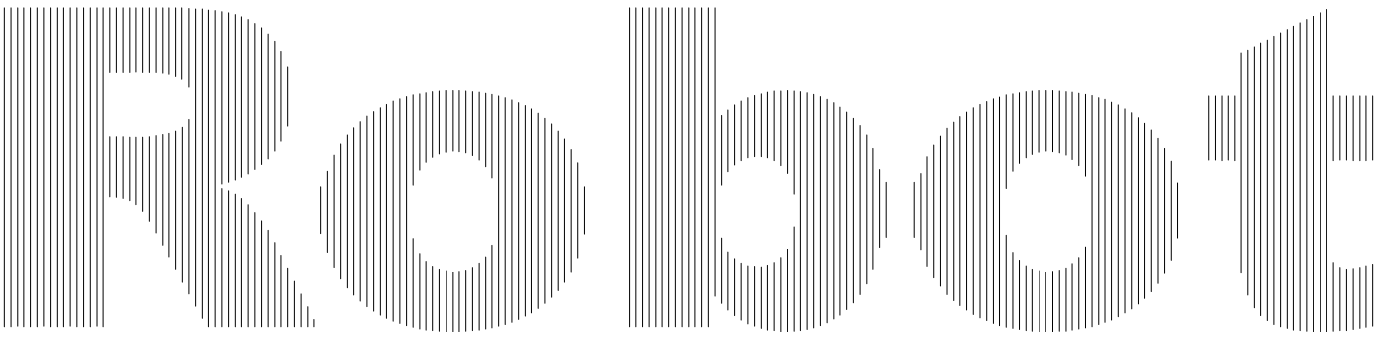
Simple and friendly

Kawasaki

Kawasaki Robot
R Series

Installation and Connection Manual



Kawasaki Heavy Industries, Ltd.

90202-1112DEG

PREFACE

This manual describes installation and connection procedures for Kawasaki Robot R Series.

Read and understand the contents of this and safety manuals thoroughly and strictly observe all rules for safety before proceeding with any operation. Kawasaki cannot take any responsibility for any accidents and/or damages caused by operations that are based on only the limited part of this manual.

This manual describes only the installation and connection of the Robot Arm. Please refer to the following manual for installation and connection of Controller and for Arc-welding Robots.

"Installation and Connection Manual" for controller
"Installation and Connection Manual" for arc welding

This manual is applicable to the following robot arms.

RA05L, RA06L, RA10L, RA10N, RA20N, RC05L, RD80N, RS05L, RS05N, RS06L, RS10L, RS10N, RS15X, RS20N, RS30N, RS50N, RS80N

1. This manual does not constitute a guarantee of the systems in which the robot is utilized. 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.

SAFETY

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 damages 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, handling, teaching, operation, and maintenance.

⚠ WARNING

1. **The accuracy and effectiveness of the diagrams, procedures, and detail explanations given in this manual cannot be confirmed with absolute certainty. Accordingly, it is necessary to give one's fullest attention when using this manual to perform any work.**
2. **Safety related contents described in this manual apply to each individual work and not to all robot work. In order to perform every work in safety, read and fully understand the safety manual, all pertinent laws, regulations and related materials as well as all the safety explanation described in each chapter, and prepare safety measures suitable for actual work.**

CONTENTS

1.0 PRECAUTIONS

1.1 PRECAUTIONS DURING TRANSPORTATION, INSTALLATION AND STORAGE

When transporting the Kawasaki Robot to its installation site, strictly observe the following cautions.

⚠ WARNING

1. **When the robot arm is to be transported by using a crane or forklift, never support the robot arm manually.**
2. **During transportation, never climb on the robot arm or stay under the hoisted robot arm.**
3. **Prior to installation, turn OFF the controller power switch and the external power switch for shutting down power supply to the controller. Display signs indicating clearly "Installation and connection in progress", and lockout/tagout the external power switch to prevent accidents of electric shock etc. caused when someone accidentally turns ON the power.**
4. **Prior to moving robot, ensure safety by first confirming no abnormality is observed in installing condition, etc., and then turn ON motor power to set robot to the desired pose. Be careful not to be caught by/between any moving parts due to careless approach to robot and peripheral equipment. After setting robot to the specified pose, turn OFF the controller power and the external power switch again as mentioned above. Display signs indicating clearly "Installation and connection in progress", and lockout/tagout the external power switch before starting installation and connection.**

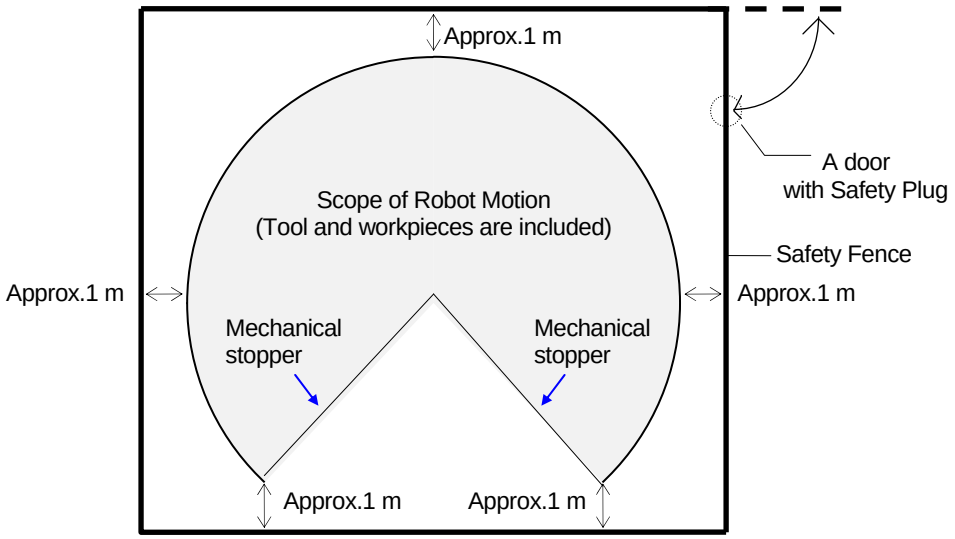
⚠ CAUTION

1. **Since the robot arm is composed of precision parts, be careful not to apply excessive shocks or vibrations during transportation.**
2. **Prior to installation, remove all obstacles so the installation is carried out smoothly and safely. Clear a passage to the installation area for transportation of the robot arm using a crane or forklift.**
3. **During transportation and storage,**
   - **(1) Keep the ambient temperature within the range of -10 to 60 °C,**
   - **(2) Keep the relative humidity within the range of 35 – 85 % RH without dew condensation,**
   - **(3) Keep free from excessively strong vibration.**

1.2 INSTALLING ENVIRONMENT OF ROBOT ARM

The robot arm must be installed in a place that satisfies all the following environmental conditions:

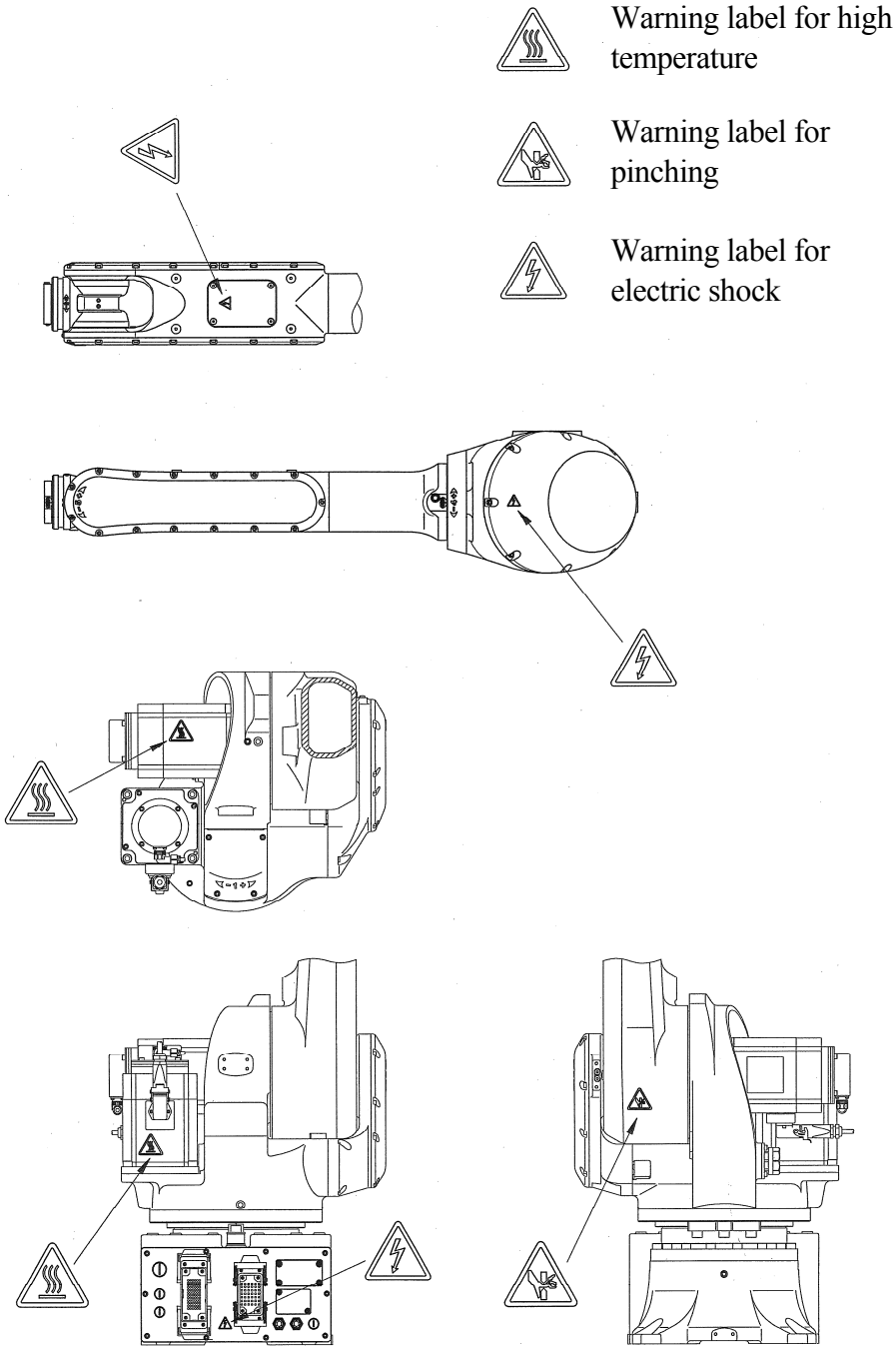
1. When robot is installed on the floor, the levelness must be within ±5°.
2. Be sure that the installation floor/pedestal has sufficient rigidity.
3. Secure a flatness to prevent undue force applied to the installation section. (If sufficient flatness is unobtainable, insert liners and adjust the flatness.)
4. Keep the ambient temperature during operation within the range of 0 to 45 °C. (Deviation or overload error may occur due to high viscosity of grease/oil when starting operation at low temperatures. When this occurs, perform break-in operation at low speed (approx. half speed of regular operation) for 5 to 10 minutes before regular operation.)
5. Keep the relative humidity during operation within the range of 35-85 %RH without dew condensation.
6. The robot installing place should be free from dust, dirt, oil, smoke, water, and other foreign matters.
7. The robot installing place should be free from flammable or corrosive liquid or gas.
8. The robot installing place should be free from excessively strong vibration. (0.5G or less)
9. The robot installing place should be free from electric noise interference.
10. The robot installing place should be sufficiently larger than the motion range of robot arm.
    (1) Install safety fence so the maximum movement of fully equipped robot arm (with tools and workpieces) does not cause interference.
    (2) Minimize the number of entrance gates (only one is best) and equip the entrance gate with a safety plug.
    (3) Observe the requirements of JIS B8433, etc. established in each region for details of the safety fence.



1.3 WARNING LABEL

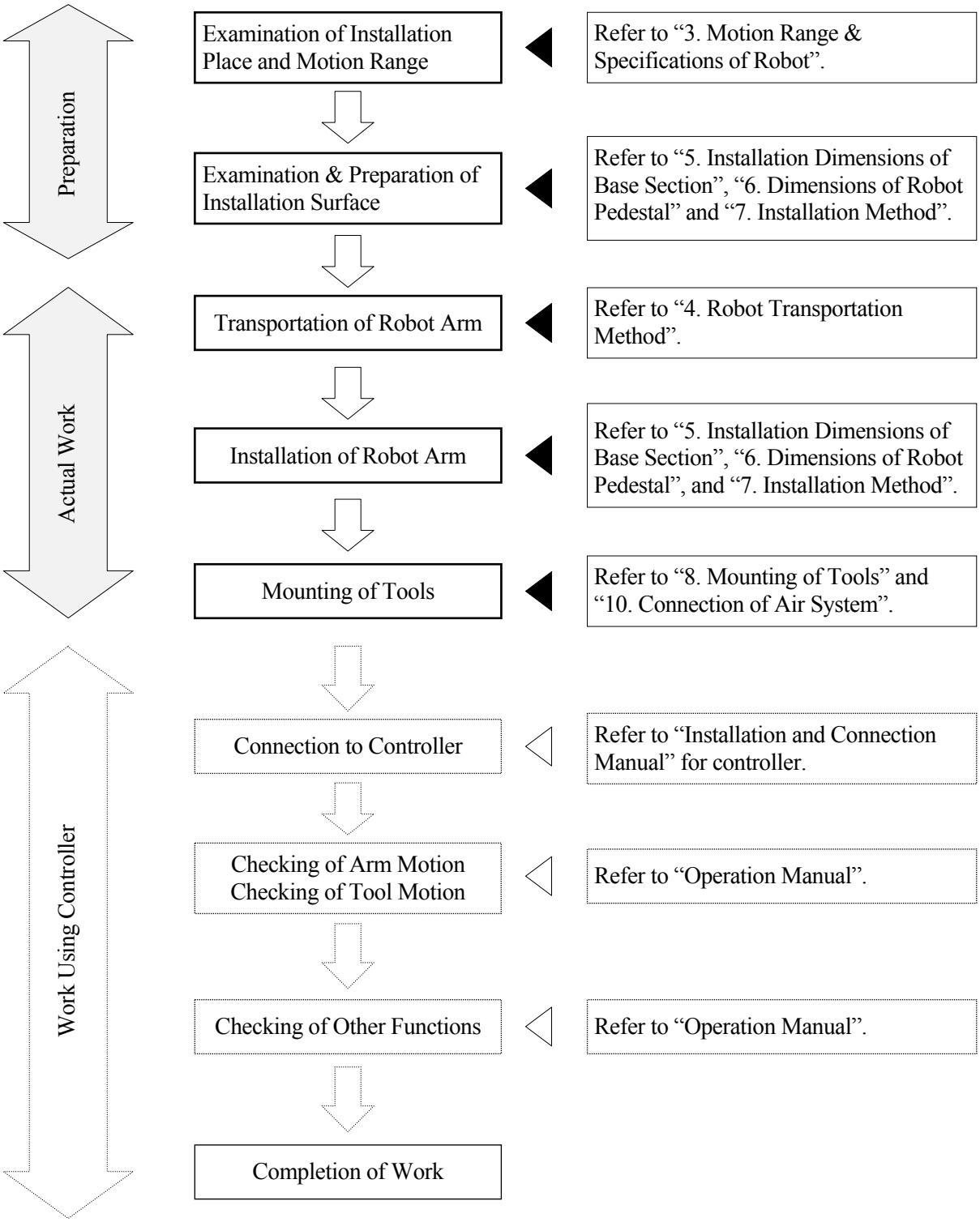
WARNING

Pay attention to the warning labels listed in the drawings below.



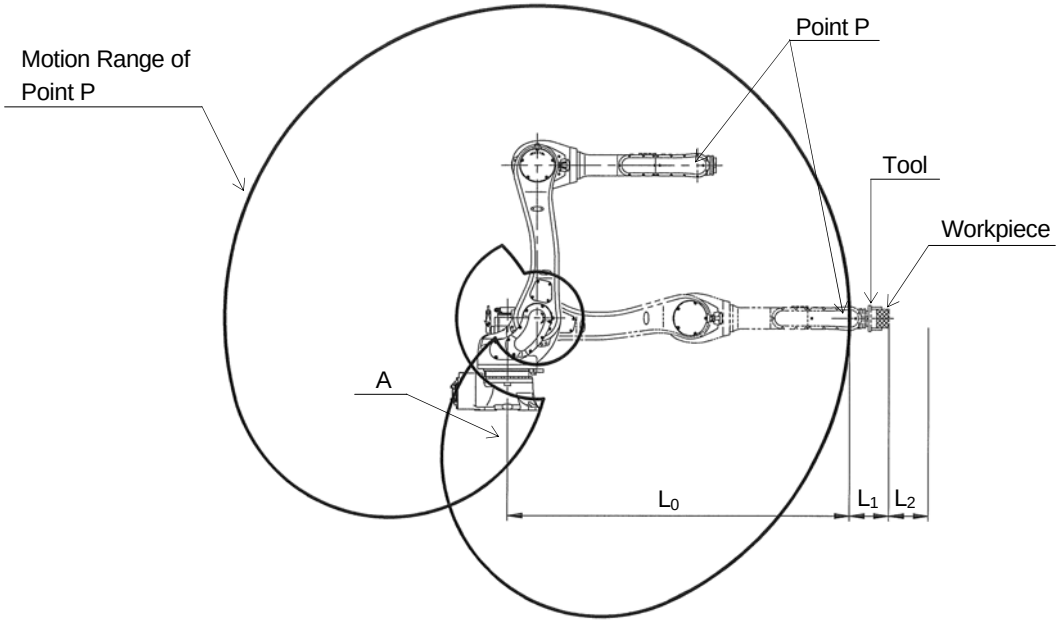
2.0 WORK FLOW AT ARM INSTALLATION AND CONNECTION

This workflow describes only the robot arm section. For the controller, refer to "Installation and Connection Manual" for controller.

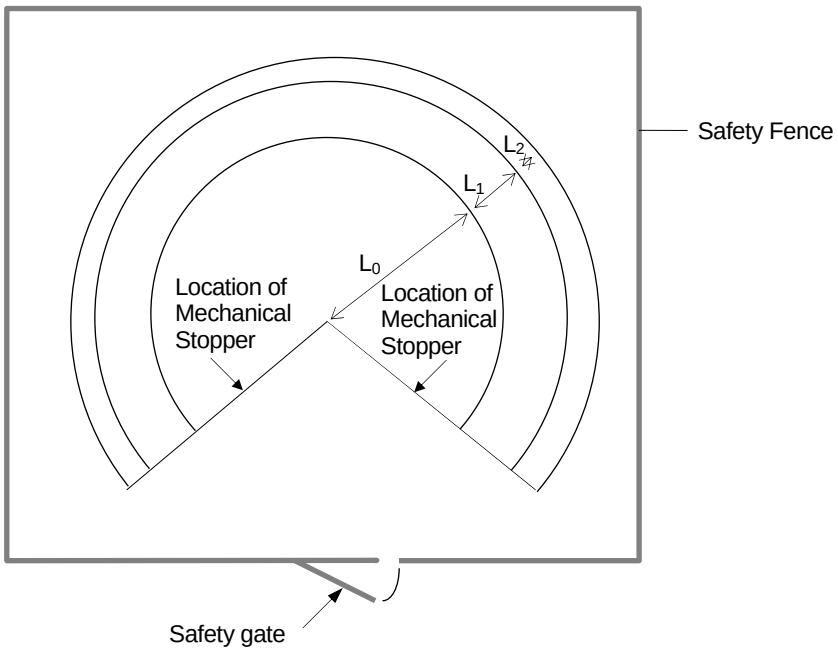


3.0 MOTION RANGE & SPECIFICATIONS OF ROBOT

3.1 DETERMINATION OF SAFETY FENCE INSTALLATION LOCATION

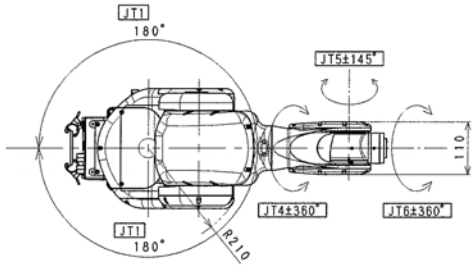


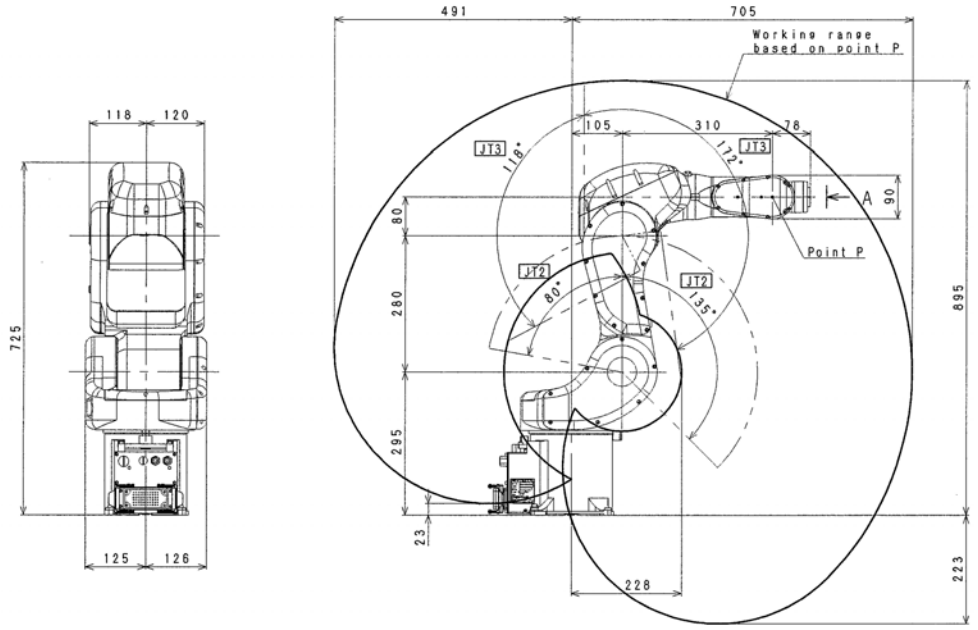
The motion range of the robot is represented by the maximum area that can be covered by point P in the figure above. Therefore, as shown in the figure below, install the safety fence outside circle whose radius is $L_0+L_1+L_2$. Where; L_0 is the length from the center line of arm (point A shown above) to the farthest point of P, L_1 is the length from point P to the farthest point of wrist flange, tool and workpiece, and L_2 is safety margin. For the length of L_0, refer to the drawings in the section 3.2.



3.2 MOTION RANGE & SPECIFICATIONS OF ROBOT

RS05N



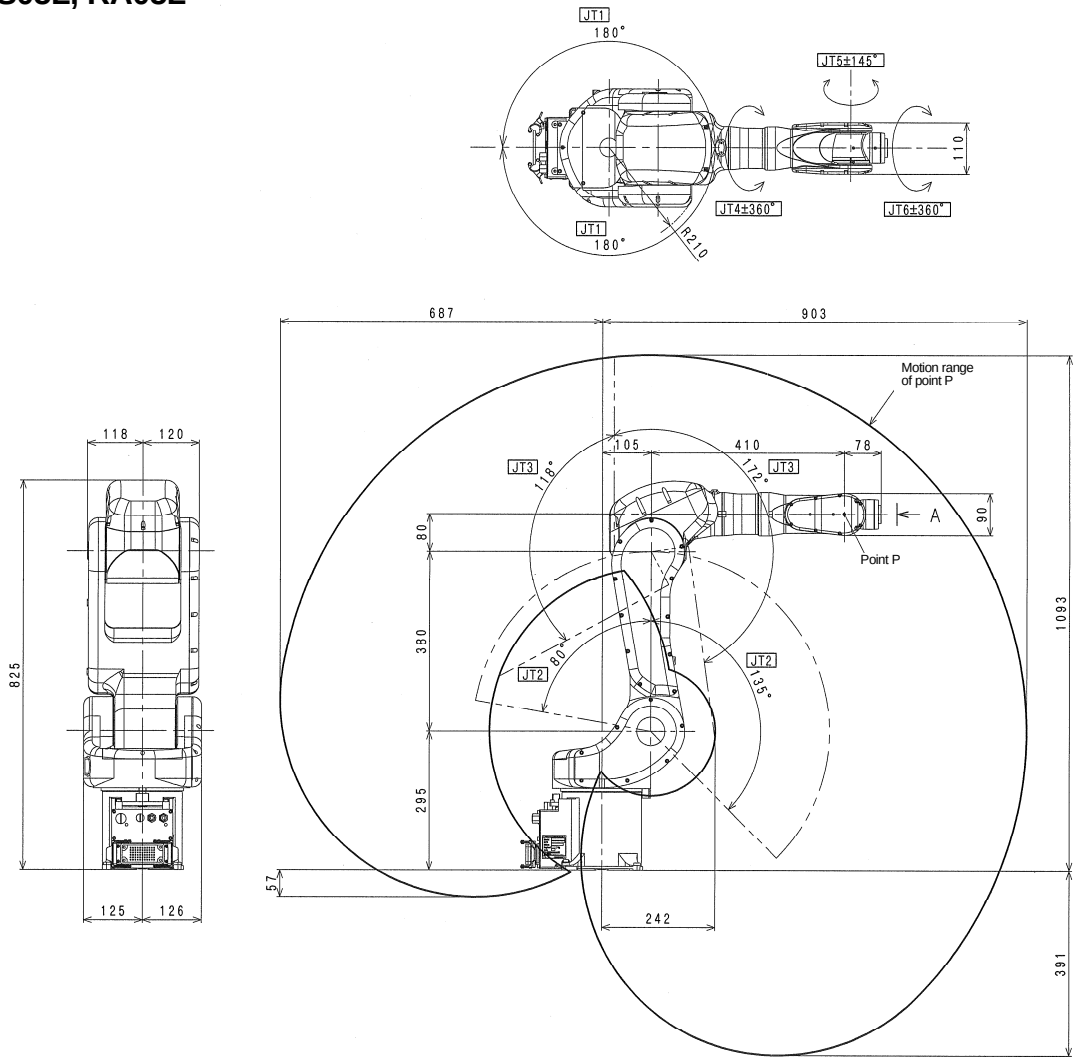


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	360 °/s
	2	+135° to -80°	360 °/s
	3	+118° to -172°	410 °/s
	4	±360°	460 °/s
	5	±145°	460 °/s
	6	±360°	740 °/s
Max. Payload	5 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	12.3 N·m	0.4 kg·m^2
	5	12.3 N·m	0.4 kg·m^2
	6	7.0 N·m	0.12 kg·m^2
Repeatability	±0.02 mm		
Mass	34 kg		
Acoustic noise	< 70 dB (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 2000 mm away from JT1 center

The noise level depends on the conditions.

RS05L, RA05L

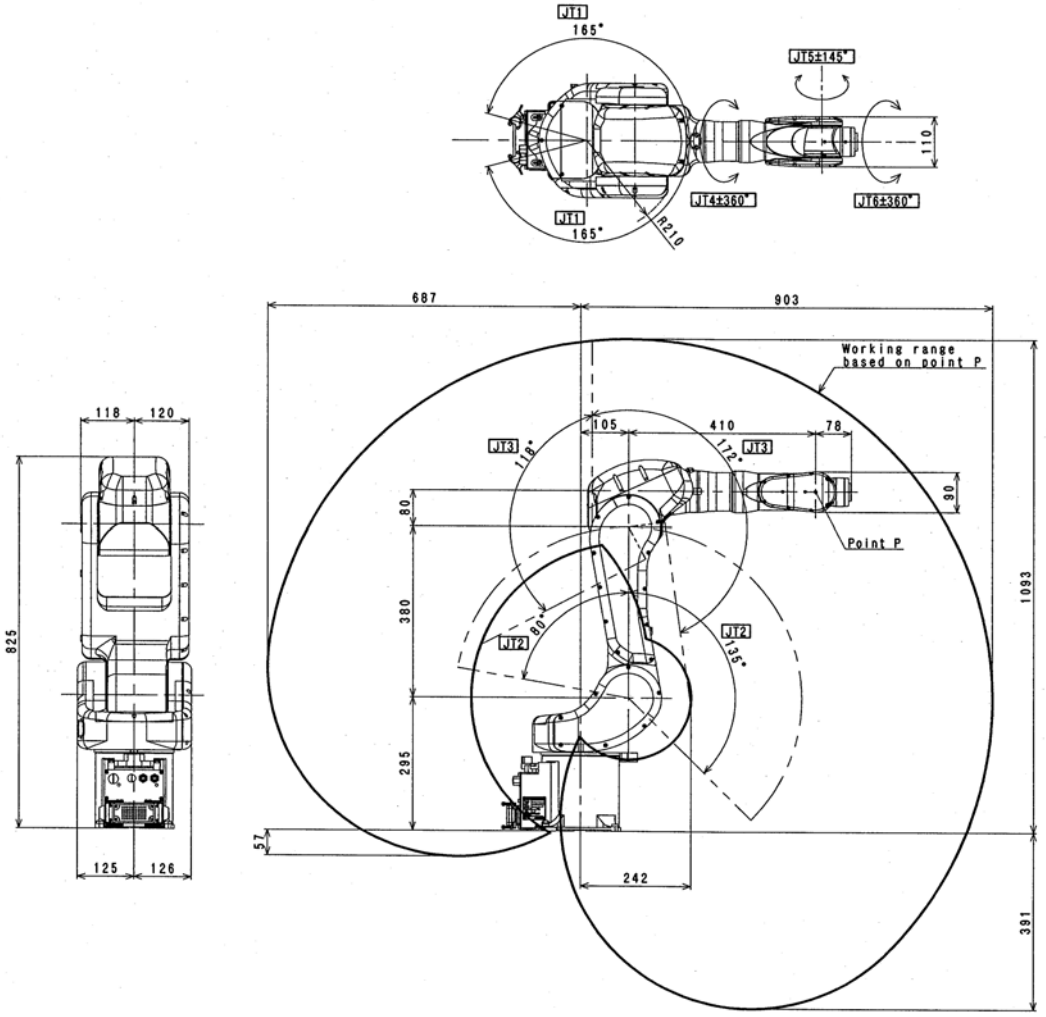


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	300 °/s
	2	+135° to -80°	300 °/s
	3	+118° to -172°	300 °/s
	4	±360°	460 °/s
	5	±145°	460 °/s
	6	±360°	740 °/s
Max. Payload	5 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	12.3 N·m	0.4 kg·m^2
	5	12.3 N·m	0.4 kg·m^2
	6	7.0 N·m	0.12 kg·m^2
Repeatability	±0.03 mm		
Mass	37 kg		
Acoustic noise	< 70 dB (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 2200 mm away from JT1 center

The noise level depends on the conditions.

RC05L

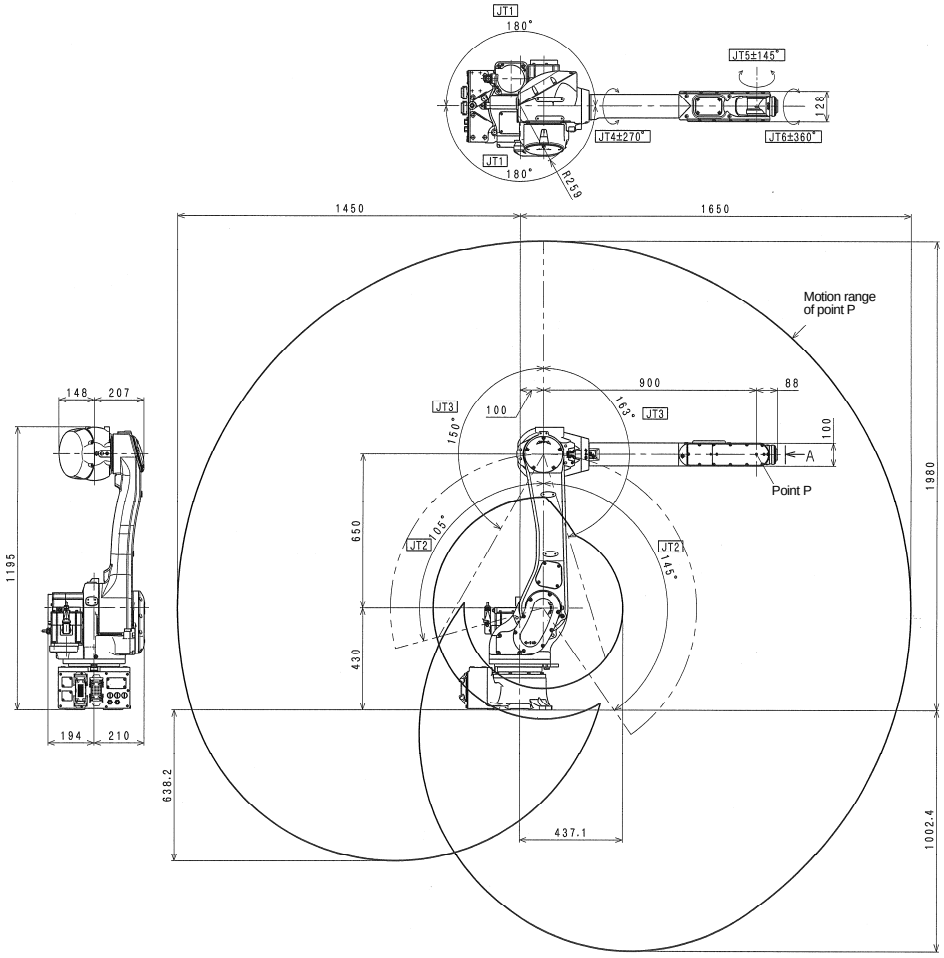


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±165°	300 °/s
	2	+135° to -80°	300 °/s
	3	+118° to -172°	300 °/s
	4	±360°	460 °/s
	5	±145°	460 °/s
	6	±360°	740 °/s
Max. Payload	5 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	12.3 N·m	0.4 kg·m^2
	5	12.3 N·m	0.4 kg·m^2
	6	7.0 N·m	0.12 kg·m^2
Repeatability	±0.03 mm		
Mass	37 kg		
Acoustic noise	< 70 dB (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 2200 mm away from JT1 center

The noise level depends on the conditions.

RS06L, RA06L

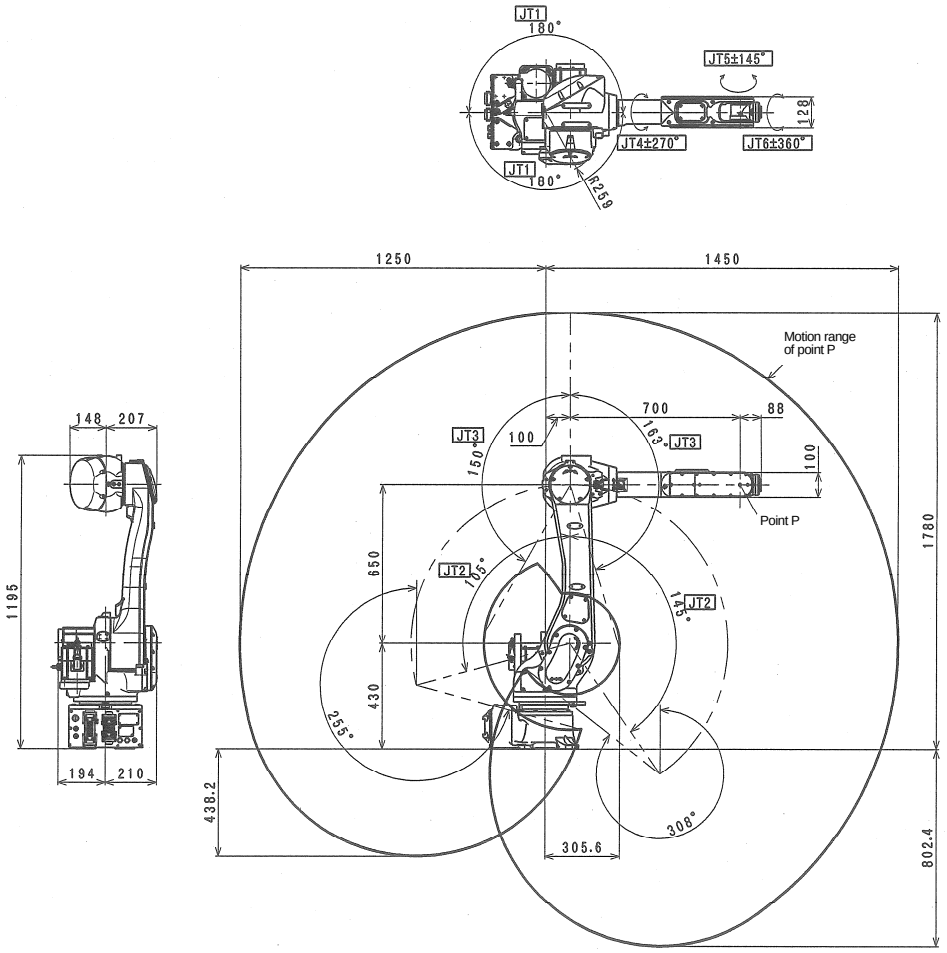


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	250 °/s
	2	+145° to -105°	250 °/s
	3	+150° to -163°	215 °/s
	4	±270°	365 °/s
	5	±145°	380 °/s
	6	±360°	700 °/s
Max. Payload	6 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	13.0 N·m	0.45 kg·m^2
	5	13.0 N·m	0.45 kg·m^2
	6	7.5 N·m	0.14 kg·m^2
Repeatability	±0.05 mm		
Mass	150 kg		
Acoustic noise	< 70 dB (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 2900 mm away from JT1 center

The noise level depends on the conditions.

RS10N, RA10N

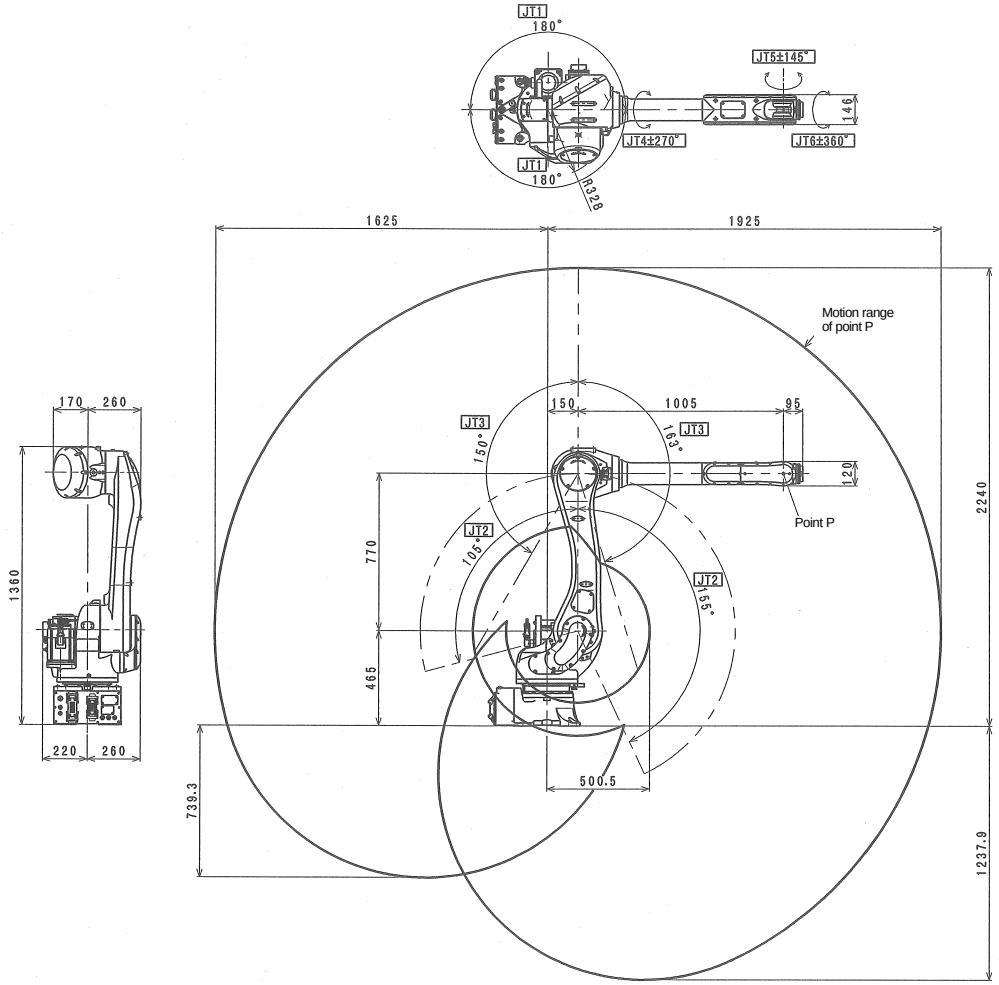


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	250 °/s
	2	+145° to -105°	250 °/s
	3	+150° to -163°	215 °/s
	4	±270°	365 °/s
	5	±145°	380 °/s
	6	±360°	700 °/s
Max. Payload	10 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	22.0 N·m	0.7 kg·m^2
	5	22.0 N·m	0.7 kg·m^2
	6	10.0 N·m	0.2 kg·m^2
Repeatability	±0.04 mm		
Mass	150 kg		
Acoustic noise	< 70 dB (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 2700 mm away from JT1 center

The noise level depends on the conditions.

RS10L, RA10L

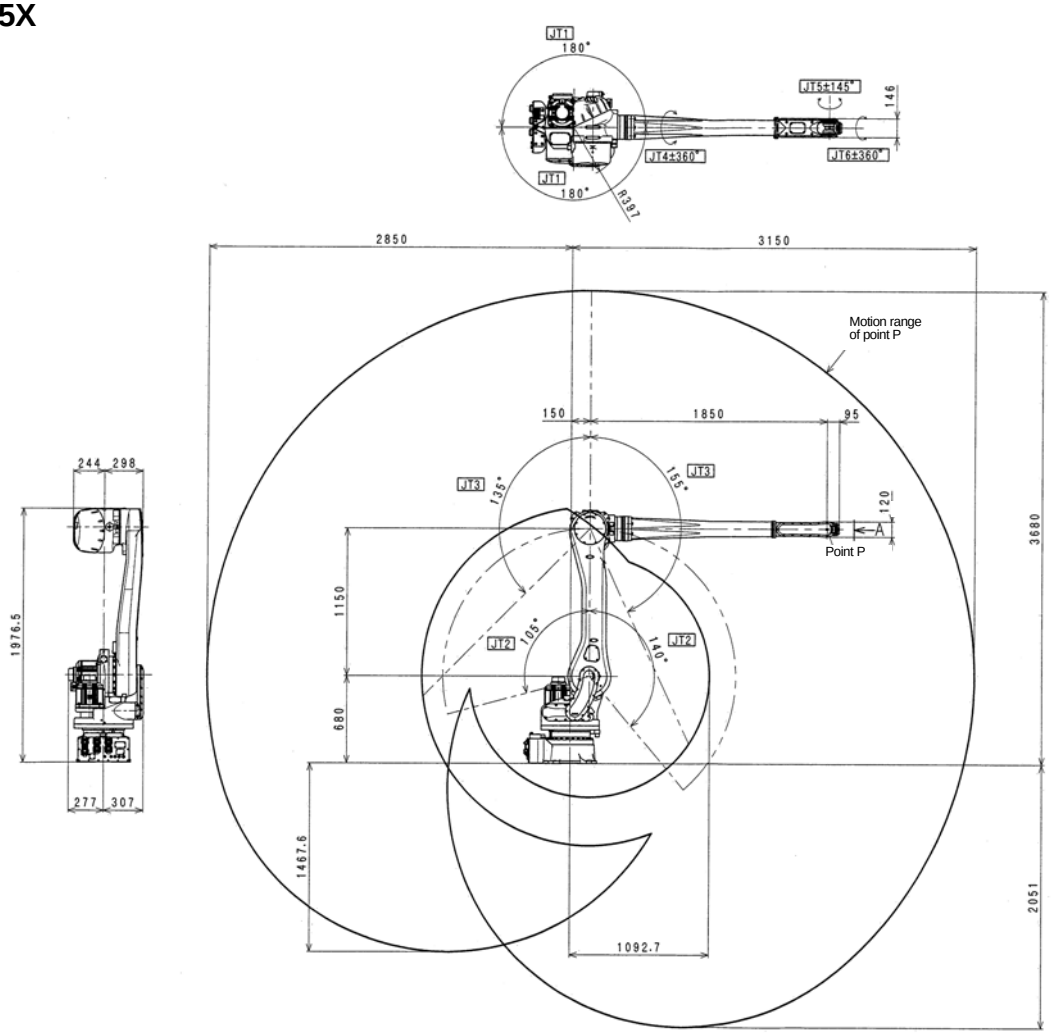


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	190 °/s
	2	+155° to -105°	205 °/s
	3	+150° to -163°	210 °/s
	4	±270°	400 °/s
	5	±145°	360 °/s
	6	±360°	610 °/s
Max. Payload	10 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	22.0 N·m	0.7 kg·m^2
	5	22.0 N·m	0.7 kg·m^2
	6	10.0 N·m	0.2 kg·m^2
Repeatability	±0.06 mm		
Mass	230 kg		
Acoustic noise	< 70 dB (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 3200 mm away from JT1 center

The noise level depends on the conditions.

RS15X

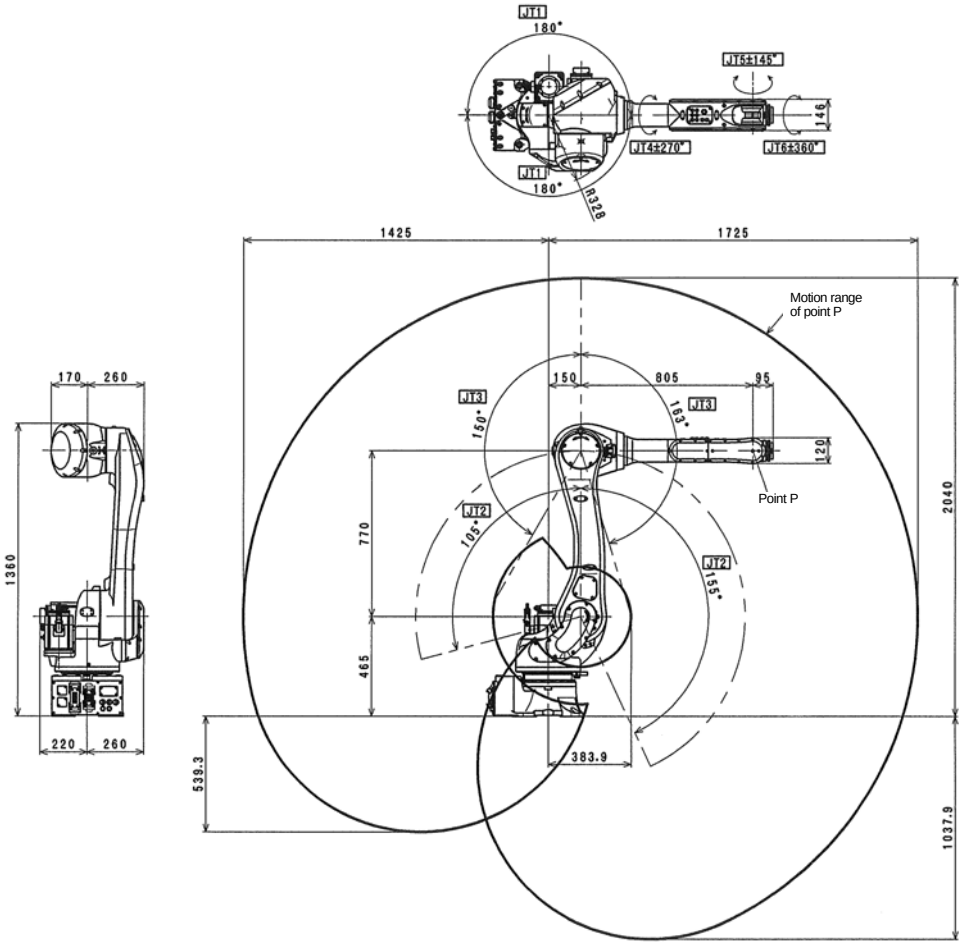


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	180 °/s
	2	+140° to -105°	180 °/s
	3	+135° to -155°	200 °/s
	4	±360°	410 °/s
	5	±145°	360 °/s
	6	±360°	610 °/s
Max. Payload	15 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	34.0 N·m	0.8 kg·m^2
	5	34.0 N·m	0.8 kg·m^2
	6	22.0 N·m	0.25 kg·m^2
Repeatability	±0.15 mm		
Mass	545 kg		
Acoustic noise	< 70 dB (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 4500 mm away from JT1 center

The noise level depends on the conditions.

RS20N, **RA20N**

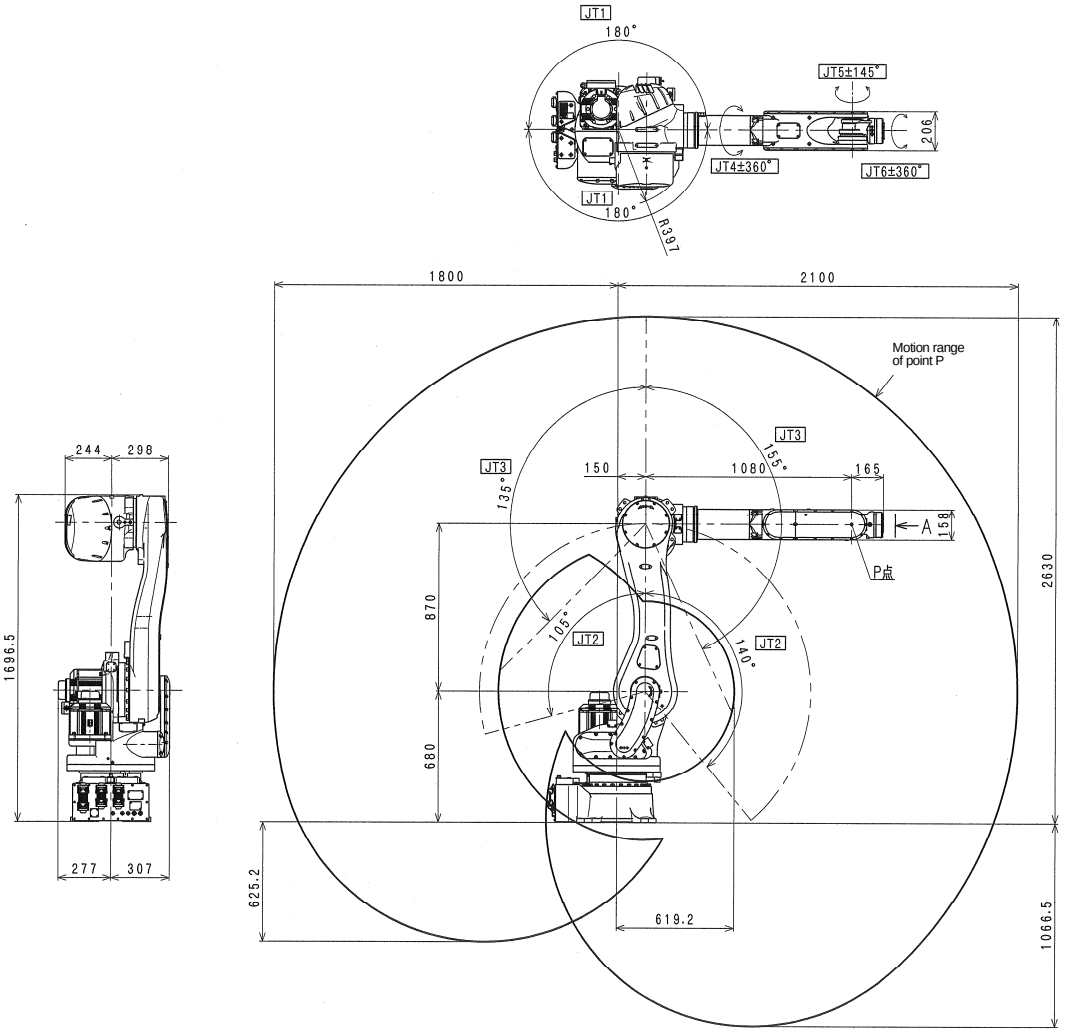


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	190 °/s
	2	+155° to -105°	205 °/s
	3	+150° to -163°	210 °/s
	4	±270°	400 °/s
	5	±145°	360 °/s
	6	±360°	610 °/s
Max. Payload	20 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	45.0 N·m	0.9 kg·m^2
	5	45.0 N·m	0.9 kg·m^2
	6	29.0 N·m	0.3 kg·m^2
Repeatability	±0.05 mm		
Mass	230 kg		
Acoustic noise	< 70 dB (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 3000 mm away from JT1 center

The noise level depends on the conditions.

RS30N

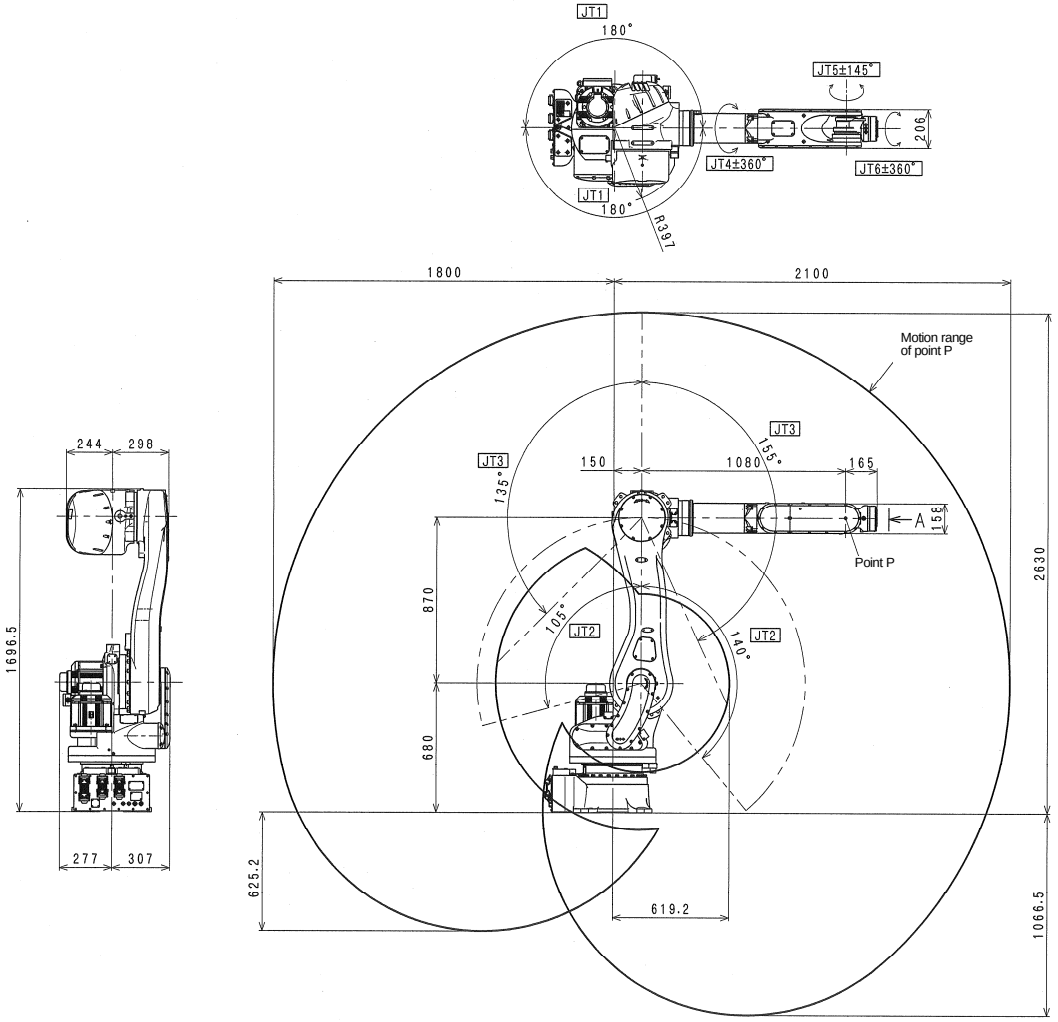


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	180 °/s
	2	+140° to -105°	180 °/s
	3	+135° to -155°	185 °/s
	4	±360°	260 °/s
	5	±145°	260 °/s
	6	±360°	360 °/s
Max. Payload	30 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	210.0 N·m	16.8 kg·m^2
	5	210.0 N·m	16.8 kg·m^2
	6	130.0 N·m	6.6 kg·m^2
Repeatability	±0.07 mm		
Mass	555 kg		
Acoustic noise	< 70 dB (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 4100 mm away from JT1 center

The noise level depends on the conditions.

RS50N

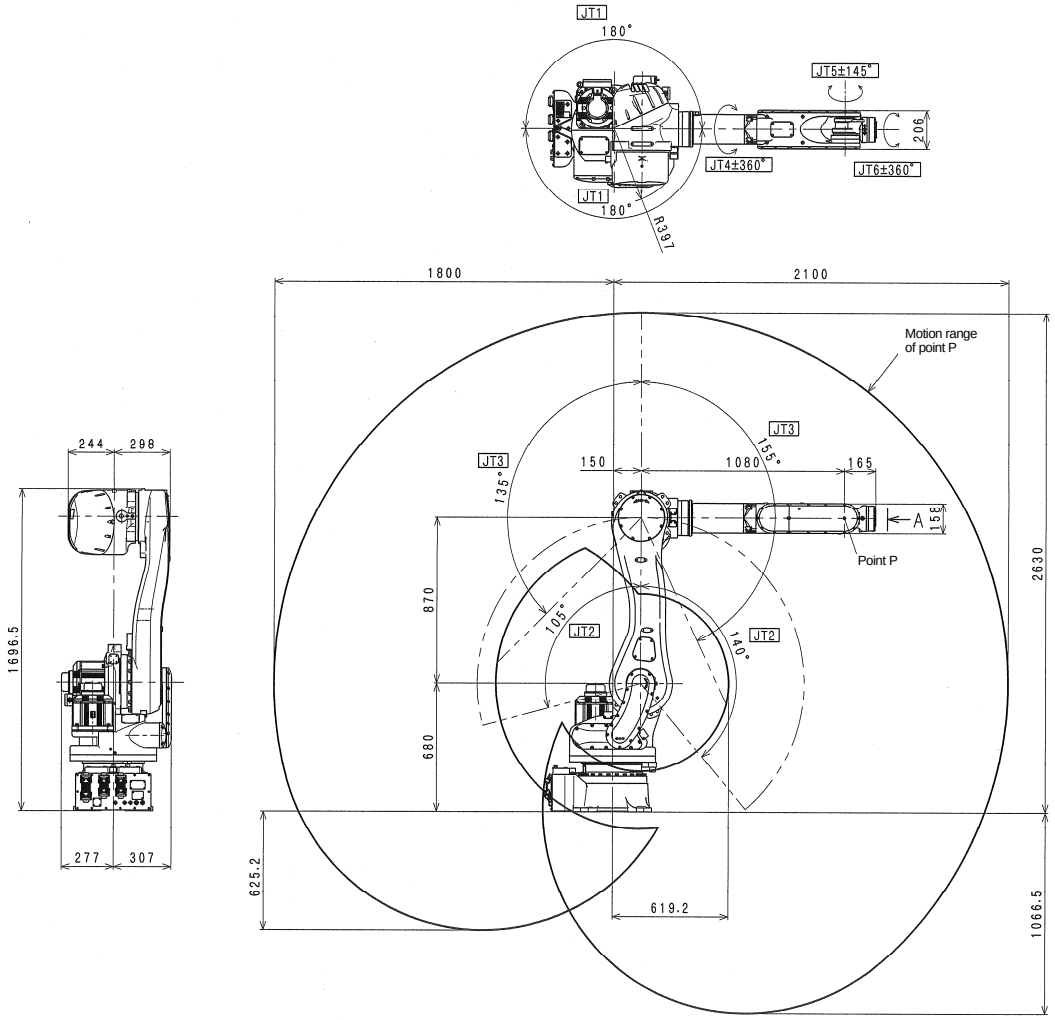


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	180 °/s
	2	+140° to -105°	180 °/s
	3	+135° to -155°	185 °/s
	4	±360°	260 °/s
	5	±145°	260 °/s
	6	±360°	360 °/s
Max. Payload	50 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	210.0 N·m	28.0 kg·m^2
	5	210.0 N·m	28.0 kg·m^2
	6	130.0 N·m	11.0 kg·m^2
Repeatability	±0.07 mm		
Mass	555 kg		
Acoustic noise	< 70 dB (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 4100 mm away from JT1 center

The noise level depends on the conditions.

RS80N

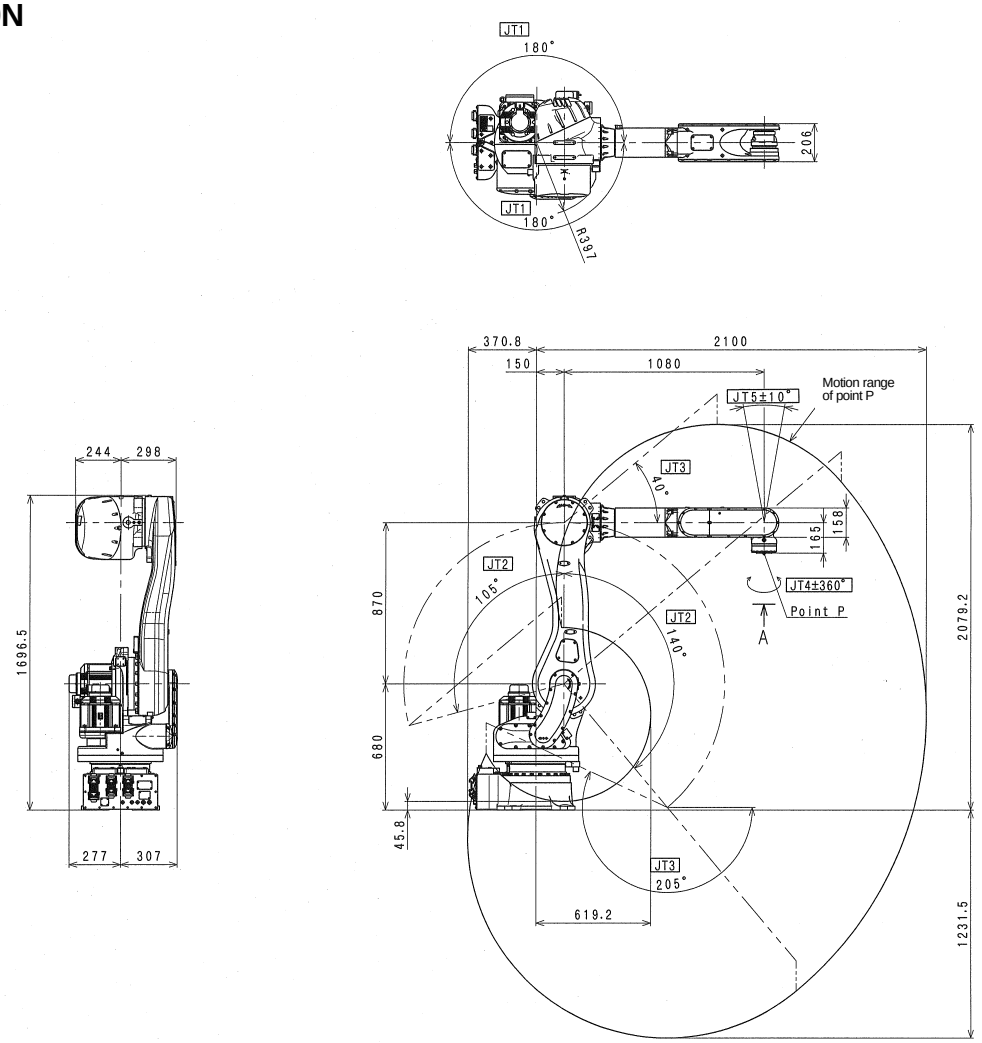


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	180 °/s
	2	+140° to -105°	180 °/s
	3	+135° to -155°	160 °/s
	4	±360°	185 °/s
	5	±145°	165 °/s
	6	±360°	280 °/s
Max. Payload	80 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	336.0 N·m	34.0 kg·m^2
	5	336.0 N·m	34.0 kg·m^2
	6	194.0 N·m	13.7 kg·m^2
Repeatability	±0.07 mm		
Mass	555 kg		
Acoustic noise	< 70 dB (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 4100 mm away from JT1 center

The noise level depends on the conditions.

RD80N



Type	Articulated Robot		
Degree of Freedom	5		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	180 °/s
	2	+140° to -105°	180 °/s
	3	+40° to -205°	175 °/s
	4	±360°	360 °/s
	5	±10° **	-
	**±10° from vertical downward direction		
Max. Payload	80 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	-	13.7 kg·m^2
Repeatability	±0.07 mm		
Mass	540 kg		
Acoustic noise	< 70 dB (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 4100 mm away from JT1 center

The noise level depends on the conditions.

4.0 ROBOT TRANSPORTATION METHOD

4.1 USING WIRE SLING (WITHOUT BASE PLATE)

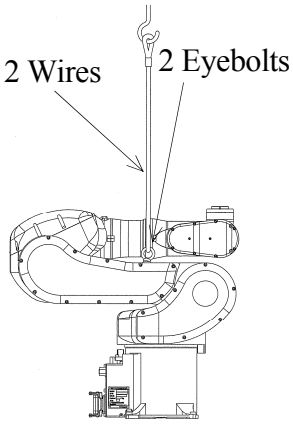
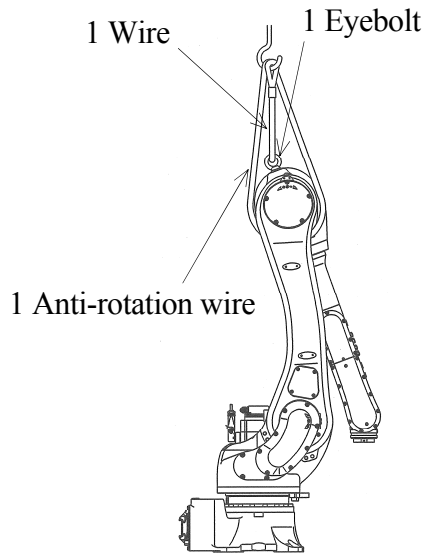
As shown in the figure below, hoist up the robot by fastening the wire slings to eyebolt attached to robot arm. (Use the same method for hoisting up the robot with pedestal.)

⚠ WARNING

Add anti-rotation wire without fail when hoisting up robot. (Except RS05N, RS05L, RA05L and RC05L.) If the robot rotates, eyebolt may come loose and the robot may fall.

⚠ CAUTION

When hoisting up the robot, be careful as robot may lean forward/backward depending on robot posture and installation condition of the options. If the robot is hoisted up in an inclined posture, it may swing, damage or the wire may interfere with the harness, piping etc., or it may damage due to interfering with surrounding objects. Remove the eyebolt attached to the arm once the transportation of robot is complete.

Model		RS05N, RS05L, RA05L, RC05L	RS06L RS10N RA06L RA10N	RS10L RS20N RA10L RA20N	RS30N RS50N RS80N RD80N	RS15X
Hoisted up posture						
Hoisted up posture	JT1	0°	0°	0°	0°	0°
	JT2	-80°	0°	-3°	0°	1°
	JT3	-170°	-163°	-163°	-155° (-55°)	-155°
	JT4	0°	0°	0°	0°	0°
	JT5	90°	-17°	-20°	-25° (0°)	-114°
	JT6	0°	0°	0°	0°	0°
Eyebolt for arm		M8×2	M16×1	M16×1	M24×1	M24×1

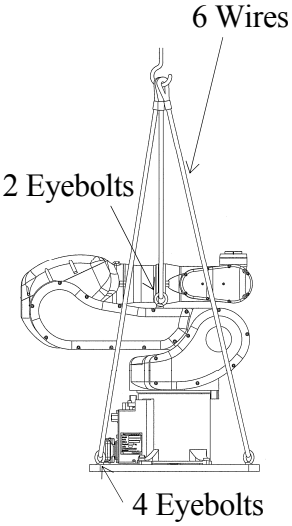
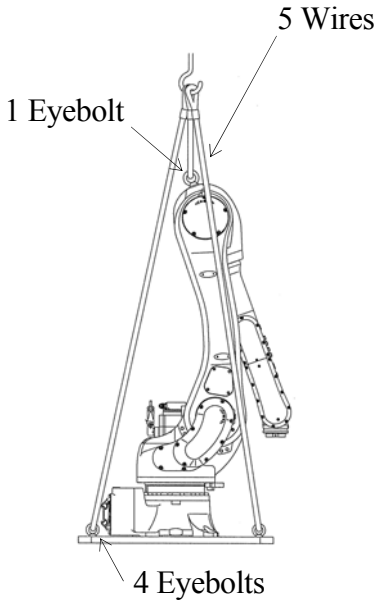
( ): RD80N

4.2 USING WIRE SLING (WITH BASE PLATE)

According to the figure below, hoist up the robot by fastening four wire slings to four eyebolts on the base plate. In addition, fasten wire slings to the eyebolt on the arm to prevent the robot from accidentally falling. (Use the same method for hoisting up the robot with pedestal.)

⚠ CAUTION

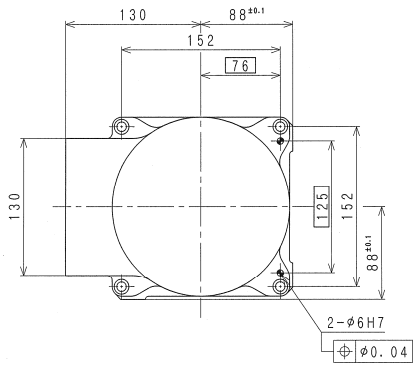
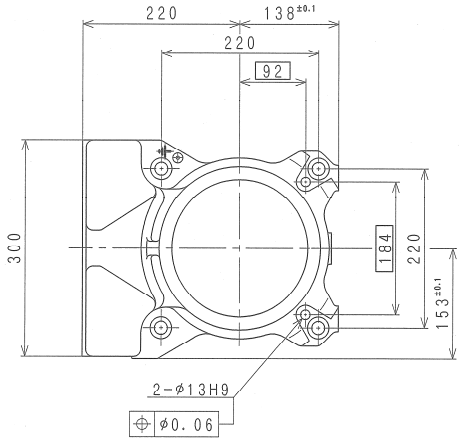
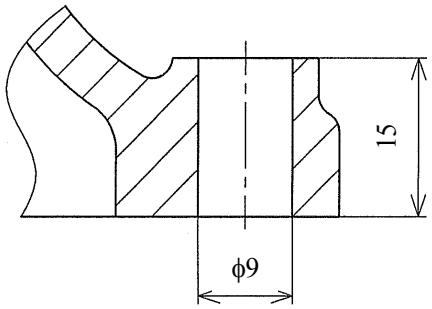
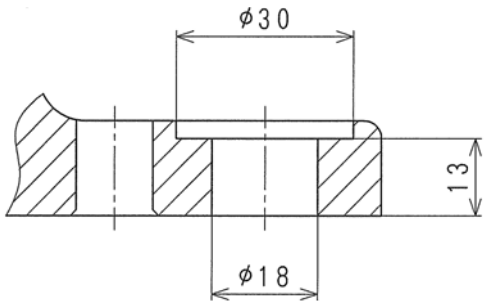
When hoisting up the robot, be careful as robot may lean forward/backward depending on robot posture and installation condition of the options. If the robot is hoisted up in an inclined posture, it may swing, damage or the wire may interfere with the harness, piping etc., or it may damage due to interfering with surrounding objects. Protect the robot with wear plates, etc. if wires interfere with a part of the robot. Remove the eyebolt attached to the arm.

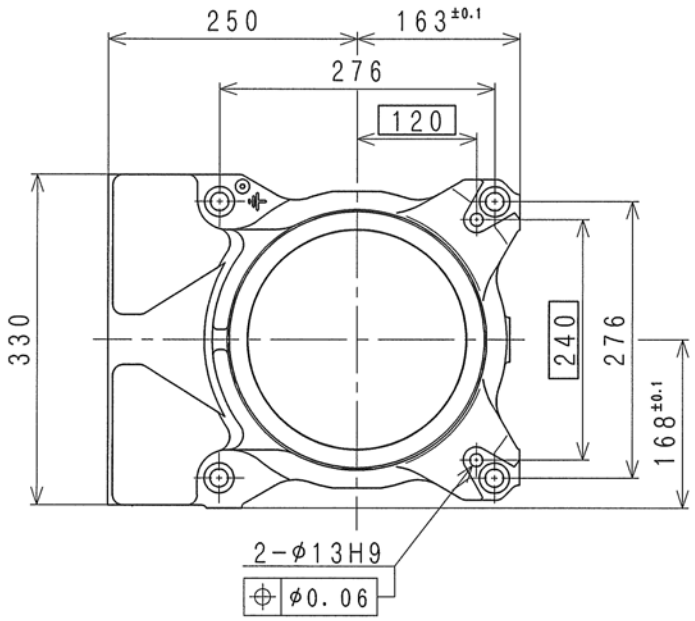
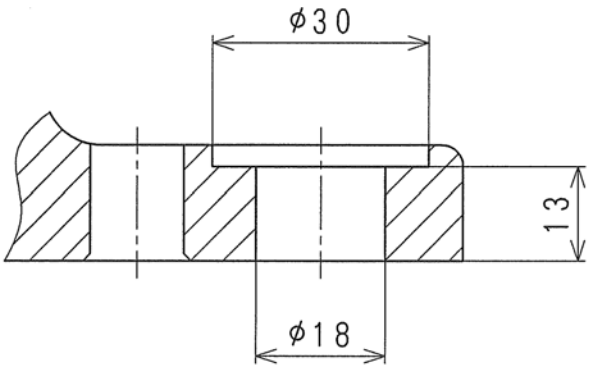
Model		RS05N, RS05L, RA05L, RC05L	RS06L RS10N RA06L RA10N	RS10L RS20N RA10L RA20N	RS30N RS50N RS80N RD80N	RS15X
Hoisted up posture						
Hoisted up posture	JT1	0°	0°	0°	0°	0°
	JT2	-80°	0°	-3°	0°	1°
	JT3	-170°	-163°	-163°	-155°(-55°)	-155°
	JT4	0°	0°	0°	0°	0°
	JT5	90°	-17°	-20°	-25° (0°)	-114°
	JT6	0°	0°	0°	0°	0°
Eyebolts for arm		M8×2	M16×1	M16×1	M24×1	M24×1

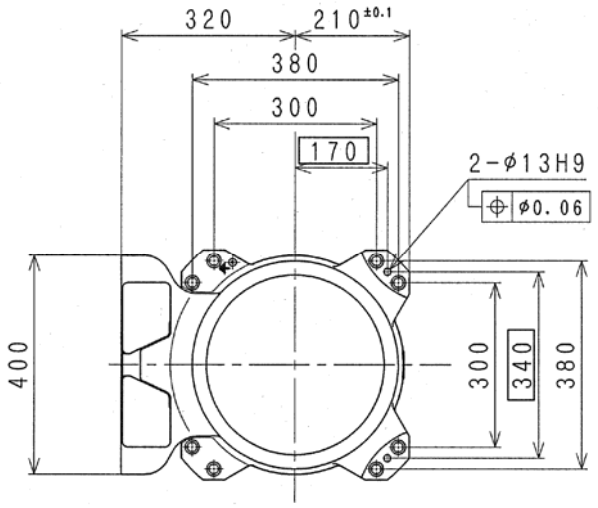
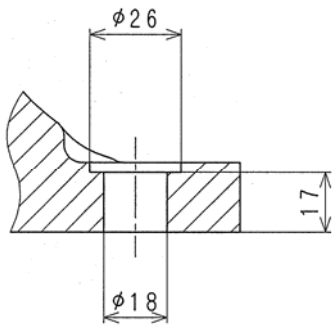
( ): RD80N

5.0 INSTALLATION DIMENSIONS OF BASE SECTION

When installing a robot, fix the base section with high tension bolts through the bolt holes.

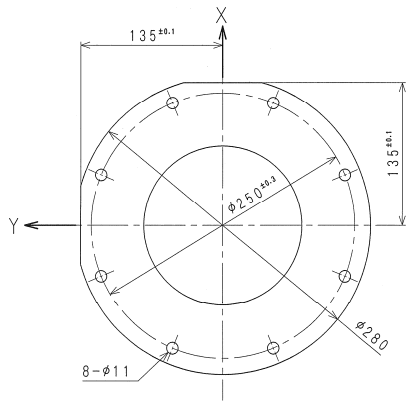
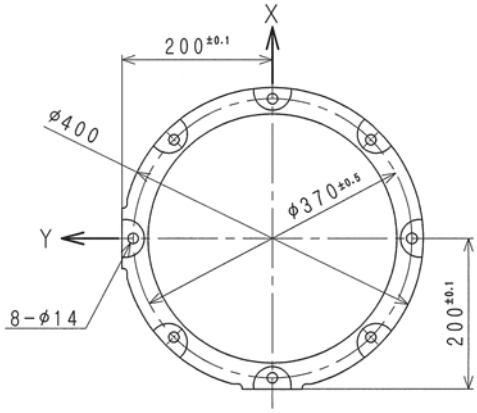
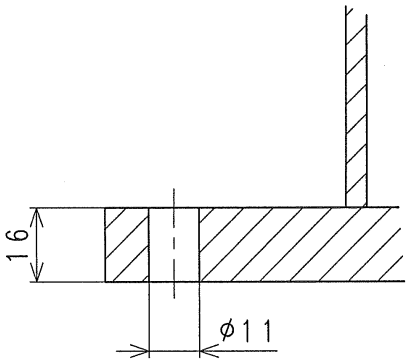
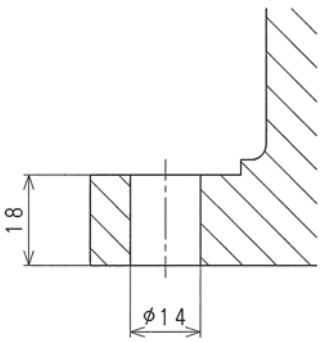
Model	RS05N, RS05L, RA05L, RC05L	RS06L, RS10N, RA06L, RA10N
Dimensions for installation		
Cross-section of installation section		
Bolt hole	4-ϕ9	4-ϕ18
High tension bolt	4-M8 Material: SCM435 Strength class: 10.9 min.	4-M16 Material: SCM435 Strength class: 10.9 min.
Tightening torque	29.4 N·m	235 N·m
Levelness	Within ±5°	Within ±5°

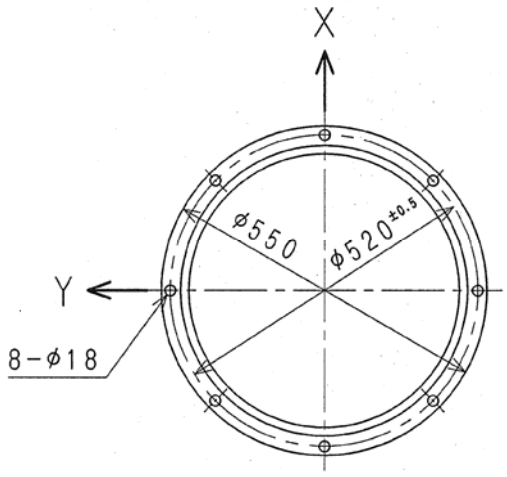
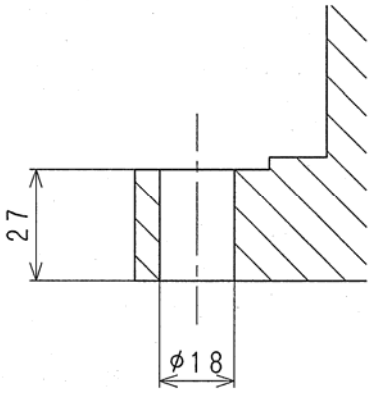
Model	RS10L, RS20N, RA10L, RA20N
Dimensions for installation	
Cross-section of installation section	
Bolt hole	4-ϕ18
High tension bolt	4-M16 Material: SCM435 Strength class: 10.9 min.
Tightening torque	235 N·m
Levelness	Within ±5°

Model	RS15X, RS30N, RS50N, RS80N, RD80N
Dimensions for installation	
Cross-section of installation section	
Bolt hole	8-ϕ18
High tension bolt	8-M16 Material: SCM435 Strength class: 10.9 min.
Tightening torque	235 N·m
Levelness	Within ±5°

6.0 DIMENSIONS OF ROBOT PEDESTAL

When installing a robot on the pedestal, fix the pedestal with high tension bolts through the bolt holes.

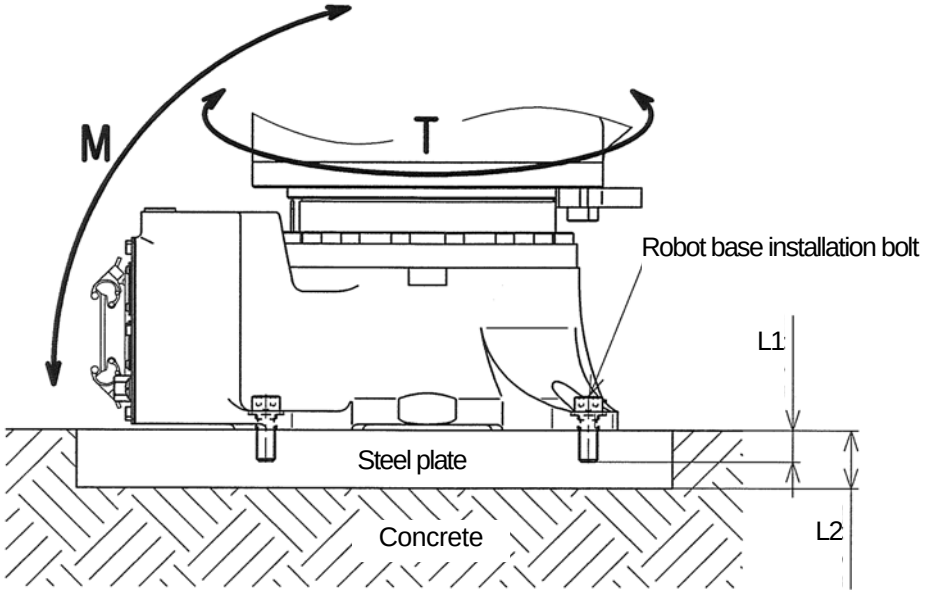
Model	RS05N, RS05L, RA05L, RC05L	RS06L, RS10N, RS10L, RS20N, RA06L, RA10N, RA10L, RA20N
Dimensions for installation		
Cross-section of installation section		
Bolt hole	8-ϕ11	8-ϕ14
High tension bolt	8-M10 Material: SCM435 Strength class: 10.9 min	8-M12 Material: SCM435 Strength class: 10.9 min
Tightening torque	56.8 N·m	98 N·m
Levelness	Within ±5°	Within ±5°

Model	RS15X, RS30N, RS50N, RS80N, RD80N
Dimensions for installation	
Cross-section of installation section	
Bolt hole	8-ϕ18
High tension bolt	8-M16 Material: SCM435 Strength class: 10.9 min
Tightening torque	235 N·m
Levelness	Within ±5°

7.0 INSTALLATION METHOD

7.1 WHEN INSTALLING THE ROBOT DIRECTLY ON THE FLOOR

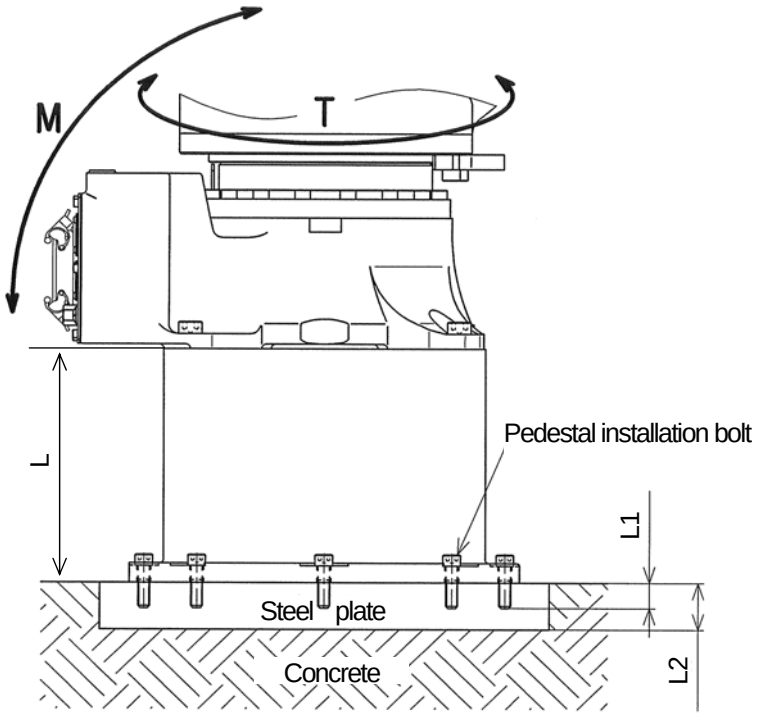
In this case, bury steel plate of L2 thickness (See the table below.) in the concrete floor as shown in the figure below or fix it with anchors. Fix the steel plate firmly enough to endure the reaction forces produced by the robot.



Model	RS05N, RS05L, RA05L, RC05L	RS06L, RS10N, RA06L, RA10N	RS10L, RS20N, RA10L, RA20N	RS15X, RS30N, RS50N, RS80N, RD80N
M (Inversion moment)	1127 N·m	3223 N·m	6300 N·m	15937 N·m
T (Rotating torque)	849 N·m	2168 N·m	5614 N·m	12101 N·m
Robot base installation bolt	4-M8	4-M16	4-M16	8-M16
Tightening torque	29.4 N·m	235 N·m	235 N·m	235 N·m
L1	Min. 12 mm	Min. 25 mm	Min. 25 mm	Min. 25 mm
L2	Min. 14 mm	Min. 28 mm	Min. 28 mm	Min. 28 mm

7.2 WHEN INSTALLING THE ROBOT PEDESTAL ON THE FLOOR

In this case, the installation procedures are practically the same as the procedure shown in the section 7.1.

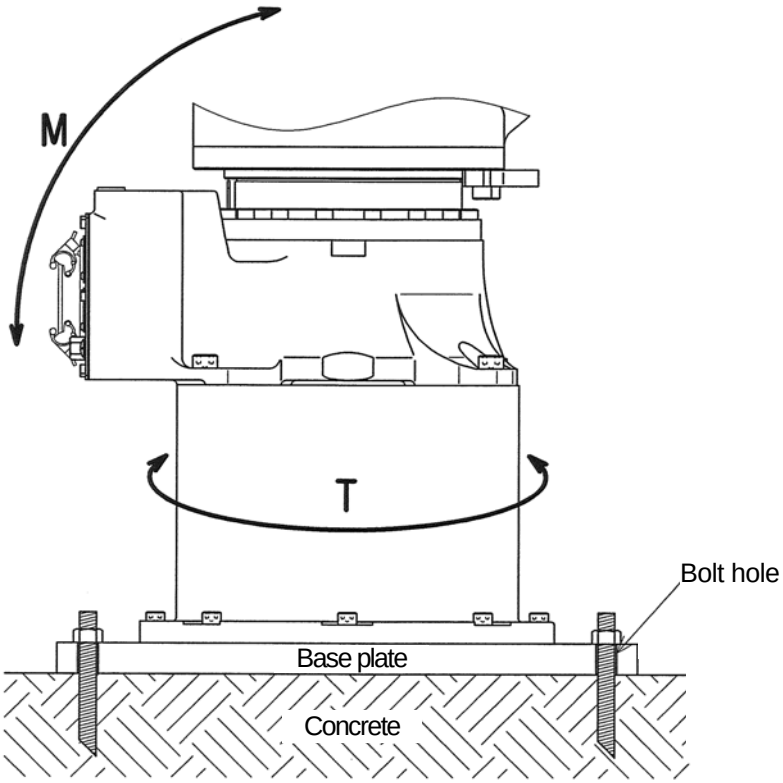


Model	RS05N, RS05L, RA05L, RC05L	RS06L, RS10N, RA06L, RA10N	RS10L, RS20N, RA10L, RA20N	RS15X, RS30N, RS50N, RS80N, RD80N
M (Inversion moment)	1127 N·m	3223 N·m	6300 N·m	15937 N·m
T (Rotating torque)	849 N·m	2168 N·m	5614 N·m	12101 N·m
Pedestal mass	24 kg (L=600)	60 kg (L=600)	70 kg (L=600)	100 kg (L=600)
	17 kg (L=300)	35 kg (L=300)	45 kg (L=300)	65 kg (L=300)
Pedestal installation bolt	8-M10	8-M12	8-M12	8-M16
Tightening torque	56.8 N·m	98 N·m	98 N·m	235 N·m
L	600 (60360-0082*)	600 (60360-1164*)	600 (60360-1166*)	600 (60360-1178*)
	300 (60360-0203*)	300 (60360-1165*)	300 (60360-1167*)	300 (60360-1179*)
L1	Min. 15 mm	Min. 18 mm	Min. 18 mm	Min. 25 mm
L2	Min. 17 mm	Min. 20 mm	Min. 20 mm	Min. 28 mm

NOTE* ( ) indicates the part number of pedestal.

7.3 WHEN INSTALLING THE ROBOT BASE PLATE ON THE FLOOR

In this case, install the base plate on concrete floor or steel plate using bolt holes on the base plate.



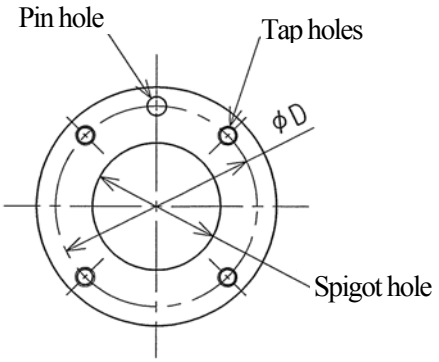
Model	RS05N, RS05L, RA05L, RC05L	RS06L, RS10N, RA06L, RA10N	RS10L, RS20N, RA10L, RA20N	RS15X, RS30N, RS50N, RS80N, RD80N
M (Inversion moment)	1127 N·m	3223 N·m	6300 N·m	15937 N·m
T (Rotating torque)	849 N·m	2168 N·m	5614 N·m	12101 N·m
Base plate mass	20 kg	110 kg	110 kg	110 kg
Base plate installation hole	4-ϕ14 (300 × 300)	4-ϕ20 (PCD800)	4-ϕ20 (PCD800)	4-ϕ26 (PCD800)
Base plate dimension (mm)	400 × 400 × 16	750 × 750 × 25	750 × 750 × 25	750 × 750 × 25

8.0 MOUNTING OF TOOLS

⚠ WARNING

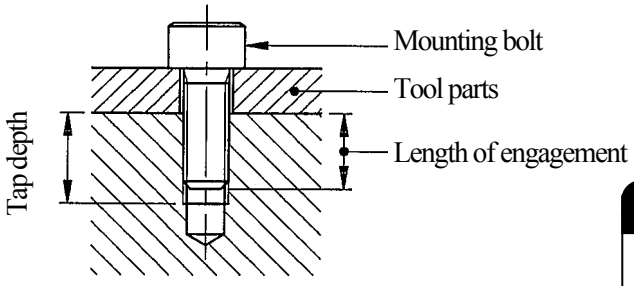
Prior to mounting tools on the robot, turn OFF the controller power switch and the external power switch. Display signs indicating clearly "Installation and connection in progress", and lockout/tagout the external power switch to prevent personnel from accidentally turning ON the power.

8.1 DIMENSIONS OF WRIST END



In the robot arm end section, a flange is provided on which hand, gun, or other tools are mounted. Screw the mounting bolts into the tap holes on the circumference of ϕD on the flange, referring to the figure on the left. Moreover, position the tool by utilizing the pin hole and the spigot hole.

8.2 SPECIFICATION OF MOUNTING BOLT



Select mounting bolts with proper length to secure the specified engagement length. Use high tension mounting bolt and tighten them to the specified torque.

⚠ CAUTION

If the engagement length has exceeded the specified value, the mounting bolt might bottom out, and the tool will not be fixed securely.

Model	RS05N, RS05L, RA05L, RC05L	RS06L, RS10N, RA06L, RA10N	RS10L, RS15X, RS20N, RA10L, RA20N	RS30N, RS50N, RS80N, RD80N
Tap holes	4-M5	4-M6	4-M6	6-M8
ϕD	ϕ31.5	ϕ40	ϕ63	ϕ80
Pin hole	ϕ5H7 Depth 8	ϕ6H7 Depth 6	ϕ6H7 Depth 6	ϕ8H7 Depth 8
Spigot hole	ϕ20H7 Depth 3	ϕ25H7 Depth 6	ϕ40H7 Depth 6	ϕ50H7 Depth 6
Tap depth	8 mm	8 mm	9 mm	13 mm
Length of engagement	6 - 7 mm	6 - 7 mm	7 - 8 mm	8 - 12 mm
High tension bolt	SCM435, 10.9 min	SCM435, 10.9 min	SCM435, 10.9 min	SCM435, 10.9 min
Tightening torque	6.86 N·m	11.76 N·m	11.76 N·m	29.40 N·m

8.3 LOAD CAPACITY

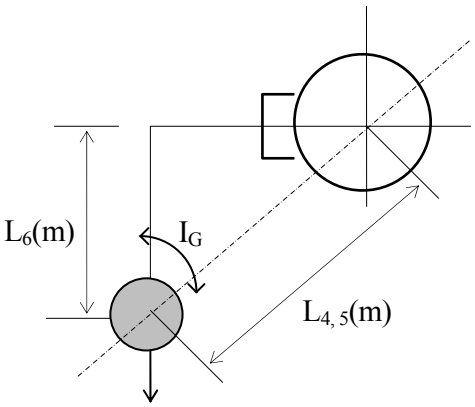
Load mass applicable to robot is specified for each model and includes the mass of tool, etc. Applicable load torque and moment of inertia around wrist axes (JT4, JT5, JT6) are also specified. Strictly observe the following restrictions on them.

⚠ CAUTION

Using the robot beyond its specified load may result in degradation of movement performance and shortening of machine service life. The load mass includes the tool mass such as hand, tool changer, shock absorber, etc. If using the robot in excess of its load capacity, first contact Kawasaki without fail.

The load torque and the moment of inertia can be calculated by the expression below:

Calculation Expression



Load mass : M≦Mmax. (kg)
(including tool)
Load torque : $T=9.8 \cdot M \cdot L$ (N·m)
Load moment of inertia: $I=M \cdot L^2+I_G$ (kg·m^2)

Mmax: Maximum load mass: See 3.2.

L: Length from axis rotation center to load center of gravity. (Unit: m)

L_6: Length from JT6 axis rotation center to load center of gravity.

$L_{4,5}$: Length from JT4(5) axis rotation center to load center of gravity.

I_G: Moment of inertia around center of gravity. (Unit: kg·m^2)

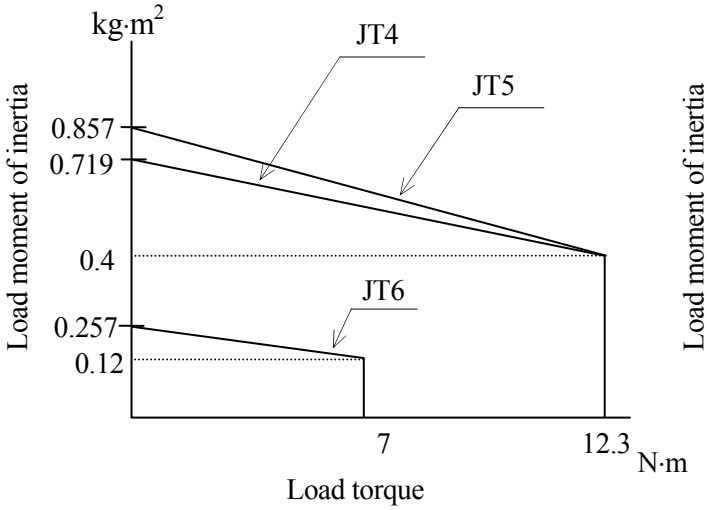
If calculation of load is made by dividing the load into construction parts, such as tools and workpieces, use the total calculation values of each part as load torque and moment of inertia.

Regarding the load on the robot wrist section, meet the following restriction conditions:

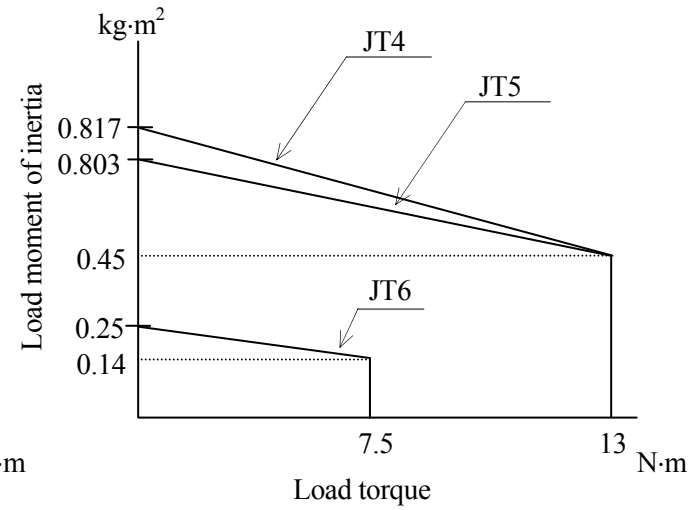
1. The load mass including tool mass should be less than the following value.
   RS05 = 5 kg, RS06 = 6 kg, RS10 = 10 kg, RS15 = 15 kg, RS20 = 20 kg, RS30 = 30 kg, RS50 = 50 kg, RS80 = 80 kg, RD80 = 80 kg
2. The load torque and the moment of inertia around each wrist axis (JT4, JT5, JT6) should be within the following restriction*:

NOTE* Load moment of inertia exceeding the restriction may be acceptable. In this case, ensure to specify the load. (However, the robot movement may become slow because of optimizing acceleration and deceleration.) See AS Language Reference Manual for setting the load. Operating the robot with wrong settings may result in degradation of movement performance and shortening of machine service life.

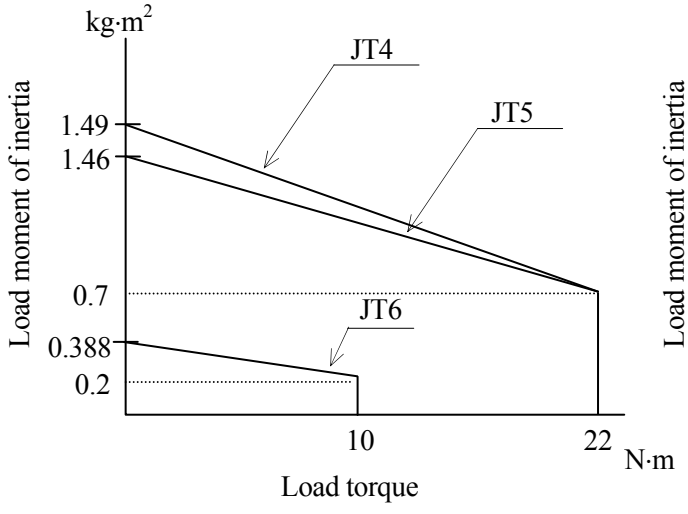
RS05N, RS05L, RA05L, RC05L



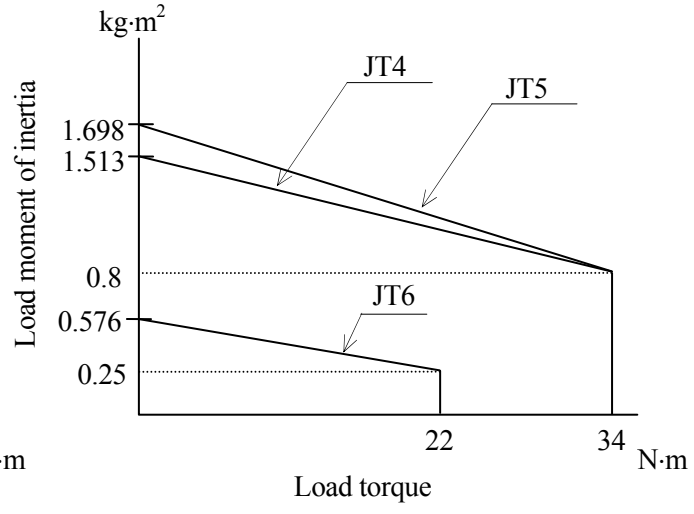
RS06L, RA06L



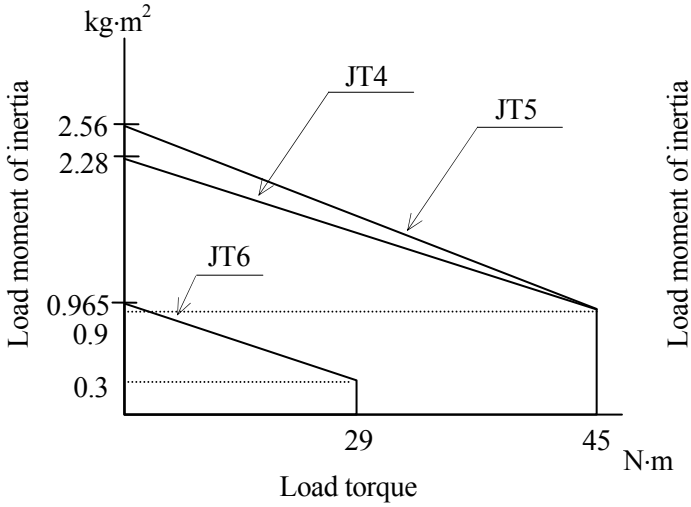
RS10N, RS10L, RA10N, RA10L



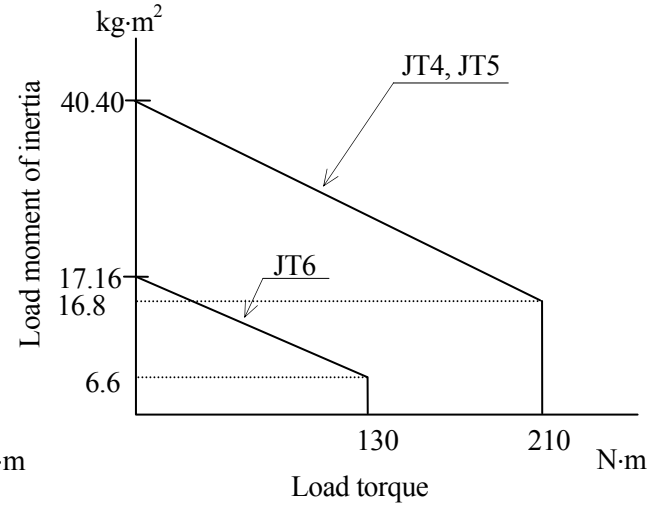
RS15X



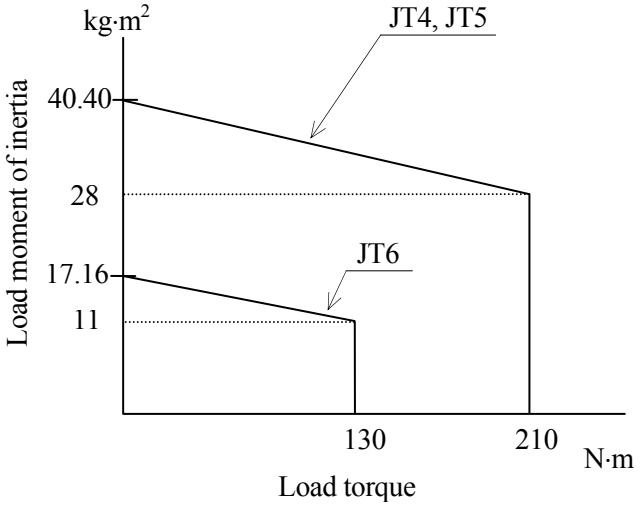
RS20N, RA20N



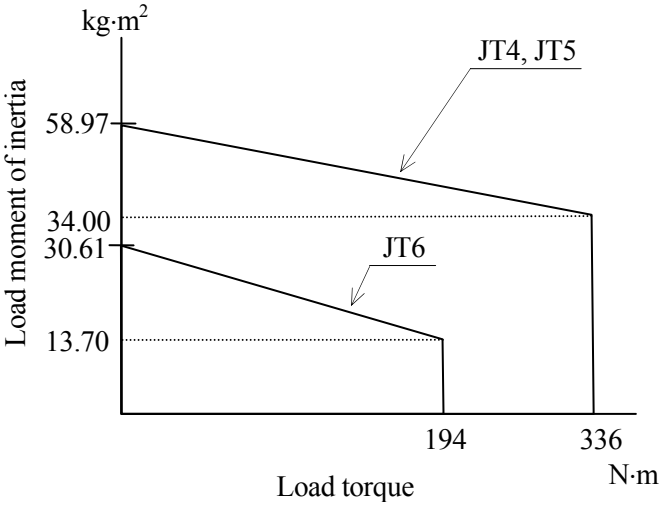
RS30N



RS50N



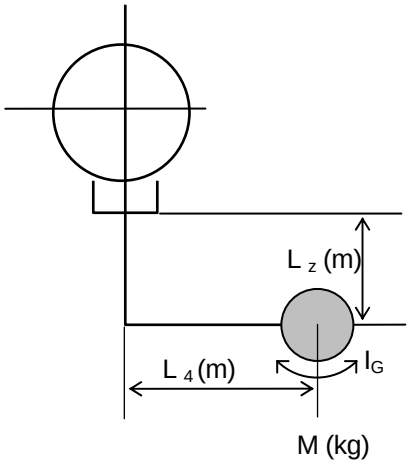
RS80N



For RD80N

The load torque and the moment of inertia in wrist section should be calculated by expressions below.

Calculation Expression



Load mass (including tool): M≤Mmax. (kg)
Load torque: not specified
Load moment of inertia: $I=M\cdot L^2+I_G$ (kg·m^2) ≤Imax (kg·m^2)
Center position of load mass (L_4, L_z): See diagrams below.
Mmax.: Maximum load mass 80 (kg)
Imax.: Maximum load moment of inertia 13.7 (kg·m^2)
I_G: Moment of inertia around center of gravity (kg·m^2)
L_z: Length from flange to load center of load mass (m)
L_4: Length from JT4 axis rotating center to load center of load mass (m)

When calculating the load by dividing it into sections (for example, tool section, workpiece section, etc.), evaluate the moment of inertia from the sum of all the sections.

Strictly observe the following restrictions applied to wrist sections.

1. The allowable load mass including tools should be less than the Mmax. above.
2. Restrictions are applied to the load moment of inertia in wrist section (JT4). The load moment of inertia should be below 13.7 kg·m^2.
3. Restrictions are applied to the center of load mass. The center should be positioned within the allowable range. There are two diagrams for the cases; when moving with JT5 faced vertically down (0°) and when moving with JT5 tilted (within +/- 10° of vertical down). In both cases, keep the center of gravity within the allowable range for load of 10 kg even when the load mass is below 10 kg. See below.

Diagram of load on wrist section (JT5:0°)

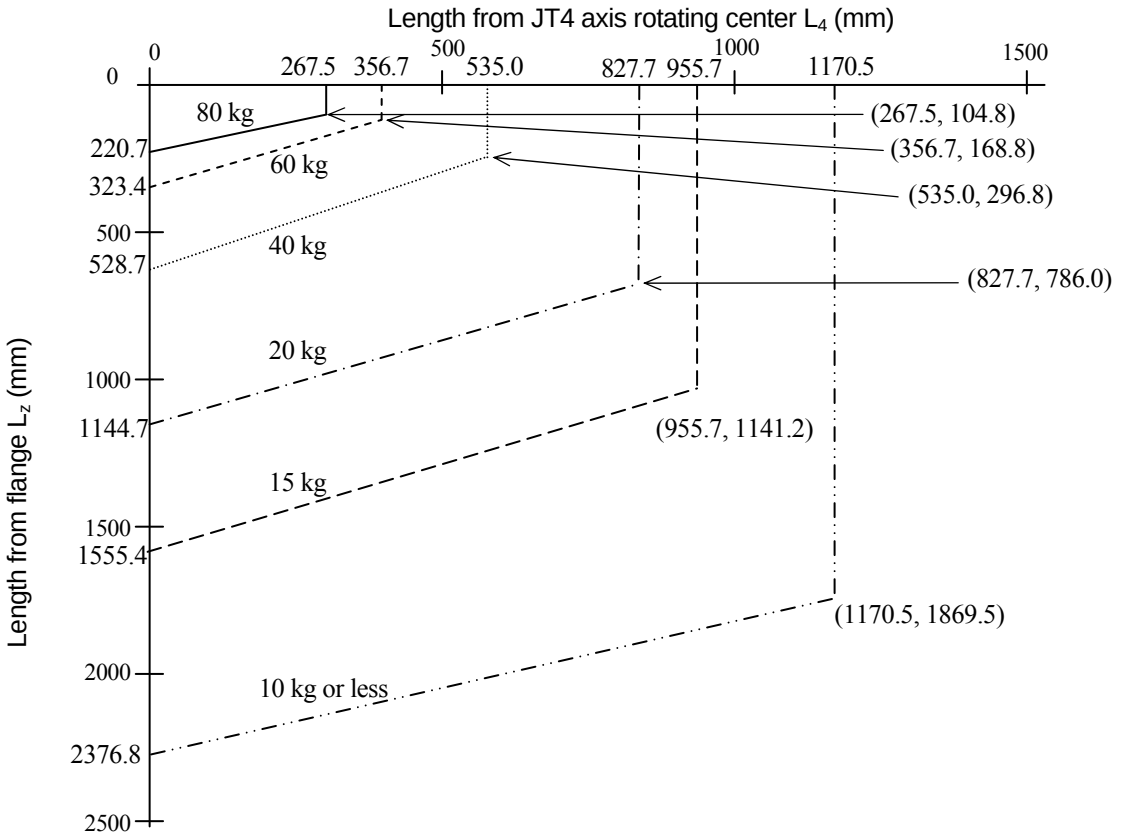
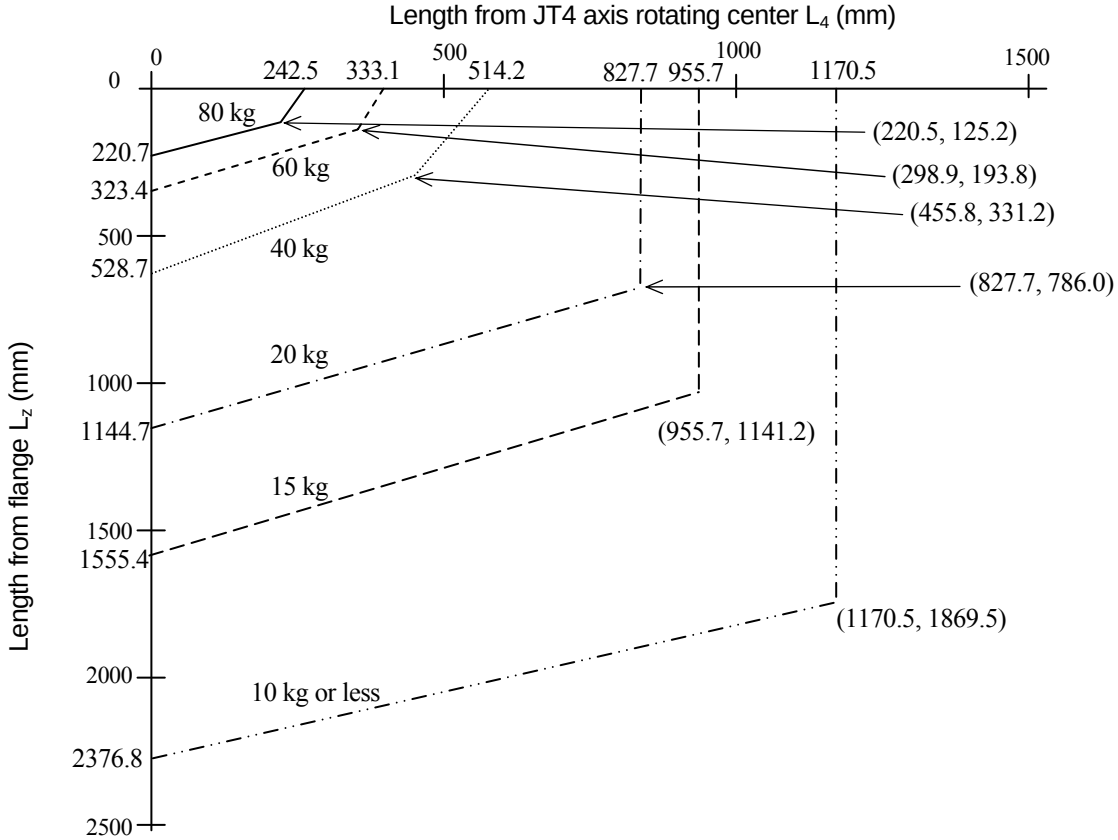


Diagram of load on wrist section (JT5: within +/-10°)



9.0 MOUNTING EXTERNAL EQUIPMENT

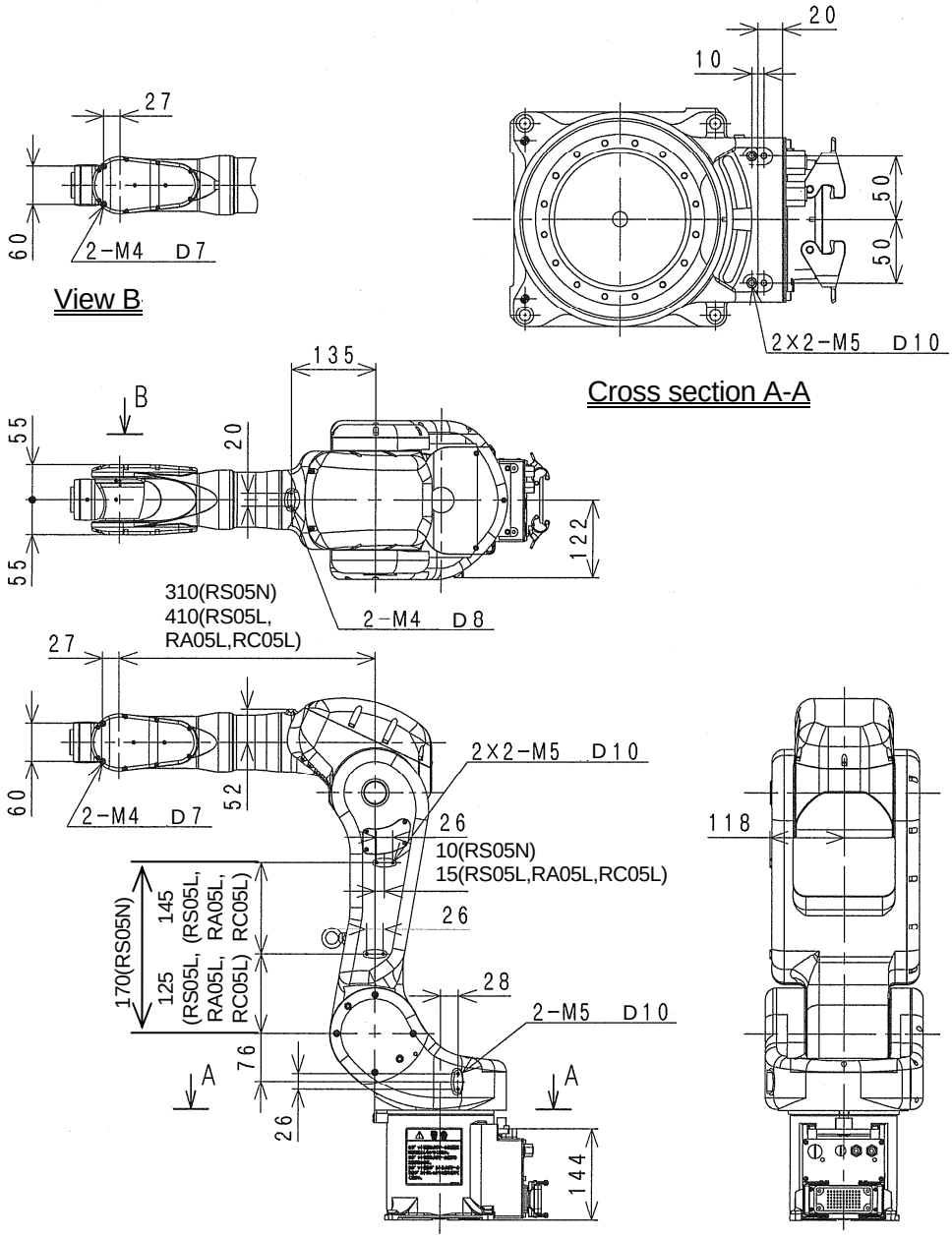
9.1 SERVICE TAPPED HOLE POSITIONS

Service tapped holes shown in the figure below are available to mount wiring brackets and external equipment on each part of robot arm.

⚠ CAUTION

Check the robot movement very carefully and confirm that mounted brackets and external equipment do not interfere with peripheral equipment and robot arm itself.

RS05N, RS05L, RA05L, RC05L

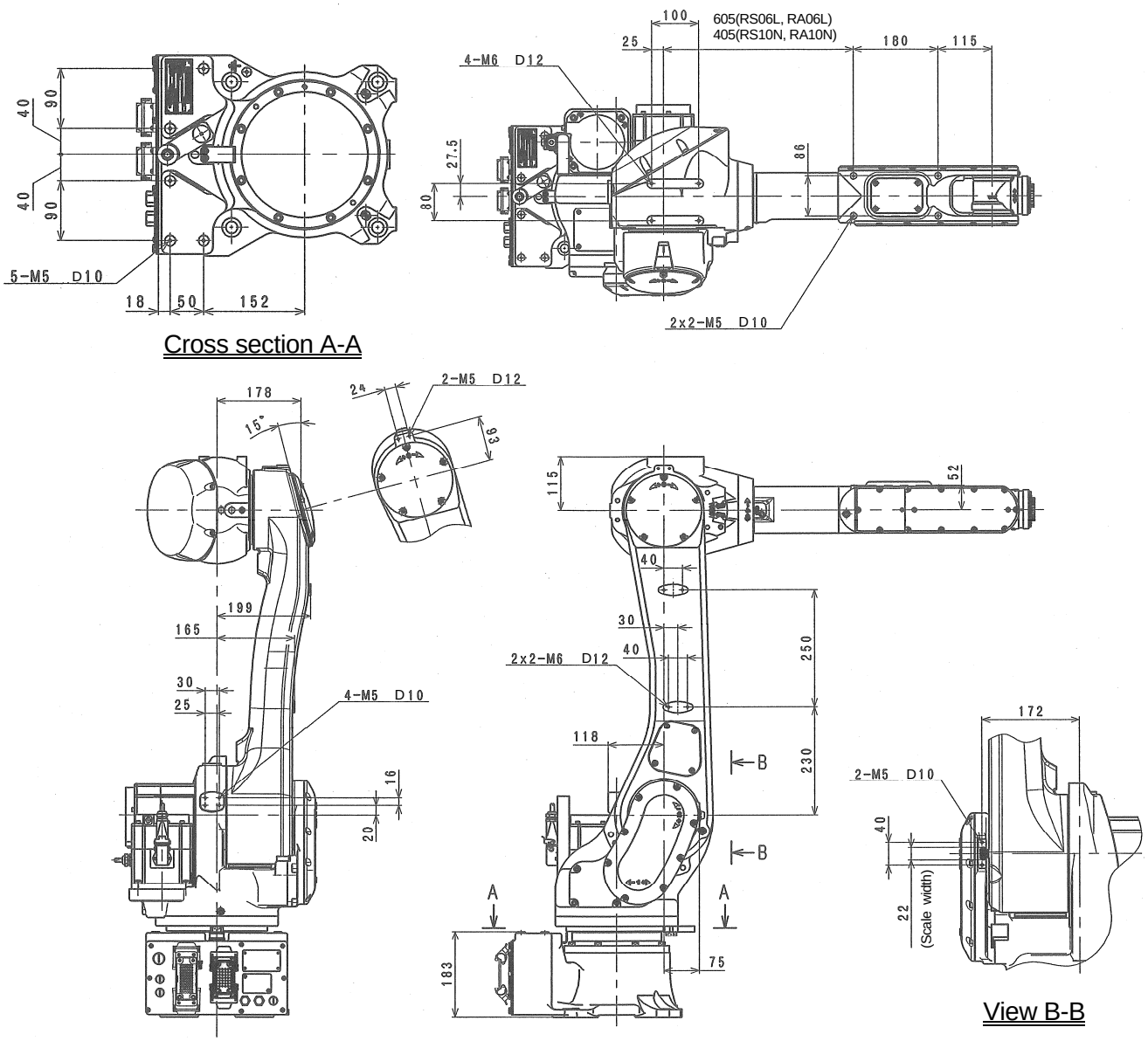


Service tapped holes shown in the figure below are available to mount wiring brackets and external equipment on each part of robot arm.

⚠ CAUTION

Check the robot movement very carefully and confirm that mounted brackets and external equipment do not interfere with peripheral equipment and robot arm itself.

RS06L, RS10N, RA06L, RA10N

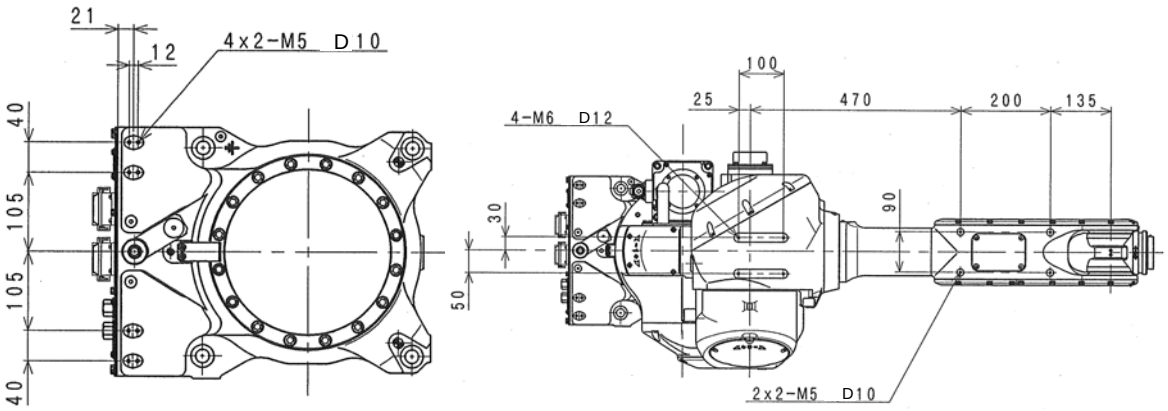


Service tapped holes shown in the figure below are available to mount wiring brackets and external equipment on each part of robot arm.

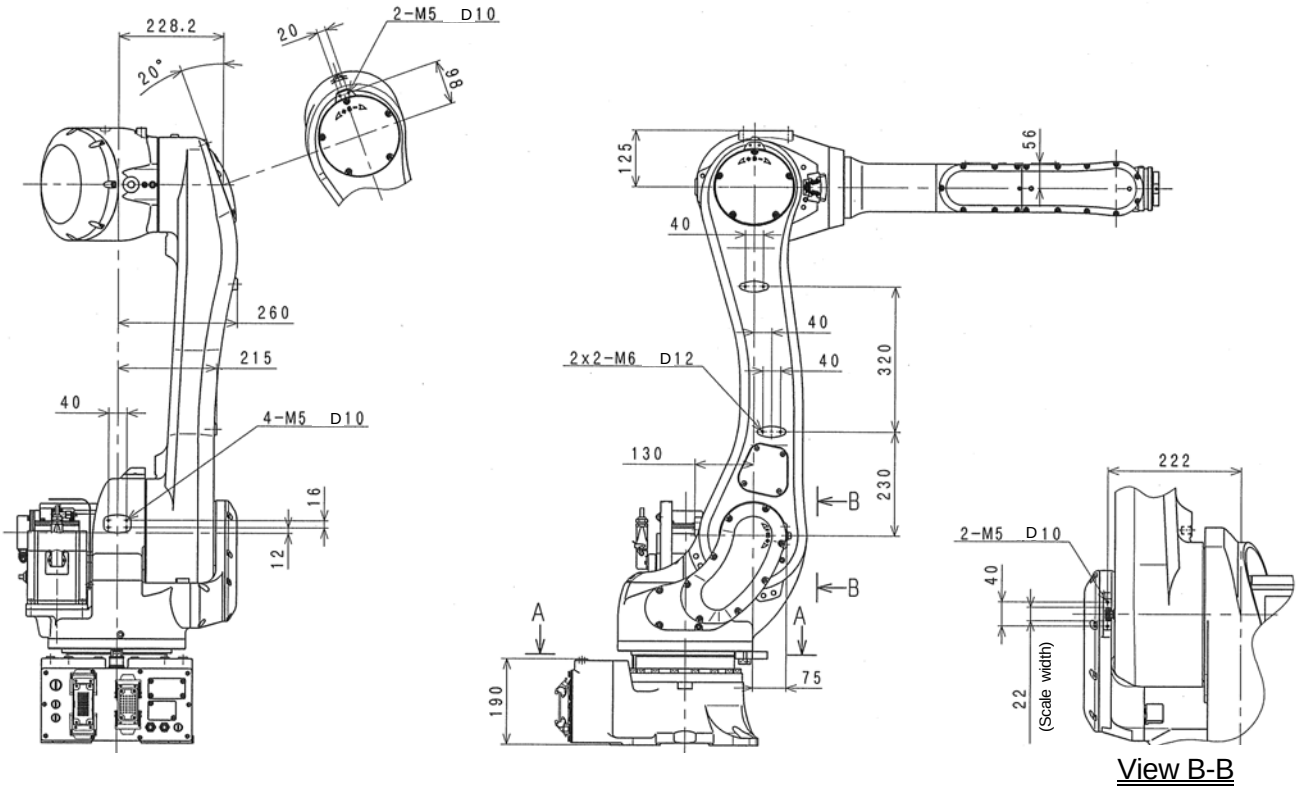
CAUTION

Check the robot movement very carefully and confirm that mounted brackets and external equipment do not interfere with peripheral equipment and robot arm itself.

RS10L, RS20N, RA10L, RA20N



Cross section A-A



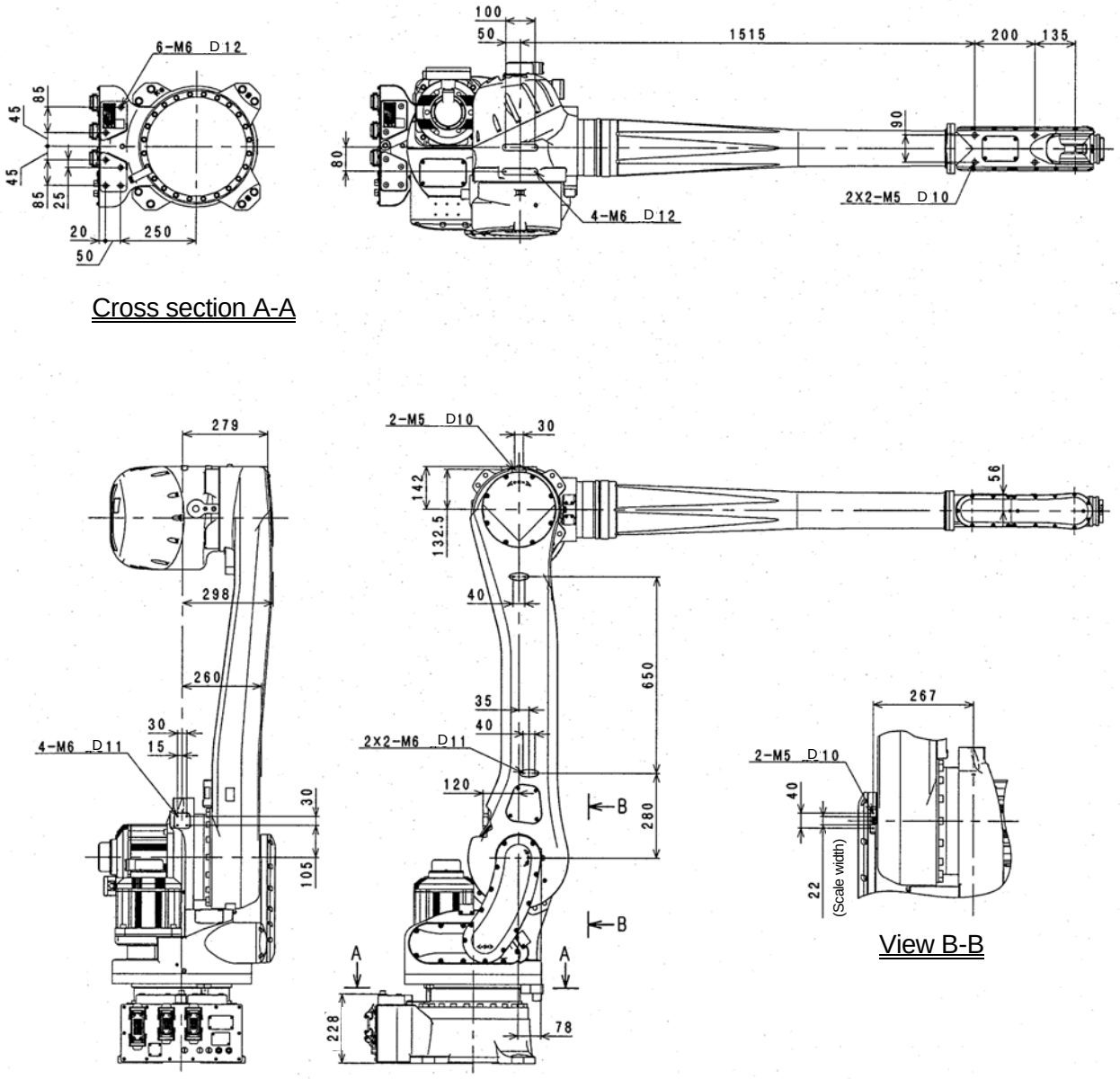
View B-B

Service tapped holes shown in the figure below are available to mount wiring brackets and external equipment on each part of robot arm.

CAUTION

Check the robot movement very carefully and confirm that mounted brackets and external equipment do not interfere with peripheral equipment and robot arm itself.

RS15X

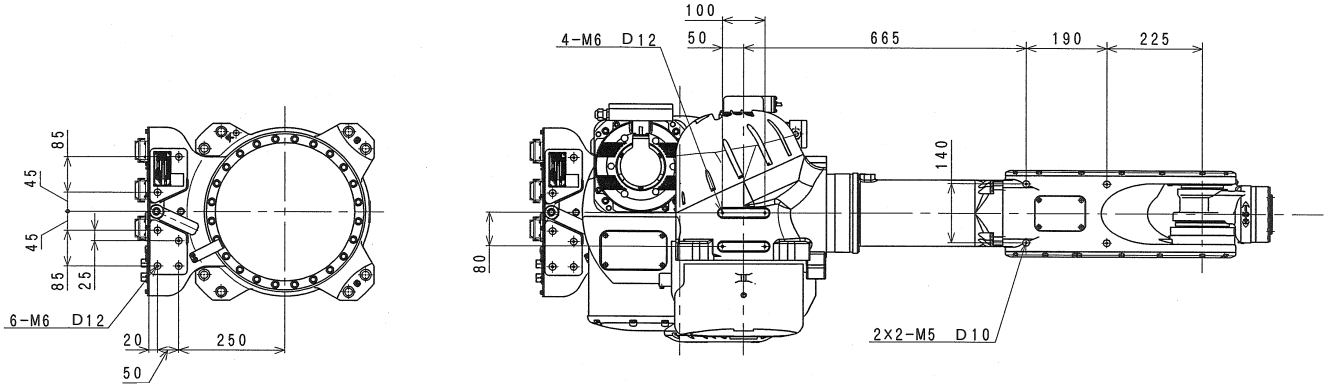


Service tapped holes shown in the figure below are available to mount wiring brackets and external equipment on each part of robot arm.

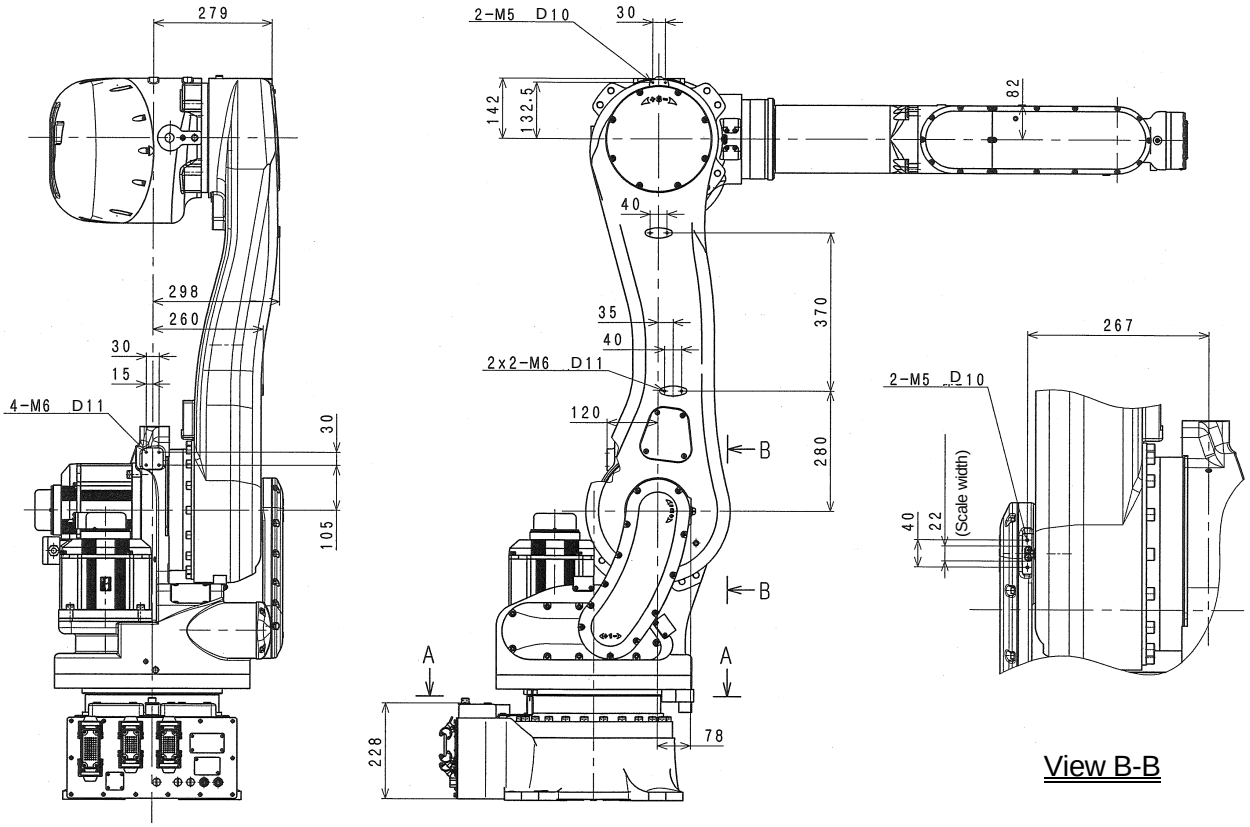
⚠ CAUTION

Check the robot movement very carefully and confirm that mounted brackets and external equipment do not interfere with peripheral equipment and robot arm itself.

RS30N, RS50N, RS80N, RD80L



Cross section A-A



View B-B

9.2 CALCULATION OF LOAD CAUSED BY EXTERNAL EQUIPMENT

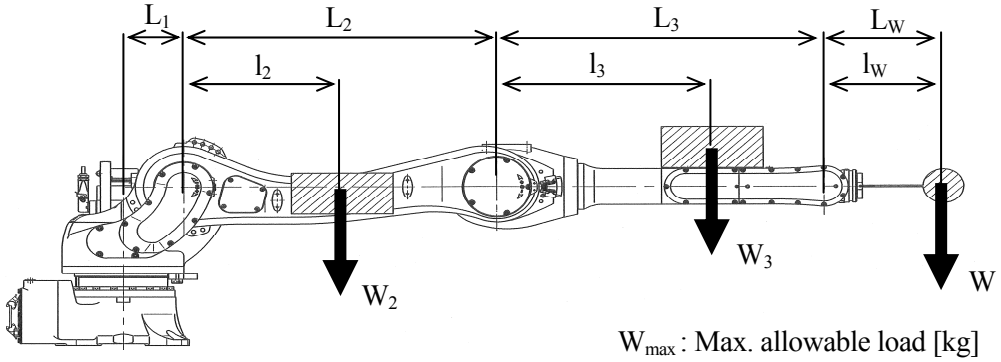
The load capacity is set for each arm model. Strictly observe the following restrictions of the load torque and load moment of inertia on arm.

⚠ CAUTION

Check the robot movement very carefully and confirm that mounted brackets and external equipment do not interfere with peripheral equipment and robot arm itself.

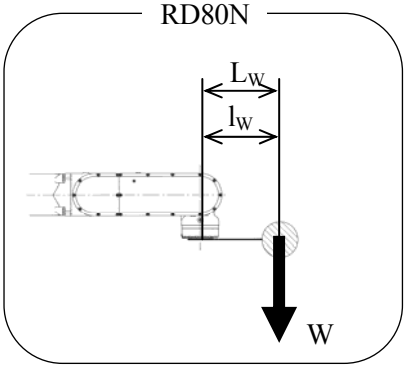
For JT2 and JT3, limit the total load torque on wrist end and arm not to exceed the maximum allowable load torque. The load torque and the moment of inertia can be calculated by the expression on next page.

Calculation Expression



W_{max} : Max. allowable load [kg]
W : Load on wrist end [kg]
W_2 : Total load on lower arm [kg]
W_3 : Total load on upper arm [kg]
l_w : Position of the center of the gravity for load on wrist section [mm]
l_2 : Position of the center of the gravity for total load on lower arm [mm]
l_3 : Position of the center of the gravity for total load on upper arm [mm]

RD80N



- JT3: $W(L_3+l_w)+W_3 \cdot l_3 \leqq W_{max}(L_3+L_W)$
- JT2: $W(L_2+L_3+l_w)+W_3(L_2+l_3)+W_2 \cdot l_2 \leqq W_{max}(L_2+L_3+L_W)$

Use data in the table below for calculation.

	L_1 [mm]	L_2 [mm]	L_3 [mm]	L_w [mm]	W_{max} [kg]
RS05N	105	280	310	251	5
RS05L, RA05L, RC05L	105	380	410	251	5
RS06L, RA06L	100	650	900	221	6
RS10N, RA10N	100	650	700	224	10
RS10L, RA10L	150	770	1005	224	10
RS15X	150	1150	1850	230	15
RS20N, RA20N	150	770	805	230	20
RS30N	150	870	1080	714	30
RS50N	150	870	1080	428	50
RS80N	150	870	1080	428	80
RD80N	150	870	1080	220	80

However, do not exceed values below for W_2 and W_3.

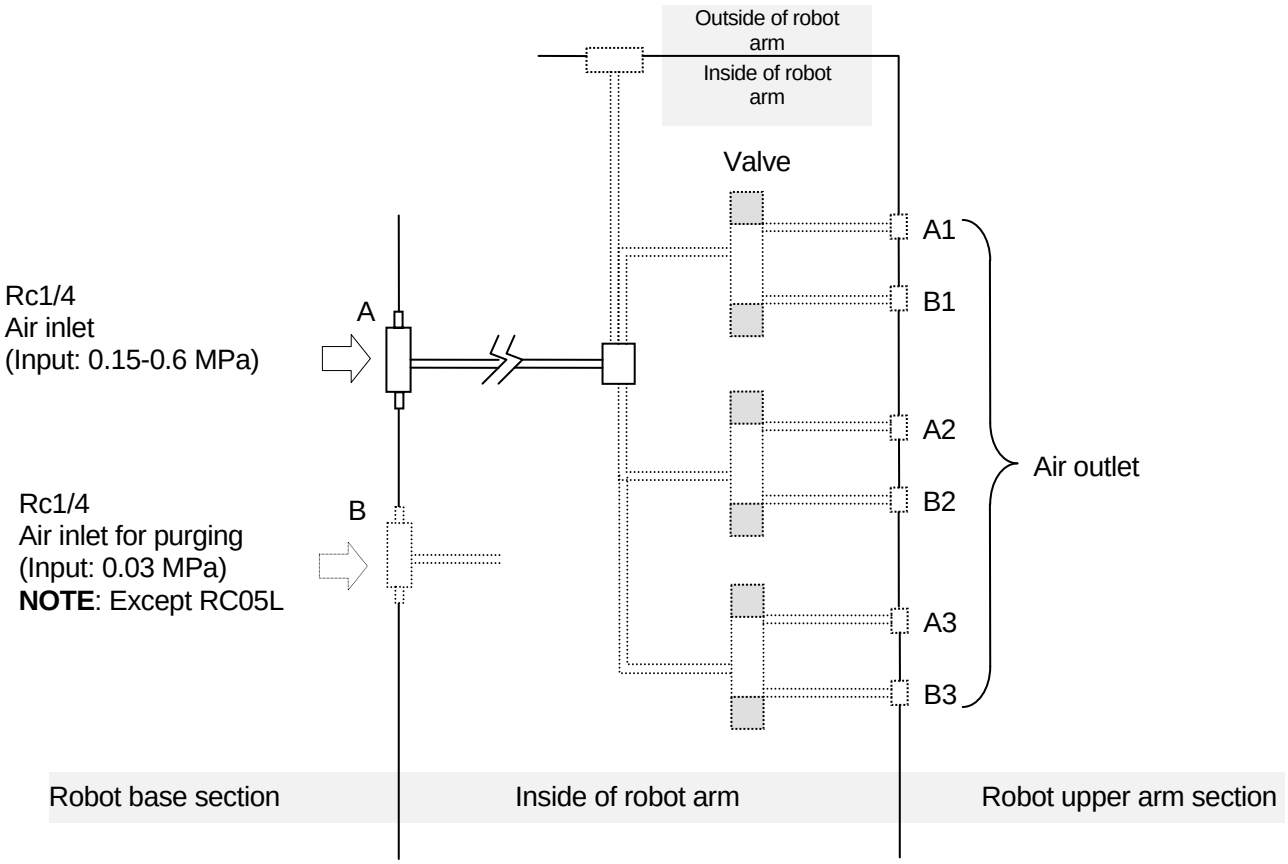
$$W_3 < \frac{W_{max}(L_1+L_2+L_3+L_W)}{L_1+L_2} \qquad W_2 < \frac{W_{max}(L_1+L_2+L_3+L_W)}{L_1}$$

10.0 CONNECTION OF AIR SYSTEM

10.1 AIR PIPING ARRANGEMENT

R series robot houses air piping and valves for driving the tool on the robot arm. The valves can be turned ON/OFF by the Teach Pendant without using an interlock panel.

RS05N, RS05L, RA05L, RC05L



Optional equipment is shown by the dotted line (.....).

The built-in valves are specified as follows:

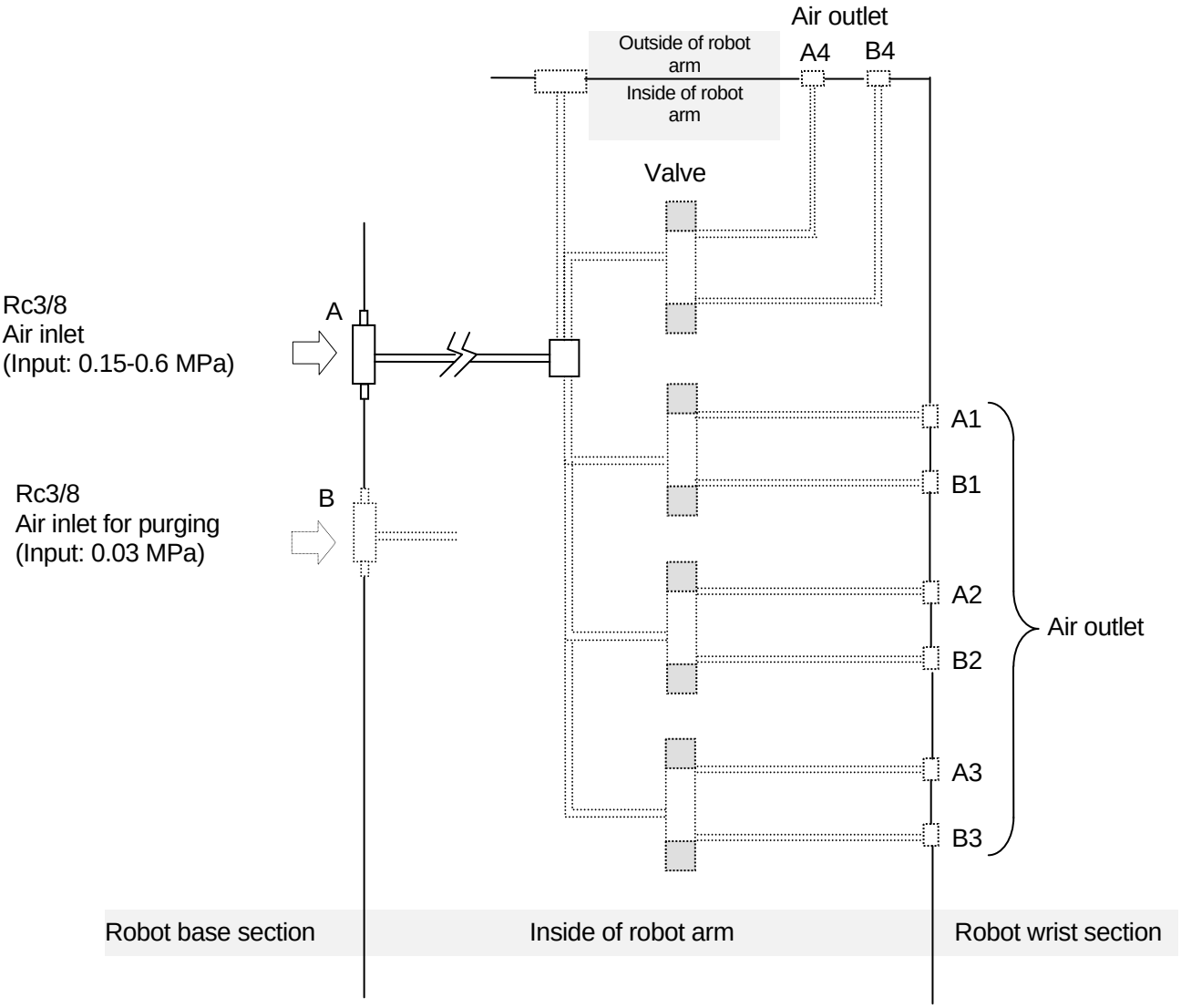
Standard	No built-in valves	
Option	Double solenoid/Single solenoid valves	3 units max.

Valve specification: CV value is 0.2 and the number of switching positions is 2.

[NOTE]

Valves that do not meet the above specifications cannot be mounted in the arm. Please contact KHI for information on air system specifications if such valves are used.

RS06L, RS10N



Optional equipment is shown by the dotted line (.....).

The built-in valves are specified as follows:

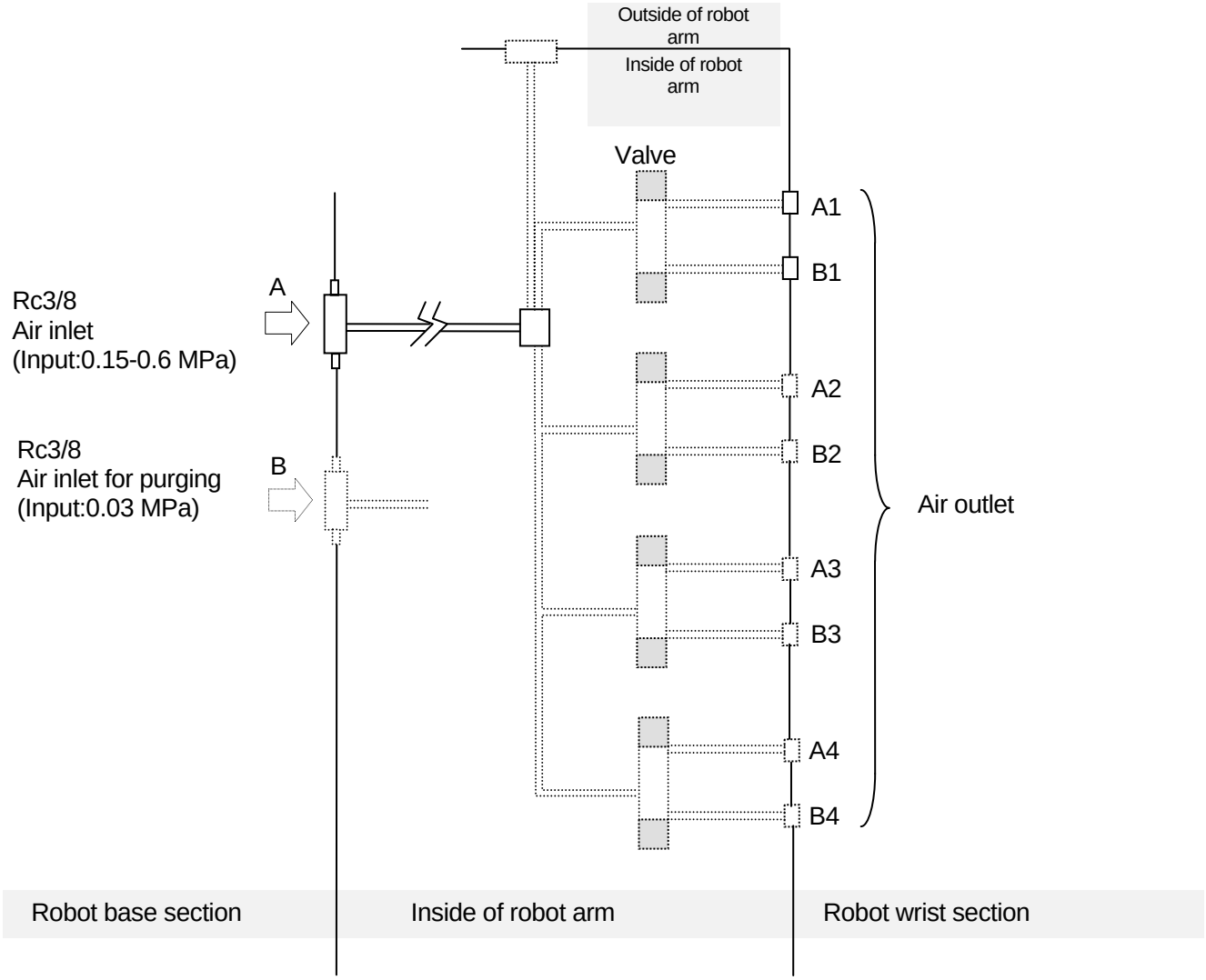
Standard	No built-in valves	
Option	Double solenoid/Single solenoid valves	4 units max.

Valve specification: CV value is 0.2 and the number of switching positions is 2.

[NOTE]

Valves that do not meet the above specifications cannot be mounted in the arm. Please contact KHI for information on air system specifications if such valves are used.

RS10L, RS15X, RS20N, RS30N, RS50N, RS80N, RD80N



Optional equipment is shown by the dotted line (.....).

The built-in valves are specified as follows:

Standard	No built-in valves	
Option	Double solenoid/Single solenoid valves	4 units max.

Valve specification

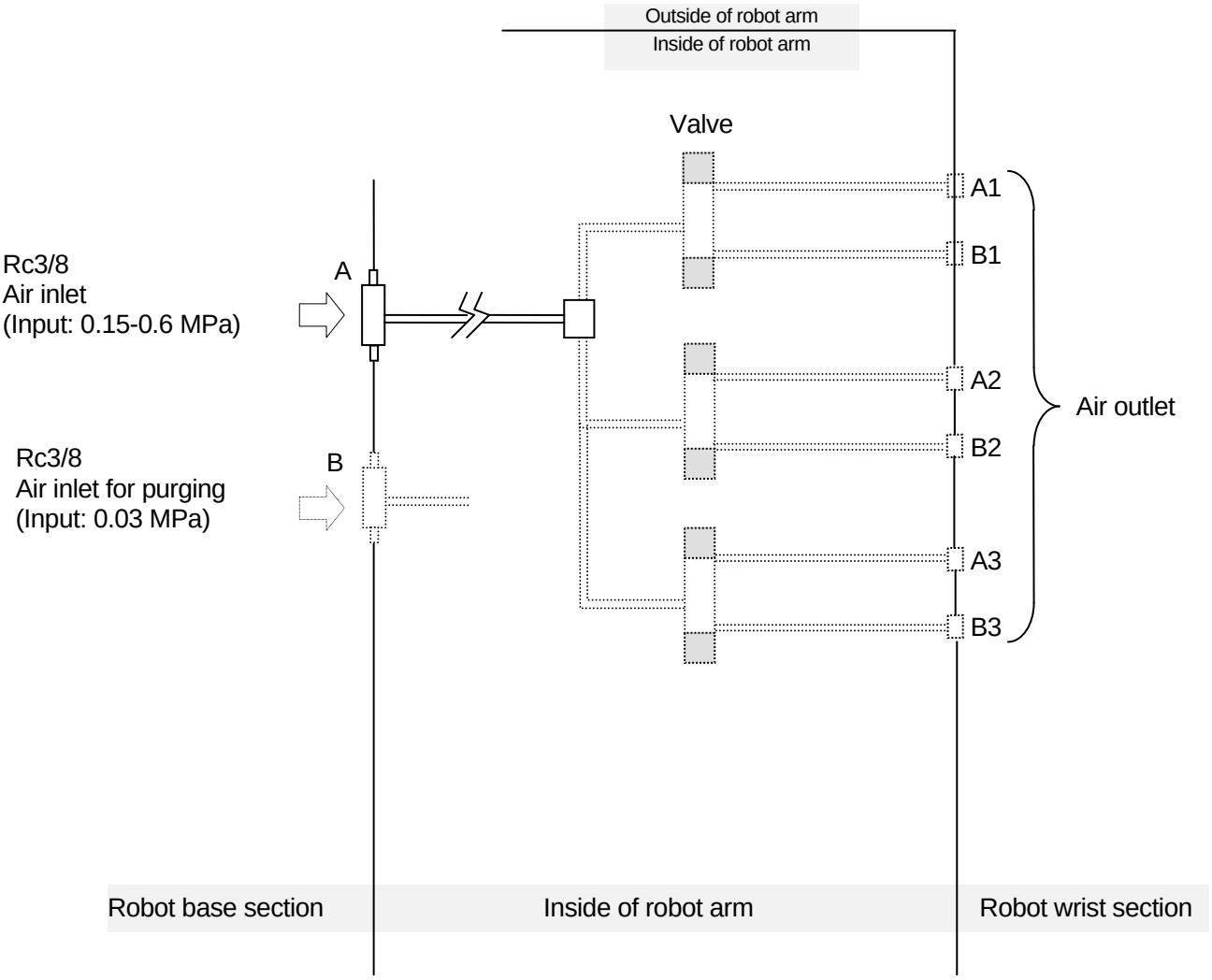
For RS10L, RS20N: CV value is 0.2 and the number of switching positions is 2.

For the other models: CV value is 0.6 and the number of switching positions is 2.

[NOTE]

Valves that do not meet the above specifications cannot be mounted in the arm. Please contact KHI for information on air system specifications if such valves are used.

RA06L, RA10N



Optional equipment is shown by the dotted line (.....).

The built-in valves are specified as follows:

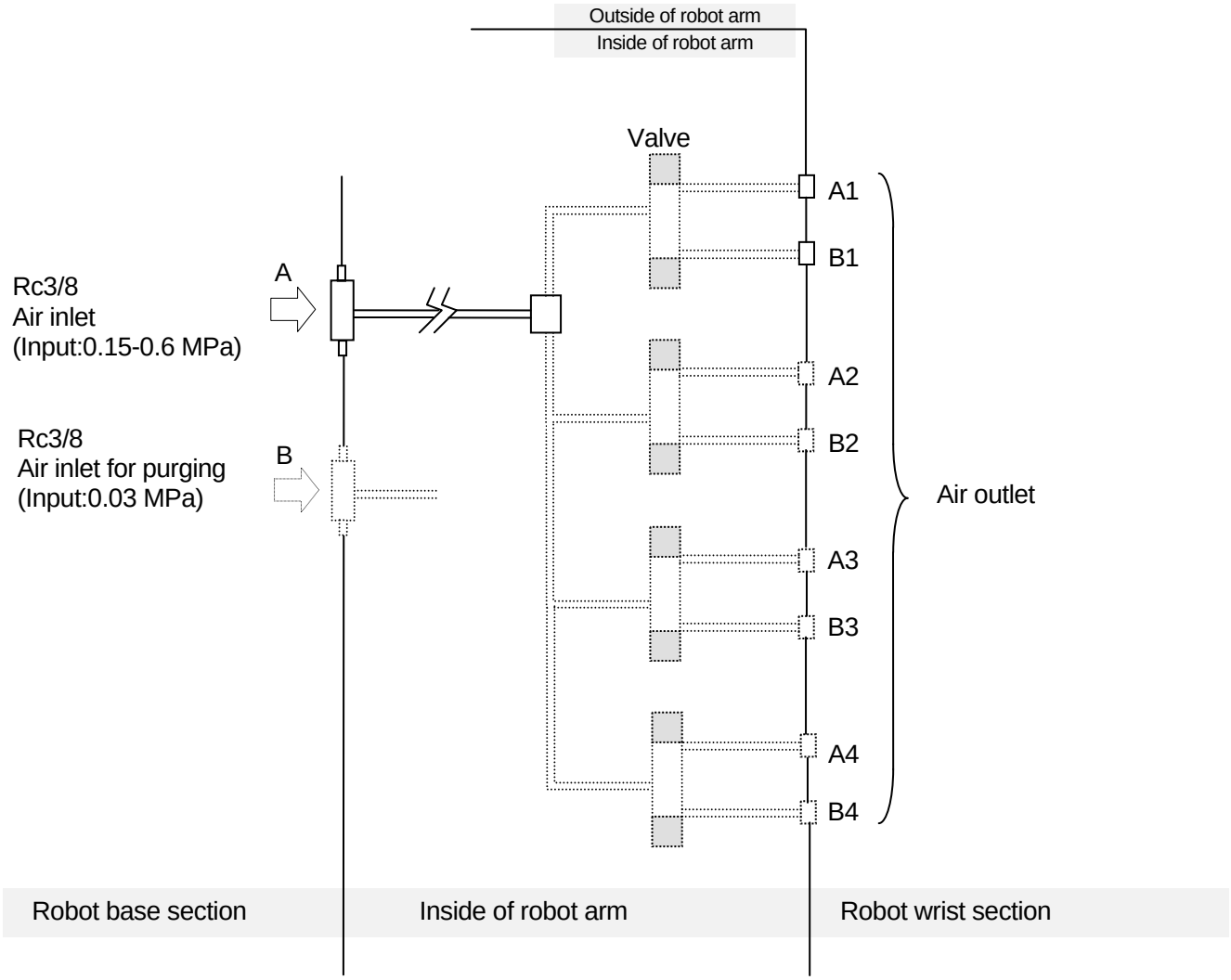
Standard	No built-in valves	
Option	Double solenoid/Single solenoid valves	3 units max.

Valve specification: CV value is 0.2 and the number of switching positions is 2.

[NOTE]

Valves that do not meet the above specifications cannot be mounted in the arm. Please contact KHI for information on air system specifications if such valves are used.

RA10L, RA20N



Optional equipment is shown by the dotted line (.....).

The built-in valves are specified as follows:

Standard	No built-in valves	
Option	Double solenoid/Single solenoid valves	4 units max.

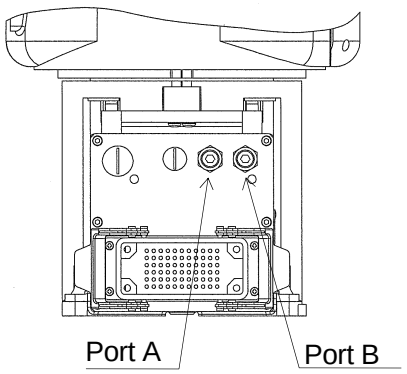
Valve specification: CV value is 0.2 and the number of switching positions is 2.

[NOTE]

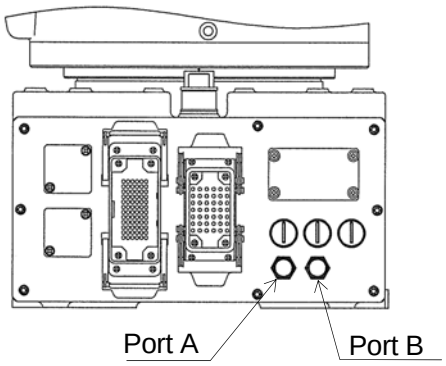
Valves that do not meet the above specifications cannot be mounted in the arm. Please contact KHI for information on air system specifications if such valves are used.

10.2 AIR SUPPLY TO THE ROBOT ARM

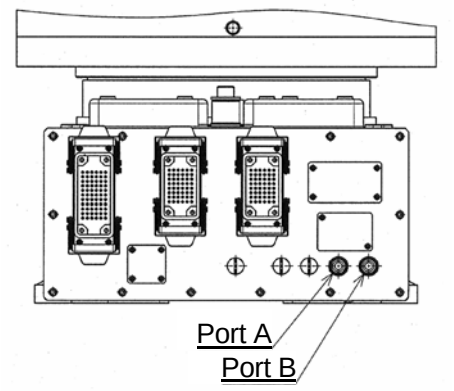
RS05N, RS05L, RA05L, RC05L



RS06L, RS10N, RS10L, RS20N, RA06L, RA10N, RA10L, RA20N



RS15X, RS30N, RS50N, RS80N, RD80N



- As shown on left or above, the air connection port is provided in the base section of robot arm.

⚠ CAUTION

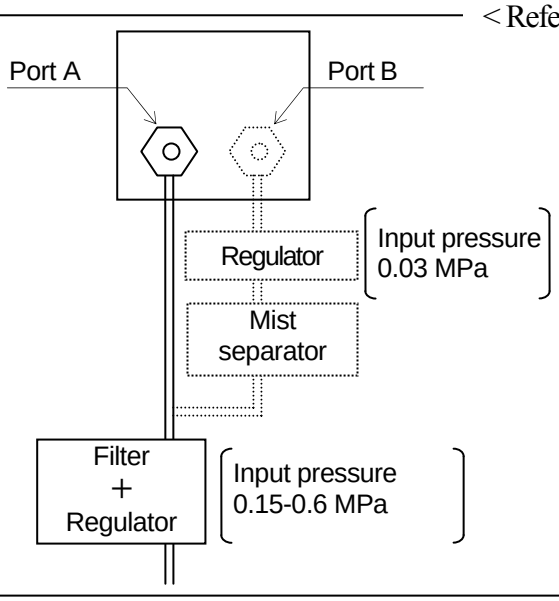
Supply input pressure; 0.15 - 0.6 MPa to the Port A (Rc1/4 for RS05N, RS05L, RA05L and RC05Land Rc3/8 for the others)

- For the air purge specification (except RC05L), Port B is provided with air inlet (Rc1/4 for RS05N, RS05L and RA05L and Rc3/8 for the others) in the same way as Port A.

⚠ CAUTION

For air purge specification, supply clean dry air with input pressure of 0.03 MPa.

< Reference >



When air regulator is connected:

- Supply tool driving air to the port A through [Filter + Regulator] placed outside as shown in the figure.

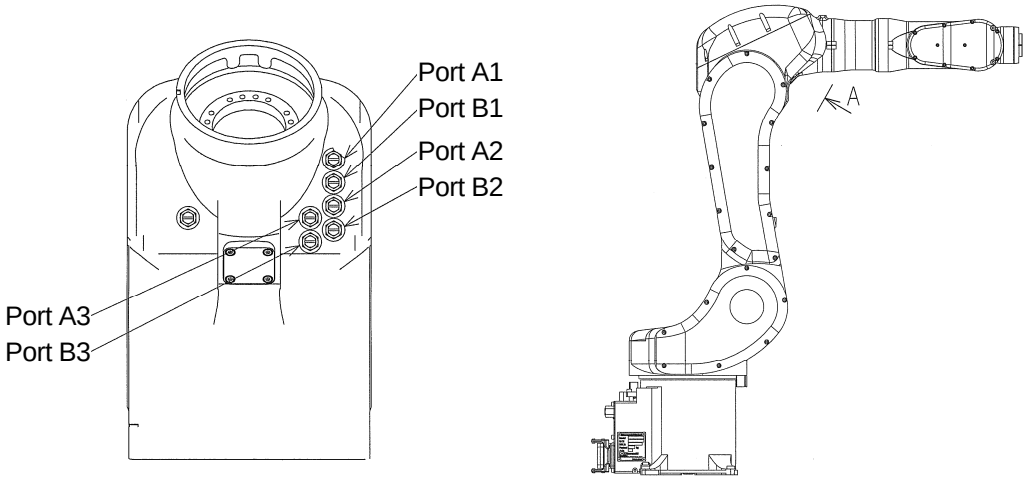
Since built-in valves are non-oiling type, do not use any lubricator (oiler).

- If clean dry air cannot be supplied for air purge, referring to the left figure, connect the [Mist separator + Regulator] to a place between the output port of [Filter + Regulator] for port A and port B.

10.3 TUBING FROM AIR OUTLET TO TOOL

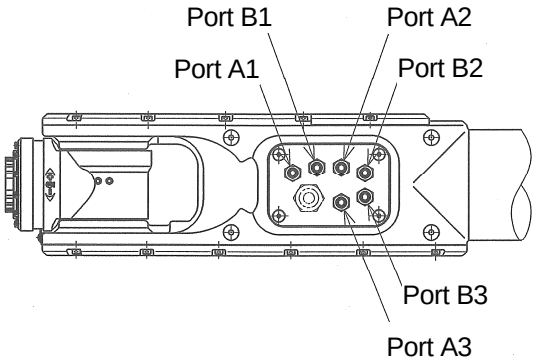
As shown in the figure below, air outlet ports are provided (Option). The outlet ports are M5 for RS05N, RS05L, RA05L and RC05L and Rc1/8 for the others.

RS05N, RS05L, RA05L, RC05L

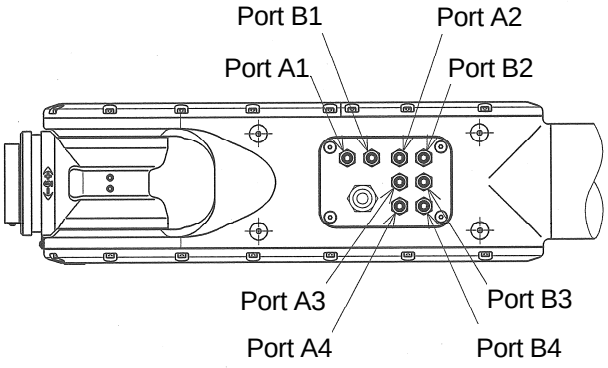


View A

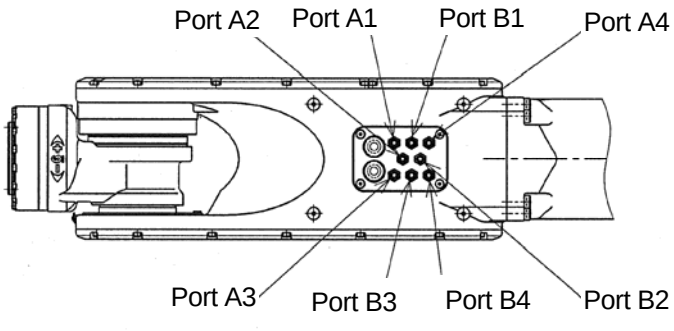
RS06L, RS10N, RA06L, RA10N



RS10L, RS20N, RA10L, RA20N



RS15X, RS30N, RS50N, RS80N, RD80N



⚠ CAUTION

When tubing, ensure that the air outlet ports are not turned. If the outlet ports turn, the internal tube may bend or break causing air supply stop at worst.

KAWASAKI ROBOT R Series

INSTALLATION AND CONNECTION

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