IAI
Quality and Innovation

Rotational Axis Specification
Pick & Rotate Specification Series Added

High-speed Cartesian Robot CT4

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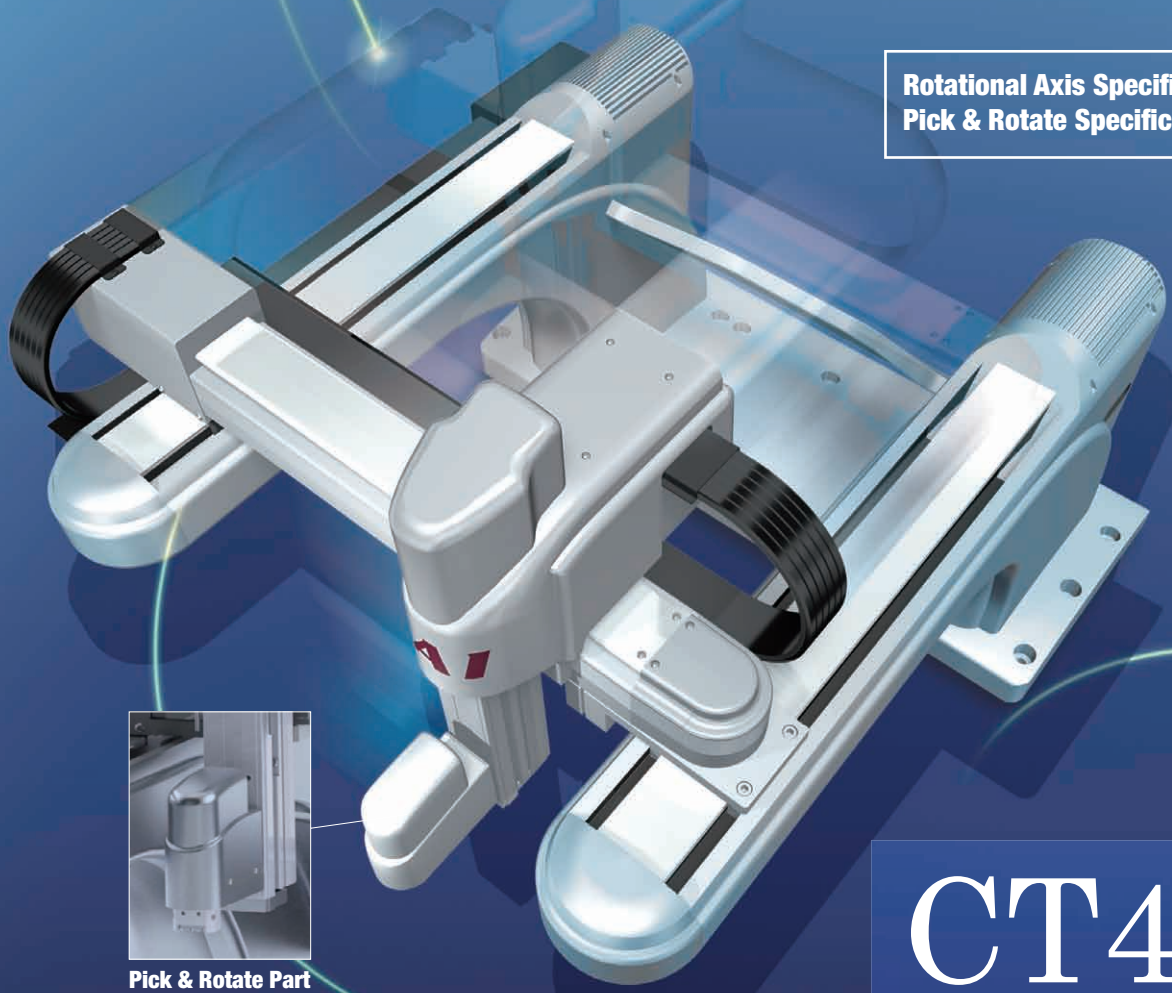
High-speed Cartesian Robot That Shortens Assembly/Inspection Cycle Times by Operating at High Speed, Ensuring High Rigidity and Demonstrating Excellent Linear Motion Performance

High-speed operation with commanded acceleration of up to 3.2 G (maximum instantaneous acceleration: 4.8 G)

Rotational Axis Specification
Pick & Rotate Specification Series Added



Pick & Rotate Part

CT4
Cartesian4AXIS

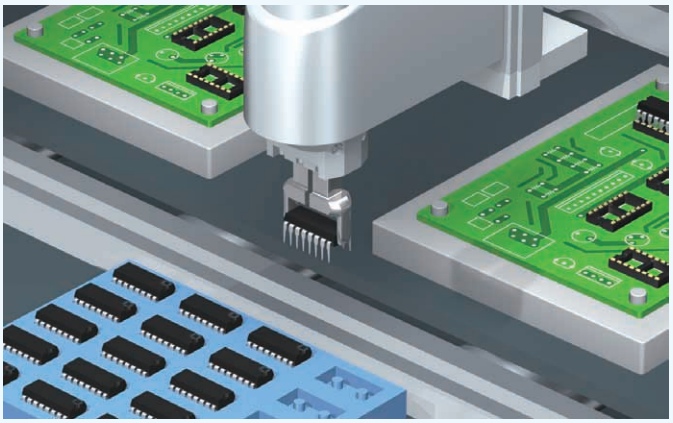
Function Comparison Table of High-speed Cartesian Robot

	High-speed Cartesian Robot CT4	Multi-jointed Robot	Parallel-link Robot
1. Speed, acceleration/deceleration	◎	○	◎
2. Rigidity	◎	○	○
3. Robot size and operating range	◎	○	○
4. Linear motion performance	◎	△	△

Note) The evaluations under “Multi-jointed robot” and “Parallel-link robot” are based on IAI’s evaluations of standard robots.
◎: Good / ○: Average / △: Not very good

1 Pick & Rotate Specification Added

CT4 Series, appraised for the superior high-speed performance, is now equipped with a variation of Pick & Rotate specification which provides a grip-and-turn function.
The grip-and-turn function, for light work pieces, allows efficient handling of materials and shapes which are difficult to grip by vacuum.

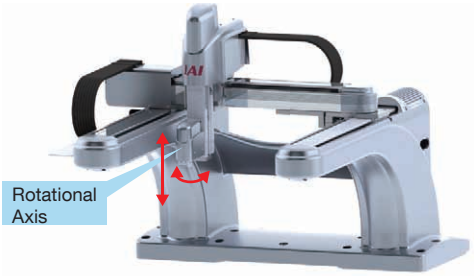


[Characteristics of Pick and Rotate Specification]

- **Integrated Unit of Grip and Turn**
  Integration of grip and rotation into one axis has made the device smaller and lighter and has enabled higher performance in operation speed.
- **Unique Gripping Feature**
  The gripping operation is accomplished with springs and utilizes a solenoid for release.
- **Floating of Gripping Feature and Rotary Feature (Patent Pending)**
  Since the cables for gripping feature do not get twisted during rotation, cables will not break.

2 Rotational Axis Specification is Available

There is also a model equipped with an ultra-small rotational axis on the tip of the vertical axis. This allows shift and alignment of the transported work pieces, with an orientation change.

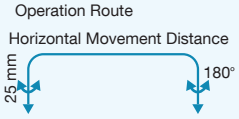


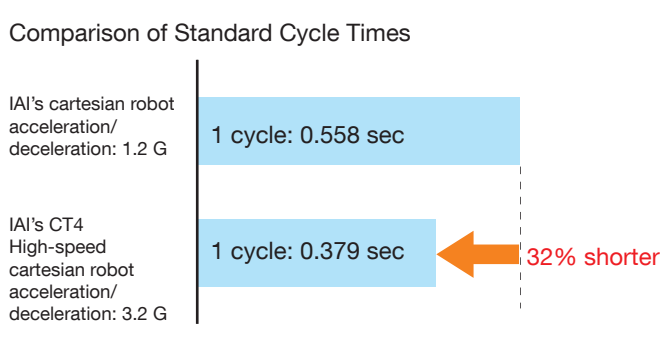
3 High Speed & High Acceleration/Deceleration

Shorten the cycle time of your equipment by operating at the maximum speed of **2500 mm/s** and maximum acceleration of **3.2 G**.

The standard cycle time (Note) is 32% less than a conventional cartesian robot.

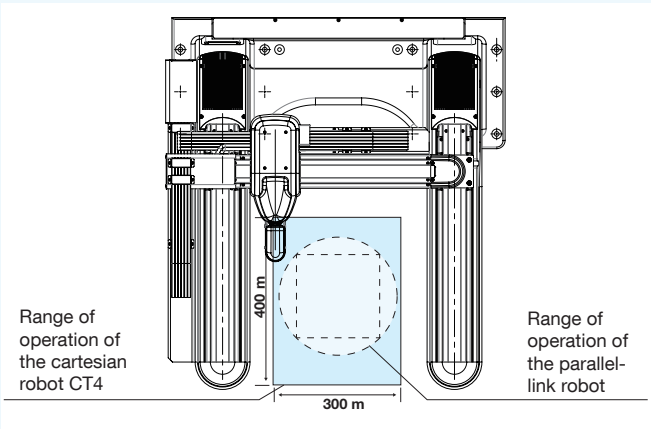
(Note) Cycle time is a function of the bidirectional travel of: vertical movement of 25 mm, horizontal movement of 200 mm and rotational movement of 180°, as shown in the figure on the right.





4 Efficient Operation Range

A wide operation range of 400 mm (X-axis) x 300 mm (Y-axis) is ensured. Square operation ranges have no wasted space and are more efficient compared to those of multi-jointed robots and parallel-link robots that can only operate in circles due to their structure.



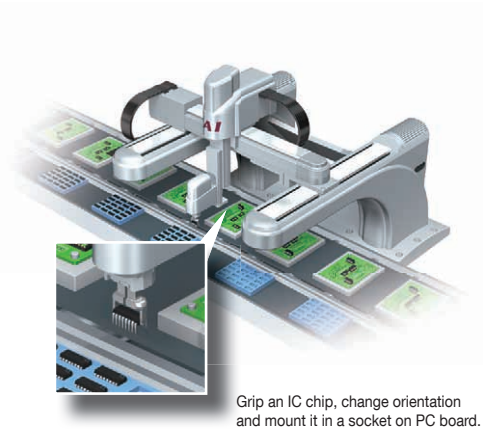
5 High Rigidity, Easy to Install

Boasting high frame rigidity, the CT4 has great acceleration capabilities and is subject to less vibration. While the parallel-link robot is installed above the work part and thus normally requires a dedicated base, the CT4 can be installed easily on a plane at the same height as the work part.

Examples of Applications

Mounting electric components

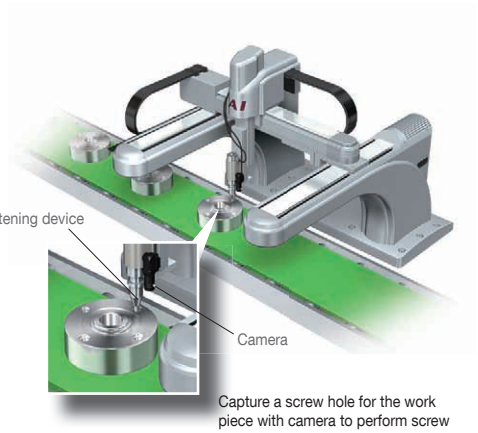
High-speed cartesian robot
(Pick & Rotate specification)
CT4-G1PR



Grip an IC chip, change orientation and mount it in a socket on PC board.

Installing screws in automobile parts

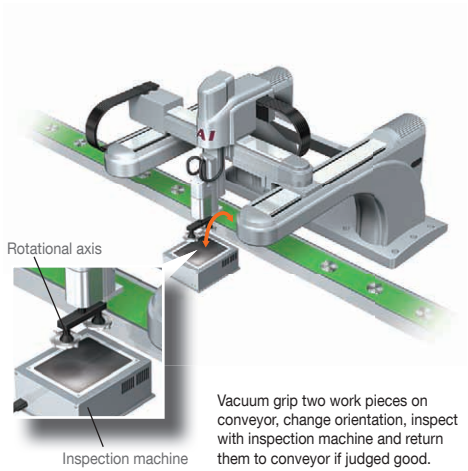
High-speed cartesian robot
(standard specification) + vision sensor
CT4-G1



Capture a screw hole for the work piece with camera to perform screw tightening.

Feeding/taking out work parts to/from a part inspection machine

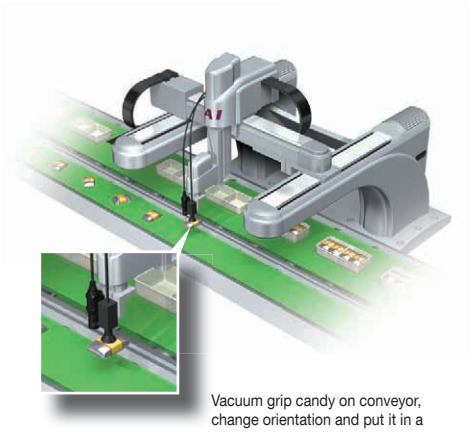
High-speed cartesian robot
(rotational axis specification)
CT4-G1RT



Vacuum grip two work pieces on conveyor, change orientation, inspect with inspection machine and return them to conveyor if judged good.

Pick and place candy in individual packages with vacuum cup

High-speed cartesian robot
(rotational axis specification) + vision sensor
CT4-G1RT

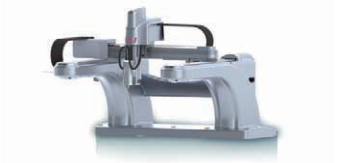


Vacuum grip candy on conveyor, change orientation and put it in a package.

Variations

4-axis Cartesian with Rotational Axis Specification
CT4-G1RT

▶ P5



Features

Rotary axis is added to CT4-G1.
Work piece orientation changes are available.

4-axis Cartesian with Pick & Rotate Specification
CT4-G1PR

▶ P7

Features

Pick & Rotate feature is added to CT4-G1.
Allows gripping work pieces which are difficult to vacuum-grip.

4-axis Cartesian Specification
CT4-G1

▶ P9

Features

3.2 G command acceleration (4.8 G maximum transient) shortens the cycle time.

About Cycle Time

Cycle time is calculated under the operational conditions and operational patterns described below.

Cycle Time [Arch Motion]

	Movement distance	
	200 mm	300 mm
4-axis Cartesian with Rotational Axis Specification: CT4-G1RT	0.379 sec	0.468 sec
4-axis Cartesian with Pick & Rotate Specification: CT4-G1PR		
4-axis Cartesian Specification: CT4-G1		

Operational Condition S-shaped Control

	Speed	Acceleration
XY-axis	2,500 mm/sec	3.2 G (4.8 G max. instantaneously)
Z-axis	833 mm/sec	3.2 G (4.8 G max. instantaneously)
R-axis	4,500°/sec	83,300°/sec²

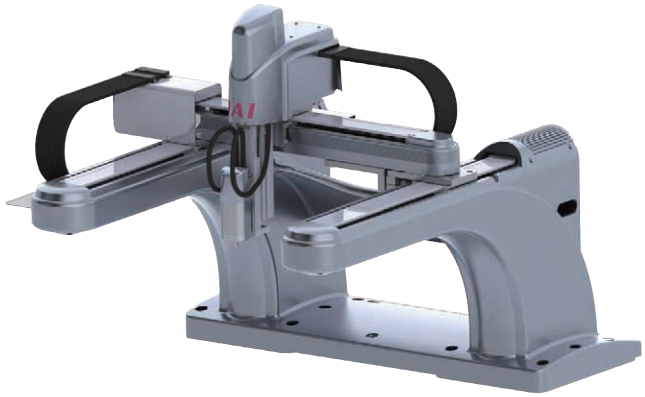
Cycle Operation Pattern

Operation Route

Cycle time of CT4 is a function of the bidirectional travel of: vertical movement of 25 mm, horizontal movement of 200 mm or 300 mm and rotational movement of 180°, as shown in the figure on the left.

CT4-G1RT-A-40-40-30-10B-36L-T2-□ 4-axis Cartesian with Rotational Axis Specification

Model Specification Items	CT4	G1RT	A	40	40	30	10B	36L	T2	□
	Series	Type	Encoder type	X1-axis stroke	X2-axis stroke	Y-axis stroke	Z-axis stroke	Range of operation of R-axis	Applicable controller	Cable length
	CT4: High-speed cartesian robot	G1RT: Gantry 4-axis with rotational axis	A: Absolute specification	40: 400 mm	40: 400 mm	30: 300 mm	10B: 100 mm with brake	36L: 360° with limit switch	T2: XSEL-PCT XSEL-QCT	3L: 3 m 5L: 5 m □L: Specified length



X-axis 400 mm
Y-axis 300 mm
Z-axis 100 mm
R-axis 360°

Caution

(Note 1) In the model number, the stroke is indicated in cm (centimeters). The range of operation of the R-axis is indicated in units of 10 degrees.

(Note 2) The cable length indicates the length from the connection point on the actuator's connector to the controller.
The standard cable length is 3 m or 5 m, but any other length can be specified in units of meters. Lengths up to 30 m are supported.

Specifications

Model number			CT4-G1RT-A-40-40-30-10B-36L-T2-□				
			X1 (master) axis	X2 (slave) axis	Y-axis	Z-axis	R-axis
Specifications of each axis	Axis type		Slider	Slider	Slider	Table	Rotational axis
	Stroke	(mm)	400	400	300	100	360°
	Maximum speed	(mm/sec)	2,500	2,500	2,500	833	4500°/s
Combination specifications	Structure		4-axis cartesian (X-axis synchronized operation) + rotational axis				
	Degrees of freedom		4				
	Range of operation	X-Y-Z (mm)-R (deg)	400-300-100-360				
	Positioning repeatability	(mm)	X direction : ±0.02, Y direction : ±0.02, Z direction : ±0.02, R direction : ±0.025°				
	Lost motion	(mm)	X direction: 0.05 or less, Y direction: 0.05 or less, Z direction: -, R direction: -				
	Payload	(kg)	0.5				
	Travel life	(km)	X/Y: 20,000, Z: 5,000 (90% probability of survival)				
	R-axis allowable load inertia	(kg·cm²)	2				
	R-axis allowable moment	(N·m)	1.2				
	Installation orientation		Limited to horizontal installation				
Ambient temperature/humidity			Temperature: 0 to 40°C, Humidity: 20 to 85%RH max. (non-condensing)				

Structure

Item	X1 (master) axis	X2 (slave) axis	Y-axis	Z-axis	R-axis
Motor	AC Servo motor (200 V)				
Home detection	Absolute				
Drive method	Ball screw + coupling				Integrated with motor output shaft
Brake	N/A	N/A	N/A	Standard equipment	N/A
C frame	Aluminum casting				
Robot weight	83.0 kg				

Dynamic Allowable Moment (R-axis)
Allowable moment of rotational axis 1.2 N·m

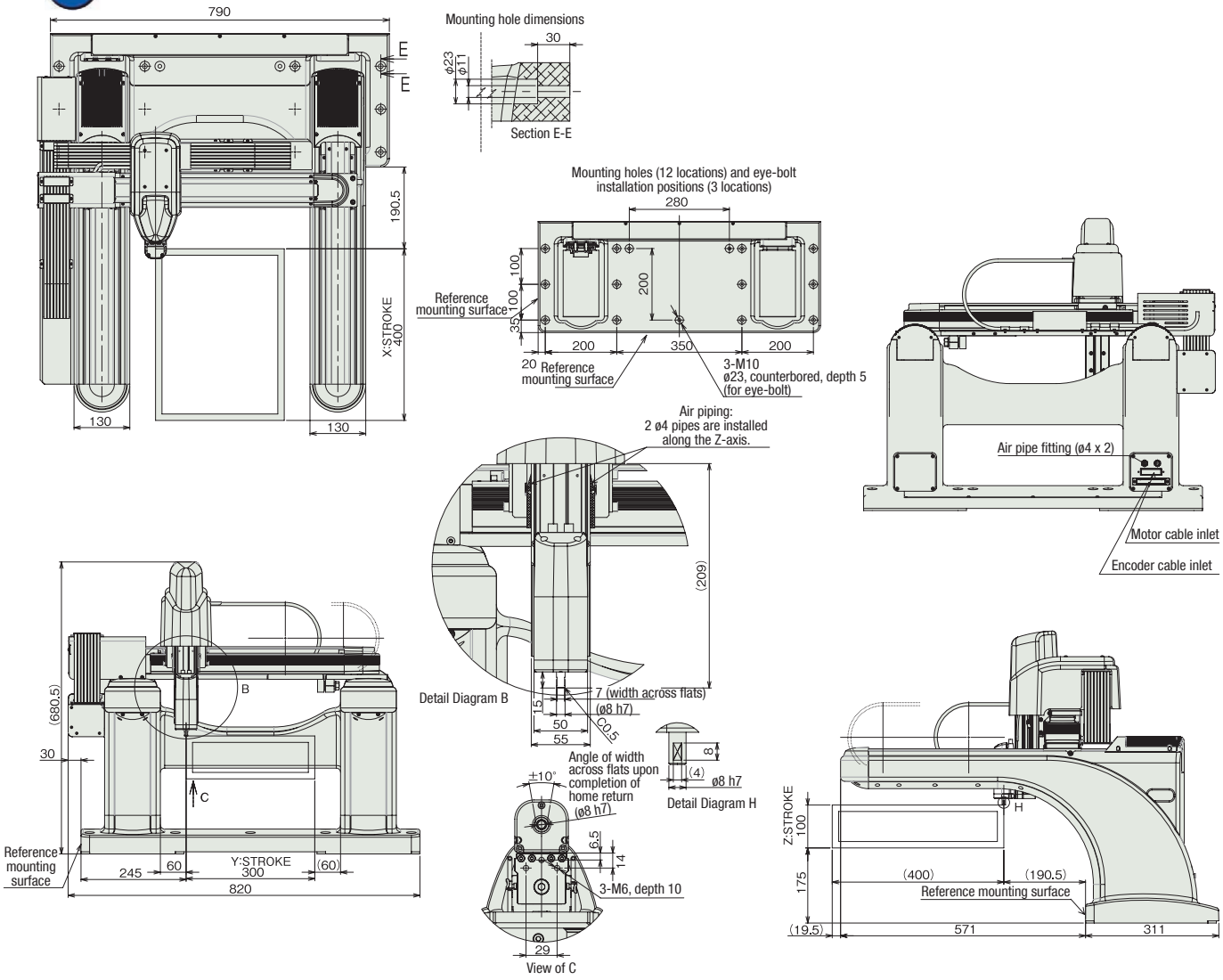
Direction of dynamic allowable moment

[Note on selection]
Cables and air pipes on a mounted tool may also be a load to the rotary axis depending on their layout.
Make sure not to exceed the allowable value of the moment of inertia for a mounted tool, also considering the load of cables and pipes. If possible fix cables and pipes so they will not be a load.

Dimensions

You can download CAD drawings from our website. www.intelligentactuator.com

2D CAD RoHS



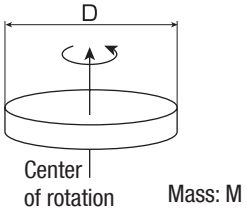
Applicable Controller

Applicable controller	Maximum number of controlled axes	Compatible encoder type	Number of programs	Number of positions	Power-supply voltage	Description
XSEL-PCT	6 axes	Absolute	128 programs	20,000 positions	3-phase, AC200 V	Dedicated controller for CT4
XSEL-QCT						Dedicated global controller for CT4 (Safety Category compliant)

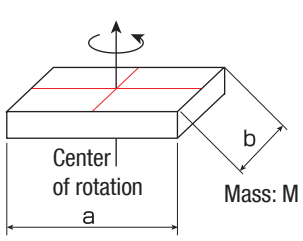
[Rough Guide for Work Part Permitted on Rotational Axis]

Use the load inertia calculation formula below to check if the load inertia of the work part is equal to or less than the allowable value (2 kg·cm²).

$J = 1/8 \times M \times D^2$



$J = 1/12 \times M \times (a^2 + b^2)$



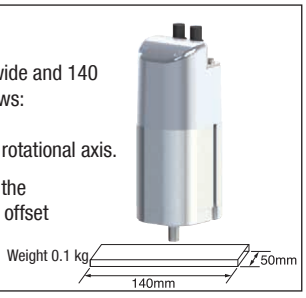
<Example of Permitted Work Part>

If the work part weighs 0.1 kg and is 50 mm wide and 140 mm long, the load inertia is calculated as follows:

$1/12 \times 0.1 \times (0.14^2 + 0.05^2) \cong 0.00018$ kg·m²

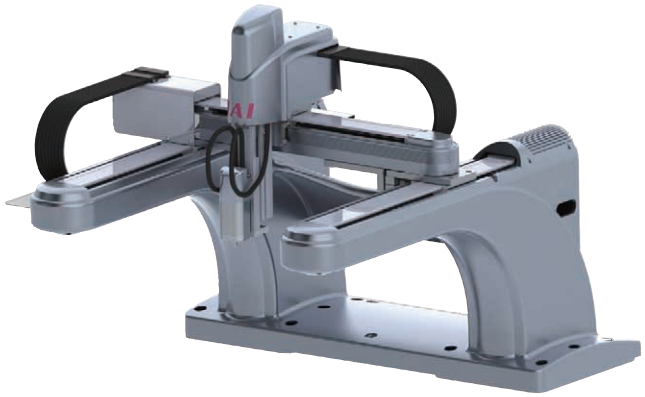
Accordingly, this work part is permitted on the rotational axis.

※ Be careful not to let the center of gravity of the work part at the tip of the rotational axis be offset from the output shaft of the rotational axis.



CT4-G1PR-A-40-40-30-10B-36-T2-☐ 4-axis Cartesian with Pick & Rotate Specification

Model Specification Items	CT4	G1PR	A	40	40	30	10B	36	T2	☐
	Series	Type	Encoder type	X1-axis stroke	X2-axis stroke	Y-axis stroke	Z-axis stroke	Range of operation of PR-axis	Applicable controller	Cable length
	CT4: High-speed cartesian robot	G1PR: Gantry 4-axis with Pick & Rotate axis	A: Absolute specification	40: 400 mm	40: 400 mm	30: 300 mm	10B: 100 mm with brake	36: 360°	T2: XSEL-PCT XSEL-QCT	3L: 3 m 5L: 5 m ☐L: Specified length



X-axis		400 mm
Y-axis		300 mm
Z-axis		100 mm
PR-axis	Rotation	360°
	Stroke	2 mm (One side)

Caution

(Note 1) In the model number, the stroke is indicated in cm (centimeters). The range of operation of the R-axis is indicated in units of 10 degrees.

(Note 2) The cable length indicates the length from the connection point on the actuator's connector to the controller.
The standard cable length is 3 m or 5 m, but any other length can be specified in units of meters. Lengths up to 30 m are supported.

Specifications

Model number			CT4-G1PR-A-40-40-30-10B-36-T2-☐				
			X1 (master) axis	X2 (slave) axis	Y-axis	Z-axis	PR-axis
Specifications of each axis	Axis type		Slider	Slider	Slider	Table	Pick & Rotate axis
	Stroke	(mm)	400	400	300	100	360°
	Maximum speed	(mm/sec)	2,500	2,500	2,500	833	4500°/s
Combination specifications	Structure		4-axis cartesian (X-axis synchronized operation) + Pick & Rotate axis				
	Maximum grip force (Note 1)	(N)	-				10
	Open-Close duration	(sec)	-				0.13 (2 mm One side) (Note 2)
	Degrees of freedom		4				
	Range of operation	X-Y-Z-P (mm)-R (deg)	400-300- 100-2(one side) -360				
	Positioning repeatability	(mm)	X direction : ±0.02, Y direction : ±0.02, Z direction : ±0.02, R direction : ±0.025°				
	Lost motion	(mm)	X direction: 0.05 or less, Y direction: 0.05 or less, Z direction: -, R direction: 0.1° or less				
	Payload	(kg)	0.5				
	Travel life	(km)	X/Y: 20,000, Z: 5,000 (90% probability of survival)				
	R-axis allowable load inertia	(kg·cm²)	0.4				
	R-axis allowable moment	(N·m)	1.2				
	Installation orientation		Limited to horizontal installation				
Ambient temperature/humidity			Temperature: 0 to 40°C, Humidity: 20 to 85% RH or less (non-condensing)				

Structure

Item	X1 (master) axis	X2 (slave) axis	Y-axis	Z-axis	R-axis
Motor	AC Servo motor (200 V)				
Home detection	Absolute				
Drive method	Ball screw + coupling				Grip: Solenoid + Link feature Rotation: Motor + Timing belt
Brake	N/A	N/A	N/A	Standard equipment	N/A
C frame	Aluminum casting				
Robot weight	83.0 kg				

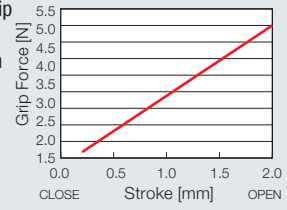
(Note 1) Grip force shows the total value of the grip force on two slides at the slide top (grip position 0 mm, overhang 0 mm). (Note 2) It is a reference value.

Caution on Gripping

[Correlation Graph for Stroke and Grip Force]

As the gripping feature utilizes springs, the grip force varies with the opening distance.

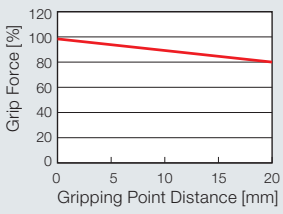
*This graph shows the measurement value on one gripping side. Double the value for two sides.



[About Gripping Point Distance and Grip Force]

The grip force varies depending on the distance between gripping surfaces.

1. The graph shows the grip force at gripping point distances, with the maximum grip force as 100%.
2. Gripping point distance shows the distance in vertical orientation from the finger attachment surface to the gripping point.
3. Grip force may vary due to variances in individual applications.
Use the value only as a reference.



Dimensions

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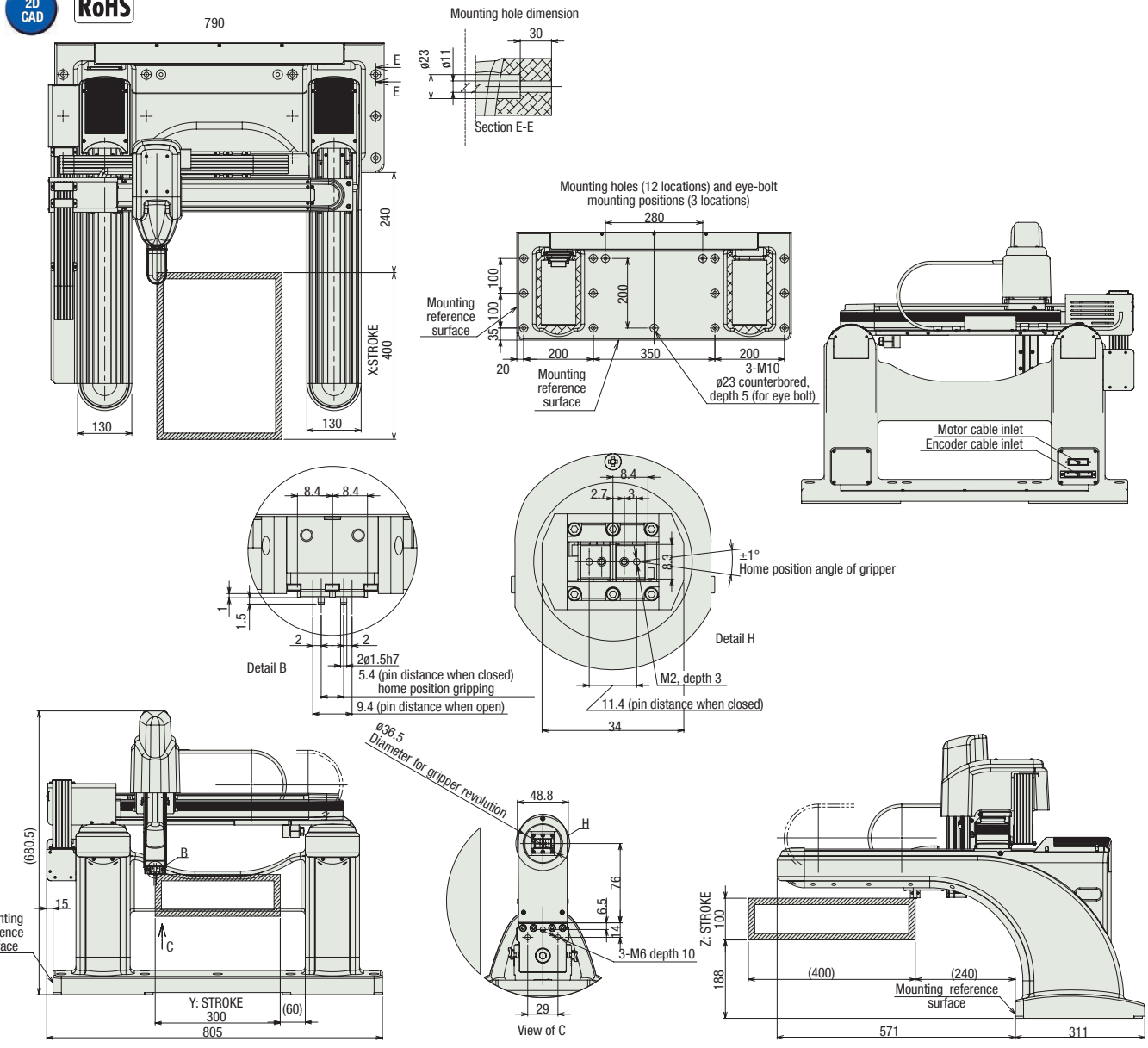
2D CAD RoHS



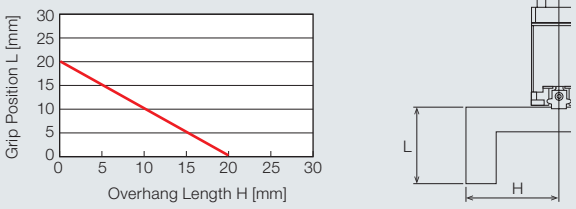
Applicable Controller

Applicable controller	Maximum number of controlled axes	Compatible encoder type	Number of programs	Number of positions	Power-supply voltage	Description
XSEL-PCT	6 axes	Absolute	128 programs	20,000 positions	3-phase, AC200 V	Dedicated controller for CT4
XSEL-QCT						Dedicated global controller for CT4 (Safety Category compliant)

[Operational Conditions for Pick & Rotate Axis]
The weight actually available to transfer may differ depending on the coefficient of friction due to finger attachment (fingers) and material of the work piece.
See “Operational Conditions for Pick & Rotate Axis” in instruction manual when selecting.

[About Duty during Operation]
There is a limitation to the duty of the open and close operation when the ambient temperature of the controller exceeds 25°C. Refer to the instruction manual for details.

[Allowable Overhang Length]
Select Grip Position L and Overhang Length H in the range of use shown in the graph. Usage out of this range may extremely decrease the life of guide.



CT4-G1-A-40-40-30-10B-T2-□ 4-axis Cartesian Specification

Model Specification Items	CT4	G1	A	40	40	30	10B	T2	□	□
	Series	Type	Encoder type	X1-axis stroke	X2-axis stroke	Y-axis stroke	Z-axis stroke	Applicable controller	Cable length	Option
	CT4: High-speed cartesian robot	G1: Gantry 4-axis type	A: Absolute specification	40: 400 mm	40: 400 mm	30: 300 mm	10B: 100 mm with brake	T2: XSEL-PCT XSEL-QCT	3L: 3 m 5L: 5 m □L: Specified length	Blank: No option AC: Air pipe connection (Vacuum port)

X-axis 400 mm
Y-axis 300 mm
Z-axis 100 mm

Note

(Note 1) In the model number, the stroke is indicated in cm (centimeters).
(Note 2) The cable length is from the connection point on the robot connector to the controller. The standard length is 3 m or 5 m, but other lengths can be specified in units of meters. Lengths up to 30 m are supported.

Specifications

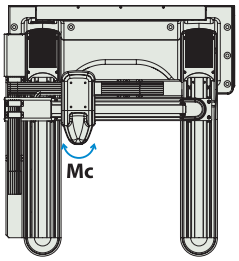
Model number			CT4-G1-A-40-40-30-10B-T2-□			
			X1 (master) axis	X2 (slave) axis	Y-axis	Z-axis
Specifications of each axis	Axis type		Slider	Slider	Slider	Table
	Stroke	(mm)	400	400	300	100
	Maximum speed	(mm/sec)	2,500	2,500	2,500	833
Combination specifications	Structure		4-axis cartesian (X-axis synchronizing operation)			
	Degrees of freedom		3			
	Operating range	X-Y-Z (mm)	400-300-100			
	Positioning repeatability	(mm)	X direction : ±0.02, Y direction : ±0.02, Z direction : ±0.02			
	Lost motion	(mm)	X direction : 0.05 or less, Y direction: 0.05 or less, Z direction : -			
	Payload	(kg)	1			
	Travel life	(km)	X/Y : 20,000, Z : 5,000 (90% survival probability)			
	Dynamic allowable moment (Note 1)	(N·m)	Ma = 6.4, Mb = 9.2, Mc = 14.2 (based on travel life of 5,000 km)			
	Overhang load length (Note 1)	(mm)	X direction : 50, Y direction : 50, Z direction : 50			
	Installation orientation		Limited to horizontal installation			
Ambient temperature/humidity			Temperature: 0 to 40°C, humidity : 20 to 85% RH or less (non-condensing)			

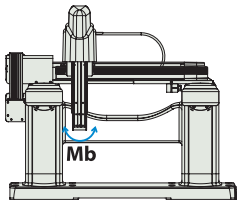
(Note 1) Measured at the mounting point at the end of the Z-axis.

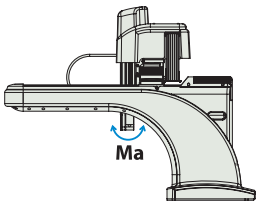
Structure

Item	X1 (master) axis	X2 (slave) axis	Y-axis	Z-axis
Motor	AC servo motor (200 V)			
Home detection	Absolute			
Drive method	Ball screw + coupling			
Brake	N/A	N/A	N/A	Standard equipment
C frame	Aluminum casting			
Robot weight	82.0 kg			

Dynamic allowable moment (Z-axis)



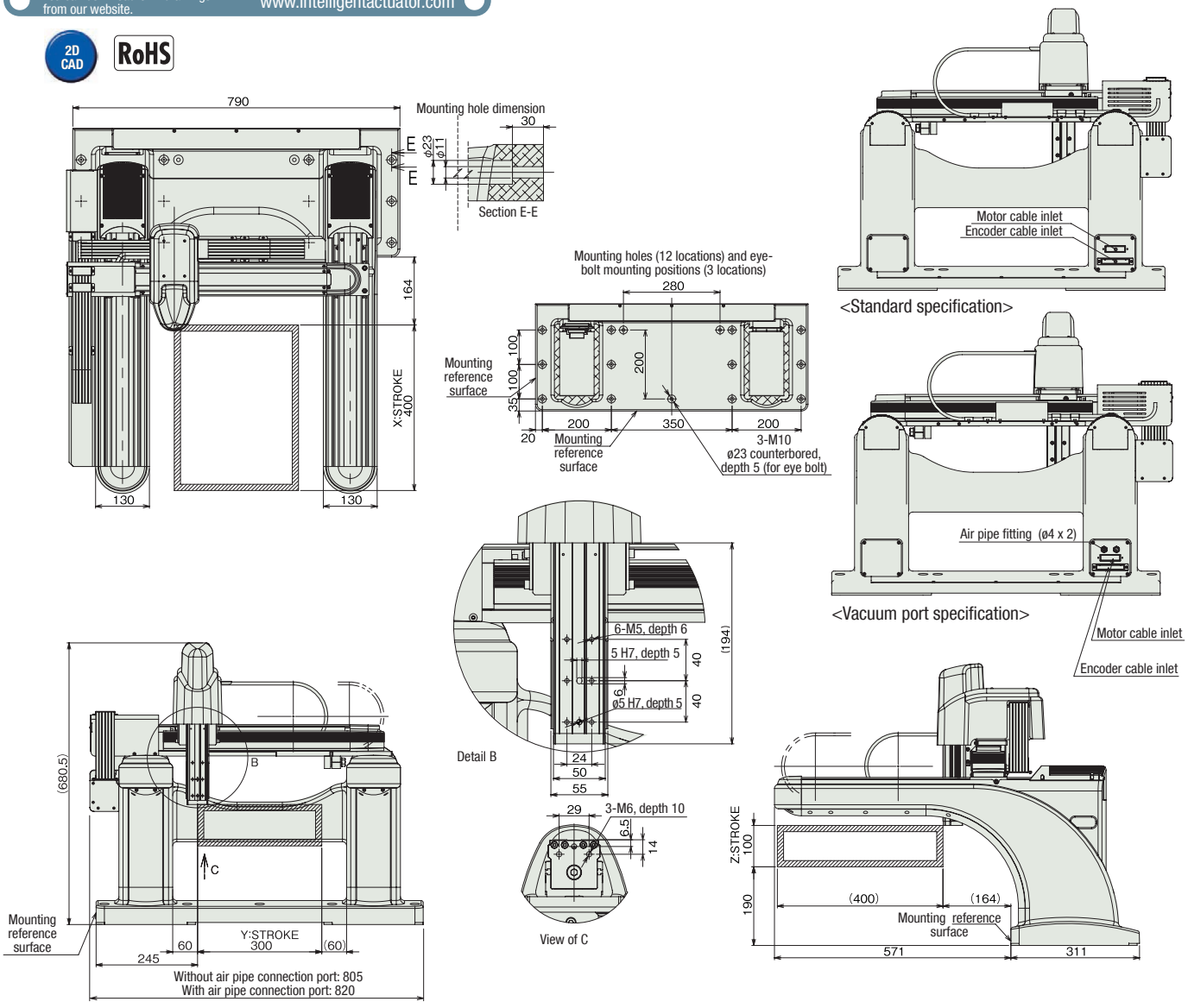




Dimensions

You can download CAD drawings from our website. www.intelligentactuator.com

2D CAD RoHS



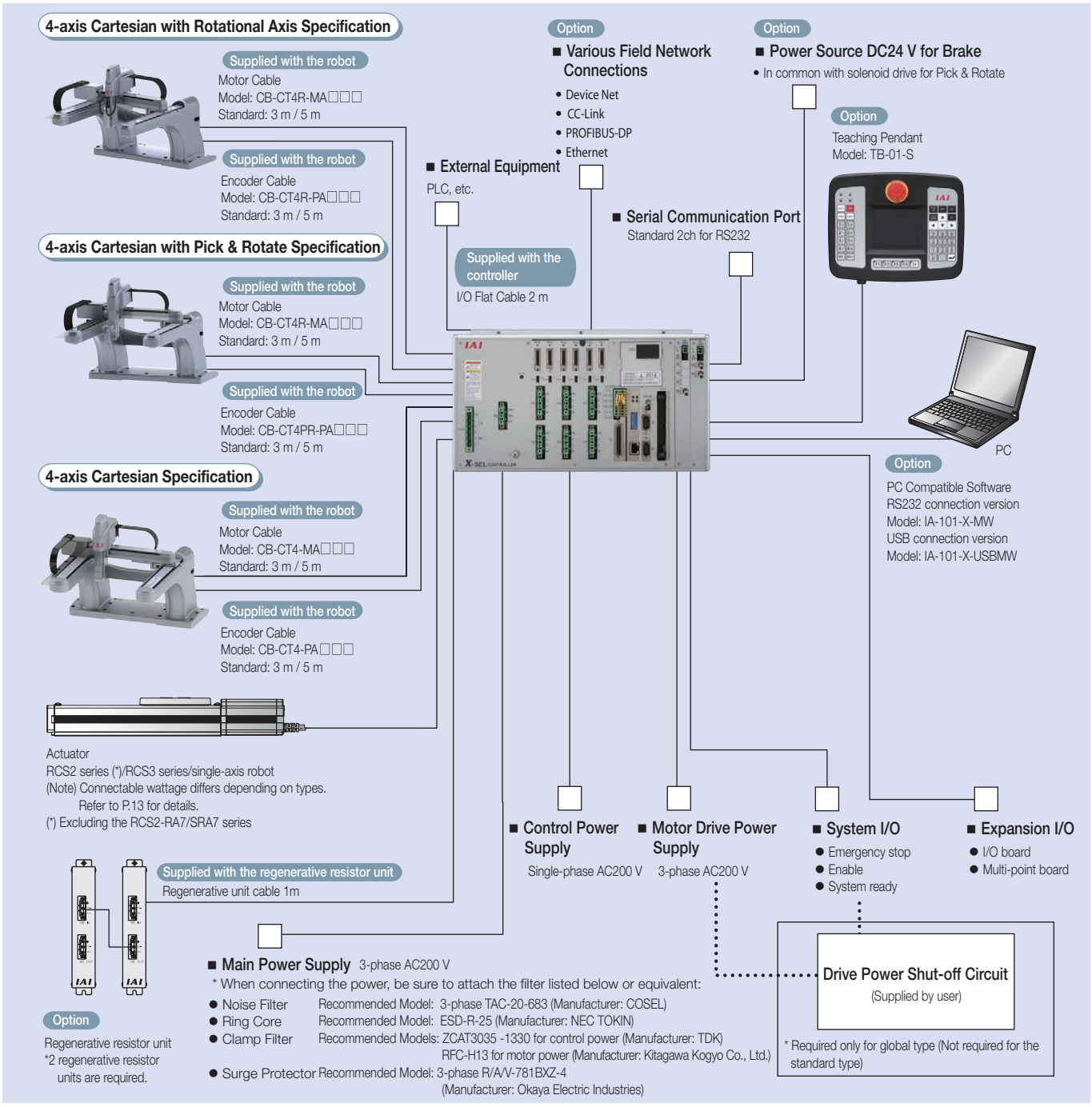
Applicable Controller

Applicable controller	Maximum number of controlled axes	Compatible encoder type	Number of programs	Number of positions	Power-supply voltage	Description
XSEL-PCT	6 axes	Absolute	128 programs	20,000 positions	3-phase, AC200 V	Dedicated controller for CT4
XSEL-QCT						Dedicated global controller for CT4 (Safety Category compliant)

[Calculation of Dynamic Allowable Moment]

With the CT4, the dynamic allowable moment is calculated based on a travel life of 20,000 km for the X-axis/Y-axis and travel life of 5,000 km for the Z-axis (both at a survival probability of 90%).

System configuration



Regenerative Resistance Unit

Model: REU-1

* Order two regenerative resistor units together with the robot.

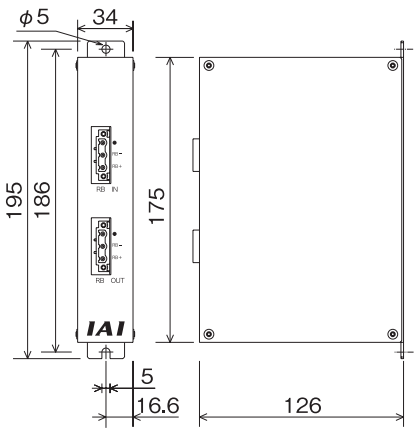
Description

This unit converts regenerative current produced by motor deceleration to heat.

Two regenerative units are needed to operate the CT4.

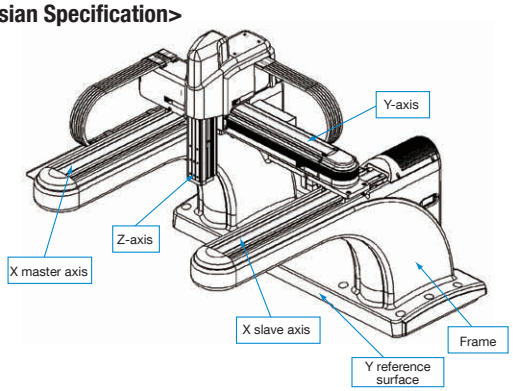
Specifications

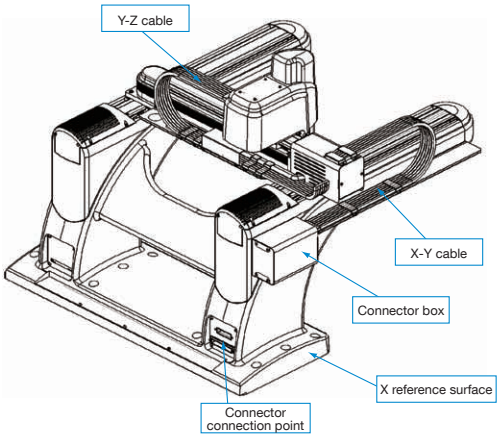
Item	Specifications
Main Unit dimensions	W34 mm x H195 mm x D126 mm
Main Unit Weight	0.9 kg
Built-in regenerative resistor	220Ω 80W
Accessory	Controller Connection Cable (Model No. CB-ST-REU010) 1 m



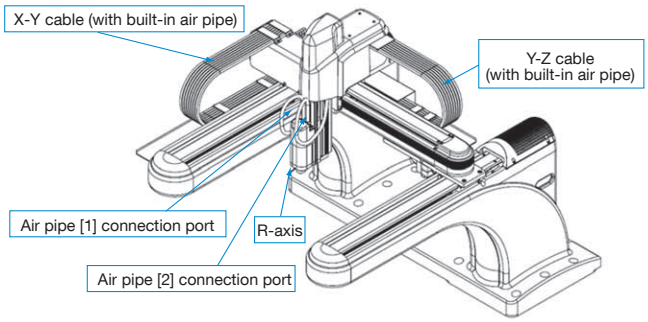
Part Names

<4-axis Cartesian Specification>

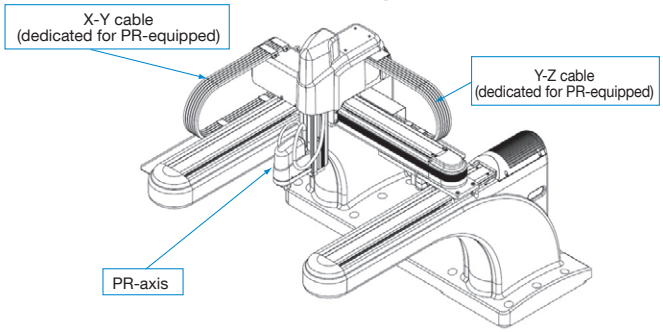




<4-axis Cartesian + Rotational Axis Specification>



<4-axis Cartesian + Pick & Rotate Specification>



<Air Pipe>
The 4-axis cartesian + rotational axis specification type comes standard with an air pipe to the end of the Z-axis.
The 4-axis cartesian specification does not come standard with built-in air pipes, so specify the optional specification with air pipes (option code: AC) if necessary.

Notes

Installation Frame

- The mounting surface shall be a machined plane or flat plane of equivalent accuracy. The flatness shall be within 0.05 mm/m.
- The frame shall have a structure that allows the robot to be installed horizontally.
- The frame on which the robot is installed receives a large reactive force. The table below shows the maximum instantaneous reactive force (rough guide) received by each axis when the axis moves at the maximum speed and maximum acceleration carrying 1 kg of load.
  Provide a frame of sufficient rigidity. Secure the frame to the floor, etc., using anchor bolts, etc., so that the CT4 will not move as a result of robot operation.
- The natural vibration frequency of the frame shall be 75 Hz or more

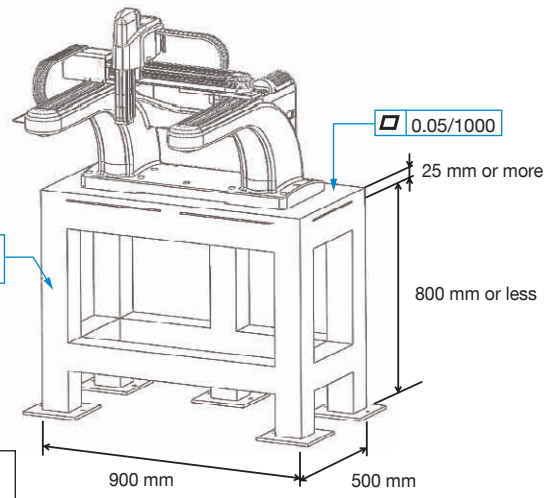
Axis	Reactive force
X-axis	660N
Y-axis	235N
Z-axis	85N

Example of the Installation Frame

An example of the installation frame is shown to the right. Fabricate the installation frame by referring to this example.

Use the hexagonal head bolt, as described below, for the mounting bolt, depending on the installation frame material.

Use high-strength bolts of ISO-10.9 or more.



<Frame Made of Steel>

Applicable bolt: M10 x 40 (effective engagement length: 10 or more), Applicable washer: M10 (10.5 x 18 x 2)
Tightening torque: 60 N.m

<Frame Made of Aluminum>

Applicable bolt: M10 x 50 (effective engagement length: 20 or more), Applicable washer: M10 (10.5 x 18 x 2)
Tightening torque: 60 N.m

Danger

Use the specified type of bolt. Pay attention when selecting the bolt length. If bolts other than the specified type or of inappropriate lengths are used, the tapped holes may be damaged or sufficient mounting strength may not be achieved, potentially leading to noise/vibration, breakdown or shorter life. In the worst case, the CT4 may move suddenly and cause serious accidents such as damage to the work part and surrounding areas, injury or even death.

Operation Setting

When operating the high-speed cartesian robot, the acceleration/deceleration setting for sigmoid motion, and vibration control, must be set in the program.
It is necessary to correct the servo gain applicable to the load inertia in the parameter for the rotary axis and Pick & Rotate axis.
For details, refer to the instruction manual.

XSEL-PCT/QCT

Dedicated program controller for CT4 high-speed cartesian robot

<4-axis Cartesian + Rotational Axis Specification>

XSEL- ☐ - ☐ - 400A - 400A - 400A - 60AB - 60AL - ☐ - ☐ - ☐ - ☐☐☐ - ☐ - 3

Series / Type / Number of connected axes / Axis 1 / Axis 2 / Axis 3 / Axis 4 / Axis 5 / Axis 6 / Network / Standard I/O / Expansion I/O / I/O Cable Length / Power supply voltage

Type	
PCT	Dedicated CT4 type
QCT	Dedicated CT4 global type (Safety Category compliant)

Number of connected axes	
5	5-axis specification
6	6-axis specification

* Same as the 5-axis specification if only the CT4 is operating.

Axis 1 / Axis 2 / Axis 3	
400A	400W motor, absolute

Axis 4	
60AB	60W motor, absolute, with brake

Axis 5	
60AL	60W motor, absolute, with limit switch

Axis 6	
12I	12W motor (incremental)
12A	12W motor (absolute)
20I	20W motor (incremental)
20A	20W motor (absolute)
30DI	RCS 30W motor (incremental)
30DA	RCS 30W motor (absolute)
30RI	RS 30W motor (incremental)
30RA	RS 30W motor (absolute)

* The maximum wattage of axis 6 is 30W. (If the wattage is more than the above, the axis cannot operate due to the limitations of the power-supply capacity.)

Network	
Blank	Not used
DV	DeviceNet connection board
CC	CC-Link connection board
PR	ProfiBus connection board
ET	Ethernet connection board

Standard I/O	
E	Not used
N1	Input 32/Output 16 (NPN)
N2	Input 16/Output 32 (NPN)
N3	Input 48/Output 48 (NPN)
P1	Input 32/Output 16 (PNP)
P2	Input 16/Output 32 (PNP)
P3	Input 48/Output 48 (PNP)
S	With expansion I/O base

* If expansion I/O will not be used, enter E (Not used) for slots 2 to 4. If you are using expansion I/Os, enter the expansion I/O base specification code in the desired slot. If an expansion I/O is specified, the controller chassis will come with the expansion I/O base. If you will not be using the expansion I/O initially but will be adding it later, specify the chassis with I/O expansion board, but specify S for slots 2 to 4.

Expansion I/O	
0	No cable
2	2 m (standard)
3	3 m
5	5 m

* If "E" (not used) or "S" (with expansion I/O base) is specified for all of standard and expansion I/Os slots, the I/O cable length will become "0" (no cable).

Power supply voltage	
3	Three-phase AC200 V

<4-axis Cartesian + Pick & Rotate Specification>

XSEL- ☐ - ☐ - 400A - 400A - 400A - 60AB - 12APAR - ☐ - ☐ - ☐ - ☐☐☐ - ☐ - 3

Series / Type / Number of connected axes / Axis 1 / Axis 2 / Axis 3 / Axis 4 / Axis 5 / Axis 6 / Network / Standard I/O / Expansion I/O / I/O Cable Length / Power supply voltage

Type	
PCT	Dedicated CT4 type
QCT	Dedicated CT4 global type (Safety Category compliant)

Number of connected axes	
5	5-axis specification
6	6-axis specification

* Same as the 4-axis specification if only the CT4 is operating.

Axis 1 / Axis 2 / Axis 3	
400A	400W motor, absolute

Axis 4	
60AB	60W motor, absolute, with brake

Axis 5	
12APAR	12W motor, absolute, with limit switch

Axis 6	
12I	12W motor (incremental)
12A	12W motor (absolute)
20I	20W motor (incremental)
20A	20W motor (absolute)
30DI	RCS 30W motor (incremental)
30DA	RCS 30W motor (absolute)
30RI	RS 30W motor (incremental)
30RA	RS 30W motor (absolute)
60I	60W motor (incremental)
60A	60W motor (absolute)

* The maximum wattage of axis 6 is 30W. (If the wattage is more than the above, the axis cannot operate due to the limitations of the power-supply capacity.)

Network	
Blank	Not used
DV	DeviceNet connection board
CC	CC-Link connection board
PR	ProfiBus connection board
ET	Ethernet connection board

Standard I/O	
E	Not used
N1	Input 32/Output 16 (NPN)
N2	Input 16/Output 32 (NPN)
N3	Input 48/Output 48 (NPN)
P1	Input 32/Output 16 (PNP)
P2	Input 16/Output 32 (PNP)
P3	Input 48/Output 48 (PNP)
S	With expansion I/O base

* If expansion I/O will not be used, enter E (Not used) for slots 2 to 4. If you are using expansion I/Os, enter the expansion I/O base specification code in the desired slot. If an expansion I/O is specified, the controller chassis will come with the expansion I/O base. If you will not be using the expansion I/O initially but will be adding it later, specify the chassis with I/O expansion board, but specify S for slots 2 to 4.

Expansion I/O	
0	No cable
2	2 m (standard)
3	3 m
5	5 m

* If "E" (not used) or "S" (with expansion I/O base) is specified for all of standard and expansion I/Os slots, the I/O cable length will become "0" (no cable).

Power supply voltage	
3	Three-phase AC200 V

<4-axis Cartesian Specification>

XSEL- ☐ - ☐ - 400A - 400A - 400A - 60AB - (☐ - ☐) - ☐ - ☐ - ☐☐☐ - ☐ - 3

Series / Type / Number of connected axes / Axis 1 / Axis 2 / Axis 3 / Axis 4 / Axis 5 / Axis 6 / Network / Standard I/O / Expansion I/O / I/O Cable Length / Power supply voltage

Type	
PCT	Dedicated CT4 type
QCT	Dedicated CT4 global type (Safety Category compliant)

Number of connected axes	
4	4-axis specification
5	5-axis specification
6	6-axis specification

* Same as the 4-axis specification if only the CT4 is operating.

Axis 1 / Axis 2 / Axis 3	
400A	400W motor, absolute

Axis 4	
60AB	60W motor, absolute, with brake

Axis 5 / Axis 6	
12I	12W motor (incremental)
12A	12W motor (absolute)
20I	20W motor (incremental)
20A	20W motor (absolute)
30DI	30W motor for RCS (incremental)
30DA	30W motor for RCS (absolute)
30RI	30W motor for RS (incremental)
30RA	30W motor for RS (absolute)
60I	60W motor (incremental)
60A	60W motor (absolute)
100I	100W motor (incremental)
100A	100W motor (absolute)

* The total wattage of Axes 5 and 6 must not be more than 100W. (Take note that if the above wattage is exceeded, the robot will not operate due to power-supply capacity limitations.)

Network	
Blank	Not used
DV	DeviceNet board
CC	CC-Link board
PR	Profibus board
ET	Ethernet board

Standard I/O	
E	Not used
N1	Input 32/Output 16 (NPN)
N2	Input 16/Output 32 (NPN)
N3	Input 48/Output 48 (NPN)
P1	Input 32/Output 16 (PNP)
P2	Input 16/Output 32 (PNP)
P3	Input 48/Output 48 (PNP)
S	With expansion I/O base

* If expansion I/O will not be used, enter E (not used) for slots 2 to 4. If you are using expansion I/O, enter the expansion I/O code in the desired slot. If an expansion I/O is specified, the controller chassis will come with the expansion I/O base. If you will not be using the expansion I/O initially but will be adding it later, specify the chassis with I/O expansion board, but specify S for slots 2 to 4.

Expansion I/O	
0	No cable
2	2 m (standard)
3	3 m
5	5 m

* If "E" (not used) or "S" (with expansion I/O base) is specified for all of standard and expansion I/O slots, the I/O cable length will become "0" (no cable).

Power supply voltage	
3	Three-phase AC200 V

Specifications

Model	Description					
Controller series, type	PCT (standard) type			QCT (global) type		
Connecting robots/actuators	CT4/Added axis:RCS2, RCS3, single-axis robot					
Connectable motor output	CT4 + 100W max. (*3)					
Number of controlled axes	4-axis	5-axis	6-axis	4-axis	5-axis	6-axis
Control power-supply input	AC200/230 V, single-phase -15%, +10%					
Motor power-supply input	AC200/230 V, three-phase -10%, +10%					
Power supply frequency	50/60 Hz					
Insulation resistance	10 MΩ or more (between power-supply terminal and I/O terminal, or between all external terminals and case, at DC500 V)					
Withstand voltage	AC1500 V (1 minute)					
Power supply capacity (*1)	Max 4019VA	Max 4265VA	Max 4271VA	Max 4019VA	Max 4265VA	Max 4271VA
Position detection method	Incremental Encoder (serial encoder) Absolute encoder with a rotational data backup (serial encoder)					
Safety circuit configuration	Redundancy not supported			Redundancy supported		
Drive source breaker system	Cutoff by internal relay			External safety circuit		
Enable input	Contact B input (internally powered)			Contact B input (externally powered, redundant)		
Speed setting	1 mm/sec or greater. The upper limit varies according to the actuator specification.					
Acceleration/deceleration setting	0.01 G or greater. The upper limit varies according to the actuator.					
Program language	Super SEL language					
Number of programs	128 programs					
Number of program steps	9,999 steps (total)					
Number of multi-tasking programs	16 programs					
Number of positions	20,000 steps (total)					
Data memory device	Flash ROM + SRAM battery backup					
Data input method	Teaching pendant or PC compatible software					
Standard input/output	48-I/O PIO board (NPN/PNP) or 96-I/O PIO board (NPN/PNP). Only 1 board can be installed.					
Expansion input/output	48-I/O PIO board (NPN/PNP) and/or 96-I/O PIO board (NPN/PNP). Up to 3 boards can be installed.					
Serial communication function	Teaching pendant port (D-sub 25-pin) + 2-channel RS232C port (D-sub, 9-pin x 2). Standard equipment.					
Protective function	Motor overcurrent, overload, motor driver temperature check, overload check, encoder open-circuit check, soft limit over, system error, battery error					
Ambient operating temperature/ humidity and atmosphere	0 to 40ºC, 10 to 95% (non-condensing). Free from corrosive gases. In particular, there shall be no significant dust.					
Robot weight (*2)	5.2 kg		5.7 kg	4.5 kg		5 kg
Accessory	I/O flat cable					

*1 When the connected axes represent the maximum wattage.
*2 Including the absolute data backup battery, brake mechanism and expansion I/O box.
*3 Connectable wattage differs depending on types. Refer to P.13 for derails.

I/O Signal table

Standard I/O Signal Table (when N1 or P1 is selected)

Pin No.	Classification	Port No.	Standard Settings
1		-	(24V Connection)
2		000	Program Start
3		001	General Purpose Input
4		002	General Purpose Input
5		003	General Purpose Input
6		004	General Purpose Input
7		005	General Purpose Input
8		006	General Purpose Input
9		007	Program Designation (PRG No.1)
10		008	Program Designation (PRG No.2)
11		009	Program Designation (PRG No.4)
12		010	Program Designation (PRG No.8)
13		011	Program Designation (PRG No.10)
14		012	Program Designation (PRG No.20)
15		013	Program Designation (PRG No.40)
16		014	General Purpose Input
17	Input	015	General Purpose Input
18		016	General Purpose Input
19		017	General Purpose Input
20		018	General Purpose Input
21		019	General Purpose Input
22		020	General Purpose Input
23		021	General Purpose Input
24		022	General Purpose Input
25		023	General Purpose Input
26		024	General Purpose Input
27		025	General Purpose Input
28		026	General Purpose Input
29		027	General Purpose Input
30		028	General Purpose Input
31		029	General Purpose Input
32		030	General Purpose Input
33		031	General Purpose Input
34		300	Alarm Output
35		301	Ready Output
36		302	Emergency Stop Output
37		303	General Purpose Output
38		304	General Purpose Output
39		305	General Purpose Output
40		306	General Purpose Output
41		307	General Purpose Output
42	Output	308	General Purpose Output
43		309	General Purpose Output
44		310	General Purpose Output
45		311	General Purpose Output
46		312	General Purpose Output
47		313	General Purpose Output
48		314	General Purpose Output
49		315	General Purpose Output
50		-	(0V Connection)

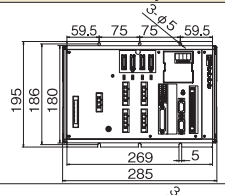
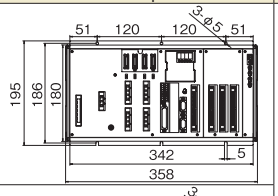
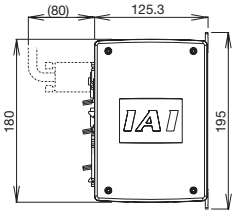
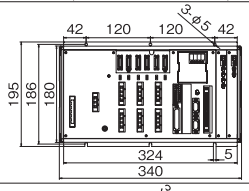
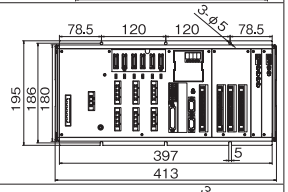
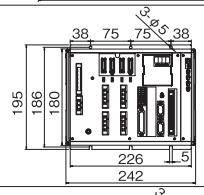
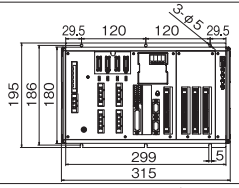
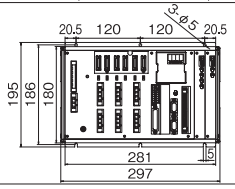
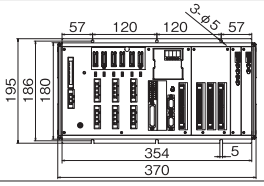
Extension I/O Signal Table (when N1 or P1 is selected)

Pin No.	Classification	Standard Settings
1		(24V Connection)
2		General Purpose Input
3		General Purpose Input
4		General Purpose Input
5		General Purpose Input
6		General Purpose Input
7		General Purpose Input
8		General Purpose Input
9		General Purpose Input
10		General Purpose Input
11		General Purpose Input
12		General Purpose Input
13		General Purpose Input
14		General Purpose Input
15		General Purpose Input
16		General Purpose Input
17	Input	General Purpose Input
18		General Purpose Input
19		General Purpose Input
20		General Purpose Input
21		General Purpose Input
22		General Purpose Input
23		General Purpose Input
24		General Purpose Input
25		General Purpose Input
26		General Purpose Input
27		General Purpose Input
28		General Purpose Input
29		General Purpose Input
30		General Purpose Input
31		General Purpose Input
32		General Purpose Input
33		General Purpose Input
34		General Purpose Output
35		General Purpose Output
36		General Purpose Output
37		General Purpose Output
38		General Purpose Output
39		General Purpose Output
40		General Purpose Output
41		General Purpose Output
42	Output	General Purpose Output
43		General Purpose Output
44		General Purpose Output
45		General Purpose Output
46		General Purpose Output
47		General Purpose Output
48		General Purpose Output
49		General Purpose Output
50		(0V Connection)

Extension I/O Signal Table (when N2 or P2 is selected)

Pin No.	Classification	Standard Settings
1		(24V Connection)
2		General Purpose Input
3		General Purpose Input
4		General Purpose Input
5		General Purpose Input
6		General Purpose Input
7		General Purpose Input
8		General Purpose Input
9	Input	General Purpose Input
10		General Purpose Input
11		General Purpose Input
12		General Purpose Input
13		General Purpose Input
14		General Purpose Input
15		General Purpose Input
16		General Purpose Input
17		General Purpose Input
18		General Purpose Output
19		General Purpose Output
20		General Purpose Output
21		General Purpose Output
22		General Purpose Output
23		General Purpose Output
24		General Purpose Output
25		General Purpose Output
26		General Purpose Output
27		General Purpose Output
28		General Purpose Output
29		General Purpose Output
30		General Purpose Output
31		General Purpose Output
32		General Purpose Output
33		General Purpose Output
34	Output	General Purpose Output
35		General Purpose Output
36		General Purpose Output
37		General Purpose Output
38		General Purpose Output
39		General Purpose Output
40		General Purpose Output
41		General Purpose Output
42		General Purpose Output
43		General Purpose Output
44		General Purpose Output
45		General Purpose Output
46		General Purpose Output
47		General Purpose Output
48		General Purpose Output
49		General Purpose Output
50		(0V Connection)

External Dimensions

Controller Type		Standard Specification	With Expansion I/O Base	Side View
	Encoder	Absolute (Note1)	Absolute (Note1)	Common
	Brake	Yes	Yes	
	I/O	Standard only	Standard + Expansion	
PCT	4-axis Specification			
	5 to 6-axis Specification			
QCT	4-axis Specification			
	5 to 6-axis Specification			

(Note1) Additional axes are either of incremental or absolute.

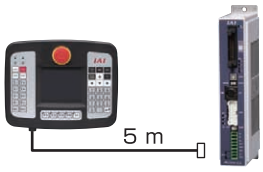
Option

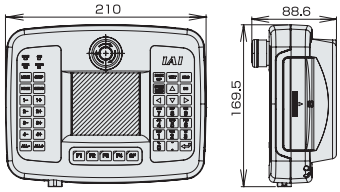
Teaching Pendant

Features A teaching device that has position input, test operation, monitoring function, etc.

Model **TB-01-S**

Configuration



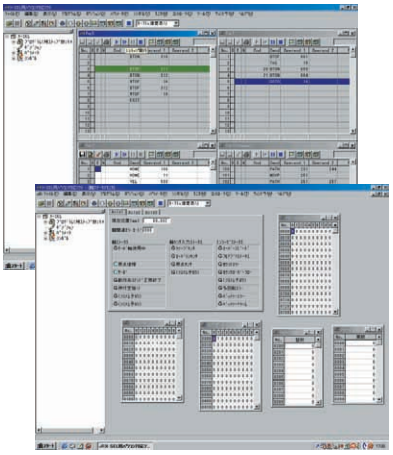


Specifications

Rated voltage	DC24 V
Power consumption	3.6W or less (150mA or less)
Ambient operating temperature	0 to 50ºC
Ambient operating humidity	20 to 85% RH (non-condensing)
Environment endurance	IP40 (in initial state)
Weight	507 g (TB-01-S body only)

PC Compatible Software (Windows Only)

Features A startup support software program offering program/position input function, test operation function, monitoring function, and more.
The functions needed for debugging have been enhanced to help reduce the startup time.



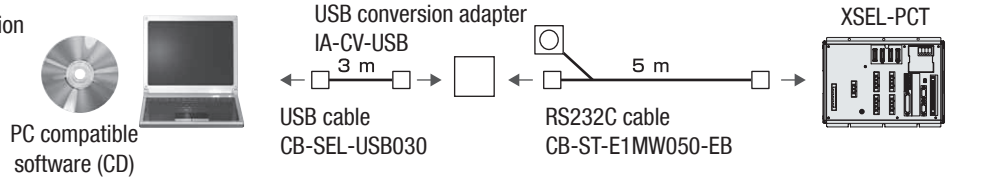
<XSEL-PCT Type>

Model **IA-101-X-MW** (with RS232C cable)

Configuration

Model **IA-101-X-USBMW** (with USB Conversion Adapter + Cable)

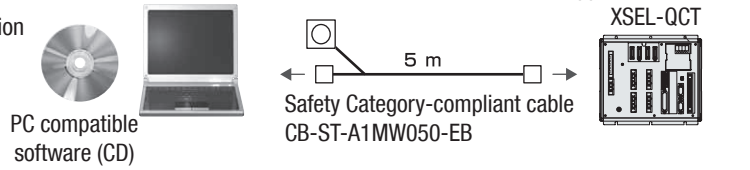
Configuration



<XSEL-QCT Type>

Model **IA-101-XA-MW** (with Safety Category 4-compliant cable)

Configuration



Note

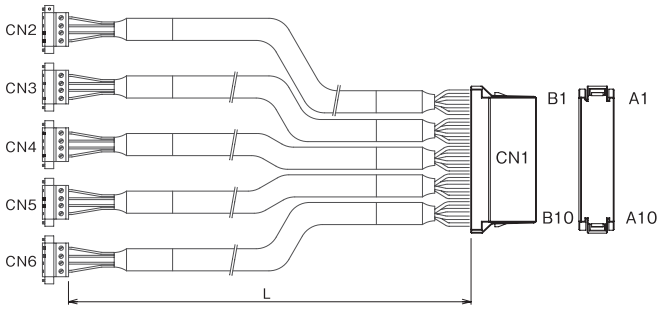
Use the IA-101-X-MW or IA-101-X-USBMW for the XSEL-PCT.
Use the IA-101-XA-MW for the XSEL-QCT.
Note that connecting a PC software cable to a controller not supporting the cable may damage the internal parts of the controller.

Service Parts

Motor Cable <4-axis cartesian + rotational axis specification / 4-axis cartesian + Pick & Rotate specification>

Model: **CB-CT4R-MA** ☐☐☐

[Minimum bending radius]
Dynamic bending condition: 51 mm
Static bending condition: 34 mm



Enter the cable length (L) into ☐☐☐ (Maximum 30m). Ex.: 080 = 8m

CN 2

Pin no.	Signal name	Size
1	PE	AWG 18
2	U	
3	V	
4	W	

CN 3

Pin no.	Signal name	Size
1	PE	AWG 18
2	U	
3	V	
4	W	

CN 4

Pin no.	Signal name	Size
1	PE	AWG 18
2	U	
3	V	
4	W	

CN 5

Pin no.	Signal name	Size
1	PE	AWG 18
2	U	
3	V	
4	W	

CN 6

Pin no.	Signal name	Size
1	PE	AWG 18
2	U	
3	V	
4	W	

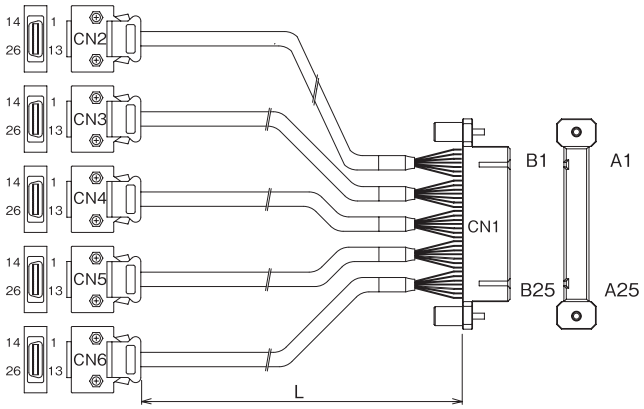
CN 1

Pin no.	Signal name	Size
A01	U	AWG 18
A02	V	
B01	W	
B02	PE	
A03	U	
A04	V	
B03	W	
B04	PE	
A05	U	
A06	V	
B05	W	
B06	PE	
A07	U	
A08	V	
B07	W	
B08	PE	
A09	U	
A10	V	
B09	W	
B10	PE	

Encoder Cable <4-axis cartesian + rotational axis specification>

Model: **CB-CT4R-PA** ☐☐☐

[Minimum bending radius]
Dynamic bending condition: 54 mm
Static bending condition: 36 mm



Enter the cable length (L) into ☐☐☐ (Maximum 30m). Ex.: 080 = 8m

CN 2

Pin no.	Signal name	Size
10	NC	AWG26 (soldered)
11	NC	
12	NC	
13	NC	
26	NC	
25	NC	
24	NC	
23	NC	
9	NC	
18	NC	
19	NC	
1	NC	
2	NC	
3	NC	
4	NC	
5	NC	
6	NC	
7	SRD+	
8	SRD-	
14	BAY+	
15	BAT-	
16	Vcc	
17	GND	
20	BKR-	
21	BKR+	

The shield is connected to the hood by a clamp.

CN3: Same with CN2

CN4: Same with CN2

CN5: Same with CN2

CN 6

Pin no.	Signal name	Size
10	NC	AWG26 (soldered)
11	NC	
12	E24V	
13	OV	
26	LS	
25	CREEP	
24	OT	
23	RSV	
9	NC	
18	NC	
19	NC	
1-6	NON	
7	SRD+	
8	SRD-	
14	BAT+	
15	BAT-	
16	Vcc	
17	GND	
20		
21		

The shield is connected to the hood by a clamp.

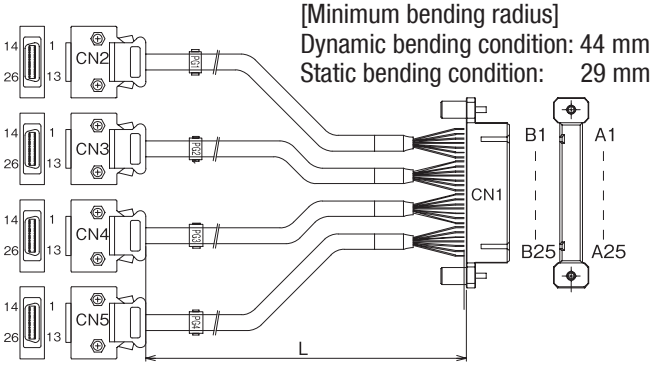
CN 1

Pin no.	Signal name	Size
A01	BAT+	AWG 26
A02	BAT-	
A03	SD	
A04	-SD	
A05		
B01	Vcc	
B02	GND	
B03	F.G	
B04	BK-	
B05	BK+	
A06	BAT+	
A07	BAT-	
A08	SD	
A09	-SD	
A10		
B06	Vcc	
B07	GND	
B08	F.G	
B09	BK-	
B10	BK+	
A11	BAT+	
A12	BAT-	
A13	SD	
A14	-SD	
A15		
B11	Vcc	
B12	GND	
B13	F.G	
B14	BK-	
B15	BK+	
A16	BAT+	
A17	BAT-	
A18	SD	
A19	-SD	
A20		
B16	Vcc	
B17	GND	
B18	F.G	
B19	BK-	
B20	BK+	
A21	BAT+	
A22	BAT-	
A23	SD	
A24	-SD	
A25	LS	
B21	Vcc	
B22	GND	
B23	F.G	
B24	N	
B25	24V	

Encoder cable <4-axis cartesian Pick & Rotate specification>

Model: **CB-CT4PR-PA** □□□

[Minimum bending radius]
Dynamic bending condition: 44 mm
Static bending condition: 29 mm



Enter the cable length (L) into □□□ (Maximum 30m). Ex.: 080 = 8m

CN 2

Pin no.	Signal name	Size
10		AWG26 (soldered)
11		
12	E24V	
13	0V	
26	LS	
25	CREEP	
24	OT	
23	RSV	
9		
18		
19		
1-6	NON	
7	SRD+	
8	SRD-	
14	BAT+	
15	BAT-	
16	Vcc	
17	GND	
20	BKR-	
21	BKR+	

The shield is connected to the hood by a clamp.

CN3: Same with CN2

CN4: Same with CN2

CN5: Same with CN2

CN6: Same with CN2

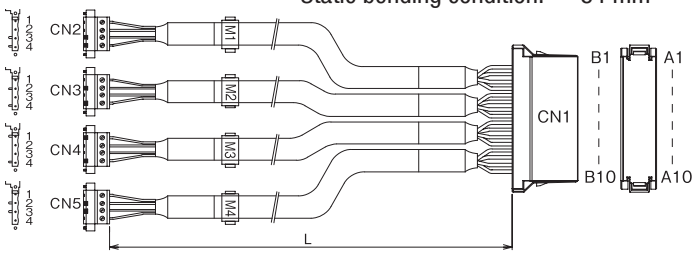
CN 1

Pin no.	Signal name	Size
A01	BAT+	AWG 26
A02	BAT-	
A03	SD	
A04	-SD	
A05		
B01	Vcc	
B02	GND	
B03	F.G	
B04	BK-	
B05	BK+	
A06	BAT+	
A07	BAT-	
A08	SD	
A09	-SD	
A10		
B06	Vcc	
B07	GND	
B08	F.G	
B09	BK-	
B10	BK+	
A11	BAT+	
A12	BAT-	
A13	SD	
A14	-SD	
A15		
B11	Vcc	
B12	GND	
B13	F.G	
B14	BK-	
B15	BK+	
A16	BAT+	
A17	BAT-	
A18	SD	
A19	-SD	
A20		
B16	Vcc	
B17	GND	
B18	F.G	
B19	BK-	
B20	BK+	
A21	BAT+	
A22	BAT-	
A23	SD	
A24	-SD	
A25		
B21	Vcc	
B22	GND	
B23	F.G	
B24	BK-	
B25	BK+	

Motor cable <4-axis cartesian specification>

Model: **CB-CT4-MA** □□□

[Minimum bending radius]
Dynamic bending condition: 51 mm
Static bending condition: 34 mm



Enter the cable length (L) into □□□ (Maximum 30m). Ex.: 080 = 8m

CN 2

Pin no.	Signal name	Size
1	PE	AWG 18
2	U	
3	V	
4	W	

CN 3

Pin no.	Signal name	Size
1	PE	AWG 18
2	U	
3	V	
4	W	

CN 4

Pin no.	Signal name	Size
1	PE	AWG 18
2	U	
3	V	
4	W	

CN 5

Pin no.	Signal name	Size
1	PE	AWG 18
2	U	
3	V	
4	W	

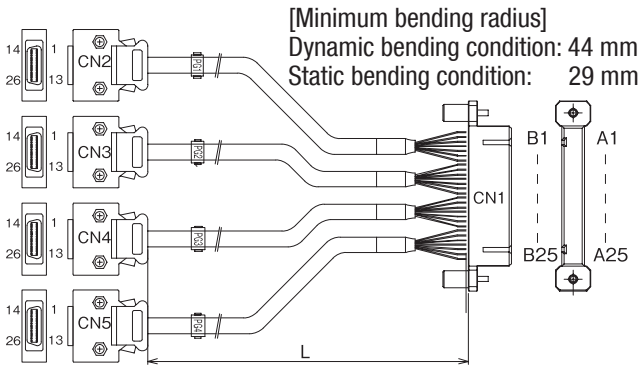
CN 1

Pin no.	Signal name	Size
A01	U	AWG 18
A02	V	
B01	W	
B02	PE	
A03	U	
A04	V	
B03	W	
B04	PE	
A05	U	
A06	V	
B05	W	
B06	PE	
A07	U	
A08	V	
B07	W	
B08	PE	
A09	NC	
A10	NC	
B09	NC	
B10	NC	

Encoder cable <4-axis cartesian specification>

Model: **CB-CT4-PA** ☐☐☐

Enter the cable length (L) into ☐☐☐ (Maximum 30m). Ex.: 080 = 8m



CN 2

Pin no.	Signal name	Size
10	NC	AWG18 (soldered)
11	NC	
12	NC	
13	NC	
26	NC	
25	NC	
24	NC	
23	NC	
9	NC	
18	NC	
19	NC	
1	NC	
2	NC	
3	NC	
4	NC	
5	NC	
6	NC	
7	SRD+	
8	SRD-	
14	BAY+	
15	BAT-	
16	Vcc	
17	GND	
20	BKR-	
21	BKR+	

The shield is connected to the hood by a clamp.

CN3: Same with CN2

CN4: Same with CN2

CN5: Same with CN2

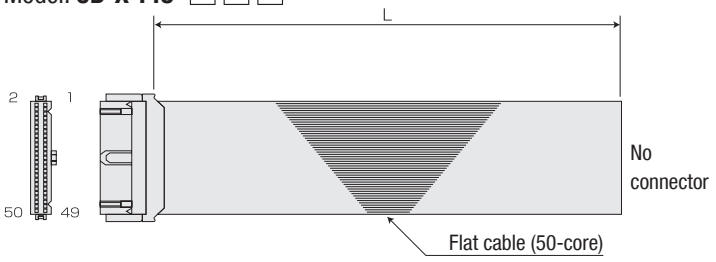
CN 1

Pin no.	Signal name	Size
A01	BAT+	AWG 26
A02	BAT-	
A03	SD	
A04	-SD	
A05		
B01	Vcc	
B02	GND	
B03	F.G	
B04	BK-	
B05	BK+	
A06	BAT+	
A07	BAT-	
A08	SD	
A09	-SD	
A10		
B06	Vcc	
B07	GND	
B08	F.G	
B09	BK-	
B10	BK+	
A11	BAT+	
A12	BAT-	
A13	SD	
A14	-SD	
A15		
B11	Vcc	
B12	GND	
B13	F.G	
B14	BK-	
B15	BK+	
A16	BAT+	
A17	BAT-	
A18	SD	
A19	-SD	
A20		
B16	Vcc	
B17	GND	
B18	F.G	
B19	BK-	
B20	BK+	
A21		
A22		
A23		
A24		
A25		
B21		
B22		
B23		
B24		
B25		

I/O flat cable (for XSEL-P/Q)

Model: **CB-X-PIO** ☐☐☐

Enter the cable length (L) into ☐☐☐ (Maximum 10m). Ex.: 080 = 8m



Number	Color	Wire	Number	Color	Wire	Number	Color	Wire
1	Brown 1	Flat cable crimped	18	Gray 2	Flat cable crimped	35	Green 4	Flat cable crimped
2	Red 1		19	White 2		36	Blue 4	
3	Orange 1		20	Black 2		37	Purple 4	
4	Yellow 1		21	Brown 3		38	Gray 4	
5	Green 1		22	Red 3		39	White 4	
6	Blue 1		23	Orange 3		40	Black 4	
7	Purple 1		24	Yellow 3		41	Brown 5	
8	Gray 1		25	Green 3		42	Red 5	
9	White 1		26	Blue 3		43	Orange 5	
10	Black 1		27	Purple 3		44	Yellow 5	
11	Brown 2		28	Gray 3		45	Green 5	
12	Red 2		29	White 3		46	Blue 5	
13	Orange 2		30	Black 3		47	Purple 5	
14	Yellow 2		31	Brown 4		48	Gray 5	
15	Green 2		32	Red 4		49	White 5	
16	Blue 2		33	Orange 4		50	Black 5	
17	Purple 2		34	Yellow 4				

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