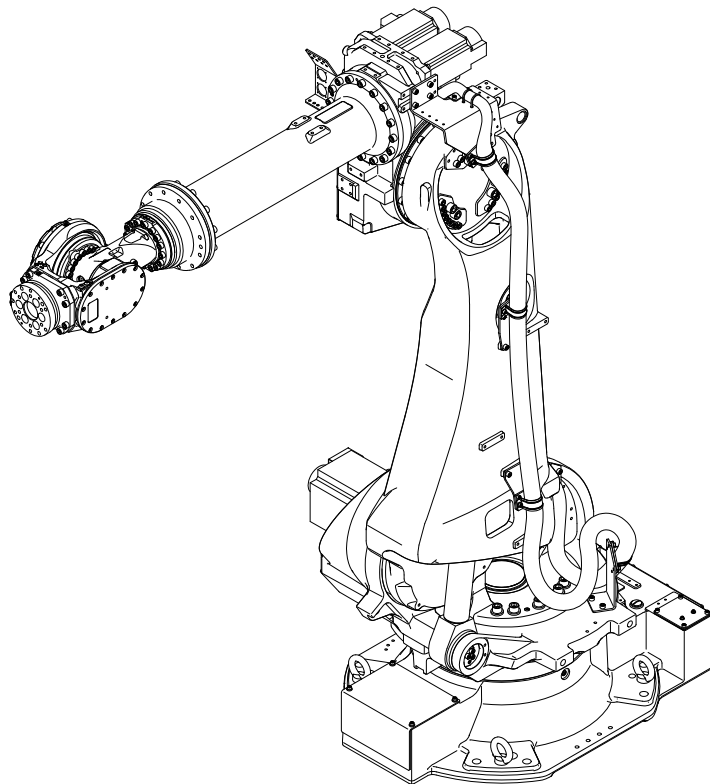


Standard specifications

**SRA-01-FD11
SRA-01A-FD11
SRA-L-01-FD11
SRA-EL-01-FD11**

9th edition



NACHI-FUJIKOSHI CORP.

Table of contents

1. Outline.....	1
2. Basic specifications.....	2
3. Robot dimensions and working envelope.....	5
4. Detail of load mounting plate.....	11
5. Installation procedure.....	15
6. Allowable wrist load.....	18
7. Option specifications.....	29
8. Application wiring and piping diagram.....	31
9. Transport procedure.....	35
10. Delivery style (specification which contains a robot).....	37
11. Consuming power (Robot + Controller).....	37
12. Paint color.....	37
13. Warranty.....	37

1. Outline

NACHI ROBOT “SRA series” is optimal robot for spot welding, material handling and other applications, and provides dramatically improved productivity by its overwhelming speed and compact body.

This series contains not only the “Standard type” but also the “A-Trac4 type” which equips the best designed cable support system for spot welding, and furthermore contains the “Long arm type” which spreads its operating range.

Standard type

	Max. payload 100 kg	Max. payload 166 kg	Max. payload 210 kg	Max. payload 240 kg
Floor mount	SRA100-01	SRA166-01	SRA210-01	SRA240-01

A-Trac4 type

	Max. payload 100 kg	Max. payload 166 kg	Max. payload 210 kg
Floor mount	SRA100-01A	SRA166-01A	SRA210-01A

Long arm type

	Max. payload 120 kg	Max. payload 133 kg	Max. payload 166 kg
Extended arm length	450 mm	300 mm	300 mm
Floor mount	SRA120EL-01	SRA133L-01	SRA166L-01

A-trac4 for long arm type can be manufactured after order.

■ World class speed robot

- Cycle time reduced 30% (*1) from existing model by 3 improvements of light weight, high rigidity and quick motion control, resulting in high acceleration and minimum vibration.

■ Ease of use

- Operating range of robot is irrelevant to the payload mass. Axis 5 (wrist) operating range is maximum in its class. These features open the robot to more diverse applications, thus resulting in easier application design (*2).
- By installing the balance unit inside arm, swivel base becomes slim (floor mount type). Slim and compact design allows closer installation in less floor space.
- Sufficient application wires and tubes are installed inside arm in order to apply to bigger and high function tool.

■ Improved energy efficiency

- Power consumption reduced 15% from existing model by reducing the robot’s weight by 20% and using cutting edge motor drive controls.

■ “A-Trac4” that is the best design for spot welding

- Spot welding cables are installed around the fore arm (axis 3 arm). Because the cable behavior is stably connected with the robot’s motion, reliability of cables has substantially advanced.
- In case of off-line programming (*3), taught robot pose and cable arrangement needs to be modified because the cable behavior is difficult to simulate. But by utilizing “A-Trac4”, this work is unnecessary, thus the lead-time until startup of the production line can be reduced.

*1; Comparison of SRA166-01-FD and existing model ST166-AX, spot welding work with 27 spots on flat panel.

*2; “Application” is the purpose of robot’s usage. For example, spot welding and material handling.

*3; “Off-line programming” is teaching the robot program on desk, prior to installing the real robot. Computer (hardware) and special simulator (software) are necessary except robot.

2. Basic specifications

Standard type

Item		Specifications			
Robot model		SRA100-01	SRA166-01	SRA210-01	SRA240-01
Construction		Articulated			
Number of axis		6			
Drive system		AC servo motor			
Max. working envelope	Axis 1	±3.14 rad (±180°)			
	Axis 2	-1.40 ~ +1.05 rad (-80 ~ +60°)			
	Axis 3	-2.56 ~ +2.62 rad (-146.5 ~ +150°)			
	Axis 4	±6.28 rad (±360°)			
	Axis 5	±2.36 rad (±135°)		±2.27 rad (±130°)	
	Axis 6	±6.28 rad (±360°)			
Max. speed	Axis 1	2.37 rad/s (136°/s)	2.18 rad/s (125°/s)	2.01 rad/s (115°/s)	1.83 rad/s (105°/s)
	Axis 2	2.36 rad/s (135°/s)	2.01 rad/s (115°/s)	1.83 rad/s (105°/s)	1.57 rad/s (90°/s)
	Axis 3	2.36 rad/s (135°/s)	2.11 rad/s (121°/s)	1.97 rad/s (113°/s)	1.74 rad/s (100°/s)
	Axis 4	4.19 rad/s (240°/s)	3.14 rad/s (180°/s)	2.44 rad/s (140°/s)	2.27 rad/s (130°/s)
	Axis 5	4.07 rad/s (233°/s)	3.02 rad/s (173°/s)	2.32 rad/s (133°/s)	2.18 rad/s (125°/s)
	Axis 6	6.13 rad/s (351°/s)	4.54 rad/s (260°/s)	3.49 rad/s (200°/s)	3.40 rad/s (195°/s)
Max. pay load	Wrist	100 kg	166 kg	210 kg	240 kg
	Forearm *1	45 kg (90 kg at maximum)			20 kg (45 kg at maximum)
Allowable static load torque	Axis 4	580 N·m	951 N·m	1,337 N·m	
	Axis 5	580 N·m	951 N·m	1,337 N·m	
	Axis 6	290 N·m	490 N·m	720 N·m	
Allowable moment of inertia *2	Axis 4	60 kg·m ²	88.9 kg·m ²	141.1 kg·m ²	
	Axis 5	60 kg·m ²	88.9 kg·m ²	141.1 kg·m ²	
	Axis 6	30 kg·m ²	45.0 kg·m ²	79.0 kg·m ²	
Position repeatability *3		±0.1 mm		±0.15 mm	±0.2 mm
Installation		Floor mounting			
Ambient conditions		Temperature: 0 to 45 °C *4 Humidity: 20 to 85%RH (No dew condensation allowed) Vibration to the installation face: Not more than 0.5G (4.9 m/s ²)			
Noise *5		79.6 dB			
Robot mass		960 kg		990 kg	

1[rad] = $180/\pi$ [°], 1[N·m] = 1/9.8[kgf·m]

- On controller display, axis 1 to 6 is displayed J1 to J6 for each.

- The specification and externals described in this specification might change without a previous notice for the improvement.

- Explosion-proof is not available.

*1: This value changes by placement and load conditions of a wrist.

*2: The Allowable moment of inertia of a wrist changes with load conditions of a wrist.

*3: This value conforms to "JIS B 8432".

*4: Permitted height is not higher than 1,000m above sea level. If used in higher place, permitted temperature is affected by height.

*5: Robot noise is A-weighted equivalent sound level measured under "JIS Z 8737-1" (ISO 11201) with max. payload and max. speed.

A-Trac4 type

Basic specifications when cable support "A-trac4" is equipped (only difference from standard type)

Item		Specifications		
Robot model		SRA100-01A	SRA166-01A	SRA210-01A
Max. working envelope	Axis 4	± 3.67 rad ($\pm 210^\circ$)		
	Axis 5	± 2.09 rad ($\pm 120^\circ$)		
	Axis 6	± 3.58 rad ($\pm 205^\circ$)		
Max. pay load	Forearm *1	15 kg (60 kg at maximum)		
Robot mass		1,060 kg		1,090 kg

*1: This value changes by placement and load conditions of a wrist.

Long arm type

Item		Specifications		
Robot model		SRA120EL-01	SRA133L-01	SRA166L-01
Construction		Articulated		
Number of axis		6		
Drive system		AC servo motor		
Max. working envelope	Axis 1	±3.14 rad (±180°)		
	Axis 2	-1.40 ~ +1.05 rad (-80 ~ +60°)		
	Axis 3	-2.23 ~ +2.62 rad (-127.7 ~ +150°)	-2.33 ~ +2.62 rad (-133.4 ~ +150°)	
	Axis 4	±6.28 rad (±360°)		
	Axis 5	±2.36 rad (±135°)		
	Axis 6	±6.28 rad (±360°)		
Max. speed	Axis 1	2.01 rad/s (115 °/s)	2.18 rad/s (125 °/s)	2.01 rad/s (115 °/s)
	Axis 2	1.83 rad/s (105 °/s)	2.01 rad/s (115 °/s)	1.83 rad/s (105 °/s)
	Axis 3	1.97 rad/s (113 °/s)	2.11 rad/s (121 °/s)	1.97 rad/s (113 °/s)
	Axis 4	2.44 rad/s (140 °/s)		
	Axis 5	3.02 rad/s (173 °/s)		
	Axis 6	4.54 rad/s (260 °/s)		
Max. pay load	Wrist	120 kg	133 kg	166 kg
	Forearm *1	45 kg (90 kg at maximum)		
Allowable static load torque	Axis 4	687 N·m	800 N·m	951 N·m
	Axis 5	687 N·m	800 N·m	951 N·m
	Axis 6	353 N·m	400 N·m	490 N·m
Allowable moment of inertia *2	Axis 4	60 kg·m ²	76 kg·m ²	88.9 kg·m ²
	Axis 5	60 kg·m ²	76 kg·m ²	88.9 kg·m ²
	Axis 6	30 kg·m ²	38 kg·m ²	45.0 kg·m ²
Position repeatability *3		±0.15 mm		
Installation		Floor mounting		
Ambient conditions		Temperature: 0 to 45 °C *4 Humidity: 20 to 85%RH (No dew condensation allowed) Vibration to the installation face: Not more than 0.5G (4.9 m/s ²)		
Noise *5		79.6 dB		
Robot mass		985kg	980 kg	

1[rad] = 180/ π [$^\circ$], 1[N·m] = 1/9.8[kgf·m]

- On controller display, axis 1 to 6 is displayed J1 to J6 for each.

- The specification and externals described in this specification might change without a previous notice for the improvement.

- Explosion-proof is not available.

*1: This value changes by placement and load conditions of a wrist.

*2: The Allowable moment of inertia of a wrist changes with load conditions of a wrist.

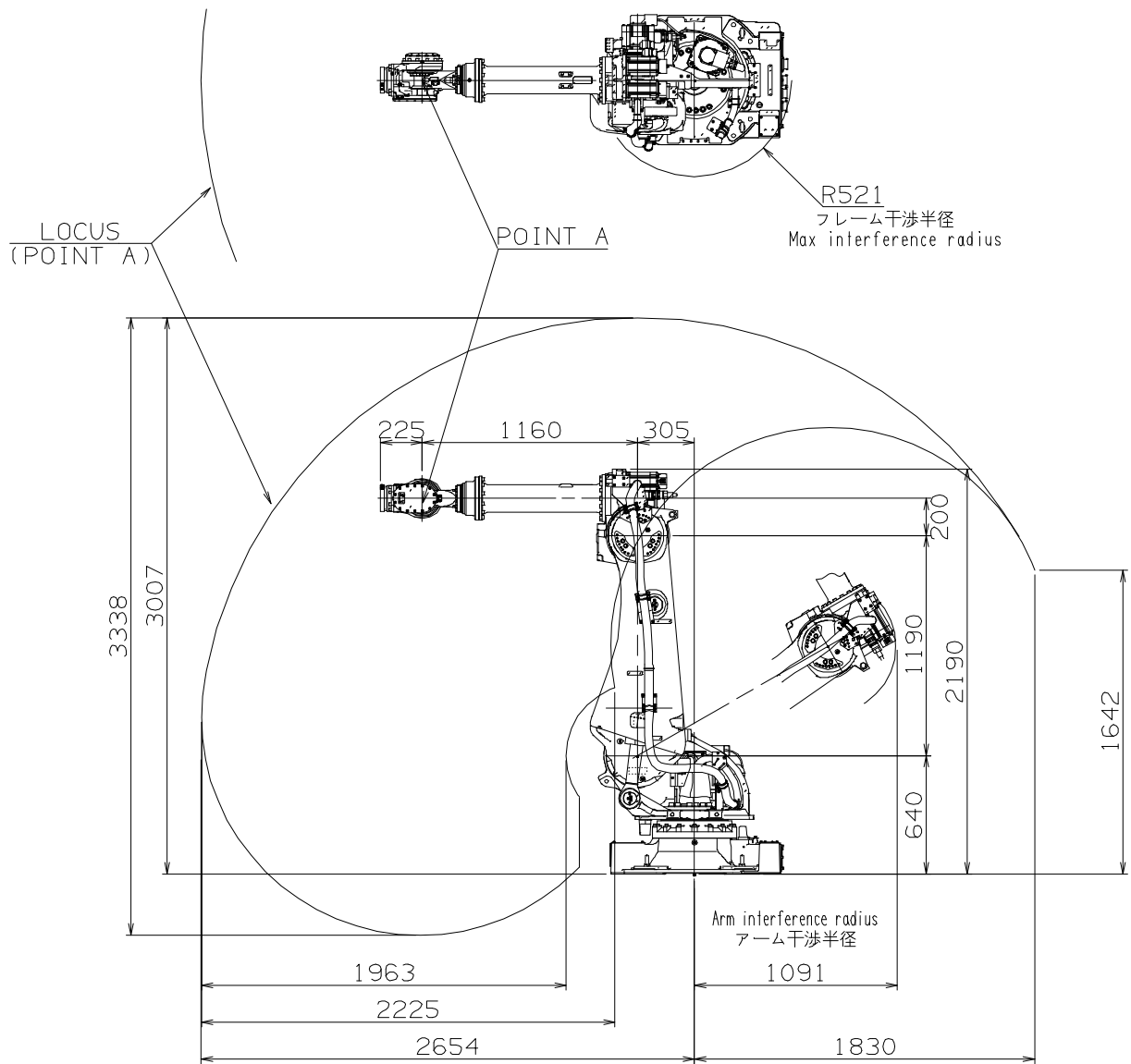
*3: This value conforms to "JIS B 8432".

*4: Permitted height is not higher than 1,000m above sea level. If used in higher place, permitted temperature is affected by height.

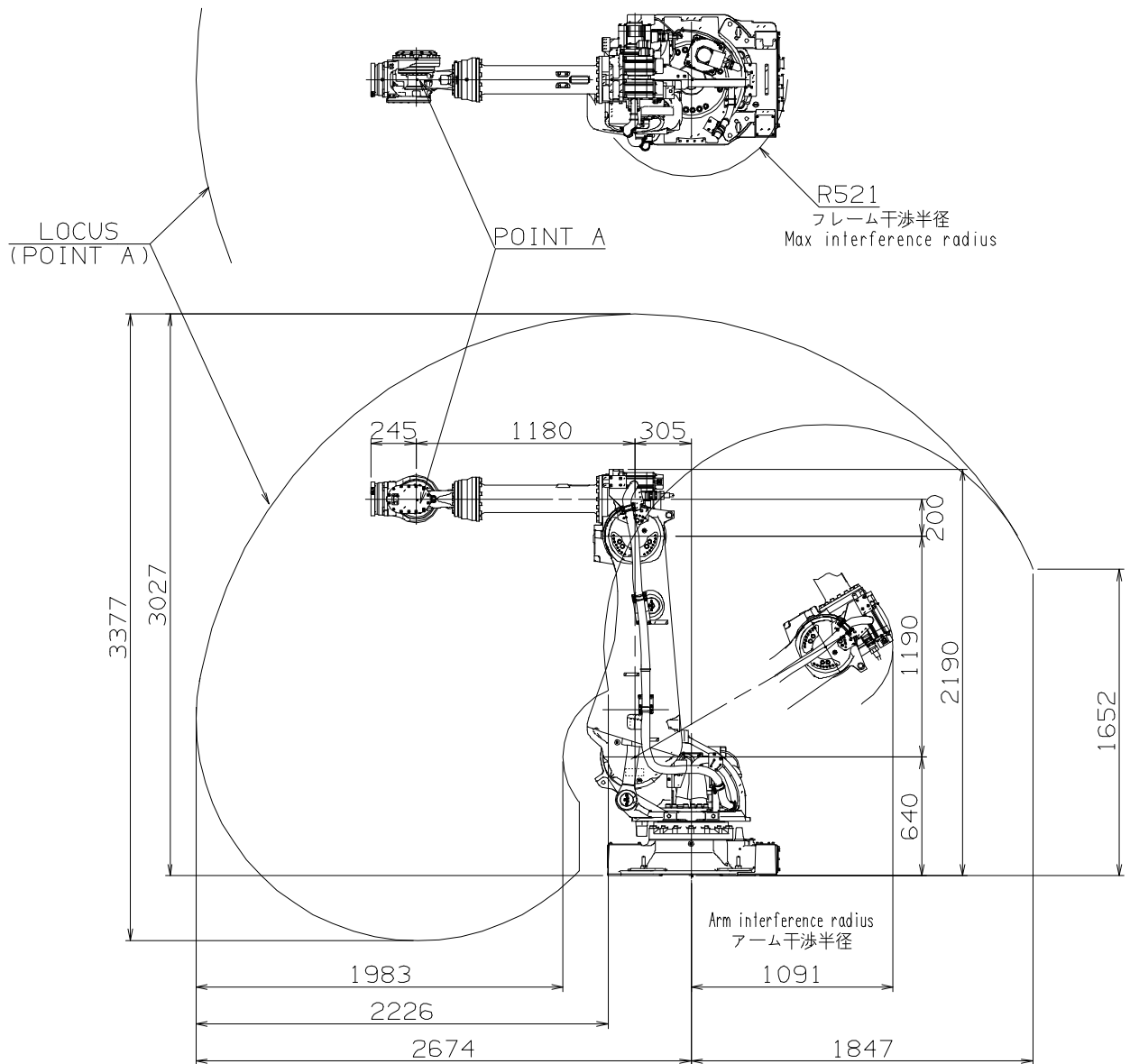
*5: Robot noise is A-weighted equivalent sound level measured under "JIS Z 8737-1" (ISO 11201) with max. payload and max. speed.

3. Robot dimensions and working envelope

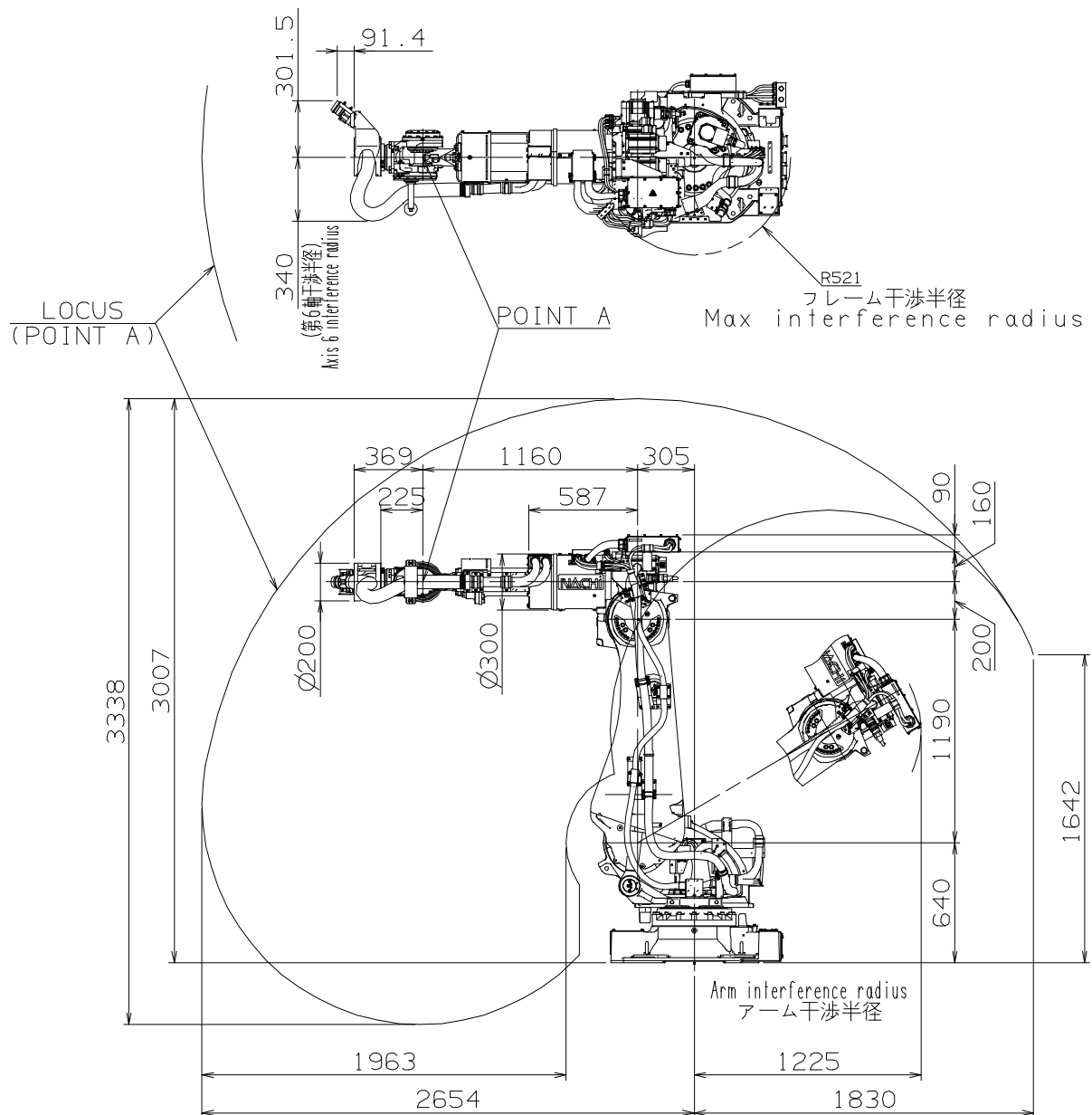
【SRA100-01】 【SRA166-01】



【SRA210-01】【SRA240-01】

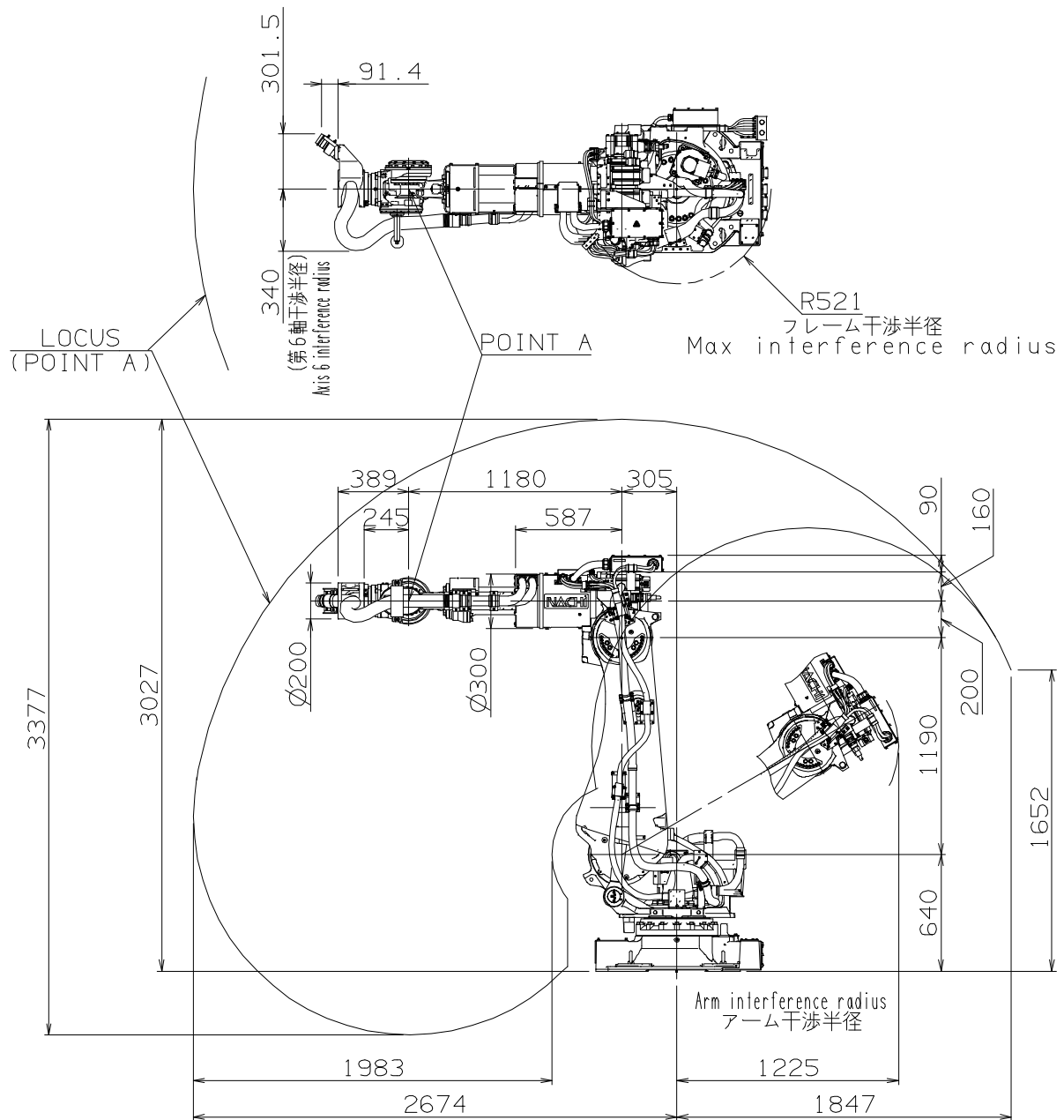


【SRA100-01A】 【SRA166-01A】



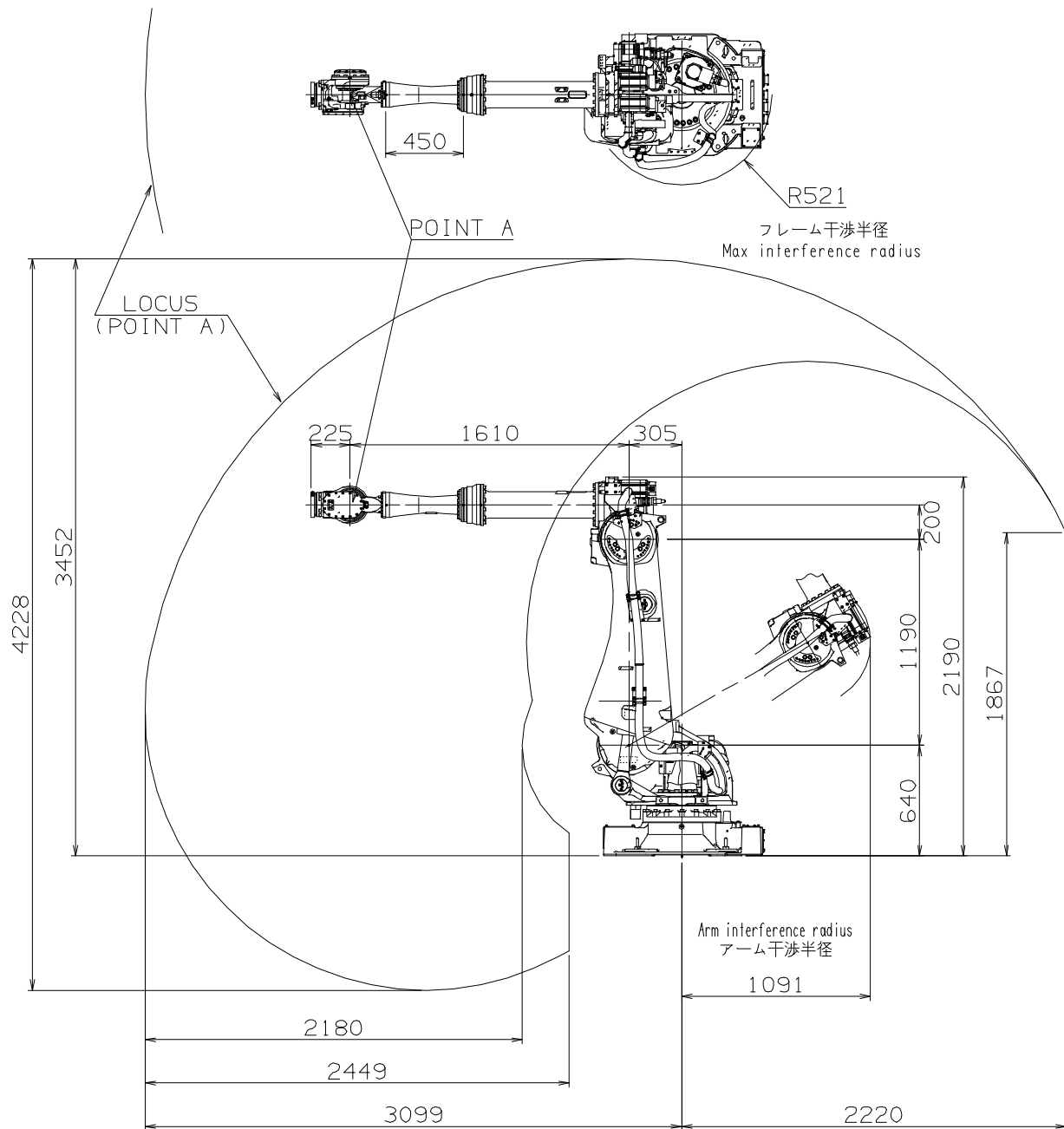
This figure is for the robot equipping the cable support (A-trac4) on the arm for spot welding application.

【SRA210-01A】

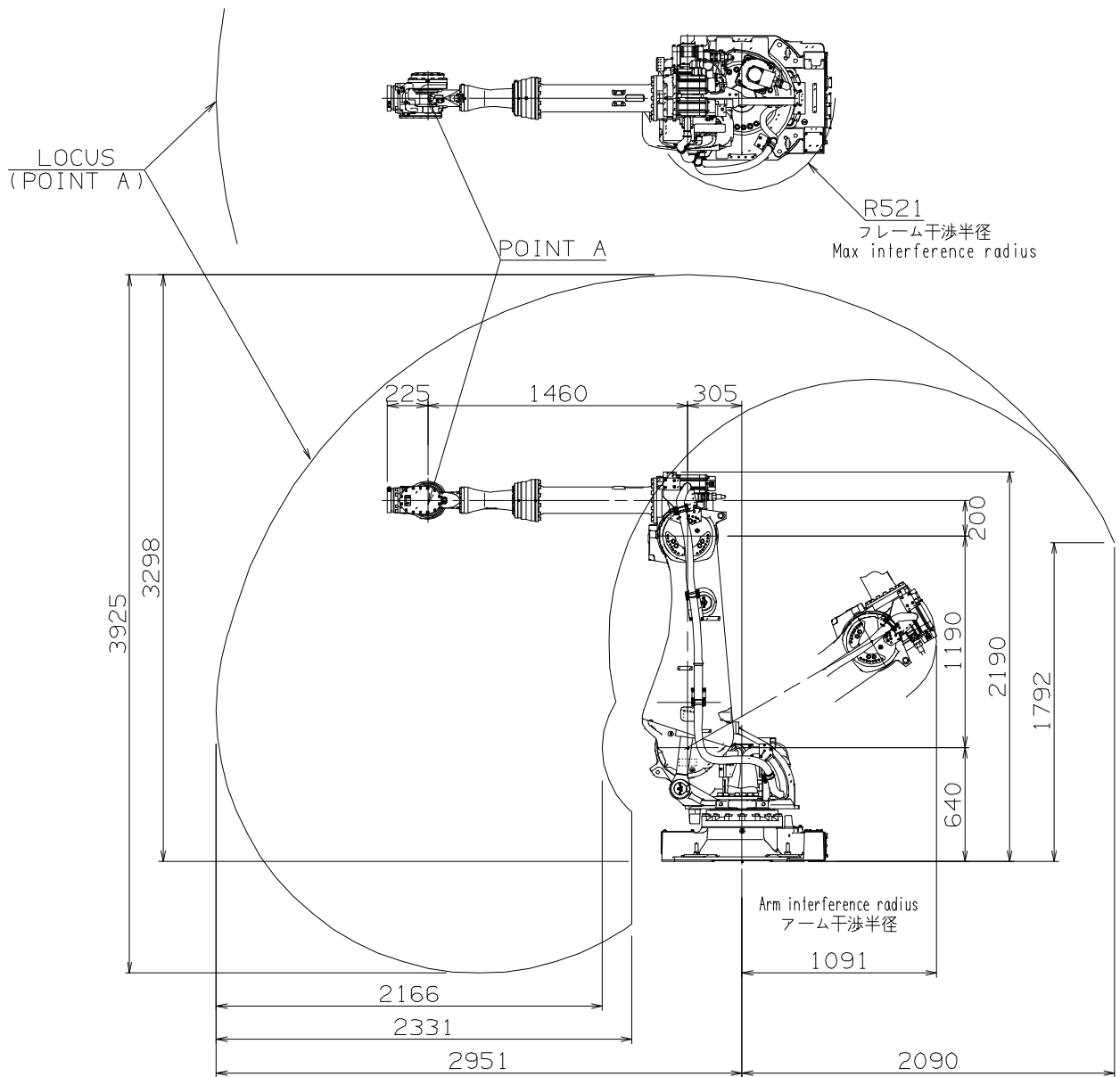


This figure is for the robot equipping the cable support (A-trac4) on the arm for spot welding application.

【SRA120EL-01】



【SRA133L-01】 【SRA166L-01】



4. Detail of load mounting plate

■ Wrist

For the end effector fixing bolts, use the mounting P.C.D. shown in the following figures.
Besides the mounting P.C.D., different P.C.D. (option) is available. For details, contact our service division.

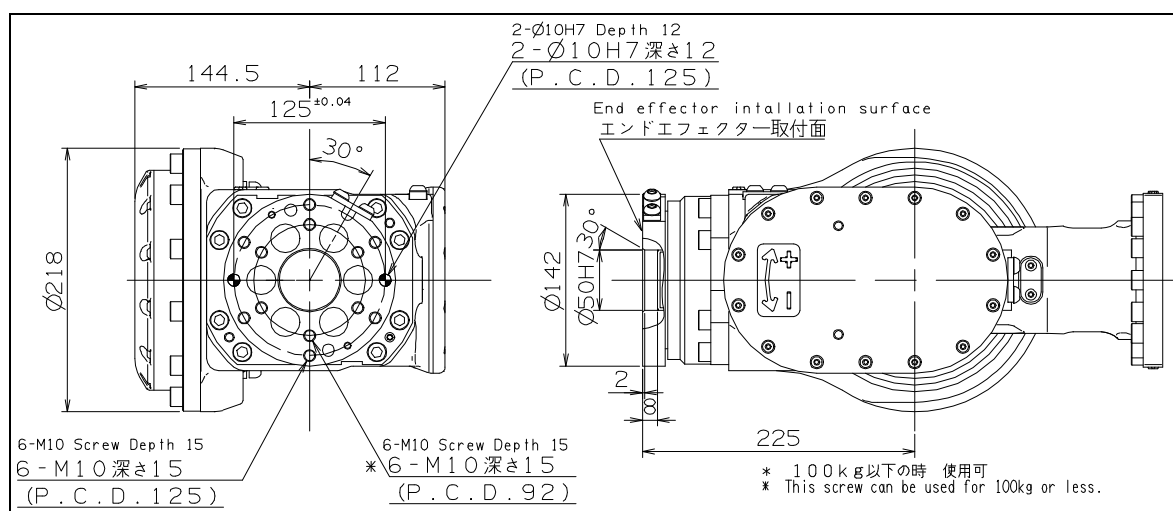


Be sure to screw the M10 tool fixing bolts in the wrist not deeper than the screw depth in the mounting face. Screwing the bolts deeper than the screw depth may damage the wrist.

【SRA100-01】【SRA166-01】【SRA120EL-01】【SRA133L-01】【SRA166L-01】



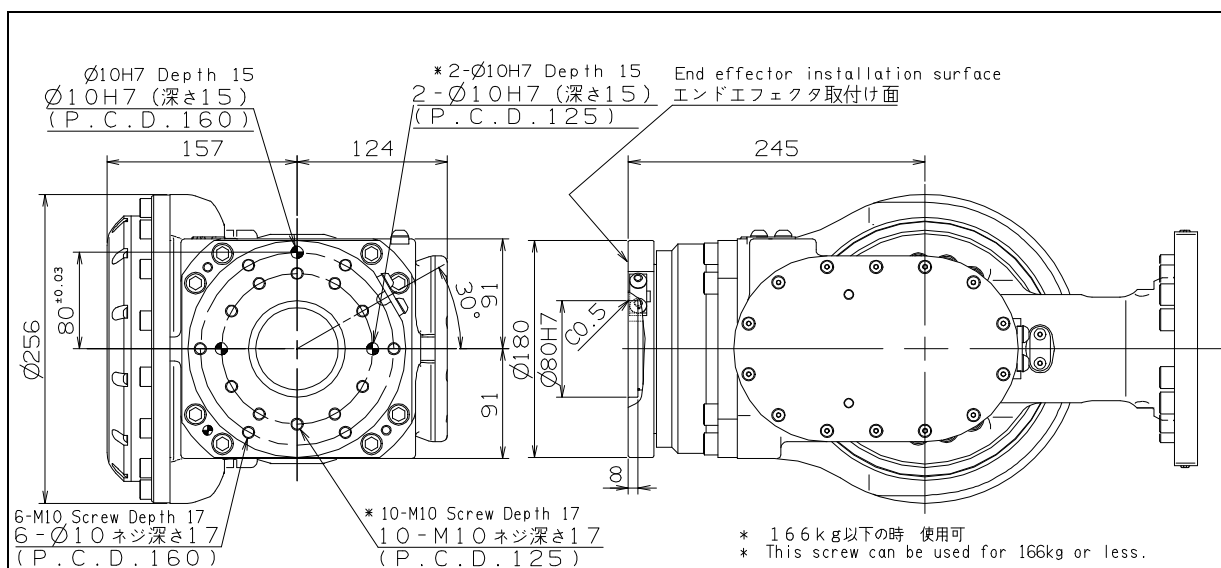
Use the mounting P.C.D.125 when tool weight is 100 kg or more.





【SRA210-01】【SRA240-01】



Use the mounting P.C.D.160 when tool weight is 166 kg or more.



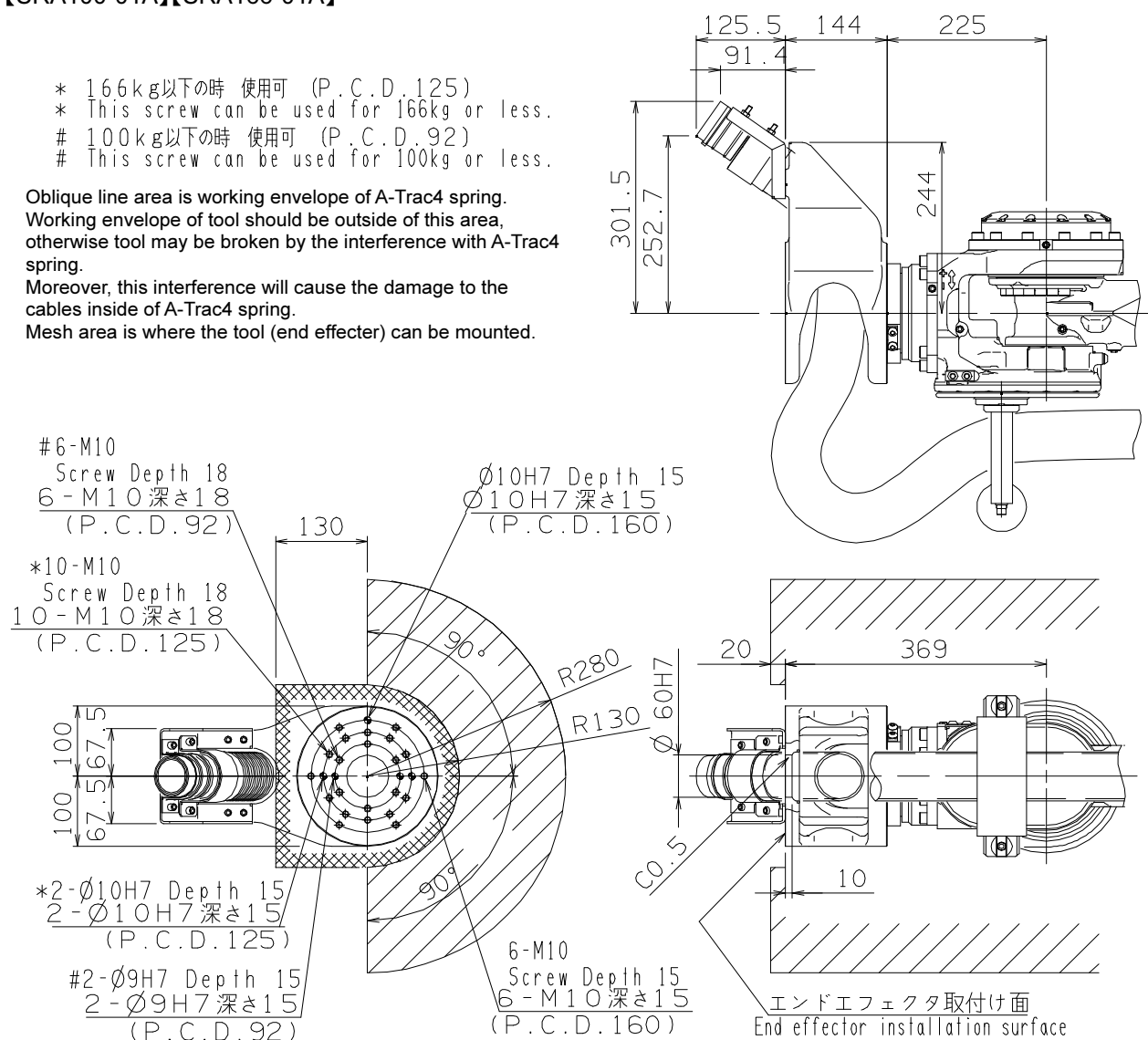
 CAUTION	<p>Be sure to screw the M10 tool fixing bolts in the wrist not deeper than the screw depth in the mounting face. Screwing the bolts deeper than the screw depth may damage the spring and cable inside of A-Trac4.</p>
 IMPORTANT	<p>Use the mounting P.C.D.125 or 160 when tool weight is 100 kg or more. (Only when the customer doesn't consider strength of the bolt.)</p>

【SRA100-01A】【SRA166-01A】

- * 166kg以下の時 使用可 (P.C.D.125)
- * This screw can be used for 166kg or less.
- # 100kg以下の時 使用可 (P.C.D.92)
- # This screw can be used for 100kg or less.

Oblique line area is working envelope of A-Trac4 spring.
Working envelope of tool should be outside of this area,
otherwise tool may be broken by the interference with A-Trac4
spring.

Moreover, this interference will cause the damage to the
cables inside of A-Trac4 spring.
Mesh area is where the tool (end effector) can be mounted.



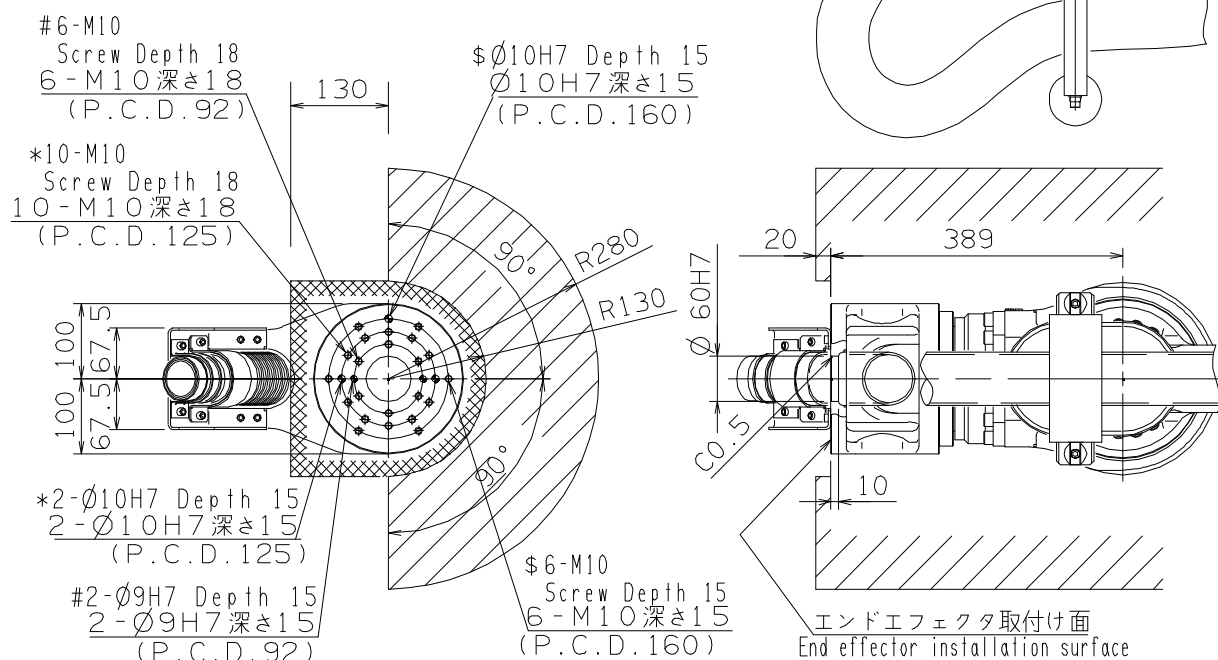
【SRA210-01A】

- \$ 210kg以下の時 使用可 (P.C.D.160)
- \$ This screw can be used for 210kg or less.
- * 166kg以下の時 使用可 (P.C.D.125)
- * This screw can be used for 166kg or less.
- # 100kg以下の時 使用可 (P.C.D.92)
- # This screw can be used for 100kg or less.

Oblique line area is working envelope of A-Trac4 spring.
Working envelope of tool should be outside of this area,
otherwise tool may be broken by the interference with A-Trac4
spring.

Moreover, this interference will cause the damage to the
cables inside of A-Trac4 spring.

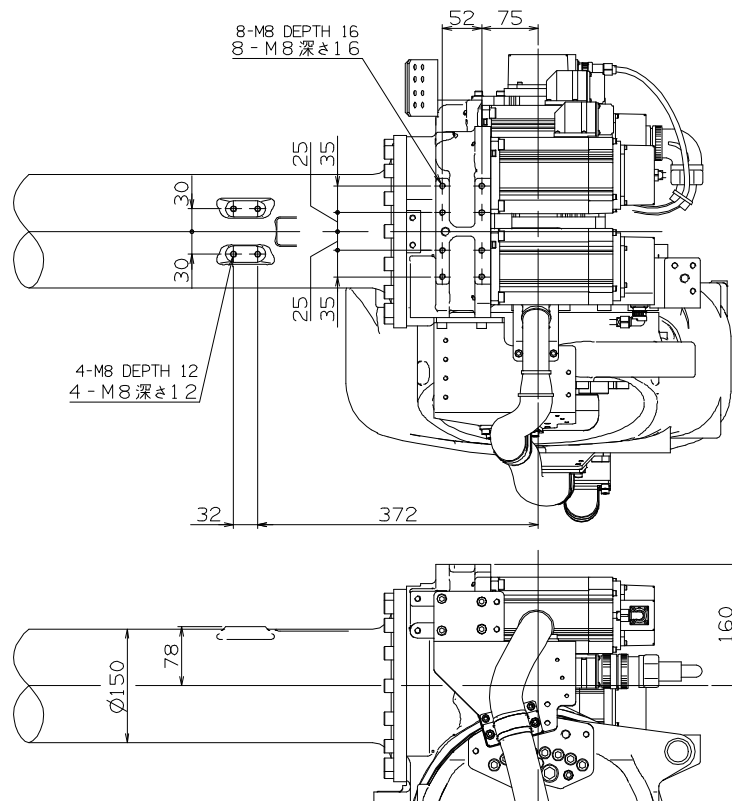
Mesh area is where the tool (end effector) can be mounted.



■ Upper part of forearm

Ancillary equipment can be mounted to the upper part of robot forearm.

In case of A-Trac4 model, screw holes of 4-M8 depth 12 marked ※ cannot be used because they are hidden in the cover part.




5. Installation procedure

The installation location and the installation procedure of the robot are critical factors to maintain robot functions. The ambient conditions of installation location not only have influence on the life of mechanical sections of the robot, but also get involved in safety issues. Consequently, strictly observe the environmental conditions shown below. Furthermore, utmost care should be exerted for the installation procedure and the foundation for the robot in order to maintain the robot performance. Strictly observe the installation procedure for the robot provided below.

Installation

To install the robot, give it first priority to thoroughly consider safety of workers and take safety measures. The following describes precautions for this purpose.

Safety measures against entry in the robot operating area

 WARNING	<p>While the robot is in operation, workers are in danger of coming in contact with the robot. To avoid that, install a Safety fence so as to keep the worker away from the robot. Not doing so will cause the workers or other persons to accidentally enter the operating area, thus resulting in accidents.</p>
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■ Installation location and ambient conditions

Conditions (temperature, humidity, height and vibration) are written in “2. Basic Specifications”. Further ambient conditions listed below must be observed.

- (1) Location with the drainage structure so that swivel base is not flooded, when the liquid such as water or cutting fluid is splashed on the robot body
- (2) Location with no flammable or corrosive fluid or gas.
- (3) Type D grounding (the grounding resistance is 100Ω or less) is necessary.

■ Installation procedure

While robot moves, large reaction force is applied to the swiveling base from all directions. Consequently, the robot should be installed in such a manner that the foundation endures reaction force caused by accelerating or decelerating the speed to lock the robot, not to mention that it endures static loads.

Repair uneven spots, cracks, and others on the floor, and then install the robot by following to the table below. If thickness of floor concrete is less than needed level, an independent foundation should be constructed. Inspect the foundation prior to the robot installation, and then construct the foundation, if necessary.



Robot Model	SRA100-01 SRA100-01A	SRA166-01 SRA166-01A SRA133L-01	SRA210-01 SRA210-01A SRA120EL-01 SRA166L-01	SRA240-01
Thickness of floor concrete	Not less than 160 mm			
Installation parts *1	8 bolts of M20 (JIS: Strength class 12.9) not less than 65mm 8 plain washers of not less than 4.5 mm in thickness and HRC35 in hardness			
Tightening torque	560 ± 30 N·m			
Allowable repeated tensile *2	Appx. 18,000 N	Appx. 22,000 N	Appx. 28,000 N	Appx. 30,000 N

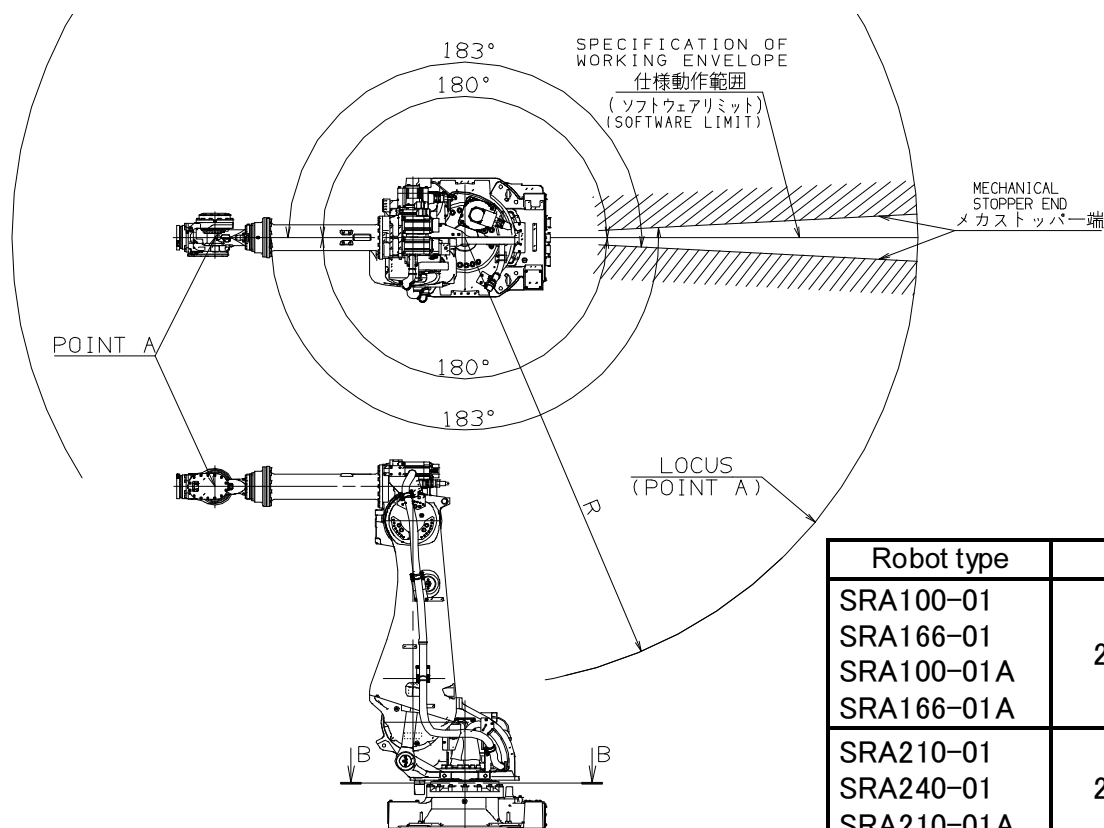
*1 : Installation parts are not accessory of robot.

*2 : This tensile is per installation bolt when robot is installed with all bolts written in table above.

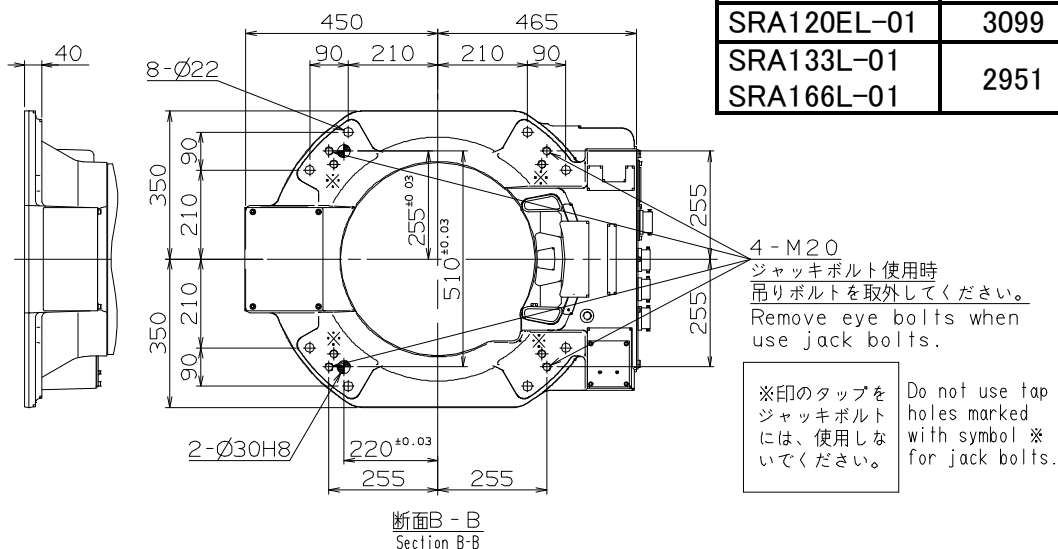
■ Installation space

To install the robot, lock the swiveling base of the robot.

 CAUTION	<p>The mechanical stopper end is located in a position exceeding the specified working envelope (software limit) of axis 1 by 3°. To install the safety fence, with consideration given to the wrist configuration and the shape of end effector.</p>
 DANGER	<p>On axes 1, 2 and 3, the robot working envelope can be regulated for safety (optional function). Since optional parts should be installed to enable this function, do not independently move the standard parts (e.g. mechanical stopper).</p>



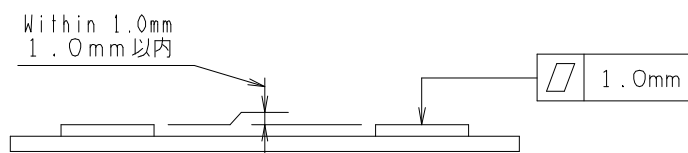
Robot type	R
SRA100-01 SRA166-01 SRA100-01A SRA166-01A	2654
SRA210-01 SRA240-01 SRA210-01A	2674
SRA120EL-01	3099
SRA133L-01 SRA166L-01	2951



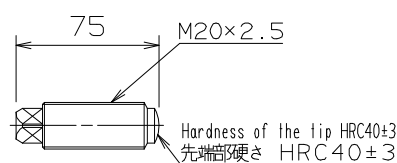
■ Accuracy of installation surface

When installing robot, strictly observe precautions listed below to cause no deformation in the swivel base.

- (1) Make the deviation from the flatness of the 4 plates on the robot installation surface fall within 1.0 mm.
- (2) Make the deviation in height between the 4 places of each base plate installation surface and the robot installation surface fall in the range of 1.0 mm (± 0.5 mm).



- (3) If the two precautions above cannot be observed, use jack bolts to bring the four places into even contact with the installation surface.

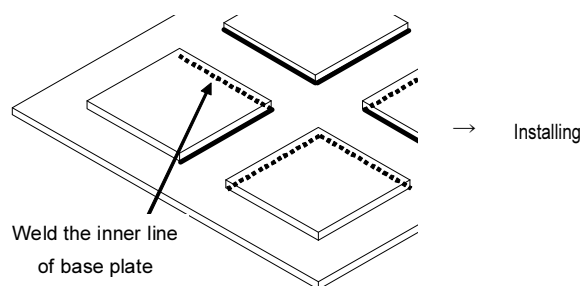
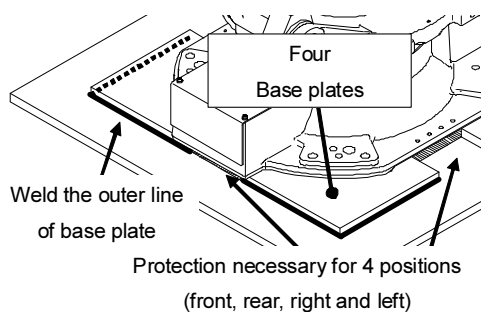


■ Welding of base plate

Protect the space (4 places of the front, back, left and right) on robot bottom and installed side by the cover etc. as follows when you weld with the base plate installed in the robot body by the welding spatter and the spark, etc. so that wiring in the robot should not receive damage. After welding the outer line, once remove the robot and weld the inner line.

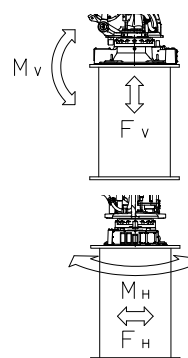
Temporary install the robot, and weld the outer line of base plate.

Once remove the robot and weld the inner line.



■ Maximum robot generative force

Robot model	Max. vertical generative force F_v	Max. horizontal generative force F_H	Max. vertical generative moment M_v	Max. horizontal generative moment M_H
SRA100-01 SRA100-01A	40,400 N	29,400 N	71,400 N·m	60,900 N·m
SRA133L-01	43,500 N	31,800 N	88,200 N·m	75,700 N·m
SRA166-01 SRA166-01A	46,800 N	35,200 N	92,300 N·m	79,700 N·m
SRA210-01 SRA210-01A SRA120EL-01 SRA166L-01	52,800 N	40,500 N	113,200 N·m	98,300 N·m
SRA240-01	56,300 N	43,700 N	122,000 N·m	106,300 N·m



6. Allowable wrist load



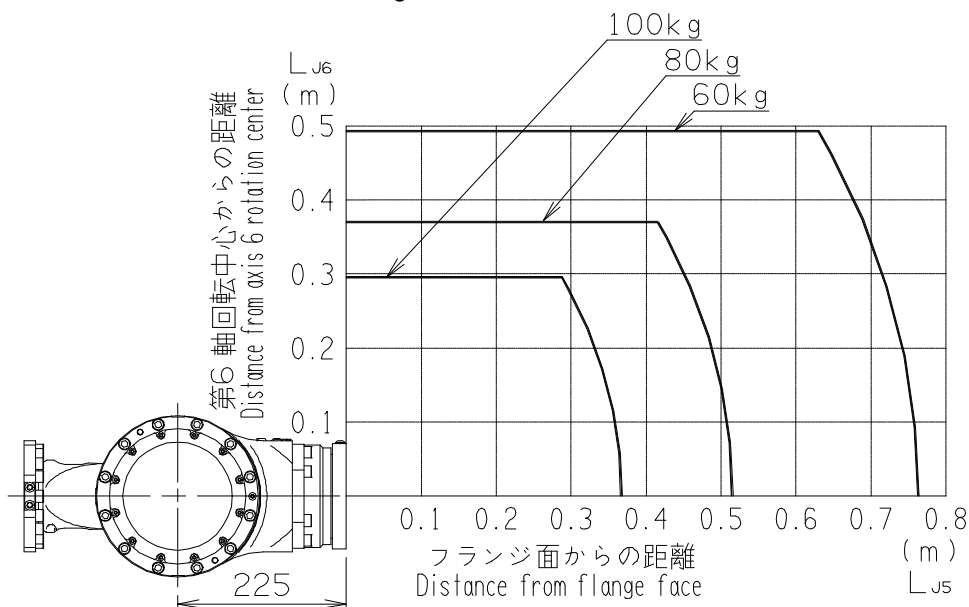
CAUTION

Load fixed on the tip of wrist is regulated by “allowable payload mass”, “allowable static load torque”, and “allowable moment of inertia”. Strictly keep the wrist load within each allowable value. If wrist load exceeds the allowable value, this robot is out of guarantee. Refer to the table of “2. Basic specifications” and following figures for the detail of each specification.

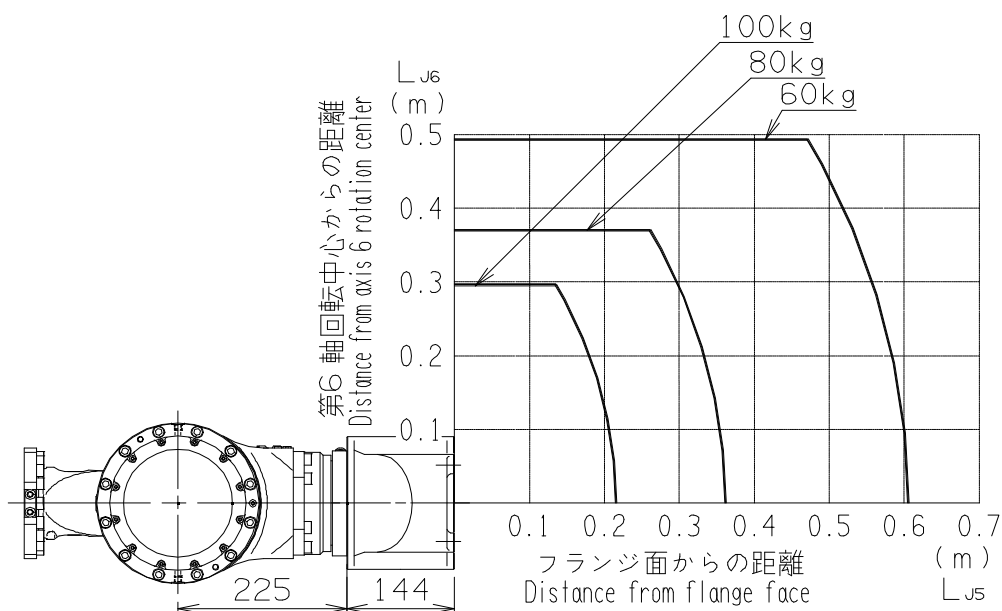
■ Torque map

C.O.G. of wrist load should exist inside the range shown below.

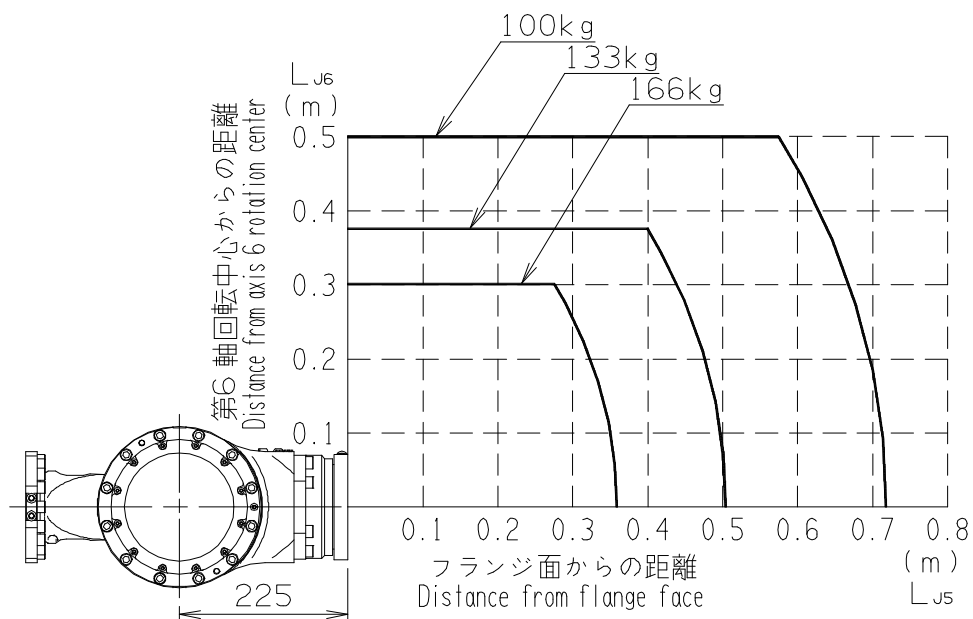
【SRA100-01】



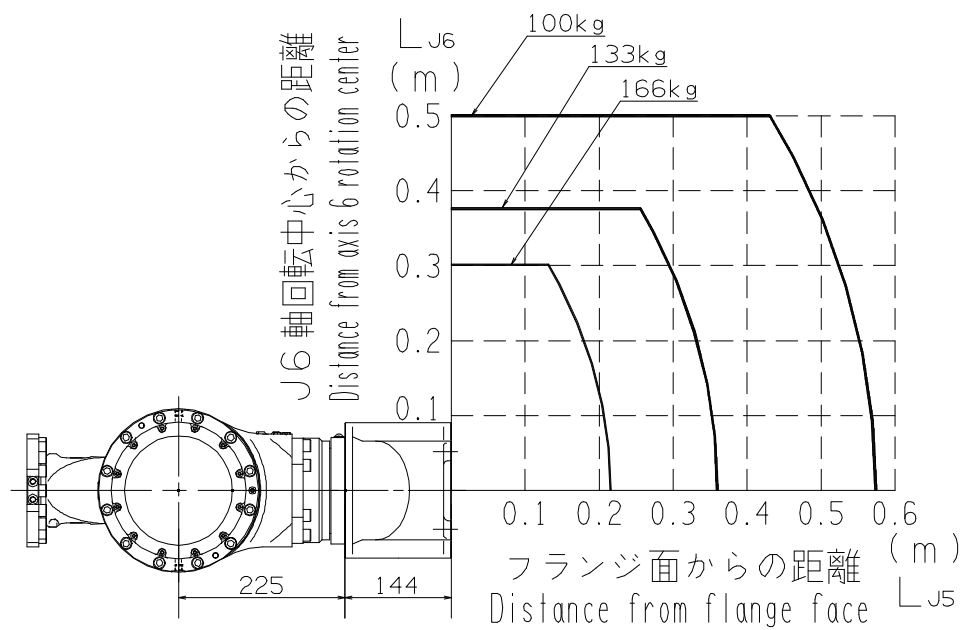
【SRA100-01A】



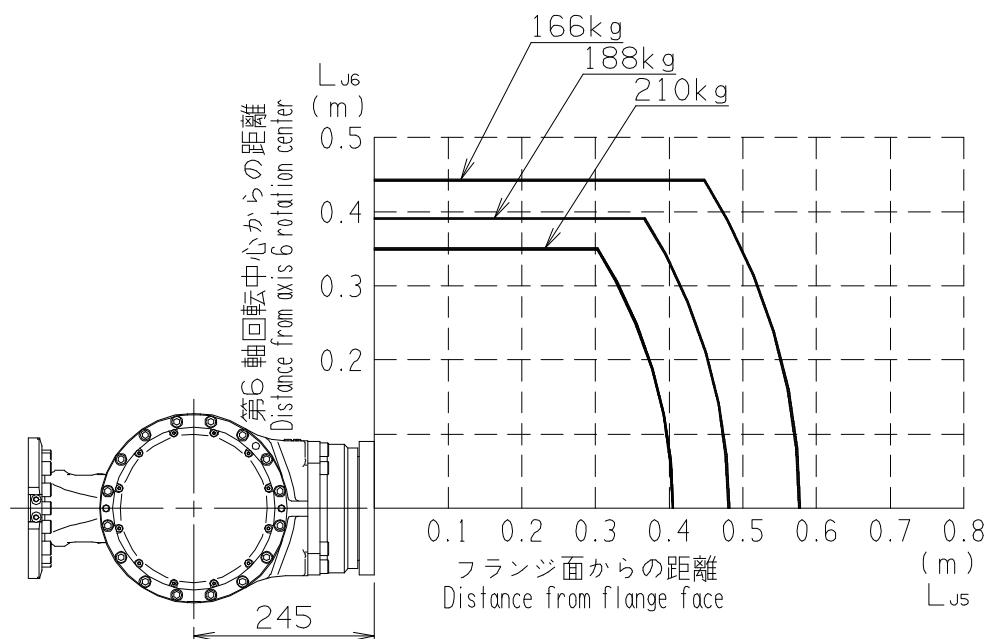
【SRA166-01】
【SRA166L-01】



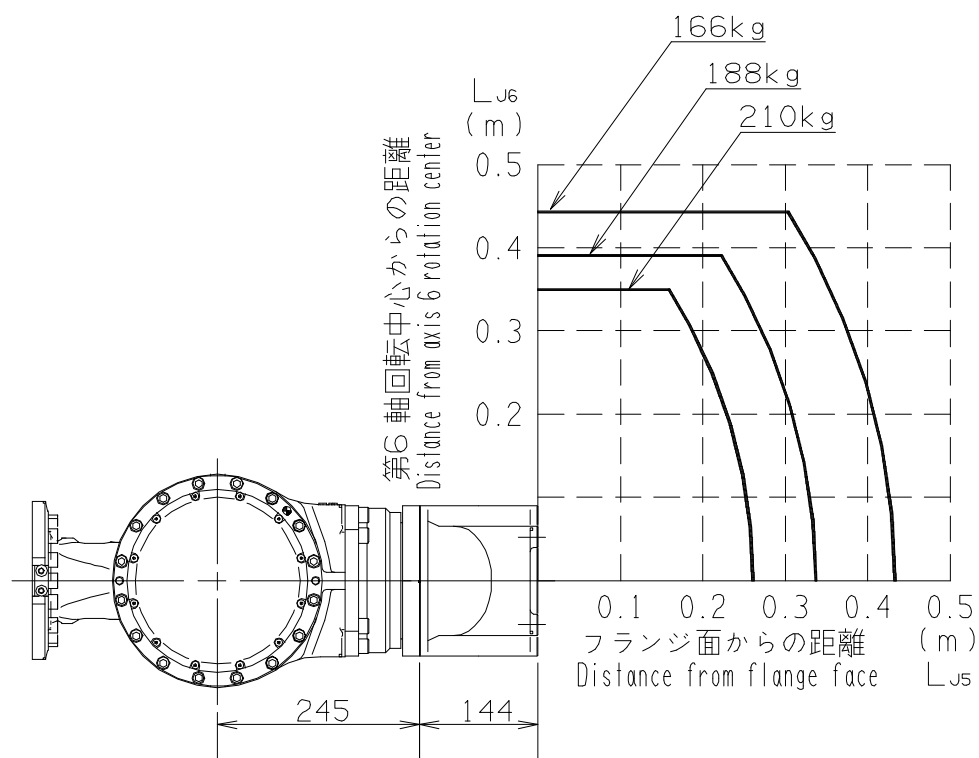
【SRA166-01A】



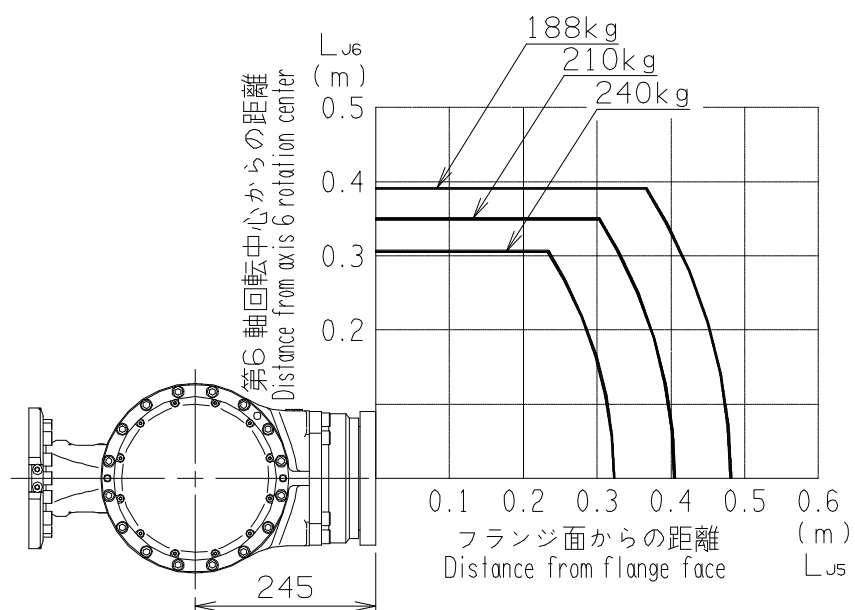
【SRA210-01】



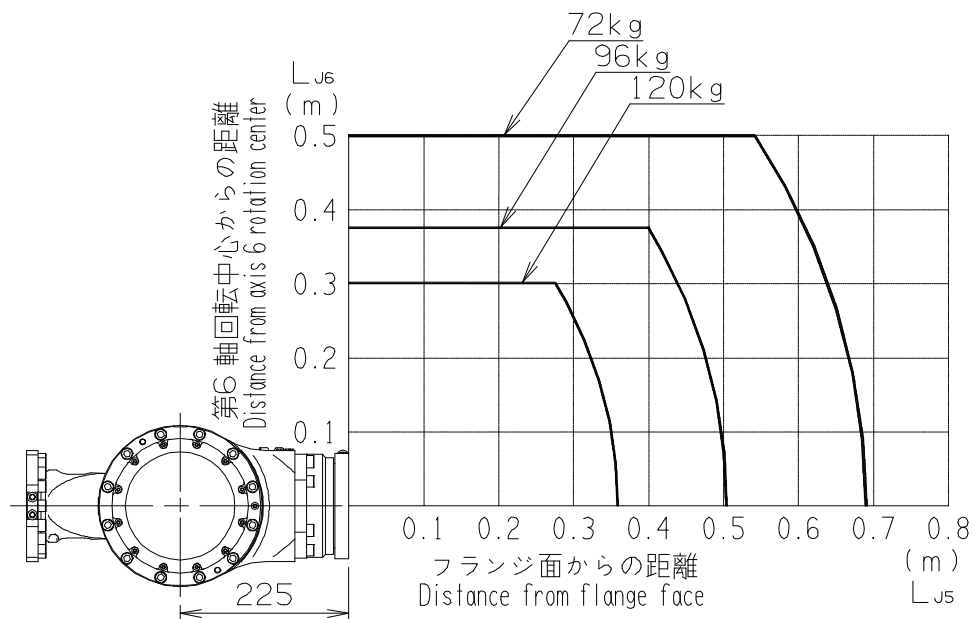
【SRA210-01A】



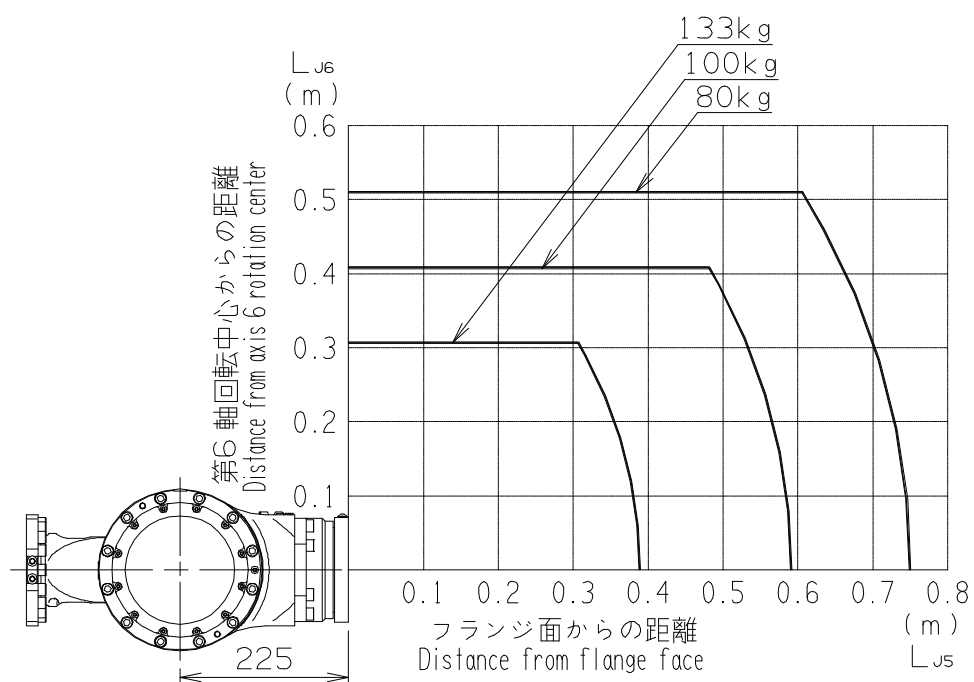
【SRA240-01】



【SRA120EL-01】



【SRA133L-01】



Wrist load conditions

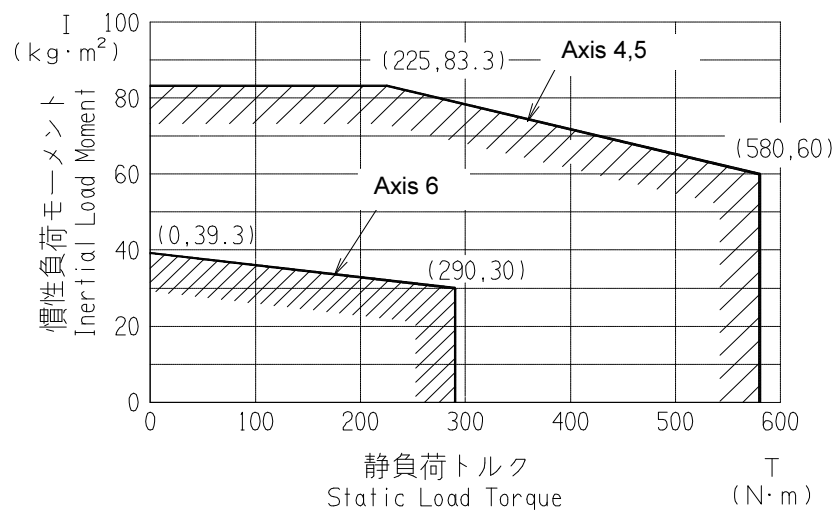
Static load torque and moment of inertia of wrist load should exist inside the range shown below.



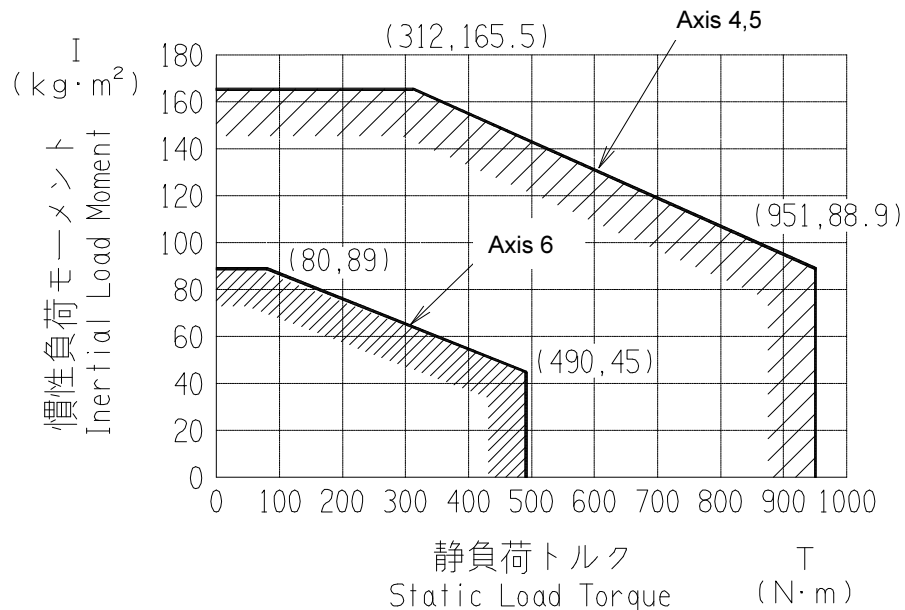
IMPORTANT

If the real inertia is over the limit written in "2. Basic specifications", maximum speed will be restrained by software.

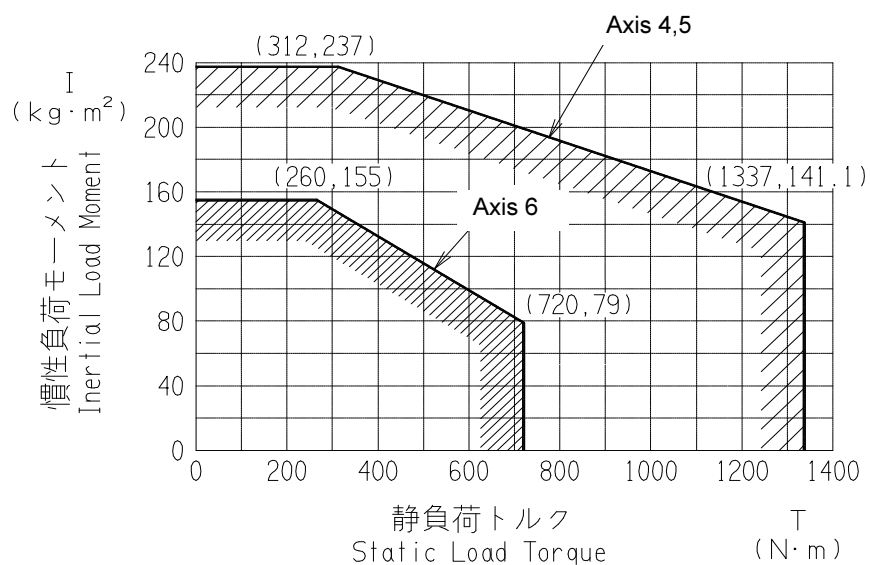
【SRA100-01】
【SRA100-01A】



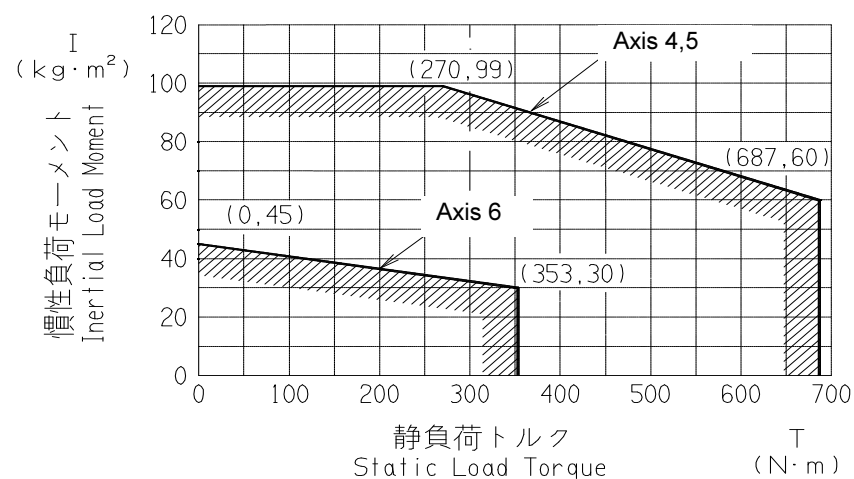
【SRA166-01】
【SRA166-01A】
【SRA166L-01】



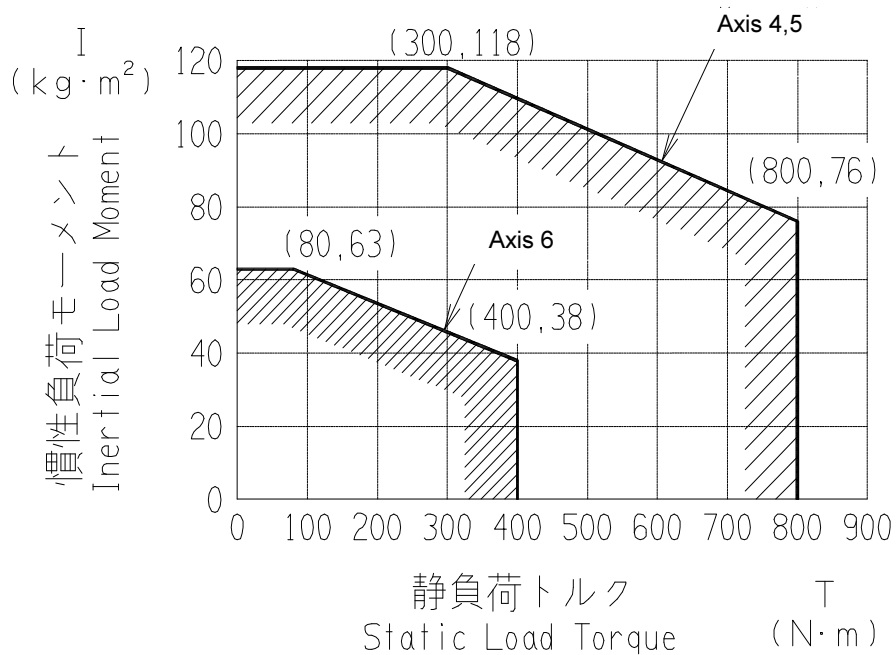
【SRA210-01】
【SRA240-01】
【SRA210-01A】



【SRA120EL-01】

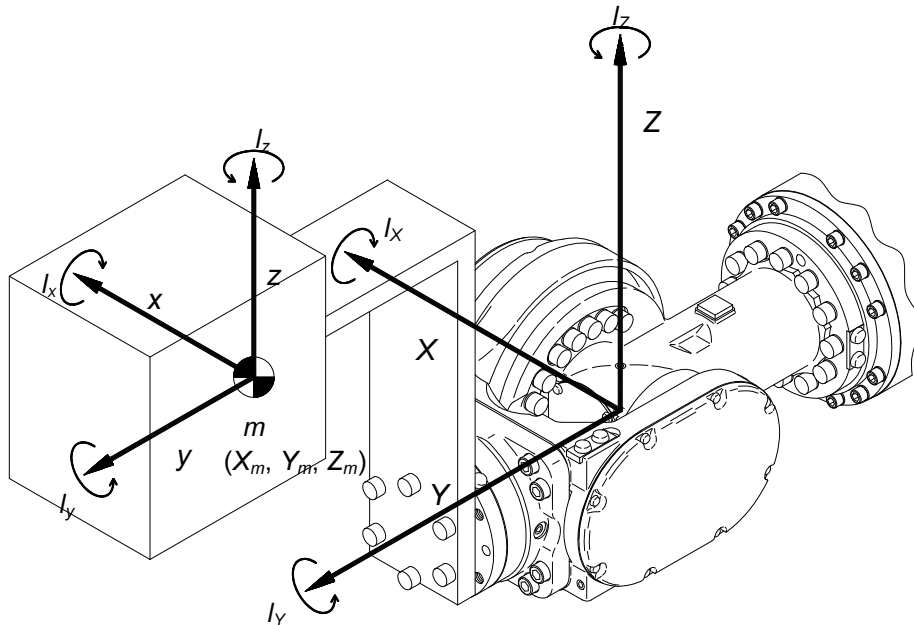


【SRA133L-01】



■ How to find the inertia moment of each axis

The following section shows general methods of calculating the inertia moment around each axis.



X: Axis 5 rotation in the basic wrist configuration

Y: Axis 6 and axis 4 rotation in the basic wrist configuration

Z: Axis at right angles to the X and Y axes in the basic wrist configuration

x: Axis parallel to the X axis in the load gravity center

y: Axis parallel to the Y axis in the load gravity center

z: Axis parallel to the Z axis in the load gravity center

I_x : Inertia moment around the X axis passing through the load gravity center

I_y : Inertia moment around the Y axis passing through the load gravity center

I_z : Inertia moment around the Z axis passing through the load gravity center

m : Load mass

(X_m, Y_m, Z_m) : Gravity center coordinates of load

1. Inertia moment around axis 6

The inertia moment of around axis 6 is found by the expression shown below.

$$I_{J6} = I_y = m \cdot (X_m^2 + Z_m^2) + I_y$$

2. Inertia moment around axis 4 and axis 5

The inertia moment around axis 4 and axis 5 varies with axis 6 configuration. Consequently, in order to simplify the calculation, take a maximum value around the X and Z axes in above figure, as the inertia moment.

$$I_{J4J5} = \max (I_x, I_z)$$

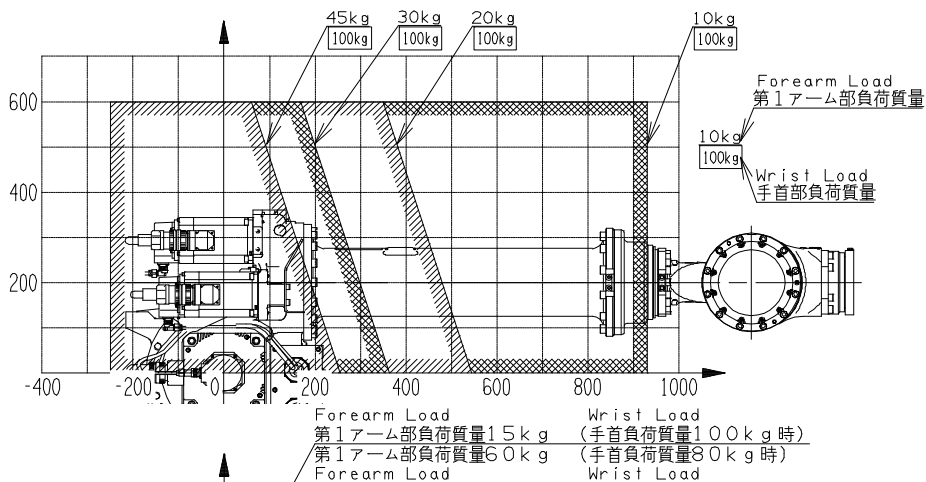
$$\because I_x = m \cdot (Y_m^2 + Z_m^2) + I_x$$

$$\because I_z = m \cdot (X_m^2 + Y_m^2) + I_z$$

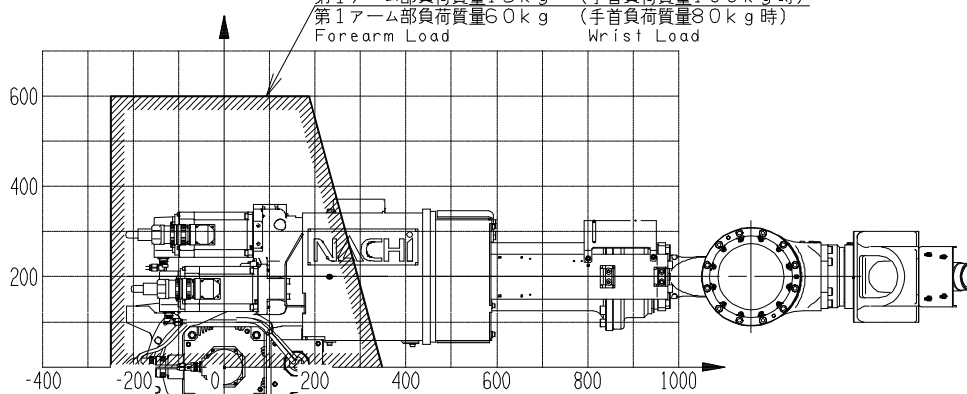
■ Allowable forearm load

Use the robot under condition that COG of the ancillary equipment on the forearm falls in the range shown below.

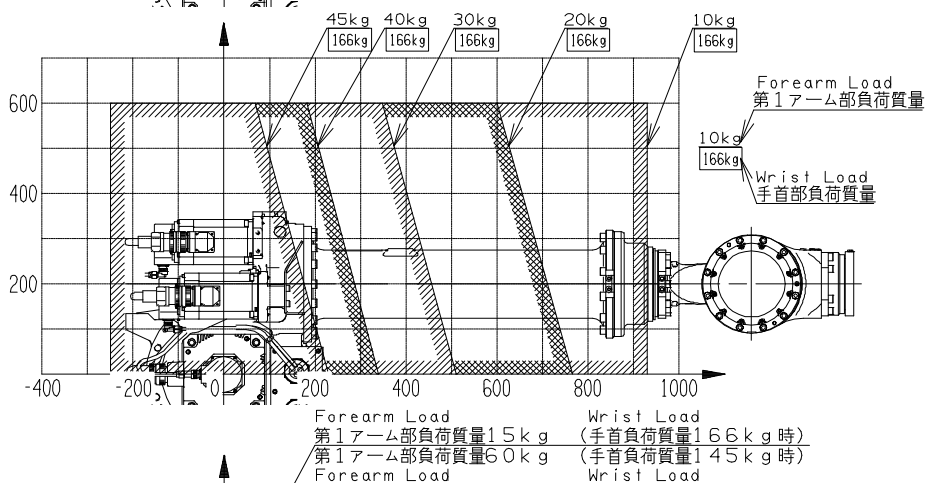
[SRA100-01] When wrist load is 100kg



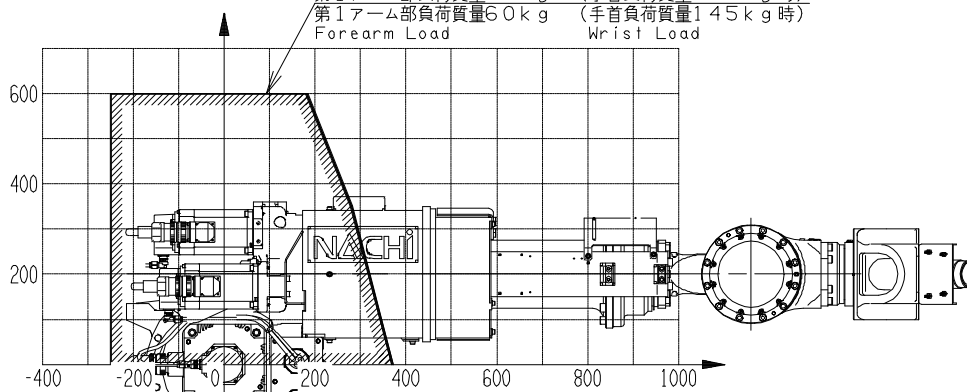
[SRA100-01A] When wrist load is 100kg or 80Kg



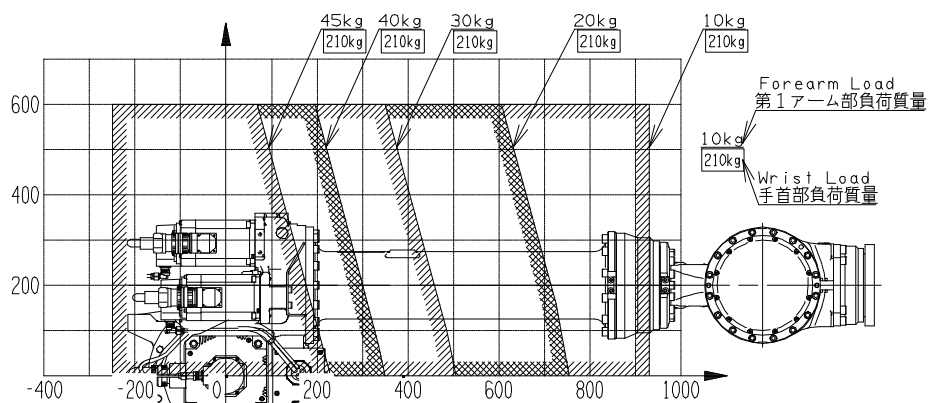
[SRA166-01] When wrist load is 166kg



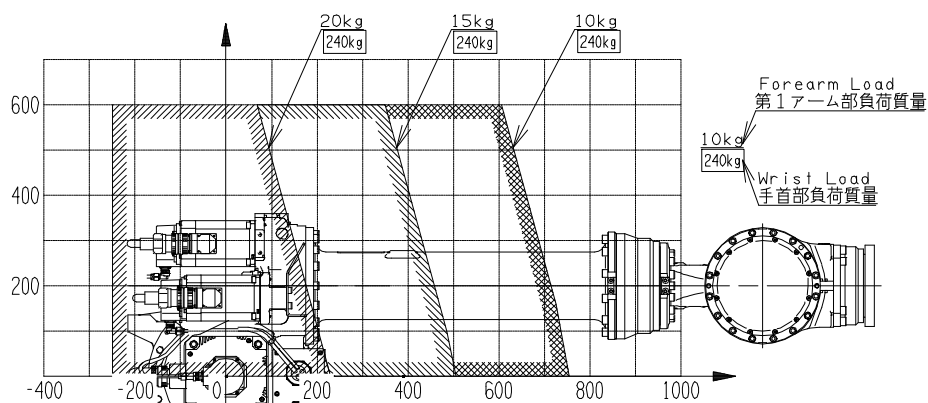
[SRA166-01A] When wrist load is 166kg or 145Kg



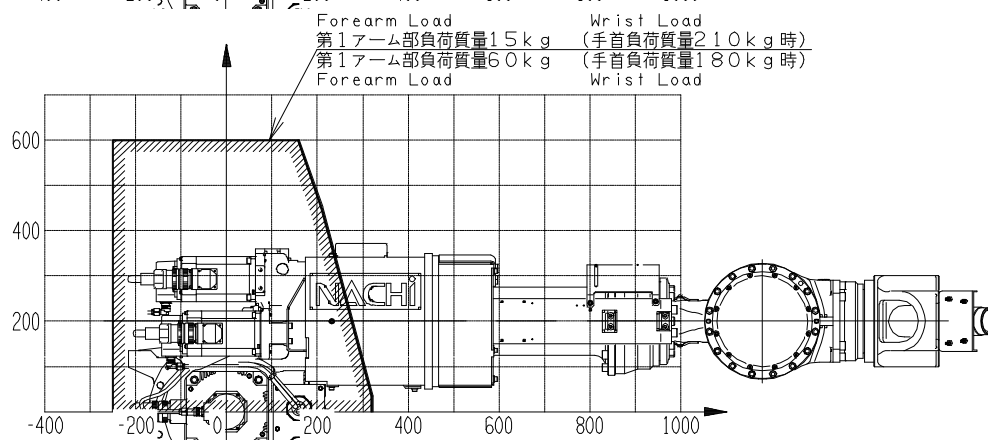
[SRA210-01]
When wrist
load is 210kg



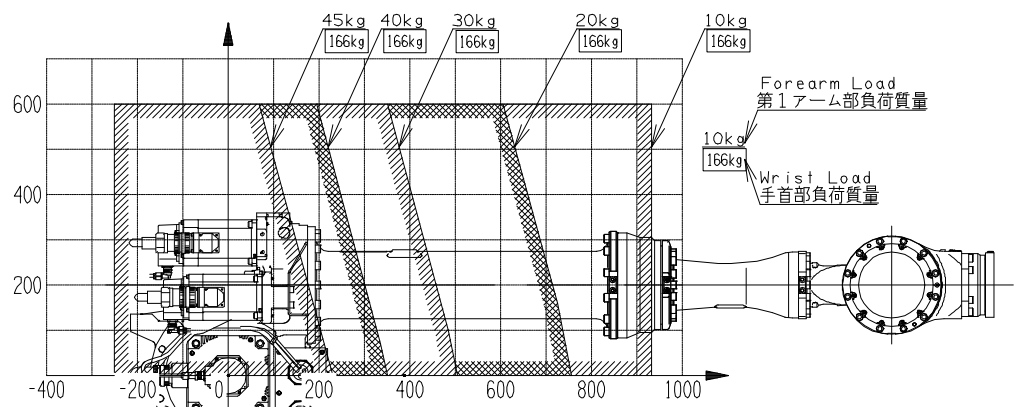
[SRA240-01]
When wrist
load is 240kg



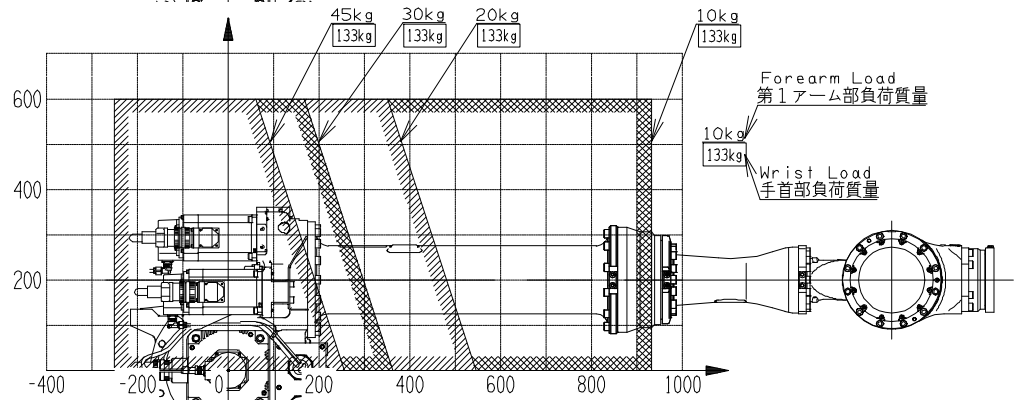
[SRA210-01A]
When wrist
load is 210kg
or 180kg



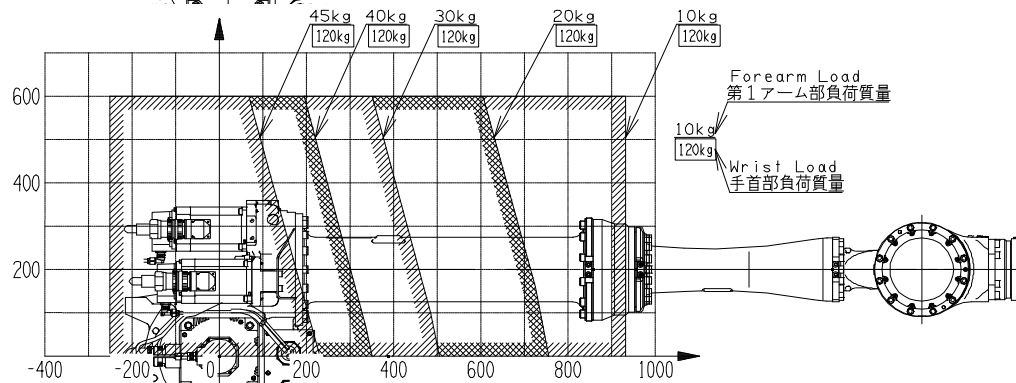
[SRA166L-01]
When wrist load
is 166kg



[SRA133L-01]
When wrist load
is 133kg



[SRA120EL-01]
When wrist load
is 120kg



7. Option specifications

○: Possible to correspond / —: Impossible to correspond

No.	Item	Specifications		Parts No.	Robot model										
					SRA100-01	SRA166-01	SRA210-01	SRA240-01	SRA100-01A	SRA166-01A	SRA210-01A	SRA120EL-01	SRA133L-01	SRA166L-01	
1	Installation parts *1	Chemical anchor specification	with pin hole	OP-F1-024	○	○	○	○	○	○	○	○	○	○	○
		Base plate welded (anchors not included)	without pin hole	OP-F1-028	○	○	○	○	○	○	○	○	○	○	○
		Ore anchor specification	with pin hole	OP-F2-018	○	○	○	○	○	○	○	○	○	○	○
		Base plate welded (anchors not included)	without pin hole	OP-F2-019	○	○	○	○	○	○	○	○	○	○	○
		Pins set (Installation pins & polyethylene plug)		OP-F1-025	○	○	○	○	○	○	○	○	○	○	○
		Leveling plate (□180mm×t=32mm, 4 plates)		OP-F1-026	○	○	○	○	○	○	○	○	○	○	○
		Installation bolts & washers		OP-F1-027	○	○	○	○	○	○	○	○	○	○	
2	Axis 1 adjustable stopper *1 *2 *3	Restriction of axis 1 operation edge (±2.61 rad every 0.17 rad)		OP-S5-019	○	○	○	○	○	○	○	○	○	○	
3	Axis 2 adjustable stopper *1 *3	Restriction of axis 2 operation edge (-0.26 and -0.52 rad from the operation edge)		OP-A5-027	○	○	○	○	○	○	○	○	○	○	
4	Axis 3 adjustable stopper *1 *3	Restriction of axis 3 upside operation edge (-0.52, -0.79, -1.05, -1.31 and -1.57 rad from the operation edge)		OP-A6-023	○	○	○	○	○	○	○	○	○	○	
5	Axis 2 adjustable LS dog *3	Axis 2 axis adjustable limit switch dog set		OP-S8-007	○	○	○	○	○	○	○	○	○	○	
6	Axis 3 adjustable LS dog *3	Axis 3 axis adjustable limit switch dog set		OP-S4-009	○	○	○	○	○	○	○	○	○	○	
7	Big capacity application box	Big capacity BJ3 wiring junction box		OP-E5-003	○	○	○	○	○	○	○	○	○	○	
8	Transfer jig	Fork bracket for floor mounting type		OP-S2-033	○	○	○	○	○	○	○	○	○	○	
9	Zeroing pin & Zeroing block *1	For 166 kg payload (for 100 kg to 166 kg)		OP-T2-053	○	—	—	—	○	○	—	○	○	○	
		For 210 kg payload (for 210 kg to 240 kg)		OP-T2-054	—	○	○	○	—	—	○	—	—	—	
10	ISO Flange adaptor	Converts into the tool installation size with ISO		OP-W2-001	○	—	—	—	○	○	○	○	○	○	
11	Flange adaptor	For 166 kg payload (for 100 kg to 166 kg) (P.C.D.92)		OP-W3-001	○	—	—	—	—	—	—	○	○	○	
		For 210 kg payload (for 210 kg to 240 kg) (P.C.D.92, 125)		OP-W3-006	—	○	○	○	—	—	—	—	—	—	
12	Wrist axis positioning marking	For 166 kg payload (for 100 kg to 166 kg)		OP-N3-006	○	—	—	—	—	—	—	○	○	○	
		For 210 kg payload (for 210 kg to 240 kg)		OP-N3-007	—	○	○	○	—	—	—	—	—	—	
13	Dual circuit limit switch	For axes 1, 2 and 3 (3pcs. of dual circuit LS)		OP-D7-008	○	○	○	○	○	○	○	○	○	○	
14	Encoder connector Protector	For axis 3		OP-P6-005	○	○	○	○	○	○	○	○	○	○	
15	Bypass cable *1			BCUNIT20-20	○	○	○	○	○	○	○	○	○	○	
16	Arm fixed jig *1	For axis 2		KP-ZD-005	○	○	○	○	○	○	○	○	○	○	
		For axis 3		KP-ZJ-011	○	○	○	○	○	○	○	○	○	○	
17	Scale seal	For wrist three axes		OP-N2-020	○	○	○	○	○	○	○	○	○	○	
18	Gas balancer unit Pressure gauge *1	Analog pressure gauge		KP-ZJ-013	○	○	○	○	○	○	○	○	○	○	
		Digital pressure gauge		KP-ZJ-014	○	○	○	○	○	○	○	○	○	○	
19	Gas balancer unit Charging equipment *1 *4	Charging unit (W22, pitch14, Female)		KP-ZJ-015	○	○	○	○	○	○	○	○	○	○	
		Charging unit (W23, pitch14, Male)		KP-ZJ-016	○	○	○	○	○	○	○	○	○	○	
		Joint of Female->Male (W22)		KP-ZJ-019	○	○	○	○	○	○	○	○	○	○	
		Analog pressure gauge		KP-ZJ-013	○	○	○	○	○	○	○	○	○	○	

*1 : These parts are packed separately from the robot. (Not attached on the robot)

*2 : A dog part for adjustable LS is included. If motion limit LS is not used, this dog is also not used.

*3 : Concerning the motion range limit options, please refer to the table in the next page.

*4 : If diameter of charging equipment is "W22, pitch14, Female, Right screw, Metal contacts", please prepare the charging equipment "KP-ZJ-015" and the joint "KP-ZJ-019".

■ Motion range limit option table (Please select the option part number to order referring to the following table.)

Function		Axis name	Motion range Limit Switch (dual circuit) 3pcs. set	Axis 1 adjustable stopper (including dog part for adjustable LS)	Axis 2 Adjustable LS dog part set	Axis 3 Adjustable LS dog part set	Axis 2 Adjustable stopper	Axis 3 Adjustable stopper
			OP-D7-008	OP-S5-019 *1	OP-S8-007	OP-S4-009	OP-A5-027 *1	OP-A6-023 *1
Without LS	Only adjustable stopper	Axis 1	—	● *2				
		Axis 2	—				●	
		Axis 3	—					●
Dual circuit Limit Switch	Motion range Limit Switch	Axis 1・2・3 (3 pcs.set)	●					
	Adjustable LS	Axis 2	●		●			
		Axis 3	●			●		
	Adjustable stopper and Adjustable LS	Axis 1	●	●				
		Axis 2	●		●		●	
		Axis 3	●			●		●

*1 : These parts are packed separately from the robot. (Not attached on the robot)

*2 : In this option, both axis 1 adjustable stopper and axis 1 adjustable LS dog part are supplied in 1 package.

(Please be sure that even if only the stopper part is used and no LS is used, the dog part is also included in this package)

(Example 1) To add only an adjustable stopper for axis 2, please order;
OP-A5-027.

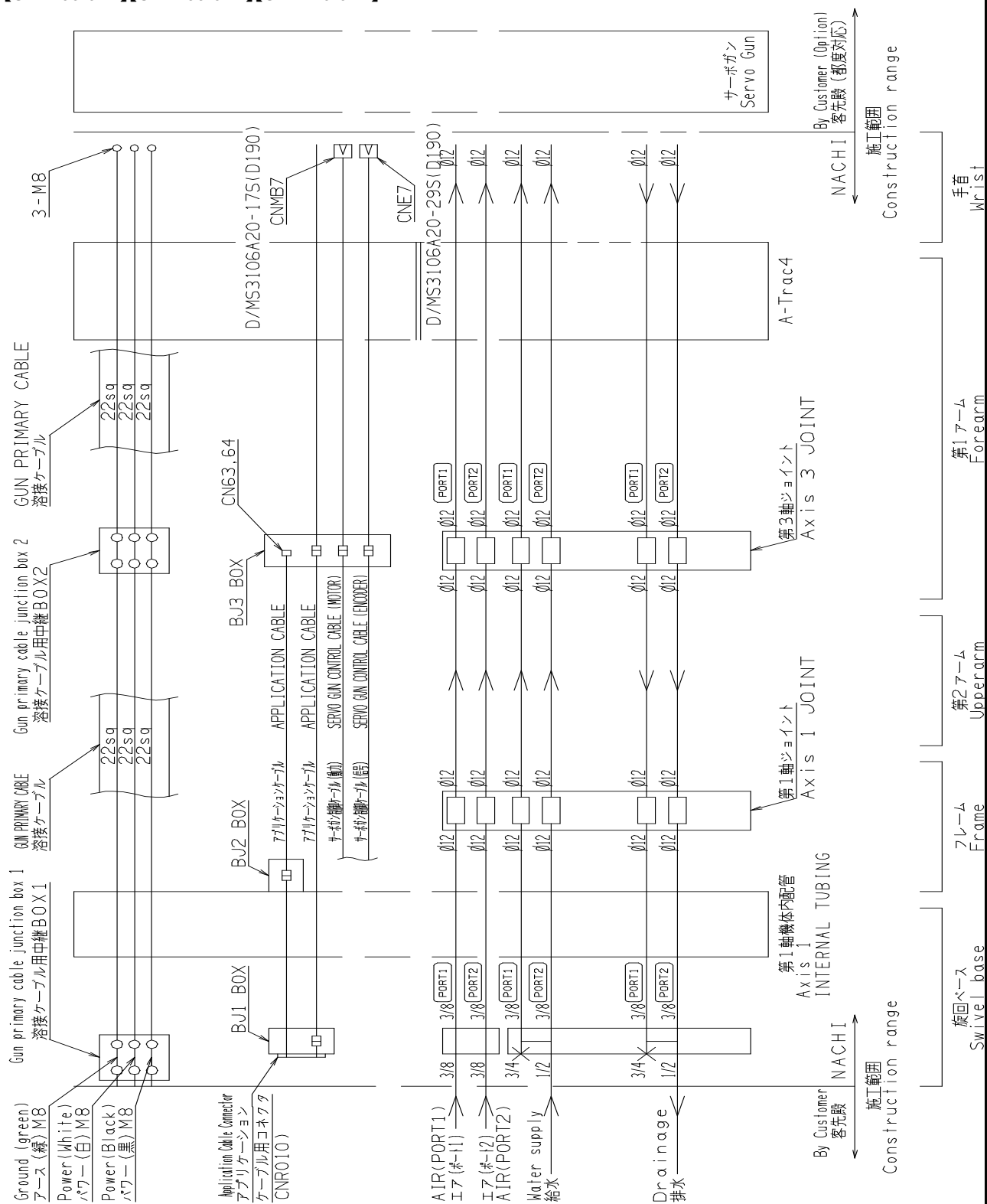
(Example 2) To add dual circuit adjustable limit switch for axis 2 and 3, please order the following options.
OP-D7-008、OP-S8-007、OP-S4-009

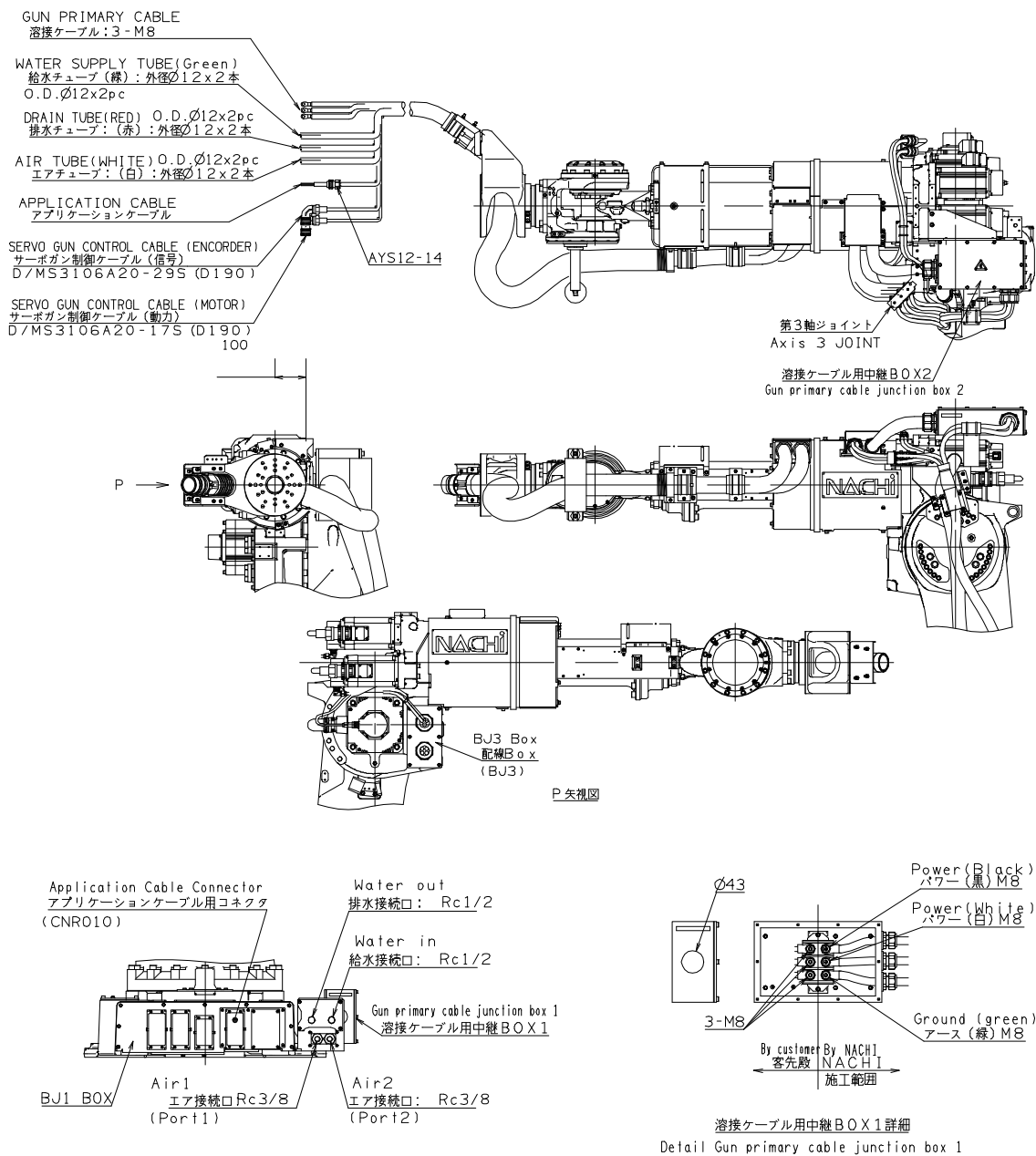
(NOTE) To use the limit switch for axis 1 as an adjustable limit switch, OP-S5-019 is also necessary.

8. Application wiring and piping diagram

■ Spot specification

【SRA100-01A】【SRA166-01A】【SRA210-01A】

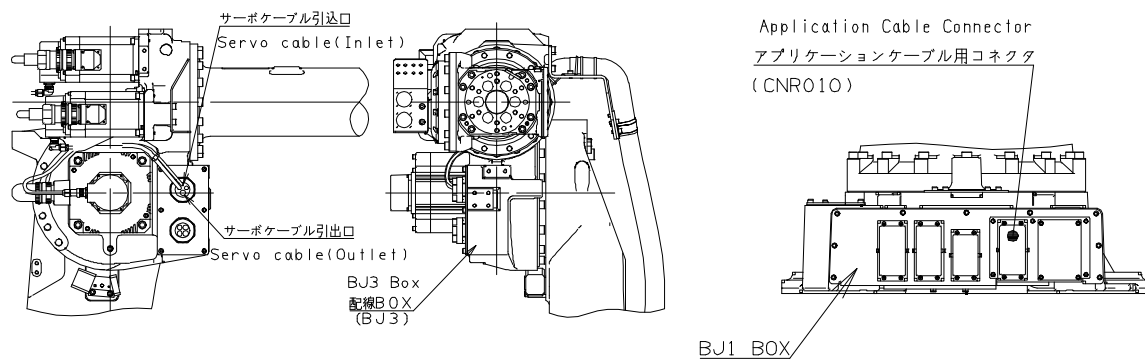
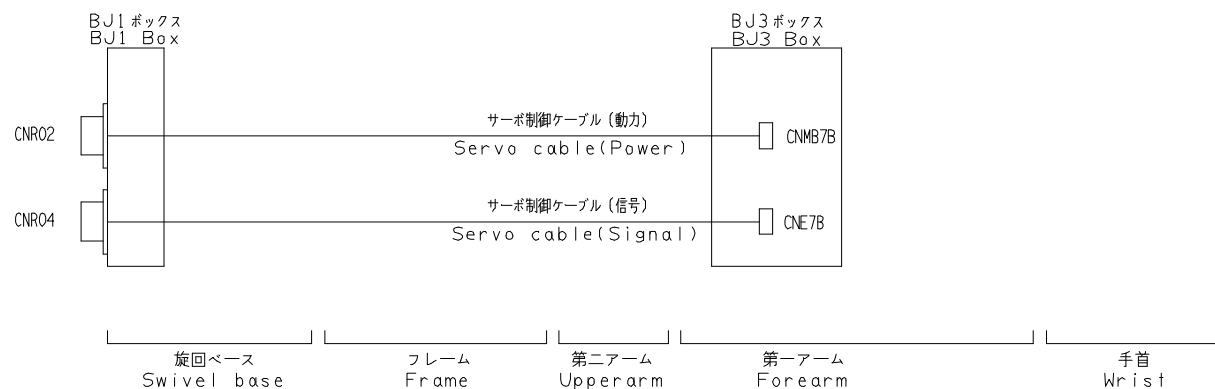




※ In wiring BOX (BJ3 BOX), there is an “application connector of BJ3 side”.

■ Standard specification

【SRA100-01】【SRA166-01】【SRA210-01】【SRA240-01】【SRA120EL-01】【SRA133L-01】【SRA166L-01】



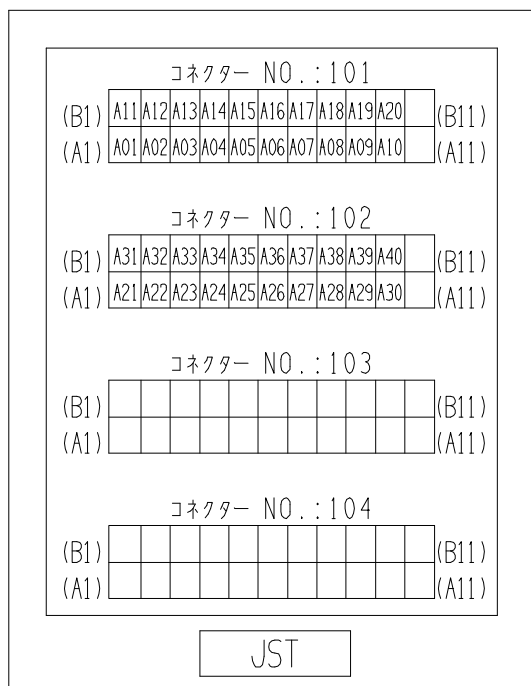
※ In wiring BOX (BJ3 BOX), there is an “application connector of BJ3 side”.

■ Detailed diagram of the application connectors

【SRA100-01A】【SRA166-01A】【SRA210-01A】

(These are option for 【SRA100-01】【SRA166-01】【SRA210-01】【SRA240-01】【SRA120EL-01】【SRA133L-01】【SRA166L-01】)

(1) BJ1 side (connector)



User-side Connectors

Wire-side shell: JFM-WSA-4-A (JST)

or JFM-WSA-4-C (JST)

Guide plate A kit: JFM-GPAK-4 (JST)

Receptacle housing: JFM2FDN-22V-K (JST)

Receptacle contact:

a: SJ2F-01GF-P1.0 (JST) (0.20 ~ 0.50sq)

b: SJ2F-21GF-P1.0 (JST) (0.30 ~ 0.75sq)

Manual crimp tool:

a: YRS-8861

b: YRF-1120

Cable diameter suitable for wire-side shell:

JFM-WSA-4-A $\phi 26.2 \sim \phi 28.0$

JFM-WSA-4-C $\phi 15.5 \sim \phi 16.5$

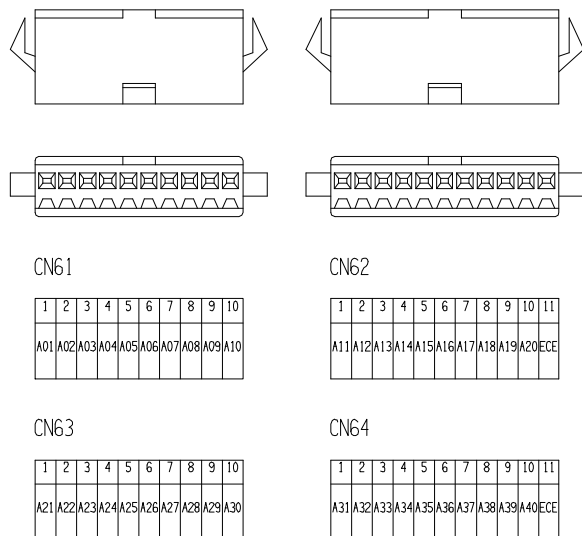
(Pin location shows the connector mounted on robot body and is the view from connecting side.)

Application wiring specification

Rated voltage Max. AC/DC 115 V

Rated current rating Max. 1 A

(2) BJ3 side (connector)



Connector form (CN61, CN63)

Housing SMP-10V-BC (JST)

User-side Connectors

Housing SMR-10V-B (JST)

Contact SYM-001T-P0.6 (Wire of Application : AWG#22~28)

Pressure tool YRS-121

Connector form (CN62, CN64)

Housing SMP-11V-BC (JST)

User-side Connectors

Housing SMR-11V-B (JST)

Contact SYM-001T-P0.6 (Wire of Application : AWG#22~28)





Pressure tool YRS-121

※ In spot specification, CN61 and CN62 are connected directly with the wrist flange as an application cable. Connectors are not attached.

9. Transport procedure

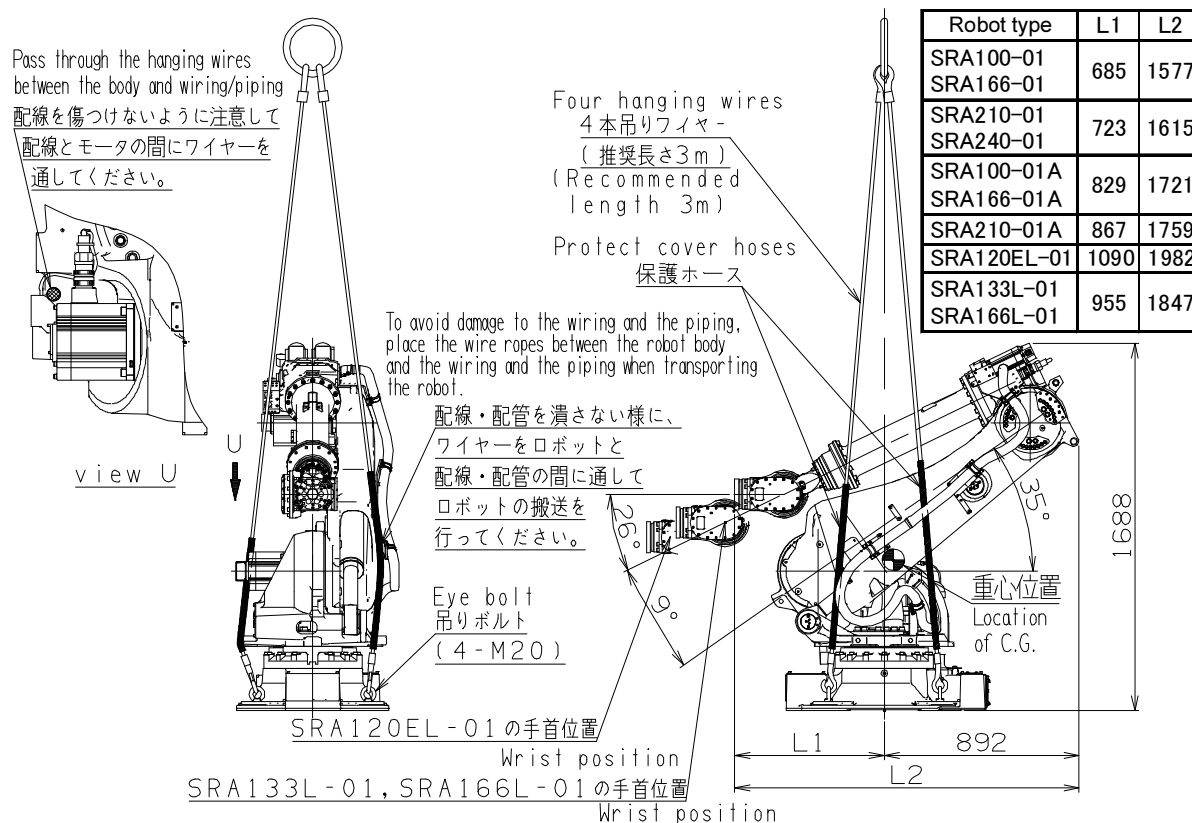
Safety measures against transport

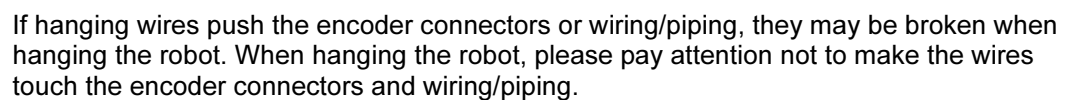
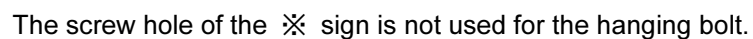
The following describes precautions for transporting the robot. Fully understand the precautions for safe transport work.

 WARNING	The robot must be transported by personnel who have licenses required for slinging work, crane operation, forklift truck operation, and others. The weight of the robot and controller is listed in the Operating Manual and the Maintenance Manual. Check for the weight, and then handle them according to procedures suitable for the weight.
 WARNING	To lift the robot or the controller, follow the procedures specified in the Maintenance Manual. Following any procedures other than those specified will cause the robot to topple over or drop during transport, thus resulting in accidents.
 WARNING	During transport or installation work of the robot, pay utmost care not to cause damage to wirings. Furthermore, after installing the robot, take protective measures such as using protective guards so that the wirings will not be damaged by workers or other persons, or forklift trucks or else.
 WARNING	Gas in balancer must be released when robot is transported by air. Gas in balancer must be charged before using robot, so customer needs to prepare the nitrogen gas and charging unit. Please contact to NACHI-FUJIKOSHI office to order the charging unit. Charging procedure is written in manipulator maintenance manual.

To transport the robot, make it a rule to use a crane.

At first, put the robot into the configuration shown in figure below and mount the four M20 hanger bolts to the swivel base. Then, be sure to lift the robot using four hanging wires. For this purpose, it is recommended to use hanging wires of 3 m in length and protect areas that contact the robot, using rubber hoses to cover the wire ropes. For the areas to be covered with the rubber hoses refer to figure below.





第1軸工
Axis 1 Enc

第2軸工
Axis 2 Enc

—ダコネクタ
Connector
—ダコネクタ
Connector

第1軸エンコーダコネ
Axis 1 Encoder Connector
第2軸エンコーダコネ
Axis 2 Encoder Connector

10. Delivery style (specification which contains a robot)

1. There are three styles as shown below.

	Style	Details
1	Delivery on the truck	Robot is delivered on the truck near the entrance of customer's plant. (Installation and test-run is not included)
2	Delivery after installation and test-run	Robot is installed and test-run is done. (Teaching with work piece is not included.)
3	Delivery after installation and teaching with work piece	After style 2, teaching with work piece is done.

Because the expense is different, which form to choose be sufficiently examined.

Gas in balancer is not filled when robot is transported by air. Gas in balancer must be charged before using robot, so customer needs to prepare the nitrogen gas and charging unit. Please contact to NACHI-FUJIKOSHI office to order the charging unit. Charging procedure is written in manipulator maintenance manual.

2. Operation and maintenance education

The special spot operation guide and the special spot preservation guide are the outside of the estimation. Consult with each NACHI-FUJIKOSHI office for the details as for the schooling system.

11. Consuming power (Robot + Controller)

7.0 kVA (may vary according to the application and motion pattern.)


12. Paint color

Standard color	Controller cabinet	Munsell 10GY9/1
	Robot body	Munsell 10GY9/1

13. Warranty

Elapse of 1 year after delivery. (8 hours/day running)

The specification and externals described in this specifications might change without a previous notice for the improvement.

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San Antonio Service Office	Use 248-305-6545	Use 248-305-6542	Texas, U.S.A.
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United Kingdom		http://www.nachi.co.uk/	
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Czech Republic		http://www.nachi.co.kr/	
Nachi Europe	Phone: + 420-255-734-000 Fax: +420-255-734-001	Prague 9, VGP Park, Czech republic	
NACHI ROBOTIC ASIA		http://www.nachi-korea.co.kr/	
Korea		2F Dongsan Bldg. 276-4, Sungsu 2GA-3DONG, Sungdong-ku, Seoul 133-123, KOREA	
Korea	Phone: +82-(0)2-469-2254 Fax: +82-(0)2-469-2264		

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