Oriental motor

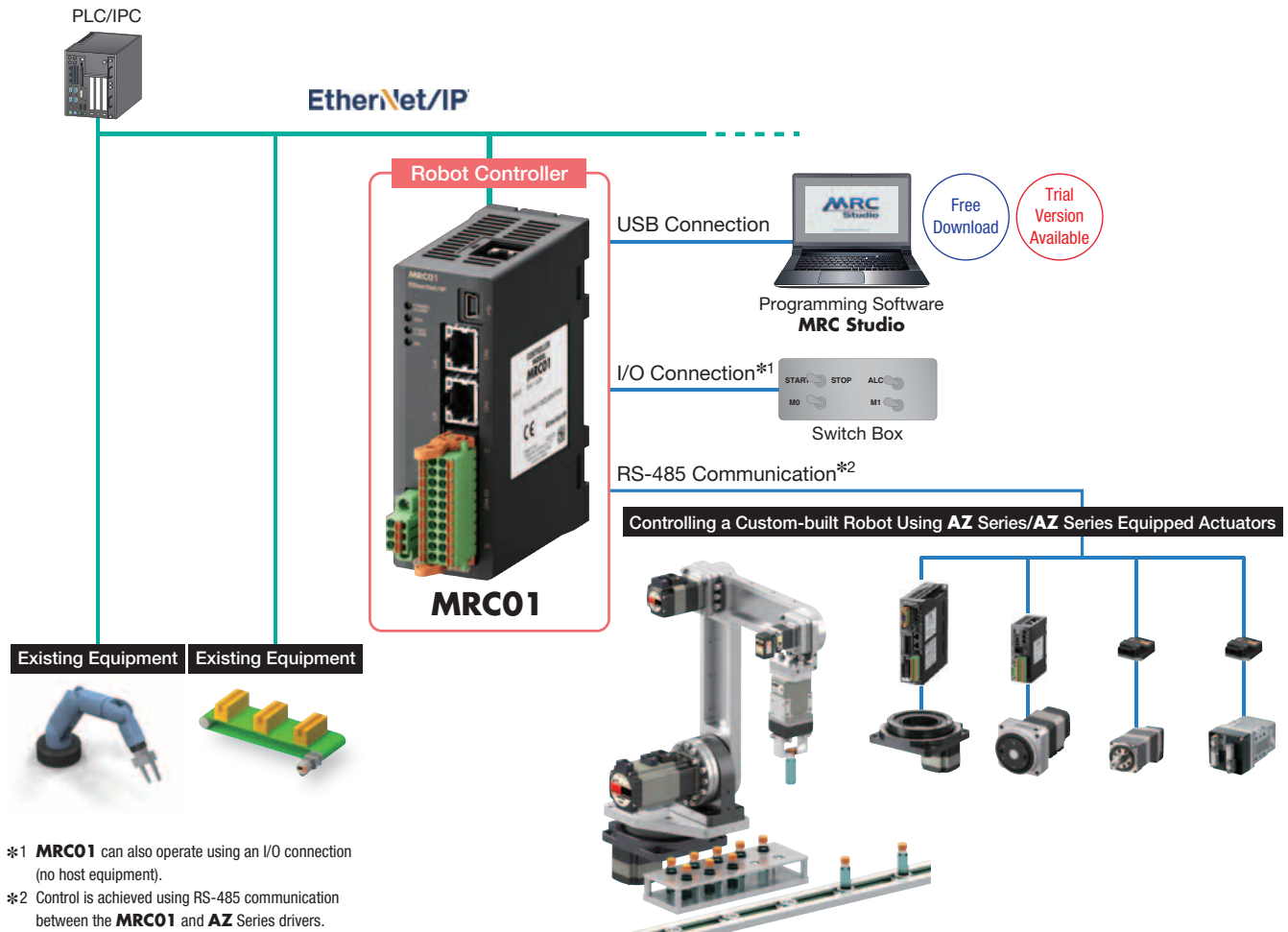## Become a Robot Master in Just 3 Steps

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.

PLC/IPC

EtherNet/IP

Robot Controller

USB Connection

Free Download

Trial Version Available

Programming Software
MRC Studio

I/O Connection*1

START   STOP   ALC
M0   M1

Switch Box

RS-485 Communication*2

Controlling a Custom-built Robot Using **AZ** Series/**AZ** Series Equipped Actuators

MRC01

Existing Equipment | Existing Equipment

*1 **MRC01** can also operate using an I/O connection (no host equipment).
*2 Control is achieved using RS-485 communication between the **MRC01** and **AZ** Series drivers.

Vertically Articulated Robot Load Mass 1 kg (2.2 lb) Standard Cycle Time for Reciprocating Motion (Reference value)

Z

X   Y

Standard Cycle Time:
1.86 sec

300 mm (11.8 in.)

25 mm (0.98 in.)
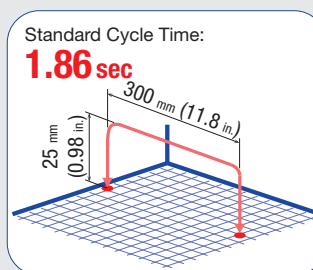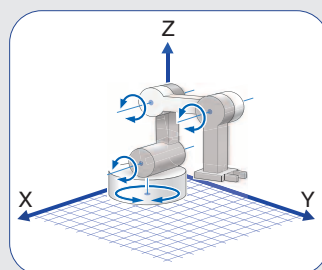
Even for Beginners, Easy Setup

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.

Custom-built Robots Using **AZ** Series/ **AZ** Series Equipped Actuators

Robot Controller **MRC01**

Programming Software **MRC Studio**
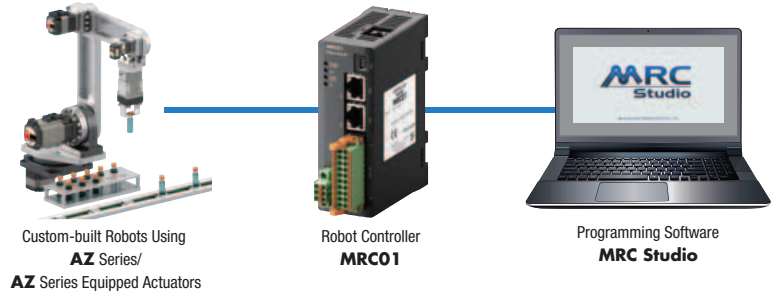
Step 1 — Setup is Easy with Step by Step Guidance.

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.
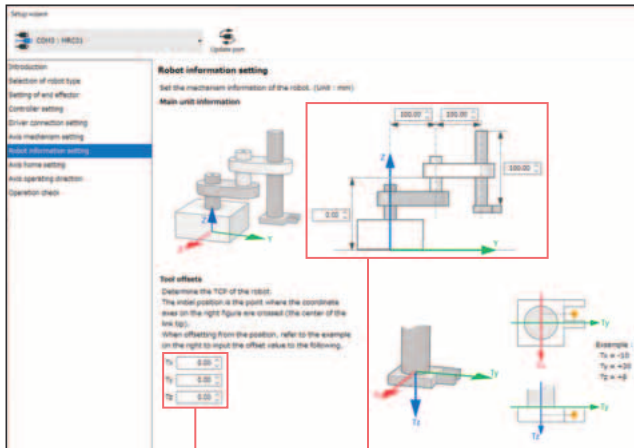
●Follow Set Up Steps

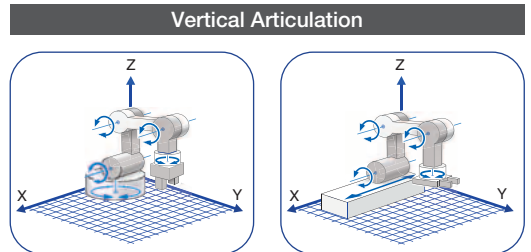Proceed through initial setting of the robot by following the wizard menu.

### ●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

Vertical Articulation

3 link base axis swivels + Rz axis

3 link linear motion of base axis + Rz axis

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

Horizontal Articulation (SCARA)
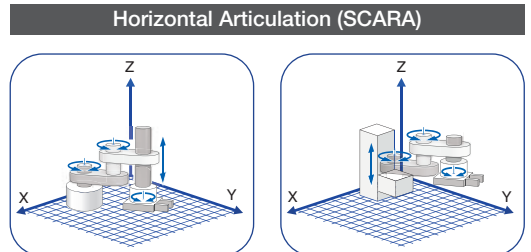
2 link elevating end axis + Rz axis

2 link elevating base axis + Rz axis

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

Perpendicular

X-Y-Z
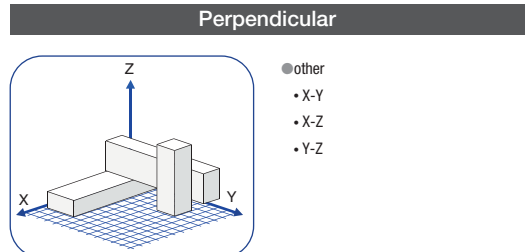
●other
• X-Y
• X-Z
• Y-Z

ORIM VEXTA Robot

Articulated robot arms from ORIM VEXTA are supported.
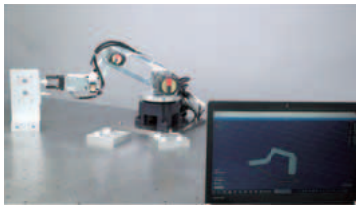Please refer to the ORIM VEXTA website for details.

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

➜An easy-to-understand explanation of the products

➜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.

| | P to P Control | Linear Interpolation | Circular Interpolation (Helical interpolation) | Arch Motion | Palletizing |
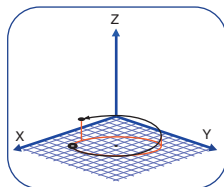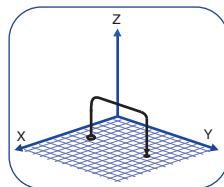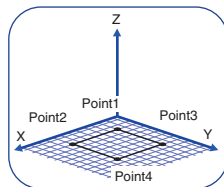
Step 3   **Check Operation and Verify Programming Using the Simulator.**

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.

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.

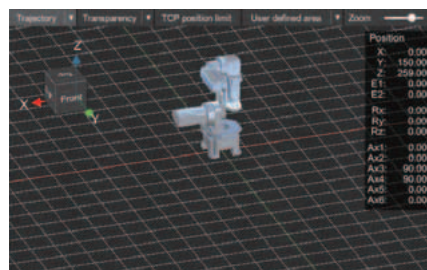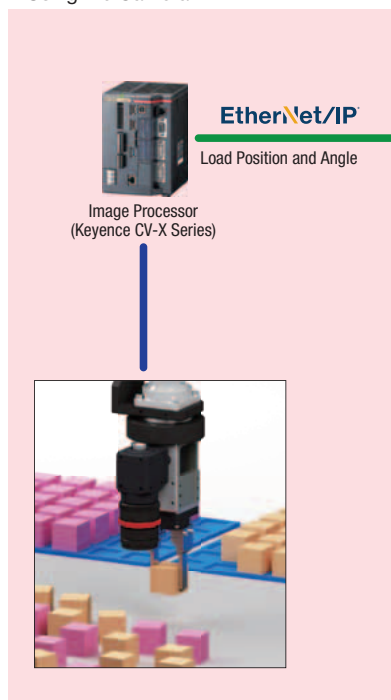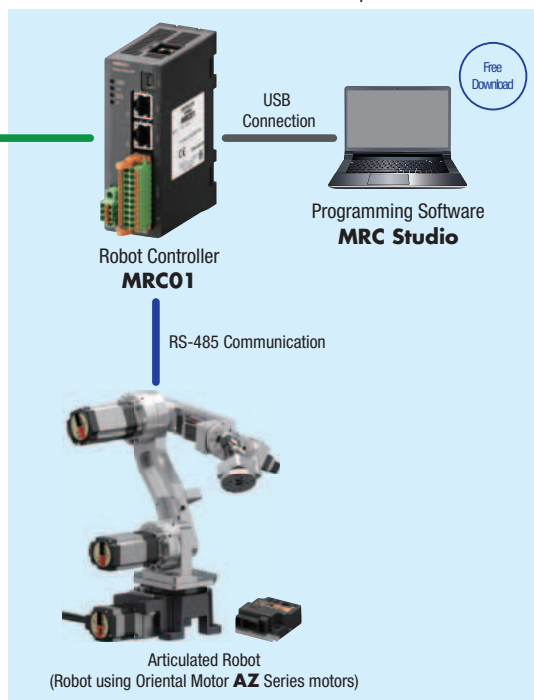●Acquire Load Position and Angle Information Using the Camera

●Convert to Robot Coordinates and Operate

EtherNet/IP™
Load Position and Angle

Image Processor
(Keyence CV-X Series)

PLC

EtherNet/IP™
Load Position and Angle

USB Connection

Free Download

Robot Controller
MRC01

Programming Software
MRC Studio

RS-485 Communication

Articulated Robot
(Robot using Oriental Motor **AZ** Series motors)

●**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)
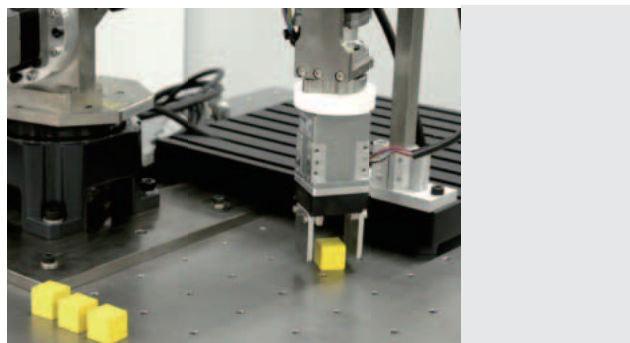
◇**Color Discrimination**
Differentiates workpieces of different colors (Hand-eye system)

■Product Line

Product Name
MRC01

■Included

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

■Specifications

●Basic Specifications

$C\epsilon$

Power Supply	Input Voltage	24 VDC ±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.).[*1]
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 **MRC Studio**
Number of Control Axes		8 axes max.[*2]
Robot Model[*3]		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 ➜ **MRC01**)	2 to 228 bites
	Input (**MRC01** ➜ Scanner)	2 to 228 bites
Implicit Communication	Number of Supported Connections	2
	Connection Type	Exclusive Owner, Input Only
	Communication Cycle	10 to 3,200 ms
	Connection Type (Scanner ➜ **MRC01**)	Point-to-Point
	Connection Type (**MRC01** ➜ 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 MΩ 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.).
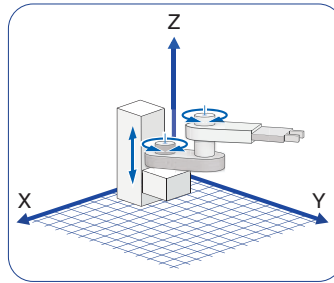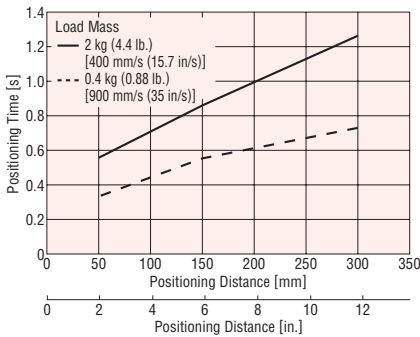
300 mm (11.8 in.)

Standard Cycle Time
1.86 sec

25 mm (0.98 in.)
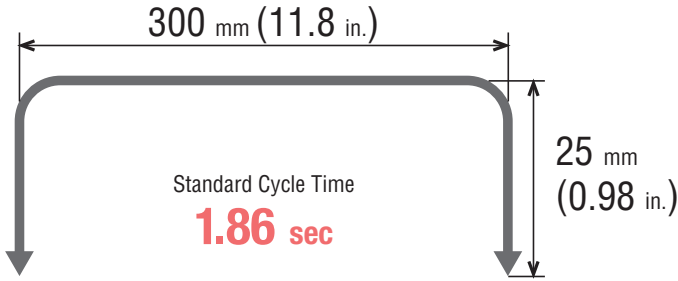
Note

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.
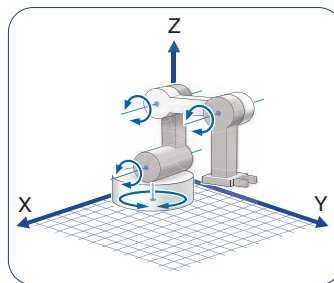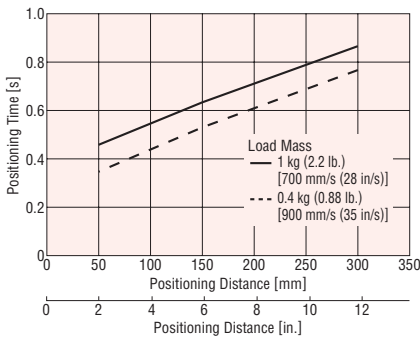Cycle time depends on your operating conditions.

■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.

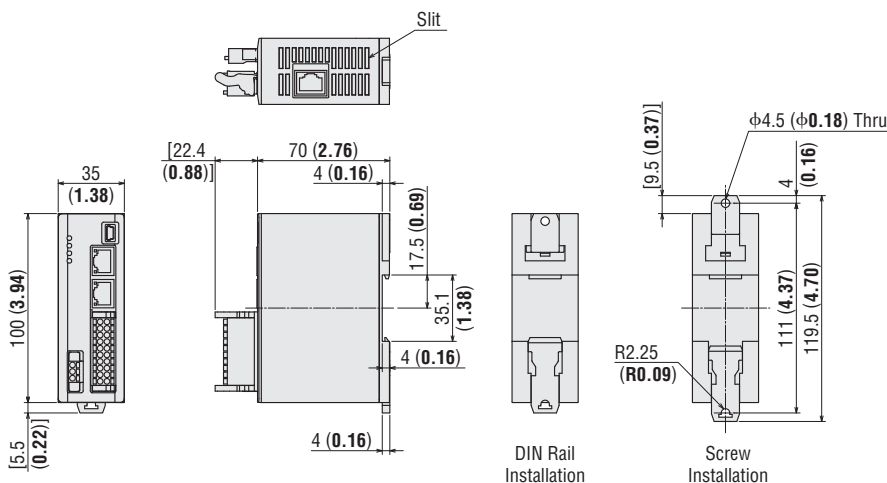## ●Horizontal Multi-Joint Robot (2-Links, Elevating Base Axis)

Load Mass
— 2 kg (4.4 lb.) [400 mm/s (15.7 in/s)]
- - - 0.4 kg (0.88 lb.) [900 mm/s (35 in/s)]

Positioning Time [s] vs Positioning Distance [mm] / [in.]

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

Load Mass
— 1 kg (2.2 lb.) [700 mm/s (28 in/s)]
- - - 0.4 kg (0.88 lb.) [900 mm/s (35 in/s)]

Positioning Time [s] vs Positioning Distance [mm] / [in.]

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

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

Slit

35 (1.38)
100 (3.94)
[5.5 (0.22)]

[22.4 (0.88)]
70 (2.76)
4 (0.16)
17.5 (0.69)
35.1 (1.38)
4 (0.16)
4 (0.16)

DIN Rail Installation

[9.5 (0.37)]
φ4.5 (φ0.18) Thru
4 (0.16)
111 (4.37)
119.5 (4.70)
R2.25 (R0.09)

Screw Installation

●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

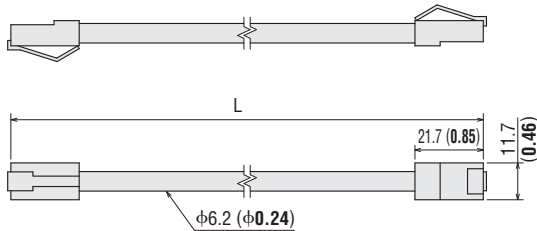These cables are used to connect **MRC01** and **AZ** Series driver.

●Product Line

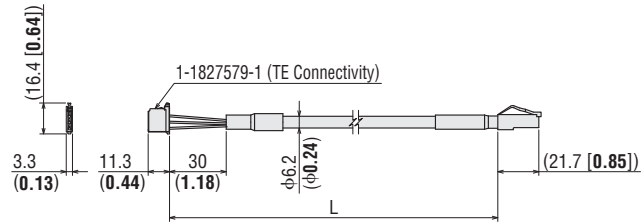| Product Name	Length L [m (ft.)]	Applicable Driver
CC001-RS4	0.1 (0.33)	Built-in Controller Type DC Input Driver
CC002-RS4	0.25 (0.83)	Built-in Controller Type AC Input Driver Built-in Controller Type DC Input Driver
CC02FLT6	2 (6.6)	Compact Driver RS-485 Communication Type
CC05FLT6	5 (16.4)	

**CC001-RS4
CC002-RS4** **CC02FLT6
CC05FLT6**

●Dimensions Unit: mm (in.)

CC001-RS4, CC002-RS4

L
21.7 (**0.85**)
11.7 (**0.46**)
φ6.2 (φ**0.24**)

CC02FLT6, CC05FLT6

(16.4 [**0.64**])
1-1827579-1 (TE Connectivity)
3.3 (**0.13**) 11.3 (**0.44**) 30 (**1.18**) φ6.2 (φ**0.24**) (21.7 [**0.85**]) L

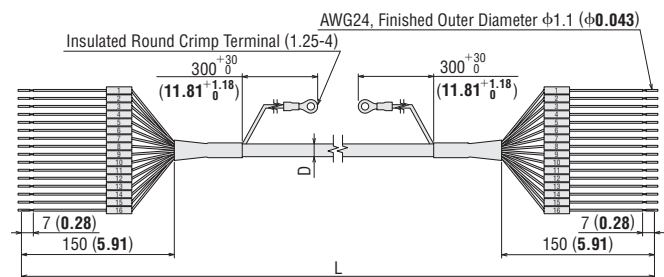## ■I/O Signal Cables General-Purpose Type

- 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
CC06D005B-1	0.5 (1.64)	6	φ5.4 (φ0.21)	24
CC06D010B-1	1 (3.3)			
CC06D015B-1	1.5 (4.9)			
CC06D020B-1	2 (6.6)			
CC10D005B-1	0.5 (1.64)	10	φ6.7 (φ0.26)	
CC10D010B-1	1 (3.3)			
CC10D015B-1	1.5 (4.9)			
CC10D020B-1	2 (6.6)			
CC12D005B-1	0.5 (1.64)	12	φ7.5 (φ0.30)	
CC12D010B-1	1 (3.3)			
CC12D015B-1	1.5 (4.9)			
CC12D020B-1	2 (6.6)			
CC16D005B-1	0.5 (1.64)	16	φ7.5 (φ0.30)	
CC16D010B-1	1 (3.3)			
CC16D015B-1	1.5 (4.9)			
CC16D020B-1	2 (6.6)			

●Dimensions Unit: mm (in.)

AWG24, Finished Outer Diameter φ1.1 (φ**0.043**)
Insulated Round Crimp Terminal (1.25-4)
300^{+30}_{0} (**11.81**$^{+1.18}_{0}$) 300^{+30}_{0} (**11.81**$^{+1.18}_{0}$)
7 (**0.28**) 150 (**5.91**) 7 (**0.28**) 150 (**5.91**) L

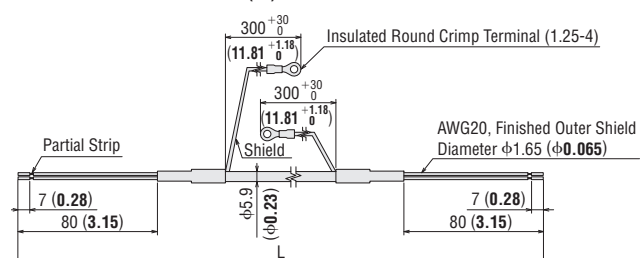● The figure depicts 16 core wires.

■DC Power Supply Cables

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

●Product Line

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

●Dimensions Unit: mm (in.)

300^{+30}_{0} (**11.81**$^{+1.18}_{0}$) Insulated Round Crimp Terminal (1.25-4)
300^{+30}_{0} (**11.81**$^{+1.18}_{0}$)
Partial Strip Shield AWG20, Finished Outer Shield Diameter φ1.65 (φ**0.065**)
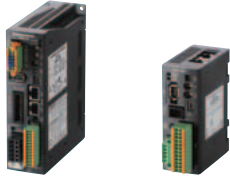7 (**0.28**) 80 (**3.15**) φ5.9 (φ**0.23**) 7 (**0.28**) 80 (**3.15**) L

■ 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,
Single-Phase/Three-Phase
200-240 VAC

24/48 VDC

● 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

Electric Cylinders
EAC Series

Lack and Pinion Systems
L Series

Electric Gripper
EH Series

Specifications are subject to change without notice. This catalog was published in April, 2024.

ORIENTAL MOTOR U.S.A. CORP.