

# F Series Robots

## Vertically Articulated (RV)



Model Number	RV2F	RV2FL	RV4F	RV4FL	RV7F	RV7FL	RV7FLL	RV13F	RV13FL	RV20F	RV35F	RV50F	RV70F	
Maximum Load Capacity (kg)	2	2	4	4	7	7	7	13	13	20	35	50	70	
Maximum Reach Radius (mm)	504	649	515	649	713	908	1,503	1,094	1,388	1,094	2050			
Environmental Specifications	Standard	IP30		IP40									(J1 to J4:IP40, J5 to J6:IP67)	
	Oil Mist	-		IP67										
	Cleanroom	-		ISO class3										
	Chemical Resistant	-		IP65 Resistant to hydrogen peroxide gas/water (120ppm/concentration 6%) H1 Grease, Stainless steel used for flange and exterior bolts, hex head bolts, chemical resistant bellows, seals and exterior coating.										
	Food Grade	-		IP65 NSF H1 Certified Grease, stainless steel used for flange.										
Controller	CR751-D/Q; CR750-D/Q; CR750-MB IP54 controller protection box available										CR760-D/Q			

## Horizontally Articulated SCARA (RH)



Model Number	RH1FHR	RH3FHR	RH3FH35	RH3FH45	RH3FH55	RH3CH40	RH6CH60	RH6CH70
Maximum Load Capacity (kg)	1	3	3	3	3	3/5 (*2)	6	6
Maximum Reach Radius (mm)	550	350	350	450	550	400	600	700
Environmental Specifications	Standard	IP20/IP67 (*1)		IP20				
	Oil Mist	-		IP65		-		
	Cleanroom	-		ISOclass5		ISOclass3		-
	Chemical Resistant	-		-		-		
	Food Grade	-		-		-		
Controller	CR751-D/Q; CR750-D/Q; CR750-MB IP54 controller protection box available					CR751-D		

**Notes:**

1. With optional bellows
2. S52 model required for 5kg payload



Model Number	RH6FH35	RH6FH45	RH6FH55	RH12FH55	RH12FH70	RH12FH85	RH20FH85	RH20FH100
Maximum Load Capacity (kg)	6	6	6	12	12	12	20	20
Maximum Reach Radius (mm)	350	450	550	550	700	850	850	1000
Environmental Specifications	Standard	IP20						
	Oil Mist	IP65						
	Cleanroom	ISOclass3						
	Chemical Resistant	IP65 Resistant to hydrogen peroxide gas/water (120ppm/concentration 6%). H1 Grease, Stainless steel used for flange and exterior bolts, hex head bolts, chemical resistant bellows, seals and exterior coating.						
	Food Grade	IP65 NSF H1 Certified Grease, stainless steel used for flange.						
Controller	CR751-D/Q; CR750-D/Q; CR750-MB IP54 controller protection box available							

## Internal Wiring Options (RVF Series)

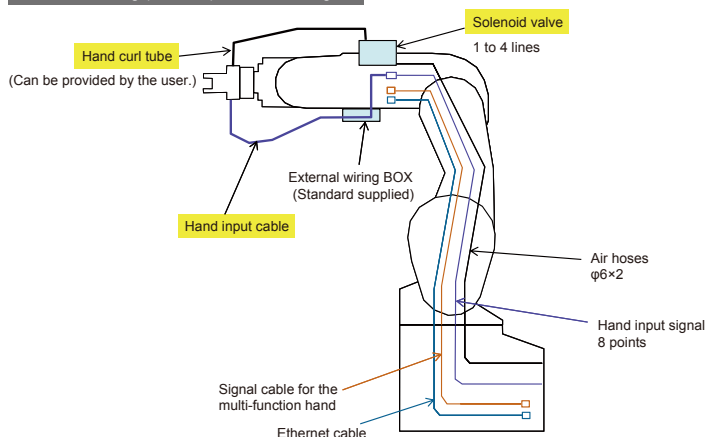
### RV4F/RV7F/RV13F/RV20F Series Tooling Device Configuration

Hand Configuration	Wiring Format	Robot Specifications	Required Device		Remarks
			External Wiring Set for the Forearm	External Wiring Set for the Base	
Air-Hand + Hand Input Signal	Interior equipment	SHxx01	- (*1)	-	Air hoses: Up to 2 systems (4 mm diameter x 4 mm); 8 input signals
	Exterior equipment	Standard	- (*2)	-	Air hoses: Up to 4 systems (4 mm diameter x 8 mm) are possible
Hand Input Signal + Ethernet + Force Sensor OR Electric Hand (*3, *4)	Interior equipment	-SHxx02	- (*1)	1F-HA01S-01 (Included)	
	Exterior equipment	Standard	1F-HB01S-01 (*2)	1F-HA01S-01	Air hoses: Up to 4 systems (4 mm diameter x 8 mm) are possible
Electric Hand + Ethernet + Force Sensor	Interior equipment	-SHxx03	- (*1)	1F-HA02S-01 (Included)	
	Exterior equipment	Standard	1F-HB02S-01	1F-HA02S-01	
Air-Hand + Hand Input Signal + Force Sensor	Interior equipment	-SHxx04	- (*1)	1F-HA01S-01 (Included)	Air hoses: Up to 1 system (4 mm diameter x 2 mm); 8 input signals
	Exterior equipment	Standard	1F-HB01S-01 (*2)	1F-HA01S-01	Air hoses: Up to 4 systems (4 mm diameter x 8 mm) are possible
Air-Hand + Hand Input Signal + Ethernet	Interior equipment	-SHxx05	- (*1)	1F-HA01S-01 (Included)	Air hoses: Up to 1 system (4 mm diameter x 2 mm); 8 input signals
	Exterior equipment	Standard	1F-HB01S-01 (*2)	1F-HA01S-01	Air hoses: Up to 4 systems (4 mm diameter x 8 mm) are possible

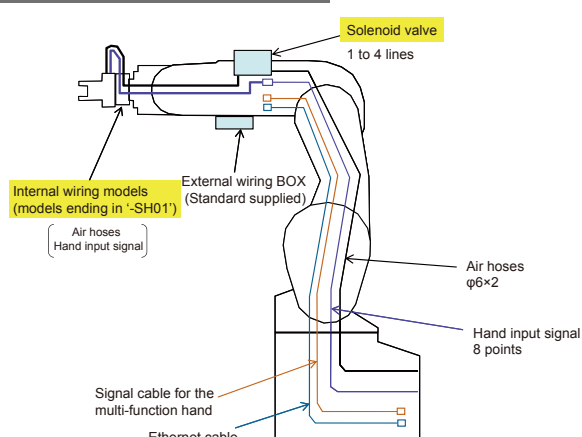
**Notes:**

1. For internal routing. (Pneumatics sold separately)
2. For external routing. (Hoses, input cables and solenoid valves sold separately)
3. For SHxx02 configuration, the Air hand and Electric hand cannot be used simultaneously.
4. For SHxx02 configuration, the Force sensor and Electric hand cannot be used simultaneously.

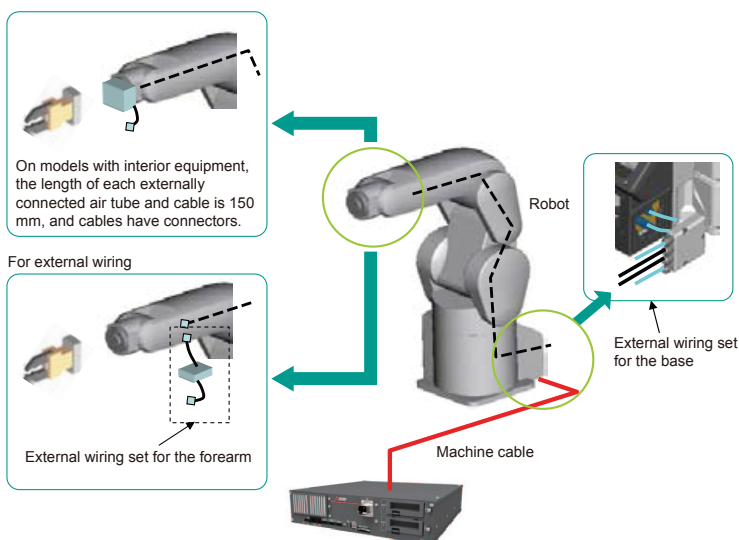
RV series tooling (air-hand): External wiring



RV series tooling (air-hand): Internal wiring



For models with internal wiring and hoses



# RVF Series

## Part Number Configuration



Must select items 1–5.

### 1 Max Load Capacity

Symbol	Maximum Load Capacity
2	2kg
4	4kg
7	7kg
13	13kg
20	20kg
35	35kg
50	50kg
70	70kg

### 2 Arm Length

Symbol	Arm Length/Option
Blank	Standard specifications
L	Long arm: Applies to RV2, RV4, RV7, RV13
LL	Extended long arm: RV7 only
B	Brakes on all axes for RV2 only (Standard for all other models)

### 3 Environment

Symbol	Environment Protection
Blank	Standard specification (No J2 cover for RV35, RV50 and RV70)
M	Oil mist specification (Excludes RV2. Must use for SE01/02 specification)
C	Cleanroom specification (Excludes RV2, RV35, RV50, RV70)

### 4 Controller

Symbol	Controller Type
D	CR760-D (For Non-CE) For RV35 RV50 and RV70 only
Q	CR760-Q (For Non-CE) For RV35 RV50 and RV70 only
D1	CR750-D (For CE)
Q1	CR750-Q (For CE)
1D1	CR751-D (For CE)
1Q1	CR751-Q (For CE)
1D	CR751-D (For Non-CE)
1Q	CR751-Q (For Non-CE)

Select from only one table below:  
 5 Compliance Specification, Internal Wiring Specification, or Special Environmental Protection

S1 _	Compliance Specification
5	CE specification for CR750 and CR751 controllers
1	Non-CE specification for CR751 and CR760 controllers

OR

SH1 _ _ _ _	RV Tooling Config (*1)	Internal Wiring Specification (Optional, Excludes RV2, RV35, RV50, RV70)
1 _ _	01, 02, 03, 04, or 05	for non-CE
5 _ _	01, 02, 03, 04, or 05	for CE

Note 1: See RV Tooling Device Configurations table for definitions

OR

X5 _	Special Environmental Protection for CE only (Optional, Excludes RV2, RV35, RV50, RV70)
1	Chemical specification
2	Food grade grease for NSF H1 specification

Note: Oil mist specification required.

## RV2F • RV2FL

Model Number	RV2F(B)	RV2FL(B)
Environmental Specifications	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 (RV-2F/2FL: J2, J3, J5 axes have the brake) (RV-2FB/2FLB: All axes have the brake)	
Position Detection Method	Absolute encoder	
Maximum Load Capacity (Rating) kg	2	
Arm Length (mm)	230 + 270	310 + 335
Maximum Reach Radius (mm)	504	649
Operating Range (deg)	J1	480 (±240)
	J2	240 (±120)
	J3	160 (-0 to +160)
	J4	400 (±200)
	J5	240 (±120)
	J6	720 (±360)
Maximum Speed (deg/sec)	J1	300
	J2	150
	J3	300
	J4	450
	J5	450
	J6	720
Maximum Composite Speed (mm/sec) (*3)	4950	4,206
Cycle Time (sec) (*4)	0.6	
Position Repeatability (mm)	±0.02	
Ambient Temperature (°C)	0 to 40	
Weight (kg)	19	21
Tolerable Moment (Nm)	J4	4.17
	J5	4.17
	J6	2.45
Tolerable Amount of Inertia (kgm <sup>2</sup> )	J4	0.18
	J5	0.18
	J6	0.04
Tool Wiring	Hand: 4 input points/4 output points; Signal cable for the multi-function hand	
Tool Pneumatic Pipes	ø4 x 4 (Base to forearm section)	
Machine Cable	5m (connector on both ends)	
Connected Controller	CR751-D/Q; CR750-D/Q; CR750-MB IP54 controller protection box available	

Notes:

- The standard model does not have a brake on the J1, J4, or J6 axis. There are models available with brakes included for all axes. (RV2FB)
- The wall-mounted specification is a custom specification where the operating range of the J1-axis is limited.
- This is the value at the surface of the mechanical interface when all axes are composited.
- 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.

RV4F • RV4FL

Model Number		RV4FM/C	RV4FLM/C
Environmental Specifications		Standard / Oil Mist / Cleanroom	
Protection Degree		IP40 (standard) / IP67 (oil mist) (*1) / ISOclass3 (*6)	
Installation		Floor type, ceiling type, (wall-mounted type) (*2)	
Structure		Vertical, multiple-joint type	
Degrees of Freedom		6	
Drive System (*1)		AC servo motor	
Position Detection Method		Absolute encoder	
Maximum Load Capacity (Rating) kg		4	
Arm Length (mm)		240 + 270	245 + 300
Maximum Reach Radius (mm)		515	649
Operating Range (deg)	J1	480 (±240)	
	J2	240 (±120)	
	J3	161 (-0 to +161)	164 (-0 to +164)
	J4	400 (±200)	
	J5	240 (±120)	
	J6	720 (±360)	
Maximum Speed (deg/sec)	J1	450	420
	J2	450	336
	J3	300	250
	J4	540	540
	J5	623	623
	J6	720	720
Maximum Composite Speed (mm/sec) (*3)		9027	9048
Cycle Time (sec) (*4)		0.36	0.36
Position Repeatability (mm)		±0.02	
Ambient Temperature (°C)		0 to 40	
Weight (kg)		39	41
Tolerable Moment (Nm)	J4	6.66	
	J5	6.66	
	J6	3.96	
Tolerable Amount of Inertia (kgm <sup>2</sup> )	J4	0.2	
	J5	0.2	
	J6	0.1	
Tool Wiring		Hand: 8 input points/8 output points; Signal cable for the multi-function hand and sensors; LAN X 1 <100 BASE-TX> (8-pin) (*5)	
Tool Pneumatic Pipes		Primary: Ø6 x 2; Secondary: Ø4 x 8, Ø4 x 4 (from base portion to forearm)	
Machine Cable		5m (connector on both ends)	
Connected Controller		CR751-D/Q; CR750-D/Q; CR750-MB IP54 controller protection box available	

Notes:

1. Please contact Mitsubishi Electric dealer since the environmental resistance may not be secured depending on the characteristics of oil you use. Air will need to be purged from the lines. For details, refer to the specifications sheet.
2. The wall-mounted specification is a custom specification where the operating range of the J1-axis is limited.
3. This is the value at the surface of the mechanical interface when all axes are composited.
4. 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.
5. Can also be used as a spare line (0.2 sq. mm, 4-pair cable) for conventional models.
6. Preservation of cleanliness levels depends on conditions of a downstream flow of 0.3 m/s in the cleanroom and internal robot suctioning. A Ø8-mm coupler for suctioning is provided at the back of the base.

## RV7F • RV7FL • RV7FLL

Model Number	RV7FM/C	RV7FLM/C	RV7FLLM/C
Environmental Specifications	Standard / Oil Mist / Cleanroom		
Protection Degree	IP40 (standard) / IP67 (oil mist) (*1) / ISO class3 (*6)		
Installation	Floor type, ceiling type, (wall-mounted type) (*2)		
Structure	Vertical, multiple-joint type		
Degrees of Freedom	6		
Drive System (*1)	AC servo motor		
Position Detection Method	Absolute encoder		
Maximum Load Capacity (Rating) kg	7		
Arm Length (NO1 am)	340 + 360	430 + 465	565 + 805
Maximum Reach Radius (mm)	713	908	1503
Operating Range (deg)	J1	480 (±240)	
	J2	240 (-115 to +125)	240 (-110 to +130)
	J3	156 (-0 to +156)	162 (-0 to +162)
	J4	400 (±200)	
	J5	240 (±120)	
	J6	720 (±360)	
Maximum Speed (deg/sec)	J1	360	288
	J2	401	321
	J3	450	360
	J4	337	337
	J5	450	450
	J6	720	720
Maximum Composite Speed (mm/sec) (*3)	11064	10977	15,300
Cycle Time (sec) (*4)	0.32	0.35	0.63
Position Repeatability (mm)	±0.02		
Ambient Temperature (°C)	0 to 40		
Weight (kg)	65	67	130
Tolerable Moment (Nm)	J4	16.2	
	J5	16.2	
	J6	6.86	
Tolerable Amount of Inertia (kgm <sup>2</sup> )	J4	0.45	
	J5	0.45	
	J6	0.10	
Tool Wiring	Hand: 8 input points/8 output points (20 pins total); Serial signal cable for parallel I/O (2-pin + 2-pin power line); LAN X 1 <100 BASE-TX> (8-pin)) (*5)		
Tool Pneumatic Pipes	Primary: Ø6 x 2; Secondary: Ø4 x 8, Ø4 x 4 (from base portion to forearm)		
Machine Cable	5m (connector on both ends)		
Connected Controller	CR751-D/Q; CR750-D/Q; CR750-MB IP54 controller protection box available		

## Notes

- Please contact a Mitsubishi Electric dealer since the environmental resistance may not be secured depending on the characteristics of oil you use. Air will need to be purged from the lines. For details, refer to the specifications sheet.
- The wall-mounted specification is a custom specification where the operating range of the J1-axis is limited.
- This is the value at the surface of the mechanical interface when all axes are composited.
- 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.
- Can also be used as a spare line (0.2 sq. mm, 4-pair cable) for conventional models.
- Preservation of cleanliness levels depends on conditions of a downstream flow of 0.3 m/s in the cleanroom and internal robot suctioning. A Ø8-mm coupler for suctioning is provided at the back of the base.

RV13F • RV13FL • RV20F

Model Number	RV13FM/C	RV13FLM/C	RV20FM/C	
Environment	Standard / Oil Mist / Cleanroom			
Protection Degree	IP40 (standard), IP67 (oil mist) (*1), ISO Class 3 (*2)			
Mounting Position	The floor, the ceiling suspension (hanging wall) (*3)			
Structure	Vertical articulated			
Degree of Freedom	6 axis			
Drive System	AC servo motor			
Position Detection Method	Absolute encoder			
Maximum Payload (Rated) kg	13		20	
Arm Length (mm)	400 + 550	565 + 960	410 + 550	
Maximum Reach Radius (mm)	1,094	1,388	1,094	
Operating Range (deg)	J1	380 (±190)		
	J2	240 (-90 to +150)		
	J3	167.5 (-10 to +157.5)		
	J4	400 (±200)		
	J5	240 (±120)		
	J6	720 (±360)		
Maximum Speed (deg/sec)	J1	290	234	110
	J2	234	164	110
	J3	312	219	110
	J4	375	375	124
	J5	375	375	125
	J6	720	720	360
Synthetic Maximum Speed (mm/sec) (*4)	10,450	9,700	4,200	
Cycle Time (sec) (*5)	0.53	0.68	0.70	
Position Repeatability (mm)	±0.05			
Ambient Temperature (°C)	0 to 40			
Weight (kg)	Approx. 120	Approx. 125	Approx. 120	
Allowable Movement (Nm)	J4	19.3	49.0	
	J5	19.3	49.0	
	J6	11	11	
Allowable Inertia (KGM <sup>2</sup> )	J4	0.47	1.40	
	J5	0.47	1.40	
	J6	0.14	0.14	
Tool Wiring	Hand: 8 input points / 8 output points, multifunction hand dedicated signal line LAN x 1 (100BASE-TX)			
Tool Pneumatic Pipes	Primary: ø6 x 2 Secondary: 8 ø 6 x 4 this ø 4 x (wrist interior at the time)			
Machine Cable	5m (connector on both ends)			
Connection Controller	CR751-D/Q; CR750-D/Q; CR750-MB IP54 controller protection box available			

Notes:

1. Depending on the nature of the oil to be used by the customer, please contact your dealer because there is a case to withstand environment performance can not be ensured.
2. Robot internal suction and low down 0.3m/s of cleanroom condition becomes the protection of cleanliness. I am prepared to back the base joint of Ø8 to suction.
3. Wall specification is a special specification that limits the J1 axis operating range.
4. This is the value on the mechanical interface of the surface when all axes are combined.
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 5kg.

## RV35F • RV50F • RV70F

Model Number	RV35FM	RV50FM	RV70FM	
Environment	Standard / Oil Mist			
Protection Degree	J1 to J4:IP40, J5 to J6:IP67 (standard)/ IP67 (oil mist) (*1)			
Mounting Position	Floor type			
Structure	Vertical, multiple-joint type			
Degree of Freedom	6 axis			
Drive System	AC servo motor			
Position Detection Method	Absolute encoder			
Maximum Payload (Rated) kg	30	50	70	
Arm Length, NO1 arm (mm)	900 + 990			
Maximum Reach Radius (mm)	2050			
Operating Range (deg)	J1	330 (±165)		
	J2	215 (-80 to +135)		
	J3	261 (-90 to +171)		
	J4	720 (±360)		
	J5	250 (±125)		
	J6	900 (±450)		
Maximum Speed (deg/sec)	J1	185	180	175
	J2	180	180	145
	J3	190	180	165
	J4	305	255	235
	J5	305	255	235
	J6	420	370	350
Maximum Composite Speed (mm/sec) (*2)	13450	13000	11500	
Position Repeatability (mm)	±0.07			
Ambient Temperature (°C)	0 to 40			
Weight (kg)	640			
Allowable Movement (Nm)	J4	160	210	300
	J5	160	210	300
	J6	90	130	150
Allowable Inertia (KGM <sup>2</sup> )	J4	16	30	
	J5	16	30	
	J6	5	12	
Tool Wiring	Hand: 16 input points/16 output points LAN X 1			
Tool Pneumatic Pipes	ø10 x 2			
Connection Controller	CR760-D/Q			

## Notes:

1. Please contact a Mitsubishi Electric dealer since the environmental resistance may not be secured depending on the characteristics of oil you use.
2. This is the value at the surface of the mechanical interface when all axes are composited.