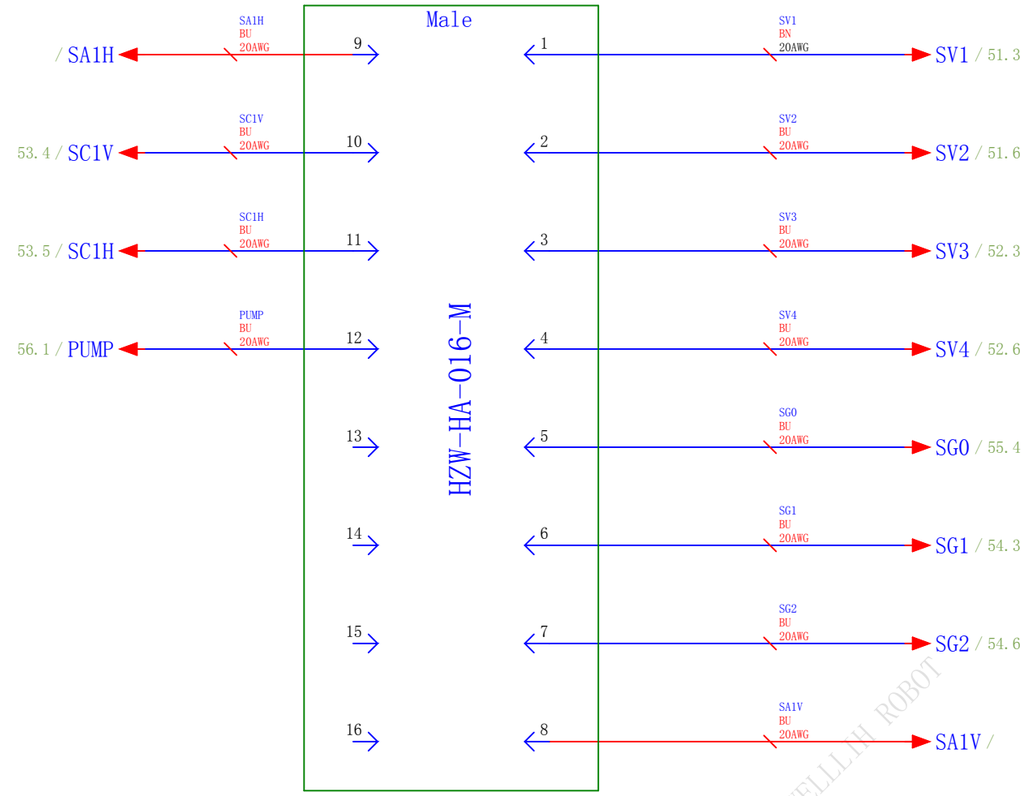
			Date	2019-05-27	American Standard Electrical Schematic	WELLLIH 伟立机器人	-PL2 connector definition map		=
			Ed	10169					+
			Appr					460V/3P/PE	WL-Max-GUS-A2-MN-001
Modification	Date	Name	Original		Replacement of	Replaced by			

Page 32

Page 32/65

-PL3=





			Date	2019-05-27	American Standard Electrical Schematic	WELLLIH 伟立机器人	-PL3 connector definition map		=
			Ed	10169					+
			Appr					460V/3P/PE	WL-Max-GUS-A2-MN-001
Modification	Date	Name	Original		Replacement of	Replaced by			

-PL4 =

31.8 / 1P24
31.8 / 1N24

1P24 / 35.0
1N24 / 35.0

Female

1P24 BN 20AWG	1	9	
27.4 / A2 — A2 BU 20AWG	2	10	
1P24 BN 20AWG	3	11	
22.4 / I6 — I6 BU 20AWG	4	12	
1P24 BN 20AWG	5	13	
22.4 / I7 — I7 BU 20AWG	6	14	
1N24 BU 20AWG	7	15	
15.4 / 1-DI9 — 1-DI9 BU 20AWG	8	16	

HZW-HA-016-F

Male

9	1		1P24 BN 20AWG — 1P24 / 38.7
10	2		A2 BU 20AWG — A2 / 38.7
11	3		1P24 BN 20AWG — 1P24 / 38.4
12	4		I6 BU 20AWG — I6 / 38.5
13	5		1P24 BN 20AWG — 1P24 / 38.6
14	6		I7 BU 20AWG — I7 / 38.6
15	7		1N24 BU 20AWG — 1N24 / 38.3
16	8		1-DI9 BU 20AWG — 1-DI9 / 38.4

HZW-HA-016-M

33

35

			Date	2019-05-27				=
			Ed	10169				+
			Appr		American Standard Electrical Schematic	WELLIH 伟立机器人	-PL4 connector definition map	
Modification	Date	Name	Original		Replacement of	Replaced by	460V/3P/PE	WL-Max-GUS-A2-MN-001

Page 34
Page 34/65

34.9 / 1P24
34.9 / 1N24

1P24 / 40.1
1N24 / 40.1

-PL5 =

Male

HZW-HA-016-M

9	1	1P24 BN 20AWG		
10	2	1N24 BU 20AWG		
11	3	I8 BU 20AWG	I8 / 22.4	
12	4	I9 BU 20AWG	I9 / 22.5	
13	5	DI27 BU 20AWG	DI27 / 14.4	
14	6	DI28 BU 20AWG	DI28 / 14.5	
15	7	DI29 BU 20AWG	DI29 / 14.5	
16	8	1-DO15 BU 20AWG	1-DO15 / 15.6	

Female

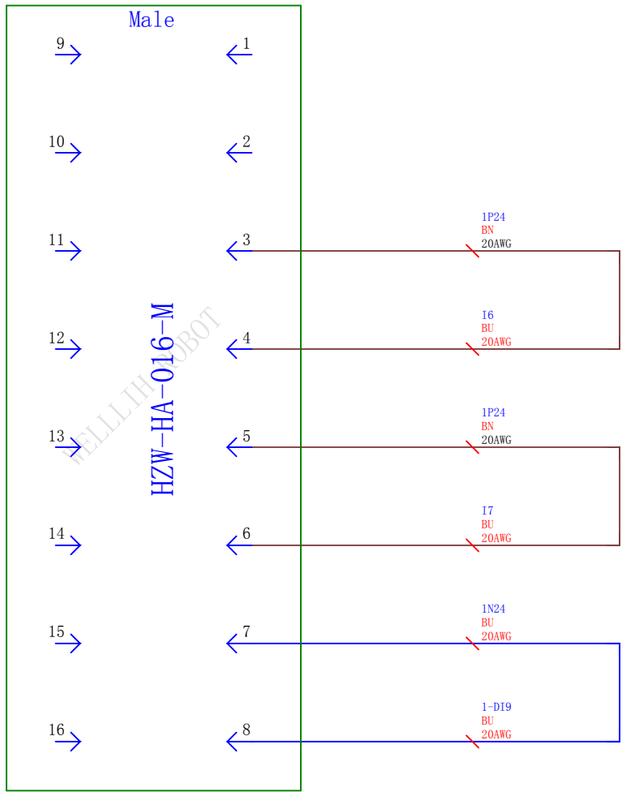
HZW-HA-016-F

1	9	1P24 BN 20AWG	39.3 / 1P24	
2	10	1N24 BU 20AWG	39.4 / 1N24	
3	11	I8 BU 20AWG	39.3 / I8	
4	12	I9 BU 20AWG	39.4 / I9	
5	13	DI27 BU 20AWG	39.5 / DI27	
6	14	DI28 BU 20AWG	39.7 / DI28	
7	15	DI29 BU 20AWG	39.4 / DI29	
8	16	1-DO15 BU 20AWG	39.8 / 1-DO15	

			Date	2019-05-27			=	
			Ed	10169			+	
			Appr		American Standard Electrical Schematic	-PL5 connector definition map		
Modification	Date	Name	Original		Replacement of	Replaced by	460V/3P/PE	WL-Max-GUS-A2-MN-001

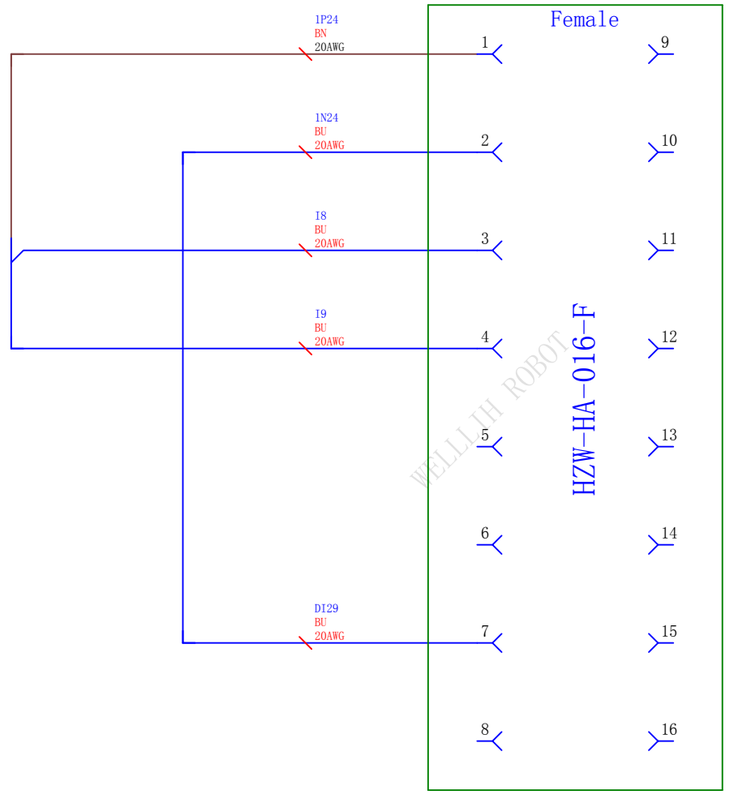
Page 35
Page 35/65

-PL 4 Shorting Plug



			Date	2019-05-27	American Standard Electrical Schematic		-PL4 Shorting Plug	=	
			Ed	10169				+	
			Appr				460V/3P/PE	WL-Max-GUS-A2-MN-001	Page 36
Modification	Date	Name	Original		Replacement of	Replaced by			Page 36/65

-PL 5 Shorting Plug

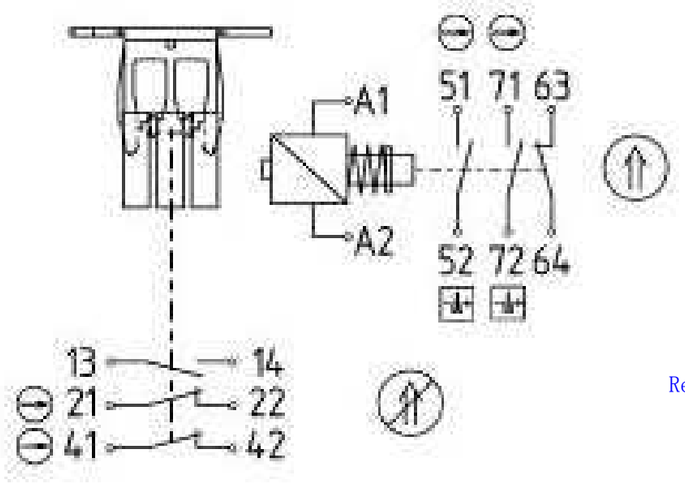


			Date	2019-05-27				=	
			Ed	10169				+	
			Appr		American Standard Electrical Schematic		-PL5Shorting Plug		
Modification	Date	Name	Original		Replacement of	Replaced by		460V/3P/PE	WL-Max-GUS-A2-MN-001 Page 37 / 65

-U4

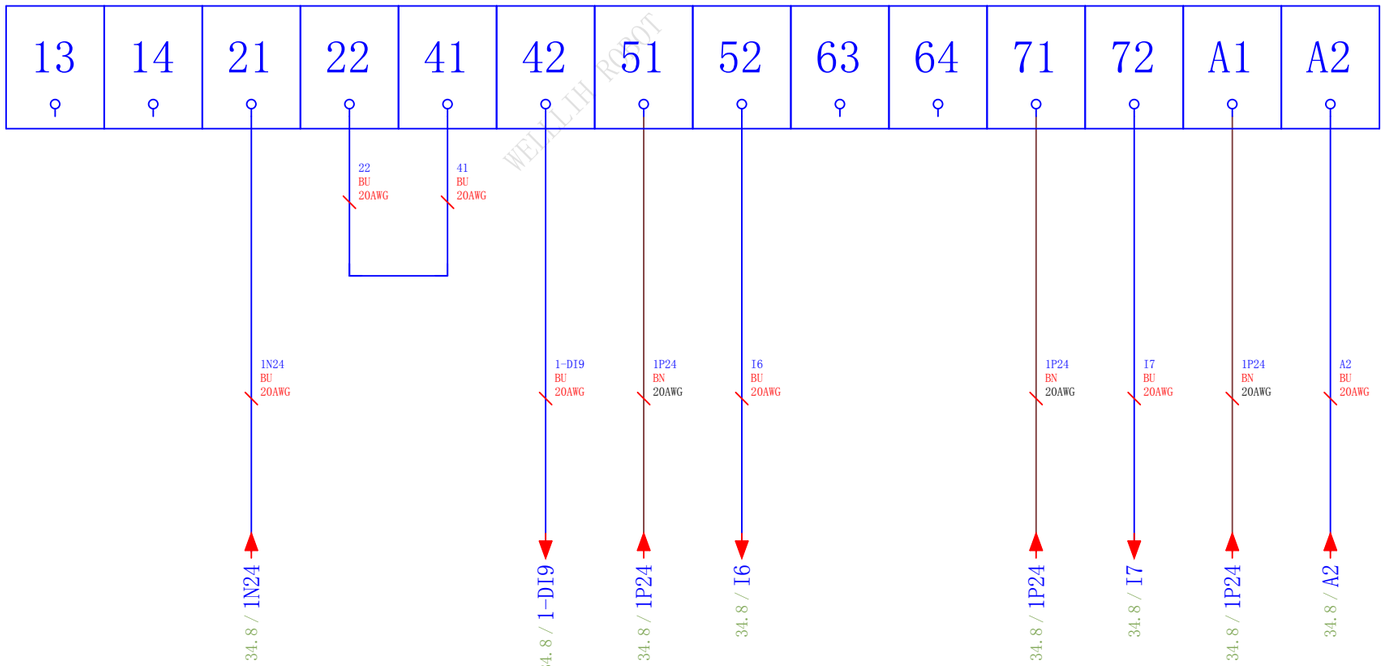
SCHMERSAL

AZM161SK12/12RKA-024



Remark:

Safety door locks are provided by the customer



37

39

			Date	2019-05-27	American Standard Electrical Schematic	WELLIH 伟立机器人	External fence door	=
			Ed	10169				+
			Appr				460V/3P/PE	WL-Max-GUS-A2-MN-001
Modification	Date	Name	Original		Replacement of	Replaced by		

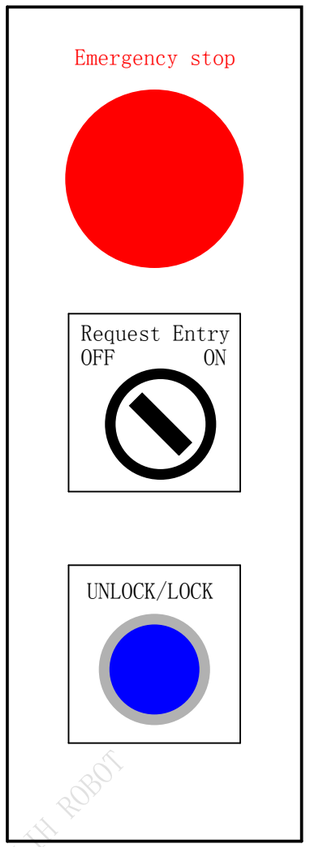
Page 38

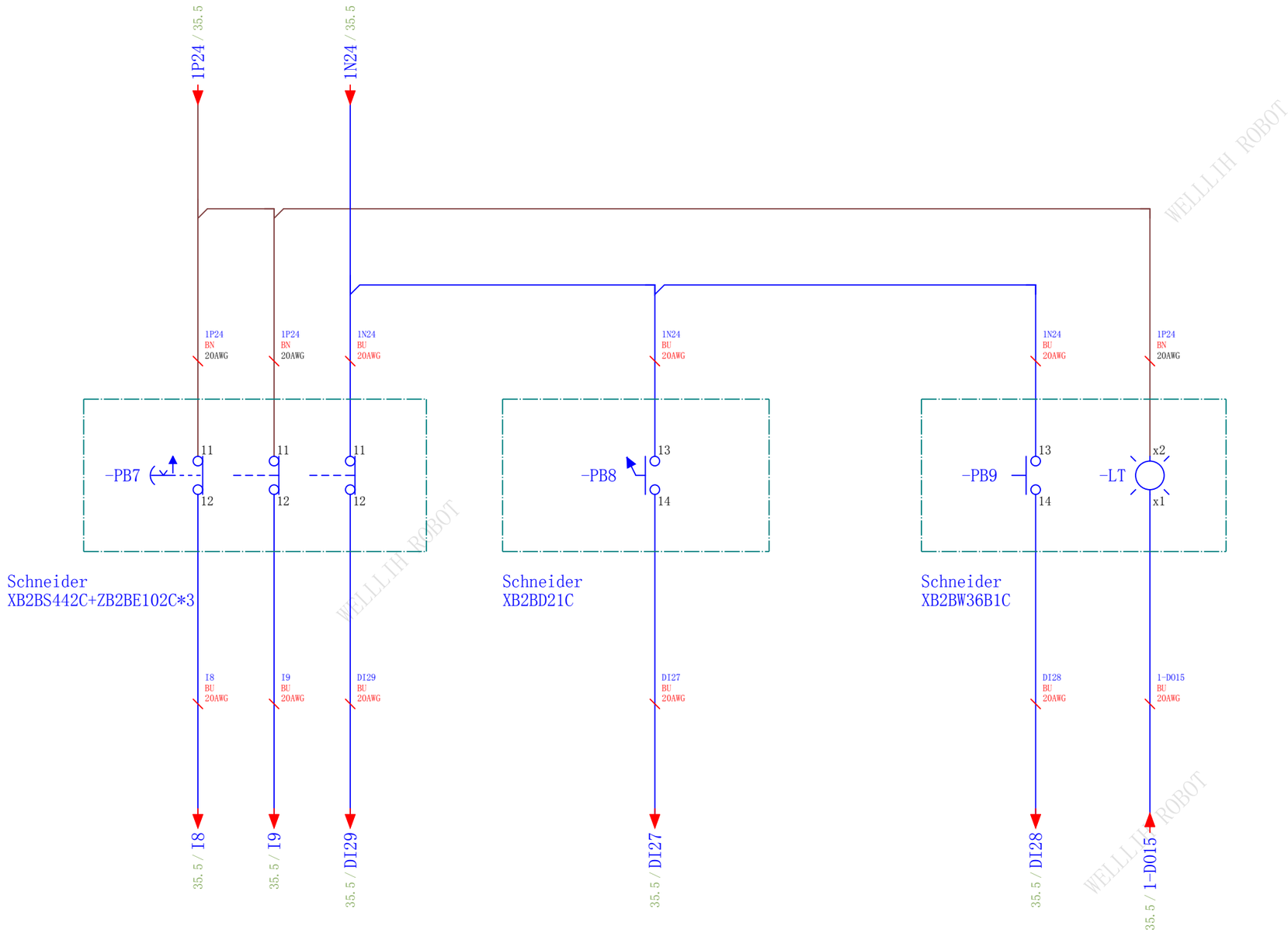
Page 38/65

-U5

Remark:

Button box is provided by the customer





			Date	2019-05-27				=	
			Ed	10169				+	
			Appr		American Standard Electrical Schematic	WELLLIH 伟立机器人	External button box		
Modification	Date	Name	Original		Replacement of	Replaced by		460V/3P/PE	WL-Max-GUS-A2-MN-001	Page 39 / Page 39/65

35.9 / 1P24

35.9 / 1N24

1P24 / 41.2

1N24 / 41.2

1P24
BN
20AWG

1N24
BU
20AWG

1 2

−B1

3

LX0
BU
20AWG

31.8 / LX0

Inductive sensor

X-axis origin switch (three-wire system)

NPN normally open type

1P24
BN
20AWG

1N24
BU
20AWG

1 2

−B2

3

LX1
BU
20AWG

31.8 / LX1

Inductive sensor

X-axis storage switch (three-wire system)

NPN normally open type

39

41

			Date	2019-05-27	American Standard Electrical Schematic		X-axis sensor	=	
			Ed	10169				+	
			Appr				460V/3P/PE	WL-Max-GUS-A2-MN-001	Page 40
Modification	Date	Name	Original		Replacement of	Replaced by			Page 40/65

40.8 / 1P24 →

40.8 / 1N24 →

1P24 / 42.2

1N24 / 42.2

1P24
BN
20AWG

1N24
BU
20AWG

1 2

−B3

3

LY1-
BU
20AWG

31.8 / LY1-

Inductive sensor

Y1 axis reverse limit switch (three-wire system)

NPN normally open type

			Date	2019-05-27			Y1-axis sensor		=	
			Ed	10169					+	
			Appr		American Standard Electrical Schematic			460V/3P/PE	WL-Max-GUS-A2-MN-001	Page 41
Modification	Date	Name	Original		Replacement of	Replaced by				Page 41/65

41.8 / 1P24 → 1P24 / 43.1

41.8 / 1N24 → 1N24 / 43.1

1P24 BN 20AWG

1N24 BU 20AWG

1 2 3

-B4

LY1- BU 20AWG

31.8 / LY2-

Inductive sensor

Y2 axis reverse limit switch (three-wire system)

NPN normally open type

			Date	2019-05-27			Y2-axis sensor	=	
			Ed	10169				+	
			Appr		American Standard Electrical Schematic				
Modification	Date	Name	Original		Replacement of	Replaced by		460V/3P/PE	WL-Max-GUS-A2-MN-001	Page 42 / Page 42/65

42.8 / 1P24

42.8 / 1N24

1P24 / 44.1

1N24 / 44.1

1P24
BN
20AWG

1N24
BU
20AWG

1

2

−B5

3

LZ10
BU
20AWG

31.8 / LZ10

Inductive sensor

Z1-axis storage switch (three-wire system)

NPN normally open type

			Date	2019-05-27	American Standard Electrical Schematic		Z1-axis sensor		=
			Ed	10169					+
			Appr					460V/3P/PE	WL-Max-GUS-A2-MN-001
Modification	Date	Name	Original		Replacement of	Replaced by			

43.8 / 1P24

43.8 / 1N24

1P24 / 45.1

1N24 / 45.1

1P24
BN
20AWG

1N24
BU
20AWG

1

2

-B6

3

LZ20
BU
20AWG

31.5 / LZ20

Inductive sensor

Z2-axis storage switch (three-wire system)

NPN normally open type

			Date	2019-05-27	American Standard Electrical Schematic		Z2-axis sensor		=
			Ed	10169					+
			Appr					460V/3P/PE	WL-Max-GUS-A2-MN-001	Page 44
Modification	Date	Name	Original		Replacement of	Replaced by				Page 44/65

44.8 / 1P24 → 1P24 / 46.1

44.8 / 1N24 → 1N24 / 46.1

1N24
BU
20AWG

13

-S1 P

/2.6

14

Gas source detection

LAIR
BU
20AWG

31.8 / LAIR

Gas source detection

NPN normally open type

			Date	2019-05-27	American Standard Electrical Schematic		WELLIH 伟立机器人	Air pressure detection		=
			Ed	10169						+
			Appr						460V/3P/PE	WL-Max-GUS-A2-MN-001
Modification	Date	Name	Original		Replacement of	Replaced by				

Page 45
Page 45/65

45.8 / 1P24

45.8 / 1N24

1P24 / 47.1

1N24 / 47.1

-BP1

FES.8035553 FESTO
SPAN-B2R-Q4-PN-PN-L1

p1

PNP NPN | PNP NPN

BN +24V DC power supply | BK Output A | WH Output B | BU 0V DC

1 2 3 4

1P24 BN 20AWG

1N24 BU 20AWG

LV1 BU 20AWG

32.8 / LV1

-BP2

FES.8035553 FESTO
SPAN-B2R-Q4-PN-PN-L1

p1

PNP NPN | PNP NPN

BN +24V DC power supply | BK Output A | WH Output B | BU 0V DC

1 2 3 4

1P24 BN 20AWG

1N24 BU 20AWG

LV2 BU 20AWG

32.8 / LV2

Negative pressure gauge 1

Negative pressure gauge 2

Suction cup 1 detection (three-wire system)

NPN normally open type

Suction cup 2 detection (three-wire system)

NPN normally open type

45

47

			Date	2019-05-27				=	
			Ed	10169				+	
			Appr		American Standard Electrical Schematic		Negative pressure gauge		
Modification	Date	Name	Original		Replacement of	Replaced by		460V/3P/PE	WL-Max-GUS-A2-MN-001	Page 46 / Page 46/65

46.8 / 1P24

46.8 / 1N24

1P24 / 48.1

1N24 / 48.1

Negative pressure gauge 3

1P24
BN
20AWG

1N24
BU
20AWG

-BP3

FES. 8035553
SPAN-B2R-Q4-PN-PN-L1
FESTO

p1

PNP NPN | PNP NPN

BN +24V DC power supply | BK Output A | WH Output B | BU 0V DC

1 2 3 4

LV3
BU
20AWG

32.8 / LV3

Suction cup 3 detection (three-wire system)

NPN normally open type

1P24
BN
20AWG

1N24
BU
20AWG

-BP4

FES. 8035553
SPAN-B2R-Q4-PN-PN-L1
FESTO

p1

PNP NPN | PNP NPN

BN +24V DC power supply | BK Output A | WH Output B | BU 0V DC

1 2 3 4

LV4
BU
20AWG

32.8 / LV4

Suction cup 4 detection (three-wire system)

NPN normally open type

Negative pressure gauge 4

			Date	2019-05-27	American Standard Electrical Schematic		Negative pressure gauge		=
			Ed	10169					+
			Appr					460V/3P/PE	WL-Max-GUS-A2-MN-001	Page 47
Modification	Date	Name	Original		Replacement of	Replaced by				Page 47/65

47.8 / 1P24 → 1P24 / 49.1

47.8 / 1N24 → 1N24 / 49.1

1N24
BU
20AWG

13
−B7
14

LC1V
BU
20AWG

32.5 / LC1V

Lateral position sensor (two-wire system)

C-axis screwed into place (two-wire system)

1N24
BU
20AWG

13
−B8
14

LC1H
BU
20AWG

32.5 / LC1H

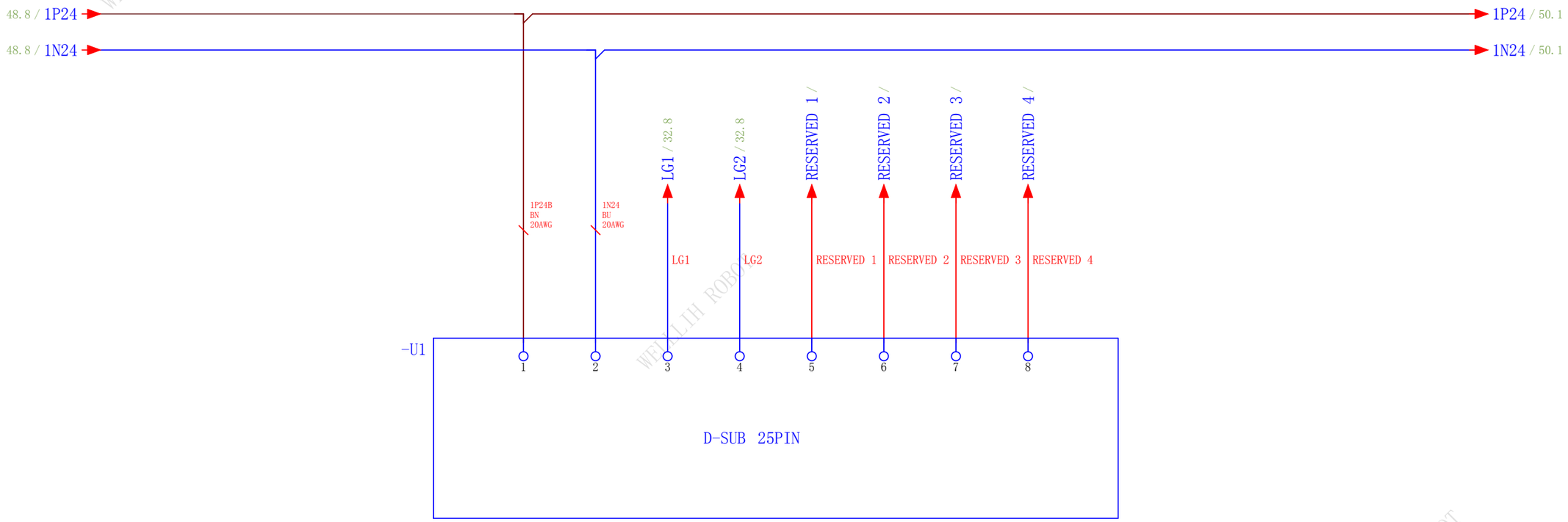
Lateral position sensor (two-wire system)

C-axis is screwed out in place (two-wire system)

			Date	2019-05-27				=	
			Ed	10169				+	
			Appr		American Standard Electrical Schematic				
Modification	Date	Name	Original		Replacement of	Replaced by	460V/3P/PE	WL-Max-GUS-A2-MN-001	Page 48 / Page 48/65

WELLLIH 伟立机器人

Lateral position signal



			Date	2019-05-27				=	
			Ed	10169				+	
			Appr		American Standard Electrical Schematic		Arm end fixture signal		
Modification	Date	Name	Original		Replacement of	Replaced by		460V/3P/PE	WL-Max-GUS-A2-MN-001	Page 49 / Page 49/65

49.8 / 1P24 → 1P24 / 51.1

49.8 / 1N24 → 1N24 / 51.1

1N24
BU
20AWG

13

-B9

14

LG0
BU
20AWG

31.5 / LG1

Auxiliary gripper sensor (two-wire system)

Secondary arm clamp detection

			Date	2019-05-27	American Standard Electrical Schematic	WELLIH 伟立机器人	Auxiliary fixture signal		=
			Ed	10169					+
			Appr					460V/3P/PE	WL-Max-GUS-A2-MN-001
Modification	Date	Name	Original		Replacement of	Replaced by			

50.8 / 1P24

50.8 / 1N24

1P24 / 52.1

1N24 / 52.1

1P24
BN
20AWG

-Y1

x1

x2

SV1
BU
20AWG

33.8 / SV1

Festo solenoid valve

Suction cup 1 solenoid valve output

1P24
BN
20AWG

-Y2

x1

x2

SV2
BU
20AWG

33.8 / SV2

Suction cup 2 solenoid valve output

			Date	2019-05-27	American Standard Electrical Schematic		WELLIH 伟立机器人	Suction cup solenoid valve output		=
			Ed	10169						+
			Appr						460V/3P/PE	WL-Max-GUS-A2-MN-001
Modification	Date	Name	Original		Replacement of	Replaced by				

51.8 / 1P24

51.8 / 1N24

1P24 / 53.1

1N24 / 53.1

1P24
BN
20AWG

-Y3

x1

x2

SV3
BU
20AWG

33.8 / SV3

Festo solenoid valve

Suction cup 3 solenoid valve output

1P24
BN
20AWG

-Y4

x1

x2

SV4
BU
20AWG

33.8 / SV4

Suction cup 4 solenoid valve output

51

53

			Date	2019-05-27	American Standard Electrical Schematic	WELLLIH 伟立机器人	Suction cup solenoid valve output	=	
			Ed	10169				+	
			Appr				460V/3P/PE	WL-Max-GUS-A2-MN-001	Page 52
Modification	Date	Name	Original		Replacement of	Replaced by			Page 52/65

52.8 / 1P24

52.8 / 1N24

1P24 / 54.1

1N24 / 54.1

1P24
BN
20AWG

1P24
BN
20AWG

-Y8

SC1V
BU
20AWG

SC1H
BU
20AWG

33.5 / SC1V

33.5 / SC1H

Festo solenoid valve

C-axis screwed into the electric solenoid valve output

C-axis unwinding solenoid valve output

			Date	2019-05-27	American Standard Electrical Schematic	WELLLIH 伟立机器人	Side view solenoid valve output		=
			Ed	10169					+
			Appr					460V/3P/PE	WL-Max-GUS-A2-MN-001	Page 53
Modification	Date	Name	Original		Replacement of	Replaced by				Page 53/65

53.8 / 1P24

53.8 / 1N24

1P24 / 55.1

1N24 / 55.1

1P24
BN
20AWG

-Y5

x1

x2

SG1
BU
20AWG

33.8 / SG1

Clamp 1 solenoid valve output

1P24
BN
20AWG

-Y6

x1

x2

SG2
BU
20AWG

33.8 / SG2

Clamp 2 solenoid valve output

Festo solenoid valve

53

55

			Date	2019-05-27			Clamp solenoid valve output		=
			Ed	10169	American Standard Electrical Schematic				+
			Appr					460V/3P/PE	WL-Max-GUS-A2-MN-001	Page 54
Modification	Date	Name	Original		Replacement of	Replaced by				Page 54/65

54.8 / 1P24

54.8 / 1N24

1P24 / 56.0

1N24 / 56.0

1P24
BN
20AWG

-Y7

x1

x2

SGO
BU
20AWG

33.8 / SGO

Festo solenoid valve

Secondary arm clamp
solenoid valve output

54

56

			Date	2019-05-27	American Standard Electrical Schematic	WELLIH 伟立机器人	Auxiliary arm clamp solenoid valve output	=	
			Ed	10169				+	
			Appr				460V/3P/PE	WL-Max-GUS-A2-MN-001	Page 55
Modification	Date	Name	Original		Replacement of	Replaced by			Page 55/65

55.8 / 1P24
55.8 / 1N24
1P24 / 57.1
1N24 / 57.1

1P24
BN
20AWG

PUMP-1
BU
20AWG

-CR35

13 A1
12 NC
11NO
42 NC
41NO
DRM

14 A2
14COM
44COM

PUMP-2
BU
20AWG

PUMP
BU
20AWG

33.5 / PUMP

-U4

Oil can

DIP switch

KE

ON

1 2 3 4 5 6 7

Input

1 2

Remark:
4 and 7 are ON

Automatic lubricating oil pot

			Date	2019-05-27				=	
			Ed	10169				+	
			Appr		American Standard Electrical Schematic				
Modification	Date	Name	Original		Replacement of	Replaced by	460V/3P/PE	WL-Max-GUS-A2-MN-001	Page 56 / Page 56/65

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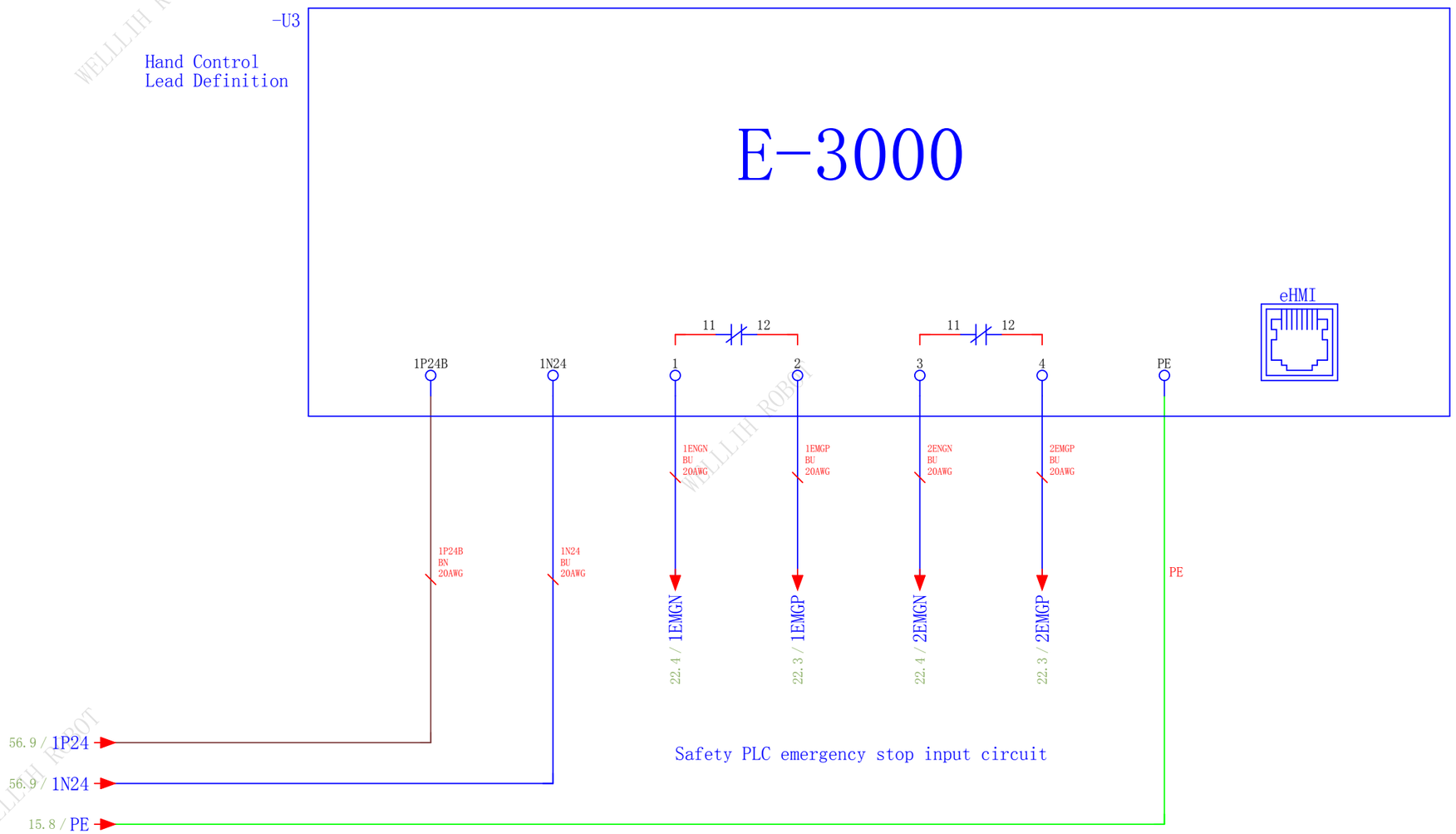
Oil Can

-U3

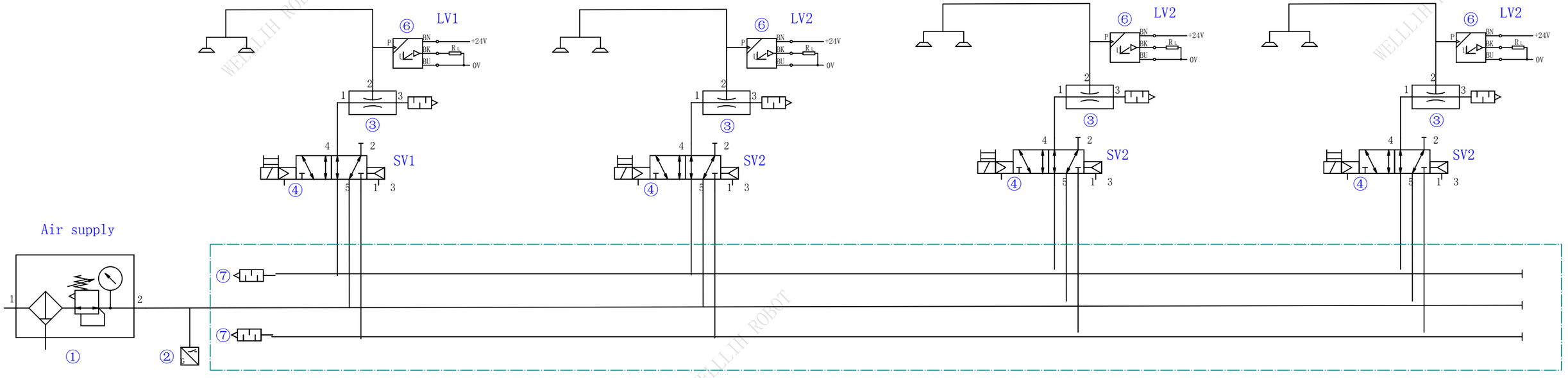
Hand Control
Lead Definition

E-3000



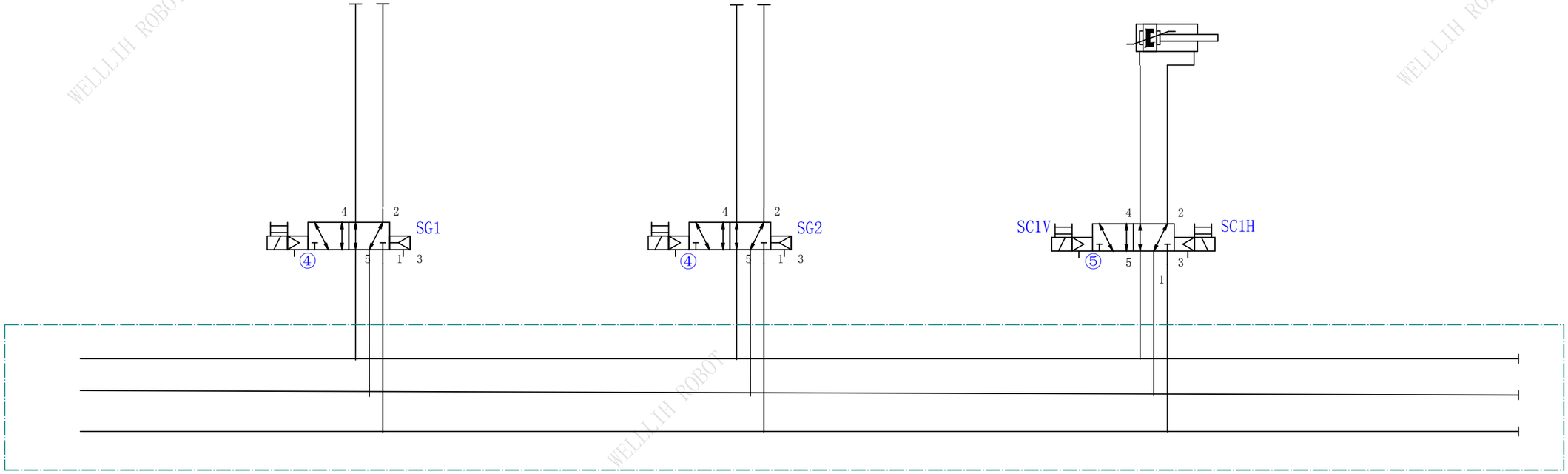
Safety PLC emergency stop input circuit

			Date	2019-05-27	American Standard Electrical Schematic		E3000 hand controller	=	
			Ed	10169				+	
			Appr				460V/3P/PE	WL-Max-GUS-A2-MN-001	Page 57
Modification	Date	Name	Original		Replacement of	Replaced by			Page 57/65



Number	Name	Model
①	Valve	STBW-II
②	LAIR	QYBH001
③	Vacuum generator	VTM20-B
④	Solenoid valve	VUVG-L14-M52-AT-G18-1P3
⑥	Sensor	SPTE-V1R-S6-B-2.5K
⑦	silencer	SN200-02

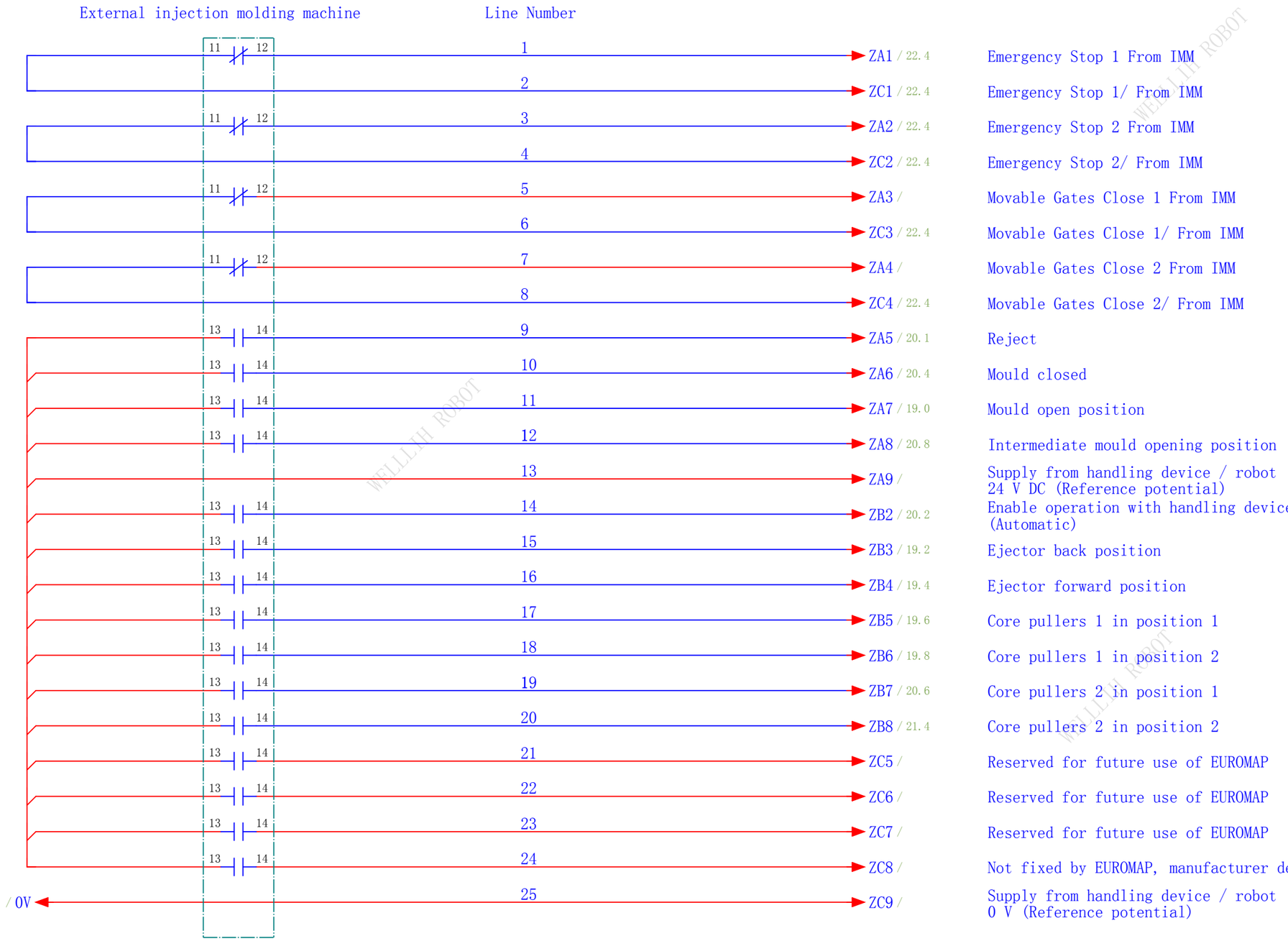
			Date	2019-04-18	American Standard Electrical Schematic		Gas road map 1		=
			Ed	10169					+
			Appr					460V/3P/PE	WL-Max-GUS-A2-MN-001
Modification	Date	Name	Original		Replacement of	Replaced by			



Number	Name	Model
④	Solenoid valve	VUVG-L14-M52-AT-G18-1P3
⑤	Solenoid valve	VUVG-L14-B52-T-G18-1P3

			Date	2019-04-18				=	
			Ed	10169				+	
			Appr		American Standard Electrical Schematic		Gas road map 2		
Modification	Date	Name	Original		Replacement of	Replaced by		460V/3P/PE	WL-Max-GUS-A2-MN-001	Page 59
										Page 59/65

EUROMAP 67 Robot input signal



REMARK:

1、 ZA3, ZA4, ZA9 need to be connected to 1P24

2、 ZC9 need to be connected to 1N24

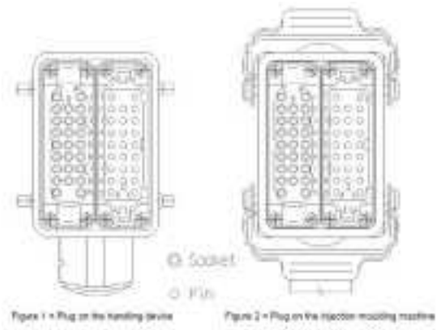


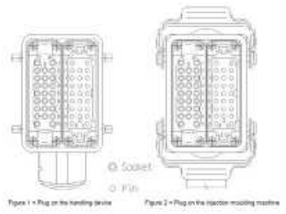
Figure 1 = Plug on the handling device Figure 2 = Plug on the injection moulding machine

			Date	2019-05-27				=	
			Ed	10169				+	
			Appr		American Standard Electrical Schematic	WELLIH 伟立机器人	European standard 67 input signal		
Modification	Date	Name	Original		Replacement of	Replaced by		460V/3P/PE	WL-Max-GUS-A2-MN-001	Page 60 / Page 60/65

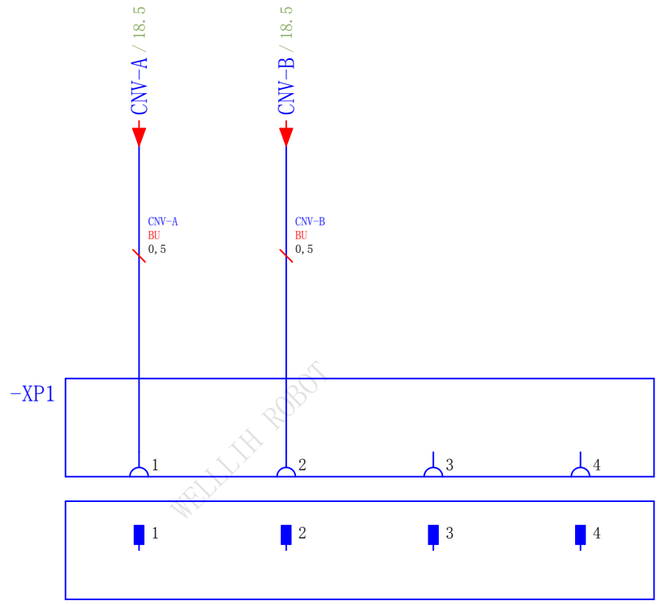
EUROMAP 67 Robot output signal

Robot	Line Number		
12 11	26	A1 / 26.4	Emergency stop of handling device / robot Channel 1
	27	C1 / 26.4	
12 11	28	A2 / 26.4	Emergency stop of handling device / robot Channel 2
	29	C2 / 26.4	
13 14	30	A3 / 17.8	Mould area free
	31	C3 / 17.9	
13 14	32	A4 /	Reserved for future use by EUROMAP
	33	C4 /	
13 14	34	A5 /	Not fixed by EUROMAP, manufacturer dependent
13 14	35	A6 / 16.4	Enable mould closure
13 14	36	A7 /	Enable full mould opening
13 14	37	A8 /	Reserved for future use by EUROMAP
	38	A9 / 18.8	Supply from injection moulding machine 24V DC / 2A (Reference potential)
13 14	39	B2 / 17.3	Handling device / robot operation mode
13 14	40	B3 / 17.7	Enable ejector back
13 14	41	B4 / 17.5	Enable ejector forward
13 14	42	B5 / 18.3	Enable movement of core pullers 1 to position 1
13 14	43	B6 / 18.1	Enable movement of core pullers 1 to position 2
13 14	44	B7 / 18.9	Enable movement of core pullers 2 to position 1
13 14	45	B8 / 18.7	Enable movement of core pullers 2 to position 2
13 14	46	C5 /	Not fixed by EUROMAP, manufacturer dependent
13 14	47	C6 /	Reserved for future use by EUROMAP
13 14	48	C7 /	Reserved for future use by EUROMAP
13 14	49	C8 /	Not fixed by EUROMAP, manufacturer dependent
C9	50	C9 /	Supply from injection moulding machine 0V (Reference potential)
	51		Reserve line
	PE		Reserve line

51 and PE is Reserve line

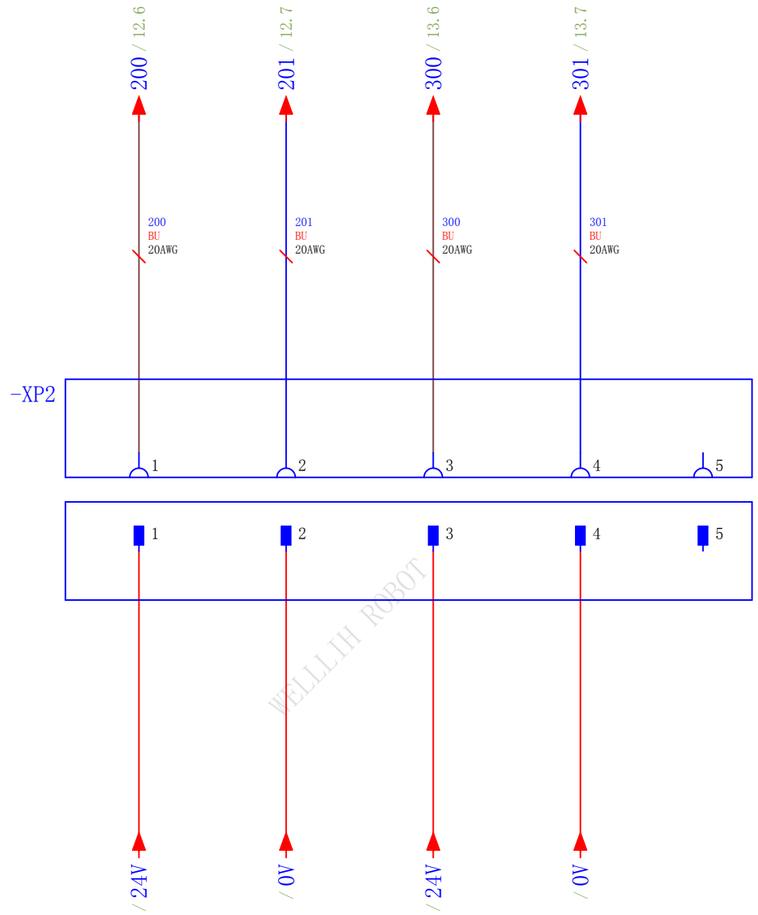


			Date	2019-05-27	American Standard Electrical Schematic	WELLIH 伟立机器人	European standard 67 output signal	=	
			Ed	10169				+	
			Appr					460V/3P/PE	WL-Max-GUS-A2-MN-001
Modification	Date	Name	Original		Replacement of	Replaced by			Page 61 / Page 61/65



To conveyor

			Date	2019-05-27			Conveyor belt connector		=
			Ed	10169	American Standard Electrical Schematic				+
			Appr					460V/3P/PE	WL-Max-GUS-A2-MN-001
Modification	Date	Name	Original		Replacement of	Replaced by			



REMARK:
24V power supply from the customer
for raising or lowering the arm

			Date	2019-05-27	American Standard Electrical Schematic	WELLIH 伟立机器人	External connector	=
			Ed	10169				+
			Appr				460V/3P/PE	WL-Max-GUS-A2-MN-001 Page 63
Modification	Date	Name	Original		Replacement of	Replaced by		Page 63/65

67 to 12 interface adaptor

EUROMAP 67 SOCKET

European regulations 67
connector corresponding
to the shell

32 core wire number

EUROMAP 12 PLUS

European regulations 12
connector corresponding
to the shell

ZA1		ZA1 /65.4
ZC1		ZC1 /65.4
ZA2		ZA2 /65.5
ZC2		ZC2 /65.5
ZA3		ZA3 /65.8
ZC3		ZC3 /65.8
ZA4		ZA4 /65.9
ZC4		ZC4 /65.9
ZA5	8	8 /
ZA6	12	12 /
ZA7	2	2 /
ZA9	16	16 /
ZB2	10	10 /
ZB3	4	4 /
ZB4	5	5 /
ZB5	6	6 /
ZB6	7	7 /
ZC9		Reserved, do not connect
A1	19	19 /
C1		
A2		
C2	27	27 /
A3	18	18 /
C3	26	26 /
A6	17	17 /
A9	32	32 /
B2	20	20 /
B3	21	21 /
B4	22	22 /
B5	23	23 /
B6	24	24 /
C9		Reserved, do not connect

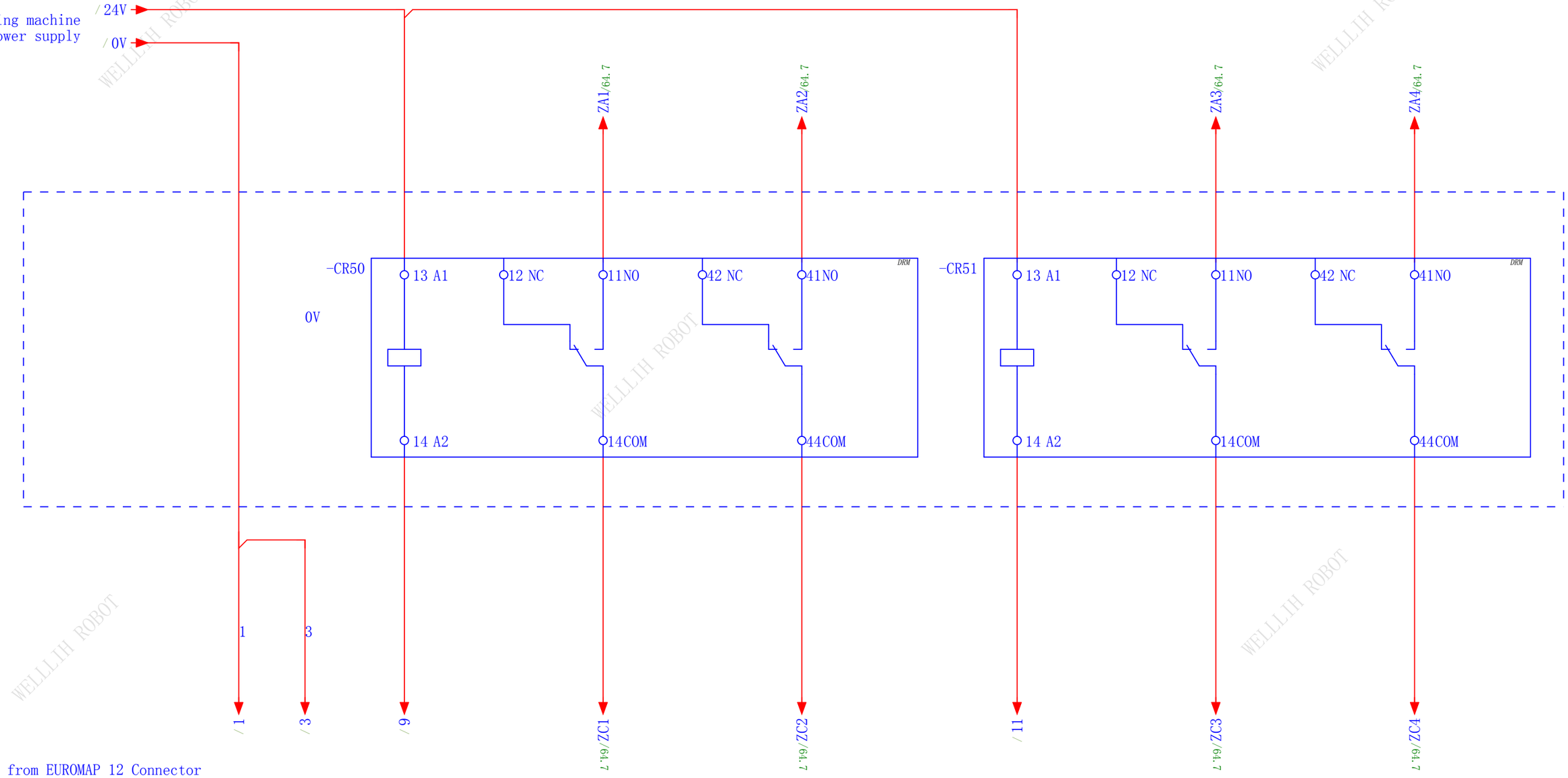
63

65

			Date	2019-05-28				=	
			Ed	10169				+	
			Appr		American Standard Electrical Schematic	WELLLIH 伟立机器人	European standard 67 to European regulations 12 schematic		
Modification	Date	Name	Original		Replacement of	Replaced by		460V/3P/PE	WL-Max-GUS-A2-MN-001	Page 64 / Page 64/65

67 to 12 interface adaptor

Remark:
Injection molding machine
or robot 24V power supply



Remark:
1: 1、3、9、11 from EUROMAP 12 Connector
2: ZA1、ZC1、ZA2、ZC2、ZA3、ZC3、ZA4、ZC4
from EUROMAP 67 Connector
3: 24V、0V from Injection molding machine
or robot 24V power supply
4: CR13 and CR14 is Intermediate relay

			Date	2019-05-28	American Standard Electrical Schematic		European standard 67 to European regulations 12 schematic	=
			Ed	10169				+
			Appr				460V/3P/PE	WL-Max-GUS-A2-MN-001
Modification	Date	Name	Original		Replacement of	Replaced by		Page 65 / Page 65/65