



UFACTORY

UFACTORY Lite 6 Hardware Manual



S H E N Z H E N U F A C T O R Y C O . , L T D .

V 2.6.2

Preface

Apply to Model: UFACTORY Lite6

Joint Range:

Joint	Range	Joint	Range
J1	$\pm 360^\circ$	J4	$\pm 360^\circ$
J2	$\pm 150^\circ$	J5	$\pm 124^\circ$
J3	$-3.5^\circ \sim 300^\circ$	J6	$\pm 360^\circ$

Motion Parameters:

	TCP Motion	Joint Motion
Speed	0~500mm/s	0 ~ 180°/s
Acceleration	0~50000mm/s ²	0 ~ 1145°/s ²
Jerk	0 ~ 100000mm/s ³	0 ~ 28647°/s ³

- In the TCP motion (Cartesian space motion) commands (set_position () function of the SDK), If a motion command involves both position transformation and attitude transformation, the attitude rotation speed is generally calculated automatically by the system. In this situation, the specified speed parameter is the maximum linear speed, range from: 0 ~ 500mm/s.
- When the expected TCP motion only changes the attitude (roll, pitch, yaw), with position (x, y, z) remains unchanged, the specified speed is the attitude rotation speed, so the range 0 to 500 corresponds to 0 to 180 ° / s.

Unit Definition:

Parameter	Python-SDK	Blockly	Communication Protocol
X (Y/Z)	millimeter (mm)	millimeter (mm)	millimeter (mm)
Roll (Pitch/Yaw)	degree (°)	degree (°)	radian (rad)
J1~J6	degree (°)	degree (°)	radian (rad)

Parameter	Python-SDK	Blockly	Communication Protocol
TCP Speed	mm/s	mm/s	mm/s
TCP Acceleration	mm/s ²	mm/s ²	mm/s ²
TCP Jerk	mm/s ³	mm/s ³	mm/s ³
Joint Speed	°/s	°/s	rad/s
Joint Acceleration	°/s ²	°/s ²	rad/s ²
Joint Jerk	°/s ³	°/s ³	rad/s ³

1. Safety

1.1 Validity and Responsibility

The information in this manual does not cover designing, installing, and operating of a complete robotic application system, nor does it cover all peripheral equipment that can influence the safety of the application. The complete system must be designed and installed under the safety requirements outlined in the standards and regulations of the country where the robotic arm is installed.

The integrators of Lite6 are responsible for the compliance of applicable safety laws and regulations in the country, to prevent any hazards in the operating environment. This includes, but is not limited to:

- Making a risk assessment for the complete system. Make sure to have a safe distance between people and Lite6 when interacting with the Lite6.
- Interfacing other machines and additional safety devices if defined by the risk assessment.
- For software programming, please read the interface documentations carefully and set up the appropriate safety functions in the software.
- Specifying instructions for use to prevent unnecessary property damage or personal injury caused by improper operation.

1.2 Limitation of Liability

Any safety information provided in this manual must be construed as a warranty by UFACTORY, that the Lite6 will not cause injury or damage even if all safety instructions are complied with.

Safety Alarms	
 DANGER	DANGER This indicates an imminently hazardous electrical situation, which if not avoided, could result in death or serious damage to the device.
 WARNING	WARNING This indicates a potentially hazardous situation which, if not avoided, could result in death or serious damage to the device.
 HIGH TEMPERATURE	HIGH TEMPERATURE This indicates a potential hot surface, which if touched, could result in personal injury.
 NOTICE	NOTICE Failure to prevent this may lead to personal injury or equipment damage.
 CAUTION	CAUTION Failure to prevent this may lead to personal injury or equipment damage.

1.3 General Warning and Cautions

This section contains some general warnings and cautions on installation and application planning for the robotic arm. To prevent damage to the machine and associated equipment, users need to learn all the relevant content and fully understand the safety precautions. We do not control or guarantee the relevance or completeness of such information in this manual, for which users should conduct self-assessment of their specific problems.

DANGER

- Make sure to use the correct installation settings in this manual for the robotic arm and all the electrical equipment.

- Please follow the instructions in this manual, installation, and commissioning needs to be performed by professionals in accordance
- Make sure the robotic arm and tool are properly and securely bolted in place.
- The integrity of the device and system must be checked before each use (e. g. the operational safety and the possible damage of the robotic arm and other device systems).
- Preliminary testing and inspection for both robotic arm and peripheral protection system before production is essential.
- The operator must be trained to guarantee a correct operation procedure when using SDK(Python/ROS/C++) and graphical interface UFactory studio.
- A complete safety assessment must be recorded each time the robotic arm is re-installed and debugged.
- When the robotic arm is in an accident or abnormal operation, the emergency stop switch needs to be pressed down to stop the movement, and the posture of the robotic arm will slightly brake and fall.
- The xArm joint module has brakes inside, which will remain manipulator's pose when a power outage occurs.
- When the robotic arm is in operation, make sure no people or other equipment are in the working area.
- When releasing the brakes of xArm, please take protective measures to prevent the robotic arm or operator from damage or injury.
- When connecting the xArm with other machinery, it may increase risk and result in dangerous consequences. Make sure a consistent and complete safety assessment is conducted for the installation system.

HIGH TEMPERATURE

- The robotic arm and Control Box will generate heat during operation. Do not handle or touch the robotic arm and Control Box while in operation or immediately after the operation.
- Never stick fingers to the connector of the end-effector.

CAUTION

- Make sure the robotic arm's joints and tools are installed properly and safely, and check the status for all circuits.
- Make sure that there is enough space for the manipulator to move freely.
- Make sure that there is no obstacle in the robotic arm's working space.

- The Control Box must be placed outside the working range of the robotic arm to ensure the emergency stop button can be pressed once an emergency occurs.
- If the robotic arm is in operation and needs an emergency stop, make sure the restart/reset motions will not collide with any obstacle.
- Do not modify the robotic arm (or Control Box). Any modification may lead to unpredictable danger to the integrators. The authorized restructuring needs to be in accordance with the latest version of all relevant service manuals. If the robotic arm is modified or altered in any way, UFACTORY (Shenzhen) Technology Co., Ltd. disclaims all liability.
- Users need to check the collision protection and water-proof measures before any transportation.

NOTICE

- When the xArm cooperates with other machinery, a comprehensive safety assessment of the entire collaboration system should be performed. It is recommended that any equipment that may cause mechanical damage to xArm be placed outside the working range during application planning.

1.4 Personnel Safety

When operating or running robots, the foremost priority must be to ensure the safety of operating personnel. General precautions are listed below. Please properly implement corresponding measures to guarantee the safety of personnel involved in the operation.

CAUTION

- Each operator who uses the robotic arm system should read the product user manual carefully. Users should fully understand the standardized operating procedures with the robotic arm, and the solution to the robotic arm running error.
 - When the device is running, even if the robotic arm seems to stop, the robotic arm may be waiting for the signal and in the upcoming action status. Even in such a state, it should be considered as the robotic arm is in action.
 - A line should be drawn to mark the range of motion of the robotic arm to let the operator acknowledge the robotic arm, including its end tools (such as gripper and suction cup, etc) operating range.
 - Check the robotic arm regularly to prevent loosening of the bolts that may cause undesirable consequences.
-

- Be careful when the robotic arm is running too fast.
- Be careful about dropping items that can be caused by accidental power off or unstable clamping of the robotic arm.

WARNING

- Do not alter any information in the controller safety configuration. If parameters in the configuration file are modified, the entire robot system shall be deemed a new system, which necessitates the update of all safety review processes, such as risk assessments.
- Replace faulty components only with new parts of the same part number or UFACTORY-approved equivalent components.
- Document all maintenance operations in writing and retain these records within the technical documentation associated with the entire robot system.

DANGER

- Remove the main power cable from the controller to ensure complete power disconnection. Take necessary precautions to prevent unauthorized re-energization of the system by others during maintenance.
 - Before restarting the system, ensure that grounding connections are verified.
 - Comply with ESD (Electrostatic Discharge) regulations when disassembling the mechanical arm or controller.
 - Avoid disassembling the power supply system within the controller. The power supply system may retain high voltage for several hours after the controller is shut down.
 - Prevent the ingress of water or dust into the mechanical arm or controller.
-

2. Hardware Installation

2.1 Hardware Composition

2.1.1 Hardware Composition

The composition of robotic arm hardware includes:



- Lite6 Robotic Arm
- Power Supply
- E-stop button
- Mounting Tool
- Gripper Lite
- Vacuum Gripper Lite

The Lite 6 robotic arm system consists of a base and rotary joints, and each joint represents a degree of freedom. From the bottom to the top, in order, Joint 1, Joint 2, Joint 3, etc. The last joint is known as the tool side and can be used to connect end-effector (e. g. gripper, vacuum gripper, etc).

2.2 xArm Installation

2.2.1 Safety Guidelines

DANGER

- Make sure the arm is properly and safely installed in place. The mounting surface must be shockproof and sturdy.
- To install the arm body, check that the bolts are tight.
- The robotic arm should be installed on a sturdy surface that is sufficient to withstand at least 10 times the full torsion of the base joint and at least 5 times the weight of the arm.

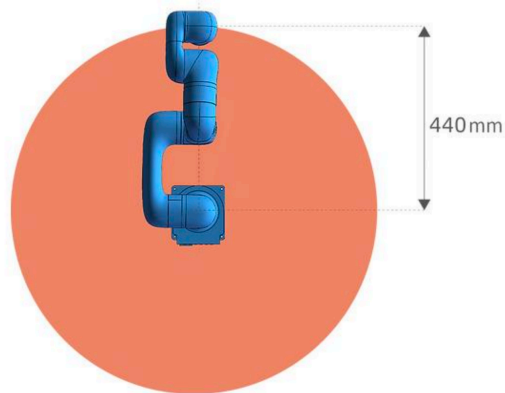
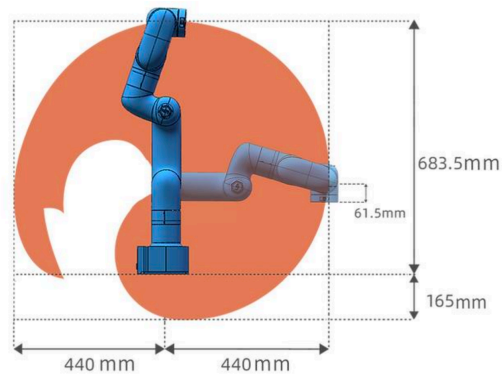
WARNING

- The robotic arm and its hardware composition must not be in direct contact with the liquid, and should not be placed in a humid environment for a long time.
- A safety assessment is required each time installed.
- When connecting or disconnecting the arm cable, make sure that the external AC is disconnected. To avoid any electric shock hazard, do not connect or disconnect the robotic arm cable when the robotic arm is connecting with external AC.

2.2.2 Define Working Space

The robotic arm workspace refers to the area within the extension of the links. The figure below shows the dimensions and working range of the robotic arm. When installing the robotic arm, make sure the range of motion of the robotic arm is taken into account, so as not to bump into the surrounding people and equipment (the end-effector not included in the working range).

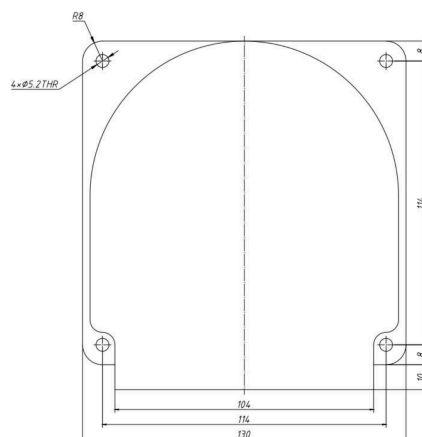
- Working range of Lite6, Unit:mm

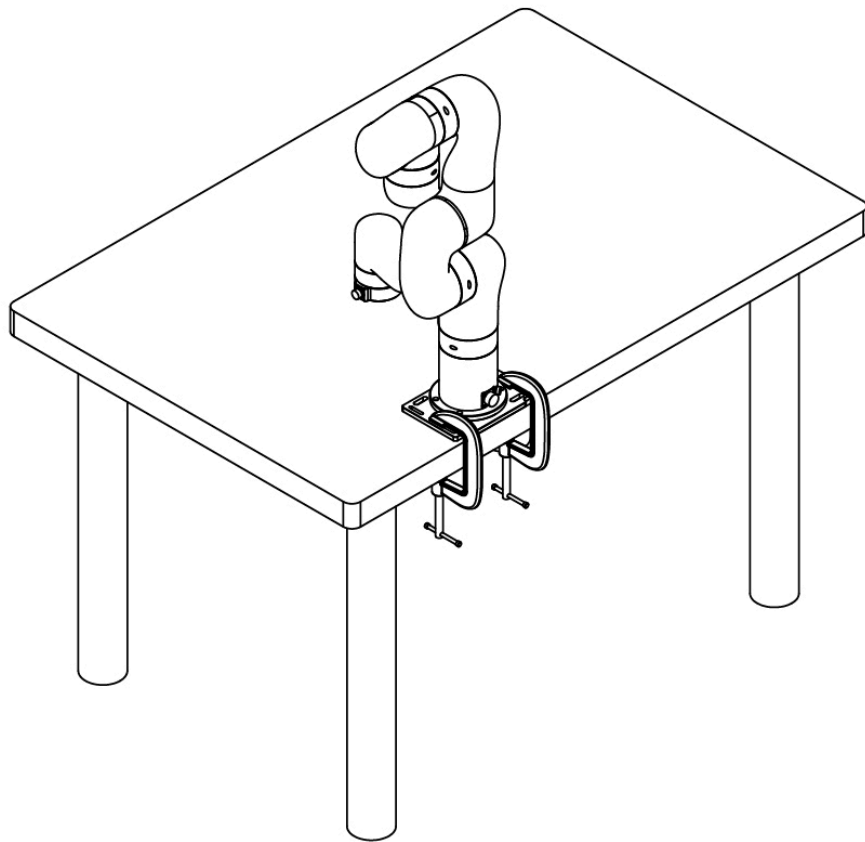


2.2.3 Installation

2.2.3.1 Robot Base Mounting

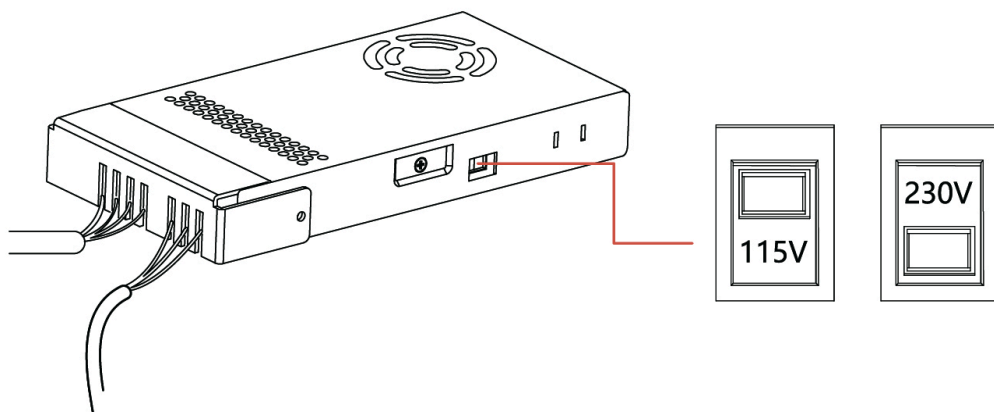
The robotic arm has five M5 bolts provided and can be mounted through four $\varnothing 5.5$ holes in the base of the robotic arm. It is recommended to tighten these bolts with a torque of 20N·m.



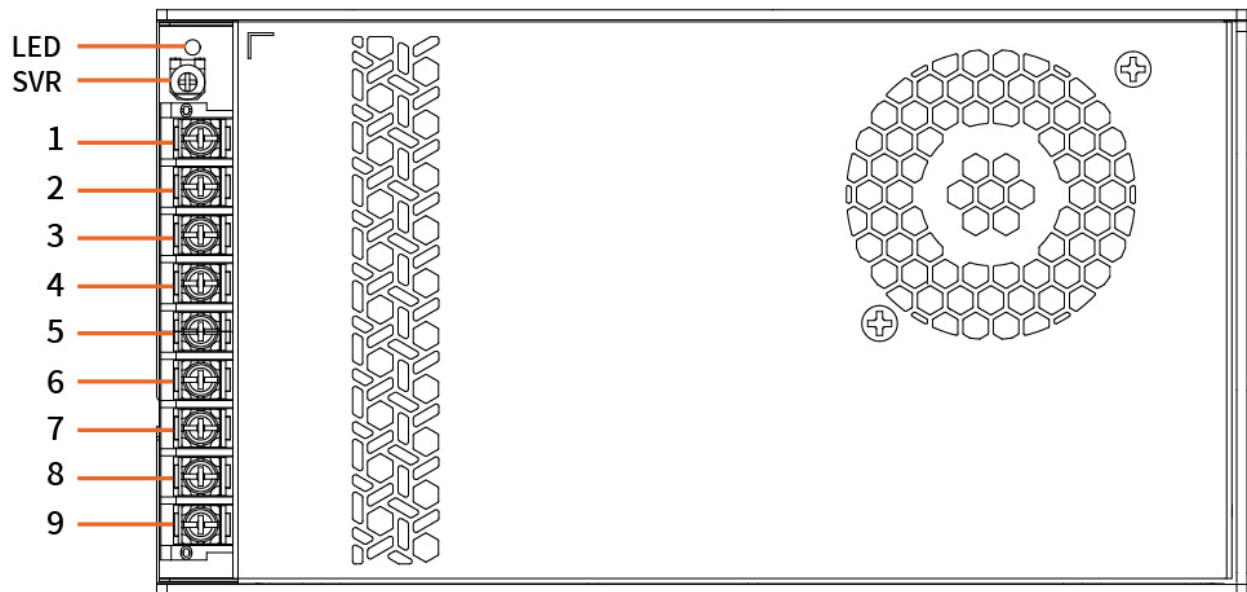


2.2.3.2 Connect with Power Supply

1. Plug the connector of the Robotic Arm Power Supply into the interface of the Robotic Arm. The connector is a fool proof design. Please do not unplug and plug it violently.
2. Please make sure the voltage selector switch has been adjusted to correct gear according to the local voltage before powering on. Otherwise, the circuit of Lite6 may be damaged.



3. Power Supply Pin Assignment

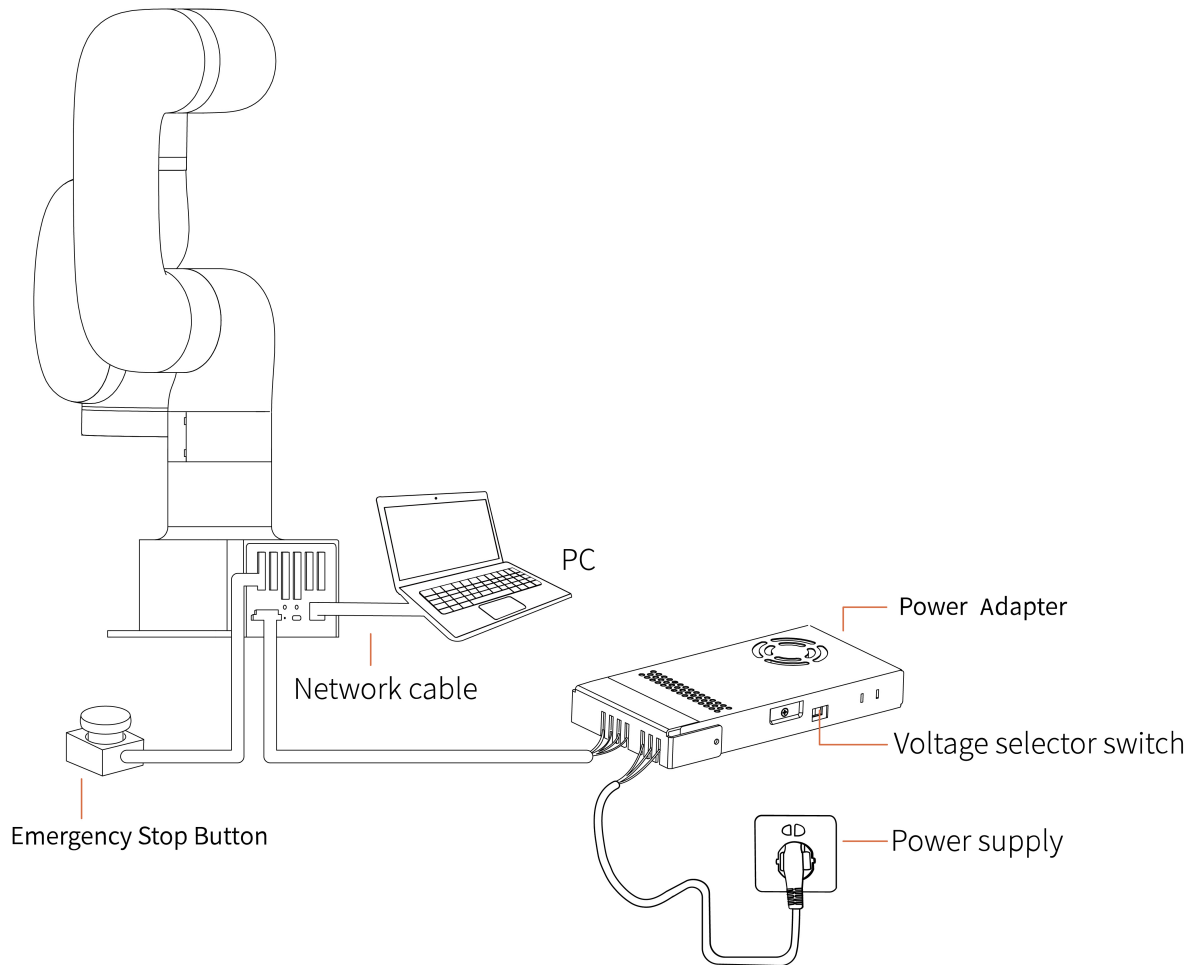


Pin	Function	Pin	Function
1	+Vo (24V, Fixed Output Voltage)	6	-Vo(GND)
2	+Vo (24V, Fixed Output Voltage)	7	⊥
3	+Vo (24V, Fixed Output Voltage)	8	AC(N)
4	-Vo(GND)	9	AC(L)
5	-Vo(GND)		

- Factory Default Wiring:
 - Pin 2 & Pin 3: +Vo (24V, Fixed Output Voltage)
 - Pin 4 & Pin 5: -Vo (GND)

2.2.3.3 Controller Networking

Plug the network cable into the interface marked LAN of the robot, and plug the other end of the network cable into the computer.



2.3 Power on the Lite6

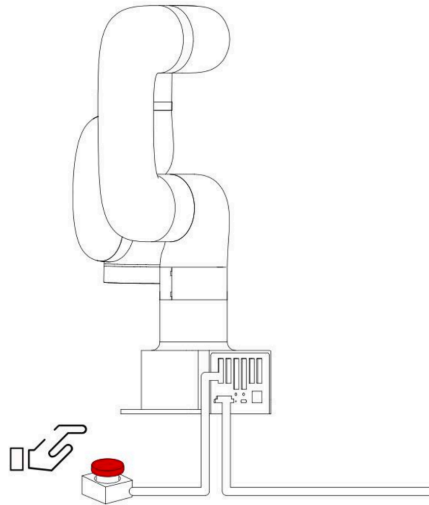
- Ensure the network cable is properly connected.
- Ensure the Lite 6 will not hit any personnel or equipment within the working range.

2.3.1 Power On

1. Release the emergency stop, the power indicator (ROBOT PWR) will on.
2. Use the UFACTORY Studio or SDK commands to complete the operation of enabling the robotic arm.

2.3.2 Shut Down

1. Press the emergency stop button.



2. Go to UFACTORY Studio-Settings-My Device- Device Info-Shut down, click Shutdown.

← Settings

Search for settings

Motion

Externals

Safety

General

My Device

Device Info

Check Update

Log

System Info

Hardware

Robot Model

Lite 6

Robot SN

LI100607241B04

Control Box SN

DL100001240090

NetWork

IP Address:

192.168.1.62

Netmask:

255.255.255.0

BroadCast:

192.168.1.255

Routers:

192.168.1.1

Software

Firmware Version

2.5.5

Studio Version

2.5.110

DNS

Add

DNS1:

1.1.1.1

DNS2:

192.168.1.1

Time

2025-04-29 02:19:57

Sync

Controller

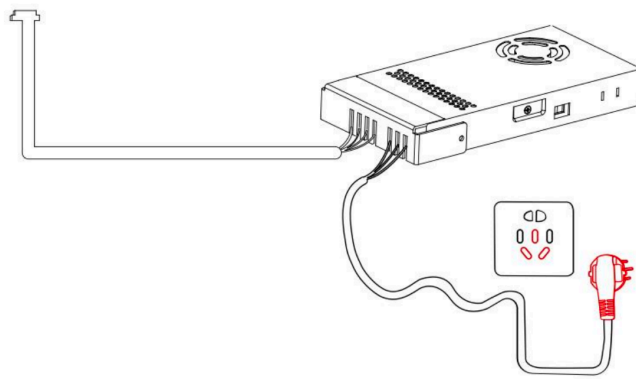
Shutdown

Reboot

Robot

Disable

3. Unplug the socket.



3. Controller Electrical Interface

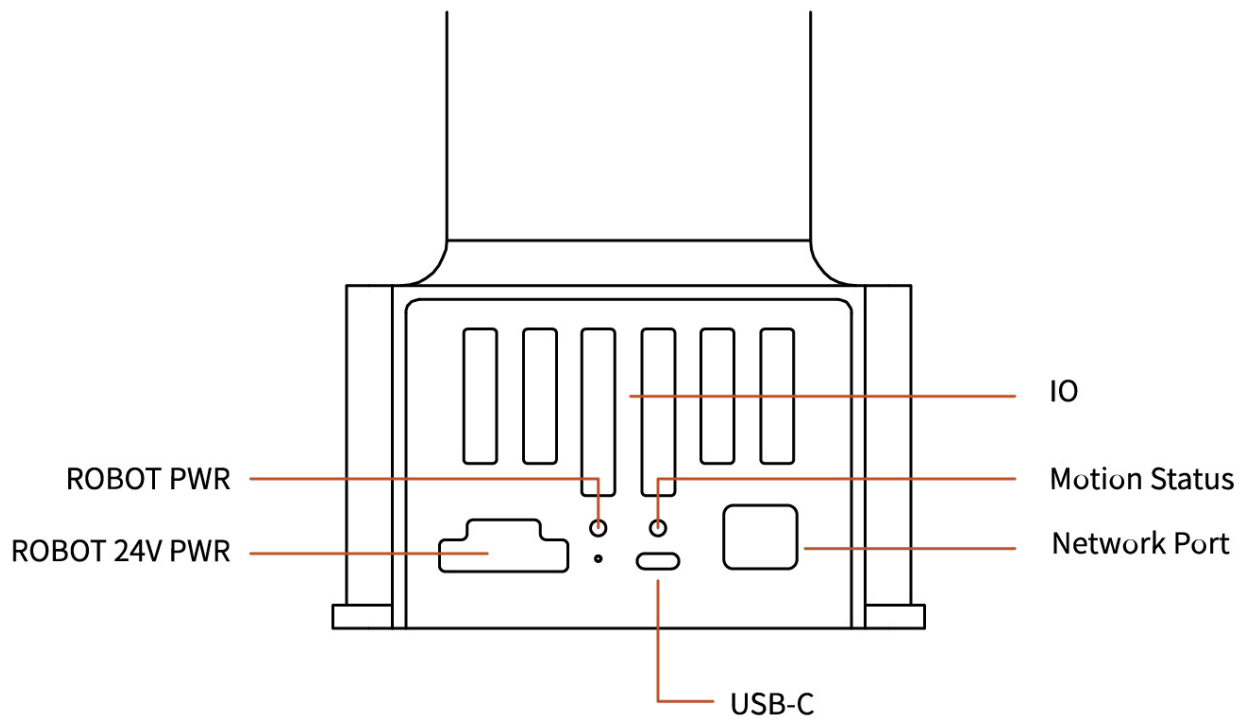
3.1 Electrical Alarms and Cautions

Always follow the warnings and cautions below when designing and installing a robotic arm application. These warnings and cautions are also subject to the implementation of maintenance work.

ICON	
 NOTICE	1. Make sure that all the non-waterproof equipment is kept dry. If water enters the product, turn off the power supply, and contact your supplier. 2. Use only the original cable of the robotic arm. Do not use the robotic arm in applications where the cable needs to be bent. If you need a longer cable or flexible cable, please contact your supplier. 3. All GND connectors mentioned in this manual are only suitable for powering and transmitting signals. 4. Be careful when installing the interface cable to the I/O of the robotic arm.
 CAUTION	1. Interfering signals above the level specified in the IEC standard will cause abnormal behaviour of the robotic arm. Extremely high signal levels or excessive exposure can cause permanent damage to the robotic arm. UFACTORY (Shenzhen) Technology Co., Ltd. is not responsible for any loss caused by EMC problems. 2. The length of the I/O cable that used to connect the Control Box with other mechanical and plant equipment must not exceed 30 meters unless it is feasible after the extension testing.
 WARNING	When wiring the electrical interface of the Control Box, the Control Box must be powered off.
 DANGER	Never connect a safety signal to a non-safety PLC. Failure to follow this warning may result in serious injury or death due to an invalid safety stop function.

3.2 Communication Interface

The robot provides a gigabit Ethernet interface, as shown in the figure below.



ROBOT PWR :The Lite6 is powered on.

Motion Status :The status of Lite6.

Network Port :The Lite6 is communicating normally.

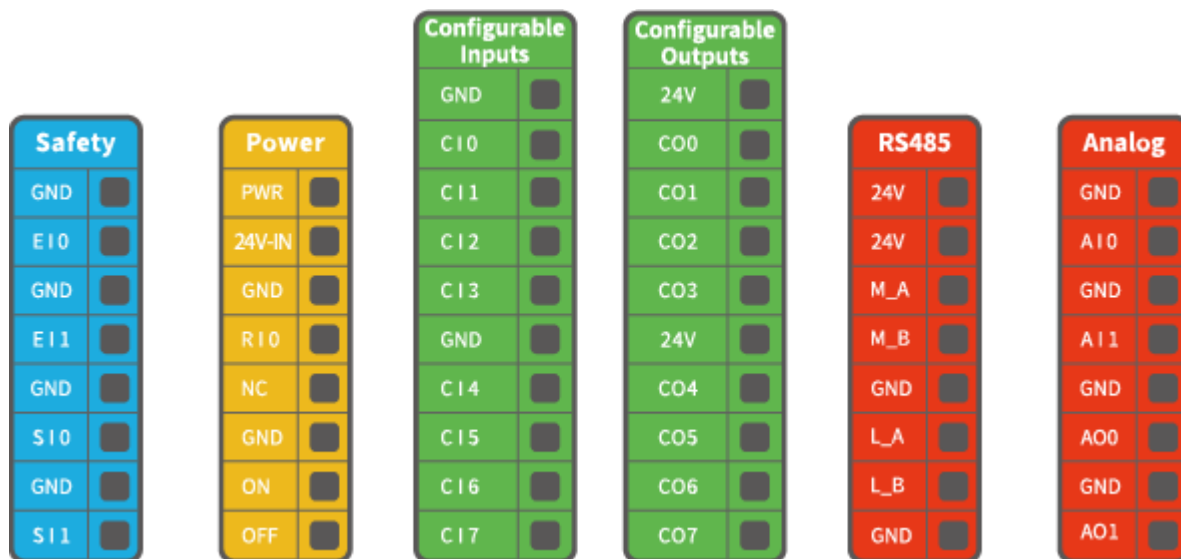
USB-C : Flash the system of Lite6, only for debug internally.

3.3 Controller Electrical IO

This chapter explains how to connect devices to the electrical I/O outside of the control box.

The I/Os are extremely flexible and can be used in many different devices, including pneumatic relays, PLCs, and emergency stop buttons.

The figure below shows the electrical interface layout inside the control box.

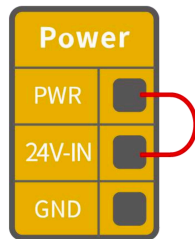


Configurable IO:

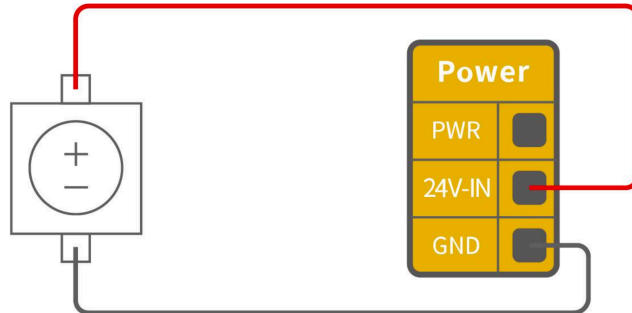
Configurable Function	C I 0-C I 7	Configurable Function	C O 0-C O 7
General Input	Yes	General Output	Yes
Stop Moving	Yes	Motion Stopped	Yes
Safeguard Reset	Yes	Robot Moving	Yes
Offline Task	Yes	Warning	Yes
Manual Mode	Yes	Collision	Yes
Reduced Mode	Yes	Manual Mode	Yes
Enable Robot	Yes	Reduced Mode	Yes
		Offline Task Running	Yes
		Robot Enabled	Yes
		Emergency Stop is Pressed	Yes

It is very important to install xArm according to the electrical specifications.

All the I/O must comply with the specifications. The digital I/O can be powered by a internal 24V power supply or by an external power supply by configuring the power junction box. In the following figure, PWR is the internal 24V power output. The lower terminal (24V-IN) is the 24V input external power input for I/O. The default configuration is to use internal power, see below.



If larger current is needed, connect the external power supply as shown below.



The electrical specifications for the internal and external power supplies are as follows.

Terminal	Parameter	Min. Value	Typical Value	Max. Value	Unit
Built-in 24V Power Supply					
[PWR - GND]	Voltage	23	24	30	V
[PWR - GND]	Current	0	-	1.8	A
External 24V Input Requirement					
[24V - 0V]	Voltage	20	24	30	V
[24V - 0V]	Current	0	-	3	A

The digital I/O electrical specifications are as follows(For resistive or inductive loads up to 1H).

Terminal	Parameter	Min. Value	Typical Value	Max. Value	Unit
Digital Output					
[COx]	Current	0	-	100	mA

Terminal	Parameter	Min. Value	Typical Value	Max. Value	Unit
[COx]	Voltage Goes Down	0	-	0.5	V
[COx]	Open Drain Current	0	-	0.1	mA
[COx]	Function	-	NPN (OC)	-	Type
Digital Input					
[Elx/Slx/Clx/Rlx]	Voltage	0	-	30	V
[Elx/Slx/Clx/Rlx]	OFF Area	15	-	30	V
[Elx/Slx/Clx/Rlx]	ON Area(low level)	0	-	5	V
[Elx/Slx/Clx/Rlx]	Current (0-0.5)	3	-	8	mA
[Elx/Slx/Clx/Rlx]	Function	-	-	-	Type

CAUTION

There is no current protection on the digital output of the Control Box. If the specified values exceeded, permanent damage may result.

3.3.1 Safety IO(EISI)

All safety I/Os exist in pairs (redundancy) and must be kept in two separate branches. A single I/O failure should not result in the loss of safety features. There are two fixed safety inputs:

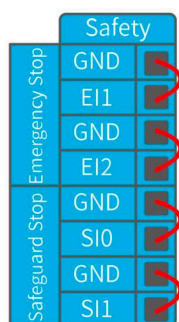
- The robotic arm emergency stop input is only used for the emergency stop of the device.
- The protective stop input is used for all types of safety protection.

The functional differences are as follows.

	Emergency Stop	Protective Stop
Stops the motion of the robotic arm	Yes	Yes

	Emergency Stop	Protective Stop
Program execution	Stop	Suspend
Reset	Manual	Auto or manual
Usage frequency	Not frequent	No limit
Need re-initiation	Only releasing the brake	No

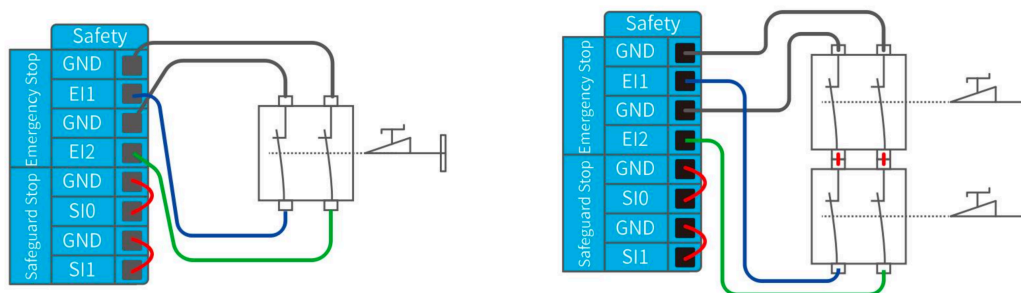
The robotic arm has been configured by default and can be operated without any additional safety equipment, as the figure below. If there is a problem with the robotic arm, please check the following figure for the correct connection.



3.3.1.1 Connect to Emergency Stop Button

Digital IO: EI1, EI2, SI0, SI1.

In most applications, one or more additional emergency stop buttons are required. The figure below shows how to connect one or more emergency stop buttons.

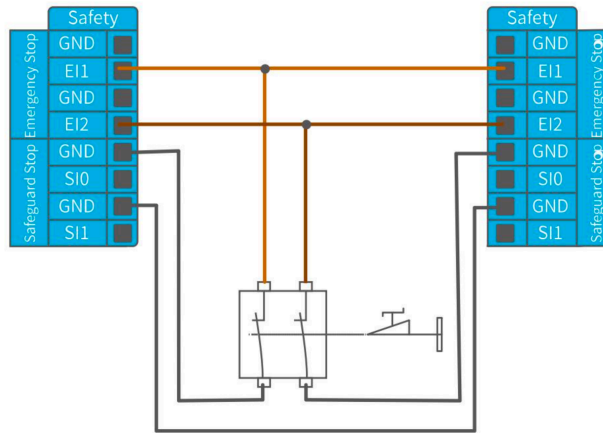


3.3.1.2 Share Emergency Stop with other Machines

Digital IO: EI1, EI2, SI0, SI1.

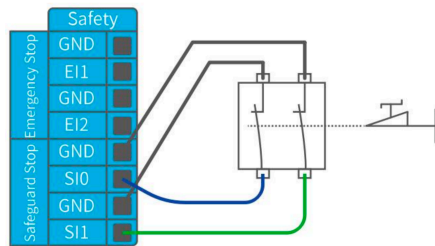
When a robotic arm is used with other machines, it requires to set up a common emergency stop circuit in most of the time. The following figure shows that two robotic arms share an

emergency stop button (the connection method shown in the figure below also applies to multiple robotic arms sharing an emergency stop button).

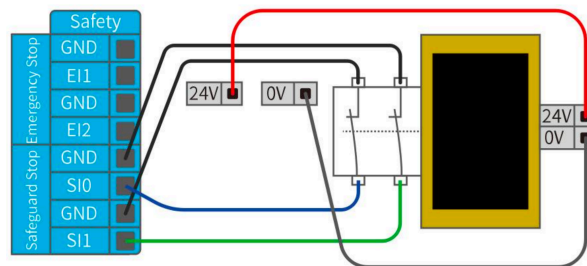


3.3.1.3 Automatically Recoverable Protective Stop

The door switch is an example of a basic protective stop device. When the door is open, the robotic arm stops. See the figure below.

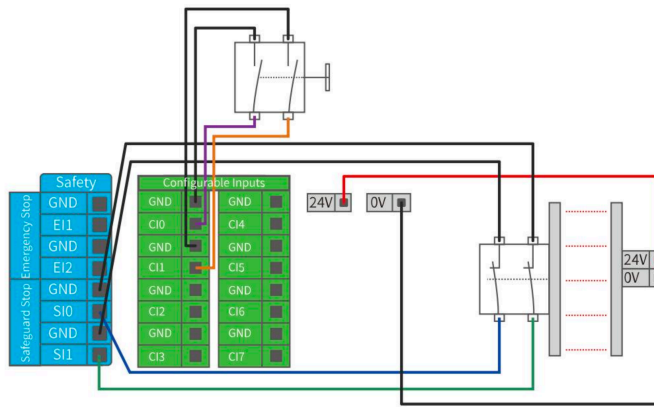


This configuration is only for applications where the operator is unable to close the door from behind. Configurable I/O can be used to set the reset button outside the door, as to reactivate the movement of the robotic arm. Another example of an automatic recovery is the use of a safety pad or a safety laser scanner, see the figure below.



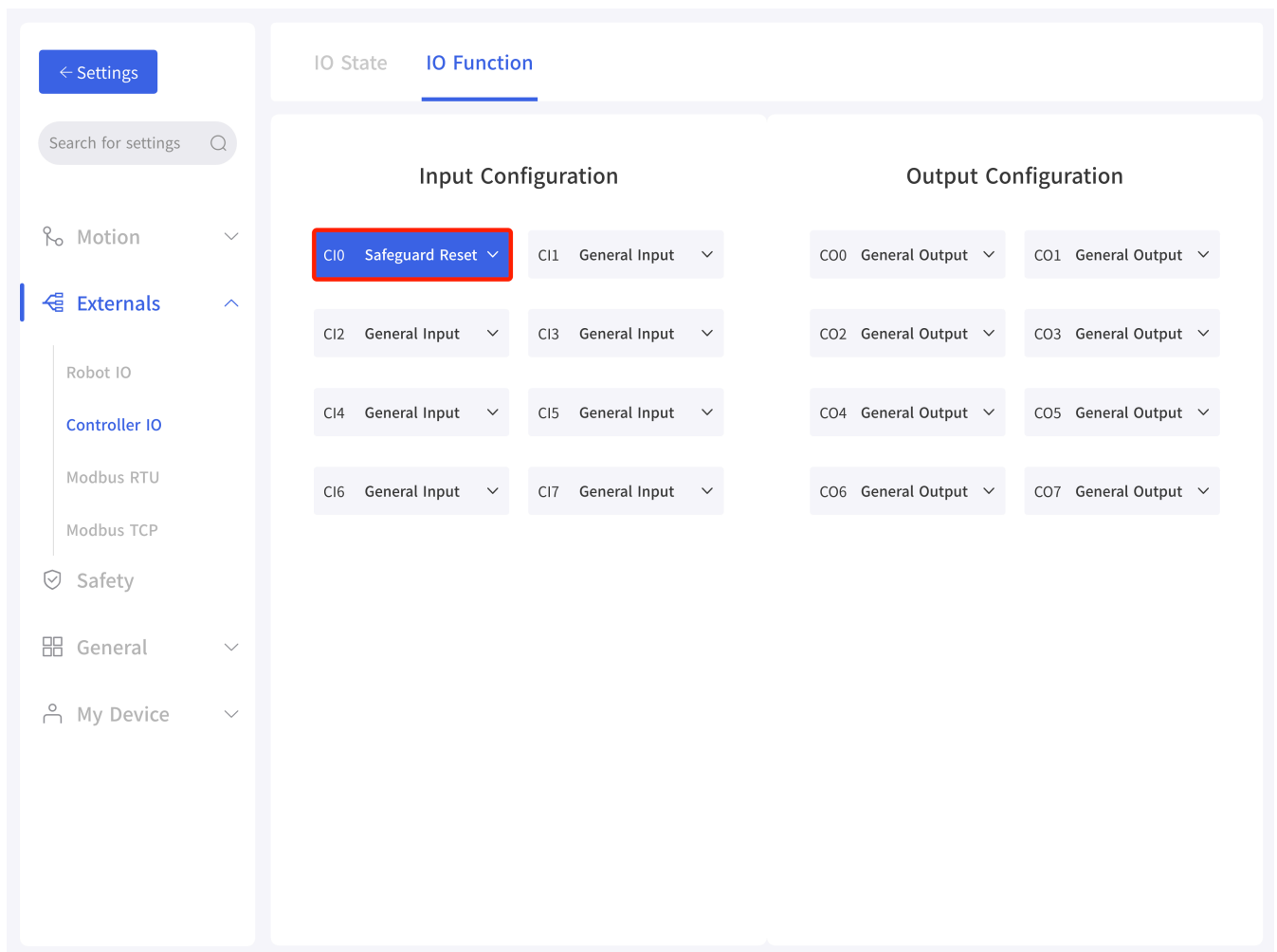
3.3.1.4 Protective Stop with Rest Button

If you use a protective interface to interact with the light curtain, you need to reset from outside the safety zone. The reset button must be a two-channel button. In the example shown below, the I/O of the reset configuration is CI0 (the corresponding configuration must also be done in UFactory Studio).



How to realize the protection reset function with reset button:

1. Configure "CI0" as the safeguard reset in UFactory studio. The specific steps are as follows: Enter 'Settings - External - Controller IO - IO Function', set CI0 as safeguard reset and save.



2. If xArm needs to resume motion, connect SI0 and SI1 to GND, and trigger the motion of xArm by connecting CI0 to GND; if xArm needs to pause the motion, disconnect SI0 and SI1 from GND.

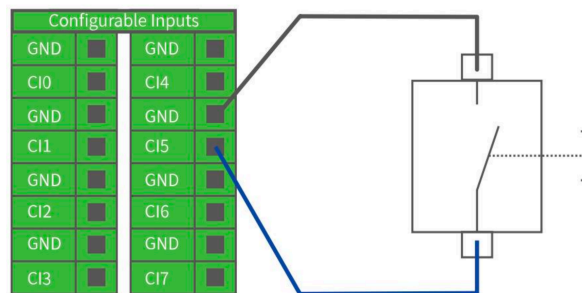
NOTE DI0-DI7 are not equipped with the following three functions: stop moving, safeguard reset, and reduced mode.

3.3.2 Controller Digital Input&Output(CICO)

3.3.2.1 Controller Digital Input(CI)

The digital input is implemented in the form of a weak pull-up resistor. This means that the reading of the floating input is always high.

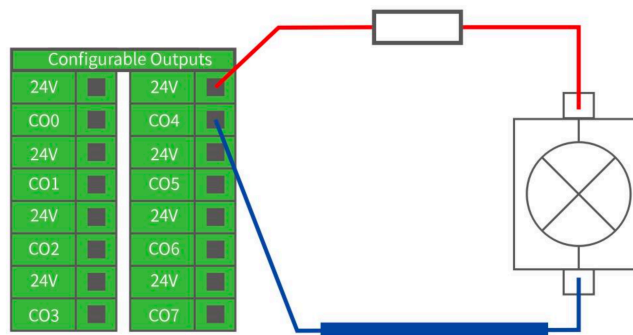
This example shows how a simple button is connected to a digital input.



3.3.2.2 Controller Digital Output(CO)

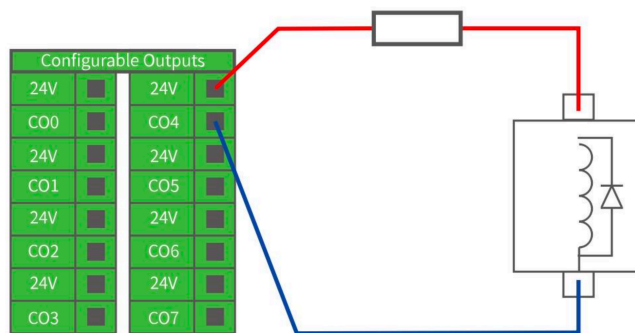
The digital output is implemented in the form of NPN. When the digital output is enabled, the corresponding connector will be driven to GND. When the digital output is disabled, the corresponding connector will be open (OC/OD).

The following example shows how to use the digital output, as the internal output is an open-drain (OD) output, so you need to connect the resistor to the power supply according to the load. The resistance and power of the resistor depend on the specific use.



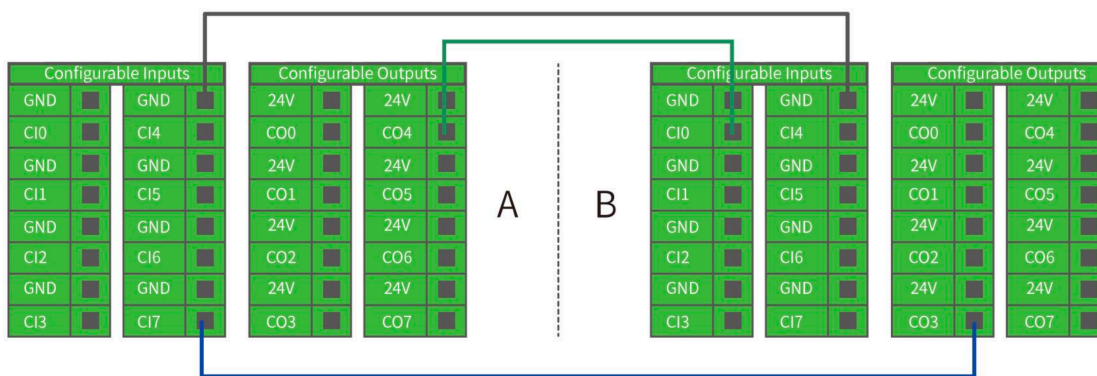
Note

It is highly recommended to use a protection diode for inductive loads as shown below.



3.3.2.3 Communicate with other Machines or PLCs

If general GND (0V) is established and the machine uses open-drain output technology, digital I/O and other can be used device communication, see the figure below.



3.3.3 Controller Analog IO(AIAO)

This type of interface can be used to set or measure voltage (0-10V) going into or out of other devices.

For the highest accuracy, the following instructions are recommended:

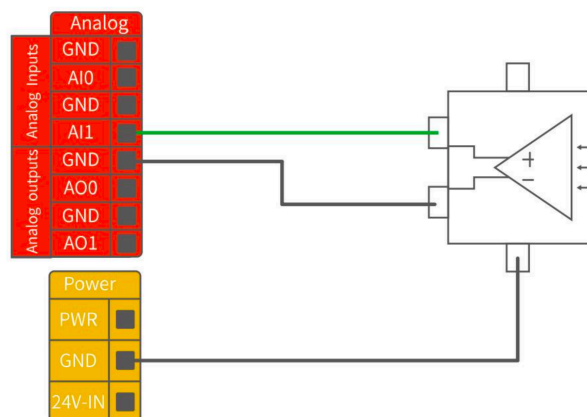
- Use the GND terminal closest to this I/O.
- The device and Control box use the same ground (GND). The analog I/O is not isolated from the control box.
- Use shielded cables or twisted pairs. Connect the shield to the GND terminal on the Power section.

Terminal	Parameter	Min. Value	Typical Value	Max. Value	Unit
Analog Input under Voltage Mode					
[AIx - AG]	Voltage	0	-	10	V

Terminal	Parameter	Min. Value	Typical Value	Max. Value	Unit
[AIx - AG]	Resistance	-	10K	-	Ω
[AIx - AG]	Resolution	-	12	12	Bit
Analog Output under Voltage Mode					
[AOx - AG]	Voltage	0	-	10	V
[AOx - AG]	Current	0	-	20	mA
[AOx - AG]	Resistance	-	100K	-	Ω
[AOx - AG]	Resolution	-	12	-	Bit

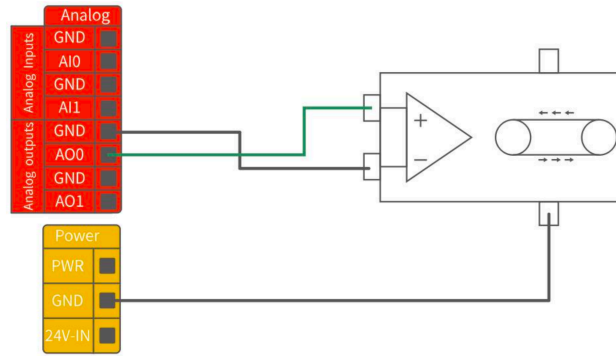
3.3.3.1 Analog Input

The following example shows how to connect an analog sensor(Connect to AI0 or AI1).



3.3.3.2 Analog Output

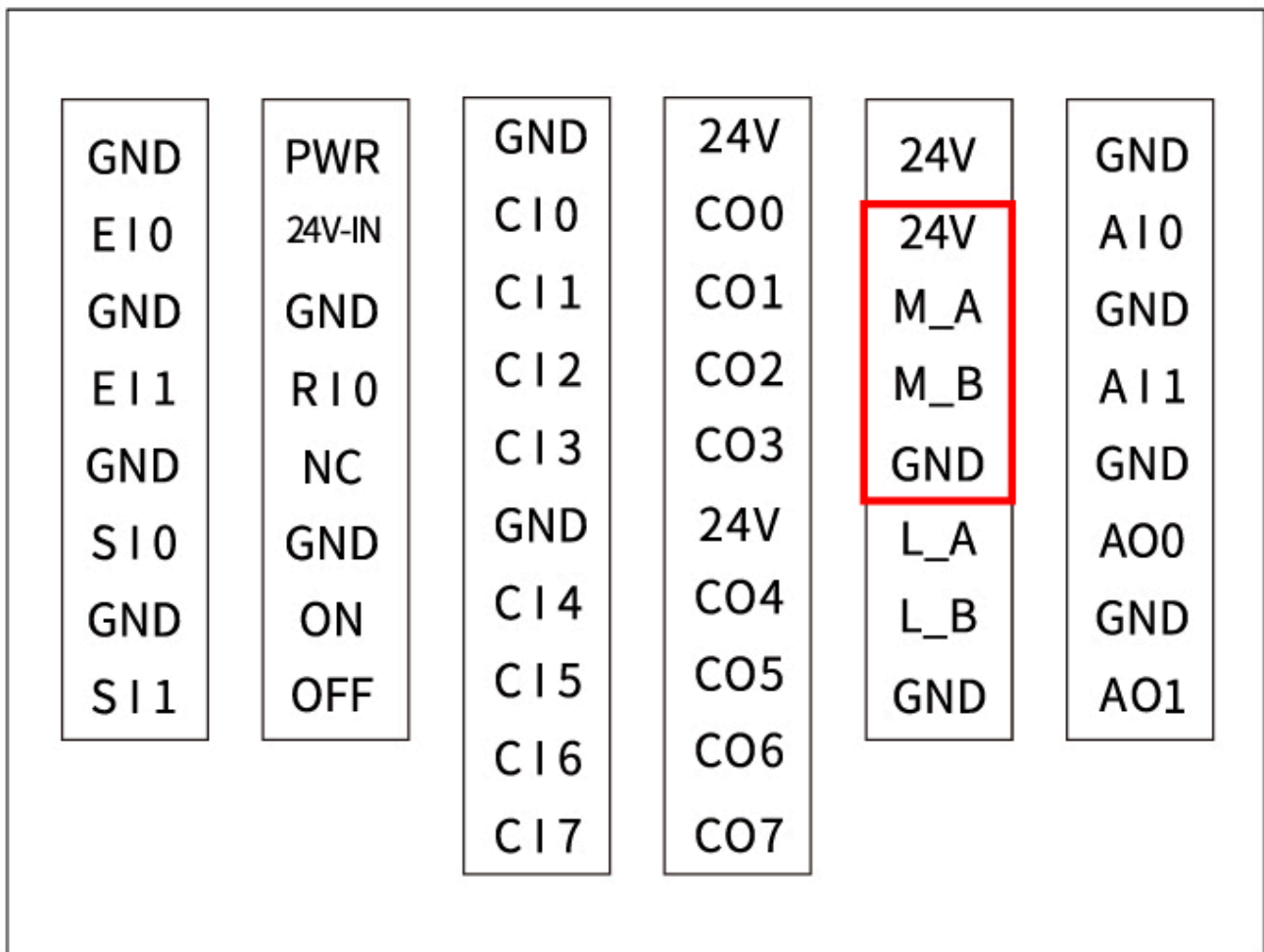
The following example shows how to use the analog speed control input to control the conveyor belt(Connect to AO0 or AO1).



3.3.4 Controller RS485

The Controller IO provide an RS485 interface, use can communicate it with third-party devices that supports RS485.

The id of our controller is 10.



PIN Connection:

1. M_A (RS485-A)
2. M_B (RS485-B)
3. 24V
4. GND

NOTE

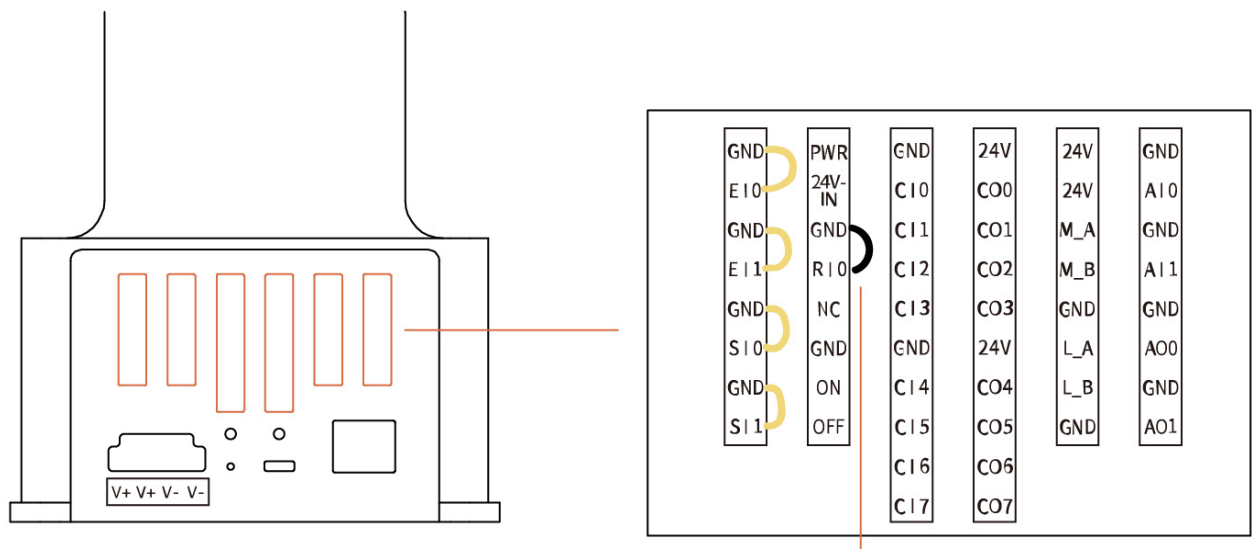
1. L_A and L_B are reserved, without functional for now.
 2. When using M_A and M_B, the robotic arm can only be considered as a master.
 3. Support standard Modbus RTU or not.
- If end effector supports standard Modbus RTU, user can debug it via '[Settings-Externals-Modbus RTU](#)', RS-485 port please choose as 'Control Box'.
 - If end effector doesn't support standard Modbus RTU, user can send the command via [getset_tgpio_modbus_data](#), please set is_transparent_transmission to True, the host_id=10.

3.3.5 Reset IP

If you change the IP address, be sure to mark it on the control box. If you forget or lose the modified IP address, you can use the following method to reset the IP.

Reset IP:

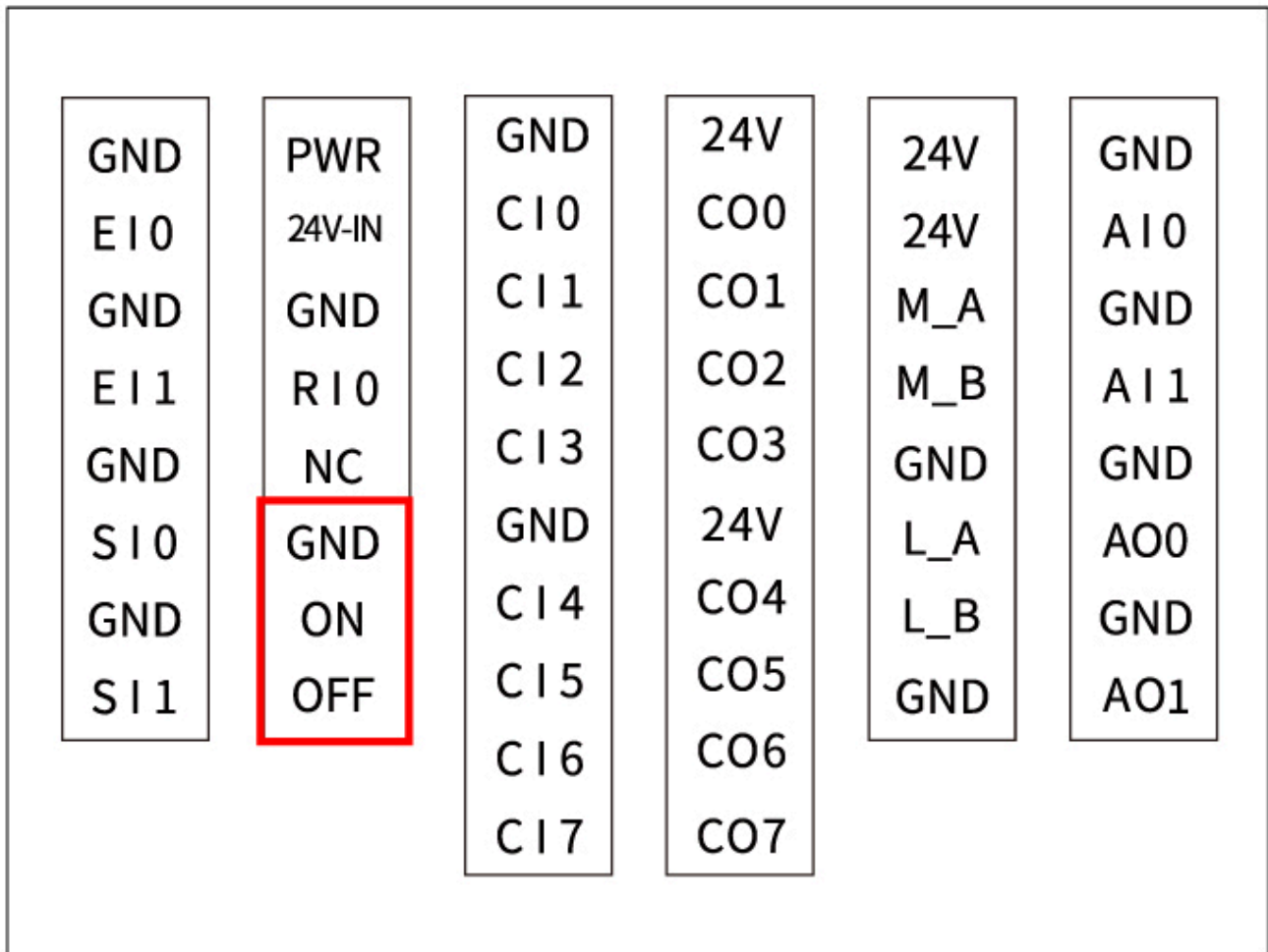
1. Press the emergency stop button and turn off the power of the control box.
2. Connect RI0 to GND with a cable.



RI0 and GND connection cable

3. Turn on the power of the robot. After hearing the sound of 'beep', it means that the IP address of the robot has been reset successfully. The reset IP is 192.168.1.111.
4. Please unplug the cable connecting RI0 and GND and wait for the robot to start up (60 seconds).
5. Enter 192.168.1.111:18333 in the browser to connect the robot.

3.3.6 Remote ON/OFF



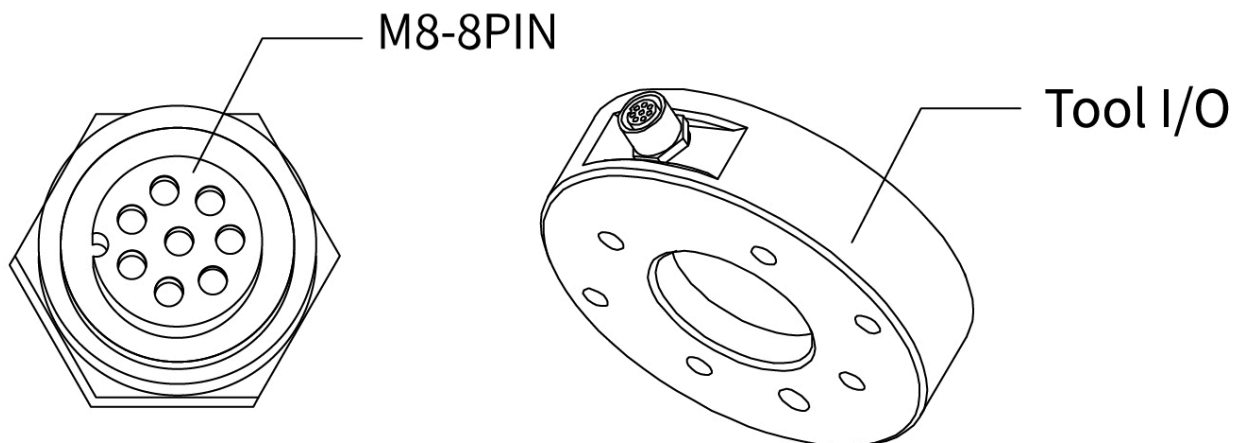
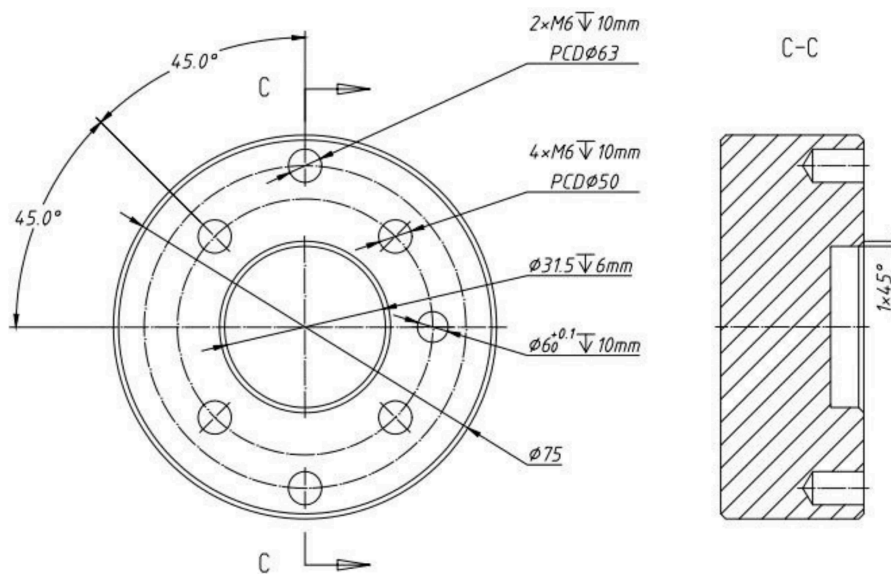
Remote ON: Short ON to GND. Remote OFF: Short ON to GND.

4. Robotic Electrical Interface

4.1 End Flange

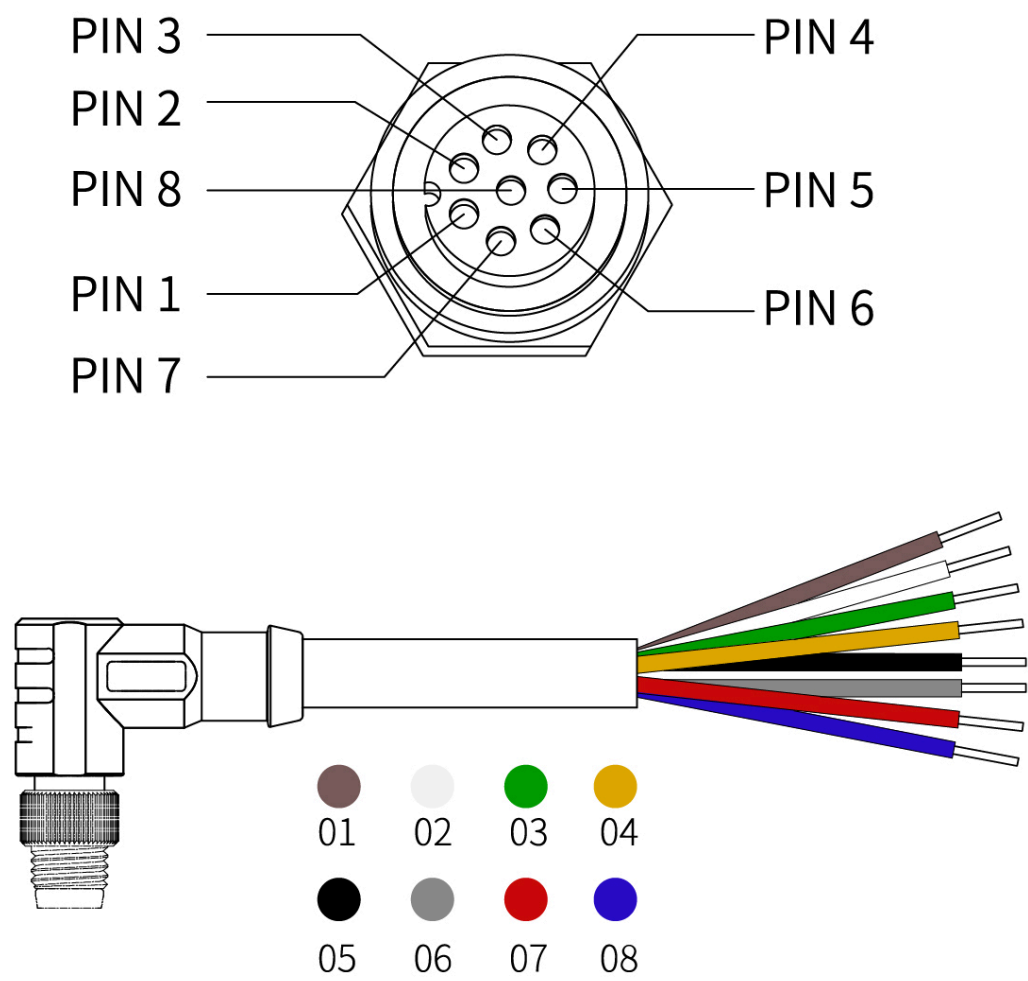
The End-effector flange has 6 M6 threaded holes and one $\Phi 6$ positioning hole, where the end-effector of two different sizes can be mounted.

If the effector does not have a positioning hole, the orientation of the end-effector must be documented in a file format, to avoid errors and unexpected results when re-installing the end-effector. The end-effector flange referenced ISO 9409-1-50-4-M6 standard.



4.2 Tool IO

At the tool side of the robotic arm, there is an avionic socket 8-pin female industrial connector. This connector provides power and control signals for the grippers and sensors used on a particular robotic arm tool. Please refer to the figure below:



There are 8 pins inside the cable with different colors, each color represents different functions, please refer to the following table:

PIN	Color	Signal	PIN	Color	Signal
1	Brown	+24V (Power)	5	Black	Tool Output 0 (TO0)
2	White	0V (GND)	6	Grey	Tool Output 1 (TO1)
3	Green	RS485-A/Analog Input 0 (TAI0)	7	Red	Tool Input 0 (TI0)
4	Yellow	RS485-B/Analog Input 0 (TAI1)	8	Purple	Tool Input 1 (TI1)

Electrical Specifications:

Parameter	Min. Value	Typical Value	Max. Value	Unit
Supply Voltage in 24V Mode	20	24	30	V
Supply Current	-	-	1000	mA

NOTE

It is strongly recommended to use a protection diode for inductive loads.

DANGER

Make sure that the connecting tool and the gripper do not cause any danger when the power is cut, such as dropping of the work-piece from the tool.

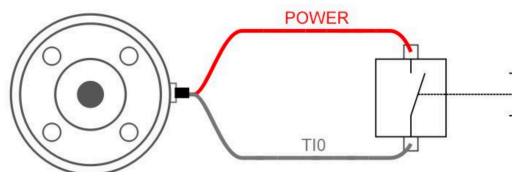
4.2.1 Tool Digital Input(TI)

The digital input is already equipped with a pull-down resistor. This means that the reading of the floating input is always low.

Electrical Specifications:

Parameter	Min	Typical	Max	Unit
Input Voltage	-0.5	-	30	V
Logic Low Voltage	-	-	1.0	V
Logic High Voltage	1.6	-	-	V
Input Resistance	-	47k	-	Ω

The following figure shows the connection with the simple switch.

**4.2.2 Tool Digital Output(TO)**

The digital output is implemented in the form of NPN with an open collector (OC). When the digital output is activated, the corresponding connector will be driven to GND. When the

digital output is disabled, the corresponding connector will be open (open collector/open drain).

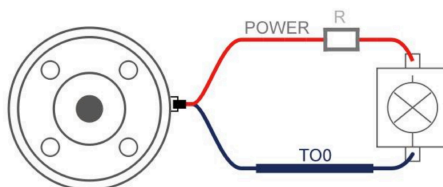
Electrical Specifications:

Parameter	Min	Typical	Max	Unit
Open-circuit Voltage	-0.5	-	30	V
Voltage when sinking 50mA	-	0.05	0.2	V
Sink Current	0	-	100	mA
Current through GND	0	-	100	mA

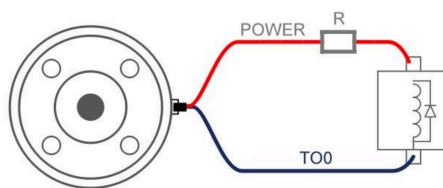
CAUTION

There is no current protection on the digital output of the tool, which can cause permanent damage if the specified value exceeded.

The following example illustrates how to use the digital output. As the internal output is an open collector, the resistor should be connected to the power supply according to the load. The size and power of the resistor depend on the specific use.



NOTE It is highly recommended to use a protection diode for inductive loads as shown below.



4.2.3 Tool Analog Input(TAI)

The tool analog input is a non-differential input.

Electrical Specifications:

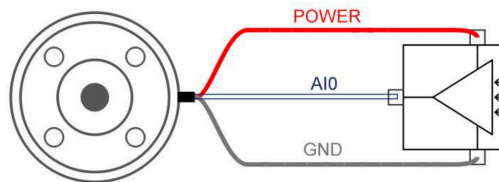
Parameter	Min	Typical	Max	Unit
Input Voltage in Voltage Mode	-0.5	-	3.3	V
Resolution	-	12	-	Bit
Input Current in Current Mode	-	-	-	mA
Pull-down Resistors in the 4mA to 20mA Current Range	-	-	165	Ω
Resolution	-	12	-	Bit

CAUTION

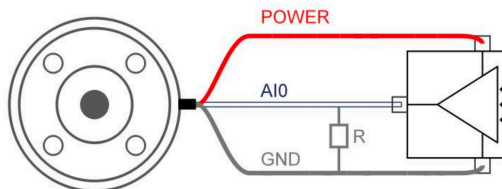
1. In the current/voltage mode, the analog input does not provide over-voltage protection. Exceeding the limits in the electrical code may result in permanent damage to the input port.
2. In current mode, the pull-down resistance depends on the range of the input current.

The following figures show how the analog sensor can be connected to a **non-differential** output.

- Voltage Mode

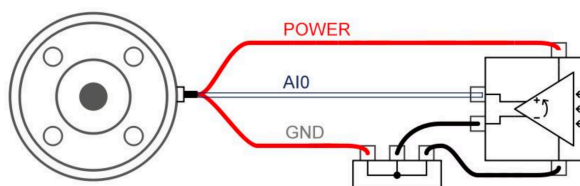


- Current Mode

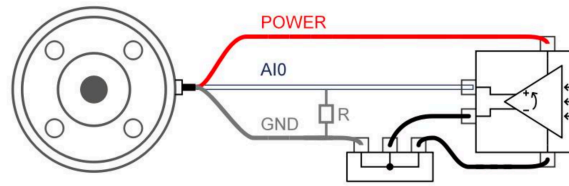


The following figures show how the analog sensor is connected to the differential output. Connect the negative output to GND (0V), and it can work like a non-differential sensor.

- Voltage Mode



- Current Mode



4.2.4 Tool RS485

The Tool side provide an RS485 interface, use can communicate it with third-party devices that supports RS485.

The id of our end tool is 9.

PIN Connection:

1. PIN3: RS485-A
2. PIN4: RS485-B
3. PIN1: 24V
4. PIN2: GND

- If end effector supports standard Modbus RTU, user can debug it via '[Settings-Externals-Modbus RTU](#)'.
- If end effector doesn't support standard Modbus RTU, user can send the command via [getset_tgpio_modbus_data](#), please set is_transparent_transmission to True.

5. End-Effector

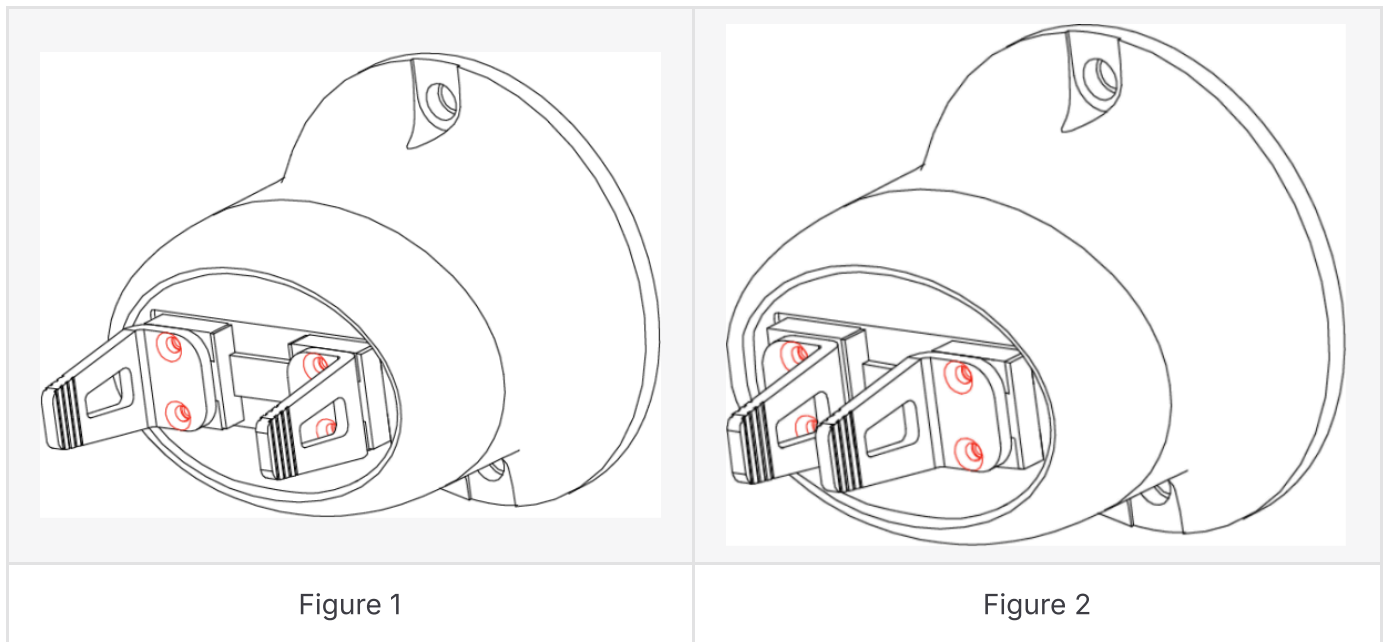
5.1 Gripper Lite

The Gripper Lite is the end-effector of the robotic arm, which can grasp objects dynamically. There are two installation methods for the mechanical claw of Lite 6: normal installation, the stroke range of the mechanical claw is 0-16mm, and reverse installation, the stroke range of the mechanical claw is 20-38mm. Regardless of the installation method, the stroke of the gripper is only 16mm. The maximum payload of the gripper $\leq 600g$.

There are two states of the gripper, open and close.

- **Note:**

- There are two ways to install the Gripper Lite, using the tool to unscrew the 4 red screws, Figure 1 can be changed to Figure 2.
- The default installation method is Figure 1, with a stroke range of 20-38mm.

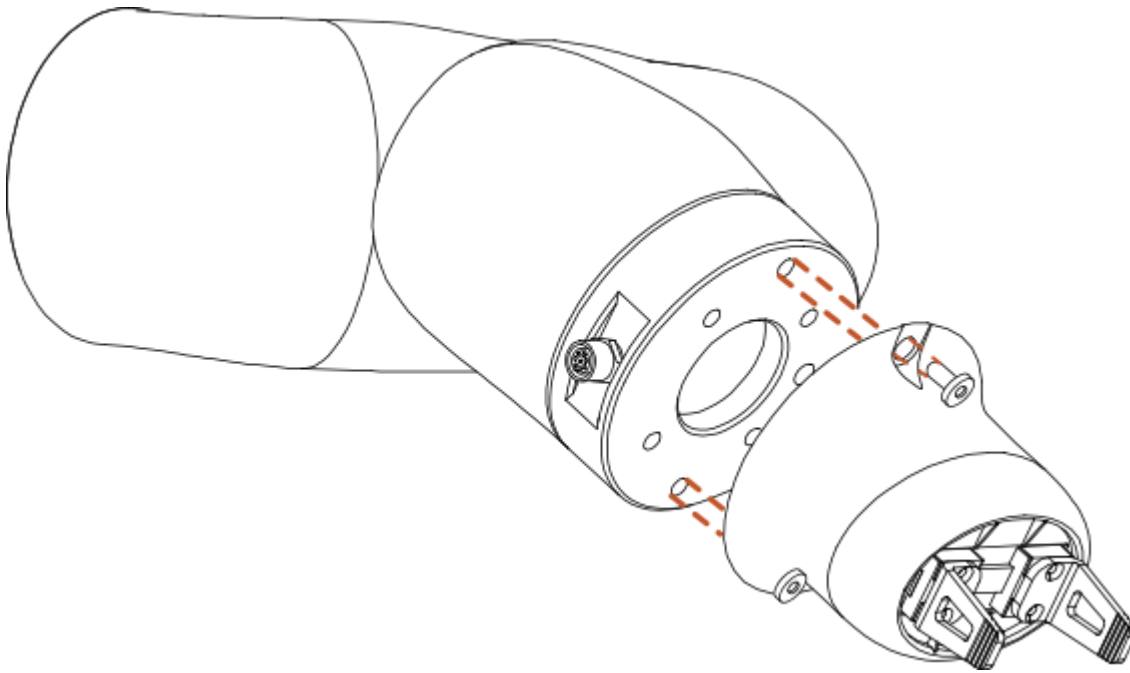


5.1.1 Gripper Lite Installation

Installation Procedure:

1. Move the robotic arm to a safe position. Avoid collision with the robotic arm mounting surface or other equipment.
2. Power off the robotic arm by pressing the emergency stop button on the control box.

3. Fix the gripper on the end of the robotic arm with 2*M6 bolts.
4. Connect the robotic arm and the gripper with the gripper connection cable.

**Note:**

1. When wiring the gripper connection cable, be sure to power off the robotic arm, to set the emergency stop button in the pressed state, and to ensure that power indicator of the robotic arm is off, so as to avoid robotic arm failure caused by hot-plugging.
2. Due to limited length of the gripper connection cable, the gripper connector and the tool/end effector connector must be on the same side.
3. When connecting the gripper and the robotic arm, be sure to align the positioning holes at the ends of the gripper and the robotic arm. The male pins of the connecting cable are relatively thin, please be careful to avoid bending the male pins during disassembly.

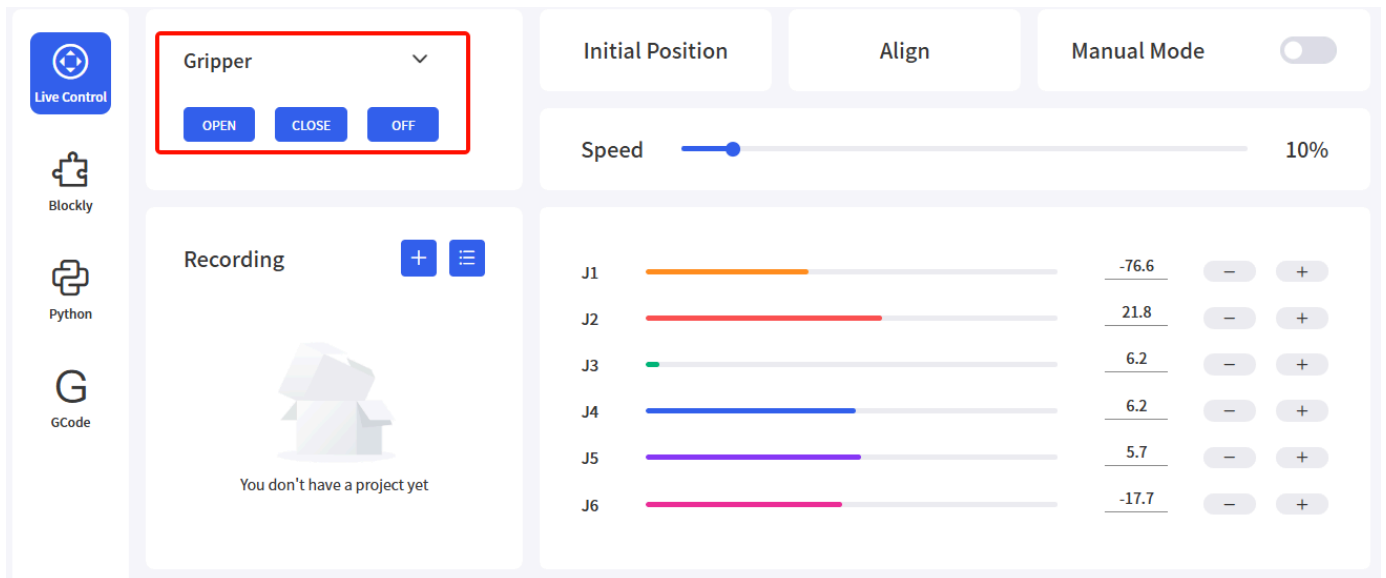
5.1.2 Precautions

Precautions	
 DANGER	When a robotic arm equipped with a gripper is used for trajectory planning, it is necessary to perform a safety assessment on whether to return to the zero-point or whether the operation can be performed and to avoid collisions.

5.1.3 Control

5.1.3.1 Live Control

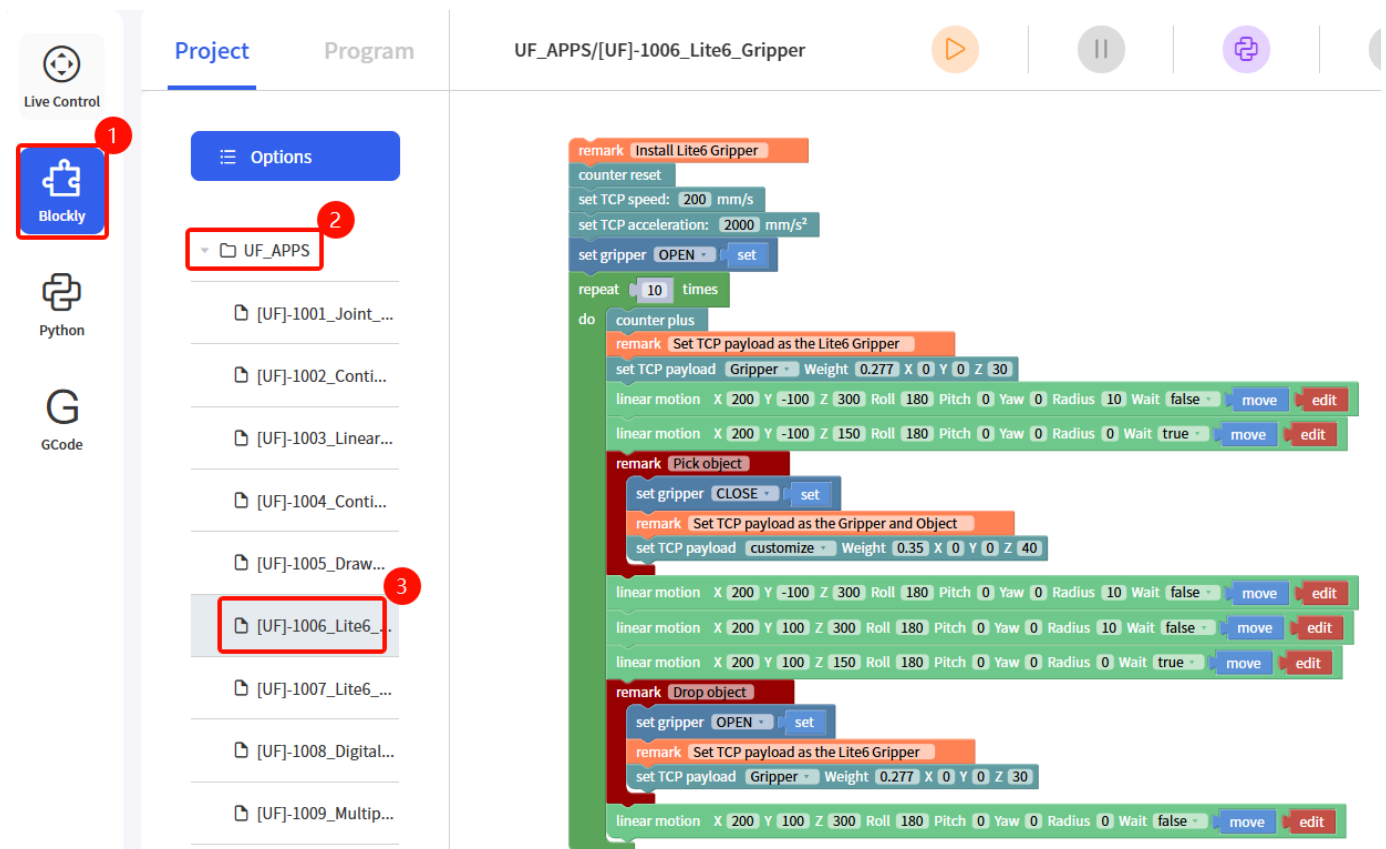
Enter the Live control page, select Gripper and then by clicking the "Open/Close" button, you can control the opening and closing of the gripper.



5.1.3.2 Control via Blockly

Find the example file [UF]-1006_Lite6_Gripper in the Blockly module.

The role of this program: Execute this program to control the gripper to grasp the target object at the specified position, and then place it at the target position.

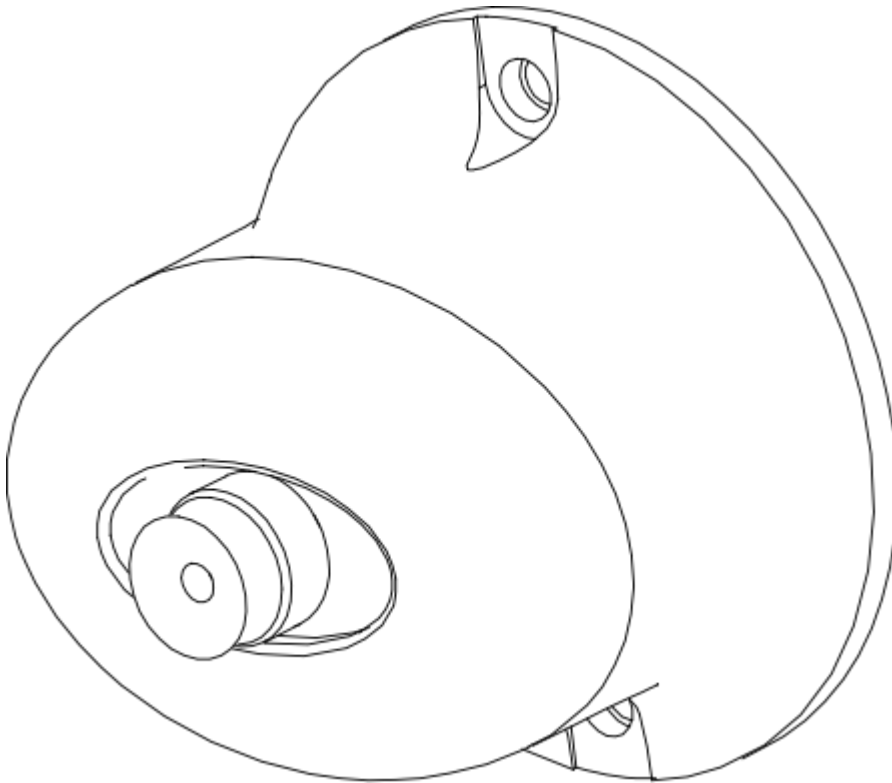


5.1.3.3 Python-SDK Control

- The interface of controlling gripper:
 - `arm.open_lite6_gripper()` : open gripper
 - `arm.close_lite6_gripper()` : close gripper
 - `arm.stop_lite6_gripper()` : stop gripper

Python-SDK: <https://github.com/xArm-Developer/xArm-Python-SDK>

5.2 Vacuum Gripper Lite



The Vacuum Gripper Lite can dynamically suck and release smooth flat objects with a payload of $\leq 600\text{g}$. The Vacuum Gripper Lite has only 1 suction cup.

Note: If the surface of the object is not smooth, there will be air leakage from the suction cup which makes the object fail to be sucked up firmly.

5.2.1 Vacuum Gripper Lite Installation

Installation Procedure:

1. Move the robotic arm to a safe position. Avoid collision with the robotic arm mounting surface or other equipment.
 2. Power off the robotic arm by pressing the emergency stop button on the control box.
-

3. Fix the vacuum gripper on the end of the robotic arm with 2 M6 bolts.
4. Connect the robotic arm and the vacuum gripper with the vacuum gripper connection cable.

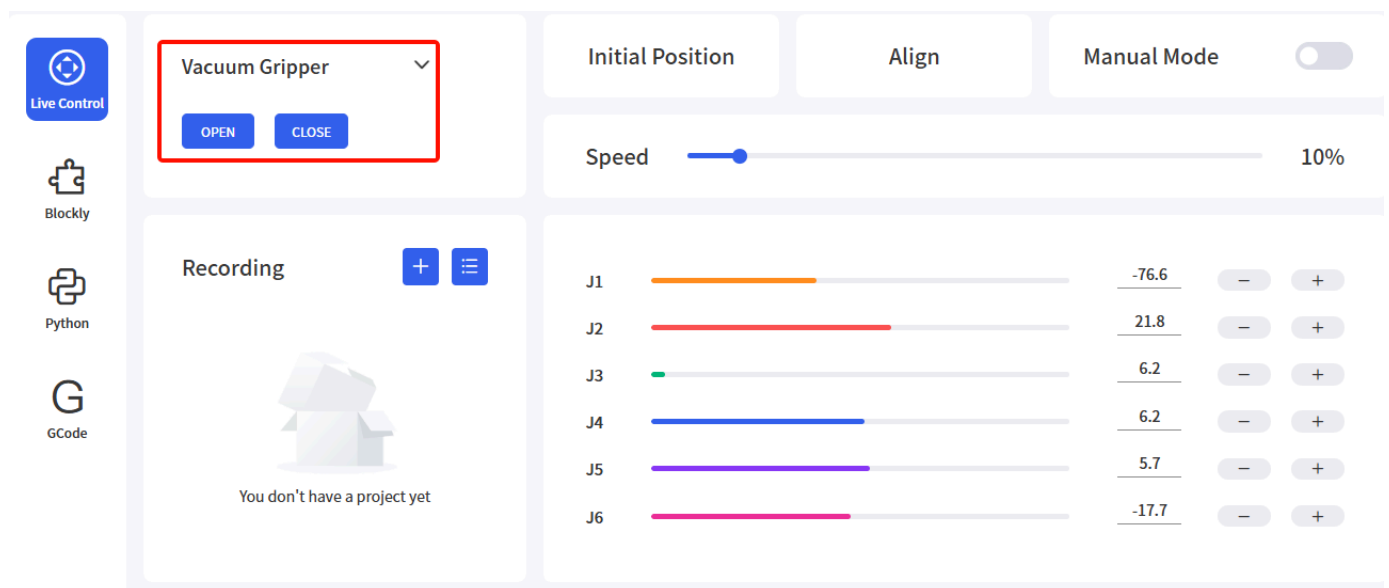
Note:

1. When connecting the vacuum gripper connection cable, be sure to power off the robotic arm, and to ensure that power indicator of the robotic arm is off, so as to avoid robotic arm failure caused by hot-plugging.
2. Due to the length limitation of the vacuum gripper connection cable, the vacuum gripper interface and the tool IO interface must be in the same direction.
3. When connecting the vacuum gripper and the robotic arm, be sure to align the positioning holes on the two ends of the interface. The male pins of the connecting cable are relatively thin, so be careful to avoid bending them during disassembly.

5.2.2 Control

5.2.2.1 Live Control

Enter the Live control page, select Vacuum Gripper and then by clicking the "Open/Close" button, you can control the opening and closing of the vacuum gripper.



5.2.2.2 Control via Blockly

Find the example file **[UF]-1007_Lite6_Vacuum_Gripper** in the Blockly module.

The role of this program: execute this program to control the vacuum gripper to suck the target object at the specified position, and then place the target object at the target

position.

Note: When the vacuum gripper is installed on the robotic arm, the TCP Payload of the vacuum gripper should be set in the Blockly program. When the total weight of the vacuum gripper changes after the object is sucked, a new TCP Payload needs to be set.

5.2.2.3 Python-SDK Control

- The interface of controlling vacuum gripper:
 - `arm.set_vacuum_gripper(True, wait=False)` : open vacuum gripper
 - `arm.set_vacuum_gripper(False, wait=False)` : close vacuum gripper

Python-SDK: <https://github.com/xArm-Developer/xArm-Python-SDK>

6. Maintenance and Inspection

1. Long-term placement If the robotic arm is not used for a long time (≥ 3 months), you need to power on the robotic arm for 6 hours every 3 months to charge the built-in battery of the robotic arm. When powering on the robotic arm, please release the emergency stop button on the control box, and the robotic arm does not need to be enabled.

2. Clean

After the robotic arm is used for a long time, there may be dirt or grease on the carbon fiber shell (in rare cases, a small amount of grease can be seen at the joints, which will not affect the normal use or life of the joints). You can use 95% alcohol or 70% isopropanol to wipe the carbon fiber surface for cleaning.

Note

When cleaning the carbon fiber surface, be careful not to let the liquid penetrate the joints.

7. After Sales Service

1. Repair work must only be done by UFACTORY.

After repair work, checks must be done to ensure the required safety level. Checks must adhere to valid national or regional work safety regulations. The correct functioning of all safety functions shall also be tested

2. After-sales policy: For the detailed after-sales policy of the product, see the official website: <https://www.ufactory.cc/warranty-and-returns/>

3. The general process of after-sales service is:

- Contact UFACTORY technical support (support@ufactory.cc) to confirm whether the product needs to repair and which part should be sent back to UFACTORY.
- After the bill of lading on UPS, we will send the invoice and label to you by mail. You need to make an appointment with the local UPS and then send the product to us.
- UFACTORY will check the product warranty status according to the after-sales policy.
- Generally, the process takes around 1-2 weeks except for shipment.

Note

1. Please keep the original packaging materials of the product. When you need to send the product back to get repaired, please pack the product with the original box to protect the product during the transportation.
2. If you need to send the control box to get repaired, please export and save the configuration file([UFACTORY Studio-General-Advanced Settings](#)) of the robotic arm to prevent the original data from being lost or changed during the repair process

8. Production Information

8.1 Product Label

- Robotic Arm

UFACTORY Robotic Arm

UFACTORY Lite 6

MODEL: LI10

MAX.PAYLOAD: 600g

WEIGHT: 8kg

MAX.REACH: 440mm

RATED VOLTAGE: 24VDC

MAX.POWER: 350Wmax



PRODUCTION DATE:
Apr. 2025

LI100604255F32

2F, Building M-6, Ma Que Ling Industrial Zone,
Nanshan District, Shenzhen, Guangdong, P.R.China

UFACTORY Co.,Ltd.
www.ufactory.cc
M a d e i n C h i n a



LI100604255F32

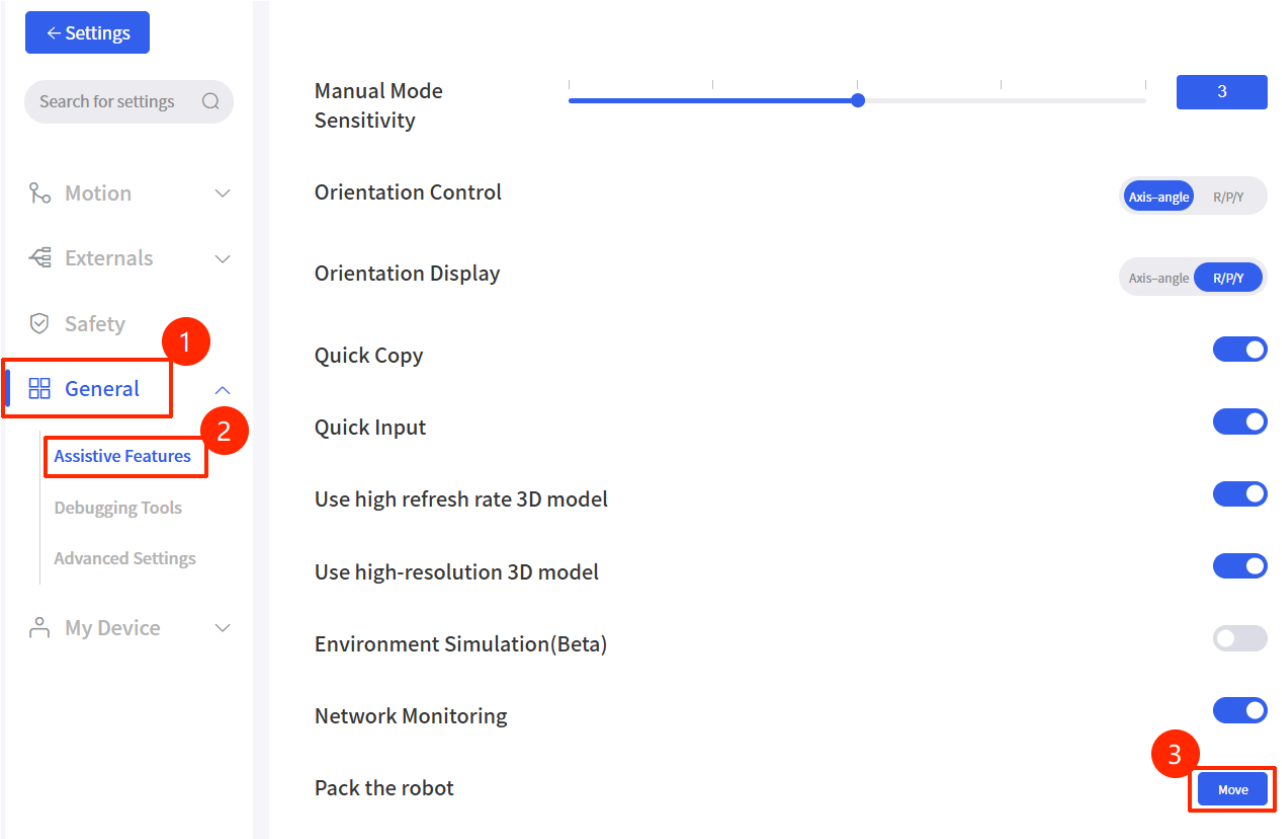
8.2 Disposal and Environment

- Low humidity (25%-85% non-condensing)

- Altitude: <2000m
- Ambient temperature: 0°C ~ 50°C
- Avoid direct sunlight (indoor use)
- No corrosive gas or liquid.
- No flammable materials.
- No oil mists.
- No salt sprays.
- No dust or metal powder.
- No mechanical shock, vibration.
- No electromagnetic noise.
- No radioactive materials.

8.3 Transportation

- Move the robot to the packaging position by UFactory studio, then put the Lite6 robot and Control Box in the original packaging.

- 

- Transport the robot in the original packaging.

- Lift both tubes of the robot arm at the same time when moving it from the packaging to the installation place. Hold the robot in place until all mounting bolts are securely tightened at the base of the robot.
- The controller box shall be lifted by the handle.
- Save the packaging material in a dry place, you may need to pack down and move the robot in the future.

8.4 Power Supply

The power cut-off method of this product is a plug/socket connection, so when using this product, it is recommended to equip with a suitable switching device with sufficient breaking capacity (such as an air switch; insulation voltage: 400V AC; rated current: 10A)

8.5 Special Consumables

Fuse Specifications: 15A 250V 5×20mm Time-Lag glass body cartridge fuse.

8.6 Stop Categories

Stop Category 1 and **Stop Category 2** decelerates the robot with drive power on, which enables the robot to stop without deviating from its current path.

Safety Input	Description
Emergency Stop Button of the Control Box	Stop Category 1
Safeguard Stop of Control Box(SI)	Stop Category 2

8.7 Certification

[LCSA051123040S-CE-LVD.pdf](#)

[LCSA051123041E001-CE-EMC.pdf](#)

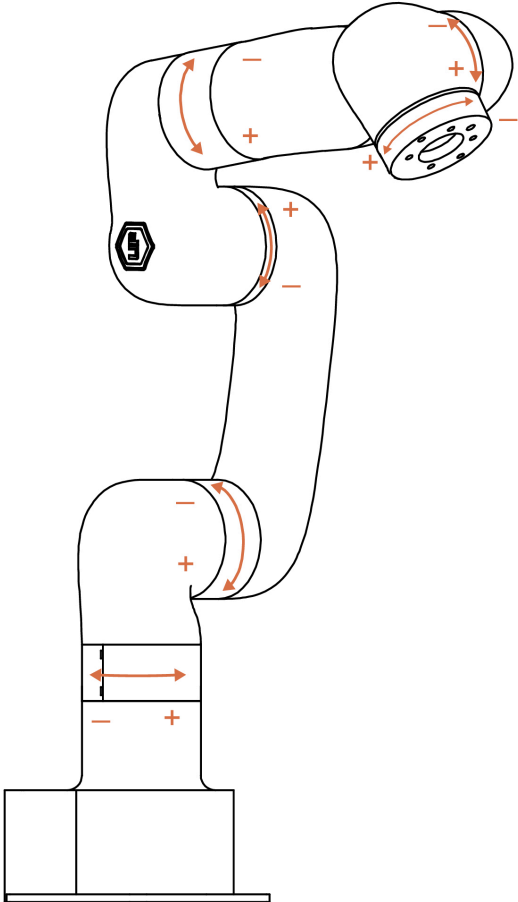
[LCSA051123043R-RoHS.pdf](#)

8.8 DH Parameters

[Lite6 DH Parameters](#)

9. Technical Specifications

Lite6	
Robot Type	Lite6
Cartesian Range	X: ±440mm; Y: ±440mm; Z: -165~683.5mm; Roll/Pitch/Yaw: ±180°
Weight(robotic only)	8KG
Maximum Payload	600g
Maximum Joint Speed	180°/s
Maximum Speed of End-Effector	500mm/s
Repeatability	±0.5mm
Ambient Temperature Range	0-50°C
Power Consumption	Typical 150W, 300W Power is recommended.
Input Power Supply	24V DC, 14.66A
ISO Class Cleanroom	5
Mounting Way	Any Direction
Materials	Aluminium, Carbon Fiber
Footprint	130×140 mm
End Flange	DIN ISO 9409-1-A50/63 (M5*6)
Robotic Arm Communication Protocol	Private TCP(custom)
End Effector Communication	Modbus RTU

Lite6	
Protocol	
Programming	UFACTORY Studio, Python/C++/ROS
Joint Rotation Direction	

Gripper Lite (LG1000)	
Input Power Supply	24V DC
Stroke	16mm
Gripping Force	5N
Weight	350g
communication Mode	I/O
Lifespan	>6000H

Vacuum Gripper Lite(LS1001)	
Input Power Supply	24V DC

Vacuum Gripper Lite(LS1001)	
Vacuum Level	-40kPa
Weight	250g
Communication Mode	I/O
Feedback	Pick-Up Detection
Lifespan	>6000H