FACTORY AUTOMATION

# MITSUBISHI ELECTRIC COLLABORATIVE ROBOT MELFA ASSISTA

e-F@ctory

MELFA

assista

# GLOBAL IMPACT OF MITSUBISHI ELECTRIC

Through Mitsubishi Electric's vision, "Changes for the Better" are possible for a brighter future.

## *Changes for the Better*

We bring together the best minds to create the best technologies. At Mitsubishi Electric, we understand that technology is the driving force of change in our lives. By bringing greater comfort to daily life, maximizing the efficiency of businesses and keeping things running across society, we integrate technology and innovation to bring changes for the better.

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 new future of automation made possible by next-generation intelligent robots and e-F@ctory

**e-F@ctory**

## Providing improvements in productivity, quality, environmental protection, safety and security
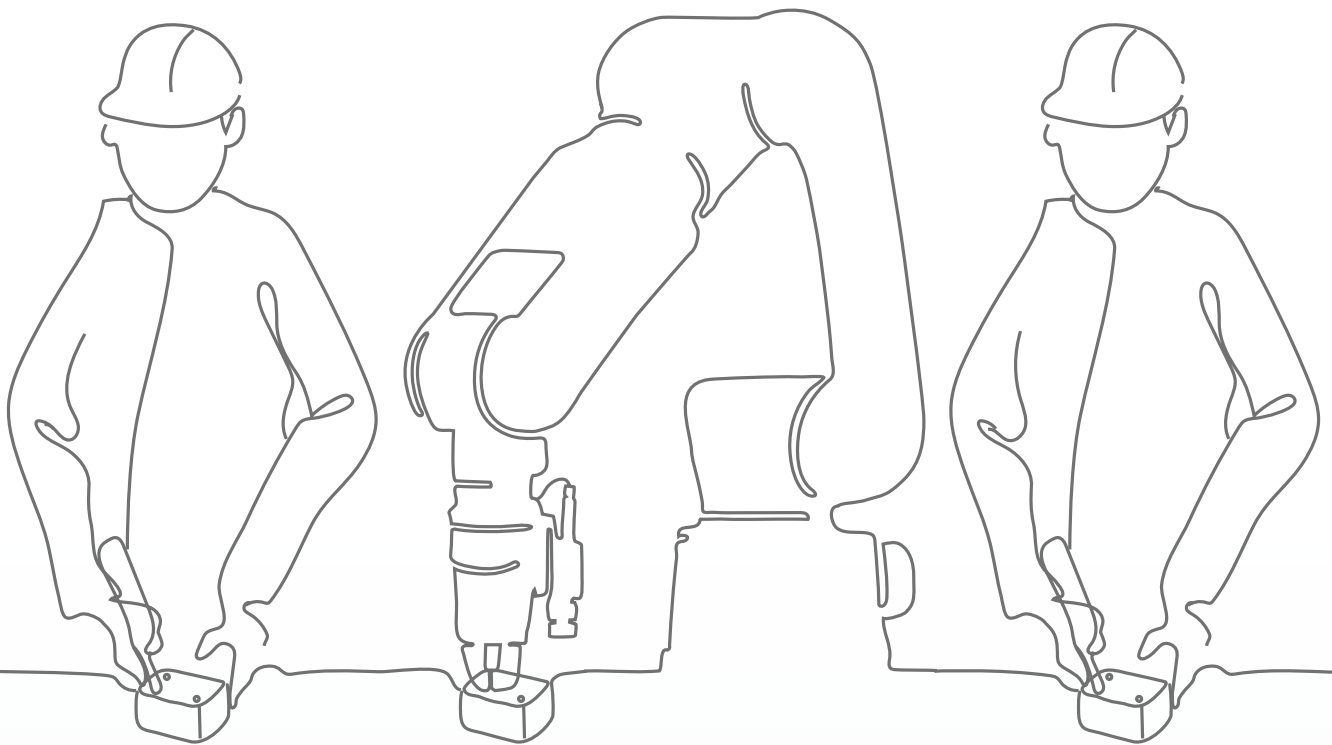## to help reduce companies' TCO* and boost their corporate value

We offer solutions that use FA technology and IT to reduce total costs in everything from development through to production
and maintenance, supporting customers to continuously improve their business operations and achieve truly cutting-edge manufacturing.

*TCO: Total Cost of Ownership

e-F@ctory is Mitsubishi Electric's trademark and registered trademark.



**Seeing: Improvement**
IT systems feed the results of analysis back into the production site

**IT systems**

**Observing: Analysis**
Primary processing of data collected using FA (edge computing)
Seamless integration with IT systems

**Edge computing**

**Watching: Visibility**
Collecting production site data in real time

**Production site**

**Helping to increase corporate value through "Visibility³ (cubed) —seeing, observing, watching" and "Usability"**

e-F@ctory since2003

Supply chain · Procurement · Production · Sales and distribution · Engineering chain · Product design · Process design · Operation and maintenance

ERP · SCM · MES · CAD/CAM · Simulator · SCADA

Data primary processing/ analysis · Data handling

EDGECROSS

Edge Computing Products

CC-Link IE TSN

Sensor · Drive · Programmable Controller · Mechatronics · Energy-saving

Productivity · Quality · Sustainability · Safety · Security

e-F@ctory Alliance

# Integrate.

Mitsubishi Electric Collaborative Robot - ASSISTA

**MELFA**

as**S**ista

# Collaborate.
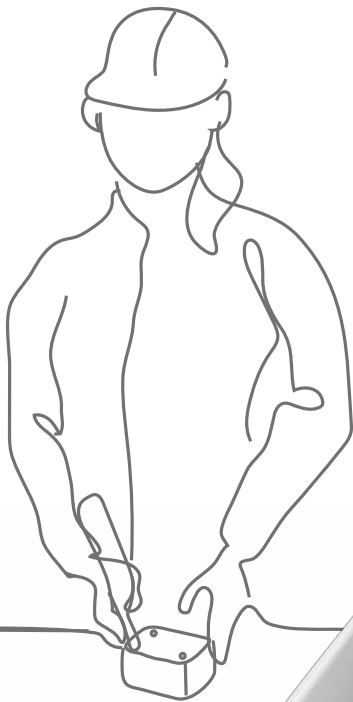
# Simpler and Easier

**MITSUBISHI ELECTRIC**

Mitsubishi Electric Collaborative Robot - MELFA ASSISTA

can share a workspace with humans.

Simpler, Easier and more flexible.

This robot will change your perception of what a "ROBOT" is.

Easy operation with
the Operation button.

## Easy Control

No robot programming expertise required.
# Easy Programming

## MELFA

## assista

Easy connectivity with
a wide variety of components.
# Easy Connecting

# Easy Control

## Move Easily with
## the Operating Buttons

The operating buttons on the robot arm provide you
with easy control for ASSISTA and the teaching pendant
for programming and teaching is no longer needed.
The LED on the robot arm display the status of the robot.

Easy
Programming

Easy
Connecting

Easy
Control

DIRECT
TEACHING    TEACH    HAND

RESET    START    ENABLE
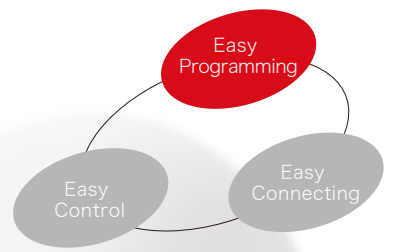LOCK

MITSUBISHI
ELECTRIC

# Easy Program

## No Expertise
## for Robot Required.

You can create programs visually using intuitive operations with RT-Visual-Box. "Visual Programming"
- This software allows operators to simply program this robot with a "train by demonstration" programming interface.  This allows them to move the robot arm position and set way-points easily.
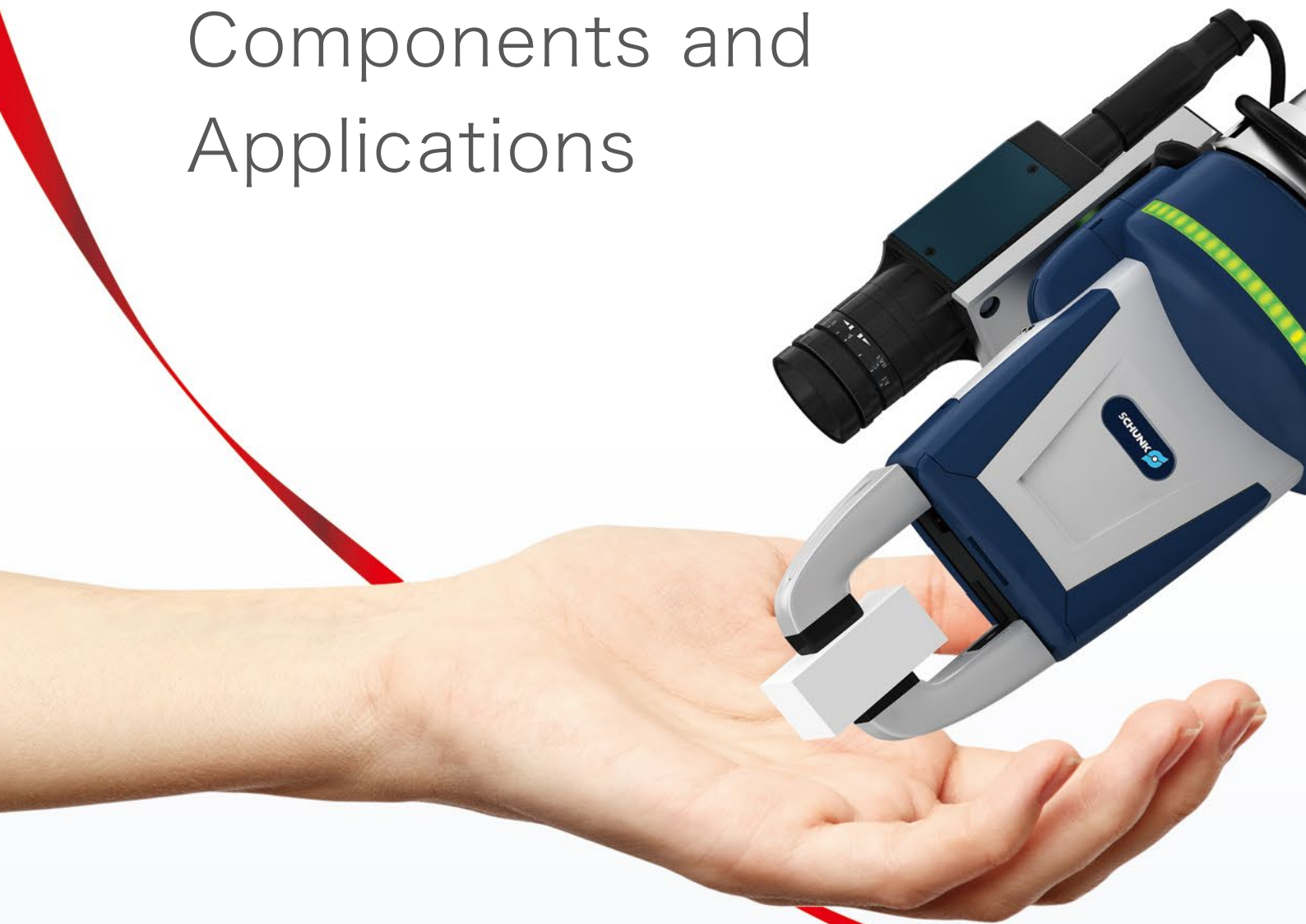
# ming

Help

X: 450.50 Y: 254.77 Z: 195.52
A: 180.00 B: -0.10 C: -144.49

Standard
Speed limit: 250 mm/s

Edit Mode

Speed Ratio — 70 %

st
onitor
nitor
ory

• 002 001

• 007

• 004

• 005

• 003

001
Move

End

002
Move

003
Move

Hand 1

Wait

004
Move

005
Move

006
Move

Hand

W

1s
Wait

1s
Wait

1
Hand

**Command**

Move | Hand | Wait | Signal | Calculate | Vision | Pause

**Flow**

Branch | Repeat

**Library**

Pallet

# Easy Connect
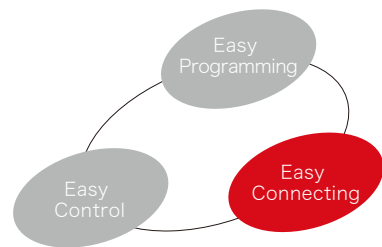
## A Wide Variety of Components and Applications

ASSISTA offers a wide variety of components—Grippers, Fingers, Vision and other peripherals—developed by a group of organizations known as MELFA Robot Partners.
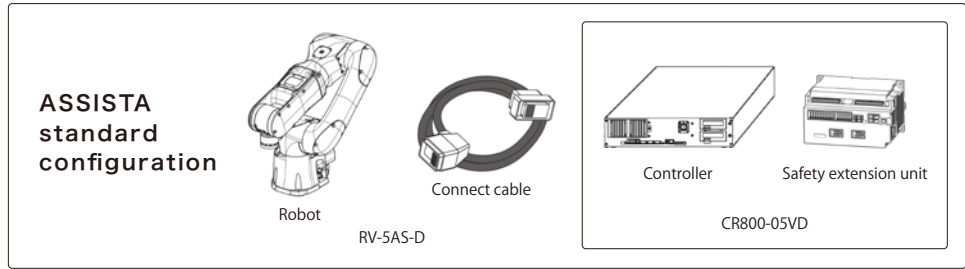These tools can easily be setup and configured for your application. ASSISTA can also be configured to move freely as as part of an AGV/AMR or as a mobile robot.

AGV: Automated Guided Vehicle
AMR: Autonomous Mobile Robot

# ing

Easy
Programming

Easy
Control

Easy
Connecting

MITSUBISHI
ELECTRIC

Fence

Gripper

Sensor

AGV/AMR

e-F@ctory
Alliance

MELFA
ROBOT
PARTNER

Screw Driver

Hand Cart

Vision

Software

# Robot arm

## Standard specifications of RV-5AS-D robot

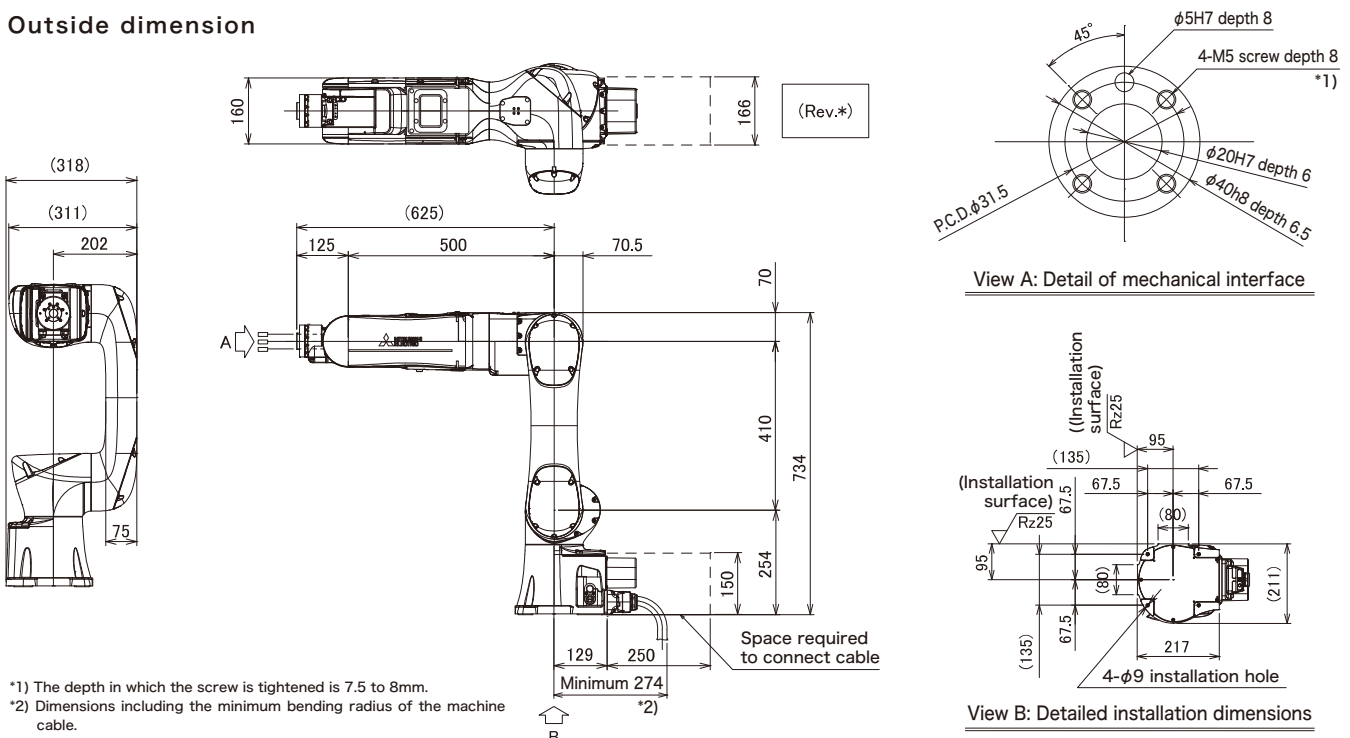| Item | | Unit | Specifications |
|---|---|---|---|
| IP Rate | | | IP54 |
| Degree of freedom | | | 6 |
| Installation posture | | | Floor mounted / ceiling mounted |
| Structure | | | Vertical, multiple-joint type |
| Operating range | Waist (J1) | Degree | ±240 |
| | Shoulder (J2) | | ±148 |
| | Elbow (J3) | | ±150 |
| | Wrist twist (J4) | | ±200 |
| | Wrist pitch (J5) | | ±120 |
| | Wrist roll (J6) | | ±200 |
| Speed of motion Note1) | Waist (J1) | Degree/s | 124 (59.6) |
| | Shoulder (J2) | | 124 (34.0) |
| | Elbow (J3) | | 124 (34.0) |
| | Wrist twist (J4) | | 297 (142) |
| | Wrist pitch (J5) | | 356 (215) |
| | Wrist roll (J6) | | 360 |
| Maximum reach radius | | mm | 910 |
| Maximum resultant velocity Note2) | High-speed operation mode | mm/sec | 1,000 |
| | Collaborative operation mode (Standard operation) | | 250 |
| | Collaborative operation mode (Low-speed operation) | | 50 |
| Load | Rating | kg | 5 |
| | Maximum Note3) | | 5.5 |
| Pose repeatability | | mm | ±0.03 |
| Ambient temperature Note4) | | ℃ | 0 to 40 |
| Mass | | kg | 32 |
| Wiring | Hand I/O | – | Mechanical interface: 2 inputs/4 outputs Forearm: 6 inputs/0 outputs Base: 0 inputs/4 outputs |
| | Force sensor cable/Spare cable | – | 5-conductor (24 V/0.7 A) One of the conductors should be used for the frame ground (FG). |
| | LAN cable | – | Cat-5e supported |
| Plumbing | Primary hoses | – | Φ6 × 2 |
| | Secondary hoses | – | Φ4 × 4 From the base of the robot to the elbow. |
| Supply pressure | | MPa | 0.54 |

Note1) Values in parentheses indicate the maximum speed when the input voltage is single-phase 100 to 120 VAC.
Note2) These values represent the maximum overall speed of all axes combined. The safety functions limit the robot to the speeds shown in the table. For accurate collision force data when the robot is in Collaborative operation mode, measure collision forces under actual operating conditions.
Note3) Allowable load when the mechanical interface faces downward at an inclination within ±10° to the vertical direction.
Note4) Sets the robot's operating environmental temperature as parameter OLTMX. The initial value is 30 (℃). Corresponding to the environment, the continuous control action performance and the overload-protection function are optimized.

## Outside dimension



(Rev.*)

View A: Detail of mechanical interface

Space required to connect cable

View B: Detailed installation dimensions

*1) The depth in which the screw is tightened is 7.5 to 8mm.
*2) Dimensions including the minimum bending radius of the machine cable.
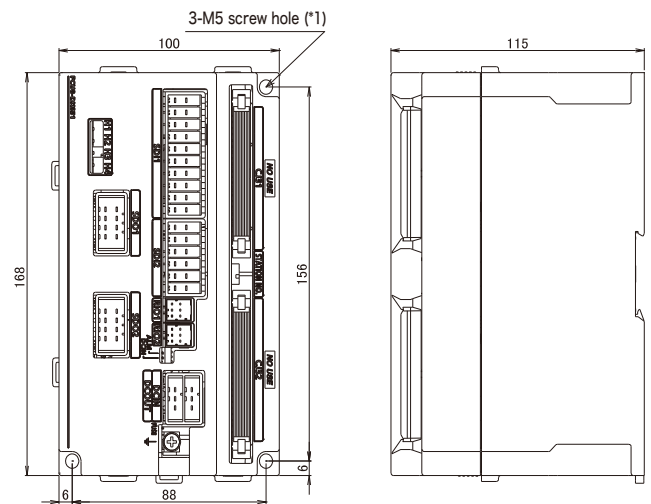
## CR800-05VD controller specifications of controller

| | Item | Unit | Specification | Remarks |
|---|---|---|---|---|
| Number of control axis | | – | Simultaneously 6 | – |
| Memory capacity | Programmed positions | point | 39,000 | Number of program blocks when using RT VisualBox: 2000 (vision sensor not used), 1800 (vision sensor used) Number of programs: 505 (vision sensor not used), less than 500 (vision sensor used) Note1) |
| | No. of steps | step | 78,000 | |
| | Number of program | – | 512 | |
| Robot language | | – | MELFA-BASIC VI | – |
| Teaching method | | – | Pose teaching method, MDI method | – |
| External input and output | Input/output | point | 0/0 | Max. 64/64 by option |
| | Dedicated input/output | – | Assigned with general-purpose input/output | The signal number of "STOP" input signals is fixing. |
| | Emergency stop input Note2) | point | 1 (duplicated) | |
| | Emergency stop output | point | 1 (duplicated) | |
| | Mode selector switch input Note3) | point | 1 (duplicated) | |
| | Mode output | point | 1 (duplicated) | |
| | Robot error output | point | 1 (duplicated) | |
| | Door switch input | point | 1 (duplicated) | |
| | Encoder input | Channel | 2 | – |
| Safety I/O | | point | 8 (duplicated) / 4 (duplicated) | Safety extension unit |
| Interface | Force sensor interface | Channel | 1 | – |
| | Remote input/output | Channel | 1 | For connection to the Safety extension unit. |
| | USB | port | 1 | Ver. 2.0 HighSpeed device functions only. USB mini-B |
| | Ethernet | port | 1 | For customer: 1000BASE-T/100BASE-TX/10BASE-T |
| | | | 1 | Dedicated T/B port: 100BASE-TX/10BASE-T |
| | Option slot | slot | 2 | For option interface |
| | SD memory card slot | slot | 1 | For extended memory |
| | RS-422 | port | 1 | Dedicated T/B port |
| Power source | Input voltage rang | V | Single phase AC 100 to 120 Single phase AC 200 to 230 | The rate of power-supply voltage fluctuation is within 10%. |
| | Power capacity | kVA | 1.0 | Does not include rush current. Note4) |
| | Power supply frequency | Hz | 50/60 | – |
| Outline dimensions | | mm | 430(W) x 425(D) x 99.5(H) | Excluding protrusions |
| Mass | | kg | Approx.12.5 | – |
| IP Rate | | | IP20 | |
| Ambient temperature | | ℃ | 0 to 40 | Without freeze |
| Ambient humidity | | %RH | 45 to 85 | Without dew drops |
| Grounding | | Ω | 100 or less | Class D Grounding Note5) |
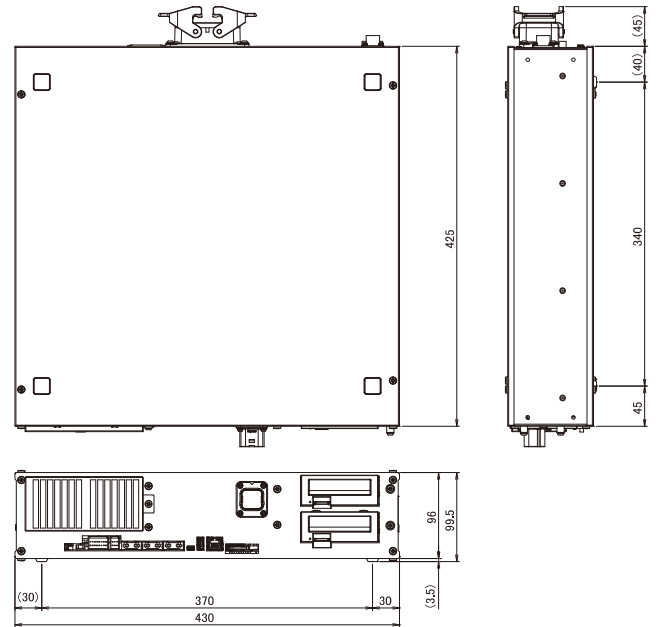
Note1) The maximum number of usable programs differs depending on the number of types of workpieces that are registered.
Note2) Only the STO function can meet the requirements of Category 4, Performance Level e. At factory settings, the STO function meets the requirements of Category 3, Performance Level d. To make the STO function meet the requirements of Category 4, Performance Level e, change the parameter setting.
Note3) Provide a mode selector switch to change the mode (MANUAL/AUTOMATIC) of the controller.
Note4) The power capacity is the recommended value. The power capacity does not include the rush current when the power is turned ON. The power capacity is a guideline and the actual operation is affected by the input power voltage.
Note5) The robot must be grounded by the customer.

## Safety extension unit

| | Item | | Description | Remarks |
|---|---|---|---|---|
| Safety function | STO function | | The function electrically shuts off the driving energy to the motor of the robot arm. | IEC 60204-1 Corresponds to stop category 0 |
| | SS1 function | | The function to control and decelerate the motor speeds of the robot. After stopping, the robot transitions to the STO state. | IEC 60204-1 Corresponds to stop category 1 |
| | SS2 function | | The function to control and decelerate the motor speeds of the robot. After stopping, the robot transitions to the SOS state. | IEC 60204-1 Corresponds to stop category 2 |
| | SOS function | | Without shutting off the driving energy to the motors, this function monitors the robot so that it stays at rest. | When SOS, SLS, SLP, and STR detect error, activate SS1. EN 61800-5-2 compliant |
| | SLS function | | This is a function to monitor each part of the robot arm so that their speeds do not exceed monitoring speeds. | |
| | SLP function | | The function monitors specified monitoring positions so that they do not go across position monitoring planes. | |
| | STR function | | This function ensures that the torque limits of each motor in the robot are not exceeded. | |
| Safety performance | Standard | | EN ISO 10218-1: 2011 ISO/TS 15066: 2016 EN ISO 13849-1: 2015 IEC 61800-5-1: 2007 EN 61800-5-2: 2017 EN 61000-6-7: 2015 EN 61326-3-1: 2017 IEC 61508-1: 2010 IEC 61508-2: 2010 IEC 61508-3: 2010 EN 62061: 2005/A2: 2015 IEC 62061: 2005/AMD1: 2012/AMD2: 2015 | – |
| | Performance | STO | SIL2, PLd/Category 3 (at factory settings) SIL3, PLe/Category 4 (with changes to parameters) | – |
| | | SS1,SOS,SS2, SLS,SLP, STR | SIL 2, PLd/Category 3 | – |
| | Dangerous failure rate | STO | PFH = $1.40×10^{-8}$ [1/h] | – |
| | | SS1,SS2,SOS | PFH = $3.42×10^{-7}$ [1/h] | – |
| | | SLS | PFH = $3.42×10^{-7}$ [1/h] | – |
| | | SLP | PFH = $3.42×10^{-7}$ [1/h] | – |
| | | STR | PFH = $3.62×10^{-7}$ [1/h] | – |
| Safety extension unit | Power supply specifications | Voltage | 24 V DC±5% Ripple 0.2 V (P-P) | Supplied by customer |
| | | Maximum consumption current | 300 mA | – |
| | IP Rate | | IP20 | – |
| | Weight | | 0.8kg | – |
| | Environment | Operating temperature range | 0 to 40°C | It must be kept away from heat appliances and other heat sources. |
| | | Relative humidity | 45 to 75% | Without drew drop |
| | Input signal | | 8 routes (duplicated signal) | |
| | Output signal | | 4 routes (duplicated signal) | |



3-M5 screw hole (*1)

## The list of robot option equipment

| Item | Type | Description |
|---|---|---|
| Machine cable (replacement) | 1F-□□UCBL-41 | " □□ " in type shows the length of the cables as follows. 02=2 m, 10=10 m (Changed from the original length of 5 m) |
| Solenoid valve set | 1F-VD0□-01(Sink) <br> 1F-VD0□E-01(Source) | Sets with one or two valves are available. Φ4 diameter output hoses The number that replaces "□" indicates the number of valves the solenoid has (1 or 2). |
| 2-piece force sensor conversion cable set | 1F-ASSISTA-ADCBL | 2-piece force sensor conversion cable set (hand cable/base cable) required to connect the force sensor to the robot. |
| Vision sensor mounting bracket | 1F-ASSISTA-2DVSFLG | Bracket required to connect a vision sensor to the hand. |

## The list of the controller option equipment and special specification

| Item | Type | Description |
|---|---|---|
| Easy-setup kit | 4F-ASSISTASETUP-JP (for Japan/NorthAmerica) <br> 4F-ASSISTASETUP-EU (for Europe/China) | A kit which aids setup that consists of switches, a connector cable, and a 24 V power supply. |
| RT VisualBox | 3G-30C-WINE | Windows 10 Supporting English. |
| RT ToolBox3 | 3F-14C-WINE | Windows 7, Windows 8, Windows 8.1, Windows 10 Supporting English. (With the simulation function) Ver.1.70Y or later |
| RT ToolBox3 mini | 3F-15C-WINE | Windows 7, Windows 8, Windows 8.1, Windows 10 Supporting English. Ver.1.70Y or later |
| Simple teaching pendant | R32TB/R32TB-15 | Cable length 7m, Cable length 15m |
| Highly efficient teaching pendant | R56TB/R56TB-15 | Cable length 7m, Cable length 15m |
| Parallel I/O Interface | 2D-TZ368(Sink type) <br> 2D-TZ378(Source type) | DO: 32 point <br> DI: 32 point |
| External I/O cable (For Parallel I/O Interface) | 2D-CBL05 | CBL05:5m, CBL15：15m　Use to connect the external peripheral device to the parallel input/output interface. |
| CC-Link interface *1 | 2D-TZ576 | Only intelligent device station, Local station. |
| Network base card (EtherNet/IP interface) *1 | 2D-TZ535 | Communication interface for mounting the Anybus CompactCom module manufactured by HMS. The customer needs to prepare the EtherNet/IP module (AB6314) manufactured by HMS. |
| Network base card (PROFINET interface) *1 | 2D-TZ535-PN | Communication interface for mounting the Anybus CompactCom module manufactured by HMS. The customer needs to prepare the PROFINET IO module (AB6489-B) manufactured by HMS. |
| Network base card (CC-Link IE Field interface) *1 | 2F-DQ535 | Communication interface for mounting the Anybus CompactCom module manufactured by HMS. The customer needs to prepare the CC-Link IE Field module (AB6709) manufactured by HMS. |
| Network base card (EtherCAT interface) *1 | 2F-DQ535-EC | Communication interface for mounting the Anybus CompactCom module manufactured by HMS. The customer needs to prepare the EtherCAT module (AB6607) manufactured by HMS. |
| SD memory card *1 | 2F-2GBSD | Memory card capacity 2GB. |

*1 Not supported by RT VisualBox.

## The list of function extension device

| Item | Type name | Specifications |
|---|---|---|
| Force sensor set *1 | 4F-FS002H-W200 | A set of devices necessary for force sense control function, such as a force sensor, an interface unit, and support software. |

*1 Not supported by RT VisualBox.

## ASSISTA Startup Configuration



**MELFA ASSISTA** + **Options RT VisualBox** + **Options Easy-setup kit**

# Memo

# Memo

# YOUR SOLUTION PARTNER
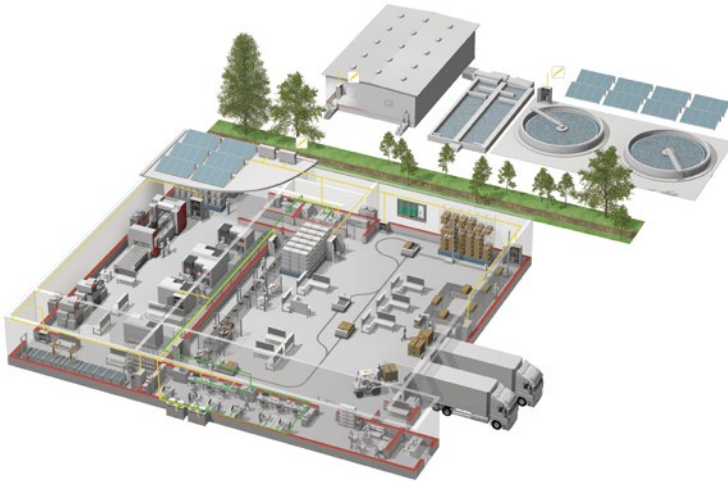


Mitsubishi Electric offers a wide range of automation equipment from PLCs and HMIs to CNC and EDM machines.


Low voltage: MCCB, MCB, ACB


Medium voltage: VCB, VCC


Power monitoring, energy management


Compact and Modular Controllers


Inverters, Servos and Motors


Visualisation: HMIs


Numerical Control (NC)


Industrial / Collaborative Robots


Processing machines: EDM, Lasers, IDS


Transformers, Air conditioning, Photovoltaic systems

## A NAME TO TRUST

Since its beginnings in 1870, some 45 companies use the Mitsubishi name, covering a spectrum of finance, commerce and industry.

The Mitsubishi brand name is recognized around the world as a symbol of premium quality.

Mitsubishi Electric Corporation is active in space development, transportation, semi-conductors, energy systems, communications and information processing, audio visual equipment and home electronics, building and energy management and automation systems, and has 237 factories and laboratories worldwide in over 121 countries.

This is why you can rely on Mitsubishi Electric automation solution - because we know first hand about the need for reliable, efficient, easy-to-use automation and control in our own factories.

As one of the world's leading companies with a global turnover of over 4 trillion Yen (over $40 billion), employing over 100,000 people, Mitsubishi Electric has the resource and the commitment to deliver the ultimate in service and support as well as the best products.

* Not all products are available in all countries.

# Global Partner. Local Friend.

Mitsubishi Electric Corporation Nagoya Works is
a factory certified for ISO 14001
(standards for environmental management systems)

ISO 14001
JACO
JAPAN AUDIT AND CERTIFICATION ORGANIZATION FOR ENVIRONMENT AND QUALITY
EC 98 J 2017

UKAS
MANAGEMENT
SYSTEMS
0051

**MITSUBISHI ELECTRIC CORPORATION** HEAD OFFICE: TOKYO BLDG., 2-7-3 MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN