Motor circuit breakers

Debut!

Motor circuit breakers

MMP-T Series

MITSUBISHI ELECTRIC
Changes for the Better

Motor circuit breakers

Safety Warning
To ensure proper use of the products listed in this catalog, please be sure to read the instruction manual prior to use.

Mitsubishi Electric Corporation Nagoya Works is a factory certified for ISO14001 (standards for environmental management systems) and ISO9001 (standards for quality assurance management systems).

MITSUBISHI ELECTRIC CORPORATION
HEAD OFFICE: TOKYO, 105-8051, JAPAN
www.mitsubishelectric.co.jp/motorbreakers
Bring a breath of fresh air into a Motor Control Circuit!

With Mitsubishi Electric’s range of smart Motor circuit breakers!

**MMP-T series**

- Customers’ Needs
- Outline of Motor circuit breakers
  - What is a Motor circuit breaker?
  - What is the role of a Motor circuit breaker?
  - Why is a Motor circuit breaker required at this time?
- Advantages of Adopting Motor circuit breakers
- Specifications
- Optional Unit
- Outline Drawing
- UL Standard and SCCR
- About Warranty
- Information of Our FA-related Products
Do there requirements sound familiar?

The new MMP-T Series can help you solve there issues.

Desire to down-size the machine control panels

Desire to increase wiring efficiency

Desire to meet global demands

Down-sizing small
Wiring reduction smart wiring
Safety & Quality safety & Quality
Worldwide coverage standard

Global
What is a Motor circuit breaker?

A Motor circuit breaker is a device integrating Low voltage circuit breakers and Thermal Overload Relays functions. This device is capable of protecting the motor branch circuits from overload, phase-loss, and short-circuit alone. It enable even more secure wiring and motor protection.

<table>
<thead>
<tr>
<th>Basic type</th>
<th>MMP-T32</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated current (A)</td>
<td>0.16 to 32 (15 types)</td>
</tr>
<tr>
<td>Rated short-circuit breaking capacity (kA)</td>
<td></td>
</tr>
<tr>
<td>240V</td>
<td>100</td>
</tr>
<tr>
<td>415V</td>
<td>50</td>
</tr>
<tr>
<td>Outside dimension (mm) W x H x D</td>
<td>45 x 96 x 76</td>
</tr>
</tbody>
</table>

What is the role of a Motor circuit breaker in a motor circuit?

The motor circuit requires various roles, including disconnection, circuit on/off switching, short-circuit protection, device protection, motor control, and overload protection. A motor circuit consisting of a Low voltage circuit breakers, Magnetic Contactor, and Thermal Overload Relays is typically adopted and each of the devices has its own independent role. On the other hand, in a motor circuit consisting of a Motor circuit breaker and an Magnetic Contactor, only motor control is provided by the Magnetic Contactor and other functions are provided by the Motor circuit breaker.

Conventional method

- Low voltage circuit breakers
- Magnetic Contactor
- Thermal Overload Relays

A method using Motor circuit breaker

- Motor circuit breaker

Integration of Low voltage circuit breakers and Thermal Overload Relays functions

Motor circuit breaker

(Released at the same time, New MS-T Series)

Disconnection

Circuit on/off switching

Short-circuit protection

Device protection

Motor control

Overload protection

Applicable to motor circuit requirements other than motor control

When you use a Motor circuit breaker, then...

Disconnection

Circuit on/off switching

Short-circuit protection

Device protection

Motor control

Overload protection

Applicable to motor circuit requirements other than motor control

(Released at the same time, New MS-T Series)
Why is a Motor circuit breaker required at this time?

When exporting products to foreign countries including the U.S.A. and European countries, not only the device component but also the motor circuit are required to comply with the standards of the respective countries including UL and EN standards. The electric wires and devices that make up the motor control circuit (Low Voltage Circuit Breakers, Fuse, Magnetic Contactor, Thermal Overload Relays) must be protected under a short-circuit condition. In addition, we need to select each device considering their functions and characteristics. Thus, we have encountered difficulties in realizing the reliable circuit protection at times.

The device to reduce such burden is our “Motor circuit breaker”. Undertaking multiple protection roles stated above, the Motor circuit breaker can not only protect electric wires and load devices from short-circuit accident but also simplify motor circuit combination. In addition, in North America, a control panel shall be marked with SCCR (short-circuit current rating), but even high SCCR that cannot be covered by the combination of Low voltage circuit breakers and Magnetic motor starters can be covered by the use of a Motor circuit breaker.

Having these advantages tends to increase demand for “Motor circuit breakers”.

In case of application in North America

General motor circuits have many devices to be combined and are complicated.

Combination of Motor circuit breaker and option enables wiring reduction and space saving. This allows us to respond to the needs of down-sizing the control panel, which increases the demand for Motor circuit breakers. (For details about wiring reduction & space saving, please refer to the next section.)

In order to connect motor circuit breaker and magnetic contactor, please use the connection conductor unit.

Wiring reduction & Space saving

Combination of Motor circuit breaker and option enables wiring reduction and space saving. This allows us to respond to the needs of down-sizing the control panel, which increases the demand for Motor circuit breakers. (For details about wiring reduction & space saving, please refer to the next section.)

Space-saving design has realized down-sizing of the control panel.

Space saving-applied example

Conventional method

A method in which a Motor circuit breaker is used
Advantages of Adopting This Device

Wiring reduction

smart wiring

Wiring streamlining terminal

1. Using a wiring streamlining terminal facilitates the wiring!

Wiring reduction-applied example

Both common electric wire-used wiring and unit-used wiring are available! Using the unit facilitates combination with respective devices. In addition, the terminal connected to control terminal of magnetic contactor arranged at the front also facilitates the wiring, thus contributing to improvement of production.

Safety & Quality

Safe and reliable MMP-T32

As with the combination of Low voltage circuit breakers, Magnetic Contactor, and Thermal Overload Relays, the combination of Motor circuit breaker and Magnetic Contactor can prevent secondary disasters.

Global standard

Acquisition of main international standards can support customers' overseas business.

- Certification to various major international standards
- Not only major international standards such as IEC, JIS, UL, CE, and CCC but also other national standards are certified. This will help our customers expand their business in foreign countries. This will help our customers expand their business in foreign countries.
- UL60947-4-1A Type E/F is also covered.

Both common electric wire-used wiring and unit-used wiring are available! Using the unit facilitates combination with respective devices. In addition, the terminal connected to control terminal of magnetic contactor arranged at the front also facilitates the wiring, thus contributing to improvement of production.
Specifications

Key points

- Integrated finger protection provides convenient safety.
- A round solderless terminal is applicable.
- The compact breaker design also allows Auxiliary contact unit (AX) and alarm contact unit (AL).
- Optional short-circuit indicator unit can be added speeding up fault diagnosis.
- Breaker type operating handle with off-lock hole.

Frame A

<table>
<thead>
<tr>
<th>Type name</th>
<th>MMP-T32</th>
<th>MMP-T32BC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>JIS C8201-2.1 Ann.1, IEC60947-4-1, E60947-4-1, IEC60947-2, IEC60947-4-1, GB14048.2</td>
<td></td>
</tr>
<tr>
<td>Number of poles</td>
<td>³</td>
<td>³</td>
</tr>
<tr>
<td>Handle shape</td>
<td>Tumbler handle</td>
<td></td>
</tr>
<tr>
<td>Rated current In [A]</td>
<td>0.1 to 32</td>
<td>0.1 to 32</td>
</tr>
<tr>
<td>Rated operational voltage Ue [V]</td>
<td>200 to 690</td>
<td></td>
</tr>
<tr>
<td>Rated impulse withstand voltage Uimp [kV]</td>
<td>50/60</td>
<td></td>
</tr>
<tr>
<td>Rated insulation voltage Ui [V]</td>
<td>690</td>
<td></td>
</tr>
</tbody>
</table>

Frame B

| Rated current In [A] | 0.16 - 0.32 | 0.32 - 0.63 | 0.63 - 1.0 | 1.0 - 1.6 | 1.6 - 2.5 | 2.5 - 4 | 4 - 6.3 | 6.3 - 10 | 10 - 15 | 15 - 18 | 18 - 25 | 25 - 32 | 32 - 40 | 40 - 50 | 50 - 63 | 63 - 80 | 80 - 100 | 100 - 130 | 130 - 160 | 160 - 200 | 200 - 250 | 250 - 320 | 320 - 500 | 500 - 800 | 800 - 1000 | 1000 - 1500 | 1500 - 2000 | 2000 - 2500 | 2500 - 3200 | 3200 - 5000 | 5000 - 8000 | 8000 - 10000 |
|---------------------|-------------|-------------|-------------|-----------|-----------|---------|---------|----------|--------|---------|--------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| JIS C8201-4-1 Ann.1 | 100         | 100         | 100         | 100       | 100       | 100     | 100     | 100      | 100    | 100     | 100    | 100     | 100     | 100     | 100     | 100     | 100     | 100     |
| IEC60947-4-1        | 100         | 100         | 100         | 100       | 100       | 100     | 100     | 100      | 100    | 100     | 100    | 100     | 100     | 100     | 100     | 100     | 100     | 100     |

Wiring-supporting BC terminal (Option)

Adjustment dial settable to full load current

Test trip function

45mm

Applicable Standards

- International Standards
  IEC60947-2, EN60947-1, IEC60947-4-1
  UL approval CE, CCC
- Domestic Standards in Japan
  JIS C8201-2.1 Ann.1, 8201-4-1
  Electric Applicable Safety Law
  (Electric articles other than specified)

How to Order

Auxiliary contact unit
- Type name: UT-MAX
- Contact arrangement: 1a

Alarm contact unit
- Type name: UT-MAL
- Contact arrangement: 1b

Short-circuit indicator unit
- Type name: UT-TU

How to Order the Options

Auxiliary contact unit
- Type name: UT-MAX
- Contact arrangement: 1a

Alarm contact unit
- Type name: UT-MAL
- Contact arrangement: 1b

Short-circuit indicator unit
- Type name: UT-TU

Frame A

<table>
<thead>
<tr>
<th>JIS C8201-2.1 Ann.1</th>
<th>947-4-1</th>
<th>GB14048.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>UT-MAX</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>UT-MAL</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>UT-TU</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Frame B

<table>
<thead>
<tr>
<th>JIS C8201-2.1 Ann.1</th>
<th>947-4-1</th>
<th>GB14048.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>UT-MAX</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>UT-MAL</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>UT-TU</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>
Specifications

Usage Environment

1. Ambient temperature: -10°C to 40°C (Applied to the outside of the control panel)
   Average daily atmospheric temperature: 35°C (Max.), Average yearly atmospheric temperature: 25°C (Max.)
2. Maximum temperature of the inside of the control panel: 85°C (Yearly average temperature of the inside of the control panel should be 40°C or less.)
3. Ambient temperature: 45% to 85%RH (for subtle load) However, dew condensation and freezing should be avoided.
4. Height above sea level: 2000m or less
5. Vibration: 10 to 55Hz, 19.6m/s² or less
6. Impact: 49m/s² or less
7. Atmosphere: Inclusion of dust, smoke, corrosive gas, moisture, salt content and the like in the atmosphere should be avoided as much as possible.
   Please note that continuing to use the device in a closed condition for a long period may cause contact failure. Never use the device under an atmosphere that contains flammable gas.
8. Storage temperature/Relative humidity: -30°C to 65°C 45% to 85%RH However, dew condensation and freezing should be avoided.
   The storage temperature is ambient temperature during transportation or storage and should be within the usage temperature when starting to use the device.

* As for handling, temperature adjustment, and closely-attached installation, please read the Instruction Manual.

Operating Characteristic Curve

<table>
<thead>
<tr>
<th>Operating time (s)</th>
<th>Multiple of rated current (%)</th>
<th>Operating model</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.01</td>
<td>0</td>
<td>0.01</td>
</tr>
<tr>
<td>0.1</td>
<td>0.01</td>
<td>0.1</td>
</tr>
<tr>
<td>1</td>
<td>0.1</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>100</td>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>1000</td>
<td>100</td>
<td>1000</td>
</tr>
<tr>
<td>10000</td>
<td>1000</td>
<td>10000</td>
</tr>
</tbody>
</table>

List of Options

<table>
<thead>
<tr>
<th>Number</th>
<th>Product name</th>
<th>Model</th>
<th>Specification</th>
<th>Applied model</th>
</tr>
</thead>
<tbody>
<tr>
<td>①</td>
<td>Auxiliary contact unit (to be internally installed)</td>
<td>UT-MAX</td>
<td>1a</td>
<td>Contact of the unit operates in conjunction with ON/OFF operation of MMP-T32.</td>
</tr>
<tr>
<td>②</td>
<td>Alarm contact unit (to be internally installed)</td>
<td>UT-MAL</td>
<td>1a</td>
<td>Contact of the unit operates in conjunction with the trip operation of MMP-T32.</td>
</tr>
<tr>
<td>③</td>
<td>3-phase feed-in terminal</td>
<td>UT-MT32</td>
<td>1a</td>
<td>MMP-T32</td>
</tr>
<tr>
<td>④</td>
<td>Bus bar</td>
<td>UT-CU3</td>
<td>45mm</td>
<td>A unit to connect the large size electric wire to MMP-T32.</td>
</tr>
<tr>
<td>⑤</td>
<td>Line side terminal adapter kit</td>
<td>UT-MT20</td>
<td>45mm</td>
<td>A unit to supply power to two or three MMP-T32.</td>
</tr>
<tr>
<td>⑥</td>
<td>Short-circuit indicator unit</td>
<td>UT-MT32</td>
<td>45mm</td>
<td>A unit to connect and link the MMP-T32 and Magnetic Contactor electrically and mechanically.</td>
</tr>
<tr>
<td>⑦</td>
<td>Connection conductor unit</td>
<td>UT-MT32</td>
<td>45mm</td>
<td>A plate to install the combination starter with MMP-T32 and Magnetic Contactor combined. Rail mounting and screw mounting are available.</td>
</tr>
<tr>
<td>⑧</td>
<td>Mounting base unit</td>
<td>UT-MT32</td>
<td>45mm</td>
<td>A set of the blocks for mechanically connecting two mounting base units.</td>
</tr>
</tbody>
</table>

Option combination Diagram

1. Auxiliary contact unit
2. Alarm contact unit
3. 3-phase feed-in terminal
4. Bus bar
5. Line side terminal adapter kit
6. Short-circuit indicator unit
7. Connection conductor unit
8. Mounting base unit
9. Jointing block unit
10. Option combination Diagram
MOTOR CIRCUIT BREAKERS

Outline Drawing

**MMP-T32 + UT-MAX(LL)/UT-MAL(LL)**
(Unit: mm)

*The diagram above shows two UT-MAX(LL) and/or UT-MAL(LL) in mounted condition. The outline dimensions of UT-MAX(LL) and UT-MAL(LL) are the same.*

**MMP-T32 + UT-EP3**
(Unit: mm)

**MMP-T32×2 + UT-2B4/UT-2B5**
(Unit: mm)

**MMP-T32×3 + UT-3B4/UT-3B5**
(Unit: mm)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>UT-2B4</td>
<td>100</td>
<td>82</td>
<td>35</td>
</tr>
<tr>
<td>UT-2B5</td>
<td>110</td>
<td>92</td>
<td>57</td>
</tr>
</tbody>
</table>

* UT-2B4/UT-2B5
* UT-3B4/UT-3B5

Self-lifting

M3.5 screws

MMP-T32

UT-MAX(LL)/UT-MAL(LL)

UT-EP3

UT-2B4/UT-2B5

UT-3B4/UT-3B5

MMP-T32
MOTOR CIRCUIT BREAKERS

Outline Drawing

MMP-T32 + UT-CV3 + UT-TU

(Unit: mm)

MMP-T32 + UT-MT□ + UT-BT□ + S-T□

(Unit: mm)

MMP-T32 + UT-MT□ + UT-BT□ + S-2×T□ + UT-RT□

(Unit: mm)

Dimension A B C Table (Unit: mm)
UT-BT20 163 106 116
UT-BT32 167 104 120
S-T10/T12/T20
S-T32
UT-RT10 91 46 116
UT-RT20 99 54 116
S-2×T10
S-2×T12/T20
S-2×T32

Top Hat Rail (35mm)

Installation holes for 3-M4 screw

M4×20 screw

Top Hat Rail (35mm)

The height of rail is 15mm
Configurations using Motor circuit breakers

Type E applicable circuit

Type E/F configuration

On basic configuration circuit of NEC (National Electric Code) and application to Motor circuit breaker

The Clause 430 of NEC (National Electric Code) regulates the basic configuration of an electric motor protection circuit to be as shown in the following figure. UL standards define several motor circuit configurations, and among them you find Type E and Type F using a Motor circuit breaker. A Mitsubishi Motor circuit breaker can be used for path disconnecting, motor control and protection from overload as a single unit, but can also be used as Type E in combination with specific options, and as Type F in combination with Magnetic Contactors. By using a Motor circuit breaker to conform to the motor circuit configuration defined by UL, you can reduce the number of applicable devices against NEC basic circuit configuration, and further enhance the value of SCCR. The following figure. UL standards define several motor circuit configurations, and among them you find Type E and Type F using a Motor circuit breaker, General motor circuits have many devices to be combined and are complicated.

UL60947-4-1A and Type E

General motor circuits have many devices to be combined and are complicated. Application of a Motor circuit breaker can integrate the role of path disconnection, motor control and motor overload protection, to make the circuit simple. In addition, using the line side terminal adapter kit and short-circuit indicator unit enables the Type E/F circuit configuration and also enables branch circuit protection in addition to the protection functions of 

UL60947-4-1A Type E/F Selection List

Since Type E can be used as BCP, it can be used in place of upper class BCP. Therefore you will have a further merit of reducing the number of breakers.

UL60947-4-1A and Type F

A device of Type E, fuse or UL 489 Listed Circuit Breakers) in combination with Magnetic Contactors. The general motor circuits have many devices to be combined and are complicated. In addition, using the line side terminal adapter kit and short-circuit indicator unit enables the Type E/F circuit configuration and also enables branch circuit protection in addition to the protection functions of 

UL60947-4-1A Type F Selection List

It is necessary for using the connection conductor unit to apply for "Type" certification.
About Warranty

Before purchasing and using our products, please confirm the following product warranty.

Warranty period

1. The warranty period for our products shall be one year after purchase or delivery to the designated location. However, the maximum warranty period shall be 18 months after production, in consideration that the maximum length of distribution period is to be 6 months after shipping.

2. This warranty period may not apply in the case where the use environment or use conditions specifically impact the life of products.

Scope of warranty

1. When any failure occurs during the above warranty period which is clearly our responsibility, we will replace or repair the failed portion of the product free of charge at the location of purchase or delivery. Note that the "failure" mentioned here shall not include such items as scratches and discoloration which do not affect performance.

2. In the following cases, even during the warranty period, charged repair services shall be applied.
   - Failures caused by inappropriate conditions, environment, handling, and uses other than those specified in catalog, instruction manuals or specifications.
   - Failures caused by inaccurate installation.
   - Failures caused by the design of customer's equipment or software.
   - Failures caused by the customer tampering with our products such as renewals without our authorization.
   - Failures caused by uses of the product other than ordinarily intended.
   - Failures caused by force majeure such as fire and abnormal voltage accidents, and natural disasters such as earthquakes, wind and flood.
   - Failures caused by reasons that were unforeseeable by the level of technology at the time of shipment.

3. The warranty period shall mean warranty of the unit of delivery, and any losses induced by the failures of delivered products shall be excluded from our warranty.

Exemption from warranty related to opportunity or secondary losses.

Regardless of in or out of warranty period, loss of opportunity and lost earnings at the customer side caused by the failures of our products, any damages caused by special situation regardless of our foreseeability, secondary losses, accident compensation, damages on anything other than our products, compensation to other jobs, and damages caused by any reasons for which we are not held responsible, shall be outside the scope of our compensation.

Applicable areas of our products

1. The contents of products shown in this catalog are for your selection of models. When you actually use the product, read the “Instruction Manual” carefully beforehand and use correctly. Please note that the external view or specifications that should not affect the model selection can change without prior announcement.

2. When using a product listed in this catalog, you are required to accept that your use should not lead to any serious accident if by any chance the product develops any failures or errors, and, in the event any failure or error occurs, backup or fail-safe functions are in place outside the device by the system.

3. The products described in this catalog are designed and manufactured as general products to be used for general industrial fields. For this reason, the products described in this catalog should not be used for the applications requiring special quality assurance systems, such as serious public uses as atomic power plants and other power plants owned by power companies, railway applications and government and public office applications. Note, however, that the products shall be applicable to such uses if the use limit and the customer agrees not to require specially high quality.

Furthermore, when the customer is investigating application for the uses where serious impact is foreseen to the human body and assets and therefore high reliability for security and control system is required, such as aviation, medical services, railways, communications, fuel equipment, manned transportation equipment, entertainment facilities and security machines, please contact our representatives and discuss any necessary agreement or specifications.

Supply period of spare goods after production stop

1. For our Motor circuit breakers, no repairs or supply of spare parts are provided by us.

2. For the discontinuation of production, we will announce in such media as "Sales and Service" paper created by us.

Recommendation for renewal due to life

Our Motor circuit breakers with contacts and mechanical parts have certain wear life in line with the number of open/close operations, while our Molded Case Circuit Breakers and Earth-Leakage Circuit Breakers as mentioned by "The Report on Recommended Renewal Timing for Low Voltage Devices" issued by Japan Electrical Manufacturers’ Association (JEMA).

[Notes for adopting the product]
Information of Our FA-related Products

[Related Products]

<table>
<thead>
<tr>
<th>Product Type</th>
<th>Model Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Servomotor</td>
<td>Mitsubishi General Purpose AC Servomotor MELSERVO J4 Series</td>
</tr>
<tr>
<td>CNC</td>
<td>Mitsubishi Numeric Controller M70V Series</td>
</tr>
</tbody>
</table>

A global standard model pursuing speed and precision

- With the control by instruction unit being 0.1μm and the internal interpolation unit being 1μm, high precision and smooth mechanical work have been achieved.
- Operation and display that do not let one feel the layer structure of the screen, as well as easy program control using standard implementation of Ethernet IP have been realized.
- A compact unit integrating a display and controller being integrated has contributed to miniaturization of the control panel.
- The lineup of Type A suited for combined lathe and Type B suited for tapping center

Production Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of poles</td>
<td>2, 4, 6, 8 poles</td>
</tr>
<tr>
<td>Voltage range</td>
<td>200/200/200V (400V)</td>
</tr>
</tbody>
</table>

- High-performance servomotor of industry-leading level
  - Industry-leading level of basic performance: Speed frequency response (2.5kHz), 4M pulse (4,194,304p/rev) encoder
  - Advanced one-touch tuning function allows one-touch adjustment of advanced vibration suppression control II
  - Large capacity drive recorder and machine diagnosis function are implemented. It has achieved reduction of maintenance load.
- The lineup of servo-ampifiers with two-axis/three-axis in a body. This has achieved energy saving, space saving, wiring reduction and cost saving.

Production Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power unit specifications</td>
<td>Single-phase/3-phase AC200V</td>
</tr>
<tr>
<td>Instruction interface</td>
<td>Digital/analogue, digital/analogue</td>
</tr>
<tr>
<td>Control mode</td>
<td>Position control, speed control, torque control</td>
</tr>
<tr>
<td>Speed-frequency response</td>
<td>2.5kHz</td>
</tr>
<tr>
<td>Tuning functions</td>
<td>Advanced one-touch tuning, advanced vibration suppression control II, robot filter, etc.</td>
</tr>
<tr>
<td>Rotation functions</td>
<td>ST1, ST2, SS1, SS2, S1, S2, S3, 55A (to be supported by the combination with a motion controller)</td>
</tr>
<tr>
<td>Supported sensors</td>
<td>Servomotor, linear servomotor, encoder, etc.</td>
</tr>
<tr>
<td>Receiving sensor-motor capacity</td>
<td>0.4 - 7kW</td>
</tr>
</tbody>
</table>

Robot | Industrial Robot MELFA F Series RV-4F |

High-speed, high-precision, high-function 4kg transportable vertical-multijoint robot

- Using the unique driving technology, higher-speed motion has been realized.
- Hand wiring and internal piping have contributed to enhanced toileing performance.
- Expansion of the rotational axis motion range has enabled full utilization of the installation space.

Production Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree of freedom of motion</td>
<td>6</td>
</tr>
<tr>
<td>Structure</td>
<td>Vertical multijoint type</td>
</tr>
<tr>
<td>Installation posture</td>
<td>From standing, hanging from the ceiling, hanging on the wall (paths some restrictions on the rotation angle) J1 75°, J2 45°</td>
</tr>
<tr>
<td>Weight capacity</td>
<td>4kg</td>
</tr>
<tr>
<td>Maximum reach diameter</td>
<td>515mm</td>
</tr>
<tr>
<td>Cycle time (load weights)</td>
<td>0.36 sec. (1kg)</td>
</tr>
<tr>
<td>Position repetition accuracy</td>
<td>±0.020mm</td>
</tr>
<tr>
<td>Protection specifications</td>
<td>IP44 (Clean specification: ISO class 3, oil mist specification: IP67)</td>
</tr>
</tbody>
</table>

MAGNETIC STARTER

MS-T Series

Exceed your expectations.

- 10A frame model is over 16% smaller with a width of just 36mm!
- New integrated terminal covers.
- Reduce your coil inventory by up to 50%.
- Be certified to the highest international levels while working to gain other country.

Product Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frame</td>
<td>10A to 32A</td>
</tr>
<tr>
<td>Certifications</td>
<td>CE, UL, CEE, IEC, GB, CCC, CCC</td>
</tr>
<tr>
<td>Terminal cover</td>
<td>Standard terminal cover improves safety, simplified cabling, and reduced inventory, etc.</td>
</tr>
<tr>
<td>Improved wiring</td>
<td>Wiring and cabling are improved with standardizing wire termination IC specifications.</td>
</tr>
<tr>
<td>Option coil</td>
<td>Various types including Auxiliary Contact Unit, Control Coil, Contacts, etc.</td>
</tr>
</tbody>
</table>