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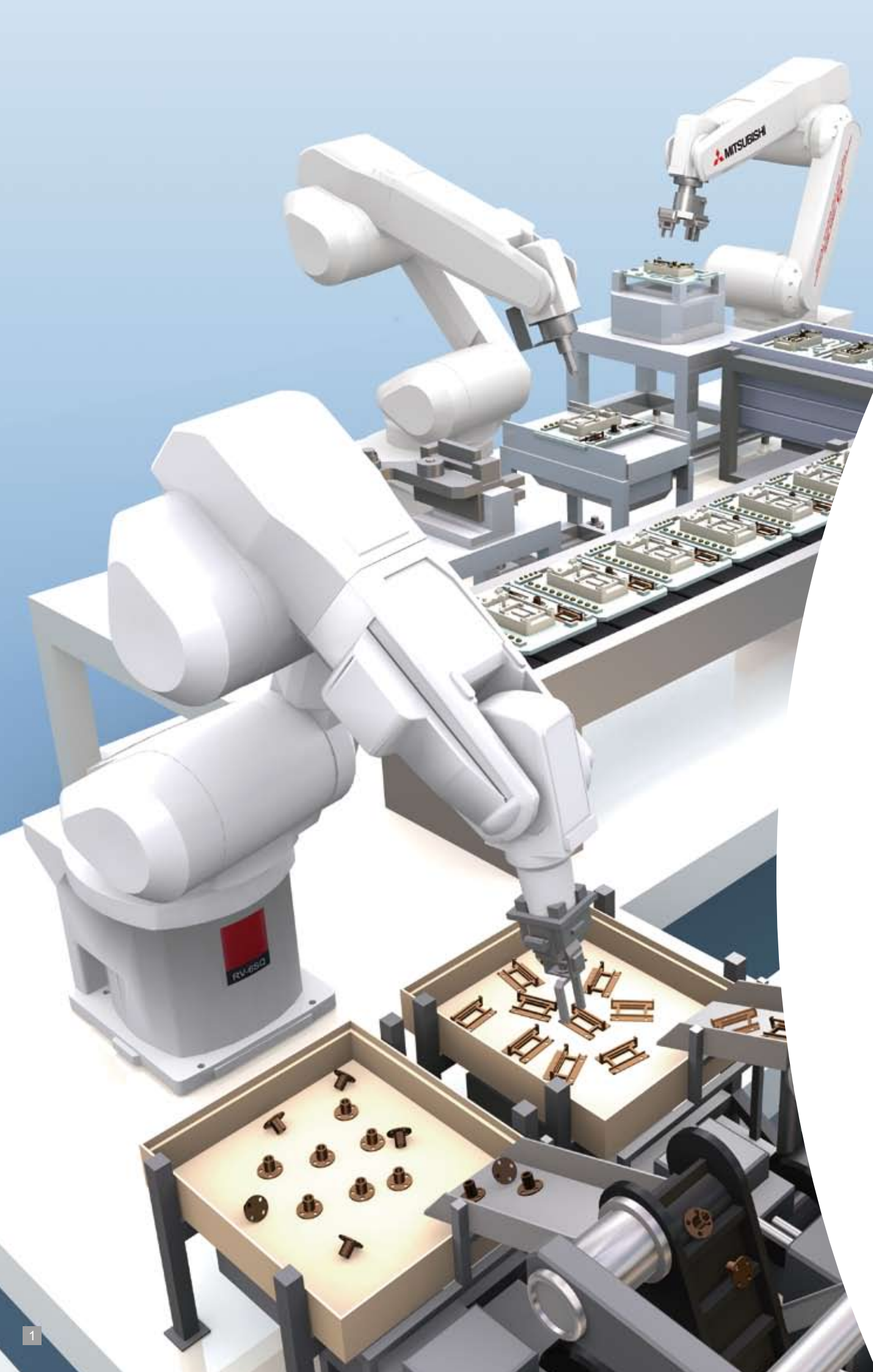
MITSUBISHI ELECTRIC CORPORATION

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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.





Features

Mitsubishi Electric's line of industrial robots offers high performance and reliability to address demanding applications across many industries. Utilization of our own leading servo and motion technologies provide superior speed and repeatability. Likewise, extended compatibility with other automation products allows for greater flexibility of integration. Standard, clean-room, and mist-proof models are available for many environments.

- Compliant to all major safety standards for global acceptance (ISO, ANSI, CE and UL models are available)
- Multiple network interfaces assure convenience and flexibility in integration
- Comprehensive programming, modeling and diagnostic software is intuitive and easy to use

Vertical type

Compact but powerful vertically articulated RV models are available in five and six axis configurations. Floor mount or ceiling mount capabilities enhances overall design flexibility. Small footprints with high rigidity and payload capabilities are ideal for high speed / high accuracy applications.

- Offers the fastest high-speed operation in its class
- High-accuracy operation with rigid arm design and active gain control
- Suitable for many environmental conditions



Horizontal type

Our horizontally articulated RH (SCARA) robots range from 350mm to 1000mm in reach and can handle up to 20Kg payload. The RH series is an excellent choice for high speed material handling, packaging, and assembly. Leading acceleration, speeds, settling time, and rigidity allow the RH to handle high throughput applications.

- Application flexibility due to wide variations in payload, reach, and stroke
- Capable of high-speed and high-accuracy operation with a simple arm and advanced motion control
- Available in ceiling mount configuration



Lineup













A wide range of available models allows for ease of

The Mitsubishi Electric robot product line is equipped with all of the performance features expected for demanding applications. Mitsubishi's broad offering ensures a confident fit for most every application.













selection

such as strength, speed, and a compact footprint.

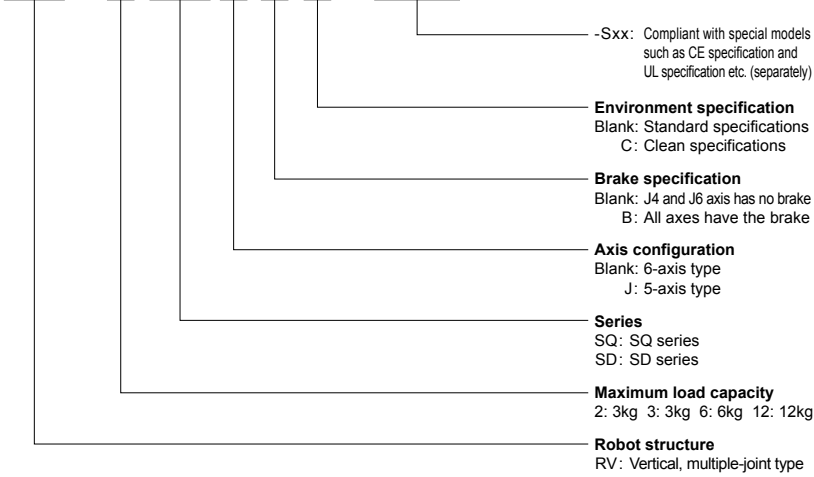
Vertical, multiple-joint type (RV)

							
	ⓅP5	ⓅP7	ⓅP8	ⓅP9	ⓅP10	ⓅP11	ⓅP12
Type	RV-2SQ RV-2SD	RV-3SQJ RV-3SDJ	RV-3SQ RV-3SD	RV-6SQ RV-6SD	RV-6SQL RV-6SDL	RV-12SQ RV-12SD	RV-12SQL RV-12SDL
Number of axes	6	5	6	6	6	6	6
Maximum load capacity (kg)	3	3.5	3.5	6	6	12	12
Maximum reach radius (mm)	504	641	642	695	901	1086	1385
Controller *1	 For RV-2SQ  For RV-2SD/ RV-3SQ/RV-3SD CR1QA-7xx ⓅP19 CR1DA-7xx			 CR2QA-7xx ⓅP19 CR2DA-7xx CR3Q-7xx/CR3D-7xx type for mist specification		 CR2QA-7xx ⓅP19 CR2DA-7xx CR3Q-7xx/CR3D-7xx type for mist specification  CR3Q-7xx ⓅP19 CR3D-7xx	

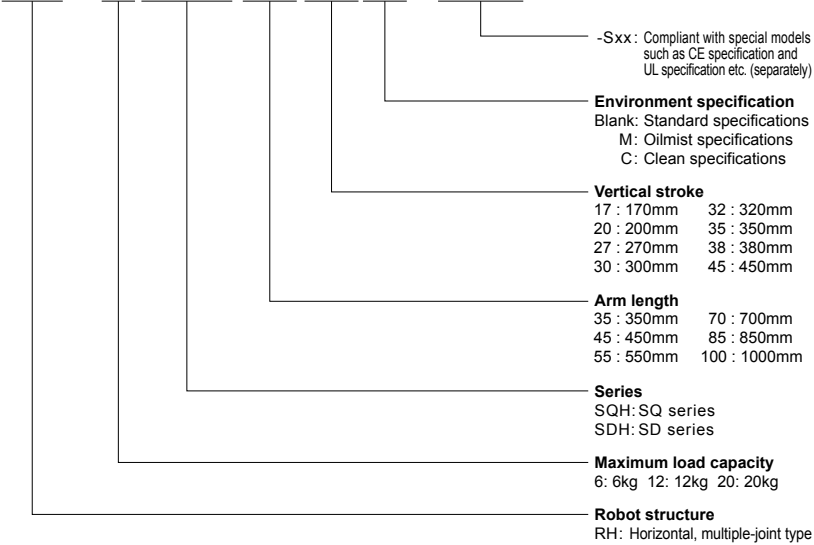
Horizontal, multiple-joint type (RH)

									
	ⓅP13	ⓅP15	ⓅP15	ⓅP15	ⓅP16	ⓅP16	ⓅP16	ⓅP17	ⓅP17
Type	RH-3SQHR RH-3SDHR	RH-6SQH35 RH-6SDH35	RH-6SQH45 RH-6SDH45	RH-6SQH55 RH-6SDH55	RH-12SQH55 RH-12SDH55	RH-12SQH70 RH-12SDH70	RH-12SQH85 RH-12SDH85	RH-20SQH85 RH-20SDH85	RH-20SQH100 RH-20SDH100
Number of axes	4	4	4	4	4	4	4	4	4
Maximum load capacity (kg)	3	6	6	6	12	12	12	20	20
Maximum reach radius (mm)	350	350	450	550	550	700	850	850	1000
Controller *1	 CR2QA-7xx ⓅP19 CR2DA-7xx	 CR1QA-7xx ⓅP19 CR1DA-7xx			 CR2QA-7xx ⓅP19 CR2DA-7xx CR3Q-7xx/CR3D-7xx type for mist specification				

RV - 3 SD J B C - Sxx



RH - 6 SDH 55 17 M - Sxx



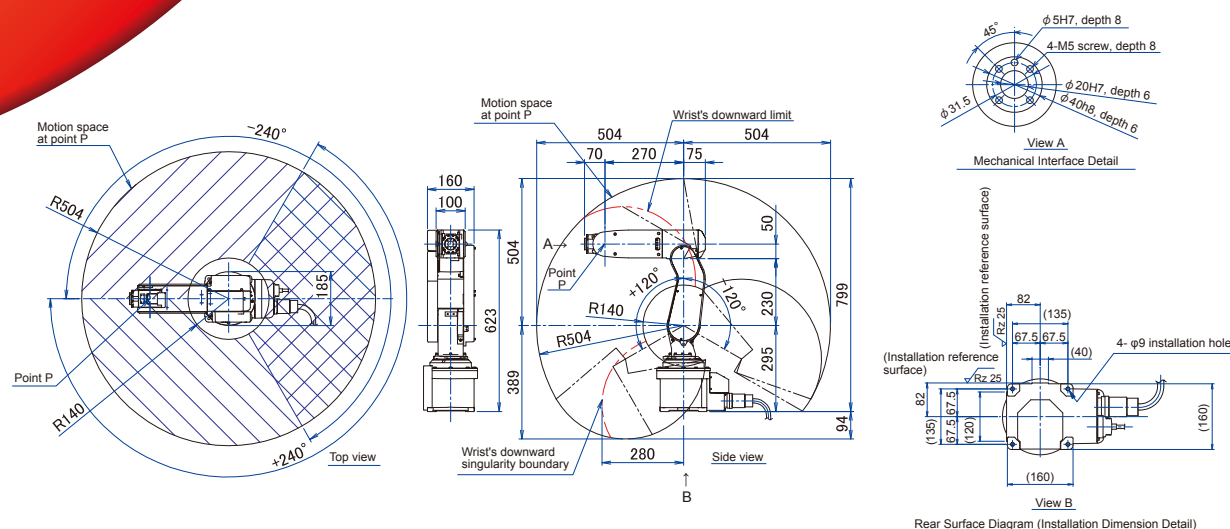
*1: 7xx in controller type names differ according to the robot arm.



Vertical
2kg
type

RV-2SQ RV-2SD

External Dimensions/Operating Range Diagram



<Operating range restriction> When J1 axis is within (-75° < J1 < 70°) and J2 axis is within (J2 < -110°), J3 axis is restricted within (80° □ J3).

Specifications

Type	Unit	RV-2SQ / RV-2SD
Machine class		Standard
Protection degree		IP30
Installation		Floor type, ceiling type, (wall-mounted type *2)
Structure		Vertical, multiple-joint type
Degrees of freedom		6
Drive system *1		AC servo motor (J2, J3 and J5: with brake)
Position detection method		Absolute encoder
Maximum load capacity (rating) *3	kg	3 (2)
Arm length	mm	230 + 270
Maximum reach radius	mm	504
Operating range	J1	480 (-240 to +240)
	J2	240 (-120 to +120)
	J3	160 (-0 to +160)
	J4	400 (-200 to +200)
	J5	240 (-120 to +120)
	J6	720 (-360 to +360)
Maximum speed	J1	225
	J2	150
	J3	275
	J4	412
	J5	450
	J6	720
Maximum composite speed *4	mm/sec	Approx. 4400
Cycle time *5	sec	0.6-0.7
Position repeatability	mm	±0.02
Ambient temperature	°C	0 to 40
Mass	kg	19
Tool wiring *6		Hand: 4 input points / 0 output points
Tool pneumatic pipes		Primary piping: φ4 x 4 (from base portion to forearm)
Machine cable		5m (connector on both ends)
Connected controller		CR1QA-772 / CR1DA-771

*1: The standard model has no brake on the J1-axis, J4-axis, and J6-axis. (A model with brake on all axes is also available.)

*2: The wall-mounted specification is a custom specification where the operating range of the J1-axis is limited.

*3: The maximum load capacity indicates the maximum payload when the wrist flange is facing downward (±10°).

*4: This is at the hand flange surface when all axes are composited.

*5: The cycle time is based on back-and-forth movement over a vertical distance of 25 mm and horizontal distance of 300 mm when the load is 1 kg.

*6: When the tool (hand) output is used, the pneumatic hand interface (optional) is required.

A COMPACT 6 AXIS ROBOT IDEALLY SUITED FOR ASSEMBLY, MATERIAL HANDLING, INSPECTION, AND A WIDE VARIETY OF OTHER TASKS.

● Reduced profile while maintaining a large operating range

- The length and shape of the arm are designed for optimum performance and maximum reach while providing the ability to reach positions close to the robot base.
- A greater range of motion is insured in applications requiring ceiling or wall mount.
- J1 operation range is expanded to 480°(±240°). This eliminates any rear side dead zone.

● Advanced servo control provides high-speed and high-accuracy operation

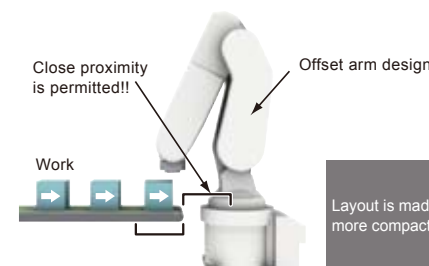
- Maximum composite speed is 4,400mm/s. Additionally, the speeds of axes J4-J6 have been optimized to satisfy high-speed assembly applications.
- Positioning repeatability of ±0.02mm combined with active-gain control and highly rigid arm design for high accuracy positioning at high speed.

● Unique arm design allows greater range of motion and accessibility.

- Offset arm design greatly reduces the robots minimum operating radius allowing work close to the robot base.
- Reduced elbow protrusion lessens rear interference points.
- A compact wrist design enables the robot to reach into smaller spaces at many angles.

Ability to layout the work cell with points near the robot base

Range of motion is now closer to the base of the robot. This allows more flexibility and smaller system footprint.



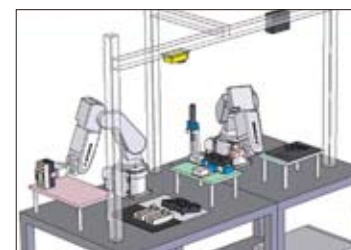
Position/posture at minimum operating radius

The minimum radius becomes smaller by the offset arm design. However the overall operating range is greater.

Increased space efficiency and the compact layout is possible.

Quicker posture changes- ideal for assembly applications

Assembly work typically requires many postures compared to pick and place work.



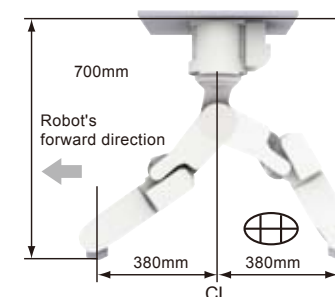
Assembly cell

Increasing the speed of posture change has a significant affect on overall cycle time. By optimizing the performance of axes J4-J6, posture change time is improved.

The speed of J4,J5 and J6 have improved.

Large work area can be reached without rotating the arm

Extended back reaching access is effective for ceiling mount applications.



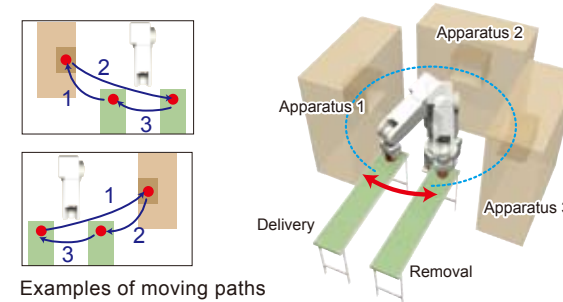
Unlike its conventional varieties, the robot can even extend back into its rear space.

Expanded J2 operation range for extended back reach.

Wide work area can be reached without turning around the arm. Decreases extra motion and reduces the cycle time.

The J1 operation range designed +/- 240 degree

Cycle time can be shortened if it is possible to take a short cut path.



Examples of moving paths

J1 operation range expanded to 480°(±240°).

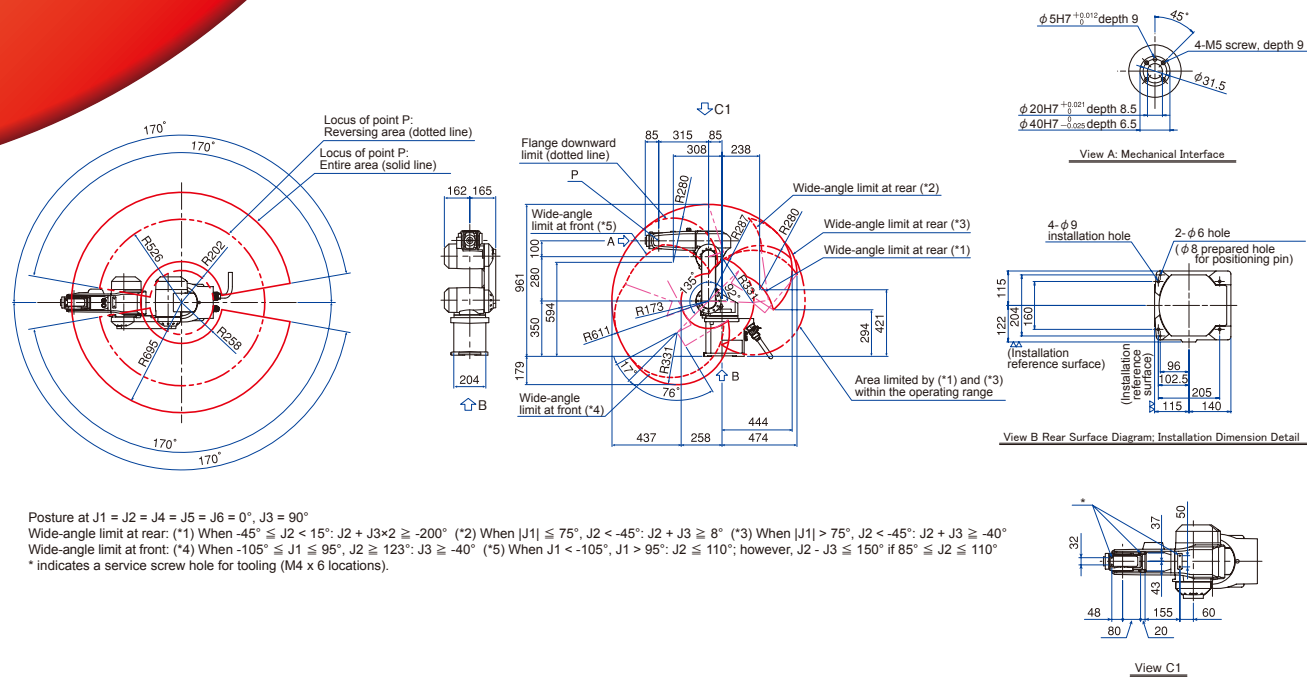
Minimize path, Minimize cycle time. Increased flexibility of machine layout.



Vertical
6 kg
type

RV-6SQ RV-6SD

External Dimensions/Operating Range Diagram



Specifications

Type	Unit	RV-6SQ / RV-6SD	RV-6SQ-SM6 / RV-6SD-SM6	RV-6SQC / RV-6SDC
Machine class		Standard (oil mist)		Clean
Protection degree		IP65 (J4 to J6), IP54 (J1 to J3) *1		Class 10 (0.3 μm)
Installation		Floor type, ceiling type, (wall-mounted type *2)		Floor type
Structure		Vertical, multiple-joint type		
Degrees of freedom		6		
Drive system		AC servo motor (with brake on all axes)		
Position detection method		Absolute encoder		
Maximum load capacity (rating) *3	kg	6 (5)		
Arm length	mm	280 + 315		
Maximum reach radius	mm	695		
Operating range	J1	340 (±170)		
	J2	227 (-92 to +135)		
	J3	273 (-107 to +166)		
	J4	320 (±160)		
	J5	240 (±120)		
	J6	720 (±360)		
Maximum speed	J1	401		
	J2	321		
	J3	401		
	J4	352		
	J5	450		
	J6	660		
Maximum composite speed *4	mm/sec	Approx. 9300		
Cycle time *5	sec	0.47		
Position repeatability	mm	±0.02		
Ambient temperature	°C	0 to 40		
Mass	kg	Approx. 58		
Tool wiring *6		Hand: 8 input points / 8 output points (forearm), 8 spare lines: AWG#27 (0.1mm ²)		
Tool pneumatic pipes		Primary: φ6 x 2 Secondary: φ4 x 8		
Machine cable		5m (connector on both ends)		
Connected controller *7		CR2QA-711 / CR2DA-711	CR3Q-711M / CR3D-711M	CR2QA-711 / CR2DA-711

*1: Please contact to Mitsubishi Electric dealer since the environmental resistance cannot be secured depending on the characteristics of oil you use.

*2: The wall-mounted specification is a custom specification where the operating range of the J1-axis is limited.

*3: The maximum load capacity indicates the maximum payload when the wrist flange is facing downward (±10°).

*4: This is at the hand flange surface when all axes are composited.

*5: The cycle time is based on back-and-forth movement over a vertical distance of 25 mm and horizontal distance of 300 mm when the load is 1 kg. The cycle time may increase if specific requirements apply such as high work positioning accuracy, or depending on the operating position.

*6: When the tool (hand) output is used, the pneumatic hand interface (optional) is required.

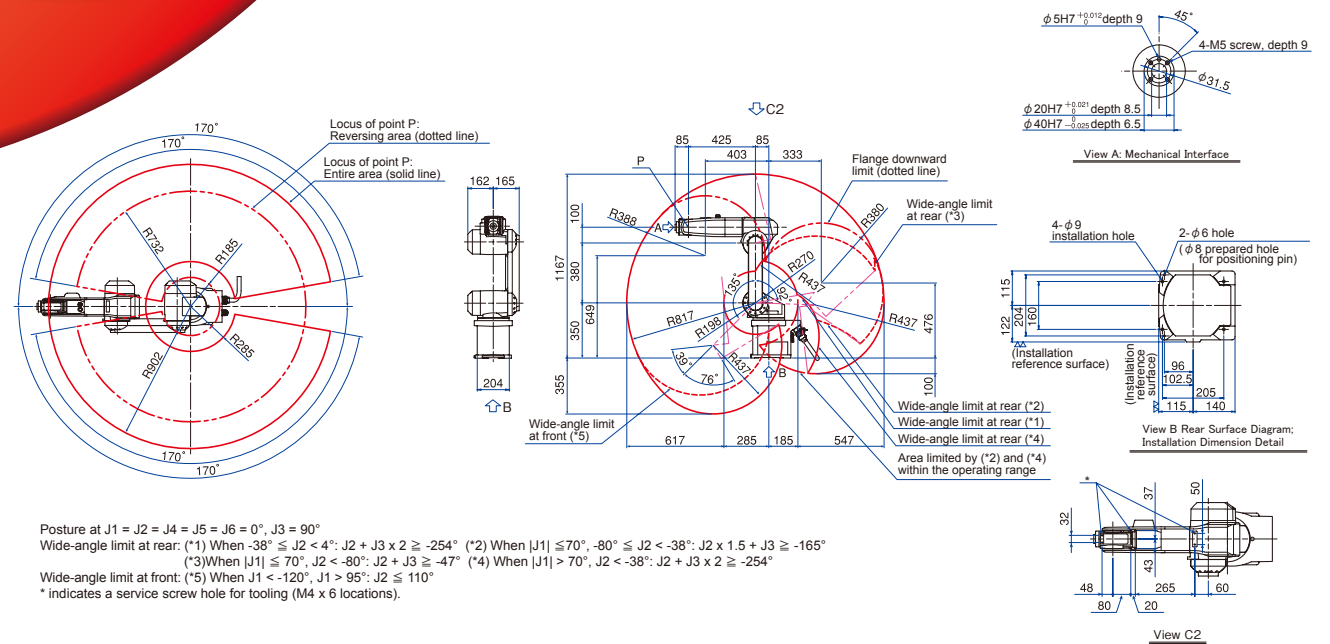
*7: Select either controller according to your application. "SM6" is appended at the end of the robot model name when the CR3Q-711M/CR3D-711M is selected.



Vertical
6 kg
type

RV-6SQL RV-6SDL

External Dimensions/Operating Range Diagram



Specifications

Type	Unit	RV-6SQL / RV-6SDL	RV-6SQL-SM6 / RV-6SDL-SM6	RV-6SQLC / RV-6SDLC
Machine class		Standard (oil mist)		Clean
Protection degree		IP65 (J4 to J6), IP54 (J1 to J3) *1		Class 10 (0.3 μm)
Installation		Floor type, ceiling type, (wall-mounted type *2)		Floor type
Structure		Vertical, multiple-joint type		
Degrees of freedom		6		
Drive system		AC servo motor (with brake on all axes)		
Position detection method		Absolute encoder		
Maximum load capacity (rating) *3	kg	6 (5)		
Arm length	mm	380 + 425		
Maximum reach radius	mm	902		
Operating range	J1	340 (±170)		
	J2	227 (-92 to +135)		
	J3	295 (-129 to +166)		
	J4	320 (±160)		
	J5	240 (±120)		
	J6	720 (±360)		
Maximum speed	J1	250		
	J2	267		
	J3	267		
	J4	352		
	J5	450		
	J6	660		
Maximum composite speed *4	mm/sec	Approx. 8500		
Cycle time *5	sec	0.50		
Position repeatability	mm	±0.02		
Ambient temperature	°C	0 to 40		
Mass	kg	Approx. 60		
Tool wiring *6		Hand: 8 input points / 8 output points (forearm), 8 spare lines: AWG#27 (0.1mm ²)		
Tool pneumatic pipes		Primary: φ6 x 2 Secondary: φ4 x 8		
Machine cable		5m (connector on both ends)		
Connected controller *7		CR2QA-711 / CR2DA-711	CR3Q-711M / CR3D-711M	CR2QA-711 / CR2DA-711

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*2: The wall-mounted specification is a custom specification where the operating range of the J1-axis is limited.

*3: The maximum load capacity indicates the maximum payload when the wrist flange is facing downward (±10°).

*4: This is at the hand flange surface when all axes are composited.

*5: The cycle time is based on back-and-forth movement over a vertical distance of 25 mm and horizontal distance of 300 mm when the load is 1 kg. The cycle time may increase if specific requirements apply such as high work positioning accuracy, or depending on the operating position.

*6: When the tool (hand) output is used, the pneumatic hand interface (optional) is required.

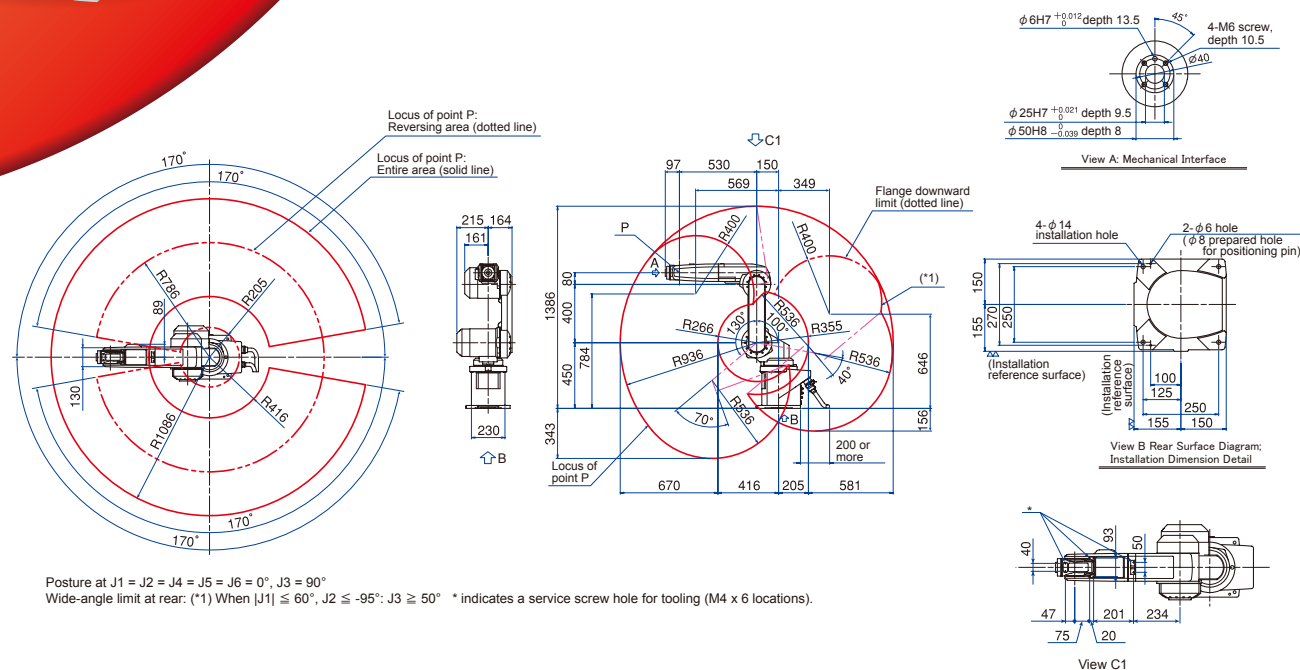
*7: Select either controller according to your application. "SM6" is appended at the end of the robot model name when the CR3Q-711M/CR3D-711M is selected.



Vertical
12kg
type

RV-12SQ RV-12SD

External Dimensions/Operating Range Diagram



Posture at J1 = J2 = J4 = J5 = J6 = 0°, J3 = 90°
Wide-angle limit at rear: (*1) When |J1| ≤ 60°, J2 ≤ -95°; J3 ≥ 50° * indicates a service screw hole for tooling (M4 x 6 locations).

Specifications

Type	Unit	RV-12SQ / RV-12SD	RV-12SQ-S300 / RV-12SD-S300	RV-12SQC / RV-12SDC
Machine class		Standard (oil mist)		Clean
Protection degree		IP65 (J4 to J6), IP54 (J1 to J3) *1		Class 10 (0.3 μm)
Installation		Floor type, ceiling type, (wall-mounted type *2)		Floor type
Structure		Vertical, multiple-joint type		
Degrees of freedom		6		
Drive system		AC servo motor (with brake on all axes)		
Position detection method		Absolute encoder		
Maximum load capacity (rating) *3	kg	12 (10)		
Arm length	mm	400 + 530		
Maximum reach radius	mm	1086		
Operating range	J1	340 (±170)		
	J2	230 (-100 to +130)		
	J3	290 (-130 to +160)		
	J4	320 (±160)		
	J5	240 (±120)		
	J6	720 (±360)		
Maximum speed	J1	276		
	J2	230		
	J3	267		
	J4	352		
	J5	375		
	J6	660		
Maximum composite speed *4	mm/sec	Approx. 9600		
Cycle time *5	sec	0.66		
Position repeatability	mm	±0.05		
Ambient temperature	°C	0 to 40		
Mass	kg	Approx. 93		
Tool wiring *6		Hand: 8 input points / 8 output points (forearm), 8 spare lines: AWG#27 (0.1mm ²)		
Tool pneumatic pipes		Primary: φ6 x 2 Secondary: φ6 x 8		
Machine cable		7m (connector on both ends)		
Connected controller *7		CR3Q-701M / CR3D-701M	CR2QA-701 / CR2DA-701	CR3Q-701 / CR2QA-701 CR3D-701 / CR2DA-701

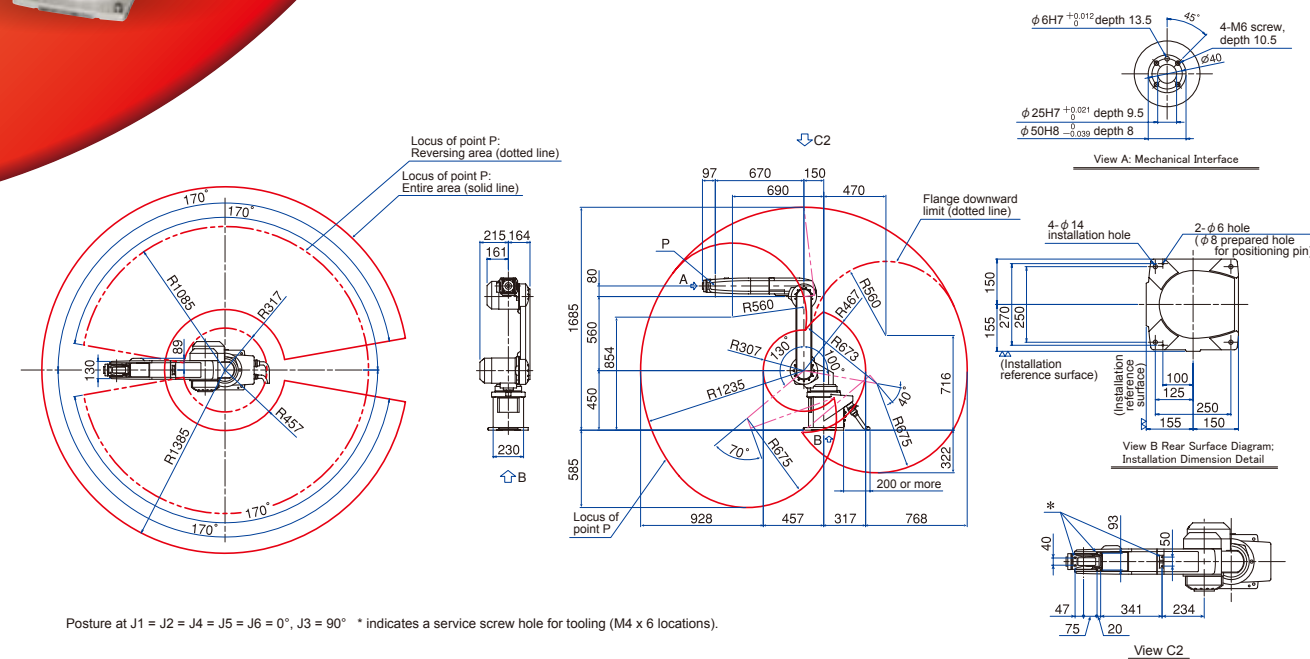
*1: Please contact to Mitsubishi Electric dealer since the environmental resistance cannot be secured depending on the characteristics of oil you use.
*2: The wall-mounted specification is a custom specification where the operating range of the J1-axis is limited.
*3: The maximum load capacity indicates the maximum payload when the wrist flange is facing downward (±10°).
*4: This is at the hand flange surface when all axes are composited.
*5: The cycle time is based on back-and-forth movement over a vertical distance of 25 mm and horizontal distance of 300 mm when the load is 5 kg. The cycle time may increase if specific requirements apply such as high work positioning accuracy, or depending on the operating position.
*6: When the tool (hand) output is used, the pneumatic hand interface (optional) is required.
*7: Select either controller according to your application. "-S300" is appended at the end of the robot model name when the CR2QA-701/CR2DA-701 is connected. CR2QA-701/CR2DA-701 (IP20) are open structures. Take care with the installation environment.



Vertical
12kg
type

RV-12SQL RV-12SDL

External Dimensions/Operating Range Diagram



Posture at J1 = J2 = J4 = J5 = J6 = 0°, J3 = 90° * indicates a service screw hole for tooling (M4 x 6 locations).

Specifications

Type	Unit	RV-12SQL / RV-12SDL	RV-12SQL-S300 / RV-12SDL-S300	RV-12SQLC / RV-12SDLC
Machine class		Standard (oil mist)		Clean
Protection degree		IP65 (J4 to J6), IP54 (J1 to J3) *1		Class 10 (0.3 μm)
Installation		Floor type, ceiling type, (wall-mounted type *2)		Floor type
Structure		Vertical, multiple-joint type		
Degrees of freedom		6		
Drive system		AC servo motor (with brake on all axes)		
Position detection method		Absolute encoder		
Maximum load capacity (rating) *3	kg	12 (10)		
Arm length	mm	560 + 670		
Maximum reach radius	mm	1385		
Operating range	J1	340 (±170)		
	J2	230 (-100 to +130)		
	J3	290 (-130 to +160)		
	J4	320 (±160)		
	J5	240 (±120)		
	J6	720 (±360)		
Maximum speed	J1	230		
	J2	172		
	J3	200		
	J4	352		
	J5	375		
	J6	660		
Maximum composite speed *4	mm/sec	Approx. 9500		
Cycle time *5	sec	0.74		
Position repeatability	mm	±0.05		
Ambient temperature	°C	0 to 40		
Mass	kg	Approx. 98		
Tool wiring *6		Hand: 8 input points / 8 output points (forearm), 8 spare lines: AWG#27 (0.1mm ²)		
Tool pneumatic pipes		Primary: φ6 x 2 Secondary: φ6 x 8		
Machine cable		7m (connector on both ends)		
Connected controller *7		CR3Q-701M / CR3D-701M	CR2QA-701 / CR2DA-701	CR3Q-701 / CR2QA-701 CR3D-701 / CR2DA-701

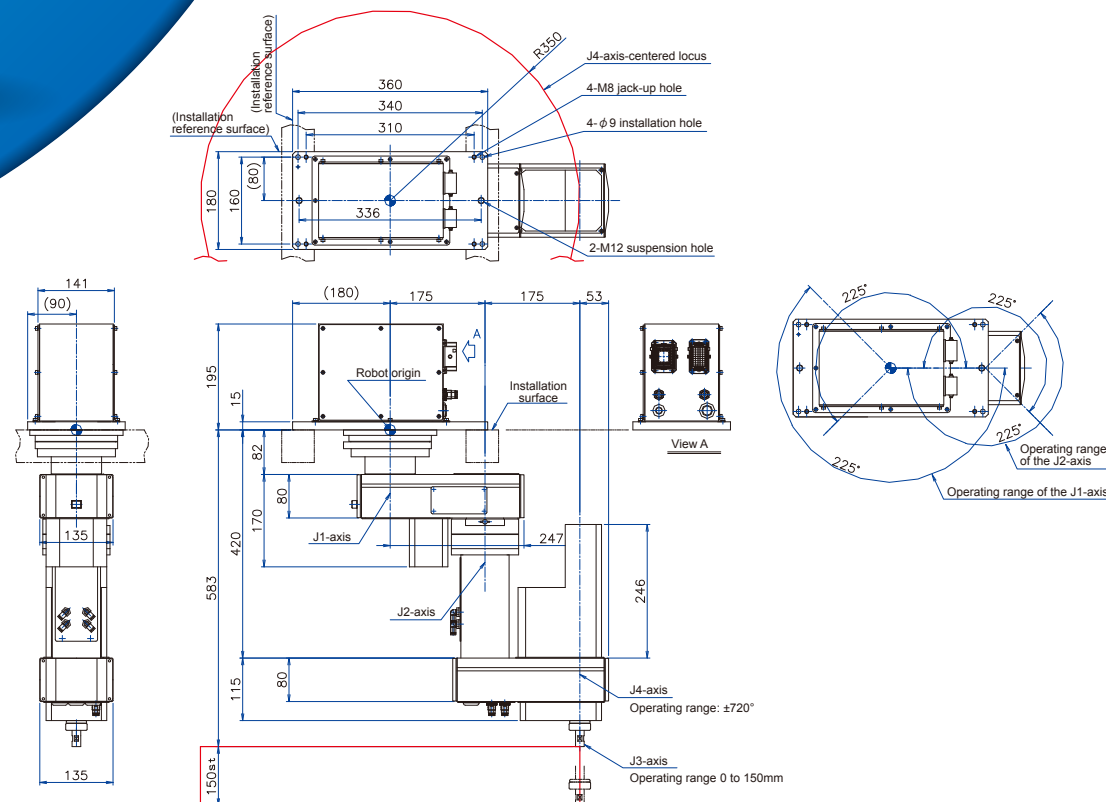
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*3: The maximum load capacity indicates the maximum payload when the wrist flange is facing downward (±10°).
*4: This is at the hand flange surface when all axes are composited.
*5: The cycle time is based on back-and-forth movement over a vertical distance of 25 mm and horizontal distance of 300 mm when the load is 5 kg. The cycle time may increase if specific requirements apply such as high work positioning accuracy, or depending on the operating position.
*6: When the tool (hand) output is used, the pneumatic hand interface (optional) is required.
*7: Select either controller according to your application. "-S300" is appended at the end of the robot model name when the CR2QA-701/CR2DA-701 is connected. CR2QA-701/CR2DA-701 (IP20) are open structures. Take care with the installation environment.



Horizontal
3 kg
type

RH-3SQHR RH-3SDHR

External Dimensions/Operating Range Diagram



Specifications

Type	Unit	RH-3SQHR RH-3SDHR
Machine class		Standard
Protection degree		IP20
Installation		Ceiling type
Structure		Horizontal, multiple-joint type
Degrees of freedom		4
Drive system		AC servo motor (J1, J2 and J4: with no brake, J3: with brake)
Position detection method		Absolute encoder
Maximum load capacity (rating)	kg	3 (1)
Arm length	No. 1 arm No. 2 arm	175 175
Maximum reach radius (No. 1 + No. 2)	mm	350
Operating range	J1 J2 J3 (Z) J4 (θ)	450 (±225) 450 (±225) 150 (0 to 150) 1440 (±720)
Maximum speed	J1 J2 J3 (Z) J4 (θ)	672 708 1500 3146
Maximum composite speed *1	mm/sec	6267
Cycle time *2	sec	0.32
Position repeatability	X-Y composite J3 (Z) J4 (θ)	±0.01 ±0.01 ±0.01
Ambient temperature	°C	0 to 40
Mass	kg	Approx. 24
Tool wiring		Hand: 8 input points / 0 output points, 8 spare lines (8 output points by options)
Tool pneumatic pipes		Primary: φ6 x 2 (Secondary: φ4 x 8)
Machine cable		5m (connector on both ends)
Connected controller		CR2QA-781 / CR2DA-781

*1: The value assumes composition of J1 and J2.

*2: Back-and-forth movement over a vertical distance of 25 mm and horizontal distance of 300 mm when the load is 1 kg

DIVERSE APPLICATIONS INCLUDE ASSEMBLY OF ELECTRIC AND ELECTRONIC PARTS, PRECISION ASSEMBLY OF SMALL PARTS, INSPECTIONS, HIGH SPEED TRANSFER, AND PACKING.

Capable of high-speed operation with dedicated motor and high rigidity mechanical structure

- The highly rigid arm section and Mitsubishi low-inertia motor enable operations at high acceleration/deceleration speeds with high accuracy.
- An inverted SCARA design that is arranged such that the No.2 arm can completely pass by the No.1 arm. This allows high-speed operation between points following the optimum path.
- High-speed movement with a cycle time of 0.32 seconds. (30% increase from Mitsubishi conventional models)

(*Cycle time: 0.32 sec ... Load: 1kg, Operation: 25mm vertical - 300mm horizontal reciprocal operation)

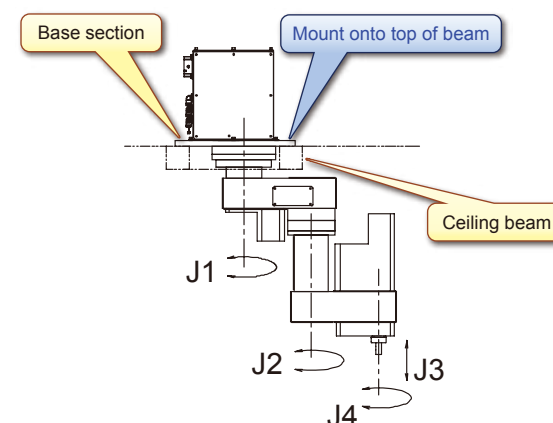
Space-saving layout realized with ceiling mounted installation

- The ceiling mounted installation allows previously unusable robot installation spaces to be used effectively. A wide operating range encompasses the entire cylindrical area (Φ700 x 150) under the arm.
- The cylindrical operating range simplifies the layout setting by eliminating restrictions resulting from the layout orientation of pallets and conveyors, etc.

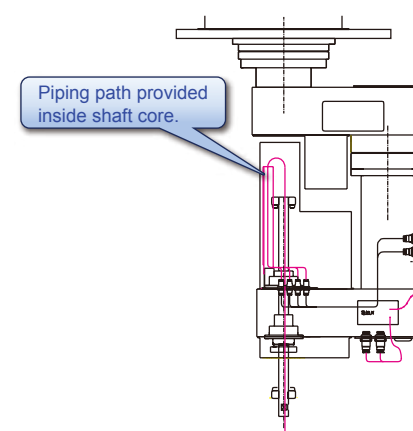
Improved robot system start up and serviceability

- The iQ Platform is supported allowing the robot to be operated, monitored and controlled easily from the Mitsubishi programmable controller and GOT.
- The robot's internal information (error status, maintenance information, etc.) can be displayed on the GOT, and control can be realized without a robot program.
- Piping work is simplified by providing a hand piping path in the Z axis shaft.

Easy installation and start up

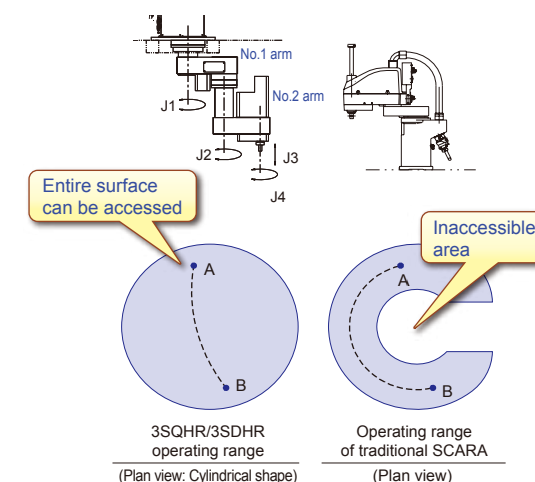


(1) The robot can be mounted and installed onto the top of a ceiling beam making it easy to install the system.

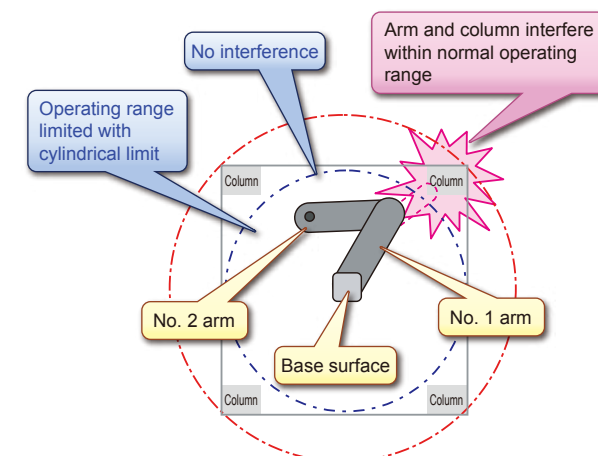


(2) An interior path for piping the hand is provided at the end axis allowing tools to be piped easily. This eliminates problems with external piping.

Saving work-cell space



Installing the robot on the ceiling eliminates wasted space.



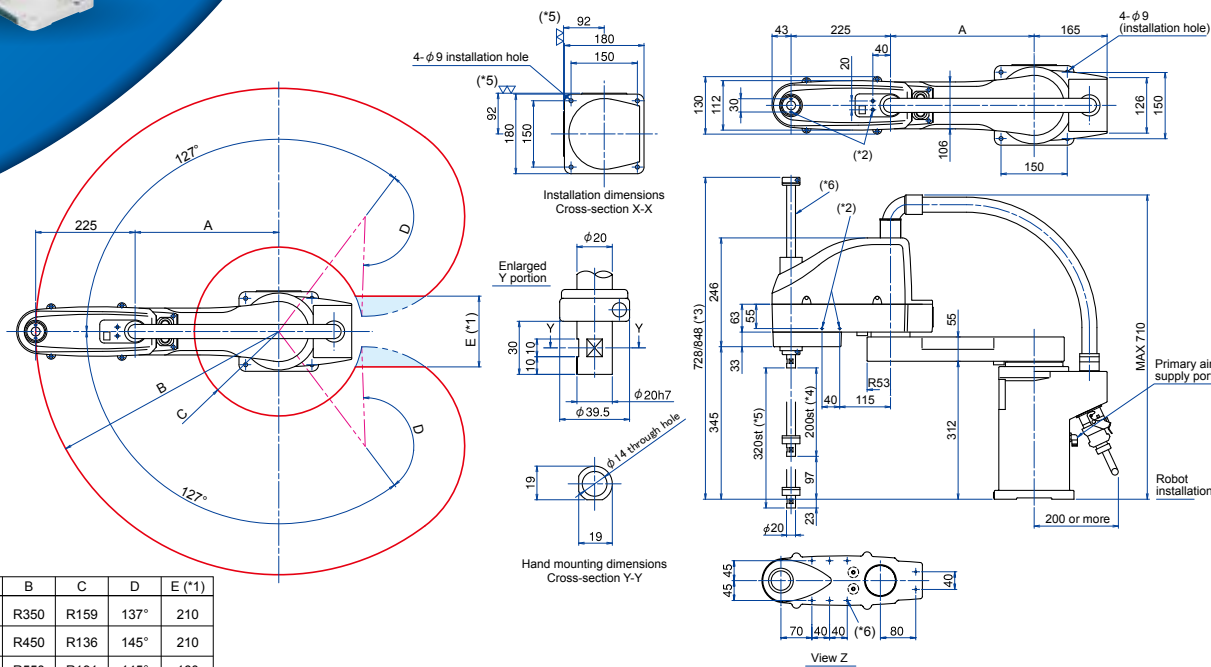
(3) When starting up a compact system which fits into the robot's maximum operating range, if the cylindrical operating range limit function is used, the robot will move without protruding from the set cylindrical range. This allows the system to be started up and adjusted without worrying about interference.



Horizontal
6 kg
type

RH-6SQH
RH-6SDH

External Dimensions/Operating Range Diagram



Variable dimensions					
Robot series	A	B	C	D	E (*1)
RH-6SQH35	125	R350	R159	137"	210
RH-6SDH35	125	R350	R159	137"	210
RH-6SQH45	225	R450	R136	145"	210
RH-6SDH45	225	R450	R136	145"	210
RH-6SQH55	325	R550	R191	145"	160
RH-6SDH55	325	R550	R191	145"	160

*1: Limited area according to the drawing of operating ranges. *2: Indicates the screw hole (M4) used for affixing user wiring and piping. *3: 788 (908) on the oil mist and clean specification models.
*4: 170 st on the oil mist and clean specification models. *5: 270 st on the oil mist and clean specification models.
*6: On the oil mist and clean specification models, bellows are installed in the exposed areas (top and bottom) of the ball screw spline.

Specifications

Type	Unit	RH-6SQH35xx RH-6SDH35xx	RH-6SQH45xx RH-6SDH45xx	RH-6SQH55xx RH-6SDH55xx	RH-6SQH35xxM RH-6SDH35xxM	RH-6SQH45xxM RH-6SDH45xxM	RH-6SQH55xxM RH-6SDH55xxM	RH-6SQH35xxC RH-6SDH35xxC	RH-6SQH45xxC RH-6SDH45xxC	RH-6SQH55xxC RH-6SDH55xxC
Machine class		Standard			Oil mist proof			Clean		
Protection degree *1		IP20			IP54 *2			Class 10 (0.3 μm)		
Installation		Floor type								
Structure		Horizontal, multiple-joint type								
Degrees of freedom		4								
Drive system		AC servo motor (J1, J2 and J4: with no brake, J3: with brake)								
Position detection method		Absolute encoder								
Maximum load capacity	kg	6								
Arm length	No. 1 arm	125	225	325	125	225	325	125	225	325
	No. 2 arm	225								
Maximum reach radius	mm	350	450	550	350	450	550	350	450	550
Operating range	J1	254 (±127)								
	J2	274 (±137)	290 (±145)		274 (±137)	290 (±145)		274 (±137)	290 (±145)	
	J3 (Z)	200 (97 to 297)/320 (-23 to 297)			170 (97 to 267)/270 (-23 to 247)					
	J4 (θ)	720 (±360)								
Maximum speed	J1	375								
	J2	612								
	J3 (Z)	1177								
	J4 (θ)	2411								
Maximum composite speed *3	mm/sec	6473 (4694)	7128 (5349)	7782 (6003)	6473 (4694)	7128 (5349)	7782 (6003)	6473 (4694)	7128 (5349)	7782 (6003)
Cycle time *4	sec	0.42		0.43	0.42		0.43	0.42		0.43
Position repeatability	X-Y composite	±0.02								
	J3 (Z)	±0.01								
	J4 (θ)	±0.02								
Ambient temperature	°C	0 to 40								
Mass	kg	Approx. 20		Approx. 21	Approx. 20		Approx. 21	Approx. 20		Approx. 21
Tool wiring *5		Hand: 8 input points / 8 output points (forearm), 8 spare lines: AWG#24 (0.2mm²)								
Tool pneumatic pipes		Primary: φ6 x 2 Secondary: φ4 x 8								
Machine cable		5m (connector on both ends)								
Connected controller *6		CR1QA-761 / CR1DA-761			CR1QA-761 (Protection box (CR1D-MB) included for -SM specification) CR1DA-761 (Protection box (CR1D-MB) included for -SM specification)			CR1QA-761 / CR1DA-761		

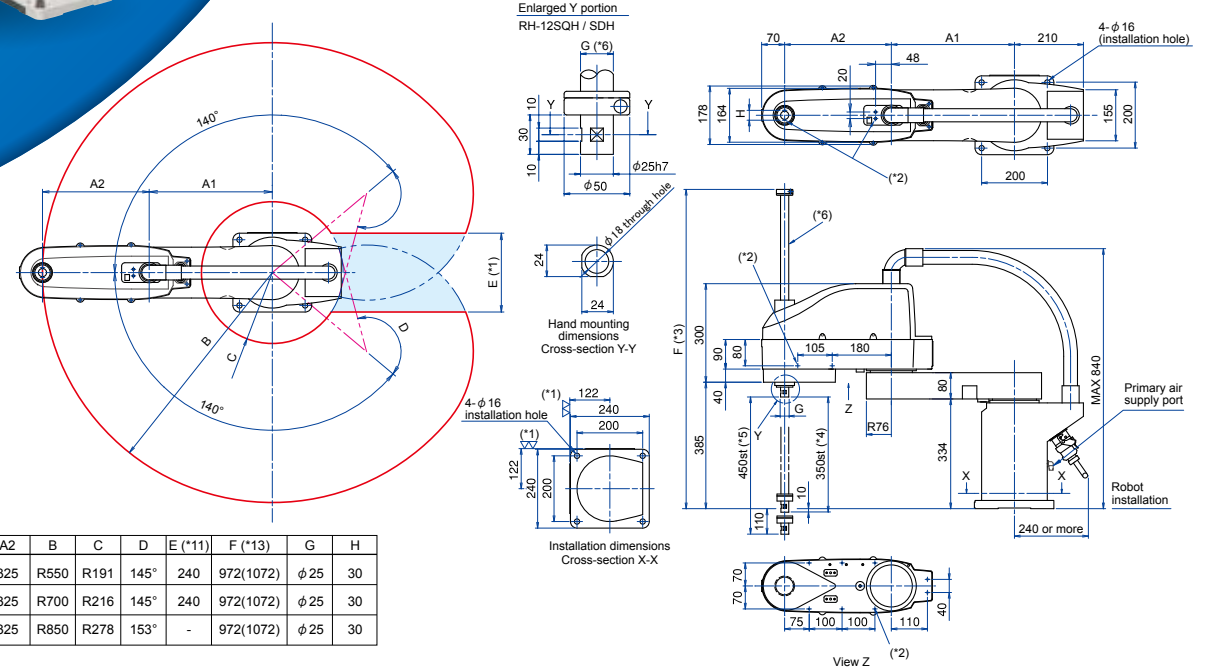
*1: Take note that on the models of environment-resistant specifications (C: Clean specification, M: Mist specification), the operating range of the vertical axis is smaller than on the standard models.
The environment-resistant specifications are factory-set custom specifications. For the approximate timeframe for delivery, contact the Mitsubishi Electric dealer or sales agent near you.
*2: Please contact to Mitsubishi Electric dealer since the environmental resistance cannot be secured depending on the characteristics of oil you use.
*3: The value assumes composition of J1, J2, and J4. The value in parentheses assumes composition of J1 and J2.
*4: Based on a load capacity of 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.)
*5: If the hand output is used, the pneumatic hand interface (optional) is required.
*6: Select either controller according to your application. The controller protection box is attached to the mist specification controller (CR1D-MB (protection box) is attached to CR1QA-7xx/CR1DA-7xx (IP20)), and "-SM" is appended to the model name. If you require it, consult with the Mitsubishi Electric dealer.



Horizontal
12 kg
type

RH-12SQH
RH-12SDH

External Dimensions/Operating Range Diagram



Variable dimensions										
Robot series	A1	A2	B	C	D	E (*11)	F (*13)	G	H	
RH-12SQH55	225	325	R550	R191	145°	240	972(1072)	φ25	30	
RH-12SDH55	225	325	R550	R191	145°	240	972(1072)	φ25	30	
RH-12SQH70	375	325	R700	R216	145°	240	972(1072)	φ25	30	
RH-12SDH70	375	325	R700	R216	145°	240	972(1072)	φ25	30	
RH-12SQH85	525	325	R850	R278	153°	-	972(1072)	φ25	30	
RH-12SDH85	525	325	R850	R278	153°	-	972(1072)	φ25	30	

*1: Limited area according to the drawing of operating ranges. *2: Indicates the screw hole (M4) used for affixing user wiring and piping.
*3: 1027 (1127) on the RH-12SQH/12SDH-series models, and 999 (1079) on the RH-20SQH/20SDH-series models, of oil mist or clean specification.
*4: 300 st on the oil mist and clean specification models. *5: 380 st on the oil mist and clean specification models.
*6: On the oil mist and clean specification models, bellows are installed in the exposed areas (top and bottom) of the ball screw spline.

Specifications

Type		Unit	RH-12SQH55xx RH-12SDH55xx	RH-12SQH70xx RH-12SDH70xx	RH-12SQH85xx RH-12SDH85xx	RH-12SQH55xxM RH-12SDH55xxM	RH-12SQH70xxM RH-12SDH70xxM	RH-12SQH85xxM RH-12SDH85xxM	RH-12SQH55xxC RH-12SDH55xxC	RH-12SQH70xxC RH-12SDH70xxC	RH-12SQH85xxC RH-12SDH85xxC			
Machine class			Standard			Oil mist proof			Clean					
Protection degree *1			IP20			IP54 *2			Class 10 (0.3 μ m)					
Installation			Floor type											
Structure			Horizontal, multiple-joint type											
Degrees of freedom			4											
Drive system			AC servo motor (J1, J2 and J4: with no brake, J3: with brake)											
Position detection method			Absolute encoder											
Maximum load capacity			kg	12										
Arm length	No. 1 arm	mm	225	375	525	225	375	525	225	375	525			
	No. 2 arm		325											
Maximum reach radius			mm	550	700	850	550	700	850	550	700	850		
Operating range	J1	deg	280 (±140)											
	J2		290 (±145)		306 (±153)		290 (±145)		306 (±153)		290 (±145)		306 (±153)	
	J3 (Z)		350 (-10 to +340)/450 (-110 to +340)			300 (-10 to +290)/380 (-110 to +270)								
	J4 (θ)		720 (±360)											
Maximum speed	J1	deg/sec	360		288		360		288		360		288	
	J2		412.5											
	J3 (Z)		1300											
	J4 (θ)		1500											
Maximum composite speed *3			mm/sec	10555 (5796)	11498 (6738)	11221 (6612)	10555 (5796)	11498 (6738)	11221 (6612)	10555 (5796)	11498 (6738)	11221 (6612)		
Cycle time *4			sec	0.43	0.44	0.45	0.43	0.44	0.45	0.42	0.44	0.45		
Position repeatability	X-Y composite	mm	±0.02		±0.025		±0.02		±0.025		±0.02		±0.025	
	J3 (Z)		±0.01											
	J4 (θ)	deg	±0.03											
Ambient temperature			°C	0 to 40										
Mass			kg	Approx. 41	Approx. 43	Approx. 45	Approx. 41	Approx. 43	Approx. 45	Approx. 41	Approx. 43	Approx. 45		
Tool wiring *5			Hand: 8 input points / 8 output points (forearm), 8 spare lines: AWG#24 (0.2mm ²)											
Tool pneumatic pipes			Primary: φ6 x 2 Secondary: φ6 x 8											
Machine cable			5m (connector on both ends)											
Connected controller *6			CR2QA-741 / CR2DA-741											

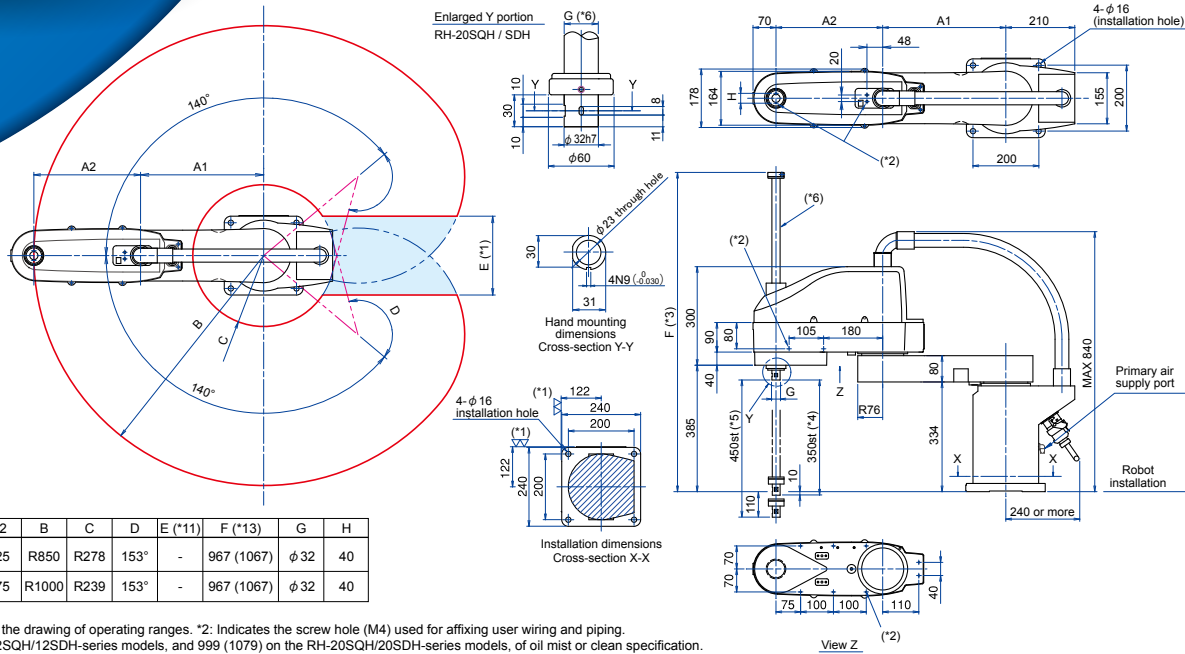
*1: Take note that on the models of environment-resistant specifications (C: Clean specification, M: Mist specification), the operating range of the vertical axis is smaller than on the standard models. The environment-resistant specifications are factory-set custom specifications. For the approximate timeframe for delivery, contact the Mitsubishi Electric dealer or sales agent near you.
*2: Please contact to Mitsubishi Electric dealer since the environmental resistance cannot be secured depending on the characteristics of oil you use.
*3: The value assumes composition of J1, J2, and J4. The value in parentheses assumes composition of J1 and J2.
*4: Based on a load capacity of 5 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.)
*5: If the hand output is used, the pneumatic hand interface (optional) is required.
*6: Select either controller according to your application. The mist specification controller is CR3Q/CR3D type, and "-SM6" is appended to the model name. If you require it, consult with the Mitsubishi Electric dealer.



Horizontal
20kg
type

RH-20SQH RH-20SDH

External Dimensions/Operating Range Diagram



Variable dimensions

Robot series	A1	A2	B	C	D	E (*1)	F (*13)	G	H
RH-20SQH85 RH-20SDH85	525	325	R850	R278	153°	-	967 (1067)	φ 32	40
RH-20SQH100 RH-20SDH100	525	475	R1000	R239	153°	-	967 (1067)	φ 32	40

*1: Limited area according to the drawing of operating ranges. *2: Indicates the screw hole (M4) used for affixing user wiring and piping.
*3: 1027 (1127) on the RH-12SQH/12SDH-series models, and 999 (1079) on the RH-20SQH/20SDH-series models, of oil mist or clean specification.
*4: 300 st on the oil mist and clean specification models. *5: 360 st on the oil mist and clean specification models.
*6: On the oil mist and clean specification models, bellows are installed in the exposed areas (top and bottom) of the ball screw spline.

Specifications

Type		Unit	RH-20SQH85xx RH-20SDH85xx	RH-20SQH100xx RH-20SDH100xx	RH-20SQH85xxM RH-20SDH85xxM	RH-20SQH100xxM RH-20SDH100xxM	RH-20SQH85xxC RH-20SDH85xxC	RH-20SQH100xxC RH-20SDH100xxC
Machine class			Standard			Oil mist proof		Clean
Protection degree *1			IP20			IP54 *2		Class 10 (0.3 μ m)
Installation			Floor type					
Structure			Horizontal, multiple-joint type					
Degrees of freedom			4					
Drive system			AC servo motor (J1, J2 and J4: with no brake, J3: with brake)					
Position detection method			Absolute encoder					
Maximum load capacity		kg	20					
Arm length		No. 1 arm No. 2 arm	525					
			325	475	325	475	325	475
Maximum reach radius		mm	850	1000	850	1000	850	1000
Operating range	J1	deg	280 (±140)					
	J2		306 (±153)					
	J3 (Z)		350 (-10 to + 340)/450 (-110 to +340)			300 (-10 to + 290)/380 (-110 to +270)		
	J4 (θ)		720 (±360)					
Maximum speed	J1	deg/sec	288					
	J2		412.5					
	J3 (Z)		1200					
	J4 (θ)		1500					
Maximum composite speed *3		mm/sec	11221 (6612)	13055 (8446)	11221 (6612)	13055 (8446)	11221 (6612)	13055 (8446)
Cycle time *4		sec	0.46	0.57	0.46	0.57	0.46	0.57
Position repeatability	X-Y composite	mm	±0.025					
	J3 (Z)		±0.01					
	J4 (θ)		±0.03					
Ambient temperature		°C	0 to 40					
Mass		kg	Approx. 47	Approx. 51	Approx. 47	Approx. 51	Approx. 47	Approx. 51
Tool wiring *5			Hand: 8 input points / 8 output points (forearm), 8 spare lines: AWG#24 (0.2mm ²)					
Tool pneumatic pipes			Primary: φ 6 x 2 Secondary: φ 6 x 8					
Machine cable			5m (connector on both ends)					
Connected controller *6			CR2QA-751 / CR2DA-751					

*1: Take note that on the models of environment-resistant specifications (C: Clean specification, M: Mist specification), the operating range of the vertical axis is smaller than on the standard models. The environment-resistant specifications are factory-set custom specifications. For the approximate timeframe for delivery, contact the Mitsubishi Electric dealer or sales agent near you.
*2: Please contact to Mitsubishi Electric dealer since the environmental resistance cannot be secured depending on the characteristics of oil you use.
*3: The value assumes composition of J1, J2, and J4. The value in parentheses assumes composition of J1 and J2.
*4: Based on a load capacity of 5kg. 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.)
*5: If the hand output is used, the pneumatic hand interface (optional) is required.
*6: Select either controller according to your application. The mist specification controller is CR3Q/CR3D type, and "-SM6" is appended to the model name. If you require it, consult with the Mitsubishi Electric dealer.

MELFA RH SERIES HAS A VERSATILITY TO FULFILL A WIDE RANGE OF TASKS FROM THE PRECISION ASSEMBLY OF SMALL PARTS TO TRANSFER AND PACKAGING OF HEAVY ITEMS.

● Payload: 6 kg to 20 kg

- The conventional 18 kg model has been enhanced to a 20 kg rating. Greater payloads are now possible.
- Ability to use heavier multifunction tooling.

● Arm reach: 350 mm to 1,000 mm

- Arm reach has been extended to 1000 mm. (20 kg model only)
- A greater flexibility in choosing pallet sizes and layout design.
Also, eliminated are problems with the shortage of stroke which are encountered when rearranging conventional units.

● Z Stroke: 200 mm to 450 mm

- Z stroke with 6 to 20 kg model is available with an extended stroke:
 - 6 kg model: 320 mm added to conventional 200 mm
 - 12/20 kg model: 450 mm added to conventional 350 mm
- More application versatility in long reach applications such as packaging.

Model



RH-6SQH/6SDH



RH-12SQH/12SDH



RH-20SQH/20SDH

Payload

6 kg

12 kg

20 kg

Reach

350 mm

450 mm

550 mm

700 mm

850 mm

1000 mm

Z stroke

200 mm

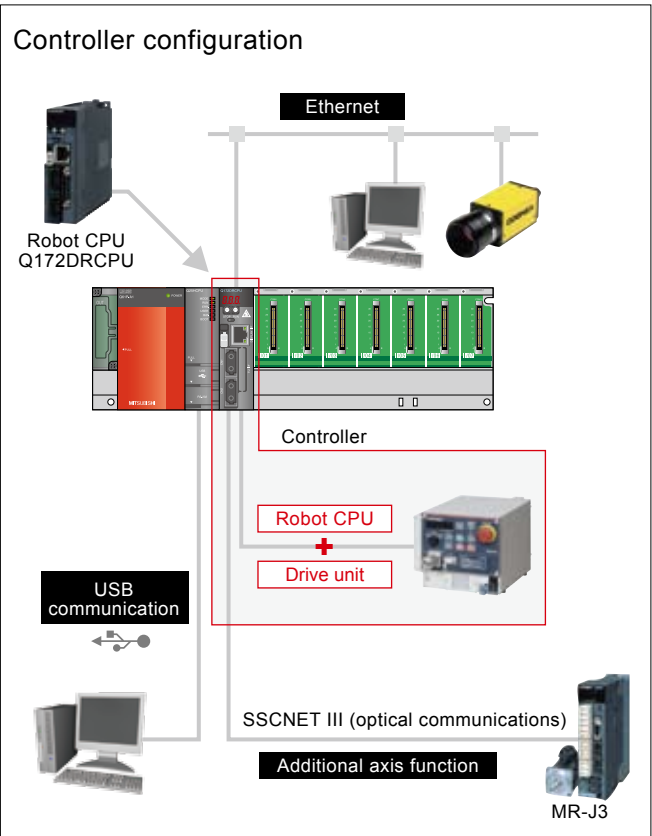
320 mm

350 mm

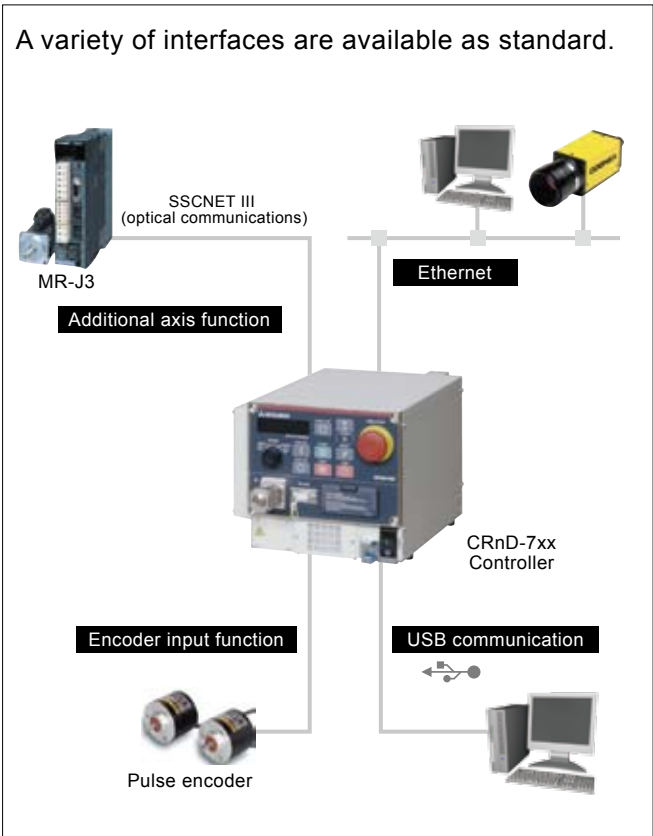
450 mm

Controller

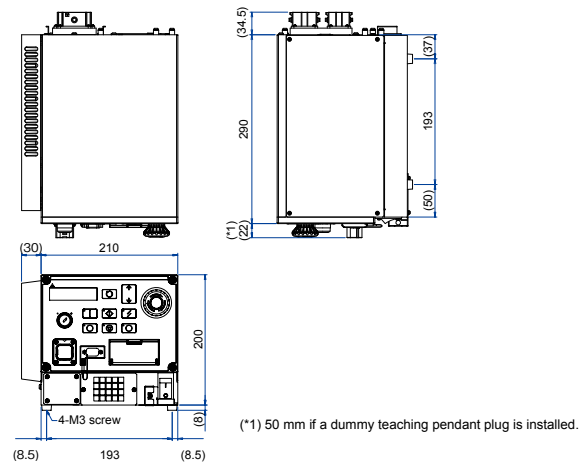
SQ series



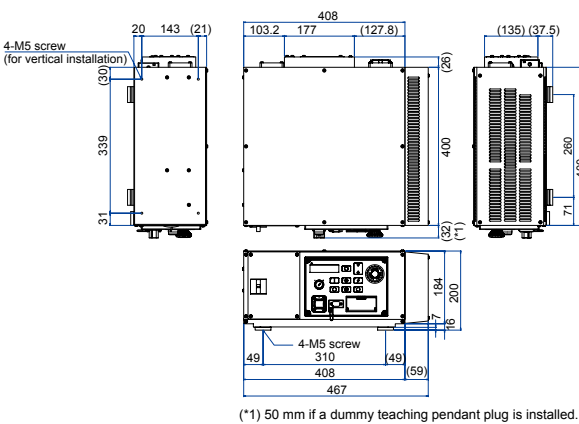
SD series



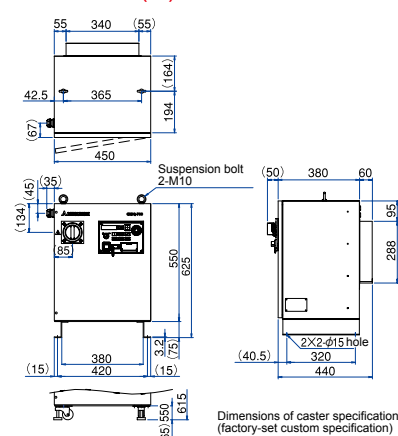
Drive unit **DU1A-7xx**
Controller **CR1DA-7xx**



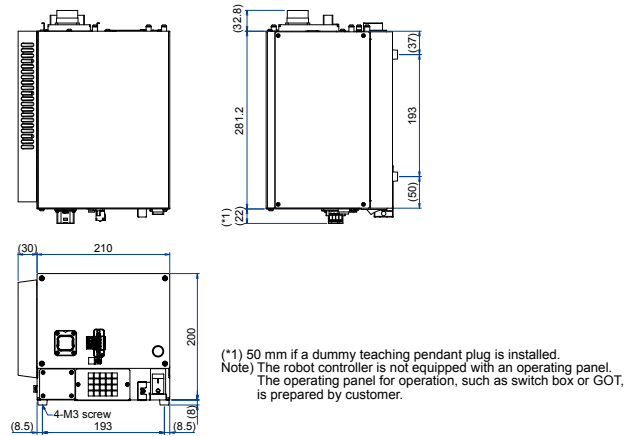
Drive unit **DU2A-7xx**
Controller **CR2DA-7xx**



Drive unit **DU3-7xx (M)**
Controller **CR3D-7xx (M)**



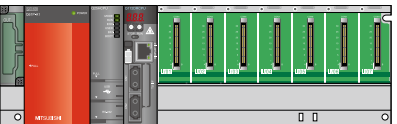
Drive unit **CR1QA-772**



Specifications

Type		Unit	CR1QA-772 CR1DA-771	CR1QA-721 CR1DA-721	CR1QA-731 CR1DA-731	CR2QA-711 CR2DA-711	CR2QA-701 CR2DA-701	CR3Q-701M CR3Q-711M CR3D-701M CR3D-711M	CR3Q-701 CR3D-701	CR1QA-761 CR1DA-761	CR2QA-781 CR2DA-781	CR2QA-741 CR2QA-751 CR2DA-741 CR2DA-751	CR3Q-741M CR3Q-751M CR3D-741M CR3D-751M				
Robot CPU			Q172DRCPU														
Drive unit			DU1A-772	DU1A-721	DU1A-731	DU2A-711	DU2A-701	DU3-701M DU3-711M	DU3-701	DU1A-761	DU2A-781	DU2A-741 DU2A-751	DU3-741M DU3-751M				
Path control method			PTP control and CP control														
Number of axes controlled			6 axes		5 axes		6 axes				4 axes						
Robot language			MELFA-BASIC V or MELFA-BASIC IV														
Position teaching method			Teaching method, MDI method														
Memory capacity	Number of teaching points	points	13,000														
	Number of steps	step	26,000														
	Number of programs	Unit	256														
External input/output	General-purpose I/O	points	SQ 8192 input points/8192 output points with the multiple CPU common device / SD 0 input/0 output (Up to 256/256 when options are used)														
	Dedicated I/O		SQ Assigned to multiple CPU common device. / SD Assigned to general-purpose I/O.														
	Special stop input		1														
	Hand open/close		4 input / 0 output *7	8 input / 0 output *6													
	Emergency stop input		1 (redundant)														
	Door switch input		1 (redundant)														
	Enabling device input		1 (redundant)														
	Emergency stop output		1 (redundant)														
	Mode output		1 (redundant)														
	Robot error output		1 (redundant)														
	Synchronization of additional axes		1 (redundant)														
	Interface		RS-232	ports	SQ - / SD 1 (for the extension of a personal computer, vision sensor, etc.)												
RS-422		1 (Teaching pendant: dedicated T/B)															
Ethernet		SQ 1 (dedicated teaching pendant port) 10BASE-T / SD 1 (dedicated teaching pendant port), 1 (for customer) 10BASE-T/100BASE-TX															
USB		SQ 1 (USB port of programmable controller CPU unit (mini B terminal) can be used.) / SD 1 (device functions only, mini B terminal)															
Hand dedicated slot		slots	1 (dedicated for pneumatic hand interface)														
Key switch interface		points	SQ 1 / SD -	-													
Additional-axis interface		channels	1 (SSCNET III)														
Tracking interface		SQ Q173DPX (sold separately) / SD 1															
Memory slot		slots	SQ - / SD 1														
Extension slot *1			SQ - / SD 1				SQ - / SD 3				SQ - / SD 1		SQ - / SD 3				
Ambient temperature		°C	0 to 40														
Relative humidity		%RH	SQ 0 to 40 (drive unit)/0 to 55 (Robot CPU) / SD 45 to 85														
Power supply	Input voltage range	V	3-phase AC180 to 253 *2														
	Power capacity *3	KVA	0.5	1.0		2.0		3.0			1.0	2.0		3.0			
External dimensions (including legs)		mm	240 (W) x 290(D) x 200 (H) (excluding protrusions)		240 (W) x 290 (D) x 200 (H)		470 (W) x 400 (D) x 200 (H)		450 (W) x 440 (D) x 625 (H) *5		450 (W) x 380 (D) x 625 (H) *5		240 (W) x 290 (D) x 200 (H)	470 (W) x 400 (D) x 200 (H)		450 (W) x 440 (D) x 625 (H) *5	
Weight		kg	Approx. 9			Approx. 21			Approx. 60			Approx. 9		Approx. 21		Approx. 60	
Structure [protective specification]			Self-contained floor type/open structure [IP20]						Self-contained floor type/ sealed structure [IP54]		Self-contained floor type/open structure [IP20]						Self-contained floor type/ sealed structure [IP54]
Grounding *4			Ω	100 or less (class D grounding)													

Multiple CPU environment



Unit	Type
Base	High-speed standard base between multiple CPU • Q38DB: 8 slots • Q312DB: 12 slots
Power supply	• Q61P • Q62P • Q63P • Q64PN
Programmable controller CPU	Universal model (CPU that can transmit by multiple CPU high speed transmission) • Q03UD (E) HCPU • Q04UD (E) HCPU • Q06UD (E) HCPU • Q10UD (E) HCPU • Q13UD (E) HCPU • Q20UD (E) HCPU • Q26UD (E) HCPU • Q100UD (E) HCPU

Note) For details of each programmable controller unit, refer to the programmable controller manuals, MELFANSweb, etc.

*1: For installing option interface.
*2: The rate of power-supply voltage fluctuation is within 10%.
*3: The power capacity indicates the rating for normal operation. Take note that the power capacity does not include the current being input when the power is turned on.
The power capacity is only a rough guide and whether or not operation can be guaranteed depends on the input power-supply voltage.
*4: Grounding works are the customer's responsibility.
*5: 615 (H) for the caster specification.
*6: 8 input / 8 output when pneumatic hand interface is used.
*7: 4 input / 4 output when pneumatic hand interface is used.

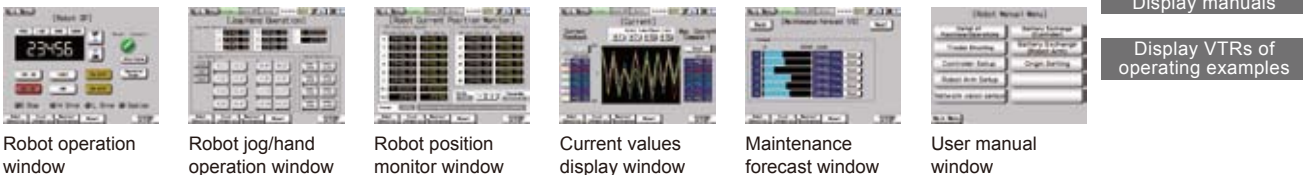
Features (SQ series)

Shared memory expansion function (operating and monitor functions)

Robot Controller Software
Ver. N8 or later
No need for
a teaching pendant/
personal computer

- Convenient monitoring and retrieval of information from robot and other machine components at a single point.

The following types of operating and information windows can be displayed on the GOT:



- Easy to get the status of the robot!

- Essential data from the robot can be displayed without referring to the robot program, editing software, or teaching pendant.

GOT interface provides easy access to robot data and status.

Status information of robot

- Error, variable, and program information
- Robot status (current speed, current position, etc.)
- Maintenance information (remaining battery/grease life, etc.)
- Servo data (load factor/current value, etc.)



Sequencer direct operation

Robot Controller Software
Ver. N8 or later
No need to use
any programs

- The ability to command the robot directly from the programmable controller language.

Use of this function

Traditional method

In most cases, the PLC program and robot program are written independently by different programmers and in different languages. This increases programming and debug time and the need for multiple programming environments.

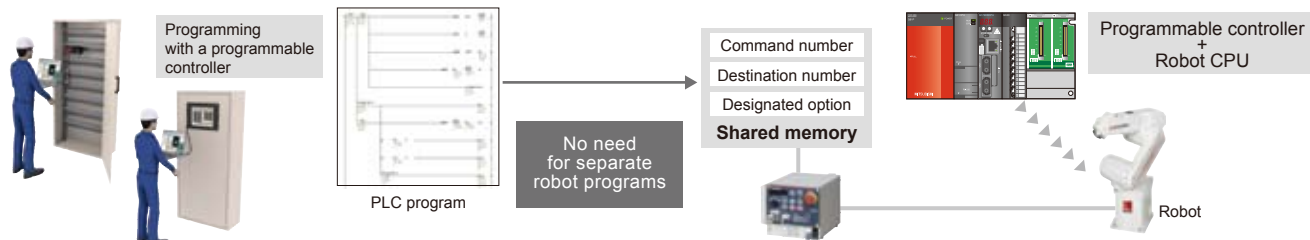
With direct robot control from a programmable controller

Programming can be accomplished directly within the programmable controller language. No need to use a second language/ program to control the robot.



What is the direct execution function for programmable controller?

Robots can be operated through writing of setting values decided in advance to given addresses in multi-CPU's and shared memory, regardless of programm (ladder, ST language, SFC, etc.). Joint interpolation movement and linear interpolation movement modes are available. Additionally robot operations such as operating speed, acceleration/deceleration, and tool settings can be set in detail.



Advantages provided by the direct robot control from a programmable controller

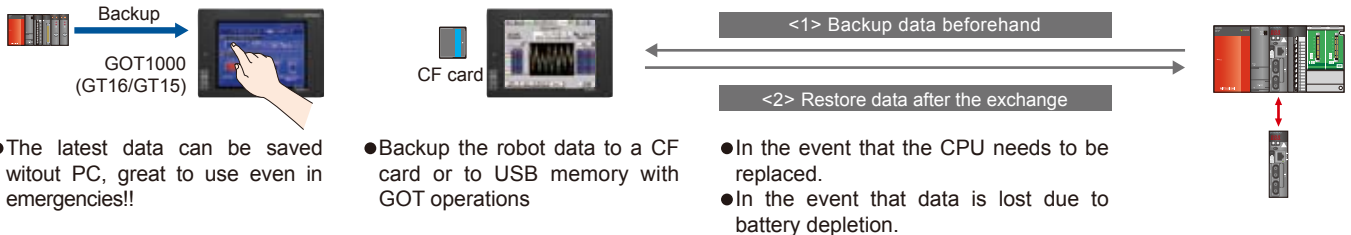
- System operation can be controlled solely by the programmable controller. Easy to operate those systems because only PLC programmer can handle system specifications or trouble shooting.

GOT backup / restore function

Robot Controller Software
SQ: Ver. N8 or later, SD: Ver. P8 or later

Features for
protecting
program data

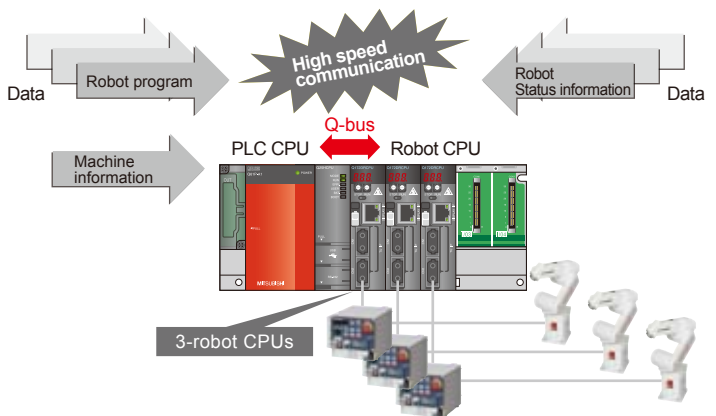
- Robot data can be backed-up and restored from GOT without personal computer (for SQ/SD series)



Note) To use the back-up / restore function with the GOT, install an operating system (OS) with a backup/restore function on the GOT using GT Designer3 Ver. 1.07H or later.

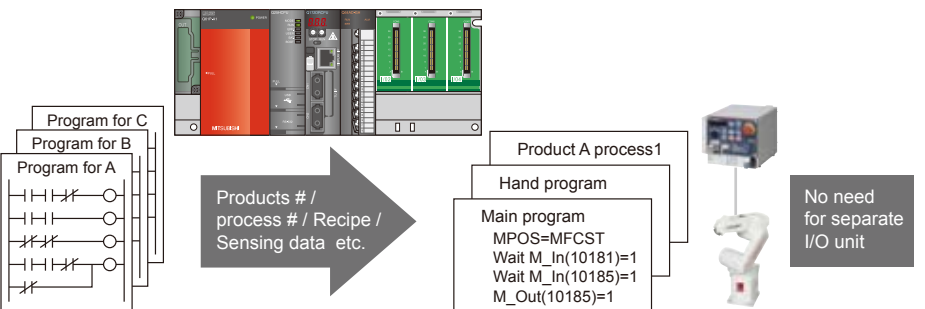
High-speed communication between the programmable controller ↔ robot

With the robot CPU mounted in an iQ system, communications between the programmable controller or other available CPU's are much faster and at greater volumes. Total machine integration is simplified and performance is enhanced.



High capacity communication between the programmable controller ↔ robot

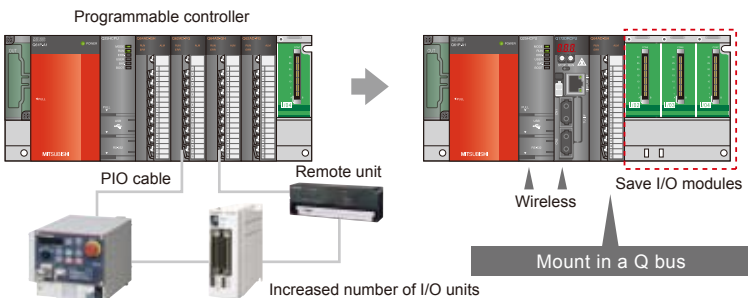
High capacity communication can support multi machines system with large I/O requirements. Enables simplified integration of all I/O in complex systems. (8192 Input/8192 Output)



Save wiring / save communication modules

No need for any
configurations
options

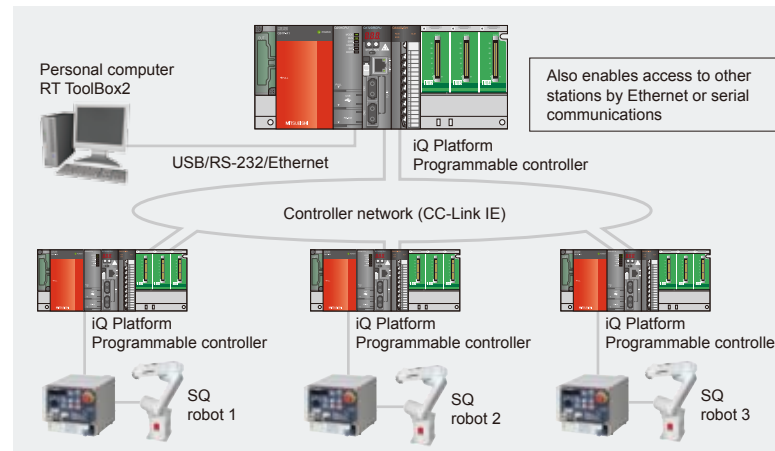
Less wiring and shard modules reduces overall system cost.



Program maintenance from one port.

Network is controlled from one port.

Multiple robots can be accessed from a personal computer connected to the main CPU via a control network. This provides convenience and time savings when performing setup and maintenance.



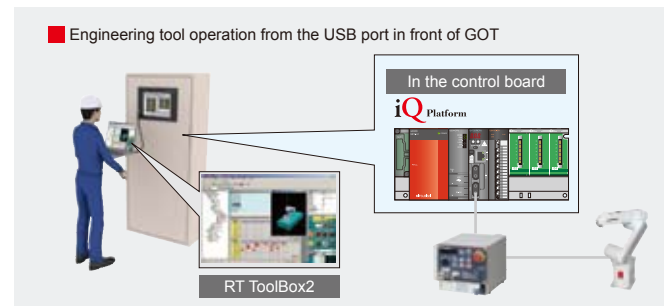
Robots 1, 2, and 3 can be monitored from a single location.

GOT connection (transparent function)

Simple connection

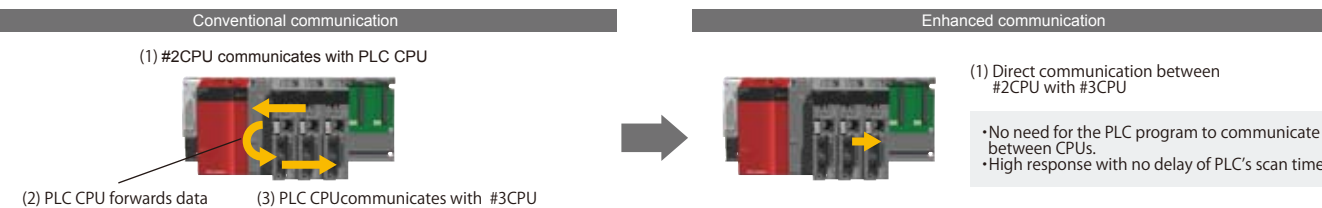
Programs and parameters can be written from the USB interface on the front of the GOT using a transparent function. This function is available for SD Series as well.

Note) Compatible with the transparent function when the GOT and CPU are connected by bus connection and in direct connection mode.



Robot CPU ↔ Robot CPU direct communication

High speed direct communication with shared memory between CPU's increases the efficiency of detailed control programs which improves processing time.



Robot CPU ↔ IO control unit direct operation

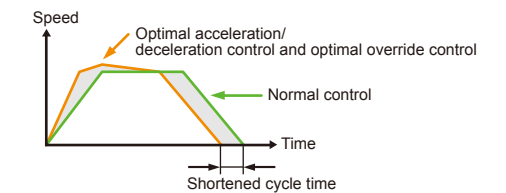
High speed direct communication with shared memory, robot CPU, and I/O signals improves response time and reduces tact time.



Functions

Optimal acceleration/deceleration control and optimal override function

- The optimal acceleration/deceleration time and speed are automatically set according to operation position, posture, and load conditions of the robot.

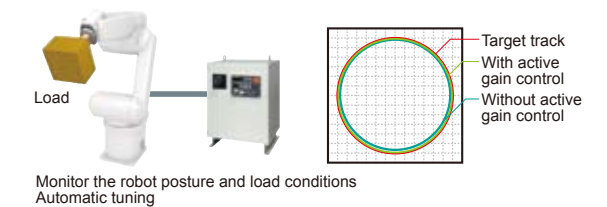


Improved productivity through shortened cycle times

Shortened startup time

Active gain control

- Optimal motor control tuning is set automatically based on the operating position, posture, and load conditions of the robot.
- 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.

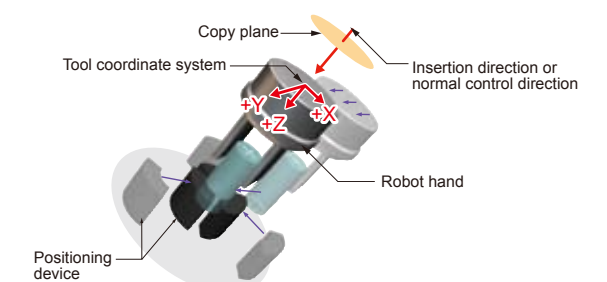


Improved trajectory accuracy

Improved vibration-damping performance

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.
- The amount of force generated through interference during chucking and workpiece insertion can be reduced, and external movement copying forces can 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.

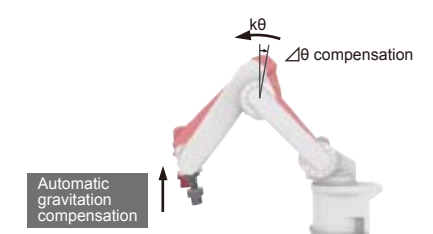


Reduce tooling cost

Shortened startup time

Automatic gravitation compensation

- Independent of the load fixture - if near the base or far away - the gravitation control positions the load always with the same accuracy. This supports the high precision robot arm.
- Calculates the amount of compensation needed based on the movement position, posture, and load conditions of the robot and compensates for any deflection automatically.
- This is effective for work transporting workpieces to cassettes with low pitch and palletizing work.



Improved palletization accuracy

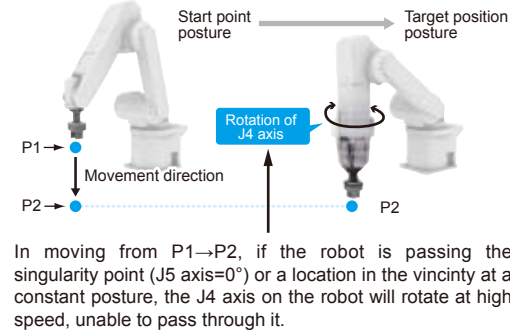
Improved trajectory accuracy

Function for passing through points of singularity

- The robot can pass through the singularity point, and the flexible layout can be achieved.
- Teaching operations can be performed easily as there is no longer any need to cancel operations due to the singularity point.

What is a singularity point?:

There is an unlimited number of angles at which one interpolation axis can be set for a given position, the posture of the robot changes when linear interpolation operations are performed using position data from a joint coordinate system. In this case the robot can't be operated at a assigned position and posture under normal conditions. The position at which this occurs is referred to as a singularity point.



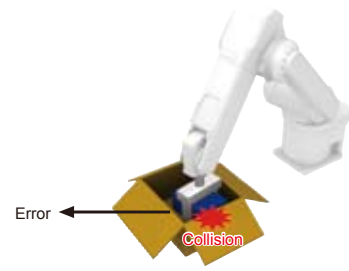
Expansion of the operating area

Easy to design

Shortened teaching operation times

Collision detection function

- 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 detection level can be changed according to the protection targets.
- The collision detection function can be programmed to generate an alarm or perform a specific escape move or both.
Ex.) An error is output due to the robot stopping suddenly, an error is output after escape movements are made, etc.



Shortened startup time

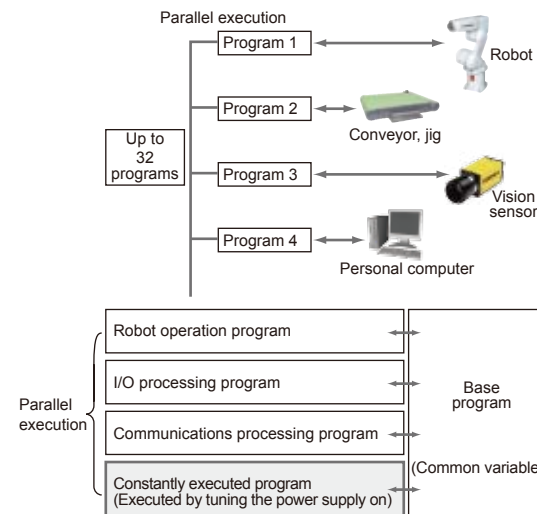
Reduced tooling cost

Reduced line stop time

Reduced maintenance cost

Multi-tasking function

- Division of tasks other than robot motion tasks, such as machine vision, external motion, and I/O can be divided and executed in one of 32 slots at the same time.
- Reading external sensor data for example has no impact on robot motion processing or movement.
- Priority can be assigned to processes between programs.

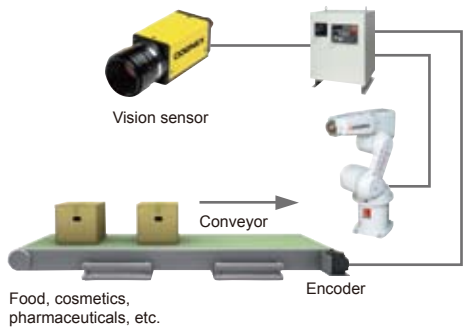


Shortened takt time

Reduce system costs

Tracking function

- Transport, alignment, and installation work, etc. can be performed while robots are tracked with the workpiece on the conveyor without stopping the conveyor.
- Different variations can be selected, including vision tracking in combination with a vision sensor, tracking in combination with an opto-electric sensor, etc.
- Tracking can be performed simultaneously for more than one conveyor.
(SQ series: up to 8 lines, SD series: up to 2 lines)
- Programs can be created easily in robot language (MELFA BASIC IV, V).
- Standard interface function. (For the SD series only. For the SQ series, prepare a separate Q173DPX motion unit for input of encoder signals).



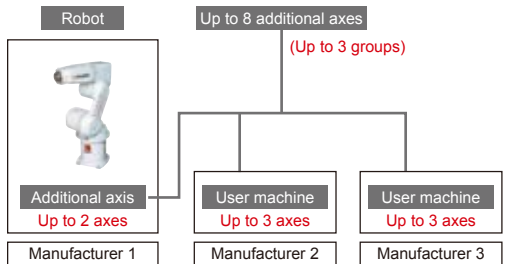
No need for a positioning device

Improved operating tact

Reduce system costs

Additional axis function

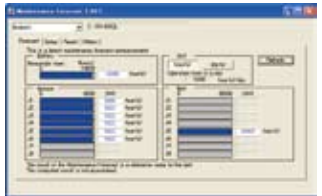
- Robot controller has plug-and-play connection to the MELSERVO-J3 servos.
- Up to 8 additional axes can be controlled by the controller.
- Additional axes and user machines can be operated from the robot program and teach pendant without any additional motion control hardware.
- Additional axis control is performed directly from the robot program.



No need for separate motion control hardware

Maintenance forecast function

- This function notifies users of when to complete maintenance tasks such as greasing, replacing belts, etc. Signals and warnings are output as notification at scheduled times set in advance.
- Data for load conditions during times when the robot is in an actual operating state is collected and analyzed so that the rate of usage of consumables such as grease and belts can be estimated and used in calculating replacement periods.
- System status can also be checked using the personal computer support software.



Shortened line stop time

Reduce maintenance cost

Safety features

- Complies with the latest ISO-10218 (2006) standards for Robots and robotic devices--Safety requirements.
- Safety circuits (emergency stop circuits) can easily be installed for the customer's entire system, not just for the robot itself.

Reduce maintenance cost

Enabling device input function

- Enabling devices can be connected in three different positions to protect the robot system and robot operators from accidents.
- The level of safety is increased due to collaborative robot control by multiple operators.
- All safety signals are redundant inputs.

Improved safety

Complies with safety standards

CE standards : European safety standards

- Compliant with the EMC Directive, 2004/108/EC
- Compliant with the EMC Directive, 2006/42/EC
- Compatible with devices with special specifications

UL standards : North American safety standards

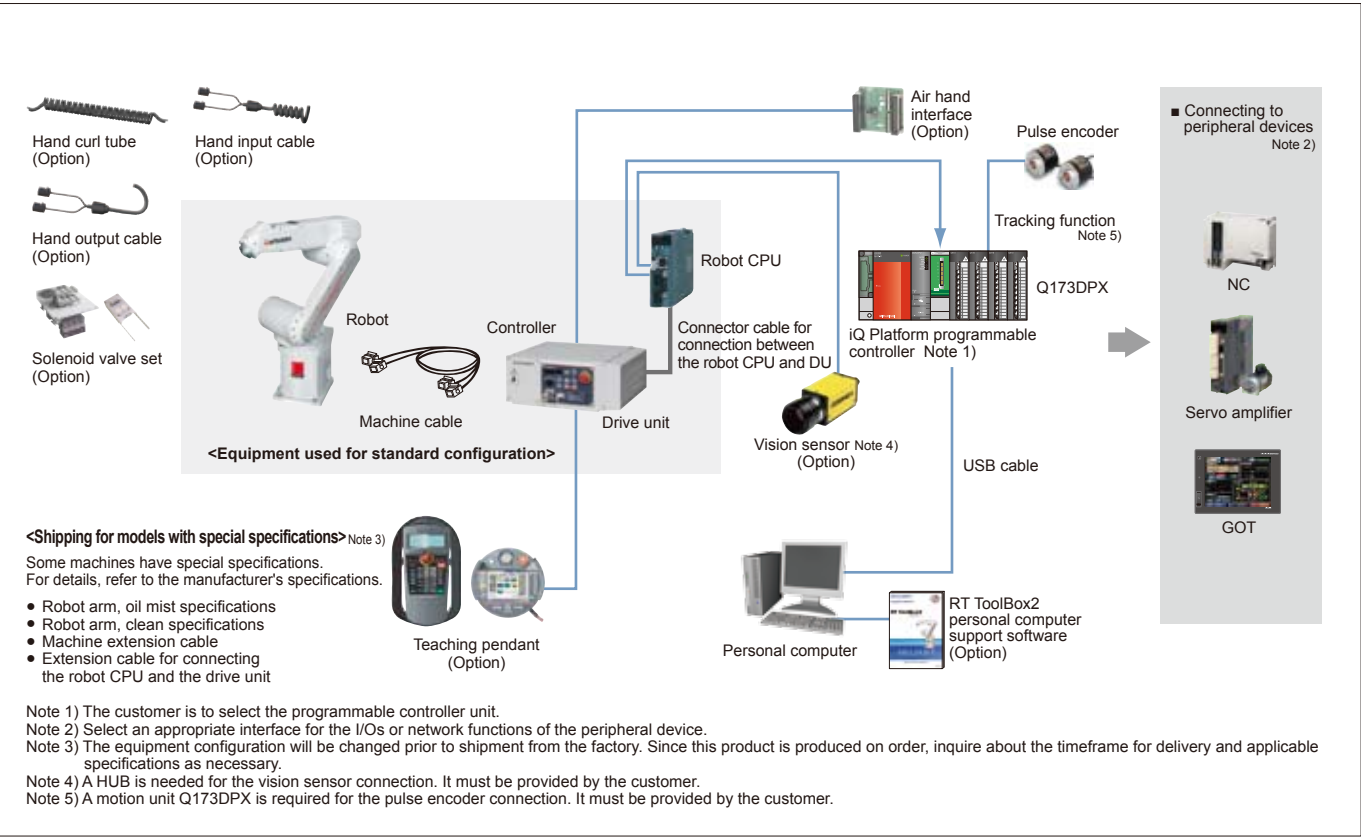
- Compliant with UL/CSA standards
- Compatible with devices with special specifications

System Configuration

SQseries

System Configuration iQ Platform

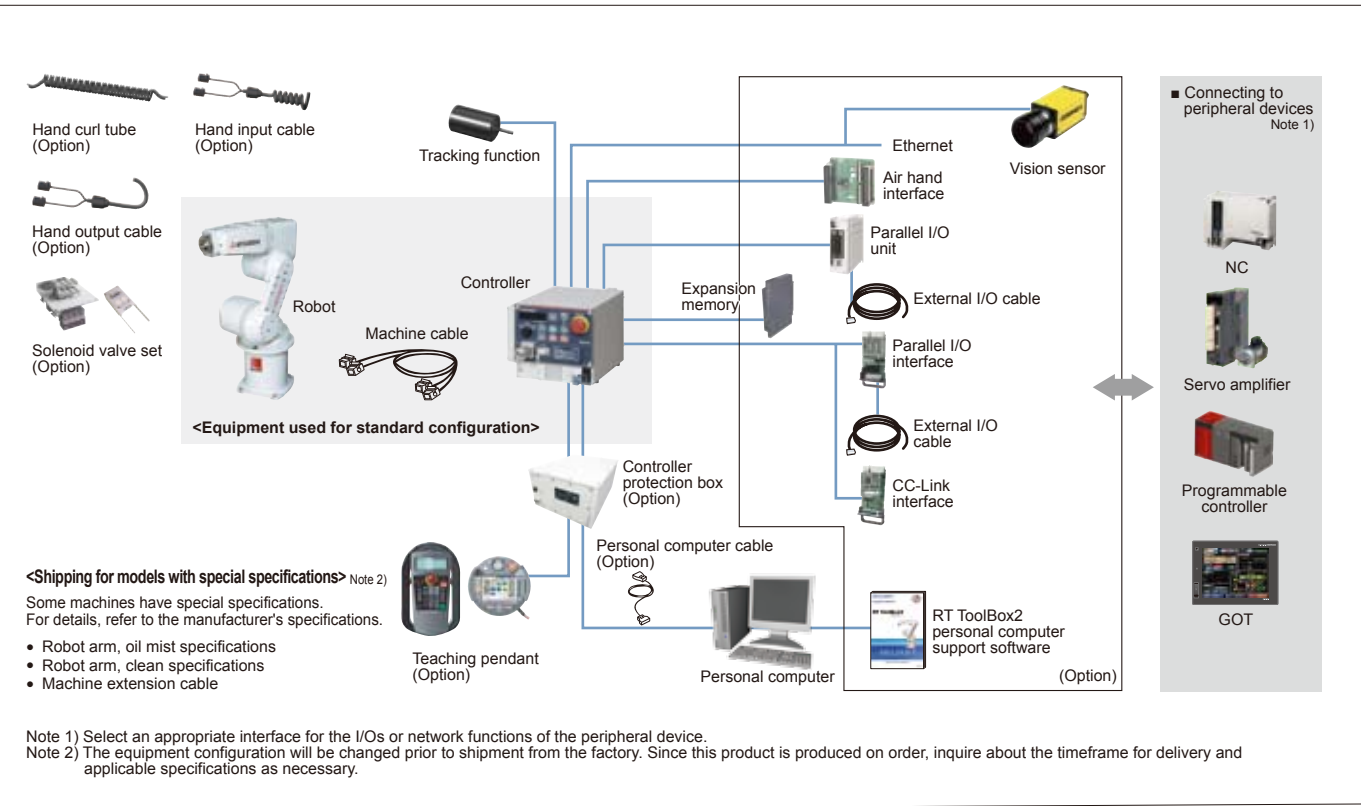
(Example with RV-6SQL)



SDseries

System Configuration

(Example of RV-3SDJ-SM)



Configurations Options

Configurations options For details, refer to the specifications sheets.

Classification	Name	Type	RV				RH			Functional specifications
			2SQ 2SD	3SQ 3SDJ	6SQ 6SQL 6SD 6SDL	12SQ 12SQL 12SD 12SDL	3SQHR 3SDHR	6SQH 6SDH	12SQH 20SQH 12SDH 20SDH	
Robot arm	Solenoid valve set	1S-VD0□-01 (Sink) 1S-VD0□E-01 (Source)	-	-	-	○	-	-	-	1 to 4 valves, with solenoid valve output cable. □ indicates the number of solenoid valves (1, 2, 3, or 4 valves) Only 1- or 2-valve models available for RV-2SQ/2SD.
		1S-VD0□-02 (Sink) 1S-VD0□E-02 (Source)	-	○	○	-	-	-	-	
		1S-VD0□M-03 (Sink) 1S-VD0□ME-03 (Source)	-	-	-	-	-	-	○	
		1S-VD0□M-04 (Sink) 1S-VD0□ME-04 (Source)	-	-	-	-	-	○	-	
		1S-VD0□-05 (Sink) 1S-VD0□E-05 (Source)	-	-	-	-	○	-	-	
		1E-VD0□ (Sink) 1E-VD0□E (Source)	○	-	-	-	-	-	-	
	Hand output cable	1S-GR35S-01	-	○	○	○	-	-	-	4-valve type, not terminated at one end 2-valve type, not terminated at one end, for RV-2SQ/2SD
		1S-GR35S-02	-	-	-	-	○	○	○	
	Hand input cable	1E-GR35S	○	-	-	-	-	-	-	8-point type with splash-proof grommet 4-valve type, not terminated at one end, for RV-2SQ/2SD * RH-20SQH/SDH 1000mm Arm: 1S-HC35C-03
		1S-HC25C-01	-	○	○	○	-	-	-	
		1S-HC35C-02	-	-	-	-	-	○	○*	
		1S-HC30C-11	○	-	-	-	-	-	-	
	Hand (curl) tube	1S-HC00S-01	-	-	-	-	○	-	-	φ 3 tube for RH-3SQHR/SDHR φ 4 tube for RV-3SQ/SD, RV-6SQ/SD, and RH-6SQ/SD φ 6 tube for RV-12SQ/SD and RH-12SQH/SDH, RH-20SQH/SDH □ indicates the number of sets (2, 4, 6, or 8 sets) φ 4 tube for RV-2SQ/2SD, with 2 or 4 sets.
		1N-ST060□C	-	-	-	○	-	-	-	
		1E-ST040□C	○	○	○	-	-	-	-	
		1E-ST0408C-300	-	-	-	-	-	○	-	
		1N-ST0608C	-	-	-	-	-	-	○	
	Stopper for changing the J1-axis operating range	1S-ST0304S	-	-	-	-	○	-	-	For changing the angle for 3SQ/SD (±30°, ±60°, ±90°, ±120°) For changing the angle for 6, 12SQ/SD (±45°, ±90°, ±135°) For changing the angle for 2SQ/SD (±90°, ±150°, ±210°) Installation is the responsibility of the customer.
		1S-DH-01	-	-	-	○	-	-	-	
		1S-DH-02	-	-	○	-	-	-	-	
		1S-DH-03	-	○	-	-	-	-	-	
		1S-DH-11J1	○	-	-	-	-	-	-	
	Stopper for changing the J2-axis operating range	1S-DH-05J1	-	-	-	-	○	-	-	For changing the angle for 2SQ/SD (±30°) Installation is the responsibility of the customer.
		1S-DH-11J2	○	-	-	-	-	-	-	
	Stopper for changing the J3-axis operating range	1S-DH-05J2	-	-	-	-	○	-	-	For changing the angle for 2SQ/SD (+70°) Installation is the responsibility of the customer.
		1S-DH-11J3	○	-	-	-	-	-	-	
	Machine cable (replacement for shorter 2-m type) (Note 1)	1S-02UCBL-03	-	○	-	-	-	○	-	2 m (A 2-m cable is supplied instead of the standard 5-m one) [Special specifications]
		1S-02CBL-1	-	-	○	-	-	-	-	
		1S-02UCBL-01	-	-	-	-	○	-	○	
	Machine cable, for extension/fixed	1S-□□CBL-01	-	-	○	○	○	-	○	Extension type, extended length: 5 m, 10 m, 15 m □ indicates the length of the cable (5 m, 10 m, or 15 m) Replacement type for 2SQ/2SD: 10 m, 15 m
		1S-□□CBL-03	-	○	-	-	-	○	-	
		1S-□□CBL-11	○	-	-	-	-	-	-	
		1S-□□LCBL-01	-	-	○	○	○	-	○	
	Machine cable, for extension/flexible	1S-□□LCBL-03	-	○	-	-	-	○	-	
		1S-□□LCBL-11	○	-	-	-	-	-	-	

Note 1) This is a special specification for shipping. Inquire for delivery and prices.

Classification	Name	Type	SQ	SD	Functional specifications
Controller	Standard teaching pendant (7m, 15m)	R32TB-**	○	○	7 m: Standard, 15 m: Custom ("15" is included in the model name)
	High-function teaching pendant (7 m, 15 m)	R56TB-**	○	○	7 m: Standard, 15 m: Custom ("15" is included in the model name)
	Air hand interface (Sink type) (Source type)	2A-RZ365 2A-RZ375	○	○	8 output points, used exclusively for hand 24 VDC, 0.1 A/point
	On-board Parallel I/O interface (Sink type) (Source type)	2D-TZ368 2D-TZ378	-	○	32 output points (12/24 VDC: 0.1 A/point) 32 input points (12 VDC: 3 mA, 24VDC: 7 mA)
	On-board Parallel I/O cable (5m, 15m)	2D-CBL**	-	○	CBL05: 5 m, CBL15: 15 m, not terminated at one end. For 2D-TZ368/378.
	Remote Parallel I/O (Sink type) (Source type)	2A-RZ361 2A-RZ371	○	○	32 output points (12/24 VDC: 0.1 A/point) 32 input points (12 VDC: 3 mA, 24VDC: 7 mA)
	Remote Parallel I/O cable (5m, 15m)	2A-CBL**	-	○	CBL05: 5 m, CBL15: 15 m, not terminated at one end. For 2A-RZ361/371.
	CC-Link interface	2D-TZ576	-	○	CC-Link Intelligent device station, Ver. 2.0, 1 to 4 stations
	Key switch extension cable	2D-KEY-CBL**M	○	-	Key switch that can be connected to the key switch interface. (For CR1QA-772) ** indicates the cable length, where 05 = 5 m, 10 = 10 m, and 15 = 15 m.
	TB extension cable	2D-EXTB-CBL**M	○	○	Extension cable for connecting to the teaching pendant. ** indicates the cable length, where 05 = 5 m, 10 = 10 m, and 15 = 15 m.
	Expansion memory	2D-TZ454	-	○	User program area with expansion memory: 2 MB (For SD series only)
	Controller protection box *1	CR1D-MB	○	○	With a built-in CR1QA-7XX/CR1DA-7XX for improved dust-proofing.
	Personal computer support software	RT ToolBox2	○	○	With simulation function (CD-ROM)
	Personal computer support software -mini	RT ToolBox2 mini	○	○	Simple version (CD-ROM)
	Personal computer cable	2D-232CBL03M	-	○	RS-232 cable for PC-AT compatible machine, 3 m
Service part	Backup battery	MELFA-Works	○	○	Layout study/Takt time study/Program debug. Add-in software for Solidworks® *2
		A6BAT Q6BAT	○	○	Installed in the robot arm (Quantity: Differs by model type) Installed in the controller (Quantity: 1 pc.)

*1: This only applies to CR1QA-7xx/CR1DA-7xx. Please ask a sales representative for details at the time of purchase. *2: SolidWorks® is a registered trademark of SolidWorks Corporation (USA).

Support Software

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 tact time, debugging during robot startup, monitoring robot operation after startup, and trouble shooting.

Windows®-compatible

- Easy operation on Windows®.
- Compatible with Windows®2000, Windows®XP, and Windows®Vista.

Support for all processes, from programming and startup to maintenance

- Programming can be completed using the MELFA-BASIC IV/V and Movemaster languages (vary depending on the model).
- Robot movement and operating status, input signals, and servo status can be monitored.

Enhanced simulation functions

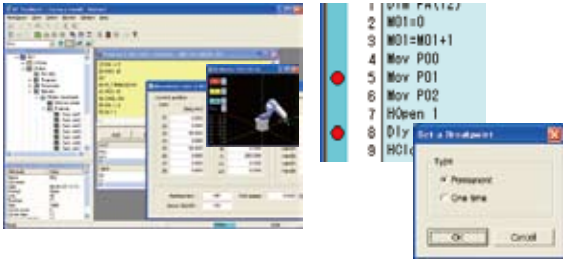
- This function is compatible with all models that connect to CRn-500 series and CRn-700 controllers.
- Robots can be operated and tact time calculated using a personal computer. (Not available for the mini version.)
- Robot movements, operating status, input signals, and servo status can be monitored.

Advanced maintenance functions

- The software has a maintenance function that notifies the operators greasing periods, battery life cycles as well as position recovery support function when trouble occurs, etc. and is effective for preventative maintenance, shortening of recovery time.

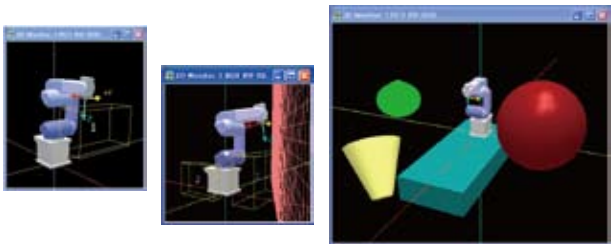
Program editing and debugging functions

Creation of programs in MELFA-BASIC IV and V and the Movemaster languages. *1 Improvement of work operations by a multi-window format and the various editing functions. This is helpful for use in checking operations such as the execution of program steps, setting of breakpoint settings, and other tasks.



3D viewer

Graphical representation of a work along with the dimensions, color and other specified details of the work area to be gripped.



*1: MELFA-BASIC is a programming language that further expands upon and develops the commands needed for robot control. In MELFA-BASIC IV/V, the expansion of the command as well as parallel processing or structuring that were difficult to realize in BASIC language can make it possible to operate MELFA easily.

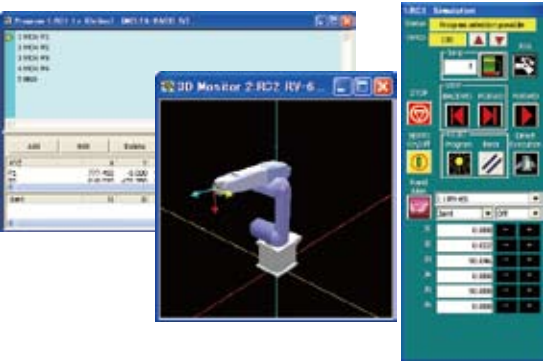
Example of a Pick & Place program

Mov Psafe
Mov Pget,-50
Mvs Pget
Dly 0.2
Hclose 1
Dly 0.2
Mvs Pget,-50
Wait M_In (12) =1
Mov Pput,-80
Mvs Pput
Dly 0.2
Hopen 1
.....

Classification	Main functions
Operation-related	Joint, linear, and circular interpolation, optimal acceleration/deceleration control, compliance control, collision detection, and singular point passage
Input/output	Bit/byte/word signals, interrupt control
Numerical operations	Numerical operations, pose (position), character strings, logic operations
Additional functions	Multi-tasking, tracking, and vision sensor functions

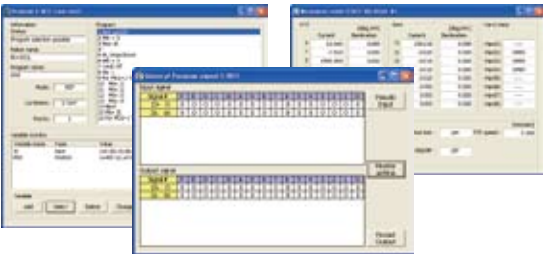
Simulation functions

Check the robot movements and measurement the tact time for designated parts of a program can be realized with running the program.



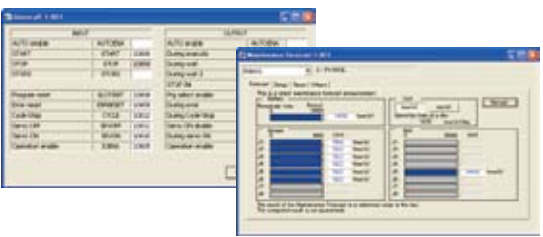
Monitor functions

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



Maintenance functions

This function is for maintenance and includes maintenance forecast and position recovery support functions, a parameter management function, etc.



MELFA-Works

A 3D robot simulator offering powerful support for system design and preliminary layout.

MELFA-Works is an add-in tool that runs under solid-works, used for simulating production systems using robots on personal computers, converting processing paths defined for workpieces to data and outputting this data.

What is MELFA-Works?

MELFA-Works is an add-in tool (*1) for 3D CAD SolidWorks® (*2) software (hereinafter, SolidWorks®). Adding MELFA-Works into the SolidWorks® platform adds to and expands on the robot simulation functions.

*1) An add-in tool is a software program that adds certain functions to application software packages.
*2) SolidWorks® is a registered trademark of SolidWorks Corp. (USA).

Features

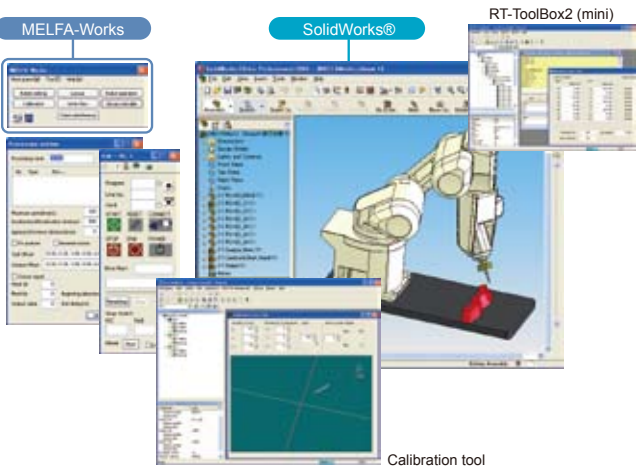
Automatic robot program creation function

The teaching position data and robot operation programs necessary for operating robots can be generated automatically by simple loading of 3D CAD data (*3) for the applicable works into SolidWorks® and then setting of processing conditions and areas using MELFA-Works.

*3) Formats that can be loaded into SolidWorks®

- IGES
 - STEP
 - ParasolidR
 - SAT (ACISR)
 - Pro/ENGINEERR
 - CGR (CATIARgraphics)
 - Unigraphics
 - PAR (Solid Edge TM)
 - IPT (Autodesk Inventor)
 - DWG
 - DXFTM
 - STL
 - VRML
 - VDA-FS
 - Mechanical Desktop
 - CADKEYR
 - Viewpoint
 - RealityWave
 - HOOPS
 - HCG (Highly compressed graphics)
- Note) Check the SolidWorks website and other published documents for the latest specifications.

Example Screens for MELFA-Works



List of functions

Loading of part data from peripheral devices and rearrangement	Display of the robot movement path
Part data created in Solidworks® can be loaded. The ositions of loaded parts can be rearranged relative to the CAD origin and otherparts. Part positions can also be changed via numerical input.	Robot movement path can be displayed in space as trace lines.
Installation of hands	Interference checks
Hands designed/created in SolidWorks® can be installed on robots. An ATC (Auto Tool Changer) can also be specified for each hand.	Interference between the robot and peripheral devices can be checked. A target of interference check can be specified simply by clicking it on the screen. Information explaining the condition of interference that occurred (such as the contacted part, program line that was being executed when the interference occurred, and corresponding robot position) can be saved to a log.
Handling of work	Saving of video data
Simulations of hand signal control can be created using a robot program to handle workpieces.	Simulated momements can be saved to video files (AVI format).
CAD link	Measurement of cycle times
Operation data needed to perform sealing and other operations requiring many teaching steps are easily created. All you need is to select the target area to be processed from 3D CAD data. Since operation data is created from 3D CAD source data, complex three-dimensional curves can be recreated with ease. This leads to significant reduction in teaching time.	The cycle time of robot movement can be measured using an easy-to-use function resembling a stopwatch. It realizes the measurement the cycle time of a specified part in a program.
Offline teaching	Robot program debugging functions
The robot posture can be set up on the screen in advance.	The following functions are provided to help you debug robot programs. <ul style="list-style-type: none">• Step operation : A specified program can be executed step by step.• Breakpoint : Breakpoints can be set in a specified program.• Direct execution : Desired robot commands can be executed.
Creation of robot programs (template)	Jog function
Workflow processes can be created using a combination of the offline teaching and CAD link functions and then converted into robot programs. (MELFA-BASIC IV, V format)	The robot shown in SolidWorks® can be jogged just like you normally jog a robot using a teaching pendant.
Assignment of robot programs	Traveling axis
Programs used with actual robots can be used as is. A different robot program can also be specified for each task slot.	A traveling axis can be installed to a robot to verify the operation of the system equipped with this.
Simulation of robot operations	Calibration
Robot programs, including I/O signals, can be simulated.This means that movements of the actual system can be recreated directly and accurately. The following two methods are provided to simulate I/O signals of your robot controller. <ul style="list-style-type: none">(1) Create simple definitions of operations associated with I/O signals.(2) Link I/O signals with GX Simulator.	Point sequence data of CAD coordinates created by the CAD link function can be corrected to robot coordinate data. Operation programs and point sequence data can also be transferred to robots. To provide greater convenience for operators who perform calibration frequently on site, the calibration tool is provided as an application independent of MELFA-Works. Accordingly, the calibration tool can be operated effectively on a notebook computer in which SolidWorks® software is not installed