

ARIA (Automated Robotic Industrial Assistant)

MITSUBISHI ELECTRIC AUTOMATION ENGINEERED SOLUTIONS





MITSUBISHI ELECTRIC AUTOMATION

Our Solutions Deliver

Mitsubishi Electric Automation's strength comes from the fact that we're a large global company and a single-source provider of game-changing technologies. We design and manufacture every core automation technology and continuously set new standards for:

PERFORMANCE – Constant innovation and iterative improvements deliver industry-leading performance for the most demanding applications.

COMPATIBILITY – We deliver unparalleled forward migration and backward compatibility, so you can upgrade and deploy new products while protecting legacy equipment investments.

QUALITY – Our solutions have fewer out-of-box failures and 10X lower repair rate than other industry leaders.

Let's change the future together.



Our Factory Automation business is focused on "Automating the World" to make it a better, more sustainable environment supporting manufacturing and society, celebrating diversity and contributing towards an active and fulfilling role.

Mitsubishi Electric is involved in many areas including the following:

Energy and Electric Systems

A wide range of power and electrical products from generators to large-scale displays.

Electronic Devices

A wide portfolio of cutting-edge semiconductor devices for systems and products.

Home Appliance

Dependable consumer products like air conditioners and home entertainment systems.

Information and Communication Systems

Commercial and consumer-centric equipment, products and systems.

Industrial Automation Systems

Maximizing productivity and efficiency with cutting-edge automation technology.



The Mitsubishi Electric Group is actively solving social issues, such as decarbonization and labor shortages, by providing production sites with energy-saving equipment and solutions that utilize automation systems, thereby helping towards a sustainable society.



ARIA OVERVIEW

ARIA (Automated Robotic Industrial Assistant) is an ideal and cost-effective solution to address labor shortages and productivity challenges across a multitude of industries. Unique in design, ARIA has a small footprint that enables use in confined spaces. ARIA can be implemented as a stand-alone system or into an existing

automation cell with relative ease. Pre-programmed software packages enable ease of use with little to no robot programming knowledge.

With payload capacities of 13 kg (28.6 lbs.) and reach capabilities of 1503mm (59.173"), ARIA provides unrivaled performance and flexibility.



ARIA Standard Base with HMI, Safety Package, and RV-13 Robot

ARIA Standard Base with HMI and RV-8 Robot

ARIA Machine Tool Base with RV-8 Robot

ARIA BASE & SELECTABLE OPTIONS

ARIA is offered with two different base options. The standard base is designed for various industry applications where flexibility and mobility are a must. ARIA is also available in a machine tending version that is specifically designed for tending of CNC MILL, Lathe and CNC Swiss applications. Whether the application requires the standard base or machine tool base, we have a solution that delivers quick ROI and maximum productivity.



ARIA with Standard Base



ARIA with Machine Tool Base

ARIA Standard Option	Benefit to End-User	ARIA Base Options	
		Standard Base	Machine Tool Tending Base
Mitsubishi Electric FX5 PLC	Enables use and storage of pre-programmed software templates for various applications	X	X
External 120V Outlet	Power source for accessories	X	X
Parts Tray	Raw material/finished part storage	—	X
Casters with Jackscrews	Ease of movement and work positioning	X	X
Air connection with Filter/Regulator and Lubricator	Eliminates additional plumbing and components	X	X
Teach Pendant Bracket	Clean storage of teach pendant reduces the potential for damage	X	X
Network Switch with External Ethernet Port	Network connectivity is clean and simple	X	X
24 VDC Power Supply	Power source for system accessories	X	X
NEMA 1 Rated Enclosure	Protection of electrical components	X	X
Operations Buttons: Start/Stop, Key Switch, E-Stop	Ease of use and safety	X	X
Connections for EOAT (End of Arm Tooling)	Speed and ease of implementation	X	X
Floor Mounting Brackets	Ease of use, safety, system rigidity	X	X
MELFA SAFE PLUS Safety Card CR-800	Enables enhanced safety logic functionality for guarding, area scanners, and safety mats	X	X

ARIA Selectable Option	Benefit to End-User	ARIA Base Options	
		Standard Base	Machine Tool Tending Base
12.1" Color, Hi-resolution HMI	Enables easy access to factory stored programs and programming capability from the HMI	X	—
(2) Area Safety Scanners	Safety integration without hard guarding	X	X
Pneumatic Valving	Enables actuation of pneumatic gripper systems	X	X
Various System Communication Interface Options	Flexible system connectivity and communication	X	X

IDEAL MARKETS AND APPLICATIONS

Metal Working: Metal processing

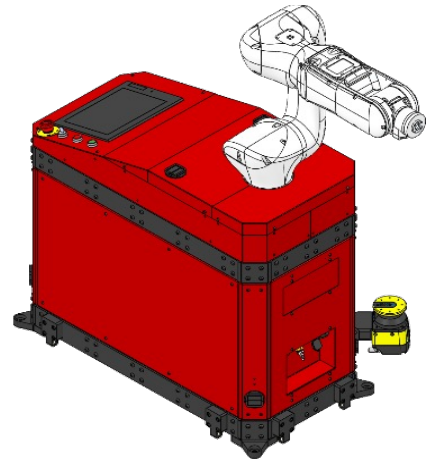
Machine Tending: Mill (horizontal & vertical), lathe, brake press

Food & Beverage: Primary packing, secondary packing, end-of-line packing

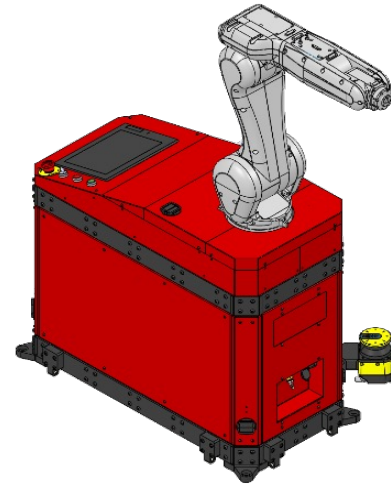
Manufacturing / Industrial: Assembly/sub-assembly, press tending automation, pick & place/parts transfer, screw driving, dispensing/sealer application

ARIA ROBOT OPTIONS

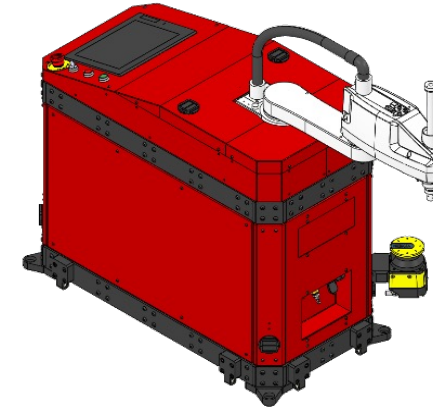
Standard Base and Robot Options



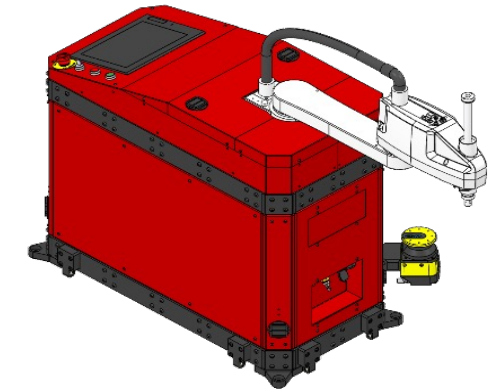
Collaborative



Vertical/Articulated

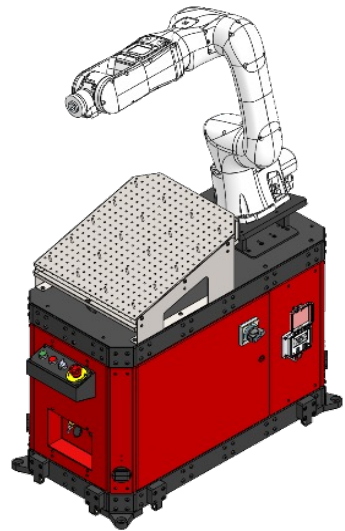


SCARA – Standard Reach



SCARA – Long Reach

Machine Tool Base and Robot Options



RV-5AS-D

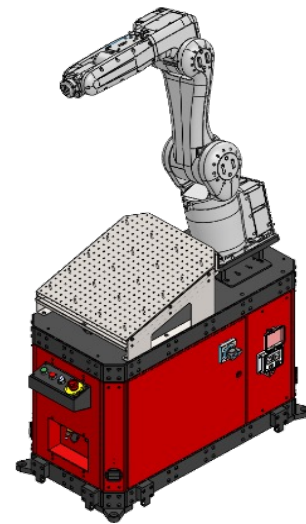
6 axis

Payload Capacity: 5kg

Reach: 910mm

Robot IP Rating: IP54

Option for Food-Grade



RV-7FR, RV-8CRL, RV-12CRLD, RV-13FRLMD

6 axis

Payload Capacity

RV-7FR: 7kg

RV-8-CRL: 8kg

RV-12: 12kg

RV-13FRLMD: 13kg

Reach

RV-7FR: 713, 908, 1503mm

RV-8CRL: 935mm

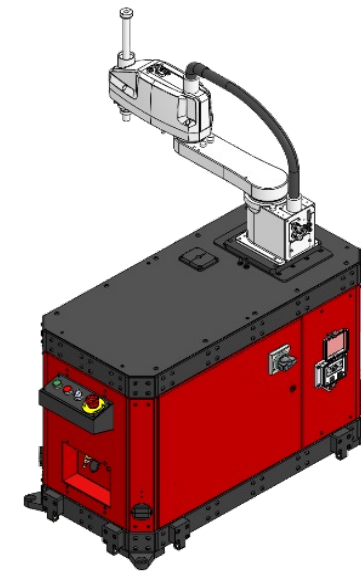
RV-12CRL: 1504mm

RV-13FRLMD: 1388mm

Robot IP Rating

IP40 (FR Series)

IP65 (CR Series)



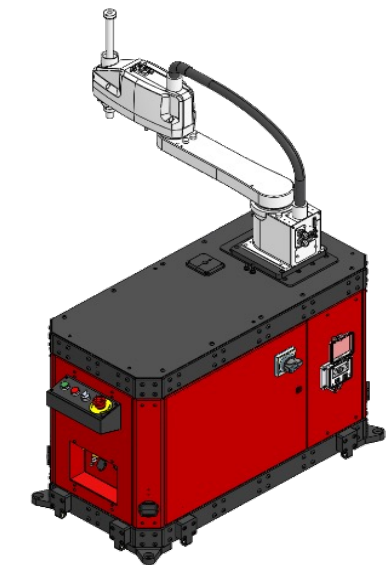
RH-6CRH6020-DS15

4 axis

Payload Capacity: 6kg

Reach: 600mm

Robot IP Rating: IP20



RH-6CRH7020-DS15

4 axis

Payload Capacity: 6kg

Reach: 700mm

Robot IP Rating: IP20

HOW TO ORDER

Part Number Configuration

AR 1 2 3 4 5 6 7

1 Stand Type

Symbol	Description
1	Standard Base – Flat Surface Robot Mounting
2	Machine Tool Base ¹

¹ Machine Tool Base robot mounting is angled for:

- RV-5AS, RV-7FRD
- RV-7FRLMDL
- RV-8CRLD

All other robot models listed utilize flat surface mounting.

2 Safety Package

Symbol	Description
L	Laser Area Scanner
M	No Laser Scanner

3 Robot

Symbol	Robot Selection
5A	RV-5AS-D (ASSISTA Cobot)
6	RH-6CRH6020-DS15 (SCARA)
6L	RH-6CRH7020-S15 (SCARA)
7	RV-7FRD
7L	RV-7FRLMD
7LL	RV-7FRLLD
8	RV-8CRLD-S15
12	RV-12CRLD-S15
13L	RV-13FRLMD

4 Valve Pack

Symbol	Description
V	Pneumatic Valve Pack
X	No Valve Pack

6 System Interface

Symbol	Description
X	Discreet I/O – Supports Direct Robot Control and CC-Link IE Field Basic
EIP	Ethernet IP – Direct Ethernet Port to Robot Controller with Ethernet IP Card
PRO	Profibus
ASL	Anywire ASLINK

5 HMI/GOT Display

Symbol	Description
X	No HMI (Standard when Selection Machine Tool Tending Base)
H	12.1" Standard Resolution HMI GT25 Handy HMI (Machine Tool Base)

7 Robot Mounting

Symbol	Description
-L	Left Mounting
-R	Right Mounting

NOTE:

See pages 28 and 29 for definitions regarding robot mounting.

SAFETY NOTES:

Prior to operation, ARIA must be removed from wheels / jack screws and must be bolted to the floor with anchor bolts. Larger robot sizes (RV-7FRLLD, RV-12CRLD, and RV-13FRLMD) supplied with out rigger supports to stabilize unit when relocating over large distances.

ARIA Accessories

Please reference the following table for accessories used to raise and move ARIA units safely. All accessories listed can be ordered separately from the robot cell.

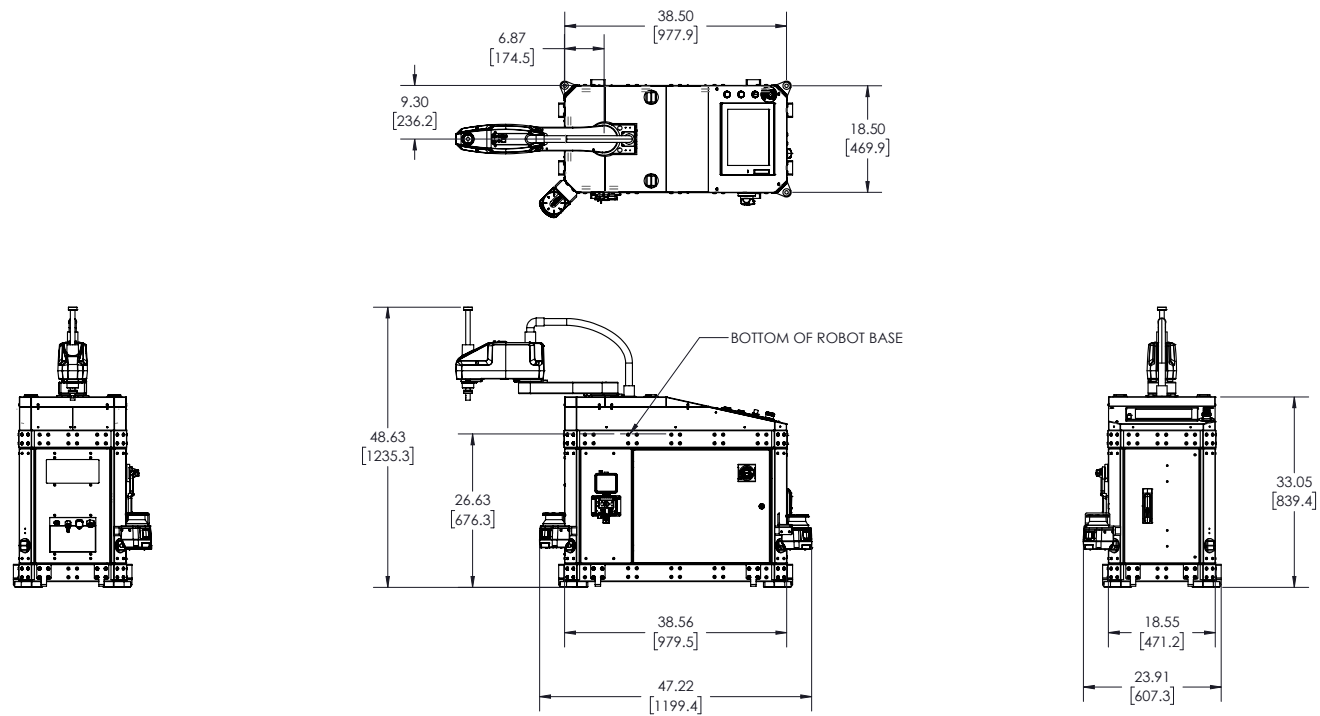
ARIA Accessory Model Number	Accessory Description
ARIA-ACC-CT	(4) Caster assemblies with quick disconnect mechanism for ease of movement
ARIA-ACC-OR	(2) Outriggers for large robots on casters for safe movement
ARIA-ACC-JK	(1) ARIA jack assembly for raising base. Used for lifting base to install casters
ARIA-ACC-MP	(1) ARIA jack assembly + (4) casters. Designed for ARIA units using 5A, 6, 6L, 7, 7L and RV-8 robots
ARIA-ACC-MPL	(1) ARIA jack assembly + (4) Casters and (2) outriggers. Designed for ARIA units using RV-7FRLLD, RV-12 and RV-13 robots
ARIA-ACC-56B	Teach pendant bracket for R56TB
ARIA-ACC-86B	Teach pendant bracket for R86TB
ARIA-ACC-PT	ARIA raw material and finished parts tray. Machine Tool base option only

Please refer to the [accessory section of the catalog](#) for details associated with all accessories offered with ARIA.

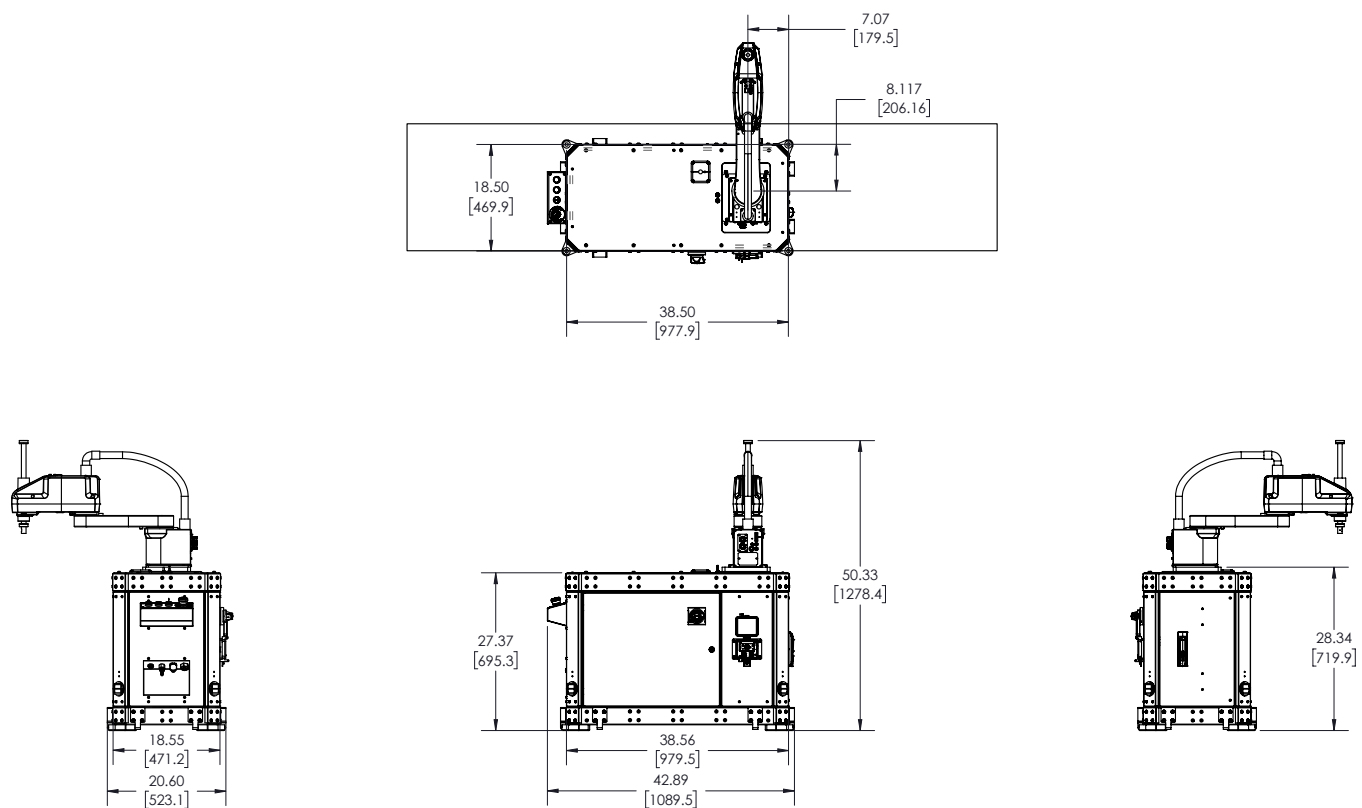
RH-6CRH6020-DS15 SCARA ROBOT WITH STANDARD BASE

All dimensions, limits, and views are representations only.

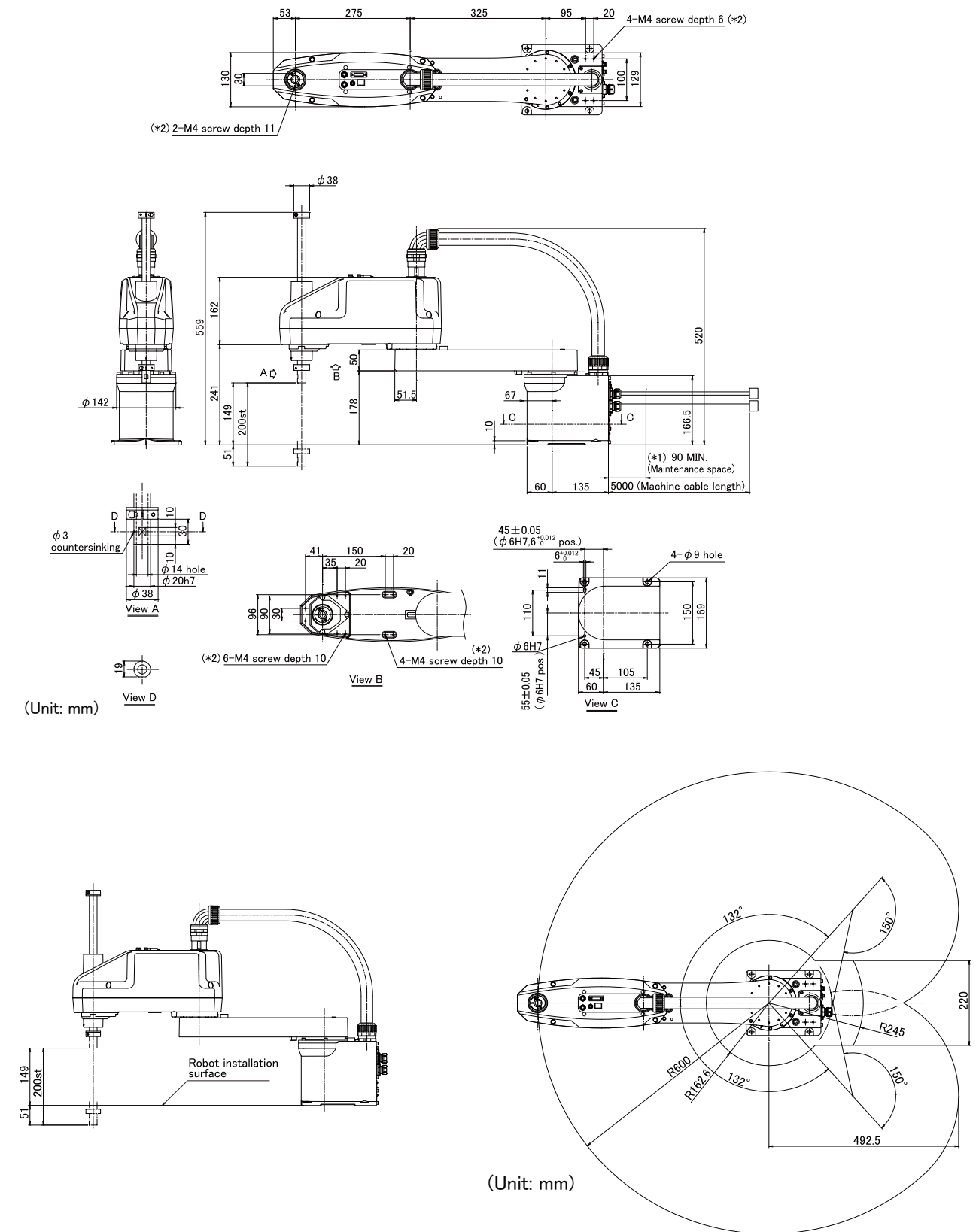
Validate critical dimensions and limits in latest robot specification and with Mitsubishi Electric Engineering prior to order.



RH-6CRH6020-DS15 SCARA ROBOT WITH MACHINE TOOL BASE



OPERATING RANGE DIAGRAM OF RH-6CRH6020



(Unit: mm)

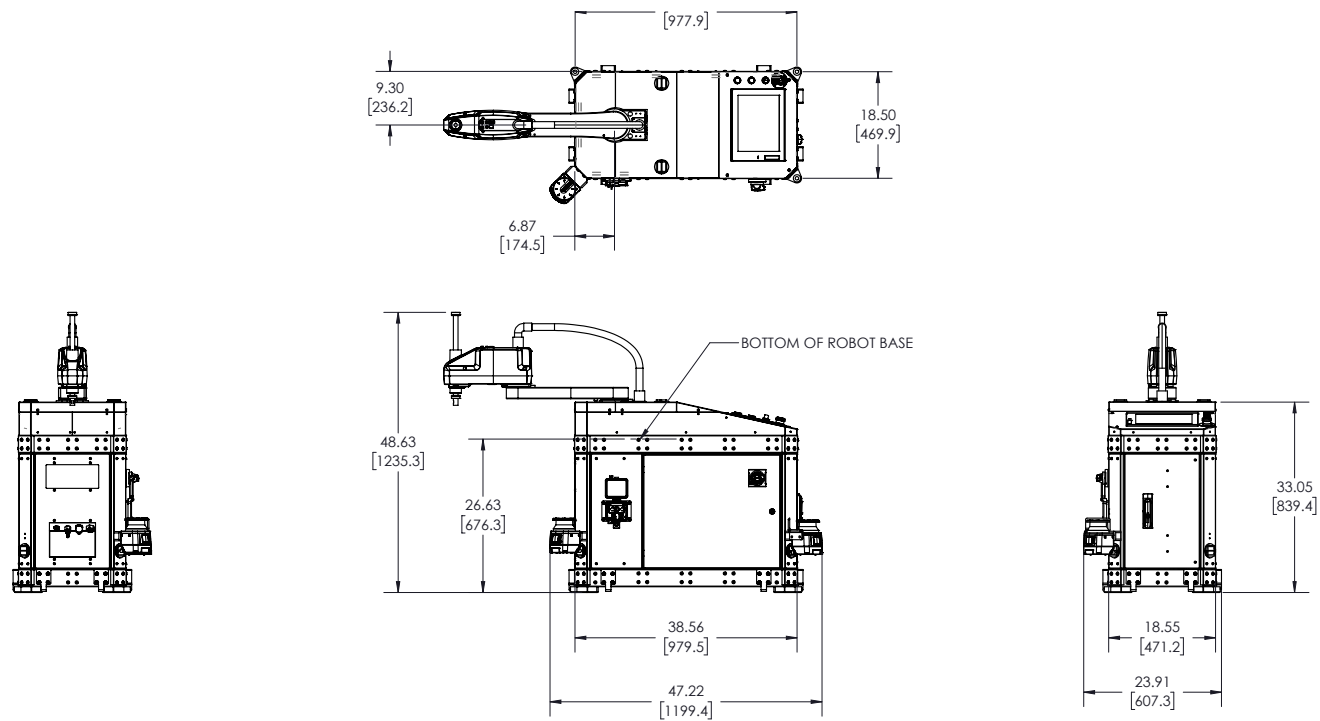
(Unit: mm)

1. The space is required for battery replacement. The distance to the minimum bending radius of the machine cable is specified.
2. The screw hole for fixing wiring and piping installed by the user.

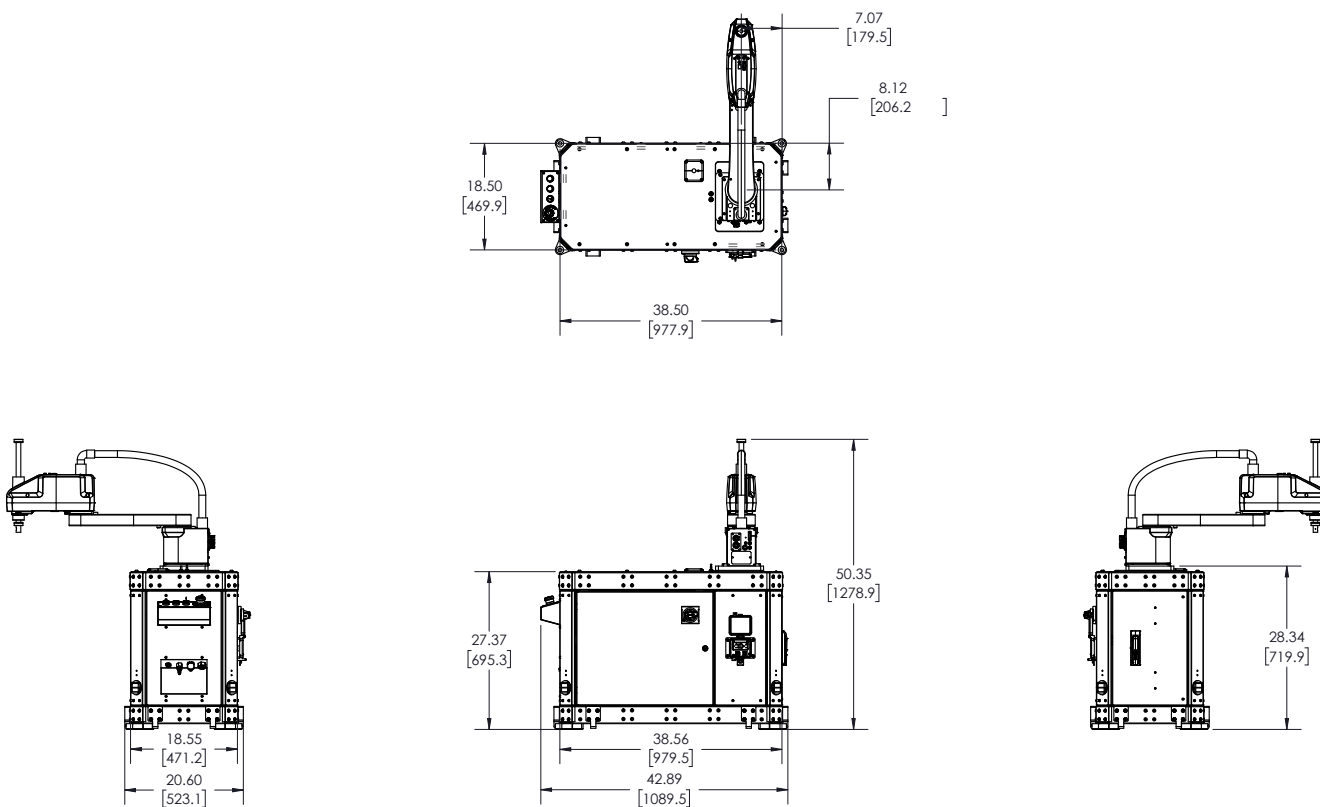
RH-6CRH7020-DS15 SCARA ROBOT WITH STANDARD BASE

All dimensions, limits, and views are representations only.

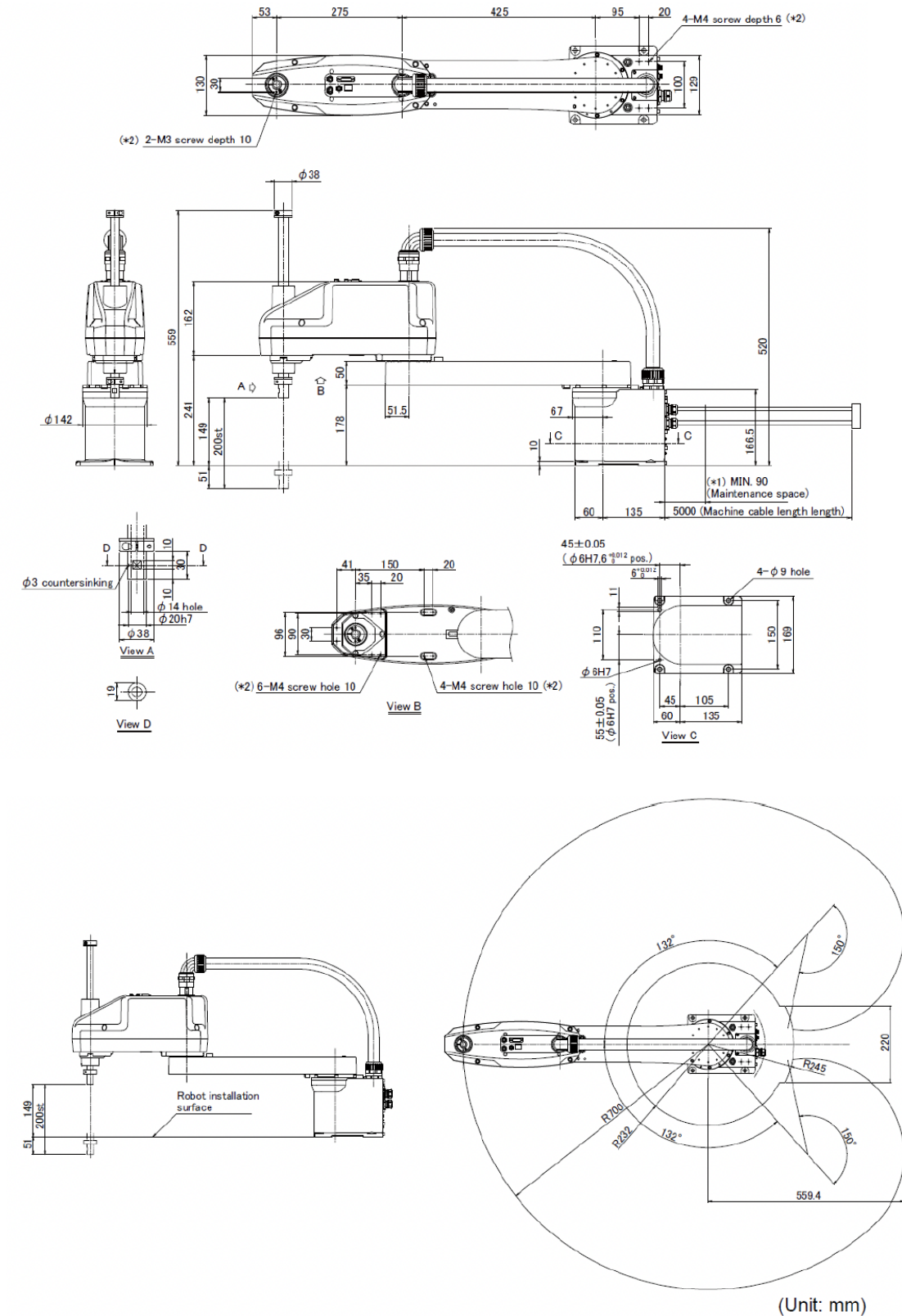
Validate critical dimensions and limits in latest robot specification and with Mitsubishi Electric Engineering prior to order.



RH-6CRH7020-DS15 SCARA ROBOT WITH MACHINE TOOL BASE



OPERATING RANGE DIAGRAM OF RH-6CRH7020

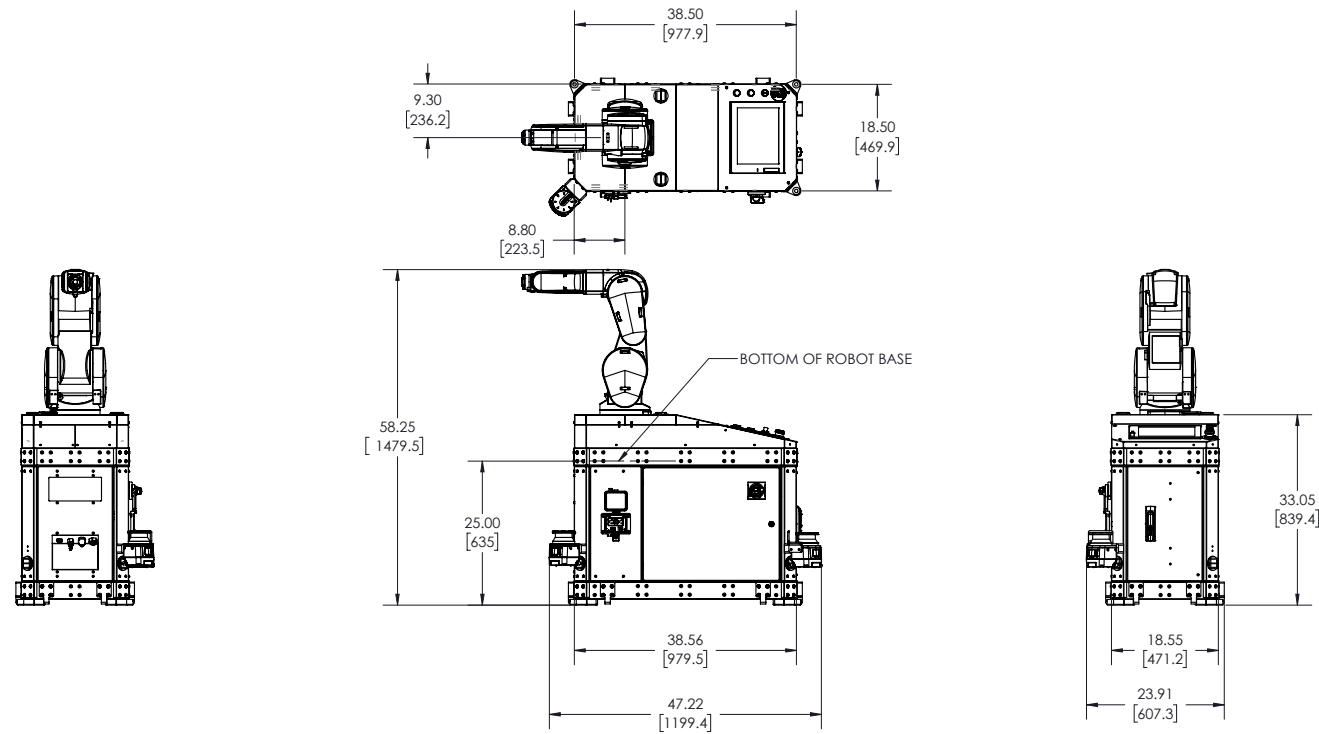


1. The space is required for battery replacement. The distance to the minimum bending radius of the machine cable is specified.
2. The screw hole for fixing wiring and piping installed by the user.

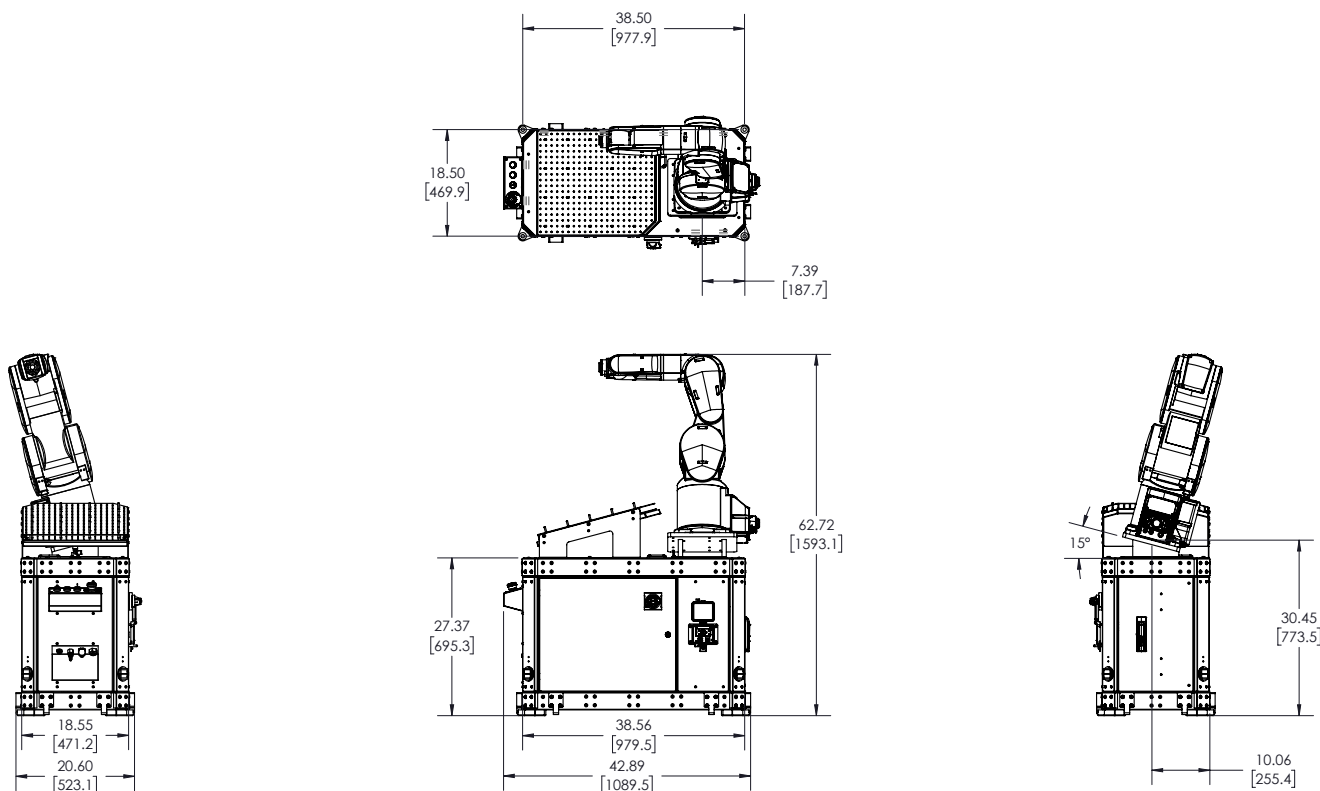
RV-7FRD ROBOT WITH STANDARD BASE

All dimensions, limits, and views are representations only.

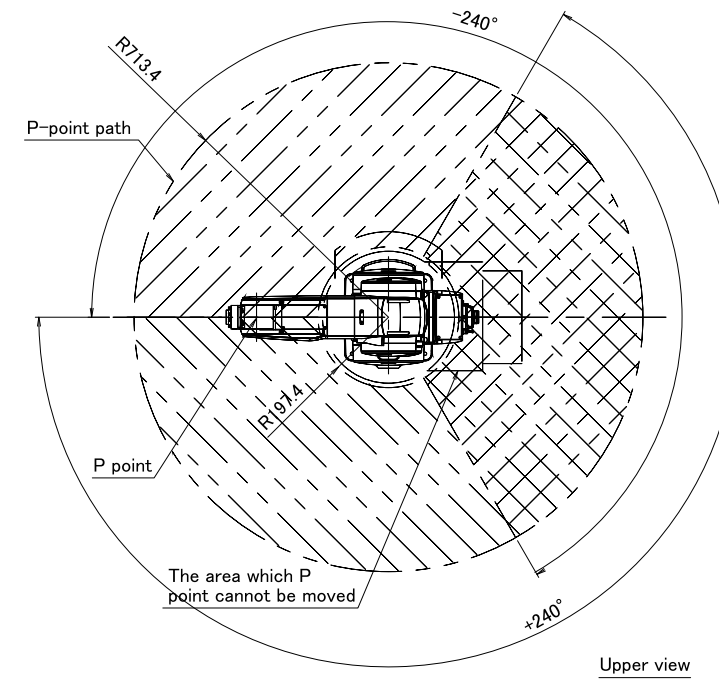
Validate critical dimensions and limits in latest robot specification and with Mitsubishi Electric Engineering prior to order.



RV-7FRD ROBOT WITH MACHINE TOOL BASE

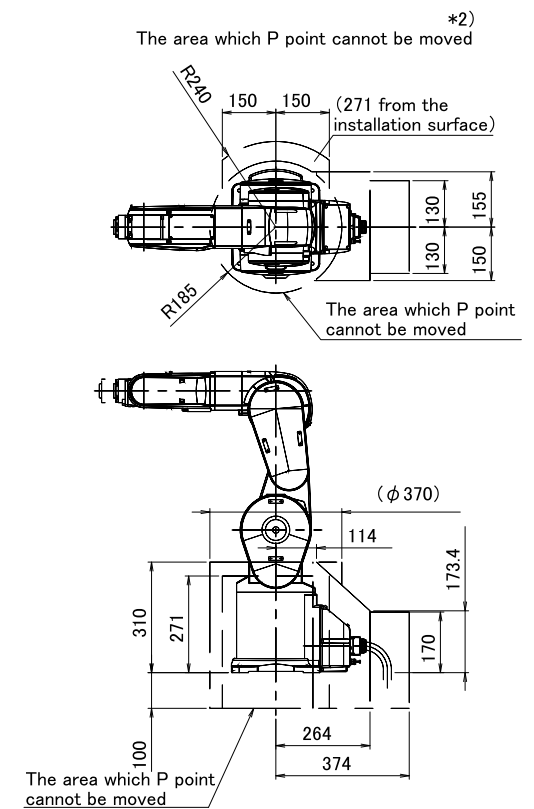
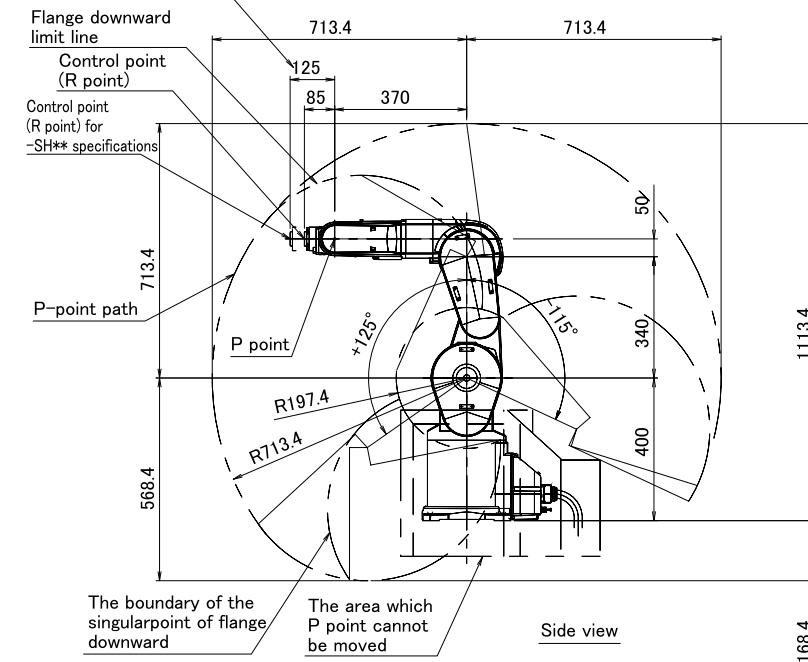


RV-7FRD REACH



Operating range for each axis:
 J1: $\pm 240^\circ$
 J2: -115° to 125°
 J3: 0° to 156°
 J4: $\pm 200^\circ$
 J5: $\pm 120^\circ$
 J6: $\pm 360^\circ$
 J6 when -SH specifications are used: $\pm 200^\circ$

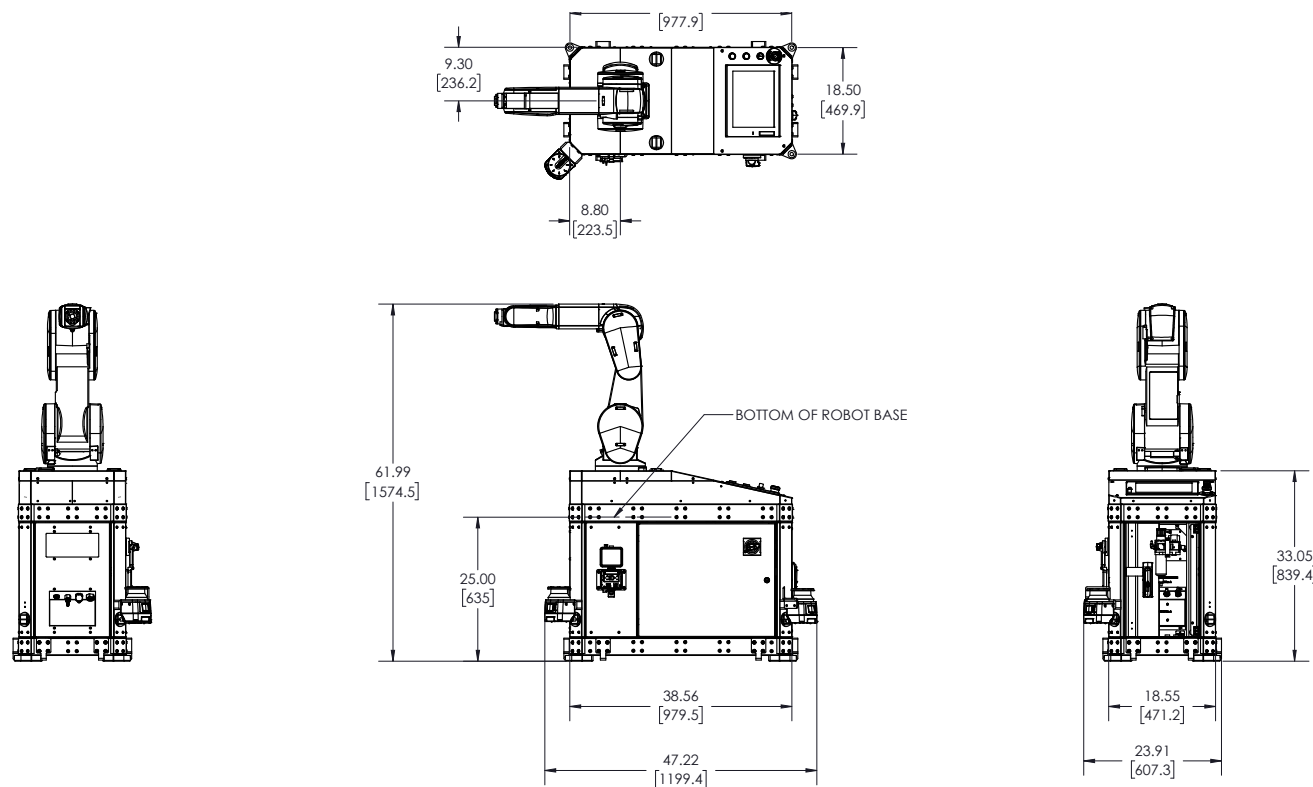
For internal wiring and piping specification (-SH**)



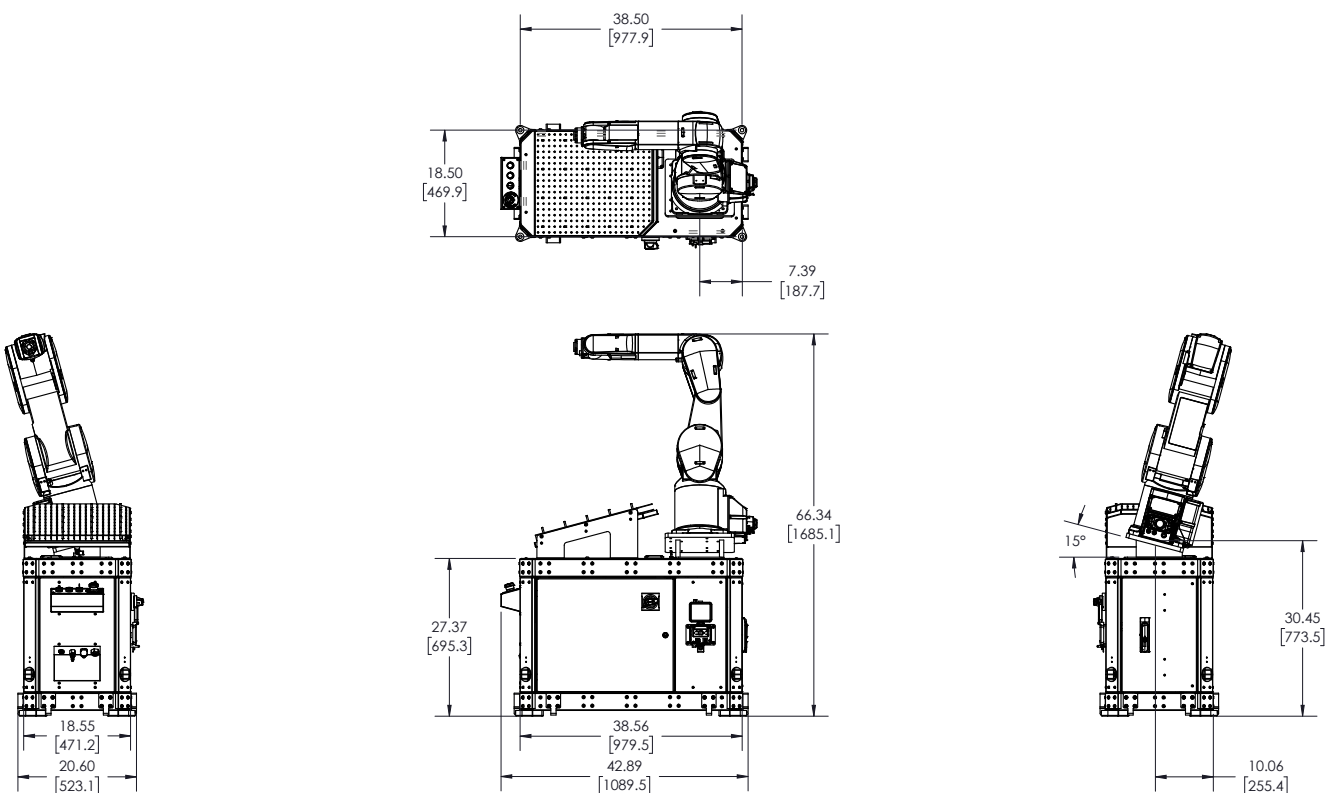
- The above figure shows a robot at the position of: J1=0°, J2=0°, J3=90°, J4=0°, J5=0°, and J6=0°
- The area which P point cannot be moved: P point cannot move to this area. This limitation is valid at factory shipping, but it can be released by parameter MELTEXS.

RV-7FRLMD ROBOT WITH STANDARD BASE

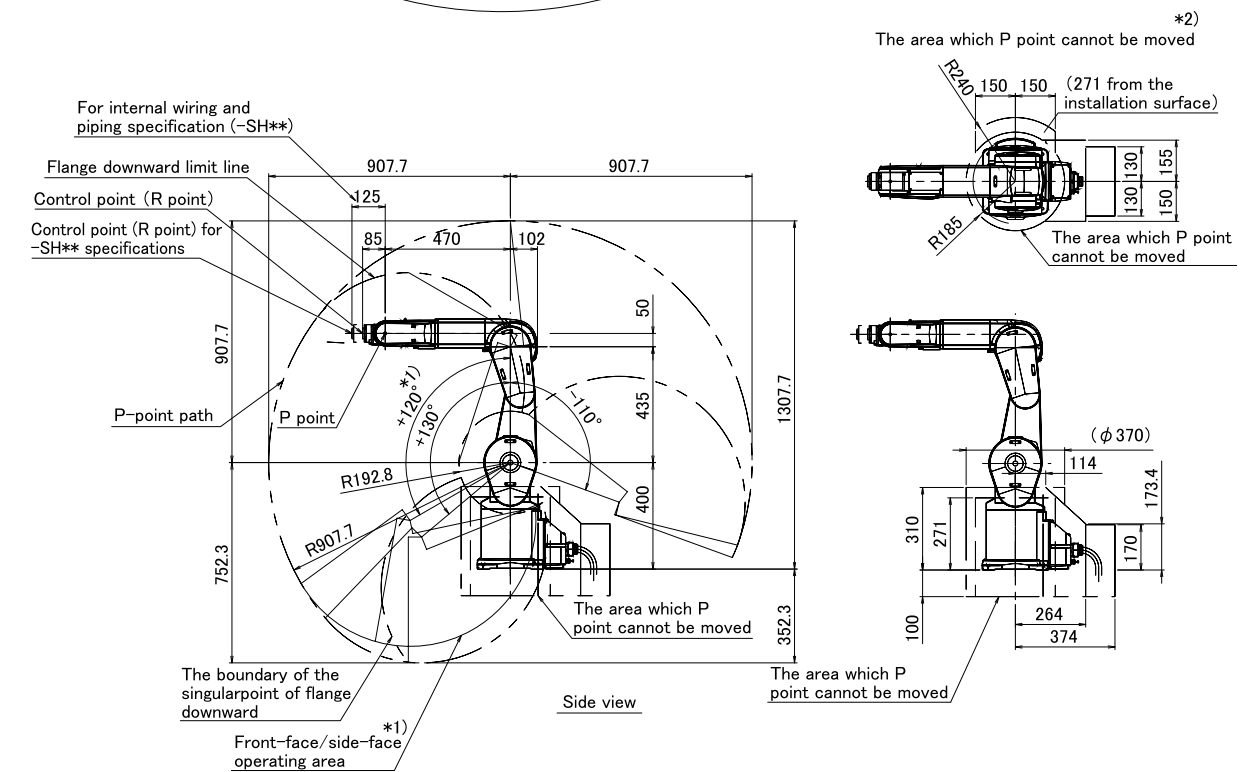
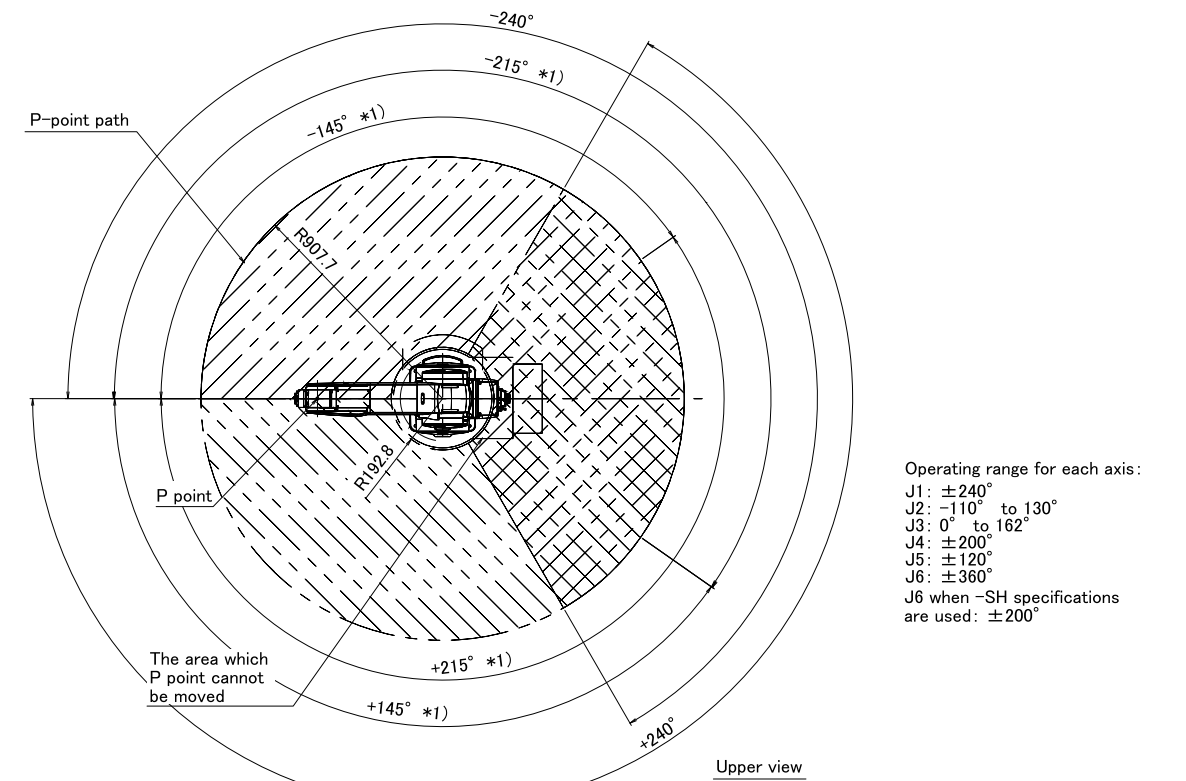
All dimensions, limits, and views are representations only.
 Validate critical dimensions and limits in latest robot specification and with Mitsubishi Electric Engineering prior to order.



RV-7FRLMD ROBOT WITH MACHINE TENDING BASE



RV-7FRLMD REACH

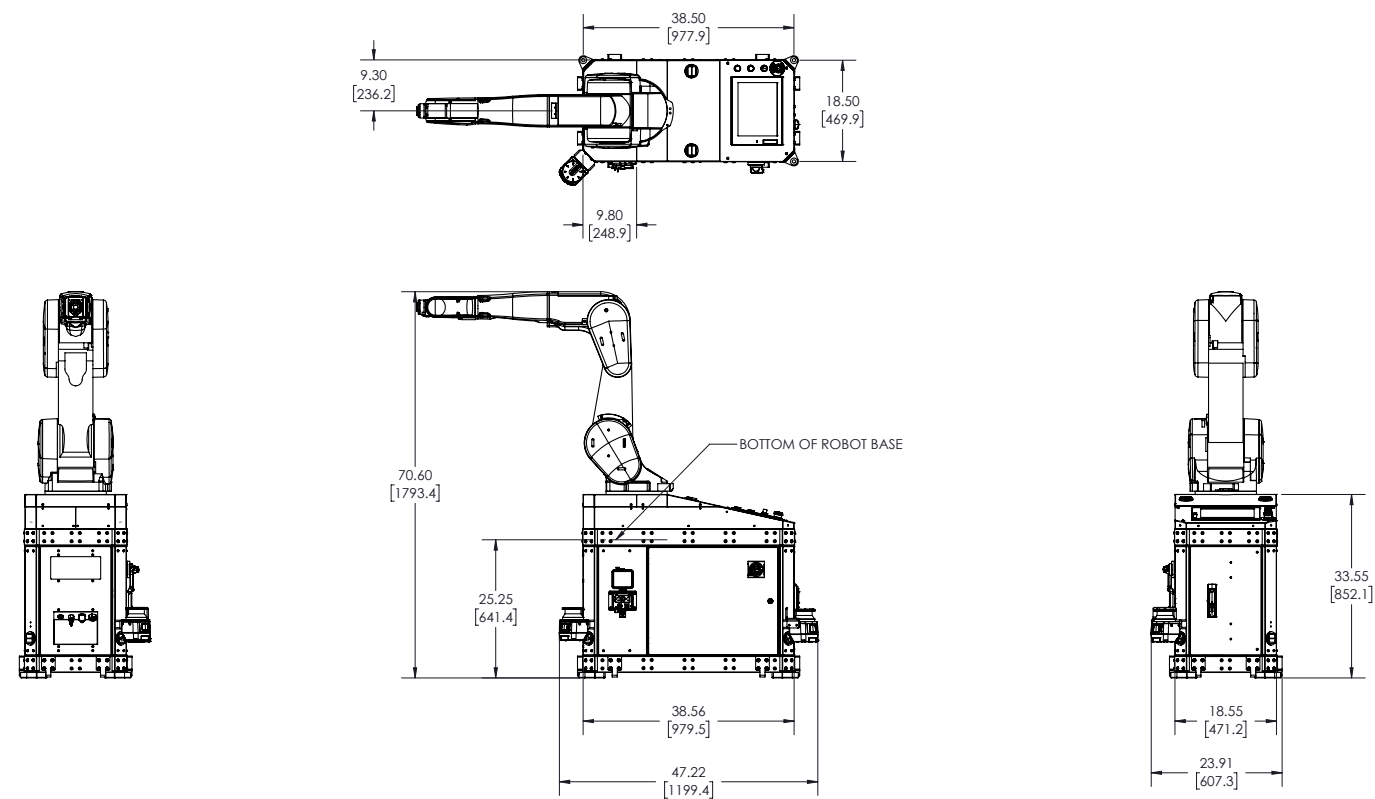


1. The following figure shows a robot at the position of: J1=0°, J2=0°, J3=90°, J4=0°, J5=0°, and J6=0°
2. Front face operation limit: When the J1 axis angle is +145° ≤ J1 ≤ +215° or -145° ≤ J1 ≤ -215°, the J2 axis operation is limited to -110° ≤ J2 ≤ +120°.
3. The area which P point cannot be moved: P point cannot move to this area. This limitation is valid at factory shipping, but it can be released by parameter MELTEXS.

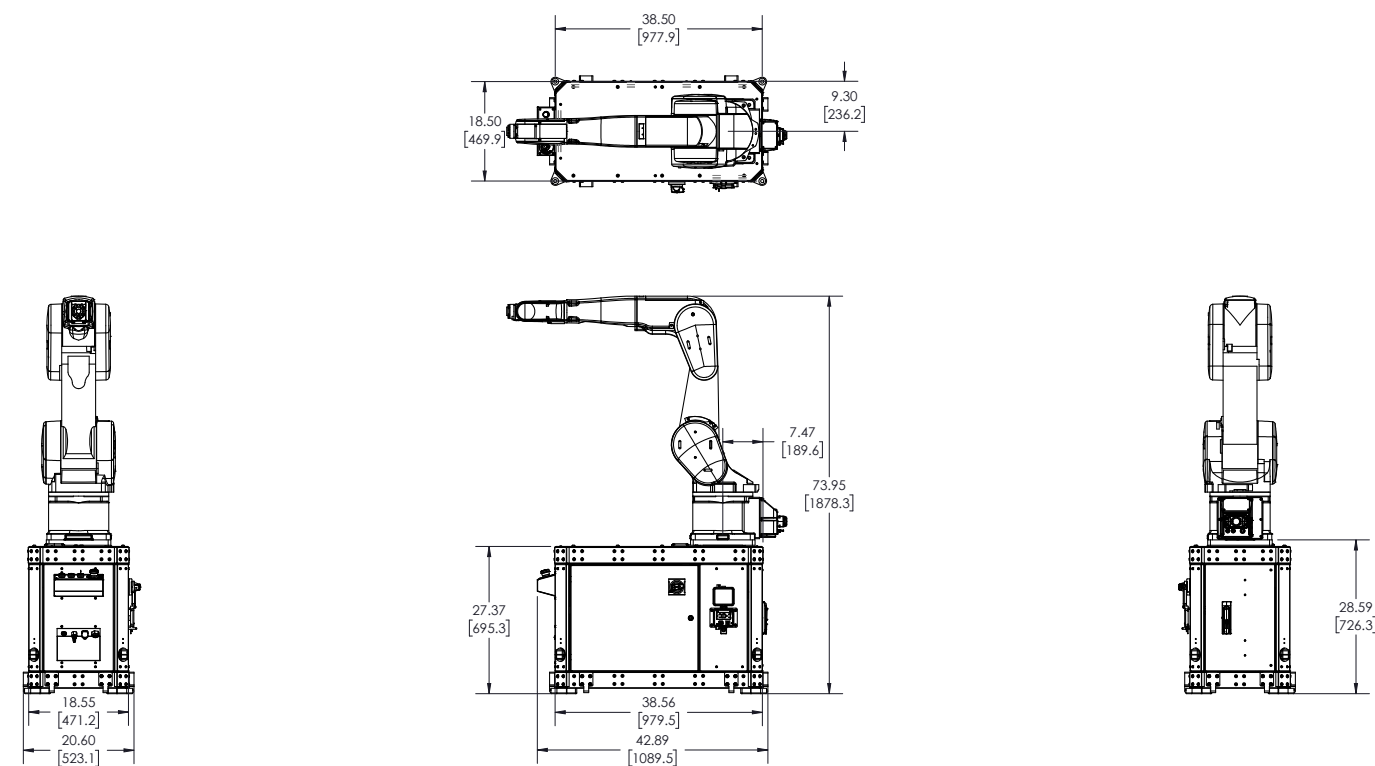
RV-7FRLL ROBOT WITH STANDARD BASE

All dimensions, limits, and views are representations only.

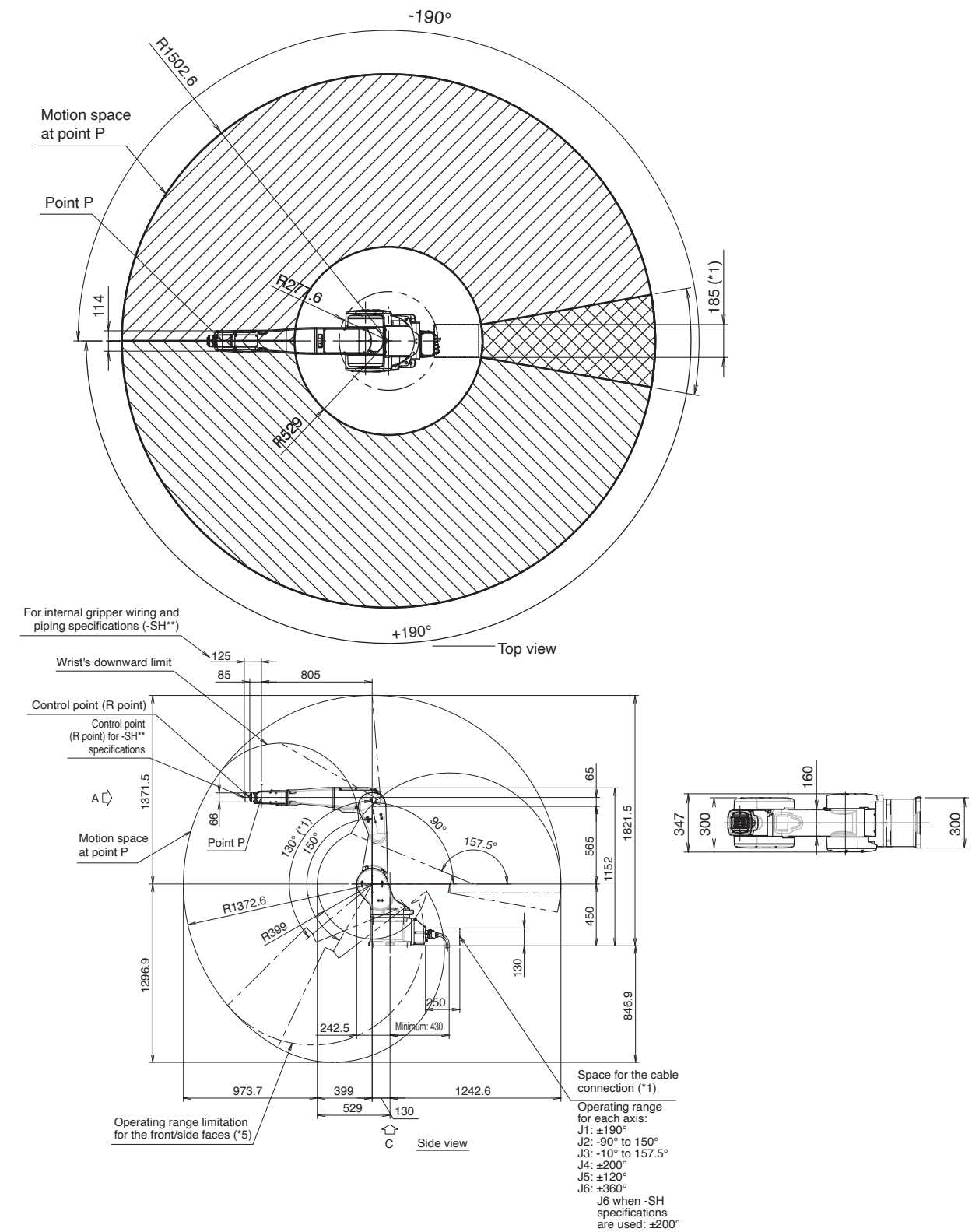
Validate critical dimensions and limits in latest robot specification and with Mitsubishi Electric Engineering prior to order.



RV-7FRLL ROBOT WITH MACHINE TENDING BASE



RV-7FRLL REACH

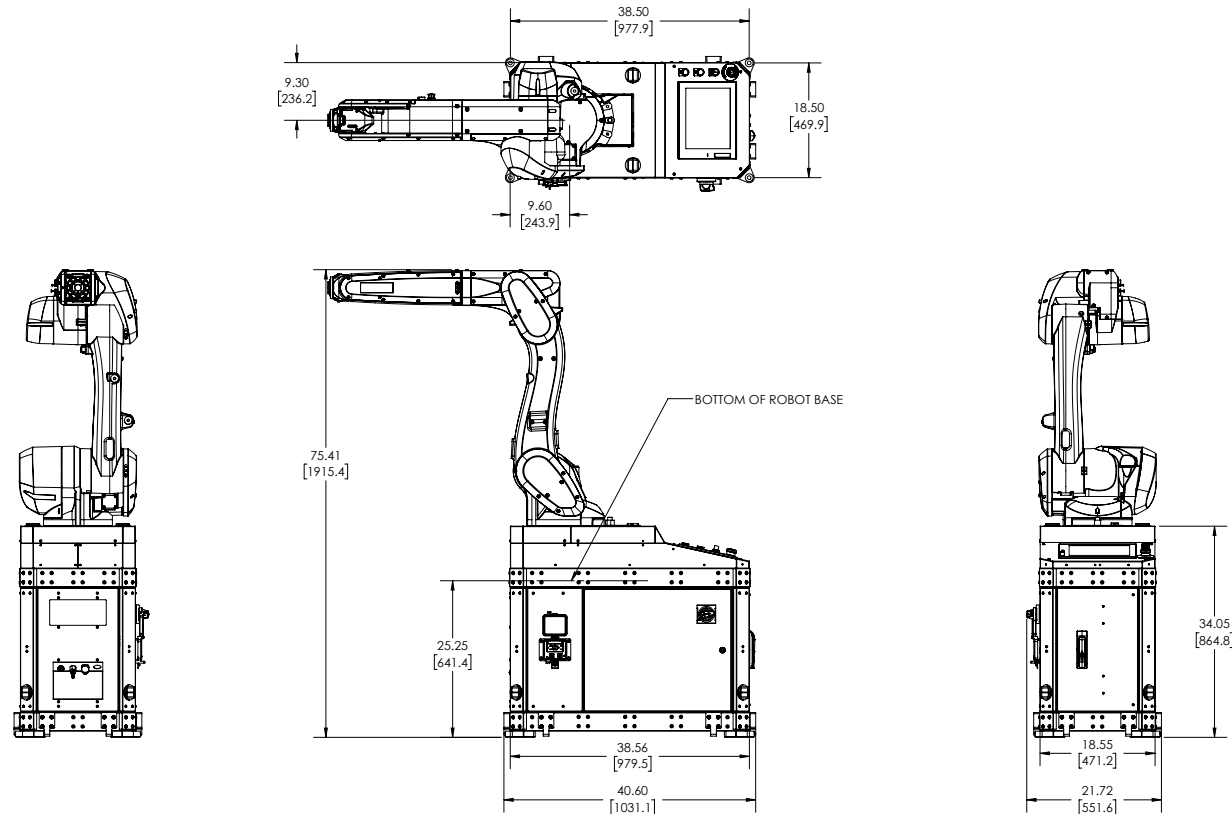


1. Make sure to leave enough space open for cable connections between devices.
2. Make sure to leave enough space open for removing and attaching covers during maintenance work.
3. Specify a thread engagement length of 7.5 to 8 mm.
4. Limits on the operating range for the front part: When the J1-axis angle is inside the range of $+145^\circ \leq J1 \leq +215^\circ$ or $-145^\circ \leq J1 \leq -215^\circ$, the operating range of the J2-axis is limited to $-110^\circ \leq J2 \leq +120^\circ$.
5. Limits on the operating range for the front part: When the J1-axis angle is inside the range of $J1 \geq +120^\circ$ or $J1 \leq -120^\circ$, the operating range of the J2-axis is limited to $-90^\circ \leq J2 \leq +130^\circ$.
6. Refer to the standard specification manual for detailed specification of -SH.

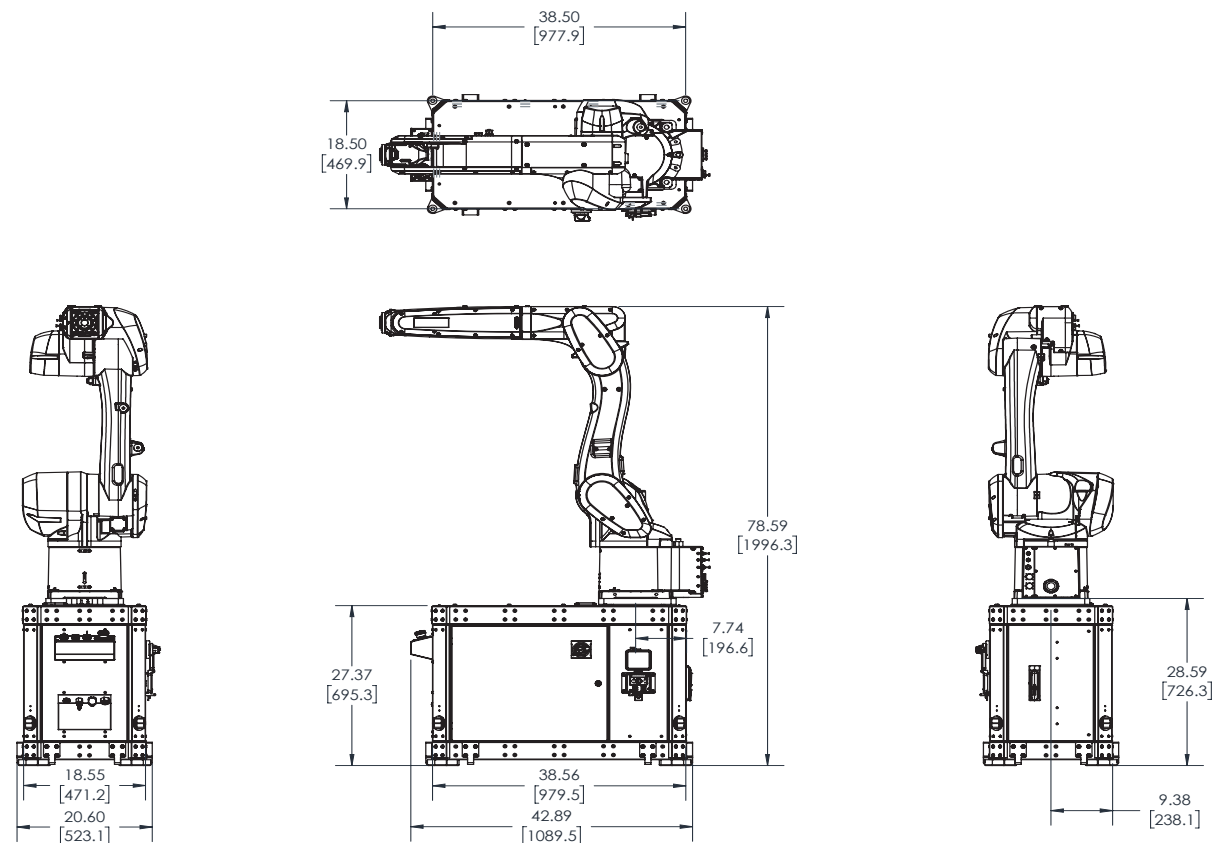
RV-12CRLD-S15 ROBOT WITH STANDARD BASE

All dimensions, limits, and views are representations only.

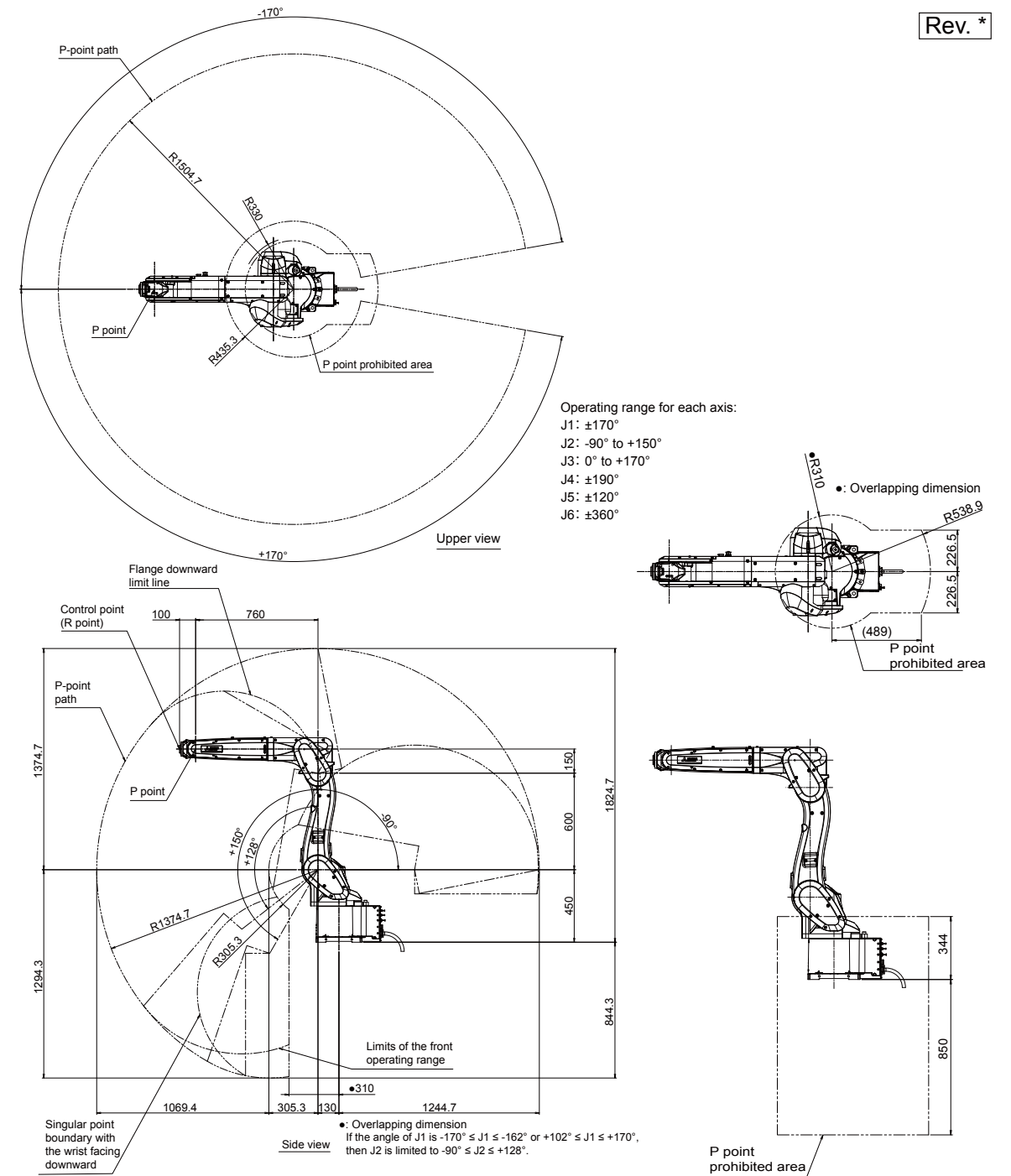
Validate critical dimensions and limits in latest robot specification and with Mitsubishi Electric Engineering prior to order.



RV-12CRLD-S15 ROBOT WITH MACHINE TENDING BASE



RV-12CRL REACH

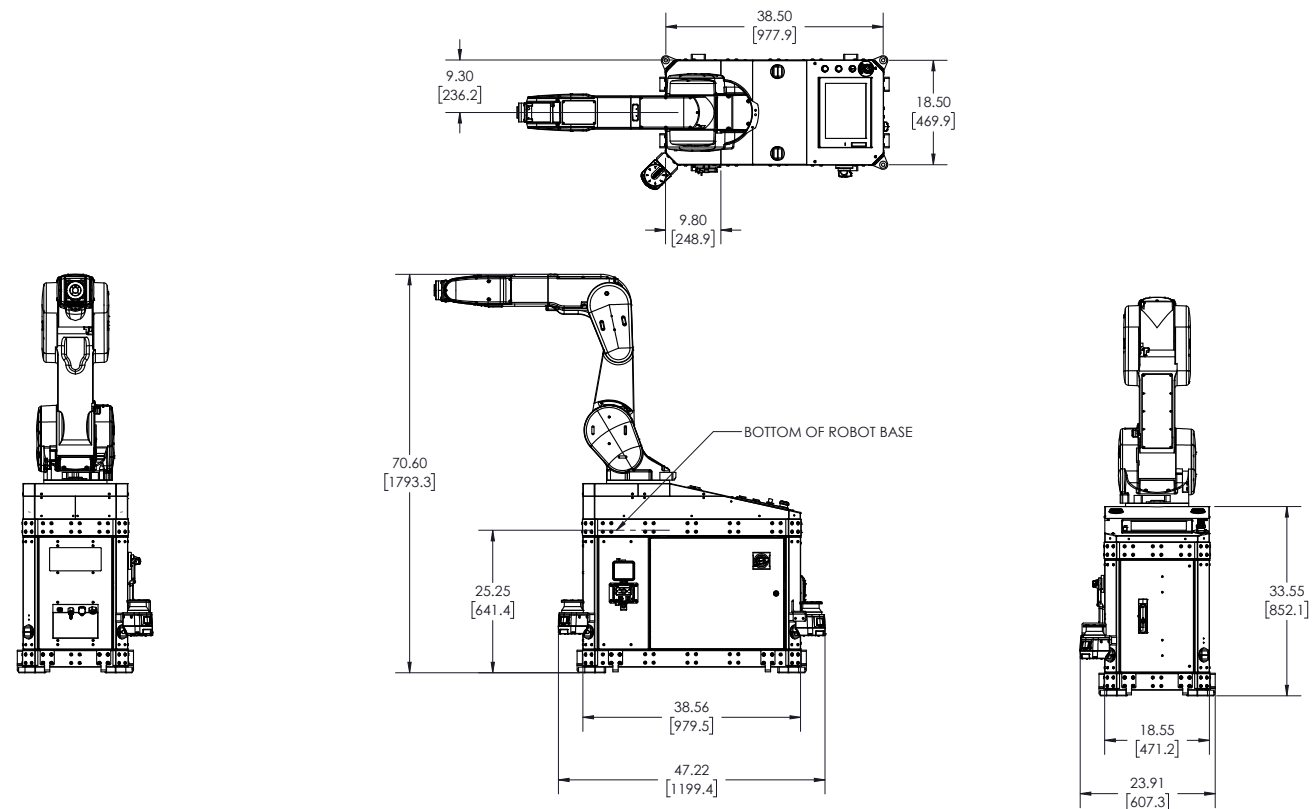


1. The following figure shows a robot at the position of: J1=0°, J2=0°, J3=90°, J4=0°, J5=0°, and J6=0°
2. P point prohibited area: P point cannot enter the area shown in the diagram. However, parameter "MELTEXS" can be used to disable the P point prohibited area. The prohibited area is enabled from the factory.

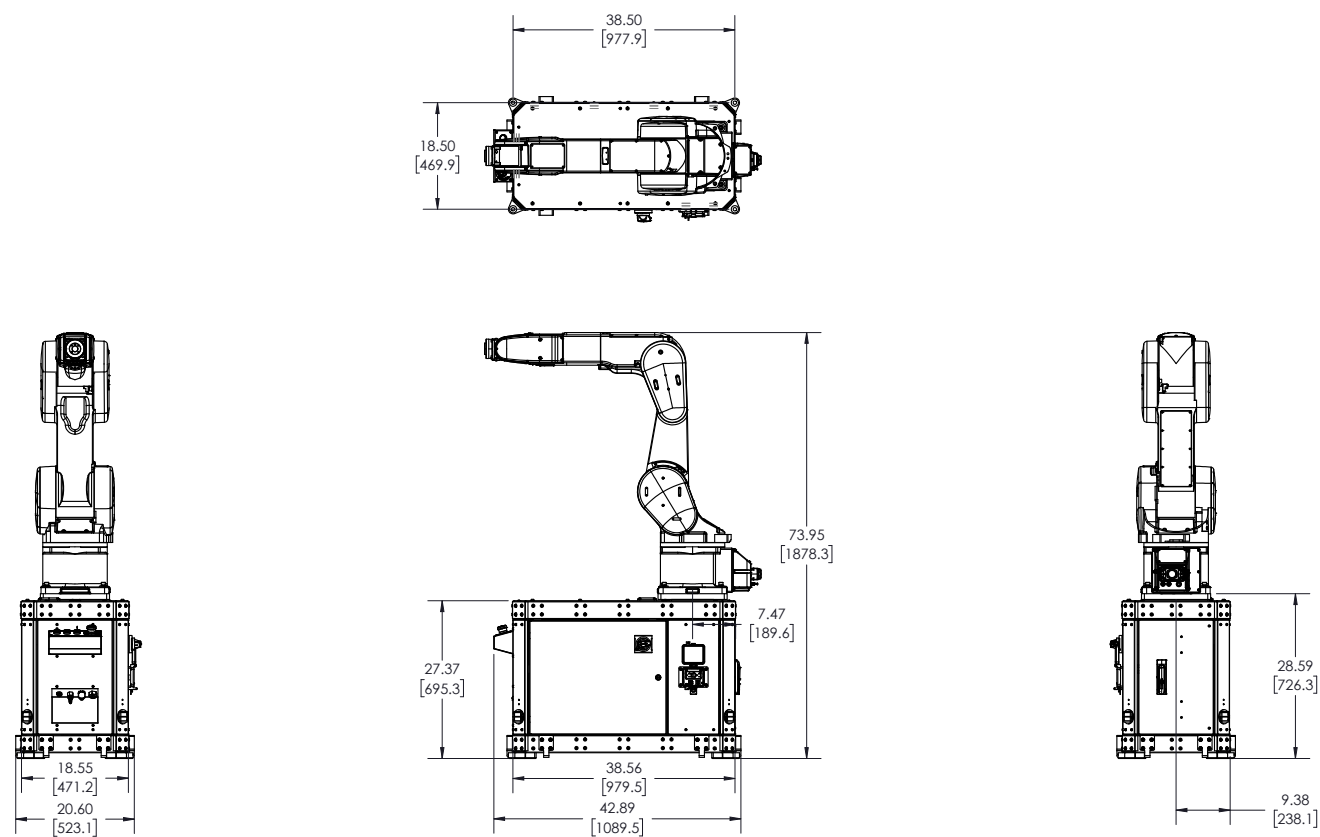
RV-13FRLMD ROBOT WITH STANDARD BASE

All dimensions, limits, and views are representations only.

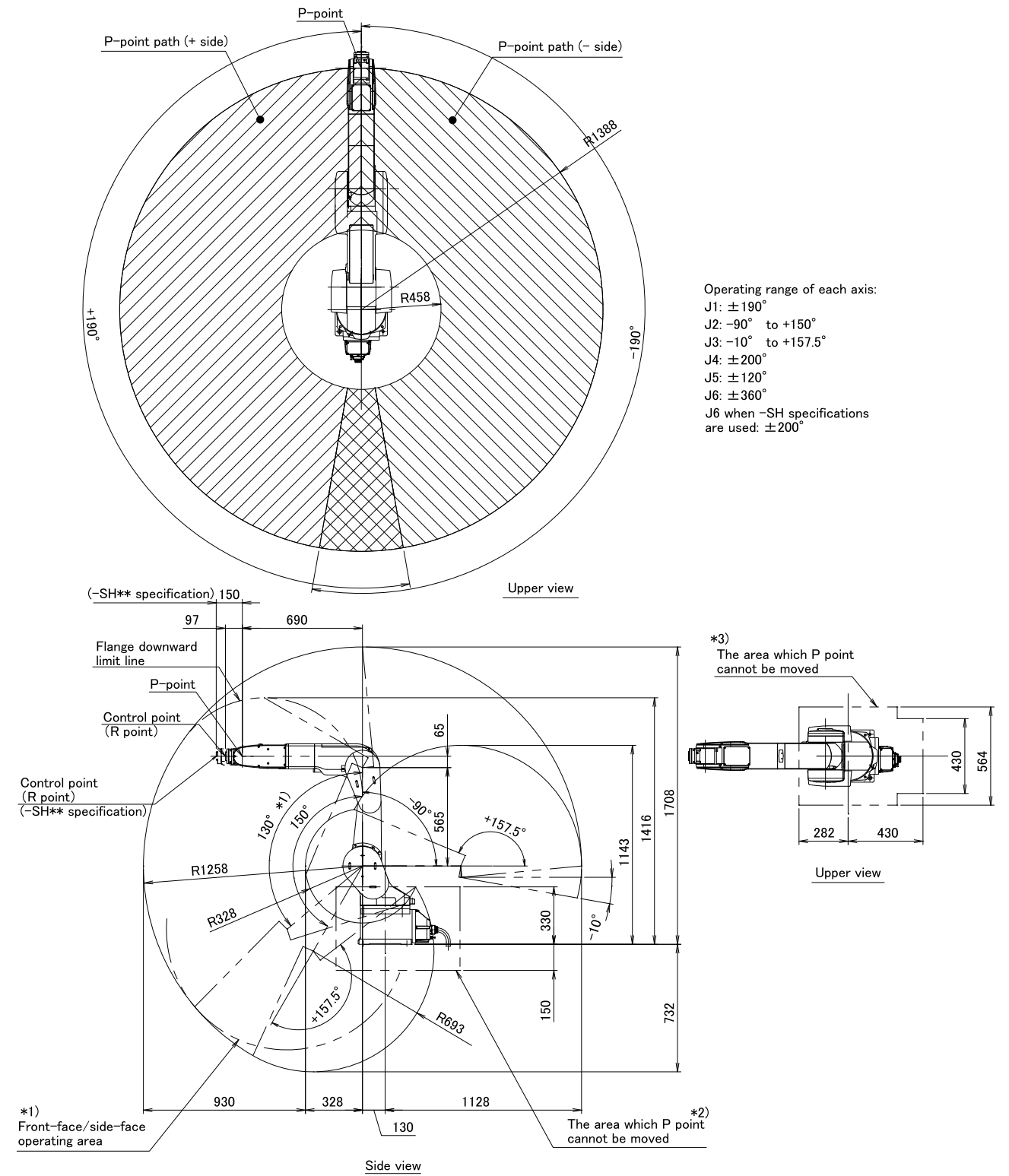
Validate critical dimensions and limits in latest robot specification and with Mitsubishi Electric Engineering prior to order.



RV-13FRLMD ROBOT WITH MACHINE TENDING BASE



RV-13FRLMD REACH

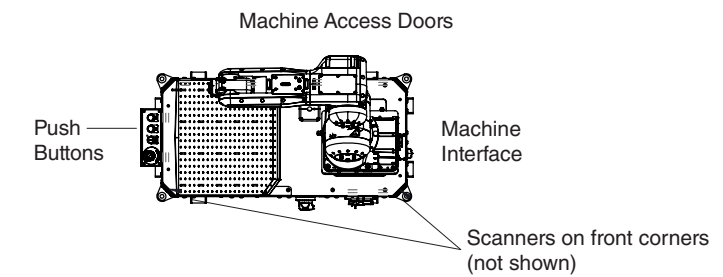
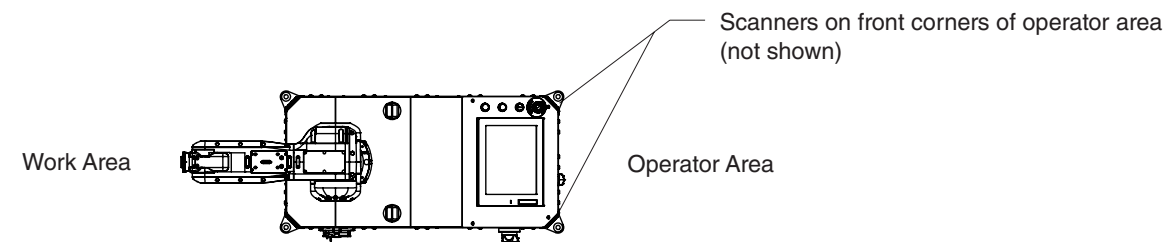


Operating range of each axis:
 J1: $\pm 190^\circ$
 J2: -90° to $+150^\circ$
 J3: -10° to $+157.5^\circ$
 J4: $\pm 200^\circ$
 J5: $\pm 120^\circ$
 J6: $\pm 360^\circ$
 J6 when -SH specifications are used: $\pm 200^\circ$

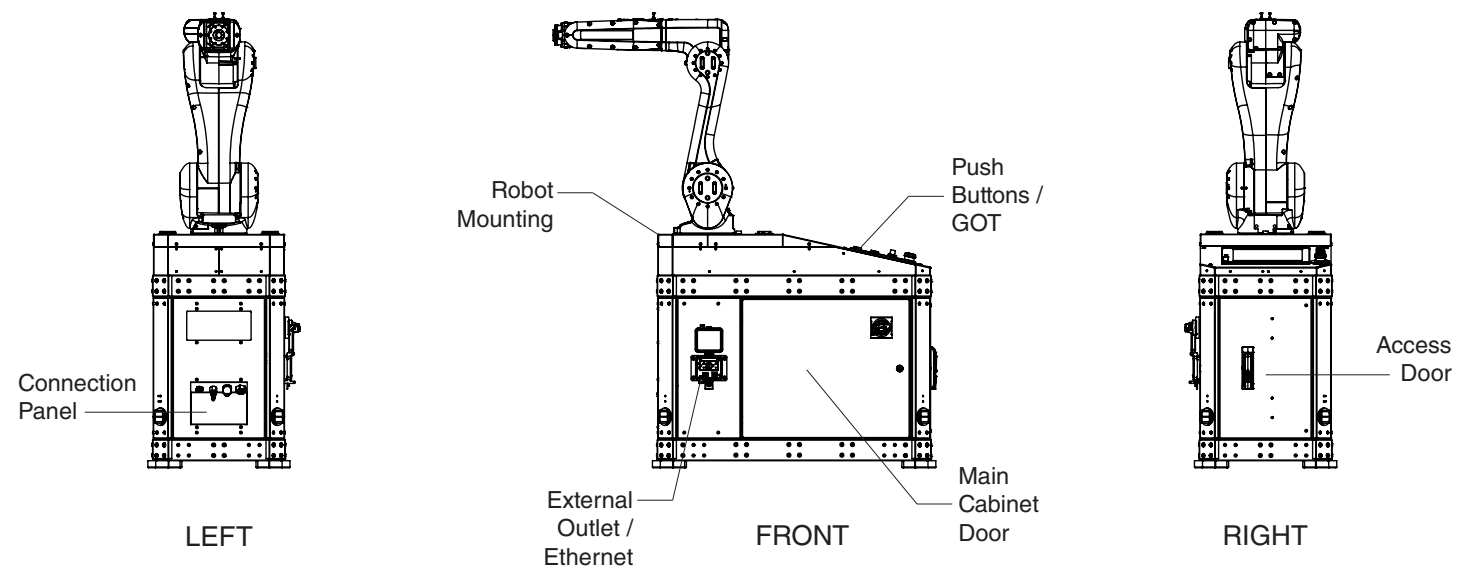
1. The side view figure shows a robot at the position of: J1=0°, J2=0°, J3=90°, J4=0°, J5=0°, and J6=0°
2. Front face operation limit: When the J1 axis angle is $+130^\circ \leq J1$ or $J1 \leq -140^\circ$, the J2 axis operation is limited to $-90^\circ \leq J2 \leq +130^\circ$.
3. The area which P point cannot be moved: P point cannot move to this area. This limitation is valid at factory shipping, but it can be released by parameter MELTEXS.

The following is intended to be used as a guide for placing of the robot on any given ARIA Unit. When selecting the robot position relative to the base, the front view (main cabinet door) should be accessible at all times. This assures that the unit can easily be turned off or serviced by the operator or maintenance technician. Furthermore, the ability to gain entry to the access door should be readily available for adjustment of air pressure and connection of a teach pendant should it be required.

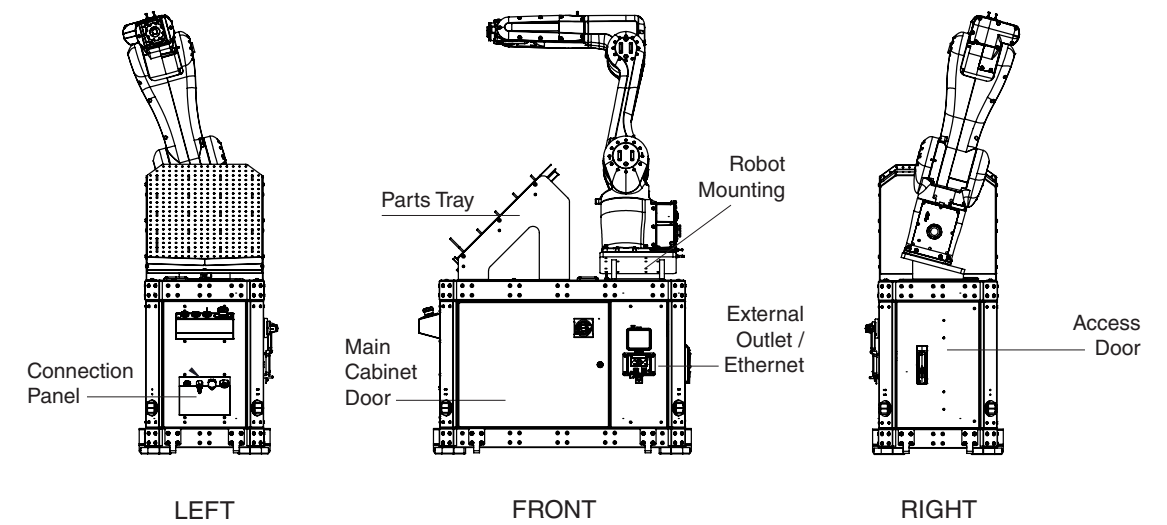
Location of Component or Work Area	Standard Base		Machine Tending Base	
	ST-R	ST-L	MT-R	MT-L
Robot	Right	Left	Right	Left
Connection Panel	Right	Left	Left	Right
Access Door	Left	Right	Right	Left
Parts Tray	N/A	N/A	Left	Right
GOT	Left	Right	N/A	N/A
Push Buttons	Left	Right	Left	Right
Operator Area	Left	Right	N/A	N/A
Assembly Line	Right	Left	N/A	N/A
Machine Access Door	N/A	N/A	Back Right	Back Left
Machine Interface	N/A	N/A	Right	Left
Scanners	Left	Right	Front	Front



STANDARD BASE – LEFT MOUNTING



MACHINE TOOL BASE – RIGHT MOUNTING



ARIA ACCESSORIES

PREPROGRAMMED SOFTWARE PACKAGES

Mitsubishi Electric Automation's preprogrammed software packages enable easy programming with little to no robot programming experience. Accessible through the HMI, end-users can select a given program, adjust to their requirements, and save the changes to create a custom program for common industry applications.

Model Number	Description
CNC MILL SFTWRE	CNC Mill Software Pick & Place Template
CNC LTHE SFTWRE *	CNC Lathe Software Pick & Place Template
PRESS BRAKE SFTWRE *	Press Brake Software Pick & Place Template
F&B PRM PAK SFTWRE *	Food & Bev. Software Primary Pack Template
F&B SEC PAK SFTWRE *	Food & Bev. Software Secondary Pack Template
F&B EOL PAK SFTWRE *	Food & Bev. Software End-of-Line Template
MFCT. ASSY. SFTWRE *	Manufacturing Software Assembly/ Sub-Assembly Template
MFCT. PRESS SFTWRE *	Manufacturing Software Press Tending Template
MFCT. P&P SFTWRE	Manufacturing Pick & Place Software Template
MFCT. DRV SFTWRE *	Manufacturing Screw/Nut Driving Software Template
MFCT. DISP SFTWRE *	Manufacturing Dispense/Sealant Software Template

* Currently in development.
Contact your local sales representative for availability.

RT TOOLBOX3 PROGRAMMING SOFTWARE

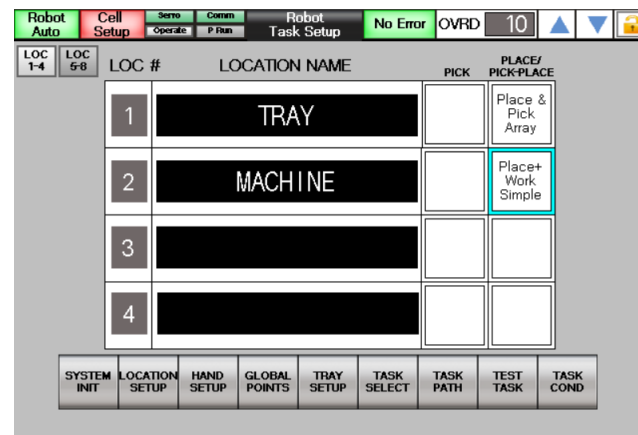
RT ToolBox3 is a software that supports the life cycle of your system, including programming and editing, verification of the scope of operations prior to introducing a robot, estimation of tact time, robot debugging prior to startup, and monitoring of robot conditions and malfunctions during operations.

Windows® Compatible

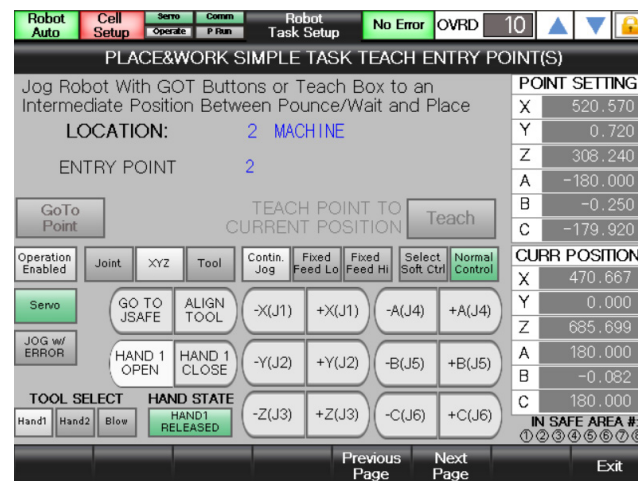
- Easy operations on Windows
- Compatible with Windows10 (32bit, 64bit) and 11

System Life Cycle Support

- Programs can be edited using MELFA-BASIC IV, V and VI (varies depending on the model).
- Monitor robot movements, operational status, input signals, and Servo conditions.



Task Setup Screen



Pick & Place Teach Screen

Simulation Functions

- Compatible with all models that connect to the CRn-500 Series, CRn-700 Series, CR750 Series, and CR800 Series controllers.
- Robot movements and tact times can be calculated using a PC (not available with the mini version).

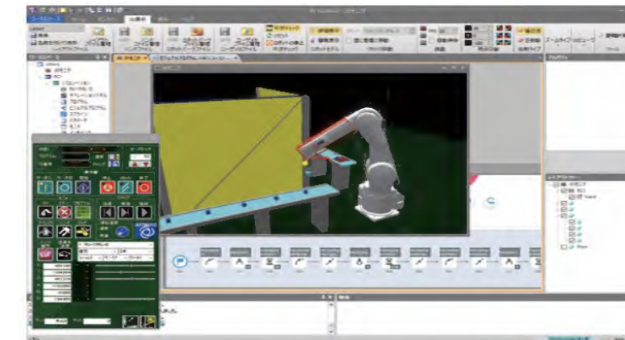
Enhanced Maintenance Functions

- Preventative maintenance and shortened recovery time with maintenance forecast function that notifies users of the robot's greasing time and battery life, and an assistance function for position recovery in the event of trouble.
- Data is managed by project to allow collective backup of the entire system.

RT TOOLBOX3 CONTINUED

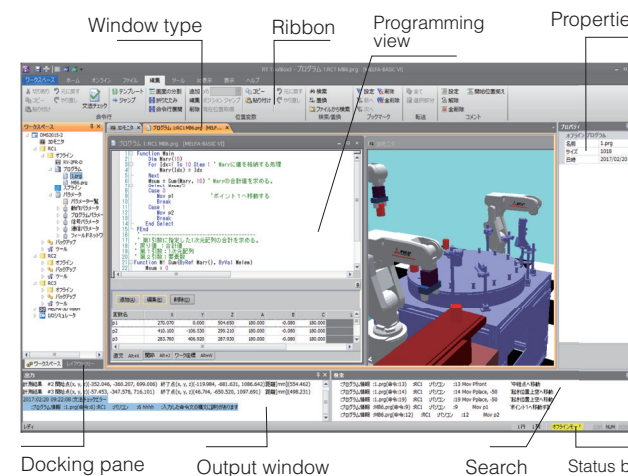
Visual Programming

RT ToolBox3 includes the visual programming function of RT VisualBox, which enables intuitive operations. It is easy to start up robots even without knowledge of robotics. It also supports simulation, allowing you to perform motion confirmation and interference checks of programs created with visual programming on a 3D layout.



Program Editing and Debugging Functions

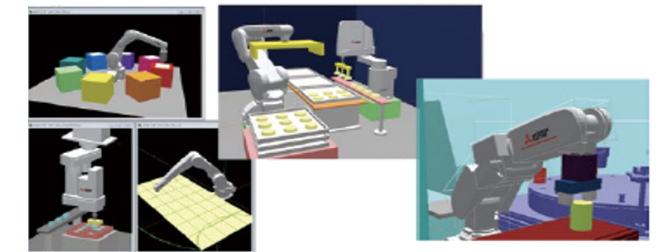
Programs are created using MELFA-BASIC IV, V and VI^{*1}. A multi-window format has been adopted for greater work efficiency and enhanced editing. Operations such as program step executions and breakpoint settings can be conveniently verified.



*1: MELFA BASIC is a language that has been developed based on the usability and user-friendliness of the widely-used conventional BASIC language, with the addition of commands needed for robot control. MELFA BASIC IV/V not only offers these additional commands, but also incorporates structuring and parallel processing functions that were difficult to realize with BASIC, for even greater ease of use and detailed control.

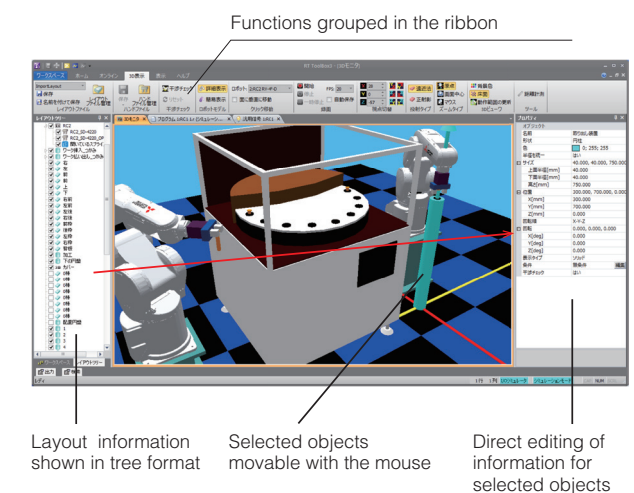
3D Viewer

The 3D viewer allows easy verification of robot poses and movements, verification of the limit values of user-defined parameters, and virtual placements of peripheral devices by basic objects. It can also be used to check for interferences between the robot and peripheral devices. Distance measuring functions are also available on the screen.



Simulation Functions

Programs that have been created can be executed in the PC, movements can be verified, and the tact times of specified parts of a program can be measured. Such simulation functions are also effective for preliminary system examinations. Servo simulations can also be performed for preliminary examination of loads. Signals can be coordinated with GX Works2 and GX Works3 for easy creation of line simulators. A maximum of 8 robots can be operated, and coordinated movements among robots can be verified.



RT TOOLBOX3 CONTINUED

Monitoring Functions

Program execution status, variables, I/O signals, etc. can be monitored.

Maintenance Functions

Maintenance functions include maintenance forecasts, position recovery support, parameter management, etc.

<Example of a Pick & Place program>

Mov Psafe	Move to evasion point
Mov Pget, -50	Move above workpiece extraction position
Mvs Pget	Workpiece extraction position
Dly 0.2	Wait 0.2 seconds
Hclose 1	Close hand
Dly 0.2	Wait 0.2 seconds
Mvs Pget, -50	Move above workpiece extraction position
Wait M_In (12)=1	Wait for signal
Mov Pput, -80	Move above workpiece placement position
Mvs Pput	Workpiece placement position
Dly 0.2	Wait 0.2 seconds
Hopen 1	Open hand

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

Model Number	Description
RT-TOOLBOX3-C1	Robot configurator software – (1) seat
RT-TOOLBOX3PRO-C1	Robot configurator software with plug-in for Solidworks

RT-Toolbox Overview

MELFA WORKS

The MELFA Works function can be used in RT ToolBox3 Pro. MELFA Works, an add-in tool of SolidWorks®, can simulate robot production systems on SolidWorks and output the data of processing paths on workpieces.

CAD Links

Work data for performing sealing operations and other such tasks that require many teaching steps can be easily created by selecting the processing area on the 3D CAD data. Since work data is created from 3D CAD data, even complex 3D curves can be generated, and the number of teaching steps can be significantly reduced.

Simulation of Robot Operations

Robot programs, including I/O signals, can be simulated. That is, the operations of the actual system can be reproduced as they are. The I/O signals of a robot controller may be simulated according to two methods: (1) by defining movements associated with I/O signals in a simple manner, or (2) by linking robot programs with GX Simulator2/3.

Interference Checks

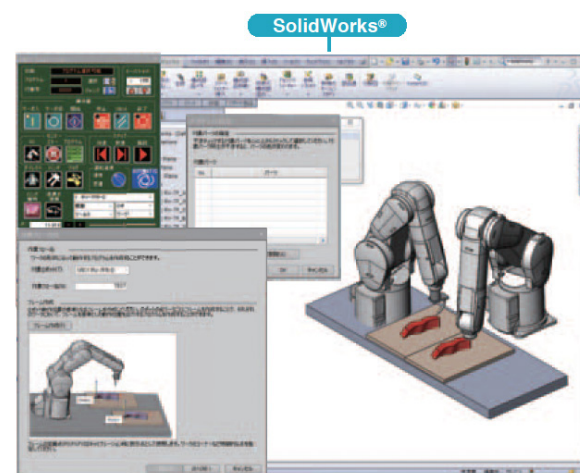
Interferences between the robot and peripheral devices can be checked. Items that are to be subject to an interference check may be specified simply by clicking on it on screen. If an interference is detected, information about the interference (name of the part, the program line that was executed, the position of the robot when the interference occurred, etc.) may be stored in a log file.

Calibration

The point sequence data of CAD coordinates created using CAD links is corrected into robot coordinate data, and the operation program and point sequence data are sent to the robot. In consideration of the frequent need for calibration on site, the calibration tool is an application separate from SolidWorks, designed to run efficiently on a laptop PC without SolidWorks software.

Cycle Time

The cycle time of robot operations can be measured as if you are using a stopwatch. The cycle time of specified locations of a program can also be measured.



Calibration tool

MELFA SAFE PLUS

- Standard feature on all versions of ARIA
- Improved safety through collaborative work applications
- Collaborative human-machine operation support that includes safety options allows working areas to be used jointly by people and robots. This ensures that factories provide both productivity and flexibility. (*Customers must conduct risk assessments.)

SAFETY OPTION FEATURES

- Operators can enter an operation area without stopping robots.
- High safety compliant with international standards.
- The safety input function enables safety doors to open without causing an emergency stop of the robot.
- While an operator is in a cooperative operation area, a robot does not approach the area. (Operation range limit function)
- A robot in cooperative operation continues its operation at the safety speed to secure operator's safety.
- Closing the safety door switches cooperative operation to single operation, and enables the robot to approach to the shared area.

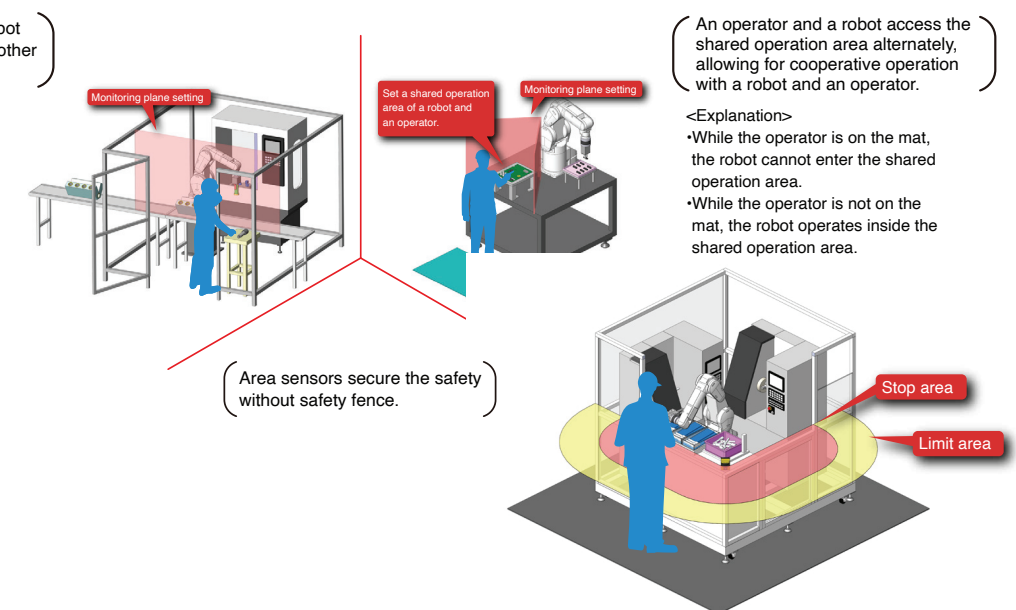
*Risk assessment and safety level proof need to be performed for the system. Please contact us if you require any further information.

Model Number	Description
4F-SF002-01	MELFA SAFE PLUS Safety Card CR-800 Robot Controller

(The operator operation area and robot operation area are separated each other with a monitoring plane for safety.)

- <Explanation>
- The robot operates at high speed while the safety fence is close.
 - While the safety fence is open, the robot continues its operation at low speed inside the monitoring plane. The operator can perform inspection inside the safety fence and outside the monitoring plane.

- <Explanation>
- When the operator enters the limit area, the robot operation speed is limited.
 - Further, the operator approaches to the stop area, the robot stops its operation.



MELFA Safe Plus Overview

Safety monitoring function

Safety features are provided that make risk assessment easier.

Safety I/O

Supports safe system connection through duplicated safe I/O (8 inputs and 4 outputs)

Safety communication function

CC-Link IE TSN safety communication function (CR800-R) is supported for a simpler configuration.

Position monitoring function

Monitors robot positions
Monitors movement into designated areas (8 locations)

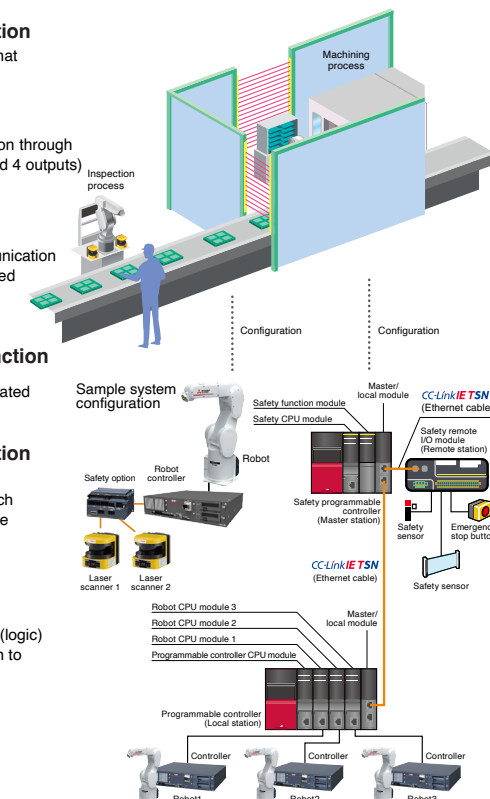
Speed monitoring function

Monitors robot speeds

Also capable of monitoring each of the speed components in the X, Y and Z directions for the monitoring point

Safety logic editing

Allows the working parameters (logic) of the safety monitoring function to be defined.



MELFA SMART PLUS

MELFA Smart Plus is an option that brings next-generation intelligence to MELFA FR, CR and RH Series robots. Inserting a MELFA Smart Plus card into the robot controller activates a multitude of intelligent functions. Additional functionality comes in the form of expanded hardware (A-Type), or Artificial Intelligence capability (B-Type). MELFA Smart Plus cards can be selected to add activate one A or B-Type function. Or, can be ordered to enable activation of all A-Type or A and B-Type functions.



MELFA SMART PLUS CARD



AI function MELFA Smart Plus card: A-type

Preventive Maintenance Function: Tracking the robot's operating status helps manage the condition of the robot. Scheduling maintenance becomes more efficient by calculating wear based on actual operation.

MELFA-2D Vision Enhancement Function: Various vision applications are used to facilitate vision alignment. Vision systems can be set-up easily using the vision sensor without specialist knowledge.

Calibration Assistance Function: Easy set-up of 2D vision sensors and improved job precision.

- A. Automatic calibration
- B. Work coordinate calibration
- C. Relative position calibration

Coordinated Control of Additional Axis: Enables coordinated operation between the robot and an additional linear axis to allow the robot to work on objects that exceed its operating reach.

Robot Mechanism Thermal Compensation Function: Compensates for thermal expansion of the robot arm to increase position accuracy.



AI function MELFA Smart Plus card: B-type

Enhancement Function for Force Sense Control: Parameters for the optimum operation pattern are found using repeat learning in a short amount of time. Set up and tact times are reduced.

MELFA-3D Vision Enhancement Function: Reduced start-up time thanks to automatic armature adjustments which utilizes our proprietary AI technology Maisart.

Predictive Maintenance Function: Failing drive parts are detected before abnormalities in robot behavior become apparent.

Model Number	Description:
2F-DQ511	MELFA Smart Plus Card: One of the A-Type Functions can be activated
2F-DQ521	MELFA Smart Plus Card: One of the B-Type Functions can be activated
2F-DQ510	MELFA Smart Plus Card Pack: All of the A-Type Functions can be activated
2F-DQ520	MELFA Smart Plus Card Pack: All of the A and B-Type Functions can be activated

[MELFA Smart Plus Overview](#)

FORCE SENSOR

Assembly/processing tasks are performed in the same manner as a human being, while sensing the force that is applied to the gripper. Tasks requiring subtle adjustment and detection of force can be performed.

Improved Production Stability

Parts can be inserted/attached without damage, while adjusting for displacement absorptions caused by parts variations and subtle external forces. Work stability is improved by position latching and retry processing at times of work failure. Furthermore, quality can be managed using log data, and the causes of work errors can be analyzed.

Realization of Complex Assembly and Processing Tasks

Parts can be inserted/attached without damage, while adjusting for subtle external forces. Action direction and pushing force can be changed by detecting the contact force, and interrupt processing can be performed using trigger conditions that combine position information and force information.

Easy Control

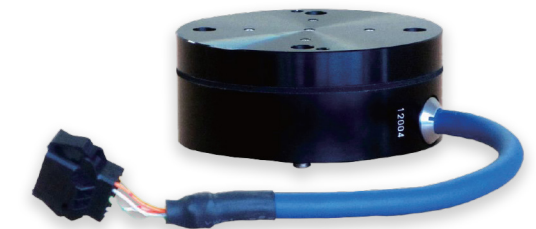
Programs can be easily created using dedicated robot language. Based on representative examples of application programs, work programs can be easily created in response to each customer's required task.

Simple Operations

The robot can be quickly "taught" accurate positions based on position and force data from the teaching box. Work conditions can be verified and adjusted by viewing the position and force data from the teaching box and the graph waveform on RT ToolBox3.

PRODUCT FEATURES

Controller	Force Control	Force Control	Function for controlling robots while applying a specified force
		Stiffness Control	Function for controlling the stiffness of robot appendages
Controller	Force Detection	Gain Changes	Function for changing control characteristics while the robot is running
		Execution of Interrupts	Interrupts can be executed (MO triggers) under trigger conditions combining position and force information
		Data Latch	Function for acquiring force sensor and robot positions while contact made
Controller	Force Log	Data Reference	Function for display force sensor data and maintaining maximum values
		Synchronous Data	Function for acquiring force sensor information as log data and displaying it in graph form
		Start/stop Trigger	Allows logging start/stop commands to be specified in robot programs
		FTP Transmission	Function for transferring acquired log files to the FTP server
Teach Pendant	Force Sense Control	Force Sense Monitor	Enables/disables force sensor control and sets control conditions while jogging
		Teaching Position Search	Function for searching for the contact position
		Parameter Setting Screen	Parameter setting screen dedicated for the force sense function. (For R565B/R57TB)



[Force Sensor Product Detail](#)

FORCE SENSOR SPECIFICATIONS

Item	Unit	Specification Value	
Rated Load	-	4F-FS002H-W200	4F-FS002H-W1000
Max. Static Load	Fx, Fy, Fz	N	200
	Mx, My, Mz	Nm	4
Breaking Load	Fx, Fy, Fz	N	.03
	Mx, My, Mz	Nm	0.03
Consumption Current	mA	200	
Weight (Sensor Unit)	g	360	580
External Dimensions	mm	ø80x32.5	ø90x40
Protective Structure	-	IP30	

PRODUCT CONFIGURATION

Name	Quantity
Force sensor	1
Force sensor interface unit	1
Sensor adapter (*1)	1
Adapter cable	1
24V DC power supply	1
24V DC power supply cable	1m
Serial cable between the unit and sensor	5m
SSCNET III cable	10m

Note 1: Not included in 4F-FS001H-W1000. An adapter needs to be selected from the chart at right and purchased separately in accordance with your robot model

FORCE SENSOR INTERFACE UNIT SPECIFICATIONS

Item	Unit	Specification Value	
Interface	RS-422	ch	1 (For sensor connection)
	SSCNET III	ch	1 (For robot controller and additional axis amp connection)
Power Supply	Input Voltage	VDC	24±5%
	Power Consumption	W	25
External Dims. (W x D x H)	mm	22 x 111 x 48	
Weight	kg	Approx. 0.8	
Construction	-	IP20 (Panel install, open type)	

FORCE SENSOR MODEL NUMBERS

Model Number	Description:
4F-FS001-W1000	Force sensor for robot arm
4F-FS002H-W200	Force sensor set (CR-800/200N Max)*
4F-FS002H-W1000	Force sensor set (CR-800/1000N Max)*

SENSOR MOUNTING ADAPTER (FOR 4F-FS002H-W1000)

Description	Model Number
Sensor mounting adapter (for RV-2/4/7F)	1F-FSFLGSET-01
Sensor mounting adapter (for RV 13/20F)	1F-FSFLGSET-02

HIGH-PERFORMANCE R86TB TEACH PENDANT

The R86TB teach pendant delivers improved graphics and flexibility with a 10.1" high-definition display.

Model Number	Description
R86TB	Advanced Teach Pendant
2F-32EXTBST-01M	Extension Cable: 1 Meter
2F-32EXTBST-05M	Extension Cable: 5 Meter
2F-32EXTBST-15M	Extension Cable: 15 Meter

- The HOME screen has function icons, which allow easy access to all functions, such as programs and parameters.
- Frequently used functions can be accessed from any screen.
- Shortcuts for frequently used functions can be created on the home screen for easy access.
- 3D monitor is incorporated for visualization of robot movement in 3D mode with set parameters and areas.

FEATURES

Improved operability
Accessible from any screen

Customizable
Shortcut registration, user definition screens

3D monitor incorporated
Accessible from any screen

Security function
File editing can be restricted with a password, and use of functions can be restricted with user authority settings

Improved processing speed
Stress-free operability

Secure hardware buttons
Tactile and consistent operation using physical buttons

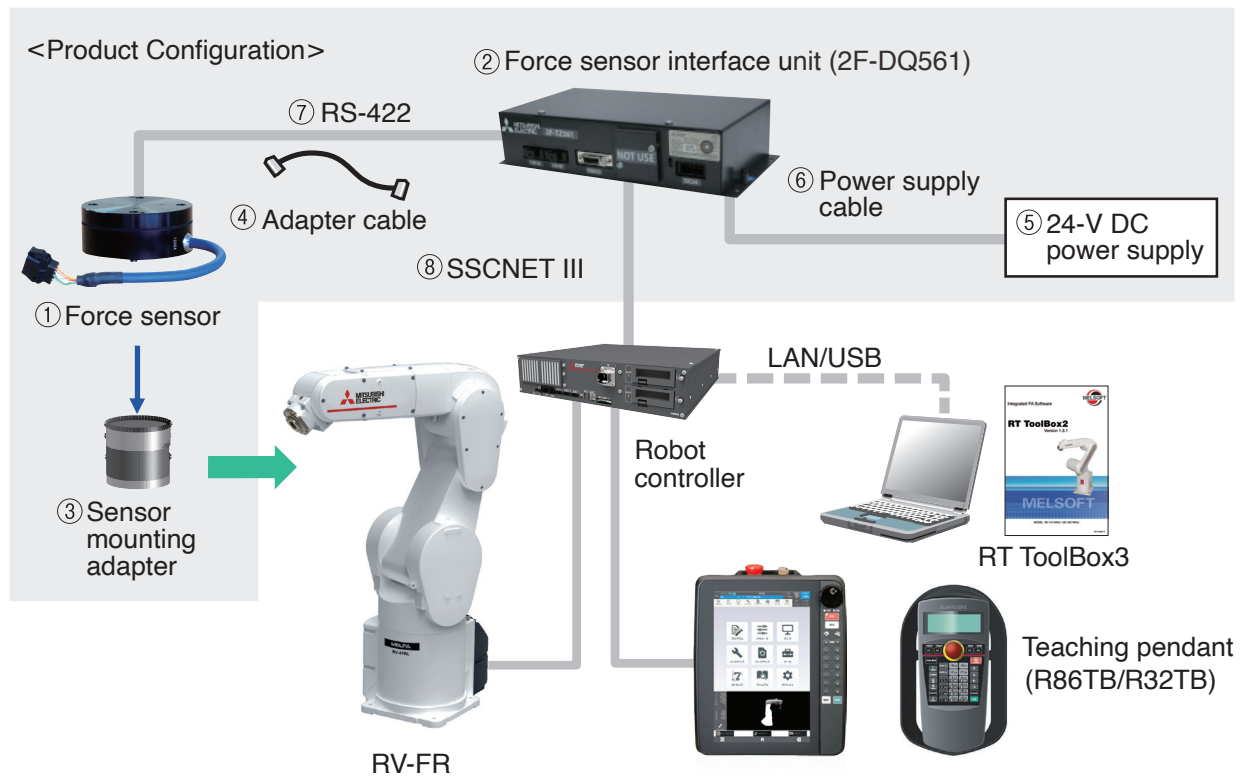
Abundant information on the **10.1"** high-definition display



Built-in RT ToolBox3 Programming Functionality

- Save time on debugging with built-in program support functions, parameter and program screens, and 3D monitoring.
- Programs can be edited using the easy edit function and templates. They support a wide range of users from robot programming beginners to experienced users.
- Visualization of setting areas on the 3D monitor screen, settings of safety logic, monitoring of signals, variables, load conditions, and more features can be utilized with just this one teach pendant.

R86TB Teach Pendant Overview



GT25 HANDY SERIES

Utilizing the GT25 Handy HMI is recommended for customers selecting an ARIA with Machine Tool Tending Base that want to have the ability to store and access preprogrammed software.

In using the GT25 Handy HMI, customers will be able to take advantage of the same functionality one would experience with an ARIA unit incorporating a built-in HMI.


The GT25 Handy Series is a portable handheld graphical operator terminal that is lightweight, compact and has 6.5" high resolution screen with a crisp VGA resolution display. It is perfect for applications that require an operator to provide inputs or check status at multiple points around a machine or robot.

Model Number	Description
GT2506HS-VTBD	(GT Handy HMI 6.5" VGA 640 x 480 dots resolution)
GT16H-CNB-42S	(GT Handy Conversion Box)
GT16H-C30-42P	(GT Handy Ethernet Cable)

KEY BENEFITS:

- **Safe and secure operation** – Multiple safety and security measures protect against unintended operation and operator injury
- **Fast commissioning** – Quickly set up and fine tune parameters
- **Freedom of movement** – Take the HMI around the machine when setting inputs and checking work instructions while observing physical machine changes
- **Removable** – Connect as needed to check detailed machine information
- **Maintenance platform** – The convenient on demand portal allows access to detailed system information and PDF work instructions, ladder monitoring, program backup and restore function.

FEATURES



Keylock switch
Prevent operation without a key or switch between manual and automatic mode operation.

High Resolution Display
VGA 640x480, TFT 65536 colors

Quick Release
Immediately ready for use with easy, fault-free connect and disconnect between connection points or between machines to set up, adjust, or check operation.

Emergency Stop Switch
Quickly and safely stop machine operation in case of emergency.

Enable Switch
A three-position grip switch on the back prevents mistakes and acts as a failsafe in the event the operator becomes unable to perform normal operation.

SD memory card interface
USB interface (host)
USB interface (device)

Lightweight and compact
6.5" screen model

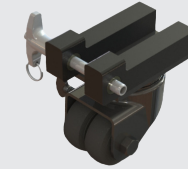
GT25 Handy Series

ADDITIONAL OPTIONS FOR CUSTOMIZATION

CASTERS, CT

Model Number: ARIA-ACC-CT

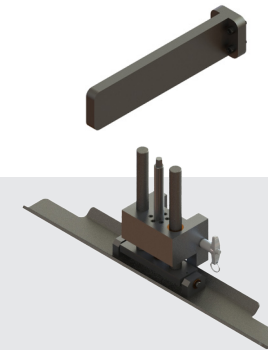
Used to move the ARIA short distances over smooth, even surfaces. Requires another tool to lift the ARIA for installation and removal, such as the Jack, JK. This option includes four casters in total.



OUTRIGGERS, OR

Model Number: ARIA-ACC-OR

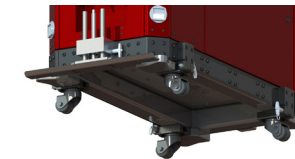
Used to minimize the risk of tipping while moving an ARIA with a larger robot. This option includes three outriggers in total.



JACK, JK

Model Number: ARIA-ACC-JK

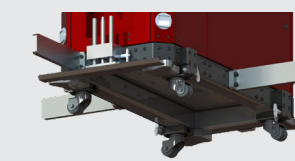
Used to raise and lower the ARIA one side at a time to install and remove Casters, CT.



MOBILITY PACKAGE, MP

Model Number: ARIA-ACC-MP

Package that includes Jack, JK and Casters, CT accessories.



MOBILITY PACKAGE – L, MPL

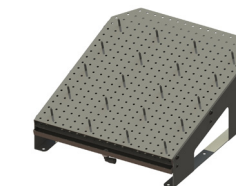
Model Number: ARIA-ACC-MPL

Package that includes Jack, JK, Casters, CT, and Outriggers, OR accessories.

PARTS TRAY, PT

Model Number: ARIA-ACC-PT

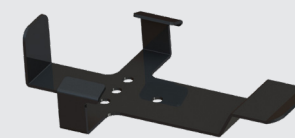
Used to store parts, typically for machine tending, on ARIA applications using a machine tool base. Includes multiple pins to adjust storage to fit different part shapes, and includes a drip pan with drain port to catch oil and debris from parts.



TEACH BRACKET – R56, 56B

Model Number: ARIA-ACC-56B

Used to hold teach pendant R56. Matte black color. Final mounting location depends on the customer.



TEACH BRACKET – R86, 86B

Model Number: ARIA-ACC-86B

Used to hold teach pendant R86. Matte black color. Final mounting location depends on the customer.



Explore Engineered Solutions



LoadMate Plus™ – Pre-engineered robot cells designed to satisfy a variety of applications. Available in a multitude of configurations, LoadMate Plus is ideal for machine tending, pick-and-place, assembly, packaging, and various other automation applications.

Configured Drives – Designed using Mitsubishi Electric components to create standard and custom drive panel systems for HVAC, pump & fan, heavy-duty, or general applications.

Custom Panels – Complete panel systems designed and built to exact specifications for OEMs and systems integrators seeking a single-source solution. Utilizing Mitsubishi Electric's extensive engineering capability and product offering reduces supply chain complexity and assembly time by delivering a complete panel system that is tested and ready for installation.

Customized Products – Custom labeling, packed electromechanical solutions, and parameterization & programming services for OEMs requiring these value-added services.

Software Solutions – Remotely monitor and manage your Mitsubishi Electric controlled CNC machine through our CNC Manager, IMA Adapter, and IMA Mobile software for maximized productivity. Mitsubishi Electric also designs and creates software solutions for OEMs and systems integrators requiring tailored software per a given application requirement.

Americas Offices

<p>US Mitsubishi Electric Automation, Inc. 500 Corporate Woods Parkway Vernon Hills, Illinois 60061 847-478-2100</p>	<p>Canada Mitsubishi Electric Automation, Inc. 4299 14th Avenue Markham, Ontario L3R 0J2 905-754-3805</p>	<p>Mexico Blvd. Miguel de Cervantes Saavedra 301 Col. Ampliación Granada, Miguel Hidalgo CDMX, 11520, México</p>
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e-Factory

e-Factory Alliance

Mitsubishi Electric's e-F@ctory concept utilizes both FA and IT technologies, through collaboration with e-F@ctory Alliance Partners, to reduce the total cost of development, production, and maintenance, with the aim of achieving manufacturing that is a "step ahead of the times".