BORUNTE Product Instruction

BRT_Robot_V1.2_207_F1_2023.9

- www.borunte.com -

《Declaration of Common Prosperity》

I declare that I will be faithful to BORUNTE’s goal, practice common prosperity methodology, perform the responsibilities of common Prosperity Practitioner, behave in a fully self-disciplined, to honor commitment and take practical actions and follow fundamental principle. Common prosperity totally depends on ourselves.

Declared by:XXX

BORUNTE 100% encourages employees to start businesses and become BORUNTE integrator or supplier.

SELF-DISCIPLINE

PRACTICAL

SIMPLICITY

BORUNTE: COMMON PROSPERITY PRACTITIONER

《Practical Philosophy》

II

Self-discipline + Practical + Simplicity

II

BORUNTE goals:

Step 1: Realize an annual operating income of over
RMB 100 billion and obtain over 1,000 licensed invention patents.

Step 2: Realize an annual operating income of over
RMB 1 trillion and obtain over 10,000 licensed invention patents.

Step 3: Realize an annual operating income of over
RMB 10 trillion and obtain over 100,000 licensed invention patents.

Note: The future statements above, including future planning, do not constitute the Company's commitment for its investors. Both the investors and relevant personnel shall have full understandings on risks and know about the difference between planning and commitment.

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Common Prosperity Methodology

① Management Aim: BORUNTE realizes common prosperity driven by the innovation of "negative gross margin and positive cash flow".

② BORUNTE integrators: Place an order for 1000 BORUNTE products of a single model from BORUNTE, and then you can become the integrator of BORUNTE. And BORUNTE only accepts 100% prepayment order and BORUNTE will deliver the goods in 90 working days/ 180 working days/ 1800 working days. At the same time, BORUNTE provide 50% rebate for integrators. And the rebate can be cashed if you place an order again and the order quantity must be greater than twice the number of rebates.

③ BORUNTE supplier:The payment method is cash transfer for the current month, that is, if the reconciliation period is from the 16th day of last month to the 15th day of this month, and the cash transfer and quality delivery date are both met before the 25th day of this month, and the cost has priority, the supplier will become the primary supplier.

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Common Prosperity Practitioner

1= ♭E $\frac{4}{4}$

3 - 2 4 3 | 3 0 0 1 | 2 1 2 4 3 | 3 0 0 0 | 1.1 - 1 | 2 - - 1 | 3 - - - | 3 - 0 0 |
伯 朗 特 的 共同富 裕， 凝成 一 条 路，

3 - 2 4 3 | 3 - - - | 5 - 5 6 6 | 6 - - 6 | 4 4 4. 0 | 5 4 4. 3 4 | 5 5 6 5 5 | 5 - - - |
负 毛利率 正 现金流 的 创 新 驱 动实现 共同富 裕，

5 1 1 7 1 | 1 - - - | 3 2 1 7 1 | 1 - - - | 6 6 6 6 7 | 1 6 6. 2 3 | 4 - 5 - | 6 - 5 - |
保证完 成， 坚决完 成， 世界的共同 富 裕,我们 道 远 任 重，

5 1 1 7 1 | 1 - - - | 3 2 1 2 1 6 | 6 - - - | 4 4 4. 5 | 6 1 7 - 7 | 1 7 6 5 5 | 5 - - - |
共同富 裕， 世界大 同， 创 新促 永 续， 勇攀巅 峰，

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完成伯朗特的 目 标就是 共同富 裕， 完成伯朗特的 目 标就是 共 同 富 裕 。

Scan the QR code on the robot to learn more

BRTYZGT02S2B
二轴机器人
Two-axis Robot

BRTYZGT04S2B
二轴机器人
Two-axis Robot

BRTIRSC0810A
四轴机器人
Four-axis Robot

BRTIRSC0603A
四轴机器人
Four-axis Robot

BRTIRPL1003A
四轴机器人
Four-axis Robot

BRTIRPL1608A
四轴机器人
Four-axis Robot

BRTIRPZ1508A
四轴机器人
Four-axis Robot

BRTIRPZ1825A
四轴机器人
Four-axis Robot

BRTIRUS0401A
六轴机器人
Six-axis Robot

BRTIRUS0805A
六轴机器人
Six-axis Robot

BRTIRUS0707A
六轴机器人
Six-axis Robot

BRTIRUS1510A
六轴机器人
Six-axis Robot

BRTIRPH1210A
六轴机器人
Six-axis Robot

BRTIRWD1506A
六轴机器人
Six-axis Robot

BRTIRWD1606A
六轴机器人
Six-axis Robot

BRTIRUS1820A
六轴机器人
Six-axis Robot

BRTIRWD2206A
六轴机器人
Six-axis Robot

BRTIRUS2110A
六轴机器人
Six-axis Robot

BRTIRSE2013A
六轴机器人
Six-axis Robot

BRTIRUS2030A
六轴机器人
Six-axis Robot

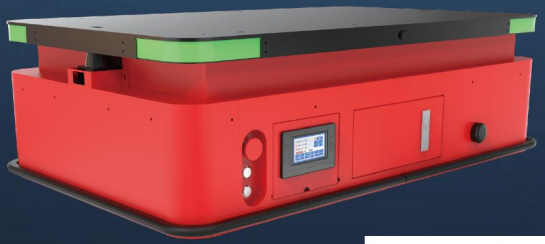
BRTIRXZ0805A
六轴机器人
Six-axis Robot

BRTIRSE2013F
六轴机器人
Six-axis Robot

*含配套气阀箱
及防爆控制柜

BRTAGV12010A
潜伏式AGV
Lurking AGV

BRTAGV21050A
复合移动机器人平台
Composite mobile robot platform



BRTIRUS3030A
六轴机器人
Six-axis robot

BRTIRPZ2250A
四轴机器人
Four-axis robot

BRTIRUS2550A
六轴机器人
Six-axis robot

BRTIRBR2260A
六轴机器人
Six-axis robot

BRTIRUS3511A
六轴机器人
Six-axis robot

BRTIRUS2520B
六轴机器人
Six-axis robot

BRTIRPZ2480A
四轴机器人
Four-axis robot

BRTIRPZ3013A
四轴机器人
Four-axis robot

BRTIRPZ3030B
四轴机器人
Four-axis robot

BRTIRUS3050B
六轴机器人
Six-axis robot

* 扫描机器人二维码，可获取产品最新的机型介绍、应用案例、图片下载、教学视频、开机注意事项、说明书及教材、机器保养手册、故障处理手册等产品信息。

*Scan the robot QR code to obtain the latest product model introduction, application cases, robot pictures downloads, teaching videos, startup precautions, instructions and textbooks, robot maintenance manual, fault handling manual, and other product information.

Safety Precautions

Make sure to read this Manual through before using the Machine , in order to use it safely and conveniently, and keep it properly for further reference. Do not operate this machine until you get familiar with all knowledge, safety instructions and precautions of the machine.

The safety information in this Manual is general provisions and does not contain all details of robot application. So, necessary safety measures should be taken and followed strictly based on the real conditions of system and application environment when using the robot.

Safety precautions in this Manual are divided into "Danger", "Caution", "Compulsory" and "Inhibit".

DANGER

A hazardous misoperation may lead to deaths or major casualties.

Caution

A hazardous misoperation may lead to moderate injuries and machine fault.

Caution

Rule which must be followed.

INHIBIT

Prohibited contents.

Note: All precautions are vitally important and must be followed strictly, for the contents in "Caution" may also lead to serious consequences depending on the actual conditions.

Some rules must be followed strictly by users, even if they are not specified in "Caution" or "Danger".

DANGER

★ Before operating the robot, make sure all control servos are running normally, press the emergency stop to power off and brake the motor and stop all axles of machine completely. When power supply is cut off, the teaching programmer will show the alarm information of emergency stop.

Personal injury or machine damage may occur if failing to brake the robot in time in case of emergency.

Press the emergency stop

☆When servo power supply needs to be switched on after releasing emergency stop, make sure to remove the fault that triggers emergency stop before connecting the servo power supply.

Robot action due to misoperation may lead to a personal injury.

White arrow direction
Rotate it to release the emergency stop

☆Please follow the rules below when conducting teaching within the motion range of robot:

Observe the robot at the front side
Follow the operation steps strictly.
Consider the emergency plan when robot moves to the operator direction suddenly.
A shelter should be arranged just in case.
Robot action due to misoperation may lead to a personal injury.

☆Make sure there's no person within the motion range of robot and operator is in a safe position before starting the following operation:

When powering up the robot's control cabinet.
Operate the robot through the teaching programmer.
During test runs.
Auto reproduction.
Personal injury may occur when entering the robot motion range or touching the robot by accident. In case of emergency, please press the red emergency stop button immediately.

★The following precautions must be followed during operation

1、The robot controller must be handled by the assigned operator who has passed the safety training and acquired the certificate.

2、Safety fence should be arranged around the robot motion range to effectively prevent the robot from leaving the fence due to error, robot arm falling or material falling. The safety door on fence should be fitted with safety pin. The safety pin must be unplugged before entering the fence and the robot must stop safely when safety pin is unplugged.

3、No one is allowed to enter the safety fence range of robot while the robot is running (auto, manual).

4、When robot application system is handled by multiple operators, make sure all operators and relevant personnel are familiar with machine before starting the robot.

5、The operator should carry the safety pin, cut off power supply of robot or press "Emergency stop" button before inspecting the robot, to prevent the robot from being operated by others.

6、Emergency stop device should be arranged at the accessible position of operator, so operator can execute "emergency stop" quickly and easily when the robot has a failure.

7、Confirm the safety conditions, clear the obstacles on the running path of robot and make sure there's person within the motion range of robot before power-on or start of robot. Do not try to stop the motion of robot

with tools or body. Please press "Emergency stop" button to stop the robot.
Do not exceed the rated capability of robot, including: Load, speed, motion range and running environment.

Caution

★Make sure to confirm the followings before operating the robot:

Whether the operator is trained on machine operation.
The operator has adequate understanding of the robot's movement characteristics.
The operator has sufficient knowledge of the robot's hazards
Do not operate after drinking
Not take the drugs which affect nervous system and lead to lags in response.

★Make sure to inspect the followings before conducting robot teaching, do repairing or take other necessary measures in case of failure.

Whether robot action has a fault.
The origin is calibrated correctly
External auxiliary devices associated with the robot are functioning properly.

☆Put the demonstrator back and fix it after use.

When demonstrator is placed on the robot, fixture or ground by accident, the teaching programmer may have collision with robot during operation and lead to personal injury or equipment damage. Avoid personal injury and equipment damage due to robot misoperation when teaching programmer has falling by accident.

★Precautions of fence

1、The safety fence must be firm and fixed, to prevent it from being easily broken or dismantled by operators. Besides, the safety fence should be free from sharp edges, corners and potential dangerous parts.

2、The robot status (teaching, running, maintenance) must be clearly indicated outside the safety fence. To avoid misoperation of robot and peripheral equipment through demonstrator and HMI.

3、Please mark the dangerous area on ground with paint, including the motion range of robot and peripheral equipment. In addition, reserve enough safety space and install safety protection device around the robot for sheltering the operators in case of misoperation or emergency.

4、Check whether "Emergency stop" button has normal function before operating the robot. Inspect all necessary switches, displays, signal name and functions of robot.

5、Check whether robot original point and axle operation are normal before operating the robot. The operator should keep observing the robot from the front side during operation.

6、Safety supervisor must be assigned outside the safety fence during teaching and maintenance. The supervisor must press "emergency stop" quickly and easily when robot has abnormal motion during teaching or maintenance. In addition, the safety supervisor must pass the safety training and examination.

7、Put the demonstrator back and fix it after use. When demonstrator is placed on the robot, fixture or ground by accident, the teaching programmer may have collision with robot during operation and lead to personal injury or equipment damage. Avoid personal injury and equipment damage due to robot misoperation when teaching programmer has falling by accident.

8、The robot can be reset and restarted outside the safety fence after emergency stop. Confirm that all safety conditions are satisfied; confirm the robot's motion range and there are no personnel and obstacles in the safety fence.

9、When teaching of robot motion is done, set the robot soft limit at the position that has certain distance outside the range of robot teaching and motion.

10、When workpiece is gripped through mechanism such as pneumatic gripper or electromagnetic device, please use the fail-safety system to avoid popup of workpiece when mechanism drive force is disconnected suddenly.

Mandatory

Safety operating procedures

1、All operators of robot system should pass the training on system, learn the safety protection measures and robot functions.

2、Ensure that the robot and peripheral equipment have no faults or dangerous conditions before running the robot.

3、Make sure to switch off power supply or press the emergency stop button before entering the operation area, even if the robot is not running.

4、Assign a specific supervisor when robot is programming in working area, to make sure the robot can stop quickly in case of emergency.

Do not wear gloves while conducting inching of robot. Slow-speed operation is recommended when inching the robot, in order to stop the robot effectively in case of a failure.

5、Make sure to know the position of emergency stop buttons on robot controller and peripheral equipment, in order to press them correctly in case of emergency.

6、Do not assume that program is completed when robot is stopped. For the robot may wait for the input signal of continuous operation.

INHIBIT

Inhibited operation

1、It is forbidden to plug or unplug any electrical connector when the robot is powered on

2、It is forbidden to short-circuit the safety device by any means.

3、Personnel failing to pass safety training and examination are prohibited from operating and using the robot.

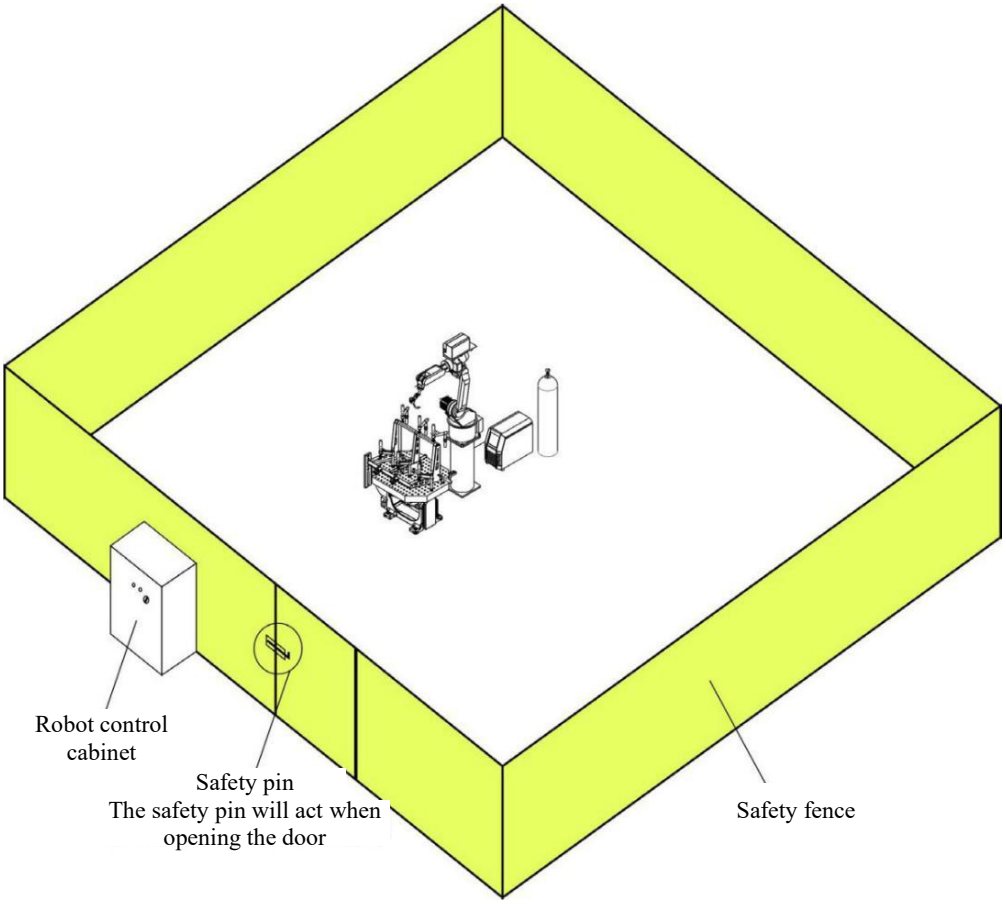
4、It is forbidden to work after drinking.

5、It is forbidden to dismantle or alter any part of controller. For any equipment damage and personal injury due to unauthorized altering, the Company does not bear any liability.

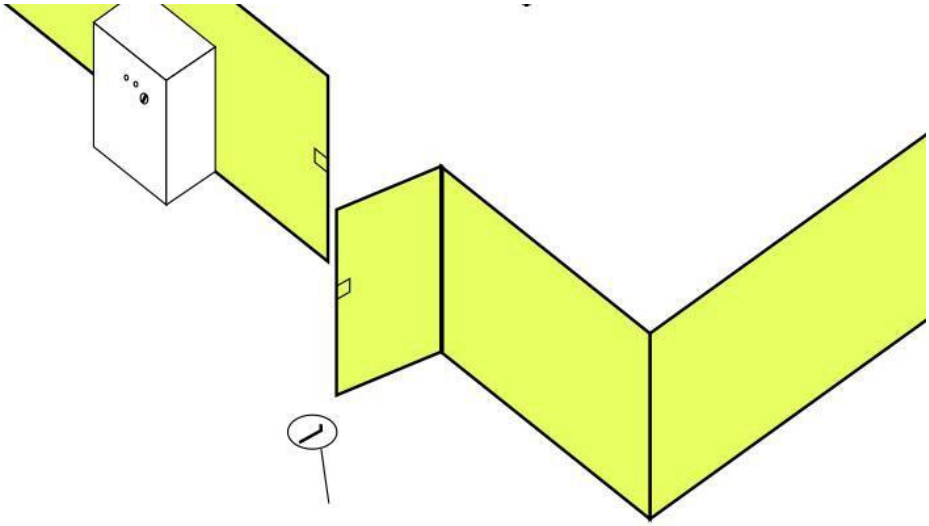
Safety instructions

1. Danger

1. The robot controller must be handled by the assigned operator who has passed the safety training and acquired the certificate.
2. Safety fence should be arranged around the robot motion range to effectively prevent the robot from leaving the fence due to error, robot arm falling or material falling. The safety door on fence should be fitted with safety pin. The safety pin must be unplugged before entering the fence and the robot must stop safely when safety pin is unplugged.

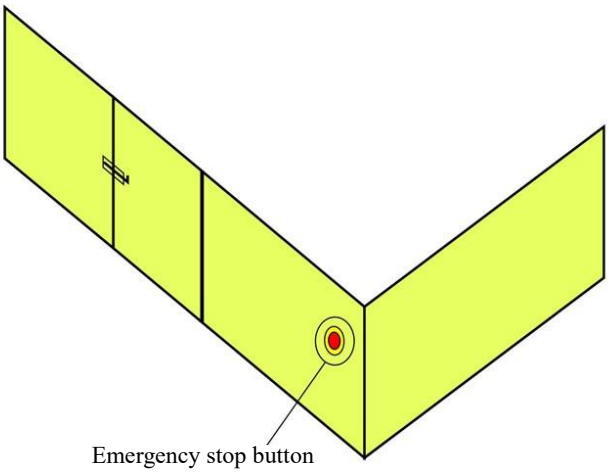


3. Man-machine separation: No one is allowed to enter the safety fence range of robot while the robot is running (auto, manual).
4. When robot application system is handled by multiple operators, make sure all operators and relevant personnel are familiar with machine before starting the robot.
5. The operator should carry the safety pin, cut off power supply of robot or press "Emergency stop" button before inspecting the robot, to prevent the robot from being operated by others.



Before opening the safety door and entering the robot operating area
Unplug and carry the safety pin, or lock it

6. Emergency stop device should be arranged at the accessible position of operator, so operator can execute "emergency stop" quickly and easily when the robot has a failure.



Emergency stop button
Emergency stop device should be arranged outside the safety fence or at an accessible position to operator

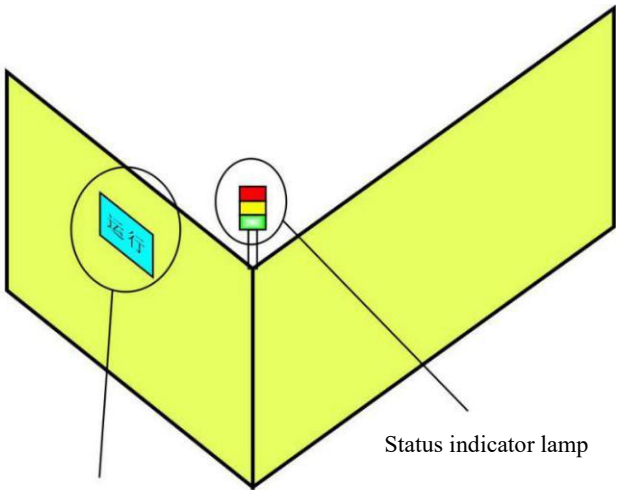
7. Confirm the safety conditions, clear the obstacles on the running path of robot and make sure there's person within the motion range of robot before power-on or start of robot. Do not try to stop the motion of robot with tools or body. Please press "Emergency stop" button to stop the robot.

Emergency Stop Button

8. Do not exceed the rated capability of robot, including: Load, speed, motion range and running environment.

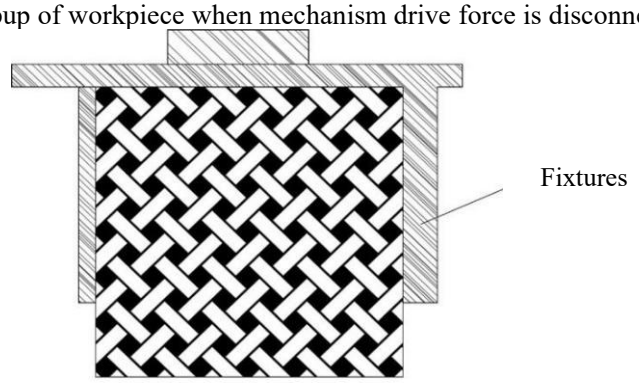
2. Caution

1. The safety fence must be firm and fixed, to prevent it from being easily broken or dismantled by operators. Besides, the safety fence should be free from sharp edges, corners and potential dangerous parts.
2. The robot status (teaching, running, maintenance) must be clearly indicated outside the safety fence. To avoid misoperation of robot and peripheral equipment through demonstrator and HMI.



Display of robot working status

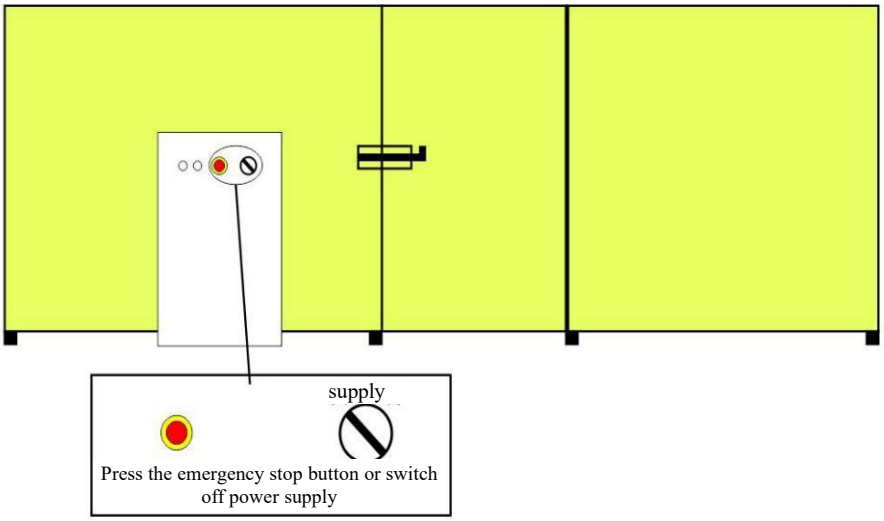
3. Please mark the dangerous area on ground with paint, including the motion range of robot and peripheral equipment. In addition, reserve enough safety space and install safety protection device around the robot for sheltering the operators in case of misoperation or emergency.
4. Check whether "Emergency stop" button has normal function before operating the robot. Inspect all necessary switches, displays, signal name and functions of robot.
5. Check whether robot original point and axle operation are normal before operating the robot. The operator should keep observing the robot from the front side during operation.
6. Safety supervisor must be assigned outside the safety fence during teaching and maintenance. The supervisor must press "emergency stop" quickly and easily when robot has abnormal motion during teaching or maintenance. In addition, the safety supervisor must pass the safety training and examination.
7. Put the demonstrator back and fix it after use. When demonstrator is placed on the robot, fixture or ground by accident, the teaching programmer may have collision with robot during operation and lead to personal injury or equipment damage. Avoid personal injury and equipment damage due to robot misoperation when teaching programmer has falling by accident.
8. The robot can be reset and restarted outside the safety fence after emergency stop. Confirm that all safety conditions are satisfied; confirm the robot's motion range and there are no personnel and obstacles in the safety fence.
9. When teaching of robot motion is done, set the robot soft limit at the position that has certain distance outside the range of robot teaching and motion.
10. When workpiece is gripped through mechanism such as pneumatic gripper or electromagnetic device, please use the fail-safety system to avoid popup of workpiece when mechanism drive force is disconnected suddenly.



Power-off and clamping status

3. Compulsory

1. All operators of robot system should pass the training on system, learn the safety protection measures and robot functions.
2. Ensure that the robot and peripheral equipment have no faults or dangerous conditions before running the robot.
3. Make sure to switch off power supply or press the emergency stop button before entering the operation area, even if the robot is not running.

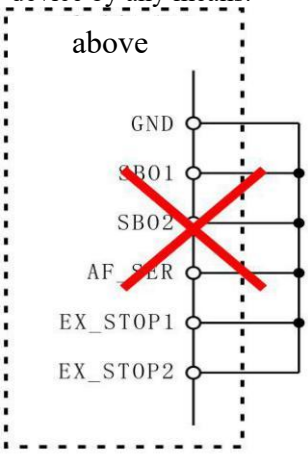


Press the emergency stop button or switch off power supply before opening safety door and entering robot working area

4. Assign specific supervisor when robot has programming in working area, to make sure the robot can stop quickly in case of emergency. Do not wear gloves while conducting inching of robot. Slow-speed operation is recommended when inching the robot, in order to stop the robot effectively in case of a failure.
5. Make sure to know the position of emergency stop buttons on robot controller and peripheral equipment, in order to press them correctly in case of emergency.
6. Do not assume that program is completed when robot is stopped. For the robot may wait for the input signal of continuous operation.

4. Prohibition

1. It is forbidden to plug or unplug any electrical connector when the robot is powered on.
2. It is forbidden to short-circuit the safety device by any means.



Do not short-circuit the signal systems

3. Personnel failing to pass safety training and examination are prohibited from operating and using the robot.
4. It is forbidden to work after drinking.
5. It is forbidden to dismantle or alter any part of controller. For any equipment damage and personal injury due to unauthorized altering, the Company (Borunte) does not bear any liability.

Contents

Chapter 1 Precautions of Robot Handling, Installation & Debugging

1.1 Robot unpacking

• The 6DoF (6 degree of freedom) industrial robot is packaged with unified wooden case when leaving the factory. The base plate is the load-bearing part of packaging box. Fixation measures are taken between the packaged objects to avoid sliding on the base plate. It is the force bearing position of crane or forklift. The box shell and upper cover are used for protection purpose only and have limited load-bearing capacity. Do not put heavy objects on package box, nor tilt it or expose it to rainwater.

• Before unpacking, please check whether it has any damage. In case of any damage, please contact the supplier or manufacturer in time. Confirm that it has no damage, then dismantle the cover with tools such as crowbar and wrench, then dismantle the shells at four corners. Do not damage the objects inside. Finally, move the robot to the fixed position. Check whether root system parts are intact according to the list below:

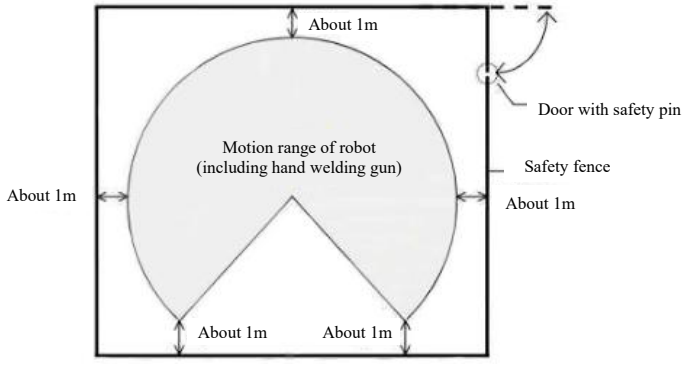
Item	Quantity
Electrical cabinet	1 set
6-axis robot	1 set
Teaching box	1 set
Connection cable of electric control box	1 pcs (attached with electric box)
Instructions of industrial robot	1 copy
Checklist and calibration sheet	1 pc respectively
Other attached components of order	are provided based on the order

Note:

The items above are configuration list of single machine. The configuration list can be multiplied when list includes two or multiple machines due to the package mode. For details, please refer to the delivery list. The delivery list should prevail.

1.2 Requirements of robot installation

• The ambient temperature should be 0~45°C (32~113°F) during operation, or be -10~60°C (14~140°F) during handling and maintenance.
• The robot must be used at the average altitude of 0-1000M.
• The humidity must be lower than the dew point (relative humidity is below 10%).
• Places with less dust, powder, oily fume and water.
• Inflammables, liquid and gas are not allowed in the operation area.
• Places with less vibration or energy impact on robot (vibration is below 0.5G).
• High electrical noise (such as gas shielded welding (TIG) equipment), electromagnetic disturbance and electrostatic discharge are not allowed near the robot.
• No potential danger of collision with movable equipment (such as forklift).



Arrangement of safety fence

1.3 Robot installation

- Firstly, guarantee the installation environment, space and position of robot. Evaluate the plant layout, ground leveling and power supply conditions of robot, then arrange the robot position according to the motion range of instructions. Ensure enough motion space of robot. When it has application limit space, please refer to the Manual or contact the supplier to determine whether the robot can be used safely. Refer to equipment running range and parameters in the following chapter for the detailed running and operation range of robot.
- Confirm the installation position, move the robot to the installation position with tools such as forklift, install the robot firmly at the installation position, for the robot has high inertia during motion, and it may topple and cause unnecessary damages when the installation position is not heavy or installation is unstable. It may even cause personal injury.
- The safety fence should have reasonable design layout to prevent person from entering the robot motion range or having collision with robot, for they can lead to personal injuries.
- After the robot and control box are placed, connect the wiring cable of electric control cabinet to the robot. Insertion of control cabinet cable: Firstly, align the power and coding socket, slightly insert the socket inwards and lock it; do not handle it by force to avoid a damage. Connect the corresponding power supply based on the nameplate on electric box of 6-axis robot. Note: The equipment must be connected to ground wire and have good grounding. Finally, insert the teaching box on the control box.
- Please view the relevant data or consult the dealer to supplement other additional appliances and port wiring.

1.4 Inspection and test of robot before leaving factory

All electronic components of equipment should be purchased in strict with requirements. The hardware should be inspected in strict accordance with drawings and pass inspection before being assembled. The assembled semi-finished products should pass the inspection before entering the next process. For details, please refer to the attached inspection items of machine.

Each robot will undergo the following important tests and inspections before leaving factory:

1. Whether all parts of robot are installed stably and conform to the installation requirements; the appearance has impact mark and scratch. Whether connecting wire between robot and control box is normal, all buttons of teaching box are effective, and all commands of touch screen can be received normally.
2. Whether the emergency stop button of robot control box, emergency stop button and brake release button of teaching box are normal.
3. Speed test. Firstly, carry out speed test to manual motion in teaching mode. Do test in node mode, rectangular mode and tool coordinate mode, to see if motion speed is within the standard range; then modify the speed to see if speed control is effective.
4. Stability test Prepare a general test program in the Company, each axis of robot will move within the max. range; then reduce the speed level by level, run for a certain period and check whether the machine is stable.
5. The robot is qualified after passing the tests and inspections above (within the specified range). Each robot must undergo calibration inspection, compensation and revision through precise instruments before leaving factory in order to ensure high accuracy of robot action, for the robot is a high-accuracy equipment and an error is inevitable during installation. Make compensation to the parameters, such as axle length, specific speed of reducer and eccentricity, within the reasonable accuracy range, in order to ensure precise action and track of equipment. The accuracy should be within the qualification range (see calibration judgment sheet for details) after calibration and compensation; otherwise, carry out re-analysis, debugging, assembly and re-calibration in the production line until the robot is qualified.

1.5 Precautions of robot first use

The robot should undergo safety test when it is programmed, ready for production and used for the very first time:

1. While testing the robot, carry out single step run, check whether all points are reasonable and have risks of collision.
2. Reduce the speed to the level that has enough response time, then run the robot, check whether external emergency stop and protective stop functions are normal; the program logic is conforming to the requirements and there's risk of collision; do inspection step by step.

Note: Single-step action should be conducted in test steps in strict accordance with the action sequence of program.

1.6 Precautions of replacing robot components

Only professional technicians can replace the robot components, including update of system software, and test them to make sure they conform to the requirements before use.

1. Make sure power supply is cut off before operation.
2. Cut off the input power supply before cutting off the output and ground wire.
3. Do not dismantle the parts by force. The new parts should be firstly connected to output and ground wire before being connected to input wire.
4. Finally, inspect the circuit and make sure there's no error before power-on test.

Note: Do inspection and find the cause, check whether parameters are reset and installed hardware conforms to the requirements as motion track can be affected after replacing some key parts. Where necessary, return the robot to factory for calibration and make compensation to the hardware installation error.

1.7 Safety guarantee

Generally, the manipulator has different requirements with other mechanical equipment, such as its large motion range and fast operation of arm, both of which may lead to hidden danger of safety. Read and understand the instructions and relevant documents, and follow all procedures, in order to avoid personal injury or equipment accident. The user should ensure that the safe operation environment conforms to the local and national safety laws, regulations and rules.

• The teaching and maintenance of robot must conform to the following laws and regulations:
- Laws of industrial safety and health.
- Laws and compulsory commands of industrial safety and health.
- Relevant laws and regulations about industrial safety and health.

Other relevant laws:
- Occupational safety and health laws of USA.
- Factory law of Germany.
- Work safety and health law of UK.
- 89/392 mechanical industry director of EU and 91/368 directive of European Community.

• Preparation
- Technical rules of safety

Carry out safety management according to the specific policies of relevant laws and regulations.

• Compliance
- Safe operation of industrial robot (ISO 10218).

• Supplementation
- Safety management system

Assign the authorized operator and safety manager and provide further safety education.

• The teaching and robot maintenance is listed in "dangerous operation" in the law of industrial safety and health.

1.8 Training on specialist

• The teaching and robot maintenance personnel must pass the training in advance.
• For more information about training, please consult our company or dealer.

1.9 Precautions of personnel safety operation

• Potential hazards exist within the max. motion range of entire robot.

All robot-related personnel (safety manager, installation, operation and maintenance personnel) must cultivate the awareness of safety first, in order to keep safety of all personnel.

• Dangerous operation is prohibited in the robot installation area.

Arbitrary touch of robot and its peripheral equipment may lead to personal injuries.

• Please take safety prevention measures strictly and set the warning boards in relevant areas in factory, such as "Inflammable", "High voltage", "No entry" or "Staff only".

Ignorance of these warnings may lead to fire alarm and electric shock. Arbitrary touch of robot and other equipment may lead to personal injuries.

Abide by the following articles strictly:
- Wear working clothes (not loose clothes).
- Do not wear gloves when handling the robot.
- The underclothes, shirts and ties should not be exposed from the working clothes.
- Do not wear large jewelries such as earrings, finger rings or pendants.

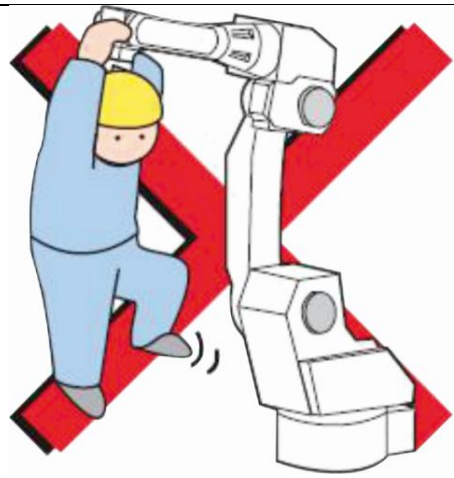
Wear necessary PPEs, such as safety helmets, safety shoes (with non-slip sole), mask, safety goggles and gloves. Improper clothes may lead to personal injuries.

• Authorized access to the robot and its peripheral equipment is not allowed.

Any violation of this prompt may lead to injuries due to touching of robot control cabinet, workpiece and positioning device.

• Do not pull the robot axle by force.

Otherwise, it may lead to personal injury and equipment damage.



• Do not lean on the robot or its control cabinet; do not press the operation key arbitrarily.
Otherwise, the robot may have unexpected action, lead to personal injury and equipment damage.

• Unauthorized personnel are not allowed to touch the robot during operation.
Otherwise, the robot may have unexpected action, lead to personal injury and equipment damage.

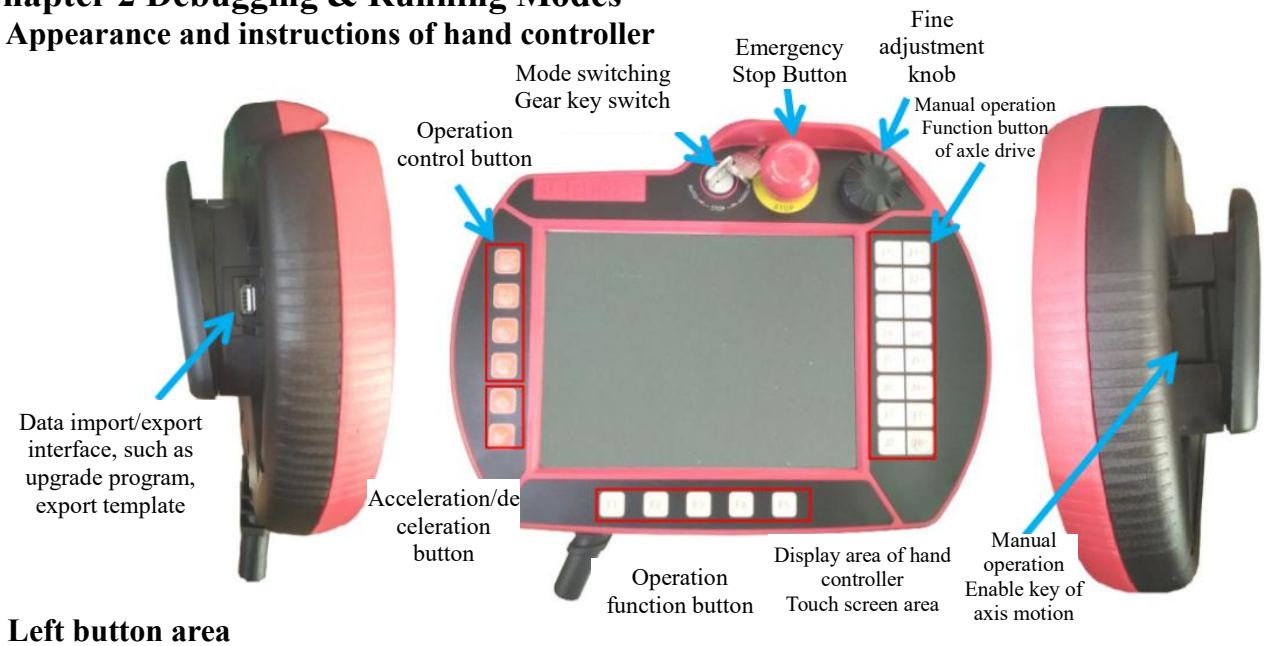
1.10 Guidance for rescuing trapped person

Confirm that there are no personnel within the robot motion range before starting the robot. When workers are trapped in the robot, implement the followings carefully:

1. When workers are trapped in robot, press the emergency stoop button immediately to stop the equipment.
2. The rescue personnel should hold the robot near it, to avoid further injury of trapped person due to accidental operation of robot.
3. Turn on the protection device, press the button to release brake manually, remove and rescue the trapped person.

Chapter 2 Debugging & Running Modes

1. Appearance and instructions of hand controller



1. Left button area

启动/start : Auto mode: Under auto mode, press "Start" button to start the robot and run the selected mode number and program;

Manual mode: Under stop or manual status, enable hand control, press "Reset" button, pop up the reset window, press "Start" button to start the action of bound programmable button "reset".

停止/stop : Manual mode: While running the reset program, press "Stop" button to stop the reset action;

Auto mode: While the robot is running, press "Stop" button once to switch to single cycle mode and it will stop when running to the module; when press the button twice, the running robot will stop program action immediately;

Alarm: When alarm occurs, press "Stop" button to clear general alarms. Note: Some alarms need to be cleared at stop gear; alarms which fail to be cleared: They can be cleared after releasing the trigger condition;

W/J : Press this button once to switch to operation coordinate system. Switching sequence: Alternate switching between world coordinate, node coordinate, tool coordinate and user coordinate, in order to operate under different coordinate systems; *Note: It is not switching of coordinates displayed below the hand controller screen, but the coordinate system type; the user workbench and tools need to be switched manually;

复归/return : Under manual mode, press hand control enable, then press "Reset" button to pop up the window of enabling programmable button reset, press start button to execute the process of programmable button, it will stop after execution is completed; when it is stopped at half way, press the button twice and start from the beginning;

*Note: Other commands can also be added in this programmable button; for example, disconnect certain output point when pressing reset button;

速度+/speed+ : Manual mode, increase the speed ratio of manual drive; under auto mode, tick "Enable speed control" to increase the global speed ratio.

速度-/speed- : Manual mode, reduce the speed ratio of manual drive; under auto mode, tick "Enable speed control" to reduce the global speed ratio.

2. Right button area

The followings are drive operation of manually-controlled external buttons, in order to have movement to the direction defined by the selected operation coordination system;

J1+/X+ Button: Move to the forward direction of operation coordination system (J1+ / X+);	J1-/X- Button: Move to the reverse direction of operation coordination system (J1- / X-).
J2+/Y+ Button: Move to the forward direction of operation coordination system (J2+ / Y+);	J2-/Y- Button: Move to the reverse direction of operation coordination system (J2- / Y-).
J3+/Z+ Button: Move to the forward direction of operation coordination system (J3+ / Z+);	J3-/Z- Button: Move to the reverse direction of operation coordination system (J3- / Z-).
J4+/U+ Button: Move to the forward direction of operation coordination system (J4+ / U+);	J4-/U- Button: Move to the reverse direction of operation coordination system (J4- / U-).
J5+/V+ Button: Move to the forward direction of operation coordination system (J5+ / V+);	J5-/V- Button: Move to the reverse direction of operation coordination system (J5- / V-).
J6+/W+ Button: Move to the forward direction of operation coordination system (J6+ / W+);	J6-/W- Button: Move to the reverse direction of operation coordination system (J6- / W-).
J7+/M7+ Button: Move to the forward direction of	J7-/M7- Button: Move to the reverse direction of operation

operation coordination system (J7+ / M7+);	coordination system (J7- / M7-).
J8+/M8+ Button: Move to the forward direction of operation coordination system (J8+ / M8+);	J8-/M8- Button: Move to the reverse direction of operation coordination system (J8- / M8-).

3. Upper switch area

1. Knob gear switch

The gear switch of hand controller has 3 gears, i.e. manual, stop and auto, to switch to different pages for operation:

[Manual]:	Turn the state selection switch to the left to enter manual state, the icon at upper left corner of display screen will become  . The programmable button operations such as manual operation, programming and reset, are supported in this state;
[Stop]:	Pull the state selection switch to the middle to enter stop state, the icon at the upper left corner of display will become  . Parameters can be set and all actions of robot can be stopped in this state;
[Auto]:	Pull the state selection switch to the right to enter auto state, the icon at the upper left corner of display will become  . In this state, press "Start" button to start full auto running of robot and set the auxiliary operation;

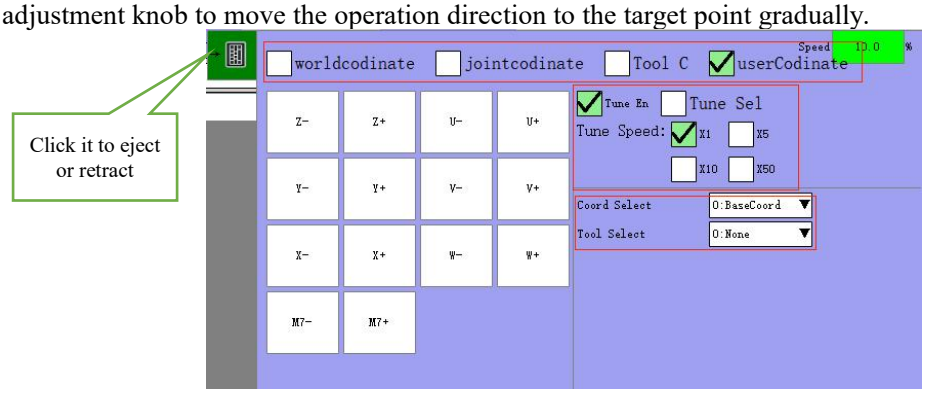
2. Emergency stop button

Function: Press the emergency stop button in case of emergency, to cancel the enabled functions of all axles, the system will give alarm and have "emergency stop"; release the knob and press [Stop] button to clear the alarm.

3. Fine adjustment knob

Function: Have precise movement of axis by using this knob when making fine position adjustment in manual state.

Operation method: Click  at the right side, open the operation button in "soft keyboard", tick "Enable handwheel" option, select handwheel speed, operate the button at the left side, select the operation direction button that needs fine adjustment or press the external control button (upper and right side of hand controller) of hand controller, then operate and roll the fine adjustment knob to move the operation direction to the target point gradually.



Operation instructions for manual touch screen or external knob

Handwheel speed:

X1: The axis has translation for 0.01mm or rotates for 0.01° when it moves by one grid.
X5: The axis has translation for 0.05mm or rotates for 0.05° when it moves by one grid.
X10: The axis has translation for 0.1mm or rotates for 0.1° when it moves by one grid.
X50: The axis has translation for 0.5mm or rotates for 0.5° when it moves by one grid.

Note: Please select the corresponding tools and workbenches for operation when entering different operation coordinate systems, tool coordinate systems and user coordinate systems; please select the operation direction key correctly, for the operation direction varies along with the operation coordinate system;

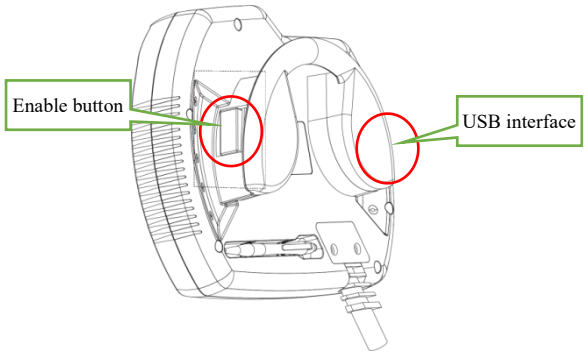
4. Lower button area

Function buttons at lower row of touch screen: F1 - F5: Function buttons, which can be used normally under specific conditions or they are bound with function setting; for example: F5 can realize trial operation to the selected path command under manual programming mode; F1 - F4 can be used for setting binding functions in the parameter setting page of buttons and indicators. For details, please refer to the explanations in the chapters below.

5. Interface and button

1. Left USB interface: Enable data import/export, such as program import/export, data export and program update;
2. Right button: Enable button of axis drive, 3 gears of switch: Gear 1 is entered by default, press it slightly to enter Gear 2, or press it with force to enter Gear 3; Gear 2 will be enabled when Gear 1 and 3 are disabled; long press the enable button to move the axis or have trial operation; otherwise, it will give alarm of disabling and fail to

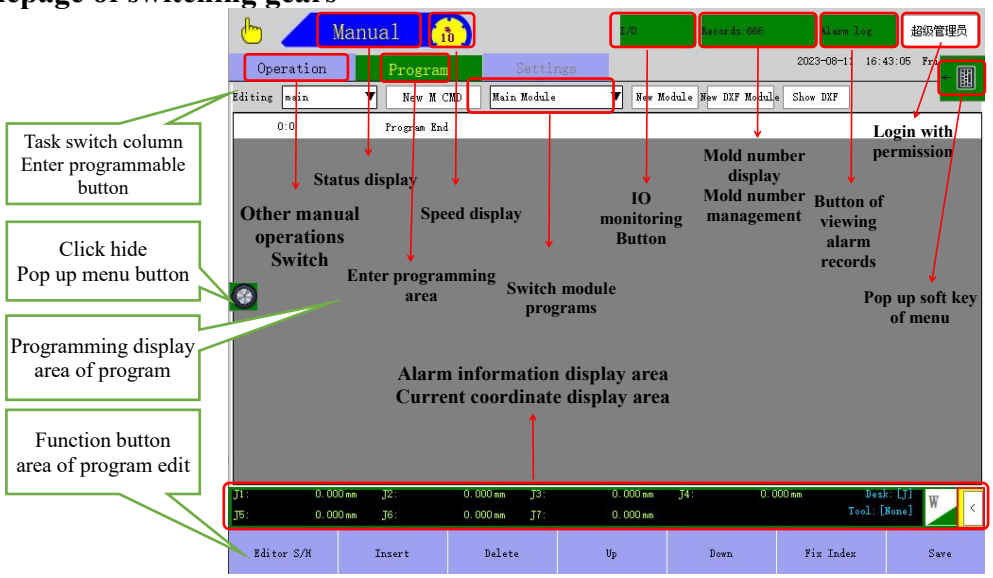
move the axis;



Enable switch of hand controller

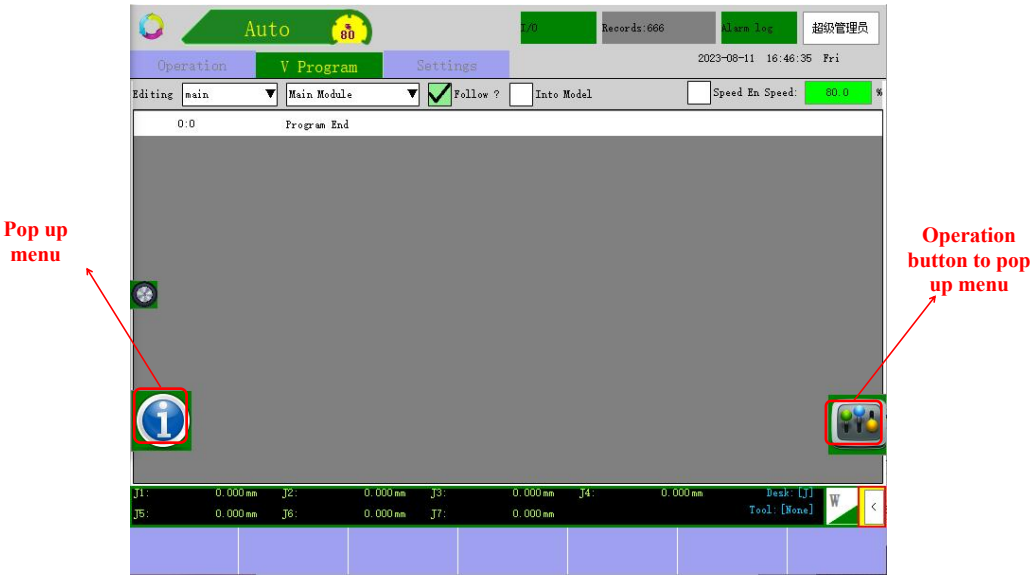
2. Homepage of hand controller

1. Homepage of switching gears



Homepage of manual gear

Homepage of stop gear



Homepage of auto gear

2. Authority login

Authority login: Click "Login" to enter the login interface, select user type, enter the password and then click "Login". Click "Logout" to log out system directly, as shown in the diagram below:

Authority login operation page

*Note: Please login before system setting, for the management authority, display and operation authority vary along with username. For details of user authority, please see user management chapters below;

3. View log

Click popup or recall log and view the records; alarm record: Click tick box of "Alarm record" to view the alarm records, or tick the operation records and button records to view the relevant contents.

1. Alarm record page

Record the information records and logs when robot gives alarms; click the alarm bar to view the detailed alarms and record other information for further analysis and use; * Note: Drag the page up or down to view more contents;

Log page of viewing alarms

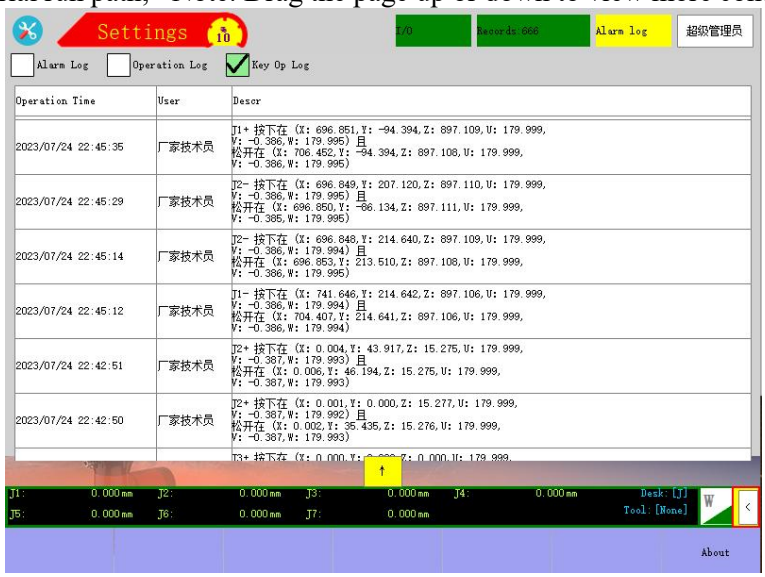
2. Operation log page

Record the operation records and support auxiliary functions, such as programming, parameter modification and user login; *Note: Drag the page up or down to view more contents;

Operation log modification page

3. Button record page

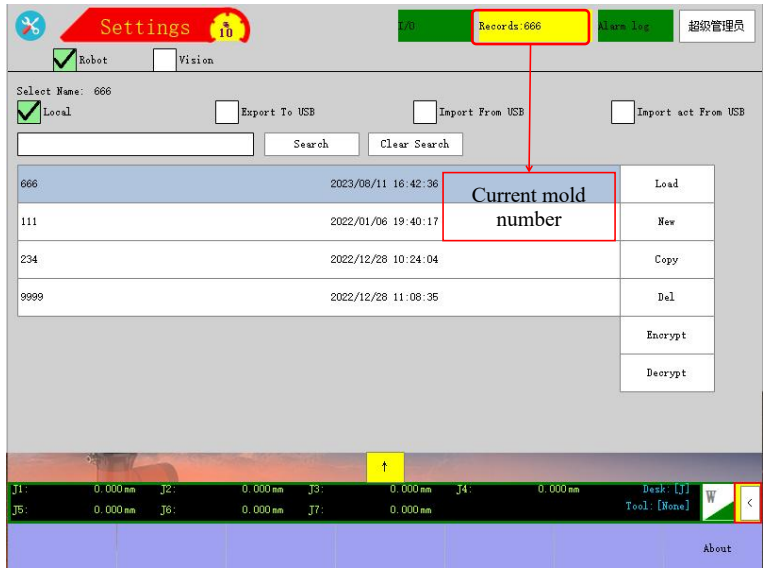
Record the operation records of buttons or switches; for example, the auxiliary records of running, pressing stop button or gear switch and trial run path; *Note: Drag the page up or down to view more contents;



Button operation log page

4. Mold number

Mold number: Display the mold number based on different processes. Click mold number to enter the mold number management page and have operations such as "New", "Load", "Copy" and "Delete". The mold number management page is as follows:



Mold number management page

*Note: Only "administrator" and user of higher authority can open the mold number management page.

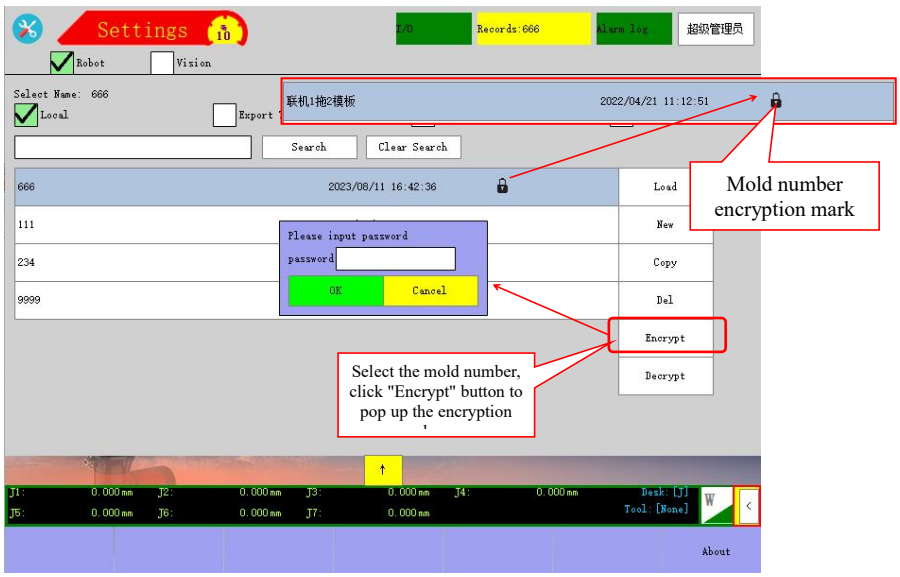
Load: Select the target mold number, click "Load" button to load the selected mold number. This mold number will be executed during auto running.

New: Click "New" button to pop up the naming edit box of mold number; enter the mold number name, then click "OK" button to create a blank mold number. Chinese, English or figure can be entered in mold number name.

Copy: Select the target mold number, click "Copy" button, pop up the naming edit box of mold number name, enter new mold number name, click "OK" button to copy the existing mold number in the new mold number.

Delete: Select the target mold number, click "Delete" button to delete the mold number. The loaded mold number can't be deleted.

Encryption: The encrypted mold number can't be modified. It must be decrypted before being modified and deleted. It is used for locking some important process mold numbers. Select the target mold number, click "Encrypt" button to pop up the following page:



Encryption operation

As shown in picture above, enter the password and click "OK" button to complete mold number encryption. Lock icon will appear at the right side of encrypted mold number.

Decryption: Select the decrypted mold number, click "Decrypt" button, enter the encryption password to complete decryption.

Export: Insert the U disk into the USB port of hand controller, click "Export to U disk" selection box, select the to-be-exported mold number, click "Export" button to export the mold number to U disk. (*Note: The exported mold number will be saved in U disk as the compressed package file that is named by time; for example, the name of compressed package file is HCBackupRobot_20190329183021.zip)

Import:

1. Insert the U disk into the USB port of hand controller, click "Import from U disk " selection box, select the to-be-imported mold number, click "Open" button and select the mold number, click "Import" to import the mold number.
2. Insert the U disk into the USB port of hand controller, click "Import from offline programming" button, select .@

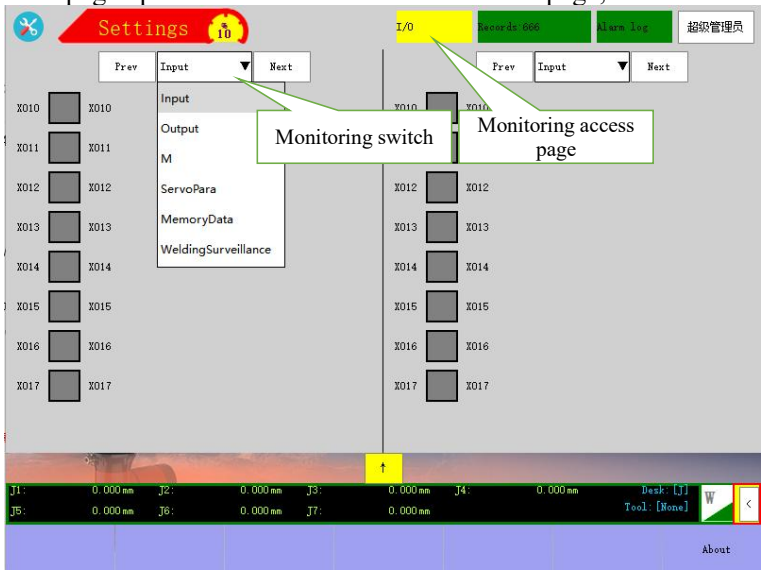
file click "Import" to import the mold number.

Search: Enter the mold number in edit box, click "Search" button to search the existing mold numbers.

Clear searching: Click it to clear the search records.

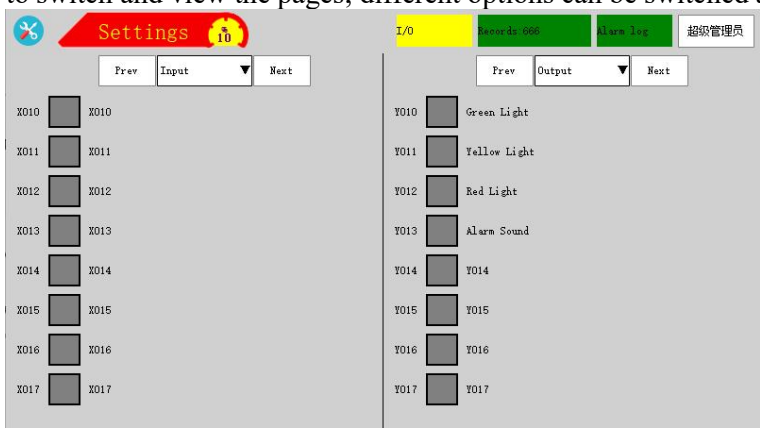
5. IO monitoring

The relevant information can be viewed in monitoring page in real time, including; "Input" and "Output" O, "Intermediate variable", "Servo monitoring", "Stored data" and "Welding data"; click "I/O monitoring" to pop up the window, click it again to retract the window; click page up/down button to switch the current page;

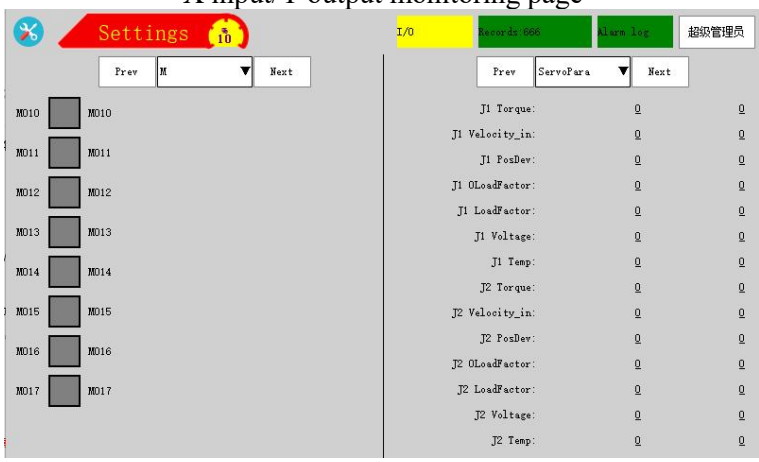


Call out and view monitoring page

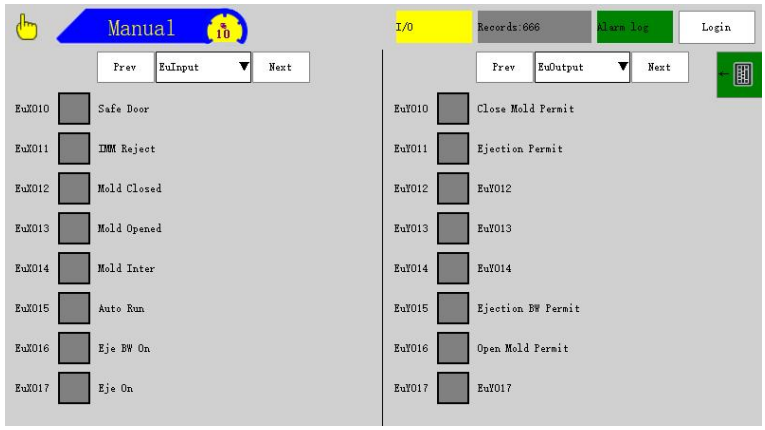
Note: Click "Monitor switch" to pop up the options, select the to-be-switched items to switch to monitoring page, press page up/down button to switch and view the pages; different options can be switched at both ends for viewing;



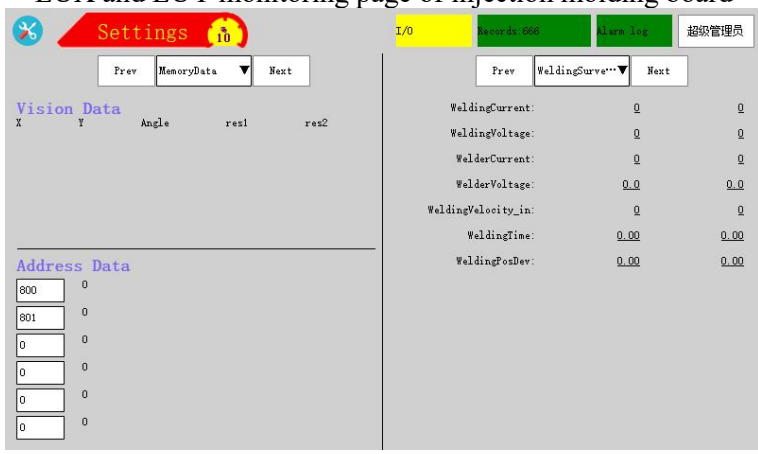
X input/Y output monitoring page



Monitoring page of intermediate variable/servo parameter item



EUX and EUY monitoring page of injection molding board



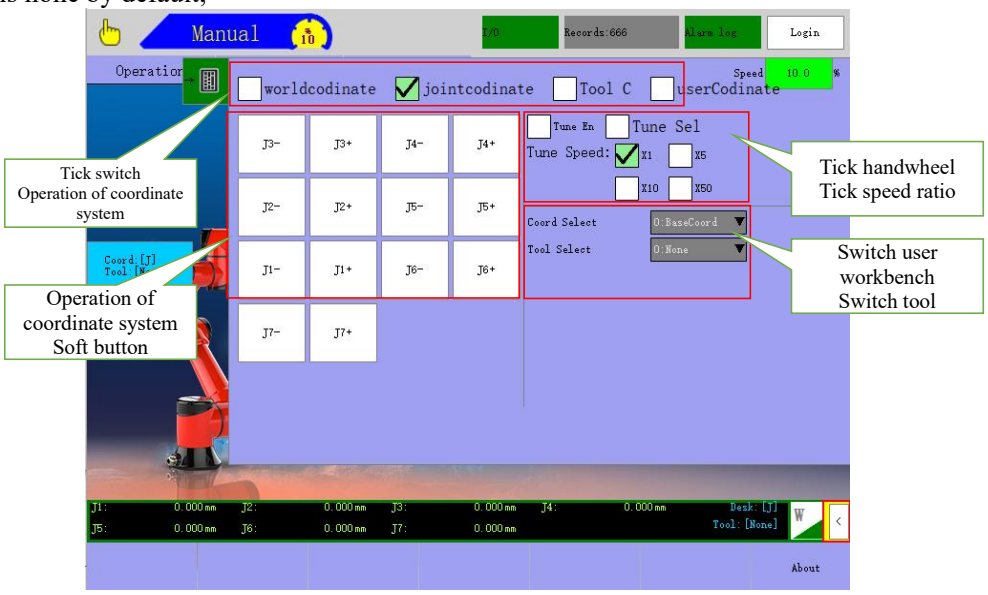
Monitoring page of data address and welding parameters

Chapter 3 Manual Gear (Operation)

1. Operation of manual coordinate system

Note: Switch to operable coordinates under manual state of robot: World coordinate, node coordinate, tool coordinate, user workbench;

Note: Operation under tool coordinate is based on the selected and established tool, the flange tool is adopted when it is none by default; the operation under user coordinate system is based on the selected workbench, world coordinate is adopted when it is none by default;



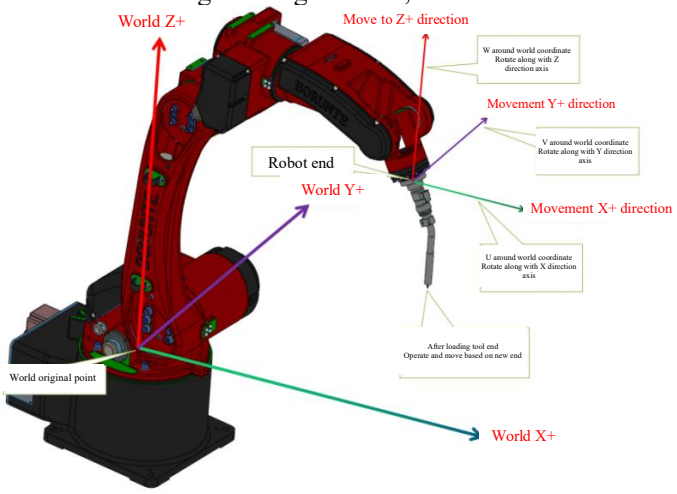
Operation of soft button

The type of drive motion can be divided into the followings based on the operation and movement of switched coordinate system:

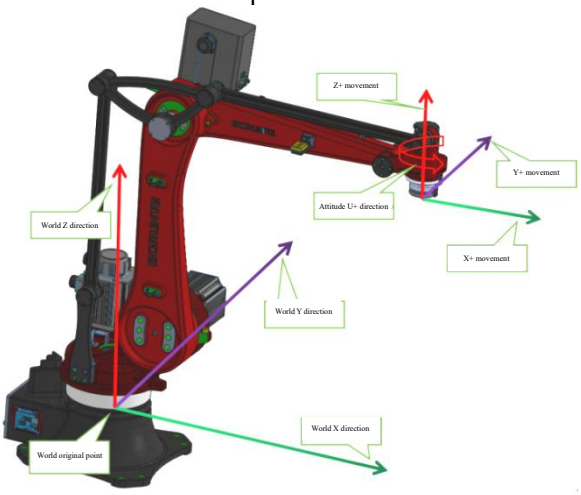
Spatial operation

1. World coordinate system

Move to end X, Y and Z spatial direction according to the base coordinate system (world coordinate system), have attitude rotation according to the end spacial coordinate U, V and W, the additional axis of M7 and M8 has coordinated linkage or single action; the movement rules and direction are as shown in picture below:



World coordinate system of 6-axis model



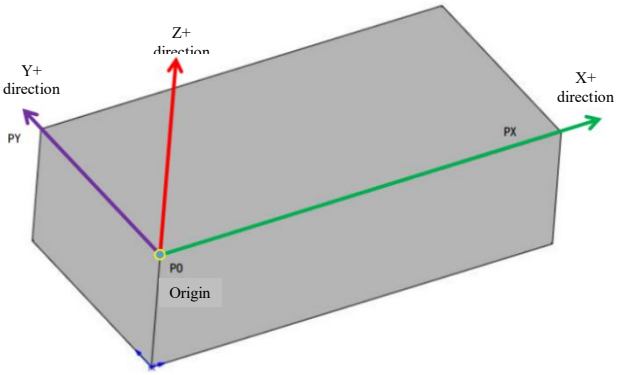
World coordinate system of 4-axis model

Special notes: Attitude rotation of spatial position is based on the robot end point and coordinate system direction; U has direction along with X direction axis, V has rotation along with Y direction axis, W has rotation along with Z direction axis; the subsequent user coordinate systems and tool coordinate systems also have movement and rotation based on the rules above; when tool is not loaded in robot, the end is the center of 6-axis flange; when tool is loaded, the end will have movement based on the calibrated tool end position; note: 4-axis machine is a special model that supports U attitude operation only; the rotation around Z is the same with that of 6-axis model;

2. User coordinate system

Switch to user to establish workbench, move to end X, Y and Z spatial direction, have attitude rotation according to the end spacial coordinate U, V and W, the additional axis of M7 and M8 has coordinated linkage or single action; note: The world coordinate operation is adopted by default when user workbench is not established; note: The movement rule and direction are as shown in picture below:

Special note: When user workbench is established, the operation direction and rotation attitude defined by workbench are based on the rotation attitude of customized direction and direction axis; for 4-axis model, the operation may have certain difference when X and Y of established user workbench are not in parallel with world X, Y side, for there's no end, no U attitude and rotation along with Z axis!!!

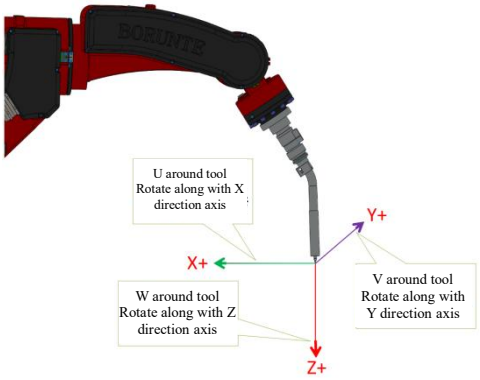


Established user coordinate system (workbench)

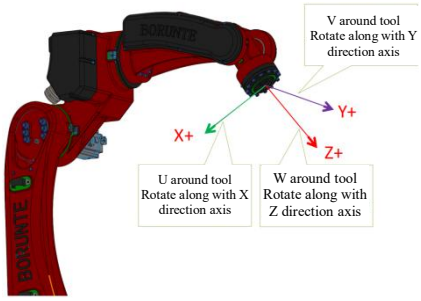
3. Tool coordinate system

Switch to the established tool, have spacial direction to X, Y and Z direction of end tool under the tool coordinate system, have spatial attitude rotation to end coordinate U, V and W, the additional axis of M7 and M8 has linkage or single action; note: Operation of robot end flange is adopted by default when tool is not established; for 4-axis stacking model, the Z direction of tool coordinate system faces downwards by default, U is tool attitude (equals to operation of tool attitude W), there's no operation at V and W attitude angle;

Special note: As tool direction X, Y, Z, U, V and W are relative to the directions defined by tool end, the tool direction will rotate along with attitude change; so, the actual movement direction has already changed even if tool direction is unchanged; note: The movement rule and direction are as shown in picture below:



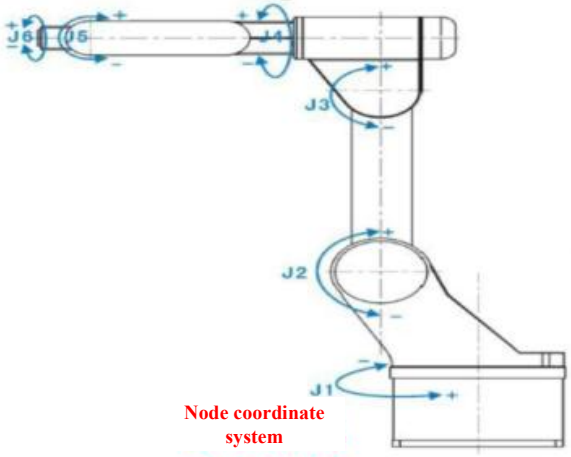
Customized tool coordinate system



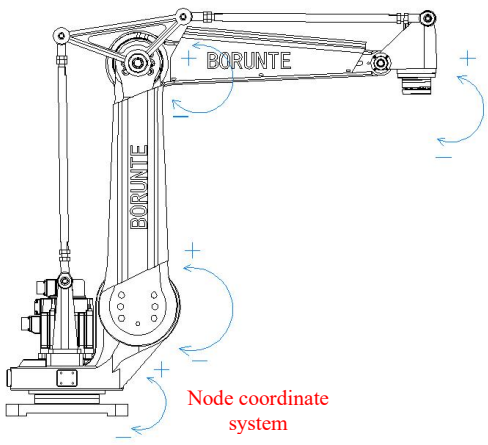
Default tool coordinate system

4. Node coordinate system

Drive at node axis direction under node coordinate and pay attention to the correct direction of axis; the movement direction is as shown in picture below:



Origin and node axis direction of 6-axis model



Origin and node axis direction of 4-axis model

Operate under manual state, press enable button and corresponding spatial direction button, have corresponding actions and special movement;

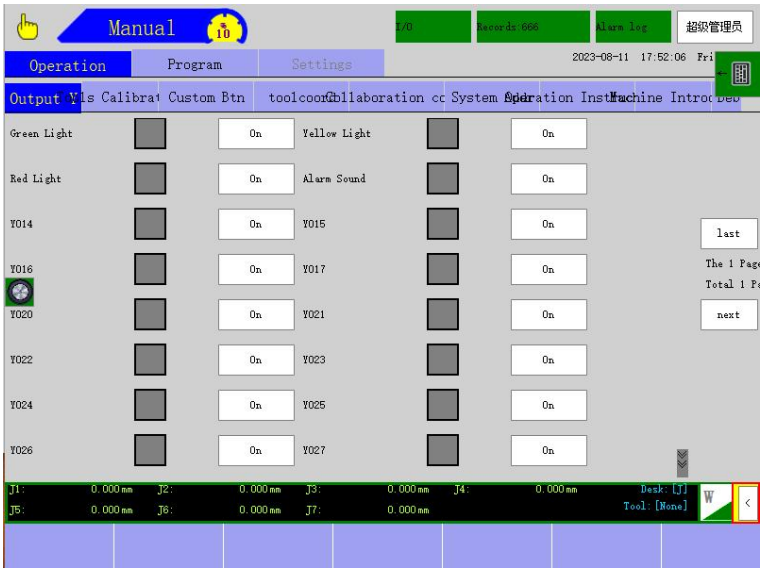
Special Note:

When operating under world coordinate, tool coordinate and user coordinate, movement of X, Y and Z is based on the defined direction of coordinate system; the rotation attitude is also based on the rotation attitude of corresponding rotation axis; U rotation along with X axis, V rotation along with Y axis, W rotation along with Z axis, the end position is unchanged;

2. Button

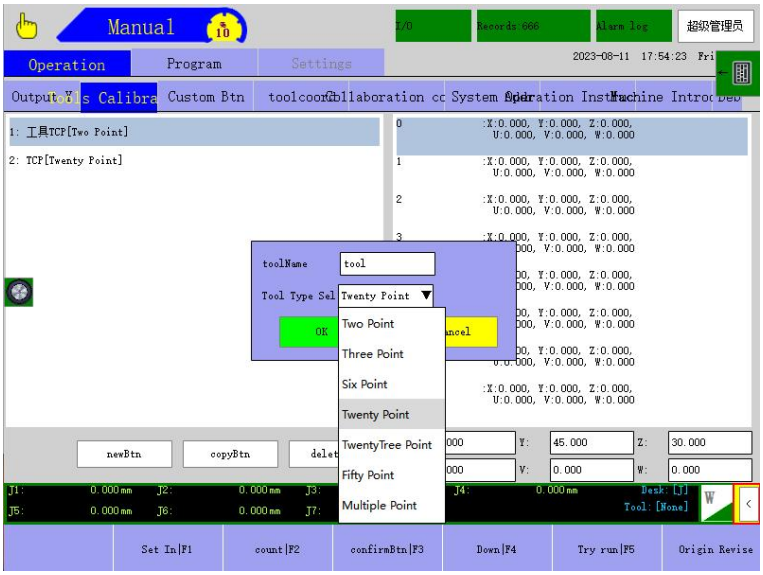
Note: For details of external operation buttons on hand controller, please refer to appearance introduction;

3. Signal output



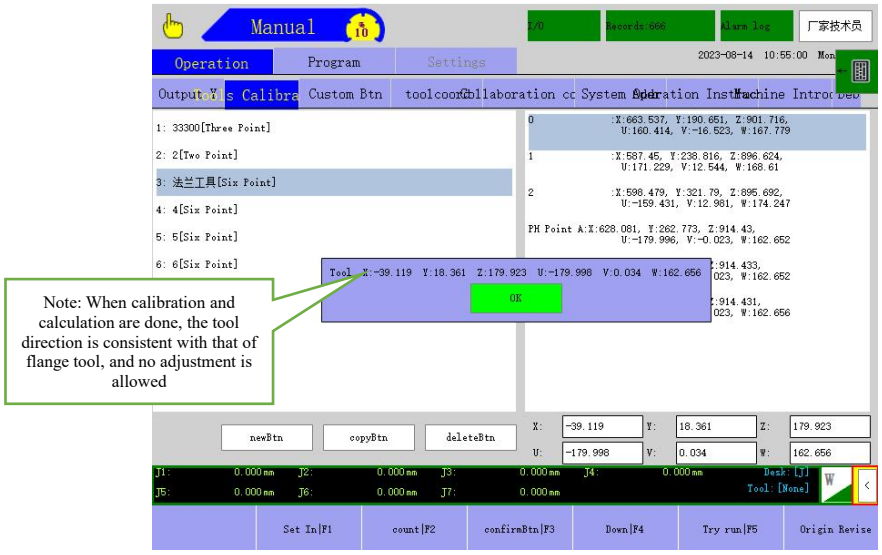
Note: Manually click the corresponding IO control output, to confirm whether IO corresponds to output and switching (on or off) status.

4. Tool calibration



Operation page of tool calibration

Note: The fixed reference sharp points must be established before tool calibration, the tool sharp point should be close to reference sharp point infinitely, do verification at different attitude angles, record the verified action attitude points as required; then click "Calculate" and when "OK" confirmation box pops up, the displayed data are the center distance from tool sharp point to flange end, tool defined direction and relative rotation angle of flange tool; then click "OK" button and click "Save" button to save the data; when it fails, it will pop up the prompt box of tool calculation failure;



OK prompt box of tool calibration results

Operation method:

1. Click "New" button, pop up the "New" window, create tool name and select tool calibration method, then click "OK";
2. Keep the tool end close to the reference sharp indefinitely, record the data of all points until all data are recorded as required; click "Record point" button, write data into the selected point or direct data point;
3. When data are recorded, click "Calculate" button and wait for the calculation results, as shown in picture above; pop up the calculation box, prompt OK and results, which means calibration is correct; when calibration is wrong or result has major deviation, it will pop up the box prompt of tool calculation failure (as shown in picture below)! **Re-calibrate all points as required;**

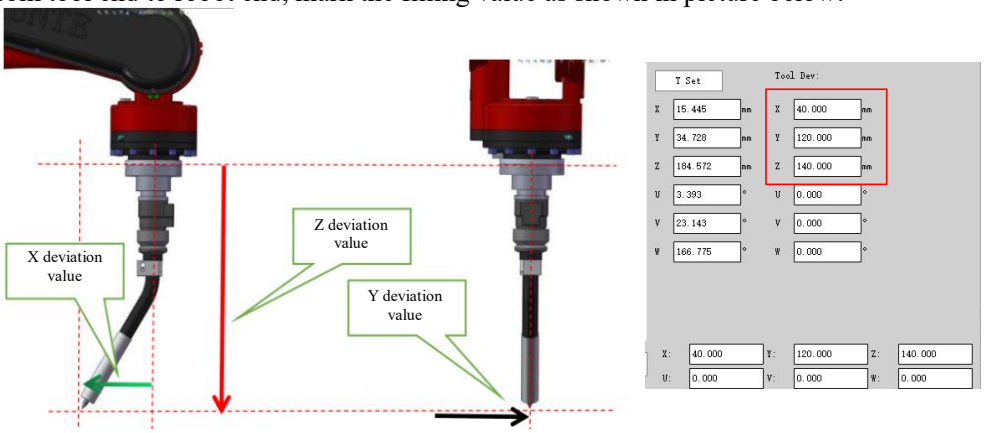
Calibration failure

4. When calibration succeeds, click "OK" and "Save" button to complete tool calibration;

Tool accuracy verification: Switch tool coordinate system to tool calibration, check whether tool direction X, Y and Z are correct, attitude U, V and W have rotation along with tool direction, and whether end has movement. Note: After rotating Tool Z (W), the Tool X and Y will rotate accordingly; when rotating Tool U and V, the Tool Z will also change direction.

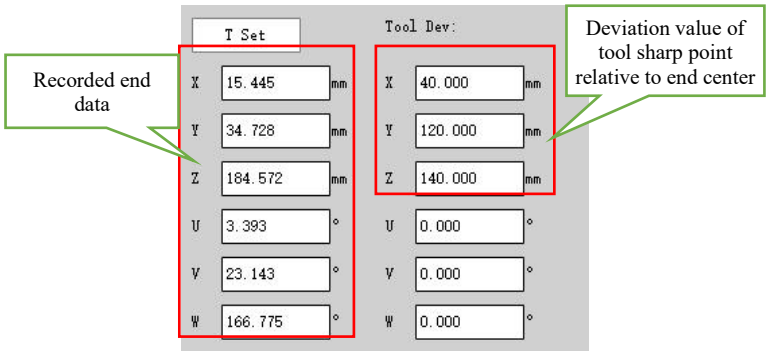
4.1. Two-point calibration method

Mark the value from tool end to robot end, mark the filling value as shown in picture below:



Set the difference of Direction X, Y and Z of tool end and flange end

Note: Measure the X, Y and Z deviation value from end to flange tool point of robot based on the standard action in picture; note: The given value includes positive and negative values, the values are calculated from the flange center as starting point; for example: Flange Z is 150mm downwards, 50mm to X negative direction, 10mm to Y positive direction, then the deviation value should be filled as: Z: 150mm, Y: 10mm, X: 50mm.



The tool direction is consistent with flange tool direction by default

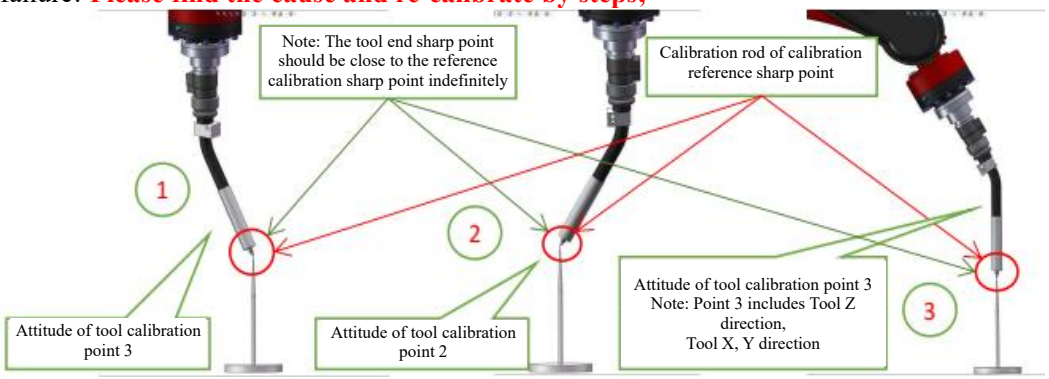
As shown in picture, confirm the deviation data, click "Calculate", save the data to take effects of tool parameters; switch and use this tool, the robot end position will move to the existing deviation position; customized tool direction is not allowed in 2-point calibration method; for details of default tool direction, please refer to the default direction of reference tool coordinate;

Note: It is not required to refer to calibration point in 2-point calibration method, but the flange center position should be correctly set as deviation value of tool end;

4.2. 3-point calibration of tool

Note: Fixed reference point must be provided for reference in 3-point calibration method. For example, take reference point A as calibration point, the sharp point of tool end should be close to reference sharp point indefinitely, record the points of 3 positions; record the calibration steps as shown in picture below:

1. Select reference point, adjust the attitude angle of flange tool, until the reference sharp point is close to flange tool sharp point indefinitely, record Point 1 by referring to diagram ①;
2. Remove the corresponding points, readjust the flange angle and the angle with record point 1 should be above 30°; keep the sharp point close to flange tool sharp point indefinitely again, record Point 2 by referring to diagram ②;
3. Note: While calibrating Point 3, readjust flange tool angle by referring to diagram ③, the angle between record point 1 and 2 should be above 30°, keep the flange tool sharp point close to reference sharp point indefinitely, and record Point 3;
4. Click "Calculate" button, wait for calculation results, pop up the calculation box, prompt OK and results, which means calibration is correct; when calibration is wrong or result has major deviation, it will pop up the box prompt of tool calculation failure! **Please find the cause and re-calibrate by steps;**



Calibration reference diagram

When tool calibration is done, please switch the tool to verify whether there's not calibrated position at end position; adjust the attitude, check whether the end moves within the proper range during rotation; 3. Customized calibration tool direction is not allowed in 3-point calibration method; please refer to the default direction of tool coordinate system for the default tool direction;

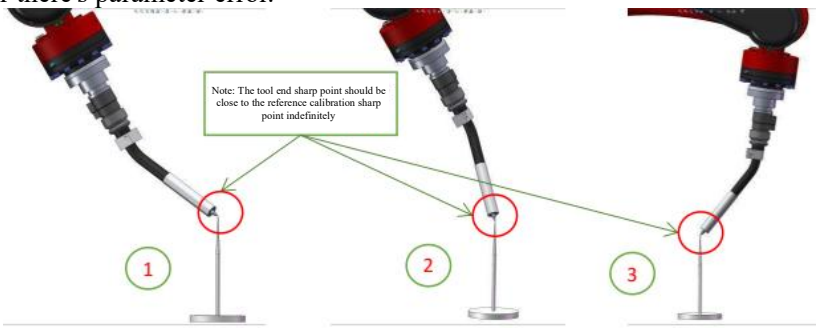
4.3. 6-point calibration of tool

Note: Please fix one calibration reference point before performing calibration. The calibration steps are as shown in picture below; the calibration of points above can be used as reference:

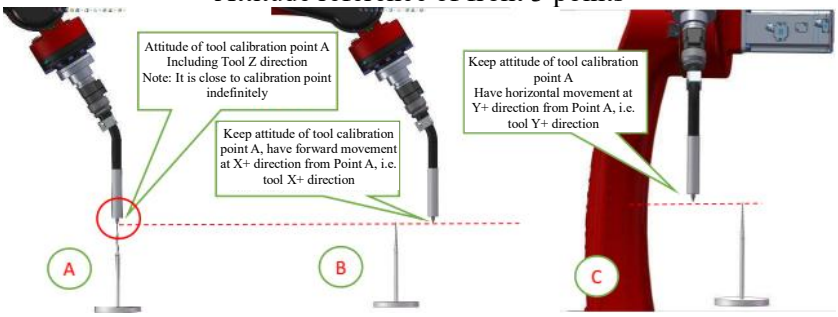
1. Select and fix the reference point, adjust the attitude of flange tool, until the reference sharp point is close to flange tool sharp point indefinitely, record Point 1 by referring to diagram ①;
2. Remove the corresponding points, readjust the flange angle and the angle with record point 1 should be above 30°; keep the sharp point close to flange tool sharp point indefinitely again, record Point 2 by referring to diagram ②;
3. Remove the corresponding points, readjust the flange angle and the angle with record point 1 and 2 should be above 30°; keep the sharp point close to flange tool sharp point indefinitely again, record Point 3 by referring to diagram ②;
4. Note: While calibrating Point 4, define tool direction z, confirm the tool direction of welding gun to ensure easy programming; as shown in Fig. A, the reference welding gun should be vertical, the direction of Tool Z should be in

parallel with world Z direction, keep the welding gun sharp point to reference point indefinitely, record Point 2, as shown in Fig. A.

5. Keep the attitude at the position of record point A, the world parallel movement X+ direction is tool X+ direction, record Point b, as shown in Fig. B.
6. Keep the attitude at the position of record point A, the world parallel movement Y+ direction is tool Y+ direction, record Point c, as shown in Fig. C.
7. After recording all points, click "Calculate" and wait for the results; when calibration is correct or there's minor error, it will pop up the OK confirmation box of calibration, then click OK; otherwise, it will pop up the prompt box of calibration failure, find the cause if calibration fails, to see if the calibration point is not close to the reference point indefinitely or there's parameter error.



Attitude reference of front 3 points



Direction reference of Tool A, B, C

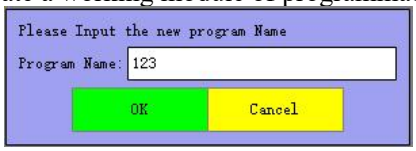
Special Note:

The 6-point calibration method is shown above. When calibration above 6 points is adopted, please do tool calibration by referring to this method. In principle, the calibration tool sharp points are closer to reference points when there are more points; the tool accuracy greatly depends on whether calibration points are close to reference points indefinitely. The original points of node can be corrected when calibration above 23 points is adopted. Please use this method with caution!!! Please switch to world coordinate (select tool as none) when recording parameters;

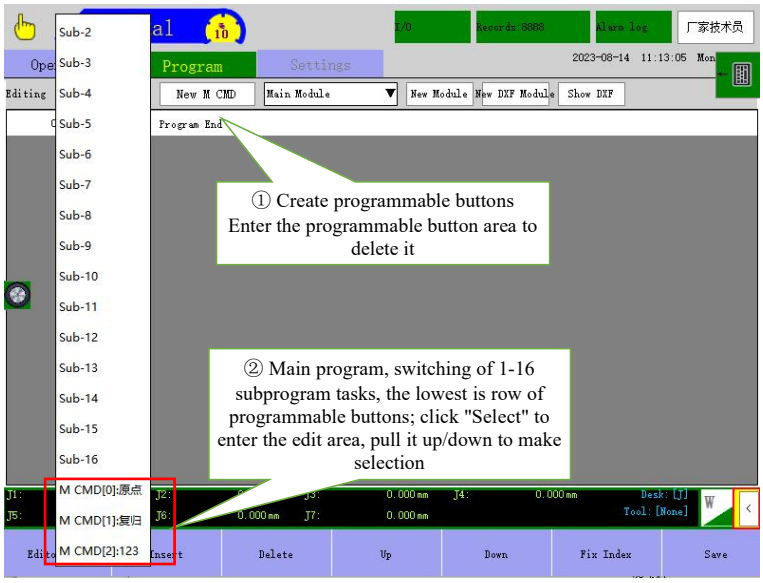
Note: As for calibration in picture above, Tool Z direction is upward movement, the calibration Z direction of some tools is downward movement. Please do calibration based on the use habits. Please confirm the principle of Z direction by referring to the established workbench;

5. Programmable buttons

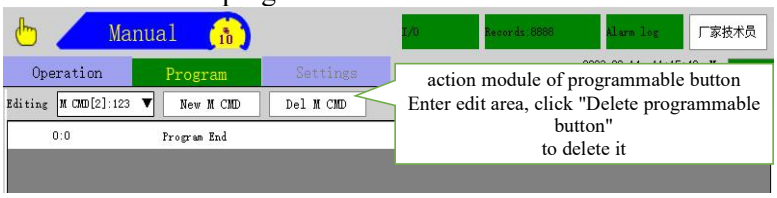
Note: Click "New programmable button" during programming, pop up the dialogue box to set the naming of programmable buttons, confirm and generate a working module of programmable button task,



Naming of new programmable buttons

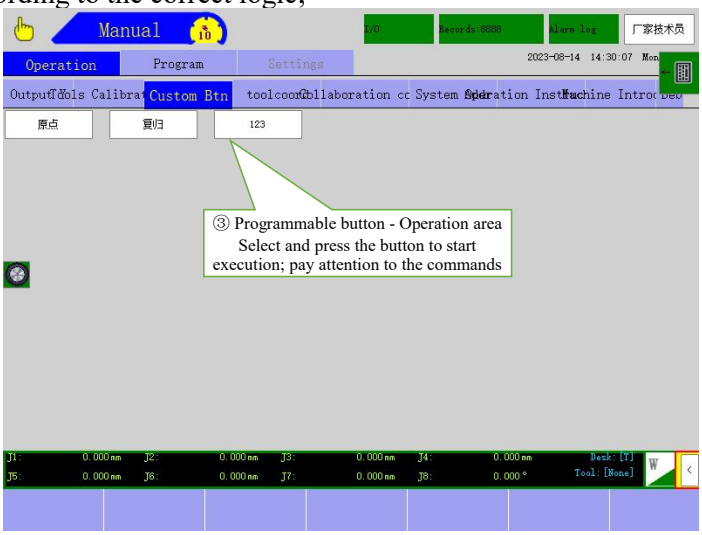


Select the programmable task to switch and enter



Enter the programmable action module

to edit the actions of edit process. Almost all commands are supported. The actual conditions should prevail. Please prepare the action steps according to the correct logic;



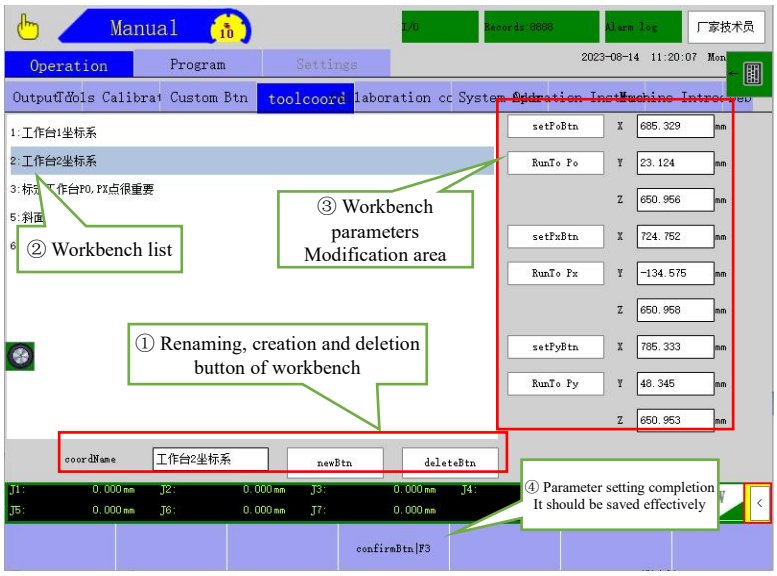
Operation of programmable button

Operation and use method of programmable button: The button names generated can be seen in the programmable button area during execution. Firstly, press "Enable" button, then press the programmable button continuously to start execution of internal process action of programmable button; note: When multiple actions exist, the internal process actions will be executed from Step 1 until it is ended; when it is paused in the halfway and pressed again, the actions will be restarted from the beginning;

Reset method: The programmable button "Reset" is bound with the external buttons; under stop or manual state, press "Reset" button once and then press "Start" button to reset the origin; the "Reset" operation in soft button area can also be used;

***Note:** The user should not perform manual and auto operation and parameter setting to mechanical manipulator while resetting the origin. In case of emergency, press "Stop" button to reset the origin or press "Emergency stop button";

6. Workbench calibration



Calibration parameter page

Note: The coordinate system is redefined on working surface or workbench, and set on working surface of activity space to realize easy programming and operation, as shown in picture below; taking certain point as origin PO, define PX and PY direction point by taking this point as the origin; the established user coordinate system is called workbench;

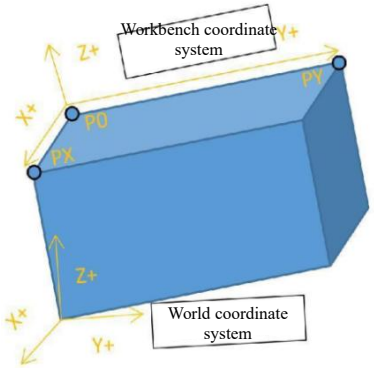
Operation of user coordinate system: Switch to user coordinate system and established workbench, perform operation of X, Y, Z, U, V and W, which equals to operation of customized and new "world coordinate system" after one rotation or movement; on basis of route commands of this workbench, it can realize fast filling of relevant data or movement during programming and operation, and the program can be reused in other workbenches;

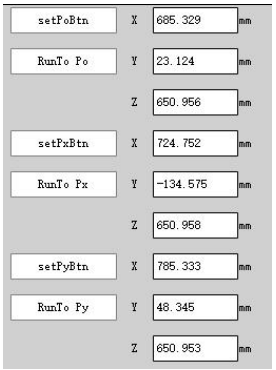
Use during programming: It can realize fast filling of relevant data and bring them to this workbench during programming and operation; the switchable workbench variable can be used during reset; as for the specific command for switching workbench, the workbench that is used for switching is the reusable program;

Note: When calibrating the workbench with tools, please calibrate the tool end precisely, use this tool to do workbench calibration of Point PO, PX and PY by using the tool end; otherwise, the robot must hold the same attitude at the defined Point PO, PX and PY during calibration; the calibration results are regarded as the working surface that is formed at robot end, while the actual calibration surface is the workbench that is established after calibration reference point has deviation at robot end position; so, this calibration applies to the scenarios with no strict requirements;

For any strict requirements for fixed point and attitude, make sure to calibrate the tool and then calibrate the workbench with this tool (switch to calibration tool); otherwise, it may fail to meet the requirements of accuracy and attitude change position.

While performing calibration, pay attention to the direction line of PX and PY line; the Z direction of workbench is taken as reverse direction when PX and PY line is exchanged;





Verify workbench: Switch to user operation coordinate system and established workbench, move X, Y and Z; when the defined direction is correct, and the workbench position, X0, Y0 and Z0 are at the PO position defined by workbench, the calibration is correct; note: The connection point must be robot end; please switch to the used tool (if any);

7. Coordination of coordination axis

Note: The rotation axis should be supplemented for auxiliary operation while assembling the workpiece (similar work), for the workpiece needs to be rotated in order to continue the work normally. The additional axis should also enter working status during rotation, for it may have poor working efficiency when the additional axis has positioning after simple rotation, so, the additional axis should be marked in order to realize coordination work; when coordination axis is enabled, it must have enabling and calibration before normal coordination. The common single-axis drive can be used without calibration;

Parameter description:

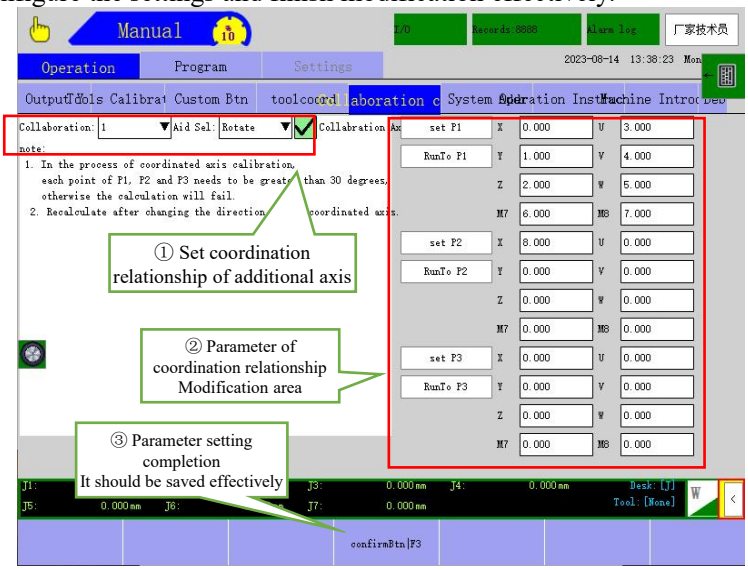
Coordination shaft: Set the corresponding coordination axis parameters in coordination axis 1 and 2 (1 means Axis 7 of expansion axis; 2 means Axis 8 of expansion axis; please select the corresponding axis for parameter setting).

Axis type: Rotation and translation (please select and set it according to the motion type of Axis 7 and 8). Select the corresponding axis for parameter setting).

Enable: Tick "Enable" when using the coordination axis; otherwise, they will be disabled.

Set P1-P3: Run to position of P1, P2, P3 calibration point and record it one by one.

Save: Click "Save" to configure the settings and finish modification effectively.

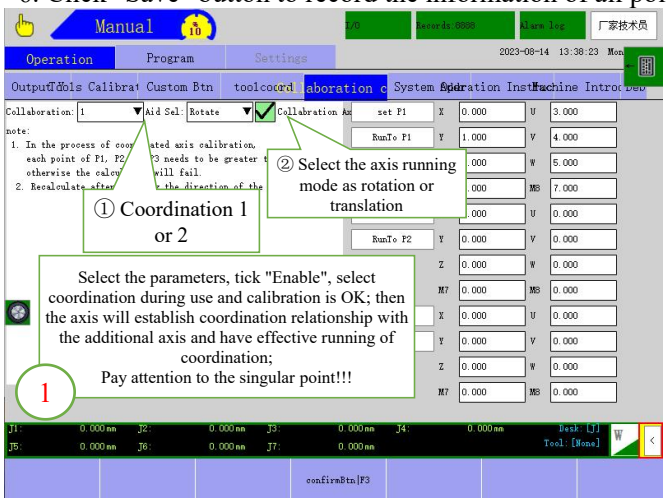


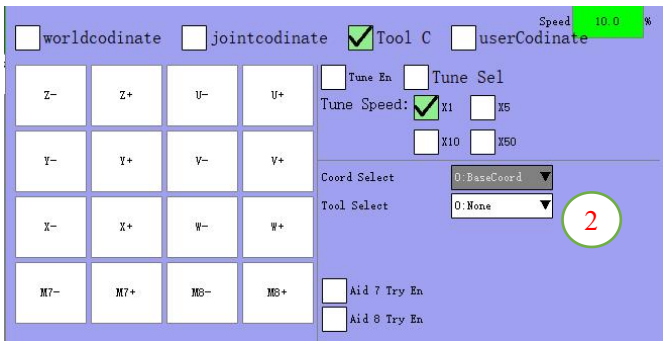
Calibration parameter page of coordination axis

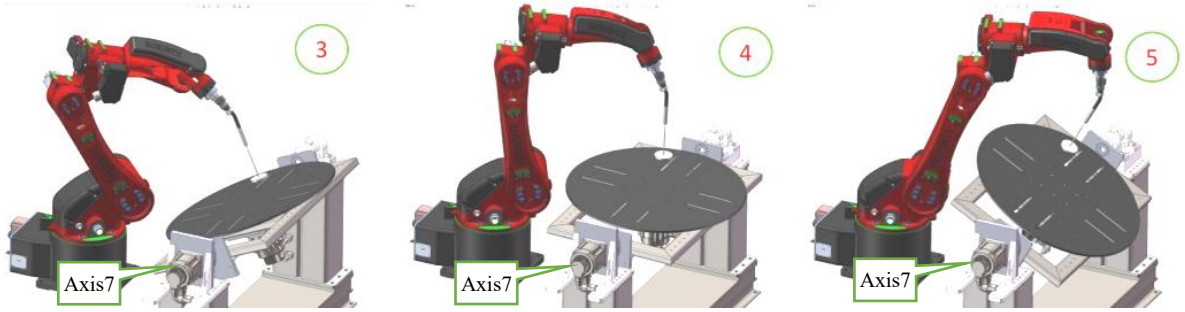
7.1 Calibration of coordination axis 1 (7-axis) - Rotation

The calibration method is as follows:

1. Make sure to calibrate the tool and reach certain accuracy prior to calibration. The subsequent calibration may have better effects along with the increase of accuracy, then switch and load the tool calibration;
2. Fix one reference sharp point on the axis surface of additional Axis 7, point at coordination 1, set the rotation type of axis, tick "Enable", as shown in Fig. 1;
3. As shown in Fig. 3, rotate Axis 7, until the tool sharp point is close to the fixed reference sharp point of additional axis indefinitely, and record Point P1 (Fig. 1);
4. As shown in Fig. 4, remove the sharp point, rotate the additional axis, until the angle difference between Point P1 and P2 is above 30°, the tool sharp point should be close to the fixed reference sharp point of additional axis indefinitely, and record Point P2 (Fig. 1);
5. As shown in Fig. 5, remove the sharp point, continue rotation of additional axis, keep the angle difference between Point P2 and P3 above 30°, keep the tool sharp point close to the fixed reference sharp point of additional axis indefinitely, and record Point P3 (Fig. 1);
6. Click "Save" button to record the information of all points (Fig. 1);







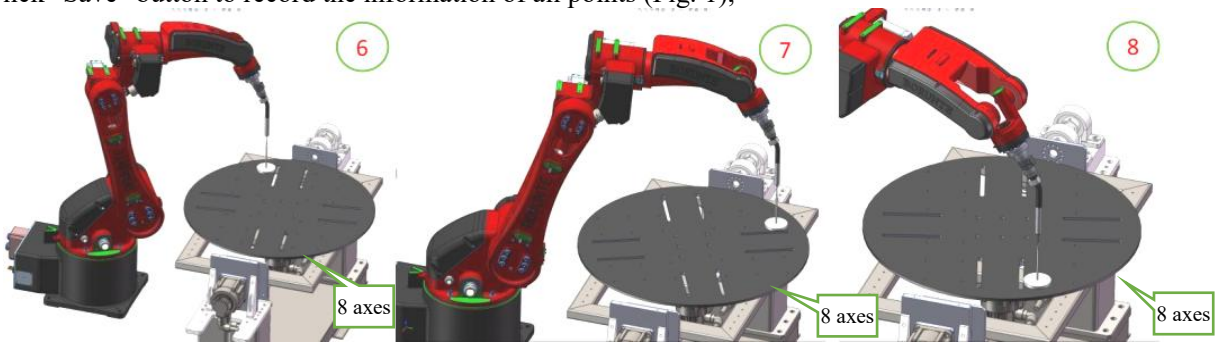
Calibration of coordination axis

Function verification: Enter manual gear, open Fig. 2, tick "Coordinate", move to Fig. 3, or 4 and 5, drive the additional axis at low speed, check whether calibration contact has rotation and change, and whether the tool and calibration axis have rotation and movement at consistent direction; calibration is OK if the deviation is within certain range; otherwise, the calibration is wrong or affected by other parameters, find out the cause and perform re-calibration;

7.2. Calibration of coordination axis 2 (8-axis) - Rotation

The calibration method is as follows:

1. Make sure to calibrate the tool and reach certain accuracy prior to calibration. The subsequent calibration may have better effects along with the increase of accuracy, then switch and load the tool;
2. Fix one reference sharp point on the axis surface of additional Axis 7 (Fig. 1), point at coordination 1, set the rotation type of axis, tick "Enable";
3. As shown in Fig. 3, rotate Axis 7, until the tool sharp point is close to the fixed reference sharp point of additional axis indefinitely, and record Point P1 (Fig. 1);
4. As shown in Fig. 7, remove the sharp point, rotate the additional axis, until the angle difference between Point P1 and P2 is above 30°, the tool sharp point should be close to the fixed reference sharp point of additional axis indefinitely, and record Point P2 (Fig. 1);
5. As shown in Fig. 8, remove the sharp point, continue rotation of additional axis, keep the angle difference between Point P2 and P3 above 30°, keep the tool sharp point close to the fixed reference sharp point of additional axis indefinitely, and record Point P3 (Fig. 1);
6. Click "Save" button to record the information of all points (Fig. 1);



Calibration of coordination axis

Function verification: Enter manual gear, open Fig. 2, tick "Coordinate", move to Fig. 6, 7 or 8, drive the additional axis at low speed, check whether calibration contact has rotation and change, and whether the tool and calibration axis have rotation and movement at consistent direction; calibration is OK if the deviation is within certain range; otherwise, the calibration is wrong or affected by other parameters, find out the cause and perform re-calibration;

7.3. Calibration of coordination axis - Translation

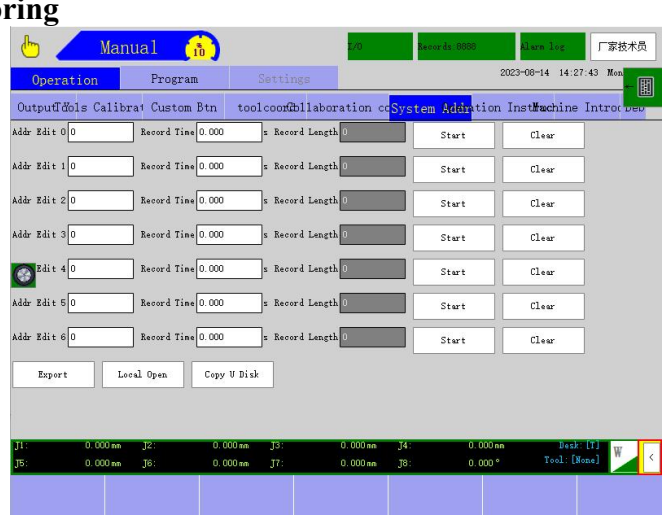
The calibration method is as follows:

1. Make sure to calibrate the tool and reach certain accuracy prior to calibration. The subsequent calibration may have better effects along with the increase of accuracy, then switch and load the tool;
2. Fix one reference sharp point at the starting point at translation side of additional axis, enter calibration page of coordination (Fig. 1), point to coordination 1, set axis translation type and tick "Enable";
3. Starting point: The tool sharp point (end sharp point that is calibrated with tool) should be close to the fixed reference sharp point of additional axis indefinitely and record Point P1;
4. Move the additional axis continuously and stop at the middle position, keep the tool sharp point close to the fixed reference sharp point of additional axis indefinitely and record Point P2;
5. Move the additional axis continuously for certain distance and stop, keep the tool sharp point close to the fixed reference sharp point of additional axis indefinitely and record Point P3;
6. Click "Save" button to record the information of all points (Fig. 1);

Function verification: Enter manual gear, open Fig. 2, tick "Coordinate", move to Point 2, have forward or reverse translation of additional axis at low speed, check the position of calibration contact point, and whether the tool and calibration axis have rotation and movement at consistent direction; calibration is OK if the deviation is within

certain range; otherwise, the calibration is wrong or affected by other parameters, find out the cause and perform re-calibration;

8. System address monitoring



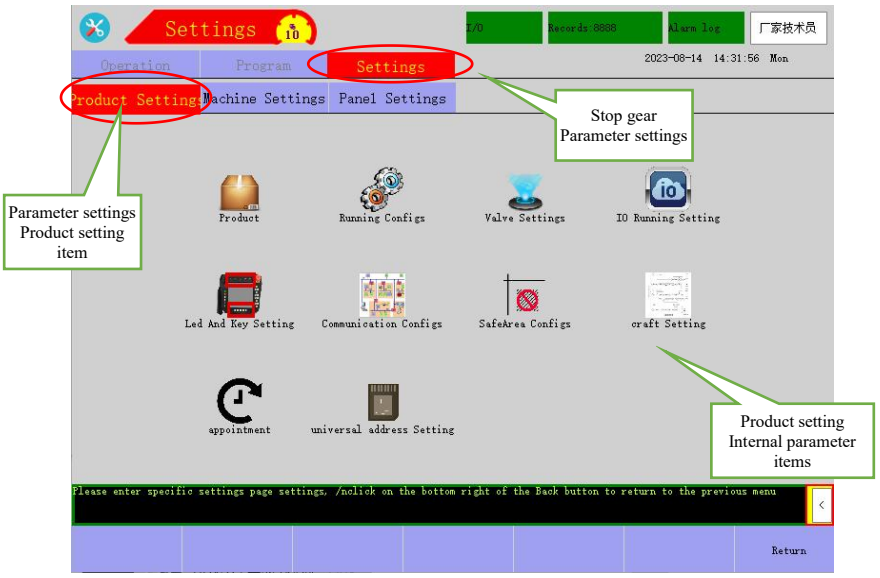
Note: Enter the monitoring address by time interval, click "Start" to monitor the address data change of monitoring system, record the data length, click "Stop" button again to stop recording, click "Clear" button to clear the record data; it is used for collecting and analyzing data and coordinate with problem handling; it can be opened locally or exported for viewing;

9. Debugging

Note: The internal parameters of debugging are not available for users.

Chapter 4 Stop Gear (Parameter Setting)

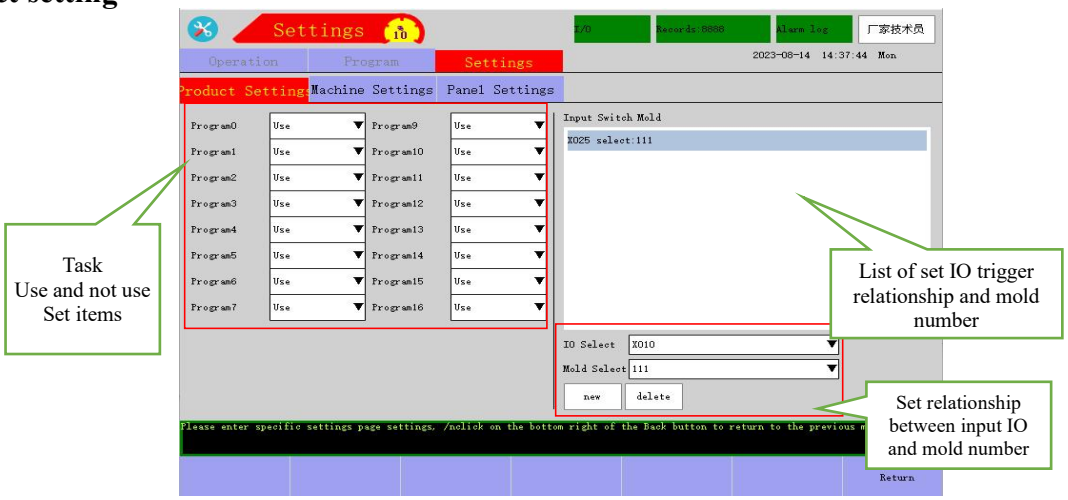
1. Product setting



Items of product setting page

Note: Enter parameter setting → Product setting item, to set the the following relevant parameters; it belongs to auxiliary setting parameters;

1.1. Product setting



Product setting - Parameters in parameter item

1.1.1. Task program

Note: Subprogram and main program equal to use of multiple tasks. When preparing actions or having auto running in task, the internal programming action will have logic scanning and execution by sequence; the steps for enabling and disabling use and not use are as follows:

Use: The subprogram task will have synchronous operation during auto running; the internally prepared actions will have logic scanning and execution by sequence;

Not use: The tasks are not executed during internal preparation and auto running;

Note: The action in subprogram equals to main program tasks; pay attention to the conflict between task call and Action 1 when command step is supported by internal button!!!

Subprogram 8: As a special task program, the subprogram 8 will have auto execution of internal preparation of action program commands since the running of system; when internal tasks have action, the prepared actions should be saved before they can be executed!!! This is default setting and not settable!

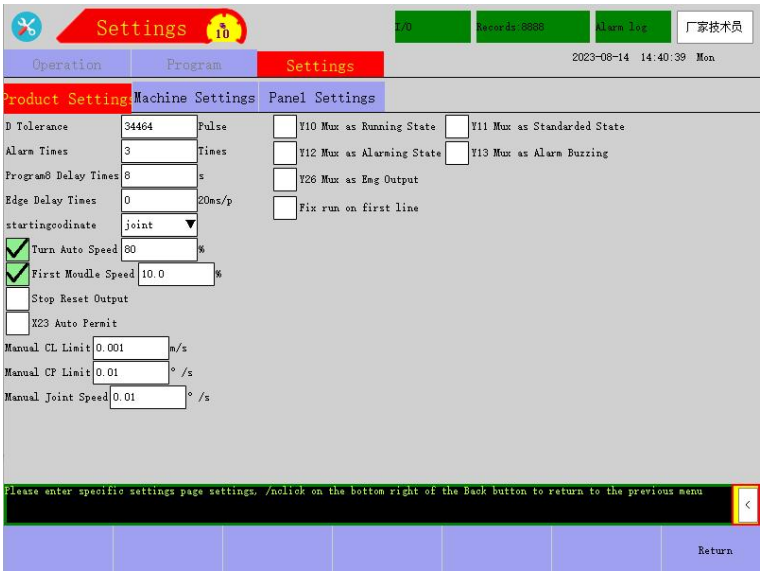
1.1.2. Mold number switching via IO signal

Note: While setting the assigned input IO, switch to the selected mold number, confirm and display it in the list; select the set item in list, click "Delete" button to delete the selected items; note: When creating new mold number, it is not allowed to set the same assigned input Io and multiple mold numbers, or set different assigned IO with the same mold number;

Working principle: Certain assigned IO in the set list is triggered by the edge signal; it will execute and switch to the bound mold number program when the robot is stopped; when executing mold number switching during auto running, the robot needs to be stopped to switch the mold number; when the switched mold number program is run, press "Start" button at auto state to start running;

Note: During normal use, the switching program should not be executed in running process, the mold number will not be switched until the program running is completed and its execution is triggered by edge signal; when multiple programs are connected and triggered, only the final one has effective connection and switching;

1.2. Running parameters



Setting items of running parameters

1.2.1. Dynamic tolerance

Note: Error range of sending pulse and feedback pulse; the set allowed deviation during running; when the instantaneous value is higher than set value during running, it will give alarm of major deviation and stop running, and the value must be set properly; it may have high tolerance fluctuation when speed is high while acceleration/deceleration is small, please set it according to the realities;

1.2.2. Times of alarm sounds

Note: Set the output and flicker times of alarm sound; when an alarm is given, it will give alarm at the interval of 0.5s according to the set times, and stop output when reaching the set times; it is different from alarm sound output;

1.2.3. Start delay of subprogram 8

Note: When teaching in subprogram 8 has action step, save it and subprogram 8 will restart and save the start delay;

1.2.4. Edge signal filtering

Note: When inputting signals, the signals will be received normally when reaching the set time; when maintaining time of effective edge signal, such as signal filtering grade, is set as 1, then the edge signal is effective only if its on or off time is maintained for over 20ms, or it is ineffective edge signal when the time is below 20ms; normally, the filtering value can be set as 0; if it is too high, the signal filtering may fail to be received due to short connection time;

1.2.5. Default coordinate system

Note: The default set coordinate system after start of system; Press "Set" to switch to the default coordinate system, select node or world during setting.

1.2.6. Speed after switching to auto mode

Note: Tick and set n rate, which is the initial and set starting rate n% after switching to auto mode; if not ticked, it will be disabled and the rate is 10% by default;

1.2.7. Auto first mold speed

Note: Tick it and set the first mold rate, which is the first mold speed after switching to auto mode; the first mold will run according to the set rate when running to the first mold (the 1st cycle), regardless of the set running rate;

Note: It is regarded as one cycle and one mold when all mold groups are being executed during running of main program; otherwise, it will run as the first mold; when the program has closed loop and fails to be stopped when the mold group is ended, it will keep running at the first mold speed; please use it properly for it belongs to special use;

1.2.8. Stop output of reset time

Note: When ticked, the execution action with time output command will be reset automatically if it is switched to stop immediately during auto running, to prevent misoperation; if not ticked, it may enter continuous output state; please use it with caution, for it belongs to special use;

1.2.9. X23 "Permit full auto" signal

Note: The mode of controlled machine is locked, which means, confirm whether machine is under this mode before running; if not it will give alarm as prompt. It will take effects when anti-misoperation is enabled; when signal connection mode is locked, it will not start and give alarm in this mode; it must be ticked in order to have effective detection;

1.2.10. Manual speed limit

Note: It is operated under manual mode and used at low-speed and safe operation: **Actual speed = Speed limit ***

Manual set speed (percentage);

Limit of manual linear speed: The max. movement speed that is limited by trial linear movement during operation and movement of world, tool and user coordinate system under manual gear; generally, it is set 1;

Limit of manual angular speed: The limit speed of attitude change when world, tool and user coordinate system have operation attitude changes or trial linear commands under the manual gear;

Limit of manual node speed: The limit of max. operation and rotation angle of node movement when operating nodes in node coordinate system under manual gear;

1.2.11. Reuse output IO

Note: Output special binding function: Reset and use Y10 - Y13: When ticked, the original binding function will fail, which means, it can be used as common IO;

Y26 emergency stop output: Tick this function to have emergency stop output; press the emergency stop button and the system will give alarm of emergency stop, and Y026 output will be disconnected; release the emergency stop button to eliminate the emergency stop alarm, and Y026 output will be connected; when ticked, other operations are not allowed in order to avoid a conflict;

1.2.12. Start from fixed first line

Note: Special use; when ticked, it will start running from the first line by default after startup.

1.3. Valve setting

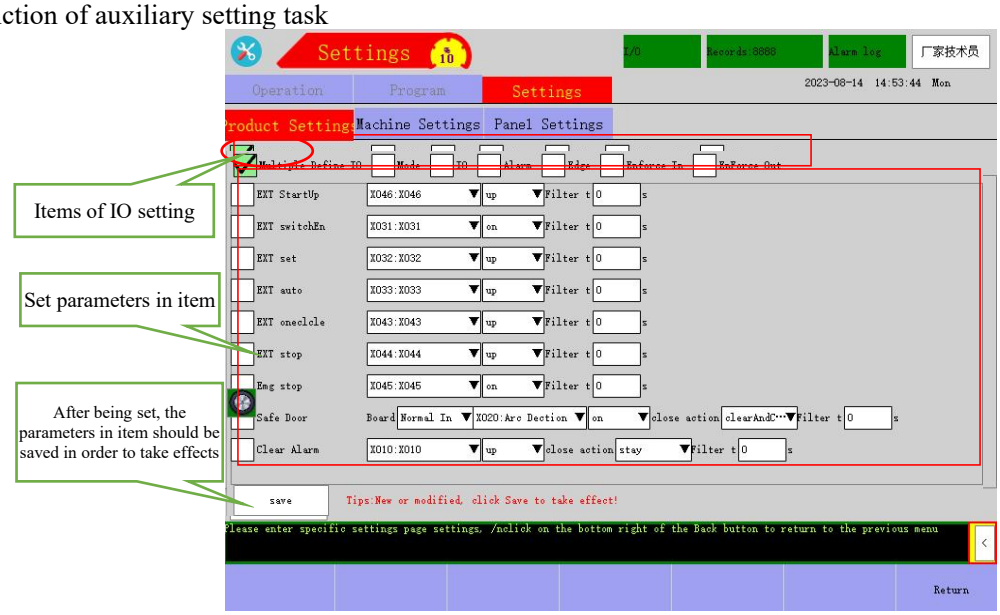
***Note:** 1. The contents will be displayed in this page only if it is edited and IO program is upgraded by using the text change tool software of the Company; otherwise, this page will be null.

2. When stamping process is used, this page will show single-head valve after restart;

For details of stamping process package, please refer to the process specification;

1.4. IO setting

Function of auxiliary setting task



IO setting - Setting page of reusing IO definition

1.4.1. Reuse IO definition

Note: As shown in picture above

External start: Remote control over start function, the assigned input IO and triggered by edge signal; set option: Rising edge or falling edge; tick "Save" to take effects;

External enabling: Perform detection according to the set conditions during remote control; disable the alarm and servo when the conditions are inconsistent; tick "Save" to take effects;

External stop gear: Remote control, which equals to the stop gear functions of gear switch of hand controller; assigned input IO and triggered by edge signal; set option: Rising edge or falling edge; tick "Save" to take effects;

External auto gear: Remote control, which equals to the auto gear functions of gear switch of hand controller; assigned input IO and triggered by edge signal; set option: Rising edge or falling edge; tick "Save" to take effects;

External single loop: Remote control, which equals to the enabling function of single loop; assign input IO and triggered by edge signal; set option: Rising edge or falling edge; tick "Save" to take effects;

External stop: Remote control, stop function (pause); assigned input IO and triggered by edge signal; set option: Rising edge or falling edge; tick "Save" to take effects; note: When external stop is enabled and signal are connected, the robot fails to start and it prompts that robot is paused;

External emergency stop: Remote control, emergency stop function, triggered when connected or disconnected; the assign input IO will be triggered when connected or disconnected; set option: On or off, tick "Save" to take

effects;

Safety door:

Safety door alarm condition: IO option of assigned input type; assigned IO triggering; set trigger condition: On or off;

Setting of closing action reset: Clear alarm and continue, stay and reset enable option; generally, it applies to opening or closing of similar injection molding safety door;

Working principle: When the set conditions are satisfied during auto running, for example, open door to trigger stop alarm Err36; when door is closed and condition is not satisfied, closing will act and it will trigger the set options, in order to realize the following actions:

Clear alarm and continue: When this option is set, it will clear alarm and continue the action after the closing action;

Stay: When this option is set, it will clear the alarm and pause after the closing action, and wait for manual treatment, such as start and continue;

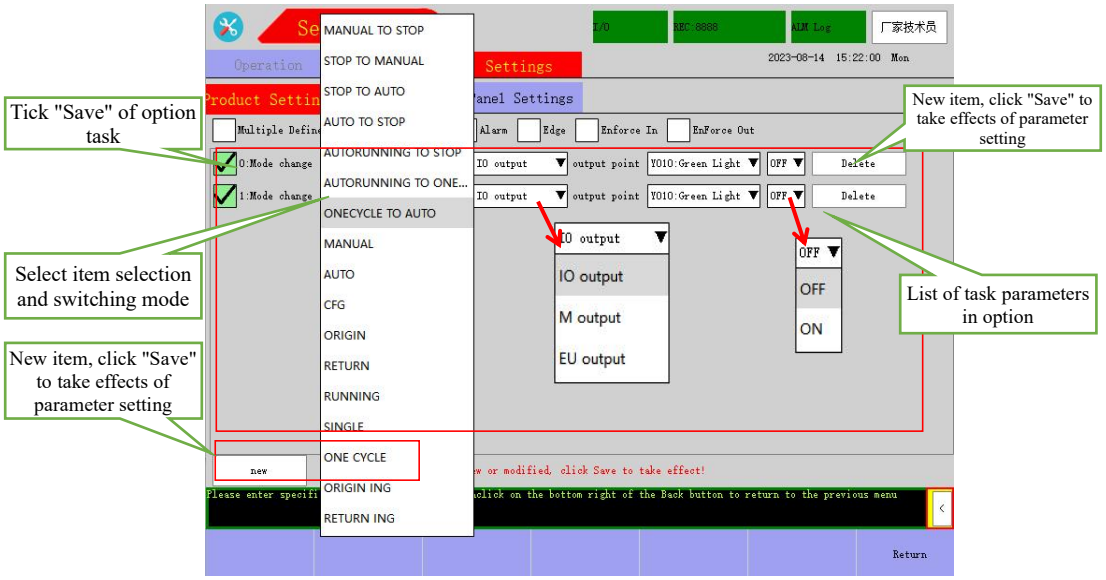
Reset and start: When this option is set, it will clear alarm automatically, reset and restart running after the closing action;

Note: Please conduct setting according to the actual demands, for the trigger action may vary along with the set options after setting of closing action; otherwise, wrong action may occur. Please use it correctly;

Clear external alarm: Similar with safety door functions, assigned input IO and triggered by edge signal; set option: Rising edge or falling edge; **closing action setting:** Stay and reset enabling option; stay is selected by default; the option functions are the same with safety door functions;

Special note: Edge signal or signal must be above the pulse time (filtering time) of on or off setting in order to take effects; otherwise, the signals will be invalid and be filtered; please set it correctly and the default value can be set as 0;

1.4.2. Mode state



IO setting - Setting of mode state page

Note: It is mainly used for automatically controlling the on/off state of signals after switching to certain mode

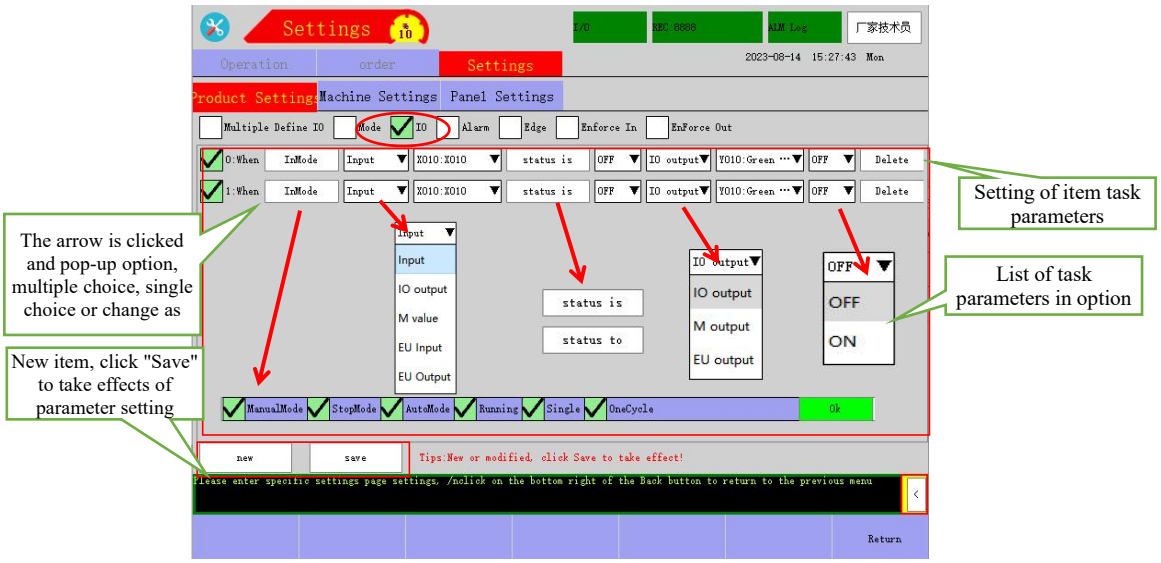
Operation method:

1. Click "New" button, establish parameter item task and display it in the list;
2. Switch to the assigned mode (select pop-up option in current mode), single option, assign the output type of triggering IO (Y, M, EUY), and assign the output IO and action state: On or off;
3. After setting is one, click "Save" button to take effects (make sure to tick option to enable it); untick or delete the item and click "Save" when it is not required.

Function verification: When it is switched to the set mode, execute the auxiliary output tasks according to the settings; it applies to the auxiliary operation tasks under special switching modes;

Note: Please set it according to the normal logic and avoid conflict with other functions; otherwise, setting may have error.

1.4.2. IO state



IO setting - IO state setting page

Note: It is mainly used for connecting/disconnecting the other output signal by controlling the on/off state of single output signal under some modes.

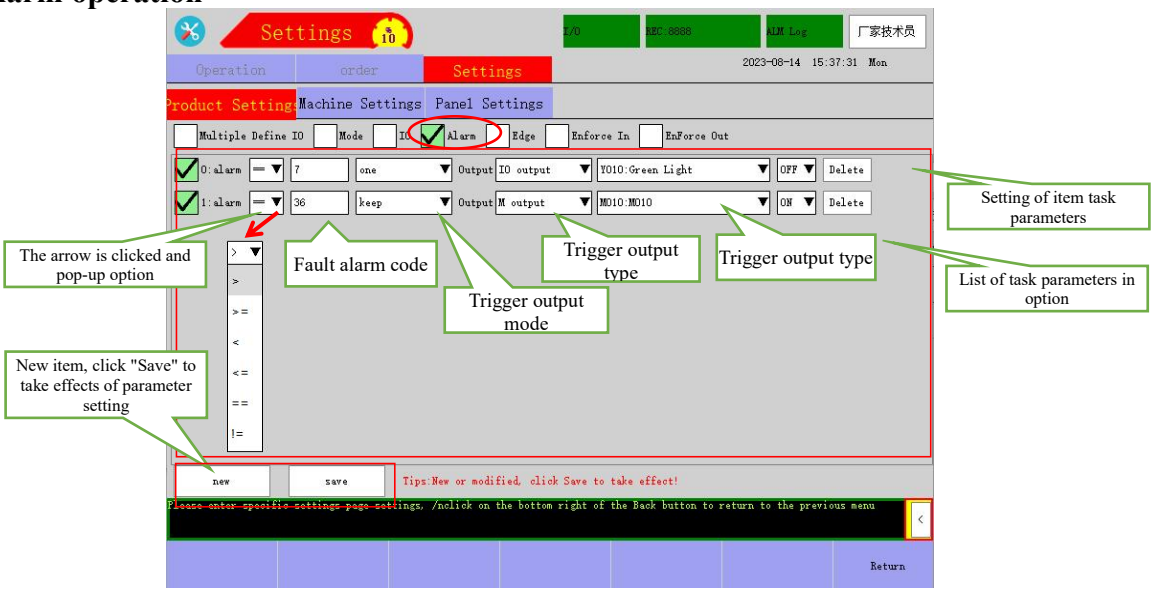
Operation method:

1. Click "New" button, establish parameter item task and display it in the list;
2. Click the button in current mode to pop up the mode, assign the mode (click it to tick multiple modes), assign the IO type and select input or output type (as shown in picture below), assign IO and state: Set state as or change state as (click it to change), trigger output type IO when designating the state (on or off); output state: On or off.
3. After setting is one, click "Save" button to take effects (make sure to tick option to enable it); untick or delete the item and click "Save" when it is not required.

***Note:** When the selected state becomes, the edge signal will be detected and switched;

Function verification: When the assigned (input or output) IO state is changed as assigned on or off state under the set mode (any of multiple modes), it will trigger output of assigned output IO, output on or off;

1.4.3. Alarm operation



IO setting - Alarm operation page

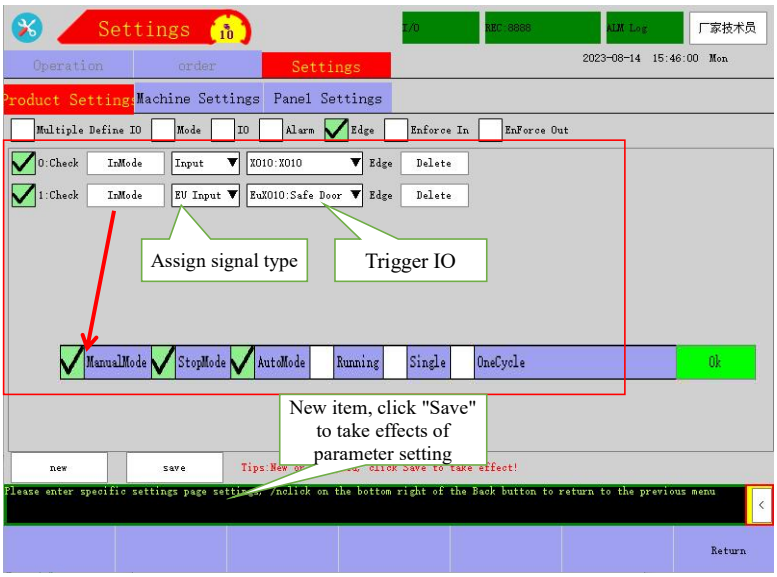
Note: It is mainly used for controlling the on/off state of certain output signal when alarm satisfies certain condition

Operation method:

1. Click "New" button, establish parameter item task and display it in the list;
2. Select the comparison operators as shown in picture above, assign the fault alarm number, trigger output mode, output IO type, assigned IO and output state;
3. After setting is one, click "Save" button to take effects (make sure to tick option to enable it); untick or delete the item and click "Save" when it is not required;

Function verification: When robot has a fault and the corresponding alarm number is generated or in the setting area, it will trigger the assigned mode to output IO output state; it applies to action function in auxiliary task.

1.4.5. Edge signal



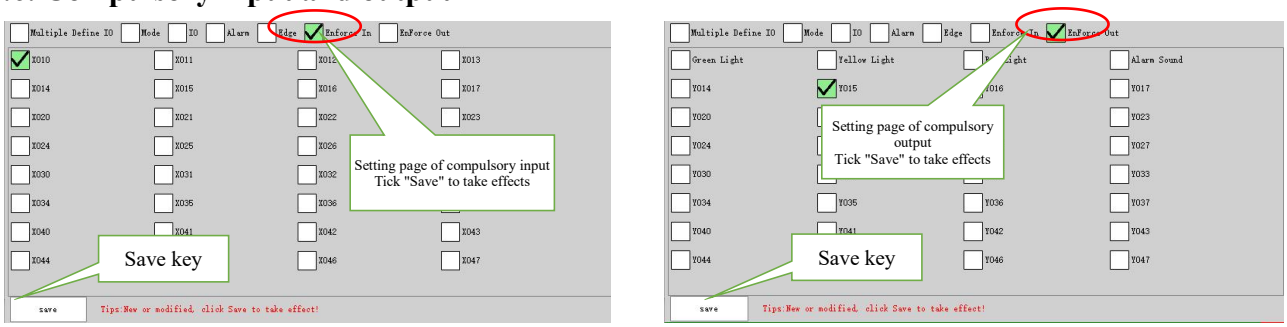
IO setting - Edge signal

Note: It is used in special conditions, inspect the execution of IO edge signals under special mode; normally, the IO edge signal will be effective during auto running; for example, subprogram 8 has internal action, it can run in any mode, while IO edge signal must run in auto running mode in order to take effects, so it should be set as required; setting is also required during single-step use in the test; otherwise, it should simulate the skip of step test;

Operation method:

1. Click "New" button, establish parameter item task and display it in the list;
2. Select (multiple) mode and assign the input IO;
3. After setting is one, click "Save" button to take effects (make sure to tick option to enable it); untick or delete the item and click "Save" when it is not required.

1.4.6. Compulsory input and output



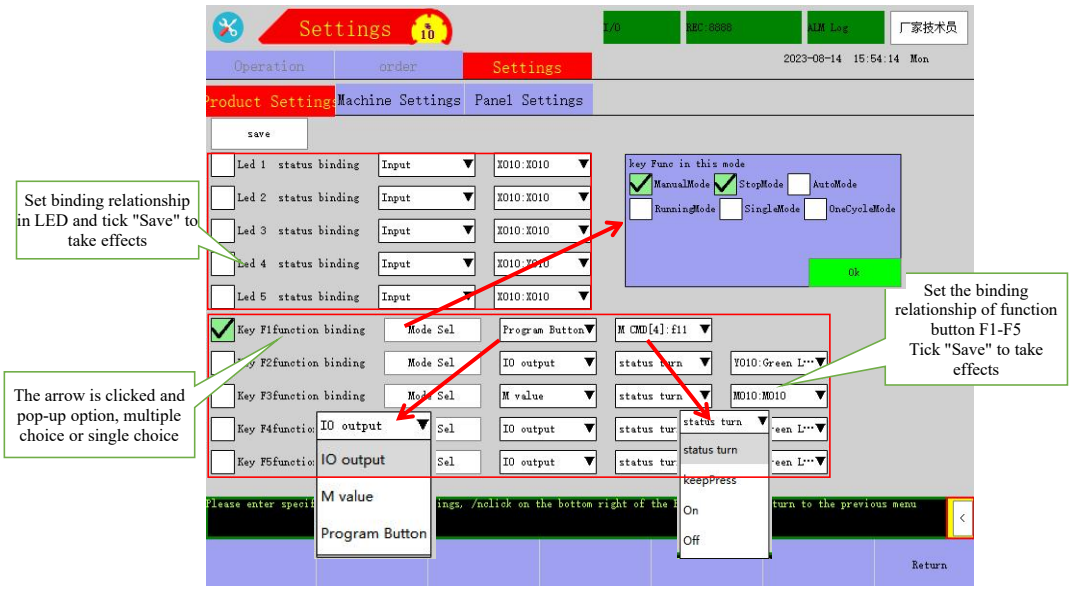
Setting page of compulsory input/output

Operation method:

1. Tick the compulsory (input or output) IO required
2. Click "Save" button to take effects of settings; tick compulsory input to realize connection; tick compulsory output to realize output connection;

It applies to special debugging, tick it to use the IO of compulsory input/output; input signal to have output of compulsory signal and realize connection of compulsory output; please use it with caution; if not ticked, it will enter normal use;

1.5. Buttons and indicators



Buttons and indicators - Setting page

1.5.1. Function button F1 - F5

Note: Buttons F1 - F5 are bound with setting, to control the on/off of output IO point and M value in certain mode

Operation method:

1. Tick and bind the assigned F1 - F5 functions and they can be triggered in the mode (click to pop up and tick the mode; multiple modes can be ticked); assign the output trigger IO or tasks of programmable buttons;
   1. IO output: Assign the output type IO, output action mode, status change (trigger output of connection/disconnection switch), pulse, connection and disconnection;
   2. Programmable button: Assign the programmable buttons, select the function name of programmable buttons;
2. Click "Save" button to take effects of settings; untick the item and click "Save" when it is not required.

Setting verification: Press the set function button of F1 - F5 in the set mode, to start operation based on the set triggering condition;

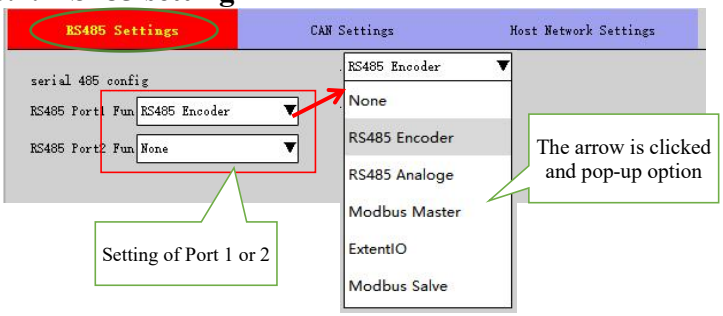
1. **When setting output IO:** Output state change (trigger output of on/off switch), pulse (on/off per 0.5s), on and off based on the settings, and control IO output;
2. **Set programmable buttons:** Enable the programmable button and establish process execution action in the button; note: When enabling the programmable button, the hand controller should be enabled and press the programmable button until the action is executed; when execution is stopped halfway and the programmable button has multiple actions, then press the programmable button and start execution from the beginning;

Note: Check whether there is logic conflict or function conflict during setting; otherwise it will have error, and the same goes to other settings. For example, when F5 is bound under manual programming, the operation will be invalid in programming mode at present;

1.6. Communication configuration

Communication parameters are configured and mainly divided into three types: 485 communication, CAN communication and network TCP communication; CAN1 and CAN2 interfaces, which contain 3 groups of ports, 2 groups of RS485 and 1 group of CAN, support two communication protocols; the two ports are connected to the signal lines. The communication modes of modbus RTU 485 and Can are supported. Monitor interface is provided with network TCP communication, such as vision and remote communication;

1.6.1. RS485 setting



Can1/Can2 interface definition		
Pin No.	Definition	Remarks
1	CANL	CAN communication
2	CANH	
3	CAN_GND	
4	RS-485_A1	RS485 port 1
5	RS-485_B1	
6	RS-485_GND	RS485 GND
7	RS-485_A2	RS485 port 2
8	RS-485_B2	

RS485 setting Port definition

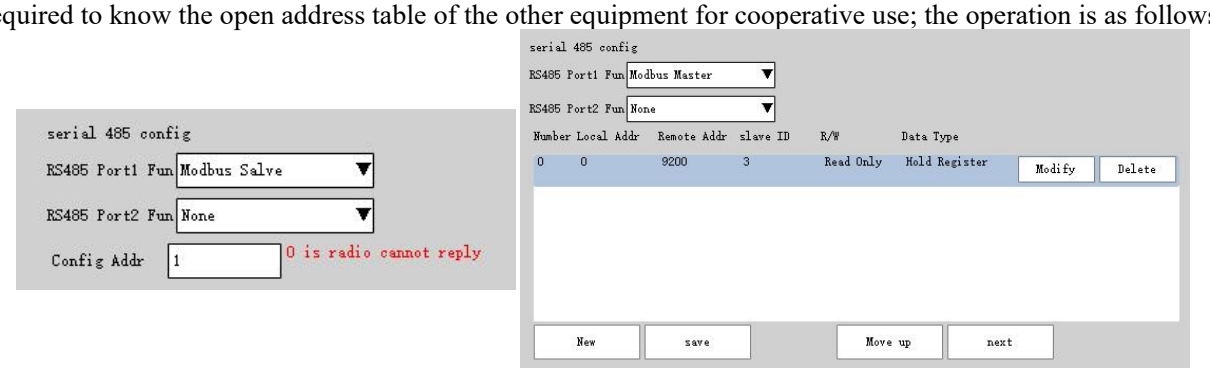
Note: Wiring must be made as required when ports are used for communication. CAN port has 3 groups of communication ports as shown in table above; the modbus RTU 485 and Can communication are supported;

Communication supports: RS485 encoder; RS485 analog module; MODBUS master station; extended IO; MODBUS slave station; it is necessary to arrange the corresponding hardware, connect and test the communication

line before using the functions such as welding and position searching;

Communication parameters: Default baud rate: 115200; data bits: 8; stop bit: 1; efficacy: None; data check code mode: CRC16.

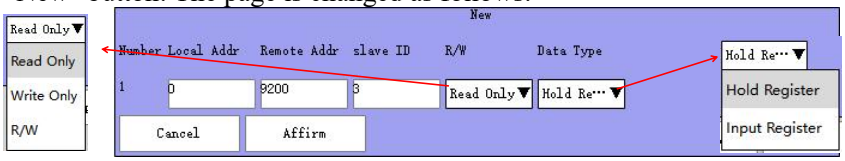
1. **RS485 encoder:** Applies to the assigned port; connected to the communication line of matched encoder, to set the application parameters in the process; rotary encoder, it is normal when values are changed; note: Other parameters should be set correctly before being used normally, such as consistent encoder ID and communication allocation. It may give communication failure alarm when the wiring is wrong or the parameters are set incorrectly; Briter RS485 encoder can be used to follow the process at present;
2. **RS485 analog module:** Assign and connect the matched analog module, set the module analog signal input (receiving and monitoring) or output analog signal, monitor or measure the output signal. It is normal when error value is 0.1 (acquired by measuring the hardware output). See the user manual of analog module for details.
3. **MODBUS master station and MODBUS slave station:** Set the communication mode as required. When setting the slave station, the information is processed passively, and the slave station number needs to be set. When setting station number 0, the robot will not have reply of information; when setting the master station, the robot will actively read and write the slave station information, and when sending data to the remote equipment, it is required to know the open address table of the other equipment for cooperative use; the operation is as follows:



Setting of slave station and master station

MODBUS communication variables can be added in this page when setting up a master station. Perform the following steps

1. Click "New" button: The page is changed as follows:



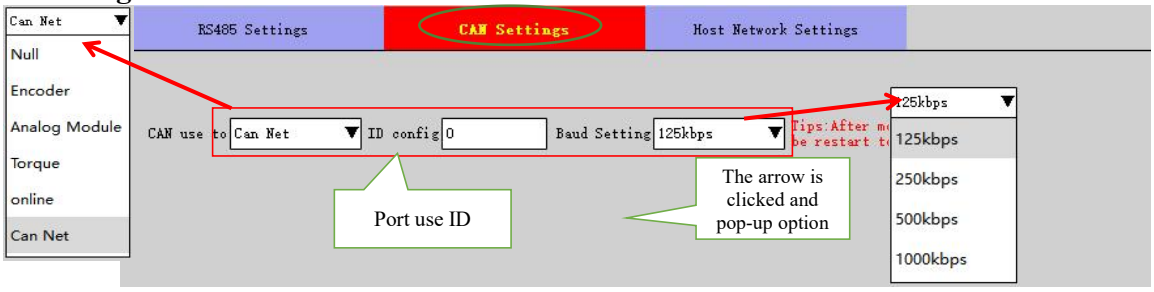
Setting page of new parameters

Local address: Open 800-890 direct address of controller;
Remote address: Variable address of MODBUS slave station;
Slave station ID: Address of Modbus slave station;
Read/write: Read: Read the data of "remote address"; or write to remote address;
Write: send the value of "local address" to MODBUS slave station; read the local address;
Note: It is related to the function code used, i.e. the local address;
Data type: Function code of MODBUS protocol;

2. Click "OK" after setting the rules, to complete the setting;
3. Click "Save" button to save all the rules;
4. **Extension IO:** Set and connect the matched extension IO board, and set the hardware IO board correctly as required;

While performing the access test above, it is necessary to set the parameters and connect the corresponding equipment or coordinate with the software test. When the setting is completed, restart the system before starting the function and test. For details, please refer to the corresponding test requirements and hardware test. Set it as none if not used. Note: The set functions of Port 1 and 2 should be different when they are used at the same time;

1.6.2. Can setting



CAN setting

Note:Wiring must be made as required when it is used communication. CAN1 and CAN2 ports are shared with RS485 port, as defined in the table above.

The setting and use are similar to RS485; set the parameters as follows:

Applications: Encoder, analog module, torque, online, can network communication,

ID configuration: Station ID is unique in connections, set as 0-255;

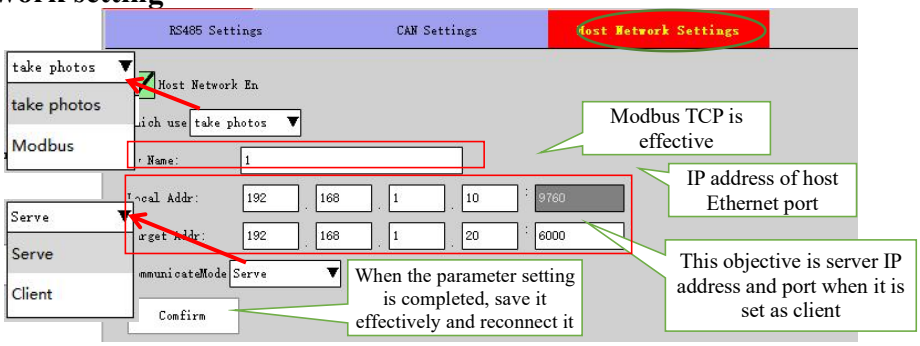
Baud rate: The communication baud rate must be consistent with that of communication equipment.

Instructions for parameters and functions:

1. Encoder and analog module: The use is the same as RS485, only the communication mode is different. Note: Only hardware provided by the Company can be used;
2. Torque: Read the torque of drive and control integrated servo node shaft motor;
3. Online: The stamping process is used online. See stamping process for details.
4. can network: Only the robots in this system can be used online, and CAN command communication can be used;

Note: Make sure to connect terminal resistors and use anti-interference communication lines when connecting multiple computers at a long distance. It should be used within the allowed length range as much as possible.

1.6.3. Host network setting



Communication setting of host Ethernet port

Note: Tick the network host to enable it; the set network IP address, network usage, communication mode and other settings of the host network card will be saved to take effects;

The settings are as follows:

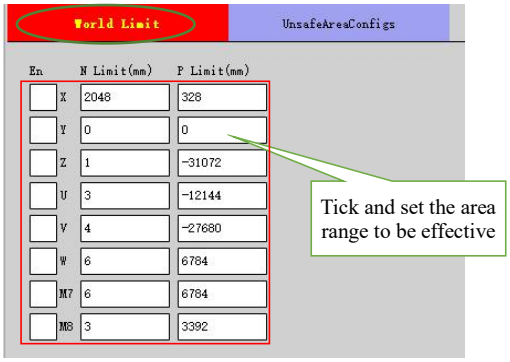
1. Tick enable host network to start network for use; otherwise, network communication cannot be used;
2. The network applications vary along with settings; the network communication port number of host is different, and it can't be modified after binding;
3. Host ID: The host ID of modbus TCP communication protocol is used. The information will not be processed when the information received is inconsistent with the set ID;
4. Host IP: I.e. the address IP of local robot network card; note: The set address must be in the same network segment as the communicated equipment or have normal communication, otherwise, the communication will be abnormal;
5. Target address: When the communication mode is set as client, this address will be IP address and set port of server for target communication, and the robot will initiate connection actively;
6. Communication mode: Set the robot as server or client;
   Server: When being connected,4 clients can be connected maximally, and information can be replied passively;
   Client: The robot will actively connect to the target server, and after connecting is done, it will actively send information to the server (target address IP and port) to request or passively accept information.

Confirm that the modification of above parameter settings is effective. After the modification is confirmed, disconnect the original connection and reconnect it. For details of communication methods, please refer to the remote instruction manual and MODBUS TCP communication manual.

1.7. Safety area parameters

Note: The safety area is set as general setting and avoid conflict with other settings;

1.7.1. Soft limit of world coordinates

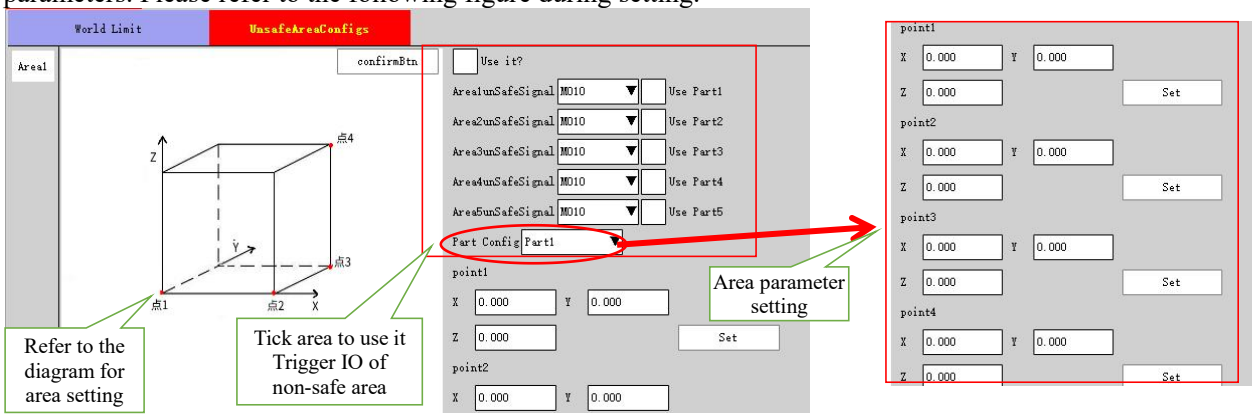


Setting of world safety area

Note: The mobile activity area and attitude range of robot end are limited by the world space direction X, Y, Z and attitude U, V, W, and it will give alarm if it exceeds the range; Additional Axis M7 and M8 are different from node limit, and related to the set axis type mode; tick "Save limit";

1.7.2. Non-safe area configuration

Note: Tick to use it; multiple areas can be combined, and 5 areas can be set maximally. Each area consists of 4 point parameters. Please refer to the following figure during setting:



When modification or setting is done in non-safe area setting parameter page, click to confirm that the modification is effective

Setting method of **non-safe area configuration** is as follows:

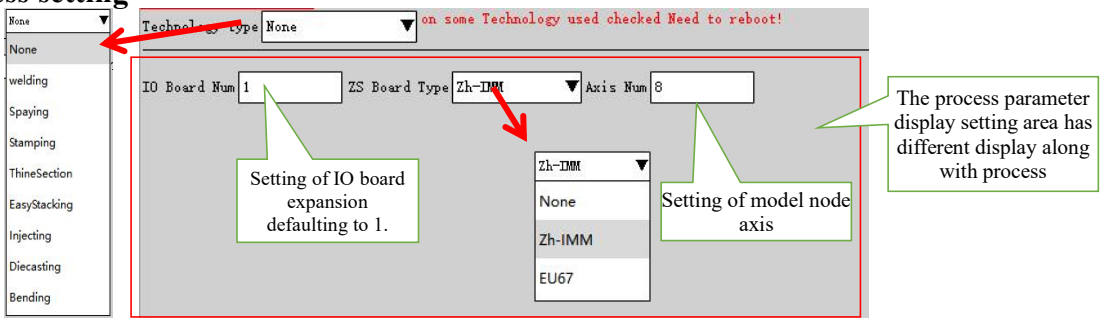
1. Tick "Use" and "Use Area 1-5"; note: Set at least one area;
2. To set the reference diagram, select and set the use items in "Area Parameters" and "Areas 1-5", and set the position of Point 1, 2, 3 and 4; the group and defined areas are non-safe areas.
3. After setting is done, click "Confirm modification" to take effects;

Working principle: When the robot moves, it is limited to move outside the non-safe area, it will alarm and trigger the change of binding M value when it moves into the area;

Area description: Each area is composed of 4 azimuth point parameters, the defined area is: The "area body", which is formed by combining point 1, point 2 and point 3 into a plane and taking point 4 as the direction, is a non-safe area;

Note: Please set the enabled area parameters completely, otherwise it will lead to conflict;

1.8. Process setting



Parameter Setting Page

Note: Process type: This parameter is selected when setting the process, and it needs to be turned off and restarted after switching. Please refer to the relevant process instructions;

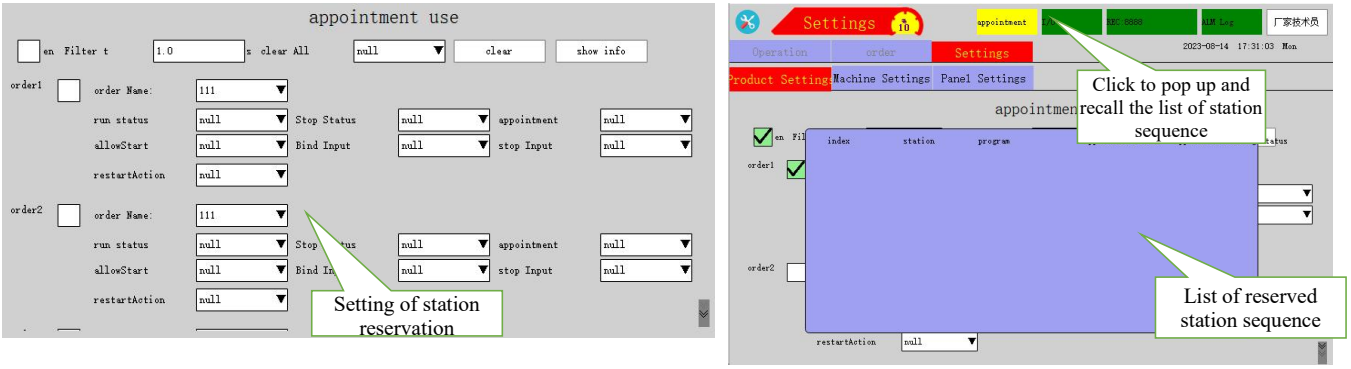
The followings are the structural parameters of machine, please do not alter them after setting:

1. **Number of IO boards:** Set expansion IO board. By default, it is provided with 1 board. Please add values and wiring according to the actual situation for expansion;
2. Type of injection molding IO board: Set expansion; By default, it is provided with a medium gauge board. Please set it according to the actual situation. Use the European Standard 67 board and select European Standard 67 option during expansion. Note: It is not allowed to use two types of expansion boards at the same time, please choose 1 from 2;
3. Number of axles: Select and set the model. Normally, it can be divided into 4-axis model and 6-axis model. For other types, please contact our company for setting. When adding additional axis to the model, please add 1 or 2 axles on the basis of 6 axles; 2 axles can be supplemented maximally;

1.8.1. Process type

* Note: Select the relevant process types for use. For details, please refer to *BORUNTE Process Specification*.

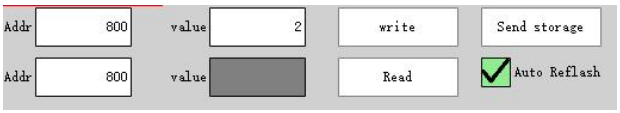
1.9. Reservation function



Reservation parameter setting and reservation monitoring

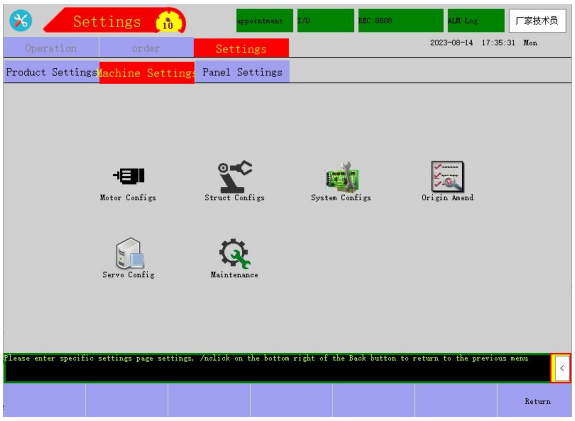
For details of user, please refer to *Reservation Process Specification*;

1.10. General address



Note: Read, write in and modify the general open address internally; address range: 800-899;

2. Machine setting



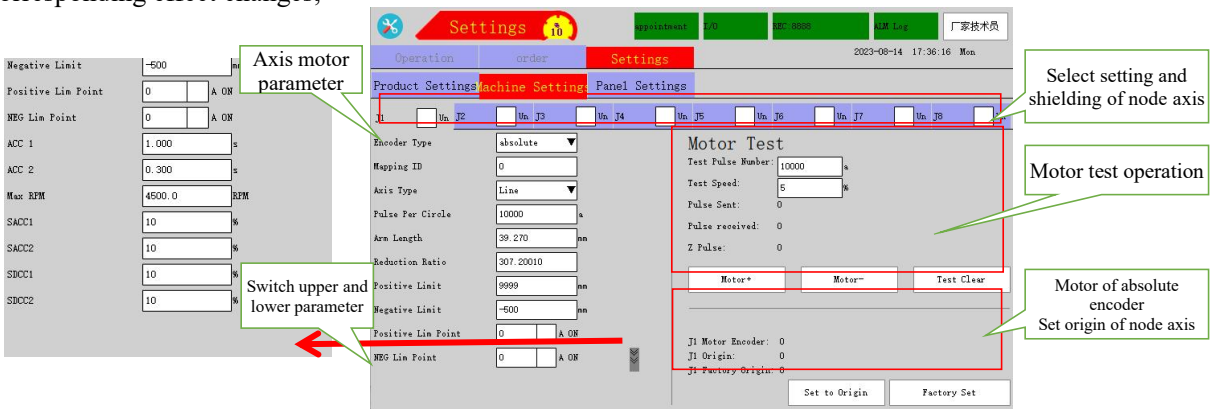
Click to enter set item in machine setting page

Note: The structural key parameters of machine are operated under certain authority, do not modify them arbitrarily;

2.1. Motor parameters

*Robot setting - Motor parameters

Note: Encoder type, motor mapping, servo manufacturer, axis type, number of pulses per turn, deceleration ratio, positive and negative limits, acceleration time and deceleration time, max. speed, S acceleration 1, S acceleration 2, S deceleration 1 and S deceleration 2, etc. After performing modification by parameter names, the corresponding axles will have corresponding effect changes;



Setting of motor parameter page

2.1.1. Axis shielding

By default, all axes are selected to be used (select none if not ticked). Please check the "None" selection box if it is not used;

2.1.2. Encoder type

Note: There are five types of encoders at present, such as "increment", "absolute value", "stepping", "grating", "rotary encoder" and "speed mode". The processing methods may vary along with settings, which will affect the subsequent parameter settings. This system can be set as absolute value by default;

2.1.3. Motor mapping

Note: Motor mapping is the address assigned by the system for servo (module allocation), the system has

communication with the servo address for control; the number of servo distribution addresses is related to the connection mode, please perform wiring as required; note: Communication in/out network port; **setting of mapping is to assign the communication address to the servo axis assigned by the system;**

Rules of module address allocation:

Connect the communication line correctly from the nearest servo module to the farthest one, each module is assigned 2 addresses starting from the farthest module, and the addresses are assigned from top to bottom; take the general 6-axis module as example:

Taking 6-axis machine with 3 servo modules as example: The farthest module is Module 1, the middle module is Module 2, and the nearest module is Module 3; the address is assigned as follows:

Axis address assignment: Assignment address of Module 1: 0 and 1; Module 2 address: Assignment 2 and 3, Module 3 address: Assignment 4 and 5; the module port has a low address and a high address;

Axis assignment: Axis 1 corresponds to mapping 0, Axis 6 corresponds to mapping 1; Axis 2 corresponds to mapping 1, Axis 5 corresponds to mapping 2; Axis 3 corresponds to mapping 4, Axis 4 corresponds to mapping 5; After setting it correctly, power off and restart it, manually test the node coordinates, J1-J6 axis, to see whether the manual key control axis is consistent with the actual motion axis. Please refer to the parameters of actual model electrical box for specific parameters.

Special note: Due to the different motor power of each model, the axis can be distributed at different addresses of module. In such case, the operation is as follows:

1. Firstly, correctly connect the communication line, determine and assign the axis address of distribution module. If the module is newly installed or replaced, the address needs to be redistributed (Recover SII operation on the diagnosis page);
2. Find out the module port corresponding to the physical axis, fill in the correct address according to the assignment;
3. After the setting is completed, turn off the power and restart, manually test the action of corresponding axis at low speed to check the corresponding situation; the axis control will not operate normally if the mapping is wrong (note: The servo parameters must be correct);

2.1.4. Axis type

Note: It includes rotation, straight line and rotation clearing;

Rotation: Set node axis as rotation;

Straight line: Set linear axis , straight line moving axis;

Rotating clearing: Special setting, automatic clearing when rotating the setting sample of node axis for 360°;

2.1.5. Number of pulses per revolution

Note: Set the number of pulses and feedback pulses sent by servo motor each revolution; the default setting is 10000 pulses;

2.1.6. Lead

Note: Generally, lead refers to the axial distance between the thread or worm and the adjacent corresponding point on the helix; the setting item is displayed when it is set as a straight axis, this distance refers to the rotation distance of thread or worm per revolution;

2.1.7. Reduction ratio

Note: Set the reduction ratio of servo motor; deceleration ratio refers to the ratio between instantaneous input speed and output speed in deceleration mechanism, which is represented by symbol "i"; generally, the speed reduction ratio is expressed by taking 1 as the denominator and using ":"to connect the ratio of input speed and output speed. When the input speed is 1500r/min and the output speed is 25r/min, then the speed reduction ratio is: i = 60:1;

2.1.8. Positive limit and negative limit

Note: Positive limit refers to the max. angle of axial node angle movement and the min. angle of axial node angle movement of negative limit; it will be the distance travel position if it is a straight axis. Note: the angle or travel is measured from the origin position;

2.1.9. Positive limit point/negative limit point

Note: This item can define the physical IO assigned point of negative limit of axis. It is normally closed by default. When ticked, it means that it is set as a normally open point. When entering a specified value in the box, it means that an input point is assigned as the negative limit point of axis. When it is set as 0, IO will not be assigned. Please refer to the following table for detailed number comparison:

Value	Input	Value	Input	Value	Input	Value	Input
0	Not used						
1	X010	9	X020	17	X030	25	X040
2	X011	10	X021	18	X031	26	X041
3	X012	11	X022	19	X032	27	X042
4	X013	12	X023	20	X033	28	X043
5	X014	13	X024	21	X034	29	X044
6	X015	14	X025	22	X035	30	X045
7	X016	15	X026	23	X036	31	X046
8	X017	16	X027	24	X037	32	X047

Corresponding IO of number

2.1.10. Acceleration time/deceleration time

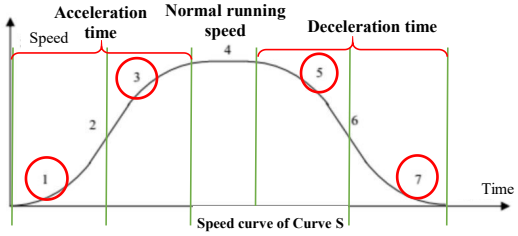
Note: The acceleration time: The time when the servo motor axis corresponding to the set axis stops to normal speed; the deceleration time: The time from the normal rotation speed to the stop of servo motor corresponding to the set axis; Unit: s; Accuracy: 0.001;

2.1.11. Max. speed

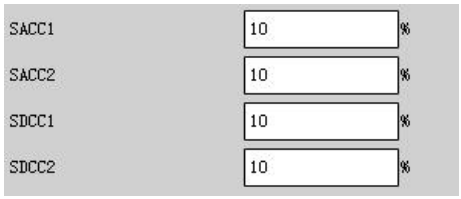
Note: The software limits the max. running speed of corresponding servo motor; this speed cannot be exceeded during running; note: The motor must reach the set max. speed; otherwise, the motor can't reach the max. speed if the set value is too large, which will lead to other faults; therefore, it is necessary to set a proper speed limit, which is generally less than the rated max. running speed of the motor;

2.1.12. S acceleration 1/2, S deceleration 1/2

Curve diagram of system S increase/decrease



Time relationship between acceleration and deceleration of motor



Setting of acceleration/deceleration ratio

Note: The S acceleration and deceleration value is used for curve acceleration and deceleration processing for each stage of single node motor, such as start and stop; it is used along with the acceleration and deceleration time. As shown in the above figure, the parameters can be set according to the structural parameters;

2.1.13. Motor forward rotation/reverse rotation/test speed

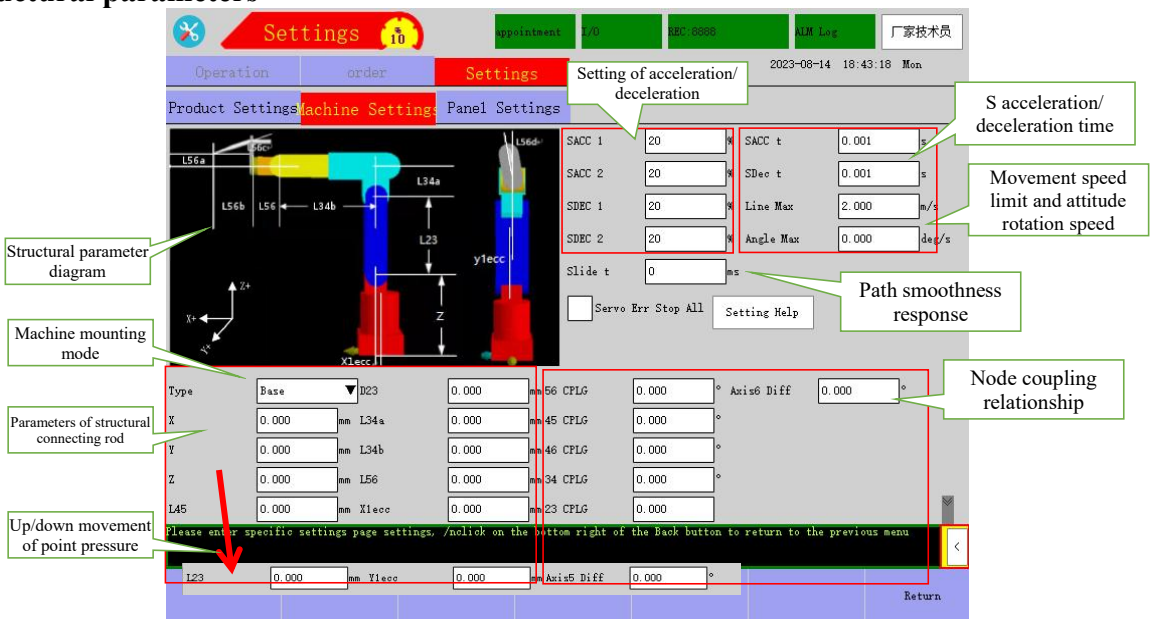
Note: Carry out motor running test, set the number of pulses sent each time and test speed, click forward or reverse rotation test; for example, set 10,000 pulses for each test and set the test speed at 10%; click "Motor forward rotation" to send 10,000 pulses and feedback 10,000 pulses, indicating that the forward rotation test is normal; reverse rotation test: Click "Motor reverse rotation", send 10,000 pulses, the feedback shows -10,000 pulses, indicating that the reverse rotation test is normal; wait for the motor to stop before clicking the test button again in order to test the forward or backward rotation of motor during the test; press the enable button to carry out the auxiliary test and running;

2.1.14. Set as origin/all as origin

Note: Set as the origin, which means, set the current position of selected axis as the origin, click to pop up confirmation box, confirm to complete the setting; set all as the factory origin: Set the current positions of all axes as the origin, click the pop-up password input confirmation box, and enter the password to confirm the setting;

Note: Make sure to determine the current operation and whether the axis is at the origin when setting the origin. It will affect the spatial point operation of robot if the setting is wrong;

2.2. Structural parameters



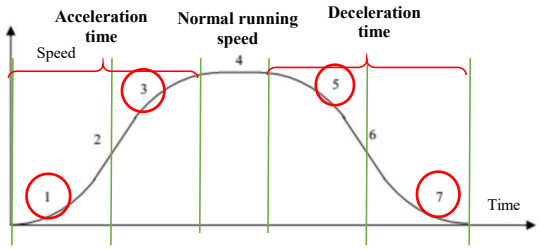
Note: Under the selected model, fill in the corresponding parameter values correctly, establish the world coordinate system when the parameters take effect, calculate and accumulate the position values from the base origin to the robot end position; this parameter relates to the parameters of each node connecting rod, such as spatial movement, attitude change, smooth response and coupling.

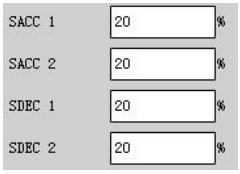
1. Parameter description

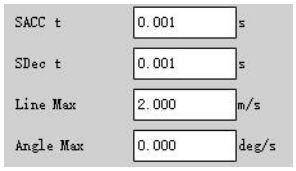
1. S acceleration 1/2, S deceleration 1/2
   Note: Acceleration percentage, set it by referring to the curve diagram, unit: %;
2. S acceleration and S deceleration
   Note: Linear moving speed, acceleration (S acceleration 1/2) time and reduction (S deceleration 1/2) time when stopping, unit: s;
3. Max. linear speed
   Note: Set the max. speed limit setting of end linear movement, unit: m/s; it will adapt to the max. value of system automatically when the set value is too large and not allowed in structure;
4. Max. angular speed
   Note: Set limit of angular speed at the end of action, unit: degree/s; it will adapt to the max. value of system automatically when the set value is too large and not allowed in structure;
5. Smooth filtering
   Note: Response time between actions when smoothing is used, time: ms;
6. Model
   Note: The parameters will vary along with the model type and different settings; for example, display settings of extended special parameters such as connecting rod parameters and node coupling;
7. Connecting rod parameters
   Note: The corresponding relationship will vary along with models. Please refer to the structure diagram to identify the corresponding parameter items
8. Coupling relationship
   Note: Define related linkage relationships, such as the 5-and 6-axis linkage relationships of welding machines, the 3-and 4-axis linkage relationships of 4-axis horizontal machines;

2. Relevant parameters and working principle related to spatial movement

Refer to the principle of axis S acceleration and deceleration curve, it has the same principle with axis acceleration and deceleration time







S acceleration/deceleration section, relationship between acceleration/deceleration time and line speed curve
Setting of S acceleration/deceleration section % Setting of S acceleration/deceleration s

Note: When S acceleration/deceleration value applies to end movement, it is used for curve acceleration and deceleration processing for each stage, such as start and stop; it is used along with the acceleration and deceleration time. The corresponding relationship is as follows:

The set S acceleration/deceleration and acceleration/deceleration time respectively correspond to the line segments above, as shown in picture below:

S acceleration 1: Section 1 "acceleration section"
S acceleration 2: Section 3 "acceleration section"

S acceleration 1/2 is the acceleration period

S acceleration 1: Section 5 "variable deceleration section"
S acceleration 2: Section 7 "deceleration section"

S deceleration 1/2 is the deceleration period

The numerical meaning of S-curve speed curve is as follows:

1. Acceleration section: The acceleration is increased from 0 to the max. acceleration according to the set value, and the speed is increased progressively according to the acceleration;
2. Uniform acceleration section: Maintain the max. acceleration constant and the speed increases progressively according to the max. acceleration;
3. Variable acceleration section: The max. acceleration decreases to 0 according to the set acceleration, and the speed increases progressively according to the acceleration;

Note: The total period required for Section 1, 2 and 3 to speed up to the uniform speed (max. line speed or limited speed) according to the set S acceleration time; there may be jitter during acceleration start or variable acceleration if the set value is too large; when the value is too small, it may have slow acceleration and big jitter of speed;

4. Uniform speed section: The acceleration is 0, the target speed is kept unchanged;

Note: It means the set max. speed or limited speed

5. Variable deceleration section: The acceleration is increased from 0 to the max. acceleration according to the set acceleration, and the speed is decreased progressively according to the acceleration;
6. Uniform deceleration section: The max. acceleration is kept unchanged, and the speed decreases progressively according to the max. acceleration;
7. Deceleration section: The acceleration decreases progressively from the max. acceleration to zero according to the set acceleration, and the speed decreases progressively according to the acceleration;

Note: The total period required for Section 5, 6 and 7 to decrease 0 and stop according to the set S deceleration time; there may be jitter during deceleration start or deceleration if the set value is too large; when the value is too small, it may have slow deceleration and big jitter of speed;

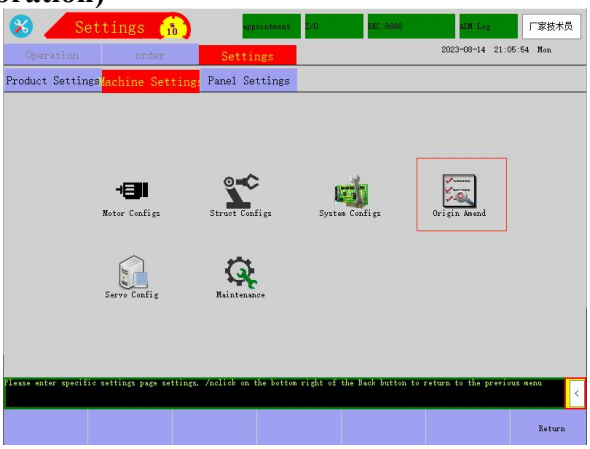
Note:

While performing adjustment, S acceleration 1 and 2 and S acceleration time; S deceleration 1 and 2 should be matched with S deceleration time and the set max. linear speed. Set the running curve as shown in the diagram above, and it should have smooth running at each set speed;

2.3. System parameters

Note: It is not allowed to change the model setting and control panel type arbitrarily after normal internal setting. It may lead to abnormal use in case of setting error;

2.4. Origin revision (for calibration)



Note: It applies to laser calibration software, and its main functions include: Import the calibration result file of laser calibration software, one-key import of robot, and make corresponding compensation and correction for corresponding parameters, such as connecting rod parameters, origin, deceleration ratio of each motor; the non-calibration parameters should not be used;

Usage method:

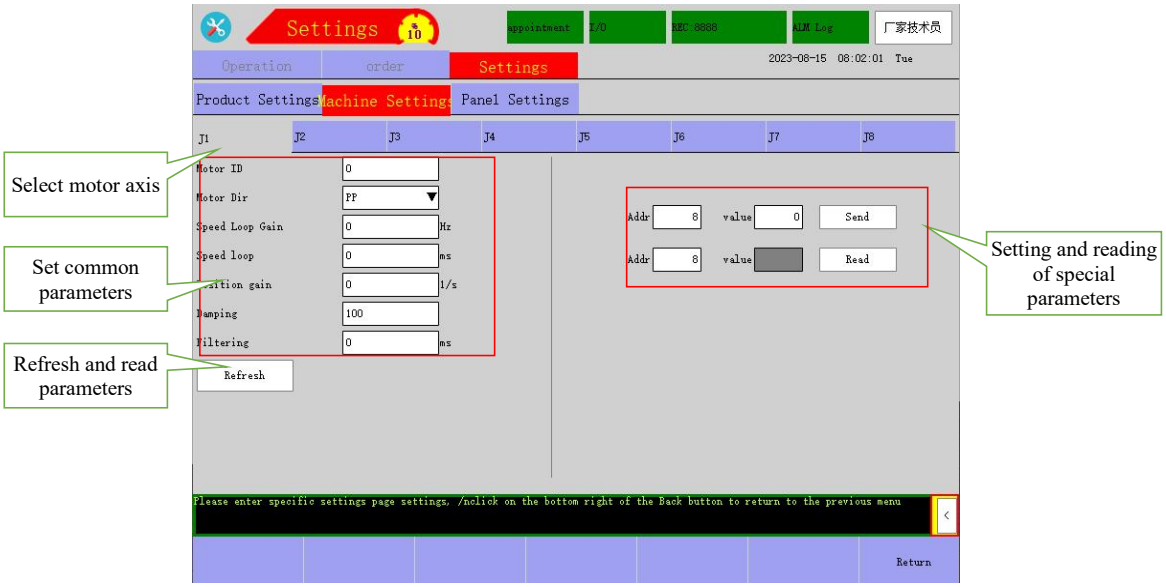
① The login authority is senior administrator → Select parameter setting → Machine setting → Origin correction (for calibration).

② Click scan file → Select the required calibration result file "calibration result.dat" → Click OK

③ Prompt "Are you sure to import calibration data?" → Click "OK" after confirmation → One-key calibration is completed. After completing the steps above, inspect all the parameters of the one-key import robot to see if they are the same as the calibration results.

* Note: For details, please refer to the *Instructions for Importing One-key Calibration Parameters of Huacheng System*. **For calibration personnel of company only!!!**

2.5. Servo parameters



Setting page of motor servo parameters

Note: This parameter applies to integrated matching of drive and control only; when the system parameters are set as other types, such as motherboard selection: This item is not displayed for single board item of hardware;

Each axis is set separately, the parameters that can be set directly include: Motor code, motor direction, speed loop gain, speed loop integral, position loop gain, damping parameters, smooth filtering and other common parameters; as for other hidden parameters, it is required to set servo address parameters and parameter values on the right side, and then click "Write";

2.5.1. Motor code

Note: No.2 parameter: Motor code; each power, brand, model, etc., each of which has a specific motor code to distinguish the use of control. If the input is wrong, the control will be abnormal and dangerous. check the motor code, check the code attached to the motor nameplate. If the motor does not match or has a new brand, it may not support or force the use of the code. See the corresponding debugging of servo version parameters for details; do not modify the factory settings;

2.5.2. Motor direction

Description: No.8 parameter: motor direction; the motor steering will be changed after modification; do not modify the factory settings;

2.5.3. Speed loop gain

Note: No.21 parameter: Motor running speed identification. The larger the principle value is, the faster the response and the more stable the control will be. When the load changes greatly, it will cause vibration if it is too large; determine the parameters of speed loop responsiveness. As the low responsiveness of speed loop will become the cause of delay of the outer position loop, it may lead to overshoot or speed command vibration. Therefore, the servo system may have better stability and response along with the increase of set value in the range where the mechanical system does not vibrate;

Note: When the speed loop gain, speed loop integration and position loop gain settings do not match, the motor will be damaged due to resonance with mechanical parameters; please set these three parameters reasonably during adjustment;

2.5.4. Speed loop integral

Note: No.22 parameter: While the motor is running, the feedback will be slower when value increases, and feedback will be more sensitive when value decreases; the value can be decreased appropriately when the high-speed motor is running; note: The integral can eliminate static error, but it is an unstable source during dynamic operation, and its influence increases in proportion to the load size; when the integral is compared to a small signal interference source, the load can be regarded as an amplifier, and its magnification is proportional to the load inertia; the integral only plays an obvious role at low speed (near zero speed), and it may lead to instability at high speed; this parameter should be used in conjunction with the speed loop gain. The motor will vibrate abnormally if it is not matched properly;

2.5.5. Position loop gain

Note: No. 23 parameter: The responsiveness of motor position loop is determined by position loop gain; it may have higher responsiveness and shorter positioning period along with the increase of position loop gain. It may have high impact on the motor when the speed is high or the load is heavy, which can easily lead to motor burning due to high motor current, especially when the motor is running at high load and speed;

Attention: Pay attention to the speed inertia caused by running speed, load, etc. when setting the speed loop gain, speed loop integral and position loop gain. When the speed changes too much, the response current of motor will be too large, which will cause great damage to the mechanical hardware and motor. Generally, the position loop gain cannot be increased beyond the range of natural vibration number of mechanical system. Please set these

three parameters reasonably when making adjustment; it may have adjustment failure in case of overload, which will burn the motor or lead to other failures;

2.5.6. Damping parameter

Note: No.30 parameter: It mainly applies to low speed and heavy load operation, and needs to be set properly; damping coefficient of position ring, adjust the parameters at low speed and heavy load; no altering is required in general;

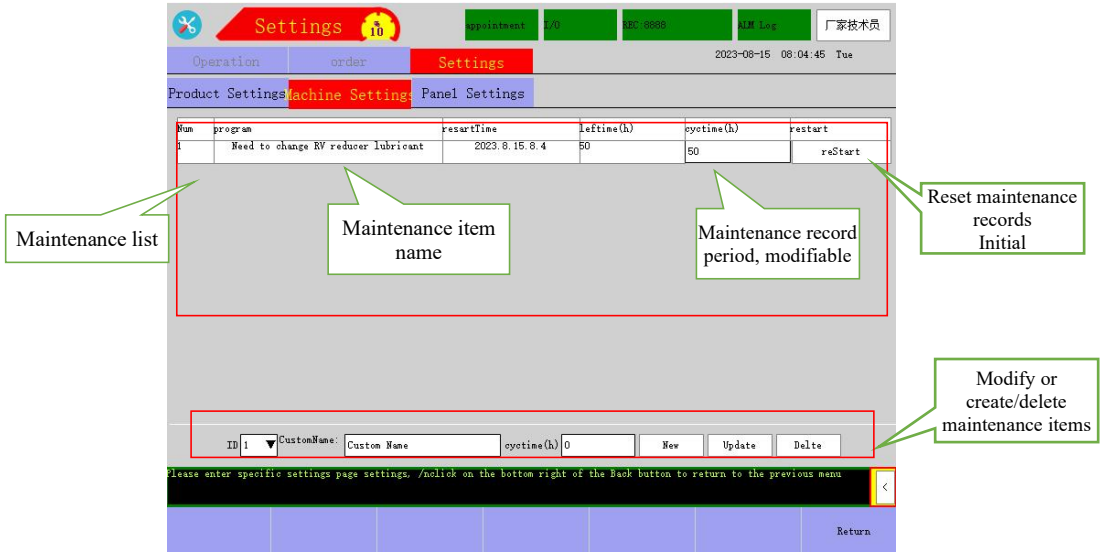
2.5.7. Smooth filtering

Note: No.41 parameter: If sudden speed change occurs when the smoothing motor runs at high speed, it will result in a feedback spike to deal with the filtering time constant, so as to avoid control failure due to major motor run-out; the parameters can be set properly, and no alternation is required in general;

2.5.8. Instructions of servo parameters

Parameter Number	Mapping address	Function code name	Parameter description	Setting Range	Unit	Default value
00	0x2E00	Software version/recover factory parameters	Write in 8051 to recover factory parameters (version above 2107)	0~65535		Version No.
01	0x2E01	Drive model	2:100~200w; 3:400w; 4:750w; 5:850~1300w 6:1800w	2~6		4
02	0x2E02	Motor code	Motor calibration code	1000~1600		1400
03	0x2E03	Parameter management	Write in 256 to recover factory parameters (version of 11xx series) 1. Advanced mode, inspect shielding parameter, it can clear overload and encoder error alarm	0x0000~0x1111		0x0000
04	0x2E04	Mandatory motor code	1: Compulsory			
08	0x2E08	Motor direction logic	0: Forward CCW 1: Reverse CCW	0~1		0
09	0x2E09	Encoder type selection	0: Increment 1: Absolute value 2: Absolute value of single turn	0~2		0
15	0x2E0F	Motor overload protection factor	10~100	10~100	%	50
19	0x2E13	Selection of single and double axles	0: Double axis, 1: Single axis			
21	0x2E15	Speed loop gain	The larger the response is, the faster the response will be. Vibration will result if the response is too large. Coordinated regulation of position mode and position loop gain	0~500	Hz	90
22	0x2E16	Speed loop integral time constant	The smaller the integral, the stronger the effect and the stronger the speed tracking ability. It should be coordinated with speed loop gain and position loop gain	0~300	ms	25
23	0x2E17	Position loop gain	The larger the response is, the faster the response will be. Vibration will result if the response is too large. Coordinated regulation of position mode and position loop gain	0~20	1/s	4
28	0x2E18	Speed feedforward gain	Its increase can reduce the steady-state position deviation, and it will lead to overshoot if it is too high	0~100	%	0
30	0x2E1E	damping coefficient	Position ring damping coefficient	100~500		100
31	0x2E1F	Speed feedback low-pass filtering coefficient		100~20000		20000
32	0x2E20	Current feedback low-pass filtering coefficient	Detect the actual current direction	100~20000		20000
33	0x2E21	Torque feedforward coefficient		0~100		0
34	0x2E22	Speed loop differential gain (low frequency)		0~1000		0
41	0x2E29	Moving average filtering constant	0~200.0	0~200.0	ms	0
42	0x2E2A	First-order low-pass filtering constant	0~6000.0	0~6000.0	ms	0
49	0x2E31	Position deviation limit	0.1~50.0 loops	0.1~50.0		5.0
69	0x2E45	Torque command low-pass filtering coefficient		100~20000		20000
71	0x2E47	Action command	1: Setting the current position as zero point	0~255		0
72	0x2E48	Notching filtering frequency		0~10000		0
73	0x2E49	Notching filtering frequency bandwidth		0~1000		0
99	0x2E63	Software version	Software version	0x0000~0xFFFF		0x0000
Note: The parameters above are commonly used for servo setting. Do not modify them at will unless necessary; otherwise, it will lead to control failure or damage to hardware equipment!!!						

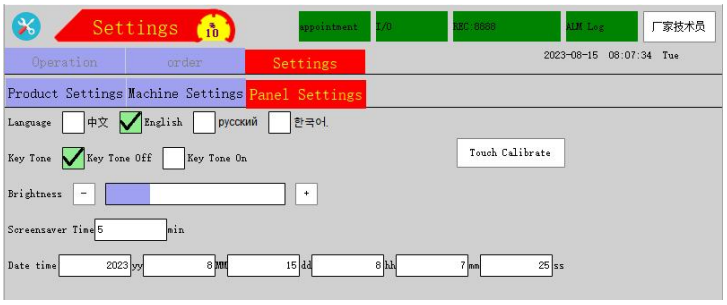
2.6. Maintenance



Note: Set the maintenance item name and cycle time, click "New" to start the cycle of one maintenance item. When the cycle time expires, the system will pop up to prompt the maintenance item event; to clear the item and enter this page again, click Restart or Delete (no need to trigger next time); note: The maintenance prompt is only a periodic reminder, which does not mean that the system can be maintained. It can only be cleared after the maintenance is completed manually according to the maintenance operation flow, and the cycle can be re-timed. It is allowed to modify the cycle time on this page to customize the maintenance schedule freely;

3. Setting of hand controller

3.1. Setting of hand controller



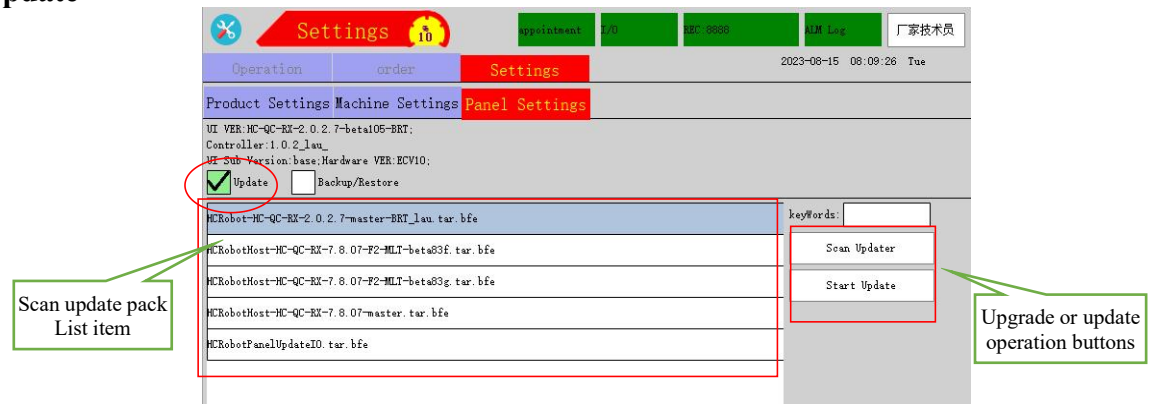
Note: The manual controller can be set, such as setting of switching operation language of hand controller; button sound on/off; screen brightness; screen saver time; screen time setting; touch screen correction;

Touch correction: Click the "Touch Correction" button and follow the prompts to perform the correction, or randomly rotate the third gear knob and then press F5 →F1 →F4 →F1→F3 →F1 →F2→ F5 in sequence to enter the screen calibration interface, perform the screen calibration according to the prompts; where the arrow of the hand controller cannot be selected, do not do re-calibration unless necessary. If the screen is damaged, it may fail to be repaired through calibration;

3.2. Maintenance

Operations such as system version update or other related upgrades or updates;

3.2.1. Update



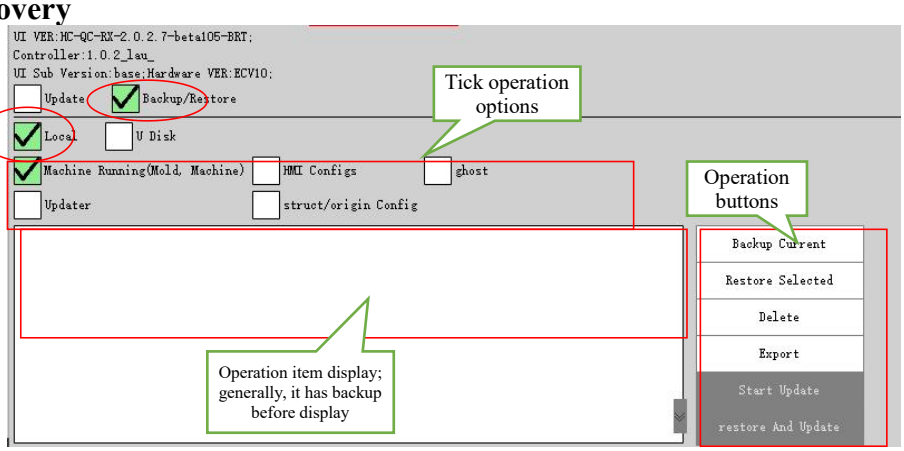
Note: The upgrade and update of hand controller, host system, servo system and other programs are operated here; the operation of upgrade is as follows:

1. Spare U disk, which should have capacity of 32G, non-system installation disk, realize storage in FAT32 format;
2. It is required to import the updated file into the root directory of the U disk and insert it into the U disk port of hand controller as required;

3. Click "Scan update pack" and display it in the list after identification;
4. Select the update program, click to start the update, do not power off during the update until the update is completed and the system is restarted;

For details, please refer to the operating instructions of upgrade program;

3.2.2. Backup/recovery



Backup and recover operation page

Note: Operate the parameters backup and recovery. The data backup is saved in the hand controller by default, and the exported backup file can be identified and displayed in the corresponding item on the U disk. The parameters that can be backed up or recovered include:

1. **Machine parameters (module number, machine setting):** Assigned parameters, such as setting of axis parameters, including soft limit and distance per revolution;
2. **Hand controller parameters (programmable buttons, manual control settings):** Assigned parameters, such as parameter settings in programmable buttons and all settings under hand controller settings;
3. **ghost:** Hand controller system and all back-up data; back up all the data of current manual controller;
4. **Update package:** When this machine is ticked, the previously updated program will be saved in the memory of hand controller; tick U disk to display the updated files in the U disk for selection and update;
5. **Structure/origin parameters:** Back up all structure parameters and origin parameters of all axes;

Instructions of operable keys:

Back up current state: Tick 本机 → Select the data requiring backup (machine parameters/hand controller parameters/ ghost / structure /origin parameters) → Click back up current state→ Enter the backup name in the pop-up dialog box of backup name → Click OK. The steps above are to back up the parameters to this machine. To back up to a USB flash drive, plug in a U disk on the basis of the above steps, then select the name of parameters which are backed up to this machine → Click the export button → Pop up the export completion dialog box and click OK. Rotate the three-gear knob at will, and then press F5 →F3→F4→F3→F2→F3→F1→F5 in sequence by using the short-cut button on hand controller, to enter the backup interface and make backup as prompted;

Restore the selected backup: Tick 本机 or U盘 → Select the identification data to be restored (machine parameters/hand controller parameters/ghost/ structure/origin parameters) → Click the "Restore the selected backup" button → The hand controller will restart and wait for the restart to complete the restoration based on the prompts;

Delete: Select the backup parameter item in the backup list and click this button to delete it;

Export: Select the backup parameter item in the backup list, click this button to export the selected parameter to a U disk inserted into the U disk port. Note:The U disk should meet the data storage requirements;

Start update: Re-operate the previously updated package (program update package);

Update and restore database: When the version of 207 and above is downgraded and updated to the version of 206 or earlier version, select the update package in the backup/restore, click "Update ' at the lower right corner and restore the database for update (this button is available for version of 207 and above); otherwise, there may be some database errors;

Explanation:

After inserting the U disk, tick U disk, display the identification file in the backup list, select the corresponding parameter type, and operate it accordingly; the operation and function are equivalent to the local operation, but the difference is that the backed-up data file is read from the U disk (the data which originally exported to the U disk); pay attention to the storage format and capacity of the U disk (it is recommended to store data with FAT16/32 format within 32G, otherwise, identification may fail) before operation, whether it is plugged in properly; otherwise, identification and operation may fail.

3.3. User management

This interface can be used to set the administrator's authority and modify the password;

Op: Authority of this item:

1. The axis can be moved in manual state, but it is unable to enter the teaching page for teaching;

2. It supports manipulator start and speed adjustment in the automatic state;
3. It can reset the origin and enter the product setting page to set parameters in stop state;
4. The registration page can be entered;

Mold: Authority of this item:
1. All authorities of Op;
2. Settings related to mold number;
3. Enter teaching page for teaching;
4. Support edit and revision of position, speed and delay of program action;

System: Authority of this item:
1. All authorities of Op;
2. Modify machine parameters;
3. Enter most setting pages of hand controller;

User: Authority of this item:
1. All authorities of Op;
2. Enter user management page.

Root: Authority of this item:
1. All authorities of Op;
2. The factory code on registration page can be seen.

Auto Modify: Authority of this item:
1. All authorities of Op;
2. Support edit and modification of position, speed and delay of program actions in auto mode;

New user: Edit the user name → Set the password → Tick the authority → Click "OK". Note: Authority above User is required

□Op
□Admin
□Super
□System
□User
□Root
□Auto Modify

Modify users: Select users in the user list → Edit user name/set password/tick authority→ Click OK;
Delete users: Select user in the user list → Click "Delete" button at the right side of user line;

Default user password

User Permission Management	Object-oriented	Initial default password
Operator (OP)	In manual mode, this authority can be used for moving axis only, instead of entering the teaching page for teaching; it supports robot start and speed adjustment in auto state; origin reset is supported in stop state.	Initial password 123
Administrator (admin)	In manual mode, this authority can be used for moving axis only, instead of entering the teaching page for teaching; it supports robot start and speed adjustment in auto state; origin reset is supported in stop state.	Initial password 123
Senior administrator (Super)	This authority supports all operations except for setting of factory parameters	Initial password 123456
Manufacturer technician (Factory technician)	This authority supports setting of factory parameters and all operations:	Initial password brtbrt
technician)	Developer	Reserved by factory

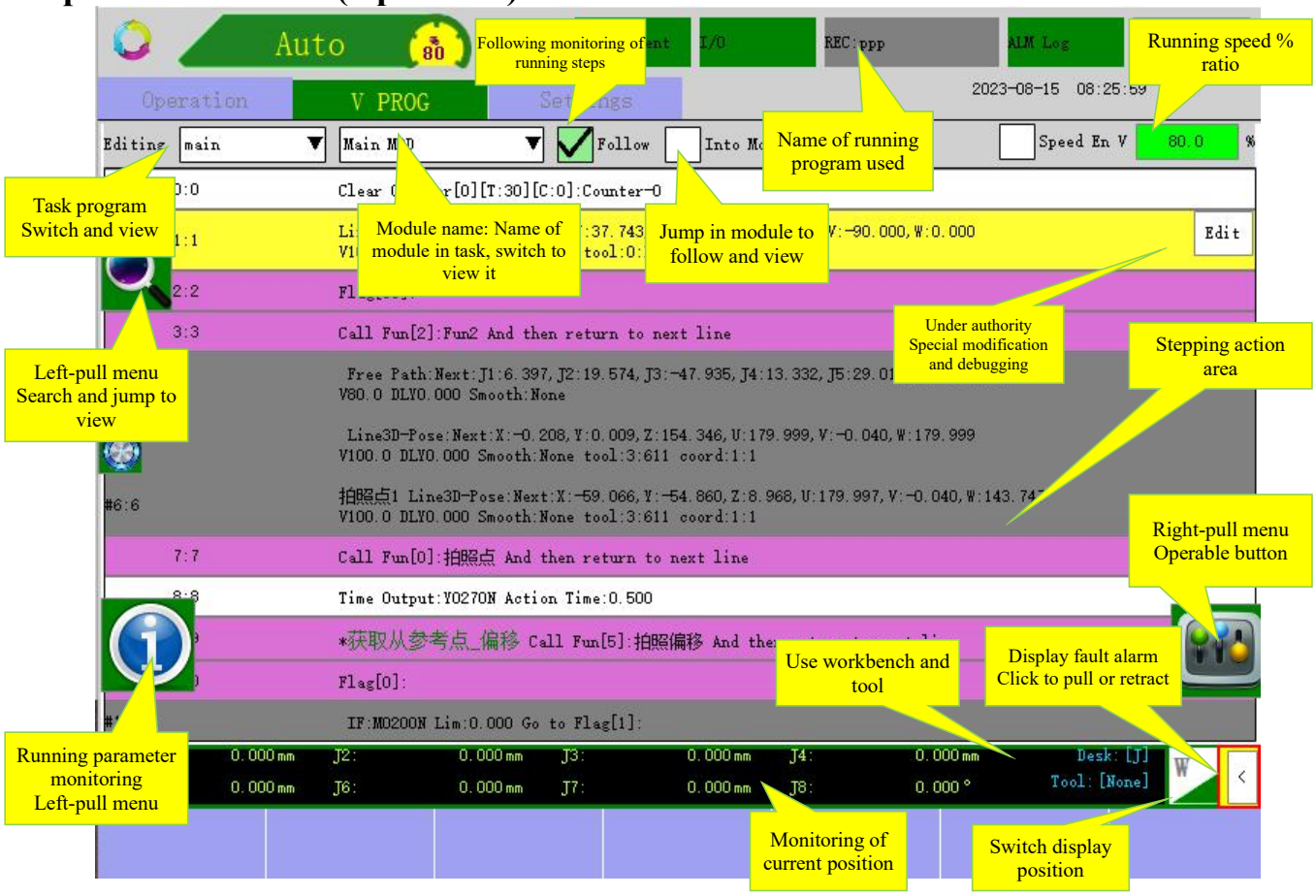
User authority:

Operations	Use authority			
	OPS	Administrator	Advanced Administrator	Factory technician
Reset	✓	✓	✓	✓
IO monitoring function	✓	✓	✓	✓
Log	✓	✓	✓	✓
Control movement	✓	✓	✓	✓
Run program	✓	✓	✓	✓
Switch mode number	×	✓	✓	✓
Modify and edit current program	×	✓	✓	✓
Programmable button	×	✓	✓	✓
Workbench calibration	×	✓	✓	✓
Calibration of coordination axis	×	✓	✓	✓
Operation Manual	Not open	Not open	Not open	Not open
Test run	Not open	Not open	Not open	Not open
Debugging log	Not open	Not open	Not open	Not open
Programming teaching	×	✓	✓	✓
Operating parameters	×	✓	✓	✓
Valve setting	×	✓	✓	✓
IO setting	×	✓	✓	✓
Buttons and indicators	×	✓	✓	✓
Communication configuration	×	✓	✓	✓
Safety area parameters	×	✓	✓	✓
Process setting	×	✓	✓	✓
Motor parameters - Read	×	✓	✓	✓
Motor parameters - Read - write	×	×	×	✓
Motor parameters - Axis enabling and shielding	×	✓	✓	✓
Motor parameters - Test over forward/reverse pulse	×	✓	✓	✓
Motor parameters - Set as origin	×	✓	✓	✓
Motor parameters - Set	×	×	×	✓

all as default origin				
Structural parameters - Read	×	✓	✓	✓
Structural parameters - Read-write	×	×	×	✓
System parameters	Not open	Not open	Not open	Not open
Revise origin (for calibration)	×	×	✓	✓
Servo parameters - Read	×	✓	✓	✓
Servo parameters - Read-write	×	×	×	✓
Hand controller setting	×	✓	✓	✓
Network Configuration	×	✓	✓	✓
Registration	Not open	Not open	Not open	Not open
Maintenance	×	✓	✓	✓
User management	×	×	×	✓

Note: The management authority varies along with user name. The authority ticked by user should prevail, as shown in picture above:

Chapter 5 Auto Gear (Operation)



Display relevant information under auto mode

1. Running monitoring

Explanation:

Under auto running mode, it can monitor the position of running action step, related IO status, related counters, counters, data address data of running;

IO monitoring: It can also be monitored under auto running, including routine monitoring of IO and data address;

Task item program: This option can monitor or view the programs which are edited and run in its tasks. The tasks include main programs and subroutines 1-16, a total of 17 task programs, among which, subprogram 8 is procedural for special tasks. Please refer to the stop gear section for relevant instructions for the instruction of subprogram 8. Note: In manual programming mode, *Programmable Button* can also be switched for viewing here;

Module name: The default main module, which is the main program action area of this task; other newly created modules are calling modules, which can be used for calling; it is allowed to switch to the module from here to check the program action; when programming in manual gear, it can be switched to the module to view and write action steps;

Follow and jump into the module: Tick these two items and when auto mode is entered and tasks are selected, it will start from the main program, the stepping area will display the current execution step in the step action area along with the execution step; generally, the green step is taken as the current execution step; if there's action step in a module, the original main program display will automatically switch to the module name;

Display current position monitoring and switching: Display node coordinates and spatial coordinates, which include the position of world and workbench; the workbench and tools are used for monitoring during running, and the real-time monitoring display needs to be switched to W/J mode;

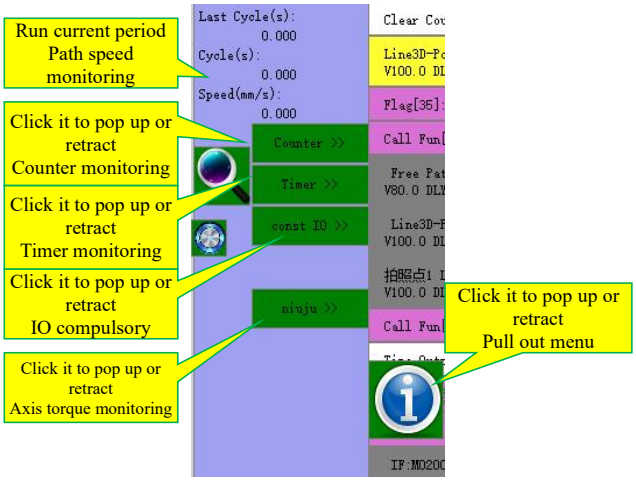
Running speed display: When debugging is enabled, use the acceleration and deceleration button to accelerate and decrease, and display the speed ratio;

Operation parameter monitoring (left pull-out menu): It can monitor its counter, timer, torque and other lines or perform general operations; it applies to compulsory IO operation and debugging, do not use it when it is unclear; search pull-out box, assign or distinguish more areas to search for action steps, and click to jump to the action (task program or action block) area to view the action steps;

Action step modification: It applies to special debugging, such as modification of delay action time and percentage of path action speed;

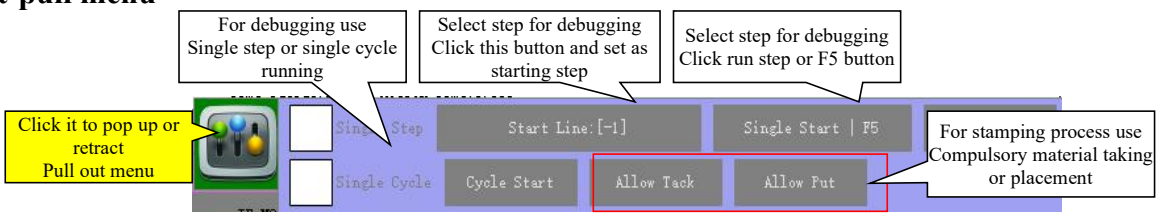
Right pull-out menu: Click to pop up or retract operation menu, to operate the corresponding key function;

2. Left-pull menu



Instruction: For monitoring or debugging use;

3. Right-pull menu



Explanation:

Pop-up button: Click the pop-up or retract menu, at the right side in auto mode;

Single-step mode: Click it to pop up the menu. During debugging, tick the single-step mode, select a step in the program display area, and click "Set as Start", which means, start the debugging operation from the selected behavior. It is started from Step 0 by default. Click the single-step start button, and the robot will have downward execution in turns according to the order of executed action steps; sometimes it equals to the intermittent operation of single action of robot. The Step 1 will be executed each time the single-step start button or F5 function button is pressed;

Single cycle mode: Click it to pop up the menu, tick the single cycle mode during debugging, and click start single cycle, which means, the action step of main module program will stop when the program is ended, and other actions in task will have synchronized start; note: When the program has a loop body, it can't be ended nor stopped after entering, and the loop will be executed constantly;

Permit material receiving/placement: This button will be displayed only when stamping process is started, or hidden and disabled in other processes;

4. Start running

Note: In addition to the execution of single-step mode debugging or single-cycle mode startup mentioned above, the program can also be started by using the start button on the hand controller or the external button (parameters need to be set) to start the program operation or remote communication command. The stop is also performed through the stop button on hand controller or external stop button. Press the stop key of the hand controller or the external stop key; if the gear switch is switched during operation, the program will also stop running. When the follow-up action is ticked during running, the running action will be green.

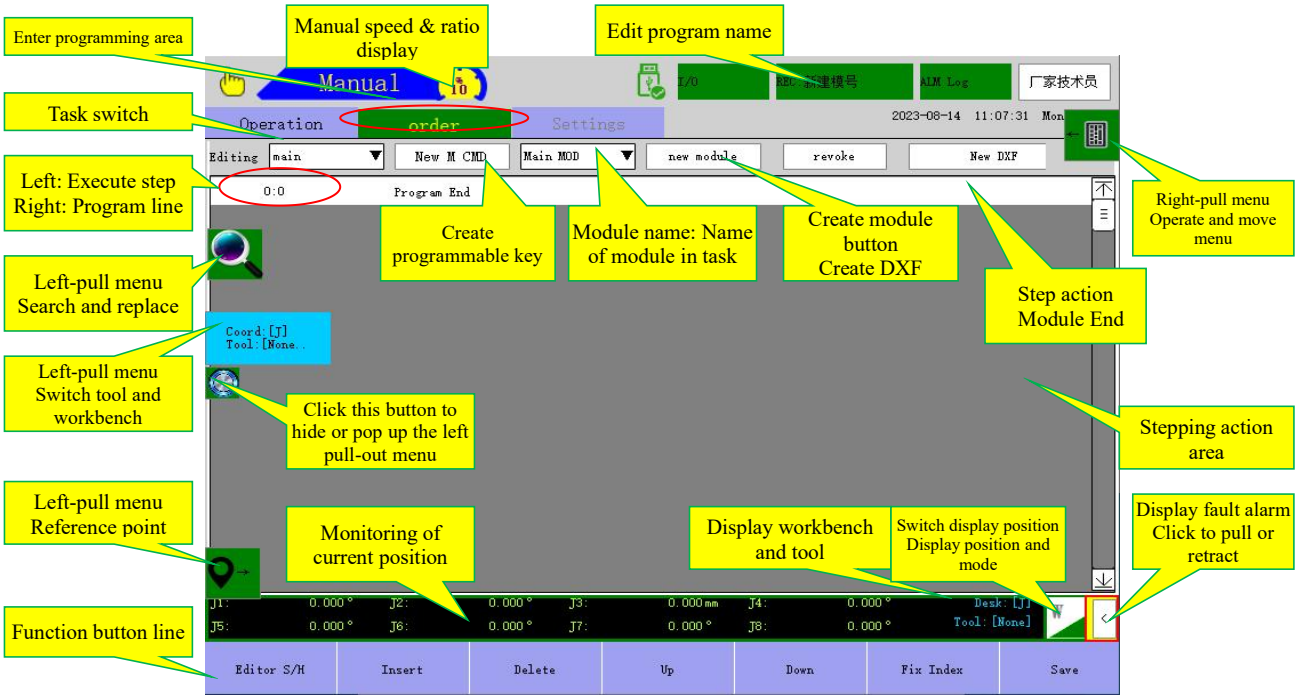
Note:

As a multi-function button, the stop button of hand controller may have varying functions in different modes or states; in auto stop mode, press the button once to switch to single cycle mode, or press it twice to stop immediately; when an alarm is given, press the stop button to clear some alarms, and some alarms need to be cleared at stop gear; please perform operation according to the actual conditions or prompts;

Chapter 6 Instructions & Programming

1. Software function button and operation menu

Instructions such as display



Display programming page

1. Manual speed ratio

Note: Speed when manually moving nodes or moving space positions/trial path speed, actual manual speed = N% * manual linear speed limit or manual node speed limit or manual angular speed limit;

2. Edit program name

Note: Use the mold number or the program being edited; click to pop up the item operations, such as create mold number or switch program mold number;

3. Switch task

Note: Edit in progress: Display the task number, such as main program, subprogram 1-16, a total of 17 tasks, each task runs independently, and it runs simultaneously during automatic operation. In general, the programming is based on the main program, and other tasks are the auxiliary ones to write logical actions; "Programmable button" can also be switched into the "Programmable button" programming action area from here, to view the program actions in the task or the action steps in the programming task; the program actions in subprogram 8, the system itself will have auto running in any state (automatic/manual/stop) by default, and the programming should be used for auxiliary purpose with caution;

4. Module name

Note: Display the module name, and the main program is the task start block; it can switch different modules and display the contents of step action in module here; except the main module, other established modules belong to action blocks which can be reused, and can be called in any task program, they will not work unless called; switch into the module, and click "Delete module" button to delete the module;

5. New module

Note: The newly created module is also called action module that is mainly used for the same action and multiple calls; when modification is required, the actions at all call position can be modified by modifying the actions in module. Note: When being called, the action module should not be called along with other tasks; otherwise, a fault may occur;

6. New programmable button

Note: Click "New programmable button" to establish special task module that can't be called; use of programmable button: View or use it in "Programmable button" area at manual gear. After being established, it has the same operation with new module; enter the action area of programmable button, click "Delete programmable button" to delete the programmable button that is entered;

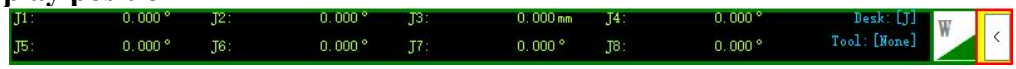
7. Display fault alarm

Alarm display

Note: When the robot gives alarm, the alarm information will cover the current position, as shown in picture above; click "!" to pop up the information box that shows the fault cause and treatment method, then click it again to retract; click ">" to pop up or retract the display of alarm information;

Note: In case of fault alarm, this information can be displayed and viewed under any gear;

8. Switch display position



Location display

note: Click the  button at the right side to switch the location display of spatial coordinate or node coordinate system. Note: The spatial coordinate includes the world and user workbench.

9. Current position

Note: As shown above, switch the modes to display the current position of robot end or nodes in real time; note: When a tool is used, the robot end will be displayed as the tool end position; when workbench is switched, the display position will be displayed as relative workbench position;

10. Function button line

Note: The function button line may have varying function buttons along with the modes. Programming is the commonly used function button and its functions are as follows:

Action menu: Programming command button, click this button to pop up or retract the command selection interface;

Insert: Select the programming commands and set the parameters, click this button to write the parameters into the interface of action step preparation area, and the selected line is the insertion position;

Delete: Select certain line in the action step preparation area, click this button to delete the selected line; note: The mold completion line, which exists in all modules, can't be deleted;

Up/down: Select certain line, click up or down to exchange the up or down position; note: Up will be ineffective when there's no up line, or down will be ineffective when down line is mold completion;

Arrange number: Click this button to rearrange the execution step number and program line step number; it is divided into left execution step number and right programming step number. The middle is separated by ":"; the left is program execution step sequence, while the right is program modification and programming step number; if this number does not exist, it will prepare the number from the end; when the number is deleted, the programming step number will be removed directly; after number is arranged, the execution step line has the same display with programming step line, and the line number is started from 0;

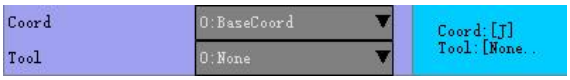
Save: Save the prepared program action; when not saved, it will quit immediately and the saved action line will be missing;

11. Stepping action area

Note: Programming step action area or execution step action area will display the edited program step action; note: <Module completion> step action is the default action step which can't be deleted or removed at the stop bit of action block or step action area;

12. Left pull-out menu - Switch workbench and tool

Pop up window: Switch workbench/tool

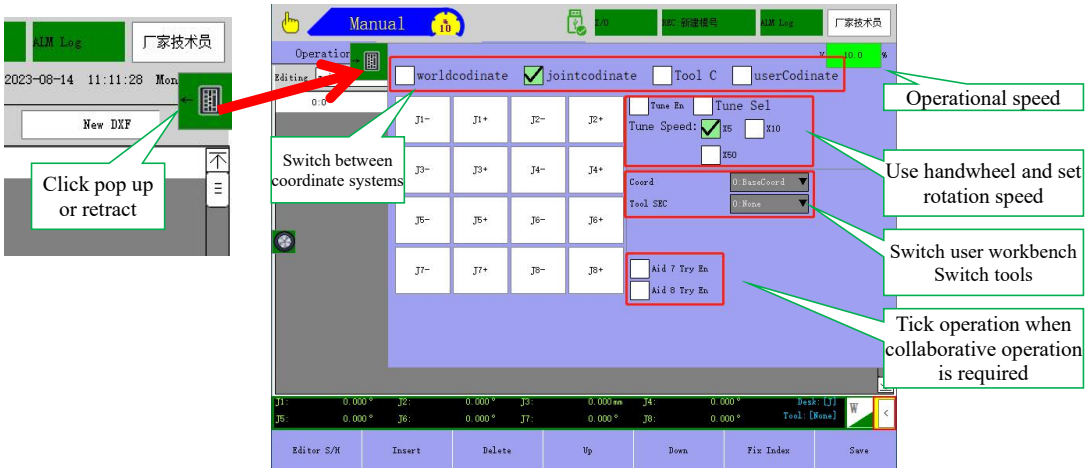


Pop up short-cut switch coordinate system

Note: Switch the coordinate and tools quickly

13. Right pull-out menu - Switch between coordinate system and soft operation

Pop up menu: Switch between operation soft button, workbench and tool

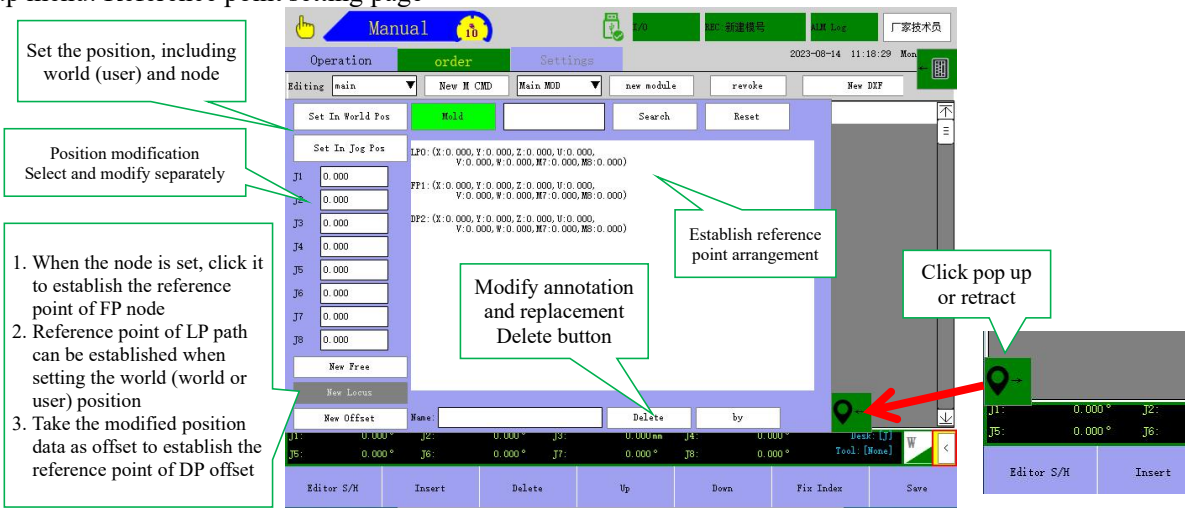


For details of operation above, please refer to the operation of manual operation coordinate system and external right button area

Note: This menu is mainly used for switching the operation coordinate system and tool, binding workbench and other auxiliary operation items; meanwhile, its page includes axis operation button and movement button, and the operation is related to coordinate system selection;

14. Left pull-out menu - Establish reference point

Pop up menu: Reference point setting page



Establish and delete reference point

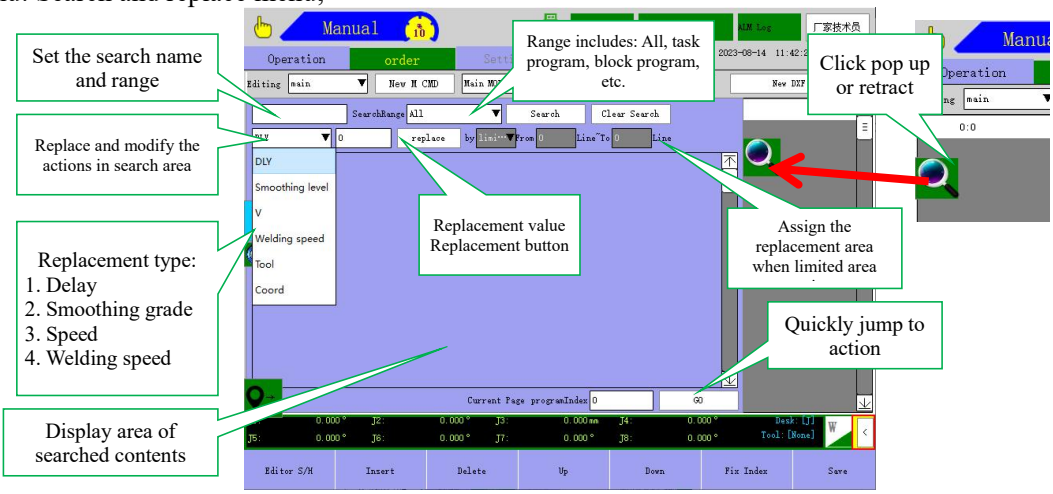
1. Operation process of establishing reference point:
   1. **New node:** Move to the position, click *Set Node Position*, confirm the data, click *New Node* button, the established action points are distinguished by the beginning of *FP + Serial Number*; when single point needs naming, enter the point name at the point name position, then click "New" button to complete;
   2. **New path point:** Move to position, click *Set World Position*, confirm the data, click *New Path Point* button, the established action point is distinguished by *FP + Serial Number*; when single point needs naming, enter the point name at the point name position, then click "New" button to complete;
   3. **New path point:** Fill the movement data at deviation direction, click *New Offset Point* button, the new action point is distinguished by *DP + Serial Number*; when single point needs naming, enter the point name at the point name position, then click "New" button to complete;
2. Operation process of modifying and deleting reference point
   1. **Modify:** Click and select the reference point in action point area, the data read by system will be displayed in the corresponding parameter items in the left area, modify the corresponding parameters and when all parameters (including modification of replacement point name), click *Replacement Position* button to pop up the menu, click *Yes* to modify the action point; or click *No* if it is not deleted;
   2. **Delete:** Click and select reference point in action point area, click *Delete* button to pop up the menu, click *Yes* to delete it, or click *No* if it is not deleted;
3. **Trial operation:**

   Click the corresponding reference points in action point area, press *Trial* button on the selected line to conduct trial operation of reference point; during operation, enable it and click Trial button to conduct trial operation of reference point;

Note: Establish type of reference point; point name: FP applies to node command, LP applies to attitude command, while DP applies to offset command;

15. Left pull-out menu - Search and replace

Pop up menu: Search and replace menu;



Replacement operation area

Action:

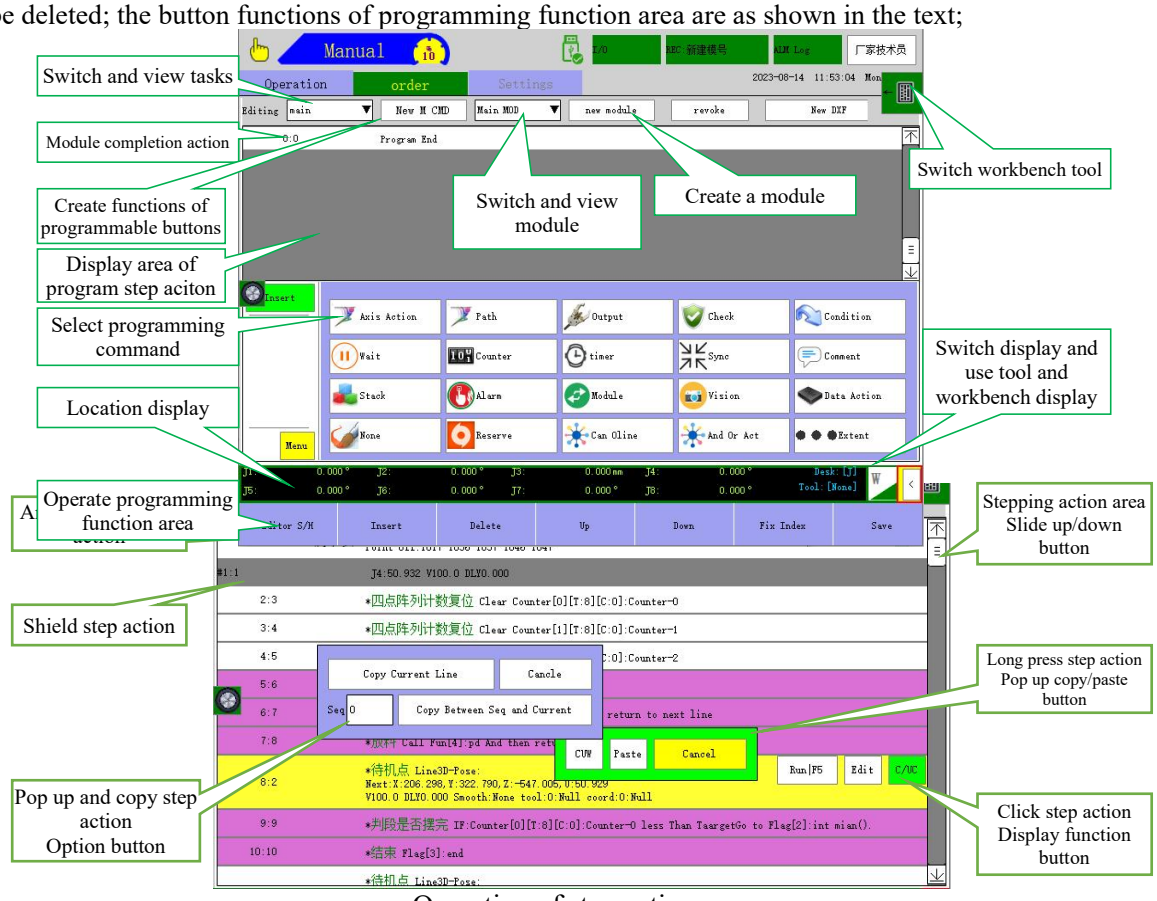
1. Search: Search name, area range (task or module), click Search to display the corresponding results in the lower box area by section;
2. Replacement parameter: Select the parameters such as replacement parameter, set the area range, click Replace button to replace the corresponding parameters;

Note: As for the search results, certain parameters can be modified or replaced within the assigned range or jump to this position;

2. Programming command and function

1. Programming operation

Note: Programming area, i.e. display area of program action; when action step command is inserted, it will be displayed in the program display area; when there's no action step and only module completion is reserved, this step can't be deleted; the button functions of programming function area are as shown in the text;



Operation of step action area

1. **Step action annotation:** Click step action, click Modify button, the command parameter page has "Customized name" parameter, i.e. command annotation that belongs to single step annotation; the annotation texts are in green, marked with *; the blue texts are process command names and not modifiable;
2. **Shield step action:** Click step action to display the "Shield" function button, to shield the step action or open

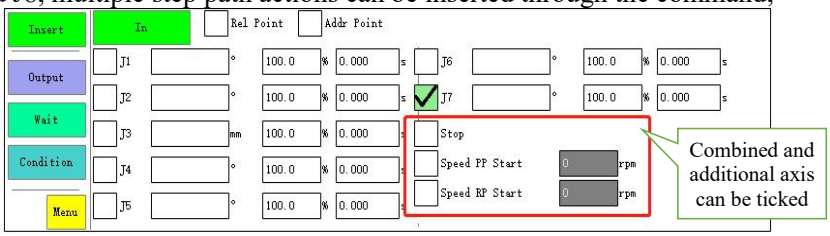
shielding operation; for shield action,when "#" is displayed at front of step action number and there's gray command, the command will not be executed during auto running;

3. **Copy step action:** Long press certain step action, pop up copy and paste box, click "Copy" button to pop up the copy box, and it is divided into copy of single step and copy of continuous action;
   1. **Copy single step:** Select the copied action step, click "Copy" to store the current step action in the copy area; when using paste function, insert the step action at the upper position according to the selected step action;
   2. **Copy continuous step:** Set the initial serial number, select "Copy to action step position", click "Copy serial number to current line" button, that is to say, copy the action in area to the copy area; when using paste function, insert the step action at the upper position according to the selected step action;
4. **Trial F5:** Click step action, press external function button "F5", or click step action to display "Trial | F5" button; when it is enabled and the condition is satisfied, the robot will move the robot to the action position of command path according to the command or execute the action of command, such as output; pay attention whether the execution can have trial operation!
5. **Modify:** Click step action, click to display "Modify" function button, pop up the modified parameter page if the command supports modification; perform modification to corresponding position according to the parameters, and press "OK" to modify this command;

2. Programming command

1. Axis action

Note: It mainly refers to the commands which drive the action of single axis; the axis position can be value position, replacement position of reference point or replacement position of reference address variable; it can drive Axis J1-J6, additional axis J7 and J8, multiple step path actions can be inserted through the command;



Menu of axis action page

1. **Axis position:** Tick the axis, click "Set"or directly enter the position to the node position, then insert it to the assigned position of step action area; tick multiple axles to insert the action of multiple axles at the same time; sequence: J1, J2, J3, J4, J5, J6, J7, J8;
2. **Set position via reference point:** The reference point (FP) path must be established before use; tick the axis and reference point, select the new reference point at axis position for binding, and then insert it into the step action area;
3. **Set position via reference address:** Control the axis action position through the open memory address (800-899), tick the axis and reference address, enter the reference address at the position, then click "Insert step action area";
4. **Stop:** Combined function, all axles (additional axis) can be used along with this function, and the axis action will be stopped immediately when this function is executed; note: Any conflict of command axis may lead to unexpected faults or accidents;
5. **Forward start of speed:** This function can be used along with additional axis only; this function can be used for driving the axis when the axis is set as single-direction continuous action, and the end point is unlimited; note: The axis should be set as rotation clearing, which equals to control of motor rotation;
6. **Reverse start of speed:** This function can be used along with additional axis only; this function can be used for driving the axis when the axis is set as single-direction continuous action, and the end point is unlimited; note: The axis should be set as rotation clearing, which equals to control of motor rotation;

Note: When this function is used, it is not allowed to execute action of the same axis in other tasks (not allowed to execute axis action while executing path command); any conflict with path command path may lead to fault alarm;

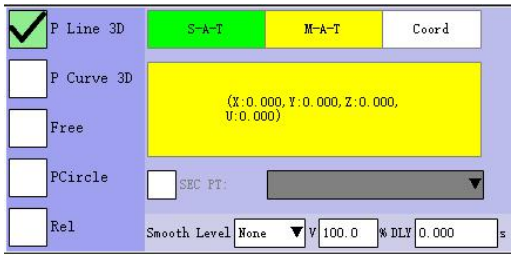
2. Path

Note: The path command includes attitude straight line, attitude curve, free path, attitude whole circle and relative command (relative attitude straight line, relative attitude curve and relative free path);

Note: The command is attached with tools and workbench; the current position, tool and workbench are set (free action is not provided with tool and workbench) when setting the position; the position or end attitude can be different (the actual running position and attitude are not changed) when the command is manual switch of tool or workbench (relative command), attitude change may occur when path action have movement; it will give alarm and path planning will fail when moving at the singular point or exceeding the action range;

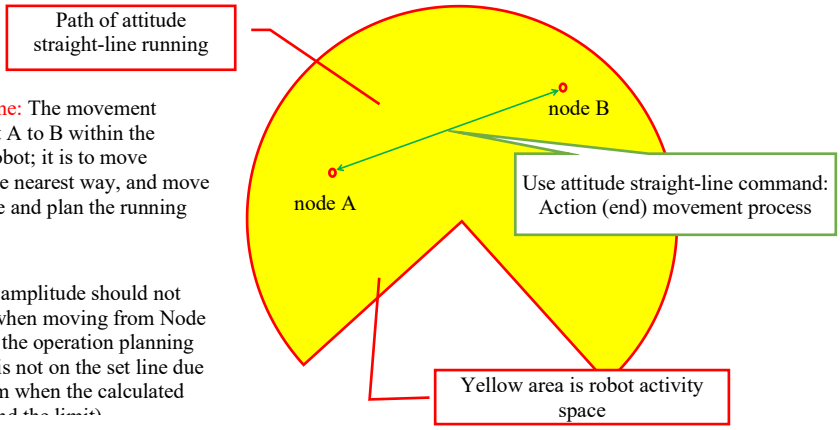
Instructions of operation command:

1. **Attitude straight line:** Tick "Attitude straight line" and set the end point position (current position);



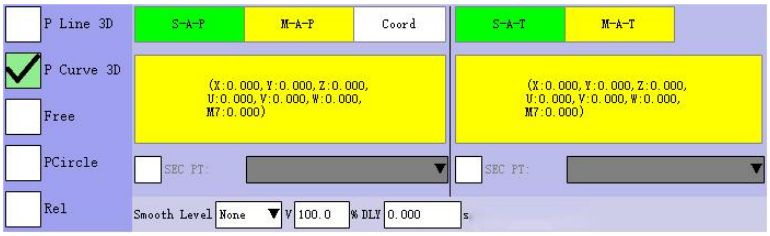
Attitude straight line - End point

Working principle: Start movement to the set end point position from certain starting point; the robot has straight-line movement to the end point position from the end starting point; the end must be calibrated when tools are attached;



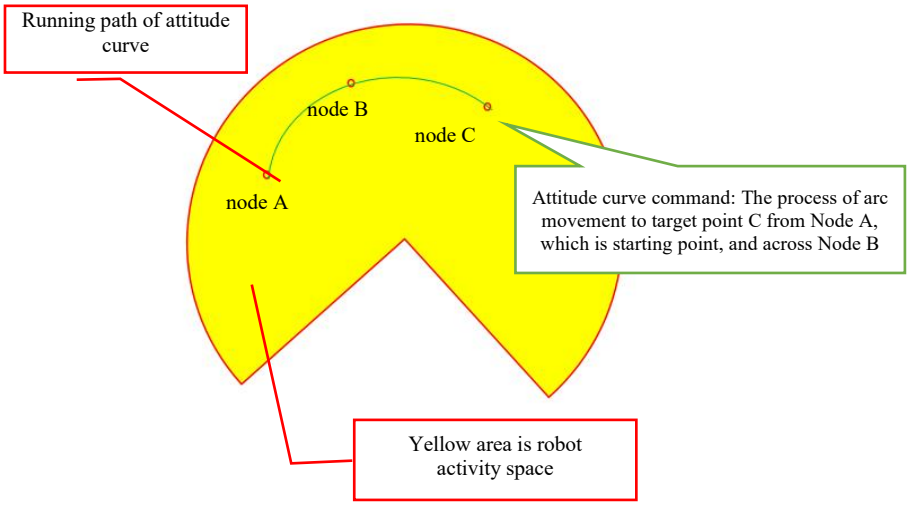
Attitude straight line - Movement track

2. Attitude curve: Tick "Attitude curve", select position on the planned curve, set the middle position, end position (curve terminal) and one action position point is set as starting point before the command, i.e. the curve starting point;



Attitude curve - Middle node and end node

Working principle: Start arc movement from the starting point, cross the middle node and stop when reaching the set end point; attitude change: The attitude difference may lead to attitude changes, the robot end will have curve movement and reach the end point across the middle node; when the starting point is not on the original curve, it will start from the halfway (not paused), and the curve track may be different from the previously planned curve; the end must be calibrated when tools are provided;

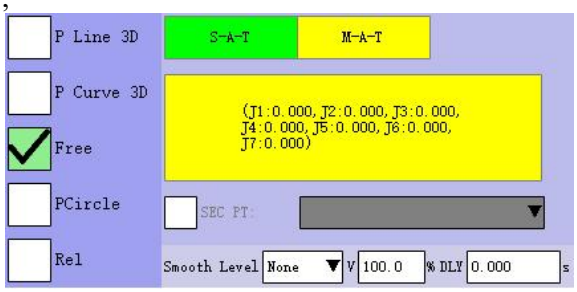


Attitude curve - Movement track

Note: The trial operation must be started from the previous node of command, in order to ensure correct path; perform trial operation to Node A and then have trial operation of curve command; the curve command

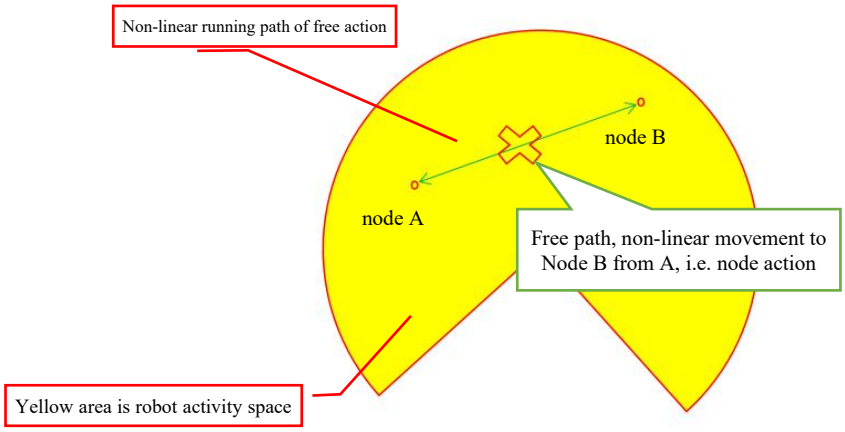
includes Node B (middle node) and Node C (end node);

3. Free path: Tick "Free action";



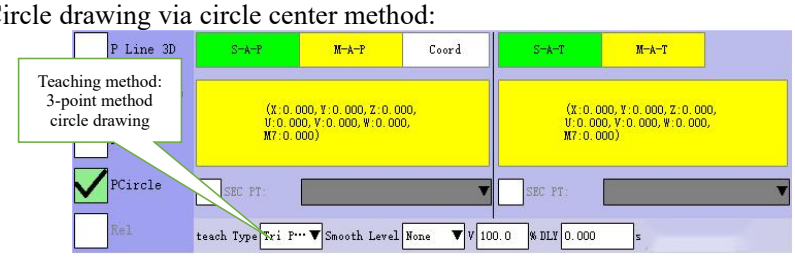
Free path - End node

Working principle: The node moves to the end node from the starting node, reaches the assigned node position at the highest speed, which equals to combined execution of axis action and non-linear movement to end node; note: Check whether there's obstacle during movement when using this command!!!

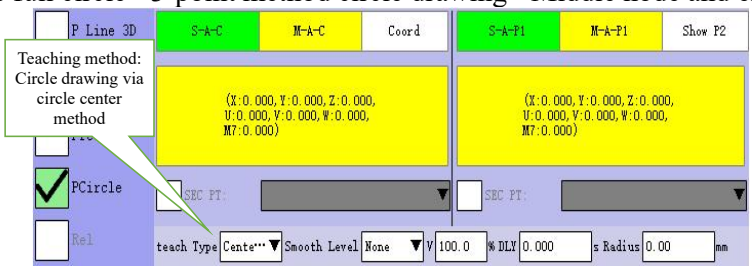


Free action - Movement track

4. Attitude full circle: Tick "Attitude full circle" and circle drawing is divided into two methods: 1. 3-point method circle drawing; 2. Circle drawing via circle center method:



Attitude full circle - 3-point method circle drawing - Middle node and end node



Attitude full circle - Circle drawing via circle center method - Circle center, Point P1 and P2

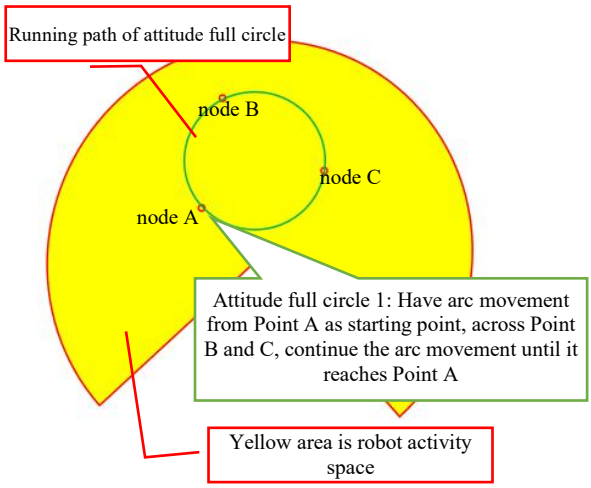
3-point method circle drawing: Draw a circle by using 3 points on the circle, set the starting point (it must be on the circle), middle point (arc direction), set the end point, auxiliary point and select arc point;

Working principle: Start arc movement from the starting point, cross the middle point and end point, then return to the starting point in curve line and then stop; note: The attitude of each recording point guides the attitude transformation and movement of circular track; when the starting point is not on the planned arc, the running track will not be the original defined circle; when the movement is stopped at halfway and restart, the track of running curve may be inconsistent with the original defined track, and the starting point of returning will also be the starting point in the middle; the end must be calibrated when tools are provided;

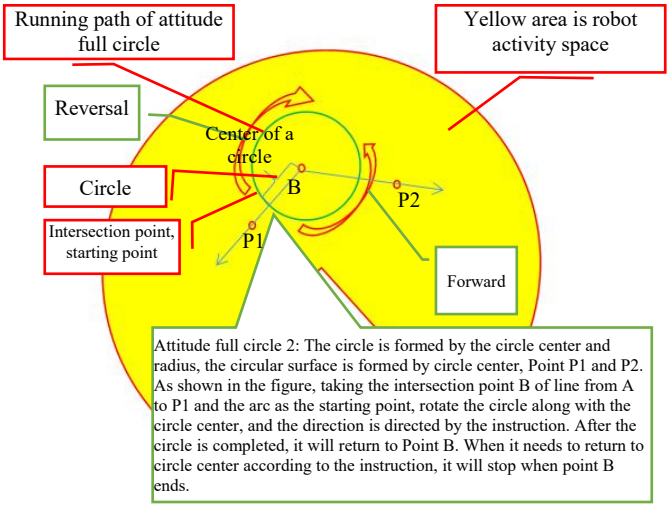
Circle drawing via circle enter method: Set the circle center, set P1 as starting point, P2 as auxiliary point, set the circle radius and movement track direction;

Working principle: Extend to Point P1 from the circle center, taking the start of radius distance as starting point, rotate the track at forward or reverse direction of track to draw the circle, and stop at the starting point; note: The circle plane is composed of circle center, P1 and P2; the end must be calibrated when tools are

provided;



3-point method circle drawing

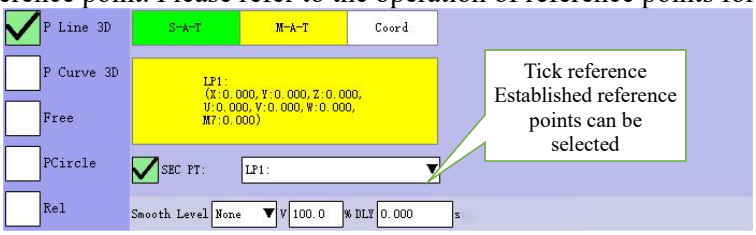


Circle drawing via circle center method

5. Relative: When it is used in combination with attitude straight line, attitude curve and free path command, a new track of point operation is formed by referring to and setting the data after the relative deviation of each point through the origin (stop position); note: Compared with the reference origin (stop point), the starting point is the reference of the current position of operation. When stop it halfway and run again, it will have major difference from the original set path at this time, so please use it with caution;

Relative command - *Attitude Straight Line*, *Attitude Curve* and *Free Path* are used in combination

9. Reference address: The reference point action should be established before use, which are LP → Attitude straight line and curve reference points, FP → Free path reference point, DF → offset (relative instruction) reference points; when reference point is used for a path instruction, it is required to tick the reference point and select an established reference point. When modifying the path position, the reference point can be modified directly, which is suitable for the action path with repeated paths. When unifying actions, it can be modified by modifying the same reference point. Please refer to the operation of reference points for details:



Use reference address

Attached parameters of command:

Bind workbench: Bind the current workbench and tool to the command when command is in the set position; it can be switched in the bound workbench and re-save the command to switch; the command position may be different from the original set position when switching the bound workbench and save tool only; when the robot end needs to enter the action recording position after switching workbench and tool, it is required to reset the current position after switching of workbench and tool, which means, the command position is saved as the switched workbench and tool command!

Smoothing: The angle formed by the combination of position point of the last path, the position of this recording path and the position of the next recording path. When the track is running, the action smoothness brought by corner change in a smooth way; when smoothing is not used solely, a recording position point must be in place before running to the next point; when smoothing is used and the record point is not reached according to the level of smoothing value at the corner, which means, it is switched to the mode of running in the next running track;

Speed: Preset speed of path command, actual running speed = Set max. speed * running speed % * preset speed %; special note: If special auxiliary control commands are used before the command, such as physical speed setting, the set operation will prevail during operation, until the cancellation command is executed;

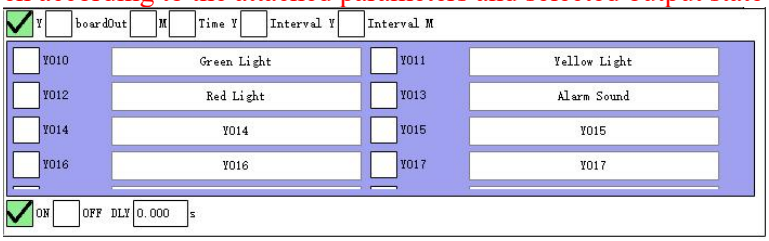
Delay: While executing this action point, it will have action of this point position according to the set delay;

3. Signal output

Note: Physical IO control output and output mode; the point types include: Point Y, M middle relay point and point of EUY injection molding board;

1. IO output Y, M, EUY: Common output, the output modes include: On or off status; attached with command parameter of delay execution; 1 IO insertion is selected in command;

   Working principle: Insert the generated command according to the selected IO type, output point and attached parameters; it is driven according to the attached parameters and selected output state during execution;



Signal output - Point Y or M middle variable, EUY point

2. Board output: On or off of multi-point selection output, support output of Point Y and Point M board temporarily; the set parameters include:

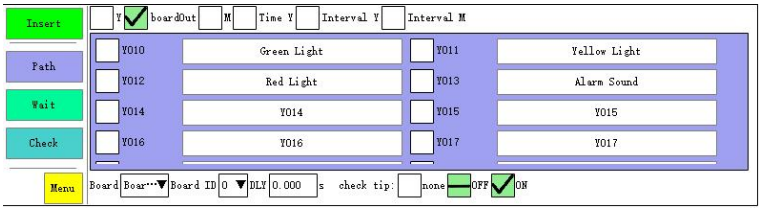
   Board type: IO board (Point Y) and M board (Point M);

   Board ID: Distribute ID to assigned board, the default is Board 0; when expanding boards, it should be analogized according to Board 1, 2; the actual conditions should prevail;

   Delay: The delay time of command execution;

   Select and control IO area: Display all output IO of IO board by default; selection mode: It can be selected as none, on or off; it is none by default, select 1 of 3 (none☐, on☑, off ⊟); note: Multiple settings can be set for IO;

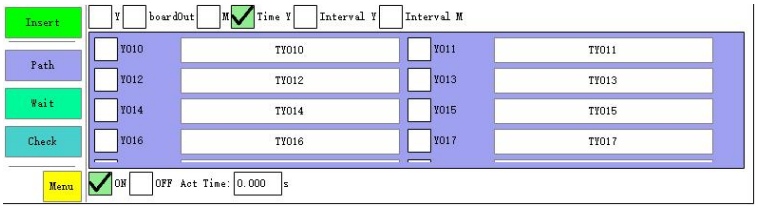
   Working principle: Select the options and attached parameters, such as none, on or off of IO area according to the IO type and ID of board in display area, insert and establish the command information; drive output on or off according to the attached parameters and selected output IO state during execution, it is not driven when not selected.



Signal output - Output of Point Y board

3. Time output: Type Y IO, select 1 IO, set the action time parameters according to the output state of on or off;

   Working principle: When the set output is Y010 connection and action time is 0.5S, then it will execute reset 0.5S after output on while executing the action; when output off is selected, it will be reset as on after 0.5S off of action output;



Signal output - Y time output

4. Interval output Y and M: The interval type includes Y and M;

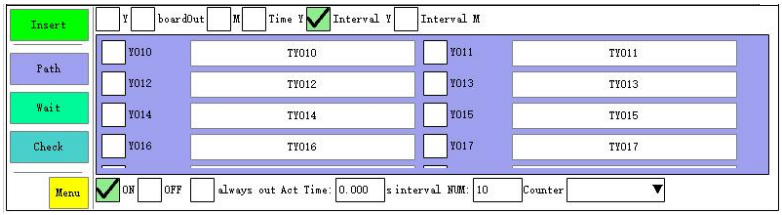
   Output state includes: Connection, disconnection and constant output (save output and action time will not take effects) can be ticked;

   Action time: Output on or off is effective according to the setting, output the set action time;

   Interval number: Execution times, the command is executed for the set times and then output according to the set IO action time or the ticked state always has output;

   Counter: Counter mode, attached counter or established counter; the attached counter is selected by default and counting is not saved; select the counter and save counting;

   Working principle: The count value is compared with the number of intervals while executing the command. If the number of intervals is greater than the same, it has output according to the ticked output IO state, and the output is reset according to the set action time, and there is similar time output; When constant output is selected, the output can be turned on or off according to the set output; note: When the value of attached counter is equal to the number of intervals, the value will be cleared automatically; when the external counter is selected, it is regarded to be cleared;



Signal output - Y, M interval output

4. Signal detection

Note: There's Type IO detection of X and EUX input;

Command 1: Give alarm when the set IO on or off is detected;

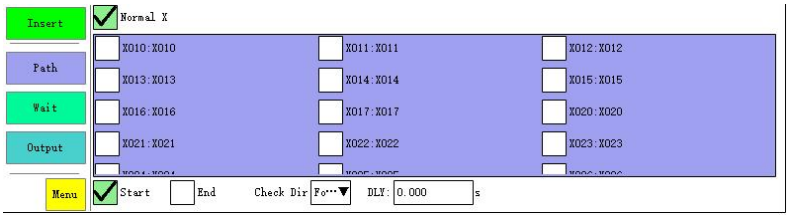
Command 2: Assign IO and stop detection;

Note: Only 1 IO can be selected each time;

Operating principle:

Start command: When the start detection command is executed, tick IO to start detection whether the state is on or off, and then give an alarm; when non-execution is ended, detect the state at real time according to the command; the alarm will stop when ticked IO state is changed to the set state.

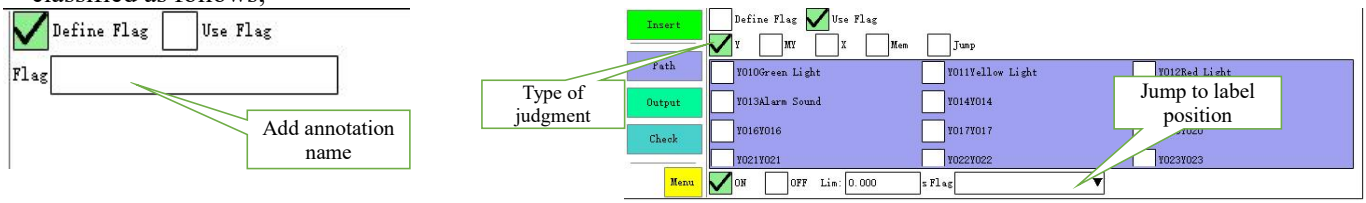
End command: End the assigned IO detection, tick detection task when it is ended; it is provided with delay execution command.



Signal detection - Operation page

5. Conditional jump

Note: Take label step action as target (label is added firstly), then make logic judgment by using the conditions such as IO, intermediate variable or counter, timer and data value; jump to label position when conditions are satisfied; otherwise, jump to the next line; the attached parameters are provided with delayed execution, and the conditions are classified as follows;



Jump command - Left: Establish label, right: Select and use condition

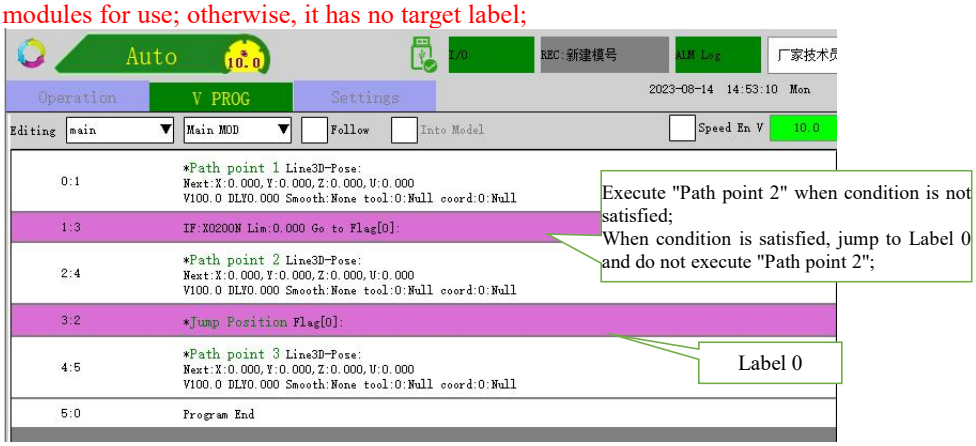
Establish label: Tick "Define label" option, click "Label[ ]" in label edit box to pop up the keyboard to edit name and confirm; or insert it and have label annotation, click "Insert step position";

Operating principle:

When condition is not satisfied, it will not execute jump but execute the following action; when condition is satisfied, it will jump to the assigned label bit as start, and then execute the action;

Note: 1. When target label is deleted, the program may fail to be saved or lead to other faults;

2. Jump command is used only for searching the corresponding labels in the current module and can't be jumped to the label of other modules for use; otherwise, it has no target label;

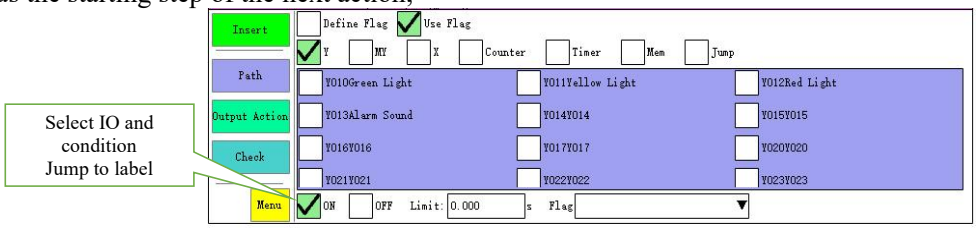


Simple cases of jump command

5.1. Condition - Output IO type (Type Y, EUY)

Note: Judge the IO on/off state of bool; when step is executed and condition is satisfied, it will jump to the assigned

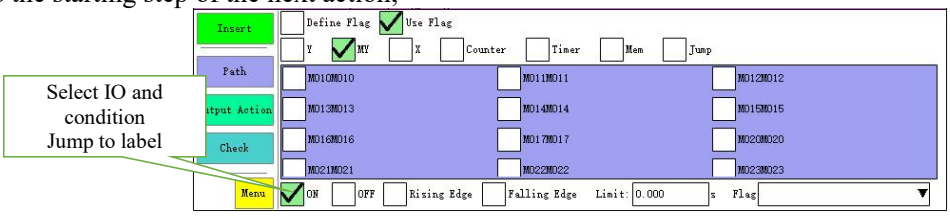
label position as the starting step of the next action;



Tick single IO condition

5.2. Condition - Input or output

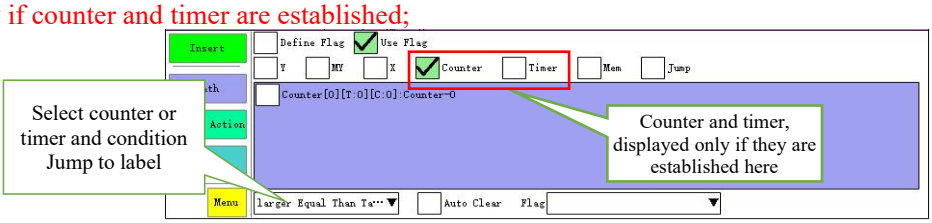
Note: Type IO (Type X, M, EUX): Judge the type of Type bool input IO signal: Triggered by the conditions such as on, off, rising edge and falling edge signal; when condition is executed and condition is satisfied, jump to the assigned label position as the starting step of the next action;



Tick single IO condition

5.3. Condition - Counter and timer

Note: Compare the current change value (value comparison: Higher than, higher than and equal to, lower than, lower than and equal to, equal to, not equal to, lower than target value, higher than and equal to target value) with the fixed value by establishing the counter or timer, execute the step and when the condition is satisfied, jump to the assigned label position as the starting step of the next action; it is attached with function clearing counter or timer; this function can be used only if counter and timer are established;



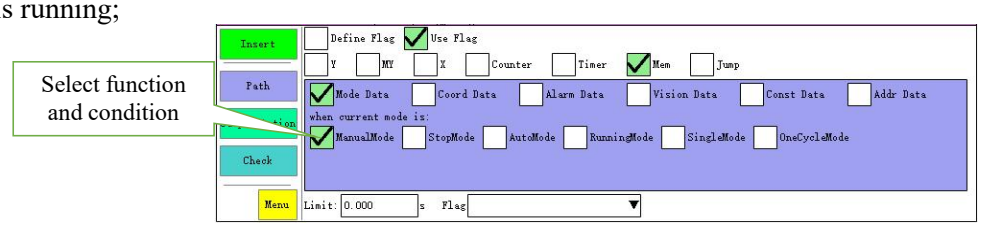
Jump - Comparison and operation page of counter/timer

5.4. Condition - Data comparison

Note: The data include the fixed data area of system, such as mode, coordinate, alarm number, vision, to have comparison with functions in fixed parameter, or compare the data of open memory with integer, or compare the data of memory; when step is executed and condition is satisfied, jump to the assigned label position as the starting step of the next action;

Mode condition

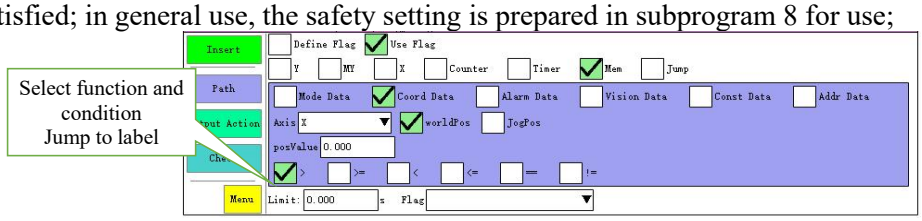
Note: Generally, this condition applies to the internal detection mode of subprogram 8; subprogram 8 can be detected for it has constant running during switching and change.This function will be abnormal when it is used while program is running;



Jump - Mode condition

Coordinate condition

Note: Compare the current position value of selected world or node with the set coordinate value and jump when the condition is satisfied; in general use, the safety setting is prepared in subprogram 8 for use;

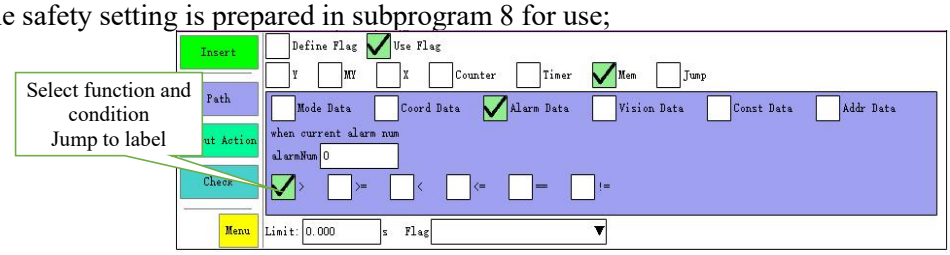


Jump - Spatial coordinate

Alarm number condition

Note: Compare the alarm number triggered by robot with the set area range and jump when condition is satisfied;

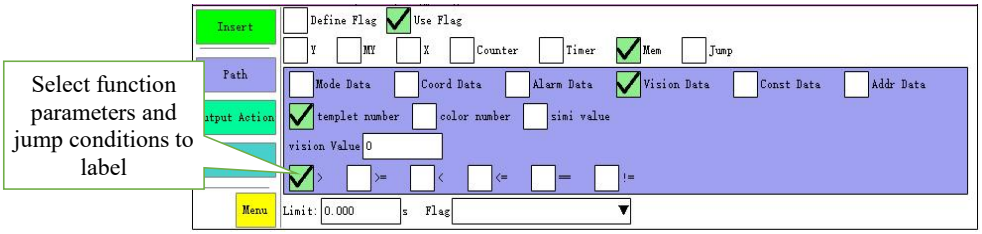
in general use, the safety setting is prepared in subprogram 8 for use;



Jump - Alarm code

Visual Parameter

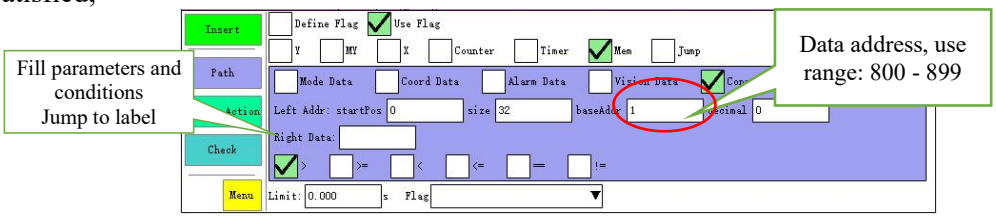
Note: While performing communication, it will have visual receiving of data and the visual system will send the command data to the set robot. While the robot is executing the command, it will take out the existing data, such as mold number, color number and similarity, in order to make judgment, and it will jump immediately when the conditions are satisfied;



Jump - Visual parameter condition

Data memory and data comparison

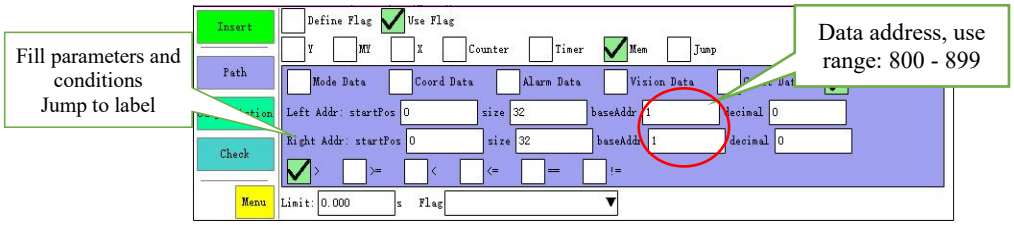
Note: Take out the value of data address, compare it with the actual value and jump immediately when the conditions are satisfied;



Jump - Data memory and data comparison

Data memory value and its comparison

Note: Take out the values from 2 data addresses for comparison, and jump immediately when the conditions are satisfied;

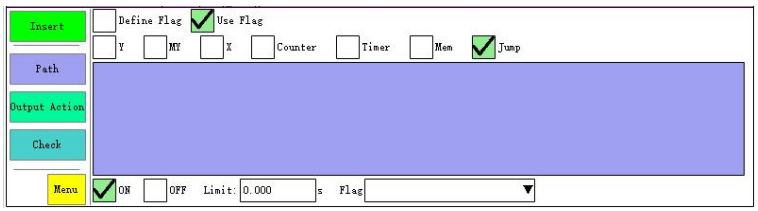


Jump - Memory data comparison

Note: Conditional jump of data comparison; the internal parameters include the conditions such as mode, coordinate, alarm number, vision and data address; make sure to understand the corresponding parameters to certain level when using them, to ensure correct use of them;

5.5. Condition - Unconditional jump

Note: When the executed step jumps to the designated label position directly, it will be the starting step of the next action;



Jump - Unconditional jump

Special node: The jump label number must exist before inserting the jump command;

6. Waiting

Note: The signal type includes: X, EUX, M and pure delay; the attached parameters of waiting include limit delay and unlimited delay;

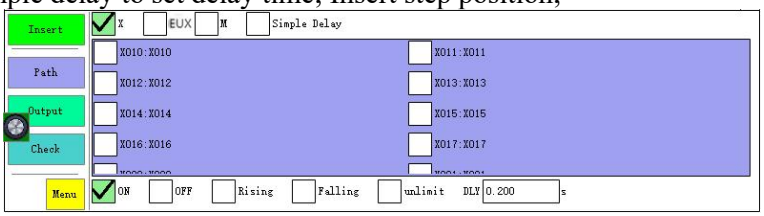
1. Working principle of waiting: X, EUX and M condition: When the step is executed, it will have downward

execution of step action when the conditions are satisfied; the attached parameters include limited time waiting and unlimited waiting; **when edge signal is selected as condition, it will start detection since running; the edge signal generated will be ineffective when it is stopped;**

Wait for instruction insertion: The ticked IO types are X, EUX and M; signal type: On, off, rising edge (signal from unavailable to available), falling edge (signal from available to unavailable) signal, etc.; additional parameters: Limited time setting or unlimited time; insert step position;

2. **Delay working principle:** If execution is made and delay is required only, delay timing will start until reaching the next action step;

Operation: Tick simple delay to set delay time; Insert step position;



Wait, operation page menu

7. Counter

Remarks: Before using the counter, click “Create” button to establish counter. The current value is the counter value, and the target value is the max. allowable value. The max. value can be set: 67108863; when counter is not used, tick to delete the counter by clicking “Delete” button;

Note: The counter cannot be deleted, if the counter is inserted and used inside program;

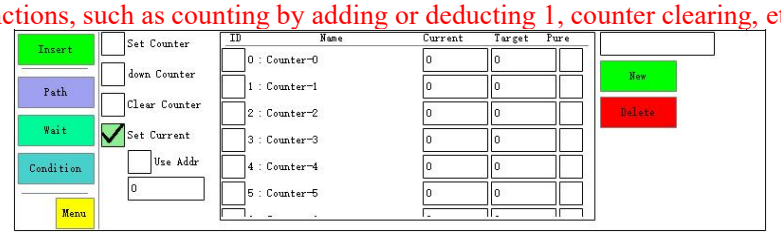
Use counter as per the following operation steps:

1. Tick the counter function option;
2. Tick the No. of required counter and required functions (ticking required only for pure counter. Do not tick, if unnecessary);
3. Set target values (this item cannot be set, if using pure counting)
4. Click to insert the specified step action position;

Function descriptions:

1. **Add/Deduct 1 counter:** When instruction is executed, count according to the set max. value, and execute +1 or-1 for every time. The max. value of +1 counter can be 67108863 (this value needs to be set by the target value) without adding value; no deduction will be made, if the current value is at least 0;
2. **Counter clearing:** When executing instruction, the current value of the ticked counter will be cleared;
3. **Set the current value of counter:** When instruction is executed, the set value can be modified to the current count value, or the current value of counter can be set via data address value. When setting the current value using data address, tick the address used and output data address number in the value, such as address: 800;
4. **Pure counter:** It is similar to adding counter in terms of functions. The difference is that the counting of target value is unavailable. As long as the instruction is executed once, i.e. it will add by 1. The max. count is 67108863;

Working principle: When the instruction is executed according to settings, the corresponding processing will be made according to the set functions, such as counting by adding or deducting 1, counter clearing, etc.;



Operation page of counter

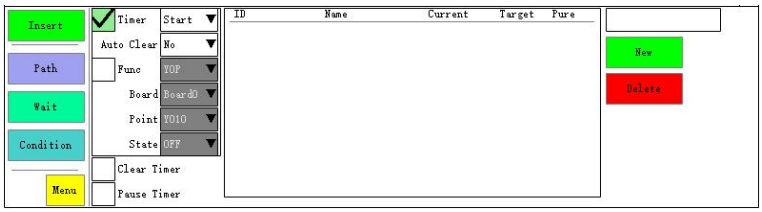
8. Timer

Remarks: Before using timer, click “Create” to establish a timer. Use the timer based on set functions and insert the specified step location;

Working principle and functions:

1. **Instruction counting:** When executing this step, the timer will be triggered to start counting. When timing continues until the target value is ended or timing suspends in the middle way, pure timing without a target value can be made;
2. **Working principle:** It is similar to the counter but the differences lie in the followings: The timer will start timing (automatic timing) after triggering for once, and does not need to be triggered again. When timing needs stopping, trigger the pause timing; triggering the reset timer to clear the timing and stop; the timer can also be set with ancillary functions, such as setting to automatically reset or resetting for start;
3. **Combined ancillary functions:** Once timing starts, the ticking function will be triggered; for example: Trigger the start/stop of single point output (Y, M and EUY); or the detection of the specified IO (X) state is started after time is out; if conditions are met, the alarm will be given out, etc.

4. The timer can be created or deleted; **please be noted that any timer inserted and used into the program cannot be deleted;**

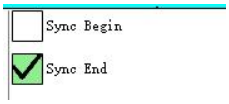


Operation page of the timer

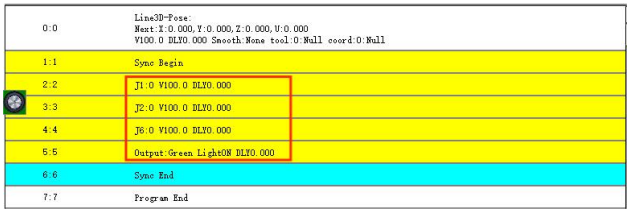
9. Synchronization

Remarks: There are instructions that are synchronously started and stopped. Use with simultaneous drive with many steps is equivalent to combination of one step for execution; the instructions are used in pairs. The intermediate action step is the combined execution task when execution starts;

Note: When executing path and axis actions, it is not allowed to drive to the same axis or the same path simultaneously; otherwise abnormality will occur. The same as driving other tasks, logical conflict will make action abnormal; synchronization does not support mutual nesting while skipping does not be performed within the synchronization functions;



Instructions



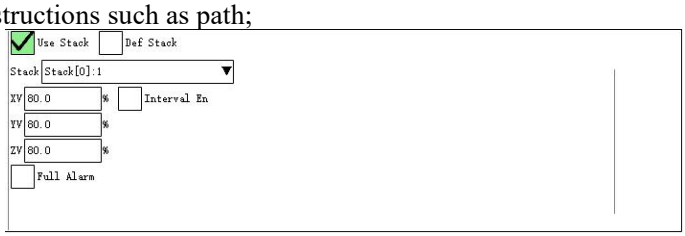
Cases & usage

10. Comments

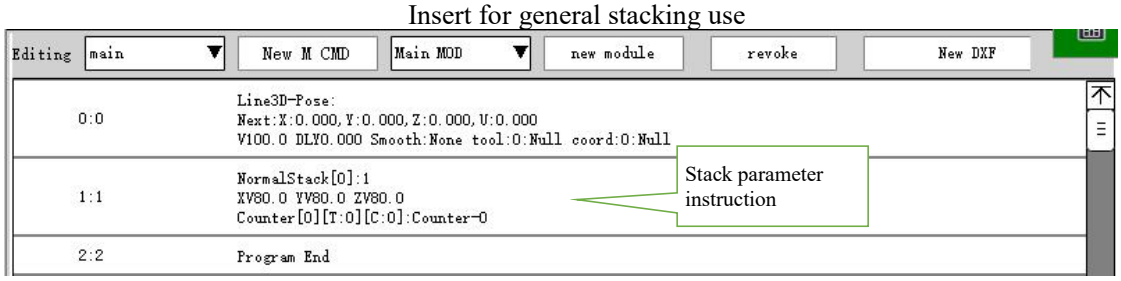
Remarks: As for the descriptions of program action sections, etc., action will not be executed normally and comments will be made only. This is similar to custom descriptions of single-step action;

11. Stack

Remarks: Before stacking and palletizing, the corresponding parameters must be established, of which, the stacking parameters are: General stacking, packing, data source, palletizing, 4-point array, etc.; note: Stacking and palletizing and simple palletizing are common stacking parameters; simple palletizing is a process by taking palletizing as the core and the collection of instructions such as path;



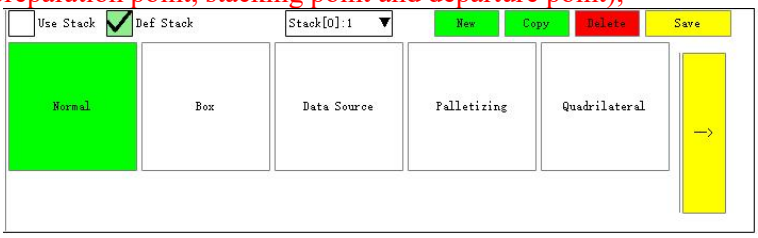
Insert for general stacking use



Insert instruction

Note:

1. Insert instructions for general stacking, packing, data source, 4-point arrays; during operation, one point location will be operated by executing the instruction for once;
2. Insert instructions for stacking and palletizing data: Operate once without operating point location. It only reads the corresponding instruction positions, then executes the point location through special instructions (transition point, preparation point, stacking point and departure point);



Types of stacking parameters created and designed

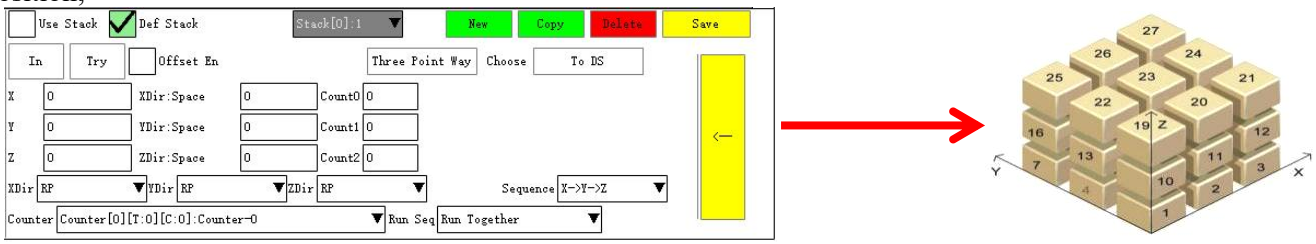
11.1. General stacking

Remarks: It's a basic simple programming stack, where starting points, X, Y, Z direction need setting only for writing a simple stack; for example: Rectangle; the way of rhombus can be stacked after adding offset parameter;

The steps are as follows:

1. Establish stacking name, designate it as general stacking, and click right "->" to set parameters;
2. Form a simple stacking matrix based on set starting point, article spacing in each direction (X, Y, Z) and the counting number, etc.;
3. If stacking direction is wrong, the forward or reverse adjustment can be modified in the X, Y and Z direction. The stacking order can also be adjusted according to realities, such as: X->Y->Z, etc.; operation order: Operate together;
4. Stack counter can be bound with their counts or to external counter; when operating, the stacking position is determined by counter value; counter cannot be controlled externally. Clearing will be triggered after automatic stacking;

For stacking use and ticking, select parameters and settings in the stack parameters, and insert the specified step position;

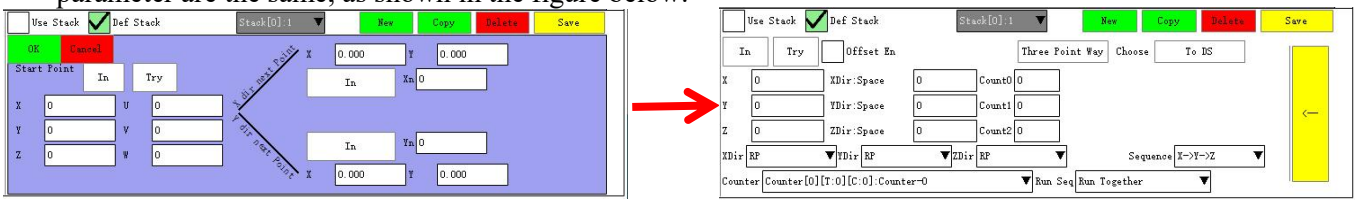


Setting of general stack parameters

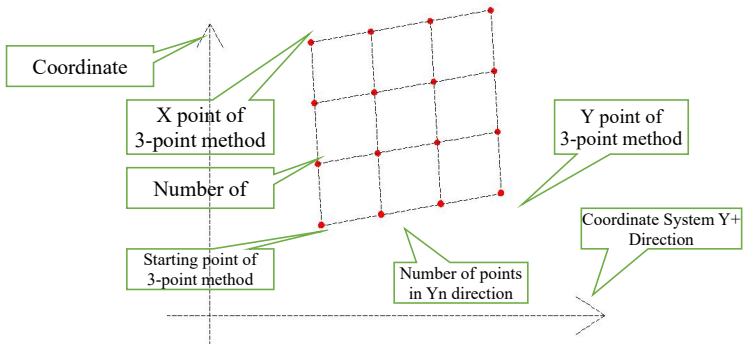
Edit a stack parameter simply by setting as per the way above. In a more complex case, use offset or the 3-point method to set the auxiliary offset setting;

The offset method is as follows:

1. After setting parameters according to the steps above, check Use Offset, and directly fill in the offset value in the direction offset;
2. As for setting using an auxiliary method, click to enter the "three-point method" setting page, and set starting point as required. Take points in X and Y directions respectively as well as the number of directions. Click OK after completion. After returning, all parameters will be automatically calculated and filled in. Settings of other parameter are the same, as shown in the figure below:



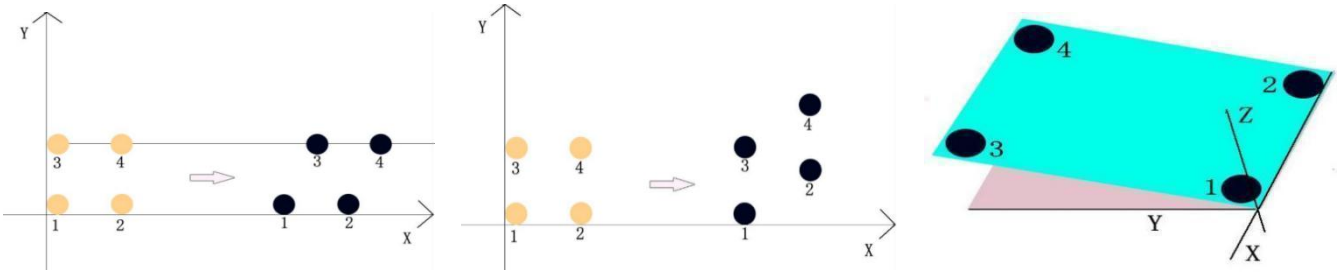
Setting of three-point offset operation



3-point operation-point location data setting

Special remarks: When setting according to three-point method, ensure X and Y directions must be consistent with X and Y directions of worktable or ensure a small difference; otherwise, the setting parameters will be incorrect;

For complex offset stacks, the adjustment effect works as follows. The block dots appears after offset:

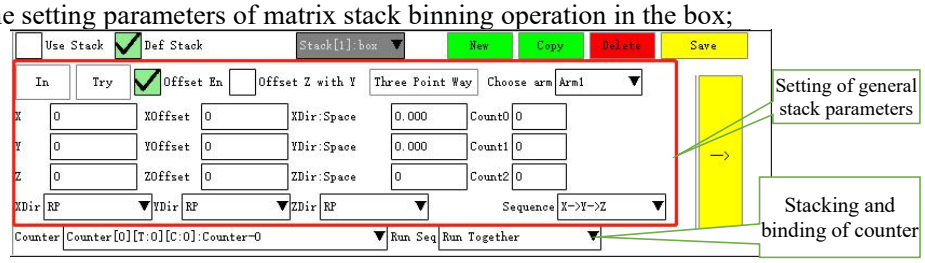


Before offset After X offset Before offset After Y offset, Before offset After Z offset

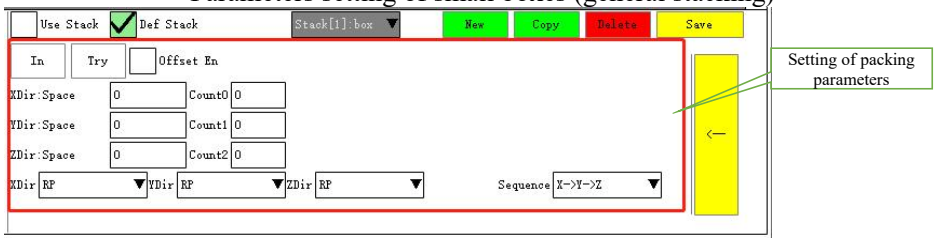
Note: The stack is simply a point location of assigned item. One point location is executed per cycle. For point location movement, the counter data is determined by counter. When the number of stacks exceeds the total number of stacks, a data source error will be reported; when the whole matrix is stacked and rotated in a complicated way, the starting point is taken as the center, and the rotation offset is performed through the reference bit of point 1, making operation complex;

11.2. Boxing and stacking inside box

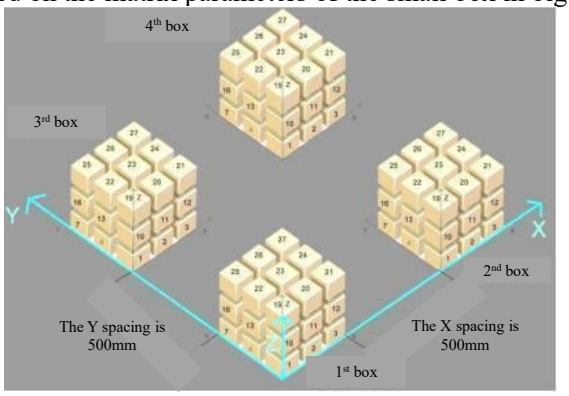
Remarks: Similar to general stacking, boxing is based on the general stack and by taking general stacking as small box and combination matrix as large one; during the operation process, set the stack parameters of small box (general stacking) first and then the next small box matrix for replacement. Similar to general stacking, it takes the first box as its starting point and diffuses and combines into big box. If the spacing is 0, it means close, counting the number of boxes, stacking direction and other parameters (similar to the general stacking direction, sequence, etc.). When operation, add the setting parameters of matrix stack binning operation in the box;



Parameters setting of small boxes (general stacking)



Set based on the matrix parameters of the small box in big box



Assembly and Packing Global Diagram

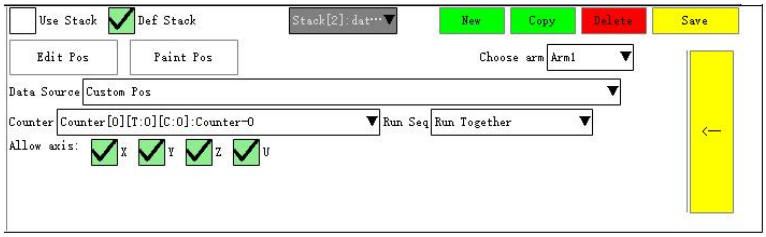
Note: If small box is offset, the X and Y direction in big box are determined by the offset direction of the source. During use, avoid misleading but try to cooperate with the worktable;

11.3. Data source (stacking)

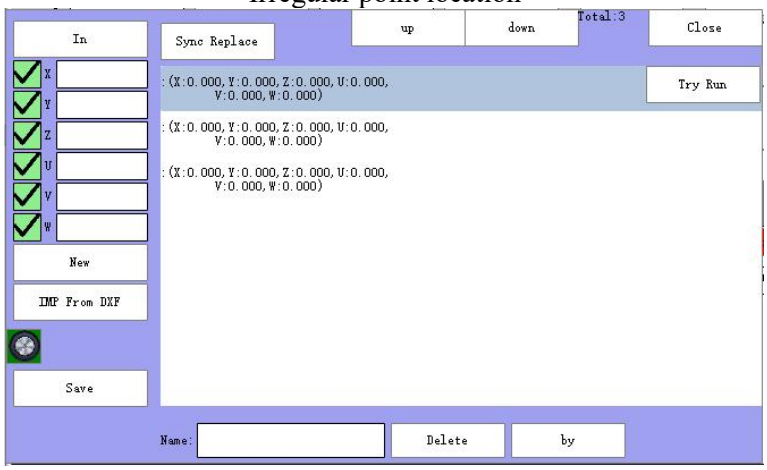
Remarks: Stacking of custom point location source and communication to data location;

1. There are two ways to stack data sources:

1. **Irregular point location:** Irregular point location was first used for data. After the preset position is set by editing the point location or the point location is generated by drawing board, data is confirmed in the editing point; if it is normal, it is necessary to edit the one-to-one correspondence effect of the point locations to ensure the correctness of point location.



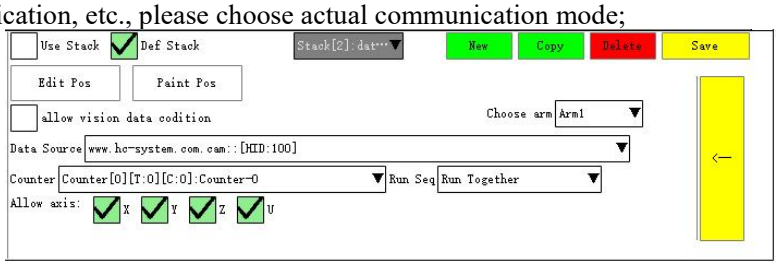
Irregular point location



Irregular point location-edit point location page

Remarks: When editing point location screen, creating stacking point or confirming the point locations generated by drawing board, confirm or modify them here and operate by similar reference points; note: Allow axis, select tick all; the order of work point locations is from top to bottom;

2.Communication data source: Obtain the data source position data by the selected communication protocol and a special mark is available. Determine the position in the form of communication or visual protocol; for visual communication, etc., please choose actual communication mode;



Communication data source

Note: In consideration of probably different positions given per time during communication, its own counter must be used. When executing every time, position data and taking-out will be executed and the counter will add 1 automatically. If the execution number is equal to the position data, the counter and the position will be cleared; for re-execution, the error alarming of data source will be alarmed when there is no position data, or the count value exceeds the numb of positions;

2. Counter:

1. When editing point location is used, either its own counter or binding counter can be used; if the latter counter is used, make sure the target value must correspond to the number of editing point locations;
2. When communicating at a given position, its own counter must be used, for counters cannot be used together after considering the number of acquired data and the point location position are provide externally;

3. Operating sequence: Priority operating order;

4. Allowed axes: Select operating together and tick all allowed axes.

During operation, execute corresponding actions according to actual point location or point location given by communication, and execute one point location in one cycle.1 point location is executed in each cycle. When all the point locations are executed, the counting value shall be cleared and repeated. If the point locations are exceeded or there is no point location, the data source error will be alarmed;

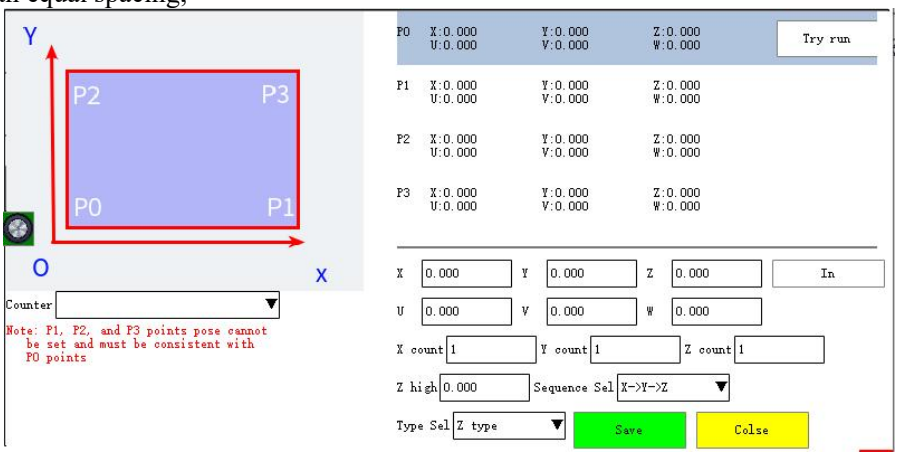
11.4. Palletizing

Remarks: When using special stacking, it's required to carry out some complex stacking modes such as changing postures. See the part of General Stacking for details;

11.5. 4-point arrays

Remarks: According to the editing graph, set the positions of P0, P1, P2, P3 (the articles at the four corners of the working surface), and set the number of X (P0-P1 direction), the number of Y (P0-P2 direction), the number of Z (layer) and the height of Z (layer height), the selection of action running sequence (execute X or Y direction) and the selection of execution type (choose round trip Z or S), the counter and other related parameters; note: Applicable to

regular stacking with equal spacing;



4-point setting

Note: Set the corresponding parameters as shown in the figure. The figure is a plane quadrangle. If it is an inclined plane, please establish a workbench, and then use it based on the workbench programming;

11.6. Stacking use descriptions

Stacking and unstacking for general stacking, such as stacking by methods of general stacking, packing box stacking, data source, four-point stacking, etc. are as below:

1. Stacking: Insert the bound counter into + counting. Stack from bottom to top when executing stacking; the stack position is controlled by counter value;
2. Unstacking: There are two ways of unstacking;
   1. Make use of the equal value of the counter value and stack value and use -11 counter; unstack from top to bottom. Parameter settings for unstacking are the same as stack settings;
   2. Take the upper part of the parameter stack as a starting point and use axial direction X, Y and Z; control the stacking position by using accumulated value of a bound counter from top to bottom;

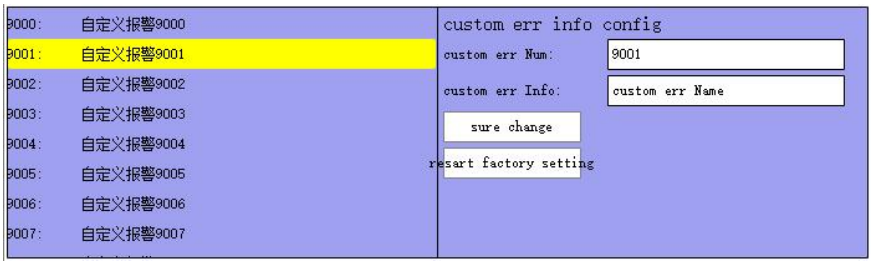
12. Custom alarms

Remarks: The custom alarm number is between 9000 and 9999. Alarm information can be modified according to the definition. Default alarm number + alarm comment: Custom alarm + number;

Use and working principle: Insert stepping. When the action step is executed, the robot will stop and prompt alarm information; continue with operation after resetting alarm;

Modification of alarm information: Click the specified alarm number, read and modify the alarm number; modify the required alarm notes in the custom information, and click “Confirm Modification” to change the alarm information in the alarm number;

Restore factory settings: Click Restore Factory Settings and a confirmation box will appear. Click Confirm to restore all the original custom alarm information.

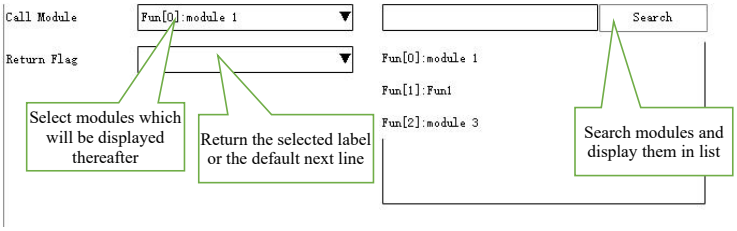


Operation page of custom alarm

13. Modules

Remarks: Call and use of modules: Before use, a module must be established, in which an action segment, is similar to a flow program block can be established. In running process, the **main module of task** or other modules are inserted to establish an interface to be transferred into operation, and the internal constructions can support all instructions. The module can be reused. After running the reuse, it will act after returning to the original interface program for calling or designates the label inside the called module for further action. Note: When module nesting is used, it is not allowed to nest itself. If necessary, please use skipping instruction loop

Operation and use: Select the called module (for the established module, please refer to the previous chapter *New Module*), and select the return tag (if there is an established tag in the current program block, specify the tag bit when returning, and the next line will be generated directly). When there are many modules, their name can be searched;



Settings of module call page

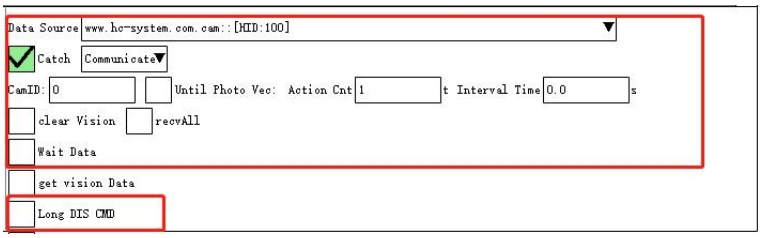
For module creation and deletion, please refer to the chapter of “Software Function Buttons and Operation Menu, Display, etc." and button descriptions;

14. Vision and distance

Remarks: The function instruction is related to remote communication. It is used for sending and receiving communication data of external equipment for data exchange. The instruction mainly supports:

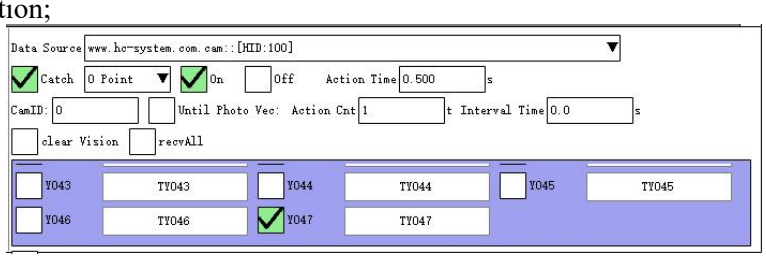
1. Visual data

Take photos, and wait for visual data, visual calibration instructions, etc. The instructions in the frame are the combination of instructions related to vision or process. Please see relevant process instructions for vision for details;



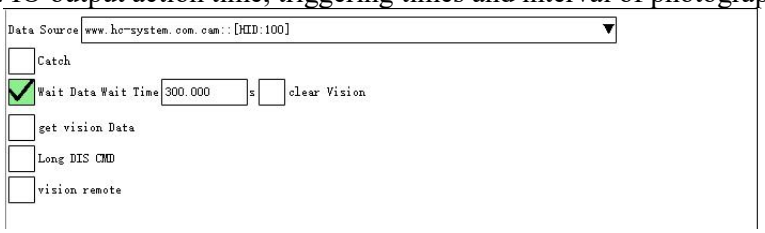
Visual - Communication triggers photo-taking

Remarks: Execute insertion instruction, and notify and trigger camera to take picture through communication protocol instruction; parameters involved: Times and interval time of notifying camera by communication photo-taking instruction;



Visual - Output IO to trigger photo-taking

Remarks: Execute the insert instruction and trigger the camera to take pictures through the physical output IO; parameters involved: IO output action time, triggering times and interval of photographing instruction;

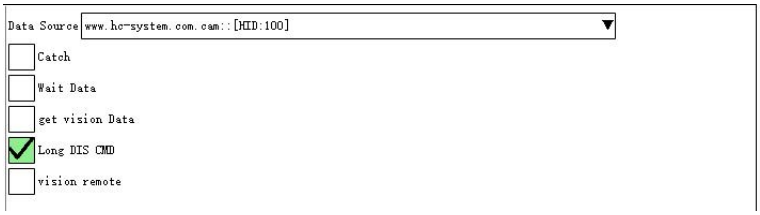


Visual - Waiting for visual data

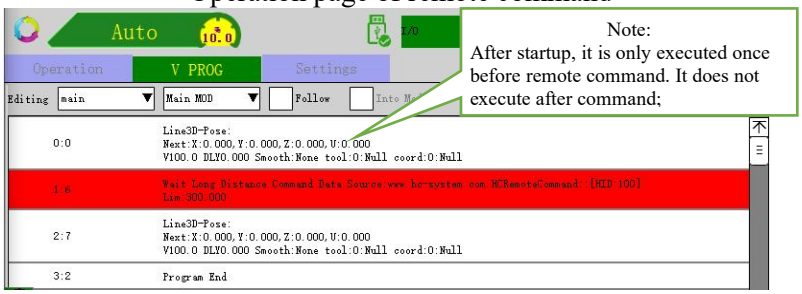
Remarks: The instruction is to wait for the position data sent by camera data. If the position execution action returned by the camera is received but no information is received within the limited time, an alarm prompt will be given out;

2. Remote command

As for communication use, the upper computer will send the path and wait for the queuing of relevant instructions in robot instruction set for execution; during use, insert the instruction only for circulating in the main program loop; note: At this time, the robot cannot execute other related conflicting instructions, and the whole process is controlled by remote host computer; when the instruction is executed, other instructions in the task will not be executed any longer. The instruction is always waiting for the remote instruction to be sent for execution or cyclic execution. See the Instructions of Remote Command Communication-Remote Command for details;



Operation page of remote command



Remote command-use

15. Data command

Note: Data command:

1. Execution, such as control command;
2. Write value in address memory of target data after calculation;

Data command includes:

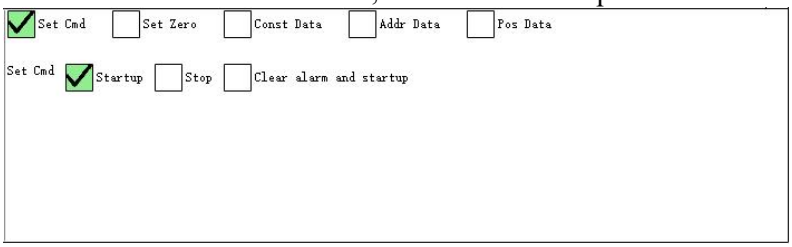
1. Control command

Note: It includes start, stop, clear alarm and continue; the command can be inserted at proper position and be triggered to execute the commands; in special use, the commands are established in the constant cycle program for use, such as special subprogram 8;

Start: Trigger the command to start robot; it equals to start button of external hand controller;

Stop: Execute it once to switch the robot to single loop; execute it twice to stop immediately; it equals to stop button of hand controller;

Clear alarm and continue: When alarm is stopped, execute the command to trigger it, clear alarm and start two actions of robot; note: When alarm can't be cleared, this alarm will stop after execution;

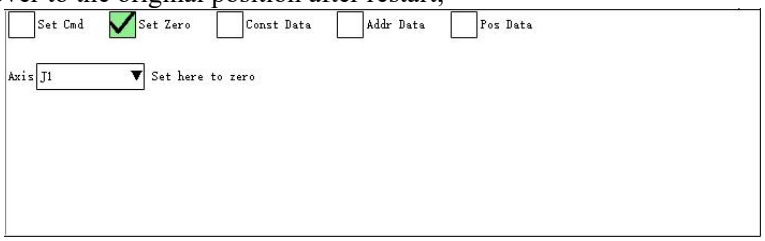


Page of data control command

Note: Only subprogram 8 can satisfy the use environment while using the three commands. The input signal switch must be inching switch; the details are subject to the real conditions;

2. Origin command

Note: Set the node as the origin records in special conditions, please use this function with caution; use of incremental motor; note: Recover to the original position after restart;

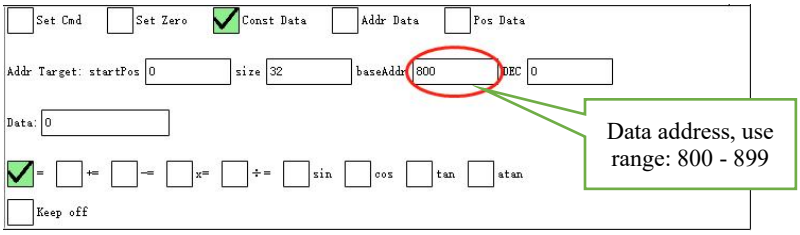


Origin command page

3. Immediate value

Note: After calculating the data in target address memory and immediate value, put the results into the target address; data type of immediate value: 32 integers, not floating points (decimals);

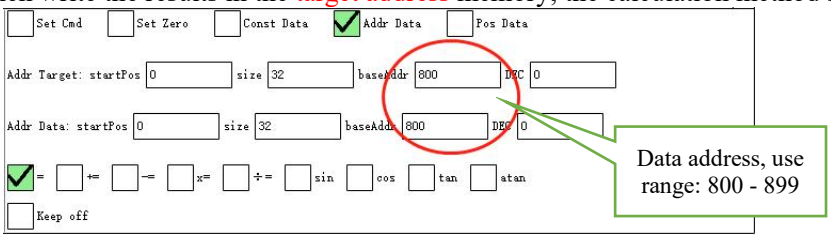
Calculation methods include: = Assignment, += Add immediate value, -= Subtract immediate value, ÷= Divide immediate value, Sin/Cos/Tan/arctan function calculation; after calculating the value in target address, immediate value and the existing options, perform assignment of results in **target address** memory;



Page of immediate value command

4. Address data

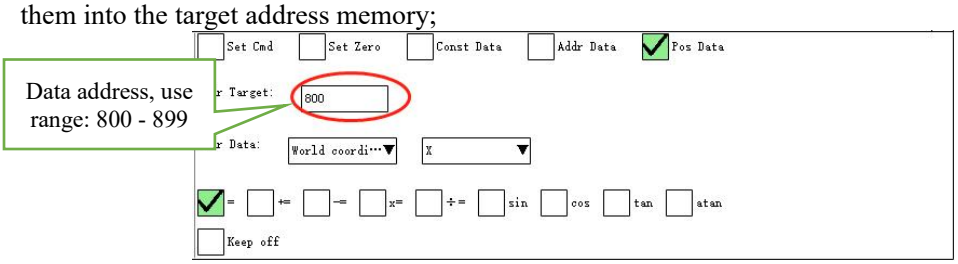
Note: The same with immediate value command, calculate the value of target address memory and value in address data memory, then write the results in the target address memory; the calculation method selected matters;



Page of data address command

5. Position data

Note: After execution of command, calculate the current counting data at the assigned node position or current position at spatial direction, or the connected encoder, as well as the data in target address memory, then write them into the target address memory;



Position data command

6. Special note

When it is required to power off and save the data in address memory, please tick power off and save; use range of address data: 800 ~ 899, please do not exceed the range;

16. Process

Note: This display is related to the selected process. The different process may have varying display, and it has no display if there's no process; for details, please refer to the relevant process specification;

17. Reservation

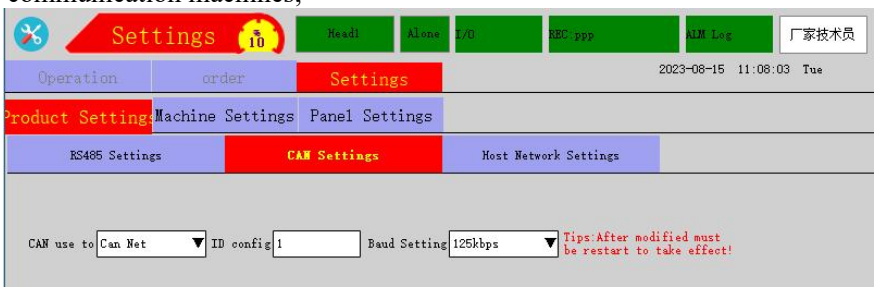
Reserved

18. CAN command

Note: CAN communication is a function for transmitting signals between robots; make sure to enable the CAN network and use its communication (make sure to set relevant parameters correctly and establish communication normally) in order to use this command; the corresponding IO or data memory of remote target ID machine can be operated while using the command;

Set steps: Click Parameter Setting → Product Setting → Communication Configuration. Once opened, tick Can setting, then click on the purpose and choose Can network communication. Set the ID configuration to 1 (please set according to your needs) and set the baud rate to 125kbps. After setting, power off and restart for it to take effect.

Note: The communication baud rate must be consistent, set ID should not repeat and the connection should be correct; it should have at least 2 communication machines;



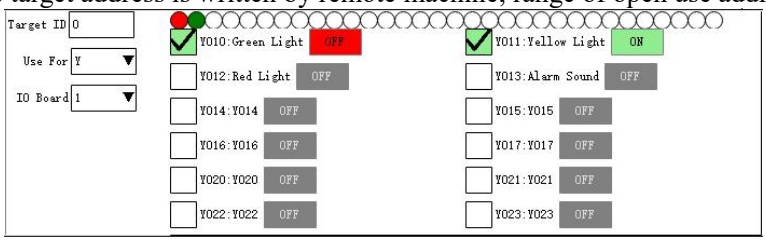
Enable CAN network communication

Command parameters:

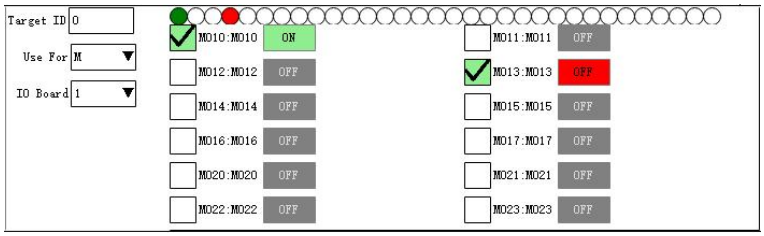
1. Target ID: Distribute ID number to remote CAN network communication;

Note: This ID must be within the network; range: 0~255; **when it is set as 0, send the information to all machines and all robot will receive and handle this information;**

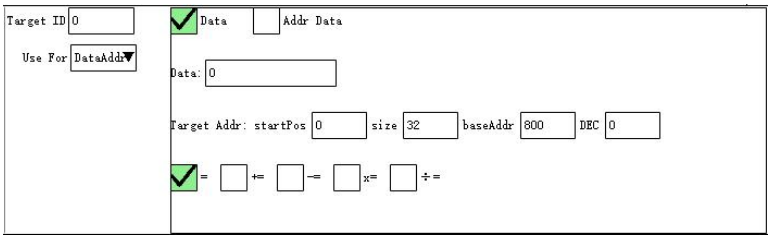
2. Application: Control Type Y and M IO of remote machine, or write value in data address;
   Note:
   1. While operating Y or M of remote machine, fill the ID number of IO board from opposite side, tick set remote IO, set on or off and multi-point operation;
   2. Fill data in remote address memory; operation and data command have the same principle;
      Immediate value: Type of immediate value: 32-bit integer;
      Data address: The target address is written by remote machine; range of open use address: 800-899;



Write in Y control of remote machine



Write in M control of remote machine



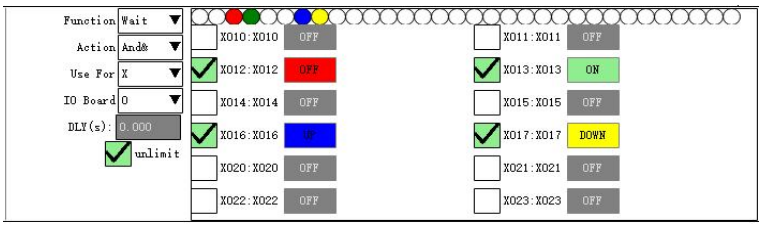
Write in control of remote data address

19. And or command

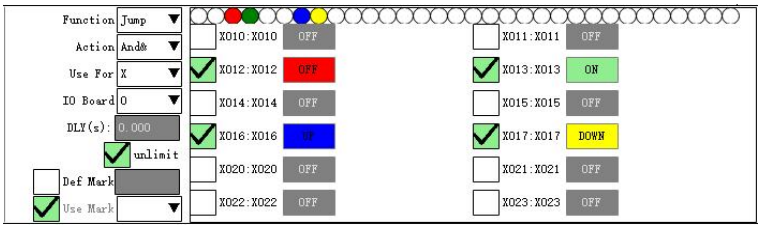
Note: It applies to multi-condition waiting or multi-condition jump, such as an or (cascade) of multi-point IO or (parallel) calculation, this is command is not recommended for single control; while using it, AND, OR IO must be within the same area; the logic IO type includes Type X and M (assigned IO board number);

Related to the following parameters:

1. **Function:** "Wait" and "Condition jump" option: Make sure to establish label, tick definition label and insert the label position required before jump;
2. **Command:** Option of "AND &" (cascade) operation or "OR |" (parallel) operation;
3. **Application:** IO type, including Type X, M and Y;
4. **IO board:** Assign IO in the board N;
5. **IO tick area:** Tick the assigned IO; signal type: Click signal switch to select: On, rising edge, falling edge, off; note: This item has no multi-choice IO setting;
6. **Time limit:** Execution time, when setting delay time or ticking no time limit;
7. **Define label/use label:** This item is displayed when selecting "Conditional jump", define label and establish label, which equals to label jump and establishment; to use the label, select the condition and jump to the label position;



Page of waiting for "AND &", "OR |" command, tick multiple conditions



Page of "AND &", "OR |" jump command, tick multiple conditions

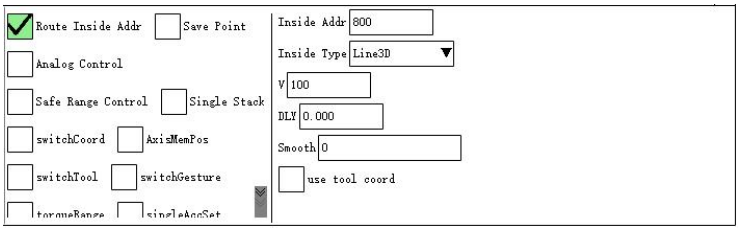
Special note: "AND OR waiting" function is the same with waiting function, this is multi-condition waiting; "AND OR jump" is the same with jump function, this is multi-condition jump;

20. Extension

Note: This is special function command, including: Path reference address, point storage, analog control, safety zone, single-axis stacking, coordinate system conversion, recording position axis action, tool switching, attitude switching, safety torque, axis acceleration and deceleration setting, path acceleration and deceleration setting, target following, enabling setting, physical speed setting, stop action setting, and other functional instructions. The detailed functions are as follows:

20.1. Path reference address

Note: The data value in command reference data address are position address, and similar with selected command type and path command use; different command types and options have different occupied address. The setting page is as follows:



Command page of path reference address

Parameter description:

1. **Reference address:** Set starting data address of command, data address range is 800-890; data address memory is 32-bit integer;
2. **Reference type:** Command types such as straight line 3D, attitude straight line, free path and relative attitude straight line; both working principle and path command are the same; data conversion is position relationship; **position = (convert symbol data to floating point number) ÷ 1000**, relationship of occupied data address is as follows:

   Straight-line 3D: 3 addresses are occupied continuously from the starting address, to record the data of Position X, Y and Z;

   Attitude straight line: 6 addresses are occupied continuously from the starting address, to record the Position X, Y and Z and data of Attitude U, V and W (for 4-axis machine, record Position X, Y and Z and attitude U, the excessive data will be reserved automatically);

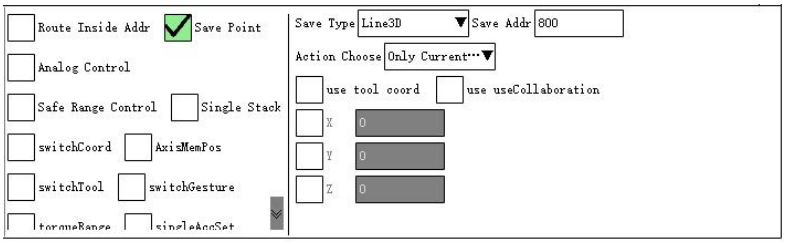
   Free path: 6 addresses are occupied continuously from the starting address, to record the node data of Axis J1 - J6 (for 4-axis machine, record Axis J1 - J4, the excessive data will be reserved automatically);

   Relative attitude straight line: 6 addresses are occupied continuously from the starting address, to record Position X, Y and Z and data of Attitude U, V and W (for 4-axis machine, record Position X, Y and Z and attitude U, the excessive data will be reserved automatically); note: The working principle equals to relative path command, there's no action when special direction position is 0;

   Note: Tick enable when tool and workbench are used; total number of occupied address = Continuous occupation number of original command + lately connected 2 addresses, the occupation of later 2 data addresses is: Tool and workbench number; such as: Path reference address - attitude straight line, use tool and workbench, reference address 800; then, the corresponding relationship is: 800 → X, 801 → Y, 802 → Z, 803 → U, 804 → V, 805 → W, 806 → Tool, 807 → Workbench; no workbench and tool is provided in free action;
3. **Speed:** Preset speed of path; **running speed = Set speed * Global speed;**
4. **Delay:** The delayed execution of movement action;
5. **Smoothing grade:** Set Grade 0-9, a total of 10 levels of smoothing; the deviation of path connection position may increase along with the smoothing during running;
6. **Use tool and workbench:** When ticked, automatically delay the occupation of two more data addresses based on the address occupied by the command in the original step, as explained above;

20.2. Node storage

Note: While executing this command, the data at current position will be stored to the data address for use, the storage range is related to command type; the set parameters are as follows:



Node storage command page

Parameter description:

1. **Storage type:** Have classified storage by the form of path command: World coordinate X, Y, Z (straight line 3D); world coordinate X, Y, Z, U, V, W (attitude straight line); node coordinate (free action: Position of Axis J1-J6), 3 data storage modes in total:

   World coordinate X, Y, Z: Straight line 3D, 3+2 addresses continuously from the starting address;

   World coordinate X, Y, Z, U, V, W: Attitude straight line, 6+2 addresses continuously from the starting address;

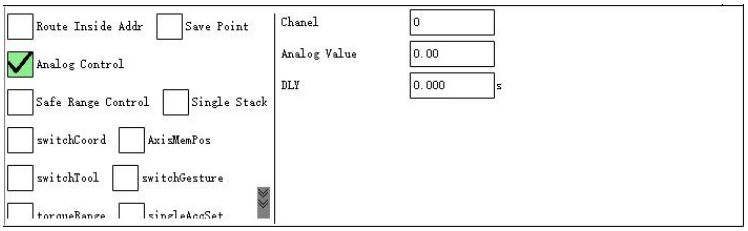
   Node coordinate: Free action, 6+2 addresses continuously from the starting address;

   Note: Tick use tool when the tool and workbench are used in the command, total number of occupied address = Continuous occupation number of original command + lately connected 2 addresses, the occupation of later 2 data addresses is: Tool and workbench number; the address is occupied by default even if not ticked, but the tool and workbench number are not stored; the world position is related to workbench, but the position will be stored at workbench display position when workbench is used;
2. **Storage address:** From the set starting address according to selection of storage command; the relationship of data address number is as shown in introduction above:
3. **Action type:** Storage mode, the current position, or the current position and offset data can be added and then stored in the data address;
   1. **Store current coordinate:** Perform one-to-one storage of current position according to the starting address; the position data type is related to command storage type;
   2. **Storage current coordinate + offset position:** Add and calculate the current position and deviation data, perform one-to-one storage according to the starting address;
4. **Offset data:** Value can be filled in the data area when offset is used; tick the filled value, which is the offset data;
6. **Use tool and workbench:** When ticked, the command occupies the tool and workbench number at storage position of 2 data addresses behind address; not stored if not ticked, as mentioned above;

Note: Use range of data address: 800-890, stored data are 32-bit integer; conversion is required when it is changed as position, for it is not floating point number; relationship between storage sequence and memory: Starting address, continuous number, correspondence, world: X, Y, Z, U, V, W+ tool and workbench; Node J1-J6 + tool and workbench;

20.3. Analog control

Note: After being connected through the matched analog module, this command can write analog value to the assigned analog channel; the parameters are as follows:



Parameter setting page

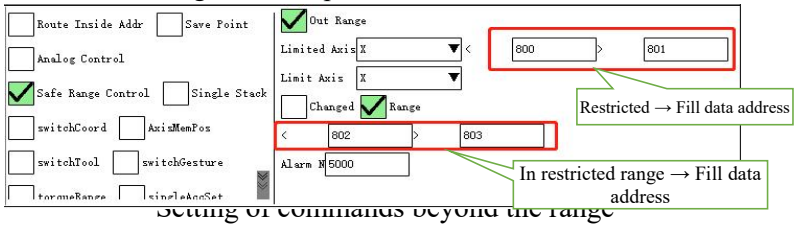
Channel: Channel 0-6, assign channel number

Analog quantity: Fill the analog output value within the range of 0.00-10.00; setting accuracy: 0.01;

Delay: The delay time of command execution;

20.4. Safety area

Note: Special purpose command, trigger prompt alarm when the assigned axis (X, Y, Z, U, V, W) is within the restricted area (restricted axis) range or beyond the range value, the restricted axis (assigned axis) is in the area or has changes, the alarm number should be filled as customized range; the data range is provided by data address value; similar with other safety area, please avoid conflict while using it; the set parameters are as follows:



Setting of commands beyond the range

Parameter description:

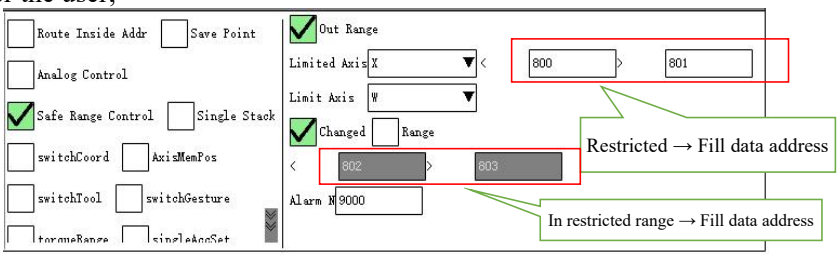
1. **Within range/beyond range:** Set the data within the restricted axis range; not within the set range when not ticked; within the set range when ticked;
2. **Restricted axis and set range:** Select the restricted axis and area range value; the range value is provided by data address value; address range: 800-899;
2. **Restriction axis:** Assign the restriction axis;
3. **Change/range:** Condition of restriction axis;
    1. **Change:** When ticked, it will trigger alarm when the restriction axis has action, the restricted axis is within the set range or beyond the range;
    2. **Range:** When ticked, the restriction axis has action within the set range; it will trigger alarm when it exceeds the range, the restricted axis is within the set range or beyond the range according to the setting; the range of activity area should be set;
4. **Alarm number:** Fill the customized alarm number, customized alarm range is 9000-9999; it is not suggested to have conflict with other alarms;

Note:

Generally, the set edit of safety area is in subprogram 8 and user can apply it according to the actual conditions; the distance range between restricted axis and restriction axis can be the address between 800~890; the input address does not represent the actual distance, while the actual distance should be set in data command;

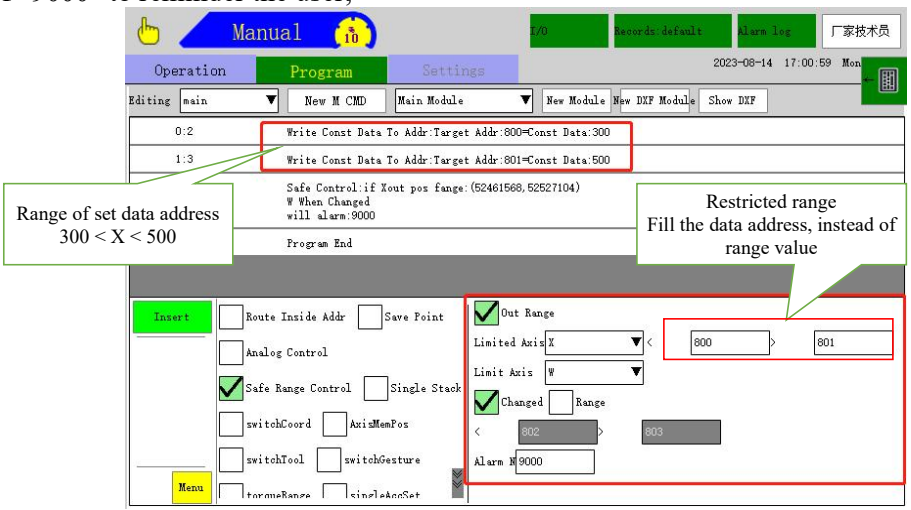
Example:

Assumption 1: Axis X is within 300~500, W has or change or W is not within 0~100, then the system will give alarm of "9000" to reminder the user;

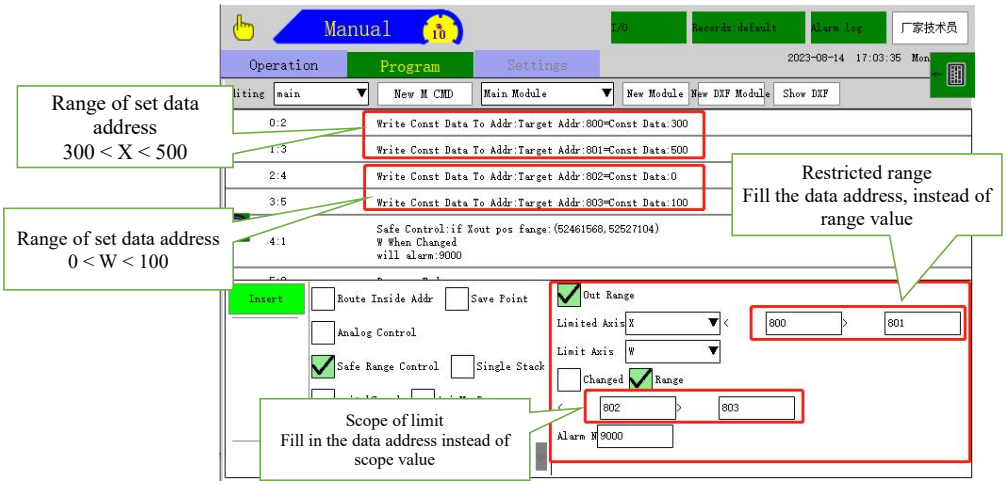


The conditions are set within the range

Assumption 2: Axis X is not within 300 ~ 500 and W has change, or W is not within 0 ~ 100, then the system will give alarm of "9000" to reminder the user;



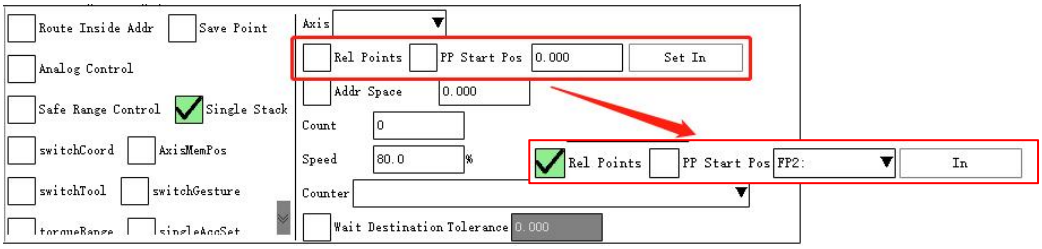
Condition 1: When Axis W (restriction axis) has position change, the system will give alarm of "9000"



Condition 2:When W (restriction axis) is not within the range of 0 ~ 100, the system will give alarm of "9000".

20.5. Single-axis stacking

Note: This function applies to straight line axis, such as attached axis (it must be straight line axis) and its working mode is: After setting the axis starting point, interval and counting, it will perform single-axis stacking according to the set data while executing the command; after each execution, it will start calculation from the starting point according to the accumulation of set interval (reduce interval when it is reverse), until it reaches the set counting (compared with counter data); parameter setting is as follows:



Setting page of single-axis stacking

Parameter description:

1. **Axis:** Assigned motion straight line axis, which can be set according to the actual conditions;
2. **Set starting point:** The min. point of stacking (it may be the highest point), which is known as the position of the first product since stacking; it has two setting methods:
   1. Set the axis position as the starting position, set button; Set the current position as the starting point;
   2. Establish and tick reference point, tick the reference point (FP) as the starting point;

   Note: Confirm the running direction, tick forward direction according to the actual conditions, or it is reverse direction by default if not ticked;

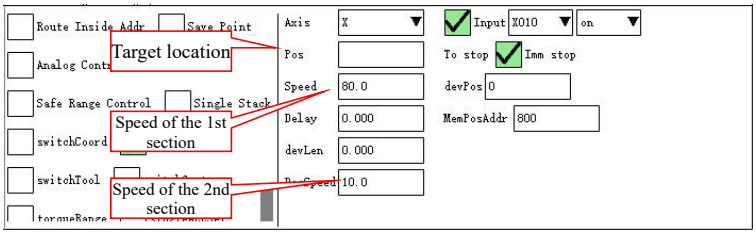
   Forward: Tick forward interval accumulated increase from starting point, the stacking target value is higher than or equal to the starting point;

   Reverse: Tick forward interval accumulated decrease from starting point, the stacking target value is lower than or equal to the starting point position;
3. **Interval:** After each tacking is completed, execute accumulated increase/decrease (calculated according to forward or reverse increase or decrease) as the next stacking position; note: The data are set as positive rear number;

   When address is ticked, the interval is provided by data address memory and the memory address is filled; use range: 800-899;
4. **Counting:** Total number of stacking, target value;
5. **Speed:** Preset speed of axis; **running speed = Set speed * Global speed;**
6. **Counter:** The current value of counter is accumulated by 1 when it is executed once; the stacking is full when the accumulated value equals to the counting; when external counter is used and the position is incorrect, the position can be changed by adjusting the current value of counter;
7. **Detect end point progress:** Detect the accuracy of action and stacking position, tick and set the deviation value;

20.6. Record axis position

Note: Applies to the work such as object taking via linear axis, such as object detection and taking; normally, it applies to the attached linear axis, such as Axis 7 and 8; note: The node axis can be used according to the settings;



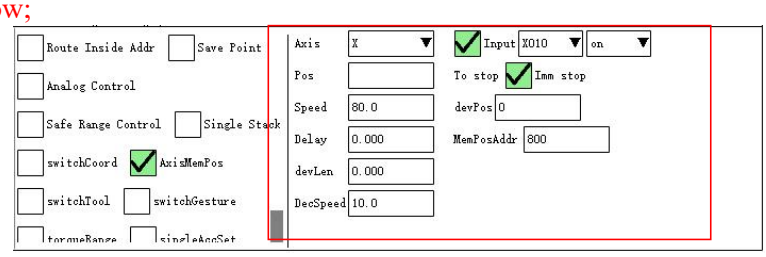
Parameter setting page

Parameter description:

1. **Axis:** Assigned linear axis, Axis: X, Y, Z, U, V, W refer to Axis J1 - J6, attached axis: J7, J8;
2. **Input point:** When ticked, it will trigger to record the target speed of the 1st section during mold feeding when the IO condition of set input point is satisfied; when not ticked, it will run according to the set speed of the 1st and 2nd section;
3. **Position:** Target end point of running; when immediate top is ticked and trigger condition is satisfied, it will stop forward running action immediately and execute the next action command;
4. **Speed:** The preset running speed of the 1st section; common mode, running position = target - advanced offset, depending on the set parameters;
5. **Delay:** Delayed execution of command;
6. **Advanced deceleration offset:** The interval and division between the 1st and 2nd section; for example, set the target as 500 and the advance offset is 20, then the position is 480; the detailed value is related to the set combined parameter;
7. **Advanced deceleration speed:** This is the speed of the 2nd section, which means, the speed is changed to the 2nd speed and runs to the target position after finishing running of the 1st section speed;
8. **Memory address:** When input detection and immediate stop function are ticked, this parameter will be effective; it is used for storing the data address of position after triggering signals; note: The memory address should be filled here within the range of 800-899;
9. **Position offset:** This parameter will be effective when input detection and immediate stop function are ticked; when the storage position is triggered, it will be added with the offset position and then stored in the data address;

Working mode is:

1. **Common mode:** Not tick input detection, enable the box selection parameters in picture below
   Working principle: Execute the command, run to the target position and realize running at two sections of speed
   The 1st section: Run from current position to → Target position - Advanced offset position, at the 1st speed
   The 2nd section: Target position - Run from advanced offset position to → Target position, at the 2nd speed (deceleration)
2. **Detect variable speed:** Tick input, set IO detection, it will stop immediately if not ticked
   Working principle: Execute the command, run to the target under the common mode, start detection of input IO signal; when IO condition is satisfied, switch to the 2nd speed immediately and run to the target position;
3. **Stop detection and record position:** Tick detection and immediate stop, to take effects of the following parameters, position offset and memory address parameters
   Working principle: Execute the command, run to the target under the common mode and start detection of input IO signal; when IO condition is satisfied, stop the action to target position immediately and jump to the the action of next row; while executing the actions, store the current position according to the set parameters, calculate the position offset and store it in memory address;
   Note:
   1. Rules of running at the 1st speed: When value (position) of memory address is 0, it will skip the 1st speed directly and run to the target position at the 2nd speed;
   2. Rules of running at the 2nd speed, starting position of the 2nd speed = The last memory position, i.e. from position of data memory address to target position; when input IO is detected, stop running immediately and execute the next row;



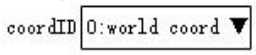
Record action of position axis

Note:

When the detected (Mode 3) object reaches the bottom, reset the first mode and clear the position in memory address; for example, write 0 to the 800 data address above;

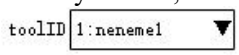
20.7. Switch coordinate systems

Note: It is used for switching workbench for the version before 207; for subsequent versions, the path is provided with workbench and tool for use; when workbench switching is required, set the bound variable of path to be controllable and use it in combination with the workbench command; note: the should be established in advance and be normal before switching the coordinate systems; otherwise, it will be world coordinate by default;



20.8. Switch tools

Note: It is used for switching tools for the version before 207; for subsequent versions, the path is provided with workbench and tool for use; when tool switching is required, set the bound variable of path to be controllable and use it in combination with the tool command; note: the should be established in advance and be normal before switching the tool systems; otherwise, it has no tool by default;



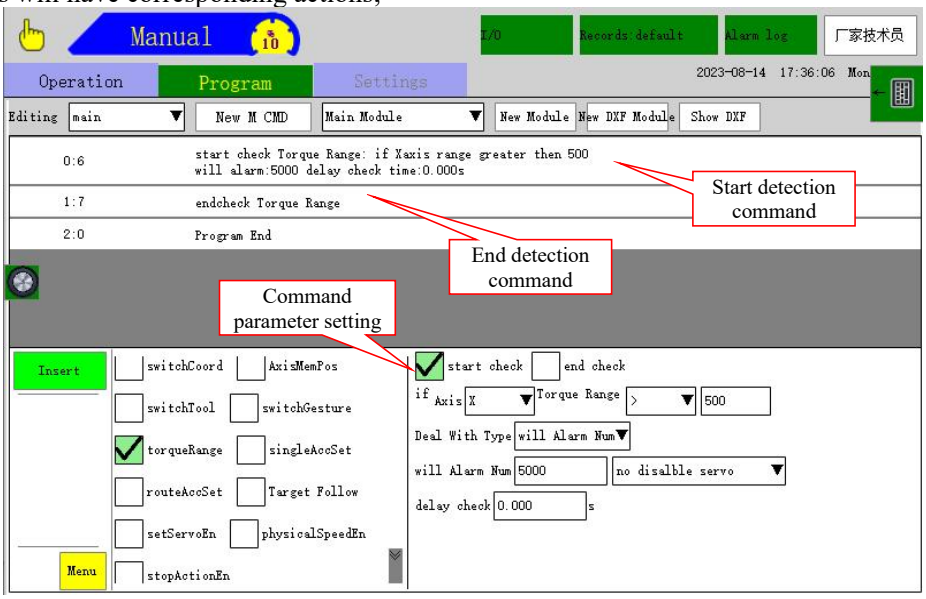
20.9. Switch gesture

It is used for changing the changing the horizontal multi-node machine and calculating the default Axis 2 rotation direction; gesture switch will change the Axis 2 direction only and do not change the position and gesture; there will have no action when the offset is consistent with setting; otherwise, it will perform re-calibration to change Axis 2 offset;

20.10. Safety torque

Note: The command is divided into start detection and end detection, to detect and monitor the axis torque, trigger alarm or output M;

Working principle: Assign certain axis, set the detection torque range, give alarm or output the assigned IO according to the settings when end is not executed after command execution and the settings are exceeded; after alarm is given, the attached setting axis will have corresponding actions;



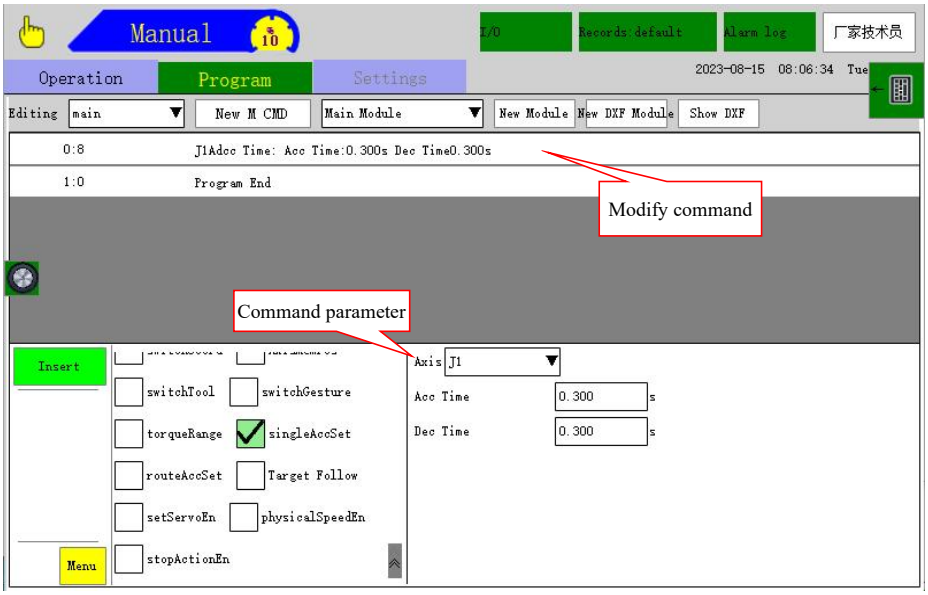
Parameter setting page

Related to the following parameters:

1. **Detection start/end:** Execute detection start of end;
2. **Axis and torque:** Assign the monitoring axis, torque, higher than > or lower than <, torque value range: 2508 represents 100% torque, 7524 means 3 times of torque; view the monitoring servo parameters in the monitor;
3. **Treatment method:** Give alarm or output M value, the relevant methods and parameters are as follows:
   Alarm: Fill the alarm number within the range of: 9000-9999; enable the attached setting axis: Enable servo/disable servo or disable all servos;
   Output Value M: Set output M number and trigger output channel; enable the attached setting axis; enable servo/disable this servo or disable all servos;
4. **Delayed detection:** After detection is started, it will start triggering condition after the delay of set time

20.11. Axis acceleration/deceleration

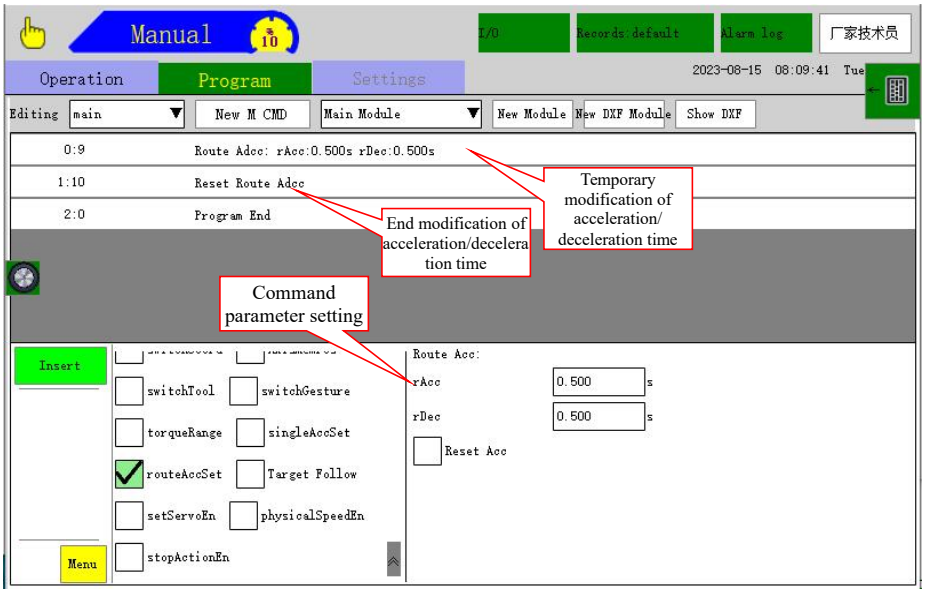
Note: After executing step action, assign and modify the acceleration/deceleration time of single axis, have dynamic modification of node acceleration/deceleration time;



Parameter setting page

20.12. Set path acceleration/deceleration

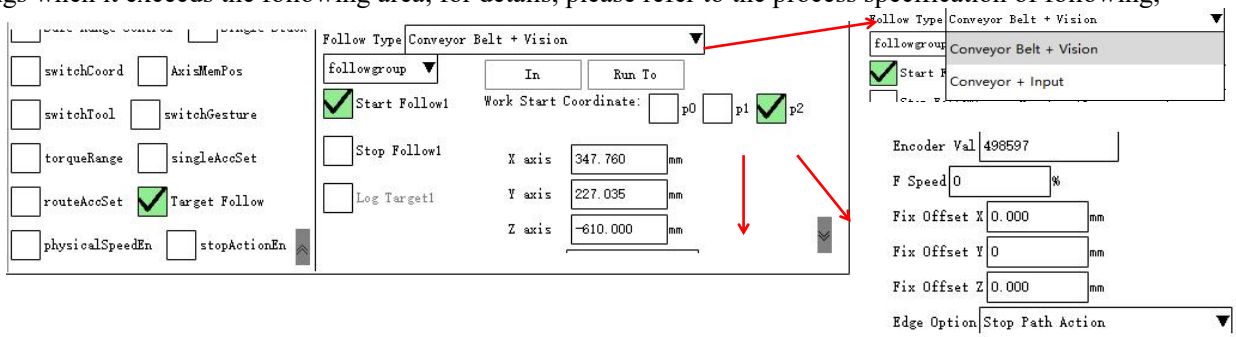
Note: Modify the Path S acceleration/deceleration of system setting, it mainly applies to gesture straight-line path and special conditions; when reset path acceleration/deceleration is ticked, it will cancel the setting and recover the default system settings;



Parameter setting page

20.13. Target following

Note: Assign the following group according to the set following mode (transmission belt + signal or transmission belt + vision), calibrate the relationship of P0, P1 and P2 according to the process requirements and when it is triggered, have corresponding actions in the following area; end the following when action is completed; give alarm according to the settings when it exceeds the following area; for details, please refer to the process specification of following;



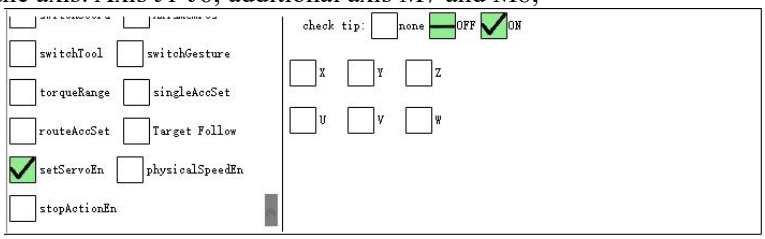
Parameter setting page

20.14. Enable settings

Note: Settings such as enabling axis on/off/no operation

When the program runs to "Enable setting servo: X off; Y on;", it will disable the servo of Axis X but enable the servo of

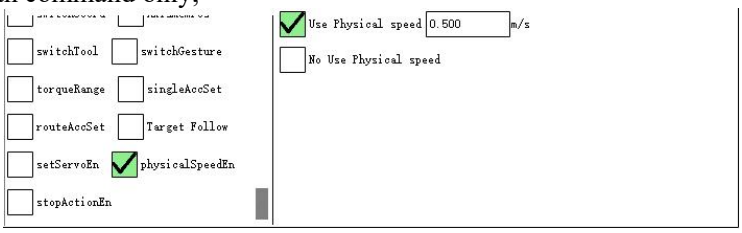
Axis Y; it will give alarm of servo disabling when running to action of Axis X;
* Note: Enable/disable switching is not allowed during high-speed running, in order to avoid an accident; tick enable: X, Y, Z, U, V and W refer to the axis: Axis J1-J6; additional axis M7 and M8;



Parameter setting page

20.15. Physical speed setting

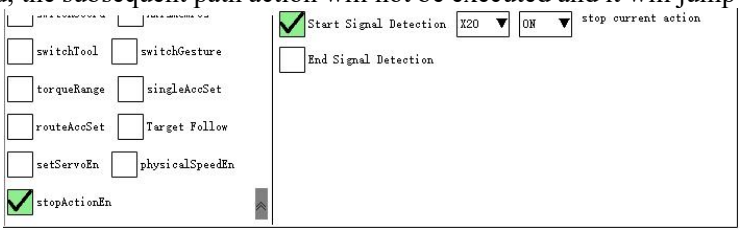
Note: After executing the command, the moving linear speed of path gesture linear action after the command is changed, and the global speed change after change has not affect on the speed, the path linear speed can be restored to the system setting only after executing the command to disable the physical speed; move at the set speed of meters per second, which applies to gesture path command only;



Parameter setting page

20.16. Stop action setting

Note: The command is divided into detection start and end;
Working mode: When **start detection** command is executed, the command will detect the bound IO and setting state according to the settings; when signal condition is established, the path action being executed will stop continued action, until end detection is executed;
Note: When condition is satisfied and recovered immediately (not satisfied), and end detection is not being executed, it will continuously execute the process action according to the normal steps; when end detection command is not executed but the condition is satisfied, the subsequent path action will not be executed and it will jump to the next action;



Parameter setting page

Note: While executing the path actions, the action will be skipped when condition is satisfied until the detection is ended, then it will recover normal execution of path action; when certain signal is detected while executing path action, the path action being executed will not be executed when the condition is satisfied, until the detection is ended, then the path action will be executed normally;

Chapter 7 Process Package

For details, please refer to *BORUNTE Process Specification*

Chapter 8 Alarm and Treatment

1. View alarm

Click "Log" button to pop up alarm history for viewing;

2. Clear alarm

When alarm occurs, firstly analyze the cause and solve it, then switch to stop status, press stop button to clear the alarm

3. Alarm contents and countermeasures

Alarm number	Alarm Information	Reason	Solution
Err1	Initialization fails	Data initializing in progress	It will be cleared automatically after start
Err2	Host axis configuration is inconsistent with that of hand controller axis	Hand controller does not match the host	Select host or hand controller as required
Err3	Parameter error of host axis configuration	Internal cause	Contact the technical personnel
Err4	Insufficient memory	Teaching program is too long	Use module to integrate the actions with the same reciprocating. Press stop button to clear the alarm.
Err5	Teaching data analysis error	Teaching program error; program version of hand controller and host does not match	Update the matched program version. Press stop button to clear the alarm.
Err6	Teaching data edit error	Edit program error	Reload or create mold number. Press stop button to clear the alarm.
Err7	Emergency stop	1. The emergency stop switch is pressed. 2. The emergency switch port on host has no wiring; short-circuit the STOP port when switch is not connected separately.	Release the emergency stop button to clear the alarm
Err8	Auto running and jump error	1. Check whether the label of teaching program jump is ineffective or deleted.	Press stop button to clear the alarm.
Err9	Host connection failure	1. Version error 2. Communication line error or poor communication quality of upper and lower computer 3. Host crash, host indicator is off	1、Perform programming of corresponding versions 2、Inspect the fault of communication line 3、Try to restart it
Err10	Teaching program error	The same with alarm information	Inspect the teaching program
Err11	Configuration parameter storage failure	The same with alarm information	Reset the parameters or reinspect the configuration parameters
Err12	Model setting error	The set motor quantity is lower than the min. motor quantity of model	Modify the model or inspect axis setting
Err15	IO board communication failure	IO board communication error	1. Inspect the wiring; 2. Inspect the main board and IO board
Err16	Fail to read the position of servo absolute value	Communication timeout	Inspect the wiring between host and servo
Err17	Fail to read and calibrate the position of servo absolute value	Communication timeout	Inspect the wiring between host and servo
Err18	The position reading function code of servo absolute value has error	Communication timeout	Inspect the wiring between host and servo
Err19	Position reading timeout of servo absolute value	Communication timeout	Inspect the wiring between host and servo
Err20	Communication failure of IO board 2	Communication timeout	1. Inspect the wiring; 2. Inspect the main board and IO board
Err21	IO board 3 communication failure	Communication timeout	1. Inspect the wiring; 2. Inspect the main board and IO board
Err22	IO board 4 communication failure	Communication timeout	1. Inspect the wiring; 2. Inspect the main board and IO board
Err23	IO board 5 communication failure	Communication timeout	1. Inspect the wiring; 2. Inspect the main board and IO board
Err24	FPGA alarm, please power off and restart!!!!	Internal cause	Contact the technical personnel
Err25	Output calibration error of analog quantity output module	Communication timeout	Inspect the communication line between analog quantity module and control board
Err26	Reading timeout of analog quantity output module	Communication timeout	Inspect the communication line between analog quantity module and control board
Err27	The current workbench as coordinate error and switching failure	Workbench data error	Inspect the set workbench data
Err28	Internal error	Memory application failure	Please optimize the mold number, reduce the quantity of commands in mold number
Err29	Position is being stabilized	Wait for stabilization of servo position	Wait for a while. Please contact the technical technician if the fault remains
Err30	Current workbench coordinate system does not exist	Wrong workbench data are used	Please inspect the workbench settings
Err31	Current turntable is undefined	Internal error	Contact the technical personnel
Err32	The current tool has coordinate error and switching failure	Wrong tool data are switched	Please inspect the tool data
Err33	Current tool coordinate system does not exist	Wrong tool data are used	Please inspect the tool data
Err34	EUIO board 1 communication failure	Communication timeout	Inspect the communication connection of EUIO board
Err35	EUIO board 2 communication failure	Communication timeout	Inspect the communication connection of EUIO board
Err36	Safety door open	NO	Close the safety doors.

Err37	Reference address of single axis action has error	Address reference error	Inspect the corresponding commands
Err38	Path reference address error	Address reference error	Inspect the corresponding commands
Err39	Axis mapping error	Axis mapping setting error	Check whether each axis mapping is repeated or exceeds the max. axis quantity
Err40	Teaching program of hand controller and host is inconsistent	1. Inconsistent version 2. Replace the hand controller or host	1. Upgrade the corresponding version 2. Select the parameters required
Err42	Servo not enabled	1. Servo safety switch is not pressed (or soft enable switch is not opened) 2. Input signal is not provided when using external enable signal (X31)	Enable servo
Err90~ Err97	Motor 1~8 gives alarm	1. Connection wire between host and servo drive is damaged; 2. Servo alarm fault;	Motor wiring fault or host circuit fault
Err100~ Err107	Axis 1~8 motion failure	1. Teach the same axis to have simultaneous motion; 2. The same axis of main program and subprogram runs at the same time; 3. Teaching track motion and single-axis motion occur at the same time;	Press stop button to clear the alarm. Restart running.
Err110~ Err117	Axis 1~8 speed setting error	NO	Press stop button to clear the alarm. Restart running.
Err120~E rr127	Axis 1~8 motion overspeed	Track acceleration is too high	Press stop button to clear the alarm. Restart running.
Err130~ Err137	Axis 1~8 positive limit alarm	1. The motion exceeds the range of single-axis soft limit; reset the range of single-axis soft limit; 2. Teaching program position exceeds the range of single-axis soft limit, modify the position of teaching program.	Press stop button to clear the alarm. Restart running.
Err140~ Err147	Axis 1~8 negative limit alarm	1. The motion exceeds the range of single-axis soft limit; reset the range of single-axis soft limit; 2. Teaching program position exceeds the range of single-axis soft limit, modify the position of teaching program.	Press stop button to clear the alarm. Restart running.
Err150~ Err157	Excessive deviation of Axis 1~8	1. Servo feedback pulse signal is wrong; test the motor forward/reverse rotation in motor page. 2. The tolerance is too small; the feedback pulse and output pulse have certain difference during the motion; set the tolerance value reasonably.	Machine setting → Running parameters, increase the tolerance settings; press stop button to clear the alarm. Restart running.
Err160~ Err167	Axis 1~8 acceleration alarm	Acceleration is too high.	Press stop button to clear the alarm. Restart running.
Err180~ Err187	Axis 1~8 negative limit signal alarm	1. Limit signal is disconnected 2. Limit signal is normally off or on and inconsistent with the installed switch; 4. Limit signal is connected to wrong port	Press stop button to clear the alarm. Restart running.
Err190~ Err197	Origin signal of Axis 1~8 is not set	The origin signal of this axis is not set in the system parameters. But origin parameters are provided while executing origin teaching.	Press stop button to clear the alarm. Reset it.
Err200	Track motion failure	Some singular points exist in track motion; evade the singular points through single-axis motion.	Press stop button to clear the alarm. Restart running.
Err201	The starting coordinates of manual straight-linear track motion are not set	The same with alarm information	Inspect the teaching data
Err202	The end point coordinates of manual straight-line track motion are not set	The same with alarm information	Inspect the teaching data
Err203	The starting coordinates of manual node motion are not set	The same with alarm information	Inspect the teaching data
Err204	The end point coordinates of manual node motion are not set	The same with alarm information	Inspect the teaching data
Err205	The relative motion coordinates of manual straight line are not set	The same with alarm information	Inspect the teaching data
Err206	The relative motion coordinates of manual node are not set	The same with alarm information	Inspect the teaching data
Err207	The starting coordinates of teaching straight-line track motion are not set	The same with alarm information	Inspect the teaching data
Err208	The end point coordinates of teaching straight-line track motion are not set	The same with alarm information	Inspect the teaching data
Err209	The starting coordinates of teaching node motion are not set	The same with alarm information	Inspect the teaching data
Err210	The end point coordinates of teaching node motion are not set	The same with alarm information	Inspect the teaching data

Err211	The relative movement coordinates of teaching straight line are not set	The same with alarm information	Inspect the teaching data
Err212	The relative motion coordinates of teaching node are not set	The same with alarm information	Inspect the teaching data
Err213	The starting coordinates of manual arc track motion are not set	The same with alarm information	Inspect the teaching data
Err214	The middle point coordinates of manual arc track motion are not set	The same with alarm information	Inspect the teaching data
Err215	The end point coordinates of manual arc track motion are not set	The same with alarm information	Inspect the teaching data
Err216	The starting coordinates of teaching arc track motion are not set	The same with alarm information	Inspect the teaching data
Err217	The middle coordinates of teaching arc track motion are not set	The same with alarm information	Inspect the teaching data
Err218	The end point coordinates of teaching arc track motion are not set	The same with alarm information	Inspect the teaching data
Err219	Setting failure of track motion speed	1. Set speed as 0; 2. The next track motion is entered while track is in running progress; for example, another track motion is started by subprogram while the main program is running one track.	Press stop button to clear the alarm. Restart running.
Err220	Track planing failure	Some singular points exist in track motion; evade the singular points through single-axis motion.	Press stop button to clear the alarm. Lower the speed and restart motion.
Err221	Track re-planing failure	1. Track motion is too fast; the motion of certain node is still too fast after multiple modification of track speed.	1. Check whether it is near the singular point 2. Check whether structural parameters are correct 3. Check whether external following data are correct 4. Check whether motion is continued before the front motion is not completed
Err222	Waiting timeout of stacking data source	1. Visual photography failure. 2. Visual communication disconnected.	NO
Err223	Stacking data source error	Setting is wrong	Inspect the setting of stacking counter
Err300	Counter is undefined	The same with alarm information	Press stop button to clear the alarm. Reset it.
Err310	Waiting timeout of AND OR command	The same with alarm information	AND OR command is taught in program. Check whether the waiting signal point is given in the waiting time
Err500~ Err507	Axis 1~8 overcurrent alarm	The same with alarm information	NO
Err510~ Err517	Axis 1~8 z pulse error	The same with alarm information	Inspect the servo wiring and servo
Err520~ Err527	Axis 1~8 has no z pulse	The same with alarm information	Inspect the servo wiring and servo
Err530~ Err537	Axis 1~8 origin offset	The same with alarm information	The origin has changed; reset the origin
Err600~ Err605	Non-safe area 1~6 alarm	The same with alarm information	Move the manipulator to the safety area
Err800~ Err807	Motor 1~8 disconnected	The same with alarm information	1. Check whether the communication wire between slave stations is connected reliably 2. Eliminate the interference 3. Return to the manufacturer for repair
Err900~ Err907	Encoder battery fault of Motor 1~8	The batteries are out of power.	Replace the battery
Err910~ Err917	Encoder on/off fault of Motor 1~8	Reset the origin after replacing battery	Reset the origin
Err920~ Err927	Motor 1~8 is not identified, restart it	NO	Reboot
Err1000~ Err1007	Servo 1~8 fault, servo is not enabled	NO	Inspect the servo fault
Err1498	The manufacturer selected is different	NO	The manufacturer of servo should be consistent
Err1499	The control mode selected is different	NO	The servo control should be consistent
Err1500~ Err1507	CAN communication timeout of Axis 1~8	NO	Check whether CAN communication wire or terminal resistor are connected
Err1508~ Err1515	CAN data reading error of Axis 1~8	Drive communication error	Check whether servo manufacturer is consistent with the realities
Err1516~ Err1523	CAN data writing error of Axis 1~8	Drive communication error	Check whether servo manufacturer is consistent with the realities
Err1524~ Err1531	Axis 1~8 servo overcurrent	Drive overcurrent	Inspect the drive
Err1532~ Err1539	Main circuit of Axis 1~8 drive has overvoltage	Main circuit of drive has overvoltage	Inspect the drive wiring

Err1540~ Err1547	Main circuit of Axis 1~8 drive has under-voltage	Main circuit of drive has under-voltage	Inspect the drive wiring
Err1548~ Err1555	Servo control of Axis 1~8 has under-voltage	Servo control has under-voltage	Inspect the drive wiring
Err1556~ Err1563	Axis 1~8 servo output has short circuit to ground	Servo output has short circuit to ground	Inspect the drive wiring
Err1564~ Err1571	Open phase alarm of Axis 1~8 power wire	NO	Check whether power wiring is correct
Err1572~ Err1579	Servo brake resistance of Axis 1~8 has overload	Servo brake resistance overload	Inspect the drive
Err1580~ Err1587	Drive overload alarm of Axis 1~8	Driver overload warning	Check whether the servo load exceeds the max. load of servo
Err1588~ Err1595	Motor power wire of Axis 1~8 is disconnected	NO	Replace the power wire
Err1596~ Err1603	Drive cooler of Axis 1~8 has overheat	The same with alarm information	Check whether fan is functioning properly
Err1604~ Err1611	Drive parameter storage of Axis 1~8 has error	The same with alarm information	Inspect the drive
Err1612~ Err1619	Axis 1~8 drive parameter error	The same with alarm information	Inspect the drive
Err1620~ Err1627	Axis 1~8 servo motor blocked	The same with alarm information	Inspect the drive
Err1628~ Err1635	Axis 1~8 encoder internal fault	The same with alarm information	Inspect the drive
Err1636~ Err1643	Axis 1~8 servo motor overspeed	Motor max. speed error	Set the motor max. speed properly
Err1644~ Err1651	Drive position of Axis 1~8 has excessive deviation	The same with alarm information	Increase drive tolerance or increase the acceleration/deceleration
Err1652~ Err1659	Axis 1~8 drive pulse error	The same with alarm information	Inspect the drive
Err1660~ Err1667	Axis 1~8 CANopen node protection/heartbeat timeout	The same with alarm information	Inspect the drive
Err1668~ Err1675	Axis 1~8 CANopen PDO transmission length error	The same with alarm information	Inspect the drive
Err1676~ Err1683	Axis 1~8 servo alarm, reach reverse switch	The same with alarm information	Inspect the drive
Err1684~ Err1691	Axis 1~8 servo alarm	The same with alarm information	Inspect the drive
Err1692~ Err1699	Travel limit alarm of Axis 1~8 servo	The same with alarm information	Inspect the drive limit
Err1700~ Err1707	Axis 1~8 EEPROM read/write error	The same with alarm information	Inspect the drive
Err1708~ Err1715	Axis 1~8 CANopen communication error	The same with alarm information	1. Check whether CANopen of servo drive is turned on 2. Check if CAN communication wire is connected properly 3. Check if terminal resistor is connected
Err1716~ Err1723	Axis 1~8 servo overload	The same with alarm information	Inspect the drive
Err1724~ Err1731	Axis 1~8 servo can synchronization error	The same with alarm information	Inspect the drive
Err1732~ Err1739	Servo 1~8 failure, IGBT overheat	The same with alarm information	Inspect the drive
Err1740	No or multiple first machines are detected online	NO	Set one first machine only
Err1741~ Err1756	Online manipulator 1~16 communication timeout	NO	Inspect the CAN communication wire or can communication setting
Err1757~ Err1772	ID number 1~16 conflict of online manipulator	Online ID conflict	Set the unique ID number
Err1773~ Err1788	Online manipulator 1~16 is not under auto state	Online manipulator 1~16 is not under auto state	Check whether each machine is under auto state
Err1850	Can encoder read/write failure	Fail to connect Can encoder	1. Check can encoder id 2. Check the terminal resistor 3. Check the baud rate of can encoder
Err1900	Can encoder setting failure	Can encoder setting error	Check whether the can encoder is supported
Err2048	Starting address of IO alarm	NO	Press stop button to clear the alarm.
Err4095	End address of IO alarm	NO	Press stop button to clear the alarm.
Err5000	Start customized alarm	User-defined	Press stop button to clear the alarm.
Err10000	End customized alarm	User-defined	Press stop button to clear the alarm.
10001	X axis emergency stop alarm	The servo has input of emergency stop signal	1. Screw out the emergency stop knob on the hand controller 2. Short-circuit the emergency stop signal of the host
10002	X axis overcurrent	IPM module overcurrent protection	1. Check whether the motor is blocked 2. Pull the power wire and brake wire and then power on again; when it gives alarm after power-on, the host is fault and replace it; otherwise, check whether motor and circuit have problem.
10003	X axis overcurrent	IPM module overcurrent protection	1. Check whether the motor is blocked 2. Pull the power wire and brake wire and then power on again; when it gives alarm after power-on, the host is fault and replace it; otherwise, check whether motor and circuit have problem.
10004	X axis external bus is disconnected	Fail to receive bus normal signal	1. The 3pin white terminal at top is loose 2. Host failure

10005	X axis overload	The max load is exceeded	1. Check the load condition 1. Check whether the motor is blocked
10006	X axis overload	The max load is exceeded	1. Check the load condition 2. Check whether motor is blocked and brake is released 3. Check whether No. 1 parameter is the corresponding power
10007	X axis motor initializing in progress	Power-on initialization of drive is not completed	1. Press stop to clear the fault 2. Power on again if failing to clear the fault 3. Host has a fault; replace it
10008	X axis motor initializing in progress	Power-on initialization of drive is not completed	1. Press stop to clear the fault 2. Power on again if failing to clear the fault 3. Host has a fault; replace it
10009	X axis 3-phase error	The current exceeds the alarm value	1. Line sequence error 2. Open phase 3. Motor code does not match the motor
10010	X axis 3-phase error	The current exceeds the alarm value	1. Line sequence error 2. Open phase 3. Motor code does not match the motor
10011	X axis VDC under-voltage	Detected voltage is lower than 195v	1. Check whether the voltage drops too much due to excessive load and/or excessive acceleration 2. Check whether the external feed voltage is too low 3. Host has a fault; replace it
10012	X axis VDC overvoltage	Detected voltage is higher than 405v	1. Check whether the voltage rises too much due to excessive load and excessive deceleration 2. Check whether brake resistor has a fault or disconnection 3. Host has a fault; replace it
10013	X axis overspeed	The maximum rotational speed is exceeded	1. Internal communication disconnected; check whether the grounding is good 2. No. 50 parameter setting error
10014	X axis overspeed	The maximum rotational speed is exceeded	1. Internal communication disconnected; check whether the grounding is good 2. No. 50 parameter setting error
10015	Drive overheating	The internal temperature exceeds 75°C	1. Check whether fan is functioning properly 2. Host has a fault; replace it
10016	X axis EEPROM writing failure	The storage chip is abnormal	Replace the host
10017	X axis EEPROM reading failure	The storage chip is abnormal	Replace the host
10018	X axis has major position deviation	The difference between the instruction value and the actual encoder value exceeds the set value of Parameter 49	1. Set the parameters of No. 49 servo parameters, increase the deviation range 2. The acceleration/deceleration is too low 3. System failure
10019	X axis has major position deviation	The difference between the instruction value and the actual encoder value exceeds the set value of Parameter 49	1. Set the parameters of No. 49 servo parameters, increase the deviation range 2. The acceleration/deceleration is too low 3. System failure
10020	X axis encoder error	Encoder communication failure	1. The encoder wire has a fault 2. Encoder joint has poor contact 3. Motor encoder has a fault
10021	X axis speed measurement abnormality	Motor rotation abnormality	1. Motor code setting error 2. Gain parameter error 3. Motor fault leads to disorder rotation
10022	X axis encoder initializing in progress	The encoder is initializing	1. The encoder wire has a fault 2. Encoder joint has poor contact 3. Motor encoder has a fault
10023	X axis VDC hardware overvoltage	Internal hardware overvoltage protection	1. Check whether the voltage rises too much due to excessive load and excessive deceleration 2. Check whether brake resistor has a fault or disconnection 3. Host has a fault; replace it
10024	X axis external bus ERR	Fail to receive bus normal signal	1. The 3pin white terminal at top is loose 2. Host failure
10025	X axis position buffer area is full	System Error	
10026	X axis position buffer area is full	System Error	
10027	X axis EEPROM parameter detection error	The storage chip is abnormal	Replace the host
10028	X axis encoder error	Encoder communication failure	1. The encoder wire has a fault 2. Encoder joint has poor contact 3. Motor encoder has a fault
10029	X axis speed measurement abnormality	The encoder feedback value is abnormal	1. Motor code setting error 2. Gain parameter error 3. Motor fault leads to disorder rotation
10030	X axis encoder initializing in progress	The encoder is initializing	1. The encoder wire has a fault 2. Encoder joint has poor contact 3. Motor encoder has a fault
10031	X axis clear alarm too fast	Alarm clearing frequency too high	
10032	X axis EEPROM needs recovery	Stored parameter detection error	Write 8051 through No. 0 parameter, wait for 10s and then power on to clear the fault
10033	X axis Ethercat communication timeout	Bus communication timeout	Replace the host
10034	Battery failure of X axis encoder	The encoder has power failure identifier	Make sure battery has good connection, set No. 13 parameter as 0 to clear the fault
10035	Battery failure of X axis encoder	The encoder has power failure identifier	Make sure battery has good connection, set No. 13 parameter as 0 to clear the fault

10036	Battery low voltage of X axis encoder	The encoder has battery low voltage identifier	Encoder voltage is too low
10037	Battery low voltage of X axis encoder	The encoder has battery low voltage identifier	Encoder voltage is too low
10038	X axis motor code is inconsistent	The motor code that is read from encoder is inconsistent with the setting value	1. Check whether No. 2 parameter is correct motor code; if so, restart to clear the fault 2. In case of error, set No. 4 parameter as 1, then manually set No. 2 parameter as the correct motor code
10039	X axis motor code is inconsistent	The motor code that is read from encoder is inconsistent with the setting value	1. Check whether No. 2 parameter is correct motor code; if so, restart to clear the fault 2. In case of error, set No. 4 parameter as 1, then manually set No. 2 parameter as the correct motor code
10040	X axis has illegal motor code	Motor code is not supported by system	Set No. 4 parameter as 1, then manually set No. 2 parameter as the correct motor code
10041	X axis has illegal motor code	Motor code is not supported by system	Set No. 4 parameter as 1, then manually set No. 2 parameter as the correct motor code
10042	X axis encoder data are not updated	Encoder value has no change	Motor encoder has a fault
10043	X axis encoder data are not updated	Encoder value has no change	Motor encoder has a fault
10044	X axis encoder multi-turn value error		Power off, unplug the battery, reset encoder/set No. 13 parameter as 0
10045	X axis encoder multi-turn value error		Power off, unplug the battery, reset encoder/set No. 13 parameter as 0
10046	X axis power mismatching		View Parameter 2 and confirm whether the motor code matches Parameter 1 "power"
10047	X axis power mismatching		View Parameter 2 and confirm whether the motor code matches Parameter 1 "power"
10048	X axis parameter setting error	Parameters are set unreasonably	Check whether the parameters are within the range: 5(1, 6000),6(1,300),7(1~300),11(10,5000),15(10,100),21(1,1000),22(0,300), 23(1,20),31(20000),32(2000/20000),69(4096), 71(0), 72(0), 73(0)
10049	X axis parameter setting error	Parameters are set unreasonably	Check whether the parameters are within the range: 5(1, 6000),6(1,300),7(1~300),11(10,5000),15(10,100), 21(1,1000),22(0,300), 23(1,20),31(20000),32(2000/20000),69(4096),71(0),72(0),73(0)
11001	Y axis emergency stop alarm	The servo has input of emergency stop signal	1. Screw out the emergency stop knob on the hand controller 2. Short-circuit the emergency stop signal of the host
11002	Y axis overcurrent	IPM module overcurrent protection	1. Check whether the motor is blocked 2. Pull the power wire and brake wire and then power on again; when it gives alarm after power-on, the host is fault and replace it; otherwise, check whether motor and circuit have problem.
11003	Y axis overcurrent	IPM module overcurrent protection	1. Check whether the motor is blocked 2. Pull the power wire and brake wire and then power on again; when it gives alarm after power-on, the host is fault and replace it; otherwise, check whether motor and circuit have problem.
11004	Y axis external bus is disconnected	Fail to receive bus normal signal	1. The 3pin white terminal at top is loose 2. Host failure
11005	Y axis overload	The max load is exceeded	1. Check the load condition 1. Check whether the motor is blocked
11006	Y axis overload	The max load is exceeded	1. Check the load condition 2. Check whether motor is blocked and brake is released 3. Check whether No. 1 parameter is the corresponding power
11007	Y axis motor initializing in progress	Power-on initialization of drive is not completed	1. Press stop to clear the fault 2. Power on again if failing to clear the fault 3. Host has a fault; replace it
11008	Y axis motor initializing in progress	Power-on initialization of drive is not completed	1. Press stop to clear the fault 2. Power on again if failing to clear the fault 3. Host has a fault; replace it
11009	Y axis 3-phase error	The current exceeds the alarm value	1. Line sequence error 2. Open phase 3. Motor code does not match the motor
11010	Y axis 3-phase error	The current exceeds the alarm value	1. Line sequence error 2. Open phase 3. Motor code does not match the motor
11011	Y axis VDC under-voltage	Detected voltage is lower than 195v	1. Check whether the voltage drops too much due to excessive load and/or excessive acceleration 2. Check whether the external feed voltage is too low 3. Host has a fault; replace it
11012	Y axis VDC over-voltage	Detected voltage is higher than 405v	1. Check whether the voltage rises too much due to excessive load and excessive deceleration 2. Check whether brake resistor has a fault or disconnection 3. Host has a fault; replace it
11013	Y axis overspeed	The maximum rotational speed is exceeded	1. Internal communication disconnected; check whether the grounding is good 2. No. 50 parameter setting error
11014	Y axis overspeed	The maximum rotational speed is exceeded	1. Internal communication disconnected; check whether the grounding is good 2. No. 50 parameter setting error

11015	Y axis drive overheat	The internal temperature exceeds 75°C	1. Check whether fan is functioning properly 2. Host has a fault; replace it
11016	Y axis EEPROM writing failure	The storage chip is abnormal	Replace the host
11017	Y axis EEPROM reading failure	The storage chip is abnormal	Replace the host
11018	Y axis has major position deviation	The difference between the instruction value and the actual encoder value exceeds the set value of Parameter 49	1. Set the parameters of No. 49 servo parameters, increase the deviation range 2. The acceleration/deceleration is too low 3. System failure
11019	Y axis has major position deviation	The difference between the instruction value and the actual encoder value exceeds the set value of Parameter 49	1. Set the parameters of No. 49 servo parameters, increase the deviation range 2. The acceleration/deceleration is too low 3. System failure
11020	Y axis encoder error	Encoder communication failure	1. The encoder wire has a fault 2. Encoder joint has poor contact 3. Motor encoder has a fault
11021	Y axis speed measurement abnormality	Motor rotation abnormality	1. Motor code setting error 2. Gain parameter error 3. Motor fault leads to disorder rotation
11022	Y axis encoder initializing in progress	The encoder is initializing	1. The encoder wire has a fault 2. Encoder joint has poor contact 3. Motor encoder has a fault
11023	Y axis VDC hardware overvoltage	Internal hardware overvoltage protection	1. Check whether the voltage rises too much due to excessive load and excessive deceleration 2. Check whether brake resistor has a fault or disconnection 3. Host has a fault; replace it
11024	Y axis external bus ERR	Fail to receive bus normal signal	1. The 3pin white terminal at top is loose 2. Host failure
11025	Y axis position buffer area is full	System Error	
11026	Y axis position buffer area is full	System Error	
11027	Y axis EEPROM parameter detection error	The storage chip is abnormal	Replace the host
11028	Y axis encoder error	Encoder communication failure	1. The encoder wire has a fault 2. Encoder joint has poor contact 3. Motor encoder has a fault
11029	Y axis speed measurement abnormality	The encoder feedback value is abnormal	1. Motor code setting error 2. Gain parameter error 3. Motor fault leads to disorder rotation
11030	Y axis encoder initializing in progress	The encoder is initializing	1. The encoder wire has a fault 2. Encoder joint has poor contact 3. Motor encoder has a fault
11031	Y axis clear alarm too fast	Alarm clearing frequency too high	
11032	Y axis EEPROM needs recovery	Stored parameter detection error	Write 8051 through No. 0 parameter, wait for 10s and then power on to clear the fault
11033	Y axis Ethercat communication timeout	Bus communication timeout	Replace the host
11034	Battery failure of Y axis encoder	The encoder has power failure identifier	Make sure battery has good connection, set No. 13 parameter as 0 to clear the fault
11035	Battery failure of Y axis encoder	The encoder has power failure identifier	Make sure battery has good connection, set No. 13 parameter as 0 to clear the fault
11036	Battery low voltage of Y axis encoder	The encoder has battery low voltage identifier	Encoder voltage is too low
11037	Battery low voltage of Y axis encoder	The encoder has battery low voltage identifier	Encoder voltage is too low
11038	Y axis motor code is inconsistent	The motor code that is read from encoder is inconsistent with the setting value	1. Check whether No. 2 parameter is correct motor code; if so, restart to clear the fault 2. In case of error, set No. 4 parameter as 1, then manually set No. 2 parameter as the correct motor code
11039	Y axis motor code is inconsistent	The motor code that is read from encoder is inconsistent with the setting value	1. Check whether No. 2 parameter is correct motor code; if so, restart to clear the fault 2. In case of error, set No. 4 parameter as 1, then manually set No. 2 parameter as the correct motor code
11040	Y axis has illegal motor code	Motor code is not supported by system	Set No. 4 parameter as 1, then manually set No. 2 parameter as the correct motor code
11041	Y axis has illegal motor code	Motor code is not supported by system	Set No. 4 parameter as 1, then manually set No. 2 parameter as the correct motor code
11042	Y axis encoder data are not updated	Encoder value has no change	Motor encoder has a fault
11043	Y axis encoder data are not updated	Encoder value has no change	Motor encoder has a fault
11044	Y-axis encoder multi-turn value error		Power off, unplug the battery, reset encoder/set No. 13 parameter as 0
11045	Y axis encoder multi-turn value error		Power off, unplug the battery, reset encoder/set No. 13 parameter as 0
11046	Y axis power mismatching		View Parameter 2 and confirm whether the motor code matches Parameter 1 "power"
11047	Y axis power mismatching		View Parameter 2 and confirm whether the motor code matches Parameter 1 "power"

11048	Y axis parameter setting error	Parameters are set unreasonably	Check whether the parameters are within the range: 5(1, 6000), 6(1,300),7(1~300), 11(10, 5000),15(10,100), 21(1, 1000), 22(0,300), 23(1, 20), 31(20000),32(2000/20000),69(4096), 71(0), 72(0), 73(0)
11049	Y axis parameter setting error	Parameters are set unreasonably	Check whether the parameters are within the range: 5(1, 6000), 6(1,300),7(1~300), 11(10, 5000),15(10,100), 21(1, 1000), 22(0,300), 23(1, 20), 31(20000),32(2000/20000),69(4096), 71(0), 72(0), 73(0)
12001	Z axis emergency stop alarm	The servo has input of emergency stop signal	1. Screw out the emergency stop knob on the hand controller 2. Short-circuit the emergency stop signal of the host
12002	Z axis overcurrent	IPM module overcurrent protection	1. Check whether the motor is blocked 2. Pull the power wire and brake wire and then power on again; when it gives alarm after power-on, the host is fault and replace it; otherwise, check whether motor and circuit have problem.
12003	Z axis overcurrent	IPM module overcurrent protection	1. Check whether the motor is blocked 2. Pull the power wire and brake wire and then power on again; when it gives alarm after power-on, the host is fault and replace it; otherwise, check whether motor and circuit have problem.
12004	Z axis external bus is disconnected	Fail to receive bus normal signal	1. The 3pin white terminal at top is loose 2. Host failure
12005	Z axis overload	The max load is exceeded	1. Check the load condition 1. Check whether the motor is blocked
12006	Z axis overload	The max load is exceeded	1. Check the load condition 2. Check whether motor is blocked and brake is released 3. Check whether No. 1 parameter is the corresponding power
12007	Z axis motor initializing in progress	Power-on initialization of drive is not completed	1. Press stop to clear the fault 2. Power on again if failing to clear the fault 3. Host has a fault; replace it
12008	Z axis motor initializing in progress	Power-on initialization of drive is not completed	1. Press stop to clear the fault 2. Power on again if failing to clear the fault 3. Host has a fault; replace it
12009	Z axis 3-phase error	The current exceeds the alarm value	1. Line sequence error 2. Open phase 3. Motor code does not match the motor
12010	Z axis 3-phase error	The current exceeds the alarm value	1. Line sequence error 2. Open phase 3. Motor code does not match the motor
12011	Z axis VDC under-voltage	Detected voltage is lower than 195v	1. Check whether the voltage drops too much due to excessive load and/or excessive acceleration 2. Check whether the external feed voltage is too low 3. Host has a fault; replace it
12012	Z axis VDC overvoltage	Detected voltage is higher than 405v	1. Check whether the voltage rises too much due to excessive load and excessive deceleration 2. Check whether brake resistor has a fault or disconnection 3. Host has a fault; replace it
12013	Z axis overspeed	The maximum rotational speed is exceeded	1. Internal communication disconnected; check whether the grounding is good 2. No. 50 parameter setting error
12014	Z axis overspeed	The maximum rotational speed is exceeded	1. Internal communication disconnected; check whether the grounding is good 2. No. 50 parameter setting error
12015	Drive Z overheat	The internal temperature exceeds 75°C	1. Check whether fan is functioning properly 2. Host has a fault; replace it
12016	Z axis EEPROM writing failure	The storage chip is abnormal	Replace the host
12017	Z axis EEPROM reading failure	The storage chip is abnormal	Replace the host
12018	Z axis has major position deviation	The difference between the instruction value and the actual encoder value exceeds the set value of Parameter 49	1. Set the parameters of No. 49 servo parameters, increase the deviation range 2. The acceleration/deceleration is too low 3. System failure
12019	Z axis has major position deviation	The difference between the instruction value and the actual encoder value exceeds the set value of Parameter 49	1. Set the parameters of No. 49 servo parameters, increase the deviation range 2. The acceleration/deceleration is too low 3. System failure
12020	Z axis encoder error	Encoder communication failure	1. The encoder wire has a fault 2. Encoder joint has poor contact 3. Motor encoder has a fault
12021	Z axis speed measurement abnormality	Motor rotation abnormality	1. Motor code setting error 2. Gain parameter error 3. Motor fault leads to disorder rotation
12022	Z axis encoder initializing in progress	The encoder is initializing	1. The encoder wire has a fault 2. Encoder joint has poor contact 3. Motor encoder has a fault
12023	Z axis VDC hardware overvoltage	Internal hardware overvoltage protection	1. Check whether the voltage rises too much due to excessive load and excessive deceleration 2. Check whether brake resistor has a fault or disconnection 3. Host has a fault; replace it
12024	Z axis external bus ERR	Fail to receive bus normal signal	1. The 3pin white terminal at top is loose 2. Host failure
12025	Z axis position buffer area is full	System Error	
12026	Z axis position buffer area is full	System Error	

12027	Z axis EEPROM parameter detection error	The storage chip is abnormal	Replace the host
12028	Z axis encoder error	Encoder communication failure	1. The encoder wire has a fault 2. Encoder joint has poor contact 3. Motor encoder has a fault
12029	Z axis speed measurement abnormality	The encoder feedback value is abnormal	1. Motor code setting error 2. Gain parameter error 3. Motor fault leads to disorder rotation
12030	Z axis encoder initializing in progress	The encoder is initializing	1. The encoder wire has a fault 2. Encoder joint has poor contact 3. Motor encoder has a fault
12031	Z axis clear alarm too fast	Alarm clearing frequency too high	
12032	Z axis EEPROM needs recovery	Stored parameter detection error	Write 8051 through No. 0 parameter, wait for 10s and then power on to clear the fault
12033	Z axis Ethercat communication timeout	Bus communication timeout	Replace the host
12034	Battery failure of Z axis encoder	The encoder has power failure identifier	Make sure battery has good connection, set No. 13 parameter as 0 to clear the fault
12035	Battery failure of Z axis encoder	The encoder has power failure identifier	Make sure battery has good connection, set No. 13 parameter as 0 to clear the fault
12036	Battery low voltage of Z axis encoder	The encoder has battery low voltage identifier	Encoder voltage is too low
12037	Battery low voltage of Z axis encoder	The encoder has battery low voltage identifier	Encoder voltage is too low
12038	Z axis motor code is inconsistent	The motor code that is read from encoder is inconsistent with the setting value	1. Check whether No. 2 parameter is correct motor code; if so, restart to clear the fault 2. In case of error, set No. 4 parameter as 1, then manually set No. 2 parameter as the correct motor code
12039	Z axis motor code is inconsistent	The motor code that is read from encoder is inconsistent with the setting value	1. Check whether No. 2 parameter is correct motor code; if so, restart to clear the fault 2. In case of error, set No. 4 parameter as 1, then manually set No. 2 parameter as the correct motor code
12040	Z axis has illegal motor code	Motor code is not supported by system	Set No. 4 parameter as 1, then manually set No. 2 parameter as the correct motor code
12041	Z axis has illegal motor code	Motor code is not supported by system	Set No. 4 parameter as 1, then manually set No. 2 parameter as the correct motor code
12042	Z axis encoder data are not updated	Encoder value has no change	Motor encoder has a fault
12043	Z axis encoder data are not updated	Encoder value has no change	Motor encoder has a fault
12044	Z-axis encoder multi-turn value error		Power off, unplug the battery, reset encoder/set No. 13 parameter as 0
12045	Z axis encoder multi-turn value error		Power off, unplug the battery, reset encoder/set No. 13 parameter as 0
12046	Z axis power mismatching		View Parameter 2 and confirm whether the motor code matches Parameter 1 "power"
12047	Z axis power mismatching		View Parameter 2 and confirm whether the motor code matches Parameter 1 "power"
12048	Z axis parameter setting error	Parameters are set unreasonably	Check whether the parameters are within the range: 5(1,6000), 6(1,300),7(1~300),11(10,5000),15(10,100),21(1,1000),22(0,300), 23(1,20),31(20000),32(2000/20000),69(4096),71(0),72(0),73(0)
12049	Z axis parameter setting error	Parameters are set unreasonably	Check whether the parameters are within the range: 5(1, 6000), 6(1,300),7(1~300), 11(10,5000),15(10,100), 21(1,1000),22(0,300),23(1,20),31(20000),32(2000/20000),69(4096), 71(0), 72(0), 73(0)
13001	U axis emergency stop alarm	The servo has input of emergency stop signal	1. Screw out the emergency stop knob on the hand controller 2. Short-circuit the emergency stop signal of the host
13002	U axis overcurrent	IPM module overcurrent protection	1. Check whether the motor is blocked 2. Pull the power wire and brake wire and then power on again; when it gives alarm after power-on, the host is fault and replace it; otherwise, check whether motor and circuit have problem.
13003	U axis overcurrent	IPM module overcurrent protection	1. Check whether the motor is blocked 2. Pull the power wire and brake wire and then power on again; when it gives alarm after power-on, the host is fault and replace it; otherwise, check whether motor and circuit have problem.
13004	U axis external bus is disconnected	Fail to receive bus normal signal	1. The 3pin white terminal at top is loose 2. Host failure
13005	U axis overload	The max load is exceeded	1. Check the load condition 1. Check whether the motor is blocked
13006	U axis overload	The max load is exceeded	1. Check the load condition 2. Check whether motor is blocked and brake is released 3. Check whether No. 1 parameter is the corresponding power
13007	U axis motor initializing in progress	Power-on initialization of drive is not completed	1. Press stop to clear the fault 2. Power on again if failing to clear the fault 3. Host has a fault; replace it
13008	U axis motor initializing in progress	Power-on initialization of drive is not completed	1. Press stop to clear the fault 2. Power on again if failing to clear the fault 3. Host has a fault; replace it

13009	U axis 3-phase error	The current exceeds the alarm value	1. Line sequence error 2. Open phase 3. Motor code does not match the motor
13010	U axis 3-phase error	The current exceeds the alarm value	1. Line sequence error 2. Open phase 3. Motor code does not match the motor
13011	U axis VDC under-voltage	Detected voltage is lower than 195v	1. Check whether the voltage drops too much due to excessive load and/or excessive acceleration 2. Check whether the external feed voltage is too low 3. Host has a fault; replace it
13012	U axis VDC overvoltage	Detected voltage is higher than 405v	1. Check whether the voltage rises too much due to excessive load and excessive deceleration 2. Check whether brake resistor has a fault or disconnection 3. Host has a fault; replace it
13013	U axis overspeed	The maximum rotational speed is exceeded	1. Internal communication disconnected; check whether the grounding is good 2. No. 50 parameter setting error
13014	U axis overspeed	The maximum rotational speed is exceeded	1. Internal communication disconnected; check whether the grounding is good 2. No. 50 parameter setting error
13015	U axis drive overheat	The internal temperature exceeds 75°C	1. Check whether fan is functioning properly 2. Host has a fault; replace it
13016	U axis EEPROM writing failure	The storage chip is abnormal	Replace the host
13017	U axis EEPROM reading failure	The storage chip is abnormal	Replace the host
13018	U axis has major position deviation	The difference between the instruction value and the actual encoder value exceeds the set value of Parameter 49	1. Set the parameters of No. 49 servo parameters, increase the deviation range 2. The acceleration/deceleration is too low 3. System failure
13019	U axis has major position deviation	The difference between the instruction value and the actual encoder value exceeds the set value of Parameter 49	1. Set the parameters of No. 49 servo parameters, increase the deviation range 2. The acceleration/deceleration is too low 3. System failure
13020	U axis encoder error	Encoder communication failure	1. The encoder wire has a fault 2. Encoder joint has poor contact 3. Motor encoder has a fault
13021	U axis speed measurement abnormality	Motor rotation abnormality	1. Motor code setting error 2. Gain parameter error 3. Motor fault leads to disorder rotation
13022	U axis encoder initializing in progress	The encoder is initializing	1. The encoder wire has a fault 2. Encoder joint has poor contact 3. Motor encoder has a fault
13023	U axis VDC hardware overvoltage	Internal hardware overvoltage protection	1. Check whether the voltage rises too much due to excessive load and excessive deceleration 2. Check whether brake resistor has a fault or disconnection 3. Host has a fault; replace it
13024	U axis external bus ERR	Fail to receive bus normal signal	1. The 3pin white terminal at top is loose 2. Host failure
13025	U axis position buffer area is full	System Error	
13026	U axis position buffer area is full	System Error	
13027	U axis EEPROM parameter detection error	The storage chip is abnormal	Replace the host
13028	U axis encoder error	Encoder communication failure	1. The encoder wire has a fault 2. Encoder joint has poor contact 3. Motor encoder has a fault
13029	U axis speed measurement abnormality	The encoder feedback value is abnormal	1. Motor code setting error 2. Gain parameter error 3. Motor fault leads to disorder rotation
13030	U axis encoder initializing in progress	The encoder is initializing	1. The encoder wire has a fault 2. Encoder joint has poor contact 3. Motor encoder has a fault
13031	U axis clear alarm too fast	Alarm clearing frequency too high	
13032	U axis EEPROM needs recovery	Stored parameter detection error	Write 8051 through No. 0 parameter, wait for 10s and then power on to clear the fault
13033	U axis Ethercat communication timeout	Bus communication timeout	Replace the host
13034	Battery failure of U axis encoder	The encoder has power failure identifier	Make sure battery has good connection, set No. 13 parameter as 0 to clear the fault
13035	Battery failure of U axis encoder	The encoder has power failure identifier	Make sure battery has good connection, set No. 13 parameter as 0 to clear the fault
13036	Battery low voltage of U axis encoder	The encoder has battery low voltage identifier	Encoder voltage is too low
13037	Battery low voltage of U axis encoder	The encoder has battery low voltage identifier	Encoder voltage is too low
13038	U axis motor code is inconsistent	The motor code that is read from encoder is inconsistent with the setting value	1. Check whether No. 2 parameter is correct motor code; if so, restart to clear the fault 2. In case of error, set No. 4 parameter as 1, then manually set No. 2 parameter as the correct motor code

13039	U axis motor code is inconsistent	The motor code that is read from encoder is inconsistent with the setting value	1. Check whether No. 2 parameter is correct motor code; if so, restart to clear the fault 2. In case of error, set No. 4 parameter as 1, then manually set No. 2 parameter as the correct motor code
13040	U axis has illegal motor code	Motor code is not supported by system	Set No. 4 parameter as 1, then manually set No. 2 parameter as the correct motor code
13041	U axis has illegal motor code	Motor code is not supported by system	Set No. 4 parameter as 1, then manually set No. 2 parameter as the correct motor code
13042	U axis encoder data are not updated	Encoder value has no change	Motor encoder has a fault
13043	U axis encoder data are not updated	Encoder value has no change	Motor encoder has a fault
13044	U axis encoder multi-turn value error		Power off, unplug the battery, reset encoder/set No. 13 parameter as 0
13045	U axis encoder multi-turn value error		Power off, unplug the battery, reset encoder/set No. 13 parameter as 0
13046	U axis power mismatching		View Parameter 2 and confirm whether the motor code matches Parameter 1 "power"
13047	U axis power mismatching		View Parameter 2 and confirm whether the motor code matches Parameter 1 "power"
13048	U axis parameter setting error	Parameters are set unreasonably	Check whether the parameters are within the range: 5(1, 6000), 6(1,300),7(1~300), 11(10, 5000),15(10,100), 21(1, 1000), 22(0,300), 23(1, 20), 31(20000),32(2000/20000),69(4096), 71(0), 72(0), 73(0)
13049	U axis parameter setting error	Parameters are set unreasonably	Check whether the parameters are within the range: 5(1, 6000), 6(1,300),7(1~300), 11(10, 5000),15(10,100), 21(1, 1000), 22(0,300), 23(1, 20), 31(20000),32(2000/20000),69(4096), 71(0), 72(0), 73(0)
14001	V axis emergency stop alarm	The encoder has power failure identifier	Make sure battery has good connection, set No. 13 parameter as 0 to clear the fault
14002	V axis overcurrent	The encoder has power failure identifier	Make sure battery has good connection, set No. 13 parameter as 0 to clear the fault
14003	V axis overcurrent	The encoder has battery low voltage identifier	Encoder voltage is too low
14004	V axis external bus is disconnected	The encoder has battery low voltage identifier	Encoder voltage is too low
14005	V axis overload	The motor code that is read from encoder is inconsistent with the setting value	1. Check whether No. 2 parameter is correct motor code; if so, restart to clear the fault 2. In case of error, set No. 4 parameter as 1, then manually set No. 2 parameter as the correct motor code
14006	V axis overload	The motor code that is read from encoder is inconsistent with the setting value	1. Check whether No. 2 parameter is correct motor code; if so, restart to clear the fault 2. In case of error, set No. 4 parameter as 1, then manually set No. 2 parameter as the correct motor code
14007	V axis motor initializing in progress	Motor code is not supported by system	Set No. 4 parameter as 1, then manually set No. 2 parameter as the correct motor code
14008	V axis motor initializing in progress	Motor code is not supported by system	Set No. 4 parameter as 1, then manually set No. 2 parameter as the correct motor code
14009	V axis 3-phase error	Encoder value has no change	Motor encoder has a fault
14010	V axis 3-phase error	Encoder value has no change	Motor encoder has a fault
14011	V axis VDC under-voltage		Power off, unplug the battery, reset encoder/set No. 13 parameter as 0
14012	V axis VDC overvoltage		Power off, unplug the battery, reset encoder/set No. 13 parameter as 0
14013	V axis overspeed		View Parameter 2 and confirm whether the motor code matches Parameter 1 "power"
14014	V axis overspeed		View Parameter 2 and confirm whether the motor code matches Parameter 1 "power"
14015	V axis drive overheat	Parameters are set unreasonably	Check whether the parameters are within the range: 5(1, 6000), 6(1,300),7(1~300), 11(10, 5000),15(10,100), 21(1, 1000), 22(0,300), 23(1, 20), 31(20000),32(2000/20000),69(4096), 71(0), 72(0), 73(0)
14016	V axis EEPROM writing failure	Parameters are set unreasonably	Check whether the parameters are within the range: 5(1, 6000), 6(1,300),7(1~300),11(10,5000),15(10,100),21(1,1000),22(0,300), 23(1,20),31(20000),32(2000/20000),69(4096),71(0), 72(0),73(0)
14017	V axis EEPROM reading failure	The storage chip is abnormal	Replace the host
14018	V axis has major position deviation	The difference between the instruction value and the actual encoder value exceeds the set value of Parameter 49	1. Set the parameters of No. 49 servo parameters, increase the deviation range 2. The acceleration/deceleration is too low 3. System failure
14019	V axis has major position deviation	The difference between the instruction value and the actual encoder value exceeds the set value of Parameter 49	1. Set the parameters of No. 49 servo parameters, increase the deviation range 2. The acceleration/deceleration is too low 3. System failure
14020	V axis encoder error	Encoder communication failure	1. The encoder wire has a fault 2. Encoder joint has poor contact 3. Motor encoder has a fault
14021	V axis speed measurement abnormality	Motor rotation abnormality	1. Motor code setting error 2. Gain parameter error 3. Motor fault leads to disorder rotation

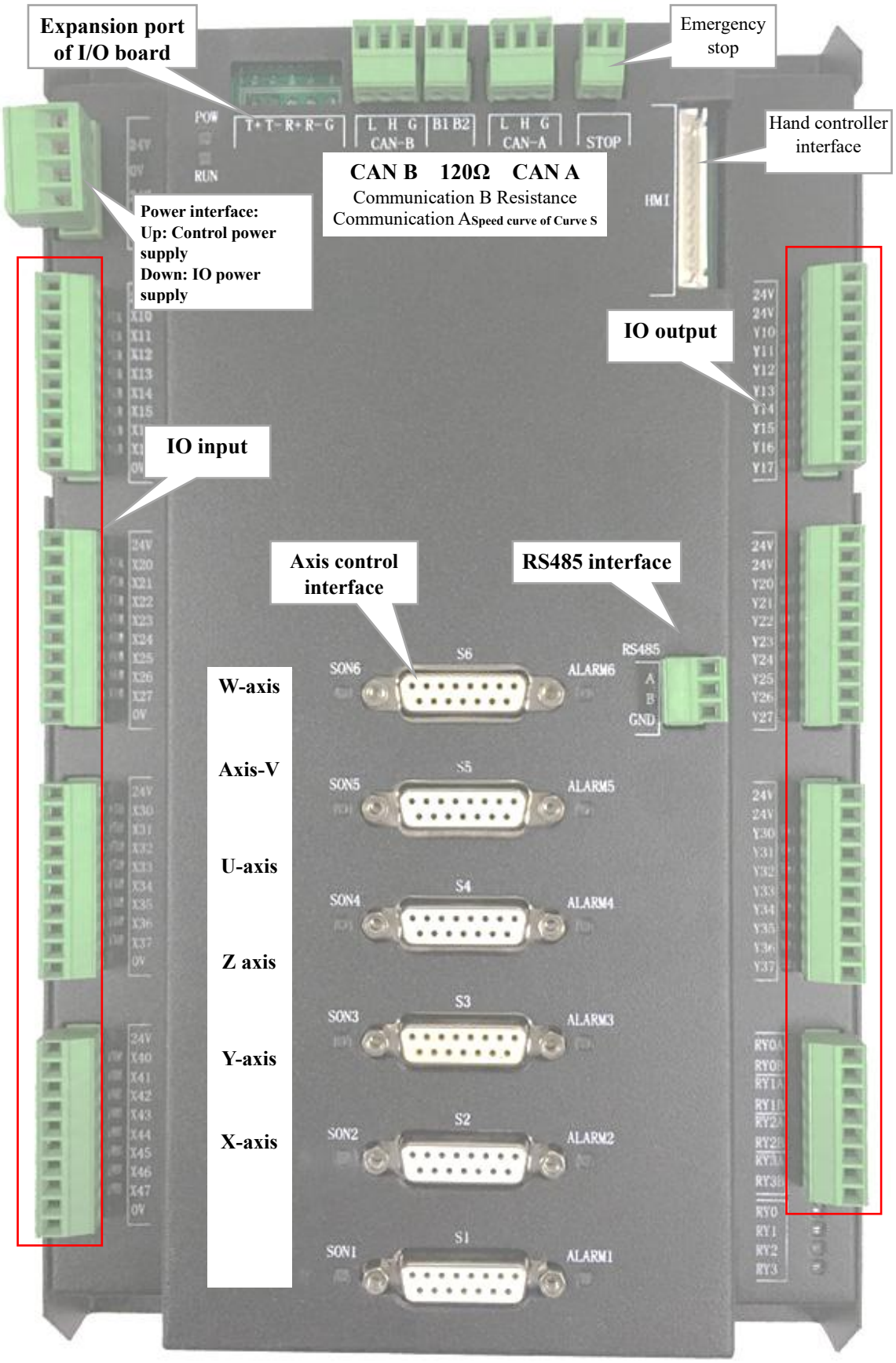
14022	V axis encoder initializing in progress	The encoder is initializing	1. The encoder wire has a fault 2. Encoder joint has poor contact 3. Motor encoder has a fault
14023	V axis VDC overvoltage	Internal hardware overvoltage protection	1. Check whether the voltage rises too much due to excessive load and excessive deceleration 2. Check whether brake resistor has a fault or disconnection 3. Host has a fault; replace it
14024	V axis external bus ERR	Fail to receive bus normal signal	1. Check whether the voltage rises too much due to excessive load and excessive deceleration 2. Check whether brake resistor has a fault or disconnection 3. Host has a fault; replace it
14025	V axis position buffer area is full	System Error	1. The 3pin white terminal at top is loose 2. Host failure
14026	V axis position buffer area is full	System Error	
14027	V axis EEPROM parameter detection error	The storage chip is abnormal	
14028	V axis encoder error	Encoder communication failure	Replace the host
14029	V axis speed measurement abnormality	The encoder feedback value is abnormal	1. The encoder wire has a fault 2. Encoder joint has poor contact 3. Motor encoder has a fault
14030	V axis encoder initializing in progress	The encoder is initializing	1. Motor code setting error 2. Gain parameter error 3. Motor fault leads to disorder rotation
14031	V axis clear alarm too fast	Alarm clearing frequency too high	1. The encoder wire has a fault 2. Encoder joint has poor contact 3. Motor encoder has a fault
14032	V axis EEPROM needs recovery	Stored parameter detection error	
14033	V axis Ethercat communication timeout	Bus communication timeout	1. Write 8051 through No. 0 parameter, wait for 10s and then power on to clear the fault
14034	Battery failure of V axis encoder	The encoder has power failure identifier	Replace the host
14035	Battery failure of V axis encoder	The encoder has power failure identifier	1. Make sure battery has good connection, set No. 13 parameter as 0 to clear the fault
14036	Battery low voltage of V axis encoder	The encoder has battery low voltage identifier	1. Make sure battery has good connection, set No. 13 parameter as 0 to clear the fault
14037	Battery low voltage of V axis encoder	The encoder has battery low voltage identifier	1. Encoder voltage is too low
14038	V axis motor code is inconsistent	The motor code that is read from encoder is inconsistent with the setting value	1. Encoder voltage is too low
14039	V axis motor code is inconsistent	The motor code that is read from encoder is inconsistent with the setting value	1. Check whether No. 2 parameter is correct motor code; if so, restart to clear the fault 2. In case of error, set No. 4 parameter as 1, then manually set No. 2 parameter as the correct motor code
14040	V axis has illegal motor code	Motor code is not supported by system	1. Check whether No. 2 parameter is correct motor code; if so, restart to clear the fault 2. In case of error, set No. 4 parameter as 1, then manually set No. 2 parameter as the correct motor code
14041	V axis has illegal motor code	Motor code is not supported by system	1. Set No. 4 parameter as 1, then manually set No. 2 parameter as the correct motor code
14042	V axis encoder data are not updated	Encoder value has no change	1. Motor encoder has a fault
14043	V axis encoder data are not updated	Encoder value has no change	1. Motor encoder has a fault
14044	V axis encoder multi-turn value error		1. Power off, unplug the battery, reset encoder/set No. 13 parameter as 0
14045	V axis encoder multi-turn value error		1. Power off, unplug the battery, reset encoder/set No. 13 parameter as 0
14046	V axis power mismatching		1. View Parameter 2 and confirm whether the motor code matches Parameter 1 "power"
14047	V axis power mismatching		1. View Parameter 2 and confirm whether the motor code matches Parameter 1 "power"
14048	V axis parameter setting error	Parameters are set unreasonably	1. Check whether the parameters are within the range: 5(1, 6000), 6(1,300),7(1~300), 11(10, 5000),15(10,100), 21(1, 1000), 22(0,300), 23(1, 20), 31(20000),32(2000/20000),69(4096), 71(0), 72(0), 73(0)
14049	V axis parameter setting error	Parameters are set unreasonably	1. Check whether the parameters are within the range: 5(1, 6000), 6(1,300),7(1~300), 11(10, 5000),15(10,100), 21(1, 1000), 22(0,300), 23(1, 20), 31(20000),32(2000/20000),69(4096), 71(0), 72(0), 73(0)
15001	W axis emergency stop alarm	The servo has input of emergency stop signal	1. Screw out the emergency stop knob on the hand controller 2. Short-circuit the emergency stop signal of the host
15002	W axis overcurrent	IPM module overcurrent protection	1. Check whether the motor is blocked 2. Pull the power wire and brake wire and then power on again; when it gives alarm after power-on, the host is fault and replace it; otherwise, check whether motor and circuit have problem.
15003	W axis overcurrent	IPM module overcurrent protection	1. Check whether the motor is blocked 2. Pull the power wire and brake wire and then power on again; when it gives alarm after power-on, the host is fault and replace it; otherwise, check whether motor and circuit have problem.
15004	W axis external bus is disconnected	Fail to receive bus normal signal	1. The 3pin white terminal at top is loose 2. Host failure

15005	W axis overload	The max load is exceeded	1. Check the load condition 1. Check whether the motor is blocked
15006	W axis overload	The max load is exceeded	1. Check the load condition 2. Check whether motor is blocked and brake is released 3. Check whether No. 1 parameter is the corresponding power
15007	W axis motor initializing in progress	Power-on initialization of drive is not completed	1. Press stop to clear the fault 2. Power on again if failing to clear the fault 3. Host has a fault; replace it
15008	W axis motor initializing in progress	Power-on initialization of drive is not completed	1. Press stop to clear the fault 2. Power on again if failing to clear the fault 3. Host has a fault; replace it
15009	W axis 3-phase error	The current exceeds the alarm value	1. Line sequence error 2. Open phase 3. Motor code does not match the motor
15010	W axis 3-phase error	The current exceeds the alarm value	1. Line sequence error 2. Open phase 3. Motor code does not match the motor
15011	W axis VDC under-voltage	Detected voltage is lower than 195v	1. Check whether the voltage drops too much due to excessive load and/or excessive acceleration 2. Check whether the external feed voltage is too low 3. Host has a fault; replace it
15012	W axis VDC overvoltage	Detected voltage is higher than 405v	1. Check whether the voltage rises too much due to excessive load and excessive deceleration 2. Check whether brake resistor has a fault or disconnection 3. Host has a fault; replace it
15013	W axis overspeed	The maximum rotational speed is exceeded	1. Internal communication disconnected; check whether the grounding is good 2. No. 50 parameter setting error
15014	W axis overspeed	The maximum rotational speed is exceeded	1. Internal communication disconnected; check whether the grounding is good 2. No. 50 parameter setting error
15015	W axis drive overheat	The internal temperature exceeds 75°C	1. Check whether fan is functioning properly 2. Host has a fault; replace it
15016	W axis EEPROM writing failure	The storage chip is abnormal	Replace the host
15017	W axis EEPROM reading failure	The storage chip is abnormal	Replace the host
15018	W axis has major position deviation	The difference between the instruction value and the actual encoder value exceeds the set value of Parameter 49	1. Set the parameters of No. 49 servo parameters, increase the deviation range 2. The acceleration/deceleration is too low 3. System failure
15019	W axis has major position deviation	The difference between the instruction value and the actual encoder value exceeds the set value of Parameter 49	1. Set the parameters of No. 49 servo parameters, increase the deviation range 2. The acceleration/deceleration is too low 3. System failure
15020	W axis encoder error	Encoder communication failure	1. The encoder wire has a fault 2. Encoder joint has poor contact 3. Motor encoder has a fault
15021	W axis speed measurement abnormality	Motor rotation abnormality	1. Motor code setting error 2. Gain parameter error 3. Motor fault leads to disorder rotation
15022	W axis encoder initializing in progress	The encoder is initializing	1. The encoder wire has a fault 2. Encoder joint has poor contact 3. Motor encoder has a fault
15023	W axis VDC overvoltage	Internal hardware overvoltage protection	1. Check whether the voltage rises too much due to excessive load and excessive deceleration 2. Check whether brake resistor has a fault or disconnection 3. Host has a fault; replace it
15024	W axis external bus ERR	Fail to receive bus normal signal	1. Check whether the voltage rises too much due to excessive load and excessive deceleration 2. Check whether brake resistor has a fault or disconnection 3. Host has a fault; replace it
15025	W axis position buffer area is full	System Error	1. The 3pin white terminal at top is loose 2. Host failure
15026	W axis position buffer area is full	System Error	
15027	W axis EEPROM parameter detection error	The storage chip is abnormal	
15028	W axis encoder error	Encoder communication failure	Replace the host
15029	W axis speed measurement abnormality	The encoder feedback value is abnormal	1. The encoder wire has a fault 2. Encoder joint has poor contact 3. Motor encoder has a fault
15030	W axis encoder initializing in progress	The encoder is initializing	1. Motor code setting error 2. Gain parameter error 3. Motor fault leads to disorder rotation
15031	W axis clear alarm too fast	Alarm clearing frequency too high	1. The encoder wire has a fault 2. Encoder joint has poor contact 3. Motor encoder has a fault
15032	W axis EEPROM needs recovery	Stored parameter detection error	
15033	W axis Ethercat communication timeout	Bus communication timeout	Write 8051 through No. 0 parameter, wait for 10s and then power on to clear the fault
15034	Battery failure of W axis encoder	The encoder has power failure identifier	Replace the host

15035	Battery failure of W axis encoder	The encoder has power failure identifier	Make sure battery has good connection, set No. 13 parameter as 0 to clear the fault
15036	Battery low voltage of W axis encoder	The encoder has battery low voltage identifier	Make sure battery has good connection, set No. 13 parameter as 0 to clear the fault
15037	Battery low voltage of W axis encoder	The encoder has battery low voltage identifier	Encoder voltage is too low
15040	W axis has illegal motor code	Motor code is not supported by system	1. Check whether No. 2 parameter is correct motor code; if so, restart to clear the fault 2. In case of error, set No. 4 parameter as 1, then manually set No. 2 parameter as the correct motor code
15041	W axis has illegal motor code	Motor code is not supported by system	1. Set No. 4 parameter as 1, then manually set No. 2 parameter as the correct motor code
15042	W axis encoder data are not updated	Encoder value has no change	1. Motor encoder has a fault
15043	W axis encoder data are not updated	Encoder value has no change	1. Motor encoder has a fault
15044	W axis encoder multi-turn value error		1. Power off, unplug the battery, reset encoder/set No. 13 parameter as 0
15045	W axis encoder multi-turn value error		1. Power off, unplug the battery, reset encoder/set No. 13 parameter as 0
15046	W axis power mismatching		1. View Parameter 2 and confirm whether the motor code matches Parameter 1 "power"
15047	W axis power mismatching		1. View Parameter 2 and confirm whether the motor code matches Parameter 1 "power"
15048	W axis parameter setting error	Parameters are set unreasonably	1. Check whether the parameters are within the range: 5(1, 6000), 6(1,300),7(1~300), 11(10, 5000),15(10,100), 21(1, 1000), 22(0,300), 23(1, 20), 31(20000),32(2000/20000),69(4096), 71(0), 72(0), 73(0)
15049	W axis parameter setting error	Parameters are set unreasonably	1. Check whether the parameters are within the range: 5(1, 6000), 6(1,300),7(1~300), 11(10, 5000),15(10,100), 21(1, 1000), 22(0,300), 23(1, 20), 31(20000),32(2000/20000),69(4096), 71(0), 72(0), 73(0)
16001	W axis emergency stop alarm	NO	Inspect the servo fault
17001	W axis emergency stop alarm	NO	Inspect the servo fault
18001	Arc starting failure of welding machine	NO	Inspect the servo fault

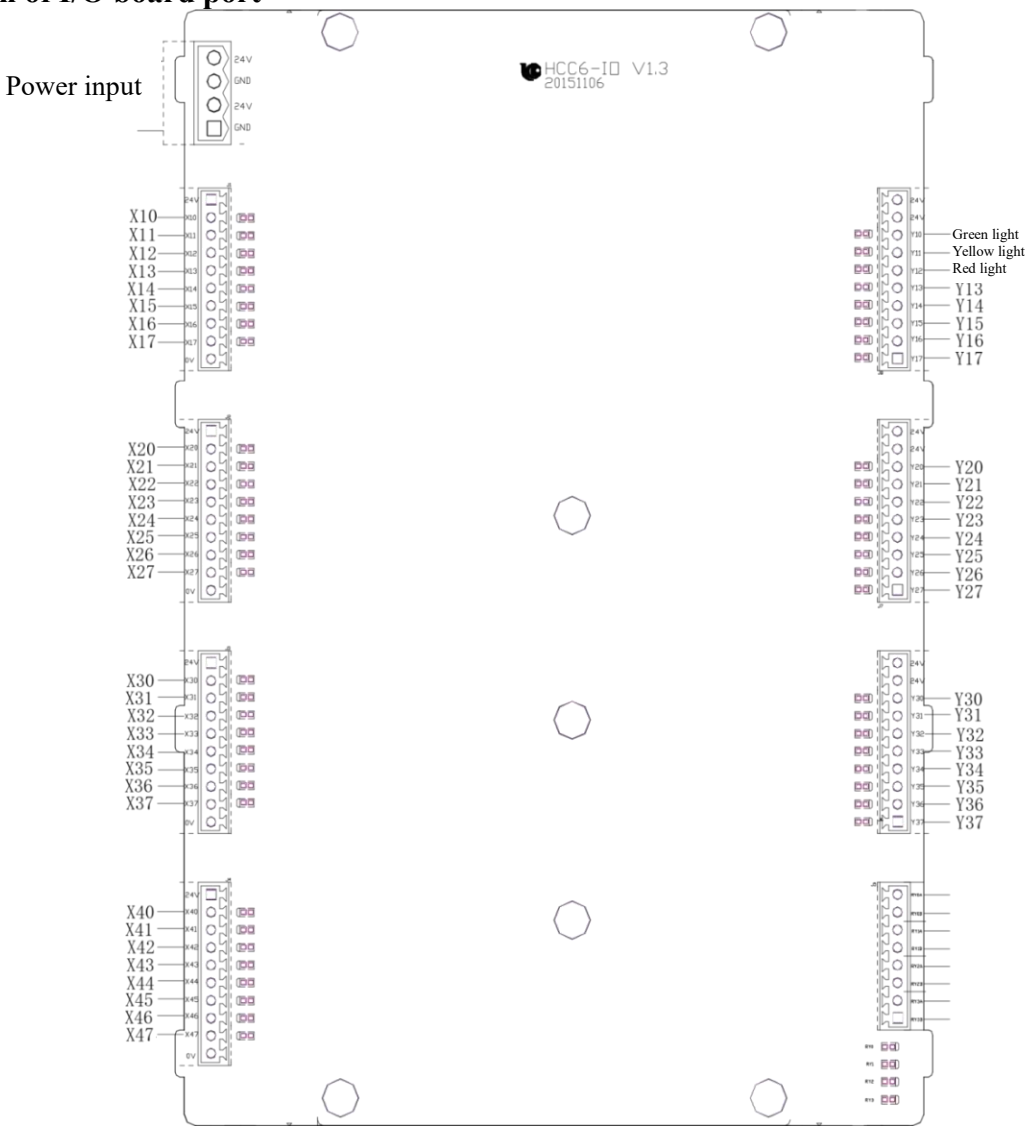
Chapter 9 Port Definition of Circuit Board

1 Port Definition for Main Control Panel of Single Board

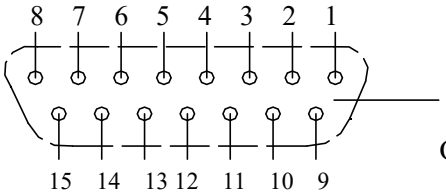


Note: When IO wiring is performed, a matched IO input power supply should be used because only when the inputted OV is valid can OV be outputted.

1.1. Definition of I/O board port



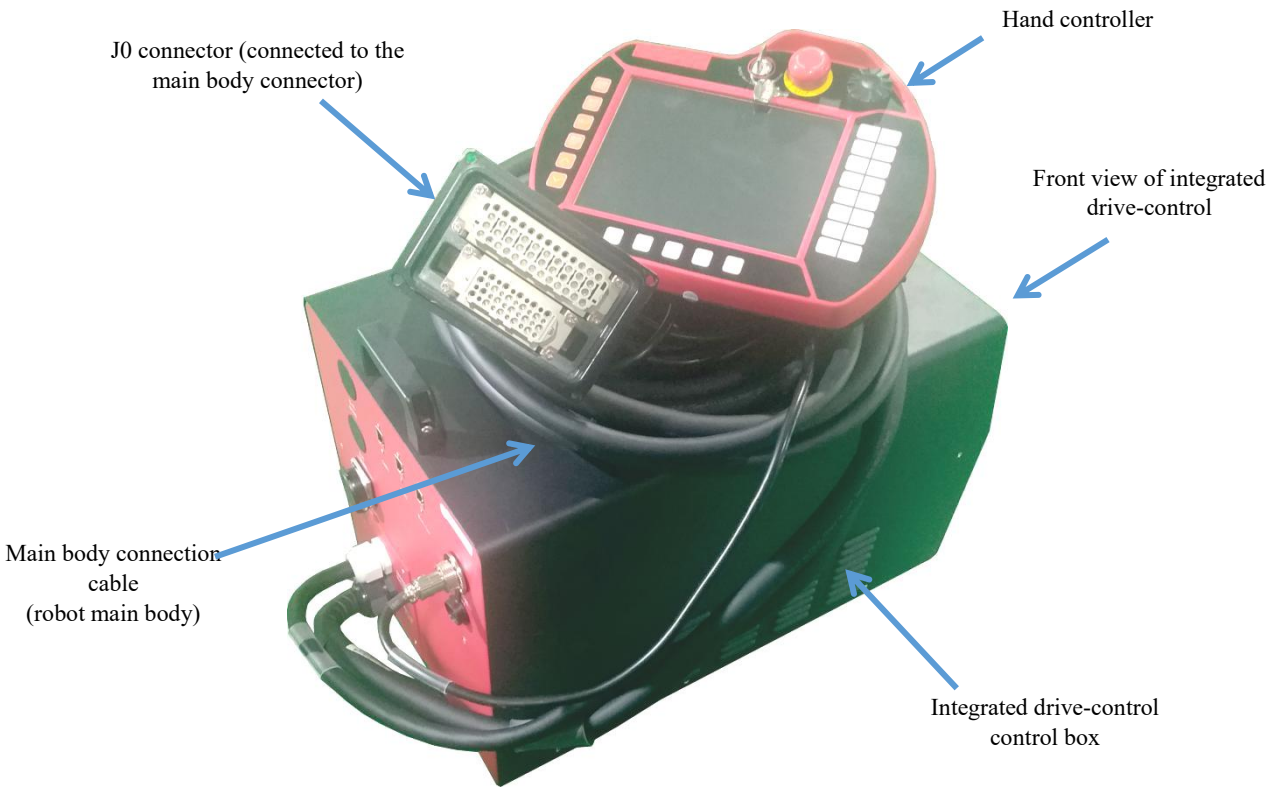
1.2. Definition of servo drive interface



Observed from welding wire side

Pin No.	Definition of terminal	Pin No.	Definition of terminal
1	+24V	9	0V
2	OA+	10	P+
3	OA-	11	P-
4	OB+	12	BRAKE
5	OB-	13	N+
6	OZ+	14	N-
7	OZ-	15	ALM
8	SON		

2 Overview of the integrated drive-control



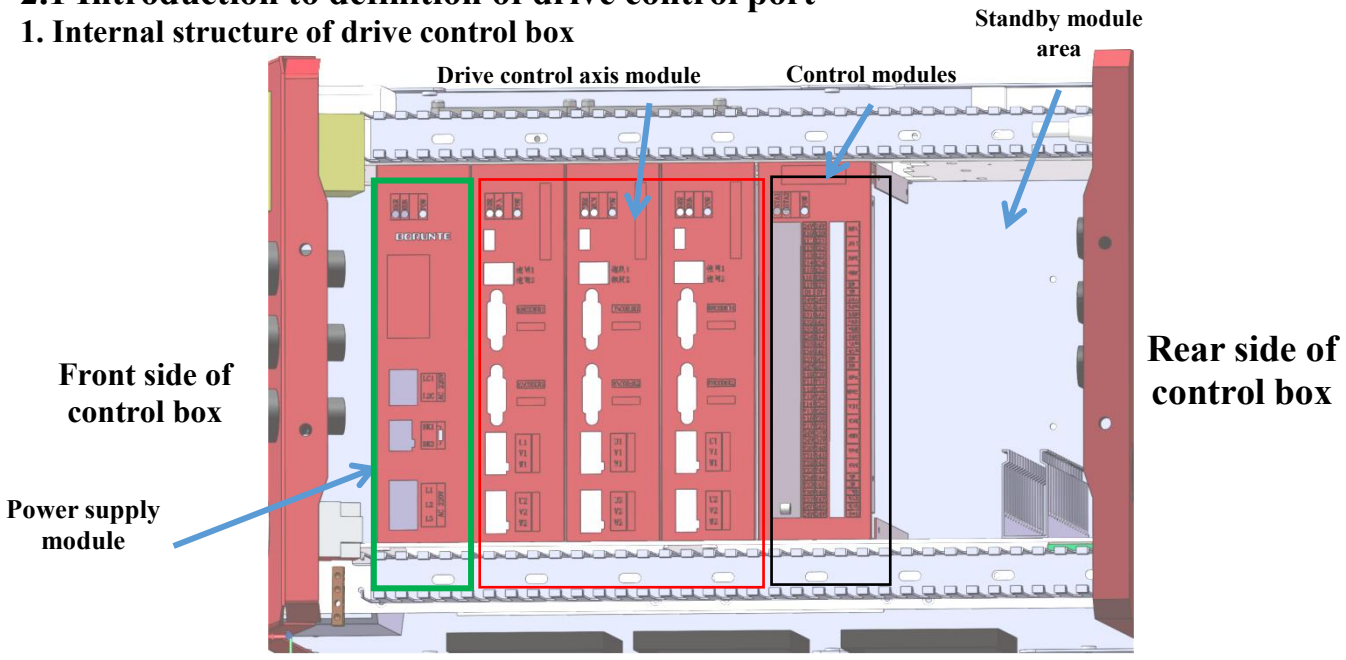
Appearance of drive control box (the real product should prevail)

Front side of drive control box

Rear side of drive control box

2.1 Introduction to definition of drive control port

1. Internal structure of drive control box



Internal layout, the real product should prevail

2. Power module

Terminal identification	Terminal designation	Feature description	Remarks
L1C	Auxiliary power terminal	AC single-phase 220V 50/60HZ	The power supply of internal control circuit is the auxiliary power supply.
L2C			
BK1	Braking resistor terminal	Access point of external brake resistor	External resistance (50Ω200W) The real product configuration should prevail.
BK2			
L1	Power terminal of main circuit	AC single-phase/3-phase 220V 50/60HZ	The internal high-voltage power supply is used as power supply of main circuit.
L2			
L3			

3. Drive module mapping

Mapping relationship of drive module				
General Axis 6	General Axis 4	Port (UVW)	Encoder port	Brake signal
Axis 1	Axis 1	S1	ENCODER1	Brake 1
Axis 6	Axis 4	S2	ENCODER2	Brake 2
Axis 2	Axis 2	S3	ENCODER3	Brake 3
Axis 5	Axis 3	S4	ENCODER4	Brake 4
Axis 3	Reserved	S5	ENCODER5	Brake 5
Axis 4	Reserved	S6	ENCODER6	Brake 6

Caution
1. When adding Axis 7 and 8, install the module at the control board installation position, move the control board backwards; the 7-axis and 8-axis brake relay should be installed in the module standby area.
2. The analog quantity module can be installed at the lateral side.
3. For details of braking board wiring, please refer to the circuit diagram in chapter below.
4. The mapping relationship of axis module should be subject to the realities.

4. Control module

This module is core control area, including control board, input/output IO (32-way input, 32 output) board and injection molding IO board.

4. Standby module area

This area is optional or extended installation area. No installation as standard configuration.

6. Introduction to states of module indicator

Terminal identification	Terminal designation	Feature description	Remarks
ERR	Status indicator	Error indicator	Running state error indicator
RUN		Operation indication	System operation instructions
POW		Power indicator	Power indicator
SAT1		Status light	State display of software application layer
SAT2			State display of software core layer

7. 16-pin reset joint definition

Definition of 16-core reset joint			
Pin No.	Corresponding IO	Pin No.	Corresponding IO
1	24V	9	Y20
2	X20	10	Y21
3	X21	11	Y22
4	X22	12	Y23
5	X23	13	Y24
6	X24	14	Y25
7	X25	15	Y26
8	X26	16	0V

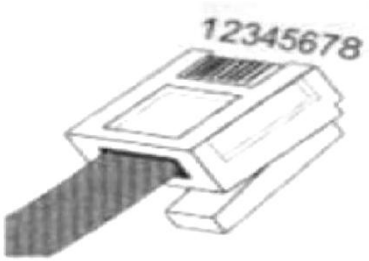
Note:
1. This table is definition and wiring for standard and common standby points of 6-axis general robot.
2. Definition of IO function may be occupied when process package is enabled. For details, please refer to instructions of process package.

Note: When IO wiring is performed, a matched IO input power supply should be used because only when the inputted OV is valid can OV be outputted.

8. CAN communication Ethernet port

Can1/Can2 interface definition		
Pin No.	Definition	Remarks
1	CANL	
2	CANH	
3	CAN_GND	
4	RS-485_A1	
5	RS-485_B1	
6	RS-485_GND	
7	RS-485_A2	

Note:
1. For smooth communication during CAN connection, ensure the first and last machines have a resistor of 120Ω connected between the CANL and CANH lines (a factory-provided connector can be plugged in directly).
2. RS-485 is used for communication with other devices.
3. When using an Ethernet cable for CAN communication, it must be a standard crimped cable. Do not lead out any unused

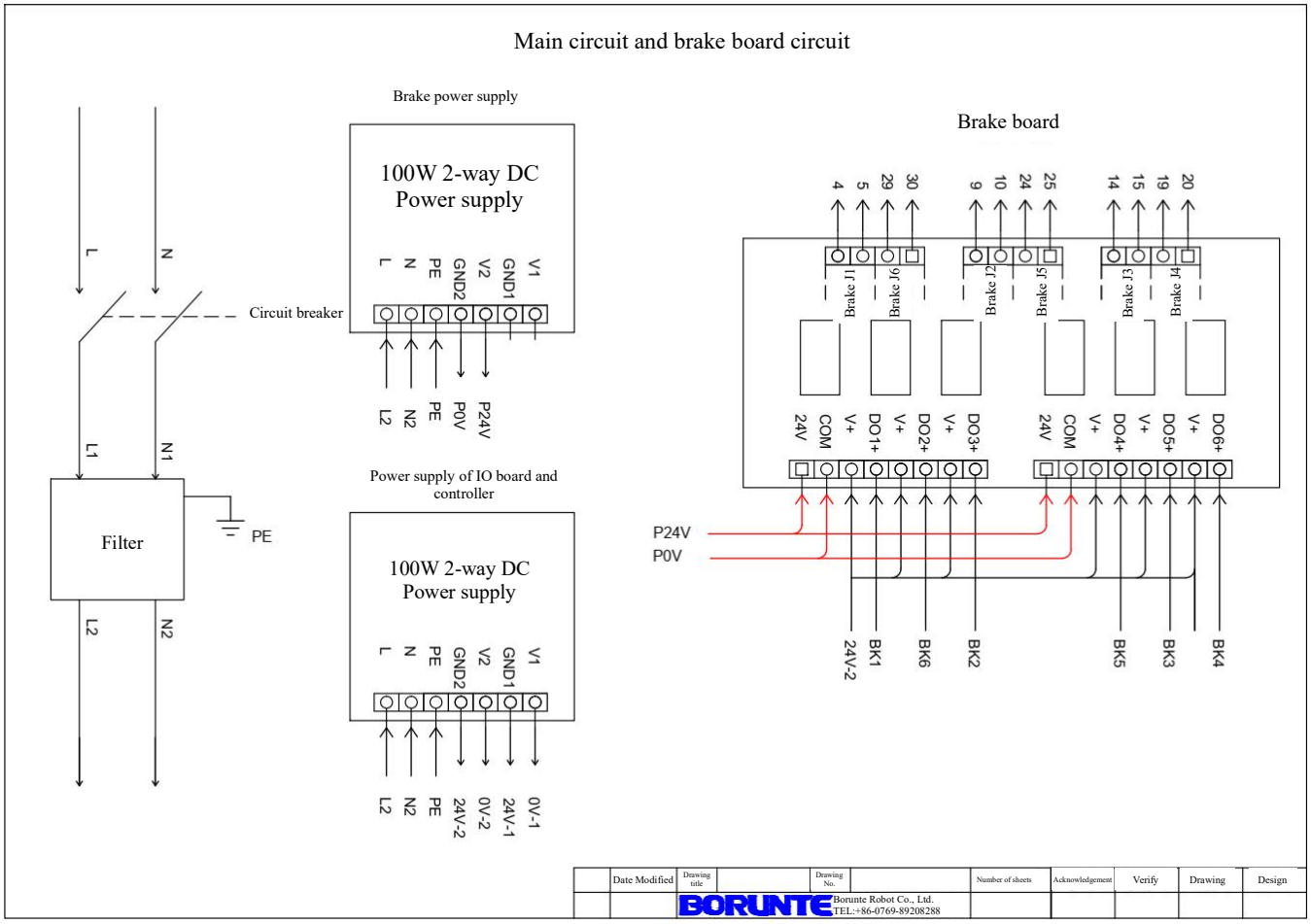


RJ-45 connector

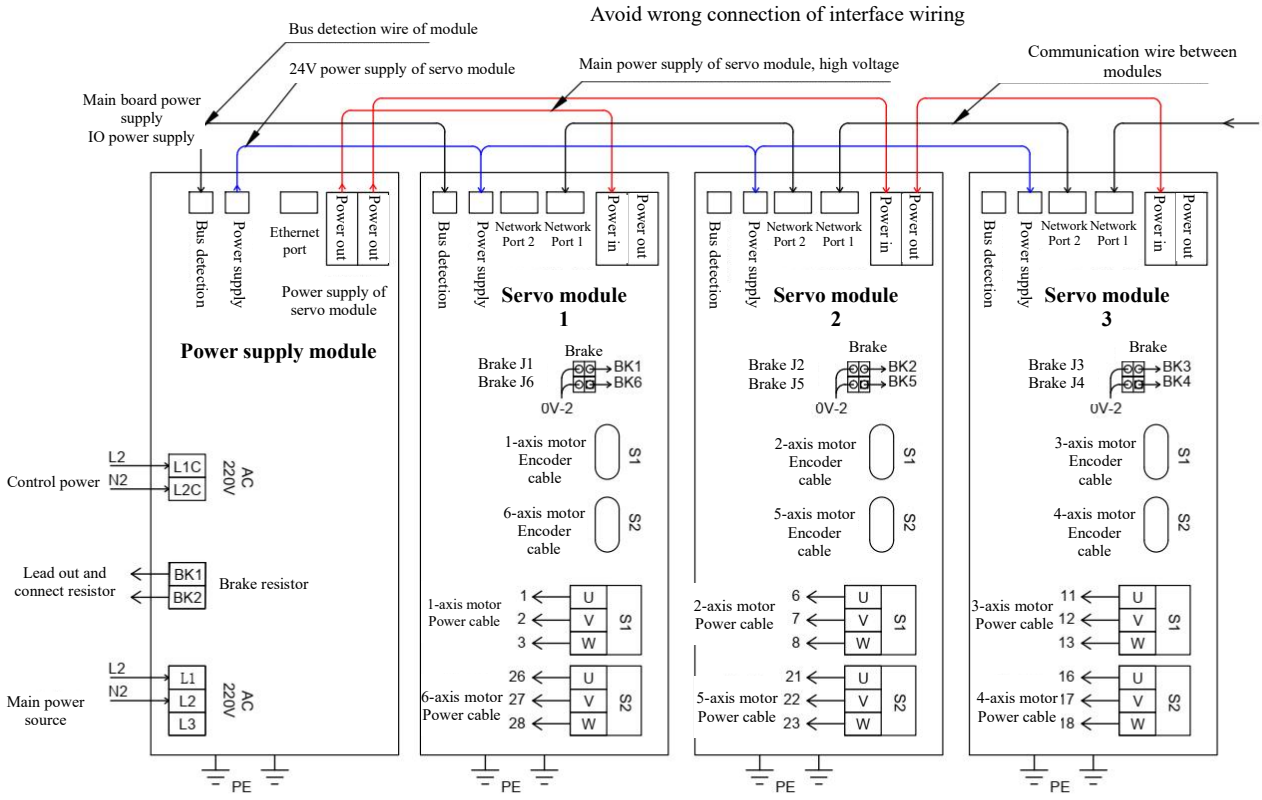
8	RS- 485_B2		connection ports.

Note: The above definitions are for CAN1 and CAN2 interface communication; do not confuse them with the monitor interface.
The monitor interface is a standard Ethernet interface and can be used for vision and remote communication, among others.

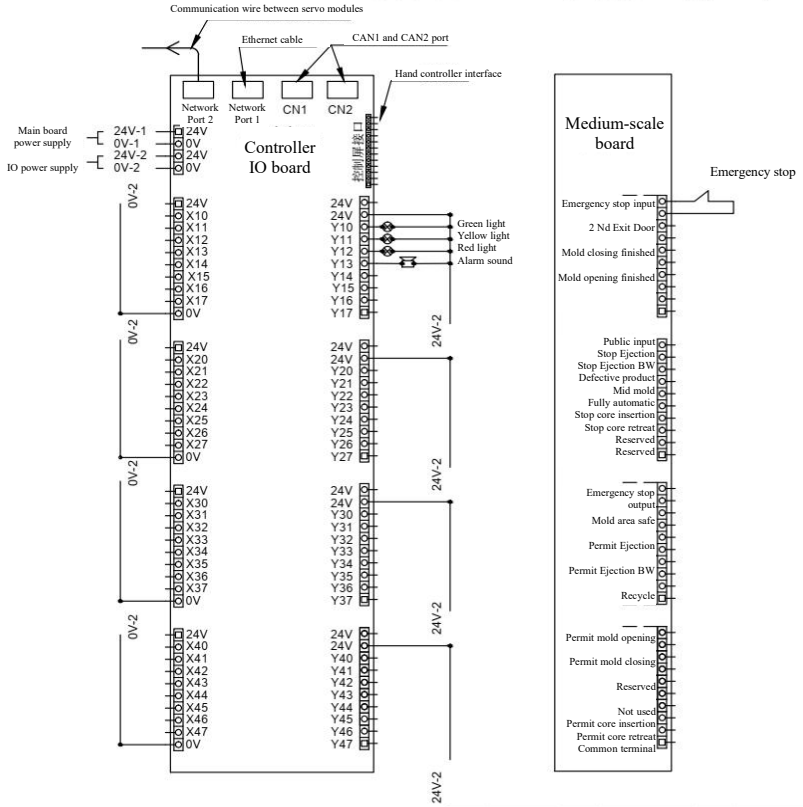
2.2 Schematic diagram of drive control integrated circuit



Module connection control circuit



Input/ output signal of IO control board and injection molding board



Note: When IO wiring is performed, a matched IO input power supply should be used because only when the inputted OV is valid can OV be outputted.

When other type of voltage is inputted to or outputted from a special port, attention should be paid to the wiring method and the supply voltage.

The drawings above are for reference only. The real product should prevail.

Chapter 10 Appendix Table

Drive and control integrated motor code table:

Motor model	Motor code	Matched drive	Power		Motor model	Motor code	Matched drive	Power
HC040R10G30U0SE-02-1095	1200	S1R5C	100W		HC080R75G30U0LD-02-1095	1400	S4R5C	750W
HC040R10G30U2SE-02-1095	1200	S1R5C	100W		HC080R75G30U2LD-02-1095	1400	S4R5C	750W
HC060R20G30U0SE-02-1095	1201	S1R5C	200W		HC080R75G30D0LD-02-1095	1401	S4R5C	750W
HC060R20G30U2SE-02-1095	1201	S1R5C	200W		HC080R75G30D2LD-02-1095	1401	S4R5C	750W
HC-040130A4AUAA	1206	S1R5C	100W		HC080R75G30U0BE-02-1095	1402	S4R5C	750W
HC-040130A4AVBA	1206	S1R5C	100W		HC080R75G30U2BE-02-1095	1402	S4R5C	750W
HC-060230A4AUAA	1208	S1R5C	200W		STQ LE 750W	1407	S4R5C	750W
HC-060230A4AVBA	1208	S1R5C	200W		HC-080830A4AUAA	1414	S4R5C	750W
					HC-080830A4AVBA	1414	S4R5C	750W
HC060R40G30U0AD-02-1095	1300	S3R0C	400W					
HC060R40G30U2AD-02-1095	1300	S3R0C	400W		HC130R85G15U0BE-02-1095	1502	S7R5C	850W
HC060R40G30U0SE-02-1095	1301	S3R0C	400W		HC130R85G15U2BE-02-1095	1502	S7R5C	850W
HC060R40G30U2SE-02-1095	1301	S3R0C	400W		HC-130915A4AUAA	1508	S7R5C	850W
HC060R40G30D0AD-02-1095	1302	S3R0C	400W		HC-130915A4AVBA	1508	S7R5C	850W
HC060R40G30D2AD-02-1095	1302	S3R0C	400W		HC1301R3G15U0BE-02-1095	1506	S7R5C	1300W
HC-060430A4AUAA	1308	S3R0C	400W		HC1301R3G15U2BE-02-1095	1506	S7R5C	1300W
HC-060430A4AVBA	1308	S3R0C	400W					
STQ MC 400W	1319	S3R0C	400W					
The above are common motor models, each of which has corresponding motor code, power, and drive control servo module. If any new motor is not included in this table, please consult our after-sales service for customer.								

Chapter 11 Robot Aviation Plug and Bonding Definitions

1. 46PIN heavy duty connector mortise definitions

1. General 6-axis robot

46PIN heavy duty connector mortise definitions (six-axis general)										
Mortise hole position	1	2	3	4	5	6	7	8	9	10
Wire code definition	U1	V1	W1	Brake 1-1	Brake 1-2	U2	V2	W2	Brake 2-1	Brake 2-2
Remarks	Axis (I)					Axis (II)				
Mortise hole position	11	12	13	14	15	16	17	18	19	20
Wire code definition	U3	V3	W3	Brake 3-1	Brake 3-2	U4	V4	W4	Brake 4-1	Brake 4-2
Remarks	Axle (III)					Axis (IV)				
Mortise hole position	21	22	23	24	25	26	27	28	29	30
Wire code definition	U5	V5	W5	Brake 5-1	Brake 5-2	U6	V6	W6	Brake 6-1	Brake 6-2
Remarks	Axis (V)					Axis (VI)				
Axis number	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	ReservedReserved			
Mortise hole position	31	32	33	34	35	36	37	38	39	40
Wire code definition	PE	PE	PE	PE	PE	PE	NO	NO	NO	NO
Remarks	Each axis is correspondingly grounded						Standby			
Mortise hole position	41	42	43	44	45	46				
Wire code definition	NO	NO	NO	NO	NO	NO				
Remarks	ReservedReserved									
Remarks: 46PIN heavy duty connector mortise (HEE-046-MC, HEE-046-FC, 16A/500V), wires (36*0.75mm²), silvered pins (0.5-0.75mm) Remark: Wires and contact pins configured for body must be matched according to the actual situation.										

Explanation:

Unused ports can be matched with corresponding contact pins and wires for additional use. This table is applicable to electric box connected to general industrial robot body. This socket is only applicable to contact pin defined for motor power wire. Male terminal (body) and female terminal (electric box) are matched in the same way. Ground wire must be connected to connector GND pin.

2. 4-axis stamping machine

46PIN heavy duty connector mortise definitions (4-axis stamping and marking machine)										
Mortise hole position	1	2	3	4	5	6	7	8	9	10
Wire code definition	U1	V1	W1	Brake 1-1	Brake 1-2	U2	V2	W2	Brake 2-1	Brake 2-2
Body wire color	White 1	Black 1	Red 1	Brown 1	Blue 1	White 2	Black 2	Red 2	Brown 2	Blue 2
Line No.	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10
Axis number	Axle (I)					Axis (II)				
Mortise hole position	11	12	13	14	15	16	17	18	19	20
Wire code definition	U3	V3	W3	Brake 3-1	Brake 3-2	U4	V4	W4	Brake 4-1	Brake 4-2
Body wire color	White 3	Black 3	Red 3	Brown 3	Blue 3	White 4	Black 4	Red 4	Brown 4	Blue 4
Line No.	#11	#12	#13	#14	#15	#16	#17	#18	#19	#20
Axis number	Axle (III)					Axle (IV)				
Mortise hole position	21	22	23	24	25	26	27	28	29	30
Wire code definition				24V	0V	Y32	Y34	X32	X33	Y33
Body wire color				Brown	Blue	Yellow	Green	Cocoa powder	White	Grey
Line No.	#21	#22	#23	#24	#25	#26	#27	#28	#29	#30
Axis number	Standby			7-core wire definition (body)						
Mortise hole position	31	32	33	34	35	36	37	38	39	40
Wire code definition	PE	PE	PE	PE						
Body wire color	Yellow/ green 1	Yellow /green 2	Yellow/g reen 3	Yellow/gre en 4						
Line No.	#31	#32	#33	#34						
Axis number	Standby				Standby					
Mortise hole position	41	42	43	44	45	46				

Wire code definition										
Body wire color										
Line No.	Standby									

Explanation:

The heavy duty connectors in the table above are applicable to standard four-axis stamping robot, whose body is connected to electric box. This socket is only applicable to contact pin defined for motor power wire. Male terminal (body) and female terminal (electric box) are matched in the same way. Ground wire must be connected to connector GND pin.

2. 40PIN heavy duty connector mortise definitions

40PIN heavy duty connector mortise definitions											
Defined axis number		Axis (I)				Axis (II)				/	/
Row A	Mortise hole position	1	2	3	4	5	6	7	8	9	10
	Wire hole definition	PS+	PS-	+5V	GND	PS+	PS-	+5V	GND	Standby	
Defined axis number		Axle (III)				Axle (IV)				/	/
Row B	Mortise hole position	1	2	3	4	5	6	7	8	9	10
	Wire hole definition	PS+	PS-	+5V	GND	PS+	PS-	+5V	GND	Standby	
Defined axis number		Axis (V)				Axis (VI)				/	/
Row C	Mortise hole position	1	2	3	4	5	6	7	8	9	10
	Wire hole definition	PS+	PS-	+5V	GND	PS+	PS-	+5V	GND	Standby	
		/	/	/	/	/	/	/	/	/	/
Row D	Mortise hole position	1	2	3	4	5	6	7	8	9	10
	Wire hole definition	Standby									
Remarks: 40PIN heavy duty connector mortise (HD-040-MC, HD-040-FC, 10A/250V), wires (28*0.25), silvered pins (0.37-0.5) Shielded wire should be connected to contact pin housing; heat shrinkable tube should be used for protecting against short-circuiting to other wires. The above is for reference only. The actual production shall prevail.											

Explanation:

This connector is defined for encoder wire. For axis color definition, please refer to bonding information. The standby socket can be matched with contact pin according to the actual situation, and its use can be defined by yourself. The encoder battery is not connected to the electric box (installed in body base), so it is not defined. For four-axis stamping robot, Axis5 and Axis6 are standby, and if needed, should be wired by yourself.

3. Welding wire definition (for controller of single-board system)

3.1 Control wire for BORUNTE robot system

HCFA X3E series/INOVANCE IS620P series/RUKING SEA3 series control wire definitions for BORUNTE robot system

HCFA X2E series/INOVANCE IS620P series/RUKING SEA3 series control wire definitions for BORUNTE robot system					
System 15Pin	Wire color	HCFA 50Pin	INOVANCE 44Pin	RUKING 50Pin	Signal definition
1	Red/blue	3	11	11	COM+(24V)
2	Red	36	21	1	A+
3	Yellow	37	22	2	A-
4	Green	38	25	26	B+
5	Brown	39	23	27	B-
6	Cocoa powder	40	13	3	Z+
7	Blue	41	24	4	Z-
8	Yellow/brown	4	33	12	SON
9	White/green	12，22	2，14,26	19，22，25	COM-(0V)
10	Purple	26	38	17	P+
11	White	27	36	18	P-
12	Yellow white	/	8	/	ALM-CLR
13	Grey	30	42	43	S+
14	Black	31	40	44	S-
15	Brown/grey	21	1	24	ALM
Brake wire as weld leader		13	3	23	BK
Shielded cable connected to housing					
Note: 1、Brake wire can be taken as external weld leader for connection as long as its length is appropriate. 2、For cable color, the actual situation shall prevail. Each cable must be twisted-pair. Pulse, direction, and feedback must be of twisted-pair cable group.					

3.2 System and servo RS485 communication definitions

HCFA X3E series/INOVANCE IS620P series/RUKING SE series RJ45 registered jack cable definitions for BORUNTE robot system

system RS485 port	HCFA servo RS485 communication pin		INOVANCE servo RJ45 registered jack		RUKING SEA3 servo RJ45 registered jack		Definition
A	A	Blue	4	Blue	5	Blue and white	RS-485A+
B	B	Blue and white	5	Blue and white	4	Blue	RS-485B-
GND	SG	Brown	8	Brown	1	Orange	GND/shielded
Note: 1. Shielded network cable is recommended. 2. Registered jack should be made with standard network cable. There is a correspondence between pin and wire color. The above is for reference only. 3. For detailed servo end RS-485 definitions, please refer to servo manual.							FG (shielded)

3.3 Servo system encoder/motor wire definitions

1. HCFA servo X3E series

HCFA encoder wire definitions

Drive end 6Pin	Wire color	Motor end 6Pin	Motor above 1KW	Definition	Description
5	Yellow/blue	2	5	PS+	
6	Green/purple	3	6	PS-	
1	Brown/white	4	1	5V	
2	White/black	5	2	GND	Battery -
		1	4	BAT+	Battery +
Shell	Shielded wire	6		Shielding	

Remark: Battery negative voltage and encoder GND are shared.
For wire color, the definitions for workmanship shall prevail.

HCFA motor power wire definitions

Drive end Definition	Wire color	Motor 4Pin/2Pin	Motor above 1KW
U	Red	1	A
V	White	2	B
W	Black	3	C
PE	Yellow	4	D
Brake Wire 1	Brown	1	1
Brake Wire 2	Blue	2	2

Remark: For wire color, the definitions for workmanship shall prevail.
Brake 1 and Brake 2 are for 2PIN, and need to be connected separately.

2. INOVANCE servo IS620P series

INOVANCE encoder wire definitions

Drive end 9Pin	Wire color	Motor end 9Pin	Motor above 850W	Definition	Description
1	Yellow /blue	3	A	PS+	
2	Green/ purple	6	B	PS-	
7	Brown/ white	9	G	5V	
8	White /black	8	H	GND	
Shell	Shielded wire	7	J	Shielding	
	Red	1	E	V+	Battery -
	Black	4	F	V-	Battery +

Remark: Pay attention to the positive and negative poles of encoder battery.
For wire color, the definitions for workmanship shall prevail.

INOVANCE motor power wire definitions

Drive end Definition	Wire color	Motor 6Pin	Aviation 20-18	Maintenance of aeronautical 20-22
U	Red	1	B	A
V	White	2	I	C
W	Black	4	F	E
PE	Yellow	5	G	F
Brake 1	Brown	3	C	B
Brake 2	Blue	6	E	D

Remark: For wire color, the definitions for workmanship shall prevail.

3. RUKING servo SE A3 series

RUKING encoder wire definitions

Drive end 6Pin	Wire color	Motor end 9Pin	RUKING above 1KW	Definition	Description
5	Yellow/blue	4	K	PS+	
6	Green/purple	5	L	PS-	
1	Brown/white	7	H	5V	
2	White/black	8	G	GND	
Shell	Shielded wire	3	J	Shielding	
	Red	1	T	V+	Battery -
	Black	2	S	V-	Battery +

Remark: Pay attention to the positive and negative poles of encoder battery.
For wire color, the definitions for workmanship shall prevail.

RUKING motor power wire definitions

Drive end Definition	Wire color	Motor 4Pin/2Pin	RUKING, above 1KW
U	Red	1	F
V	White	2	I
W	Black	3	B
PE	Yellow	4	E
Brake 1	Brown	1	G
Brake 2	Blue	2	H

Remark: For wire color, the definitions for workmanship shall prevail.
Brake 1 and Brake 2 are for 2PIN, and need to be connected separately.

Note:

The above information is for reference only. For detailed definitions, please refer to related operation manual. In case of change, please consult our after-sales technical support.

Chapter 12 Robot Running Range and Parameters

For details, please refer to the mechanism maintenance manual. The data are subject to the latest structural parameters. It will not be described here;

Chapter 13 Maintenance Instructions

Warning: Before repairing the manipulator, please read the following safety specifications carefully, to avoid danger!

Maintenance Precautions

When overhauling and replacing control cabinet parts, please observe the following precautions for safe operation.

1. During part replacement, please cut off the power, wait 5 minutes and then start operation. (Do not open the door of the control device within 5 minutes after the power is cut off). Moreover, do not operate with wet hand.
2. During maintenance and debugging, please set up warning and/or other eye-catching signs around the machine, to prevent others from entering the warning area.
3. Replacement must be conducted by personnel who have received robot maintenance training of our company or related school.
4. It is strictly forbidden that one person is manipulating the handle while another person is dismounting parts or staying around the machine. In principle, only one person is permitted to debug or manipulate the machine at any time.
5. Any operator's body (hand) must remain electrically short-circuited to "GND terminal" of the control device, and related operation should be conducted at the same potential.
6. Do not damage any connecting wire during replacement. Moreover, do not touch any electronic part of printed substrate and any touching part of circuit/connector.
7. Only after manual debugging is confirmed to be OK can maintenance and debugging be converted to automatic trial run.
8. Do not replace or modify any original part arbitrarily.

Serial number	Maintenance check item	Frequency				
1	Keep the machine body clean	Daily	Daily	Daily	Daily	Daily
2	The screws of all protective covers and jigs are not loose	✓				
3	The suckers, fixtures and jigs are functioning normally	✓				
4	The indicators are working normally	✓				
5	Whether there is oil leakage in any reducer	✓	✓			
6	Whether the screws of any moving component of the machine are loose		✓			
7	Whether the connection of any electrical component is loose			✓		
8	Whether the contacts of relays and contactors are aged; if aged, please replace them				✓	
9	Whether the wire connections inside the electric box and outside the machine body are stable				✓	
10	Whether any synchronous belt is worn and/or aged				✓	
11	Remove dust from the fan in the electric box, and replace the fan filter cotton or the entire fan				✓	
12	Where any reducer makes abnormal noise, and whether the motor is working normally					✓

Note:

The above maintenance schedule is for reference only. In case of service cycle/environment change, every month/half year/year (frequency) may be appropriately shortened or prolonged.

Chapter for operation instruction of 2-axis robot

Chapter 1 Configuration and Installation

Thank you for using the Product. Please read the Manual carefully before using it. Be sure to read and observe the following precautions during installation and maintenance.

1 Basic Configuration

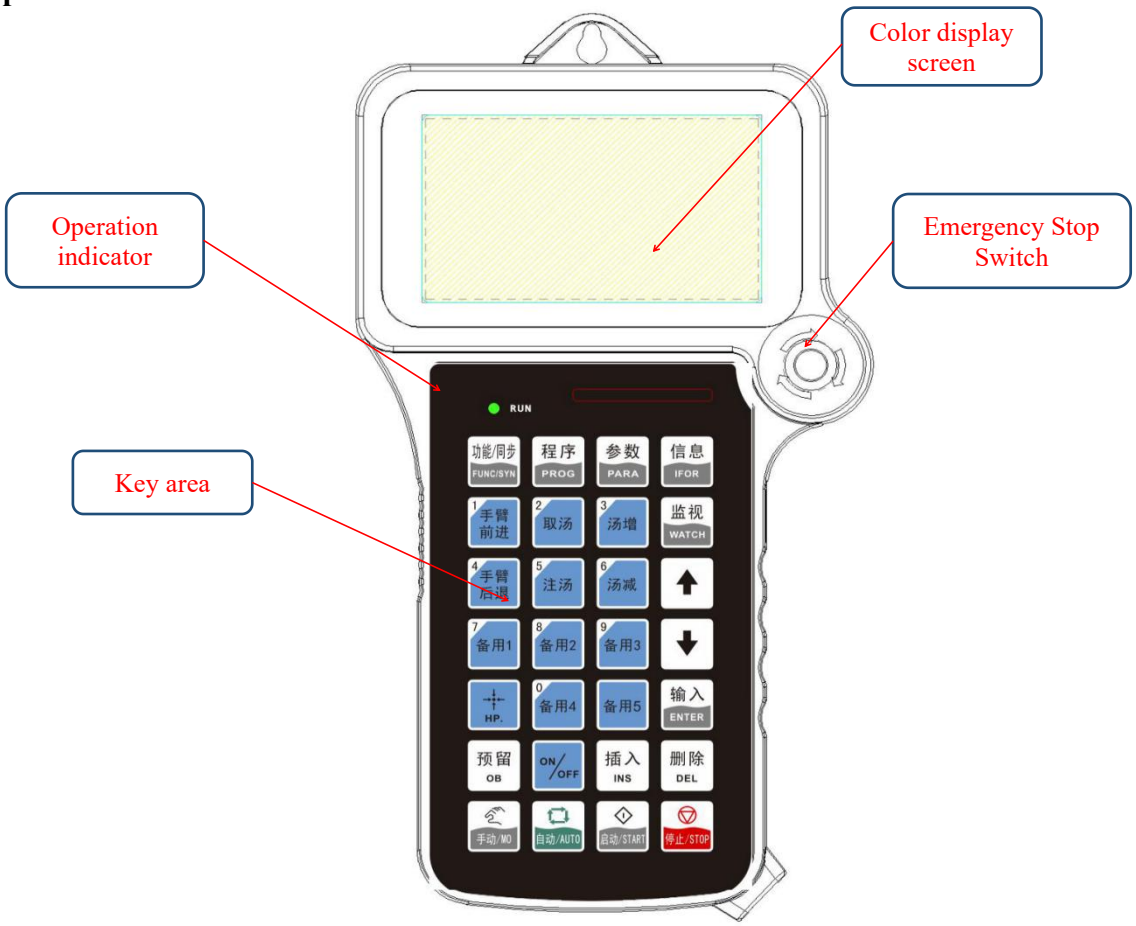
1. 4.3" colored operation panel;
2. Integrated drive-control control box;
3. Power supply; (50W 100W)
4. Servo motor (750W 750W, the actual configuration should prevail);
5. Brake resistor;
6. UVW Power wire, encoder wire;
7. Transformer;
8. Fan;
9. Safety door (accessories);
10. Connection wire of die casting machine (accessories);

2. Cautions

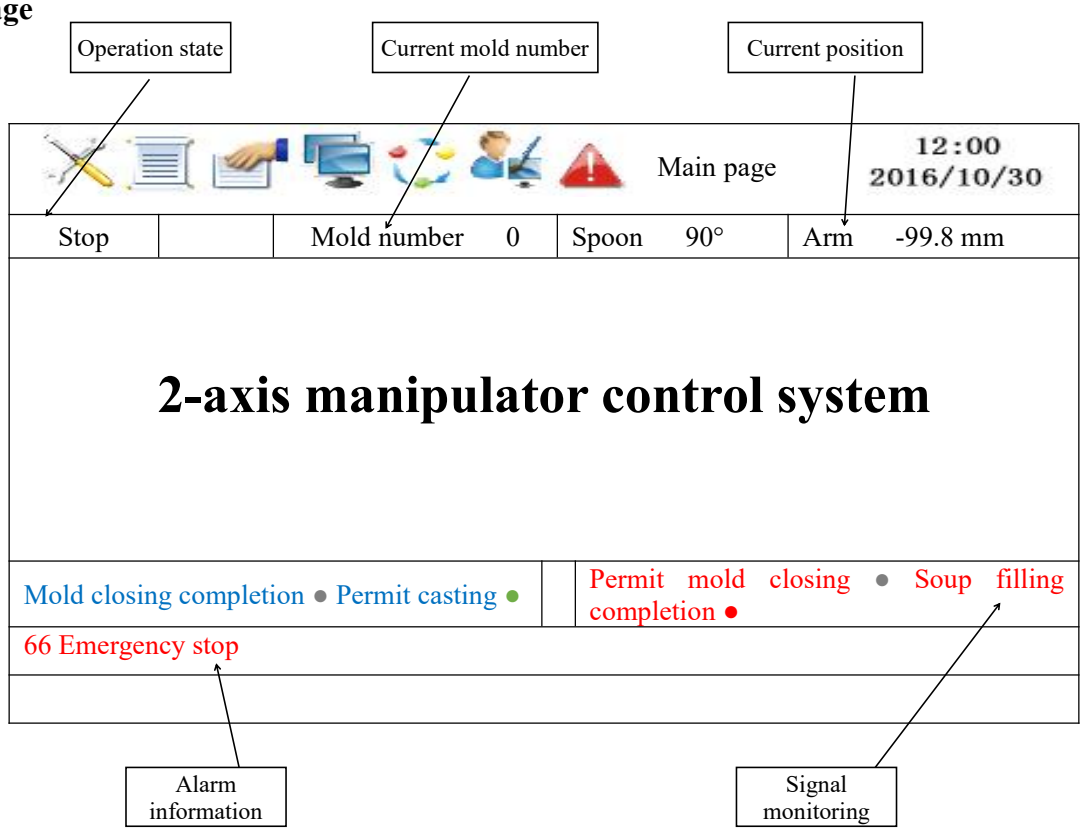
1. The wiring must be conducted by professional electrician. Make sure to cut off power supply prior to operation.
2. Please install the product on the metal or any other flame retardants and keep it away from any combustibles.
3. Make sure to connect the grounding terminal to ground wire; otherwise, electric shock or fire hazard may occur.
4. Make sure to arrange safety circuit on the control system to keep safety of control system, for the control system may have a fault when external power supply has error.
5. The electric board installed should not be too close to the AC devices such as contactor and frequency converter, to avoid unnecessary surge interference.
6. The electrical cabinet installed with the controller shall be well-ventilated, oilproof and dustproof. When electric control box is sealed, the over-high temperature will affect the normal operation, thus, an exhaust fan must be installed. The appropriate temperature in the electrical cabinet shall be below 50 ℃. Do not use it in any dew or freeze.

Chapter 2 Introduction to Hand Controller Page of Drive Control Integrated 2-axis Robot

1. Appearance and instructions



2 Homepage



3 Operation mode

Origin reset: In order to enable the robot to operate automatically and correctly, the origin action is carried out in the stop state after turning on the power every time. Origin reset: The robot electric axis will be reset to the original position. Under stop state, press 

button and then 

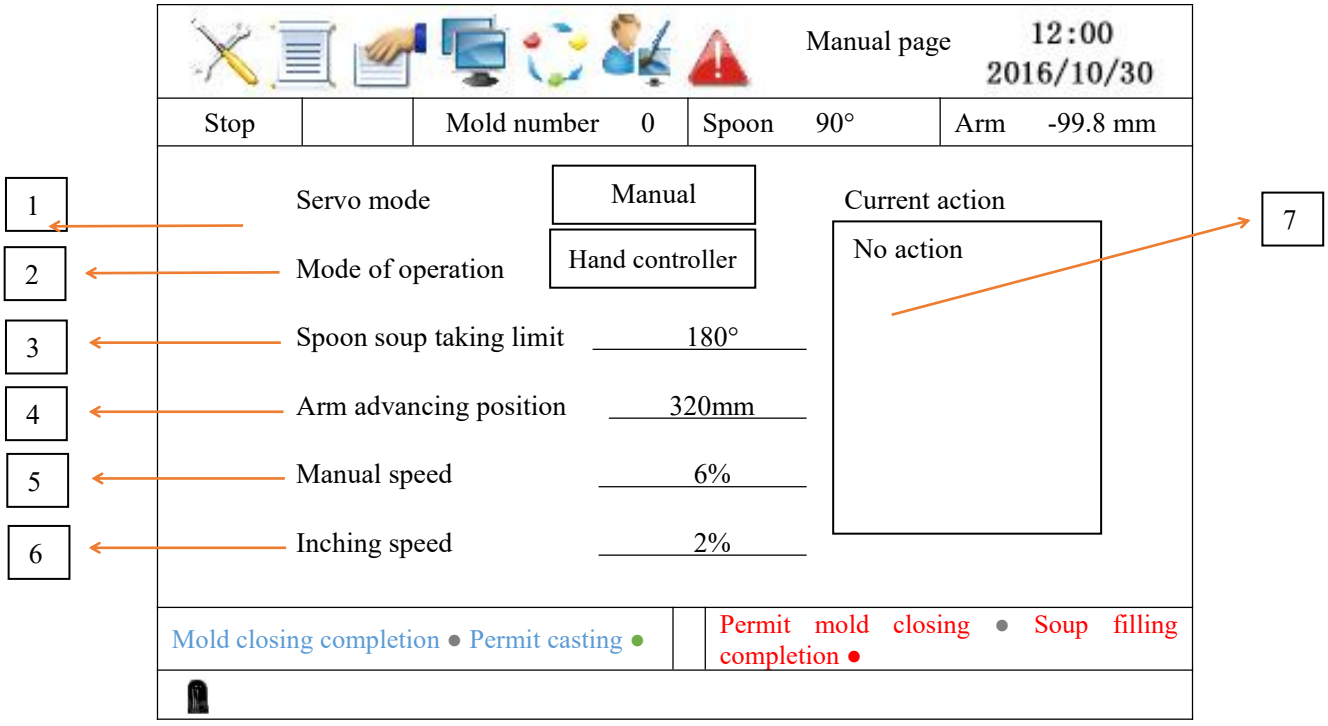
button to reset the origin, return the electric axis to the original point. Auto and manual operation is not allowed until origin reset is done.

The user should not perform manual and auto operation and parameter setting to mechanical manipulator while resetting the origin. In case of emergency, press "Stop" button to reset the origin or press "Emergency stop button".

3.1 Manual operation

Press 

button to enter the manual image, have manual operation and control the robots to have single action.



1. Servo mode:

Press 

button to select manual mode or inching mode.

Manual mode: Hold <Arm advancing> button to execute arm advancing action (the spoon should stay at horizontal position of 90° before arm advancing); the robot will stop immediately when button is released. The robot must return to the origin before it can enter manual mode.

Note: The running stroke of axles are restricted by parameters during manual mode to run between the min. and the max. value.

Inching mode: The operation mode is consistent with manual mode. The robot must return to the origin before it can enter inching mode.

Note: The running stroke of axles are restricted by parameters during inching mode. Keep an eye on the current position of robot to avoid collision.

2. Operation mode:

Press 

button to select hand controller or operation box.

Hand controller: Perform manual action through the hand controller (external operation box will be ineffective when hand controller is selected)

Operation box: Perform manual action through the operation box (hand controller will be ineffective when operation box is selected) ※ External operation box is not provided so far

3. Spoon soup taking limit: Monitor the max. set position of robot manual soup taking; unit: °.

4. Arm advancing position: Monitor the max. set position of advancing of robot manual arm; unit: mm.

5. Manual speed: Monitor the manual set speed of robot.

6. Inching speed: Monitor the inching set speed of robot.

7. Current action: Monitor the current manual/inching action executed by robot.

3.2 Manual button

Arm advancing button: Keep pressing the key, the arm execution arm moves forward, and release the key to stop the movement.

Arm retreat button: Keep pressing the key, the arm execution arm moves backward, and release the key to stop the movement.

Soup taking button: Keep pressing the key, the spoon executes soup taking action, and release the key to stop the movement.

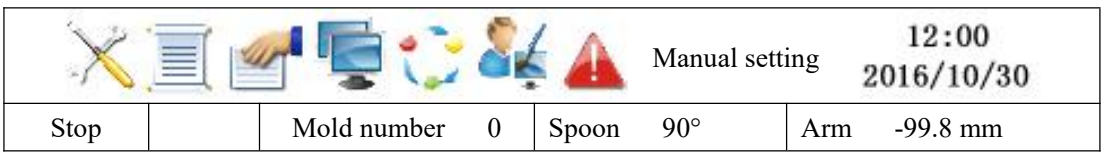
Soup filling button: Keep pressing the key, the spoon executes soup filling action, and release the key to stop the movement.

Soup increase button: During auto running, press the soup increase button to slightly increase the soup taking amount.

Soup decrease button: During auto running, press the soup decrease button to slightly decrease the soup taking amount.

ON/OFF button: Enter the parameter to switch between the positive and negative value; all parameters are positive number by default; press ON/OFF button to enter negative value.

Parameter button: Under stop/manual state, press parameter button to enter the image of manual parameter adjustment; the display image is as follows:



Spoon soup taking limit	180°	Inching speed	5%
Arm advancing position	350mm	Global speed	100%
Reserved parameter 1	0.0mm	Origin speed	4%
Reserved parameter 2	0.0mm	Screen closing time	60s

Mold closing completion ● Permit casting ●		Permit mold closing ● Soup filling completion ●

1. **Spoon soup taking limit:** It's the max. value that the spoon can operate in manual state. Move the cursor to this position to change the setting value.
2. **Arm advancing position:** It's the max. value that the arm can operate in manual state. Move the cursor to this position to change the setting value.
3. **Reserved parameter 1:** Not available yet
4. **Reserved parameter 2:** Not available yet
5. **Inching speed:** It's the manual speed set under inching mode. Move the cursor to this position to change the setting value.
6. **Global speed:** Global speed at which the servo motor is running, in %.
   For example: If the global speed is 80% and the arm forward speed is 50%, the actual arm forward speed is 80% * 50% = 40%
7. **Origin speed:** It's speed of motor shaft at home reset.
8. **Screen off time:** It's the time during which the screen is on when the hand controller is not operated.

3.3 Automatic operation

Press the 

button to enter the automatic screen, and then press the 

button to enter the automatic operation mode.

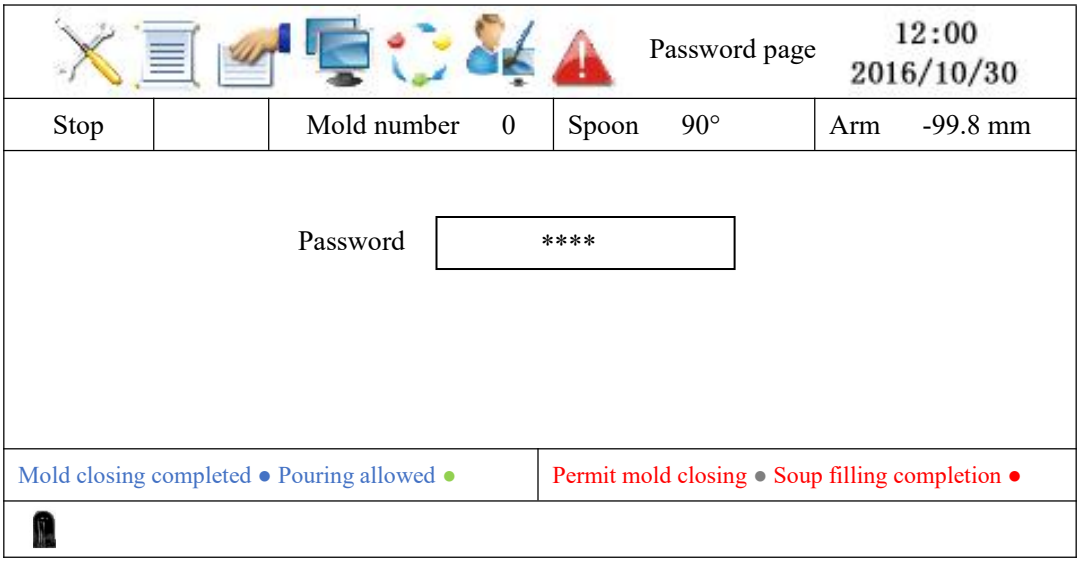
(1) First, manually return to detection position of the noodle soup (the detection rod touches the aluminum material), immerse the spoon into the aluminum soup for preheating, or take and pour soup at least three times; press the switch to "auto" to start operation.
(2) When the timer is finished, the spoon will rise to the dropping position (excessive aluminum will drop back into the furnace).
(3) The spoon will return to horizontal position when the timer is finished.
(4) Arm forward, switch between high and low speeds automatically.
(5) When the arm stops after reaching the forward limit, and the spoon is at the soup pour position, abnormal backward timer will start timing for 16 seconds. Before the timer finishes timing, the die-casting machine will enter the soup pour action when the soup pour instruction signal occurs after die closing.
(6) When the pour limit is ON, the pour delay time timer will start timing. When timing is over, the timer will send a pour signal to the die-casting machine and the arm will go backward.
(7) When the arm moves backward to the backward low speed limit (i.e. the standby position on furnace), the spoon is in the measuring and tilting state and reaches the soup noodle detection position; the spoon will stop, and the timing will start for taking soup.
(8) Operation is performed by the loop (1-7). However, if the abnormal backward timer is timed out in step (4) and the signal that the die-casting machine has finished clamping (i.e., the soup filling signal) is not received, the spoon arm will move backward automatically to the detecting position of noodle soup. Operation is performed in the loop of step (2).
(9) Rear positioning function of two-axis robot: When the two-axis robot selects rear positioning, the two-axis robot will stop at the furnace for standby after completing the step (3), and the timer will start timing until the forward start signal (release signal is limited by mold opening of die-casting machine by default) is received. Then continue operating with step. If the start signal is not received when timing is finished, the arm of the two-axis robot will move backward to detection position of the noodle soup automatically, and the action is circularly carried out from step (2).

Chapter 3 Function Setting

1 Special Functions

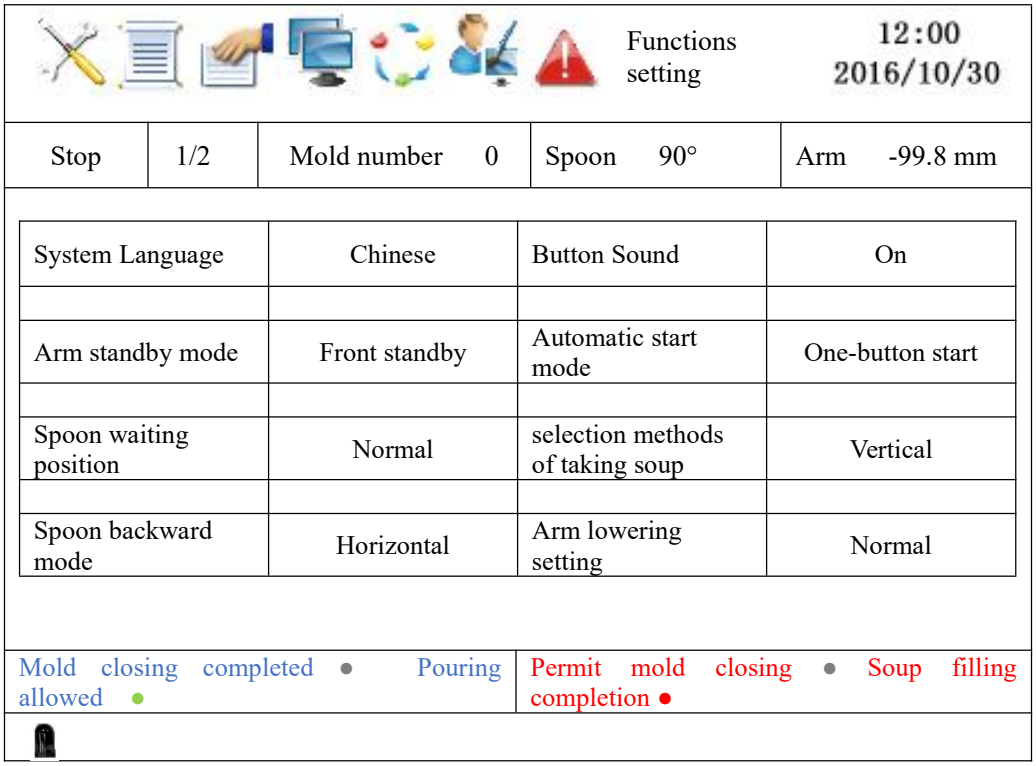
Press the 

button under stop screen to enter the password screen.



1.1 Password 2010

Enter the password "2010" and press the 输入 ENTER button to enter the screen of special function 1. There are two setting screens. Press the up and down cursor buttons to move to each setting item. After changing required parameters, press the 输入 ENTER button to change the setting value.



1. System language: Press <Enter> button to select Chinese or English version.
2. Arm standby mode: Press <Enter> button to switch between front and rear standbys.

Front standby: In the automatic operation state, the arm moves forward to the soup pour position, and waits for the mold closing signal and the allow pouring signal. It will pour soup after the two signals appear at the same time. If there is no signal (abnormal backward time due), the arm will go backward and take soup again for taking the soup again! It will remain at home position if there is no signal after repeating for 5 times. If there is a mold closing signal and allow pouring signal at this time, take the soup again. If not, stop at the origin position and wait.

Rear standby: In the operating state, the arm waits at the original position after taking soup. When the system detects (the mold opening limit is disconnected), the arm will advance to the soup pouring position (waiting for the pouring signal to pour soup). If the allow pouring signal is present, pour the soup. Otherwise, the abnormal backward time will be due. Take the soup again, and it will remain at the original position if there's no signal after repeating 5 times. If there is a mold closing signal and allow pouring signal at this time, take the soup again;

otherwise, stop at the origin position and wait.

3. Spoon waiting position: Normal/Setting, press <Enter> button to switch.
Normal: The spoon is under horizontal standby state and waits for the allow pouring signal and the mold closing limit signal.
Setting: The spoon is under standby state according to the set state, and waits for the allow pouring signal and the mold closing limit signal.

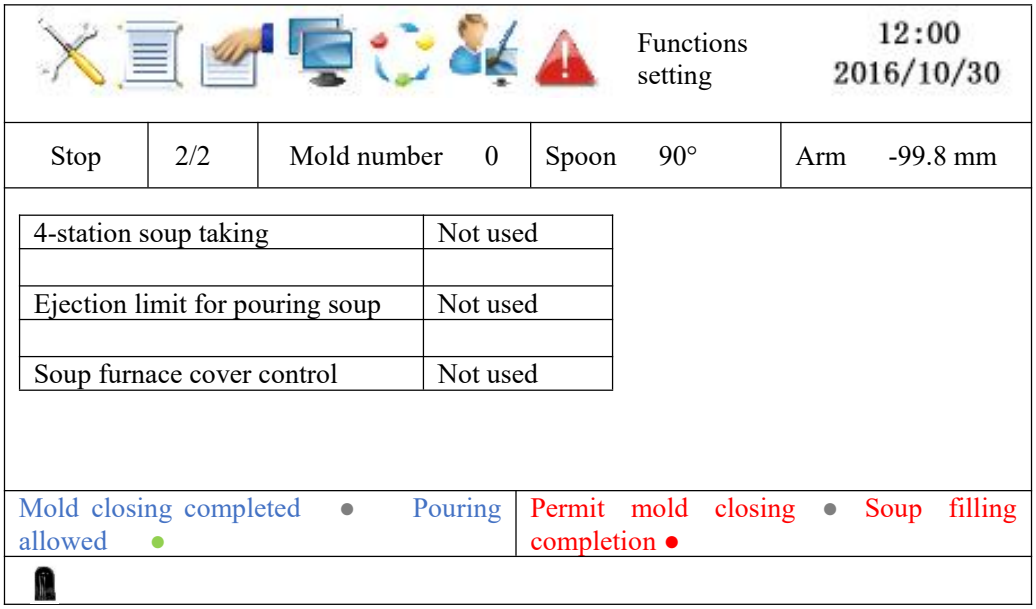
4. Spoon backward mode: Horizontal/Non-horizontal, press <Enter> button to switch.
Horizontal: The spoon must be under horizontal position when the soup arm moves backward; otherwise an alarm will be given out.
Non-horizontal: When the arm moves backward, the state of the spoon is not limited.

5. Button sound: On/Off, press <Enter> button to switch.
On: There is a button tone when pressing the button.
Off: There is no button tone when pressing the button.

6. Automatic start mode: One-button start/Noodle soup detection, press <Enter> button to switch.
One-button start: If the two-axis robot selects automatic state, auto running will be enabled after pressing the one-button start button.
Noodle soup detection: When the two-axis robot is in the automatic state, auto running will not be enabled until the arm returns to the soup detection position.

7. Selection methods of taking soup: Vertical/Non-vertical, press <Enter> button to switch.
Vertical: When taking soup, move the spoon to the vertical position (180°) before coming to the set angle of the amount of soup taking.
Non-vertical: In the process of taking soup, the spoon moves to the set angle of the amount of soup taking directly.

8. Arm lowering setting: Normal/Horizontal, press <Enter> button to switch.
Normal: When arm descends, the spoon is at the set angle of the amount of soup taking.
Horizontal: When arm descends, the spoon keeps horizontal



9. 4-station soup taking: Use/Not used, press <Enter> button to switch.
Use: Take the corresponding four kinds of soups according to the 4-station signals (this function is used for non-standard two-axis robot)
Not-used: Logic of standard two-axis robot.

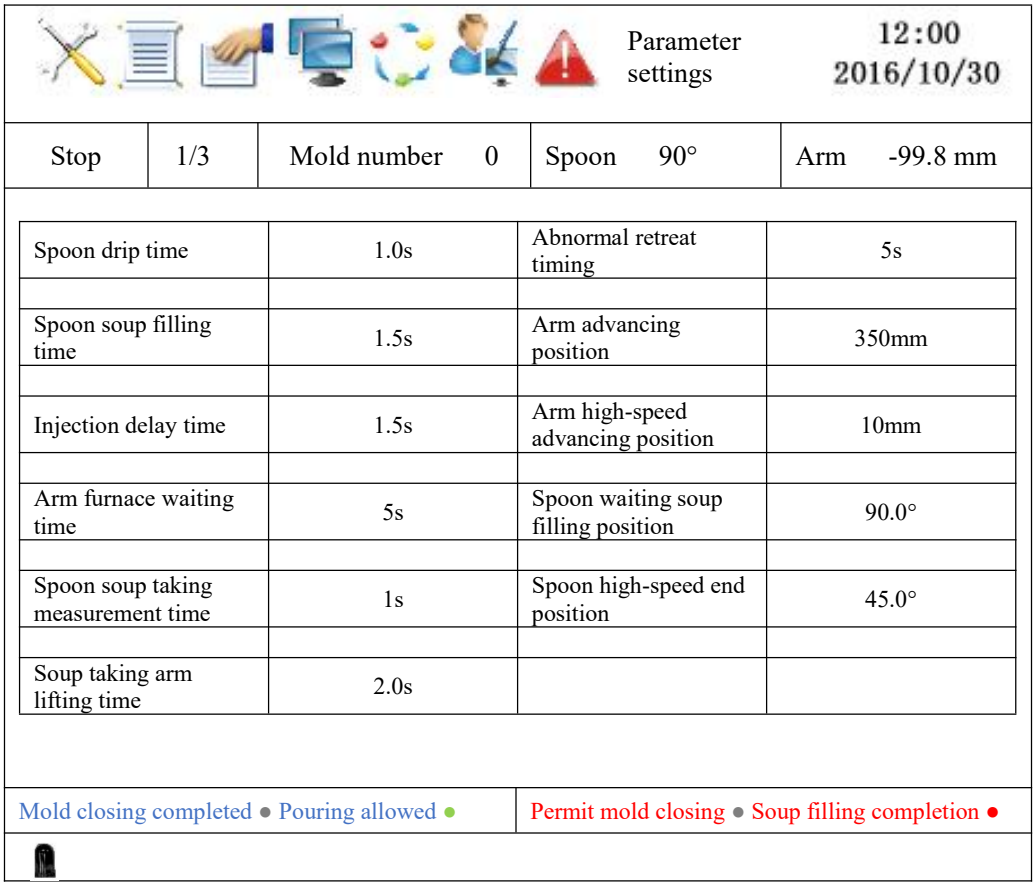
10. Ejection limit for pouring soup: Use/Not used, press <Enter> button to switch.
Use: Before the automatic operation of soup arm moves forward, detect whether there is a signal for the X25 pour limit. If there is a signal, move forward; if no, wait.
Not used: The X25 ejection limit is not detected during automatic operation.

11. Soup furnace cover control: Use/Not used, press <Enter> button to switch.
Use: When arm descends, detect whether the soup furnace cover is open.
Not used: When arm descends, the opening of soup furnace cover is not detected.

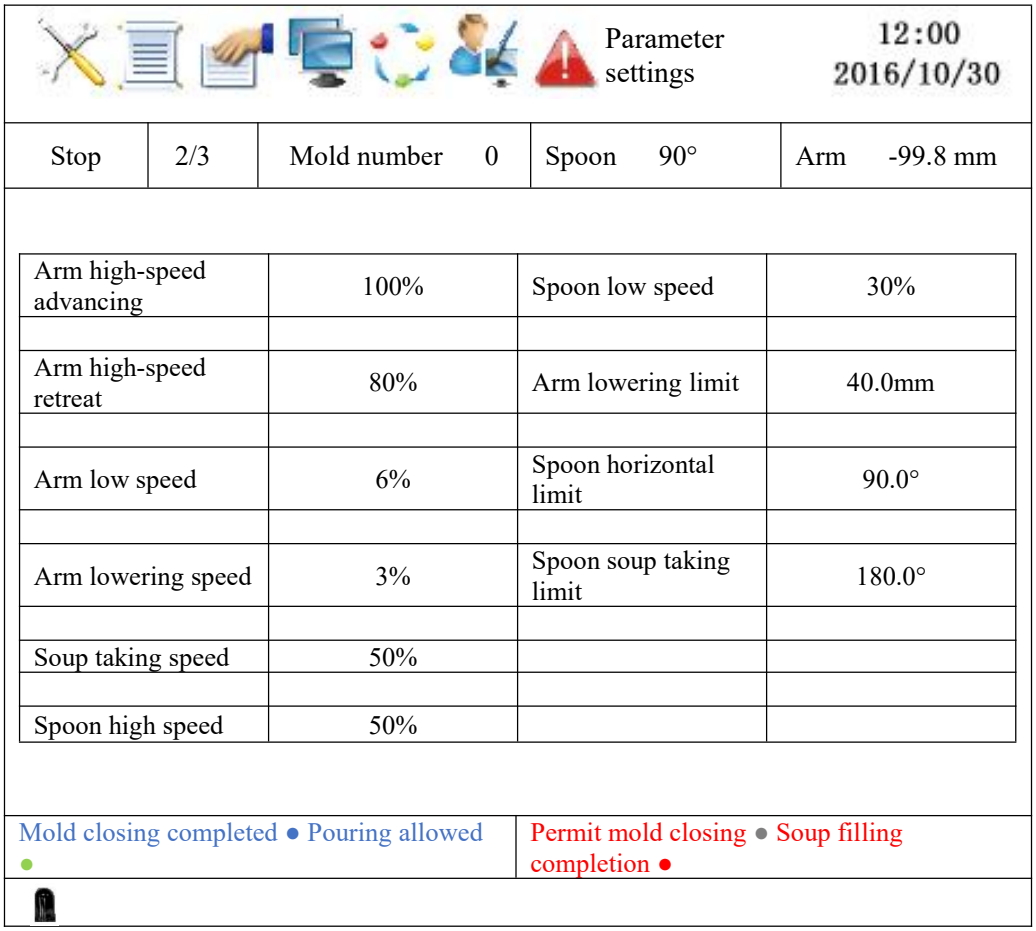
1.2 Password 2011

Press 输入 ENTER button to enter the image of special function 2; there are 3 set images in total; press up/down cursor to

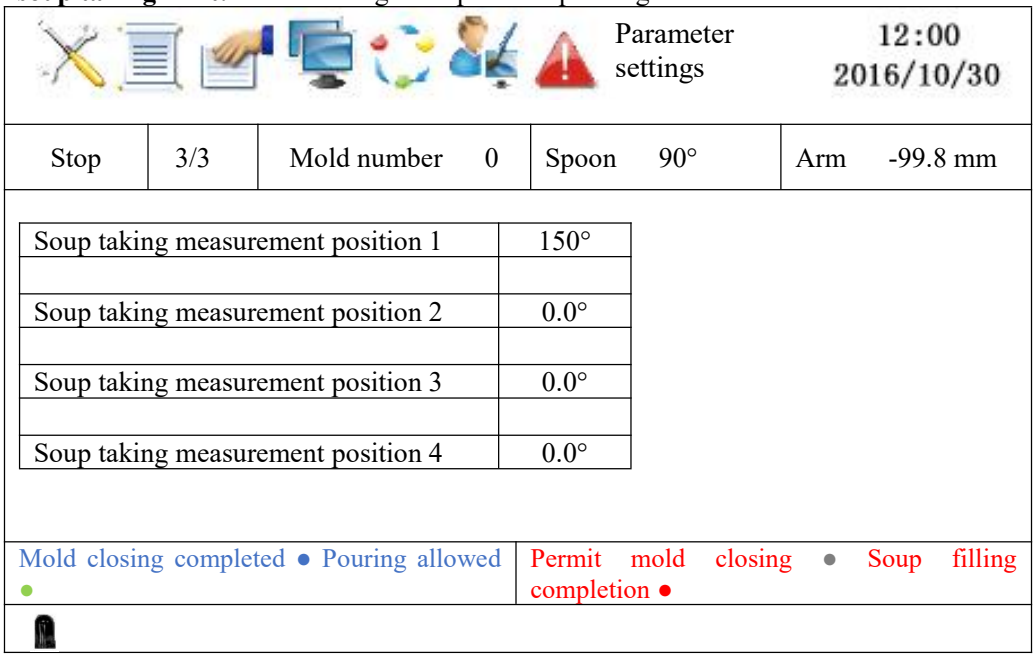
move to the set options, change the parameters, then press 输入 ENTER button to change the set value.



1. **Spoon drip time:** When "Arm lifting time" is reached, the arm will stop advancing, spoon is fixed, the excessive soup has overflow and the soup stop time is set through this function.
2. **Spoon soup filling time:** The period from start to end of soup filling.
3. **Injection delay time:** The delay time of permitting injection signal outputted by the robot to the die casting machine.
4. **Arm furnace waiting time:** The waiting time for arm to return to furnace when the 2-axis robot finishes auto soup filling; when the time is reached, the arm will retreat to soup and perform the next cycle.
5. **Spoon soup taking measurement time:** The stay period of spoon in the aluminum soup, wait until the spoon is filled with aluminum soup.
6. **Soup taking arm lifting time:** The time for arm to uplift to soup position from soup surface.
7. **Abnormal retreat timing:** The timing for arm to advance to soup filling position and wait for soup filling command; the arm will retreat to the soup furnace if no filling command is received in this period.
8. **Arm advancing position:** The arm advancing completion position during auto running.
9. **Arm advancing high-speed position:** The difference between the completion position of arm advancing and arm high-speed advancing. (Distance of arm low-speed section)
10. **Spoon waiting soup filling position:** The waiting soup filling angle of spoon when arm reaches the advancing position and waits for soup filling command. (This parameter will be effective only if spoon waiting position is selected as setting)
11. **Spoon soup taking measurement time:** The completion position of high-speed soup filling; the system will enter low speed by default after this position.



12. Arm high-speed advancing: The set value for arm high-speed advancing.
13. Arm high-speed retreat: The set value of arm high-speed retreat.
14. Arm low speed: Set value of arm low speed.
15. Arm lowering speed: The arm lowering speed from arm retreat low speed limit to soup detection.
16. Soup taking speed: The speed for soup to return to horizontal level during soup taking.
17. Spoon high speed: The max. running speed of spoon.
18. Spoon low speed: The min. running speed of spoon.
19. Arm lowering limit: The allowed max. lowering position compared with the previous soup detection position.
20. Spoon horizontal limit: The set value of spoon horizontal position.
21. Spoon soup taking limit: The max. angle of spoon soup taking.



22. Soup taking measurement position 1: The angle 1 with liquid surface after spoon soup taking.

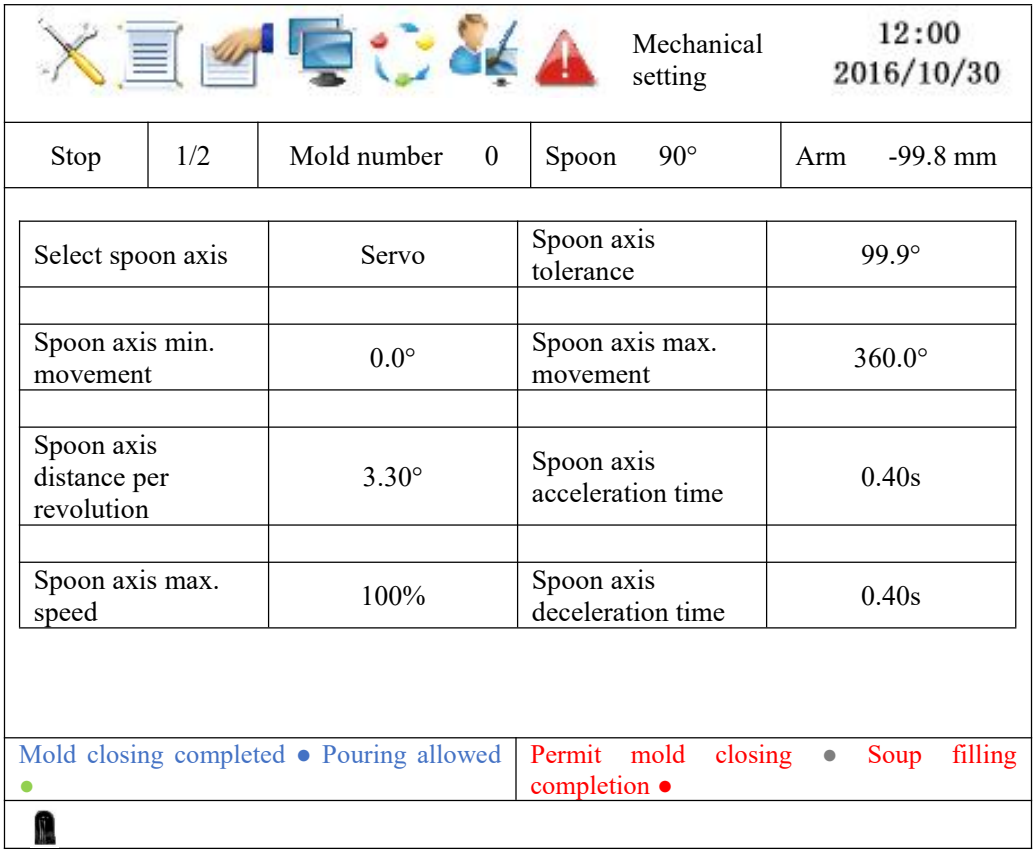
23. Soup taking measurement position 2: The angle 2 with liquid surface after spoon soup taking. (Take effects only when four-station function is used)

24. Soup taking measurement position 3: The angle 3 with liquid surface after spoon soup taking. (Take effects only when four-station function is used)

25. Soup taking measurement position 4: The angle 4 with liquid surface after spoon soup taking. (Take effects only when four-station function is used)

1.3 Password 2012

Enter password "2012" and press button to enter the image of special function 3; there are 3 set images in total; press up/down cursor to move to the set options, change the parameters, then press button to change the set value.



1. **Select spoon axis:** Set the servo axis as pneumatic axis or servo axis.
2. **Spoon axis tolerance:** Difference between sending pulse and feedback pulse; unit: °.
   When this difference is exceeded, it will give alarm of "Feedback pulse has excessive deviation"
3. **Spoon axis min. movement:** The min. movement distance of axis.
4. **Spoon axis max. movement:** The max. movement distance of axis.
5. **Spoon axis distance per revolution:** Set the running distance of each servo axis motor per revolution.
   [Warning: This modification may lead to a fault of machine]
6. **Spoon axis acceleration time:** Set the acceleration time of spoon axis.
7. **Spoon axis max. speed:** Set the max. running speed of spoon axis.
8. **Spoon axis deceleration time:** Set the deceleration time of spoon axis.

Select arm axis	Servo	Arm axis tolerance	99.9°
Min. movement of spoon arm axis	-150.0mm	Max. movement of spoon arm axis	350.0mm
Spoon axis distance per revolution	9.50mm	Spoon axis acceleration time	0.70s
Spoon axis max. speed	100%	Spoon axis deceleration time	0.70s

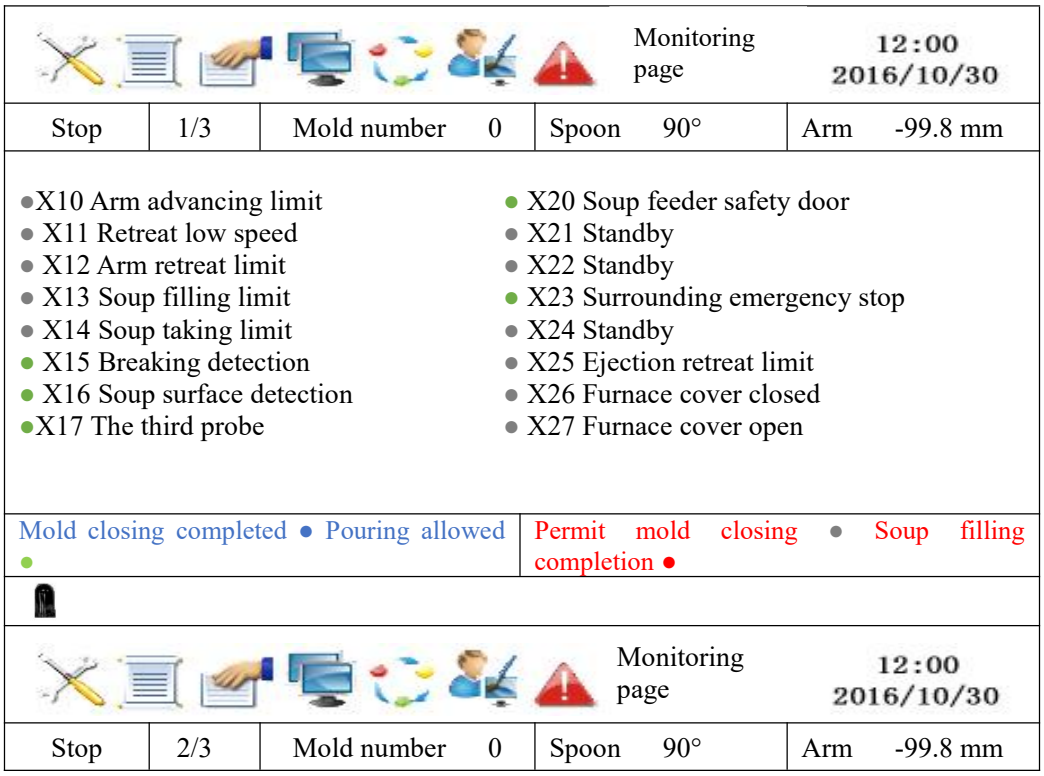
Mold closing completed ● Pouring allowed ●	Permit mold closing ● Soup filling completion ●

1. **Select arm axis:** Set the servo axis as pneumatic axis or servo axis.
2. Arm axis tolerance:
   When this difference is exceeded, it will give alarm of "Feedback pulse has excessive deviation"
3. **Arm axis min. movement:** The min. movement distance of axis.
4. **Arm axis max. movement:** The max. movement distance of axis.
5. **Spoon axis distance per revolution:** Set the running distance of servo axis motor per resolution.
   [Warning: This modification may lead to a fault of machine]
6. **Spoon axis acceleration time:** Set the acceleration time of arm axis.
7. **Spoon axis max. speed:** Set the max. running speed of arm axis.
8. **Spoon axis deceleration time:** Set the deceleration time of arm axis.

Chapter 4 Running Information

1 I/O Monitoring

Press button once to enter signal monitoring image, press up/down button to switch the monitoring image.



● X30 Soup feeder auto ● X31 One-key start ● X32 Arm advancing ● X33 Arm retreat ● X34 Soup filling ● X35 Soup taking ● X36 Soup increase ● X37 Soup decrease	● X40 Station signal 1 ● X41 Station signal 2 ● X32 Station signal 3 ● X43 Station signal 4 ● X44 Standby ● X45 Standby ● X46 Standby ● X47 Standby
Mold closing completed ● Pouring allowed ●	Permit mold closing ● Soup filling completion ●

		Monitoring page		12:00 2016/10/30
Stop	3/3	Mold number 0	Spoon 90°	Arm -99.8 mm

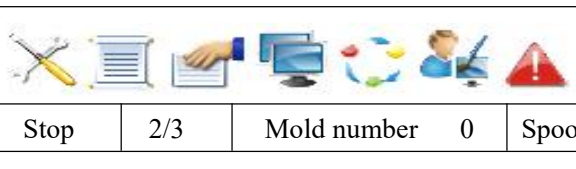
● Safety door ● Defective product ● Mold closing completion ● Mold opening completion ● Middle plate template ● Full auto ● Permit casting (ejection completion) ● Emergency input	
Mold closing completion ● Permit casting ●	Permit mold closing ● Soup filling completion ●

Press 监视 WATCH button twice to enter signal monitoring image, press up/down button to switch the monitoring image.

		Monitoring page		12:00 2016/10/30
Stop	1/3	Mold number 0	Spoon 90°	Arm -99.8 mm

●	Y10 Origin indication	●	Y20 Standby
●	Y11 Furnace cover output	●	Y21 Standby
●	Y12 Standby	●	Y22 Standby
●	Y13 Standby	●	Y23 Standby
●	Y14 Standby	●	Y24 Standby
●	Y15 Standby	●	Y25 Standby
●	Y16 Standby	●	Y26 Standby
●	Y17 Alarm	●	Y27 Brake

Mold closing completed ● Pouring allowed ●	Permit mold closing ● Soup filling completion ●



		Monitoring page		12:00 2016/10/30
Stop	2/3	Mold number 0	Spoon 90°	Arm -99.8 mm

●	Y30 Standby	●	Y40 Standby
●	Y31 Standby	●	Y41 Standby
●	Y32 Standby	●	Y42 Standby
●	Y33 Standby	●	Y43 Standby
●	Y34 Standby	●	Y44 Standby
●	Y35 Standby	●	Y45 Standby
●	Y36 Standby	●	Y46 Standby
●	Y37 Alarm	●	Y47 Brake

Mold closing completed ● Pouring allowed ●	Permit mold closing ● Soup filling completion ●

Monitoring page 12:00 2016/10/30

Stop	3/3	Mold number 0	Spoon 90°	Arm -99.8 mm

●	Permit mold closing
●	Permit mold opening
●	Soup filling completion (permit needle ejection)
●	Recycle
●	Standby
●	Standby
●	Standby
●	Standby

Mold closing completed ● Pouring allowed ●	Permit mold closing ● Soup filling completion ●

Press button for times to enter the servo monitoring page. This page is servo motor status monitoring, to monitor the data, such as revolving speed, current, voltage and temperature, in real time. Press up/down button to switch the monitoring image.

Monitoring page 12:00 2016/10/30

Stop		Mold number 0	Spoon 90°	Arm -99.8 mm

Spoon axis motor speed	0	Spoon axis voltage	321.7
Spoon axis encoder position	120413	Spoon axis temperature	33.3
Spoon axis rotation angle 2	0	Spoon axis load rate	0
Spoon axis position deviation	0	Spoon axis regeneration load	0
Spoon axis output signal	0	Spoon axis DB power consumption	0
Spoon axis offset	0	Spoon axis - q axis current	0

Mold closing completed ● Pouring allowed ●	Permit mold closing ● Soup filling completion ●

Monitoring page 12:00 2016/10/30

Stop		Mold number 0	Spoon 90°	Arm -99.8 mm

Arm axis motor speed	0	Arm axis voltage	321.5
Arm axis encoder position	86767	Arm axis temperature	33.4
Arm axis rotation angle 2	0	Arm axis load rate	0
Arm axis position deviation	0	Arm axis regeneration load	0
Arm axis output signal	0	Arm axis DB power consumption	0
Arm axis offset	0	Arm axis - Q axis current	0

Mold closing completed ● Pouring allowed ● | Permit mold closing ● Soup filling completion ●

2 Alarm record

Press 信息 IFOR button once to enter alarm record page, which can record the latest 15 alarm information. Press up/down button to switch the monitoring image.

Information page 12:00 2016/10/30

Stop		Mold number 0	Spoon 90°	Arm -99.8 mm

S/N	No.	Alarm Information
1	5004	Parameter setting error
2	5004	Parameter setting error
3	5004	Parameter setting error
4	66	Emergency stop
5	66	Emergency stop

Mold closing completed ● Pouring allowed ● | Permit mold closing ● Soup filling completion ●

Press 信息 IFOR button again to enter the auto period recording page, which records the period of the latest 5 molds.

Information page 12:00 2016/10/30

Stop		Mold number 0	Spoon 90°	Arm -99.8 mm

S/N	Mold Number	Period s
1	0	2.51
2	0	2.51
3	0	2.51
4	0	2.51
5	0	2.51

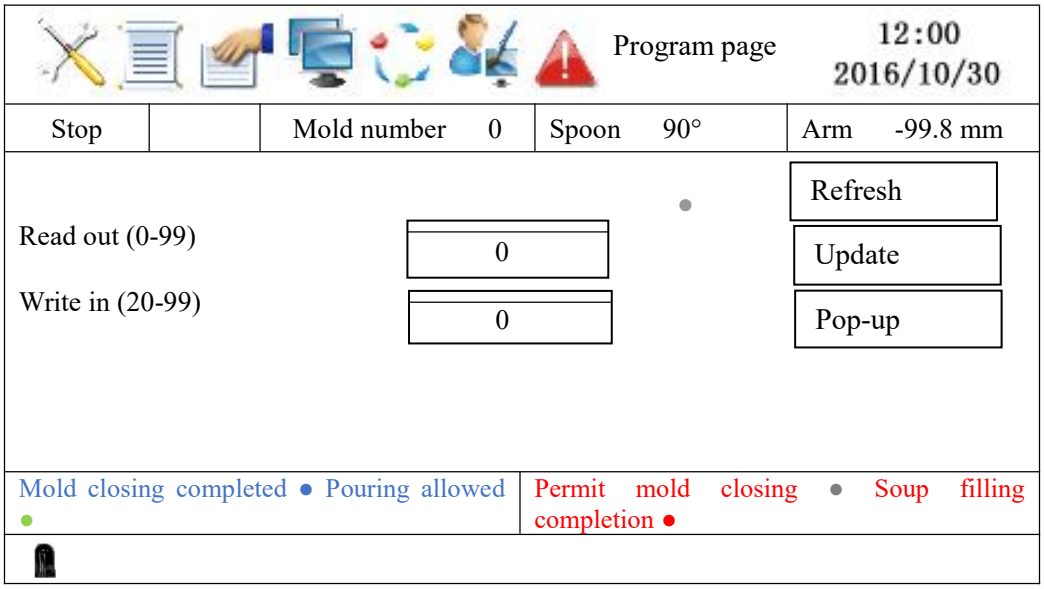
Mold closing completed ● Pouring allowed ● | Permit mold closing ● Soup filling completion ●

Chapter 5 Program Update

1 Manual Program Update

Insert the U disk into the USB port at the right side of hand controller, press Emergency Stop button, power off and reboot, insert the homepage, enter 2014 password page and check whether the version number is correct (do not unplug the D disk before entering the homepage).

2 Update Main Control Program



Insert the U disk, click button to enter the program page, and perform update as follows

(1) Refresh: Click "Refresh" button at the right side; the left indicator will be gray when D disk is not detected, or turn green when D disk is detected, then click Update button.

(2) Update: When the left indicator turns red from green, the operation indicator on host flickers at high frequency and the system update percentage is changing, the program is updated when the percentage becomes 100% and it will show prompt at the bottom of screen (update complete!).

(3) Eject: Then click pop-up button to eject the inserted U disk, the the left indicator will turn gray from red. The U disk can be unplugged now, to complete host update.

*Note: 1. The update period of host program is about 2min.

2. After clicking ejection button or unplugging U disk, make sure to reboot the system before refreshing and detecting to U disk.

Chapter 6 I/O Definition and Circuit Diagram of Drive and Control Integrated Two-axis Robot

1. Standard I/O Definition

X10	Arm forward limit	X30	Automation of two-axis robot
X11	Low speed for arm (origin)	X31	Push start of two-axis robot
X13	Soup filling limit	X33	Arm backward
X14	Soup taking limit	X34	Soup filling
X15	Disconnection detection	X35	Soup taking
X16	Soup level detection	X36	Soup increase
X17	Third probe	X37	Soup decrease
X20	Safety door of two-axis robot	X40	Station Signal 1
X21	/	X41	Station Signal 2
X22	/	X42	Station Signal 3
X23	Peripheral emergency stop	X43	Station Signal 4
X24	/		
X25	Sucking back limit		
X26	Soup kettle lid open		
X27	Soup kettle lid closed		
Y10	Origin Indicator Light	Y17	Alarm output
Y11	Soup kettle lid output		

2. Definition of Signal Plate of Die-casting Machine

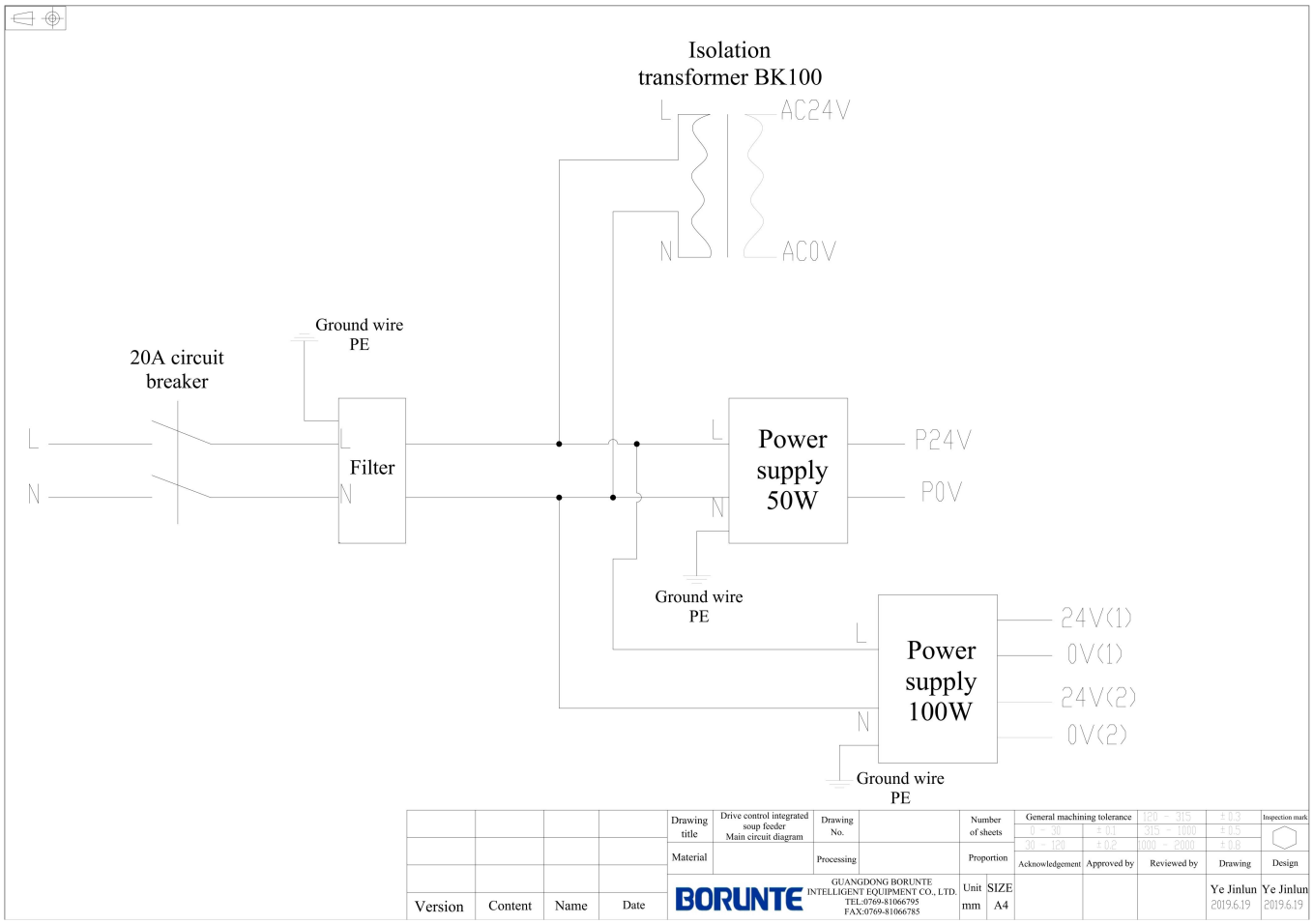
Input		
X010	Full auto of die-casting machine	Fully automatic
X011	Mold closing limit for die-casting machine	Mold closing finished
X012	Permit casting	Ejection finished
X013	Mold opening limit for die-casting machine	Mold opening finished
Output		
Y010	Soup filling finished	Permit Ejection
Y011	Mold closing permitted for die-casting machine	Permit mold closing
Y013	Recycle of die-casting machine	Recycle

3. Die-casting Machine Connecting Wire Definitions

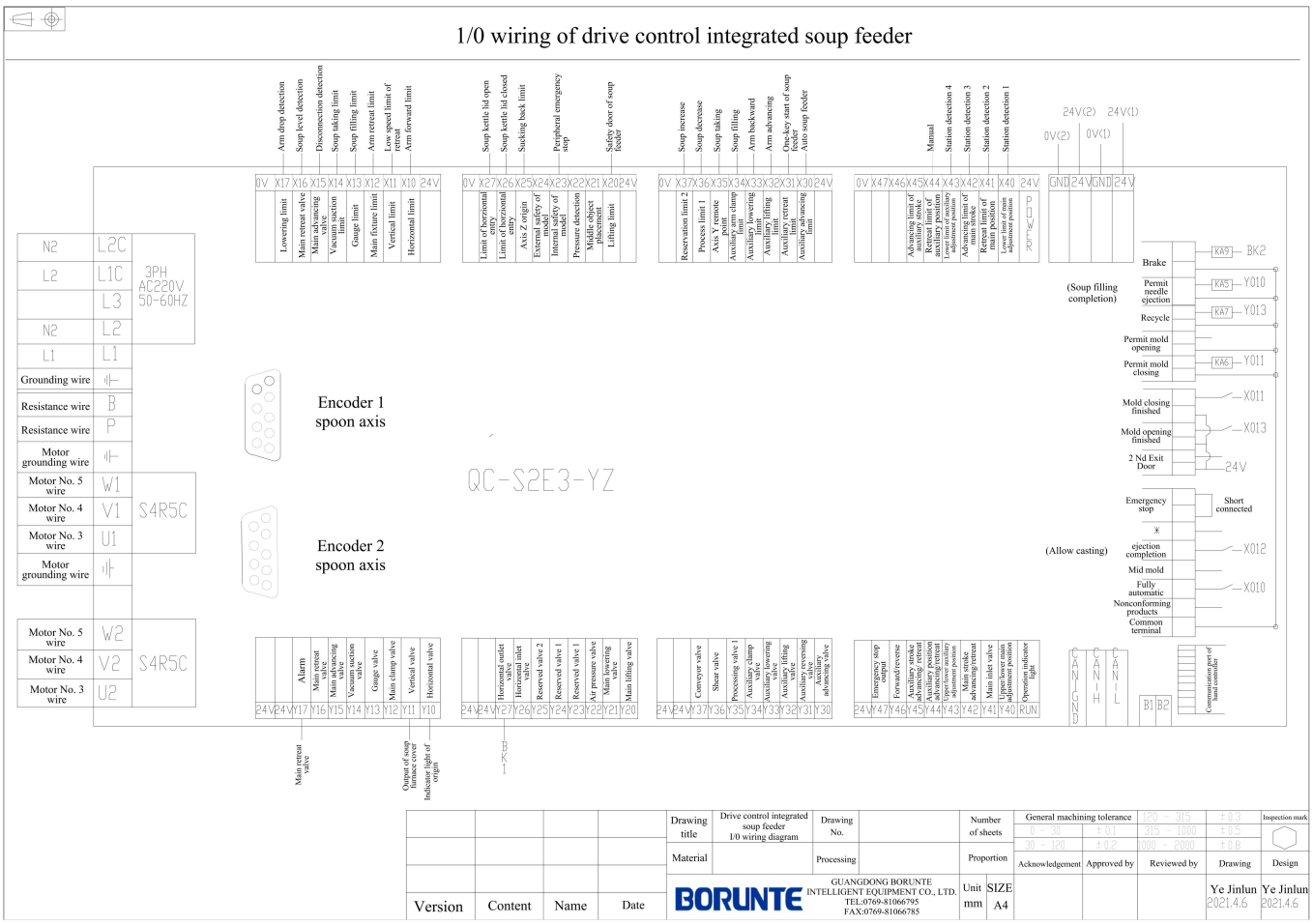
Line No.	Needle No.	Definition	Intention of device
#1	1	F	Common terminal of relay of die-casting machine
#2	2	88	Injection by die-casting machine after finish of soup filling
#3	3	89	Injection by die-casting machine after finish of soup filling
#4	4	90	Automation of die-casting machine
#5	5	91	Mold closing limit for die-casting machine
#6	6	92	Signal of die-casting machine's finishing preparation for soup filling or sucking back limit
#7	7	93	Mold opening limit for die-casting machine
#8	8	94	Ejection FW limit for die-casting machine
#9	9	A011	Permit mold closing
#10	10	B011	Permit mold closing
#11	11	C011	Connection in series to the switch in front of the door during automation of die-casting machine, to start the next cycle
#12	12	D011	Connection in series to the switch in front of the door during automation of die-casting machine, to start the next cycle
#13	13	A012	Permit Ejection OW
#14	14	B012	Permit Ejection OW
#15	15	A013	Cycle start
#16	16	B013	Cycle start
#17	17	C013	Cycle start
#18	18	D013	Cycle start
#19	19	95	Sucking back limit
#20	20		
#21	21		
#22	22		
#23	23		
#24	24		

Note: Please perform wiring in strict accordance with the drawing requirements.

4. Main Circuit Diagram

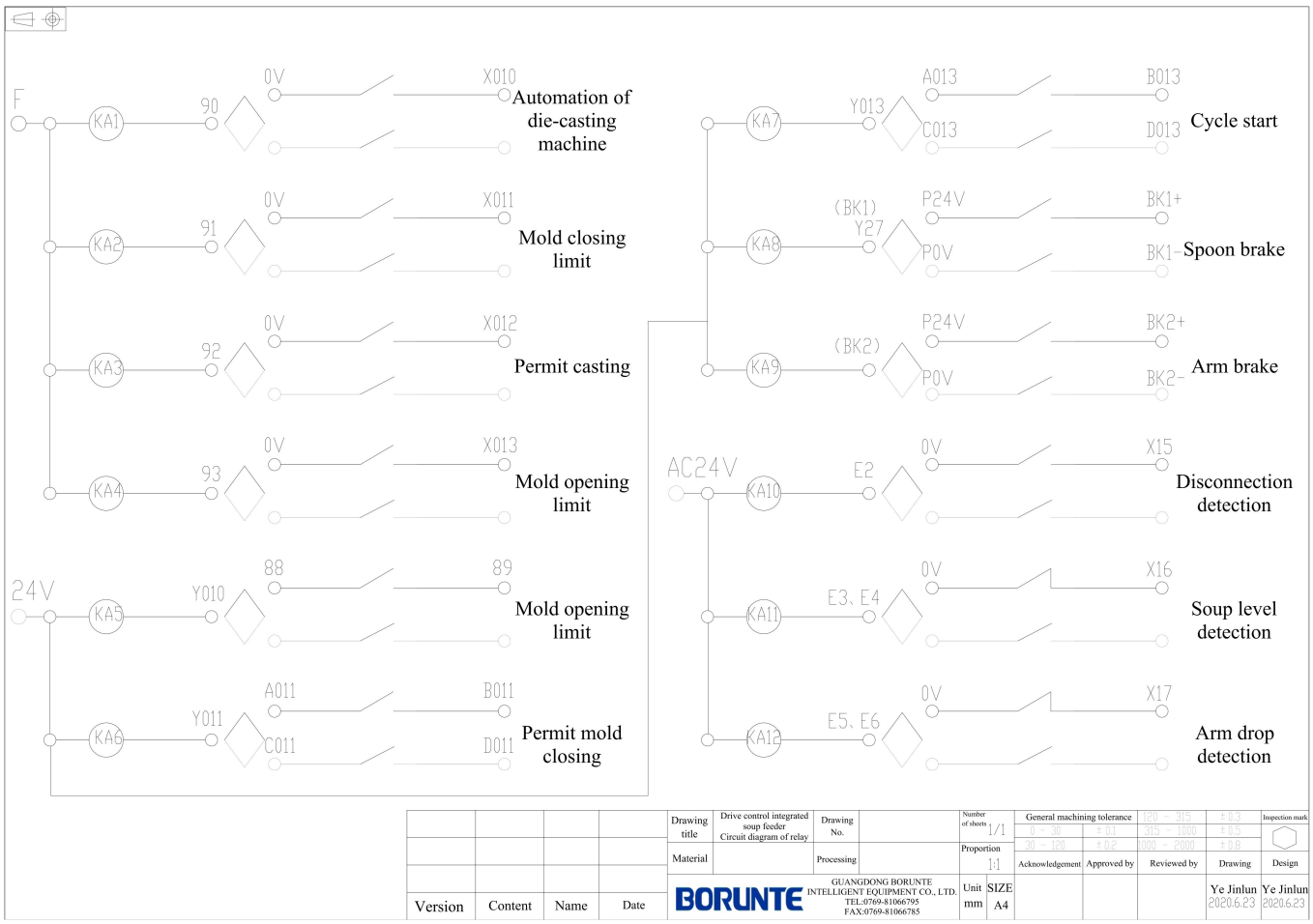


5. I/O Definition Diagram of Drive and Control Integrated System



Note: When IO wiring is performed, a matched IO input power supply should be used because only when the inputted OV is valid can OV be outputted.
When other type of voltage is inputted to or outputted from a special port, attention should be paid to the wiring method and the supply voltage.

6. Relay Signal Wiring Diagram



7. List of Alarm Contents of Standard Drive and Control Integrated Two-axis Robot

Alarm Content	Reason	Solution
40: Soup feeding spoon over-speed	The output pulse instruction frequency > 600K	Decrease the speed
41: Soup feeding arm over-speed	The output pulse instruction frequency > 600K	Decrease the speed
50: Soup feeding spoon not as servo axis	Failed to select the spoon as the servo axis in the spoon axis mode	Select the spoon axis as the servo axis with the password "2012"
51: Soup feeding arm not as servo axis	Failed to select the arm as the servo axis in the arm axis mode	Select the arm axis as the servo axis with the password "2012"
100: Excessive soup feeding spoon axis feedback pulse deviation	The difference between the pulse instruction count and the feedback pulse instruction count is greater than the tolerance setting	1. Press the "Stop" button to clear the alarm 2. Modify the parameter "tolerance" in the hand controller if the alarm cannot be cleared
101: Excessive soup feeding arm axis feedback pulse deviation	The difference between the pulse instruction count and the feedback pulse instruction count is greater than the tolerance setting	1. Press the "Stop" button to clear the alarm 2. Modify the parameter "tolerance" in the hand controller if the alarm cannot be cleared
118: Current soup feeding spoon value too large	The current spoon angle is greater than the max spoon position setting	1. Check whether the set parameter "distance per turn" in the hand controller is correct 2. Modify the parameter "max position" in the hand controller
119: Current soup feeding spoon value too small	The current spoon angle is smaller than the min spoon position setting	1. Check whether the set parameter "distance per turn" in the hand controller is correct 2. Modify the parameter "min position" in the hand controller
138: Soup feeding spoon not as servo	Failed to select the spoon as the servo axis in the spoon axis mode	Select the spoon axis as the servo axis with the password "2012"
139: Soup feeding arm not as servo	Failed to select the arm as the servo axis in the arm axis mode	Select the arm axis as the servo axis with the password "2012"
170: Soup feeding spoon runtime too long	The spoon axis run position is greater than the max position	1. Check whether the set max position of spoon in the hand controller is too small 2. Check whether the set soup taking amount in the hand controller is too large

171: Soup feeding arm runtime too long	The arm axis run position is greater than the max position	1. Check whether the set max position of arm in the hand controller is too small 2. Check whether the set forward limit in the hand controller is too large
180: Soup feeding spoon runtime too short	The spoon axis run position is smaller than the min position	1. Check whether the set min position of spoon in the hand controller is too large
181: Soup feeding arm runtime too short	The arm axis run position is smaller than the min position	1. Check whether the set min position of arm in the hand controller is too large
200: Soup feeding spoon memory error	Spoon axis parameter memory error	Reset the spoon axis machine parameters
201: Soup feeding arm memory error	The arm axis parameter memory is wrong	Reset the arm axis machine parameters
210: Soup feeding spoon comparison	The spoon axis parameters in the host are inconsistent with those in the hand controller	Reset the spoon axis parameters in the hand controller
211: Soup feeding arm comparison	The arm axis parameters in the host are inconsistent with those in the hand controller	Reset the arm axis parameters in the hand controller
220: Soup feeding spoon parameter check	The parameters in the host are inconsistent with those in the hand controller	Reset the spoon axis machine parameters in the hand controller and then cut off the power for saving
221: Soup feeding arm parameter check	The parameters in the host are inconsistent with those in the hand controller	Reset the arm axis machine parameters in the hand controller and then cut off the power for saving
228: Structural parameter check	The parameters in the host are inconsistent with those in the hand controller	Reset the parameters in the hand controller and then cut off the power for saving
300: Soup feeding spoon axis setting error	The spoon axis machine parameter setting is wrong	Reset the spoon axis machine parameters in the hand controller and then cut off the power for saving
301: Soup feeding arm setting error	The axis machine parameter setting is wrong	Reset the arm axis machine parameters in the hand controller and then cut off the power for saving
304: Emergency stop input	There is emergency stop signal input	1. Screw out the emergency stop knob on the hand controller 2. Screw out the emergency stop knob on the external operation box 3. Short-circuit the emergency stop signal of the system
305: Main cycle error	The host is initialized incorrectly	Restart the host
309: Mold function parameter error	Mold parameters mismatch between host and hand controller	Reset the parameters in the hand controller and then cut off the power for restarting
321: Check code error when calling	The check code is inconsistent with the host when the program runs	1. Cut off the power for restarting 2. Replace the host if the alarm cannot be cleared
322: GM check error when calling	The check code is inconsistent with the host when the program runs	1. Cut off the power for restarting 2. Replace the host if the alarm cannot be cleared
324: GM error during automatic adjustment	The check code is inconsistent with the host when the program runs	1. Cut off the power for restarting 2. Replace the host if the alarm cannot be cleared
365: Structural parameter check	Parameters mismatch between host and hand controller	Reset the parameters in the hand controller and then cut off the power for restarting
400: Two-axis robot back to origin not in manual mode	In the automatic state when returning to the origin	Adjust the two-axis robot to the stopped/manual state
403: Machine parameters not permitted to be set with two-axis robot in automatic mode	Machine parameters adjusted in the automatic state	Adjust the two-axis robot to the stopped/manual state
406: Function initialization error	Parameters mismatch between host and hand controller	Reset the parameters in the hand controller and then cut off the power for restarting
500: Broken communication with host	Failed to connect the demonstrator to the host	1. Press the "Stop" button to clear the alarm 2. Power on again if the alarm cannot be cleared 3. If the alarm remains, it means that the host or hand controller is faulty and needs to be replaced
502: Set output already reached	The current production has reached the set output	1. Increase the set output. 2. Clear the current output.
700: Waiting for X043 timed out	Waiting for X043 signal is timed out	1. Please check whether the signal being waited for is normal 2. Increases the waiting time limit
701: Waiting for X044 timed out	Waiting for X044 signal is timed out	1. Please check whether the signal being waited for is normal 2. Increases the waiting time limit
702: Waiting for fixture 1 confirmation timed out	Waiting for fixture 1 signal is timed out	1. Please check whether the signal being waited for is normal 2. Increases the waiting time limit
703: Waiting for fixture 2 confirmation timed out	Waiting for fixture 2 signal is timed out	1. Please check whether the signal being waited for is normal 2. Increases the waiting time limit

704: Waiting for fixture 3 confirmation timed out	Waiting for fixture 3 signal is timed out	1. Please check whether the signal being waited for is normal 2. Increases the waiting time limit
705: Waiting for fixture 4 confirmation timed out	Waiting for fixture 4 signal is timed out	1. Please check whether the signal being waited for is normal 2. Increases the waiting time limit
706: Waiting for sucker 1 confirmation timed out	Waiting for sucker 1 signal is timed out	1. Please check whether the signal being waited for is normal 2. Increases the waiting time limit
707: Waiting for sucker 2 confirmation timed out	Waiting for sucker 2 signal is timed out	1. Please check whether the signal being waited for is normal 2. Increases the waiting time limit
708: Waiting for thimble forward in place timed out	Waiting for the signal of thimble forward in place is timed out	1. Please check whether the signal being waited for is normal 2. Increases the waiting time limit
709: Waiting for thimble backward in place timed out	Waiting for the signal of thimble backward in place is timed out	1. Please check whether the signal being waited for is normal 2. Increases the waiting time limit
710: Waiting for core insertion timed out	Waiting for the signal of core insertion is timed out	1. Please check whether the signal being waited for is normal 2. Increases the waiting time limit
711: Waiting for core retreat timed out	Waiting for the signal of core retreat is timed out	1. Please check whether the signal being waited for is normal 2. Increases the waiting time limit
1000: Arm backward limit reached	The signal of arm backward limit is abnormal	1. Check whether the set parameter "distance per turn" in the hand controller is correct 2. Adjust the induction position of arm backward limit
1001: The set soup taking amount of spoon is greater than the set soup taking limit for spoon	The soup taking amount of spoon is greater than the vertical limit or the max position of spoon	Check the set soup taking amount and vertical limit in the hand controller, and ensure that the soup taking amount is smaller than or equal to the vertical limit and the max position of spoon
1003: The soup taking amount of spoon reaches the soup taking limit but does not reach the soup taking position of spoon	There is a signal of soup taking limit when the spoon does not reach the taking soup position	1. Check whether the set parameter "distance per turn" in the hand controller is correct 2. Check whether the set parameter "soup taking amount" in the hand controller is too large 3. Adjust the induction position of soup taking limit
1006: Disconnection detection failure	The signal of disconnection detection is abnormal	1. Check whether the signal wire related to the disconnection detection signal is normal 2. Check whether the disconnection detection signal relay is faulty 3. If the alarm remains, it means that the probe is faulty and needs to be replaced
1007: Soup level detection failure	The soup level detection signal is abnormal	1. Check whether the signal wire related to the soup level detection signal is normal 2. Check whether the soup level detection signal relay is faulty 3. If the alarm remains, it means that the probe is faulty and needs to be replaced
1008: Two-axis robot arm forward limit	The arm forward limit is ON	1. Check whether the set parameter "distance per turn" in the hand controller is correct 2. Check whether the set parameter "forward limit" in the hand controller is too large 3. Adjust the induction position of forward limit
1009: Action of filling/taking limit for spoon	The signal of soup filling/taking limit for spoon is abnormal	Adjust the soup filling/taking parameter to no more than the soup filling/taking limit
1010: Abnormal distance of two-axis robot spoon rising for soup taking	The arm rising distance is abnormal	1. Check whether the soup amount in the soup kettle is too small and whether the rising distance is too long 2. Check whether the set dripping time is too short
1011: Two-axis robot spoon origin position error	There is still an origin signal when the spoon is 10 degrees away from the origin.	1. Check whether the origin signal is short-circuited 2. Check whether the linkage structure is faulty and needs motor control
1012: Inaction of soup filling limit for spoon of two-axis robot	There is no origin signal when the spoon is 0 degree	1. Check whether the origin signal is abnormal (inductor/line fault)
1013: 3rd probe for soup level detection signaled	The 3rd probe signal is abnormal	1. Check whether the signal wire related to the third probe signal is normal 2. Check whether the third probe signal relay is faulty 3. If the alarm remains, it means that the probe is faulty (short-circuited) and needs to be replaced

1014: 3rd probe for soup level detection still signaled after away from backward/low speed limit	The 3rd probe signal is abnormal	1. Check whether the signal of backward/low speed limit is normal 2. Check whether the signal wire related to the third probe signal is normal 3. Check whether the third probe signal relay is faulty 4. If the alarm remains, it means that the probe is faulty (short-circuited) and needs to be replaced
1016: Two-axis robot station signal error	The station signal is abnormal	The station signal is out of order, and the current station signal is inconsistent with the station signal detected by the system
1017: Two-axis robot station soup amount error	The soup amount is wrong	The soup taking amount is inconsistent with the station signal. Please check whether the station signal is normal
1018: The arm reaches the max deviation position, and the soup level detection is abnormal	The arm descends to the protection position, and the soup level detection signal is abnormal	1. Check whether the signal wire related to the soup level detection signal is normal 2. Check whether the soup level detection signal relay is faulty 3. If the alarm remains, it means that the probe is faulty and needs to be replaced
3001: Emergency stop alarm	There is emergency stop signal input	1. Screw out the emergency stop knob on the hand controller 2. Short-circuit the emergency stop signal of the host
3002: Axis 1 over-current	The max current is exceeded	1. Check whether the motor is blocked 2. Check whether the motor power wiring is correct 3. If the alarm remains, it means that the motor is faulty and needs to be replaced
3003: Axis 2 over-current	The max current is exceeded	1. Check whether the motor is blocked 2. Check whether the motor power wiring is correct 3. If the alarm remains, it means that the motor is faulty and needs to be replaced
3005: Axis 1 over-load	The max load is exceeded	1. Check the load condition 2. Check whether the manipulator is stuck or jammed in structure 3. Check whether the motor brake is on 4. If the alarm remains, it means that the motor is faulty and needs to be replaced
3006: Axis 2 over-load	The max load is exceeded	1. Check the load condition 2. Check whether the manipulator is stuck or jammed in structure 3. Check whether the motor brake is on 4. If the alarm remains, it means that the motor is faulty and needs to be replaced
3007: Axis 1 motor initializing	The motor is power-on and initializing	1. Press the "Stop" button to clear the alarm 2. Power on again if the alarm cannot be cleared 3. If the alarm remains, it means that the host is faulty and needs to be replaced
3008: Axis 2 motor initializing	The motor is power-on and initializing	1. Press the "Stop" button to clear the alarm 2. Power on again if the alarm cannot be cleared 3. If the alarm remains, it means that the host is faulty and needs to be replaced
3009: Axis 1 three-phase error	The current exceeds the alarm value	1. Check whether the line sequence is wrong 2. Check whether there is any phase lost 3. If the alarm remains, it means that the main engine is faulty and needs to be replaced
3010: Axis 2 three-phase error	The current exceeds the alarm value	1. Check whether the line sequence is wrong 2. Check whether there is any phase lost 3. If the alarm remains, it means that the main engine is faulty and needs to be replaced
3011: VDC under-voltage	The 220V voltage is too low	1. Check whether the voltage drops too much due to excessive load and/or excessive acceleration 2. Check whether the external feed voltage is too low 3. If the alarm remains, it means that the host is faulty and needs to be replaced
3012: VDC over-voltage	The 220V voltage is too high	1. Check whether the voltage rises too much due to excessive load and/or excessive acceleration 2. Check whether the external feed voltage is too low 3. If the alarm remains, it means that the host is faulty and needs to be replaced
3013: Axis 1 over-speed	The maximum rotational speed is exceeded	Replace the host
3014: Axis 2 over-speed	The maximum rotational speed is exceeded	

3015: Drive over-heat	Temperature too high	1. Check the cooling fan of the system 2. Check the cooling fan of the electrical cabinet 3. Reduce the ambient temperature
3016: EEPROM writing failure	The storage chip is abnormal	Replace the host
3017: EEPROM reading failure		
3018: Excessive Axis 1 position deviation	The difference between the instruction value and the actual encoder value exceeds the set value of Parameter 49	1. Set Servo Parameter 49 and increase the deviation range 2. The set acceleration and deceleration values are too small 3. The system is abnormal
3019: Excessive Axis 2 position deviation	The difference between the instruction value and the actual encoder value exceeds the set value of Parameter 49	1. Set Servo Parameter 49 and increase the deviation range 2. The set acceleration and deceleration values are too small 3. The system is abnormal
3020: Axis 1 encoder error	Encoder fault	Replace the motor
3021: Axis 1 speed measurement abnormality	The encoder feedback value is abnormal	
3022: Axis 1 encoder initializing	The encoder is initializing	
3023: Axis 1 motor code error	The motor code is wrong	Modify the motor code
3024: Axis 2 motor code error	The motor code is wrong	Modify the motor code
3028: Axis 2 encoder error	Encoder fault	Replace the motor
3029: Axis 2 speed measurement abnormality	The encoder feedback value is abnormal	
3030: Axis 2 encoder initializing	The encoder is initializing	
3046: Axis 1 power mismatching	Parameter 2 (motor code) does not match Parameter 1 (motor power section)	View Parameter 2 and confirm whether the motor code matches Parameter 1 "power"
3047: Axis 2 power mismatching	Parameter 2 (motor code) does not match Parameter 1 (motor power section)	View Parameter 2 and confirm whether the motor code matches Parameter 1 "power"
3226: Error found during factory mark position check	Alarm is given for the reserve position	Replace the host
3227: Unique hardware token error	Alarm is given for the reserve position	Replace the host
3228: Servo EEPROM error	Failed to read EEPROM	Cut off the power for a restart attempt. If the alarm remains, replace the host

Standard for power switch selection of Borunte robot

It is recommended to use independent power cable and switch for the robot when connecting the equipment to power supply, instead of sharing them with other equipment; the ground wire should have good grounding. **The resistance of ground wire to ground should not exceed 4Ω!!!**

As the robot electric control system consists of electrical components such as filter, rectifier, inverter, power supply and motor, all of which may have minor leakage current, the leakage current of entire robot may be accumulated and form the leakage current of complete machine.

Where leakage switches are required by customer to strengthen safety protection, the recommended types of switches are as follows:

1. 220V drive control integrated cabinet
   According to the test, the leakage current is lower than 30mA for the machines such as BRTIRUS0707A, BRTIRUS0805A, BRTIRUS1510A, BRTIRUS1820A, BRTIRSC0603A and BRTIRSCO810A; it is recommended to choose 30mA leakage switch;
2. 380V drive control integrated cabinet:
   According to the test, the leakage current is within 100mA-200mA for high power machines, such as BRTIRUS3030A, BRTIRBR2260A, BRTIRUS2550A, BRTIRUS3511A, BRTIRUS2520B and BRTIRUS3050B. It is recommended to use the 100mA-200mA adjustable leakage switch;

Note: The mechanical equipment must have good grounding wire in order to prevent electric shock!!!

The product is being improved, and any changes will not be separately notified!

伯朗特机器人股份有限公司

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因改良等原因，规格及外观有所变更时，不另行通知，敬请谅解。因排样需要，某些部件有所增减，请按实际订单为准。

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All stated here is subject to change without advance notice. Some parts have been increased or deleted because of the shooting needed, please order as the actual standard.

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