This catalog is an introduction to only part of what Mitsubishi Electric has to offer. Mitsubishi Electric offers individualized solutions for the challenges in your factory.

When exported from Japan, this manual does not require application to the Ministry of International Trade and Industry for service transaction permission.

Specifications are subject to change without notice.
Features

Mitsubishi Electric’s F-Series industrial robots are equipped with technology developed and tested at its own production plants. Equipped with advanced technology and easy-to-use features, these robots are designed to facilitate automation of any production plant.

- Designed for flexible automation
- Compact and powerful
- High reliability

**Vertical type**

A compact 6-axis jointed robot with an optimal arm length and wider range of movement suited for complex assembly and processing tasks. Compact body and slim arm design, allowing operating area to be expanded and load capacity increased. Layout accommodates a wide range of applications from transport of mechanical parts to assembly of electrical parts. Environmental resistance specifications enable application to a wide range of uses without needing to consider the installation environment.

- The fastest high-speed operation in its class
- Contributes to improved productivity with high-frequency operations
- Prevention of interference with cables
- Compatibility with internal Ethernet cable tools
- Expanded J4 axis operating range
- Compact installation with operation performed near the robot base
- Changes in operating posture made even more quickly
- Full use of installation space

**Horizontal type**

Matches perfectly to a variety of applications with a wide range of operating areas and variations. High speed and high accuracy achieved with the highly rigid arm and latest servo control technology. Suitable for a wide range of fields from mass production of food and pharmaceutical products requiring high-speed operation to assembly operations requiring high precision.

- The fastest high-speed operation in its class
- Improved speed for vertical movements
- Improved continuous operability
- Enhanced wrist axis
- Internal routing of cables results in simplified cable management
- Compatibility with internal Ethernet cable tools
- Full use of installation space

Features

- Designed for flexible automation
- Compact and powerful
- High reliability
With a wide range of variations from Mitsubishi

The Mitsubishi Electric robot product line is equipped with all of the basic performance features desired in a robot, such as being powerful, speedy, and compact. The variations that Mitsubishi Electric is confident meet the needs of the current era and have pushed Factory Automation forward in a dramatic way.

Vertical, multiple-joint type (RV)

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<th>Type</th>
<th>Maximum load capacity (kg)</th>
<th>Maximum reach radius (mm)</th>
<th>Environmental specifications</th>
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Controller: CRT50

Horizontal, multiple-joint type (RH)

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Controller: CRT750

Electric, committed to ease in selection.

Controller type:
- CR750: Japan, Europe, U.S.; CR751: Asia
- CR751: Japan, Europe, U.S.
- CR751: Japan, Asia

Environment specification:
- M: Oilmist specifications
- C: Clean specifications
- Blank: Standard specifications

Vertical stroke:
- 12: 120mm
- 15: 150mm
- 20: 200mm
- 34: 340mm
- 35: 350mm
- 45: 450mm

Arm length:
- L: Long arm
- Series: F series

Robot load capacity:
- 2 kg
- 4 kg
- 6 kg
- 12 kg
- 20 kg

Robot structure:
- Vertical, multiple-joint type

Controller with protective specifications (Equipped with controller protection base)
**RV-2F**

**Specifications**

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<tr>
<td>Installation degree</td>
<td></td>
<td>Standard 11, basic type</td>
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<tr>
<td>Installation</td>
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<td>Standard 11, basic type</td>
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<tr>
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<td>6800</td>
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<td>Maximum load capacity kg</td>
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<tr>
<td>Installation floor type</td>
<td></td>
<td>Floor type</td>
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</tr>
</tbody>
</table>

### RV-7F

#### Mechanical Interface Detail

- **Type**: RV-7F(M)(C)
- **Unit**: Standard 11, basic type
- **Dimensions**:
  - **Height**: 1113.4 mm
  - **Width**: 400 mm
  - **Depth**: 340 mm
- **Control point (R point)**: for -SH** specifications
- **Wrist's downward limit**: 15.9 mm
- **Singularity boundary**: RV-7F(M)(C)
- **Arm length**:
  - J1: ±240°
  - J2: ±115°
  - J3: -240°
  - J4: ±360°
  - J5: ±120°
  - J6: ±360°
- **Vertical movement over a vertical distance of 25 mm and horizontal distance of 300 mm.**

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  - J2: ±115°
  - J3: -240°
  - J4: ±360°
  - J5: ±120°
  - J6: ±360°
- **Vertical movement over a vertical distance of 25 mm and horizontal distance of 300 mm.**
Specifications

**Minimum load capacity**: 2 kg. The cycle time may increase if specific requirements apply such as high work positioning accuracy, or depending on the operating position. (The cycle time is based on back-and-forth movement over a vertical distance of 25 mm and horizontal distance of 300 mm.)

**Machine class**: Standard/ Oil Mist/ Clean

**Structure**: Horizontal, multi-joint type

**Degrees of freedom**: 4

**Tooling**: No 1 arm

**Maximum composite speed**: 2 mm/sec

**Maximum speed**: 830 deg/sec

**Position detection method**: Absolute encoder

**Drive system**: AC servo motor

**Number of axes**: 4

**Maximum load capacity**: 12 kg (rating 3)

**Protection degree**: IP20/ IP65

External Dimensions/Operating Range Diagram

Specifications

**Minimum load capacity**: 2 kg. The cycle time may increase if specific requirements apply such as high work positioning accuracy, or depending on the operating position. (The cycle time is based on back-and-forth movement over a vertical distance of 25 mm and horizontal distance of 300 mm.)

**Machine class**: Standard/ Oil Mist/ Clean

**Structure**: Horizontal, multi-joint type

**Degrees of freedom**: 4

**Tooling**: No 2 arm

**Maximum composite speed**: 2 mm/sec

**Maximum speed**: 830 deg/sec

**Position detection method**: Absolute encoder

**Drive system**: AC servo motor

**Number of axes**: 4

**Maximum load capacity**: 12 kg (rating 3)

**Protection degree**: IP20/ IP65

External Dimensions/Operating Range Diagram

Specifications

**Minimum load capacity**: 2 kg. The cycle time may increase if specific requirements apply such as high work positioning accuracy, or depending on the operating position. (The cycle time is based on back-and-forth movement over a vertical distance of 25 mm and horizontal distance of 300 mm.)

**Machine class**: Standard/ Oil Mist/ Clean

**Structure**: Horizontal, multi-joint type

**Degrees of freedom**: 4

**Tooling**: No 3 arm

**Maximum composite speed**: 2 mm/sec

**Maximum speed**: 830 deg/sec

**Position detection method**: Absolute encoder

**Drive system**: AC servo motor

**Number of axes**: 4

**Maximum load capacity**: 12 kg (rating 3)

**Protection degree**: IP20/ IP65

External Dimensions/Operating Range Diagram

Specifications

**Minimum load capacity**: 2 kg. The cycle time may increase if specific requirements apply such as high work positioning accuracy, or depending on the operating position. (The cycle time is based on back-and-forth movement over a vertical distance of 25 mm and horizontal distance of 300 mm.)

**Machine class**: Standard/ Oil Mist/ Clean

**Structure**: Horizontal, multi-joint type

**Degrees of freedom**: 4

**Tooling**: No 4 arm

**Maximum composite speed**: 2 mm/sec

**Maximum speed**: 830 deg/sec

**Position detection method**: Absolute encoder

**Drive system**: AC servo motor

**Number of axes**: 4

**Maximum load capacity**: 12 kg (rating 3)

**Protection degree**: IP20/ IP65

External Dimensions/Operating Range Diagram

Specifications

**Minimum load capacity**: 2 kg. The cycle time may increase if specific requirements apply such as high work positioning accuracy, or depending on the operating position. (The cycle time is based on back-and-forth movement over a vertical distance of 25 mm and horizontal distance of 300 mm.)

**Machine class**: Standard/ Oil Mist/ Clean

**Structure**: Horizontal, multi-joint type

**Degrees of freedom**: 4

**Tooling**: No 5 arm

**Maximum composite speed**: 2 mm/sec

**Maximum speed**: 830 deg/sec

**Position detection method**: Absolute encoder

**Drive system**: AC servo motor

**Number of axes**: 4

**Maximum load capacity**: 12 kg (rating 3)

**Protection degree**: IP20/ IP65

External Dimensions/Operating Range Diagram

Specifications

**Minimum load capacity**: 2 kg. The cycle time may increase if specific requirements apply such as high work positioning accuracy, or depending on the operating position. (The cycle time is based on back-and-forth movement over a vertical distance of 25 mm and horizontal distance of 300 mm.)

**Machine class**: Standard/ Oil Mist/ Clean

**Structure**: Horizontal, multi-joint type

**Degrees of freedom**: 4

**Tooling**: No 6 arm

**Maximum composite speed**: 2 mm/sec

**Maximum speed**: 830 deg/sec

**Position detection method**: Absolute encoder

**Drive system**: AC servo motor

**Number of axes**: 4

**Maximum load capacity**: 12 kg (rating 3)

**Protection degree**: IP20/ IP65

External Dimensions/Operating Range Diagram

Specifications

**Minimum load capacity**: 2 kg. The cycle time may increase if specific requirements apply such as high work positioning accuracy, or depending on the operating position. (The cycle time is based on back-and-forth movement over a vertical distance of 25 mm and horizontal distance of 300 mm.)

**Machine class**: Standard/ Oil Mist/ Clean

**Structure**: Horizontal, multi-joint type

**Degrees of freedom**: 4

**Tooling**: No 7 arm

**Maximum composite speed**: 2 mm/sec

**Maximum speed**: 830 deg/sec

**Position detection method**: Absolute encoder

**Drive system**: AC servo motor

**Number of axes**: 4

**Maximum load capacity**: 12 kg (rating 3)

**Protection degree**: IP20/ IP65
Controller

**FQ series**

**Controller configuration**

Robot CPU Q172DRCPU

- Ethernet
- USB communication
- MR-J4-B
- MR-J3-BS

**Specifications**

<table>
<thead>
<tr>
<th>Type</th>
<th>Unit</th>
<th>CR750-Q</th>
<th>CR751-Q</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robot CPU</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interface</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power supply</td>
<td></td>
<td>230 V</td>
<td>230 V</td>
</tr>
<tr>
<td>Temperature range</td>
<td></td>
<td>-10°C to +55°C</td>
<td>-10°C to +55°C</td>
</tr>
<tr>
<td>Humidity</td>
<td></td>
<td>45 to 95%RH</td>
<td>45 to 95%RH</td>
</tr>
<tr>
<td>Dimensions (excluding legs)</td>
<td></td>
<td>430 (W) x 425 (D) x 174 (H)</td>
<td>430 (W) x 425 (D) x 98 (H)</td>
</tr>
<tr>
<td>Weight</td>
<td></td>
<td>15.8 kg</td>
<td>15.8 kg</td>
</tr>
</tbody>
</table>

**Controller protection box (IP54)**

Drive unit CR750-MB

The controller protection box is used to protect the controller from oil mist and other usage environments. (For CR750)

The front panel of the protection box has a mode switch and teaching box connection. It also contains a display window for viewing the controller operation panel.

**FD series**

**Controller configuration**

- MR-J4-B
- MR-J3-BS

**Specifications**

<table>
<thead>
<tr>
<th>Type</th>
<th>Unit</th>
<th>CR750-D</th>
<th>CR751-D</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
</tbody>
</table>

**Multiple CPU environment**

Unit: High-speed dedicated base (between multiple CPU)

<table>
<thead>
<tr>
<th>Base</th>
<th>HWP-D, 4 axis</th>
<th>HWP-B, 8 axis</th>
<th>HWP-08, 16 axis</th>
</tr>
</thead>
</table>

**Drive unit CR750-MB**

- MR-J3-BS
- MR-J4-B

**Drive unit CR751-MB**

- MR-J3-BS
- MR-J4-B

**Note:** The operating panel is not attached to the CR751. Set up the robot operating environment to accommodate operation by an external graphical optical terminal (GOT) or operating panel. Automatic and other operation modes can be enabled from the teaching pendant.
Functions

Shortened takt times

Improved control performance
Produced the fastest operating performance in its class using high-performance motors and unique drive control technology developed by Mitsubishi Electric.

- Enabled high torque output at high rotational speed, shortening acceleration/deceleration time.
- Shortened positioning time for improved device throughput.
- Continuous operability improved
- Improved speed for the vertical movements that are so essential to horizontal multi-joint robot operation: 2400 mm/s. [RH-6FH: Twice as fast as the conventional speed]

High-speed execution of programs
Enables execution up to 1.2 times faster than with the SQ/SD series. Numerical operation and conditional branch processing speeds increased by up to twice as fast, leading to shortened takt times.

Sample program

| JOV/SD 100 | PUP+PUPF+PUPZ*SHFT |
| RHI Series | MP+PUP+PUP*Z |
| RH-6FH | MP+PUP*Z |
| SQ/SD Series | MUP+PUP+PUP*Z |

Robot programs can be executed 1.2 times faster than before if compiled in advance and processed using an intermediate language. Takt times can be shortened by up to 3 times as much for longer times. (Compared to previous models)

Optimal acceleration/deceleration control and optimal override control
- Optimal acceleration/deceleration times and speeds set automatically based on robot operating position, posture, and load conditions.
- Load conditions are set, enabling acceleration/deceleration times and speeds to be changed automatically according to whether a workpiece is present or not.
- This enables the maximum operating speed to be produced for each task
- Time needed to shorten cycle times reduced.

Improved continuous operability
Overload detection levels optimized based on the ambient temperature settings for the robot (set in the parameters). This helps improve continuous operability using load levels calculated based on actual environmental conditions for the robot area.

The encoder temperature is monitored such that the machine is shut down due to error if the temperature exceeds the tolerable limit.

Improved tooling performance

Compatibility with internal Ethernet cable tools
Internal installation of wiring and piping for connecting to vision sensors enabled.

- Hand: 8 input points/8 output points
- Ethernet cable for the vision sensor

- Attachment of the vision sensor to the wrist facilitates wiring.

Internal routing of hand wiring and wiring channels
Internal routing of cables and air hoses is enabled through the internal channels that lead up to the end of the robot arm. Such internal routing increases the areas of the work envelope that the robot can reach without twisting and entangling cables and hoses.

This prevents interference with cables around devices and reduces the risk of wiring disconnection.

Full use of installation space
Expanded pivotal operating range
Improved flexibility for robot layout design considerations.

Enabling more effective use of access space around the entire perimeter including to the rear:

Shortened movement distances, enabling takt times to be shortened.

Expanded J1 axis pivotal operating range to allow access to rear of machine

- Movable stopper for the J1 axis
- RV-2FQ/2FD pivot operation

To hand

Note) The sections of wiring that can be routed internally may differ depending on the model.

The supported internal wiring types may vary by model.

Expanded pivotal operating range

Improved tooling performance

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Improved accuracy

Active gain control

- Optimal motor control tuning set automatically based on robot operating position, posture, and load conditions.
- Improves tracking accuracy for the target trajectory.
- Active gain control is a control method that allows the position gain to be changed in real time.
  - This is effective for standard operations and tooling work requiring high accuracy.

Operating mode setting function

- Trajectory priority mode/speed priority operation can be set in programs to match customer system requirements.
- Optimal motor control tuning set automatically based on robot operating position, posture, and load conditions.
- Improves tracking accuracy for the target trajectory.

- This is effective for standard operations and tooling work requiring high accuracy.

Improved trajectory accuracy

Improved vibration-damping performance

Deflection compensation function

- Compensates for deflection in the robot arm occurring due to gravity.
- Calculates the amount of compensation needed based on the operating position, posture, and load conditions of the robot and compensates for any deflection automatically.
- Compensates not only for static deflection due to gravitational pull but also for dynamic deflection due to the inertial force present during operation.

- Effective for work transporting workpieces to cassettes with low pitch and palletizing work.

Improved palletization accuracy

Improved trajectory accuracy

Adaptation to operation

Function for passing through the singular point

- The robot can be made to pass through the singular point, unlike with previous robot models. This allows for greater flexibility in the layout of robots and surrounding areas.
- Teaching operations can be performed more easily as there is no longer any need to cancel operations due to the presence of the singular point.

What a singular point is:
There is an unlimited number of angles at which the J4 and J6 axes can be set such that the angle of the J5 axis is 0° when linear interpolation operations are performed using position data from a joint coordinate system. This point is the singular point and is the point at which the robot cannot be operated at an assigned position and posture under normal conditions. The position at which this occurs is referred to as a singular point.

Orthogonal compliance control

- This function reduces the rigidity of the robot arm and tracks external forces. The robot itself is equipped with a compliance function, which makes special hands and sensors unnecessary.
- This allows the amount of force generated through interference during chucking and workpiece insertion to be reduced and external movement copying forces to be controlled.

- The compliance direction can be set arbitrarily using the robot coordinate system, the tool coordinate system, etc.
- This is useful in protecting against workpiece interference and cutting down on stoppage.

- Reduced tooling costs
- Shortened line stop times
- Shortened startup times

Simplified tool length setting

Tool settings for the tool coordinate system can be set by attaching the tool and using three to eight of the same teaching points.
- Enables settings to be made for the actual tool including errors introduced when the tool was made and other data without needing to calculate values from the tool diagram.

Insertion direction or normal control direction

Copy plane

Tool coordinate system

Robot hand

Positioning device

Posture at start point

Posture at target position

In moving from P1→P2, if the robot is passing the singular point (J5 axis = 0°) or a location in the vicinity at a constant posture, the J4 axis on the robot will rotate at high speed and be unable to pass through it.
Improved user friendliness

Simple automatic operation from the teaching box

- Enables the robot to be controlled from the robot control screen using the same functions as on the operating panel of the robot controller.
- Monitoring screens can be set up individually to match the needs of user debugging conditions.

- Enabled for R32B/R33TB and R56TB/R57TB.

Enhanced RT ToolBox 2 visual functions

Enhanced RT ToolBox2 (PC software) graphic display function allowing setting parameters to be displayed visually. Visual confirmation using this function helps to proactively prevent setting errors.

Display of teaching positions and trajectories of end points helps to facilitate confirmation tasks during programming or simulations.

Display of selected position data

Display of trajectories

Hands can be created as combinations of basic diagrams on the Hand Editing screen and then attached to the robot. Allows the relationships between the hand, workpiece, and peripheral devices to be checked with a single glance during simulation.

Standard 3D polygonal models can be imported into the program. Environmental models created using 3DCAD can be displayed on the screen, allowing operators to confirm the positional relationship between the robot and peripheral devices during simulation. (Applicable 3D data file formats: STL, OBJ)

Attachment of a hand created in RT ToolBox2

Example of a system environment screen from an imported model

User-defined screen creation tools

Screens can be created anew, imported, or exported from “User-defined Screen Editing” in the project tree. Buttons, lamps, robot information, labels, and ruled lines can be arranged into layouts and assigned to robot variables.

Data created here is exported and loaded into the R56/57TB. Can be used as a user screen.

Linked to iQ Works

- Program management simplified
  Enables batch management of programs and data in blocks from the programmable controller to the servo, display device, and robot.
- Device model selection simplified
  All Mitsubishi device models are listed in the Navigator, enabling its use as a device model selection tool. Ver. 1.24A and later is equipped with robot CPU selection capability and comes packaged with RT ToolBox2 (mini ver.).

GOT connection function

- The robot can be controlled directly from a Mitsubishi GOT 1000.
- Enables robot controller statuses to be uploaded and operations to be controlled directly from the GOT. Allows robot startup/shutdown, status/alarm monitoring, and other tasks to be completed from the GOT easily and quickly.
- Use of the transparent function enables editing of programs and parameters from the USB interface on the front GOT screen, improving user friendliness.

Operation of engineering tools from the USB interface on the front GOT screen.

Example GOT screen

- Ethernet
- Serial signals
  etc.

* You can download a sample image from the Mitsubishi FA site. (Sample data corresponds to the GT16, 640×480 or more)
Connection to peripheral devices

Vision sensor
- Simple settings
  The robot and camera can be calibrated through a simple process using vision sensor setting tools.
- Simple connection
  Simple connection between the robot and camera using Ethernet.
- Simple control
  Simple control using vision control commands in the robot programs.
- Three robots connected to a single vision sensor/seven vision sensors connected to a single robot
  Enables costs to be reduced even for complicated system configurations.

Additional axis function
- Simple settings
  Up to 8 additional axes can be controlled by the controller.
- Simple connection
  Up to 8 additional axes can be controlled through an optional controller.
- Simple control
  Additional axes and user machines can be operated from the robot program and teaching pendant without additional motion control hardware.
- Three controllers
  Three robots connected to a single vision sensor/seven vision sensors connected to a single robot
  Enables costs to be reduced even for complicated system configurations.

User interfaces
- Simple settings
  The various network options available allow connection to a variety of devices used throughout the world.
- Simple connection
  Compatibility with MR-J4-B (J3-compatible mode)*
- Simple control
  Up to 2 axes compatible with MR-J4-B (J3-compatible mode)*
- Three controllers
  Up to 3 axes compatible with MR-J3-B (J3-compatible mode)*
- Seven
  Up to 3 axes compatible with MR-J3-BS (J3-compatible mode)*

Safety features
- Security features
  Security features were added to protect programs and parameters. Read/write protection prevents programs from being overwritten and programs from being changed inadvertently. Sensitive data can be protected using password protection.
  - Passwords can be set to protect created programs.
  - The viewing and copying of data from the teaching pendant and RT ToolBox2 can be disabled.
  - Writing operations for parameters can be disabled.

Sustained tracking during emergency stop
- This function detects if the arm collides with an obstacle while teaching or operating, and helps reduce damage to the robot arm and tools.
- The collision detection function can be used to protect the workspace from becoming damaged due to interference between the workspace and affected objects.
- The detection level can be changed according to the protection targets.
- Objects can be reduced or even fully prevented using the inertia of the robot arm to let it coast to a stop.

Collision detection function
- This detection function can be programmed to generate an alarm or perform a specific escape move or both.
- The trajectory may be shifted out of line depending on the timing at which the emergency stop is activated.

Compliance with safety standards
- Meets the requirements for PL d of ISO13849-1 Category 3.
- It is a robot with special specifications that comply with various safety standards. Contact a Mitsubishi Electric dealer or sales agent for further details if interested.
Expanded J4 axis operating range

- Expanding the J4 axis operating range enables the posture to be changed continuously during assembly and transport operations. It also eliminates the need for the robot to move in the opposite direction partway through an operation.

Compact installation with operation performed near the robot base

- Use of a flap-style arm contributes to a slimming of customer equipment, enabling operations to be completed even closer proximity to the robot.

Changes in operating posture can be made even more quickly!!

- Changes in operating posture, which occur frequently during assembly, can be completed at rapid speed, increasing the speed of the axis close at hand as well as that of the base axis. Enables changes to be made to the operating posture at high speed.

Enhanced wrist axis

- Tolerable J4 axis inertia dramatically increased. Applies easily to multiple hands, offset hands, etc. (5 times that of previous models (RH-20FH))

Features of IQ Platform Controllers

Improved responsibility through high-speed communications

- Increases the speed of data communications between CPUs and dramatically reduces I/O processing times using a high-speed standard base between multiple CPUs.

Measurement example: Transfer of 16-word data (With data matching check)
CC-Link: 262ms
Between multiple CPUs: 63 ms (Approx. 4x)

Large amounts of data

- The number of device points between the programmable controller and robot was increased to 8192 input points and 8192 output points. This allows the system to handle larger programs, more complicated control, and other objects that require a lot of I/O points.

Number of I/O points: 8192/8192
Remote I/O: 256/256
CC-Link (4 stations, 1×): 126/126
CC-Link (4 stations, 8×): 894/894

Reduced wiring and number of units used

- System costs can be reduced with the use of wireless systems and deletion of I/O units and network units.

Direct communication between CPU units

- Enables shared memory to be read from and written to between multiple robot CPUs. Speeds for data communications between robots increase, enabling more detailed control, such as with an interference prevention function or coordinated control, and cutting down on wasted time.

Direct control between I/O units

- Enables data to be read and written directly between the CPU unit and I/O unit. Responsivity improved and interlock times and cycle times shortened using high-speed I/O communications to peripheral devices.

Batch management of multiple robots

- Enables access to robots in the programmable controller network from a PC connected to the main CPU. Leads to a shortening of rise times and improved maintainability for robots on the production line.

Increased the speed of data communications between CPUs and dramatically reduces I/O processing times using a high-speed standard base between multiple CPUs.

Measurement example: Transfer of 16-word data (With data matching check)
CC-Link: 262ms
Between multiple CPUs: 63 ms (Approx. 4x)
Enhanced efficiency of monitoring and maintenance operations onsite using a single GOT (display device) as the Human Machine Interface (HMI).

Enables the robot to be controlled from the GOT even without a teaching box.

Current robot position data, error information, and other items can be displayed easily on the GOT.

Internal robot information
- Error, variable, and program information
- Robot status (Current speed, current position, etc.)
- Maintenance information (Remaining battery capacity, grease life, etc.)
- Servo data (Load factor, current values, etc.)

Programs and parameters can be edited from the USB interface on the front of the GOT using a transparent function for improved operability.

Robot data on the GOT can be backed up to and restored from a CF card or USB memory stick. With no need for a PC.

This helps prevent data from being lost due to the empty battery/battery or robot malfunction.

Data can be saved after periodic maintenance tasks are performed or when unexpected errors occur. Dramatically improves serviceability.

Robots can be controlled easily using programmable controller language. System operation can be controlled using a single programmable controller. This enables the operation of the programmable controller to handle making changes to system specifications and troubleshooting directly.

No need to use any robot programs!!

Operations performed from the USB interface on the front of the GOT:
- Command number
- Destination number
- Designated option
- Shared memory

The personal computer and the GOT are connected with a USB cable or RS232 cable.

GOT backup/restore functions (Supported on GT14, GT15 and GT16)

Robot data on the GOT can be backed up to and restored from a CF card or USB memory stick. With no need for a PC.

This helps prevent data from being lost due to the empty battery/battery or robot malfunction.

Data can be saved after periodic maintenance tasks are performed or when unexpected errors occur. Dramatically improves serviceability.

Current position monitor screen Jog/hand operation screen Operation panel screen

[Details of supported control operations]

<table>
<thead>
<tr>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operation</strong></td>
</tr>
<tr>
<td>- Joint-interpolated motion</td>
</tr>
<tr>
<td>- Linear-interpolated motion</td>
</tr>
<tr>
<td><strong>Motion control</strong></td>
</tr>
<tr>
<td>- Designated override</td>
</tr>
<tr>
<td>- Designated acceleration/deceleration settings</td>
</tr>
<tr>
<td>- Designated speed</td>
</tr>
<tr>
<td>- Tool settings</td>
</tr>
<tr>
<td>- Designated auxiliary motion</td>
</tr>
<tr>
<td>- Opening/closing of hand</td>
</tr>
</tbody>
</table>

Collision Avoidance

For automatic prevention of collisions between robots

The software constantly monitors robots motion, predicts collisions before they occur, and immediately stops the robots. This avoids damage to the robot during both the JOG operations and automatic mode operations. Also, this enables the number of interlocks needed to prevent collisions between robots to be reduced. (Alarm shutdown)

Decreases downtime during startup operation

Reduces the number of recovery man-hours required after collisions due to teaching operation errors or failure to set interlocks.

Collided control

Coordinated control between multiple robots

Enables coordinated control between multiple robots through CPU connection between the robots. Easy to operate and use under normal operation through individual robot operation.

Coordinated transport

Enables transport of lengthy or heavy objects using multiple small-sized robots instead of larger ones.
System Configuration

**EQseries**

**System Configuration**

- Robot arm options
- Internal wiring and piping set for hand
- External user wiring and piping box

**Software options**

- Teaching pendant (wiper)

** EDseries**

**System Configuration**

- Robot arm options
- Internal wiring and piping set for hand
- External user wiring and piping box

**Software options**

- Teaching pendant (wiper)

---

**Configurations Options**

For details, refer to the specifications sheets.

### Configurations options

<table>
<thead>
<tr>
<th>Classification</th>
<th>Name</th>
<th>Type</th>
<th>RV</th>
<th>RH</th>
<th>Functional specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>

### Notes:

1. This is a special specification for shipping. Ignore for delivery and prices.

2. Users need to provide the HMS EtherNet/IP module (AB6314-B) themselves.

3. SolidWorks® is a registered trademark of SolidWorks Corporation (USA).

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**Product Lineup**

- Robot specifications and functions
- Options and accessories
- Specifications and functions of the controller

---

**EC Controller**

- Remote function (EC-3000)
- High function (EC-3000)
- High function (EC-3000)
- ...
## Options

### RV-4F/RV-7F Series Tooling device configuration

<table>
<thead>
<tr>
<th>Hand configuration</th>
<th>Wiring format</th>
<th>Required device</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air-hand + Hand input signal + Vision sensor</td>
<td>Interior equipment</td>
<td>1F-HA01S-01</td>
<td>-SH01, -SH02, -SH04, -SH05</td>
</tr>
<tr>
<td>Air-hand + Hand input signal + Force sensor</td>
<td>Exterior equipment</td>
<td>1F-HB01S-01</td>
<td>-SH01, -SH02, -SH04, -SH05</td>
</tr>
<tr>
<td>Air-hand + Hand input signal + Vision sensor + Force sensor</td>
<td>Exterior equipment</td>
<td>1F-HB01S-01</td>
<td>-SH04, -SH05</td>
</tr>
</tbody>
</table>

| Models with Internal wiring and hoses |

<table>
<thead>
<tr>
<th>Devices supporting interior hoses</th>
<th>Model (special device number)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air hoses (φ4 mm)</td>
<td>-SH01, -SH02, -SH04, -SH05</td>
</tr>
<tr>
<td>Hand input signal</td>
<td>○ (×1/×2)</td>
</tr>
<tr>
<td>Force sensor</td>
<td>○ (×1/×2)</td>
</tr>
<tr>
<td>Vision sensor</td>
<td>○ (×1/×2)</td>
</tr>
</tbody>
</table>

1: Users must provide the solenoid valves for Internal wiring models.
2: Users must provide solenoid valves and hoses/input cables as needed for External wiring models.
3: The external wiring set for the base is provided for models with Internal wiring and hoses.

### RV series Tooling (air-hand) : External wiring

- Hand curl tube
- Hand input cable
- External wiring BOX (Standard supplied)
- Air hoses φ6×2
- Signal cable for the multi-function hand
- Ethernet cable

### RV series Tooling (air-hand) : Internal wiring

- Hand input signal
- Internal wiring models (models ending in -SH01)
- External wiring BOX (Standard supplied)
- Air hoses φ6×2
- Signal cable for the multi-function hand
- Ethernet cable
Options

RT ToolBox2
Software for program creation and total engineering support.

This PC software supports everything from system startup to debugging, simulation, maintenance and operation. This includes programming and editing, operational checking before robots are installed, measuring process task time, debugging during robot startup, monitoring robot operation after startup, and trouble shooting.

Support for all purposes, from programming to start-up maintenance
- Programming can be completed using the MELFA-BASIC IV/V and Movemaster languages (depending on the model).

- Robot movement and operation status, input signals, and servo status can be monitored.

Enhanced simulation functions
- This function is compatible with all models that connect to CRn-500 series and CRn-700 controllers.
- Robot movements and other signals can be monitored using a personal computer.
- Not available for the mini version.
- Robot movements, operation status, input signals, and servo status can be monitored.

Advanced-debugging functions
- The software has a maintenance function that notifies the operators of malfunctions and downtime.
- Effective for preventative maintenance, shortening of recovery time.

Program editing and debugging functions
- Creation of programs in MELFA-BASIC IV/V and other Movemaster languages.

- Improvement of work operation by a multi-window format and the various editing functions.

- This is helpful for checking programs such as the execution of program steps, setting of break point settings, and other tasks.

Simulation functions
- Offline robot motion and test time check for designated parts of a program.

3D viewer
- Graphical representation of a work along with the dimensions, color and other specified details of the work area to be processed.

Monitor functions
- This is used to monitor program execution status and variables, input signals, etc.

Maintenance functions
- These functions include maintenance forecast, position recovery support, parameter management, etc.

Additional functions
- Graphical representation of a work along with the dimensions, color and other specified details of the work area to be processed.

Features

Automatic robot program creation function
- The teaching position data and robot operation programs necessary for operating robots can be generated automatically by simple (loading of 3D CAD data) or by simple input (or by simple input).

- This function is effective for preventative maintenance, shortening of recovery time.

List of functions

- CAD Import
  - Operation data needed to perform sealing and other operations requiring many teaching steps are easily recreated. All you need is to select the area to be processed from 3D CAD data. Since operation data is created from CAD source data, complex three-dimensional curves can be recreated with ease.

- Operation data needed to perform sealing and other operations requiring many teaching steps are easily recreated. All you need is to select the area to be processed from 3D CAD data. Since operation data is created from CAD source data, complex three-dimensional curves can be recreated with ease.

- Offline teaching
  - The robot posture can be set up on the screen in advance.

- Creation of robot programs (templates)
  - Workfile processes can be created using a combination of the offline teaching CAD I/O functions and then converted into robot programs (MELFA-BASIC IV/V format).

- Assignment of robot programs
  - Robot programs can be used as is without any modifications.

  - A different robot model can also be specified for each task.

- Simulation of robot operations
  - Robot programs, including I/O signals, can be simulated. This means that movements of the robot can be observed directly and accurately.

- Calibration
  - Point sequence data of CAD coordinates created by the CAD link function can be corrected to the current position. The following functions are provided to support the debug of robot programs.
  - Breakpoint : Breakpoints can be set in a specified program.
  - Step operation : A specified program can be executed step by step.

- Step operation : A specified program can be executed step by step.

- The cycle time of robot movement can be measured using an easy-to-use function resembling a stopwatch. It realizes the cycle time measurement of a specified part in a program.
### Force sensor set

**Options**

Allows copy and fitting work to be completed in the same way a person would while the force applied to the hand is monitored. Enables necessary work such as fine force adjustments and force detection to be completed.

**Improved production stability**

Enables parts to be inserted or attached without being damaged while absorbing shifts in position due to part variations and emulating the slight amounts of external force applied. Improved operating stability gained through position latches and retry processes when work operations fail. Log data can be used to manage quality control and analyze causes of work errors and other issues.

**Simple control**

Simple programs can be created using specialized robot language.

**Product features**

- **Force sensor control**
  - Force control: Function for controlling robots while applying a specified force.
  - Softness control: Function for controlling the softness of robot operations.
- **Data logger**
  - Data logger: Function for recording data while the robot is running.
- **Data latch**
  - Data latch: Function for acquiring force sensor and robot position data when contact is made.
- **Synchronous data**
  - Synchronous data: Function for acquiring force sensor information synchronized to position information as log data and displaying it in graph form.
- **Force sensor detection**
  - Detection trigger: Function for acquiring sensor information synchronized to position information on log data and changing it in graph form.
- **FFT processor**
  - FFT processor: Function for transforming acquired log files into the FFT format.

**Simple operation**

- Work conditions can be checked and adjusted by viewing position force and data from the teaching box and graph on RT ToolBox2.

**System Configuration**

[Diagram of system configuration]

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS-422</td>
<td></td>
</tr>
<tr>
<td>Force sensor interface unit (2F-TZ561)</td>
<td></td>
</tr>
<tr>
<td>Power supply cable</td>
<td></td>
</tr>
<tr>
<td>24-V DC power supply</td>
<td></td>
</tr>
<tr>
<td>SSNETE11</td>
<td></td>
</tr>
</tbody>
</table>

**Product Configuration**

- Force sensor: Qty. 1
- Force sensor interface unit: Qty. 1
- Data latch: Qty. 1
- Adaptor cable: Qty. 1
- 24-V AC power supply: Qty. 1
- Serial cable between the unit and sensor: Qty. 1

### In-Sight

(Manufactured by COGNEX: For Mitsubishi Electric FA devices)

The In-Sight software developed exclusively for use with Mitsubishi Electric FA devices with enhanced linking to In-Sight, the vision system produced by COGNEX Corporation, offers better compatibility with FA devices, allowing it to be utilized more easily as a more user-friendly vision system.

**Simplified settings using Easy Builder**

Easy Builder allows connection to vision systems, settings of job (vision programs) settings, and calibration between the robot and vision system to be completed easily and quickly.

**Simplified connection using Ethernet**

Up to three robots and seven vision systems can be connected together to the same system by Ethernet connection. Vision system information can be shared between multiple robots.

**Simplified control using robot language**

The included dedicated vision system commands enable vision system startup, job selection, and control of data receiving and other operations to be completed quickly and easily using a single command without any need for protocols.

**Simplified job settings**

Jobs (vision recognition programs) are created from the job editing screen. Jobs can be edited using condition settings and other data, eliminating the need for specialized knowledge of vision control commands and other programming instructions.

**Simplified control using robot language**

The calibration wizard allows settings used in converting workpiece positions recognized by the vision system into robot coordinate system coordinates easily and quickly.

**Robot controller specifications**

- **MELFA BASIC V** comes with dedicated vision system control commands and status variables. These control commands and status variables enable the vision system to be controlled using simple programs.

<table>
<thead>
<tr>
<th>Model name</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-Sight Series</td>
<td></td>
</tr>
<tr>
<td>RT ToolBox2</td>
<td></td>
</tr>
</tbody>
</table>

**RT ToolBox2: Ver. 1.0 or later recommended**

- CRnD-700 Series: S1 ver. or later
- CRnQ-700 Series: R1 ver. or later
- CR750 Series
- CR7xx/ CRnQ-7xx/ CRnD-7xx

**Simple operation**

- Separate MELFA/Vision software is available for customers using In-Sight8000 series or In-Sight Micro series products.

**Simplified job settings**

- The use of job programs corresponding to work tasks performed regularly enables even customers who are new to vision systems to easily understand and use them without problems.