

**Kawasaki Robot
KJ155/125**

**Installation and
Connection Manual**

E Controller

Robot

Kawasaki Heavy Industries, Ltd.

Preface

This manual explains the installation and connection work procedures for the Kawasaki painting robot KJ155/125.

Make sure you fully understand the contents of this manual, and pay attention to the safety considerations described in this manual as well as in the separate "Safety Manual" during operations. Note that this manual only provides descriptions of the installation and connection work procedures for the KJ155/125 robot arm. For a description of the installation and connection of controllers and cables, see "Installation and Connection Manual" for the controller for the explosion-proof robot.

Again, do not perform any kind of work until you fully understand all of the contents of this manual. Also, Kawasaki is not responsible for damages or problems that occur as a result of performing work after referring to specific pages only.

[NOTE]

The explanations in the manual are applicable to the following robots.
KJ155/125: "KJ155■-B0" "KJ155■-B4" "KJ125■-B0" "KJ125■-B4"
(■: J = Explosion-proof specification for Japan
C = Explosion-proof specification for China
U = Explosion-proof specification for North America
E = Explosion-proof specification for Europe)
Refer to "Standard Specifications" for robot shape.

-
1. This manual does not guarantee the operation of the system with which the robot is used. Accordingly, Kawasaki is not responsible for any accidents, damages, and/or problems relating to industrial property rights as a result of using the system.
 2. It is recommended that all personnel assigned for activation of operation, teaching, maintenance or inspection of the robot attend the necessary education/training course(s) prepared by Kawasaki, before assuming their responsibilities.
 3. Kawasaki reserves the right to change, revise, or update this manual without prior notice.
 4. This manual may not, in whole or in part, be reprinted or copied without the prior written consent of Kawasaki.
 5. Store this manual with care and keep it available for use at any time. If the robot is reinstalled or moved to a different site or sold off to a different user, attach this manual to the robot without fail. In the event the manual is lost or damaged severely, contact Kawasaki.
-

Symbols

The items that require special attention in this manual are designated with the following symbols.

Ensure proper and safe operation of the robot and prevent physical injury or property damage by complying with the safety matters given in the boxes with these symbols.

 **DANGER**

Failure to comply with indicated matters can result in imminent injury or death.

 **WARNING**


Failure to comply with indicated matters may possibly lead to injury or death.

 **CAUTION**

Failure to comply with indicated matters may lead to physical injury and/or mechanical damage.

[NOTE]

Denotes precautions regarding robot specification, operation and maintenance.

 **WARNING**

- 1. The accuracy and effectiveness of the diagrams, procedures, and detailed explanations given in this manual cannot be confirmed with absolute certainty. Therefore, should any unexplained questions or problems arise, please contact your nearest Kawasaki.**
- 2. Safety related contents described in this manual apply to the specific matters described and not to all robot work. They are not applicable to other general items or other matters. In order to perform all work safely, read and fully understand the "Safety Manual," all pertinent laws, regulations and related materials as well as all the safety explanations in each chapter, and prepare safety measures suitable for actual work.**

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1 Precautions

This section details precautions relating only to the installation and connection of the robot arm. For other precautions, refer to the separate "Safety Manual."

1.1 Transportation and Storage

When transporting the Kawasaki robot to the installation location, observe the following precautions for transportation and installation.



WARNING

1. When transporting the robot by crane or forklift, never allow a person to support it.
2. During transport never allow a person to ride on the robot, and never allow a person to get under it when it is suspended.



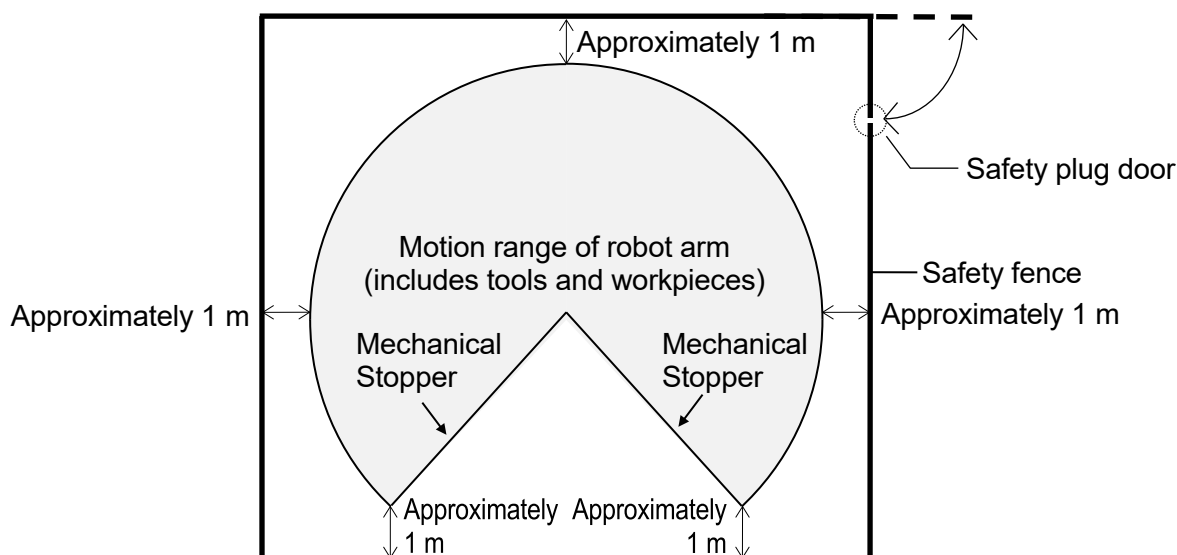
CAUTION

1. The robot is made of precision parts. Be careful not to subject it to impact or shock during transport.
2. When transporting the robot by crane or forklift, clear away obstructions, etc. in advance so that the robot can be transported safely to the installation location.
3. Please pay attention to the following points when transporting or storing the robot.
 - (1) Maintain an ambient temperature within the -10°C to 60°C range.
 - (2) Maintain a relative humidity within the 35% to 85% RH range (without any condensation).
 - (3) Avoid large vibrations or shocks.

1.2 Installation Environment

Install the robot arm in a location that satisfies the following conditions.

1. For floor-standing installation, the location must be capable of maintaining a horizontal surface within $\pm 5^\circ$.
2. The floor and frame must have adequate hardness.
3. The location must be able to maintain flatness so that excess force is not exerted on the installed part.
(If flatness cannot be ensured, adjust with a liner. Flatness of setting surface: under 0.3)
4. The ambient operating temperature must be between 0°C and 40°C .
(Starting in low temperatures increases the viscosity of grease and oil, which can lead to deviation errors and excess loads. In such cases, move the robot at low speeds before operating.)
5. Relative humidity must be 35% to 85% RH. In addition, there must not be any condensation.
6. The location must have little dirt, dust, oil, smoke or water, etc.
7. The location must not be subject to large vibrations.
8. The location must be well protected against electrical noise.
9. The location must safeguard a space that is larger than the robot arm's range of motion.
 - (1) Install a safety fence around the robot, and make sure that it does not interfere with surrounding equipment, even when the robot arm has a tool or a gun attached and is extended to its maximum motion range.
 - (2) Minimize the number of entrance gates in the safety fence (only one is best) and equip the entrance gate with a safety plug. Enter and exit the fence from here.
 - (3) The safety fence must comply with the requirements stipulated by all pertinent laws and regulations.
(Examples: ISO 14120, ISO 13857, ISO 13854, ISO 14119)



[NOTE]

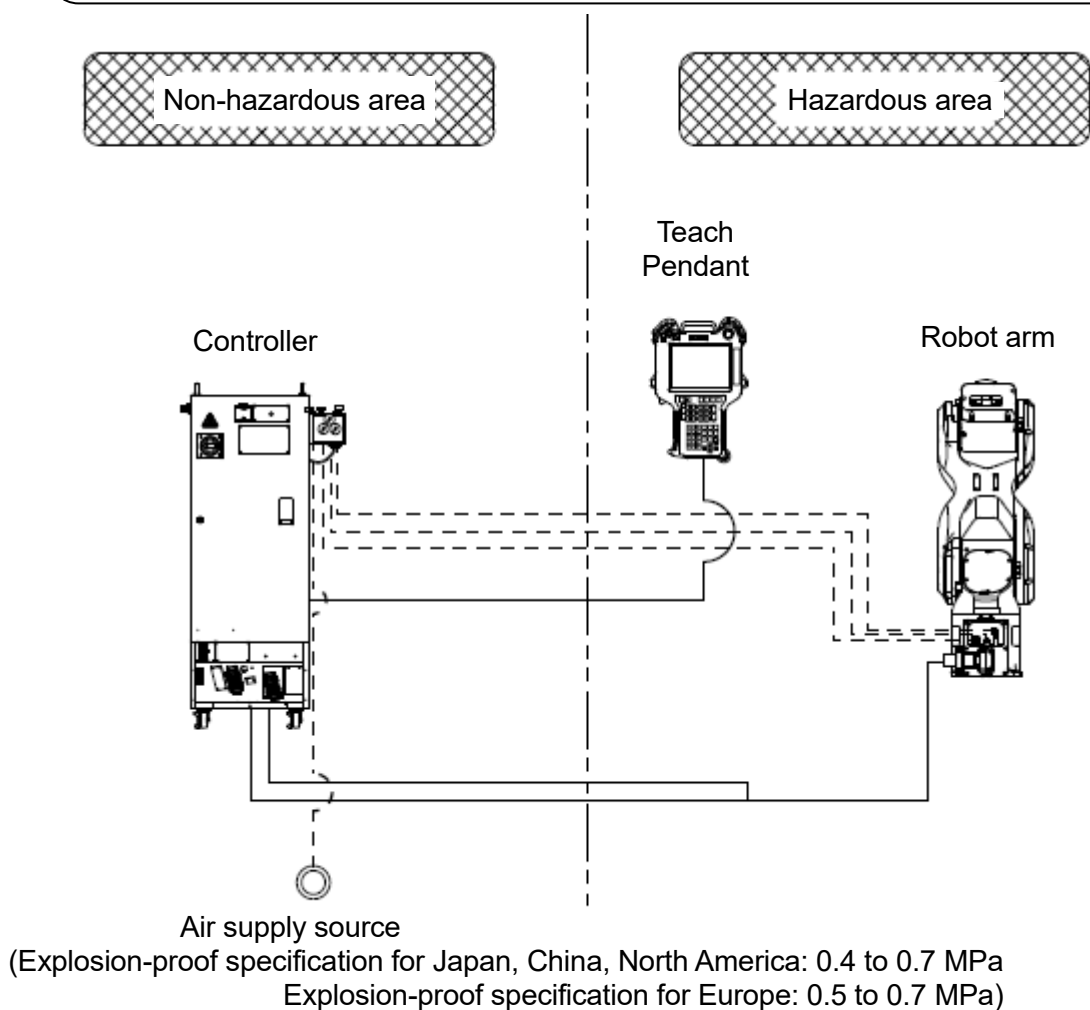
Cover areas such as the rotating seal section of the robot arm axis with a vinyl sheet to protect them from paint and contamination from foreign matter.

1.3 Explosion-Proof Precautions

The KJ155/125 has an internal pressure explosion-proof and intrinsically safe explosion-proof structure. For safety reasons, the following precautions should be strictly observed.

! **DANGER**

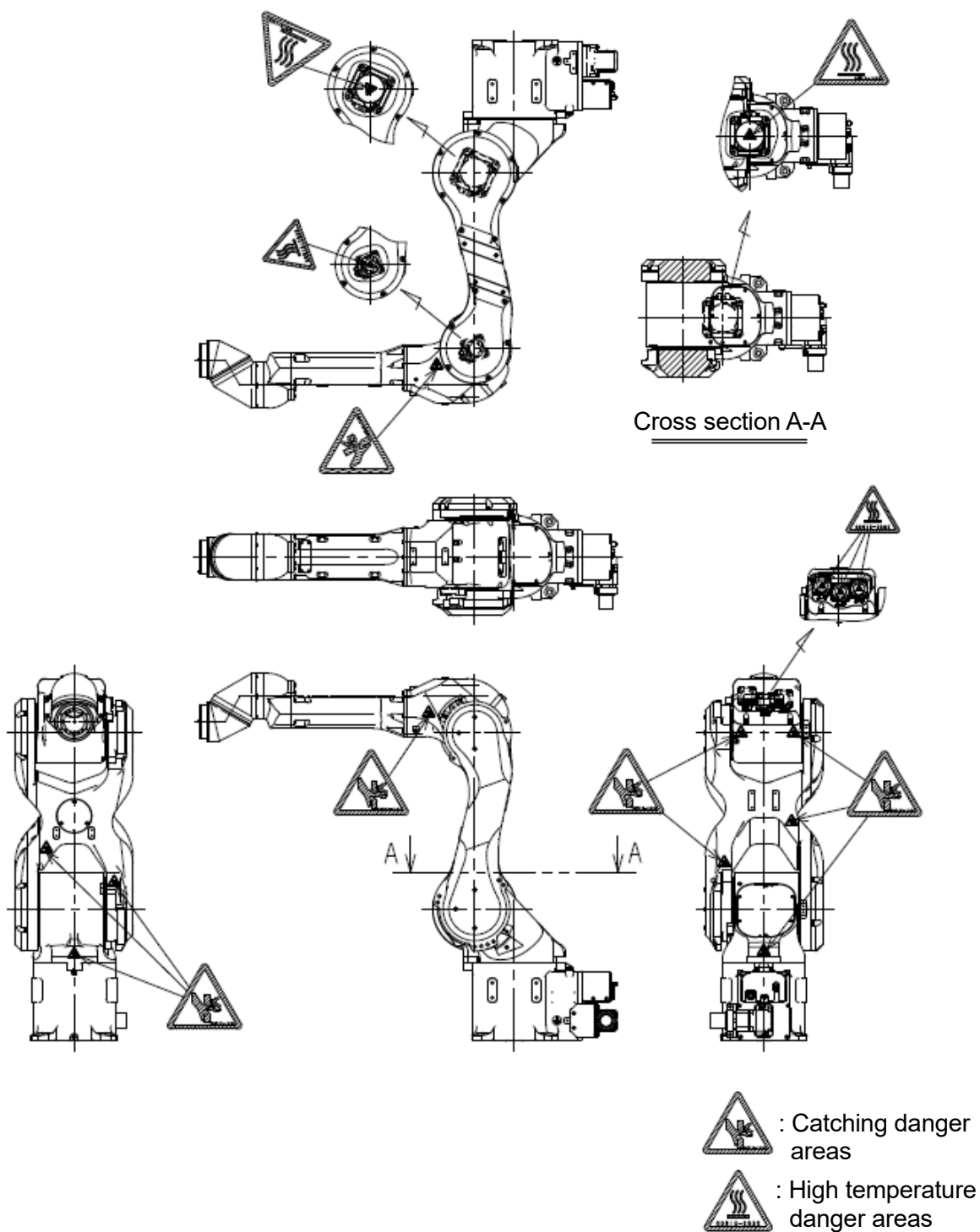
1. **This painting robot has an internal pressure explosion-proof structure. Make sure to follow the instructions of the person in charge when loosening the tightening bolts of the internal pressure container.**
 - (1) **Do not loosen the tightening bolts of the internal pressure container without instructions from the person in charge.**
 - (2) **Do not open the lid of the internal pressure container while the robot is energized.**
2. **Always install the controller in a safe, explosion-proof and non-hazardous area.**
When approaching the robot for the purpose of robot maintenance and inspection work, and for inspection or adjustment, etc., of the painting equipment, make sure to turn OFF the controller power and external power, close the valve for the air source, and confirm that there is no residual pressure.



1.4 Residual Risk when Operating

■ KJ155/125

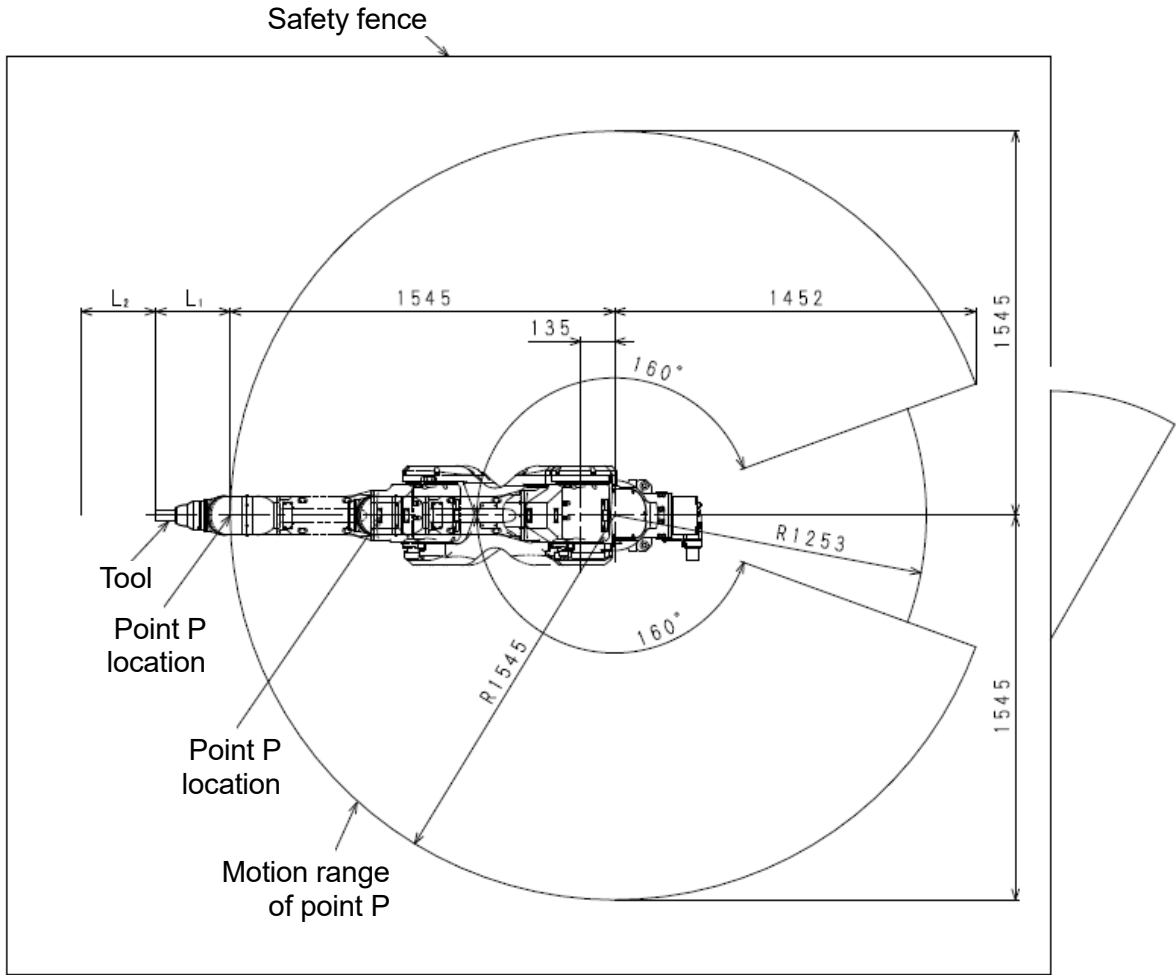
! WARNING
Pay attention to the residual risk areas described in the figures below during operation.



2 Motion Range and Specifications

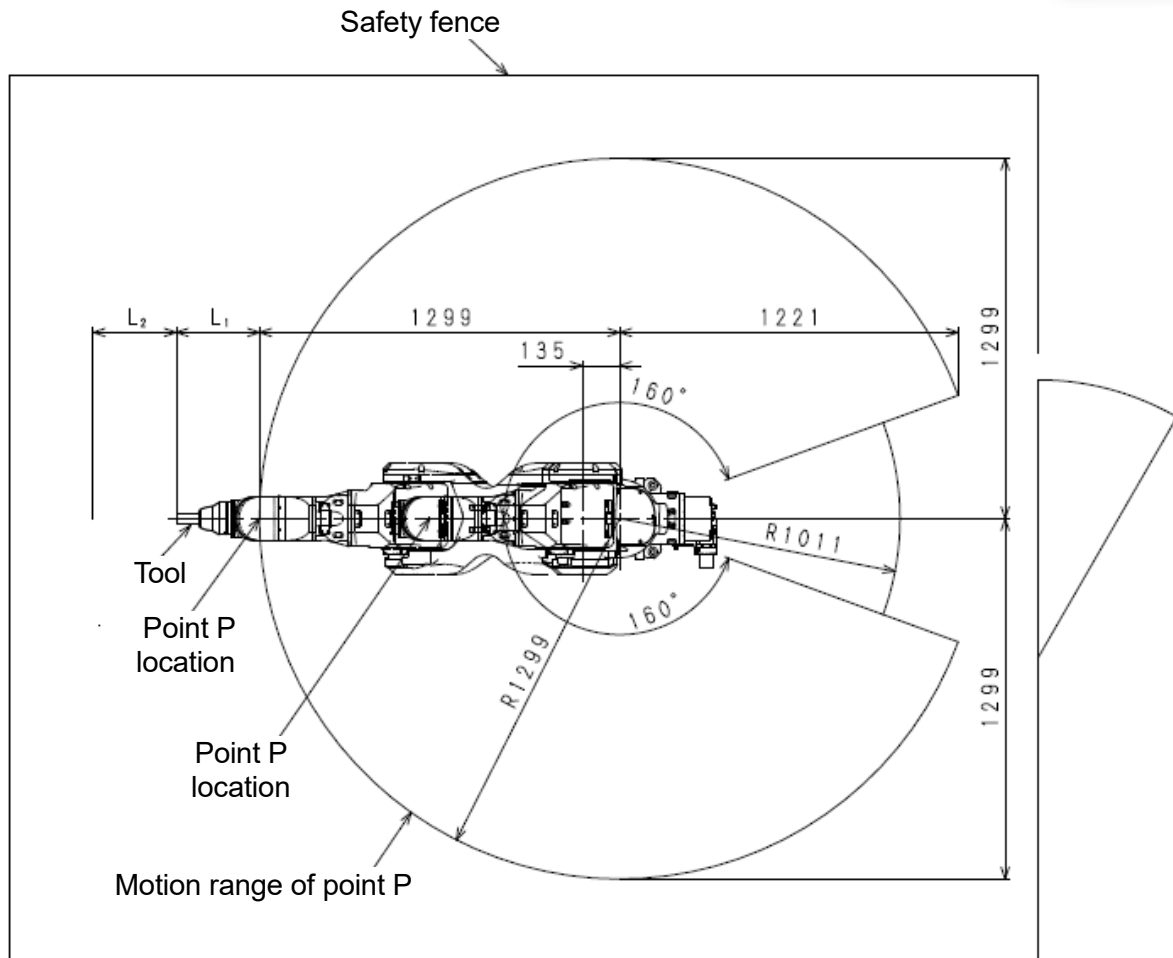
Determination of safety fence installation location from motion range

■KJ155



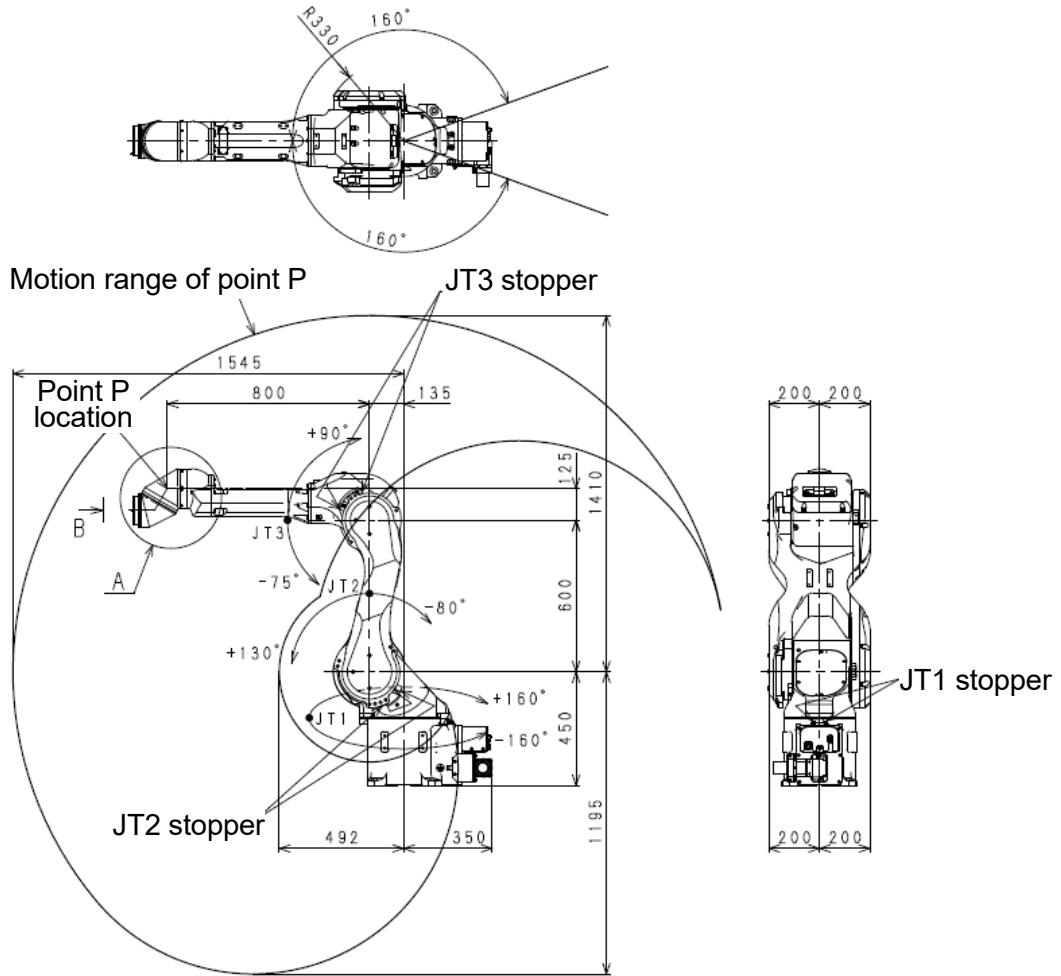
The above figure shows the robot as seen from above, and the motion range of the robot is represented by the motion range of point P in the figure. Therefore, when installing the safety fence, maintain a distance which is the sum of the distance from point P to the wrist flange and the maximum dimension of the tool L₁ plus L₂, which is the safety margin.

■KJ125

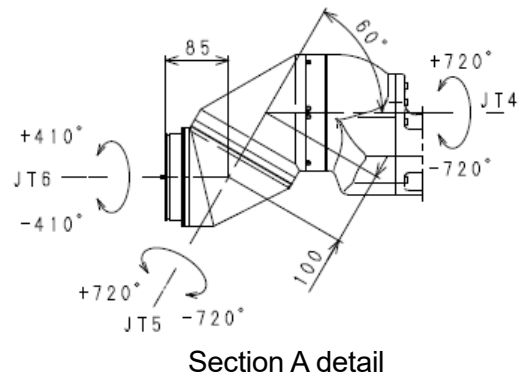


The above figure shows the robot as seen from above, and the motion range of the robot is represented by the motion range of point P in the figure. Therefore, when installing the safety fence, maintain a distance which is the sum of the distance from point P to the wrist flange and the maximum dimension of the tool L_1 plus L_2 , which is the safety margin.

■KJ155

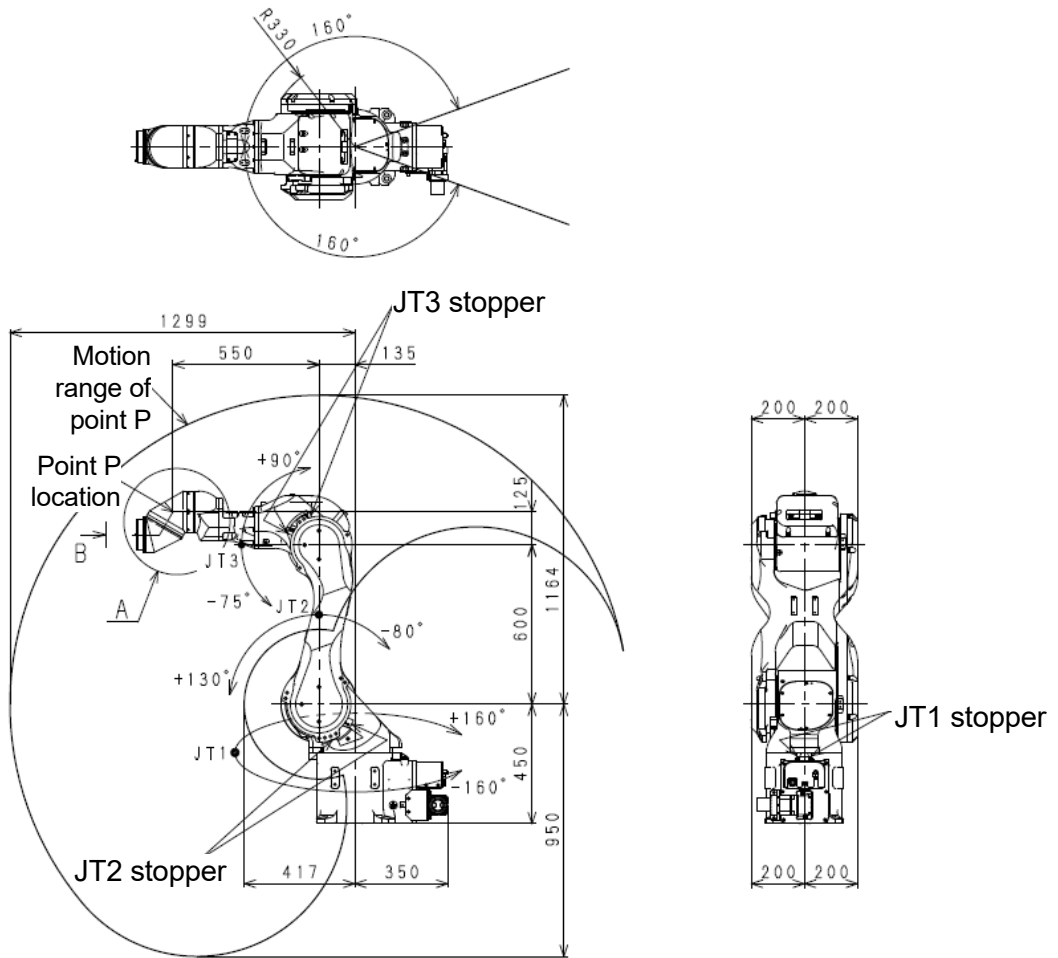


Model	Vertical articulated robot		
Degree of freedom of motion	6		
Motion range	JT	Motion range	
	1	+160° to -160°	
	2	+130° to -80°	
	3	+90° to -75°	
	4	±720°	
	5	±720°	
Maximum payload	Wrist: 8 kg (wrist flange)		
	Arm 1: 5 kg		
	Arm 2: 5 kg		
Load capacity of wrist	JT	Torque	Moment of inertia
	4	21.8 N·m	0.90 kg·m ²
	5	17.0 N·m	0.54 kg·m ²
	6	8.0 N·m	0.12 kg·m ²
Repeated positional accuracy	±0.15 mm (wrist flange)		
Mass	Approximately 195 kg		
Noise	65 dB(A) ^{*1}		

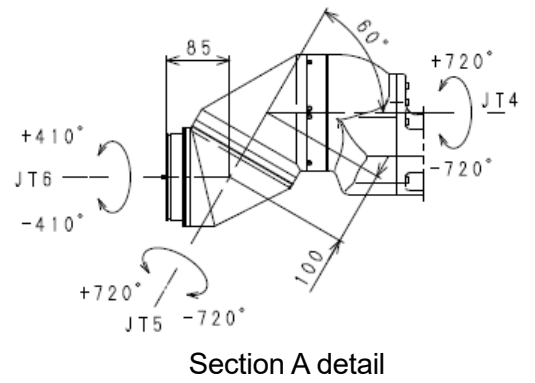


- *1 Measurement conditions
- Mount on a plate fixed to the floor
 - 1000 mm from the maximum operating range
- (Noise level varies according to conditions.)

■KJ125



Model	Vertical articulated robot		
Degree of freedom of motion	6		
Motion range	JT	Motion range	
	1	+160° to -160°	
	2	+130° to -80°	
	3	+90° to -75°	
	4	±720°	
	5	±720°	
Maximum payload	Wrist: 8 kg (wrist flange)		
	Arm 1: 5 kg		
	Arm 2: 5 kg		
Load capacity of wrist	JT	Torque	Moment of inertia
	4	21.8 N·m	0.90 kg·m ²
	5	17.0 N·m	0.54 kg·m ²
	6	8.0 N·m	0.12 kg·m ²
Repeated positional accuracy	±0.15 mm (wrist flange)		
Mass	Approximately 190 kg		
Noise	65 dB(A) ^{*1}		



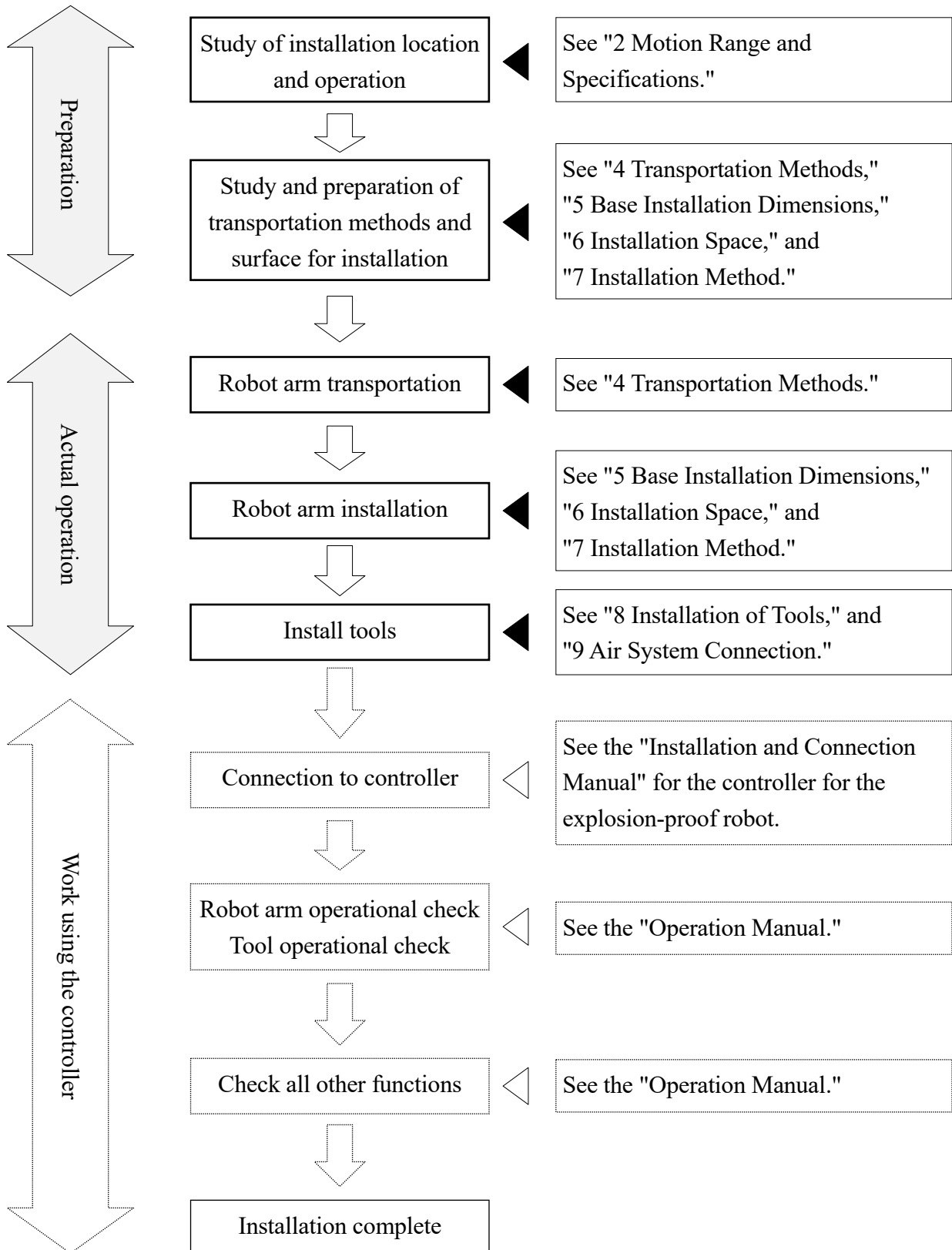
*1 Measurement conditions

- Mount on a plate fixed to the floor
- 1000 mm from the maximum operating range

(Noise level varies according to conditions.)

3 Robot Arm Installation and Connection Work Flow


The work flow described here is for the robot arm only. See the "Installation and Connection Manual" for the controller for the explosion-proof robot for more information regarding the controller.

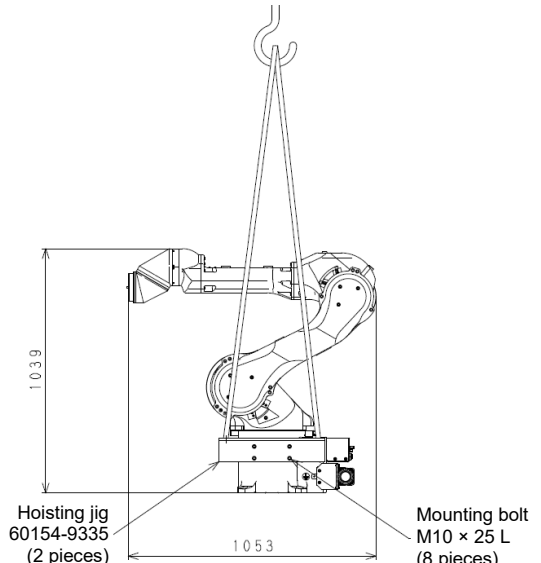


4 Transportation Methods

4.1 Wire Suspension

As shown in the figure below, hoist up the robot by fastening wires to the hoisting jig. After work is completed, remove the hoisting jig.

 WARNING	
<ol style="list-style-type: none"> 1. Do not hoist the robot from only a single point. 2. When suspending the robot, care is required as it may tip forward or back and right or left depending on its posture. If the robot is suspended at an angle, the robot may swing as a result of shock, and wires may interfere with external parts resulting in damage. Also, if the wire strikes the robot arm, protect it with a cover plate, etc. 	

Model	KJ155	
Suspended posture		
Suspended posture	JT1	0°
	JT2	-50°
	JT3	-50°
	JT4	0°
	JT5	0°
	JT6	0°

Bolt	Tightening torque
M10	57 N·m

Note Please contact Kawasaki regarding suspended posture for wall-mounted and ceiling-mounted installation.

Model		KJ125
Suspended posture		
Suspended posture	JT1	0°
	JT2	-50°
	JT3	-50°
	JT4	0°
	JT5	0°
	JT6	0°

Bolt	Tightening torque
M10	57 N·m

Note Please contact Kawasaki regarding suspended posture for wall-mounted and ceiling-mounted installation.

5 Base Installation Dimensions

When installing the robot arm, use the bolt holes in the base, and fix with high tensile bolts using plain washers.

Model	KJ155/125
Base installation dimensions	<p>JT1 center of rotation</p>
Cross-section figure of the installation bolt holes	
Bolt holes	4-φ18
High tensile bolts	4-M16 Material: SCM435 Hardness category: at least 10.9
Tightening torque	235 N·m
Installation surface angle	±5° or less
Plain washers	Material: S45C(H) Hardness: HRC 38 to 45 Kawasaki part number: RHTWM1645




CAUTION

Maintain flatness of under 0.3 mm in the robot arm installation surface.
The robot arm might become damaged if flatness is not maintained.

6 Installation Space

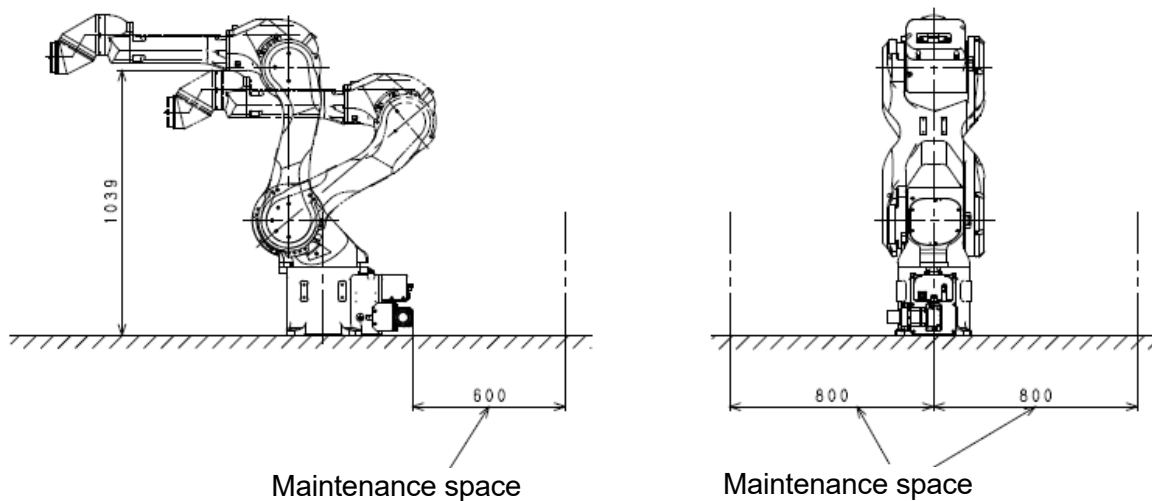
When installing the robot arm, maintain the minimum amount of space shown below for maintenance.

Maintain at least 600 mm of space around the rear of the base of the robot arm, and at least 800 mm from the center on the side surface of the base.

 **CAUTION**

This chapter describes the maintenance space that must be maintained when installing the robot arm. When installing safety fences, be sure to follow the instructions in "2 Motion Range and Specifications."

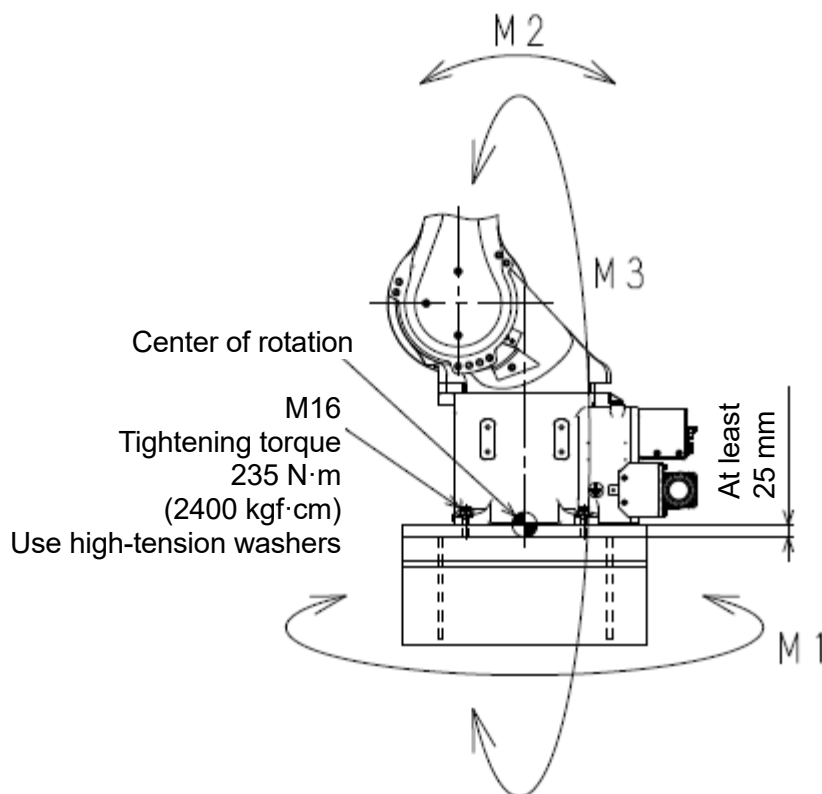
■ KJ155/125



7 Installation Method

When installing the robot arm on a steel frame, make sure that the steel plate surface where the robot arm will be installed is at least 25 mm thick. Secure the steel plate firmly enough to the floor for the frame to withstand counterforce from the robot arm.

■ KJ155/125



The center of the installation surface becomes the center of rotation at each moment of inertia

Model	KJ155/125 (Floor-standing/wall-mounted/ ceiling-mounted specification)
M1	5500 N·m
M2	8000 N·m
M3	8000 N·m

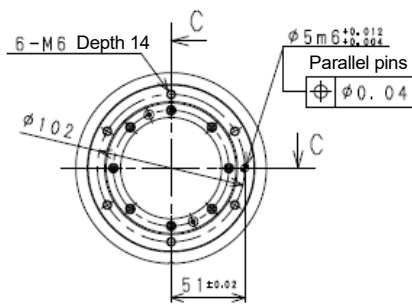
8 Installation of Tools

! WARNING

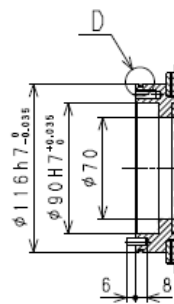
When mounting tools, turn OFF the controller power and external power, and after clearly displaying that "inspection and maintenance in progress," lock out and tag out the external power switch.

1. Wrist Tip (Flange) Dimensions

The tip of the robot arm features a flange for mounting tools. As shown in the figure below, tighten the mounting bolts using the tapped holes machined around the $\phi 102$ circumference of the flange. Also, use the pins and spigot holes to determine tool locations.



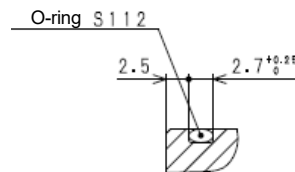
View B



Cross section C-C

! CAUTION

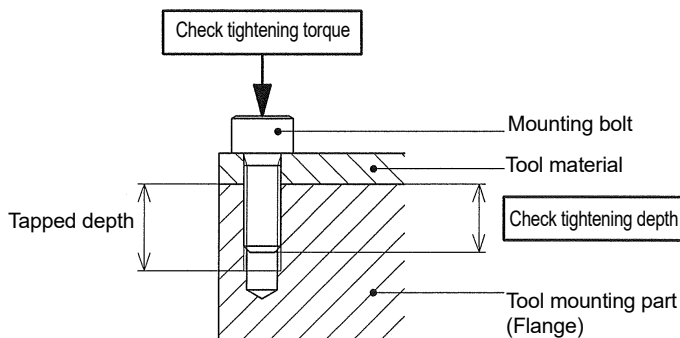
When removing or replacing tools, replace the O-rings at the same time.



Section D detail

2. Mounting Bolt Specifications

Select bolts with lengths that will reach the designated tightening depth, according to the tapped depths on the tool mounting flange. Additionally, use high tensile bolts, and tighten to the rated torque shown below.



Model	KJ155/125
Tapped hole	6-M6
P.C.D	$\phi 102$
Pin	$\phi 5$ m6 Length: 6
Spigot hole	$\phi 116$ h7
Tapped depth	14 mm
Bolting depth	9 to 12 mm
High tensile bolts	SCM435, at least 10.9
Tightening torque	12.0 N·m

! CAUTION

If the tightening depth is above the rated value, then the mounting bolts will bottom out and the tool may not be secured.

3. Wrist Load Calculation

- (1) The load capacity of the robot is fixed for each model.
- (2) Strictly observe the following restrictions for load mass, load torque and load moment of inertia around each wrist axis (JT4, JT5, JT6).

⚠ WARNING

If a load above the specified range is applied, this can result in deteriorated operational functionality or service life. The paint gun mass, gun bracket mass, pipes and wiring mass, etc. are all included in the specified range. If an amount other than the specified range will be applied, contact Kawasaki.

The load torque and moment of inertia can be calculated using the following formulas.

Calculation formula

Position of load center of gravity

Load mass : $M \leq M_{max.}$ (kg)

Load torque : $T = 9.8 \cdot M \cdot L$ (N·m)

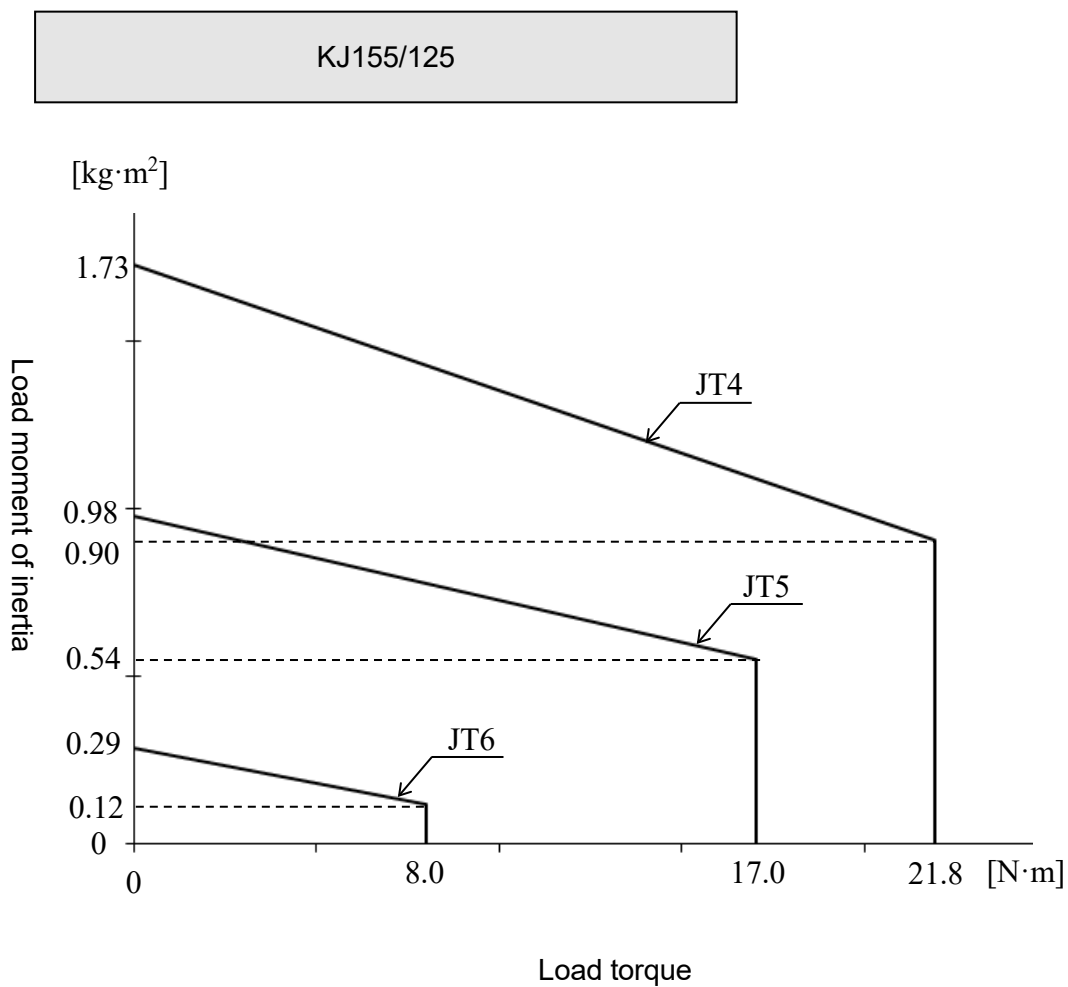
Load moment of inertia : $I = M \cdot L^2 + I_G$ (kg·m²)

M: Load mass
M_{max.}: 8 kg
I_G: Load moment of inertia around the center of gravity of the load
L_(4 to 6): Distance from center of axis rotation to load center of gravity
(Unit: m) (See figure)

$L_4 = L_T \cdot \sin 60^\circ + L_6 \cdot \cos 60^\circ + 0.165$ (m)

$L_5 = L_T \cdot \sin 60^\circ + L_6 \cdot \cos 60^\circ + 0.075$ (m)

Keep the load torque and load moment of inertia around each wrist axis within the allowable ranges shown in the figure below.



4. Loads for Arm 1 and Arm 2

The loads mounted on Arm 1 and Arm 2 must comply with the following conditions.

These conditions also apply to the loads mounted inside the pressurized chamber.

JT2 center of rotation

Arm 1 load conditions

Load mass: $M \leq M_{max}$ (kg)

Load position: $M \cdot L \leq M_{max} \cdot L_G$

L (distance from JT2 center of rotation) (mm)

M_{max} : 5 kg

L_G : 388 mm

KJ155/125

JT3 center of rotation

Arm 2 load conditions

Load mass: $M \leq M_{max}$ (kg)

Load position: $M \cdot L \leq M_{max} \cdot L_G$

L (distance from JT3 center of rotation) (mm)

M_{max} : 5 kg

L_G : 451 mm

KJ155

JT3 center of rotation

Arm 2 load conditions

Load mass: $M \leq M_{max}$ (kg)

Load position: $M \cdot L \leq M_{max} \cdot L_G$

L (distance from JT3 center of rotation) (mm)

M_{max} : 5 kg

L_G : 335 mm

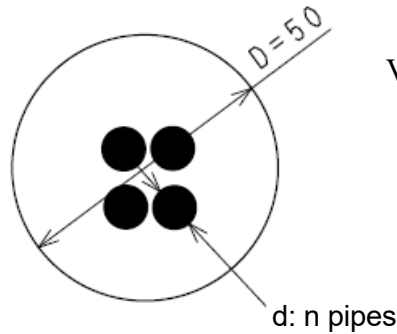
KJ125

5. Painting Piping and Wiring

Built-in hose for wrist

- (1) The hollow diameter of the wrist is
- $\phi 50$
- .

For the built-in hose, a volume to area ratio of under 25% is recommended.*¹ Volume to area ratio is calculated using the formula below.



$$\text{Volume to area ratio} = \frac{d^2}{4} \pi n \div \frac{D^2}{4} \pi \times 100[\%]$$

⏟
⏟
 Area occupied by the hose Cross-sectional area of the hollow part of the wrist

**CAUTION**

If a volume to area ratio greater than recommended is used, there might be a marked reduction in hose service life. Also, hose service life varies greatly depending on wrist posture and operating angle. Even if the volume to area ratio is lower than the recommended value, hose service life can be shortened drastically depending on the operation. Therefore, study and perform check tests whenever the built-in hose is used.

* 1 If the volume to area ratio will exceed 25%, or if a hose with a diameter large than $\phi 12$ will be used, please contact Kawasaki.

- (2) Nylon is recommended as the material for the wrist built-in hose.

**CAUTION**

If material other than the recommended material is used for the hose, there might be a marked reduction in hose service life.

- (3) When installing the piping for the wrist built-in hose, always apply a lubricant such as petroleum jelly over the entire hose. Inspect the wrist built-in hose periodically*
- ²
- , and replace early if there are signs of damage or breakage.

Recommended inspection intervals: Every 500 hours

Hose replacement time (approximate): Every 10,000 hours

* 2 When inspecting, apply a lubricant such as petroleum jelly over the entire hose.

[NOTE]

The above hose replacement times are only estimates and are not guaranteed times.

9 Air System Connection

The painting robot (KJ155/125) has a structure that combines an intrinsically safe explosion-proof structure and an internal pressure explosion-proof structure, which is based on the explosion-proof regulations for each region. The following section explains air supply to the robot arm.

Air is supplied to the controller and then supplied from the controller to the robot body, so it is necessary to install a scavenging tube between the controller and the robot.

DANGER

Do not supply air directly to the robot arm. This could damage the robot.

CAUTION

- 1. The gage is set to 0 MPa before shipment. During installation, connect the scavenging tube between the robot and the controller as instructed in this manual, and calibrate the gage. When the robot is connected to the external axis, the pilot air opening for the external axis is connected to the pilot inlet port for the external axis. When the external axis is not used it is blocked, so do not remove the tubes or plugs.**
- 2. Use the clean air specified below.**
(Explosion proof specification for Europe has different input pressure and input quantity. Refer to “9.2 Explosion-Proof Specification for Europe”.)
 - Solids.....0.01 μm or less
 - OilMist removal: At least 99.9999%
 - MoistureUnder dew-point -17°C at atmospheric pressure
 - Input pressure.....0.4 to 0.7 MPa (4.1 to 7.1 kgf/cm^2)
 - Input quantity.....300 L/min. (nor) (only during scavenging)
- 3. Use nylon (incombustible) as material for the scavenging tube mounted between the robot arm and the controller.**
- 4. If an attempt is made to operate the robot before the air pressure has risen sufficiently, such as immediately after starting up the compressor for the air supply, errors will occur due to insufficient internal pressure, and it will not be possible to operate the robot. Operate the robot after the air pressure has risen.**

[NOTE]

When scavenging is complete, the air operation valve that is mounted to the exhaust side closes. Therefore only a small amount of the air consumed while running the robot will leak from each of the air seals.

9.1 Explosion-Proof Specification for Japan, China and North America

9.1.1 Scavenging Tube Connection (Explosion-Proof Specification for Japan, China and North America)

As shown below, connect the scavenging tubes (tube that supplies the air for scavenging, tube for the pilot air, and internal pressure check tube) between the robot arm and the controller.

! DANGER

Do not supply air directly to the robot arm. This could damage it.

! CAUTION


1. Use nylon (incombustible) as material for the scavenging tube mounted between the robot arm and the controller.
2. Scavenging tubes have nameplates and green-colored caps on their connectors to identify them as scavenging tubes. Connect the same nameplates together and the same green-colored caps together.

[NOTE]

Make sure that the scavenging tubes are not bent during scavenging tube connection work or when moving the controller.

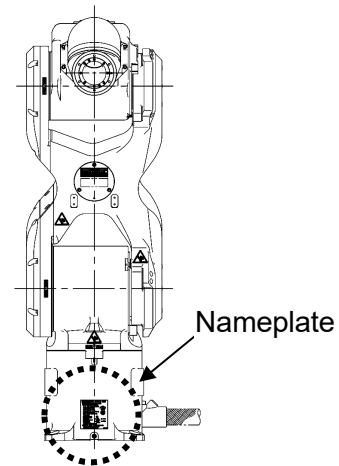
For the explosion-proof specification for North America, connection of the scavenging tubes varies depending on the model (MODEL). Confirm the model (MODEL) on the nameplate shown in the figure below to connect the scavenging tubes accordingly.

KAWASAKI SPRAY PAINTING ROBOT
 MODEL:KJaaaU-bb. Painting Robot.
 S. No. SPECIFIED SEPARATELY
 CL I, ZN 1 AEx Ib pxb IIB T4
 CERT No. FM19US0160X for US
 Ex ib pxb IIB T4 Gb
 CERT No. FM19CA0084X for Canada


CE
 0035

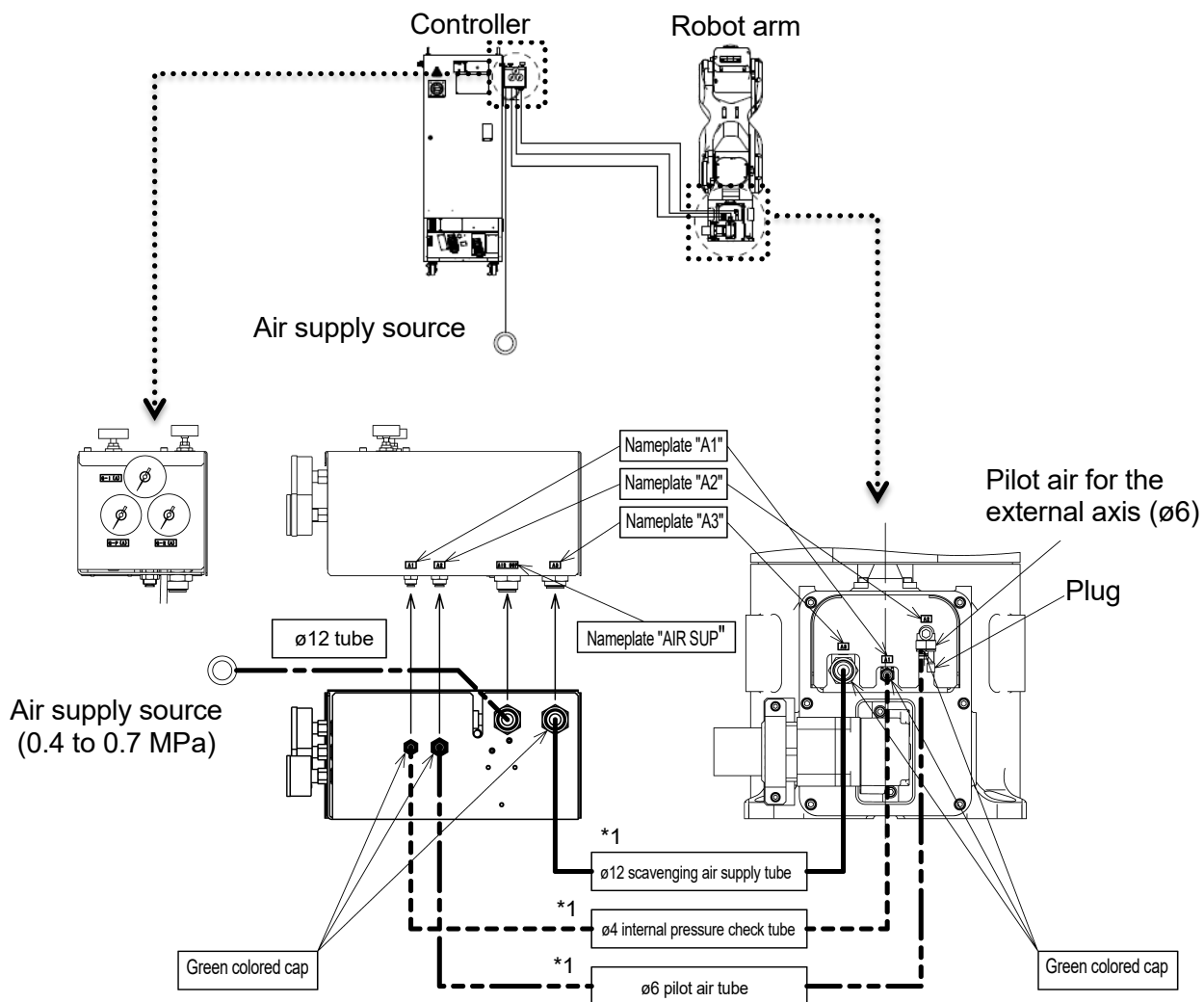
⊕ IIG Ex ib pxb IIB T4 Gb
 CERT No. FM19ATEX0196X for ATEX
 CERT No. 1ECEX FMG 19.0033X for IECEx
 Tamb 0°C to 40°C
 min. qty. of purge air 378 L
 min. purging duration 180 s
 Over pressure min. 5 kPa max. 60 kPa
 min. flow rate (purging) 126 L/min.
 Supply pressure min. 400 kPa max. 700 kPa
 max. leakage rate 50 L/min.

DRAWING No. 92200-2040
 KAWASAKI HEAVY INDUSTRIES, LTD.
 1-1, Kawasaki-Cho, Akashi-City
 Hyogo-pref., 673-8666, Japan 60819-6290



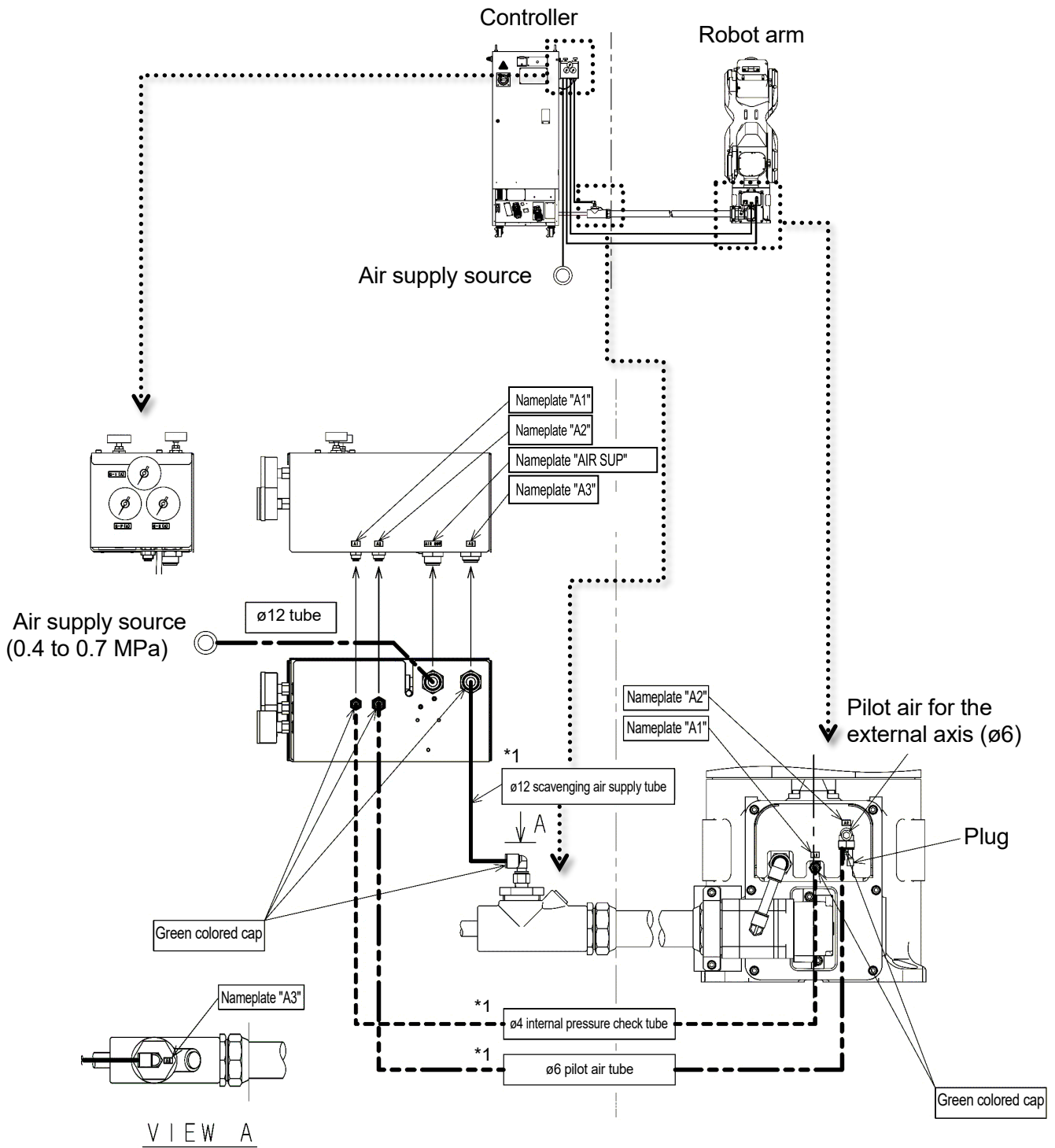
aaa	bb
KJ155 or KJ125	A1 or A2 or B

■ Explosion-proof specification for Japan, China and North America
(KJ155U/125U-A1, KJ155U/125U-B)



*1 Keep each air tube between the controller and the robot arm in the same length at or below 40 m.

■ Explosion-proof specification for North America (KJ155U/125U-A2)



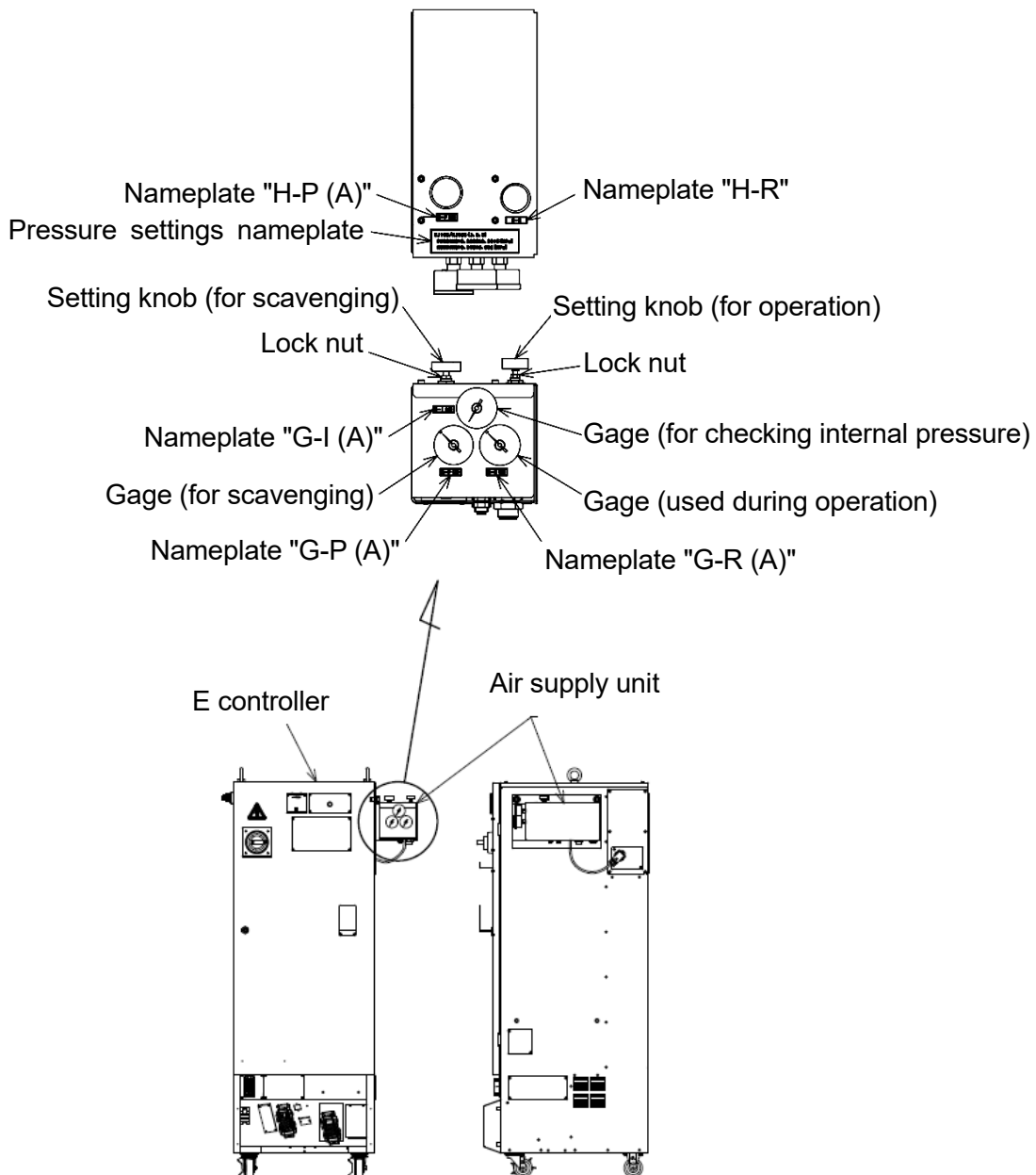
*1 Keep each air tube between the controller and the robot arm in the same length at or below 40 m.

9.1.2 Gage Calibration Method (Explosion-Proof Specification for Japan, China and North America)

Calibrate the gages using the method described below.

Do not press the Error Reset button while performing this work. If the button is pressed, return to Step 1 and perform the operation again from the beginning.

There are three types of gage: a gage for scavenging, a gage used during operation, and a gage for checking internal pressure.



CAUTION

1. The gage is set to 0 MPa before shipment. During installation, mount the scavenging tube between the robot and the controller as instructed in this manual, and calibrate the gage.
2. If the reading on the gage (for checking internal pressure) exceeds 0.040 [MPa] (40 [kPa]) during calibration, shut off the air supply.

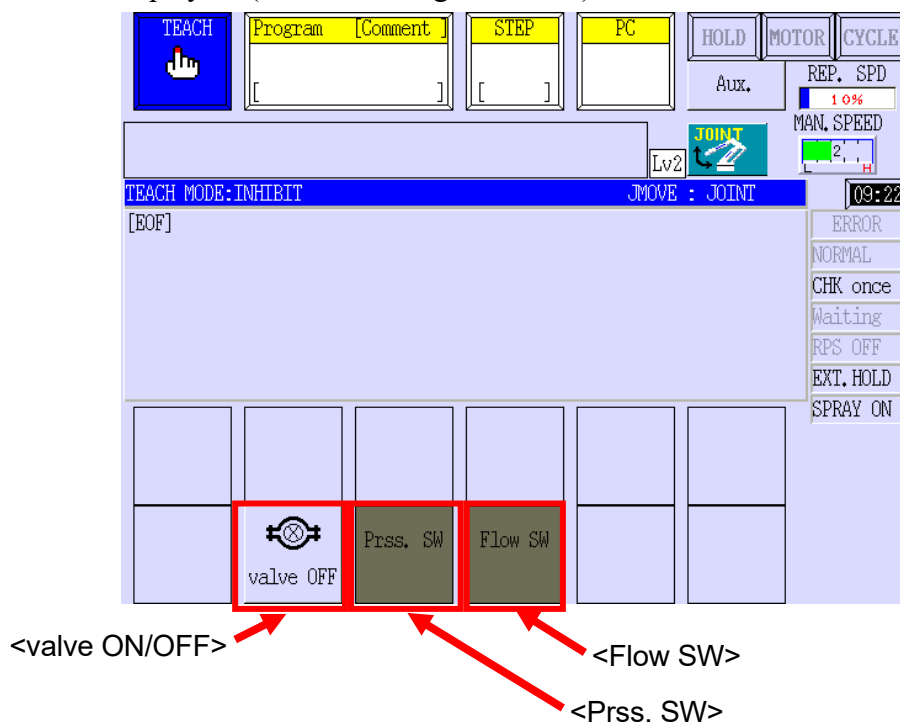
[NOTE]

1. When the motor power is ON, <valve ON/OFF> cannot be used.
Turn OFF the motor power when performing this work.
2. The controller power must always be turned back ON after this work is completed.

Before recalibrating, set the gage used during operation and the gage for scavenging to 0 [MPa].

[Procedure]

1. Turn OFF the controller power.
2. Supply air to the controller.
3. Check to make sure that each gage (gage used during operation, gage for scavenging, and gage for checking internal pressure) is set to 0 [MPa].
(If the reading on the gage (for checking internal pressure) exceeds 0.040 [MPa] (40 [kPa]), shut off the air supply, and check the connections of the scavenging tubes.)
(If internal pressure remains, disconnect the ø12 scavenging air supply tube and wait until the gage (for checking internal pressure) reads 0 [MPa].)
4. Turn ON the controller power.
The internal pressure will be abnormally low, so the error message "(E6032) [Purge control board] Pressure within enclosure is low.(during purging)" is displayed.
5. Press **CLOSE** while pressing **A** on the teach pendant.
6. Close the error screen, and make sure that the normal teaching screen is displayed.
(The error screen closes, but error reset has not been executed yet.)
7. Press **→** while pressing **A** on the teach pendant, and <valve ON/OFF>, <Flow SW>, and <Prss. SW> are displayed. (Refer to the figure below.)



8. Confirm that <valve ON/OFF> is OFF.
9. Loosen the lock nuts of the setting knob for operation and the setting knob for scavenging.
10. Turn the setting knob (for operation) and adjust until the pressure displayed on the gage (for checking internal pressure) is 0.015 ± 0.002 [MPa] (15 ± 2 [kPa]).

**CAUTION**

When calibrating the gage, turn the setting knob gradually in the direction that increases the setting values.


11. Tighten the lock nut for the setting knob (for operation).
12. After calibration, wait at least two minutes, then check the setting values. (If the setting values are out, loosen the lock nut again and go back to Step 10.)
Confirm that <Prss. SW> has turned yellow.
13. Touch <valve ON/OFF>
<valve ON/OFF> will turn yellow, and the scavenging solenoid valve will turn ON.
When the scavenging solenoid valve turns ON, the value on the gage (for checking internal pressure) changes.
14. Turn the setting knob (for scavenging) to adjust until the setting value on the gage (for scavenging) becomes 0.150 [MPa] (150 [kPa]), and tighten the lock nuts on the setting knob (for scavenging).
15. If the reading on the gage (for checking internal pressure) exceeds 0.040 [MPa] (40 [kPa]), shut off the air supply, and check to make sure that the scavenging tubes are connected.
16. Check to make sure that the pressure displayed on the gage (for checking internal pressure) is 0.0265 ± 0.0015 [MPa] (26.5 ± 1.5 [kPa]). If it is within range, go to Step 18. If it is out of range, go to Step 17.
17. If the pressure displayed on the gage (for checking internal pressure) is higher than 0.0265 ± 0.0015 [MPa] (26.5 ± 1.5 [kPa]), loosen the lock nut on the setting knob (for scavenging), and turn the setting knob (for scavenging) to lower the pressure to below the range. Then increase the pressure to within the range and tighten the lock nut.
If the pressure displayed on the gage (for checking internal pressure) is lower than 0.0265 ± 0.0015 [MPa] (26.5 ± 1.5 [kPa]), loosen the lock nut on the setting knob (for scavenging), increase the pressure to within the range by turning the setting knob (for scavenging), and tighten the lock nut.
18. Confirm that <Flow SW> and <Prss. SW> have turned yellow.
Touch <valve ON/OFF>. The scavenging solenoid valve will turn OFF.
19. Turn the controller power OFF, and then ON. Scavenging will begin.
20. Monitor 1 will display [57. Air purge Input Signals monitor].
21. Make sure that [006: EXT. Air purge comp.] has changed to yellow, and turn OFF Monitor 1.

**CAUTION**

If an attempt is made to operate the robot before the air pressure has risen sufficiently, such as immediately after starting up the compressor for the air supply, errors will occur due to insufficient internal pressure, and it will not be possible to operate the robot. Operate the robot after the air pressure has risen.


9.2 Explosion-Proof Specification for Europe


Use the air specified below for explosion-proof specification for Europe.

 CAUTION	
Use the clean air specified below.	
• Solids.....	0.01 μm or less
• Oil.....	Mist removal: At least 99.9999%
• Moisture.....	Under dew-point -17°C at atmospheric pressure
• Input pressure.....	0.5 to 0.7 MPa(5.1 to 7.1 kgf/cm²)
• Input quantity.....	450 L/min.(nor)(only during scavenging)

9.2.1 Scavenging Tube Connection (Explosion-Proof Specification for Europe)

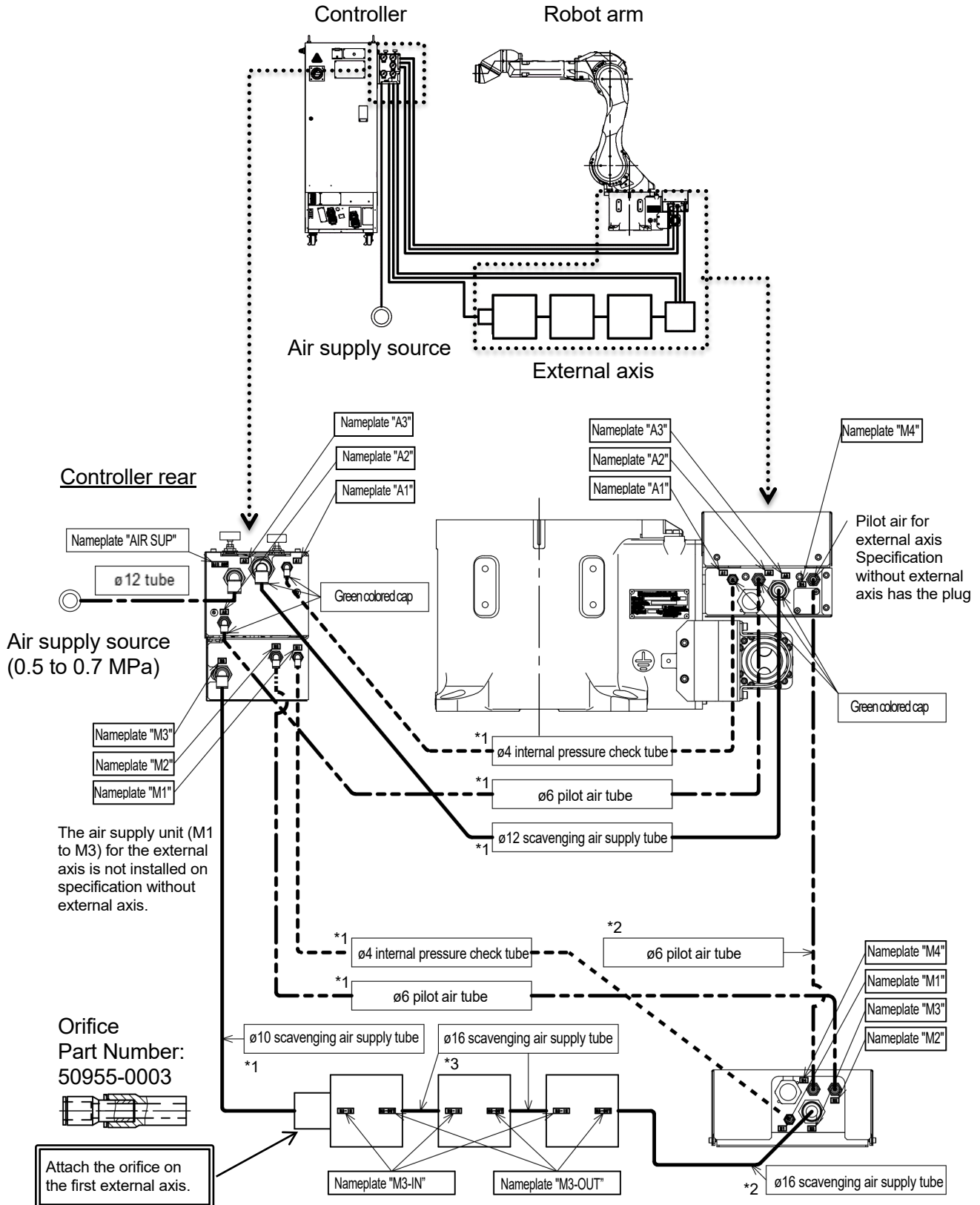
As shown the figure on the next page, connect the scavenging tubes (tube that supplies the air scavenging, tube for the pilot air, and internal pressure check tube) between the robot arm, the external axis and the controller.

 DANGER	
1. Do not supply air directly to the robot arm. This could damage it.	
2. Attach the orifice (Part number: 50955-0003) on the first external axis for the specification with external axis. Failure to do this could damage it.	

 CAUTION	
1. Use nylon (incombustible) as material for the scavenging tube mounted between the robot arm and the controller.	
2. Scavenging tubes have nameplates and green-colored caps on their connectors to identify them as scavenging tubes. Connect the same nameplates together and the same green-colored caps together.	

[NOTE]	
Make sure that the scavenging tubes are not bent during scavenging tube connection work or when moving the controller.	

■ Explosion-proof specification for Europe



- *1 Keep each air tube between the controller and the robot arm, between the controller and the external axis in the same length at or below 40 m.
- *2 Keep the length of the air tube at or below 3 m.
- *3 Keep the total length of the air tube at or below 20 m.

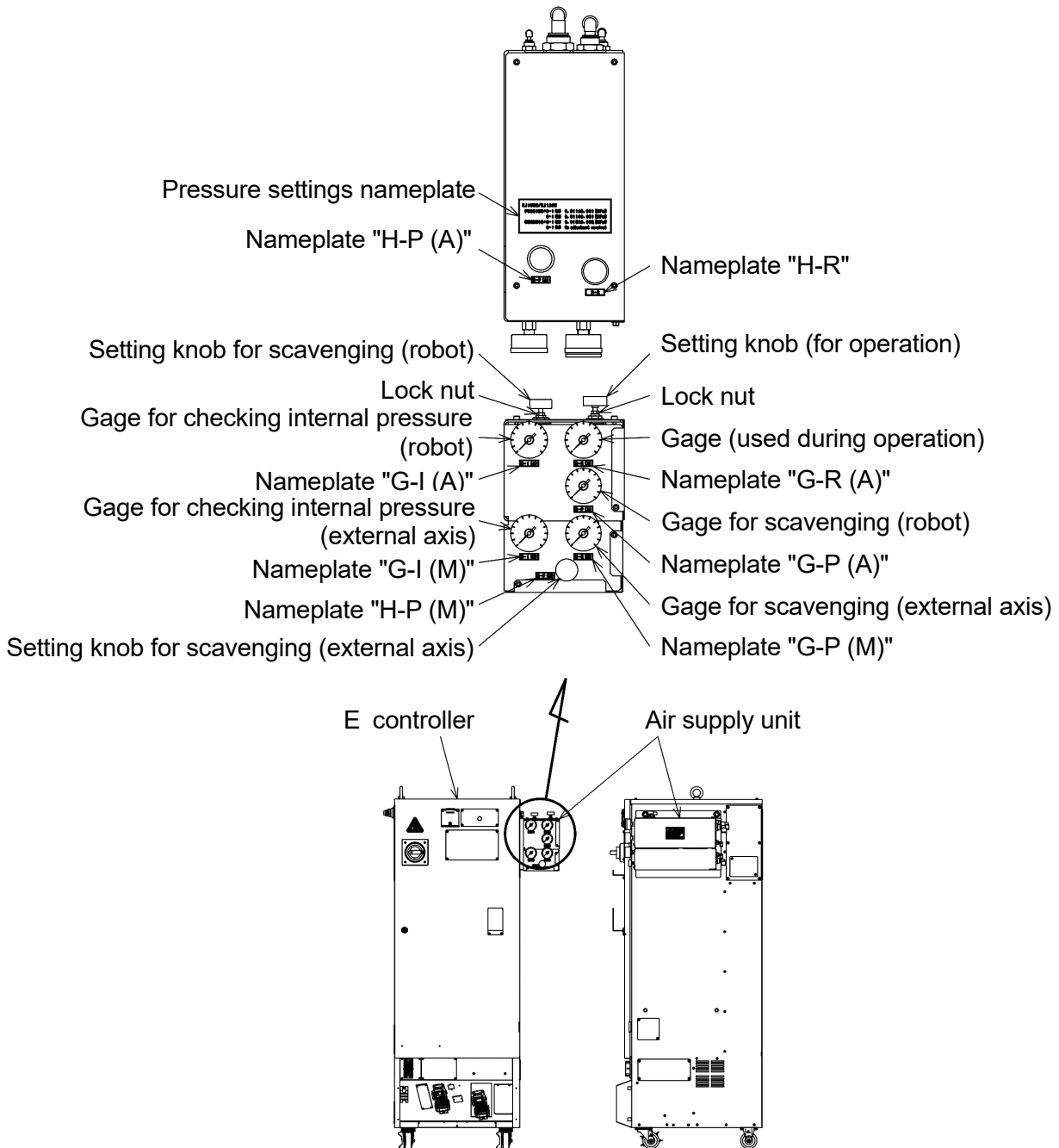
9.2.2 Gage Calibration Method (Explosion-Proof Specification for Europe)

Calibrate the gages using the method described below.

Do not press the Error Reset button while performing this work. If the button is pressed, return to Step 1 and perform the operation again from the beginning.

There are five types of gage: a gage used during operation, a gage for scavenging (robot), a gage for checking internal pressure (robot), a gage for scavenging (external axis) and a gage for checking internal pressure (external axis).

The air supply unit for the external axis is not installed on the specification without external axis. Making adjustment to the external axis is not necessary.



**CAUTION**

1. The gage is set to 0 MPa before shipment. During installation, mount the scavenging tube between the robot and the controller as instructed in this manual, and calibrate the gage.
2. If the reading on the gage for checking internal pressure (robot) exceeds 0.040 [MPa] (40 [kPa]) during calibration, shut off the air supply.
3. If the reading on the gage for checking internal pressure (external axis) exceeds 0.040 [MPa] (40 [kPa]) during calibration, shut off the air supply.

[NOTE]

1. When the motor power is ON, <valve ON/OFF> cannot be used. Turn OFF the motor power when performing this work.
2. The controller power must always be turned back ON after this work is completed.

Before recalibrating, set the gage used during operation, the gage for scavenging (robot) and the gate for scavenging (external axis) to 0 [MPa].

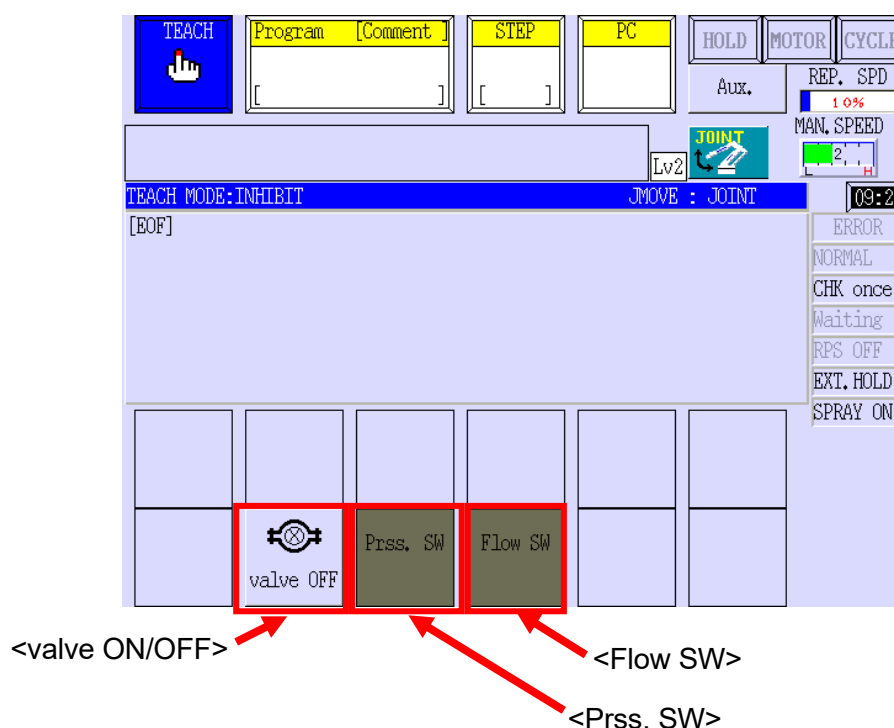
[Procedure]

1. Turn OFF the controller power.
2. Supply air to the controller.
3. Check to make sure that each gage is set to 0 [MPa].
(If the reading on the gage for checking internal pressure (robot) exceeds 0.040 [MPa] (40 [kPa]), shut off the air supply, and check the connections of the scavenging tubes.)
(If the reading on the gage for checking internal pressure (external axis) exceeds 0.040 [MPa] (40 [kPa]), shut off the air supply, and check the connections of the scavenging tubes.)
(If internal pressure remains, disconnect the scavenging air supply tube (robot: \varnothing 12, external axis: \varnothing 10) and wait until the gage for checking internal pressure (robot) and the gage for checking internal pressure (external axis) read 0 [MPa].)
4. Loosen the lock nuts of the setting knob (for operation) and the setting knob for the scavenging (robot).
5. Turn the setting knob (for operation) and adjust until the pressure displayed on the gage for checking internal pressure (robot) is 0.015 ± 0.002 [MPa] (15 ± 2 [kPa]).

**CAUTION**

When calibrating the gage, turn the setting knob gradually in the direction that increases the setting values.

6. Tighten the lock nut for the setting knob (for operation).
After calibration, wait at least two minutes, then check the setting values. (If the setting values are out, loosen the lock nut again and go back to Step 5.)
7. Turn ON the controller power.
The internal pressure will be abnormally low, so the error message "(E6032) [Purge control board] Pressure within enclosure is low. (during purging)" is displayed. (After about one minute later from the controller power is turned ON, it is displayed when the scavenge control unit starts scavenging.)
8. Press **CLOSE** while pressing **A** on the teach pendant.
9. Close the error screen, and make sure that the normal teaching screen is displayed.
(The error screen closes, but error reset has not been executed yet.)
10. Press **→** while pressing **A** on the teach pendant, and <valve ON/OFF>, <Flow SW>, and <Prss. SW> are displayed. (Refer to the figure below.)



11. Confirm that <valve ON/OFF> is OFF.
12. Confirm that <Prss. SW> has turned yellow.
13. Touch <valve ON/OFF>.
<valve ON/OFF> will turn yellow, and the scavenging solenoid valve will turn ON.
When the scavenging solenoid valve turns ON, the valve (for checking internal pressure) changes.
14. Turn the setting knob for scavenging (robot) to adjust until the setting value on the gage for scavenging (robot) becomes 0.250 [MPa] (250 [kPa]) and tighten the lock nuts on the setting knob for scavenging (robot).

15. If the reading on the gage for checking internal pressure (robot) exceeds 0.040 [MPa] (40 [kPa]), shut off the air supply, and check to make sure that the scavenging tubes are connected.
16. Check to make sure the pressure displayed on the gage for checking internal pressure (robot) exceeds 0.011 ± 0.001 [MPa] (11.0 ± 1.0 [kPa]). If it is within range, go to Step 18. If it is out of range, go to Step 17.
17. If the pressure displayed on the gage for checking internal pressure (robot) is higher than 0.011 ± 0.001 [MPa] (11.0 ± 1.0 [kPa]), loosen the lock nut on the setting knob for scavenging (robot), and turn the setting knob for scavenging (robot) to lower pressure to below the range. Then increase the pressure to within the range and tighten the lock nut. If the pressure displayed on the gage for checking internal pressure (robot) is lower than 0.011 ± 0.001 [MPa] (11.0 ± 1.0 [kPa]), loosen the lock nut on the setting knob for scavenging (robot), raise the pressure to within the range by turning the setting knob for scavenging (robot), and tighten the lock nut.
18. For specification without external axis, go to Step 23. For specification with external axis, go to Step 19.
19. Turn the setting knob for scavenging (external axis) to adjust until the setting value on the gage for scavenging (external axis) becomes 0.090 [MPa] (90 [kPa]) and tighten the lock nuts on the setting knob for scavenging (external axis).
20. If the reading on the gage for checking internal pressure (external axis) exceeds 0.040 [MPa] (40 [kPa]), shut off the air supply, and check to make sure that the scavenging tubes are connected.
21. Check to make sure that the pressure displayed on the gage for checking internal pressure (external axis) is 0.011 ± 0.001 [MPa] (11.0 ± 1.0 [kPa]). If it is within range, go to Step 23. If it is out of range, go to Step 22.
22. If the pressure displayed on the gage for checking internal pressure (external axis) is higher than 0.011 ± 0.001 [MPa] (11.0 ± 1.0 [kPa]), loosen the lock nut on the setting knob for scavenging (external axis) and turn the setting knob for scavenging (external axis) to lower the pressure to below the range. Then increase the pressure to within the range and tighten the lock nut.
If the pressure displayed on the gage for checking internal pressure (external axis) is lower than 0.011 ± 0.001 [MPa] (11.0 ± 1.0 [kPa]), loosen the lock nut on the setting knob for scavenging (external axis), raise the pressure within the range by turning the setting knob for scavenging (external axis), and tighten the lock nut.
23. Confirm that <Flow SW> and <Prss.SW> have turned yellow.
Touch <valve ON/OFF>. The scavenging solenoid valve will turn OFF.
24. Turn the controller power OFF, and then ON. Scavenging will begin.
25. Monitor 1 will display [57. Air purge Input Signals monitor].

26. Make sure that [006: EXT. Air purge comp.] has changed to yellow, and turn OFF Monitor 1.

**CAUTION**

If an attempt is made to operate the robot before the air pressure has risen sufficiently, such as immediately after starting up the compressor for the air supply, errors will occur due to insufficient internal pressure, and it will not be possible to operate the robot. Operate the robot after the air pressure has risen.

10 Protection Sheet Removal for Mirror-Surfaced Wrist Specification (Mirror-Surfaced Wrist Specification Only)

For the mirror-surfaced wrist specification, the robot is delivered with protection sheets (colorless and transparent) fixed with vinyl tape and double-sided tape in order to protect the mirror condition of the wrist surface.

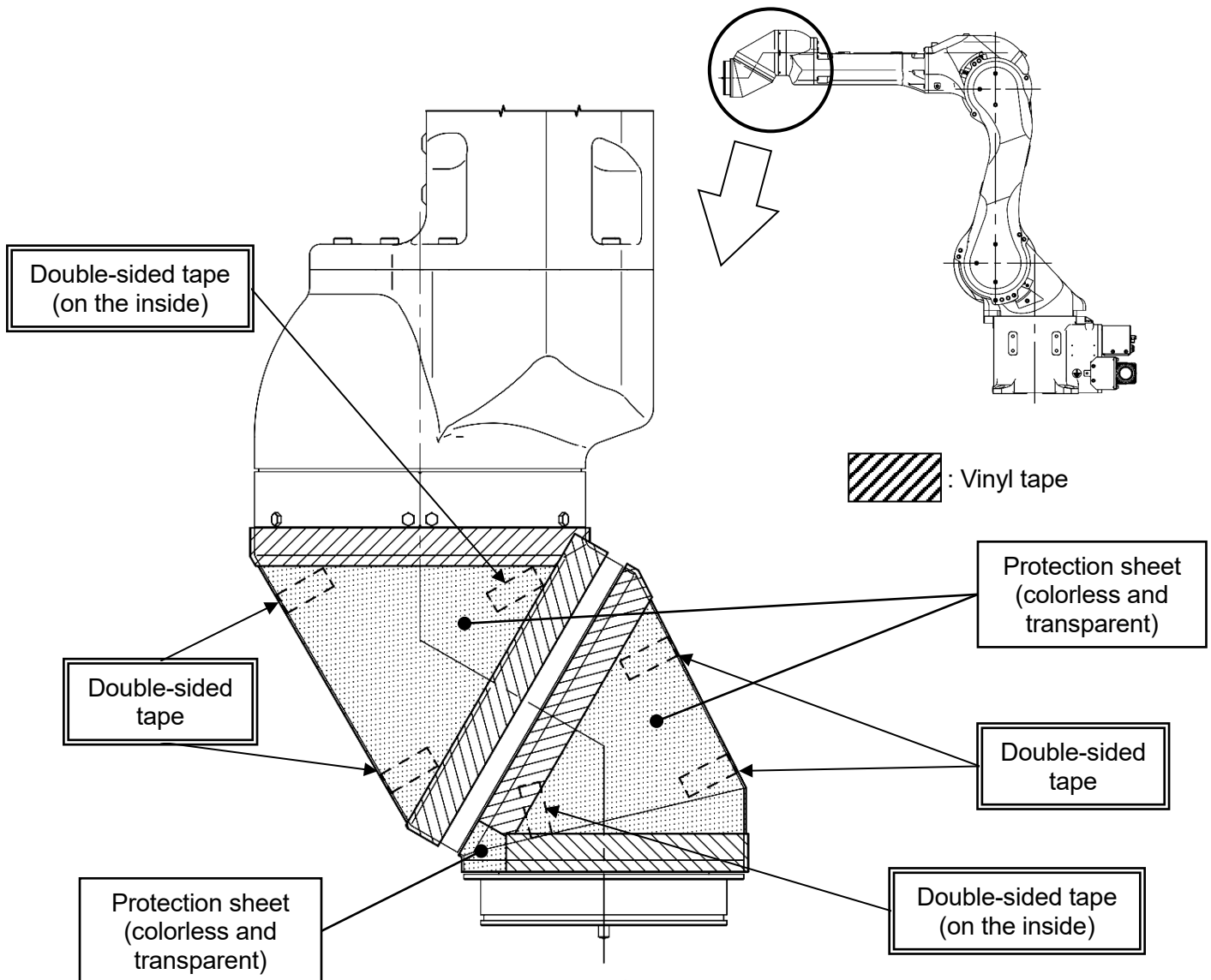
The protection sheets are not solvent-resistant, so please remove them before use.

[Protection sheets (breakdown for one robot)]

- Protection sheet (colorless and transparent) 3 pieces
- Double-sided tape 8 locations
- Vinyl tape

[NOTE]

Adhesive of the double-sided tape and vinyl tape may remain on the wrist surface.
Use cleaning solution etc. to remove the adhesive in such case.





Kawasaki Robot KJ155/125 (E Controller)
Installation and Connection Manual

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