

### Order example

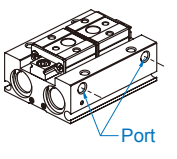
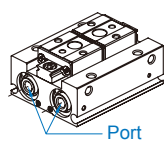
**MCHD – 20R**

MODEL TUBE I.D.  
8  
12  
16  
20

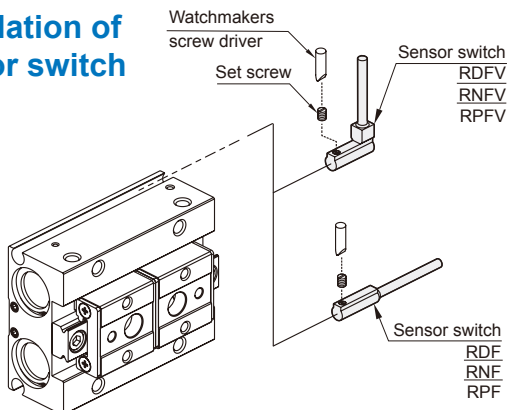
PIPING TYPE

Blank: Axial piping

R: Side piping



### Installation of sensor switch



### Features

- Low profile design saves space and reduces bending moments, improved accuracy with smooth operation.
- Improved mounting repeatability, easy positioning for mounting.
- Double piston construction achieves compact design with strong gripping force.
- High rigidity and high precision with martensitic stainless steel.
- Grooves on the body for sensor switch to be inserted into.
- Standard with magnet.

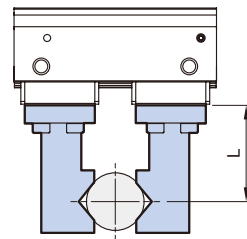
### Specification

| Model                    | MCHD                    |                             |     |     |
|--------------------------|-------------------------|-----------------------------|-----|-----|
| Acting type              | Double acting           |                             |     |     |
| Tube I.D. (mm)           | 8                       | 12                          | 16  | 20  |
| Port size                | M3×0.5                  | M5×0.8                      |     |     |
| Medium                   | Air                     |                             |     |     |
| Operating pressure range | 0.15~0.7                | 0.1~0.7 MPa                 |     |     |
| Ambient temperature      | -10~+60°C (No freezing) |                             |     |     |
| Repeatability            | ± 0.05 mm (*1)          |                             |     |     |
| Max. frequency           | 120 cycles / min        |                             |     |     |
| Lubricator               | Not required            |                             |     |     |
| Sensor switch (*2)       | 2 wire                  | RDF(V) : Solid state type   |     |     |
|                          | 3 wire                  | RNF(V) : NPN ; RPF(V) : PNP |     |     |
| Attached bolt            | 2 pcs                   |                             | —   |     |
| Weight (g)               | 65                      | 150                         | 350 | 660 |

\* 1. This is the value when no offset load is applied to the finger. When an offset load is applied to the finger, the maximum value is ±0.15mm due to the influence of backlash of the rack and pinion.

\* 2. RDF/ RNF/ RPF specification, please refer to page 5-10.

### Gripping force

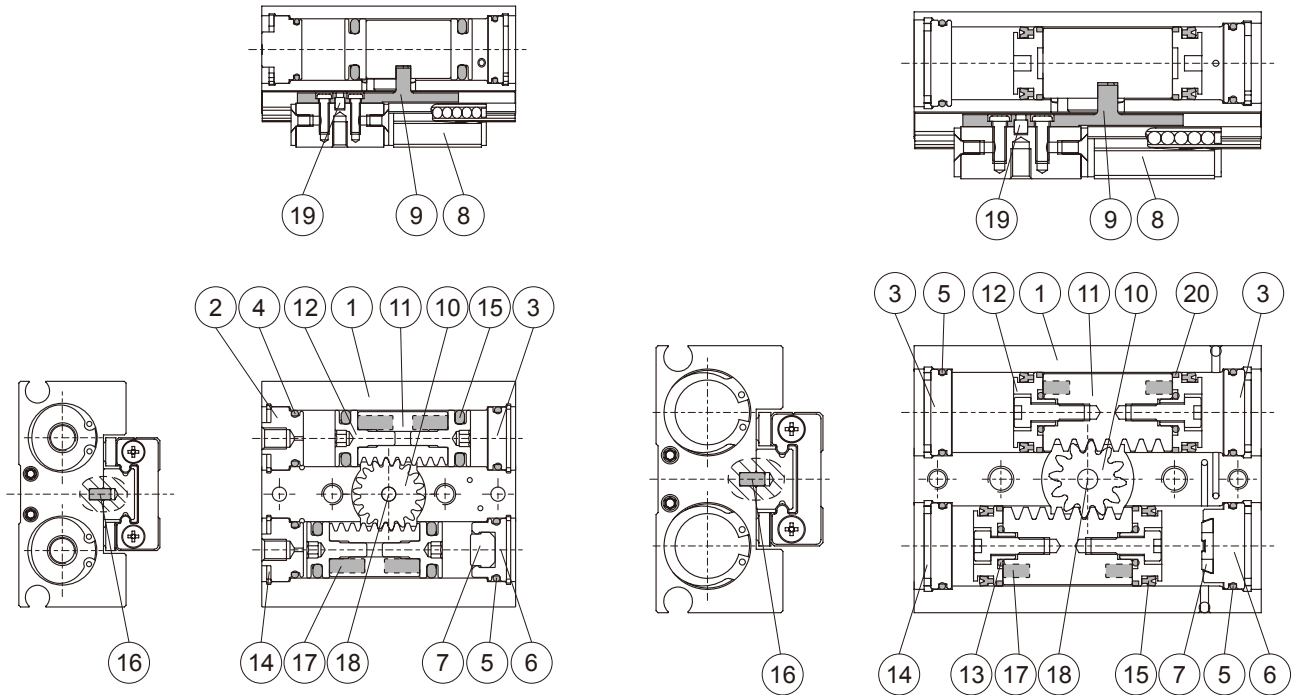


| Tube I.D. (mm) | Gripping force per finger effective value (N) (*) | Open / close stroke (both sides)(mm) |
|----------------|---|--------------------------------------|
| 8              | 19  | 8                                    |
| 12             | 48  | 12                                   |
| 16             | 90  | 16                                   |
| 20             | 141   | 20                                   |

\* Values based on pressure of 0.5 MPa, gripping point L=20mm, at center of stroke.

### Axial piping

### Side piping



### Material

| No. | Tube I.D.<br>Part name | Material        |                |                 |    | Q'y          |             | Repair kits<br>(inclusion) |
|-----|------------------------|-----------------|----------------|-----------------|----|--------------|-------------|----------------------------|
|     |                        | 8               | 12             | 16              | 20 | Axial piping | Side piping |                            |
| 1   | Body                   | Aluminum alloy  |                |                 |    | 1            | 1           |                            |
| 2   | Cover A                | Aluminum alloy  |                |                 |    | 2            | —           |                            |
| 3   | Cover B                | Aluminum alloy  |                |                 |    | 1            | 3           |                            |
| 4   | Cover A packing        | NBR             |                |                 |    | 2            | —           | ●                          |
| 5   | Cover B packing        | NBR             |                |                 |    | 2            | 4           | ●                          |
| 6   | Cover C                | Aluminum alloy  |                |                 |    | 1            | 1           |                            |
| 7   | Cushion pad            | PU              |                |                 |    | 1            | 1           | ●                          |
| 8   | Guide set              | Stainless steel |                |                 |    | 1            | 1           |                            |
| 9   | Lever                  | Stainless steel |                |                 |    | 2            | 2           |                            |
| 10  | Pinion                 | SCM             |                |                 |    | 1            | 1           |                            |
| 11  | Pinion piston          | Stainless steel |                |                 |    | 2            | 2           |                            |
| 12  | Piston                 | *1              | Aluminum alloy |                 |    | 4            | 4           |                            |
| 13  | O-ring                 | —               | NBR            |                 |    | 4            | 4           | ●                          |
| 14  | Snap ring              | *1              | *2             | Stainless steel |    | 4            | 4           |                            |
| 15  | Piston packing         | NBR             |                |                 |    | 4            | 4           | ●                          |
| 16  | Pin                    | Bearing steel   |                |                 |    | 2            | 2           |                            |
| 17  | Magnet                 | Magnet material |                |                 |    | 4            | 4           |                            |
| 18  | Pin                    | Bearing steel   |                |                 |    | 1            | 1           |                            |
| 19  | Pin                    | Bearing steel   |                |                 |    | 2            | 2           |                            |
| 20  | Wear ring              | —               | Teflon         |                 |    | 4            | 4           |                            |

\*1 Stainless steel \*2. Carbon steel

### Order example of repair kits

| Tube I.D. | Repair kits       |
|-----------|-------------------|
| ø8        | <b>PS-MCHD-8</b>  |
| ø12       | <b>PS-MCHD-12</b> |
| ø16       | <b>PS-MCHD-16</b> |
| ø20       | <b>PS-MCHD-20</b> |

### Model selection

Please select your model according to the weight of workpiece

- Although conditions differ according to the work piece 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.
- If high acceleration, deceleration or impact forces are encountered during motion, a further margin of safety should be considered.

When gripping a workpiece as in the figure as shown above:

**F**: Gripping force (N)

$\mu$ : Coefficient of friction between the attachments and the workpiece

**m**: Workpiece mass (kg)

**g**: Gravitational acceleration (=9.8m/s<sup>2</sup>)

**mg**: Workpiece weight (N)

the conditions under which the workpiece will not drop are,

$$2 \times \mu F > mg$$

Number of fingers

Therefore,

$$F > \frac{mg}{2 \times \mu}$$

With "a" representing the extra margin, "F" is determined by the following formula:

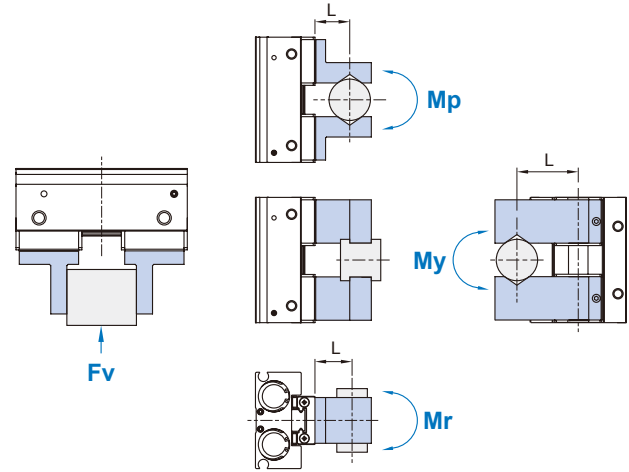
$$F = \frac{mg}{2 \times \mu} \times a$$

The "10 to 20 times or more of the workpiece weight" is calculated with a safety margin of a=4, which allows for impacts that occur during normal transportation, etc.

| $\mu=0.2$   | $\mu=0.1$   |
|---|---|
| $F = \frac{mg}{2 \times 0.2} \times 4$ $= 10 \times mg$ | $F = \frac{mg}{2 \times 0.1} \times 4$ $= 20 \times mg$ |
| ↓   | ↓   |
| 10×workpiece weight                                     | 20×workpiece weight                                     |

- \* 1. Even in cases where the coefficient of friction is greater than  $\mu=0.2$ , for reasons of safety, please select a gripping force which is at least 10 to 20 times greater than the workpiece weight.
- \* 2. If high acceleration, deceleration or impact forces are encountered during motion, a further margin of safety should be considered.

### Confirmation of external force on fingers



L: Distance to the point at which the load is applied (mm)

| Tube I.D. (mm) | Allowable vertical load Fv(N) | Maximum allowable moment |                    |                     |
|----------------|-------------------------------|--------------------------|--------------------|---------------------|
|                |                               | Pitch moment Mp(N·m)     | Yaw moment My(N·m) | Roll moment Mr(N·m) |
| 8              | 58                            | 0.26                     | 0.26               | 0.53                |
| 12             | 98                            | 0.68                     | 0.68               | 1.4                 |
| 16             | 176                           | 1.4                      | 1.4                | 2.8                 |
| 20             | 294                           | 2                        | 2                  | 4                   |

\* Values for load and moment in the table indicate static values.

### Allowable load calculation

$$\text{Allowable load } F(N) = \frac{M(\text{maximum allowable moment})(N \cdot m)}{L(m)}$$

#### Example

When a static load of f=20N is operating, which applies pitch moment to point L=25mm from the **MCHD-16** guide.

$$\text{Allowable load } F(N) = \frac{1.4 (N \cdot m)}{25 \times 10^{-3} (m)}$$

$$= 56 (N)$$

Load f=20 (N) < 56 (N), so can be used.

### Model selection example

In the motion process did not produce high acceleration, deceleration or impact forces,  
 Workpiece mass: 300g, Gripping method: External gripping,  
 Operating pressure: 0.5 MPa, Coefficient of friction ( $\mu$ ): 0.1,  
 Holding position: 20mm (no overhang)

1. The conditions under which the workpiece will not drop are,

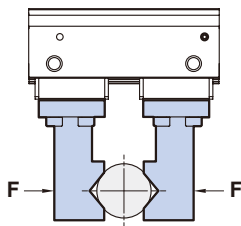
$$F = \frac{0.3}{2 \times 0.1} \times 4 = 6 \text{ (kgf)} \approx 60 \text{ (N)}$$

2. From Effective Gripping Force Fig,  
 Operating pressure: 0.5 MPa; Holding position: 20 mm  
 Effective gripping force is greater than 60 (N)  
 So selected **MCHD-16** grippers.

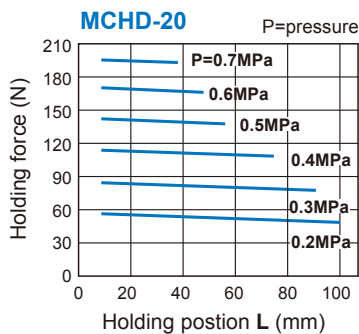
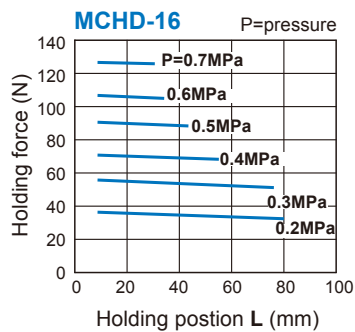
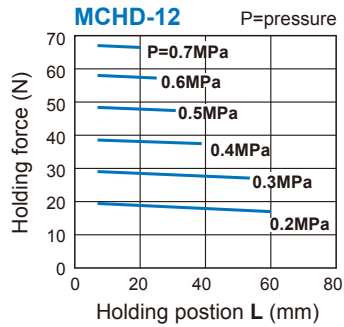
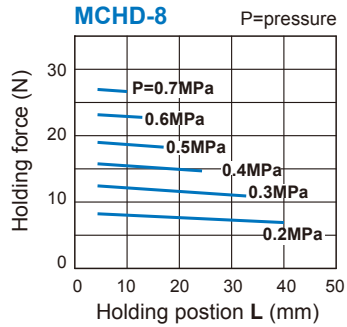
### Effective gripping force (Double acting)

Indication of effective force.

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

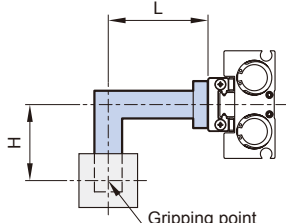
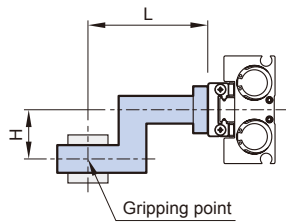
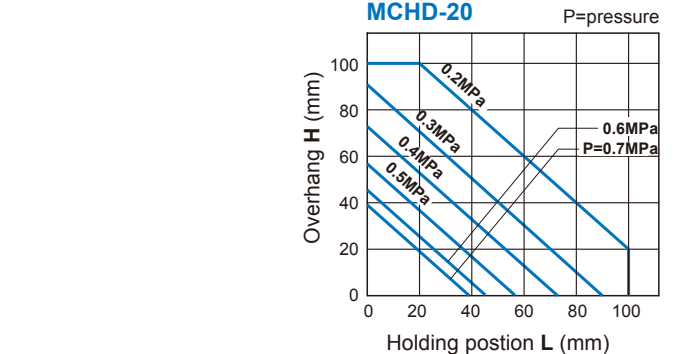
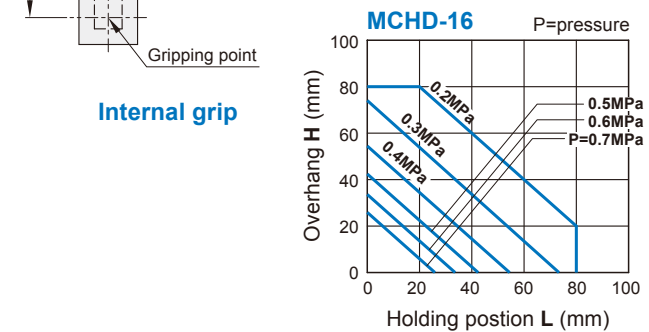
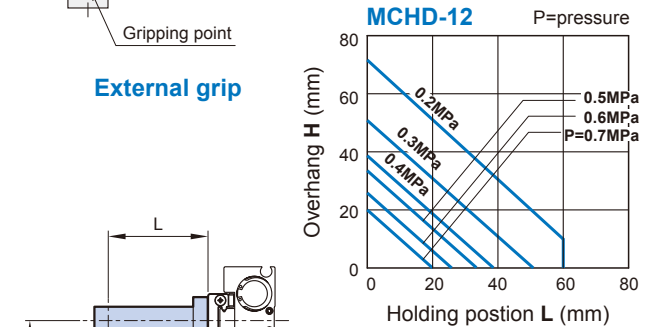
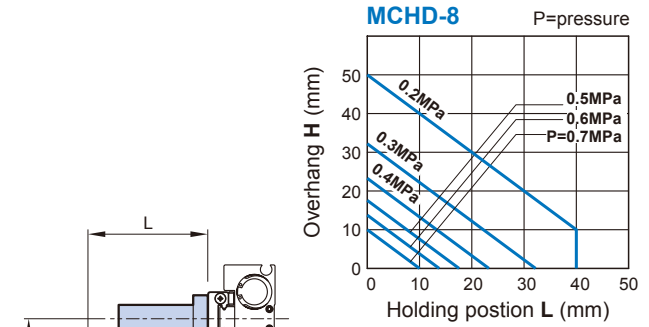


1N=0.102 kgf  
1MPa=10.2 kgf/cm<sup>2</sup>



### Confirmation of gripping point

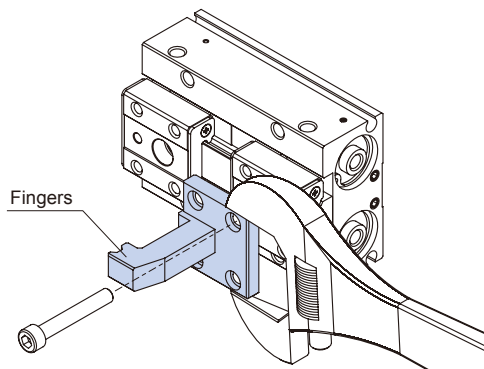
- The air gripper should be operated so that the workpiece gripping point "L" and the amount of overhang "H" stay within the range shown for each operating pressure given in the graphs.
- If the workpiece gripping point goes beyond the range limits, this will have an adverse effect on the life the air gripper.



### Product precautions

Before mount the fingers, sure be refer the tightening torque values in the table below.

| Tube I.D. (mm) | Bolt      | Max. tightening torque (N.m) |
|----------------|-----------|------------------------------|
| 8              | M2.5×0.45 | 0.36                         |
| 12             | M3×0.5    | 0.63                         |
| 16             | M4×0.7    | 1.5                          |
| 20             | M4×0.7    | 1.5                          |

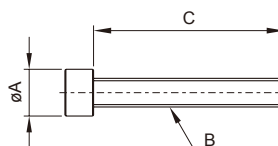


### Order example of attached bolt

**BOLT — MCHD — 8**

ATTACHED BOLT

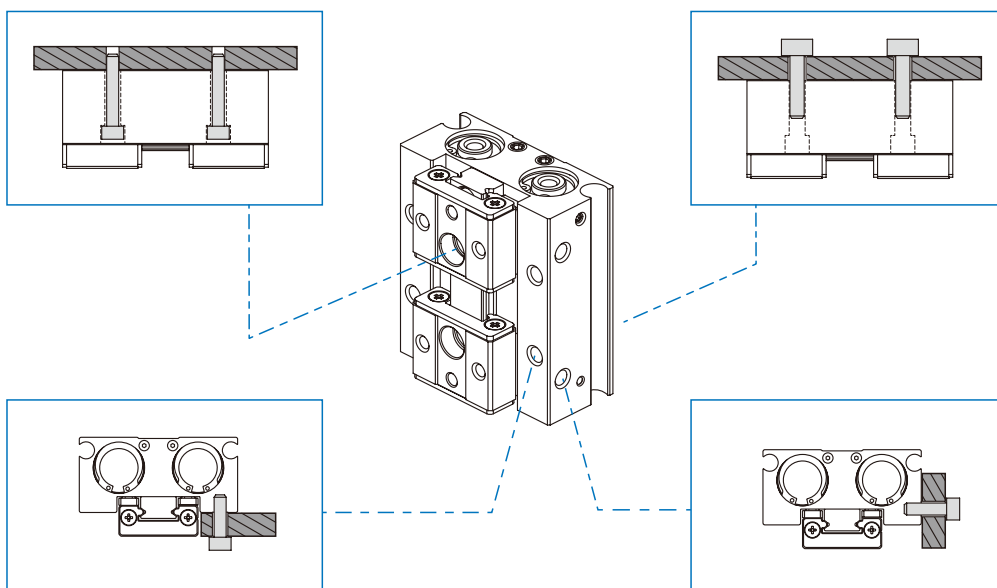
TUBE I.D.  
8  
12



| Code<br>Tube I.D. | A   | B         | C  |
|-------------------|-----|-----------|----|
| 8                 | 3.8 | M2.5×0.45 | 15 |
| 12                | 4.9 | M3×0.5    | 20 |

### High degree of mounting flexibility

\* Use the attached bolt for mounting in tube I.D.  $\varnothing 8$ ,  $\varnothing 12$ .

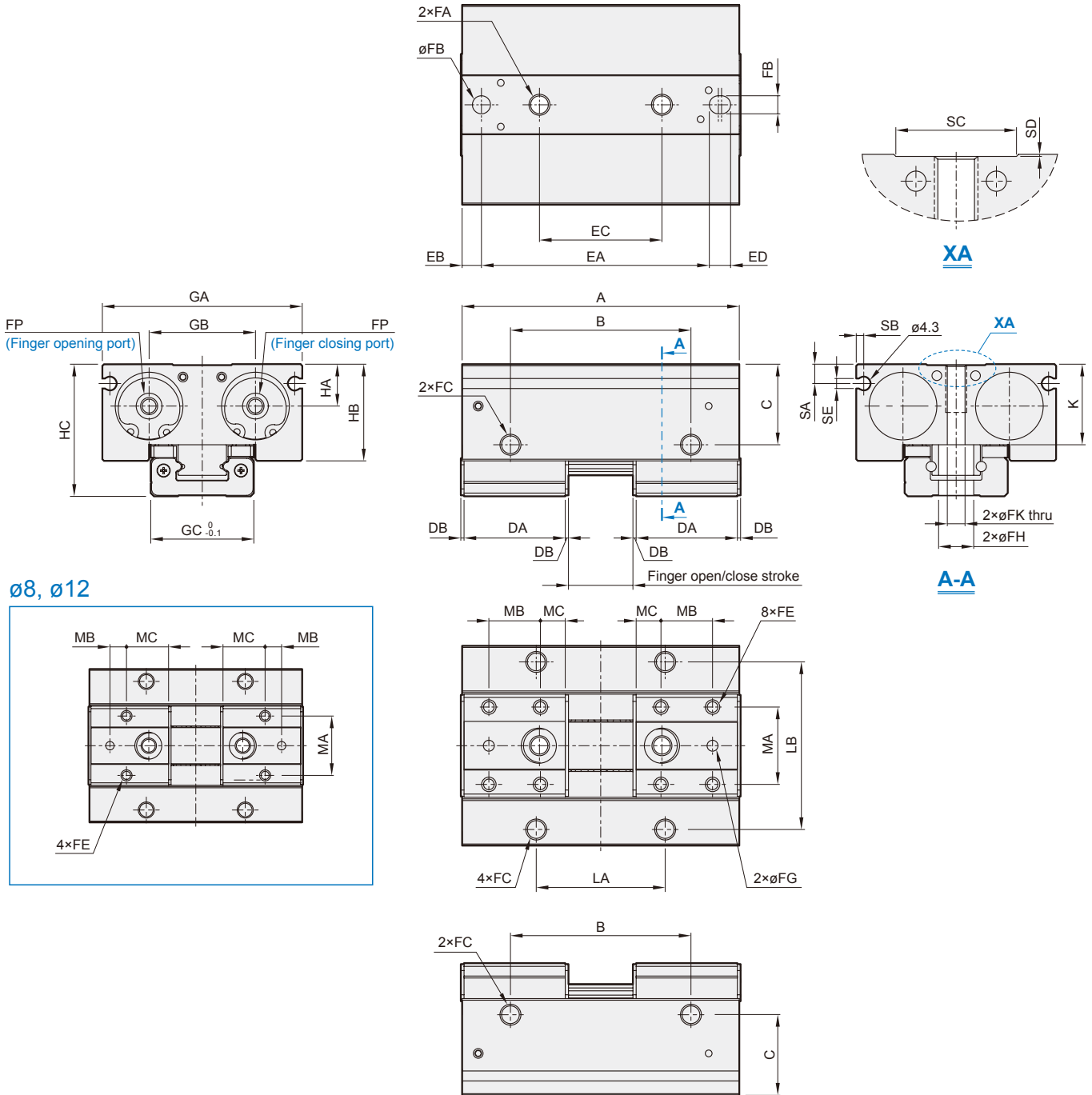


# MCHD Dimensions – Axial piping $\varnothing 8 \sim \varnothing 20$



## PARALLEL GRIPPER (2-Finger)

Mindman



$\varnothing 8, \varnothing 12$

Unit: mm

| Code<br>Tube I.D. | A  | B  | C  | DA   | DB  | EA   | EB | EC | ED  | FA           | FB                          | FC            | FE             | FG                           | FH  |
|-------------------|----|----|----|------|-----|------|----|----|-----|--------------|-----------------------------|---------------|----------------|------------------------------|-----|
| 8                 | 36 | 22 | 11 | 12   | 0.8 | 28.3 | 3  | 16 | 3.4 | M3×0.5×7 dp  | 2.5H9 $^{+0.025}_{0}$ 2.5dp | M3×0.5×4 dp   | M2.5×0.45×3 dp | 2H9 $^{+0.025}_{0}$ 2 dp     | 4.5 |
| 12                | 52 | 38 | 15 | 18   | 1   | 42   | 4  | 26 | 4   | M4×0.7×10 dp | 3H9 $^{+0.025}_{0}$ 3dp     | M4×0.7×5 dp   | M3×0.5×4 dp    | 2.5H9 $^{+0.025}_{0}$ 2.5 dp | 5.5 |
| 16                | 72 | 52 | 20 | 25.4 | 1   | 57.5 | 6  | 38 | 5   | M5×0.8×12 dp | 4H9 $^{+0.03}_{0}$ 3dp      | M5×0.8×5.5 dp | M4×0.7×4 dp    | 3H9 $^{+0.025}_{0}$ 3 dp     | 7.5 |
| 20                | 86 | 56 | 25 | 31.4 | 1   | 71   | 6  | 38 | 6   | M6×1.0×15 dp | 5H9 $^{+0.03}_{0}$ 4dp      | M6×1.0×6 dp   | M4×0.7×4 dp    | 3H9 $^{+0.025}_{0}$ 3 dp     | 10  |

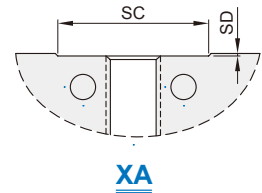
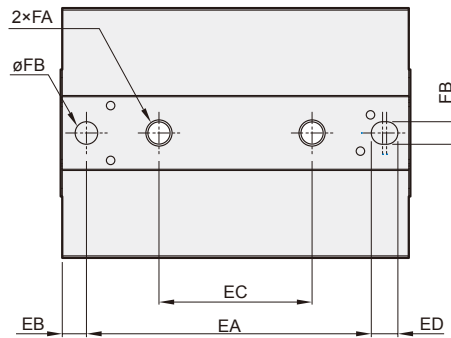
| Code<br>Tube I.D. | FK  | FP     | GA | GB   | GC | HA   | HB | HC | K    | LA | LB | MA | MB | MC  | SA  | SB  | SC   | SD  | SE  |
|-------------------|-----|--------|----|------|----|------|----|----|------|----|----|----|----|-----|-----|-----|------|-----|-----|
| 8                 | 2.6 | M3×0.5 | 32 | 15.8 | 17 | 5.9  | 14 | 19 | 11   | 14 | 26 | 12 | 4  | 6   | 3   | 1.3 | 11   | 0.2 | 3.4 |
| 12                | 3.4 | M5×0.8 | 40 | 20   | 20 | 7.7  | 19 | 25 | 14.8 | 28 | 33 | 15 | 5  | 9   | 3.3 | 1.7 | 10   | 0.3 | 3.1 |
| 16                | 4.3 | M5×0.8 | 50 | 26   | 27 | 10.6 | 24 | 33 | 20   | 36 | 43 | 20 | 15 | 5.2 | 4.6 | 2.2 | 14.4 | 0.3 | 3.1 |
| 20                | 5.2 | M5×0.8 | 62 | 33   | 32 | 13   | 30 | 41 | 25   | 40 | 52 | 24 | 16 | 7.7 | 6   | 2.3 | 18   | 0.3 | 3.1 |

# MCHD Dimensions – Side piping $\varnothing 8 \sim \varnothing 20$

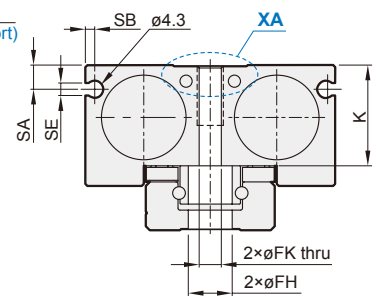
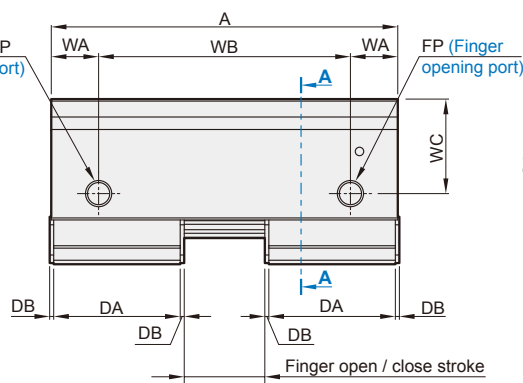
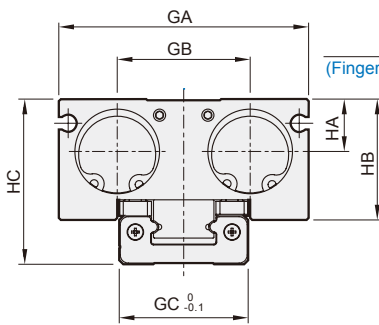


## PARALLEL GRIPPER (2-Finger)

Mindman

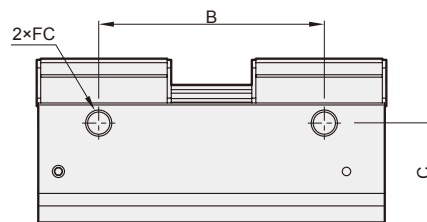
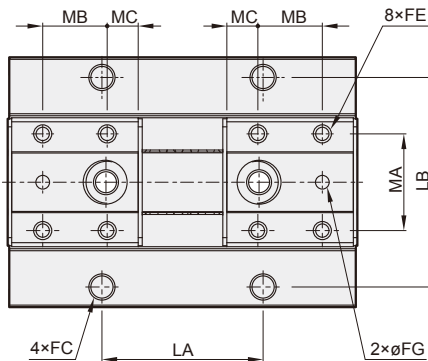
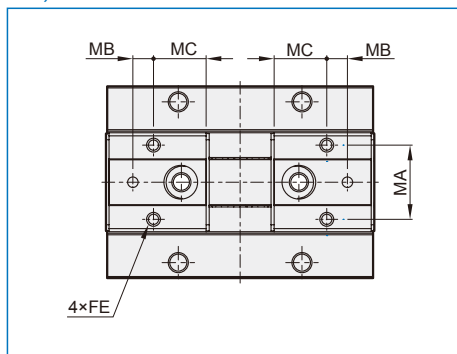


XA



A-A

$\varnothing 8, \varnothing 12$



Unit: mm

| Code<br>Tube I.D. | A  | B  | C  | DA   | DB  | EA   | EB | EC | ED  | FA           | FB   | FC            | FE             | FG  | FH  |
|-------------------|----|----|----|------|-----|------|----|----|-----|--------------|--|---------------|----------------|---|-----|
| 8                 | 36 | 22 | 11 | 12   | 0.8 | 28.3 | 3  | 16 | 3.4 | M3×0.5×7 dp  | 2.5H9 <sup>+0.025</sup> <sub>0</sub> 2.5dp | M3×0.5×4 dp   | M2.5×0.45×3 dp | 2H9 <sup>+0.025</sup> <sub>0</sub> 2 dp     | 4.5 |
| 12                | 52 | 38 | 15 | 18   | 1   | 42   | 4  | 26 | 4   | M4×0.7×10 dp | 3H9 <sup>+0.025</sup> <sub>0</sub> 3dp     | M4×0.7×5 dp   | M3×0.5×4 dp    | 2.5H9 <sup>+0.025</sup> <sub>0</sub> 2.5 dp | 5.5 |
| 16                | 72 | 52 | 20 | 25.4 | 1   | 57.5 | 6  | 38 | 5   | M5×0.8×12 dp | 4H9 <sup>+0.03</sup> <sub>0</sub> 3dp      | M5×0.8×5.5 dp | M4×0.7×4 dp    | 3H9 <sup>+0.025</sup> <sub>0</sub> 3 dp     | 7.5 |
| 20                | 86 | 56 | 25 | 31.4 | 1   | 71   | 6  | 38 | 6   | M6×1.0×15 dp | 5H9 <sup>+0.03</sup> <sub>0</sub> 4dp      | M6×1.0×6 dp   | M4×0.7×4 dp    | 3H9 <sup>+0.025</sup> <sub>0</sub> 3 dp     | 10  |

| Code<br>Tube I.D. | FK  | FP     | GA | GB   | GC | HA   | HB | HC | K    | LA | LB | MA | MB | MC  | SA  | SB  | SC   | SD  | SE  | WA  | WB | WC   |
|-------------------|-----|--------|----|------|----|------|----|----|------|----|----|----|----|-----|-----|-----|------|-----|-----|-----|----|------|
| 8                 | 2.6 | M3×0.5 | 32 | 15.8 | 17 | 5.9  | 14 | 19 | 11   | 14 | 26 | 12 | 4  | 6   | 3   | 1.3 | 11   | 0.2 | 3.4 | 5.5 | 25 | 11   |
| 12                | 3.4 | M5×0.8 | 40 | 20   | 20 | 7.7  | 19 | 25 | 14.8 | 28 | 33 | 15 | 5  | 9   | 3.3 | 1.7 | 10   | 0.3 | 3.1 | 7   | 38 | 14.8 |
| 16                | 4.3 | M5×0.8 | 50 | 26   | 27 | 10.6 | 24 | 33 | 20   | 36 | 43 | 20 | 15 | 5.2 | 4.6 | 2.2 | 14.4 | 0.3 | 3.1 | 9   | 54 | 19   |
| 20                | 5.2 | M5×0.8 | 62 | 33   | 32 | 13   | 30 | 41 | 25   | 40 | 52 | 24 | 16 | 7.7 | 6   | 2.3 | 18   | 0.3 | 3.1 | 10  | 66 | 23   |