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IR-R10 Series International 6-Axis Robot

User Guide - Manipulator

Industrial Automation | Intelligent Elevator | New Energy Vehicle | Industrial Robot | Rail Transit

Data code PS00017923A01

Preface

Introduction

With a maximum arm length of 1422 mm and up to 10 kg load capacity, the IR-R10 series 6-axis robot of Inovance features compact structure, lightweight, and high flexibility, repeatability, and speed. It offers great usability and reliability when working with an IRCB501 high-performance and high-protection control system. It is applicable to handling, loading/unloading, automatic stamping, assembly, grinding, and polishing in general industries, and teaching demonstration applications in the teaching instrument industry.

This guide describes the information, installation, wiring, motion range, and maintenance of the product.

More Data

Name	Data Code	Description
IRCB501 International Series High-Protection Robot Control Cabinet User Guide	PS00017685	Describes the basic specifications, installation and wiring, common fault diagnosis and troubleshooting, and maintenance of the IRCB501 series high-protection control cabinets.
IRTP80 Series Teach Pendant User Guide	19012261	Describes the product information, wiring, and operation of the IRTP80 series teach pendant.
IR-R10 Series International 6-Axis Robot User Guide - Mechanical (this guide)	PS00017923	Describes the information, installation, wiring, motion range, and maintenance of the product.

Note

- The drawings in the user guide are shown for illustration only and may be different from the product. Actual products may vary.
- The instructions are subject to change without notice due to product upgrade, specification modification as well as efforts to improve the accuracy and convenience of the guide.

Revision History

Date	Version	Description
April 2025	A01	**Update** • Updated *"1.1 Model and Nameplate" on page 17* • Updated *"1.5 Specifications" on page 21* • Updated *"3.4 Handling" on page 36* • Updated *"6.3 Applying Lubricating Grease" on page 61* • Updated *"6.7.2 Procedure of Zero Point Adjustment" on page 69* • Updated *"6.8 Options" on page 75* • Updated *" Certification and Standard Compliance" on page 77* **Addition** • Added *"6.5.2 Oil Leakage Inspection Parts" on page 64*
November 2024	A00	Initial release.

Access to the Guide

This guide is not delivered with the product. You can obtain the PDF version in the following way:

- Visit www.inovance.com, go to Support > Download, search by keyword, and then download the PDF file.
- Scan the QR code on the product with your smart phone.
- Scan the QR code below to install the My Inovance app, where you can search for and download guides.

Warranty

For faults and damage incurred during normal use in the warranty period, Inovance provides free repair service. (For details of the warranty period, see the purchase order.) A maintenance fee will be charged out of the warranty period.

Even in the warranty period, a maintenance fee will be charged for repair of the following damage:

- Damage caused by operations not following the instructions in the guide
- Damage caused by fire, flood, or abnormal voltage
- Damage caused by unintended use of the product
- Damage caused by use beyond the specified scope of application of the product
- Damage or secondary damage caused by force majeure (such as natural disaster, earthquake, and lightning strike)

The maintenance fee will be charged according to our latest Price List if not otherwise agreed upon.

For details, see the Product Warranty Card.

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Safety Precautions

Safety Disclaimer

- This chapter presents essential safety instructions for proper use of the equipment. Before operating the equipment, read through the guide and comprehend all the safety instructions. Failure to comply with the safety precautions may result in equipment damage, severe physical injuries, or even death.
- "CAUTION", "WARNING", and "DANGER" items in the guide only indicate some of the instructions that need to be followed; they just supplement the safety instructions.
- Use this product in an environment that complies with the design specifications. Malfunctions or component damage caused by improper use is not covered by warranty.
- Inovance shall not be held liable for any physical injuries or property damage caused by improper use.

Safety Categories and Definitions



indicates that failure to comply with the notice will result in severe physical injuries or even death.



indicates that failure to comply with the notice may result in severe physical injuries or even death.



indicates that failure to comply with the notice may result in minor or moderate physical injuries or equipment damage.

Safety Precautions

- Some drawings in this guide show the equipment without covers or protective guards to display more details. Be sure to install the covers and protective guards before using the equipment and operate the equipment in accordance with this guide.
- The drawings in the guide are shown for illustration only and may be different from the product you purchased.
- Operators must take mechanical protective measures to protect personal safety. For example, wear and use necessary protective equipment, such as crush-resistant shoes, safety clothing, safety glasses, protective gloves, and sleeves.

Unpacking



- Do not install the product if you find damage, rust, or signs of use on it or its accessories upon unpacking.
- Do not install the product if you find water seepage or any components being missing or damaged upon unpacking.
- Do not install the product if the packing list does not match the product you received.



- Check whether the packing is intact and whether there is damage, water seepage, dampness, and deformation before unpacking.
- Unpack the product layer by layer. Do not strike the package violently.
- Check the surfaces of the equipment and accessories for any damage, rust, and scratches.
- Check the equipment, accessories, and materials in the package against the packing list.

Storage and Transportation



- Large-scale or heavy equipment must be transported by qualified professionals using specialized hoisting equipment. Failure to comply may result in physical injuries or equipment damage.
- Before hoisting the equipment, ensure the equipment components such as the front cover and terminal blocks are secured firmly with screws. Loosely-connected components may fall off and result in physical injuries or equipment damage.
- Never stand or stay below the equipment when the equipment is being hoisted.
- When hoisting the equipment with a steel rope, ensure the equipment is hoisted at a constant speed without suffering from vibration or shock. Do not turn the equipment over or let the equipment stay hanging in the air. Failure to comply may result in physical injuries or equipment damage.



- Handle the equipment with care and mind your steps. Failure to comply may result in physical injuries or equipment damage.
- When carrying the equipment with bare hands, hold the equipment casing firmly with care to prevent parts from falling. Failure to comply may result in physical injuries.
- Store and transport the equipment based on the storage and transportation requirements. Failure to comply will result in equipment damage.
- Avoid storage and transportation in environments with water splash, rain, direct sunlight, strong electric field, strong magnetic field, and strong vibration.
- Avoid storage for more than three months. Long-term storage requires stricter protection and necessary inspections.
- Pack the product properly before transportation by vehicle. Use an enclosed box for long-distance transportation.
- Never transport the product with devices or materials that may damage or negatively impact the product.

Installation
 • Installation must be carried out by technicians who have received relevant training on electrical equipment and have sufficient electrical expertise. Non-professionals are not allowed to operate the equipment.
 • Read through the guide and safety instructions before installation. • Do not install the product in places with strong electric or magnetic fields. • Before installation, check that the mechanical strength of the installation site can bear the weight of the equipment. Failure to comply will result in mechanical hazards. • Do not wear loose clothes or accessories during installation. Failure to comply may result in an electric shock. • When installing the equipment in a closed environment (such as a cabinet or casing), use a cooling device (such as a fan or air conditioner) to cool the environment down to the required temperature. Failure to comply may result in equipment over-temperature or fire. • Do not modify the product. • Do not fiddle with the bolts used to fix parts and components or the bolts marked in red. • When the equipment is installed in a cabinet or final assembly, a fireproof enclosure providing both electrical and mechanical protections must be provided. The IP rating must meet IEC standards and local laws and regulations. • If any equipment with strong electromagnetic interference, such as a transformer, is needed, install a shielding device to prevent malfunction of this product. • Install the equipment on metal or other incombustible objects. Keep the equipment away from combustible objects. Failure to comply will result in fire.
 • Cover the top of the equipment with a piece of cloth or paper during installation. This is to prevent unwanted objects such as metal chippings, oil, and water from falling into the equipment and causing faults. After installation, remove the cloth or paper on the top of the equipment to prevent over-temperature caused by poor ventilation due to blocked ventilation holes. • Resonance may occur when a machine supposed to run at a constant speed is running at variable speeds. In this case, install the vibration-proof rubber under the motor frame or use the vibration suppression function to reduce resonance.

Wiring



- Do not allow non-professionals to perform equipment installation, wiring, maintenance, inspection, or parts replacement.
- Before wiring, cut off all the power supplies of the equipment. Wait for at least the time designated on the equipment warning label before further operations because residual voltage still exists after power-off. After waiting for the designated time, measure the DC voltage in the main circuit to ensure the DC voltage is within the safe voltage range. Failure to comply may result in an electric shock.
- Do not perform wiring, remove the equipment cover, or touch the circuit board while power is on. Failure to comply may result in an electric shock.
- Ensure that the equipment is well grounded. Failure to comply may result in an electric shock.



- Do not connect the input power supply to the output end of the equipment. Failure to comply may result in equipment damage or even fire.
- When connecting a drive to the motor, check that the phase sequences of the drive and motor terminals are consistent to prevent reverse motor rotation.
- Use cables with required diameter and shield. Properly ground one end of the shield if a shielded cable is used.
- Fix the terminal screws with the tightening torque specified in the user guide. Improper tightening torque may overheat or damage the connecting part, resulting in fire.
- After wiring is done, check that all cables are connected properly and no screws, washers, or exposed cables are left inside the equipment. Failure to comply may result in an electric shock or equipment damage.



- During wiring, follow the proper electrostatic discharge (ESD) procedures and wear an anti-static wrist strap. Failure to comply will result in damage to the equipment or internal circuits of the product.
- Use shielded twisted pairs for the control circuit. Connect the shield to the grounding terminal of the equipment for grounding purpose. Failure to comply will result in equipment malfunction.

Power-on



- Before power-on, check that the equipment is installed properly with reliable wiring and the motor can be restarted.
- Check that the power supply meets equipment requirements before power-on to prevent equipment damage or fire.
- After power-on, do not open the cabinet door or protective cover of the equipment, touch any terminal, or disassemble any unit or component of the equipment. Failure to comply may result in an electric shock.



- Perform a trial run after wiring and parameter setting to ensure the equipment operates safely. Failure to comply may result in physical injuries or equipment damage.
- Before power-on, check that the rated voltage of the equipment is consistent with that of the power supply. Failure to comply may result in fire.
- Before power-on, check that no one is near the equipment, motor, or machine. Failure to comply may result in physical injuries or even death.

Operation



- The equipment must be operated only by professionals. Failure to comply will result in physical injuries or even death.
- Do not touch any connecting terminals or disassemble any unit or component of the equipment during operation. Failure to comply may result in an electric shock.



- Do not touch the equipment casing, fan, or resistor to check the temperature. Failure to comply may result in burns.
- Prevent metal or other objects from falling into the equipment during operation. Failure to comply may result in fire or equipment damage.

Maintenance



- Do not allow non-professionals to perform equipment installation, wiring, maintenance, inspection, or parts replacement.
- Do not maintain the equipment while power is on. Failure to comply may result in an electric shock.
- Before maintenance, cut off all the power supplies of the equipment and wait for at least the time designated on the equipment warning label.
- In case of a permanent magnet motor, do not touch the motor terminals immediately after power-off because the motor terminals will generate induced voltage during rotation even after the equipment power supply is off. Failure to comply may result in an electric shock.



- Carry out daily and periodic inspection and maintenance on the equipment according to maintenance requirements and retain a maintenance record.

Repair



- Do not allow non-professionals to perform equipment installation, wiring, maintenance, inspection, or parts replacement.
- Do not repair the equipment while power is on. Failure to comply may result in an electric shock.
- Before inspection and repair, cut off all the power supplies of the equipment and wait for at least the time designated on the equipment warning label.



- Submit the repair request according to the warranty agreement.
- When the fuse is blown or the circuit breaker or earth leakage current breaker (ELCB) trips, wait for at least the time designated on the equipment warning label before power-on or further operations. Failure to comply may result in equipment damage, physical injuries, or even death.
- When the equipment is faulty or damaged, the troubleshooting and repair work must be performed by professionals that follow the repair instructions, with repair records kept properly.
- Replace quick-wear parts of the product according to the replacement instructions.
- Do not use damaged equipment. Failure to comply may result in further equipment damage, physical injuries, or even death.
- After equipment replacement, check the wiring and set parameters again.

Disposal
WARNING • Dispose of retired equipment in accordance with local regulations and standards. Failure to comply may result in property damage, physical injuries, or even death. • Recycle retired equipment in accordance with waste disposal standards of the industry to avoid environmental pollution.

Safety Label

For safe equipment operation and maintenance, comply with the safety labels on the equipment. Do not damage or remove the safety labels. The following table describes the safety labels.

Safety Label	Description
	• Read through the safety instructions before operating the equipment. Failure to comply may result in equipment damage, physical injuries, or even death. • Do not touch the terminals or remove the cover while power is on or within 10 min after power-off. Failure to comply may result in an electric shock.

Special Precautions

To prevent accidents with the robot, be sure to set up relevant safety measures according to the specific situation. All operators must fully comply with the requirements.

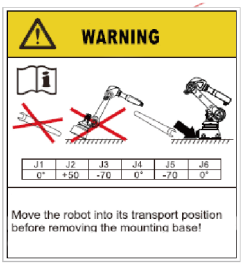
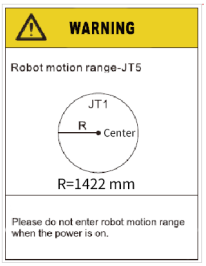
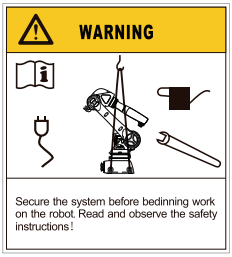
1. Ensure a safety protection range that is greater than the maximum motion range of the robot. Set up comprehensive guard devices (such as fences) around the safety protection range, with an emergency stop device easily accessible to operators. Leave sufficient space (safety zone) around for the operator to avoid abnormal operations or emergency situations.
2. Ensure that the safety protection devices has only one entrance and is equipped with a safety latch. Manually remove the safety latch when closing or opening the entrance. Ensure that the safety devices (such as emergency stop buttons and safety latch) are working properly before accessing the safety protection devices.
3. The safety fences must be sturdy enough to withstand impacts and pressures from both internal and external sources. The safety fences must be fixed and immovable to prevent operators from easily dismantling or breaking them. The safety fences must also be free of sharp angles, edges, or spikes, and must not contain any potentially hazardous components.
4. On the guard devices (fences), clearly display robot status, such as automatic running, teaching, and emergency stop, so that everyone onsite can easily see the status of the robot.

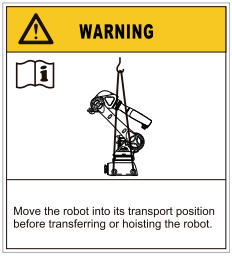
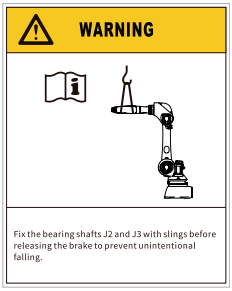
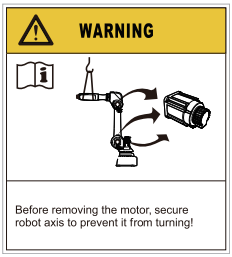
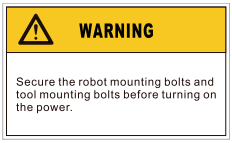
Before turning on or starting the robot, check all safety conditions to ensure that there are no people or obstructions within the robot's motion range.

Warning Label

The following table describes the warning labels affixed on the robot body. Pay special attention that specific dangers exist around the positions where these labels are affixed. Comply with the cautions and warnings on the warning labels to operate and maintain the robot system safely. Do not damage or remove the warning labels.

The following table lists the warning labels.

Warning Label	Safety Instructions
	Fasten the robot first before removing the fastening screws of the base to prevent the robot from tilting forward due to its center of gravity, which may cause equipment damage or personal injury.
	When the robot is powered on, it is prohibited to enter its working radius area to prevent personal injury.
	Before starting work on the robot, read and observe the safety instructions to ensure the safety of the system.

Warning Label	Safety Instructions
	When lifting the robot with the eye bolts, use slings that prevent the robot from rotating and tilting.
	The J2 and J3 axes are gravity bearing axes. Secure them with a sling before releasing the brake to prevent falling and injury.
	Before removing the motor, secure the robot axes to prevent them from rotating.
	Secure the robot mounting bolts and tool mounting bolts before turning on the power.

Warning Label	Safety Instructions
	No stepping!
	Do not touch the energized parts during power-on. Failure to comply may result in an electric shock.

1 Product Information

1.1 Model and Nameplate

IR- R 10 - 140 S - INT
① ② ③ ④ ⑤ ⑥

① **Product family** INOVANCE Robot	③ **Maximum load** 10: 10 kg	⑤ **Installation environment** S: Standard
② **Series** R: 6-axis robot	④ **Arm length** 140: 1422 mm	⑥ **Version** INT: International (With functional safety)

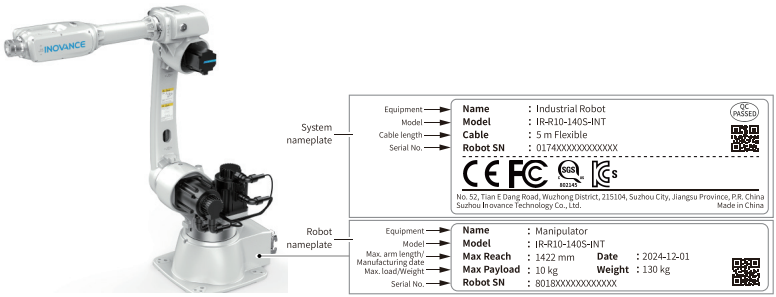


Figure 1-1 Nameplate

Note

- Before use, make sure that the system manufacturing numbers of the robot body and control cabinet are consistent. Otherwise, the robot may not work properly.
- The product information in this guide is the information of standard models in a standard environment. For information about non-standard models, contact the provider.

1.2 Components



Figure 1-2 Product appearance and components

Table 1–1 Components

No.	Component	No.	Component
①	Wrist flange	⑥	Base
②	Forearm	⑦	Swivel base
③	Warning label	⑧	Upper arm
④	Nameplate	⑨	Elbow
⑤	Heavy-duty connector	-	-

1.3 Rotation Directions

The following figure illustrates the rotation direction of each axis.

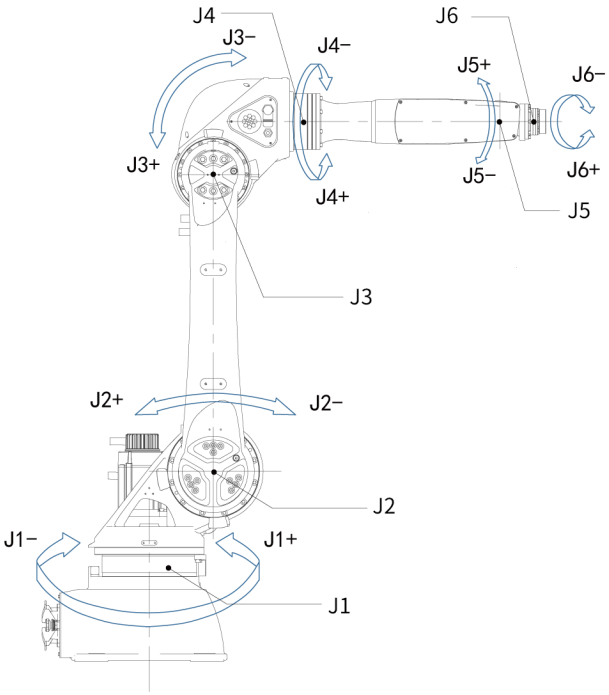


Figure 1-3 Axis rotation directions

1.4 Outline Dimensions

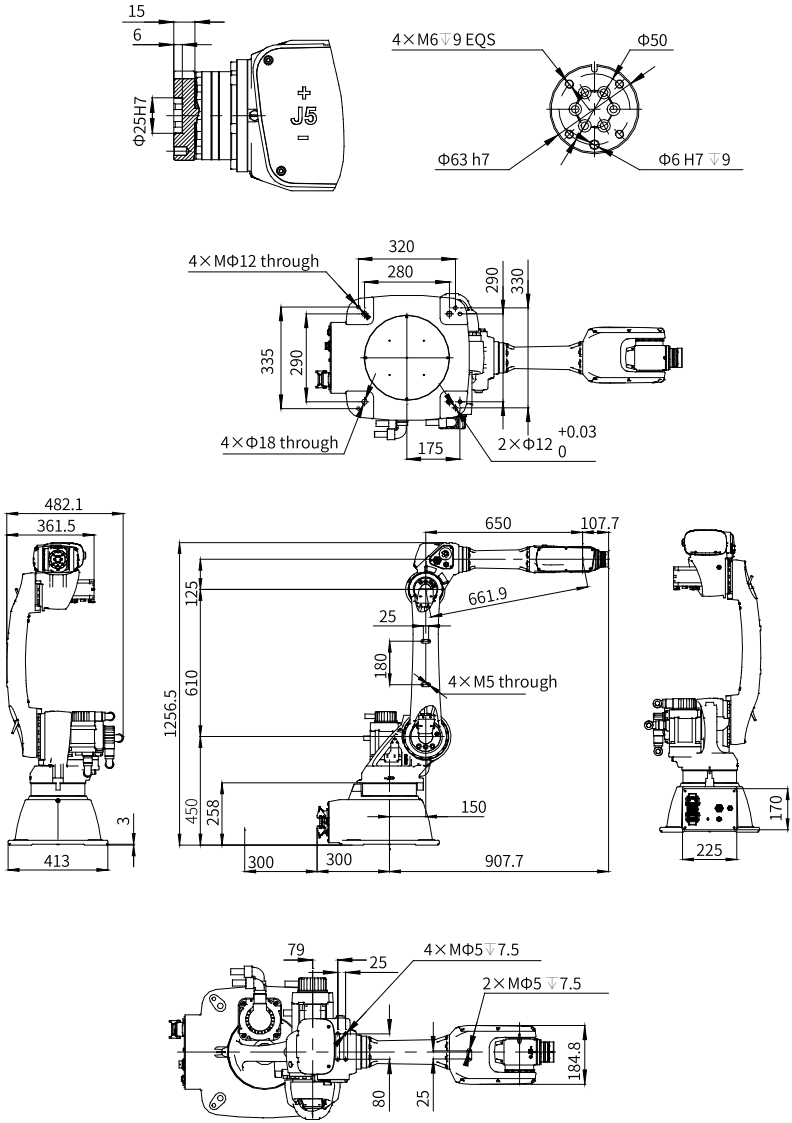


Figure 1-4 Outline dimensions for IR-R10–140S-INT (unit: mm)

1.5 Specifications

Model		IR-R10-140S-INT
Structure	Structure	Vertical multi-axis cascading structure
Number of axes	Number of axes	6 axes
Maximum reach	Maximum reach	1422 mm
Repeatability	Repeatability	±0.05 mm
Maximum wrist load	Maximum wrist load	10 kg
IP rating	IP rating	Body: IP65, wrist: IP67
Maximum velocity	J1 axis	200°/s
	J2 axis	200°/s
	J3 axis	200°/s
	J4 axis	375°/s
	J5 axis	375°/s
	J6 axis	600°/s
Maximum motion range	J1 axis	–170° to +170°
	J2 axis	–160° to +60°
	J3 axis	–80° to +160°
	J4 axis	–180° to +180°
	J5 axis	–140° to +140°
	J6 axis	–360° to +360°
Allowed wrist torque	J4 axis	22 N·m
	J5 axis	22 N·m
	J6 axis	9.8 N·m
Allowed wrist inertia	J4 axis	0.63 kg·m²
	J5 axis	0.63 kg·m²
	J6 axis	0.2 kg·m²
User interface	Wiring	18-channel signals of 30 V 0.5 A
	Air duct	Air duct: Φ8 mm x 1 Pressure resistance: 0.59 MPa
Ambient condition	Ambient temperature[1]	0°C to 45°C
	Ambient humidity	5% RH to 95% RH (non-condensing)
	Maximum temperature gradient	1.5°C/min
Body weight	Body weight	130 kg
Input power (average power consumption)	Input power (average power consumption)	3 kVA (0.6 kW)

Model		IR-R10-140S-INT
Applicable control cabinet (standard)	Applicable control cabinet (standard)	IRCB501-6ND-INT
Mounting method	Mounting method	Floor-standing installation
Noise level	Noise level[2]	$L_{Aeq} \leqslant 80$ dB(A)
Base installation dimensions	Base installation dimensions	290 mm x 280 mm (4 x Φ18 mm)
Certification	CE, cSGSus, FCC, KCs, and functional safety certification (supported by the "-INT" control cabinet only, requiring a functional safety expansion card)	

Note

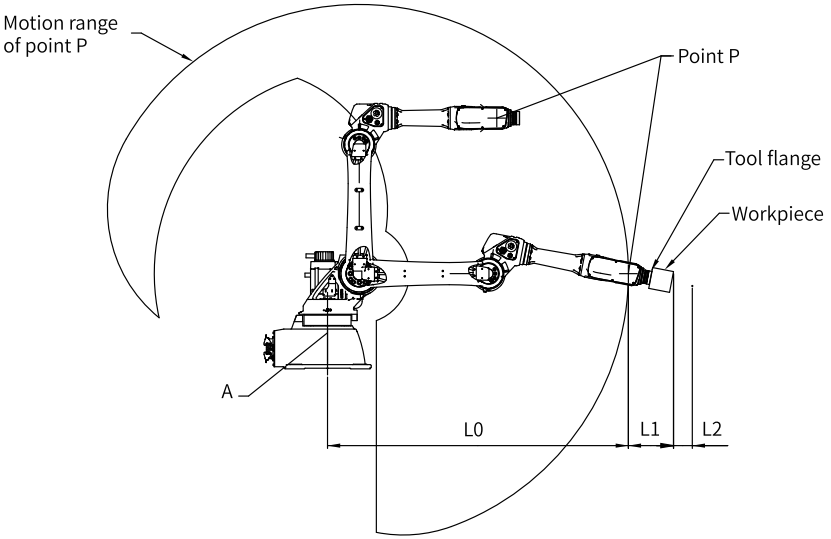
[1] Ambient temperature: In low temperatures close to the minimum allowed temperature in the product specifications, or after a long time of unuse during holidays or nights, it is recommended to preheat the robot for 10 minutes before operation.

[2] Noise level: The value is the noise level equivalent to load A, which is measured according to ISO 11201 (EN31201). (Measuring conditions: operation at a rated load and a high speed)

1.6 Motion Range

Caution

- Ensure a safety protection range that is greater than the maximum operating area of the robot. Set up comprehensive guard devices (such as fences) around the safety protection range, with an emergency stop device easily accessible to operators.
- On the guard devices (fences), clearly display robot status, such as automatic running, teaching, and emergency stop, so that on-site personnel can easily see the status of the robot.
- The safety fences must be sturdy enough to withstand impacts and pressures from both internal and external sources. The safety fences must be fixed and immovable to prevent operators from easily dismantling or breaking them. The safety fences must also be free of sharp angles, edges, or spikes, and must not contain any potentially hazardous components.



- L0: Motion range of the robot
- L1: Total length of the wrist, tool flange, and workpiece
- L2: Safety margin
- The safety distance of the safety fences should be greater than the sum of L0, L1, and L2 (> 1700 mm).

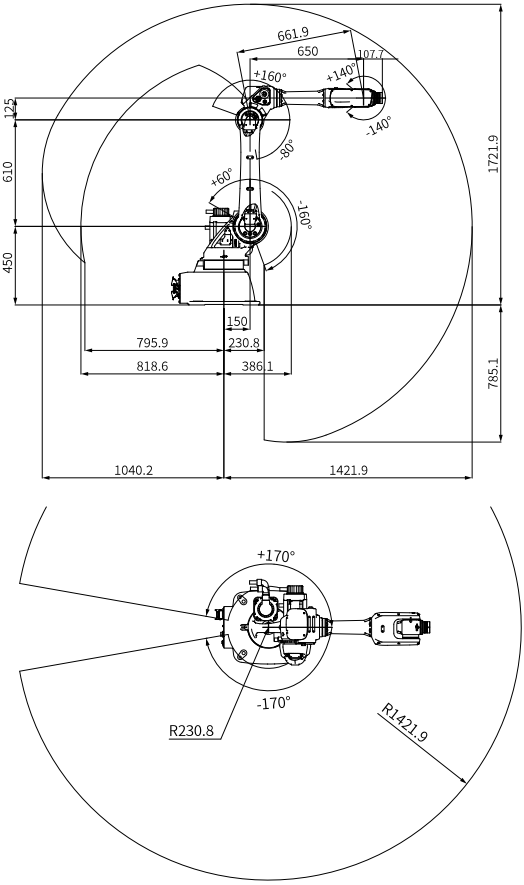


Figure 1-5 Motion range (unit: mm)

1.7 Maximum Load of Wrist Flange

The IR-R10 series robot supports a maximum load of 10 kg. The allowed wrist torque and inertia should meet the following requirements. External force (other than gravity) applied to the robot should not exceed the range in the table below.

Wrist Load Condition		IR-R10-140S-INT
Allowed wrist torque (N·m)	J4	22 N·m
	J5	22 N·m
	J6	9.8 N·m
Allowed wrist inertia (kg·m²)	J4	0.63 kg·m²
	J5	0.63 kg·m²
	J6	0.2 kg·m²

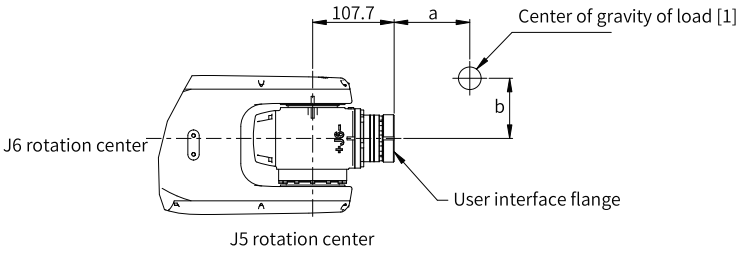


Figure 1-6 Distance to the rotation center of the J5/J6 axis (unit: mm)

Note

- [1]: Distance to the rotation center of J5: a + 107.7 (mm)
- Distance to the rotation center of J6: b (mm)

Caution

- During the use of the robot, define the correct load and correct the robot's payload. Incorrectly defined load data may cause the robot to be overloaded. Using incorrect load data or using load data other than those shown in the load chart may result in damage to motors, gears, and mechanical structures due to overload.
- Robots operating with incorrect load data or with loads other than those shown in the load chart will not be covered by the robot warranty.

The load conditions of the IR-R10 series robot system should be within the range shown in the figure. The following figure shows the wrist load curve.

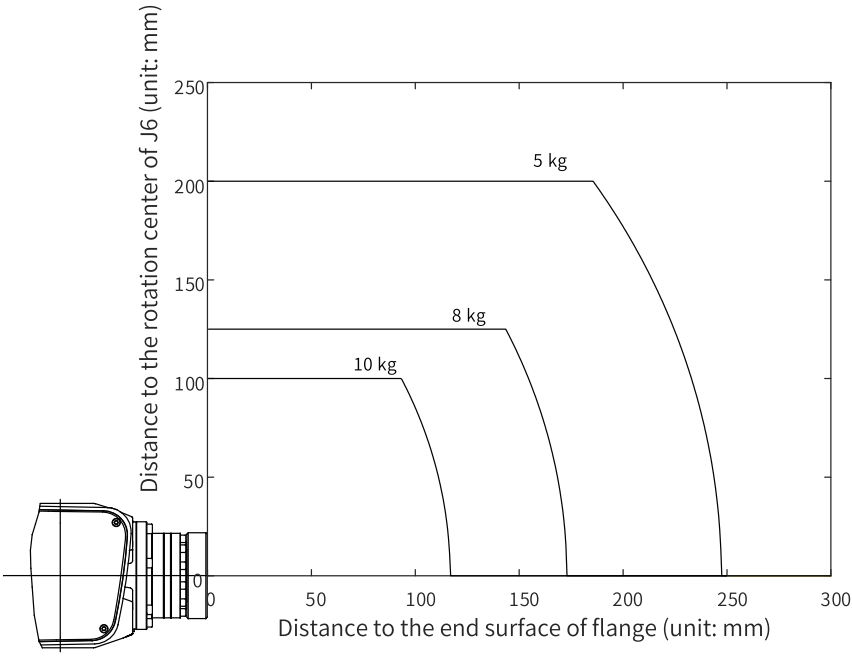


Figure 1-7 Wrist load curve

2 Preparations for Installation

2.1 Installation Personnel Requirements

- Ensure that the installation personnel have obtained mechanics knowledge or received mechanics training in advance to understand various dangers and risks in the installation process.
- The installation personnel must be familiar with the installation requirements and relevant technical information.
- Do not allow non-professionals to perform equipment installation, wiring, maintenance, inspection, or parts replacement.

2.2 Installation Environment Requirements

General environment requirements

Set up the robot system in accordance with the following environment requirements to maximize and maintain the performance of the robot and to use it safely.

Table 2–1 Ambient conditions

Item	Requirements
Ambient temperature and humidity	• Operating temperature range: 0°C to 45°C Air temperature change rate less than 1.5° C/min • Humidity range: 5% RH to 95% RH, non-condensing
Storage temperature and humidity	• Temperature range: –10°C to +55°C • Humidity range: Up to 95% RH, non-condensing
Transportation temperature and humidity	• Temperature range: –10°C to +55°C • Humidity range: Up to 95% RH, non-condensing
Electrical fast transient/burst immunity	⩽ 2 kV
Static immunity	⩽ 6 kV
Environment	• Install indoors • Keep away from direct sunlight. • Keep away from dust, oil smoke, salt, and iron filings. • Keep away from flammable and corrosive liquids and gases. • Keep away from water. • Keep away from shocks and vibrations. • Keep away from sources of electrical interference.



The robot is not suitable for use in harsh environments such as explosive spraying operations. Contact your provider if the robot needs to be used in an environment that does not meet the preceding conditions.

The EMC test is performed according to IEC 61800-3:2017.

Special environment requirements

- The surface of the robot provides certain protection. However, contact your provider and confirm in advance if the robot may come into contact with special liquid or gas during use.
- There may be condensation inside the robot if it is used in an environment with large changes in temperature and humidity. Consult your provider.
- If you want to use the robot to handle food directly, consult your provider in advance to avoid contamination of the food by the robot.



Do not wipe the robot hard with alcohol or benzene, as this may cause the gloss of the painted surface to deteriorate.

2.3 Foundation

If the robot is installed on the ground, prepare the foundation for installation of the robot.

- The foundation shall be able to bear the gravity and dynamic force generated by the robot.
- The ground is level and flat.
- The vibration generated by machines near the robot will reduce the accuracy and repeatability of the robot motion. The vibration isolation design for the foundation structure is recommended to minimize the vibration.



Do not install the robot directly on the ground because the robot will put great stress on the ground and need a suitable support surface.

2.4 Installation Base Table Requirements

You need to make a base table to fix the robot. The shape and size of the base table vary depending on the purpose of the robot system. You may refer to the following requirements when designing a base table.

- The base table supports not only the weight of the robot, but also the dynamic forces produced by the robot when it moves at maximum acceleration. Ensure that the base table has sufficient bearing capacity by reinforcing it with materials like connecting beams.
- Consider the following torques and reaction forces produced by movements of the robot.

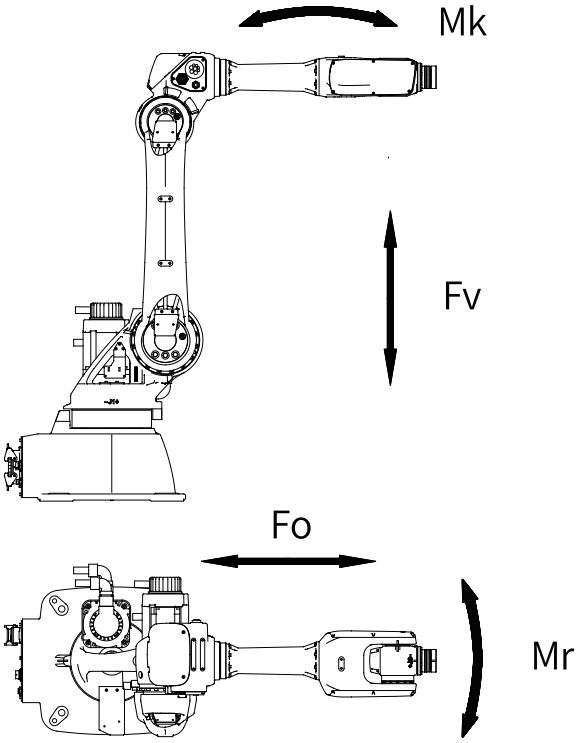


Figure 2-1 Stress generated by the robot on the support structure

- Use M16 threaded holes on the base table to mount the robot. Use screws with a strength equivalent to the performance level of Grade 12.9 specified in GB/T 3098.1.
- To dampen vibrations, use a steel plate with a thickness over 30 mm, a surface roughness of 25 μm, and a flatness below 0.2 mm as the robot mounting surface.
- Fix the base table firmly on the ground.
- Keep the Z axis of the robot perpendicular to the horizontal plane during installation.

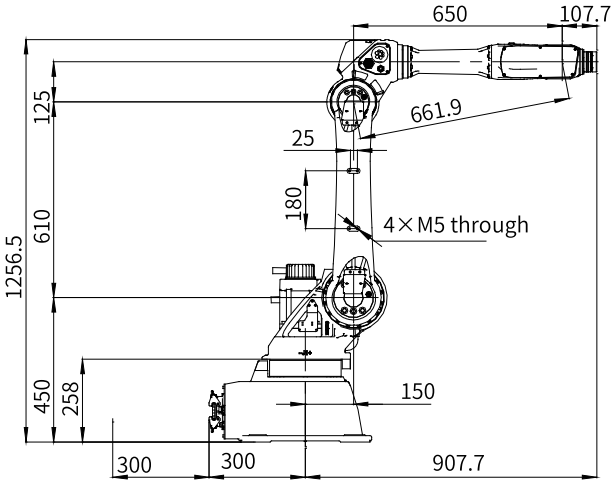
- Reserve enough space for the robot control cabinet in the base table design. For space requirements of control cabinets, see the user guide of the robot control cabinet.

2.5 Installation Clearance

2.5.1 Installation Space

1. In addition to the space required for the robot body, control cabinet, and peripherals, ensure the following minimum required spaces:
   - Space for teaching
   - Space for maintenance and inspection (for mounting fixtures)
   - Space for cables
2. The minimum bending radius of power cords and signal cables is 170 mm. When installing the robot, pay attention to the distance from obstacles. Reserve enough space for cable bending radius to avoid cable damage or breakage caused by extreme bending. For details, see *"4.3.3 Cable Hole Dimensions" on page 44*.
3. Reserve at least 100 mm between the boundary of the motion range and the safety fence.

2.5.2 Installation Dimensions



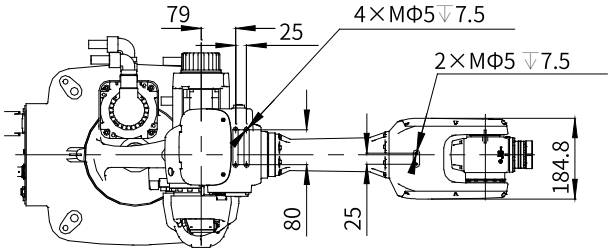


Figure 2-2 Installation part dimensions

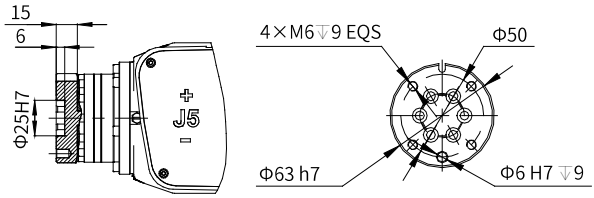


Figure 2-3 Flange installation dimensions

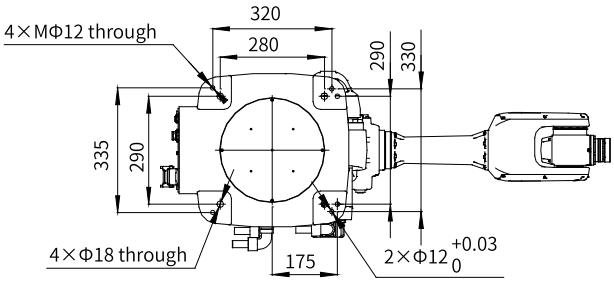


Figure 2-4 Base installation dimensions

3 Unpacking and Transportation

3.1 Precautions



Check whether the packing is intact and whether there is damage, water seepage, dampness, and deformation before unpacking.
Unpack the product layer by layer. Do not strike the package violently.
Check the surfaces of the equipment and accessories for any damage, rust, and scratches.
Check the equipment, accessories, and materials in the package against the packing list.



Do not install the equipment if you find damage, rust, or indications of use on the equipment or accessories.
Do not install the equipment if you find water seepage, component missing or damage upon unpacking.
Do not install the equipment if you find the packing list does not conform to the equipment you received.
Unpack the packing box according to the direction instructed.

Danger

Only qualified personnel are allowed to carry out transportation including rigger operation, hoisting by crane, and forklift driving.

Warning

- Transport the equipment with a hoist or forklift with the original package.
- Wear personal protective equipment (PPE) during transportation with a hoist or forklift. Prohibit any personnel to stand or stay in the transportation route.
- Stabilize the equipment with hands when hoisting it. Unstable hoisting may result in the equipment falling over. This may cause severe bodily injury or equipment damage.

Caution

- Store and transport this equipment based on the storage and transportation requirements for humidity and temperature.
- Avoid transporting the equipment in environments such as water splashing, rain, direct sunlight, strong electric field, strong magnetic field, and strong vibration.
- Pack the equipment strictly before transportation. Use a sealed box for long-distance transportation.
- Never transport this equipment with other equipment or materials that may harm or have negative impacts on this equipment.
- If condensation occurs on the device during transportation or storage, remove the condensation before turning on the power.

3.2 Unpacking Procedure

Prepare a claw hammer, a pair of scissors, and a pair of gloves.

Unpacking procedure:

1. Wear protective gloves before operation, and remove the top access cover and four side plates of the case.

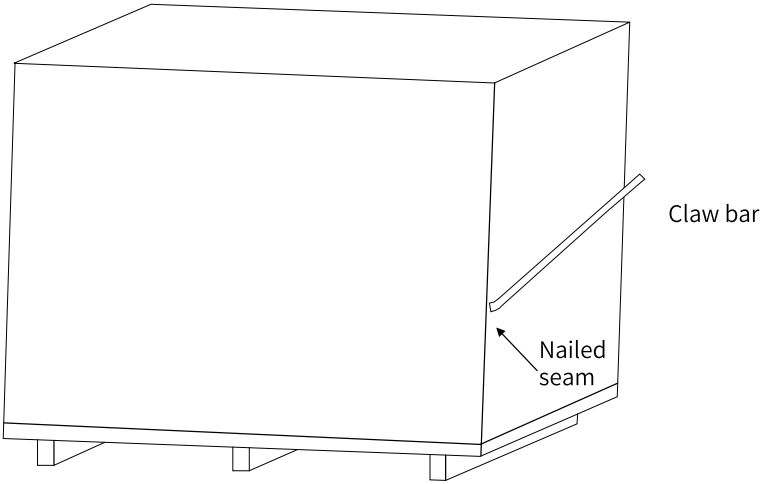


Figure 3-1 Outer carton structure

Note

Use a claw hammer for unpacking, which is more secure.

2. Use scissors to cut the packing tape of the case.

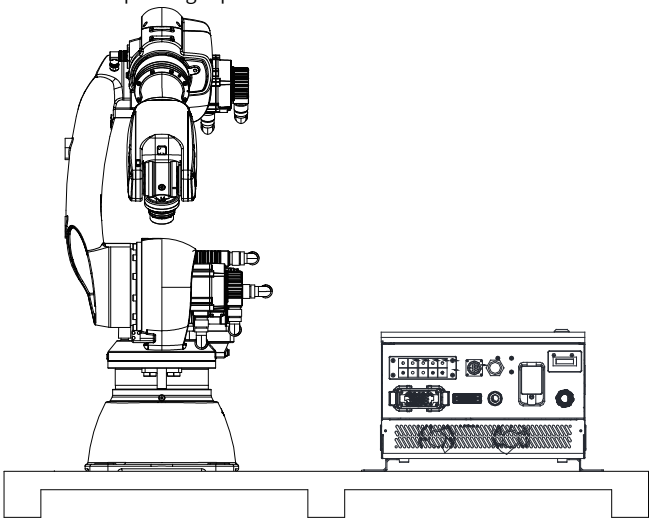


Figure 3-2 Packing of the robot

3.3 Check After Unpacking

Check the products and accessories against the packing list after unpacking.

Table 3–1 Packing list

Description	Quantity (pcs)
IR-R10-140S-INT robot body	1
IRCB501 high-protection robot control cabinet	1
Inovance Product Warranty Card	1
Cable set	1
M16x50 hexagon socket head cap screws(Grade 12.9 in GB/T 70.1-2000)	4
Spring washer (GB/T 93-1987)-16	4
Plain washer (GB/T 97.1-2002)-16	4
Eye bolt (GB/T 825)-M12	4
Cable plug-in kit	1
List of zero point information for each axis	1

3.4 Handling

Pre-Handling Preparation

Follow safe operation during the handling process. For details, see *" Safety Precautions" on page 6*.

Prepare safety shoes, lifting ropes, forklift, and other equipment. The handling must be performed by at least two people.

1. If the robot is newly manufactured, keep it in the same posture as it was in the factory, as shown in the following figure.
   Angles of the axes:

J1	J2	J3	J4	J5	J6
0°	+50°	–70°	0°	–70°	0°

2. If the robot has been used and needs to be moved to another location, complete the following steps before handling:
   - Adjust the robot to the posture for handling.
   - Disconnect power to all devices.
   - Unplug power and signal cables connected to the control cabinet.
   - Unscrew the base mounting screws and remove the robot from the mounting base.
   - Secure the robot to the handling equipment.

Handling procedure

Note

- The equipment is heavy and manual handling is strictly prohibited.
- Wear safety shoes for handling and at least two people are required.
- Wear protective equipment and ensure that the lifting area is safe enough to avoid collision hazards.

Warning

- Take care when lifting the robot with a crane or forklift. When placing the robot on the ground, avoid any strong collision between the robot mounting face and the ground.
- Before handling the robot, remove the end effector and the pallet. When it is necessary to handle the robot with the pallet, observe the following precautions.
- The end effector may oscillate due to vibration during transportation and excessive loads may be applied to the robot.
- When handling the robot with the pallet installed, lift the pallet rather than the robot directly.

Handling with a crane

In principle, use a crane to move and transport the robot.

1. Set up the robot in the factory posture as shown in the figure below, then install four eye bolts (M12) on the robot base, and lift it with four lifting straps. It is recommended that the lifting strap length be 1.5 m, and the lifting strap load capacity be no less than 500 kg. Protect the contact part between the lifting straps and the robot body with soft cloth or a protective soft pad.

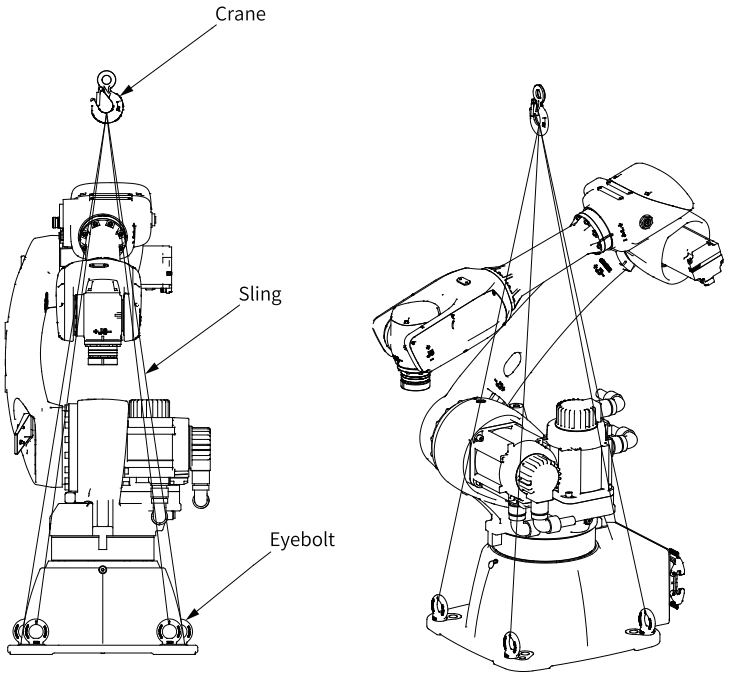


Figure 3-3 Lifting the robot

2. Use four lifting straps to lift the robot. Ensure that the robot is balanced before moving the crane.
3. Two people should work together for the handling. One person should observe in the safety zone to ensure that the ambient conditions are met during the operation, while the other operates the crane to slowly lift the robot body and move it to the base table.

Note

- It is recommended to use a 1.5 m flat sling. Make sure that the flat sling is intact with a load-bearing capacity of not less than 500 kg.
- Wear protective equipment and ensure that the lifting area is safe enough to prevent collision hazards.

Handling with a forklift

When handling the robot using a forklift, use bolts to secure the robot onto its original pallet or use screws to secure it on a baseplate with sufficient load-carrying capacity, and lift the robot together with the pallet or baseplate.

Transport the robot slowly and carefully to prevent it from toppling or tilting over.

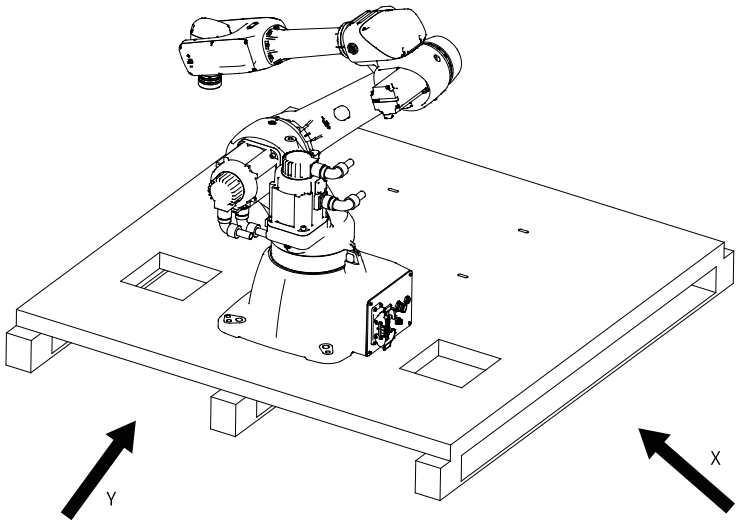


Figure 3-4 Handling the robot with a forklift

Note

When the factory pallet is used and the robot is located on one side of the pallet, apply a counterweight on the other side upon forklift insertion, to prevent the robot from tipping over.

4 Installation

4.1 Installation precautions



- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed by professionals.
- Install a safety fence for the system. Failure to comply will result in serious accidents.
- Reserve sufficient space between the equipment and surrounding buildings, structural parts, and devices. Failure to comply may cause serious injury or major damage.
- Fix the manipulator before turning on the power or operating the system. Otherwise, the manipulator may fall over and cause serious injury or major damage.

Note

- Do not modify the equipment.
- Do not install this equipment in places with strong electric or magnetic fields.
- Remove the mounting screws of the manipulator and adjust the robot to its transport posture.
- For the tabletop mounting, at least two people are required for the operation.

4.2 Installing the Robot Body

Follow the following steps to install the robot body:

1. Disconnect power to all devices.
2. Clean the surface onto which the robot is to be mounted.

Note

To dampen vibrations, use a steel plate with a thickness over 30 mm and a surface roughness below 25 μm as the robot mounting surface.

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3. Move the robot near the mounting surface.
4. Align the robot base with the two locating pin holes.
5. Install the two locating pins.

6. Install four spring washers and four plain washers, and tighten them with four M16x50 hexagon socket head cap screws (tightening torque: 250±10 N·m). Use screws with a strength equivalent to the performance level of Grade 12.9 specified in GB/T 3098.1.

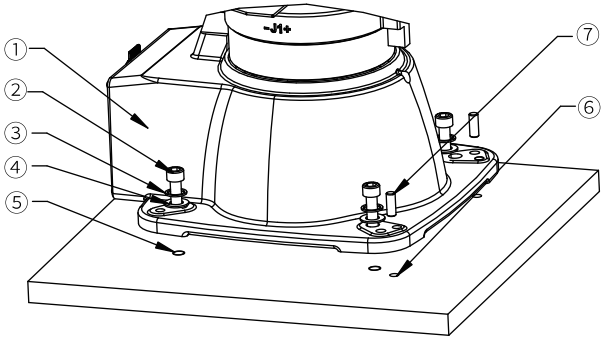


Figure 4-1 Installing the base

No.	Component
①	Robot base
②	Four M16x50 hexagon bolts (Grade 12.9 in GB/T 70.1-2000)
③	Four spring washers (GB/T 93-1987)-16
④	Four plain washers (GB/T 97.1-1985)-16
⑤	Threaded mounting holes (depth: > 25 mm)
⑥	Mounting pin holes (depth: > 20 mm)
⑦	Two Φ6x32 parallel pin with internal threads (GB/T 120.2-2000)

4.3 Cable Connection

4.3.1 Connecting the Power Line and Signal Cable

Danger

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed by professionals.
- Cut off the power before wiring. Failure to comply will result in electric shock or system fault.
- Before wiring, cut off all equipment power supplies. Residual voltage exists after power cut-off. Therefore, wait at least 10 minutes before further operations.
- Ensure that the safety input signals, such as the emergency stop switch and safety door switch are connected correctly before wiring. Otherwise, the safety protection will not work properly in emergency cases, causing serious injury or damage.
- Make sure that the equipment is well grounded. Failure to comply will result in an electric shock.
- During wiring, follow the proper electrostatic discharge (ESD) procedure, and wear an antistatic wrist strap. Failure to comply will damage the equipment or the internal circuits of the equipment.

Warning

- Connect the cables securely. Do not lay heavy objects on the cables, or bend or pull the cables forcibly. Failure to comply will result in cable damage, wire breaking, or poor contact, causing electric shock or system fault.
- Wiring cables must meet diameter and shielding requirements. The shielding layer of the shielded cable must be reliably grounded at one end.
- Make the connections in correct sequence. Otherwise, the system may not work properly, which may cause safety hazards.
- After wiring, make sure there are no fallen screws and exposed cables inside the equipment.

Connection method:

1. Connect the heavy-duty connector for the user cable to the heavy-duty connector on the robot base.
2. Connect the power connector and signal connector of the user cables to the electric control cabinet.
3. Connect the safety terminals in the accessory kit to the corresponding terminals in the control cabinet.

4. Connect the power terminals in the accessory kit and then plug them into the power connectors of the control cabinet. Check that the L/PE/N sequence of the cable is correct.

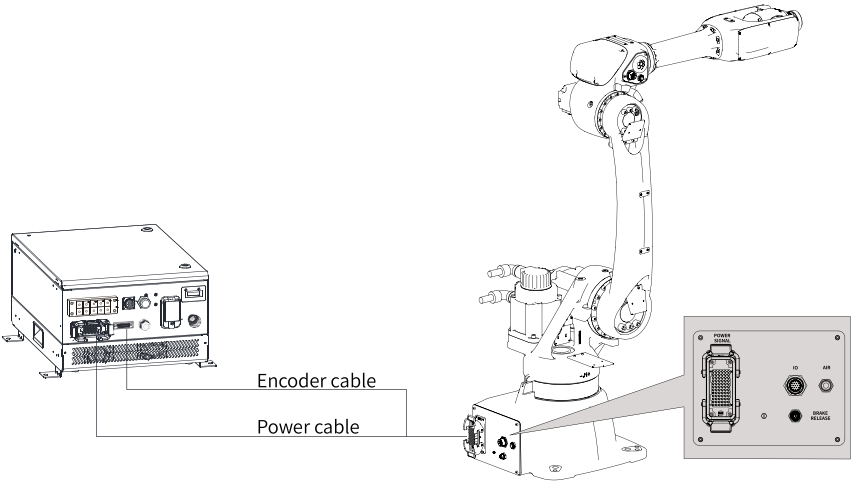
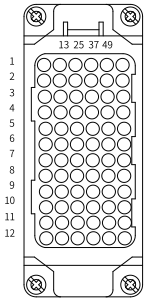


Figure 4-2 Power line and encoder cable connection

4.3.2 Terminal Assignment of the Heavy-Duty Connector

Table 4–1 Terminal assignment

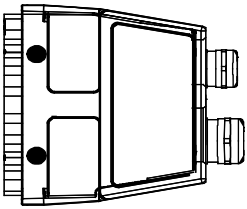
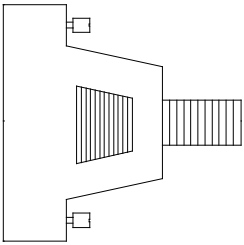
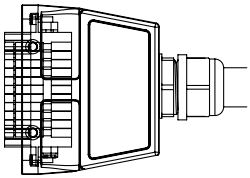
Connector pin layout	Pin No.	Assign ment	Pin No.	Assign ment	Pin No.	Assign ment	Pin No.	Assign ment
	1	1U	21	-	41	4BK–	61	6U
	2	1V	22	14GND	42	56BK+	62	6V
	3	1W	23	2PS–	43	-	63	6W
	4	1PE	24	2PS+	44	GND	64	6PE
	5	1BK–	25	3U	45	-	65	6BK–
	6	0V	26	3V	46	23GND	66	-
	7	-	27	3W	47	4PS–	67	-
	8	-	28	3PE	48	4PS+	68	B–
	9	1FG	29	3BK–	49	5U	69	A–
	10	14VCC	30	34BK+	50	5V	70	56GND
	11	1PS–	31	-	51	5W	71	6PS–
	12	1PS+	32	0V	52	5PE	72	6PS+
	13	2U	33	—	53	5BK–	-	-
	14	2V	34	23VCC	54	-	-	-
	15	2W	35	3PS–	55	-	-	-
	16	2PE	36	3PS+	56	B+	-	-
	17	2BK–	37	4U	57	A+	-	-
	18	12BK+	38	4V	58	56VCC	-	-
	19	-	39	4W	59	5PS–	-	-
	20	24V	40	4PE	60	5PS+	-	-

4.3.3 Cable Hole Dimensions

When cutting cable holes on the base table, refer to the following connector dimensions.

Reserved cable bending radius: 170 mm

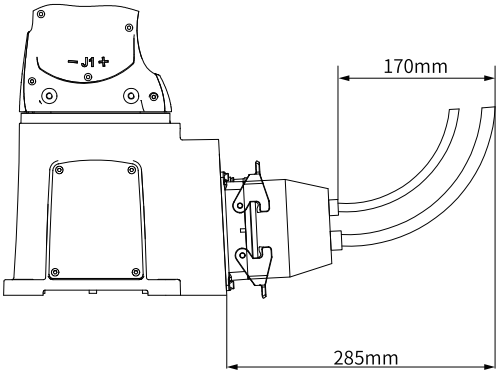
Table 4–2 Cable hole dimensions

Name	Connector on Robot Body Side	Encoder Cable Connector (Control Cabinet Side)	Power Line Connector (Control Cabinet Side)
Dimensions			
	105 mm x 100 mm x 60 mm (L x W x H)	54 mm x 55 mm x 18 mm (L x W x H)	85 mm x 72 mm x 42 mm (L x W x H)

Caution

- During cable connection, reserve a margin for cables at turns and do not pull the cables tight. The bending radius of a cable is about 10 times its diameter (170 mm).
- Do not bind the redundant power cables into a bundle of coils (two coils are acceptable) stacked together. Otherwise, cables may be damaged due to overheating.
- Connect the male heavy-duty connector straight to the female connector to avoid damaging the guide pin or contact.
- Never violently connect heavy-duty connectors (male and female) to avoid pin displacement or bending.
- The clips on the heavy-duty connectors are only used to fasten the connectors.

Reserved space (connector size+cable bending radius) for cables on the robot side: 285 mm. The bending radius of cables is approximately 170 mm, as shown in the following figure.



Opening size: the size of the opening reserved on the housing or sheet metal for the robot plug to pass through, as shown in the following figure.

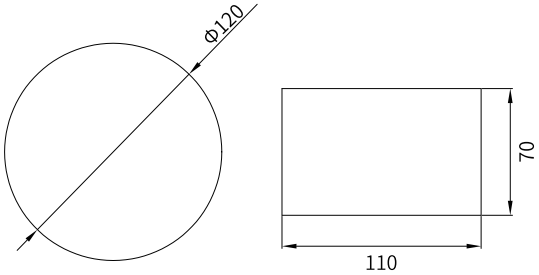


Figure 4-3 Opening size (unit: mm)

4.4 User Wiring and Tubing

4.4.1 Wiring (Cables)

Note

- Perform wiring and air tubing of the chuck only when the power supply is disconnected and the workpiece is not placed.
- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.

Available cables are built in the robot body. The following table describes the specifications of signal cables.

Rated Voltage	Allowable Current	Number of Lines	Nominal Cross-sectional Area of Conductor
30 VAC/VDC	0.5 A	19	25 AWG



Current higher than 0.5 A is not allowed.

The following table describes the specifications of connectors.

Model	Code
19-pin male aviation connector (90°)	15050930
19-pin male aviation connector (90°), with cable	15051215
I/O cable (5 m)	1504B978

4.4.2 Tubing (Air Ducts)

User tubing (air ducts)

The following table describes the specifications of air ducts.

Maximum Operating Pressure	Quantity	Specifications (Outer Diameter x Inner Diameter)
0.59 MPa (5.9 kgf/cm^2)	1	Φ 8 mm x Φ 5.7 mm

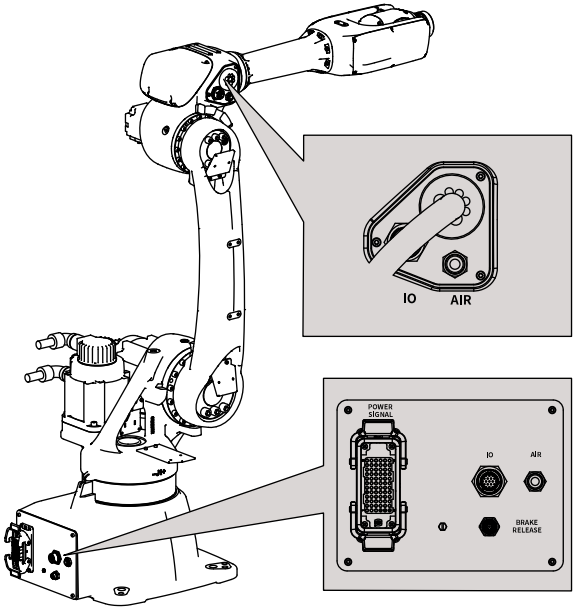


Figure 4-4 User wiring/tubing connectors

Terminal	Description
POWER/SIGNAL	Interface for power/signal cable
I/O	User I/O interface
AIR	User tubing interface
BRAKE RELEASE	Brake release interface

4.4.3 Robot Aviation Connector Pins

The robot provides a 19-pin aviation connector at the elbow joint and on the base respectively. The two connectors are interconnected by a special cable inside the robot body.

The connector on the elbow joint is a 90° elbow aviation connector (without wire), and the connector on the base is a straight aviation connector (with wire). The connection between the 19-pin aviation connector on the base and that at the elbow joint (top of the forearm) is described as follows:

1. Pins other than pin 19 of the two connectors are directly connected internally as user I/Os, and the pin functions can be customized.
2. Pin 19 is connected to the shield.

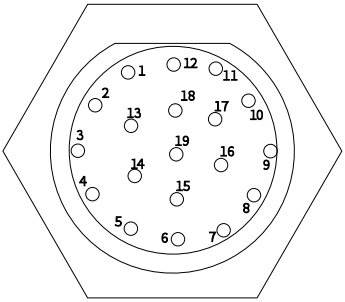


Figure 4-5 Aviation connector pin layout

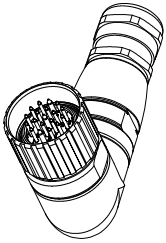


Figure 4-6 Aviation connector pins at the elbow

Base Position			9P×0.2 mm²	Elbow Position		
Pin	Color	Signal		Pin	Color	Signal
19	Shield	FG		19	Shield	FG
1	Blue			1	Blue	
2	White			2	White	
3	Yellow			3	Yellow	
4	White			4	White	
5	Green			5	Green	
6	White			6	White	
7	Red			7	Red	
8	White			8	White	
9	Purple			9	Purple	
10	White			10	White	
11	Blue			11	Blue	
12	Brown			12	Brown	
13	Yellow			13	Yellow	
14	Brown			14	Brown	
15	Green			15	Green	
16	Brown			16	Brown	
17	Red			17	Red	
18	Brown			18	Brown	

Figure 4-7 Internal wiring of the I/O cable

Aviation connectors are options. *"6.8 Options" on page 75*

4.5 Installing an End Effector

Customers shall prepare end effectors. Observe the following precautions when installing an end effector.

Caution

- Perform installation only when the power supply is disconnected and the workpiece is not placed. If the emergency stop switch is pressed when the power is still connected, the workpiece may be released at this time, which may cause damage to the robot system and workpiece.
- Pay attention to the interference area of the end effector during system layout design. After the end effector is installed, the end effector or workpiece may come into contact with the robot body during motion due to the outer diameter of the end effector, the size of the workpiece, or the position of the robot arm, which may cause damage to the robot system and the workpiece.

Use M6 screws to attach the end effectors to the wrist flange.

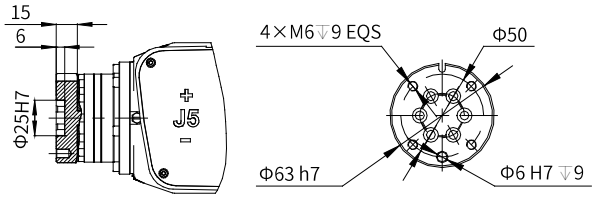


Figure 4-8 Wrist flange (unit: mm)

5 Motion Range

5.1 Methods of Setting the Motion Range



- When limiting the motion range for safety reasons, consider both the angle ranges and mechanical stops.
- The default motion range at delivery is the maximum motion range of the robot.

To improve layout efficiency and to take into account the maximum safe range of motion of the robot, the following motion range setting methods are provided:

1. Angle range (all joints)
   The basic unit of motion of a robot is degree. The robot's motion limit (motion range) is set based on the angle lower limit and angle upper limit (angle range) of each axis.

   The motion angle is determined by the encoder output pulse value of the servo motor, and the angle range must be set within the mechanical stop range.

   When the robot receives a motion command, it will check whether the target position of the command is within the angle range before moving. If the target position is beyond the set angle range, an error occurs and no action will be taken.

Note

You can set the angle range by choosing "Settings" > "Motion Parameters" > "Axis Parameter Settings" > "Axis Limits" on the teach pendant.

2. The mechanical stop is used to mechanically set an absolute motion range beyond which motion is not allowed.
   If you need to limit the motion range for safety reasons or to improve layout efficiency, set it according to *"5.2.1 Maximum Angle Range of J1" on page 51*. *"5.3 Mechanical Limit Stops" on page 56*

5.2 Setting Motion Range By Using Angle Range

5.2.1 Maximum Angle Range of J1

The counterclockwise angle is positive (+), and the clockwise angle is negative (–).

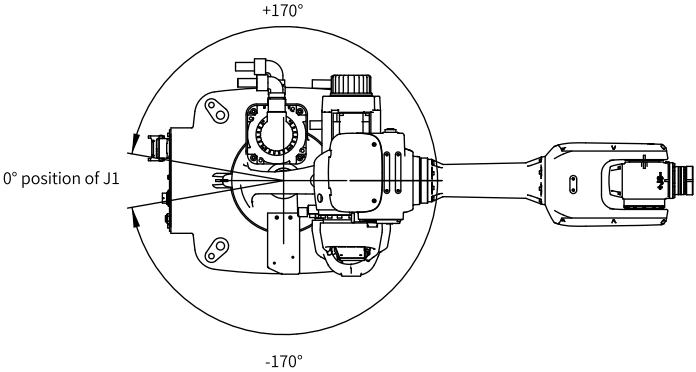


Figure 5-1 Maximum Angle Range of J1

5.2.2 Maximum Angle Range of J2

The counterclockwise angle is positive (+), and the clockwise angle is negative (–).

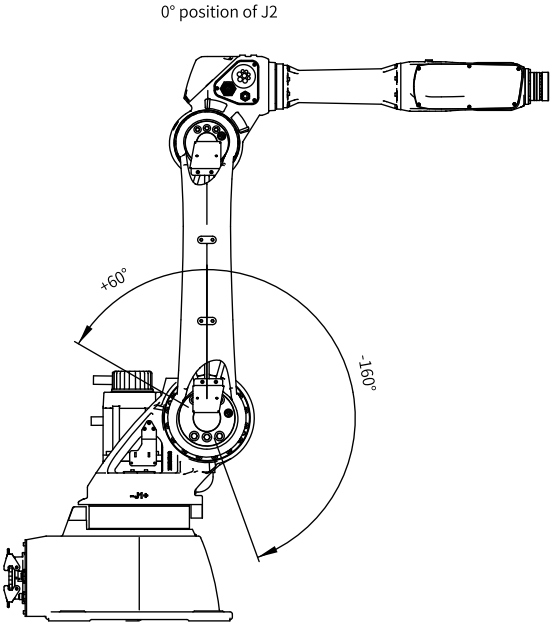


Figure 5-2 Maximum Angle Range of J2

5.2.3 Maximum Angle Range of J3

The counterclockwise angle is positive (+), and the clockwise angle is negative (–).

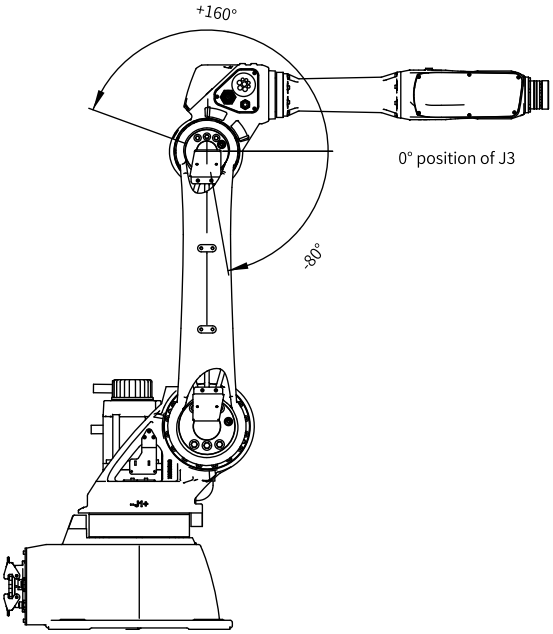


Figure 5-3 Maximum angle range of J3

5.2.4 Maximum Angle Range of J4

Viewed from the end of the robot arm, the counterclockwise angle is positive (+), and the clockwise angle is negative (–).

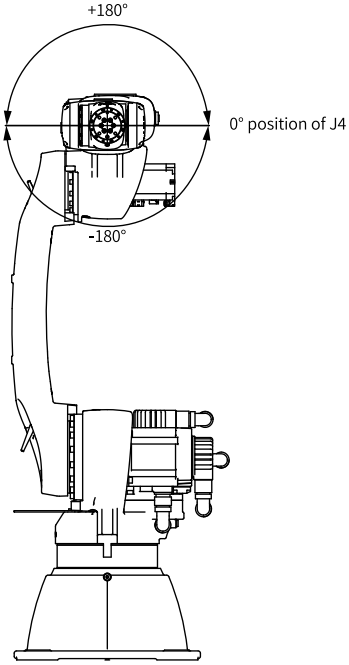


Figure 5-4 Maximum angle range of J4

Caution

J4 is not equipped with a mechanical stop. If its maximum angle range is exceeded, the internal wiring may be damaged or the robot may fail.

5.2.5 Maximum Angle Range of J5

The counterclockwise angle is positive (+), and the clockwise angle is negative (–).

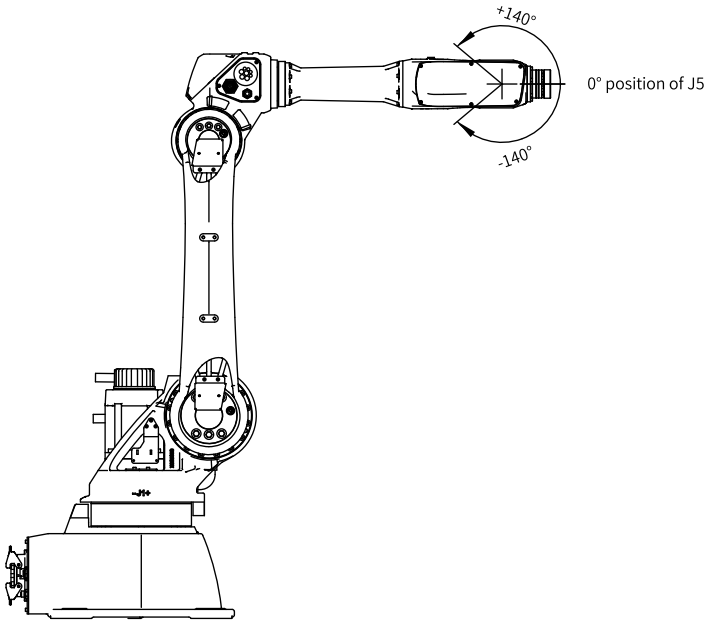


Figure 5-5 Maximum angle range of J5

5.2.6 Maximum Angle Range of J6

Viewed from the end of the robot arm, the counterclockwise angle is positive (+), and the clockwise angle is negative (–).

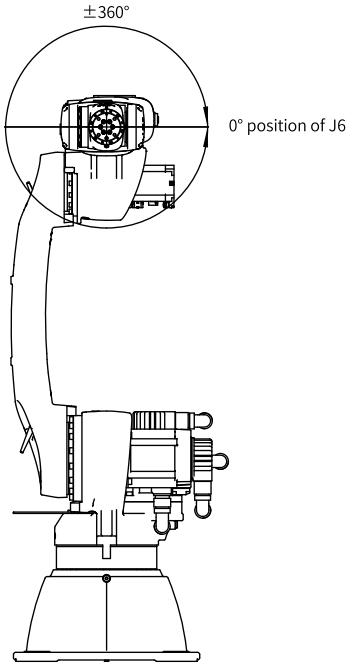


Figure 5-6 Maximum angle range of J6

5.3 Mechanical Limit Stops

As shown in *"Figure 5–7 " on page 57* , IR-R10 series models have a mechanical limit stop that is pre-installed at J1.

The setting of the angle range cannot exceed the set angle range of the mechanical stop, which is ±173°.

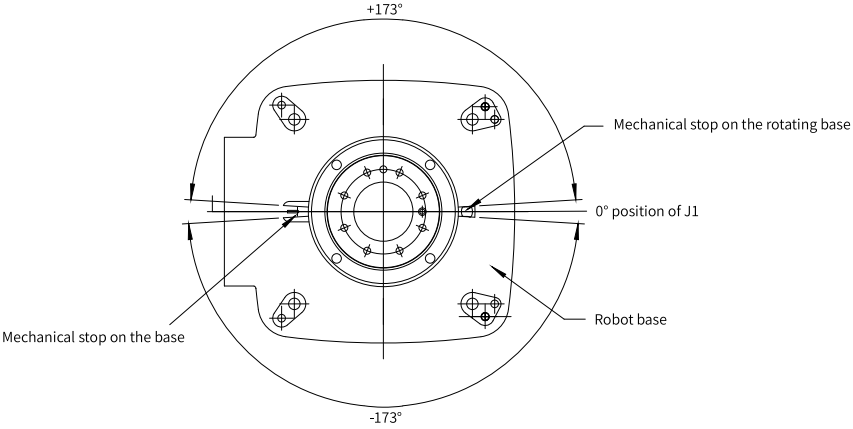


Figure 5-7 Mechanical limit stops for J1

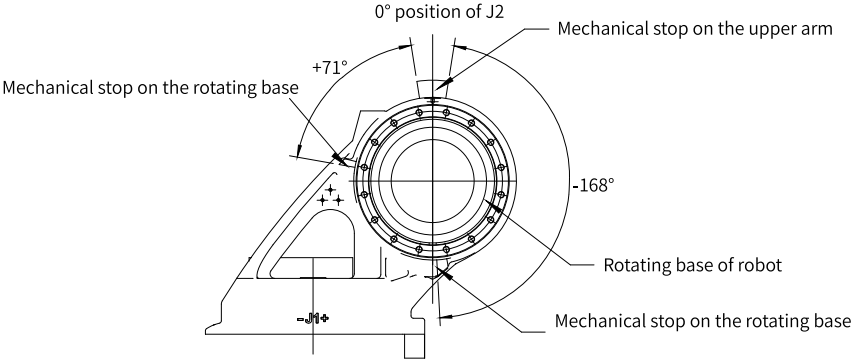


Figure 5-8 Mechanical limit stops for J2

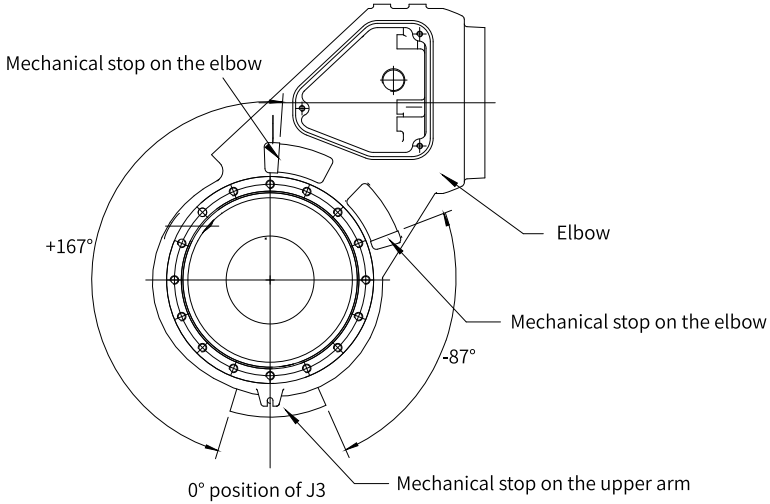


Figure 5-9 Mechanical limit stops for J3

6 Maintenance

6.1 Safety Instructions

Before maintenance, read the precautions for maintenance, this guide, and other related guides carefully to fully understand the methods of safe maintenance.



- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed by professionals.
- Do not maintain the equipment after power-on. Failure to comply will result in an electric shock.
- Do not remove the parts not mentioned in this document. Do not maintain any part with a method different from that described in this document.
- Check the motion of the robot after parts replacement outside the safety fence. Failure to comply may cause severe safety issues due to abnormal movement of the robot.
- Make sure that the emergency stop switch and safety door switch work properly before operation. Otherwise, safety protection function will not work properly in emergency cases, causing serious injury or damage.



- Require for repair services according to the product warranty agreement.
- Perform daily and periodic inspection and maintenance for the equipment according to maintenance requirements and keep a maintenance record.
- When the equipment is faulty or damaged, require professionals to perform troubleshooting and repair by following repair instructions and keep a repair record.
- Replace quick-wear parts of the equipment according to the replacement guide.
- Prevent foreign objects from entering the equipment and terminals during maintenance.
- Open the equipment cover only when repair and maintenance.
- After the equipment is replaced, perform wiring inspection and parameter settings again.

6.2 Inspection and Maintenance Items

Inspect and maintain the robot regularly for the robot to run more safely and efficiently. The target parts can be inspected and maintained daily, monthly, quarterly, semi-annually, and annually as needed.

The list of maintenance items lists the necessary maintenance items at each stage. In the rightmost column of the table, the maintenance personnel are divided into "Professionals", "Qualified Personnel", and "Manufacturer" (that is, Inovance). You can designate skilled personnel to carry out various maintenance operations.

1. Daily inspection and maintenance

Check Item	Check Measure
Visual inspection	• Check all joint gaps, oil filling ports, and drain ports for grease leakage. • Check robot exterior for any impact damage.
Screw tightening inspection	Check all screws for looseness throughout the robot and check whether the screw tightening torques meet the requirements.
Noise inspection	Check all transmission mechanisms for unusual sounds.
Joint transmission mechanism inspection	Check for table running and abnormal jittering of the transmission mechanisms.
Pipeline accessory inspection	Check whether the pipeline accessories are complete, worn and rusted.
Control inspection of all electrical components	Check whether the control buttons of all electrical components of the robot are normal.

2. Weekly inspection and maintenance

Check Item	Check Measure
Brake inspection	Check whether the brake of each axis of the robot is effective.
Motion range of each axis	• Check whether the motion range of each axis is within the normal angle range. • Check whether the zero point position of each axis is aligned.
Torque wrench and hexagon screwdriver bit	Due to the risk of screw thread stripping, inspect the torque wrench and hexagon screwdriver bit for wear before use and replace if necessary.

3. Monthly inspection and maintenance

Check Item	Check Measure
Control cabinet heat dissipation inspection	Check whether the fan behind the control cabinet is ventilated smoothly. It is recommended to replace or maintain the fan once a month.

4. Inspection and maintenance every six months

Check Item	Check Measure
All wiring harnesses for each electrical component	• Check all cable connectors of the robot body for bending, corrosion and falling off. • Check the cables outside the control cabinet for bending, corrosion and falling off. • Check the cable of the teach pendant for bending, corrosion and falling off.

5. Inspection and maintenance every year

Check Item	Check Measure
Control cabinet DI/DO signal	Check whether the DI/DO signal response of the control cabinet is normal.
Reducer of each axis	Check whether the lubrication of the reducer of each axis of the robot is normal and whether there is abnormal noise.
Cleaning of all electrical components	Check the cleanliness of all electrical components. Under normal circumstances, remove dust for all electrical components every year.
Control cabinet fan filter	Check the cleanliness of the filter of the control cabinet fan, and replace the filter once a year under normal circumstances.
Concentration of iron powder worn by each joint of robot	Check the wear iron powder concentration of each joint once a year.

6. Inspection and maintenance every 1.5 years

Check Item	Check Measure
Battery inspection	Check whether the battery is normal. Under normal circumstances, replace the battery once every 1.5 years. If the battery capacity is low, replace the battery in time.



Due to the risk of screw thread stripping, inspect the torque wrench and hexagon screw-driver bit for wear before use and replace if necessary.

6.3 Applying Lubricating Grease

Measure the concentration of iron powder in the reducer grease every 5,000 hours or every 1 year of operation (2,500 hours or every six months for loading and unloading application).

If the standard concentration value is exceeded, replace the grease or reducer. Contact the service center of Inovance.

Note

Lubricating grease of reducers of J1 to J3 of the IR-R10-140S-INT robot must be replaced. The J4, J5, and J6 use a harmonic reducer and thus lubricating grease replacement is not required.

Caution

1. Only apply the original lubricating grease to the reducer.
2. Normally, the reducer does not need to be greased. However, under the extreme conditions (duty cycle, speed, and load), the grease needs to be replaced regularly.
3. Replacing grease by non-professional personnel is not allowed. If maintenance is needed, contact Inovance after-sales maintenance personnel.

Note

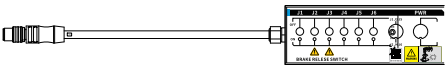
If the lubricant gets into your eyes, mouth, or on your skin, follow the instructions below:

1. If the lubricant gets into your eyes, flush them thoroughly with clean water, and then see a doctor immediately.
2. If the lubricant gets into your mouth, wash out your mouth with water thoroughly, If swallowed, see a doctor immediately.
3. If the lubricant gets on your skin, wash the area thoroughly with soap and water.

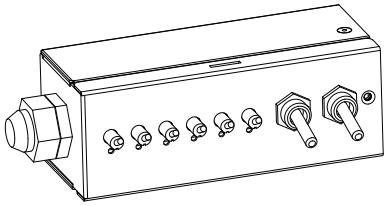
6.4 Wiring of the Brake Release Switch

In the event of an abnormal robot operation, such as a collision that causes a jam, which cannot be improved using the teach pendant, you can alleviate the jam using the brake release switch provided that the control cabinet is powered on.

The brake release switch is optional. The following table describes the brake release switch.

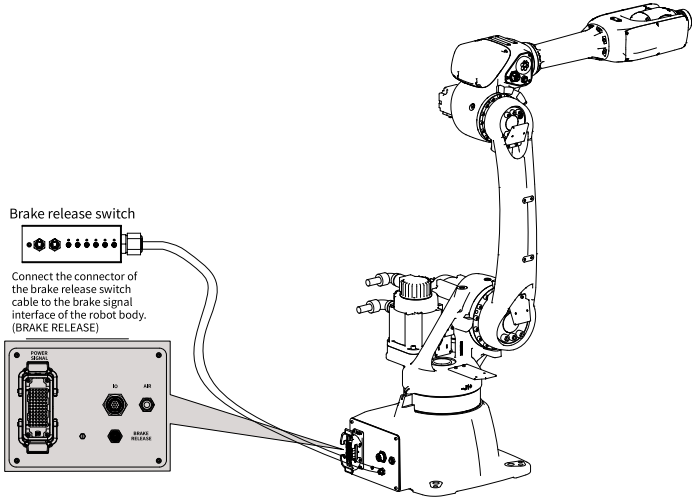
Order No.	Accessory Description
01660004	Control cabinet option - IRCB-KEY1-6 axis brake release switch box
Product appearance	

Appearance of the brake release switch



Connect and use the brake release switch as follows:

1. Connect the cable of the brake release switch box to the brake release signal interface of the robot body.



2. Toggle the PWR switch to ON, then toggle the switch of the corresponding axis (such as J1) to ON, and keep pressing to release the brake of the corresponding axis.
3. Manually rotate the robot arm to move it away from he collision object.

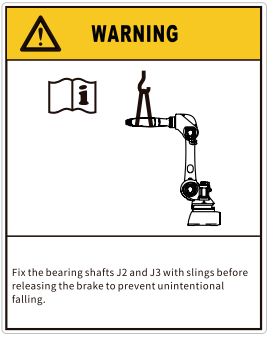
Note

- When the group switch is turned to J1, J3, and J5, the corresponding J1, J3, and J5 single-axis switches must be turned to the ON position to open the corresponding axis brake. When the group switch is turned to J2, J4, and J6, the corresponding J2, J4, and J6 single-axis switches must be turned to the ON position to open the corresponding axis brake.
- For example, to release the brake of J1, first turn the PWR switch to the ON position, turn the group switch to J1, J3, and J5, then turn J1 to ON, and keep pressing to release the brake of J1.

Caution

- For system safety, perform brake release operation on a single axis.
- Before releasing the brake, ensure that the arm weight will not increase the pressure on trapped personnel. Otherwise, the risk of injury may be increased.
- When releasing the brake, note that the robot arm may fall due to gravity, resulting in injury, pinching, or equipment damage or malfunction.
- After the brake release is completed, be sure to disconnect the brake release box to avoid accidental operation that may result in injury to personnel.
- For the release of the brake for any robot arm with a weight greater than 20 kg, two people are required for the operation.

The J2 and J3 axes are gravity bearing axes. Secure them with a sling before releasing the brake to prevent falling and injury, as shown in the figure below.



4. After the brake release operation is completed, disconnect the brake release switch box.

6.5 Oil Leakage Inspection

6.5.1 Daily Inspection

Check the following items each day when the system is running.

Inspection Item	Content
Oil leakage	Check for oil leakage at each joint. Wipe off any oil leaked.

6.5.2 Oil Leakage Inspection Parts

- Insert a piece of cloth into the gap of each joint. Check for oil leakage at each joint. Wipe off any oil leaked.

- Depending on operating conditions and the surrounding environment, a small amount of oil may seep out from the outer side of the oil seal lip (minor adhesion). When this oil accumulates into droplets, it may drip under certain movements. Before operating the robot, wipe off any oil residue beneath the oil seal.
- In case of great leakage, change another grease or oil.
- When opening the lubrication grease supply/drain port, take care to prevent grease splashing.
- If the operating temperature becomes excessively high, internal pressure in the grease chamber may rise. In such cases, after operation, open the oil filler port once to restore normal internal pressure.

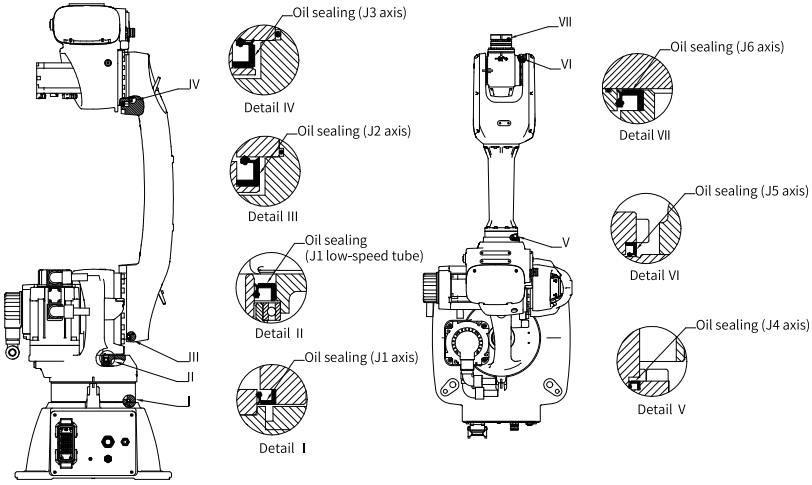


Figure 6-1 Oil leakage inspection parts

Caution

- When opening the oil filling port, lubricating grease may be sprayed out at high temperature. Prepare plastic bags in advance and lay them under the oil filling port.
- Wear heat-resistant gloves, protective goggles, masks, and protective clothing as needed.
- If oil leakage persists after frequent wiping, see *"6.5.3 Lubricating Grease Leakage and Solution" on page 66* for handling.
- When reinstalling the screw plug into the oil filler port, check whether the tightening torque meets the standard torque value. The torque of the M10 screw plug is 7 N·m.

6.5.3 Lubricating Grease Leakage and Solution

Problem	Problem Description	Cause Analysis	Solution
Oil seepage or leakage at gearbox	Oil leakage at joints	The robot has been used for an extended period, causing aging of sealing rubber parts.	Replace the sealing rubber parts or O-rings.
		Improper disassembly/ reassembly operations may damage sealing rubber parts or O-rings.	
		Oil seal damage may be caused by foreign particles (such as dust) scratching the oil seal lip.	If the oil seal at the reducer is damaged (based on leakage position), replace the reducer. If the motor oil seal is damaged, replace the motor.
		Gaps exist on sealing surfaces.	Re-tighten mounting screws to ensure a tight fit between surfaces.
		Threadlocker LT 5699 on motor or reducer mounting surfaces becomes invalid.	Re-apply the threadlocker LT 5699.
		Combined sealing washers matching hexagon socket screw plugs at oil filling and draining ports of joints function improperly.	Replace with new hexagon socket screw plugs and matching combined sealing washers.
		Cracks on castings or oil chamber damage occurs due to collisions or other impacts.	Replace with new parts.

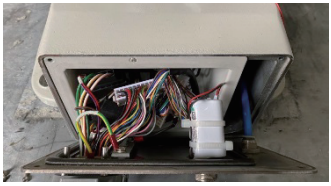
6.6 Component Replacement

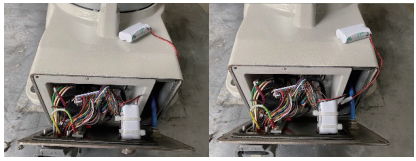
6.6.1 Battery (Lithium Battery) Replacement

Warning

- Do not perform equipment maintenance or servicing while power is on. Failure to comply will result in an electric shock.
- When disposing of waste batteries, consult a professional disposal company or follow relevant local regulations.
- Use lithium batteries correctly. Incorrect usage may result in overheating, leakage, explosion, or fire, causing severe risks to personal and property safety.
  - Charging lithium batteries is prohibited.
  - Applying pressure to deform lithium batteries is prohibited.
  - Disassembling lithium batteries is prohibited.
  - Short-circuiting or incorrect connections to lithium batteries are prohibited.
  - Heating lithium batteries is prohibited.
  - Disposing of lithium batteries in fire is prohibited.
  - Welding battery terminals is prohibited.
  - Forcing discharge of lithium batteries is prohibited.

To prevent loss of zero points, after removing the back cover of the robot body, first insert a new battery into the white 2P connector. Secure the new battery in the wiring compartment, and then remove the used battery. The replacement steps are as follows:

Step	Diagram
1. Turn off all power supplies and unplug the heavy-duty connector from the robot base.	
2. Loosen four M4 screws.	

Step	Diagram
3. Connect the new battery to the white 2P battery connector, remove the old battery, and then fix the new battery.	
4. Fix the base mounting plate and the power line connector.	

Note

Failure to comply with the procedure described above may cause loss of zero points. For details, see *"6.7.2 Procedure of Zero Point Adjustment" on page 69*.

6.7 Zero Point Adjustment

6.7.1 Overview of Zero Point Adjustment

The zero point is the reference point and base point for the robot. When robot parts (such as the motor, reducer, synchronous belt, and cables) are replaced, the zero point stored on the motor side may deviate from that stored on the controller side, which leads to failure of correct positioning. Therefore, after the parts are replaced, zero point adjustment is required.

Note

After home position calibration, the absolute accuracy of the robot may deviate from the default absolute accuracy at delivery.

Warning

- Install a safety fence for the system to prevent people from entering the motion range of the system. Failure to comply may result in severe safety issues.
- Before operation, ensure that there is no person within the safety fence. Do not enter the motion range during system running. Failure to comply may result in severe safety issues.
- Operating the robot system in teach mode can ensure the safety of the operator to a certain extent, although the motion is limited (low speed and low power). However, severe safety issues may also occur when the robot performs unexpected actions.

6.7.2 Procedure of Zero Point Adjustment

Both the PC-based teach pendant and the hand-held teach pendant provide an operation interface for zero point adjustment. The following is an explanation using the PC-based teach pendant, with similar operations for the hand-held teach pendant.

When performing zero point adjustment using the teach pendant, adjust J4 and J3 at the same time.

1. Select a role and log in to the system.

   a. On the main screen of the teach pendant, click the "User Settings" shortcut key to open the "User Settings" screen.

   b. Enter the password in the password input box and click "Log In".

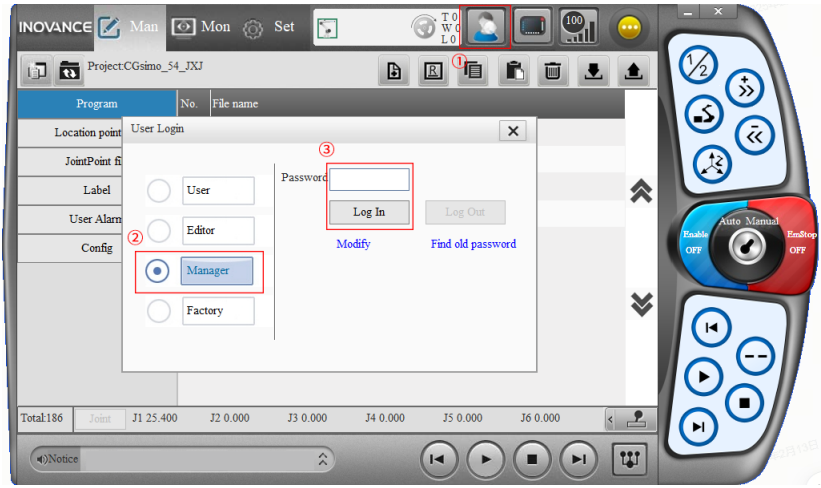


Figure 6-2 Screen of IRTP80 series tech pendant

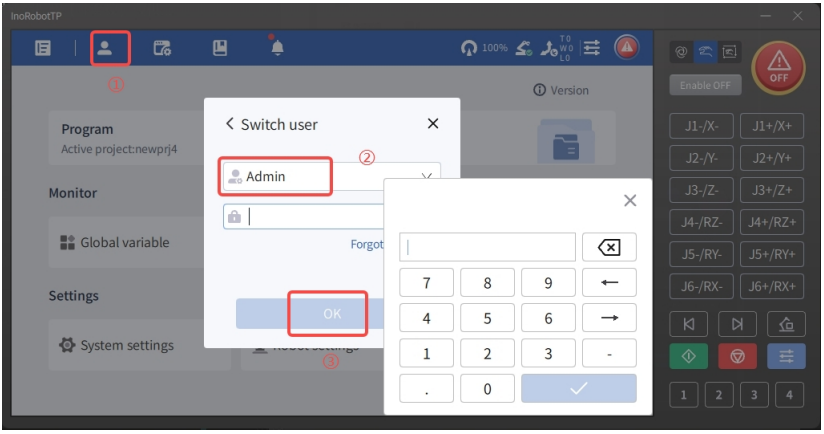


Figure 6-3 Screen of IRTP200 series tech pendant

2. Switch to the ZeroPoint setting screen.
   On the main screen of the teach pendant, choose "Set" > "BasePos" > "ZeroPoint" to open the "ZeroPoint" screen.

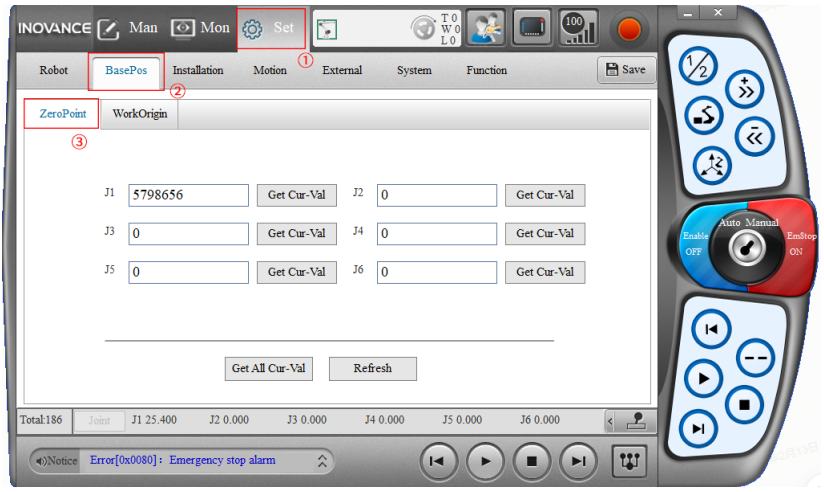


Figure 6-4 Screen of IRTP80 series tech pendant

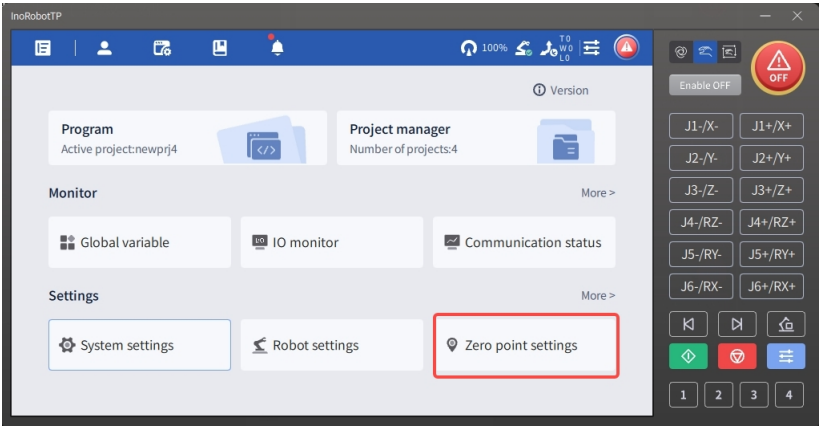


Figure 6-5 Screen of IRTP200 series tech pendant

3. Manually move each axis of the robot to the corresponding zero point.
   a. Move the robot axes to their respective zero points on the hand-held or PC-based teach pendant. For details, see Teach Pendant User Guide.
   b. If disabled, manually push the robot to reach the zero point.

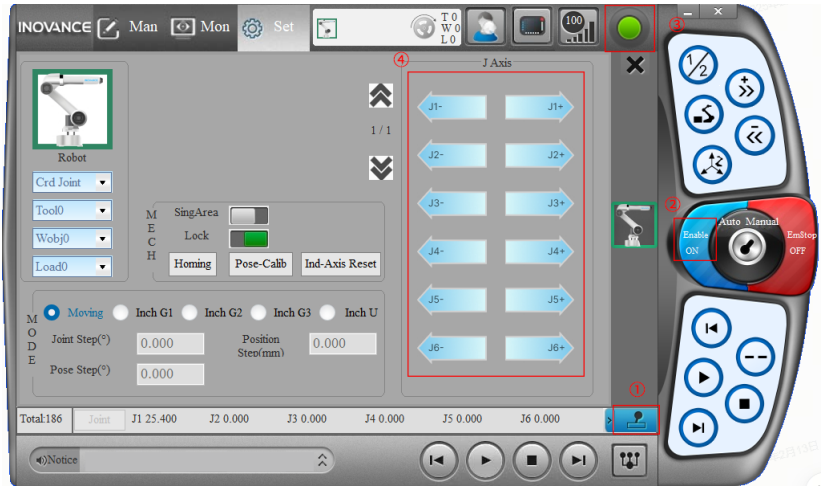


Figure 6-6 Screen of IRTP80 series tech pendant

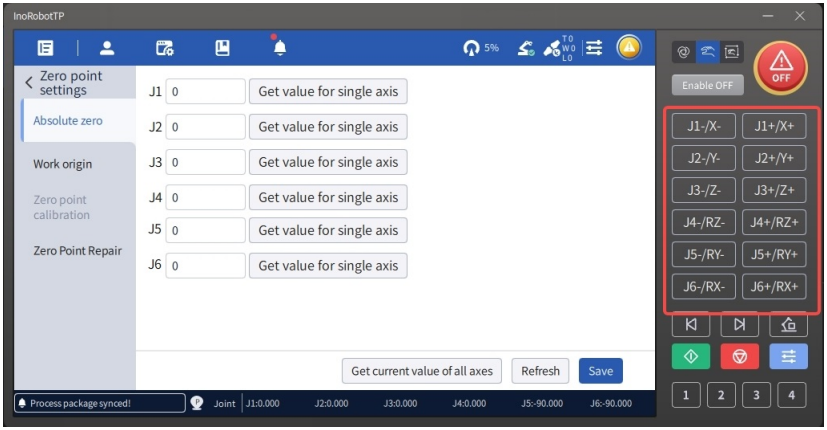


Figure 6-7 Screen of IRTP200 series tech pendant

4. Switch to the emergency stop state.

   a. Click the virtual emergency stop button on the PC-based teach pendant, or press the red "EmStop" button on the hand-held teach pendant.

   b. The status indicator in the upper right corner of the PC-based teach pendant (or the display of the hand-held teach pendant) indicates the emergency stop state (red).

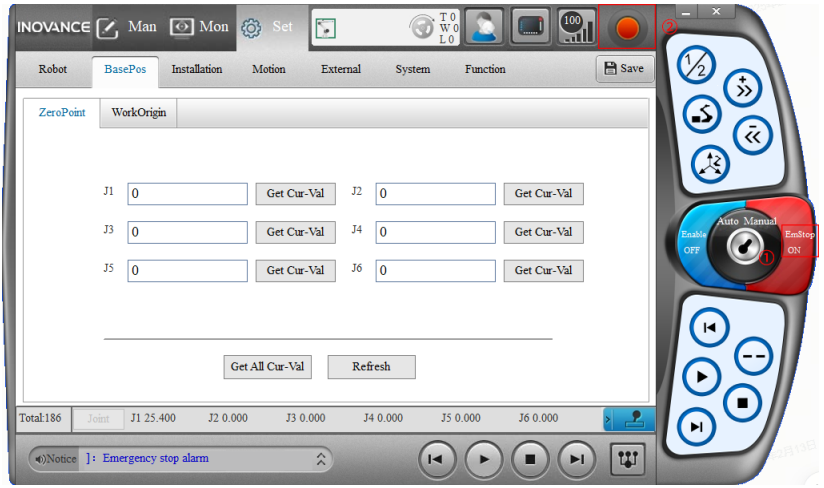


Figure 6-8 Screen of IRTP80 series tech pendant

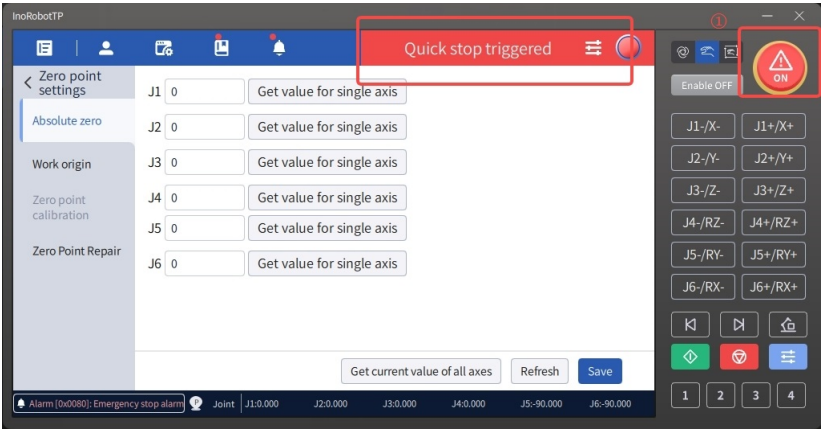


Figure 6-9 Screen of IRTP200 series tech pendant

5. Obtain and save the zero point information.

a. Click the "Get Cur" button when the robot moves to the zero point position to obtain the encoder pulses at the zero point position.

b. Click "Save" to complete zero point adjustment.

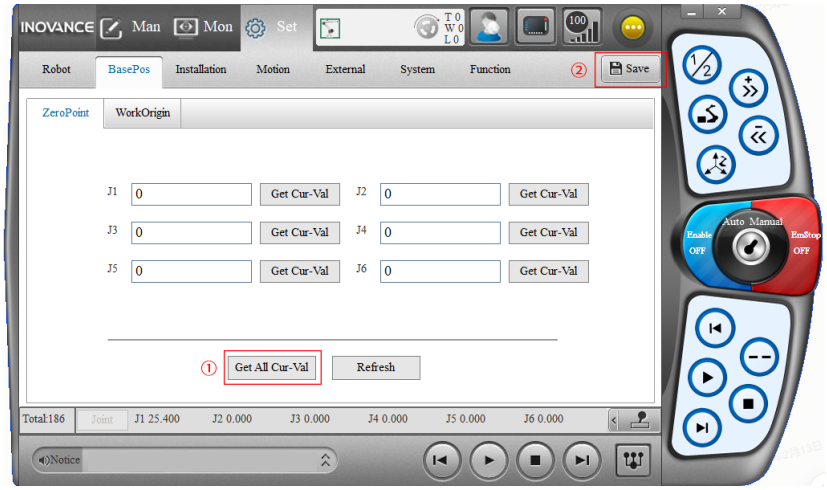


Figure 6-10 Screen of IRTP80 series tech pendant

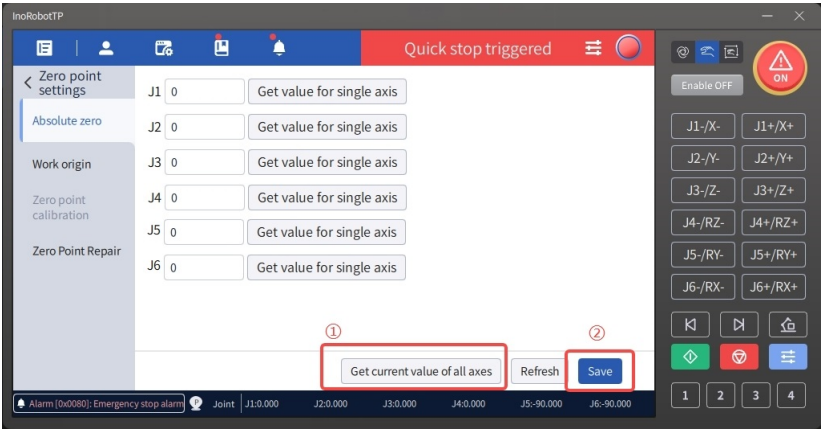


Figure 6-11 Screen of IRTP200 series tech pendant

6.7.3 Zero Point of Each Axis

- **Calibration tool**
  The calibration tool is used to calibrate the rotary axes of the robot manually.

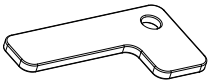


Figure 6-12 Calibration tool

- **Calibration of axes J1 to J6**
  During calibration, control the robot to move at the lowest speed by using the teach pendant. Adjust J1 to J6 until the calibration tool fits snugly in the reference slot, as shown in the figure below.

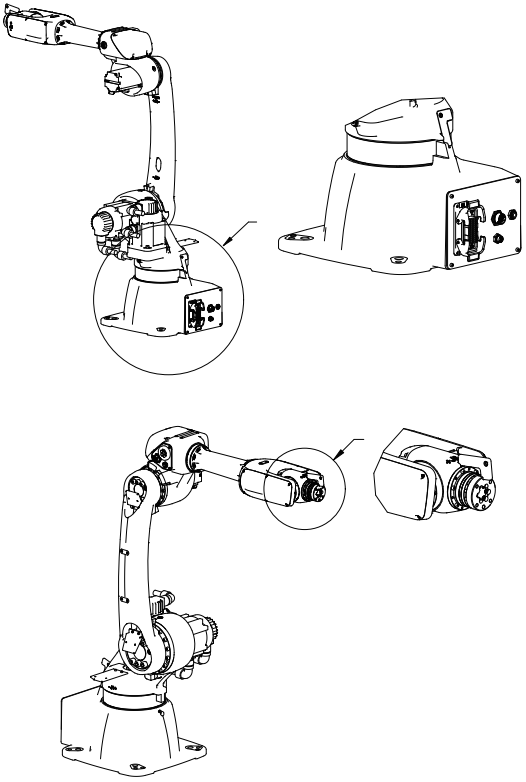


Figure 6-13 Calibration of axes J1 to J6

6.8 Options

Category	Description	Specifications	Material Code
I/O cable	Connecting the body of the IR-R10 series 6-axis robot to an electric cabinet	5 m	1504B978
I/O male aviation connector (90°)	Connects a cable to the aviation connector on the forearm of the IR-R10 series 6-axis robot	19 pins	15050930
Hand-held brake release box	Manually releases the brake for the body of full series 6-axis robots in case of emergency	-	01660004

Category	Description	Specifications	Material Code
Forklifting tool	Forklifts and transports sheet metal workpieces	-	01660006
Zero point calibration tool	Used to calibrate the J1 to J6 of the robot manually	-	01660015

7 Certification and Standard Compliance

Third-party certification

Certification mark	Certification	Description	Instruction
	CE	This product complies with Low Voltage Directive (LVD), Machinery Directive (MD), Electromagnetic Compatibility (EMC), and Restriction of Hazardous Substances (RoHS) directives and carries the CE mark.	• EN 60204-1:2018 • EN ISO 10218-1:2011 • EN ISO 12100:2010 • EN 61000-6-2:2019 • EN 61000-6-4:2019 • ISO 13849-1:2023, • EN ISO 13849-1:2015
	SGS-TUV Saar	This product is certified by SGS-TUV Saar for functional safety.	
	cSGSus	This product is certified by SGS North America of Nationally Recognized Test Laboratory (NRTL).	• UL 1740, 4th Ed., Jan. 26, 2018 • NFPA 79 2021 Edition, Dated Oct. 25, 2020 • CAN/CSA Z434-14 (R2019), Reaffirmed 2019
	FCC	This product has passed the Federal Communications Commission (FCC) EMC testing and carries the FCC mark.	-
	KCs	This product is verified by Korea Occupational Safety and Health Agency (KOSHA) in terms of special equipment, labor protection supplies, and guard devices and carries the KCs mark.	-

Note

The preceding certification standards only apply to standard models of products. For specific certification information about customized products, consult Inovance technical personnel.

Declaration of conformity with EU directives

Inovance robots have been certified by the following directives and meet basic requirements of the CE-MD, CE-LVD, CE-EMC, and RoHS directives.

Machinery Directive (MD)	2006/42/EC
Low Voltage Directive (LVD)	2014/35/EU
Electromagnetic Compatibility Directive (EMC)	2014/30/EU
RoHS Directive (ROHS)	2011/65/EU Amended by (EU)2015/863
Applied Harmonized Standards	• EN 60204-1:2018 • EN ISO 10218-1:2011 • EN ISO 12100:2010 • EN 61000-6-2:2019 • EN 61000-6-4:2019 • ISO 13849-1:2023 • EN ISO 13849-1:2015

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