General Purpose Robot Arm for Industry Use

ZERO

Articulated Robot Specifications

Document Number : M-0104-210831

August 2021

Manipulator Specifications

Item		Unit	ZRA-0503P	ZRA-0515P	ZRA-0502N	ZRA-0514N
Structure		—	Articulated robot			
Degrees of motion freedom		—	6			
Mount direction		—	Floor, Ceiling			
Drive system		—	BLDC motor			
Position detection method		—	Multi-turn Absolute Encoder (Battery Backup)			
Position control method		—	Servo control			
Break		—	J1, J2, J3: Holding brake (Disc brake) J4, J5, J6: Holding brake (Mechanical stopper)			
Payload (*1)	Standard	kg	5			
	Maximum		7	5	7	5
Arm Length (1st Arm + 2nd Arm)		mm	660 (390 + 270)	860 (490 + 370)	660 (320 + 340)	860 (420 + 440)
Work area		mm	1320	1720	1320	1720
Motion range (*2)	J1	deg	480 (± 240)	480 (± 240)	480 (± 240)	480 (± 240)
	J2		480 (± 240)	480 (± 240)	480 (± 240)	480 (± 240)
	J3		480 (± 240)	480 (± 240)	300 (± 150)	300 (± 150)
	J4		480 (± 240)	480 (± 240)	480 (± 240)	480 (± 240)
	J5		480 (± 240)	480 (± 240)	480 (± 240)	480 (± 240)
	J6		720 (± 360)	720 (± 360)	720 (± 360)	720 (± 360)
Resultant Velocity (*3)		mm/sec	4420	5540	4570	5700
Repeatablity		mm	±0.02			
Permissible load inertia (*5)	J4	$x10^{-4}$ $kg \cdot m^2$	0.15	0.15	0.15	0.15
	J5		0.27	0.27	0.27	0.27
	J6		0.33	0.33	0.33	0.33
Dimensions		—	149 x 331 x 873	149 x 331 x 1073	149 x 331 x 873	149 x 331 x 1073
Weight		kg	17.2	17.5	17.2	17.5
Compatible controller		—	ZC1***			
Arm I/O (for Tool)		—	8 input ports, 4 output ports / Asynchronous communication RS-422 1 port / DC 24 power output			
Manipulator cable length		m	3			
Manipulator mount		—	M8 screws at 7 spots (refer the dimension drawing) (*6)			
End-effector mount		—	M5 screws at 4 spots (refer the dimension drawing)			
Noise		dB	Under 70 (Based on our test)			

*1) The payload includes loads of tasks, weight of tools, and so. Allowable torque exceeding error c13 and overload error c14 may occur even within specification depending on the posture, speed, acceleration/deceleration time, direction of operation, etc. Adjust motion factors and variables then.

*2) Refer to" Coordinate Systems" for information on definitions of axes. Depending upon arm postures, unreachable points exist even within the work envelop.
*3) Value is for a reference.
*4) In case of the maximum load at the maximum speed.
*5) Depends on operating conditions, such as acceleration and deceleration.
*6) Using screws of at least 30 mm long is recommended

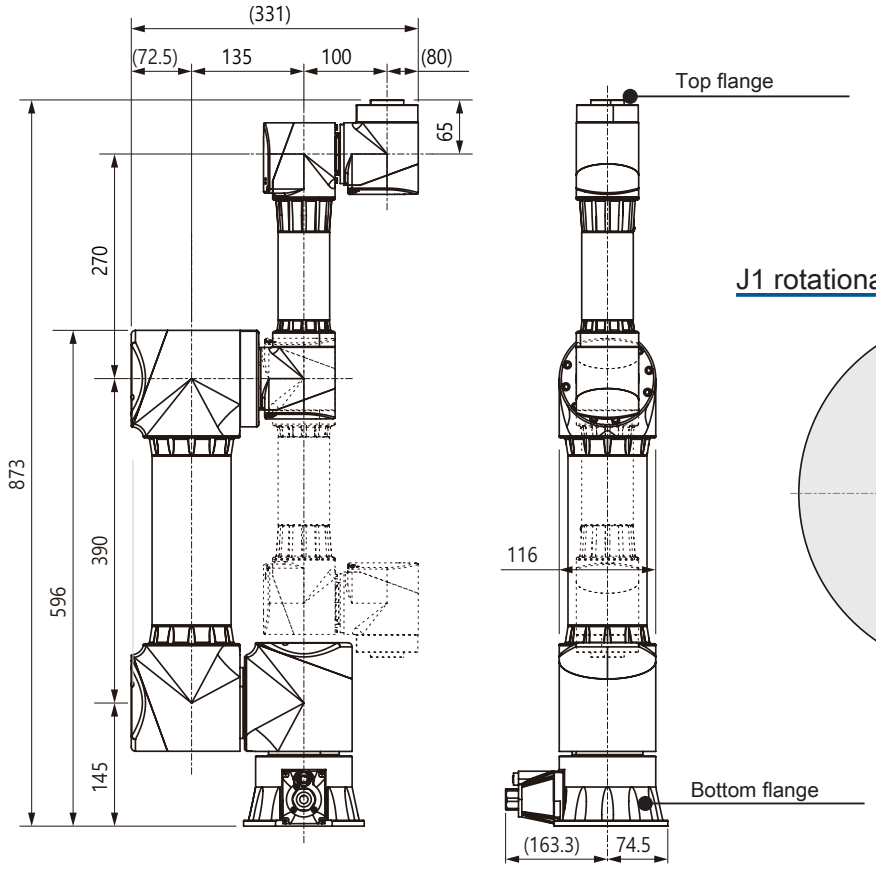
Replenishment) This product is a stop category "0". Corresponds to PL = d.

Manipulator Dimensions

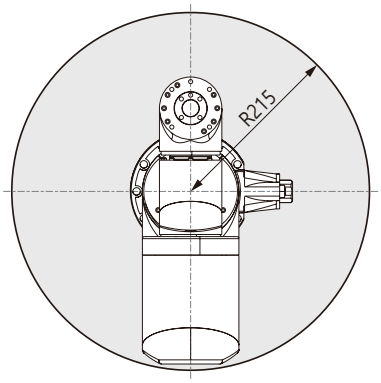
ZRA-0503P Arm Length: 660 mm Pass Through Type

Not to Scale

(mm)

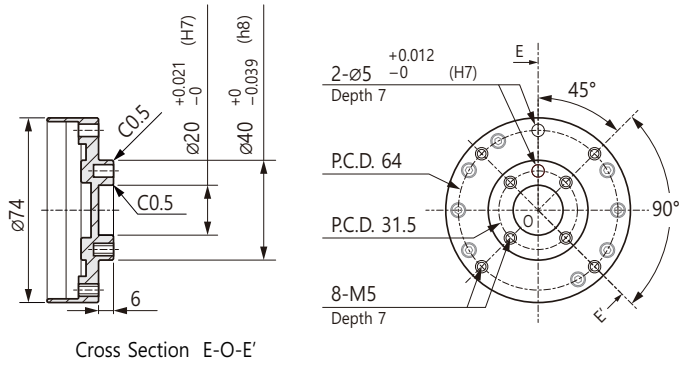


J1 rotational range



Top flange

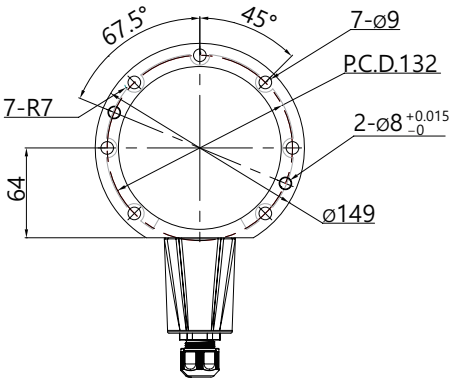
for end-effector attachment



Cross Section E-O-E'

Bottom flange

for mounting



Mounting bottom flange

To mount bottom flange, Using M8 hex sockethead cap screws of at least 30 mm long is recommended.

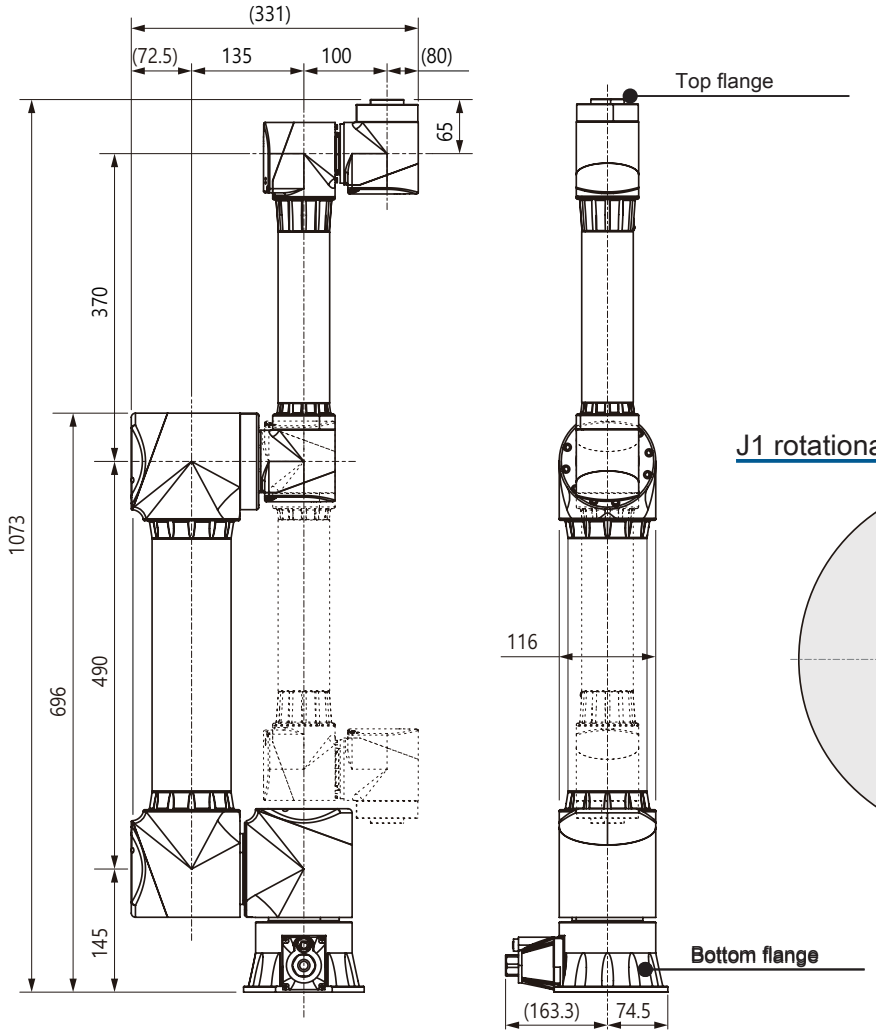
The recommended tightening torque is 22 Nm.

Manipulator Dimensions

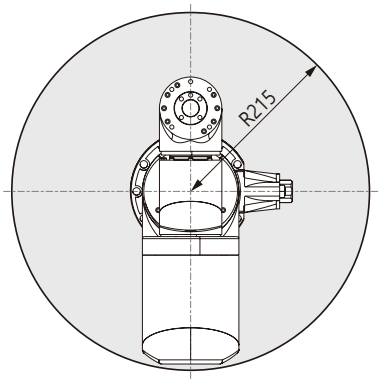
ZRA-0515P Arm Length: 860 mm Pass Through Type

Not to Scale

(mm)

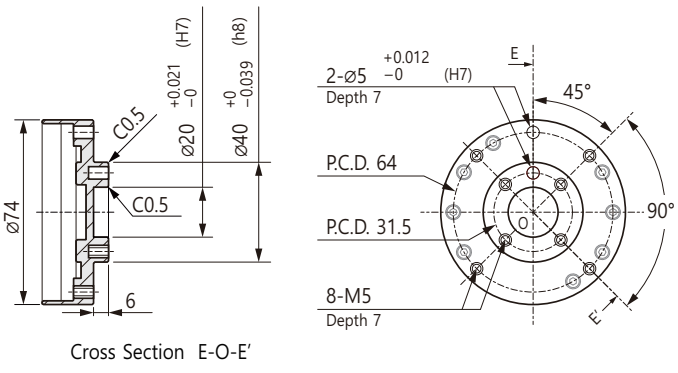


J1 rotational range



Top flange

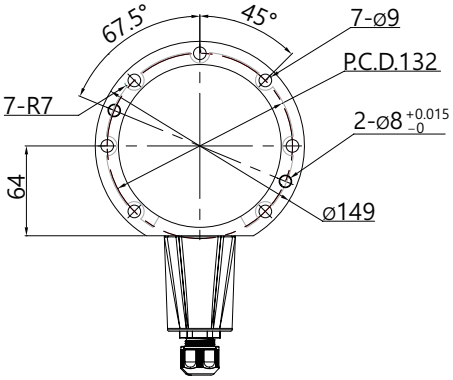
for end-effector attachment



Cross Section E-O-E'

Bottom flange

for mounting



Mounting bottom flange

To mount bottom flange, Using M8 hex sockethead cap screws of at least 30 mm long is recommended.

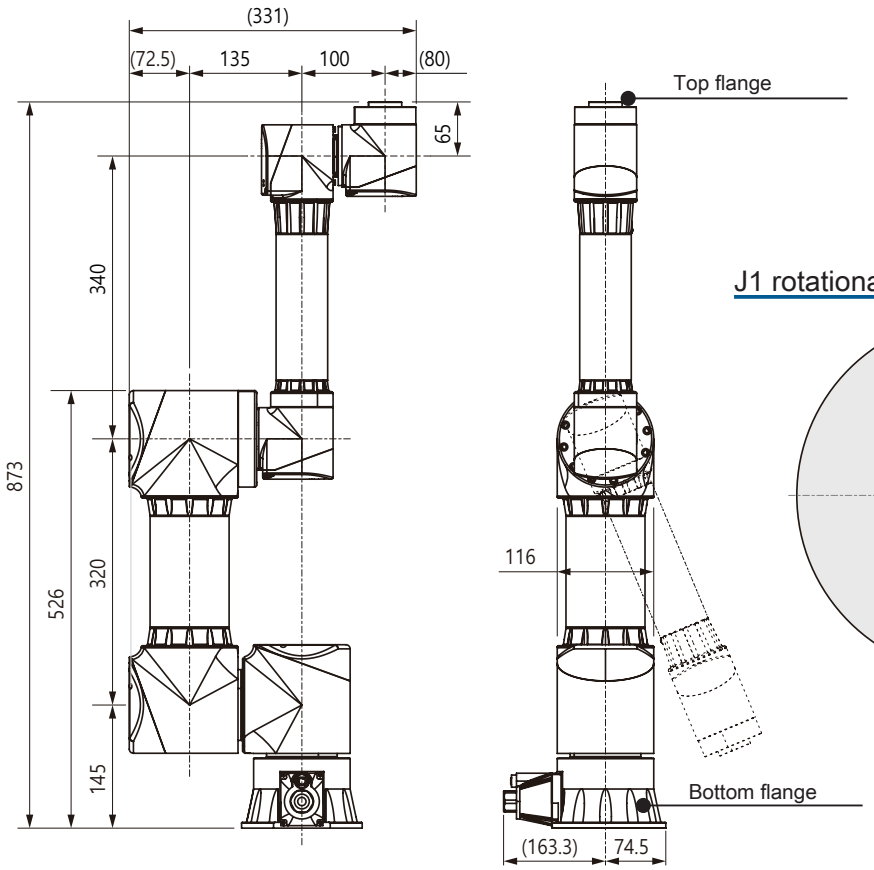
The recommended tightening torque is 22 Nm.

Manipulator Dimensions

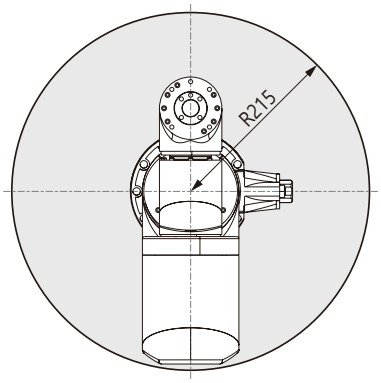
ZRA-0502N Arm Length: 660 mm Turn Around Motion Type

Not to Scale

(mm)

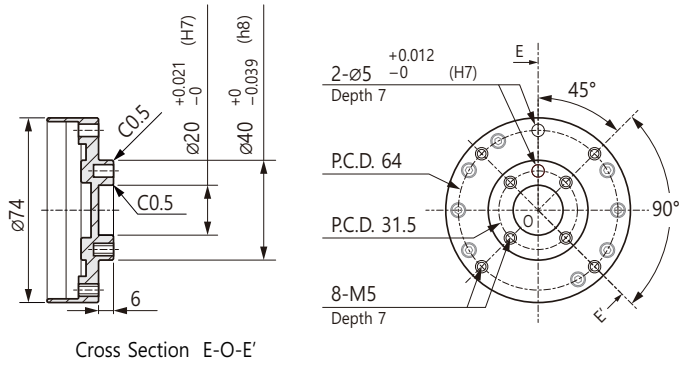


J1 rotational range



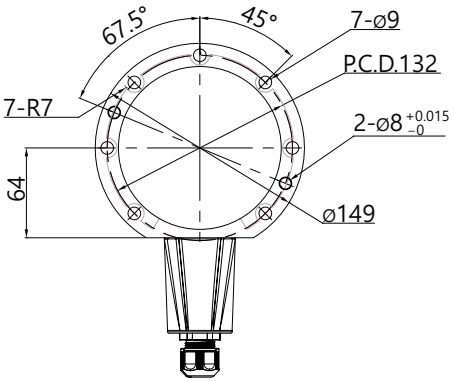
Top flange

for end-effector attachment



Bottom flange

for mounting



Mounting bottom flange

To mount bottom flange, Using M8 hex sockethead cap screws of at least 30 mm long is recommended.

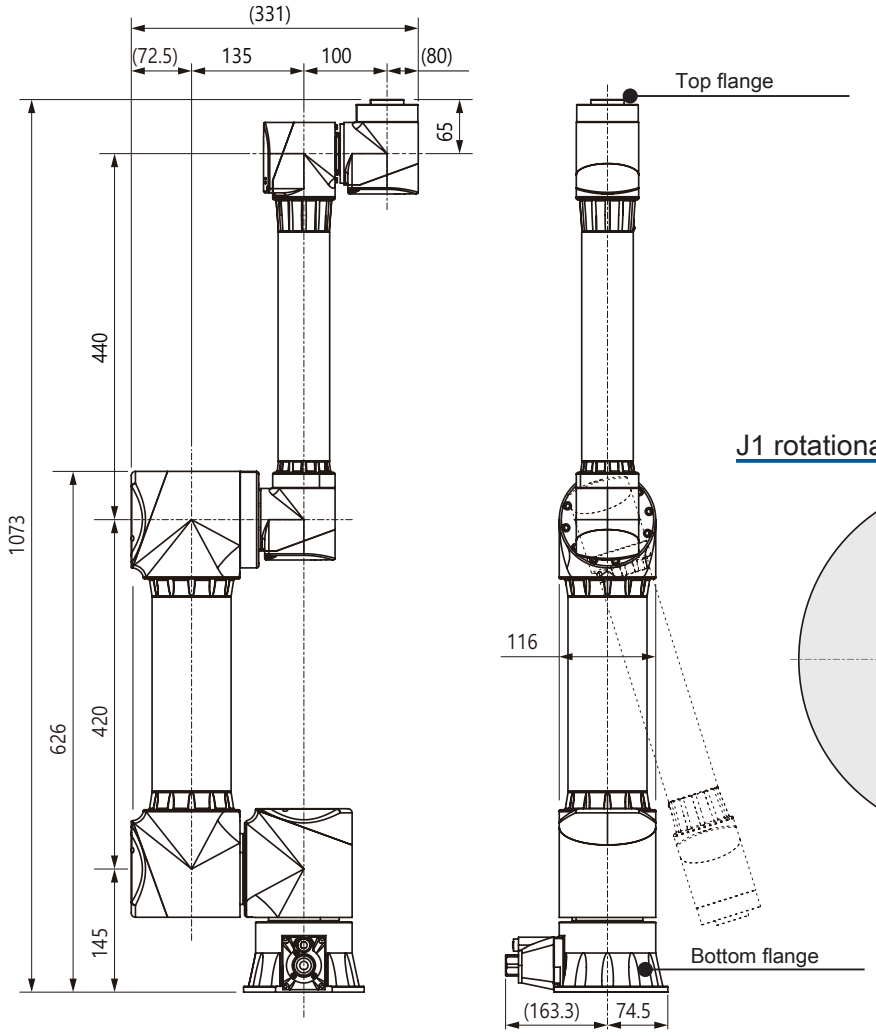
The recommended tightening torque is 22 Nm.

Manipulator Dimensions

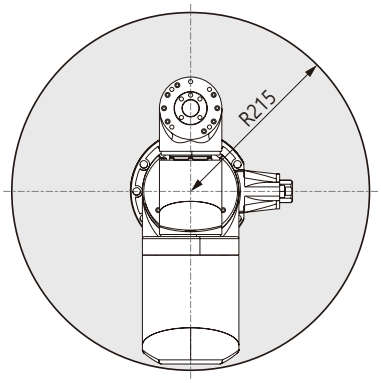
ZRA-0514N Arm Length: 860 mm Turn Around Motion Type

Not to Scale

(mm)

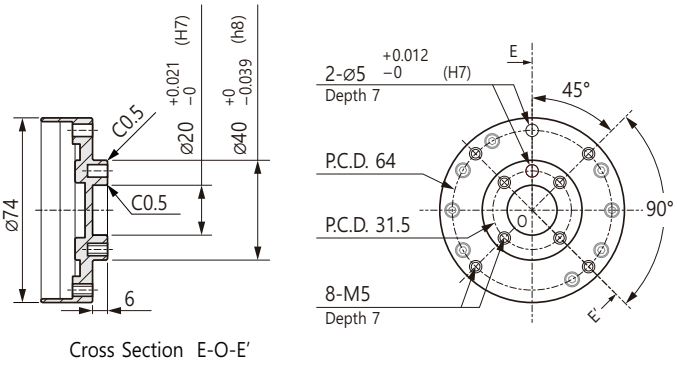


J1 rotational range



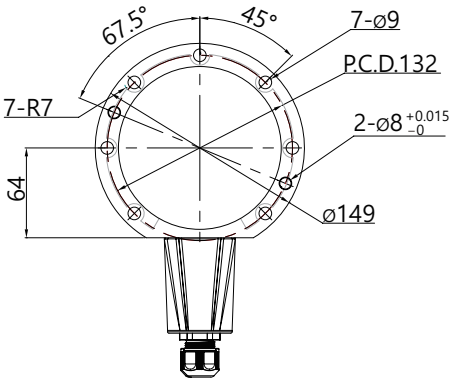
Top flange

for end-effector attachment



Bottom flange

for mounting



Mounting bottom flange

To mount bottom flange, Using M8 hex sockethead cap screws of at least 30 mm long is recommended.

The recommended tightening torque is 22 Nm.

Range of Movement

ZRA-0503P Arm Length: 660 mm Pass Through Type

Maximum reachable range of the top flange :

R725 sphere (around J2 rotantional axis)

1st Arm movable range

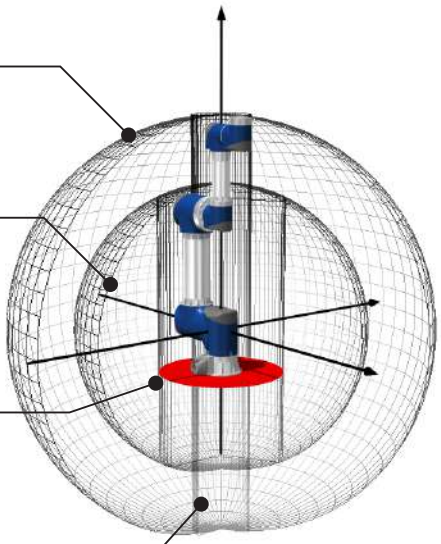
(where contact with the manipulator or pinch point risk exists)
R500 sphere (around J2 rotantional axis)

J1 minimum rotational range :

(where contact with the manipulator or pinch point risk exists at J2=0° , J3=180°)
R215 sphere (around J1 rotantional axis)

Unreachable points of the top flange
when top flange faces up or down:

R100 sphere (around J1 rotantional axis)



ZRA-0515P Arm Length: 860 mm Pass Through Type

Maximum reachable range of the top flange :

R925 sphere (around J2 rotantional axis)

1st Arm movable range

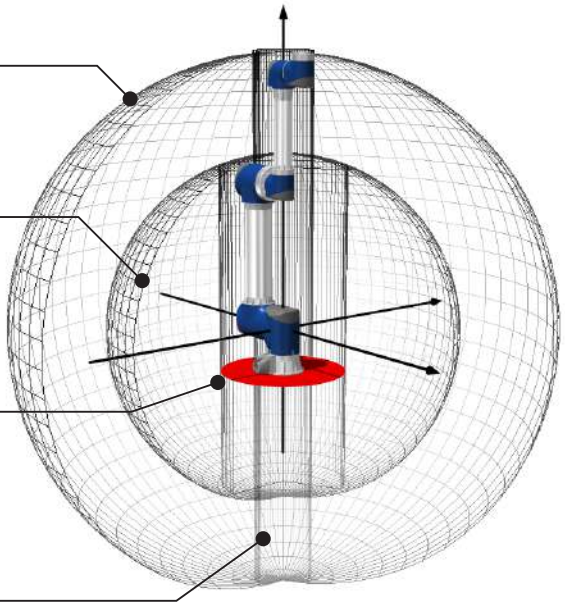
(where contact with the manipulator or pinch point risk exists)
R600 sphere (around J2 rotantional axis)

J1 minimum rotational range :

(where contact with the manipulator or pinch point risk exists at J2=0° , J3=180°)
R215 sphere (around J1 rotantional axis)

Unreachable points of the top flange
when top flange faces up or down:

R100 sphere (around J1 rotantional axis)



Replenishment

Depending upon arm postures, unreachable points exist even within the work envelop.

ZRA-0502N Arm Length: 660 mm Turn Around Motion Type

Maximum reachable range of the top flange :

R725 sphere (around J2 rotantional axis)

1st Arm movable range

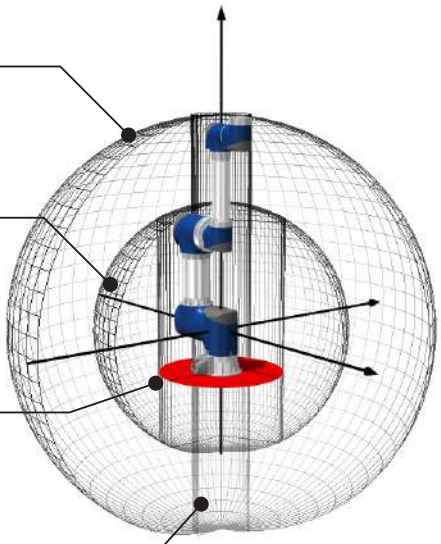
(where contact with the manipulator or pinch point risk exists)
R435 sphere (around J2 rotantional axis)

J1 minimum rotational range :

(where contact with the manipulator or pinch point risk exists at J2=0° , J3=180°)
R215 sphere (around J1 rotantional axis)

Unreachable points of the top flange
when top flange faces up or down:

R100 sphere (around J1 rotantional axis)



ZRA-0514N Arm Length: 860 mm Turn Around Motion Type

Maximum reachable range of the top flange :

R925 sphere (around J2 rotantional axis)

1st Arm movable range

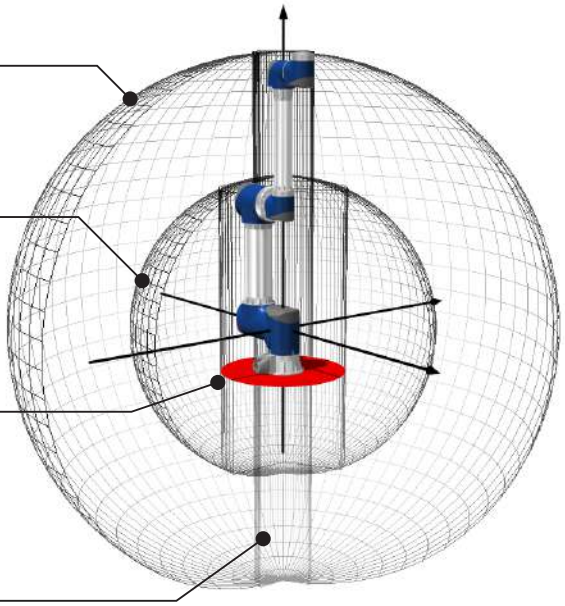
(where contact with the manipulator or pinch point risk exists)
R520 sphere (around J2 rotantional axis)

J1 minimum rotational range :

(where contact with the manipulator or pinch point risk exists at J2=0° , J3=180°)
R215 sphere (around J1 rotantional axis)

Unreachable points of the top flange
when top flange faces up or down:

R100 sphere (around J1 rotantional axis)



Replenishment

Depending upon arm postures, unreachable points exist even within the work envelop.

Recommended End-effector Structure

Caution

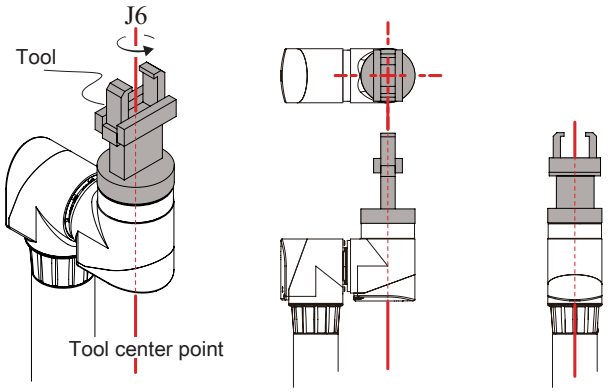
When designing an end-effector which will be attached to the tool center point, thoroughly validate manipulator postures and motion ranges. See below for examples.

Example 1

Recommended

The rotational axis of Rz and the central axis of the tool are coaxial.

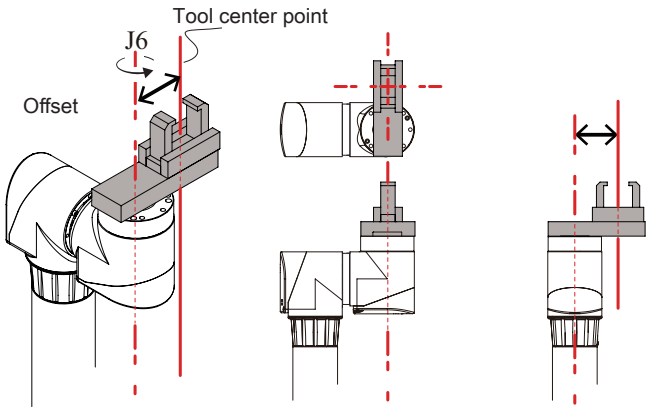
Note that the longer the distance between the tool center point and the end of the tool is, the larger the payload to the manipulator becomes, which may result in vibrations or slower motion speed.



Example 2

Not Recommended

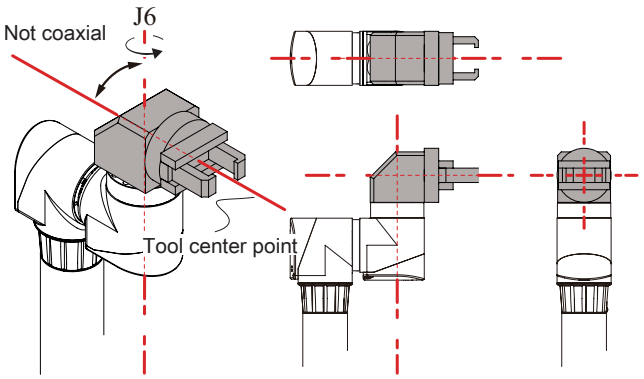
Because an offset exists between the central axis of the tool and the Rz rotational axis, the robot may become unable to handle a workpiece.



Example 3

Not Recommended

Because the central axis of the tool and the Rz rotational axis are not coaxial, the robot may become unable to handle a work piece.



Controller Specifications

Item		ZC1000	ZC1001	Note
Compatible Manipulator		ZERO series		In case using Teaching Pendant(ZP1000) ZC1001 is necessary
General Specifications	Dimensions	(See a dimension drawing)		The overhang is not included
	Weight	5 kg		—
	Number of Control Axes	6 axes		—
	Programming Method	Off-line programming with a PC		Application programs are transferred with TFP and executed.
	Programming language	Python		Use the special libraries for the robot operation
	Storage Memory	eMMC		—
	Teaching method	PC Jog Stick	PC Jog Stick Teaching Pendant	Monitoring, storing and controlling data via http with a web browser
Display function	7-segment display panel	3 digits		—
	Status LED indicators	3 lamps		—
Interface (Controller)	Manipulator Connector	1 Port		—
	Input	16 Bit		Isolated; selection of high-side or low-side
	Output	16 Bit		Isolated; selection of high-side or low-side
	Safety	1 Port		EMS x 2; Mode; Servo-On input Servo power monitor
	Ethernet	2 Port		—
	USB	2 Port		—
	JOG Stick	1 Port		A special input device I/F for teaching
Interface (Arm I/O)	Digital input	8 Bit		Not isolated; comparator input
	Digital output	4 Bit		Non-isolated; high-side switch
	Asynchronous communication	1 Ch		RS422/RS485
	Power output	24 V		0.2 A max
Specifications of Power supply(*)	Voltage	Single-phase 100 VAC - 240 VAC		—
	Frequency	50 Hz - 60 Hz		—
	Current	2.7 A, 230 VAC / 5.4 A, 115 VAC		—
	In-rush current	75 A, 230 VAC		—
	leakage current	5.0 mA, 240 VAC		—
	Rated short circuit current	1,500 A		UL File No. E10480
Grounding		Type 3 grounding or above		Grounding resistance value of 100 Ω or below
Safety	Rating	ISO 10218-1		Certified
	Voltage-resistance	1,500 VAC		Primary-FG, 1 minute
	Insulation resistance	1 M Ω or above		I/P - FG 500VDC / 25℃ / 70%RH
EMC		EN61000-6-2:2005 EN55011 : 2009+A1:2010		Heavy industrial level

*) Voltage variation should be within input voltage range

Be no power outage more than 20 ms.

Gain sufficient power including in-rush current

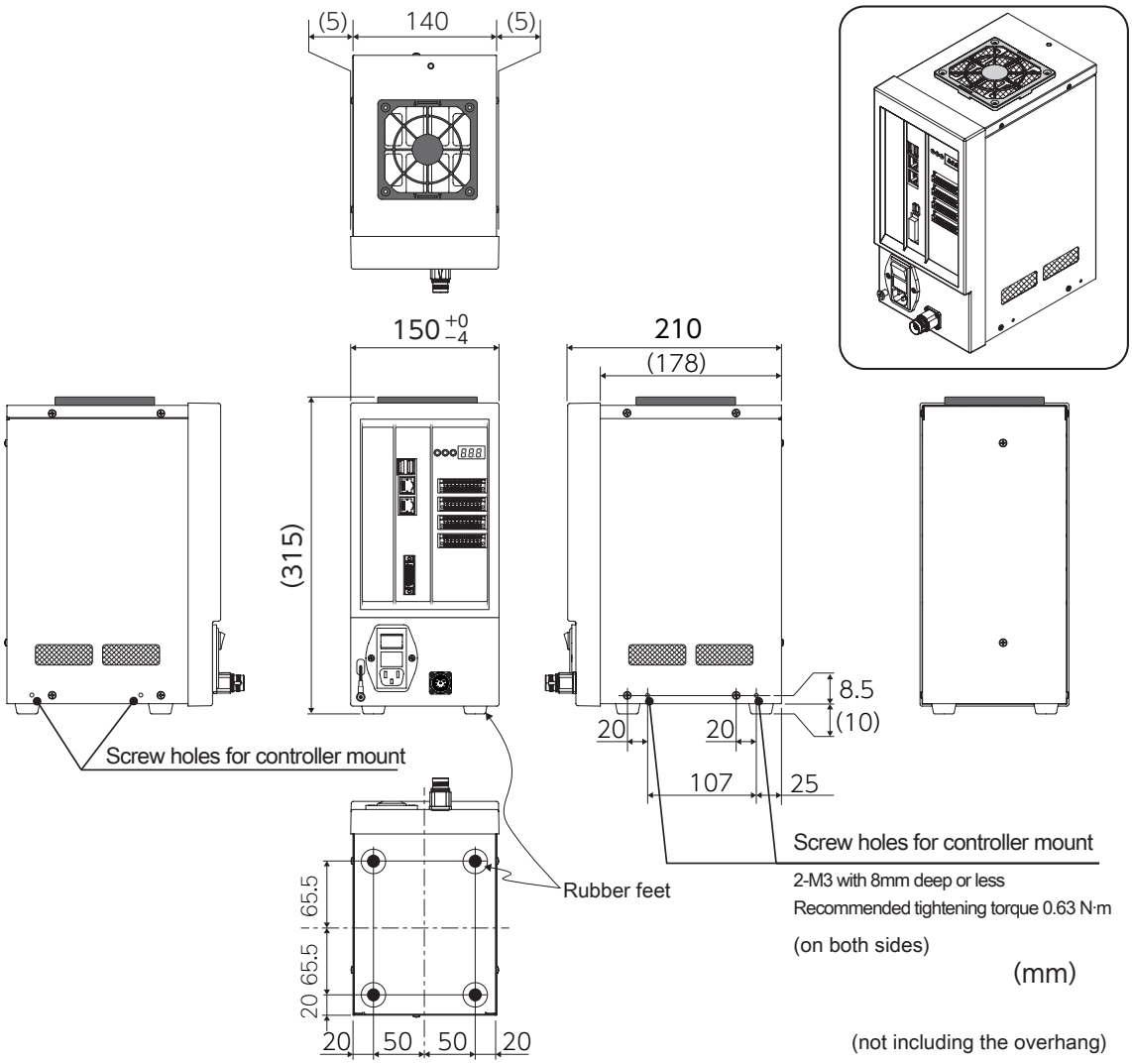
Use fuses with rated current: 8A, rated breaking capacity: AC250 V / 1,500A

The specification items and their contents described in this document are general information. For more details, please refer to a copy of the document " SPECIFICATIONS" included in the product.

Controller Dimensions

CAUTION

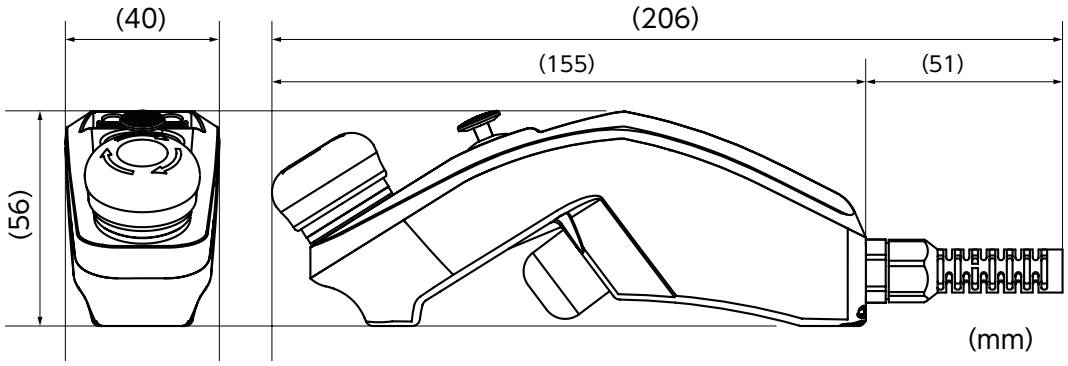
When designing a metal fitting, make it so that the cover fixing screws are 20 mm away from the controller mount holes and also the air inlets will not be blocked.



JOG Stick Specifications

Item		Specification	Remark
General Specifications	Model	ZJ1000	—
	Dimensions	H56 mm × D155 mm × W40 mm	Not including a cable
	Weight	600 g or less	—
	Frame material	ABS resin	Color: Yellow / Black
	Power supply volatage	DC24 V ± 10%	—
	Power consumption	5 W or less	—
	Cable length	5 m	—
Environmental Specifications	Operating temperature	0 ℃ – 40 ℃	—
	Operating humidity	30 % – 85 %	—
	Storage temperature	- 40 ℃ – 85 ℃	—
	Storage humidity	10 % – 90 %	—
	Cooling	Natural cooling	—

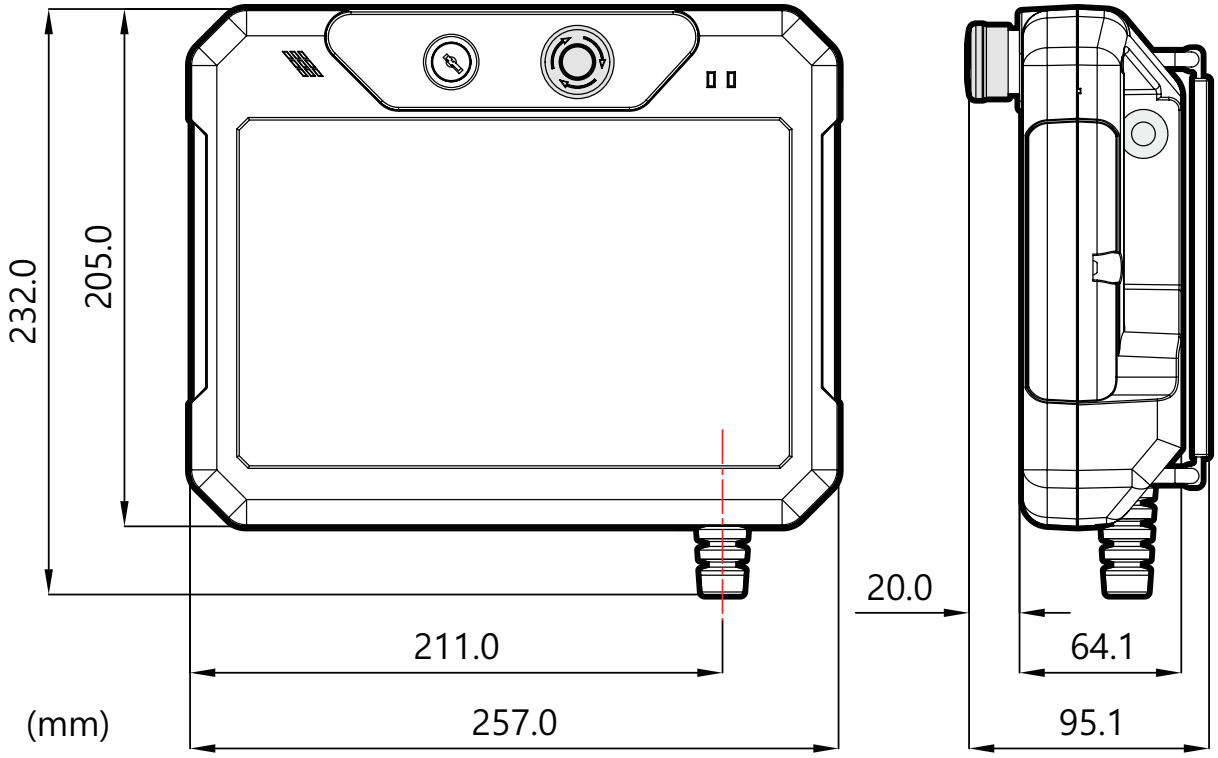
JOG Stick Dimensions



Teaching Pendant Specifications

Item		Specification	Remark
General Specifications	Model	ZP1000	—
	Dimensions	H95.1 mm × D257 mm × W205 mm	Not including a cable
	Weight	1.2 kg or less	—
	Frame material	PC + ABS resin	Color: Black
	Power supply volatage	DC24 V ± 10%	—
	Power consumption	12 W or less	—
	Cable length	3 m	—
Environmental Specifications	Operating temperature	0 ℃ – 40 ℃	—
	Operating humidity	30 % – 85 %	—
	Storage temperature	- 40 ℃ – 85 ℃	—
	Storage humidity	10 % – 90 %	—
	Cooling	Natural cooling	—

Teaching Pendant Dimensions



(not including the bumper and cable)

Customer service center
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e-mail : zero@globalzeus.com