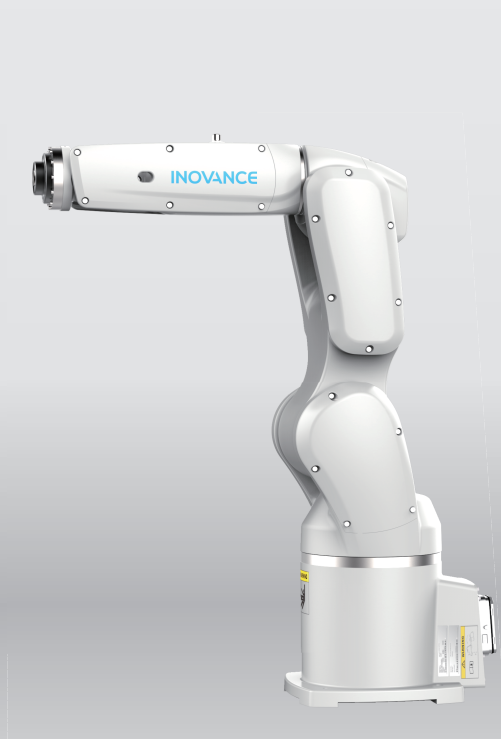




IRS311-7 Series International 6-Axis Robot User Guide - Manipulator



Industrial
Automation



Intelligent
Elevator



New Energy
Vehicle



Industrial
Robot



Rail
Transit



Data code PS00017864A01

Preface

Introduction

With a maximum arm length of 717 mm (extended length of 911 m) and up to 7 kg load capacity, the IRS311-7 series international 6-axis robot of Inovance features compact structure, lightweight, and high flexibility, repeatability, and speed. It offers great usability and reliability when working with a high-performance control system. It is applicable to robot assembly, labeling, patching, dispensing, inserting, soldering, sorting, grinding, polishing, and other applications in the 3C industry, as well as automotive, hard drive, healthcare, laboratory automation, consumer products, industrial products, telecommunications, pharmaceuticals, packaging, semiconductors, electronics, and other industries.

This guide 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.
-

More Data

Name	Data Code	Description
IRCB501 Series International Robot Control Cabinet User Guide	PS00017628	Describes the specifications, installation, and wiring of the IRCB501 international series control cabinet.
IRTP80 Series Teach Pendant User Guide	19012261	Describes the product information, wiring, and operation of the IRTP80 series teach pendant.
IRS311-7 Series International 6-Axis Robot User Guide (this manual)	PS00017864	Describes the basic specifications, installation, wiring, motion range, and maintenance of the product.

Revision History

Date	Version	Description
April 2025	A01	Update • Updated <i>"2.1 Model and Nameplate"</i> on page 15. • Updated <i>"6.5.2 Procedure of Zero Point Adjustment"</i> on page 64. Addition • Added <i>"6.4.2 Oil Leakage Inspection Parts"</i> on page 61. • Added <i>"6.6 Options"</i> on page 71.
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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1 Safety Instructions

1.1 Safety Precautions

Safety Disclaimer

- This chapter provides essential safety instructions for proper use of the product. Before using this product, read through the user guide, especially the safety instructions. Failure to observe the safety instructions may result in equipment damage, personal injuries, or even death.
- "DANGER", "WARNING", and "CAUTION" items in this guide do not indicate all safety precautions that need to be followed; instead, they just supplement the safety precautions.
- Use this product according to the designated environment requirements. Damage caused by improper use is not covered by warranty.
- Inovance shall take no responsibility for any personal injuries or property damage caused by improper usage.

Safety Levels and Definitions



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



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



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

Safety Precautions

- Some drawings in the guide shows the product without covers or protective guards to display more details. Remember to install the covers or protective guards as specified first, and then perform operations in accordance with the instructions.
- Operators must take mechanical precautions to protect personal safety and wear protective equipment, such as anti-smashing shoes, safety clothing, safety glasses, protective gloves, and protective sleeves.

Unpacking



WARNING

- Do not install the product when you find that the product and its accessories have any damage or corrosion or they have been used.
- Do not install the product when there is water inside the product or any of its parts is missing or damaged.
- Do not install the product when the product name is inconsistent with that in the packing list.



CAUTION

- Before unpacking, check whether the package is intact, without damage, water seepage, damp, and deformation.
- Unpack the product layer by layer. Do not strike the package violently.
- During unpacking, check whether the product and its accessories have any damage, corrosion, or bump on the surface.
- Check the quantity of the product and its accessories and documents against the packing list.

Storage and Transportation**WARNING**

- Large-scale or heavy equipment must be transported by qualified professionals using specialized hoisting equipment. Failure to comply may result in personal injuries or equipment damage.
- Before hoisting the equipment, ensure that components, such as the front cover and terminal blocks, are secured firmly with screws. Loosely-connected components may fall off and result in personal injury or equipment damage.
- Never stand or stay below the equipment when the equipment is being hoisted by the hoisting equipment.
- 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 personal injuries or equipment damage.

**CAUTION**

- Handle the equipment with care during transportation and mind your steps to prevent personal injuries or equipment damage.
- When handling the product by hand, grab the product case tightly to avoid dropping the product and causing injuries.
- Store and transport the equipment based on the storage and transportation requirements. Failure to comply may 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 storing the product for more than 3 months. When the product needs to be stored for an extended period, take more strict protection and necessary inspection.
- Package the product strictly before transporting it, and use an enclosed container for long-distance transportation.
- Never transport the equipment with other equipment or materials that may harm or have negative impacts on this equipment.

Installation



DANGER

- 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.



WARNING

- 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 may result in mechanical hazards.
- Do not wear loose clothes or accessories during installation. Failure to comply may result in electric shocks.
- When installing the equipment (such as the control cabinet) 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 loosen the fixing bolts of the product parts and components.
- When installing the equipment (such as the control cabinet) in a cabinet or final assembly, make sure that the enclosure of the cabinet or final assembly provides adequate fire prevention, electrical protection, and mechanical protection conforming to relevant IEC standards and local laws and regulations.
- Before installing devices with strong electromagnetic interference, such as a transformer, install a shielding device for the equipment to prevent malfunction.
- Install the product on an incombustible object, such as metal, and do not touch or attach the product to combustibles. Failure to comply may result in fire accident.



CAUTION

- Cover the top of the equipment (such as the control cabinet) with cloth or paper during installation 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 top of the equipment to prevent over-temperature caused by poor ventilation due to blocked ventilation holes.

Wiring**DANGER**

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed by only professionals.
- 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 electric shocks.
- Do not perform wiring, remove the equipment cover, or touch the circuit board with power ON. Failure to comply may result in electric shocks.
- Check that the equipment is grounded properly. Failure to comply may result in electric shocks.

**WARNING**

- Do not connect the input power supply to the output end of the equipment. Failure to comply may result in equipment damage or even a fire.
- When connecting a drive to a motor, check that the phase sequences of the drive and motor terminals are consistent to prevent reverse motor rotation.
- Cables used for wiring must meet cross sectional area and shielding requirements. The shield of the cable must be reliably grounded at one end.
- 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 a 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 electric shocks or equipment damage.

**CAUTION**

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

Power-on



DANGER

- 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 will result in electric shocks.



WARNING

- 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



DANGER

- The equipment must be operated only by professionals. Failure to comply may result in death or personal injury.
- Do not touch any connecting terminals or disassemble any unit or component of the equipment during operation. Failure to comply may result in electric shocks.



WARNING

- Do not touch the equipment enclosure, fan, or resistor with bare hands. Failure to comply may result in personal injury.
- Prevent metal or other objects from falling into the equipment during operation. Failure to comply may result in a fire or equipment damage.

Maintenance**DANGER**

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed by only professionals.
- Do not maintain the equipment while power is on. Failure to comply may result in electric shocks.
- Before maintenance, cut off all the power supplies of the equipment and wait for at least the time designated on the equipment warning label.
- When a permanent magnet motor is used, do not touch the motor terminals immediately after power-off because the motor terminals can generate induced voltage during rotation even after the equipment power supply is off. Failure to comply may result in electric shocks.

**WARNING**

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

Repair**DANGER**

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed by only professionals.
- Do not repair the equipment while power is on. Failure to comply may result in electric shocks.
- 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.

**WARNING**

- 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 death, personal injury or equipment damage.
- 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 in according with the replacement instructions.
- Do not perform operations on damaged equipment. Failure to comply may result in death, personal injury, or severe equipment damage.
- After the equipment is replaced, 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, personal injuries, or even death. • Recycle retired equipment by observing industry waste disposal standards to avoid environmental pollution.

Safety Sign

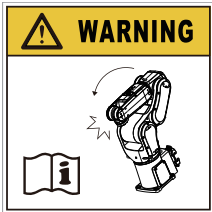
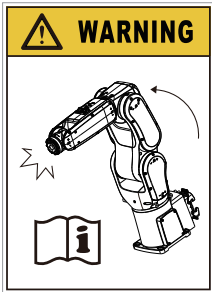
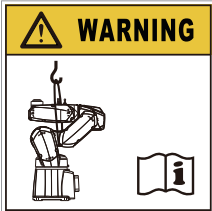
For safe equipment operation and maintenance, comply with the safety labels on the equipment. Do not damage or remove the safety labels. The following table describes the safety labels.

To ensure safe operation, comply with equipment-related safety labels. The following table describes the safety labels.

Safety Sign	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 with power ON or within 10 minutes after power-off. Failure to comply may result in electric shocks.

1.2 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.

Warning Label	Description
	Secure the robot before removing the fastening screws on the base to prevent the robot from tilting forward due to its center of gravity for the posture at delivery, which may cause equipment damage or physical injury.
	Secure the robot on the base table to prevent the robot from tilting forward due to its center of gravity, which may cause equipment damage or physical injury.
	Never enter the robot motion range during robot running. Otherwise, you may bump into the robot, and severe safety issues may occur.
	If a lifting is required, follow the lifting diagram. Otherwise, the robot may tilt and cause damage to the machine or injury to personnel. See the user guide for information on lifting the robot.
	Do not touch the energized parts during power-on. Failure to comply may result in an electric shock.

1.3 Robot Start Precautions

In winter (or when the temperature is close to 10°C), or when the robot is in the non-operating state for a long time, starting the robot at a high speed may cause a current protection alarm or an excessive following error alarm.

- Main reasons: The grease is viscous at low temperature, which leads to a large joint friction of the robot when the robot is started in the cold state, triggering relevant alarms.
- Suggestions: Run the robot at a low speed for about 10 minutes (or longer at a low temperature), and then start normal operation.

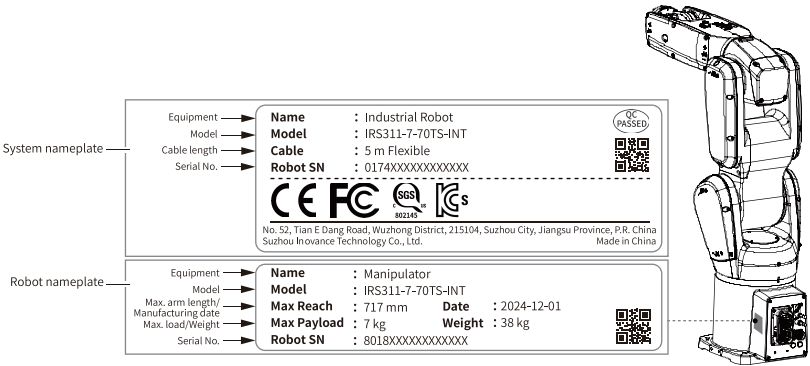
2 Product Information

2.1 Model and Nameplate

IRS311-7-70TS-INT

① ② ③ ④ ⑤ ⑥ ⑦

① Product family IRS: Inovance robot system	④ Arm length 70: 717 mm 90: 911 mm	⑦ Version INT: International (With functional safety)
② Series 311: 6-axis robot (Drive and control integrated cabinet)	⑤ Mounting method T: Standard	-
③ Load 7: 7 kg	⑥ Installation environment S: Standard	-

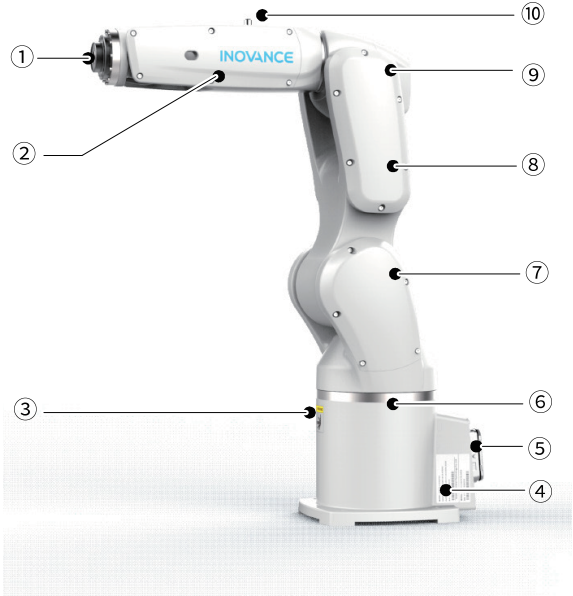


Note

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.

2.2 Components

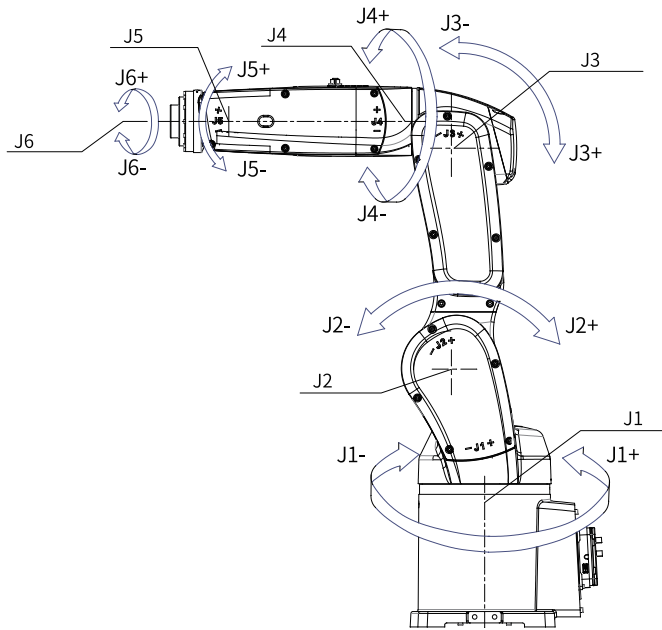
The mechanical system of the robot is composed of the base, swivel base, upper arm, elbow, linkage arm, forearm, wrist, and pipeline. With six motors driving six axes, the robot can achieve different motion forms in the working space in order to complete various tasks. The following figure shows each part of the robot.



No.	Name	No.	Name
①	Wrist flange	⑥	Base
②	Forearm	⑦	Swivel base
③	Warning label	⑧	Upper arm
④	Nameplate	⑨	Elbow
⑤	Heavy-duty connector	⑩	Air tube connector

2.3 **Rotation Directions**

The following figure shows the rotation direction of each axis.



J3

2.4 Outline Dimensions

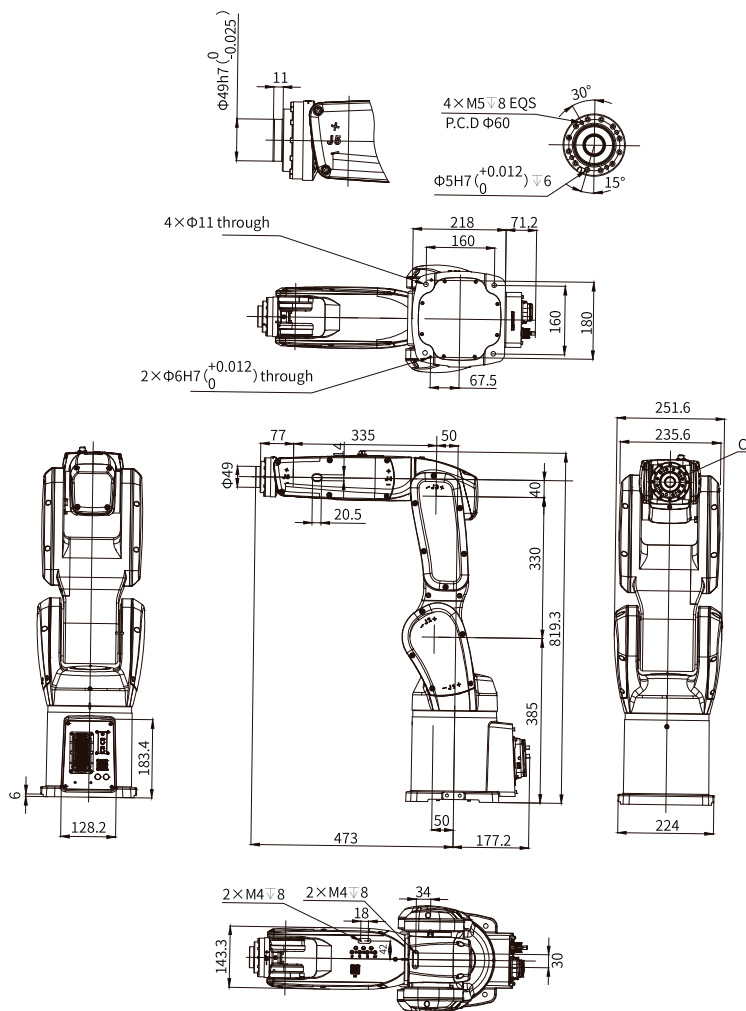


Figure 2-1 Outline dimensions for IRS311-7-70TS-INT (unit: mm)

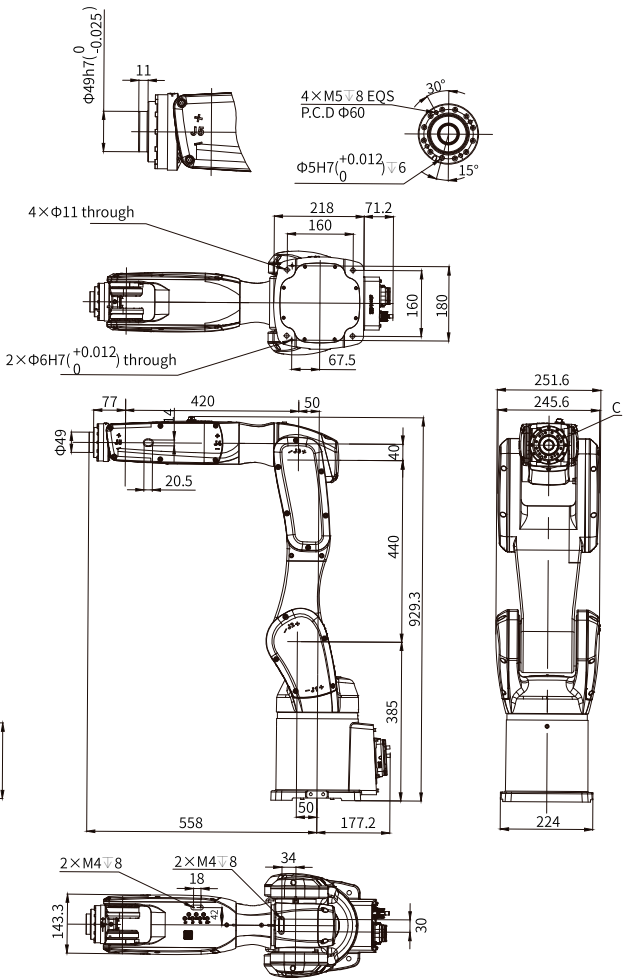


Figure 2-2 Outline dimensions for IRS311-7-90TS-INT (unit: mm)

2.5 Specifications

Model		IRS311-7-70TS-INT	IRS311-7-90TS-INT
Structure	Structure	Vertical multi-axis cascading structure	Vertical multi-axis cascading structure
Number of axes	Number of axes	6 axes	6 axes
Maximum reach	Maximum reach	717 mm	911 mm
Repeatability	Repeatability	± 0.02 mm	± 0.03 mm
Maximum wrist load	Maximum wrist load	7 kg	7 kg

Model		IRS311-7-70TS-INT	IRS311-7-90TS-INT
IP rating	IP rating	IP65	IP65
Maximum velocity	J1 axis	450°/s	300°/s
	J2 axis	380°/s	280°/s
	J3 axis	520°/s	360°/s
	J4 axis	550°/s	550°/s
	J5 axis	550°/s	550°/s
	J6 axis	1000°/s	620°/s
Maximum motion range	J1 axis	−170° to +170°	−170° to +170°
	J2 axis	−135° to +80°	−125° to +80°
	J3 axis	−70° to +190°	−70° to +190°
	J4 axis	−190° to +190°	−190° to +190°
	J5 axis	−120° to +120°	−120° to +120°
	J6 axis	−360° to +360°	−360° to +360°
Allowed wrist torque	J4 axis	16.6 N·m	16.6 N·m
	J5 axis	16.6 N·m	16.6 N·m
	J6 axis	9.4 N·m	9.4 N·m
Allowed wrist inertia	J4 axis	0.47 kg·m ²	0.47 kg·m ²
	J5 axis	0.47 kg·m ²	0.47 kg·m ²
	J6 axis	0.15 kg·m ²	0.15 kg·m ²
User interface	Wiring	12-channel signals of 30 V 0.5 A	12-channel signals of 30 V 0.5 A
	Air duct	Air duct: Φ4 mm x 2 Pressure resistance: 0.59 MPa	Air duct: Φ4 mm x 2 Pressure resistance: 0.59 MPa
Ambient condition	Ambient temperature ^[1]	0°C to 45°C	0°C to 45°C
	Ambient humidity	5% RH to 95% RH (non-condensing)	5% RH to 95% RH (non-condensing)
	Maximum temperature gradient	1.5°C/min	1.5°C/min
Body weight	Body weight	38 kg	40 kg
Input power (average power consumption)	Input power (average power consumption)	2 kVA (0.5 kW)	2 kVA (0.5 kW)
Applicable control cabinet (standard)	Applicable control cabinet (standard)	IRCB501-6LD-INT	
Mounting method	Mounting method	Floor-standing installation	Floor-standing installation
Noise level	Noise level ^[2]	$L_{Aeq} \leq 75$ dB(A)	$L_{Aeq} \leq 75$ dB(A)

Model		IRS311-7-70TS-INT	IRS311-7-90TS-INT
Base installation dimensions	Base installation dimensions	160 mm x 160 mm (4 x Φ 11 mm)	160 mm x 160 mm (4 x Φ 11 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)

2.6 Motion Range

The following figure shows the motion range of the robot.

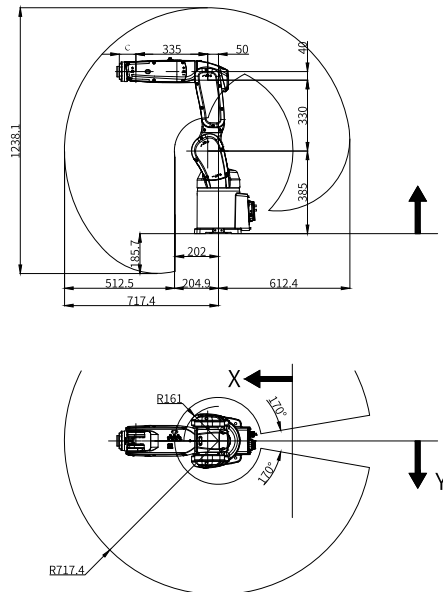


Figure 2-3 Motion range of IRS311-7-70TS-INT (unit: mm)

Note

- c=77 corresponds to IRS311-7 series 6-axis robots.
- The product information in this guide is the information of standard models in a standard environment. For information about non-standard models or models in clean environment, contact the provider.

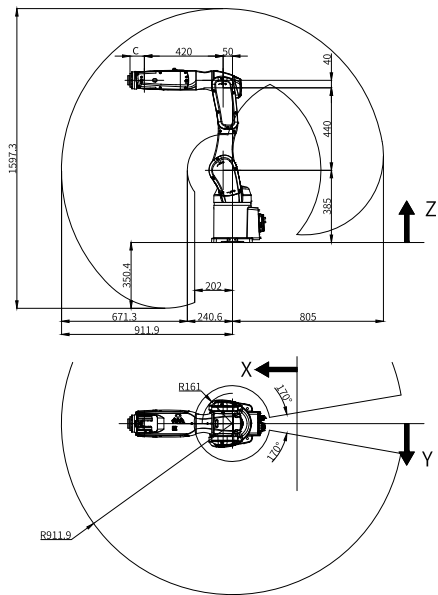


Figure 2-4 Motion range of IRS311-7-90TS-INT (unit: mm)

Note

- c=77 corresponds to IRS311-7 series 6-axis robots.

2.7 Maximum Load of Wrist Flange

This series robot supports a maximum load of 7 kg. In addition, the torque and maximum inertia should meet the following conditions. External force (other than gravity) applied to the robot should not exceed the range in the table below.

Wrist Load Condition		IRS311-7-70TS-INT	IRS311-7-90TS-INT
Allowed wrist torque ($\text{N} \cdot \text{m}$)	J4 axis	16.6 $\text{N} \cdot \text{m}$	16.6 $\text{N} \cdot \text{m}$
	J5 axis ^[1]	16.6 $\text{N} \cdot \text{m}$	16.6 $\text{N} \cdot \text{m}$
	J6 axis ^[2]	9.4 $\text{N} \cdot \text{m}$	9.4 $\text{N} \cdot \text{m}$
Allowed wrist inertia ($\text{kg} \cdot \text{m}^2$)	J4 axis	0.47 $\text{kg} \cdot \text{m}^2$	0.47 $\text{kg} \cdot \text{m}^2$
	J5 axis ^[1]	0.47 $\text{kg} \cdot \text{m}^2$	0.47 $\text{kg} \cdot \text{m}^2$
	J6 axis ^[2]	0.15 $\text{kg} \cdot \text{m}^2$	0.15 $\text{kg} \cdot \text{m}^2$

Note

[1]: Distance to the rotation center of J5: $a + 77$ (mm)

[2]: Distance to the rotation center of J6: b (mm)

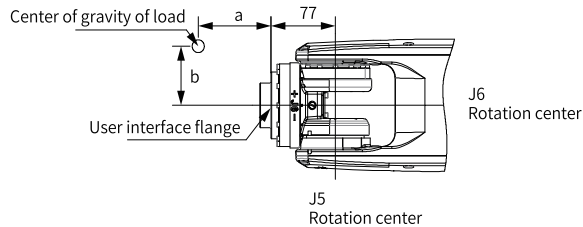


Figure 2-5 Distance to the rotation center of the J5/J6 axis

The following figure shows the wrist load curve of the IRS311-7 series robot system. The load conditions should be within the range shown in the figure.

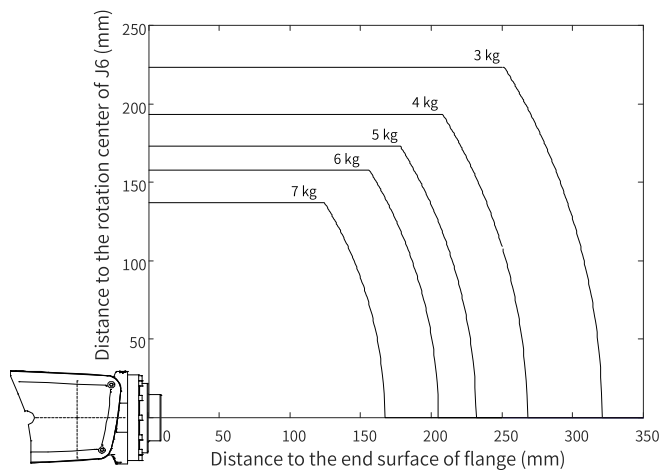


Figure 2-6 Wrist load curve

**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.

3 Installation

3.1 Installation Process

The installation process table can be used to check the installation progress of the robot. You are advised to make a copy of this form and fill in the "Completed" column upon completion of each operation.

Table 3-1 Installation process

Step	Operation	Completed
1 Preparation for installation		
①	Installation personnel	☐
②	Installation environment	☐
③	Foundation	☐
④	Base table	☐
2 Installation dimensions		
3 Unpacking and handling		
①	Unpacking	☐
②	Check against the packing list	☐
③	Handling	☐
4 Robot body installation		
①	Fasten the robot to the mounting plate	☐
5 Cable connection		
①	Connect the power and signal cables between the robot body and the control cabinet	☐
6 Wiring/Tubing		
①	Connect I/O signal cables and air tubes	☐

3.2 Preparation for Installation

3.2.1 Installation Personnel and Environment

Installation personnel

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.

Installation environment

1. Ambient conditions

Install the robot system in an environment that meets the following conditions.

Table 3-2 Environment requirements^[1]

Item	Requirement
Ambient temperature	0°C to 45°C
Relative humidity	5% RH to 95% RH (non-condensing)
Maximum temperature gradient	1.5°C/min
Electrical fast transient/burst immunity ^[2]	< 4 kV (power cords) < 2 kV (signal cables)
Static immunity ^[2]	< 6 kV (contact) < 8 kV (air)
Environment	● Keep away from direct sunlight. ● Avoid places with salt or moisture and other rust-prone places. ● Avoid places with dust, oil fume, iron filings, or other dust pollution. ● Avoid places with flammable or corrosive liquid and gas, and explosive gas. ● Keep away from shocks and vibrations. ● Avoid sources of electrical interference nearby.

Note

[1]: 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.

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

2. Special environmental conditions

- 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.
- Confirm whether the robot may cause food contamination when handling food directly with your provider.

Note

- Do not wipe the robot hard with alcohol or benzene. Otherwise, the coated surface may lose gloss.
 - The product information in this guide is the information of standard models in a standard environment. For information about non-standard models or models in clean environment, contact the sales representative of Inovance.
-

3.2.2 Base Table

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.

Robot Model	Torque in the Vertical Plane, M_k (N·m)	Vertical Force, F_v (N)	Torque in the Horizontal Plane, M_r (N·m)	Horizontal Force, F_o (N)
IRS311-7-70TS-INT	1000	1,600	900	1200
IRS311-7-90TS-INT	1250	2000	1130	1500

The following figure shows the stress generated by the robot on the support structure.

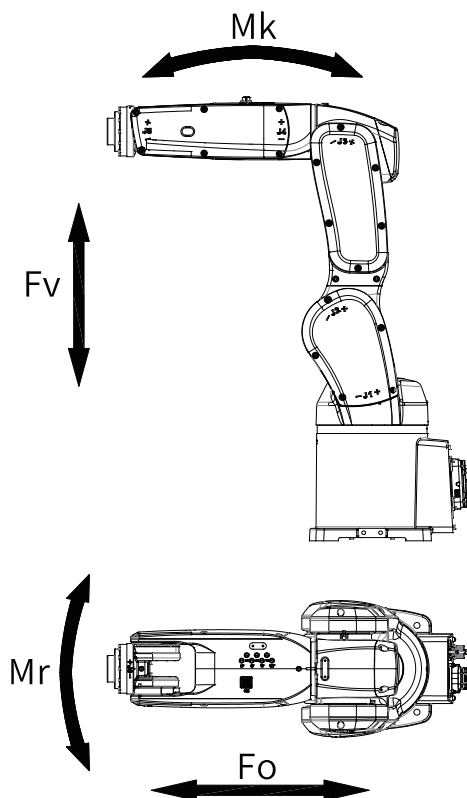


Figure 3-1 Stress generated by the robot on the support structure

- Use M10 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. For the specific dimensions, see ["2.4 Outline Dimensions" on page 18](#).
- To dampen vibrations, use a steel plate with a thickness over 30 mm, a surface roughness below 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.
- For the environment requirements (space conditions) for storing the control cabinet on the stand, see the IRCB501 Series International Robot Control Cabinet User Guide.

3.3 Mounting Dimensions

3.3.1 Installation Space and Dimensions

Installation space

- 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
- 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 of the cables.
- Reserve at least 100 mm between the boundary of the motion range and the safety fence.

Installation dimensions

For detailed installation dimensions, see ["2.4 Outline Dimensions" on page 18](#).

3.4 Unpacking, Storage, and Transportation

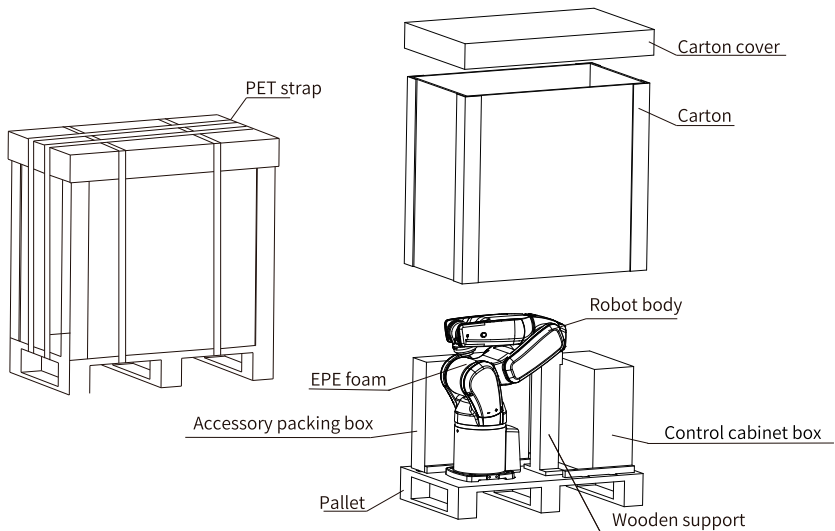
3.4.1 Unpacking Procedure

Prepare an M10 outer hexagon wrench, a pair of scissors/a utility knife, and a pair of protective gloves. The following takes IRS311-7-70TS-INT as an example to illustrate the unpacking procedure.

Unpacking procedure:

1. Remove the outer carton.

Cut the PET straps on the carton with scissors or a utility knife. Remove the carton cover and the paper corner protectors.



Note

Wear gloves to prevent scratches.

2. Unpack the control cabinet.

- Cut the packing straps securing the control cabinet and accessory packing boxes with scissors.
- Remove the accessory packing box from the pallet. Then, transfer the control cabinet packing box from the pallet to an open area, ensuring to follow the orientation instructions on the box.
- Cut the sealing tape on the control cabinet packing box with scissors, and then open the box.
- Remove the expanded polyethylene (EPE) foam from the sides of the control cabinet. Grip the holes on the sides of the control cabinet or hold the bottom to remove the control cabinet from the packing box. Transfer the control cabinet to the desired location.

Tools: Utility knife/Scissors

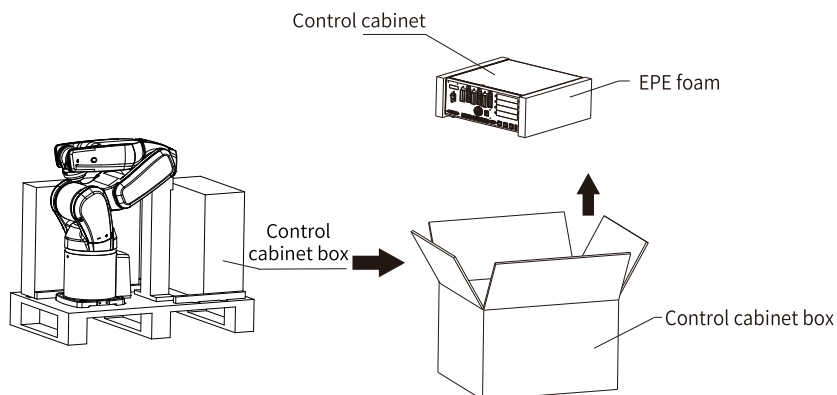


Figure 3-2 Control cabinet disassembly and assembly

3. Remove the bolts securing the robot body.

Remove bolts (M8x80) connecting the robot and the pallet using the M8 outer hexagon wrench.

Tools: M8 outer hexagon wrench

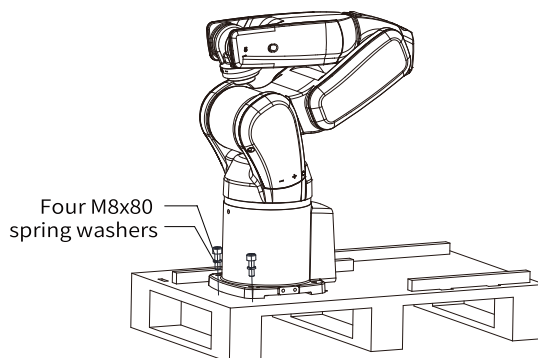


Figure 3-3 Removing bolts securing the robot body

Note

When removing the body fixing bolts, another person must hold the equipment during the whole process to prevent it from tilting over due to unbalanced center of gravity when the fixing base is removed, which may cause personal injury or equipment damage.

4. Take out the robot body.

Lift the robot vertically and then move it horizontally to remove it from the pallet. Avoid interference between the bottom of the robot body and the top of the fixtures. Then, transfer the robot body to the desired location.

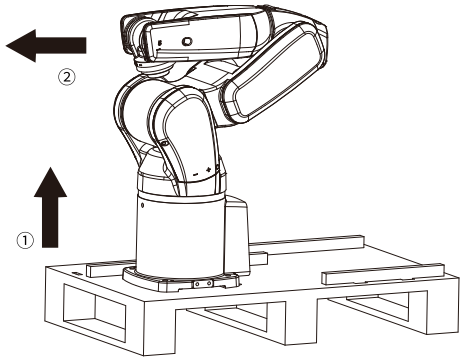


Figure 3-4 Taking out the robot body

Note

- Take out the machine carefully to avoid bumping.
- If you need to repack the robot, reverse the steps. Wear protective gloves to prevent scratches, and operate carefully to avoid damage to the machine.

3.4.2 Check After Unpacking

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

Description	Quantity (pcs)
Robot body	1
Robot control cabinet	1
Inovance Product Warranty Card	1
Cable set	1
6-axis control cabinet mounting baffle (RoHS)	1
M10x45 hexagon bolts (Grade 12.9 in GB/T 70.1-2000)	4
Spring washer (GB/T 93-1987)-10	4
Plain washer (GB/T 93-1987)-10	4

3.4.3 Handling



Danger

Allow only qualified personnel to carry out transportation including rigger operation, hoisting by crane, and forklift driving.



Warning

- Transport the equipment with a crane or forklift with the original package.
 - Wear personal protective equipment (PPE) during transportation with a crane or forklift. Prohibit any personnel from standing or staying around the transportation route.
 - Hold the equipment with hands to keep its balance when hoisting the equipment. Otherwise, the equipment may fall, resulting in serious injury or damage.
-



Caution

- Store and transport the equipment in accordance with the storage and transportation requirements. Observe the humidity and temperature requirements.
 - Avoid storage and transportation in environments with water splash, rain, direct sunlight, strong electric field, strong magnetic field, and strong vibration.
 - Pack the equipment properly before transportation by vehicle. Use an enclosed box for long-distance transportation.
 - Never transport the equipment with devices or materials that may damage or have negative impacts on the equipment.
 - When a device that has been stored for a long time is reassembled into the system for use, conduct a trial run and then switch to normal running if no abnormality is found.
 - If condensation occurs on the device during transportation or storage, remove the condensation before turning on the power.
-

Handling procedure

1. Position the robot according to its posture at delivery. The recommended angles of each axis are described below.

J1	J2	J3	J4	J5	J6
0°	+65°	-65°	0°	-105°	0°

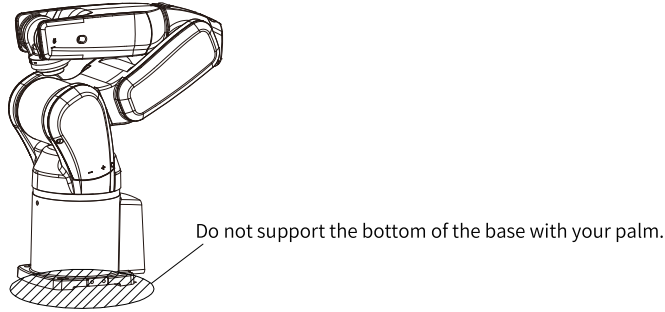


Figure 3-5 Robot posture at delivery

2. Disconnect power to all devices.
3. Unplug the power cord connector and signal cable connector of the control cabinet, unfasten the clip, and unplug the heavy-duty connector connected to the robot body.
4. Unscrew the base mounting screws and remove the robot from the mounting base.
5. Secure the robot to the handling equipment.

- Handling with a crane

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

Use a flat sling to fix the robot, as shown in the following figure. Keep the robot in the posture at delivery, put the flat sling into the lower gap, and make the sling fit tightly onto the robot. It is recommended that the flat sling be 1 m long and provide a load-bearing capacity of 50 kg or higher.

- Handling with a forklift

When handling the robot using a forklift, secure the robot onto its original pallet or a baseplate with sufficient load-carrying capacity with screws. Insert the fork of the forklift under the pallet or baseplate and lift the robot together with the pallet or baseplate.

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

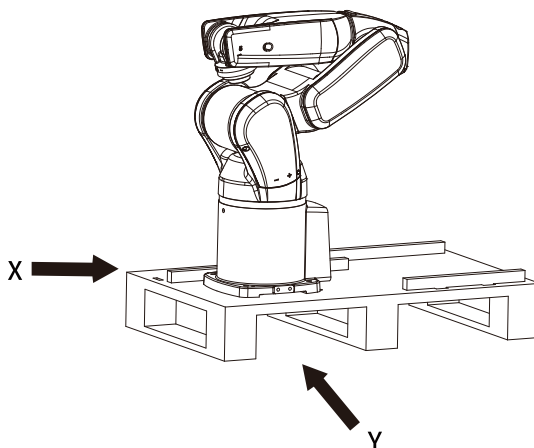


Figure 3-6 Handling with a forklift

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.

3.5 Installing the Robot Body



Danger

- Do not allow non-professionals to perform equipment installation, wiring, maintenance, inspection, or parts replacement.
 - Install a safety fence for the system. Failure to comply may result in severe safety issues.
 - 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 robot body before turning on the power or operating the system. Otherwise, the robot body may fall over and cause serious injury or major damage.
-



Warning

- Do not modify the equipment.
 - Do not install the equipment in places with strong electric or magnetic fields.
 - When removing the mounting screws of the robot body, hold the robot to prevent it from toppling over.
 - For the desktop mounting mode, arrange for at least two installation personnel.
 - When mounting the robot onto the wall, support the robot body first before tightening the base fixing screws. Removing the support before the base fixing screws are fully tightened may cause the robot to fall, which is very dangerous.
-

Robot installation procedure:

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

Note

To suppress vibration, use a steel plate that meets the following requirements as the mounting surface of the robot: thickness > 30 mm; surface roughness < 25 μm ; flatness < 0.2 mm.

3. Move the robot near the mounting surface.
4. Align the robot base with the two locating pin holes.
5. Install two pins.
6. Install four spring washers and four plain washers, and tighten them with four M10x45 hexagon screws (tightening torque: 56.8 N·m).

Use screws with a strength equivalent to the performance level of Grade 12.9 specified in GB/T 3098.1.

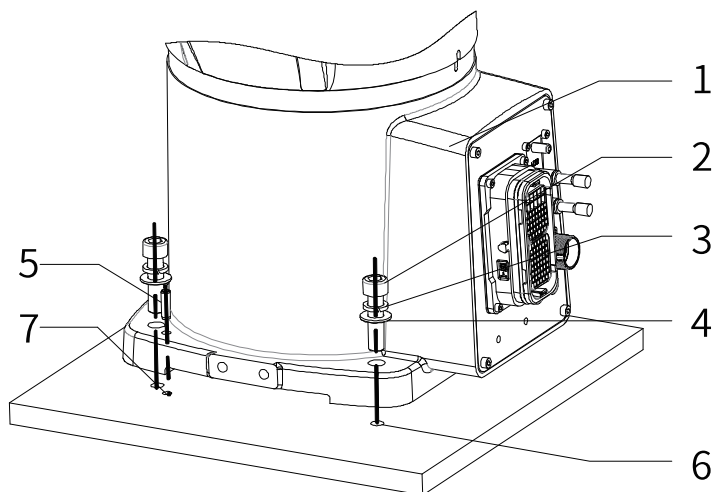


Figure 3-7 Installing the base

No.	Name
1	Robot base
2	Four M10x45 hexagon screws (Grade 12.9 in GB/T 70.1-2000)
3	Four spring washers (GB/T 93-1987)-10
4	Four plain washers (GB/T 97.1-1985)-10
5	Two 6x32 parallel pins with internal threads (GB/T 120.2-2000-F)
6	Threaded mounting holes (depth: > 20 mm)
7	Mounting pin holes (depth: > 20 mm)

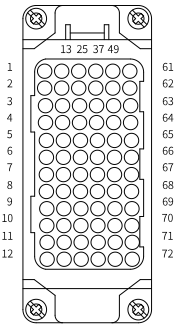
When the robot is mounted upside down or side-mounted, install a fall prevention device on the base of the robot for protection, as shown in the following figure.

Note

If you select the upside-down mounting or side mounting mode, inform Inovance in advance when you order the robot. For onsite implementation of upside-down mounting or side mounting, consult Inovance and conduct it under the guidance of Inovance.

3.6 Cable Connections

3.6.1 Connector Pin Assignment

Connector pin layout	Pin No.	Assign ment	Pin No.	Assign ment	Pin No.	Assign ment	Pin No.	Assign ment
	1	1U	21	23FG	41	4BK-	61	6U
	2	1V	22	14GND	42	56BK+	62	65V
	3	1W	23	2PS-	43	-	63	65W
	4	1PE	24	2PS+	44	GND	64	6PE
	5	1BK-	25	3U	45	56FG	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	4FG	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	2BK+	38	4V	58	56VCC	-	-
	19	-	39	4W	59	5PS-	-	-
	20	24V	40	4PE	60	5PS+	-	-

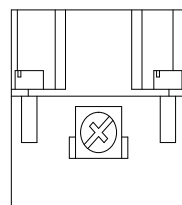
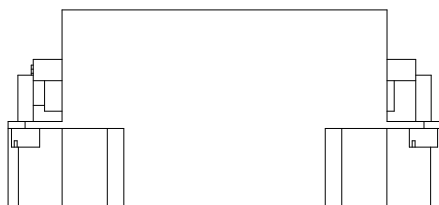
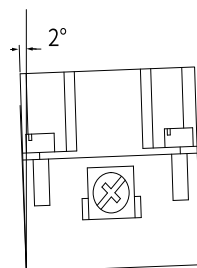
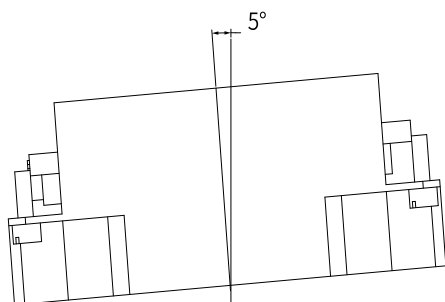
3.6.2 Connection Method

Connecting the IRCB501 series robot control cabinet

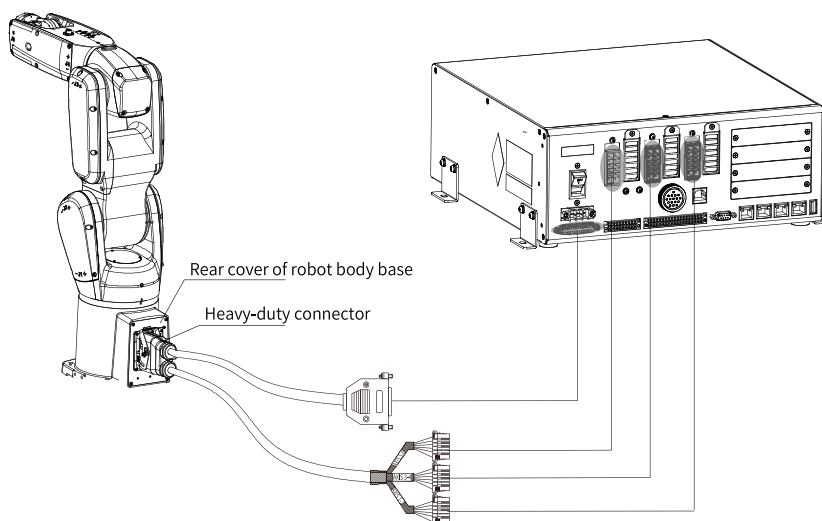
1. Connect the heavy-duty connector for the user cable to the heavy-duty connector on the robot base.

Note

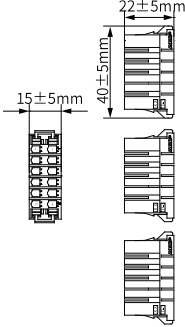
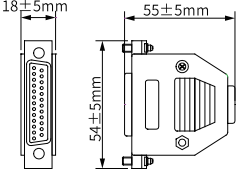
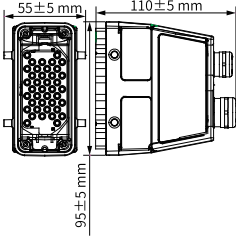
When inserting the heavy-duty connector, check that the guide groove of the rubber core matches and insert the heavy-duty connector vertically (less than 2° in the left and right directions, and less than 5° in the up and down directions).



2. Connect the power connector and signal connector of user cables to the 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.



The following table lists the cable hole dimensions.

Name	Power Line Connector (Cabinet Side)	Encoder Cable Connector (Cabinet Side)	Heavy-Duty Connector (Robot Side)
Dimensions			
	40 mm x 22 mm x 15 mm (L x W x H)	55 mm x 60 mm x 25 mm (L x W x H)	110 mm x 95 mm x 55 mm (L x W x H)

3.7 Wiring and Tubing

3.7.1 Wiring (Cables)



Do not allow non-professionals to perform equipment installation, wiring, maintenance, inspection, or parts replacement.

The available cables/air tubes are embedded 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	Remarks
30 VAC/VDC	0.5 A	12	25 AWG	Signal cable



Make sure that the current does not exceed 0.5 A.

The following table describes the specifications of connectors.

Name	Cable	Code
IRCB501 series robot control cabinet	12-pin aviation connector on the forearm	15050817
	5 m 19-pin I/O cable on the base	1504B978
	Aviation connector for manual brake release	01660004

3.7.2 Tubing (Air Ducts) (IRCB501 Series Robot Control Cabinet)

Standard specifications (without solenoid valves)

The following table describes the specifications of air ducts.

Maximum Operating Pressure	Quantity	Specifications (Outer Diameter x Inner Diameter)
0.59 MPa (6 kgf/cm ²)	2	Φ4 mm x Φ2.5 mm

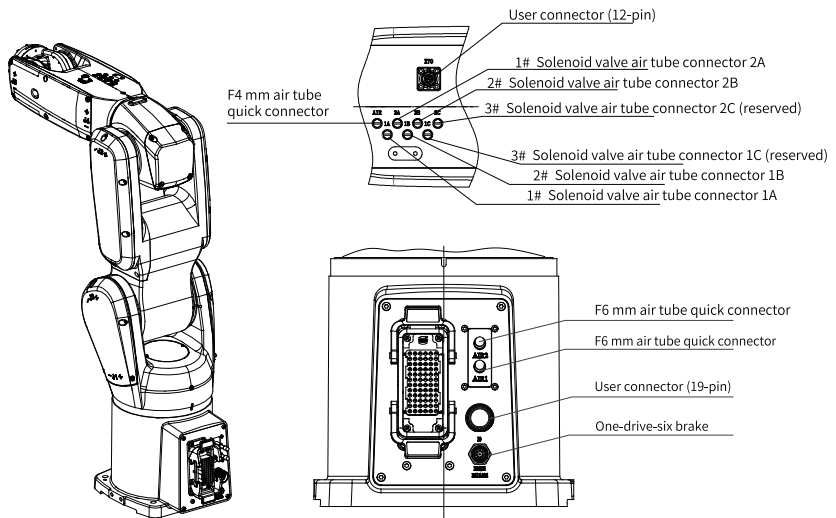


Figure 3-8 User wiring/tubing connectors of the standard model

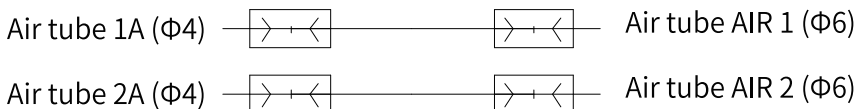
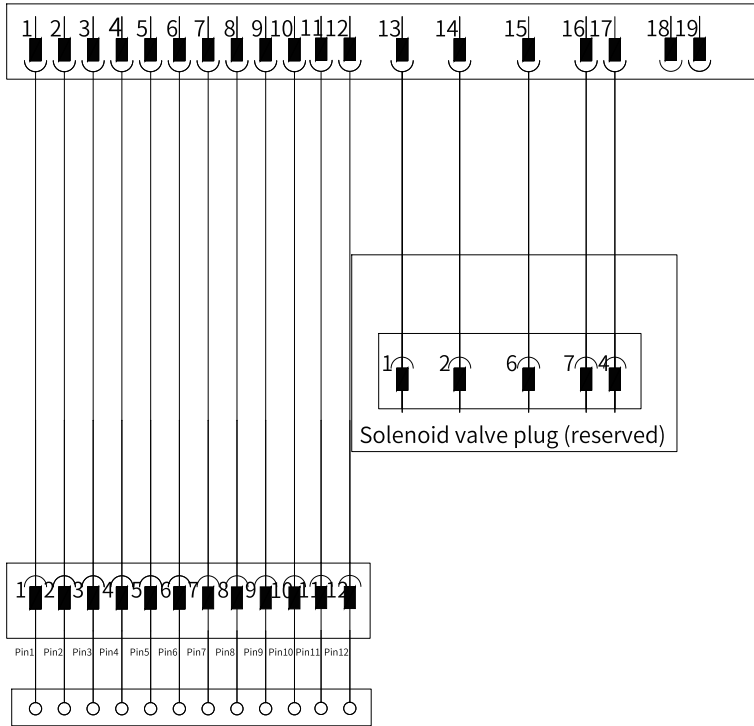


Figure 3-9 Pneumatic schematic diagram of the standard robot

19-pin connector on the base



12-pin connector on the forearm

Figure 3-10 Internal electrical connection of the aviation connector

3.7.3 Robot Aviation Connector Pins

IRCB501 series robot control cabinet

The robot provides a 12-pin aviation connector on the forearm top and a 19-pin aviation connector on the base. The two connectors are interconnected by a special cable inside the robot body.

The connection between the 19-pin aviation connector on the base and the 12-pin aviation connector on the top of the forearm is described as follows:

1. Pins 1 to 12 of the 19-pin connector are directly connected to pins 1 to 12 of the 12-pin connector.
2. Pins 13 to 17 of the 19-pin connector are connected to the reserved solenoid valve connector.
3. Pins 18 to 19 of the 19-pin connector are reserved.

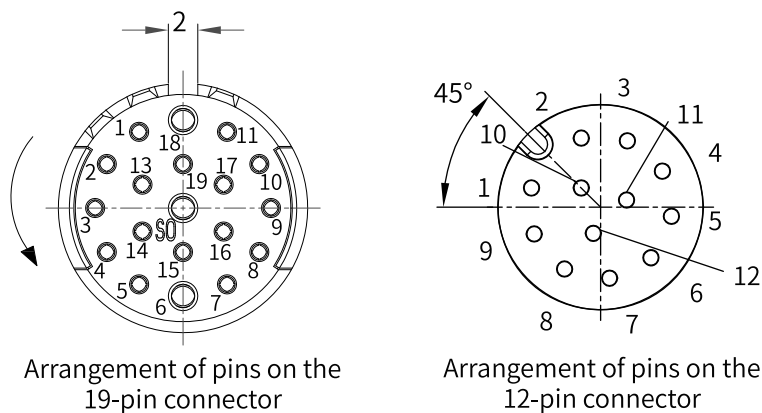


Figure 3-11 Aviation connector pin layout

Table 3-3 Functions of solenoid valve control pins

Pin No. of 19-Pin Aviation Connector	Function
13	Solenoid valve 1A control
14	Solenoid valve 1B control
15	Solenoid valve 2A control
16	Solenoid valve 2B control
17	24 V (power supply of solenoid valve)
18 to 19	Reserved

The following table describes the specifications of the solenoid valve inside the base.

Table 3-4 Specifications of the solenoid valve inside the base

Item	Specifications
Switchover Method	2-position dual control
Operating pressure range ^[1]	0.1 MPa to 0.7 MPa
Response time (0.5 MPa)	Less than 10 ms
Maximum running frequency	10 Hz
Operating voltage	24 VDC
Power	0.4 W

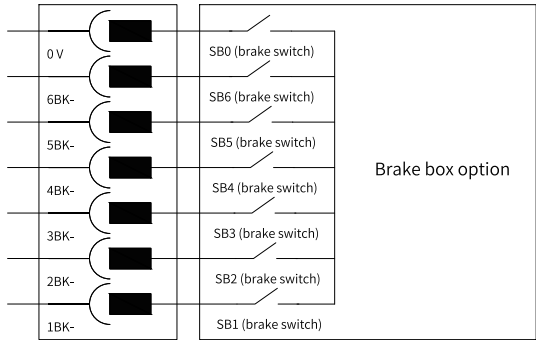
Note

[1]: Use the air source connected to the robot within the maximum operating pressure (0.59 MPa) of the air duct.

3.7.4 Aviation Connector for Brake Release on Base

Pin 12 of the aviation connector for brake is the common terminal, while pins 3 to 8 are connected to J1 to J6 motor brake signals.

To manually release the brake, purchase the corresponding manual brake release box. The following figure shows the manual brake release connections.



4 Installing End Effector

4.1 Installing an End Effector

You need to make your own end effector. Note the following when installing the end effector.



Caution

- Perform wiring and air tubing of the chuck 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 M5 screws to attach the end effectors to the wrist flange.

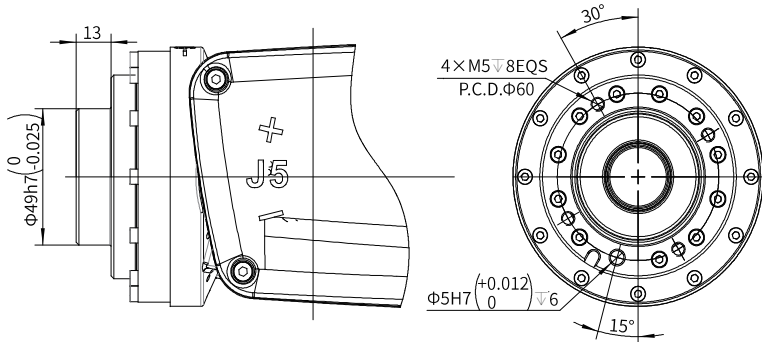


Figure 4-1 Wrist flange (unit: mm)

4.2 Installing the Pneumatic Valve and Other Auxiliary Accessories

The robot is equipped with installation interfaces on the forearm and upper end of the elbow, which are used for installing auxiliary accessories such as the pneumatic valve. Two M4 screws of 8 mm long are used. The following figure shows the dimensions.

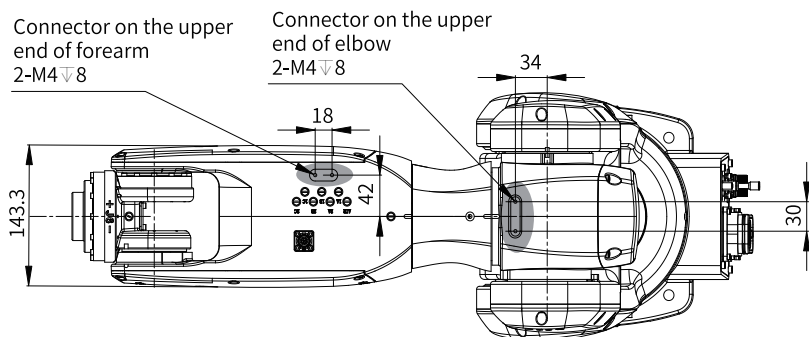


Figure 4-2 Installation position of pneumatic valve (unit: mm)

5 Motion Range

5.1 Motion Range

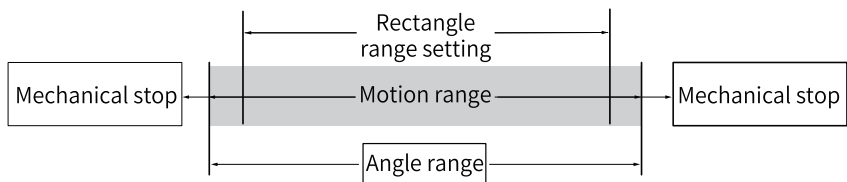


Caution

- 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.

Set the motion range based on the following:

- Angle range (all joints)
- Mechanical stop
- Rectangular range in the robot coordinate system



If you need to limit the motion range for safety reasons or to improve layout efficiency, set it according to ["4.1 Installing an End Effector" on page 45](#) and ["4.2 Installing the Pneumatic Valve and Other Auxiliary Accessories" on page 45](#).

5.2 Motion Range Setting by Angle Range

5.2.1 Maximum Angle Range of J1

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.

Note

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.

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

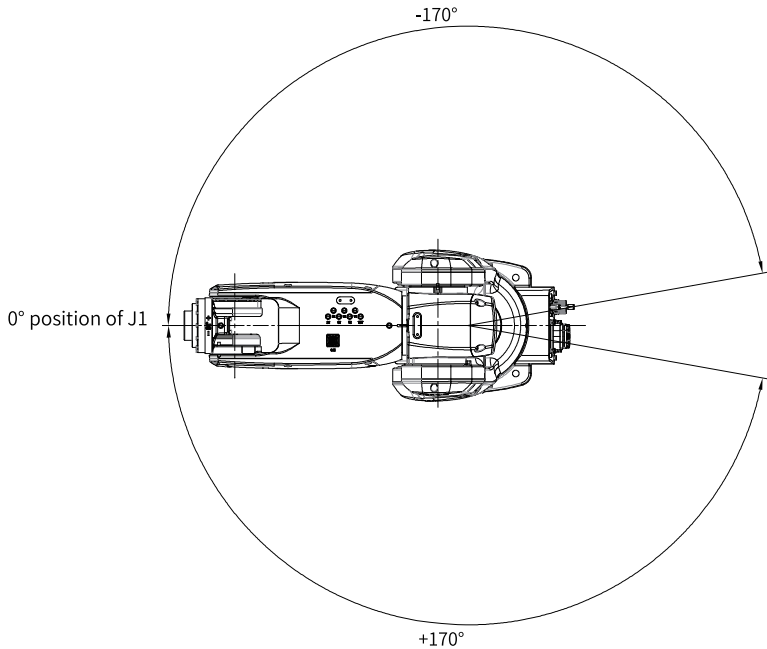


Figure 5-1 Maximum angle range of J1

5.2.2 Maximum Angle Range of J2

The clockwise angle is positive (+), and the counterclockwise angle is negative (-). The maximum angle range of J2 is different for IRS311-7-70TS-INT and IRS311-7-90TS-INT, as shown in the figures below.

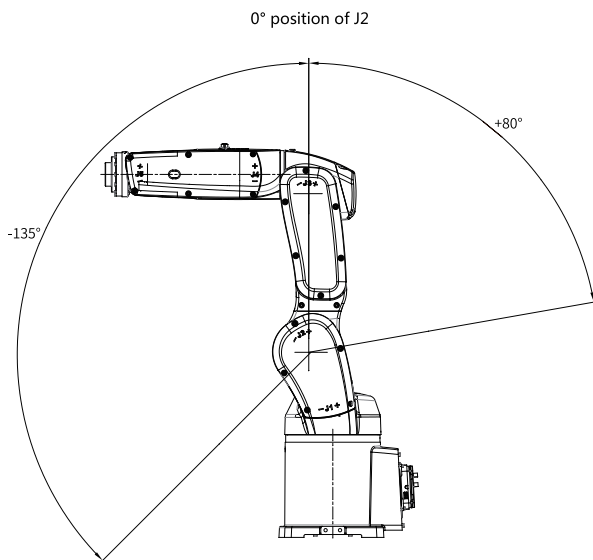


Figure 5-2 Maximum angle range of J2 for IRS311-7-70TS-INT

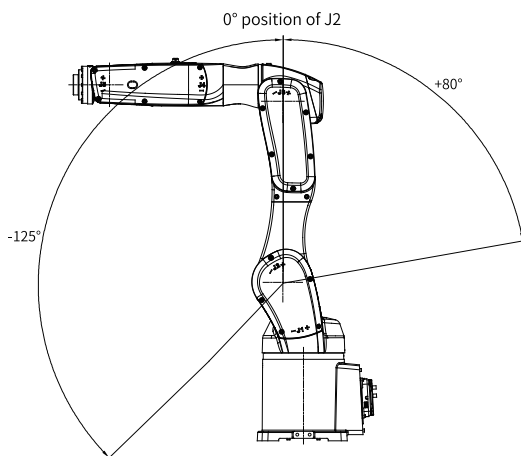


Figure 5-3 Maximum angle range of J2 for IRS311-7-90TS-INT

5.2.3 Maximum Angle Range of J3

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

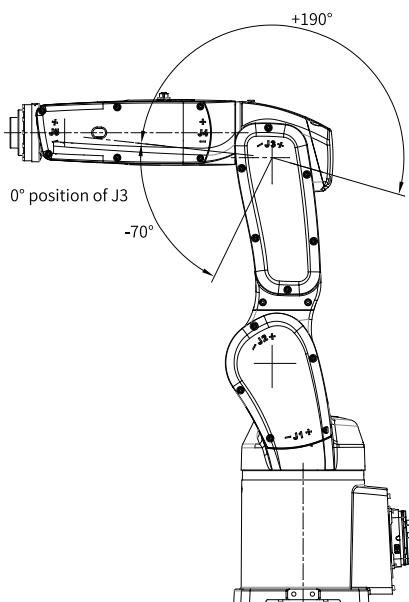


Figure 5-4 Maximum angle range of J3

5.2.4 Maximum Angle Range of J4

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

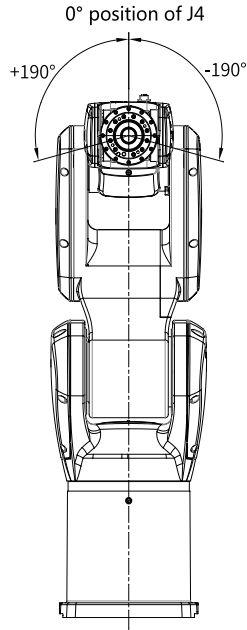


Figure 5-5 Maximum angle range of J4



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

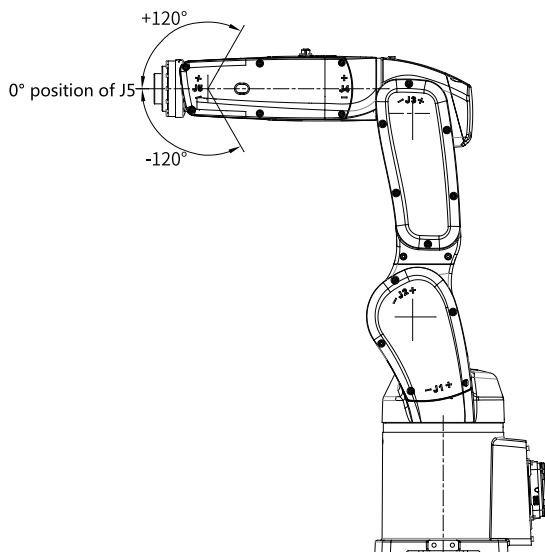


Figure 5-6 Maximum angle range of J5

5.2.6 Maximum Angle Range of J6

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

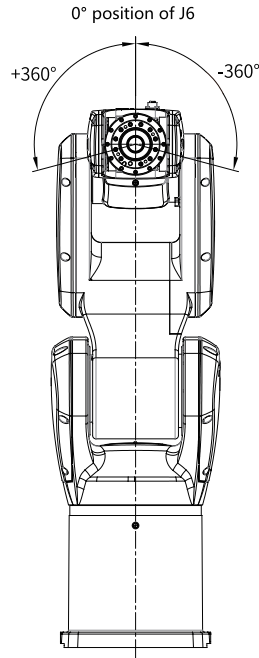


Figure 5-7 Maximum angle range of J6

5.3 Setting Motion Range By Using Mechanical Stop

As shown in the figure below, IRS311-7 has a mechanical limit stop that is pre-installed at J1.

The mechanical stop is used to mechanically set an absolute motion range beyond which motion is not allowed.

The setting of the angle range cannot exceed the set angle range of the mechanical stop.

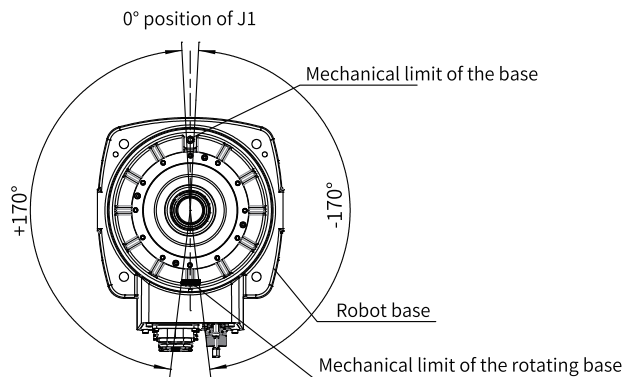


Figure 5-8 Mechanical limit stops for J1

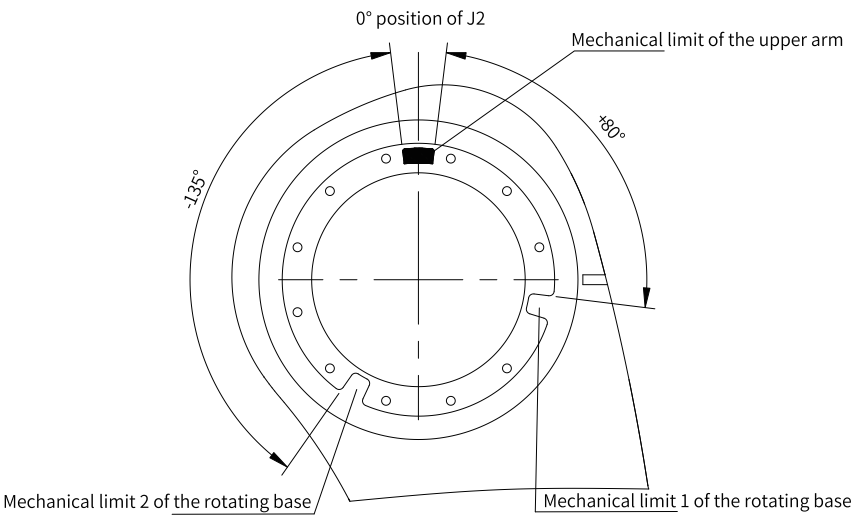


Figure 5-9 Mechanical limit stops for J2 (IRS311-7-70TS-INT)

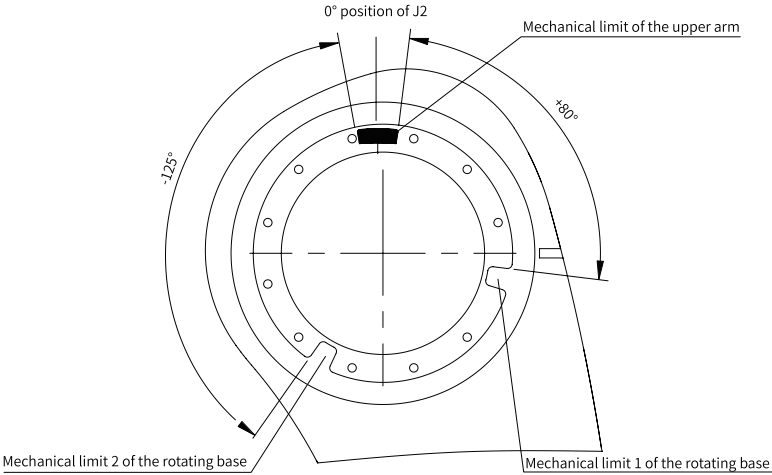


Figure 5-10 Mechanical limit stops for J2 (IRS311-7-90TS-INT)

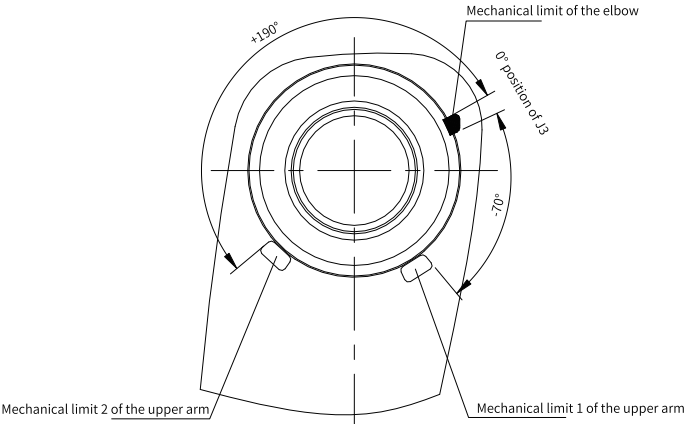


Figure 5-11 Mechanical limit stops for J3

6 Maintenance

6.1 Maintenance Precautions

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



Danger

- Equipment installation, wiring, inspection, maintenance, 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 any parts that are not covered in this guide. Follow the maintenance procedure strictly as described in this guide.
 - 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.
-



Warning

- Submit the repair request according to the 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.

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.
Timing belt	Check whether the tension frequency of timing belt is within the standard range.

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.



Caution

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.

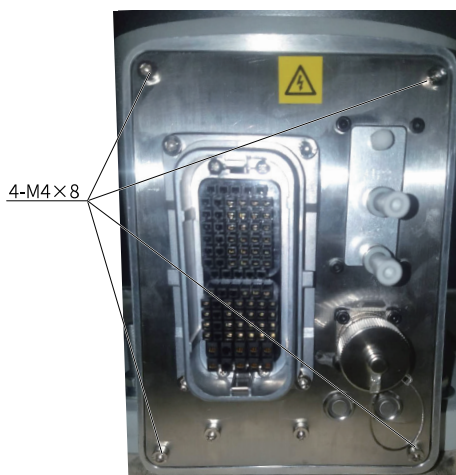
6.3 Part Replacement

The robot base is equipped with a lithium battery, which can be replaced as needed.

 Warning

- Do not perform equipment maintenance or servicing while power is on. Failure to comply may 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.

1. Remove the four M4x8 screws on the back cover and remove the back cover.



2. Remove the battery.



- To prevent loss of zero points, first insert a new battery into the white 2P connector. Secure the new battery in the wiring compartment, and then remove the used battery. Failure to comply will cause loss of zero points.

Detailed procedure:

1. Cut the zip tie securing the battery to the cable plate.
2. Tie the new battery onto the cable plate with a zip tie.
3. Connect the terminal of the new battery to the empty white 2P connector.
4. Remove the used battery.

Note

Failure to comply with the procedure described above may cause loss of zero points. ["6.5.2 Procedure of Zero Point Adjustment" on page 64](#)

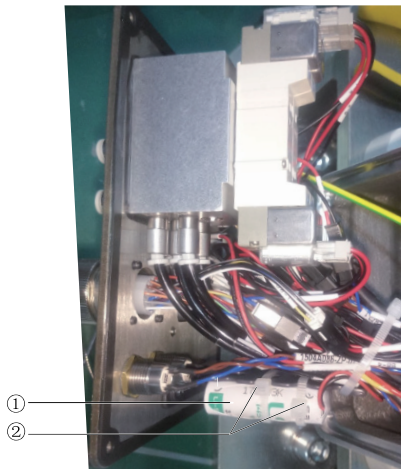


Figure 6-1 Replacing the battery

No.	Name
①	Battery
②	Tie strap

6.4 Oil Leakage Inspection

6.4.1 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.

6.4.2 Oil Leakage Inspection Parts

- Insert a dust-free cloth and scouring pad 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.
- If significant oil leakage is observed, contact the manufacturer for technical support.
- When opening the lubrication grease supply/drain port, take care to prevent grease splashing.

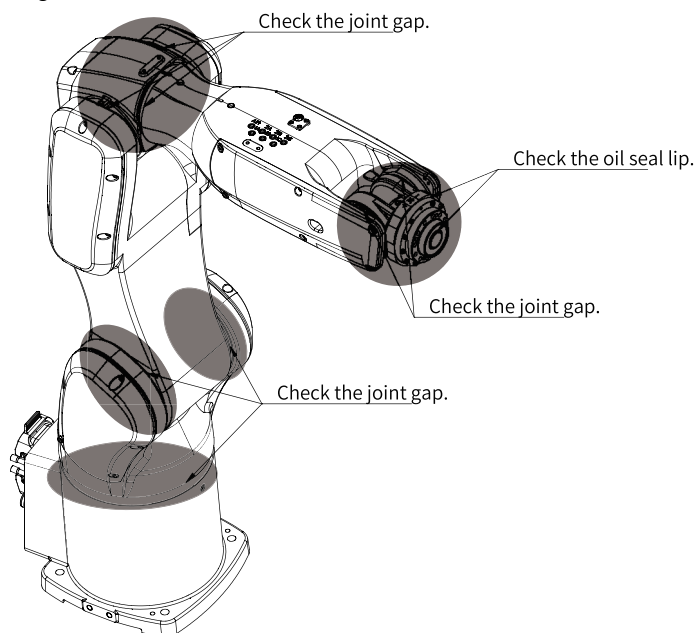


Figure 6-2 Oil leakage inspection parts



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 ["6.4.3 Lubricating Grease Leakage and Solution" on page 63](#) 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 M5 screw plug is $1.8 \text{ N} \cdot \text{m}$ and the torque of M3 screw plug is $0.25 \text{ N} \cdot \text{m}$ (only for the J3 oil outlet).
-

6.4.3 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.	
		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 LT518 on motor or reducer mounting surfaces becomes invalid.	Re-apply the threadlocker LT518.
		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.

6.5 Home Position Calibration

6.5.1 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 action area of the system. Failure to comply will result in serious accidents.
- Before operation, check that there is no person inside the safety fence. Do not enter the action area during system running. Failure to comply will result in serious safety problems.
- Operating the robot system in teaching 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.

6.5.2 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".

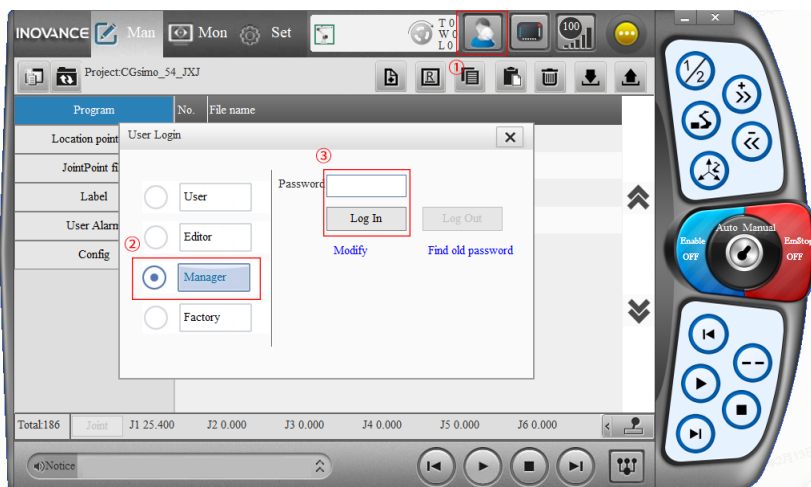


Figure 6-3 Screen of I RTP80 series tech pendant

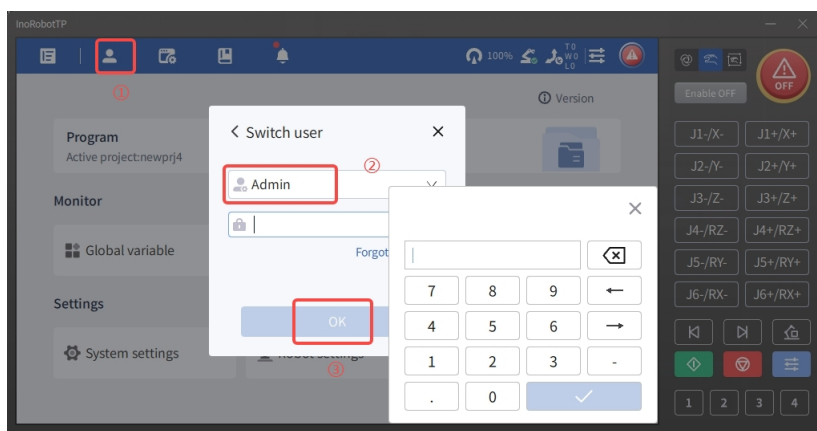


Figure 6-4 Screen of I RTP200 series tech pendant

2. Switch to the ZeroPoint setting screen.

On the main screen of the tech pendant, choose "Set" > "BasePos" > "ZeroPoint" to open the "ZeroPoint" screen.

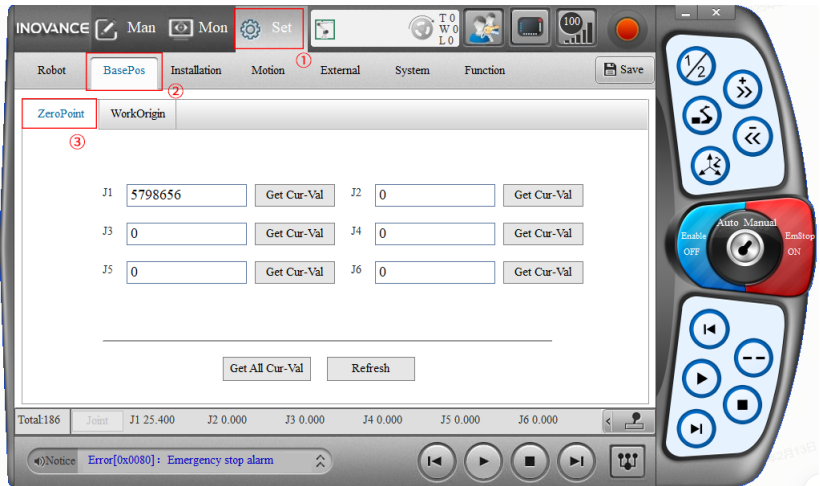


Figure 6-5 Screen of IRTP80 series tech pendant

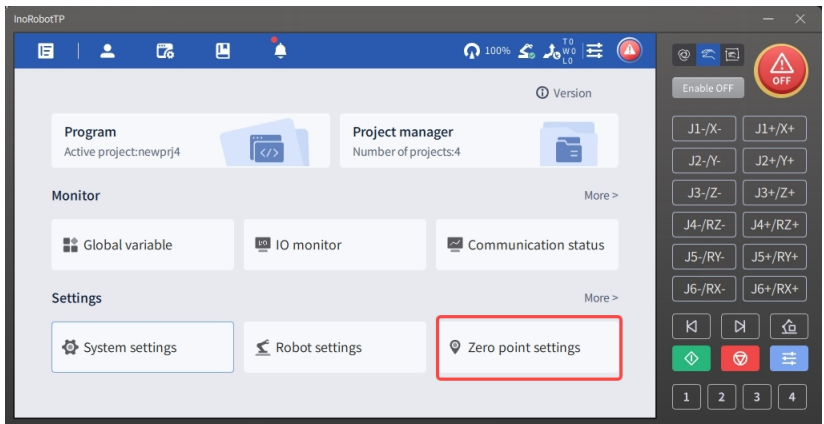


Figure 6-6 Screen of IRTP200 series tech pendant

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.

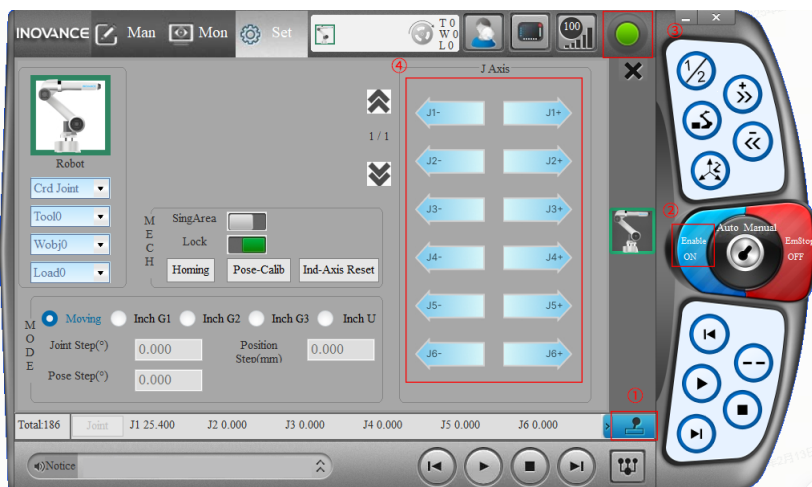


Figure 6-7 Screen of IRTP80 series tech pendant

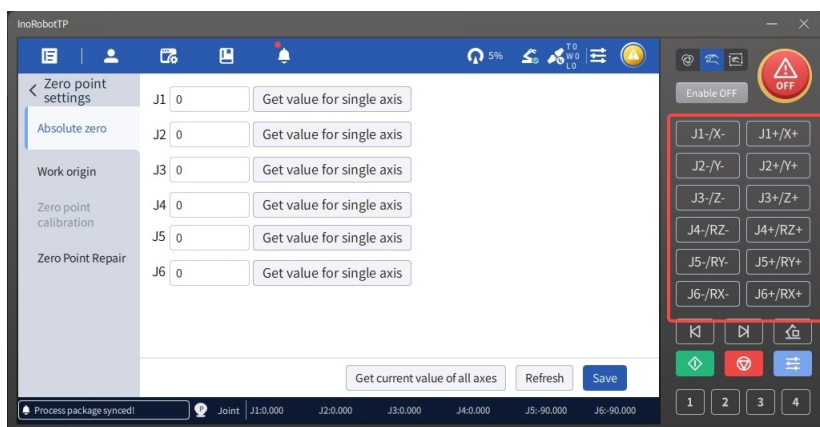


Figure 6-8 Screen of IRTP200 series tech pendant

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).

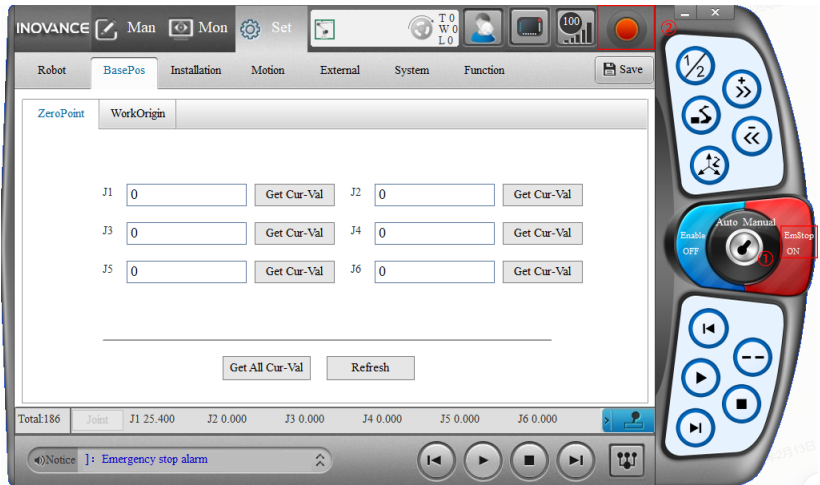


Figure 6-9 Screen of IRT80 series tech pendant

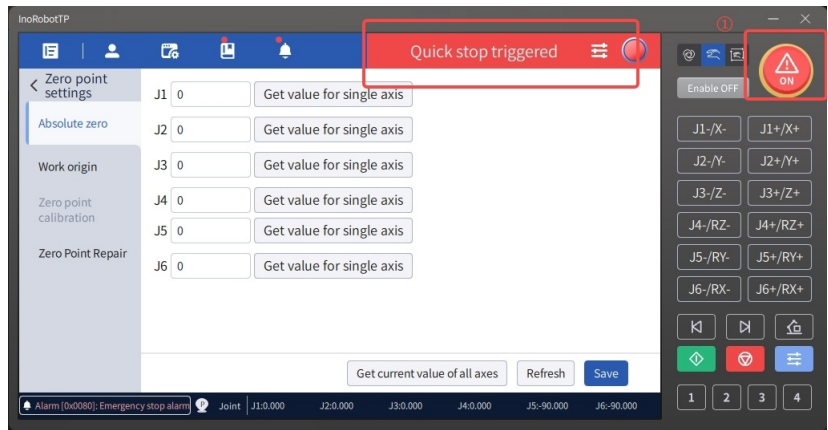


Figure 6-10 Screen of IRT200 series tech pendant

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.

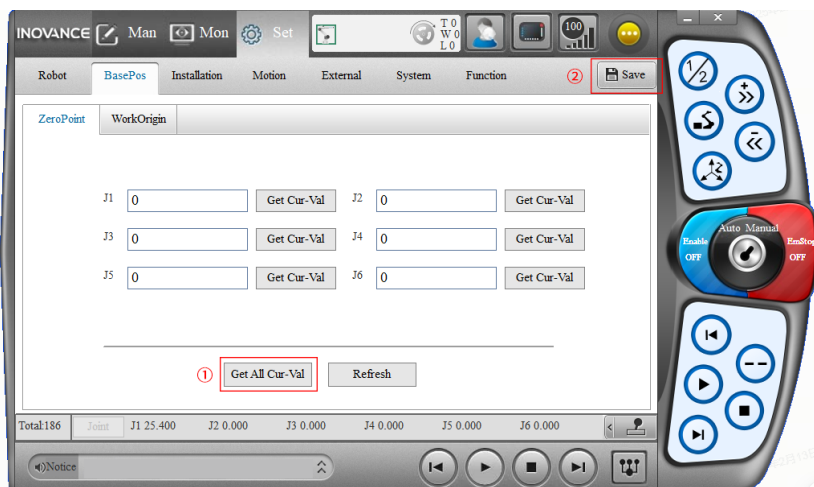


Figure 6-11 Screen of I RTP80 series tech pendant

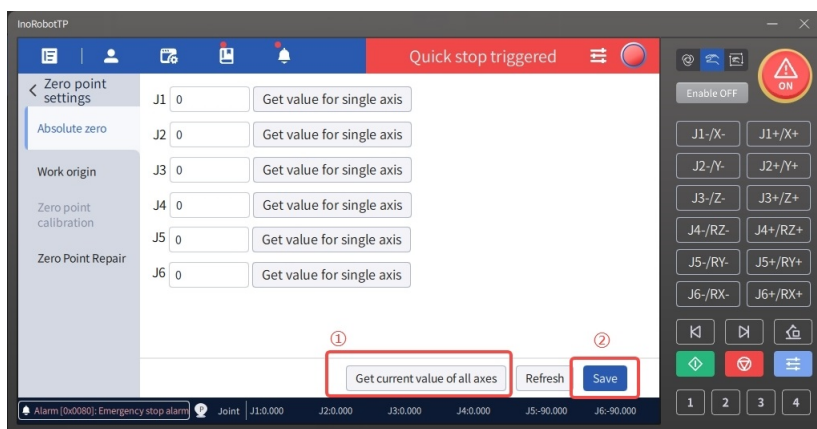


Figure 6-12 Screen of I RTP200 series tech pendant

6.5.3 Origin of Each Joint

Calibration tool

The calibration tool is used to calibrate the rotary axes of the robot manually, as shown in the figure below.

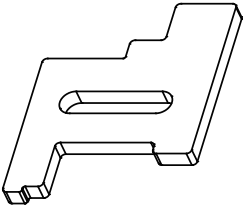


Figure 6-13 Calibration tool

Calibration method 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.

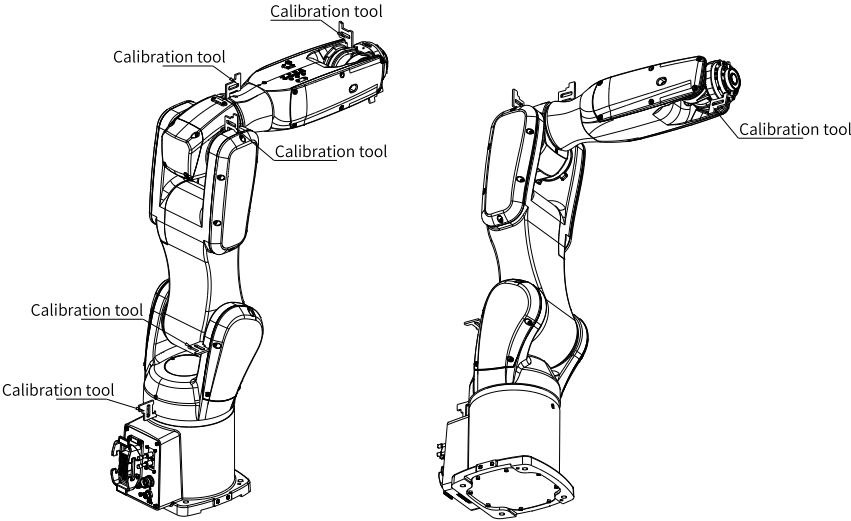


Figure 6-14 Calibration of axes J1 to J6

6.6 Options

Option	Description	Specifications	Code
Base I/O cable	Connecting the body of the IRS311-7 series 6-axis robot to an electric cabinet	5 m	1504B978
90° I/O aviation connector on forearm	Used for wiring of the aviation connector on the forearm in IRS311-7 series 6-axis robots	12 pins	15050817
Zero point calibration tool	Used to calibrate the J1 to J6 of the robot manually	-	32022076

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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