Rotary Gripper
Series MRHQ
Size: 10, 16, 20, 25

How to Order

- **Lead wire length**
  - Nil
  - L 0.5 m
  - L 3 m
  - L 5 m

- **Number of auto switches**
  - Nil 2 pcs.
  - S 1 pc.

- **Type of auto switch for gripping opening/closing**
  - Nil Without auto switch

Applicable Auto Switch

<table>
<thead>
<tr>
<th>Type</th>
<th>Electrical entry</th>
<th>Wiring (output)</th>
<th>Load voltage</th>
<th>Auto switch model</th>
<th>Lead wire length* (m)</th>
<th>Applicable load</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid state switch</td>
<td>Yes</td>
<td>3-wire (NPN)</td>
<td>5 V</td>
<td>M9N</td>
<td>L</td>
<td>IC circuit</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>3-wire (PNP)</td>
<td>12 V</td>
<td>M9P</td>
<td>Z</td>
<td>PLC</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>2-wire</td>
<td>12 V</td>
<td>M9B</td>
<td>Z</td>
<td>—</td>
</tr>
</tbody>
</table>

- **Lead wire length symbols:** 0.5 m .......... Nil (Example) M9N
  - 3 m .......... L                    M9NL

- **Type of auto switch for detecting rotation**
  - Nil Without auto switch

Applicable Auto Switch

<table>
<thead>
<tr>
<th>Type</th>
<th>Electrical entry</th>
<th>Wiring (output)</th>
<th>Load voltage</th>
<th>Auto switch model</th>
<th>Lead wire length* (m)</th>
<th>Applicable load</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid state switch</td>
<td>Yes</td>
<td>3-wire (NPN)</td>
<td>5 V</td>
<td>M9N</td>
<td>L</td>
<td>IC circuit</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>3-wire (PNP)</td>
<td>12 V</td>
<td>M9P</td>
<td>Z</td>
<td>PLC</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>2-wire</td>
<td>12 V</td>
<td>M9B</td>
<td>Z</td>
<td>—</td>
</tr>
</tbody>
</table>

- **Lead wire length symbols:** 0.5 m .......... Nil (Example) M9N
  - 3 m .......... L                    M9NL

- **Type of auto switch for gripping opening/closing**
  - N Without auto switch

Applicable Auto Switch

<table>
<thead>
<tr>
<th>Type</th>
<th>Electrical entry</th>
<th>Wiring (output)</th>
<th>Load voltage</th>
<th>Auto switch model</th>
<th>Lead wire length* (m)</th>
<th>Applicable load</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid state switch</td>
<td>Yes</td>
<td>3-wire (NPN)</td>
<td>5 V</td>
<td>M9N</td>
<td>L</td>
<td>IC circuit</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>3-wire (PNP)</td>
<td>12 V</td>
<td>M9P</td>
<td>Z</td>
<td>PLC</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>2-wire</td>
<td>12 V</td>
<td>M9B</td>
<td>Z</td>
<td>—</td>
</tr>
</tbody>
</table>

- **Lead wire length symbols:** 0.5 m .......... Nil (Example) M9N
  - 3 m .......... L                    M9NL

- **Refer to page 12-13-1 for further information on auto switches.**
- **Auto switches marked with a “/L50263” are made upon receipt of order.**

Unit list

<table>
<thead>
<tr>
<th>Model</th>
<th>Unit part no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRHQ10D</td>
<td>P407090-3D</td>
</tr>
<tr>
<td>MRHQ10S</td>
<td>P407090-3S</td>
</tr>
<tr>
<td>MRHQ10C</td>
<td>P407090-3C</td>
</tr>
<tr>
<td>MRHQ16D</td>
<td>P407060-3D</td>
</tr>
<tr>
<td>MRHQ16S</td>
<td>P407060-3S</td>
</tr>
<tr>
<td>MRHQ16C</td>
<td>P407060-3C</td>
</tr>
<tr>
<td>MRHQ20D</td>
<td>P407080-3D</td>
</tr>
<tr>
<td>MRHQ20S</td>
<td>P407080-3S</td>
</tr>
<tr>
<td>MRHQ20C</td>
<td>P407080-3C</td>
</tr>
<tr>
<td>MRHQ25D</td>
<td>P408080-3D</td>
</tr>
<tr>
<td>MRHQ25S</td>
<td>P408080-3S</td>
</tr>
<tr>
<td>MRHQ25C</td>
<td>P408080-3C</td>
</tr>
</tbody>
</table>

Switch mounting unit

<table>
<thead>
<tr>
<th>Model</th>
<th>Unit part no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRHQ10</td>
<td>P407090-1</td>
</tr>
<tr>
<td>MRHQ16</td>
<td>P407060-1</td>
</tr>
<tr>
<td>MRHQ20</td>
<td>P407080-1</td>
</tr>
<tr>
<td>MRHQ25</td>
<td>P408080-1</td>
</tr>
</tbody>
</table>

- **Switch holder B**
- **Switch holder A**

- **Switch holder B**
- **Switch holder A**

- **Each unit includes two of each of the parts indicated left.**
- **Switches are not included with a unit.**
Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>MRHQ10</th>
<th>MRHQ16</th>
<th>MRHQ20</th>
<th>MRHQ25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluid</td>
<td>Air</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating pressure</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotary unit</td>
<td>0.25 to 0.7 MPa</td>
<td>0.25 to 1.0 MPa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gripper unit</td>
<td>Double acting</td>
<td>0.25 to 0.7 MPa</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Single acting</td>
<td>0.1 to 0.7 MPa</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.35 to 0.7 MPa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotation angle</td>
<td>90° ±10°, 180° ±10°</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gripper action</td>
<td>Double acting, Single acting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Finger opening/closing repeatability</td>
<td>±0.01 mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gripper maximum operating frequency</td>
<td>180 c.p.m</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient and fluid temperature</td>
<td>5 to 60°C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjustable rotation time (Note)</td>
<td>0.07 to 0.3 s/90° (at 0.5 MPa)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allowable kinetic energy</td>
<td>0.0046 J, 0.014 J, 0.034 J, 0.074 J</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Auto switch</td>
<td>Rotary unit</td>
<td>Solid state switch (2-wire, 3-wire)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gripper unit</td>
<td>Solid state switch (2-wire, 3-wire)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Operate within the speed adjustment range, as speed control exceeding the limit value of the low speed may cause sticking or failure to operate.

Model

<table>
<thead>
<tr>
<th>Action</th>
<th>Model</th>
<th>Cylinder bore (mm)</th>
<th>Opening/Closing stroke (mm)</th>
<th>Rotating angle (°)</th>
<th>Weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Double acting</td>
<td>MRHQ10D</td>
<td>10</td>
<td>4</td>
<td>90</td>
<td>306</td>
</tr>
<tr>
<td></td>
<td>MRHQ16D</td>
<td>16</td>
<td>6</td>
<td>90</td>
<td>305</td>
</tr>
<tr>
<td></td>
<td>MRHQ20D</td>
<td>20</td>
<td>10</td>
<td>90</td>
<td>1055</td>
</tr>
<tr>
<td></td>
<td>MRHQ25D</td>
<td>25</td>
<td>14</td>
<td>90</td>
<td>1561</td>
</tr>
<tr>
<td>Single acting</td>
<td>MRHQ10S</td>
<td>10</td>
<td>4</td>
<td>90</td>
<td>307</td>
</tr>
<tr>
<td></td>
<td>MRHQ10C</td>
<td></td>
<td></td>
<td>180</td>
<td>306</td>
</tr>
<tr>
<td></td>
<td>MRHQ16S</td>
<td>16</td>
<td>6</td>
<td>90</td>
<td>594</td>
</tr>
<tr>
<td></td>
<td>MRHQ16C</td>
<td></td>
<td></td>
<td>180</td>
<td>592</td>
</tr>
<tr>
<td></td>
<td>MRHQ20S</td>
<td>20</td>
<td>10</td>
<td>90</td>
<td>1060</td>
</tr>
<tr>
<td></td>
<td>MRHQ20C</td>
<td></td>
<td></td>
<td>180</td>
<td>1057</td>
</tr>
<tr>
<td></td>
<td>MRHQ25S</td>
<td>25</td>
<td>14</td>
<td>90</td>
<td>1566</td>
</tr>
<tr>
<td></td>
<td>MRHQ25C</td>
<td></td>
<td></td>
<td>180</td>
<td>1560</td>
</tr>
</tbody>
</table>

Note: Values do not include auto switch weight.

Gripper Rotation Range/View from Gripper Side

- The figure at the right indicates the position of the gripper when pressure is applied to port B.
- When pressure is applied to port A, the gripper rotates clockwise.
### Series MRHQ

#### Model Selection

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Calculation</th>
<th>Example</th>
</tr>
</thead>
</table>
| **Operating conditions** | | ![Diagram](https://example.com/diagram.png)  
*Please refer to page 12-11-12 for drawing dimensions.* |

1. **Enumerate the operating conditions according to the mounting position and workpiece configuration.**

2. **Rotation time**
   - Confirm that it is within the adjustable rotation time range.
   - Graph (1)  
   - Gripping point range limit
   - Within the range limit OK

3. **Overhang and gripping point distance**
   - Confirm that the overhang (H) and the gripping point distance (L) are within the operating pressure range limit.

4. **Load weight**
   - Confirm that the load converted from the load weight is less than 1/20 of the effective gripping force. (A greater margin must be allowed if large impacts will be applied when work pieces are transported.)
   - Graph (2)  
   - $20 \times 9.8 \times (m_1 + m_2) \times H/1000 < \text{Effective torque (N m)}$
   - $20 \times 9.8 \times 0.07 = 13.72$
   - $13.72 \text{ N} < \text{Effective gripping force} \text{ OK}$

5. **External force on finger**
   - Make sure that the vertical load and each moment on finger are within allowable value.

6. **Rotational torque**
   - (horizontal mounting only)
   - Convert the weight of the load and attachments (2 pcs.) into a load value and multiply by the overhang (H). Confirm that this value is less than 1/20 of the effective torque.
   - Graph (3)  
   - $20 \times 9.8 \times (m_1 + m_2) \times H/1000 < \text{Effective torque (N m)}$
   - $20 \times 9.8 \times (0.07 + 0.05) \times 10/1000 = 0.24$
   - $0.24 \text{ N m} < \text{Effective torque} \text{ OK}$

7. **Find the moment of inertia, "I" for the load + attachments (2 pcs.)**
   - $I = K \times (a^2 + b^2 + 12h^2) \times (m_1 + m_2)/(12 \times 10^6)$
   - $K = 2$: Safety factor
   - $\frac{1}{2} \times I \times \omega^2 < \text{Allowable energy (J)}$
   - $\omega = \frac{2 \theta \times (t/2)}{t}$: Angular speed at the end
   - $h$: Rotation angle (rad)
   - $t$: Rotation time (s)
   - $1/2 \times 0.00005 \times (2 \times (3.14/2)/0.2)^2 = 0.0062$
   - $0.0062 \text{ J} < \text{Allowable energy} \text{ OK}$

8. **Kinetic energy**
   - Confirm that the kinetic energy of the load + attachments (2 pcs.) is no more than the allowable value.

---

Refer to "Moment of Inertia Calculation and Allowable Kinetic Energy" on page 12-11-12.

**Note:** Please refer to page 12-11-12 for drawing dimensions.

- Rotary gripper: MRHQ16D-90S
- Pressure: 0.4 MPa
- Mounting position: Horizontal
- Rotation time (t): 0.2 s/90°
- Overhang (H): 10 mm
- Gripping point distance (L): 20 mm
- Distance between central axis and center of gravity (h): 10 mm
- Load weight (m1): 0.07 kg
- Weight of 2 attachments (m2): 0.05 kg
Gripping Point

External gripping

• Operate so that the workpiece gripping point distance “L” and the amount of overhang “H” stay within the range shown for each operating pressure given in the graphs to the right.

• If operated with the workpiece gripping point outside of the range limit, an excessive eccentric load will be applied to the fingers and guide section, causing play in the fingers and adversely affecting the gripper’s life.

L: Gripping point distance
H: Overhang

<table>
<thead>
<tr>
<th>Gripping Point Range Limit</th>
<th>Graph (1)</th>
<th>Internal Gripping</th>
<th>MRHQ10</th>
<th>Pressure 0.2MPa</th>
<th>0.3MPa</th>
<th>0.4MPa</th>
<th>0.5MPa</th>
<th>0.6MPa, 0.7MPa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gripping point L mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overhang H mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MRHQ16

MRHQ20

MRHQ25

<table>
<thead>
<tr>
<th>Gripping Point Range Limit</th>
<th>Graph (1)</th>
<th>External Gripping</th>
<th>MRHQ10</th>
<th>Pressure 0.2MPa</th>
<th>0.3MPa</th>
<th>0.4MPa</th>
<th>0.5MPa</th>
<th>0.6MPa, 0.7MPa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gripping point L mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overhang H mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MRHQ16

MRHQ20

MRHQ25
### Effective Gripping Force

Expressing the effective gripping force

The effective gripping force shown in the graphs to the right is expressed as $F$, which is the impellent force of one finger, when both fingers and attachments are in full contact with the workpiece as shown in the figure below.

External gripping

![External Gripping Diagram](image)

Internal gripping

![Internal Gripping Diagram](image)

$L$: Gripping point distance

### Model Selection Guidelines by Workpiece Weight

- Although conditions differ according to the workpiece shape and the coefficient of friction between the attachments and the workpiece, select a model that can provide a gripping force of 10 to 20 times the workpiece weight, or more.
- A greater margin of safety is required when high acceleration or impact occurs during workpiece transfer.

---

#### Graphs

**External Gripping/Double Acting**

- **MRHQ10D**
  - [Graph](image)
- **MRHQ16D**
  - [Graph](image)
- **MRHQ20D**
  - [Graph](image)
- **MRHQ25D**
  - [Graph](image)

---

**Internal Gripping/Double Acting**

- **MRHQ10D**
  - [Graph](image)
- **MRHQ16D**
  - [Graph](image)
- **MRHQ20D**
  - [Graph](image)
- **MRHQ25D**
  - [Graph](image)

---

**External Gripping/Double Acting**

- **MRHQ10D**
  - [Graph](image)
- **MRHQ16D**
  - [Graph](image)
- **MRHQ20D**
  - [Graph](image)
- **MRHQ25D**
  - [Graph](image)
Rotary Gripper Series MRHQ

External Gripping Force/Single Acting

- **MRHQ10S**
  - Pressure 0.7MPa
  - 0.6MPa
  - 0.5MPa
  - 0.4MPa
  - 0.3MPa
  - 0.25MPa

- **MRHQ16S**
  - Pressure 0.7MPa
  - 0.6MPa
  - 0.5MPa
  - 0.4MPa
  - 0.3MPa
  - 0.25MPa

- **MRHQ20S**
  - Pressure 0.7MPa
  - 0.6MPa
  - 0.5MPa
  - 0.4MPa
  - 0.3MPa
  - 0.25MPa

- **MRHQ25S**
  - Pressure 0.7MPa
  - 0.6MPa
  - 0.5MPa
  - 0.4MPa
  - 0.3MPa
  - 0.25MPa

Internal Gripping Force/Single Acting

- **MRHQ10C**
  - Pressure 0.7MPa
  - 0.6MPa
  - 0.5MPa
  - 0.4MPa
  - 0.35MPa

- **MRHQ16C**
  - Pressure 0.7MPa
  - 0.6MPa
  - 0.5MPa
  - 0.4MPa
  - 0.3MPa
  - 0.25MPa

- **MRHQ20C**
  - Pressure 0.7MPa
  - 0.6MPa
  - 0.5MPa
  - 0.4MPa
  - 0.35MPa

- **MRHQ25C**
  - Pressure 0.7MPa
  - 0.6MPa
  - 0.5MPa
  - 0.4MPa
  - 0.35MPa
  - 0.3MPa
Rotational Torque and Gripping Point

Rotational Torque

![Graph](3)

How to Mount Attachment on Fingers

When mounting attachments on fingers, support the fingers with a tool such as a spanner to prevent them from twisting. Refer to the table on the right for the tightening torques of finger mounting bolts.

<table>
<thead>
<tr>
<th>Model</th>
<th>Bolt</th>
<th>Max. tightening torque N(\cdot)m</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRHQ10</td>
<td>M2.5 x 0.45</td>
<td>0.31</td>
</tr>
<tr>
<td>MRHQ16</td>
<td>M3 x 0.5</td>
<td>0.59</td>
</tr>
<tr>
<td>MRHQ20</td>
<td>M4 x 0.7</td>
<td>1.4</td>
</tr>
<tr>
<td>MRHQ25</td>
<td>M5 x 0.8</td>
<td>2.8</td>
</tr>
</tbody>
</table>
### Allowable Value of External Force on Fingers

<table>
<thead>
<tr>
<th>Model</th>
<th>Allowable vertical load</th>
<th>Maximum allowable moment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$F_v$ (N)</td>
<td>$M_p$ (N·m)</td>
</tr>
<tr>
<td>MRHQ10D</td>
<td>58</td>
<td>0.26</td>
</tr>
<tr>
<td>MRHQ16D</td>
<td>98</td>
<td>0.68</td>
</tr>
<tr>
<td>MRHQ20D</td>
<td>147</td>
<td>1.32</td>
</tr>
<tr>
<td>MRHQ25D</td>
<td>255</td>
<td>1.94</td>
</tr>
</tbody>
</table>

**Note:** Values of load and moment in the above table are static values.

When static load $f = 10$ N, which produces pitch moment to the point $L = 30$ mm from MRHQ16D guide, is applied. Operable condition requires that $F$ be bigger than $f$.

**Example:**

$$F_v = \frac{M (\text{Maximum allowable moment})}{L \times 10^{-3}}$$  
$\times$ Unit conversion factor

When static load $f = 10$ N, which produces pitch moment to the point $L = 30$ mm from MRHQ16D guide, is applied. Operable condition requires that $F$ be bigger than $f$.

**Example:**

$\text{Allowable load } F = 0.68 \times 30 \times 10^{-3}$

$= 22.7$ (N) $> 10$

Since load $F > f$, it is operable.
Calculate the moment of inertia as shown below, and confirm that the operating conditions are within the allowable kinetic energy shown in the graph “Moment of inertia and rotation time” on the right.

Moment of Inertia Calculation and Allowable Kinetic Energy

\[
I = \frac{(a^2 + b^2 + 12h^2)(m_1 + m_2)}{12 \times 10^6}
\]

Practical moment of inertia  \( I_R: \text{kg} \cdot \text{m}^2 \)

\[
I_R = K \times I
\]

* Use \( I \) for this product.

---

**Graph (Moment of inertia and rotation time)**

How to Use the Graph

**[Example 1]**
- Moment of Inertia: \( 1 \times 10^{-5} \text{kg} \cdot \text{m}^2 \)
- Rotation time: 0.2 s/90°
- To select model MRHQ10

It can be used because the point of intersection \( P_1 \) on the graph is within the limiting range.

**[Example 2]**
- Moment of Inertia: \( 5 \times 10^{-5} \text{kg} \cdot \text{m}^2 \)
- Rotation time: 0.1 s/90°
- To select model MRHQ16

It cannot be used because the point of intersection \( P_2 \) on the graph is outside the range limit. (Review is necessary.)

To confirm by calculation, use formula (1) on the right and check that the kinetic energy of load \( E \) is within the allowable values below.

**Kinetic energy of load**  \( E: \text{J} \)

\[
E = \frac{1}{2} \times I_R \times \omega^2 
\]

\( \omega = \frac{2\pi}{t} \)  
(\( \omega \): Angular speed at the end)  
(\( t \): Rotating angle (rad))  
(\( t \): Rotation time (s))

**Allowable Kinetic Energy**

<table>
<thead>
<tr>
<th>Model</th>
<th>Allowable value ( E )</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRHQ10</td>
<td>0.0046</td>
</tr>
<tr>
<td>MRHQ16</td>
<td>0.014</td>
</tr>
<tr>
<td>MRHQ20</td>
<td>0.034</td>
</tr>
<tr>
<td>MRHQ25</td>
<td>0.074</td>
</tr>
</tbody>
</table>
Dimensions

MRHQ10

Rotary Gripper Series MRHQ

- **Angle adjustment bolt**: 4-M4 x 0.7 depth 6 (two on the other side)
- **3-3H9**: depth 4 (one each on three sides)
- **3-R1.5**:
- **4-M2.5 x 0.45**: (attachment mounting screw)
- **M5 x 0.8**: Finger opening port
- **Finger closing port**: M5 x 0.8
- **2-4.5 through 2-8 depth of counter bore 2.5**
- **M5 x 0.8**: Port A
- **Port B**: M5 x 0.8
- **M5 x 0.8**: Finger opening port
- **Angle adjustment bolt**: 4-M4 x 0.7 depth 6 (two on the other side)
- **3-3H9 0.025** long groove depth 3 (one each on three sides)

**Dimensions**

Side A

- 12
- 11
- 13
- 1
- 5
- 15
- 10

Side B

- 12
- 11
- 13
- 1
- 5
- 15
- 10

**Rotary Gripper Series MRHQ**

**SMC**

12-11-13
**Construction**

**Component Parts**

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Material</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>①</td>
<td>Gripper unit</td>
<td>———</td>
<td></td>
</tr>
<tr>
<td>②</td>
<td>Rotary unit</td>
<td>———</td>
<td>Two types for 90° and 180°</td>
</tr>
<tr>
<td>③</td>
<td>Body C</td>
<td>Aluminum alloy</td>
<td>Gray-White</td>
</tr>
<tr>
<td>④</td>
<td>Stopper lever</td>
<td>Carbon steel</td>
<td>Two types for 90° and 180°</td>
</tr>
<tr>
<td>⑤</td>
<td>Stopper guide</td>
<td>Stainless steel</td>
<td></td>
</tr>
<tr>
<td>⑥</td>
<td>Retainer</td>
<td>Carbon steel</td>
<td></td>
</tr>
<tr>
<td>⑦</td>
<td>Switch guide</td>
<td>Resin</td>
<td></td>
</tr>
<tr>
<td>⑧</td>
<td>Switch holder A</td>
<td>Resin</td>
<td></td>
</tr>
<tr>
<td>⑨</td>
<td>Switch case</td>
<td>Resin</td>
<td></td>
</tr>
<tr>
<td>⑩</td>
<td>Switch holder B</td>
<td>Resin</td>
<td></td>
</tr>
<tr>
<td>⑪</td>
<td>Bearing</td>
<td>High carbon bearing steel</td>
<td></td>
</tr>
<tr>
<td>⑫</td>
<td>O-ring</td>
<td>NBR</td>
<td></td>
</tr>
<tr>
<td>⑬</td>
<td>Adjustment bolt</td>
<td>Carbon steel</td>
<td></td>
</tr>
<tr>
<td>⑭</td>
<td>Nut</td>
<td>Carbon steel</td>
<td></td>
</tr>
<tr>
<td>⑮</td>
<td>Hexagon socket head cap screw</td>
<td>Carbon steel</td>
<td></td>
</tr>
<tr>
<td>⑯</td>
<td>Parallel pin</td>
<td>Stainless steel</td>
<td></td>
</tr>
<tr>
<td>⑰</td>
<td>Hexagon socket head cap screw</td>
<td>Stainless steel</td>
<td></td>
</tr>
</tbody>
</table>
Series MRHQ

Auto Switch Specifications

Applicable Series

<table>
<thead>
<tr>
<th>Series</th>
<th>Application</th>
<th>Auto switch model</th>
<th>Electrical entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRHQ10</td>
<td>Gripper opening/closing verification</td>
<td>Solid state</td>
<td>D-M9BV</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Grommet/2-wire</td>
</tr>
<tr>
<td>MRHQ16</td>
<td></td>
<td>Solid state</td>
<td>D-M9NV, M9PV</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Grommet/3-wire</td>
</tr>
<tr>
<td>MRHQ20</td>
<td>Rotation verification</td>
<td>Solid state</td>
<td>D-M9B</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Grommet/2-wire</td>
</tr>
<tr>
<td>MRHQ25</td>
<td></td>
<td>Solid state</td>
<td>D-M9N, M9P</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Grommet/3-wire</td>
</tr>
</tbody>
</table>

Auto Switch Hysteresis

Auto switches have hysteresis similar to micro switches. Use the table below as a guide when adjusting auto switch positions, etc.

<table>
<thead>
<tr>
<th>Model</th>
<th>Hysteresis (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRHQ10</td>
<td>0.5</td>
</tr>
<tr>
<td>MRHQ16</td>
<td>0.5</td>
</tr>
<tr>
<td>MRHQ20</td>
<td>1.0</td>
</tr>
<tr>
<td>MRHQ25</td>
<td>1.0</td>
</tr>
</tbody>
</table>
Mounting of Auto Switch

### Mounting Switches to Verify Rotation

1. First, remove the slotted set screw installed in a standard switch.

2. Insert the switch into the switch case, and install switch holder B into the first groove (MRHQ20/25) or the second groove (MRHQ10/16) and secure the switch.

3. Install the switch case, with a switch attached securely in the hole, in the direction indicated in Figure (1).

### Mounting Switches to Verify Opening/Closing of Gripper

1. Position switch holder A in the groove of the switch guide in the direction indicated in Figure (2).

2. Insert an auto switch into the switch guide and align the set screw with the hole of switch holder A.

3. Secure the switch at an appropriate position with a flat head watchmakers screwdriver as indicated in Figure (3).  
   **Tightening torque:** 0.05 to 0.1 N·m
**Series MRHQ**

Auto Switch Installation Example and Mounting Position

Various auto switch applications will be available with combinations of using different numbers of auto switches and varieties of detecting positions.

1) Detection when Gripping Exterior of Workpiece

<table>
<thead>
<tr>
<th>Detection example</th>
<th>1. Confirmation of fingers in reset position</th>
<th>2. Confirmation of workpiece held</th>
<th>3. Confirmation of workpiece released</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Position to be detected</strong></td>
<td>Position of fingers fully opened</td>
<td>Position when gripping a workpiece</td>
<td>Position of fingers fully closed</td>
</tr>
<tr>
<td><strong>Operation of auto switch</strong></td>
<td>Switch turned ON when fingers return. (Light ON)</td>
<td>Switch turned ON when gripping a workpiece. (Light ON)</td>
<td>When a workpiece is held (Normal operation): Switch to turn OFF (Light not illuminating) When a workpiece is not held (Abnormal operation): Switch to turn ON (Light illuminating)</td>
</tr>
<tr>
<td><strong>Detecting combinations</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One auto switch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two auto switches</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>How to determine auto switch installation position</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At no pressure or low pressure, connect the switch to a power supply, and follow the directions.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Step 1)** Fully open the fingers.

**Step 2)** Refer to “Mounting Switches to Verify Opening/Closing of Gripper” on page 12-11-19 and position an auto switch in switch mounting groove.

**Step 3)** Slide the auto switch in the direction of the arrow until the indicator light illuminates.

**Step 4)** Slide the auto switch further in the direction of the arrow until the indicator light goes out.

**Step 5)** Move the auto switch in the opposite direction and fasten it at a position 0.3 to 0.5 mm beyond the position where the indicator light illuminates.

---

Note 1) It is recommended that gripping of a workpiece be performed close to the center of the finger stroke.

Note 2) When holding a workpiece close at the end of open/close stroke of fingers, detecting performance of the combinations listed in the above table may be limited, depending on the hysteresis of an auto switch, etc.
### Detection when Gripping Interior of Workpiece

**Detection example**

<table>
<thead>
<tr>
<th>Detection example</th>
<th>1. Confirmation of fingers in reset position</th>
<th>2. Confirmation of workpiece held</th>
<th>3. Confirmation of workpiece released</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position to be detected</td>
<td>Position of fingers fully closed</td>
<td>Position when gripping workpiece</td>
<td>Position of fingers fully opened</td>
</tr>
</tbody>
</table>

**Operation of auto switch**

- Switch turned ON when fingers return. (Light ON)
- Switch turned ON when gripping a workpiece. (Light ON)
- When a workpiece is held (Normal operation): Switch to turn OFF (Light not illuminating)
- When a workpiece is not held (Abnormal operation): Switch to turn ON (Light illuminating)

**Detection combinations**

- One auto switch
- Two auto switches

**How to determine auto switch installation position**

At no pressure or low pressure, connect the switch to a power supply, and follow the directions.

**Step 2)** Refer to “Mounting Switches to Verify Opening/Closing of Gripper” on page 12-11-19 and position auto switch in switch mounting groove.

**Step 1)** Fully close the fingers.
**Step 1)** Position fingers for gripping a workpiece.
**Step 1)** Fully open the fingers.

**Step 3)** Move the auto switch in the direction of the arrow and fasten it at a position 0.3 to 0.5 mm beyond the position where the indicator light illuminates.

**Step 3)** Slide the auto switch in the direction of the arrow until the indicator light illuminates.

**Step 4)** Slide the auto switch in the direction of the arrow until the indicator light goes out.

**Step 5)** Move the auto switch in the opposite direction, and fasten it at a position 0.3 to 0.5 mm in the direction of the arrow beyond the position where the indicator light illuminates.

---

**Note 1)** It is recommended that gripping of a workpiece be performed close to the center of the finger stroke.

**Note 2)** When holding a workpiece close at the end of open/close stroke of fingers, detecting performance of the combinations listed in the above table may be limited, depending on the hysteresis of an auto switch, etc.