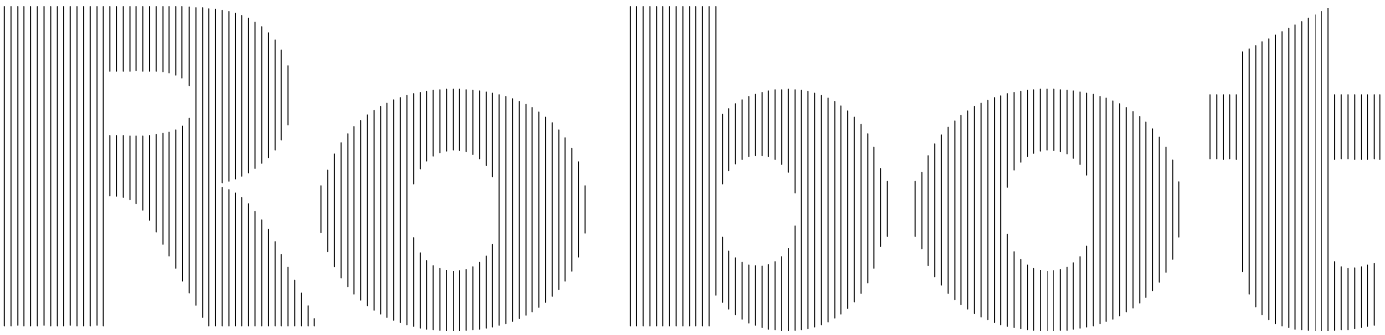
Simple and friendly

Kawasaki

Kawasaki Robot

Instruction Manual

(Original instructions)



Kawasaki Heavy Industries, Ltd.

90201-1163DEC

PREFACE

This manual summarizes the necessary instructions for Kawasaki Robot from its introduction to the maintenance procedures.

This manual applies to the following robot arm and controller models.

Robot arm: B, BA, CP, CX, M, MC, MS, R, Y, Z series
Controller: E01, E02, E03, E04, E40, E42, E43, E44, E70, E71, E91 (European Specification)

For specifications of robot arms not shown in this manual, see the specification sheets, delivered separately.

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, damage, 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 side or sold off to a different use, 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, handling, teaching, operation and maintenance.

⚠ WARNING

1. **The accuracy and effectiveness of the diagrams, procedures, and explanations given in this manual cannot be confirmed with absolute certainty. Should any unexplained problems arise, please contact the nearest Kawasaki office or distributor in your country.**
2. **In order to perform every work in safety, read and fully understand this manual, all pertinent laws, regulations and related materials as well as all the safety explanations described in each chapter, and prepare safety measures and procedures suitable for actual work.**

CONTENTS

1.0 KAWASAKI ROBOT

Kawasaki Robot is an industrial robot, used for variant applications according to the user's needs.

An industrial robot is officially defined by ISO as an automatically controlled, reprogrammable, multipurpose manipulator programmable in three or more axes. Typical applications of industrial robot includes welding, painting, assembly, pick and place, packaging, palletizing, product inspection, sealing, cutting, and so on.

Please do not use industrial robot by the following purposes:
Nuclear power
Munitions
Medical treatment
Nursing, etc.

1.1 NOMENCLATURE

Kawasaki robots are named according to the arm part characteristics (1 through 4) and the controller type (5) as shown in the chart below.

1	2	3	4	5
BA	006	N	F	E01
BT	165	L	F	E02
BT	200	L	F	E02/E42
BX	100	L	F	E02/E42
BX	100	N	F	E02/E42
BX	100	S	F	E02/E42
BX	130	X	F	E02/E42
BX	165	L	F	E02/E42
BX	165	N	F	E02/E42
BX	200	L	F	E02/E42
BX	250	L	F	E02/E42
BX	300	L	F	E02/E42
CP	180	L	D	E03
CP	300	L	D	E03
CP	500	L	D	E03
CX	110	L	F	E02
CX	165	L	F	E02
CX	210	L	F	E02
MC	004	N	F	E70
MD	400	N	E	E44

1	2	3	4	5
MD	500	N	E	E44
MS	005	N	G	E70
MT	400	N	F	E02/E42
MX	350	L	F	E04/E44
MX	420	L	F	E04
MX	500	N	F	E04/E44
MX	700	N	F	E04/E44
RA	006	L	F	E01/E40
RA	010	L	F	E01/E40
RA	010	N	F	E01/E40
RA	020	N	F	E01
RC	005	L	F	E71
RD	080	N	E	E03/E42
RS	003	N	F	E70
RS	005	L	F	E71
RS	005	N	F	E71
RS	006	L	F	E01/E40/E71
RS	010	L	F	E01/E40/E91
RS	010	N	F	E01/E40/E71
RS	015	X	F	E02/E42
RS	020	N	F	E01/E40/E91
RS	030	N	F	E02/E42
RS	050	N	F	E02/E42
RS	080	N	F	E02/E42
YF	002	N	D	E91
YF	003	N	D	E40/E91
ZB	150	S	F	E02/E42
ZD	130	S	D	E43
ZD	250	S	D	E43
ZH	100	U	F	E02/E42
ZT	130	L	F	E02
ZT	130	S	F	E02
ZT	130	U	F	E02
ZT	165	U	F	E02
ZT	200	S	F	E02
ZT	200	U	F	E02
ZX	130	L	F	E02/E42
ZX	130	S	F	E02/E42
ZX	130	U	F	E02
ZX	165	U	F	E02/E42
ZX	200	S	F	E02/E42
ZX	200	U	F	E02
ZX	300	S	F	E02/E42

1. Robot type

   The first two letters show the robot type. Following robot types are used with E0x/E4x/E70/E71/E91 controllers:

   BA: small sized floor mounted robot
   BT: medium sized shelf mounted robot
   BX: medium sized floor mounted robot
   CP: large sized robot for palletizing
   CX: medium sized floor mounted robot
   MC: small sized floor mounted robot
   MD: large sized robot for palletizing
   MS: small sized floor mounted robot
   MT: large sized shelf mounted robot
   MX: large sized floor mounted robot
   RA: small sized robot for arc welding
   RC: small sized robot for cleanroom environments
   RD: small sized robot for palletizing
   RS: small sized floor mounted robot
   YF: picker
   ZB: medium sized robot with short arm
   ZD: medium sized robot for palletizing
   ZH: medium sized robot with compact arm
   ZT: medium sized shelf mounted robot
   ZX: medium sized floor mounted robot

2. Payload (kg)

3. Variation

4. Number of axes

   The number of axes the robot has is represented by alphabet. D=4, E=5, F=6, G=7.

5. Controller model

1.2 DECLARATION

DECLARATION OF INCORPORATION OF PARTLY COMPLETED MACHINERY

Manufacturer : KAWASAKI HEAVY INDUSTRIES, LTD.
Robot Division
Address : 1-1, Kawasaki-cho, Akashi, 673-8666, Japan

Herewith declares that

Product Name	Industrial robot
Function	Handle the materials or the tools
Make :	KAWASAKI ROBOT
Robot Type :	ZX130LFD42
Serial number(s) :	2428, 2429, 2430, 2431
WO or PO	81L4809

is intended to be incorporated into machinery or to be assembled with other machinery to constitute machinery covered by

Machinery Directive 2006/42/EC
Low Voltage Directive 2006/95/EC
EMC Directive 2004/108/EC

and that
the following standards have been applied ;

EN ISO 10218-1: 2011	Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots
EN ISO 13849-1: 2008	Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design
EN 60204-1: 2006	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
EN 61000-6-4: 2007	Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments
EN 61000-6-2: 2005	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments

and that
the following essential health and safety requirements have been applied and fulfilled,and the relevant technical documentation is compiled in accordance with Annex Ⅶ,part B of Directive 2006/42/EC:

- 1.1.2; 1.1.3; 1.1.5; 1.1.6; 1.2; 1.3.1; 1.3.2; 1.3.4; 1.3.6; 1.5.1; 1.5.2; 1.5.4-1.5.6; 1.5.8-1.5.10; 1.6.3; 1.6.4; 1.7

and that
the relevant information will be transmitted by the electronic method in response to a reasoned request by the national authorities;

and furthermore declares that
it is not allowed to put the machinery into service until the machinery into which it is to be incorporated or of which it is to be a component has been found and declared to be in conformity with the provisions of Directive 2006/42/EC and with national implementing legislation, i,e. as a whole, including the machinery referred to in this declaration.

Authorized representative and Person authorized to compile the Technical documentation in Europe:

KAWASAKI ROBOTICS GMBH
Sperberweg 29, 41468 Neuss, Germany
Noboru Takagi
President

Place and Date : Akashi, 21-June-10
signature:

Koji Muneto
Senior Manager
Development Department, Robot Division
KAWASAKI HEAVY INDUSTRIES, LTD

2.0 ROBOT SPECIFICATION

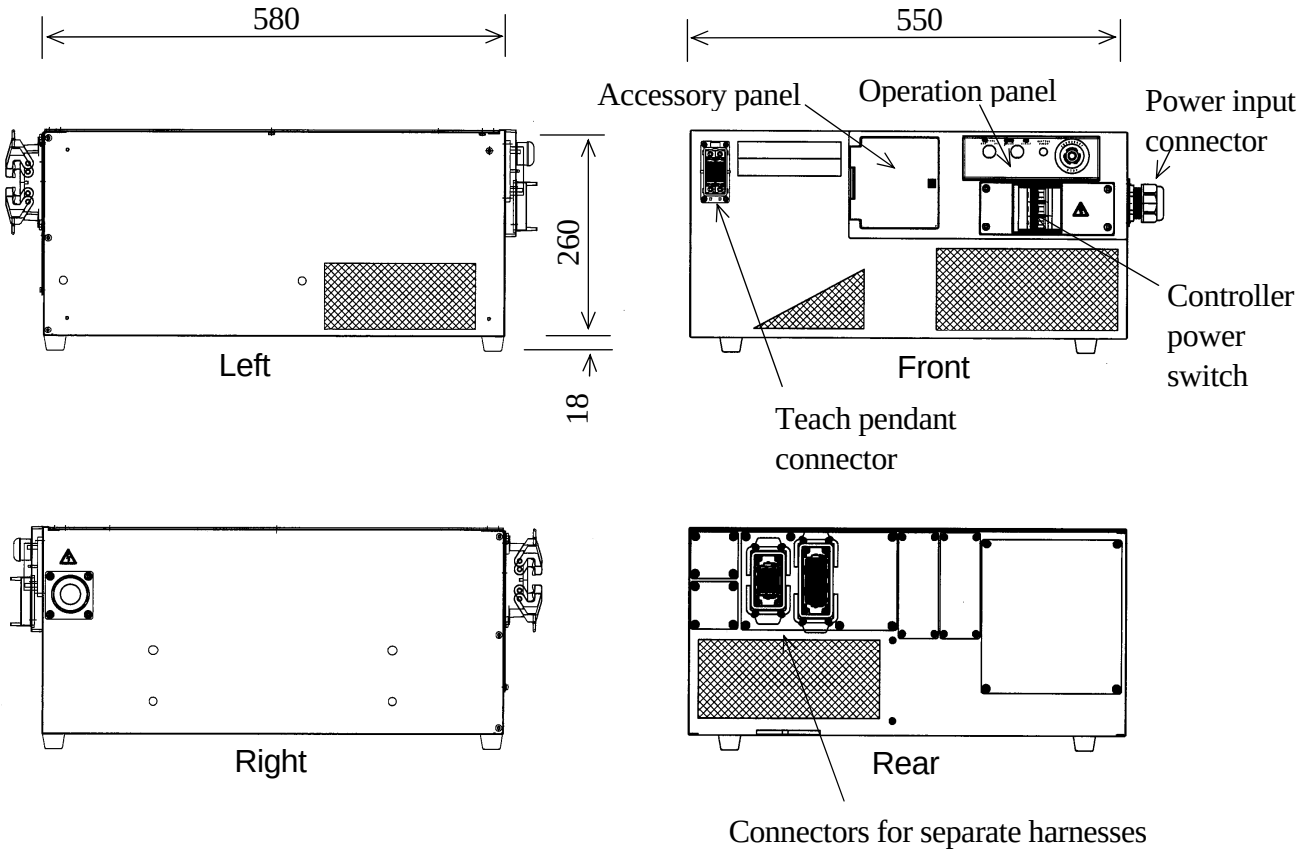
The European spec. robot arm and controller complies with the following standards.

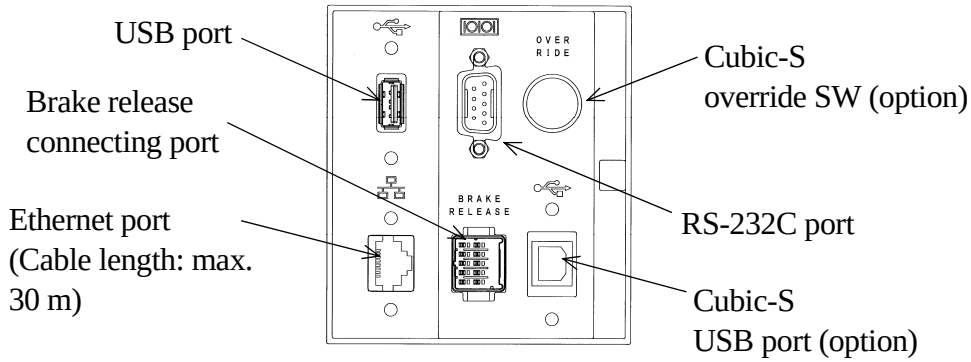
EN ISO 10218-1:2011	Robots for industrial environments - Safety requirements - Part 1: Robot
EN 954-1: 1997	Safety of machinery - Safety related parts of control systems - Part 1: General principles for design
EN ISO 13849-1:2008	Safety of machinery - Safety related parts of control systems - Part 1: General principles for design
EN 60204-1:2006	Electrical equipment of industrial machines General requirements
EN 61000-6-4:2007	Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments
EN 61000-6-2:2005	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments

2.1 CONTROLLER APPEARANCE AND SPECIFICATION

2.1.1 APPEARANCE OF E SERIES CONTROLLERS

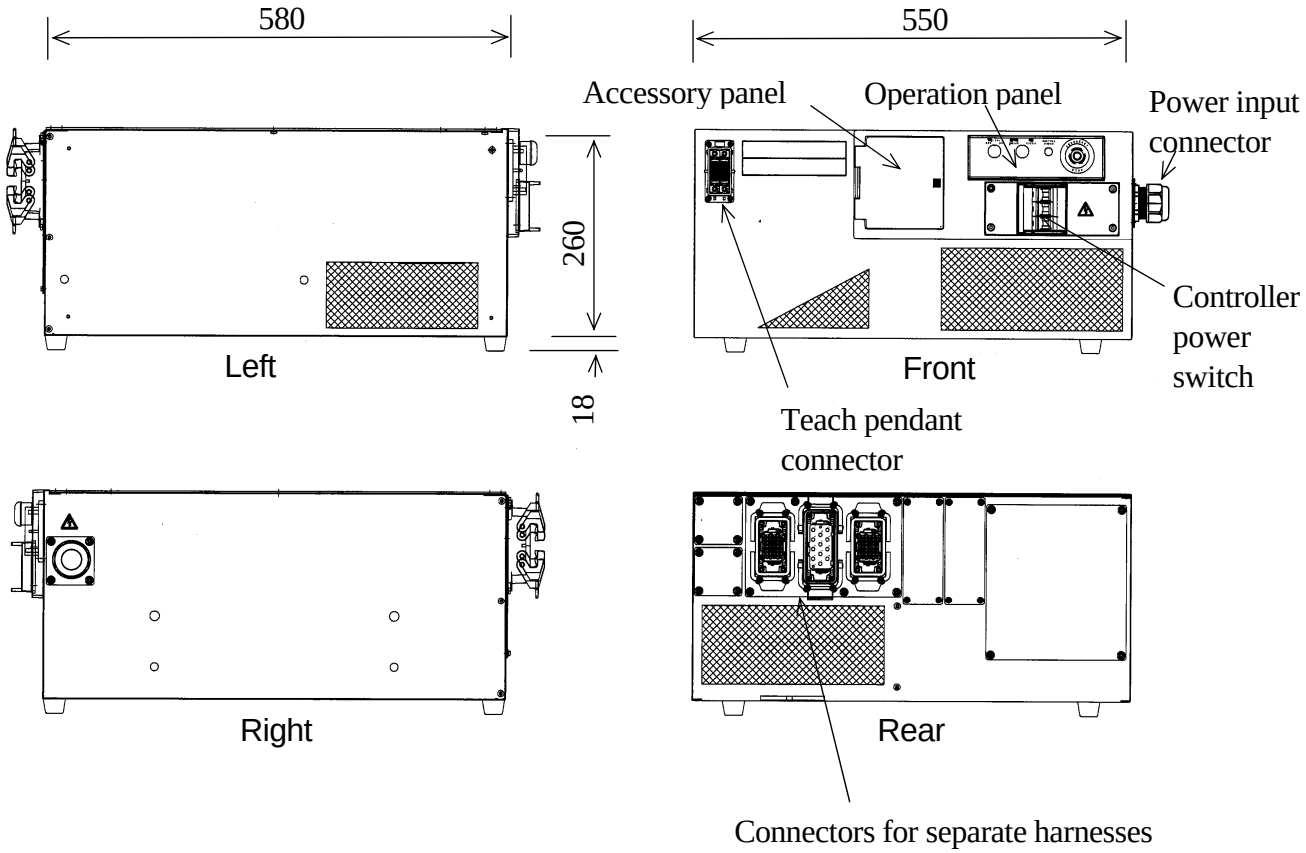
E01 controller

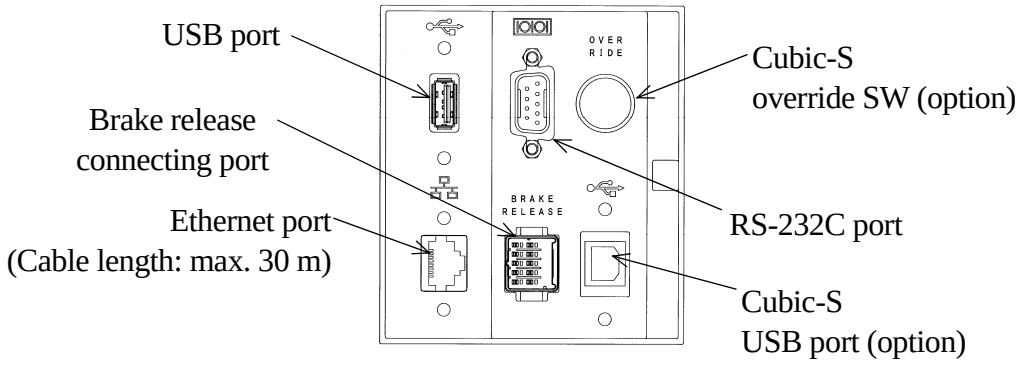




Connecting ports in the accessory panel

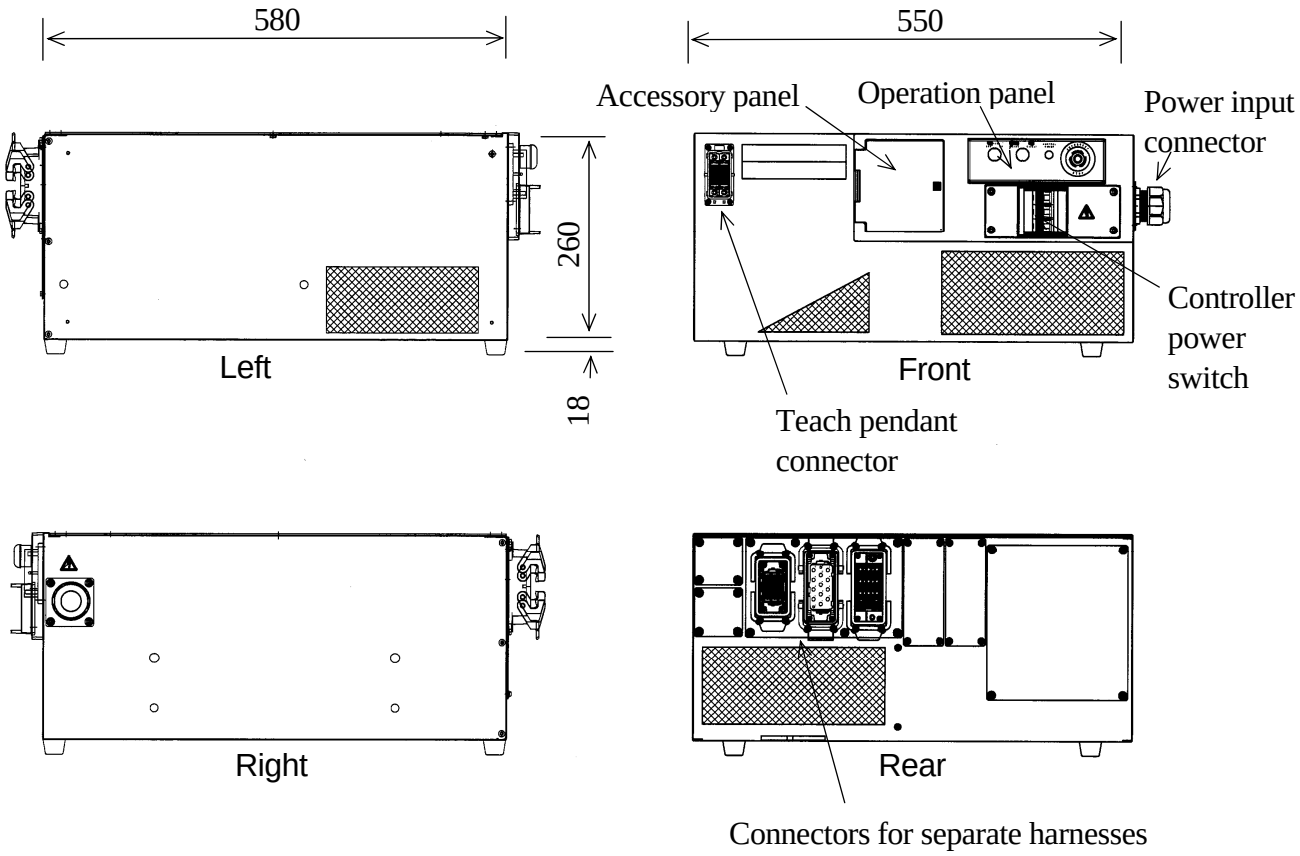
E02 controller

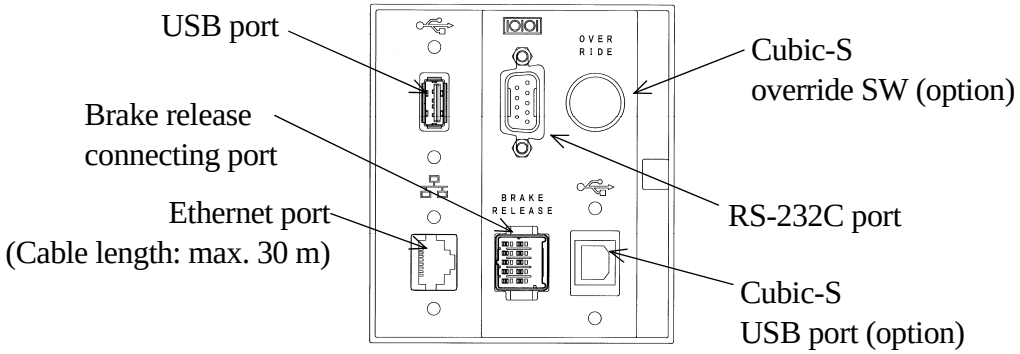




Connecting ports in the accessory panel

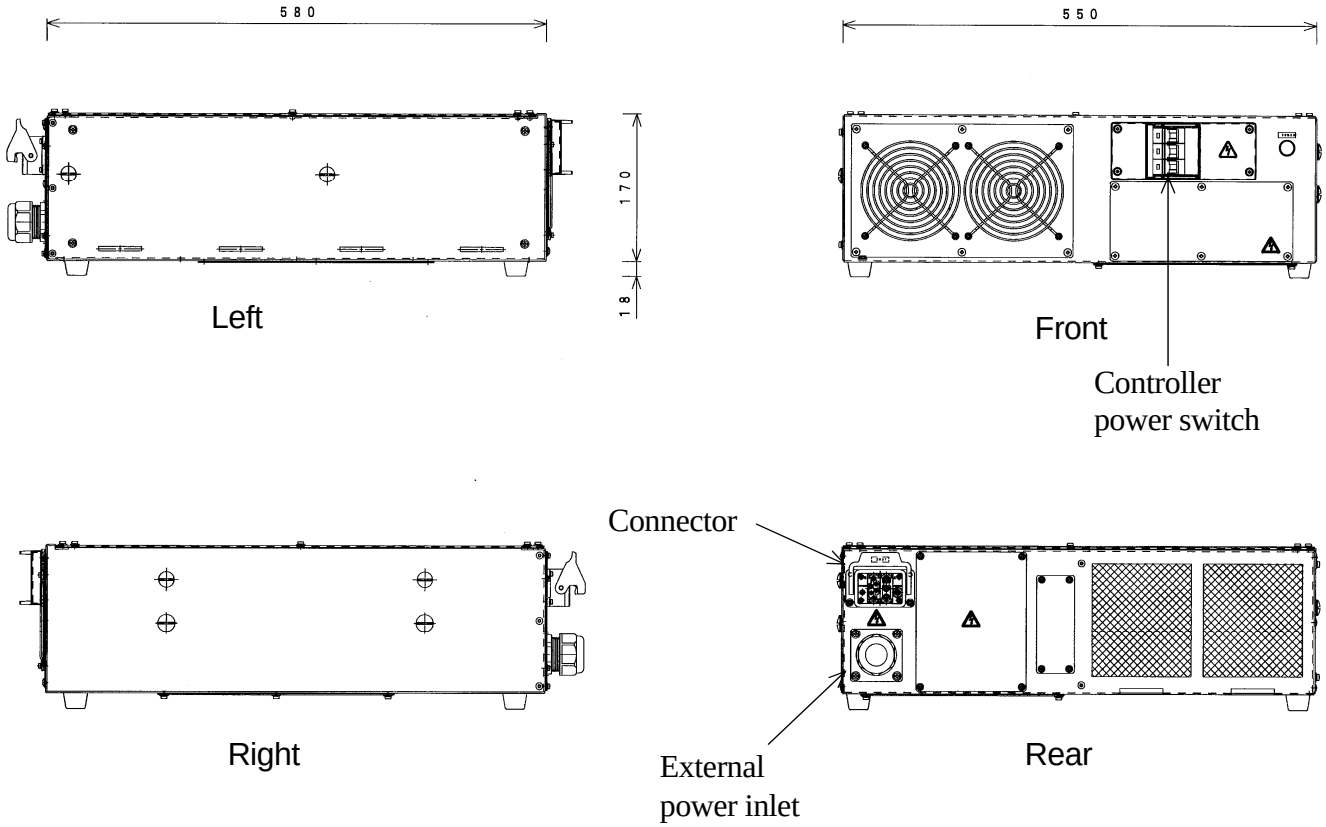
E03/E04 controllers



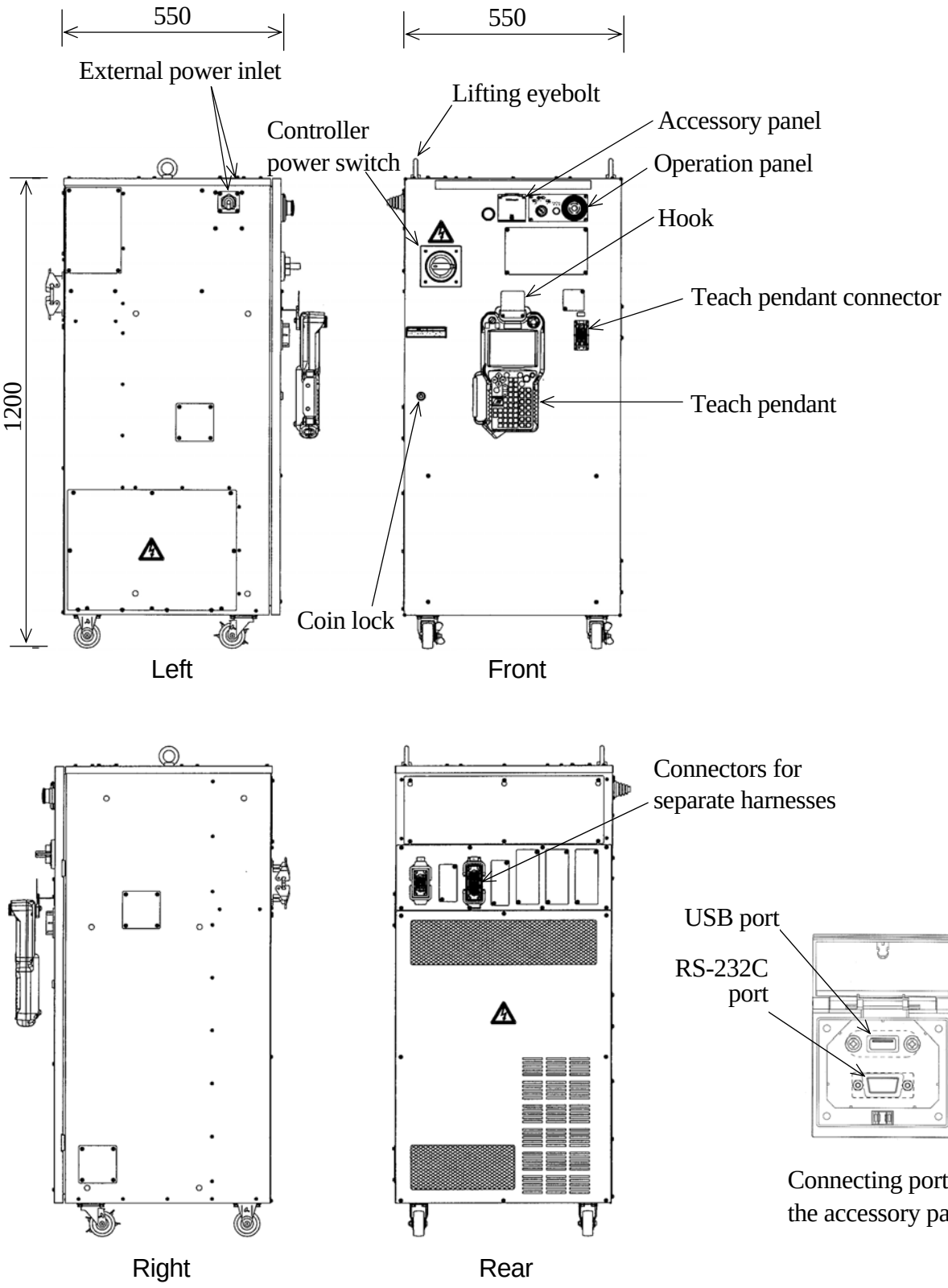


Connecting ports in the accessory panel

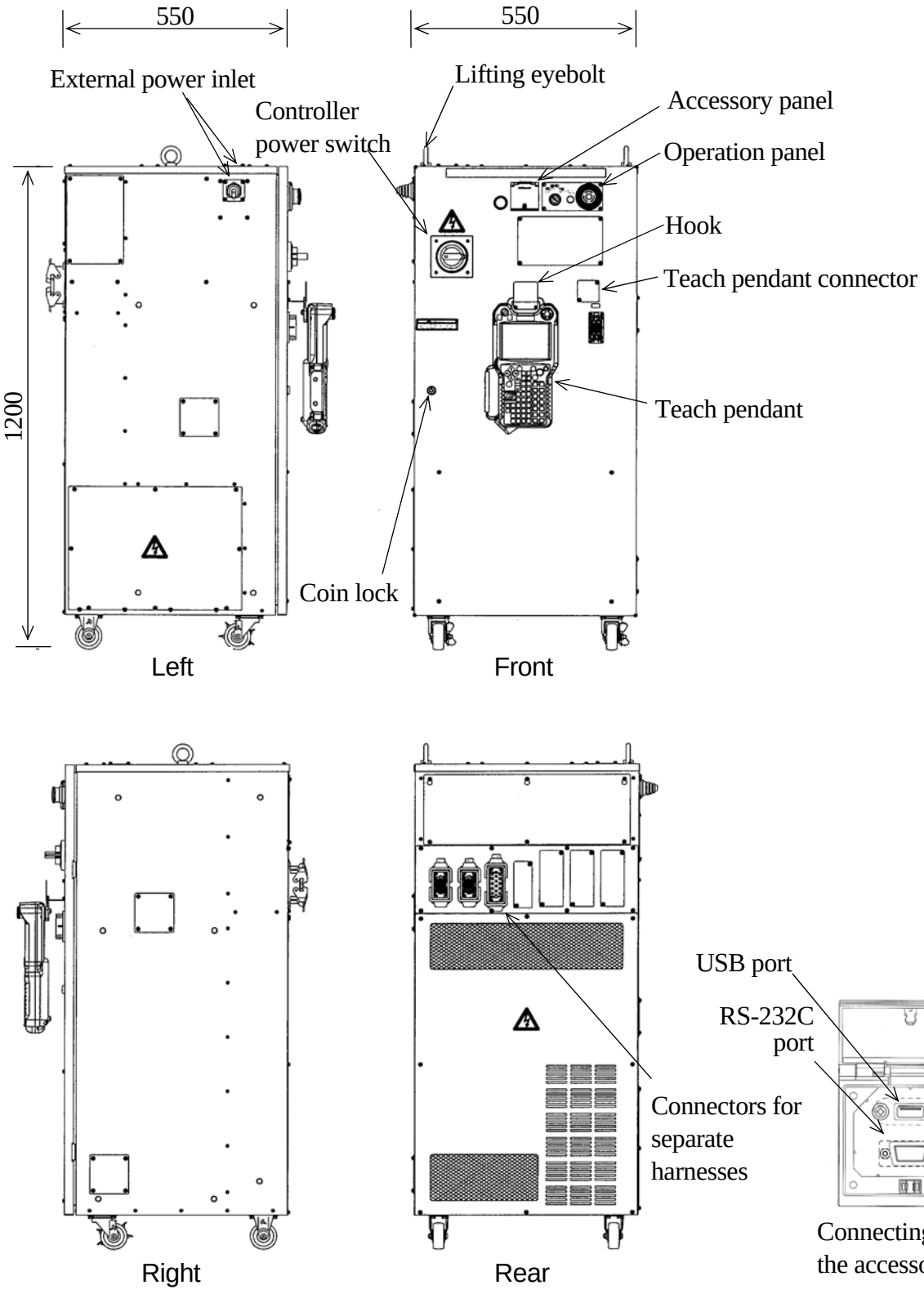
Transformer unit



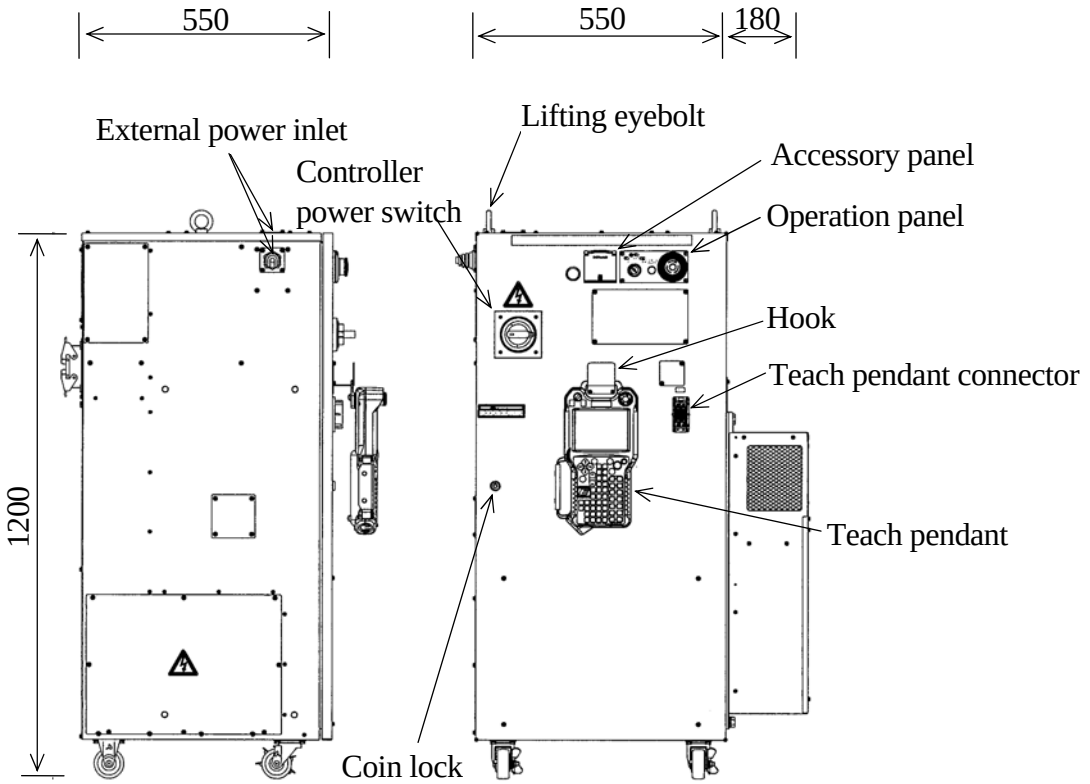
E40 controller

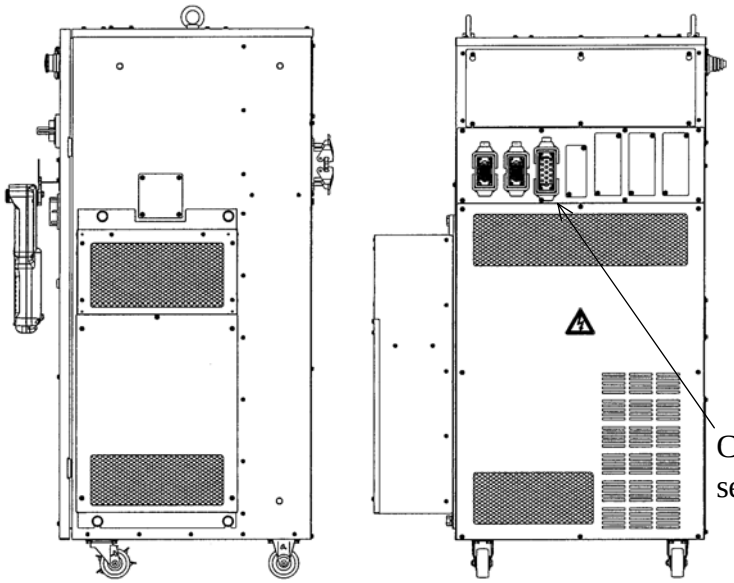


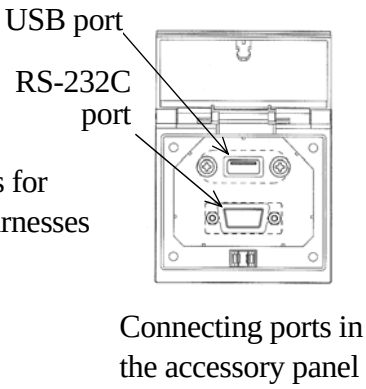
E42 controller



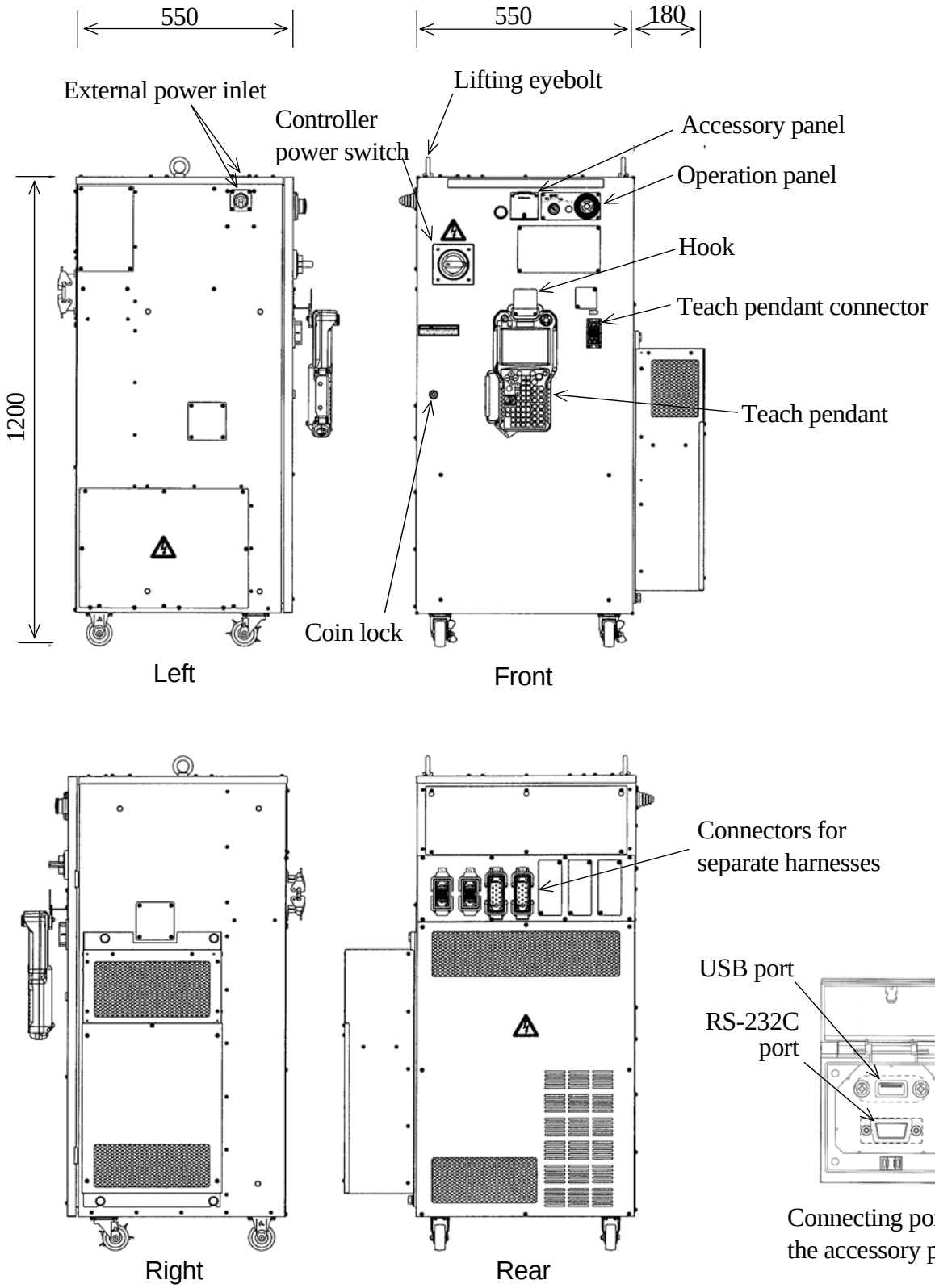
E43 controller



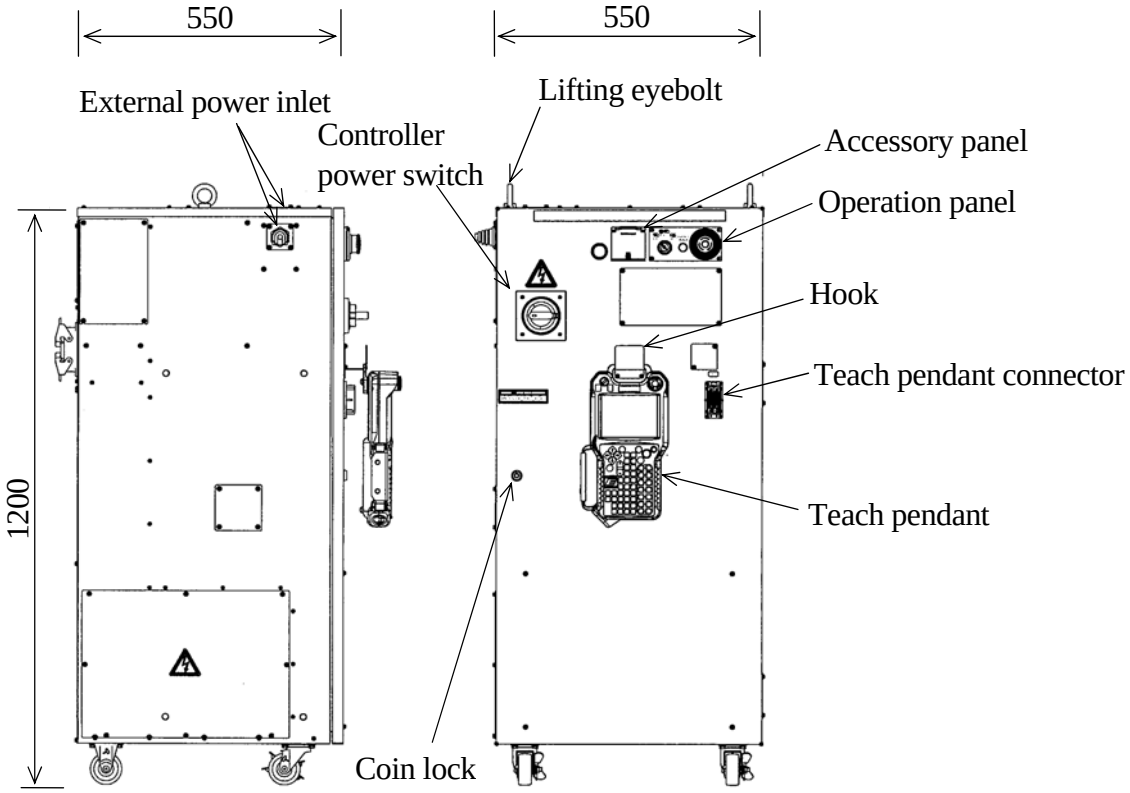


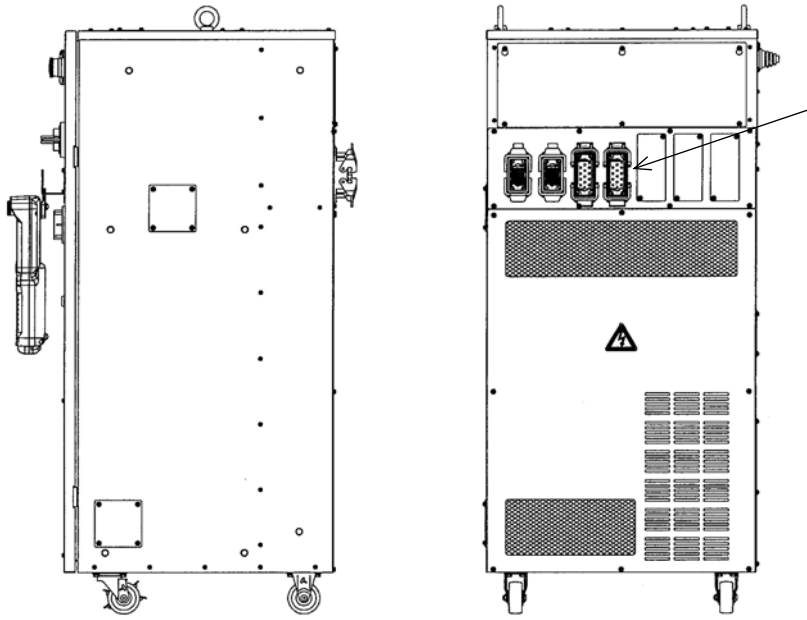


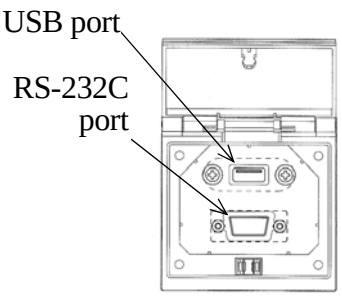
E44 controller (MD)



E44 controller (MX)

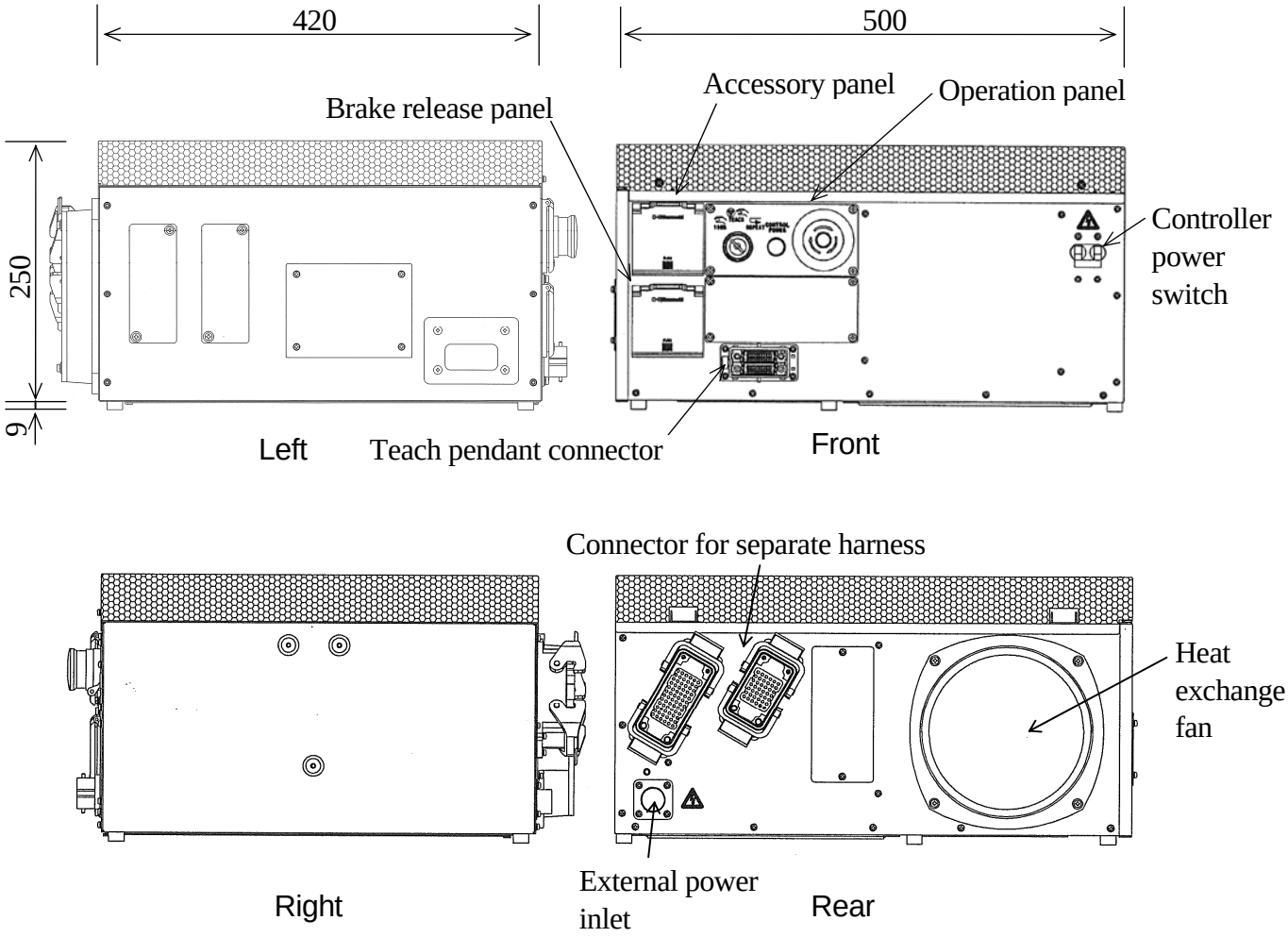


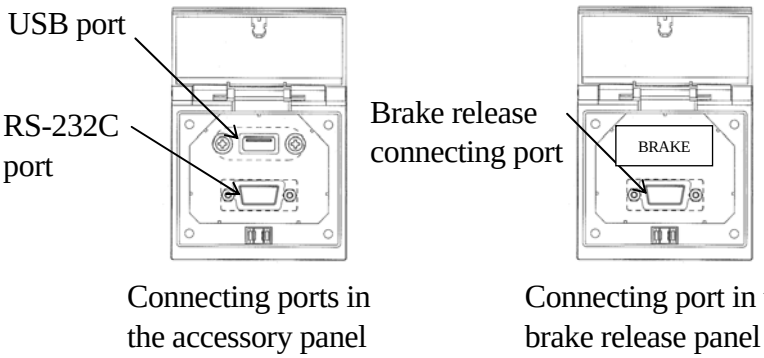




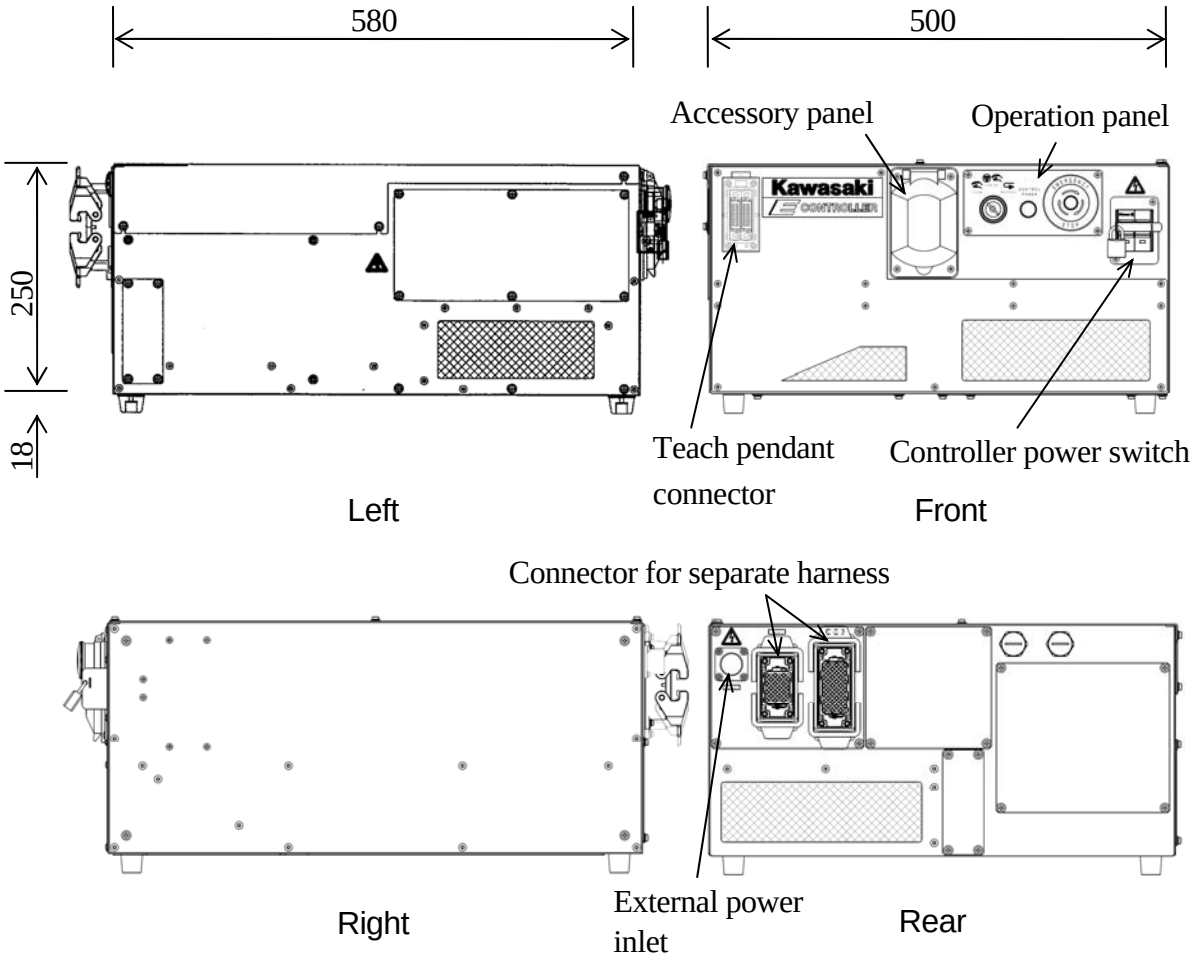
Connecting ports in the accessory panel

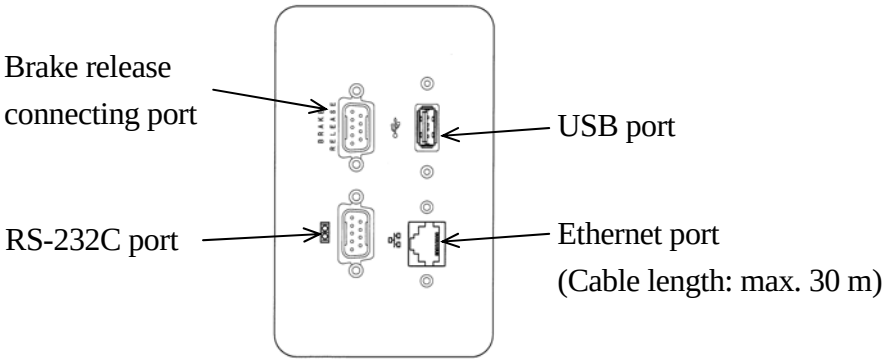
E70/E71 controllers





E91 controller





Connecting ports in the accessory panel

2.1.2 CONTROLLER SPECIFICATIONS

E0x controller

Construction		Enclosed structure, indirect cooling system
Mass		E01, E02, E04: 40 kg E03: 45 kg
Ambient environment	Temperature	0 - 45 °C
	Humidity	35 - 85 %RH (Non condensing)
	Altitude	Up to 1000 meters above mean sea level
	Pollution degree	3 or below
Power source		AC 200-220 V ±10 %, 50/60 Hz, 3 Phase
Power capacity		Refer to the table below.
Earthing		Dedicated earthing (100 Ω or less)
Length of Teach pendant cable		5 m/10 m/15 m

Transformer unit

Construction		Enclosed structure, indirect cooling system
Mass		45 kg
Ambient environment	Temperature	0 - 45 °C
	Humidity	35 - 85 %RH (Non condensing)
	Altitude	Up to 1000 meters above mean sea level
	Pollution degree	3 or below
Power source		AC 380-415 V±10 %, 50/60 Hz, 3 Phase or AC 440-480 V±10 %, 50/60 Hz, 3 Phase (Switched by voltage switching connector.)
Power capacity		Refer to the table below.
Earthing		Dedicated earthing (100 Ω or less)
Length of connection cable with controller		1 m (max. 5 m for option)

Controller model	Arm model	Power capacity	Recommended power cable size (Including earth wire)	Length requirement
E01 controller	BA series RA series 06L/10L/10N 20N RS series 06L/10L/10N 20N	5.6 KVA max.	3.5 mm^2 or more (AWG #12 or more)	200 m or less
E02 controller	B series CX series MT series RS series 15X/30N/50N 80N ZB/ZH series ZT series 130L/130S 130U/165U 200S/200U ZX series 130L/130S 130U/165U 200S/200U 300S	7.5 KVA max.	5.5 mm^2 or more (AWG #10 or more)	200 m or less
E03 controller	CP series RD series	12 KVA max.	5.5 mm^2 or more (AWG #10 or more)	200 m or less
E04 controller	MX series	12 KVA max.	5.5 mm^2 or more (AWG #10 or more)	200 m or less
Transformer unit		12 KVA max.	5.5 mm^2 or more (AWG #10 or more)	200 m or less

E4x controller

Construction		Self-sustaining fully closed, indirect cooling system
Mass		E40: 145 kg, E42, E44 (MX): 180 kg E43, E44 (MD): 195 kg
Ambient environment	Temperature	0 - 45 °C
	Humidity	35 - 85 %RH (Non condensing)
	Altitude	Up to 1000 meters above mean sea level
	Pollution degree	3 or below
Power source		AC 380-415 V±10 %, 50/60 Hz, 3 Phase
Power capacity		Refer to the table below.
Earthing		Dedicated earthing (100 Ω or less)
Length of Teach pendant cable		5 m/10 m/15 m (5 m, 15 m are options.)
Length of separate harnesses*		5 m/10 m/15 m (5 m, 15 m are options.)

NOTE* Harness length between robot arm and controller.

Controller model	Arm model	Power capacity	Recommended power cable size (Including earth wire)	Length requirement
E40	RA series 06L/10L/10N RS series 06L/10L/10N/20N YF series 03N	4.9 KVA max.	3.5 mm^2 or more (AWG #12 or more)	200 m or less
E42/E43	B series 100L/100N/100S 130X/165L/165N 200L/250L/300L MT series RD series RS series 15X/30N/50N/80N ZB/ZD/ZH series ZX series 130L/130S/165U/200S/300S	9.9 KVA max.	5.5 mm^2 or more (AWG #10 or more)	200 m or less
E44	MD series MX series 350L/500N/700N	9.9 KVA max.	5.5 mm^2 or more (AWG #10 or more)	200 m or less

E70/E71 controllers

Construction		Horizontal enclosed structure, indirect cooling system
Mass		30 kg
Ambient environment	Temperature	0 - 45 °C (0 - 40°C in vertical placing)
	Humidity	35 - 85 %RH (Non condensing)
	Altitude	Up to 1000 meters above mean sea level
	Pollution degree	3 or below
Power source		AC 200-240 V±10 %, 50/60 Hz, Single phase
Power capacity		Refer to the table below.
Earthing		Dedicated earthing (100 Ω or less)
Length of Teach pendant cable		5 m/10 m/15 m (5 m, 15 m are options.)
Length of separate harnesses*		5 m/10 m/15 m (5 m, 15 m are options.)

NOTE* Harness length between robot arm and controller.

Controller model	Arm model	Power capacity	Recommended power cable size (Including earth wire)	Length requirement
E70	MC/MS series RS series 03N	1.5 KVA max.	2-2.5 mm^2 or more (AWG #14)	200 m or less
E71	RC series 05L RS series 05L/05N/06L/10N	3.0 KVA max.	2-2.5 mm^2 or more (AWG #14)	200 m or less

E91 controller

Construction		Horizontal enclosed structure, indirect cooling system
Mass		40 kg
Ambient environment	Temperature	0 - 40 °C
	Humidity	35 - 85 %RH (Non condensing)
	Altitude	Up to 1000 meters above mean sea level
	Pollution degree	3 or below
Power source		AC 200-230 V±10 %, 50/60 Hz, Single phase
Power capacity		Refer to the table below.
Earthing		Dedicated earthing (100 Ω or less)
Length of Teach pendant cable		5 m/10 m/15 m (5 m, 15 m are options.)
Length of separate harnesses*		5 m/10 m/15 m (5 m, 15 m are options.)

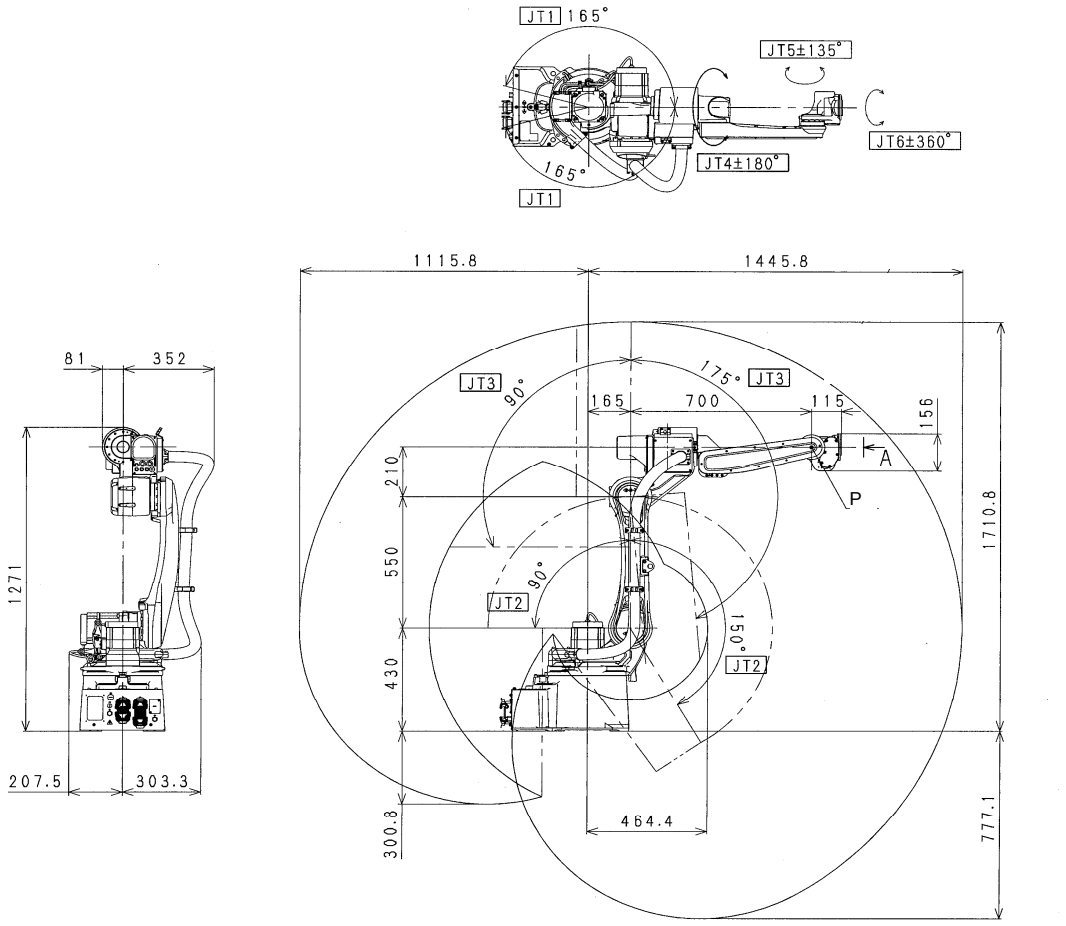
NOTE* Harness length between robot arm and controller.

Controller model	Arm model	Power capacity	Recommended power cable size (Including earth wire)	Length requirement
E91	RS series 10L/20N YF series	5 KVA max.	3.5 mm^2 or more (AWG #12)	200 m or less

2.2 ARM SPECIFICATIONS

The motion ranges shown in the figures below are based on point P. For specifications of robot arms not shown in this manual, see the specification sheets, delivered separately.

BA006N

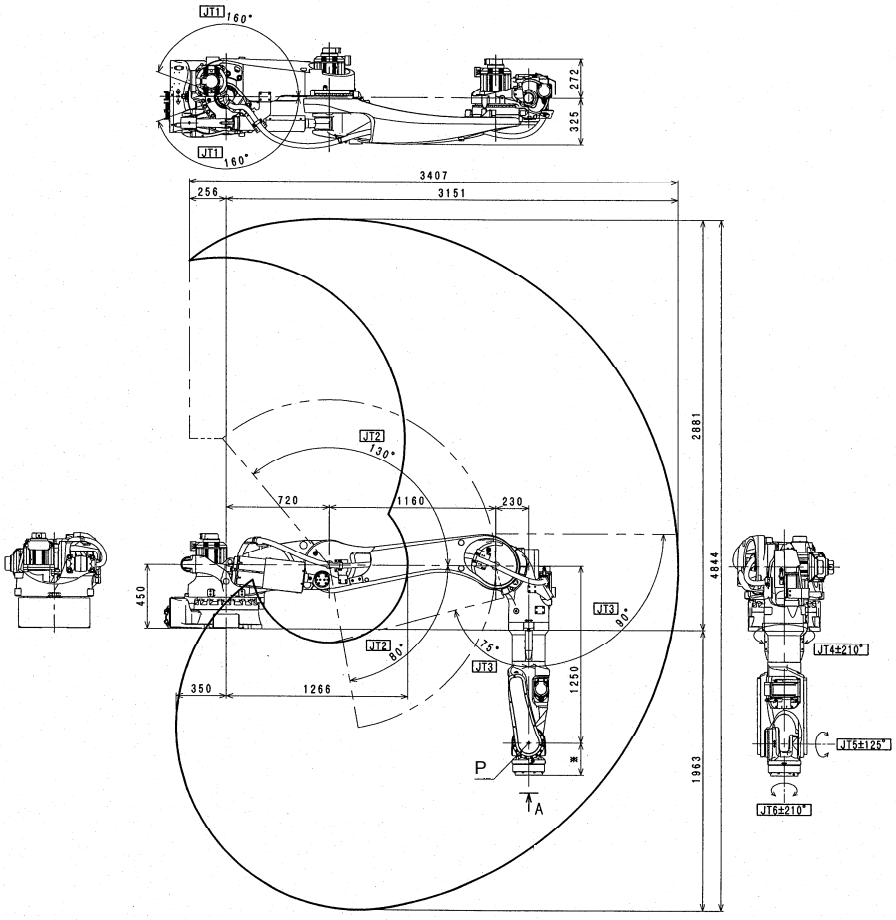


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±165°	240 °/s
	2	+150° to -90°	240 °/s
	3	+90° to -175°	220 °/s
	4	±180°	430 °/s
	5	±135°	430 °/s
	6	±360°	650 °/s
Max. Payload	6 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	12 N·m	0.4 kg·m^2
	5	12 N·m	0.4 kg·m^2
	6	3.75 N·m	0.07 kg·m^2
Repeatability	±0.06 mm		
Mass	150 kg		
Acoustic noise	< 70 dB (A)*		

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

Noise level depends on the conditions.

BT165L

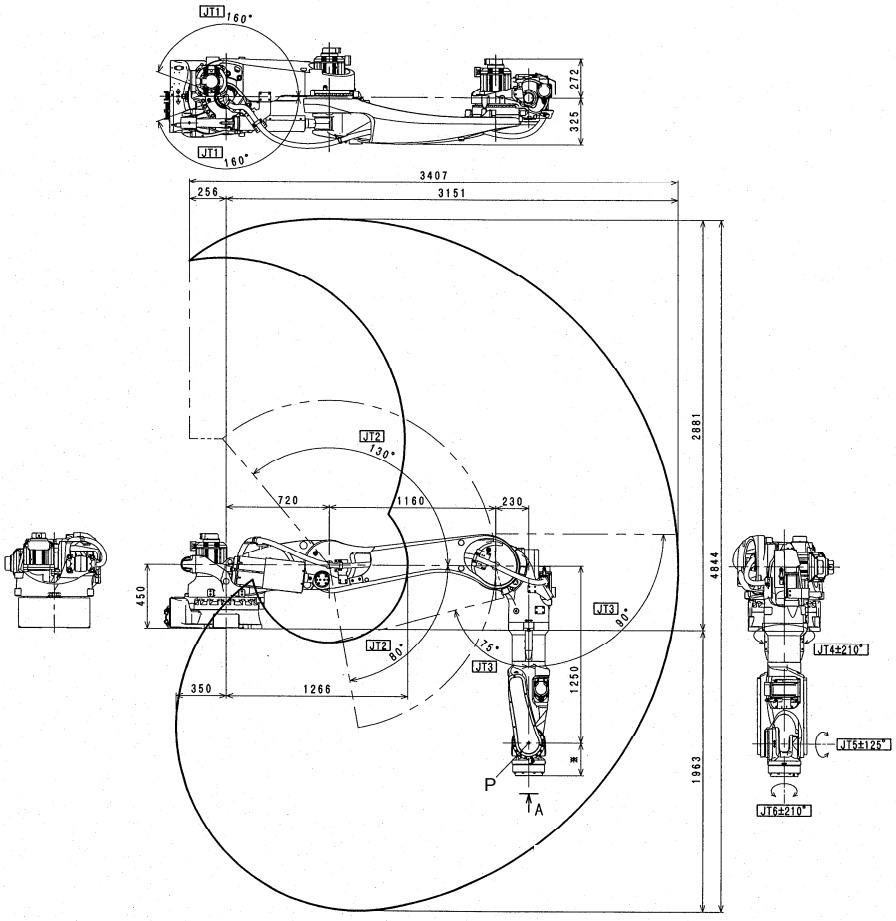


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±160 °	120 °/s
	2	+80 ° to -130 °	110 °/s
	3	+90 ° to -75 °	130 °/s
	4	±210 °	170 °/s
	5	±125 °	170 °/s
	6	±210 °	280 °/s
Max. Payload	165 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	952 N·m	99 kg·m^2
	5	952 N·m	99 kg·m^2
	6	491 N·m	49.5 kg·m^2
Repeatability	±0.2 mm		
Mass	1100 kg		
Acoustic Noise	< 80 db (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 5200 mm away from JT1 center

Noise level depends on the conditions.

BT200L

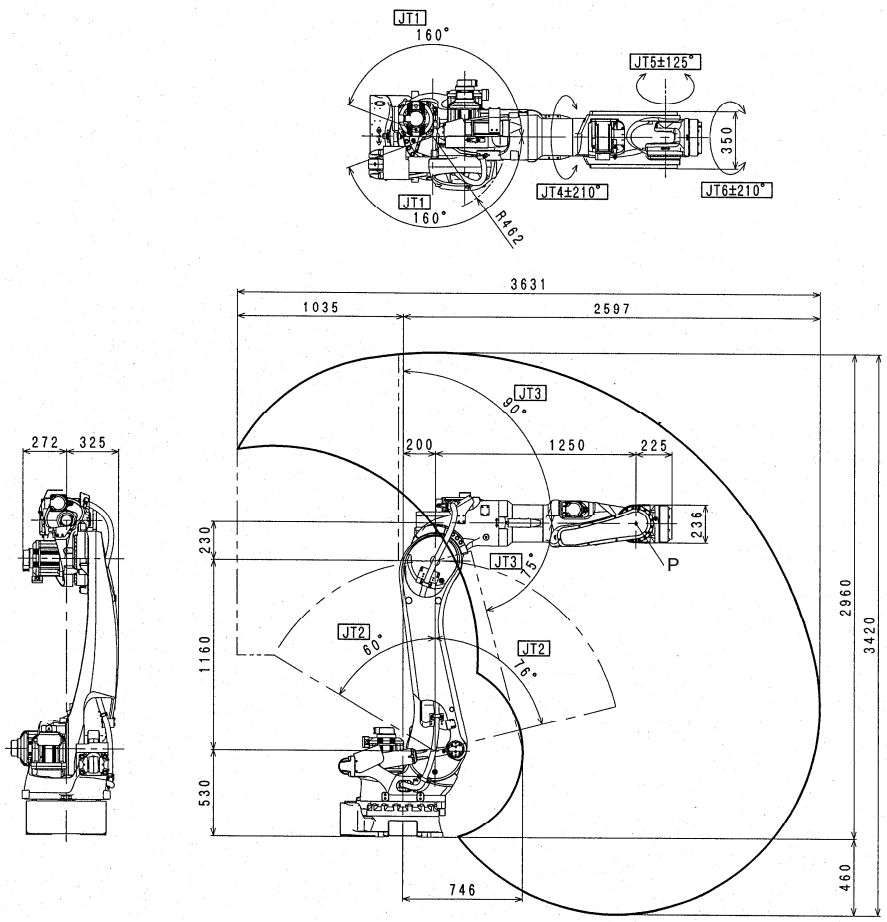


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±160 °	105 °/s
	2	+80 ° to -130 °	85 °/s
	3	+90 ° to -75 °	100 °/s
	4	±210 °	120 °/s
	5	±125 °	120 °/s
	6	±210 °	200 °/s
Max. Payload	200 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	1334.0 N·m	199.8 kg·m^2
	5	1334.0 N·m	199.8 kg·m^2
	6	588.0 N·m	154.9 kg·m^2
Repeatability	±0.2 mm		
Mass	1100 kg		
Acoustic Noise	< 80 db (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 5200 mm away from JT1 center

Noise level depends on the conditions.

BX100L

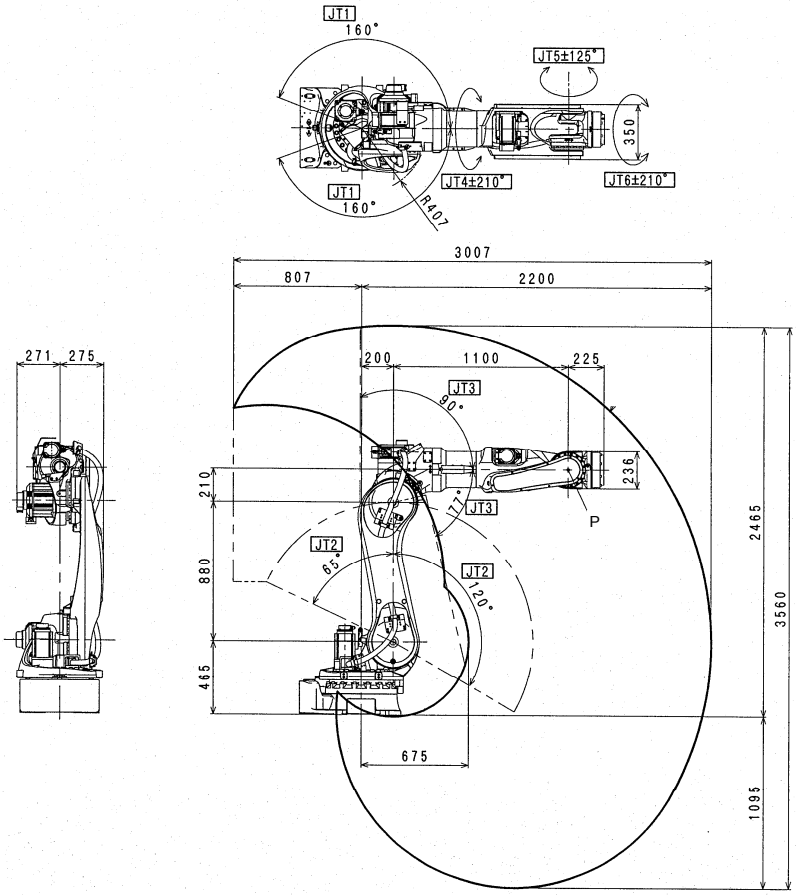


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±160 °	105 °/s
	2	+76 ° to -60 °	130 °/s
	3	+90 ° to -75 °	130 °/s
	4	±210 °	200 °/s
	5	±125 °	160 °/s
	6	±210 °	300 °/s
Max. Payload	100 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	830 N·m	85 kg·m^2
	5	830 N·m	85 kg·m^2
	6	441 N·m	45 kg·m^2
Repeatability	±0.2 mm		
Mass	930 kg		
Acoustic Noise	< 80 db (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 4600 mm away from JT1 center

Noise level depends on the conditions.

BX100N

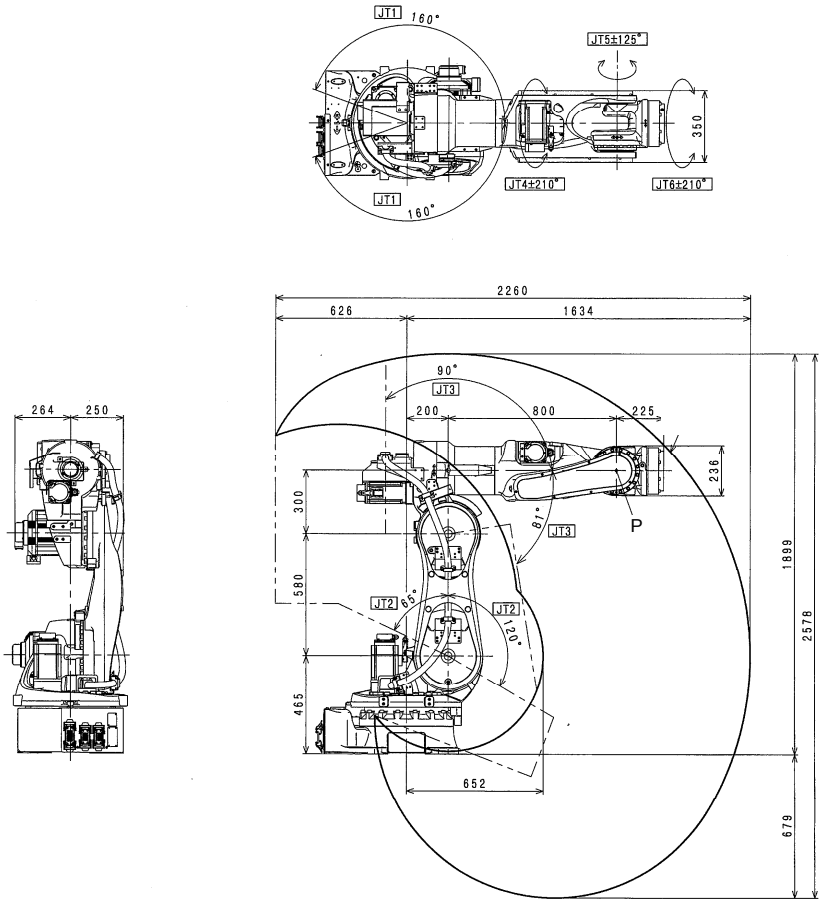


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±160 °	135 °/s
	2	+120 ° to -65 °	110 °/s
	3	+90 ° to -77 °	140 °/s
	4	±210 °	200 °/s
	5	±125 °	200 °/s
	6	±210 °	300 °/s
Max. Payload	100 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	588.4 N·m	60 kg·m^2
	5	588.4 N·m	60 kg·m^2
	6	294.2 N·m	30 kg·m^2
Repeatability	±0.2 mm		
Mass	740 kg		
Acoustic Noise	< 80 db (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 4200 mm away from JT1 center

Noise level depends on the conditions.

BX100S

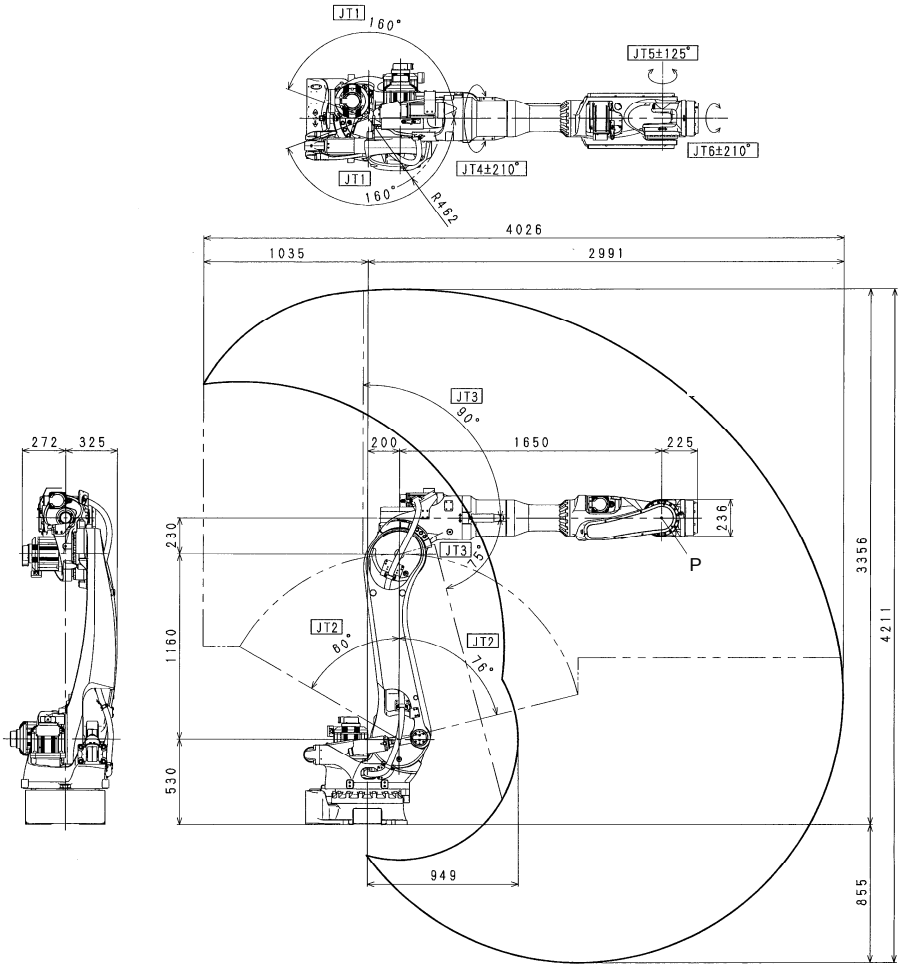


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±160 °	135 °/s
	2	+120 ° to -65 °	125 °/s
	3	+90 ° to -81 °	155 °/s
	4	±210 °	200 °/s
	5	±125 °	160 °/s
	6	±210 °	300 °/s
Max. Payload	100 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	830 N·m	85 kg·m^2
	5	830 N·m	85 kg·m^2
	6	441 N·m	45 kg·m^2
Repeatability	±0.2 mm		
Mass	720 kg		
Acoustic Noise	< 80 db (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 3600 mm away from JT1 center

Noise level depends on the conditions.

BX130X

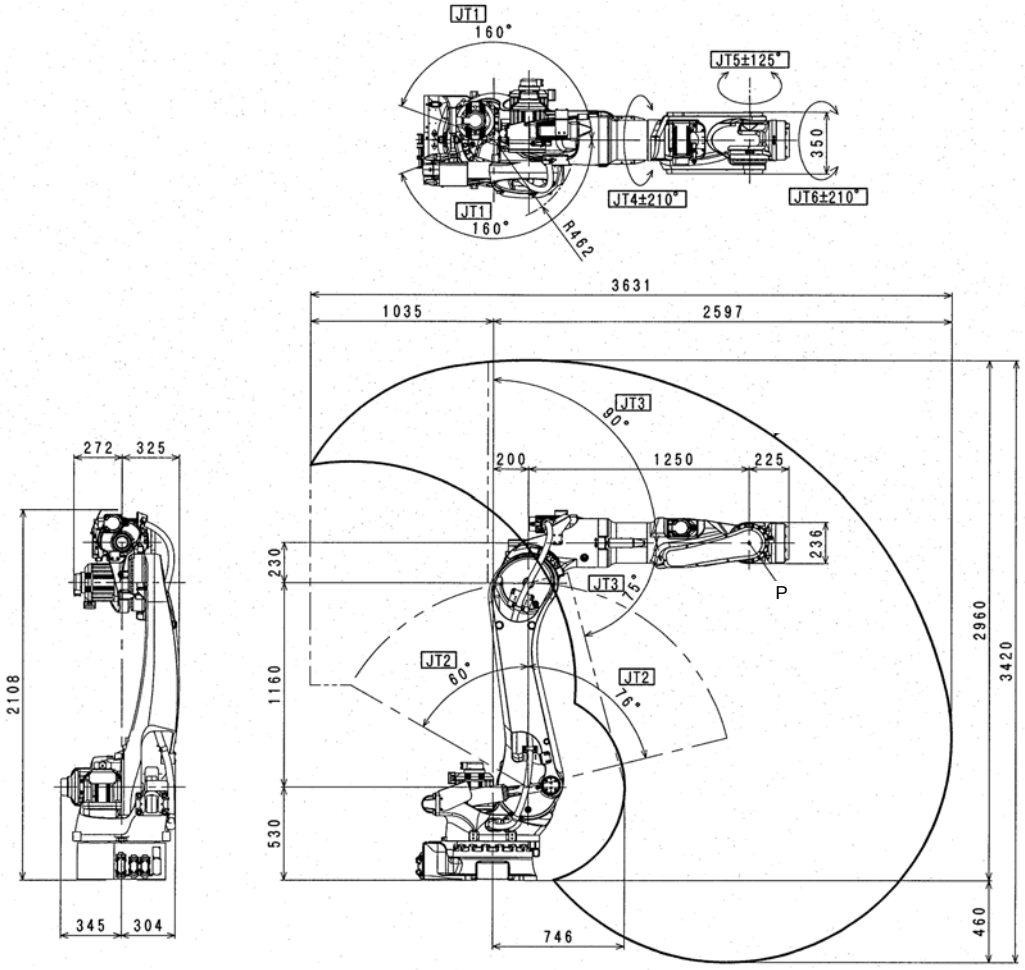


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±160 °	105 °/s
	2	+76 ° to -60 °	90 °/s
	3	+90 ° to -75 °	130 °/s
	4	±210 °	200 °/s
	5	±125 °	160 °/s
	6	±210 °	300 °/s
Max. Payload	130 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	830 N·m	85 kg·m^2
	5	830 N·m	85 kg·m^2
	6	441 N·m	45 kg·m^2
Repeatability	±0.2 mm		
Mass	970 kg		
Acoustic Noise	< 80 db (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 5000 mm away from JT1 center

Noise level depends on the conditions.

BX165L

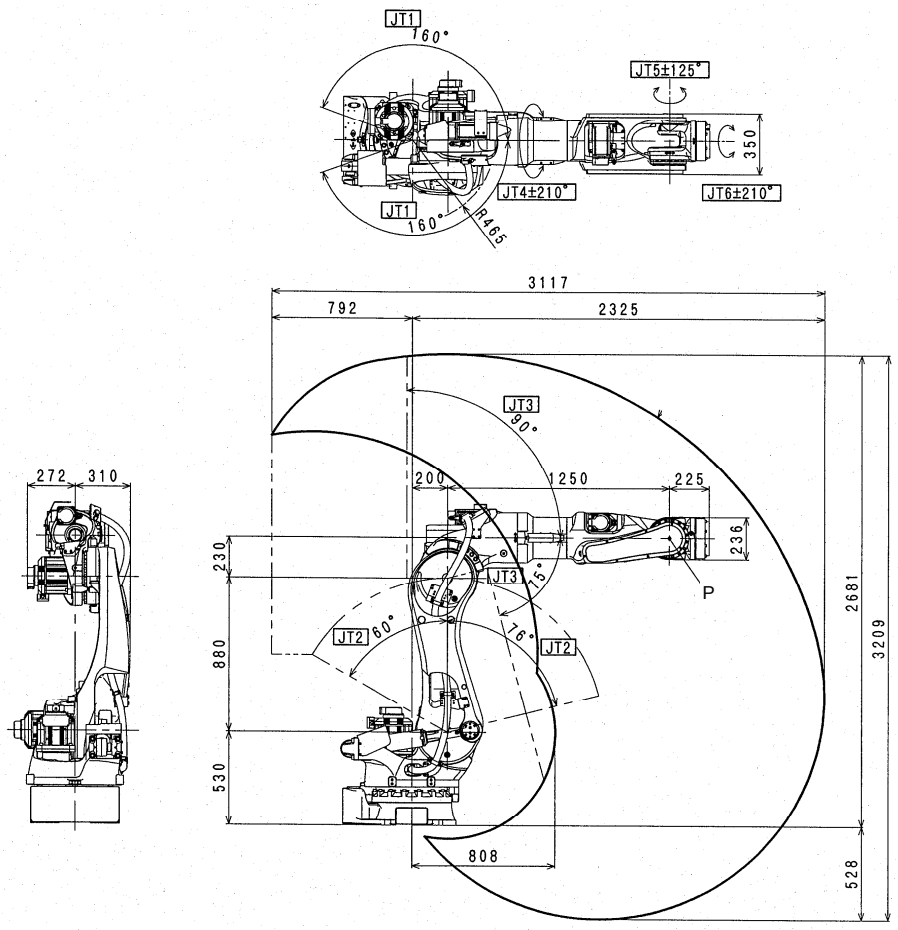


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±160 °	120 °/s
	2	+76 ° to -60 °	110 °/s
	3	+90 ° to -75 °	130 °/s
	4	±210 °	170 °/s
	5	±125 °	170 °/s
	6	±210 °	280 °/s
Max. Payload	165 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	952 N·m	99 kg·m^2
	5	952 N·m	99 kg·m^2
	6	491 N·m	49.5 kg·m^2
Repeatability	±0.2 mm		
Mass	930 kg		
Acoustic Noise	< 80 db (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 4600 mm away from JT1 center

Noise level depends on the conditions.

BX165N

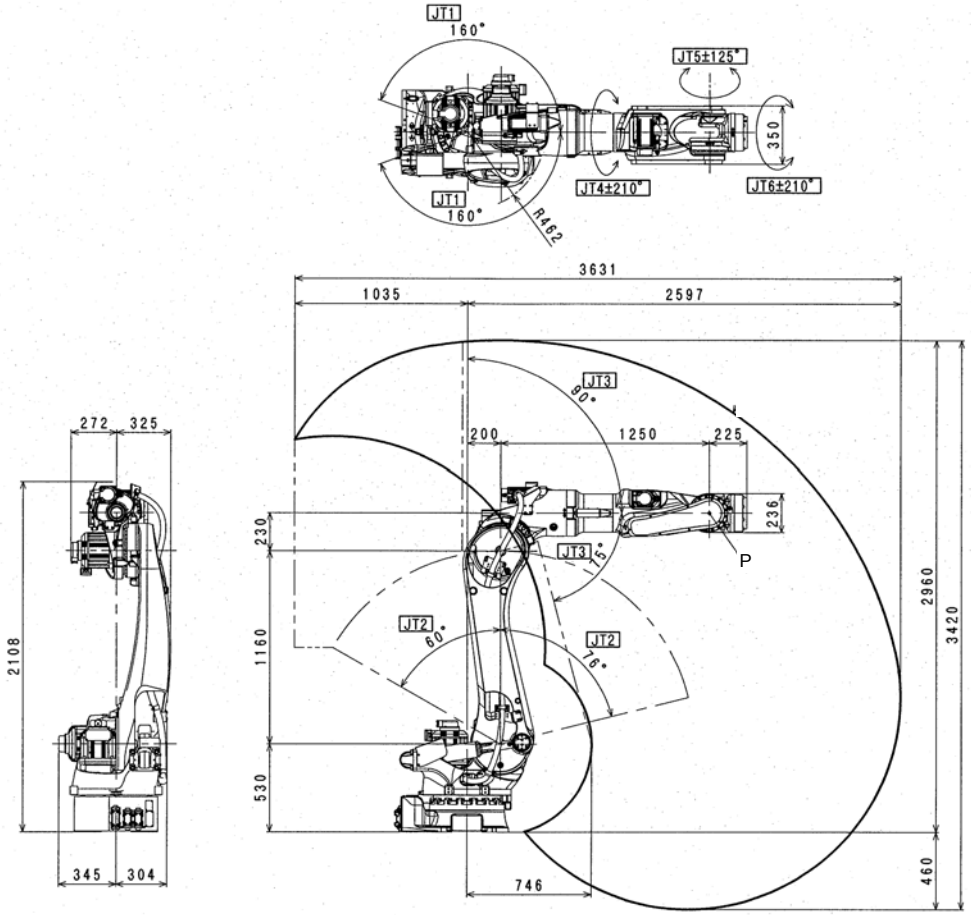


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±160 °	105 °/s
	2	+76 ° to -60 °	130 °/s
	3	+90 ° to -75 °	130 °/s
	4	±210 °	120 °/s
	5	±125 °	160 °/s
	6	±210 °	300 °/s
Max. Payload	165 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	930 N·m	99 kg·m^2
	5	930 N·m	99 kg·m^2
	6	490 N·m	49.5 kg·m^2
Repeatability	±0.2 mm		
Mass	903 kg		
Acoustic Noise	< 80 db (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 4300 mm away from JT1 center

Noise level depends on the conditions.

BX200L

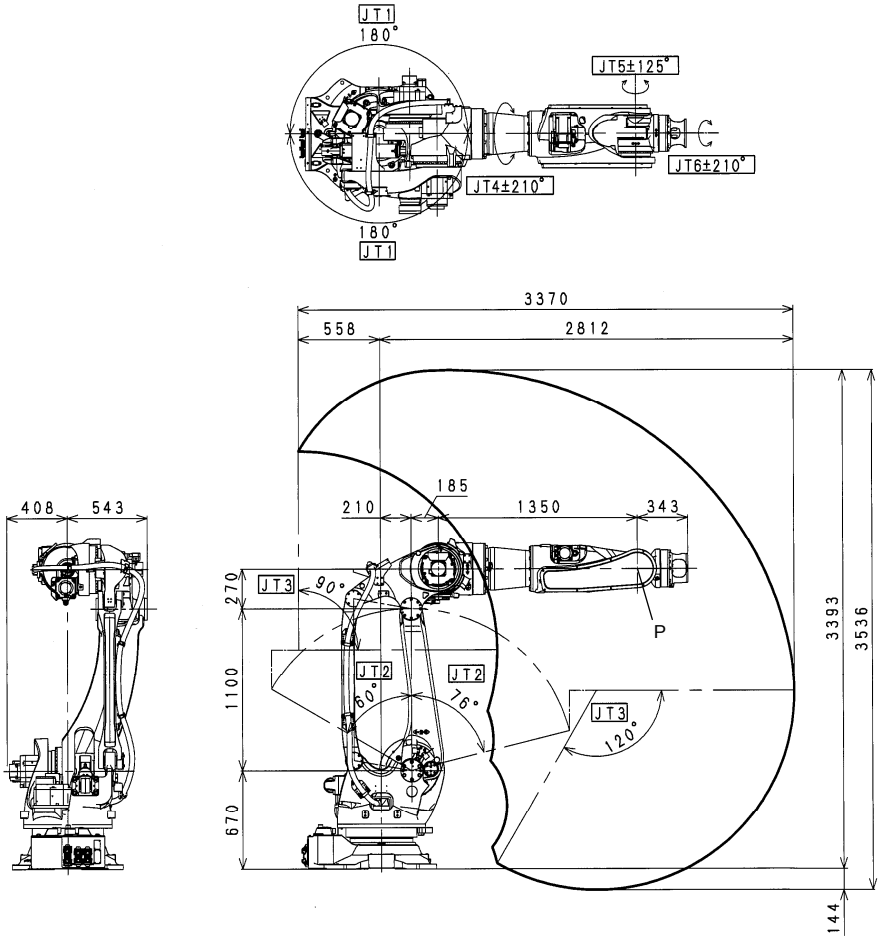


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±160 °	105 °/s
	2	+76 ° to -60 °	90 °/s
	3	+90 ° to -75 °	100 °/s
	4	±210 °	120 °/s
	5	±125 °	120 °/s
	6	±210 °	200 °/s
Max. Payload	200 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	1334.0 N·m	199.8 kg·m^2
	5	1334.0 N·m	199.8 kg·m^2
	6	588.0 N·m	154.9 kg·m^2
Repeatability	±0.2 mm		
Mass	930 kg		
Acoustic Noise	< 80 db (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 4600 mm away from JT1 center

Noise level depends on the conditions.

BX250L

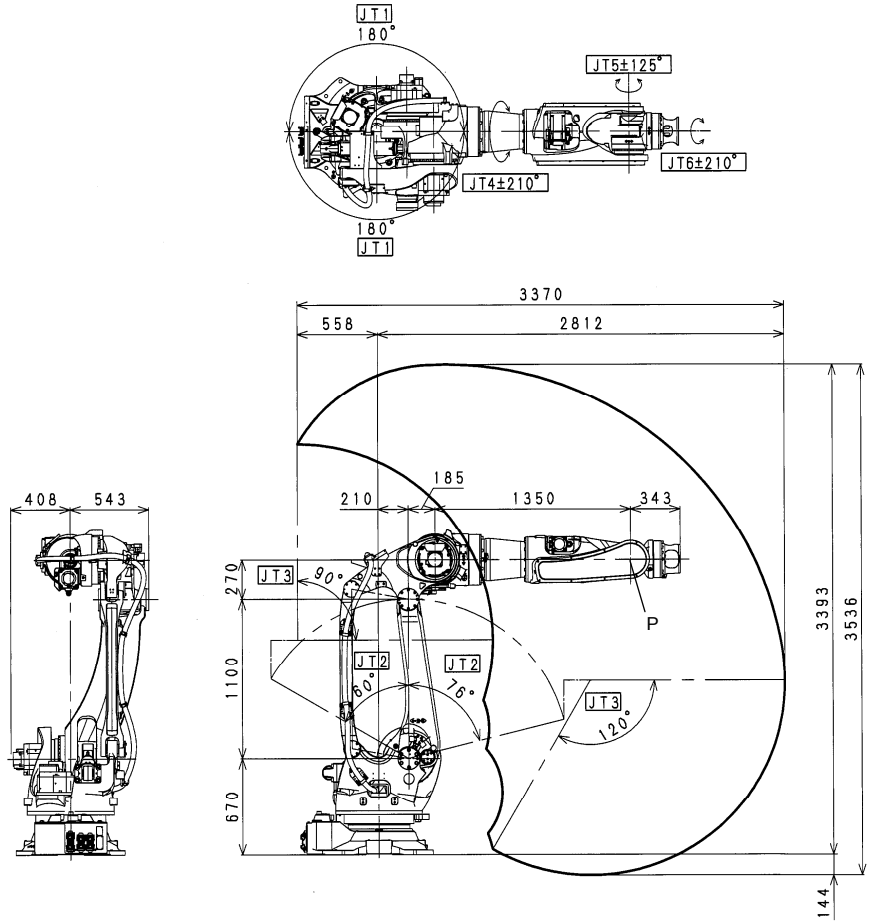


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180 °	125 °/s
	2	+76 ° to -60 °	120 °/s
	3	+90 ° to -120 °	100 °/s
	4	±210 °	140 °/s
	5	±125 °	140 °/s
	6	±210 °	200 °/s
Max. Payload	250 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	1800.0 N·m	200.0 kg·m^2
	5	1800.0 N·m	200.0 kg·m^2
	6	750.0 N·m	165.0 kg·m^2
Repeatability	±0.2 mm		
Mass	1460 kg		
Acoustic Noise	< 80 db (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 4800 mm away from JT1 center

Noise level depends on the conditions.

BX300L

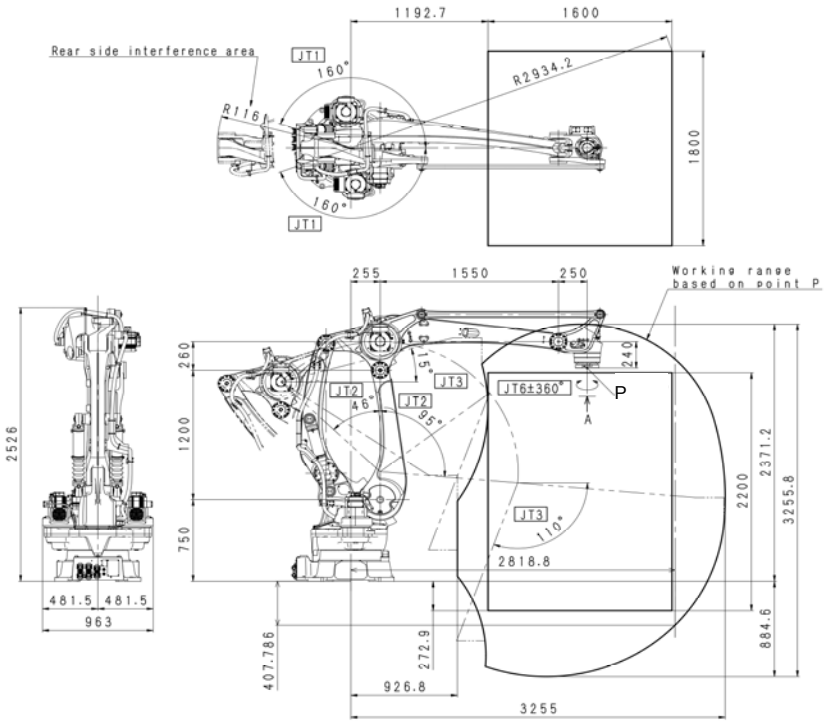


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180 °	125 °/s
	2	+76 ° to -60 °	102 °/s
	3	+90 ° to -120 °	85 °/s
	4	±210 °	105 °/s
	5	±125 °	110 °/s
	6	±210 °	180 °/s
Max. Payload	300 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	2300.0 N·m	240.0 kg·m^2
	5	1300.0 N·m	240.0 kg·m^2
	6	1000.0 N·m	200.0 kg·m^2
Repeatability	±0.2 mm		
Mass	1460 kg		
Acoustic Noise	< 80 db (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 4800 mm away from JT1 center

Noise level depends on the conditions.

CP180L



Type		Articulated Robot		
Degree of Freedom		4		
Motion Range		JT1	±160°(320°): When installing mechanical stopper ±180°(360°): When not installing mechanical stopper	
		JT2	+95° to -46°	
		JT3	+15° to -110°	
		JT4	±360°	
Maximum Speed		-	High speed spec.*	Standard spec.*
		JT1	140 °/s	130 °/s
		JT2	125 °/s	120 °/s
		JT3	130 °/s	125 °/s
		JT4	400 °/s	330 °/s
Wrist Load Capacity	Torque	JT4	-	-
	Moment of Inertia	JT4	50 kg·m^2	85 kg·m^2
Max. Payload		-	130 kg	180 kg
Repeatability		±0.5 mm		
Mass		1600 kg		
Acoustic Noise		<80 dB (A)**		

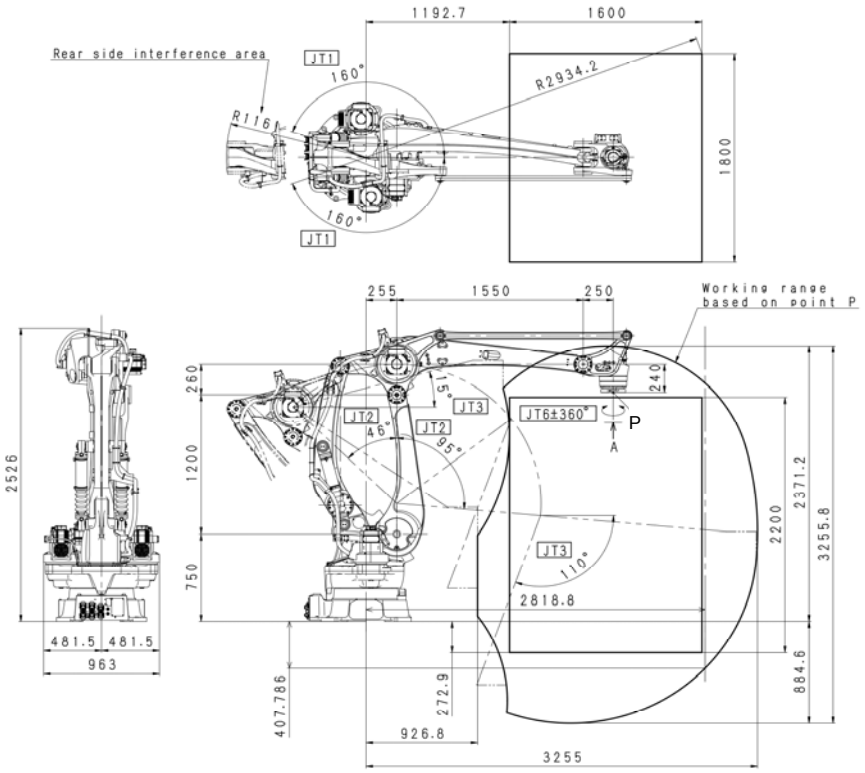
*Maximum speed and moment of inertia change depending on max. payload (130 kg - 180 kg).

**measured condition

- installed on the plate rigidly fixed on the floor
- 5255 mm away from JT1 center

Noise level depends on the conditions.

CP300L



Type		Articulated Robot		
Degree of Freedom		4		
Motion Range		JT1	±160°(320°): When installing mechanical stopper ±180°(360°): When not installing mechanical stopper	
		JT2	+95° to -46°	
		JT3	+15° to -110°	
		JT4	±360°	
Maximum Speed		-	High speed spec.*	Standard spec.*
		JT1	115 °/s	100 °/s
		JT2	100 °/s	90 °/s
		JT3	100 °/s	90 °/s
		JT4	250 °/s	220 °/s
Wrist Load Capacity	Torque	JT4	-	-
	Moment of Inertia	JT4	100 kg·m^2	140 kg·m^2
Max. Payload		-	250 kg	300 kg
Repeatability		±0.5 mm		
Mass		1600 kg		
Acoustic Noise		<80 dB (A)**		

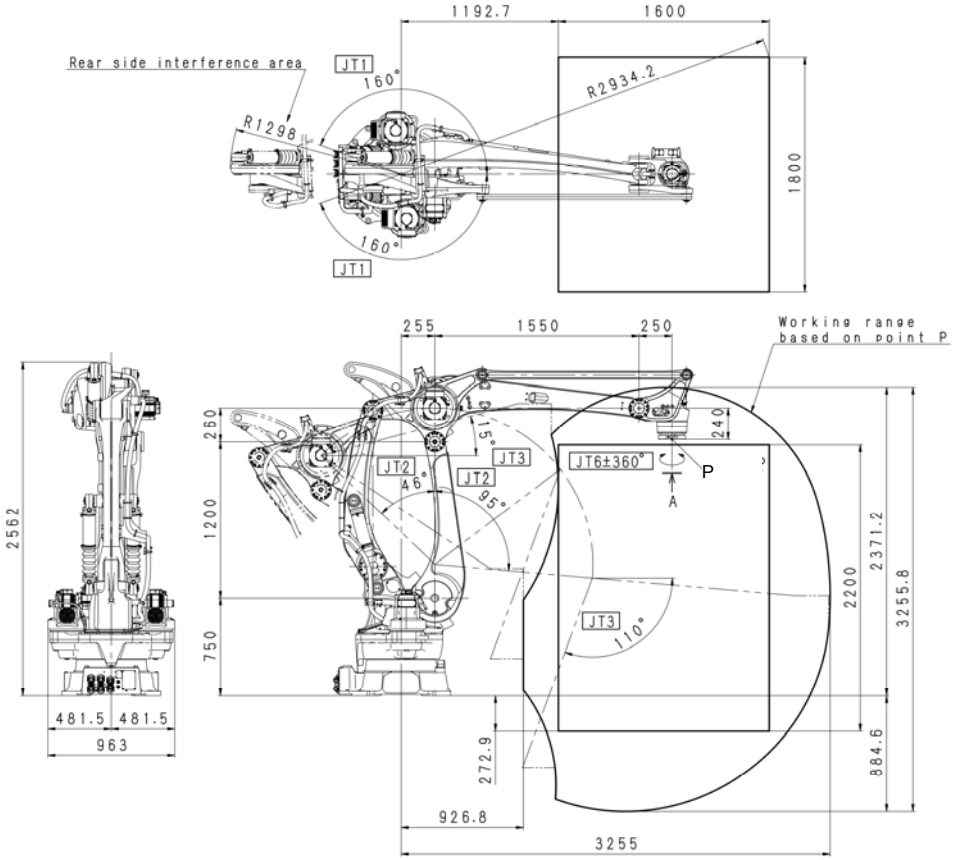
*Maximum speed and moment of inertia change depending on max. payload (250 kg - 300 kg).

**measured condition

- installed on the plate rigidly fixed on the floor
- 5255 mm away from JT1 center

Noise level depends on the conditions.

CP500L



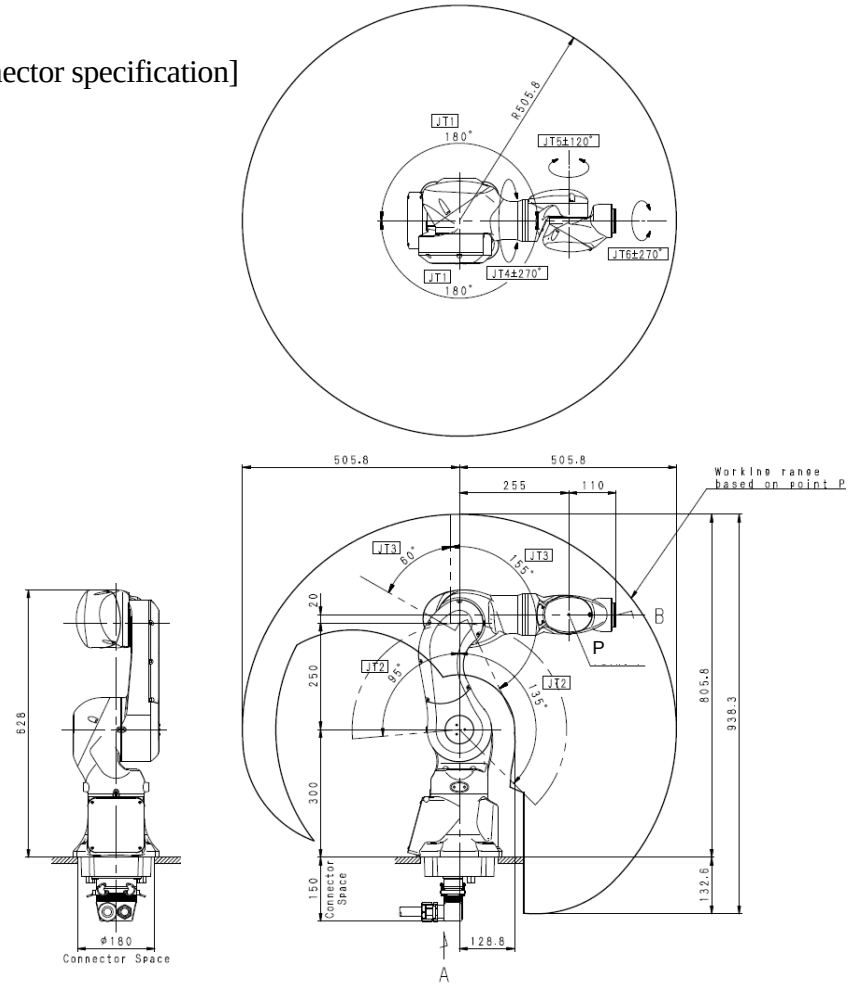
Type	Articulated Robot		
Degree of Freedom	4		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±160°(320°): When installing mechanical stopper ±180°(360°): When not installing mechanical stopper	85 °/s
	2	+95° to -46°	80 °/s
	3	+15° to -110°	80 °/s
	4	±360°	180 °/s
Max. Payload	500 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	-	250 kg·m^2
Repeatability	±0.5 mm		
Mass	1650 kg		
Acoustic Noise	<80 dB (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 5255 mm away from JT1 center

Noise level depends on the conditions.

MC004N

[Bottom connector specification]

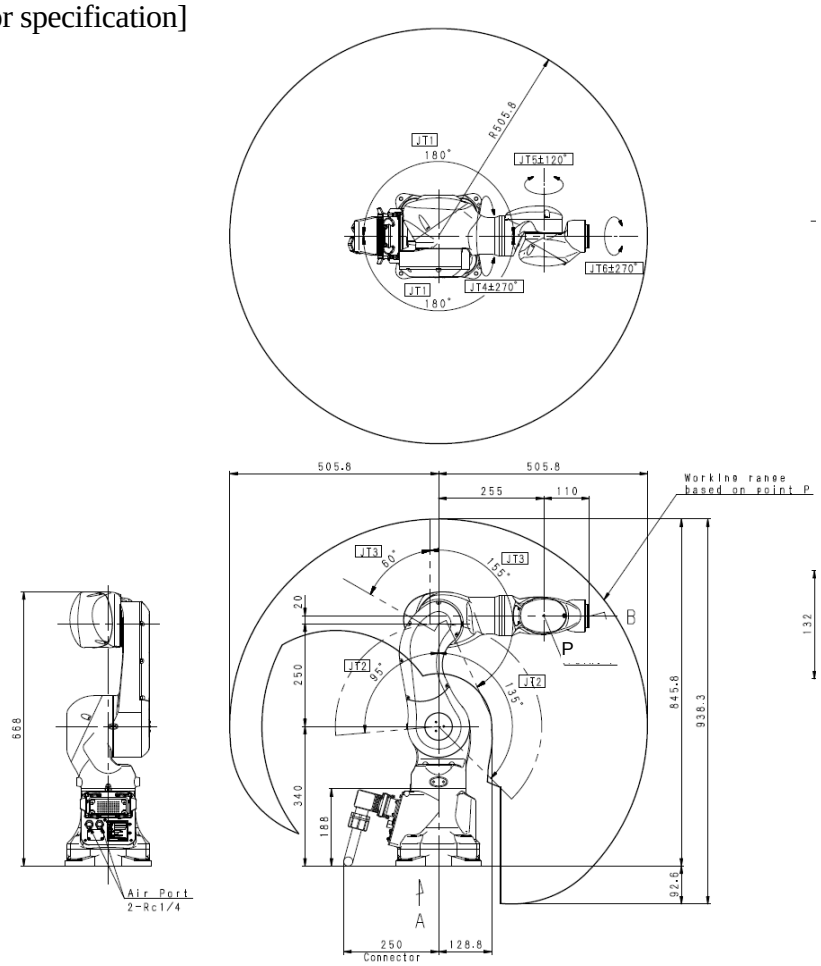


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	200 °/s
	2	+135° to -95°	180 °/s
	3	+60° to -155°	225 °/s
	4	±270°	700 °/s
	5	±120°	500 °/s
	6	±270°	350 °/s
Max. Payload	4 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	8.5 N·m	0.2 kg·m^2
	5	8.5 N·m	0.2 kg·m^2
	6	4.0 N·m	0.1 kg·m^2
Repeatability	±0.05 mm		
Mass	25 kg		
Acoustic Noise	<70 dB (A)*		

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

Noise level depends on the conditions.

[Backside connector specification]

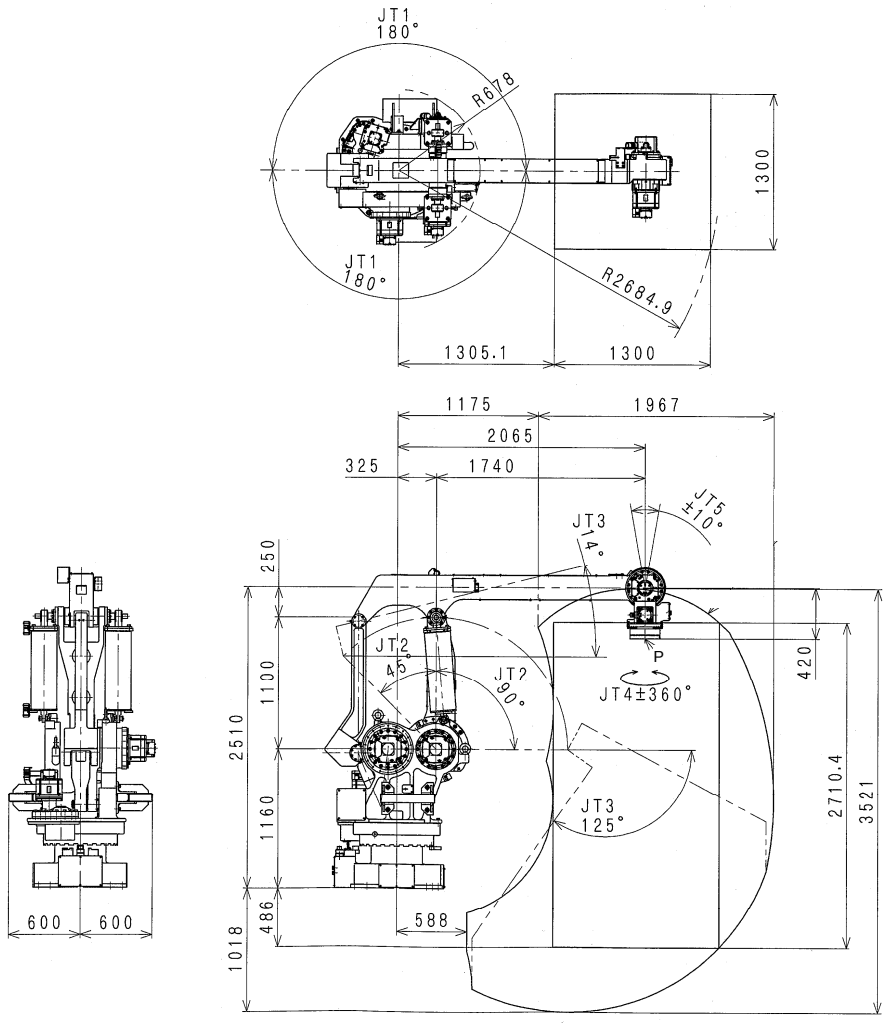


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	200 °/s
	2	+135° to -95°	180 °/s
	3	+60° to -155°	225 °/s
	4	±270°	700 °/s
	5	±120°	500 °/s
	6	±270°	350 °/s
Max. Payload	4 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	8.5 N·m	0.2 kg·m^2
	5	8.5 N·m	0.2 kg·m^2
	6	4.0 N·m	0.1 kg·m^2
Repeatability	±0.05 mm		
Mass	25 kg		
Acoustic Noise	<70 dB (A)*		

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

Noise level depends on the conditions.

MD400N

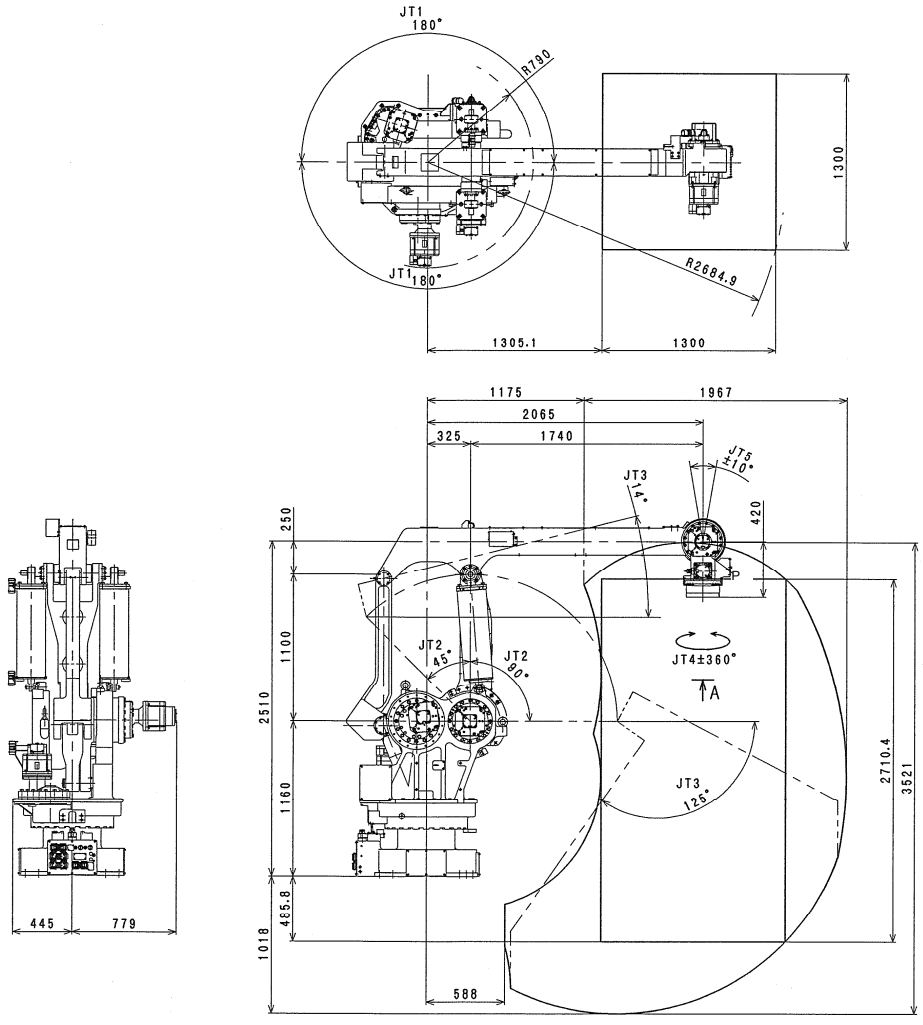


Type	Articulated Robot		
Degree of Freedom	5		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	80 °/s
	2	+90° to -45°	70 °/s
	3	+14° to -125°	70 °/s
	4	±360°	180 °/s
	5	±10°	-
	*±10° in vertical direction		
Max. Payload	400 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	-	200 kg·m^2
Repeatability	±0.5 mm		
Mass	Approx. 2650 kg		
Acoustic Noise	< 70 db (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 5142 mm away from JT1 center

Noise level depends on the conditions.

MD500N

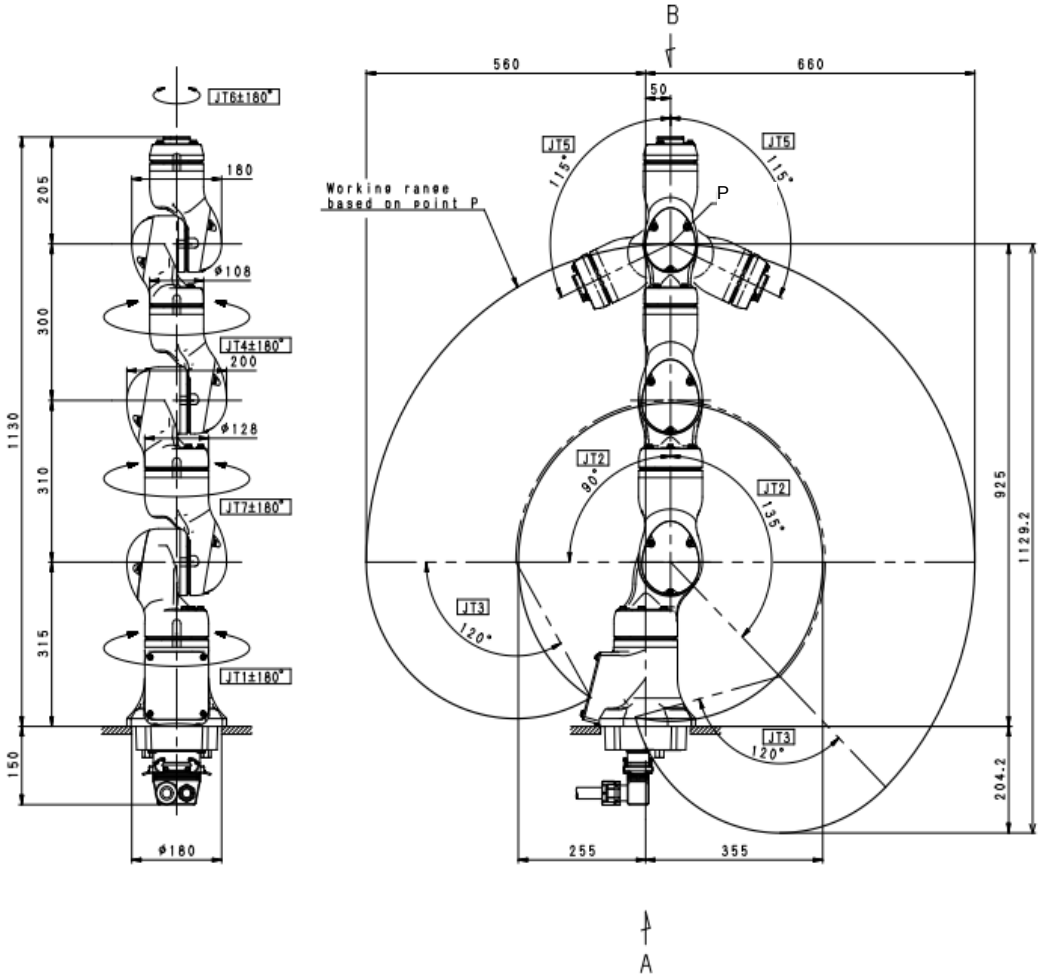


Type	Articulated Robot		
Degree of Freedom	5		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	+180° to -180°	70 °/s
	2	+90° to -45°	65 °/s
	3	+14° to -125°	45 °/s
	4	+360° to -360°	160 °/s
	5	+10° to -10°	-
	*±10° in vertical direction		
Max. Payload	500 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	-	250 kg·m^2
Repeatability	±0.5 mm		
Mass	Approx. 2680 kg		
Acoustic Noise	< 70 db (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 5142 mm away from JT1 center

Noise level depends on the conditions.

MS005N

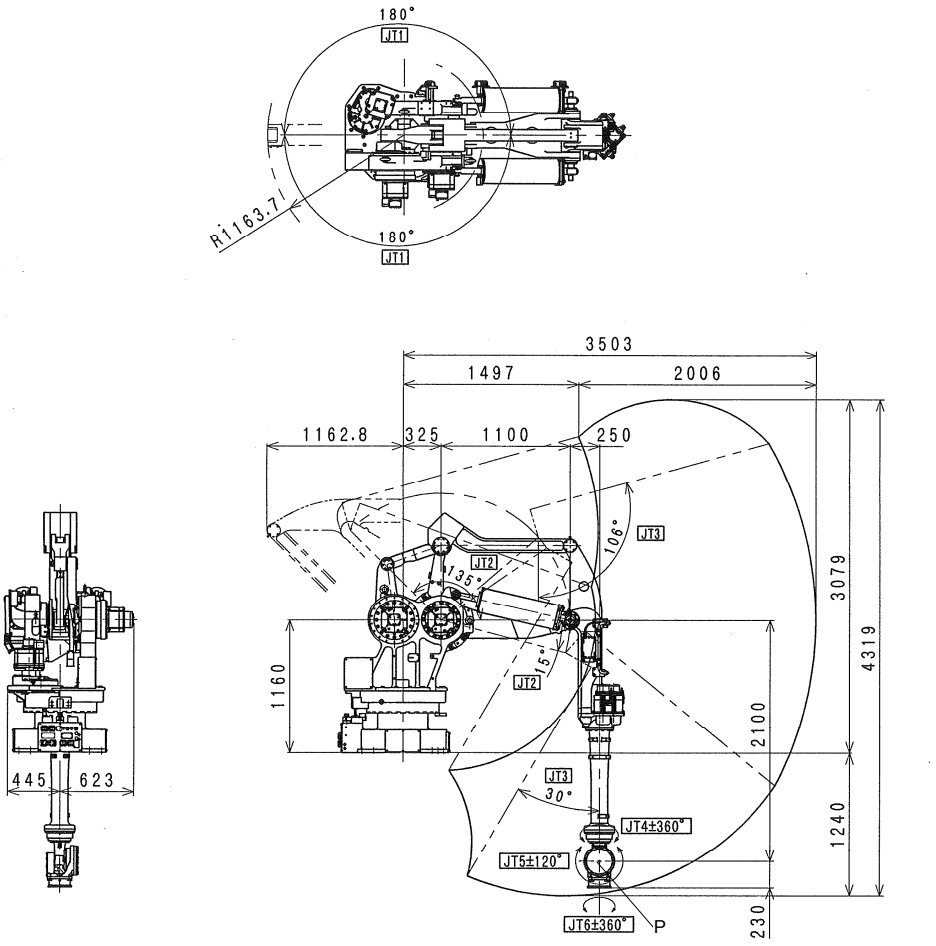


Type	Articulated Robot		
Degree of Freedom	7		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	130 °/s
	2	+135° to -90°	130 °/s
	3	±120°	215 °/s
	4	±180°	300 °/s
	5	±115°	300 °/s
	6	±180°	480 °/s
	7	±180°	215 °/s
Max. Payload	5 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	17 N·m	0.9 kg·m^2
	5	17 N·m	0.9 kg·m^2
	6	7 N·m	0.4 kg·m^2
Repeatability	±0.1 mm		
Mass	50 kg		
Acoustic Noise	<70 dB (A)*****		

*measured condition
- installed on the plate rigidly fixed on the floor
- 1700 mm away from JT1 center

Noise level depends on the conditions.

MT400N



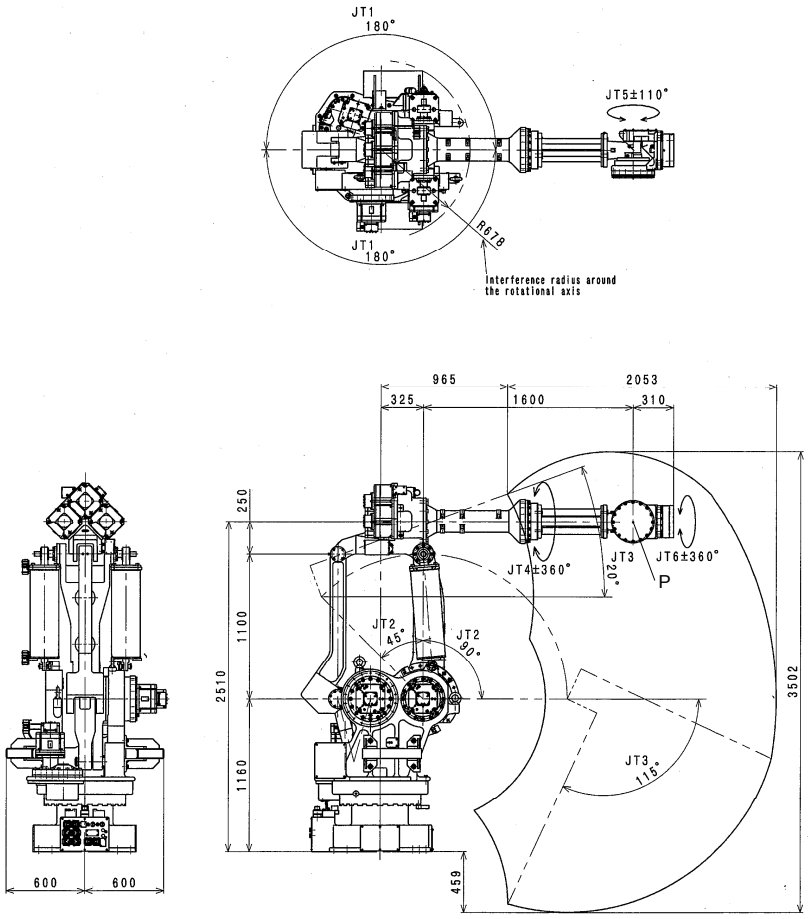
Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	80 °/s
	2	+15° to -135°	70 °/s
	3	+106° to -30°	70 °/s
	4	±360°	70 °/s
	5	±120°	70 °/s
	6	±360°	130 °/s
Max. Payload	400 kg*		
Wrist Load Capacity Load mass: below 380 kg	JT	Torque	Moment of Inertia
	4	2150 N·m	200 kg·m^2
	5	2150 N·m	200 kg·m^2
	6	980 N·m	147 kg·m^2
Repeatability	±0.5 mm		
Mass	Approx. 2600 kg		
Acoustic Noise	< 70 db (A)**		

*If load mass exceeds 380 kg, the wrist flange surface should face downward vertically without fail.

**measured condition
- installed on the plate rigidly fixed on the floor
- 5020 mm away from JT1 center

Noise level depends on the conditions.

MX350L

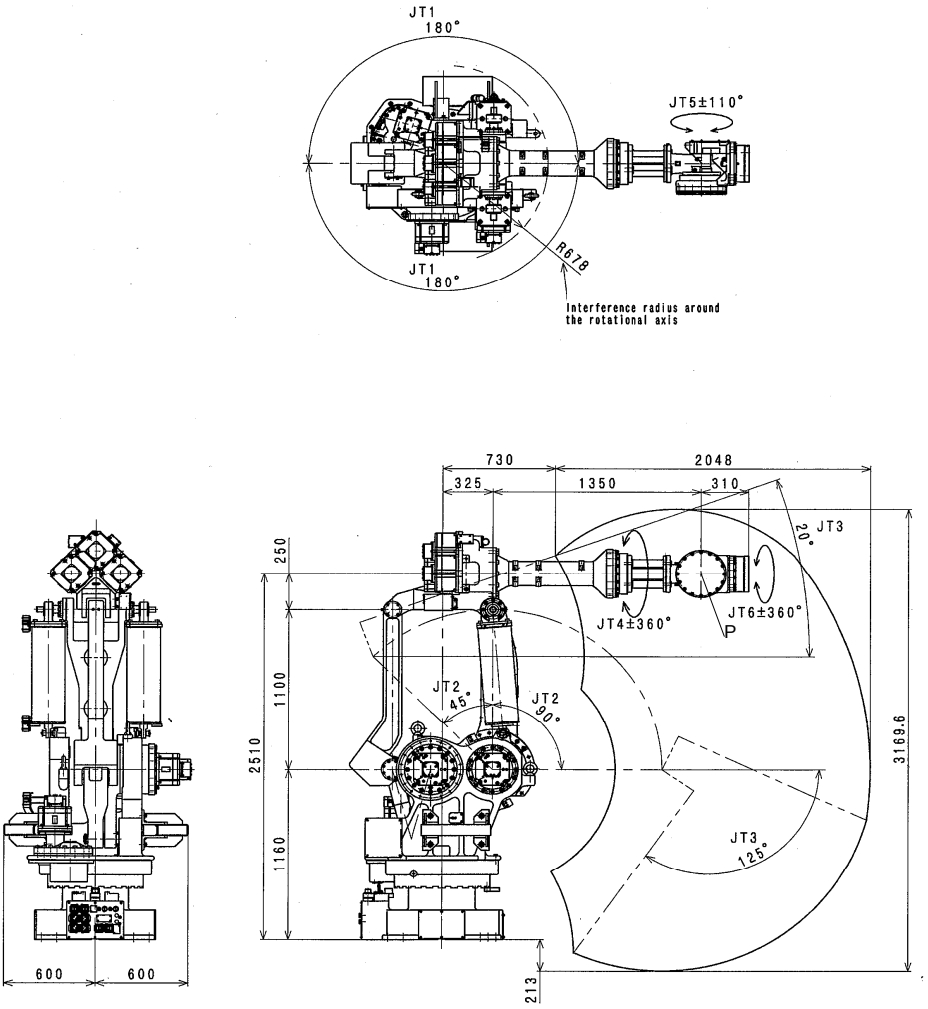


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	80 °/s
	2	+90° to -45°	70 °/s
	3	+20° to -115°	70 °/s
	4	±360°	80 °/s
	5	±110°	80 °/s
	6	±360°	120 °/s
Max. Payload	350 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	2740 N·m	400 kg·m^2
	5	2740 N·m	400 kg·m^2
	6	1960 N·m	259 kg·m^2
Repeatability	±0.5 mm		
Mass	Approx. 2800 kg		
Acoustic Noise	< 70 db (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 5020 mm away from JT1 center

Noise level depends on the conditions.

MX420L

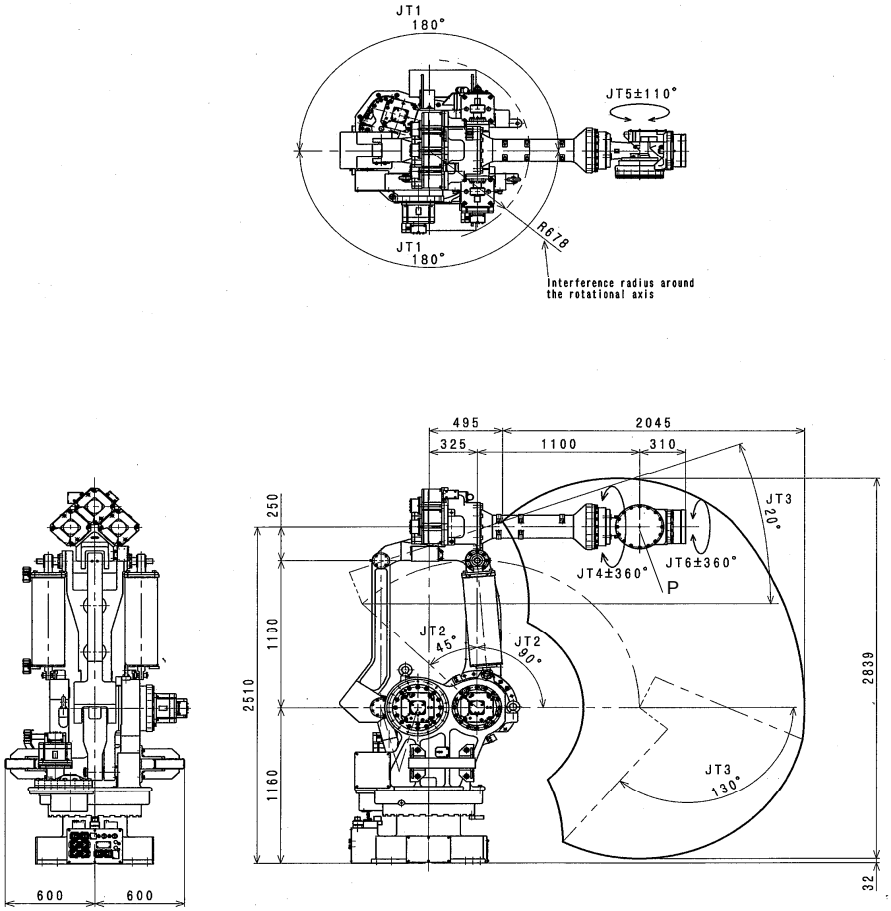


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	80 °/s
	2	+90° to -45°	70 °/s
	3	+20° to -125°	70 °/s
	4	±360°	80 °/s
	5	±110°	80 °/s
	6	±360°	120 °/s
Max. Payload	420 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	3290 N·m	400 kg·m^2
	5	3290 N·m	400 kg·m^2
	6	1960 N·m	259 kg·m^2
Repeatability	±0.5 mm		
Mass	Approx. 2800 kg		
Acoustic Noise	< 70 db (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 4780 mm away from JT1 center

Noise level depends on the conditions.

MX500N

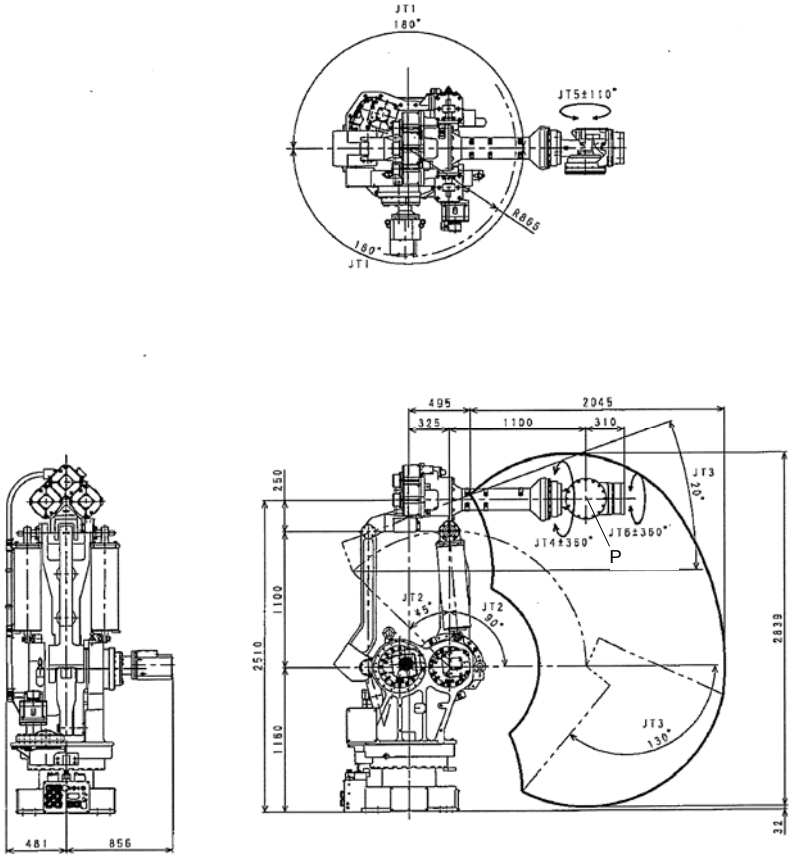


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	+180° to -180°	80 °/s
	2	+90° to -45°	70 °/s
	3	+20° to -130°	70 °/s
	4	+360° to -360°	80 °/s
	5	+110° to -110°	80 °/s
	6	+360° to -360°	120 °/s
Max. Payload	500 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	3920 N·m	400 kg·m^2
	5	3920 N·m	400 kg·m^2
	6	1960 N·m	259 kg·m^2
Repeatability	±0.5 mm		
Mass	Approx. 2750 kg		
Acoustic Noise	< 70 db (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 4540 mm away from JT1 center

Noise level depends on the conditions.

MX700N

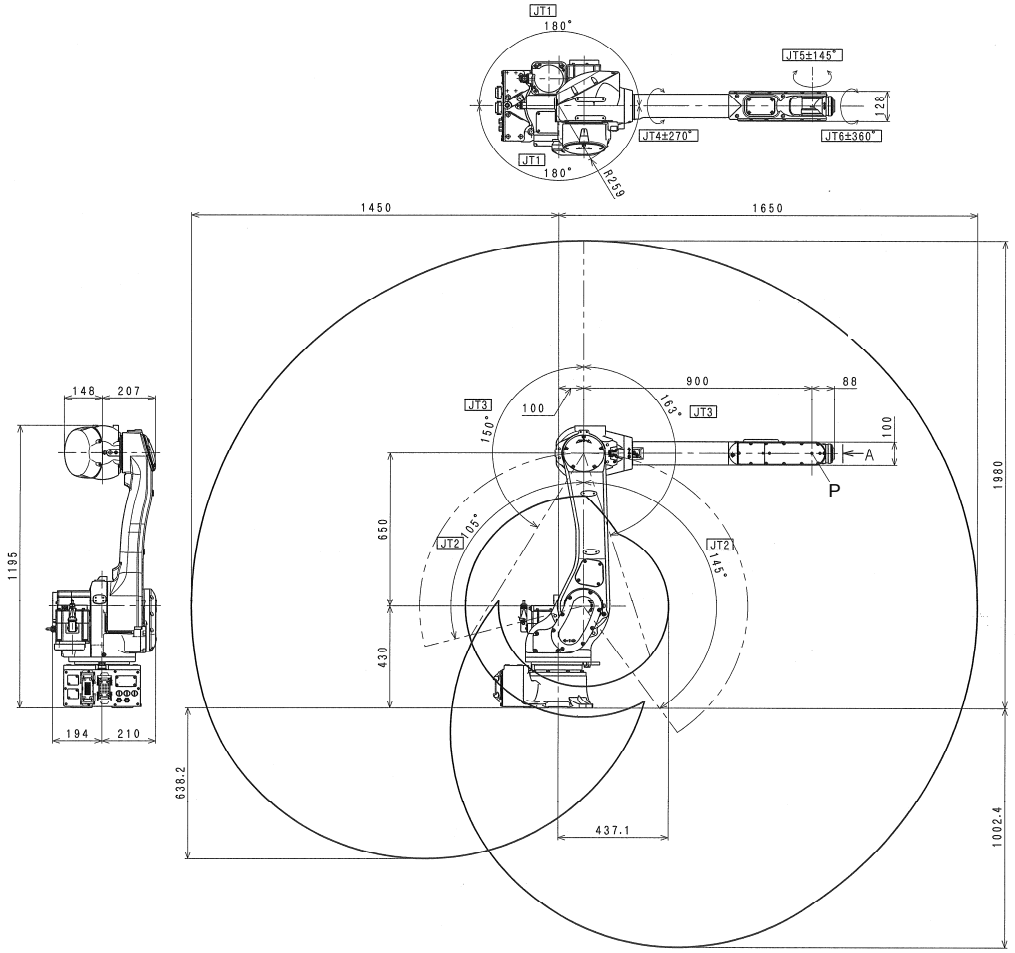


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	65 °/s
	2	+90° to -45°	50 °/s
	3	+20° to -130°	45 °/s
	4	±360°	50 °/s
	5	±110°	50 °/s
	6	±360°	95 °/s
Max. Payload	700 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	5488 N·m	600 kg·m^2
	5	5488 N·m	600 kg·m^2
	6	2744 N·m	388 kg·m^2
Repeatability	±0.5 mm		
Mass	Approx. 2860 kg		
Acoustic Noise	< 70 db (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 4540 mm away from JT1 center

Noise level depends on the conditions.

RA06L/RS06L

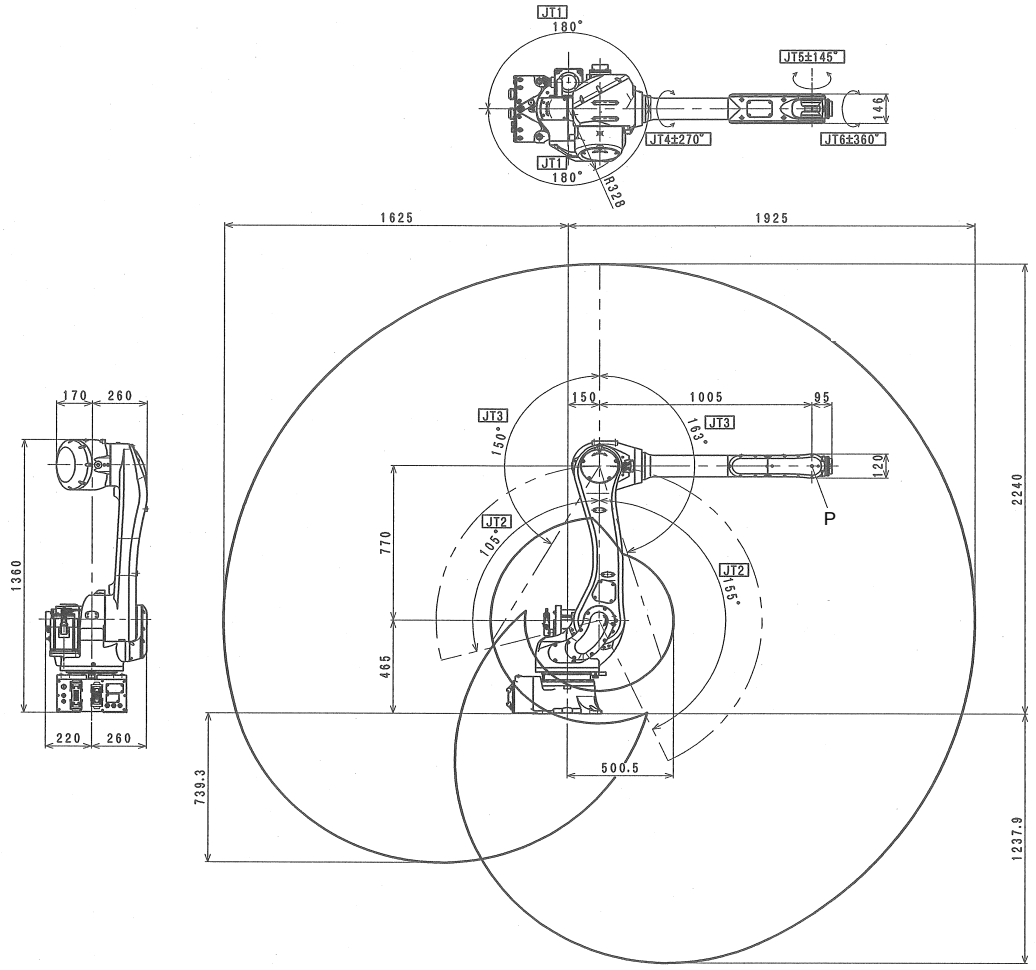


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	250 °/s
	2	+145° to -105°	250 °/s
	3	+150° to -163°	215 °/s
	4	±270°	365 °/s
	5	±145°	380 °/s
	6	±360°	700 °/s
Max. Payload	6 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	13.0 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

Noise level depends on the conditions.

RA10L/RS10L

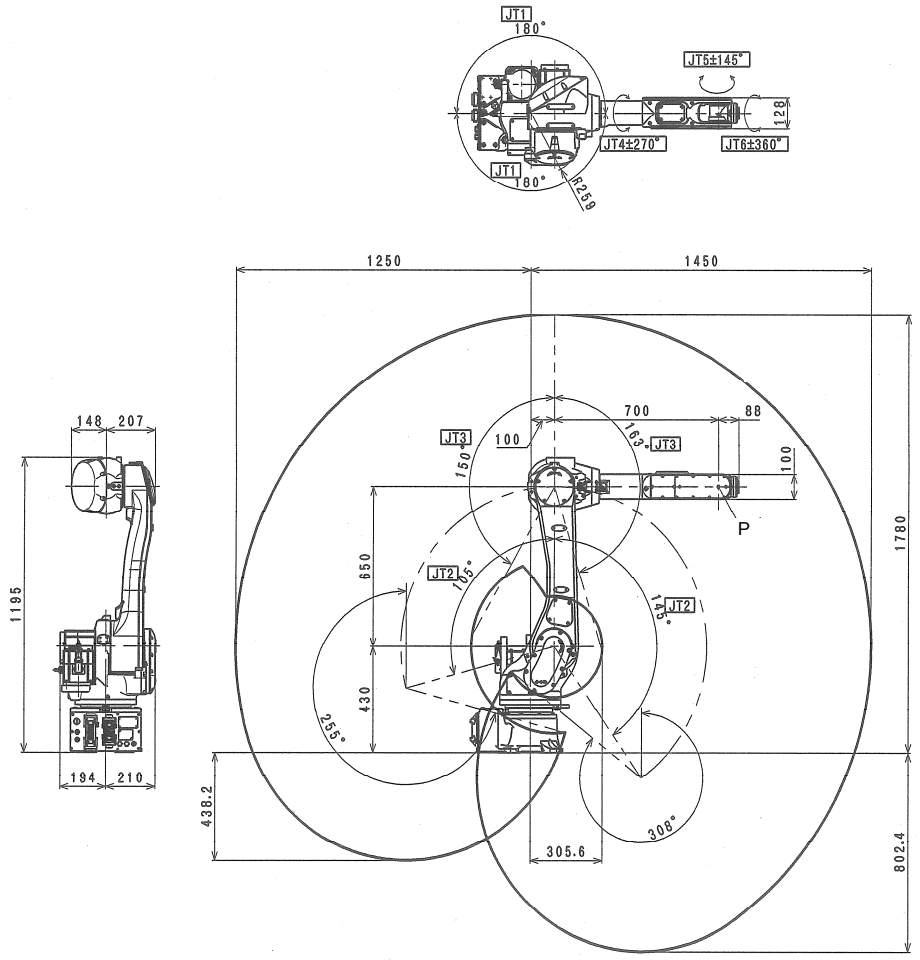


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	190 °/s
	2	+155° to -105°	205 °/s
	3	+150° to -163°	210 °/s
	4	±270°	400 °/s
	5	±145°	360 °/s
	6	±360°	610 °/s
Max. Payload	10 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	22.0 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

Noise level depends on the conditions.

RA10N/RS10N

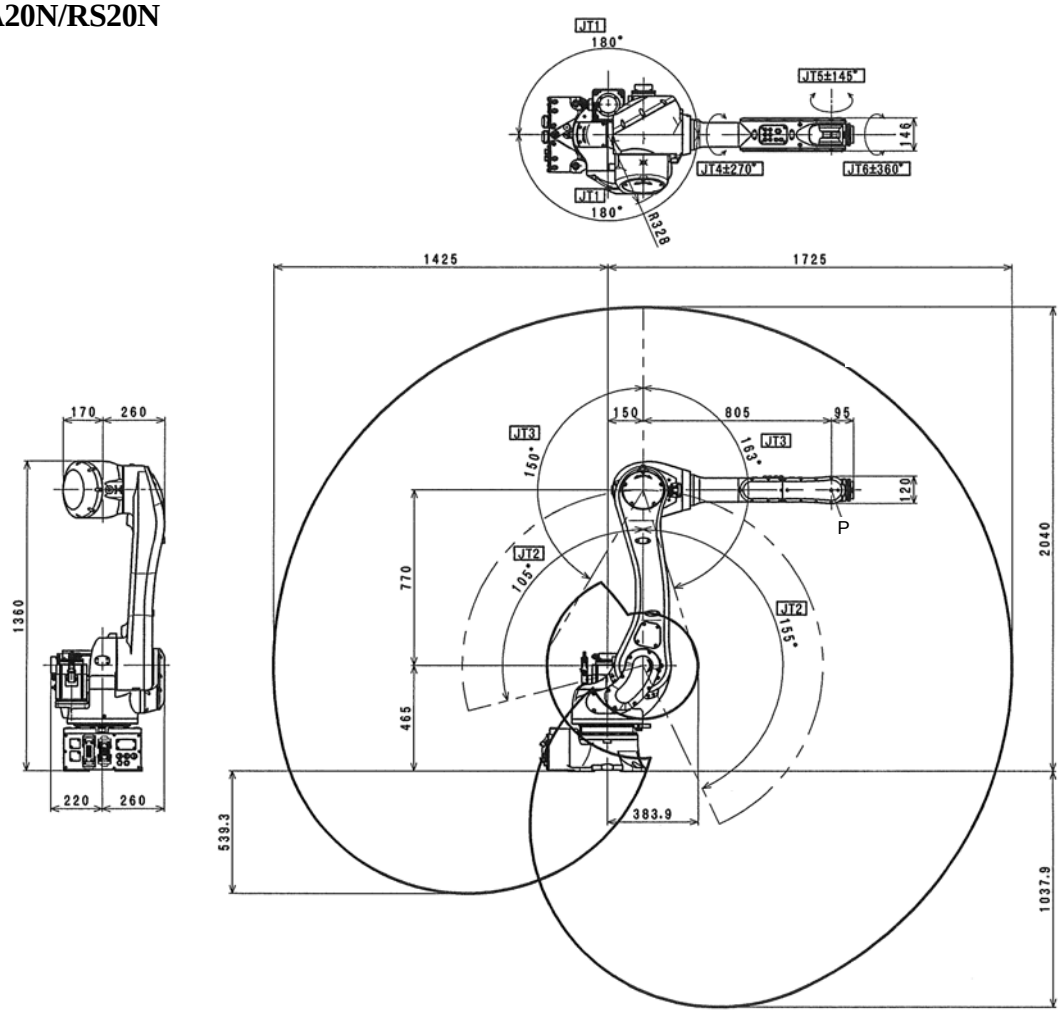


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	250 °/s
	2	+145° to -105°	250 °/s
	3	+150° to -163°	215 °/s
	4	±270°	365 °/s
	5	±145°	380 °/s
	6	±360°	700 °/s
Max. Payload	10 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	22.0 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

Noise level depends on the conditions.

RA20N/RS20N

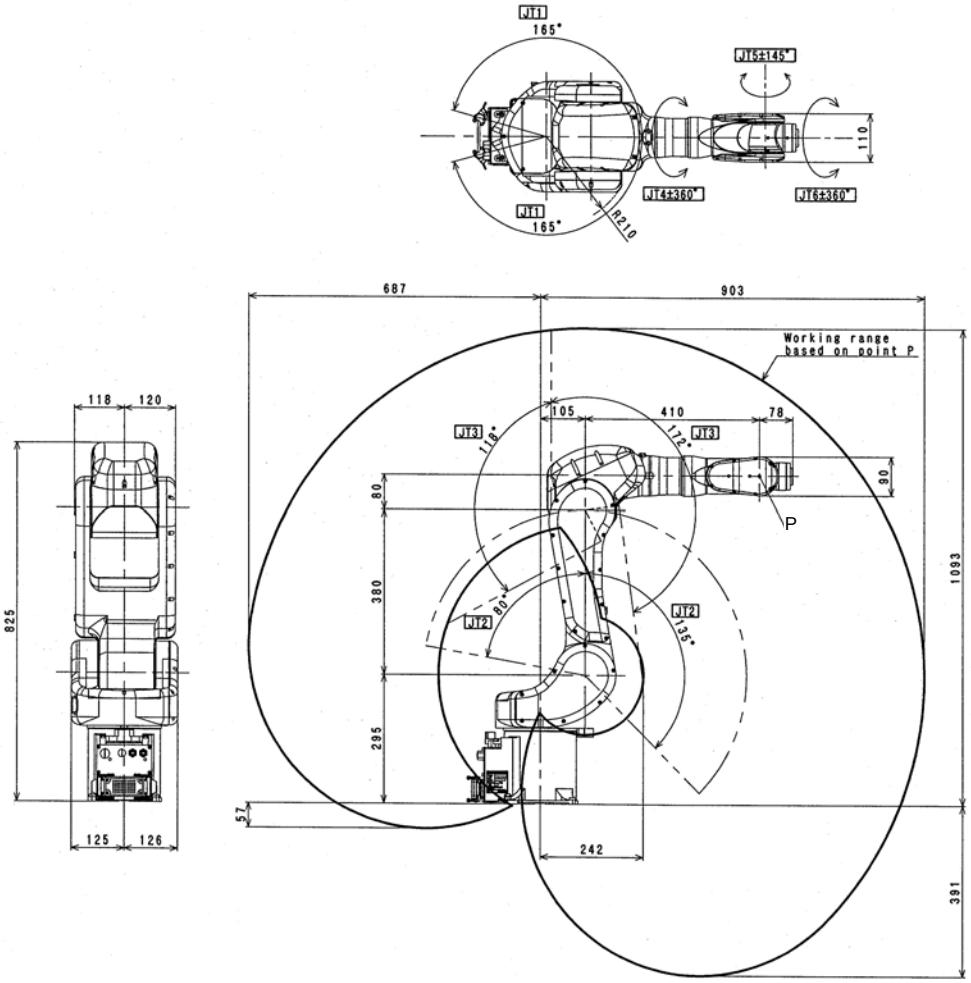


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	190 °/s
	2	+155° to -105°	205 °/s
	3	+150° to -163°	210 °/s
	4	±270°	400 °/s
	5	±145°	360 °/s
	6	±360°	610 °/s
Max. Payload	20 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	45.0 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

Noise level depends on the conditions.

RC05L

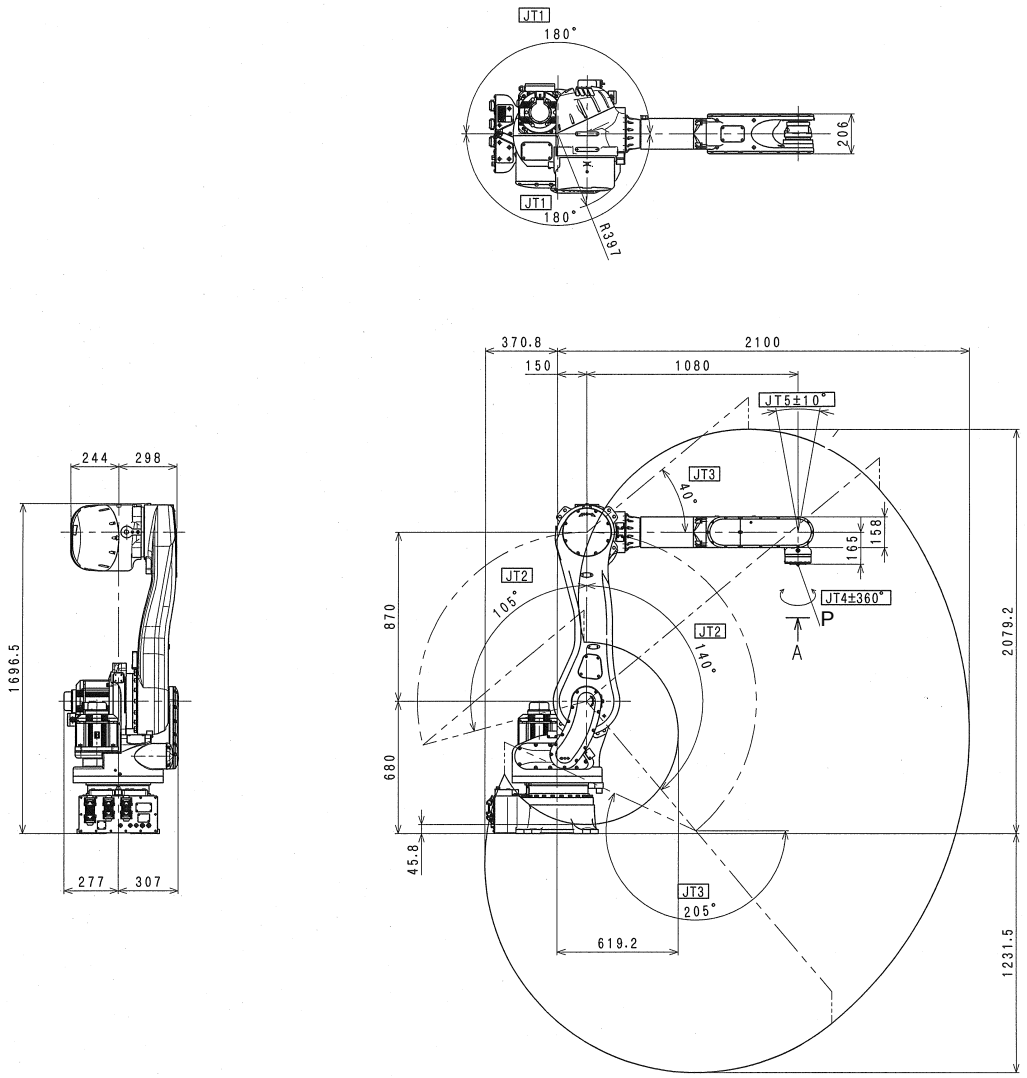


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±165°	300 °/s
	2	+135° to -80°	300 °/s
	3	+118° to -172°	300 °/s
	4	±360°	460 °/s
	5	±145°	460 °/s
	6	±360°	740 °/s
Max. Payload	5 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	12.3 N·m	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

Noise level depends on the conditions.

RD80N

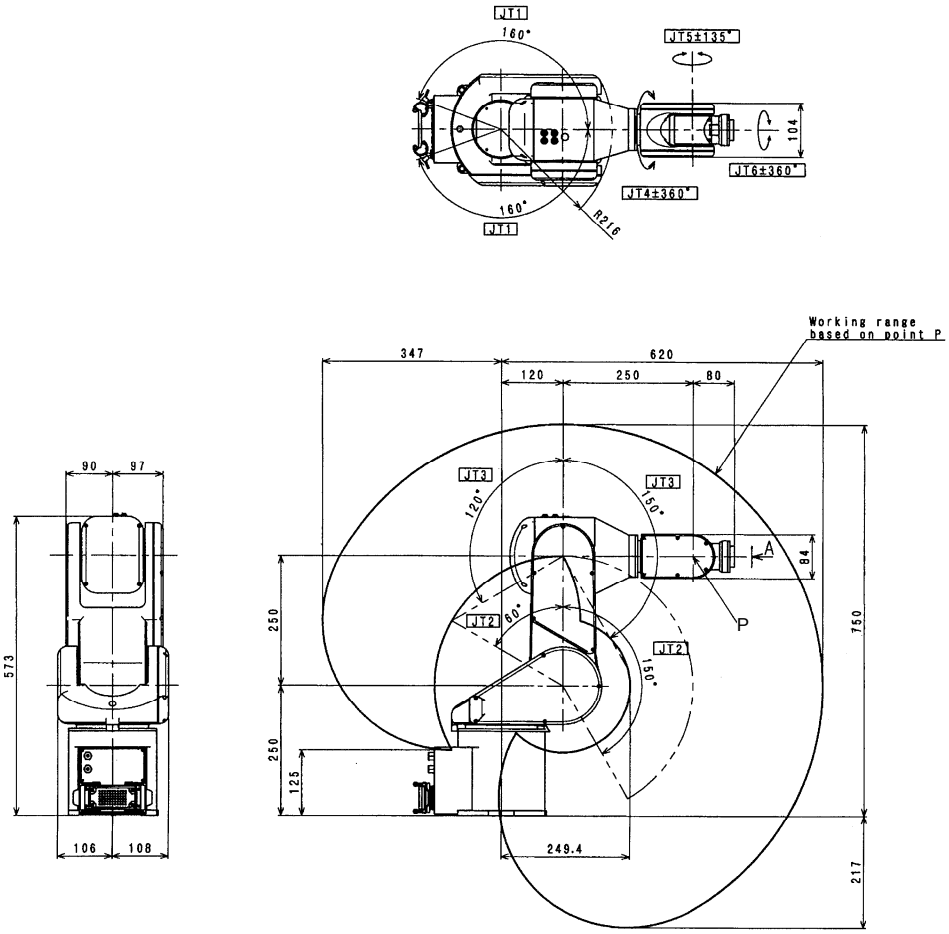


Type	Articulated Robot		
Degree of Freedom	5		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	180 °/s
	2	+140° to -105°	180 °/s
	3	+40° to -205°	175 °/s
	4	±360°	360 °/s
	5	±10° **	-
	**±10° in vertical direction		
Max. Payload	80 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	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

Noise level depends on the conditions.

RS03N

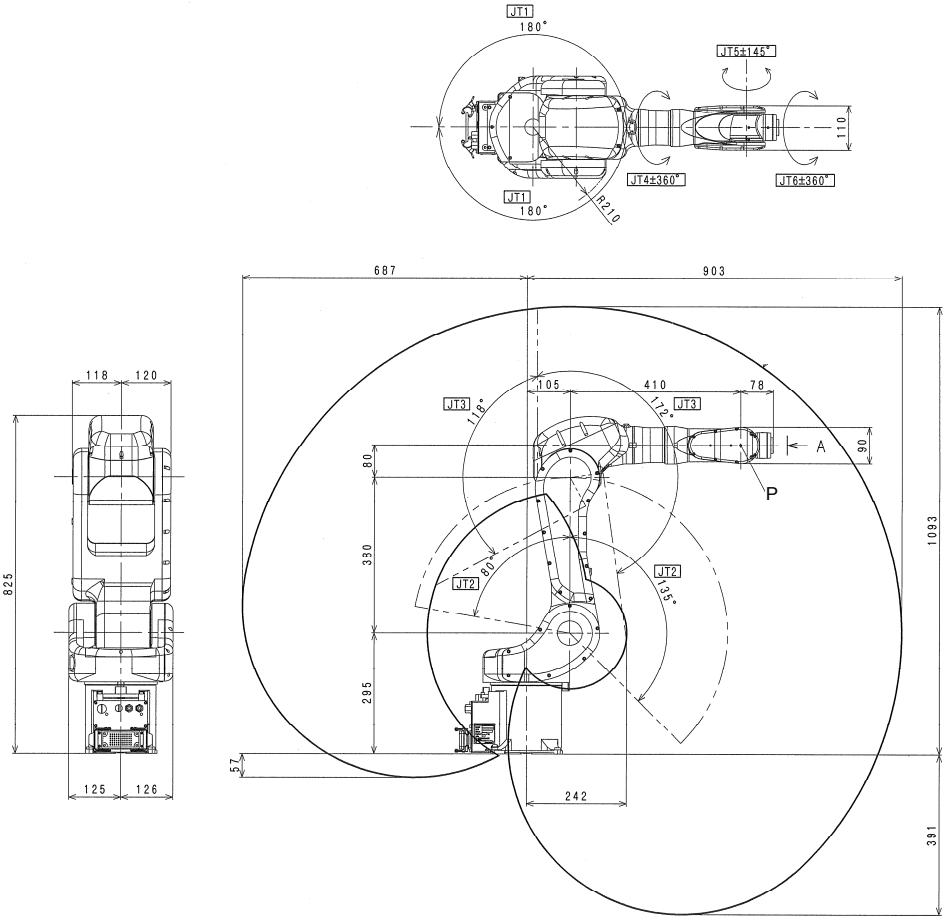


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±160°	360 °/s
	2	+150° to -60°	250 °/s
	3	+120° to -150°	225 °/s
	4	±360°	540 °/s
	5	±135°	225 °/s
	6	±360°	540 °/s
Max. Payload	3 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	5.8 N·m	0.12 kg·m^2
	5	5.8 N·m	0.12 kg·m^2
	6	2.9 N·m	0.03 kg·m^2
Repeatability	±0.05 mm		
Mass	Approx. 20 kg		
Acoustic noise	< 70 dB (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 1300 mm away from JT1 center

Noise level depends on the conditions.

RS05L

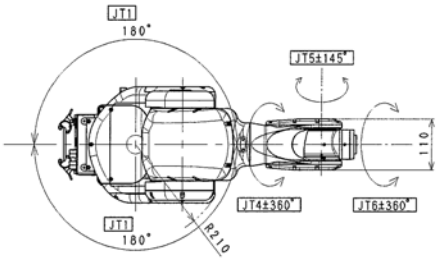


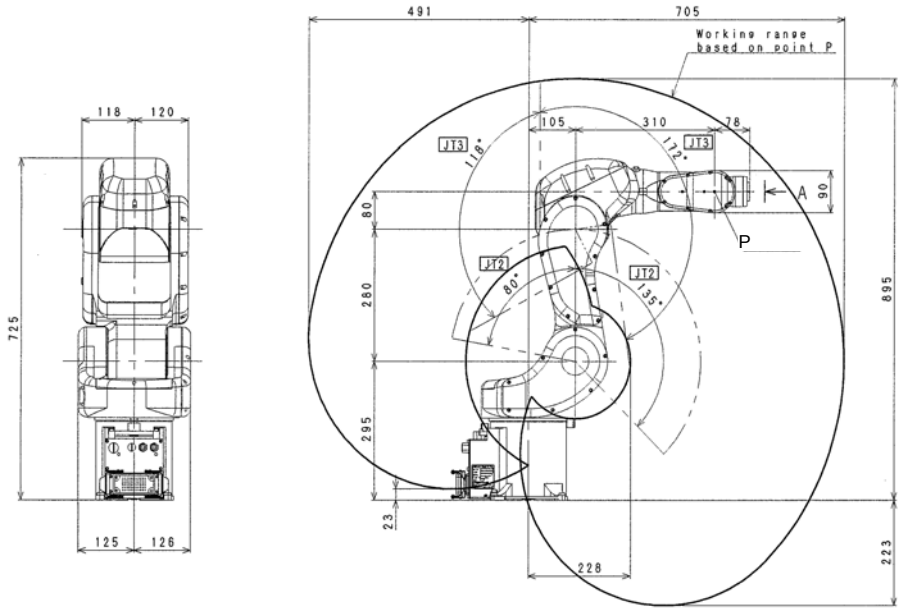
Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	300 °/s
	2	+135° to -80°	300 °/s
	3	+118° to -172°	300 °/s
	4	±360°	460 °/s
	5	±145°	460 °/s
	6	±360°	740 °/s
Max. Payload	5 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	12.3 N·m	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

Noise level depends on the conditions.

RS05N



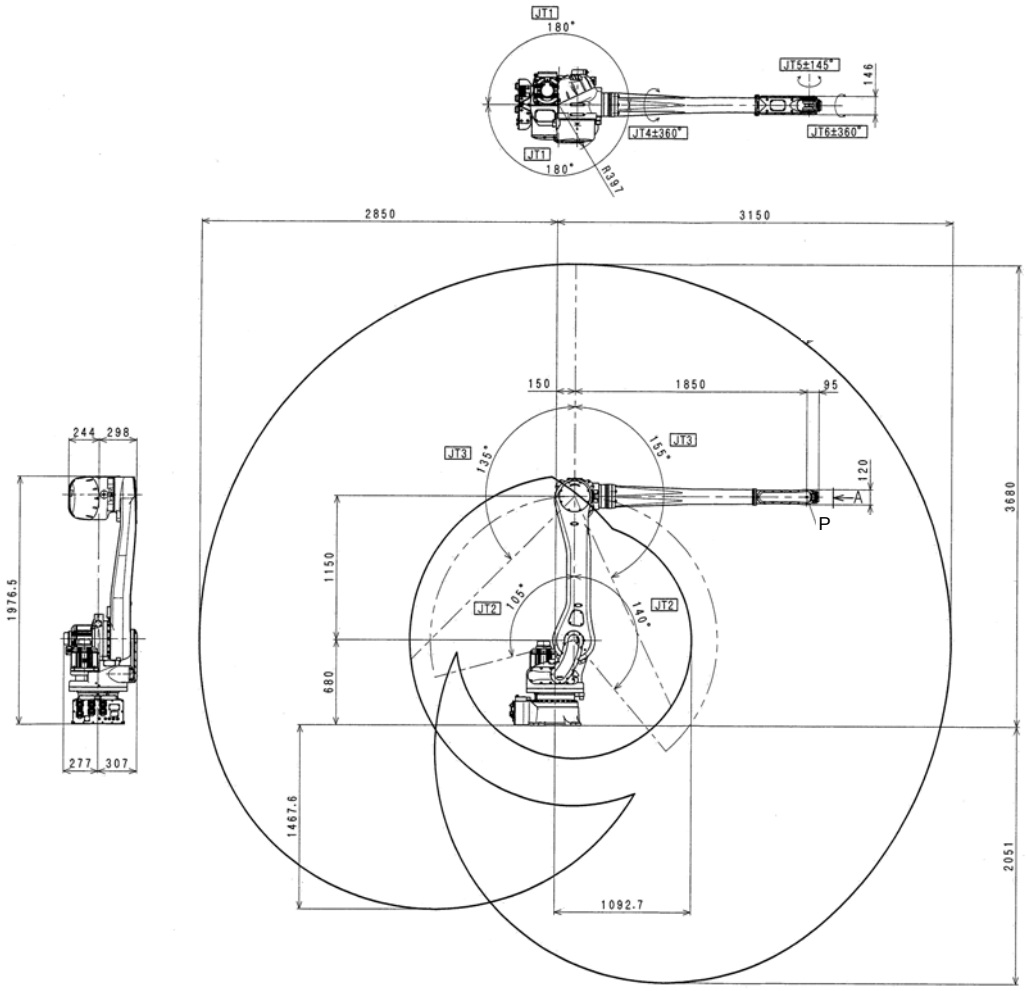


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	360 °/s
	2	+135° to -80°	360 °/s
	3	+118° to -172°	410 °/s
	4	±360°	460 °/s
	5	±145°	460 °/s
	6	±360°	740 °/s
Max. Payload	5 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	12.3 N·m	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

Noise level depends on the conditions.

RS15X

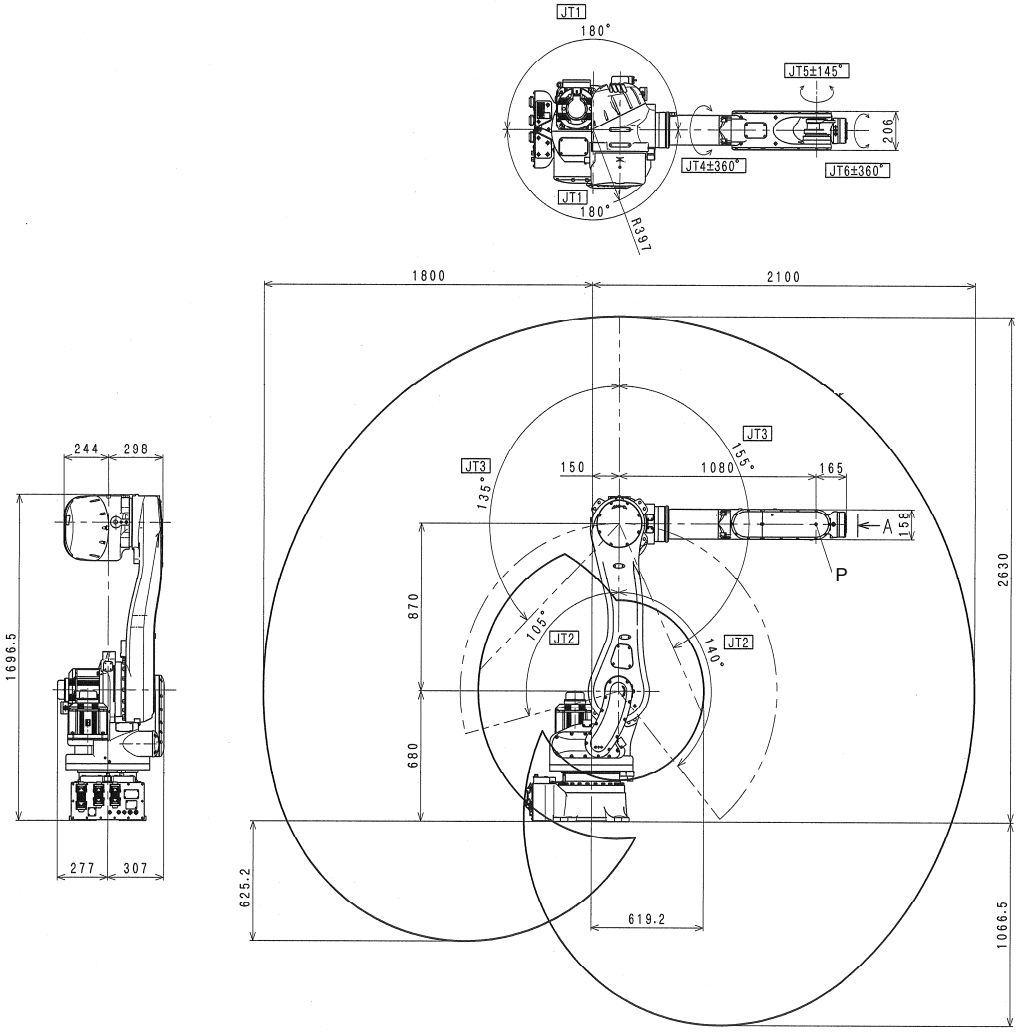


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	180 °/s
	2	+140° to -105°	180 °/s
	3	+135° to -155°	200 °/s
	4	±360°	410 °/s
	5	±145°	360 °/s
	6	±360°	610 °/s
Max. Payload	15 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	34.0 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

Noise level depends on the conditions.

RS30N

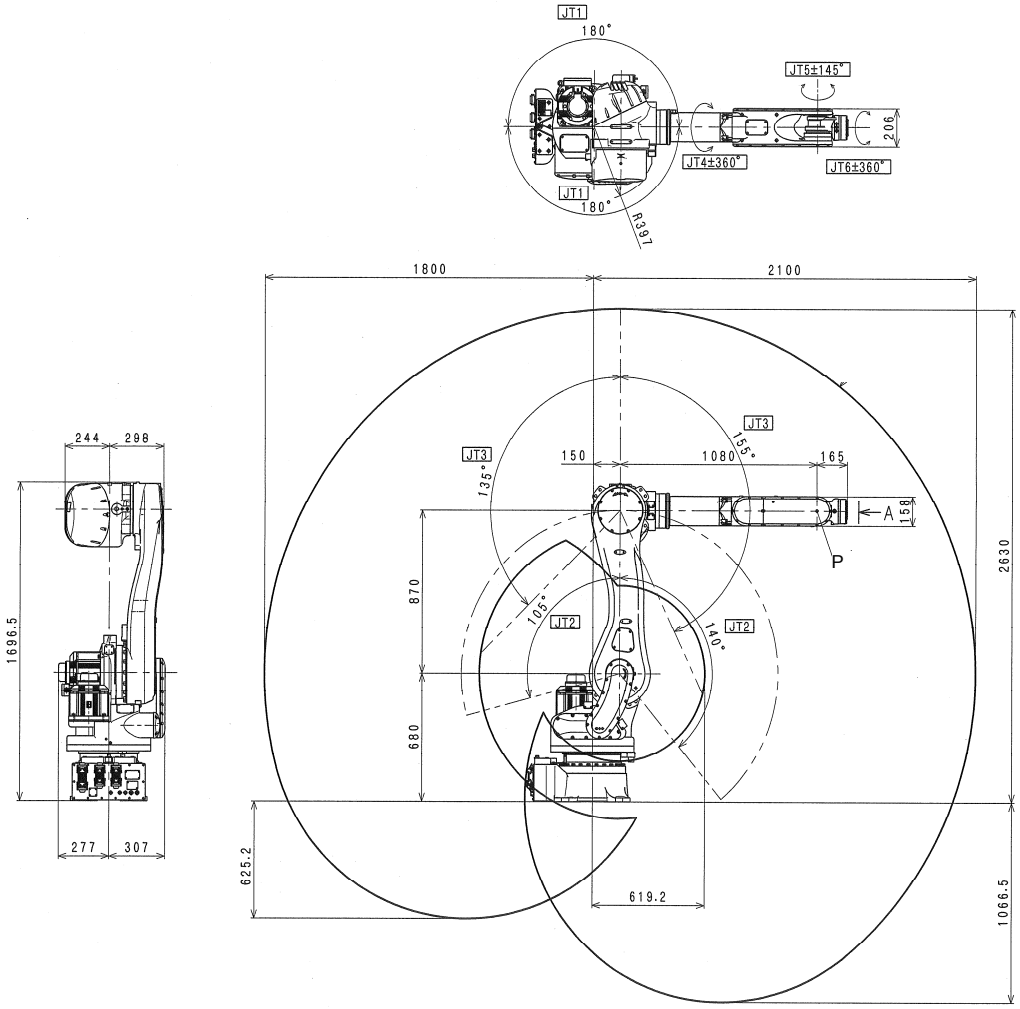


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	180 °/s
	2	+140° to -105°	180 °/s
	3	+135° to -155°	185 °/s
	4	±360°	260 °/s
	5	±145°	260 °/s
	6	±360°	360 °/s
Max. Payload	30 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	210.0 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

Noise level depends on the conditions.

RS50N

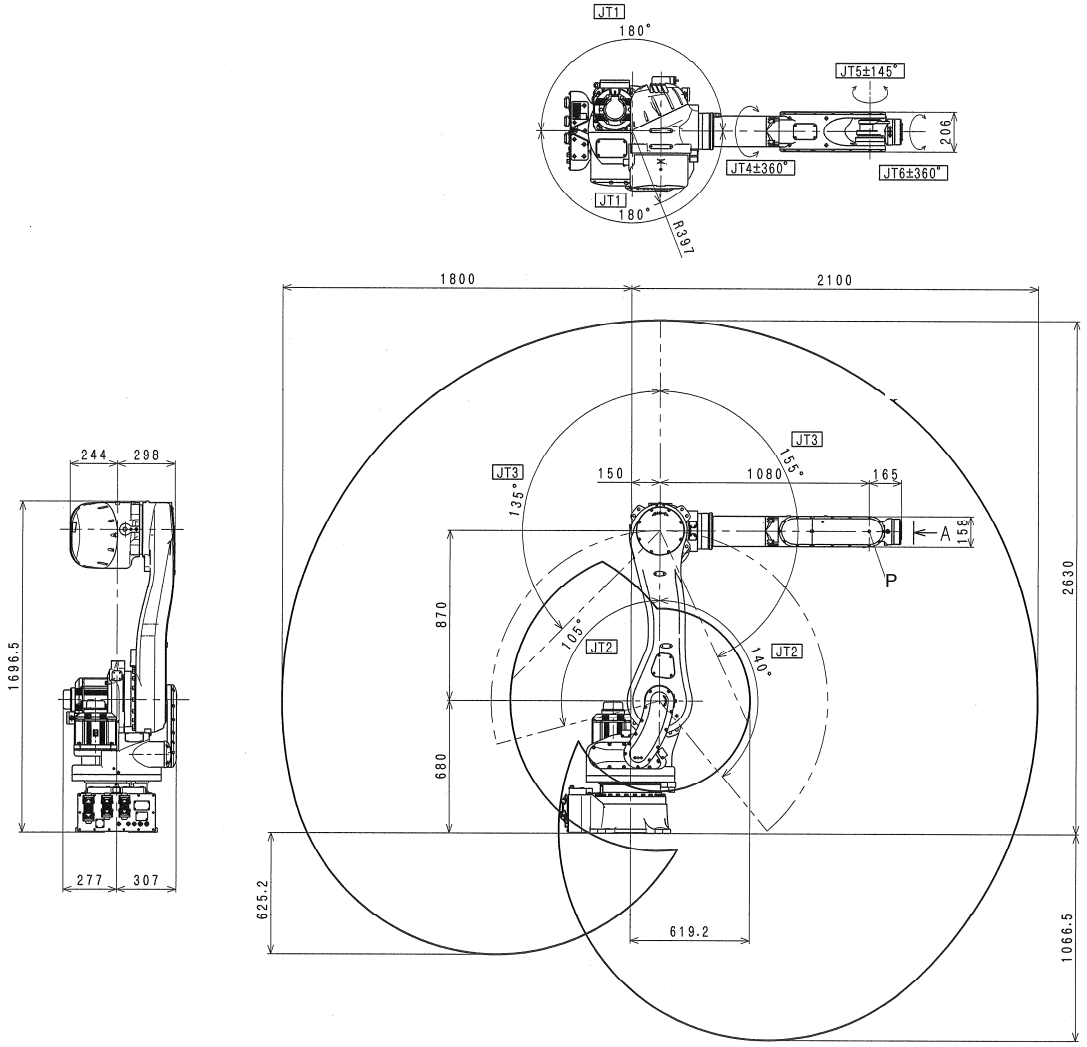


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	180 °/s
	2	+140° to -105°	180 °/s
	3	+135° to -155°	185 °/s
	4	±360°	260 °/s
	5	±145°	260 °/s
	6	±360°	360 °/s
Max. Payload	50 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	210.0 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

Noise level depends on the conditions.

RS80N

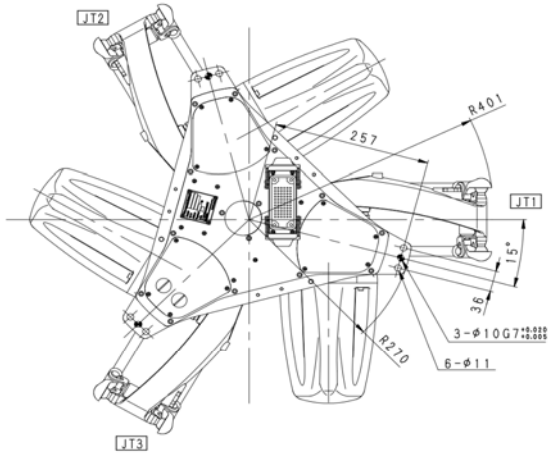


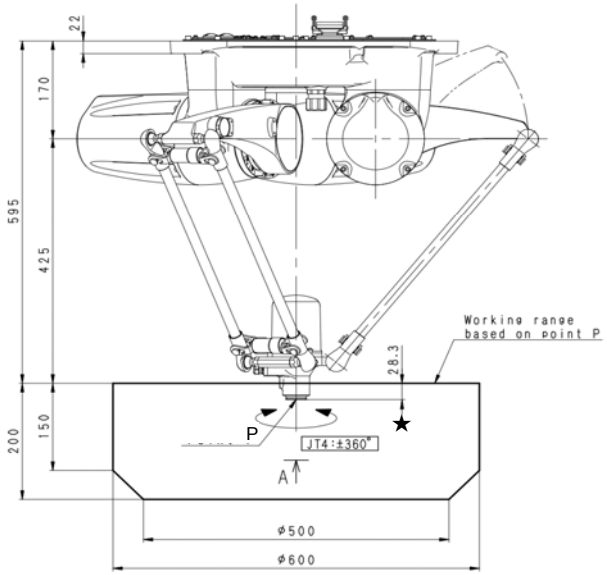
Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	180 °/s
	2	+140° to -105°	180 °/s
	3	+135° to -155°	160 °/s
	4	±360°	185 °/s
	5	±145°	165 °/s
	6	±360°	280 °/s
Max. Payload	80 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	336.0 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

Noise level depends on the conditions.

YF002N





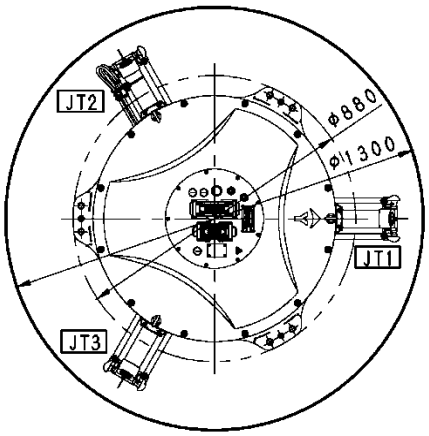
Dimension with ★ shows how far apart from the upper limit of motion range the Point P is when JT1,2 and 3 are 0°.

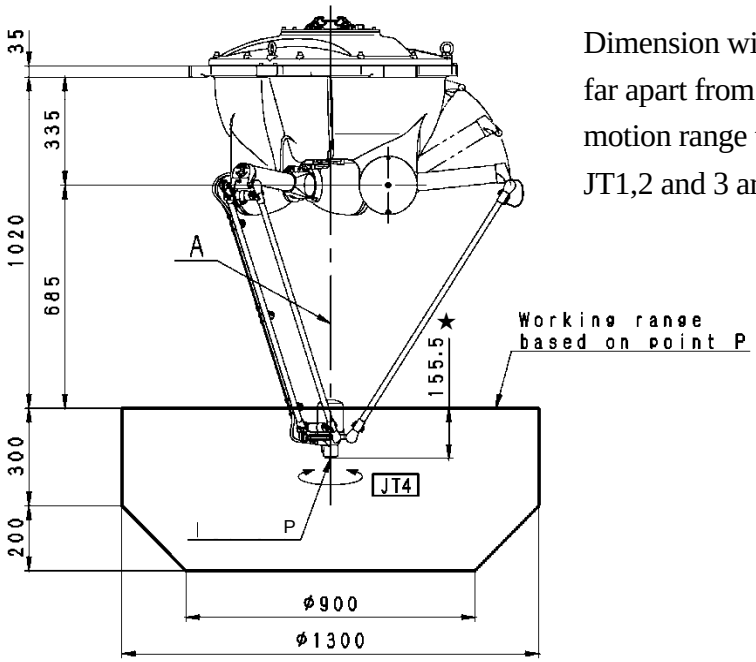
Model	Delta type parallel link		
Degree of Freedom	4		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	+77° to -34.5°	490 °/s
	2	+77° to -34.5°	490 °/s
	3	+77° to -34.5°	490 °/s
	4	±360°	1714 °/s
Max. Payload	2 kg		
Wrist Load Capacity	Differs according to the payload.		
Repeatability	±0.04 mm		
Mass	60 kg		
Acoustic Noise	＜70 dB (A)*		

*measured condition
- Installed on stand of 1400 mm height
- 1300 mm away from A axis

Noise level depends on the conditions.

YF003N





Dimension with ★ shows how far apart from the upper limit of motion range the Point P is when JT1,2 and 3 are 0°.

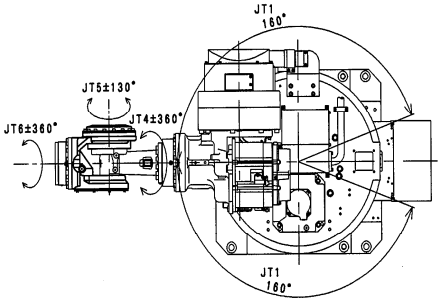
Model	Delta type parallel link		
Degree of Freedom	4		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	+95° to -52.5°	1091 °/s
	2	+95° to -52.5°	1091 °/s
	3	+95° to -52.5°	1091 °/s
	4	±360°	1714 °/s
Max. Payload	3 kg		
Wrist Load Capacity	Differs according to the payload.		
Repeatability	±0.10 mm		
Mass	145 kg		
Acoustic Noise	＜70 dB (A)*		

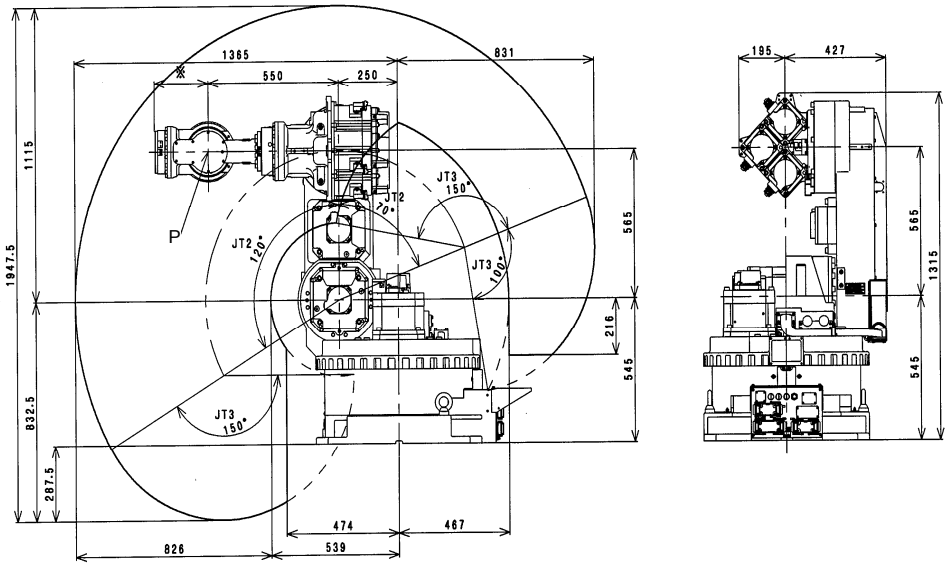
*measured condition

- Installed on stand of 2150 mm height
- 1650 mm away from A axis

Noise level depends on the conditions.

ZB150S



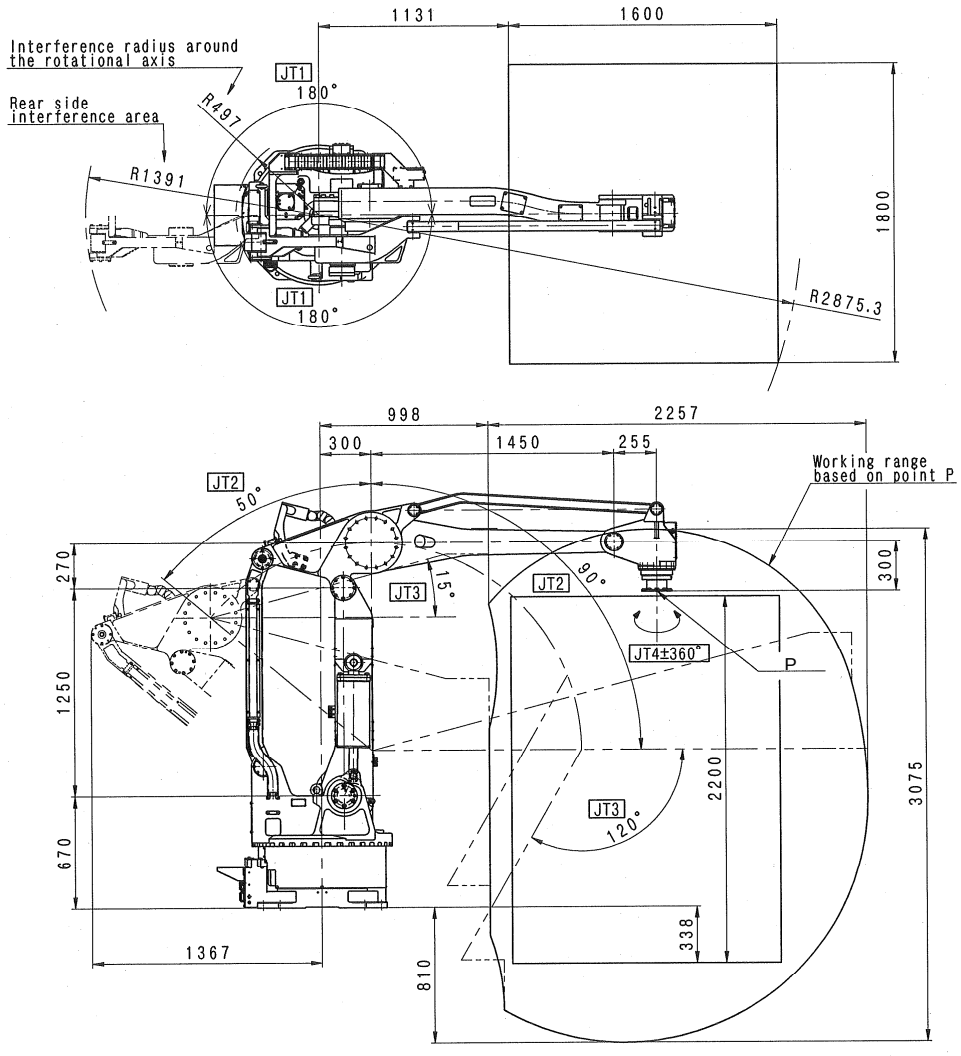


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	JT1	+/-160°	100 °/s
	JT2	-70° to +120°	100 °/s
	JT3	-150° to +100°	90 °/s
	JT4	+/-360°	135 °/s
	JT5	+/-130°	135 °/s
	JT6	+/-360°	210 °/s
	JT7	Standard 2000 mm	1000 mm/s
Max. Payload	150 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	911.4 N·m	78.4 kg·m^2
	5	911.4 N·m	78.4 kg·m^2
	6	450.8 N·m	40.2 kg·m^2
Repeatability	± 0.3 mm		
Mass	Approx. 900 kg		
Acoustic Noise	< 70 db (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 3365 mm away from JT1 center

Noise level depends on the conditions.

ZD130S

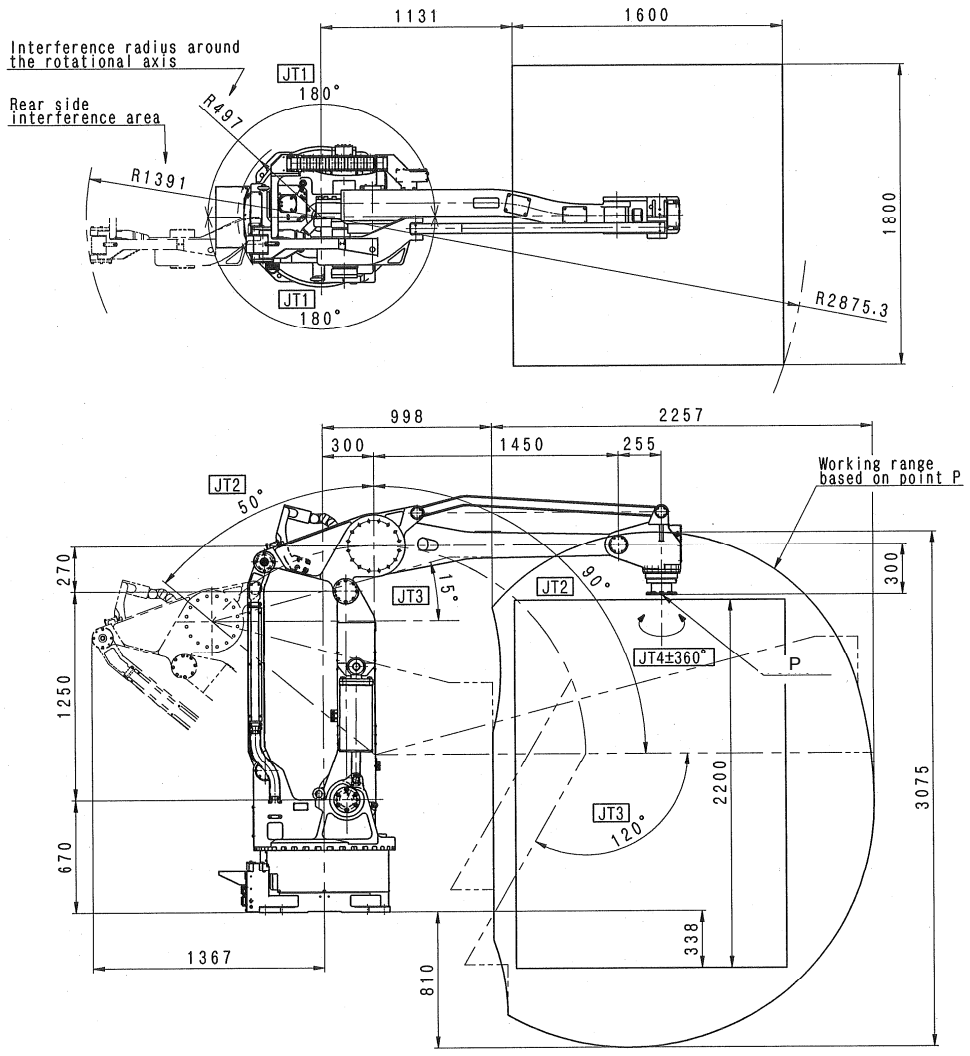


Type	Articulated Robot		
Degree of Freedom	4		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	135°/s
	2	+90° to -50°	110°/s
	3	+15° to -120°	130°/s
	4	±360°	300°/s
Max. Payload	130 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	-	50 kg·m^2
Repeatability	±0.5 mm		
Mass	Approx. 1350 kg		
Acoustic noise	< 70 db (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 5260 mm away from JT1 center

Noise level depends on the conditions.

ZD250S

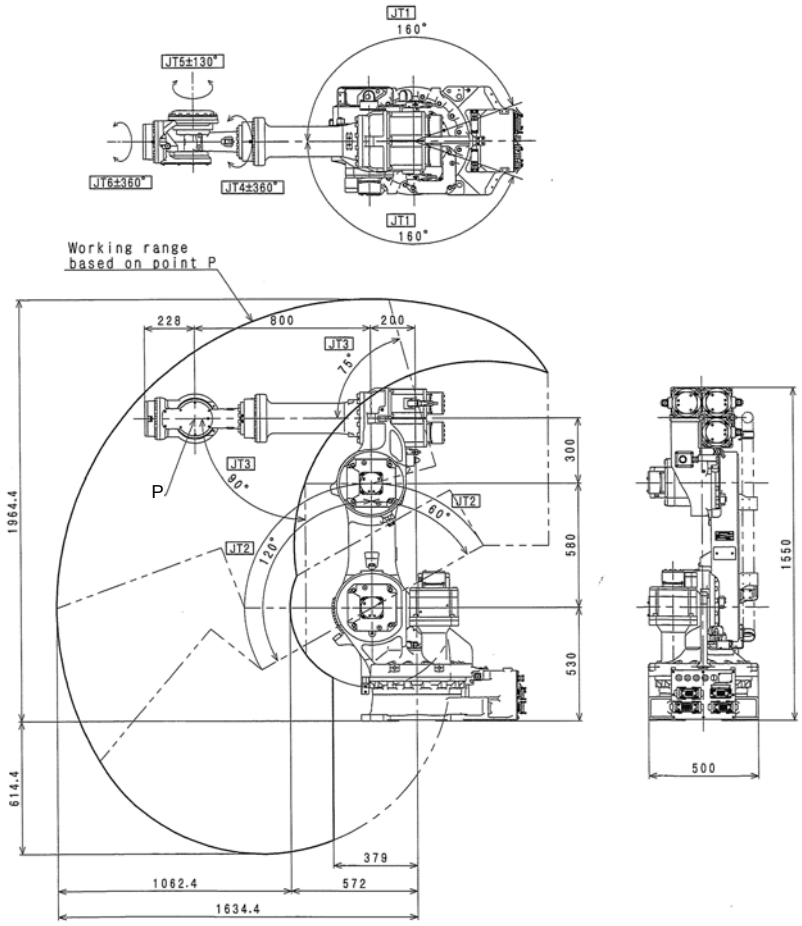


Type	Articulated Robot		
Degree of Freedom	4		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	95°/s
	2	+90° to -50°	95°/s
	3	+15° to -120°	95°/s
	4	±360°	190°/s
Max. Payload	250 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	-	100 kg·m^2
Repeatability	±0.5 mm		
Mass	Approx. 1350 kg		
Acoustic noise	< 70 db (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 5260 mm away from JT1 center

Noise level depends on the conditions.

ZH100U

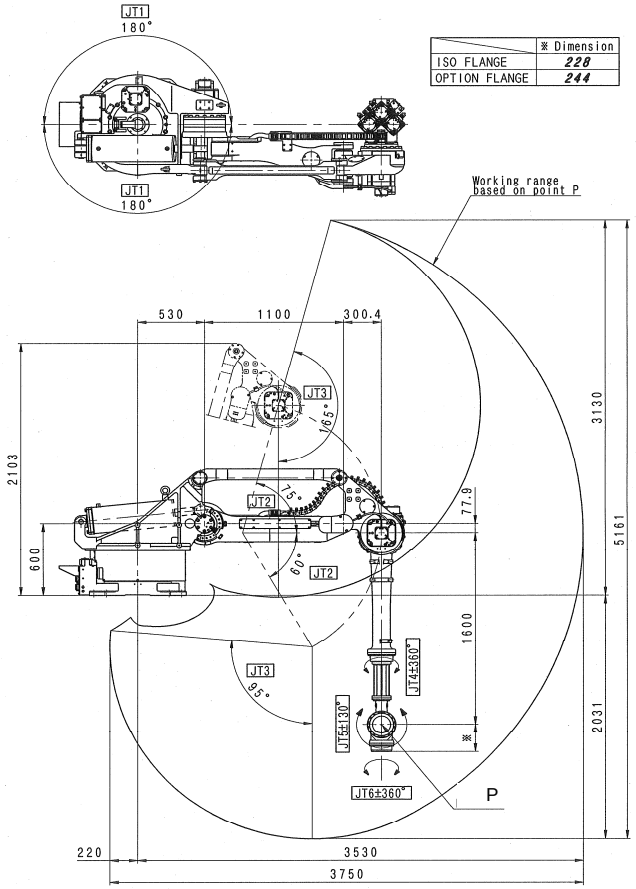


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±160°	140 °/s
	2	+120° to -60°	100 °/s
	3	+75° to -90°	100 °/s
	4	±360°	150 °/s
	5	±130°	150 °/s
	6	±360°	250 °/s
Max. Payload	100 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	874.8 N·m	90 kg·m^2
	5	874.8 N·m	90 kg·m^2
	6	392.0 N·m	20 kg·m^2
Repeatability	±0.3 mm		
Mass	Approx. 750 kg		
Acoustic Noise	<70db（A）*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 3634.4 mm away from JT1 center

Noise level depends on the conditions.

ZT130L

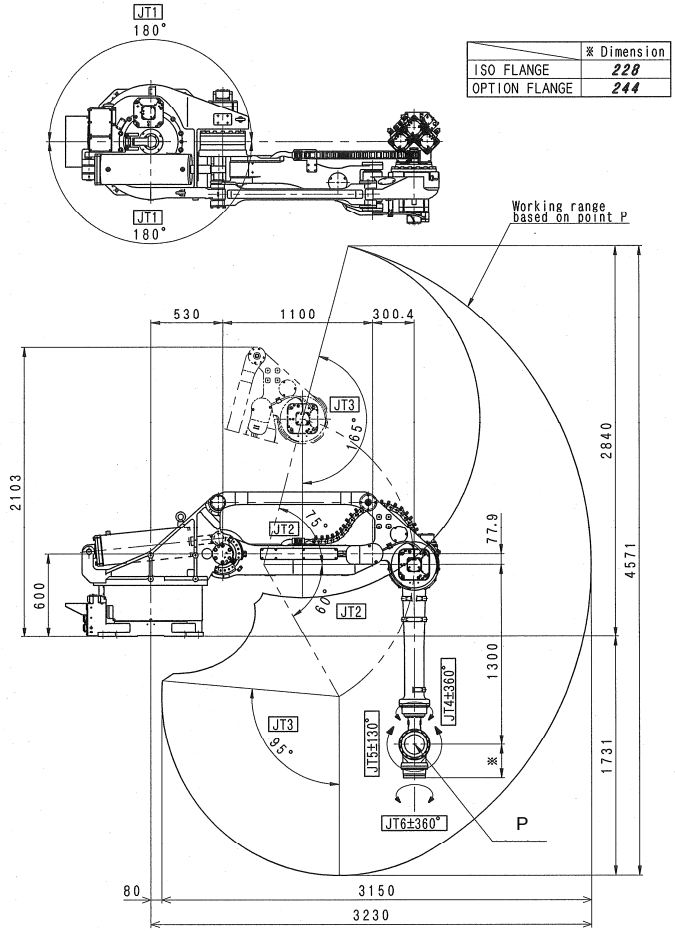


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	105°/s
	2	+60° to -75°	105°/s
	3	+165° to -95°	105°/s
	4	±360°	140°/s
	5	±130°	135°/s
	6	±360°	230°/s
Max. Payload	130 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	980 N·m	93.1 kg·m^2
	5	980 N·m	93.1 kg·m^2
	6	490 N·m	46.1 kg·m^2
Repeatability	±0.3 mm		
Mass	Approx. 1565 kg		
Acoustic noise	< 70 db (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 5330 mm away from JT1 center

Noise level depends on the conditions.

ZT130S

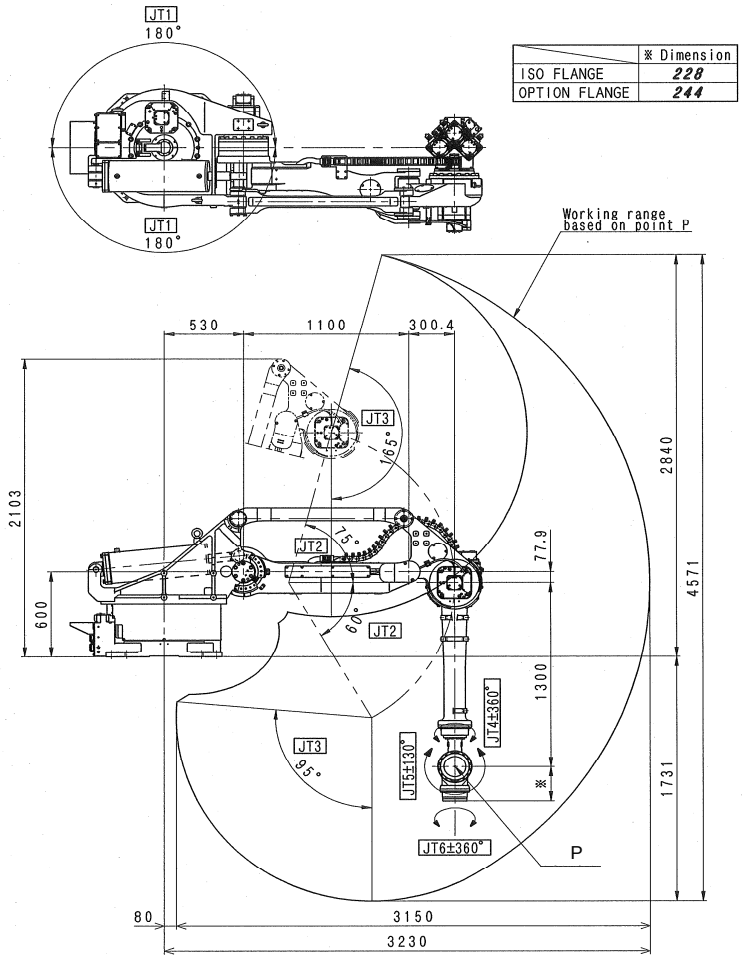


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	130°/s
	2	+60° to -75°	130°/s
	3	+165° to -95°	130°/s
	4	±360°	180°/s
	5	±130°	180°/s
	6	±360°	280°/s
Max. Payload	130 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	735 N·m	51.9 kg·m^2
	5	735 N·m	51.9 kg·m^2
	6	421.4 N·m	27.4 kg·m^2
Repeatability	±0.3 mm		
Mass	Approx. 1550 kg		
Acoustic noise	< 70 db (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 5230 mm away from JT1 center

Noise level depends on the conditions.

ZT130U

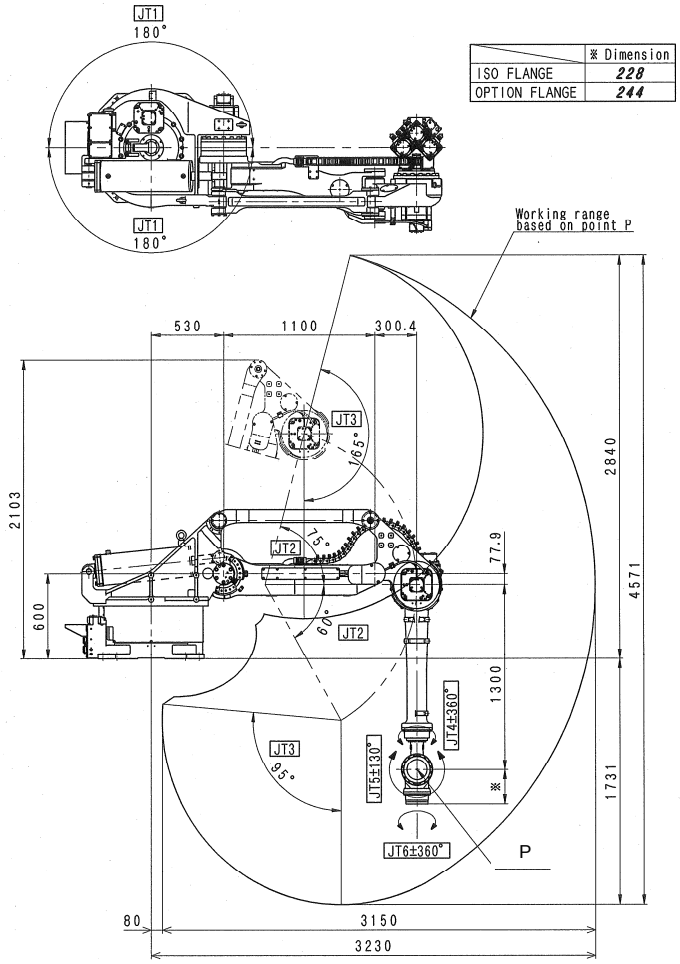


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	105°/s
	2	+60° to -75°	105°/s
	3	+165° to -95°	105°/s
	4	±360°	140°/s
	5	±130°	135°/s
	6	±360°	230°/s
Max. Payload	130 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	735 N·m	51.9 kg·m^2
	5	735 N·m	51.9 kg·m^2
	6	421.4 N·m	27.4 kg·m^2
Repeatability	±0.3 mm		
Mass	Approx. 1550 kg		
Acoustic noise	< 70 db (A)*****		

*measured condition
- installed on the plate rigidly fixed on the floor
- 5230 mm away from JT1 center

Noise level depends on the conditions.

ZT165U

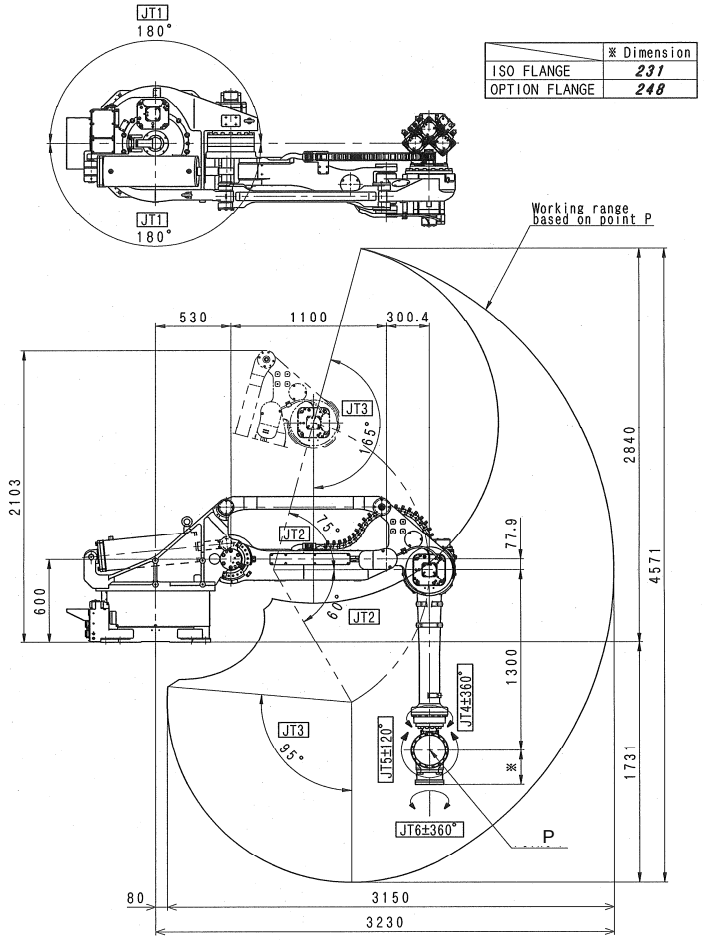


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	105°/s
	2	+60° to -75°	105°/s
	3	+165° to -95°	105°/s
	4	±360°	135°/s
	5	±130°	135°/s
	6	±360°	210°/s
Max. Payload	165 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	911.4 N·m	78.4 kg·m^2
	5	911.4 N·m	78.4 kg·m^2
	6	450.8 N·m	40.2 kg·m^2
Repeatability	±0.3 mm		
Mass	Approx. 1550 kg		
Acoustic noise	< 70 db (A)*****		

*measured condition
- installed on the plate rigidly fixed on the floor
- 5230 mm away from JT1 center

Noise level depends on the conditions.

ZT200S

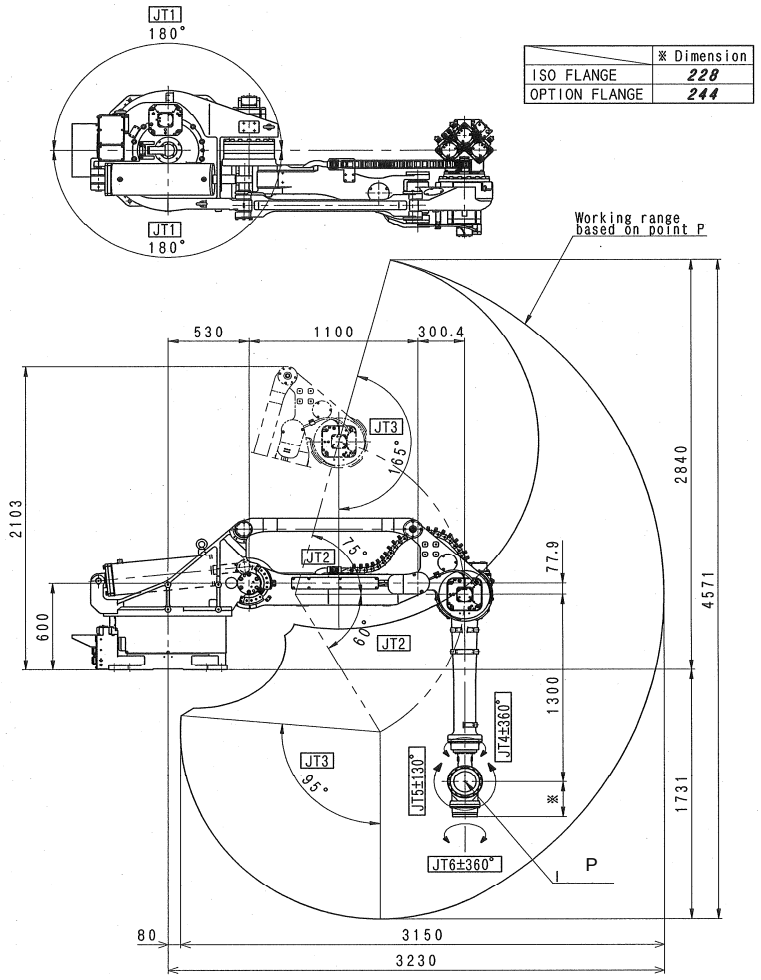


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	100°/s
	2	+60° to -75°	100°/s
	3	+165° to -95°	90°/s
	4	±360°	120°/s
	5	±120°	115°/s
	6	±360°	180°/s
Max. Payload	200 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	1274 N·m	117.6 kg·m^2
	5	1274 N·m	117.6 kg·m^2
	6	686 N·m	63.7 kg·m^2
Repeatability	±0.3 mm		
Mass	Approx. 1600 kg		
Acoustic noise	< 70 db (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 5230 mm away from JT1 center

Noise level depends on the conditions.

ZT200U

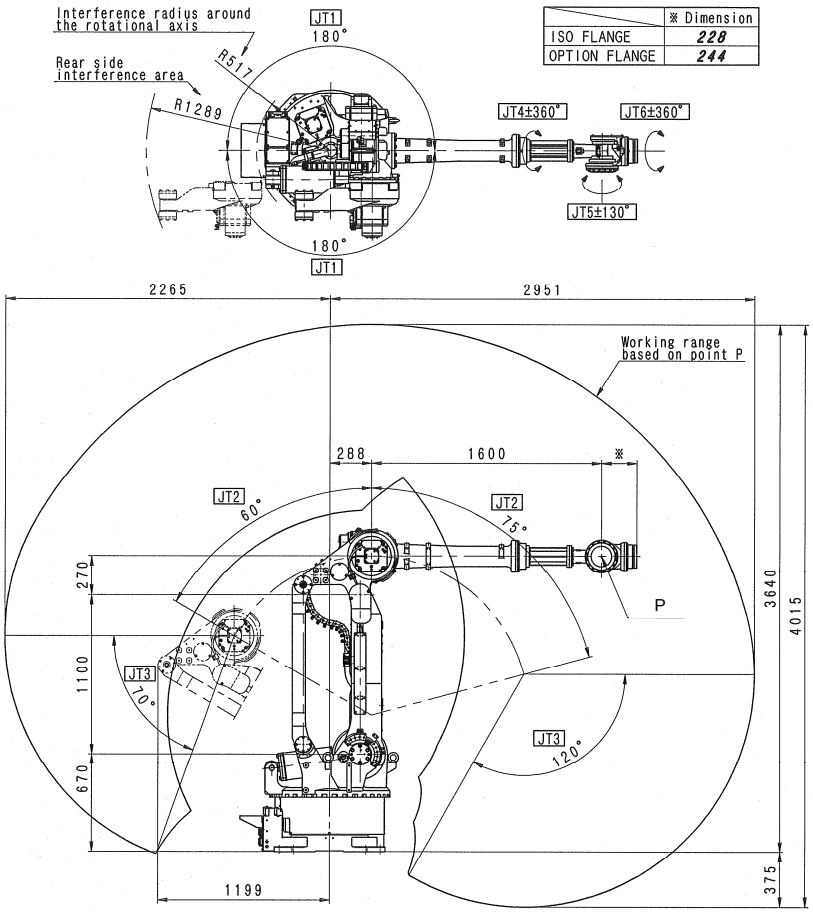


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	90°/s
	2	+60° to -75°	90°/s
	3	+165° to -95°	90°/s
	4	±360°	120°/s
	5	±130°	115°/s
	6	±360°	180°/s
Max. Payload	200 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	980 N·m	93.1 kg·m^2
	5	980 N·m	93.1 kg·m^2
	6	490 N·m	46.1 kg·m^2
Repeatability	±0.3 mm		
Mass	Approx. 1550 kg		
Acoustic noise	< 70 db (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 5230 mm away from JT1 center

Noise level depends on the conditions.

ZX130L

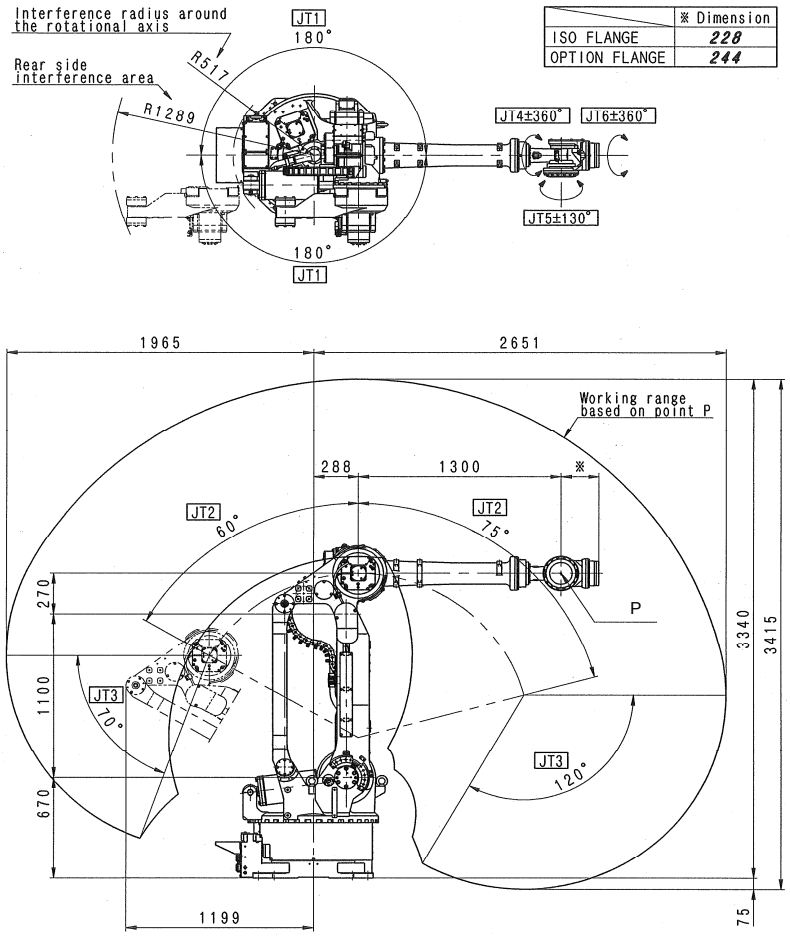


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	110°/s
	2	+75° to -60°	110°/s
	3	+250° to -120°	110°/s
	4	±360°	140°/s
	5	±130°	135°/s
	6	±360°	230°/s
Max. Payload	130kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	735 N·m	51.9 kg·m^2
	5	735 N·m	51.9 kg·m^2
	6	421.4 N·m	27.4 kg·m^2
Repeatability	±0.3 mm		
Mass	Approx. 1400 kg		
Acoustic noise	< 70 db (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 4900 mm away from JT1 center

Noise level depends on the conditions.

ZX130S

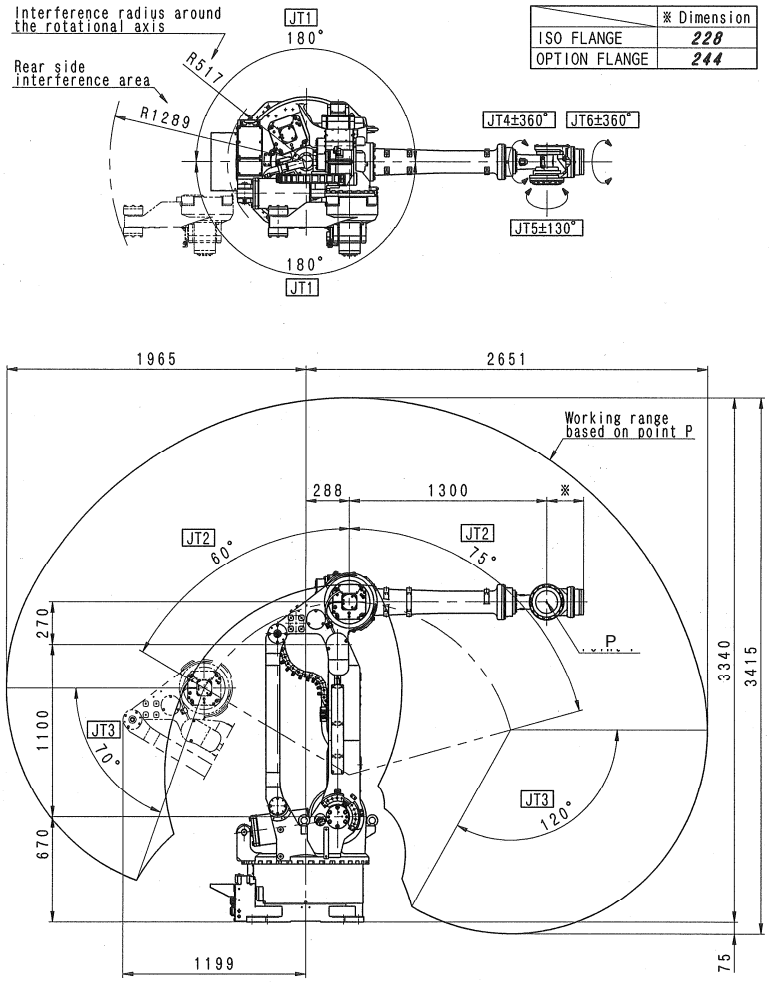


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	130°/s
	2	+75° to -60°	130°/s
	3	+250° to -120°	130°/s
	4	±360°	180°/s
	5	±130°	180°/s
	6	±360°	280°/s
Max. Payload	130 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	735 N·m	51.9 kg·m^2
	5	735 N·m	51.9 kg·m^2
	6	421.4 N·m	27.4 kg·m^2
Repeatability	±0.3 mm		
Mass	Approx. 1350 kg		
Acoustic noise	< 70 db (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 4650 mm away from JT1 center

Noise level depends on the conditions.

ZX130U

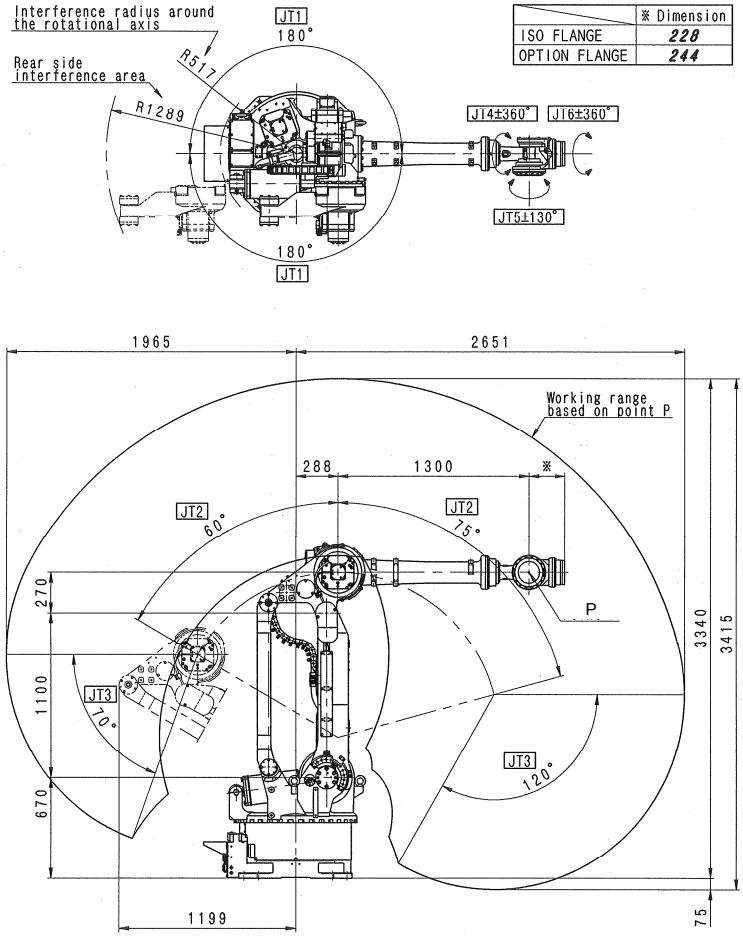


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	110°/s
	2	+75° to -60°	110°/s
	3	+250° to -120°	110°/s
	4	±360°	140°/s
	5	±130°	135°/s
	6	±360°	230°/s
Max. Payload	130 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	735 N·m	51.9 kg·m^2
	5	735 N·m	51.9 kg·m^2
	6	421.4 N·m	27.4 kg·m^2
Repeatability	±0.3 mm		
Mass	Approx. 1350 kg		
Acoustic noise	< 70 db (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 4650 mm away from JT1 center

Noise level depends on the conditions.

ZX165U

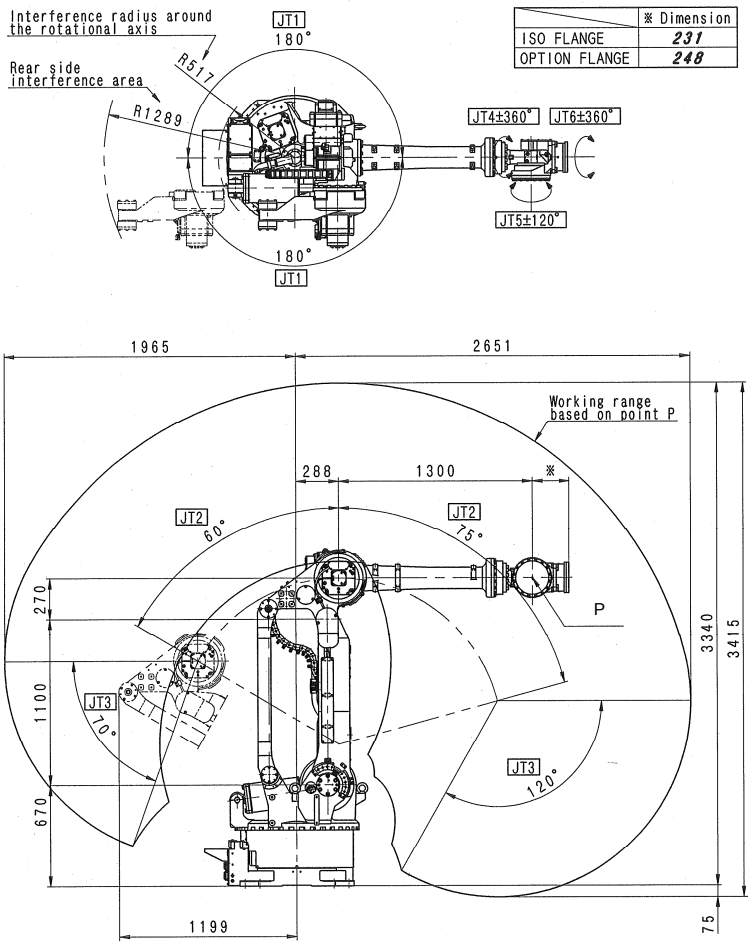


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	110°/s
	2	+75° to -60°	110°/s
	3	+250° to -120°	110°/s
	4	±360°	135°/s
	5	±130°	135°/s
	6	±360°	210°/s
Max. Payload	165 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	911.4 N·m	78.4 kg·m^2
	5	911.4 N·m	78.4 kg·m^2
	6	450.8 N·m	40.2 kg·m^2
Repeatability	±0.3 mm		
Mass	Approx. 1350 kg		
Acoustic noise	< 70 db (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 4650 mm away from JT1 center

Noise level depends on the conditions.

ZX200S

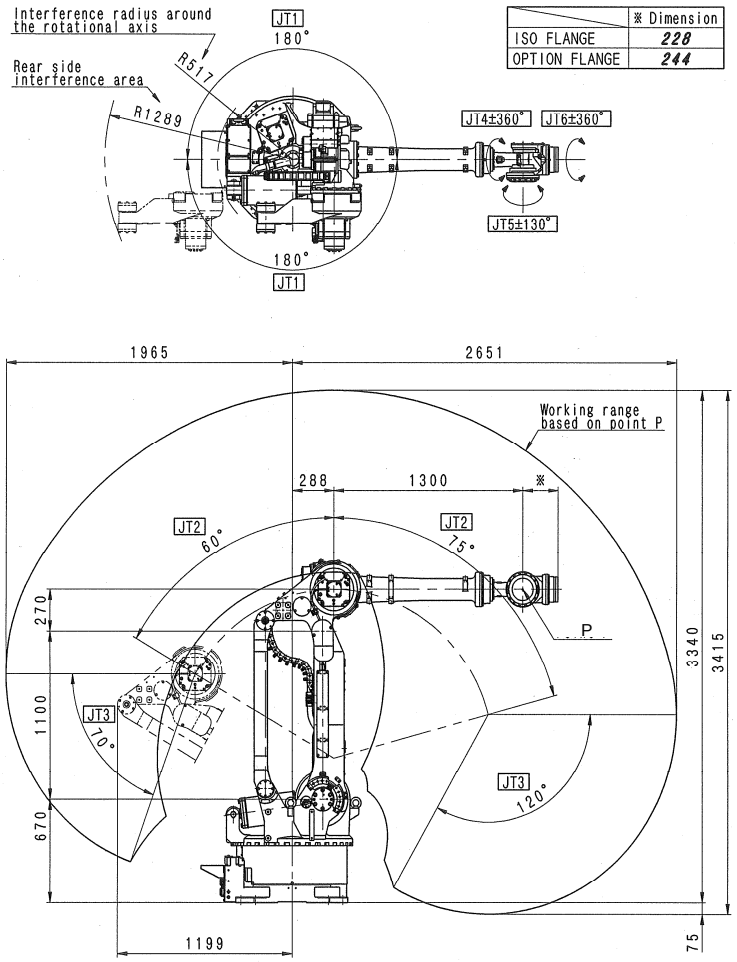


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	100°/s
	2	+75° to -60°	100°/s
	3	+250° to -120°	95°/s
	4	±360°	120°/s
	5	±120°	115°/s
	6	±360°	180°/s
Max. Payload	200 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	1274 N·m	117.6 kg·m^2
	5	1274 N·m	117.6 kg·m^2
	6	686 N·m	63.7 kg·m^2
Repeatability	±0.3 mm		
Mass	Approx. 1400 kg		
Acoustic noise	< 70 db (A)*		

*measured condition
- installed on the plate rigidly fixed on the floor
- 4650 mm away from JT1 center

Noise level depends on the conditions.

ZX200U

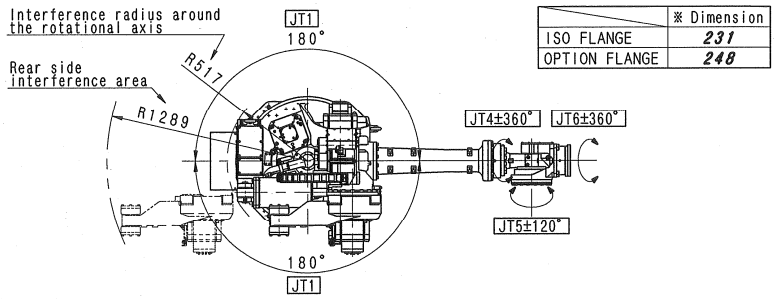


Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	95°/s
	2	+75° to -60°	95°/s
	3	+250° to -120°	95°/s
	4	±360°	120°/s
	5	±130°	115°/s
	6	±360°	180°/s
Max. Payload	200 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	980 N·m	93.1 kg·m^2
	5	980 N·m	93.1 kg·m^2
	6	490 N·m	46.1 kg·m^2
Repeatability	±0.3 mm		
Mass	Approx. 1350 kg		
Acoustic noise	< 70 db (A)*		

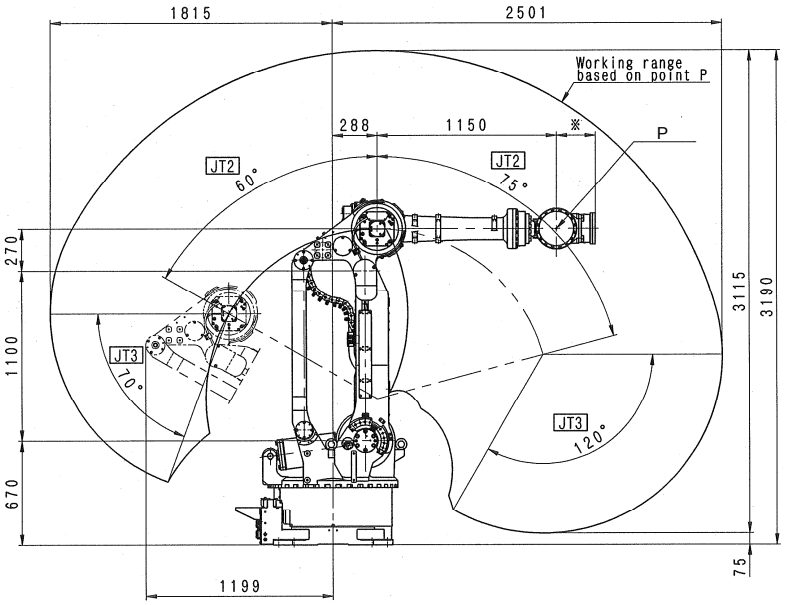
*measured condition
- installed on the plate rigidly fixed on the floor
- 4650 mm away from JT1 center

Noise level depends on the conditions.

ZX300S



	※ Dimension
ISO FLANGE	231
OPTION FLANGE	248



Type	Articulated Robot		
Degree of Freedom	6		
Motion Range and Maximum Speed	JT	Motion Range	Max. Speed
	1	±180°	100°/s
	2	+75° to -60°	85°/s
	3	+250° to -120°	85°/s
	4	±360°	90°/s
	5	±120°	90°/s
	6	±360°	150°/s
Max. Payload	300 kg		
Wrist Load Capacity	JT	Torque	Moment of Inertia
	4	1715 N·m	166.6k g·m^2
	5	1715 N·m	166.6 kg·m^2
	6	862.4 N·m	107.8 kg·m^2
Repeatability	±0.3 mm		
Mass	Approx. 1400 kg		
Acoustic noise	< 70 db (A)*		

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

Noise level depends on the conditions.

3.0 RISK ASSESSMENT

For each procedure of system setting, installation, teaching, operation, maintenance, disposal, etc., always make sure the instructions and specifications match the requirements of the purpose of robot use. Also, perform the adequate risk assessment without fail to reduce any avoidable risk.

3.1 SAFETY FEATURES

To safeguard the user, Kawasaki robot systems are equipped with many safety features, including the following:

1. All E-stops are hard-wired.
2. All robot controllers are equipped with a redundant dual channel safety circuit. Both channels of the safety circuit must be closed to allow for robot operation in the teach and automatic playback modes.
3. Safety circuits of E4x/E70/E71/E91 controller satisfy requirements of PLd in category 3 defined by ISO 13849-1:2006. (PLe in category 4 for E0x controller) Category and Performance level (PL) are determined by the whole system and conditions. The safety circuit of these controllers is available in the system of category: up to 3, PL: up to d. (for E0x controller, category: up to 4, PL: up to e)
4. (For the arms which are equipped with servo lamp ON) When the servo ON lamp is illuminated, servo motor power is available to the robot and motion is possible.
5. The teach pendant and operation panel are equipped with red mushroom-type E-stop switches. All robot controllers have external E-stop inputs.
6. The teach pendant is equipped with three-position, enabling device. The enabling device must be pressed to enable motor power in the teach and check modes.
7. Teach and check mode velocities are limited to a maximum of 250 mm/s (10.0 in/s).
8. E4x/E70/E71 controller is equipped with Fast Check mode that satisfies the requirements of ISO 10218-1:2006. (optional for E0x controller) Teach and check mode velocities are not limited to 250 mm/s (10.0 in/s) in the Fast Check mode.
9. JT1 is equipped with overtravel limit switches. Optional overtravel limit switches are available on JT2 and JT3 for Z series and M series robots.
10. All R-series, M-series, and Z-series arms have overtravel hardstops on JT1, JT2 and JT3 (optional for JT2 and JT3) axes. Mechanical hardstops are capable of stopping the robot moving at full speed and with maximum payload.
11. All robot axes are equipped with electromechanical brakes that engage when power is removed. If the robot loses power unexpectedly, the arm is held in position by the brakes.

3.2 SAFETY CIRCUIT OFF

The following 3 types of input signals are available for externally shutting down the robot motor power for safety purposes.

1. External emergency stop (Valid in teach and automatic playback mode.)
2. Safety fence input (Valid only in automatic playback mode.)
3. External trigger input (Valid only in teach mode.)

⚠ WARNING

Safety circuit OFF function and operation must be designed based on IEC60204-1, ISO10218 and ISO13849-1, because it is very important for human safety. Safety circuit of E4x/E70/E71/E91 controller satisfy requirements of PLd in category 3 defined by ISO 13849-1:2006. (PLe in category 4 for E0x controller) When constructing the comprehensive safety system including robot, conduct risk assessments and make sure that safety circuit of the controller satisfies performance requirements.

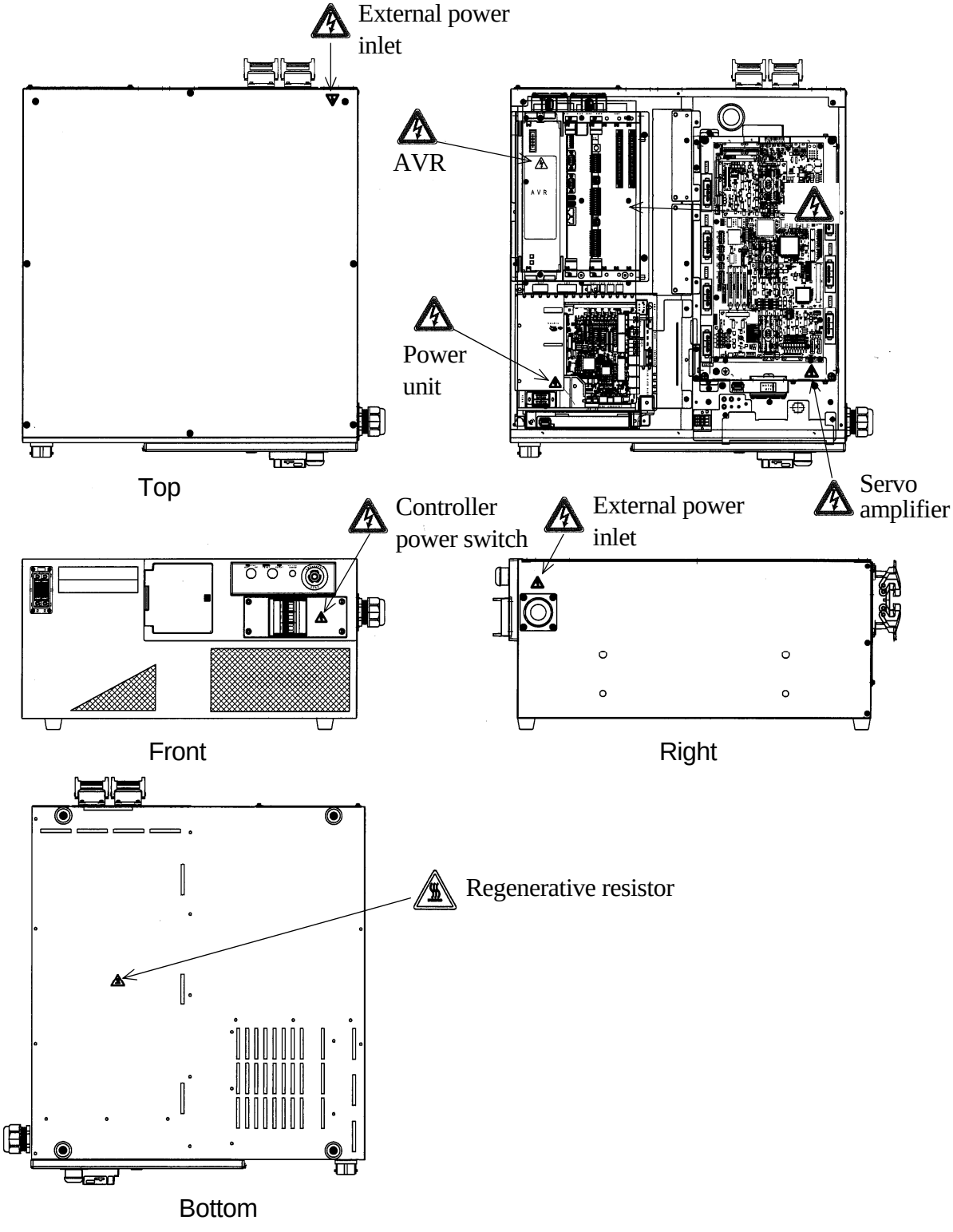
For details on safety circuit connection, consult a personnel who has completed the required special education and training courses.

3.3 RESIDUAL RISKS

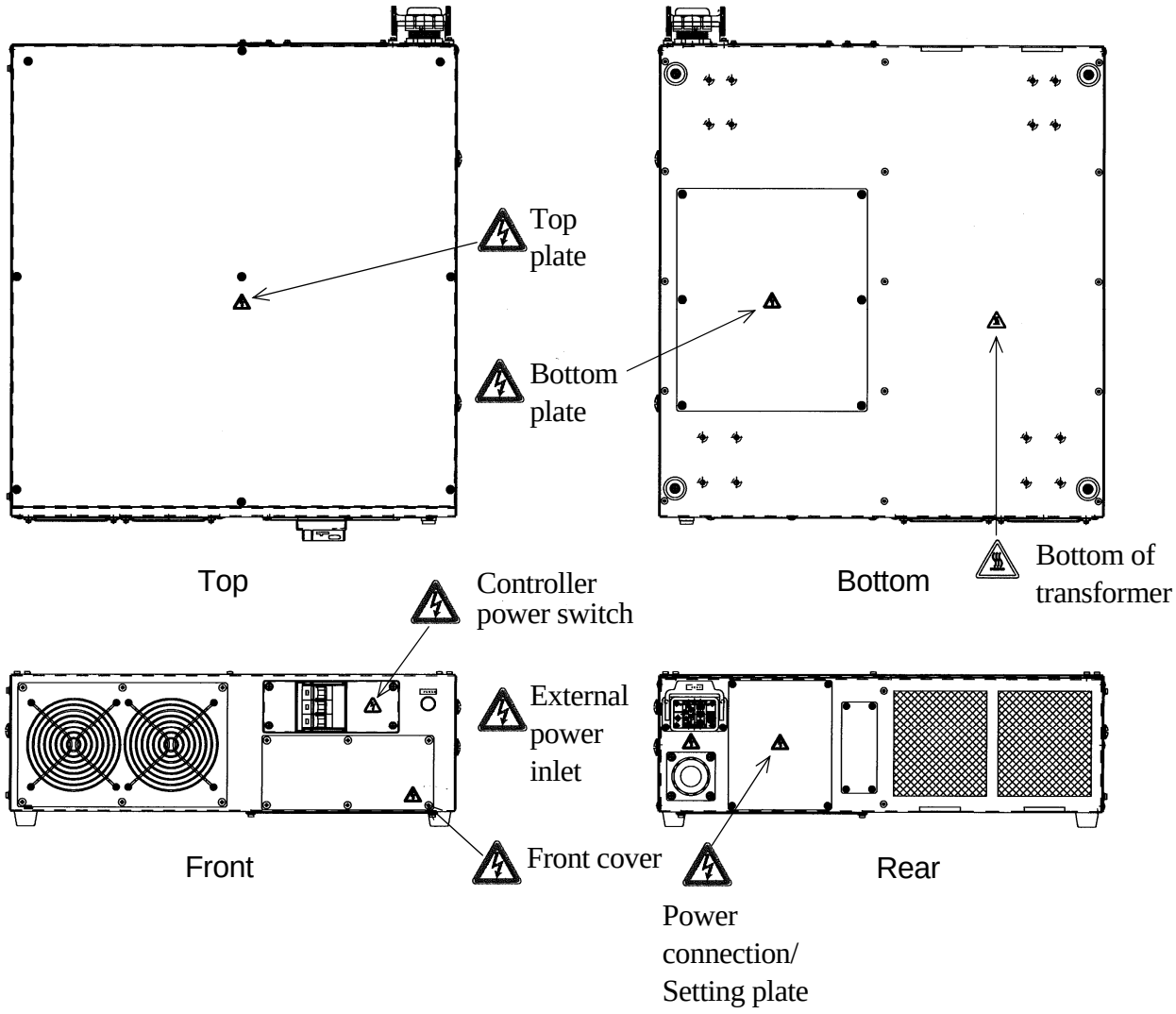
Warning labels for residual risks are on locations indicated in the figures below.

3.3.1 CONTROLLER ELECTRIFICATION RISK

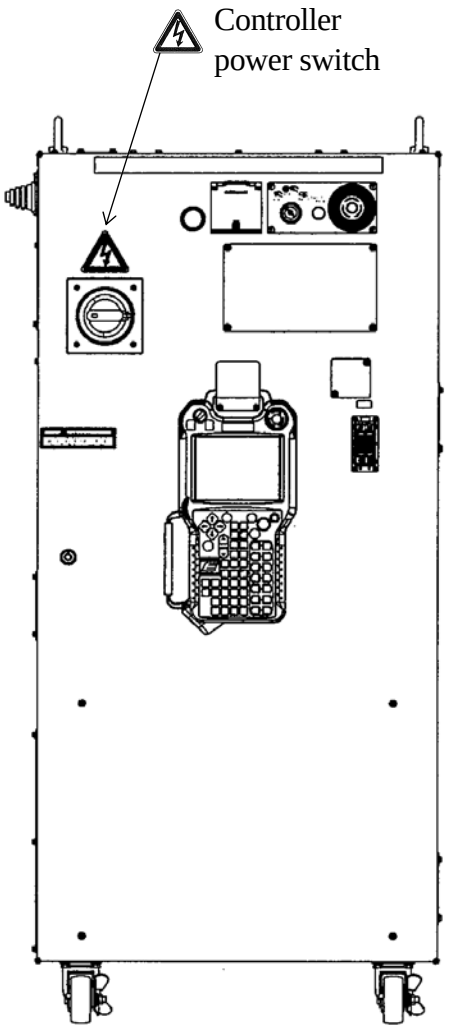
E01 controller (Warning labels of E02-E04 controllers are attached on the same places.)



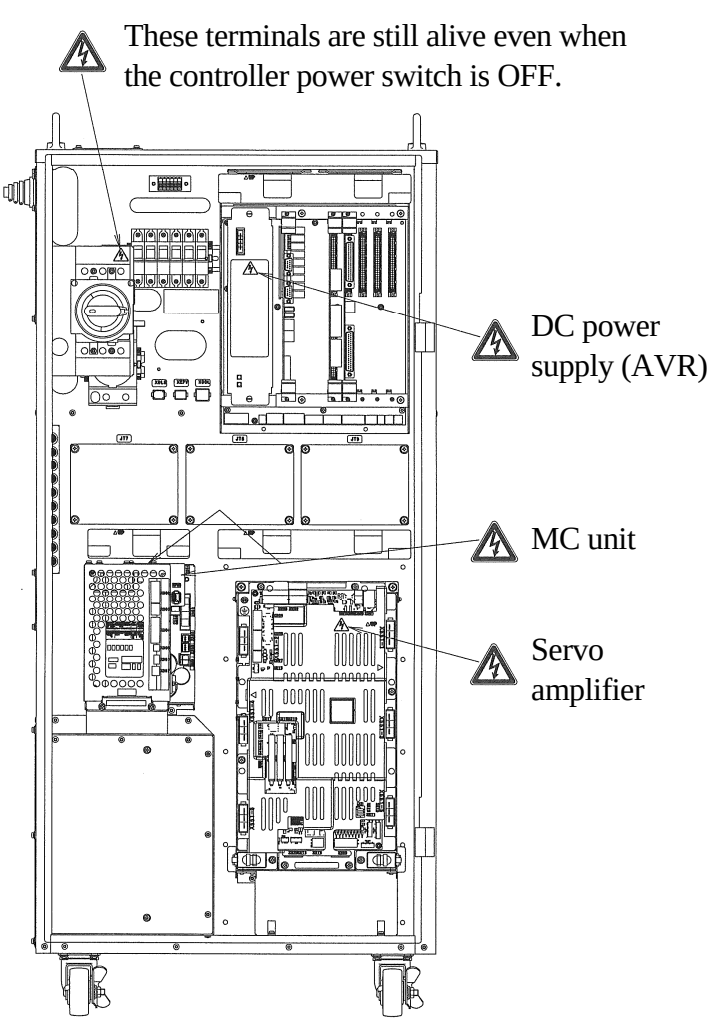
Transformer unit



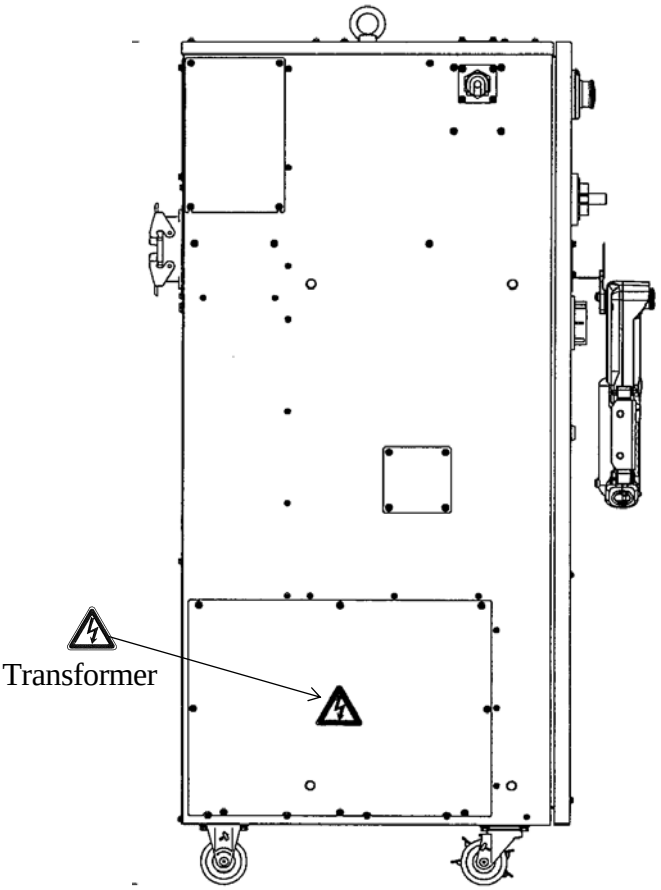
E4x controller



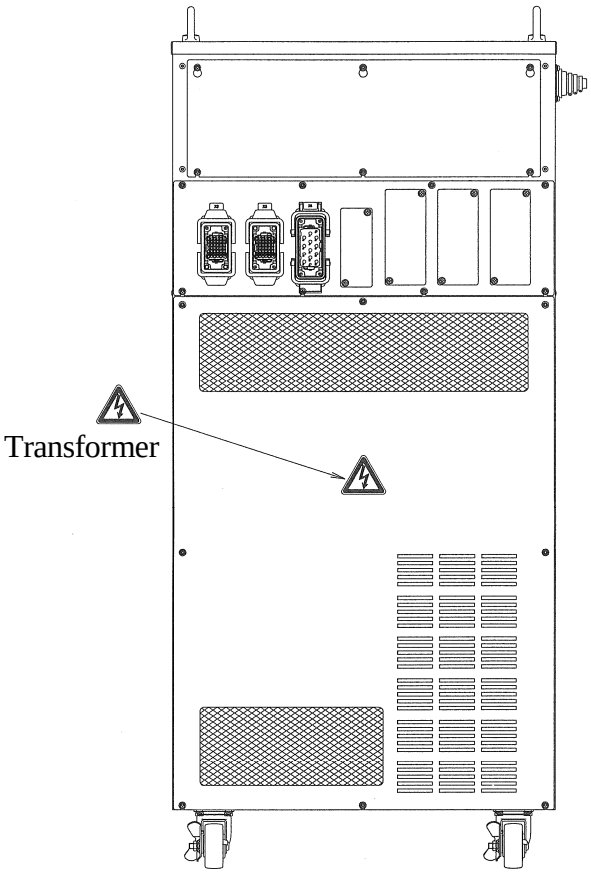
Front



(Door omitted)

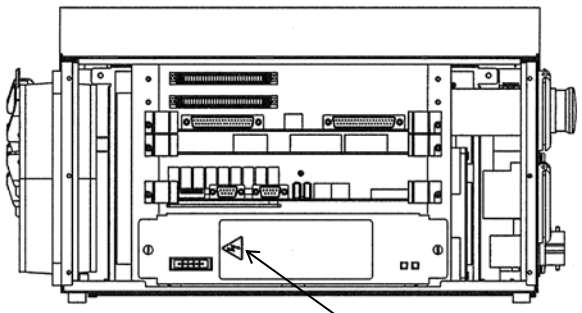


Left



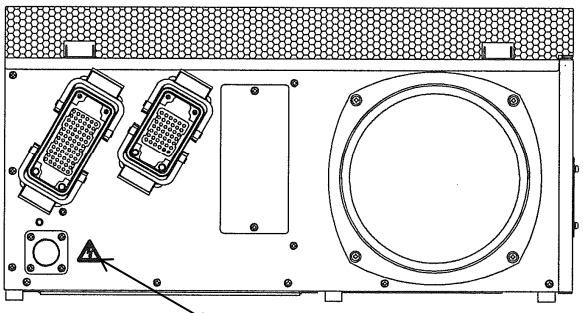
Rear

E70/E71 controllers



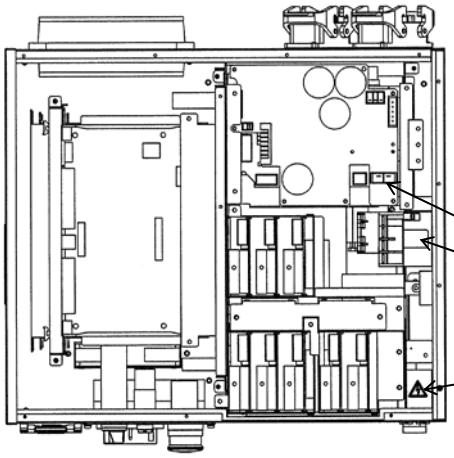
Left

DC power supply (AVR)



External power inlet

Rear



Top

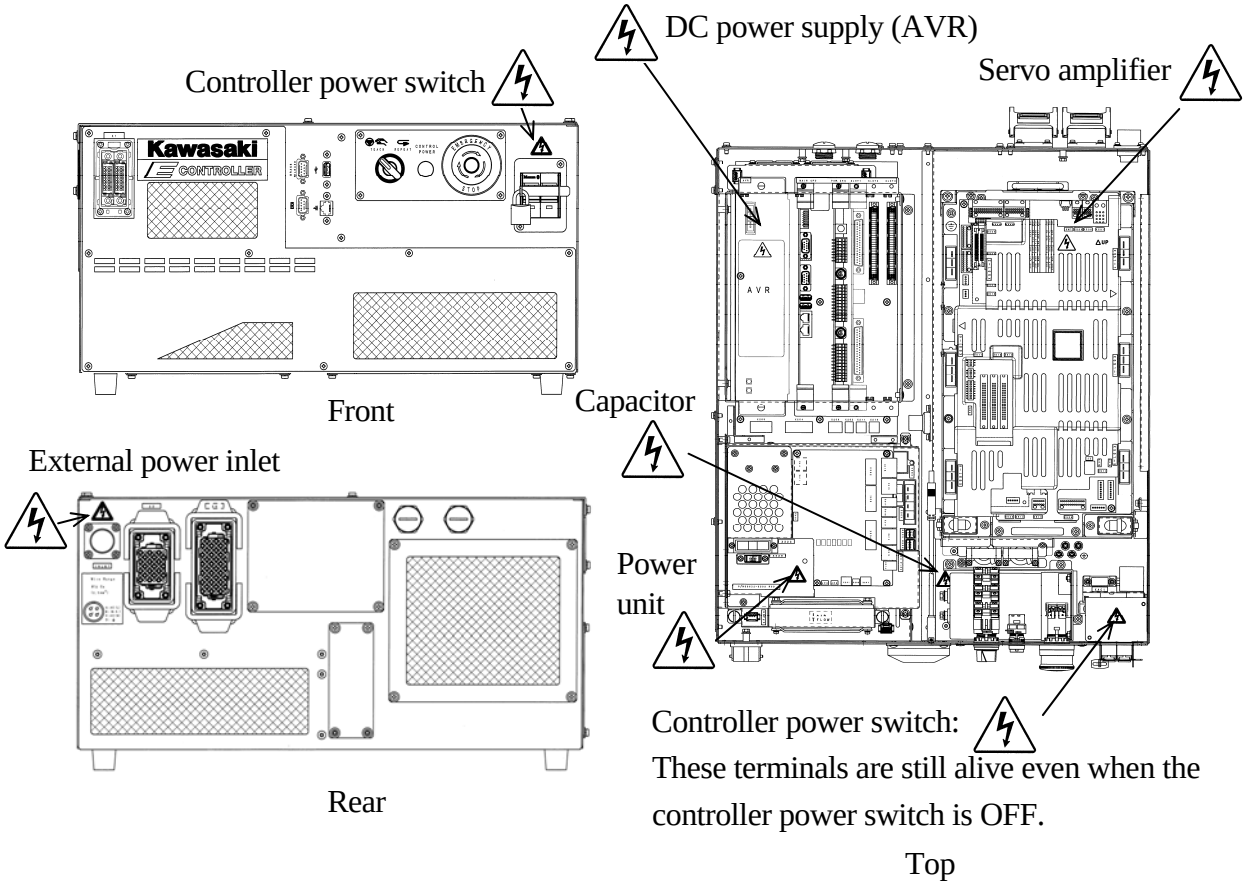
Power unit

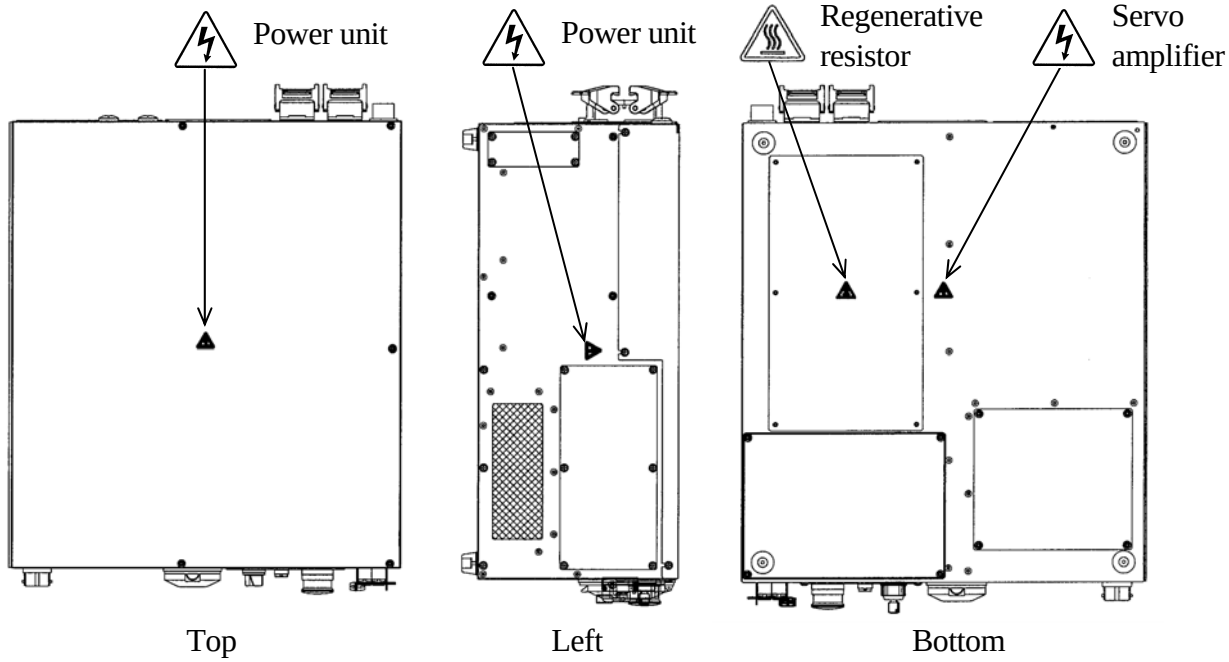
MC unit

Controller power switch

These terminals are still alive even when the controller power switch is OFF.

E91 controller

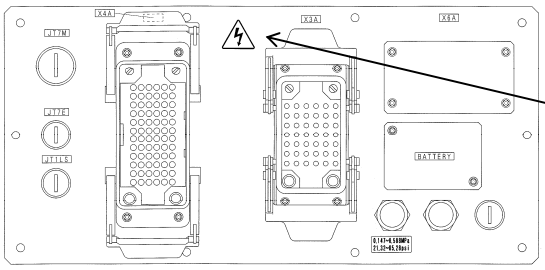




3.3.2 ARM ELECTRIFICATION, HIGH TEMPERATURE AND PINCHING RISKS

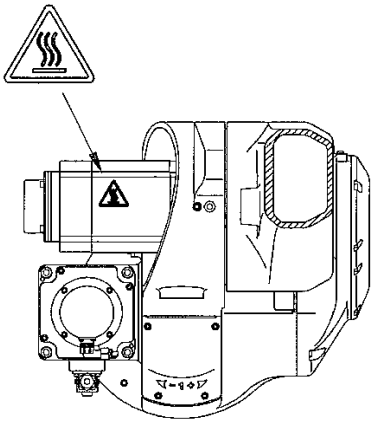
The figures below show the residual risk warning labels on RS20 arm as an example. Residual risk warning signs are located on similar places on all arm series.

RS20



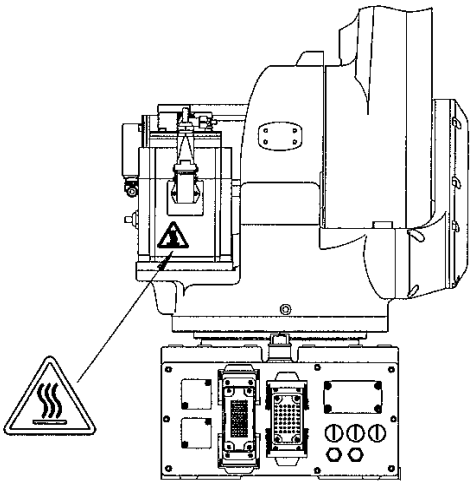
Warning label for electrification

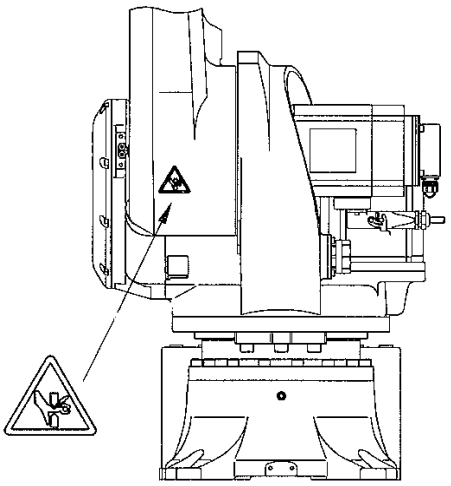
Base plate



Warning label for high temperature

Warning label for pinching





4.0 TRANSPORTATION

4.1 SAFETY PRECAUTIONS DURING TRANSPORTATION, INSTALLATION AND STORAGE

To transport the Kawasaki Robot to its installation place, strictly observe the following cautions while carrying out the transportation and installation work.

[NOTE]

The installation shall be made by qualified installation personnel and should conform to all national and local codes.

⚠ WARNING

1. **When transporting a controller or a robot arm with a crane or a forklift, never support the controller manually.**
2. **During the transportation, stay out from under the lifted controller or robot arm.**
3. **Prior to installation, turn OFF the controller power switch and the external power switch to shut down the 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 by someone accidentally turning ON the power.**
4. **When moving the robot, ensure safety by first confirming no abnormality is observed in the 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 by carelessly approaching the robot and peripheral equipment. After setting the robot to the specified pose, turn OFF the controller and external power switch again. 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 the 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 following range:**
     0 - 45 °C for Y series arm,
     -10°C to 60 °C for B, BA, CP, CX, M, MC, MS, R, Z series arm and controller,
   - **(2) keep the relative humidity within the range of 35 - 85 % RH without dew condensation,**
   - **(3) keep free from excessively strong vibration.**

4.2 TRANSPORTATION OF CONTROLLER

When transporting the controller, strictly observe the precautions given in the sections below for whichever transport method is chosen.

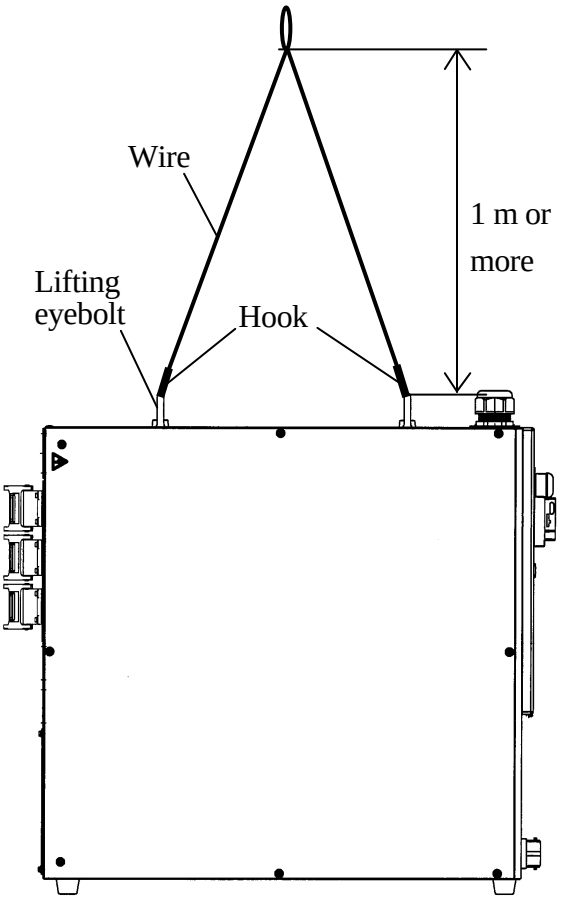
4.2.1 BY CRANE LIFTING

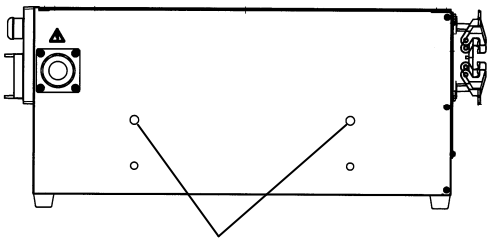
⚠ WARNING

1. **Never support the controller manually when it is lifted up. And, never go under or stay too close to the controller during transport.**
2. **Hook the wire at the lifting eyebolts as shown below.**
3. **Ensure that the lifting eyebolts are not loose. Check each one and retighten if loose. Otherwise, the controller may fall and suffer damage.**

E0x controller

Attach the following eyebolts to the M10 tapped holes in the figure below when transporting the controller by crane lifting. (Manufacturer: TAKIGEN MGF CO., LTD. Model: B-130-10 or equivalent. The screw length should be 25 mm or less.)



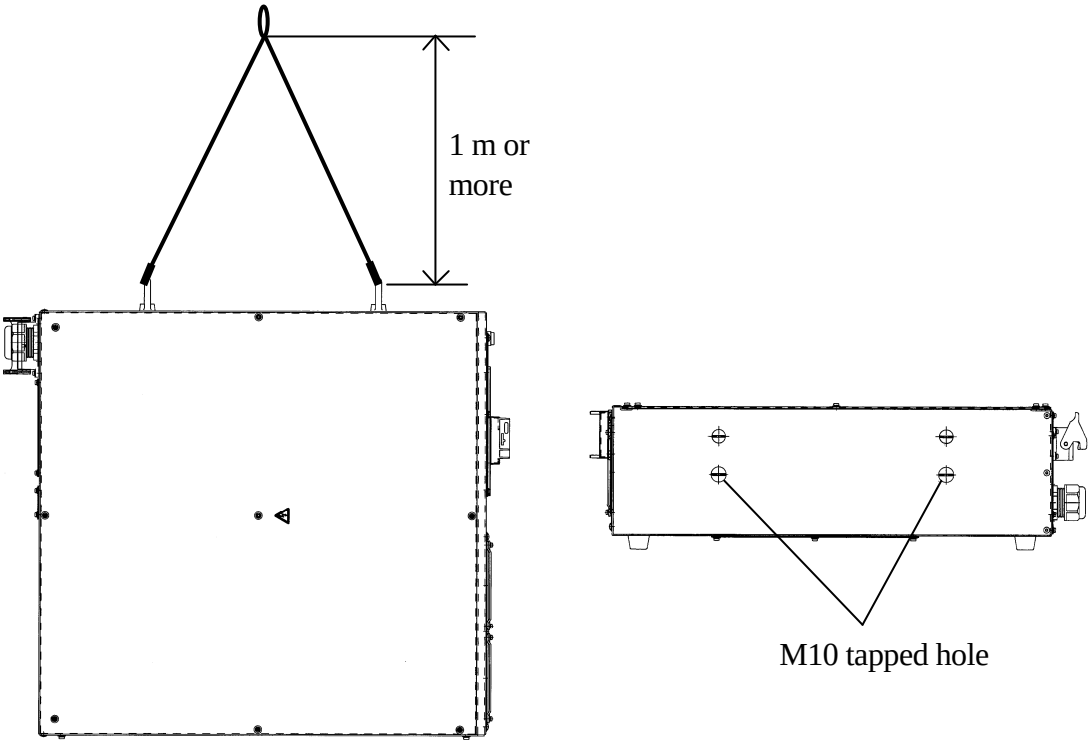


M10 tapped hole

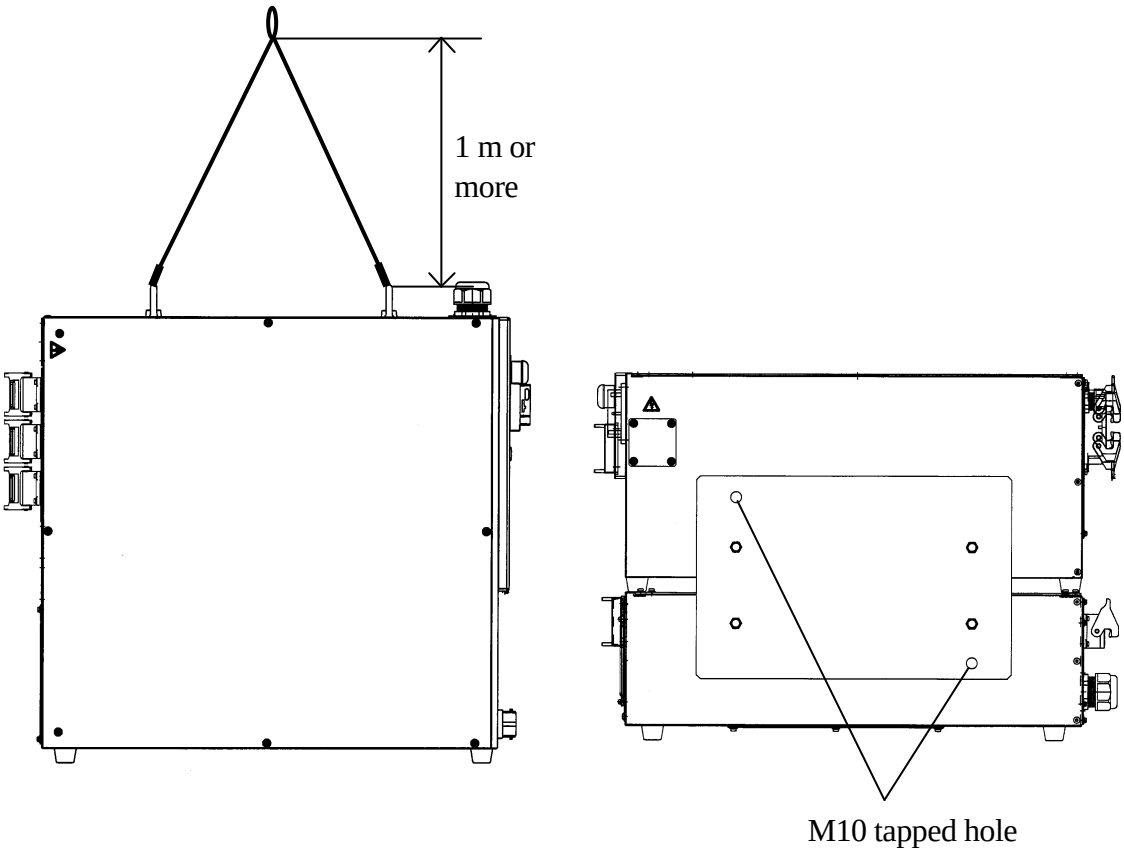
⚠ CAUTION

1. **Prepare wire and crane capable of hoisting 200 kg or more, sufficient for a controller loaded with full options.**
2. **Remove the teach pendant and teach pendant holder (if equipped) before lifting with the wire sling.**
3. **Wire length: 1 m or more as shown in the figure on the left.**
4. **Be careful as the controller may tilt when lifted up.**
5. **Be careful not to let the wire to get caught on other equipments.**

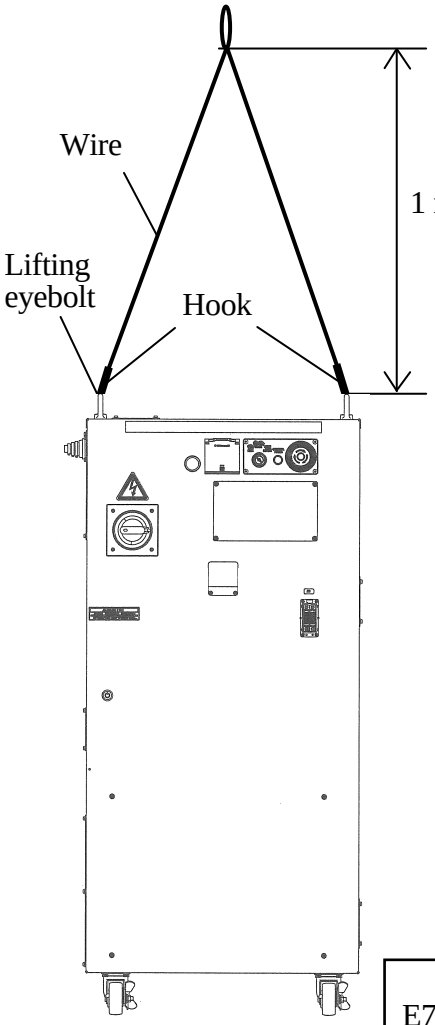
Transformer unit



Controller combined with transformer unit



E4x controller



E4x controller

⚠ CAUTION

1. **Prepare wire and crane capable of hoisting 300 kg or more, sufficient for a controller loaded with full options.**
2. **Remove the teach pendant and teach pendant holder (if equipped) before lifting with the wire sling.**
3. **Wire length: 1 m or more as shown in the figure on the left.**
4. **Be careful as the controller may tilt when lifted up.**
5. **Be careful not to let the wire to get caught on other equipments.**

[**NOTE**]

E70/E71/E91 controllers must not be transported by crane lifting.

4.2.2 BY CASTER (E4X)

⚠ WARNING

1. **The controller can be moved on its casters only when the entire transport path is level enough. Otherwise, moving the controller on an inclined or an uneven surface will cause it to topple, resulting in a serious damage.**
2. **E4x controller falls over if it is tilted as follows.**
   Back or forth: Approx. 15° or more
   Right or left: Approx. 15° or more

⚠ CAUTION

1. **Release the stoppers on the two front casters of the controller when moving the controller. (Push the "OFF" side pedal.)**
2. **Relock the casters after the transport is complete.**
   (Push the "ON" side pedal for locking.)

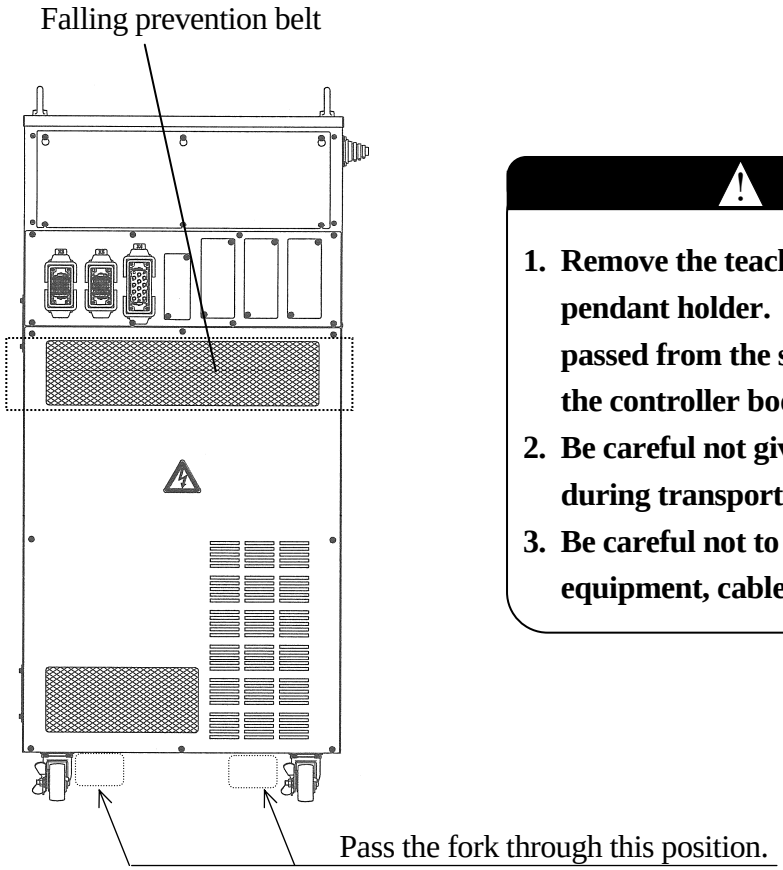
[**NOTE**]

E0x (or with transformer unit)/E70/E71/E91 controllers must not be transported by caster.

4.2.3 BY FORKLIFT TRUCK (E4X)

⚠ WARNING

To avoid the controller from toppling over, fasten it to the forklift with a belt as shown below.



⚠ CAUTION

1. **Remove the teach pendant and teach pendant holder. The fork cannot be passed from the side. Pass the fork under the controller body as shown on the left.**
2. **Be careful not give shock to the controller during transport.**
3. **Be careful not to get caught on other equipment, cables, etc.**

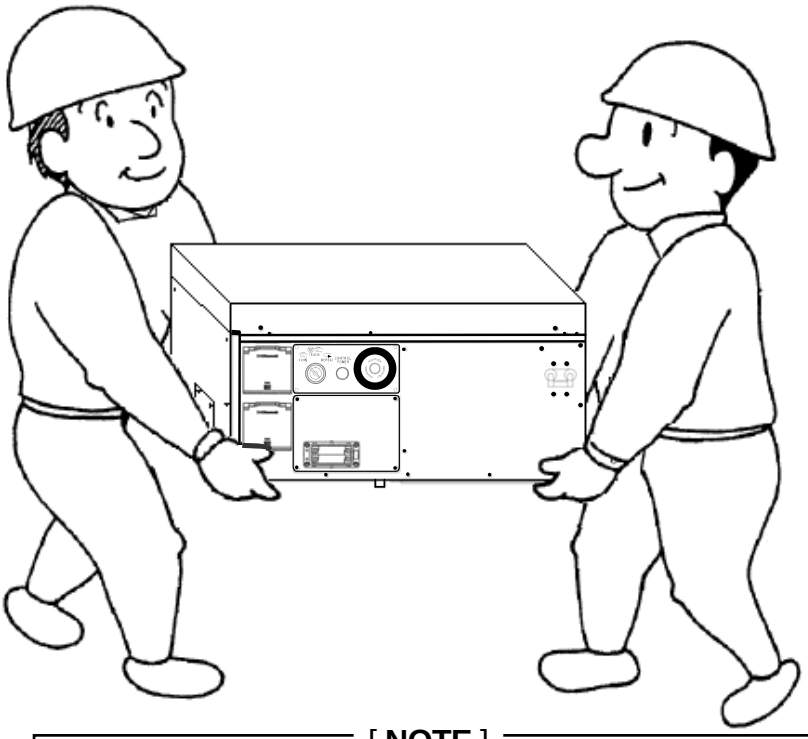
[NOTE]

E0x (or with transformer unit)/E70/E71/E91 controllers must not be transported by forklift.

4.2.4 BY TWO PERSONS (E0X (OR WITH TRANSFORMER UNIT)/E70/E71/E91)

⚠ CAUTION

1. **Disconnect the Teach Pendant.**
2. **Be careful not give shock on the controller during transportation.**
3. **The clearance between the bottom of the controller and the floor is small (E70/E71: 9 mm, E0x/E91: 18 mm). Accordingly, hold up one side of the controller then the other side, and get your fingers placed on the bottom of controller body sufficiently before holding up the controller. Because the controller has mass (E70/E71: 30 kg, E01/E02/E04/E91: 40 kg, E03/transformer unit: 45kg), it is impossible to carry the controller with fingertips. On the left side of E70/E71 controller, handle is provided to hold up the controller.**
4. **It is impossible to carry the control equipment by two persons when the controller is combined with the transformer unit, because the total mass is 90 kg. Carry the control equipment by crane lifting or carry the controller and the transformer unit separately after disconnecting them.**



[NOTE]

E4x controllers must not be carried manually.

4.3 TRANSPORTATION METHOD OF ROBOT ARM

⚠ CAUTION

1. **When lifting up the robot, be careful as robot may tilt forward/backward depending on robot posture and installation condition of the options. If the robot is lifted up in an inclined posture, it may swing or damage. Also, the wire may interfere with the harness, piping etc., or it may damage due to interfering with surrounding objects.**
2. **Remove the eyebolt or the hoisting jig or the transportation jig attached to the arm once the transportation of robot is complete.**
3. **Protect the robot with guard plates, etc. if wires interfere with a part of the robot.**

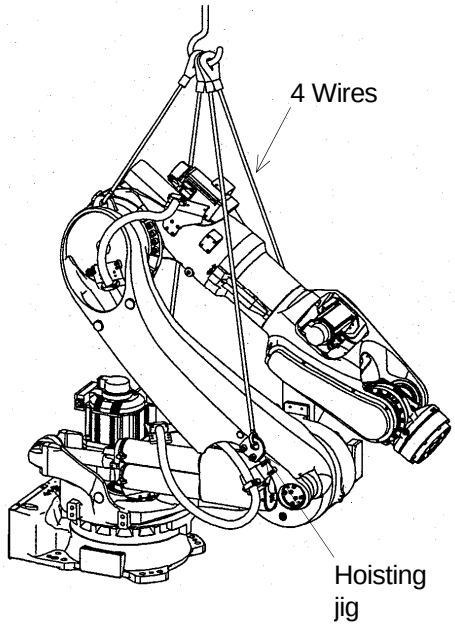
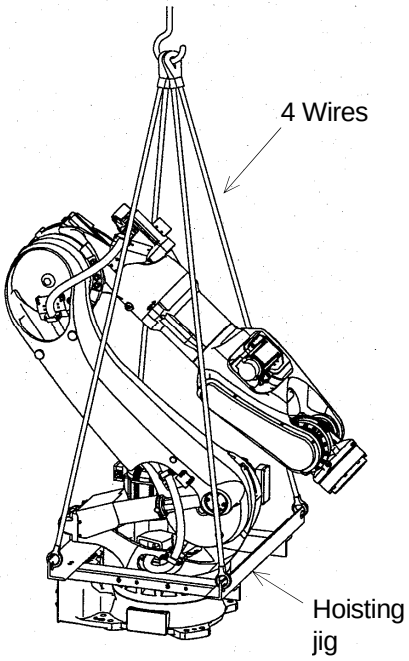
4.3.1 B SERIES

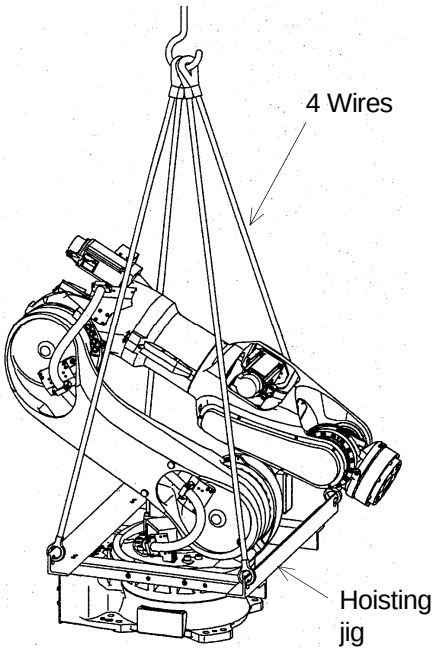
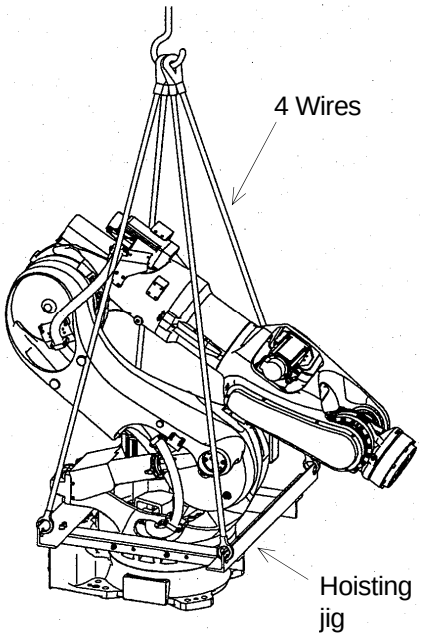
Using Wire Sling (Using hoisting jig)

As shown in the figure below, hoist up the robot by fastening the wire slings to the hoisting jig attached to robot arm.

⚠ WARNING

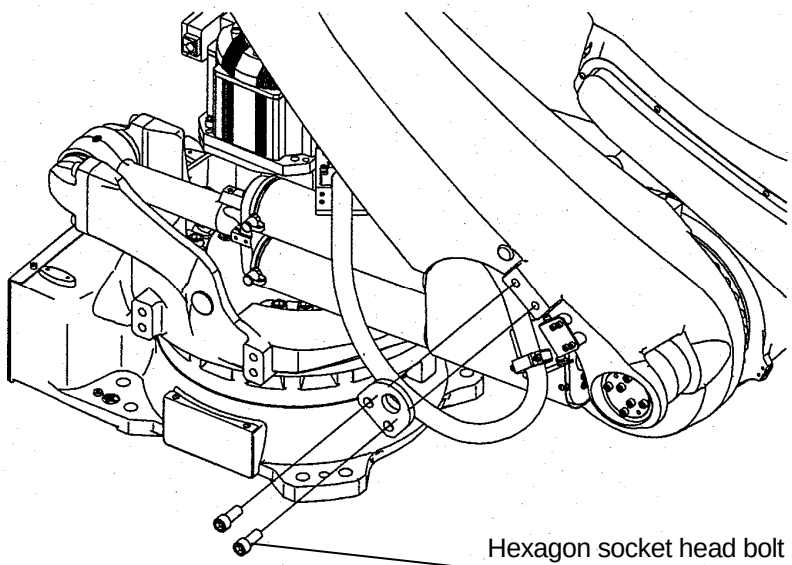
Use a hoisting jig without fail when hoisting up robot. If the robot is hoisted up without using the jig, robot may fall.

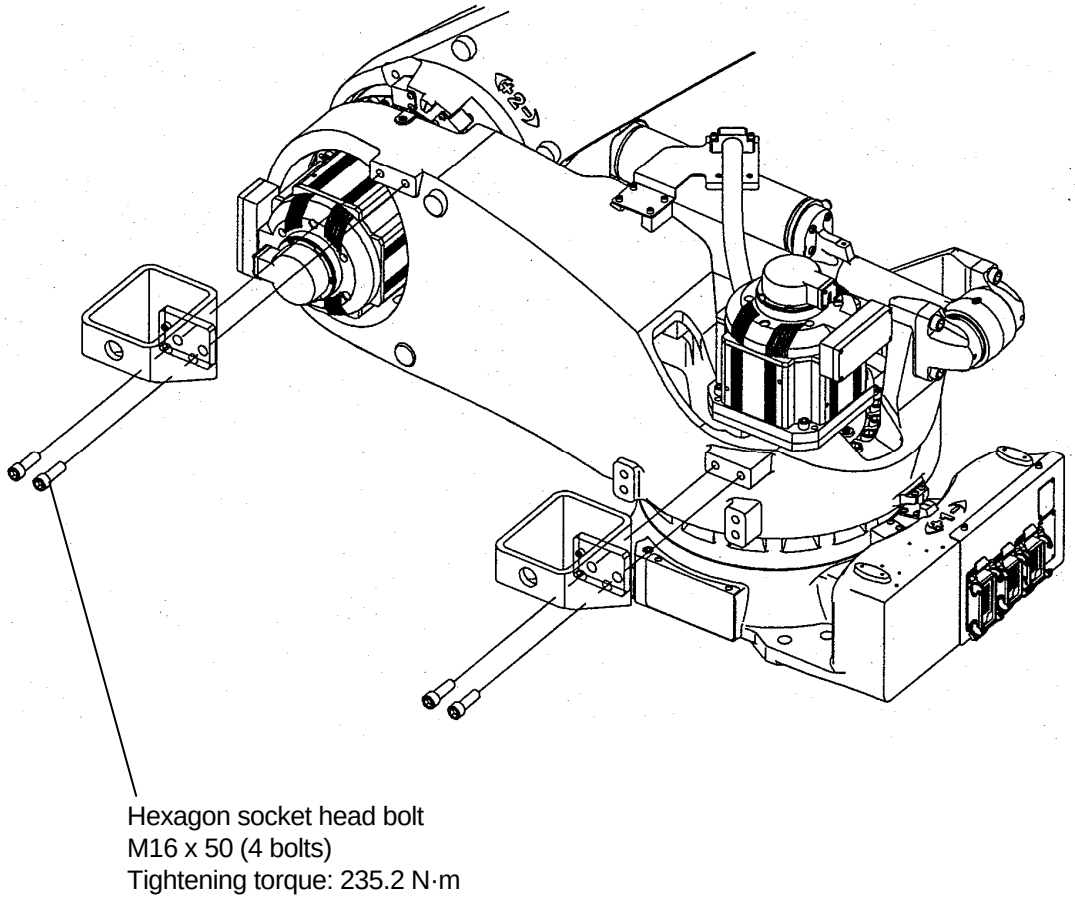
Model		BT165L, BT200L	BX100L, BX130X, BX165L, BX200L
Hoisted up posture			
Hoisted up posture	JT1	0°	0°
	JT2	-130°	-35°
	JT3	-75°	-75°
	JT4	0°	0°
	JT5	0°	0°
	JT6	0°	0°

Model		BX100N	BX165N
Hoisted up posture			
Hoisted up posture	JT1	0°	0°
	JT2	-50°	-45°
	JT3	-77°	-75°
	JT4	0°	0°
	JT5	0°	0°
	JT6	0°	0°

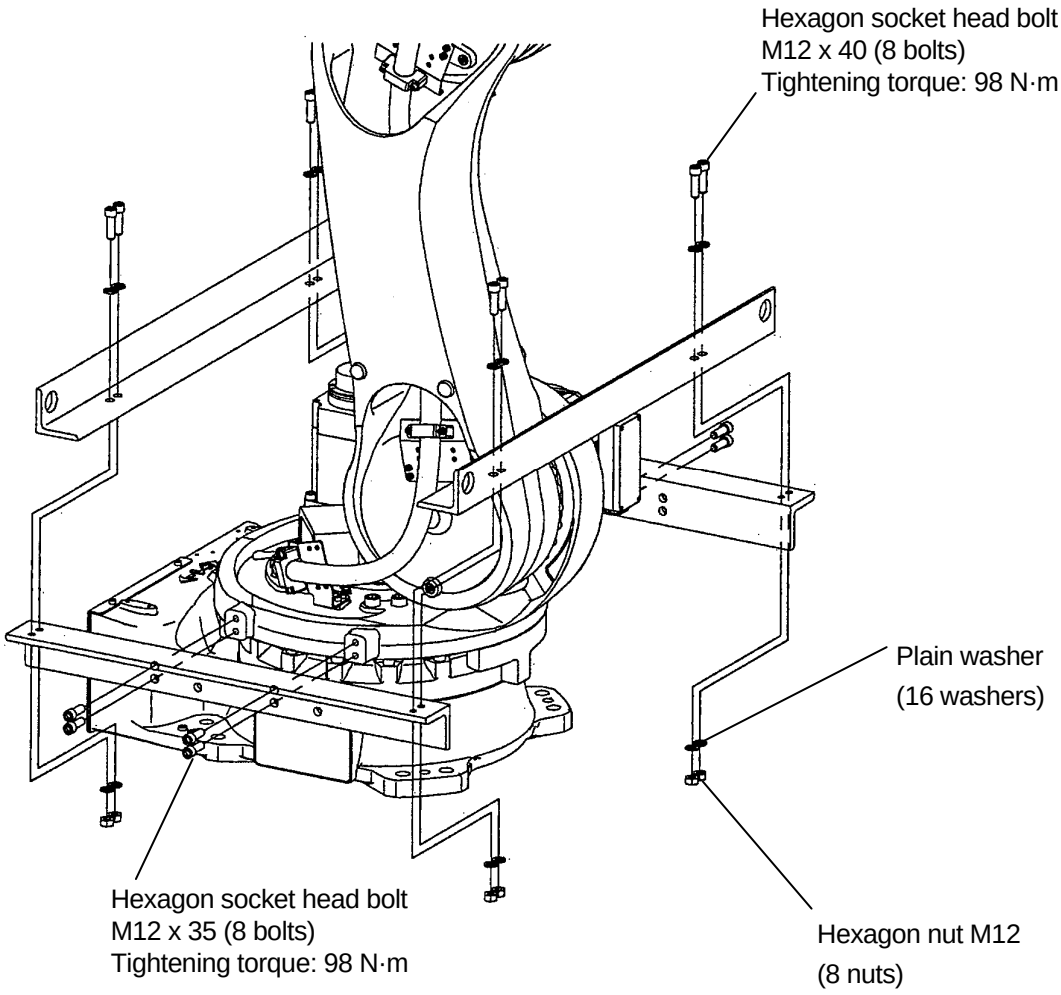
Attach the hoisting jig as shown in the figure below.

BT165L, BT200L

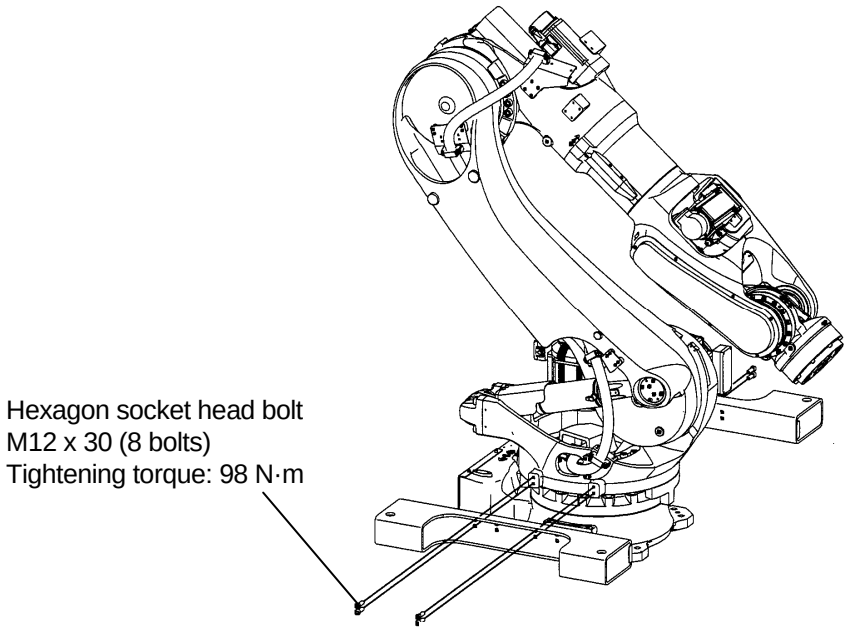




BX100L, BX100N, BX130X, BX165L, BX165N, BX200L



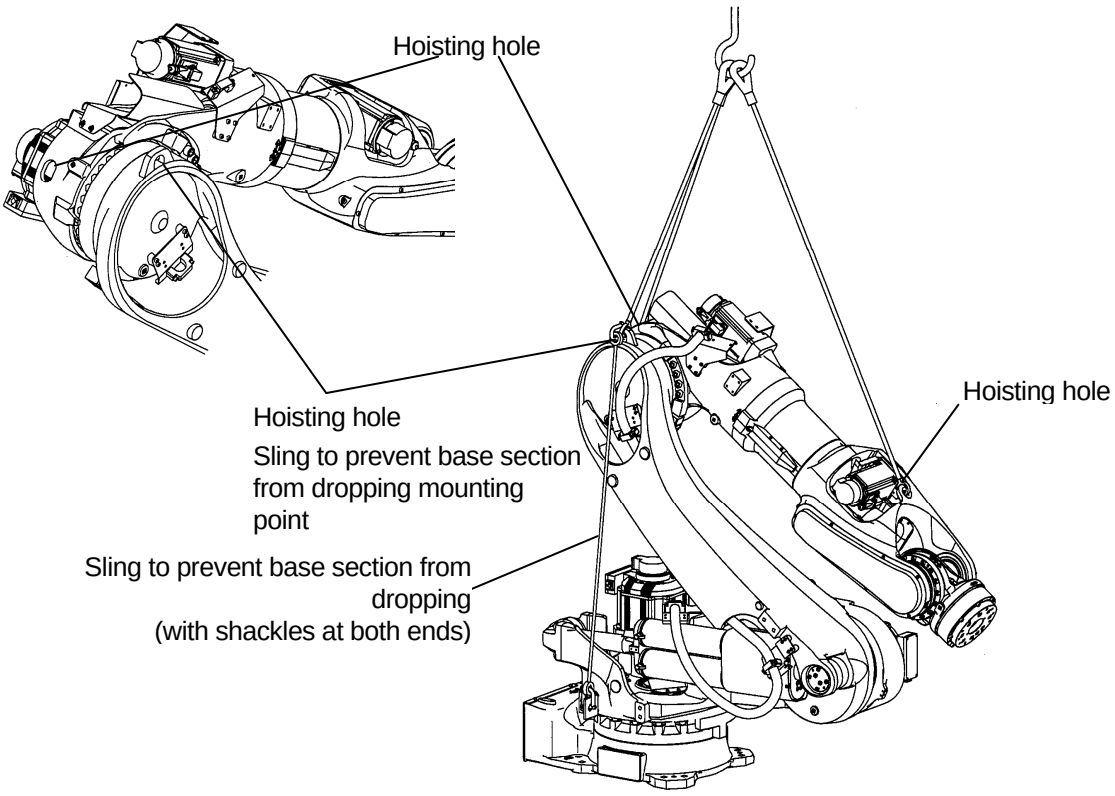
or

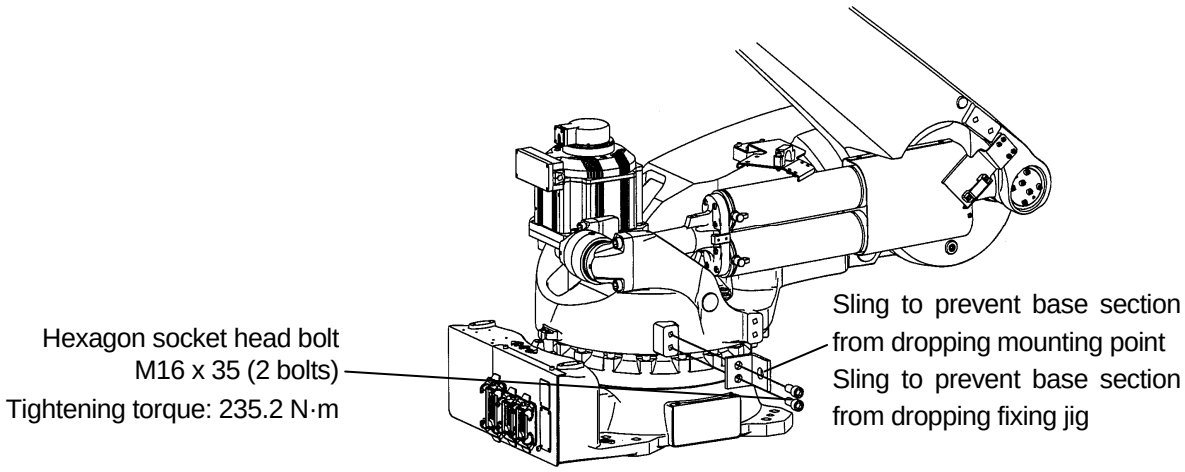


Using Wire Sling (Fastening wire sling directly on the arm)

BT165L, BT200L

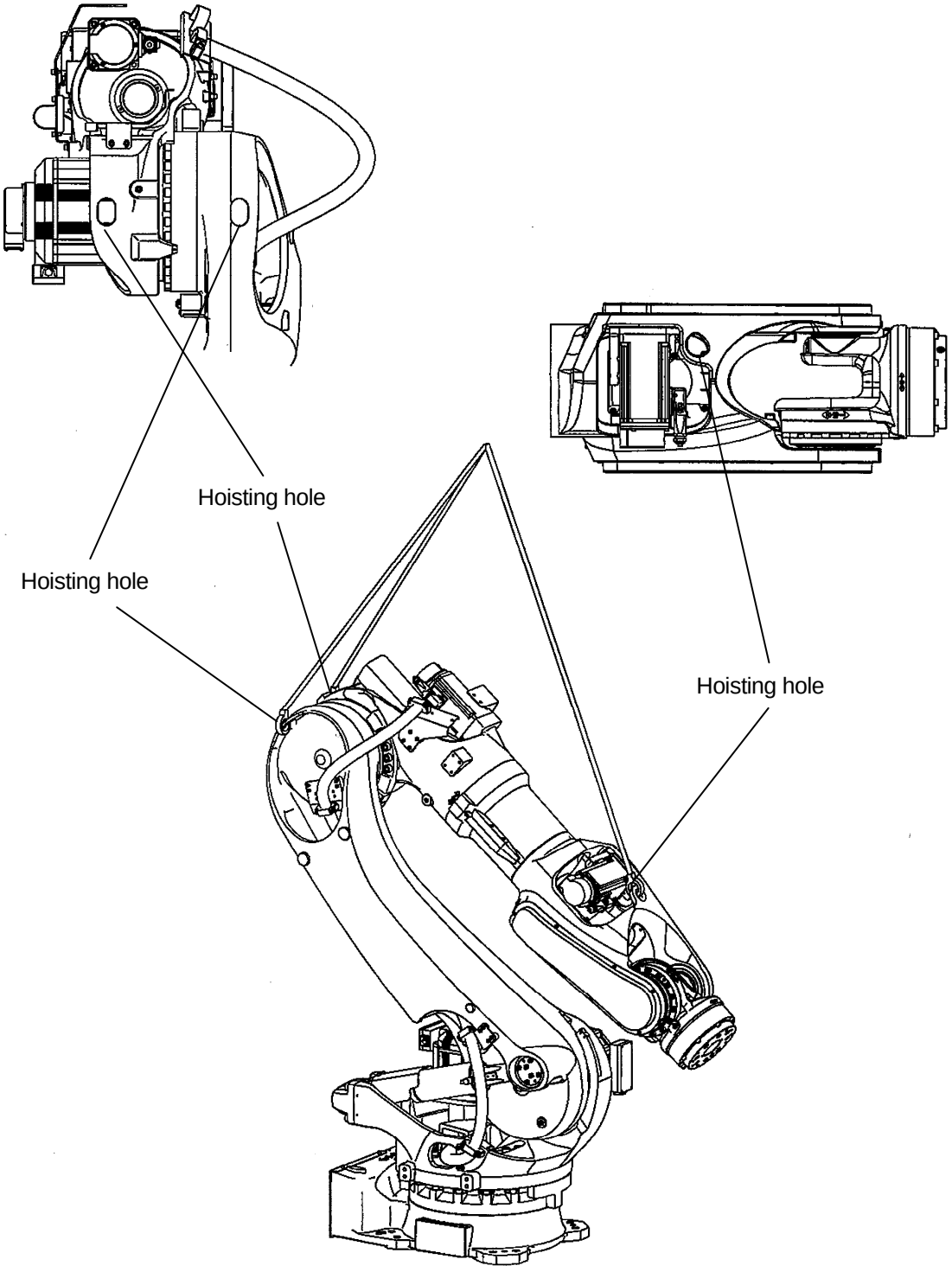
Hoist up the robot arm with wire slings by hooking at the three hoisting holes of the arm shown in the figure below and hooking the sling to prevent base section from dropping at the one hoisting hole of the arm and the one hoisting hole of the jig (Manufactured by TAIYO, Name: V-hook, Nominal working load: 1.25t or equivalent).





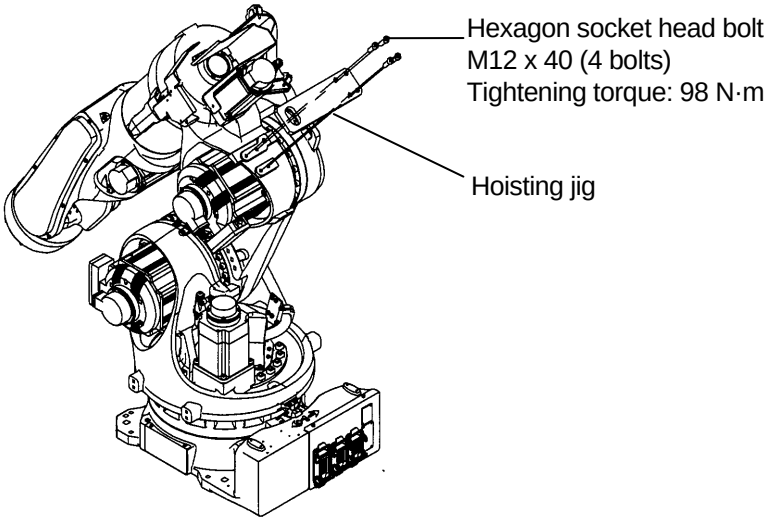
BX100L, BX130X, BX165L, BX200L

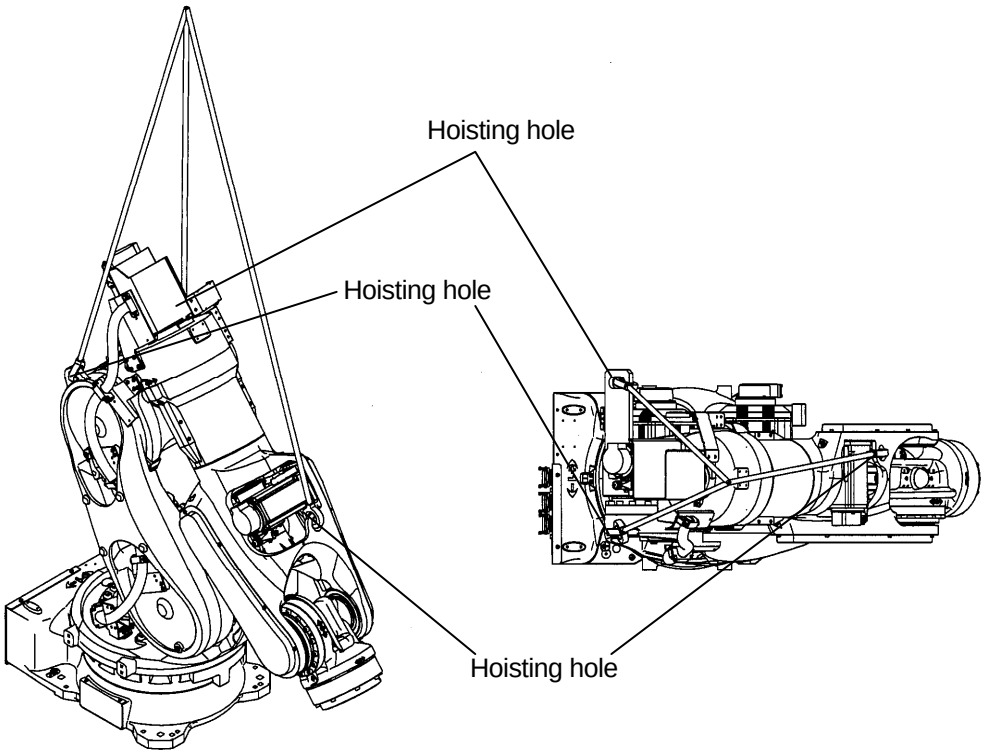
Hoist up the robot arm with wire slings by hooking at the three hoisting holes of the arm shown in the figure below. (Manufactured by TAIYO, Name: V-hook, Nominal working load: 1.25t or equivalent)



BX100S

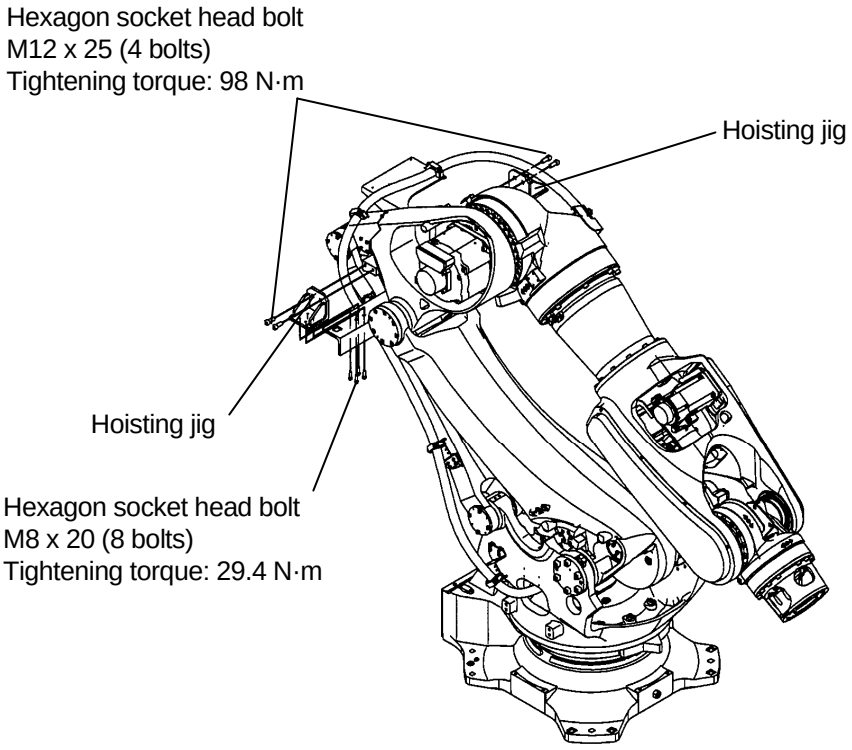
Hoist up the robot arm with wire slings by hooking at the two hoisting holes of the arm and one hoisting hole of hoisting jig shown in the figure below. (Manufactured by TAIYO, Name: V-hook, Nominal working load: 1.25t or equivalent)

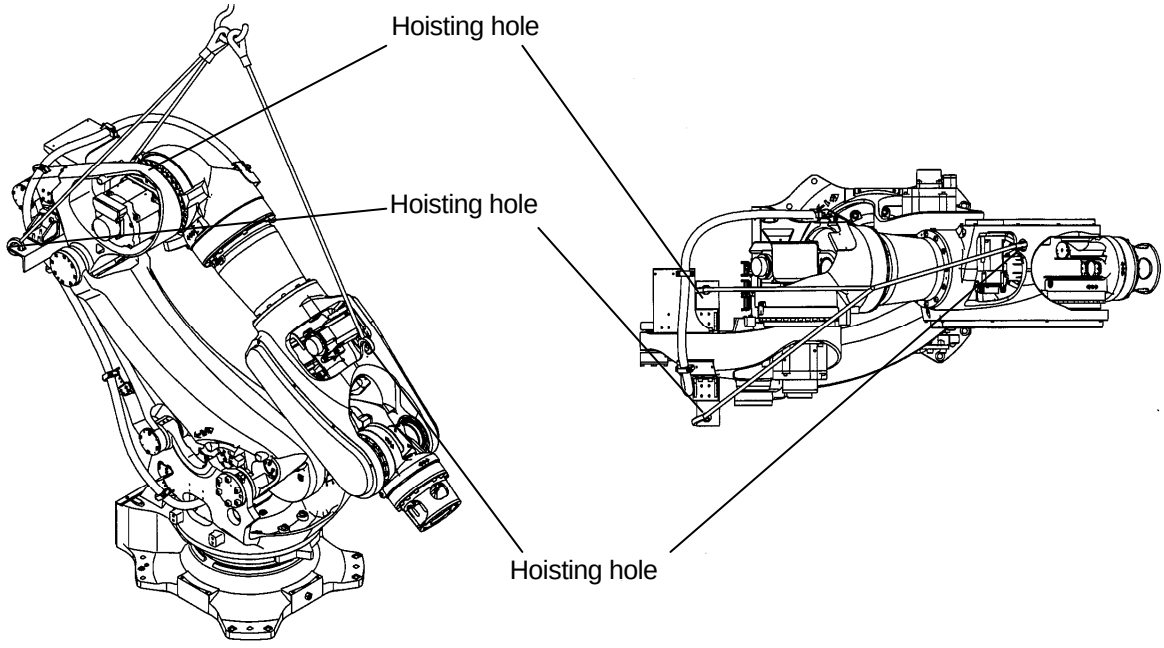


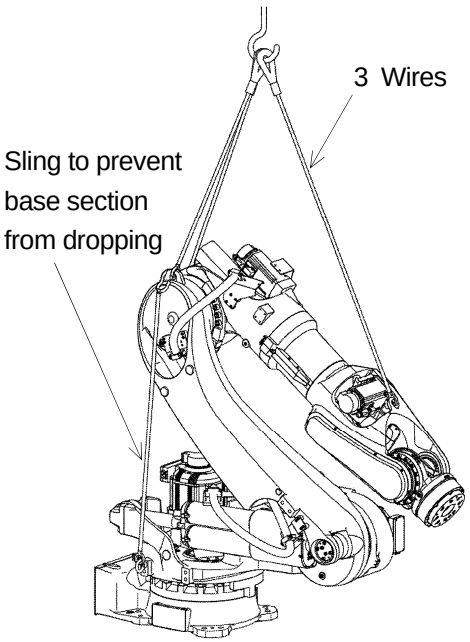
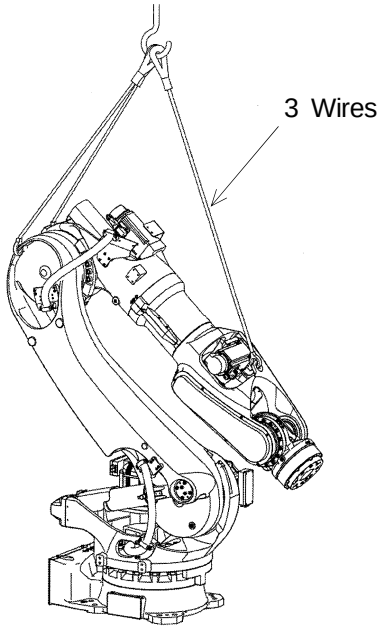


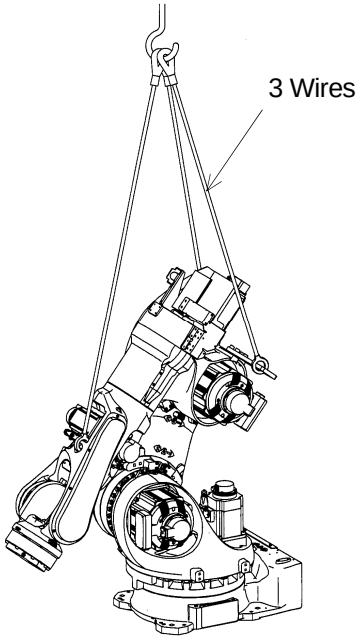
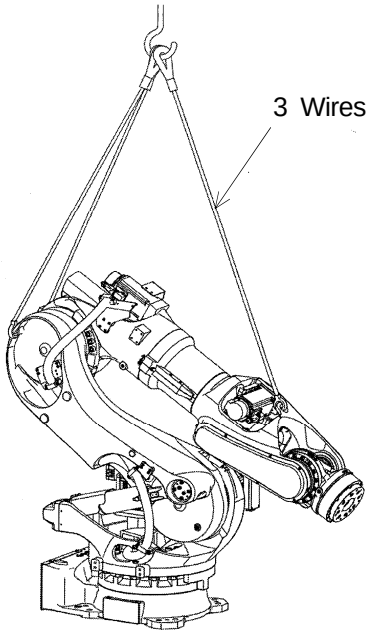
BX250L, BX300L

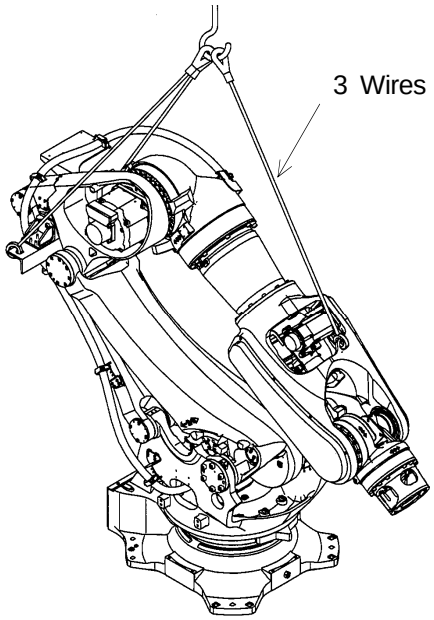
Hoist up the robot arm with wire slings by hooking at the one hoisting hole of the arm and two hoisting holes of hoisting jig shown in the figure below. (Manufactured by TAIYO, Name: V-hook, Nominal working load: 1.25t or equivalent)





Model		BT165L, BT200L	BX100L, BX130X, BX165L, BX200L
Hoisted up posture			
Hoisted up posture	JT1	0°	0°
	JT2	-130°	-35°
	JT3	-75°	-75°
	JT4	0°	0°
	JT5	0°	0°
	JT6	0°	0°

Model		BX100S	BX165N
Hoisted up posture			
Hoisted up posture	JT1	0°	0°
	JT2	-30°	-45°
	JT3	-81°	-75°
	JT4	0°	0°
	JT5	0°	0°
	JT6	0°	0°

Model		BX250L, BX300L
Hoisted up posture		
Hoisted up posture	JT1	0°
	JT2	-40°
	JT3	-35°
	JT4	0°
	JT5	0°
	JT6	0°

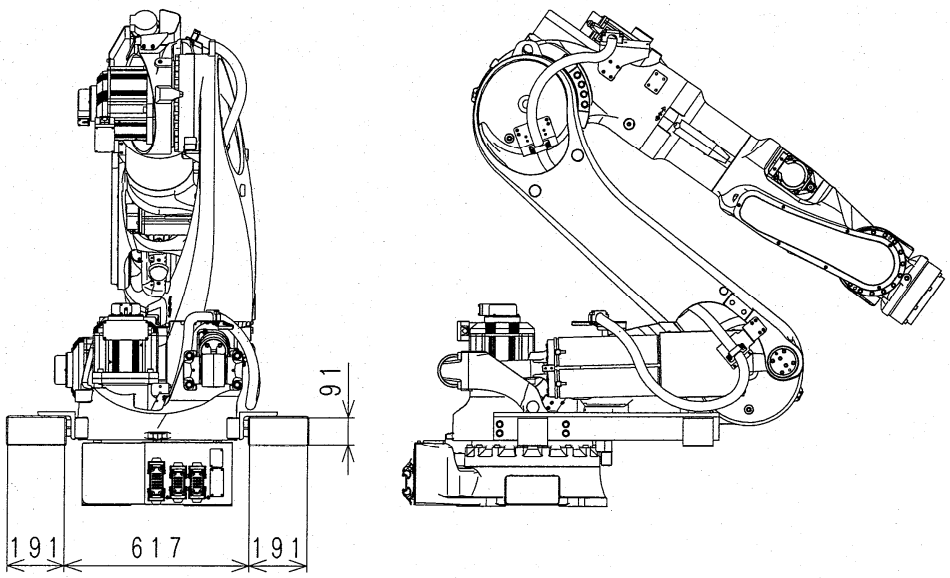
Using Forklift

According to the figure below, transport the robot by using a transportation jig for forklift attached to the robot arm.

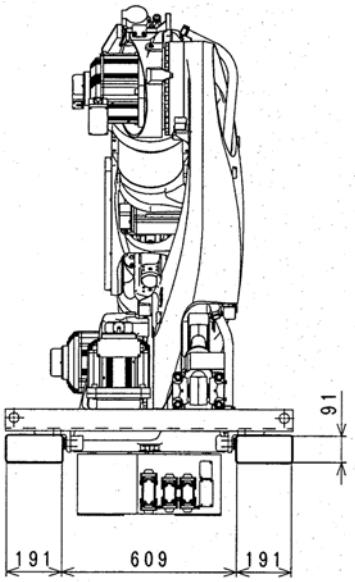
⚠ CAUTION

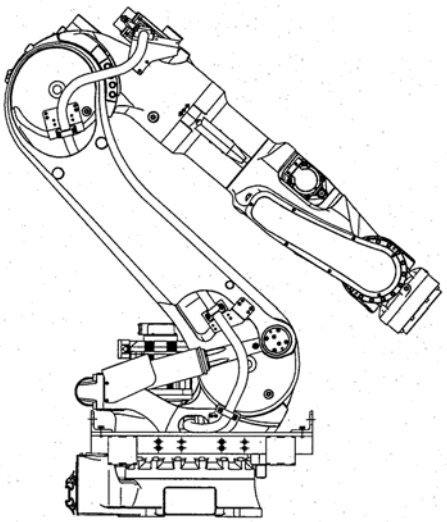
1. **Confirm that the forks of forklift penetrate sufficiently without fail.**
2. **When transporting robot on an inclined or rough surface, be careful to maintain balance to prevent forklift/robot from falling.**

BT165L, BT200L

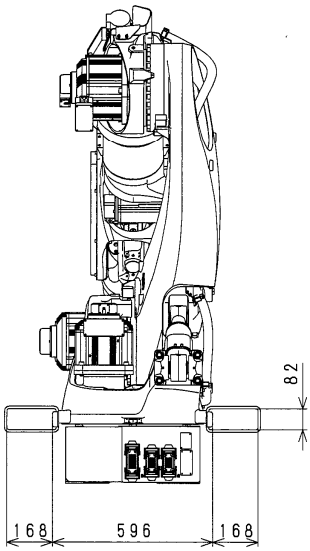


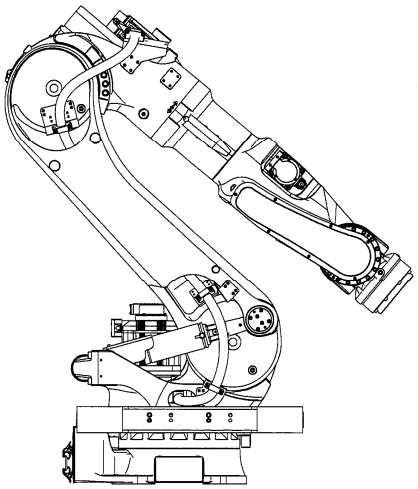
BX100L, BX130X, BX165L, BX165N, BX200L



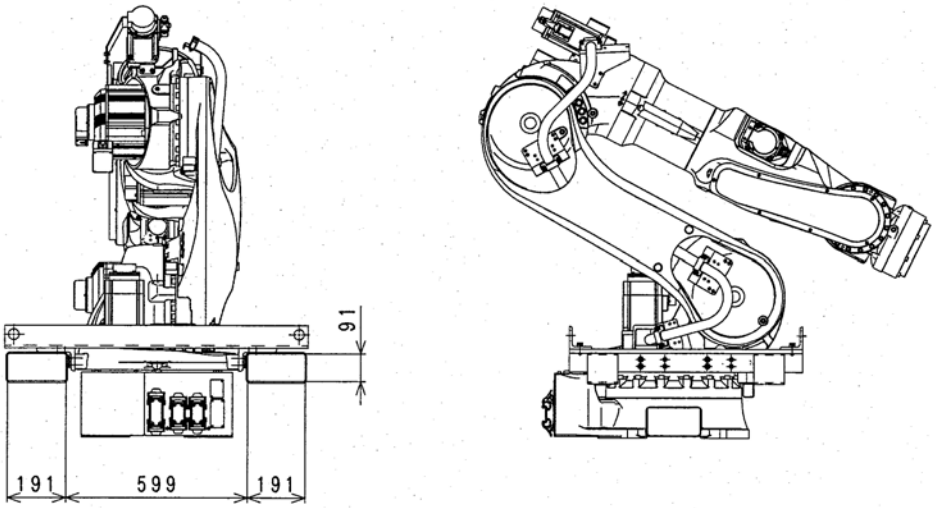


or

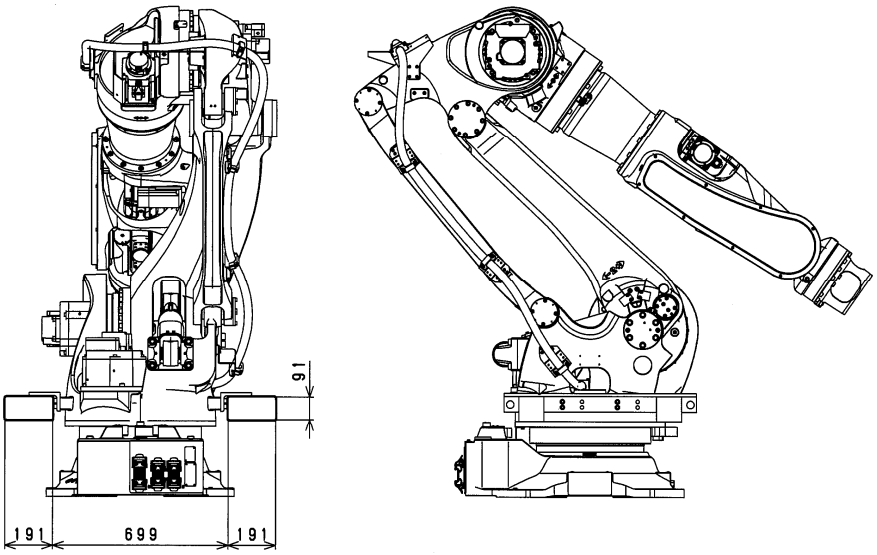




BX100N, BX100S

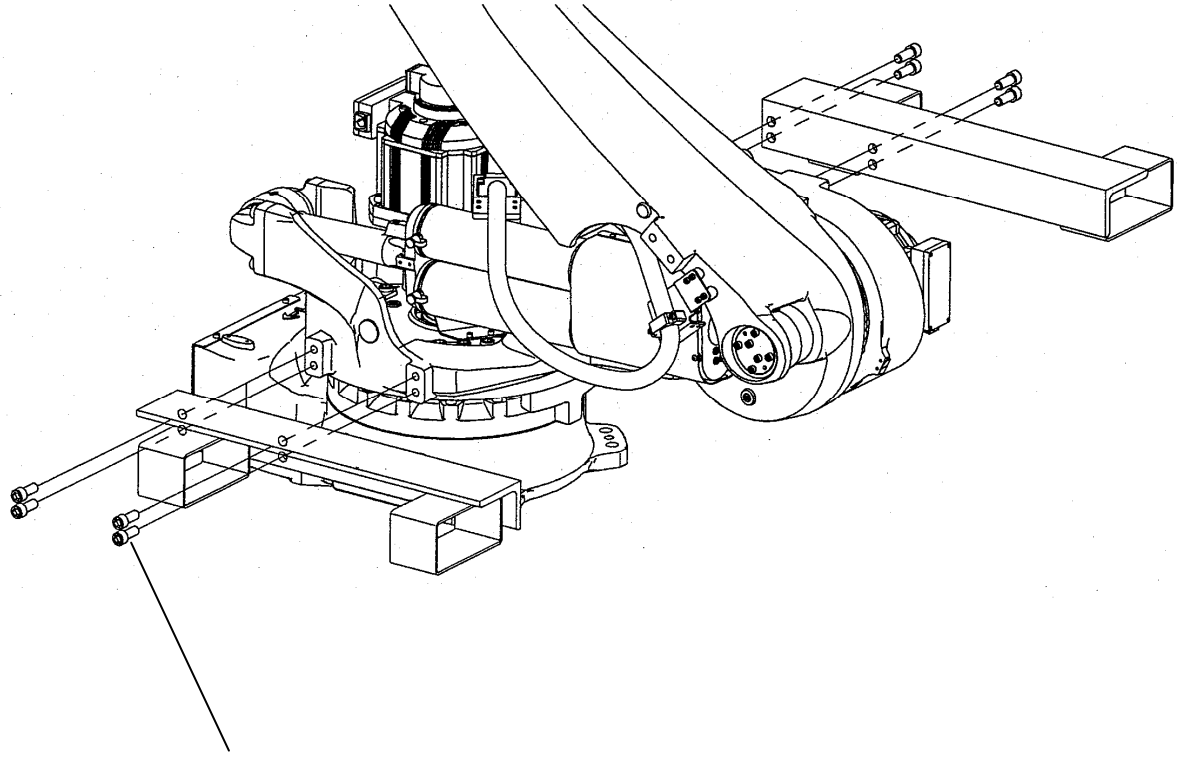


BX250L, BX300L



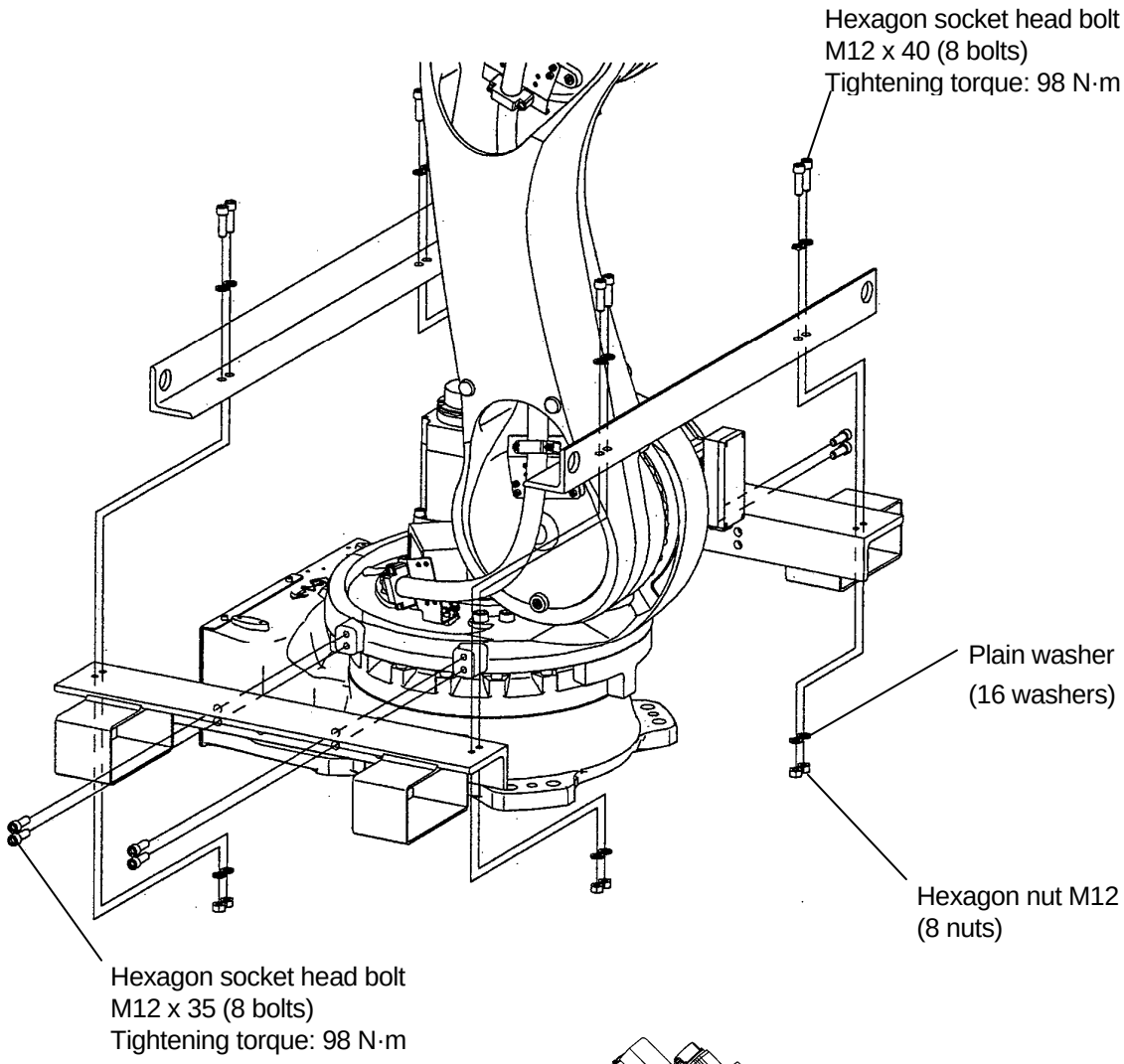
Attach the transportation jig as shown in the figure below.

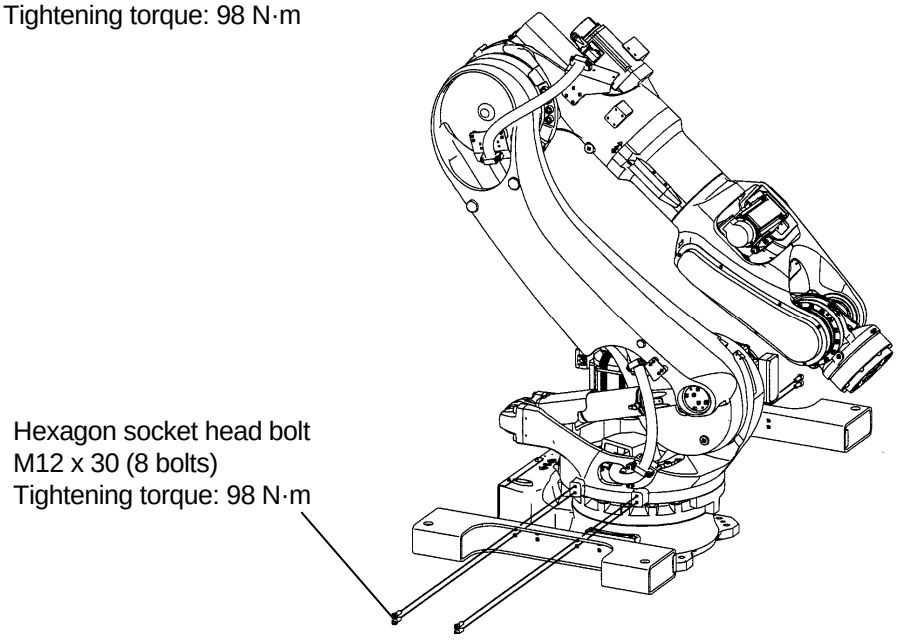
BT165L, BT200L



Hexagon socket head bolt
M16 x 40 (8 bolts)
Tightening torque: 235.2 N·m

BX100L, BX100N, BX100S, BX130X, BX165L, BX165N, BX200L, BX250L, BX300L

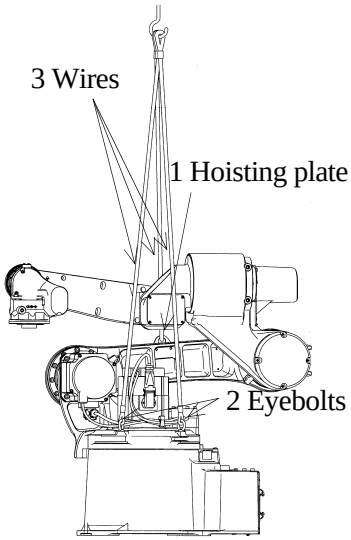




4.3.2 BA SERIES

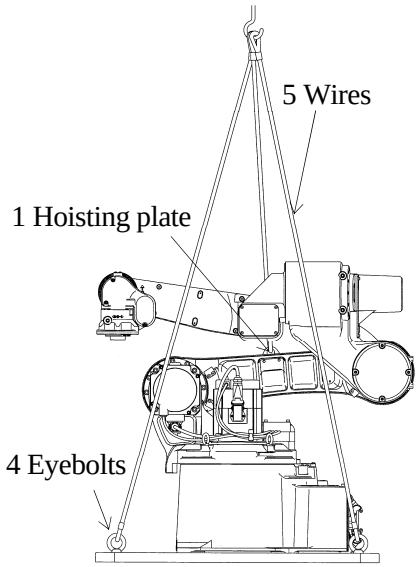
Using Wire Sling (Without base plate)

As shown in the figure below, fasten wire slings to two eyebolts and a hoisting plate on the arm and hoist up the robot. (Use the same method for hoisting up the robot with pedestal.)

Hoisted up posture		
Hoisted up posture	JT1	0°
	JT2	-85°
	JT3	-175°
	JT4	0°
	JT5	-90°
	JT6	0°
Hoisting parts on arm		Eyebolt M8 × 2 Hoisting plate × 1

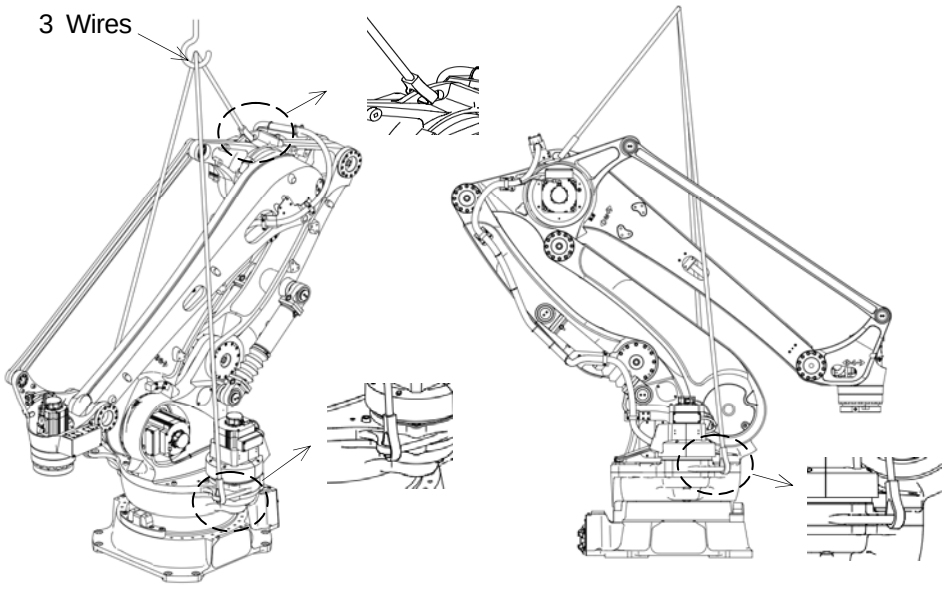
Using Wire Sling (With base plate)

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 a hoisting plate on the arm to prevent the robot from accidentally falling. (Use the same method for hoisting up the robot with pedestal.)

<table>
<tr><td>Hoisted up posture</td><td colspan="2"> 
</td></tr>
<tr><td rowspan="6">Hoisted up posture</td><td>JT1</td><td>0°</td></tr>
<tr><td>JT2</td><td>-85°</td></tr>
<tr><td>JT3</td><td>-175°</td></tr>
<tr><td>JT4</td><td>0°</td></tr>
<tr><td>JT5</td><td>-90°</td></tr>
<tr><td>JT6</td><td>0°</td></tr>
<tr><td colspan="2">Hoisting parts on arm</td><td>Hoisting plate × 1</td></tr>
</table>

4.3.3 CP SERIES

Using Wire Sling
Hoist up the robot arm by fastening wire slings directly to the three hoisting holes of the arm shown in the figure below.

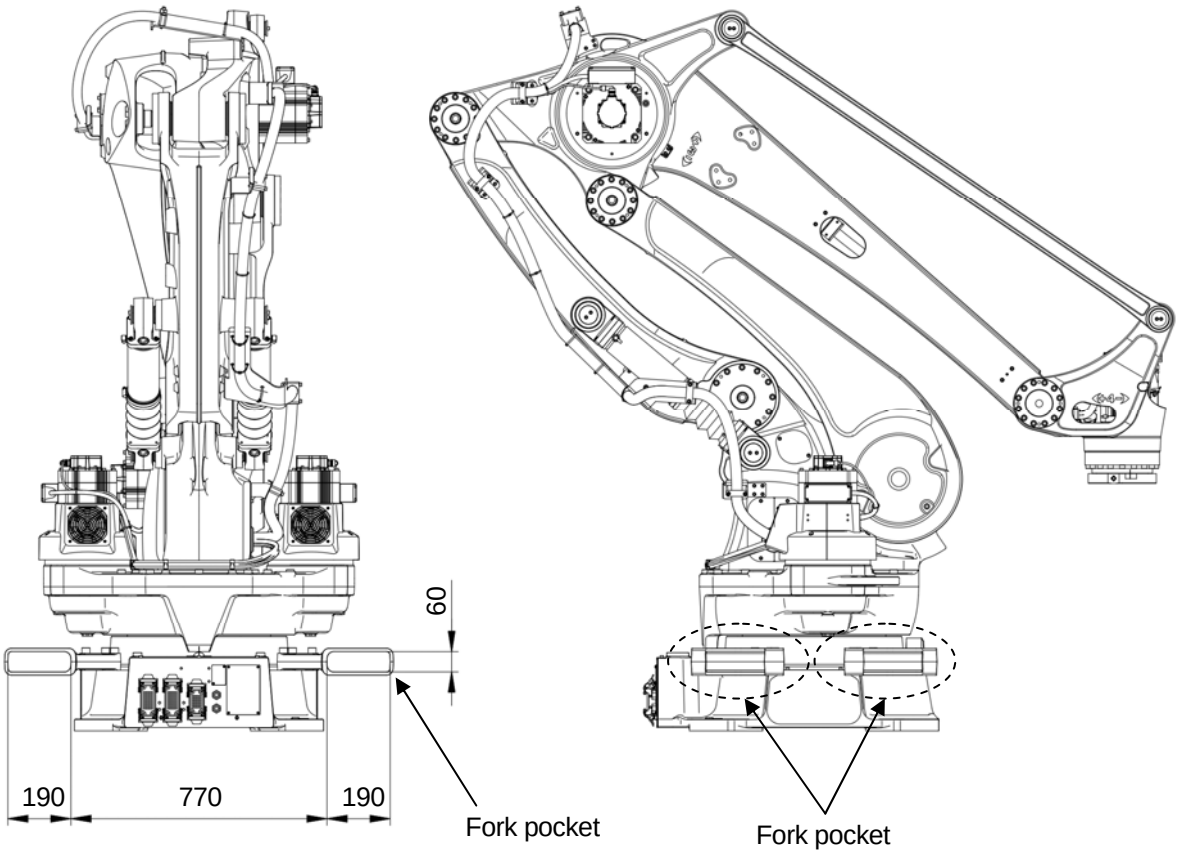
Model		CP series
Hoisted up posture		
Hoisted up posture	JT1	0°
	JT2	-46°
	JT3	-34°
	JT4	0°
	JT5	0°
	JT6	0°

Using Forklift

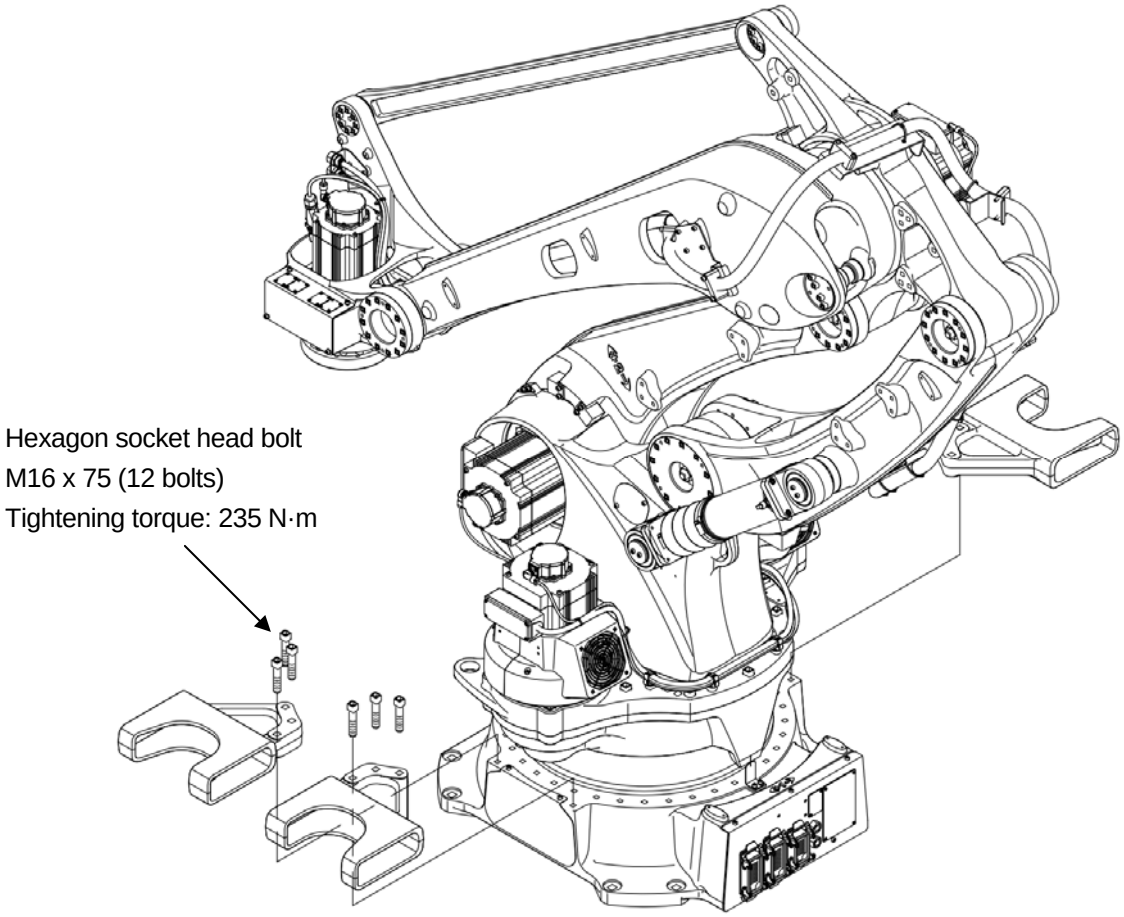
According to the figure below, transport the robot by using a transportation jig for forklift attached to the robot arm.

⚠ CAUTION

1. **Confirm that the forks of forklift penetrate sufficiently without fail.**
2. **When transporting robot on an inclined or rough surface, be careful to maintain balance to prevent forklift/robot from falling.**



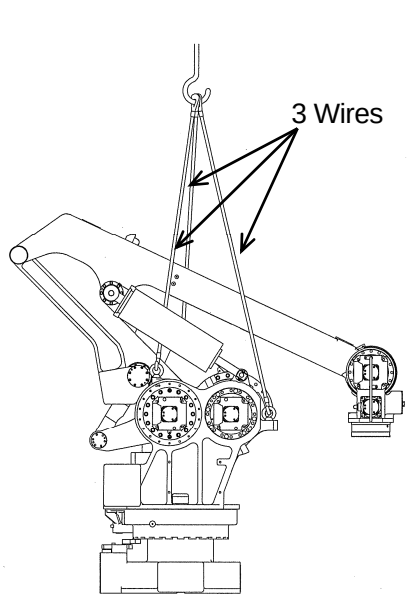
Attach the transportation jig as shown in the figure below.



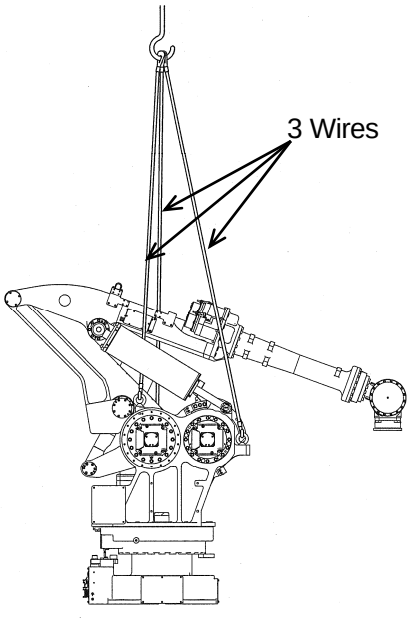
4.3.4 M SERIES

Using Wire Sling

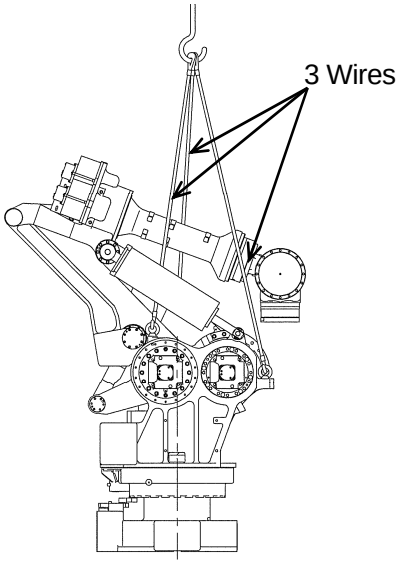
Attach three eye bolts on the arm as shown in the figure below. Fasten the wires through the eyebolts to lift the robot arm.



MD Series

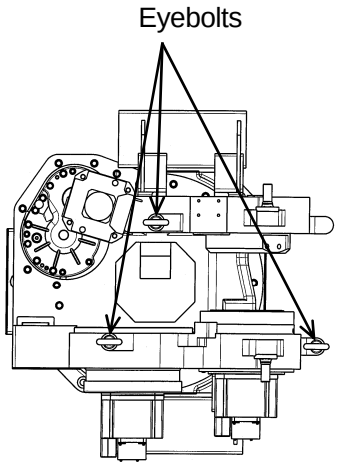


MT400N



MX Series

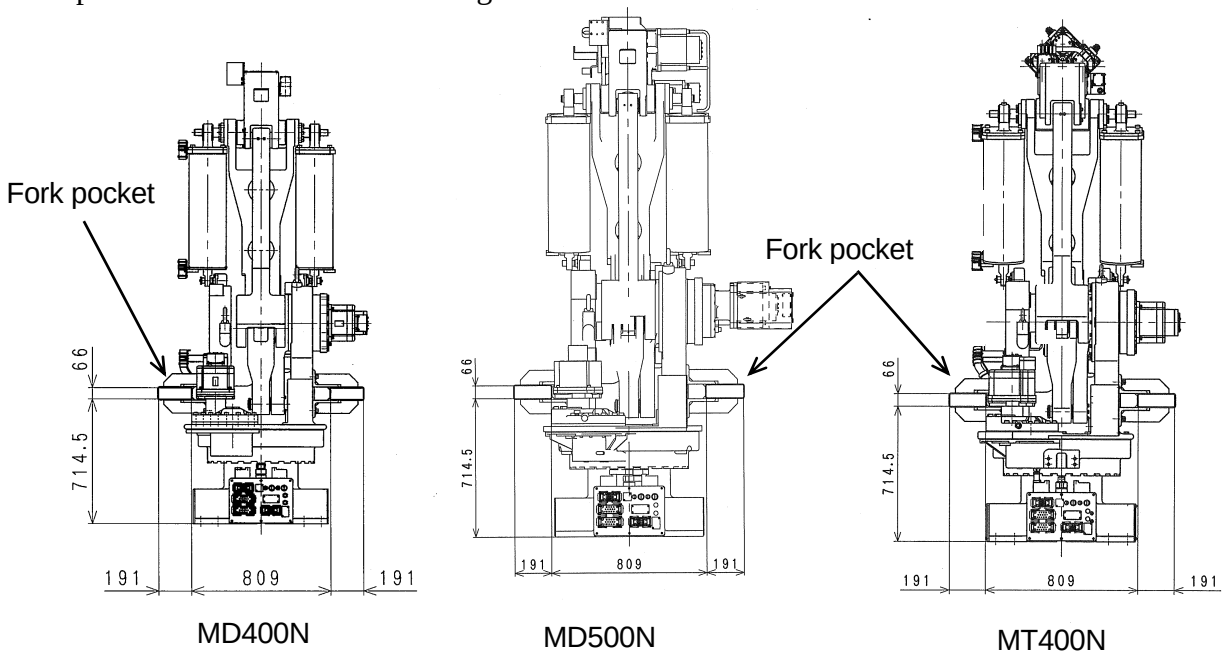
Model		MD Series	MT400N	MX Series
Hoisted up posture	JT1	0 °	0 °	0 °
	JT2	-45 °	70 °	-45 °
	JT3	-20 °	-135 °	-23 °
	JT4	0 °	0 °	0 °
	JT5	0 °	70 °	0 °
	JT6	0 °	0 °	—



Using Forklift

Fork pocket comes as an optional jig to use when lifting the robot with a forklift.

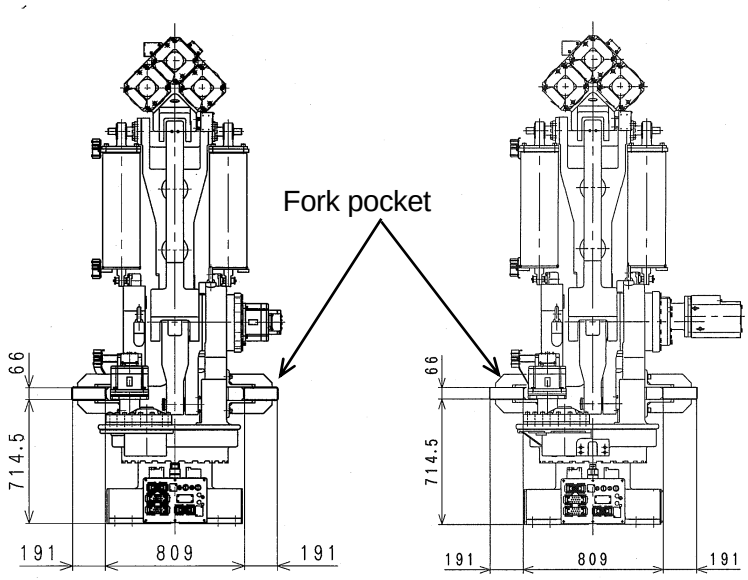
1. When carrying MX or MD series robot by forklift, JT 2 should be at the angle of 0° to - 45°.
2. When carrying MT400N by forklift, JT 2 should be at the angle of -135°.
3. Confirm that the forks of forklift penetrate sufficiently without fail.
4. When transporting robot on an inclined or rough surface, be careful to maintain balance to prevent forklift/robot from falling.



MD400N

MD500N

MT400N

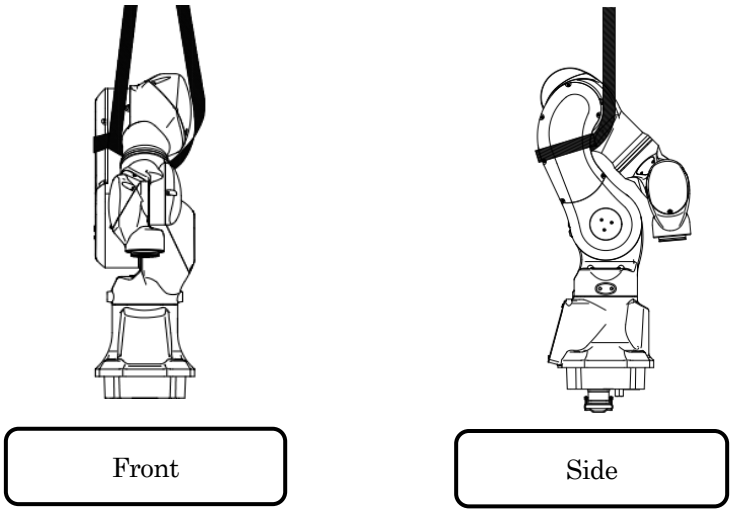


MX350L, MX420L, MX500N

MX700N

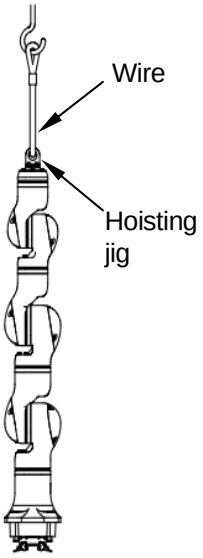
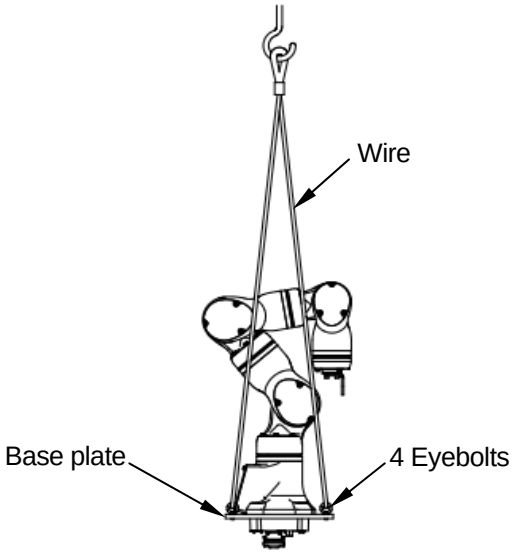
4.3.5 MC SERIES

There are no service tapped holes for hoisting the robot with wire. Therefore, secure a belt around the rear arm to hoist up the robot.

<table>
<tr><td>Hoisted up posture</td><td colspan="2"> 
</td></tr>
<tr><td rowspan="6">Hoisted up posture</td><td>JT1</td><td>0°</td></tr>
<tr><td>JT2</td><td>-15°</td></tr>
<tr><td>JT3</td><td>-150°</td></tr>
<tr><td>JT4</td><td>0°</td></tr>
<tr><td>JT5</td><td>-40°</td></tr>
<tr><td>JT6</td><td>0°</td></tr>
</table>

4.3.6 MS SERIES

Attach a hoisting jig or eyebolts on arm or base plate as shown in the figure, and hoist up the robot with wires.

Model		MS005N	MS005N (with base plate)
Hoisted up posture			
Hoisted up posture	JT1	0°	0°
	JT2	0°	-40°
	JT3	0°	-120°
	JT4	0°	0°
	JT5	0°	-100°
	JT6	0°	0°
	JT7	0°	0°
Hoisting jig		60154-3715 (jig, hoisting) RSBM616Z×4	60333-7009 (plate, base) 0EBM8Z (eyebolt)×4

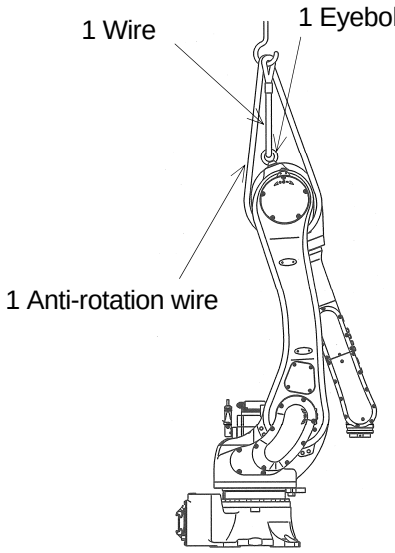
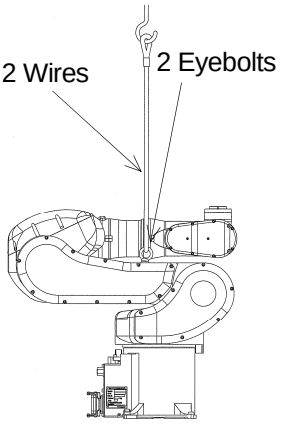
4.3.7 R SERIES

Using Wire Sling (Without base plate)

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

⚠ WARNING

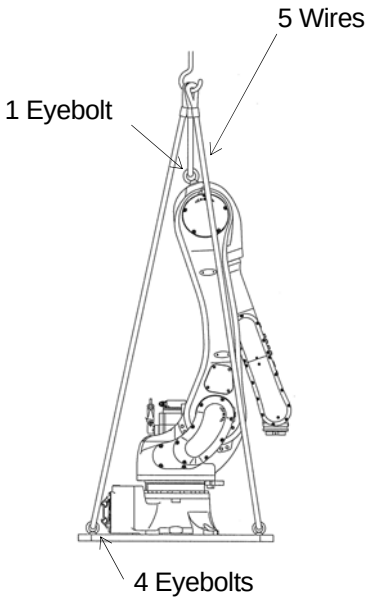
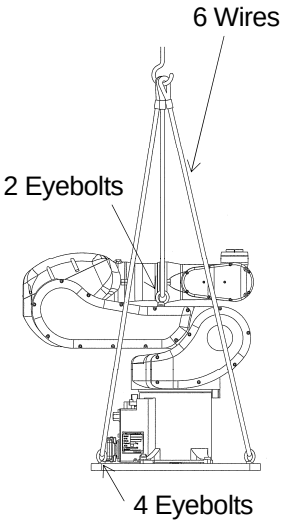
When lifting up the R series arm with a wire sling, support the arm with an additional wire to avoid the arm from rotating. (Except RC05L/RS05L/RS05N.) The eyebolt may loosen and cause the robot to fall if the arm rotates when lifted.

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

( ): RD80N

Using Wire Sling (With base plate)

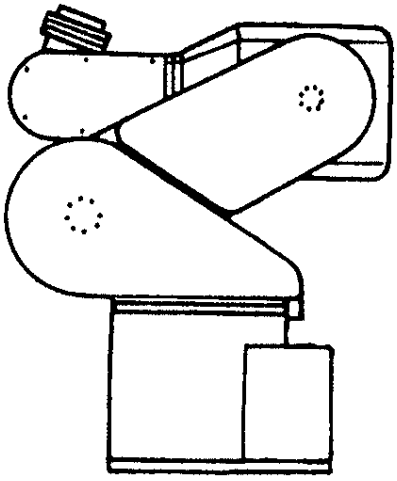
According to the figure below, hoist up the robot by fastening four wire slings to four eyebolts on the base plate. In addition, fasten a wire sling to the eyebolt on the arm to prevent the robot from accidentally falling. (Use the same method for hoisting up the robot with pedestal.)

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

( ): RD80N

By Two Or More Persons

Robot arm is packed as shown below at time of factory shipment.

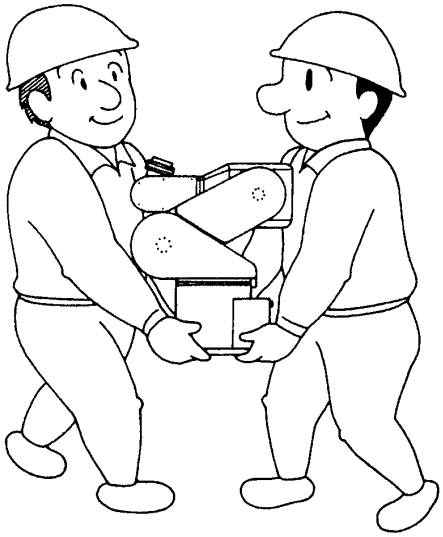


RS03N

Standard posture
JT1 : 0°
JT2 : -60°
JT3 : -150°
JT4 : 0°
JT5 : +135°
JT6 : 0°

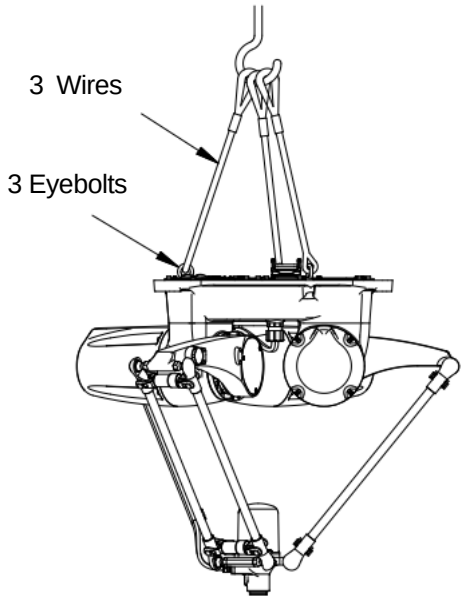
⚠ CAUTION

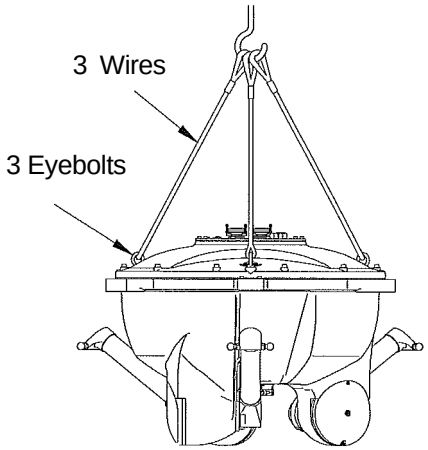
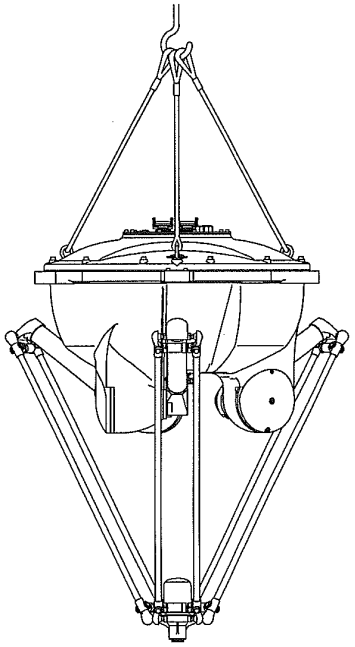
The mass of robot arm is approx. 20 kg for model RS03N. For your safety, transport robot arm by two or more persons.



4.3.8 YF SERIES

Using Wire Sling
According to the figure, attach three eyebolts to arm and hoist up by attaching wire slings to the jigs.

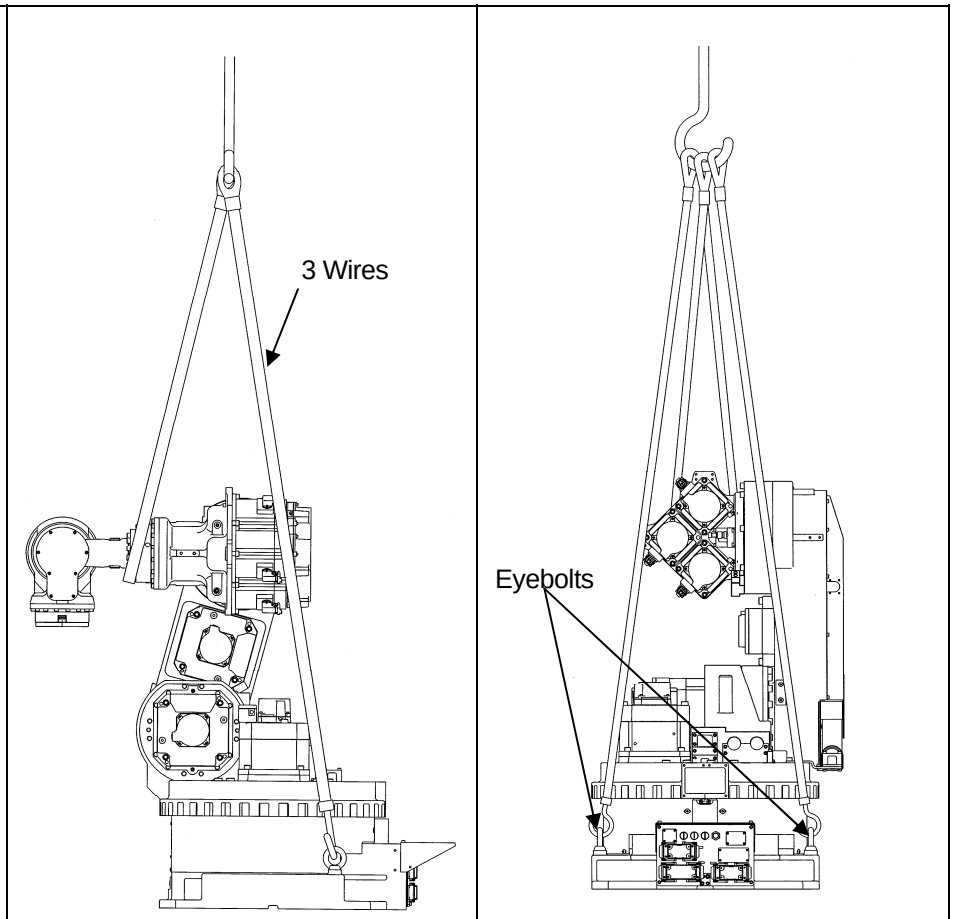
Model	YF002N	
Hoisted up posture		
Hoisted up posture	JT1	0°
	JT2	0°
	JT3	0°
	JT4	0°
Hoisting jig	0EBM8Z (Eyebolt)×3	

<table>
<tr><td>Model</td><td colspan="3">YF003N</td></tr>
<tr><td rowspan="2">Hoisted up posture</td><td colspan="2">At time of shipment</td><td>After assembly of lower arm</td></tr>
<tr><td colspan="2"> 
</td><td>  </td></tr>
<tr><td rowspan="4">Hoisted up posture</td><td>JT1</td><td colspan="2">-28°</td></tr>
<tr><td>JT2</td><td colspan="2">-28°</td></tr>
<tr><td>JT3</td><td colspan="2">-28°</td></tr>
<tr><td>JT4</td><td colspan="2">0°</td></tr>
<tr><td>Hoisting jig</td><td colspan="3">60154-1879 (Eyebolt)×3</td></tr>
</table>

4.3.9 ZB SERIES

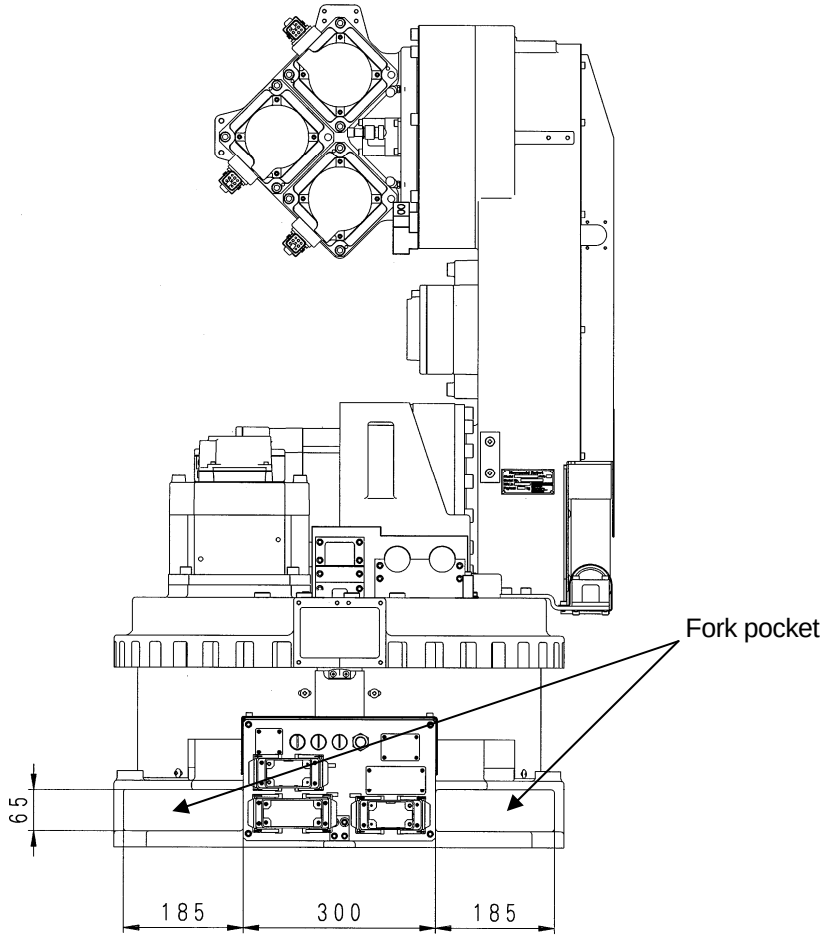
Using Wire Sling

According to the figure, hoist up the robot by three slings through two eyebolts.

<table>
<tr><td>Hoisted up posture</td><td colspan="2"> 
</td></tr>
<tr><td rowspan="6">Hoisted up posture</td><td>JT1</td><td>0°</td></tr>
<tr><td>JT2</td><td>-15°</td></tr>
<tr><td>JT3</td><td>-15°</td></tr>
<tr><td>JT4</td><td>0°</td></tr>
<tr><td>JT5</td><td>-90°</td></tr>
<tr><td>JT6</td><td>0°</td></tr>
</table>

Using Forklift

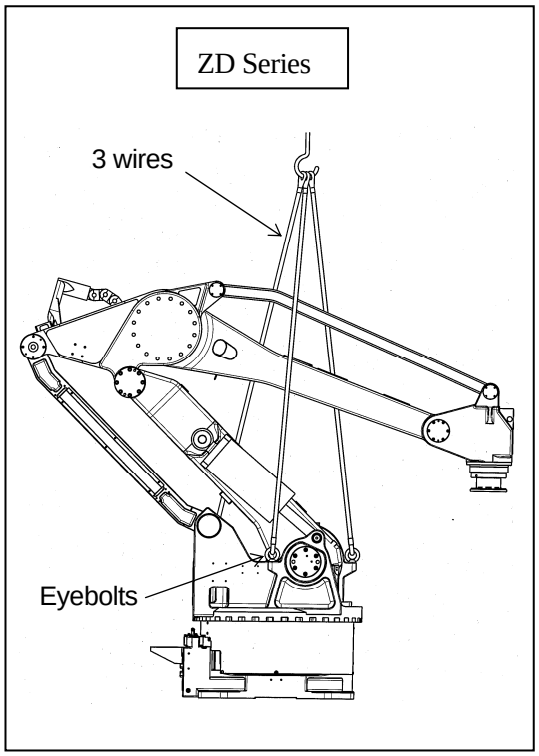
1. When carrying by forklift, use the pocket for the forklift located at the robot base.
2. Before carrying robot by forklift, set JT2 to approx. -15°, and JT3 in a horizontal position.
3. Confirm that the forks of forklift penetrate sufficiently without fail.
4. When transporting robot on an inclined or rough surface, be careful to maintain balance to prevent forklift/robot from falling.



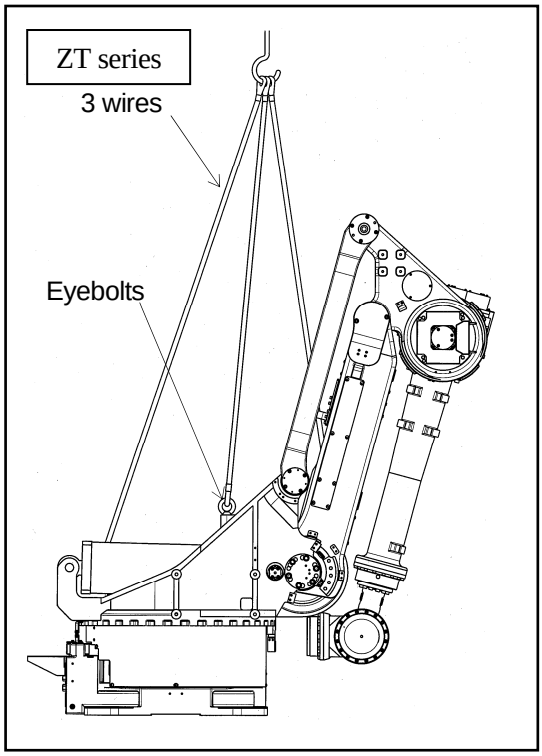
4.3.10 ZD/ZT/ZX SERIES

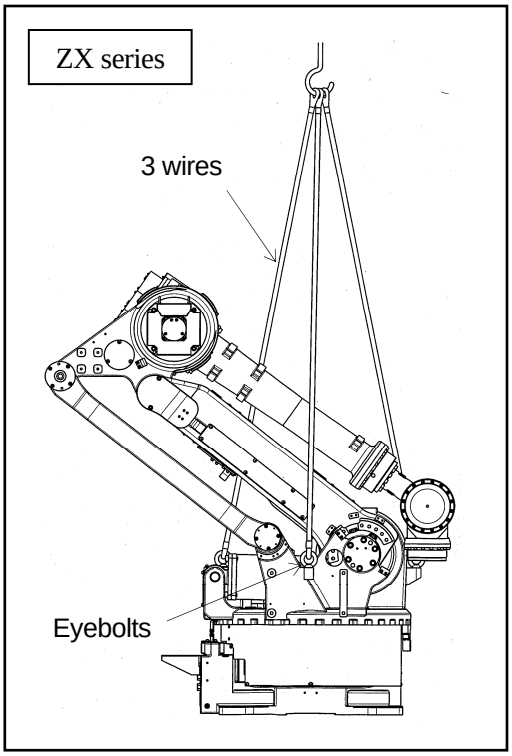
Using Wire Slings

According to the figure, hoist up the robot by three wires through three eyebolts.



Model		ZD
Shipment posture	JT1	0°
	JT2	-45°
	JT3	-20°
	JT4	0°

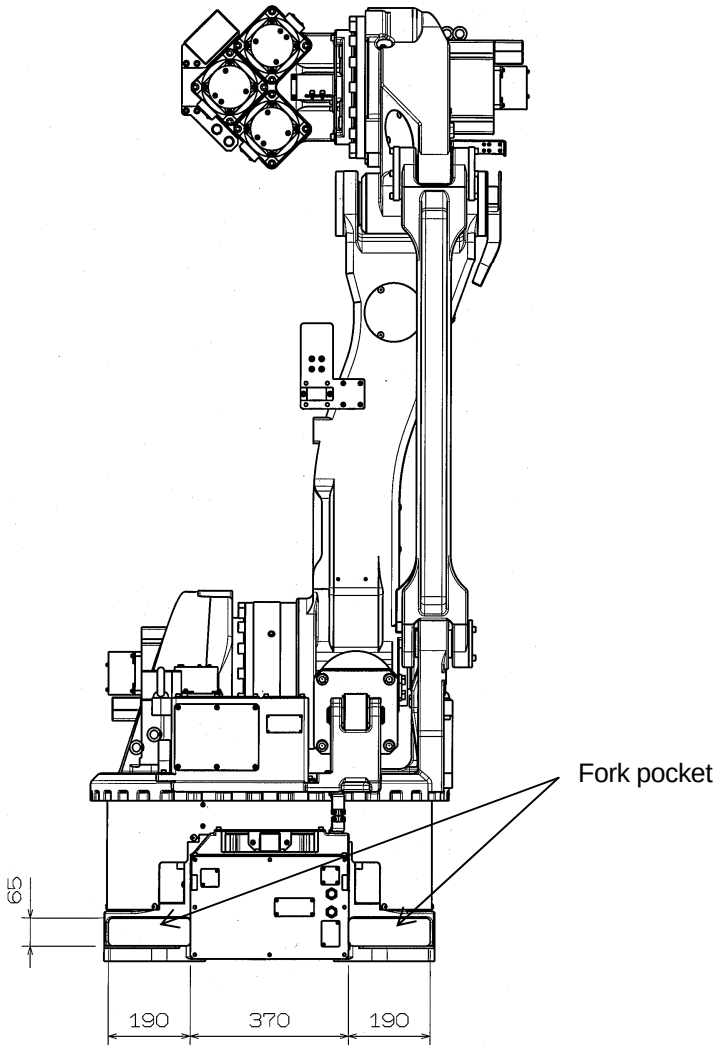




Model		ZT	ZX
Hoisted up posture	JT1	0°	0°
	JT2	-70°	-52°
	JT3	-13°	-35°
	JT4	0°	0°
	JT5	-103°	-55°
	JT6	0°	0°

Using Forklift

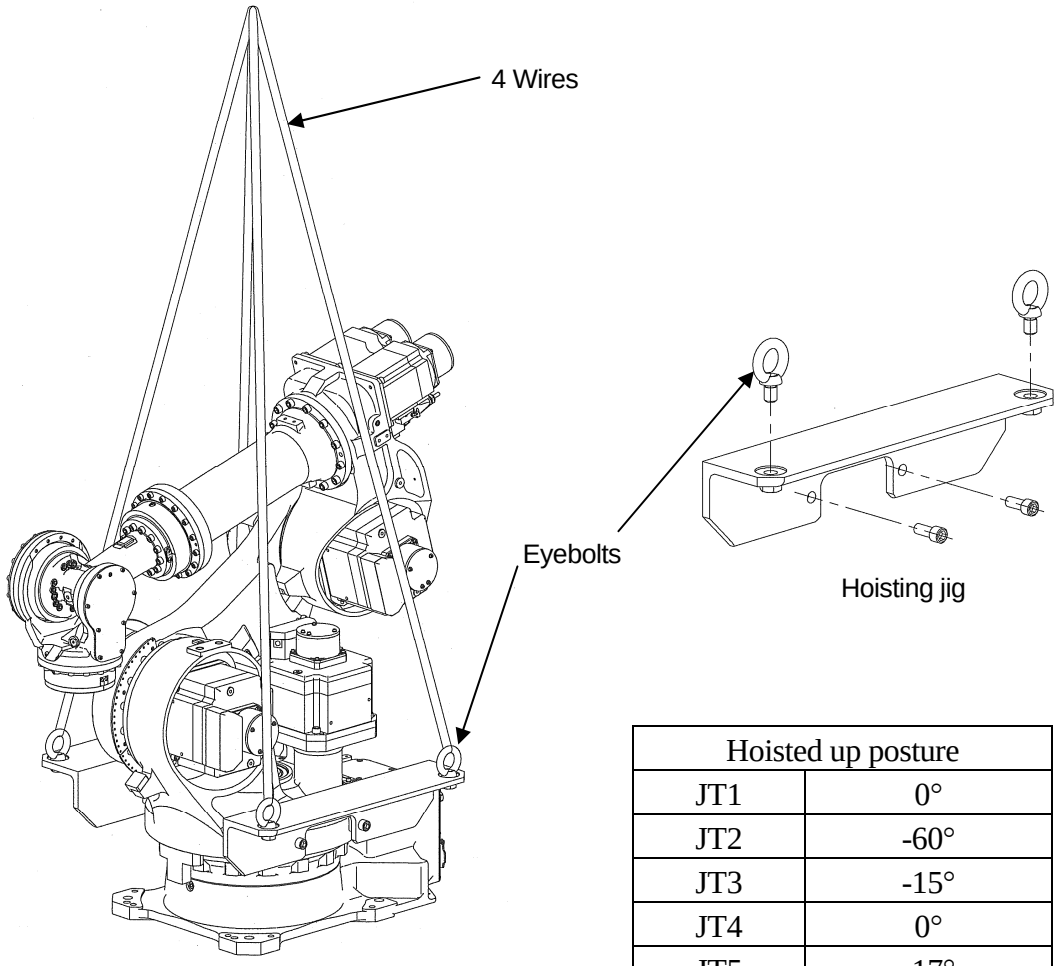
1. When carrying by forklift, use the pocket for the forklift located at the robot base.
2. Confirm that the forks of forklift penetrate sufficiently without fail.
3. When transporting robot on an inclined or rough surface, be careful to maintain balance to prevent forklift/robot from falling.
4. When the retract stopper and retract pin (Option) are mounted, set the forks of forklift to a height of 54 mm or less.



4.3.11 ZH SERIES

Wire Sling

According to the figure, mount a hoisting jig and eyebolts. Hoist up the robot by four slings through four eyebolts.



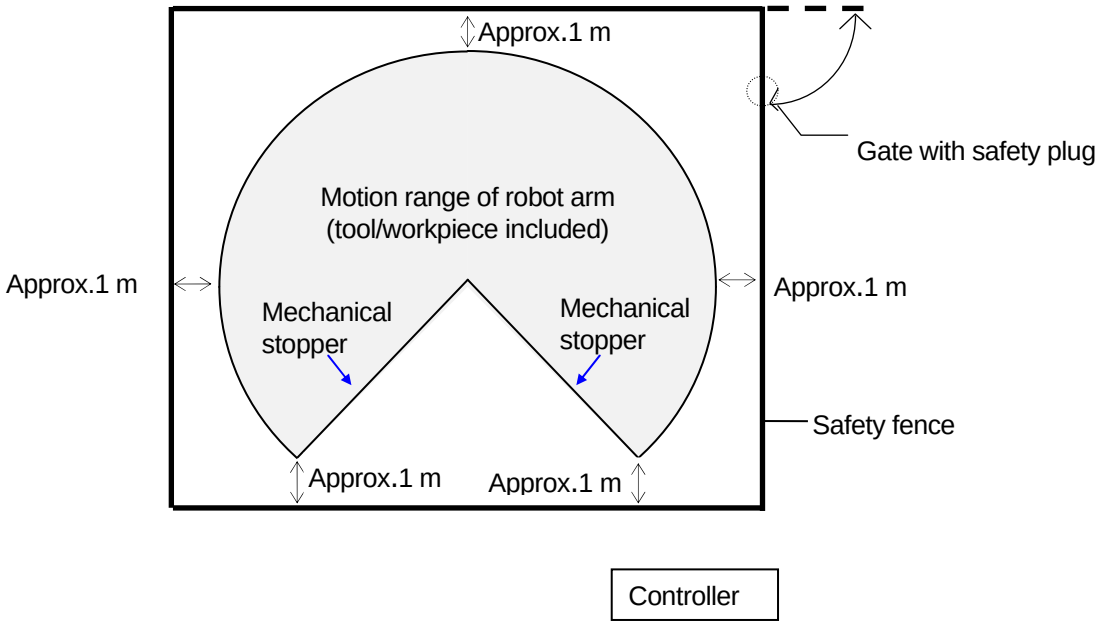
Hoisted up posture	
JT1	0°
JT2	-60°
JT3	-15°
JT4	0°
JT5	-17°
JT6	0°

5.0 INSTALLATION

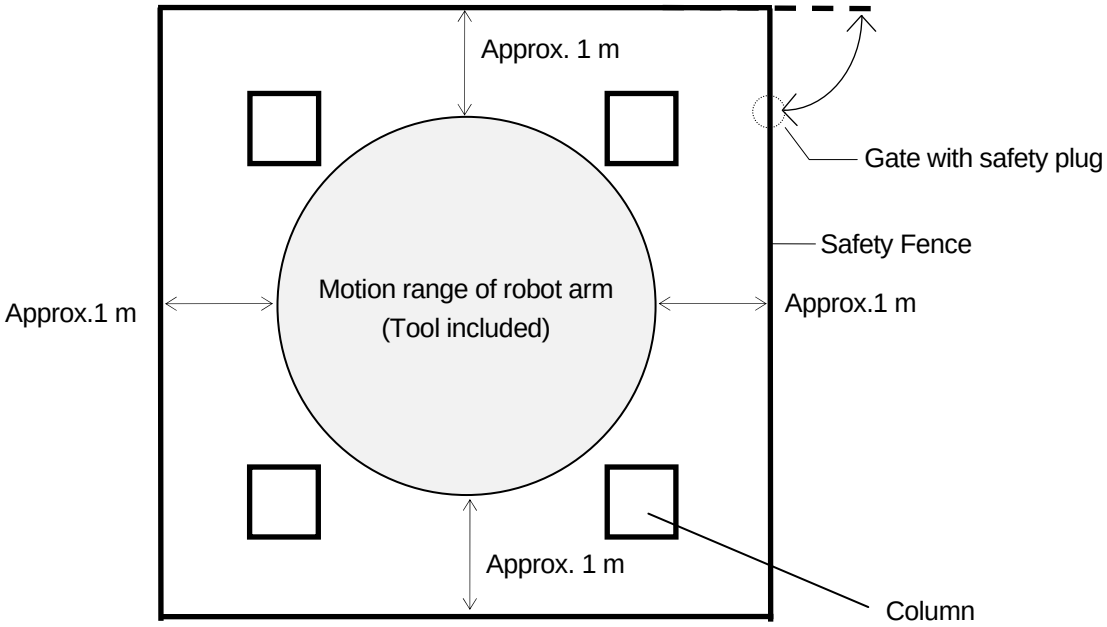
5.1 INSTALLATION ENVIRONMENT

The installation site of the robot must fulfill all the following environmental conditions:

1. When robot arm is installed on the floor, the levelness must be within ±5°.
2. Be sure that the floor/stand has sufficient rigidity.
3. Secure a flat place to prevent the base section from receiving undue force.
   (If an accurate flatness is unobtainable, insert liners and adjust the flatness).
4. Keep the ambient temperature during operation within the range of 0°C to 45°C (with the exception of E70/E71 controllers installed on the side and E91 controller: 0°C to 40°C). Deviation or overload error may occur due to high viscosity of grease/oil when starting operation at low temperatures. In this case, warm-up robot at low speed before regular operation.
5. Keep the relative humidity during operation within the range of 35% to 85%RH without dew condensation.
6. The altitude of the installation place should be within the range of 0 m to 1000 m above mean sea level.
7. The robot installing place should be free from dust, dirt, smoke, water, and other foreign matters. (In dusty or moist condition, use a robot arm with dust-proof or waterproof spec.)
8. The robot installing place should be free from flammable or corrosive liquid or gas. (Use an explosion-proof arm in a flammable environment.)
9. The robot installing place should be free from excessively strong vibration. (0.5 G or less)
10. The robot installing place should be free from electric noise interference.
11. Place where power satisfying the specification is supplied.
12. Place where dedicated earthing is provided. (100 Ω or less)
13. The robot installing place should be sufficiently larger than the motion range of robot arm. Safety fence must enclose area larger than the maximum motion range of fully equipped robot arm (with tools) so it does not interfere with the surrounding objects.
    (1) Enough space for easy access to the controller during maintenance.
    (2) An entrance gate with a safety plug should be provided to the safety fence.
    (3) About details of the safety fence, observe the requirements which are established in each region. (e.g. EN953, EN294, EN811, EN1088, ISO13852, ISO13854, and ISO/NP 14120)


Approx.1 m
Gate with safety plug
Motion range of robot arm
(tool/workpiece included)
Approx.1 m
Approx.1 m
Mechanical
stopper
Mechanical
stopper
Safety fence
Approx.1 m
Approx.1 m
Controller

YF Series


Approx. 1 m
Gate with safety plug
Safety Fence
Motion range of robot arm
(Tool included)
Approx.1 m
Approx.1 m
Approx. 1 m
Column

5.2 SAFETY MEASURES CONCERNING ROBOT INSTALLATION

(1) Always place the robot arm within the safeguarding devices (guard, fence, equipment, etc. provided for preventing hazards) so that the robot arm is put off limits. Also, install an emergency stop device in an easily accessible area within reach of the operator.
(2) Safety guarding zone (area surrounded by the safety fence) should be built so as to prevent the robot arm from jumping over or extending beyond the fence in the event of breakdown and/or error.
(3) Minimize the number of doors on the safeguarding devices (preferably only one). The door should be equipped with a safety plug which must be removed manually in order to open/close the door. Then, set motor power to be turned OFF if plug is removed during automatic operation. Confirm that safety devices such as EMERGENCY STOP switch and safety plug function normally before entering the safeguarding devices. Then, the operator must set TEACH LOCK switch on the teach pendant to ON to prevent personnel from accidentally switching to automatic mode. Also, the operator must keep the plug on him/herself.
(4) Display the robot state clearly, such as: automatic mode, teaching, and emergency stop, etc. on the safeguarding devices so the current condition of the robot can be seen by everybody.
(5) Limit the robot operating personnel to only those who have taken and completed the training course(s) authorized by Kawasaki.

5.3 METHODS OF INSTALLATION

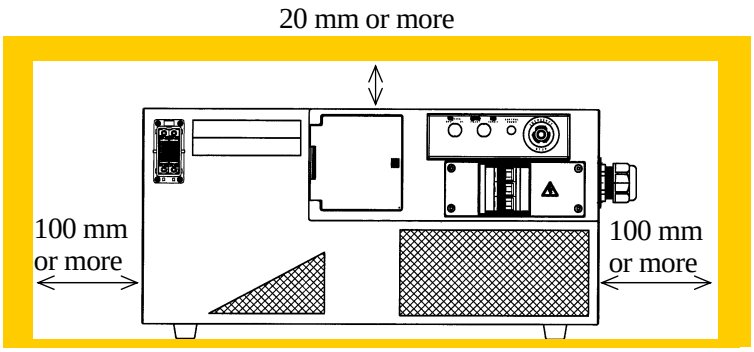
5.3.1 INSTALLING ROBOT CONTROLLER

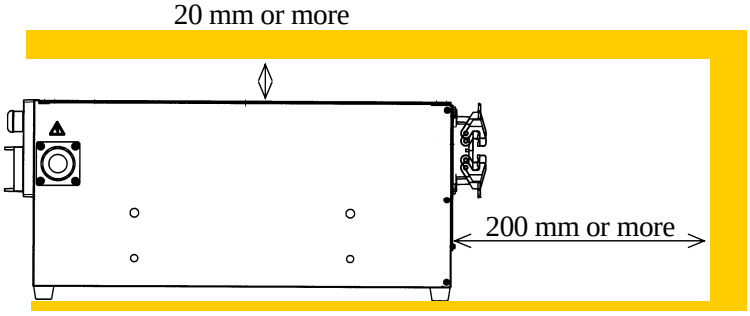
In order for the controller to maintain the proper internal temperature, the installation site must conform to the points below.

5.3.1.1 INSTALLING E0X CONTROLLERS

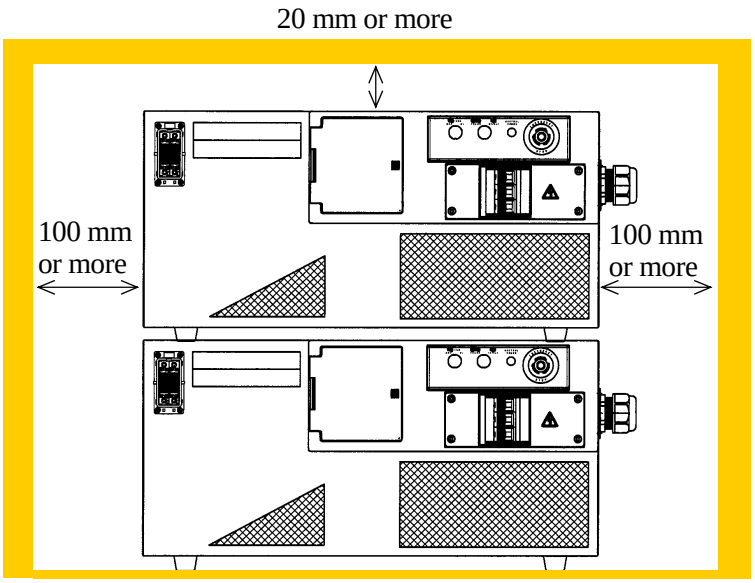
When an object is placed on the top surface of the controller, the mass should be 45 kg or less. It is possible to place a controller on another controller as far as the mass goes. However, when an object is placed on the top surface of the controller, it is necessary to remove the object once in maintenance.

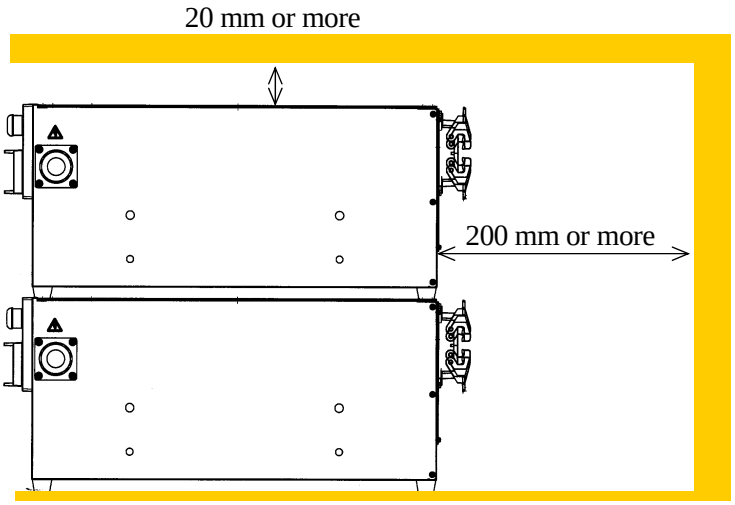
1. Arrange the controller on a flat, horizontal stand and adjust its height so that the heights of controller power switch and operation switches from the floor are between 0.6 to 1.9 m. (Provide a clearance of rubber feet height in the vertical direction because there is an air inlet on the bottom.)
2. Separate the controller right/left side from the wall by 100 mm or more.
3. Separate the controller top surface from the wall by 20 mm or more.



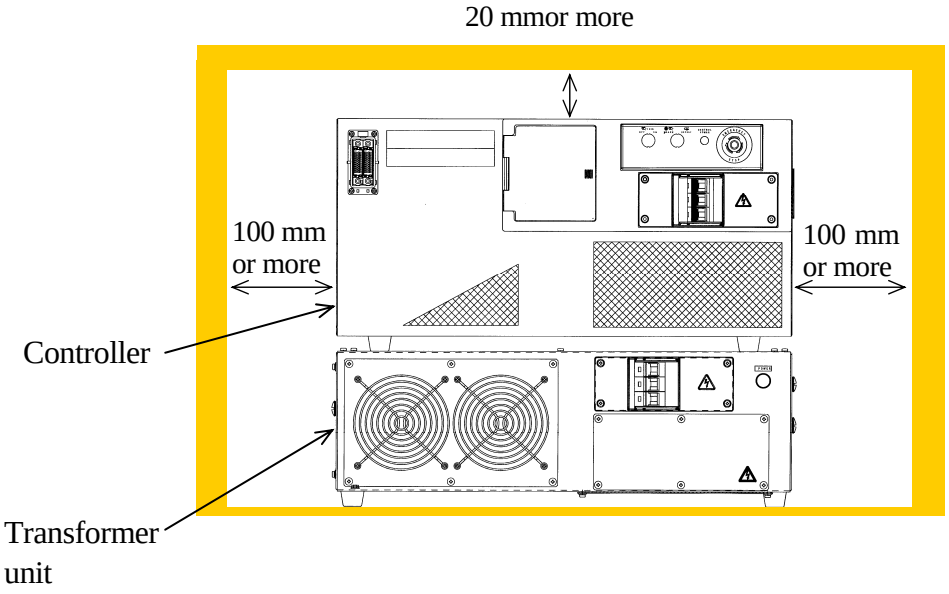


For horizontal arrangement, a controller can be placed on another controller.

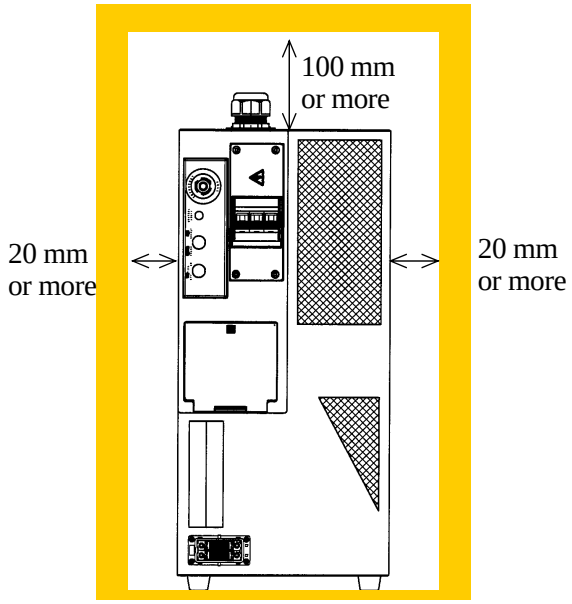




It is also possible to place a controller on a transformer unit for horizontal arrangement.



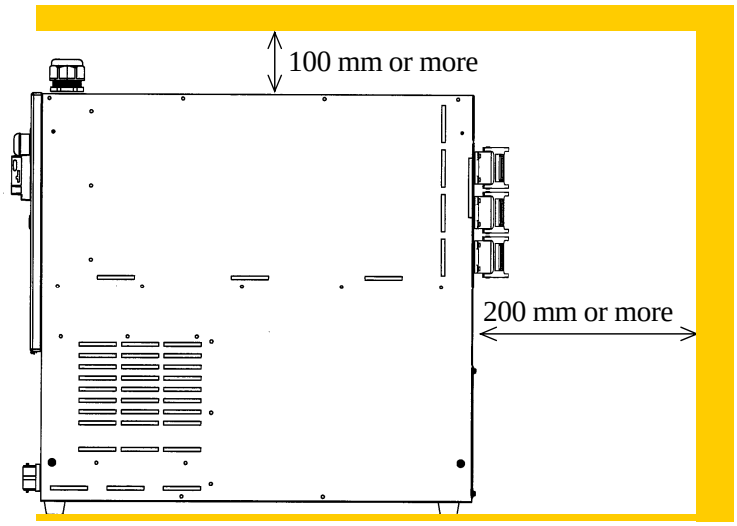
Follow the procedure below when arranging the E0x controllers vertically. Feet attached on the bottom of the controller can be reattached on the left side. An object cannot be placed on the top surface of the controller when the controllers are placed vertically.



1. Arrange the controller on a horizontal stand and adjust its height so that the heights of controller power switch and operation switches from the floor are between 0.6 to 1.9 m. Arrange the controller with its controller power switch facing upward.

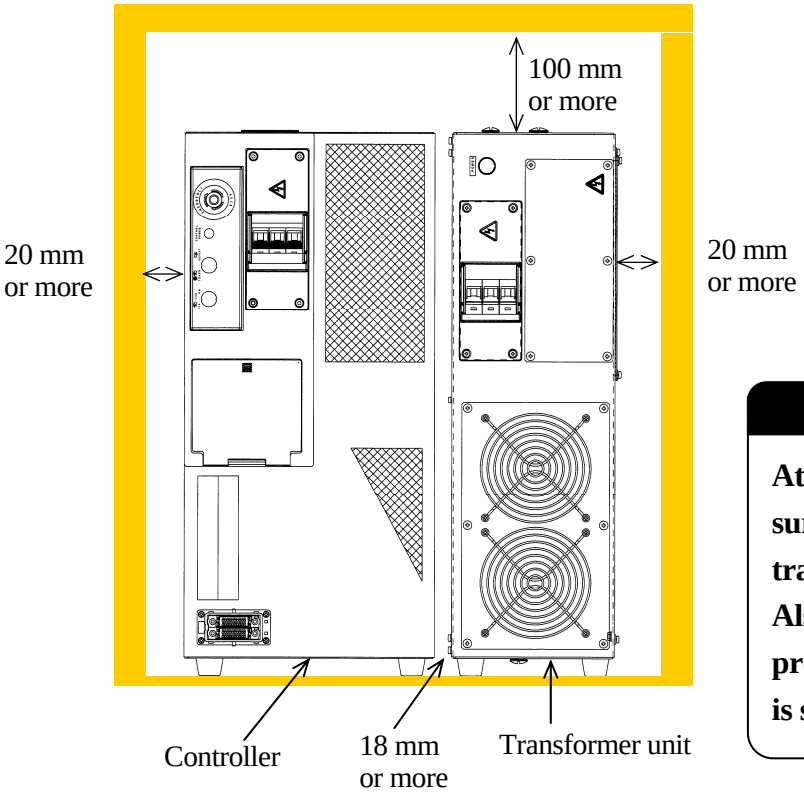
CAUTION

When arranging the controller vertically, the exhaust port comes bottom. Accordingly, reattach the rubber feet without fail ,and provide a clearance between the floor and the bottom.



2. Separate the controller right/left side from the wall by 20 mm or more.
3. Separate the controller top surface from the ceiling by 100 mm or more.
4. Separate the controller rear side from the wall by 200 mm or more.

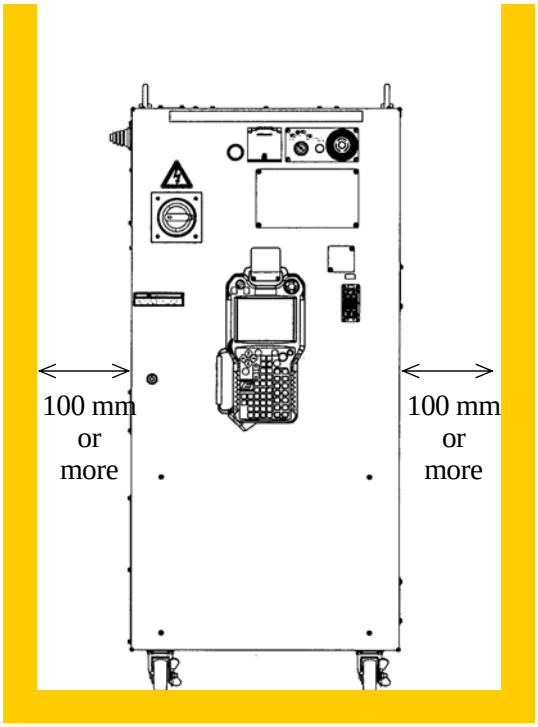
See the figure below when arranging the transformer unit vertically.



CAUTION

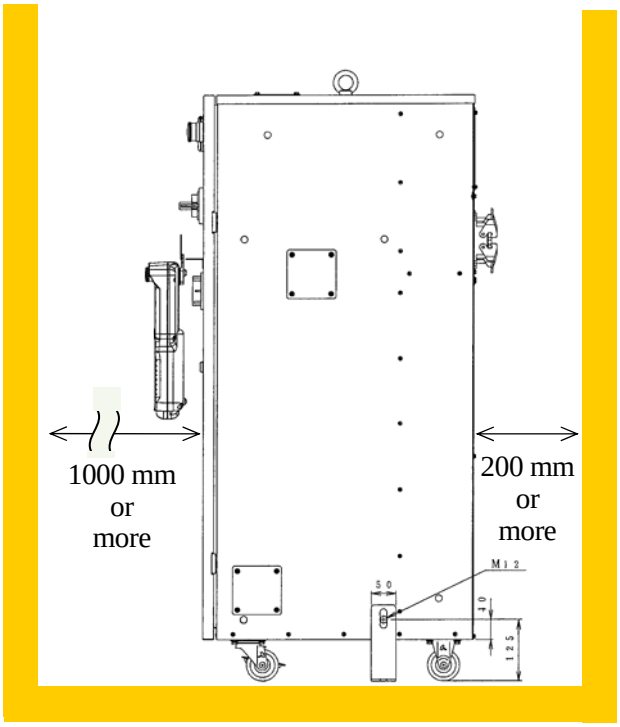
Attach rubber feet on the bottom surface when arranging the transformer unit vertically.
Also, fix the transformer unit to prevent it from falling because it is small in width.

5.3.1.2 INSTALLING E4X CONTROLLERS



1. Arrange the controller on a flat, horizontal floor. When an object is placed on the top surface of the controller, the mass should be 40 kg or less.

2. Separate the controller right/left side from the wall by 100 mm or more.



3. The inlet port for air-cooling is on the rear upside of the controller, and the air exhaust port is on the rear downside.

⚠ CAUTION

Do not block the air inlet and exhaust ports when installing the controller. Separate the controller backside from the wall by 200 mm or more.

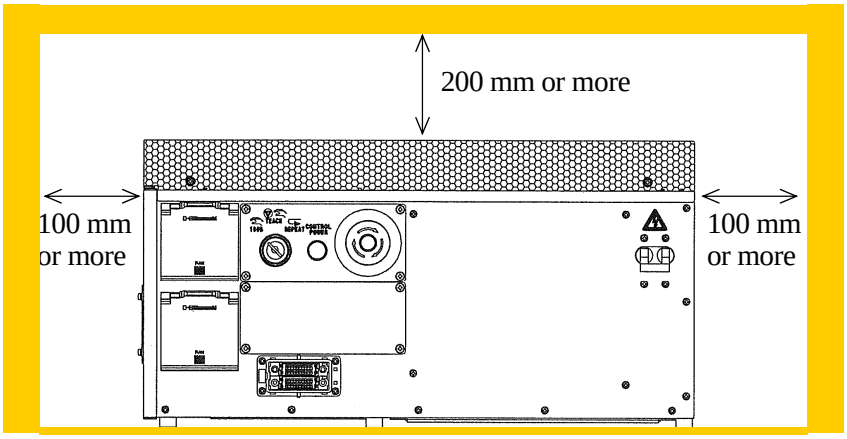
4. Make fixing bracket(s), and fix the controller with M12 bolts.

⚠ CAUTION

1. **Release the stoppers on the two front casters of the controller when moving the controller. (Push the "OFF" side pedal.)**
2. **Relock the casters after the transport is complete. (Push the "ON" side pedal for locking.)**

5.3.1.3 INSTALLING E70/E71/E91 CONTROLLERS

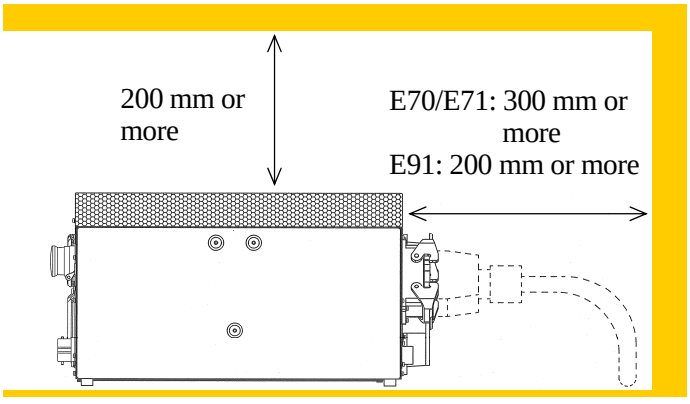
1. Arrange the controller on a flat, horizontal floor. An object cannot be placed on the top surface of E70/E71 controllers. When an object is placed on the top surface of E91 controller, the mass should be 40 kg or less. It is possible to place an E91 controller on another E91 controller as far as the mass goes. However, when an object is placed on the top surface of E91 controller, it is necessary to remove the object once in maintenance.
2. Separate the controller right/left side from the wall by 100 mm or more.
3. Separate the controller top surface from the wall by 200 mm or more.



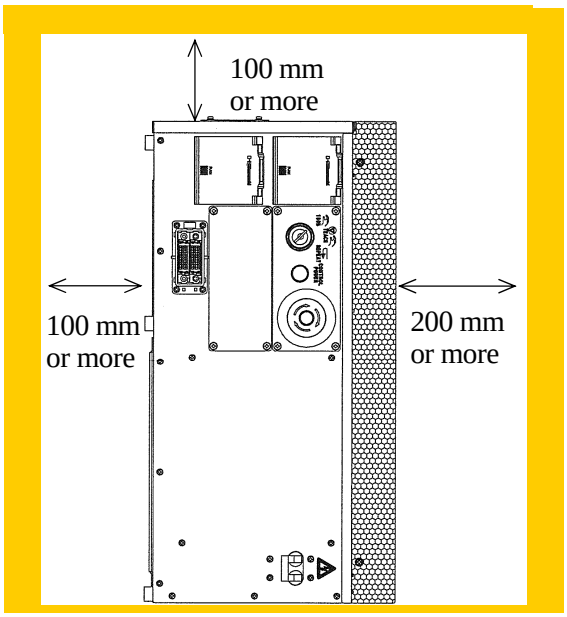
4. Heat exchange fan is provided on the rear of E70/E71 controllers.

CAUTION

Do not block the air inlet and exhaust ports when installing the E70/E71 controllers. Separate the controller rear side from the wall by 300 mm or more for E70/E71 controllers and 200 mm or more for E91 controller.



Follow the procedure below when arranging the E70/E71/E91 controllers vertically. The ambient temperature should be within 0-40 C°. For the E9x controller, feet attached on the bottom of the controller can be reattached on the right side. An object cannot be placed on the top surface of the controller when the controllers are placed vertically.

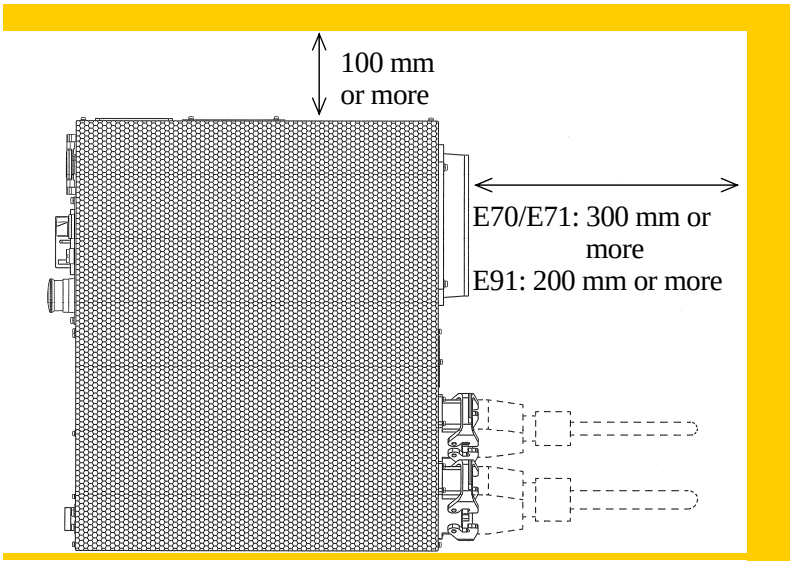


1. Place the controller on a horizontal floor with its controller power switch facing downward.

2. Separate the controller right side (or ceiling surface when arranging the controller vertically) from the wall by 200 mm or more.

3. Separate the controller top/left side from the wall by 100 mm or more.

4. Separate the controller rear side from the wall by 300 mm or more for E70/E71 controllers and 200 mm or more for E91 controller.

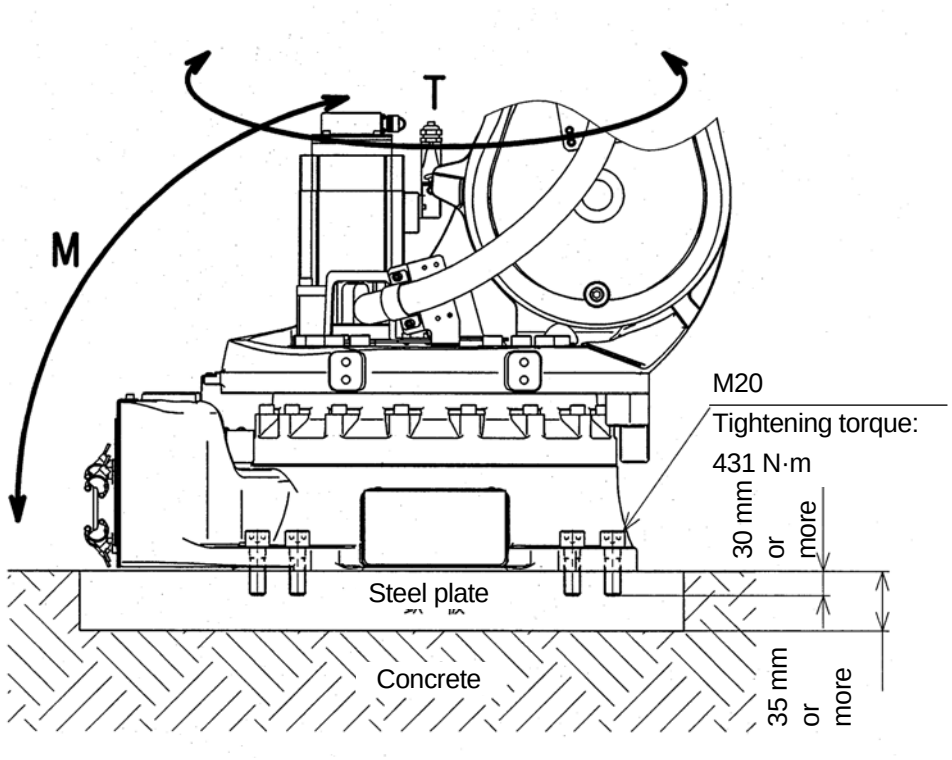


5.3.2 INSTALLING ROBOT ARM

5.3.2.1 INSTALLING B SERIES ARMS

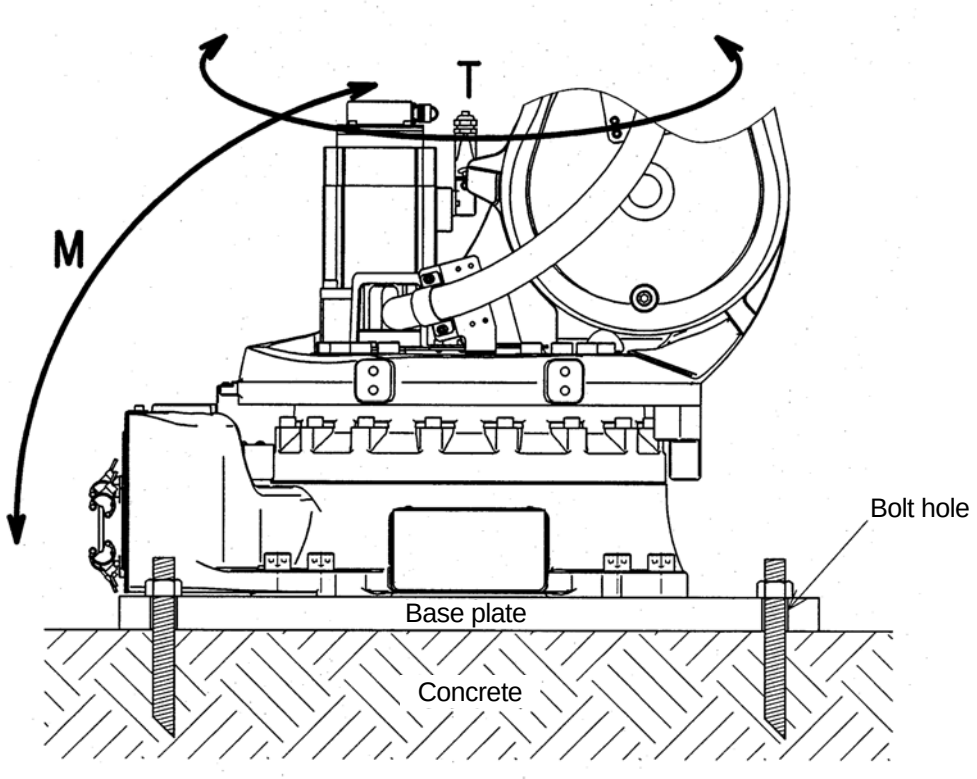
When Installing the Base Directly on the Floor

Bury a steel plate (35 mm Min. thick) in the concrete floor as shown in the figure below or fix it with anchors. The steel plate must be fixed firmly so as to sustain reaction forces from the robot.



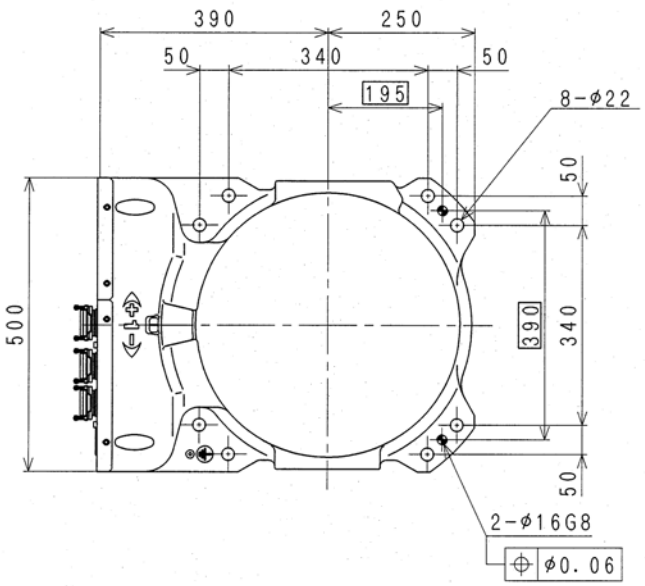
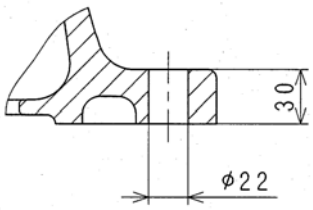
When Installing the Robot Base Plate on the Floor

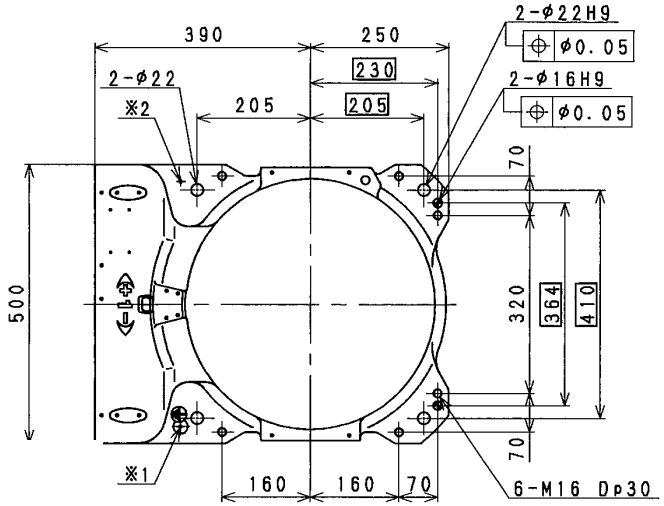
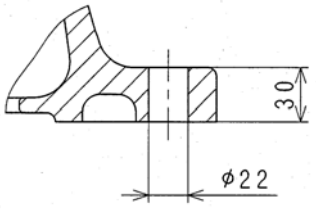
In this case, install the base plate on concrete floor or steel plate using bolt holes on the base plate. Reaction forces received from robot are the same as when installing the base directly on the floor.



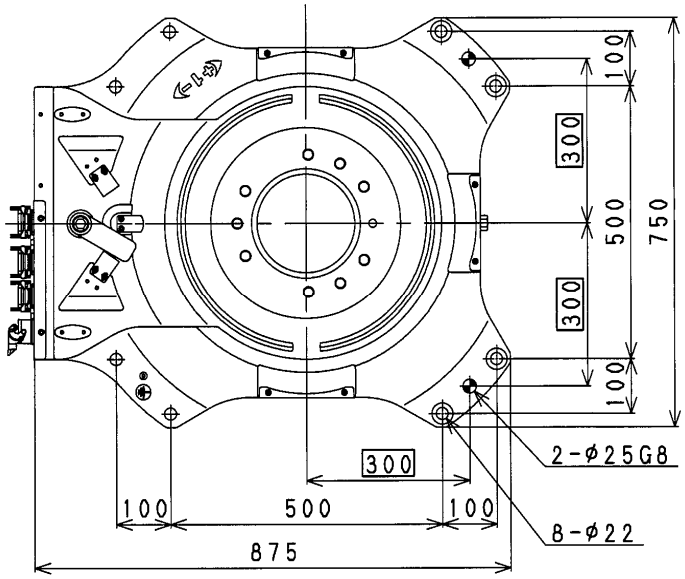
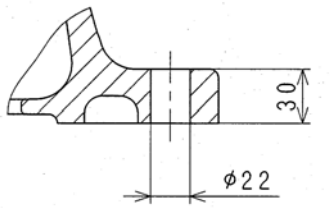
Installation Dimensions of Base Section

Fix the base section with high tension bolts through the bolt holes.

Model	BT165L, BT200L, BX100L, BX100N, BX130X, BX165L, BX165N, BX200L
Dimensions for installation	
Cross-section of installation section	
Bolt hole	8-ϕ22
High tension bolt	8-M20 Material: SCM435 Strength class: 10.9 min.
Tightening torque	431 N·m
Levelness	Within ±5°

Model	BX100S
Dimensions for installation	
Cross-section of installation section	
Bolt hole	4-ϕ22
High tension bolt	4-M20 Material: SCM435 Strength class: 10.9 min.
Tightening torque	431 N·m
Levelness	Within ±5°

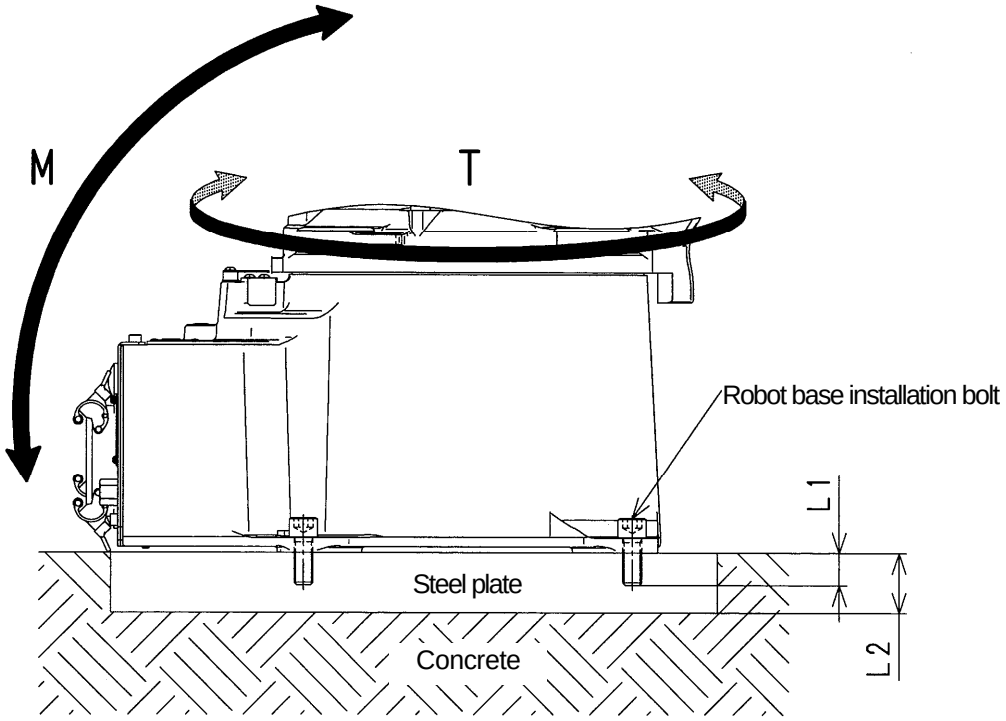
Remove coating on the surface and mount ground line when using ※2 ground tap (M6) without using ※1 ground tap (M6, ϕ26 counterbore).

Model	BX250L, BX300L
Dimensions for installation	
Cross-section of installation section	
Bolt hole	8-ϕ22
High tension bolt	8-M20 Material: SCM435 Strength class: 10.9 min.
Tightening torque	431 N·m
Levelness	Within ±5°

5.3.2.2 INSTALLING BA SERIES ARMS

When Installing the Robot Directly on the Floor

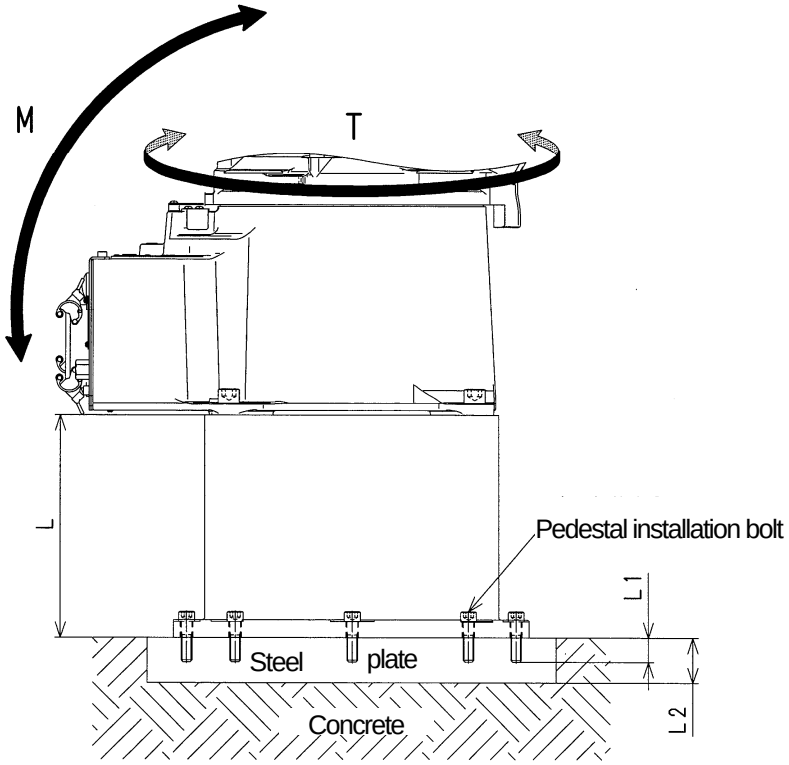
Bury steel plate of L2 thickness (See the table below.) in the concrete floor as shown in the figure below or fix it with anchors. The steel plate must be fixed firmly so as to sustain reaction forces from the robot.



Robot base installation bolt	4-M16
Tightening torque	235 N·m
L1	25 mm Min.
L2	28 mm Min.

When Installing the Robot Pedestal on the Floor

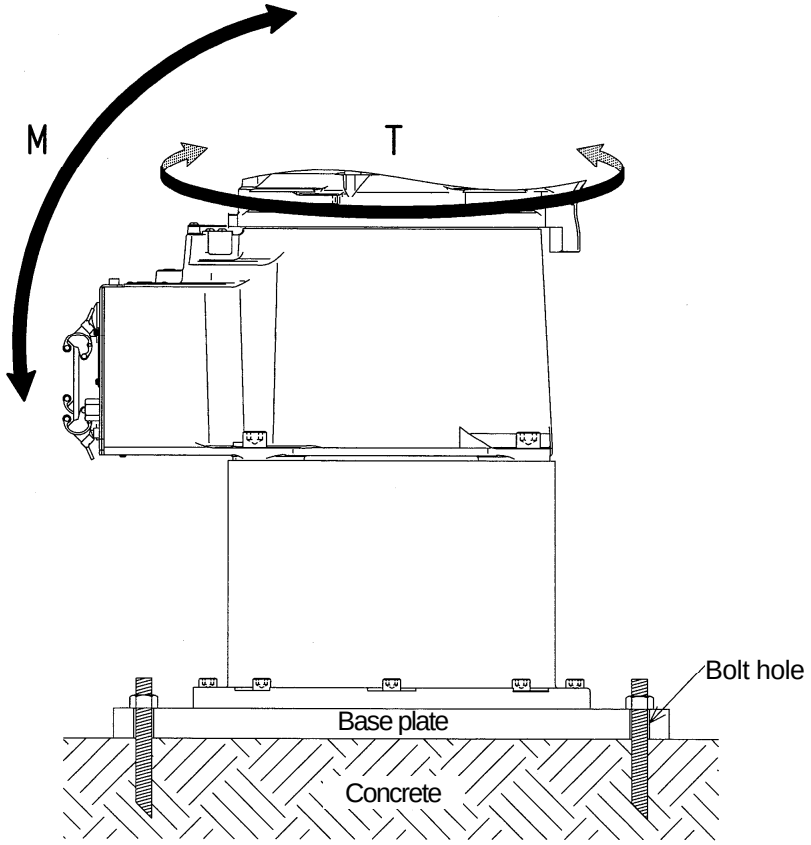
In this case, the installation procedures are practically the same as the procedure shown in the prior section.



Pedestal mass	70 kg(L=600)
	45 kg(L=300)
Pedestal installation bolt	8-M12
Tightening torque	98 N·m
L	600(60360-1166*)
	300(60360-1167*)
L1	18 mm Min.
L2	20 mm Min.

NOTE* ( ) indicates the part number of pedestal.

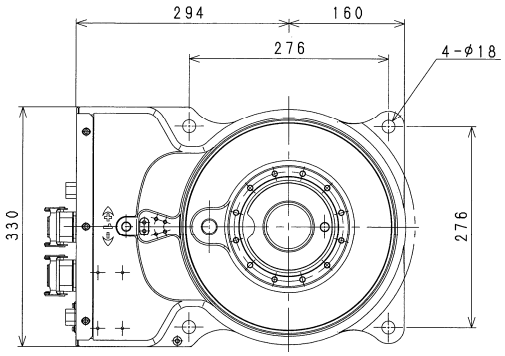
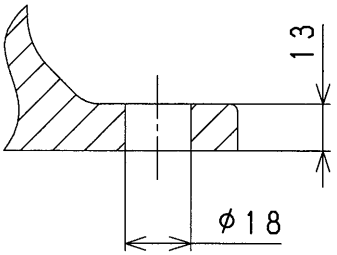
When Installing the Robot Base Plate on the Floor



Base plate mass	110 kg
Base plate installation hole	4-ϕ20 (PCD800)
Base plate dimension (mm)	750 × 750 × 25

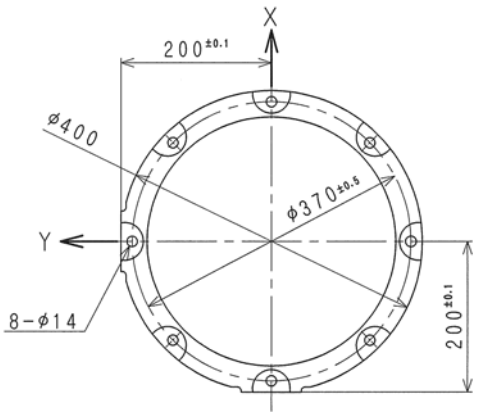
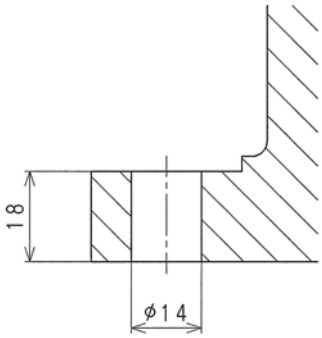
Installation Dimensions of Base Section

Fix the base section with high tension bolts through the bolt holes.

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°

Installation Dimensions of Robot Pedestal

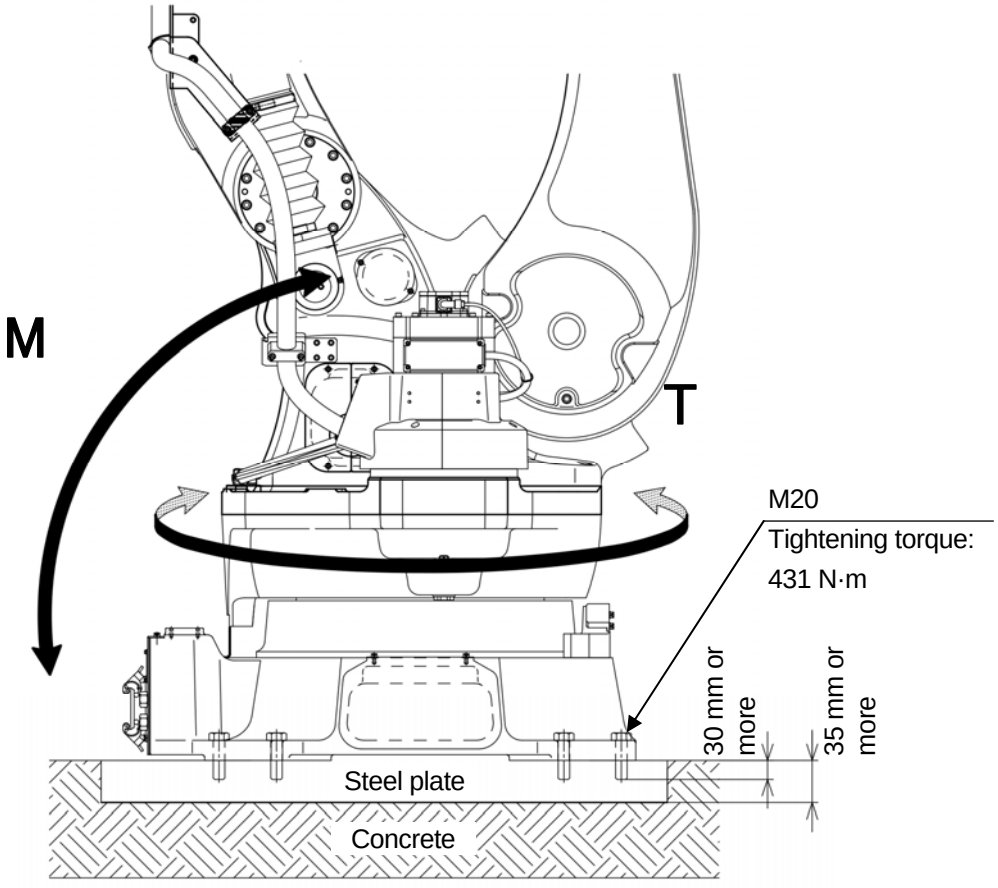
When installing a robot on the pedestal, fix the pedestal with high tension bolts through the bolt holes.

Dimensions for installation	
Cross-section of installation section	
Bolt hole	8-ϕ14
High tension bolt	8-M12 Material: SCM435 Strength class: 10.9 min
Tightening torque	98 N·m
Levelness	Within ±5°

5.3.2.3 INSTALLING CP SERIES ARMS

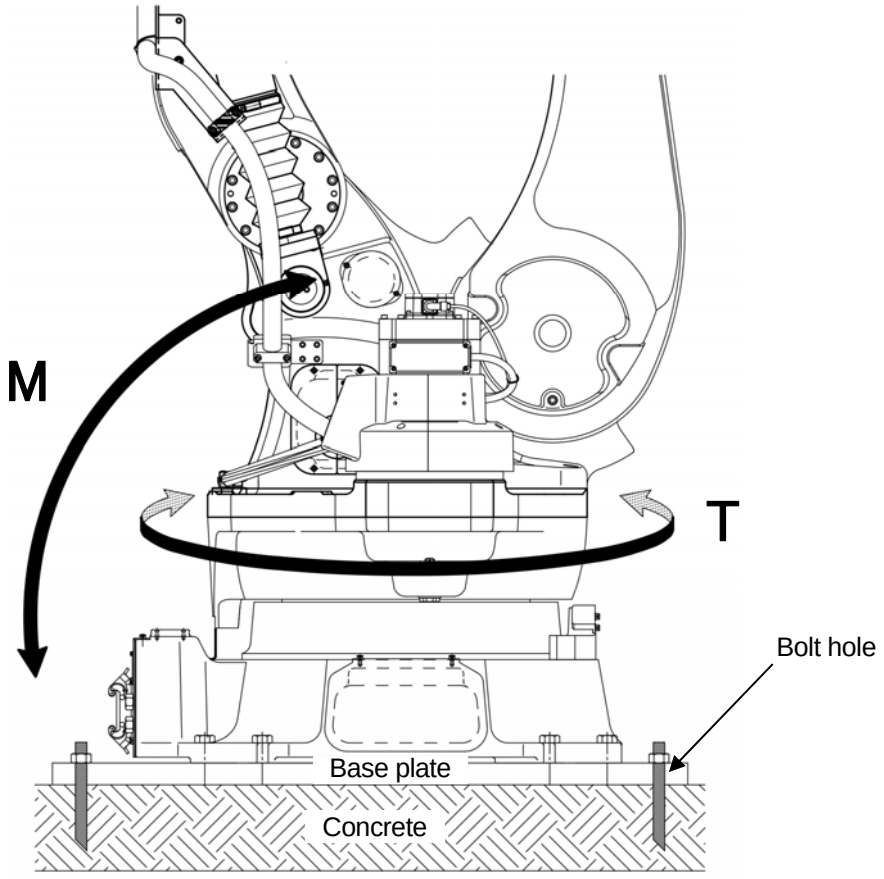
When Installing the Base Directly on the Floor

Bury a steel plate (35 mm Min. thick) in the concrete floor as shown in the figure below or fix it with anchors. The steel plate must be fixed firmly so as to sustain reaction forces from the robot.



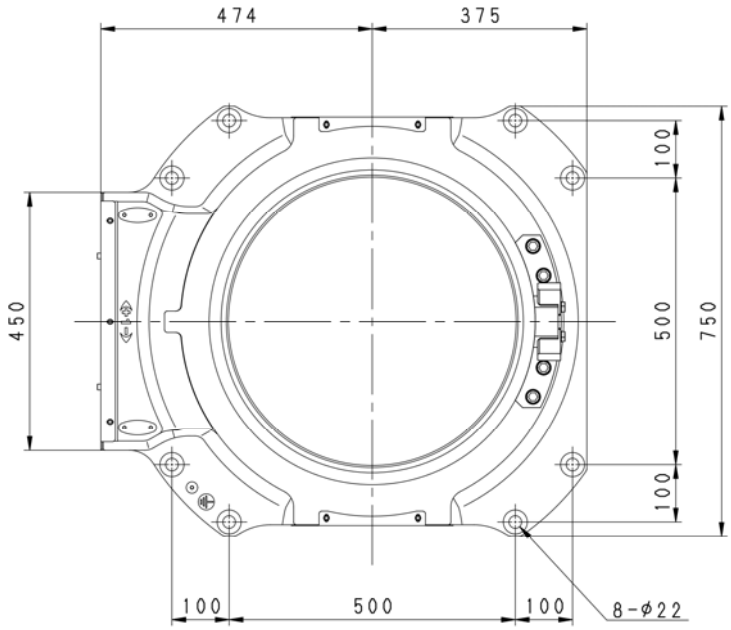
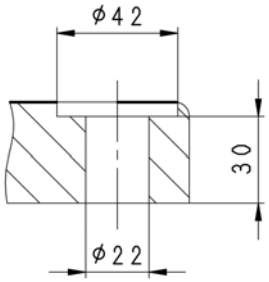
When Installing the Robot Base Plate on the Floor

In this case, install the base plate on concrete floor or steel plate using bolt holes on the base plate. Reaction forces received from robot are the same as when installing the base directly on the floor.



Installation Dimensions of Base Section

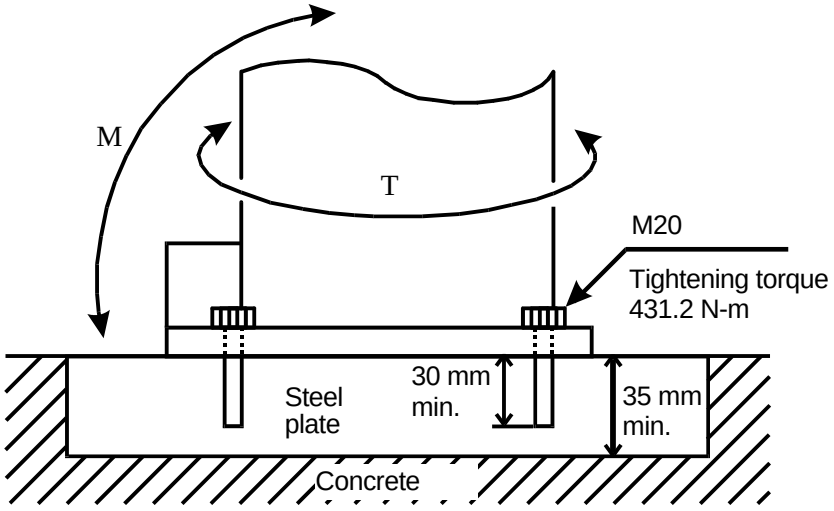
Fix the base section with high tension bolts through the bolt holes.

Model	CP series
Dimensions for installation	
Cross-section of installation section	
Bolt hole	8-ϕ22
High tension bolt	8-M20 Material: SCM435 Strength class: 10.9 min.
Tightening torque	431 N·m
Levelness	Within ±5°

5.3.2.4 INSTALLING M SERIES ARMS

When installing the base directly on the floor:

As shown in the figure below, embed steel plate (35 mm Min. thick) in the concrete floor or fix with anchor bolts. The steel plate must be fixed firmly so as to sustain reaction forces from the robot.



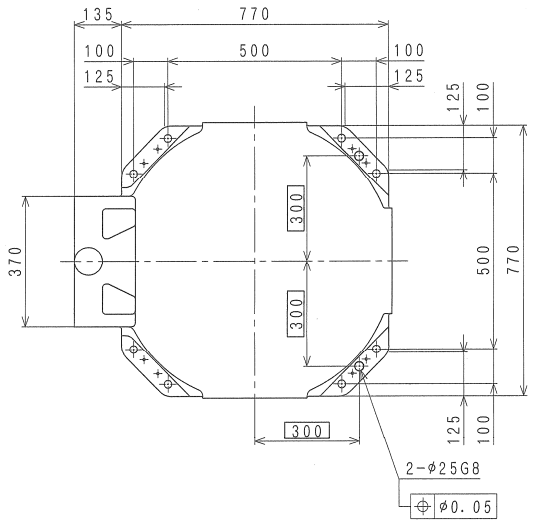
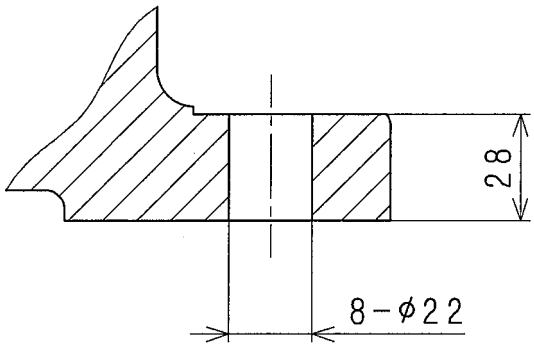
When installing the base plate on the floor:

Install the base plate utilizing 8 holes of 22 diameter. Install the base plate on the concrete floor or the steel plate floor. Reaction forces received from robot are the same as when installing the base directly on the floor.

There are two pin holes on the base plate for positioning, which enable the base plate to join with the base precisely. Thus, replacement of a broken robot can be done quickly and easily. (Beware that usually JT1 is not precision zeroed. This function is only provided as Option.)

Installing Dimensions of Base Section

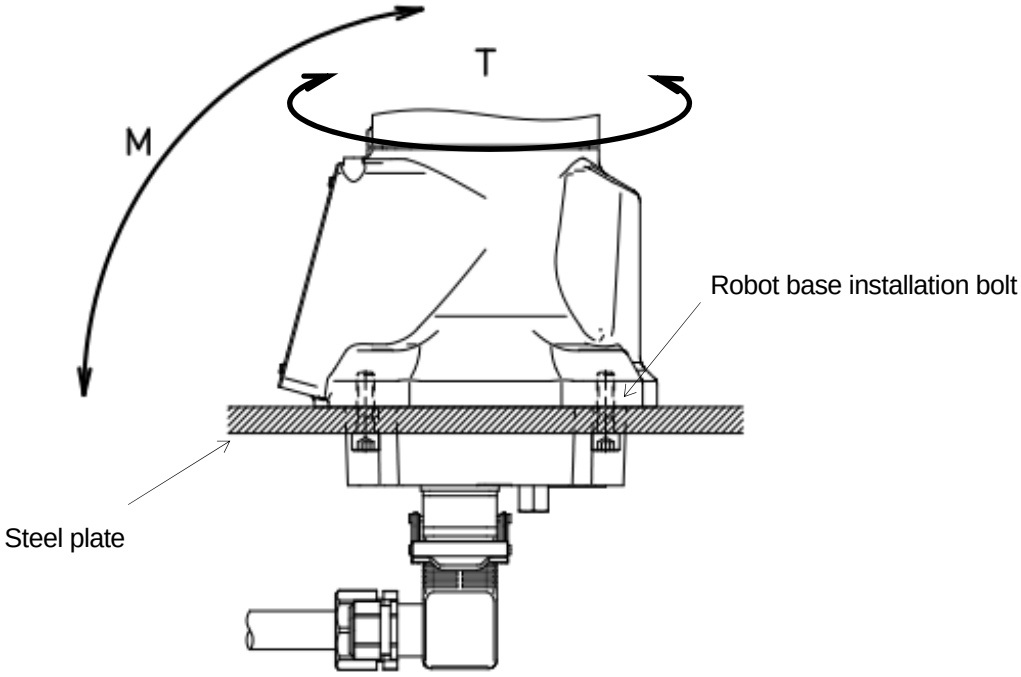
Fix the base section with high tension bolts through the bolt holes.

Installing Dimensions of Base Section	
Cross-section of Base installation hole	
Bolt Hole	8- ϕ22
High Tension Bolt	8-M20 Material: SCM435 Strength class: 10.9 min.
Tightening Torque	431.2 N-m
Levelness	Within ±5°

5.3.2.5 INSTALLING MC SERIES ARMS

Installing Bottom Connector Specification Arm

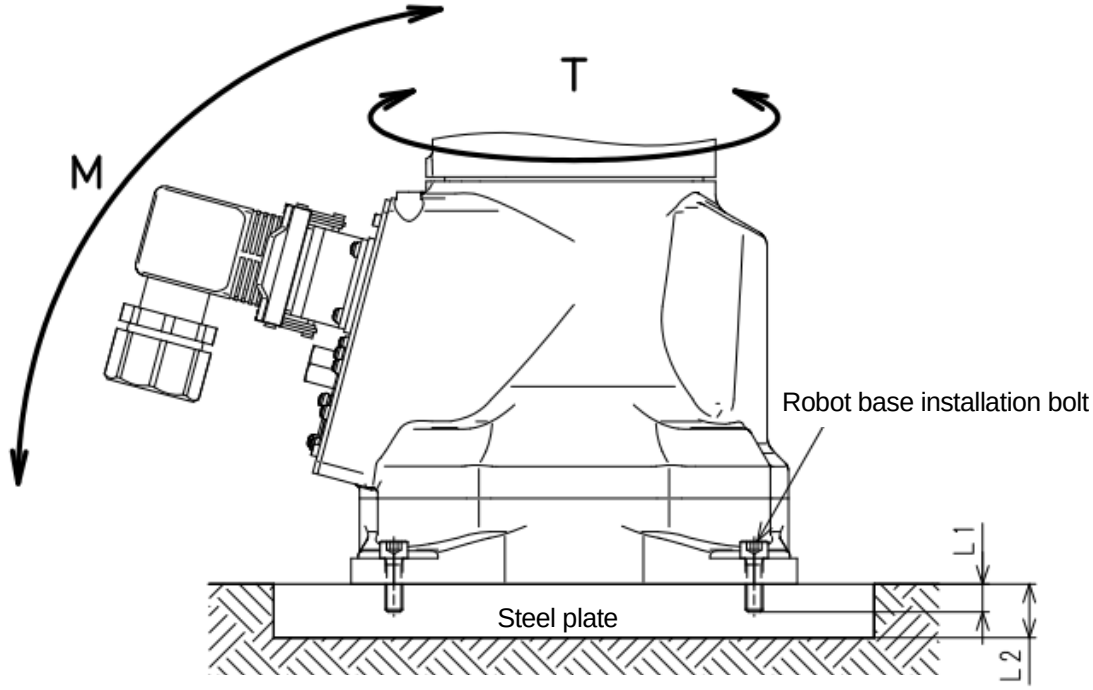
Fix the robot on the pedestal through steel plate of thickness of 17 mm or more as shown in the figure below. The pedestal must be fixed firmly so as to sustain reaction forces from the robot.



Robot base installation bolt	4-M10
Tightening torque	57 N·m

Installing Backside Connector Specification Arm

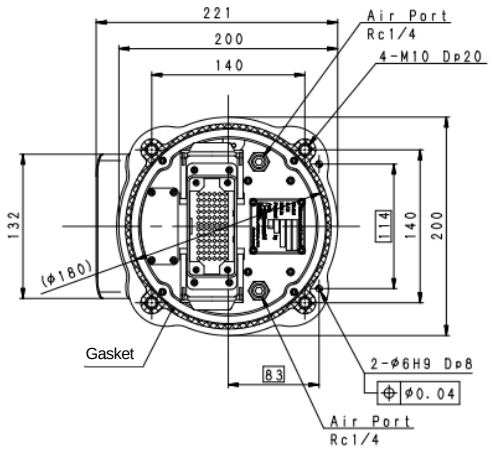
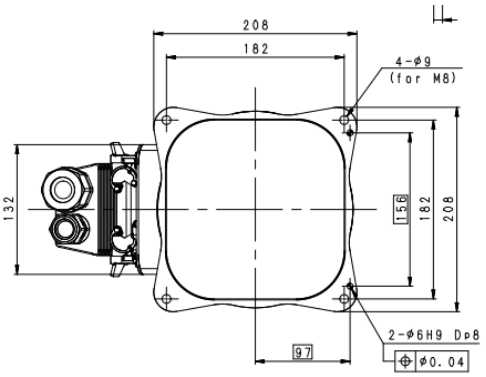
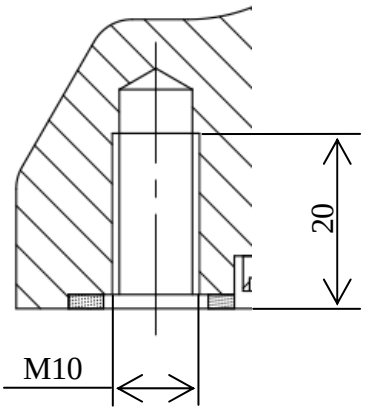
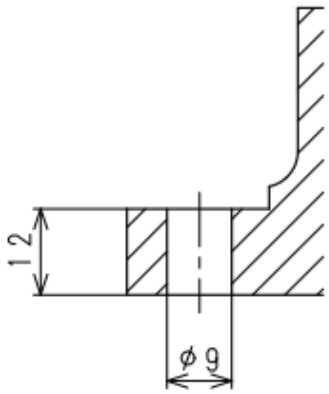
The installation method for backside connector specification arm is the same as when installing the robot base directly on the floor.



Robot base installation bolt	4-M8
Tightening torque	29 N·m
L1	15 mm or more
L2	17 mm or more

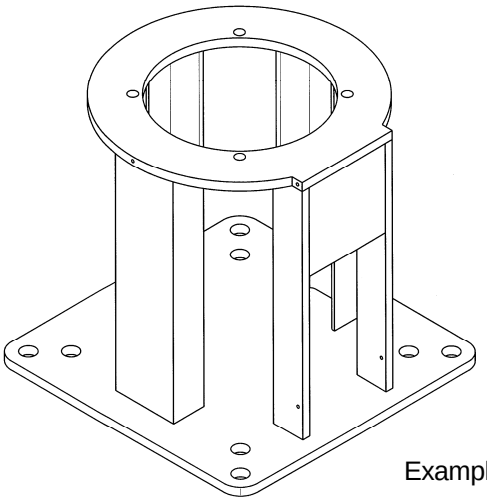
Installation Dimensions of Base Section

Fix the base section with high tension bolts through the bolt holes.

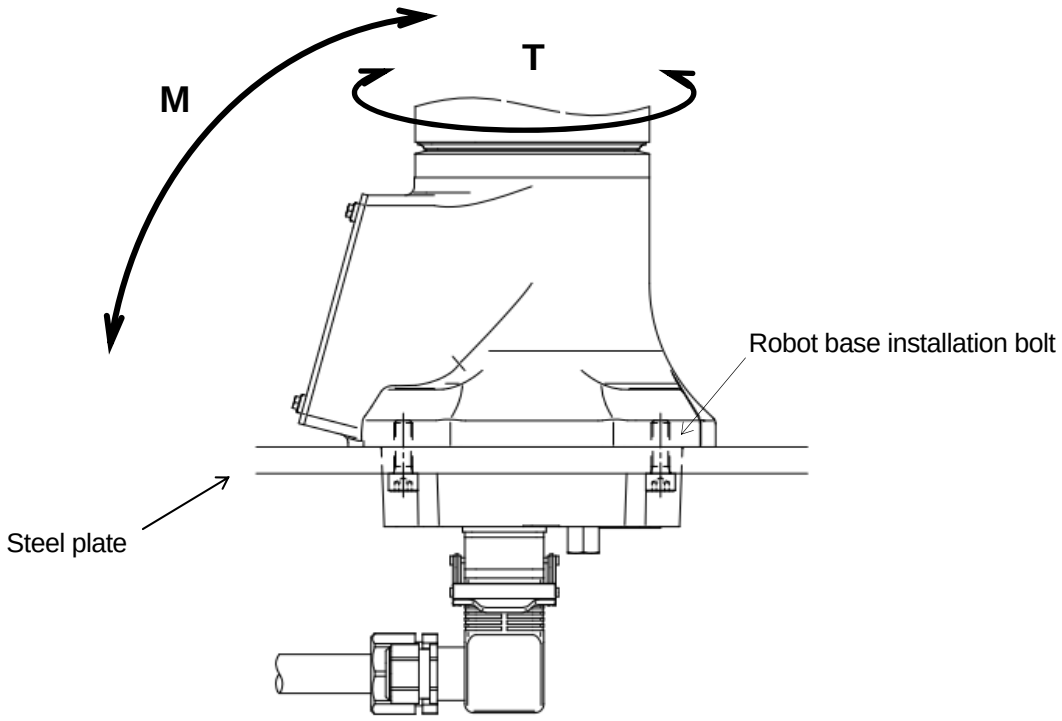
Model	MC004N (Bottom Connector Specification)	MC004N (Backside Connector Specification)
Dimensions for installation		
Cross-section of installation section		
Bolt holes	—	4-ϕ9
Tightening bolt	4-M10 Material: SCM435 Strength class: 10.9 or more	4-M8 Material: SCM435 Strength class: 10.9 or more
Tightening torque	57 N·m	29 N·m
Levelness	Within ±5°	Within ±5°

5.3.2.6 INSTALLING MS SERIES ARMS

Fix the robot on the pedestal through hole (ϕ180) in steel plate of thickness of 17 mm or more as shown in the figure below. The pedestal must be fixed firmly so as to sustain reaction forces from the robot.



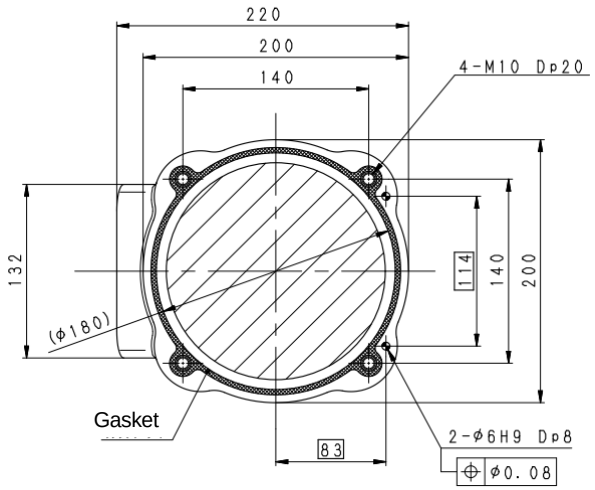
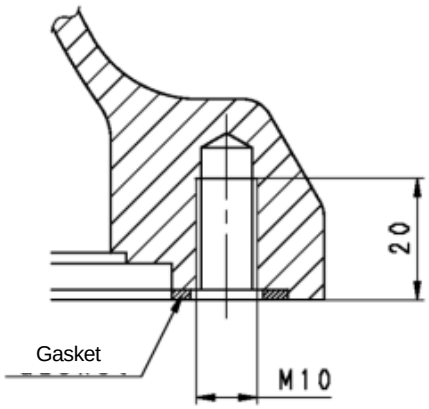
Example of pedestal



Robot base installation bolt	4-M10
Tightening torque	39 N·m

Installation Dimensions of Base Section

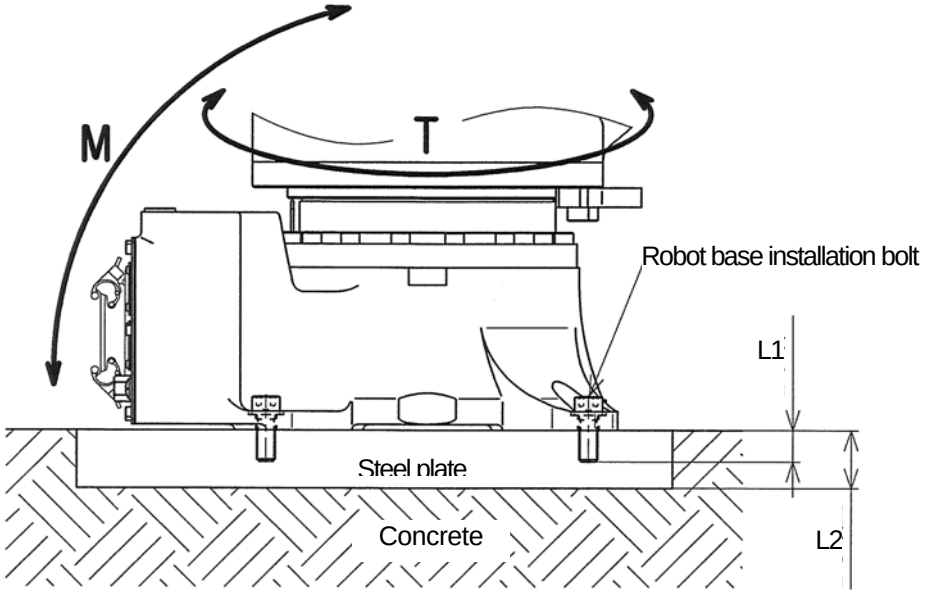
Fix the base section with high tension bolts through the bolt holes.

Model	MS005N
Dimensions for installation	
Cross-section of installation section	
Tightening bolt	4-M10 Material: SUS304
Tightening torque	39 N·m
Levelness	Within ±5°

5.3.2.7 INSTALLING R SERIES ARMS

When Installing the Robot Directly on the Floor

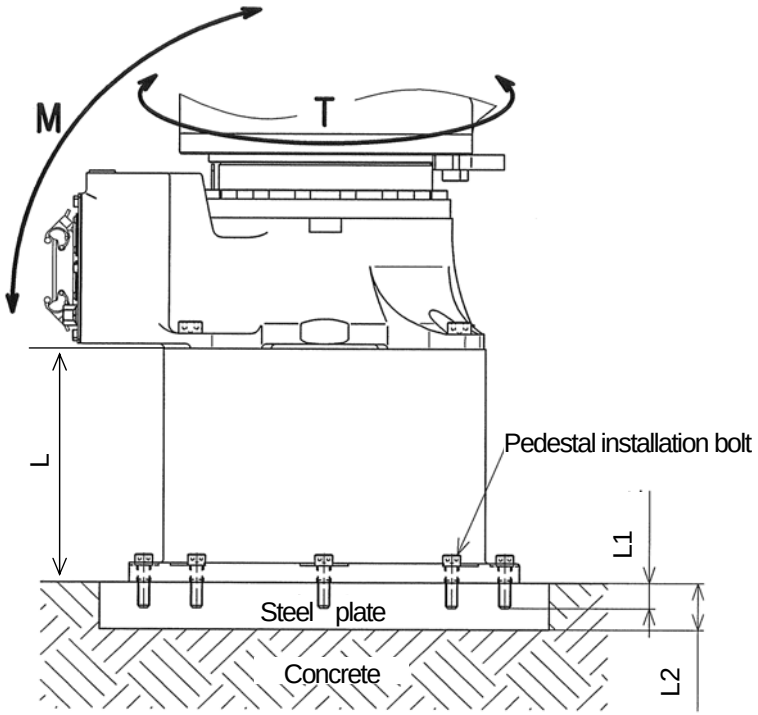
Bury steel plate of L2 thickness (See the table below.) in the concrete floor as shown in the figure below or fix it with anchors. The steel plate must be fixed firmly so as to sustain reaction forces from the robot.



Model	RA06L, RA10N, RS06L, RS10N	RA10L, RA20N, RS10L, RS20N	RC05L, RS05L, RS05N	RD80N, RS15X, RS30N, RS50N, RS80N
Robot base installation bolt	4-M16	4-M16	4-M8	8-M16
Tightening torque	235 N·m	235 N·m	29.4 N·m	235 N·m
L1	25 mm Min.	25 mm Min.	12 mm Min.	25 mm Min.
L2	28 mm Min.	28 mm Min.	14 mm Min.	28 mm Min.

When Installing the Robot Pedestal on the Floor

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

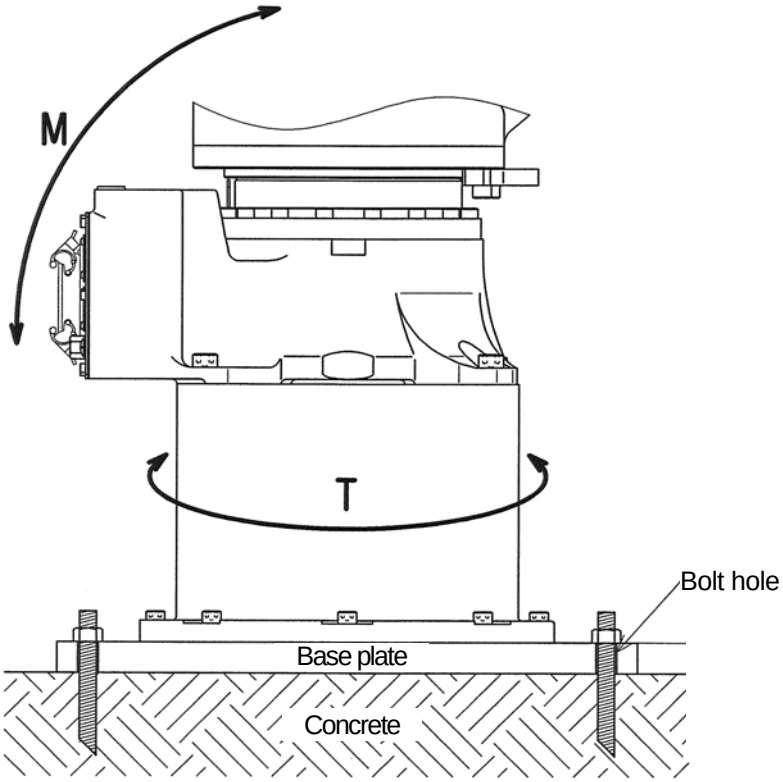


Model	RA06L, RA10N, RS06L, RS10N	RA10L, RA20N, RS10L, RS20N	RC05L, RS05L, RS05N	RD80N, RS15X, RS30N, RS50N, RS80N
Pedestal mass	60 kg (L=600)	70 kg (L=600)	24 kg (L=600)	100 kg (L=600)
	35 kg (L=300)	45 kg (L=300)	17 kg (L=300)	65 kg (L=300)
Pedestal installation bolt	8-M12	8-M12	8-M10	8-M16
Tightening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

NOTE* ( ) indicates the part number of pedestal.

When Installing the Robot Base Plate on the Floor

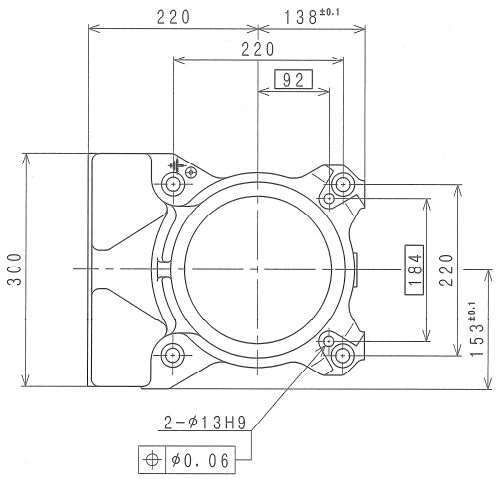
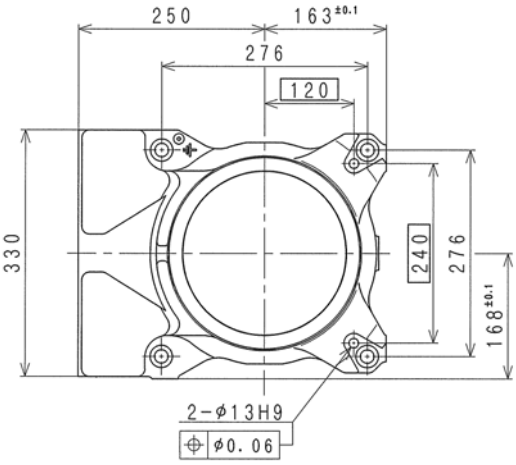
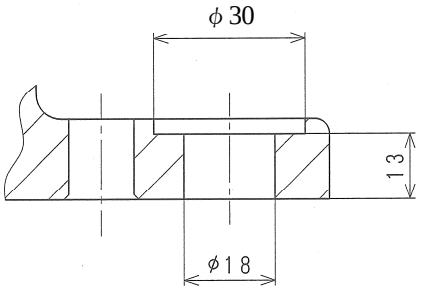
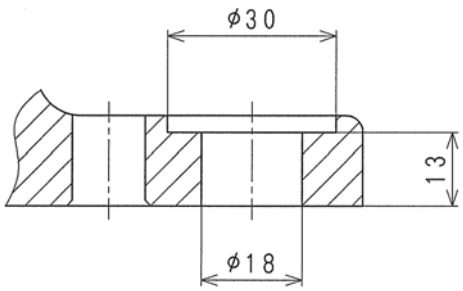
In this case, install the base plate on concrete floor or steel plate using bolt holes on the base plate.

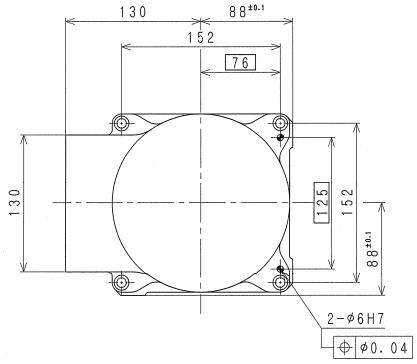
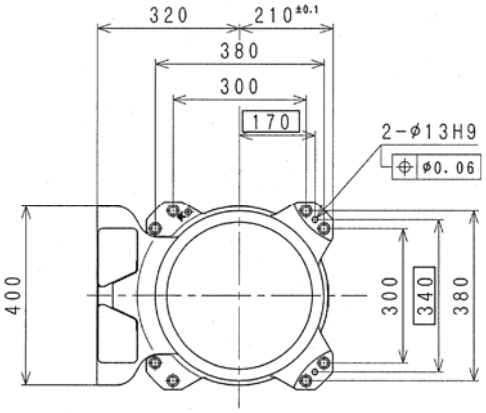
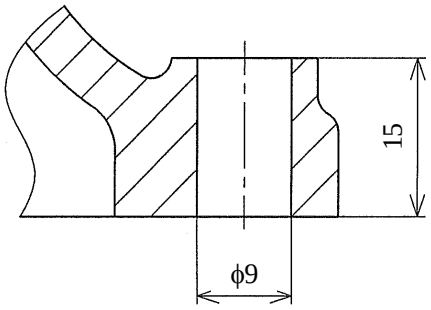
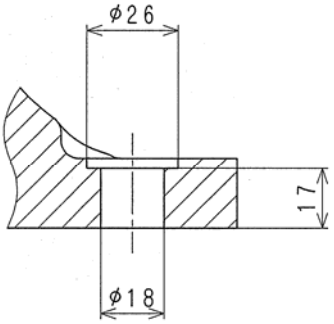


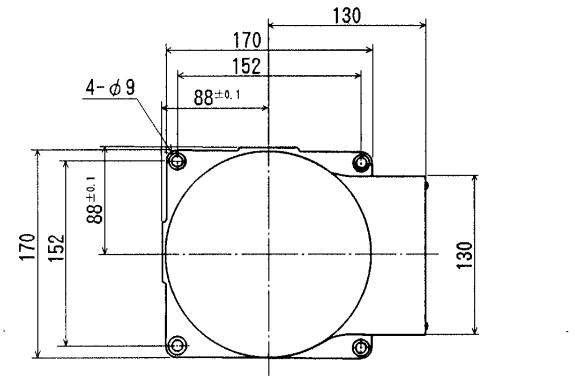
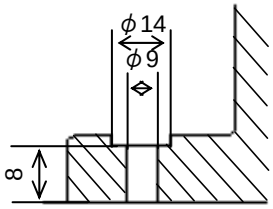
Model	RA06L, RA10N, RS06L, RS10N	RA10L, RA20N, RS10L, RS20N,	RC05L, RS05L, RS05N	RD80N, RS15X, RS30N, RS50N, RS80N
Base plate mass	110 kg	110 kg	20 kg	110 kg
Base plate installation hole	4-ϕ20 (PCD800)	4-ϕ20 (PCD800)	4-ϕ14 (300 × 300)	4-ϕ26 (PCD800)
Base plate dimension (mm)	750 × 750 × 25	750 × 750 × 25	400 × 400 × 16	750 × 750 × 25

Installation Dimensions of Base Section

Fix the base section with high tension bolts through the bolt holes.

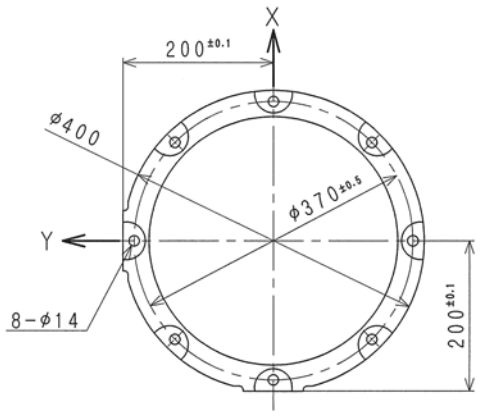
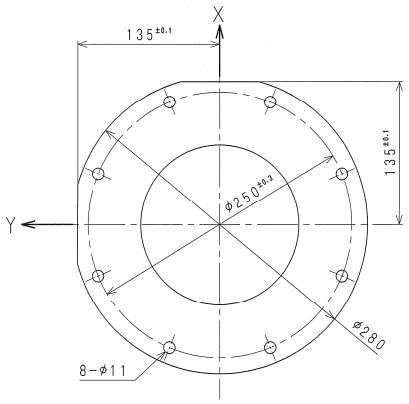
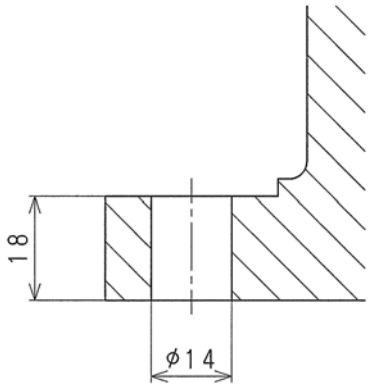
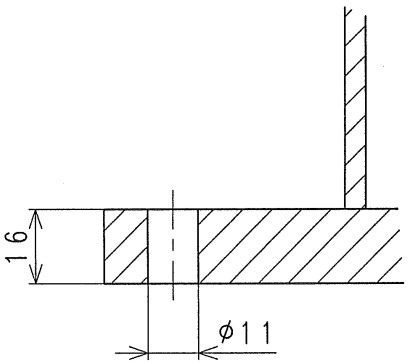
Model	RA06L, RA10N, RS06L, RS10N	RA10L, RA20N, RS10L, RS20N
Dimensions for installation		
Cross-section of installation section		
Bolt hole	4- ϕ18	4- ϕ18
High tension bolt	4-M16 Material: SCM435 Strength class: 10.9 min.	4-M16 Material: SCM435 Strength class: 10.9 min.
Tightening torque	235 N-m	235 N-m
Levelness	Within ±5°	Within ±5°

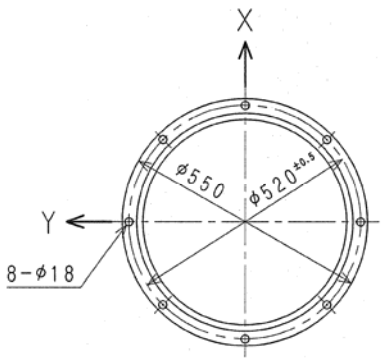
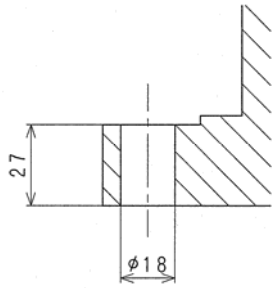
Model	RC05L, RS05N, RS05L	RD80N, RS15X, RS30N, RS50N, RS80N,
Dimensions for installation		
Cross-section of installation section		
Bolt hole	4-ϕ9	8-ϕ18
High tension bolt	4-M8 Material: SCM435 Strength class: 10.9 min.	8-M16 Material: SCM435 Strength class: 10.9 min.
Tightening torque	29.4 N·m	235 N·m
Levelness	Within ±5°	Within ±5°

Model	RS03N
Dimensions for installation	
Cross-section of installation section	
Bolt hole	4-φ9
High tension bolt	4-M8 Material: SCM435 Strength class: 10.9 min
Tightening torque	29.4 N·m
Levelness	Within ±5°

Installation Dimensions of Robot Pedestal

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

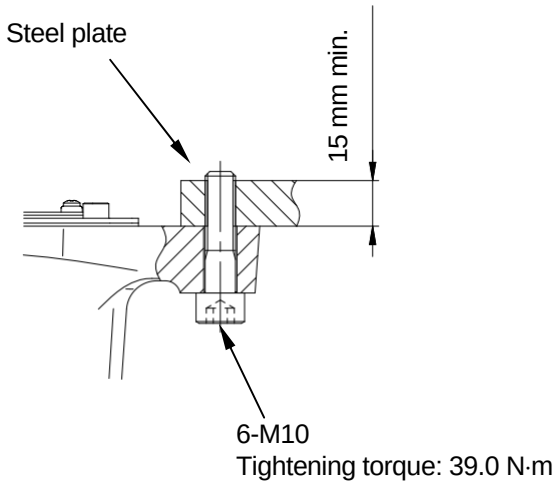
Model	RA06L, RA10L, RA10N, RA20N, RS06L, RS10L, RS10N, RS20N	RC05L, RS05L, RS05N
Dimensions for installation		
Cross-section of installation section		
Bolt hole	8-ϕ14	8-ϕ11
High tension bolt	8-M12 Material: SCM435 Strength class: 10.9 min	8-M10 Material: SCM435 Strength class: 10.9 min
Tightening torque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

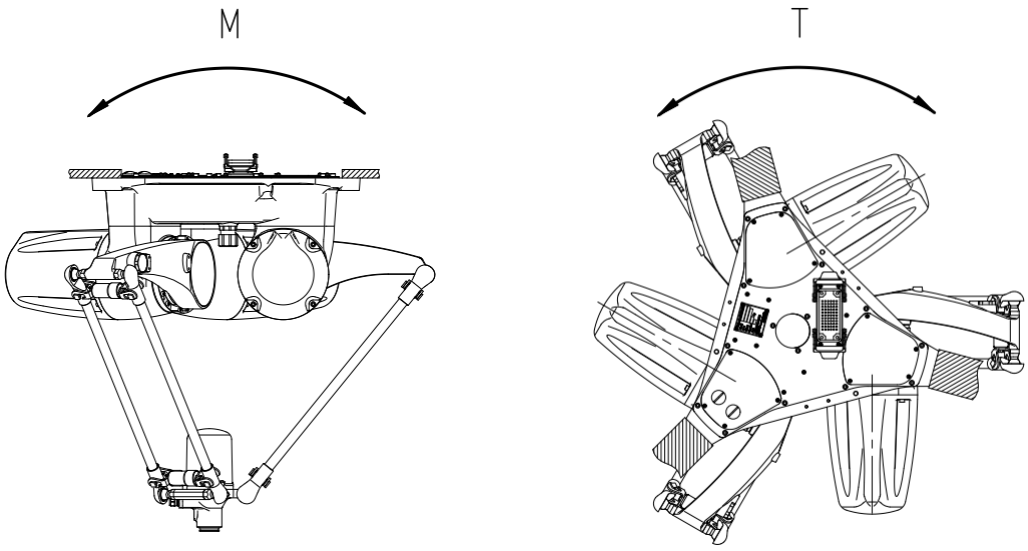
Model	RD80N, RS15X, RS30N, RS50N, RS80N
Dimensions for installation	
Cross-section of installation section	
Bolt hole	8-ϕ18
High tension bolt	8-M16 Material: SCM435 Strength class: 10.9 min
Tightening torque	235 N·m
Levelness	Within ±5°

5.3.2.8 INSTALLING Y SERIES ARMS

YF002N

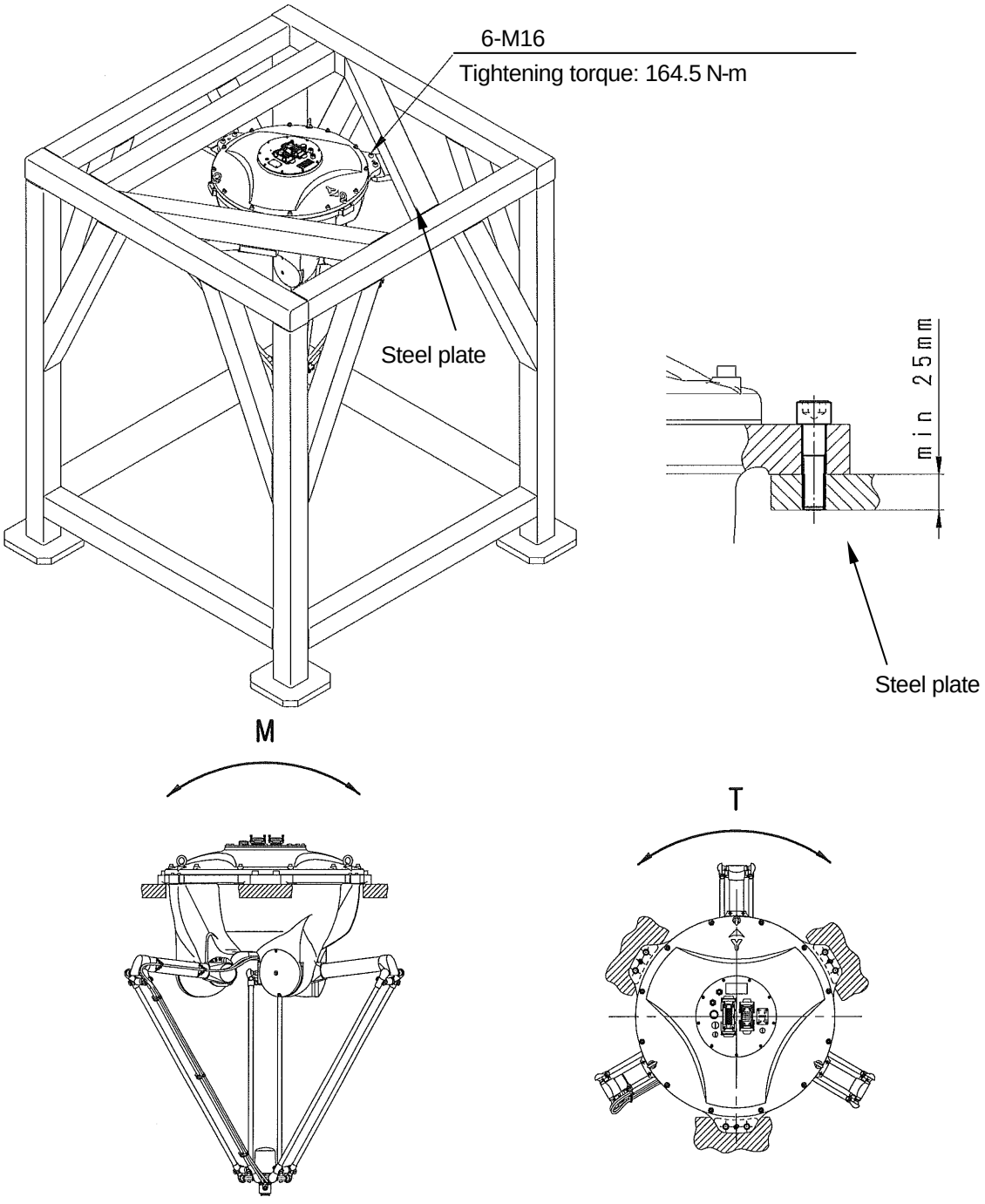
As in the figure below, embed steel plate (15 mm or more) on the stand whose natural frequency is 30 Hz or more. The steel plate must be fixed firmly so as to sustain reaction forces from the robot.





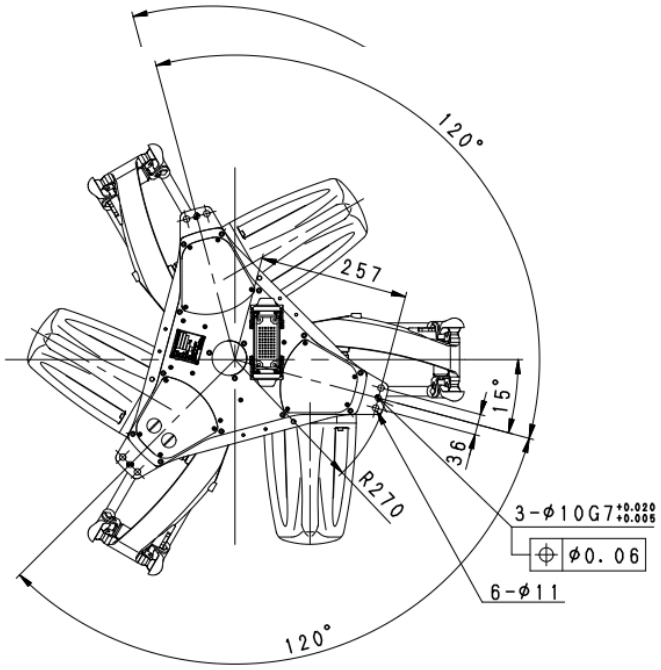
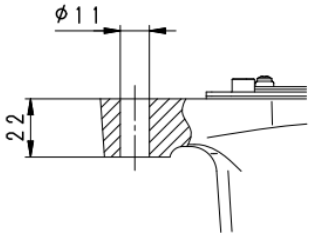
YF003N

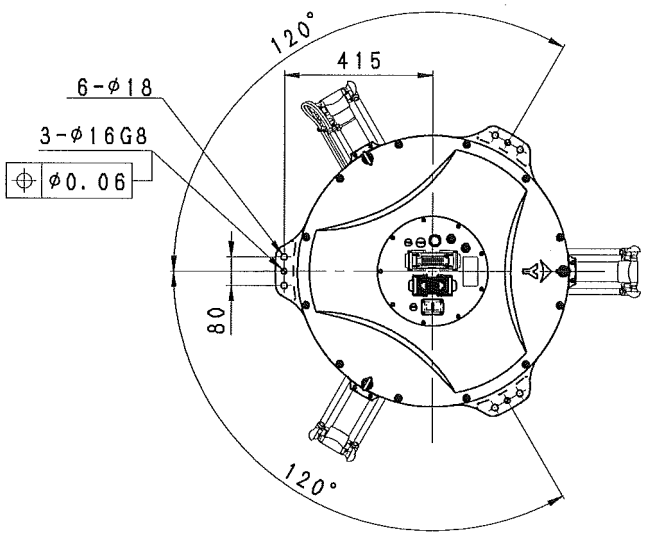
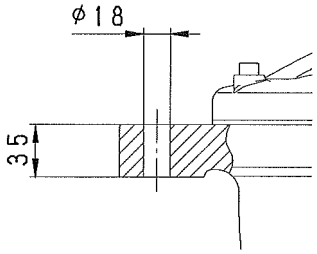
Fix the robot arm to a pedestal as shown in the figure below. The arm should be fixed on to steel plate (25 mm min. thickness) and the pedestal should be rigid with natural frequency of 30 Hz or more. Secure the pedestal strongly enough to endure the reaction forces produced by the robot arm.



Installation Dimensions of Base Section

Fix the base section with high tension bolts through the bolt holes.

Model	YF002N
Dimensions for installation	
Cross-section of installation section	
Bolt hole	6-ϕ18
Bolt	6-M10 Material: SUS304 Strength class: A2-70
Tightening torque	39.0 N-m
Levelness	Within ±5°

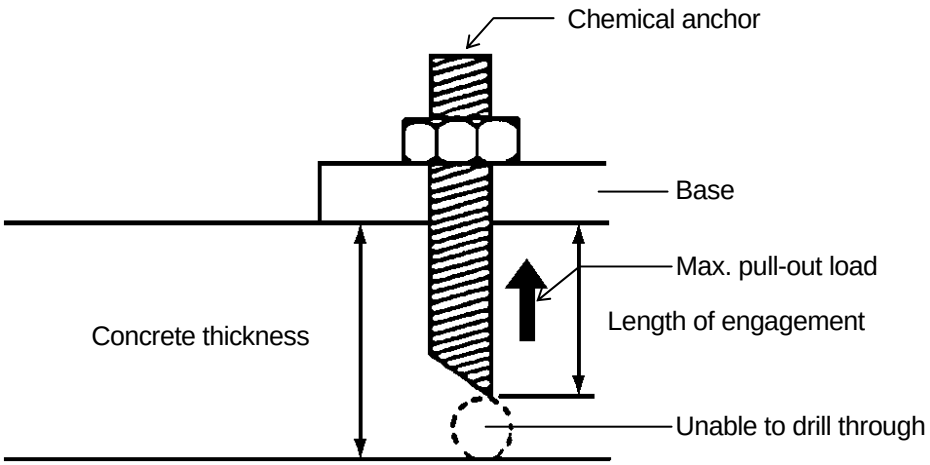
Model	YF003N
Dimensions for installation	
Cross-section of installation section	
Bolt hole	6-ϕ18
Bolt	6-M16 Material: SUS304
Tightening torque	164.5 N-m
Levelness	Within ±5°

5.3.2.9 INSTALLING Z SERIES ARMS

ZB Series

When Installing the Base Directly on the Floor

When the robot base is installed directly on the concrete floor, use chemical anchor bolts as a standard. Metal anchor bolts can be used as an alternative for the chemical anchor bolts.

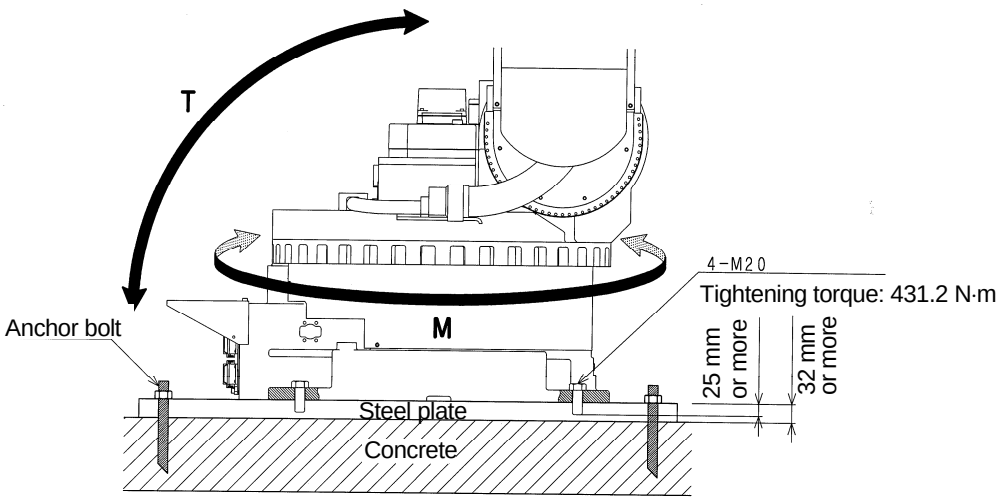


Chemical anchor	M20
Length of engagement	200 mm or more
Concrete thickness	230 mm or more
Max. pull-out load (includes bolt tightening)	127400 N

When Installing a Plate between the Robot and the Floor

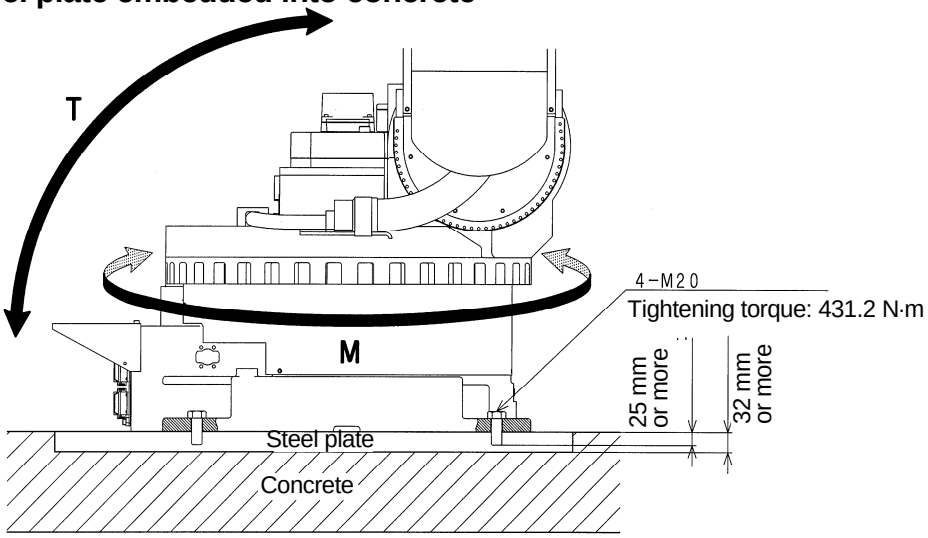
Fix the steel plate (32 mm Min. thick) onto the floor using anchor bolts or embed it into the concrete, and fix the robot base onto the steel plate using high-tension bolts. The base plate must be fixed as firmly as possible to withstand the reaction forces it receives from the robot during operation.

Fixing the steel plate using anchor bolts



High tension bolt	4-M20
Length of engagement	25 mm or more

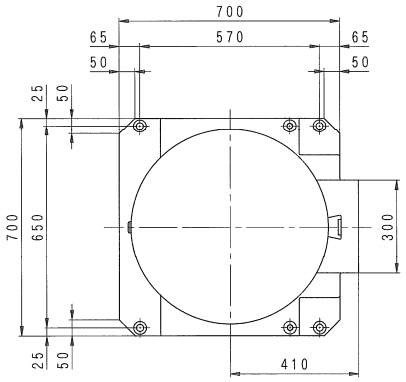
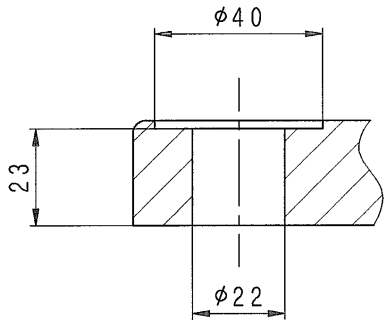
Fixing the steel plate embedded into concrete



High tension bolt	4-M20
Length of engagement	25 mm or more

Installation Dimensions of Base Section

Fix the base section with high tension bolts through the bolt holes.

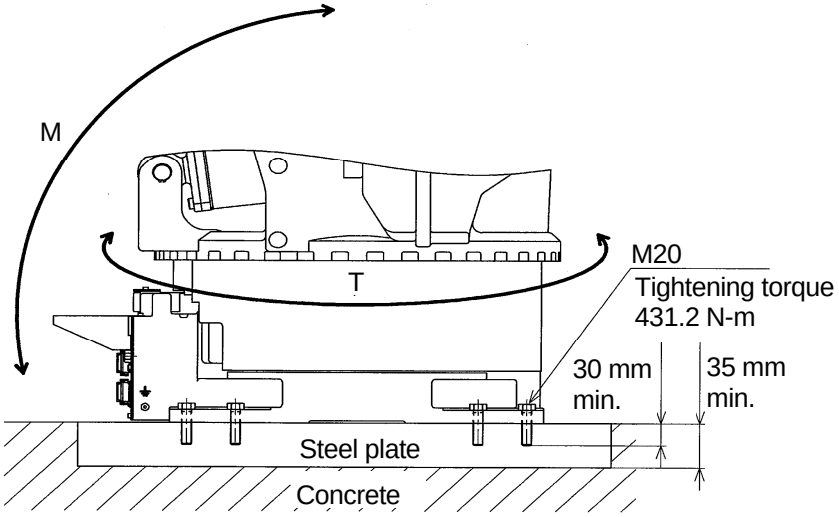
Dimensions for installation	
Cross-section of Installation	
Bolt hole	4 - ϕ22
High tension bolt	4-M20 Material: SCM435 Strength class: 10.9 or more
Tightening torque	431.2 N-m
Levelness	Within ±5 °

ZD/ZH/ZT/ZX Series

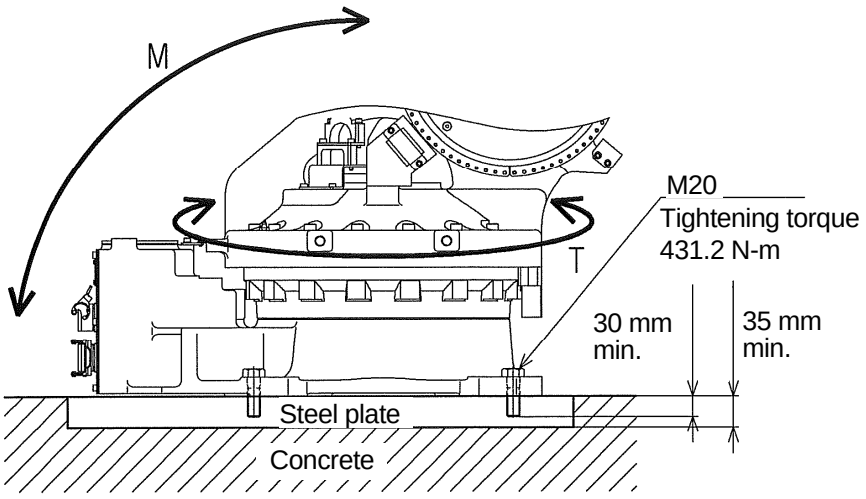
When installing the base directly on the floor:

As shown in the figure below, embed steel plate (35 mm Min. thick) in the concrete floor or fix with anchor bolts. The steel plate must be fixed firmly so as to sustain reaction forces from the robot.

ZD/ZT/ZX Series



ZH Series



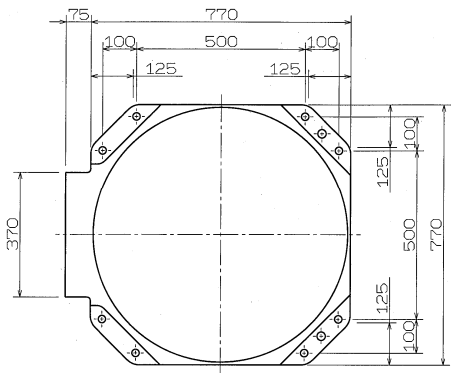
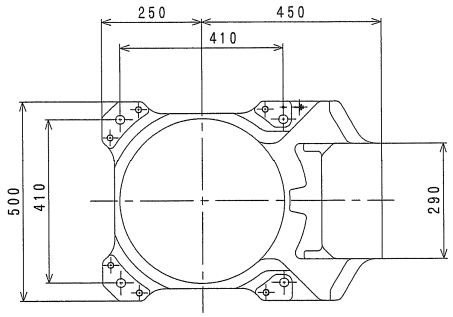
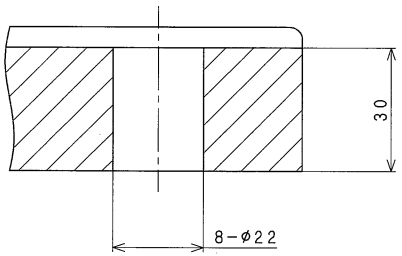
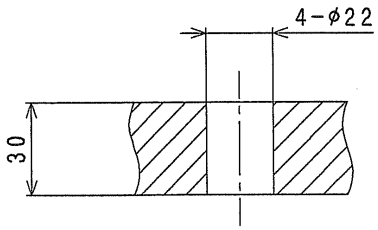
When installing the base plate with positioning holes on the floor:

Install the base plate utilizing 8 holes of 22 in diameter. (4 holes for ZH series) Install the base plate on the concrete floor or the steel plate floor. Reaction forces received from robot are the same as when installing the base directly on the floor.

There are two pin holes on the base plate for positioning, which enable the base plate to join with the base precisely. Thus, replacement of a broken robot can be done quickly and easily. (Beware that usually JT1 is not precision zeroed. This function is only provided as Option.)

Installing Dimensions of Base Section

Fix the base section with high tension bolts through the bolt holes.

	ZD/ZT/ZX series	ZH series
Dimensions for installation		
Cross-section of installation section		
Bolt hole	8-ϕ22	4-ϕ22
High tension bolt	8-M20 Material: SCM435 Strength class: 10.9 min.	4-M20 Material: SCM435 Strength class: 10.9 min.
Tightening torque	431.2 N-m	431.2 N-m
Levelness	Within ±5°	Within ±5°

5.3.3 MOVEMENT REACTION ACTING ON INSTALLATION SURFACE DURING OPERATION

Refer to the list below for the movement reaction that acts on the installation surface during normal operation. Consider these values at when installing robot arms as shown in the previous pages.

Model	T (Rotating Torque)	M (Inversion Moment)
BA006N	1935 N-m	2527 N-m
BT165L BT200L	21700 N-m	40400 N-m
BX100L/BX130X BX165L/BX200L	15000 N-m	35000 N-m
BX100N	10000 N-m	31000 N-m
BX100S	10000 N-m	27000 N-m
BX165N	13000 N-m	33400 N-m
BX250L/BX300L	17000 N-m	50000 N-m
CP180L	28000 N-m	40000 N-m
CP300L	28000 N-m	50000 N-m
CP500L	28000 N-m	60000 N-m
MC004N	378 N-m	490 N-m
MD400N	11500 N-m	44500 N-m
MD500N	14000 N-m	37000 N-m
MS005N	430 N-m	810 N-m
MT400N	18500 N-m	46500 N-m
MX350L	13500 N-m	40000 N-m
MX420L	14500 N-m	43500 N-m
MX500N/MX700N	15500 N-m	48000 N-m
RA06L/RA10N/RS06L/RS10N	2168 N-m	3223 N-m
RA10L/RA20N RS10L/RS20N	5614 N-m	6300 N-m
RC05L/RS05L/RS05N	849 N-m	1127 N-m
RD80N/RS15X/RS30N RS50N/RS80N	12101 N-m	15937 N-m

Model	T (Rotating Torque)	M (Inversion Moment)
RS03N	293 N-m	357 N-m
YF002N	200 N-m	400 N-m
YF003N	500 N-m	700 N-m
ZB150S	9000 N-m	24000 N-m
ZD series	10000 N-m	26000 N-m
ZH100U	9000 N-m	22000 N-m
ZT series	12000 N-m	35000 N-m
ZX series (Excluding ZX300S)	12000 N-m	34000 N-m
ZX 300S	12000 N-m	41000 N-m

5.4 MOUNTING OF TOOL

At the end of the robot arm, a flange is provided for mounting a tool. To mount a tool, tighten the mounting bolts into the tapped holes machined on circumference of the flange surface. Position the tool utilizing the pin holes and positioning hole or boss. Select the length of mounting bolts according to the depth of tap in arm side and thickness of tool parts so that the specified screwing engagement can be attained. Use high tension mounting bolts and tighten them to the specified torque. Refer to the following sections for specifications of the flange, mounting bolts, etc. for each robot arm.

⚠ WARNING

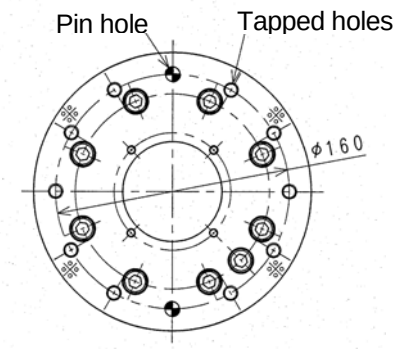
Prior to mounting tools on the robot arm, turn OFF the controller power switch and the external power switch. Display signs indicating clearly "Installation and connection in progress", and lockout/ tagout the external power switch to prevent personnel from accidentally turning ON the power.

⚠ CAUTION

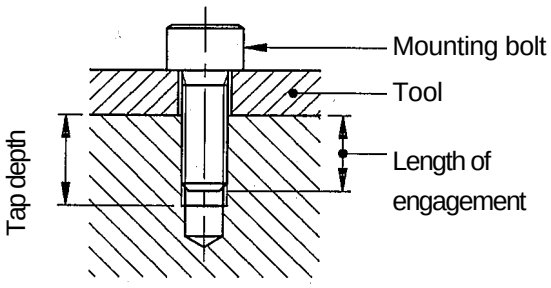
If the engagement length has exceeded the specified value, the mounting bolt might bottom out, and the tool will not be fixed securely.

5.4.1 MOUNTING TOOL TO B SERIES ARM

Dimensions of Wrist End



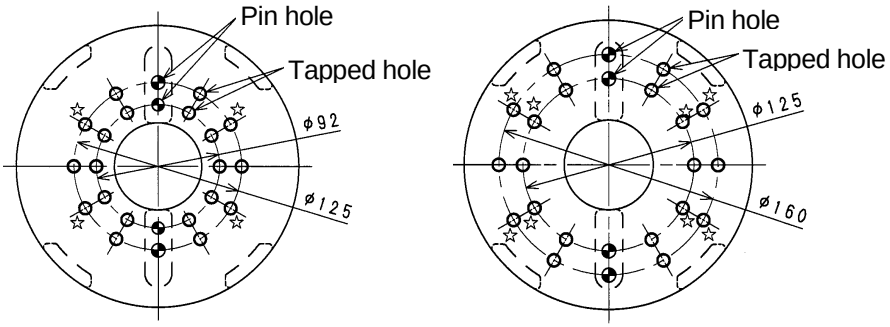
Specification of Mounting Bolts



	Standard flange		Optional flange (Adaptor plate)
Model	B series (except BX250L/300L)	BX250L/300L	B series (except BX250L/300L)
Tapped holes	6-M10	10-M10	6-M10
ϕD	ϕ160	ϕ160	ϕ125
Pin hole	2-ϕ10H7 Depth 12	2-ϕ10H7 Depth 12	2-ϕ10H7 Depth 14
Tap depth	19 mm	13 mm (through)	20 mm
Length of engagement	13 - 14 mm	13 - 18mm	13 - 14 mm
High tension bolt	SCM435, 10.9 min	SCM435, 10.9 min	SCM435, 10.9 min
Tightening torque	56.84 N·m	56.84 N·m	56.84 N·m

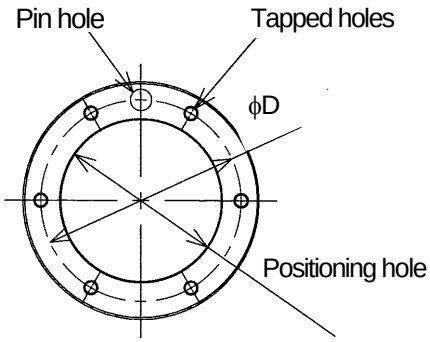
	Optional flange (Adaptor bracket)		
Model	B series (except BX250L/300L)		
Tapped holes	10-M10	6-M10*	6-M10*
ϕD	ϕ92	ϕ125	ϕ160
Pin hole	2-ϕ9H7 Depth 12	2-ϕ10H7 Depth 12	2-ϕ10H7 Depth 12
Tap depth	12 mm (through)	12 mm (through)	12 mm (through)
Length of engagement	13 - 18 mm	13 - 18 mm	13 - 18 mm
High tension bolt	SCM435, 10.9 min	SCM435, 10.9 min	SCM435, 10.9 min
Tightening torque	56.84 N·m	56.84 N·m	56.84 N·m

NOTE* No need to use the tapped holes with ☆ in the figures below.

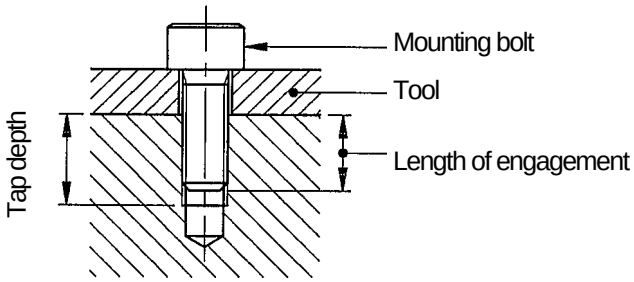


5.4.2 MOUNTING TOOL TO BA SERIES ARM

Dimensions of Wrist End



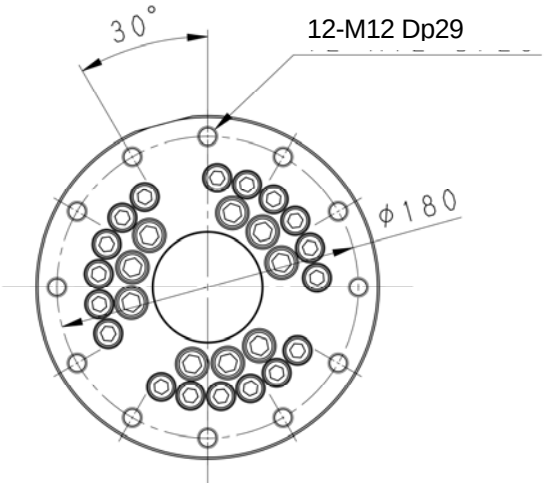
Specification of Mounting Bolts



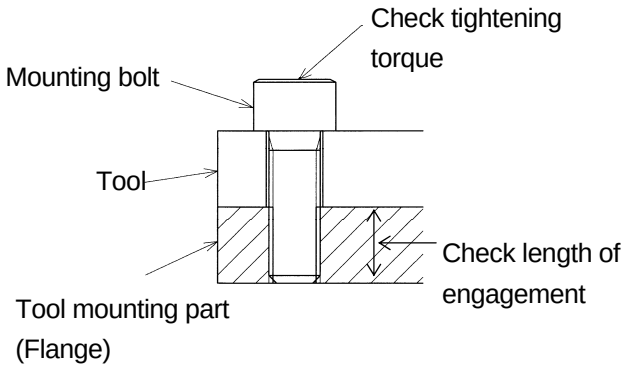
Tapped holes	6-M4
ϕD	ϕ56
Pin hole	ϕ6H7 Depth 8
Positioning hole	ϕ45H7 Depth 5
Tap depth	8 mm
Length of engagement	6 - 7 mm
High tension bolt	SCM435, 10.9 min
Tightening torque	3.43 N·m

5.4.3 MOUNTING TOOL TO CP SERIES ARM

Dimensions of Wrist End



Specification of Mounting Bolts

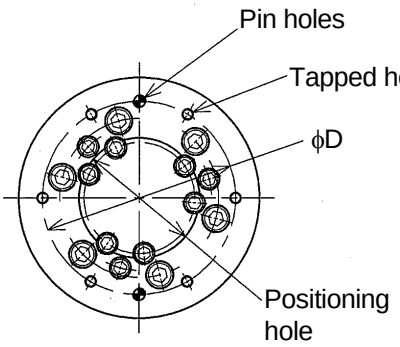


	Standard flange
Tapped holes	12-M12
ϕD	ϕ180
Tap depth	29 mm
Length of engagement	18 - 28 mm
High tension bolt	SCM435, 10.9 min
Tightening torque	98.07 N·m

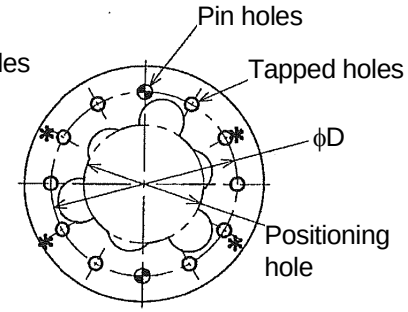
5.4.4 MOUNTING TOOL TO M SERIES ARM

Dimensions of Wrist End (Flange)

MD/MX series



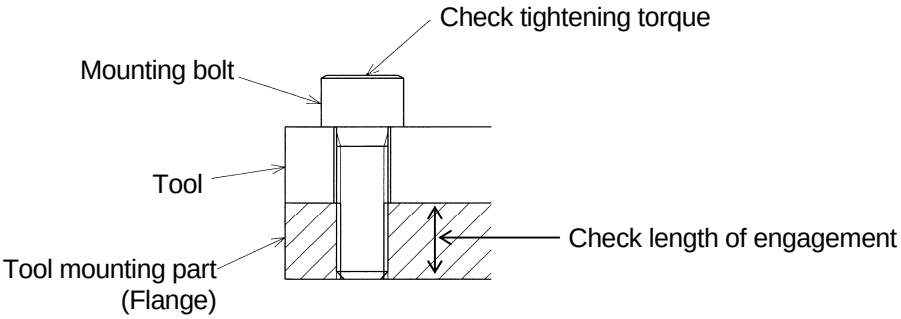
MT400N



⚠ CAUTION

Use at least one pin for assured fixing to prevent the tool on the flange from moving.

Specification of Mounting Bolts

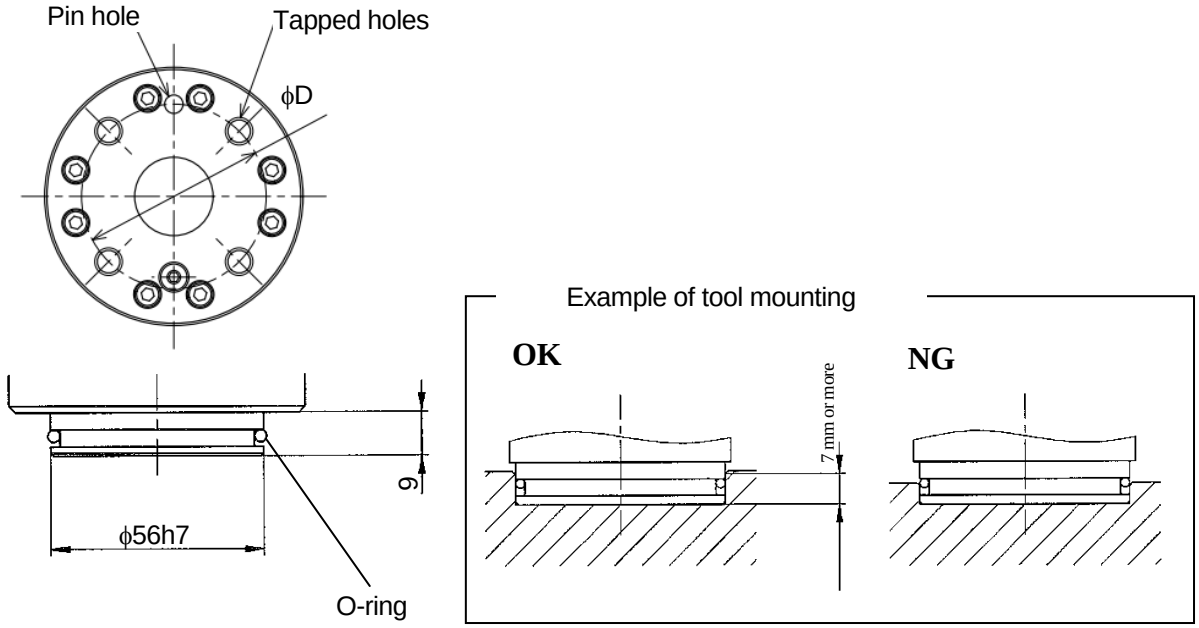


Model	MD400N/ MD500N MX350L/ MX420L MX500N/ MX700N	MT400N
Tapped holes	6-M12	6-M10
ϕD	ϕ200	ϕ160
Pin holes	2-ϕ12H7 Depth 12	2-ϕ10H7 Depth 12
Positioning hole	ϕ125H7 Depth 8.5	ϕ100H7 Depth 8
Tap depth	29 mm	12 mm
Length of engagement	18 - 28 mm	10 - 11 mm
High tension bolt	SCM435, 10.9 Min	SCM435, 10.9 Min
Tightening torque	98.07 N·m	98.07 N·m
Pin Material	S45CⒽ*	S45CⒽ*

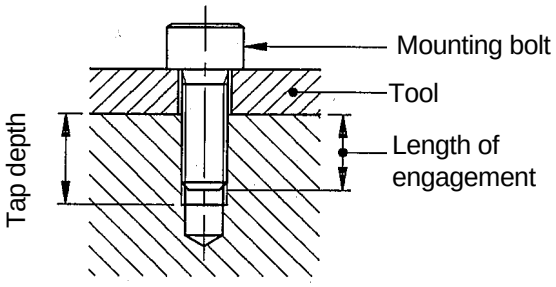
NOTE* S45C thermal refining steel or equivalent in strength

5.4.5 MOUNTING TOOL TO MC SERIES ARM

Dimensions of Wrist End (Flange)



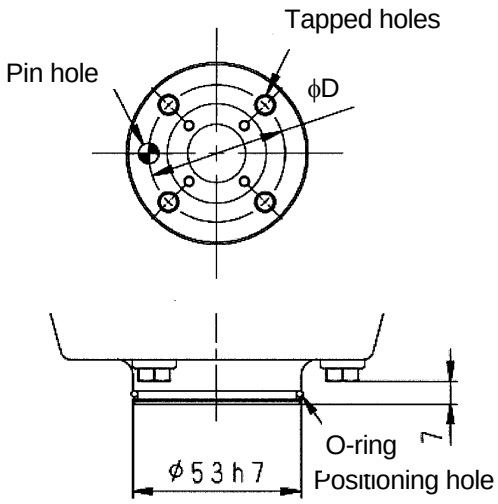
Specification of Mounting Bolts

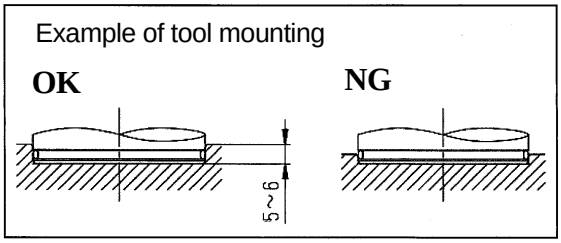


Model	MC004N
Tapped holes	4-M6
ϕD	ϕ40
Pin hole	ϕ4H7 Depth 6
Positioning hole	ϕ56h7
Tap depth	7.5 mm
Length of engagement	5 - 7 mm
High tension bolt	SCM435, 10.9 or more
Tightening torque	12 N·m

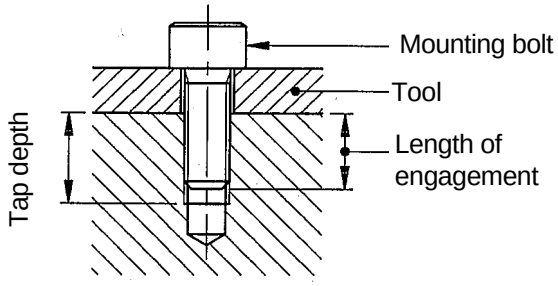
5.4.6 MOUNTING TOOL TO MS SERIES ARM

Dimensions of Wrist End (Flange)





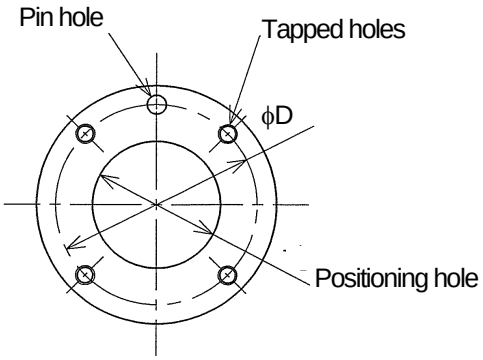
Specification of Mounting Bolts



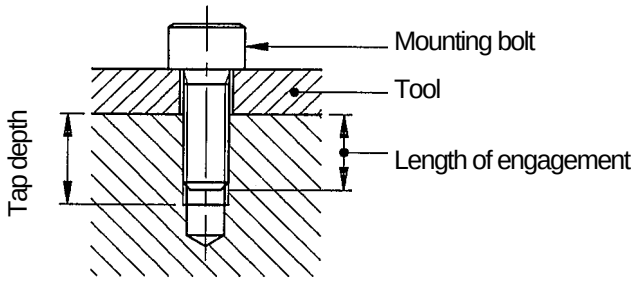
Model	MS005N
Tapped holes	4-M6
ϕD	ϕ40
Pin hole	ϕ6H7 Depth 12
Positioning hole	ϕ53h7
Tap depth	12 mm
Length of engagement	7-9 mm
Tightening bolt	SUS304
Tightening torque	8.3 N·m

5.4.7 MOUNTING TOOL TO R SERIES ARM

Dimensions of Wrist End



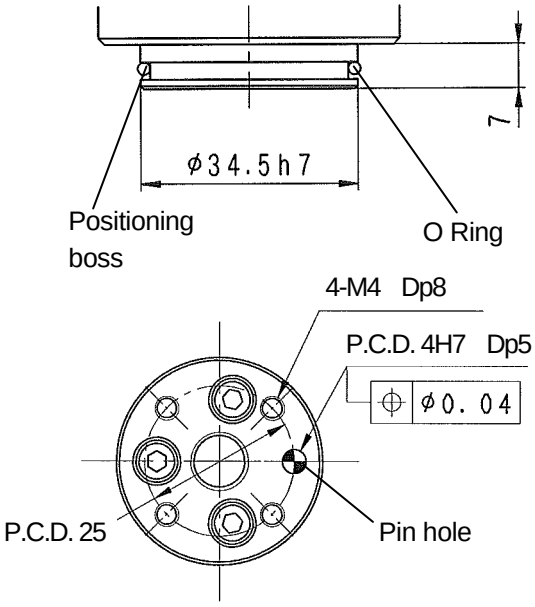
Specification of Mounting Bolts



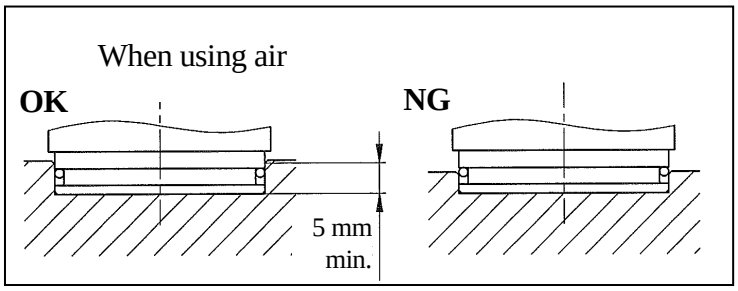
Model	RA06L, RA10N, RS06L, RS10N	RA10L, RA20N, RS10L, RS15X, RS20N	RC05L, RS05L, RS05N
Tapped holes	4-M6	4-M6	4-M5
ϕD	ϕ40	ϕ63	ϕ31.5
Pin hole	ϕ6H7 Depth 6	ϕ6H7 Depth 6	ϕ5H7 Depth 8
Positioning hole	ϕ25H7 Depth 6	ϕ40H7 Depth 6	ϕ20H7 Depth 3
Tap depth	8 mm	9 mm	8 mm
Length of engagement	6 - 7 mm	7 - 8 mm	6 - 7 mm
High tension bolt	SCM435, 10.9 min	SCM435, 10.9 min	SCM435, 10.9 min
Tightening torque	11.76 N·m	11.76 N·m	6.86 N·m

Model	RD80N, RS30N, RS50N, RS80N	RS03N
Tapped holes	6-M8	4-M5
ϕD	ϕ80	ϕ31.5
Pin hole	ϕ8H7 Depth 8	ϕ5H7 Depth 6
Positioning hole	ϕ50H7 Depth 6	ϕ20H7 Depth 4
Tap depth	13 mm	8 mm
Length of engagement	8 - 12 mm	6 - 8 mm
High tension bolt	SCM435, 10.9 min	SCM435, 10.9 min
Tightening torque	29.40 N·m	6.86 N·m

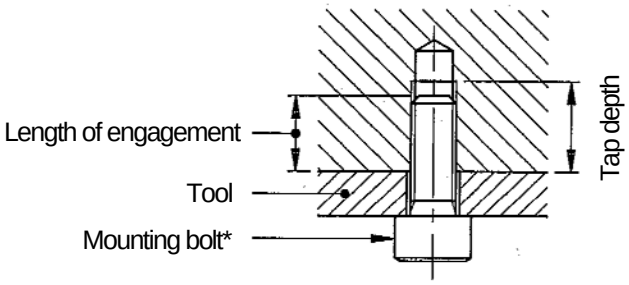
5.4.8 MOUNTING TOOL TO YF SERIES ARM



When using air, the positioning hole depth should be 5 mm or deeper.



Specification of Mounting Bolts

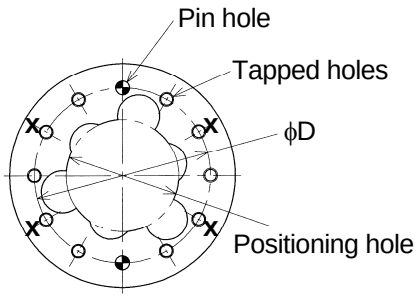


Tap depth	8 mm
Length of engagement	6 to 7 mm
Bolt	SUS304
Tightening torque	2.4 N-m

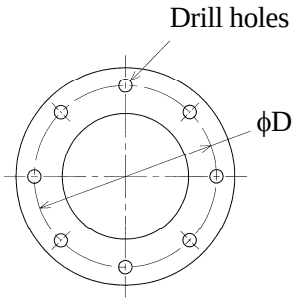
5.4.9 MOUNTING TOOL TO Z SERIES ARM

Dimensions of Wrist End (Flange)

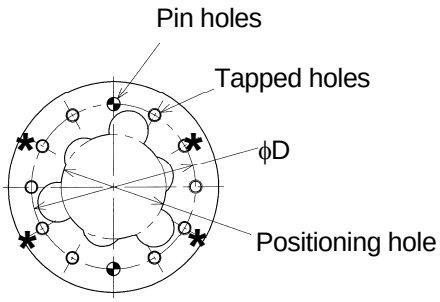
ZB Series



ZD Series



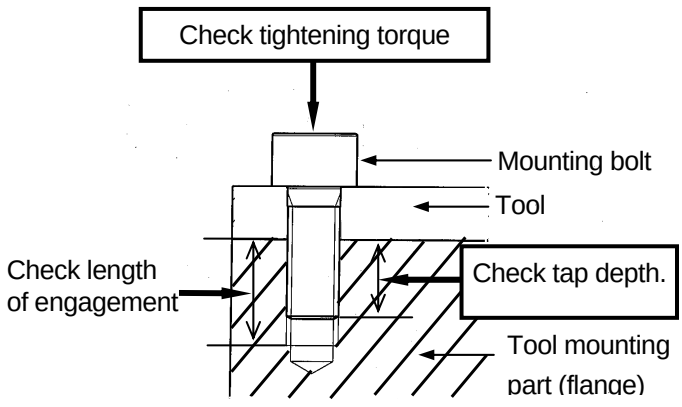
ZH/ZT/ZX Series



NOTE: 4 tapped holes marked ***** require no tightening.

Specification of Mounting Bolts

ZB Series

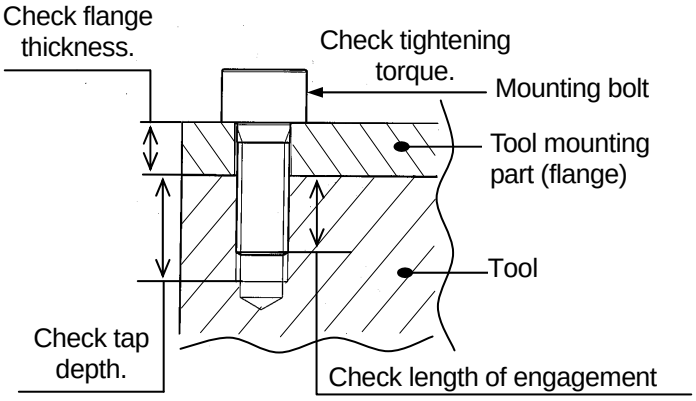


Model	ZB150S
Tapped hole	6-M10
ϕD	ϕ125
Pin hole	2-ϕ10H7 Depth 12
Positioning hole	ϕ80H7 Depth 8
Tap depth	12 mm
Length of engagement	10-11 mm
High tension bolt	SCM435, 10.9 min
Tightening torque	56.84 N·m

[**NOTE**]

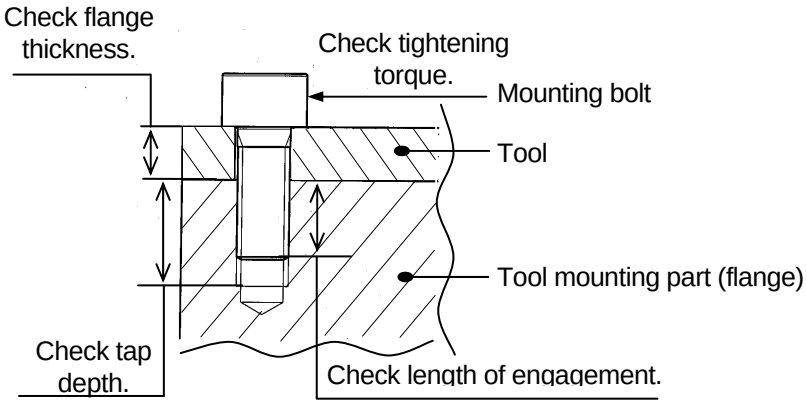
The above mounting sizes are based on ISO. If non-ISO sizes are used, insert the adapter plate (option) prior to mounting tools.

ZD Series

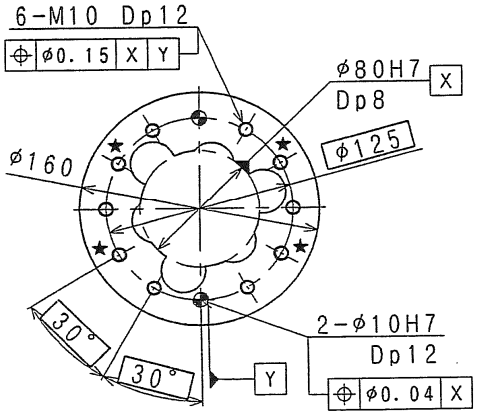


Model	ZD130S, ZD250S
Drill holes	8-ϕ11 (M10).
ϕD	ϕ150
Pin holes	-
Positioning hole	-
Arm flange thickness	15 mm
High tension bolt	SCM435, 10.9 Min
Tightening torque	56.84 N-m

ZH Series



Model	ZH100U
Tapped holes	6-M10
ϕD	ϕ125
Pin holes	2-ϕ10H7 Depth 12
Positioning hole	ϕ80H7 Depth 8
Tap depth	12 mm
Length of engagement	10 - 11 mm
High tension bolt	SCM435, 10.9 min
Tightening torque	56.84 N·m

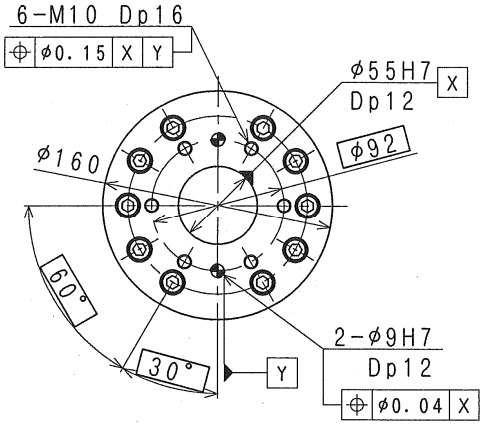


NOTE: 4 tapped holes marked ***** require no tightening.

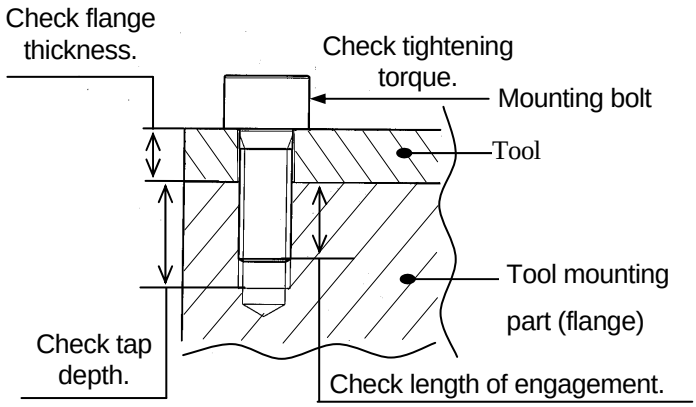
[NOTE]

The above mounting sizes are based on ISO. For the sizes below, insert the adapter plate (option) prior to mounting tools.

Model	ZH100U
Tapped holes	6-M10
ϕD	ϕ92
Pin holes	2-ϕ9H7 Depth 12
Positioning hole	ϕ55H7 Depth 12
Tap depth	16 mm
Length of engagement	14 - 15 mm
High tension bolt	SCM435, 10.9 min
Tightening torque	56.84 N·m



ZT/ZX Series

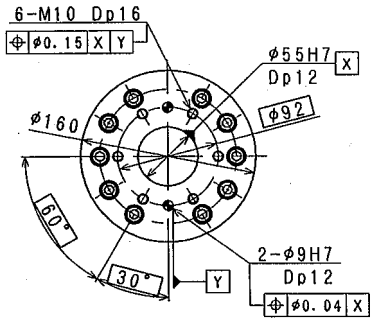


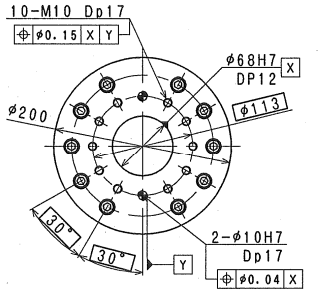
Model	ZT130L, ZT130S, ZT130U, ZT165U, ZT200U, ZX130L, ZX130S, ZX130U, ZX165U, ZX200S	ZT200S, ZX200S, ZX300S
Tapped holes	6-M10	6-M10
ϕD	ϕ125	ϕ160
Pin holes	2-ϕ10H7 Depth 12	2-10H7 Depth 12
Positioning hole	ϕ80H7, Depth 8	ϕ100H7, Depth 8
Tap depth	12 mm	12 mm
Length of engagement	10 - 11 mm	10 - 11 mm
High tension bolt	SCM435, 10.9 Min	SCM435, 10.9 Min
Tightening torque	56.84 N·m	56.84 N·m

[NOTE]

The above mounting sizes are based on ISO. For the sizes below, insert the adapter plate (option) prior to mounting tools.

Model	ZT130L, ZT130S, ZT130U, ZT165U, ZT200U, ZX130L, ZX130S, ZX130U, ZX165U, ZX200S	ZT200S, ZX200S, ZX300S
Tapped holes	6-M10	10-M10
ϕD	ϕ92	ϕ113
Pin holes	2-ϕ9H7, Depth 12	2-ϕ10H7, Depth 17
Positioning hole	ϕ55H7, Depth 12	ϕ68H7, Depth 12
Tap depth	16 mm	17 mm
Length of engagement	14 - 15 mm	15 - 16 mm
High tension bolt	SCM435, 10.9 Min	SCM435, 10.9 Min
Tightening torque	56.84 N·m	56.84 N·m





6.0 CONNECTION

6.1 PRECAUTIONS FOR ROBOT CONNECTION

⚠ WARNING

Do not connect the external power until connections between controller and robot are complete. Accidents, such as electric shock may occur.

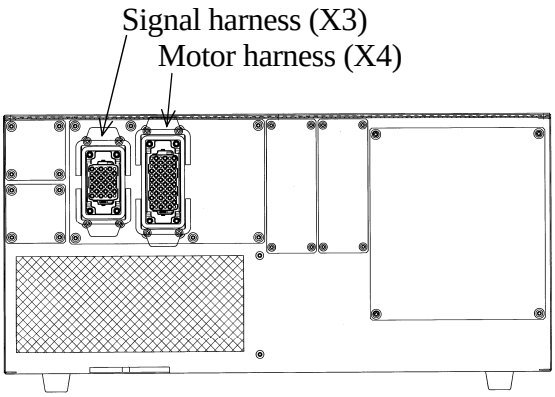
⚠ CAUTION

1. **When connecting the harnesses, be sure to use the correct harnesses. Using an incorrect harness, or misconnecting the harness may damage connectors or cause a break in the electrical system.**
2. **Use conduits, ducts, etc. to prevent people or equipment (forklift etc.) from stepping on or riding over the signal and motor harness lines. Otherwise, an unprotected harness may become damaged causing breaks in the electrical system.**
3. **Even when the harnesses are long, do not bundle them winded or bended. Bundling the harness causes the heat to build up in the harness, resulting in over-heat and furthermore may cause fire.**
4. **Separate the harnesses from any nearby high voltage lines (min. 1 m apart). Do not bundle or run the harnesses in parallel with other power lines. Otherwise, the noise generated from power lines will cause malfunctions.**
5. **Separate the motor harness from the communication and sensor cables, and distribute the lines so they are neither bundled nor running in parallel. Moreover, connect the communication and sensor cables using shield mesh wire that includes twisted pair lines and connect the mesh wire to an adequate FG terminal. Otherwise, PWM noise radiated from the robot's motor drive lines may penetrate into various cables, such as communication cable and cause communication errors.**
6. **Separate the welder secondary cable from the robot's signal harness. Do not wire them in the same duct.**
7. **The motor harness (power line) between the robot and controller will generate PWM noise due to the PWM control driving the motors. This noise may cause interference with signal lines. Prevent interference using these countermeasures:**
   - **(1) Separate the power and signal lines as much as possible.**
   - **(2) Use the shortest possible length for the power line.**
   - **(3) Avoid bundling, wiring in parallel the power and signal lines as much as possible.**
   - **(4) Do not wire the power and signal line within the same duct/conduit.**
   - **(5) Set and secure a firm earth line connection for the controller.**

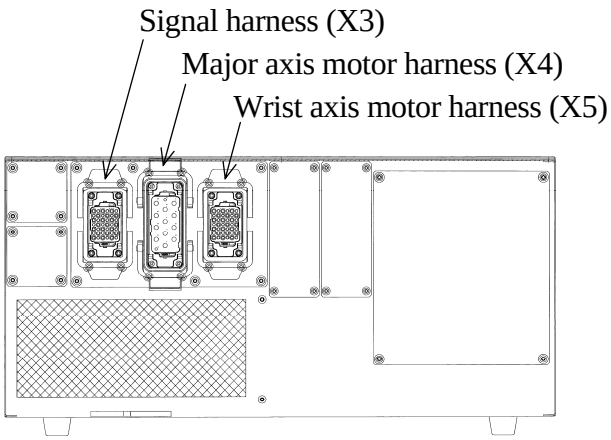
6.2 CONNECTING BETWEEN CONTROLLER AND ROBOT

6.2.1 CONTROLLER SIDE

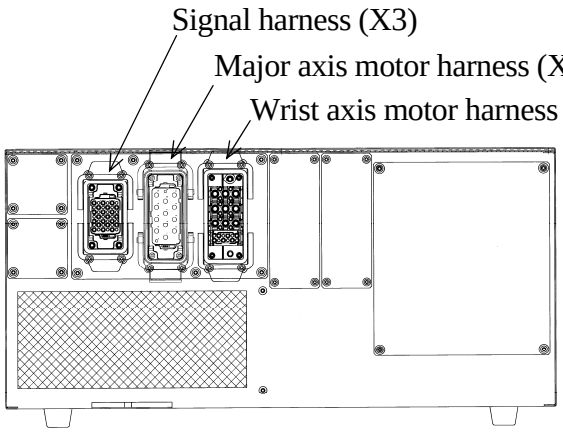
E0x controller



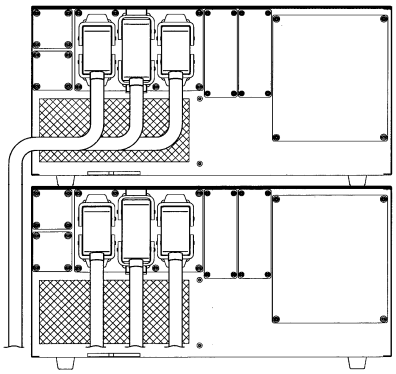
E01 controller



E02 controller



E03/E04 controller

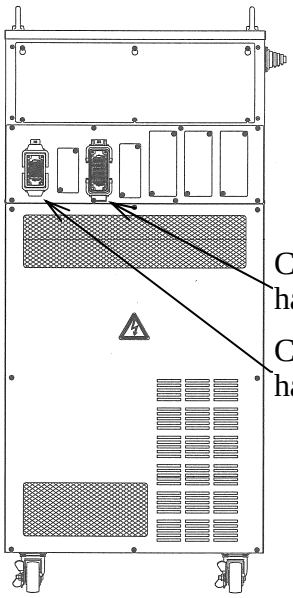


Double stack arrangement of controllers

⚠ CAUTION

1. **Fix each connector securely. The robot may malfunction if connectors loosen or detach.**
2. **When placing a controller on another controller, connect the separate harnesses so that they do not block the exhaust port of the bottom controller.**

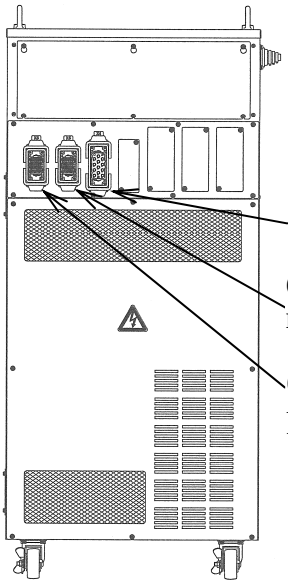
E4x controller



Connector for motor harness (X4)

Connector for signal harness (X3)

E40 controller

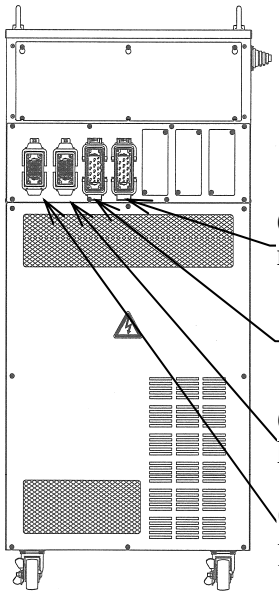


Connector for major axis motor harness (X4)

Connector for wrist axis motor harness (X5)

Connector for signal harness (X3)

E42/E43 controllers



Connector for wrist axis motor harness (X4-2)

Connector for major axis motor harness (X4-1)

Connector for brake and JT7 motor harness (X5)

Connector for signal harness (X3)

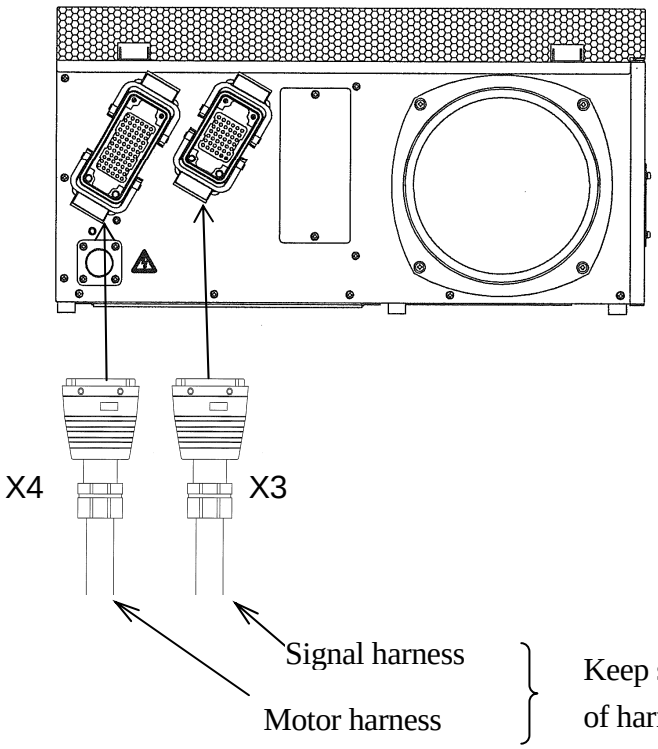
E44 controller

⚠ CAUTION

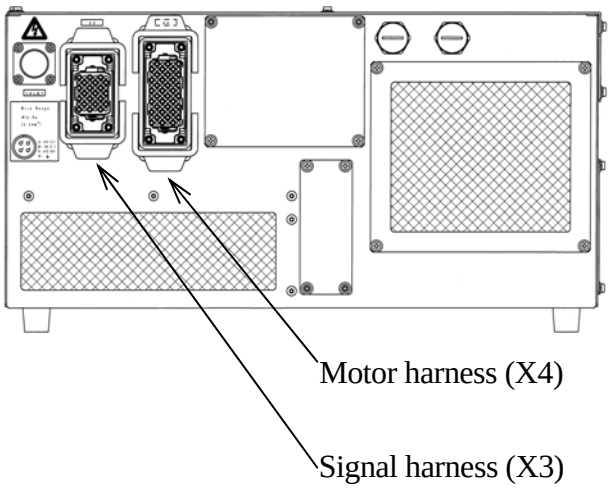
1. Fix each connector securely. The robot may malfunction if connectors loosen or detach.

2. The harness should drop straight down from the connector. Because connectors are located at the upper part of controller, if the connected harnesses are pulled to the controller side or rear direction, the controller might be toppled.

E70/E71 controllers



E91 controller



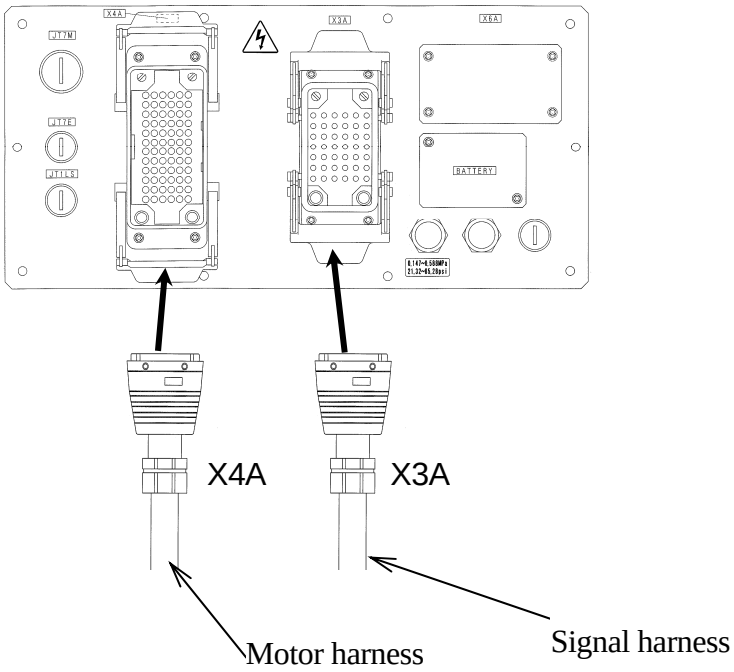
CAUTION

Fix each connector securely. The robot may malfunction if connectors loosen or detach.

6.2.2 ARM SIDE

Match the name of the connector on the controller side and arm side to connect the harnesses correctly. The controller side and arm side connectors are distinguished by an “A” placed at the end of the name of the arm connector. The connectors on the controller side are named without the “A”. Below figure shows RS20 as an example.

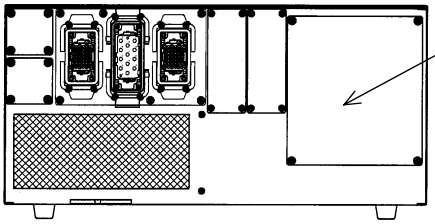
RS20



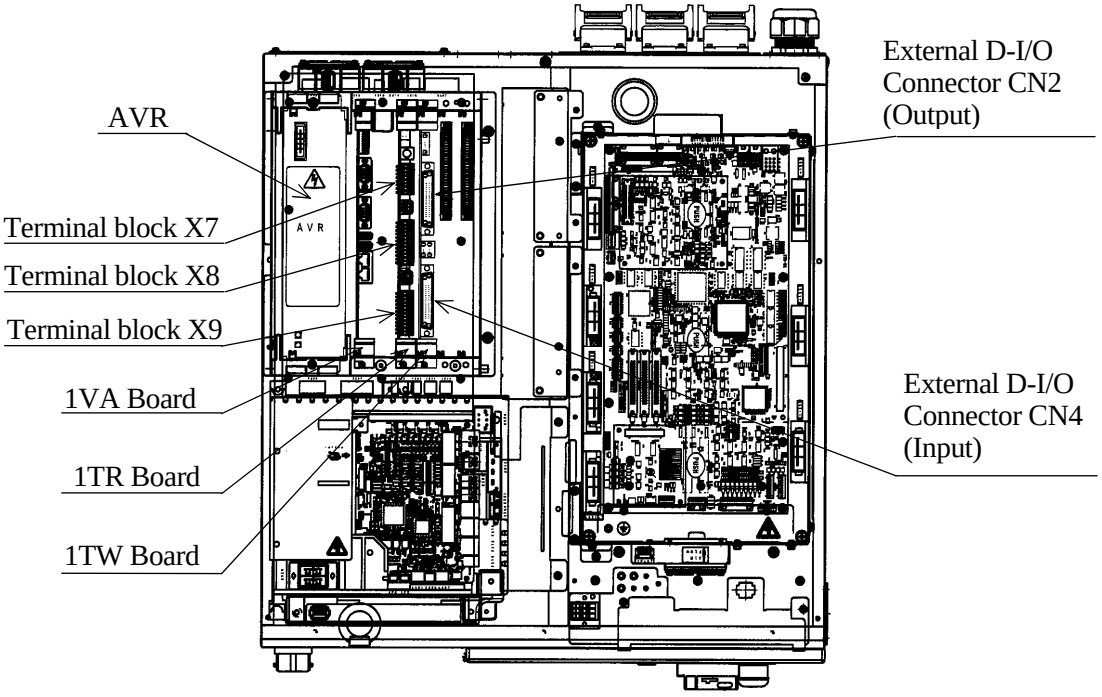
6.3 CONNECTING PERIPHERAL CONTROL EQUIPMENT

According to application specifications, connect respective connectors in the controller shown below with the peripheral controller or devices.

E0x controller

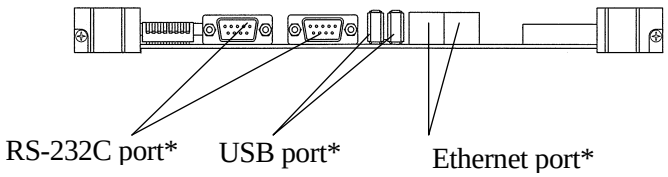


Connect each connecting port with peripheral equipment and devices, using the I/O signal inlet on the rear side of the controller.



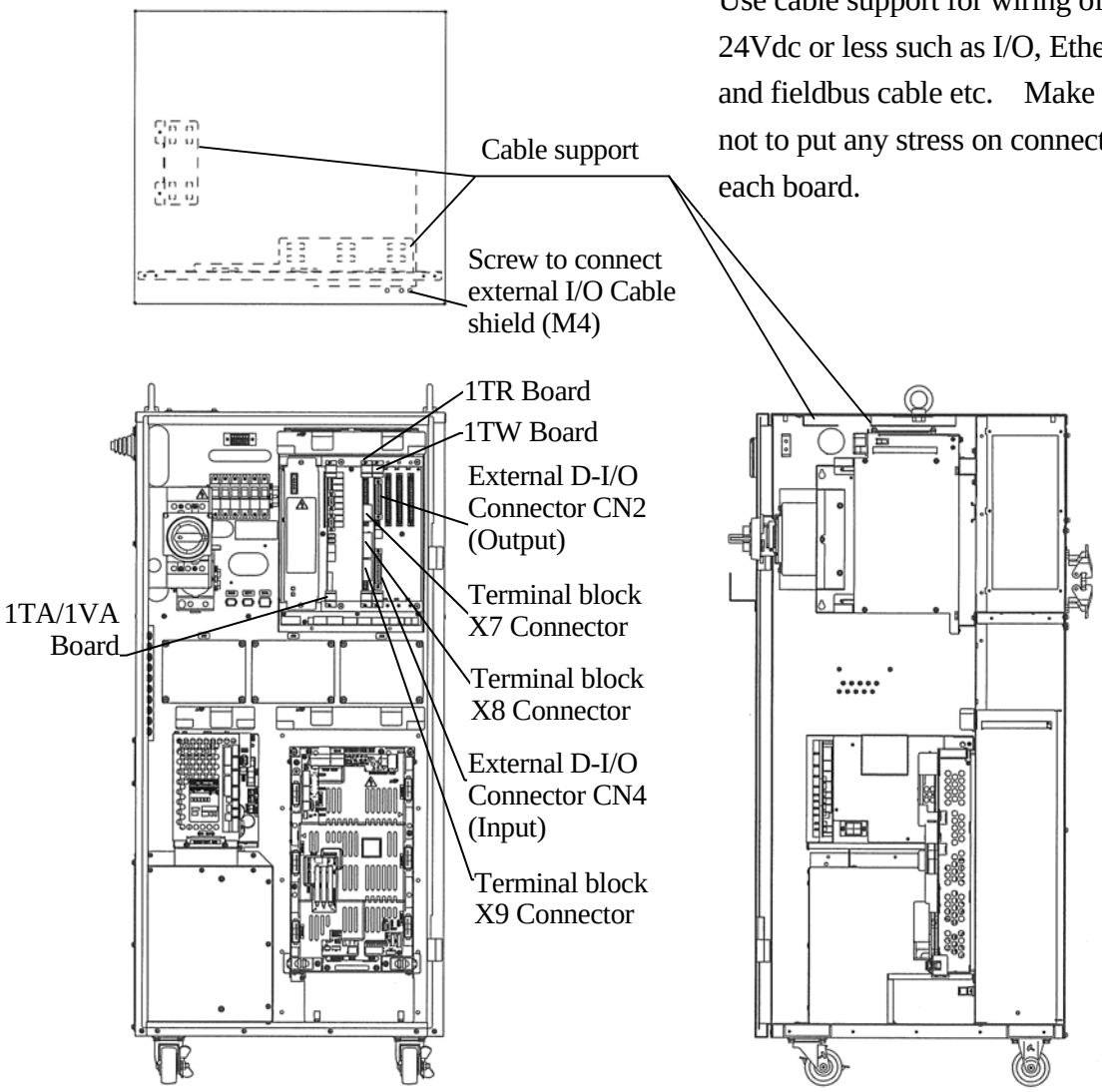
Top

See the figure on the right for details on connecting ports of 1VA board.



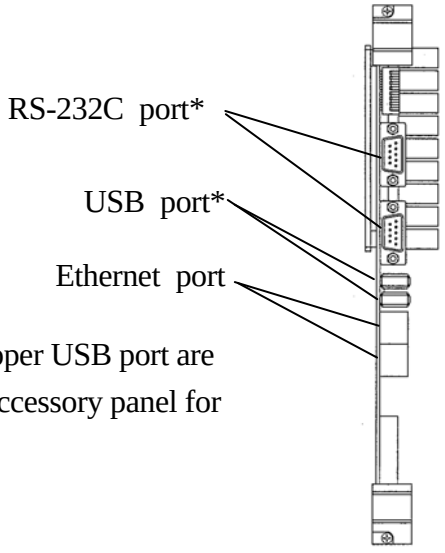
NOTE*: The left RS-232C port, the left USB port and the left Ethernet port are connected to each port in the accessory panel for standard specification.

E4x controller



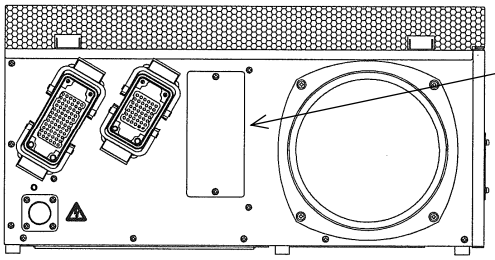
Use cable support for wiring of 24Vdc or less such as I/O, Ethernet and fieldbus cable etc. Make sure not to put any stress on connectors on each board.

See the figure on the right for details on connecting ports of 1TA/1VA board.



NOTE*: The upper RS-232C port and the upper USB port are connected to the each port in the accessory panel for standard specification.

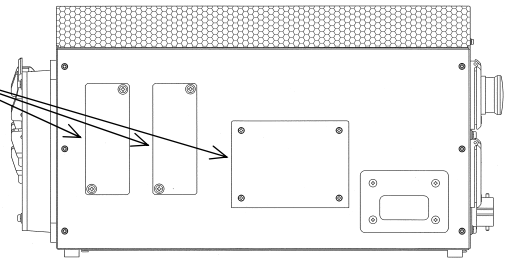
E70/E71 controllers



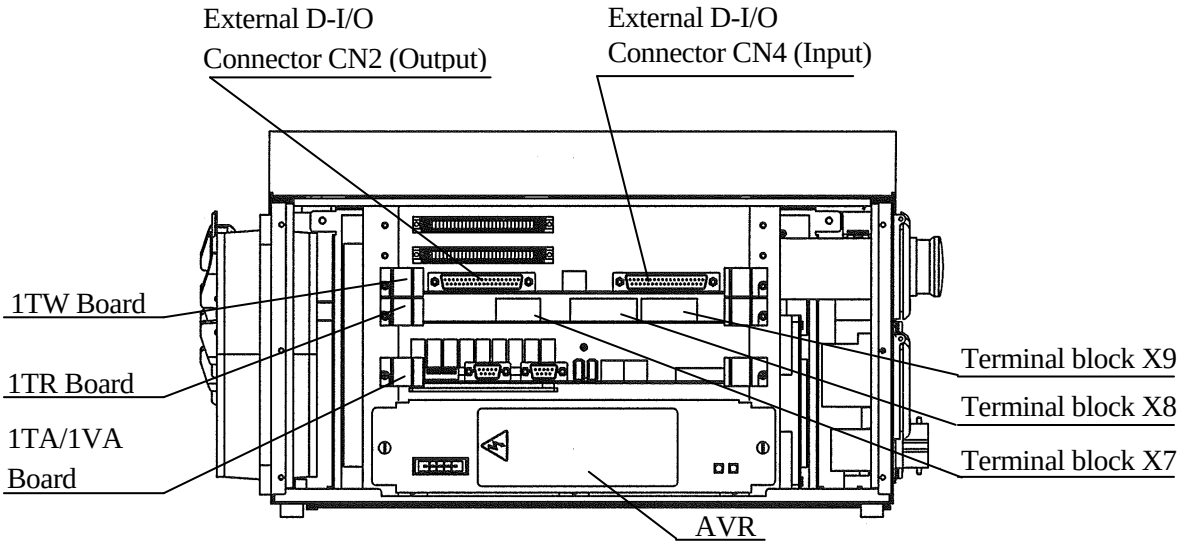
Rear

I/O signal inlet

Connect each connecting port with peripheral equipment and devices, using the I/O signal inlet on the rear or the left side of the controller.

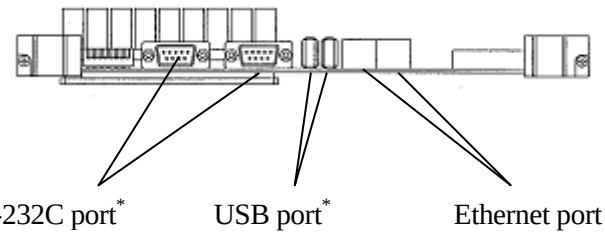


Left



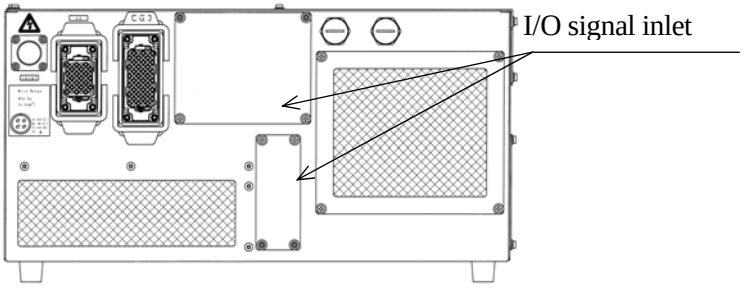
Left

See the figure on the right for details on connecting ports of 1TA/1VA board.

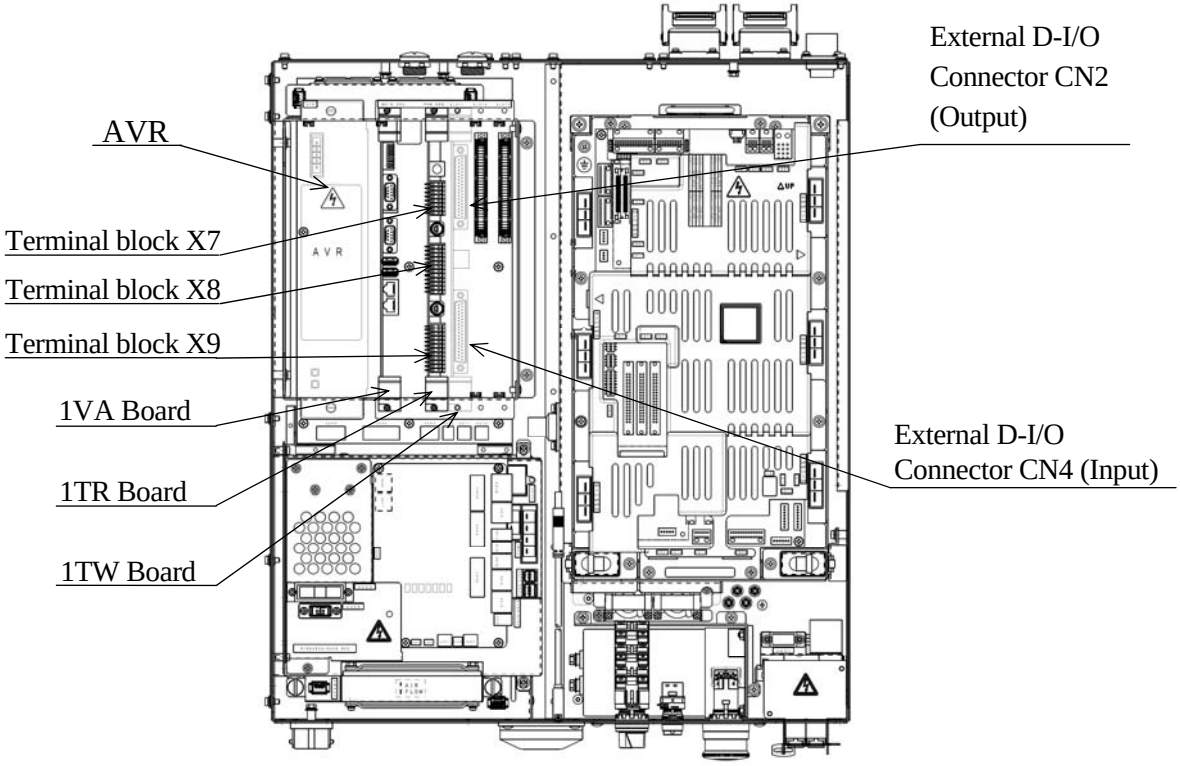


NOTE*: The left RS-232C port and the left USB port are connected to each port in the accessory panel for standard specification.

E91 controller

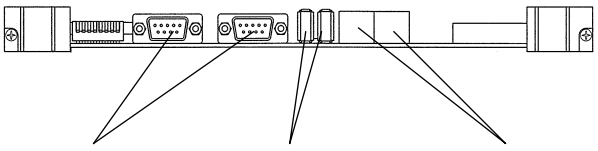


Connect each connecting port with peripheral equipment and devices, using the I/O signal inlet on the rear side of the controller.



Top

See the figure on the right for details on connecting ports of 1VA board.

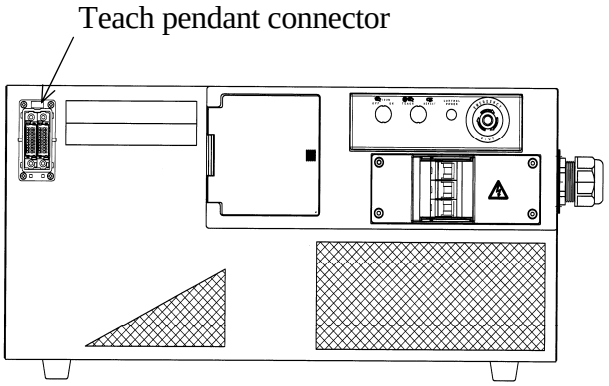


NOTE*: The left RS-232C port and the left USB port are connected to each port in the accessory panel for standard specification.

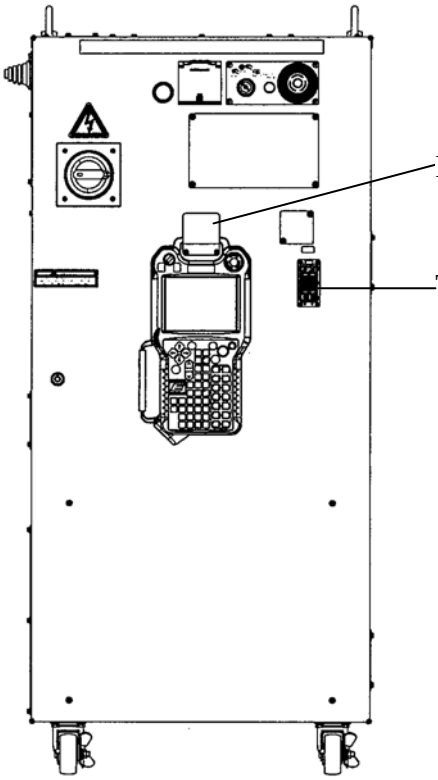
6.4 CONNECTING BETWEEN CONTROLLER AND TEACH PENDANT

1. Connect the teach pendant cable with the connector located below the operation panel.
   Pull up the lever and insert the cable side connector, and then pull down the lever to lock the connectors.

2. Hang the teach pendant and the teach pendant cable on the hook. (No hook is provided for E0x/E70/E71/E91 controllers.)



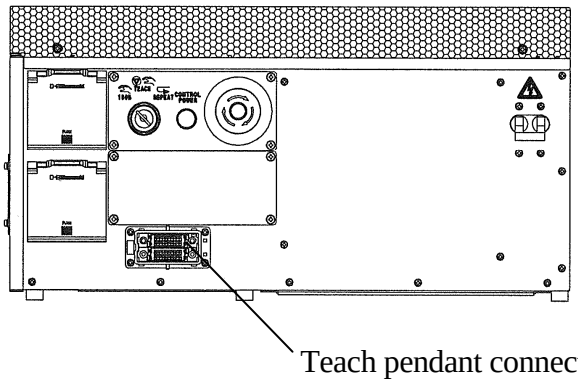
E0x controller



E4x controller

CAUTION

The hook should only be used for hanging the teach pendant or cable.



E70/E71/E91 controllers

This figure shows E70/E71 controllers.

6.5 CONNECTING THE EXTERNAL POWER

Strictly observe the following precautions when connecting the external power.

⚠ DANGER

Before beginning the connection work, confirm that the external power supply for the controller is cut off at the source. To prevent external power from being turned ON accidentally, tag the breaker and indicate clearly that work is in progress. Or, assign a supervisor in front of the breaker until all the connections are complete. Connecting components while power is supplied is extremely dangerous and may cause electric shock.

⚠ WARNING

1. **Confirm that the connected supplying power to the controller meets specifications shown on the rating plate. In addition, when using the transformer unit*, confirm the connected supply power meets specifications shown on the label attached on the side of the transformer unit and connect the voltage switching connector (X601) in accordance with the voltage specifications. Supplying out-of-specification power will damage electric components in the controller.**
2. **Earth the controller to prevent against electrical noise and shock.**
3. **Use dedicated earth wire (100 Ω or less), which is equal to or larger than the recommended power cable size (3.5 - 8.0 mm^2).**
4. **Never share an earth line with workpiece to be welded or another machine (weld machine, etc.).**
5. **In arc welding applications, connect the negative pole of the weld power supply to a jig or directly to workpiece to be welded. Insulate the robot body and controller so that they do not share a common earth line.**
6. **Before turning ON the external power to controller, make sure the power supply wiring is complete and all the covers are reattached properly. Failure to do so may cause electric shock.**

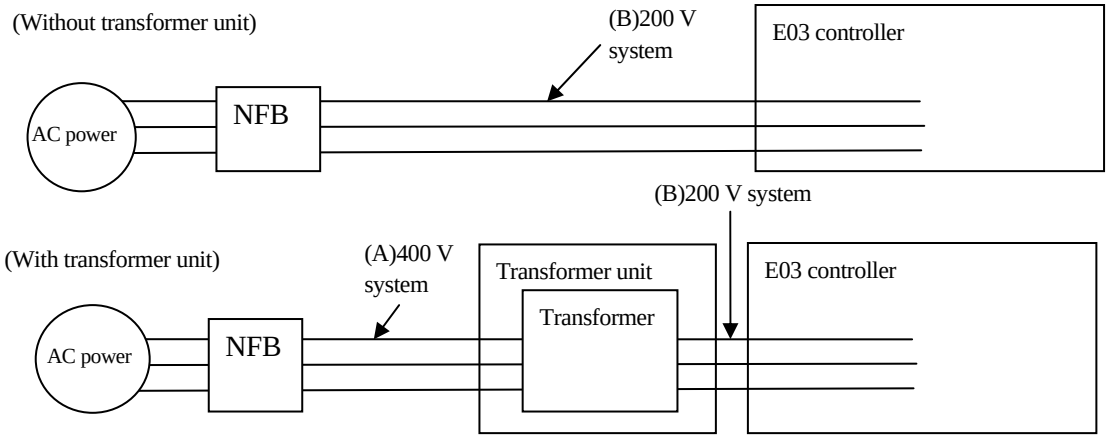
NOTE* Only E0x controller

⚠ CAUTION

1. **Prepare external power that meets the specifications of the controller in terms of momentary power interruption, voltage fluctuation, power capacity, etc. If the power is interrupted or the voltage goes out of the controller's specified range (above/below ratings), then the power monitoring circuit activates cutting off the power, and an error is returned.**
2. **If the external power emits excessive electrical noise, set up a noise filter to reduce the interference.**
3. **PWM noise from robot motor lines may cause malfunction of low noise- resistant devices* via external power line. Confirm that there are no such devices in the vicinity.**
4. **Install a separate external power switch (breaker) for the robot, independent and unconnected to the weld machine.**
5. **To prevent shorting or accidental leakage on the external power switch, install an earth leakage breaker. (Use a time delay type with sensitivity of 100 mA or more.) Also, use a time-delay-type earth leakage breaker with sensitivity of 100 mA or more when using a transformer unit.**
6. **If there is a possibility that surge voltage such as lightning surge might be applied from external power line, decrease the surge voltage level by mounting a surge absorber.**
7. **For the controller with electric power regeneration function (E03), the AC line voltage of breaker on the secondary side may increase up to the peak value in the table below if the power breaker supplying the AC power to the controller (NFB in the figure below) is cut. Mind this when other equipment shares the common power from the same breaker with the controller.**

NOTE* Proximity switch directly connected with power line etc. may suffer from the influence.

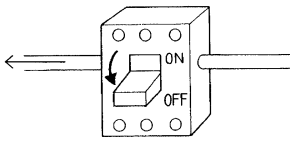
Power supplied to the controller		Peak value of line voltage at point A (400 V system) (V)	Peak value of line voltage at point B (200 V system) (V)
①Without transformer unit *For AC200-220V		380 V 10 ms or less	380 V 10 ms or less
②With transformer unit	When the power source setting inside the transformer unit (X601 connector) is on 380V - 415 V side	700 V 10 ms or less	
	When the power source setting inside the transformer unit (X601 connector) is on 440V - 480 V side	800 V 10 ms or less	

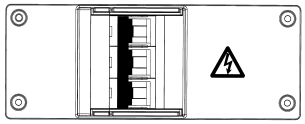


E0x controller

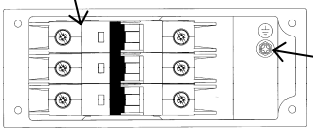
Without transformer unit

Connect with the external power circuit breaker at the installation site.

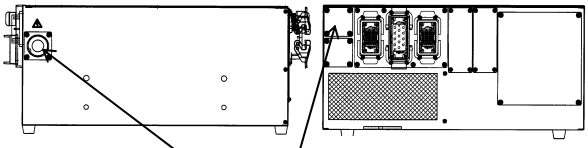




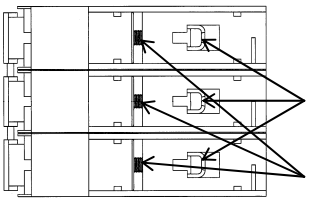
Breaker



Ground wire connecting screw



External power inlet



Bar-shaped terminal connection

Round/Y-shaped terminal connection

Right side of breaker

Connect the external power according to the following procedure.

1.Turn OFF the external power for the controller.

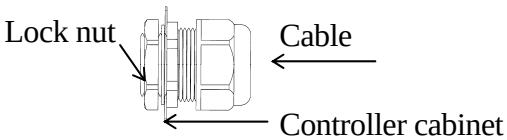
2.Set CONTROLLER POWER switch on the controller to the OFF side without fail.

3.Open the front cover of CONTROLLER POWER switch.

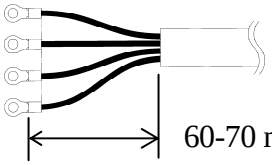
4.Feed the external power cable into the inlet on the right or rear side of controller.

5.Connect the power cable to the part shown in the right figure and the ground wire to the part shown in the above figure.

- Seal connector for external power inlet is provided on the right side of controller. Use the power cable whose diameter is ϕ16-ϕ22.



- When inserting the power cable from the right side of controller, the stripped length of cable sheath should be between 60 and 70 mm.



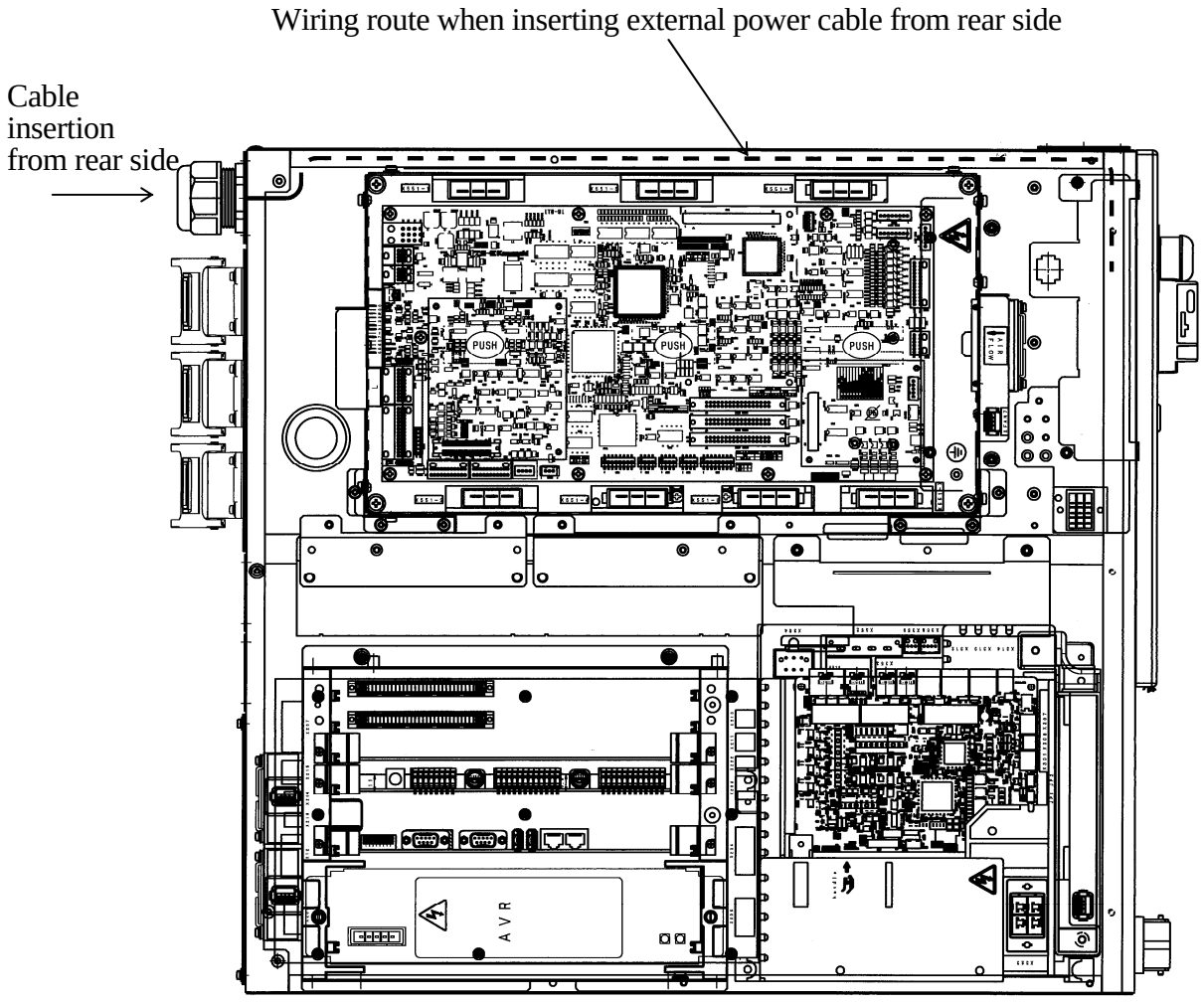
- Use crimp-type terminals to connect to the breaker. When using round/Y-shaped terminal, use the terminal for M5 screw.

NOTE*: If the cable diameter is more than ϕ22, prepare a seal connector which is appropriate for the cable diameter. The hole diameter of the plate for external power inlet is ϕ34.

- When inserting the external power cable from rear side, wire the cable along the route shown in the figure below.

⚠ CAUTION

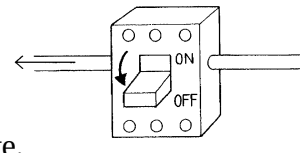
1. **Confirm current requirements and select a power cable with adequate capacity.**
2. **Do not install wire that is too small in diameter, the voltage may drop or the cable may overheat.**



With transformer unit

1. Connection between the controller and the transformer unit

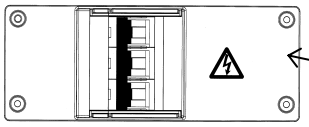
Connect with the external power circuit breaker at the installation site.



Connect the controller and the transformer unit with dedicated power cable according to the following procedure.

1. Turn OFF the external power for the controller.
2. Set CONTROLLER POWER switch on the controller to the OFF side without fail.
3. Open the top plate and front cover of the controller, and remove incoming plate on the rear side (upper, without hole) and incoming plate on the side (with seal connector). On this occasion, mount the above incoming plate on the rear side to the inlet on the side.
   *The incoming plate on the side with seal connector is not used.
4. Insert the power cable from the inlet on the rear side, and wire it to the breaker through the wiring route shown in the figure below. (At this time, tighten the seal connector on the rear side securely.)

OFF



Front cover

Wiring route inside controller
*Insert wire medial to the harness guide.

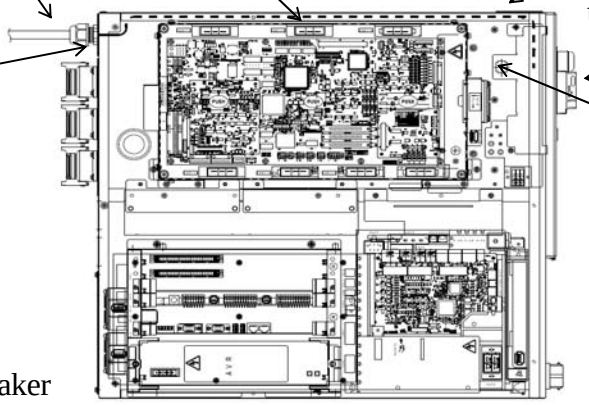
Use seal connector + incoming plate mounted on power cable.

Mount incoming plate on rear side (without hole) to the inlet on the side.

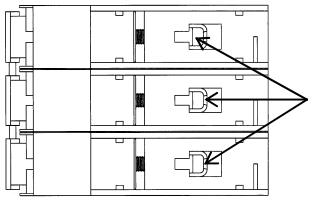
Incoming plate on rear side (upper)

Breaker

XTRFAN connector



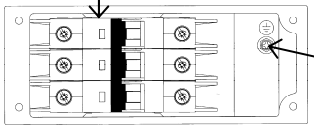
Right side of breaker



Connect here.

5. "XTRFAN" connector is provided at the place shown above. Remove the jumper connector which is being connected, and connect the connector of the power cable. (The removed jumper connector is not used.)
6. Connect the power cable to the place shown in the figure of the right side of breaker and the ground wire to the place shown in the left figure.
7. Close the top plate and the front cover.

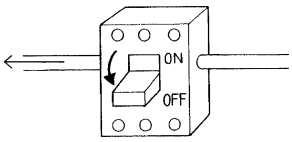
Breaker



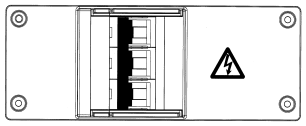
Ground wire connecting screw

2. Connection between external power and transformer unit

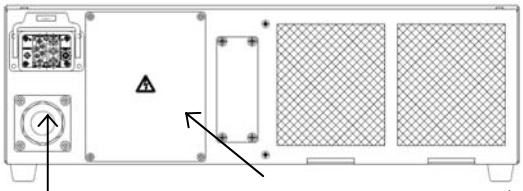
Connect with the external power circuit breaker at the installation site.



OFF



Rear

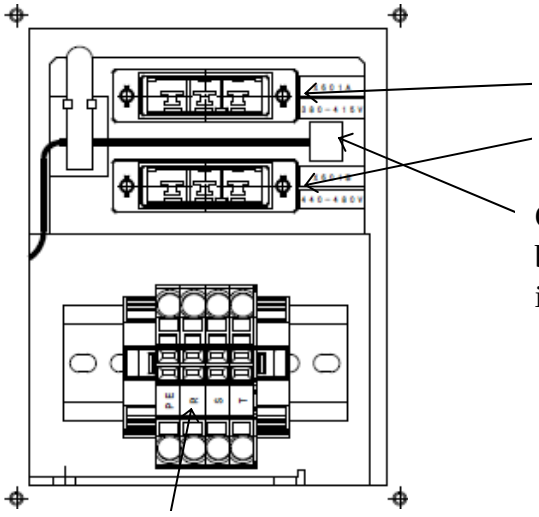


External power inlet

Power connection/
Setting plate
Opened in the figure below.

Connect the external power with the transformer unit according to the following procedure.

1. Turn OFF the external power for the control equipment.
2. Set CONTROLLER POWER switch on the transformer unit to the OFF side without fail.
3. Feed the external power cable into the inlet on the rear side of transformer unit.
4. Open the power connection/setting plate, and connect X601 power source connector in accordance with the voltage to be used.
5. Connect external power cable to each terminal of PE, R, S and T of TB1 terminal block.



(A)380V-415V connector
(B)440V-480V connector

Connect X601 power source connector bound at the place to the above (A) or (B) in accordance with the voltage to be used.

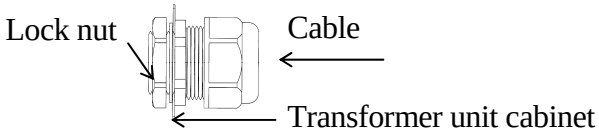
TB1 terminal block: PE, R, S and T from the left [Terminal block type: 2006-1201/WAGO]

(1) When using naked wire
Recommended wire diameter: AWG10-AWG8

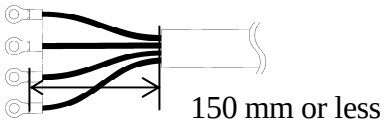
(2) When using Ferrule with insulation collar
Recommended wire diameter: AWG10
Connecting terminal length: 12 mm

*Refer to the specifications of terminal block manufacturer for details.

- Seal connector for external power inlet is provided on the rear side of transformer unit. Use the power cable whose diameter is ϕ16-ϕ22.



- The stripped length of cable sheath of inserted power cable should be 150 mm or less.

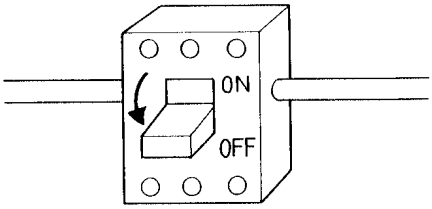


NOTE*: If the cable diameter is more than ϕ22, prepare a seal connector which is appropriate for the cable diameter. The hole diameter of the plate for transformer unit inlet is ϕ34.

⚠ CAUTION

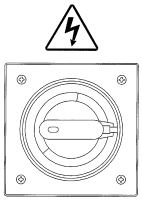
1. **Confirm current requirements and select a power cable with adequate capacity.**
2. **Do not install wire that is too small in diameter, the voltage may drop or the cable may overheat.**
3. **Confirm that two fans of the transformer unit rotate properly after connecting the transformer unit and the controller with their power switch ON.**

E4x controller

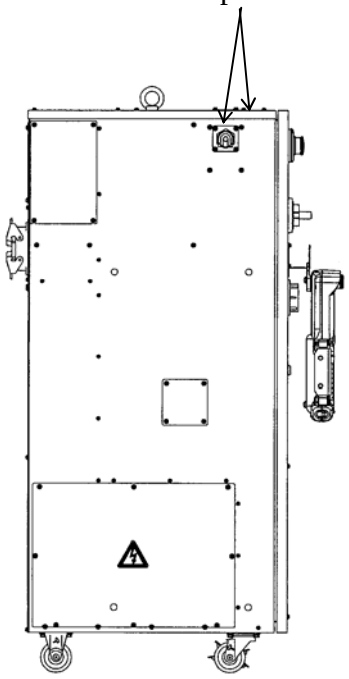


Connect with the external power circuit breaker at the installation site.

CONTROLLER POWER Switch



External power inlet



Connect the external power according to the following procedure.

1. Turn OFF the external power for the controller.

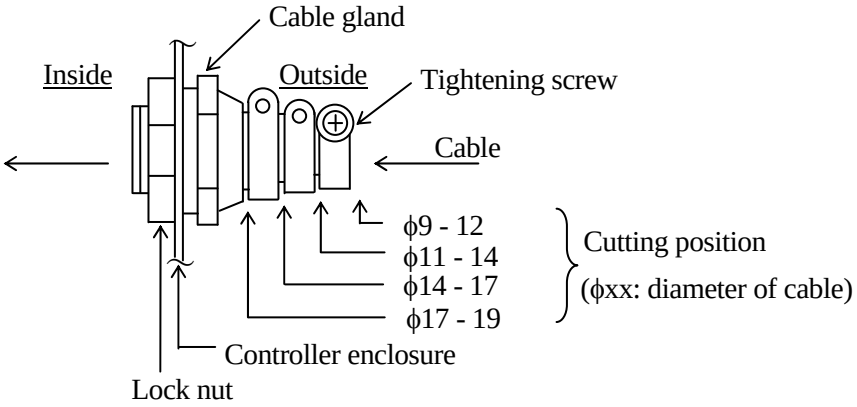
2. Set CONTROLLER POWER switch on the controller door to the OFF side.

3. Feed the external power cable into the inlet on the left side of controller.

Detailed procedure of fixing a cable is shown below.

- Cut a cable gland (supplied with the controller) in accordance with the diameter of the cable.

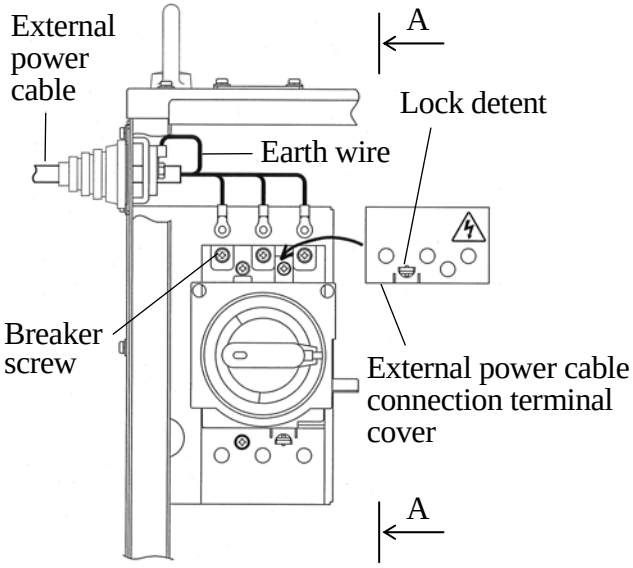
  NOTE*: If the cable diameter is more than ϕ19, prepare a seal connector which is appropriate for the cable diameter. The hole diameter of the plate is ϕ34.
- Pass the cable through the cable gland.
- Tighten the screw after adjusting length of the cable.
- Pass the cable through the inlet and tighten the lock nut.



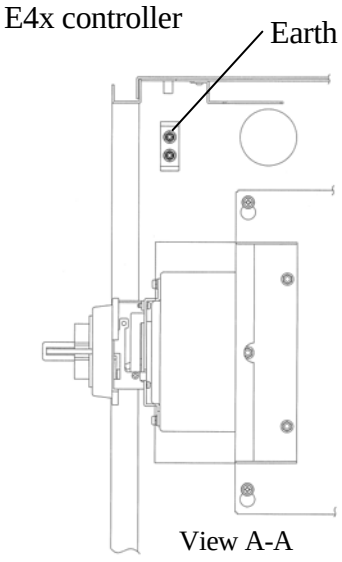
⚠ CAUTION

1. Confirm current requirements and select a power cable with adequate capacity.

2. Do not install wire that is too small in diameter, the voltage may drop or the cable may overheat.



Connect the earth wire to the earth terminal as shown below.



4. Attach round, crimp-type terminals on the ends of the individual wires of the power cable. Use round insulators on each of these wires to prevent contact between the crimped part and metal. (See left figure.)

5. Connect the external power cable to the breaker terminal (3 screws), and the dedicated earth terminal.

⚠ WARNING

Tighten the terminal screws securely. Operating the robot with loose terminals is very dangerous and may lead to electric shock, robot malfunction, or breakdown of the electrical system.

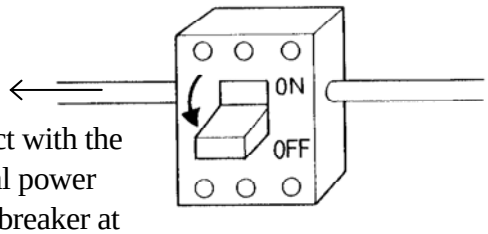
6. Mount the external power cable connection terminal cover.

⚠ DANGER

Mount the external power cable connection terminal cover when the wiring is complete. Failing to mount the cover may lead to electric shock due to accidental contact with power line.

Electric cable size to be used	Crimp-type terminal size	
	Breaker	Earth terminal
3.5 mm^2 (AWG12) 5.5 mm^2 (AWG10)	R5.5-5	R5.5-5
8 mm^2 (AWG8)	R8-5	R8-5
13 mm^2 (AWG6)	R14-5	R14-5

E70/E71/E91 controllers



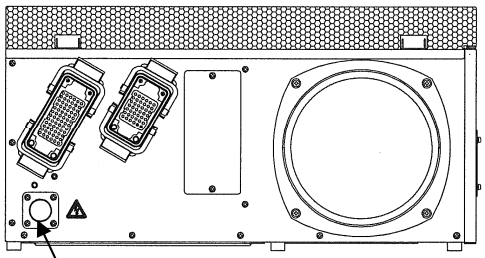
Connect with the external power circuit breaker at the installation site.

Connect the external power according to the following procedure.

1. Turn OFF the external power for the controller.

2. Set CONTROLLER POWER switch on the front of the controller to the OFF position without fail.

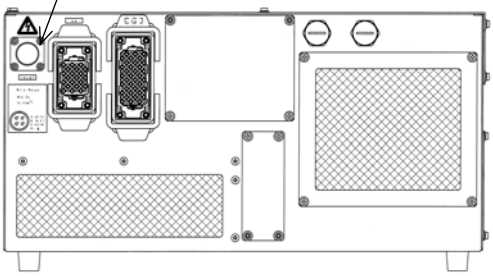
E70/E71 controllers



External power connector

3. Feed the external power cable into the inlet on the rear of the controller.

E91 controller



- Solder the attached connector on the external power cable. The figure below shows pin configuration of connector.

Wiring diagram of attached connector

A	AC(L)
B	(N.C.)
C	AC(N)
D	FG

⚠ CAUTION

1. Confirm current requirements and select a power cable with adequate capacity.
2. Do not install wire that is too small in diameter, the voltage may drop or the cable may overheat.

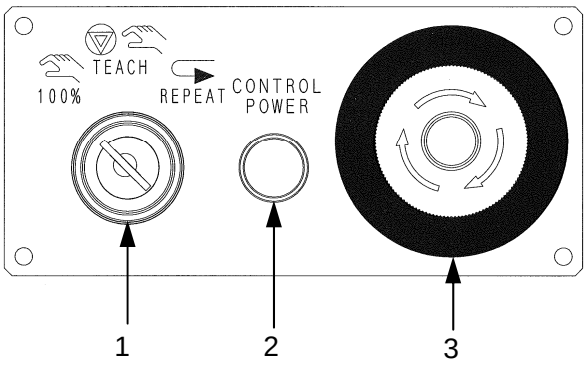
7.0 SWITCHES ON THE ROBOT CONTROLLER

7.1 OPERATION PANEL

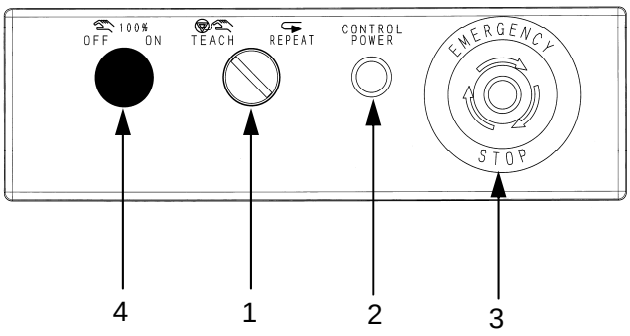
Following switches and lamps are equipped on the operation panel of the controller. Some model may be equipped with optional operation panel.

Operation panel

Europe spec. (Standard)



E0x controller



(Option)

No.	Switch and Lamp	Function
1	100%/TEACH/REPEAT (100%/Teach/Repeat switch)	Switches the mode to Fast check, Teach* or Repeat**.
2	CONTROL POWER (Controller power lamp)	Lights when the controller power is ON.
3	Emergency stop button	Intercepts motor power and stops the robot when this button is pressed in an emergency. At the same time, the <MOTOR> lamp and <CYCLE> lamp on teach pendant are turned OFF. However, the controller power is not cut OFF.
4	100 % ON/OFF (Only E0x controller)	Switches the mode to Fast check.

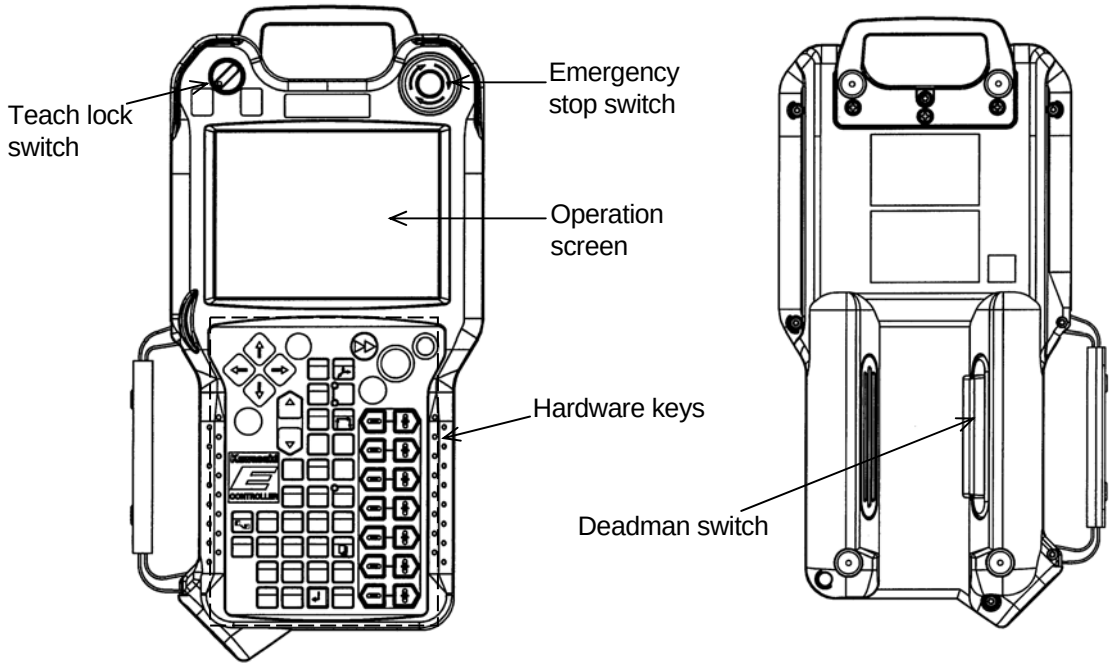
NOTE* Selected when teaching an instruction or its parameter to a robot or when operating a robot manually using the operation console called TP. Repeat operation is not possible while in teach mode though check operation is possible.

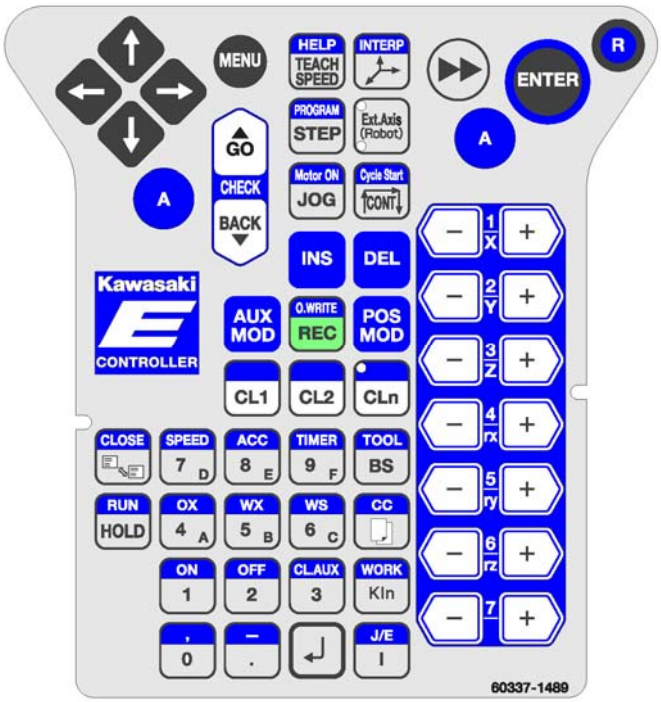
NOTE** The mode for automatic playback operation

NOTE*** Condition in which the robot automatically works and executes a memorized program continuously.

7.2 OVERVIEW OF TEACH PENDANT

Figures below (top) show the overview of the teach pendant (hereinafter referred to as TP). TP provides hardware keys and switches which are necessary for manual operation of robot and data editing, and a screen for editing/displaying various kinds of data. Figure (bottom) shows the arrangement of the hardware keys.





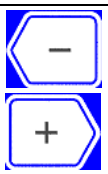
Following keys are the keys that are used the most on the teach pendant. Some of the keys other than shown below may differ according to the option setting.

Switches

Switches	Function
 Emergency stop	Cuts OFF the motor power and stops the robot. To release emergency stop, turn this button to the right until the button returns to its original position.
 Teach lock	Turning ON this switch (in teach mode) enables manual and check motions. Turning OFF this switch (in automatic playback mode) enables repeat operations. **Note:** Make sure this switch is turned ON before starting teaching operation to prevent robot from being operated in automatic playback mode erroneously.
 Deadman	This is the enable switch. Robot axes cannot operate manually without pressing this switch. Motor power cuts OFF and robot stops if switch is fully depressed to its third deadman position, or if it is released completely.

Hardware keys

Keys	Function	Functions when pressing A key
	Used with other key. The function on the upper part of the key is enabled when it is pressed with this A key.	
	Increases robot motion speed in teach or check mode. **Note:** Effective only while being pressed.	Turns ON the motor power when the motor power is OFF. Conversely, turns OFF the motor power when the motor power is ON. **Note:** Motor power cannot be turned OFF during robot motion.
	Sets how program is repeated in check mode. Toggles between Once and Continuous. **Note:** Turning controller power switches to Check Once mode.	Starts cycle operation in automatic playback mode.

Keys	Function	Functions when pressing A key
	Moves each axis from JT1 to JT7. Called AXIS keys hereinafter.	
	Puts the robot into hold (stop) state.	Puts the robot into run (active) state.

8.0 PROCEDURES FOR POWER ON/OFF AND STOPPING THE ROBOT

This chapter describes the power ON/OFF procedures for the robot controller and methods for stopping the robot.

[NOTE]

This manual explains operation procedures assuming that the optional operation panel is not used. When using the optional operation panel, both switches on the TP and the optional operation panel can be used for turning ON/OFF motor power and cycle operation start. However, for the robot activation (RUN), robot will not activate unless both settings of the TP and optional operation panel are RUN. That is, if the setting of the optional operation panel is HOLD, robot cannot be activated even if A+RUN on the TP is pressed.

8.1 POWER ON PROCEDURE

Ensure that all personnel are clear of the work cell, and that all safety devices are in place and operational. Follow the steps below to turn ON the controller power first, and then the motor power.

⚠ WARNING

When turning ON the controller power and motor power of the robot controller, thorough attention should be taken to prevent personnel from entering the motion range of the robot and the peripheral equipment controlled by the robot controller. The robot may move or operate accidentally when turning ON the motor power, if the robot servo system is damaged.

8.1.1 CONTROLLER POWER ON PROCEDURE

1. Confirm that the external power is supplied to the controller.

2. Turn ON the CONTROLLER POWER on the controller front.

8.1.2 MOTOR POWER ON PROCEDURE

1. Ensure that all personal are clear of the work cell, and that all safety devices are in place and operational. (e.g.: door on safety fence is closed and safety plug is inserted, etc.)

2. Press A + MOTOR ON on the TP to turn ON. The motor power turns ON and the <MOTOR> lamp on the top right of the TP screen illuminates at this time.*

NOTE* If motor power does not turn ON, read the contents displayed in the error screen and system message area and restore the system accordingly, and then press A + MOTOR ON again.

⚠ DANGER

Before turning ON the controller power and the motor power, ensure that all personnel are clear of the work cell and that no interfering objects are around the robot(s).

8.2 POWER OFF PROCEDURE

Stop the robot and shut down the controller in the reverse order in which it was turned ON. However, in the case of emergency, press the EMERGENCY STOP immediately to cut OFF the motor power.

1. Confirm the robot has completely stopped.

2. Press HOLD or A+<RUN> on the TP.

3. Press the EMERGENCY STOP on the controller or the TP to cut OFF the motor power.*

NOTE* In automatic playback mode, turning the TEACH/REPEAT on the controller to TEACH also cuts OFF the motor power.

4. After the <MOTOR> lamp on the TP screen turns OFF, shut OFF the power by turning OFF the CONTROLLER POWER on the controller front.

⚠ WARNING

When shutting down the controller power, press the EMERGENCY STOP to cut OFF the motor power first, and then turn OFF the CONTROLLER POWER.

8.3 METHOD FOR STOPPING THE ROBOT

The methods for stopping the robot are different in teach mode and automatic playback mode.

1. In teach mode,

(1) Release the DEADMAN on the TP.

(2) Confirm that the robot has come to a complete stop, and press HOLD or A+<RUN> on the TP.

2. In automatic playback mode,

(1) Confirm that the robot has come to a complete stop, and press HOLD or A+<RUN> on the TP.

⚠ CAUTION

1. **After robot has stopped, cut OFF power to the motors to disable any further motion by pressing EMERGENCY STOP.**
2. **Once motor power has been cut OFF, take measures to prevent personnel from accidentally turning ON the power supply (tag and lock out power switches, etc.).**

3. In emergency stop,
When the robot works abnormally and there is a possibility of danger such as injury, press immediately any EMERGENCY STOP wherever they are located, on the controller front, TP, safety fence etc. to cut off the motor power.

Applying emergency stop may cause the error screen to pop up. To restart the robot from this condition, reset errors before turning ON the motor power.

⚠ DANGER

Before moving the robot, ensure that all EMERGENCY STOP on the TP, controller and external emergency stop switches, etc. are working correctly.

9.0 TEACHING/ AUTOMATIC PLAYBACK

9.1 TEACHING

Teaching is defined as creating a robot motion program by moving the robot manually using the teach pendant. A program makes the robot work in accordance with other robots or peripheral equipments to perform the required task.

9.2 AUTOMATIC PLAYBACK

In automatic playback, a taught program is played back automatically and the robot moves in accordance with other robots and peripheral equipments to perform the required operation.

⚠ WARNING

For all teaching and automatic playback operations, risk assessment must be performed for the whole robot system used in the operation. Take safety measures and plan the operation procedures complying with international, national, and local laws and standards. In addition to this, teaching and automatic playback must only be done by certified personnel(s) who has attended the Kawasaki prepared education/training course(s) pertinent to the operation concerned.

9.3 EMERGENCY PROCEDURES

In case of emergency, any personnel available should be able to stop the robot by pressing the EMERGENCY STOP button on the operation panel or the teach pendant.

Turn back ON the motor power to move the robot manually to an adequate position to restart operation.

When the motor power does not turn back ON, a certified personnel who has completed the special education and training course should perform the brake release procedure. Before performing the brake release procedure, make sure that no parts fall off due to its own weight, and if there is any axis or part that may fall, perform the necessary countermeasures as described in the following section.

10.0 BRAKE RELEASE PROCEDURES FOR EMERGENCY CASES

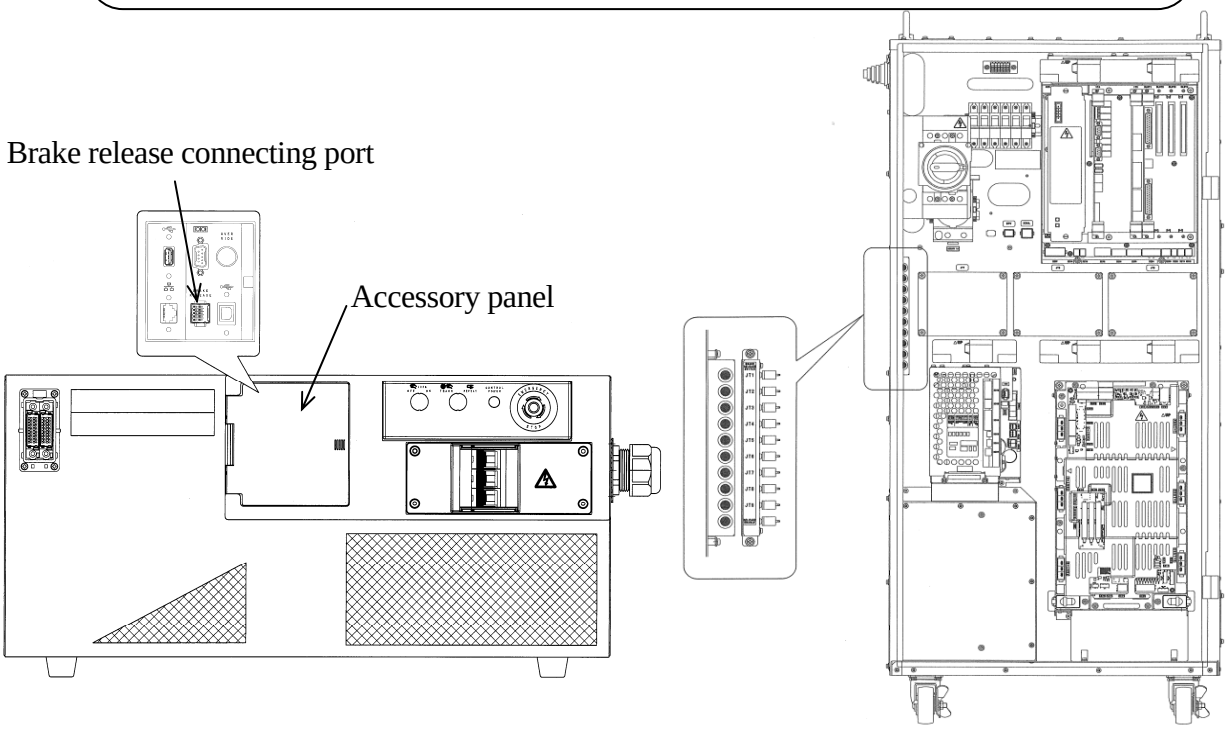
The manual brake release switches allow the operator to move individual arm axes without using motor power for maintenance and emergency situations. (E0x/E70/E71/E91 controllers: Option, E4x controllers: Standard)

10.1 LOCATION OF BRAKE RELEASE SWITCH

The manual brake release switches are located:
E0x controller: Front of the controller (E0x controller, figure below left)
E4x controller: Inside the door on the controller (E4x controller, figure below right)
E70/E71/E91 controllers: Front of the controller (E70/E71/E91 controllers, figure on next page)

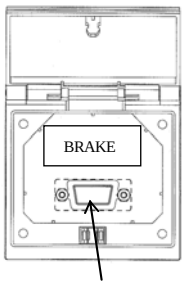
⚠ WARNING

When no servo power is applied, electromagnetic brakes lock to maintain the robot arm posture. Unsupported axes may fall when the brake release switch is pressed. Axes which are overhung, particularly JT2 and JT3, will fall the fastest, depending on robot position, weight of the tool, and wrist axis position. Position yourself to observe the entire robot arm and keep your eyes on the arm when operating this switch.



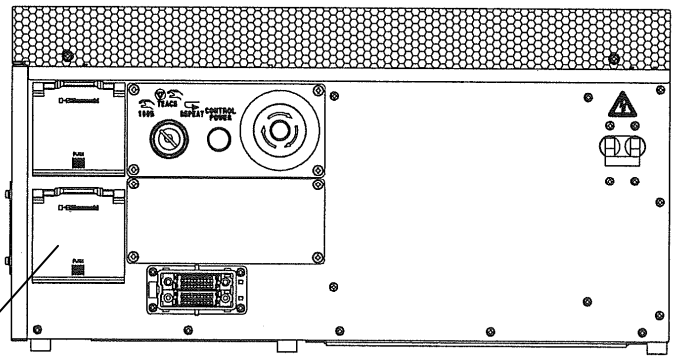
E0x controller

Manual brake release switches
E4x controller

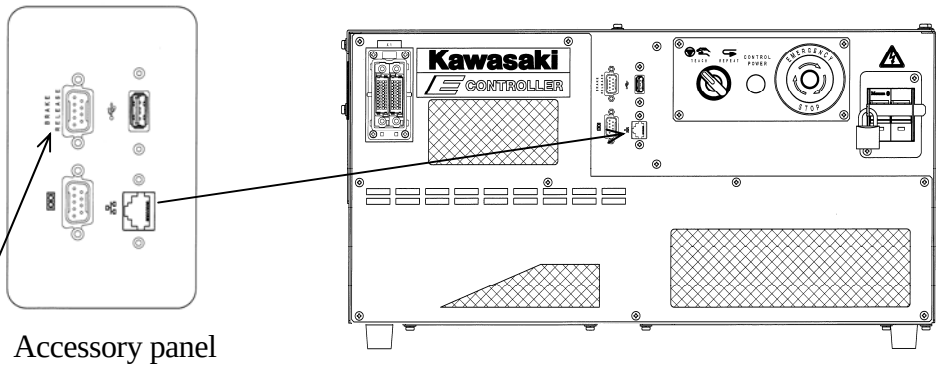


Brake release
connecting port

Brake release panel



Manual brake release switches
E70/E71 controllers

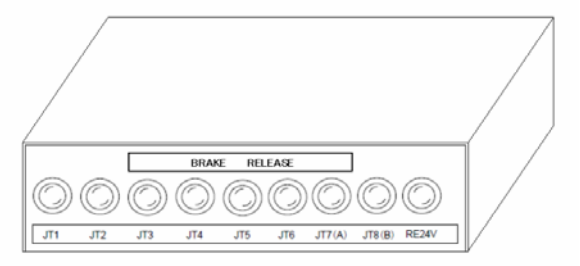


Accessory panel

Brake release
connecting port

E91 controller

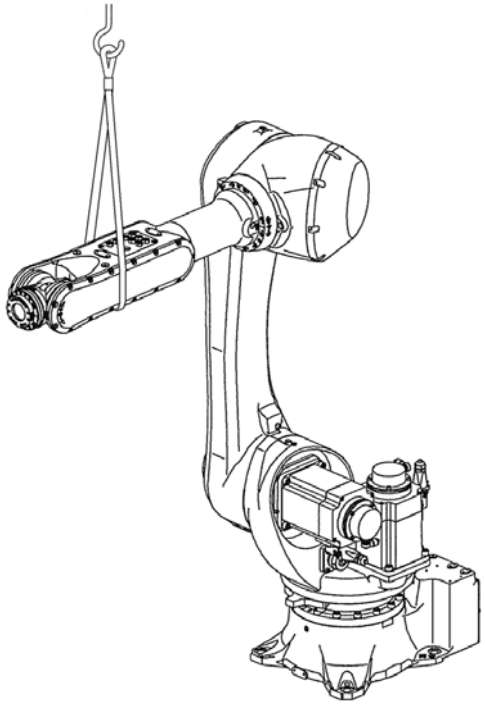
Connecting port of brake release switch is provided at the position shown in the figure.
・Brake release box is the option.



Brake release box

⚠ WARNING

To prevent injury to persons or damage to robotic equipment; provide suitable support for the robot arm, tool and load, before using a brake release switch. The robot arm can be supported from overhead using a sling and overhead crane (Figure below).



Robot arm support

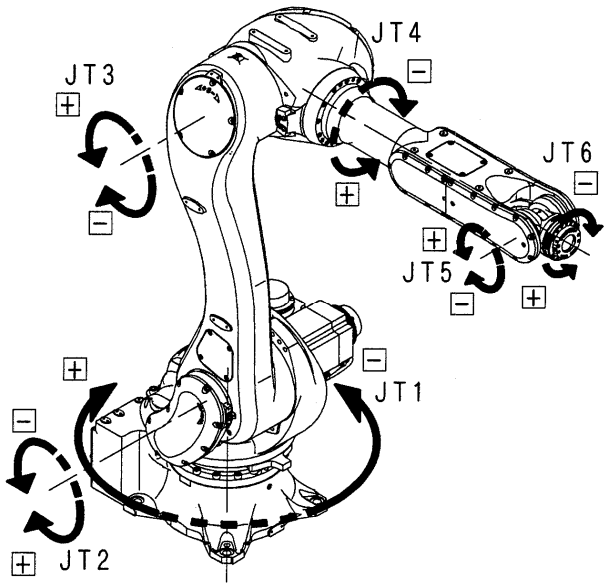
10.2 BRAKE RELEASE PROCEDURES

To manually release axes brakes use the following procedure.

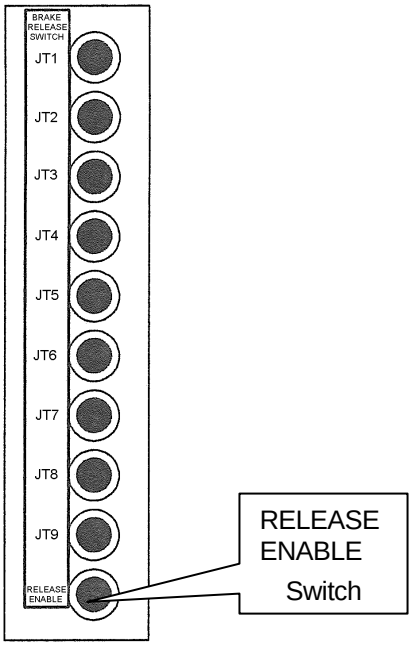
1. Set motor power OFF.
2. Ensure all personnel are clear and all safety precautions are followed.
3. Provide suitable support of the robot arm, tool, and load if there is a risk of personal injury (see above figure).
4. Open the access door to the manual brake release switches.
5. Ensure the switches are in the OFF position and in operating condition.
6. Press the brake release switch of the axis to release for a moment, and confirm that the brake will not be released.
7. Press and hold the "RELEASE ENABLE" switch (see lower right figure). If the brake is released at this time, do not use the switch (see CAUTION).
8. Press the manual brake release switch for the axis to release the brake (see lower right figure).
9. The brake remains released until the brake release switch is released.
10. After using the brake release switches, close the access door.

⚠ CAUTION

Stop using the manual brake release switch immediately if the electromagnetic brake is released by pressing only one switch. The switch may be defective.



Robot brake release axes



Manual brake release SW

11.0 MAINTENANCE

⚠ WARNING

For all maintenance operations, risk assessment must be performed for the whole robot system used in the operation. Take safety measures and plan the operation procedures complying with international, national, and local laws and standards. In addition to this, maintenance operation must only be done by certified personnel(s) who has attended the Kawasaki prepared education/training course(s) pertinent to the operation concerned.

11.1 PRECAUTIONS FOR MOTOR REPLACEMENT PROCEDURES

⚠ WARNING

1. **Prior to starting motor replacement, turn OFF control power up to the main power source. Display signs indicating clearly "Inspection and Maintenance in progress", and lockout/ tagout the main power switch to prevent personnel from accidentally turning ON the power.**
2. **When replacing a motor, support the arm safely using a crane/forklift truck or place the arm on a support so as to prevent the arm from falling/rotating accidentally by its own weight.**
3. **Servo motors are heavy, so be careful when handling it.**

12.0 CONTACT US

If you have any questions or problems, please contact us at the following:

Kawasaki Robotics GmbH
29 Sperberweg 41468 Neuss, Germany
Phone: 49-2131-34260
E-mail: info@kawasakirobot.de

Kawasaki Robotics (UK) limited
Unit 4 Easter Court, Europa Boulevard,
Westbrook, Warrington, WA5 7ZB, England
Phone: 44-1925-71-3000
E-mail: sales@kawasakirobot.co.uk

For contact information of our distributor in your country, please refer to the following URL and click Distributors.

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