



IR-TS Series International Ceiling-Mounted SCARA Robot User Guide - Manipulator



Industrial
Automation



Intelligent
Elevator



New Energy
Vehicle



Industrial
Robot



Rail
Transit



Data code PS00017900A01

Preface

Introduction

Ceiling-mounted SCARA robots feature compact structure, light weight, fast movement speed, high precision, small footprint, and no dead angles in the working space. They can be applied in mechanical or electrical assembly, picking and placement, material distribution, and material dispensing scenarios. They are suitable for industries with high precision requirements such as automotive, medical, semiconductors, food, pharmaceuticals, hard disk drives, and consumer goods. Ceiling-mounted SCARA robots are available in two arm lengths of 350 mm and 550 mm, with a maximum load of 4 kg or 5 kg, and a Z-axis travel of 150 mm. They can be installed in an overhead mounting configuration.

This guide describes basic specifications, installation, and maintenance of the product.

Note

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

Intended Audience

- Mechanical engineers
- Electrical engineers
- System engineers

More Data

Name	Data Code	Description
IRCB501 International Series Robot Control Cabinet User Guide	PS00017628	Describes the specifications, installation, and wiring of the IRCB501 international series control cabinet.
IRTP80 Series Teach Pendant User Guide	19012261	Describes the product information, wiring, and operation of the IRTP80 series teach pendant.
IR-TS Series International Ceiling-Mounted SCARA Robot User Guide - Mechanical (this guide)	PS00017900	Describes basic specifications, installation, and maintenance of the product.

Revision History

Date	Version	Description
April 2025	A01	Update - Updated <i>"1.1 Model and Nameplate"</i> on page 11. Addition - Added <i>"6.3 Applying Lubricating Grease"</i> on page 49. - Added <i>"6.5.2 Procedure of Zero Point Adjustment"</i> on page 55.
November 2024	A00	Initial release.

Access to the Guide

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

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



Warranty

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

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

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

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

For details, see the Product Warranty Card.

Safety Precautions

Safety Disclaimer

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

Safety Levels and Definitions



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



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



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

Safety Precautions

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

Unpacking



WARNING

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



CAUTION

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

Storage and Transportation**WARNING**

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

**CAUTION**

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

Installation

DANGER

- Installation must be carried out by technicians who have received relevant training on electrical equipment and have sufficient electrical expertise. Non-professionals are not allowed to operate the equipment.

WARNING

- Read through the guide and safety instructions before installation.
- Do not install the product in places with strong electric or magnetic fields.
- Before installation, check that the mechanical strength of the installation site can bear the weight of the equipment. Failure to comply may result in mechanical hazards.
- Do not wear loose clothes or accessories during installation. Failure to comply may result in electric shocks.
- When installing the equipment (such as the control cabinet) in a closed environment (such as a cabinet or casing), use a cooling device (such as a fan or air conditioner) to cool the environment down to the required temperature. Failure to comply may result in equipment over-temperature or fire.
- Do not modify the product.
- Do not loosen the fixing bolts of the product parts and components.
- When installing the equipment (such as the control cabinet) in a cabinet or final assembly, make sure that the enclosure of the cabinet or final assembly provides adequate fire prevention, electrical protection, and mechanical protection conforming to relevant IEC standards and local laws and regulations.
- Before installing devices with strong electromagnetic interference, such as a transformer, install a shielding device for the equipment to prevent malfunction.
- Install the product on an incombustible object, such as metal, and do not touch or attach the product to combustibles. Failure to comply may result in fire accident.

CAUTION

- Cover the top of the equipment (such as the control cabinet) with cloth or paper during installation to prevent unwanted objects such as metal chippings, oil, and water from falling into the equipment and causing faults. After installation, remove the cloth or paper on top of the equipment to prevent over-temperature caused by poor ventilation due to blocked ventilation holes.

Wiring**DANGER**

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed by only professionals.
- Before wiring, cut off all the power supplies of the equipment. Wait for at least the time designated on the equipment warning label before further operations because residual voltage still exists after power-off. After waiting for the designated time, measure the DC voltage in the main circuit to ensure the DC voltage is within the safe voltage range. Failure to comply may result in electric shocks.
- Do not perform wiring, remove the equipment cover, or touch the circuit board with power ON. Failure to comply may result in electric shocks.
- Check that the equipment is grounded properly. Failure to comply may result in electric shocks.

**WARNING**

- Do not connect the input power supply to the output end of the equipment. Failure to comply may result in equipment damage or even a fire.
- When connecting a drive to a motor, check that the phase sequences of the drive and motor terminals are consistent to prevent reverse motor rotation.
- Cables used for wiring must meet cross sectional area and shielding requirements. The shield of the cable must be reliably grounded at one end.
- Fix the terminal screws with the tightening torque specified in the user guide. Improper tightening torque may overheat or damage the connecting part, resulting in a fire.
- After wiring is done, check that all cables are connected properly and no screws, washers, or exposed cables are left inside the equipment. Failure to comply may result in electric shocks or equipment damage.

**CAUTION**

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

Power-on



DANGER

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



WARNING

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

Operation



DANGER

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



WARNING

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

Maintenance



DANGER

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



WARNING

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

Repair



DANGER

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed by only professionals.
- Do not repair the equipment while power is on. Failure to comply may result in electric shocks.
- Before inspection and repair, cut off all the power supplies of the equipment and wait for at least the time designated on the equipment warning label.



WARNING

- Submit the repair request according to the warranty agreement.
- When the fuse is blown or the circuit breaker or earth leakage current breaker (ELCB) trips, wait for at least the time designated on the equipment warning label before power-on or further operations. Failure to comply may result in death, personal injury or equipment damage.
- When the equipment is faulty or damaged, require professionals to perform troubleshooting and repair by following repair instructions and keep a repair record.
- Replace quick-wear parts of the equipment in according with the replacement instructions.
- Do not perform operations on damaged equipment. Failure to comply may result in death, personal injury, or severe equipment damage.
- After the equipment is replaced, check the wiring and set parameters again.

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

Safety Sign

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

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

Safety Sign	Description
	• Read through the safety instructions before operating the equipment. Failure to comply may result in equipment damage, physical injuries, or even death. • Do not touch the terminals or remove the cover with power ON or within 10 minutes after power-off. Failure to comply may result in electric shocks.

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1 Product Information

1.1 Model and Nameplate

IR - TS 4 - 35 Z15 S - INT
① ② ③ ④ ⑤ ⑥ ⑦

① Product family INOVANCE Robot	④ Arm length 35: 350 mm 55: 550 mm	⑦ Version INT: International (With functional safety)
② Series TS: Ceiling-mounted SCARA robot	⑤ Maximum travel of Z axis (empty for models without a lead screw) Z15: 150 mm	-
③ Load 4: 4 kg 5: 5 kg	⑥ Installation environment S: Standard	

Note

The product information in this guide is the information of standard models in a standard environment. For information about non-standard models, contact the provider.

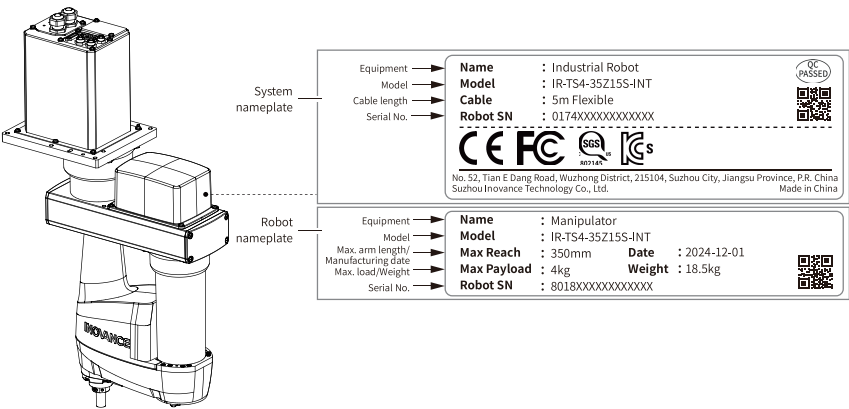
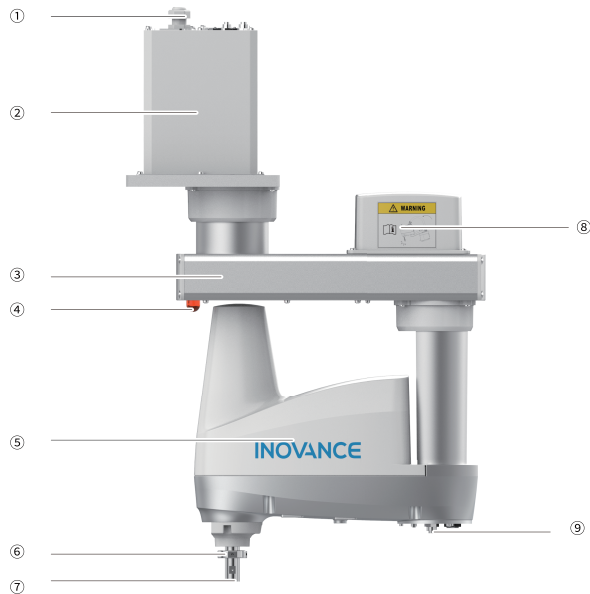


Figure 1-1 Nameplate



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

1.2 Components



No.	Description
①	Power line and encoder cable connectors
②	Base
③	Arm 1
④	State indicator
⑤	Arm 2
⑥	Mechanical stop for J3 upper limit
⑦	J3 lead screw shaft
⑧	Warning label
⑨	Air tube connector

1.3 Outline Dimensions

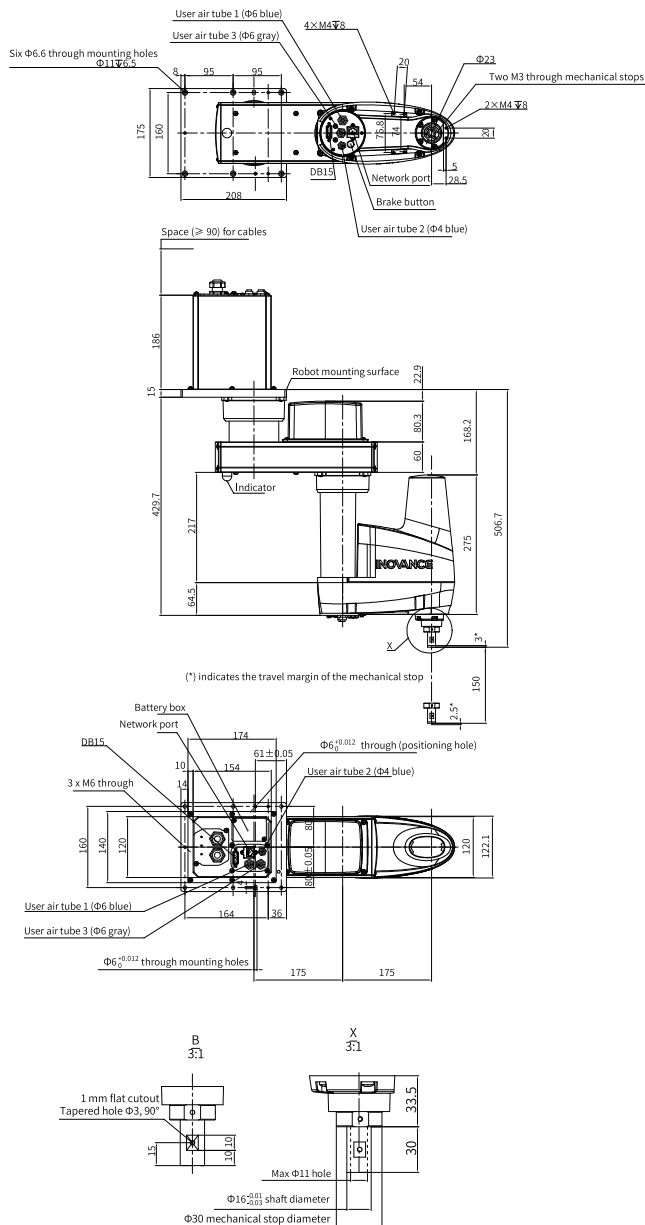


Figure 1-2 Outline dimensions for IR-TS4-35Z15S-INT (unit: mm)

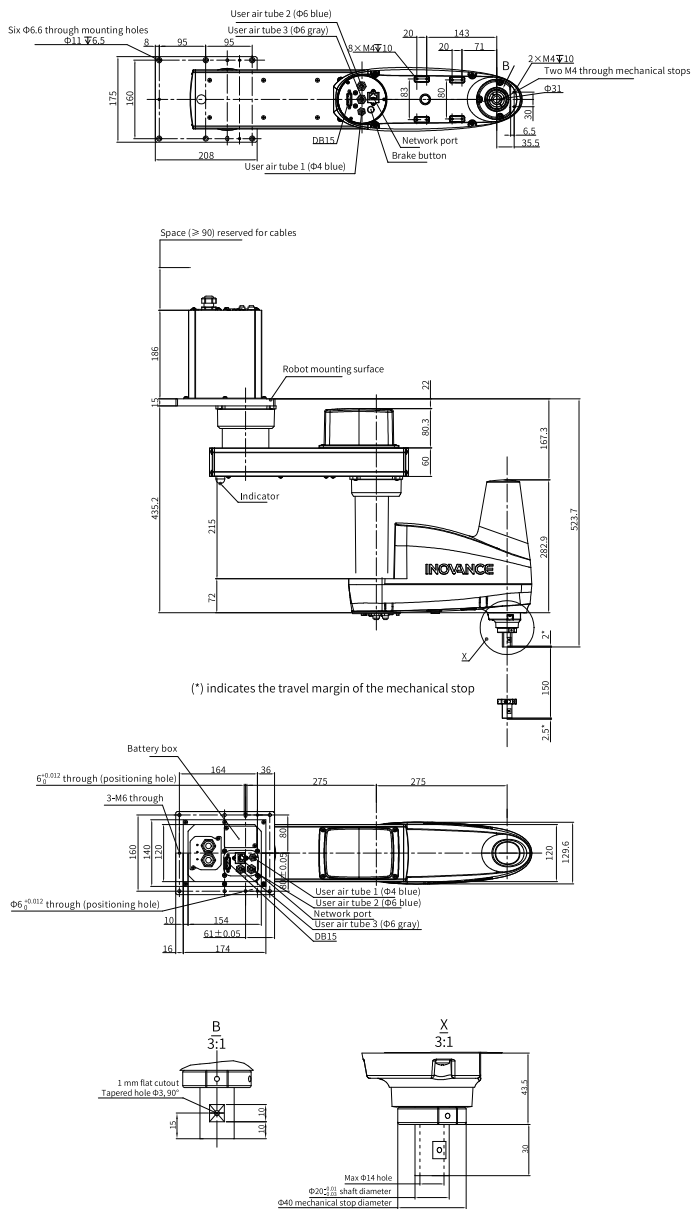


Figure 1-3 Outline dimensions for IR-TS5-55Z15S-INT (unit: mm)

1.4 Specifications

Item		IR-TS4-35Z15S-INT		IR-TS5-55Z15S-INT	
Arm length	Arm 1+Arm 2	350 mm		550 mm	
	Arm 1	175 mm		275 mm	
	Arm 2	175 mm		275 mm	
Maximum velocity	J1+J2	6180 mm/s		9712 mm/s	
	J3	1300 mm/s			
	J4	2600°/s		2000°/s	
Repeat accuracy	J1+J2	±0.01 mm		±0.015 mm	
	J3	±0.01 mm			
	J4	±0.01°			
Payload capacity	Rating	2 kg			
	Max	4 kg		5 kg	
Allowable load inertia for J4	Rating	0.005 kg·m ²		0.1 kg·m ²	
	Max	0.05 kg·m ²		0.12 kg·m ²	
Mounting hole	Mounting hole	95 mm x 95 mm x 160 mm (6 x Φ6.6 mm)			
Body weight (excluding cables)	Body weight (excluding cables)	18.5 kg		20 kg	
Press-in force of J3	Press-in force of J3	100 N		150 N	
User wiring	Wiring	15-channel signals of 30 V 0.5 A			
	Network port	CAT5E			
User air duct	User air duct	Air duct: Φ4 mm x 1, Φ6 mm x 2 Pressure resistance: 0.59 MPa			
Ambient condition	Ambient temperature ^[1]	5°C to 40°C			
	Relative humidity	10% RH to 80% RH			
Noise level	Noise level ^[2]	L Aeq ≤ 70 dB(A)			
Maximum motion range	J1	±225°			
	J2	±225°			
	J3	150 mm			
	J4	±720°			
Cycle time	Cycle time ^[3]	0.306s		0.351s	
Input power (average power consumption)	Input power (average power consumption)	2 kVA (0.3 kW)			
Applicable control cabinet (standard)	Applicable control cabinet (standard)	IRCB501-4CD-INT			
Mounting method	Mounting method	Tabletop mounting			
Certification	CE, cSGSus, FCC, KCs, and functional safety certification (supported by the "-INT" control cabinet only, requiring a functional safety expansion card)				

Note

- [1] Ambient temperature: In low temperatures close to the minimum allowed temperature in the product specifications, or after a long time of unuse during holidays or nights, it is recommended to run the robot at a low speed for 10 minutes before operation.
 - [2] Operating conditions: 4-axis linkage, 100% speed and acceleration, 50% duty cycle; measurement position: front of the robot, 1,000 mm away from the motion range, at least 50 mm above the base mounting surface.
 - [3] Standard cycle time for ceiling-mounted SCARA 350/550 models: The time required for the robot to move back and forth according to a gantry instruction (300 mm horizontal movement and 25 mm vertical movement) under a load of 1 kg.
-

2 Preparations before Installation

2.1 Installation Personnel Requirements

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

2.2 Installation Environment Requirements

General environment requirements

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

Table 2-1 Ambient conditions

Item	Requirements
Ambient temperature and humidity	• Temperature: 5°C to 40°C • Humidity: 10% RH to 80% RH, non-condensing
Storage temperature and humidity	• Temperature: -10°C to +55°C • Humidity: ≤ 80% RH, non-condensing
Transportation temperature and humidity	• Temperature: -10°C to +55°C • Humidity: ≤ 80% RH, non-condensing
Electrical fast transient/burst immunity	≤ 2 kV
Static immunity	≤ 6 kV
Environment	• Install indoors • Keep away from direct sunlight. • Keep away from dust, oil smoke, salt, and iron filings. • Keep away from flammable and corrosive liquids and gases. • Keep away from water. • Keep away from shocks and vibrations. • Keep away from sources of electrical interference.

Special environment requirements

- The surface of the robot provides certain protection. However, contact your provider and confirm in advance if the robot may come into contact with special liquid or gas during use.

- There may be condensation inside the robot if it is used in an environment with large changes in temperature and humidity. Consult your provider.
- If you want to use the robot to handle food directly, consult your provider in advance to avoid contamination of the food by the robot.



Caution

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

2.3 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.
- Consider the following torques and reaction forces produced by movements of the robot.

Type	IR-TS4-35Z15S-INT	IR-TS5-55Z15S-INT
Maximum torque in the horizontal plane	500 N · m	800 N · m
Maximum horizontal reaction force	1,200 N · m	1,400 N · m
Maximum vertical reaction force	1,200 N · m	1,300 N · m

- Use M6 threaded holes on the base table to mount the robot. Use screws with a strength equivalent to Grade 10.9 or 12.9 specified in GB/T 3098.1. For the specific dimensions, see ["1.3 Outline Dimensions" on page 13](#).
- To dampen vibrations, use a steel plate with a thickness over 20 mm and a surface roughness below 25 μm as the robot mounting surface.
- Fix the base table externally (on the ground or a wall) in a way that prevents displacement.
- Keep the Z axis of the robot perpendicular to the horizontal plane during installation.
- When using a spirit level for base table height adjustment, use bolts with a diameter larger than M8.

- When cutting cable holes on the base table, make sure that the hole diameters are at least 60 mm.
- Reserve enough space for the robot control cabinet in the base table design. For space requirements of control cabinets, see IRCB501 International Series Robot Control Cabinet User Guide.

2.4 Installation Space Requirements

Motion range

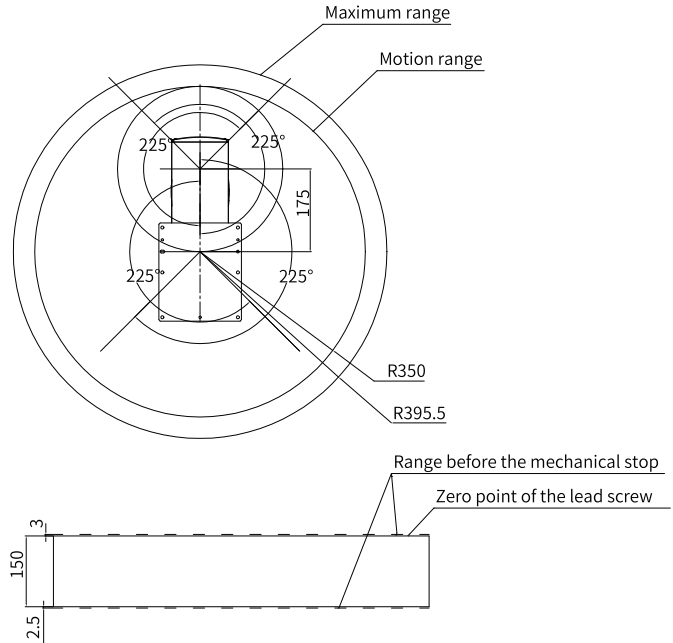


Figure 2-1 Motion range of IR-TS4-35Z15S-INT standard model (unit: mm)

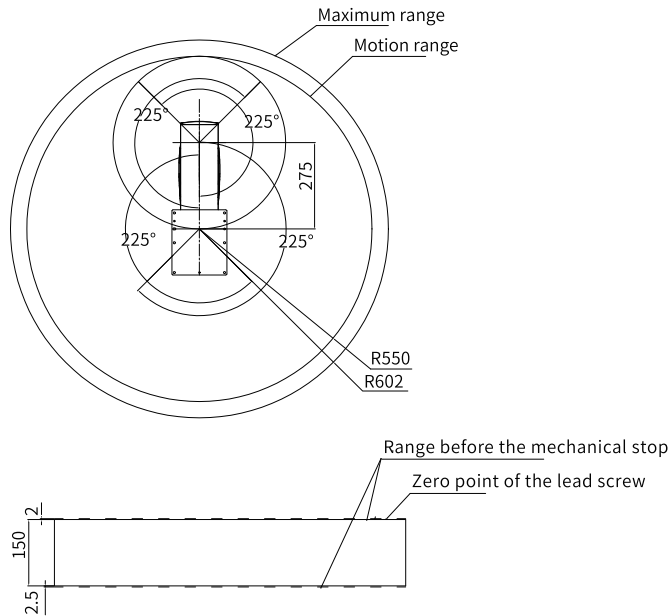
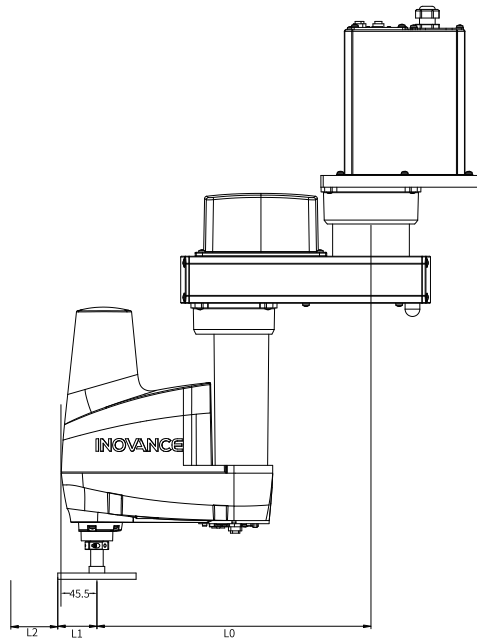


Figure 2-2 Motion range of IR-TS5-55Z15S-INT standard model (unit: mm)

Maximum range

The "maximum range" refers to the range in which the robot arm may cause interference. When installing an end effector with a radius exceeding 45.5 mm, set the "upper arm +forearm+end effector radius" as the maximum range.



- L0: Upper arm and forearm length
- L1: Radius of the end effector
- L2: Safety margin
- The safety distance should be greater than the sum of L0, L1, and L2.

2.5 Preparation of Installation Tools

Table 2-2 Preparation of tools

Tool	Quantity (pcs)
M6 outer hexagon wrench	1
Scissors or utility knife	1
Claw hammer	1
Straight screwdriver	1
Protective gloves	1
Anti-smash shoes	1
Lifting rope	1
Forklift	1

3 Unpacking, Storage, and Transportation

3.1 Precautions



Caution

Check whether the packing is intact and whether there is damage, water seepage, dampness, and deformation before unpacking.

Unpack the product layer by layer. Do not strike the package violently.

Check the surfaces of the equipment and accessories for any damage, rust, and scratches.

Check the equipment, accessories, and materials in the package against the packing list.



Warning

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

Do not install the equipment if you find water seepage, component missing or damage upon unpacking.

Do not install the equipment if you find the packing list does not conform to the equipment you received.

Unpack the packing box according to the direction instructed.

**Danger**

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

**Warning**

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

**Caution**

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

3.2 Unpacking

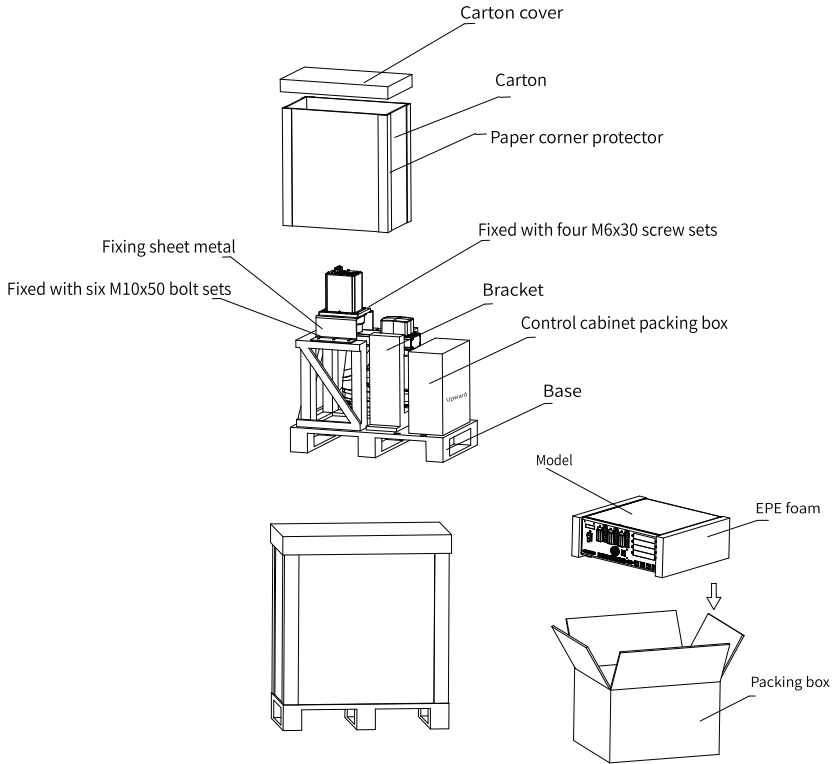
Unpacking procedure:

1. Remove the outer carton.

Cut the PET straps on the carton with scissors or a utility knife. Remove the carton cover and the paper corner protectors. Lift the carton vertically to remove it.

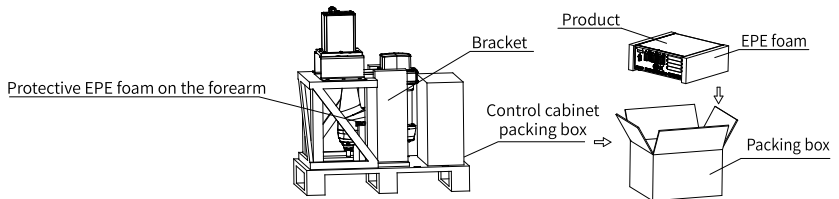
**Caution**

Wear gloves to prevent scratches.



2. Unpack the control cabinet.

- Cut the packing straps securing the control cabinet packing box with scissors.
- Transfer the control cabinet packing box from the pallet to an open area, ensuring to follow the orientation instructions on the box.
- Open the packing box. Grip the holes on the sides of the control cabinet or hold the bottom to remove the control cabinet from the packing box. Transfer the control cabinet to the desired location.



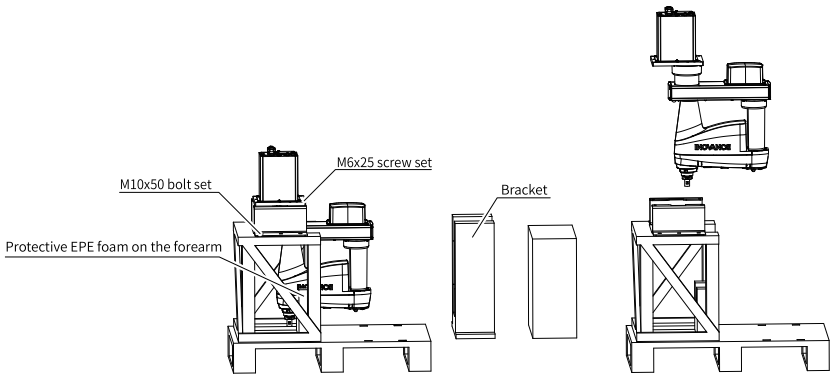
3. Remove the bracket and take out the robot body.

- Remove the outer hexagon self-tapping screws on the bracket with an inner hexagon electric screwdriver.

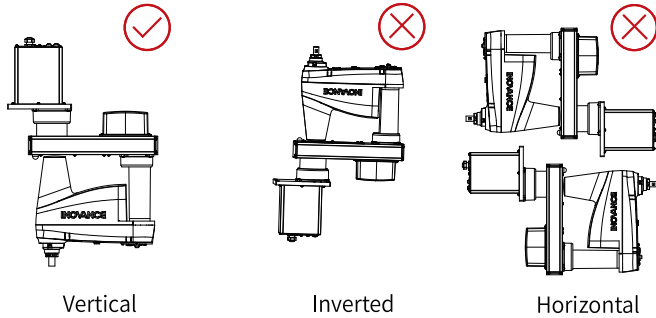
- Loosen the M6 screws on the pallet (without removing them) with an inner hexagon electric screwdriver.
- Take out the bracket.
- Remove all the M6 screws on the pallet.
- Lift the robot vertically and then move it horizontally to remove it from the pallet. Avoid interference between the bottom of the robot body and the top of the fixtures. Then, transfer the robot body to the desired location.



Be careful when removing the bracket to avoid collisions with the robot.



Place the robot in the correct manner.



Caution

- Stabilize the robot when removing the bolts fixing the manipulator to avoid bodily injury or equipment damage caused by titling of the equipment due to unstable center of gravity.
 - To repack the robot, reverse the steps above.
 - Take out the robot carefully to avoid collision.
-

3.3 Handling

Preparation for handling

1. If the robot is newly manufactured, keep it in the same posture as it was in the factory.

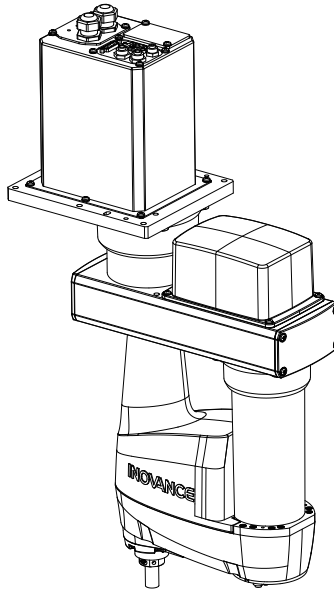


Figure 3-1

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

Handling procedure

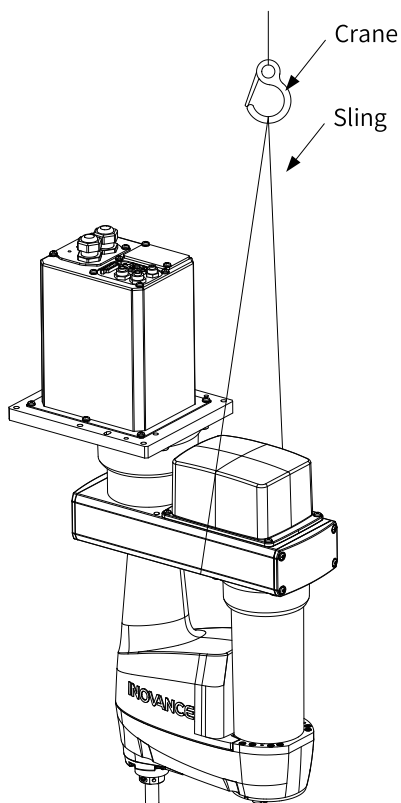
Handling with bare hands

When handling the robot, secure the robot to handling equipment or hold arm 2 and the bottom of the base with hands. Be sure to have two or more people carry out the handling operation.

Handling with a crane

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

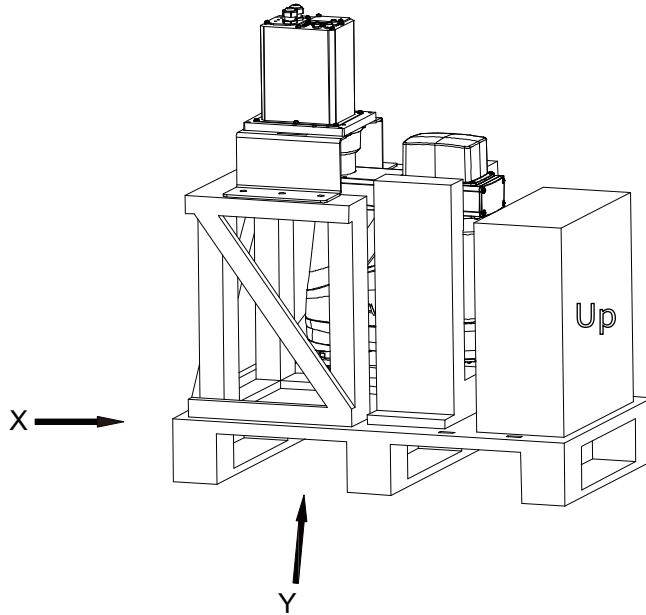
Be sure to use a flat sling to secure the robot in the same posture as it was in the factory. Thread the flat sling through the lower gap so that the sling fits snugly on the robot, as shown below.



Handling with a forklift

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

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



Note

- When the factory pallet is used and the robot is located on one side of the pallet, apply a counterweight on the other side upon forklift insertion, to prevent the robot from tipping over.
 - Do not pull the cables of the robot to prevent damage.
-

4 Installation

4.1 Installation precautions



Danger

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

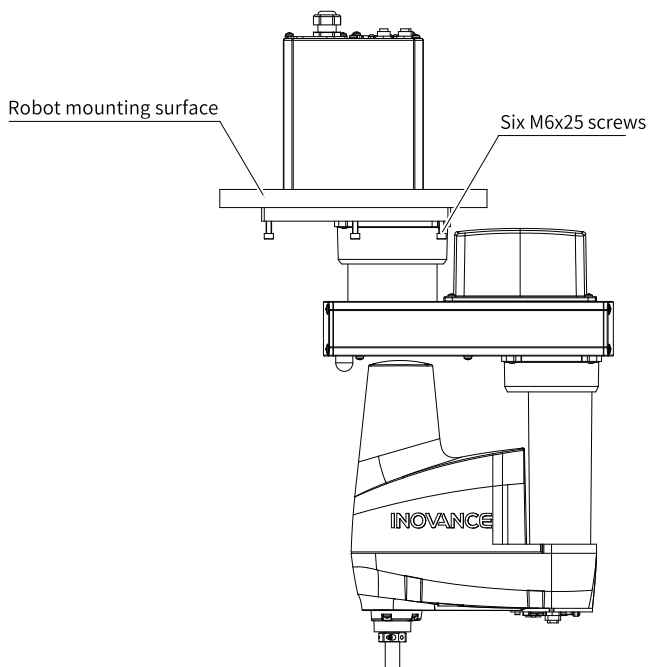


Warning

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

4.2 Installing the Robot Body

Secure the base to the base table with six M6x25 screws, as shown in the following figure. Use screws with a strength equivalent to Grade 10.9 or 12.9 specified in GB/T 3098.1.



Check if the screws are securely fastened according to the following torque recommendations.

Screw Nominal Diameter (Grade 10.9 or Higher Strength)	Installation Torque
M6	12 N · m

4.3 Installing an End Effector

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

Note

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

Refer to the following dimensions when designing your end effectors and mounting methods.

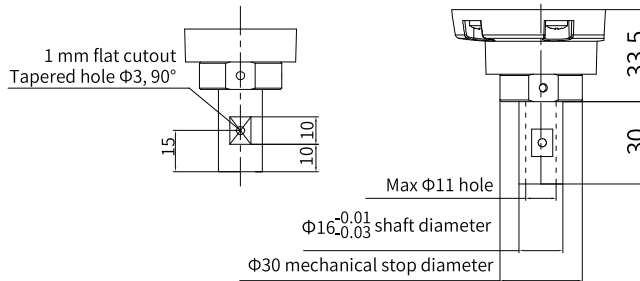


Figure 4-1 Auxiliary tooling installation dimensions for IR-TS4-35Z15S-INT (unit: mm)

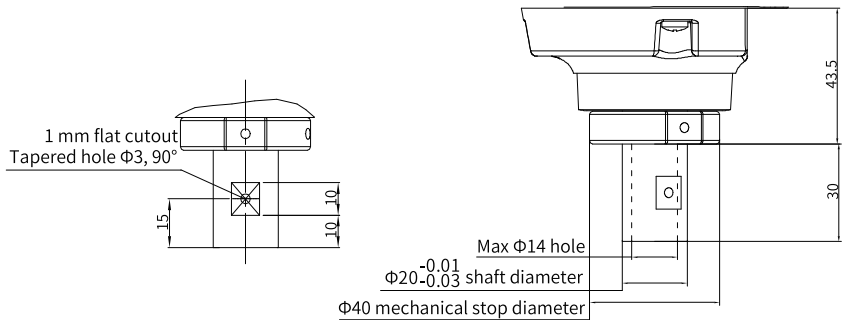


Figure 4-2 Auxiliary tooling installation dimensions for IR-TS5-55Z15S-INT (unit: mm)

The weight of any end effector on the ceiling-mounted IR-TS4-35Z15S-INT robot must not exceed 4 kg. The weight of any end effector on the ceiling-mounted IR-TS5-35Z15S-INT robot must not exceed 5 kg, as shown in the diagram.

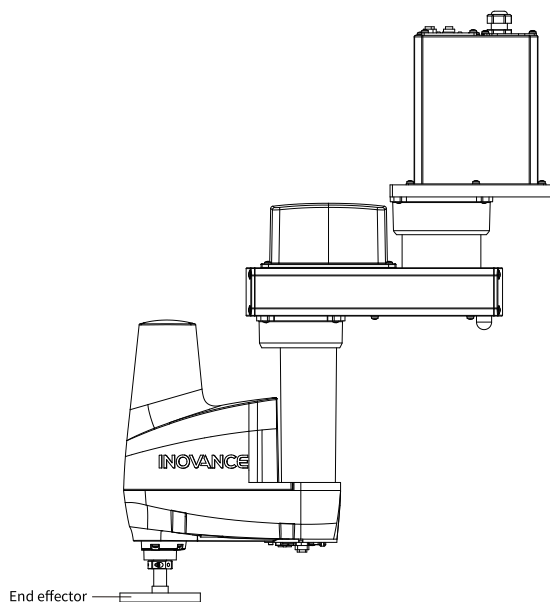


Figure 4-3 Installing an end effector

If you need to move J3 up or down when installing an end effector, turn on the controller power supply. Press the brake switch while moving the axis up or down or rotating the axis. The brake switch is a momentary switch. It releases the brake only while pressed.

When the brake release switch is pressed, be aware of the potential downward movement or rotation due to the weight of the end effector.

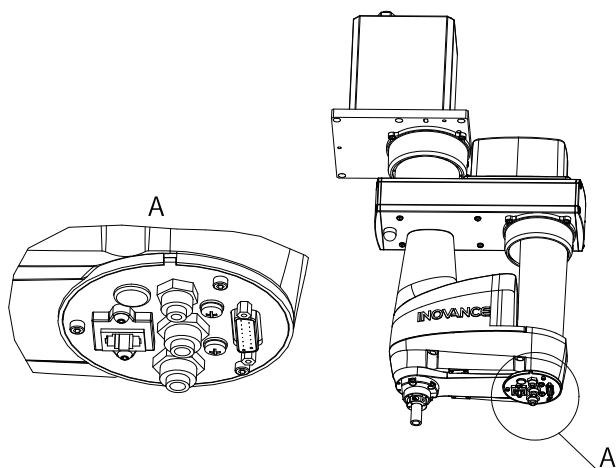


Figure 4-4 Position of the brake release switch

Note

Stop robot movement when installing an end effector to prevent contact between the end effector and the robot body due to the outer diameter of the end effector, workpiece size, or the robot arm position. Pay attention to the interference area of the end effector during system layout design. ["2.4 Installation Space Requirements" on page 19](#)

4.4 Cable Connection



Danger

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



Warning

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

Connect the power cord and the signal cable to the control cabinet separately.

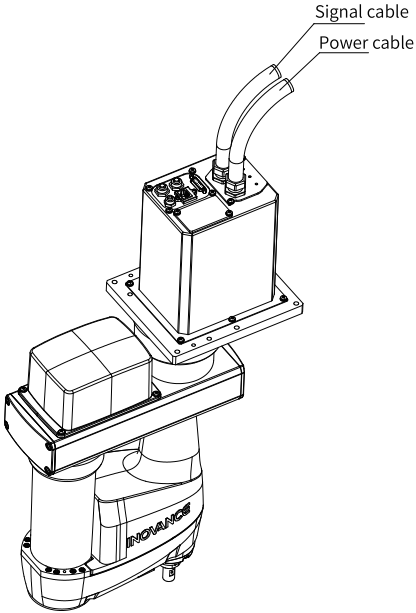
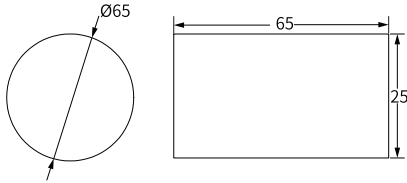
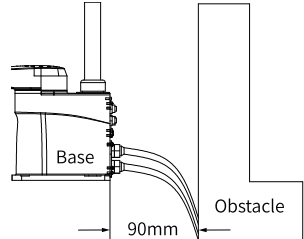


Figure 4-5 Cable connection

Table 4-1 Cable hole dimensions (IRCB501 series robot control cabinet)

Name	Power Line Connector (Cabinet Side)	Encoder Cable Connector (Cabinet Side)
Dimensions	42.5 mm x 22.8 mm x 14.77 mm (L x W x H)	53 mm x 55 mm x 16.4 mm (L x W x H)

The following table lists recommended minimum hole dimensions and space reservations for cable routing (red box indicates recommended dimensions).

Cable Hole Dimensions (Circular Hole & Square Hole) (mm)	Reserved Space (Connector Size+Cable Bending Radius) for Cables on the Robot Side
	

4.5 User Wiring and Tubing



Danger

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

Wiring (Cables)



Warning

Current higher than 0.5 A is not allowed.

Model	Allowable Current	Number of Conductors	Cable Gauge	Remarks
D-sub 15Pin	0.5 A	15	24AWG	Connector included

Note

Use connectors with the same pin number on both ends of the cable. The robot is shipped with wiring ready for the user.

Communication cable requirements

Use Cat5e shielded twisted pair cables for the network port and as the built-in network cable. The cables must support a maximum communication speed of 1000 bps and meet communication requirements of industrial cameras and other devices.

Tubing (Air Ducts)

Note

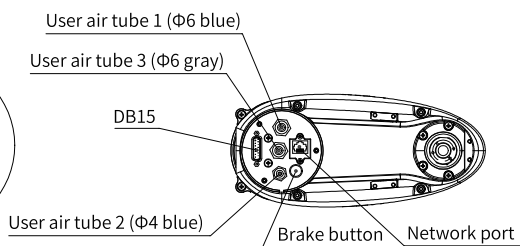
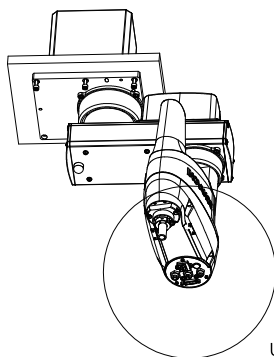
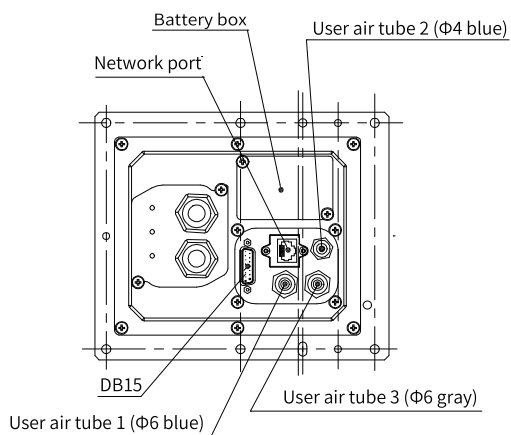
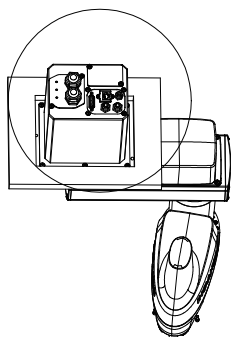
Both ends of the air tubes are equipped with quick release couplings (outer diameter of $\Phi 6$ mm and $\Phi 4$ mm).

Pressure Resistance Level	Quantity	Specifications (Outer Diameter)
0.59 MPa (5.9 kgf/cm ²)	2	$\Phi 6$ mm
0.59 MPa (5.9 kgf/cm ²)	1	$\Phi 4$ mm

Two $\Phi 6$ mm straight-through air duct connectors are provided on the base, and two on the forearm.

One $\Phi 4$ mm straight-through air duct connector is provided on the base, and one on the forearm.

Air duct connectors are color-coded, as shown in the following figure.



5 Motion Range

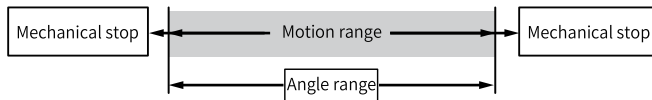
5.1 Methods of Setting the Motion Range

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

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



5.2 Motion Range Setting by Angle Range

5.2.1 Description of Angle Ranges

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

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

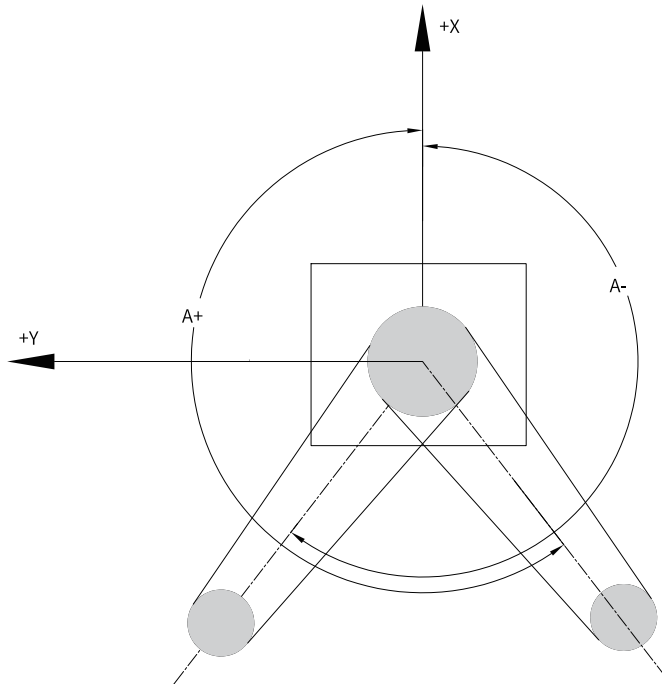
When the robot receives a motion command, it will check whether the target position of the command is within the angle range before moving. If the target position is beyond the set angle range, an error occurs and the robot does not move.

Note

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

5.2.2 Maximum Angle Range of J1

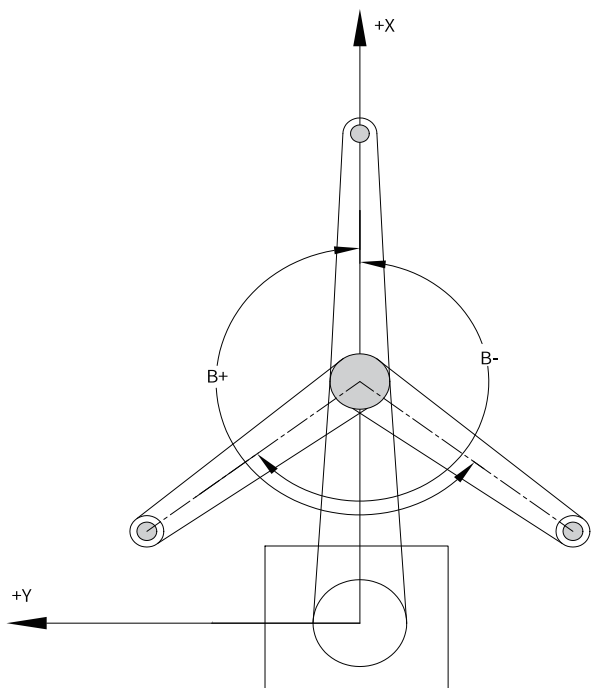
The 0° position of J1 refers to the position where arm 1 is facing the positive direction of the X coordinate axis. Positive angle values are measured counterclockwise from the 0-pulse position, while negative angle values are measured clockwise.



Model	Maximum Motion Range
IR-TS4-35Z15S-INT	$\pm 225^\circ$
IR-TS5-55Z15S-INT	

5.2.3 Maximum Angle Range of J2

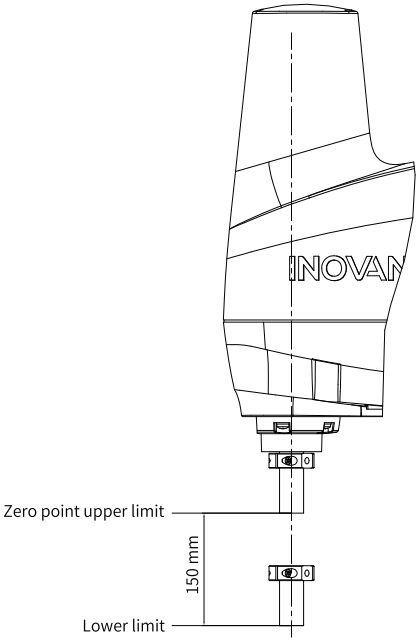
The 0° position of axis J2 refers to the position where arm 2 is perpendicular to arm 1 (regardless of the direction of arm 1). Positive angle values are measured counterclockwise from the 0° position, while negative angle values are measured clockwise.



Model	Maximum Motion Range
IR-TS4-35Z15S-INT	$\pm 225^{\circ}$
IR-TS5-55Z15S-INT	

5.2.4 Maximum Travel Range of J3

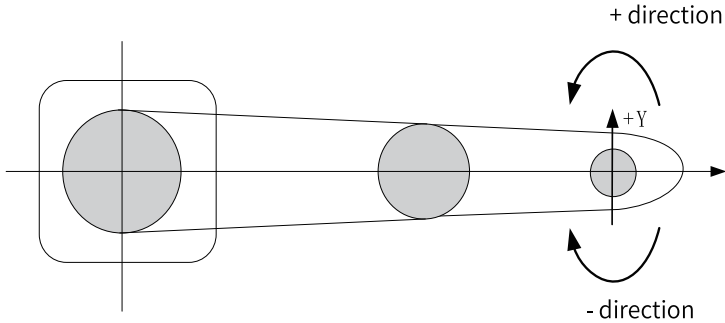
The 0° position of axis J3 refers to the upper limit position of the axis. When axis J3 descends from the 0° position, its angle value becomes negative.



Model	J3 Travel
IR-TS4-35Z15S-INT	150 mm
IR-TS5-55Z15S-INT	

5.2.5 Maximum Angle Range of J4

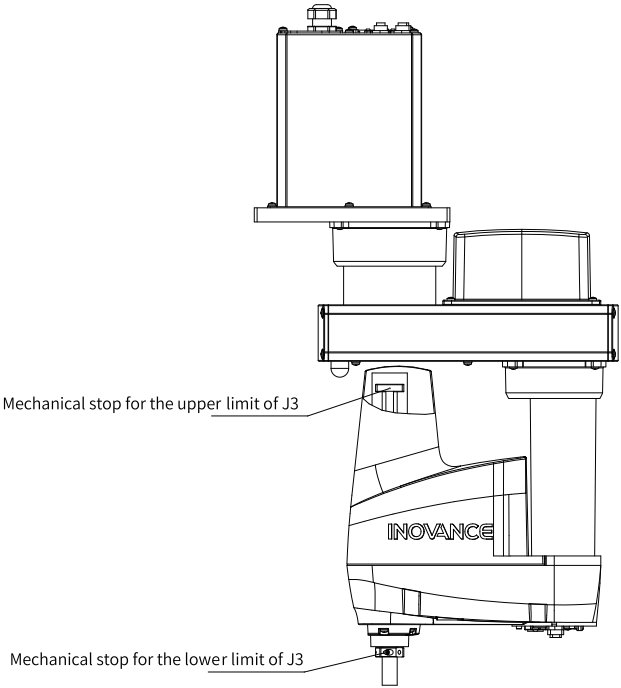
The 0° position of axis J4 refers to the position where the plane at the top of the axis is facing toward the top of arm 2 (regardless of the direction of arm 2). Positive angle values are measured counterclockwise from the 0° position, while negative angle values are measured clockwise.



Model	Maximum Motion Range
IR-TS4-35Z15S-INT	$\pm 720^{\circ}$
IR-TS5-55Z15S-INT	

5.3 Mechanical Limit Stops

The IR-TS series ceiling-mounted SCARA robot has mechanical limit stops on Axis J3. You can adjust the motion range of Axis J3 as needed, as shown in the following figure.



5.4 Standard Motion Range

Name	Description
Motion Range	The range for motion at the standard (maximum) specifications. When the motors of the axes are excited, the lower center of axis J3 moves within the range shown in the figure.
Range before the mechanical stop	The range in which the lower center of J3 moves when the motors of the axes are not excited.

Name	Description
Mechanical stop	The stop used to mechanically set an absolute motion range beyond which motion is not allowed.
Maximum range	The range in which the robot arm may cause interference. When installing an end effector with a radius exceeding 45.5 mm, set the "upper arm+forearm+end effector radius" as the maximum range.

The following figure shows the motion range.

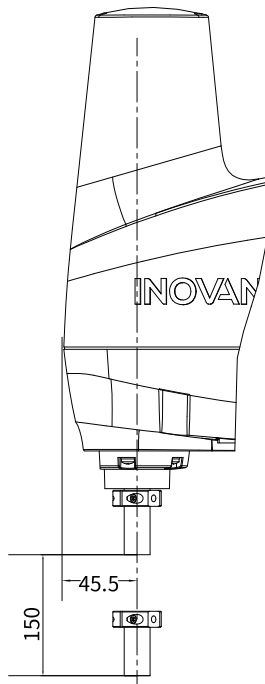


Figure 5-1 Motion range of an end effector (unit: mm)

6 Maintenance

6.1 Precautions for Maintenance and Repair

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



Danger

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



Warning

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

6.2 Periodic Inspection Items

Perform periodic inspection on items that are difficult to check during operation. Clear the dust especially metal powders on the surface of the equipment to prevent the dust from entering the equipment. Clear the greasy dirt from the cooling fan.

- Inspection during power-off (not operating)

Item	Position	Daily	Monthly	Quarterly	Semi-annual	Annual	Maintenance Personnel		
							Professionals	Qualified Personnel	Manufacturer
Check whether the screws are loose. If yes, tighten the screws.	End effector mounting screws	✓	✓	✓	✓	✓	✓	✓	✓
	Robot mounting screws	✓	✓	✓	✓	✓	✓	✓	✓
	Screws around each axis	✓	✓	✓	✓	✓	✓	✓	✓
	Screws for the motor and reducer	-	-	-	-	✓	-	✓	✓
Check whether the connectors are loose. If yes, insert/tighten the connectors.	External part of the robot body (such as the connector board)	✓	✓	✓	✓	✓	✓	✓	✓
	Robot cable unit	-	✓	✓	✓	✓	✓	✓	✓
Visually inspect for any external defects and clear attached dust.	Robot body	✓	✓	✓	✓	✓	✓	✓	✓
	External cables	-	✓	✓	✓	✓	✓	✓	✓

Item	Position	Daily	Monthly	Quarterly	Semi-annual	Annual	Maintenance Personnel		
							Professionals	Qualified Personnel	Manufacturer
Check for deformation and position offset. Repair or place it properly if necessary.	Safe guard	✓	✓	✓	✓	✓	✓	✓	✓
Check tension of timing belt. Tighten it if necessary.	Inside arm 2	-	-	-	✓	✓	✓	✓	✓
Check if the lubricating grease is sufficient for lubrication, and add an appropriate amount of lubricating grease as needed.	Ball screw	-	-	-	✓	✓	✓	✓	✓
	Spline	-	-	-	✓	✓	✓	✓	✓
	Polished rod lubrication inspection place	-	-	-	✓	✓	✓	✓	✓

- Inspection during power-on (not operating)

Item	Position	Daily	Monthly	Quarterly	Semi-annual	Annual	Maintenance Personnel		
							Professionals	Qualified Personnel	Manufacturer
Shake the cable gently by hand to check for wire breakage.	External cables (including cable units of the robot)	-	-	-	✓	✓	-	✓	✓
Press each arm by hand in the enabled state to check whether the arms shake.	Each axis	-	-	-	-	✓	-	✓	✓

- Inspection during power-on (operating)

Item	Position	Daily	Monthly	Quarterly	Semi-annual	Annual	Maintenance Personnel		
							Professionals	Qualified Personnel	Manufacturer
Confirm the motion range.	Each axis	-	-	-	-	✓	-	✓	✓
Check for abnormal noises or vibration.	Robot body	✓	✓	✓	✓	✓	✓	✓	✓
Measure the accuracy repeatedly by gauge.	Robot body	-	-	-	-	✓	-	✓	✓

6.3 Applying Lubricating Grease

Before robot body maintenance, it is necessary to clarify the type of lubricating grease, which varies from supplier to supplier. The specific types of lubricating greases used and their codes are listed in the table below.

Lubricating Grease Type	Model	Code
Lead screw lubricating grease	THK AFB-LF	24100039

After the robot body is running, it is necessary to regularly replace the lead screw and spline lubricating grease to ensure that the ball screw of the robot body can be well lubricated. The following table lists the recommended replacement part and cycle.

Component	Replacement Cycle
Ball screw and spline	3 months

The method of replacing the lead screw lubricating grease is as follows:

1. Remove the forearm enclosure according to "[6.4.4 Enclosure Replacement](#)" on page 53.
2. Use a clean cloth to wipe off the earlier lubricating grease on the lead screw.
3. Apply 1.2 g of grease to the spiral groove and spline groove of the ball screw evenly.
Remove excess grease accumulates on the surface of the lead screw except the groove.

6.4 Part Replacement

6.4.1 Precautions

Note

- Cut off the power before installing or removing the motor connector. Failure to comply may lead to abnormal movements of the robot or an electric shock.
 - Do not perform equipment maintenance or servicing while power is on. Failure to comply may result in an electric shock.
 - Prevent foreign objects from entering the equipment and terminals during maintenance.
-

6.4.2 Battery Replacement

Note

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

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

1. Unscrew the two M4x8 screws on the battery box cover.

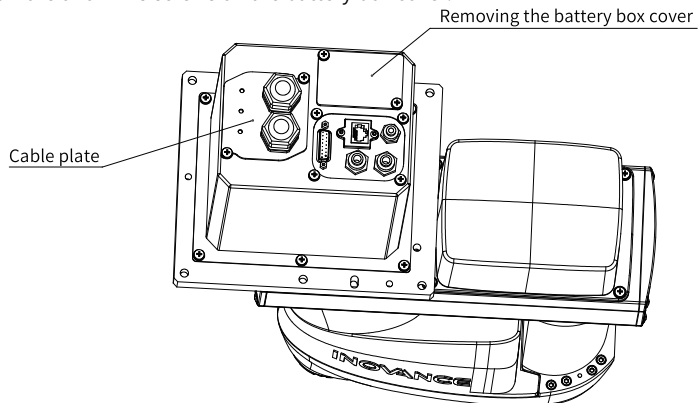
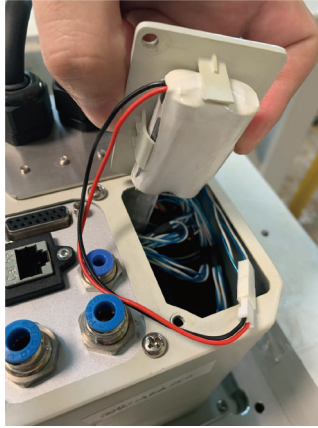


Figure 6-1

2. Connect the terminal of the new battery to the empty white 2P connector.



3. Remove the used battery.
4. Secure the new battery to the battery cover. Use M4x8 screws to fasten the battery cover to the base.

Note

Failure to comply with the procedure described above may cause loss of zero points. ["6.5.1 Overview of Zero Point Adjustment" on page 54](#)

6.4.3 Cable Replacement

1. Loosen the fixing screws with a crosshead wrench. Rotate the cable plate by a certain angle to remove it.
2. Replace the damaged cable.
3. Rotate the cable plate to fit it into the fixing hole, and then tighten the screws.

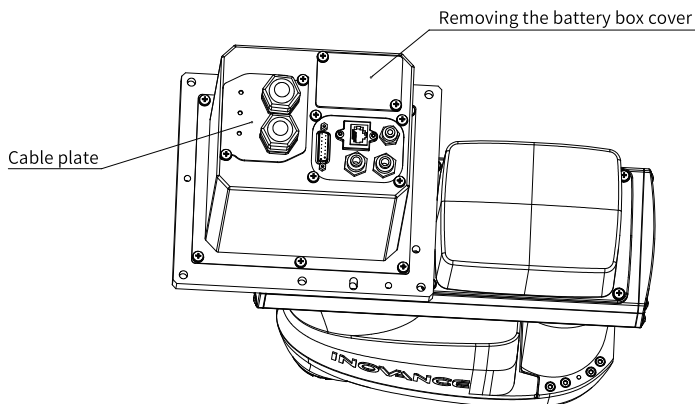


Figure 6-2 Cable plate on the base



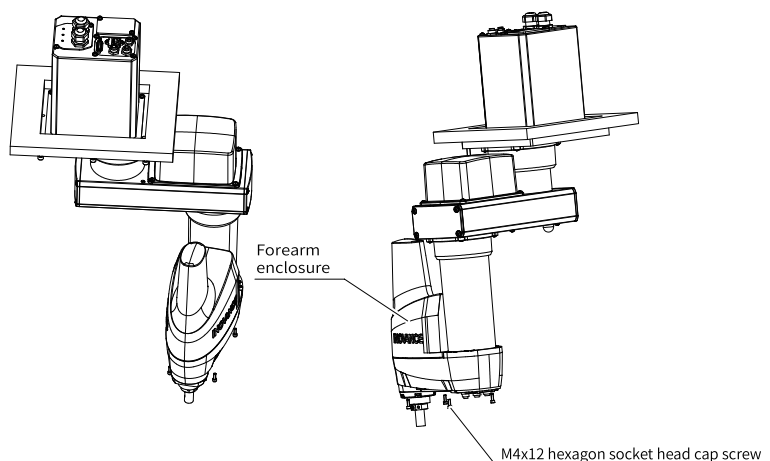
Caution

- Do not pull the cable board forcibly. Failure to comply will 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.

6.4.4 Enclosure Replacement

Removing the forearm enclosure

Rotate the forearm to a position greater than 60°. Remove the four M4x12 hexagon socket head cap screws on the forearm, as shown in the following figure. Next, lift the forearm enclosure to remove it.



Installing the forearm enclosure

Rotate the forearm to a position greater than 60°. Install the forearm enclosure onto the forearm. Secure the enclosure to the forearm with the four M4x12 hexagon socket head cap screws under a torque of 0.6 N·m. Make sure that the upper limit mechanical stop does not come into contact with the forearm enclosure.

6.5 Home Position Calibration

6.5.1 Overview of Zero Point Adjustment

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

Note

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

6.5.2 Procedure of Zero Point Adjustment

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

Due to the strong correlation between the 4-axis robot's operation point coordinate and the accuracy of J2 axis, it is necessary to complete zero point adjustment of J2 axis before calculating the robot coordinates. The teach pendant provides a right/left wrist wizard. Follow the wizard to adjust the zero point.

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

1. Select a role and log in to the system.
 - a. On the main screen of the teach pendant, click the "User Settings" shortcut key to open the "User Settings" screen.
 - b. Enter the password in the password input box and click "Log In".

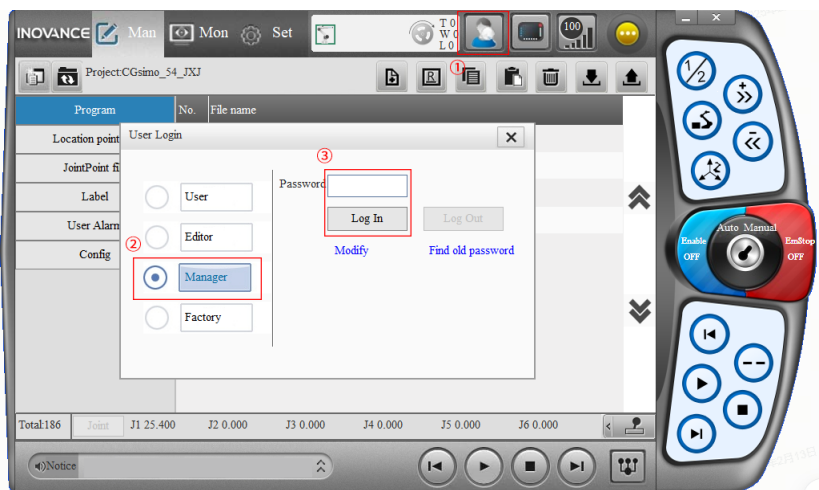


Figure 6-3 Screen of I RTP80 series tech pendant

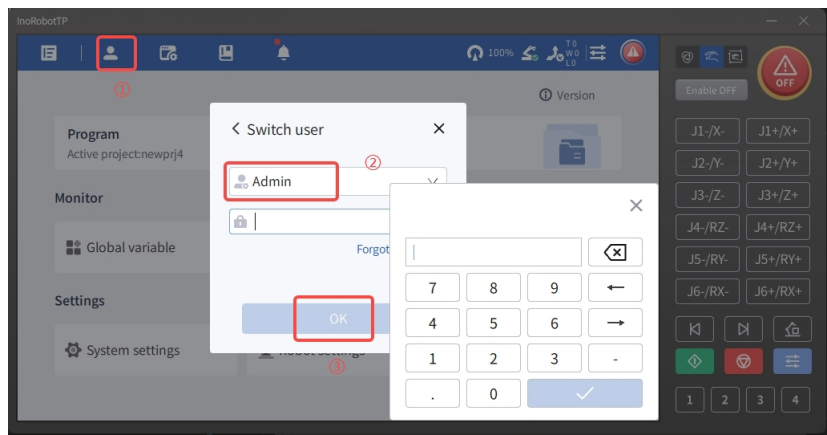


Figure 6-4 Screen of I RTP200 series tech pendant

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

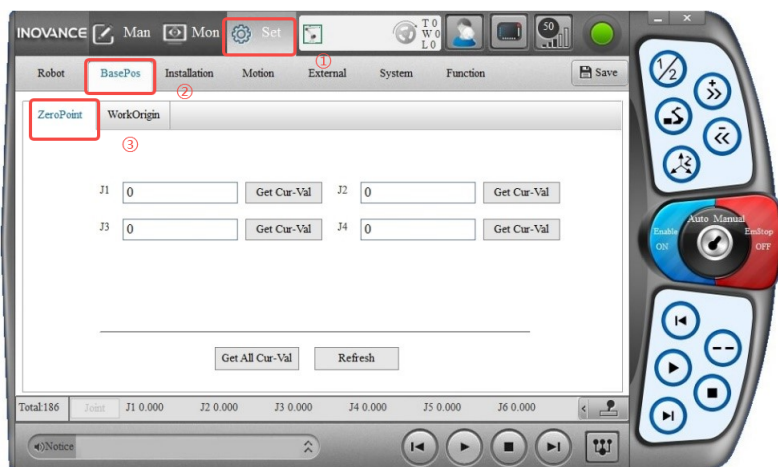


Figure 6-5 Screen of IRTP80 series tech pendant

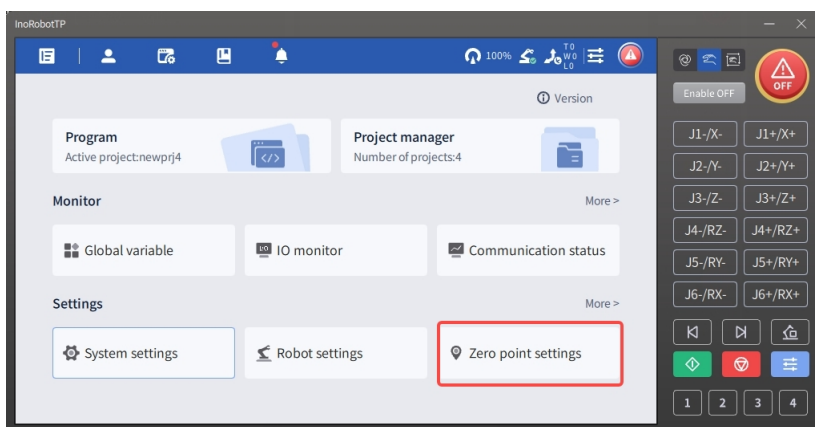


Figure 6-6 Screen of IRTP200 series tech pendant

3. Move each axis of the robot to the corresponding zero point.
 - a. Move the robot axes to their respective zero points on the hand-held or PC-based teach pendant. For details, see Teach Pendant User Guide.
 - b. Also, you can manually push a robot joint to the zero point when the motor is disabled.

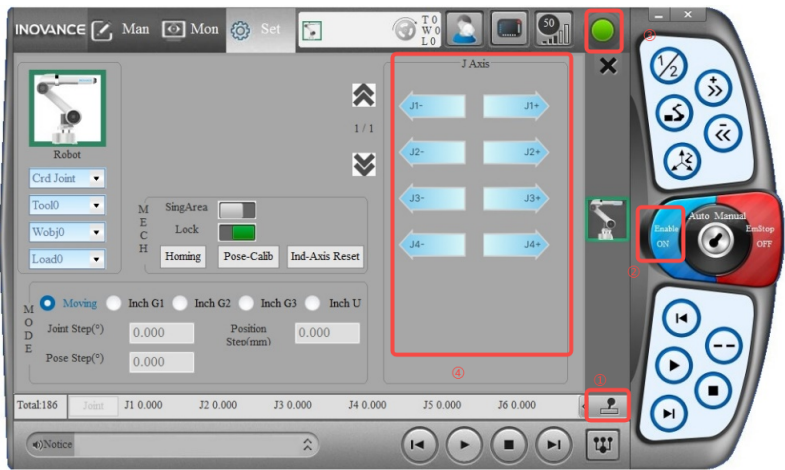


Figure 6-7 Screen of IRT P80 series tech pendant

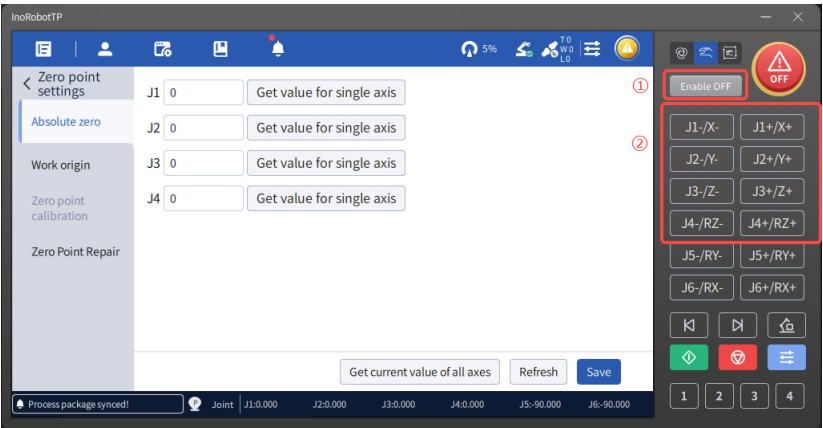


Figure 6-8 Screen of IRT P200 series tech pendant

4. Switch to the emergency stop state.
- a. Click the virtual emergency stop button on the PC-based tech pendant, or press the red "EmStop" button on the hand-held tech pendant.
 - b. The status indicator in the upper right corner of the PC-based tech pendant (or the display of the hand-held tech pendant) indicates the emergency stop state (red).

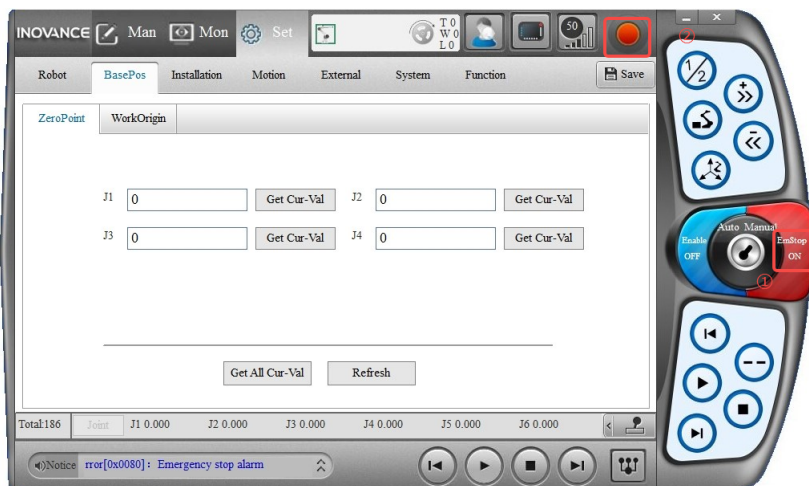


Figure 6-9 Screen of IRTP80 series tech pendant

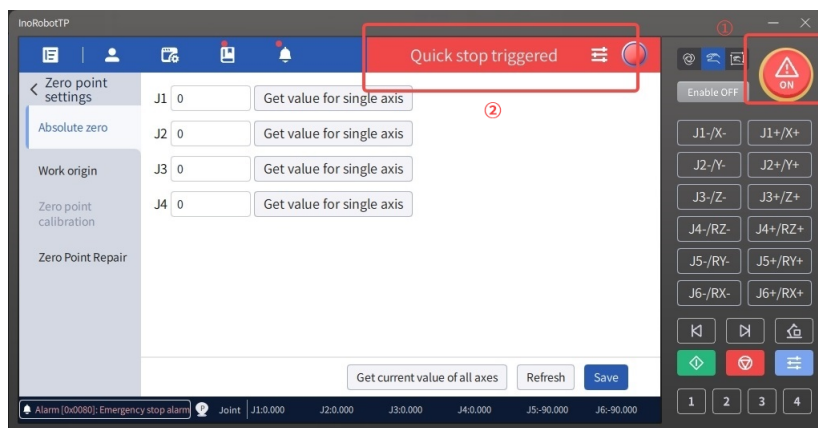


Figure 6-10 Screen of IRTP200 series tech pendant

5. Obtain and save the zero point information.
 - a. Click the "Get Cur" button when the robot moves to the zero point position to obtain the encoder pulses at the zero point position.
 - b. Click "Save" to complete zero point adjustment.

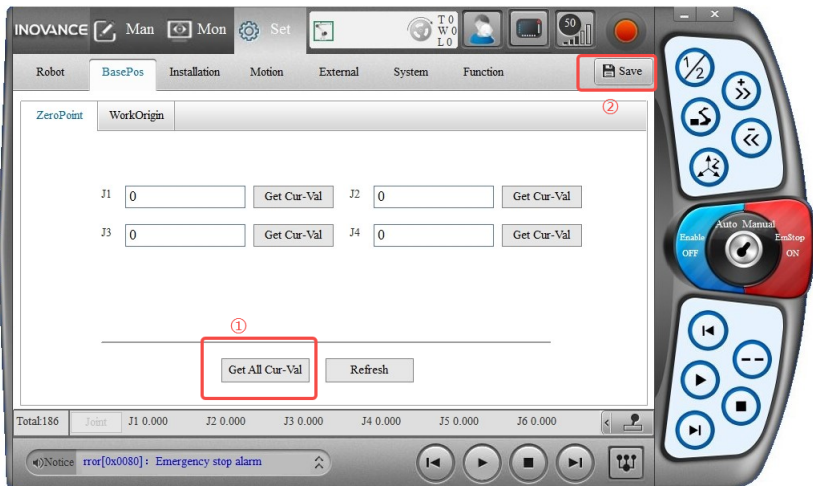


Figure 6-11 Screen of I RTP80 series tech pendant

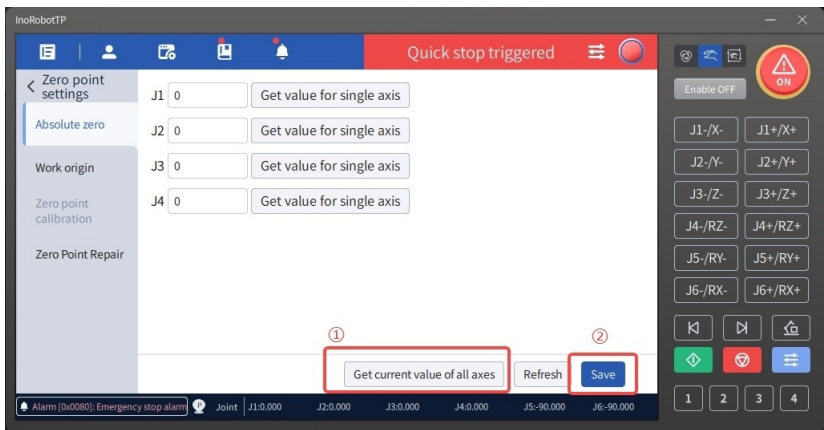


Figure 6-12 Screen of I RTP200 tech pendant

6.5.3 Zero Point Position of Each Joint

1. The zero point of axis J1 is shown in the following figure. Axis J2 does not have a zero point slot, and its zero adjustment is embedded in the software.

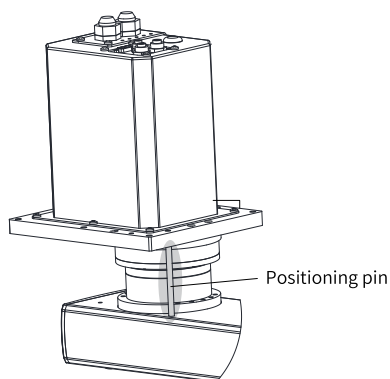


Figure 6-13 The zero point position of J1/J2

2. The zero point of axis J3 is the upper limit position of axis J3.

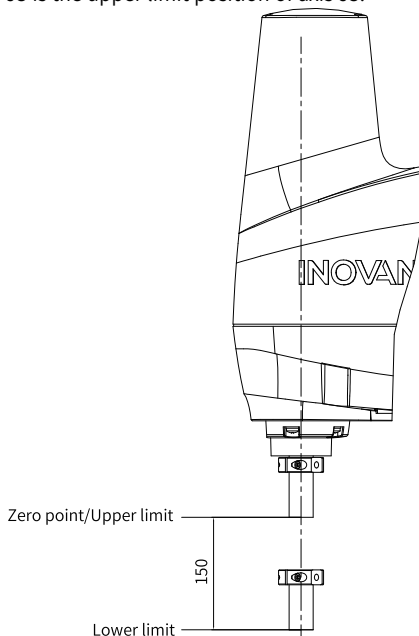


Figure 6-14 Zero point of axis J3 (unit: mm)

3. The zero point of axis J4: Position where the flat surface on the shaft (or the slots of the upper and lower mechanical stops) faces towards the tip of J2.

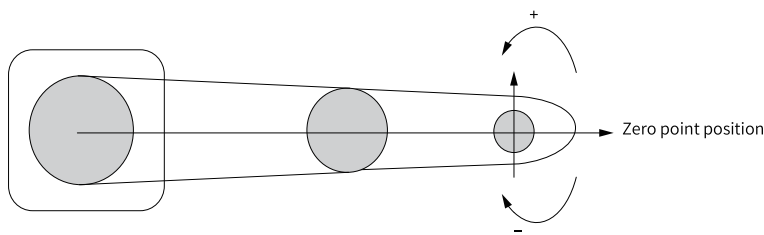


Figure 6-15 Zero point of axis J4

7 Certification and Standard Compliance

Third-party certification

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

Note

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

Declaration of conformity with EU directives

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

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



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