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IR-S60 Series IR-GS60 Series

IR-S60&GS60-INT Series SCARA Robot

User Guide - Manipulator

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

Data code PS00021829A00

Legal Information

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The contents are subject to change without notice due to product upgrade.

Waste Disposal

The storage, use, and disposal of this product (including optional accessories) must comply with local laws and regulations.

Qualified Personnel

The product/system described in this documentation may be operated only by personnel qualified for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel can identify the risks of the product/system and prevent possible dangers.

Proper Use of the Product

Proper transportation, storage, assembly, installation, commissioning, operation, and maintenance are required to ensure the safe operation of the product without any problems. The required ambient conditions must be met. All operations must follow the guidelines provided in this documentation.

Preface

Introduction

Inovance IR-S60&GS60 series SCARA robots are star products in the field of four-axis high-payload robots. The robot provides a maximum arm length of 1200 mm, a maximum paylaod of 60 kg, and a Z-axis stroke of 400 mm, featuring high efficiency, accuracy, and speed.

- Repeatability: ±0.05 mm
- The robot uses a harmonic reducer to directly drive the spline, effectively improving its rigidity.
- Optimized motion control algorithms and vibration suppression algorithms improve the smoothness of robot motion to reduce the impact of the robot on the base and line during the motion, extending the service life of the equipment.

The IR-S60&GS60 series SCARA robots are widely used in loading and unloading, precision assembly, handling, dispensing, gluing, screw tightening, labeling, material insertion, sorting in new energy, 3C and food packaging industries. The robot can be used in high-load occasions, such as handling of large parts, machine loading and unloading, machine assembly, industrial parts transfer, and other occasions.

This document describes the basic specifications, installation, and maintenance of the IR-S60&GS60 series SCARA robots.

More Data

Data Name	Data Code	Description
IRCB501-INT Series Robot Controller User Guide	PS00017628	Describes the specifications, installation, and wiring of the IRCB501 series international version controller.
IRCB501-INT High-Protection Series Robot Controller User Guide	PS00017685	Describes the specifications, installation, and wiring of the IRCB501 series international version high-protection controller.
IR-TP200 Series Industrial Robot Teach Pendant User Guide	19012798	Describes the software-related operations of the IR-TP200 series teach pendant.
IR-S60&GS60-INT SCARA Robot User Guide - Manipulator (this guide)	PS00021829	Describes the basic specifications, installation, and maintenance of the product.

Revision History

Revision Date	Version	Revision
2026-3	A00	Initial release

Access to the Guide

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

- Visit *https://www.inovance.com/global*, and choose Service&Support > Support > Documentation Download.
- Scan the QR code on the product with your smart phone.
- Scan the QR code below to install My Inovance app, where you can search for and download user guides.

Warranty Disclaimer

Inovance provides warranty service within the warranty period (as specified in your order) for any fault or damage that is caused by proper operation of the user. Maintenance will be charged after the warranty period expires.

Within the warranty period, maintenance will be charged for the following damage:

- Damage caused by operations not following the instructions in the user guide
- Damage caused by fire, flood, or unusual 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 is charged according to the latest Price List of Inovance. If otherwise agreed upon, the terms and conditions in the agreement shall prevail.

For details, see Product Warranty Card.

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1 Basic Safety Instructions

1.1 Safety Precautions

Safety Disclaimer

- This chapter presents essential safety instructions for a proper use of the equipment. Before operating the equipment, read through the guide and comprehend all the safety instructions. Failure to observe the safety instructions may result in death, severe personal injuries, or equipment damage.
- "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 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

- Drawings in the guide are sometimes shown without covers or protective guards. 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 safety shoes, safety clothing, safety glasses, protective gloves, and protective sleeves.

Unpacking
 • Do not install the equipment if you find damage, rust, or signs of use on the equipment or accessories upon unpacking. • Do not install the equipment if you find water seepage or missing or damaged components upon unpacking. • Do not install the equipment if you find the packing list does not conform to the equipment you received.
 • Before unpacking, check whether the outer package is intact, damaged, wet, damped, or deformed. • Unpack the package in sequence. Do not hit the package violently. • Check whether there is damage, rust, or injuries on the surface of the equipment and equipment accessories before unpacking. • Check whether the package contents are consistent with the packing list before unpacking.

Storage and Transportation



- Large-scale or heavy equipment must be handled 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 injuries 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.



- Handle the product with care and mind your steps to prevent personal injuries or product damage.
- When handling the equipment with bare hands, hold the equipment casing firmly with care to prevent the equipment from falling and impact damage. Failure to comply may result in personal injuries.
- Store and transport the equipment based on the storage and transportation requirements. Failure to comply will result in equipment damage.
- Avoid storing or transporting the equipment 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.
- Pack the equipment strictly before transportation. Use a sealed box for long-distance transportation.
- Never transport the equipment with other equipment or materials that may harm or have negative impacts on this equipment.

Installation



- The equipment can only be operated by professionals with electrical knowledge. Non-professionals are not allowed to operate on the equipment.



- Read through the guide and safety precautions before installation.
- Do not install the equipment 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 (such as controller) 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 a fire.
- Do not retrofit the equipment.
- Do not loosen the fixing bolts of the product parts and components.
- When the equipment (such as controller) 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.
- 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 can result in fire accident.



- Cover the top of the equipment (such as controller) 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 top of the equipment to prevent over-temperature caused by poor ventilation due to blocked ventilation holes.

Wiring



- Equipment installation, wiring, maintenance, inspection, or component replacement must be performed only by professionals.
- Before wiring, disconnect the power supplies of all equipments. Wait for at least the time designated on the equipment warning label before further operations because residual voltage still exists after power-off. Measure the direct voltage of the main circuit and ensure that the voltage is within the safety range. Failure to comply can result in an electric shock.
- Do not perform wiring, remove the equipment cover, or touch the circuit board with power ON. Failure to comply can result in an electric shock.
- Check that the equipment is grounded properly. Failure to comply can result in an electric shock.



- Do not connect the input power supply to the output side of the equipment. Failure to comply can result in equipment damage or even a 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.
- Cables used for wiring must meet cross sectional area and shielding requirements. The shield of the cable must be reliably grounded at one end.
- Tighten the terminal screws with the tightening torque specified in the user guide. Improper tightening torque may result in overheat, damage to the connecting parts, or 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 shock or equipment damage.



- Follow the electrostatic discharge (ESD) procedure and wear an anti-static wrist strap to perform wiring. Failure to comply may result in damage to the equipment or to the internal circuit.
- 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



- 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 a fire.
- Do not open the cabinet door or protective cover of the product, touch any wiring terminal of the product, or remove any part of the product with power on. Failure to comply can result in an electric shock.



- After the completion of wiring and parameter setting, perform a robot test run to confirm that the robot can operate safely. Failure to comply may result in personal 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 accident.
- Before power-on, check that no one is near the equipment, motor, or machine. Failure to comply may result in death or personal injuries.

Operation



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



- Do not touch the equipment enclosure, fan, or resistor with bare hands. 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 a fire or equipment damage.

Maintenance



- Equipment installation, wiring, maintenance, inspection, or component replacement must be performed only by professionals.
- Do not maintain the equipment with power ON. Failure to comply can 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.
- 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 is powered off. Failure to comply can result in an electric shock.



- Perform routine and regular inspection and maintenance on the equipment in accordance with maintenance requirements and keep a record.

Repair



- Equipment installation, wiring, maintenance, inspection, or component replacement must be performed only by professionals.
- Do not maintain the equipment with power ON. Failure to comply can 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 a request for repair services in accordance with the product warranty agreement.
- When the fuse is blown or the circuit breaker or earth leakage circuit 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 injuries or equipment damage.
- Troubleshooting and repair must be performed by professionals in accordance with the repair instructions, with repair records kept properly.
- Replace quick-wear parts of the equipment in accordance with the replacement instructions.
- Do not operate on damaged equipment. Failure to comply may result in death, personal injuries, 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 death, personal injuries, or property damage. • Recycle retired equipment in accordance with industry waste disposal standards to avoid environmental pollution.

Safety Label

For safe operation and maintenance, comply with the safety labels on the equipment. Do not damage or remove the safety labels. See the following table for descriptions of the safety labels.

To ensure safe operation, comply with equipment-related safety labels. See the following table for descriptions of the safety labels.

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

1.2 Industrial Information Security

The product provides an interface to connect to the network and transmits data through the network interface. To protect factories, systems, machines, and networks from cyber attacks and ensure safe operation, a proper industrial information security protection mechanism must be implemented.

The customer is responsible for providing and continuously ensuring a secure connection between the product and the customer network or any other network to prevent unauthorized access to its factories, systems, machines, and networks. The system or machine can be connected to the corporate network or the Internet only when secure connections are ensured and appropriate security measures are taken (for example, anti-virus software or firewall installed).

Inovance continuously develops and improves products and solutions to improve safety. It is strongly recommended that you update the product promptly and always use the latest version.

CAUTION

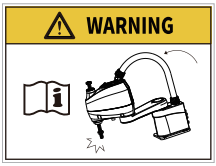
Malware (such as viruses, Trojans, and worms) can bring the device into an unsafe operating state, resulting in death, serious injury, and property damage. Observe the following precautions strictly:

- Always use the latest software version. If the product version is no longer supported or the latest program version is not applied, customers are at increased risk of cyberattacks.
- Implement and maintain appropriate security measures (including but not limited to deploying anti-virus software, firewall, WAF, IPS/IDS, situational awareness system, ID verification, and data encryption) to prevent files in the removable storage device from being damaged by malware and to protect products, networks, systems, and interfaces from unauthorized access, disruption, intrusion, data leakage, or information theft.
- Check all safety-related interfaces and settings after commissioning.

1.3 Safety Signs

The following signs are sticked on the robot body. Pay attention that special dangers exist around the positions sticked with safety signs. For safe equipment operation and maintenance, comply with safety signs on the equipment. Do not damage or remove the safety signs.

The following table lists the warning labels.

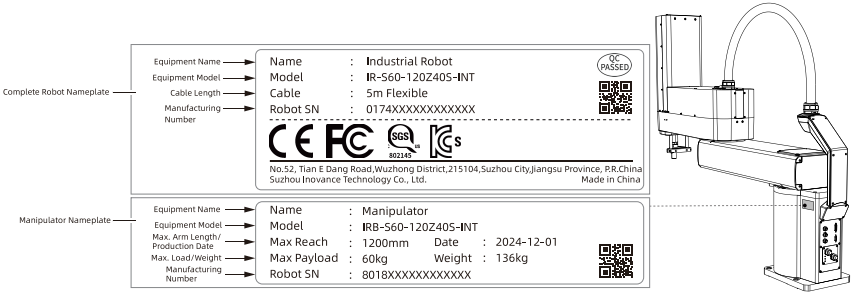
Safety Signs	Name	Description
	Electric shock hazard	Indicates that ignoring this safety sign may result in serious consequences such as equipment damage, electric shock, or personal injury.
	Crush hazard	Indicates that ignoring this safety sign may result in serious consequences such as equipment impact, damage, personnel injury, or death.
	Tip-over hazard	Indicates that ignoring this safety sign may result in serious consequences such as equipment tipping over, falling down, damage, or personnel injury.

2 Product Information

2.1 Model and Nameplate

IR - S 60 - 120 Z40 S - INT
① ② ③ ④ ⑤ ⑥ ⑦

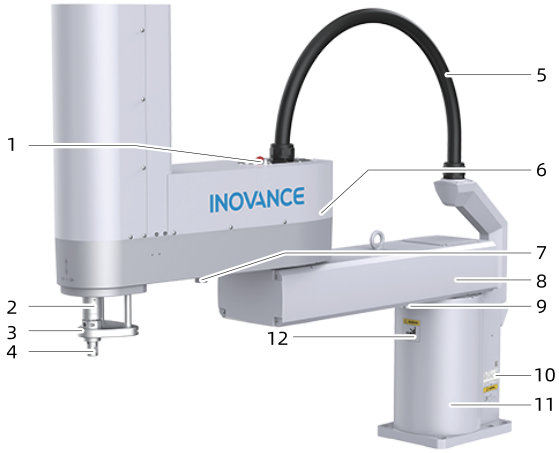
① **Product family** INOVANCE Robot	④ **Arm length** 120: 1200 mm	⑦ **Version** INT: International (with functional safety)
② **Series** S: SCARA robot GS: High performance SCARA robot	⑤ **Max. Z-axis Stroke (Blank for models without lead screw)** Z40: Max. 400 mm stroke	-
③ **Load** 60: 60 kg	⑥ **Installation environment** S: Standard	



Note

- Before use, make sure that the serial number of the robot manipulator is consistent with that of the robot controller. Otherwise, the robot system 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.

2.2 Components



No.	Name	No.	Name
1	Run indicator	7	J2 mechanical limit stop
2	Ball screw shaft of J3	8	Arm 1
3	Mechanical limit stop	9	J1 mechanical limit stop
4	Spline shaft of J4	10	Nameplate
5	Cable unit	11	Base
6	Arm 2	12	Safety sign

2.3 Product Dimensions

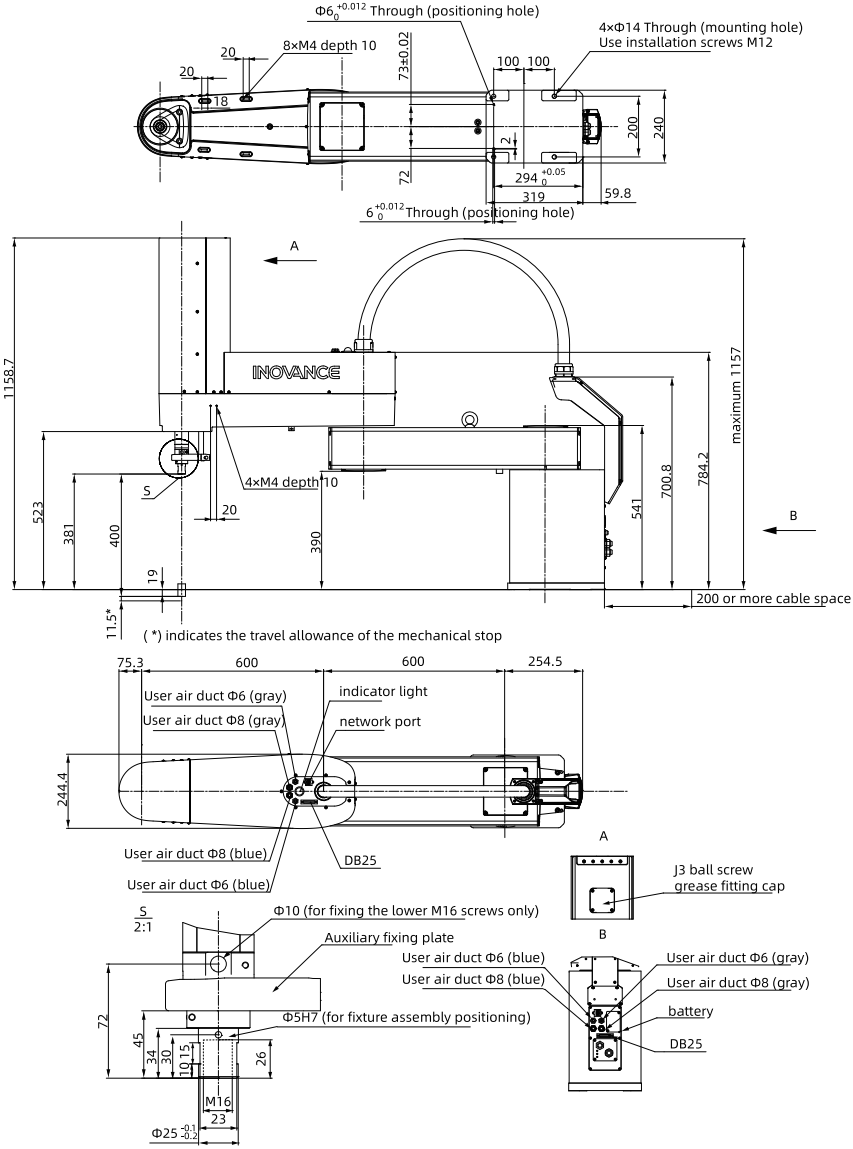


Figure 2-1 Outline dimensions of IR-S60-120Z40S-INT (unit: mm)

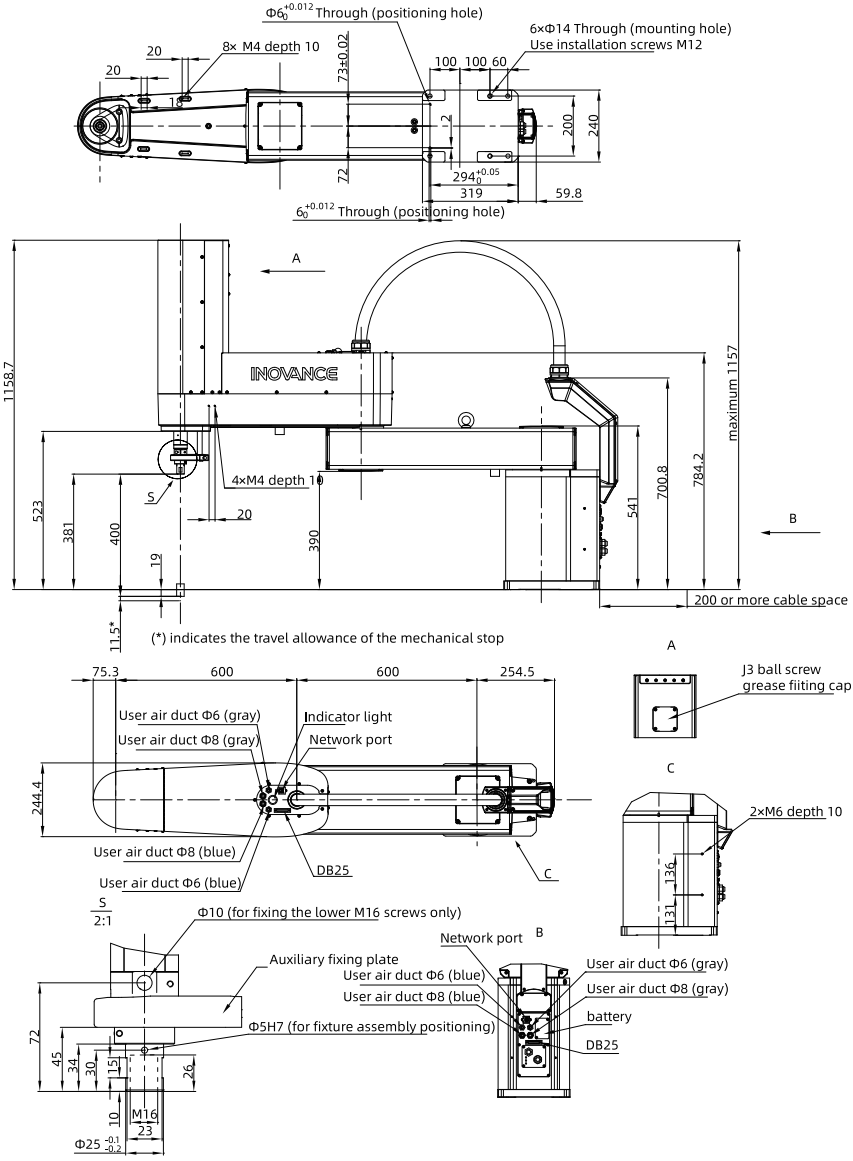


Figure 2-2 Outline dimensions of IR-GS60-120Z40S-INT (unit: mm)

2.4 Technical Specifications

Item		IR-S60-120Z40S-INT	IR-GS60-120Z40S-INT
Arm length	Arm 1 + Arm 2	1200 mm	1200 mm
	Arm 1	600 mm	600 mm
	Arm 2	600 mm	600 mm
Maximum speed	J1 + J2	7400 mm/s	7400 mm/s
	J3	1500 mm/s	1500 mm/s
	J4	600°/s	600°/s
Repeatability	J1 + J2	±0.05 mm	±0.05 mm
	J3	±0.02 mm	±0.02 mm
	J4	±0.005°	±0.005°
Handling capacity (load)	Rated	30 kg	30 kg
	Max.	60 kg	60 kg
Allowable load inertia of J4	Rated	1.20 kg·m²	1.20 kg·m²
	Max.	2.45 kg·m²	2.45 kg·m²
Mounting hole	Mounting hole	200 mm x 200 mm (4 x Φ14 mm)	200 mm x 200 mm x 60 mm (6 x Φ14 mm)
Manipulator weight (excluding cables)	Manipulator weight (excluding cables)	136 kg	136 kg
Press-in force of J3	Press-in force of J3	450 N	450 N
Signal line	Wiring	25x signal, 30 V, 0.5 A	25x signal, 30 V, 0.5 A
	Ethernet connector	CAT5E	CAT5E
Air duct	Air duct	Air tube: Φ6mm x 2, Φ8 mm x 2 Pressure resistance: 0.59 MPa	Air tube: Φ6mm x 2, Φ8 mm x 2 Pressure resistance: 0.59 MPa
Ambient condition	Ambient temperature[1]	5°C to 40°C	5°C to 40°C
	Relative humidity	10%RH to 80%RH	10%RH to 80%RH
IP rating	IP rating	IP20	IP20
Noise level	Noise level[2]	$L_{Aeq} \leq 80$ dB(A)	$L_{Aeq} \leq 80$ dB(A)
Maximum motion range	J1	±135°	±135°
	J2	±150°	±150°
	J3	400 mm	400 mm
	J4	±360°	±360°
Cycle time[3]	Cycle time[3]	0.84s	0.67s

Item		IR-S60-120Z40S-INT	IR-GS60-120Z40S-INT
Input power (average power consumption)	Input power (average power consumption)	7 kVA (0.6 kW)	7 kVA (0.6 kW)
Matching controller (Standard)	Matching controller (Standard)	IRCB501-4ED-INT	IRCB501-4MD-INT
Mounting method	Mounting method	Tabletop	Tabletop
Certification	CE certification, cSGSus certification, FCC certification, and functional safety certification (only supported by "-INT" controller and requires a functional safety expansion card), KCs certification.		

Note

[1] 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 run the robot at low speed for 10 minutes before operation.

[2] Measured in front of the robot at a distance of 1000 mm from its operating area and at least 50 mm above the base mounting surface with four axes operating at 100% speed and acceleration and rated load, with a duty cycle of 50%.

[3] Time required for a robot to move a 5 kg payload between two points 300 mm apart at a height of 25 mm.

3 Preparation

3.1 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.
- Product installation, wiring, maintenance, inspection, or component replacement must be performed only by professionals.

3.2 Installation Environment Requirements

General environmental requirements

Set up the robot system in an environment that meets the following conditions to ensure its performance and safe operation.

Table 3–1 Ambient condition

Item	Requirement
Operating temperature and humidity	• Temperature: 5°C to 40°C • Humidity: 10%RH to 80%RH (without condensation)
Storage temperature and humidity	• Temperature: -10°C to +55°C • Humidity: ≤ 80% RH (without condensation)
Transportation temperature and humidity	• Temperature: -10°C to +55°C • Humidity: ≤ 80% RH (without condensation)
EFT/B immunity	≤ 2 kV
Static immunity	≤ 6 kV
Environment	• Indoor • Keep away from direct sunlight. • Keep away from dust, oil smoke, salt, iron filings • Keep away from flammable and corrosive liquids and gases • Keep away from water • Avoid places with shocks or vibrations • Keep away from sources of electrical interference

Special environmental 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.

Note

- 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.



Do not wipe the robot hard with anhydrous ethanol or benzene. Otherwise, the coated surface may lose gloss.

3.3 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.
- The torque and reaction force generated by the robot action are described in the table below:

Type	Maximum torque in horizontal plane (N·m)	Maximum reaction force in horizontal direction (N)	Maximum reaction force in vertical direction (N)
IR-S60-120Z40S-INT IR-GS60-120Z40S-INT	5800	3900	4500

- Use M12 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 details about the dimensions, see *"2.3 Product Dimensions" on page 17*.

- The plate for the robot mounting face should be 20 mm thick or more and made of steel to reduce vibration. The surface roughness of the steel plate should be 25 μm or less.
- Secure the base table to the floor or wall to prevent any movement.
- Keep the Z-axis of the robot perpendicular to the horizontal plane during installation.
- When cutting holes in the base table for passing cables, see *"6.5 Cable Connection" on page 45* for the minimum hole size.
- The flatness of the robot installation surface should be within 0.5 mm, and the tilt should not exceed 0.5°. If the flatness of the installation surface is insufficient, it can cause damage to the robot base and affect the performance of the robot.
- Reserve enough space for the robot controller in the base table design. For details, see the "IRCB501-INT High-Protection Series Robot Controller User Guide".

3.4 Installation Space Requirements

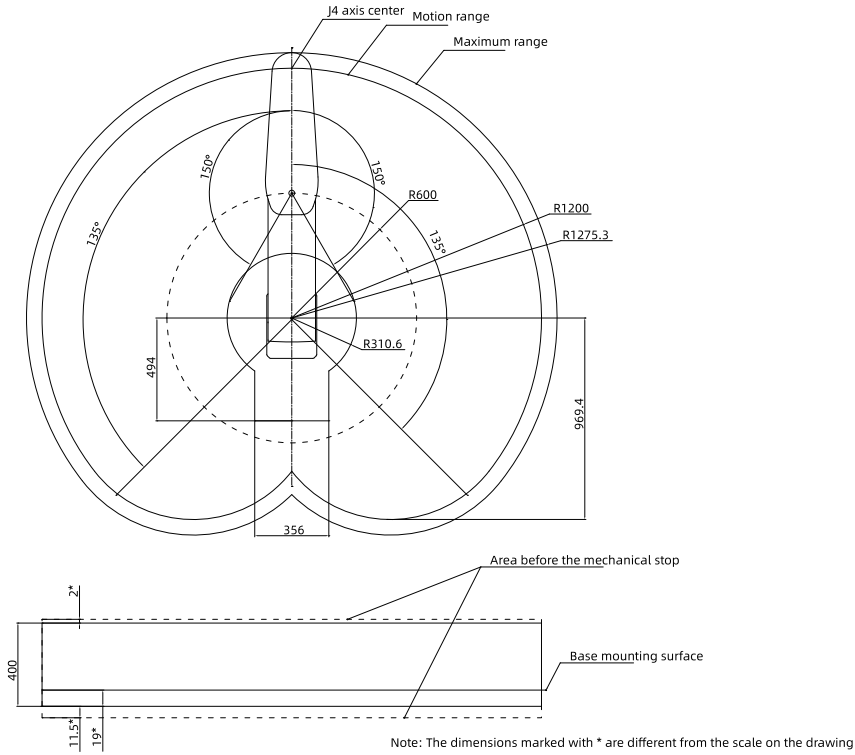
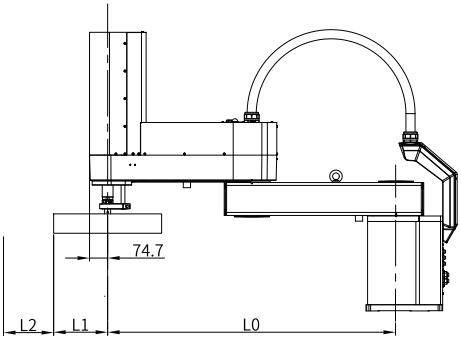


Figure 3-1 Motion range of standard model (mm)

Maximum range

"Maximum range" is the area that contains the farthest reach of the arms. When an end effector with a radius of 74.7 mm or more is mounted, set the maximum range to the length of the two robot arms plus the radius of the end effector.



- L0: length of the robot arms
- L1: radius of the end effector
- L2: safety distance
- The safety distance should be greater than L0+L1+L2.

3.5 Installation Tool Requirements

Table 3–2 Installation tools

Tool	Quantity (PCS)
M12 outer hexagon wrench	1
M12 inner hexagon wrench	1
Scissors or utility knife	1
Nail hammer	1
Protective gloves	1
Safety shoes	1
Hoisting sling	1
Sling	2
Torque wrench	1
Forklift	1

4 Unpacking, Storage, and Handling

4.1 Unpacking

4.1.1 Precautions for Unpacking



Before unpacking, check whether the outer package is intact, damaged,, damped, or deformed.

Unpack the package in sequence. Do not hit the package violently.

Check whether there is damage, rust, or injuries on the surface of the equipment and equipment accessories before unpacking.

Check whether the package contents are consistent with the packing list before unpacking.



Do not install the equipment if you find damage, rust, or indications of use on the equipment or accessories upon unpacking.

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.

4.1.2 Unpacking Procedure

1. Unpack the carton.
   Cut the PET tape using scissors or a utility knife, and remove the cover of the carton and the paper corner protectors. Move the carton from bottom to top and remove it.

CAUTION

Wear gloves to prevent scratches.

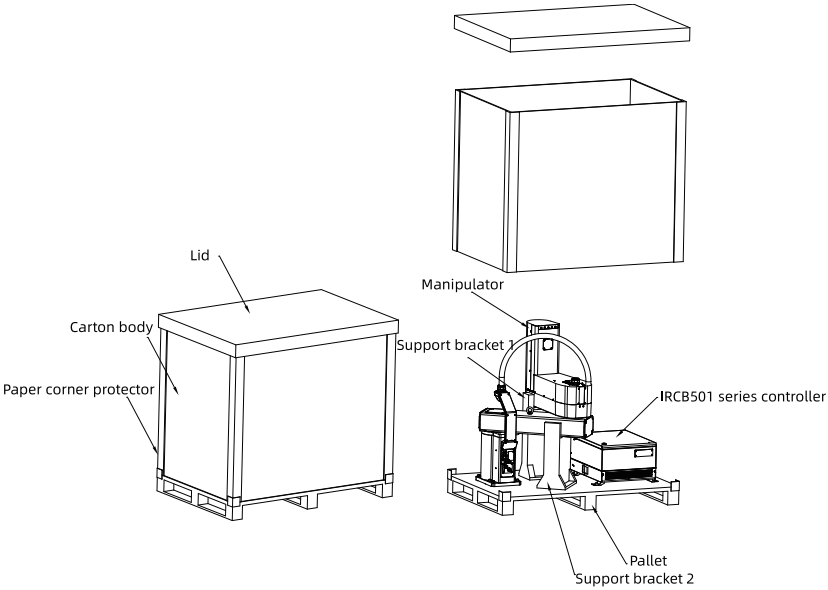


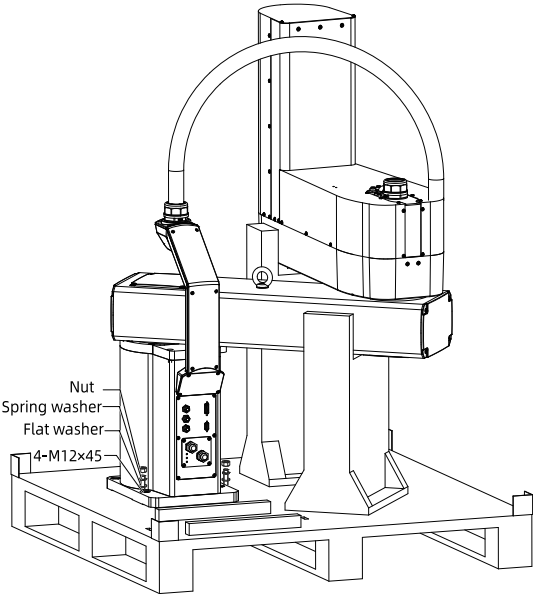
Figure 4-1 Robot packaging

2. Remove the manipulator from the pallet.

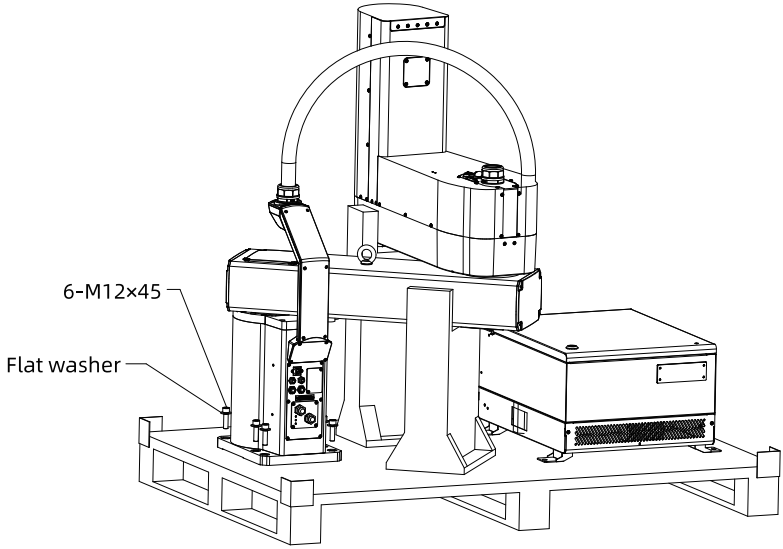
CAUTION

Stabilize the manipulator when removing the screws fixing the manipulator to avoid personal injury or equipment damage caused by titling of the equipment due to unstable center of gravity.

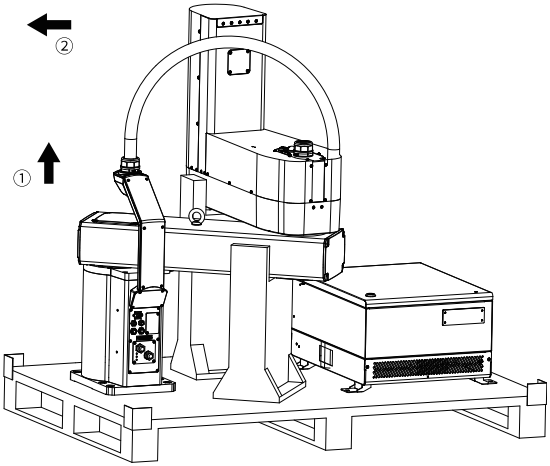
- IR-S60 series: Remove bolts connecting the manipulator and the pallet using the M12 outer hexagon wrench.



- IR-GS60 series: Remove bolts connecting the manipulator and the pallet using the M12 outer hexagon wrench.



3. Take out the manipulator.
   Take out the manipulator by lifting it from bottom to top, and moving it horizontally.
   See *"4.2.3 Handling Procedure" on page 31*.



CAUTION

- To repack the robot, reverse the steps above.
- Wear protective gloves to prevent scratches and work carefully to prevent damaging the robot.
- Take out the robot carefully to avoid collision.

4.1.3 Post-Unpacking Inspection

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

Name	Quantity (PCS)
Manipulator	1
Robot controller[1]	1
Product Warranty Card	1
Cable accessory kit	1
M12 x 45 hexagon screw	4
Spring washer (GB/T93-1987)-12	4
Flat washer (GB/T97.1-2002)-12	4

Note

[1]: The new high-protection controller for the IR-TP200 teach pendant is factory-configured with a dedicated aviation plug cap (1504U235) for the IR-TP200 teach pendant. When the controller is used with the teach pendant, this cap is not required.

4.2 Handling

4.2.1 Precautions for Handling

Note

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

Note

- Keep the equipment in its original package when handling with a hoist or forklift.
- Wear personal protective equipment (PPE) when handling with a hoist or forklift. Prohibit personnel from standing or staying in the handling route.
- Ensure the equipment is balanced when hoisting. Unstable lifting may cause the equipment to fall, resulting in serious personal injury or significant equipment damage.

CAUTION

- Store and transport this equipment based on the storage and transportation requirements for humidity and temperature.
- Avoid storing or transporting the equipment in environments with water splash, 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 equipment during transportation or storage, remove the condensation before turning on the power.

4.2.2 Pre-Handling Preparation

1. Before handling a newly shipped robot, keep it in the factory-set posture, as shown in the figure below.

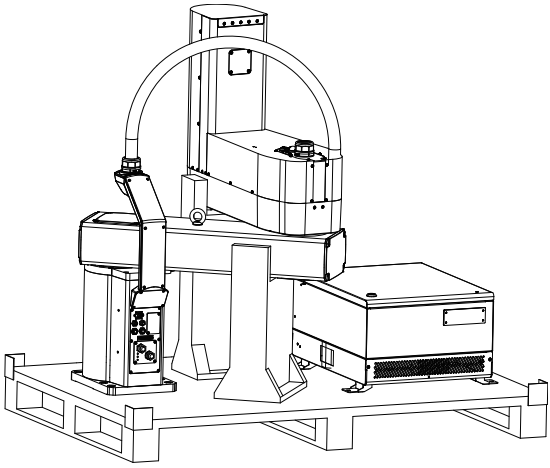


Figure 4-2 Factory-set posture of the robot

2. If the robot has been used and needs to be moved to another location, complete the following steps before handling:

   a. Disconnect all power supplies of the equipment.

   b. Disconnect the power and signal cables from the controller.

c. Remove the bolts fixing the robot to the base and then remove the robot from the installation base.

d. Secure the robot to the handling equipment.

4.2.3 Handling Procedure

Move the robot onto the base table by hoisting.

CAUTION

- When the robot is shipped, its two arms are adjusted to their extreme positions and are fixed together using bracket.
- Do not remove the bracket before the robot is secured. Otherwise, in case of an unstable center of gravity, the robot may tip over and cause personal injury.
- Do not pull the cables of the robot to avoid possible damages.
- It is recommended to use flat lifting straps with a length of 3 m. Make sure that the straps are intact with a load-bearing capacity of not less than 136 kg.
- Wear protective equipment and ensure that the lifting area is safe enough to avoid collision hazards.

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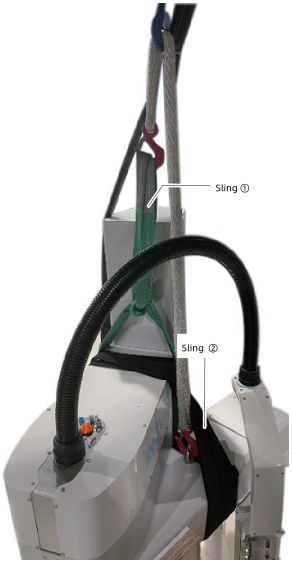
1. When the robot is delivered, its forearm is secured by a support.



2. Attach one hook of the hoisting sling to the eyebolt on the robot. Ensure the hooking is reliable.



3. Use sling ① to secure the upper arm and forearm. Pass sling ② through the forearm of the robot, then attach the other end of the hoisting sling to sling ② using a hook with an anti-loosening feature.



4. Move the robot by two people, with one stabilizing the robot during transportation, and the other operating the crane to lift the robot body and move it to the base table.

Note

- At least two people are required for handling.
- Wear safety shoes for handling.

5 Transportation Protection

5.1 Bill of Materials

The recommended bill of materials is as follows:

Name	Material	Dimensions	Quantity	Description
Bolt (individually packaging)	-	M10 x 60	4 pieces	For robot individual packaging. Use original factory-configured bolts.
Bolt (client)	-	M8 x 30 M12 x 30	4 pieces each	For packaging together with the client's automation equipment. Use original factory-configured bolts.
Iron nail	Iron	-	Several	-
Rubber washer	Rubber	-	4 pieces	Use the original factory-configured rubber washers directly.
Desiccant	Montmorillonite/Silica gel desiccant	-	8 packets	30 g/packet
PE bag	LDPE	-	1 piece	Use the bag based on the product size
Square PE bag	LDPE	-	1 piece	Use the bag based on the product size
Polyethylene foam	18 kg/m³	50 mm	-	The height of the polyethylene foam is appropriate.
Bracket	Plywood	-	-	Use original factory-configured brackets for fixation.
Stretch film	LLDPE	80 μm	1 piece	Same as PE bag
Lifting lug	Cast iron	M10 standard lifting lug	2 pieces	-

Name	Material	Dimensions	Quantity	Description
Nylon tie	NYLON 66	Length: 150 mm	4 pieces	-
Packing strap	PET	Width: 16 mm, thickness: 0.6 mm	8 m to 10 m	-
Industrial tape	BOPP	60 mm	Several	-
Compression-resistant carton	2 A	-	1 piece	Select size as per equipment packaging requirements.
Carton box	K=K	-	1 piece	For controller
Wooden pallet	Plywood	-	1 piece	-
Paper corner protector	Bobbin paper	-	4 pieces	-
Bubble bag	HDPE	-	1 piece	For cable end connector



Materials such as PE bags must comply with the laws and regulations of the destination country. Inovance packaging materials must meet the REACH certification requirements.

5.2 Packaging Guide

5.2.1 Packaging Posture

Transport Pose

Before transporting the robot, it must be placed in the transport pose. Angle of each joint:

Robot series	Position	Angle of each joint
IR-S60&GS60 series	J1	135°
	J2	150°

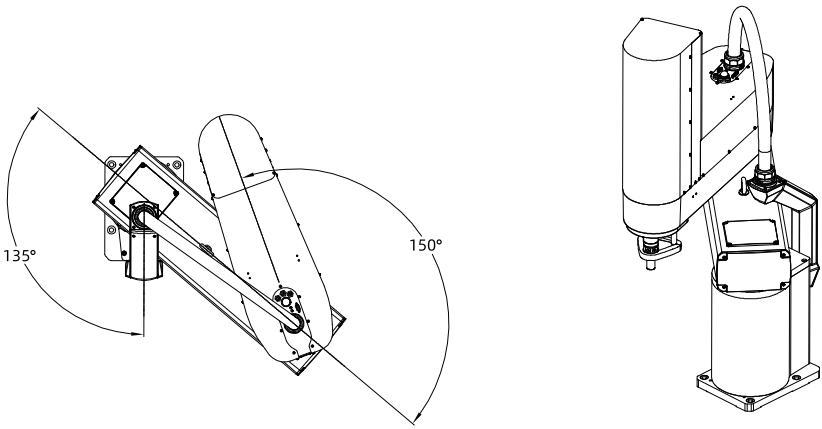


Figure 5-1 IR-S60&GS60 series

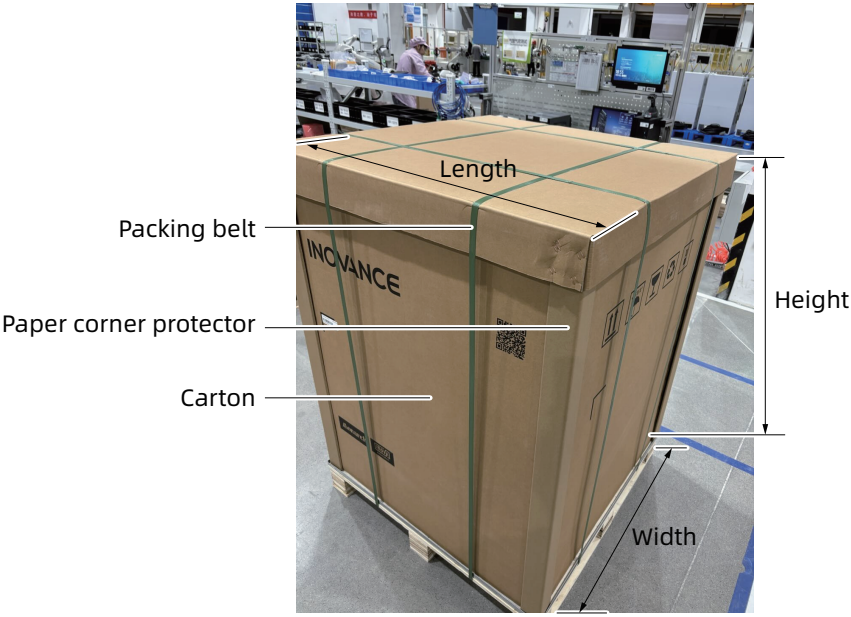
CAUTION

- Before each transportation, adjust the robot to the transport position and ensure it is securely placed.
- When the robot is not secured, always keep the robot in the transport position.
- Before lifting the robot, ensure that it can move freely.
- Remove all transportation securing elements, such as screws and bolts, in advance, and clear any rust or adhesives from the contact surfaces.
- Avoid vibrations or impacts during transportation to prevent damage to the robot.

Package dimensions

Table 5–1 Package dimensions for SCARA robot (unit: mm)

Robot system	Arm length	Height	Width	Length
IR-S60&GS60 series	1200	1365	1020	1020



Note

The factory dimensions (robot + controller) above are for customer reference only.

5.2.2 Packaging Procedure

Robot individual packaging

1. Before packaging the robot, ensure it is in the factory-set posture. For details, see *"5.2.1 Packaging Posture" on page 34*.
2. Place the product on the polystyrene foam in the wooden pallet, ensuring that the four holes at the base of the product align with the four holes on the pallet.
3. Secure the product using four M10 x 60 hexagon socket bolts (with flat washers and spring washers).
4. Install a thin layer of bubble wrap between the rubber limit blocks to prevent component scratches.
5. Clean the robot and place desiccants on the base.
6. Wrap the zero point information attachment with a PE bag and secure it to the robot with a nylon tie.
7. Completely wrap the equipment with a PE bag, ensuring full coverage (the external cables remain connected to the robot). Align the cable exit end of robot with the opening end of the bag. Do not seal the edge of the bag.

8. Seal the PE bag at the robot base with transparent adhesive tape.
9. Coil the external cables where they connect to the robot into a loop. Wrap the terminals at the cable ends with bubble wrap and place them inside the PE bag.
10. Place the carton box with packed controller onto the wooden pallet.
11. Secure it by threading packing straps through the pre-set holes in the pallet.
12. Use the wooden blocks on both sides of the pallet to secure the carton box in the length direction, ensuring overall stability.

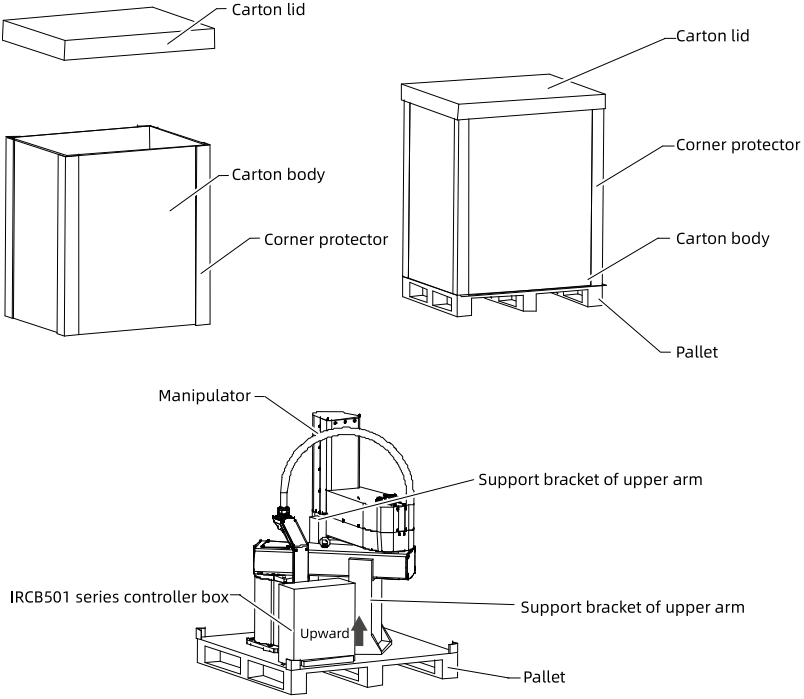


Figure 5-2 IR-S60&GS60 series

13. If a teach pendant is to be included, place the carton box for teach pendant on top of the carton box for controller, and secure it with packing straps.
14. Seal the 4 sets of standard bolts in a PE bag.
15. Place the sealed PE bag, two instruction manuals, the warranty card, the complete set of cables, and the baffle plate into the outer PE bag, arranging them in order before sealing.
16. Secure the outer PE bag to the packing straps on the carton box surface using nylon ties to ensure overall stability and reliability.
17. Place the packing list inside the carton box, fit the carton body, and cover the carton with the lid. Each carton box contains 1 piece of four-axis robot body and 1 piece of controller.

18. Secure the carton body to the pallet using PET packing straps, applying 4 straps in a grid pattern ("#"-shape).

Note

When the controller and the manipulator are packaged separately, it is recommended to prioritize the original factory packaging method to ensure transportation safety and compliance with equipment protection standards.



Figure 5-3 Physical packaging

CAUTION

- Throughout the process, take care to avoid bumps and scratches, as well as friction and scratches between the upper arm, forearm, and bracket.
- Place desiccant and cover with a PE bag to prevent dust and rust.
- It is not recommended to transport with a load (tooling or fixture) for secondary transportation.

Packaging together with client's automated equipment

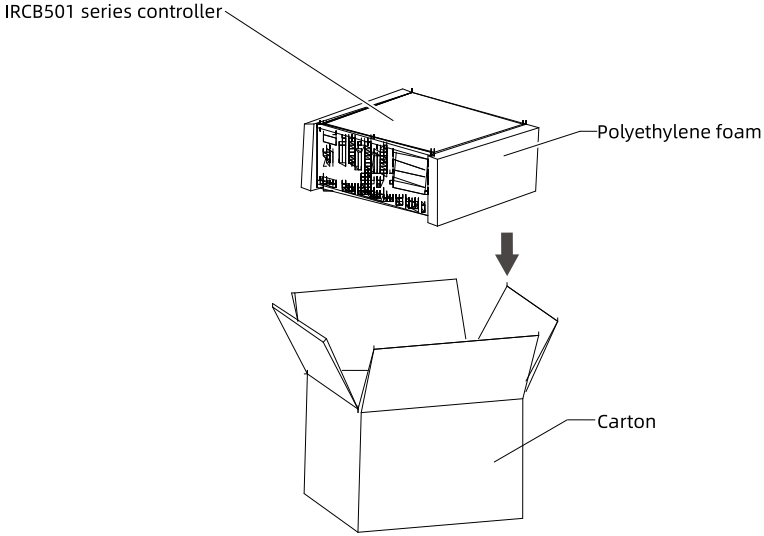
Package the robot together with the client's automated equipment in the following two methods:

Method 1: Package both the manipulator and the controller together with the client's automated equipment.

Method 2: Package the manipulator together with the client's automated equipment, and package the controller separately.

- For method 1, perform the following operations:

1. Secure the controller to the base using four M12 x 30 bolts in accordance with Inovance's mounting specifications.
2. Place four packets of desiccant (30 g/packet) beside the manipulator, and confirm that the desiccant packets are intact and the labels are clearly legible.
3. Securely fasten the upper arm and forearm using brackets to ensure they do not interfere with each other or suffer damage due to friction or displacement.
4. After fastening, completely wrap the manipulator with stretch film to protect it from dust and moisture.
5. After wrapping, perform a sealing inspection to ensure the product is protected from moisture and rust.
6. Perform final inspection to ensure that the stretch film surface has no broken straps and that the protective layer extends beyond the outline of the manipulator by at least 20 mm.



- For method 2, perform the following operations:

1. Secure the manipulator to the base using four M8 x 30 bolts.
2. Place two packets of desiccant (30 g/packet) beside the manipulator, and confirm that the desiccant packets are intact and the labels are clearly legible.
3. Securely fasten the upper arm and forearm using brackets to ensure they do not interfere with each other or suffer damage due to friction or displacement.
4. After fastening, completely wrap the manipulator with stretch film to protect it from dust and moisture.
5. After wrapping, perform a sealing inspection to ensure the product is protected from moisture and rust.

6. check that the stretch film surface has no broken straps and that the protective layer extends beyond the outline of the manipulator by at least 20 mm.
7. Select a compression-resistant carton box of appropriate size, with cushioning material pre-placed inside (bubble wrap or polyethylene foam is recommended).
8. After packaging, apply industrial tape in an "H"-shape pattern to seal the carton box.
9. Secure the packaged controller to the base using bolts at four points (a dedicated mounting bracket is provided at the bottom of the controller).
10. Check the stability of the center of gravity of the packaging to ensure there is no risk of shifting during transportation.

6 Installation

6.1 Installation Precautions

Note

- Equipment installation, wiring, maintenance, inspection, or component replacement must be performed only by professionals.
- Install a safety fence for the system. Failure to comply may result in serious 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.



- Do not modify the equipment.
- Do not install this 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 falling over.
- For the tabletop mounting, at least two people are required for the operation.

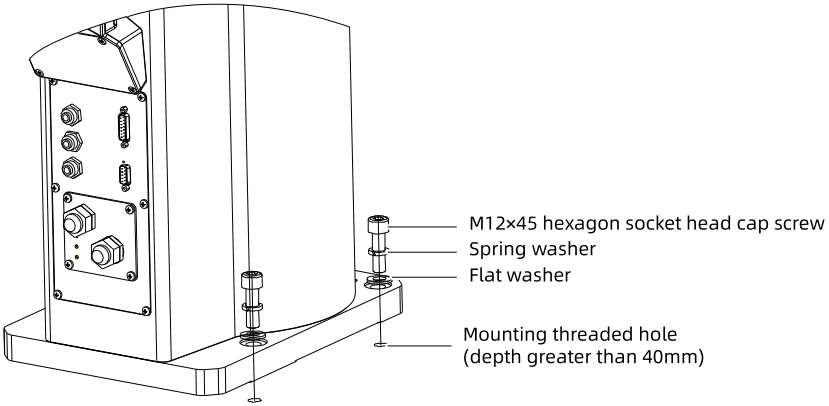
6.2 Installing the Robot Body



Ceiling mounting of IR-S60&GS60 series robots is prohibited.

IR-S60 Series

Secure the robot base to the base table with four M12 x 45 hexagon socket head cap screw conforming to the strength of GB/T 3098.1 class 10.9 or 12.9, as shown below.

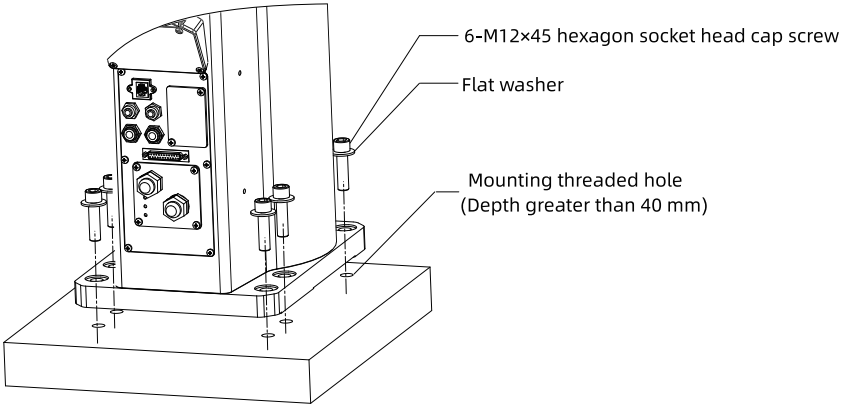


Check that the screws are tightened referring to the following recommended torque.

Nominal screw diameter (12.9 or higher)	Installation torque
M12	140 N·m

IR-GS60 Series

Secure the robot base to the base table with six M12 x 45 hexagon socket head cap screw conforming to the strength of GB/T 3098.1 class 12.9, as shown below.



Check that the screws are tightened referring to the following recommended torque.

Nominal screw diameter (12.9 or higher)	Installation torque
M12	140 N·m

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

To install the end effector:

1. Lift the end effector to the lower end of the J4 spline shaft.
2. Note that before installing the end effector, the robot must be disabled and dynamic braking must be turned off to prevent damage to the J4 axis reducer. Then, fix the end effector using auxiliary tooling and clamp the tooling with reverse force to prevent the end effector from rotating while assembling the M16 screws.

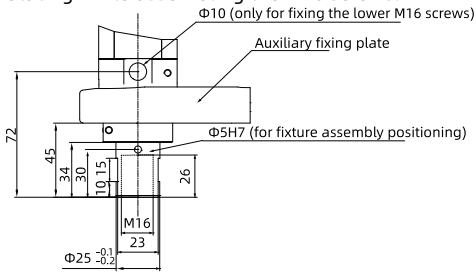


Figure 6-1 Installation position of auxiliary tooling (unit: mm)

3. Install the M16 screws from the bottom of the end effector (ensure the robot is disabled and dynamic braking is turned off to prevent damage to the J4 axis reducer). Tighten the screws using a torque wrench with a torque of 220 N.m, and use M8 screws or larger to fasten the lead screw flat portion. The weight of the end effector should not exceed 60 kg, as shown in the figure below.

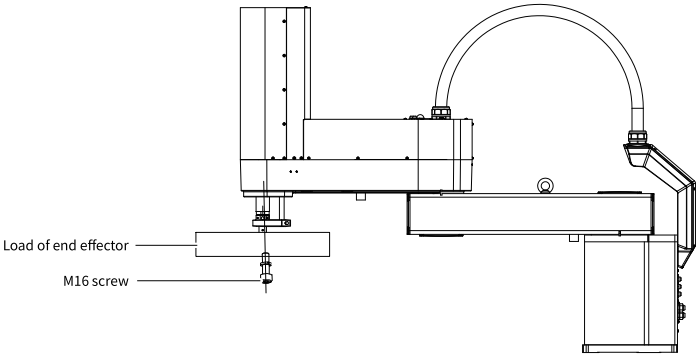


Figure 6-2 Installing the end effector

Note

To avoid contact between the end effector and the robot due to the outer diameter of the end effector, the size of the workobject, or the position of the robot arm, stop operating the robot when installing the end effector. Pay attention to the interference area of the end effector during system layout design. See the maximum area in *"3.4 Installation Space Requirements" on page 23*.

6.4 Installing Camera and Pneumatic Valve

The IR-S60&GS60 series SCARA robot provides mounting holes for the camera and pneumatic valve at the bottom of the second arm, as shown in the figure below.

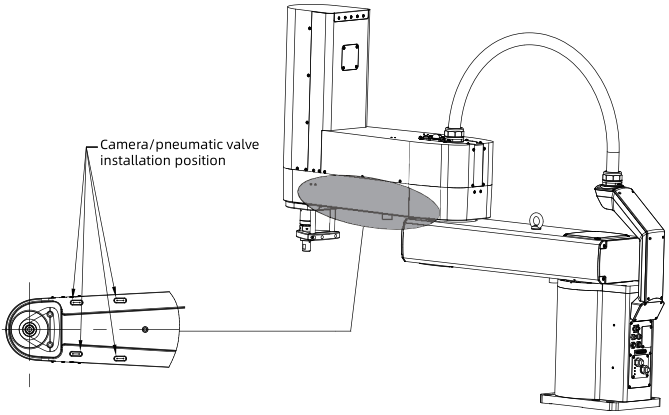


Figure 6-3 Installation position of camera and pneumatic valve

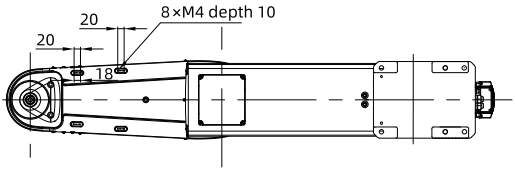


Figure 6-4 Screw size for mounting camera and pneumatic valve (unit: mm)

6.5 Cable Connection

Note

- Equipment installation, wiring, maintenance, inspection, or component replacement must be performed only by professionals.
- Always disconnect the power supply before wiring. Failure to comply will result in electric shock or system fault.
- Before wiring, disconnect the power supplies of all equipments. After disconnecting the power supply, wait for at least 10 minutes before further operations because residual voltage still exists in the internal capacitor even after power-off.
- 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.
- Check that the equipment is grounded properly. Failure to comply may result in an electric shock.
- Follow the electrostatic discharge (ESD) procedure and wear an anti-static wrist strap to perform wiring. Failure to comply may result in damage to the equipment internal circuit.

Note

- Ensure that the cables are connected 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.

Connect the power cable and signal cable to the controller.

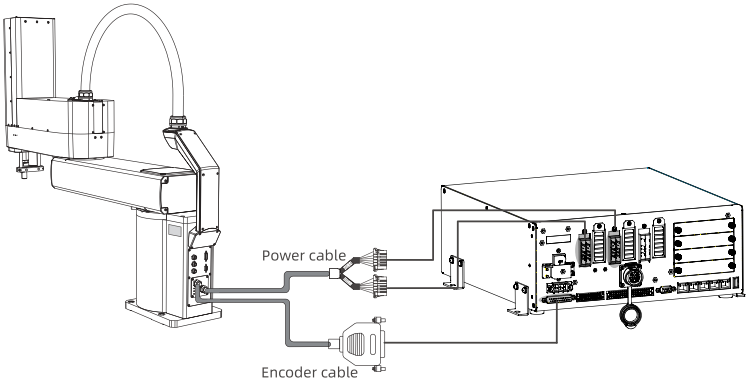


Figure 6-5 Cable connection of IR-S60

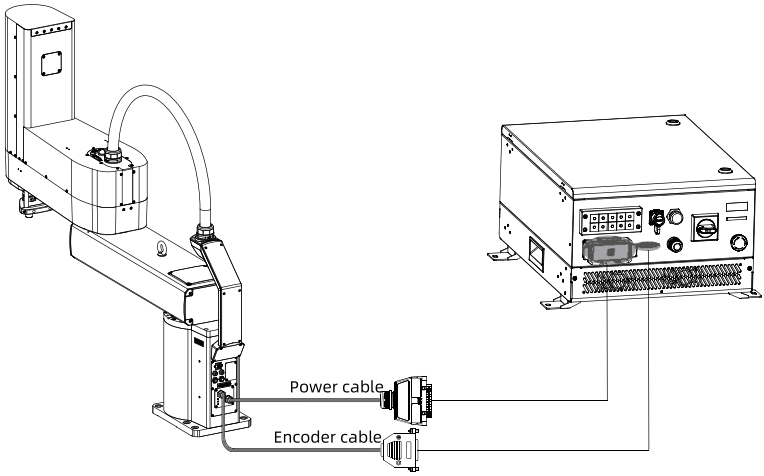


Figure 6-6 Cable connection of IR-GS60

Table 6–1 cable hole dimensions for IR-S60 (IRCB501-INT series robot controller/IRCB501-INT series high-protection robot controller)

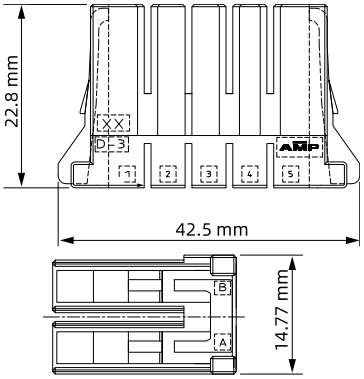
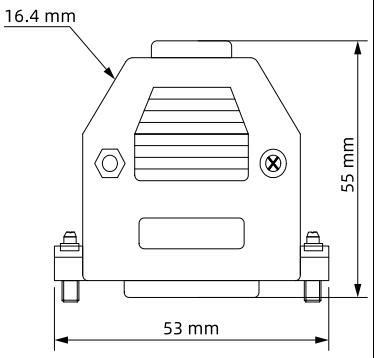
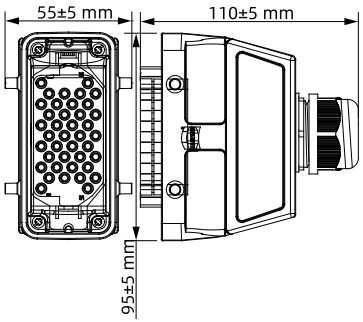
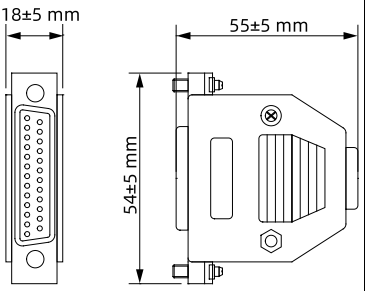
Name	Power cable connector (controller side)	Encoder cable connector (controller side)
Dimensions	42.5 mm x 22.8 mm x 14.77 mm	53 mm x 55 mm x 16.4 mm
Illustration		

Table 6–2 Cable hole dimensions for IR-GS60 (IRCB501-INT high-protection series robot controller)

Name	Power cable connector (controller side)	Encoder cable connector (controller side)
Dimensions	110 mm x 95 mm x 55 mm	55 mm x 54 mm x 18 mm
Illustration		

Recommended minimum hole dimensions and reserved space for cables are as follows:.

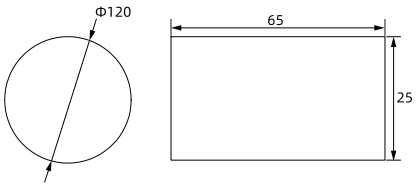
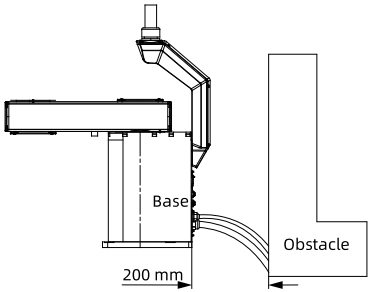
Hole dimensions (round hole and square hole) (unit: mm)	Space reserved for the manipulator cable (Connector dimensions and cable bend radius)
	

Table 6–3 Cable diameter (unit: mm)

Cable type	Power cable	Encoder cable
Highly flexible cable	15.5	11.8
Regular cable	14.5	9.9

6.6 Wiring and Tubing

Note

Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.

Wiring (Electrical Wires)

WARNING

Current higher than 0.5 A is not allowed.

Available wires are built in the robot body. see table describes the specifications of signal cables.

Rated voltage	Allowable current	Wires	Nominal sectional area	Remarks
30 VAC/VDC	0.5 A	25	24AWG	Twisted pair

Category	Code
D-Sub backshell (included in the cable accessories kit)	15010084
D-Sub 25-pin connector (included in the cable accessories kit)	15010085

Note

The connectors at both ends of the cable use the same pin numbering. This product only provides the connectors, and you need to wire them according to your actual requirements.

Communication cable requirements

Use the Cat 5e shielded twisted pair cable for external and built-in network cables, with a maximum communication rate of 1000 bps, which can meet the communication requirements of industrial cameras and other devices.

Tubing (Air Tubes)

Pressure resistance	Quantity	Dimensions (outer diameter x inner diameter)
0.59 MPa (5.9 kgf/cm^2)	2	Φ6 mm x Φ4 mm
	2	Φ8mm x Φ5.7mm

Note

Both ends of the air tubes are equipped with quick release couplings for Φ8 mm and Φ6 mm (outer diameter) air tubes.

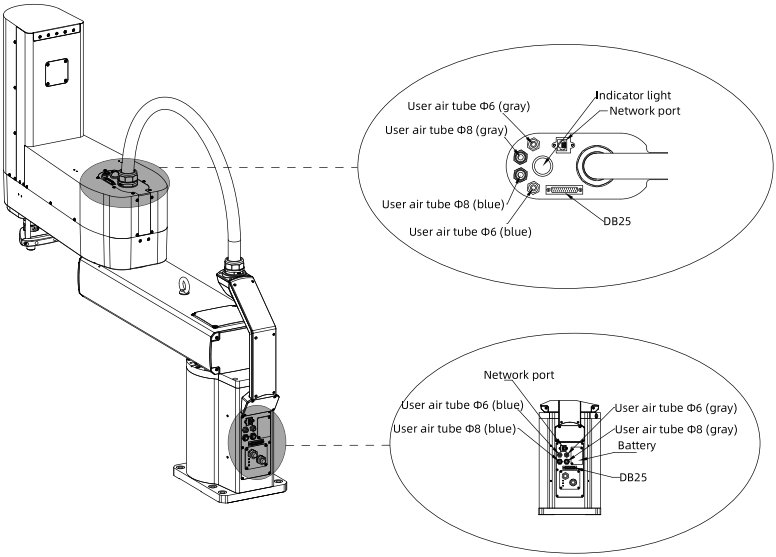


Figure 6-7 Wiring/tubing interfaces

7 Motion Range

7.1 Method for Setting the Motion Range

CAUTION

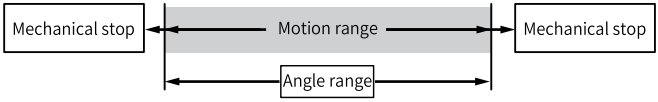
- To prevent premature wear of joint reducer bearings and gears due to insufficient oil film, avoid prolonged repetitive motion of joints within a small angular range of less than 10°.
- If the actual operating conditions require prolonged operation within an angle of less than 10°, it is recommended to cycle the mechanical joint once per hour, moving each joint more than 50° to ensure effective lubrication and extend service life.

Note

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 motion range of the robot, the following motion range setting methods are provided:

- Angle range (all joints)
- Mechanical stop (for J1 to J3)



7.2 Motion Range Setting by Angle Range

7.2.1 Description of Angle Range

The basic unit of robot motion is degree. The motion limit (motion range) of the robot is set based on the angle lower limit and angle upper limit (angle range) of each joint.

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.

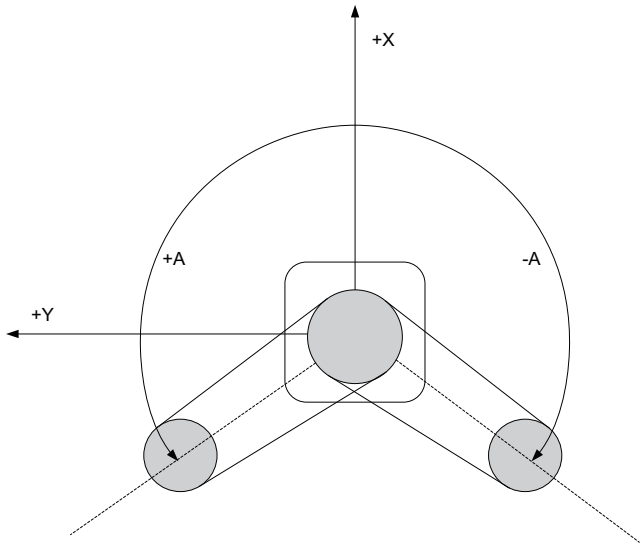
Once the robot receives a motion command, it checks whether the target position specified by the command is within the angle range before initiating the movement. If the target position is beyond the set angle range, an error occurs and the robot does not move.

Note

You can set the angle range by choosing "Set" > "Motion" > "AxisPara" > "AxisLimit" on the teach pendant.

7.2.2 Maximum Angle Range of J1

The zero-angle position of J1 refers to the position where the first arm is oriented toward the positive direction of the X coordinate axis. From the 0 pulse position,the clockwise angle is positive (+), and the counterclockwise angle is negative (-).

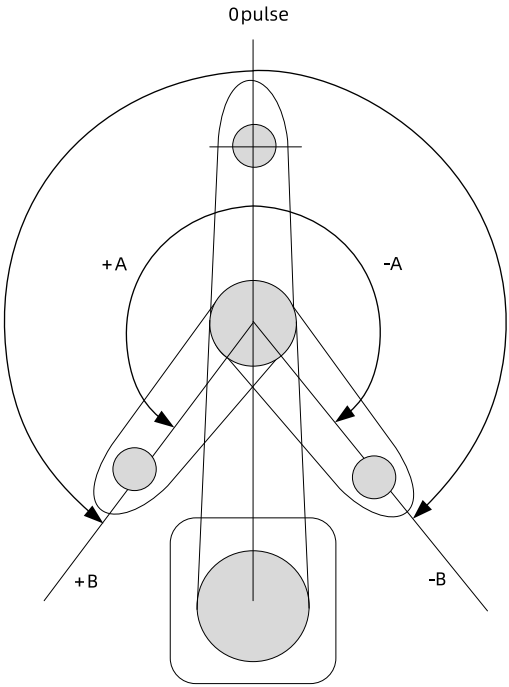


Model	Maximum motion range
IR-S60-120Z40S-INT	±135°
IR-GS60-120Z40S-INT	

7.2.3 Maximum Angle Range of J2

The zero-angle position of J2 refers to the position where the second arm is perpendicular to the base (regardless of the direction of the first arm.) From the zero-

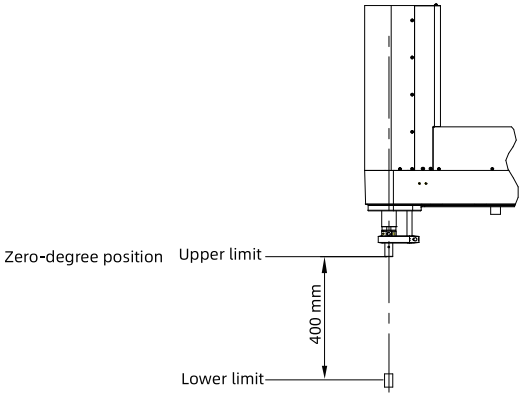
angle position,the clockwise angle is positive (+), and the counterclockwise angle is negative (-).



Model	Maximum motion range
IR-S60-120Z40S-INT	±150°
IR-GS60-120Z40S-INT	

7.2.4 Maximum Angle Range of J3

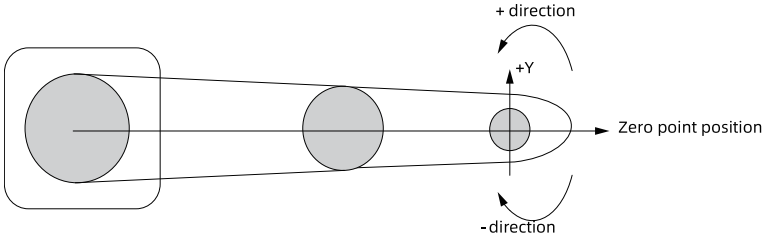
The zero-angle position of J3 is the upper limit position of the axis. When J3 descends from the zero-angle position, it will definitely change to a negative angle value.



Model	Stroke of J3
IR-S60-120Z40S-INT	400 mm
IR-GS60-120Z40S-INT	

7.2.5 Maximum Angle Range of J4

The zero-angle position of J4 refers to the position where the plane at the top of the axis is oriented toward the direction of the top of the second robot arm (regardless of the direction of the second arm.) From the 0 angle position,the clockwise angle is positive (+), and the counterclockwise angle is negative (-).



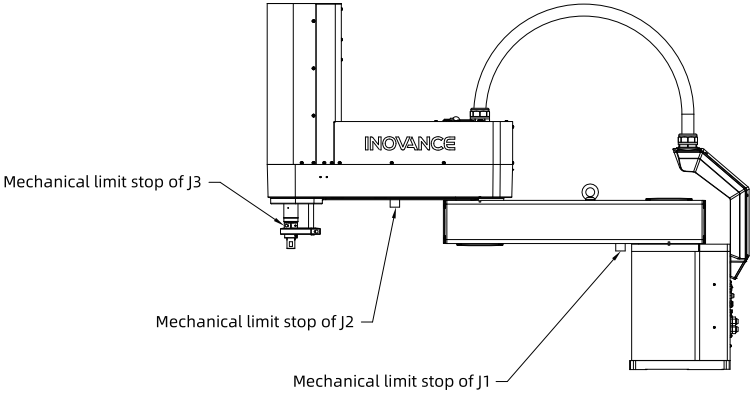
Model	Maximum motion range
IR-S60-120Z40S-INT	±360°
IR-GS60-120Z40S-INT	

7.3 Mechanical Limit Stops

"Mechanical stop" mechanically sets the absolute motion range beyond which motion is not allowed.

The IR-S60&GS60 series robots have mechanical limit stops at J1, J2 and J3, and all these mechanical limit stops are not adjustable. The motion range set by mechanical limit

stops at J1 and J2 is the extreme motion range. The up and down motion range of the mechanical limit stop at J3 is set by the internal program.



7.4 Standard Motion Range of J3

Name	Description
Motion range	Indicates the situation at the standard (maximum) specifications. When each joint is enabled, the lower center of J3 moves 400 mm within the motion range.
Maximum range	Indicates the area that contains the farthest reach of the arms. When an end effector with a radius of 74.7 mm or more is mounted, set the maximum space to the length of the two robot arms plus the radius of the end effector. For details, see *"3.4 Installation Space Requirements" on page 23*.

The motion range is shown below.

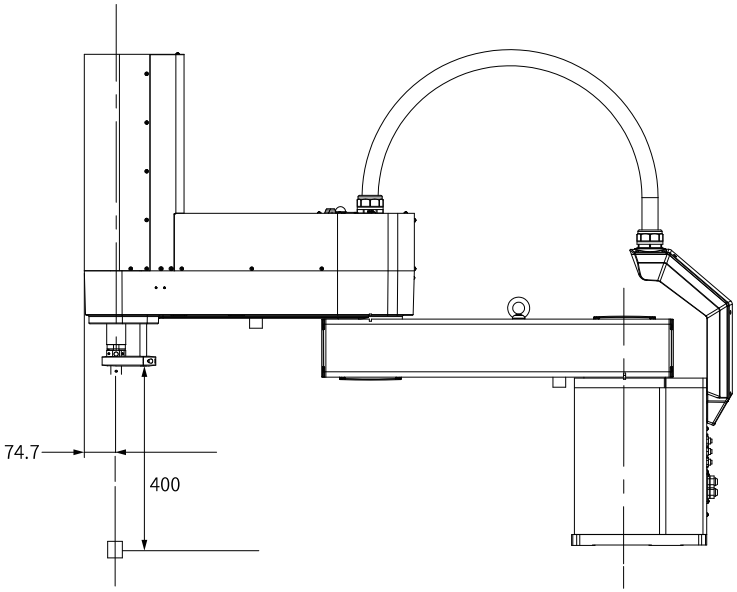


Figure 7-1 Motion range of end effector (unit: mm)

8 Inspection and Maintenance

8.1 Maintenance Precautions

Before maintenance, read this guide carefully to fully understand the methods of safe maintenance.

Note

- Equipment installation, wiring, maintenance, inspection, or component replacement must be performed only 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.



- Submit a request for repair services in accordance with the product warranty agreement.
- Perform routine and regular inspection and maintenance on the equipment in accordance with maintenance requirements and keep a record.
- Troubleshooting and repair must be performed by professionals in accordance with the repair instructions, with repair records kept properly.
- 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.

8.2 Regular Inspection Items

In order to ensure the robot operates more safely and efficiently, regular inspections and maintenance are required. Based on the parts to be inspected and maintained, it can be categorized into daily inspection, weekly inspection, monthly inspection, biannual inspection, and annual inspection.

1. Daily inspection and maintenance

Inspection item	Inspection point
Visual inspection	• Check all joint gaps, grease fitting 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.
Abnormal noise inspection	Check all transmission mechanisms for abnormal noise.
Joint transmission mechanism inspection	Check for unstable running and abnormal jittering of the transmission mechanisms.
Pipeline accessory inspection	Check whether the pipeline accessories are complete, worn and rusted.
Electrical component control inspection	Check whether the control buttons of all electrical components of the robot are normal.

2. Weekly inspection and maintenance

Inspection item	Inspection point
Brake inspection	Check whether the brake of each axis of the robot is effective.
Axis motion range inspection	• 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

Inspection item	Inspection point
Controller 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.
Ball screw and spline (plain shaft) inspection	Check the lubrication condition of the ball screw and spline. Add lubricating grease according to the recommended replacement cycle.

4. Biannual inspection and maintenance

Inspection item	Inspection point
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 controller for bending, corrosion and falling off. • Check the cables of the teach pendant for bending, corrosion and falling off.
Synchronous belt	Check whether the tensioning frequency of the synchronous belts is within the standard range.

5. Annual inspection and maintenance

Inspection item	Inspection point
Controller DI/DO signals	Check whether the DI/DO signal response of the controller is normal.
Axis reducer	• Check whether the lubrication for each axis reducer is normal and whether there is abnormal noise. • Check the iron powder concentration in the lubricating grease of each axis reducer.
Electrical components cleanliness	Check the cleanliness of all electrical components. Under normal circumstances, remove dust for all electrical components annually.
Controller fan filter cotton	Check the cleanliness of the controller fan filter cotton, and replace the filter cotton annually under normal circumstances.

6. Inspection and maintenance every 1.5 years

Inspection item	Inspection point
Battery inspection	Check the battery voltage. If the battery voltage is below 3.1 V or the software issues a battery level alarm, replace the battery promptly.

8.3 Component Replacement

Precautions

Note

- Be sure to disconnect the power supply before installing or removing the motor connector; otherwise it may cause abnormal action of the robot or electric shock.
- Prevent foreign objects from entering the equipment and terminals during maintenance.

Replacing the battery (Lithium battery)



- Do not maintain the equipment after power-on. Failure to comply will result in an electric shock.
- When disposing the battery, consult with the professional disposal services or comply with the local regulation.
- Be sure to use lithium batteries correctly, the wrong way of use may lead to lithium battery heat, leakage, explosion or even fire, resulting in serious damage to personal and property safety.
- Do not charge the lithium battery.
- Do not pressurize or deform the lithium battery.
- Do not disassemble the lithium battery.
- Do not short-circuit or misconnect the lithium battery.
- Do not heat the lithium battery.
- Do not put the lithium battery into fire.
- Do not solder the battery terminals.
- Do not force discharge the lithium battery.

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

1. Remove the two M4 x 12 cross-head screws from the battery assembly cover on the base, and then remove the cover.

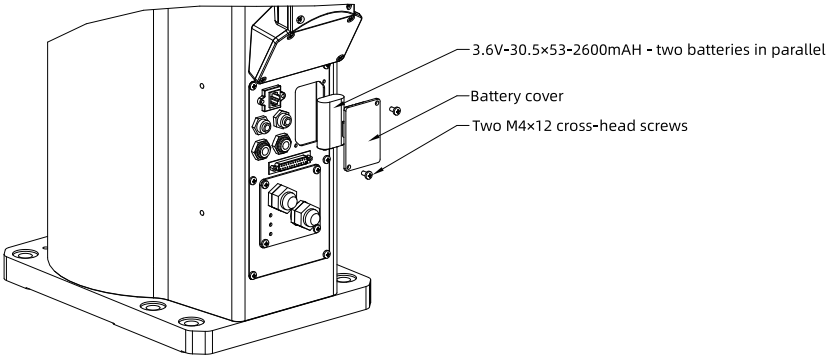


Figure 8-1 Battery position

2. Cut the binding strap securing the battery to the battery board.
3. Tie the new battery to the battery board with a binding strap.
4. Fix the battery board to the cable bracket.
5. Connect the new battery to the empty white 2Pin cable end connector.
6. Remove the old battery.
7. Install the battery cover on the base.

Note

Failure to comply with the procedure described above may cause loss of zero points. For details, see *"8.5.2 Zero Point Calibration Procedure" on page 70*.

Replacing the cable board

1. Remove the fixing screws of the base cable board, and then remove the cable board.
2. Replace the damaged cable.
3. Install the base cable board.

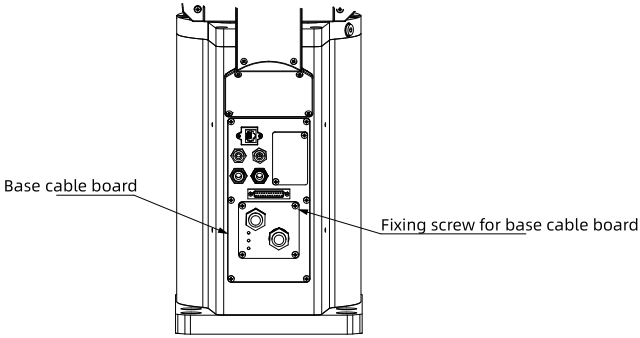


Figure 8-2 Base cable board

CAUTION

- Do not pull the cable board forcibly. Failure to comply may result in cable damage, wire breaking, or poor contact, causing electric shock or system fault.
- After removing the cable board, ensure that the cables are correctly connected during cable maintenance.

Replacing the indicator lamp

The following shows how to replace the indicator lamp.

1. Remove the top cover of arm 2, as shown in the figure below.

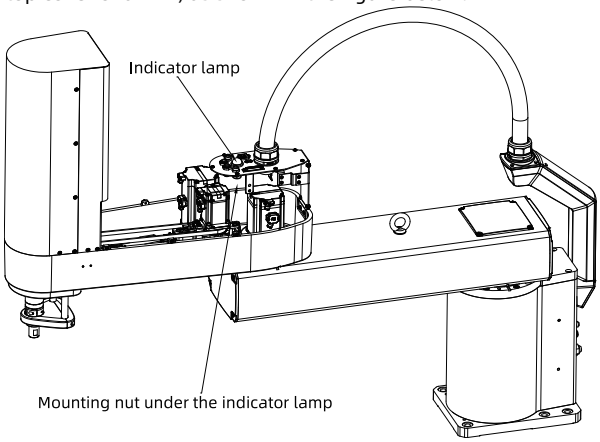


Figure 8-3 Indicator lamp position

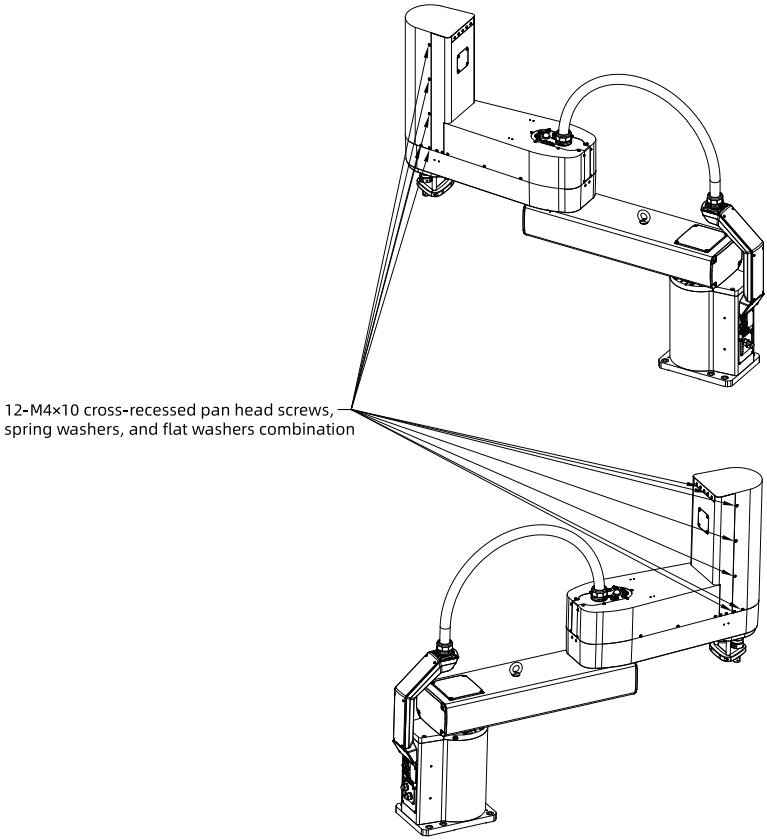
2. Remove the connector connected to the indicator lamp.
3. Rotate the fixing nut counterclockwise to remove it.
4. Remove the indicator lamp from the sheet metal.
5. Connect the removed wires to the new indicator lamp[1], then fix the new lamp onto the mounting bracket and connect it to the connector.
6. Install the top cover of arm 2.

Note

[1]: The indicator code is 10040048.

Replacing the cover

- Removing the cover of the forearm
  Remove the 12 M4 x 10 cross-recessed pan head screws with spring washers and flat washers from the bottom to the top, then take off the cover of the forearm.



- Installing the cover of the forearm

  1. Install the cover onto the forearm. Pay attention to the positioning holes on the mounting surface between the cover and the forearm to ensure that the mounting surface of the cover fits seamlessly with the mounting surface of the forearm.
  2. Install 12 M4 x 10 cross-recessed pan head screws with spring washers and flat washers from top to bottom, with a torque of 1.5 N·m.

8.4 Applying Lubricating Grease

Lubricating grease replacement period

Note

- Only apply the original lubricating grease to the reducer.
- Normally, the reducer does not need to be greased. However, under the extreme conditions (duty cycle, speed, load), the grease needs to be replaced regularly.
- Replacing grease by non-professional personnel is not allowed. If maintenance is needed, contact Inovance after-sales maintenance personnel.
- Before maintenance, prepare the necessary tools and fixtures, lubricating grease, screws and other auxiliary materials in advance.
- During the maintenance, if you encounter special problems, you can take photos for record and contact us for help.
- For special operating conditions, such as those with fast operating rhythms, regular lubrication is required. Consult Inovance technical support for specific maintenance cycles.

Before maintenance, it is necessary to clarify the parts configuration of the robot body. The type of lubricating grease used for reducers or screws varies from supplier to supplier. The specific types of lubricating grease used and their codes are listed in the table below.

Table 8–1 Grease type

Name	Grease type	Grease code
RV reducer	Reducer grease	24060215
Lead screw	Lead screw grease	24100039

Note

Contact the original manufacturer for the models of lubricating grease.

For the heavy-duty SCARA series robots, due to the aging period of the lubricating grease used in the RV reducers, regular maintenance to replace the lubricating grease is required to ensure the lubrication performance period of the reducers. The grease replacement period for RV reducers is closely related to the actual application conditions and environment. The grease replacement period for the RV joints of SCARA robots is as follows:

Application scenario	Lubricating grease replacement period
Reducer enclosure temperature below 40℃	12,000 h
Reducer enclosure temperature 40℃-55℃	8,000 h

The recommended industrial infrared thermometer and temperature rise measurement points for the reducer enclosure temperature detection are as follows:

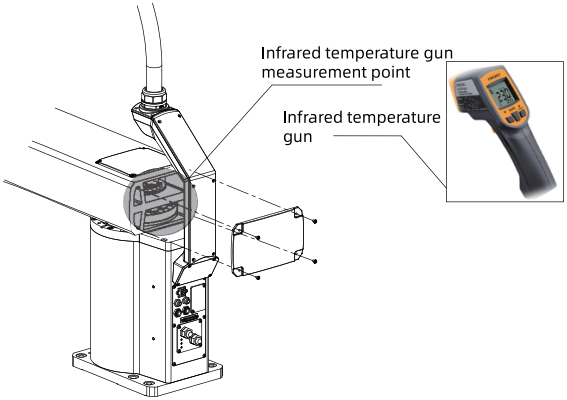


Figure 8-4 Temperature rise measurement points

For RV reducer joint application conditions, pay attention to the enclosure temperature and joint angle requirements to prevent damage and shortened lifespan of the reducer due to temperatures exceeding 60℃ and operation at small angles.

Reducer temperature

Using the reducer under high load and high power conditions may cause it to overheat and exceed the allowable temperature. Ensure that the reducer is in a cooled state to prevent the surface temperature of the reducer from exceeding 60℃. If the surface temperature exceeds 60℃, it may cause damage to the product.

Output rotation angle of the reducer

When the rotation angle is within a small range (less than 10°), the life of the reducer may be shortened due to poor lubrication and concentrated load on internal components. For specific solutions, consult Inovance for details.

For the S60 series robots, see the table below for joints that require regular grease replacement and the amount of grease to be added:

Joint	Amount	Grease code
RV reducer of J1	391 mL (341 g)[1]	24060215
RV reducer of J2	180 mL (156 g)	

Note

- [1]: For models produced before April 16, 2025, the grease amount is 440 mL (382 g).
- The J4 axis reducer of the S60&GS60 series SCARA robots is a maintenance-free harmonic reducer, and does not require lubricating grease replacement.

For the GS60 series robots, see the table below for axes that require regular grease replacement and the amount of grease to be added:

Joint	Amount	Grease code
RV reducer of J1	632 mL (550 g)	24060215
RV reducer of J2	178 mL (156 g)	

Note

See the following precautions for RV reducer grease replacement and filling:

If the greasing operation is not performed properly, the internal pressure of the grease reservoir may suddenly increase. This may damage the sealing part, resulting in leakage of the grease and abnormal actions. Therefore, observe the following when performing greasing operations:

- Before performing greasing operations, always open the grease outlet by removing the screw plug.
- Fill the grease slowly at a rate below 3.6 g/s (4 mL/s). Do not use excessive force. Use a grease gun which can indicate the amount of grease. If such grease gun is not available, check the amount of grease filled by measuring the change in the grease weight before and after filling.
- If the amount of grease filled does not meet the requirement, fill the grease again after discharging air from the grease reservoir with a precision pressure regulator. The air pressure should be controlled below 0.03 MPa using the regulator.
- Use only the specified type of grease. Using non-specified greases may damage the reducer or cause other problems.
- After greasing, release any residual pressure inside the grease reservoir before installing the hexagon socket plug. When installing the plug, ensure the sealing gasket is properly seated to prevent grease leakage at the grease inlet and outlet.
- Check if the exhaust valve is clogged with grease. If grease exists in the exhaust valve, replace the valve with a new one.
- To avoid accidents caused by slipping, remove any excess grease from the ground and robot.

After the robot is put into service, it is necessary to replace the grease for ball screw and spline periodically to ensure the good lubrication. The recommended maintenance period of lubricating grease replacement is as follows:

Table 8–2 Recommended replacement period of lubricating grease for ball screw and spline

Part	Replacement period
Ball screw and plain shaft of J3	• Fill the grease every 3 months or 100 km of operation. • Completely replace the grease every 6 months
Spline of J4	• Fill the grease every 3 months or 100 km of operation. • Completely replace the grease every 6 months

Lubricating grease replacement method

There are two methods for lubricating the ball screw of J3: one is filling grease directly through the grease fitting port, and the other is applying grease directly after removing the front cover of the forearm.

The method for filling lubricating grease to the ball screw of J3 through the grease fitting port is as follows:

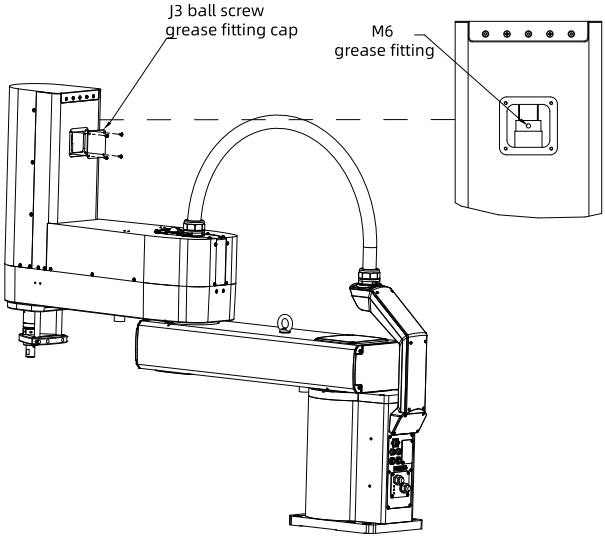


Figure 8-5 Grease fitting port of ball screw

1. Remove the grease port access cover of the ball screw.

2. Move the ball screw 100 mm downward from the zero point to expose the M6 grease fitting port on the screw.
3. Remove the M6 plug from the ball screw nut and install an M6 grease fitting.
4. Attach the grease gun coupler to the installed grease fitting and fill the lubricating grease until it emerges from the nut.
5. Remove the grease fitting and screw back the M6 plug.
6. Reinstall the grease port access cover of the ball screw.

The method for filling lubricating grease to the spline of J4 through the grease fitting port is as follows:

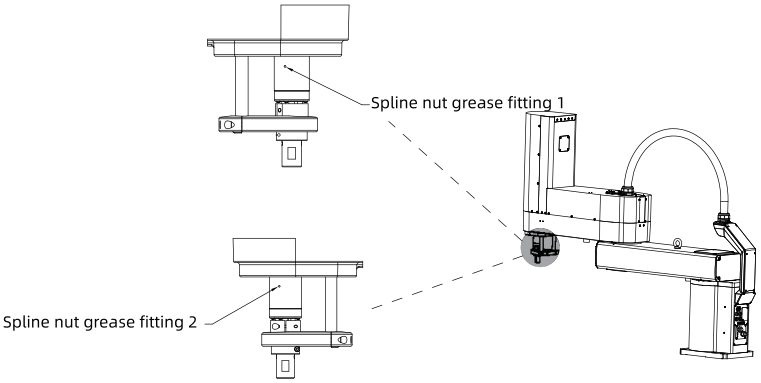


Figure 8-6 Grease fitting port of J4 spline nut

1. Use a grease gun with a tapered nozzle.
2. Locate the Φ2.5 grease ports on both sides of the spline nut and fill the lubricating grease until it emerges from the nut.

The method for replacing the lubricating grease in the ball screw, plain shaft, and spline is as follows:

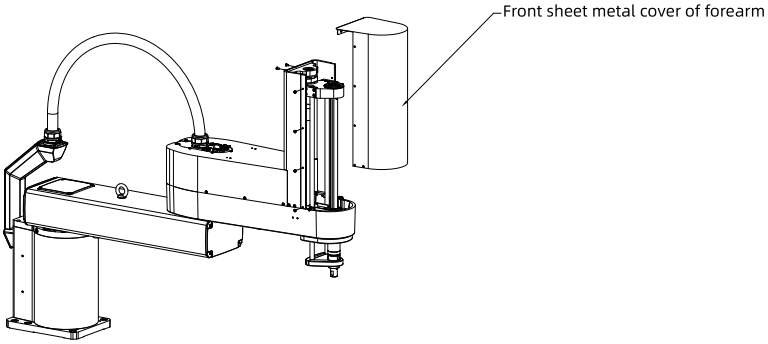


Figure 8-7 Forearm cover

1. Remove the front cover of the forearm.

2. Use a dust-free cloth to clean off the old grease from the ball screw, the two plain shafts, and the spline.
3. Apply grease to the surface of a plastic finger cot (approximately 5 cm^2 application area), and use the grease-coated finger cot to evenly coat the J3 ball screw and the two plain shafts. Use approximately 3 g of grease per shaft.
4. For the lubricating of J4 spline, fill the grease into the spline through the grease port until the grease emerges from the nut.
5. Reinstall the front cover of the forearm.



If grease gets into your eyes, mouth, or on your skin, follow the instructions below.

- If the grease gets into your eyes, flush them thoroughly with clean water, and then see a doctor immediately;
- If the grease gets into your mouth, wash out your mouth with water thoroughly; if swallowed, see a doctor immediately;
- If the grease gets on your skin, wash the area thoroughly with soap and water.

8.5 Zero Point Calibration

8.5.1 Overview

The zero point is the reference point for the operation of the robot. After parts (motors, reducer, synchronous belt, and cables etc.) have been replaced, the robot cannot position properly because a gap exists between the zero point stored in each motor and its corresponding zero point stored in the controller. Therefore, after the parts are replaced, zero point calibration is required.

Note

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

- Install a safety fence for the system to prevent people from entering the motion area of the system. Failure to comply may result in serious safety issues.
- Before operation, check that there is no person inside the safety fence. Do not enter the motion area during system running. Failure to comply may result in serious safety issues.
- Operate the robot system in teaching mode. The motion will be restricted (low speed low power) to prevent the robot from performing unexpected actions that could result in serious safety issues. This can ensure the safety of personnel to a certain extent.

8.5.2 Zero Point Calibration Procedure

Both the PC-based teach pendant software (InoRobotTP) and the hand-held teach pendant provide an operation interface for zero point calibration. The following describes the zero point calibration operations on the InoRobotTP software. The operations on the hand-held teach pendant are similar.

Due to the strong correlation between the coordinates of the four-axis robot's work points and the accuracy of J2, it is necessary to complete the zero point calibration of J2 before calculating the robot coordinates. The teach pendant provides a right/left wrist rule guide. Follow the guide to calibrate the zero point.

When calibrating the zero point using the teach pendant, calibrate J3 and J4 simultaneously.

1. Log in to the user account.
   a. Click the "User" shortcut key on the main interface of the teach pendant to open the "user mode" setting interface.
   b. Enter the password in the password input box and click "OK" to log in.

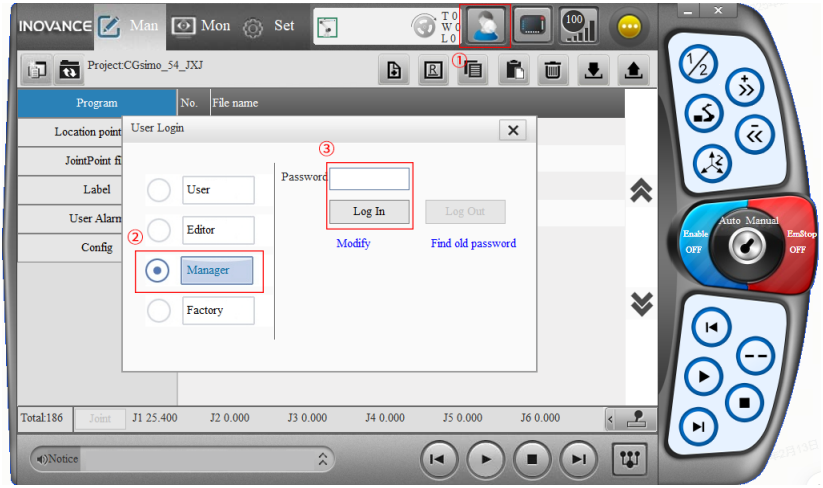


Figure 8-8 IRTP80 series teach pendant

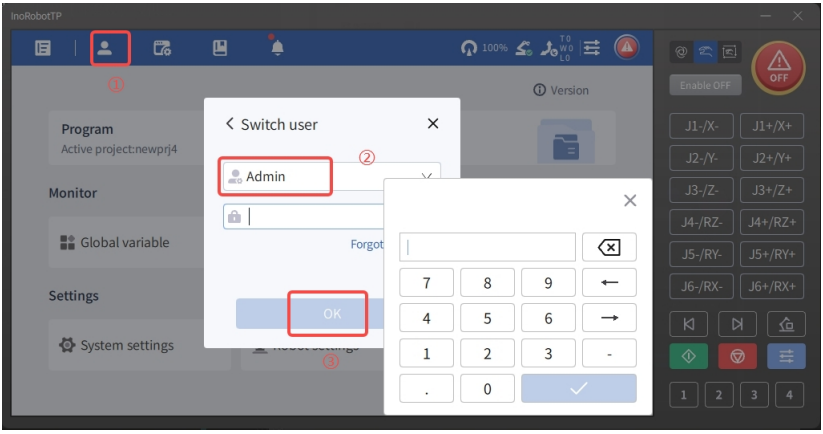


Figure 8-9 IR-TP200 series teach pendant

2. Go to the absolute zero setting interface.
   Choose "Settings" > "Zero point settings" > "Absolute zero" on the InoRobotTP main interface.

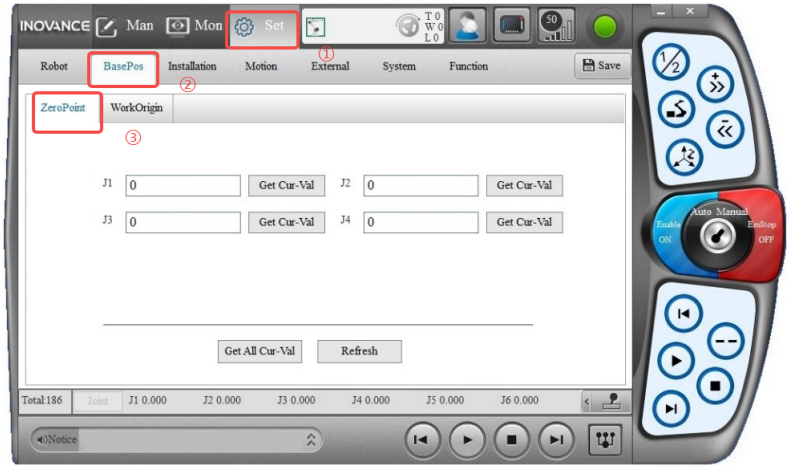


Figure 8-10 IRTP80 series teach pendant

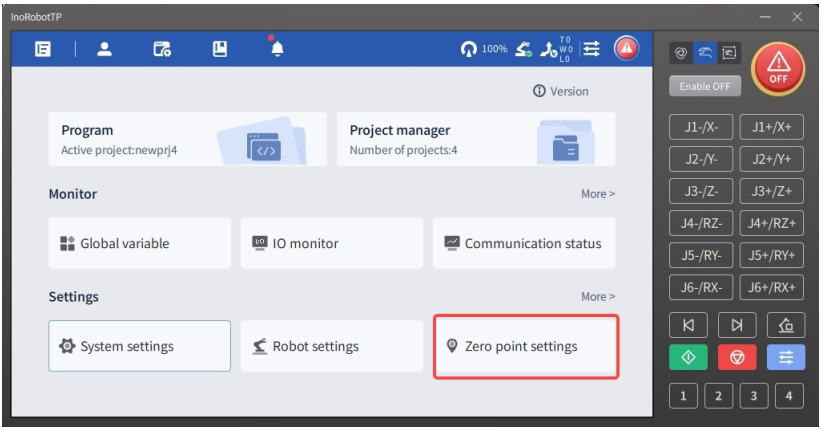


Figure 8-11 IR-TP200 series teach pendant

3. Move each joint of the robot to the position near the zero point.
   a. You can use the hand-held teach pendant or the InoRobotTP software to move the robot to the position near the zero point. See the "InoTeachPad Industrial Robot Teach Pendant User Guide" or "IR-TP200 Series Industrial Robot Teach Pendant User Guide".
   b. Also, you can manually push the robot to the position near the zero point when the robot is not enabled.

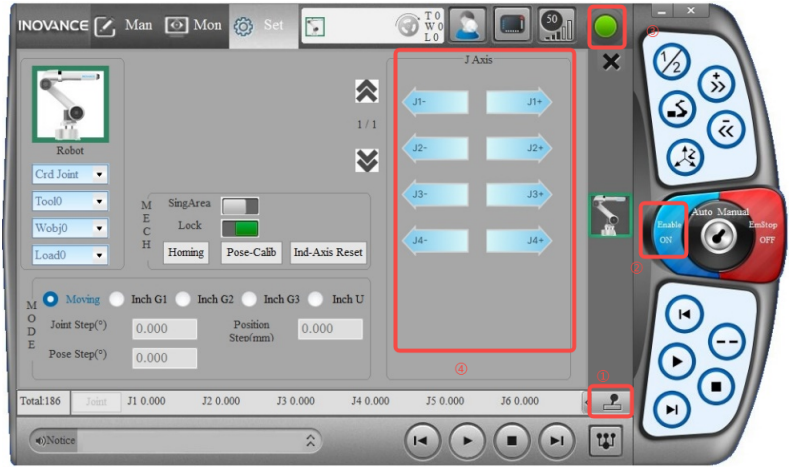


Figure 8-12 IRTP80 series teach pendant

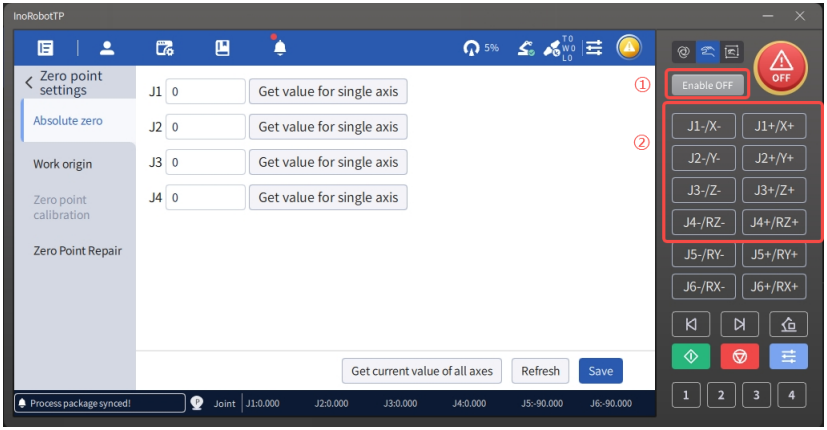


Figure 8-13 IR-TP200 series teach pendant

4. Switch to the emergency stop state.
   a. Click the virtual emergency stop button on the InoRobotTP software or press the red emergency stop button on the hand-held teach pendant.
   b. The status indicator on the upper right corner of the InoRobotTP (or the hand-held teach pendant) shows the "Emergency stop" state (in red).

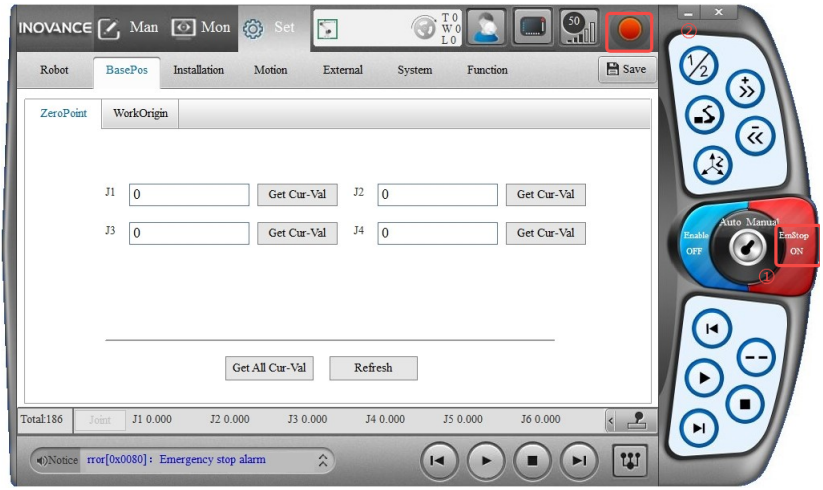


Figure 8-14 IRTP80 series teach pendant

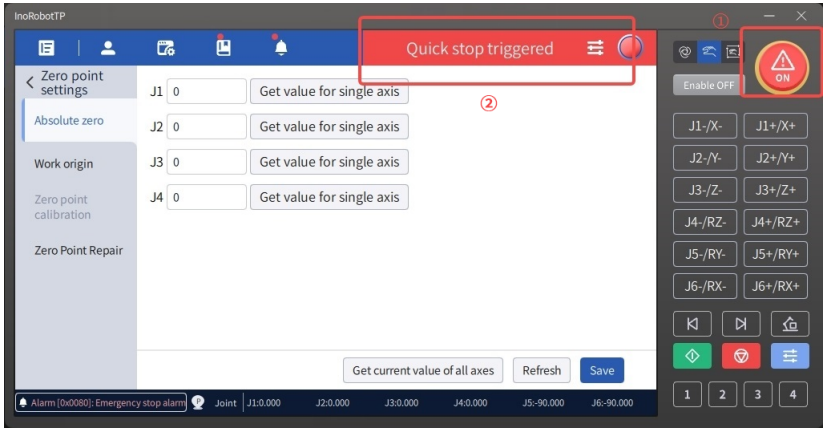


Figure 8-15 IR-TP200 series teach pendant

5. Obtain and save the zero point information.
   a. When the robot is at the zero point position, click the "Get current values for all axes" button to obtain the encoder pulse counts.
   b. Click the "Save" button to complete the zero point calibration.

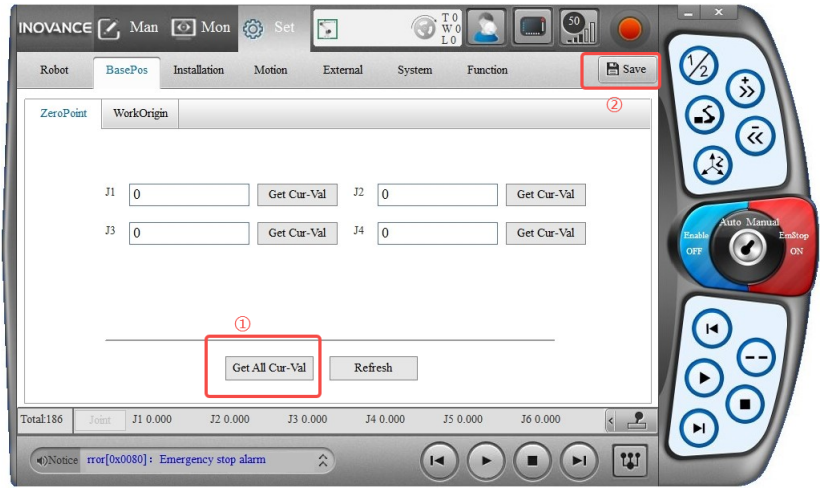


Figure 8-16 IRTP80 series teach pendant

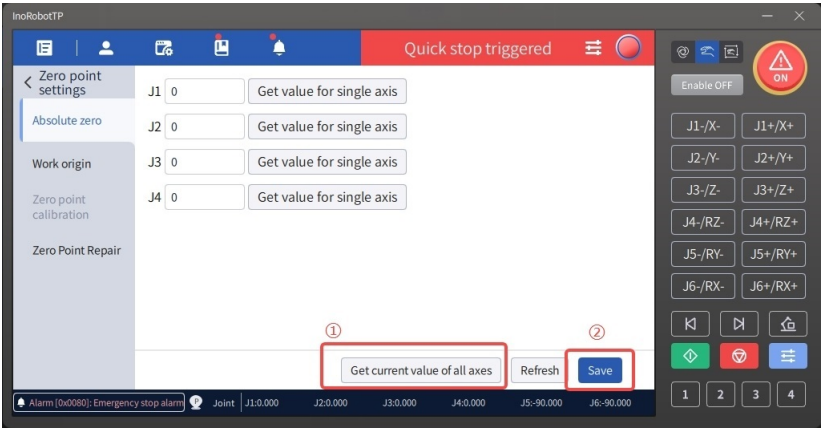


Figure 8-17 IR-TP200 series teach pendant

8.5.3 Zero Point Position of Each Joint

1. Zero point position of J1: The position that overlaps with the X-axis of the robot frame.

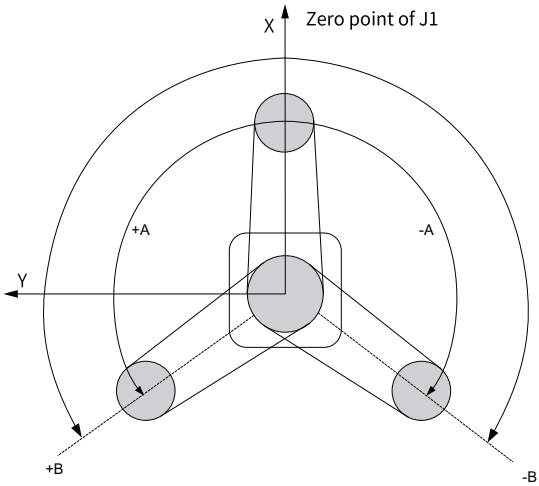


Figure 8-18 Zero point position of J1

2. Zero point position of J2: The position where the forearm is parallel to the upper arm.

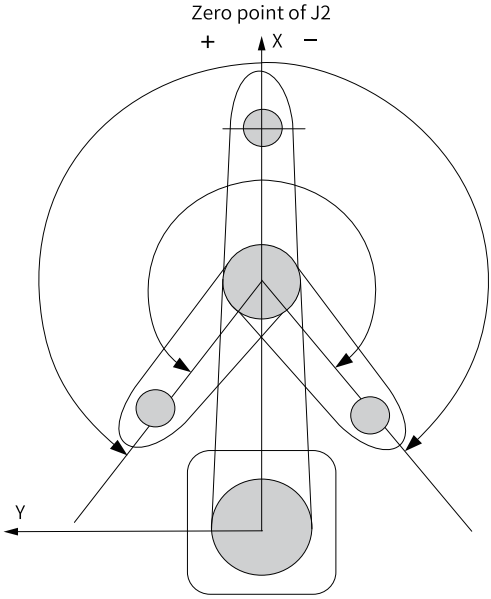


Figure 8-19 Zero point position of J2

3. Zero point position of J3: Upper limit position in motion range.

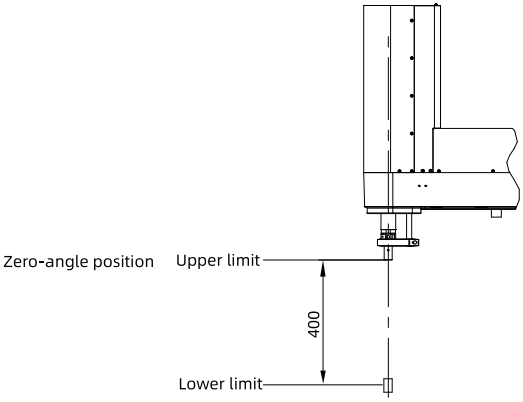


Figure 8-20 Zero point position of J3 (unit: mm)

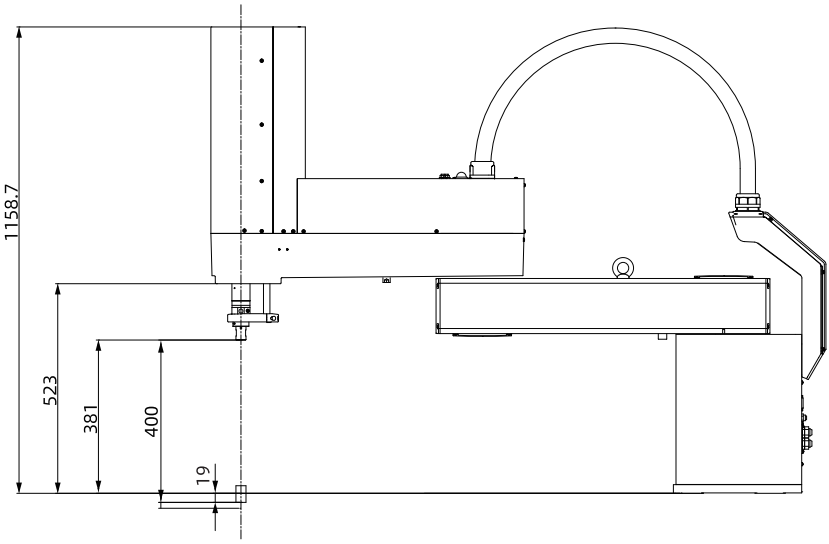


Figure 8-21 Upper limit position of J3 motion range (unit: mm)

4. Zero point position of J4: The position where the axis plane (or the notch of the upper/lower mechanical stopper) is oriented toward the tip of arm 2 (forearm).

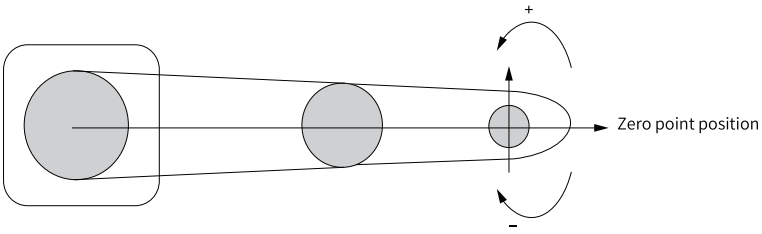


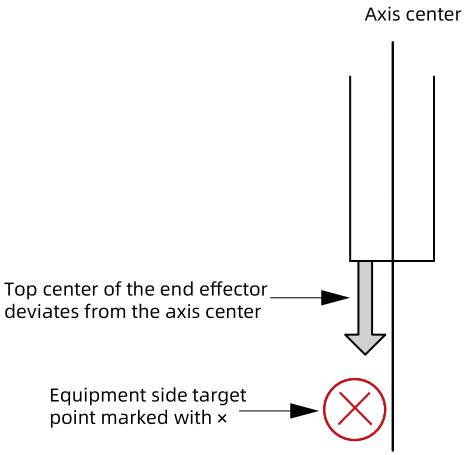
Figure 8-22 Zero point position of J4

8.5.4 Zero Point Calibration of J2

Due to the strong correlation between the coordinates of the SCARA robot's work points and the accuracy of J2, it is necessary to complete the zero point calibration of J2 before calculating the robot coordinates. To calibrate the zero point of J2 according to section "Zero Point Calibration Procedure", follow the guidance provided on the teach pendant for zero point calibration using right/left wrist rule.

Zero point calibration procedure of J2

1. Use the center of the ball screw spline shaft as the reference point for zero point calibration.
   When the center of the end effector deviates from the center of the ball screw spline shaft, the zero point calibration can be performed without removing the end effector. Make the position that can be easily recognized when changing the right wrist (or left wrist) pose the target point, and mark the equipment side target point with X.



2. Perform zero point calibration using the left/right wrist rule.
   a. Adjust the robot end to the target point position using the right wrist (or left wrist) pose, and record the robot's Cartesian coordinates P at this time in the point file

interface of the teach pendant. On the teach pendant, go to "Settings" > "Zero point settings" > "Absolute zero", click the "Get value for single axis" button, and record the degree of J2 in current state as Enc1.

b. Change the arm parameters L/R of point P to the other hand system, then execute the motion to point P. Use the left wrist (or right wrist) pose to adjust the robot to a position near the target point. In the axis control panel, teach the robot's X/Y translation so that the end effector precisely points to the target point position. During this process, ensure that the Z and A coordinate values of point P remain unchanged.

c. After teaching, go to "Settings" > "Zero point settings" > "Absolute zero", click the "Get value for single axis" button, and record the degree of J2 in current state as Enc2.

d. On the teach pendant, go to "Settings" > "Zero point settings" > "Absolute zero", click the "Default" button and get the currently saved zero point information. Calculate (Enc1+Enc2)/2 and fill in the calculation result into the input box of J2, and then click the "Save" button to complete the zero point calibration of J2.

3. Move the robot to the teaching point to verify whether there is a positional gap. If there is a positional gap, fine-tune the installation position of the end effector and teach the point again.

9 Certification and Standard Compliance

Third-party certification

Certification mark	Certification	Description	Directive
	CE	The product complies with the LVD, MD, EMC, and RoHS directives and is labeled with 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 (EMC)	2014/30/EU
ROHS Directive	2011/65/EU Amended by (EU)2015/863
Applicable 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

10 Service and Support

Should you encounter a safety accident during the use or operation of the product, or face challenges in operating and maintaining the equipment, which remain unresolved after the relevant documentation is consulted, we provide multiple channels to ensure prompt resolution:

- Channel #1: Contact service@inovance.com.
- Channel #2: Visit https://www.inovance.com/global to access document downloads, after-sales support, spare parts ordering, repair applications, and authenticity verification services.
- Channel #3: Download My Inovance app (https://zshc-eu.inovance.com/download-pc/) where you can access products info and documentation, and query product parameters.

We are committed to providing you with quick and professional technical support, and we look forward to your satisfaction and trust.

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