

## Become a Robot Master in Just 3 Steps

### Robot Controller **MRC01**



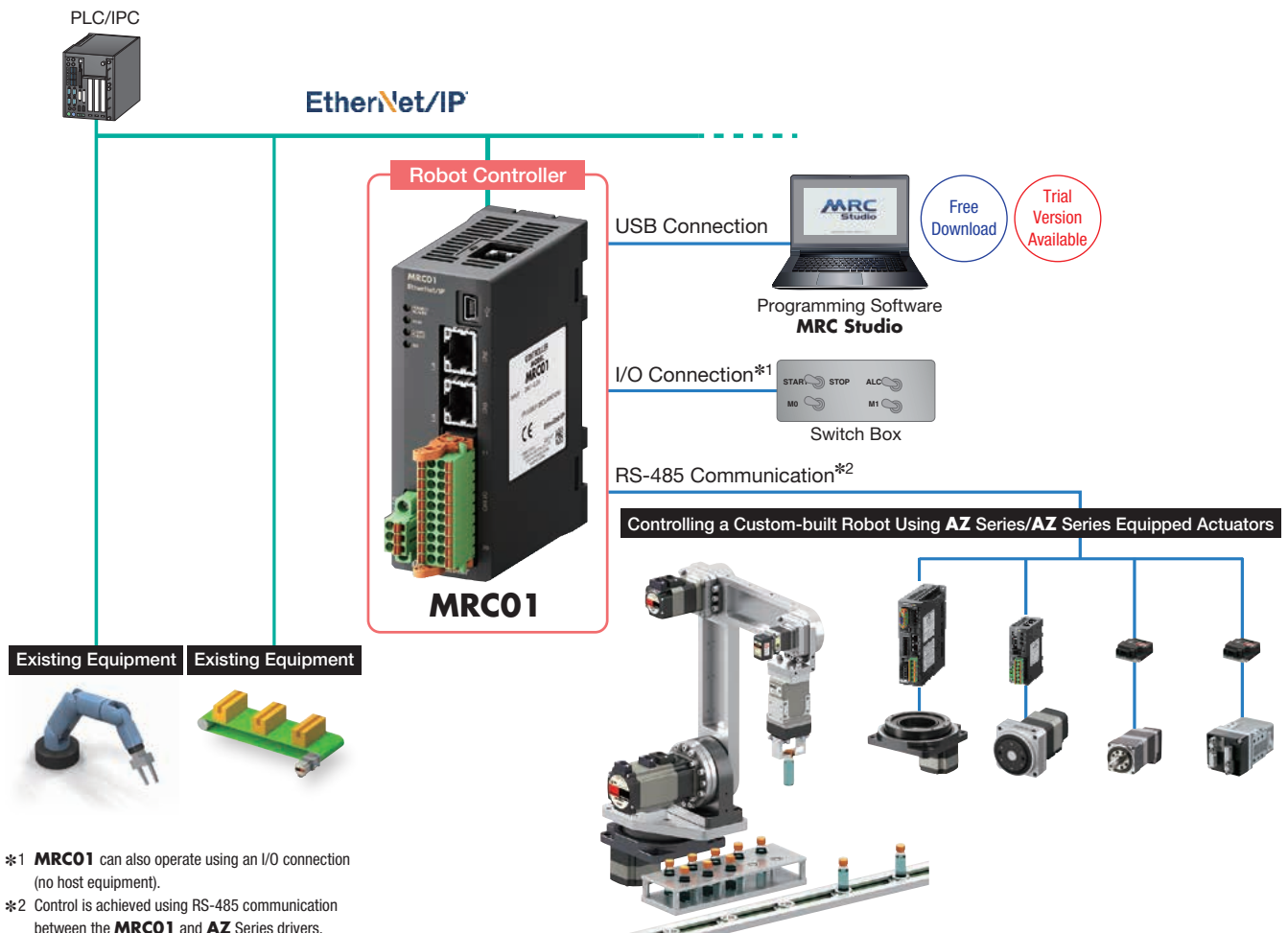
The MRC01 robot controller supports easy programming and control of in-house designed custom built robots with 3 simple steps: "Initial Setup", "Operation Programming" and "Operational Checking".

Use the **αSTEP AZ Series** family of products to support your in-house design for improved performance and ease of use.

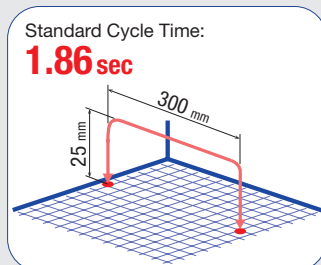
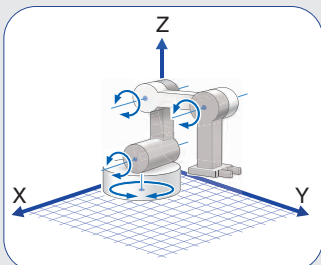
### ■ Easily Introduce Custom-Built Robots to Existing Systems

The connection between the **MRC01** and host system is controlled directly via EtherNet/IP™.

Custom-built robots can be added easily, without the need to make major changes to the control system in the existing equipment.



### Vertically Articulated Robot Load Mass 1 kg Standard Cycle Time for Reciprocating Motion (Reference value)



● Video available on the Oriental Motor website

→ Click here to watch the video "Broad Support for In-House Production of Robots"

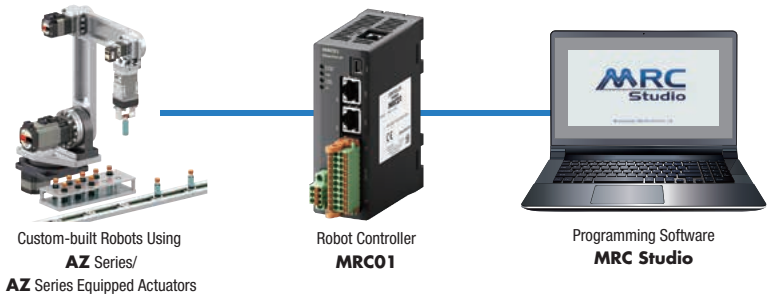


# Even for Beginners, Easy Setup

The "Programming Software **MRC Studio**" simplifies the setup of custom-built robots from the initial setting step to the operation programming step.

A trial version of the programming software is also available to allow customers the chance to experience the operation of the **MRC01** before purchase.

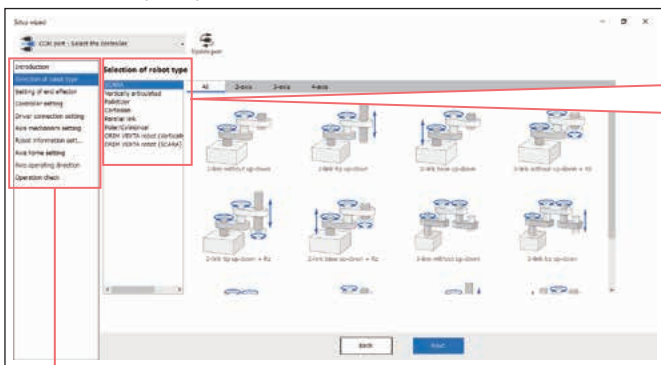
\*The **MRC Studio** software and EDS files can be downloaded for free from the Oriental Motor website.



## Step 1 Setup is Easy with Step by Step Guidance.

A setup wizard is used to configure the initial settings, select the robot type and input mechanism information. By following the guidance instructions while looking at the illustrations, even beginners can quickly set up a robot's initial settings.

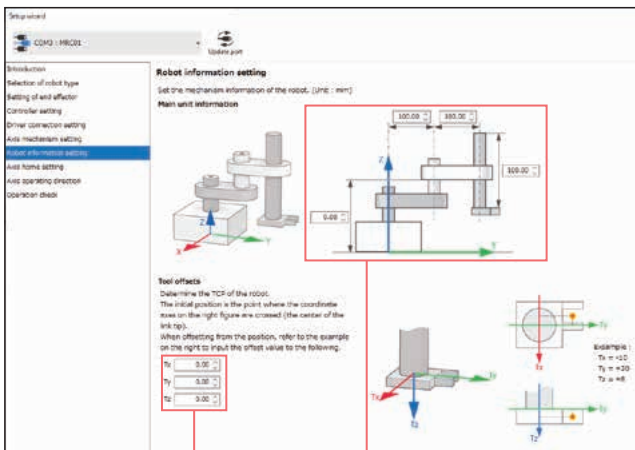
### ● Follow Set Up Steps



Proceed through initial setting of the robot by following the wizard menu.

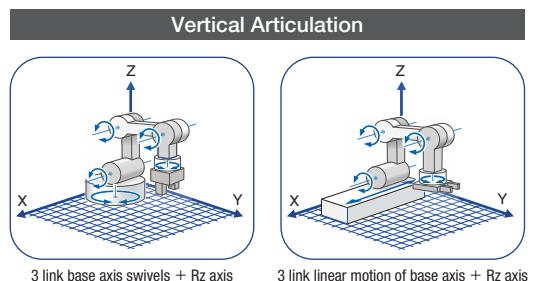


### ● Input Dimensions (Arm Length, etc.) With the Help of the Illustration

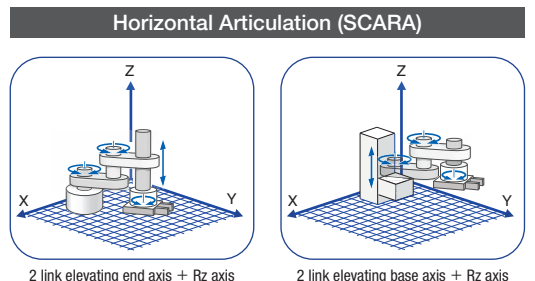


Dimensions are entered directly into the input spaces on the illustrations.

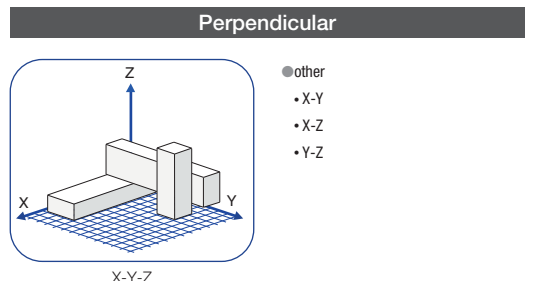
### ● Select the Robot Type



● Other: 3 link no base axis; 3 link base axis swivels; 3 link linear motion of base axis



● Other: 2 link no elevating axis; 2 link elevating end axis; 2 link elevating base axis; 2 link no elevating axis + Rz axis



● other  
 • X-Y  
 • X-Z  
 • Y-Z



● Refer to the operating manual for details on supported robots. Operating manuals can be downloaded from the Oriental Motor website.

Video is available on the Oriental Motor website

→An easy-to-understand explanation of the products



Available on website

→An overview of the trial version



## Step 2 Say Goodbye to Ladder Logic! Select Items to Program Operation.

Program creation uses a simple command selection format. Programs can be created intuitively, without requiring specialized knowledge such as ladder diagrams. The system supports P to P operation, linear interpolation operation, circular interpolation operation, arch motion and others. Operating data is executed directly from a host controller via EtherNet/IP.

- Drag and Drop the Required Commands
- Target Position and Speed Setting

Select the necessary action from the "Command" column, drag and drop into the "Sequence" column, then the "Command Setting" column is displayed.

Command	Sequence	Command Setting
Move		
PTP		
Linear		
Circular CW		
Circular CCW		
Circular via-point		
Arch		
Axis moving		
End effector		
Return-to-origin		
Pallet PTP		
Pallet linear		

Command	Name	Position [mm]
0	Return-to-origin	X
1	Loop (end)	Loop 3 times
2	End effector	Grip object
3	Arch	Move -200.000
4	End effector	Release object
5	Arch	Move to next 0.000
6	Loop (end)	

Arch

Target position

Absolute Relative

X -200.000 mm  Rx 0.000 deg

Y 60.000 mm  Ry 0.000 deg

Z 0.000 mm  Rz 0.000 deg

E 0.000 mm deg  Reflect present position

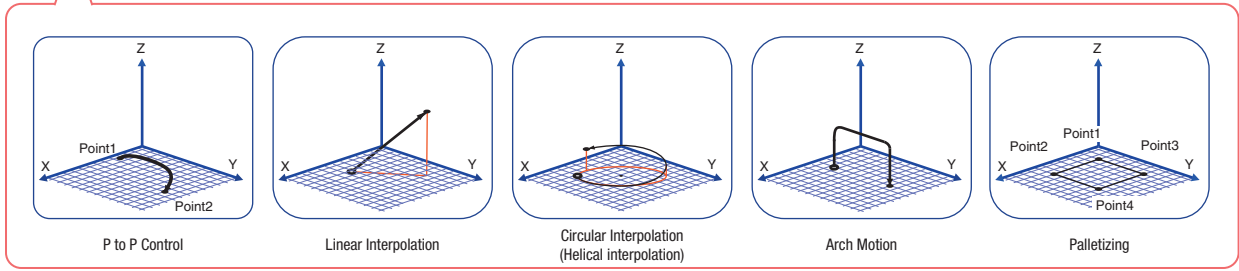
Arch

A: Ascending height 30.000 mm

B: Maximum height 40.000 mm

C: Descending start height 30.000 mm

Speed



## Step 3 Check Operation and Verify Programming Using the Simulator.

The program running time can be displayed and the contents of the program can be verified while taking into account the robot's moving ion range, etc. 3D graphics can be used to check operation, without the need to move the robot itself.

- \*There is a possibility of differences between the simulation and the actual operation.
- \*Communication with the **MRC01** is required for the simulation.

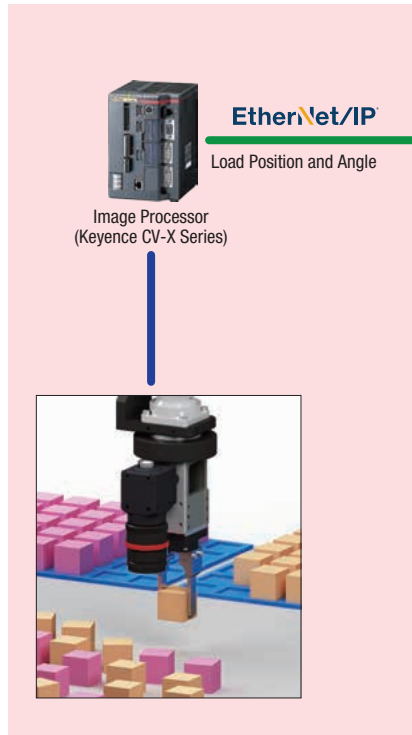
Command	Sequence	Operating t...	Command
	0	2.9	Return-to-origin
	1	...	Loop (start) Loop 3 times
	2	0.6	End effector1 Grip object
	3	14.2	Arch Move
	4	0.6	End effector1 Release obj
	5	14.2	Arch Move to next
	6	...	Loop (end)

# The 2D Camera Integration Function Allows for the Automation of More Advanced Work

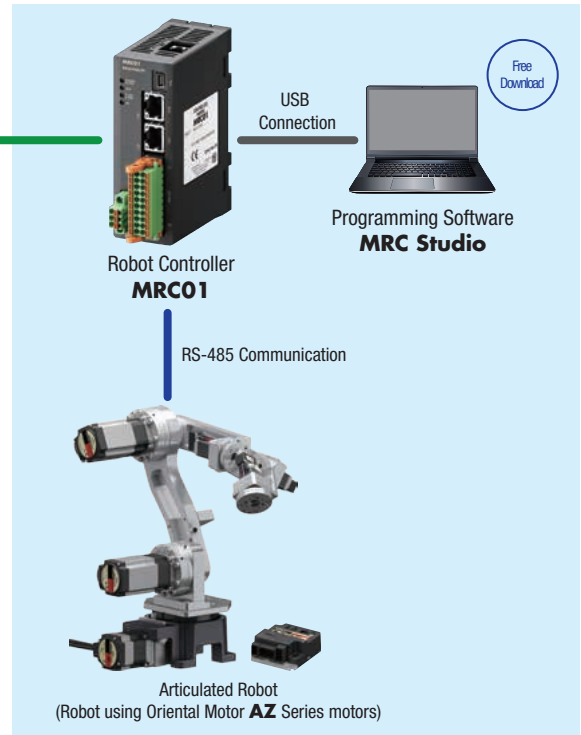
## Configuration of a Robot Vision System Using 2D Cameras

The robot controller **MRC01** is equipped with useful functions for operating the robot using load position and angle information acquired by the camera.

- Acquire Load Position and Angle Information Using the Camera



- Convert to Robot Coordinates and Operate



- About Supported Image Processors and PLC Models

The above configuration diagram is a connection example for the CV-X series from Keyence Corporation. Information about other compatible models will be posted to the Oriental Motor website as it becomes available.

- About Calibration

In order to integrate the 2D camera, **MRC Studio** is used to perform the calibration in advance. The settings can be easily configured by simply following the on-screen instructions while looking at the illustrations, allowing for a reduction in the work hours necessary for correction. (Up to 2 cameras can be calibrated.)

## Application Example

There are many automated operations that can be achieved by integrating and linking 2D cameras, such as load position detection and dimensional/external inspections. Representative examples are shown here.

- ◇ Position Correction

Alignment of complicated workpieces (Fixed camera system)



- ◇ Color Discrimination

Differentiates workpieces of different colors (Hand-eye system)



## Product Line

Product Name	List Price
<b>MRC01</b>	

## Included

- CN1 Connector (1 pc.)
- CN4 Connector (1 pc.)

## Specifications

### Basic Specifications



Power Supply	Input Voltage	24 VDC $\pm$ 10%
	Input Current	0.2 A
Interface	Field Network	EtherNet/IP
	Control Input	8 points, Photocoupler
	Control Output	8 points, Photocoupler and Open-Collector
RS-485 Communication Specification		Modbus RTU EIA-485 compliance, Straight cable Shielded twisted-pair wire (TIA/EIA-568B CAT5e or greater recommended) is used up to a total extension length of 50 m (164 ft). <sup>*1</sup>
USB Connector	Specifications	USB 2.0 (Full-Speed)
	Cable	Length: 3 m (9.8 ft.) max. Type: A to mini B
Setting Tool		Programming Software <b>MRC Studio</b>
Number of Control Axes		8 axes max. <sup>*2</sup>
Robot Model <sup>*3</sup>		Horizontal Articulated (2-link, 3-link), Vertical Articulated (3-axis to 6-axis) Palletizer (1-link mechanism, 2-link mechanism), Parallel Link, Polar/Cylindrical Coordinates, Orthogonal (2-axis, 3-axis), Orthogonal-Horizontal Gantry (2-axis, 3-axis)
Drive Command		P to P, Linear Interpolation, Circular Interpolation, Arc Interpolation, Palette (P to P, Line, Arc)
Monitor		Robot Graphic, Alarm, Information, etc.

\*1 If noise generated by the motor cable or power supply cable causes a problem due to wiring and installation, try shielding the cables or insert ferrite cores.

\*2 - Only one robot can be controlled by **MRC01**.

- The number of control axes depends on the robot model. For example, if the robot model is horizontal multi-joint (2-links, up and down of tip axis) and also controls the end effector (1 axis), the number of control axes will be 4 axes.

\*3 Refer to the operating manual for details on supported robots.

### EtherNet/IP Specifications

Protocol		EtherNet/IP (CT17 compliance)
Vendor ID		187: Oriental Motor Company
Device Type		43: Generic Device
Transmission Rate		10/100 Mbps (Auto-negotiation)
Communication Mode		Full-duplex/Half-duplex (Auto-negotiation)
Cable Specifications		Shielded Twisted-pair (STP) Cable Straight/Cross, Category 5e or greater is recommended [Total extension length: 50 m (164 ft.) max.]
Occupied Byte	Output (Scanner $\rightarrow$ <b>MRC01</b> )	2 to 228 bytes
	Input ( <b>MRC01</b> $\rightarrow$ Scanner)	2 to 228 bytes
Implicit Communication	Number of Supported Connections	2
	Connection Type	Exclusive Owner, Input Only
	Communication Cycle	10 to 3,200 ms
	Connection Type (Scanner $\rightarrow$ <b>MRC01</b> )	Point-to-Point
	Connection Type ( <b>MRC01</b> $\rightarrow$ Scanner)	Point-to-Point, Multicast
	Data Reflection Trigger	Cyclic
IP Address Setting Method		Parameter, DHCP
Supported Topology		Star, Linear, Ring (Device Level Ring)

### General Specifications

Degree of Protection	IP10
Operating Environment	Ambient Temperature: 0 to +55°C (+32 to +131°F) (Non-freezing) Humidity: 85% or less (Non-condensing) Altitude: Max. of 1000 m (3300 ft.) above sea level Atmosphere: No corrosive gases or dust. The product should not be exposed to water or oil.
Storage Conditions Transportation Conditions	Ambient Temperature: -25 to +70°C (-13 to +158°F) (Non-freezing) Humidity: 85% or less (Non-condensing) Altitude: Max. of 3000 m (10000 ft.) above sea level Atmosphere: No corrosive gases or dust. The product should not be exposed to water or oil.
Insulation Resistance	The measured value is 100 M $\Omega$ or more when a 500 VDC megger is applied between the following locations: - FG Terminal - Power Supply Terminal

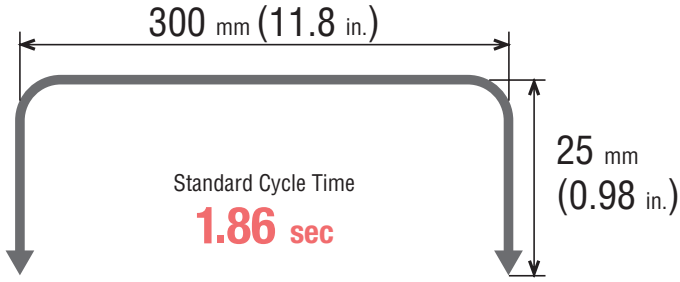
#### Note

- When measuring insulation resistance or performing dielectric voltage withstanding tests, disconnect the controller and the motor/actuator.



## Standard Cycle Time (Reference Value)

The standard cycle time (reference value) is the time required for reciprocating operation of 25 mm (0.98 in.) vertically and 300 mm (11.8 in.) horizontally with a load mass of 1 kg (2.2 lb.).



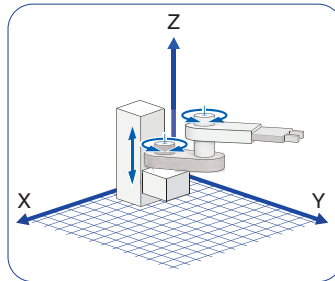
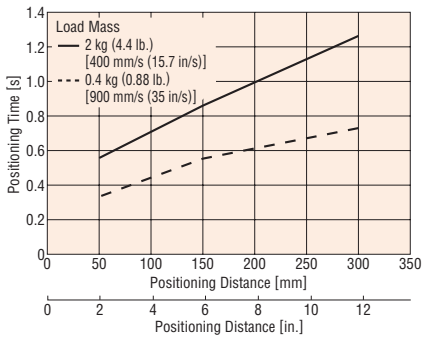
### Note

The standard cycle time (reference value) is the data obtained by our in-house robot measured under the operating conditions where the torque of each axis is sufficient for the load mass. Cycle time depends on your operating conditions.

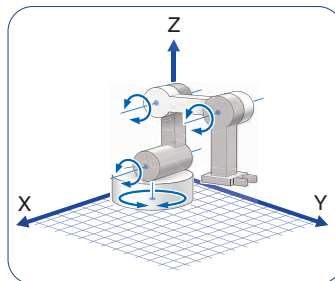
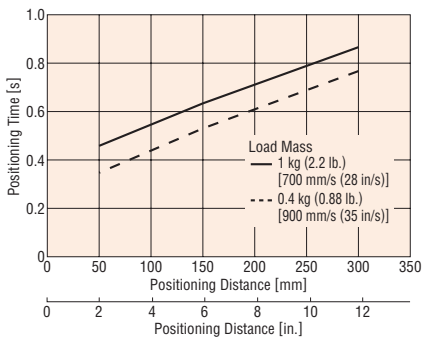
## Positioning Distance – Positioning Time (Reference Value)

The positioning time (reference) can be checked from the positioning distance. The positioning time depends on the load mass.

### Horizontal Multi-Joint Robot (2-Links, Elevating Base Axis)

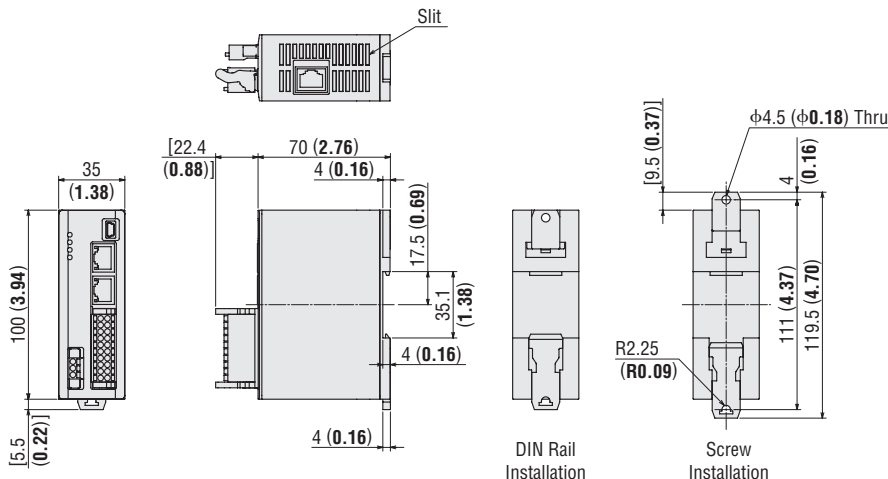


### Vertical Multi-Joint Robot (3-Links, Turning Base Axis)



## Dimensions Unit: mm (in.) 2D & 3D CAD

Product Name	Mass kg (lb.)	2D CAD
MRC01	0.12 (0.26)	B1537



### Included

Power Supply Connector (CN1)  
Connector: FMC1,5/3-STF3,5  
(Phoenix Contact)

I/O Signal Connector (CN4)  
Connector: DFMC1,5/10-ST-3,5-LR  
(Phoenix Contact)

# Cables

## RS-485 Communication Cables

These cables are used to connect **MRC01** and **AZ** Series driver.

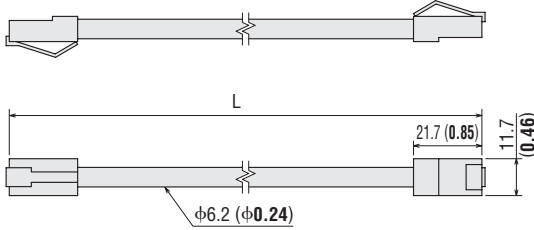
### Product Line

Product Name	Length L [m (ft.)]	Applicable Driver	List Price
<b>CC001-RS4</b>	0.1 (0.33)	Built-in Controller Type DC Input Driver	
<b>CC002-RS4</b>	0.25 (0.83)	Built-in Controller Type AC Input Driver Built-in Controller Type DC Input Driver	
<b>CC02FLT6</b>	2 (6.6)	Compact Driver RS-485 Communication Type	
<b>CC05FLT6</b>	5 (16.4)		

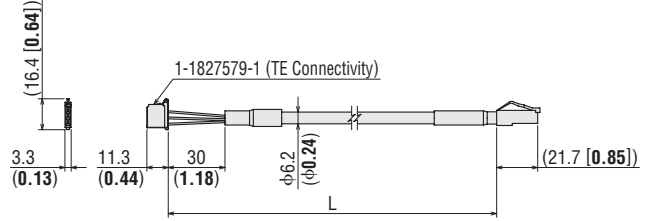


### Dimensions Unit: mm (in.)

**CC001-RS4, CC002-RS4**



**CC02FLT6, CC05FLT6**



## I/O Signal Cables General-Purpose Type

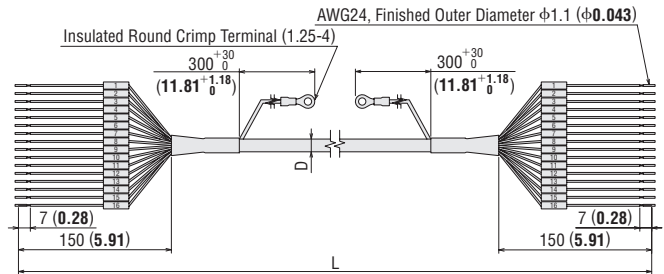
- Shielded cables
- Loose wires at both ends
- Easy shield grounding with round ground wire terminals
- The number of lead wire cores can be selected to match the functions being used



### Product Line

Product Name	Length L [m (ft.)]	Number of Lead Wire Cores	Outer Diameter D [mm (in.)]	AWG	List Price
<b>CC06D005B-1</b>	0.5 (1.64)	6	φ5.4 (φ0.21)	24	
<b>CC06D010B-1</b>	1 (3.3)				
<b>CC06D015B-1</b>	1.5 (4.9)				
<b>CC06D020B-1</b>	2 (6.6)				
<b>CC10D005B-1</b>	0.5 (1.64)	10	φ6.7 (φ0.26)		
<b>CC10D010B-1</b>	1 (3.3)				
<b>CC10D015B-1</b>	1.5 (4.9)				
<b>CC10D020B-1</b>	2 (6.6)				
<b>CC12D005B-1</b>	0.5 (1.64)	12	φ7.5 (φ0.30)		
<b>CC12D010B-1</b>	1 (3.3)				
<b>CC12D015B-1</b>	1.5 (4.9)				
<b>CC12D020B-1</b>	2 (6.6)				
<b>CC16D005B-1</b>	0.5 (1.64)	16	φ7.5 (φ0.30)		
<b>CC16D010B-1</b>	1 (3.3)				
<b>CC16D015B-1</b>	1.5 (4.9)				
<b>CC16D020B-1</b>	2 (6.6)				

### Dimensions Unit: mm (in.)



• The figure depicts 16 core wires.

## DC Power Supply Cables

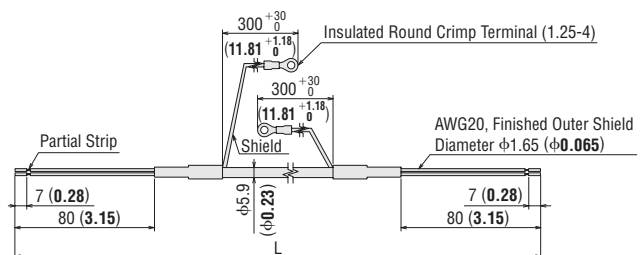
These cables are used to connect **MRC01** and the DC power supply.

### Product Line

Product Name	Length L [m (ft.)]	List Price
<b>CC02D005-3</b>	0.5 (1.64)	
<b>CC02D010-3</b>	1 (3.3)	
<b>CC02D015-3</b>	1.5 (4.9)	
<b>CC02D020-3</b>	2 (6.6)	
<b>CC02D050-3</b>	5 (16.4)	



### Dimensions Unit: mm (in.)



## ■ Applicable Products

This controller can connect to the following **AZ** Series drivers. It can also be connected to an **AZ** Series-equipped Linear & Rotary Actuators.

### **AZ** Series Drivers

#### • Built-in Controller Type



Single-Phase 100-120 VAC, 24/48 VDC  
Single-Phase/Three-Phase  
200-240 VAC

#### • mini Driver RS-485 Communication Type



24/48 VDC

### **AZ** Series Motors, **AZ** Series-Equipped Linear & Rotary Actuators



Motors



Hollow Rotary Actuators  
**DGII** Series



Compact Linear Actuators  
**DR** Series  
**DRS2** Series



Electric Linear Slides  
**EZS** Series  
**EAS** Series  
**EZSH** Series



Electric Cylinders  
**EAC** Series



Lack and Pinion Systems  
**L** Series



Electric Gripper  
**EH** Series