INTELLIGENT ACTUATOR

IX

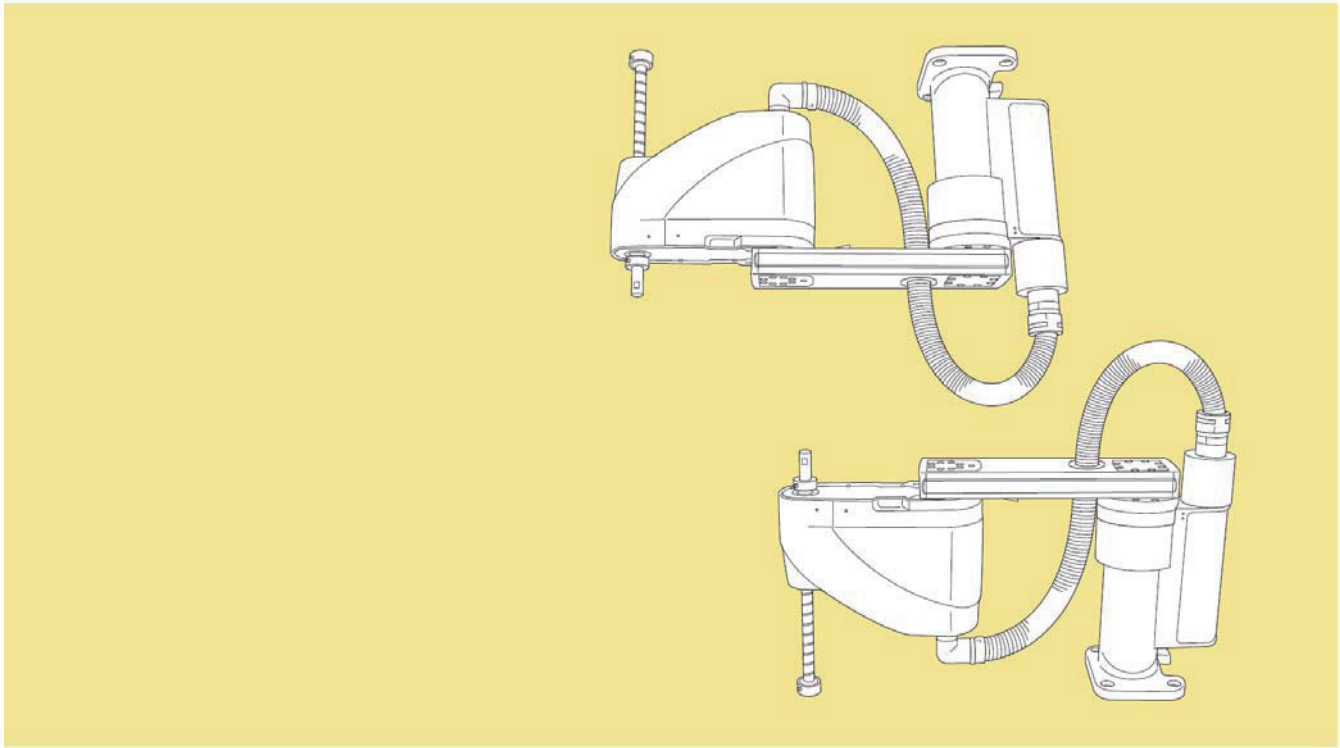
INTELLIGENT ACTUATOR

Horizontal Articulated Robot – IX Series

For Ceiling Mount Arm Length 500/600/700/800

IX-HNN50□□H/60□□H/70□□H/80□□H
IX-INN50□□H/60□□H/70□□H/80□□H

Operation Manual Fourth Eition



IAI America, Inc.

Please Read Before Use

Thank you for purchasing our product.

This Operation Manual explains the handling methods, structure and maintenance of this product, among others, providing the information you need to know to use the product safely.

Before using the product, be sure to read this manual and fully understand the contents explained herein to ensure safe use of the product.
The CD or DVD that comes with the product contains operation manuals for IAI products.
When using the product, refer to the necessary portions of the applicable operation manual by printing them out or displaying them on a PC.

After reading the Operation Manual, keep it in a convenient place so that whoever is handling this product can reference it quickly when necessary.

[Important]

- This Operation Manual is original.
- The product cannot be operated in any way unless expressly specified in this Operation Manual. IAI shall assume no responsibility for the outcome of any operation not specified herein.
- Information contained in this Operation Manual is subject to change without notice for the purpose of product improvement.
- If you have any question or comment regarding the content of this manual, please contact the IAI sales office near you.
- Using or copying all or part of this Operation Manual without permission is prohibited.
- The company names, names of products and trademarks of each company shown in the sentences are registered trademarks.

CE Marking

If a compliance with the CE Marking is required, please follow Overseas Standards Compliance Manual (ME0287) that is provided separately.

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Safety Guide

"Safety Guide" has been written to use the machine safely and so prevent personal injury or property damage beforehand. Make sure to read it before the operation of this product.

Safety Precautions for Our Products

The common safety precautions for the use of any of our robots in each operation.

No.	Operation Description	Description
1	Model Selection	● This product has not been planned and designed for the application where high level of safety is required, so the guarantee of the protection of human life is impossible. Accordingly, do not use it in any of the following applications. 1) Medical equipment used to maintain, control or otherwise affect human life or physical health. 2) Mechanisms and machinery designed for the purpose of moving or transporting people (For vehicle, railway facility or air navigation facility) 3) Important safety parts of machinery (Safety device, etc.) ● Do not use the product outside the specifications. Failure to do so may considerably shorten the life of the product. ● Do not use it in any of the following environments. 1) Location where there is any inflammable gas, inflammable object or explosive 2) Place with potential exposure to radiation 3) Location with the ambient temperature or relative humidity exceeding the specification range 4) Location where radiant heat is added from direct sunlight or other large heat source 5) Location where condensation occurs due to abrupt temperature changes 6) Location where there is any corrosive gas (sulfuric acid or hydrochloric acid) 7) Location exposed to significant amount of dust, salt or iron powder 8) Location subject to direct vibration or impact ● For an actuator used in vertical orientation, select a model which is equipped with a brake. If selecting a model with no brake, the moving part may drop when the power is turned OFF and may cause an accident such as an injury or damage on the work piece.

No.	Operation Description	Description
2	Transportation	● When carrying a heavy object, do the work with two or more persons or utilize equipment such as crane. ● When the work is carried out with 2 or more persons, make it clear who is to be the leader and who to be the follower(s) and communicate well with each other to ensure the safety of the workers. ● When in transportation, consider well about the positions to hold, weight and weight balance and pay special attention to the carried object so it would not get hit or dropped. ● Transport it using an appropriate transportation measure. The actuators available for transportation with a crane have eyebolts attached or there are tapped holes to attach bolts. Follow the instructions in the operation manual for each model. ● Do not step or sit on the package. ● Do not put any heavy thing that can deform the package, on it. ● When using a crane capable of 1t or more of weight, have an operator who has qualifications for crane operation and sling work. ● When using a crane or equivalent equipments, make sure not to hang a load that weighs more than the equipment's capability limit. ● Use a hook that is suitable for the load. Consider the safety factor of the hook in such factors as shear strength. ● Do not get on the load that is hung on a crane. ● Do not leave a load hung up with a crane. ● Do not stand under the load that is hung up with a crane.
3	Storage and Preservation	● The storage and preservation environment conforms to the installation environment. However, especially give consideration to the prevention of condensation. ● Store the products with a consideration not to fall them over or drop due to an act of God such as earthquake.
4	Installation and Start	(1) Installation of Robot Main Body and Controller, etc. ● Make sure to securely hold and fix the product (including the work part). A fall, drop or abnormal motion of the product may cause a damage or injury. Also, be equipped for a fall-over or drop due to an act of God such as earthquake. ● Do not get on or put anything on the product. Failure to do so may cause an accidental fall, injury or damage to the product due to a drop of anything, malfunction of the product, performance degradation, or shortening of its life. ● When using the product in any of the places specified below, provide a sufficient shield. 1) Location where electric noise is generated 2) Location where high electrical or magnetic field is present 3) Location with the mains or power lines passing nearby 4) Location where the product may come in contact with water, oil or chemical droplets

No.	Operation Description	Description
4	Installation and Start	(2) Cable Wiring ● Use our company's genuine cables for connecting between the actuator and controller, and for the teaching tool. ● Do not scratch on the cable. Do not bend it forcibly. Do not pull it. Do not coil it around. Do not insert it. Do not put any heavy thing on it. Failure to do so may cause a fire, electric shock or malfunction due to leakage or continuity error. ● Perform the wiring for the product, after turning OFF the power to the unit, so that there is no wiring error. ● When the direct current power (+24V) is connected, take the great care of the directions of positive and negative poles. If the connection direction is not correct, it might cause a fire, product breakdown or malfunction. ● Connect the cable connector securely so that there is no disconnection or looseness. Failure to do so may cause a fire, electric shock or malfunction of the product. ● Never cut and/or reconnect the cables supplied with the product for the purpose of extending or shortening the cable length. Failure to do so may cause the product to malfunction or cause fire.
		(3) Grounding ● The grounding operation should be performed to prevent an electric shock or electrostatic charge, enhance the noise-resistance ability and control the unnecessary electromagnetic radiation. ● For the ground terminal on the AC power cable of the controller and the grounding plate in the control panel, make sure to use a twisted pair cable with wire thickness 0.5mm^2 (AWG20 or equivalent) or more for grounding work. For security grounding, it is necessary to select an appropriate wire thickness suitable for the load. Perform wiring that satisfies the specifications (electrical equipment technical standards). ● Perform Class D Grounding (former Class 3 Grounding with ground resistance 100Ω or below).

No.	Operation Description	Description
4	Installation and Start	(4) Safety Measures ● When the work is carried out with 2 or more persons, make it clear who is to be the leader and who to be the follower(s) and communicate well with each other to ensure the safety of the workers. ● When the product is under operation or in the ready mode, take the safety measures (such as the installation of safety and protection fence) so that nobody can enter the area within the robot's movable range. When the robot under operation is touched, it may result in death or serious injury. ● Make sure to install the emergency stop circuit so that the unit can be stopped immediately in an emergency during the unit operation. ● Take the safety measure not to start up the unit only with the power turning ON. Failure to do so may start up the machine suddenly and cause an injury or damage to the product. ● Take the safety measure not to start up the machine only with the emergency stop cancellation or recovery after the power failure. Failure to do so may result in an electric shock or injury due to unexpected power input. ● When the installation or adjustment operation is to be performed, give clear warnings such as "Under Operation; Do not turn ON the power!" etc. Sudden power input may cause an electric shock or injury. ● Take the measure so that the work part is not dropped in power failure or emergency stop. ● Wear protection gloves, goggle or safety shoes, as necessary, to secure safety. ● Do not insert a finger or object in the openings in the product. Failure to do so may cause an injury, electric shock, damage to the product or fire. ● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity.
5	Teaching	● When the work is carried out with 2 or more persons, make it clear who is to be the leader and who to be the follower(s) and communicate well with each other to ensure the safety of the workers. ● Perform the teaching operation from outside the safety protection fence, if possible. In the case that the operation is to be performed unavoidably inside the safety protection fence, prepare the "Stipulations for the Operation" and make sure that all the workers acknowledge and understand them well. ● When the operation is to be performed inside the safety protection fence, the worker should have an emergency stop switch at hand with him so that the unit can be stopped any time in an emergency. ● When the operation is to be performed inside the safety protection fence, in addition to the workers, arrange a watchman so that the machine can be stopped any time in an emergency. Also, keep watch on the operation so that any third person can not operate the switches carelessly. ● Place a sign "Under Operation" at the position easy to see. ● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity. * Safety protection Fence : In the case that there is no safety protection fence, the movable range should be indicated.

No.	Operation Description	Description
6	Trial Operation	● When the work is carried out with 2 or more persons, make it clear who is to be the leader and who to be the follower(s) and communicate well with each other to ensure the safety of the workers. ● After the teaching or programming operation, perform the check operation one step by one step and then shift to the automatic operation. ● When the check operation is to be performed inside the safety protection fence, perform the check operation using the previously specified work procedure like the teaching operation. ● Make sure to perform the programmed operation check at the safety speed. Failure to do so may result in an accident due to unexpected motion caused by a program error, etc. ● Do not touch the terminal block or any of the various setting switches in the power ON mode. Failure to do so may result in an electric shock or malfunction.
7	Automatic Operation	● Check before starting the automatic operation or rebooting after operation stop that there is nobody in the safety protection fence. ● Before starting automatic operation, make sure that all peripheral equipment is in an automatic-operation-ready state and there is no alarm indication. ● Make sure to operate automatic operation start from outside of the safety protection fence. ● In the case that there is any abnormal heating, smoke, offensive smell, or abnormal noise in the product, immediately stop the machine and turn OFF the power switch. Failure to do so may result in a fire or damage to the product. ● When a power failure occurs, turn OFF the power switch. Failure to do so may cause an injury or damage to the product, due to a sudden motion of the product in the recovery operation from the power failure.

No.	Operation Description	Description
8	Maintenance and Inspection	● When the work is carried out with 2 or more persons, make it clear who is to be the leader and who to be the follower(s) and communicate well with each other to ensure the safety of the workers. ● Perform the work out of the safety protection fence, if possible. In the case that the operation is to be performed unavoidably inside the safety protection fence, prepare the “Stipulations for the Operation” and make sure that all the workers acknowledge and understand them well. ● When the work is to be performed inside the safety protection fence, basically turn OFF the power switch. ● When the operation is to be performed inside the safety protection fence, the worker should have an emergency stop switch at hand with him so that the unit can be stopped any time in an emergency. ● When the operation is to be performed inside the safety protection fence, in addition to the workers, arrange a watchman so that the machine can be stopped any time in an emergency. Also, keep watch on the operation so that any third person can not operate the switches carelessly. ● Place a sign “Under Operation” at the position easy to see. ● For the grease for the guide or ball screw, use appropriate grease according to the Operation Manual for each model. ● Do not perform the dielectric strength test. Failure to do so may result in a damage to the product. ● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity. ● The slider or rod may get misaligned OFF the stop position if the servo is turned OFF. Be careful not to get injured or damaged due to an unnecessary operation. ● Pay attention not to lose the cover or untightened screws, and make sure to put the product back to the original condition after maintenance and inspection works. Use in incomplete condition may cause damage to the product or an injury. * Safety protection Fence : In the case that there is no safety protection fence, the movable range should be indicated.
9	Modification and Dismantle	● Do not modify, disassemble, assemble or use of maintenance parts not specified based at your own discretion.
10	Disposal	● When the product becomes no longer usable or necessary, dispose of it properly as an industrial waste. ● When removing the actuator for disposal, pay attention to drop of components when detaching screws. ● Do not put the product in a fire when disposing of it. The product may burst or generate toxic gases.
11	Other	● Do not come close to the product or the harnesses if you are a person who requires a support of medical devices such as a pacemaker. Doing so may affect the performance of your medical device. ● See Overseas Specifications Compliance Manual to check whether complies if necessary. ● For the handling of actuators and controllers, follow the dedicated operation manual of each unit to ensure the safety.

Alert Indication

The safety precautions are divided into “Danger”, “Warning”, “Caution” and “Notice” according to the warning level, as follows, and described in the operation Manual for each model.

Level	Degree of Danger and Damage	Symbol
Danger	This indicates an imminently hazardous situation which, if the product is not handled correctly, will result in death or serious injury.	Danger
Warning	This indicates a potentially hazardous situation which, if the product is not handled correctly, could result in death or serious injury.	Warning
Caution	This indicates a potentially hazardous situation which, if the product is not handled correctly, may result in minor injury or property damage.	Caution
Notice	This indicates lower possibility for the injury, but should be kept to use this product properly.	Notice

Handling Precautions

1. Repetitive Positioning Accuracy Does Not Change Even If the Positioning Width is Changed.

Repetitive positioning accuracy does not change even if the positioning width is changed.
If the positioning width is narrower than the default value, the repetitive positioning accuracy does not change, but the time it takes for the positioning complete signal to be output takes longer. The execution of next operation instruction (e.g., MOVP, MOVL) is delayed and, as a result, the tact time of the entire cycle may be delayed.

2. Make sure to attach the Horizontal Articulated Robot properly by following this operation manual.

Using the product with the Horizontal Articulated Robot not being certainly retained or affixed may cause abnormal noise, vibration, malfunction or shorten the product life.

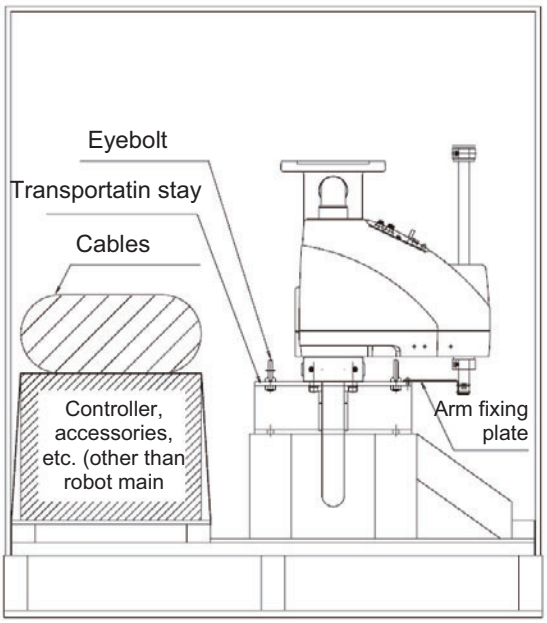
3. Handling of the Carton

Each robot is packed with a controller prior to shipment.
When transporting the carton containing the robot and controller, observe the following items and be careful not to drop the carton or apply impact due to forcible contact:

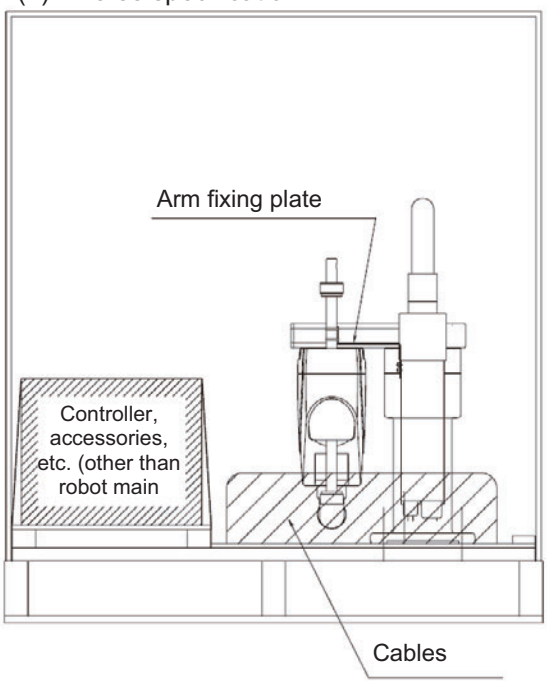
- If the carton is heavy, one operator should not attempt to carry it alone.
- Place the carton on a level surface if it is to be left there for a while.
- Do not climb upon the carton.
- Do not place on the carton any heavy object that may cause the carton to deform, or an article whose shape allows a load to be concentrated at one point.

[Carton]

(1) Ceiling mount specification



(2) Inverse specification



⚠ Warning **⚠ Caution**

- The robot and controller are very heavy. When transporting the carton containing the robot and controller, handle it with extra care so as not to drop the carton or apply impact due to forcible contact, as it may cause injury or damage to the robot or controller.
- Serious injury may result if the carton is dropped onto a person during transportation.
- Never stand below the carton as it is hoisted.
- Use a carrier device with sufficient loading capacity.
- If a machine or method is used that requires specified skills, it must be operated/performed by a person having the proper qualifications.

4. Handling of Individual Components

The robot and controller are supplied as a set.
Your robot cannot be used with the controller supplied with another robot.
When handling multiple robots, check that the serial number printed on each of the robot main bodies and the serial number of the corresponding controller are the same and take due caution not to switch the controllers.

The robot will not stand on its own after being unloaded from the carton pallet.
Hold it by hand, or place a cushioning material on the floor and place the robot on its side upon the cushion.

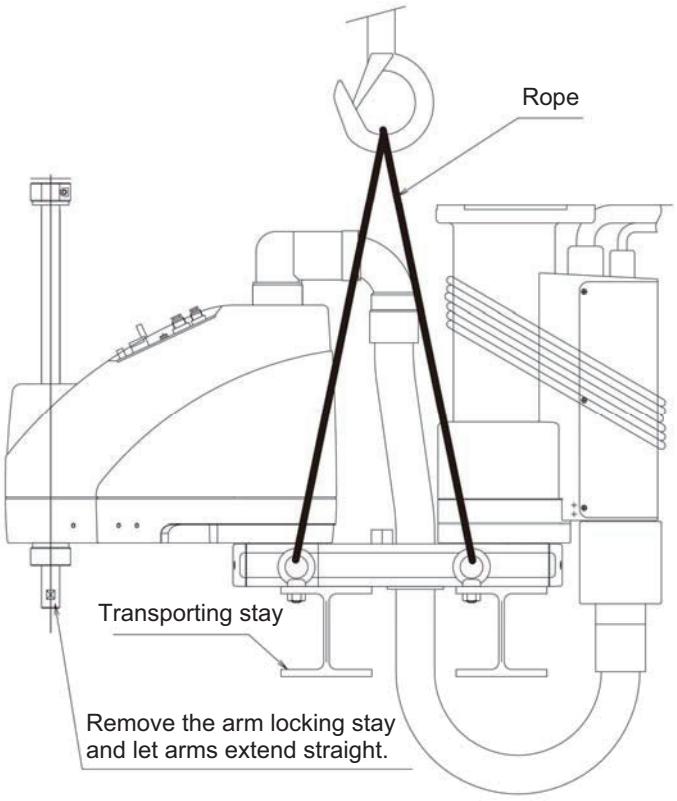
5. Transportation

5.1 IX-HNN50□□H/60□□H/70□□H/80□□H

Use a dolly, forklift, crane, etc., to transport the robot.
When transporting the robot, move the robot slowly by paying attention to the balance of the robot and being careful not to apply vibration or shock.

5.1.1 Transporting the Ceiling Specification

Remove the arm locking plates and let arms 1 and 2 extend straight.
Loop the cables around the base and secure them with adhesive tape, etc., or secure the cables to the transporting stays with adhesive tape, etc.
If a crane is used, install the supplied eye-bolts (4 pcs) on the transporting stays. Remove the arm locking plates, let arms 1 and 2 extend straight, and transport the robot in the posture shown below.

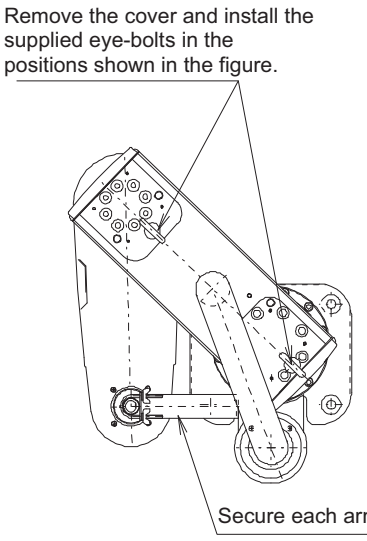


Transporting posture of ceiling specification using eye-bolts

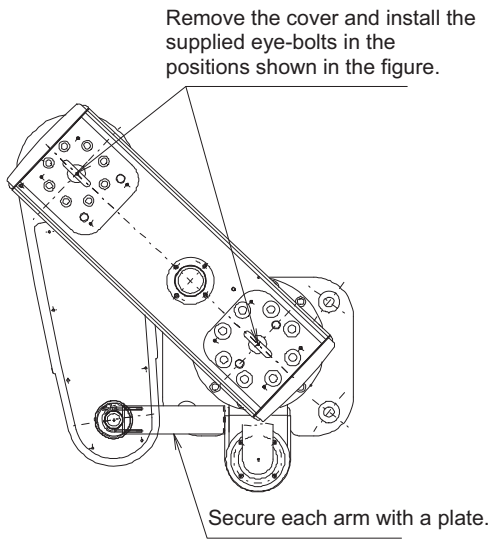
5.2 IX-INN50□□H/60□□H/70□□H/80□□H

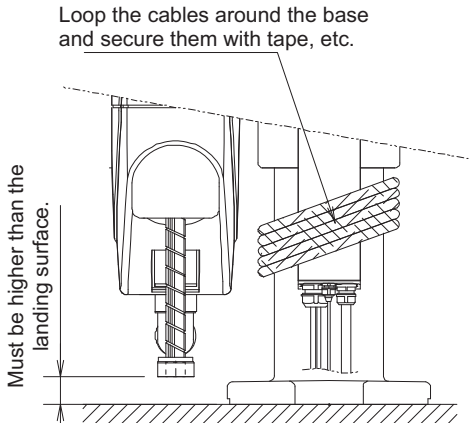
Secure the arms with arm locking plates, and loop the cables around the base and secure them with adhesive tape, etc.
If a crane is used, install the supplied eye-bolts (2 pcs) on the robot and transport the robot using the eye-bolts.
Remove the top cover of arm 1 and install the eye-bolts in the positions shown in the figure.

IX-INN50□□H/60□□H



IX-INN70□□H/80□□H



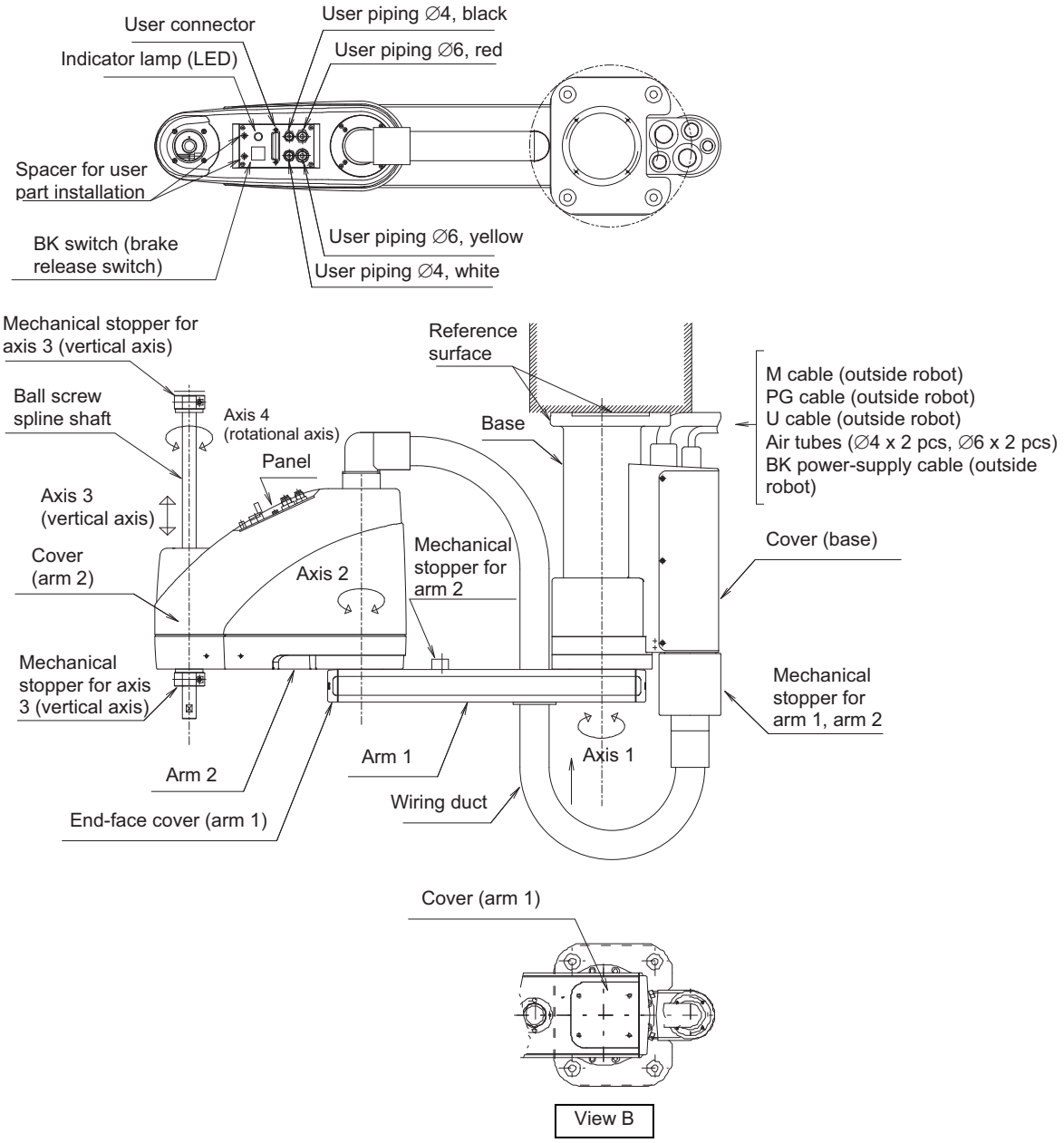


⚠ Danger **⚠ Warning**

- It is dangerous not to secure the cables because they may be dragged and catch your feet.
- Do not attempt to transport or move the robot by directly carrying it, because you may hurt your back or drop the robot onto your feet.
- If the robot drops during transport you may be pinned down and sustain serious injury.
- Never stand underneath the robot while it is suspended,
- Use an appropriate hoist and ropes whose payload is sufficiently greater than the mass of the robot.
- If any machine or means is used that requires a specified qualification, it must be operated by a person having the required qualification.

1. Name of Each Part

1.1 Robot



1.2 Labels

The following labels are attached on the robot and controller. Be sure to observe the instructions and cautions written on the labels to ensure the correct use of the robot/controller.

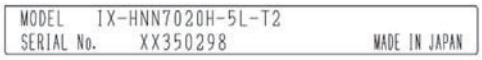
(1) Labels on the Robot

Prohibition of entry into the operation area

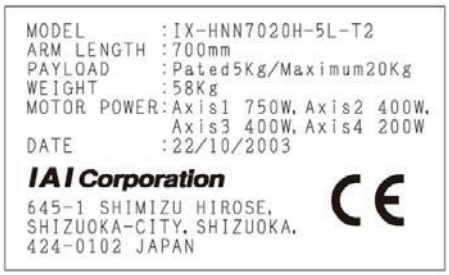
Warning on handling of the vertical axis

Warning against electric shock

Robot model nameplate

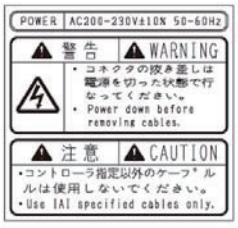


CE-certified robot
(Provided only for CE-certified models)

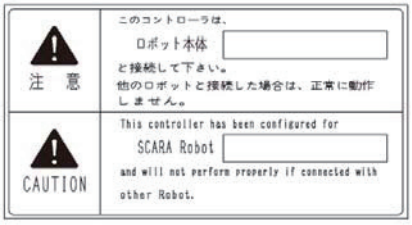


(2) Labels on the Controller

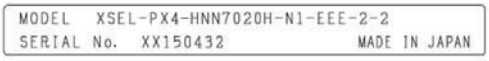
Caution/warning on handling of the controller



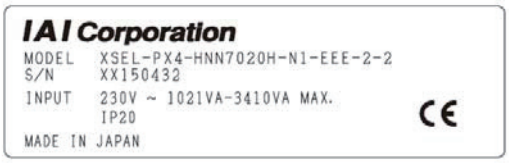
Designation of the connected robot



Controller model nameplate
(Other than CE-certified models)



Controller model nameplate
(CE-certified models)

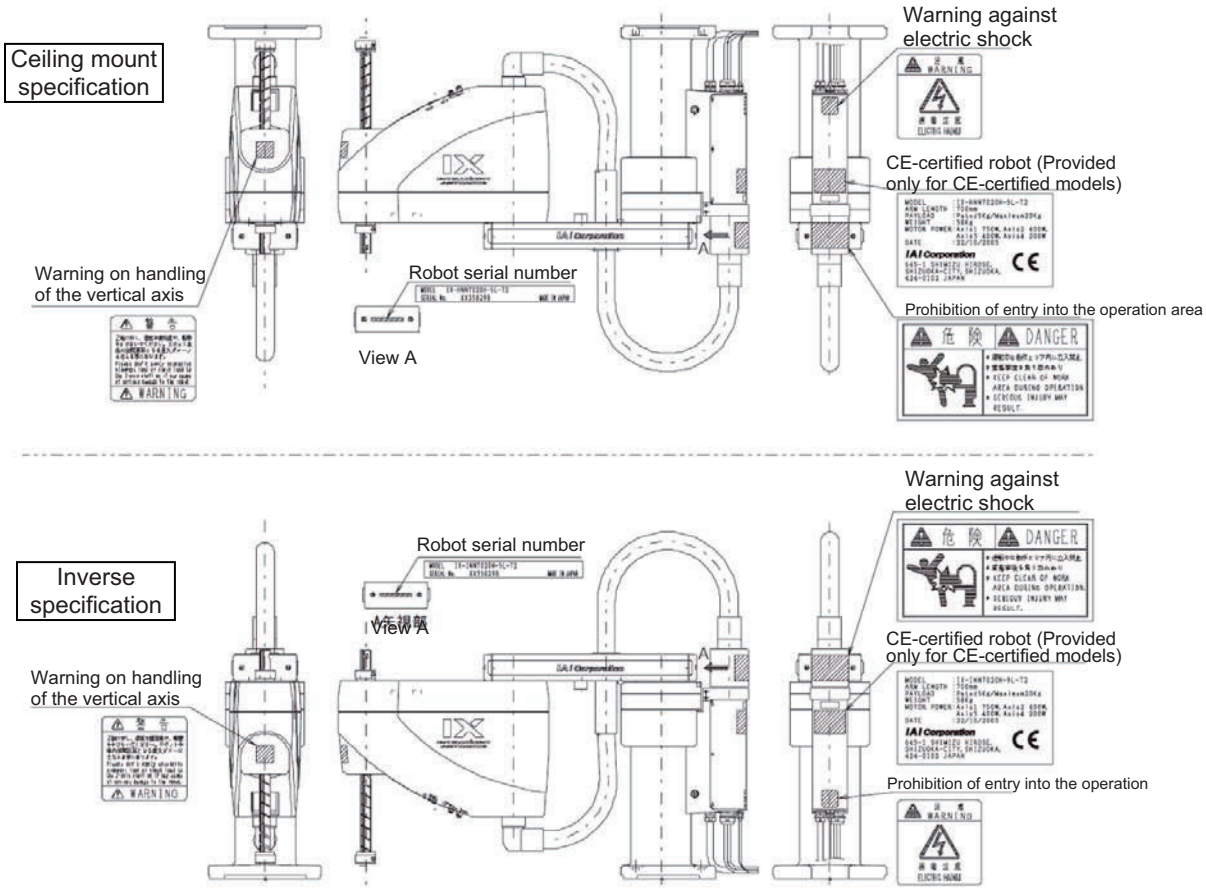


⚠ Danger **⚠ Warning** **⚠ Caution**

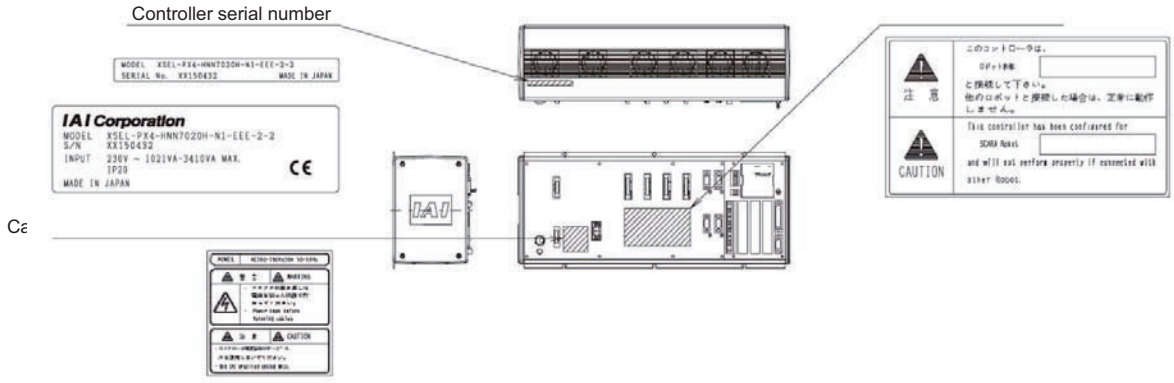
- Failure to observe the cautionary information provided on the labels may result in serious injury or damage to the robot.

1.3 Label Positions

Label Positions on the Robot

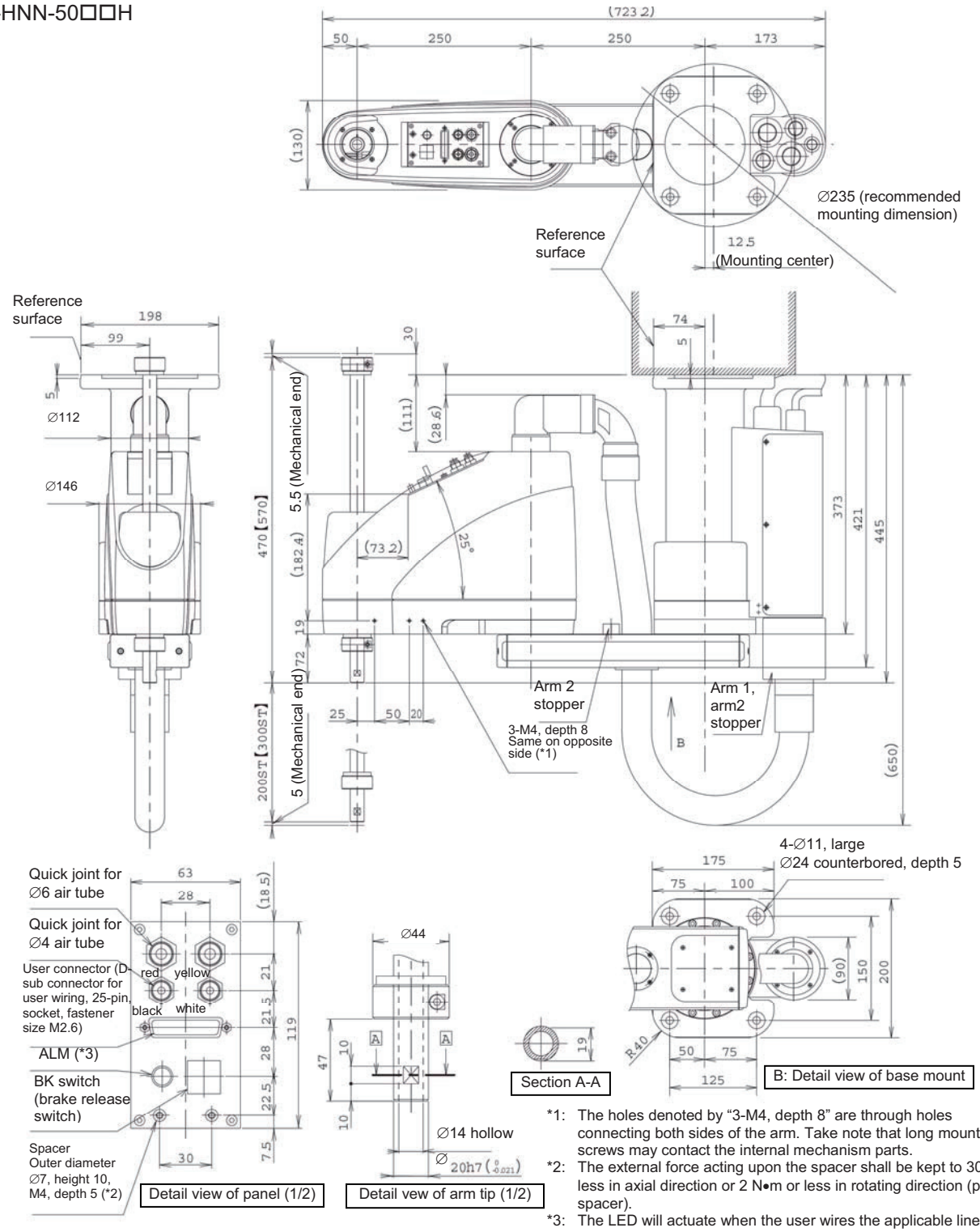


Label Positions on the Controller



2. External Dimensions

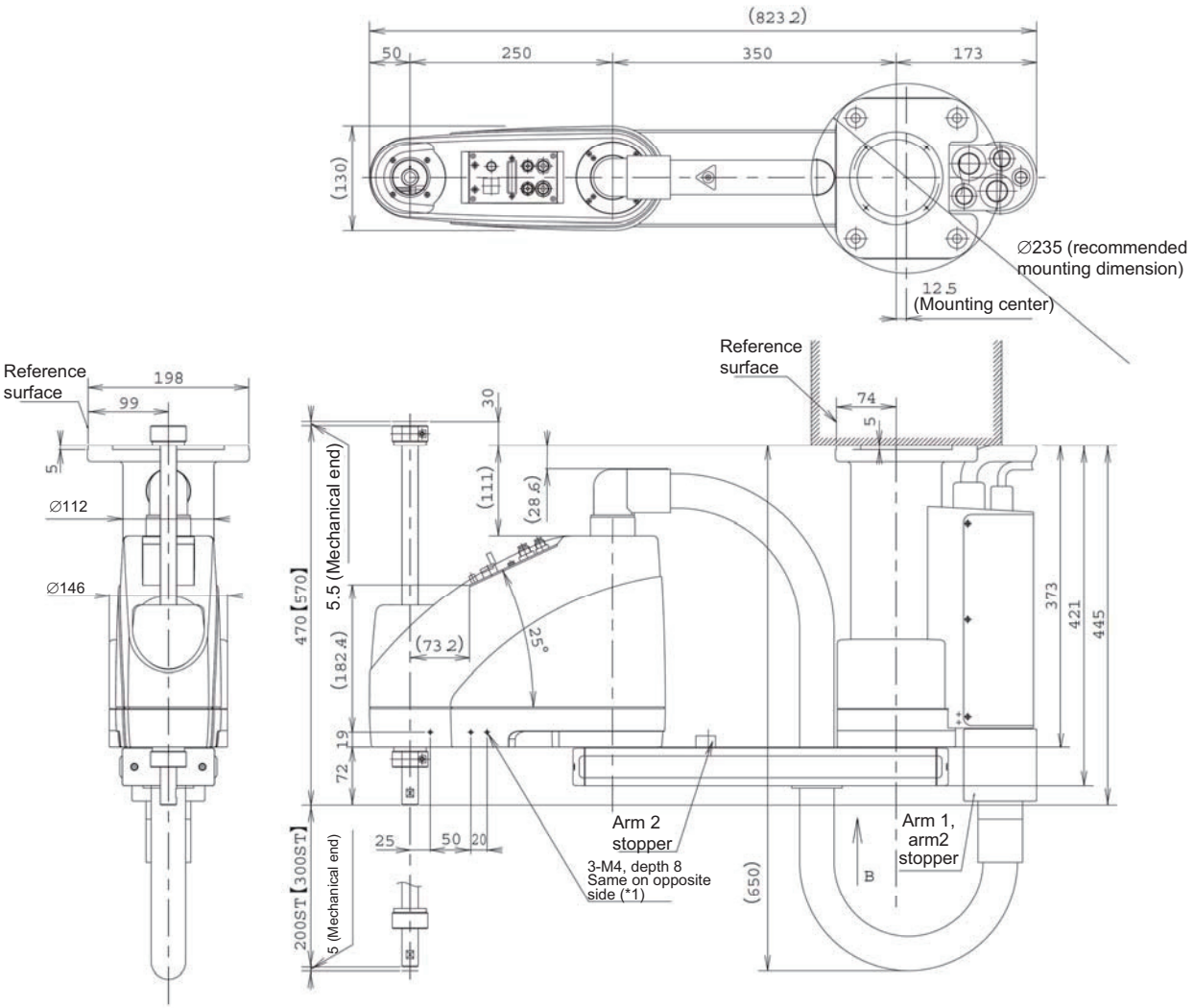
IX-HNN-50□□H

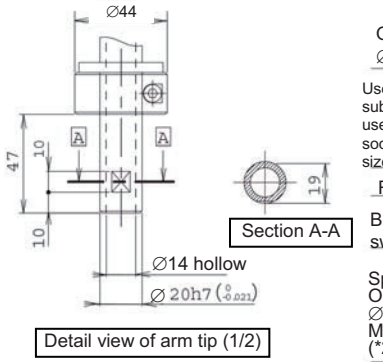


*1: The holes denoted by “3-M4, depth 8” are through holes connecting both sides of the arm. Take note that long mounting screws may contact the internal mechanism parts.

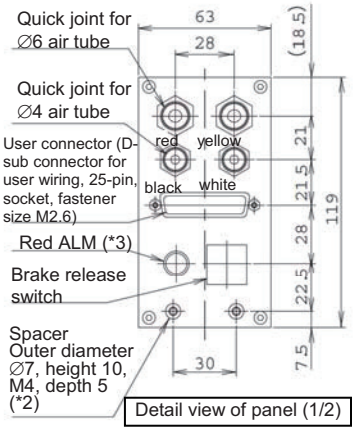
*2: The external force acting upon the spacer shall be kept to 30 N or less in axial direction or 2 N•m or less in rotating direction (per spacer).

*3: The LED will actuate when the user wires the applicable lines in such a way that 24 VDC is applied to the user-wired LED terminal upon I/O output of a signal from the controller.

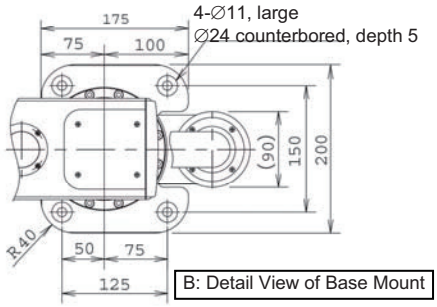




Detail view of arm tip (1/2)



Detail view of panel (1/2)



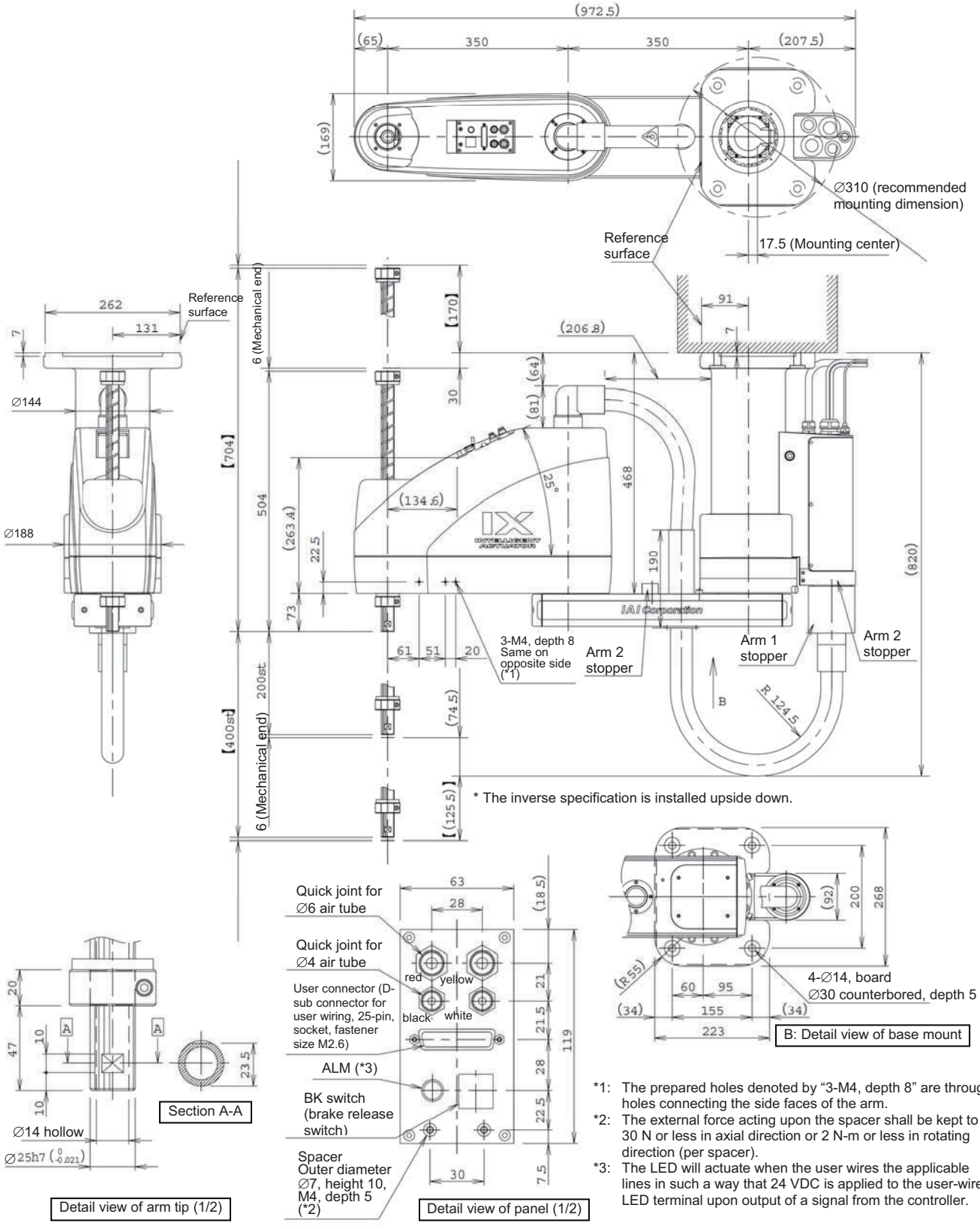
B: Detail View of Base Mount

*1: The holes denoted by “3-M4, depth 8” are through holes connecting both sides of the arm. Take note that long mounting screws may contact the internal mechanism parts.

*2: The external force acting upon the spacer shall be kept to 30 N or less in axial direction or 2 N-m or less in rotating direction (per spacer).

*3: The LED will actuate when the user wires the applicable lines in such a way that 24 VDC is applied to the user-wired LED terminal upon I/O output of a signal from the controller.

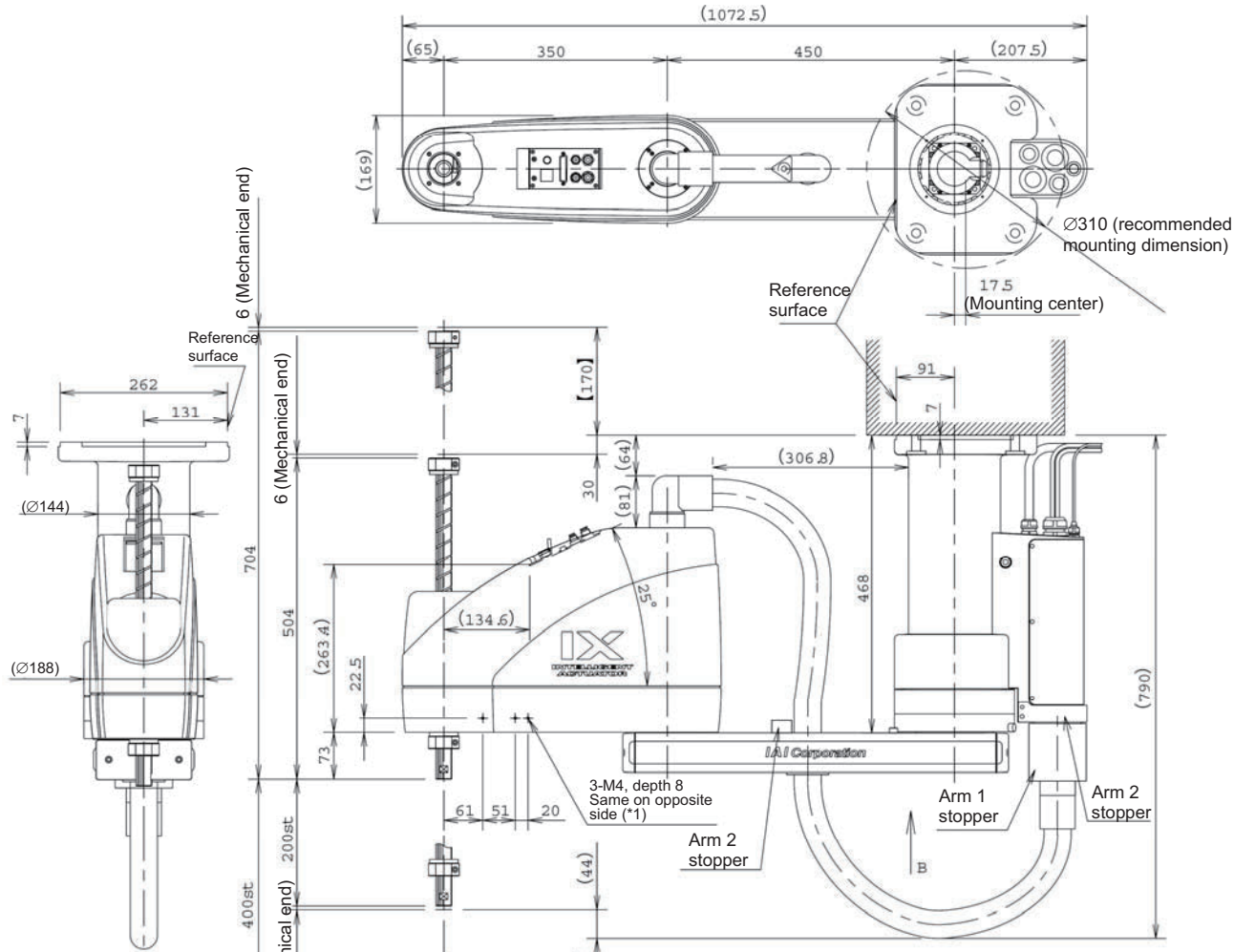
IX-HNN-70□□H



*1: The prepared holes denoted by “3-M4, depth 8” are through holes connecting the side faces of the arm.

*2: The external force acting upon the spacer shall be kept to 30 N or less in axial direction or 2 N-m or less in rotating direction (per spacer).

*3: The LED will actuate when the user wires the applicable lines in such a way that 24 VDC is applied to the user-wired LED terminal upon output of a signal from the controller.

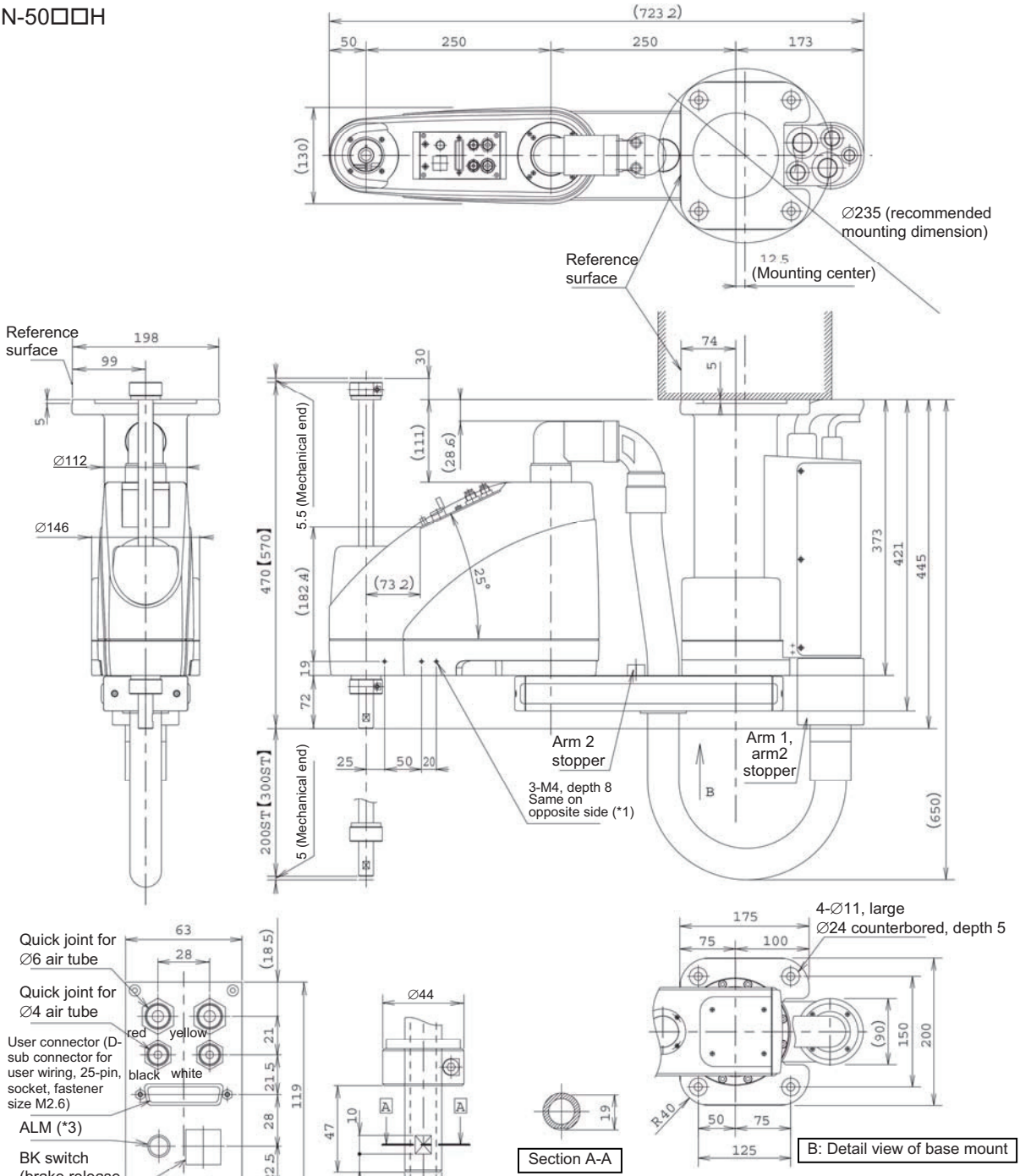


*1: The prepared holes denoted by “3-M4, depth 8” are through holes connecting the side faces of the arm.

*2: The external force acting upon the spacer shall be kept to 30 N or less in axial direction or 2 N-m or less in rotating direction (per spacer).

*3: The LED will actuate when the user wires the applicable lines in such a way that 24 VDC is applied to the user-wired LED terminal upon output of a signal from the controller.

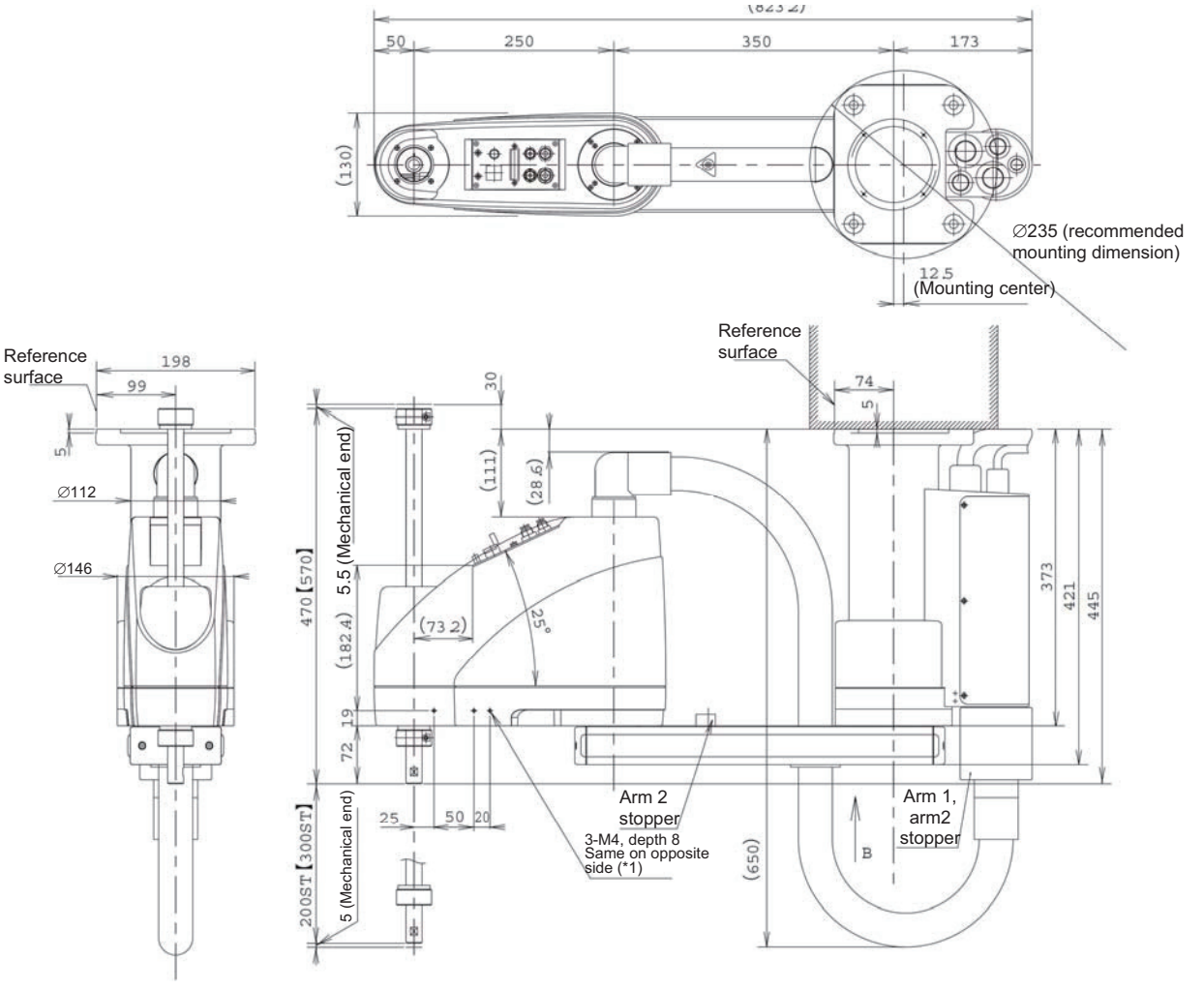
IX-INN-50□□H

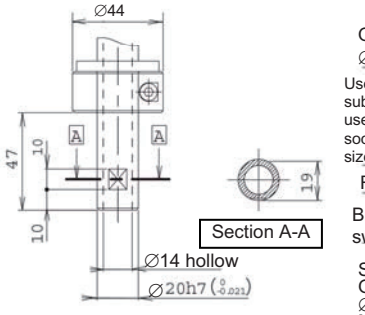


*1: The holes denoted by “3-M4, depth 8” are through holes connecting both sides of the arm. Take note that long mounting screws may contact the internal mechanism parts.

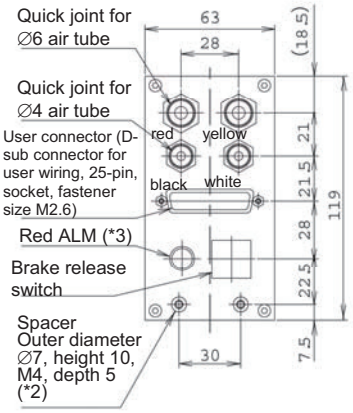
*2: The external force acting upon the spacer shall be kept to 30 N or less in axial direction or 2 N-m or less in rotating direction (per spacer).

*3: The LED will actuate when the user wires the applicable lines in such a way that 24 VDC is applied to the user-wired LED terminal upon I/O output of a signal from the controller.

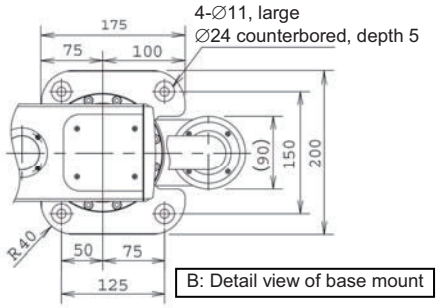




Detail view of arm tip (1/2)



Detail view of panel (1/2)



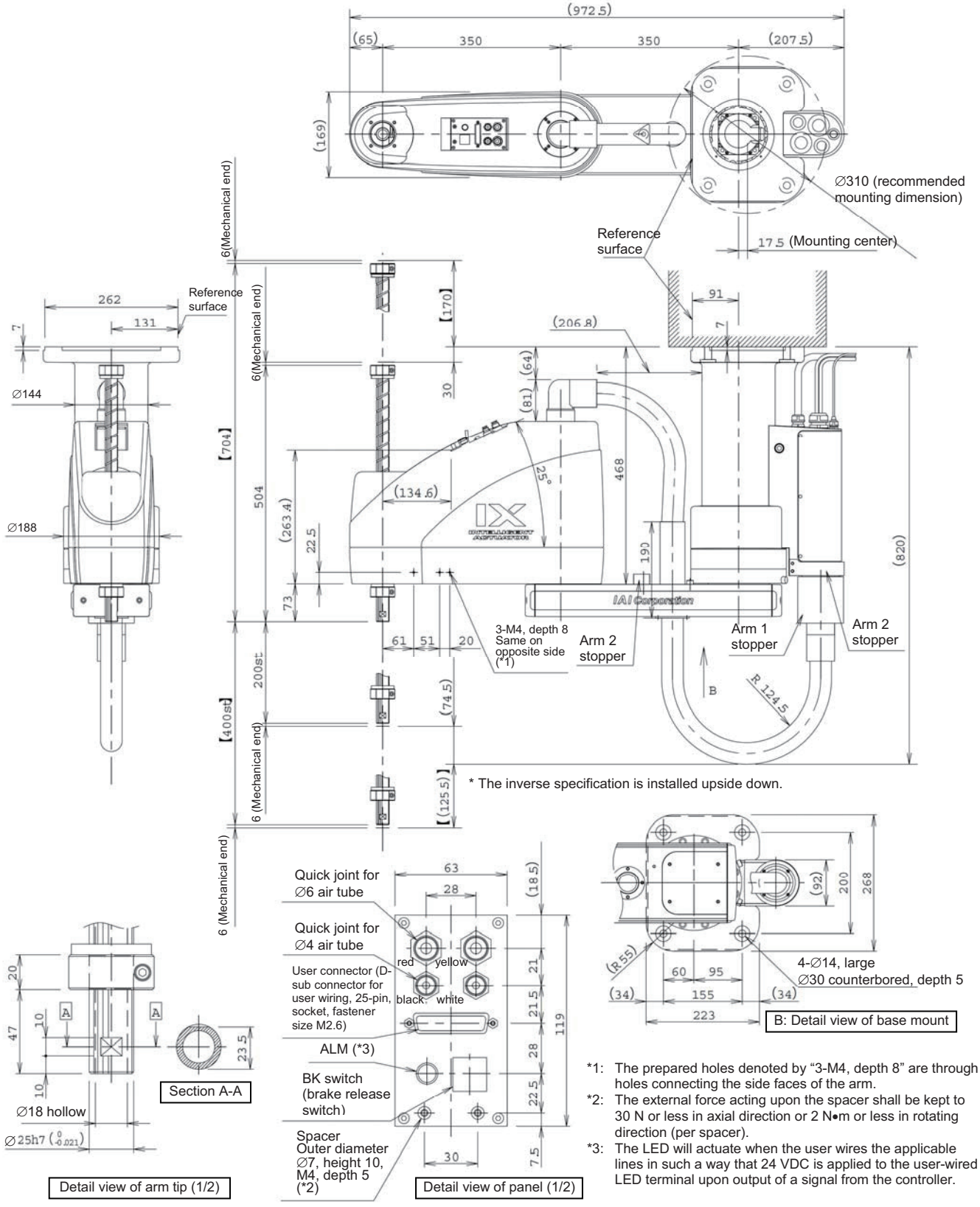
B: Detail view of base mount

*1: The holes denoted by “3-M4, depth 8” are through holes connecting both sides of the arm. Take note that long mounting screws may contact the internal mechanism parts.

*2: The external force acting upon the spacer shall be kept to 30 N or less in axial direction or 2 N-m or less in rotating direction (per spacer).

*3: The LED will actuate when the user wires the applicable lines in such a way that 24 VDC is applied to the user-wired LED terminal upon I/O output of a signal from the controller.

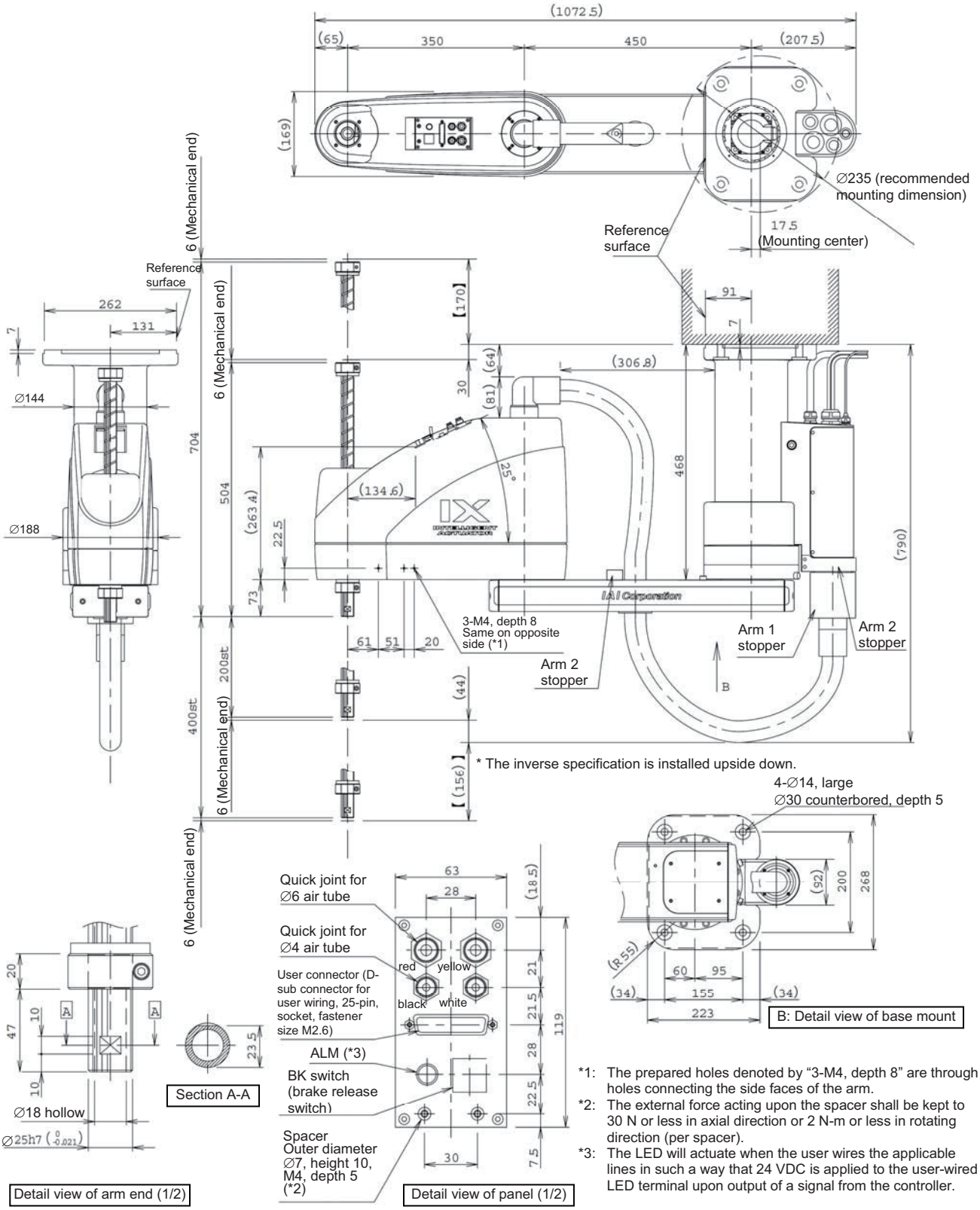
IX-INN-70□□H



*1: The prepared holes denoted by “3-M4, depth 8” are through holes connecting the side faces of the arm.

*2: The external force acting upon the spacer shall be kept to 30 N or less in axial direction or 2 N•m or less in rotating direction (per spacer).

*3: The LED will actuate when the user wires the applicable lines in such a way that 24 VDC is applied to the user-wired LED terminal upon output of a signal from the controller.



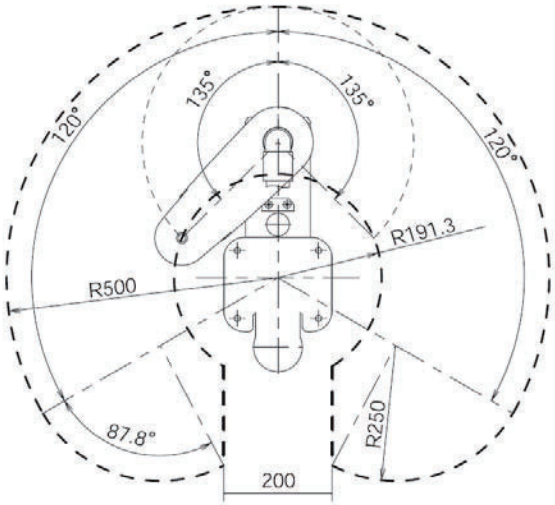
*1: The prepared holes denoted by “3-M4, depth 8” are through holes connecting the side faces of the arm.

*2: The external force acting upon the spacer shall be kept to 30 N or less in axial direction or 2 N-m or less in rotating direction (per spacer).

*3: The LED will actuate when the user wires the applicable lines in such a way that 24 VDC is applied to the user-wired LED terminal upon output of a signal from the controller.

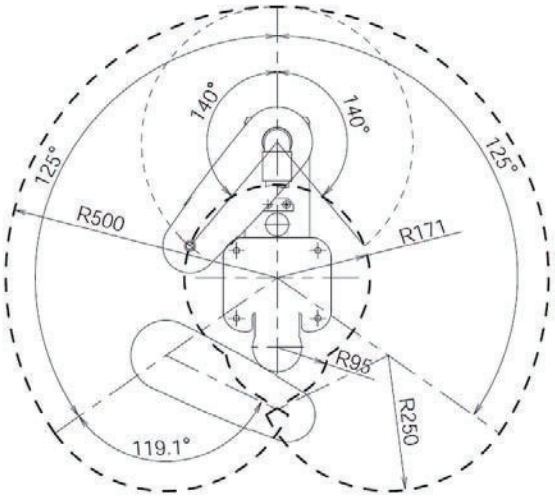
3. Robot Operation Area

IX-HNN50□□H, IX-INN50□□H



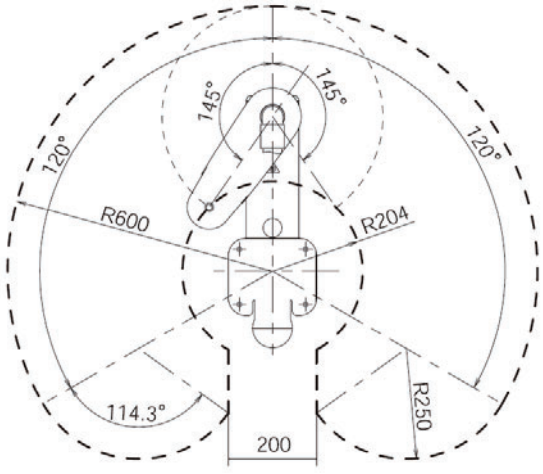
(Area of prohibited entry)

Movement range



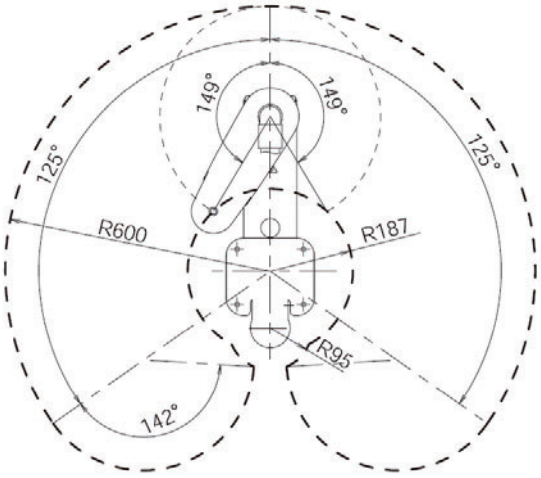
Range of stopper position

IX-HNN60□□H, IX-INN60□□H



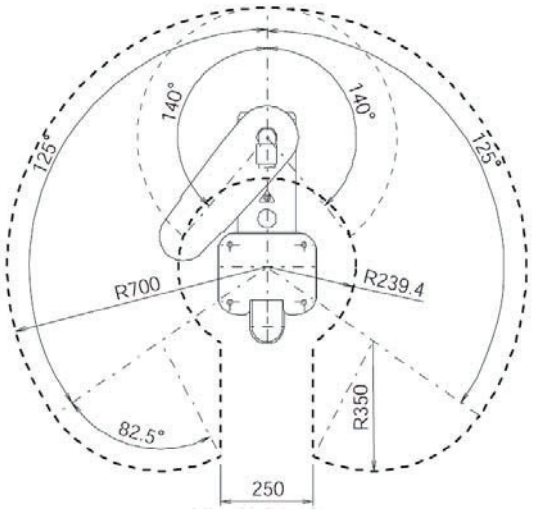
(Area of prohibited entry)

Movement range



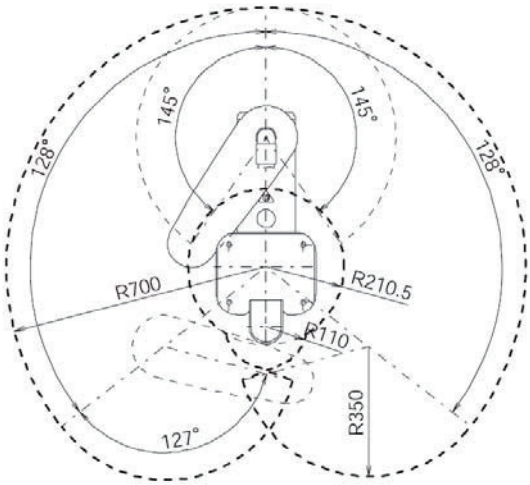
Range of stopper position

IX-HNN70□□H, IX-INN70□□H



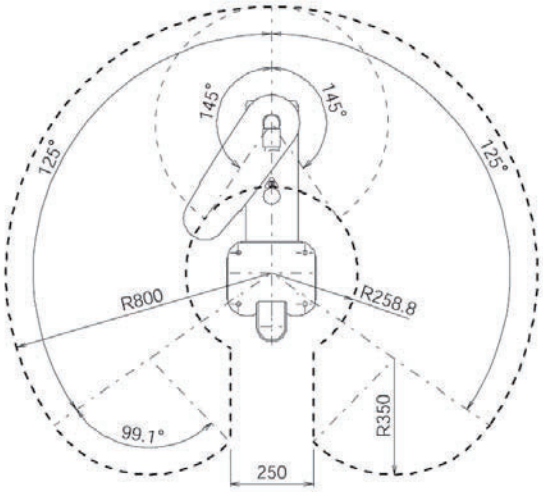
(Area of prohibited entry)

Movement range



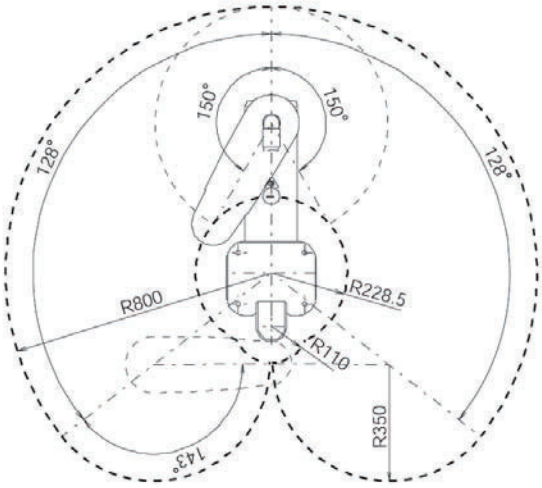
Range of stopper position

IX-HNN80□□H, IX-INN80□□H



(Area of prohibited entry)

Movement range

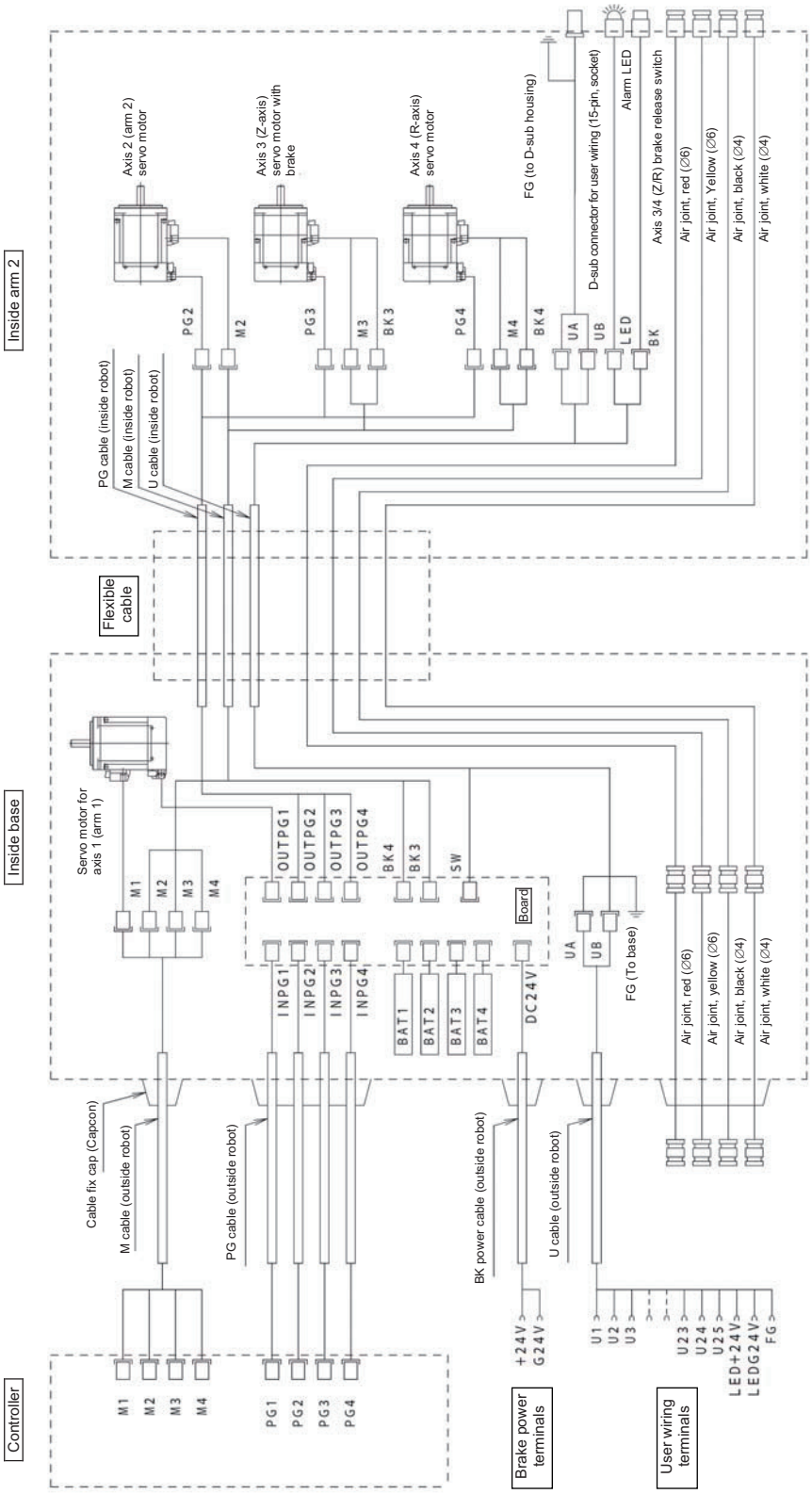


Range of stopper position

4. Wiring Diagram

4.1 Layout Drawing

Wiring/Piping Diagram (Arm Length: 500/600/700/800)



Notes
(1) The actual positions of board connectors vary from this drawing.
(2) The brake power-supply circuit is provided on the primary side (high-pressure side), so a dedicated 24-V power supply is required. The 24-V power supply for I/O or any other power supply used on the secondary side (low-pressure side) cannot be used.
(3) To operate the alarm LED, the user must provide a circuit that uses the controller I/O output signal.

4.2 230-V Circuit Components

IX-HNN50□□H/60□□H, IX-INN50□□H/60□□H

No.	Code name	Model number	Manufacturer	Remarks
1	Axis 1 servo motor	TS4609 N2077 E206	Tamagawa Seiki	AC servo motor, □ 60, 400 W, key groove, CE certified
2	Axis 2 servo motor	TS4607 N2077 E201		AC servo motor, □ 60, 200 W, key groove, CE certified
3	Axis 3 servo motor w/ brake	TS4607 N7077 E201		AC servo motor, □ 60, 200 W, w/ brake, round shaft, CE certified
4	Axis 4 servo motor w/ brake	TS4606 N7077 E201		AC servo motor, □ 60, 100 W, key groove, CE certified
5	M cable (inside robot)		IAI	Wire: 300-V/105°C (rated) AWG18 (0.84e) flexible cable, UL VW-1/c-UL FT-1
6	M cable (outside robot)		IAI	Wire: 300-V/80°C (rated) AWG18 (0.89e) flexible cable, UL VW-1/c-UL FT-1

IX-HNN70□□H/80□□H, IX-INN70□□H/80□□H

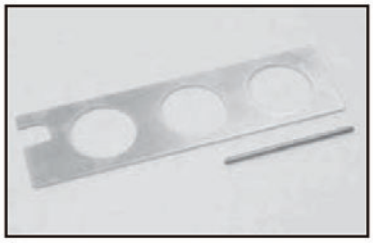
No.	Code name	Model number	Manufacturer	Remarks
1	Axis 1 servo motor	TS4614 N2077 E209	Tamagawa Seiki	□ 800, 750 W, key groove CE certified
2	Axis 2 servo motor	TS4609 N2077 E206		□ 60, 400 W, key groove CE-certified
3	Axis 3 servo motor w/ brake	TS4609 N7077 E206		□ 60, 400 W, round shaft with brake CE-certified
4	Axis 4 servo motor w/ brake	TS4607 N7077 E201		□ 60, 200 W, round shaft with brake CE-certified
5	M cable (inside robot)		IAI	Wire: 300-V/105°C rated AWG18 (0.84e) flexible cable, UL VW-1/c-UL FT-1
6	M cable (outside robot)		IAI	Wire: 300-V/80°C rated AWG18 (0.89e) flexible cable, UL VW-1/c-UL FT-1

5. Option

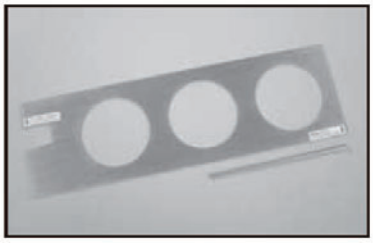
5.1 Absolute Reset Jig

This jig is used to perform an absolute reset in the event that absolute data in the encoder was lost.

Model number	Remarks
JG-2	For arm length 500/600
JG-3	For arm length 700/800



JG-1

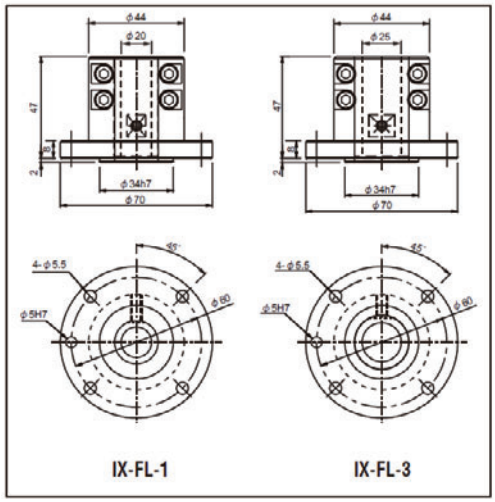


JG-3

5.2 Flange

This flange is used to install a load at the end of the Z-axis arm.

Model number	Remarks
IX-FL-1	For arm length 500/600
IX-FL-3	For arm length 700/800



5.3 Absolute Data Backup Battery

This battery is used to retain absolute data in the encoder. (Set the battery inside the cover of the SCARA robot.)

Model number	Remarks
AB-3	For arm length 250 ~ 800

* Four batteries are needed for each robot (all SCARA robot models). Since AB-3 batteries are packed individually, specify the required number in your order.

AB-3

6. Checking after Unpacking

After unpacking the carton, check the condition of the product and items included in the carton.

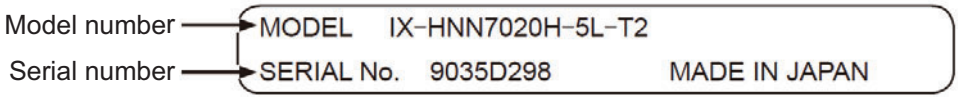
6.1 Items Included in the Carton

No.	Item	Model number	Remarks
1	Robot	Refer to 6.3, "How to Read Model Nameplate" and 6.4, "How to Read Model Number."	
2	Controller		
Accessories			
3	Eye-bolt		
4	D-sub connector		
5	Hood set (for D-sub connector)		
6	Danger label		
7	Positioning sticker		
8	PIO flat cable		
9	First step-by-step guide		
10	Operation manual (CD/DVD)		
11	Safety guide		

6.2 Operation Manuals Relating to This Product

No.	Item	Control No.
1	Operation Manual for XSEL-PX/QX Controller	ME0152
2	Operation Manual for XSEL Controller P/Q/PX/QX – RC Gateway Function	ME0188
3	Operation Manual for PC Software IA-101-X-MW/IA-101-X-USBMW	ME0154
4	Operation Manual for Teaching Pendant SEL-T/TD/TG	ME0183
5	Operation Manual for Teaching Pendant IA-T-X/XD	ME0160
6	Operation Manual for DeviceNet	ME0124
7	Operation Manual for CC-Link	ME0123
8	Operation Manual for PROFIBUS	ME0153
9	Operation Manual for X-SEL Ethernet	ME0140
10	Operation Manual for Multi-point I/O Board	ME0138
11	Operation Manual for Dedicated Terminal Block for Multi-point I/O Board	ME0139

6.3 How to Read Model Nameplate



6.4 How to Read Model Number

IX-HNN7020H-5L-T2-JY

<Series>
SCARA robot

<Type>
Ceiling mount type
Arm length 500 mm/Z-axis 200 mm
HNN5020H
Arm length 600 mm/Z-axis 200 mm
HNN6020H
Arm length 700 mm/Z-axis 200 mm
HNN7020H
Arm length 700 mm/Z-axis 400 mm
HNN7040H
Arm length 800 mm/Z-axis 200 mm
HNN8020H
Arm length 800 mm/Z-axis 400 mm
HNN8040H

Ceiling mount inverse type
Arm length 500 mm/Z-axis 200 mm
INN5020H
Arm length 600 mm/Z-axis 200 mm
INN6020H
Arm length 700 mm/Z-axis 200 mm
INN7020H
Arm length 700 mm/Z-axis 400 mm
INN7040H
Arm length 800 mm/Z-axis 200 mm
INN8020H
Arm length 800 mm/Z-axis 400 mm
INN8040H

<Cable length>
5L: 5 m
10L: 10 m

<Applicable controller>
T2: XSEL-PX/QX

<Option>
JY: Joint cable specification

7. Specifications

7.1 IX-HNN50□□H/60□□H/70□□H/80□□H

IX-HNN-50□□H (arm length 500, ceiling mount)

Item			Specifications
Model number			IX-HNN50□□H-**L
Degree of freedom			Four degrees of freedom
Overall arm length		mm	500
Arm 1 length			250
Arm 2 length			250
Drive method	Axis 1 (arm 1)		AC servo motor + Speed reducer
	Axis 2 (arm 2)		AC servo motor + Speed reducer
	Axis 3 (vertical axis)		AC servo motor with brake + Belt + Ball-screw spline
	Axis 4 (rotational axis)		AC servo motor with brake + Reduction gear + Belt + Spline
Motor capacity	Axis 1 (arm 1)	W	400
	Axis 2 (arm 2)		200
	Axis 3 (vertical axis)		200
	Axis 4 (rotational axis)		100
Movement range	Axis 1 (arm 1)	degree	±120
	Axis 2 (arm 2)		±135
	Axis 3 (vertical axis) (*1)	mm	200
	Axis 4 (rotational axis)	degree	±360
Maximum operating speed (*2)	Axis 1 + Axis 2 (maximum composite speed)	mm/sec	6381
	Axis 3 (vertical axis)		1473
	Axis 4 (rotational axis)	degree/sec	1857
Positioning repeatability precision (*3)	Axis 1 + Axis 2	mm	±0.010
	Axis 3 (vertical axis)		±0.010
	Axis 4 (rotational axis)	degree	±0.005
Cycle time (*4)		sec	0.39
Load capacity	Rated	kg	2
	Maximum		10
Axis 3 (vertical axis) Push force control range	Upper limit (*8)	N (kgf)	181.0 (18.5) Push torque limit 70%
	Lower limit (*9)		93 (9.5) Push torque limit 40%
Permissible load on axis 4	Permissible moment of inertia (*5)	kg-m^2	0.06
	Permissible torque	N-m (kgf-cm)	3.7 (38.1)
Permissible tool diameter (*6)		mm	∅100
Home detection			Absolute
User wiring			D-sub 25-pin connector with 25-core AWG26 shielded cable (socket)
Alarm indicator (*7)			One small, red LED indicator (rated voltage: 24 V)
User piping			Two air tubes (outer diameter: ∅6, inner diameter: ∅4) (normal service pressure: 0.8 MPa) Two air tubes (outer diameter: ∅4, inner diameter: ∅2.5) (normal service pressure: 0.8 MPa)

Item			Specifications
Operating environment	Surrounding air temperature/humidity		Temperature: 0 to 40°C, humidity: 20 to 85%RH or less (non-condensing)
	Altitude	m	1,000 or less
Noise		dB	73
Robot weight		kg	30.5
Brake power source for main unit		W	DC24VI10% 20W
Controller	Power supply		230 V 50/60 Hz 8 A
	Allowable supply voltage fluctuation	%	±10
	Overvoltage category (IEC60664-1)		Category III
	Pollution degree (IEC60664-1)		Pollution degree 3

*1: To move the robot horizontally at high speed, perform teaching so that the vertical axis stays as close to the top position as possible. (Fig. 1)
To operate the robot with its vertical axis at the bottom position, the speed and acceleration must be reduced as appropriate. (Fig. 2)

*2: Assuming PTP instruction operation. The maximum composite speed is not the maximum speed of CP operation.

*3: Positioning precision when the robot is operated repeatedly to one specified position from the same starting position at the same speed and acceleration/deceleration using the same arm (at a constant surrounding air temperature of 20°C). Take note that this is not the absolute positioning precision.
Also note that the positioning repeatability may deviate from the specified value if the arm is changed, positioning is performed to one specified position from multiple positions, or any of the operating conditions such as operating speed and acceleration/deceleration setting is changed.

*4: Measured when the robot is operated at the maximum speed, carrying a load of 2 kg.

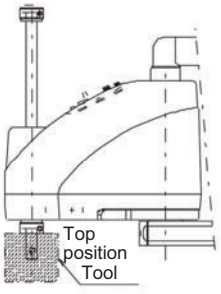
*5: Equivalent allowable inertial moment at the center of rotation of axis 4. The offset from the center of rotation of axis 4 to the center of gravity of the tool shall be 50 mm or less. (Fig. 3)
If the center of gravity of the tool deviates from the center of rotation of axis 4, the acceleration setting needs to be decreased as necessary.

*6: If the allowable tool diameter is exceeded, the tool will interfere with the robot within the robot's operation area. (Fig. 4)

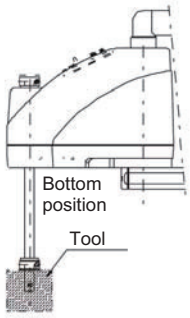
*7: The alarm LED will actuate when the user provides a circuit that applies 24 VDC to the user-wired LED terminal upon I/O output of a signal from the controller.

*8: Push force when driver card parameter No. 38, "Push torque limit during positioning" is set to 70%.

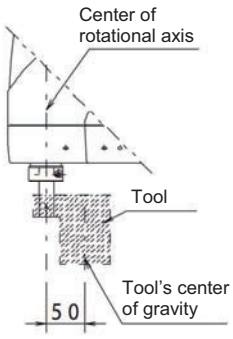
*9: Push force when driver card parameter No. 38, "Push torque limit during positioning" is set to 20%.
Although this parameter can be set to a desired value from 15% to 70%, push force will not stabilize if the set value is outside the range of 40 to 70%.



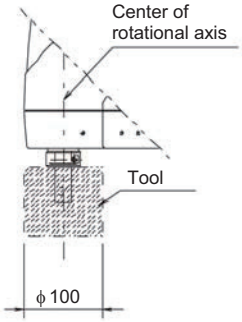
(Fig. 1)



(Fig. 2)



(Fig. 3)



(Fig. 4)

Design references: Machine Directive Annex I, EN292-1, EN292-2, EN1050, EN60204-1, EN775

IX-HNN-60□□H (arm length 600, ceiling mount)

Item			Specifications
Model number			IX-HNN60□□H-**L
Degree of freedom			Four degrees of freedom
Overall arm length		mm	600
Arm 1 length			350
Arm 2 length			250
Drive method	Axis 1 (arm 1)		AC servo motor + Speed reducer
	Axis 2 (arm 2)		AC servo motor + Speed reducer
	Axis 3 (vertical axis)		AC servo motor with brake + Belt + Ball-screw spline
	Axis 4 (rotational axis)		AC servo motor with brake + Reduction gear + Belt + Spline
Motor capacity	Axis 1 (arm 1)	W	400
	Axis 2 (arm 2)		200
	Axis 3 (vertical axis)		200
	Axis 4 (rotational axis)		100
Movement range	Axis 1 (arm 1)	degree	±120
	Axis 2 (arm 2)		±145
	Axis 3 (vertical axis) (*1)	mm	200 (option: 300)
	Axis 4 (rotational axis)	degree	±360
Maximum operating speed (*2)	Axis 1 + Axis 2 (maximum composite speed)	mm/sec	7232
	Axis 3 (vertical axis)		1473
	Axis 4 (rotational axis)	degree/sec	1857
Positioning repeatability precision (*3)	Axis 1 + Axis 2	mm	±0.010
	Axis 3 (vertical axis)		±0.010
	Axis 4 (rotational axis)	degree	±0.005
Cycle time (*4)		sec	0.43
Load capacity	Rated	kg	2
	Maximum		10
Axis 3 (vertical axis) Push force control range	Upper limit (*8)	N (kgf)	181.0 (18.5) Push torque limit 70%
	Lower limit (*9)		93 (9.5) Push torque limit 40%
Permissible load on axis 4	Permissible moment of inertia (*5)	kg-m^2	0.06
	Permissible torque	N-m (kgf-cm)	3.7 (38.1)
Permissible tool diameter (*6)		mm	∅100
Home detection			Absolute
User wiring			D-sub 25-pin connector with 25-core AWG26 shielded cable (socket)
Alarm indicator (*7)			One small, red LED indicator (rated voltage: 24 V)
User piping			Two air tubes (outer diameter: ∅6, inner diameter: ∅4) (normal service pressure: 0.8 MPa) Two air tubes (outer diameter: ∅4, inner diameter: ∅2.5) (normal service pressure: 0.8 MPa)

Item			Specifications
Operating environment	Surrounding air temperature/humidity		Temperature: 0 to 40°C, humidity: 20 to 85%RH or less (non-condensing)
	Altitude	m	1,000 or less
Noise		dB	73
Robot weight		kg	31.5
Brake power source for main unit		W	DC24VI10% 20W
Controller	Power supply		230 V 50/60 Hz 8 A
	Allowable supply voltage fluctuation	%	±10
	Overvoltage category (IEC60664-1)		Category III
	Pollution degree (IEC60664-1)		Pollution degree 3

*1: To move the robot horizontally at high speed, perform teaching so that the vertical axis stays as close to the top position as possible. (Fig. 1)
To operate the robot with its vertical axis at the bottom position, the speed and acceleration must be reduced as appropriate. (Fig. 2)

*2: Assuming PTP instruction operation. The maximum composite speed is not the maximum speed of CP operation.

*3: Positioning precision when the robot is operated repeatedly to one specified position from the same starting position at the same speed and acceleration/deceleration using the same arm (at a constant surrounding air temperature of 20°C). Take note that this is not the absolute positioning precision.
Also note that the positioning repeatability may deviate from the specified value if the arm is changed, positioning is performed to one specified position from multiple positions, or any of the operating conditions such as operating speed and acceleration/deceleration setting is changed.

*4: Measured when the robot is operated at the maximum speed, carrying a load of 2 kg.

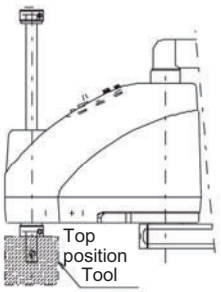
*5: Equivalent allowable inertial moment at the center of rotation of axis 4. The offset from the center of rotation of axis 4 to the center of gravity of the tool shall be 50 mm or less. (Fig. 3)
If the center of gravity of the tool deviates from the center of rotation of axis 4, the acceleration setting needs to be decreased as necessary.

*6: If the allowable tool diameter is exceeded, the tool will interfere with the robot within the robot's operation area. (Fig. 4)

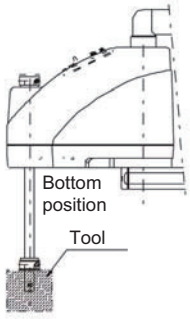
*7: The alarm LED will actuate when the user provides a circuit that applies 24 VDC to the user-wired LED terminal upon I/O output of a signal from the controller.

*8: Push force when driver card parameter No. 38, "Push torque limit during positioning" is set to 70%.

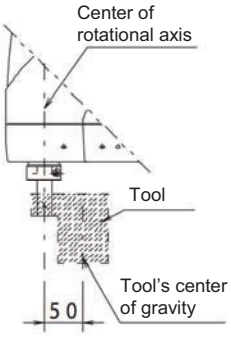
*9: Push force when driver card parameter No. 38, "Push torque limit during positioning" is set to 20%.
Although this parameter can be set to a desired value from 15% to 70%, push force will not stabilize if the set value is outside the range of 40 to 70%.



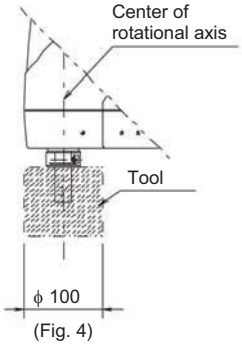
(Fig. 1)



(Fig. 2)



(Fig. 3)



(Fig. 4)

Design references: Machine Directive Annex I, EN292-1, EN292-2, EN1050, EN60204-1, EN775

IX-HNN-70□□H (arm length 700, ceiling mount)

Item			Specifications
Model number			IX-HNN70□□H-**L-T1
Degree of freedom			Four degrees of freedom
Overall arm length		mm	700
Arm 1 length			350
Arm 2 length			350
Drive method	Axis 1 (arm 1)		AC servo motor + Speed reducer
	Axis 2 (arm 2)		AC servo motor + Speed reducer
	Axis 3 (vertical axis)		AC servo motor with brake + Belt + Ball-screw spline
	Axis 4 (rotational axis)		AC servo motor with brake + Reduction gear + Belt + Spline
Motor capacity	Axis 1 (arm 1)	W	750
	Axis 2 (arm 2)		400
	Axis 3 (vertical axis)		400
	Axis 4 (rotational axis)		200
Movement range	Axis 1 (arm 1)	degree	±125
	Axis 2 (arm 2)		±145
	Axis 3 (vertical axis) (*1)	mm	200 (option: 400)
	Axis 4 (rotational axis)	degree	±360
Maximum operating speed (*2)	Axis 1 + Axis 2 (maximum composite speed)	mm/sec	7010
	Axis 3 (vertical axis)		1614
	Axis 4 (rotational axis)	degree/sec	1266
Positioning repeatability precision (*3)	Axis 1 + Axis 2	mm	±0.015
	Axis 3 (vertical axis)		±0.010
	Axis 4 (rotational axis)	degree	±0.005
Cycle time (*4)		sec	0.42
Load capacity	Rated	kg	5
	Maximum		20
Axis 3 (vertical axis) Push force control range	Upper limit (*8)	N (kgf)	304 (31.0) Push torque limit 70%
	Lower limit (*9)		146 (14.9) Push torque limit 40%
Permissible load on axis 4	Permissible moment of inertia (*5)	kg-m^2	0.1
	Permissible torque	N-m (kgf-cm)	11.7 (119.3)
Permissible tool diameter (*6)		mm	∅100
Home detection			Absolute
User wiring			D-sub 25-pin connector with 25-core AWG26 shielded cable (socket)
Alarm indicator (*7)			One small, red LED indicator (rated voltage: 24 V)
User piping			Two air tubes (outer diameter: ∅6, inner diameter: ∅4) (normal service pressure: 0.8 MPa) Two air tubes (outer diameter: ∅4, inner diameter: ∅2.5) (normal service pressure: 0.8 MPa)

Item			Specifications
Operating environment	Surrounding air temperature/humidity		Temperature: 0 to 40°C, humidity: 20 to 85%RH or less (non-condensing)
	Altitude	m	1,000 or less
Noise		dB	74
Robot weight		kg	58
Brake power source for main unit		W	DC24VI10% 20W
Controller	Power supply		230 V 50/60 Hz 15 A
	Allowable supply voltage fluctuation	%	±10
	Overvoltage category (IEC60664-1)		Category III
	Pollution degree (IEC60664-1)		Pollution degree 3

*1: To move the robot horizontally at high speed, perform teaching so that the vertical axis stays as close to the top position as possible. (Fig. 1)
To operate the robot with its vertical axis at the bottom position, the speed and acceleration must be reduced as appropriate. (Fig. 2)

*2: Assuming PTP instruction operation. The maximum composite speed is not the maximum speed of CP operation.

*3: Positioning precision when the robot is operated repeatedly to one specified position from the same starting position at the same speed and acceleration/deceleration using the same arm (at a constant surrounding air temperature of 20°C). Take note that this is not the absolute positioning precision.
Also note that the positioning repeatability may deviate from the specified value if the arm is changed, positioning is performed to one specified position from multiple positions, or any of the operating conditions such as operating speed and acceleration/deceleration setting is changed.

*4: Measured when the robot is operated at the maximum speed, carrying a load of 2 kg.

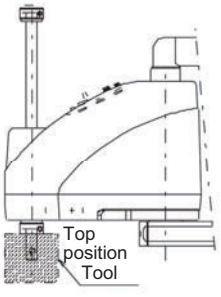
*5: Equivalent allowable inertial moment at the center of rotation of axis 4. The offset from the center of rotation of axis 4 to the center of gravity of the tool shall be 50 mm or less. (Fig. 3)
If the center of gravity of the tool deviates from the center of rotation of axis 4, the acceleration setting needs to be decreased as necessary.

*6: If the allowable tool diameter is exceeded, the tool will interfere with the robot within the robot's operation area. (Fig. 4)

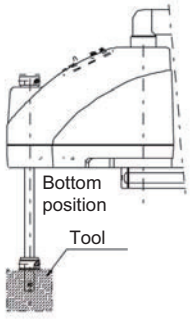
*7: The alarm LED will actuate when the user provides a circuit that applies 24 VDC to the user-wired LED terminal upon I/O output of a signal from the controller.

*8: Push force when driver card parameter No. 38, "Push torque limit during positioning" is set to 70%.

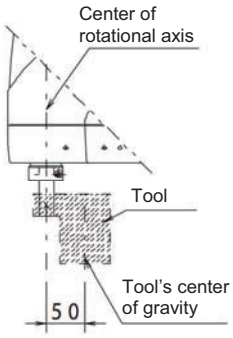
*9: Push force when driver card parameter No. 38, "Push torque limit during positioning" is set to 20%.
Although this parameter can be set to a desired value from 15% to 70%, push force will not stabilize if the set value is outside the range of 35 to 70%.



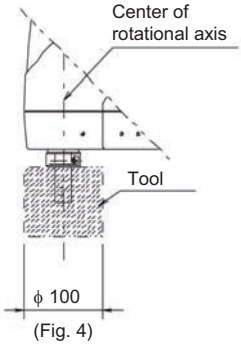
(Fig. 1)



(Fig. 2)



(Fig. 3)



(Fig. 4)

Design references: Machine Directive Annex I, EN292-1, EN292-2, EN1050, EN60204-1, EN775

IX-HNN-80□□H (arm length 800, ceiling mount)

Item			Specifications
Model number			IX-HNN80□□H-**L-T1
Degree of freedom			Four degrees of freedom
Overall arm length		mm	800
Arm 1 length			450
Arm 2 length			350
Drive method	Axis 1 (arm 1)		AC servo motor + Speed reducer
	Axis 2 (arm 2)		AC servo motor + Speed reducer
	Axis 3 (vertical axis)		AC servo motor with brake + Belt + Ball-screw spline
	Axis 4 (rotational axis)		AC servo motor with brake + Reduction gear + Belt + Spline
Motor capacity	Axis 1 (arm 1)	W	750
	Axis 2 (arm 2)		400
	Axis 3 (vertical axis)		400
	Axis 4 (rotational axis)		200
Movement range	Axis 1 (arm 1)	degree	±125
	Axis 2 (arm 2)		±145
	Axis 3 (vertical axis) (*1)	mm	200 (option: 400)
	Axis 4 (rotational axis)	degree	±360
Maximum operating speed (*2)	Axis 1 + Axis 2 (maximum composite speed)	mm/sec	7586
	Axis 3 (vertical axis)		1614
	Axis 4 (rotational axis)	degree/sec	1266
Positioning repeatability precision (*3)	Axis 1 + Axis 2	mm	±0.015
	Axis 3 (vertical axis)		±0.010
	Axis 4 (rotational axis)	degree	±0.005
Cycle time (*4)		sec	0.43
Load capacity	Rated	kg	5
	Maximum		20
Axis 3 (vertical axis) Push force control range	Upper limit (*8)	N (kgf)	304 (31.0) Push torque limit 70%
	Lower limit (*9)		146 (14.9) Push torque limit 40%
Permissible load on axis 4	Permissible moment of inertia (*5)	kg-m^2	0.1
	Permissible torque	N-m (kgf-cm)	11.7 (119.3)
Permissible tool diameter (*6)		mm	∅100
Home detection			Absolute
User wiring			D-sub 25-pin connector with 25-core AWG26 shielded cable (socket)
Alarm indicator (*7)			One small, red LED indicator (rated voltage: 24 V)
User piping			Two air tubes (outer diameter: ∅6, inner diameter: ∅4) (normal service pressure: 0.8 MPa) Two air tubes (outer diameter: ∅4, inner diameter: ∅2.5) (normal service pressure: 0.8 MPa)

Item			Specifications
Operating environment	Surrounding air temperature/humidity		Temperature: 0 to 40°C, humidity: 20 to 85%RH or less (non-condensing)
	Altitude	m	1,000 or less
Noise		dB	74
Robot weight		kg	60
Brake power source for main unit		W	DC24VI10% 20W
Controller	Power supply		230 V 50/60 Hz 15 A
	Allowable supply voltage fluctuation	%	±10
	Overvoltage category (IEC60664-1)		Category III
	Pollution degree (IEC60664-1)		Pollution degree 3

*1: To move the robot horizontally at high speed, perform teaching so that the vertical axis stays as close to the top position as possible. (Fig. 1)
To operate the robot with its vertical axis at the bottom position, the speed and acceleration must be reduced as appropriate. (Fig. 2)

*2: Assuming PTP instruction operation. The maximum composite speed is not the maximum speed of CP operation.

*3: Positioning precision when the robot is operated repeatedly to one specified position from the same starting position at the same speed and acceleration/deceleration using the same arm (at a constant surrounding air temperature of 20°C). Take note that this is not the absolute positioning precision.
Also note that the positioning repeatability may deviate from the specified value if the arm is changed, positioning is performed to one specified position from multiple positions, or any of the operating conditions such as operating speed and acceleration/deceleration setting is changed.

*4: Measured when the robot is operated at the maximum speed, carrying a load of 2 kg.

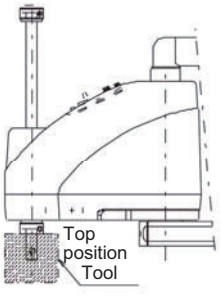
*5: Equivalent allowable inertial moment at the center of rotation of axis 4. The offset from the center of rotation of axis 4 to the center of gravity of the tool shall be 50 mm or less. (Fig. 3)
If the center of gravity of the tool deviates from the center of rotation of axis 4, the acceleration setting needs to be decreased as necessary.

*6: If the allowable tool diameter is exceeded, the tool will interfere with the robot within the robot's operation area. (Fig. 4)

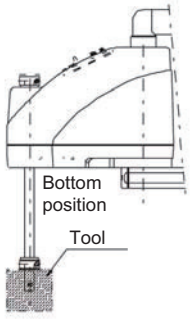
*7: The alarm LED will actuate when the user provides a circuit that applies 24 VDC to the user-wired LED terminal upon I/O output of a signal from the controller.

*8: Push force when driver card parameter No. 38, "Push torque limit during positioning" is set to 70%.

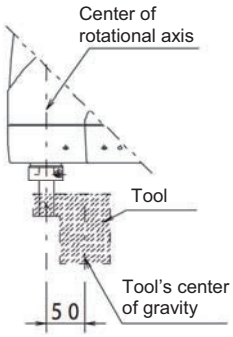
*9: Push force when driver card parameter No. 38, "Push torque limit during positioning" is set to 20%.
Although this parameter can be set to a desired value from 15% to 70%, push force will not stabilize if the set value is outside the range of 35 to 70%.



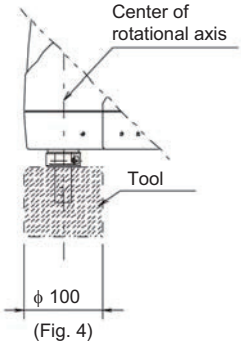
(Fig. 1)



(Fig. 2)



(Fig. 3)



(Fig. 4)

Design references: Machine Directive Annex I, EN292-1, EN292-2, EN1050, EN60204-1, EN775

7.2 IX-INN50□□H/60□□H/70□□H/80□□H

IX-INN-50□□H (arm length 500, inverse)

Item			Specifications
Model number			IX-INN50□□H-**L
Degree of freedom			Four degrees of freedom
Overall arm length		mm	500
Arm 1 length			250
Arm 2 length			250
Drive method	Axis 1 (arm 1)		AC servo motor + Speed reducer
	Axis 2 (arm 2)		AC servo motor + Speed reducer
	Axis 3 (vertical axis)		AC servo motor with brake + Belt + Ball-screw spline
	Axis 4 (rotational axis)		AC servo motor with brake + Reduction gear + Belt + Spline
Motor capacity	Axis 1 (arm 1)	W	400
	Axis 2 (arm 2)		200
	Axis 3 (vertical axis)		200
	Axis 4 (rotational axis)		100
Movement range	Axis 1 (arm 1)	degree	±120
	Axis 2 (arm 2)		±135
	Axis 3 (vertical axis) (*1)	mm	200
	Axis 4 (rotational axis)	degree	±360
Maximum operating speed (*2)	Axis 1 + Axis 2 (maximum composite speed)	mm/sec	6381
	Axis 3 (vertical axis)		1473
	Axis 4 (rotational axis)	degree/sec	1857
Positioning repeatability precision (*3)	Axis 1 + Axis 2	mm	±0.010
	Axis 3 (vertical axis)		±0.010
	Axis 4 (rotational axis)	degree	±0.005
Cycle time (*4)		sec	0.39
Load capacity	Rated	kg	2
	Maximum		10
Axis 3 (vertical axis) Push force control range	Upper limit (*8)	N (kgf)	181 (18.5) Push torque limit 70%
	Lower limit (*9)		93 (9.5) Push torque limit 40%
Permissible load on axis 4	Permissible moment of inertia (*5)	kg-m^2	0.06
	Permissible torque	N-m (kgf-cm)	3.7 (38.1)
Permissible tool diameter (*6)		mm	∅100
Home detection			Absolute
User wiring			D-sub 25-pin connector with 25-core AWG26 shielded cable (socket)
Alarm indicator (*7)			One small, red LED indicator (rated voltage: 24 V)
User piping			Two air tubes (outer diameter: ∅6, inner diameter: ∅4) (normal service pressure: 0.8 MPa) Two air tubes (outer diameter: ∅4, inner diameter: ∅2.5) (normal service pressure: 0.8 MPa)

Item			Specifications
Operating environment	Surrounding air temperature/humidity		Temperature: 0 to 40°C, humidity: 20 to 85%RH or less (non-condensing)
	Altitude	m	1,000 or less
Noise		dB	73
Robot weight		kg	30.5
Brake power source for main unit		W	DC24VI10% 20W
Controller	Power supply		230 V 50/60 Hz 8 A
	Allowable supply voltage fluctuation	%	±10
	Overvoltage category (IEC60664-1)		Category III
	Pollution degree (IEC60664-1)		Pollution degree 3

*1: To move the robot horizontally at high speed, perform teaching so that the vertical axis stays as close to the top position as possible. (Fig. 1)
To operate the robot with its vertical axis at the bottom position, the speed and acceleration must be reduced as appropriate. (Fig. 2)

*2: Assuming PTP instruction operation. The maximum composite speed is not the maximum speed of CP operation.

*3: Positioning precision when the robot is operated repeatedly to one specified position from the same starting position at the same speed and acceleration/deceleration using the same arm (at a constant surrounding air temperature of 20°C). Take note that this is not the absolute positioning precision.
Also note that the positioning repeatability may deviate from the specified value if the arm is changed, positioning is performed to one specified position from multiple positions, or any of the operating conditions such as operating speed and acceleration/deceleration setting is changed.

*4: Measured when the robot is operated at the maximum speed, carrying a load of 2 kg.

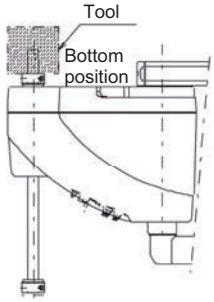
*5: Equivalent allowable inertial moment at the center of rotation of axis 4. The offset from the center of rotation of axis 4 to the center of gravity of the tool shall be 50 mm or less. (Fig. 3)
If the center of gravity of the tool deviates from the center of rotation of axis 4, the acceleration setting needs to be decreased as necessary.

*6: If the allowable tool diameter is exceeded, the tool will interfere with the robot within the robot's operation area. (Fig. 4)

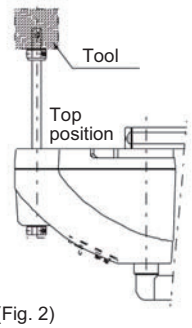
*7: The alarm LED will actuate when the user provides a circuit that applies 24 VDC to the user-wired LED terminal upon I/O output of a signal from the controller.

*8: Push force when driver card parameter No. 38, "Push torque limit during positioning" is set to 70%.

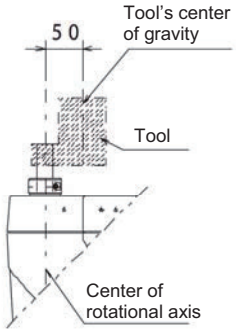
*9: Push force when driver card parameter No. 38, "Push torque limit during positioning" is set to 20%.
Although this parameter can be set to a desired value from 15% to 70%, push force will not stabilize if the set value is outside the range of 40 to 70%.



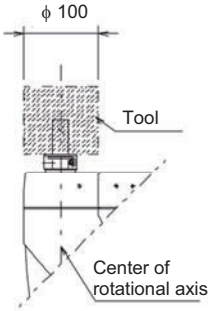
(Fig. 1)



(Fig. 2)



(Fig. 3)



(Fig. 4)

Design references: Machine Directive Annex I, EN292-1, EN292-2, EN1050, EN60204-1, EN775

IX-INN-60□□H (arm length 600, inverse)

Item			Specifications
Model number			IX-INN60□□H-**L
Degree of freedom			Four degrees of freedom
Overall arm length		mm	600
Arm 1 length			350
Arm 2 length			250
Drive method	Axis 1 (arm 1)		AC servo motor + Speed reducer
	Axis 2 (arm 2)		AC servo motor + Speed reducer
	Axis 3 (vertical axis)		AC servo motor with brake + Belt + Ball-screw spline
	Axis 4 (rotational axis)		AC servo motor with brake + Reduction gear + Belt + Spline
Motor capacity	Axis 1 (arm 1)	W	400
	Axis 2 (arm 2)		200
	Axis 3 (vertical axis)		200
	Axis 4 (rotational axis)		100
Movement range	Axis 1 (arm 1)	degree	±120
	Axis 2 (arm 2)		±145
	Axis 3 (vertical axis) (*1)	mm	200 (option: 300)
	Axis 4 (rotational axis)	degree	±360
Maximum operating speed (*2)	Axis 1 + Axis 2 (maximum composite speed)	mm/sec	7232
	Axis 3 (vertical axis)		1473
	Axis 4 (rotational axis)	degree/sec	1857
Positioning repeatability precision (*3)	Axis 1 + Axis 2	mm	±0.010
	Axis 3 (vertical axis)		±0.010
	Axis 4 (rotational axis)	degree	±0.005
Cycle time (*4)		sec	0.43
Load capacity	Rated	kg	2
	Maximum		10
Axis 3 (vertical axis) Push force control range	Upper limit (*8)	N (kgf)	181 (18.5) Push torque limit 70%
	Lower limit (*9)		93 (9.5) Push torque limit 40%
Permissible load on axis 4	Permissible moment of inertia (*5)	kg-m^2	0.06
	Permissible torque	N-m (kgf-cm)	3.7 (38.1)
Permissible tool diameter (*6)		mm	∅100
Home detection			Absolute
User wiring			D-sub 25-pin connector with 25-core AWG26 shielded cable (socket)
Alarm indicator (*7)			One small, red LED indicator (rated voltage: 24 V)
User piping			Two air tubes (outer diameter: ∅6, inner diameter: ∅4) (normal service pressure: 0.8 MPa) Two air tubes (outer diameter: ∅4, inner diameter: ∅2.5) (normal service pressure: 0.8 MPa)

Item			Specifications
Operating environment	Surrounding air temperature/humidity		Temperature: 0 to 40°C, humidity: 20 to 85%RH or less (non-condensing)
	Altitude	m	1,000 or less
Noise		dB	73
Robot weight		kg	31.5
Brake power source for main unit		W	DC24VI10%　20W
Controller	Power supply		230 V　50/60 Hz　8 A
	Allowable supply voltage fluctuation	%	±10
	Overvoltage category (IEC60664-1)		Category III
	Pollution degree (IEC60664-1)		Pollution degree 3

*1: To move the robot horizontally at high speed, perform teaching so that the vertical axis stays as close to the top position as possible. (Fig. 1)
To operate the robot with its vertical axis at the bottom position, the speed and acceleration must be reduced as appropriate. (Fig. 2)

*2: Assuming PTP instruction operation. The maximum composite speed is not the maximum speed of CP operation.

*3: Positioning precision when the robot is operated repeatedly to one specified position from the same starting position at the same speed and acceleration/deceleration using the same arm (at a constant surrounding air temperature of 20°C). Take note that this is not the absolute positioning precision.
Also note that the positioning repeatability may deviate from the specified value if the arm is changed, positioning is performed to one specified position from multiple positions, or any of the operating conditions such as operating speed and acceleration/deceleration setting is changed.

*4: Measured when the robot is operated at the maximum speed, carrying a load of 2 kg.

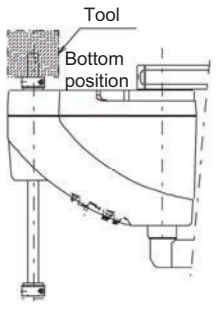
*5: Equivalent allowable inertial moment at the center of rotation of axis 4. The offset from the center of rotation of axis 4 to the center of gravity of the tool shall be 50 mm or less. (Fig. 3)
If the center of gravity of the tool deviates from the center of rotation of axis 4, the acceleration setting needs to be decreased as necessary.

*6: If the allowable tool diameter is exceeded, the tool will interfere with the robot within the robot's operation area. (Fig. 4)

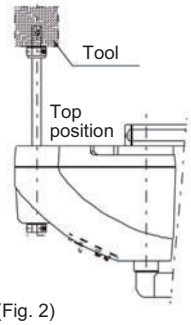
*7: The alarm LED will actuate when the user provides a circuit that applies 24 VDC to the user-wired LED terminal upon I/O output of a signal from the controller.

*8: Push force when driver card parameter No. 38, "Push torque limit during positioning" is set to 70%.

*9: Push force when driver card parameter No. 38, "Push torque limit during positioning" is set to 20%.
Although this parameter can be set to a desired value from 15% to 70%, push force will not stabilize if the set value is outside the range of 40 to 70%.



(Fig. 1)



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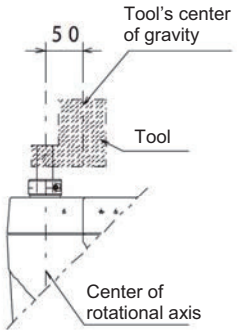
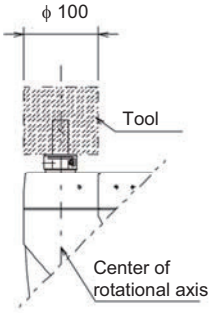


(Fig. 3)



(Fig. 4)

Design references: Machine Directive Annex I, EN292-1, EN292-2, EN1050, EN60204-1, EN775

IX-INN-70□□H (arm length 700, inverse)

Item			Specifications
Model number			IX-INN70□□H-**L-T1
Degree of freedom			Four degrees of freedom
Overall arm length		mm	700
Arm 1 length			350
Arm 2 length			350
Drive method	Axis 1 (arm 1)		AC servo motor + Speed reducer
	Axis 2 (arm 2)		AC servo motor + Speed reducer
	Axis 3 (vertical axis)		AC servo motor with brake + Belt + Ball-screw spline
	Axis 4 (rotational axis)		AC servo motor with brake + Reduction gear + Belt + Spline
Motor capacity	Axis 1 (arm 1)	W	750
	Axis 2 (arm 2)		400
	Axis 3 (vertical axis)		400
	Axis 4 (rotational axis)		200
Movement range	Axis 1 (arm 1)	degree	±125
	Axis 2 (arm 2)		±140
	Axis 3 (vertical axis) (*1)	mm	200 (option: 400)
	Axis 4 (rotational axis)	degree	±360
Maximum operating speed (*2)	Axis 1 + Axis 2 (maximum composite speed)	mm/sec	7010
	Axis 3 (vertical axis)		1614
	Axis 4 (rotational axis)	degree/sec	1266
Positioning repeatability precision (*3)	Axis 1 + Axis 2	mm	±0.015
	Axis 3 (vertical axis)		±0.010
	Axis 4 (rotational axis)	degree	±0.005
Cycle time (*4)		sec	0.42
Load capacity	Rated	kg	5
	Maximum		20
Axis 3 (vertical axis) Push force control range	Upper limit (*8)	N (kgf)	304 (31.0) Push torque limit 70%
	Lower limit (*9)		146 (14.9) Push torque limit 40%
Permissible load on axis 4	Permissible moment of inertia (*5)	kg-m^2	0.1
	Permissible torque	N-m (kgf-cm)	11.7 (119.3)
Permissible tool diameter (*6)		mm	∅100
Home detection			Absolute
User wiring			D-sub 25-pin connector with 25-core AWG26 shielded cable (socket)
Alarm indicator (*7)			One small, red LED indicator (rated voltage: 24 V)
User piping			Two air tubes (outer diameter: ∅6, inner diameter: ∅4) (normal service pressure: 0.8 MPa) Two air tubes (outer diameter: ∅4, inner diameter: ∅2.5) (normal service pressure: 0.8 MPa)

Item			Specifications
Operating environment	Surrounding air temperature/humidity		Temperature: 0 to 40°C, humidity: 20 to 85%RH or less (non-condensing)
	Altitude	m	1,000 or less
Noise		dB	74
Robot weight		kg	58
Brake power source for main unit		W	DC24VI10% 20W
Controller	Power supply		230 V 50/60 Hz 15 A
	Allowable supply voltage fluctuation	%	±10
	Overvoltage category (IEC60664-1)		Category III
	Pollution degree (IEC60664-1)		Pollution degree 3

*1: To move the robot horizontally at high speed, perform teaching so that the vertical axis stays as close to the top position as possible. (Fig. 1)
To operate the robot with its vertical axis at the bottom position, the speed and acceleration must be reduced as appropriate. (Fig. 2)

*2: Assuming PTP instruction operation. The maximum composite speed is not the maximum speed of CP operation.

*3: Positioning precision when the robot is operated repeatedly to one specified position from the same starting position at the same speed and acceleration/deceleration using the same arm (at a constant surrounding air temperature of 20°C). Take note that this is not the absolute positioning precision.
Also note that the positioning repeatability may deviate from the specified value if the arm is changed, positioning is performed to one specified position from multiple positions, or any of the operating conditions such as operating speed and acceleration/deceleration setting is changed.

*4: Measured when the robot is operated at the maximum speed, carrying a load of 2 kg.

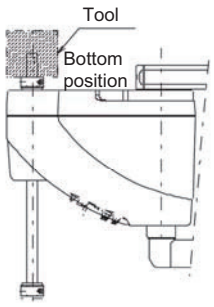
*5: Equivalent allowable inertial moment at the center of rotation of axis 4. The offset from the center of rotation of axis 4 to the center of gravity of the tool shall be 50 mm or less. (Fig. 3)
If the center of gravity of the tool deviates from the center of rotation of axis 4, the acceleration setting needs to be decreased as necessary.

*6: If the allowable tool diameter is exceeded, the tool will interfere with the robot within the robot's operation area. (Fig. 4)

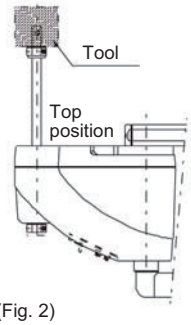
*7: The alarm LED will actuate when the user provides a circuit that applies 24 VDC to the user-wired LED terminal upon I/O output of a signal from the controller.

*8: Push force when driver card parameter No. 38, "Push torque limit during positioning" is set to 70%.

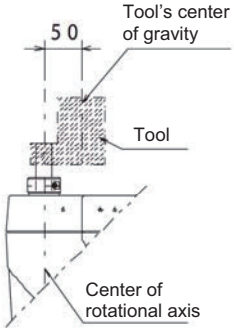
*9: Push force when driver card parameter No. 38, "Push torque limit during positioning" is set to 20%.
Although this parameter can be set to a desired value from 15% to 70%, push force will not stabilize if the set value is outside the range of 35 to 70%.



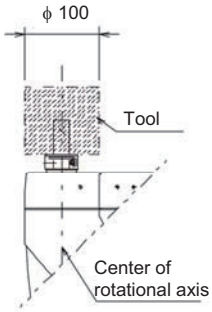
(Fig. 1)



(Fig. 2)



(Fig. 3)



(Fig. 4)

Design references: Machine Directive Annex I, EN292-1, EN292-2, EN1050, EN60204-1, EN775

IX-INN-80□□H (arm length 800, inverse)

Item			Specifications
Model number			IX-INN80□□H-**L-T1
Degree of freedom			Four degrees of freedom
Overall arm length		mm	800
Arm 1 length			450
Arm 2 length			350
Drive method	Axis 1 (arm 1)		AC servo motor + Speed reducer
	Axis 2 (arm 2)		AC servo motor + Speed reducer
	Axis 3 (vertical axis)		AC servo motor with brake + Belt + Ball-screw spline
	Axis 4 (rotational axis)		AC servo motor with brake + Reduction gear + Belt + Spline
Motor capacity	Axis 1 (arm 1)	W	750
	Axis 2 (arm 2)		400
	Axis 3 (vertical axis)		400
	Axis 4 (rotational axis)		200
Movement range	Axis 1 (arm 1)	degree	±120
	Axis 2 (arm 2)		±145
	Axis 3 (vertical axis) (*1)	mm	200 (option: 400)
	Axis 4 (rotational axis)	degree	±360
Maximum operating speed (*2)	Axis 1 + Axis 2 (maximum composite speed)	mm/sec	7586
	Axis 3 (vertical axis)		1614
	Axis 4 (rotational axis)	degree/sec	1266
Positioning repeatability precision (*3)	Axis 1 + Axis 2	mm	±0.015
	Axis 3 (vertical axis)		±0.010
	Axis 4 (rotational axis)	degree	±0.005
Cycle time (*4)		sec	0.43
Load capacity	Rated	kg	5
	Maximum		20
Axis 3 (vertical axis) Push force control range	Upper limit (*8)	N (kgf)	304 (31.0) Push torque limit 70%
	Lower limit (*9)		146 (14.9) Push torque limit 40%
Permissible load on axis 4	Permissible moment of inertia (*5)	kg-m^2	0.1
	Permissible torque	N-m (kgf-cm)	11.7 (119.3)
Permissible tool diameter (*6)		mm	∅100
Home detection			Absolute
User wiring			D-sub 25-pin connector with 25-core AWG26 shielded cable (socket)
Alarm indicator (*7)			One small, red LED indicator (rated voltage: 24 V)
User piping			Two air tubes (outer diameter: ∅6, inner diameter: ∅4) (normal service pressure: 0.8 MPa) Two air tubes (outer diameter: ∅4, inner diameter: ∅2.5) (normal service pressure: 0.8 MPa)

Item			Specifications
Operating environment	Surrounding air temperature/humidity		Temperature: 0 to 40°C, humidity: 20 to 85%RH or less (non-condensing)
	Altitude	m	1,000 or less
Noise		dB	74
Robot weight		kg	60
Brake power source for main unit		W	DC24VI10% 20W
Controller	Power supply		230 V 50/60 Hz 15 A
	Allowable supply voltage fluctuation	%	±10
	Overvoltage category (IEC60664-1)		Category III
	Pollution degree (IEC60664-1)		Pollution degree 3

*1: To move the robot horizontally at high speed, perform teaching so that the vertical axis stays as close to the top position as possible. (Fig. 1)
To operate the robot with its vertical axis at the bottom position, the speed and acceleration must be reduced as appropriate. (Fig. 2)

*2: Assuming PTP instruction operation. The maximum composite speed is not the maximum speed of CP operation.

*3: Positioning precision when the robot is operated repeatedly to one specified position from the same starting position at the same speed and acceleration/deceleration using the same arm (at a constant surrounding air temperature of 20°C). Take note that this is not the absolute positioning precision.
Also note that the positioning repeatability may deviate from the specified value if the arm is changed, positioning is performed to one specified position from multiple positions, or any of the operating conditions such as operating speed and acceleration/deceleration setting is changed.

*4: Measured when the robot is operated at the maximum speed, carrying a load of 2 kg.

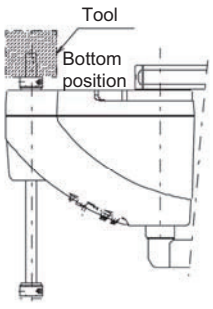
*5: Equivalent allowable inertial moment at the center of rotation of axis 4. The offset from the center of rotation of axis 4 to the center of gravity of the tool shall be 50 mm or less. (Fig. 3)
If the center of gravity of the tool deviates from the center of rotation of axis 4, the acceleration setting needs to be decreased as necessary.

*6: If the allowable tool diameter is exceeded, the tool will interfere with the robot within the robot's operation area. (Fig. 4)

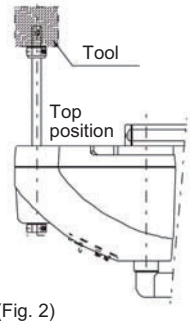
*7: The alarm LED will actuate when the user provides a circuit that applies 24 VDC to the user-wired LED terminal upon I/O output of a signal from the controller.

*8: Push force when driver card parameter No. 38, "Push torque limit during positioning" is set to 70%.

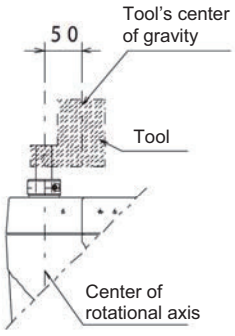
*9: Push force when driver card parameter No. 38, "Push torque limit during positioning" is set to 20%.
Although this parameter can be set to a desired value from 15% to 70%, push force will not stabilize if the set value is outside the range of 35 to 70%.



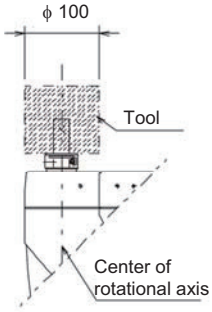
(Fig. 1)



(Fig. 2)



(Fig. 3)



(Fig. 4)

Design references: Machine Directive Annex I, EN292-1, EN292-2, EN1050, EN60204-1, EN775

8. Installation Environment and Storage Environment

8.1 Installation Environment

Install the robot in an environment that satisfies the following conditions:

- Away from direct sunlight
- Not subject to radiated heat from a high-capacity energy source such as a heat-treating furnace
- Surrounding air temperature: 0°C to 40°C
- Humidity: 85% or less (non-condensing)
- Not exposed to corrosive or flammable gases
- Not subject to impact or vibration
- Not exposed to a significant amount of electromagnetic waves, ultraviolet rays or radiation
- Sufficient space is available to ensure safety in teaching and maintenance/inspection operations

Generally, the robot must be installed where the operator need not wear protective gear in order to work.

8.2 Installation Platform

The platform on which to install the robot receives a significant reactive force. Be certain the platform has sufficient rigidity to withstand the anticipated force.

- The surface on which the robot is fixed must have a thickness of 25 mm or more.
  The levelness of the robot installation surface must be at least ±0.05 mm.
- Machine tapped holes of the size shown in the table below in the mounting surface of the platform.

Model number	Tapping size	Remarks
IX-HNN50□□/60□□ IX-INN50□□/60□□	M10	The effective thread shall be 10 mm or more (for steel, or 20 mm or more for aluminum).
IX-HNN70□□/80□□ IX-INN70□□/80□□	M12	The effective thread shall be 12 mm or more (for steel, or 24 mm or more for aluminum).

- The platform must have sufficient rigidity to withstand not only the weight of the robot but also the dynamic moment of inertia that is generated when the robot is operated at maximum speed.
- Secure the platform to the floor or other rigid structure in a manner that prevents any movement due to operation of the robot.
- The installation platform must allow the robot to be mounted on a level surface.

8.3 Storage/Preservatoin Environment

The storage/preservation environment conforms to the installation environment. If the robot is to be stored/preserved for a prolonged period of time, be sure the robot will not be exposed to dew condensation. Unless otherwise specified, desiccant is not placed in the carton when shipped. If the robot is to be kept in an environment subject to condensation, provide preventive measures from over the carton or directly to the robot after unpacking.
The maximum storage/preservation temperature is 60°C for a short storage/preservation period. If the robot is to be stored for more than a month, the temperature should not exceed 50°C.

⚠ Danger **⚠ Warning**

- Failure to provide a proper environment for installation and storage/preservation may shorten the service life of the robot, reduce its operation precision, or cause a malfunction or failure.
- Never use the robot in a flammable atmosphere. The robot may explode or ignite.

9 Installation of the Robot

9.1 Notes on Installation

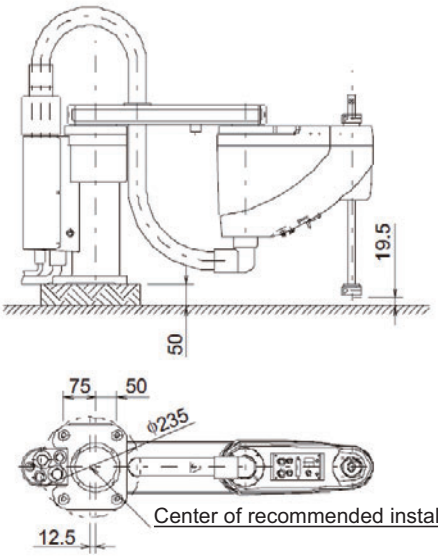
In the case of the ceiling-mount specification, the robot will move to points above the base installation surface when the vertical axis (Z-axis) is moved to the top position.
In the case of the inverse specification, the robot will move to points below the base installation surface when the vertical axis (Z-axis) is moved to the bottom position.

Additionally, when performing an absolute reset, the vertical axis (Z-axis) must be moved to the top position in the case of the ceiling-mount specification or to the bottom position in the case of the inverse specification (home-return operation).

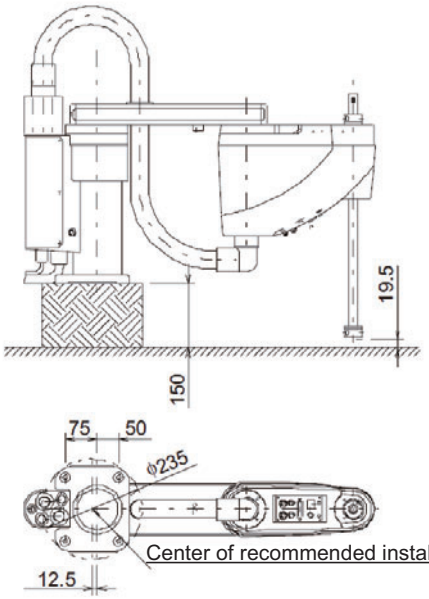
Therefore, install the robot in such a way that the vertical axis will not collide with the ceiling or platform during an absolute reset.

It is recommended that the pedestal be constructed in such a way that contact with the robot will not occur within the robot's range of movement (see the figure below). If the pedestal cannot be constructed as shown below, be sure to reduce the robot's range of movement using soft-limits and prevent the robot from contacting the pedestal.

IX-INN5020H/6020H



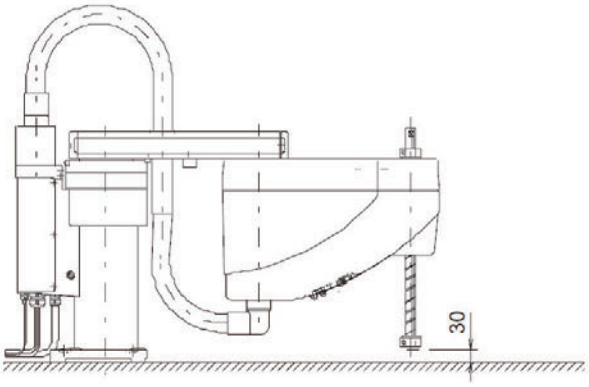
IX-INN5030H/6030H



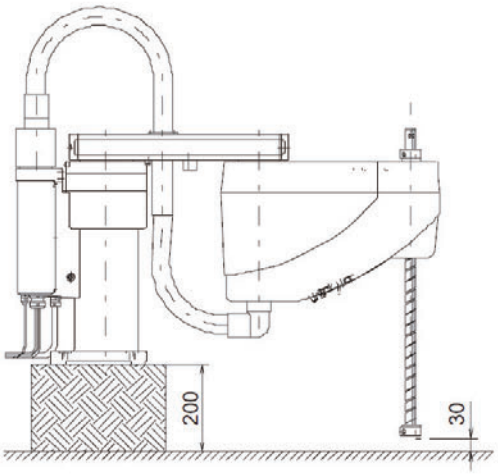
IX-HNN5020H/6020H

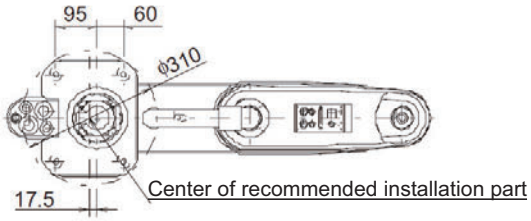
IX-HNN5030H/6030H

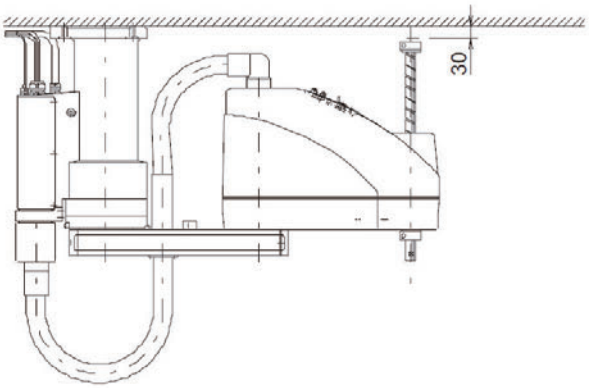
IX-INN7020H/8020H



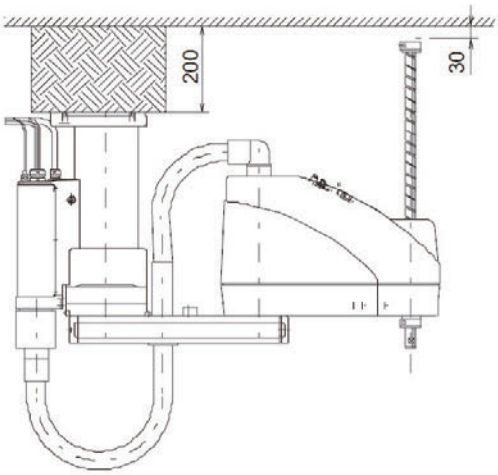
IX-INN7040H/8040H







IX-HNN7020H/8020H



IX-HNN7040H/8040H

9.2 Installing the Robot

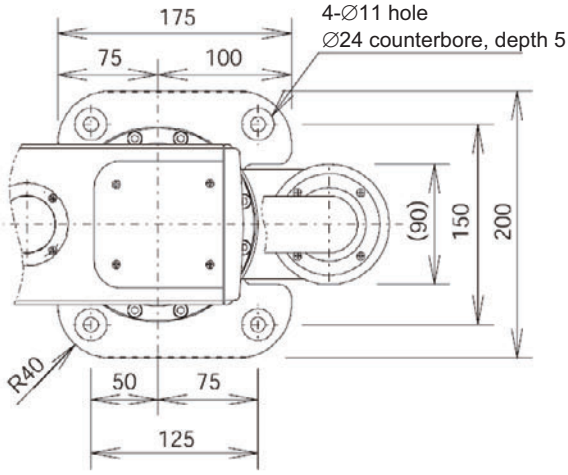
Install the robot on a level surface.

Secure the robot using M3 or M4 hex bolts (4 pcs) and washers.

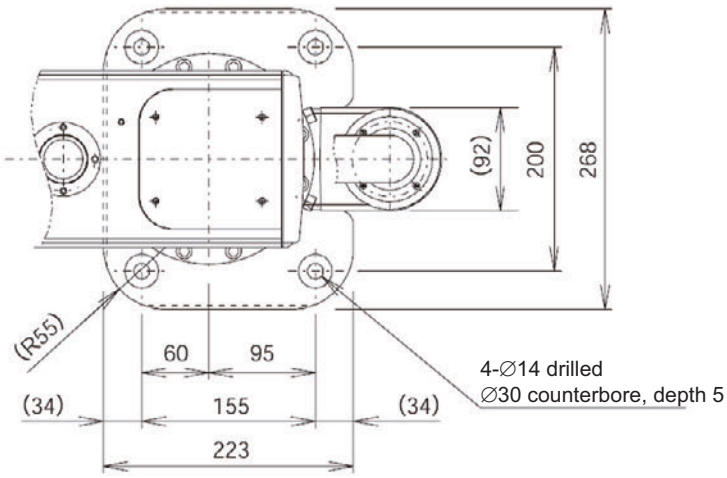
Type	Bolt size	Tightening torque
IX-HNN50□□/60□□H IX-INN50□□/60□□H	M10	60 N·m
IX-HNN70□□/80□□H IX-INN70□□/80□□H	M12	104 N·m

For the hex bolts, use high-tension bolts with an ISO rating of 10.9 or higher.

IX-HNN50 □□ H/60 □□ H
IX-INN50 □□ H/60 □□ H



IX-HNN70 □□ H/80 □□ H
IX-INN70 □□ H/80 □□ H



⚠ Warning **⚠ Caution**

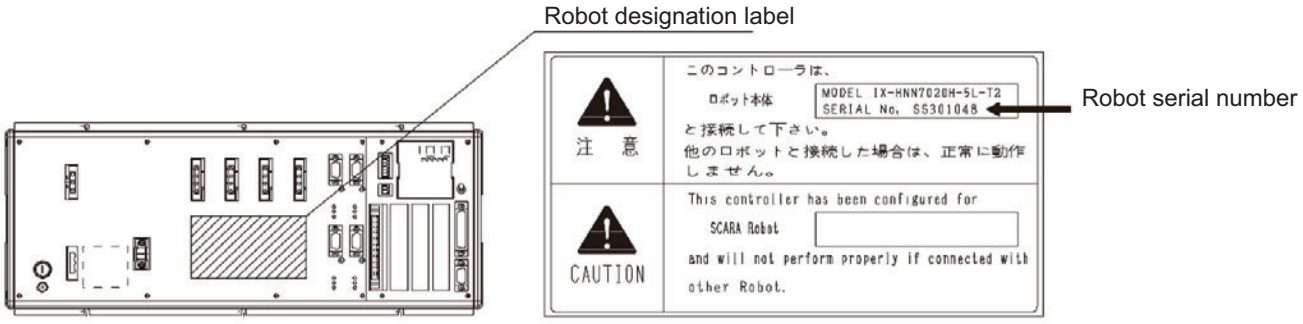
- Always insert a washer below each bolt. Without a washer, the bolt-bearing surface may sink.
- Tighten the hex bolts securely to the correct torque. Improperly tightened bolts may reduce the accuracy of robot operation, and in the worst case cause the robot to overturn.

10. Connecting the Controller

The controller connection cables are attached on the robot (standard cable: 5 m, to air-tube joint: 150 mm).

Pay attention to the following items when connecting the controller:

- Connect to the robot of the serial number specified on the robot designation label provided on the front panel of the controller.

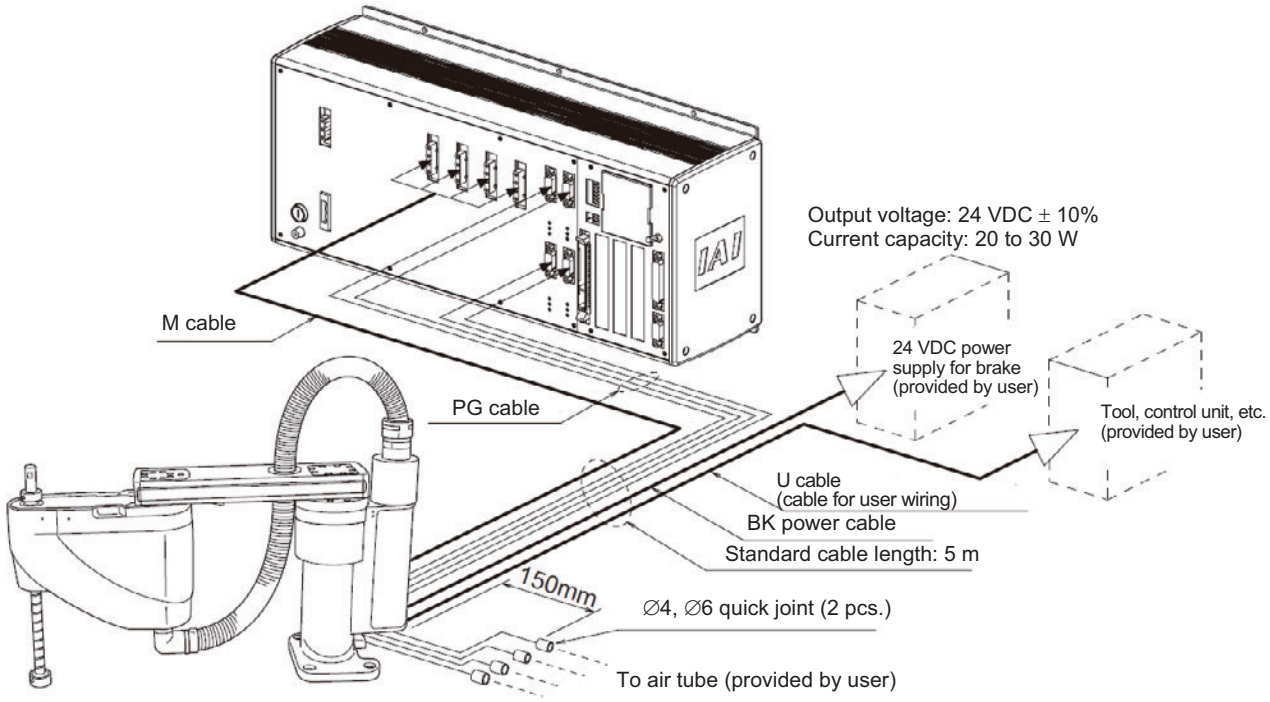


- Connect the cables securely after confirming that they are free from damage or bent connector pins.
- Connect each cable by aligning the indication on the marking tube on the cable with the indication on the controller panel.
- When installing the PG connector (D-sub connector), ensure correct orientation of the connector.
- Please prepare the dedicated 24V DC power source for the brake power circuit of Horizontal Articulated Robot since it is on the primary (high pressure) side.
  Do not attempt to share the secondary circuit power sources such as I/O power source.
  The brake power to be supplied to Horizontal Articulated Robot should be 24V DC ±10% and the voltage source capacity 20W.
  The brake power to be supplied to the controller should be 24V DC ±10% and the voltage source capacity 9W.
  (Note) It is necessary to increase the voltage source capacity of the brake power source if brake actuators are to be connected to the 5th and 6th axes of the controller. [Refer to the section of the voltage source capacity and heat generation in the controller operation manual.]

Refer to the operation manuals for the controller and PC software for the procedures to connect the I/O cable, controller power cable, PC connection cable, etc.

⚠ Warning

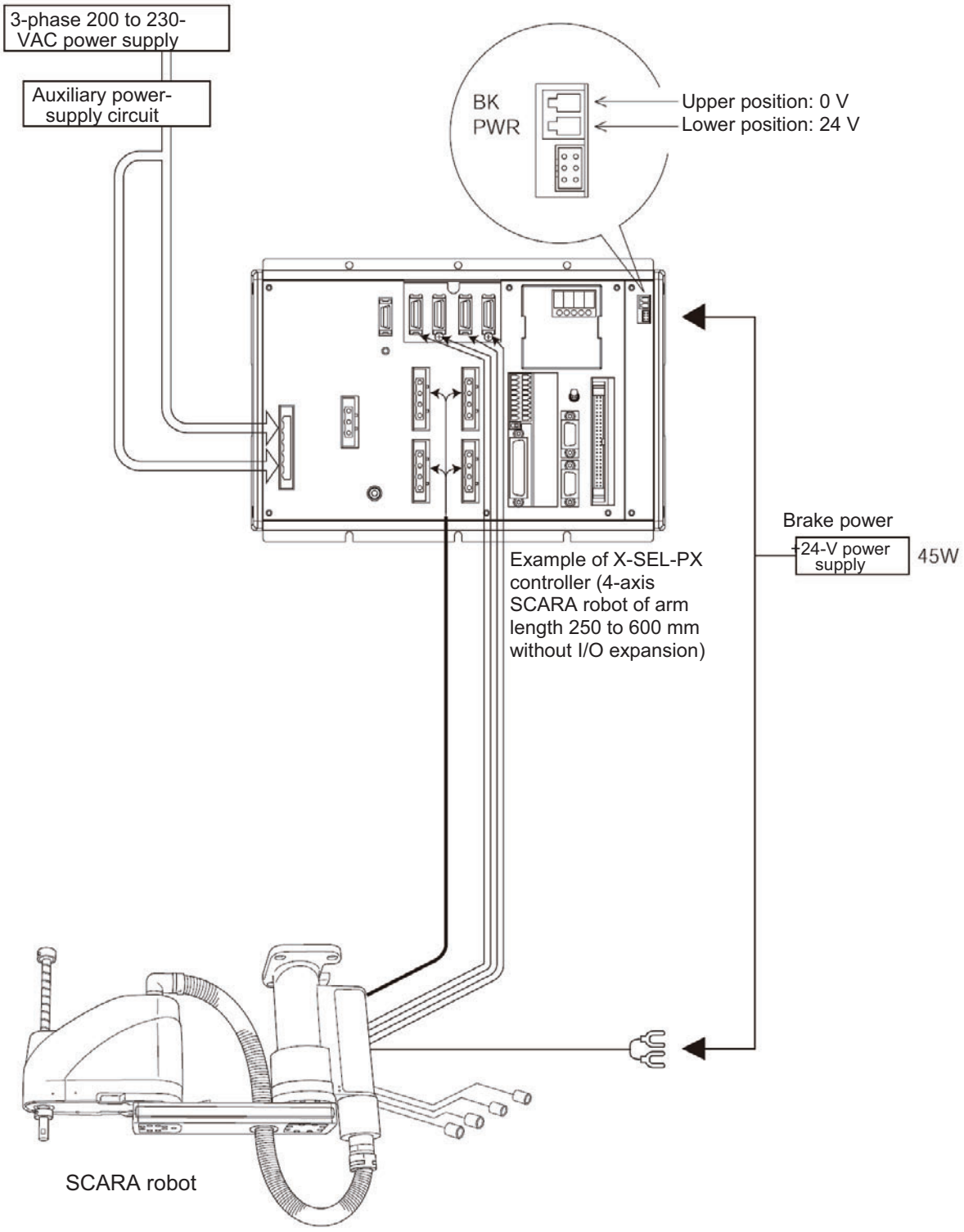
- Be sure to connect to the robot of the serial number specified on the front panel of the controller. The controller will not operate properly if any other robot is connected. Failure to observe this warning may cause the robot to malfunction, resulting in a serious accident.
- Before connecting or disconnecting a cable, always turn off the power to the controller. Connecting/disconnecting a cable with the power supplied to the controller may cause the robot to malfunction, resulting in a serious accident.
- Installing the connectors into the wrong sockets may cause the robot to malfunction. Be sure to check the designation on the cable with that on the controller panel before plugging in any connector.
- If the connectors are not inserted securely, the robot may malfunction and generate the risk of danger. Be sure to affix each connector with the supplied screws.



⚠ Warning

- Before connecting or disconnecting a cable, always turn off the power to the controller. Connecting/disconnecting a cable with the power supplied to the controller may cause the robot to malfunction, resulting in a serious accident.
- Installing the connectors into the wrong sockets may cause the robot to malfunction. Be sure to check the designation on the cable with that on the controller panel before plugging in any connector.
- If the connectors are not inserted securely, the robot may malfunction and generate the risk of danger. Be sure to affix each connector with the supplied screws.

If you are using an X-SEL-PX/QX controller, you must supply the brake power to the controller in addition to wiring the brake power cable from the SCARA robot.
Supply the brake power (+24 V) to the controller as shown in the figure.



11. Checking after Installation

Once the robot has been installed, check the following items:

- Visually check the robot, controller and cables for dents and other abnormalities.
- Confirm that the cables are connected properly and that the connectors are inserted securely.

⚠ Warning

- Failure to perform these checks may result in a malfunctioning robot or a damaged controller or robot.

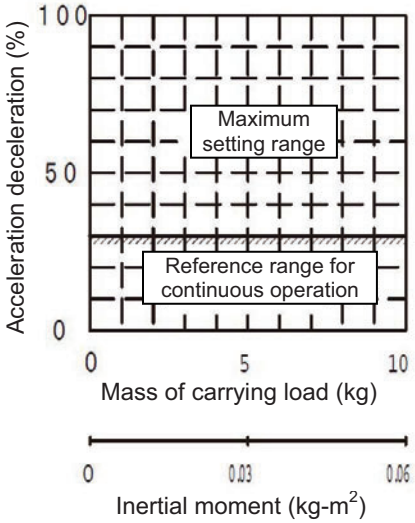
12. Precautions for Use

12.1 Setting the Acceleration/Deceleration

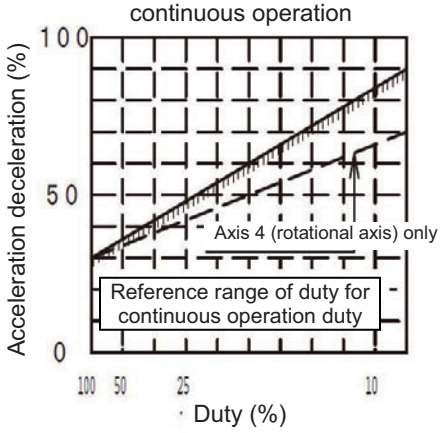
Set the acceleration/deceleration using the graphs below as a reference.

(1) PTP operation (Set using the SEL language commands ACCS and DCLS.)

IX arm length 500/600
Reference settings for PTP
acceleration/deceleration

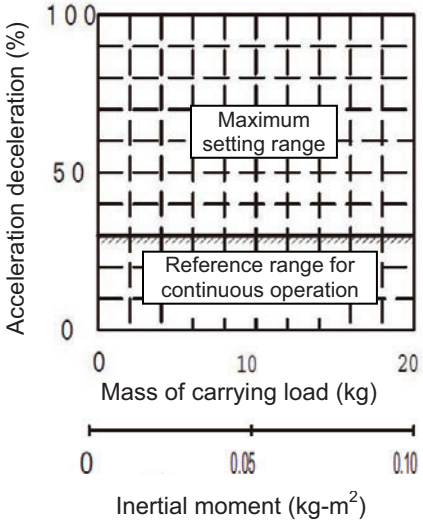


IX arm length 500/600
Reference duties for PTP
continuous operation

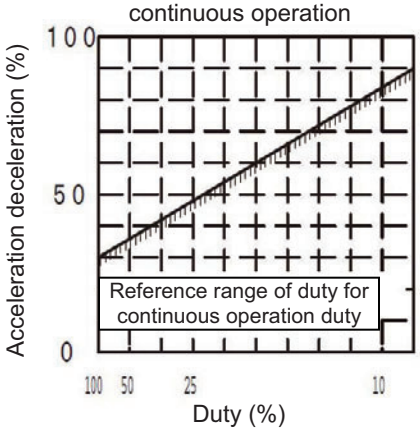


Duty (%) = (Continuous operation /
(Continuous operation + Stopping time)) / 100

IX arm length 700/800
Reference settings for PTP
acceleration/deceleration



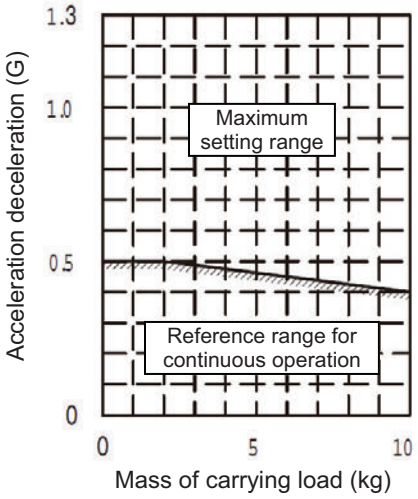
IX arm length 700/800
Reference duties for PTP
continuous operation



Duty (%) = (Continuous operation /
(Continuous operation + Stopping time)) / 100

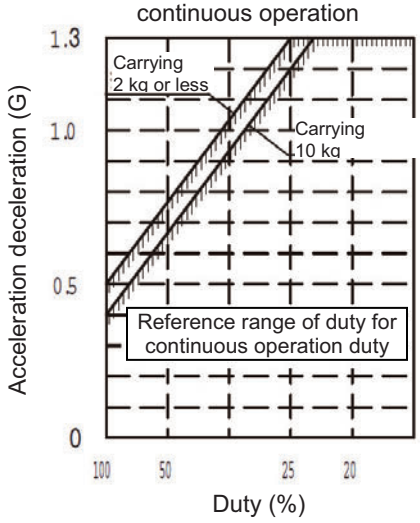
(2) CP operation (Set using the SEL Language commands ACC and DCL.)

IX arm length 500
Reference settings for PTP acceleration/deceleration



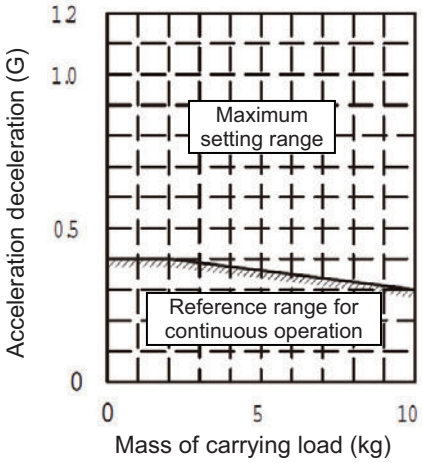
Maximum CP operation speed: 1500 mm/sec

IX arm length 500
Reference duties for CP continuous operation



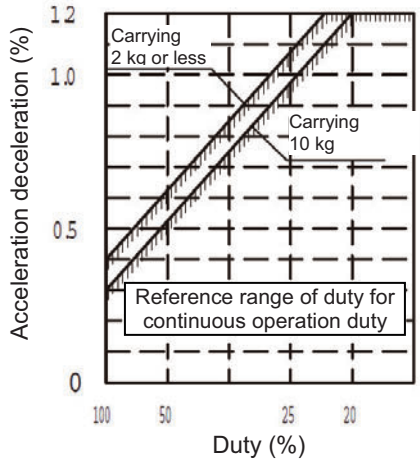
Duty (%) = (Continuous operation / (Continuous operation + Stopping time)) / 100

IX arm length 600
Reference settings for PTP acceleration/deceleration



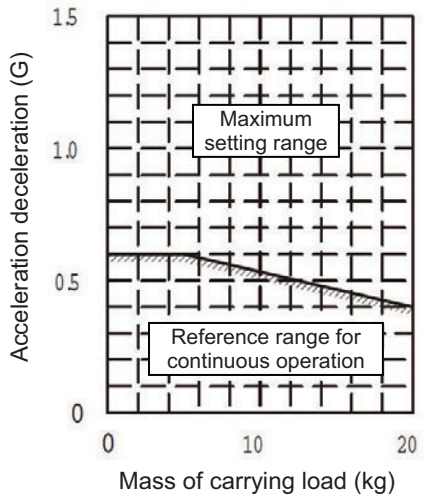
Maximum CP operation speed: 1800 mm/sec

IX arm length 600
Reference duties for CP continuous operation



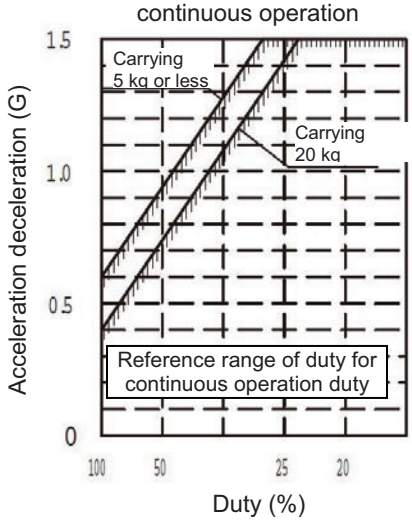
Duty (%) = (Continuous operation / (Continuous operation + Stopping time)) / 100

IX arm length 700
Reference settings for PTP
acceleration/deceleration



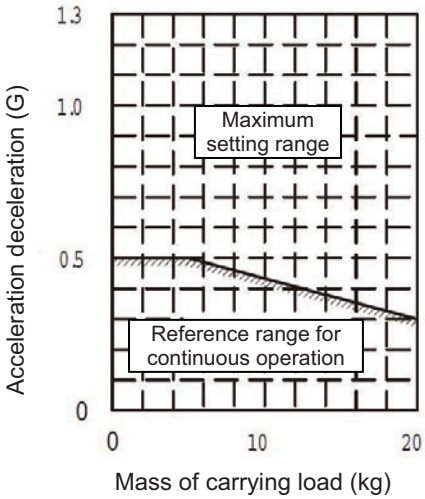
Maximum CP operation speed: 1400 mm/sec

IX arm length 700
Reference duties for CP
continuous operation



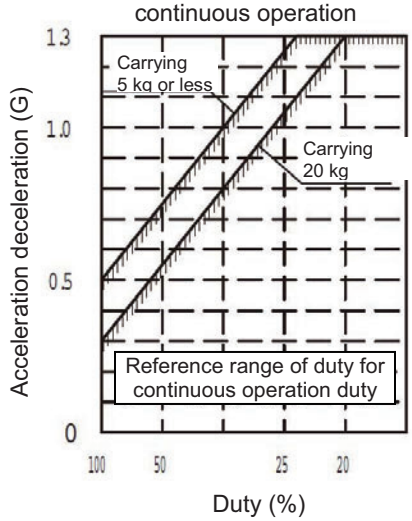
Duty (%) = (Continuous operation /
(Continuous operation + Stopping time)) / 100

IX arm length 800
Reference settings for PTP
acceleration/deceleration



Maximum CP operation speed: 1700 mm/sec

IX arm length 800
Reference duties for CP
continuous operation



Duty (%) = (Continuous operation /
(Continuous operation + Stopping time)) / 100

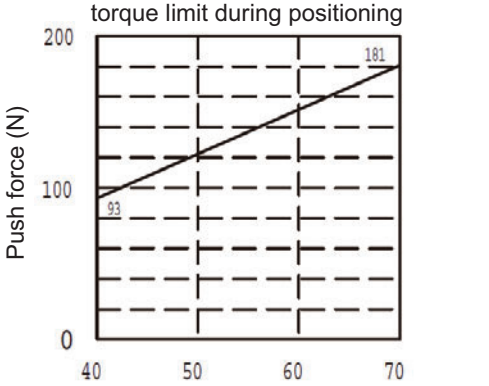
⚠ Caution

- When PTP operation is performed with the acceleration/deceleration set to 100%, the optimal acceleration/deceleration function adjusts the maximum acceleration/acceleration at which the robot can accelerate/decelerate carrying the load weight set by the WGHT command, to 100%.
  Be sure to set the mass and inertial moment using the WGHT command.
  Never set in the WGHT command a value smaller than the load mass installed on the vertical axis.
  If such smaller value is set, the robot accelerates/decelerates at the maximum acceleration/deceleration permitted for the applicable load weight or even higher, and consequently the SCARA robot may stop by generating an error or break down.
- Start from the appropriate reference setting for acceleration/deceleration during continuous operation, and then gradually raise the value for the purpose of adjustment.
- Operate the SCARA robot by maintaining an acceleration/deceleration appropriate for the applicable mass and inertial moment. If not, the life of the driving part may be shortened or damage or vibration may result.
- If an overload error (error code: D0A) occurs, lower the acceleration/deceleration setting or provide an appropriate stopping time based on the reference duty for continuous operation.
  Duty (%) = (Continuous operation / (Continuous operation + Stopping time)) / 100
- To move arm 1 or 2 of the SCARA robot horizontally at high speed, keep the vertical axis near the top position. If such high-speed operation is performed with the vertical axis lowered, the vertical axis may vibrate.
- Be sure to keep the inertial moment and carrying load at the allowable values or less.
- The carrying load represents the inertial moment and mass at the center of rotation of axis 4. If the acceleration/deceleration is raised when the inertial moment far exceeds the allowable value, control is disabled in the rotating direction.
- Depending on the position of the vertical axis, the vertical axis may generate vibration when the inertial moment of the load is high. If vibration occurs, lower the acceleration/deceleration.

12.2 Push Force of the Vertical Axis

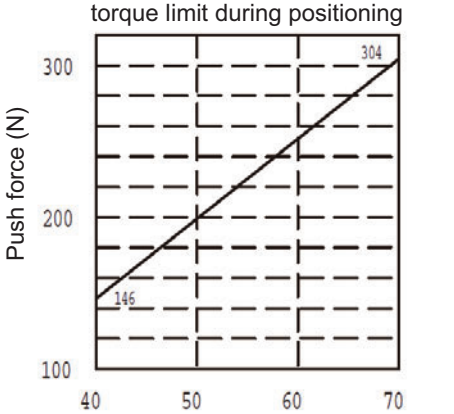
Set the push force of the vertical axis by referring to the graph below.

IX arm length 500/600
Relationship of push force and push torque limit during positioning



Push-motion operating speed: 10 mm/sec

IX arm length 700/800
Relationship of push force and push torque limit during positioning



Push-motion operating speed: 10 mm/sec

⚠ Caution

- Use the PUSH command to perform push-motion operation involving the vertical axis. If push-motion operation is performed without using the PUSH command, the life of the driving part may be shortened or damage or vibration may result.
- Push force can be changed by driver card parameter No. 38, “Torque limit during positioning.”
- When performing push-motion operation, keep the speed to 10 mm/sec or below.
  If the speed exceeds 10 mm/sec, provide a shock-reducing mechanism to keep the vertical axis from receiving shock.
- The graph of push force and push torque limit during positioning shows characteristics when no load is installed on the vertical axis. In downward push-motion operation, the applicable push force increases by the load mass.
  In upward push-motion operation with the inverse specification, the applicable push force decreases by the load mass.
- Push force is controlled by servo motor current. No control is implemented based on feedback of push force.
- Push force is subject to a variation of approx. ±5%.

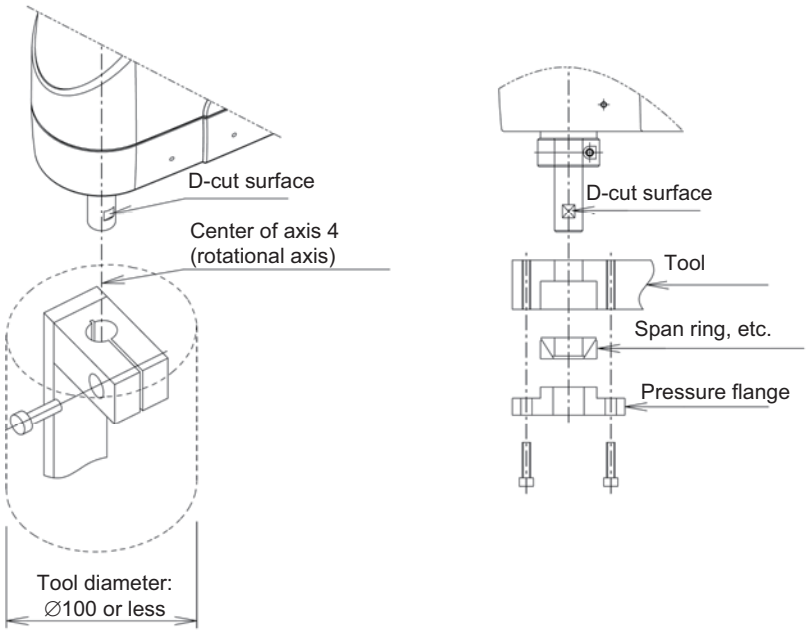
12.3 Tools

The tool mounting part must have sufficient strength and rigidity, along with adequate fastening power to prevent positional shift.

It is recommended that a tool be installed over a split ring, span ring or other appropriate part. A sample configuration of tool installation is given below.

Set the tool diameter to 100 mm or less. If the tool diameter exceeds 100 mm, the tool will interfere with the robot within the robot's operation area. If the tool diameter exceeds 100 mm or the tool interferes with peripheral equipment, decrease the soft limits to reduce the operation area.
Also keep the inertial moment of the tool and load at the allowable value or less. (Refer to 11.4, "Carrying Load.")

Use the D-cut surface at the end of axis 4 (rotational axis) to adjust the position (direction) of axis 4. To set the rotating direction using the D-cut surface and setscrews, be sure to use setscrews with resin or brass pad or set pieces made of soft material.
(Avoid attachment of the tool at the D-cut surface via thread fastening. Doing so may damage the D-cut positioning surface.)



⚠ Warning **⚠ Caution**

- Turn off the power to the controller and robot before installing a tool.
- If the tool mounting part does not have sufficient strength, it may break while the robot is operating and cause the tool to detach and fly off.
- If the tool diameter exceeds 100 mm, the tool will contact the robot within the robot's operation area, causing damage to the tool, load and/or robot.
- Avoid attachment of the tool at the D-cut surface via thread fastening. Doing so may damage the D-cut positioning surface.

12.4 Carrying Load

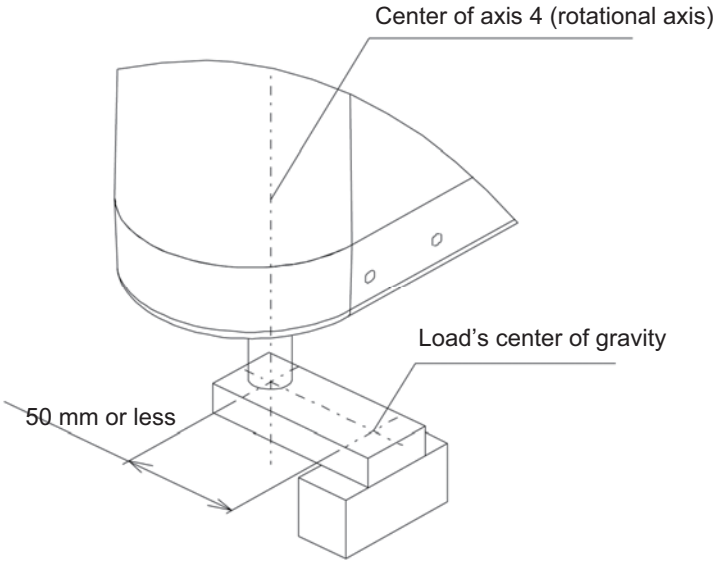
Load capacity

Model number	Rated load capacity	Maximum load capacity
IX-HNN50□□H/60□□H IX-INN50□□H/60□□H	2 kg	10 kg
IX-HNN70□□H/80□□H IX-INN70□□H/80□□H	5 kg	20 kg

Load's permissible moment of inertia

Model number	Allowable inertial moment	Remarks
IX-HNN50□□H/60□□H IX-INN50□□H/60□□H	0.06 kg-m^2	Both rated and maximum
IX-HNN70□□H/80□□H IX-INN70□□H/80□□H	0.10 kg-m^2	

Load offset (from the center of axis 4 (rotational axis))
50 mm or less

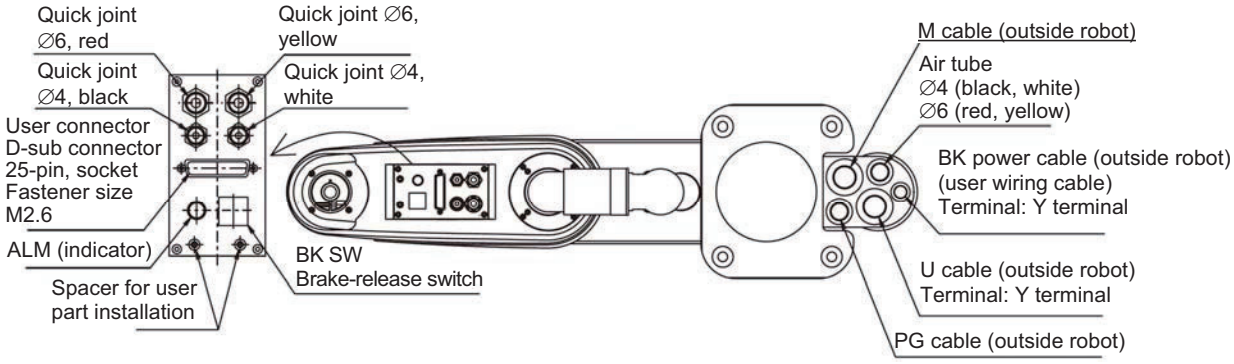


⚠ Caution

- Set appropriate acceleration/deceleration according to the mass of the end and moment of inertia. Failure to do so may cause the drive part to wear prematurely or may result in damage or vibration.
- If vibration occurs, lower the acceleration/deceleration as appropriate.
- If the load gets offset, the robot becomes more likely to cause vibration. Design the tools so that the load's center of gravity aligns with the center of axis 4.
- Do not move the robot horizontally with axis 3 (vertical axis) extended. It may cause the vertical axis to bend and disable the axis. To move the robot horizontally with axis 3 extended, adjust the speed and acceleration/deceleration as appropriate.

12.5 User Wiring and Piping

The robot comes with standard cables and tubes that the user can use in a desired wiring/piping configuration.



User connector specifications

Rated voltage	3.0 V
Permissible current	1.1 A
Conductor size and number of wires	AWG 26 (0.15 mm^2), 25 wires
Other	Twisted-pair cable (1 to 24), shielded

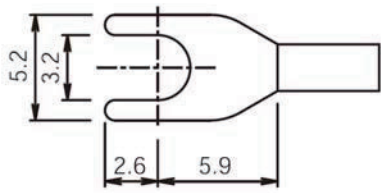
Piping specifications

Normal service pressure	0.8 MPa
Dimensions (outer diameter x inner diameter) and number of tubes	∅4 mm x ∅2.5 mm, 2 pieces
	∅6 mm x ∅4 mm, 2 pieces
Working medium	Air

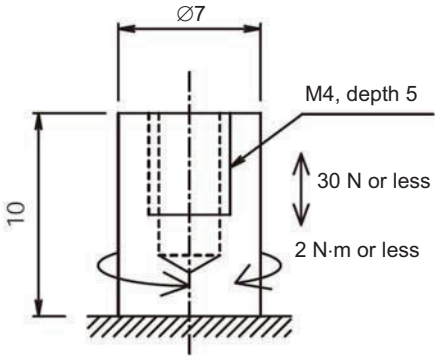
ALM (indicator) specifications

Rated voltage	24 VDC
Rated current	12 mA
Illumination color	Red LED

Shape of Y-terminal



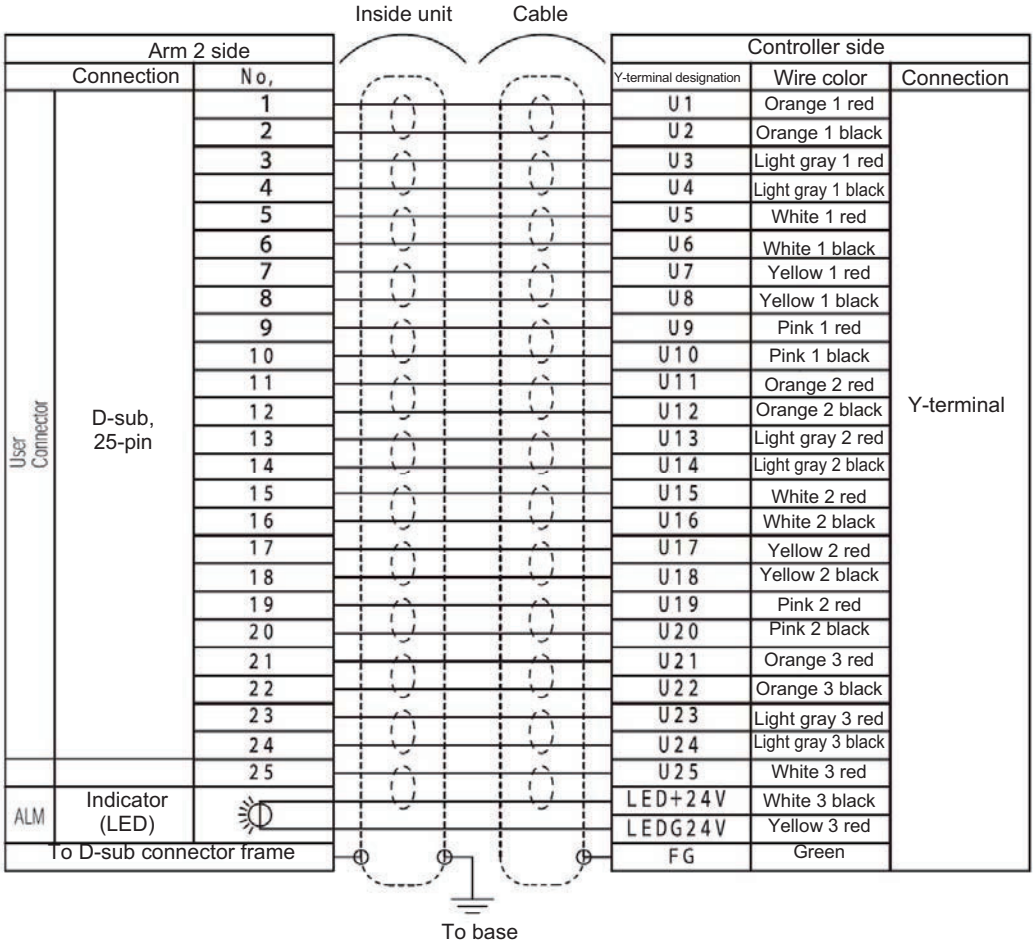
Spacer for user part installation



External force applied to the spacers must not exceed 30 N in the axial direction or 2 N·m in the rotating direction (for each spacer).

The user connector comes with the mating D-sub 25-pin plug.
Solder a user-supplied cable to the D-sub connector (plug), attach the supplied hood, and then connect to the user connector (socket). Use a shielded cable with an outer diameter of ∅11 or less.
To turn on the ALM (indicator), the user must configure a dedicated circuit that uses the controller I/O output signal, etc.

User connector pins and corresponding Y-terminals



⚠ Warning

- Before commencing wiring/piping work, turn off the power to the controller and the power/air supplies to the robot. Failure to do so may cause the robot to malfunction.
- Use cables and tubes within their specifications. Failure to do so may result in fire or short circuit due to an overheated cable, or may cause air leaks.
- Connect the shielded cable to the hood. Otherwise, the robot may malfunction due to noise.
- Secure the supplied D-sub connector using the screws on the hood.

13. Inspection/Maintenance

13.1 Inspection/Maintenance

Your horizontal articulated robot must be inspected daily and on a regular basis to ensure safe, efficient operation. Perform the necessary inspections after confirming the maintenance/inspection items required for your IAI robot, as defined in this section.

Do not inspect, adjust or repair the robot or controller, replace any of the robot/controller parts, or perform any other operation in a manner not specified in this operation manual. In particular, do not disassemble the robot or controller or cut any robot/controller cable in the installation location because it will necessitate adjustments using factory machines.

Disassembly of servo motor
Disassembly of ball reduction gear
Disassembly of ball-screw spline
Disassembly of bearing
Disassembly of harmonic speed reducer
Disassembly of brake
Cutting of cable

IAI may not be able to repair any malfunction or failure occurring as a result of or in connection with the performance of any of the operations listed above.
Periodic inspection covers items that must be performed with or without the controller power turned on. In either case, take proper measures so that operators other than the person carrying out the inspection will not be able to accidentally operate the power switch.

⚠ Warning

- Performing inspection or maintenance without fully understanding the details of work may result in a serious accident.
- If inspections are neglected, the drive part may wear prematurely or the robot may malfunction unexpectedly.

13.1.1 Daily Inspection

Check the following items daily before and after operating the robot.
Observe the precautions for work near the robot and for inspection/maintenance/adjustment operations when carrying out each check.

Check location	Description
Safety cage	• Correct the deformation or positional shift of the cage. • Confirm that the interlock mechanism is operating properly.
Robot	• Check the robot mounting bolts for looseness. • Check the exterior for abnormality, loose covers, flaws, dents, etc. (If the robot has flaws or other abnormalities, please contact IAI.) • Check for abnormal move, vibration or noise.
Cables	• Check the cables for flaws. • Check the cable mounting parts for looseness.
Emergency-stop switch	• Confirm that the emergency-stop switch functions properly.

13.1.2 Six-Month Inspection

Check the following items on the robot every six months.
Observe the precautions for work near the robot and for inspection/maintenance/adjustment operations when carrying out each check.

Check location	Description
Robot	Check the arm mounting sections for looseness. (If any of the arm mounting sections is loose, tighten the fastening parts securely.)
Ball-screw spline	• Check the ball screw and ball spline for looseness. • Add grease after removing old grease with a waste cloth, etc. (THK's AFE grease or equivalent)
Connectors	Check the connectors for looseness.

If the robot has flaws or other abnormalities, please contact IAI.

⚠ Caution

- In case the grease got into your eye, immediately go to see the doctor to get an appropriate care.
- After finishing the grease supply work, wash your hands carefully with water and soap to rinse the grease OFF.

13.1.3 Yearly Inspection

Check the following items on the robot every year.
Observe the precautions for work near the robot and for inspection/maintenance/adjustment operations when carrying out each check.

Check location	Description
Joint bearing for harmonic reduction gear	Check arms 1 and 2 for looseness in the rotating direction and axial direction. (Contact IAI should you find any abnormality.)
Ball-screw spline	Check the vertical axis for looseness. (Contact IAI if an abnormality is found.)

⚠ Warning

- Performing inspection or maintenance without fully understanding the details of work may result in a serious accident.
- If inspections are neglected, the drive part may wear prematurely or the robot may malfunction unexpectedly.
- Display a “Work in Progress” sign so that other operators will not operate the controller, operation panel, etc.

13.2 Battery Replacement

13.2.1 Preparation

The following items are required when replacing the batteries:
Before replacing the batteries, turn off the power to the controller, control panel and other relevant units.

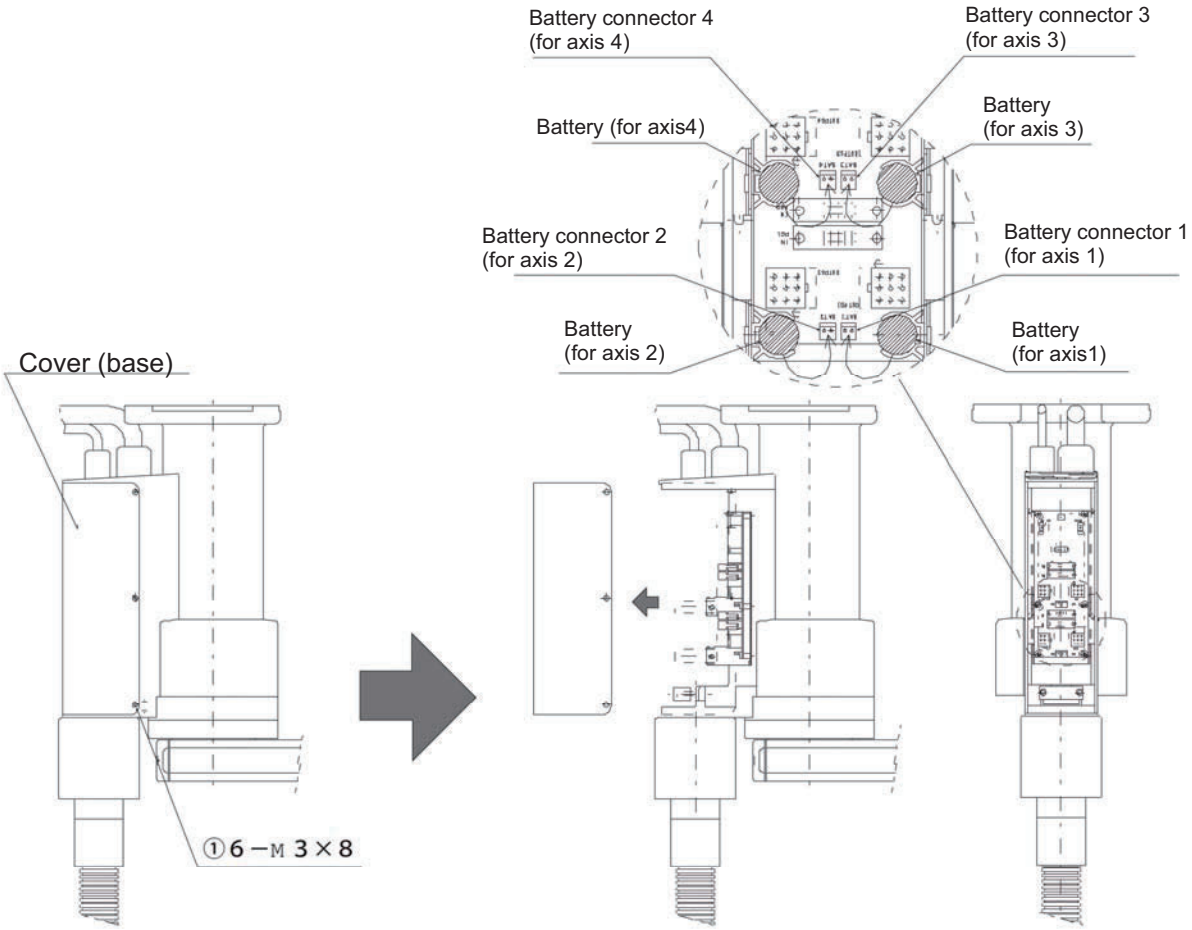
Model number	Tool	New, 1x-only specification
IX-HNN50□□H/60□□H/70□□H/80□□H	Phillips screwdriver	AB3 (4 pcs)
IX-INN50□□H/60□□H/7020H/80□□H		

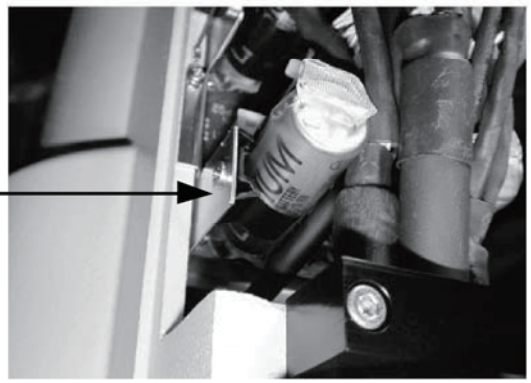
13.2.2 Replacement Procedure

(1) Remove the countersunk head screws (6 pcs) [1] and take out the cover (base).
(2) Remove the batteries from the battery holder.
(3) Unplug the BAT connector and connect a new battery.

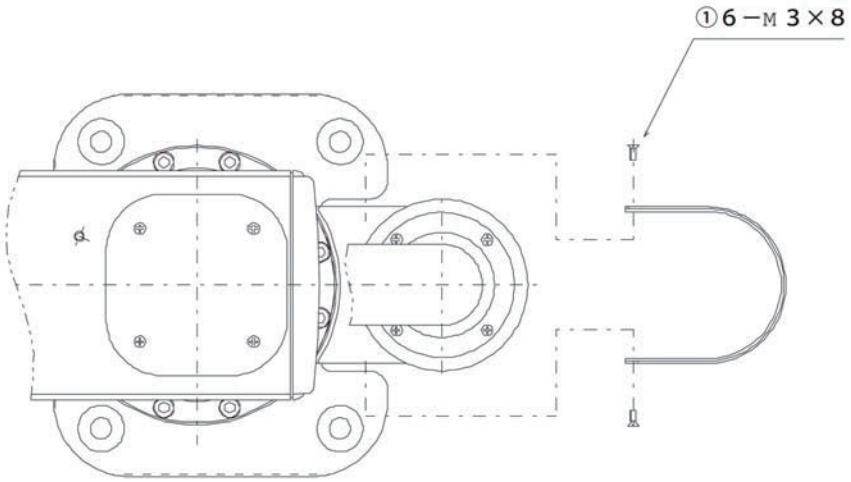
- After removing the old batteries, quickly connect new batteries (roughly within 5 minutes x number of batteries).
- If new batteries are not connected for a longer period, the rotation data will be lost and an absolute reset will become necessary.
- Replace batteries one axis at a time. If the batteries for all axes are replaced at once, the work may not be completed within the specified time.

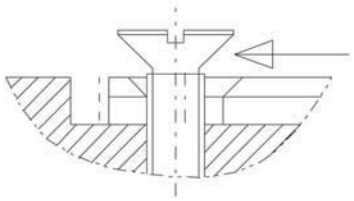
(4) Install the batteries into the battery holder.





(5) Secure the cover (base) using the countersunk head screws [1]. (Tightening torque: 0.74 N-m)





Instead of tightening to the specified torque in one go, loosely position each screw in the position shown to the left, and while pressing the cover in the direction of the arrow tighten both screws uniformly to secure the cover effectively with the gasket.

⚠ Caution

- When installing the cover (base), be careful not to pinch the internal wiring

13.3 Absolute Encoder Reset Method

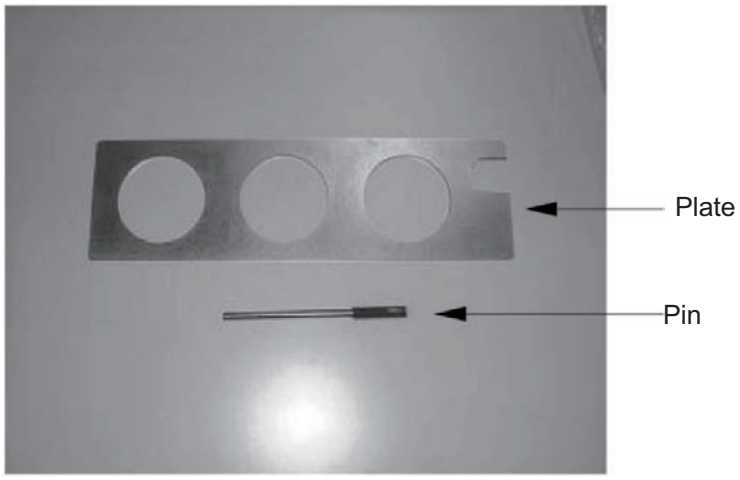
13.3.1 Preparation for Absolute Reset

The following jigs are required to perform an absolute reset.

- Absolute reset adjustment jigs

Model number	Remarks
JG-1	For arm length 500/600
JG-3	For arm length 700/800

Connect the robot, controller and PC cables so that the robot/controller can be operated using the PC software. Be sure to check the EMG switch operation beforehand.
An absolute reset of the rotational and vertical axes requires absolute reset adjustment jigs, but jigs are not always required for an absolute reset of arms 1 and 2.
(A multi-rotation reset can be performed as long as the current position is within ±1 graduation on the positioning mark sticker.)



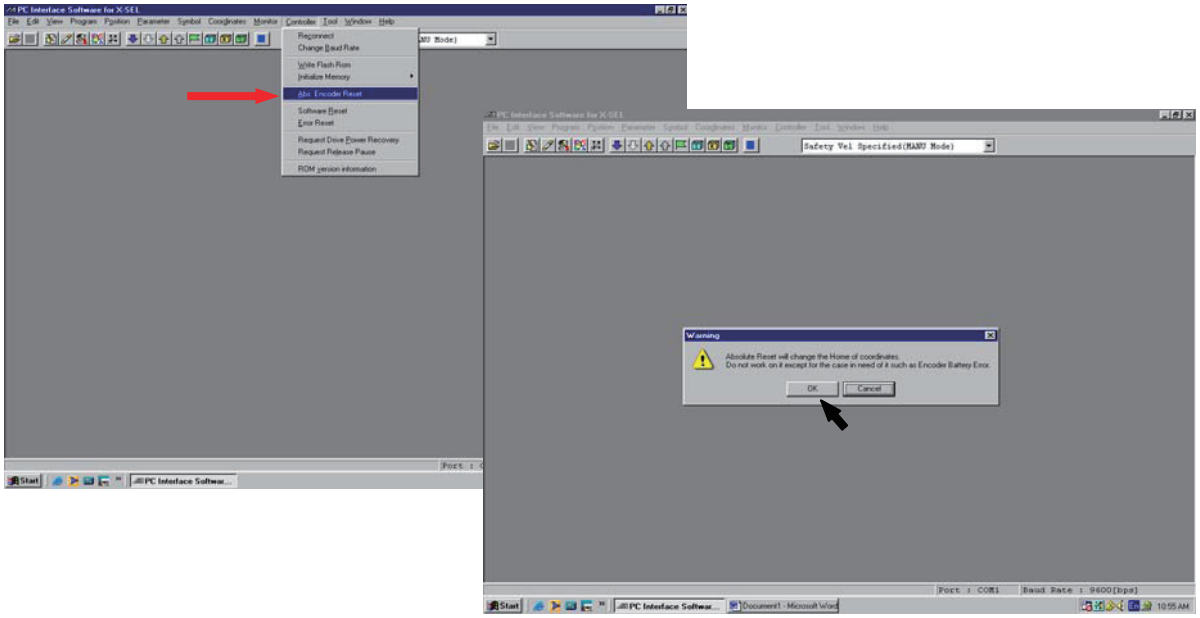
Example of Absolute Reset Adjustment Jig (Model number JG-1)

⚠ Warning

- Fully understand the applicable inspection/maintenance work, because failure to do so may result in a serious injury accident.
- Put up a “WORK IN PROGRESS” sign to prevent other operators from accidentally operating the controller, operation panel, etc.

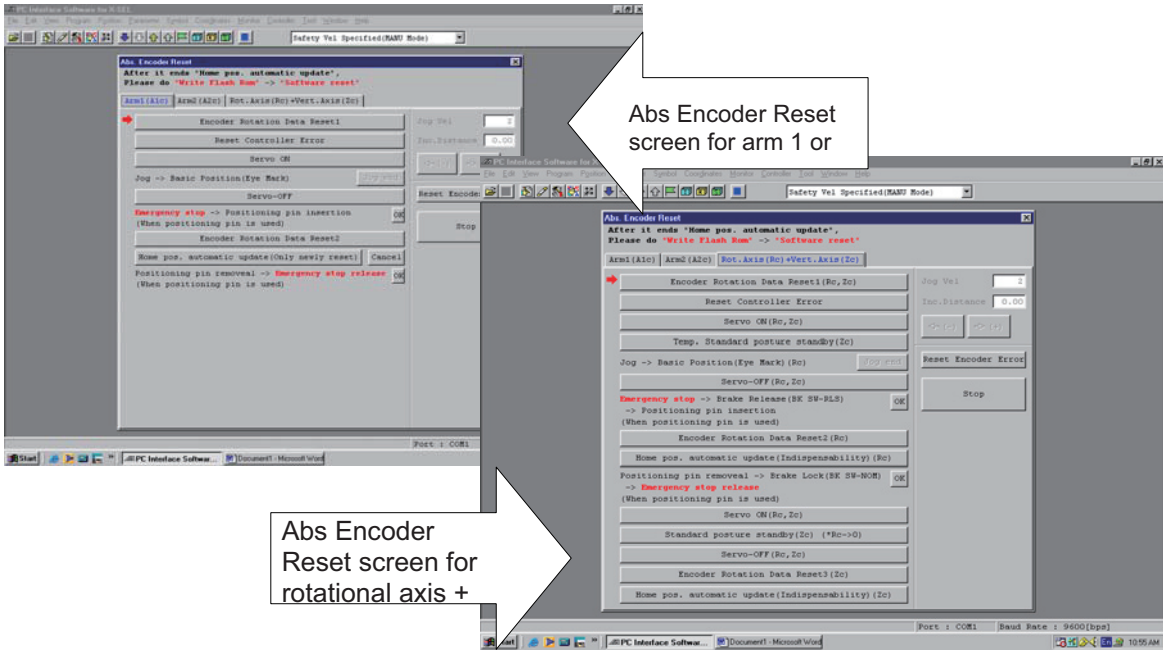
13.3.2 Starting the Absolute Reset Menu

(1) Open the Abs Encoder Reset window from the PC software.
(*) Select “Absolute Reset (SCARA Axis) (Y)" if you are using an X-SEL-PX/QX controller.



Starting Up Absolute Reset Window

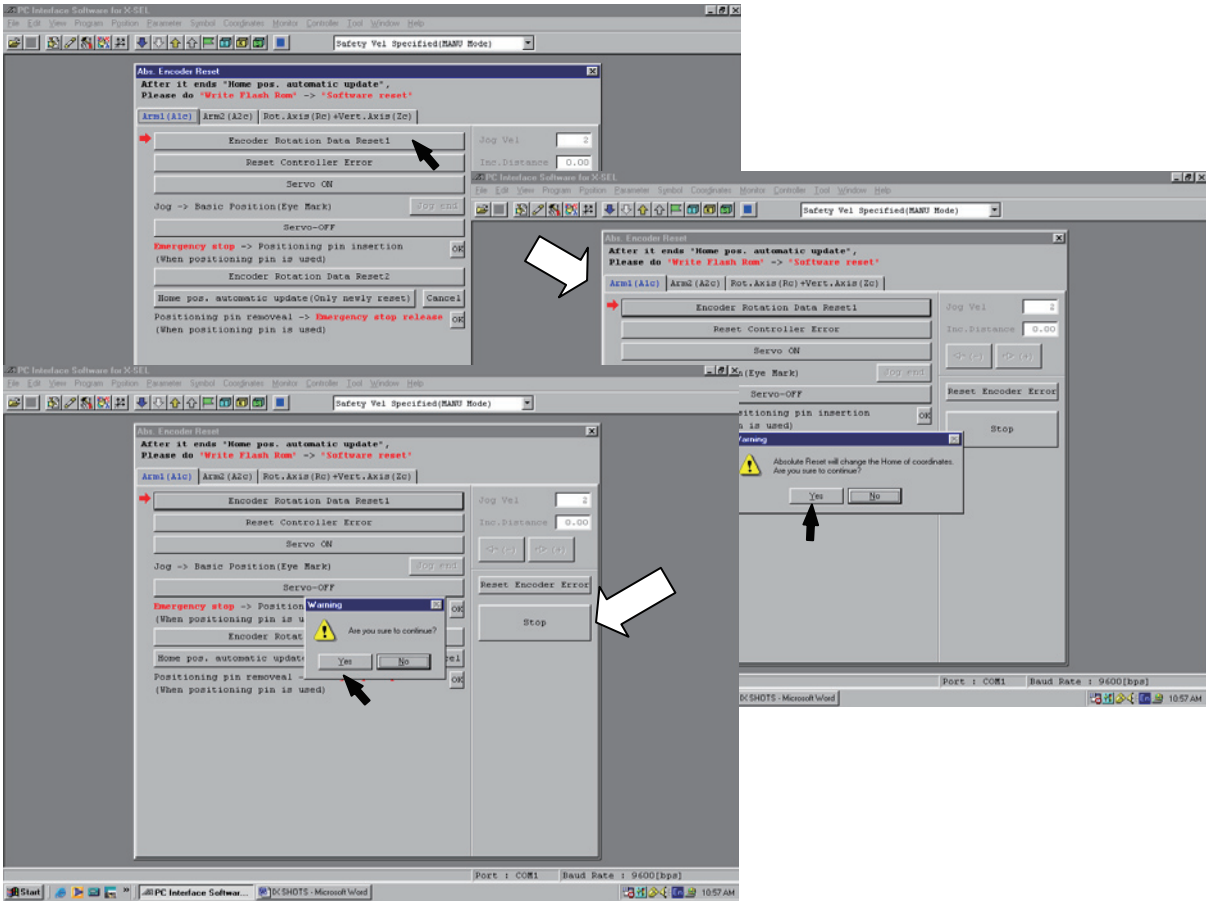
2. The Abs Encoder Reset window opens.
   - One of three absolute reset screens –for arm 1, arm 2 and rotational axis + vertical axis– is displayed when a corresponding tab is clicked.



Absolute Reset Window

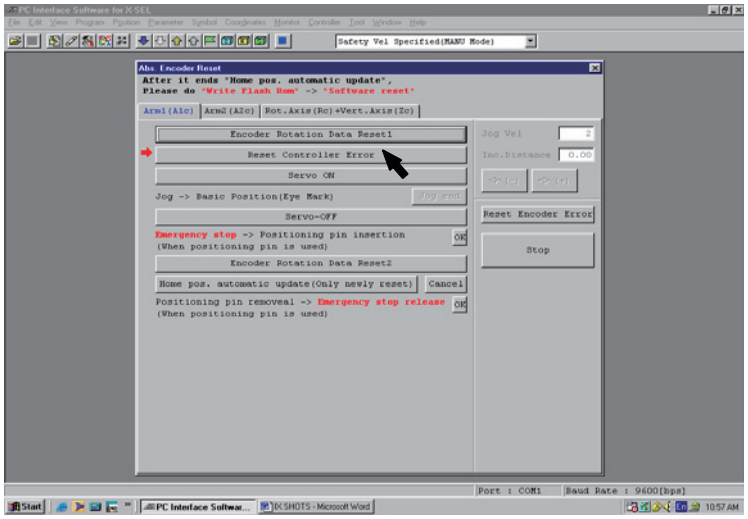
13.3.3 Absolute Reset Procedure for Arm 1 or 2

(1) Click the “Encoder Rotation Data Reset1” button.



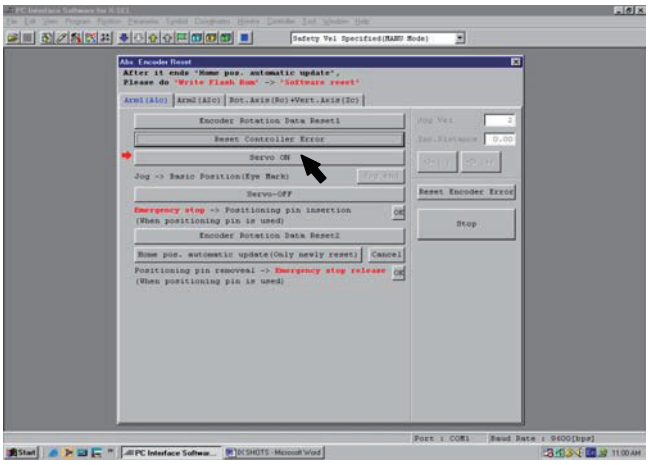
Encoder Multi-rotation Data Reset 1

(2) Click the “Reset Controller Error” button.



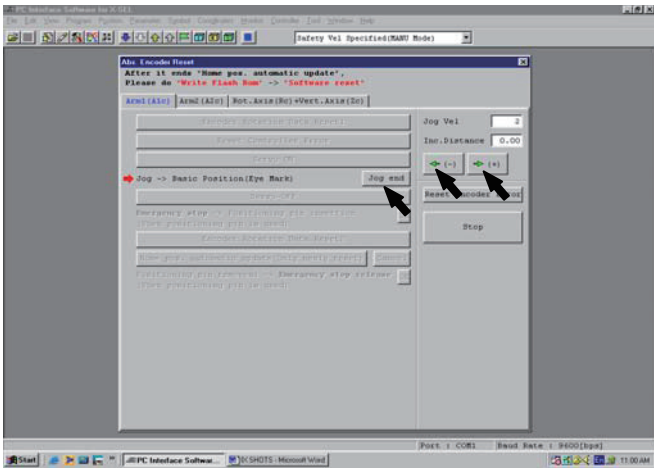
Controller Reset

(3) Click the “Servo ON” button.



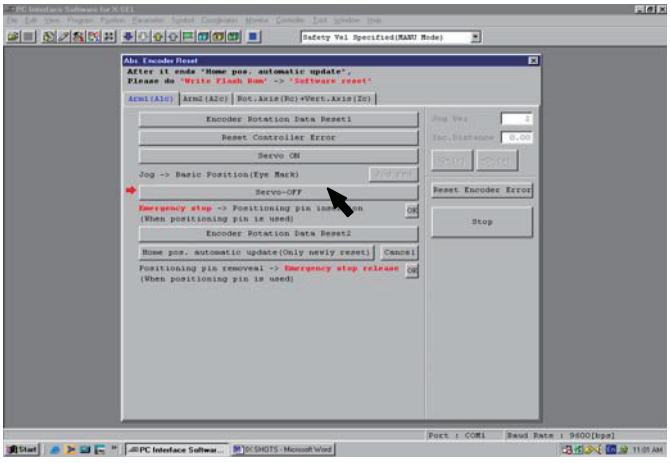
Servo ON

(4) Jog the arm to near the reference position (see reference position drawing in step (7), and click the “Jog end” button.



Jogging

(5) Click the “Servo-OFF” button.

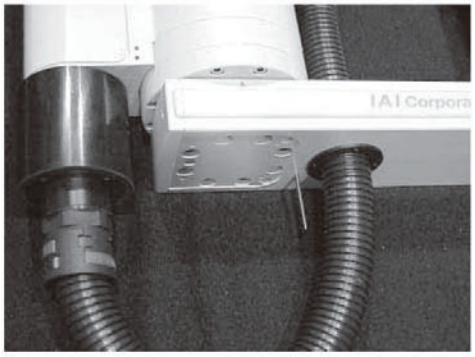


Servo OFF

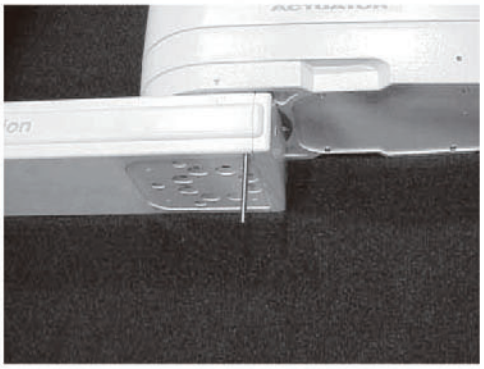
(6) Press the emergency-stop switch.

(7) When performing an absolute reset of arm 1, set the adjustment jig (pin) on arm 1 to secure the arm in its reference position. You can move arm 2 when securing arm 1. When performing an absolute reset of arm 2, set the adjustment jig (pin) on arm 2 to secure the arm in its reference position. You can move arm 1 when securing arm 2.

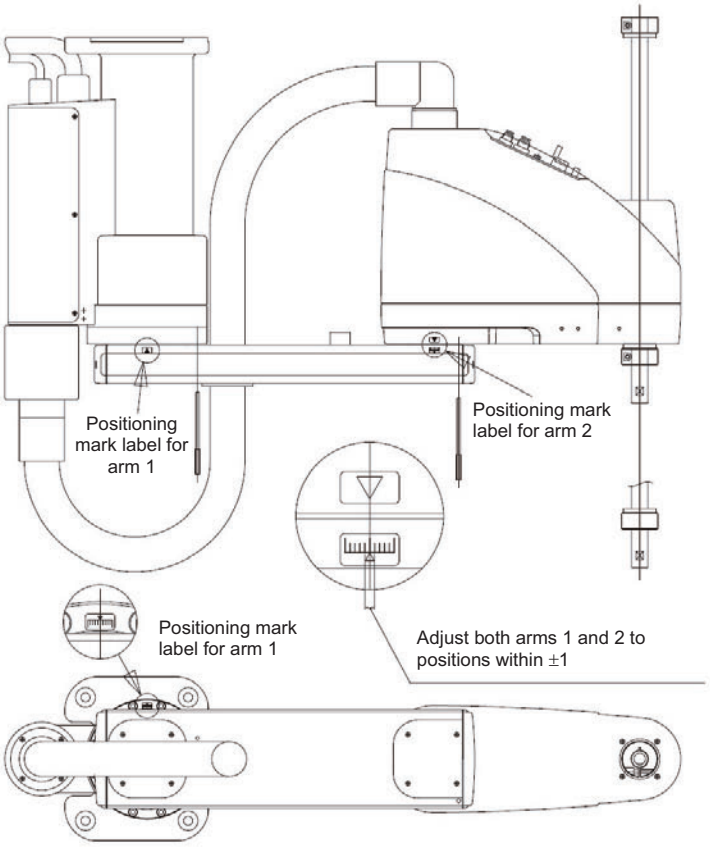
- Set the jig after confirming that the emergency-stop switch is pressed.
- Set the jig after adjusting the arm to the reference position, using the positioning mark label as a guide.
- Arm 1 has a cover (not arm 2), which is fixed with setscrews. Remove the setscrews and detach the cover before setting the jig.
- It is recommended that an adjustment jig be used to perform an absolute reset. With arm 1 or 2, however, rotation data can be reset as long as a positioning accuracy of “center of positioning mark label ±1 graduation” is ensured.



Arm 1
(arm length 500/600, arm length 700/800)



Arm 2
(arm length 500/600, arm length 700/800)



Reference Posture for Arm Length 500/600, 700/800

⚠ Warning

- Always press the emergency-stop switch before setting an adjustment jig. Failure to do so may cause the robot to malfunction and result in a serious accident.

(8) Click the “OK” button.

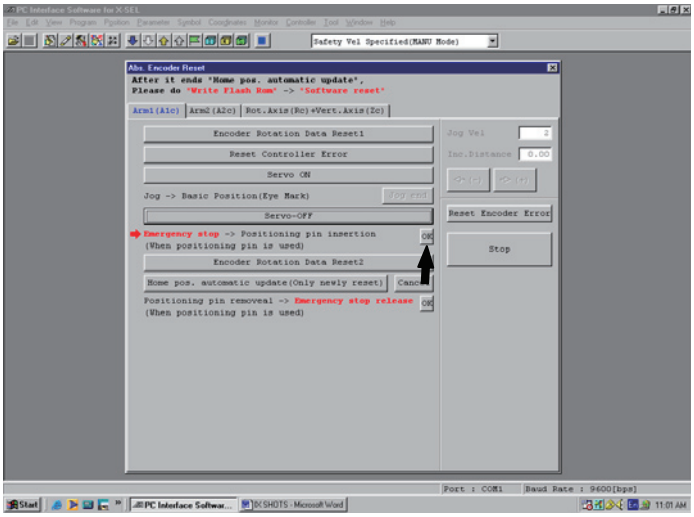
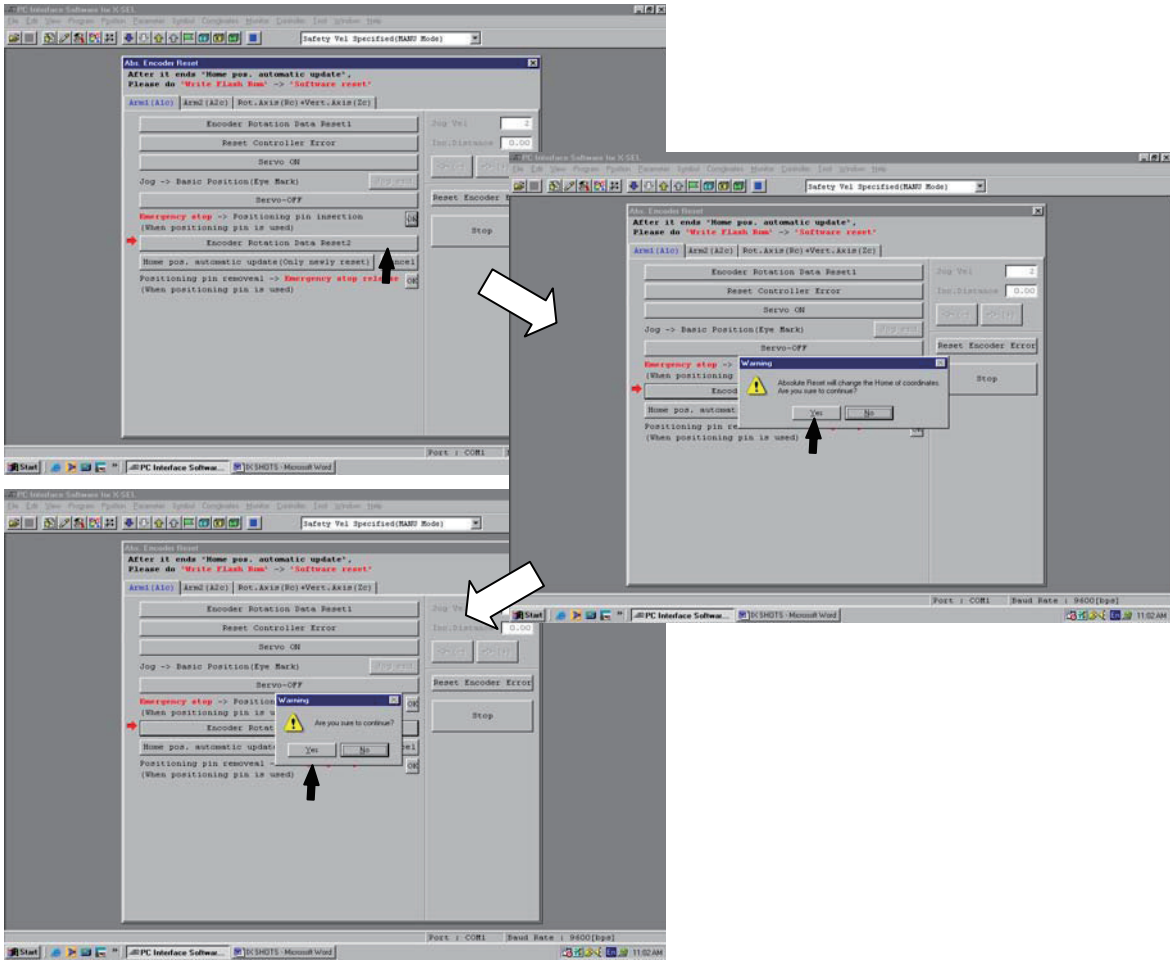


Fig. 13.18 Confirmation

(9) Click the “Encoder Rotation Data Reset2” button.

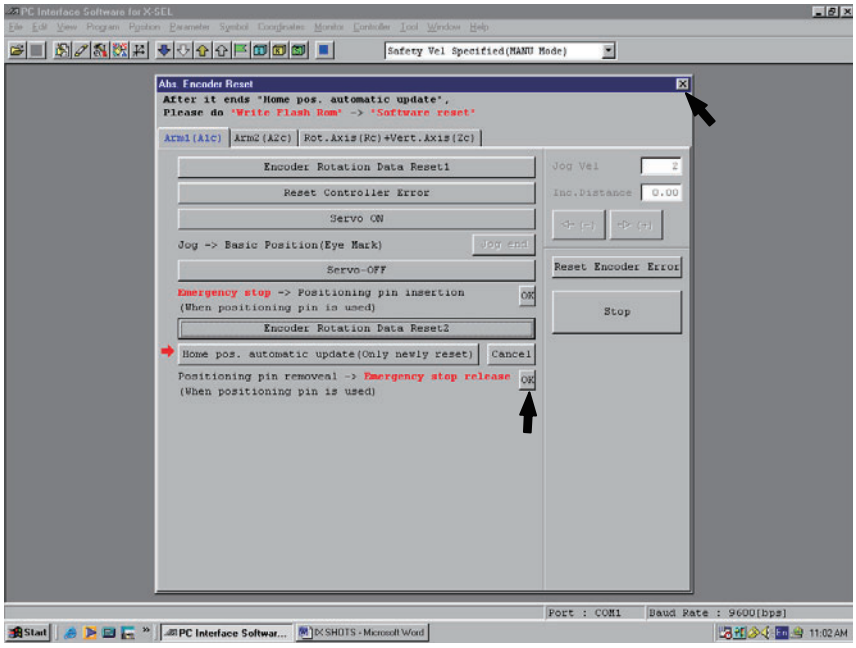


Encoder Multi-rotation Data Reset 2

(10) Remove the adjustment jig.
- If you are working on arm 1, install the cover and secure it with the setscrews (not required for arm 2).

(11) Release the emergency-stop switch.
(12) Click the “OK” button.

- An arrow is shown next to the “Home pos. automatic update” button. Do not set this item. (In particular, be sure this item is not set when performing an absolute reset without using a jig).
- If the home position is updated automatically when a reset is performed without using an adjustment jig, the home position will become offset.
- If you have allowed the home preset value to be updated automatically by mistake, do not write the updated data to the flash ROM. Instead, perform a software reset. (After the software reset, the data will return to the original condition before the home preset value was automatically updated.)
- Always click the “OK” button after removing the jig and releasing the emergency-stop switch.



Confirmation

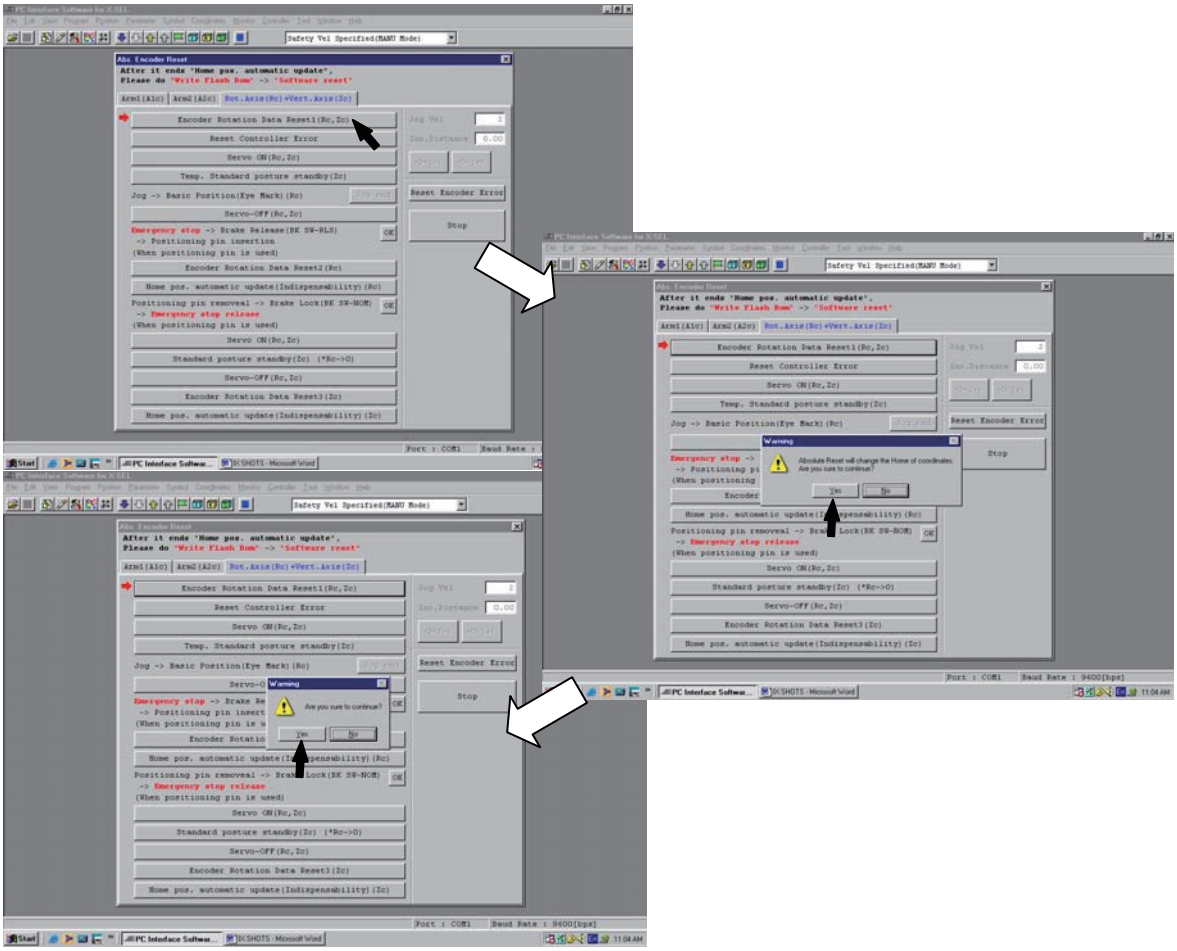
(13) Click “X” in the top right-hand corner to exit the absolute reset window.
- Once the absolute reset is complete, be sure to reset the software.

⚠ Warning

- Be careful not to perform a reset using an incorrect sequence, since it may cause the arm position to become offset.
- Update the home preset value only if any of the mechanical settings has been changed, such as after an arm has been replaced. (Changes relating to joints only)

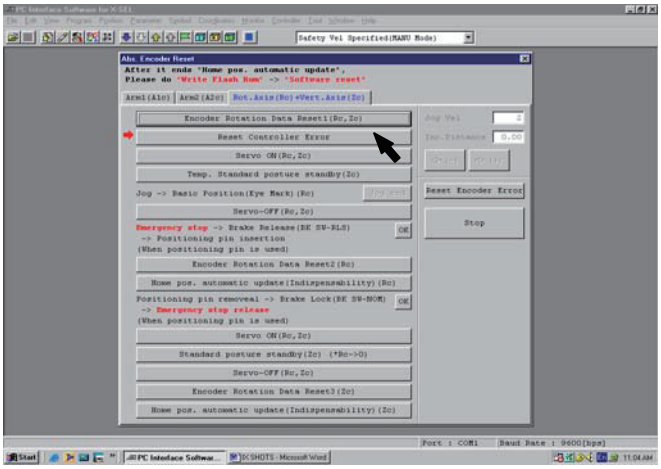
13.3.4 Absolute Reset Procedure for the Rotational Axis + Vertical Axis

(1) Click “Encoder Rotation Data Reset1” button.



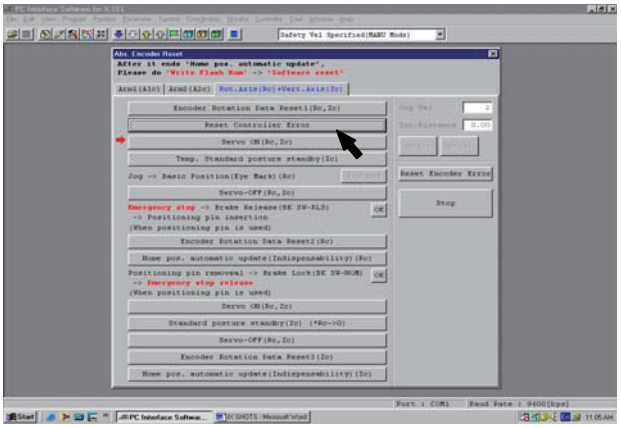
Encoder Multi-rotation Data Reset 1

(2) Click the “Reset Controller Error” button.



Controller Reset

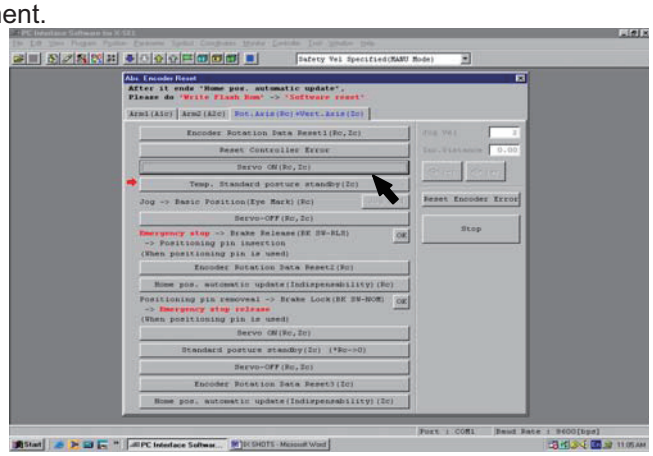
(3) Click the “Servo ON” button.



Servo ON

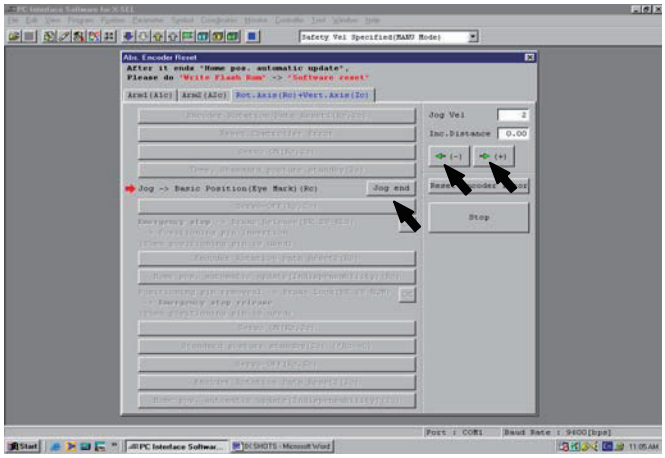
(4) Click the “Temp. Standard posture standby” button.

- The vertical axis returns to its home position. Exercise caution so as not to be injured by the axis during movement.



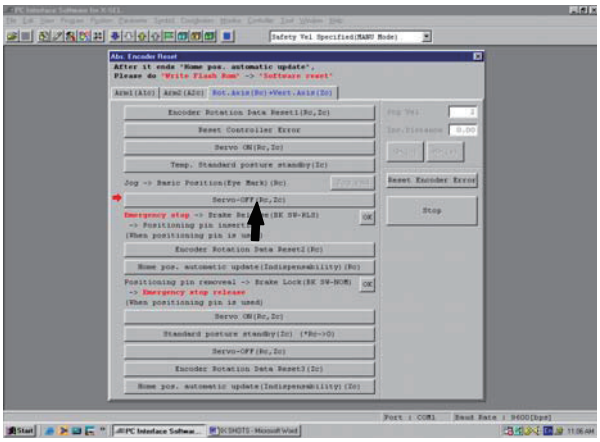
Standing By at Tentative Home Position

(5) Jog the rotational axis to the reference position (see reference position drawing in step 8), and click the “Jog end” button.



Jogging

(6) Click the “Servo-OFF” button.



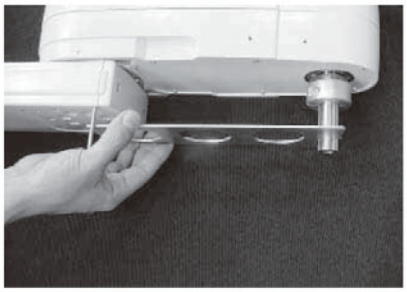
Servo OFF

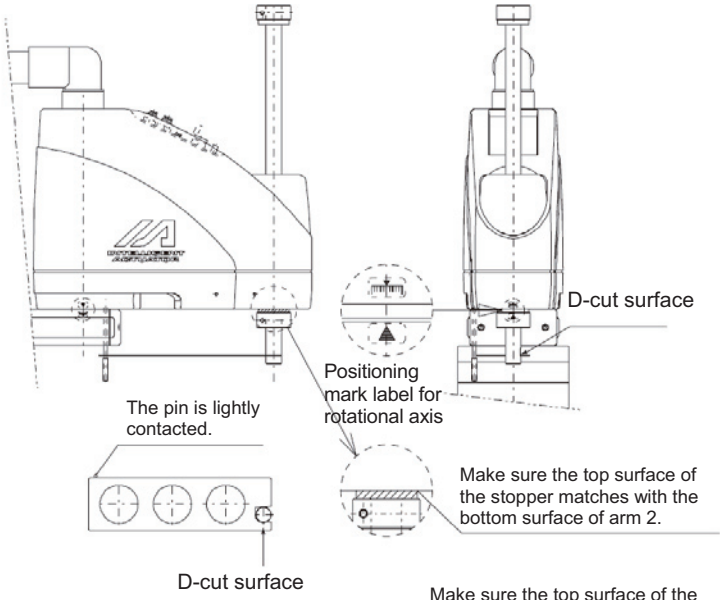
(7) Press the emergency-stop switch.

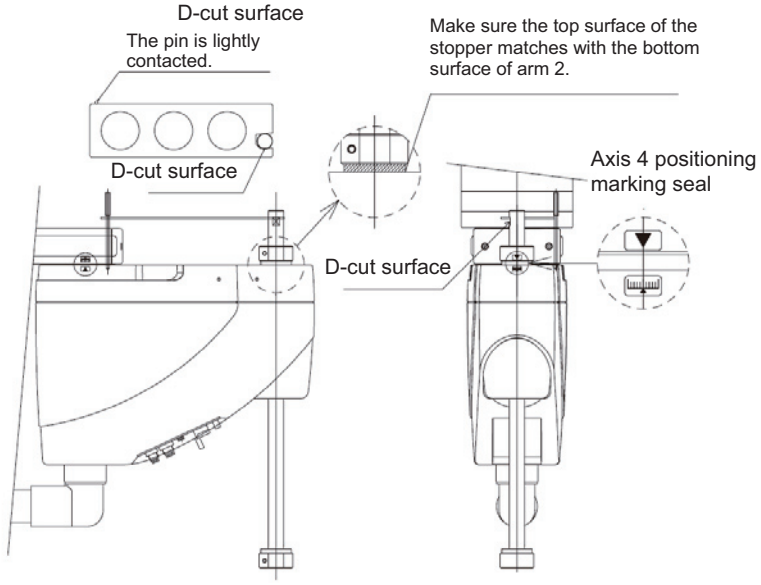
(8) Affix the rotational axis at the reference position by setting the plate and pin of the adjustment jig as illustrated below.

- Set the jig after confirming that the emergency-stop switch is pressed.
- Set the jigs by using the positioning mark as a reference.
- Make sure the top surface of the stopper roughly matches in height with the bottom surface of arm 2.

Ceiling mount specification reference position





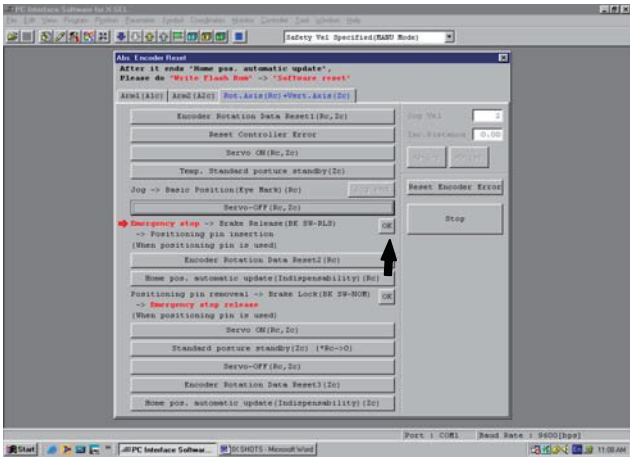


Inverse specification reference position

⚠ Warning

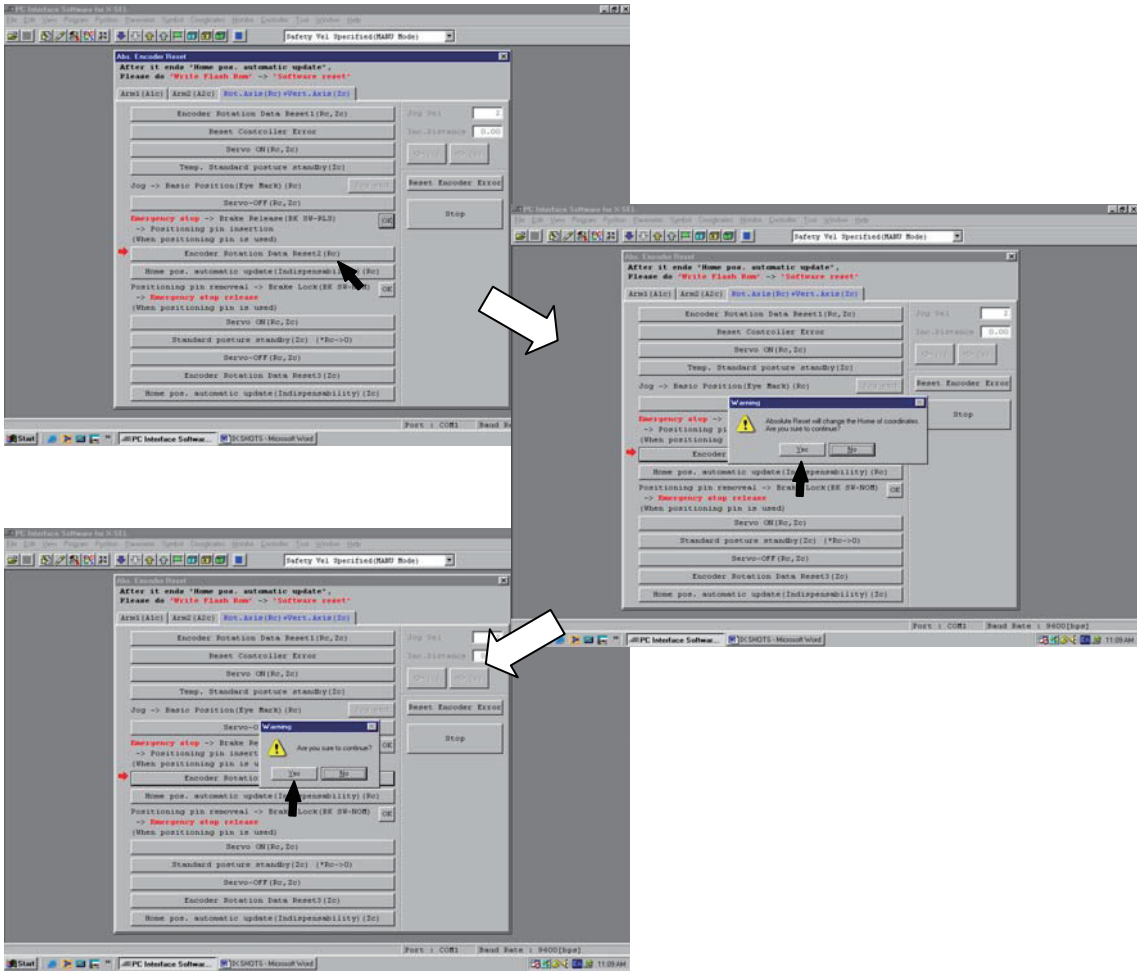
- Always press the emergency-stop switch before setting an adjustment jig. Failure to do so may cause the robot to malfunction and result in a serious accident.
- Pay attention to the orientation of the side of the plate jig that comes in contact with the D-cut surface.

(9) Click the “OK” button.



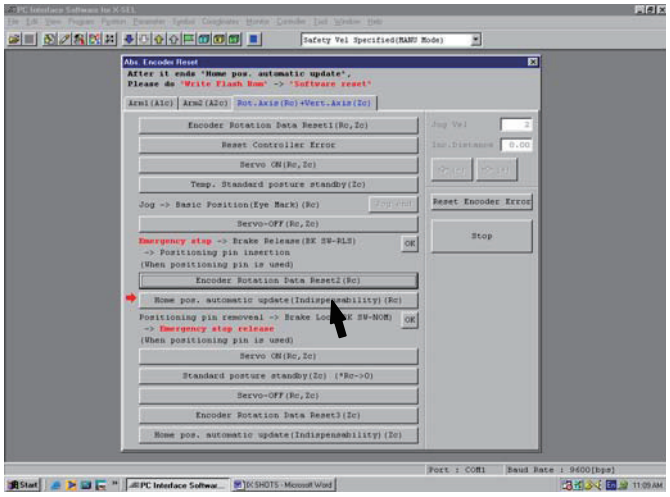
Confirmation

(10) Click the “Encoder Rotation Data Reset2” button.



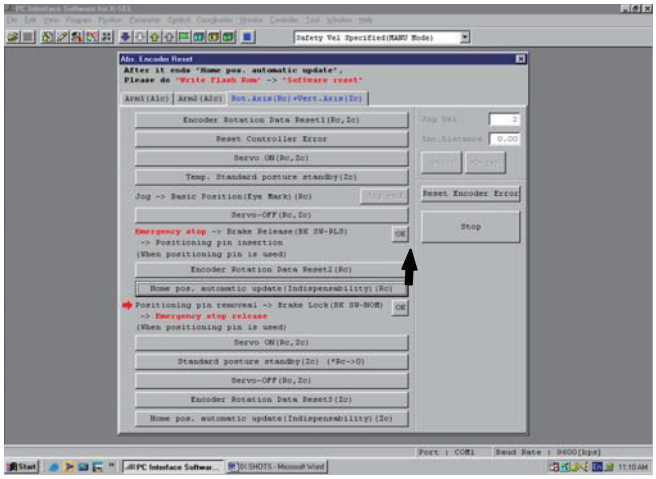
Encoder Multi-rotation Data Reset 2

(11) Click the “Home pos. automatic update” button.



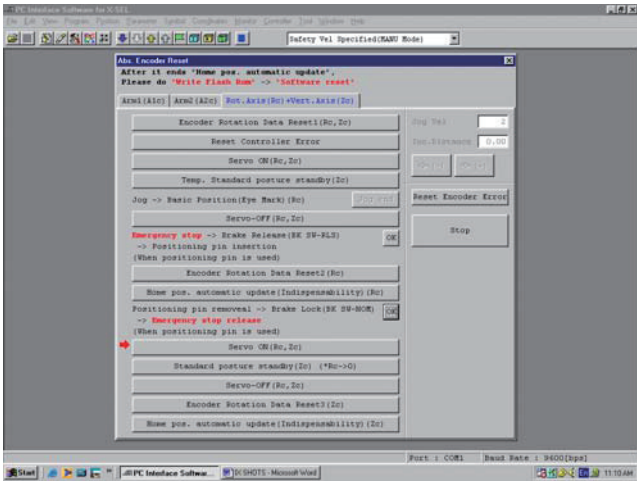
Automatic Refresh of Home Preset Value

(12) Remove the adjustment jig.
(13) Release the emergency-stop switch.
(14) Click the “OK” button.



Confirmation

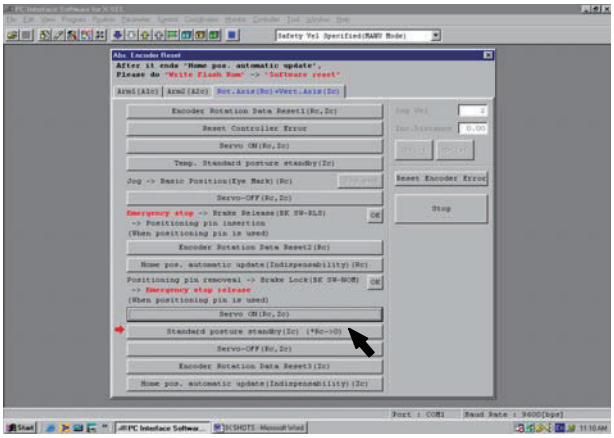
(15) Click the “Servo ON” button.



Confirmation

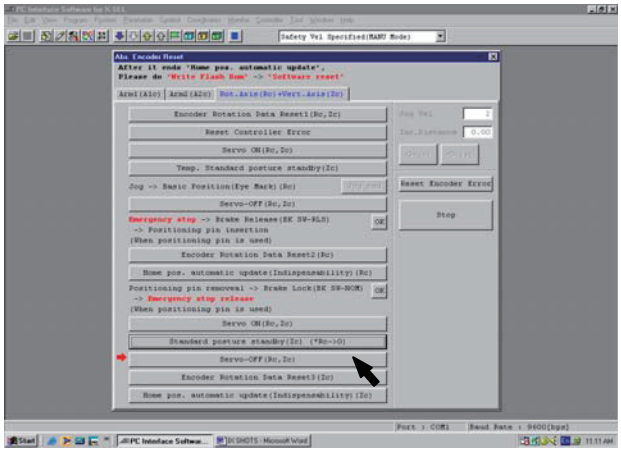
(16) Click the “Standard posture standby” button.

- The vertical axis returns to its home position. Exercise caution so as not to be injured by the axis during movement.



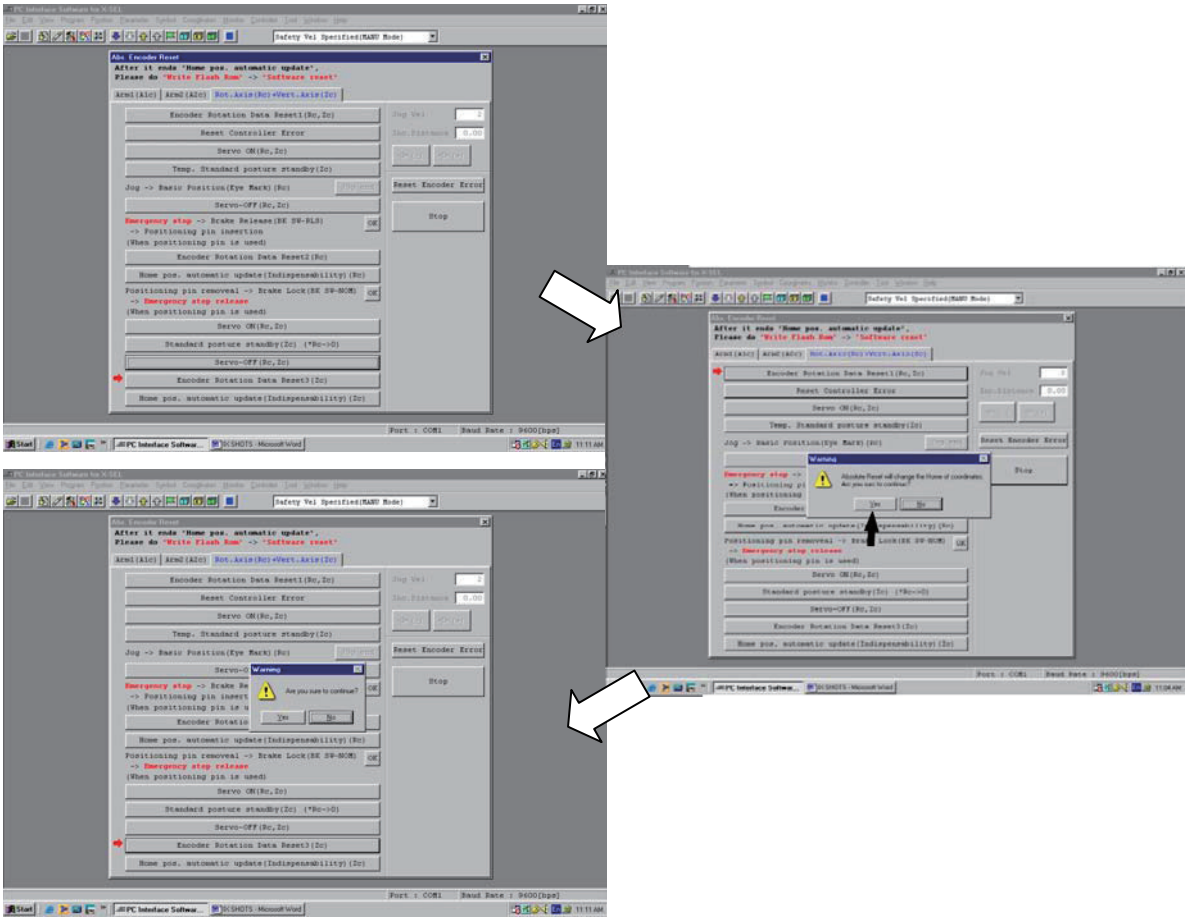
Standing By at Reference Posture

(17) Click the “Servo-OFF” button.



Servo OFF

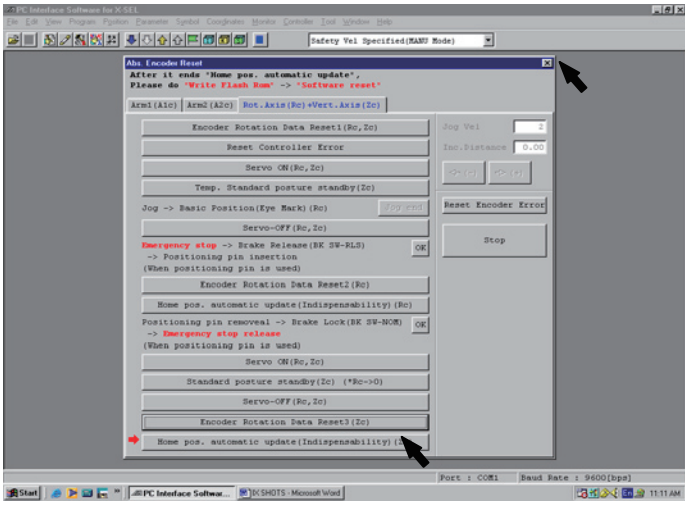
(18) Click the “Encoder Rotation Data Reset3” button.



Encoder Multi-rotation Data Reset 3

(19) Click the “Home pos. automatic update” button, and then click “X” in the top right-hand corner to exit the absolute reset window.

•After the reset is completed, be sure to perform “Software reset.”



Automatic Refresh of Home Preset Value

14. Warranty

14.1 Warranty Period

One of the following periods, whichever is shorter:
- 18 months after shipment from our company
- 12 months after delivery to the specified location

14.2 Scope of Warranty

Our products are covered by warranty when all of the following conditions are met. Faulty products covered by warranty will be replaced or repaired free of charge:

(1) The breakdown or problem in question pertains to our product as delivered by us or our authorized dealer.

(2) The breakdown or problem in question occurred during the warranty period.

(3) The breakdown or problem in question occurred while the product was in use for an appropriate purpose under the conditions and environment of use specified in the operation manual and catalog.

(4) The breakdown of problem in question was caused by a specification defect or problem, or by a quality issue with our product.

Note that breakdowns due to any of the following reasons are excluded from the scope of warranty:
- [1] Anything other than our product
- [2] Modification or repair performed by a party other than us (unless we have approved such modification or repair)
- [3] Anything that could not be easily predicted with the level of science and technology available at the time of shipment from our company
- [4] A natural disaster, man-made disaster, incident or accident for which we are not liable
- [5] Natural fading of paint or other symptoms of aging
- [6] Wear, depletion or other expected result of use
- [7] Operation noise, vibration or other subjective sensation not affecting function or maintenance

Note that the warranty only covers our product as delivered and that any secondary loss arising from a breakdown of our product is excluded from the scope of warranty.

14.3 Honoring the Warranty

As a rule, the product must be brought to us for repair under warranty.

14.4 Limited Liability

(1) We shall assume no liability for any special damage, consequential loss or passive loss such as a loss of expected profit arising from or in connection with our product.
(2) We shall not be liable for any program or control method created by the customer to operate our product or for the result of such program or control method.

14.5 Conditions of Conformance with Applicable Standards/Regulations, Etc., and Applications

(1) If our product is combined with another product or any system, device, etc., used by the customer, the customer must first check the applicable standards, regulations and/or rules. The customer is also responsible for confirming that such combination with our product conforms to the applicable standards, etc. In such a case we will not be liable for the conformance of our product with the applicable standards, etc.

(2) Our product is for general industrial use. It is not intended or designed for the applications specified below, which require a high level of safety. Accordingly, as a rule our product cannot be used in these applications. Contact us if you must use our product for any of these applications:

[1] Medical equipment pertaining to maintenance or management of human life or health
[2] A mechanism or mechanical equipment intended to move or transport people (such as a vehicle, railway facility or aviation facility)
[3] Important safety parts of mechanical equipment (such as safety devices)
[4] Equipment used to handle cultural assets, art or other irreplaceable items

(3) Contact us at the earliest opportunity if our product is to be used in any condition or environment that differs from what is specified in the catalog or operation manual.

14.6 Other Items Excluded from Warranty

The price of the product delivered to you does not include expenses associated with programming, the dispatch of engineers, etc. Accordingly, a separate fee will be charged in the following cases even during the warranty period:

[1] Guidance for installation/adjustment and witnessing of test operation
[2] Maintenance and inspection
[3] Technical guidance and education on operating/wiring methods, etc.
[4] Technical guidance and education on programming and other items related to programs

Change History

Revision Date	Description of Revision
August 2010	First edition
April 2011	Second edition P. 31 Added options “JY (Joint cable specification)”
May 2011	Third edition A page for CE Marking added
March 2012	Fourth edition P. 1 to 7 Contents added and changed in Safety Guide P. 8 Precautions in Handling Note “Certainly attach the Horizontal Articulated Robot by following this operation manual.” added P. 33, 35, 37, 39, 41, 43, 45, 47 Brake voltage source capacity 20W added to specifications P. 53 Brake voltage source capacity from 20W to 30W → changed to 20W P. 68 Caution notes added telling to go to see the doctor to have an appropriate treatment when the grease got into an eye P. 87, 88 Contents changed in 14. Warranty

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