# MRL2

## Magnet rodless cylinder

ø6/ø10/ø16/ø20/ø25/ø32

CONTENTS



The cylinder switches T2YH, T2YV, T3YH, and T3YV are scheduled for end of production at the end of December 2023.

# Twice the durability



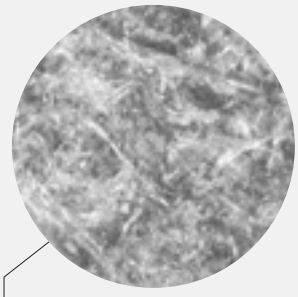
## Magnet rodless cylinder MRL2 Series

The newly adopted lubrication mechanism has significantly improved the service life and operational stability of the new magnet rodless cylinder.
ø25 and ø32 are also available.

## Dramatically improved performance with the lube keeping structure!

A fiber assemblage (lube keeping structure) soaked with grease is mounted on the sliding portions of the piston and slider. This enables stable lubrication to prevent wear long term. A significant improvement of service life (more than 2-fold compared to the previous models) and stabilization of operation have been realized.

● Lube keeping structure sectional area (180x)



### Features of lube keeping structure

#### Lubrication supplying/absorbing function

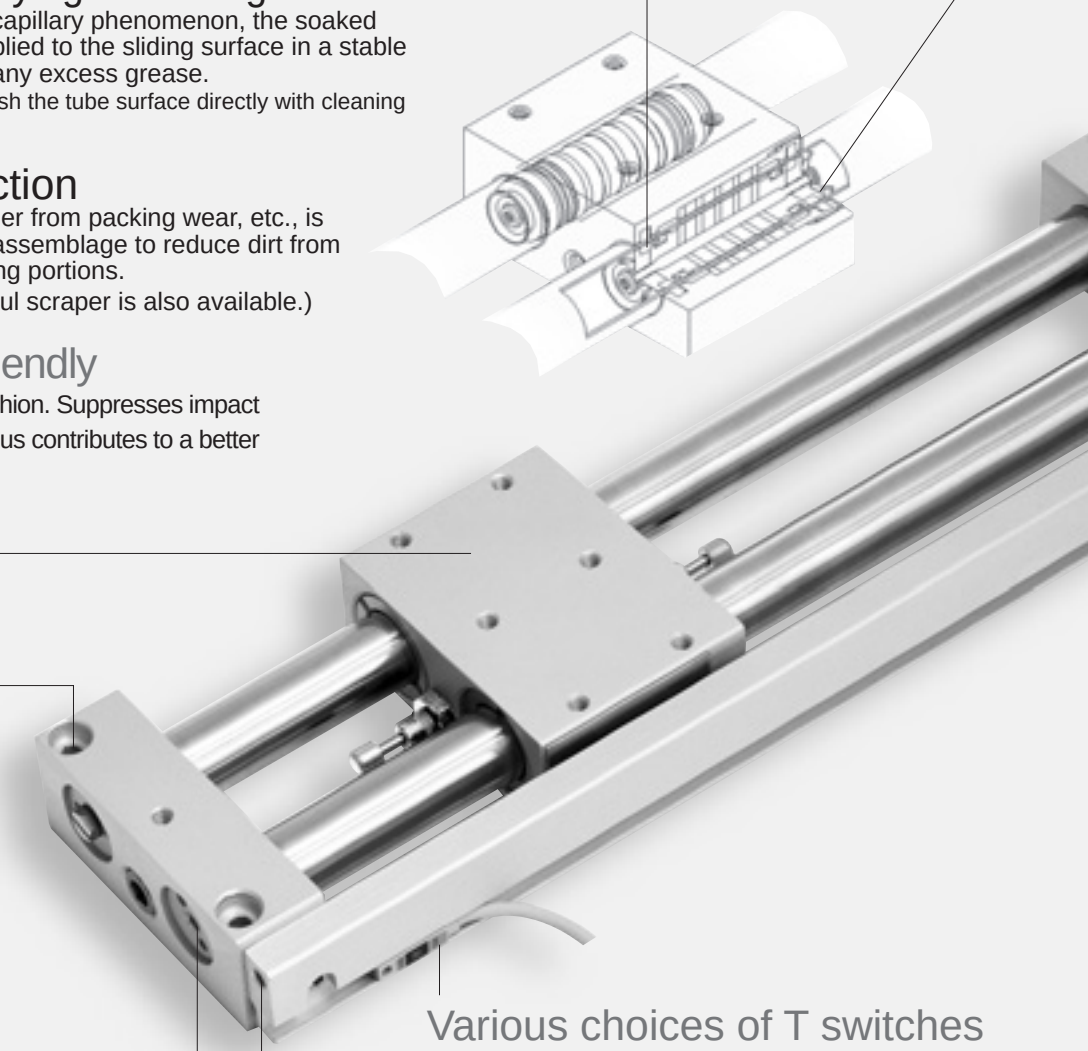
Due to the effects of the capillary phenomenon, the soaked grease can be evenly applied to the sliding surface in a stable manner while absorbing any excess grease.
Note) Use the scraper to wash the tube surface directly with cleaning liquid.

#### Dust wiper function

As well as dust, the powder from packing wear, etc., is captured within the fiber assemblage to reduce dirt from accumulating on the sliding portions.
(The conventional powerful scraper is also available.)

### Environmentally friendly

Set with optional rubber-air cushion. Suppresses impact sound at the stroke end, and thus contributes to a better factory environment.



### Thin slider

Flat design with a thin slider

### Direct mount

(Top or bottom)

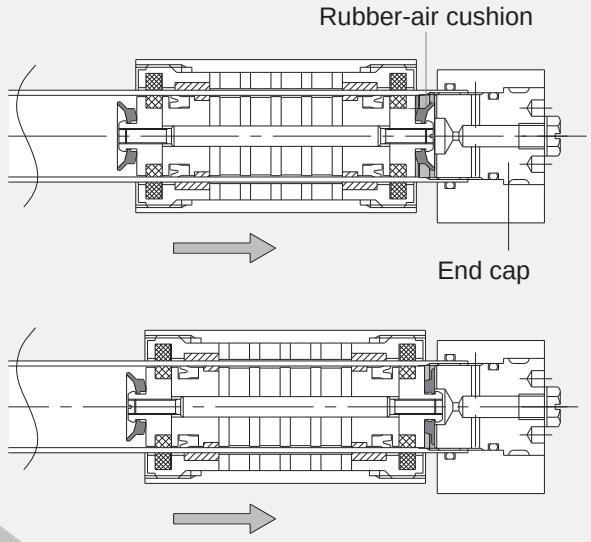
### Various choices of T switches

### Single-surface common piping is available (option)

Simplified guide (2-piston)

# MRL2-W Series

● Rubber-air cushion mechanism



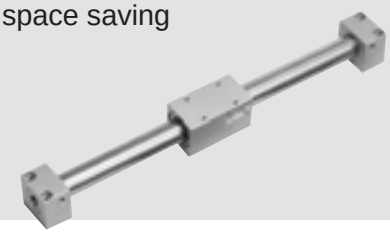

An airtight space is created in the ▭ area when the piston operates and the rubber-air cushion and end cap make contact. Air in the airtight area is further compressed, absorbing energy as the piston operates. At the end of the stroke, energy generated by compression distortion of the air cushion is also added.

## ø25 and ø32 bore sizes are now available.

**Basic**

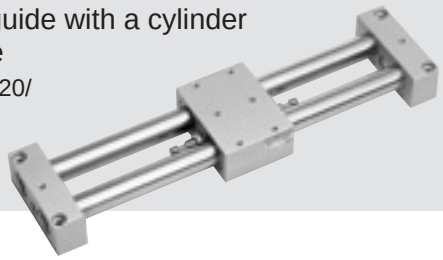
**MRL2Series**

Basic model of space saving
ø6/ø10/ø16/ø20/
ø25/ø32



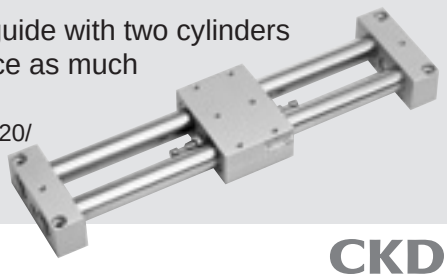
**Simplified guide**
(1-piston)
**MRL2-GSeries**

Simplified guide with a cylinder and a guide
ø6/ø10/ø16/ø20/
ø25/ø32



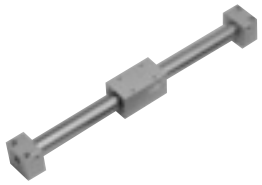
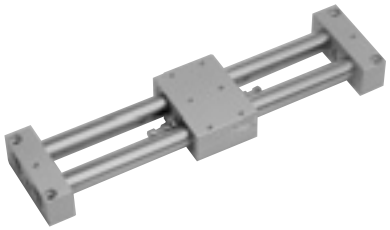
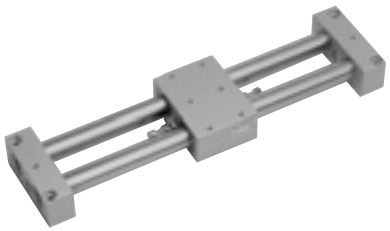
**Simplified guide**
(2-piston)
**MRL2-WSeries**

Simplified guide with two cylinders provide twice as much high thrust
ø6/ø10/ø16/ø20/
ø25/ø32



# MRL2/MRL2-G/MRL2-W Series

## ● Points regarding selection guide

| | Points regarding selection guide | Recommended model No. | |
|---|---|---|---|
| **Basic** | · When combining use of a guide system apart from the cylinder.<br>· When there are space limitations.<br>* Use together with a guide. | **MRL2**<br>ø6, ø10, ø16, ø20, ø25, ø32<br>  | |
| **Simplified guide** | · When securing the course of the slider.<br>· When using for general transportation.<br>· When the stacked load is large.<br>· When stroke adjustment is required.<br>· When absorbing the impact at the end of the stroke with a shock absorber. | **MRL2-G**<br>(Simplified guide 1-piston)<br>ø6, ø10, ø16, ø20, ø25, ø32<br>  | |
| | · When securing the course of the slider.<br>· When using for general transportation.<br>· When the stacked load is large and a double thrust is required.<br>· When stroke adjustment is required.<br>· When absorbing the impact at the end of the stroke with a shock absorber. | **MRL2-W**<br>(Simplified guide 2-piston)<br>ø6, ø10, ø16, ø20, ø25, ø32<br>  | |

| | Features | | Page |
|---|---|---|---|
| | · Lube keeping structure is used to realize a long service life.<br>· By selecting the rubber-air cushion, it is possible to reduce collision noise level and collision acceleration at the end of the stroke.<br>· Cylinder direct mounting is possible. | Specifications | 1740 |
| | | How to order | 1742 |
| | | Internal structure and parts list | 1744 |
| | | Dimensions | 1746 |
| | | Switch mounting position dimensions | 1754 |
| | | Selection guide | 1755 |
| | · With the twin tube of the MRL2 series, it is no longer necessary to separately install a guide system.<br>· Space saving with a thin design and a low slide table height.<br>· The impact at the end of the stroke will be absorbed with the type equipped with a shock absorber.<br>· Single surface piping is possible with the common piping with switch. | Specifications | 1740 |
| | | How to order | 1742 |
| | | Internal structure and parts list | 1748 |
| | | Dimensions | 1752 |
| | | Switch mounting position dimensions | 1754 |
| | | Selection guide | 1755 |
| | · With the MRL2 Series twin tube, it is no longer necessary to separately install a guide system.<br>· With the twin piston, the generated thrust is twice that of a single piston model.<br>· Space saving with a thin design and a low slide table height.<br>· The impact at the end of the stroke will be absorbed with the type equipped with a shock absorber.<br>· Single surface piping is possible with the common piping with switch. | Specifications | 1740 |
| | | How to order | 1742 |
| | | Internal structure and parts list | 1750 |
| | | Dimensions | 1752 |
| | | Switch mounting position dimensions | 1754 |
| | | Selection guide | 1755 |

| Series | Variation | Model No. | Bore size (mm) | Cushion | | Standard stroke (mm) | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Rubber cushion | Rubber-air cushion | 50 | 100 | |
| Basic<br>MRL2 series | Fine speed<br>with switch | MRL2<br>MRL2-L<br>MRL2-F | ø6 | ● | ◎ | ● | ● | |
| | | | ø10 | | | ● | ● | |
| | | | ø16 | | | | ● | |
| | | | ø20 | | | | | |
| | | | ø25 | | | | | |
| | | | ø32 | | | | | |
| Simplified guide<br>1-piston<br>MRL2-G Series | Fine speed<br>with switch | MRL2-G<br>MRL2-GL<br>MRL2-GF | ø6 | ● | ◎ | ● | ● | |
| | | | ø10 | | | ● | ● | |
| | | | ø16 | | | | ● | |
| | | | ø20 | | | | | |
| | | | ø25 | | | | | |
| | | | ø32 | | | | | |
| Simplified guide<br>2-piston<br>MRL2-W Series | Fine speed<br>with switch | MRL2-W<br>MRL2-WL<br>MRL2-WF | ø6 | ● | ◎ | ● | ● | |
| | | | ø10 | | | ● | ● | |
| | | | ø16 | | | | ● | |
| | | | ø20 | | | | | |
| | | | ø25 | | | | | |
| | | | ø32 | | | | | |

●: Standard, ◎:Option, : Not available

| Standard stroke (mm) | | | | | | | | | | Min. stroke (mm) | Max. stroke *1 (mm) | Custom stroke (per mm) | Option | | | | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 150 | 200 | 250 | 300 | 350 | 400 | 500 | 600 | 700 | | | | With scraper S | Common piping with switch R | With shock absorber C | Copper and PTFE free specifications *2 (P6) | |
| | ● | ● | | | | | | | | 1 | 300 | 1 | ◎ | | | ● | 1740 |
| | ● | ● | ● | ● | | | | | | | 500 | | ◎ | | | ● | |
| | ● | ● | ● | ● | | ● | ● | | | | 1000 | | ◎ | | | ● | |
| | | ● | ● | ● | ● | ● | ● | ● | ● | | 1500 | | ◎ | | | ● | |
| | | ● | ● | ● | ● | ● | ● | ● | ● | | 1500 | | ◎ | | | ● | |
| | | ● | ● | ● | ● | ● | ● | ● | ● | | 1500 | | ◎ | | | ● | |
| | ● | ● | | | | | | | | 1 | 300 | 1 | ◎ | | ◎ | ● | 1740 |
| | ● | ● | ● | ● | | | | | | | 500 | | ◎ | ◎ | ◎ | ● | |
| | ● | ● | ● | ● | | ● | ● | | | | 1000 | | ◎ | ◎ | ◎ | ● | |
| | | ● | ● | ● | ● | ● | ● | ● | ● | | 1500 | | ◎ | ◎ | ◎ | ● | |
| | | ● | ● | ● | ● | ● | ● | ● | ● | | 1500 | | ◎ | ◎ | ◎ | ● | |
| | | ● | ● | ● | ● | ● | ● | ● | ● | | 1500 | | ◎ | ◎ | ◎ | ● | |
| | ● | ● | | | | | | | | 1 | 300 | 1 | ◎ | | ◎ | ● | 1740 |
| | ● | ● | ● | ● | | | | | | | 500 | | ◎ | ◎ | ◎ | ● | |
| | ● | ● | ● | ● | | ● | ● | | | | 1000 | | ◎ | ◎ | ◎ | ● | |
| | | ● | ● | ● | ● | ● | ● | ● | ● | | 1500 | | ◎ | ◎ | ◎ | ● | |
| | | ● | ● | ● | ● | ● | ● | ● | ● | | 1500 | | ◎ | ◎ | ◎ | ● | |
| | | ● | ● | ● | ● | ● | ● | ● | ● | | 1500 | | ◎ | ◎ | ◎ | ● | |

*1 : · The max. strokes of models equipped with a switch are ø6: 200 mm, ø10: 300 mm, ø16: 500 mm, ø20 to ø32: 700 mm
· The max. strokes of fine speed models are ø6: 300 mm, ø10: 500 mm, ø16 to ø25: 800 mm, ø32: 700 mm
· The max. stroke of common piping models equipped with a switch are ø10: 300 mm, ø16: 500 mm, ø20 to ø32: 700 mm

*2 : · Although copper and PTFE free specifications are available with the standard models, these specifications are not available for types with shock absorber and fine speed.

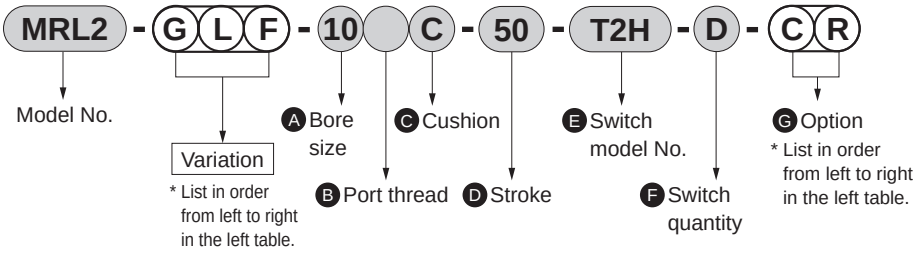
## Variation and option combination selection table

●: Standard
◎: Option
○: Available (made-to-order product)
△: Available depending on conditions (Contact CKD.)
×: Not available

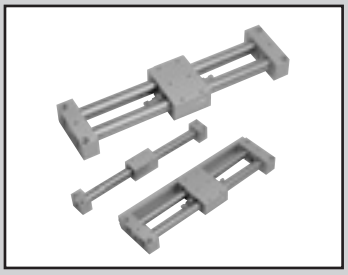
| Category | | Category | Variation | | | | | Port thread | | | Cushion | | Option | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Double acting basic | Twin 1-piston | Twin 2-piston | With cylinder switch | Fine speed | NPT (ø25/ø32) | G (ø25/ø32) | | Rubber-air cushioned | | With shock absorber | With scraper | Common piping with switch | Clean-room specifications (low dust generation) | |
| | | Code | None | G | W | L | F | N | G | | C | | C | S | R | P72 | |
| Variation | Double acting basic | Blank | ⧸ | ⧸ | ⧸ | ⧸ | ⧸ | ○ | ○ | | ◎ | | × | ◎ | × | ◎ | |
| | Twin 1 piston | G | | ⧸ | × | ◎ | ◎ | ○ | ○ | | ◎ | | ◎ | ◎ | ◎ | ◎ | |
| | Twin 2 piston | W | | | ⧸ | ◎ | ◎ | ○ | ○ | | ◎ | | ◎ | ◎ | ◎ | ◎ | |
| | With cylinder switch | L | | | | ⧸ | ◎ | ○ | ○ | | ◎ | | ◎ | ◎ | *3 | ◎ | |
| | Fine speed | F | | | | | ⧸ | ○ | ○ | | ◎ | | *1 | × | × | × | |
| Port thread | NPT(ø25/ø32) | N | | | | | | ⧸ | × | | ○ | | ○ | ○ | ○ | ○ | |
| | G (ø25/ø32) | G | | | | | | | ⧸ | | ○ | | ○ | ○ | ○ | ○ | |
| | | | | | | | | | | ⧸ | | | | | | | |
| Cushion | Rubber-air cushioned | C | | | | | | | | | ⧸ | | ◎ | ◎ | ◎ | ◎ | |
| | | | | | | | | | | | | ⧸ | | | | | |
| Option | With shock absorber | C | | | | | | | | | | | ⧸ | ◎ | ◎ | × | |
| | With scraper | S | | | | | | | | | | | | ⧸ | ◎ | *4 | |
| | Common piping with switch | R | | | | | | | | | | | | | ⧸ | ◎ | |
| | Clean-room specifications (low dust generation) | P72 | | | | | | | | | | | | | | ⧸ | |
| | | | | | | | | | | | | | | | | | |
| Accessory | Cylinder switch | Listed separately | ◎ | ◎ | ◎ | ◎ | ◎ | ○ | ○ | | ◎ | | ◎ | ◎ | ◎ | ◎ | |
| | | | | | | | | | | | | | | | | | |

Caution
*1: Fine speed performance upon entry into the shock absorber cannot be guaranteed.
*2: For P72 clean room specifications, refer to “Components for Clean Room Specifications” (catalog No. CB-033SA).
*3: When selecting a common piping with an “R” switch, be sure to combine the unit with “L” with switch.
*4: As the clean-room specifications P72 are all equipped with a scraper, the code “S” is not required.

[Example of model No.]




Model No.: Magnet rodless cylinder
● Variations: Simplified guide 1 piston, with switch, fine speed
Ⓐ Bore size : ø10 mm
Ⓑ Port thread : Rc thread
Ⓒ Cushion : Rubber-air cushion
Ⓓ Stroke : 50 mm
Ⓔ Switch model No. : Proximity T2H switch, lead wire 1 m
Ⓕ Switch quantity : 2
Ⓖ Option : With shock absorber, common piping



Magnet rodless cylinder

# · Basic **MRL2-(F) Series**
# · Simplified guide 1-piston **MRL2-G(F) Series**
# · Simplified guide 2-piston **MRL2-W(F) Series**

● Bore size: ø6, ø10, ø16, ø20, ø25, ø32

JIS symbol

RoHS CAD

## Specifications

| Item | | MRL2(L,F) , MRL2-G(L,F) , MRL2-W(L,F) | | | | | |
|---|---|---|---|---|---|---|---|
| Bore size | mm | ø6 | ø10 | ø16 | ø20 | ø25 | ø32 |
| Actuation | | Double acting | | | | | |
| Working fluid | | Compressed air | | | | | |
| Max. working pressure | MPa | 0.7 (≈100 psi, 7 bar) | | | | | |
| Min. working pressure | MPa | 0.3 (≈44 psi, 3 bar) (*1) | | 0.2 (≈29 psi, 2 bar) | | | |
| Proof pressure | MPa | 1.05 (≈150 psi, 10.5 bar) | | | | | |
| Ambient temperature | °C | -10 (14°F) to 60 (140°F) (fine speed: 5 (41°F) to 60 (140°F)) (no freezing) | | | | | |
| Port size | | M5 | | | | Rc1/8 | |
| Stroke tolerance | mm | $^{+1.5}_{0}$ ( to 1000) | | | $^{+2.0}_{0}$ ( to 1500) | | |
| Working piston speed | mm/s | 50 to 500 (fine speed: 1 to 200) | | | | | |
| Cushion | | Rubber cushion | | | | | |
| Lubrication | | Not required (use turbine oil ISO VG32 if necessary for lubrication); However, not available with fine speed | | | | | |
| Magnet holding force (*2) | N | 19 | 63 | 166 | 294 | 350 | 574 |
| Adjustable stroke range (single side) (*3) | mm | 3 | 4 | 6 | 8.5 | 10 | 10 |

*1: The value for MRL2-G-6-C (with shock absorber) is 0.4.
*2: The simplified guide 2-piston (W) will be a 2-fold value.
*3: The stroke of MRL2 (basic) cannot be adjusted.

## Stroke

| Bore size (mm) | Standard stroke (mm) | Max. stroke (mm) | Max. stroke with switch (mm) | Max. stroke (mm) of common piping with switch | Max. stroke of fine speed (mm) | Min. stroke (mm) |
|---|---|---|---|---|---|---|
| ø6 | 50, 100, 150, 200 | 300 | 200 | - | 300 | 1 |
| ø10 | 50, 100, 150, 200, 250, 300 | 500 | 300 | 300 | 500 | |
| ø16 | 100, 150, 200, 250, 300, 400, 500 | 1000 | 500 | 500 | 800 | |
| ø20 | 200, 250, 300, 350, 400, 500, 600, 700 | 1500 | 700 | 700 | 800 | |
| ø25 | 200, 250, 300, 350, 400, 500, 600, 700 | 1500 | 700 | 700 | 800 | |
| ø32 | 200, 250, 300, 350, 400, 500, 600, 700 | 1500 | 700 | 700 | 700 | |

■ The custom stroke is available in 1 mm increments.

## Number of installed T-switches and min. stroke (mm)

| Switch quantity | 1 | | | | 2 | | | | 3 | | | | 4 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Switch model No. / Bore size (mm) | T*V | T*H | T*YV | T*YH | T*V | T*H | T*YV | T*YH | T*V | T*H | T*YV | T*YH | T*V | T*H | T*YV | T*YH |
| ø6 or equiv. | 5 | 5 | 5 | 5 | 20 | 50 | 40 | 70 | 40 | 85 | 71 | 115 | 60 | 120 | 101 | 160 |
| ø10 or equiv. | 5 | 5 | 5 | 5 | 20 | 50 | 40 | 70 | 40 | 85 | 71 | 115 | 60 | 120 | 101 | 160 |
| ø16 or equiv. | 5 | 5 | 5 | 5 | 20 | 50 | 40 | 70 | 40 | 85 | 71 | 115 | 60 | 120 | 101 | 160 |
| ø20 or equiv. | 5 | 5 | 5 | 5 | 20 | 50 | 40 | 70 | 40 | 85 | 71 | 115 | 60 | 120 | 101 | 160 |
| ø25 or equiv. | 5 | 5 | 5 | 5 | 20 | 50 | 40 | 70 | 40 | 85 | 71 | 115 | 60 | 120 | 101 | 160 |
| ø32 or equiv. | 5 | 5 | 5 | 5 | 20 | 50 | 40 | 70 | 40 | 85 | 71 | 115 | 60 | 120 | 101 | 160 |

*T1H has the same min. stroke as T*YH and T1V the same as T*YV.

## Switch specifications

● 1-color/2-color LED

| Item | 2-wire proximity | | | | 3-wire proximity | | | |
|---|---|---|---|---|---|---|---|---|
| | T1H/T1V | T2H/T2V | T2YH/T2YV | T2WH/T2WV | T3H/T3V | T3PH/T3PV | T3YH/T3YV | T3WH/T3WV |
| Applications | For programmable controller, relay, compact solenoid valve | Dedicated for programmable controller | | | For programmable controller, relay | | | |
| Output method | - | | | | NPN output | PNP output | NPN output | NPN output |
| Power supply voltage | - | | | | 10 to 28 VDC | | | |
| Load voltage | 85 to 265 VAC | 10 to 30 VDC | | 24 VDC ±10% | 30 VDC or less | | | |
| Load current | 5 to 100 mA | 5 to 20 mA (*3) | | | 100 mA or less | | 50 mA or less | |
| Indicator | LED (Lit when ON) | LED (Lit when ON) | Red/green LED (Lit when ON) | Red/green LED (Lit when ON) | LED (Lit when ON) | Yellow LED (Lit when ON) | Red/green LED (Lit when ON) | Red/green LED (Lit when ON) |
| Leakage current | 1 mA or less with 100 VAC, 2 mA or less with 200 VAC | 1 mA or less | | | 10 μA or less | | | |
| Weight g | 1 m:33<br>3 m:87<br>5 m:142 | 1 m:18<br>3 m:49<br>5 m:80 | 1 m:33<br>3 m:87<br>5 m:142 | 1 m:18<br>3 m:49<br>5 m:80 | 1 m:18<br>3 m:49<br>5 m:80 | | 1 m:33<br>3 m:87<br>5 m:142 | 1 m:18<br>3 m:49<br>5 m:80 |

*1: Refer to Ending Page 1 for detailed switch specifications and dimensions.
*2: Switches other than the above models, such as switches with connectors, are also available. Refer to Ending Page 1.
*3: The max. load current is 20 mA at 25°C. The current is lower than 20 mA if the operating ambient temperature around the switch is higher than 25°C. (5 to 10 mA at 60°C)

## Cylinder weight

Unit (g)

| Model No. | No switch | | With switch | | Common piping with switch | |
|---|---|---|---|---|---|---|
| | Weight for 0 mm stroke | Additional weight per S = 100mm | Weight for 0 mm stroke | Additional weight per S = 100mm | Weight for 0 mm stroke | Additional weight per S = 100mm |
| MRL2-6 | 73 | 13 | 103 | 39 | - | - |
| MRL2-10 | 143 | 28 | 169 | 48 | - | - |
| MRL2-16 | 278 | 43 | 313 | 63 | - | - |
| MRL2-20 | 542 | 85 | 587 | 105 | - | - |
| MRL2-25 | 954 | 98 | 1017 | 128 | - | - |
| MRL2-32 | 1230 | 195 | 1301 | 225 | - | - |
| MRL2-G-6 | 193 | 28 | 223 | 54 | - | - |
| MRL2-G-10 | 368 | 53 | 394 | 73 | 411 | 94 |
| MRL2-G-16 | 635 | 85 | 670 | 105 | 691 | 126 |
| MRL2-G-20 | 1197 | 155 | 1242 | 175 | 1269 | 196 |
| MRL2-G-25 | 1852 | 196 | 1915 | 226 | 1997 | 289 |
| MRL2-G-32 | 2297 | 390 | 2368 | 420 | 2455 | 483 |
| MRL2-W-6 | 203 | 28 | 233 | 54 | - | - |
| MRL2-W-10 | 398 | 53 | 424 | 73 | 441 | 94 |
| MRL2-W-16 | 710 | 85 | 745 | 105 | 766 | 126 |
| MRL2-W-20 | 1367 | 155 | 1412 | 175 | 1439 | 196 |
| MRL2-W-25 | 2206 | 196 | 2269 | 226 | 2351 | 289 |
| MRL2-W-32 | 2859 | 390 | 2930 | 420 | 3017 | 483 |

*1: The weight of the switch is not included in the product weight of types with switch and common piping with switch.

## Theoretical thrust table

● MRL2,MRL2-G

(Unit: N)

| Bore size (mm) | Operating direction | Working pressure MPa | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 |
| ø6 | Push/Pull | - | 8.48 | 11.3 | 14.1 | 17.0 | 19.8 |
| ø10 | Push/Pull | - | 23.6 | 31.4 | 39.3 | 47.1 | 55.0 |
| ø16 | Push/Pull | 40.2 | 60.3 | 80.4 | $1.01x10^2$ | $1.21x10^2$ | $1.41x10^2$ |
| ø20 | Push/Pull | 62.8 | 94.2 | $1.26x10^2$ | $1.57x10^2$ | $1.88x10^2$ | $2.20x10^2$ |
| ø25 | Push/Pull | 98.2 | $1.47x10^2$ | $1.96x10^2$ | $2.45x10^2$ | $2.95x10^2$ | $3.44x10^2$ |
| ø32 | Push/Pull | $1.61x10^2$ | $2.41x10^2$ | $3.22x10^2$ | $4.02x10^2$ | $4.83x10^2$ | $5.63x10^2$ |

● MRL2-W

(Unit: N)

| Bore size (mm) | Operating direction | Working pressure MPa | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 |
| ø6 | Push/Pull | - | 17.0 | 22.6 | 28.3 | 33.9 | 39.6 |
| ø10 | Push/Pull | - | 47.1 | 62.8 | 78.5 | 94.2 | $1.10x10^2$ |
| ø16 | Push/Pull | 80.4 | $1.21x10^2$ | $1.61x10^2$ | $2.01x10^2$ | $2.41x10^2$ | $2.81x10^2$ |
| ø20 | Push/Pull | $1.26x10^2$ | $1.88x10^2$ | $2.51x10^2$ | $3.14x10^2$ | $3.77x10^2$ | $4.40x10^2$ |
| ø25 | Push/Pull | $1.96x10^2$ | $2.95x10^2$ | $3.93x10^2$ | $4.91x10^2$ | $5.89x10^2$ | $6.87x10^2$ |
| ø32 | Push/Pull | $3.22x10^2$ | $4.83x10^2$ | $6.43x10^2$ | $8.04x10^2$ | $9.65x10^2$ | $1.13x10^3$ |

## How to order

No switch (without magnet for switch)

**MRL2-W — 6 ( ) C — 50 ——— C**

With switch (built-in magnet for switch)

**MRL2-WL — 6 ( ) C — 50 — T2H — R — C**

Ⓐ Model No.

Ⓑ Bore size

Ⓒ Port thread *1

Ⓓ Cushion *2

Ⓔ Stroke *3

Ⓕ Switch model No. * indicates the lead wire length. *5

Ⓖ Switch quantity

Ⓗ Option *6

### Precautions for model No. selection

*1 : When the cushion is a rubber cushion (blank), the port thread will be the following.
NPT thread: NN G thread: GN

*2 : In the case of MRL2-G and W with the "C" rubber-air cushion, the stopper protrudes from the end plate by approximately 1 mm at shipment. Note that the rubber-air cushion may not function if the stopper is moved to adjust the stroke.

*3 : Refer to the following table for max. stroke with switch.

*4 : Refer to page 1740 for min. stroke with switch and max. stroke for fine speed.

*5 : Switches other than Ⓕ Switch model No. are also available. (Made to order) Refer to Ending Page 1 for details.

***6 : When selecting a common piping with "R" switch, select the model No. with a switch (MRL2-*L).**

| Bore size (mm) | Max. stroke with switch (mm) |
|---|---|
| ø6 | 200 |
| ø10 | 300 |
| ø16 | 500 |
| ø20 | 700 |
| ø25 | 700 |
| ø32 | 700 |

[Example of model No.]

**MRL2-WL-10-50-T2H-R-C**

Model: Rodless cylinder

Ⓐ Model No. : Simplified guide 2-piston
Ⓑ Bore size : ø10 mm
Ⓒ Port thread : Rc thread
Ⓓ Cushion : Rubber cushion
Ⓔ Stroke : 50 mm
Ⓕ Switch model No. : Proximity switch T2H
Ⓖ Switch quantity : 1 on R side
Ⓗ Option : With shock absorber

| Code | | Description |
|---|---|---|
| **Ⓐ Model No.** | | |
| Basic | MRL2 | No switch |
| | MRL2-L | With switch |
| | MRL2-F | Fine speed |
| | MRL2-LF | Fine speed, with switch |
| Simplified guide 1-piston | MRL2-G | No switch |
| | MRL2-GL | With switch |
| | MRL2-GF | Fine speed |
| | MRL2-GLF | Fine speed, with switch |
| Simplified guide 2-piston | MRL2-W | No switch |
| | MRL2-WL | With switch |
| | MRL2-WF | Fine speed |
| | MRL2-WLF | Fine speed, with switch |

| **Ⓑ Bore size (mm)** | |
|---|---|
| 6 | ø6 |
| 10 | ø10 |
| 16 | ø16 |
| 20 | ø20 |
| 25 | ø25 |
| 32 | ø32 |

| **Ⓒ Port thread** | |
|---|---|
| Blank | Rc thread |
| N | NPT thread (ø25 and over) (made-to-order product) |
| G | G thread (ø25 and over) (made-to-order product) |

| **Ⓓ Cushion** | |
|---|---|
| Blank | Rubber cushion |
| C | Rubber-air cushion |

**Ⓔ Stroke (mm)**

| Bore size | Stroke *4 | Custom stroke |
|---|---|---|
| ø6 | 1 to 300 | In 1 mm increments |
| ø10 | 1 to 500 | |
| ø16 | 1 to 1000 | |
| ø20 to ø32 | 1 to 1500 | |

**Ⓕ Switch model No.**

| Axial lead wire | Radial lead wire | Contact | Voltage AC | Voltage DC | Indicator | Lead wire |
|---|---|---|---|---|---|---|
| T1H* | T1V* | Proximity | ● | | 1-color LED | 2-wire |
| T2H* | T2V* | | | ● | | |
| T3H* | T3V* | | | ● | | 3-wire |
| T2WH* | T2WV* | | | ● | 2-color LED | 2-wire |
| T2YH* | T2YV* | | | ● | | |
| T3WH* | T3WV* | | | ● | | 3-wire |
| T3YH* | T3YV* | | | ● | | |
| T3PH* | T3PV* | | | ● | 1-color LED | |

| *** Lead wire length** | |
|---|---|
| Blank | 1 m (standard) |
| 3 | 3 m (option) |
| 5 | 5 m (option) |

| **Ⓖ Switch quantity** | |
|---|---|
| R | 1 on R side |
| L | 1 on L side |
| D | 2 |
| T | 3 |
| 4 | 4 (when there are more than 4 switches, indicate switch quantity.) |

| **Ⓗ Option** | |
|---|---|
| C | With shock absorber (basic cannot be selected.) |
| S | With scraper (fine speed cannot be selected) |
| R | Common piping with switch (basic and ø6 cannot be selected.) |

## How to order switch

SW – T2H

Switch model No.
(Item Ⓕ on page 1742)

## How to order discrete shock absorber

Used when changing from the standard to that with a shock absorber

MRL2 – W/G – 25 – C

Bore size
(Item Ⓑ on page 1742)

· Shock absorber and mounting nut (hexagon nut) set of 1 each.

(Reference)
Applicable shock absorber model No.

| Model | Shock absorber model No. |
|---|---|
| MRL2-W-6, MRL2-G-6 | NCK-00-0.1 |
| MRL2-W-10, MRL2-G-10 | NCK-00-0.1-C |
| MRL2-W-16, MRL2-G-16 | NCK-00-0.3-C |
| MRL2-W-20, MRL2-G-20 | NCK-00-0.7-C |
| MRL2-W-25, MRL2-G-25 | NCK-00-1.2-C |
| MRL2-W-32, MRL2-G-32 | NCK-00-1.2-C |

### Clean-room specifications (Catalog No. CB-033SA)

● Anti-dust generation structure for use in cleanrooms

MRL2 - * - ····· - P72

MRL2 - * - ····· - P52

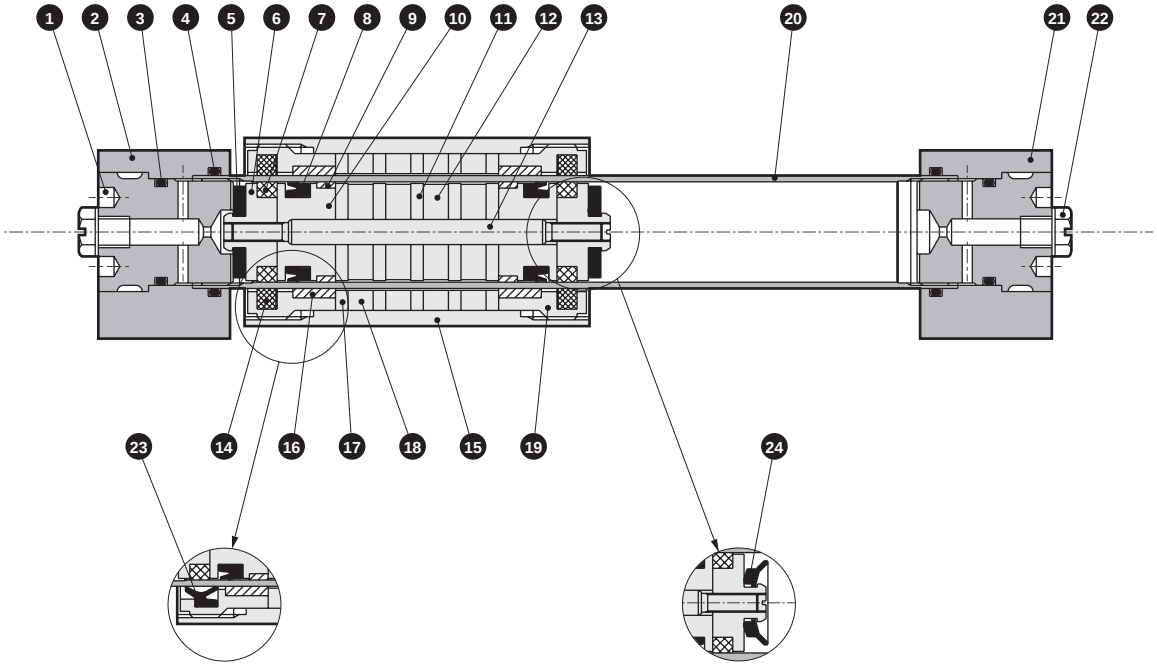
### Specifications for rechargeable battery (Catalog No. CC-1226A)

● Design compatible with rechargeable battery manufacturing process

MRL2 - ····· - P4*

## Internal structure and parts list MRL2 (basic)

● MRL2 (basic)




With scraper
option codes “S” and “P72”

Cushion code “C”
Rubber-air cushioned

Cannot be disassembled

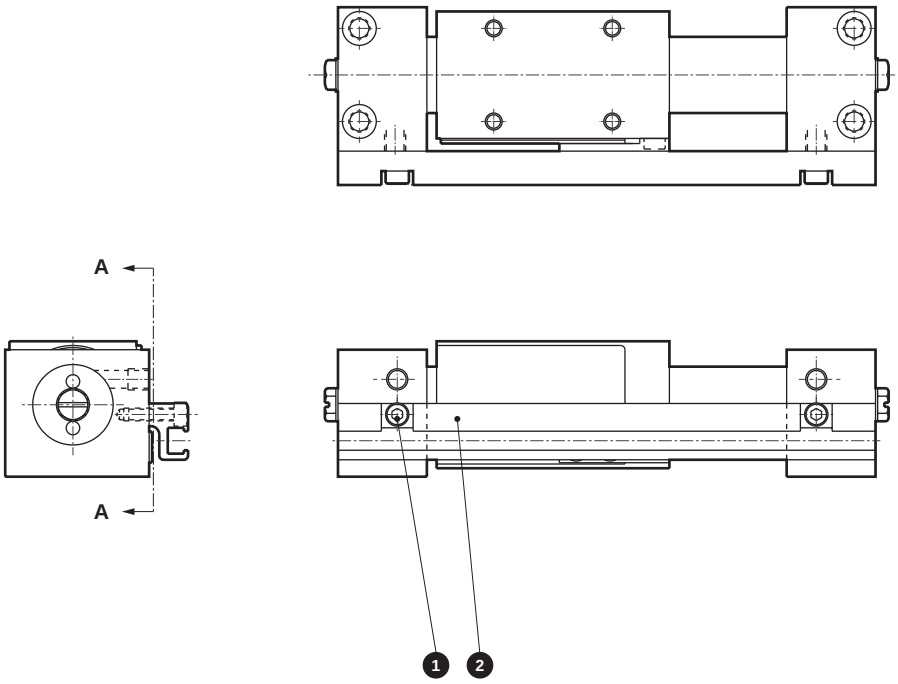
### Parts list

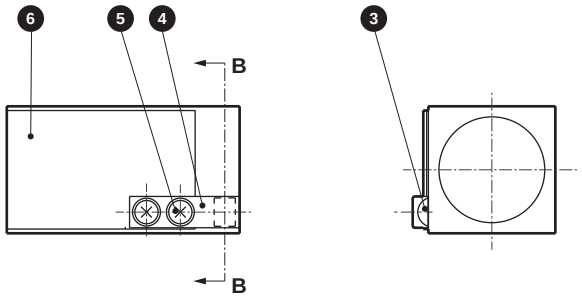
| No. | Part name | Material | Remarks | No. | Part name | Material | Remarks |
|---|---|---|---|---|---|---|---|
| 1 | End cap | Aluminum alloy | Chromate | 13 | Piston shaft | Stainless steel | |
| 2 | End plate (L) | Aluminum alloy | Alumite | 14 | Lube keeping structure (for slider) | Special rubber | None with P72 |
| 3 | O-ring | Nitrile rubber | | 15 | Slider | Aluminum alloy | Alumite |
| 4 | O-ring | Nitrile rubber | | 16 | Slider wear ring | Polyacetal resin | |
| 5 | Cushion rubber | Urethane rubber | | 17 | Slider yoke | Steel | Zinc chromate |
| 6 | Piston (2) | Aluminum alloy | Chromate | 18 | Magnet | Special alloy | |
| 7 | Lube keeping structure (for piston) | Special rubber | | 19 | Slider cover | Aluminum alloy | Chromate |
| 8 | Piston packing | Nitrile rubber | | 20 | Cylinder tube | Stainless steel | |
| 9 | Piston wear ring | Polyacetal resin | | 21 | End plate (R) | Aluminum alloy | Alumite |
| 10 | Piston (1) | Aluminum alloy | Chromate | 22 | Plug | Copper alloy or steel | |
| 11 | Piston yoke | Steel | Zinc chromate | 23 | Scraper | Urethane rubber | |
| 12 | Magnet | Special alloy | | 24 | Rubber-air cushion | Special rubber | |

Note: The magnetic strength of the embedded magnet is powerful. Do not disassemble.

## Internal structure and parts list MRL2 (basic)

● MRL2-L (with switch)



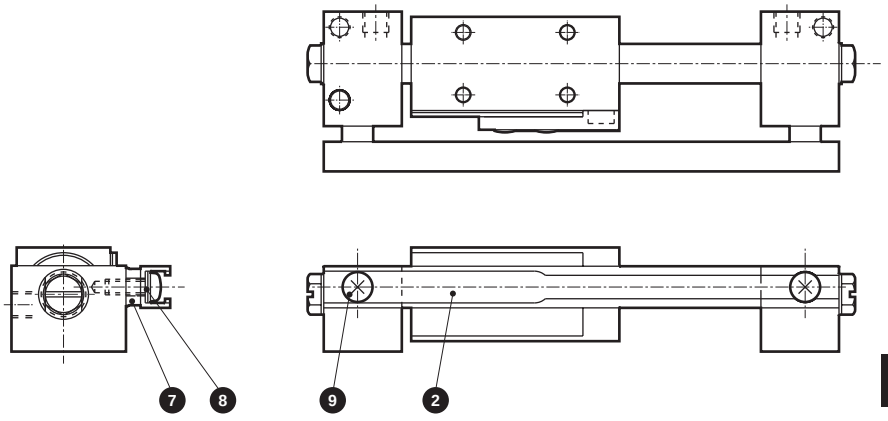




A-A arrow view

Cross section B-B

Cannot be disassembled

● Only available with MRL2-L-6



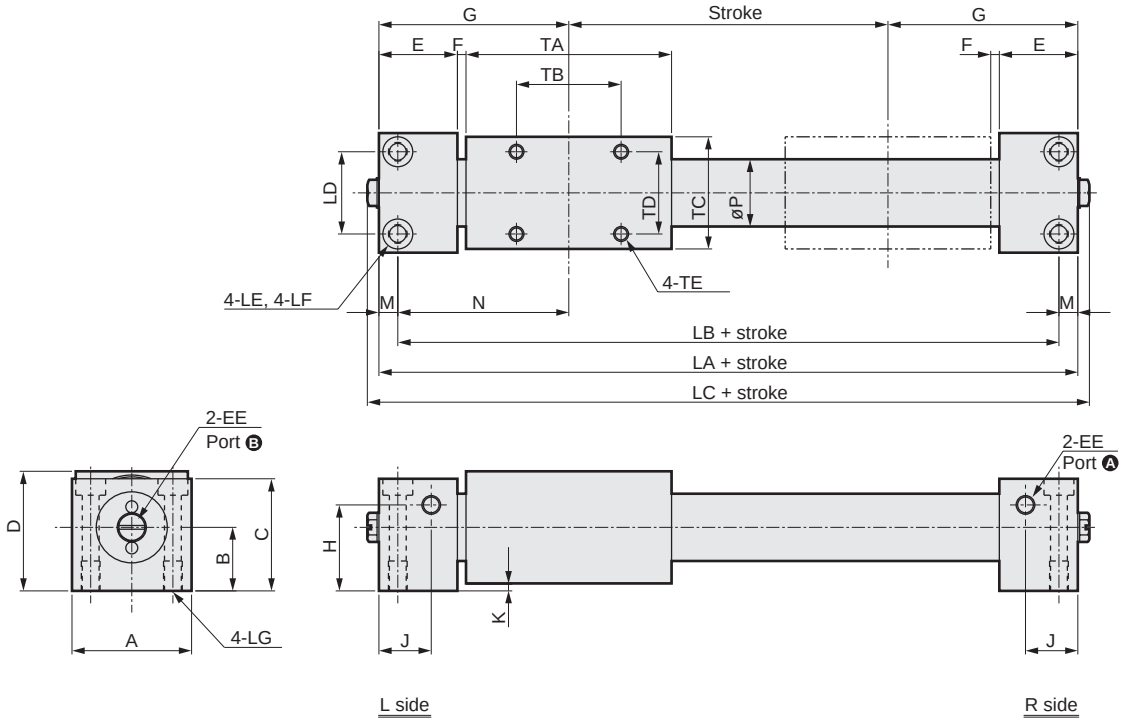

Cannot be disassembled

## Parts list

| No. | Part name | Material | Remarks | No. | Part name | Material | Remarks |
|---|---|---|---|---|---|---|---|
| 1 | Hexagon socket head cap screw | Stainless steel | | 6 | Shield plate | Steel | Nickeling |
| 2 | Switch rail | Aluminum alloy | Alumite | 7 | Spacer | Copper alloy | Nickeling |
| 3 | Magnet | Special alloy | | 8 | Plain washer | Stainless steel | |
| 4 | Magnet holder | Polyacetal resin | | 9 | Cross-recessed pan head machine screw | Stainless steel | |
| 5 | Cross-recessed pan head machine screw | Stainless steel | | | | | |

## Dimensions: MRL2 (basic)

● MRL2 (basic) without switch




Note: It is possible to select A and B for air piping port.
The unit will be shipped with the plug assembled onto port B.
· ø6 to ø20: Plug (FPL-M5)
· ø25, ø32: Hexagon socket head cap taper thread plug

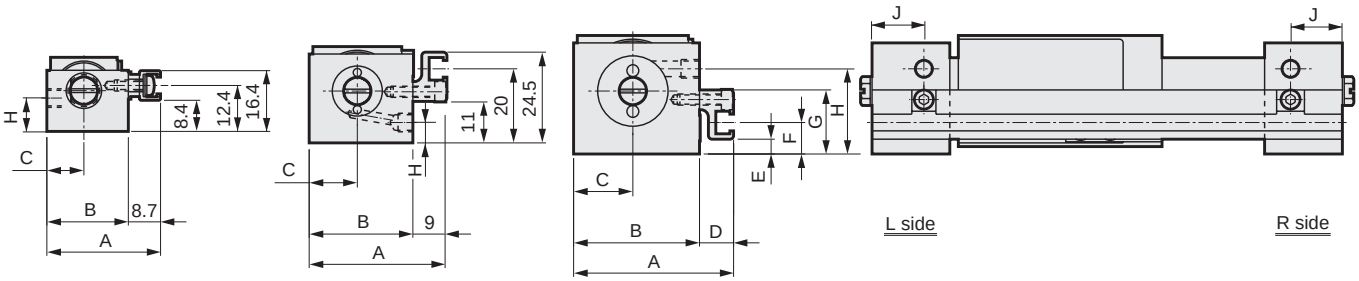
| Code | Dimensions | | | | | Mounting dimensions | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bore size (mm) | LA | LC | A | C | D | LB | LD | LE | LF | LG | TB | TD | TE |
| ø6 | 74 | 80.2 | 20 | 16.5 | 20 | 68 | 14 | ø3.5 | - | M4 depth 6 | 20 | 12 | M3 depth 4.5 |
| ø10 | 80 | 86.2 | 26 | 24 | 26 | 72 | 18 | ø3.5 | ø6.5 spot face depth 3.3 | M4 depth 8 | 20 | 18 | M3 depth 4.5 |
| ø16 | 102 | 108.2 | 32 | 30 | 32 | 92 | 22 | ø4.5 | ø8 spot face depth 4.4 | M5 depth 8 | 28 | 22 | M4 depth 6 |
| ø20 | 128 | 134.2 | 38 | 36 | 38 | 116 | 26 | ø5.5 | ø9.5 spot face depth 5.4 | M6 depth 12 | 44 | 26 | M4 depth 6 |
| ø25 | 130 | 132.2 | 52 | 45 | 48 | 118 | 40 | ø5.5 | ø9.5 spot face depth 5.4 | M6 depth 12 | 40 | 30 | M6 depth 6 |
| ø32 | 138 | 140.2 | 60 | 53 | 56 | 124 | 46 | ø6.9 | ø11 spot face depth 6.5 | M8 depth 12 | 40 | 40 | M6 depth 9 |

| Code | General dimensions | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bore size (mm) | B | E | EE | F | G | H | J | K | M | N | P | TA | TC |
| ø6 | 11 | 15 | M5 depth 4 | 2 | 37 | 9 | 9.5 | 2 | 3 | 34 | 7.6 | 40 | 18 |
| ø10 | 14 | 18 | M5 depth 4 | 2 | 40 | 5.5 | 10 | 2 | 4 | 36 | 12 | 40 | 24 |
| ø16 | 17 | 21 | M5 depth 4 | 2.5 | 51 | 23 | 14 | 2 | 5 | 46 | 18 | 55 | 30 |
| ø20 | 20 | 24 | M5 depth 4 | 3 | 64 | 28 | 15.5 | 2 | 6 | 58 | 23 | 74 | 36 |
| ø25 | 25.5 | 27 | Rc1/8 | 3 | 65 | 29 | 17 | 3 | 6 | 59 | 28 | 70 | 45 |
| ø32 | 29.5 | 27 | Rc1/8 | 3 | 69 | 37 | 17 | 3 | 7 | 62 | 35 | 78 | 53 |

## Dimensions: MRL2 (basic)

● MRL2-L (basic) with switch

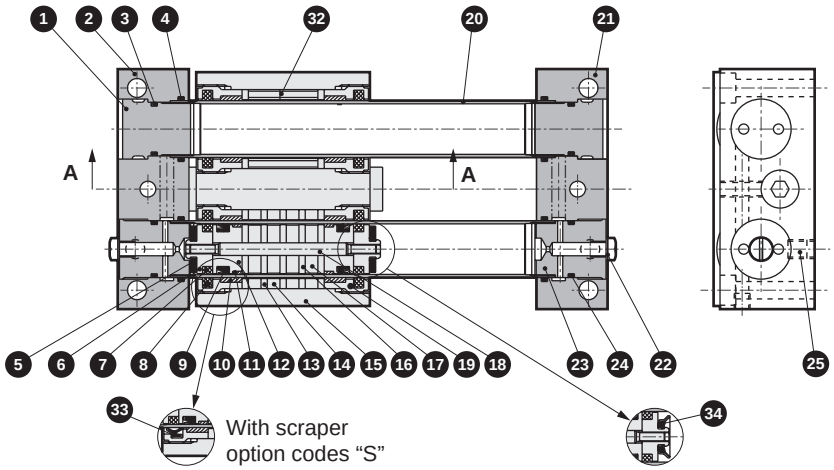
● For ø6 ● For ø10 ● For ø16 to ø32




| Code / Bore size (mm) | A | B | C | D | E | F | G | H | J |
|---|---|---|---|---|---|---|---|---|---|
| ø6 | 30.7 | 22 | 10 | - | - | - | - | 9 | 9.5 |
| ø10 | 37 | 28 | 13 | - | - | - | - | 5.5 | 10 |
| ø16 | 43 | 34 | 16 | 9.0 | 4 | 8.5 | 17.3 | 23 | 14 |
| ø20 | 49 | 40 | 19 | 9.0 | 9 | 13.5 | 22.3 | 28 | 15.5 |
| ø25 | 60.7 | 52 | 26 | 8.7 | 2 | 7.5 | 21 | 29 | 17 |
| ø32 | 68.7 | 60 | 30 | 8.7 | 10 | 15.5 | 29 | 37 | 17 |

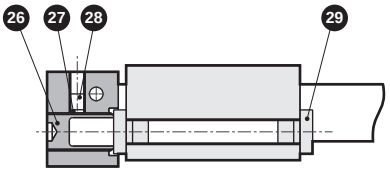
## Internal structure and parts list MRL2-G (simplified guide 1-piston)

● MRL2-G (simplified guide 1-piston)



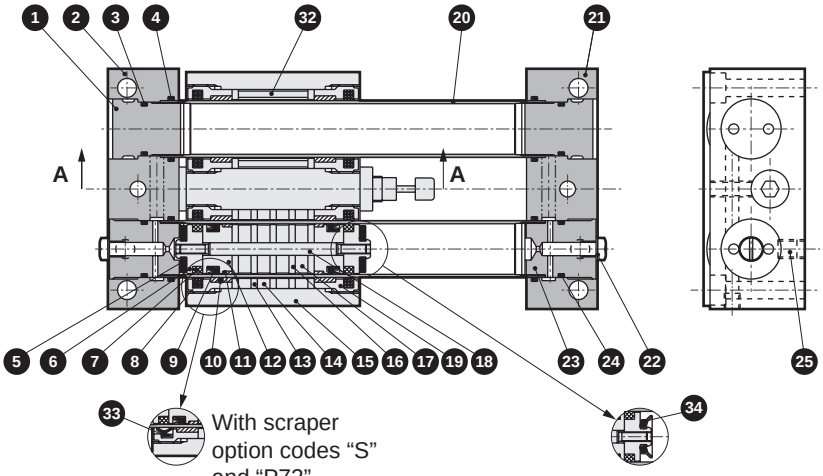

With scraper option codes "S" and "P72"

Cushion code "C" Rubber-air cushioned



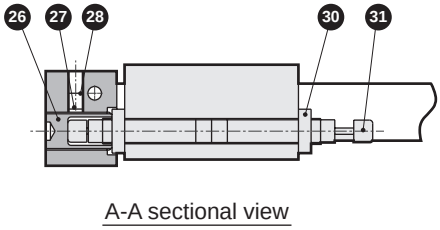

A-A sectional view

● MRL2-G-*-C (with shock absorber)




With scraper option codes "S" and "P72"

Cushion code "C" Rubber-air cushioned




A-A sectional view

**Cannot be disassembled**

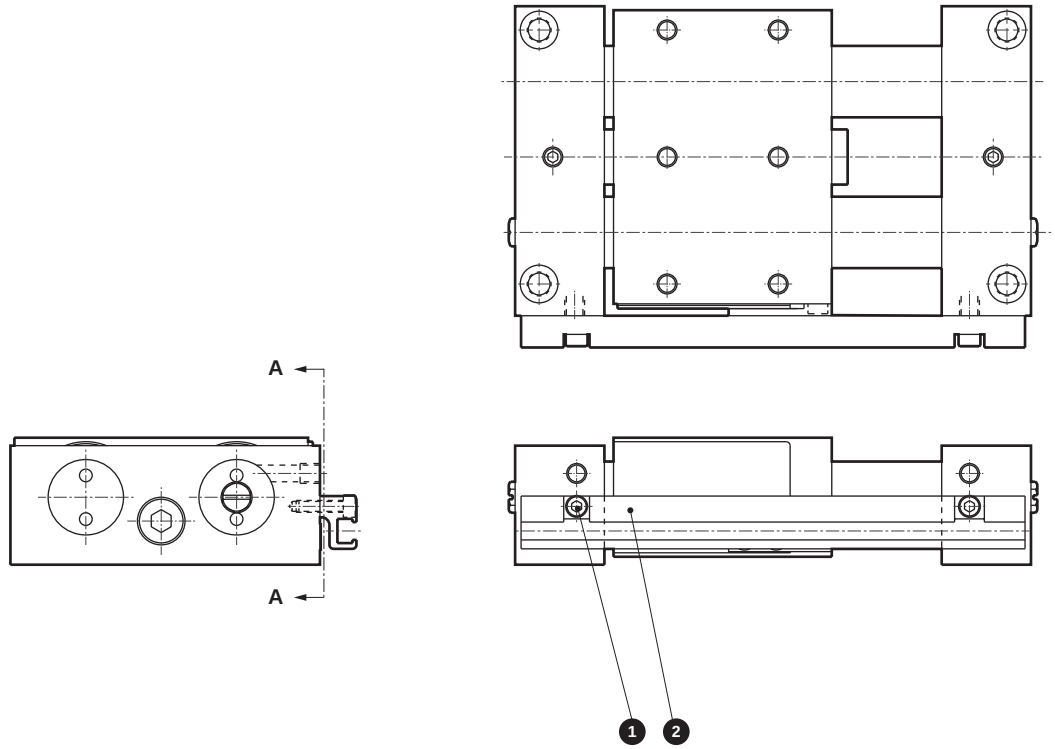
## Parts list

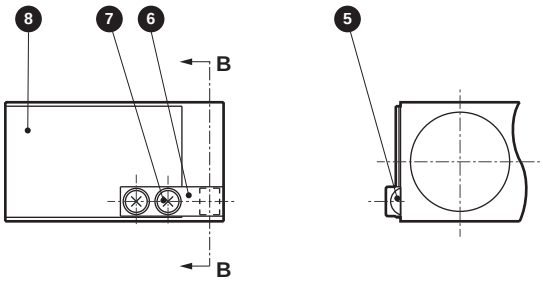
| No. | Part name | Material | Remarks | No. | Part name | Material | Remarks |
|---|---|---|---|---|---|---|---|
| 1 | End cap | Aluminum alloy | Chromate | 18 | Piston shaft | Stainless steel | |
| 2 | End plate (L) | Aluminum alloy | Alumite | 19 | Slider cover | Aluminum alloy | Chromate |
| 3 | O-ring | Nitrile rubber | | 20 | Cylinder tube | Stainless steel | |
| 4 | O-ring | Nitrile rubber | | 21 | End plate (R) | Aluminum alloy | Alumite |
| 5 | Cushion rubber | Urethane rubber | | 22 | Plug | Copper alloy or steel | |
| 6 | Piston (2) | Aluminum alloy | Chromate | 23 | End cap | Aluminum alloy | Chromate |
| 7 | Lube keeping structure (for piston) | Special rubber | | 24 | O-ring | Nitrile rubber | |
| 8 | Lube keeping structure (for slider) | Special rubber | None with P72 | 25 | Hexagon socket set screw | Alloy steel | |
| 9 | Piston packing | Nitrile rubber | | 26 | Stopper | Alloy steel | Nickeling |
| 10 | Slider wear ring | Polyacetal resin | | 27 | Set shoe | Aluminum alloy | |
| 11 | Piston wear ring | Polyacetal resin | | 28 | Hexagon socket set screw | Stainless steel | |
| 12 | Piston (1) | Aluminum alloy | Chromate | 29 | Stopper bolt | Steel | Nickeling |
| 13 | Slider yoke | Steel | Zinc chromate | 30 | Hexagon nut | Steel | |
| 14 | Magnet | Special alloy | | 31 | Shock absorber | | |
| 15 | Slider | Aluminum alloy | Alumite | 32 | Spacer | Stainless steel | |
| 16 | Piston yoke | Steel | Zinc chromate | 33 | Scraper | Urethane rubber | |
| 17 | Magnet | Special alloy | | 34 | Rubber-air cushion | Special rubber | |

Note: The magnetic strength of the magnet is powerful. Do not disassemble.

## Internal structure and parts list MRL2-G (simplified guide 1-piston)

● MRL2-GL (with switch)



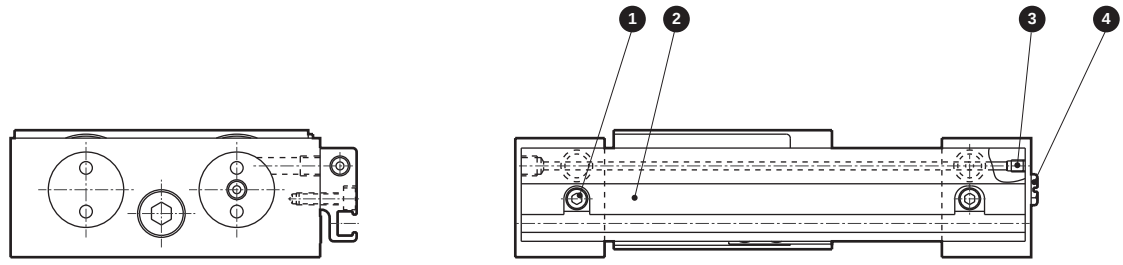




A-A arrow view

Cross section B-B

Cannot be disassembled

● MRL2-GL-*-R (common piping with switch)



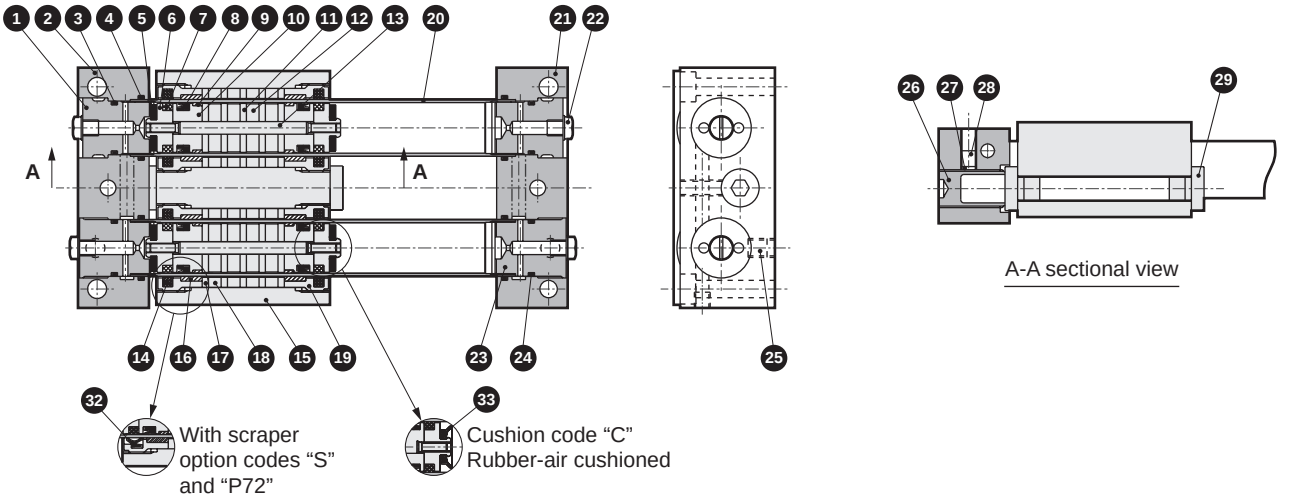

Cannot be disassembled

### Parts list

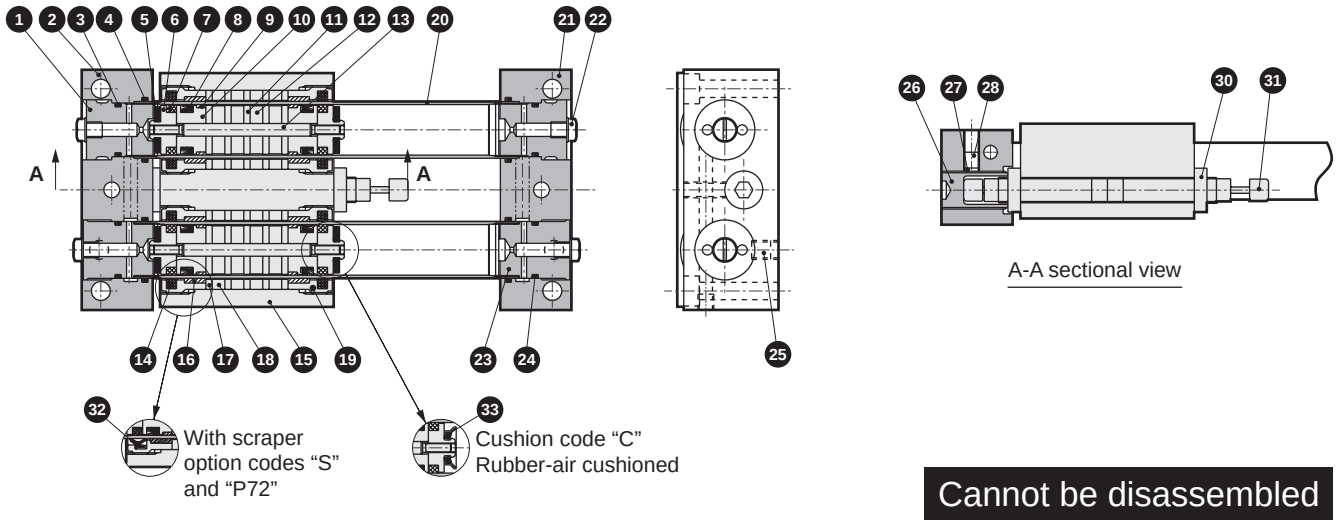
| No. | Part name | Material | Remarks | No. | Part name | Material | Remarks |
|---|---|---|---|---|---|---|---|
| 1 | Hexagon socket head cap screw | Stainless steel | | 5 | Magnet | Special alloy | |
| 2 | Switch rail | Aluminum alloy | Alumite | 6 | Magnet holder | Polyacetal resin | |
| 3 | Hexagon socket set screw | Stainless steel | | 7 | Cross-recessed pan head machine screw | Stainless steel | |
| 4 | Plug | Copper alloy or steel | | 8 | Shield plate | Steel | Nickeling |

## Internal structure and parts list MRL2-W (simplified guide 2-piston)

● MRL2-W (simplified guide 2-piston)




● MRL2-W-*-C (with shock absorber)




**Cannot be disassembled**

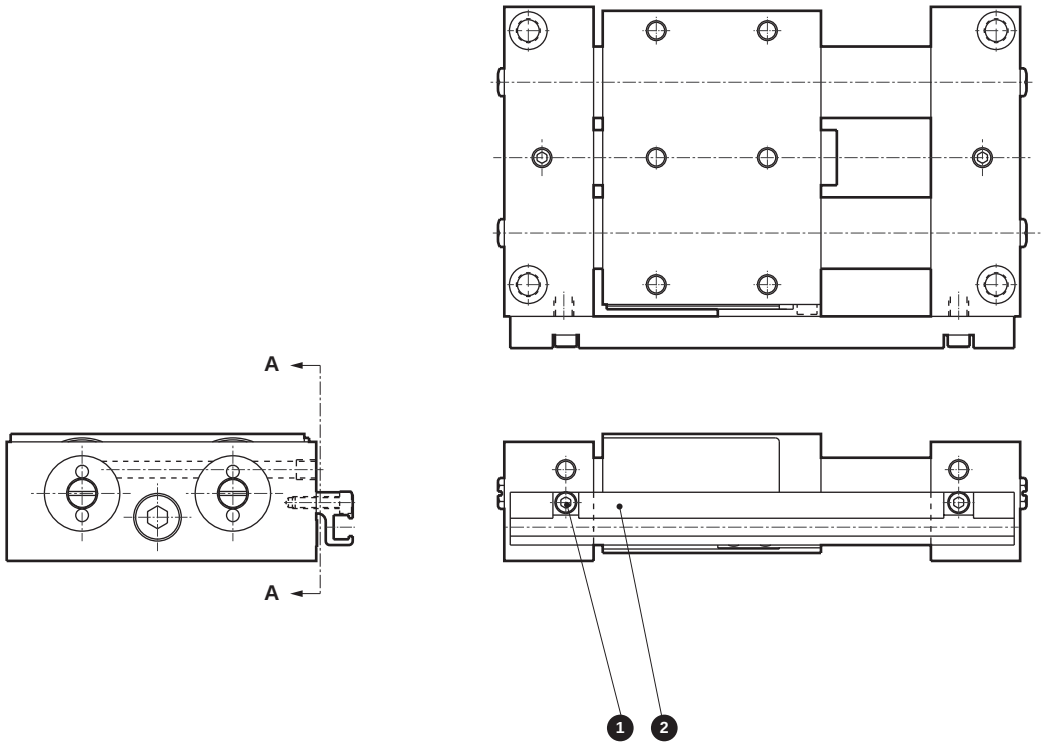
## Parts list

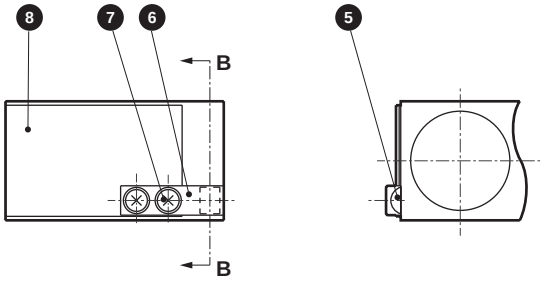
| No. | Part name | Material | Remarks | No. | Part name | Material | Remarks |
|---|---|---|---|---|---|---|---|
| 1 | End cap | Aluminum alloy | Chromate | 17 | Slider yoke | Steel | Zinc chromate |
| 2 | End plate (L) | Aluminum alloy | Alumite | 18 | Magnet | Special alloy | |
| 3 | O-ring | Nitrile rubber | | 19 | Slider cover | Aluminum alloy | Chromate |
| 4 | O-ring | Nitrile rubber | | 20 | Cylinder tube | Stainless steel | |
| 5 | Cushion rubber | Urethane rubber | | 21 | End plate (R) | Aluminum alloy | Alumite |
| 6 | Piston (2) | Aluminum alloy | Chromate | 22 | Plug | Copper alloy or steel | |
| 7 | Lube keeping structure (for piston) | Special rubber | | 23 | End cap | Aluminum alloy | Chromate |
| 8 | Piston packing | Nitrile rubber | | 24 | O-ring | Nitrile rubber | |
| 9 | Piston wear ring | Polyacetal resin | | 25 | Hexagon socket set screw | Alloy steel | |
| 10 | Piston (1) | Aluminum alloy | Chromate | 26 | Stopper | Alloy steel | Nickeling |
| 11 | Piston yoke | Steel | Zinc chromate | 27 | Set shoe | Aluminum alloy | |
| 12 | Magnet | Special alloy | | 28 | Hexagon socket set screw | Stainless steel | |
| 13 | Piston shaft | Stainless steel | | 29 | Stopper bolt | Steel | Nickeling |
| 14 | Lube keeping structure (for slider) | Special rubber | | 30 | Hexagon nut | Steel | |
| 15 | Slider | Aluminum alloy | Alumite | 31 | Shock absorber | | |
| 16 | Slider wear ring | Polyacetal resin | | 32 | Scraper | Urethane rubber | |
| | | | | 33 | Rubber-air cushion | Special rubber | |

Note: The magnetic strength of the magnet is powerful. Do not disassemble.

## Internal structure and parts list MRL2-W (simplified guide 2-piston)

● MRL2-WL (with switch)



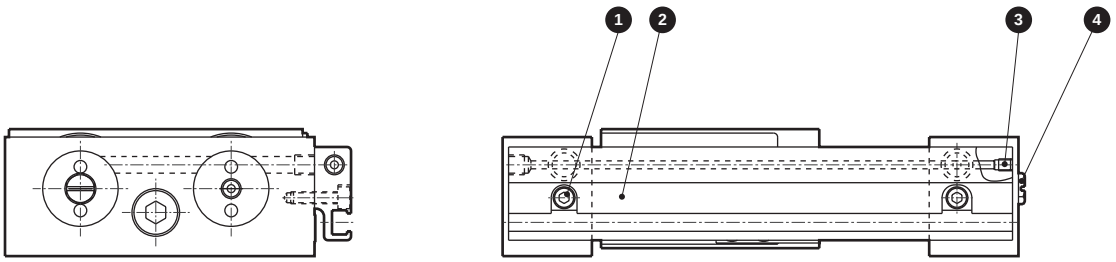




A-A arrow view

Cross section B-B

Cannot be disassembled

● MRL2-WL-*-R (common piping with switch)




Cannot be disassembled

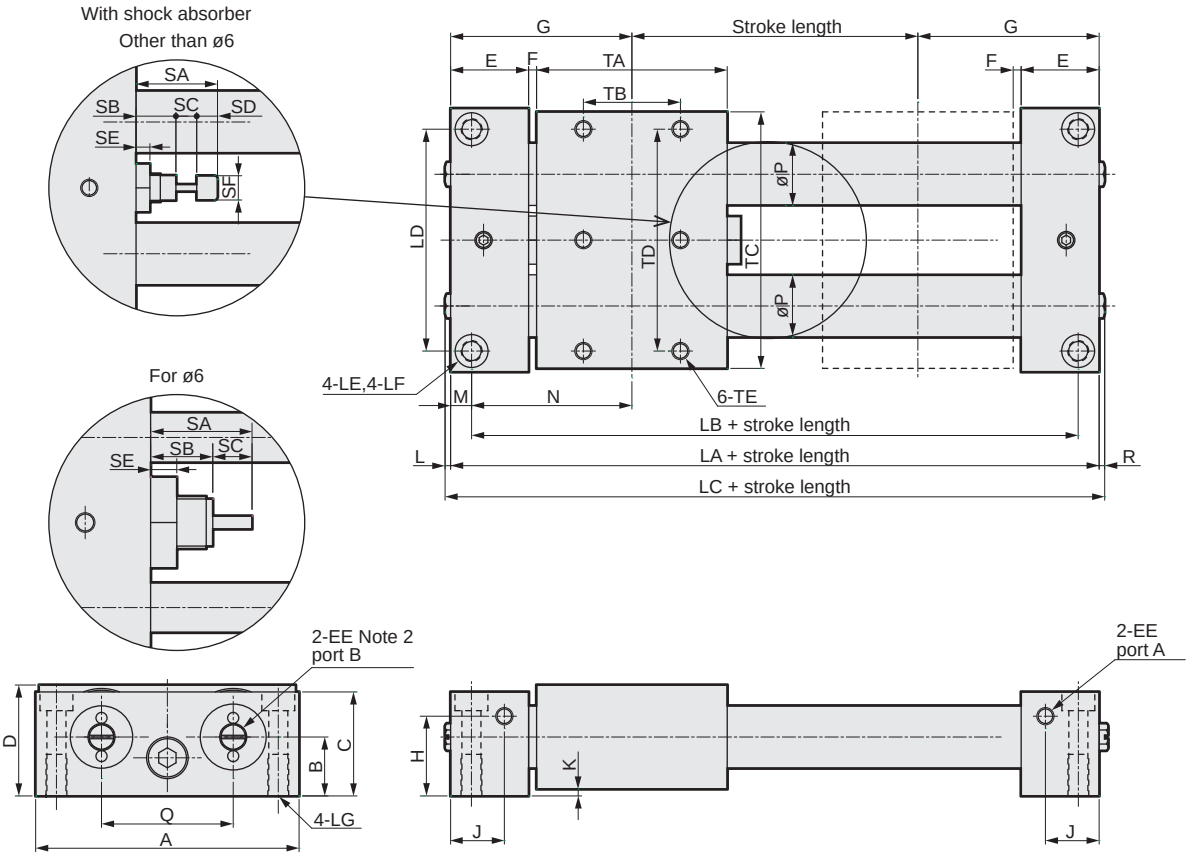
## Parts list

| No. | Part name | Material | Remarks | No. | Part name | Material | Remarks |
|---|---|---|---|---|---|---|---|
| 1 | Hexagon socket head cap screw | Stainless steel | | 5 | Magnet | Special alloy | |
| 2 | Switch rail | Aluminum alloy | Alumite | 6 | Magnet holder | Polyacetal resin | |
| 3 | Hexagon socket set screw | Stainless steel | | 7 | Cross-recessed pan head machine screw | Stainless steel | |
| 4 | Plug | Copper alloy or steel | | 8 | Shield plate | Steel | Nickeling |

## Dimensions: MRL2-G (simplified guide 1-piston)/MRL2-W (simplified guide 2-piston)

CAD

- MRL2-G (simplified guide 1-piston) without switch
- MRL2-W (simplified guide 2-piston) without switch




*1: It is possible to select Ⓐ and Ⓑ for air piping port.
The unit will be shipped with the plug assembled onto port Ⓑ.
· ø6 to ø20: Plug (FPL-M5)
· ø25, ø32: Hexagon socket head cap taper thread plug

*2: MRL2-W is "4-EE".

| Code | Dimensions | | | | | | | Mounting dimensions | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bore size (mm) | LA | LC | L | R | A | C | D | LB | LD | LE | LF | LG | TB | TD | TE |
| ø6 | 74 | 80.2 | 3.1 | 3.1 | 46 | 20 | 24 | 68 | 40 | ø3.5 | - | M4 depth 6 | 20 | 38 | M3 depth 4.5 |
| ø10 | 83 | 87.2 | 1.6 | 2.6 | 64 | 24 | 26 | 74 | 54 | ø4.5 | ø8 spot face depth 4.4 | M5 depth 10 | 20 | 55 | M4 depth 6 |
| ø16 | 105 | 109.2 | 1.6 | 2.6 | 76 | 30 | 32 | 93 | 64 | ø5.5 | ø9.5 spot face depth 5.4 | M6 depth 12 | 28 | 64 | M5 depth 8 |
| ø20 | 131 | 135.2 | 1.6 | 2.6 | 90 | 36 | 38 | 119 | 77 | ø6.9 | ø11 spot face depth 6.5 | M8 depth 12 | 44 | 78 | M5 depth 8 |
| ø25 | 136 | 138 | 0 | 2 | 108 | 45 | 48 | 122 | 90 | ø6.9 | ø11 spot face depth 6.5 | M8 depth 12 | 40 | 90 | M6 depth 9 |
| ø32 | 144 | 146 | 0 | 2 | 126 | 53 | 56 | 130 | 108 | ø6.9 | ø11 spot face depth 6.5 | M8 depth 12 | 40 | 104 | M6 depth 9 |

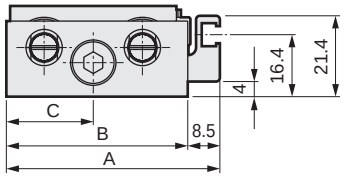
| Code | General dimensions | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bore size (mm) | B | E | EE | F | G | H | J | K | M | N | P | Q | SA | SB | SC | SD | SE | SF | TA | TC |
| ø6 | 13 | 15 | M5 depth 4 | 2 | 37 | 9 | 9.5 | 2 | 3 | 34 | 7.6 | 26 | 15.5 | 9.5 | 6 | - | 4 | - | 40 | 44 |
| ø10 | 14 | 19.5 | M5 depth 4 | 2 | 41.5 | 5.5 | 11.5 | 2 | 4.5 | 37 | 12 | 34 | 20.5 | 9.5 | 5 | 6 | 4 | 6 | 40 | 62 |
| ø16 | 17 | 22.5 | M5 depth 4 | 2.5 | 52.5 | 23 | 15.5 | 2 | 6 | 46.5 | 18 | 38 | 23.5 | 11.5 | 6 | 6 | 4 | 7 | 55 | 74 |
| ø20 | 20 | 25.5 | M5 depth 4 | 3 | 65.5 | 28 | 17 | 2 | 6 | 59.5 | 23 | 46 | 25.5 | 10.5 | 8 | 7 | 4 | 8 | 74 | 88 |
| ø25 | 25.5 | 30 | Rc1/8 | 3 | 68 | 29 | 20 | 3 | 7 | 61 | 28 | 50 | 30 | 12.5 | 10 | 7.5 | 5 | 10 | 70 | 101 |
| ø32 | 29.5 | 30 | Rc1/8 | 3 | 72 | 37 | 20 | 3 | 7 | 65 | 35 | 60 | 30 | 12.5 | 10 | 7.5 | 5 | 10 | 78 | 119 |

## Dimensions: MRL2-G (simplified guide 1-piston)/MRL2-W (simplified guide 2-piston)

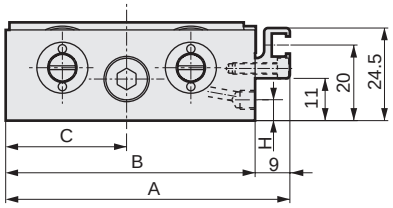
- MRL2-GL (simplified guide 1-piston) with switch
- MRL2-WL (simplified guide 2-piston) with switch

CAD

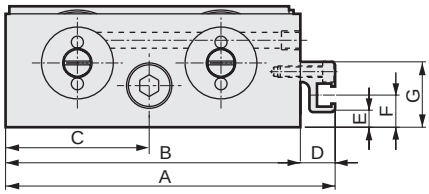
- For ø6

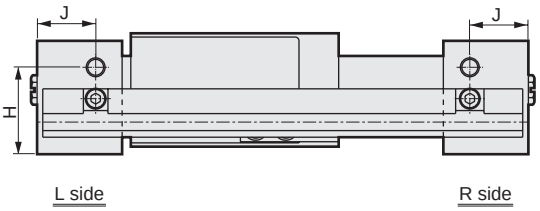



- For ø10




- For ø16 to ø32

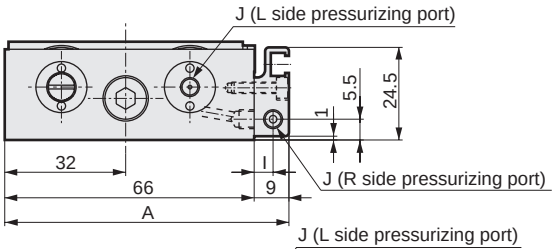


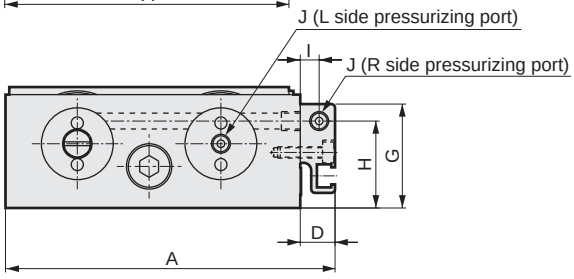

| Code / Bore size (mm) | A | B | C | D | E | F | G | H | J |
|---|---|---|---|---|---|---|---|---|---|
| ø6 | 56.5 | 48 | 23 | - | - | - | - | 9 | 9.5 |
| ø10 | 75 | 66 | 32 | - | - | - | - | 5.5 | 11.5 |
| ø16 | 87 | 78 | 38 | 9 | 4 | 8.5 | 17.3 | 23 | 15.5 |
| ø20 | 101 | 92 | 45 | 9 | 9 | 13.5 | 22.3 | 28 | 17 |
| ø25 | 116.7 | 108 | 54 | 8.7 | 2 | 7.5 | 21 | 29 | 20 |
| ø32 | 134.7 | 126 | 63 | 8.7 | 10 | 15.5 | 29 | 37 | 20 |

- MRL2-GL-*-R (simplified guide 1-piston) common piping with switch
- MRL2-WL-*-R (simplified guide 2-piston) common piping with switch

- For ø10




- For ø16 to ø32

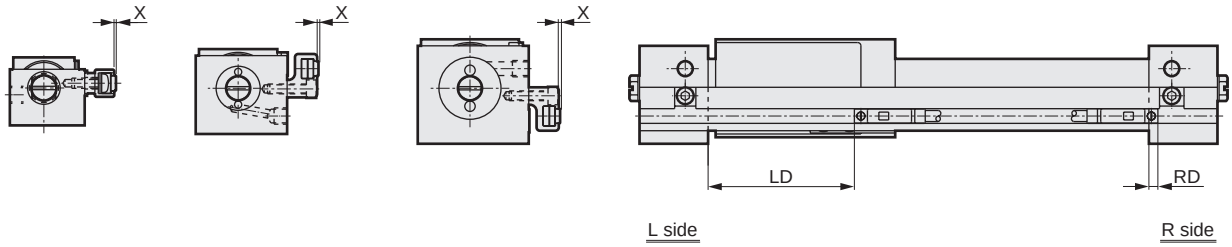



| Code / Bore size (mm) | A | D | G | H | I | J |
|---|---|---|---|---|---|---|
| ø10 | 75 | - | - | - | 5 | M5 depth 4 |
| ø16 | 87 | 9 | 27.5 | 23 | 5 | M5 depth 4 |
| ø20 | 101 | 9 | 32.5 | 28 | 5 | M5 depth 4 |
| ø25 | 122 | 14 | 45 | 29 | 7.5 | Rc1/8 |
| ø32 | 140 | 14 | 53 | 37 | 7.5 | Rc1/8 |

## Switch mounting position dimensions

● MRL2-L-* (switch: T2$^{H}$/v, T3$^{H}$/v, T2W$^{H}$/v, T3W$^{H}$/v)
GL
WL

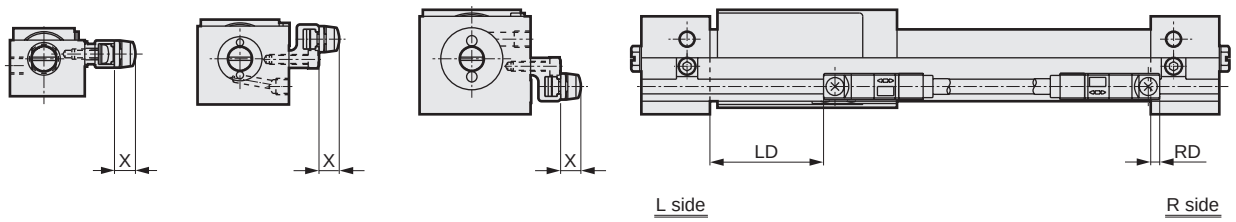
● For ø6 ● For ø10 ● For ø16 to ø32




| Code | T2 $^{H}$/v, T3 $^{H}$/v | | | T2W $^{H}$/v, T3W $^{H}$/v | | |
|---|---|---|---|---|---|---|
| Bore size (mm) | RD | LD | X | RD | HD | X |
| ø6 | 3.5 | 27 | 0.5 | 1.5 | 29 | 0.5 |
| ø10 | 2.5 | 27 | 0.5 | 0.5 | 29 | 0.5 |
| ø16 | 2.5 | 44 | 0.5 | 0.5 | 46 | 0.5 |
| ø20 | 1 | 63.5 | 0.5 | -1 | 65.5 | 0.5 |
| ø25 | 2 | 58 | 0.5 | 0 | 60 | 0.5 |
| ø32 | 1.5 | 67.5 | 0.5 | -0.5 | 69 | 0.5 |

● MRL2-L-* (switch: T1$^{H}$/v, T2Y$^{H}$/v, T3Y$^{H}$/v)
GL
WL

● For ø6 ● For ø10 ● For ø16 to ø32




| Code | RD | LD | X |
|---|---|---|---|
| Bore size (mm) | | | |
| ø6 | 4.5 | 26 | 6(11.5) |
| ø10 | 3.5 | 26 | 6(11.5) |
| ø16 | 3.5 | 43 | 6(11.5) |
| ø20 | 2 | 62.5 | 6(11.5) |
| ø25 | 3 | 57 | 6(11.5) |
| ø32 | 2.5 | 66 | 6(11.5) |

*1: Values in ( ) are for T1$^{H}$/v.

# MRL2 Series selection guide

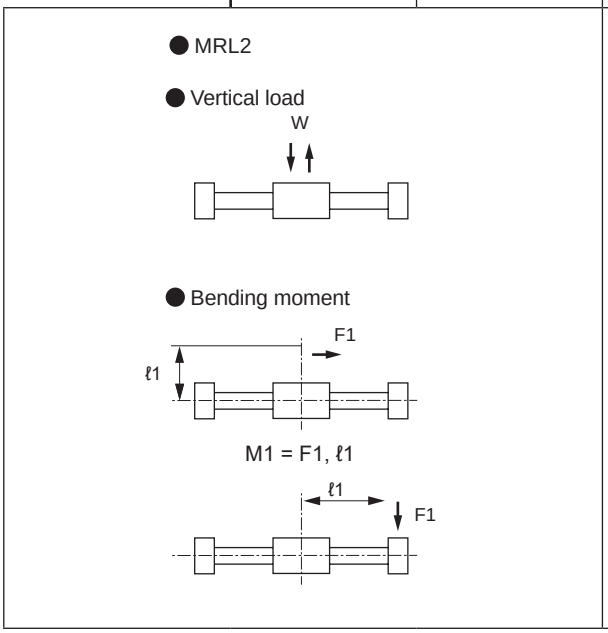
## STEP-1 Determination of allowable load

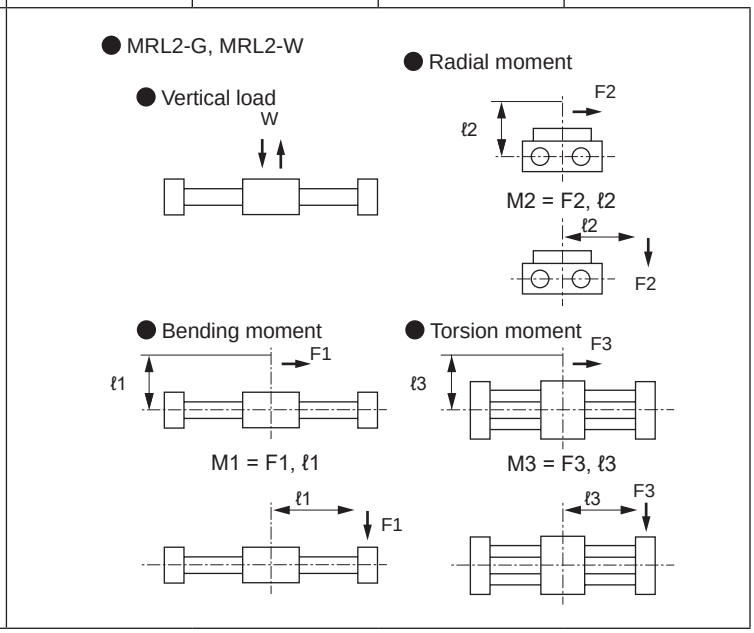
(1) Calculate all load (W) and moment (M1, M2, M3) per load.
(2) Divide each load by the max. value shown in the table below to find load/moment ratio, and confirm that the total is 1.0 or less.

$$\frac{W}{Wmax} + \frac{M1}{M1max} + \frac{M2}{M2max} + \frac{M3}{M3max} \leq 1.0$$

### ■ Max. allowable load weight

| Descriptions / Bore size (mm) | MRL2 | | MRL2-G/MRL2-W | | | |
|---|---|---|---|---|---|---|
| | Vertical load W (N) | Bending moment M1 (N·m) | Vertical load W (N) | Bending moment M1 (N·m) | Radial moment M2 (N·m) | Torsion moment M3 (N·m) |
| ø6 | 10 | 0.1 | 20 | 0.2 | 0.1 | 0.2 |
| ø10 | 15 | 0.3 | 30 | 0.6 | 0.2 | 0.6 |
| ø16 | 35 | 1.2 | 70 | 2.4 | 0.5 | 2.4 |
| ø20 | 60 | 2.5 | 120 | 5.0 | 1.0 | 5.0 |
| ø25 | 73 | 3.3 | 146 | 6.6 | 3.7 | 6.6 |
| ø32 | 89 | 4.5 | 178 | 9.0 | 5.3 | 9.0 |

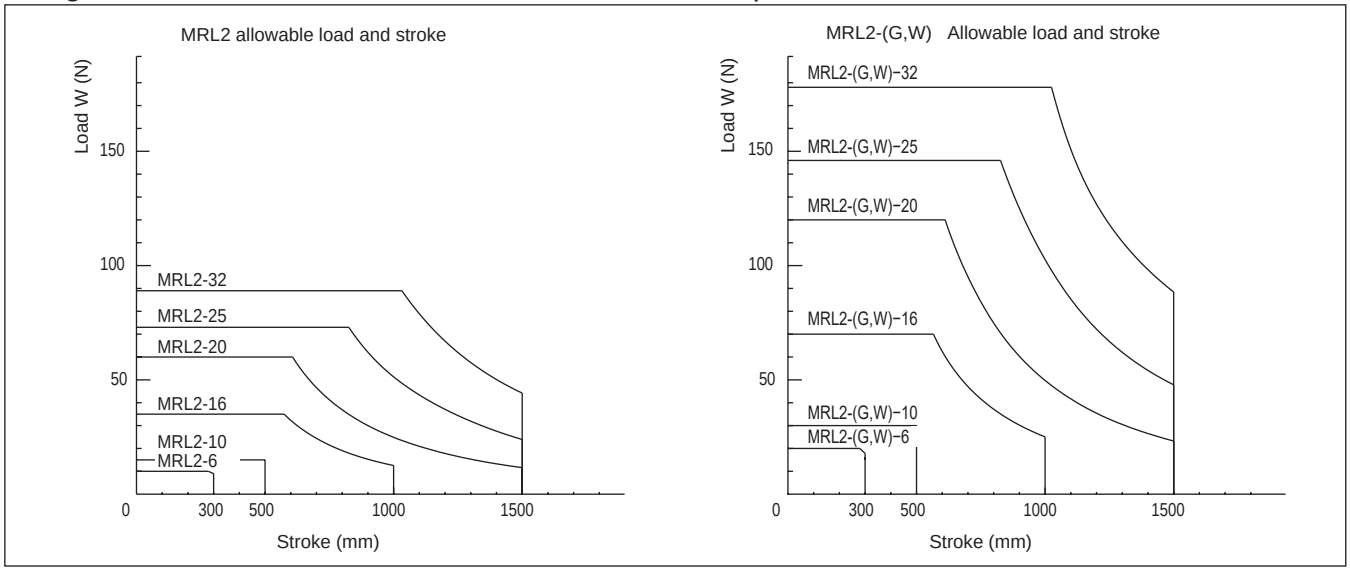



Note: Give sufficient consideration to inertia when the load moves or stops.

The value of the allowable vertical load W will vary depending on the stroke. Select so that the value falls within the graph of Fig 1.

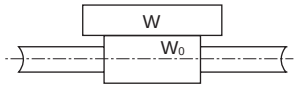
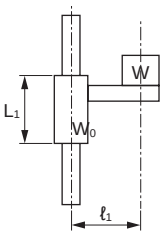
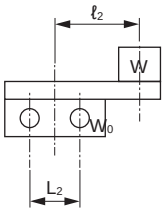
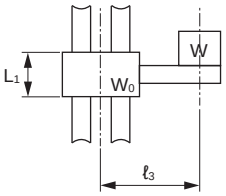
### ■ Fig. 1 stroke and allowable vertical load relationship



## STEP-2 Calculation of load factor

1. Depending on the size and direction of the load as well as the mounting orientation, calculate the required thrust with Tables 2 and 3 below as guidelines.

### ■ Table 2

| | Vertical load | Bending moment | Radial moment | Torsion moment |
|---|---|---|---|---|
| Size and direction of load |  |  |  |  |
| Mounting orientation | Horizontal | Vertical | Horizontal | Vertical |
| Required thrust | $F_N=0.2\ (W+W_0)$ | $F_N=\frac{0.2\ W\ell_1}{L_1}+W+W_0$ | $F_N=0.2\left(\frac{W\ell_2}{L_2}+W+W_0\right)$ | $F_N=\frac{0.2\ W\ell_3}{L_1}+W+W_0$ |

As the slider rotates with the single, radial moment and torsion moment cannot be applied.

$F_N$ : Required thrust (N)
W : Load (N)
$W_0$ : Slider self-weight (N)
$\ell_n$ (n = 1, 2, 3): Overhang (mm)
$L_1$ : Slider bearing pitch (mm)
$L_2$ : Pitch of guide (mm)

### ■ Table 3

| Model No. | $W_0$ | $L_1$ | $L_2$ |
|---|---|---|---|
| MRL2-6 | 0.4 | 27 | - |
| 10 | 0.6 | 27 | - |
| 16 | 1.2 | 39 | - |
| 20 | 2.4 | 58 | - |
| 25 | 3.8 | 70 | - |
| 32 | 5.2 | 78 | - |
| MRL2-$^{G}_{W}$-6 | 0.9 | 27 | 26 |
| 10 | 1.7 | 27 | 34 |
| 16 | 3.0 | 39 | 38 |
| 20 | 5.9 | 58 | 46 |
| 25 | 8.5 | 70 | 50 |
| 32 | 11.9 | 78 | 60 |

2. Calculate the load factor from the required thrust calculated in 1 and ■ Table 4, Fig. 2. (Make sure that the load factor is less than or equal to approximately 50%.)

$$\text{Load factor } \alpha = \frac{F_N}{\frac{a}{100}\cdot A} \times 100$$

$$B = \frac{a}{100}\cdot A$$

$F_N$: Required thrust (N)
A : Theoretical thrust (N)
a: Thrust efficiency (%)
B: Effective thrust (N)

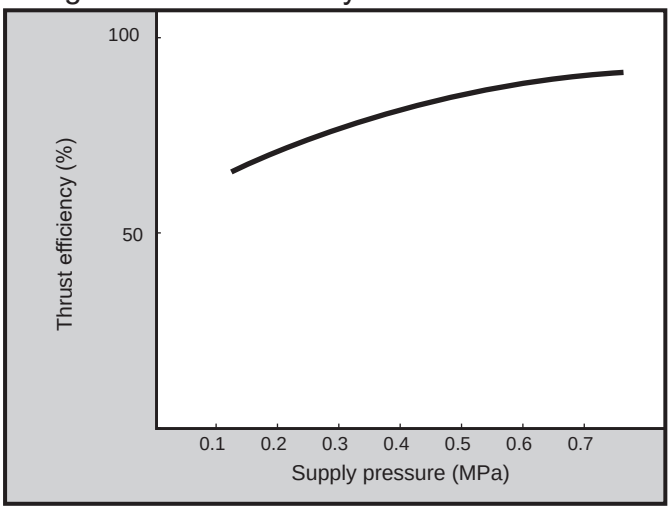
## Table 4 Theoretical thrust table

N

| Model No. | Indicator code / Working pressure MPa | | | | | |
|---|---|---|---|---|---|---|
| | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 |
| MRL2,MRL2-G-6 | - | 8 | 11 | 14 | 17 | 20 |
| 10 | - | 24 | 31 | 39 | 47 | 55 |
| 16 | 40 | 60 | 80 | 101 | 121 | 141 |
| 20 | 63 | 94 | 126 | 157 | 188 | 220 |
| 25 | 98 | 147 | 196 | 245 | 295 | 344 |
| 32 | 161 | 241 | 322 | 402 | 483 | 563 |
| MRL2-W-6 | - | 17 | 23 | 28 | 34 | 40 |
| 10 | - | 47 | 63 | 79 | 94 | 110 |
| 16 | 80 | 121 | 161 | 201 | 241 | 281 |
| 20 | 126 | 188 | 251 | 314 | 377 | 440 |
| 25 | 196 | 295 | 393 | 491 | 590 | 687 |
| 32 | 322 | 483 | 643 | 804 | 966 | 1130 |

* Note that the difference between effective thrust and theoretical thrust will be greater with a lower pressure due to the thrust efficiency being lower.

## Fig. 2 Thrust efficiency




## STEP-3 Formula for kinetic energy calculation

Calculate the kinetic energy from the load weight (m) and speed (V) and make sure that this is less than or equal to the allowed value listed in ■ Table 5.
When exceeding the allowable absorbed energy value, increase the cylinder size so that the value falls under the allowable absorbed energy or consider the use of an external shock absorber.
This speed is the velocity just before cushion entry and not the average speed, if it is unknown, calculate the cushion entry velocity by using formula (1).

$$E = \frac{1}{2} mV^2$$

$$Va = \frac{L}{t}$$

$$V = Va \times \left(1 + 1.5 \frac{\alpha}{100}\right) \quad (1)$$

E : Kinetic energy (J)
m : Weight (kg)
V : Cushion entry velocity (m/s)
Va: Average speed (m/s)
L : Stroke (m)
t : Travel time (s)
α : Load factor (%)

## Table 5 Allowable absorbed energy value

| Bore size | Allowable absorbed energy (J) | |
|---|---|---|
| | MRL2 | MRL2-$\frac{G}{W}$ |
| ø6 | 0.006 | 0.12 |
| ø10 | 0.028 | 0.12 |
| ø16 | 0.100 | 0.25 |
| ø20 | 0.265 | 0.58 |
| ø25 | 0.283 | 0.74 |
| ø32 | 0.523 | 0.74 |

## Shock absorber specifications

| Bore size | Max. absorbed energy (J) | Stroke (mm) |
|---|---|---|
| ø6 | 0.24 | 4 |
| ø10 | 0.24 | 4 |
| ø16 | 0.80 | 5.5 |
| ø20 | 2.11 | 7.5 |
| ø25 | 3.88 | 9.5 |
| ø32 | 3.88 | 9.5 |

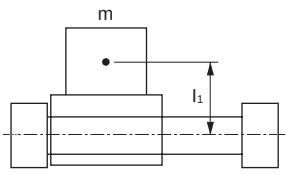
## STEP-4 Confirmation of inertia load

Confirm that the weight (m), overhang ($l_n$ (n = 1, 3)), and cushion entry velocity (V) multiplied together and then divided by the value of A shown in the table below is less than or equal to 1.
When this value exceeds 1, increase the cylinder size so that this value becomes 1 or less or review the usage conditions.

| Bore size | A | |
|---|---|---|
| | MRL2 | MRL2-$^{G}_{W}$ |
| ø6 | 5.6 | 11.2 |
| ø10 | 17 | 34 |
| ø16 | 68 | 136 |
| ø20 | 142 | 284 |
| ø25 | 187 | 374 |
| ø32 | 255 | 510 |

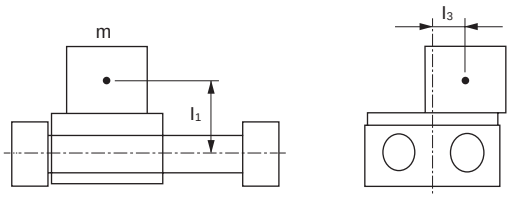
m : Weight (kg)
$l_n$ (n=1,3) : Overhang (mm)
V : Cushion entry velocity (m/s)

● MRL2




$$\frac{m \cdot l_1 \cdot V}{A} \leq 1$$

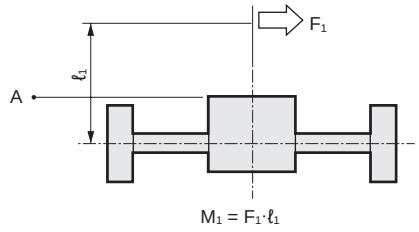
● MRL2-G,MRL2-W



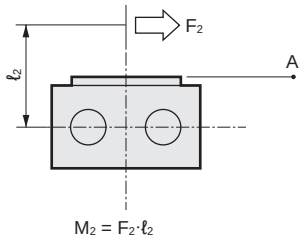

$$\frac{m \cdot (l_1 + l_3) \cdot V}{A} \leq 1$$

## MRL2-G / MRL2-W slider runout amount

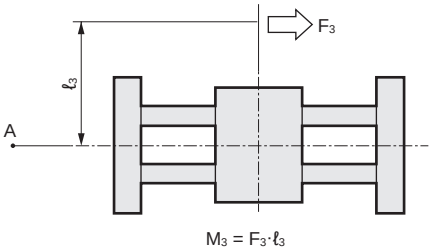
● Bending moment




● Radial moment




● Torsion moment




| Bore size | Moment load | | Table runout amount at point A (± mm) | | |
|---|---|---|---|---|---|
| | MRL2 | MRL2-G,W | $M_1$ direction | $M_2$ direction | $M_3$ direction |
| ø6 | $M_1$, $M_3$: 0.2 N·m | $M_2$: 0.1 N·m | 1.5 | 1.46 | 1.05 |
| ø10 | $M_1$, $M_3$: 0.6 N·m | $M_2$: 0.2 N·m | 1.61 | 1.12 | 0.92 |
| ø16 | $M_1$, $M_3$: 2.5 N·m | $M_2$: 0.5 N·m | 1.3 | 1.16 | 0.87 |
| ø20 | $M_1$, $M_2$, $M_3$: 2.5 N·m | | 0.89 | 0.96 | 0.65 |
| ø25 | $M_1$, $M_2$, $M_3$: 5 N·m | | 1.1 | 0.92 | 0.7 |
| ø32 | $M_1$, $M_2$, $M_3$: 5 N·m | | 1.0 | 0.77 | 0.6 |

*1: Point A is a point that is 200 mm away from the center of the slider.

## Rubber cushion and rubber-air cushion comparison data (reference values)

Measurement of the noise level (dB) generated when the piston collides at the end of the stroke.

Measuring conditions

1. Sample cylinder : MRL2 basic type, stroke 200 mm
2. Piston speed upon collision at end of stroke : V = 300 mm/S
3. Distance between noise level meter and cylinder : 0.25 m
4. Load : No load

Representative example Unit: dB

| Bore size | Rubber cushion | Rubber-air cushion |
|---|---|---|
| ø6 | 51.2 | 44.7 |
| ø10 | 51.2 | 45.6 |
| ø16 | 63.4 | 48.2 |
| ø20 | 75.9 | 59.3 |

Pneumatic components

# Safety Precautions

Be sure to read this section before use.
Refer to Intro Page 73 for general information of the cylinder, and to Intro Page 80 for general information of the cylinder switch.

Product-specific cautions: Magnet rodless cylinder MRL2 Series

## Design/selection

### 1. Common

**⚠ CAUTION**

■ Be careful of the gap between the end plate and the slider.
Be careful when operating the cylinder as getting a hand or finger caught in the unit may lead to injury.

■ Do not apply a load to the cylinder that is greater than or equal to the allowable load listed in the selection guide.

■ Do not use the product with the slider fixed.
Use the cylinder with the end plate fixed. Avoid use of the product with the slider fixed.

■ When fixing the basic type with switch with the guide, configure the rotational angle of the slider to be less than or equal to ± 1°.

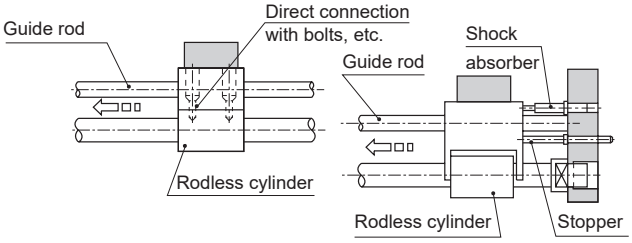
■ Mount so that the slider functions with the min. working pressure value of all processes.
When the flatness of the surface for cylinder installation is poor, the min. working pressure will rise due to guide unit torsion and cause early wear of the bearing section. For this reason, mount the unit so that the slider functions with the min. working pressure value of all processes. Although mounting mating surfaces should be highly flat, adjust with shims when this cannot be confirmed.

■ Be careful to avoid scratching or denting the outer peripheral surface of the cylinder tube.
This will cause damage to the lube keeping structure, scraper, and slider wear ring and may lead to defective operation.

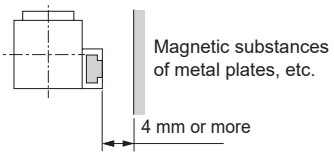
■ With the basic type MRL2, be careful of slider rotation.
Either connect with an external bearing or consider the use of MRL2-G or MRL2-W.

■ Do not use the product in a state where the slider is displaced.
When the slider has become displaced due to external force that is greater than or equal to the magnetic holding force, manually push the stroke end back to its original position.

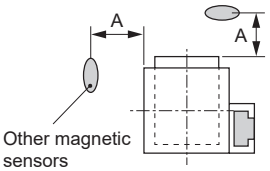
■ Do not apply an eccentric load to the slider.
When the load and cylinder are direct mounted, their respective shaft center eccentricities cannot be absorbed, and lateral load applies, leading to misoperation (figure below left). Use with consideration for a connection method which enables absorption of this eccentricity and the self-weight deflection of the cylinder. The figure below right shows recommended mounting.




■ The cylinder switch may malfunction if there is a magnetic substance such as a metal plate installed adjacently. Check that a distance of 4 mm is provided from the switch surface.




■ When using cylinders adjacent with each other or when using other magnetic sensors nearby, in order to prevent malfunctioning due to the leaked magnetic field of the cylinder embedded magnet, make sure that the distance from the surface of the slider to the other magnetic sensors is separated by at least the values listed below.




| Bore size | A(mm) |
|---|---|
| ø6 | 10 |
| ø10 | 20 |
| ø16 | 20 |
| ø20 | 37 |
| ø25 | 50 |
| ø32 | 80 |

When this distance is dimension A or less, malfunctions can be prevented by placing a magnetic substance (steel plate with thickness of 2 mm or more) between the slider and the others.

■ When using in a dusty environment, it is recommended to select the type with scraper (option S).

### 2. Rubber-air cushioned MRL2-*C

■ Note that, structurally, the stroke end position cannot be retained if air supply is cut off.
When detecting the stroke end by switch, set the switch position with pneumatic pressure applied, as otherwise the position may be out of the detection range.

### 3. Fine speed MRL2-F

■ Use without lubrication.
Applying lubrication may cause changes in characteristics.

■ Assemble the speed controller near the cylinder.
When installed far from the cylinder, the speed becomes unstable.
Use the SC-M3/M5-F, SC3W, SCD-M3/M5 or SC3U Series speed controller.

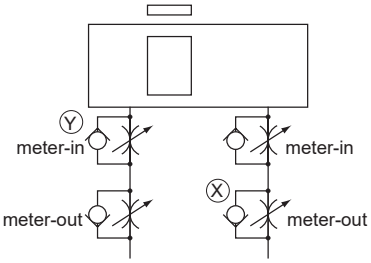
■ In general, the speed is stabler at higher air pressure and lower load factor.
Use at a 50% or less load factor.

■ Do not apply a lateral load to the slider.
Also install the sliding guide so that it is not twisted.
When the load or the resistance fluctuates, operation becomes unstable. With a large difference between static friction and kinematic friction of the guide, operation becomes unstable.

■ Avoid using this product where vibration is present.
The product will be adversely affected by vibration and operation will become unstable.

■ Stable speed control is achieved with a meter-out circuit.

● To make the operation even smoother at the start, add a meter-in circuit.

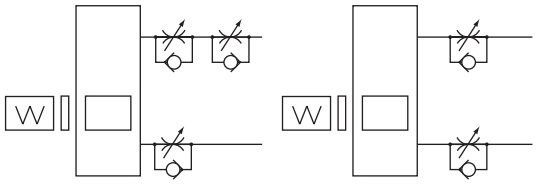



Adjustment method for speed when moving to the right

1. Adjust speed with Ⓧ speed controller
2. Narrow with Ⓨ speed controller until operation at start becomes smooth
3. Check the speed again.

(*1) As this circuit narrows the intake side, a small amount of time is required until it starts to operate. (This will vary depending on narrowing adjustment.) Take this into consideration before use.

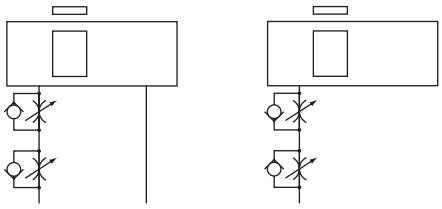
(*2) For vertical mounting, combine the cylinder with a meter-out circuit, as it will fall under its own weight when a meter-in circuit is used.




OK

✕ Falls under its own weight when lowering

(*3) Use the circuit shown in the figure below for the serial connection of the speed controllers.



OK

✕ Speed control is unstable

## Mounting, installation and adjustment

### 1. Common

⚠CAUTION

■ CKD's shock absorber is a repair part. Replace it when the energy absorption performance has degraded or the operation is not smooth.

### 2. Fine speed MRL2-*F

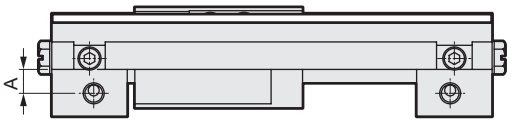
⚠CAUTION

■ Avoid using in environments with water vapor or high humidity or in alkaline atmospheres.

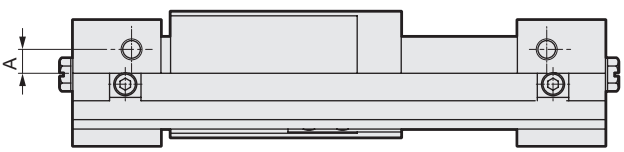
■ As compatible piping fittings are limited when with switch, refer to the table below to select the fitting.

· With switch

[ø10]

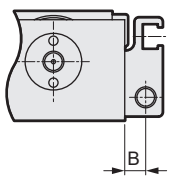



[ø16 to ø32]

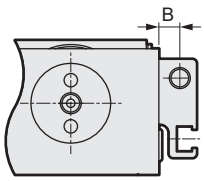



· Common piping with switch

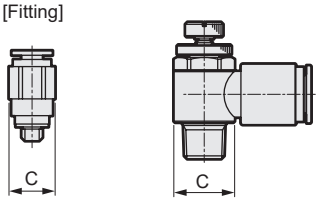
[ø10]




[ø16 to ø32]




[Fitting]




| Item | Port size | Port position dimensions | | Applicable fittings | Fitting O.D. |
|---|---|---|---|---|---|
| Bore size (mm) | | A | B | | øC |
| ø6 | M5 | - | | SC3W-M5-4, SC3W-M5-6<br>SC3U-M5-4, SC3U-M5-6<br>GWS6-M5-S, GWS4-M5<br>etc. | ø11 or less |
| ø10 | | 5.5 | 5 | | |
| ø16 | | 5.5 | 5 | | |
| ø20 | | 5.5 | 5 | | |
| ø25 | Rc1/8 | 7.5 | 7.5 | SC3W-6-4/6/8<br>GWS4-6, GWS6-6, GWS8-6 etc. | ø15 or less |
| ø32 | | 7.5 | 7.5 | | |

Note: A and B indicate the distance to the nearest interference part to the respective ports. The - means that there is no interference.
ø6 has no A dimension because the side surface port is on the opposite side from the switch rail.
(There is no interference with the switch rail.)
It also has no B dimension (port) because common piping with switch is not possible.

# Use/maintenance

## 1. Common

### ⚠ WARNING

- The magnetic strength of the embedded magnet is powerful. Do not disassemble.
- With bore size of ø16 or less, because of changes in the cushion rigidity when left for long periods, the stroke may become slightly shorter than the standard value at the low pressure setting. Perform a trial run, such as operating several times and performing back-and-forth operation at high supply pressure.

## 2. Rubber-air cushioned MRL2-*C

### ⚠ CAUTION

- Do not rapidly discharge air from the cylinder after performing low speed operation outside the catalog specifications range. (Example: Removing piping or coupler, etc.)
  Otherwise the rubber air cushion may fall. Note that the possibility of occurrence of this may increase especially when the air pressure is high.