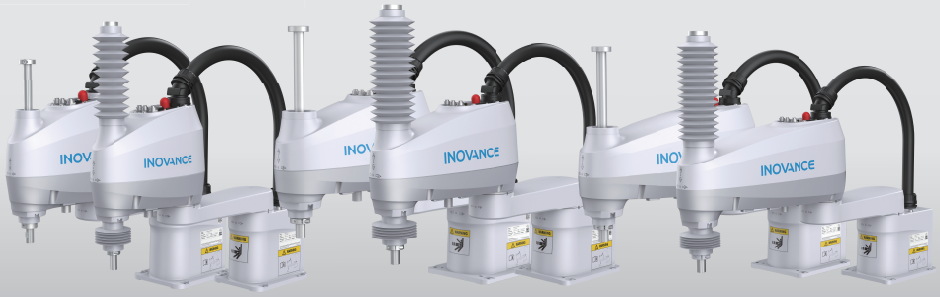
INOVANCE

Advancing industrial technology,
for a better world



IR-S4&S7&S10-INT Series SCARA Robot

User Guide

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

Data code PS00017837A03

Legal Information

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Disclaimer of Liability

Due to continuous updates and improvements of products and technologies, the content of this documentation may not fully match the actual products. In the event of any discrepancies, the actual products shall prevail.

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.

1 Fundamental 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

WARNING

- 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.

CAUTION

- 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

Tampering with software (such as viruses, Trojans, and Worms) can lead to unsafe drivestate, which can put the device in an unsafe operation state. This may result in death,serious injury, and property damage. Observe the following strictly.

- Always use the latest software version. If the product version is no longersupported or the latest version of the program is not applied, customers are atincreased risk of cyber-attacks.
- Take proper protection measures (including but not limited to deploying antivirussoftware, firewall, WAF, IPS/IDS, situational awareness system, IDverification, and data encryption) to prevent files in the mobile storage devicefrom being damaged by malware and protect products, networks, systems, andinterfaces from unauthorized access, disturbance, intrusion, data disclosure, orinformation 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.

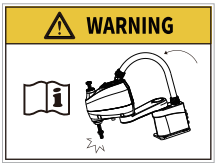
Safety Signs	Name	Description
	Electric shock hazard	Indicates that ignoring this safety sign may result in serious consequences such as equipment damage, electric shock, or personal injury.
	Crush hazard	Indicates that ignoring this safety sign may result in serious consequences such as equipment impact, 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.

Table of Contents

Legal Information 1
1 Fundamental Safety Instructions 2
1.1 Safety Precautions 2
1.2 Industrial Information Security 9
1.3 Safety Signs 10
2 IR-S4-INT SCARA Robot User Guide - Manipulator 15
2.1 Preface 15
2.2 产品信息 17
2.2.1 Model and Nameplate 17
2.2.2 Components 19
2.2.3 Product Dimensions 20
2.2.4 Technical Specifications 22
2.3 Preparations Before Installation 23
2.3.1 Installation Personnel Requirements 23
2.3.2 Installation Environment Requirements 23
2.3.3 Installation Base Table Requirements 24
2.3.4 Installation Space Requirements 26
2.3.5 Preparation of Installation Tools 28
2.4 Unpacking, Storage, and Handling 29
2.4.1 Precautions 29
2.4.2 Unpacking 30
2.4.3 Handling 32
2.5 Transportation Protection 33
2.5.1 Packaging Guide 33
2.5.1.1 Packaging Posture 33
2.5.1.2 Packaging Procedure 36
2.5.2 Bill of Materials 40
2.6 Installation 42
2.6.1 Installation Precautions 42
2.6.2 Installing the Robot Body 42
2.6.3 Installing an End Effector 43
2.6.4 Installing the Camera and Pneumatic Valve 45
2.6.5 Cable Connection 46
2.6.6 Wiring and Tubing 48
2.7 Motion Range 50
2.7.1 Method for Setting the Motion Range 50
2.7.2 Motion Range Setting by Angle Range 50
2.7.2.1 Description of Angle Ranges 50

2.7.2.2 Maximum Angle Range of J1 51
2.7.2.3 Maximum Angle Range of J2 51
2.7.2.4 Maximum Stroke of J3 52
2.7.2.5 Maximum Angle Range of J4 53
2.7.3 Mechanical Limit Stops 54
2.7.4 Standard Motion Range 54
2.8 Inspection and Maintenance 55
2.8.1 Maintenance Precautions 55
2.8.2 Regular Inspection Items 56
2.8.3 Component Replacement 58
2.8.3.1 Precautions 58
2.8.3.2 Battery Replacement 59
2.8.3.3 Cable Replacement 60
2.8.3.4 Enclosure Replacement 61
2.8.4 Applying Lubricating Grease 62
2.8.5 Zero Point Calibration 63
2.8.5.1 Overview 63
2.8.5.2 Zero Point Position of Each Axis 63
2.8.5.3 Zero Point Calibration of J2 65
2.8.5.4 Zero Point Calibration of J1 and J2 66
2.8.5.5 Zero Point Calibration of J3 and J4 72
2.8.6 Options 75
3 IR-S7-INT SCARA Robot User Guide - Manipulator 76
3.1 Preface 76
3.2 Product Information 78
3.2.1 Model and Nameplate 78
3.2.2 Components 80
3.2.3 Product Dimensions 81
3.2.4 Technical Specifications 84
3.3 Preparations Before Installation 85
3.3.1 Installation Personnel Requirements 85
3.3.2 Installation Environment Requirements 86
3.3.3 Installation Base Table Requirements 87
3.3.4 Installation Space Requirements 88
3.3.5 Preparation of Installation Tools 91
3.4 Unpacking, Storage, and Handling 91
3.4.1 Precautions 91
3.4.2 Unpacking 92
3.4.3 Handling 94
3.5 Transportation Protection 95
3.6 Installation 96
3.6.1 Installation Precautions 96

3.6.2 Installing the Robot Body 96
3.6.3 Installing an End Effector 97
3.6.4 Installing the Camera and Pneumatic Valve 99
3.6.5 Cable Connection 100
3.6.6 Wiring and Tubing 103
3.7 Motion Range 105
3.7.1 Method for Setting the Motion Range 105
3.7.2 Motion Range Setting by Angle Range 105
3.7.2.1 Description of Angle Ranges 105
3.7.2.2 Maximum Angle Range of J1 106
3.7.2.3 Maximum Angle Range of J2 106
3.7.2.4 Maximum Stroke of J3 107
3.7.2.5 Maximum Angle Range of J4 108
3.7.3 Mechanical Limit Stops 109
3.7.4 Standard Motion Range 109
3.8 Inspection and Maintenance 110
3.8.1 Maintenance Precautions 110
3.8.2 Regular Inspection Items 111
3.8.3 Component Replacement 113
3.8.3.1 Precautions 113
3.8.3.2 Battery Replacement 114
3.8.3.3 Cable Replacement 115
3.8.3.4 Enclosure Replacement 116
3.8.4 Applying Lubricating Grease 117
3.8.5 Zero Point Calibration 117
3.8.5.1 Overview 117
3.8.5.2 Zero Point Calibration of J1 and J2 118
3.8.5.3 Zero Point Calibration of J3 and J4 124
3.8.5.4 Zero Point Position of Each Axis 126
3.8.5.5 Zero Point Calibration of J2 127
3.8.6 Options 129
4 IR-S10-INT SCARA Robot User Guide - Manipulator 130
4.1 Preface 130
4.2 Product Information 132
4.2.1 Model and Nameplate 132
4.2.2 Components 134
4.2.3 Product Dimensions 136
4.2.4 Technical Specifications 138
4.3 Preparations Before Installation 139
4.3.1 Installation Personnel Requirements 139
4.3.2 Installation Environment Requirements 140
4.3.3 Installation Base Table Requirements 141

4.3.4 Installation Space Requirements 142
4.3.5 Preparation of Installation Tools 145
4.4 Unpacking, Storage, and Handling 145
4.4.1 Precautions 145
4.4.2 Unpacking 146
4.4.3 Handling 148
4.5 Transportation Protection 149
4.6 Installation 150
4.6.1 Installation Precautions 150
4.6.2 Installing the Robot Body 150
4.6.3 Installing an End Effector 151
4.6.4 Installing the Camera and Pneumatic Valve 153
4.6.5 Cable Connection 154
4.6.6 Wiring and Tubing 156
4.7 Motion Range 158
4.7.1 Method for Setting the Motion Range 158
4.7.2 Motion Range Setting by Angle Range 158
4.7.2.1 Description of Angle Ranges 158
4.7.2.2 Maximum Angle Range of J1 159
4.7.2.3 Maximum Angle Range of J2 159
4.7.2.4 Maximum Stroke of J3 160
4.7.2.5 Maximum Angle Range of J4 161
4.7.3 Mechanical Limit Stops 162
4.7.4 Standard Motion Range 162
4.8 Inspection and Maintenance 163
4.8.1 Maintenance Precautions 163
4.8.2 Regular Inspection Items 164
4.8.3 Component Replacement 166
4.8.3.1 Precautions 166
4.8.3.2 Battery Replacement 167
4.8.3.3 Cable Replacement 168
4.8.3.4 Enclosure Replacement 169
4.8.4 Applying Lubricating Grease 170
4.8.5 Zero Point Calibration 170
4.8.5.1 Overview 170
4.8.5.2 Zero Point Calibration of J1 and J2 171
4.8.5.3 Zero Point Adjustment for J3 and J4 177
4.8.5.4 Zero Point Position of Each Axis 179
4.8.5.5 Zero Point Calibration of J2 181
4.8.6 Options 183
5 Certification and Standard Compliance 184
6 Service and Support 186

2 IR-S4-INT SCARA Robot User Guide - Manipulator

2.1 Preface

Introduction

With a maximum payload of 4 kg and a Z-axis stroke of 150 mm, this robot is widely used in loading and unloading, precision assembly, handling, dispensing, gluing, screw tightening, labeling, material insertion, and sorting. 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. It is suitable for new energy, 3C and food packaging industries.

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

Audience

- Mechanical engineers
- Electrical engineers
- System engineers

More Data

Data name	Data code	Description
IRCB501-INT Series Robot Controller User Guide	19012937	Describes the specifications, installation, and wiring of the IRCB501 series international version controller.
IR-TP200 Series Industrial Robot Teach Pendant User Guide	19012798	Describes the software-related operations of the IR-TP200 series teach pendant.
IR-S4&S7&S10-INT Series SCARA Robot User Guide - Manipulator (this guide)	PS00017837	Describes the basic specifications, installation, and maintenance of the IR-S4&S7&S10 series SCARA robots.

Revision History

Revision date	Version	Revision
2026-04	A03	Added related information of IR-S4 series cleanroom robot. • Updated *"2.2.1 Model and Nameplate" on page 17*. • Updated *"2.2.3 Product Dimensions" on page 20*. • Updated *" " on page* . • Updated *"2.3.3 Installation Base Table Requirements" on page 24*. • Updated *"2.3.4 Installation Space Requirements" on page 26*. • Updated *"2.5.1.1 Packaging Posture" on page 33*. • Updated *"2.6.3 Installing an End Effector" on page 43*. • Updated . *"2.7.2.4 Maximum Stroke of J3" on page 52* • Updated *"2.7.4 Standard Motion Range" on page 54*.
2025-12	A02	**Added:** Added *" Transportation Protection" on page 33*. Added *"3.8.5.5 Zero Point Calibration of J2" on page 127*. **Update:** • Updated *"2.2.1 Model and Nameplate" on page 17*. • Updated *"2.6.5 Cable Connection" on page 46*. • Updated *"2.2.2 Components" on page 19*.
2025-04	A01	**Added:** • Added *"2.8.4 Applying Lubricating Grease" on page 62*. **Update:** • Updated *"2.2.1 Model and Nameplate" on page 17*. • Updated *"2.8.5.4 Zero Point Calibration of J1 and J2" on page 66*.
2024-11	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*, 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.

2.2 产品信息

2.2.1 Model and Nameplate

IR- S 4 - 40 Z15 S-INT
① ② ③ ④ ⑤ ⑥ ⑦

① **Product family** INOVANCE Robot	④ **Arm length** 40: 400 mm	⑦ **Version** INT: International (with functional safety)
② **Series** S: SCARA robot CS: Cost-effective SCARA robot	⑤ **Max. Z-axis stroke** Z15: Max. 150 mm stroke Z12: Max. 120 mm stroke	-
③ **Payload** 4: 4 kg	⑥ **Installation environment** S: Standard C: Cleanroom	

Note

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

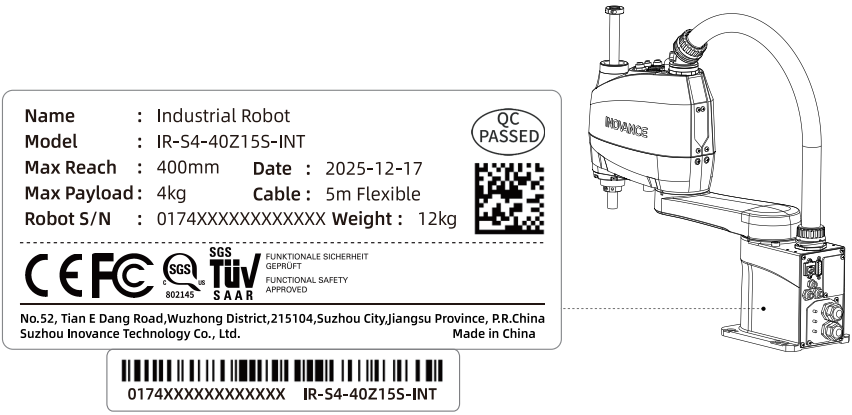


Figure 2-1 Nameplate

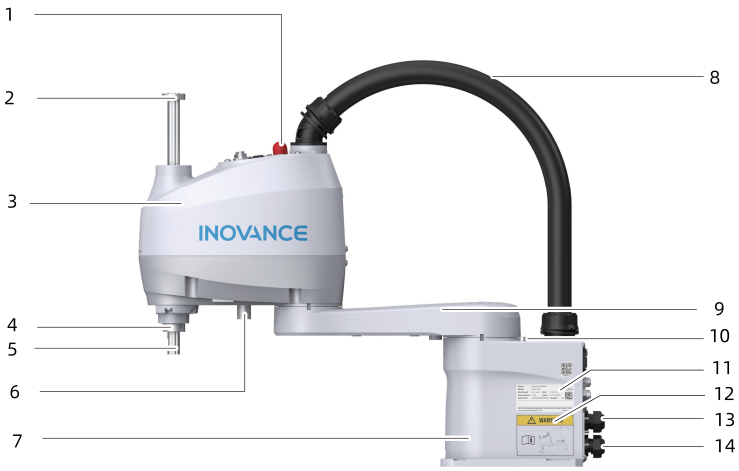
Note

- 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 certification information in the above nameplate is for illustrative purposes only; Refer to the actual product certification for specific details.

CAUTION

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

2.2.2 Components



No.	Description
1	Run indicator
2	J3 upper mechanical stop
3	Arm 2
4	J3 lower mechanical stop
5	J3 screw shaft
6	J2 mechanical stop
7	Base
8	Cable unit
9	Arm 1
10	J1 mechanical stop
11	Nameplate

No.	Description
12	Labels
13	Power cable
14	Signal cable

2.2.3 Product Dimensions

Standard model

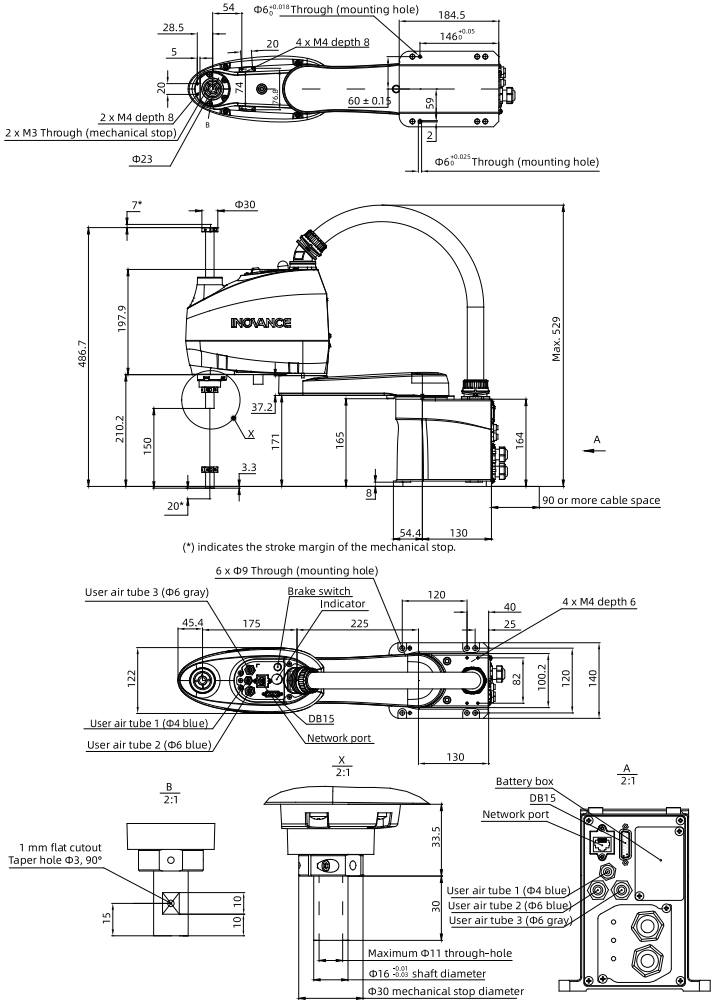


Figure 2-2 Outline dimensions (unit: mm)

Cleanroom model

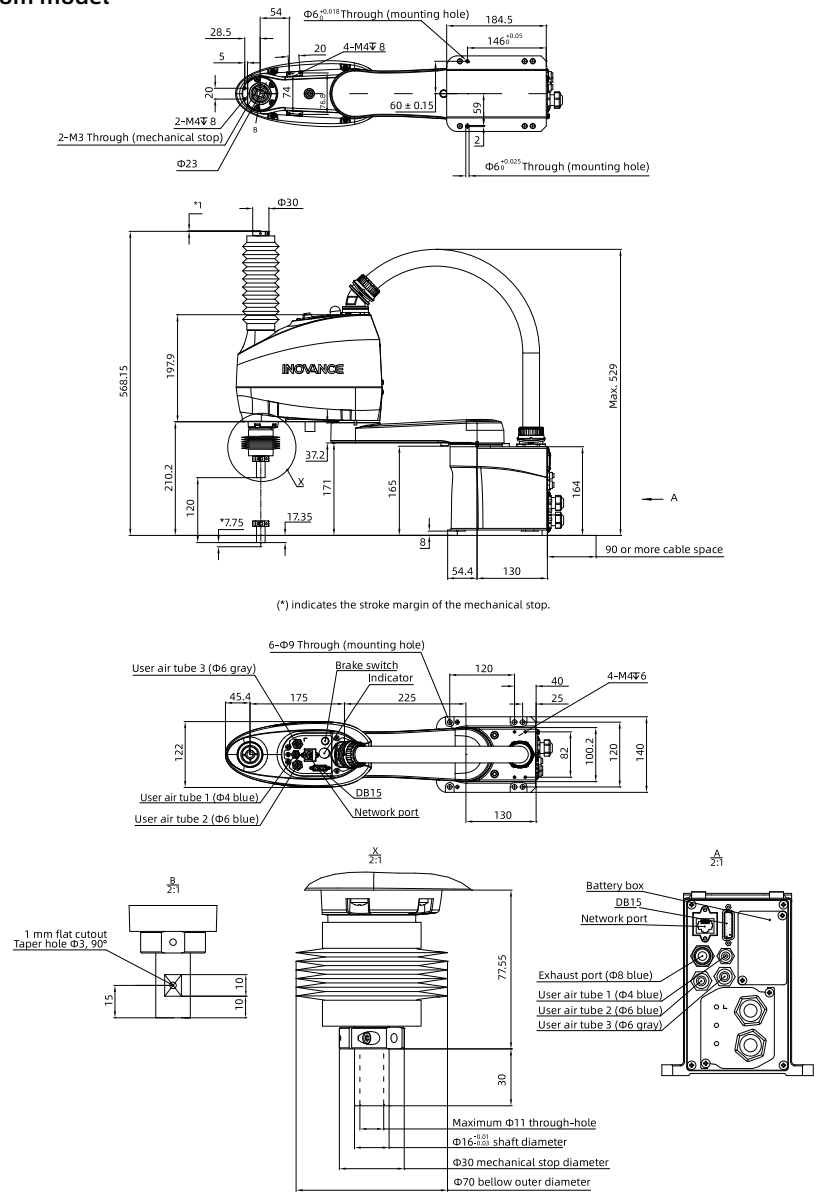


Figure 2-3 Outline dimensions (unit: mm)

2.2.4 Technical Specifications

Item		IR-S4-40Z15S-INT	IR-S4-40Z12C-INT
Arm length	Arm 1 + Arm 2	400 mm	400 mm
	Arm 1	225 mm	225 mm
	Arm 2	175 mm	175 mm
Maximum speed	J1 + J2	7200 mm/s	7200 mm/s
	J3	1300 mm/s	1300 mm/s
	J4	2600°/s	2600°/s
Repeatability	J1 + J2	±0.01 mm	±0.01 mm
	J3	±0.01 mm	±0.01 mm
	J4	±0.01°	±0.01°
Handling capacity (load)	Rated	2 kg	2 kg
	Max.	4 kg	4 kg
Allowable load inertia of J4	Rated	0.005 kg·m²	0.005 kg·m²
	Max.	0.05 kg·m²	0.05 kg·m²
Mounting hole	Mounting hole	120 mm x 120 mm (4 x Φ9 mm)	120 mm x 120 mm (4 x Φ9 mm)
Manipulator weight (excluding cables)	Manipulator weight (excluding cables)	12 kg	12.5 kg
Press-in force of J3	Press-in force of J3	100 N	100 N
User wiring	Wiring	15x signal, 30 V, 0.5 A	15x signal, 30 V, 0.5 A
	Ethernet connector	CAT5e	CAT5e
User tubing	User tubing	Air tube: Φ4 mm x 1; Pressure resistance: 0.59 MPa Air tube: Φ6 mm x 2; Pressure resistance: 0.59 MPa	Air tube: Φ4 mm x 1; Pressure resistance: 0.59 MPa Air tube: Φ6 mm x 2; Pressure resistance: 0.59 MPa
Ambient condition	Operating temperature[1]	5°C to 40°C	5°C to 40°C
	Operating humidity	10% RH to 80% RH	10% RH to 80% RH
Noise level	Noise level[2]	L_{Aeq} ≤ 70 dB(A)	L_{Aeq} ≤ 70 dB(A)
Maximum motion range	J1	±132°	±132°
	J2	±141°	±141°
	J3	150 mm	120 mm
	J4	±360°	±360°
Cycle time	Cycle time[3]	0.342s	0.352s
Input power (average power consumption)	Input power (average power consumption)	2 kVA (0.3 kW)	2 kVA (0.3 kW)

Item		IR-S4-40Z15S-INT	IR-S4-40Z12C-INT
Matching controller (standard)	Matching controller (standard)	IRCB501-4AD-INT	IRCB501-4AD-INT
Mounting method	Mounting method	Tabletop	Tabletop
Certification compliance	Certification compliance	CE certification, cSGSus certification, FCC certification, and functional safety certification (only supported by "-INT" controller and requires a functional safety expansion card), KCs certification (refer to the certifications for the certified models).	

Note

[1] When used in a low-temperature environment approximating the lowest allowable temperature, or when idle for a long period of time due to holidays and nighttime, it is recommended to warm up the product for 10 minutes before operating it.

[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 joints operating at 100% speed and acceleration, with a duty cycle of 50%.

[3] Time required for a robot to move a 1 kg payload between two points 300 mm apart at a height of 25 mm.

2.3 Preparations Before Installation

2.3.1 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.
- Do not allow non-professionals to perform equipment installation, wiring, maintenance, inspection, or parts replacement.

2.3.2 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 2–1 Ambient condition

Item	Requirement
Operating temperature/ humidity	• Temperature: 5°C to 40°C • Humidity: 10% RH to 80% RH (without condensation)
Storage temperature/ 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	• Place it indoors • 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.



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

2.3.3 Installation Base Table Requirements

You need to make a base table to secure 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-S4 Series	250	1000	1000

- Use M8 threaded holes on the base table to mount the robot. Use screws with a strength equivalent to the performance level of Grade 10.9 or 12.9 specified in GB/T 3098.1. See *"2.2.3 Product Dimensions" on page 20* for the dimensions.
- 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 using a level for height adjustment of the base table, use screws with a diameter larger than M8.
- When cutting holes in the base table for passing cables, ensure that the diameter of the holes is not less than 60 mm.
- Reserve enough space for the robot controller in the base table design. For details, see the "IRCB501-INT Series Robot Controller User Guide".

2.3.4 Installation Space Requirements

Motion range of standard model (unit: mm)

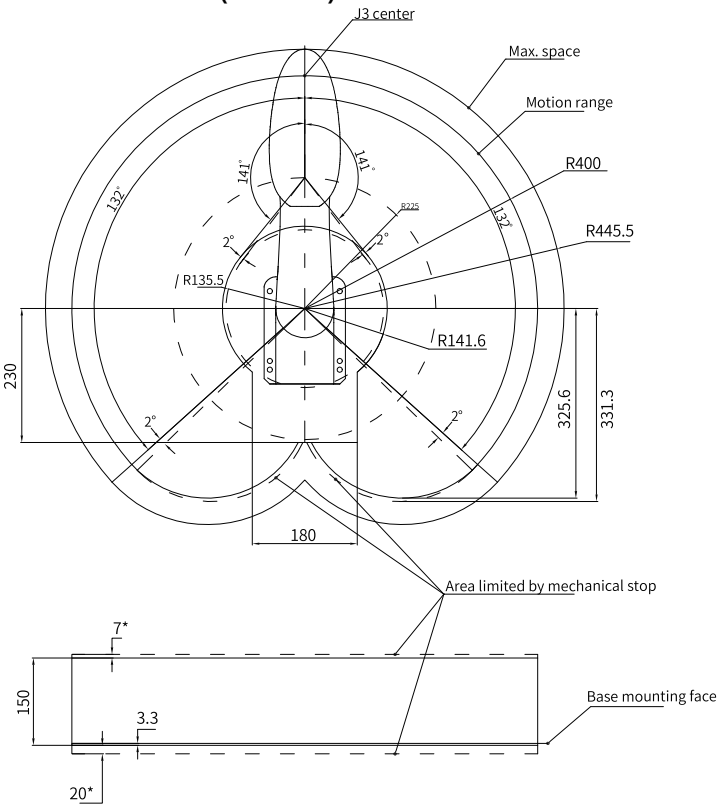


Figure 2-4 Motion range of IR-S4 series standard robot

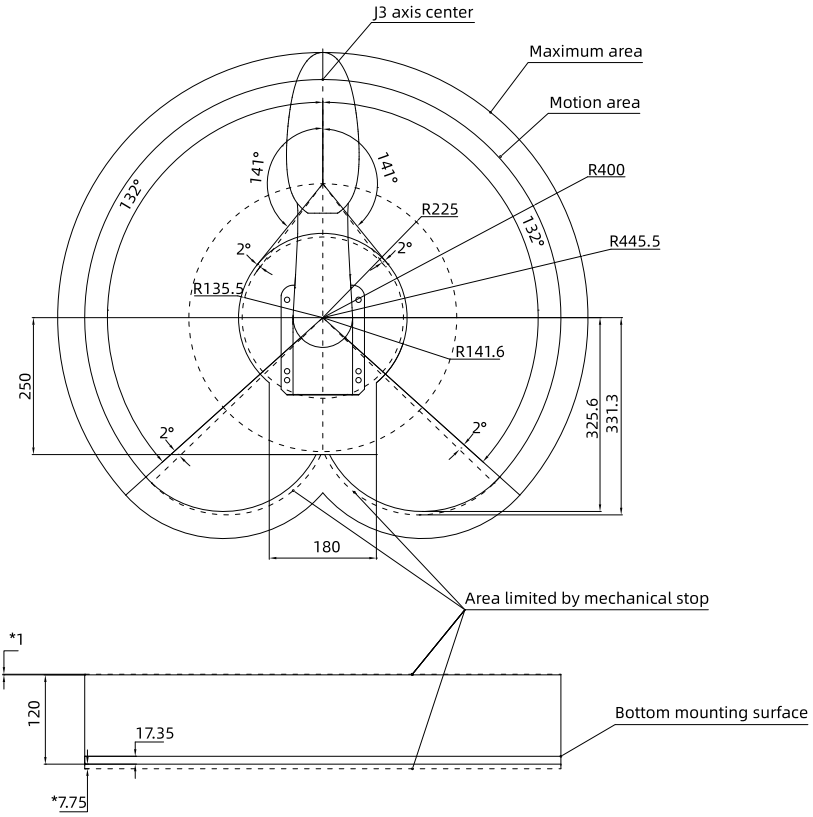
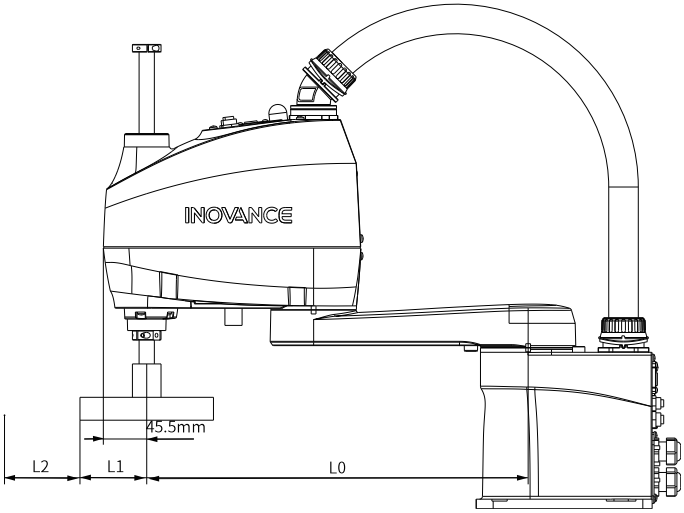


Figure 2-5 Motion range of IR-S4 series cleanroom robot

Maximum range

"Maximum range" is the area that contains the farthest reach of the arms. When an end effector with a radius of 45.5 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 space

The safety distance should be greater than L0+L1+L2.

2.3.5 Preparation of Installation Tools

Table 2–2 Preparation of tools

Tool	Quantity (pcs)
M8 outer hexagon wrench	1
Scissors or utility knife	1
Protective gloves	1
Anti-smash shoes	1
Lifting rope	1

2.4 Unpacking, Storage, and Handling

2.4.1 Precautions



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



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

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 equipment during transportation or storage, remove the condensation before turning on the power supply.

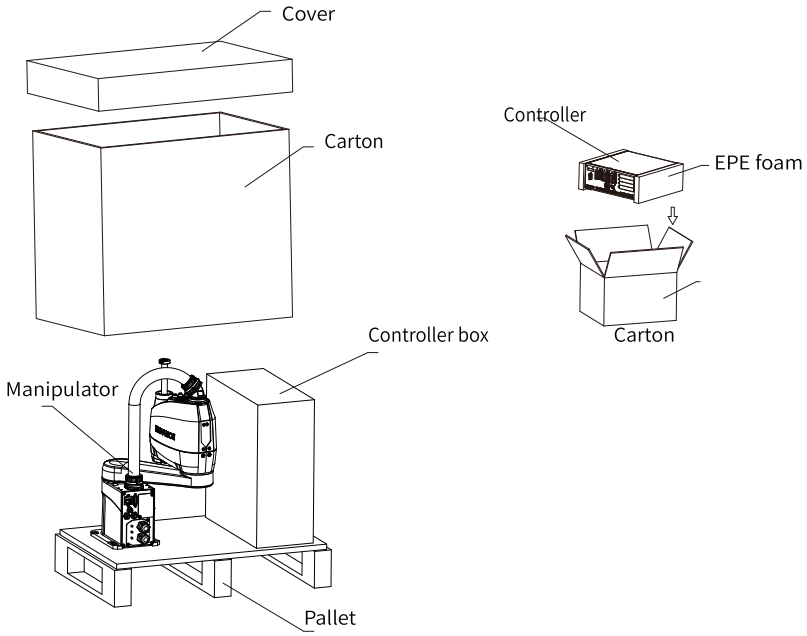
2.4.2 Unpacking

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.

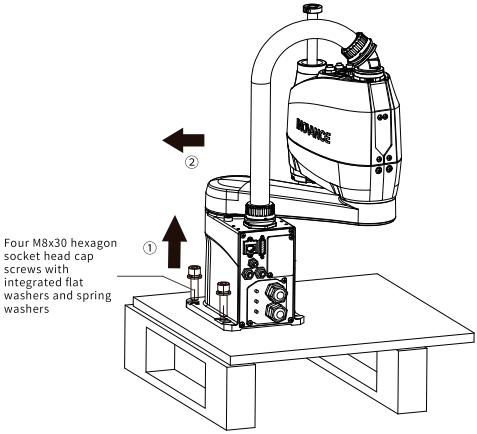
CAUTION

Wear gloves to prevent scratches.



2. Remove the robot body from the pallet.
   Remove the bolts securing the robot body on the pallet by using an M8 outer hexagon wrench.

   Take out the robot body by lifting it from bottom to top, and moving it horizontally. For details, see the handling procedure.



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.

2.4.3 Handling

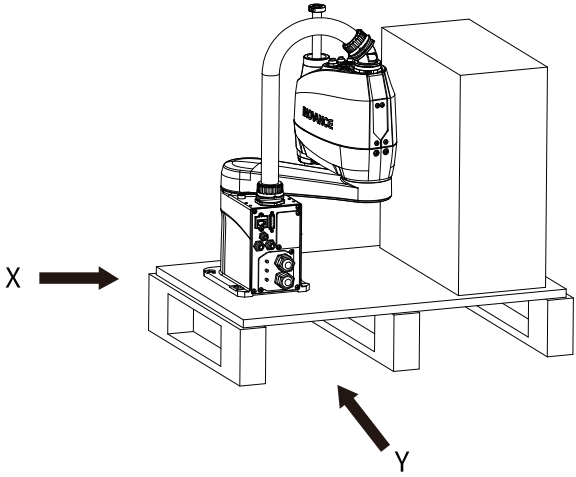
Preparation for handling

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

- **Manual handling**
  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 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.

2.5 Transportation Protection

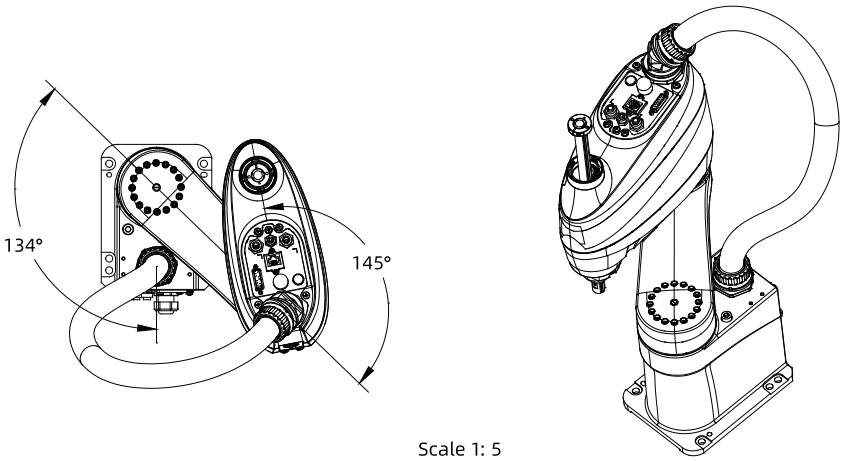
2.5.1 Packaging Guide

2.5.1.1 Packaging Posture

Transport Pose

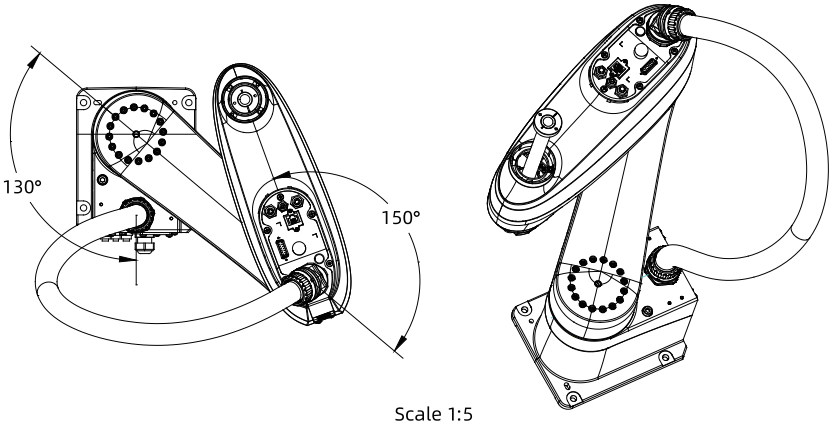
The robot must be placed in the transport pose before transportation. The angle of each joint is as follows:

Robot series	Position	Angle of each joint
IR-S4 Series	J1	134°
	J2	145°
IR-S7&S10 series	J1	130°
	J2	150°



Scale 1: 5

Figure 2-6 IR-S4 Series



Scale 1:5

Figure 2-7 IR-S7&S10 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 2–3 Package dimensions of IR-S4&S7&S10 series SCARA robots (unit: mm)

Robot system	Arm length	Height	Width	Length
IR-S4 Series	400	800	450	670
IR-S7 Series	500	840	520	740
	600	840	520	740
	700	900	600	820
IR-S10 Series	600	840	520	740
	700	900	600	820
	800	900	600	820



Figure 2-8 Packaging of IR-S4&S7&S10 series SCARA robots

Note

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

2.5.1.2 Packaging Procedure

Robot individual packaging

1. Before packaging the robot, ensure it is in the factory-set posture. For details, see *"2.5.1.1 Packaging Posture" on page 33*.
2. Place a layer of cushion between the upper arm and forearm to prevent scratches between them.
3. With the base as the reference, swing the upper arm and forearm to their extreme positions, minimizing the distance between the arms and the base.
4. Use stretch film to tightly wrap the arms and the base together as a whole, ensuring that they do not loosen.
5. For longer arm lengths (700 mm and above), a piece of appropriately sized polyethylene foam should be placed under the cantilever of the upper arm to reduce cantilever shear force.

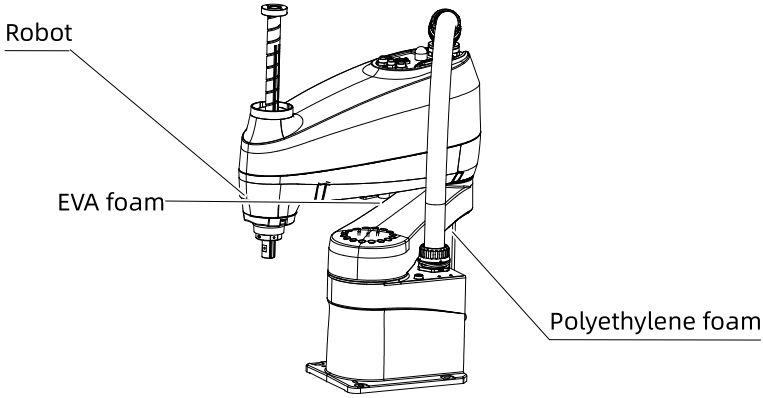
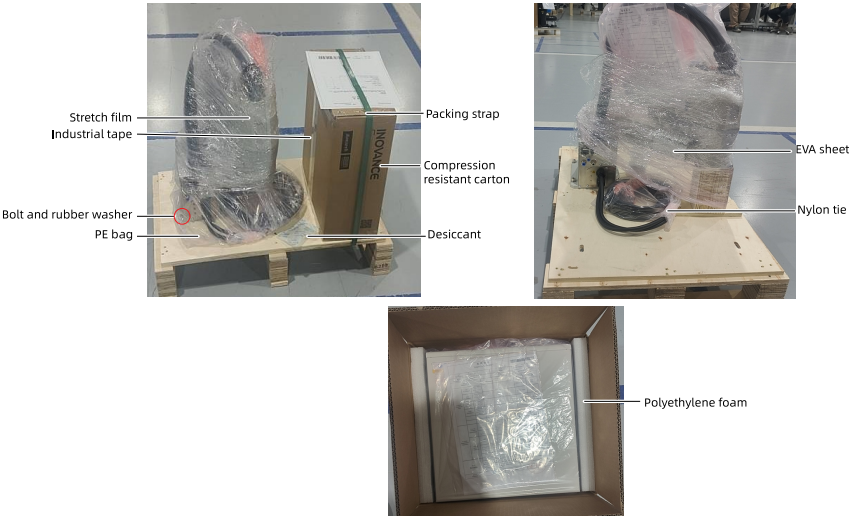


Figure 2-9 IR-S4 series, IR-S7 series (arm length 500/600 mm), and IR-S10 series (arm length 600 mm)

Figure 2-10 Physical packaging



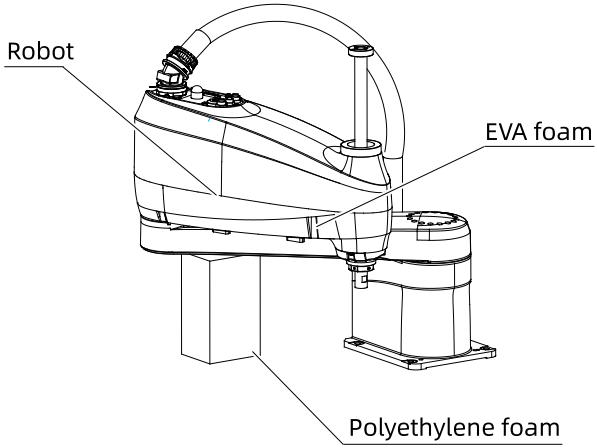


Figure 2-11 IR-S7 series (arm length 700 mm), IR-S10 series (arm length 700/800 mm)

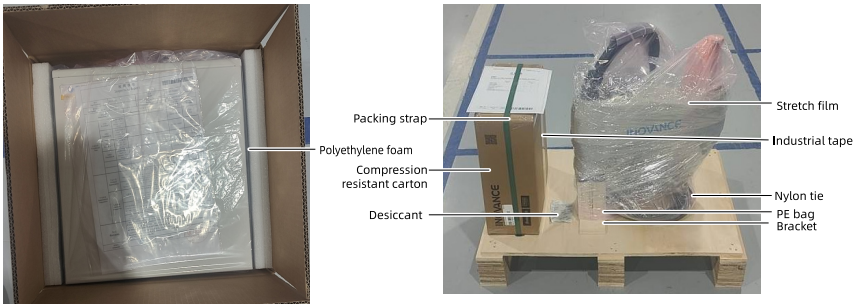


Figure 2-12 Physical packaging

When the controller and the robot support individual packaging, it is recommended to prioritize the original factory packaging method to ensure transportation safety and compliance with equipment protection standards.

CAUTION

- Place desiccant and cover with a PE bag to prevent dust and rust.
- Prevent collisions and scratches throughout the entire process.
- It is not recommended to transport with a load (tooling or fixture) for secondary transportation.

Packaging together with client's automated equipment

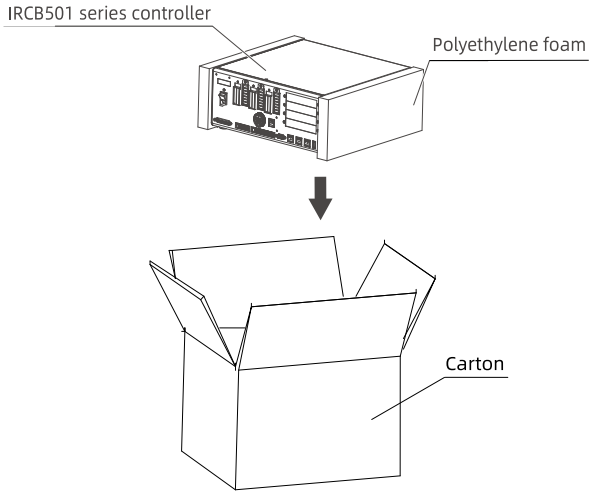
Package the robot together with the client's automated equipment in the following two methods:

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 carton containing the controller to the base using the packing straps 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. Using 80 μm thick stretch film, securely wrap the upper arm and forearm of the robot. Ensure a single-layer overlap of ≥50%, a total of ≥5 layers, with particular attention to covering the connection areas between the arms, the joint movement areas, and all exposed metal surfaces. Ensure that the stretch film completely covers all metal components.
  4. After wrapping, perform a sealing inspection to ensure the product is protected from moisture and rust.
  5. 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:
  - Installing the manipulator:

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. Using 80 μm thick stretch film, securely wrap the upper arm and forearm of the robot. Ensure a single-layer overlap of ≥50%, a total of ≥3 layers, with particular attention to covering the connection areas between the arms, the joint movement areas, and all exposed metal surfaces. Ensure that the stretch film completely covers all metal components.
4. After wrapping, perform a sealing inspection to ensure the product is protected from moisture and rust.
5. 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.

- Installing the controller:

1. Select a compression-resistant carton box of appropriate size, with cushioning material pre-placed inside (bubble wrap or polyethylene foam is recommended).
2. After packaging the controller, apply industrial tape in an "H"-shape pattern to seal the carton box.
3. Check the stability of the center of gravity of the packaging to ensure there is no risk of shifting during transportation.

2.5.2 Bill of Materials

The recommended bill of materials is as follows:

Name	Material	Dimensions	Quantity	Description
Bolt (individually packaging)	-	M8 x 60	4PCS	For robot individual packaging. Use original factory-configured bolts.
Bolt (client)	-	M8 x 30	4PCS	For packaging together with the client's automation equipment. Use original factory-configured bolts.

Name	Material	Dimensions	Quantity	Description
Rubber washer	Rubber	-	4PCS	Use the original factory-configured rubber washers directly.
Desiccant	Montmorillonite/Silica gel desiccant	-	8 packets	30 g/packet
PE bag	LDPE	1PCS	1PCS	Use the bag based on the product size
Polyethylene foam	18 kg/m³	50 mm	-	Use polyethylene foam of appropriate height
EVA sheet	EVA	400 mm x 100 mm x 5 mm	Several	-
Bracket	Plywood	-	-	Use original factory-configured brackets for fixation.
Stretch film	LLDPE	80 μm	1PCS	Same as PE bag
Eye bolt	Cast iron	M10 standard eye bolt	2PCS	-
Nylon tie	NYLON 66	Length: 150 mm	4PCS	-
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	-	1PCS	Select size as per equipment packaging requirements.
Carton box	K=K	-	1PCS	For controller

CAUTION

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.

2.6 Installation

2.6.1 Installation Precautions

Danger

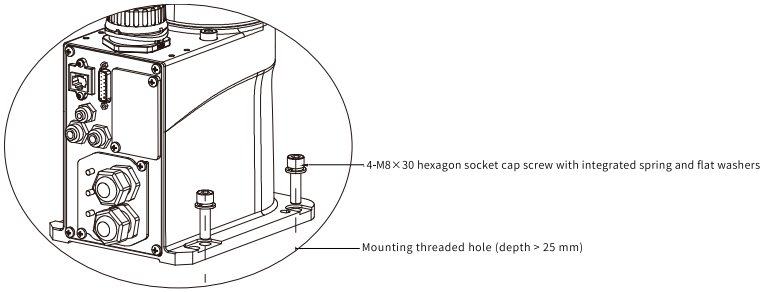
- Do not allow non-professionals to perform equipment installation, wiring, maintenance, inspection, or parts replacement.
- Install a safety fence for the system. Failure to comply may result in severe safety hazards.
- Reserve sufficient space between the equipment and surrounding buildings, structural 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 falling over.
- For the tabletop mounting, at least two people are required for the operation.

2.6.2 Installing the Robot Body

Secure the base to the base table with four M8x30 hexagon socket head cap screws with integrated flat washers and spring washers, 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
M8	30 N·m

2.6.3 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 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.

Design your own end effector mounting method with reference to the following dimensions. The weight of the end effector should not exceed 4 kg, as shown in the figure below.

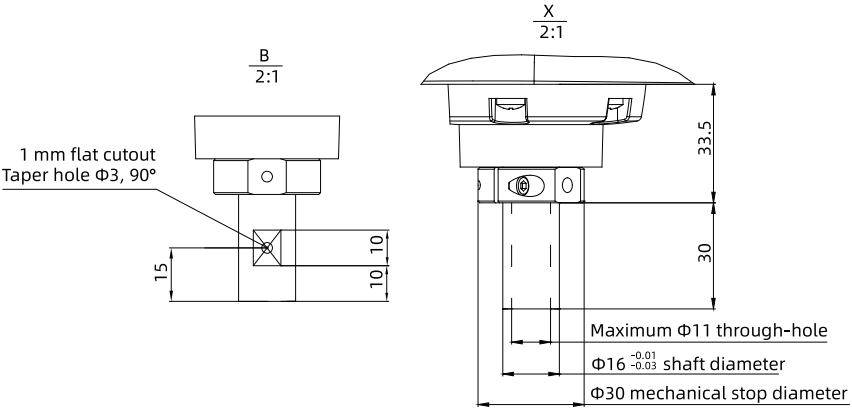


Figure 2-13 Auxiliary tooling mounting dimensions for standard model (unit: mm)

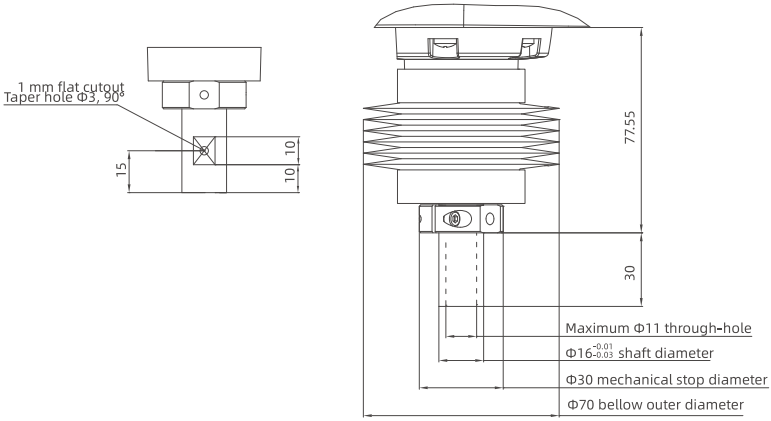


Figure 2-14 Auxiliary tooling mounting dimensions for cleanroom model (unit: mm)

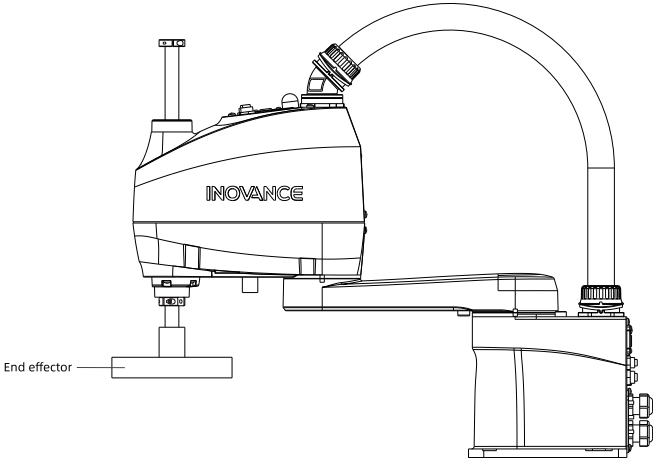


Figure 2-15 Installing the end effector

To move J3 up or down when installing the end effector, turn on the power of the controller and move the joint up/down or rotate the joint while pressing the brake release switch. This switch is a momentary type switch that releases the brake only during the time it is pressed.

Be aware of sagging or rotation due to the weight of the end effector during pressing 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. See the "maximum range" in *"2.3.4 Installation Space Requirements" on page 26*.

2.6.4 Installing the Camera and Pneumatic Valve

The series robot provides mounting holes for the camera and pneumatic valve at the bottom of arm 2, as shown in the figure below.

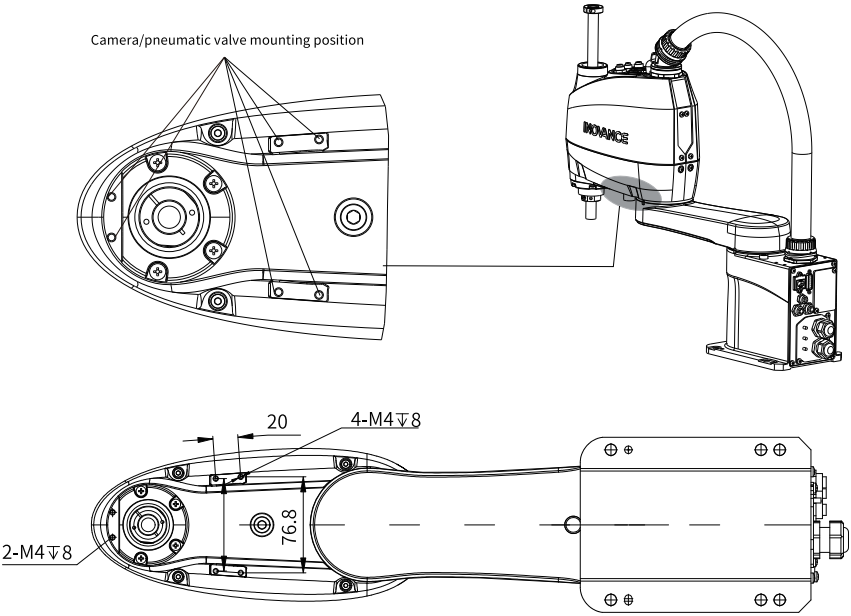


Figure 2-16 Installation of the camera and pneumatic valve (unit: mm)

2.6.5 Cable Connection

Note

- Do not allow non-professionals to perform equipment installation, wiring, maintenance, inspection, or parts replacement.
- Cut off the power before wiring. Failure to comply may result in an electric shock or system failure.
- Before wiring, cut off all the power supplies of the equipment. Wait at least 10 minutes before further operations because residual voltage exists after power-off.
- Ensure that safety input signals, such as the emergency stop switch and safety door switch, are connected correctly. Otherwise, safety protection functions will not work properly in emergency cases, causing serious injury or damage.
- Make sure that the equipment is well grounded. Failure to comply may result in an electric shock.
- During wiring, follow the ESD procedures and wear an ESD wrist strap. Failure to comply may result in damage to internal circuits of the equipment.



- Connect the cables securely. Do not lay heavy objects on the cables, or bend or drag the cables forcibly. Failure to comply will result in cable damage, wire breaking, or poor contact, causing electric shocks or system faults.
- Ensure that the diameter and shielding of the cables used meet corresponding requirements, and that the cable shield is grounded reliably 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 that no dropped screws and exposed cables are inside the equipment.

Connect the power cable and signal cable to the controller.

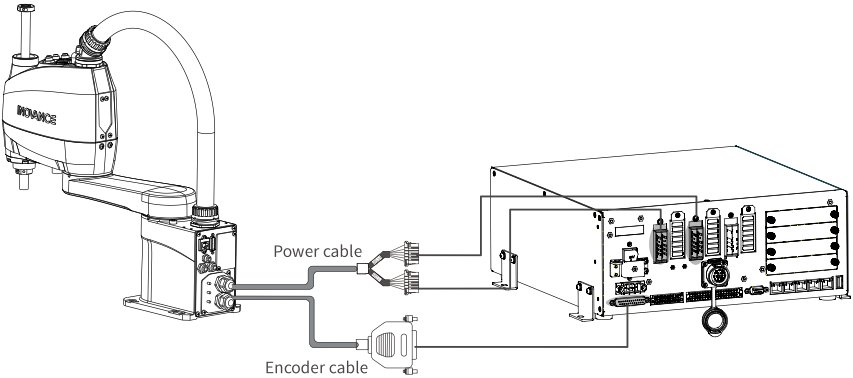
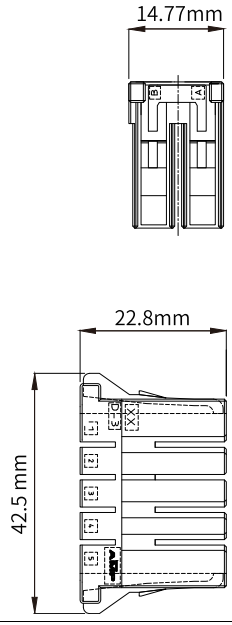
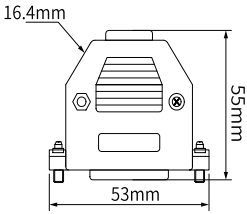
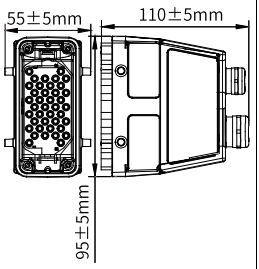
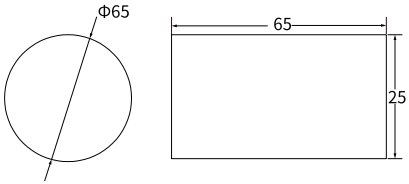
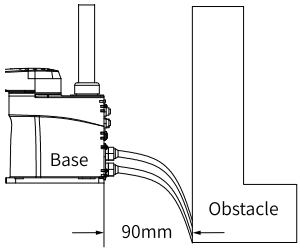


Figure 2-17 Cable connection

Table 2–4 Cable hole dimensions (IRCB501 series robot controller)

Name	Power cable connector (controller side)	Encoder cable connector (controller side)	Heavy-duty connector (robot 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)	95 mm x 110 mm x 55 mm (L x W x H)

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

Hole size (round hole & square hole) (mm)	Space reserved for the robot cable (connector size+cable bending radius)
	

2.6.6 Wiring and Tubing

Note

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

Wiring (Cables)



Current higher than 0.5 A is not allowed.

Model	Allowable current	Number of cores	Diameter	Remarks
D-sub 15Pin	0.5 A	15	24AWG	Wire connector provided as standard

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 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)

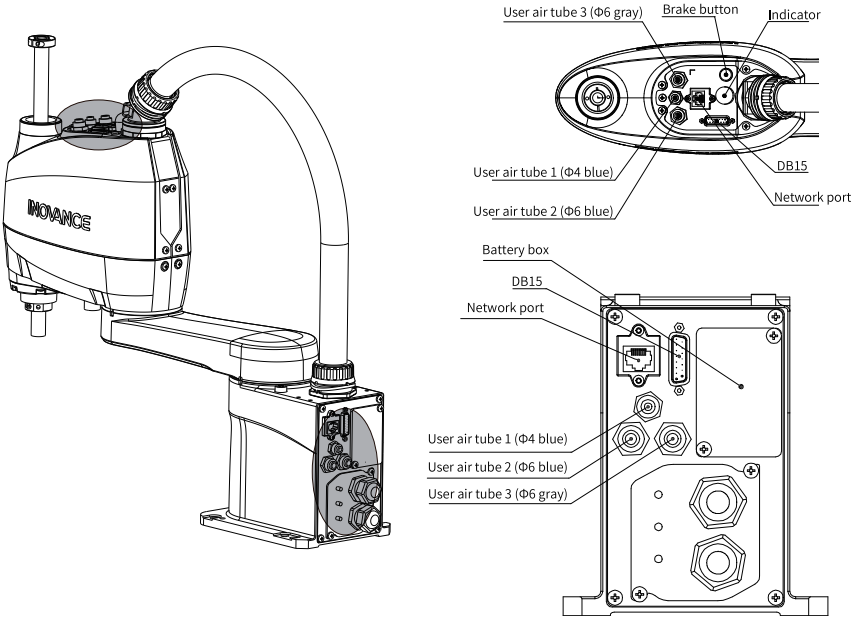
Note

Both ends of the air tubes are equipped with quick release couplings (outer diameter of Φ6 mm and Φ4 mm).

Pressure resistance	Quantity	Dimensions (outer diameter)
0.59 MPa (5.9 kgf/cm^2)	2	Φ6 mm
0.59 MPa (5.9 kgf/cm^2)	1	Φ4 mm

- Φ6 mm straight-through air tube fittings: two at the base and two at the forearm.
- Φ4 mm straight-through air tube fittings, one at the base and one at the forearm.

The air tube fittings are distinguished by color, as shown in the figure below.



2.7 Motion Range

2.7.1 Method for Setting the Motion Range

CAUTION

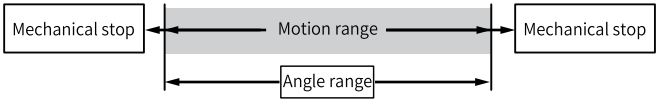
- To prevent premature wear of joint reducer bearings and gears due to insufficient oil film, avoid prolonged repetitive motion of joints within a small angular range of less than 10°.
- If the actual operating conditions require prolonged operation within an angle of less than 10°, it is recommended 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)



2.7.2 Motion Range Setting by Angle Range

2.7.2.1 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.

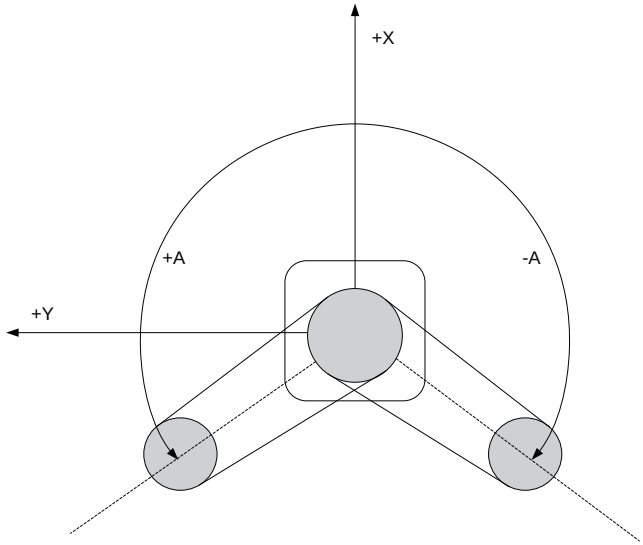
When the robot receives a motion command, it will check whether the target position of the command is within the angle range before moving. If the target position is beyond the set angle range, an error occurs and the robot does not move.

Note

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

2.7.2.2 Maximum Angle Range of J1

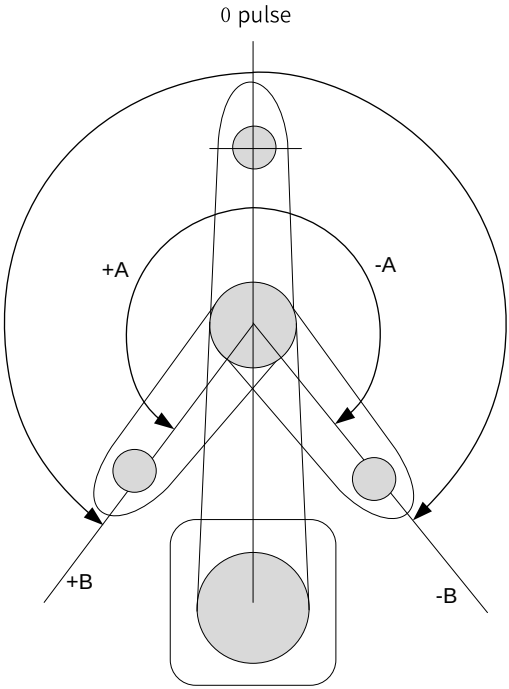
The zero-angle position of J1 refers to the position where the first arm is oriented toward the positive direction of the X coordinate axis. From the 0 pulse position, the clockwise angle is positive (+), and the counterclockwise angle is negative (-).



Model	Maximum motion range
IR-S4 Series	±132°

2.7.2.3 Maximum Angle Range of J2

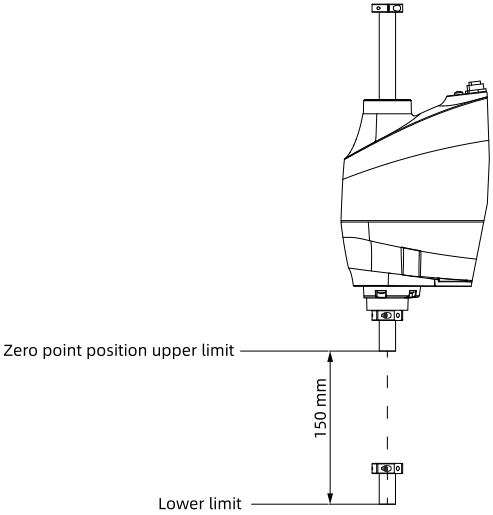
The zero-angle position of J2 refers to the position where the second arm is perpendicular to the first robot arm (regardless of the direction of the first arm). From the zero-angle position, the clockwise angle is positive (+), and the counterclockwise angle is negative (-).



Model	Maximum motion range
IR-S4 Series	±141°

2.7.2.4 Maximum Stroke of J3

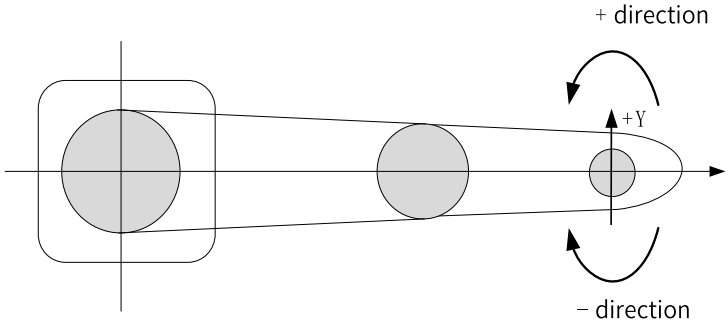
The zero-angle position of J3 is the upper limit position of the axis. When J3 descends from the zero-angle position, it will definitely change to a negative angle value.



Model	Stroke of J3
IR-S4 series standard model	150 mm
IR-S4 series cleanroom model	120 mm

2.7.2.5 Maximum Angle Range of J4

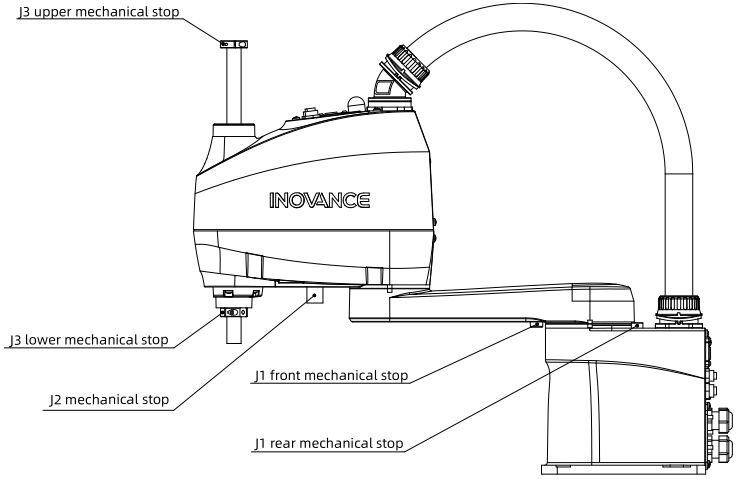
The zero-angle position of J4 refers to the position where the plane at the top of the axis is oriented toward the direction of the top of the second robot arm (regardless of the direction of the second arm). From the zero-angle position, the clockwise angle is positive (+), and the counterclockwise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



Model	Maximum motion range
IR-S4 Series	±360°

2.7.3 Mechanical Limit Stops

The robot has mechanical limit stops at J1, J2 and J3, except J4, 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 set by the mechanical limit stop at J3 is configured by the internal program.



2.7.4 Standard Motion Range

Name	Description
Motion range	Indicates the situation at the standard (maximum) specifications. When motor of each joint is excited, the center of the lowest point of J3 moves in the areas shown in the figure below.
Area limited by mechanical stop	Indicates the area where the center of the lowest point of J3 can be moved when the motor of each joint is not excited.
Mechanical stop	Mechanically sets the absolute motion range beyond which motion is not allowed.
Maximum range	Indicates the area that contains the farthest reach of the arms. When an end effector with a radius of 45.5 mm or more is mounted, set the maximum range to the length of the two robot arms plus the radius of the end effector.

The motion range is shown below:

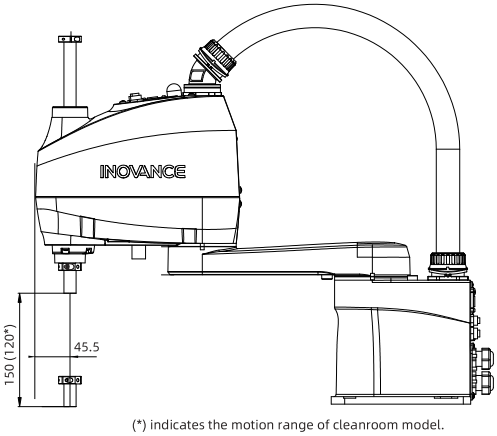


Figure 2-18 Motion range of end effector (unit: mm)

2.8 Inspection and Maintenance

2.8.1 Maintenance Precautions

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

Danger

- 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.

Warning

- 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.

2.8.2 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 rear controller fan 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.

2.8.3 Component Replacement

2.8.3.1 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.

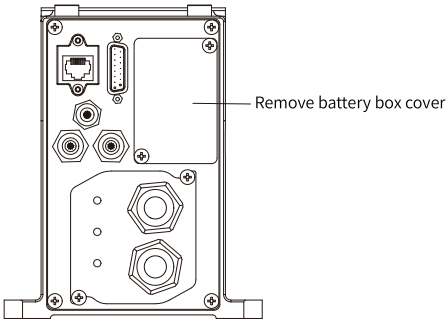
2.8.3.2 Battery Replacement

WARNING

- 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 the zero point, when replacing the battery, disassemble the battery box cover, insert the new battery into the white 2P connector and fix it in the wire chamber, and then remove the old battery. The replacement procedure is as follows:

1. Remove the two M4 x 8 screws from the battery box cover.



2. Connect the new battery to the empty white 2P cable end connector.



3. Remove the old battery.
4. Fix the new battery on the battery cover, and then secure the cover to the base with the M4 x 8 screws.

Note

Failure to comply with the procedure described above may cause loss of zero points. For details, see *"2.8.5.4 Zero Point Calibration of J1 and J2" on page 66*.

2.8.3.3 Cable Replacement

1. Loosen the fixing screw with a cross wrench, rotate the cable board by a certain angle and then take out the cable board.
2. Replace the damaged cable.
3. Rotate the cable board into the fixing hole and tighten the screw.

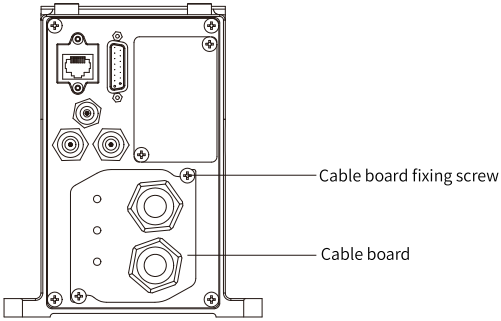


Figure 2-19 Base cable board

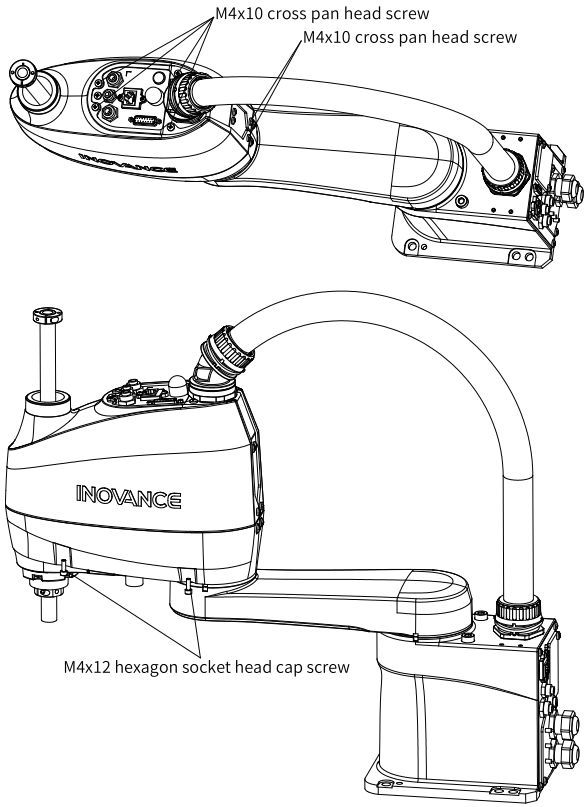
CAUTION

- 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.

2.8.3.4 Enclosure Replacement

Removing the enclosure of the forearm

Remove the six M4 x 10 cross pan head screws on the enclosure and sheet metal, and then remove the four M4 x 12 hexagon socket head cap screws connecting the enclosure and the forearm.



Installing the enclosure of the forearm

1. Install the enclosure onto the forearm. Pay attention to the positioning columns and holes between the enclosure and the forearm to ensure that the mounting surface of the enclosure fits seamlessly with the mounting surface of the forearm and sheet metal.
2. Install the six M4 x 10 cross pan head screws on the enclosure and sheet metal, with a torque of 0.6 N·m.
3. Install the four M4 x 12 hexagon socket head cap screws connecting the enclosure to the forearm, with a torque of 0.6 N·m.

2.8.4 Applying Lubricating Grease

The following table describes the grease refilling cycle:

Joint	Position	Cycle
J1	Reducer	When replacing the motor.
J2	Reducer	When replacing the motor.
J3	Ball screw and spline	Quarterly

Cautions:

1. Only use the original grease. See "IR-S4&S7&S10 Series SCARA Robot Maintenance Guide" for the grease type.
2. It is strictly forbidden to deplete the grease of the ball screw, otherwise irreversible mechanical damage may occur.
3. Normally, the reducer does not require grease refilling. However, under the extreme conditions (duty cycle, speed, load), the grease needs to be refilled every 10,000 hours.

Note

If the 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.

2.8.5 Zero Point Calibration

2.8.5.1 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 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.

2.8.5.2 Zero Point Position of Each Axis

1. The following figure shows the zero point positions of J1 and J2.

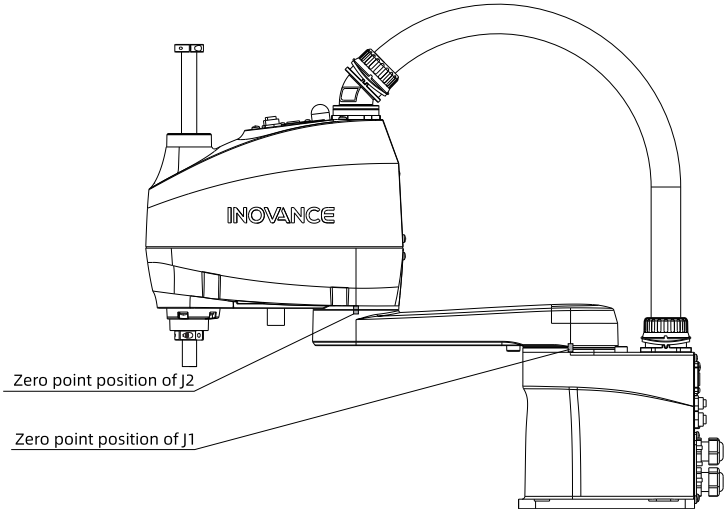


Figure 2-20 Zero point position of J1/J2

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

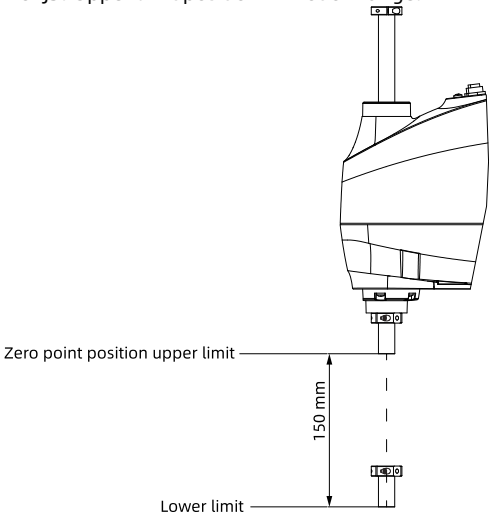


Figure 2-21 Zero point position of J3

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

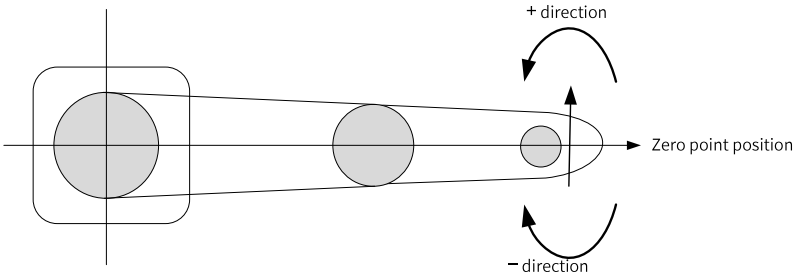


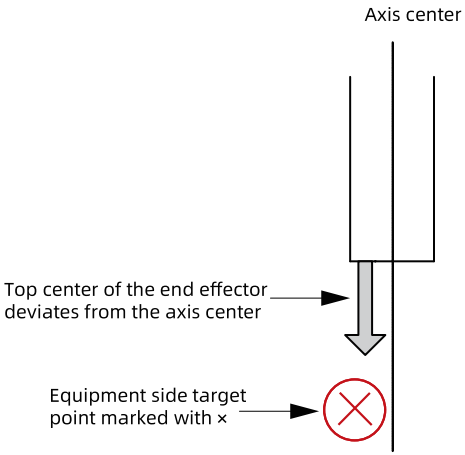
Figure 2-22 Zero point position of J4

2.8.5.3 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 through *"2.8.5.4 Zero Point Calibration of J1 and J2" on page 66*, 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 value" button to 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.

2.8.5.4 Zero Point Calibration of J1 and J2

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 (IRTP200 series teach pendant). The operations on the hand-held teach pendant are similar.

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. The teach pendant provides a right/left wrist rule wizard. Follow the wizard to calibrate the zero point.

When calibrating the zero point using the teach pendant, calibrate J3 and J4 at the same time.

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 of the PC-based teaching software or the hand-held teach pendant.
   b. Enter the password in the password input box and click "OK" to log in.

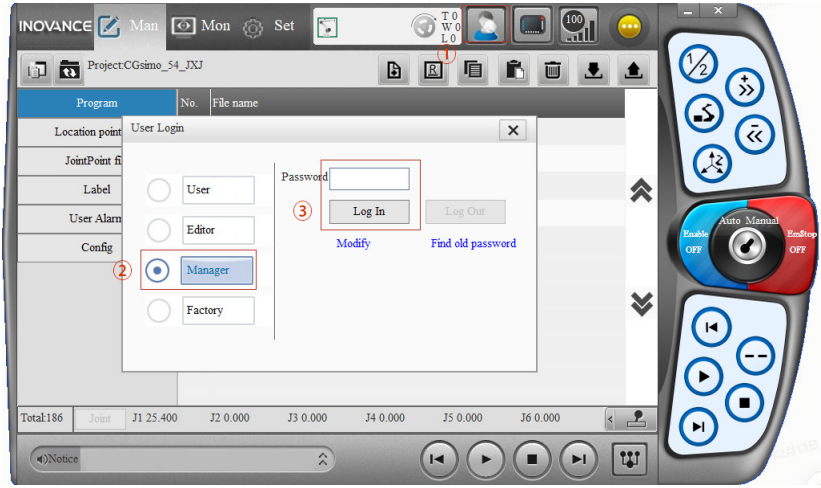


Figure 2-23 IRTP80 series teach pendant

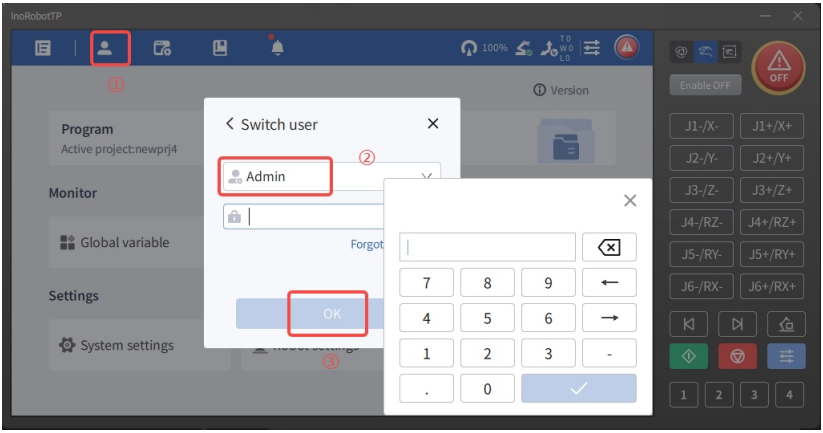


Figure 2-24 IRTP200 series teach pendant

2. Switch to the calibration interface.
   Choose "Settings" > "Zero point settings" > "Zero point calibration" on the InoRobotTP main interface.

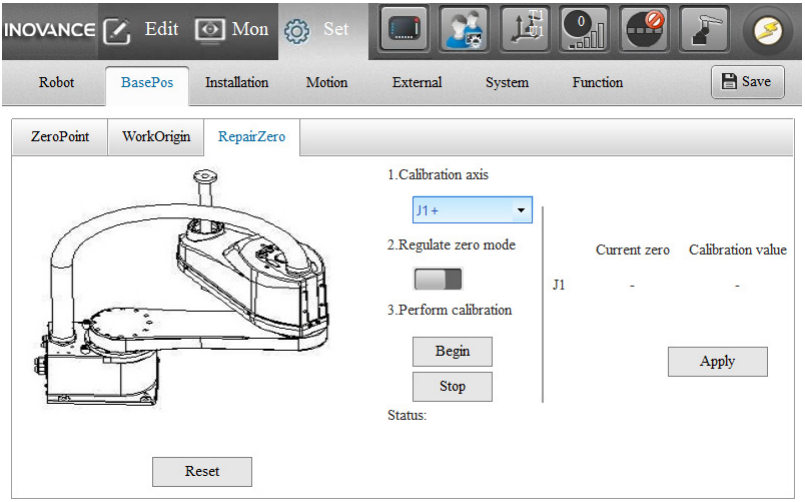


Figure 2-25 IRTP80 series teach pendant

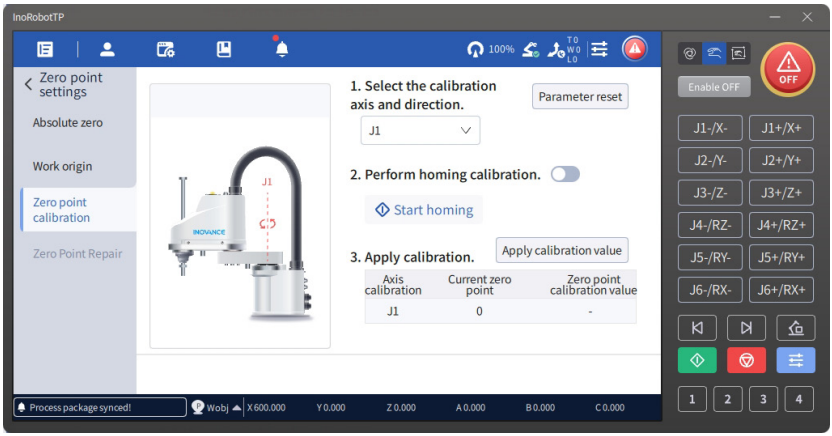


Figure 2-26 IRTP200 series teach pendant

3. Choose the axis number to enter the homing mode.
   Choose the axis you want to calibrate from the "Select the calibration axis and direction" drop-down list.

   - The homing motion direction of all axes is positive.
   - Caution: When switched to homing mode, the robot servo will be automatically enabled.

- If the multi-turn value of the encoder exceeds 2000, a warning pops up and emergency stop is triggered. In this case, you need to restart the controller and perform the homing operation again.

4. Perform the homing calibration.
   For example, select J2 axis and start homing.

   When the calibration is complete, a message "Homing successful" is displayed and the calibration value is updated.

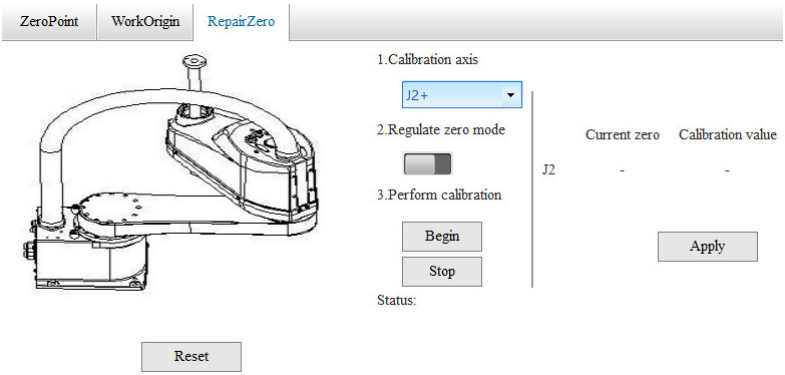


Figure 2-27 IRTP80 series teach pendant

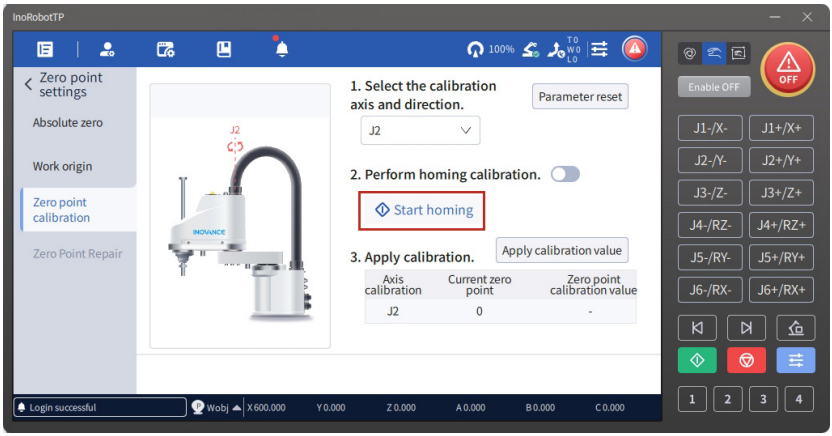


Figure 2-28 IRTP200 series teach pendant

5. 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 teaching software (or the display of the hand-held teach pendant) shows the emergency stop state (in red).

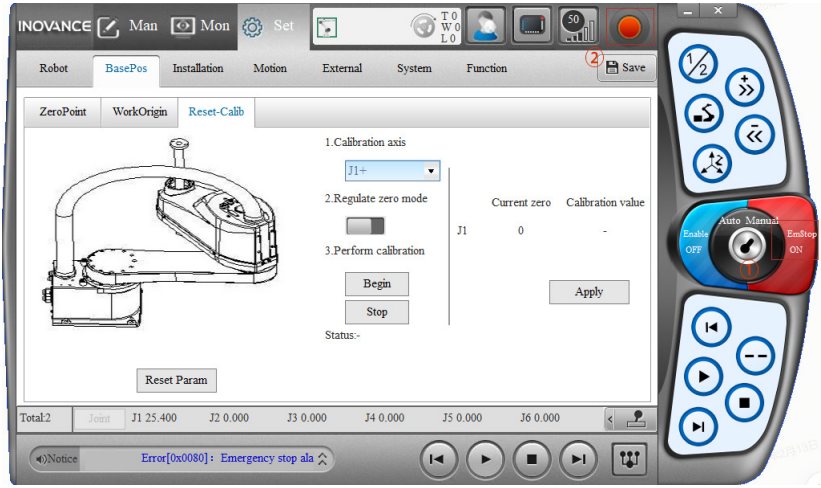


Figure 2-29 IRTP80 series teach pendant

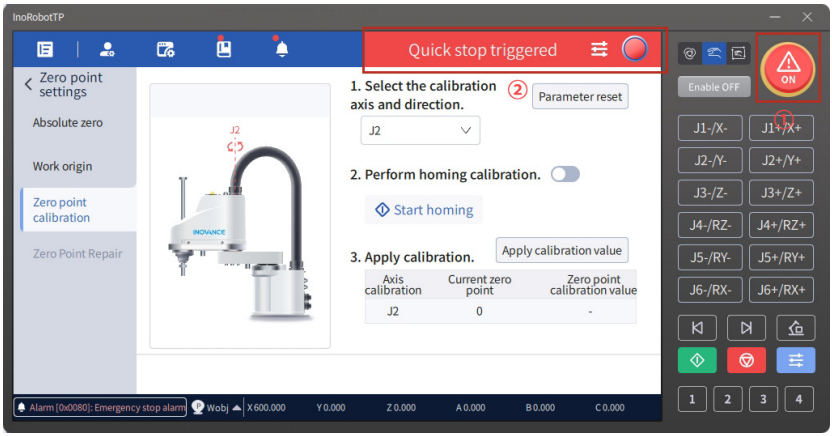


Figure 2-30 IRTP200 series teach pendant

6. Update the zero point.

a. Click "Apply calibration value".

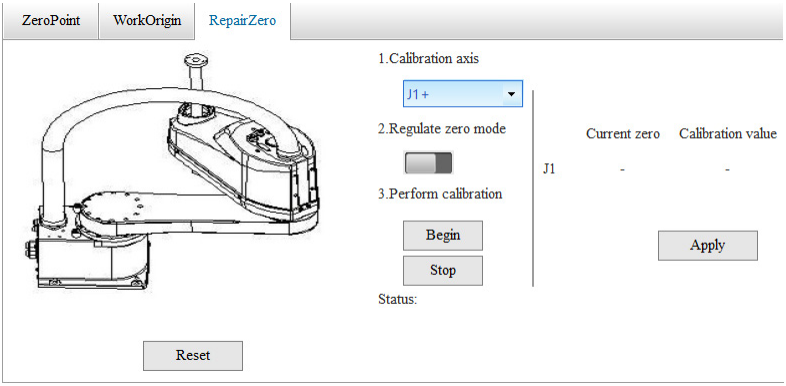


Figure 2-31 IRTP80 series teach pendant

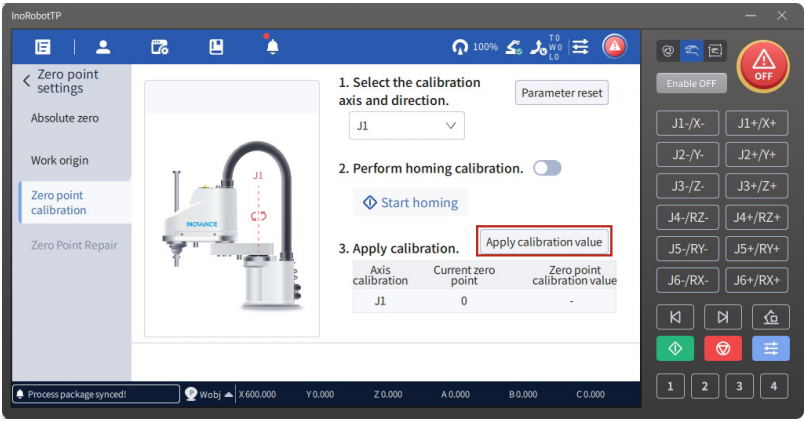


Figure 2-32 IRTP200 series teach pendant

b. Click "Yes". The current zero point is replaced by the zero calibration value.

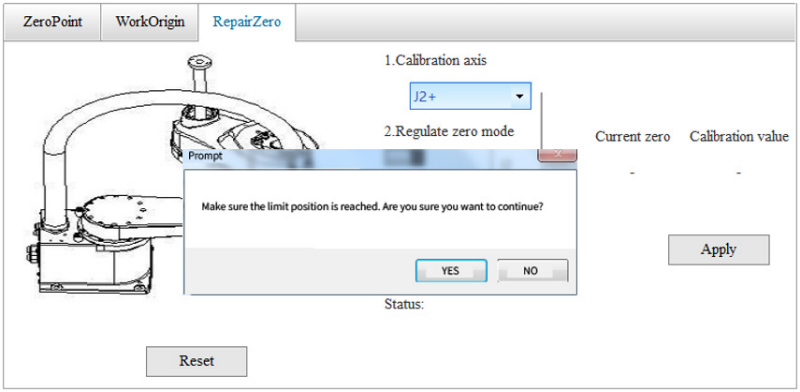


Figure 2-33 IRTP80 series teach pendant

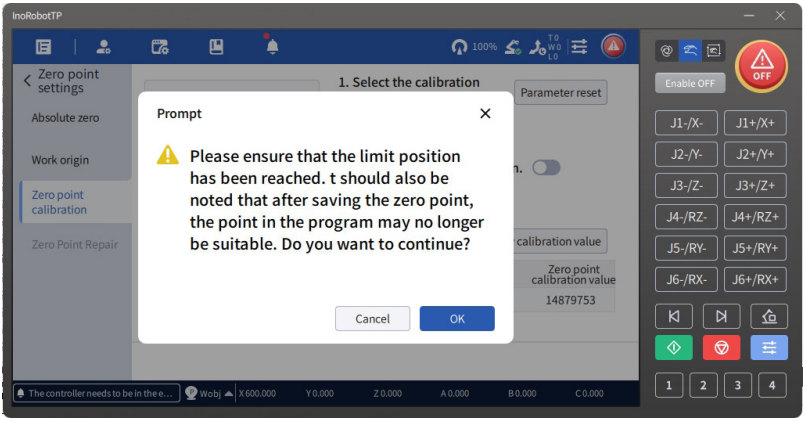


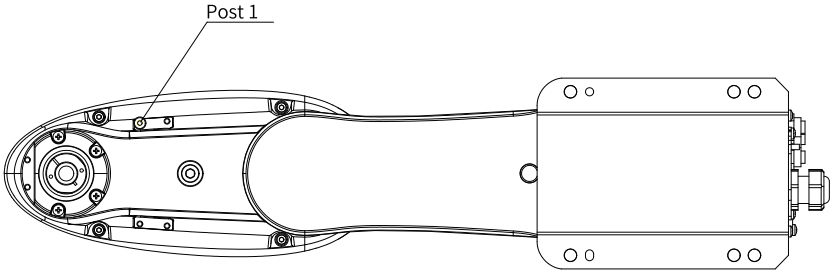
Figure 2-34 IRTP200 series teach pendant

7. Check the zero point.
   After updating the system zero point, check the result.

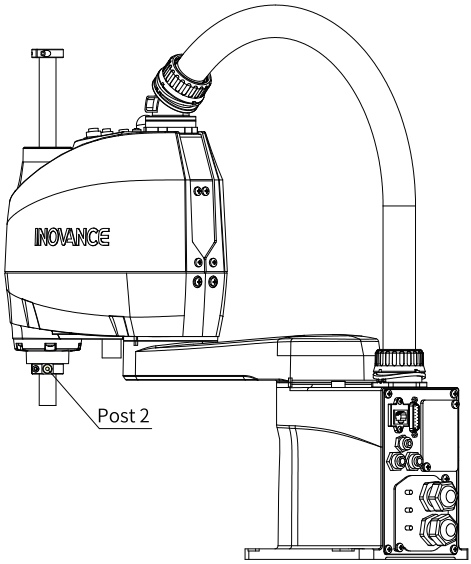
   Recommended method: Teach a point, change the left and right hand parameters, and then observe the deviation of the center of the lead screw moving to that point.

2.8.5.5 Zero Point Calibration of J3 and J4

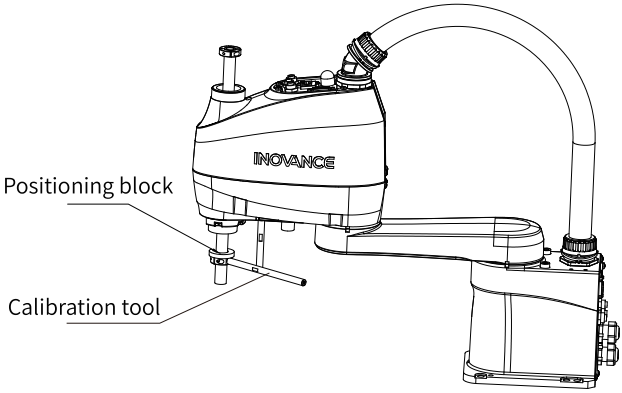
1. Fix the threaded end of the post 1 to the M4 threaded hole at the bottom of the forearm, as shown in the figure below:



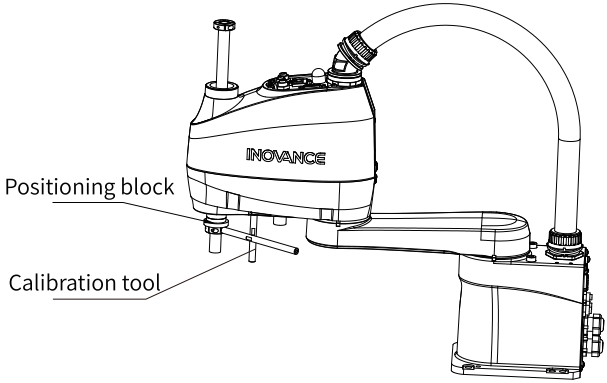
2. Fix the threaded end of the post 2 to the M5 threaded hole of the limit ring of the lead screw, as shown in the figure below:



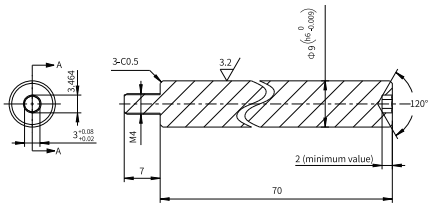
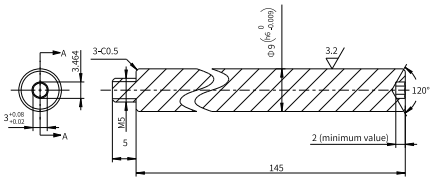
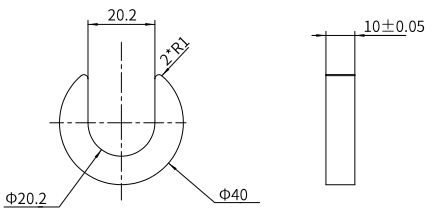
3. Rotate the post 2 in the positive direction until it contacts the post 1. Then, assemble the positioning block onto the lead screw, as shown in the figure below:



4. Press the brake button and push the lead screw upwards until the positioning block contacts the lower end of the spline nut, as shown in the figure below. For other operations, refer to the automatic calibration steps. Select "J3J4+" when selecting the calibration axes to complete the calibration.



2.8.6 Options

Name		Code	Description	Diagram (unit: mm)
Protective cover for lead screw		20212980	Mounted on the manipulator to protect the lead screw	-
Calibration tool	Post 1	32020626	Used to calibrate the zero point position of J3 and J4	
	Post 2	32020627		
	Positioning block	32040084		

3 IR-S7-INT SCARA Robot User Guide - Manipulator

3.1 Preface

Introduction

With a maximum payload of 7 kg and a Z-axis stroke of 200 mm, this robot is widely used in loading and unloading, precision assembly, handling, dispensing, gluing, screw tightening, labeling, material insertion, and sorting. 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. It is suitable for new energy, 3C and food packaging industries.

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

Audience

- Mechanical engineers
- Electrical engineers
- System engineers

More Data

Data name	Data code	Description
IRCB501-INT Series Robot Controller User Guide	19012937	Describes the specifications, installation, and wiring of the IRCB501 series international version controller.
IR-TP200 Series Industrial Robot Teach Pendant User Guide	19012798	Describes the software-related operations of the IR-TP200 series teach pendant.
IR-S4&S7&S10-INT Series SCARA Robot User Guide - Manipulator (this guide)	PS00017837	Describes the basic specifications, installation, and maintenance of the IR-S4&S7&S10 series SCARA robots.

Revision History

Revision date	Version	Revision
2026-04	A03	Added related information of IR-S7 series cleanroom robot. • Updated *"3.2.1 Model and Nameplate" on page 78*. • Updated *"3.2.3 Product Dimensions" on page 81*. • Updated *" " on page* . • Updated *"3.3.3 Installation Base Table Requirements" on page 87*. • Updated *"3.3.4 Installation Space Requirements" on page 88*. • Updated *"2.5.1.1 Packaging Posture" on page 33*. • Updated *"3.6.3 Installing an End Effector" on page 97*. • Updated *"3.7.2.4 Maximum Stroke of J3" on page 107*. • Updated *"3.7.4 Standard Motion Range" on page 109*.
2025-12	A02	**Added:** Added *"3.8.5.5 Zero Point Calibration of J2" on page 127*. **Update:** • Updated *"3.2.1 Model and Nameplate" on page 78*. • Updated *"3.6.5 Cable Connection" on page 100*. • Updated *"3.2.2 Components" on page 80*.
2025-04	A01	**Added:** • Added *"3.8.4 Applying Lubricating Grease" on page 117*. **Update:** • Updated *"3.2.1 Model and Nameplate" on page 78*. • Updated *"3.8.5.2 Zero Point Calibration of J1 and J2" on page 118*.
2024-11	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*, 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.

3.2 Product Information

3.2.1 Model and Nameplate

The IR-S7 series SCARA robots have identical nameplates to other models, except for the model number, weight, and serial number (SN). The following explanation is based on the IR-S7-60Z20S-INT model.

IR- S 7- 60 Z20 S-INT
① ②③ ④ ⑤ ⑥ ⑦

① **Product family** INOVANCE Robot	④ **Arm length** 50: 500 mm 60: 600 mm 70: 700 mm	⑦ **Version** INT: International (with functional safety)
② **Series** S: SCARA robot CS: Cost-effective SCARA robot	⑤ **Max. Z-axis stroke** Z20: Max. 200 mm stroke Z17: Max. 170 mm stroke	-
③ **Payload** 7: 7 kg	⑥ **Installation environment** S: Standard C: Cleanroom	

Note

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

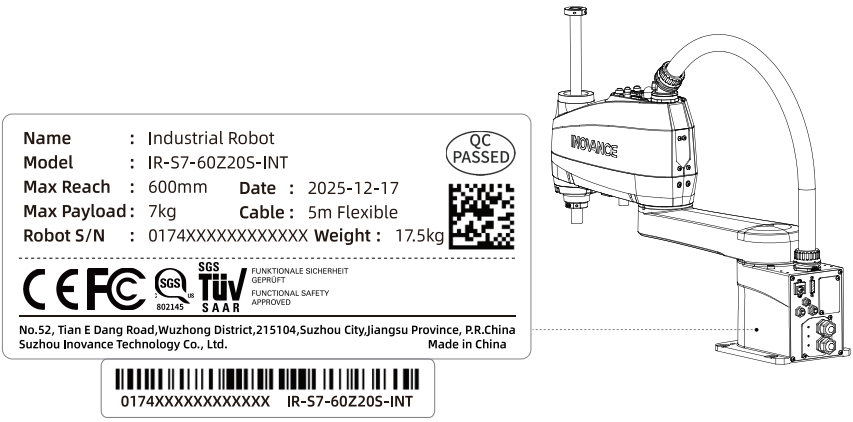


Figure 3-1 Nameplate

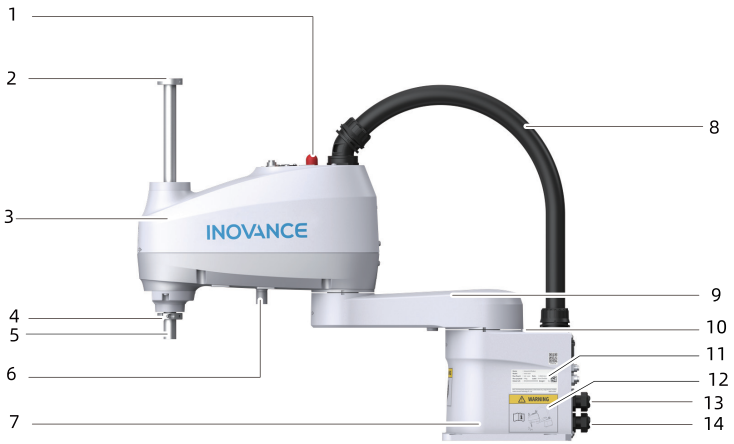
Note

- 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 certification information in the above nameplate is for illustrative purposes only; Refer to the actual product certification for specific details.

CAUTION

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

3.2.2 Components



No.	Description
1	Run indicator
2	J3 upper mechanical stop
3	Arm 2
4	J3 lower mechanical stop
5	J3 screw shaft
6	J2 mechanical stop
7	Base
8	Cable unit
9	Arm 1
10	J1 mechanical stop
11	Nameplate

No.	Description
12	Labels
13	Power cable
14	Signal cable

3.2.3 Product Dimensions

Standard model

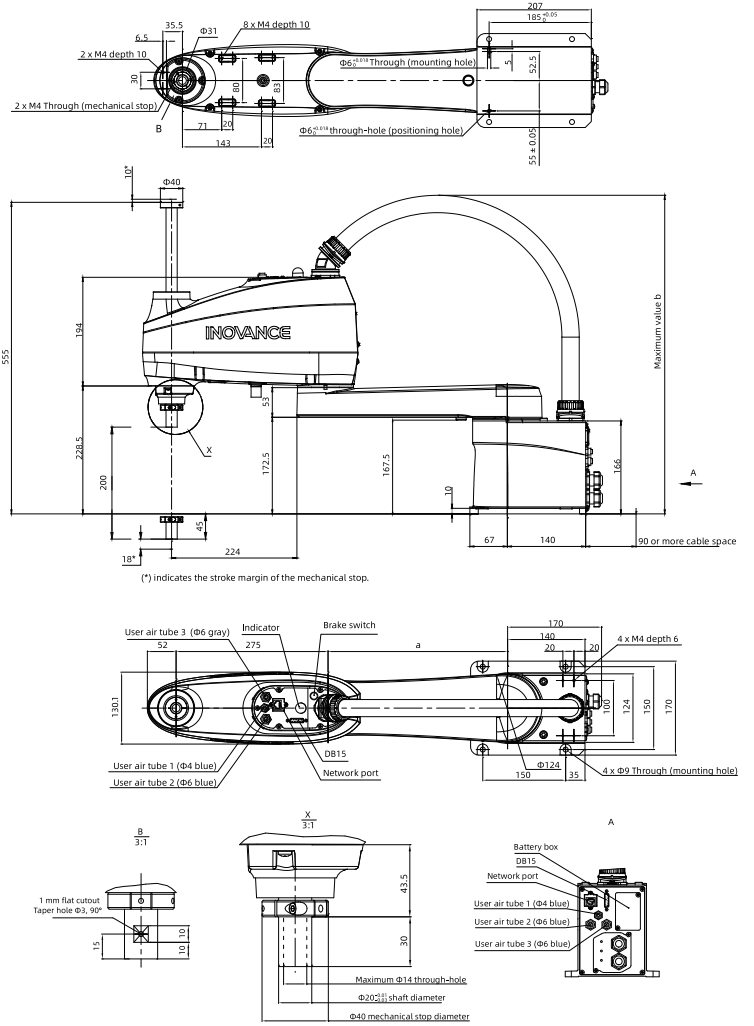


Figure 3-2 Outline dimensions (unit: mm)

Parameters of IR-S7 series standard robots with different arm lengths			
Model	IR-S7-50Z20S-INT	IR-S7-60Z20S-INT	IR-S7-70Z20S-INT
a	225	325	425
b	545	569	599

Cleanroom model

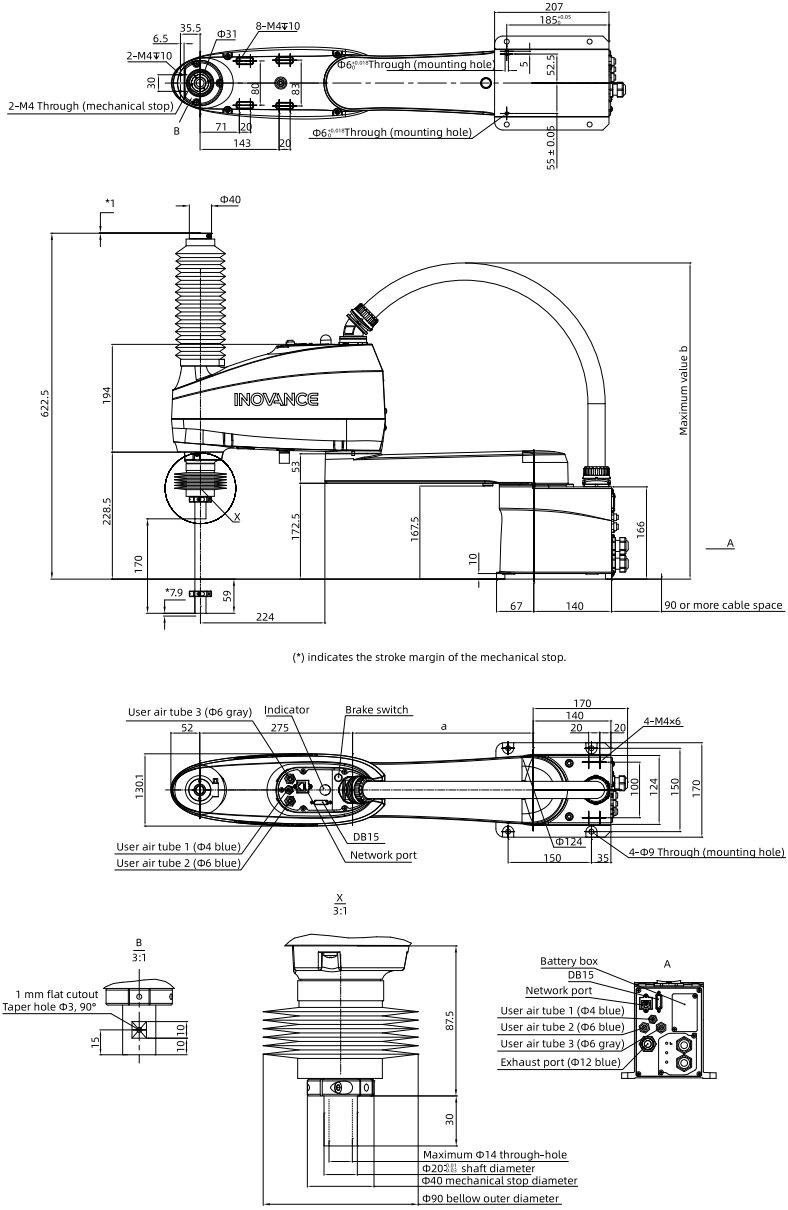


Figure 3-3 Outline dimensions (unit: mm)

Parameters of IR-S7 series cleanroom robots with different arm lengths			
Model	IR-S7-50Z17C-INT	IR-S7-60Z17C-INT	IR-S7-70Z17C-INT
a	225	325	425
b	545	569	599

3.2.4 Technical Specifications

Item		IR-S7-50Z20S-INT	IR-S7-60Z20S-INT	IR-S7-70Z20S-INT	IR-S7-50Z17C-INT	IR-S7-60Z17C-INT	IR-S7-70Z17C-INT
Arm length	Arm 1 + Arm 2	500 mm	600 mm	700 mm	500 mm	600 mm	700 mm
	Arm 1	225 mm	325 mm	425 mm	225 mm	325 mm	425 mm
	Arm 2	275 mm					
Maximum speed	J1 + J2	7120 mm/s	7850 mm/s	8590 mm/s	7120 mm/s	7850 mm/s	8590 mm/s
	J3	1600 mm/s			1600 mm/s		
	J4	2000°/s			2000°/s		
Repeatability	J1 + J2	±0.02 mm			±0.02 mm		
	J3	±0.01 mm			±0.01 mm		
	J4	±0.01°			±0.01°		
Handling capacity (load)	Rated	3 kg			3 kg		
	Max.	7 kg			7 kg		
Allowable load inertia of J4	Rated	0.01 kg·m²			0.01 kg·m²		
	Max.	0.12 kg·m²			0.12 kg·m²		
Mounting hole	Mounting hole	150 mm x 150 mm (4 x Φ9 mm)			150 mm x 150 mm (4 x Φ9 mm)		
Manipulator weight (excluding cables)	Manipulator weight (excluding cables)	17 kg	17.5 kg	19 kg	17.5 kg	18 kg	19.5 kg
Press-in force of J3	Press-in force of J3	150 N			150 N		
User wiring	Wiring	15x signal, 30 V, 0.5 A			15x signal, 30 V, 0.5 A		
	Ethernet connector	CAT5e			CAT5e		
User tubing	User tubing	Air tube: Φ4 mm x 1; Pressure resistance: 0.59 MPa			Air tube: Φ4 mm x 1; Pressure resistance: 0.59 MPa		
		Air tube: Φ6 mm x 2; Pressure resistance: 0.59 MPa			Air tube: Φ6 mm x 2; Pressure resistance: 0.59 MPa		
Ambient condition	Operating temperature[1]	5°C to 40°C			5°C to 40°C		
	Operating humidity	10% RH to 80% RH			10% RH to 80% RH		

Item		IR-S7-50Z20S-INT	IR-S7-60Z20S-INT	IR-S7-70Z20S-INT	IR-S7-50Z17C-INT	IR-S7-60Z17C-INT	IR-S7-70Z17C-INT
Noise level	Noise level[2]	L Aeq ≤ 70 dB(A)			L Aeq ≤ 70 dB(A)		
Maximum motion range	J1	±132°			±132°		
	J2	±150°			±150°		
	J3	200 mm			170 mm		
	J4	±360°			±360°		
Cycle time	Cycle time[3]	0.351s	0.360s	0.375s	0.36s	0.37s	0.385s
Input power (average power consumption)	Input power (average power consumption)	2 kVA (0.3 kW)			2 kVA (0.3 kW)		
Matching controller (standard)	Matching controller (standard)	IRCB501-4CD-INT					
Mounting method	Mounting method	Tabletop					
Certification compliance	Certification compliance	CE certification, cSGSus certification, FCC certification, and functional safety certification (only supported by "-INT" controller and requires a functional safety expansion card), KCs certification (refer to the certifications for the certified models).					

Note

[1] When used in a low-temperature environment approximating the lowest allowable temperature, or when idle for a long period of time due to holidays and nighttime, it is recommended to warm up the product for 10 minutes before operating it.

[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 joints operating at 100% speed and acceleration, with a duty cycle of 50%.

[3] Time required for a robot to move a 2 kg payload between two points 300 mm apart at a height of 25 mm.

3.3 Preparations Before Installation

3.3.1 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.

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

3.3.2 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/ humidity	• Temperature: 5°C to 40°C • Humidity: 10% RH to 80% RH (without condensation)
Storage temperature/ 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	• Place it indoors • 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.



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

3.3.3 Installation Base Table Requirements

You need to make a base table to secure 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-S7 Series	350	1700	1500

- Use M8 threaded holes on the base table to mount the robot. Use screws with a strength equivalent to the performance level of Grade 10.9 or 12.9 specified in GB/T 3098.1. See *"3.2.3 Product Dimensions" on page 81* for the dimensions.
- 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 using a level for height adjustment of the base table, use screws with a diameter larger than M8.
- When cutting holes in the base table for passing cables, ensure that the diameter of the holes is not less than 60 mm.
- Reserve enough space for the robot controller in the base table design. For details, see the "IRCB501-INT Series Robot Controller User Guide".

3.3.4 Installation Space Requirements

Motion range of standard model (unit: mm)

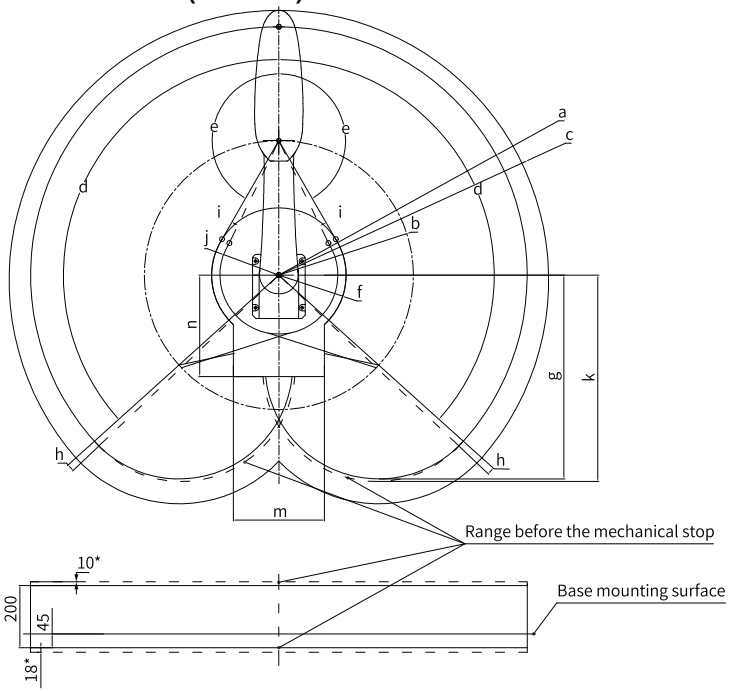


Figure 3-4 Motion range of standard model (unit: mm)

Motion range of IR-S7 series robots with different arm lengths			
Model	IR-S7-50Z20S-INT	IR-S7-60Z20S-INT	IR-S7-70Z20S-INT
a. Arm length of J1 + J2 (mm)	500	600	700
b. Arm length of J1 (mm)	225	325	425
c. Maximum motion range (mm)	552	652	752
d. Motion range of J1 (°)	132		
e. Motion range of J2 (°)	150		
f. Motion range (mm)	138.1	162.6	232
g. Rear motion range (mm)	425.6	492.5	559.4
h. Angle of mechanical stop position of J1 (°)	1		

Motion range of IR-S7 series robots with different arm lengths			
i. Angle of mechanical stop position of J2 (°)	1	3	4
j. Range of mechanical stop position (mm)	134.2	148.3	214.8
k. Range of rear mechanical stop position (mm)	428.5	496.7	564.9
m. Motion range (mm)	240	220	220
n. Motion range (mm)	245		

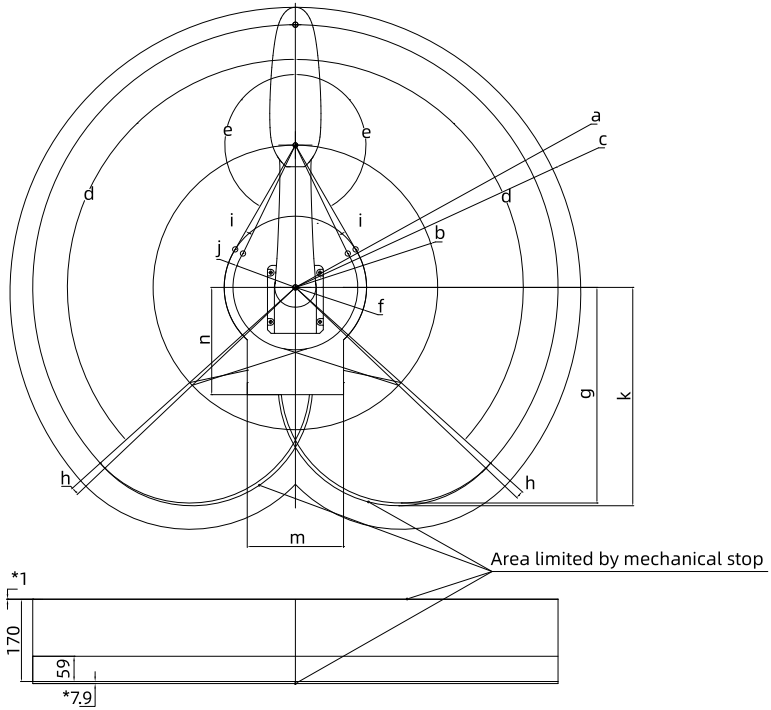


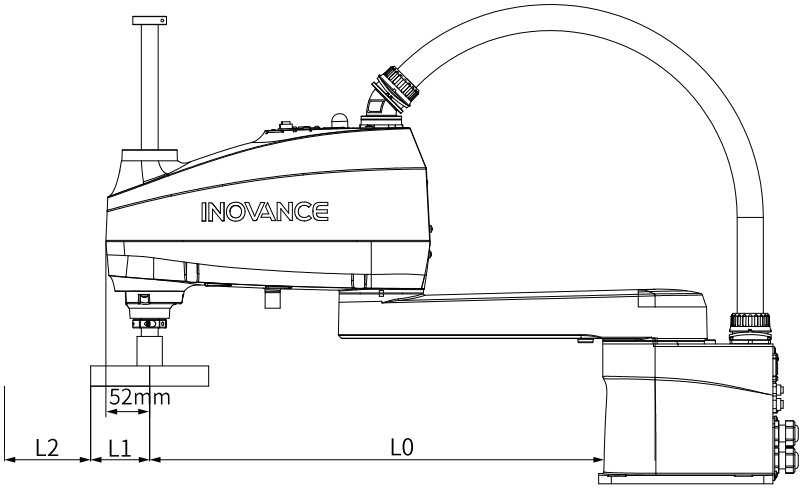
Figure 3-5 Motion range of IR-S7 series cleanroom robot

Motion range of IR-S7 series cleanroom robots with different arm lengths			
Model	IR-S7-50Z17C-INT	IR-S7-60Z17C-INT	IR-S7-70Z17C-INT
a. Arm length of J1 + J2 (mm)	500	600	700
b. Arm length of J1 (mm)	225	325	425
c. Maximum motion range (mm)	552	652	752

Motion range of IR-S7 series cleanroom robots with different arm lengths			
d. Motion range of J1 (°)	132		
e. Motion range of J2 (°)	150		
f. Motion range (mm)	138.1	162.6	232
g. Rear motion range (mm)	425.6	492.5	559.4
h. Angle of mechanical stop position of J1 (°)	1		
i. Angle of mechanical stop position of J2 (°)	1	3	4
j. Range of mechanical stop position (mm)	134.2	148.3	214.8
k. Range of rear mechanical stop position (mm)	428.5	496.7	564.9
m. Motion range (mm)	300	380	500
n. Motion range (mm)	270		

Maximum range

"Maximum range" is the area that contains the farthest reach of the arms. When an end effector with a radius of 52 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 space

The safety distance should be greater than L0+L1+L2.

3.3.5 Preparation of Installation Tools

Table 3–2 Preparation of tools

Tool	Quantity (pcs)
M8 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

3.4 Unpacking, Storage, and Handling

3.4.1 Precautions



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



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

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 equipment during transportation or storage, remove the condensation before turning on the power supply.

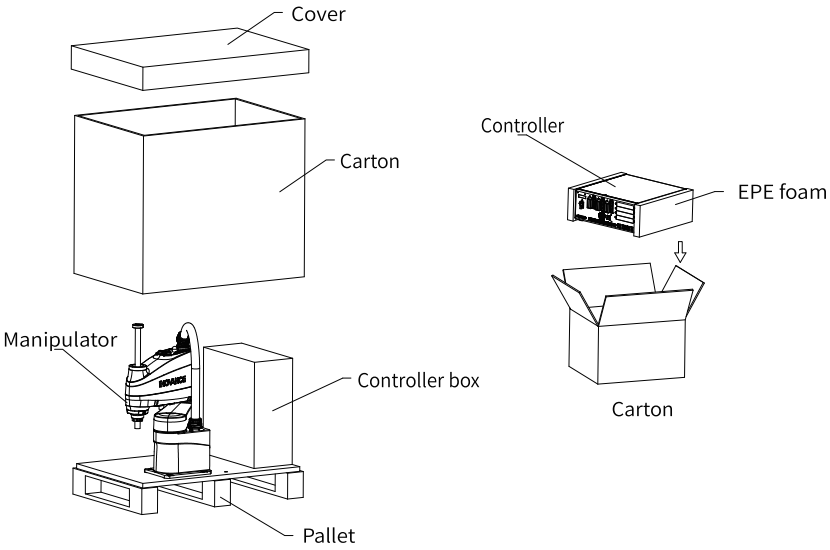
3.4.2 Unpacking

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.

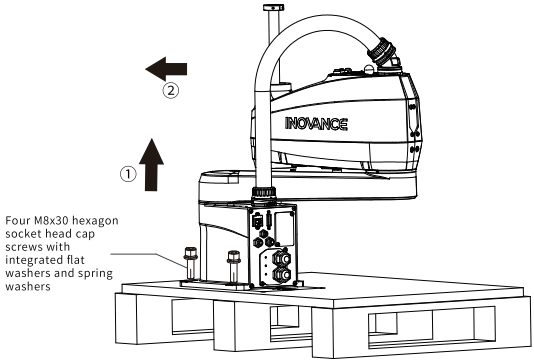
CAUTION

Wear gloves to prevent scratches.



2. Remove the robot body from the pallet.
   Remove the bolts securing the robot body on the pallet by using an M8 outer hexagon wrench.

   Take out the robot body by lifting it from bottom to top, and moving it horizontally. For details, see the handling procedure.



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.

3.4.3 Handling

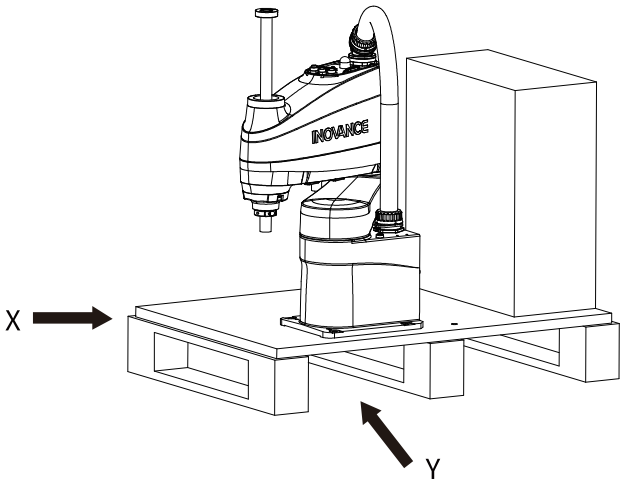
Preparation for handling

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

- **Manual handling**
  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 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.

3.5 Transportation Protection

For information on transportation protection, see *" Transportation Protection" on page 33*.

3.6 Installation

3.6.1 Installation Precautions

Danger

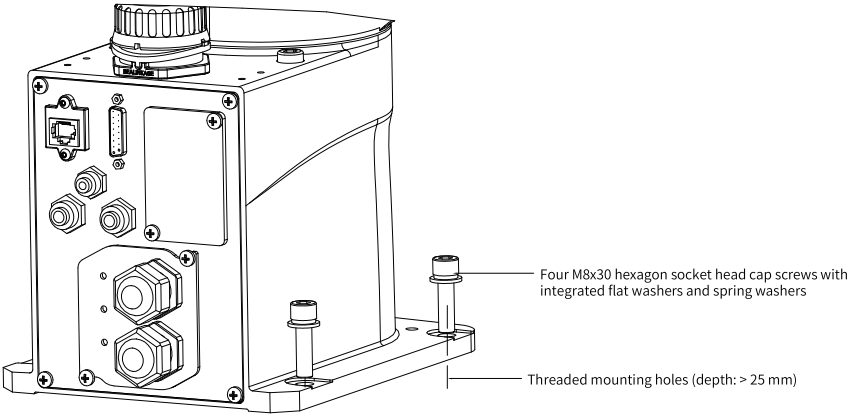
- Do not allow non-professionals to perform equipment installation, wiring, maintenance, inspection, or parts replacement.
- Install a safety fence for the system. Failure to comply may result in severe safety hazards.
- Reserve sufficient space between the equipment and surrounding buildings, structural 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 falling over.
- For the tabletop mounting, at least two people are required for the operation.

3.6.2 Installing the Robot Body

Secure the base to the base table with four M8x30 hexagon socket head cap screws with integrated flat washers and spring washers, 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
M8	30 N·m

3.6.3 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 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.

Design your own end effector mounting method with reference to the following dimensions. The weight of the end effector should not exceed 7 kg, as shown in the figure below.

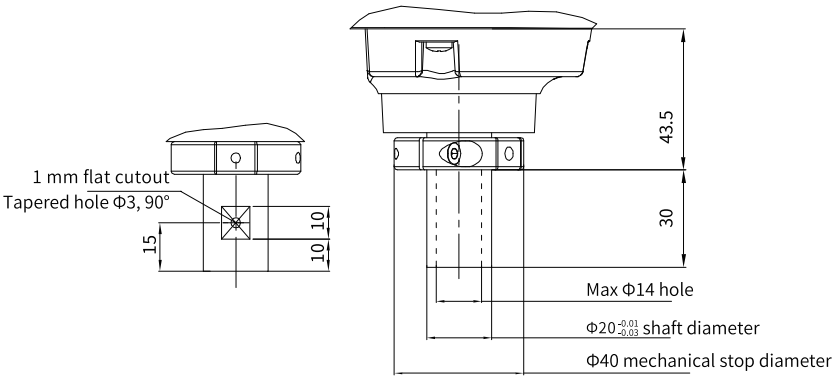


Figure 3-6 Auxiliary tooling mounting dimensions for standard model (unit: mm)

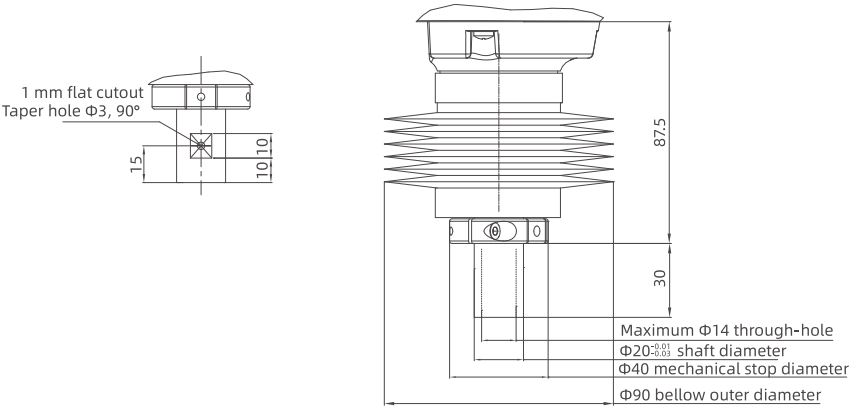


Figure 3-7 Auxiliary tooling mounting dimensions for cleanroom model (unit: mm)

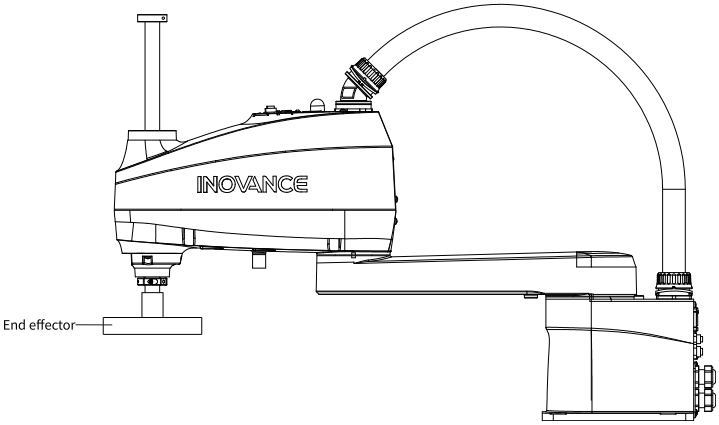


Figure 3-8 Installing the end effector

To move J3 up or down when installing the end effector, turn on the power of the controller and move the joint up/down or rotate the joint while pressing the brake release switch. This switch is a momentary type switch that releases the brake only during the time it is pressed.

Be aware of sagging or rotation due to the weight of the end effector during pressing 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. See the "maximum range" in *"3.3.4 Installation Space Requirements" on page 88*.

3.6.4 Installing the Camera and Pneumatic Valve

The series robot provides mounting holes for the camera and pneumatic valve at the bottom of arm 2, as shown in the figure below.

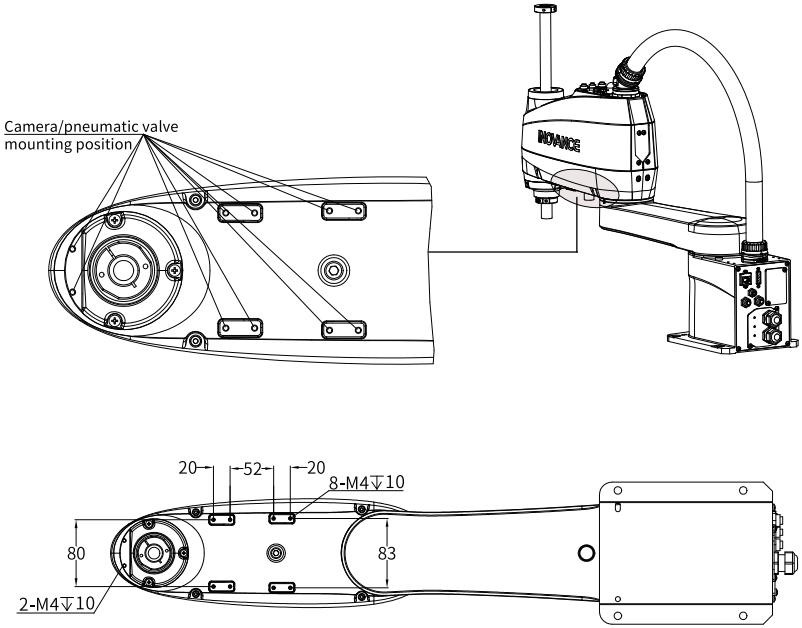


Figure 3-9 Installation of the camera and pneumatic valve (unit: mm)

3.6.5 Cable Connection

Note

- 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 cable and signal cable to the controller.

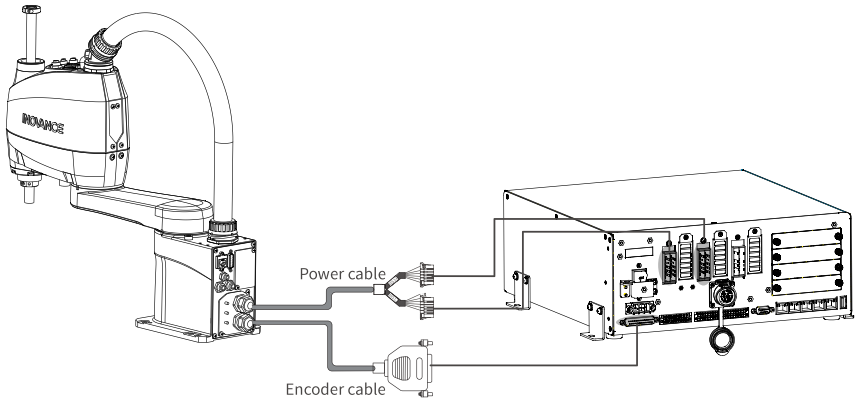
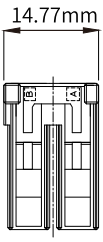
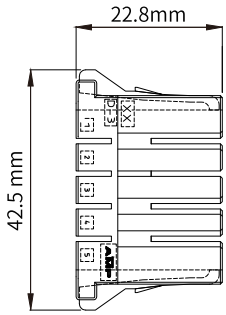
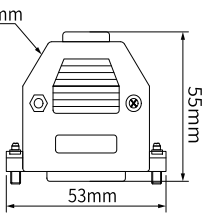
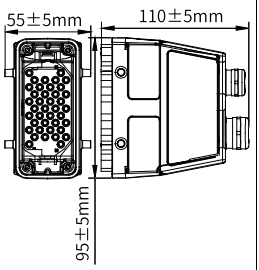
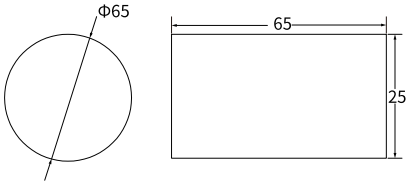
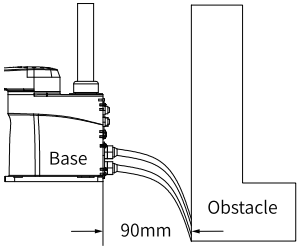


Figure 3-10 Cable connection

Table 3–3 Cable hole dimensions (IRCB501 series robot controller)

Name	Power cable connector (controller side)	Encoder cable connector (controller side)	Heavy-duty connector (robot 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)	95 mm x 110 mm x 55 mm (L x W x H)

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

Hole size (round hole & square hole) (mm)	Space reserved for the robot cable (connector size+cable bending radius)
	

3.6.6 Wiring and Tubing

Note

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

Wiring (Cables)



Current higher than 0.5 A is not allowed.

Model	Allowable current	Number of cores	Diameter	Remarks
D-sub 15Pin	0.5 A	15	24AWG	Wire connector provided as standard

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 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)

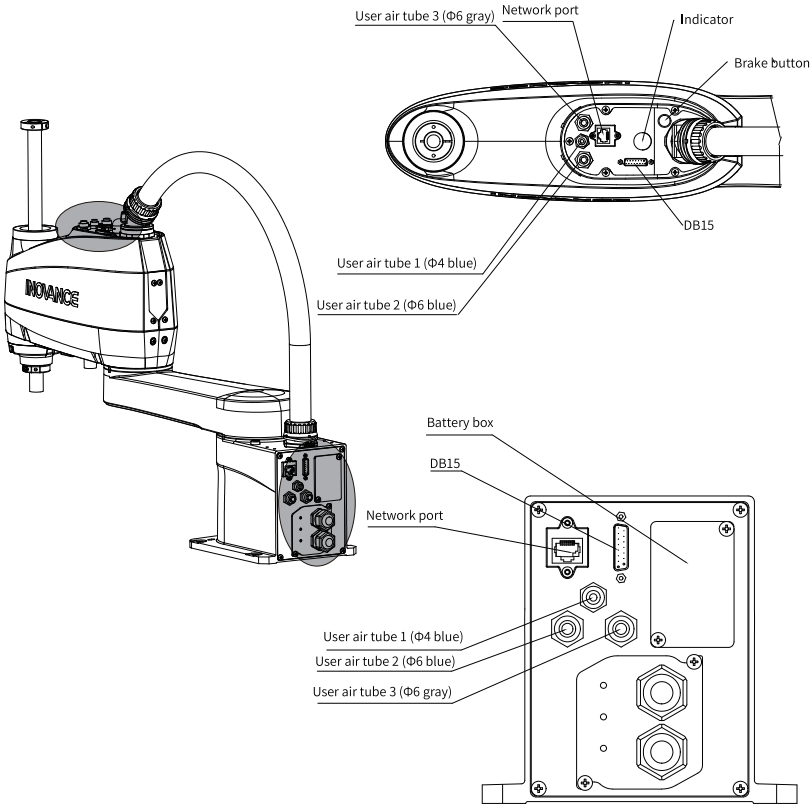
Note

Both ends of the air tubes are equipped with quick release couplings (outer diameter of Φ6 mm and Φ4 mm).

Pressure resistance	Quantity	Dimensions (outer diameter)
0.59 MPa (5.9 kgf/cm^2)	2	Φ6 mm
0.59 MPa (5.9 kgf/cm^2)	1	Φ4 mm

- Φ6 mm straight-through air tube fittings: two at the base and two at the forearm.
- Φ4 mm straight-through air tube fittings, one at the base and one at the forearm.

The air tube fittings are distinguished by color, as shown in the figure below.



3.7 Motion Range

3.7.1 Method for Setting the Motion Range

CAUTION

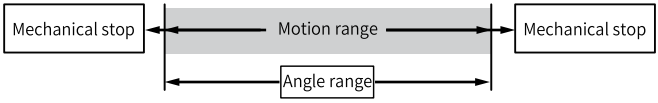
- To prevent premature wear of joint reducer bearings and gears due to insufficient oil film, avoid prolonged repetitive motion of joints within a small angular range of less than 10°.
- If the actual operating conditions require prolonged operation within an angle of less than 10°, it is recommended 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)



3.7.2 Motion Range Setting by Angle Range

3.7.2.1 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.

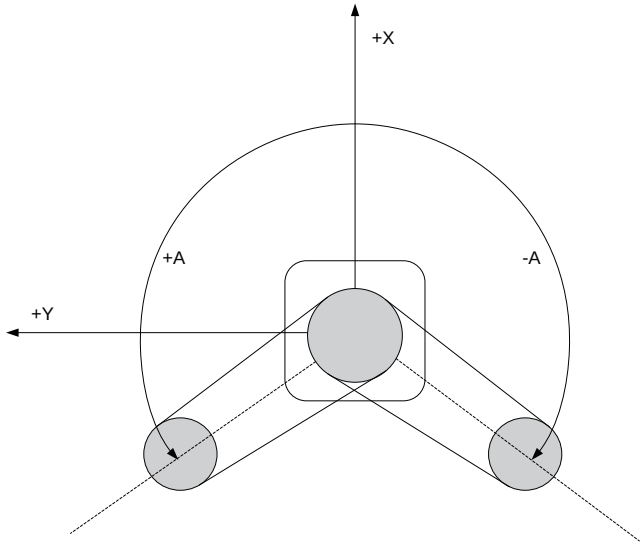
When the robot receives a motion command, it will check whether the target position of the command is within the angle range before moving. If the target position is beyond the set angle range, an error occurs and the robot does not move.

Note

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

3.7.2.2 Maximum Angle Range of J1

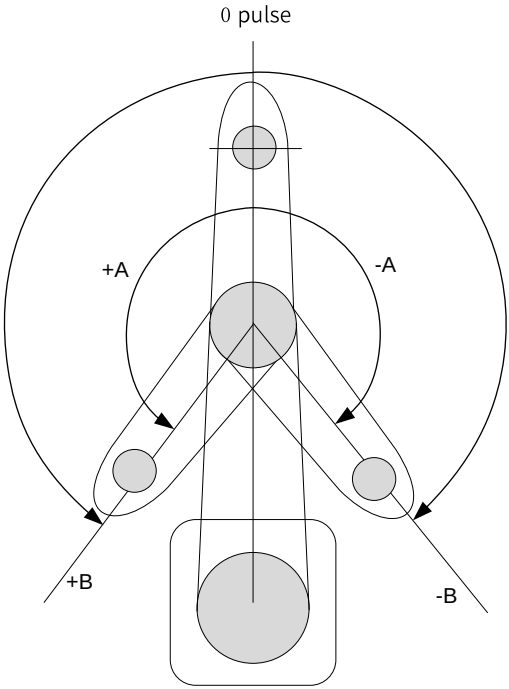
The zero-angle position of J1 refers to the position where the first arm is oriented toward the positive direction of the X coordinate axis. From the 0 pulse position, the clockwise angle is positive (+), and the counterclockwise angle is negative (-).



Model	Maximum motion range
IR-S7 Series	±132°

3.7.2.3 Maximum Angle Range of J2

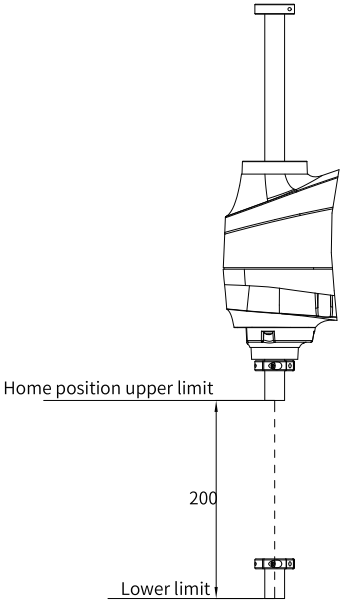
The zero-angle position of J2 refers to the position where the second arm is perpendicular to the first robot arm (regardless of the direction of the first arm). From the zero-angle position, the clockwise angle is positive (+), and the counterclockwise angle is negative (-).



Model	Maximum motion range
IR-S7 Series	±150°

3.7.2.4 Maximum Stroke of J3

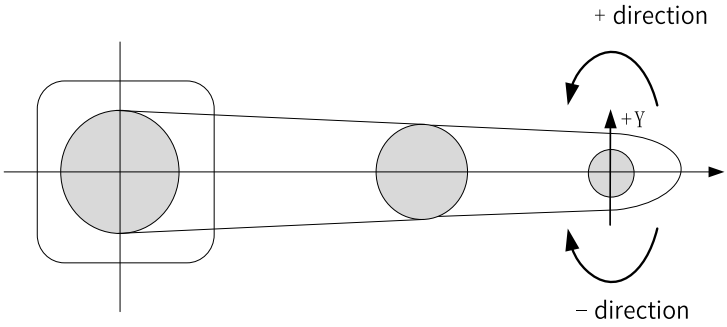
The zero-angle position of J3 is the upper limit position of the axis. When J3 descends from the zero-angle position, it will definitely change to a negative angle value.



Model	Stroke of J3
IR-S7 series standard model	200 mm
IR-S7 series cleanroom model	170 mm

3.7.2.5 Maximum Angle Range of J4

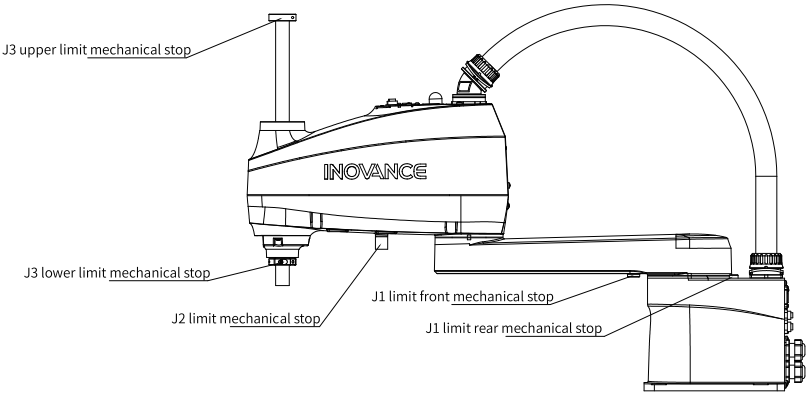
The zero-angle position of J4 refers to the position where the plane at the top of the axis is oriented toward the direction of the top of the second robot arm (regardless of the direction of the second arm). From the zero-angle position, the clockwise angle is positive (+), and the counterclockwise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



Model	Maximum motion range
IR-S7 Series	±360°

3.7.3 Mechanical Limit Stops

The robot has mechanical stops at J1, J2, and J3 but not J4, and all these mechanical stops are not adjustable. The set motion ranges for mechanical limit stops at J1 and J2 are extreme motion ranges. The up and down motion range for the mechanical limit stop at J3 is set by the internal program.



3.7.4 Standard Motion Range

Name	Description
Motion range	Indicates the situation at the standard (maximum) specifications. When motor of each joint is excited, the center of the lowest point of J3 moves in the areas shown in the figure below.
Area limited by mechanical stop	Indicates the area where the center of the lowest point of J3 can be moved when the motor of each joint is not excited.
Mechanical stop	Mechanically sets the absolute motion range beyond which motion is not allowed.
Maximum range	Indicates the area that contains the farthest reach of the arms. When an end effector with a radius of 52 mm or more is mounted, set the maximum range to the length of the two robot arms plus the radius of the end effector.

The motion range is shown below:

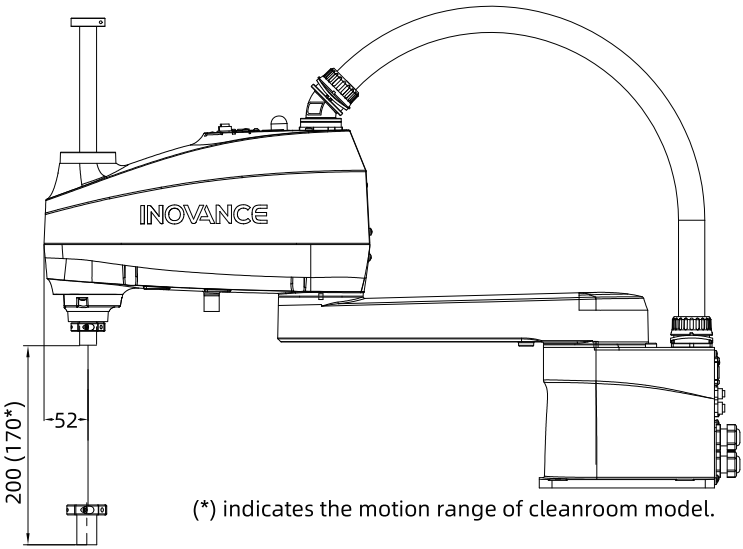


Figure 3-11 Motion range of end effector (unit: mm)

3.8 Inspection and Maintenance

3.8.1 Maintenance Precautions

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

Danger

- 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.

Warning

- 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.

3.8.2 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 rear controller fan 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.

3.8.3 Component Replacement

3.8.3.1 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.

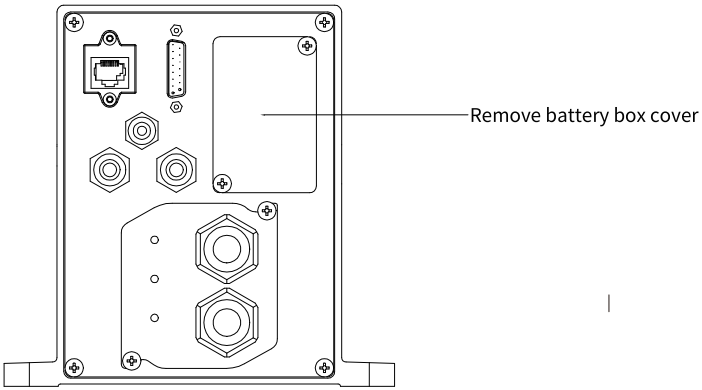
3.8.3.2 Battery Replacement

WARNING

- 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 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.



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. For details, see *"3.8.5.2 Zero Point Calibration of J1 and J2" on page 118*.

3.8.3.3 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.

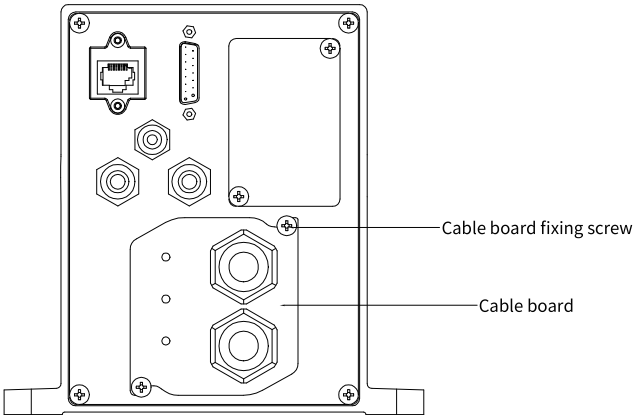


Figure 3-12 Cable plate on the base

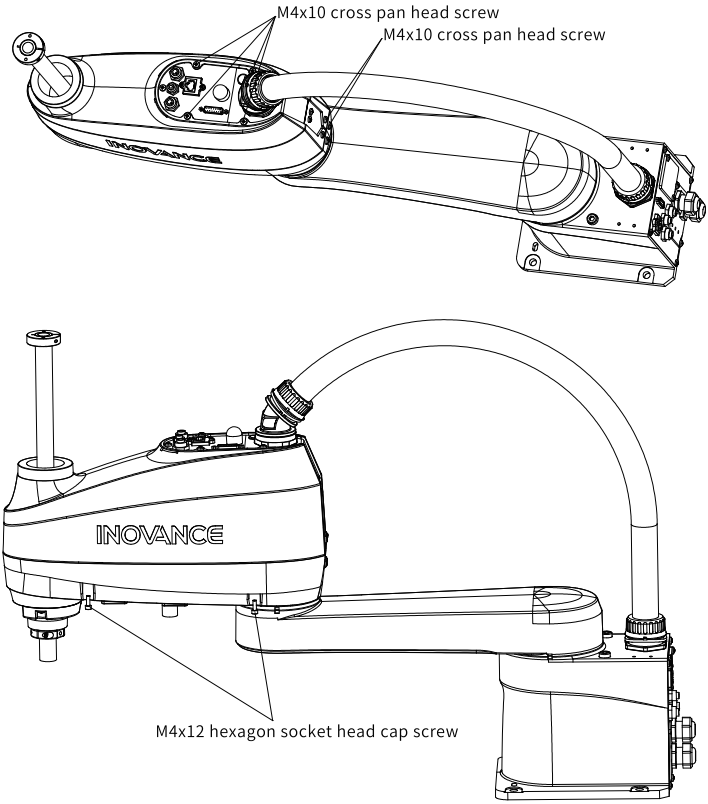
CAUTION

- 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.

3.8.3.4 Enclosure Replacement

Removing the forearm enclosure

Remove the six M4x10 screws on the enclosure and sheet metal, and then remove the four M4x12 hexagon socket head cap screws connecting the enclosure and the forearm.



Installing the forearm enclosure

1. Install the enclosure onto the forearm. Pay attention to the positioning pins and holes between the enclosure and the forearm to ensure that the mounting surface of the enclosure fits seamlessly with that of the forearm and sheet metal.
2. Install the six M4x10 screws on the enclosure and sheet metal with a torque of 0.6 N·m.
3. Install the four M4x12 hexagon socket head cap screws connecting the enclosure to the forearm, with a torque of 0.6 N.m.

3.8.4 Applying Lubricating Grease

The following table describes the grease refilling cycle:

Joint	Position	Cycle
J1 axis	Reducer	When replacing the motor.
J2 axis	Reducer	When replacing the motor.
J3 axis	Ball screw and spline	3 months

Cautions:

1. Only use original grease for the reducer and ball screw. See the IR-S4, IR-S7, and IR-S10 Series SCARA Robot Maintenance Guide for the grease type.
2. It is strictly forbidden to deplete the lubricating grease of the ball screw; otherwise, irreversible mechanical damage may occur.
3. Normally, the reducer does not require grease refilling. However, under the extreme conditions (duty cycle, speed, and load), the grease needs to be refilled every 10,000 hours.

Note

If the 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.

3.8.5 Zero Point Calibration

3.8.5.1 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 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.

3.8.5.2 Zero Point Calibration of J1 and J2

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 (IRTP200 series teach pendant). The operations on the hand-held teach pendant are similar.

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. The teach pendant provides a right/left wrist rule wizard. Follow the wizard to calibrate the zero point.

When calibrating the zero point using the teach pendant, calibrate J3 and J4 at the same time.

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 of the PC-based teaching software or the hand-held teach pendant.
   b. Enter the password in the password input box and click "OK" to log in.

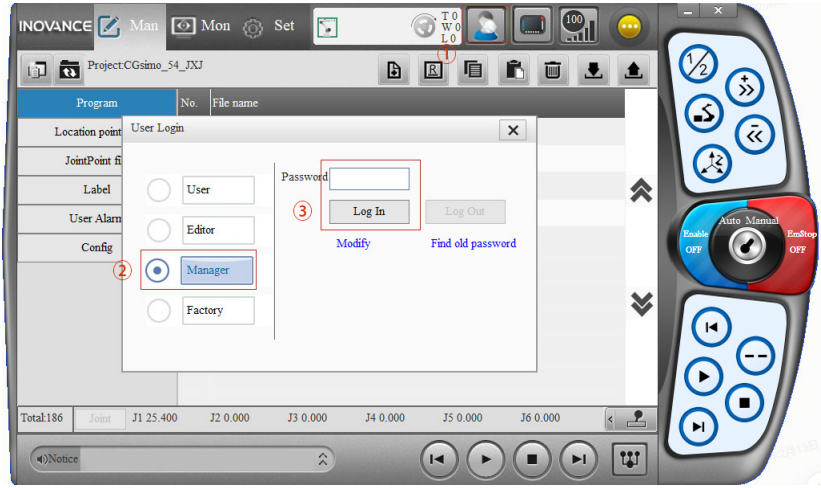


Figure 3-13 IRTP80 series teach pendant

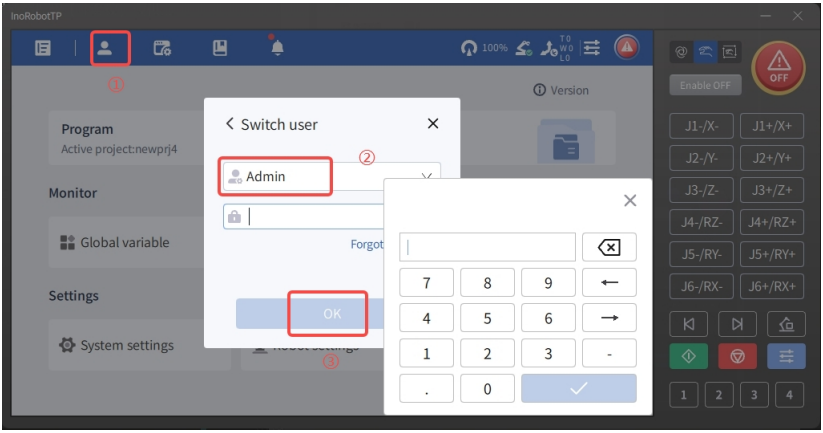


Figure 3-14 IRTP200 series teach pendant

2. Switch to the calibration interface.
   Choose "Settings" > "Zero point settings" > "Zero point calibration" on the InoRobotTP main interface.

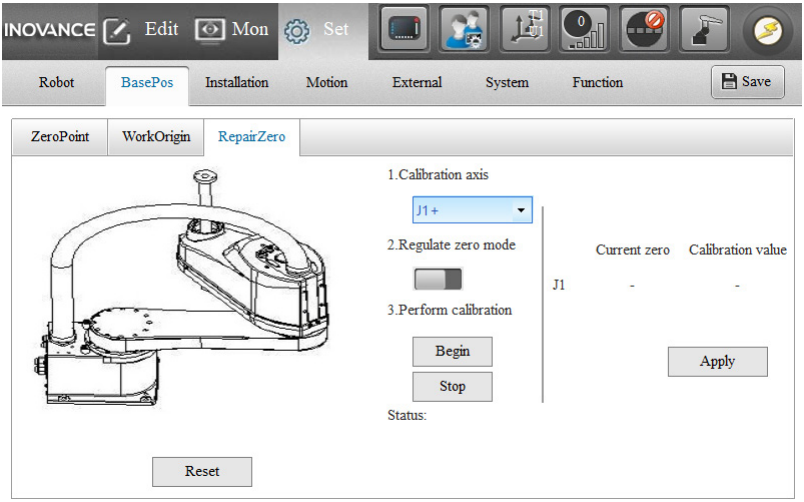


Figure 3-15 IRTP80 series teach pendant

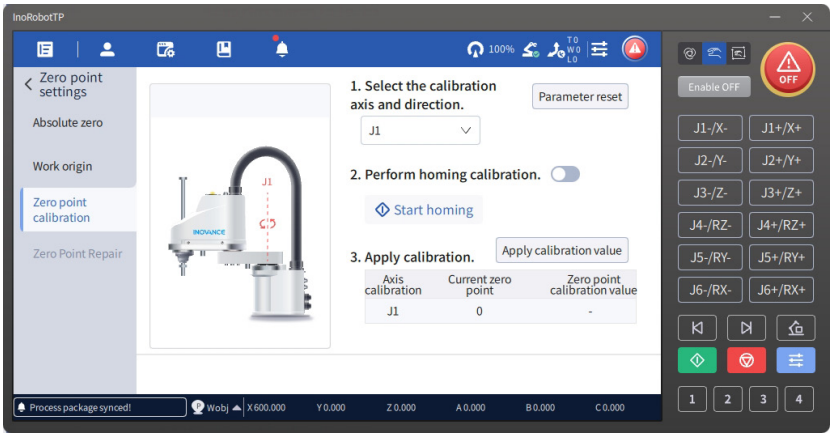


Figure 3-16 IRTP200 series teach pendant

3. Choose the axis number to enter the homing mode.
   Choose the axis you want to calibrate from the "Select the calibration axis and direction" drop-down list.
   - The homing motion direction of all axes is positive.
   - Caution: When switched to homing mode, the robot servo will be automatically enabled.

- If the multi-turn value of the encoder exceeds 2000, a warning pops up and emergency stop is triggered. In this case, you need to restart the controller and perform the homing operation again.

4. Perform the homing calibration.
   For example, select J2 axis and start homing.

   When the calibration is complete, a message "Homing successful" is displayed and the calibration value is updated.

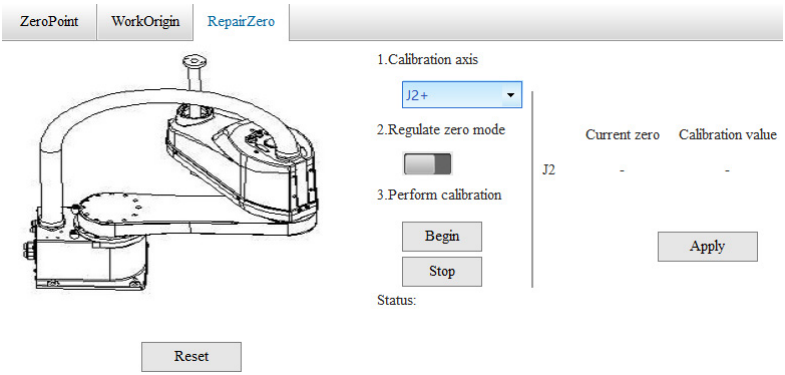


Figure 3-17 IRTP80 series teach pendant

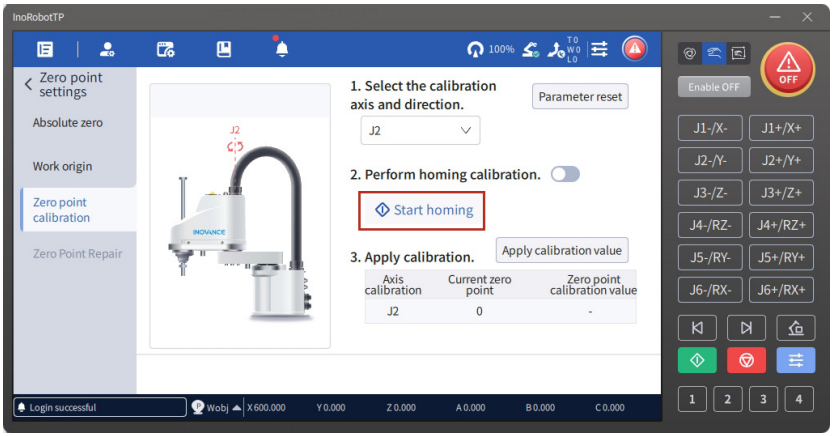


Figure 3-18 IRTP200 series teach pendant

5. 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 teaching software (or the display of the hand-held teach pendant) shows the emergency stop state (in red).

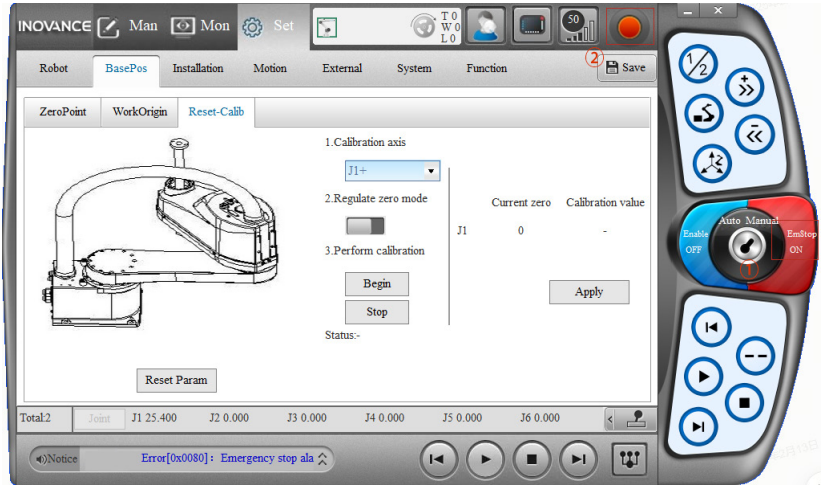


Figure 3-19 IRTP80 series teach pendant

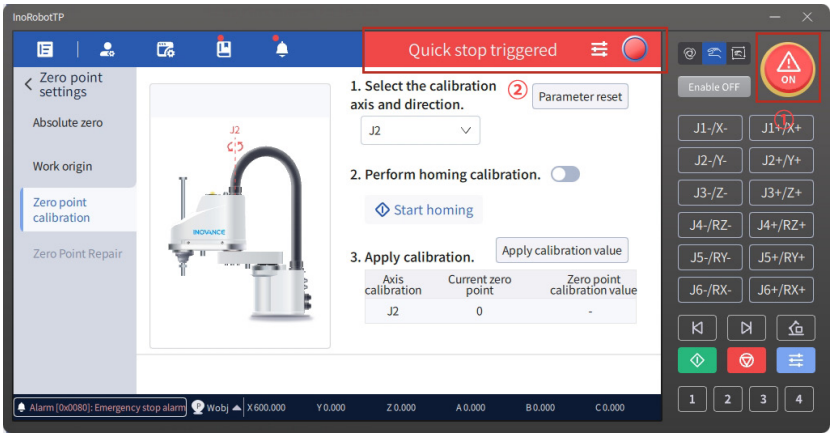


Figure 3-20 IRTP200 series teach pendant

6. Update the zero point.

a. Click "Apply calibration value".

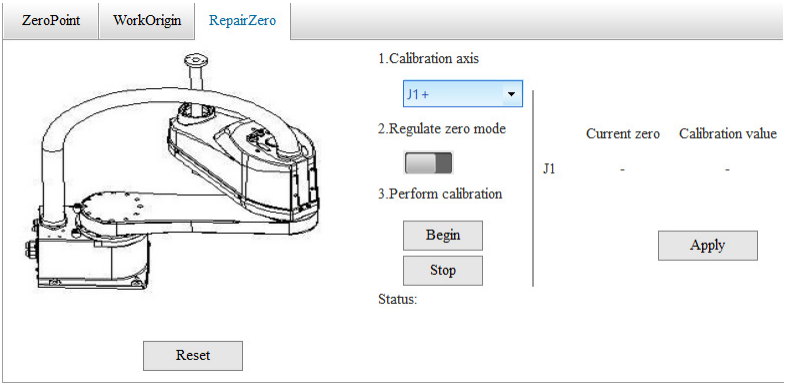


Figure 3-21 IRTP80 series teach pendant

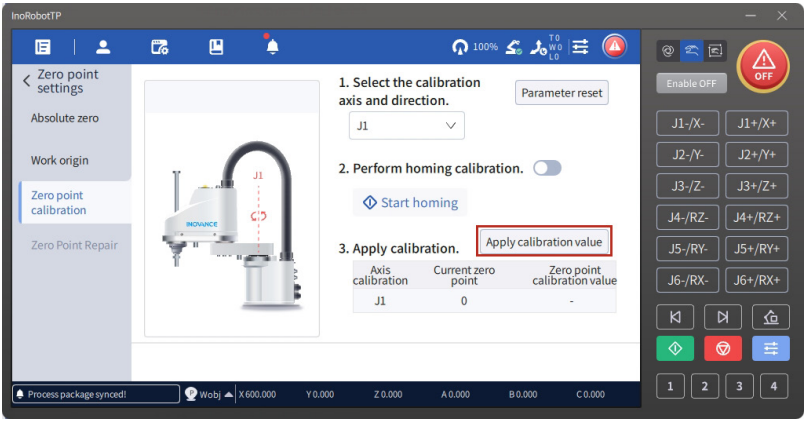


Figure 3-22 IRTP200 series teach pendant

b. Click "Yes". The current zero point is replaced by the zero calibration value.

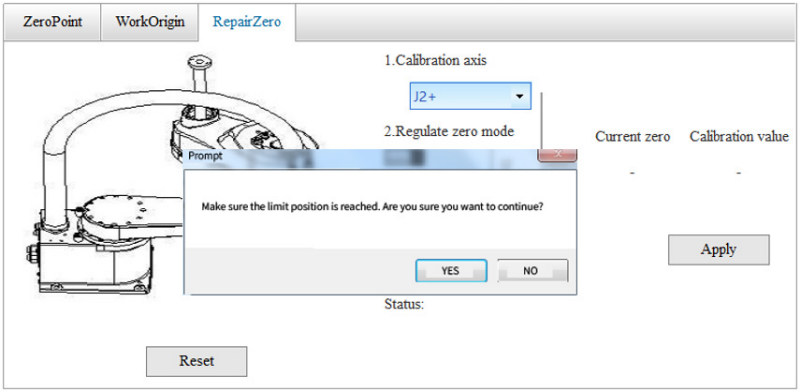


Figure 3-23 IRTP80 series teach pendant

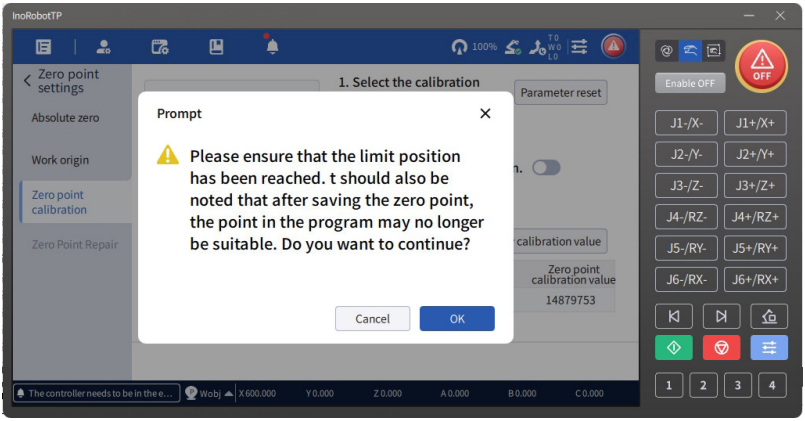


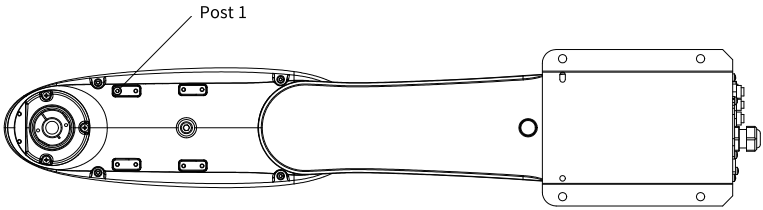
Figure 3-24 IRTP200 series teach pendant

7. Check the zero point.
   After updating the system zero point, check the result.

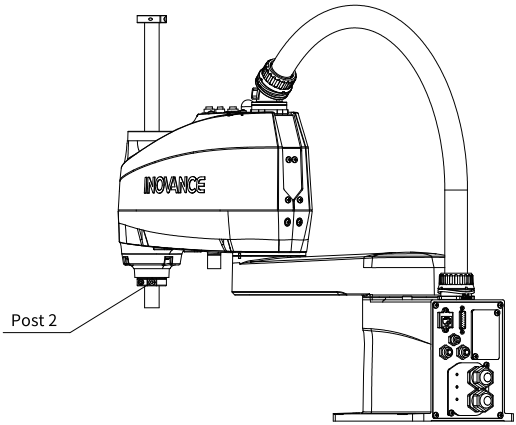
   Recommended method: Teach a point, change the left and right hand parameters, and then observe the deviation of the center of the lead screw moving to that point.

3.8.5.3 Zero Point Calibration of J3 and J4

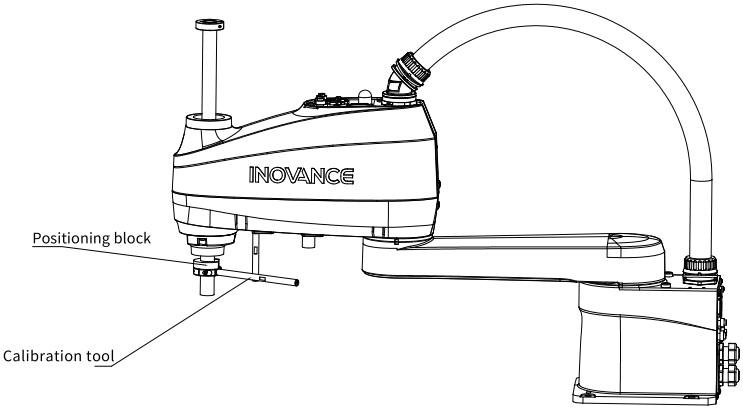
1. Fix the threaded end of homing column 1 in the M4 threaded hole at the bottom of the forearm, as shown in the figure below.



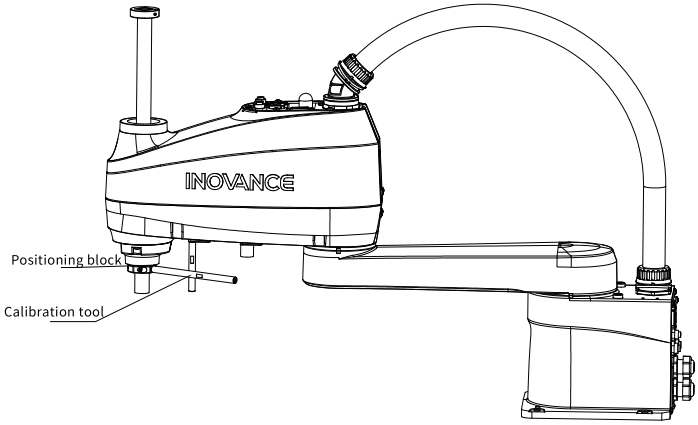
2. Fix the threaded end of homing column 2 in the M5 threaded hole of the screw limit ring, as shown in the figure below.



3. Rotate homing column 2 in the positive direction until it comes into contact with home column 1, stop rotation, and then assemble the positioning block onto the screw, as shown in the figure below.



4. Press the brake button and push the screw upwards until the located block comes into contact with the lower end of the spline nut (the screw cannot be pushed any further), as shown in the figure below. For other operations, refer to the auto homing procedure. Select the "J3J4+" homing axis to complete the homing operation.



3.8.5.4 Zero Point Position of Each Axis

1. The following figure shows the zero point positions of J1 and J2.

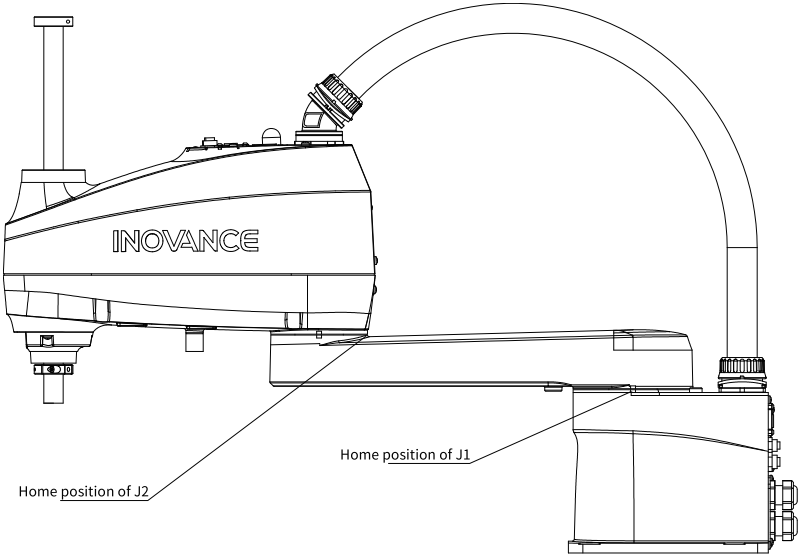


Figure 3-25 Zero point position of J1/J2

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

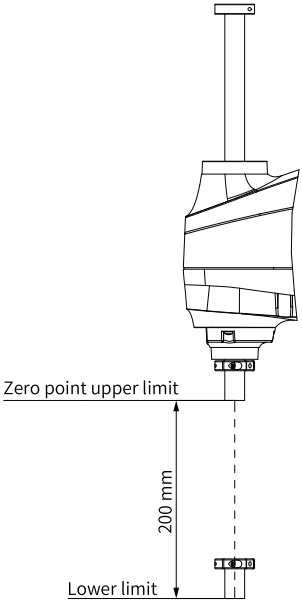


Figure 3-26 Zero point position of J3

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

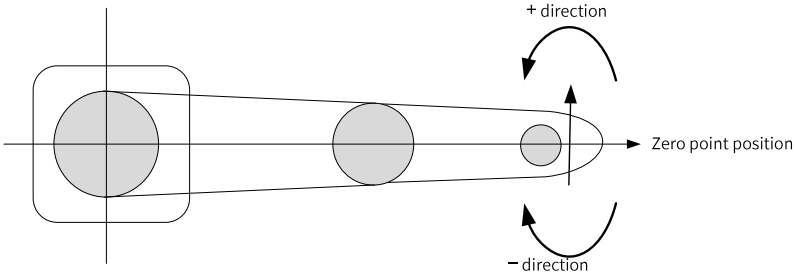


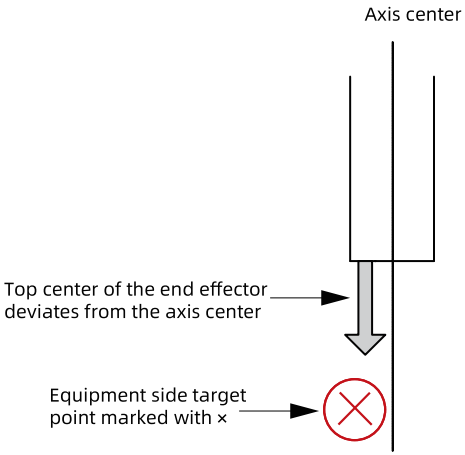
Figure 3-27 Zero point position of J4

3.8.5.5 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 through *"3.8.5.2 Zero Point Calibration of J1 and J2" on page 118*, follow the guidance provided on the teach pendant for zero point calibration using right/left wrist rule.

Zero point calibration procedure of J2

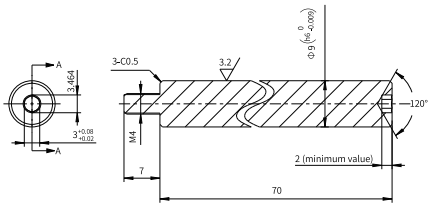
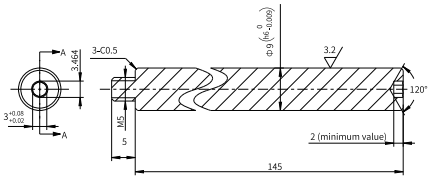
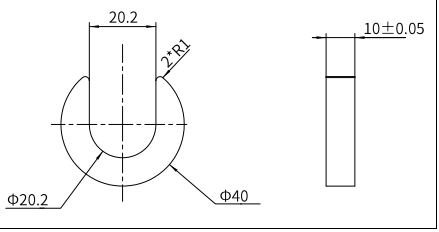
1. Use the center of the ball screw spline shaft as the reference point for zero point calibration.
   When the center of the end effector deviates from the center of the ball screw spline shaft, the zero point calibration can be performed without removing the end effector. Make the position that can 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 value" button to 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.

3.8.6 Options

Name		Code	Description	Schematic Diagram (Unit: mm)
Screw protective cover		20212980	Installed on the enclosure of the body, protecting the screw	-
Homing tool	Home column 1	32020626	Used to adjust the zero points of J3 and J4	
	Home column 2	32020627		
	Located block	32040084		

4 IR-S10-INT SCARA Robot User Guide - Manipulator

4.1 Preface

Introduction

With a maximum payload of 10 kg and a Z-axis stroke of 200 mm, this robot is widely used in loading and unloading, precision assembly, handling, dispensing, gluing, screw tightening, labeling, material insertion, and sorting. 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. It is suitable for new energy, 3C and food packaging industries.

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

Audience

- Mechanical engineers
- Electrical engineers
- System engineers

More Data

Data name	Data code	Description
IRCB501-INT Series Robot Controller User Guide	19012937	Describes the specifications, installation, and wiring of the IRCB501 series international version controller.
IR-TP200 Series Industrial Robot Teach Pendant User Guide	19012798	Describes the software-related operations of the IR-TP200 series teach pendant.
IR-S4&S7&S10-INT Series SCARA Robot User Guide - Manipulator (this guide)	PS00017837	Describes the basic specifications, installation, and maintenance of the IR-S4&S7&S10 series SCARA robots.

Revision History

Revision date	Version	Revision
2026-04	A03	Added related information of IR-S10 series cleanroom robot. • Updated *"4.2.1 Model and Nameplate" on page 132*. • Updated *"4.2.3 Product Dimensions" on page 136*. • Updated *" " on page* . • Updated *"2.5.1.1 Packaging Posture" on page 33*. • Updated *"4.3.4 Installation Space Requirements" on page 142*. • Updated *"4.6.3 Installing an End Effector" on page 151*. • Updated *"4.7.2.4 Maximum Stroke of J3" on page 160*. • Updated *"4.7.4 Standard Motion Range" on page 162*.
2025-12	A02	**Added:** Added *"3.8.5.5 Zero Point Calibration of J2" on page 127*. **Update:** • Updated *"4.2.1 Model and Nameplate" on page 132*. • Updated *"4.6.5 Cable Connection" on page 154*. • Updated *"4.2.2 Components" on page 134*.
2025-04	A01	**Added:** • Added *"4.8.4 Applying Lubricating Grease" on page 170*. **Update:** • Updated *"4.2.1 Model and Nameplate" on page 132*. • Updated *"4.8.5.2 Zero Point Calibration of J1 and J2" on page 171*.
2024-11	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*, 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.

4.2 Product Information

4.2.1 Model and Nameplate

The IR-S10 series SCARA robots have identical nameplates to other models, except for the model number, weight, and serial number (SN). The following explanation is based on the IR-S10-80Z20S-INT model.

IR- S 10 - 80 Z20 S-INT
① ② ③ ④ ⑤ ⑥ ⑦

① **Product family** INOVANCE Robot	④ **Arm length** 60: 600 mm 70: 700 mm 80: 800 mm	⑦ **Version** INT: International (with functional safety)
② **Series** S: SCARA robot CS: Cost-effective SCARA robot	⑤ **Max. Z-axis stroke** Z20: Max. 200 mm stroke Z17: Max. 170 mm stroke	-
③ **Payload** 10: 10 kg	⑥ **Installation environment** S: Standard C: Cleanroom	

Note

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

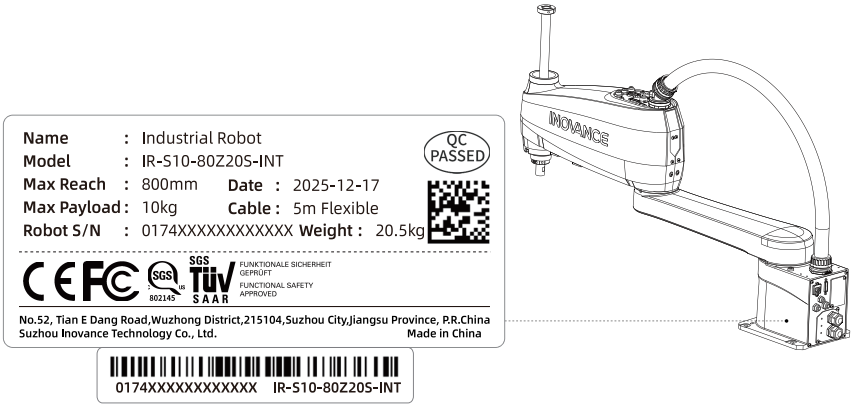


Figure 4-1 Nameplate

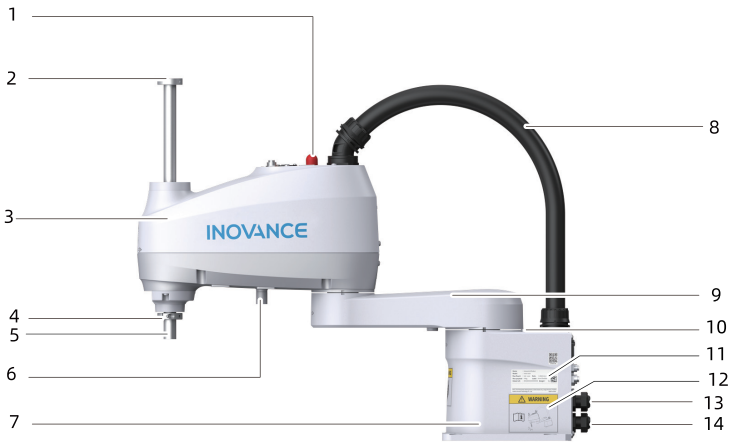
Note

- 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 certification information in the above nameplate is for illustrative purposes only; Refer to the actual product certification for specific details.

CAUTION

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

4.2.2 Components



No.	Description
1	Run indicator
2	J3 upper mechanical stop
3	Arm 2
4	J3 lower mechanical stop
5	J3 screw shaft
6	J2 mechanical stop
7	Base
8	Cable unit
9	Arm 1
10	J1 mechanical stop
11	Nameplate

No.	Description
12	Labels
13	Power cable
14	Signal cable

4.2.3 Product Dimensions

Standard model

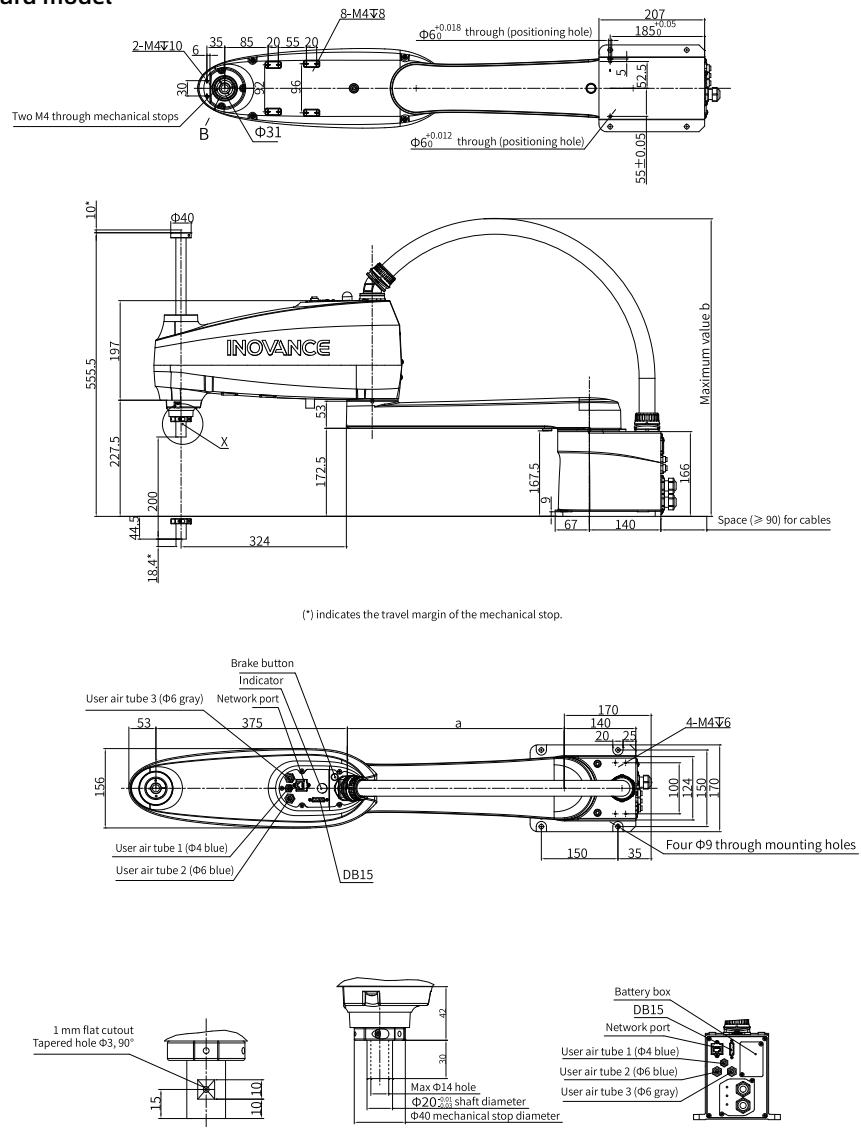


Figure 4-2 Outline dimensions (unit: mm)

Parameters of IR-S10 series standard robots with different arm lengths			
Model	IR-S10-60Z20S-INT	IR-S10-70Z20S-INT	IR-S10-80Z20S-INT
a	225	325	425
b	545	569	599

Cleanroom model

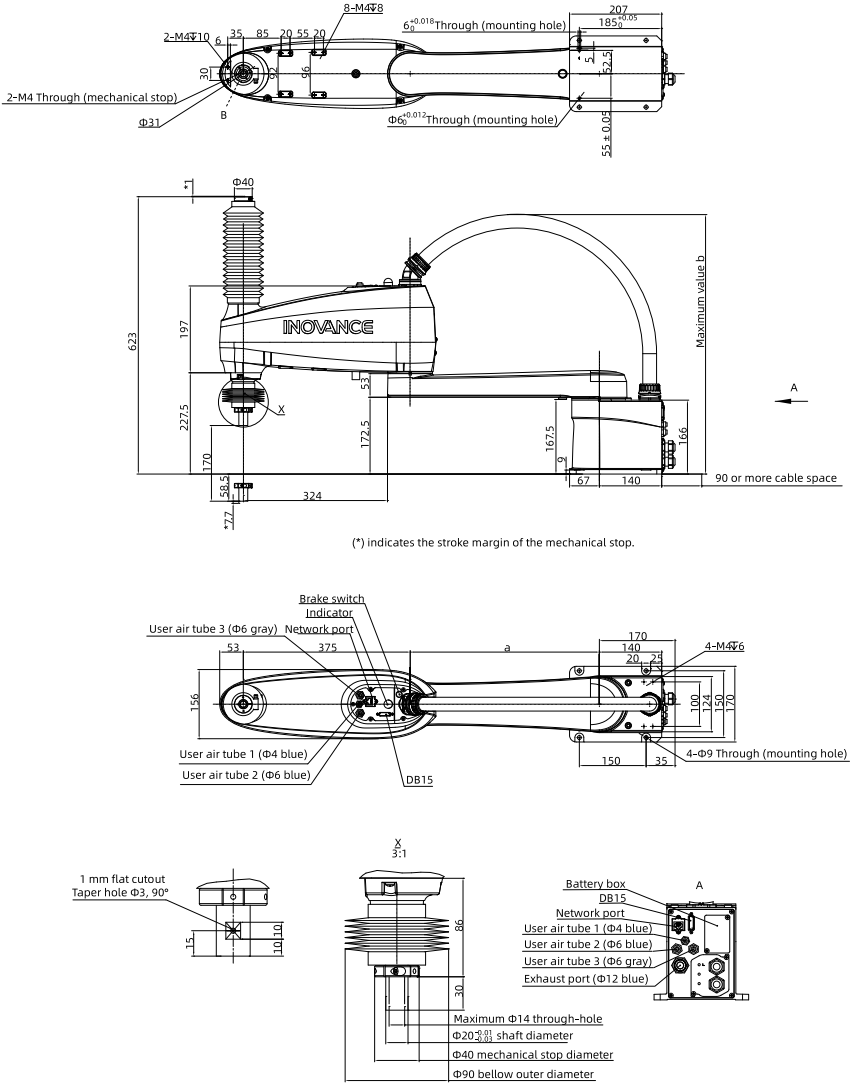


Figure 4-3 Outline dimensions (unit: mm)

Parameters of IR-S10 series cleanroom robots with different arm lengths			
Model	IR-S10-60Z17C-INT	IR-S10-70Z17C-INT	IR-S10-80Z17C-INT
a	225	325	425
b	545	569	599

4.2.4 Technical Specifications

Item		IR-S10-60Z20S-INT	IR-S10-70Z20S-INT	IR-S10-80Z20S-INT	IR-S10-60Z17C-INT	IR-S10-70Z17C-INT	IR-S10-80Z17C-INT
Arm length	Arm 1 + Arm 2	600 mm	700 mm	800 mm	600 mm	700 mm	800 mm
	Arm 1	225 mm	325 mm	425 mm	225 mm	325 mm	425 mm
	Arm 2	375 mm			375 mm		
Maximum speed	J1 + J2	9100 mm/s	9800 mm/s	10500 mm/s	9100 mm/s	9800 mm/s	10500 mm/s
	J3	1600 mm/s			1600 mm/s		
	J4	2700°/s			2700°/s		
Repeatability	J1 + J2	±0.02 mm		±0.025 mm	±0.02 mm		±0.025 mm
	J3	±0.01 mm			±0.01 mm		
	J4	±0.01°			±0.01°		
Handling capacity (load)	Rated	5 kg			5 kg		
	Max.	10 kg			10 kg		
Allowable load inertia of J4	Rated	0.02 kg·m²			0.02 kg·m²		
	Max.	0.3 kg·m²			0.3 kg·m²		
Mounting hole	Mounting hole	150 mm x 150 mm (4 x Φ9 mm)			150 mm x 150 mm (4 x Φ9 mm)		
Manipulator weight (excluding cables)	Manipulator weight (excluding cables)	18.5 kg	19 kg	20.5 kg	19 kg	19.5 kg	21 kg
Press-in force of J3	Press-in force of J3	200 N			200 N		
User wiring	Wiring	15x signal, 30 V, 0.5 A			15x signal, 30 V, 0.5 A		
	Ethernet connector	CAT5e			CAT5e		
User tubing	User tubing	Air tube: Φ4 mm x 1; Pressure resistance: 0.59 MPa			Air tube: Φ4 mm x 1; Pressure resistance: 0.59 MPa		
		Air tube: Φ6 mm x 2; Pressure resistance: 0.59 MPa			Air tube: Φ6 mm x 2; Pressure resistance: 0.59 MPa		
Ambient condition	Operating temperature[1]	5°C to 40°C			5°C to 40°C		
	Operating humidity	10% RH to 80% RH			10% RH to 80% RH		

Item		IR-S10-60Z20S-INT	IR-S10-70Z20S-INT	IR-S10-80Z20S-INT	IR-S10-60Z17C-INT	IR-S10-70Z17C-INT	IR-S10-80Z17C-INT
Noise level	Noise level[2]	L Aeq ≤ 70 dB(A)			L Aeq ≤ 70 dB(A)		
Maximum motion range	J1	±132°			±132°		
	J2	±150°			±150°		
	J3	200 mm			170 mm		
	J4	±360°			±360°		
Cycle time	Cycle time[3]	0.361s	0.386s	0.416s	0.37s	0.4s	0.43s
Input power (average power consumption)	Input power (average power consumption)	2 kVA (0.3 kW)			2 kVA (0.3 kW)		
Matching controller (standard)		IRCB501-4CD-INT					
Mounting method		Tabletop					
Certification compliance	Certification compliance	CE certification, cSGSus certification, FCC certification, and functional safety certification (only supported by "-INT" controller and requires a functional safety expansion card), KCs certification (refer to the certifications for the certified models).					

Note

[1] When used in a low-temperature environment approximating the lowest allowable temperature, or when idle for a long period of time due to holidays and nighttime, it is recommended to warm up the product for 10 minutes before operating it.

[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 joints operating at 100% speed and acceleration, with a duty cycle of 50%.

[3] Time required for a robot to move a 2 kg payload between two points 300 mm apart at a height of 25 mm.

4.3 Preparations Before Installation

4.3.1 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.

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

4.3.2 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 4–1 Ambient condition

Item	Requirement
Operating temperature/ humidity	• Temperature: 5°C to 40°C • Humidity: 10% RH to 80% RH (without condensation)
Storage temperature/ 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	• Place it indoors • 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.



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

4.3.3 Installation Base Table Requirements

You need to make a base table to secure 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-S10 Series	550	3200	1500

- Use M8 threaded holes on the base table to mount the robot. Use screws with a strength equivalent to the performance level of Grade 10.9 or 12.9 specified in GB/T 3098.1. See *"4.2.3 Product Dimensions" on page 136* for the dimensions.
- 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 using a level for height adjustment of the base table, use screws with a diameter larger than M8.
- When cutting holes in the base table for passing cables, ensure that the diameter of the holes is not less than 60 mm.
- Reserve enough space for the robot controller in the base table design. For details, see the "IRCB501-INT Series Robot Controller User Guide".

4.3.4 Installation Space Requirements

Motion range of standard model (unit: mm)

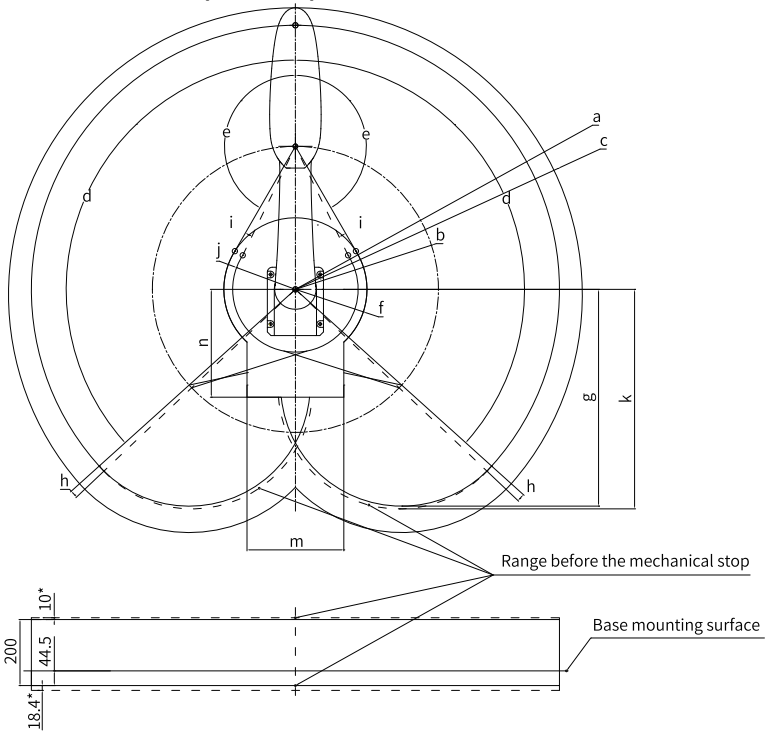


Figure 4-4 Motion range of standard model (unit: mm)

Motion range of IR-S10 series robots with different arm lengths			
Model	IR-S10-60Z20S-INT	IR-S10-70Z20S-INT	IR-S10-80Z20S-INT
a. Arm length of J1 + J2 (mm)	600	700	800
b. Arm length of J1 (mm)	225	325	425
c. Maximum motion range (mm)	653	753	853
d. Motion range of J1 (°)	132		
e. Motion range of J2 (°)	150		
f. Motion range (mm)	212.4	187.5	212.6
g. Rear motion range (mm)	525.6	592.5	659.4
h. Angle of mechanical stop position of J1 (°)	1		

Motion range of IR-S10 series robots with different arm lengths			
i. Angle of mechanical stop position of J2 (°)	1	3	4
j. Range of mechanical stop position (mm)	208.9	170.5	186
k. Range of rear mechanical stop position (mm)	528.5	596.7	664.9
m. Motion range (mm)	420	330	320
n. Motion range (mm)	300		

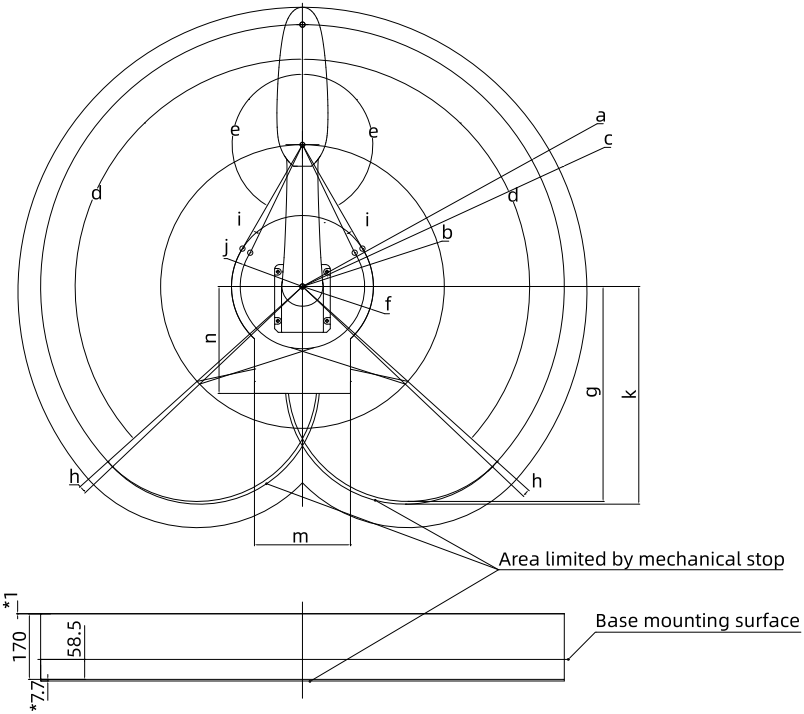


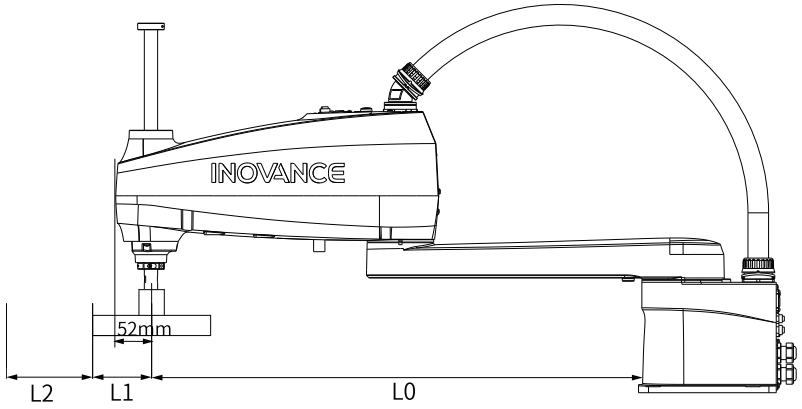
Figure 4-5 Motion range of IR-S10 series cleanroom robot

Motion range of IR-S10 series cleanroom robots with different arm lengths			
Model	IR-S10-60Z17C-INT	IR-S10-70Z17C-INT	IR-S10-80Z17C-INT
a. Arm length of J1 + J2 (mm)	600	700	800
b. Arm length of J1 (mm)	225	325	425
c. Maximum motion range (mm)	653	753	853

Motion range of IR-S10 series cleanroom robots with different arm lengths			
d. Motion range of J1 (°)	132		
e. Motion range of J2 (°)	150		
f. Motion range (mm)	212.4	187.5	212.6
g. Rear motion range (mm)	525.6	592.5	659.4
h. Angle of mechanical stop position of J1 (°)	1		
i. Angle of mechanical stop position of J2 (°)	1	3	4
j. Range of mechanical stop position (mm)	208.9	170.5	186
k. Range of rear mechanical stop position (mm)	528.5	596.7	664.9
m. Motion range (mm)	420	330	320
n. Motion range (mm)	300		

Maximum range

"Maximum range" is the area that contains the farthest reach of the arms. When an end effector with a radius of 52 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 space

The safety distance should be greater than L0+L1+L2.

4.3.5 Preparation of Installation Tools

Table 4–2 Preparation of tools

Tool	Quantity (pcs)
M8 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

4.4 Unpacking, Storage, and Handling

4.4.1 Precautions



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



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

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 equipment during transportation or storage, remove the condensation before turning on the power supply.

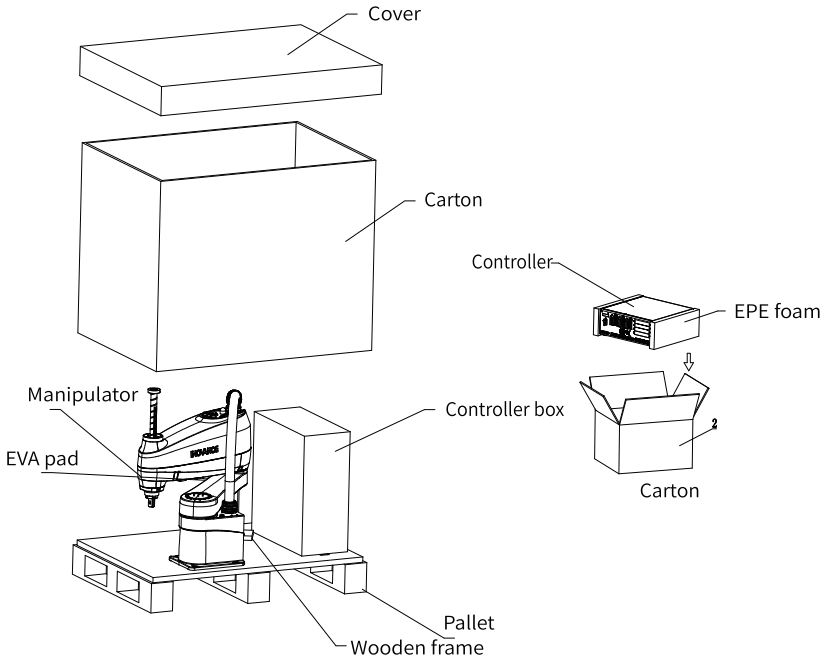
4.4.2 Unpacking

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.

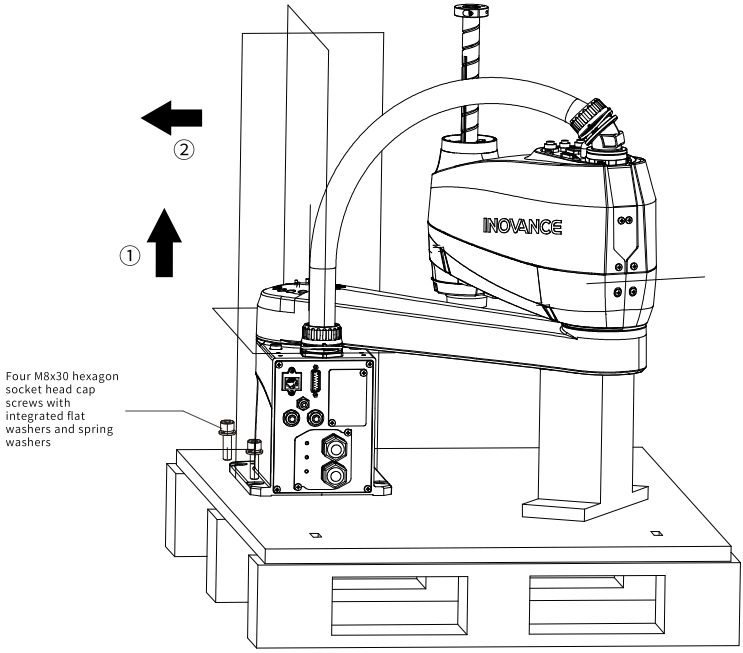
CAUTION

Wear gloves to prevent scratches.



2. Remove the robot body from the pallet.
   Remove the bolts securing the robot body on the pallet by using an M8 outer hexagon wrench.

   Take out the robot body by lifting it from bottom to top, and moving it horizontally. For details, see the handling procedure.



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.

4.4.3 Handling

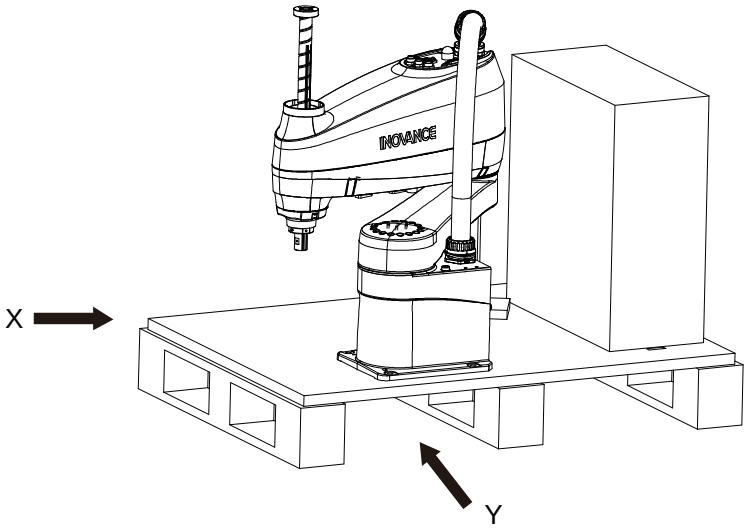
Preparation for handling

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

- **Manual handling**
  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 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.

4.5 Transportation Protection

For information on transportation protection, see *" Transportation Protection" on page 33*.

4.6 Installation

4.6.1 Installation Precautions

Danger

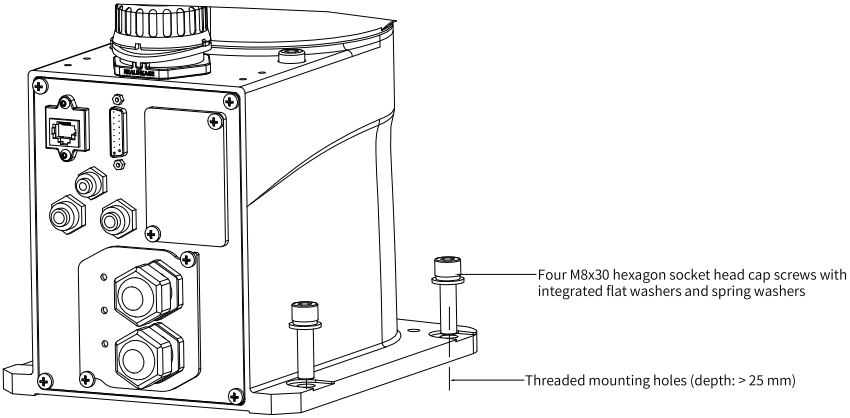
- Do not allow non-professionals to perform equipment installation, wiring, maintenance, inspection, or parts replacement.
- Install a safety fence for the system. Failure to comply may result in severe safety hazards.
- Reserve sufficient space between the equipment and surrounding buildings, structural 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 falling over.
- For the tabletop mounting, at least two people are required for the operation.

4.6.2 Installing the Robot Body

Secure the base to the base table with four M8x30 hexagon socket head cap screws with integrated flat washers and spring washers, 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
M8	30 N·m

4.6.3 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 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.

Design your own end effector mounting method with reference to the following dimensions. The weight of the end effector should not exceed 10 kg, as shown in the figure below.

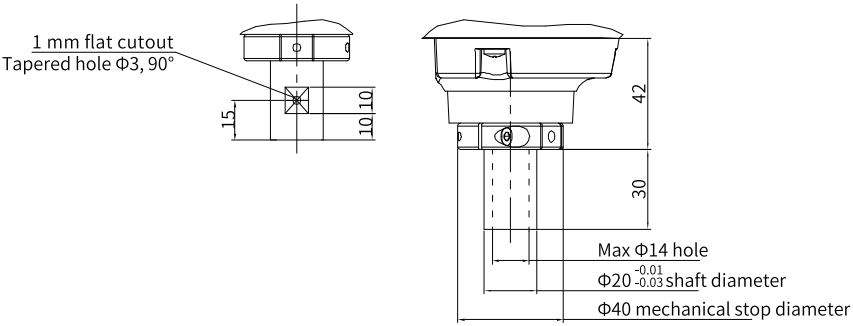


Figure 4-6 Auxiliary tooling mounting dimensions for standard model (unit: mm)

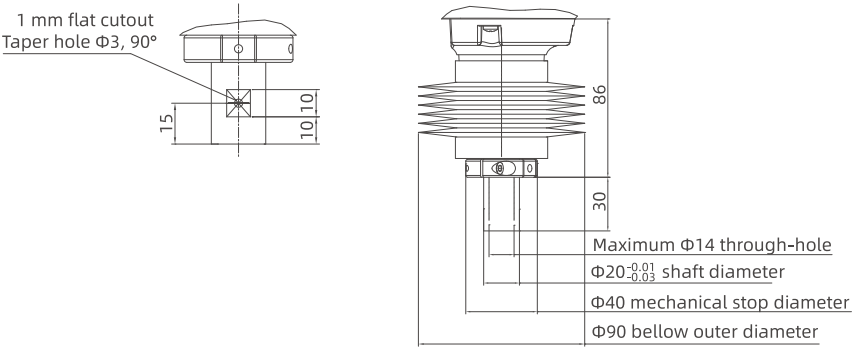


Figure 4-7 Auxiliary tooling mounting dimensions for cleanroom model (unit: mm)

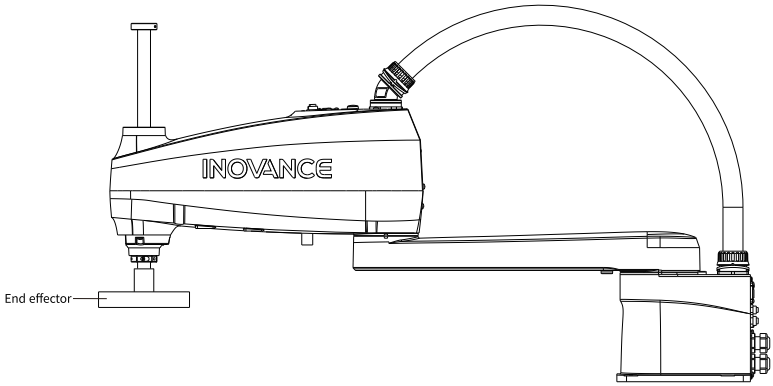


Figure 4-8 Installing the end effector

To move J3 up or down when installing the end effector, turn on the power of the controller and move the joint up/down or rotate the joint while pressing the brake

release switch. This switch is a momentary type switch that releases the brake only during the time it is pressed.

Be aware of sagging or rotation due to the weight of the end effector during pressing 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. See the "maximum range" in *"4.3.4 Installation Space Requirements" on page 142*.

4.6.4 Installing the Camera and Pneumatic Valve

The series robot provides mounting holes for the camera and pneumatic valve at the bottom of arm 2, as shown in the figure below.

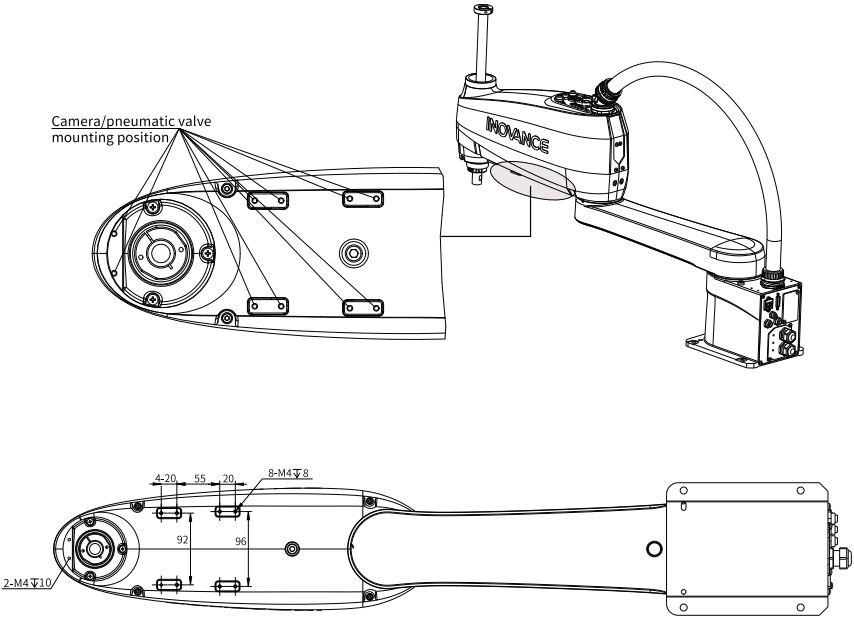


Figure 4-9 Installation of the camera and pneumatic valve (unit: mm)

4.6.5 Cable Connection

Note

- 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.



- 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 cable and signal cable to the controller.

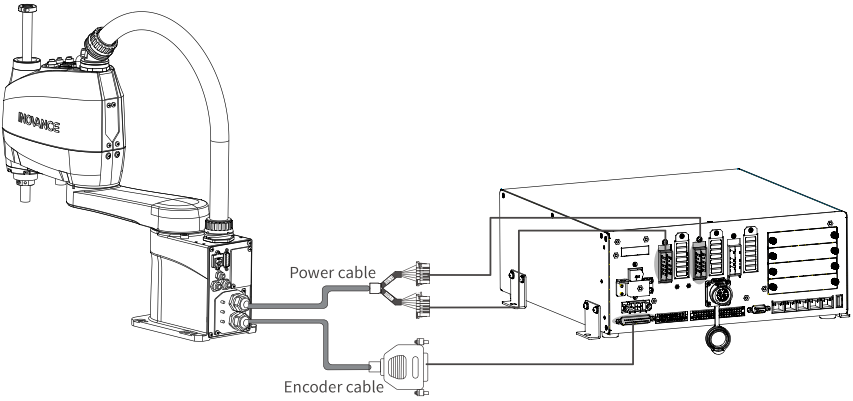
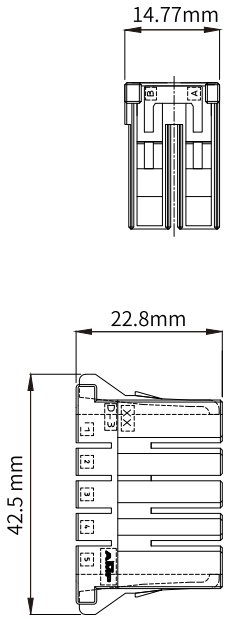
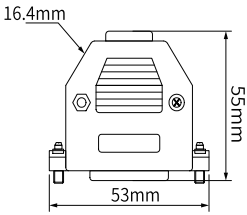
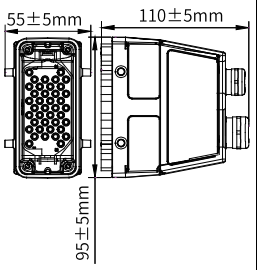
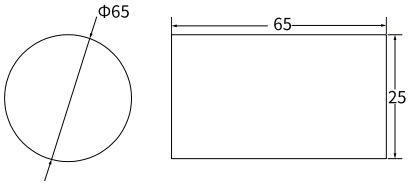
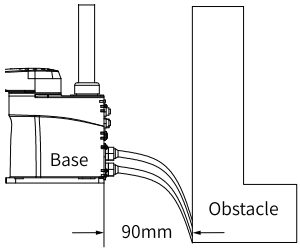


Figure 4-10 Cable connection

Table 4–3 Cable hole dimensions (IRCB501 series robot controller)

Name	Power cable connector (controller side)	Encoder cable connector (controller side)	Heavy-duty connector (robot 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)	95 mm x 110 mm x 55 mm (L x W x H)

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

Hole size (round hole & square hole) (mm)	Space reserved for the robot cable (connector size+cable bending radius)
	

4.6.6 Wiring and Tubing

Note

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

Wiring (Cables)



Current higher than 0.5 A is not allowed.

Model	Allowable current	Number of cores	Diameter	Remarks
D-sub 15Pin	0.5 A	15	24AWG	Wire connector provided as standard

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 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)

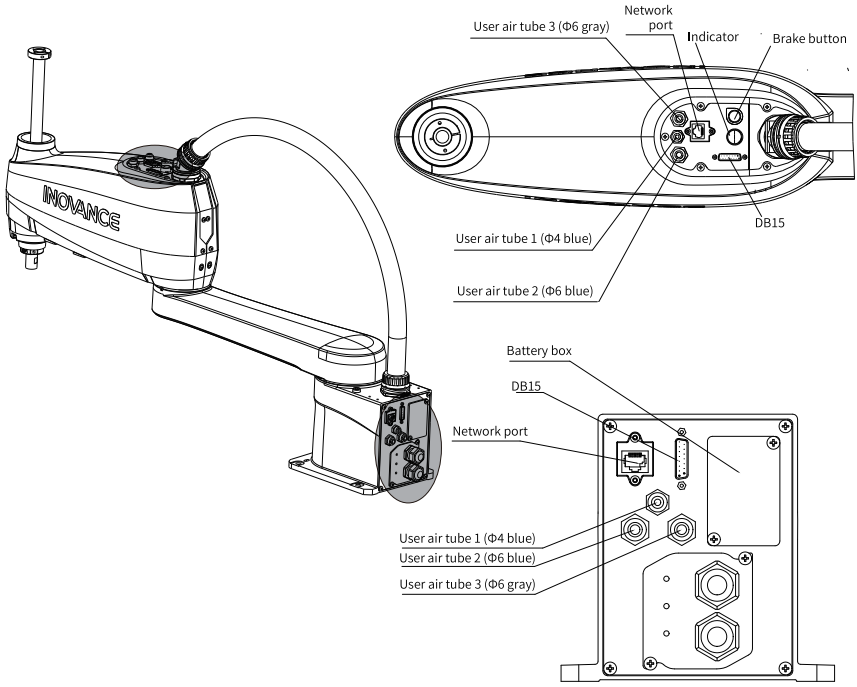
Note

Both ends of the air tubes are equipped with quick release couplings (outer diameter of Φ6 mm and Φ4 mm).

Pressure resistance	Quantity	Dimensions (outer diameter)
0.59 MPa (5.9 kgf/cm^2)	2	Φ6 mm
0.59 MPa (5.9 kgf/cm^2)	1	Φ4 mm

- Φ6 mm straight-through air tube fittings: two at the base and two at the forearm.
- Φ4 mm straight-through air tube fittings, one at the base and one at the forearm.

The air tube fittings are distinguished by color, as shown in the figure below.



4.7 Motion Range

4.7.1 Method for Setting the Motion Range

CAUTION

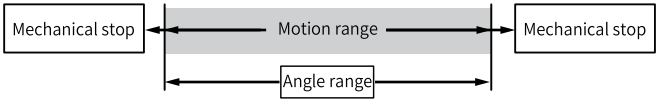
- To prevent premature wear of joint reducer bearings and gears due to insufficient oil film, avoid prolonged repetitive motion of joints within a small angular range of less than 10°.
- If the actual operating conditions require prolonged operation within an angle of less than 10°, it is recommended 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)



4.7.2 Motion Range Setting by Angle Range

4.7.2.1 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.

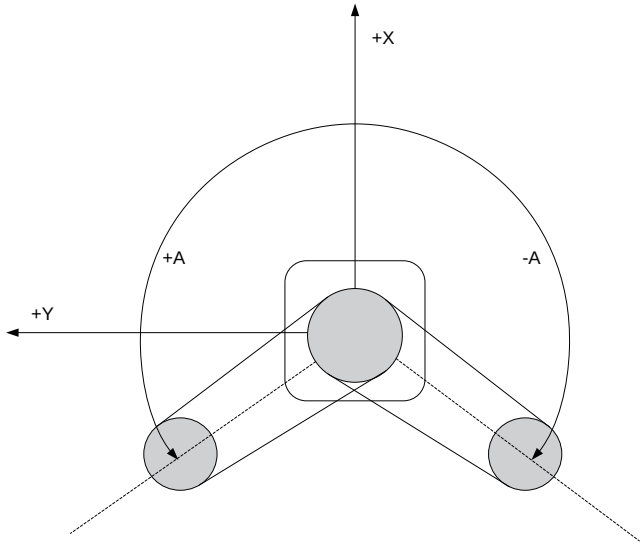
When the robot receives a motion command, it will check whether the target position of the command is within the angle range before moving. If the target position is beyond the set angle range, an error occurs and the robot does not move.

Note

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

4.7.2.2 Maximum Angle Range of J1

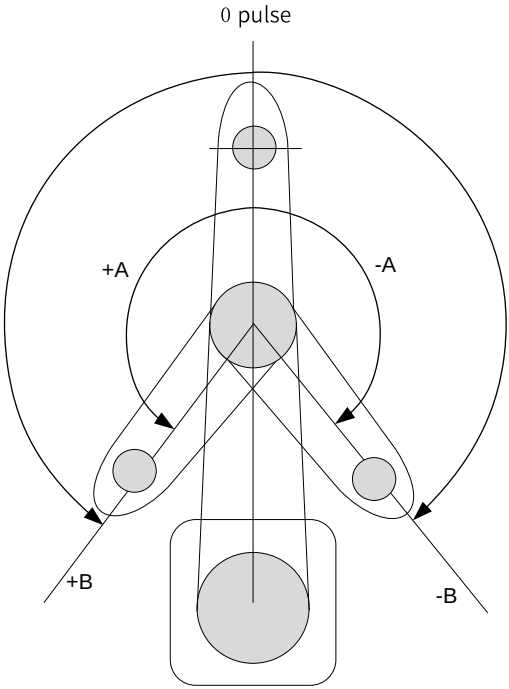
The zero-angle position of J1 refers to the position where the first arm is oriented toward the positive direction of the X coordinate axis. From the 0 pulse position, the clockwise angle is positive (+), and the counterclockwise angle is negative (-).



Model	Maximum motion range
IR-S10 Series	±132°

4.7.2.3 Maximum Angle Range of J2

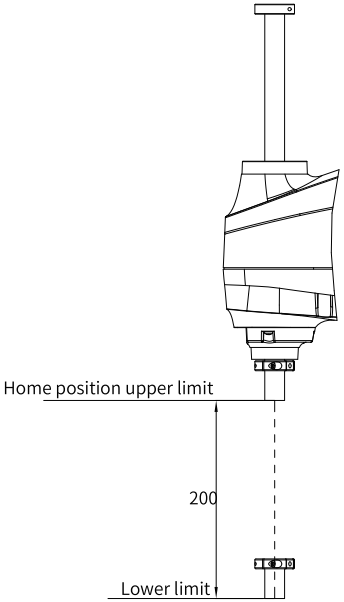
The zero-angle position of J2 refers to the position where the second arm is perpendicular to the first robot arm (regardless of the direction of the first arm). From the zero-angle position, the clockwise angle is positive (+), and the counterclockwise angle is negative (-).



Model	Maximum motion range
IR-S10 Series	±150°

4.7.2.4 Maximum Stroke of J3

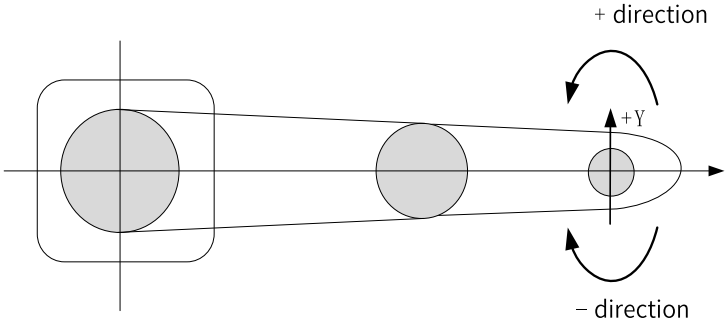
The zero-angle position of J3 is the upper limit position of the axis. When J3 descends from the zero-angle position, it will definitely change to a negative angle value.



Model	Stroke of J3
IR-S10 series standard model	200 mm
IR-S10 series cleanroom model	170 mm

4.7.2.5 Maximum Angle Range of J4

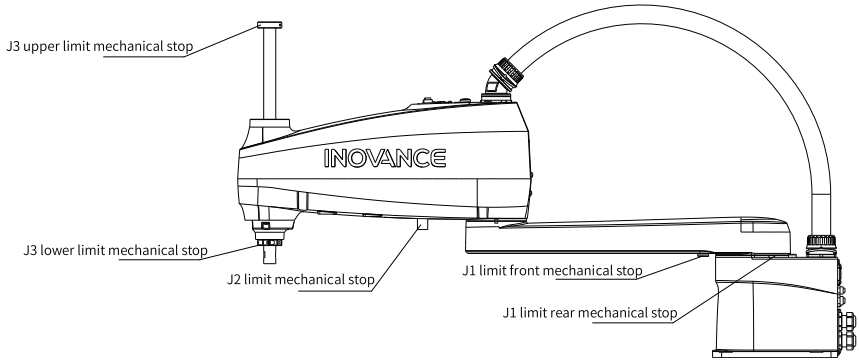
The zero-angle position of J4 refers to the position where the plane at the top of the axis is oriented toward the direction of the top of the second robot arm (regardless of the direction of the second arm). From the zero-angle position, the clockwise angle is positive (+), and the counterclockwise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



Model	Maximum motion range
IR-S10 Series	±360°

4.7.3 Mechanical Limit Stops

The robot has mechanical stops at J1, J2, and J3 but not J4, and all these mechanical stops are not adjustable. The set motion ranges for mechanical limit stops at J1 and J2 are extreme motion ranges. The up and down motion range for the mechanical limit stop at J3 is set by the internal program.



4.7.4 Standard Motion Range

Name	Description
Motion range	Indicates the situation at the standard (maximum) specifications. When motor of each joint is excited, the center of the lowest point of J3 moves in the areas shown in the figure below.
Area limited by mechanical stop	Indicates the area where the center of the lowest point of J3 can be moved when the motor of each joint is not excited.
Mechanical stop	Mechanically sets the absolute motion range beyond which motion is not allowed.
Maximum range	Indicates the area that contains the farthest reach of the arms. When an end effector with a radius of 53 mm or more is mounted, set the maximum range to the length of the two robot arms plus the radius of the end effector.

The motion range is shown below:

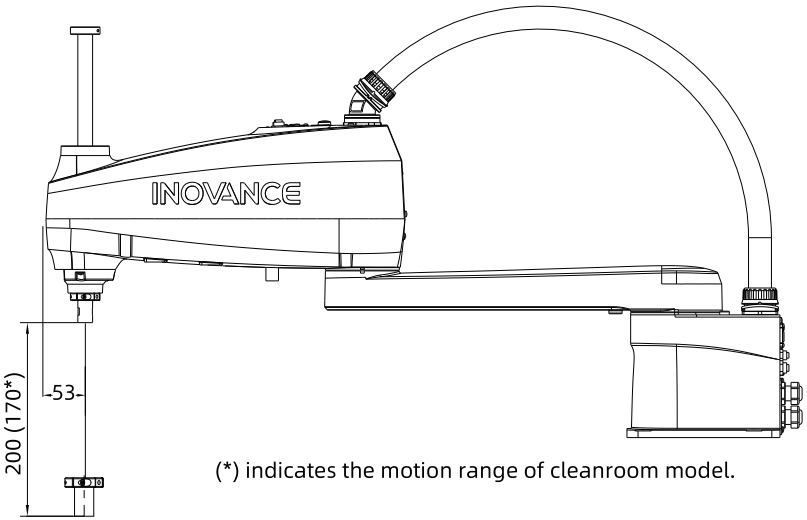


Figure 4-11 Motion range of end effector (unit: mm)

4.8 Inspection and Maintenance

4.8.1 Maintenance Precautions

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

Danger

- 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.

Warning

- 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.

4.8.2 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 rear controller fan 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.

4.8.3 Component Replacement

4.8.3.1 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.

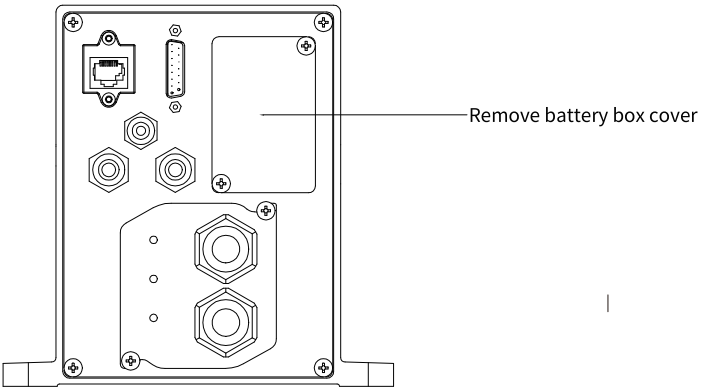
4.8.3.2 Battery Replacement

WARNING

- 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 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.



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. For details, see *"4.8.5.2 Zero Point Calibration of J1 and J2" on page 171*.

4.8.3.3 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.

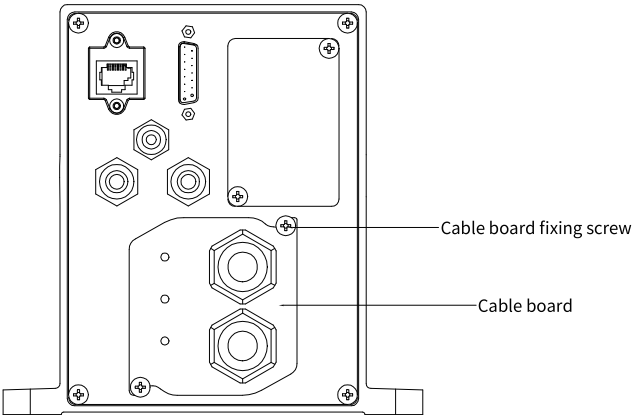


Figure 4-12 Cable plate on the base

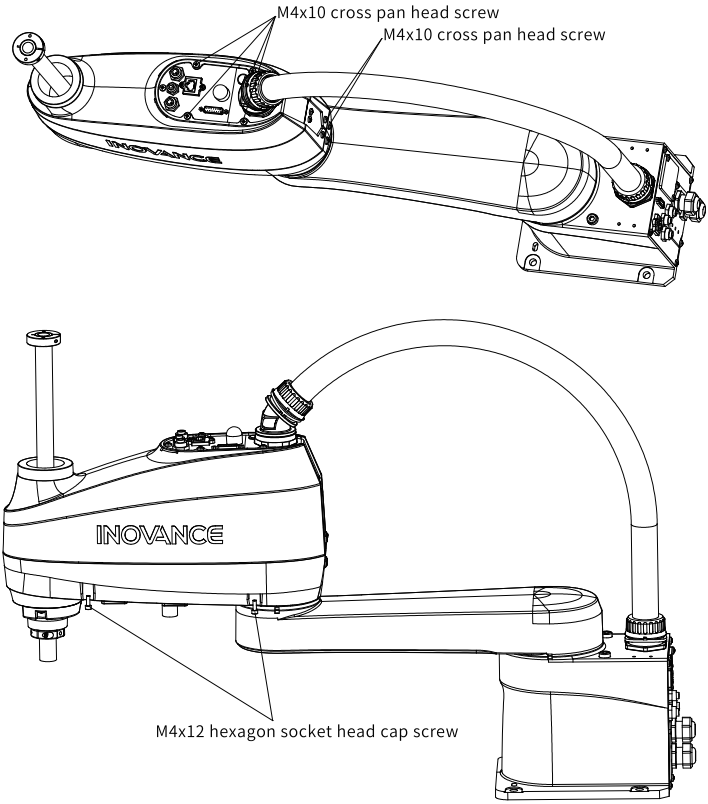
CAUTION

- 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.

4.8.3.4 Enclosure Replacement

Removing the forearm enclosure

Remove the six M4x10 screws on the enclosure and sheet metal, and then remove the four M4x12 hexagon socket head cap screws connecting the enclosure and the forearm.



Installing the forearm enclosure

1. Install the enclosure onto the forearm. Pay attention to the positioning pins and holes between the enclosure and the forearm to ensure that the mounting surface of the enclosure fits seamlessly with that of the forearm and sheet metal.
2. Install the six M4x10 screws on the enclosure and sheet metal with a torque of 0.6 N·m.
3. Install the four M4x12 hexagon socket head cap screws connecting the enclosure to the forearm, with a torque of 0.6 N.m.

4.8.4 Applying Lubricating Grease

The following table describes the grease refilling cycle:

Joint	Position	Cycle
J1 axis	Reducer	When replacing the motor.
J2 axis	Reducer	When replacing the motor.
J3 axis	Ball screw and spline	3 months

Cautions:

1. Only use original grease for the reducer and ball screw. See the IR-S4, IR-S7, and IR-S10 Series SCARA Robot Maintenance Guide for the grease type.
2. It is strictly forbidden to deplete the lubricating grease of the ball screw; otherwise, irreversible mechanical damage may occur.
3. Normally, the reducer does not require grease refilling. However, under the extreme conditions (duty cycle, speed, and load), the grease needs to be refilled every 10,000 hours.

Note

If the 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.

4.8.5 Zero Point Calibration

4.8.5.1 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 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.

4.8.5.2 Zero Point Calibration of J1 and J2

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 (IRTP200 series teach pendant). The operations on the hand-held teach pendant are similar.

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. The teach pendant provides a right/left wrist rule wizard. Follow the wizard to calibrate the zero point.

When calibrating the zero point using the teach pendant, calibrate J3 and J4 at the same time.

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 of the PC-based teaching software or the hand-held teach pendant.
   b. Enter the password in the password input box and click "OK" to log in.

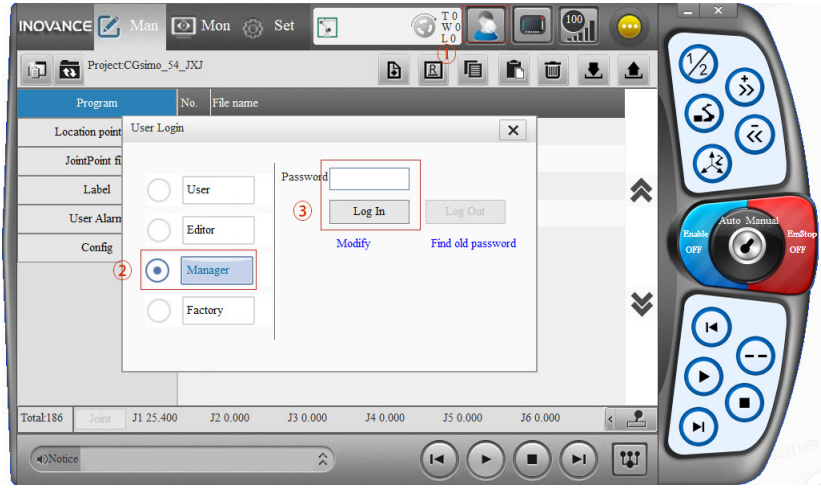


Figure 4-13 IRTP80 series teach pendant

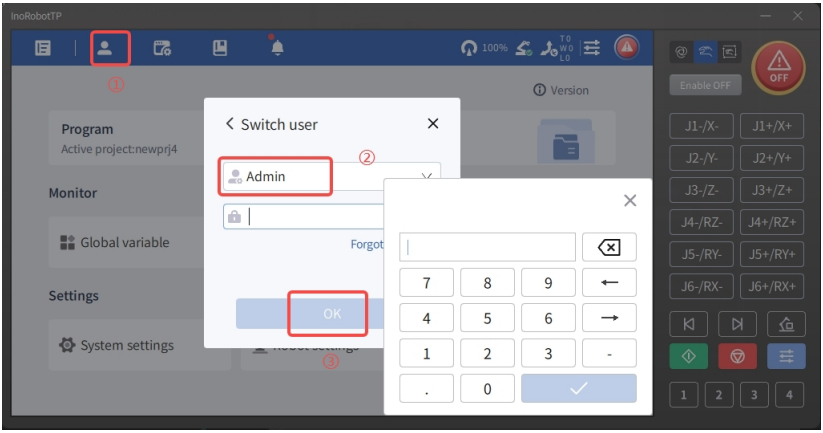


Figure 4-14 IRTP200 series teach pendant

2. Switch to the calibration interface.
   Choose "Settings" > "Zero point settings" > "Zero point calibration" on the InoRobotTP main interface.

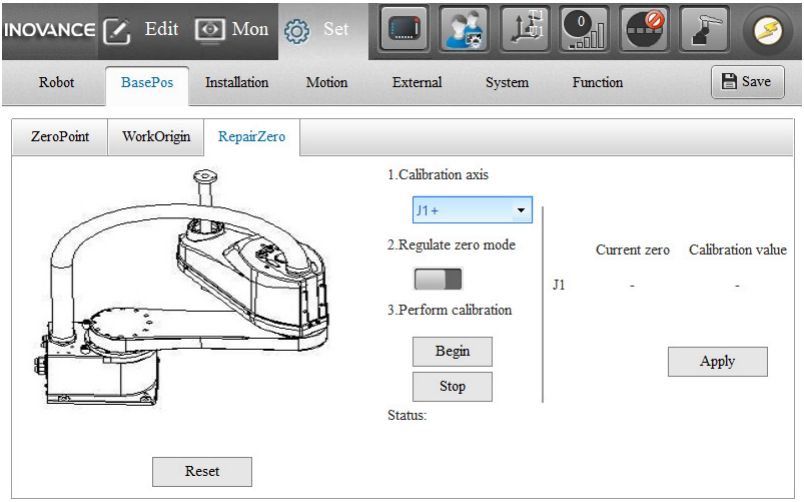


Figure 4-15 IRTP80 series teach pendant

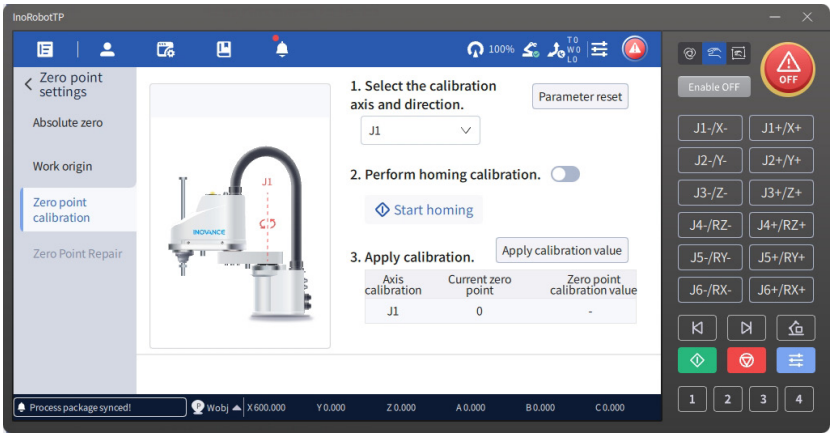


Figure 4-16 IRTP200 series teach pendant

3. Choose the axis number to enter the homing mode.
   Choose the axis you want to calibrate from the "Select the calibration axis and direction" drop-down list.
   - The homing motion direction of all axes is positive.
   - Caution: When switched to homing mode, the robot servo will be automatically enabled.

- If the multi-turn value of the encoder exceeds 2000, a warning pops up and emergency stop is triggered. In this case, you need to restart the controller and perform the homing operation again.

4. Perform the homing calibration.
   For example, select J2 axis and start homing.

   When the calibration is complete, a message "Homing successful" is displayed and the calibration value is updated.

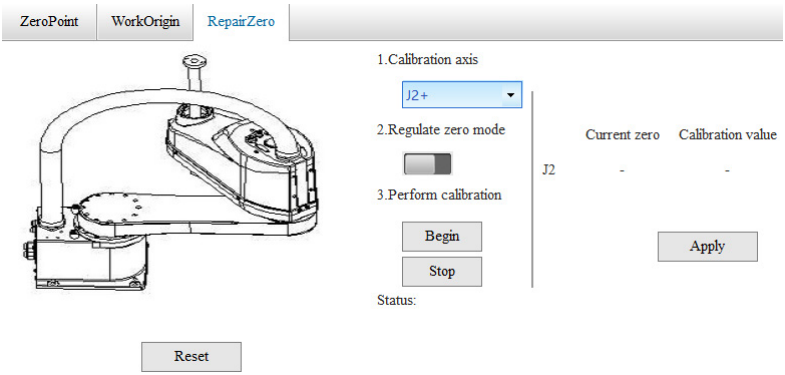


Figure 4-17 IRTP80 series teach pendant

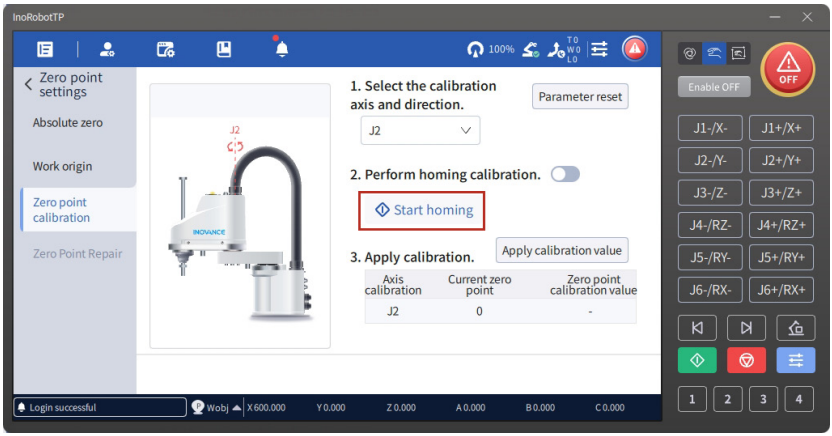


Figure 4-18 IRTP200 series teach pendant

5. 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 teaching software (or the display of the hand-held teach pendant) shows the emergency stop state (in red).

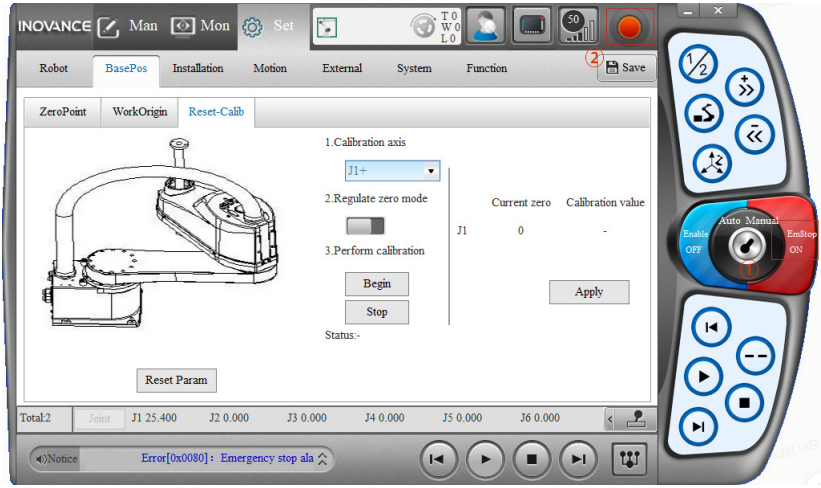


Figure 4-19 IRTP80 series teach pendant

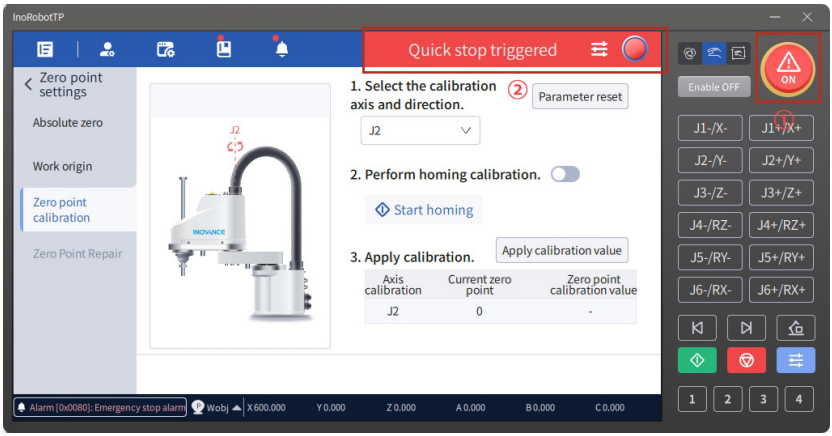


Figure 4-20 IRTP200 series teach pendant

6. Update the zero point.

a. Click "Apply calibration value".

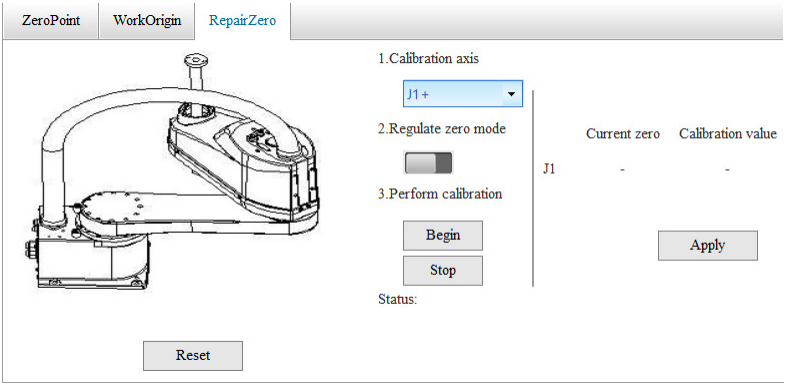


Figure 4-21 IRTP80 series teach pendant

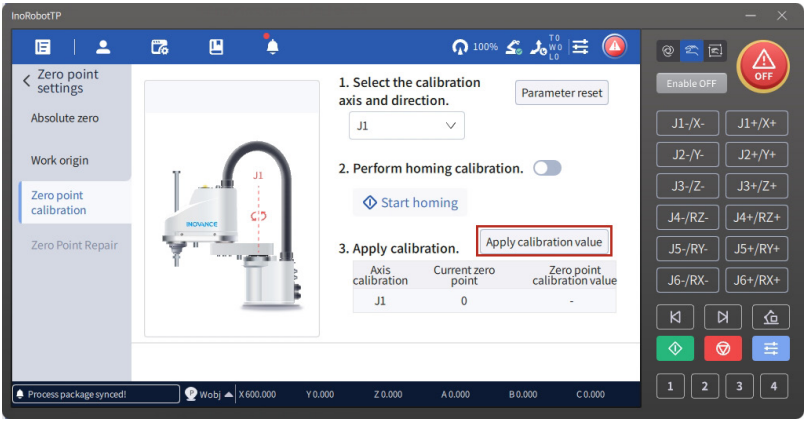


Figure 4-22 IRTP200 series teach pendant

b. Click "Yes". The current zero point is replaced by the zero calibration value.

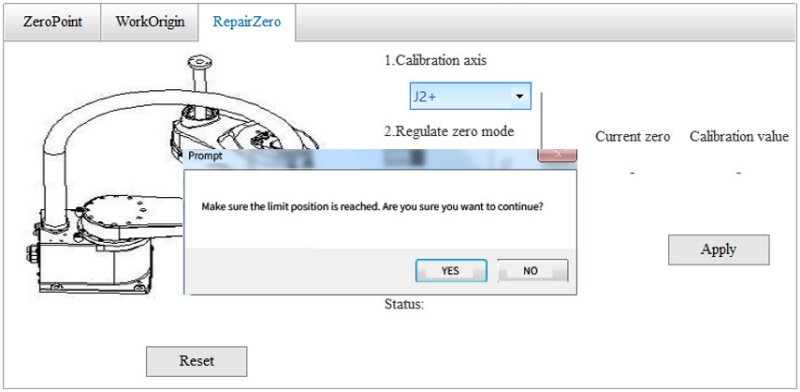


Figure 4-23 IRTP80 series teach pendant

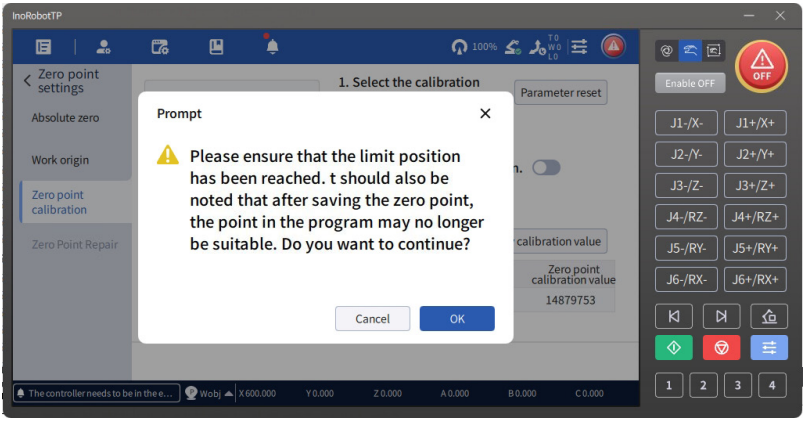


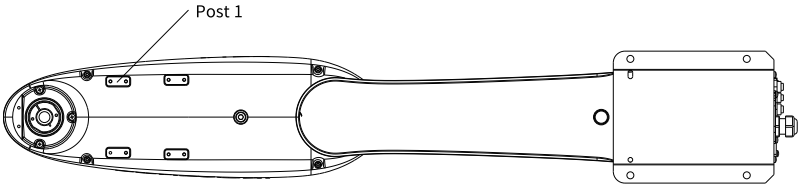
Figure 4-24 IRTP200 series teach pendant

7. Check the zero point.
   After updating the system zero point, check the result.

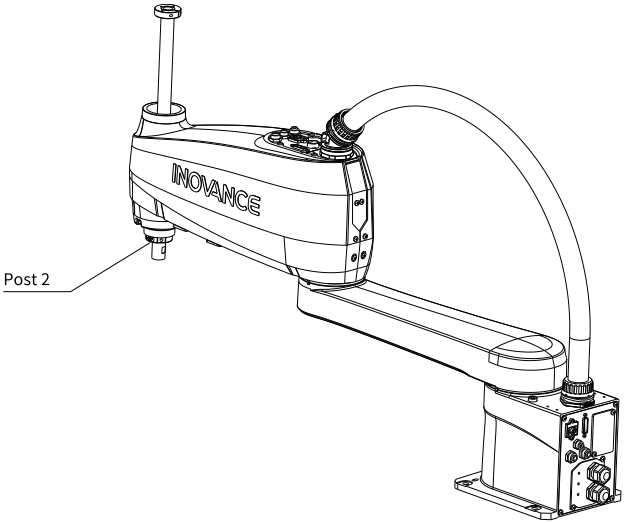
   Recommended method: Teach a point, change the left and right hand parameters, and then observe the deviation of the center of the lead screw moving to that point.

4.8.5.3 Zero Point Adjustment for J3 and J4

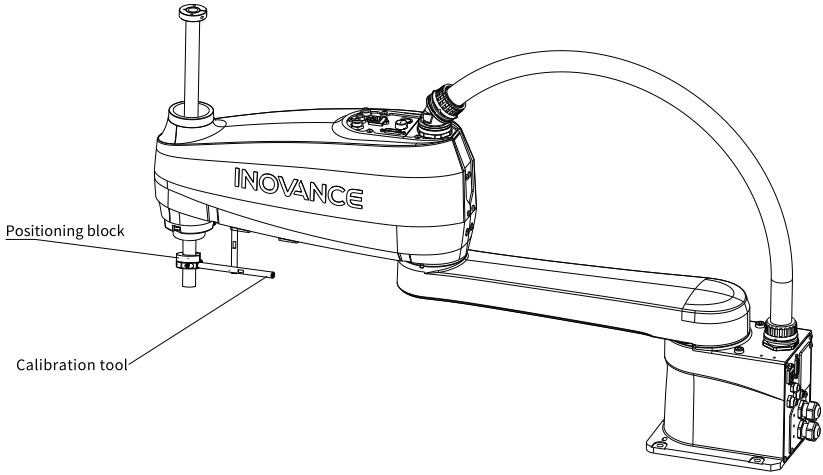
1. Fix the threaded end of homing column 1 in the M4 threaded hole at the bottom of the forearm, as shown in the figure below.



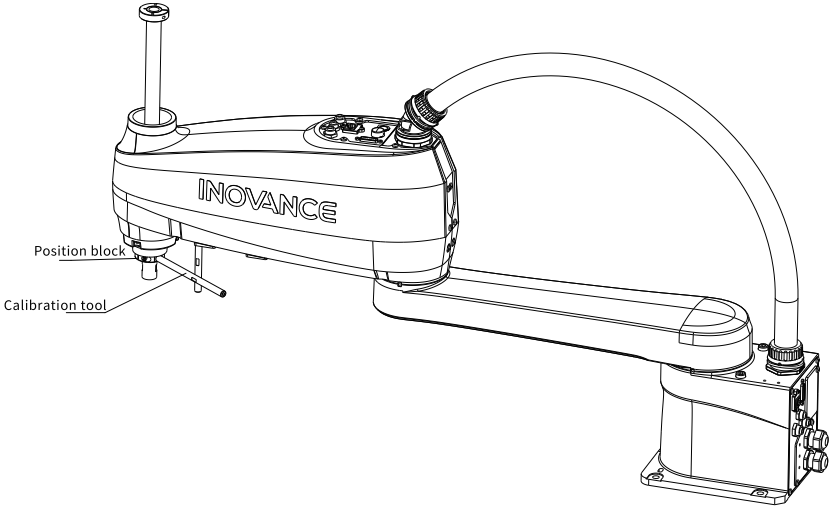
2. Fix the threaded end of homing column 2 in the M5 threaded hole of the screw limit ring, as shown in the figure below.



3. Rotate homing column 2 in the positive direction until it comes into contact with home column 1, stop rotation, and then assemble the located block onto the screw, as shown in the figure below.



4. Press the brake button and push the screw upwards until the located block comes into contact with the lower end of the spline nut (the screw cannot be pushed any further), as shown in the figure below. For other operations, refer to the auto homing procedure. Select the "J3J4+" homing axis to complete the homing operation.



4.8.5.4 Zero Point Position of Each Axis

1. The following figure shows the zero point positions of J1 and J2.

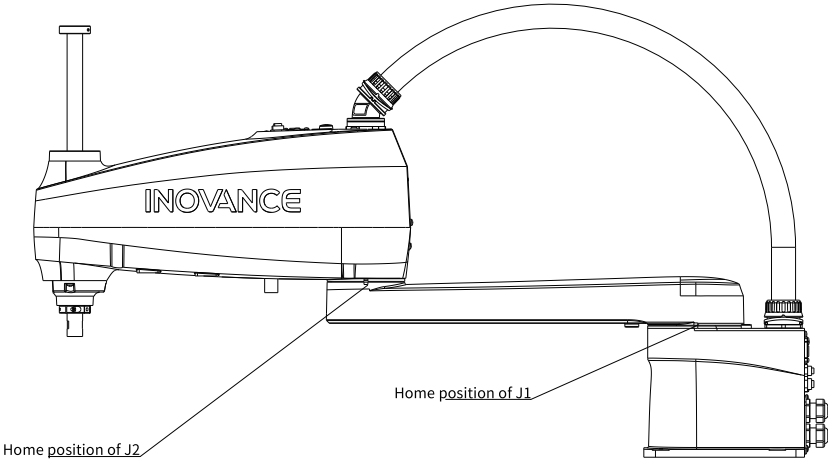


Figure 4-25 Zero point position of J1/J2

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

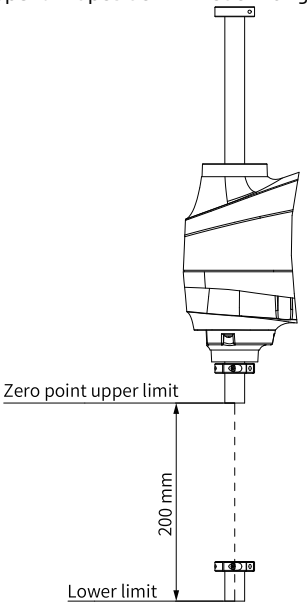


Figure 4-26 Zero point position of J3

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

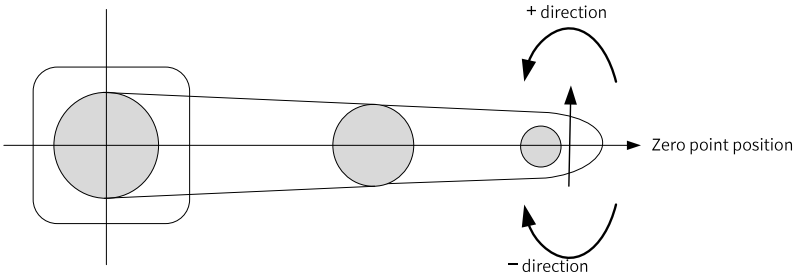


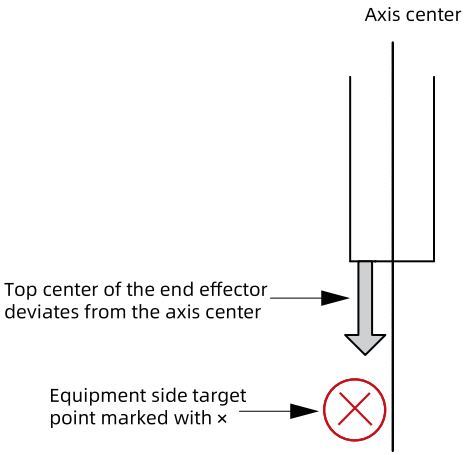
Figure 4-27 Zero point position of J4

4.8.5.5 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 through *"4.8.5.2 Zero Point Calibration of J1 and J2" on page 171*, follow the guidance provided on the teach pendant for zero point calibration using right/left wrist rule.

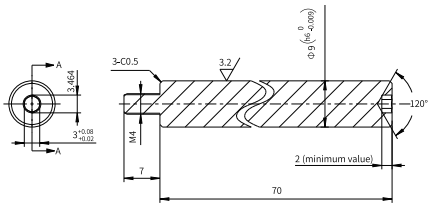
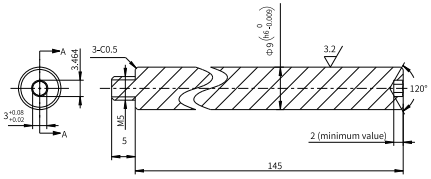
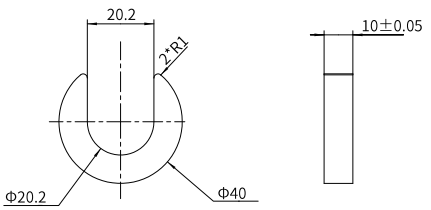
Zero point calibration procedure of J2

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 value" button to 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.

4.8.6 Options

Name		Code	Description	Schematic Diagram (Unit: mm)
Screw protective cover		20212980	Installed on the enclosure of the body, protecting the screw	-
Homing tool	Homecolumn 1	32020626	Used to adjust the zero points of J3 and J4	
	Homecolumn 2	32020627		
	Located block	32040084		

5 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 certified by Korea Occupational Safety and Health Agency (KOSHA) in terms of special equipment, labor protection supplies, and guard devices and carries the KCs mark.	Refer to the certifications for the certified models.

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

6 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.

PS00017837A03

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