CAD drawing data catalog is available.

KOGANEI

ACTUATORS GENERAL CATALOG

AIR HANDS SERIES

CONTENTS

⚠ **Caution** **Before use, be sure to read the "Safety Precautions" on p. 57.**

AIR HANDS SERIES

Full Line-up

Page 1399

Parallel Type Linear Guide Specification NHC1 Series

- **40% lighter:** Now about 40% lighter than the previous NHB series linear guide specification.
- **45% more compact:** Reduced the width, length, and height.
- **Strong:** Use of high-rigidity linear guide achieves repeatability of ±0.01mm [±0.0004in.] or less. Centering accuracy is also ±0.07mm [±0.0028in.] or less.

Page 1403

Parallel Type Linear Guide Specification

- Lever portion uses a linear guide for long operating life, high precision, long lever travel gripping, and overhang gripping.
- Gripping position repeatability ±0.01mm [±0.0004in.]. Centering accuracy is also ±0.07mm [±0.0028in.].
- Magnet for sensor switch is standard equipment.

Page 1407

Parallel Type Linear Guide Specification Long Stroke

- Open/closed stroke is about double the previous model.
- Gripping position repeatability is ±0.01mm [±0.0004in.].

Page 1411

Parallel Type Linear Guide Specification with Fingers

- Fingers attachment is simple to install.
- Gripping position repeatability is ±0.01mm [±0.0004in.].

Page 1415

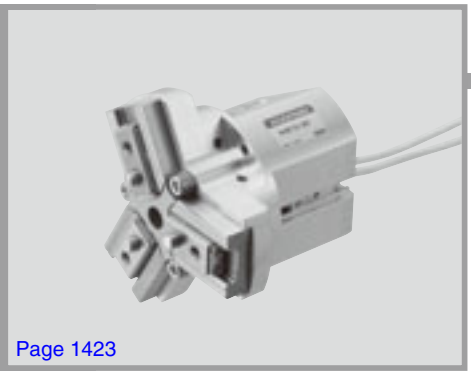
Parallel Type Linear Guide Specification with Rubber Cover

- Dust protection cover is standard equipment.
- Lever portion uses a linear guide for long operating life, high precision, long lever travel gripping, and overhang gripping.
- Gripping position repeatability ±0.01mm [±0.0004in.].
- Magnet for sensor switch is standard equipment.

Page 1419

Parallel Type Linear Guide Specification for Clean Systems

- Clean rating corresponds to Class 4 (during suction).
- Gripping position repeatability is ±0.01mm [±0.0004in.].



Page 1423

Three-finger Type Linear Guide Specification

- Linear guides are used on three-finger hand! Superior load and moment resistance.
  Centering accuracy is ±0.05mm [±0.0020in.] or less.
  Gripping position repeatability is ±0.01mm [±0.0004in.] or less.
- Body is equipped with a hollow space. Convenient for installing a cylinder for workpiece release, etc.

Page 1426

Parallel Type Cross Roller Bearing Specification

- Lever portion uses cross roller bearings for long operating life and high precision.
- Gripping position repeatability ±0.01mm [±0.0004in.].
- Dust protection cover is optional.
- Magnet for sensor switch is standard equipment.

Page 1430

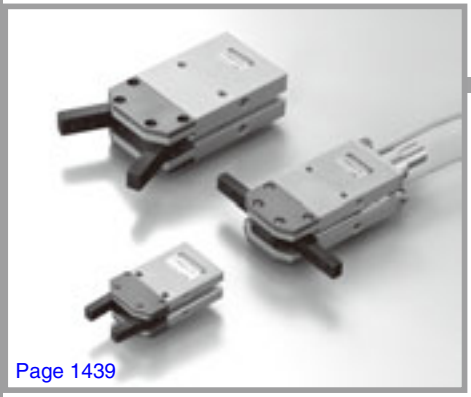
Parallel Type Plain Bearing Specification

- Lever portion uses a slide plate for long operating life.
- Magnet for sensor switch is standard equipment.
- 3-way direct mounting.

Page 1434

Swing Type

- Lever uses chrome molybdenum steel, with quench hardened major parts, to achieve long operating life.
- Magnet for sensor switch is standard equipment.
- 3-way direct mounting.



Page 1439

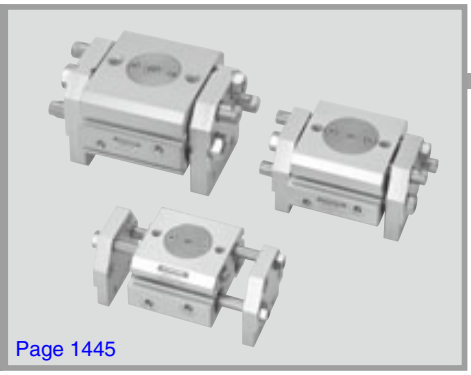
Swing Type High Precision, 180° Open Specification

- Uses a thrust bearing in the lever support area to achieve high precision, high rigidity, and long operating life.
- Uses a link mechanism for compact, high gripping force. Open-close up to 180°.

Page 1443

Swing Type 180° Open Specification

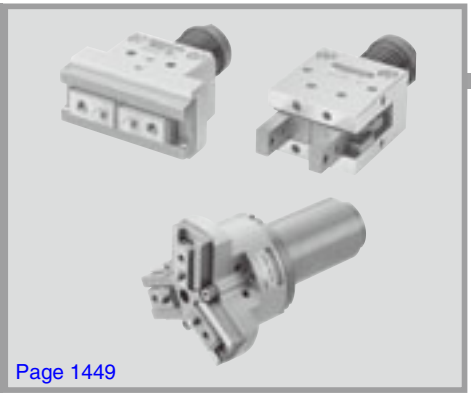
- Lever uses chrome molybdenum steel, with quench hardened major parts, to achieve long operating life.
- Open/close angle 180°, to allow gripping and releasing of workpieces without retracting a hand body.
- Magnet for sensor switch is standard equipment.
- 3-way direct mounting.



Page 1445

Rack Operation Parallel Type

- Four types of lever with open/close travel strokes, at 24, 32, 40, and 50mm [0.945, 1.260, 1.575, 1.969in.].
- Magnet for sensor switch is standard equipment.



Page 1449

Mechanical Hands

- Because these do not require air piping, these are optimum for locations where air piping cannot reach (such as on index table, etc.).
- Three types available, including parallel type, parallel type linear guide specification, and linear guide specification three-finger type.
- Spring force can be set to strong or weak in response to the workpiece.
- The linear guide specification uses a linear guide on the lever, to achieve high precision (±0.01mm [±0.0004in.]) and long operating life.

General precautions

Media

1. Use air for the media. For the use of any other media, consult us.
2. Air used for the air hand (gripper) should be clean air that contains no deteriorated compressor oil, etc. Install an air filter (with filtration of a minimum 40μm) near the air hand (gripper) or valve to remove collected liquid or dust. In addition, drain the air filter periodically.

Piping

1. Always thoroughly blow off (use compressed air) the tubing before connecting it to the air hand (gripper). Entering metal chips, sealing tape, rust, etc., generated during piping work could result in air leaks or other defective operation.
2. When screwing in piping or fittings to the air hand (gripper), tighten to the appropriate tightening torque shown below.

Connecting thread	Tightening torque N・m [ft・lbf]
M3×0.5	0.6 [0.44]
M5×0.8	1.6 [1.18]

Lubrication

Cylinder portion

The product can be used without lubrication, if lubrication is required, use Turbine Oil Class 1 (ISO VG32) or equivalent. Avoid using spindle oil or machine oil.

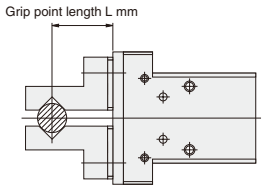
Lever slide portion

The product can be used without lubrication, if lithium-based grease or urea-based grease is applied, it will increase the product's operating life.

Atmosphere

If using in locations subject to dripping water, dripping oil, etc., or to large amount of dust, use a cover to protect the unit. Select the rubber cover specification, if using in locations subject to large amounts of dust.

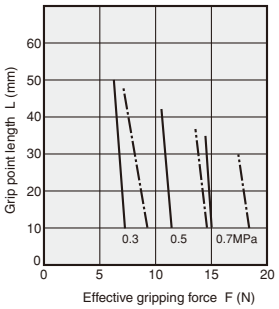
Selection



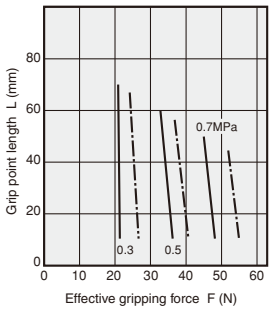
Effective gripping force

●Parallel type Linear guide specification (NHC1 series)

NHC1D-10



NHC1D-16



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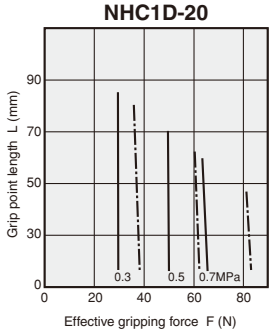
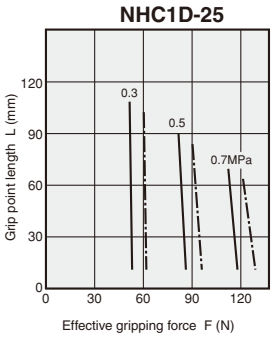


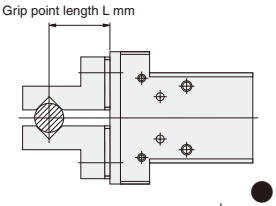
NHC1D-25



1mm = 0.0394in.
1N = 0.2248lbf.
1MPa = 145psi.

Selection

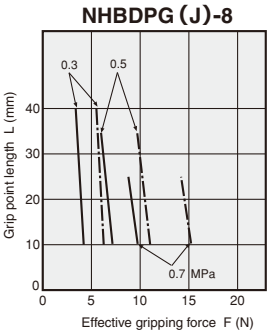
Effective gripping force



—·—·— : Open side
——— : Closed side

●Parallel type Linear guide specification (with rubber cover)

NHBDPG(J)-8



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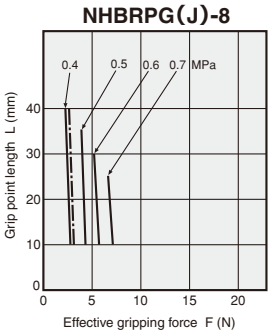

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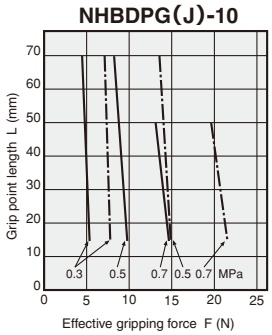

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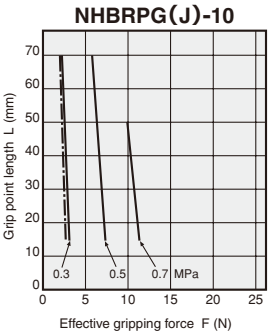

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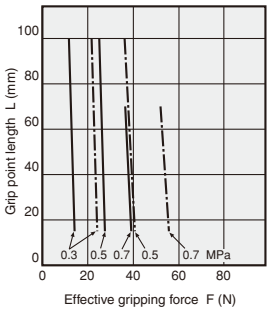

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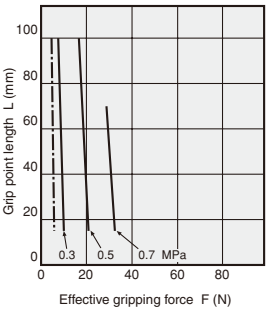

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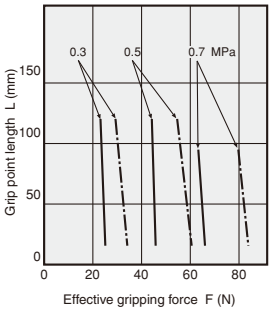

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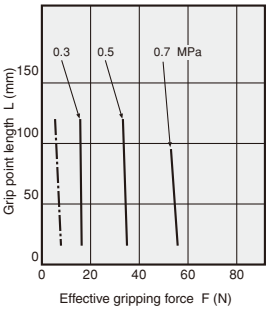
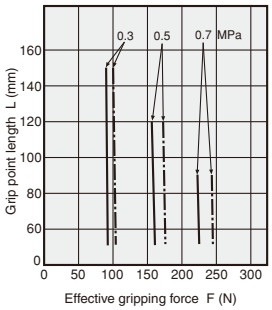


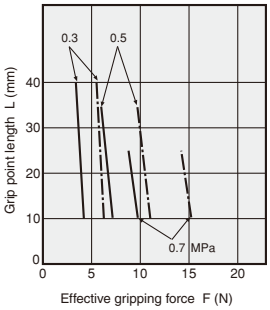
NHBDPG-32



1mm = 0.0394in.
1N = 0.2248lbf.
1MPa = 145psi.

●Linear guide specification Long stroke

NHBDPGL-8



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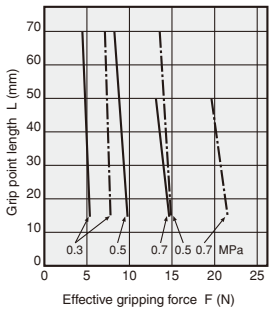
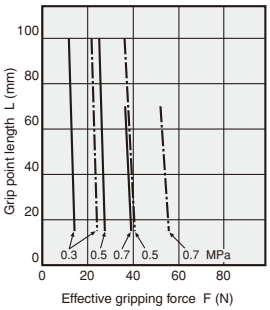


NHBDPGL-16



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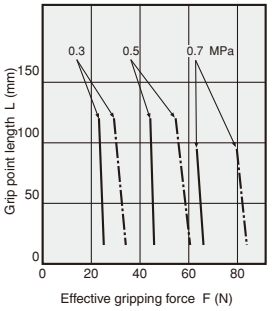
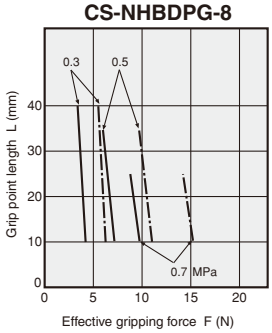


1mm = 0.0394in.
1N = 0.2248lbf.
1MPa = 145psi.

●Linear guide specification for clean systems

CS-NHBDPG-8



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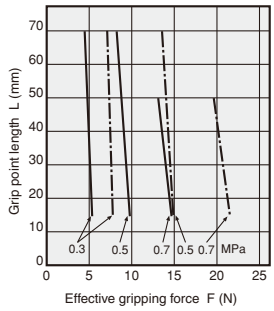

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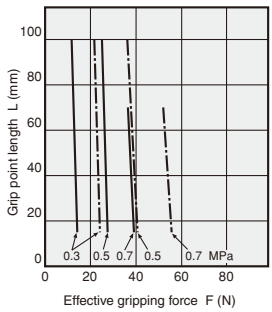

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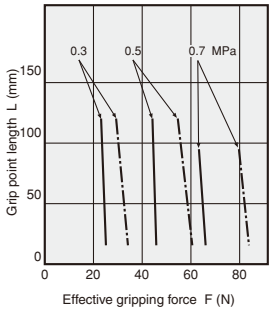
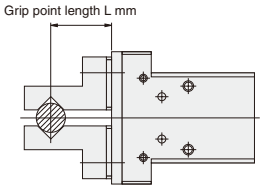
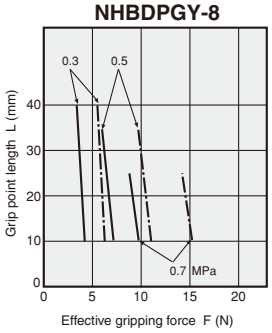


1mm = 0.0394in.
1N = 0.2248lbf.
1MPa = 145psi.



●Linear guide specification With fingers

NHBDPGY-8



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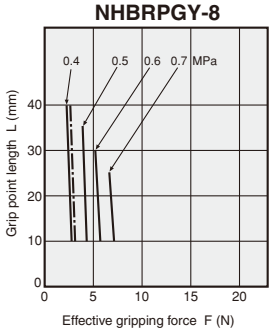

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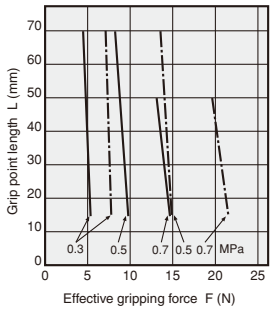

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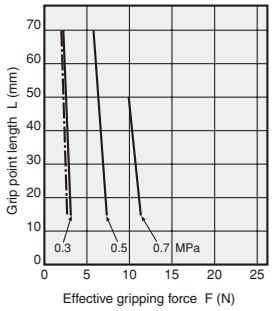

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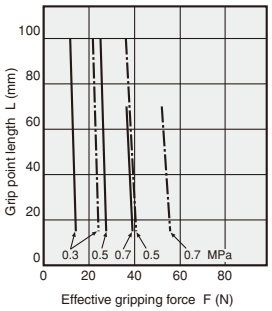

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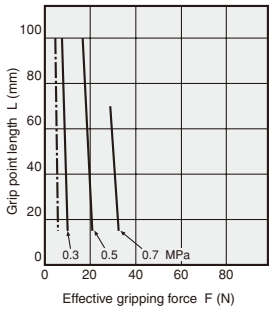

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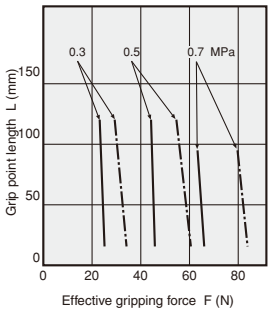

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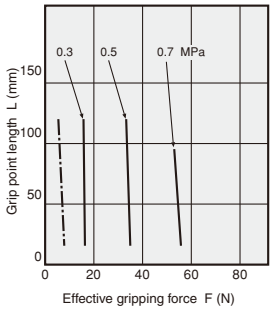
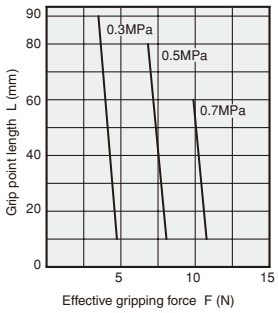


1mm = 0.0394in.
1N = 0.2248lbf.
1MPa = 145psi.

●Three-finger type Linear guide specification Air hands

(Lever open side and closed side are same value.)

NHE1D-16



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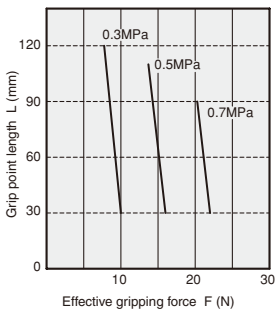

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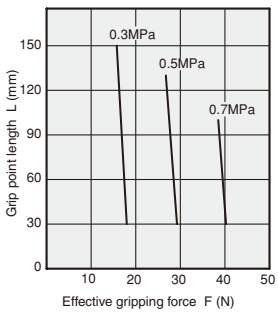
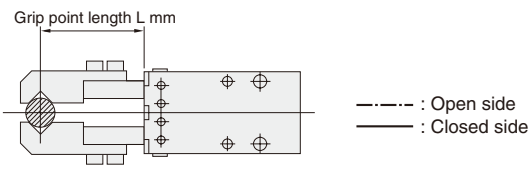
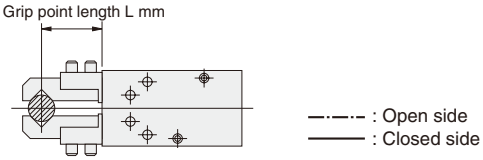


1mm = 0.0394in.
1N = 0.2248lbf.
1MPa = 145psi.

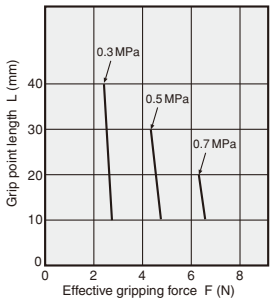
Effective gripping force





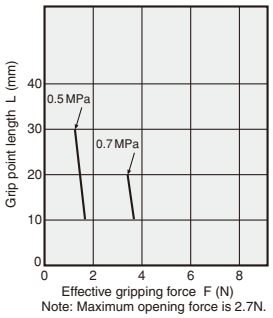
●Parallel type Cross roller bearing specification

NHBDPA-6



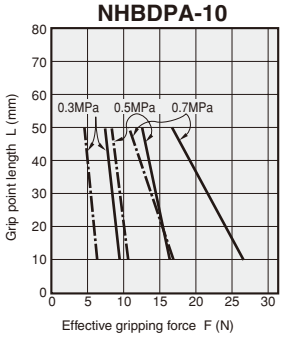
Note: Opening force is equal to or greater than closing force.

NHBRPA-6

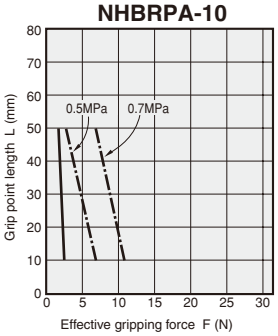


Note: Maximum opening force is 2.7N.

NHBDPA-10



NHBRPA-10



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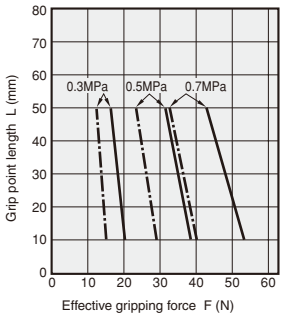

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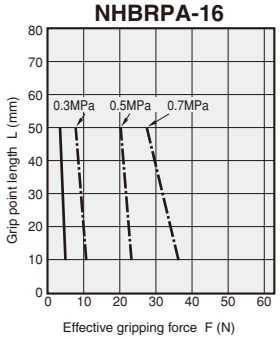
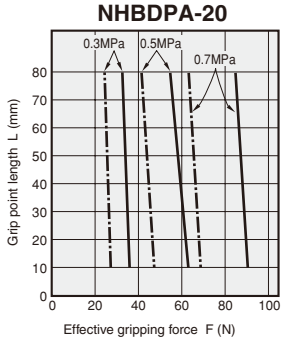
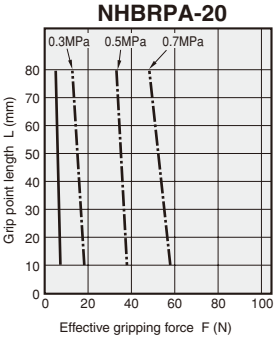


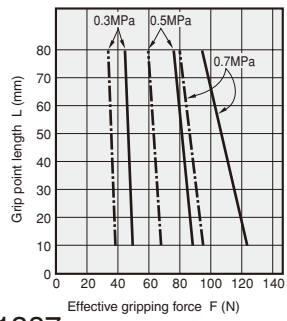
NHBDPA-20



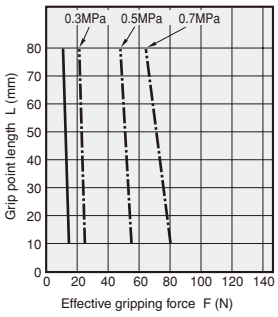
NHBRPA-20



NHBDPA-25

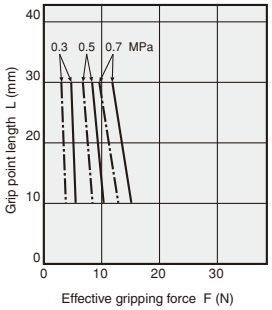


NHBRPA-25

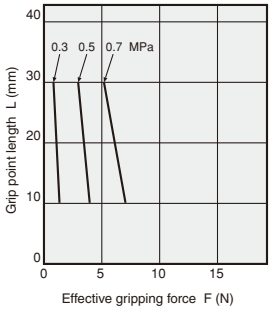


●Parallel type Plain bearing specification

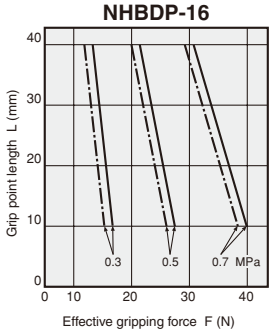
NHBDP-10



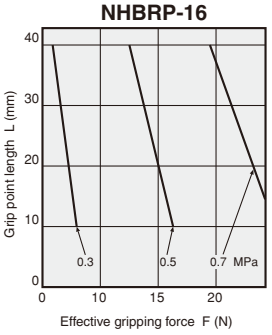
NHBRP-10



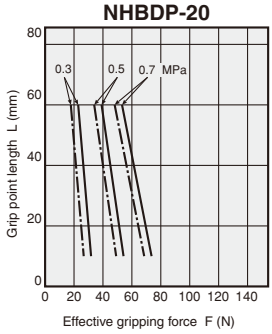
NHBDP-16



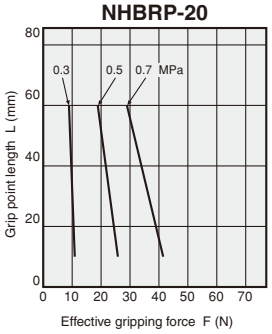
NHBRP-16



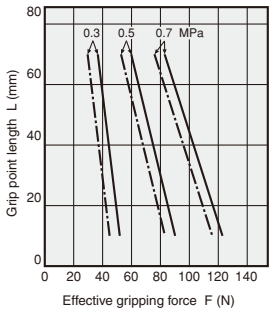
NHBDP-20



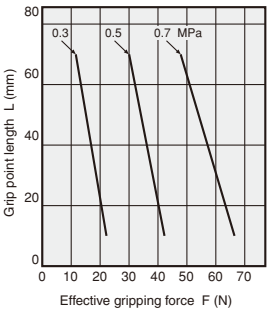
NHBRP-20



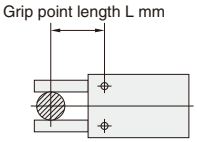
NHBDP-25



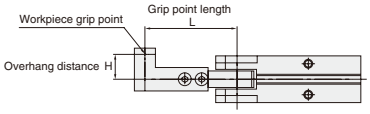
NHBRP-25



1mm = 0.0394in.
1N = 0.2248lbf.
1MPa = 145psi.

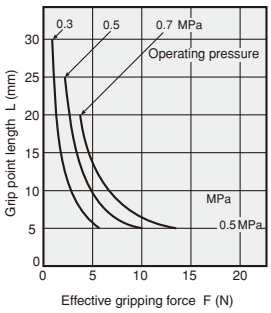


: Open side
: Closed side

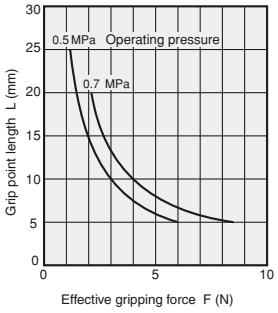


●Swing type

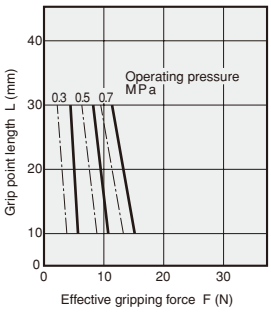
NHBDS-8



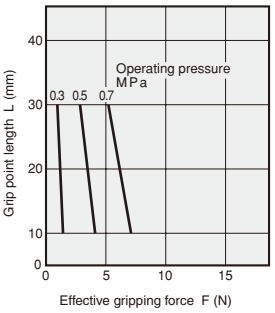
NHBRS-8



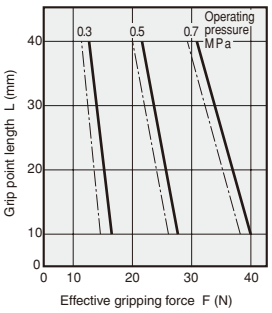
NHBDS-10



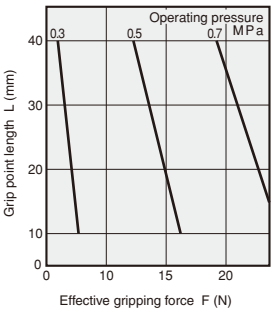
NHBRS-10



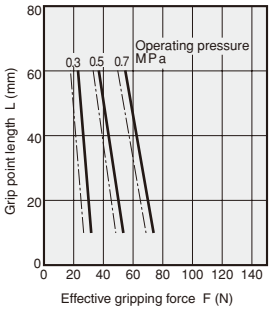
NHBDS-16



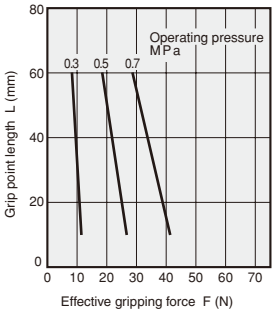
NHBRS-16



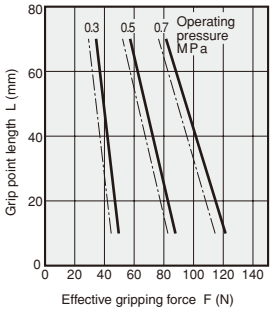
NHBDS-20



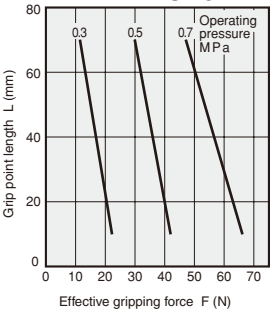
NHBRS-20



NHBDS-25

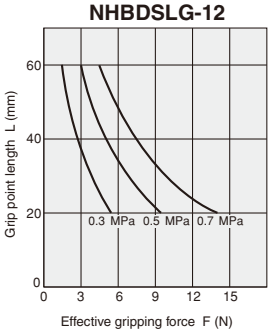


NHBRS-25

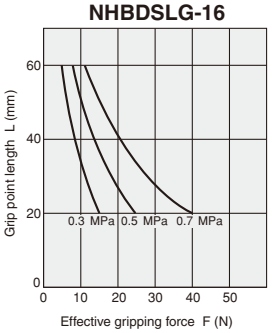


●Swing type
High precision, 180° open specification

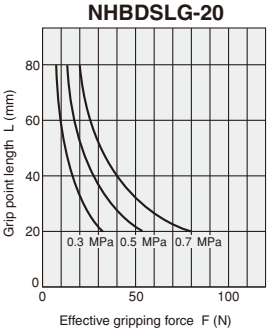
NHBDSLG-12



NHBDSLG-16



NHBDSLG-20

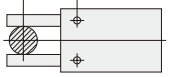


Note: Graphs show the force of closing direction.

1mm = 0.0394in.
1N = 0.2248lbf.
1MPa = 145psi.

Effective gripping force

Grip point length L mm

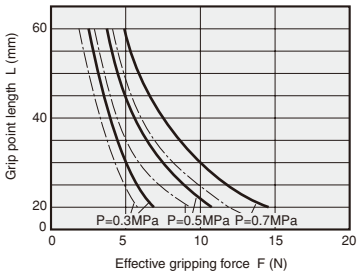


—·—·— : Open side
——— : Closed side

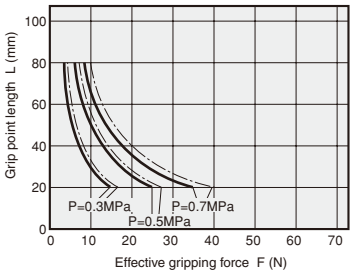
Caution: For the grip point length specifications, see p.1387 for parallel type plain bearing specification and p.1385 for parallel type linear guide specification.

●Swing type 180° open specification

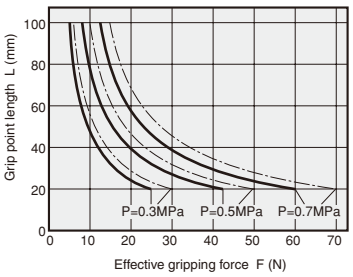
NHBDSL-12



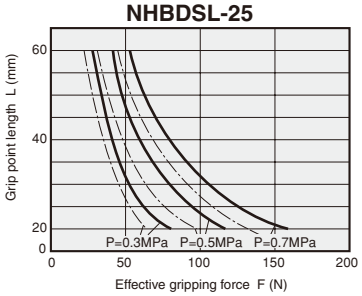
NHBDSL-16



NHBDSL-20



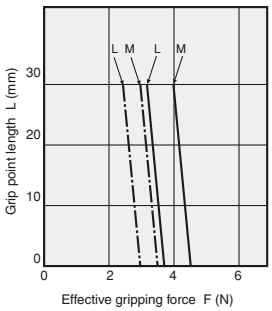
NHBDSL-25



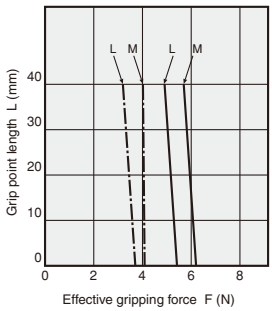
1mm = 0.0394in.
1N = 0.2248lbf.
1MPa = 145psi.

●Parallel type Mechanical hands

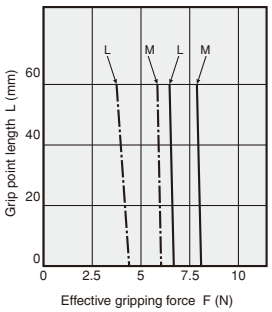
NHBMRP-10·NHBMP-10



NHBMRP16·NHBMP16



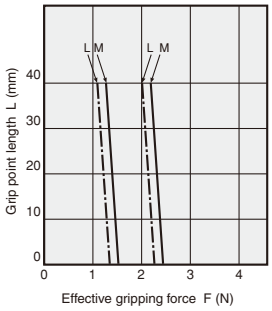
NHBMRP-20·NHBMP-20



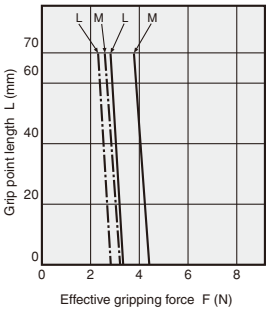
1mm = 0.0394in.
1N = 0.2248lbf.

●Parallel type Linear guide specification Mechanical hands

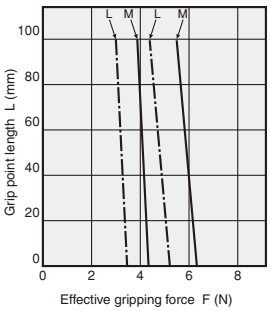
NHBMPG-8



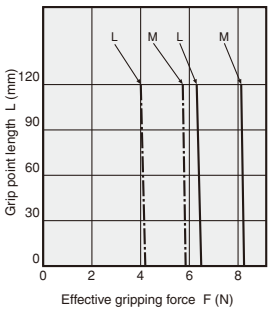
NHBMPG-10



NHBMPG-16

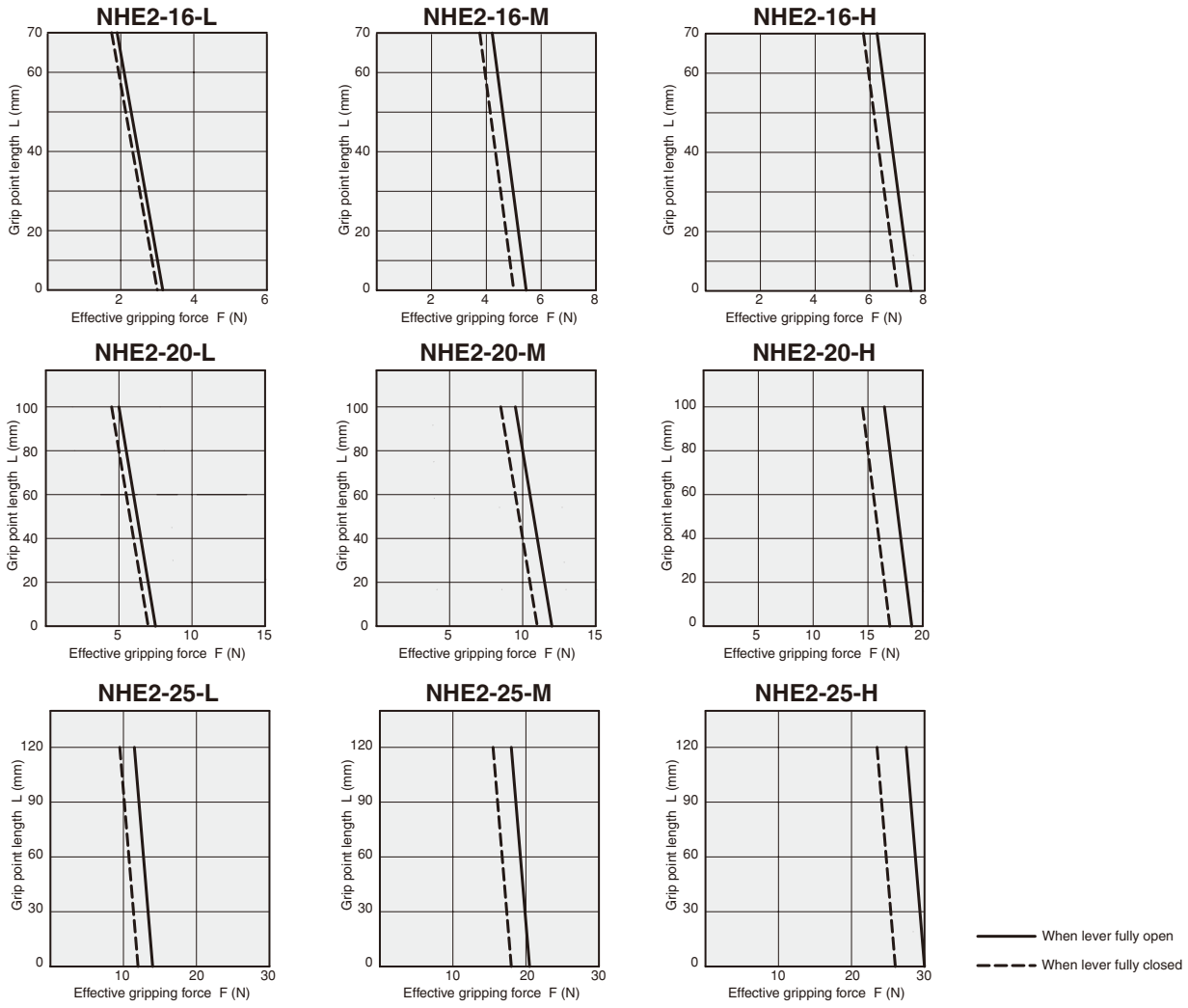


NHBMPG-20



1mm = 0.0394in.
1N = 0.2248lbf.

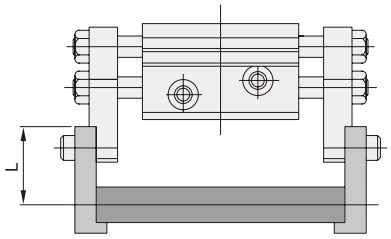
●Three-finger type Linear guide specification Mechanical hands



1mm = 0.0394in.
1N = 0.2248lbf.

Effective gripping force

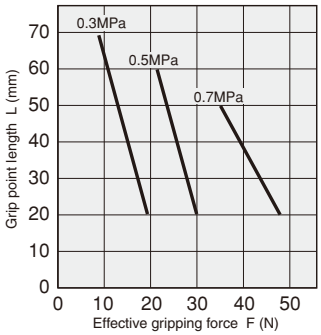
●WHDP series Rack operation parallel type



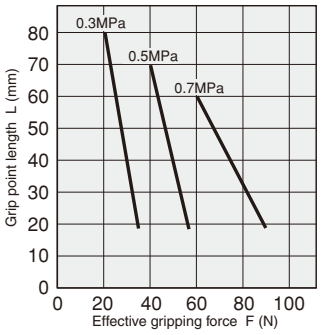
L=Grip point length

Note: Gripping force is the same for both the open and closed sides.

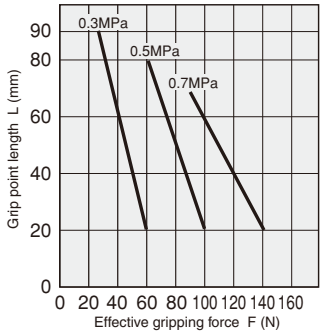
WHDP-12



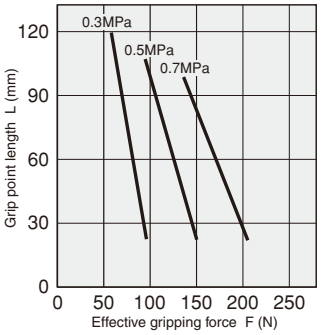
WHDP-16



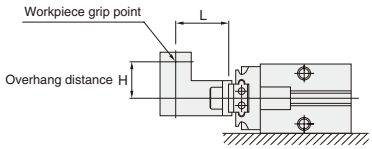
WHDP-20



WHDP-25

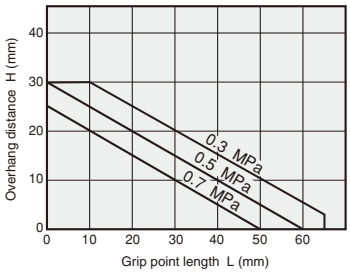


Grip point limit range

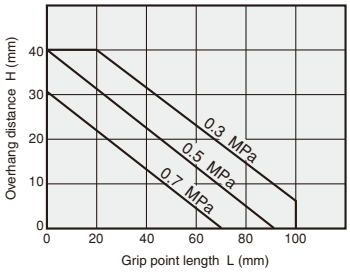


●Parallel type Linear guide specification (NHC1 series)

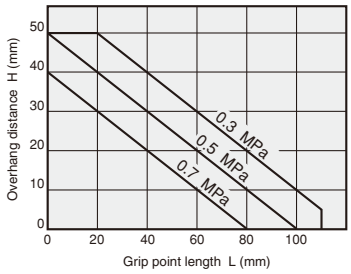
NHC1D-10



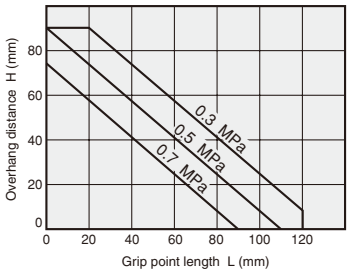
NHC1D-16



NHC1D-20



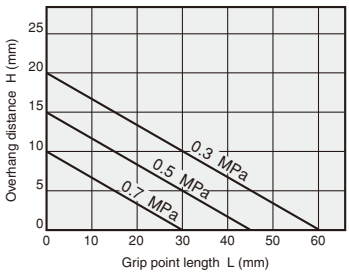
NHC1D-25



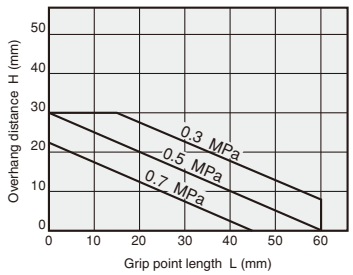
1mm = 0.0394in.
1N = 0.2248lbf.
1MPa = 145psi.

●Swing type High precision, 180° open specification

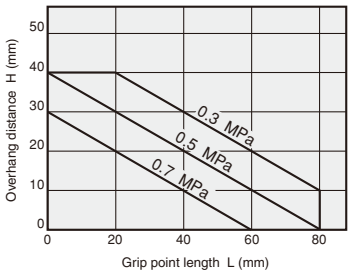
NHBDSLG-12



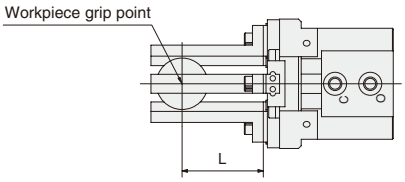
NHBDSLG-16

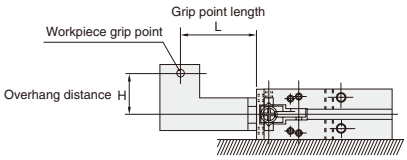


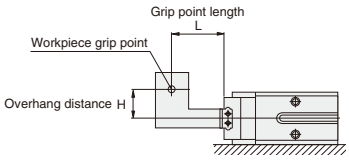
NHBDSLG-20



1mm = 0.0394in.
1MPa = 145psi.

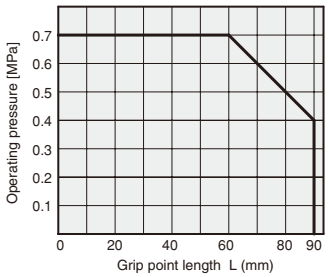




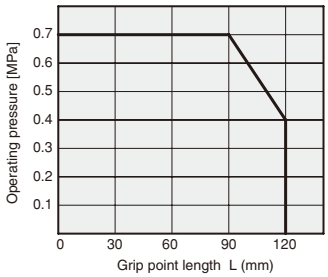


●Three-finger type Linear guide specification Air hands

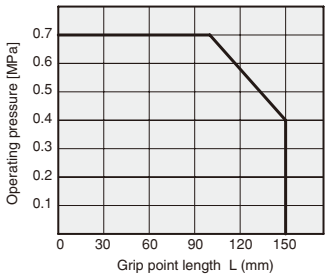
NHE1D-16



NHE1D-20



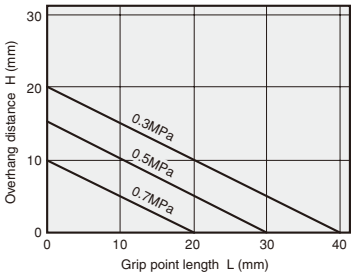
NHE1D-25



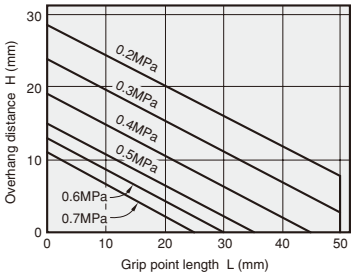
1mm = 0.0394in.
1MPa = 145psi.

●Parallel type Cross roller bearing specification

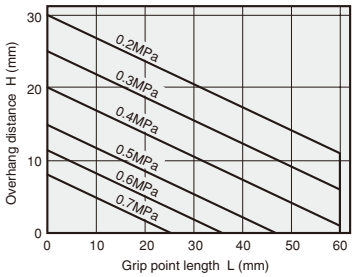
NHBDPA-6 NHBRPA-6



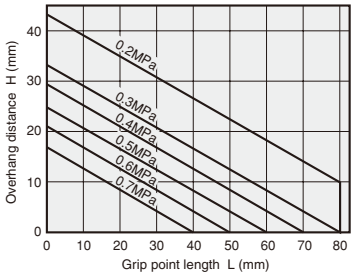
NHBDPA-10 NHBRPA-10



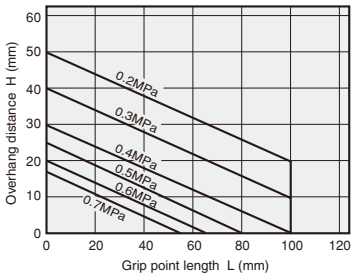
NHBDPA-16 NHBRPA-16



NHBDPA-20 NHBRPA-20



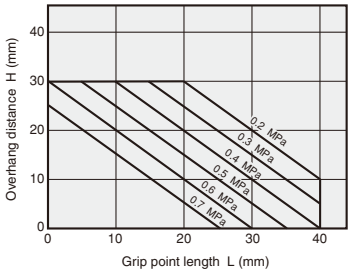
NHBDPA-25 NHBRPA-25



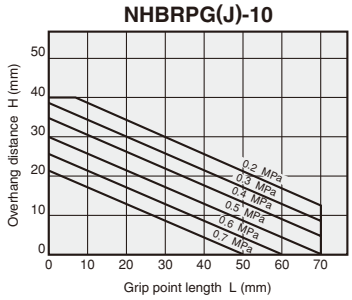
1mm = 0.0394in. 1MPa = 145psi.

●Parallel type Linear guide specification (with rubber cover)

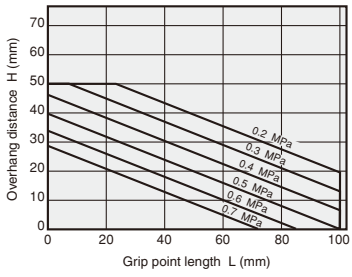
NHBDPG(J)-8 NHBRPG(J)-8



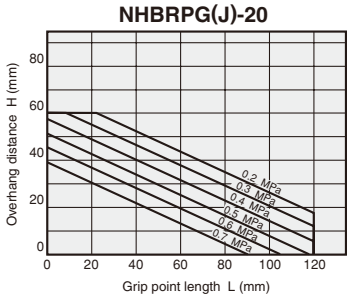
NHBDPG(J)-10 NHBRPG(J)-10



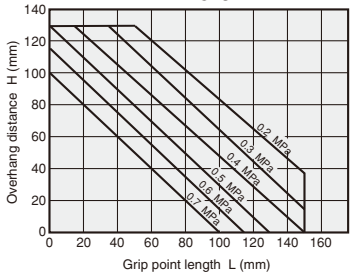
NHBDPG(J)-16 NHBRPG(J)-16



NHBDPG(J)-20 NHBRPG(J)-20

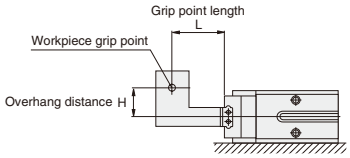


NHBDPG-32



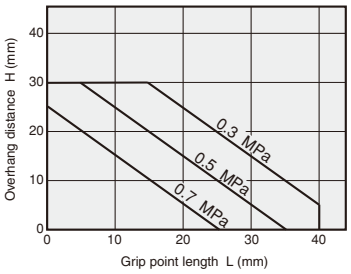
1mm = 0.0394in. 1MPa = 145psi.

Grip point limit range

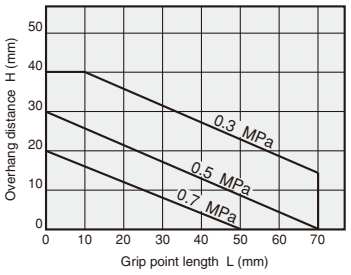


●Linear guide specification Long stroke

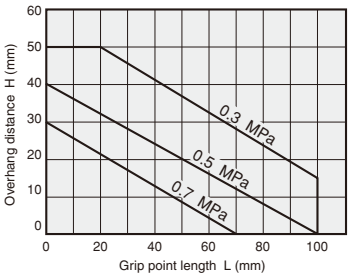
NHBDPGL-8



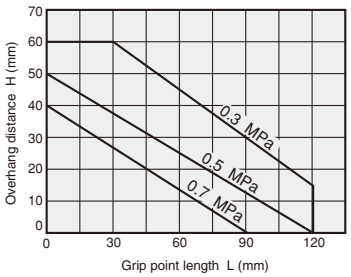
NHBDPGL-10



NHBDPGL-16



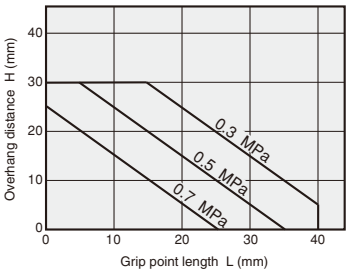
NHBDPGL-20



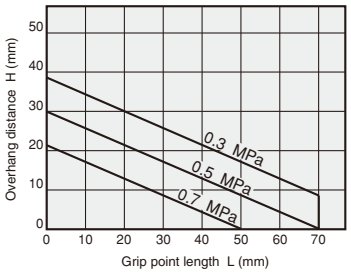
1mm = 0.0394in.
1MPa = 145psi.

●Linear guide specification With fingers

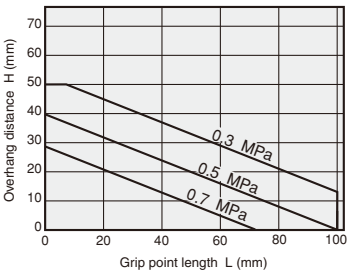
NHBDPGY-8
NHBRPGY-8



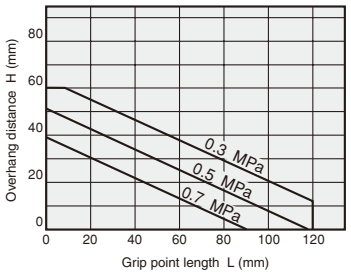
NHBDPGY-10
NHBRPGY-10



NHBDPGY-16
NHBRPGY-16



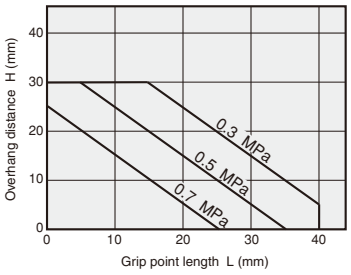
NHBDPGY-20
NHBRPGY-20



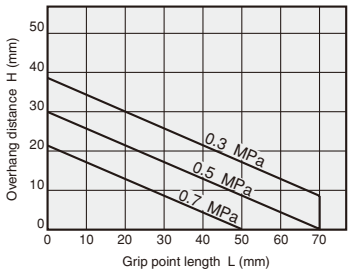
1mm = 0.0394in.
1MPa = 145psi.

●Linear guide specification for clean systems

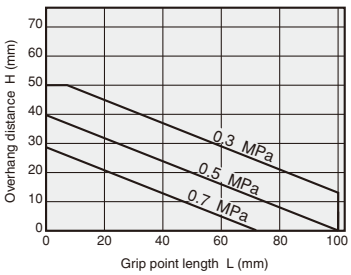
CS-NHBDPG-8



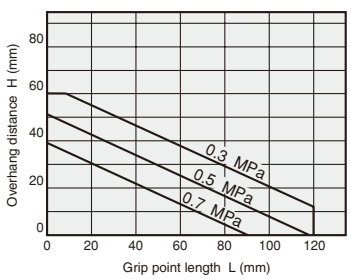
CS-NHBDPG-10



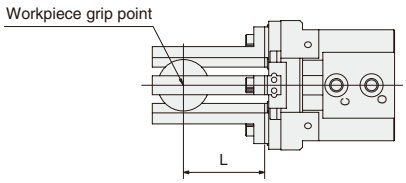
CS-NHBDPG-16



CS-NHBDPG-20

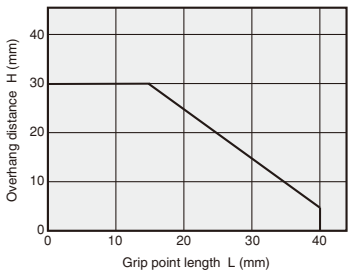


1mm = 0.0394in.
1MPa = 145psi.

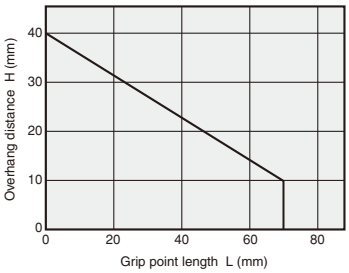


●Parallel type
Linear guide specification
Mechanical hands

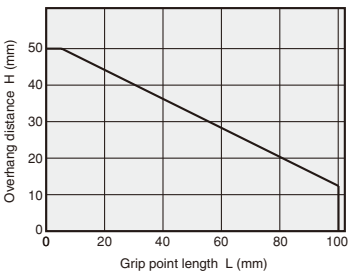
NHBMPG-8



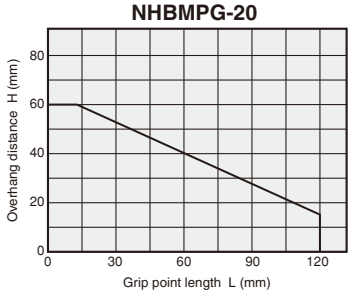
NHBMPG-10



NHBMPG-16



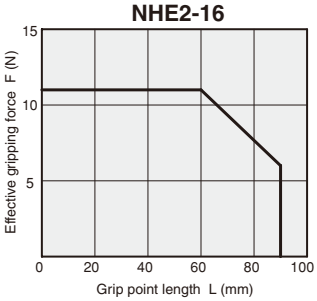
NHBMPG-20



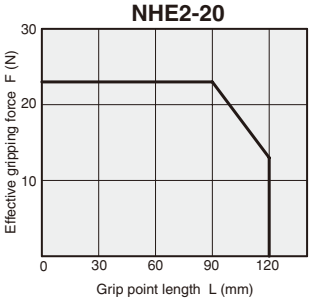
1mm = 0.0394in.

●Three-finger type
Linear guide specification
Mechanical hands

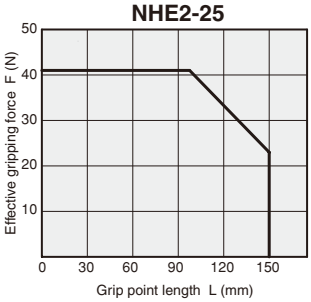
NHE2-16



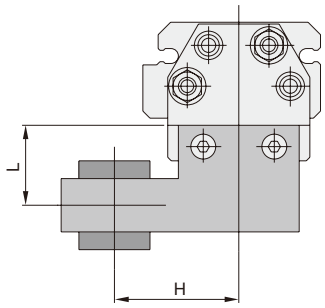
NHE2-20



NHE2-25

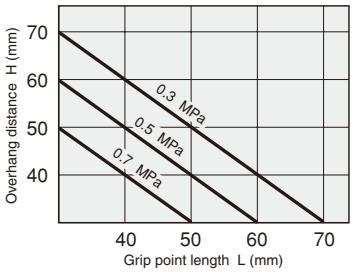


1N = 0.2248lbf.
1mm = 0.0394in.

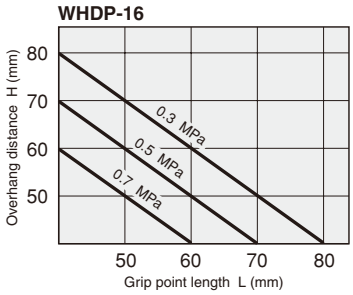


H = Overhang distance
L = Grip point length

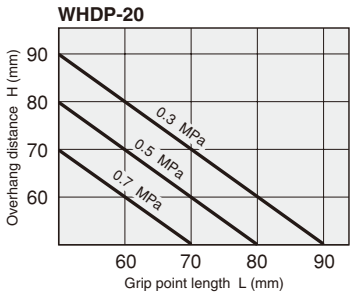
WHDP-12



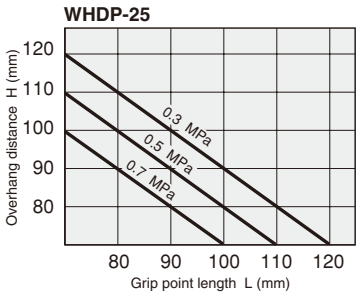
WHDP-16



WHDP-20



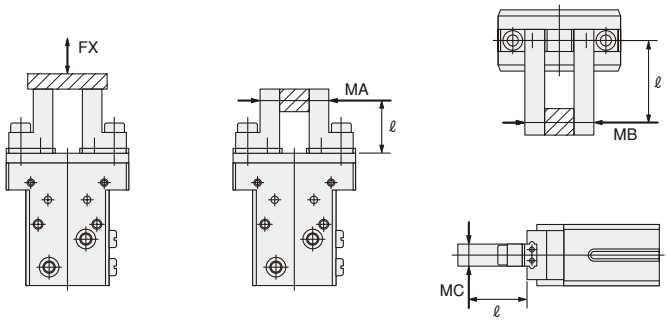
WHDP-25



1mm = 0.0394in. 1MPa = 145psi.

Allowable load and allowable moment

●Linear guide specification



●NHB series

Model \ Load and moment	FX N [lbf.]	MA N・m [in・lbf]	MB N・m [in・lbf]	MC N・m [in・lbf]
(CS-)NHB□P□□-8	12 [2.7]	0.04 [0.4]	0.04 [0.4]	0.08 [0.7]
(CS-)NHB□P□□-10	49 [11.0]	0.39 [3.5]	0.39 [3.5]	0.78 [6.9]
(CS-)NHB□P□□-16	117 [26.3]	0.98 [8.7]	0.98 [8.7]	1.96 [17.3]
(CS-)NHB□P□□-20	196 [44.1]	1.47 [13.0]	1.47 [13.0]	2.94 [26.0]
NHBDPG-32	350 [78.7]	3 [26.6]	3 [26.6]	6 [53.1]

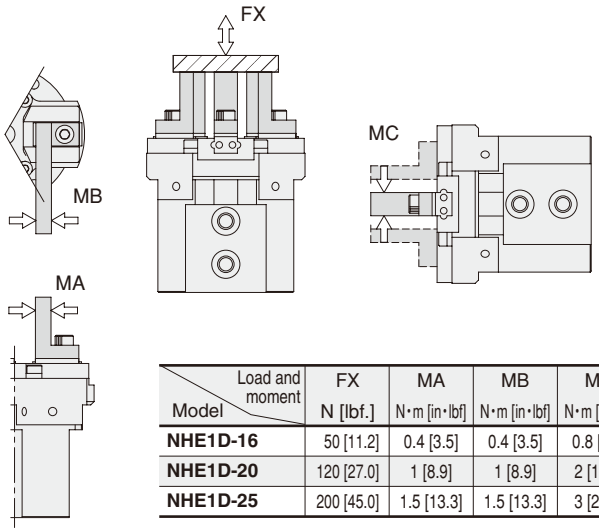
Remark: ℓ is the distance from the main body end to the gripping point.

●NHC1 series

Model \ Load and moment	FX N [lbf.]	MA N・m [in・lbf]	MB N・m [in・lbf]	MC N・m [in・lbf]
NHC1D-10	60 [13.5]	0.3 [2.7]	0.3 [2.7]	0.6 [5.3]
NHC1D-16	100 [22.5]	0.8 [7.1]	0.8 [7.1]	1.6 [14.2]
NHC1D-20	160 [36.0]	1.4 [12.4]	1.4 [12.4]	2.8 [24.8]
NHC1D-25	280 [62.9]	2.4 [21.2]	2.4 [21.2]	4.8 [42.5]

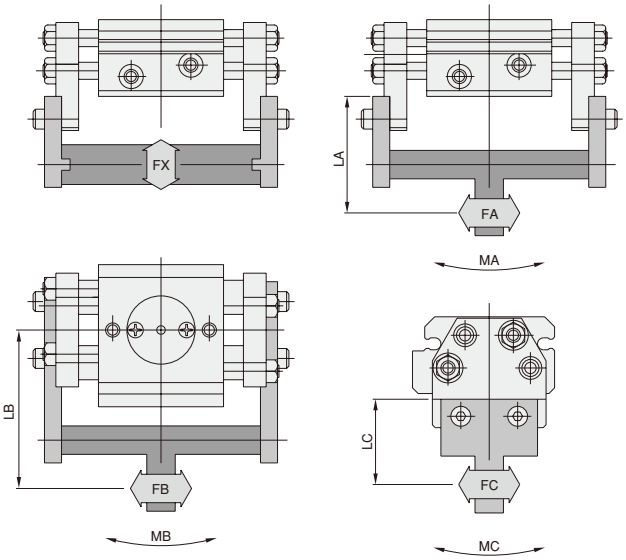
Remark: ℓ is the distance from the main body end to the gripping point.

●Three-finger type linear guide specification



Model \ Load and moment	FX N [lbf.]	MA N・m [in・lbf]	MB N・m [in・lbf]	MC N・m [in・lbf]
NHE1D-16	50 [11.2]	0.4 [3.5]	0.4 [3.5]	0.8 [7.1]
NHE1D-20	120 [27.0]	1 [8.9]	1 [8.9]	2 [17.7]
NHE1D-25	200 [45.0]	1.5 [13.3]	1.5 [13.3]	3 [26.6]

●WHDP series

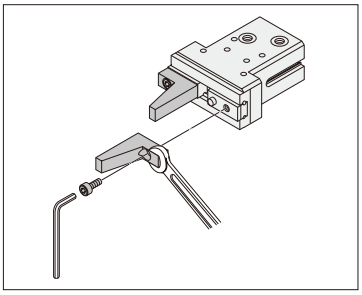


●MA＝FA×LA（N・m）
●MB＝FB×LB（N・m）
●MC＝FC×LC（N・m）

Model \ Load and moment	FX N [lbf.]	MA N・m [in・lbf]	MB N・m [in・lbf]	MC N・m [in・lbf]
WHDP-12	24 [5.4]	0.6 [5.3]	0.6 [5.3]	0.12 [1.06]
WHDP-16	36 [8.1]	1.1 [9.7]	1.1 [9.7]	0.22 [1.95]
WHDP-20	68 [15.3]	2.1 [18.6]	2.1 [18.6]	0.49 [4.34]
WHDP-25	93 [20.9]	2.7 [23.9]	2.7 [23.9]	0.76 [6.73]

Gripping

1. When attaching fingers on the levers, design them as short and as light as possible. If the fingers are longer and heavier, the impact force when opening and closing will increase and cause a decrease in the gripping accuracy and/or wear and damage to the sliding portion. Also, to prevent the workpiece from falling down or being damaged, and to reduce the metal contact noise when gripping, plastic or rubber materials should be attached to the fingers at the part of contact.
   In cases with long grip point length or high air pressure, there will be a large gripping moment exerted on the lever area that could result in damage to the lever. Always refer to the grip point limit range table, and use it within the allowed range.
2. When the lever opening and closing time is faster than necessary in relation to the workpieces, the impact force increases when opening and/or closing and causes a decrease in the gripping accuracy, and wear and damage of the sliding portion etc., therefore a speed controller should be installed and the workpiece should be gripped to make the impact as small as possible.
3. When moving the air gripper in straight lines or during circular operations, use a shock absorber etc., at the travel end to stop it as smoothly as possible. Sudden stops may cause the workpieces to pop out or fall from the gripper.
4. When installing the fingers on the lever, use a wrench etc., to hold it so that the lever doesn't get twisted. Tighten the mounting bolts to the tightening torques shown in the table below.



●NHC1 series

Model	Bolt	Maximum tightening torque N・m [in・lbf]
NHC1D-10	M3×0.5	0.6 [5.3]
NHC1D-16	M4×0.7	1.4 [12.4]
NHC1D-20	M5×0.8	2.9 [25.7]
NHC1D-25	M6×1.0	4.8 [42.5]

Caution: Avoid applications in which side loads are applied to the lever and lever mounting portion.

●NHB series (Linear guide specification)

Model	Bolt	Maximum tightening torque N・m [in・lbf]
(CS-)NHB□PG(L)-8	M2×0.4	0.15 [1.33]
(CS-)NHB□PG(L)-10	M3×0.5	0.6 [5.3]
(CS-)NHB□PG(L)-16	M4×0.7	1.4 [12.4]
(CS-)NHB□PG(L)-20	M5×0.8	2.9 [25.7]
NHBDPG-32	M6×1	4.8 [42.5]

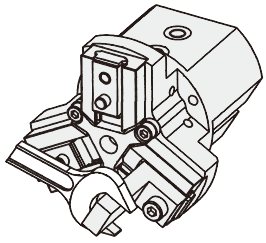
Caution: Avoid applications in which side loads are applied to the lever and lever mounting portion.

●NHB series (High precision, 180° open specification)

Model	Bolt	Maximum tightening torque N・m [in・lbf]
NHBDSLG-12	M3×0.5	0.6 [5.3]
NHBDSLG-16	M3×0.5	0.6 [5.3]
NHBDSLG-20	M4×0.7	1.4 [12.4]

Caution: Avoid applications in which side loads are applied to the lever and lever mounting portion.

●Three-finger type linear guide specification



Model	Bolt	Maximum tightening torque N・m [in・lbf]
NHE1D/NHE2-16	M3×0.5	0.6 [5.3]
NHE1D/NHE2-20	M4×0.7	1.4 [12.4]
NHE1D/NHE2-25	M5×0.8	3.0 [26.6]

Caution: Avoid applications in which side loads are applied to the lever and lever mounting portion.

Workpiece

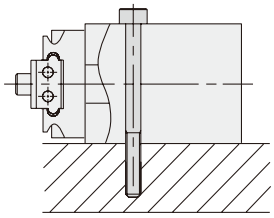
●NHB series (linear guide specification)
●Three-finger type (linear guide specification)

1. Set the mass of the workpiece actually gripped to about 1/10～1/20 of the effective gripping force.
2. Set the workpiece mass to about 1/30～1/50 of the effective gripping force when you move the air gripper while holding the workpiece.
3. As the workpiece mass which can be gripped changes greatly depending on the material and shape of the fingers, the condition of the gripping surface and the moving speed of the workpiece, etc., the values in the specifications and graphs should be used for reference only.

Body mounting method

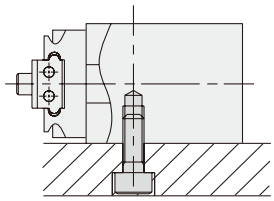
●NHC1

1. Method for using body through holes. (Sensor switches cannot be mounted.)



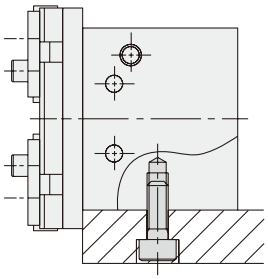
Model	Bolt	Maximum tightening torque N・m [in・lbf]
NHC1D-10	M3×0.5	0.6 [5.3]
NHC1D-16	M3×0.5	0.6 [5.3]
NHC1D-20	M4×0.7	1.4 [12.4]
NHC1D-25	M5×0.8	2.9 [25.7]

2. Method for using mounting threads on top or bottom of the body.



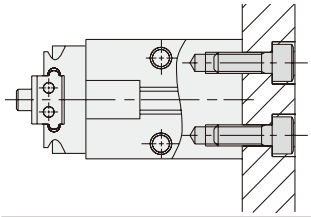
Model	Bolt	Maximum tightening torque N・m [in・lbf]
NHC1D-10	M4×0.7	1.4 [12.4]
NHC1D-16	M4×0.7	1.4 [12.4]
NHC1D-20	M5×0.8	2.9 [25.7]
NHC1D-25	M6×1.0	4.8 [42.5]

3. Method for using mounting threads on side surface of the body.



Model	Bolt	Maximum tightening torque N・m [in・lbf]
NHC1D-10	M3×0.5	0.6 [5.3]
NHC1D-16	M4×0.7	1.4 [12.4]
NHC1D-20	M5×0.8	2.9 [25.7]
NHC1D-25	M6×1.0	4.8 [42.5]

4. Method for using mounting threads on the head cover side of the body. (Some space is required in this case, however, because the sensor switch protrudes.)



Model	Bolt	Maximum tightening torque N・m [in・lbf]
NHC1D-10	M3×0.5	0.6 [5.3]
NHC1D-16	M4×0.7	1.4 [12.4]
NHC1D-20	M5×0.8	2.9 [25.7]
NHC1D-25	M6×1.0	4.8 [42.5]

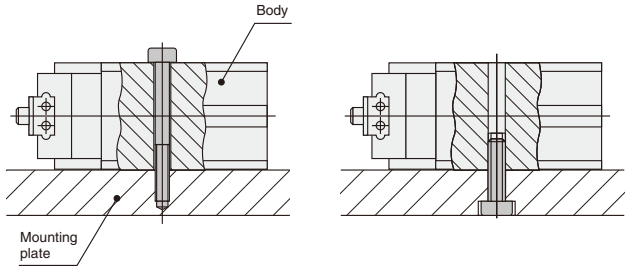
※ In examples 1, 2, and 4, locating holes can also be used. For the hole dimensions, see the Dimensions.

●NHB series (linear guide specification)

1. Method for using body through holes.

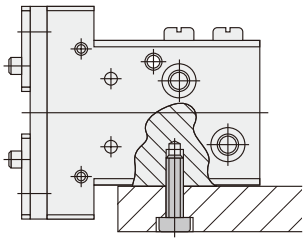
(On ϕ 8 [0.315in.], ϕ 10 [0.394in.], ϕ 16 [0.630in.], ϕ 20 [0.787in.], and ϕ 25 [0.984in.] sensor switches cannot be mounted)

2. Method for using mounting threads on back surface of the body.

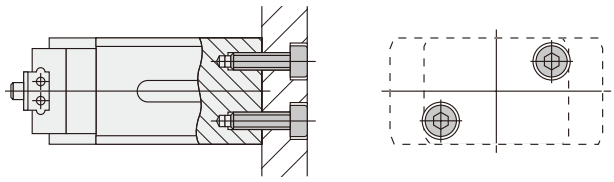


※ In examples 1 and 2, locating holes on the opposite side can also be used.

3. Method for using mounting threads on side surface of the body.

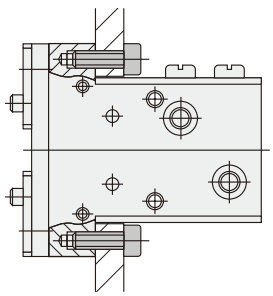


4. Method for using mounting threads on the head cover side of the body. (Some space is required in this case, however, because the sensor switch protrudes.)



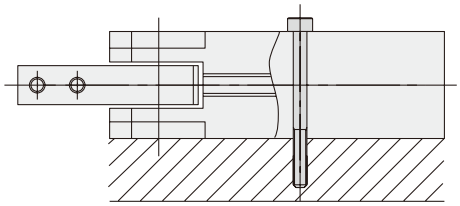
5. Method for using mounting threads on the lever side of the body.

(Not available in ϕ 8 [0.315in.].)



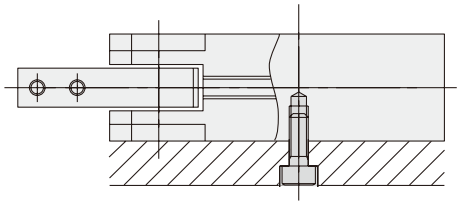
●NHB series (High precision, 180° open specification)

1. Method for using body through holes.
(Sensor switches cannot be mounted.)



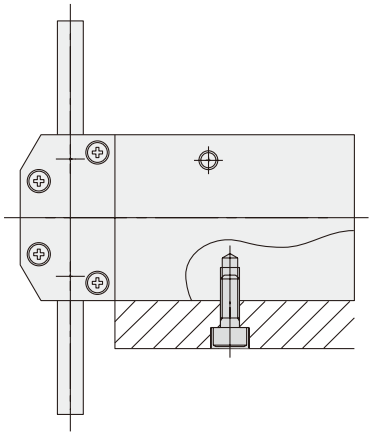
Model	Bolt	Maximum tightening torque N・m [in・lbf]
NHBDSLG-12	M3×0.5	0.6 [5.3]
NHBDSLG-16	M3×0.5	0.6 [5.3]
NHBDSLG-20	M4×0.7	1.4 [12.4]

2. Method for using mounting threads on top or bottom of the body.



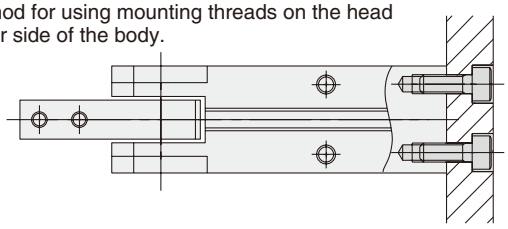
Model	Bolt	Maximum tightening torque N・m [in・lbf]
NHBDSLG-12	M4×0.7	1.4 [12.4]
NHBDSLG-16	M4×0.7	1.4 [12.4]
NHBDSLG-20	M5×0.8	2.9 [25.7]

3. Method for using mounting threads on side surface of the body.



Model	Bolt	Maximum tightening torque N・m [in・lbf]
NHBDSLG-12	M3×0.5	0.6 [5.3]
NHBDSLG-16	M4×0.7	1.4 [12.4]
NHBDSLG-20	M5×0.8	2.9 [25.7]

4. Method for using mounting threads on the head cover side of the body.

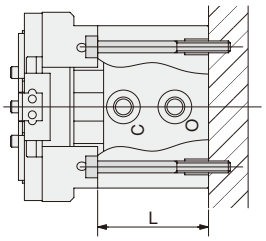


Model	Bolt	Maximum tightening torque N・m [in・lbf]
NHBDSLG-12	M3×0.5	0.6 [5.3]
NHBDSLG-16	M4×0.7	1.4 [12.4]
NHBDSLG-20	M5×0.8	2.9 [25.7]

※ For Example 4, the locating hole can be used.
For the hole dimensions, see the Dimensions on p.1441-1442.

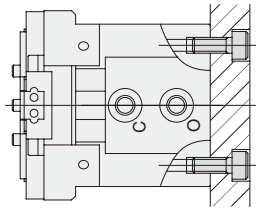
●Three-finger type linear guide specification (Air hand NHE1D)

1. Method for using body through holes.



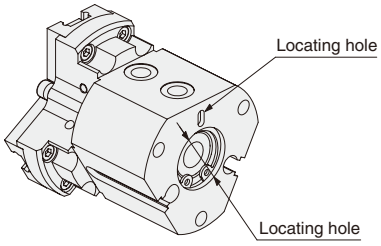
Bore mm	Bolt	Maximum tightening torque N・m [in・lbf]	L mm [in.]
16	M3×0.5	0.6 [5.3]	28 [1.102]
20	M3×0.5	0.6 [5.3]	34 [1.339]
25	M4×0.7	1.4 [12.4]	40 [1.575]

2. Method for using mounting threads on the back side of the through holes.



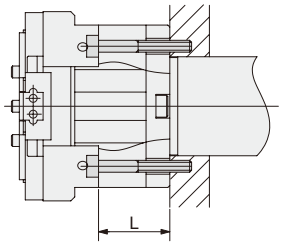
Bore mm	Bolt	Maximum tightening torque N・m [in・lbf]
16	M4×0.7	1.4 [12.4]
20	M4×0.7	1.4 [12.4]
25	M5×0.8	3.0 [26.6]

3. For locating hole dimensions (use for locating at time of mounting), see the page of dimensions.



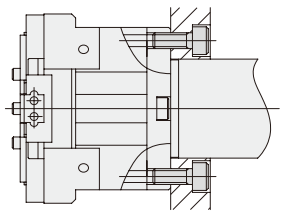
● Three-finger type linear guide specification (Mechanical hand NHE2)

1. Method for using body through holes.



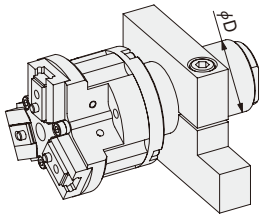
Nominal diameter mm	Bolt	Maximum tightening torque N・m [in・lbf]	L mm [in.]
16	M3×0.5	0.6 [5.3]	18 [0.709]
20	M3×0.5	0.6 [5.3]	21 [0.827]
25	M4×0.7	1.4 [12.4]	21 [0.827]

2. Method for using mounting threads on the back side of the through holes.



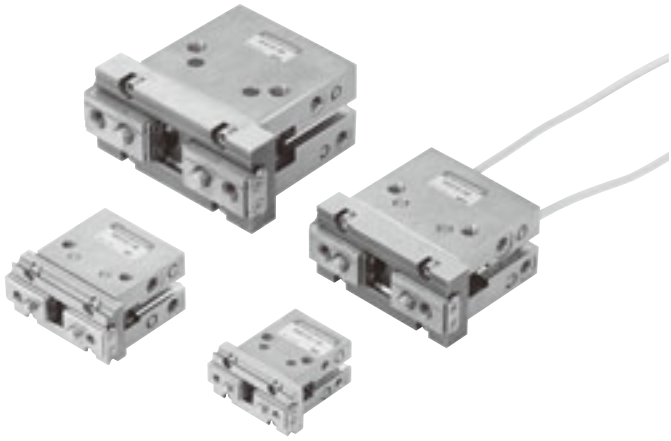
Nominal diameter mm	Bolt	Maximum tightening torque N・m [in・lbf]
16	M4×0.7	1.4 [12.4]
20	M4×0.7	1.4 [12.4]
25	M5×0.8	3.0 [26.6]

3. When using the shank portion.

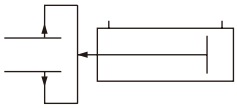


Nominal diameter mm	Shank diameter ϕD
16	$\phi 25^{-0.01}_{-0.03}$ [$0.9843^{-0.0004}_{-0.0012}$]
20	$\phi 30^{-0.01}_{-0.03}$ [$1.1811^{-0.0004}_{-0.0012}$]
25	$\phi 30^{-0.01}_{-0.03}$ [$1.1811^{-0.0004}_{-0.0012}$]

NHC1 SERIES



Symbols

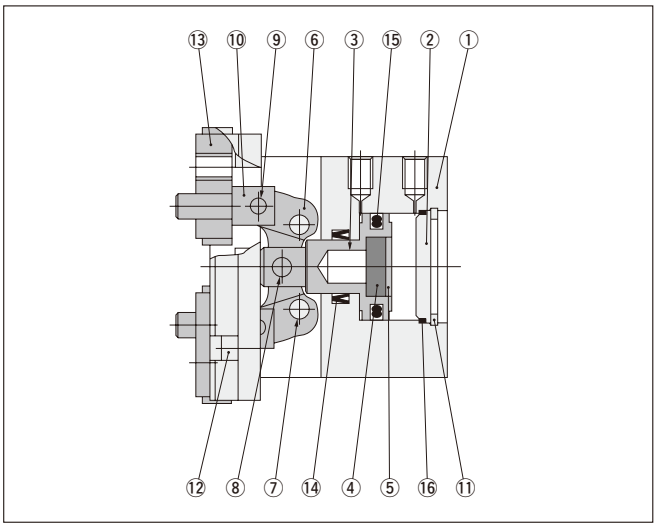


Specifications

Item \ Basic model		NHC1D-10	NHC1D-16	NHC1D-20	NHC1D-25
Cylinder bore size mm [in.]		10 [0.394]	16 [0.630]	20 [0.787]	25 [0.984]
Operation type		Double acting type			
Media		Air			
Operating pressure range MPa [psi.]		0.2～0.7 [29～102]	0.12～0.7 [17～102]	0.1～0.7 [15～102]	
Proof pressure MPa [psi.]		1.05 [152]			
Operating temperature range °C [°F]		0～60 [32～140]			
Maximum operating frequency cycle/min		180			
Lubrication		Not required			
Effective gripping force (F)[Note 1] N [lbf.]	Closed side	11 [2.5]	35 [7.9]	49 [11.0]	86 [19.3]
	Open side	17 [3.8]	46 [10.3]	65 [14.6]	111 [25.0]
Lever open/closed stroke mm [in.]		4 [0.157]	6 [0.236]	10 [0.394]	14 [0.551]
Repeatability mm [in.]		±0.01 [±0.0004]			
Port size		M3×0.5	M5×0.8		
Mass g [oz.]		45 [1.59]	96 [3.39]	205 [7.23]	366 [12.91]

Note: 1. Values are obtained when gripping point length is 30mm [1.18in.] under operating pressure 0.5 MPa [73psi.]. For details of the effective gripping force, see the graphs on p.1384.

Inner Construction



Major Parts and Materials

No.	Parts	Materials
①	Body	Aluminum alloy (nickel plated)
②	Head cover	Aluminum alloy
③	Piston rod	Stainless steel
④	Magnet	Plastic magnet
⑤	Magnet holder	Aluminum alloy
⑥	Action lever	Steel
⑦	Fulcrum pin	Steel
⑧	Press fit pin	Steel
⑨	Press fit pin	Steel
⑩	Knuckle	Stainless steel
⑪	Internal snap ring	Steel
⑫	Hexagon socket head bolt	Steel
⑬	Linear bearing	Stainless steel
⑭	Seal	Synthetic rubber (NBR)
⑮	Seal	Synthetic rubber (NBR)
⑯	O-ring	Synthetic rubber (NBR)

Order Codes

NHC1 D - □ - □ □ □

Air hand
NHC1 Series

Operation type
D：Double acting type

Bore size
10：10mm [0.394in.]
16：16mm [0.630in.]
20：20mm [0.787in.]
25：25mm [0.984in.]

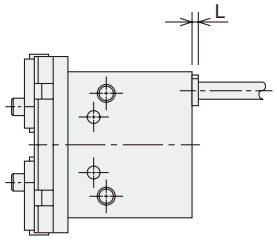
Sensor switch
Blank : No sensor switch
ZE135: 2-lead wire solid state type with indicator lamp Horizontal lead wire DC10～28V
ZE155: 3-lead wire solid state type with indicator lamp Horizontal lead wire DC4.5～28V
ZE235: 2-lead wire solid state type with indicator lamp Vertical lead wire DC10～28V
ZE255: 3-lead wire solid state type with indicator lamp Vertical lead wire DC4.5～28V
● For details of sensor switches, see p.1544.

Lead wire length
A : 1000mm [39in.]
B : 3000mm [118in.]

Number of sensor switches
1: With 1 sensor switch
2: With 2 sensor switches

Length of Sensor Switch Allowed to Protrude

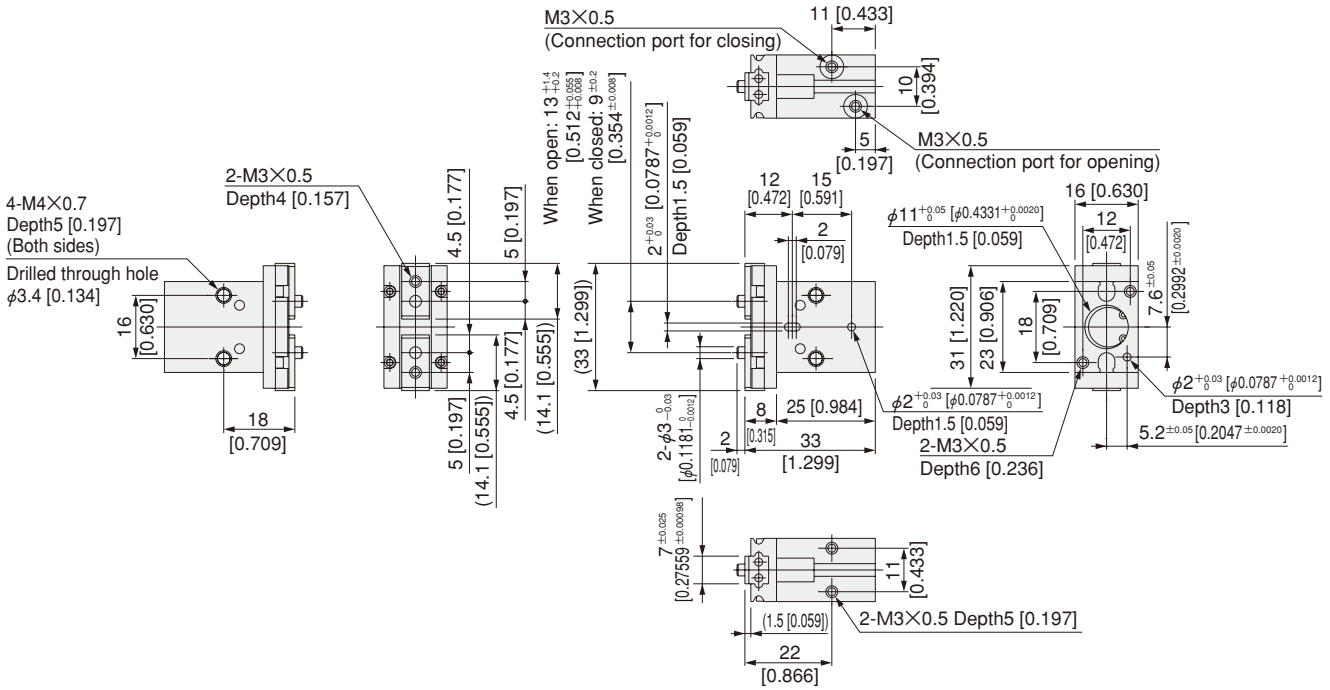
The maximum length that the sensor switch protrudes from the body end surface (when the levers are completely closed) is as shown in the table below. Use these values for mounting the sensor.



mm [in.]

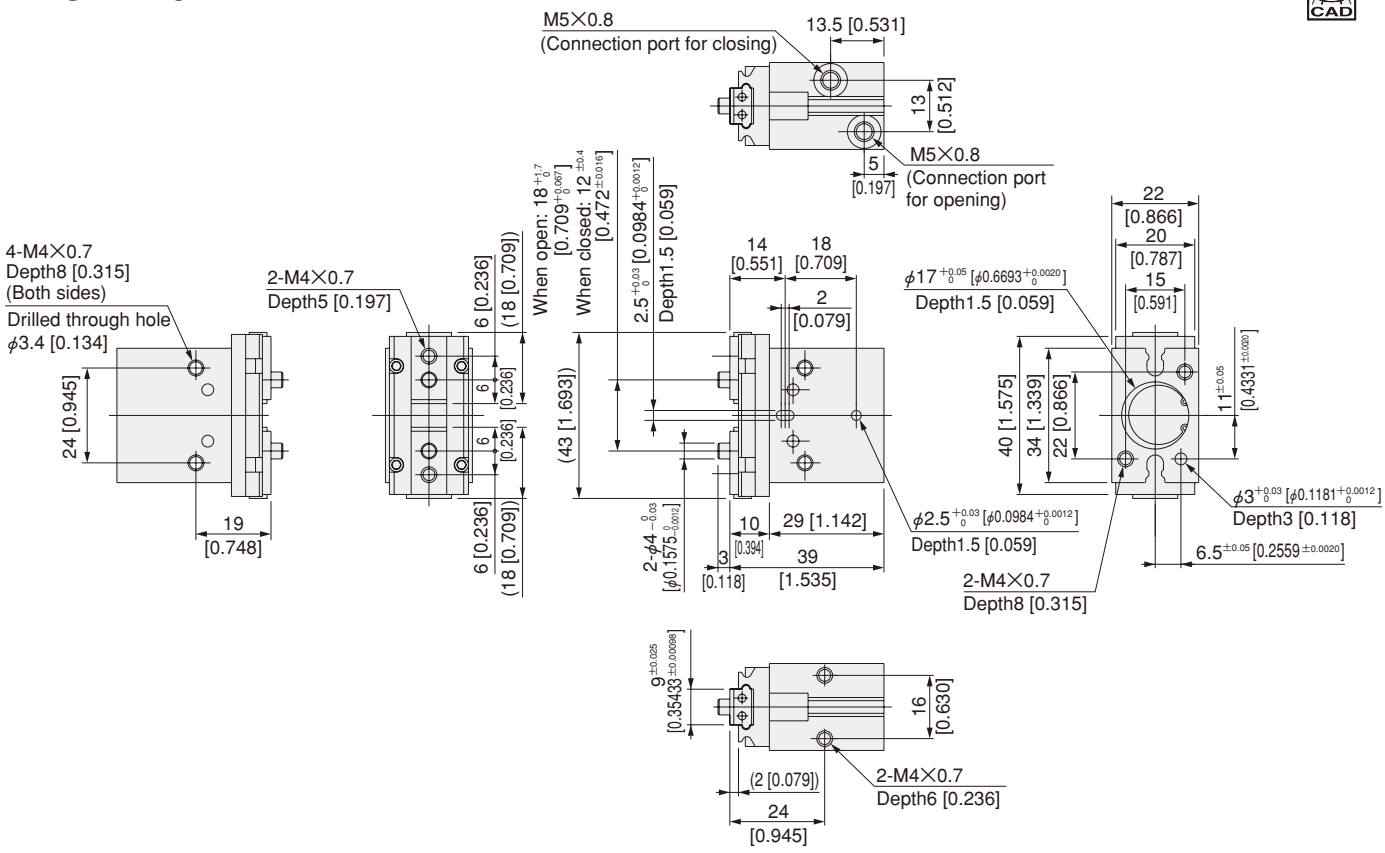
Model	Length of sensor switch allowed to protrude L
NHC1D-10	3 [0.12]
NHC1D-16	4 [0.16]
NHC1D-20	4 [0.16]
NHC1D-25	5 [0.20]

NHC1D-10



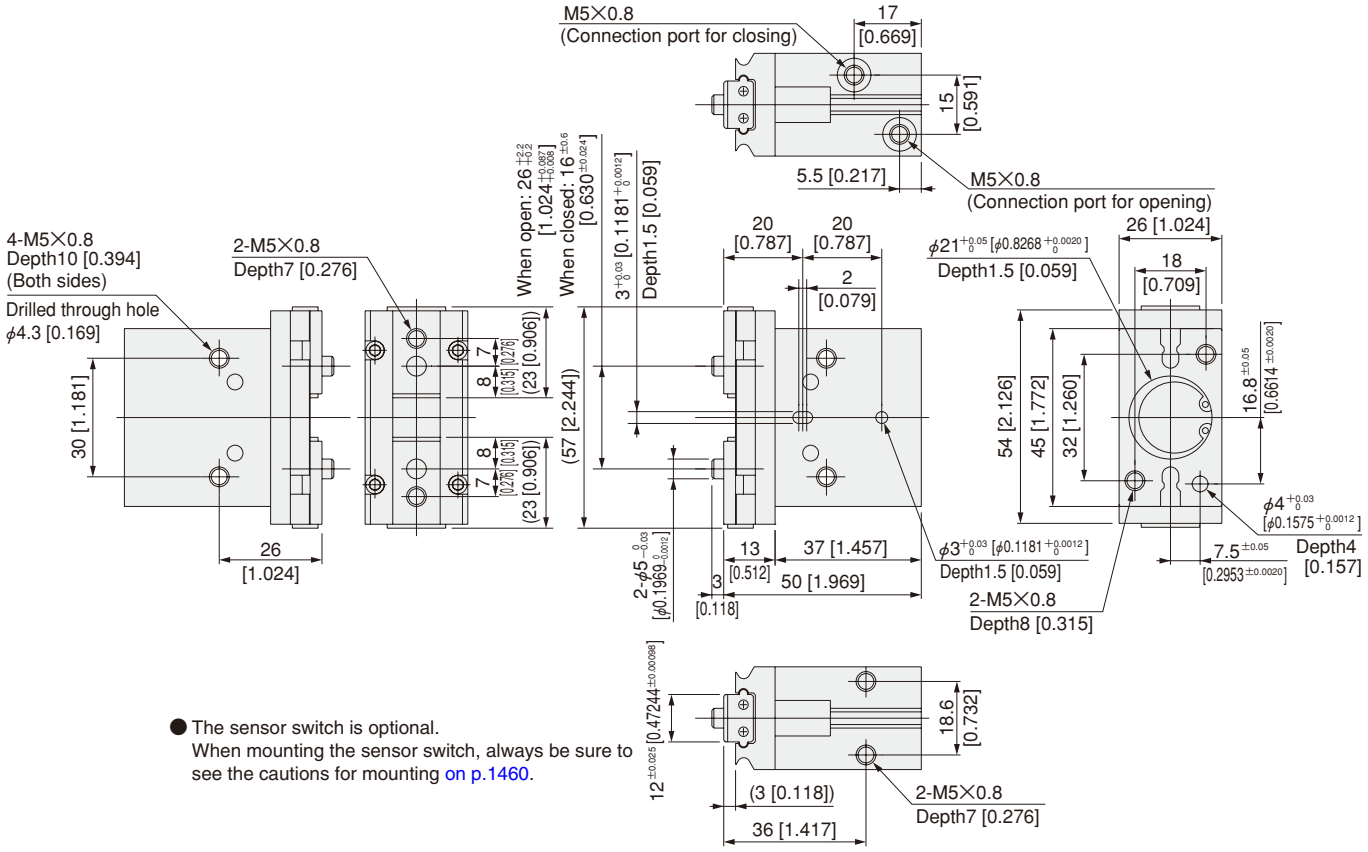
● The sensor switch is optional.
When mounting the sensor switch, always be sure to see the cautions for mounting on p.1460.

NHC1D-16



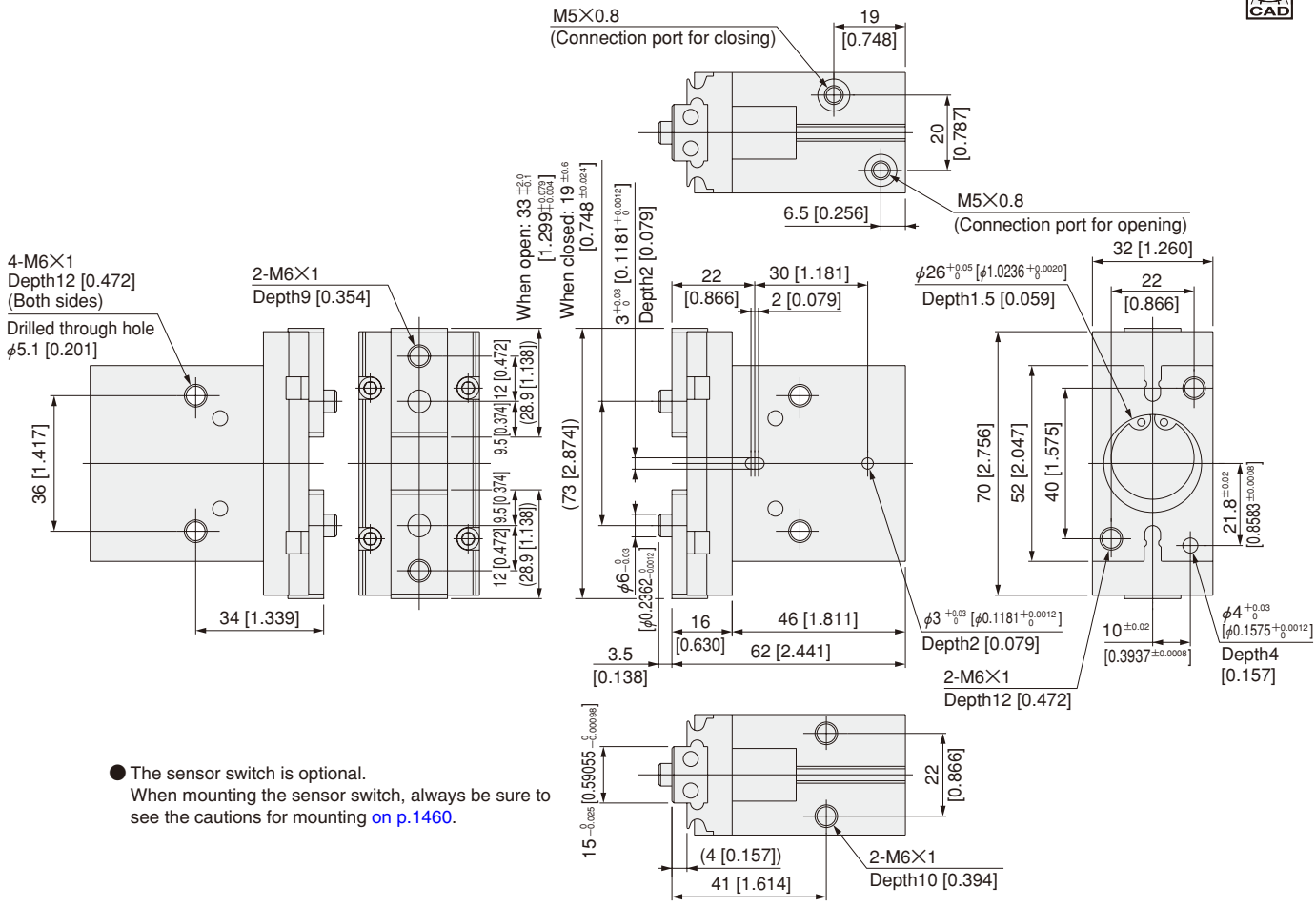
● The sensor switch is optional.
When mounting the sensor switch, always be sure to see the cautions for mounting on p.1460.

NHC1D-20



● The sensor switch is optional.
When mounting the sensor switch, always be sure to see the cautions for mounting on p.1460.

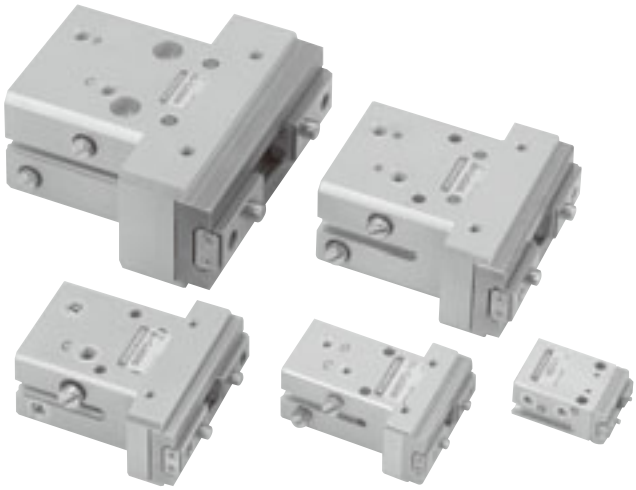
NHC1D-25



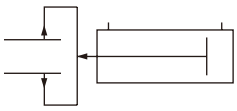
● The sensor switch is optional.
When mounting the sensor switch, always be sure to see the cautions for mounting on p.1460.

NHB SERIES
PARALLEL TYPE

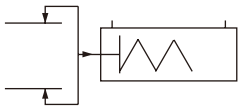
Linear Guide Specification
Double Acting Type, Single Acting Normally Open Type



Symbols



Double Acting Type



Single Acting
Normally Open Type

Specifications

●Double acting parallel type

Item \ Basic model		NHBDPG-8	NHBDPG-10	NHBDPG-16	NHBDPG-20	NHBDPG-32
Cylinder bore size mm [in.]		8 [0.315]	10 [0.394]	16 [0.630]	20 [0.787]	32 [1.260]
Operation type		Double acting type				
Media		Air				
Operating pressure range MPa [psi.]		0.22～0.7 [32～102]	0.2～0.7 [29～102]	0.12～0.7 [17～102]	0.1～0.7 [15～102]	
Proof pressure MPa [psi.]		1.05 [152]				
Operating temperature range °C [°F]		0～60 [32～140]				
Maximum operating frequency cycle/min		120				
Lubrication		Not required				
Effective gripping force (F)[Note 1] N [lbf.]	Closed side	5.8 [1.30]	9.4 [2.11]	26.4 [5.93]	45.0 [10.12]	157.8 [35.47]
	Open side	9.9 [2.23]	14.7 [3.30]	39.2 [8.81]	59.8 [13.44]	176.4 [39.65]
Lever open/closed stroke mm [in.]		4 [0.157]	6.5 [0.256]	10 [0.394]	14 [0.551]	22 [0.866]
Repeatability mm [in.]		±0.01 [±0.0004]				
Port size		M3×0.5		M5×0.8		
Mass[Note 2] g [oz.]		24 [0.85] (29 [1.02])	80 [2.82] (91 [3.21])	159 [5.61] (178 [6.28])	329 [11.60] (355 [12.52])	664 [23.42]

Notes: 1. Values are obtained when grip point length is 30mm [1.18in.] under operating pressure 0.5 MPa [73psi.]. For details of the effective gripping force, see the graphs on p.1385.
2. ( ) mean the mass with the mounting bracket: **-M**.

●Single acting normally open parallel type

Item \ Basic model		NHBRPG-8	NHBRPG-10	NHBRPG-16	NHBRPG-20
Cylinder bore size mm [in.]		8 [0.315]	10 [0.394]	16 [0.630]	20 [0.787]
Operation type		Single acting normally open type			
Media		Air			
Operating pressure range MPa [psi.]		0.4～0.7 [58～102]	0.35～0.7 [51～102]	0.25～0.7 [36～102]	
Proof pressure MPa [psi.]		1.05 [152]			
Operating temperature range °C [°F]		0～60 [32～140]			
Maximum operating frequency cycle/min		120	80		
Lubrication		Not required			
Effective gripping force (F)[Note 1] N [lbf.]	Closed side	4.1 [0.92]	6.8 [1.53]	19.6 [4.41]	34.3 [7.71]
	Open side	2.7 [0.61]	2.4 [0.54]	5.4 [1.21]	7.3 [1.64]
Lever open/closed stroke mm [in.]		4 [0.157]	6.5 [0.256]	10 [0.394]	14 [0.551]
Repeatability mm [in.]		±0.01 [±0.0004]			
Port size		M3×0.5		M5×0.8	
Mass[Note 2] g [oz.]		24 [0.85] (29 [1.02])	81 [2.86] (92 [3.25])	160 [5.64] (179 [6.31])	330 [11.64] (356 [12.56])

Notes: 1. Values are obtained when grip point length is 30mm [1.18in.] under operating pressure 0.5 MPa [73psi.]. For details of the effective gripping force, see the graphs on p.1385.
2. ( ) mean the mass with the mounting bracket: **-M**.

Inner Construction

Diagram shows double acting type.
● ϕ 8 [0.315in.]

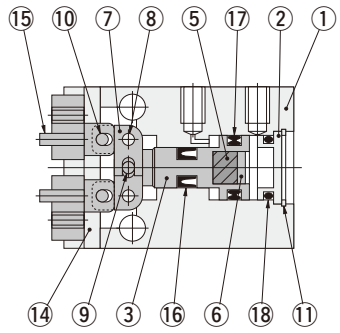
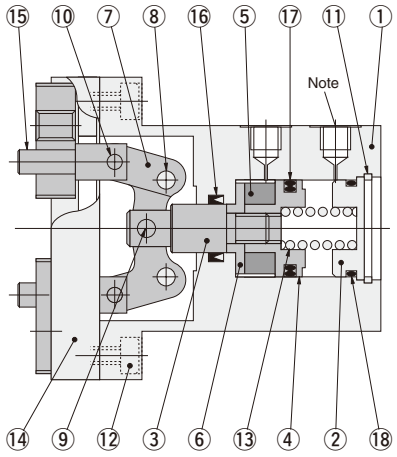


Diagram shows single acting normally open type.
● ϕ 10 [0.394in.] ~ ϕ 32 [1.260in.]



Note: An exhaust plug is attached to the exhaust connection port of the single acting normally open type (except ϕ 32 [1.260in.]). Plugs are attached to the extra connection port on the side surface (except ϕ 8 [0.315in.]).

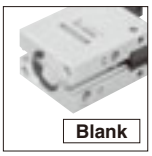
Major Parts and Materials

No.	Parts	Materials	Remarks
①	Body	Aluminum alloy	
②	Head cover	Aluminum alloy	
③	Piston rod	Stainless steel	
④	Piston	Aluminum alloy	Except ϕ 8 [0.315in.].
⑤	Magnet	Plastic magnet	
⑥	Magnet holder	Aluminum alloy	
⑦	Action lever	Steel	
⑧	Fulcrum pin	Steel	
⑨	Press fit pin	Steel	
⑩	Press fit pin	Steel	
⑪	Internal snap ring	Steel	
⑫	Hexagon socket head bolt	Steel	
⑬	Spring	Steel wire	Single acting type only
⑭	Bearing	Stainless steel	
⑮	Knuckle	Stainless steel	
⑯	Seal	Synthetic rubber (NBR)	
⑰	Seal	Synthetic rubber (NBR)	
⑱	O-ring	Synthetic rubber (NBR)	

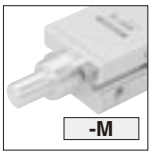
Order Codes

■Mounting bracket

No mounting bracket



With mounting bracket



★ Included at shipping

■Sensor switch

No sensor switch

With **ZE135**

●Solid state type
●With indicator lamp
●DC10~28V
●2-lead wire
●Horizontal lead wire

With **ZE155**

●Solid state type
●With indicator lamp
●DC4.5~28V
●3-lead wire
●Horizontal lead wire

With **ZE235**

●Solid state type
●With indicator lamp
●DC10~28V
●2-lead wire
●Vertical lead wire

With **ZE255**

●Solid state type
●With indicator lamp
●DC4.5~28V
●3-lead wire
●Vertical lead wire

■Lead wire length

A : 1000mm [39in.]
B : 3000mm [118in.]

■Number of sensor switches (for air hands with sensor switches)

●**1** : With 1 sensor switch
●**2** : With 2 sensor switches

★Included at shipping

Basic model	Cylinder bore size			Lead wire length	Number of sensor switches
Double acting type **NHBDPG**	**-8** **-10** **-16** **-20**	**-M**	**-ZE135** **-ZE155** **-ZE235** **-ZE255**	**A** **B**	**1** **2**
	-32				
Single acting normally open type **NHBRPG**	**-8** **-10** **-16** **-20**	**-M**	**-ZE135** **-ZE155** **-ZE235** **-ZE255**	**A** **B**	**1** **2**

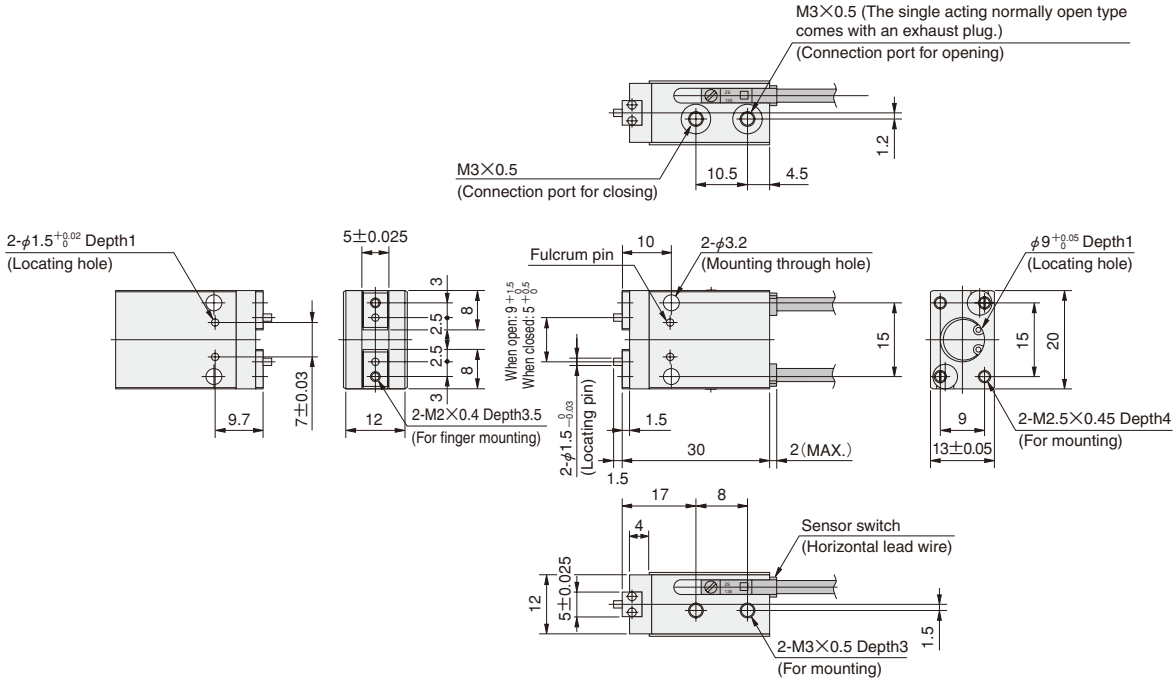
Additional Parts (To be ordered separately)

Mounting bracket

● For ϕ 8 [0.315in.] —**NHB-M8**
● For ϕ 10 [0.394in.] —**NHB-M10**
● For ϕ 16 [0.630in.] —**NHB-M16**
● For ϕ 20 [0.787in.] —**NHB-M20**

NHB□PG-8

NHBDPG8



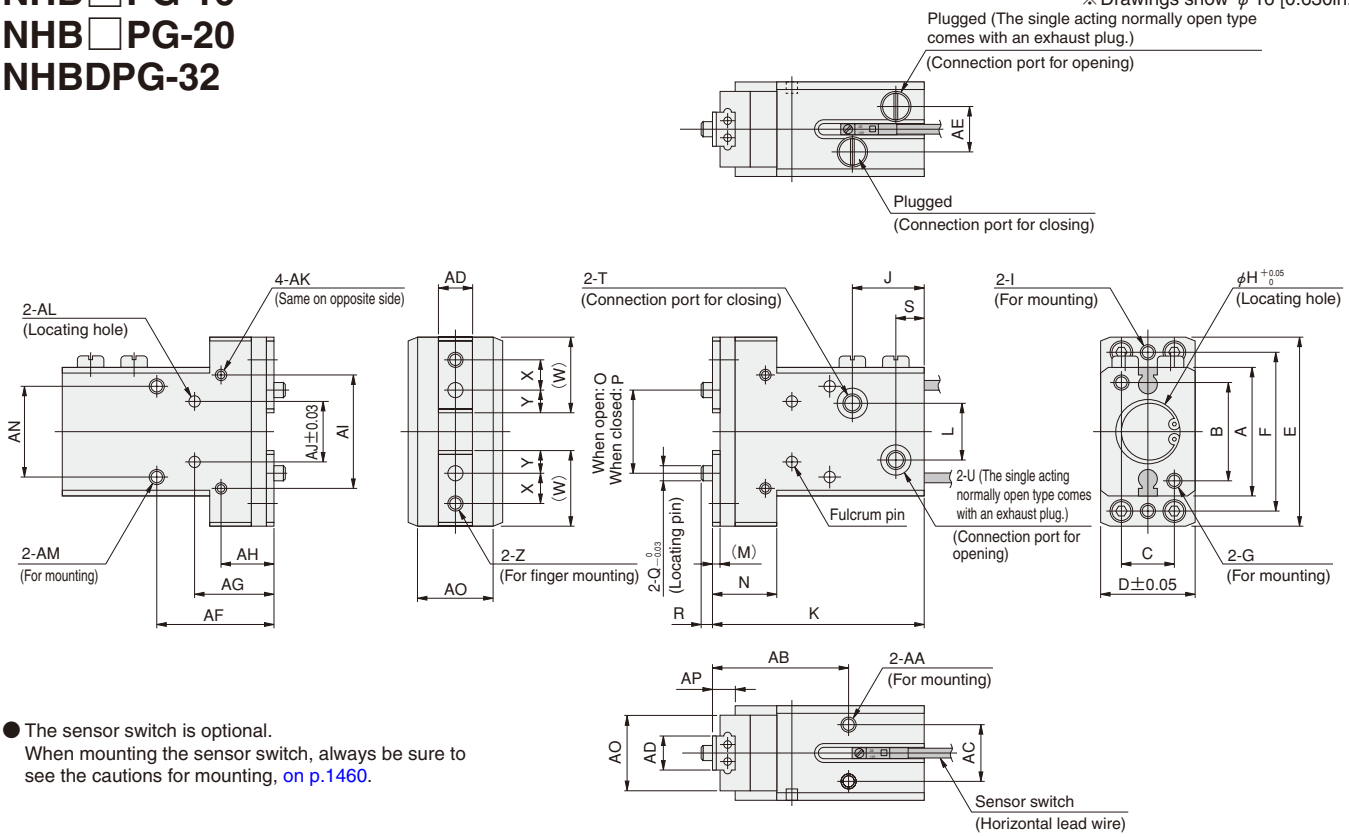
● The sensor switch is optional.
When mounting the sensor switch, always be sure to see the cautions for mounting on p.1460.

Dimensions of Liner Guide Specification Parallel Type (mm)

NHB□PG-10
NHB□PG-16
NHB□PG-20
NHBDPG-32

CAD NHBDPG Cylinder bore size

※Drawings show ϕ16 [0.630in.].



● The sensor switch is optional.
When mounting the sensor switch, always be sure to see the cautions for mounting, on p.1460.

Model / Code	A	B	C	D	E	F	G	H	I	J	K	L	M
NHB□PG-10	23	17	10	20	36	30	M3×0.5 Depth 6	11 Depth 1.5	M3×0.5 Depth 4.5	17	49	7	1.5
NHB□PG-16	34	26	14	25	50	42	M4×0.7 Depth 7	17 Depth 1.5	M4×0.7 Depth 5	19	56	15	2
NHB□PG-20	45	35	16	32	62	54	M5×0.8 Depth 9	21 Depth 1.5	M4×0.7 Depth 7	21	67	17	3
NHBDPG-32	52	40	30	40	85	70	M6×1 Depth 9	34 Depth 2	M6×1 Depth 9	28.5	83	20	4

N	O	P	Q	R	S	T	U	W	X	Y	Z	AA	AB	AC
14	15.5 +0.8 0	9 +0.5 0	ϕ3	2	7.5	M3×0.5	M3×0.5	14.7	5	4.5	M3×0.5 Depth 4	M3×0.5 Depth 5	29	12
17	22 +1.8 0	12 +1.3 0	ϕ4	3	7.5	M5×0.8	M5×0.8	20	8	6	M4×0.7 Depth 5	M4×0.7 Depth 6	36	15
23	30 +2.9 0	16 +1.4 0	ϕ5	3	7.5	M5×0.8	M5×0.8	24	8	8	M5×0.8 Depth 7	M5×0.8 Depth 8	43	18
35	41 +1.8 0	19 +1.3 0	ϕ6	3.5	9	M5×0.8	M5×0.8	31	14	9.5	M6×1 Depth 9	M6×1 Depth 8	53	20

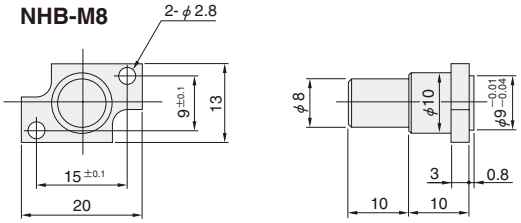
AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP
7±0.025	9	24	16	11	20	12	M3×0.5 Depth 5	ϕ2.5 +0.02 0 Depth 2.5	M4×0.7 Depth 6, Drilled hole diameter ϕ3.4 thru hole	17	17	6
9±0.025	12	31	21	14	30	16	M3×0.5 Depth 5	ϕ3 +0.02 0 Depth 3	M4×0.7 Depth 6, Drilled hole diameter ϕ3.4 thru hole	24	20	8
12±0.025	16	37	27.3	17	40	22	M4×0.7 Depth 6	ϕ4 +0.02 0 Depth 3.5	M4×0.8 Depth 8, Drilled hole diameter ϕ4.2 thru hole	30	27	10
15 0 -0.025	20	46	31	20	50	30	M5×0.8 Depth 8	ϕ5 +0.03 0 Depth 4	M6×1 Depth 9, Drilled hole diameter ϕ5.2 thru hole, ϕ9.5 Counterbore Depth 6 (back side)	30	32	13

Options

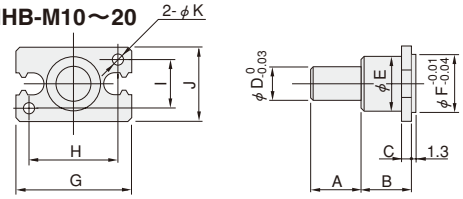
CAD HAND

● Mounting bracket: **-M**

NHB-M8



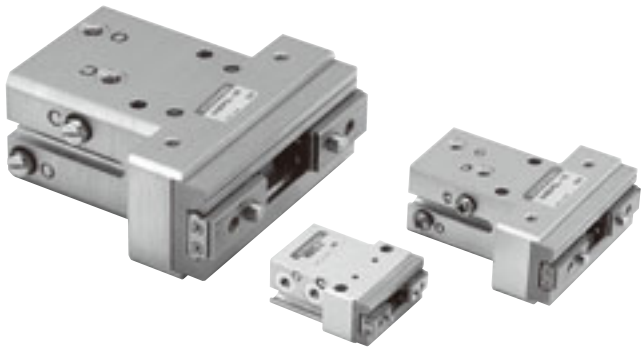
NHB-M10～20



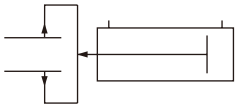
Model / Code	A	B	C	D	E	F	G	H	I	J	K
NHB-M10	15	15	3	10	11	11	23	17	10	16	3.4
NHB-M16	15	15	3	10	16	17	34	26	14	22	4.5
NHB-M20	15	15	3	10	18	21	45	35	16	26	5.5

NHB SERIES
PARALLEL TYPE

Linear Guide Specification Long Stroke Double Acting Type



Symbol



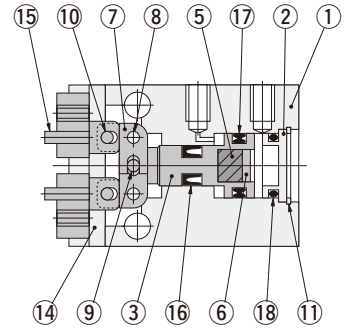
Specifications

Item \ Basic model		NHBDPGL-8	NHBDPGL-10	NHBDPGL-16	NHBDPGL-20
Cylinder bore size mm [in.]		8 [0.315]	10 [0.394]	16 [0.630]	20 [0.787]
Operation type		Double acting type			
Media		Air			
Operating pressure range MPa [psi.]		0.22～0.7 [32～102]	0.2～0.7 [29～102]	0.12～0.7 [17～102]	0.1～0.7 [15～102]
Proof pressure MPa [psi.]		1.05 [152]			
Operating temperature range °C [°F]		0～60 [32～140]			
Maximum operating frequency cycle/min		120			
Lubrication		Not required			
Effective gripping force (F)[Note 1] N [lbf.]	Closed side	5.8 [1.30]	9.4 [2.11]	26.4 [5.93]	45.0 [10.12]
	Open side	9.9 [2.23]	14.7 [3.30]	39.2 [8.81]	59.8 [13.44]
Lever open/closed stroke mm [in.]		8 [0.315]	12 [0.472]	16 [0.630]	22 [0.866]
Repeatability mm [in.]		±0.01 [±0.0004]			
Port size		M3×0.5		M5×0.8	
Mass[Note 2] g [oz.]		27 [0.95] (32 [1.13])	90 [3.17] (101 [3.56])	168 [5.93] (187 [6.60])	368 [12.98] (394 [13.90])

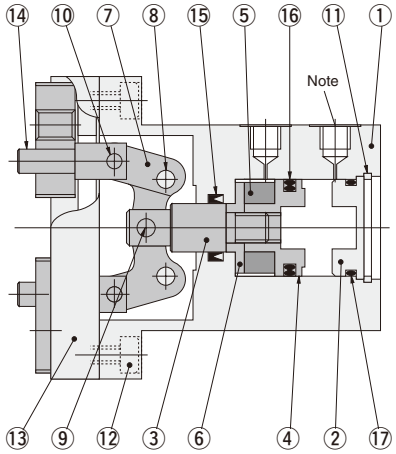
Notes: 1. Values are obtained when grip point length is 30mm [1.18in.] under operating pressure 0.5 MPa [73psi.]. For details of the effective gripping force, see the graphs on p.1385.
2. ( ) mean the mass with the mounting bracket: **-M**.

Inner Construction

● ϕ8 [0.315in.]



● ϕ10 [0.394in.] ~ϕ20 [0.787in.]



Note: Plugs are attached to the extra connection ports on the side surface (except ϕ 8 [0.135in.]).

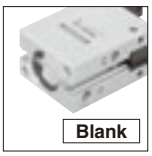
Major Parts and Materials

No.	Parts	Materials	Remarks
①	Body	Aluminum alloy	
②	Head cover	Aluminum alloy	
③	Piston rod	Stainless steel	
④	Piston	Aluminum alloy	Except ϕ 8 [0.315in.].
⑤	Magnet	Plastic magnet	
⑥	Magnet holder	Aluminum alloy	
⑦	Action lever	Steel	
⑧	Fulcrum pin	Steel	
⑨	Press fit pin	Steel	
⑩	Press fit pin	Steel	
⑪	Internal snap ring	Steel	
⑫	Hexagon socket head bolt	Steel	
⑬	Bearing	Stainless steel	
⑭	Knuckle	Stainless steel	
⑮	Seal	Synthetic rubber (NBR)	
⑯	Seal	Synthetic rubber (NBR)	
⑰	O-ring	Synthetic rubber (NBR)	

Order Codes

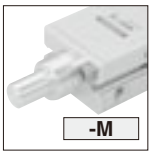
■Mounting bracket

No mounting bracket



Blank

With mounting bracket



-M

★ Included at shipping

■Sensor switch

No sensor switch

Blank

With **ZE135**

-ZE135

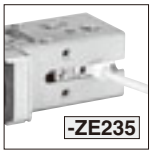
●Solid state type
●With indicator lamp
●DC10~28V
●2-lead wire
●Horizontal lead wire

With **ZE155**

-ZE155

●Solid state type
●With indicator lamp
●DC4.5~28V
●3-lead wire
●Horizontal lead wire

With **ZE235**



-ZE235

●Solid state type
●With indicator lamp
●DC10~28V
●2-lead wire
●Vertical lead wire

With **ZE255**

-ZE255

●Solid state type
●With indicator lamp
●DC4.5~28V
●3-lead wire
●Vertical lead wire

■Lead wire length

A : 1000mm [39in.]
B : 3000mm [118in.]

■Number of sensor switches (for air hands with sensor switches)

●**1** : With 1 sensor switch
●**2** : With 2 sensor switches

★Included at shipping

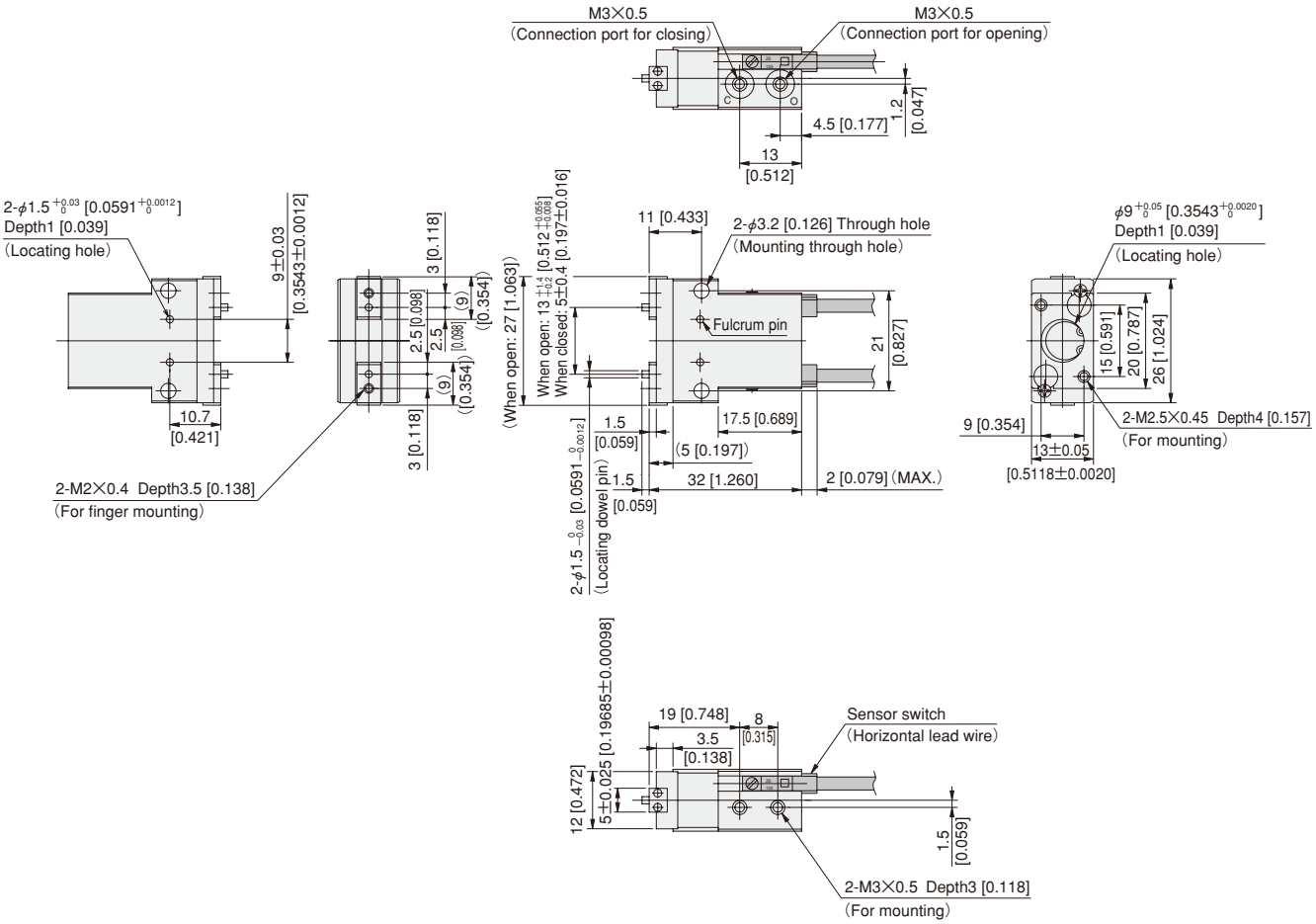
Basic model	Cylinder bore size				
Double Acting Type	**NHBDPGL**	**-8** **-10** **-16** **-20**	**-M**	**-ZE135** **-ZE155** **-ZE235** **-ZE255**	**A** **B**	**1** **2**

Additional Parts (To be ordered separately)

Mounting bracket

● For ϕ 8 [0.315in.] —**NHB-M8**
● For ϕ 10 [0.394in.] —**NHB-M10**
● For ϕ 16 [0.630in.] —**NHB-M16**
● For ϕ 20 [0.787in.] —**NHB-M20**

NHBDPGL-8

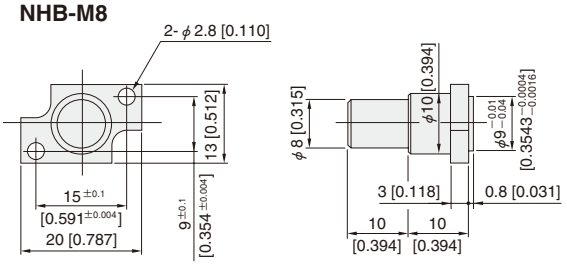


● The sensor switch is optional.
When mounting the sensor switch, always be sure to see the cautions for mounting on p.1460.

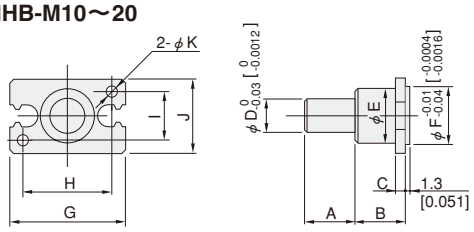
Options

● Mounting bracket: **-M**

NHB-M8



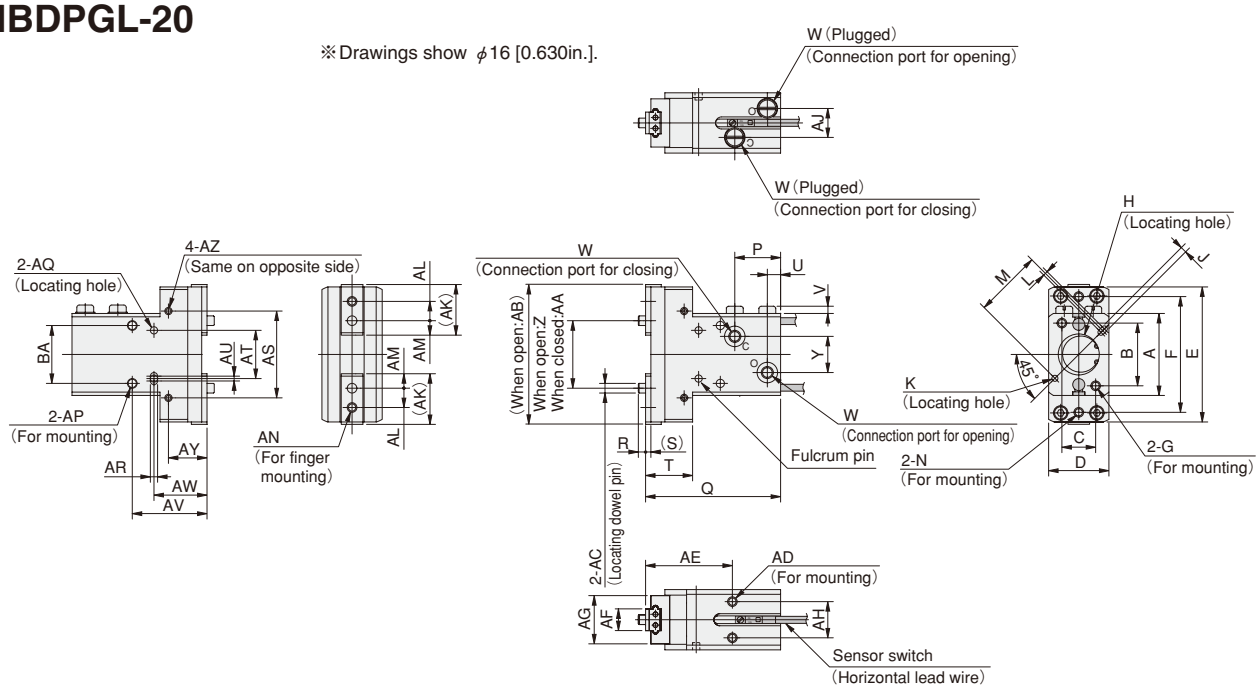
NHB-M10～20



Model \ Code	A	B	C	D	E	F	G	H	I	J	K
NHB-M10	15 [0.591]	15 [0.591]	3 [0.118]	10 [0.3937]	11 [0.433]	11 [0.4331]	23 [0.906]	17 [0.669]	10 [0.394]	16 [0.630]	3.4 [0.134]
NHB-M16	15 [0.591]	15 [0.591]	3 [0.118]	10 [0.3937]	16 [0.630]	17 [0.6693]	34 [1.339]	26 [1.024]	14 [0.551]	22 [0.866]	4.5 [0.177]
NHB-M20	15 [0.591]	15 [0.591]	3 [0.118]	10 [0.3937]	18 [0.709]	21 [0.8268]	45 [1.772]	35 [1.378]	16 [0.630]	26 [1.024]	5.5 [0.217]

NHBDPGL-10
NHBDPGL-16
NHBDPGL-20

※Drawings show ϕ16 [0.630in.].



● The sensor switch is optional.
When mounting the sensor switch, always be sure to see the cautions for mounting on p.1460.

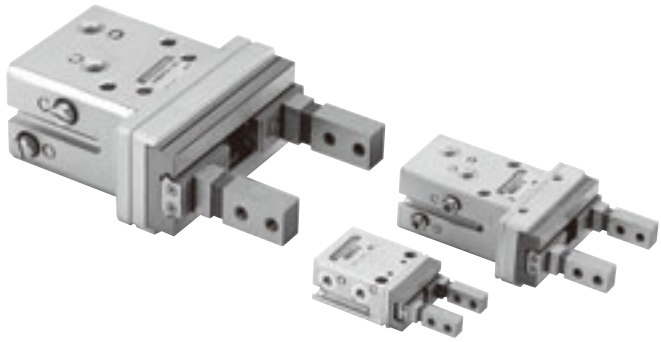
Model \ Code	A	B	C	D	E	F	G	H	J	K	L	M	N
NHBDPGL-10	23 [0.906]	17 [0.669]	10 [0.394]	20±0.05 [0.7874 ±0.0020]	45 [1.772]	39 [1.535]	M3×0.5 Depth6 [0.236]	$\phi 11^{+0.05}_{0}$ [$0.4331^{+0.0020}_{0}$] Depth1.5 [0.059]	$2^{+0.03}_{0}$ [$0.0787^{+0.0012}_{0}$] Depth2 [0.079]	$\phi 2^{+0.03}_{0}$ [$0.0787^{+0.0012}_{0}$] Depth2 [0.079]	1 [0.039]	20 [0.787]	M3×0.5 Depth4.5 [0.177]
NHBDPGL-16	34 [1.339]	26 [1.024]	14 [0.551]	25±0.05 [0.9843 ±0.0020]	56 [2.205]	48 [1.890]	M4×0.7 Depth7 [0.276]	$\phi 17^{+0.05}_{0}$ [$0.6693^{+0.0020}_{0}$] Depth1.5 [0.059]	$2.5^{+0.03}_{0}$ [$0.0984^{+0.0012}_{0}$] Depth3 [0.118]	$\phi 2.5^{+0.03}_{0}$ [$0.0984^{+0.0012}_{0}$] Depth3 [0.118]	2 [0.079]	28 [1.102]	M4×0.7 Depth5 [0.197]
NHBDPGL-20	45 [1.772]	35 [1.378]	16 [0.630]	32±0.05 [1.2598 ±0.0020]	73 [2.874]	65 [2.559]	M5×0.8 Depth9 [0.354]	$\phi 21^{+0.05}_{0}$ [$0.8268^{+0.0020}_{0}$] Depth1.5 [0.059]	$3^{+0.03}_{0}$ [$0.1181^{+0.0012}_{0}$] Depth3 [0.118]	$\phi 3^{+0.03}_{0}$ [$0.1181^{+0.0012}_{0}$] Depth3 [0.118]	2 [0.079]	34 [1.339]	M5×0.7 Depth7 [0.276]

P	Q	R	S	T	U	V	W	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL
17 [0.669]	49 [1.929]	2 [0.079]	1.5 [0.059]	18 [0.709]	5 [0.197]	2.5 [0.098]	M3×0.5	7 [0.276]	$21^{+1.5}_{0}$ [$0.827^{+0.059}_{0}$]	$9^{+0.5}_{0}$ [$0.354^{+0.020}_{0}$]	46 [1.811]	$\phi 3^{0}_{-0.03}$ [$0.1181^{0}_{-0.0012}$]	M3×0.5 Depth5 [0.197]	29 [1.142]	7±0.025 [0.27559 ±0.00098]	17 [0.669]	12 [0.472]	10 [0.394]	16.8 [0.661]	5 [0.197]
19 [0.748]	56 [2.205]	3 [0.118]	2.2 [0.087]	19.5 [0.768]	5.5 [0.217]	3 [0.118]	M5×0.8	15 [0.591]	$28^{+1.8}_{0}$ [$1.102^{+0.071}_{0}$]	$12^{+1.3}_{0}$ [$0.472^{+0.051}_{0}$]	59 [2.323]	$\phi 4^{0}_{-0.03}$ [$0.1575^{0}_{-0.0012}$]	M4×0.7 Depth6 [0.236]	36 [1.417]	9±0.025 [0.35433 ±0.00098]	20 [0.787]	15 [0.591]	12 [0.472]	21 [0.827]	8 [0.315]
23 [0.906]	73 [2.874]	3 [0.118]	3 [0.118]	26 [1.024]	5.5 [0.217]	3 [0.118]	M5×0.8	17 [0.669]	$38^{+2.4}_{0.5}$ [$1.496^{+0.094}_{+0.020}$]	$16^{+1.4}_{0}$ [$0.630^{+0.055}_{0}$]	75 [2.953]	$\phi 5^{0}_{-0.03}$ [$0.1969^{0}_{-0.0012}$]	M5×0.8 Depth8 [0.315]	43 [1.693]	12±0.025 [0.47244 ±0.00098]	27 [1.063]	18 [0.709]	15 [0.591]	26 [1.024]	8 [0.315]

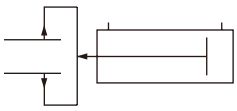
AM	AN	AP	AQ	AR	AS	AT	AU	AV	AW	AY	AZ	BA
4.5 [0.177]	M3×0.5 Depth4 [0.157]	M4×0.7 Depth6 [0.236], Drilled hole diameter ϕ3.4 [0.134] through hole	$\phi 2.5^{+0.02}_{0}$ [$0.0984^{+0.0008}_{0}$] Depth2.5 [0.098]	$2.5^{+0.02}_{0}$ [$0.0984^{+0.0008}_{0}$] Depth2.5 [0.098]	30 [1.181]	14±0.03 [0.5512 ±0.0012]	1 [0.039]	24 [0.945]	17 [0.669]	12 [0.472]	M3×0.5 Depth5 [0.197]	17 [0.669]
6 [0.236]	M4×0.7 Depth5 [0.197]	M4×0.7 Depth6 [0.236], Drilled hole diameter ϕ3.4 [0.134] through hole	$\phi 3^{+0.02}_{0}$ [$0.1181^{+0.0008}_{0}$] Depth3 [0.118]	$3^{+0.02}_{0}$ [$0.1181^{+0.0008}_{0}$] Depth3 [0.118]	36 [1.417]	20±0.03 [0.7874 ±0.0012]	2 [0.079]	31 [1.220]	22 [0.866]	16 [0.630]	M3×0.5 Depth5 [0.197]	24 [0.945]
8 [0.315]	M5×0.8 Depth7 [0.276]	M5×0.8 Depth8 [0.315], Drilled hole diameter ϕ4.2 [0.165] through hole	$\phi 4^{+0.02}_{0}$ [$0.1575^{+0.0008}_{0}$] Depth3.5 [0.138]	$4^{+0.02}_{0}$ [$0.1575^{+0.0008}_{0}$] Depth3.5 [0.138]	50 [1.969]	26±0.03 [1.0236 ±0.0012]	2 [0.079]	37 [1.457]	27.3 [1.075]	20 [0.787]	M4×0.7 Depth6 [0.236]	30 [1.181]

NHB SERIES
PARALLEL TYPE

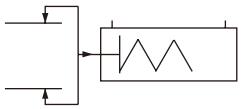
Linear Guide Specification with Fingers
Double Acting Type, Single Acting Normally Open Type



Symbols



Double Acting Type



Single Acting
Normally Open Type

Specifications

●Double acting type

Item \ Basic model		NHBDPGY-8	NHBDPGY-10	NHBDPGY-16	NHBDPGY-20
Cylinder bore size mm [in.]		8 [0.315]	10 [0.394]	16 [0.630]	20 [0.787]
Operation type		Double acting type			
Media		Air			
Operating pressure range MPa [psi.]		0.22～0.7 [32～102]	0.2～0.7 [29～102]	0.12～0.7 [17～102]	0.1～0.7 [15～102]
Proof pressure MPa [psi.]		1.05 [152]			
Operating temperature range °C [°F]		0～60 [32～140]			
Maximum operating frequency cycle/min		100			
Lubrication		Not required			
Effective gripping force (F)[Note 1] N [lbf.]	Closed side	5.8 [1.30]	9.4 [2.11]	26.4 [5.93]	45.0 [10.12]
	Open side	9.9 [2.23]	14.7 [3.30]	39.2 [8.81]	59.8 [13.44]
Lever open/closed stroke mm [in.]		4 [0.157]	6.5 [0.256]	10 [0.394]	14 [0.551]
Repeatability mm [in.]		±0.01 [±0.0004]			
Port size		M3×0.5		M5×0.8	
Mass[Note 2] g [oz.]		27 [0.95] (32 [1.13])	90 [3.17] (101 [3.56])	180 [6.35] (119 [4.20])	370 [13.05] (396 [13.97])

Notes: 1. Values are obtained when grip point length is 30mm [1.18in.] under operating pressure 0.5 MPa [73psi.]. For details of the effective gripping force, see the graphs on p.1386.
2. ( ) mean the mass with the mounting bracket: **-M**.

●Single acting normally open parallel type

Item \ Basic model		NHBRPGY-8	NHBRPGY-10	NHBRPGY-16	NHBRPGY-20
Cylinder bore size mm [in.]		8 [0.315]	10 [0.394]	16 [0.630]	20 [0.787]
Operation type		Single acting normally open type			
Media		Air			
Operating pressure range MPa [psi.]		0.4～0.7 [58～102]	0.35～0.7 [51～102]	0.25～0.7 [36～102]	
Proof pressure MPa [psi.]		1.05 [152]			
Operating temperature range °C [°F]		0～60 [32～140]			
Maximum operating frequency cycle/min			100		
Lubrication		Not required			
Effective gripping force (F)[Note 1] N [lbf.]	Closed side	4.1 [0.92]	6.8 [1.53]	20.0 [4.50]	34.0 [7.64]
	Open side	2.7 [0.61]	2.4 [0.54]	5.4 [1.21]	7.3 [1.64]
Lever open/closed stroke mm [in.]		4 [0.157]	6.5 [0.256]	10 [0.394]	14 [0.551]
Repeatability mm [in.]		±0.01 [±0.0004]			
Port size		M3×0.5		M5×0.8	
Mass[Note 2] g [oz.]		28 [0.99] (33 [1.16])	91 [3.21] (102 [3.60])	181 [6.38] (200 [7.05])	371 [13.09] (397 [14.00])

Notes: 1. Values are obtained when grip point length is 30mm [1.18in.] under operating pressure 0.5 MPa [73psi.]. For details of the effective gripping force, see the graphs on p.1386.
2. ( ) mean the mass with the mounting bracket: **-M**.

Inner Construction

Diagram shows double acting type.
● ϕ 8 [0.315in.]

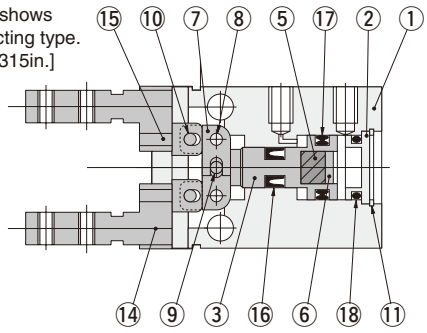
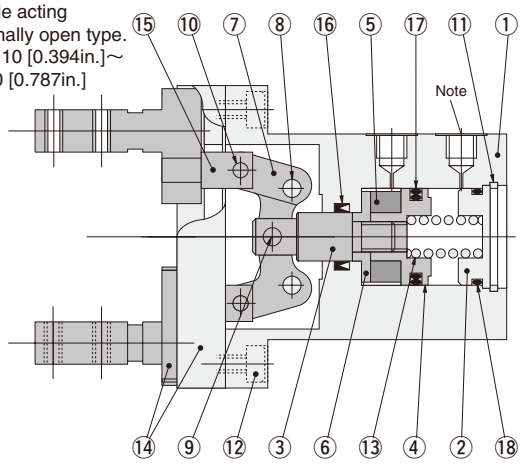


Diagram shows single acting normally open type.
● ϕ 10 [0.394in.]~ ϕ 20 [0.787in.]



Note: An exhaust plug is attached to the exhaust connection port of the single acting normally open type. Plugs are attached to the extra connection ports on the side surface (except ϕ 8 [0.315in.]).

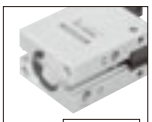
Major Parts and Materials

No.	Parts	Materials	Remarks
①	Body	Aluminum alloy	
②	Head cover	Aluminum alloy	
③	Piston rod	Stainless steel	
④	Piston	Aluminum alloy	Except ϕ 8 [0.315in.].
⑤	Magnet	Plastic magnet	
⑥	Magnet holder	Aluminum alloy	
⑦	Action lever	Steel	
⑧	Fulcrum pin	Steel	
⑨	Press fit pin	Steel	
⑩	Press fit pin	Steel	
⑪	Internal snap ring	Steel	
⑫	Hexagon socket head bolt	Steel	
⑬	Spring	Steel wire	Single acting type only
⑭	Bearing	Stainless steel	
⑮	Knuckle	Stainless steel	
⑯	Seal	Synthetic rubber (NBR)	
⑰	Seal	Synthetic rubber (NBR)	
⑱	O-ring	Synthetic rubber (NBR)	

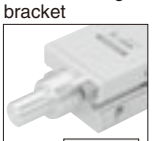
Order Codes

■Mounting bracket

No mounting bracket



With mounting bracket



★ Included at shipping

■Sensor switch

No sensor switch

With **ZE135**	With **ZE155**	With **ZE235**	With **ZE255**
			
●Solid state type ●With indicator lamp ●DC10~28V ●2-lead wire ●Horizontal lead wire	●Solid state type ●With indicator lamp ●DC4.5~28V ●3-lead wire ●Horizontal lead wire	●Solid state type ●With indicator lamp ●DC10~28V ●2-lead wire ●Vertical lead wire	●Solid state type ●With indicator lamp ●DC4.5~28V ●3-lead wire ●Vertical lead wire

■Lead wire length

A : 1000mm [39in.]
B : 3000mm [118in.]

■Number of sensor switches (for air hands with sensor switches)

●**1** : With 1 sensor switch
●**2** : With 2 sensor switches
★Included at shipping

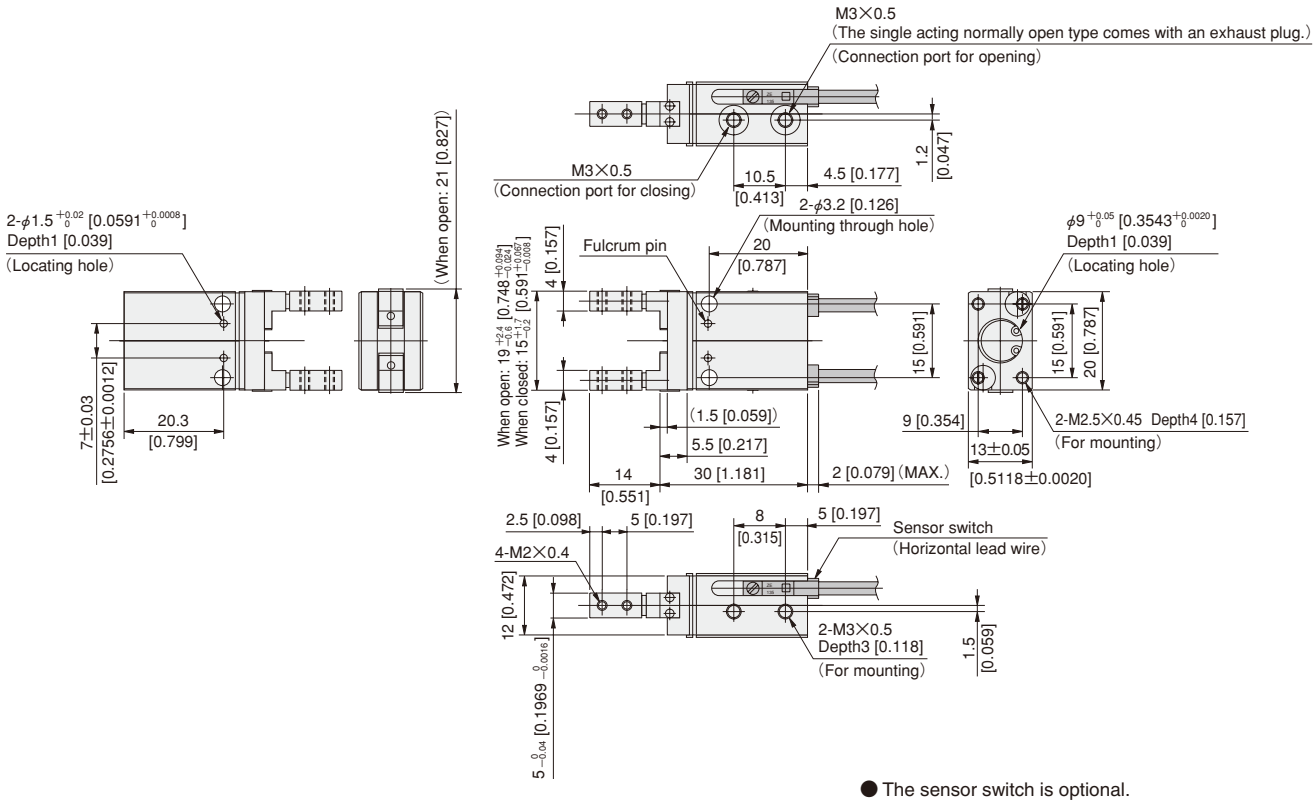
Additional Parts (To be ordered separately)

Mounting bracket

● For ϕ 8 [0.315in.] —**NHB-M8**
● For ϕ 10 [0.394in.] —**NHB-M10**
● For ϕ 16 [0.630in.] —**NHB-M16**
● For ϕ 20 [0.787in.] —**NHB-M20**

	Basic model	Cylinder bore size				
Double acting type	**NHBDPGY**	**-8** **-10** **-16** **-20**	**-M**	**-ZE135** **-ZE155** **-ZE235** **-ZE255**	**A** **B**	**1** **2**
Single acting normally open type	**NHBRPGY**	**-8** **-10** **-16** **-20**	**-M**	**-ZE135** **-ZE155** **-ZE235** **-ZE255**	**A** **B**	**1** **2**

NHB□PGY-8

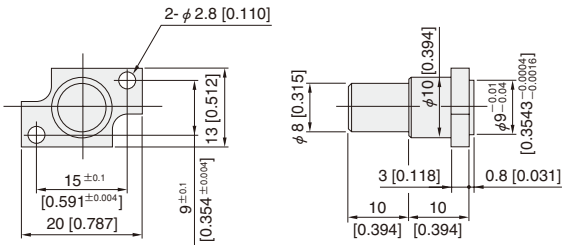


● The sensor switch is optional.
When mounting the sensor switch, always be sure to see the cautions for mounting on p.1460.

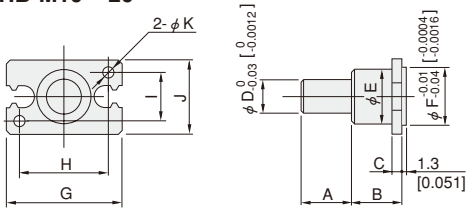
Options

●Mounting bracket: **-M**

NHB-M8



NHB-M10～20

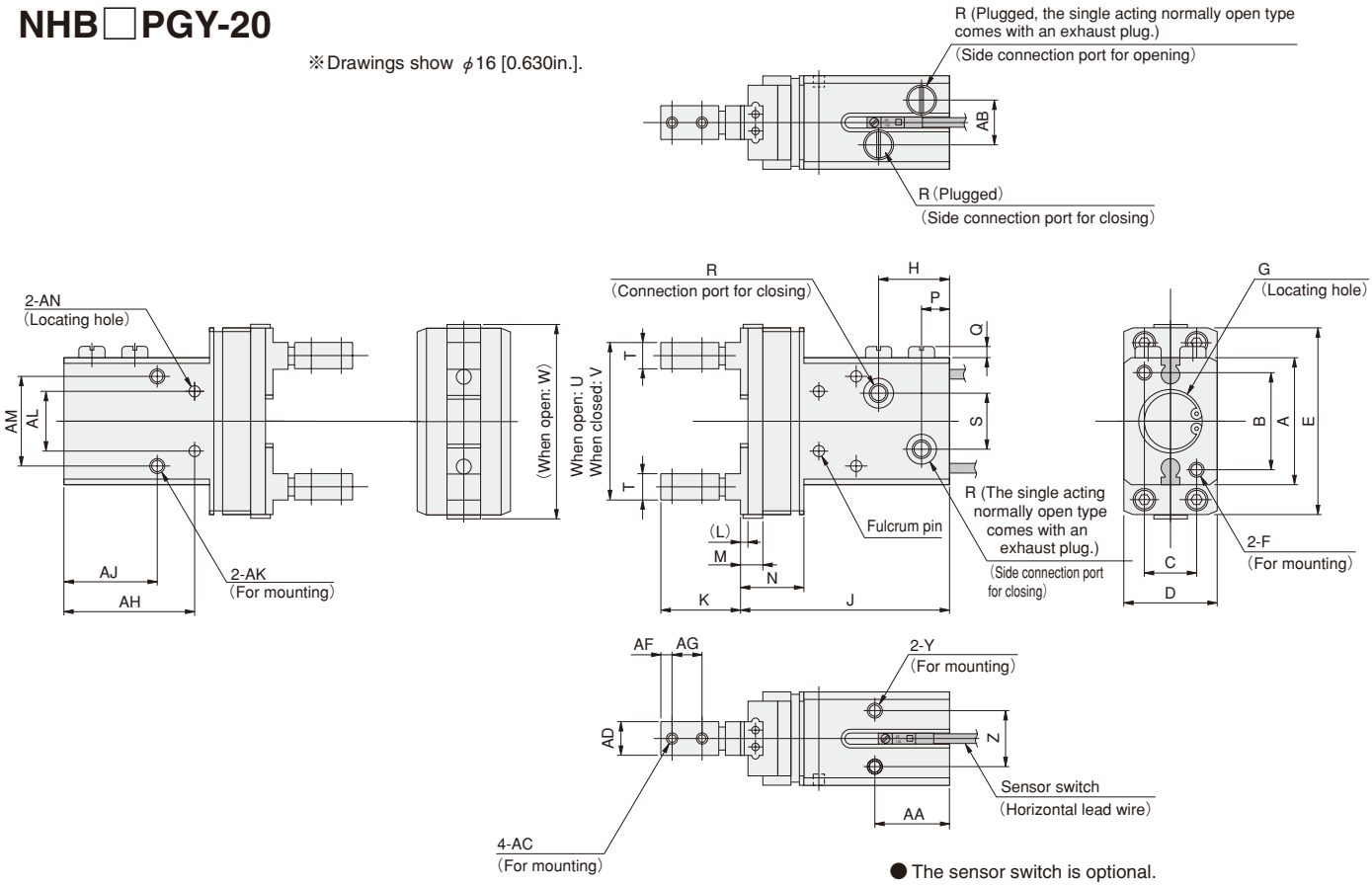


Model \ Code	A	B	C	D	E	F	G	H	I	J	K
NHB-M10	15 [0.591]	15 [0.591]	3 [0.118]	10 [0.3937]	11 [0.433]	11 [0.4331]	23 [0.906]	17 [0.669]	10 [0.394]	16 [0.630]	3.4 [0.134]
NHB-M16	15 [0.591]	15 [0.591]	3 [0.118]	10 [0.3937]	16 [0.630]	17 [0.6693]	34 [1.339]	26 [1.024]	14 [0.551]	22 [0.866]	4.5 [0.177]
NHB-M20	15 [0.591]	15 [0.591]	3 [0.118]	10 [0.3937]	18 [0.709]	21 [0.8268]	45 [1.772]	35 [1.378]	16 [0.630]	26 [1.024]	5.5 [0.217]

Dimensions of Linear Guide Specification with Fingers mm [in.]

NHB□PGY-10
NHB□PGY-16
NHB□PGY-20

※Drawings show ϕ16 [0.630in.].



● The sensor switch is optional.
When mounting the sensor switch, always be sure to see the cautions for mounting on p.1460.

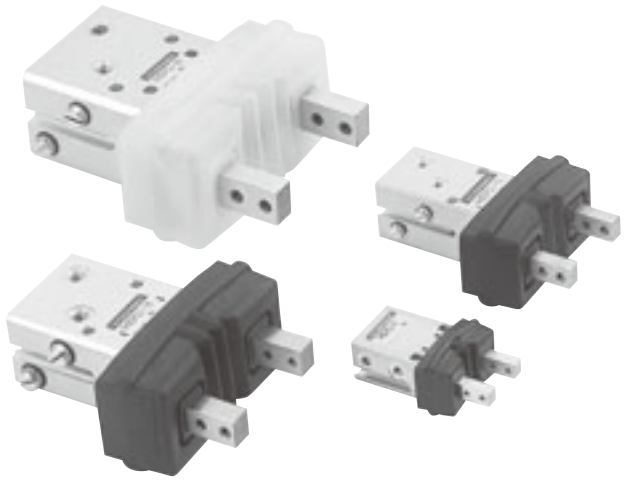
Model / Code	A	B	C	D	E	F	G	H	J	K	L
NHB□PGY-10	23 [0.906]	17 [0.669]	10 [0.394]	20±0.05 [0.7874 ±0.0020]	36 [1.417]	M3×0.5 Depth6 [0.236]	$\phi 11^{+0.05}_{0}$ [0.4331 $^{+0.0020}_{0}$] Depth1.5 [0.059]	17 [0.669]	49 [1.929]	18.5 [0.728]	1.5 [0.059]
NHB□PGY-16	34 [1.339]	26 [1.024]	14 [0.551]	25±0.05 [0.9843 ±0.0020]	50 [1.969]	M4×0.7 Depth7 [0.276]	$\phi 17^{+0.05}_{0}$ [0.6693 $^{+0.0020}_{0}$] Depth1.5 [0.059]	19 [0.748]	56 [2.205]	21 [0.827]	2 [0.079]
NHB□PGY-20	45 [1.772]	35 [1.378]	16 [0.630]	32±0.05 [1.2598 ±0.0020]	62 [2.441]	M5×0.8 Depth9 [0.354]	$\phi 21^{+0.05}_{0}$ [0.8268 $^{+0.0020}_{0}$] Depth1.5 [0.059]	21 [0.827]	67 [2.638]	30 [1.181]	3 [1.181]

M	N	P	Q	R	S	T	U	V	W	Y	Z	AA	AB
6 [0.236]	14 [0.551]	7.5 [0.295]	2.5 [0.098]	M3×0.5	7 [0.276]	5 [0.197]	$30^{+2.2}_{-0.2}$ [1.181 $^{+0.087}_{-0.008}$]	$23.5^{+1.7}_{-0.2}$ [0.925 $^{+0.067}_{-0.008}$]	37 [1.457]	M3×0.5 Depth5 [0.197]	12 [0.472]	20 [0.787]	9 [0.354]
8 [0.315]	17 [0.669]	7.5 [0.295]	3 [0.118]	M5×0.8	15 [0.591]	7 [0.276]	$41^{+2.9}_{-0.6}$ [1.614 $^{+0.114}_{-0.024}$]	$31^{+1.8}_{-0.5}$ [1.220 $^{+0.071}_{-0.020}$]	52 [2.047]	M4×0.7 Depth6 [0.236]	15 [0.591]	20 [0.787]	12 [0.472]
10 [0.394]	23 [0.906]	7.5 [0.295]	3 [0.118]	M5×0.8	17 [0.669]	8±0.1 [0.315 ±0.004]	$52^{+3.5}_{-0.5}$ [2.047 $^{+0.138}_{-0.020}$]	$38^{+2.4}_{-0.8}$ [1.496 $^{+0.094}_{-0.031}$]	64 [2.520]	M5×0.8 Depth8 [0.315]	18 [0.709]	24 [0.945]	16 [0.630]

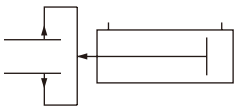
AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	AN
M3×0.5	$7^{0}_{-0.04}$ [0.2756 $^{0}_{-0.0016}$]	17 [0.669]	3 [0.118]	6 [0.236]	33 [1.299]	25 [0.984]	M4×0.7 Depth6 [0.236], Drilled hole diameter ϕ3.4 [0.134] through hole	12±0.03 [0.4724 ±0.0012]	17 [0.669]	$\phi 2.5^{+0.02}_{0}$ [0.0984 $^{+0.0008}_{0}$] Depth2.5 [0.098]
M3×0.5	$9^{0}_{-0.04}$ [0.3543 $^{0}_{-0.0016}$]	20 [0.787]	3 [0.118]	8 [0.315]	35 [1.378]	25 [0.984]	M4×0.7 Depth6 [0.236], Drilled hole diameter ϕ3.4 [0.134] through hole	16±0.03 [0.6299 ±0.0012]	24 [0.945]	$\phi 3^{+0.02}_{0}$ [0.1181 $^{+0.0008}_{0}$] Depth3 [0.118]
M4×0.7	$12^{0}_{-0.05}$ [0.4724 $^{0}_{-0.0020}$]	27 [1.063]	4 [0.157]	10 [0.394]	39.7 [1.563]	30 [1.181]	M5×0.8 Depth8 [0.315], Drilled hole diameter ϕ4.2 [0.165] through hole	22±0.03 [0.8661 ±0.0012]	30 [1.181]	$\phi 4^{+0.02}_{0}$ [0.1575 $^{+0.0008}_{0}$] Depth3.5 [0.138]

NHB SERIES
PARALLEL TYPE

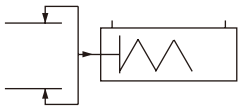
Linear Guide Specification with Rubber Cover
Double Acting Type, Single Acting Normally Open Type



Symbols



Double Acting Type



Single Acting
Normally Open Type

Specifications

●Double acting parallel type (with rubber cover)

Item \ Basic model		NHBDPGJ-8	NHBDPGJ-10	NHBDPGJ-16	NHBDPGJ-20
Cylinder bore size mm [in.]		8 [0.315]	10 [0.394]	16 [0.630]	20 [0.787]
Operation type		Double acting type			
Media		Air			
Operating pressure range MPa [psi.]		0.3～0.7 [44～102]	0.25～0.7 [36～102]	0.15～0.7 [22～102]	
Proof pressure MPa [psi.]		1.05 [152]			
Operating temperature range °C [°F]		0～60 [32～140]			
Maximum operating frequency cycle/min		100			
Lubrication		Not required			
Effective gripping force (F)[Note 1] N [lbf.]	Closed side	5.8 [1.30]	9.4 [2.11]	26.4 [5.93]	45.0 [10.12]
	Open side	9.9 [2.23]	14.7 [3.30]	39.2 [8.81]	59.8 [13.44]
Lever open/closed stroke mm [in.]		4 [0.157]	6.5 [0.256]	10 [0.394]	14 [0.551]
Repeatability mm [in.]		±0.01 [±0.0004]			
Port size		M3×0.5		M5×0.8	
Mass[Note 2] g [oz.]		27 [0.95] (32 [1.13])	90 [3.17] (101 [3.56])	180 [6.35] (119 [4.20])	370 [13.05] (396 [13.97])

Notes: 1. Values are obtained when grip point length is 30mm [1.18in.] under operating pressure 0.5 MPa [73psi.]. For details of the effective gripping force, see the graphs on p.1385.
2. ( ) mean the mass with the mounting bracket: **-M**.
Remark: The life of rubber cover may vary from the air hand (gripper), depending on its operating conditions.

●Single acting normally open parallel type (with rubber cover)

Item \ Basic model		NHBRPGJ-8	NHBRPGJ-10	NHBRPGJ-16	NHBRPGJ-20
Cylinder bore size mm [in.]		8 [0.315]	10 [0.394]	16 [0.630]	20 [0.787]
Operation type		Normally open single acting type			
Media		Air			
Operating pressure range MPa [psi.]		0.5～0.7 [73～102]	0.4～0.7 [58～102]	0.3～0.7 [44～102]	
Proof pressure MPa [psi.]		1.05 [152]			
Operating temperature range °C [°F]		0～60 [32～140]			
Maximum operating frequency cycle/min		100			
Lubrication		Not required			
Effective gripping force (F)[Note 1] N [lbf.]	Closed side	4.1 [0.92]	6.8 [1.53]	19.6 [4.41]	34.3 [7.71]
	Open side	2.7 [0.61]	2.4 [0.54]	5.4 [1.21]	7.3 [1.64]
Lever open/closed stroke mm [in.]		4 [0.157]	6.5 [0.256]	10 [0.394]	14 [0.551]
Repeatability mm [in.]		±0.01 [±0.0004]			
Port size		M3×0.5		M5×0.8	
Mass[Note 2] g [oz.]		28 [0.99] (33 [1.16])	91 [3.21] (102 [3.60])	181 [6.38] (200 [7.05])	371 [13.09] (397 [14.00])

Notes: 1. Values are obtained when grip point length is 30mm [1.18in.] under operating pressure 0.5 MPa [73psi.]. For details of the effective gripping force, see the graphs on p.1385.
2. ( ) mean the mass with the mounting bracket: **-M**.
Remark: The life of rubber cover may vary from the air hand (gripper), depending on its operating conditions.

Inner Construction

Diagram shows double acting type.
● ϕ 8 [0.315in.]

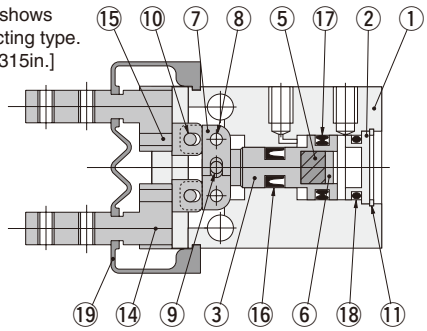
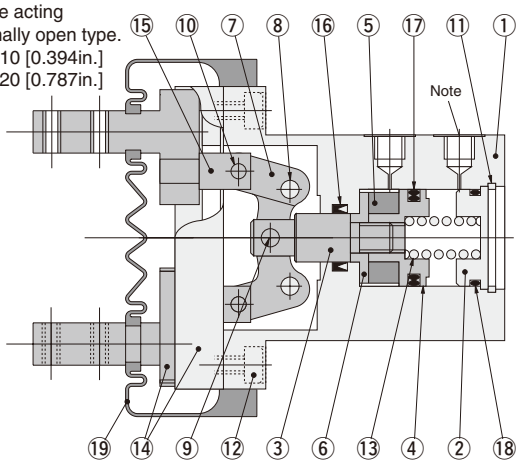


Diagram shows single acting normally open type.
● ϕ 10 [0.394in.]
~ ϕ 20 [0.787in.]



Note: An exhaust plug is attached to the exhaust connection port of the single acting normally open type. Pluga are attached to the extra connection ports on the side surface (except ϕ 8 [0.315in.]).

Major Parts and Materials

No.	Parts	Materials	Remarks
①	Body	Aluminum alloy	
②	Head cover	Aluminum alloy	
③	Piston rod	Stainless steel	
④	Piston	Aluminum alloy	Except ϕ 8 [0.315in.].
⑤	Magnet	Plastic magnet	
⑥	Magnet holder	Aluminum alloy	
⑦	Action lever	Steel	
⑧	Fulcrum pin	Steel	
⑨	Press fit pin	Steel	
⑩	Press fit pin	Steel	
⑪	Internal snap ring	Steel	
⑫	Hexagon socket head bolt	Steel	
⑬	Spring	Steel wire	Single acting type only
⑭	Bearing	Stainless steel	
⑮	Knuckle	Stainless steel	
⑯	Seal	Synthetic rubber (NBR)	
⑰	Seal	Synthetic rubber (NBR)	
⑱	O-ring	Synthetic rubber (NBR)	
⑲	Rubber cover	Synthetic rubber Note	

Note: **-JN**: NBR, **-JF**: Fluoro rubber, **-JS**: Silicone rubber.

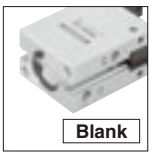
Order Codes

■ Rubber cover material

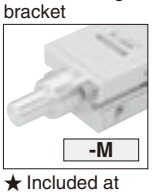
●**-JN**: NBR (Black with blue mark)
●**-JF**: Fluoro rubber (Black with green mark)
●**-JS**: Silicone rubber (White)

■ Mounting bracket

No mounting bracket



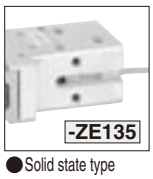
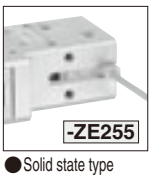
With mounting bracket



★ Included at shipping

■ Sensor switch

No sensor switch

With **ZE135**	With **ZE155**	With **ZE235**	With **ZE255**
			
●Solid state type ●With indicator lamp ●DC10~28V ●2-lead wire ●Horizontal lead wire	●Solid state type ●With indicator lamp ●DC4.5~28V ●3-lead wire ●Horizontal lead wire	●Solid state type ●With indicator lamp ●DC10~28V ●2-lead wire ●Vertical lead wire	●Solid state type ●With indicator lamp ●DC4.5~28V ●3-lead wire ●Vertical lead wire

■ Lead wire length

A : 1000mm [39in.]
B : 3000mm [118in.]

■ Number of sensor switches (for air hands with sensor switches)

●**1** : With 1 sensor switch
●**2** : With 2 sensor switches
★Included at shipping

Additional Parts (To be ordered separately)

Mounting bracket

● For ϕ 8 [0.315in.]—**NHB-M8**
● For ϕ 10 [0.394in.]—**NHB-M10**
● For ϕ 16 [0.630in.]—**NHB-M16**
● For ϕ 20 [0.787in.]—**NHB-M20**

Rubber cover

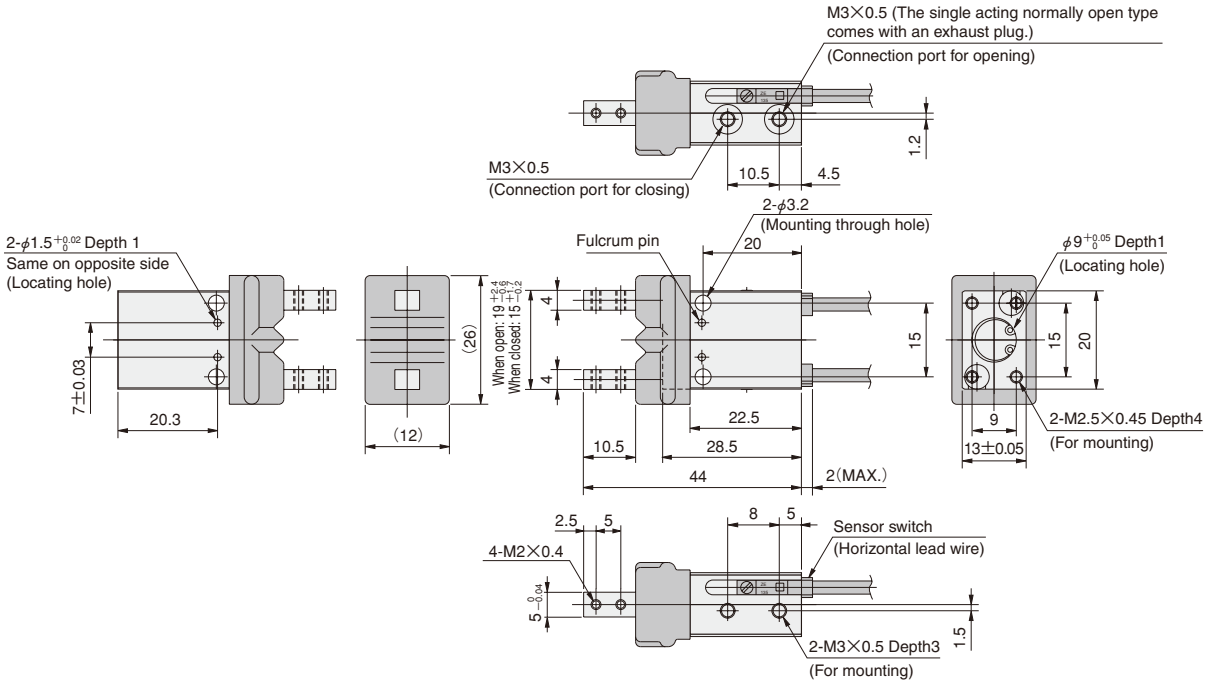
	Basic model	Cylinder bore size					
Double acting type	**NHBDPGJ**	**-8** **-10** **-16** **-20**	**-JN** **-JF** **-JS**	**-M**	**-ZE135** **-ZE155** **-ZE235** **-ZE255**	**A** **B**	**1** **2**
Single acting normally open type	**NHBRPGJ**	**-8** **-10** **-16** **-20**	**-JN** **-JF** **-JS**	**-M**	**-ZE135** **-ZE155** **-ZE235** **-ZE255**	**A** **B**	**1** **2**

□-NHBDPGJ□

Rubber cover material
JN: NBR (Black with blue mark)
JF: Fluoro rubber (Black with green mark)
JS: Silicone rubber (White)

Bore size
8 : ϕ 8 [0.315in.]
10 : ϕ 10 [0.394in.]
16 : ϕ 16 [0.630in.]
20 : ϕ 20 [0.787in.]

NHB□PGJ-8



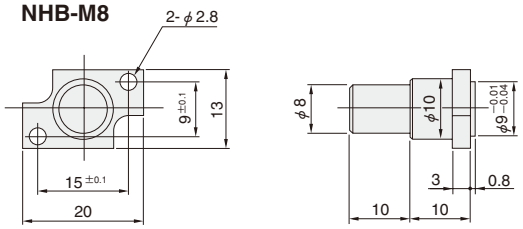
● The sensor switch is optional.
When mounting the sensor switch, always be sure to see the cautions for mounting on p.1460.

Options

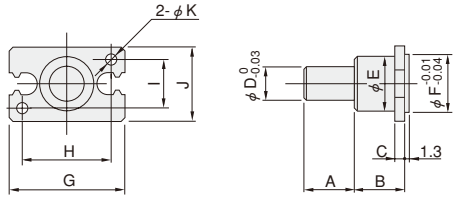
HAND

●Mounting bracket: **-M**

NHB-M8



NHB-M10～20

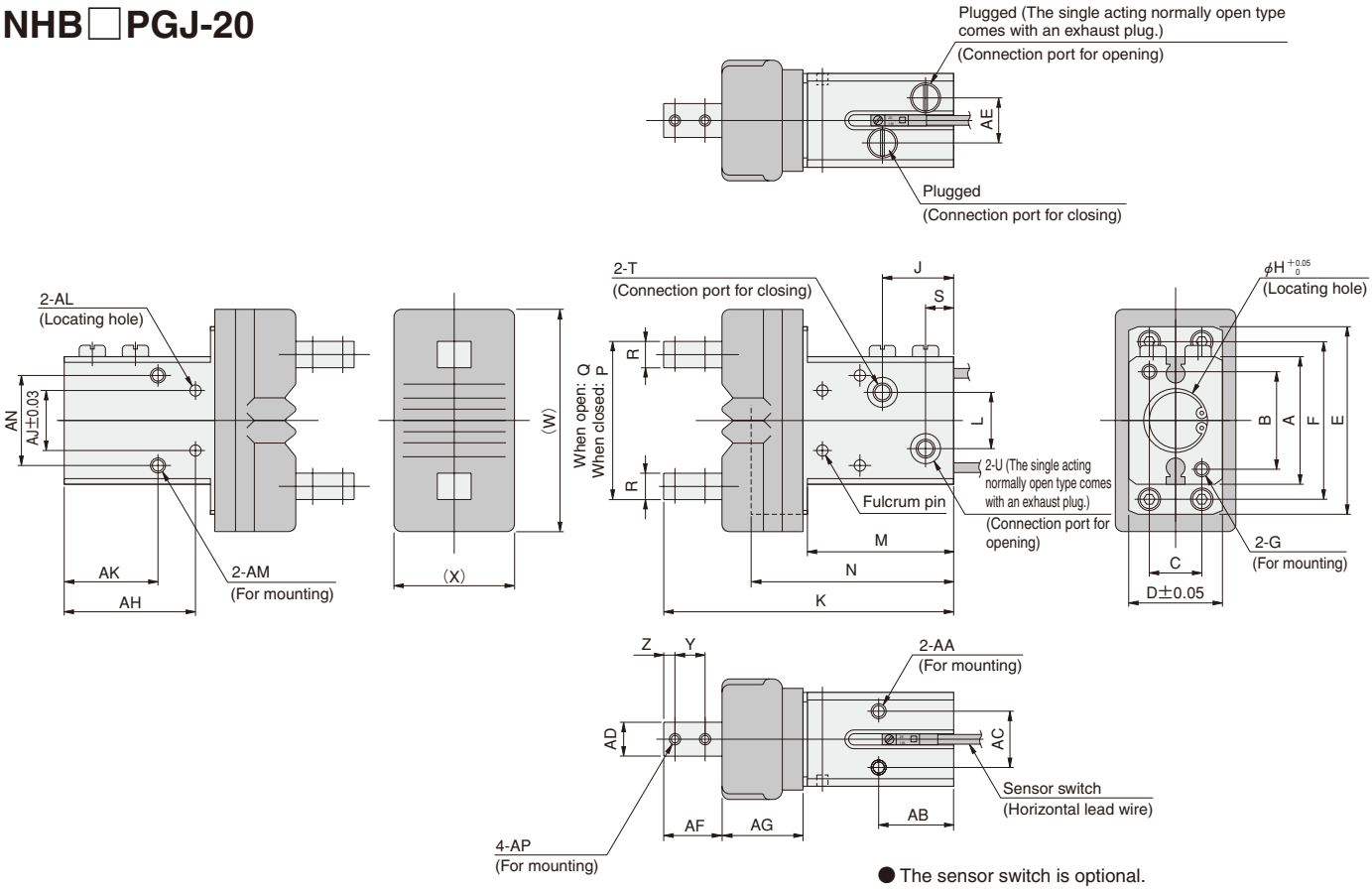


Model / Code	A	B	C	D	E	F	G	H	I	J	K
NHB-M10	15	15	3	10	11	11	23	17	10	16	3.4
NHB-M16	15	15	3	10	16	17	34	26	14	22	4.5
NHB-M20	15	15	3	10	18	21	45	35	16	26	5.5

Dimensions of Linear Guide Specification Parallel Type with Rubber Cover (mm)

NHB□PGJ-10
NHB□PGJ-16
NHB□PGJ-20

※Drawings show ϕ16 [0.630in.].



● The sensor switch is optional.
When mounting the sensor switch, always be sure to see the cautions for mounting on p.1460.

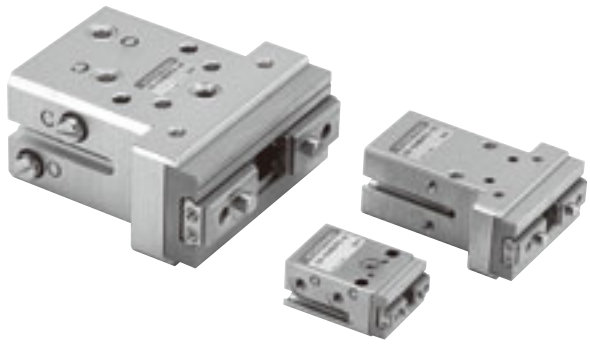
Model / Code	A	B	C	D	E	F	G	H	J	K	L	M
NHB□PGJ-10	23	17	10	20	36	30	M3×0.5 Depth 6	11 Depth 1.5	17	67.5	7	35
NHB□PGJ-16	34	26	14	25	50	42	M4×0.7 Depth 7	17 Depth 1.5	19	77	15	39
NHB□PGJ-20	45	35	16	32	62	54	M5×0.8 Depth 9	21 Depth 1.5	21	97	17	44

N	P	Q	R	S	T	U	W	X	Y	Z	AA	AB	AC
47.5	$23.5^{+1.7}_{-0.2}$	$30^{+2.2}_{-0.2}$	5	7.5	M3×0.5	M3×0.5	44	27	6	3	M3×0.5 Depth 5	20	12
54	$31^{+1.8}_{-0.5}$	$41^{+2.9}_{-0.6}$	7	7.5	M5×0.8	M5×0.8	59	32	8	3	M4×0.7 Depth 6	20	15
64	$38^{+2.4}_{-0.8}$	$52^{+3.5}_{-0.5}$	8	7.5	M5×0.8	M5×0.8	71	42	10	4	M5×0.8 Depth 8	24	18

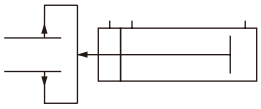
AD	AE	AF	AG	AH	AJ	AK	AL	AM	AN	AP
$7^{0}_{-0.04}$	9	13	18.5	33	12	25	$\phi 2.5^{+0.02}_{0}$ Depth 2.5	M4×0.7 Depth 6, Drilled hole diameter ϕ3.4 thru hole	17	M3×0.5
$9^{0}_{-0.04}$	12	15.5	21.5	35	16	25	$\phi 3^{+0.02}_{0}$ Depth 3	M4×0.7 Depth 6, Drilled hole diameter ϕ3.4 thru hole	24	M3×0.5
$12^{0}_{-0.05}$	16	20	28.5	39.7	22	30	$\phi 4^{+0.02}_{0}$ Depth 3.5	M4×0.8 Depth 8, Drilled hole diameter ϕ4.2 thru hole	30	M4×0.7

NHB SERIES
PARALLEL TYPE

Linear Guide Specification for Clean Systems
Double Acting Type



Symbol



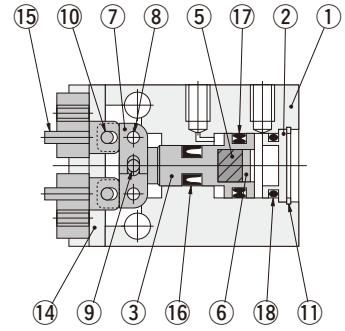
Specifications

Item \ Basic model		CS-NHBDPG-8	CS-NHBDPG-10	CS-NHBDPG-16	CS-NHBDPG-20
Cylinder bore size mm [in.]		8 [0.315]	10 [0.394]	16 [0.630]	20 [0.787]
Operation type		Double acting type			
Media		Air			
Operating pressure range MPa [psi.]		0.22～0.7 [32～102]	0.2～0.7 [29～102]	0.12～0.7 [17～102]	0.1～0.7 [15～102]
Proof pressure MPa [psi.]		1.05 [152]			
Operating temperature range °C [°F]		0～60 [32～140]			
Maximum operating frequency cycle/min		120			
Lubrication		Not required			
Effective gripping force (F)[Note 1] N [lbf.]	Closed side	5.8 [1.30]	9.4 [2.11]	26.4 [5.93]	45.0 [10.12]
	Open side	9.9 [2.23]	14.7 [3.30]	39.2 [8.81]	59.8 [13.44]
Lever open/closed stroke mm [in.]		4 [0.157]	6.5 [0.256]	10 [0.394]	14 [0.551]
Repeatability mm [in.]		±0.01 [±0.0004]			
Port size		M3×0.5		M5×0.8	
Mass[Note 2] g [oz.]		24 [0.85] (29 [1.02])	80 [2.82] (91 [3.21])	159 [5.61] (178 [6.28])	329 [11.60] (355 [12.52])

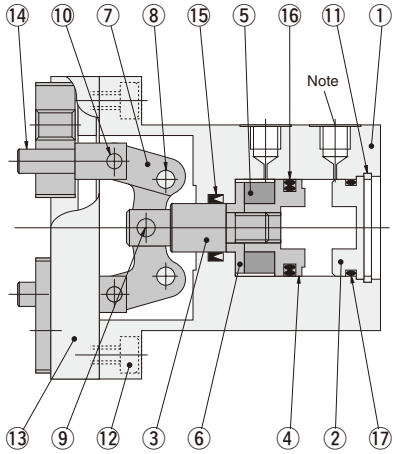
Notes: 1. Values are obtained when grip point length is 30mm [1.18in.] under operating pressure 0.5 MPa [73psi.]. For details of the effective gripping force, see the graphs on p.1385.
2. ( ) mean the mass with the mounting bracket: **-M**.

Inner Construction

● ϕ8 [0.315in.]



● ϕ10 [0.394in.] ~ϕ20 [0.787in.]



Note: Plugs are attached to the extra connection ports on the side surface (except ϕ 8 [0.135in.]).

Major Parts and Materials

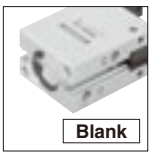
No.	Parts	Materials	Remarks
①	Body	Aluminum alloy	
②	Head cover	Aluminum alloy	
③	Piston rod	Stainless steel	
④	Piston	Aluminum alloy	Except ϕ 8 [0.315in.].
⑤	Magnet	Plastic magnet	
⑥	Magnet holder	Aluminum alloy	
⑦	Action lever	Steel	
⑧	Fulcrum pin	Steel	
⑨	Press fit pin	Steel	
⑩	Press fit pin	Steel	
⑪	Internal snap ring	Steel	
⑫	Hexagon socket head bolt	Steel	
⑬	Bearing	Stainless steel	
⑭	Knuckle	Stainless steel	
⑮	Seal	Synthetic rubber (NBR)	
⑯	Seal	Synthetic rubber (NBR)	
⑰	O-ring	Synthetic rubber (NBR)	

Order Codes

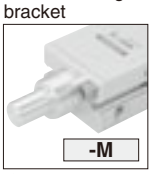
■Air Hands for Clean Systems

■Mounting bracket

No mounting bracket



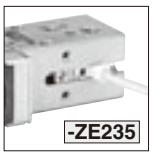
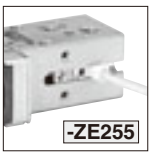
With mounting bracket



★ Included at shipping

■Sensor switch

No sensor switch

With **ZE135**	With **ZE155**	With **ZE235**	With **ZE255**
			
●Solid state type ●With indicator lamp ●DC10~28V ●2-lead wire ●Horizontal lead wire	●Solid state type ●With indicator lamp ●DC4.5~28V ●3-lead wire ●Horizontal lead wire	●Solid state type ●With indicator lamp ●DC10~28V ●2-lead wire ●Vertical lead wire	●Solid state type ●With indicator lamp ●DC4.5~28V ●3-lead wire ●Vertical lead wire

■Lead wire length

A : 1000mm [39in.]
B : 3000mm [118in.]

■Number of sensor switches (for air hands with sensor switches)

●**1** : With 1 sensor switch
●**2** : With 2 sensor switches
★Included at shipping

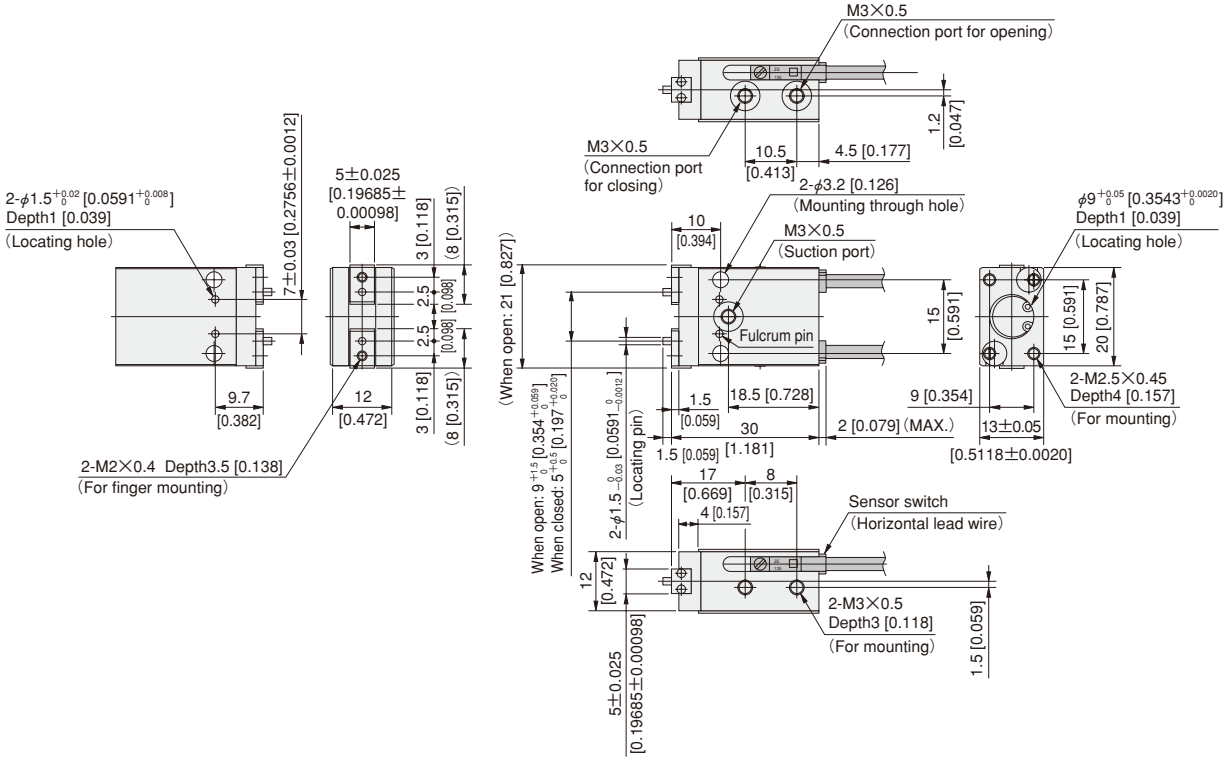
	Basic model		Cylinder bore size				
Double acting type	**CS**	**-NHBDPG**	**-8** **-10** **-16** **-20**	**-M**	**-ZE135** **-ZE155** **-ZE235** **-ZE255**	**A** **B**	**1** **2**

Additional Parts (To be ordered separately)

Mounting bracket

● For ϕ 8 [0.315in.] —**NHB-M8**
● For ϕ 10 [0.394in.] —**NHB-M10**
● For ϕ 16 [0.630in.] —**NHB-M16**
● For ϕ 20 [0.787in.] —**NHB-M20**

CS-NHBDPG-8

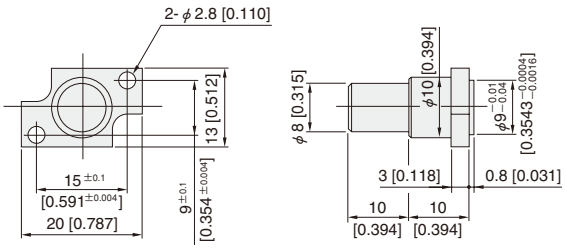


● The sensor switch is optional.
When mounting the sensor switch, always be sure to see the cautions for mounting on p.1460.

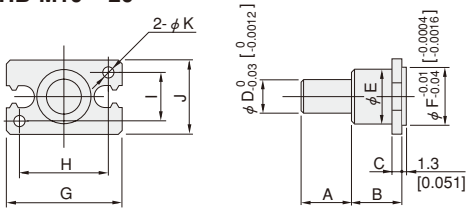
Options

● Mounting bracket: **-M**

NHB-M8



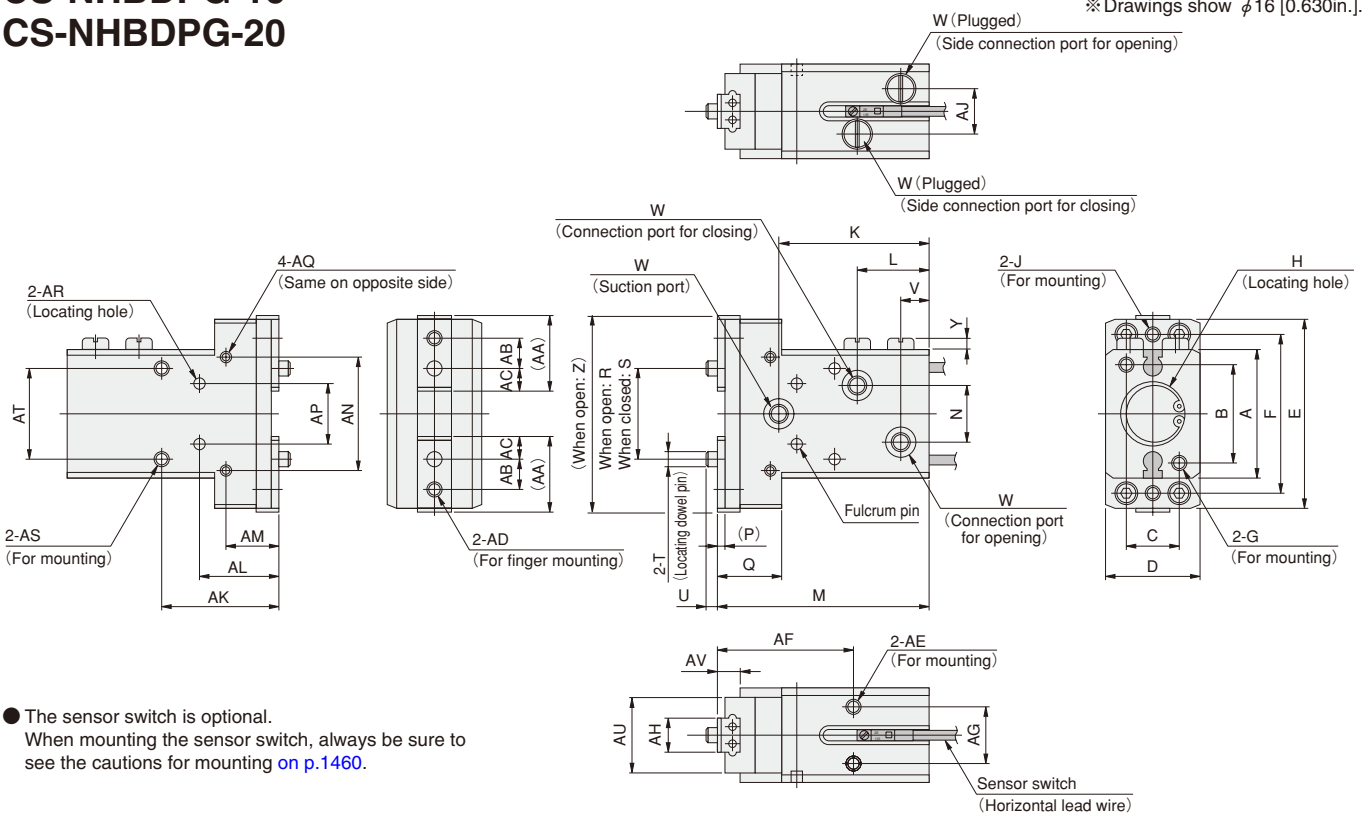
NHB-M10～20



Model \ Code	A	B	C	D	E	F	G	H	I	J	K
NHB-M10	15 [0.591]	15 [0.591]	3 [0.118]	10 [0.3937]	11 [0.433]	11 [0.4331]	23 [0.906]	17 [0.669]	10 [0.394]	16 [0.630]	3.4 [0.134]
NHB-M16	15 [0.591]	15 [0.591]	3 [0.118]	10 [0.3937]	16 [0.630]	17 [0.6693]	34 [1.339]	26 [1.024]	14 [0.551]	22 [0.866]	4.5 [0.177]
NHB-M20	15 [0.591]	15 [0.591]	3 [0.118]	10 [0.3937]	18 [0.709]	21 [0.8268]	45 [1.772]	35 [1.378]	16 [0.630]	26 [1.024]	5.5 [0.217]

CS-NHBDPG-10
CS-NHBDPG-16
CS-NHBDPG-20

※Drawings show ϕ16 [0.630in.].



● The sensor switch is optional.
When mounting the sensor switch, always be sure to see the cautions for mounting on p.1460.

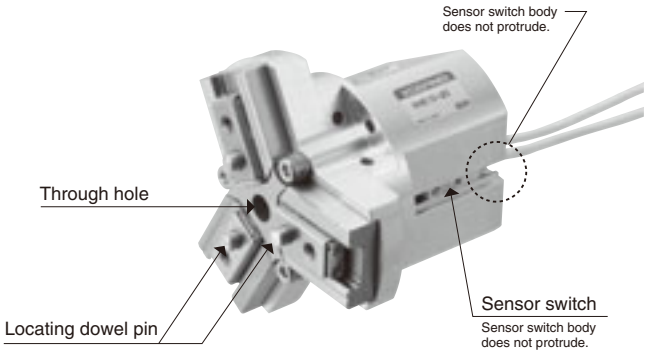
Model / Code	A	B	C	D	E	F	G	H	J	K	L	M	N	P
CS-NHBDPG-10	23 [0.906]	17 [0.669]	10 [0.394]	20±0.05 [0.7874 ±0.0020]	36 [1.417]	30 [1.181]	M3×0.5 Depth6 [0.236]	$\phi 11^{+0.05}_{0}$ [0.4331$^{+0.0020}_{0}$] Depth1.5 [0.059]	M3×0.5 Depth4.5 [0.177]	35 [1.378]	17 [0.669]	49 [1.929]	7 [0.276]	1.5 [0.059]
CS-NHBDPG-16	34 [1.339]	26 [1.024]	14 [0.551]	25±0.05 [0.9843 ±0.0020]	50 [1.969]	42 [1.654]	M4×0.7 Depth7 [0.276]	$\phi 17^{+0.05}_{0}$ [0.6693$^{+0.0020}_{0}$] Depth1.5 [0.059]	M4×0.7 Depth5 [0.197]	40 [1.575]	19 [0.748]	56 [2.205]	15 [0.591]	2 [0.079]
CS-NHBDPG-20	45 [1.772]	35 [1.378]	16 [0.630]	32±0.05 [1.2598 ±0.0020]	62 [2.441]	54 [2.126]	M5×0.8 Depth9 [0.354]	$\phi 21^{+0.05}_{0}$ [0.8268$^{+0.0020}_{0}$] Depth1.5 [0.059]	M4×0.7 Depth7 [0.276]	45 [1.772]	21 [0.827]	67 [2.638]	17 [0.669]	3 [1.181]

Q	R	S	T	U	V	W	Y	Z	AA	AB	AC	AD	AE	AF	AG
14 [0.551]	$15.5^{+0.8}_{0}$ [0.610$^{+0.031}_{0}$]	$9^{+0.5}_{0}$ [0.354$^{+0.020}_{0}$]	$\phi 3^{0}_{-0.03}$ [0.1181$^{0}_{-0.0012}$]	2 [0.079]	7.5 [0.295]	M3×0.5	2 [0.079]	37 [1.457]	14.7 [0.579]	5 [0.197]	4.5 [0.177]	M3×0.5 Depth4 [0.157]	M3×0.5 Depth5 [0.197]	29 [1.142]	12 [0.472]
17 [0.669]	$22^{+1.8}_{0}$ [0.866$^{+0.071}_{0}$]	$12^{+1.3}_{0}$ [0.472$^{+0.051}_{0}$]	$\phi 4^{0}_{-0.03}$ [0.1575$^{0}_{-0.0012}$]	3 [0.118]	7.5 [0.295]	M5×0.8	3 [0.118]	52 [2.047]	20 [0.787]	8 [0.315]	6 [0.236]	M4×0.7 Depth5 [0.197]	M4×0.7 Depth6 [0.236]	36 [1.417]	15 [0.591]
23 [0.906]	$30^{+2.9}_{0}$ [1.181$^{+0.114}_{0}$]	$16^{+1.4}_{0}$ [0.630$^{+0.055}_{0}$]	$\phi 5^{0}_{-0.03}$ [0.1969$^{0}_{-0.0012}$]	3 [0.118]	7.5 [0.295]	M5×0.8	3 [0.118]	64 [2.520]	24 [0.945]	8 [0.315]	8 [0.315]	M5×0.8 Depth7 [0.276]	M5×0.8 Depth8 [0.315]	43 [1.693]	18 [0.709]

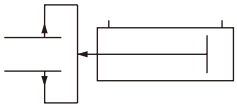
AH	AJ	AK	AL	AM	AN	AP	AQ	AR	AS	AT	AU	AV
7±0.025 [0.27559 ±0.00098]	9 [0.354]	24 [0.945]	16 [0.630]	11 [0.433]	20 [0.787]	12±0.03 [0.4724 ±0.0012]	M3×0.5 Depth5 [0.197]	$\phi 2.5^{+0.02}_{0}$ [0.0984$^{+0.0008}_{0}$] Depth2.5 [0.098]	M4×0.7 Depth6 [0.236], Drilled hole diameter ϕ3.4 [0.134] through hole	17 [0.669]	17 [0.669]	6 [0.236]
9±0.025 [0.35433 ±0.00098]	12 [0.472]	31 [1.220]	21 [0.827]	14 [0.551]	30 [1.181]	16±0.03 [0.6299 ±0.0012]	M3×0.5 Depth5 [0.197]	$\phi 3^{+0.02}_{0}$ [0.1181$^{+0.0008}_{0}$] Depth3 [0.118]	M4×0.7 Depth7 [0.276], Drilled hole diameter ϕ3.4 [0.134] through hole	24 [0.945]	20 [0.787]	8 [0.315]
12±0.025 [0.47244 ±0.00098]	16 [0.630]	37 [1.457]	27.3 [1.075]	17 [0.669]	40 [1.575]	22±0.03 [0.8661 ±0.0012]	M4×0.7 Depth6 [0.236]	$\phi 4^{+0.02}_{0}$ [0.1575$^{+0.0008}_{0}$] Depth3.5 [0.138]	M5×0.8 Depth8 [0.315], Drilled hole diameter ϕ4.2 [0.165] through hole	30 [1.181]	27 [1.063]	10 [0.394]

THREE-FINGER TYPE LINEAR GUIDE SPECIFICATION

Air Hands



Symbol

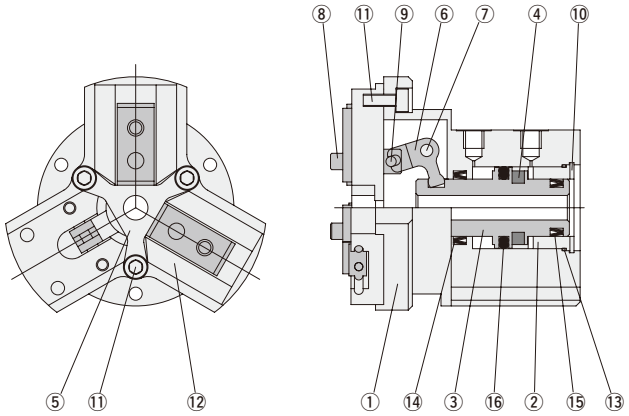


Specifications

Item \ Basic model		NHE1D-16	NHE1D-20	NHE1D-25
Cylinder bore size	mm [in.]	16 [0.630]	20 [0.787]	25 [0.984]
Operation type		Double acting type		
Media		Air		
Operating pressure range	MPa [psi.]	0.25～0.7 [36～102]	0.2～0.7 [29～102]	0.15～0.7 [22～102]
Proof pressure	MPa [psi.]	1.05 [152]		
Operating temperature range	°C [°F]	0～60 [32～140]		
Maximum operating frequency	cycle/min	180		
Lubrication		Not required (However, mechanical sliding portion required)		
Effective gripping force (F)Note 1	N [lbf.] Both open and closed sides	8 [1.8]	16 [3.6]	29 [6.5]
Lever open/closed stroke	mm [in.]	6 [0.236]	10 [0.394]	14 [0.551]
Repeatability	mm [in.]	±0.01 [±0.0004]		
Centering accuracy	mm [in.]	±0.05 [±0.0020]		
Port size		M5×0.8		
MassNote 2	g [oz.]	170 [6.00]	306 [10.79]	580 [20.46]

Note: Values are obtained when grip point length is 30mm [1.18in.] under operating pressure 0.5 MPa [73psi.]. For details of the effective gripping force, see the graphs on p.1386.

Inner Construction



Major Parts and Materials

No.	Parts	Materials
①	Body	Aluminum alloy
②	Head Cover	Aluminum alloy
③	Piston rod	Stainless steel
④	Magnet	Rubber magnet
⑤	Holder cover	Stainless steel
⑥	Action lever	Carbon steel
⑦	Fulcrum pin	Carbon steel
⑧	Knuckle	Stainless steel
⑨	Roller	Carbon steel
⑩	Snap ring	Carbon steel
⑪	Hexagon socket head bolt	Stainless steel
⑫	Bearing	Stainless steel
⑬	O-ring	Synthetic rubber (NBR)
⑭	Seal	Synthetic rubber (NBR)
⑮	Seal	Synthetic rubber (NBR)
⑯	Seal	Synthetic rubber (NBR)

Order Codes

NHE 1 D - [ ] - [ ] [ ] [ ]

Three-finger hand series
Air hands
High precision specification

Operation type
D：Double acting type

Bore size
16：φ 16mm [0.630in.]
20：φ 20mm [0.787in.]
25：φ 25mm [0.984in.]

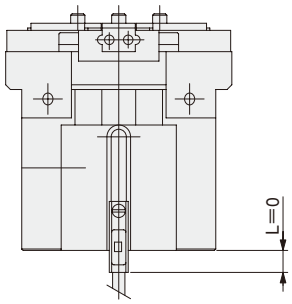
Sensor switch type
Blank： No sensor switch
ZE135： 2-lead wire solid state type with indicator Horizontal lead wire DC10～28V
ZE155： 3-lead wire solid state type with indicator Horizontal lead wire DC4.5～28V
ZE235： 2-lead wire solid state type with indicator Vertical lead wire DC10～28V
ZE255： 3-lead wire solid state type with indicator Vertical lead wire DC4.5～28V
● For sensor switch details, see p.1544.

Lead wire length
A：1000mm [39in.]
B：3000mm [118in.]

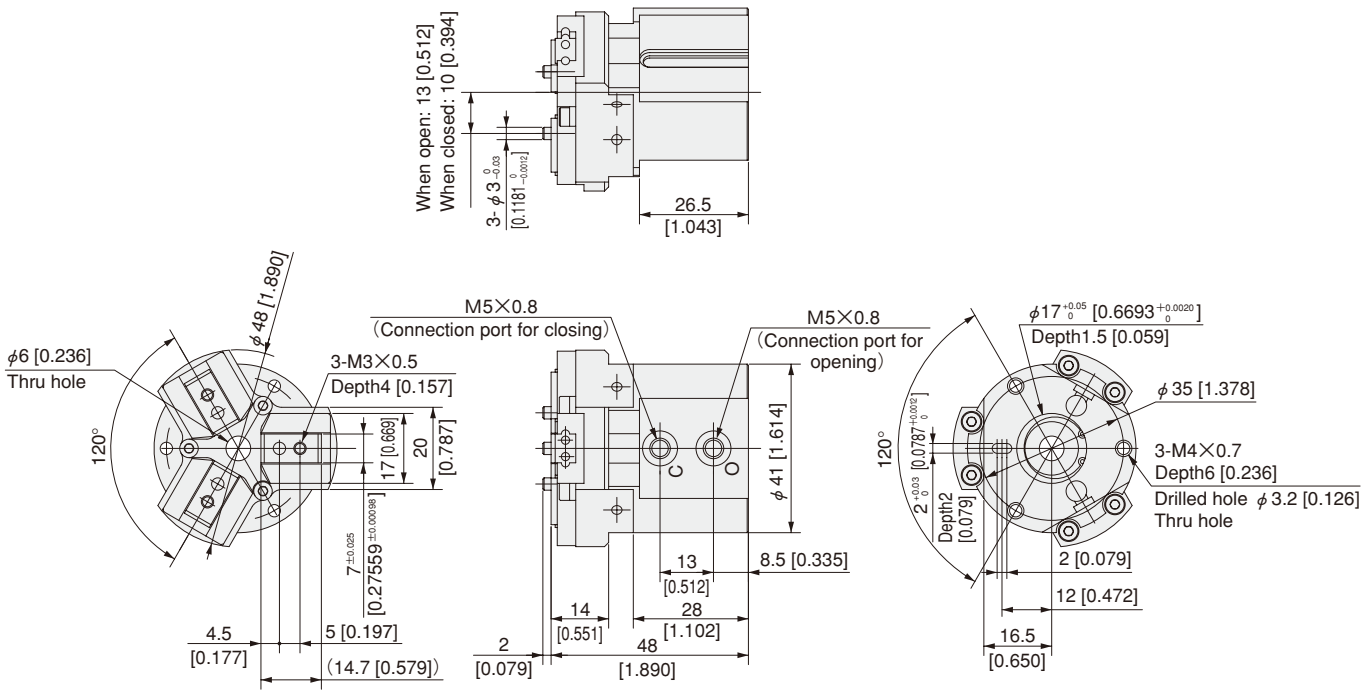
Number of sensor switches
1：With 1 sensor switch
2：With 2 sensor switches

Length of Sensor Switch Allowed to Protrude

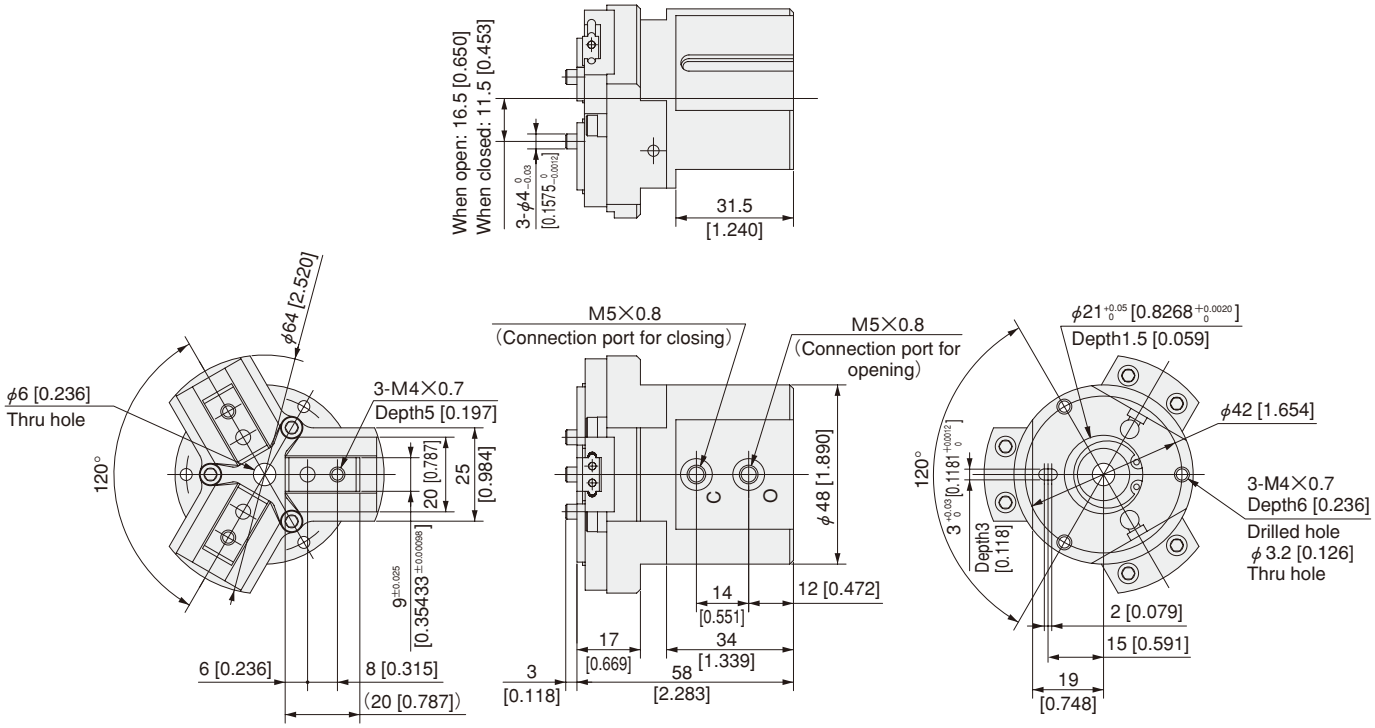
NHE1D series sensor switch does not protrude.



NHE1D-16

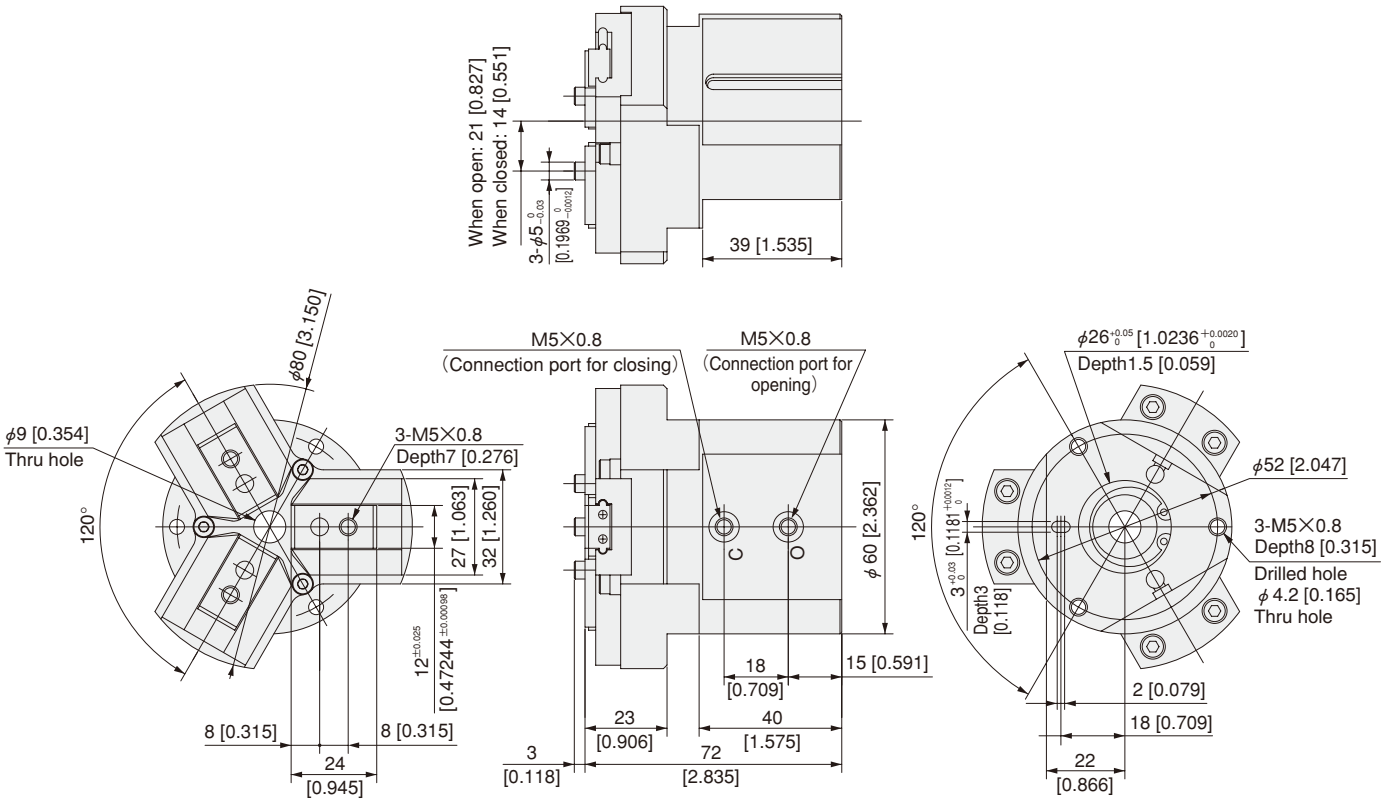


NHE1D-20



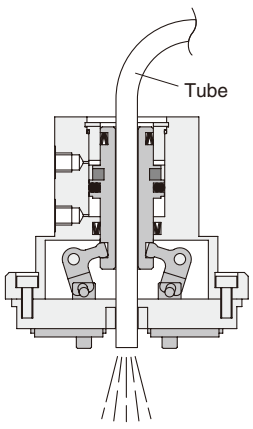
Dimensions mm [in.]

NHE1D-25

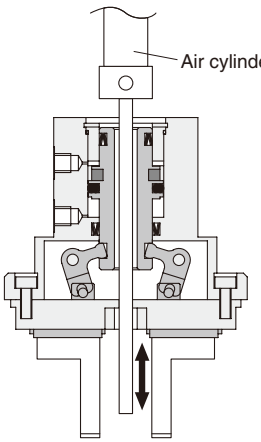


Application Examples

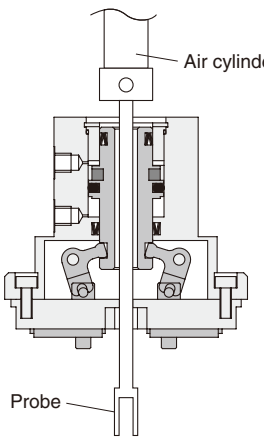
①Air blow



②Pusher

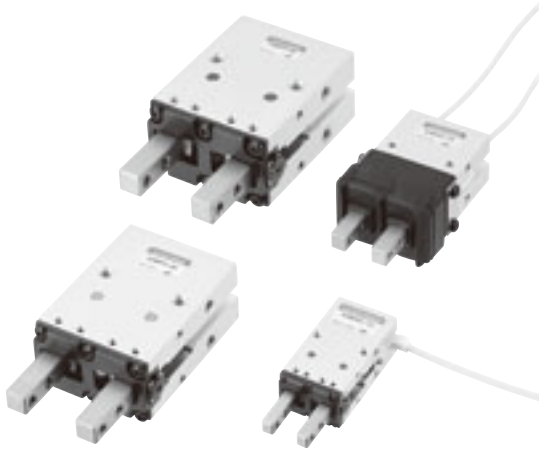


③Sensing

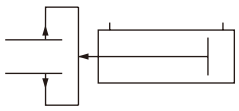


NHB SERIES
PARALLEL TYPE

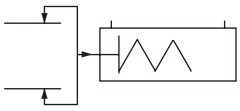
Cross Roller Bearing Specification
Double Acting Type, Single Acting Normally Open Type



Symbols



Double Acting Type



Single Acting
Normally Open Type

Specifications

●Double acting parallel type

Item \ Basic model		NHBDPA-6	NHBDPA-10	NHBDPA-16	NHBDPA-20	NHBDPA-25
Cylinder bore size mm [in.]		6 [0.236]	10 [0.394]	16 [0.630]	20 [0.787]	25 [0.984]
Operation type		Double acting type				
Media		Air				
Operating pressure range MPa [psi.]		0.22～0.7 [32～102]	0.18～0.7 [26～102]	0.12～0.7 [17～102]	0.1～0.7 [15～102]	
Proof pressure MPa [psi.]		1.05 [152]				
Operating temperature range °C [°F]		0～60 [32～140]				
Maximum operating frequency cycle/min		100	200			
Lubrication	Cylinder portion	Not required				
	Lever portion	Not required				
Maximum grip point length mm [in.]		20 [0.79]	50 [1.97]	60 [2.36]	80 [3.15]	100 [3.94]
Effective gripping force (F)Note N [lbf.]	Closed side	4.2 [0.94]	9.4 [2.11]	25.5 [5.73]	45.7 [10.27]	67 [15.06]
	Open side	5.6 [1.26]	14.6 [3.28]	34 [7.64]	60.9 [13.69]	87 [19.56]
Lever open/closed stroke mm [in.]		4 [0.157]		8 [0.315]	12 [0.472]	14 [0.551]
Repeatability mm [in.]		±0.01 [±0.0004]				
Port size		M3×0.5		M5×0.8		
Mass g [oz.]	Body	28 [0.99]	48 [1.69]	120 [4.23]	218 [7.69]	366 [12.91]
	Mounting bracket	—	11 [0.39]	19 [0.67]	26 [0.92]	51 [1.80]
	Rubber cover	—	NBR: 6 [0.21] Silicone: 6 [0.21] Fluoro rubber: 7 [0.25]	NBR: 8 [0.28] Silicone: 8 [0.28] Fluoro rubber: 10 [0.35]	NBR: 12 [0.42] Silicone: 12 [0.42] Fluoro rubber: 16 [0.56]	NBR: 15 [0.53] Silicone: 15 [0.53] Fluoro rubber: 20 [0.71]

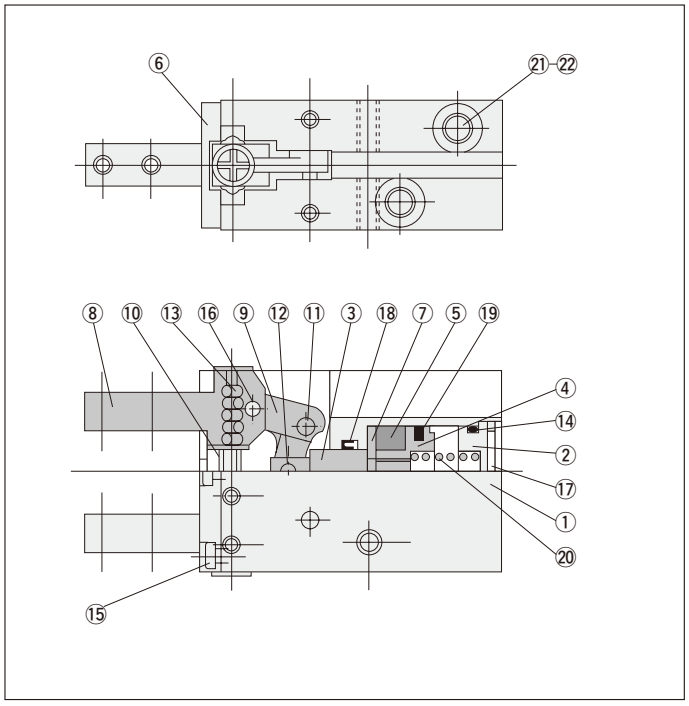
Note: Values are obtained when grip point length is 30mm [1.18in.] under operating pressure 0.5 MPa [73psi.]. For details of the effective gripping force, see the graphs on p.1387.
Remark: The life of rubber cover may vary from the air hand (gripper), depending on its operating conditions.

●Single acting normally open parallel type

Item \ Basic model		NHBRPA-6	NHBRPA-10	NHBRPA-16	NHBRPA-20	NHBRPA-25
Cylinder bore size mm [in.]		6 [0.236]	10 [0.394]	16 [0.630]	20 [0.787]	25 [0.984]
Operation type		Single acting normally open type				
Media		Air				
Operating pressure range MPa [psi.]		0.4～0.7 [58～102]	0.35～0.7 [51～102]	0.25～0.7 [36～102]		
Proof pressure MPa [psi.]		1.05 [152]				
Operating temperature range °C [°F]		0～60 [32～140]				
Maximum operating frequency cycle/min		100	200			
Lubrication	Cylinder portion	Not required				
	Lever portion	Not required				
Maximum grip point length mm [in.]		20 [0.79]	50 [1.97]	60 [2.36]	80 [3.15]	100 [3.94]
Effective gripping force (F)Note N [lbf.]	Closed side	1.3 [0.29]	4.9 [1.10]	21 [4.72]	36.4 [8.18]	54 [12.14]
	Open side	2.7 [0.61]	2 [0.45]	3.9 [0.88]	6.9 [1.55]	13.7 [3.08]
Lever open/closed stroke mm [in.]		4 [0.157]		8 [0.315]	12 [0.472]	14 [0.551]
Repeatability mm [in.]		±0.01 [±0.0004]				
Port size		M3×0.5		M5×0.8		
Mass g [oz.]	Body	27 [0.95]	49 [1.73]	121 [4.27]	220 [7.76]	368 [12.98]
	Mounting bracket	—	11 [0.39]	19 [0.67]	26 [0.92]	51 [1.80]
	Rubber cover	—	NBR: 6 [0.21] Silicone: 6 [0.21] Fluoro rubber: 7 [0.25]	NBR: 8 [0.28] Silicone: 8 [0.28] Fluoro rubber: 10 [0.35]	NBR: 12 [0.42] Silicone: 12 [0.42] Fluoro rubber: 16 [0.56]	NBR: 15 [0.53] Silicone: 15 [0.53] Fluoro rubber: 20 [0.71]

Note: Values are obtained when grip point length is 30mm [1.18in.] under operating pressure 0.5 MPa [73psi.]. For details of the effective gripping force, see the graphs on p.1387.
Remark: The life of rubber cover may vary from the air hand (gripper), depending on its operating conditions.

Inner Construction



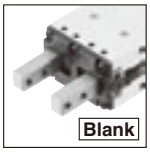
Major Parts and Materials

No.	Parts	Materials	Remarks
①	Body	Aluminum alloy	
②	Head cover	Aluminum alloy	
③	Piston rod	Stainless steel	
④	Piston	Aluminum alloy	
⑤	Magnet	Plastic magnet	
⑥	Cover	Steel	
⑦	Cover	Aluminum alloy	
⑧	Lever	Stainless steel	
⑨	Action lever	Steel	
⑩	Rail	Steel	
⑪	Fulcrum pin	Steel	
⑫	Press fit pin	Steel	
⑬	Cylindrical roller	Steel	
⑭	O-ring	Synthetic rubber (NBR)	
⑮	Cross recessed head screw	Mild steel	
⑯	Needle roller	Steel	
⑰	Snap ring	Steel	
⑱	Seal	Synthetic rubber (NBR)	
⑲	Seal	Synthetic rubber (NBR)	
⑳	Spring	Steel wire	Single acting type only
㉑	Plug	Brass	Single acting type only
㉒	Filter	Brass	Single acting type only

Order Codes

■ Rubber cover material

No rubber cover



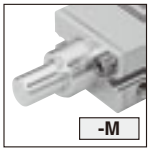
With rubber cover

●**-JN**: NBR (Black with blue mark)
●**-JF**: Fluoro rubber (Black with green mark)
●**-JS**: Silicone rubber (White)

■ Mounting bracket

No mounting bracket

With mounting bracket



★ Included at shipping

■ Sensor switch

No sensor switch

With **ZE135**

●Solid state type
●With indicator lamp
●DC10~28V
●2-lead wire
●Horizontal lead wire

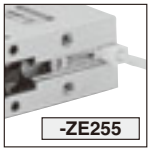
With **ZE155**

●Solid state type
●With indicator lamp
●DC4.5~28V
●3-lead wire
●Horizontal lead wire

With **ZE235**

●Solid state type
●With indicator lamp
●DC10~28V
●2-lead wire
●Vertical lead wire

With **ZE255**



●Solid state type
●With indicator lamp
●DC4.5~28V
●3-lead wire
●Vertical lead wire

Note: Select vertical lead wires ZE235 or ZE255 when using a sensor switch on the lever open side of NHB□PA Air Hands.

■ Lead wire length

A : 1000mm [39in.]
B : 3000mm [118in.]

■ Number of sensor switches (for air hands with sensor switches)

●**1** : With 1 sensor switch
●**2** : With 2 sensor switches
★Included at shipping

Additional Parts (To be ordered separately)

Mounting bracket

● For ϕ 10 [0.394in.] —**NHB-M10**
● For ϕ 16 [0.630in.] —**NHB-M16**
● For ϕ 20 [0.787in.] —**NHB-M20**
● For ϕ 25 [0.984in.] —**NHB-M25**

Rubber cover

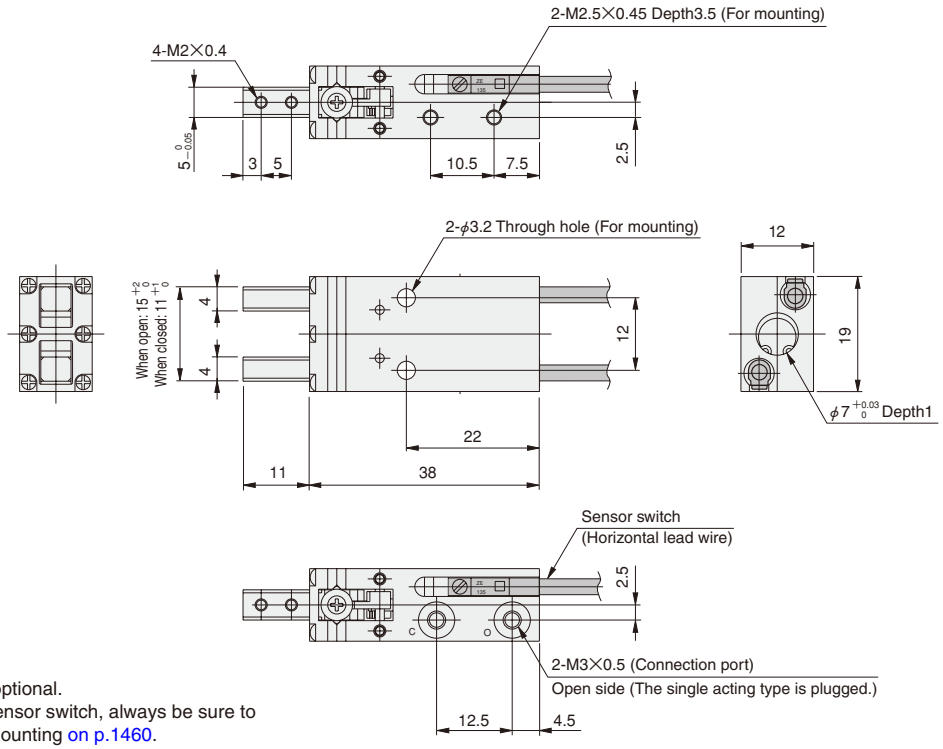
	Basic model	Cylinder bore size					
Double acting type	**NHBDPA**	**-6**	**-JN** **-JF** **-JS**	**-M**	**-ZE135** **-ZE155** **-ZE235** **-ZE255**	**A** **B**	**1** **2**
		-10 **-16** **-20** **-25**					
Single acting normally open type	**NHBRPA**	**-6**	**-JN** **-JF** **-JS**	**-M**	**-ZE135** **-ZE155** **-ZE235** **-ZE255**	**A** **B**	**1** **2**
		-10 **-16** **-20** **-25**					

□ **-NHBDPA** □

Rubber cover material
JN: NBR (Black with blue mark)
JF: Fluoro rubber (Black with green mark)
JS: Silicone rubber (White)

Bore size
10 : ϕ 10 [0.394in.]
16 : ϕ 16 [0.630in.]
20 : ϕ 20 [0.787in.]
25 : ϕ 25 [0.984in.]

NHB□PA-6

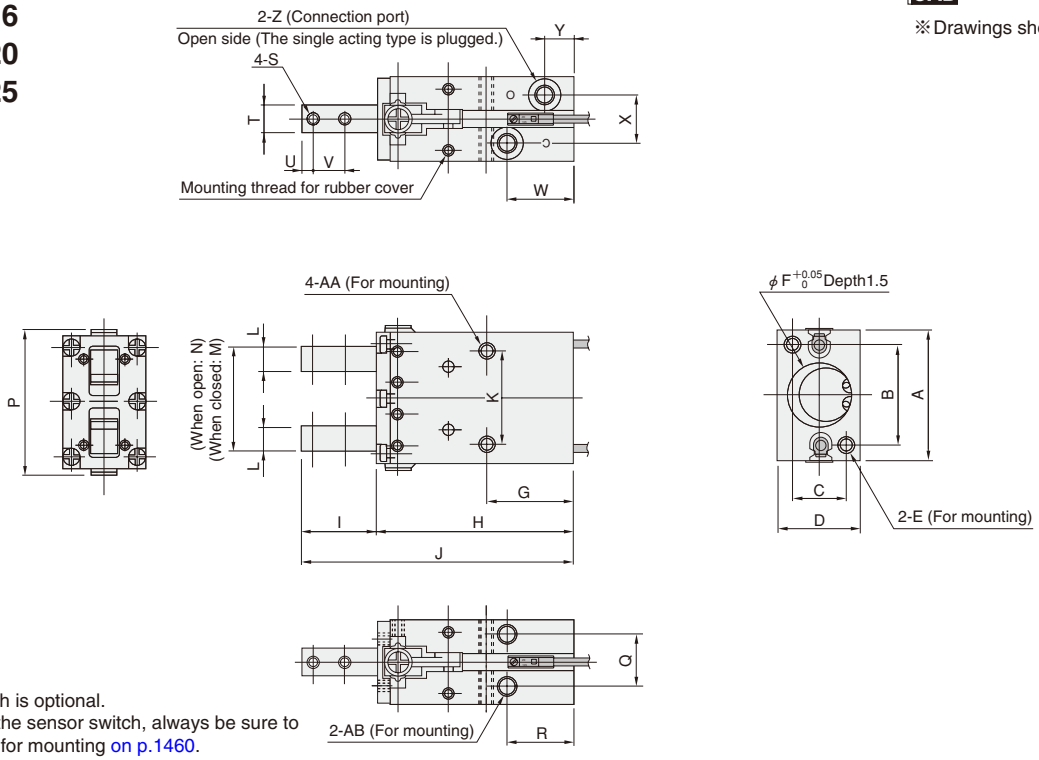


● The sensor switch is optional.
When mounting the sensor switch, always be sure to see the cautions for mounting on p.1460.

NHB□PA-10
NHB□PA-16
NHB□PA-20
NHB□PA-25

CAD NHBDPA Cylinder bore size

※Drawings show φ 16 [0.630in.].



● The sensor switch is optional.
When mounting the sensor switch, always be sure to see the cautions for mounting on p.1460.

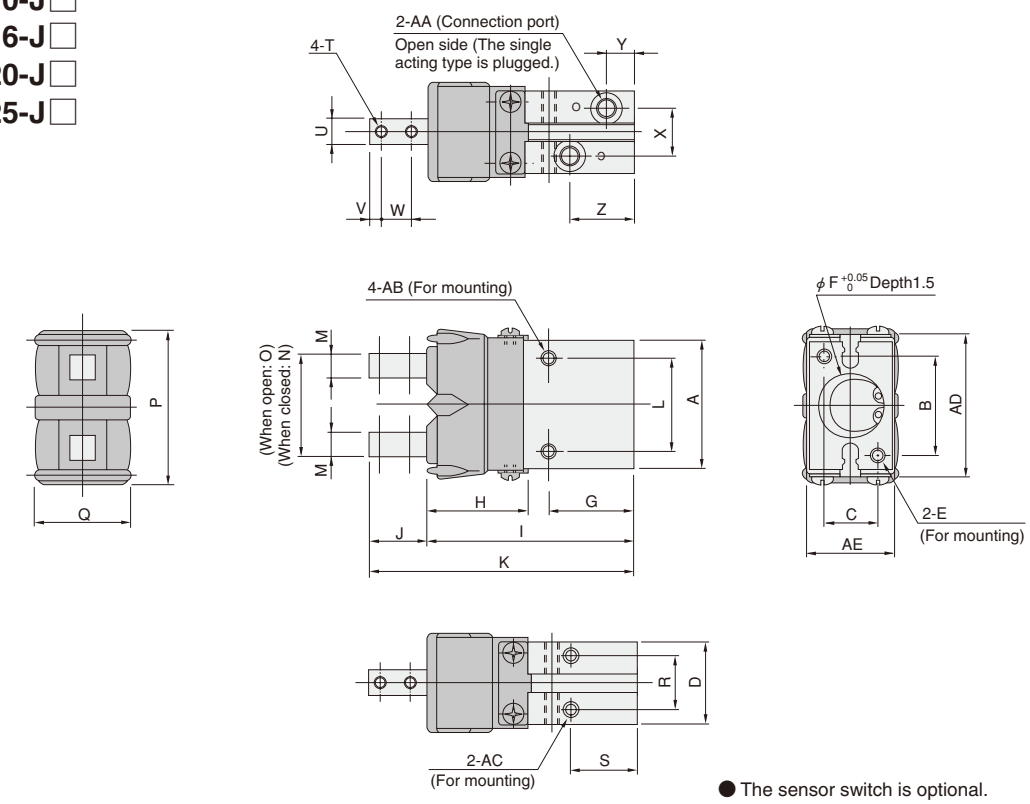
Model \ Code	A	B	C	D	E	F	G	H	I	J	K	L	M	N
NHB□PA-10	23	17	10	16	M3×0.5 Depth 5	11	20	43	16.5	59.5	18	4.5	13 ±0.4	17 +1.6 −0.2
NHB□PA-16	34	26	14	22	M4×0.7 Depth 7	17	23	52	19	71	24	6.5	18 +0.6 −0.2	26 +2.3 −0
NHB□PA-20	45	35	16	26	M5×0.8 Depth 8	21	26	60.5	23	83.5	30	8.5	24 +0.1 −0.9	36 +1.5 −0.9
NHB□PA-25	52	40	20	32	M6×1 Depth 10	26	30	68	27	95	36	10	28 ±0.4	42 +1.0 −0.7

P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB
25	10	16	M3×0.5	5.5 −0.03 0	3	6	15	10	7.5	M3×0.5	M3×0.5 Depth 5	M3×0.5 Depth 5
37.5	14	18	M3×0.5	7 −0.03 0	3	8	17.5	12	7.5	M5×0.8	M4×0.7 Depth 7	M4×0.7 Depth 7
49	16	19	M4×0.7	8 −0.04 0	4	10	20	13	8	M5×0.8	M5×0.8 Depth 8	M5×0.8 Depth 8
57.5	20	22	M5×0.8	10 −0.03 0	5	12	23	18	9	M5×0.8	M6×1 Depth 10	M6×1 Depth 10

Dimensions of Cross Roller Bearing Specification Parallel Type with Rubber Cover (mm)

NHB□PA-10-J□
NHB□PA-16-J□
NHB□PA-20-J□
NHB□PA-25-J□

※Drawings show ϕ 16 [0.630in.].



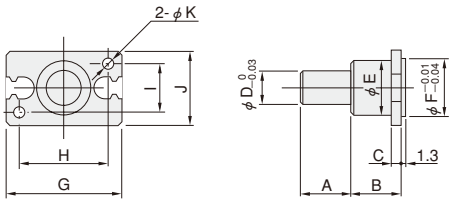
● The sensor switch is optional.
When mounting the sensor switch, always be sure to see the cautions for mounting on p.1460.

Model / Code	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
NHB□PA-10-J□	23	17	10	16	M3×0.5 Depth 5	11	20	22.5	46.5	13	59.5	18	4.5	$13^{\pm 0.4}$	$17^{+1.6}_{-0.2}$
NHB□PA-16-J□	34	26	14	22	M4×0.7 Depth 7	17	23	27.5	56	15	71	24	6.5	$18^{+0.6}_{-0.2}$	$26^{+2.3}_{0}$
NHB□PA-20-J□	45	35	16	26	M5×0.8 Depth 8	21	26	34	64.5	19	83.5	30	8.5	$24^{+0.1}_{-0.9}$	$36^{+1.5}_{-0.9}$
NHB□PA-25-J□	52	40	20	32	M6×1 Depth 10	26	30	38	73	22	95	36	10	$28^{\pm 0.4}$	$42^{+1.0}_{-0.7}$

P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE
27	20	10	16	M3×0.5	$5.5^{0}_{-0.03}$	3	6	10	7.5	15	M3×0.5	M3×0.5 Depth 5	M3×0.5 Depth 5	26.6	18
39	26	14	18	M3×0.5	$7^{0}_{-0.03}$	3	8	12	7.5	17.5	M5×0.8	M4×0.7 Depth 7	M4×0.7 Depth 7	37.6	24
51	30	16	19	M4×0.7	$8^{0}_{-0.04}$	4	10	13	8	20	M5×0.8	M5×0.8 Depth 8	M5×0.8 Depth 8	48.6	28
59	36	20	22	M5×0.8	$10^{0}_{-0.03}$	5	12	18	9	23	M5×0.8	M6×1 Depth 10	M6×1 Depth 10	55.6	34

Options

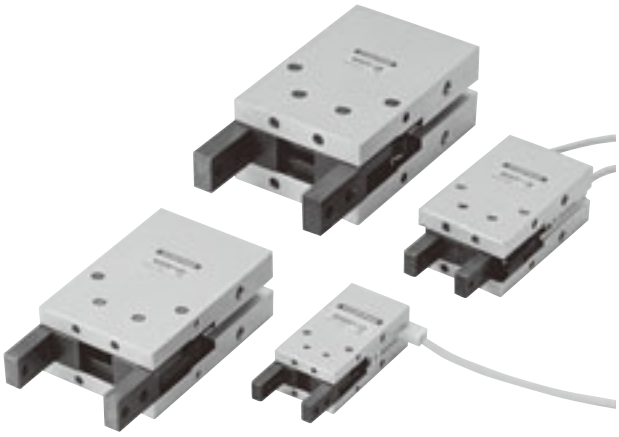
●Mounting bracket: **-M**



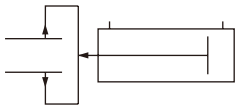
Model / Code	A	B	C	D	E	F	G	H	I	J	K
NHB-M10	15	15	3	10	11	11	23	17	10	16	3.4
NHB-M16	15	15	3	10	16	17	34	26	14	22	4.5
NHB-M20	15	15	3	10	18	21	45	35	16	26	5.5
NHB-M25	25	17	5	14	26	26	52	40	20	32	6.6

NHB SERIES
PARALLEL TYPE

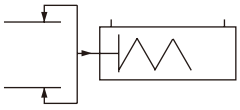
Plain Bearing Specification
Double Acting Type,
Single Acting Normally Open Type



Symbols



Double Acting Type



Single Acting
Normally Open Type

Specifications

●Double acting parallel type

Item \ Basic model		NHBDP-10	NHBDP-16	NHBDP-20	NHBDP-25
Cylinder bore size	mm [in.]	10 [0.394]	16 [0.630]	20 [0.787]	25 [0.984]
Operation type		Double acting type			
Media		Air			
Operating pressure range	MPa [psi.]	0.15～0.7 [22～102]	0.1～0.7 [15～102]		
Proof pressure	MPa [psi.]	1.05 [152]			
Operating temperature range	°C [°F]	0～60 [32～140]			
Maximum operating frequency	cycle/min	180			
Lubrication	Cylinder portion	Not required			
	Lever portion	Required (Apply grease to the sliding portion)			
Maximum grip point length	mm [in.]	30 [1.18]	40 [1.57]	60 [2.36]	70 [2.76]
Gripping force[Note 1] N [lbf.]	Closed side	7.8 [1.75]	23.5 [5.28]	46.1 [10.36]	76.5 [17.20]
	Open side	4.9 [1.10]	17.7 [3.98]	34.3 [7.71]	58.8 [13.22]
Lever open/closed stroke	mm [in.]	4 [0.157]	8 [0.315]	12 [0.472]	14 [0.551]
Port size		M3×0.5	M5×0.8		
Mass[Note 2]	g [oz.]	47 [1.66] (58 [2.05])	120 [4.23] (139 [4.90])	230 [8.11] (256 [9.03])	388 [13.69] (439 [15.49])

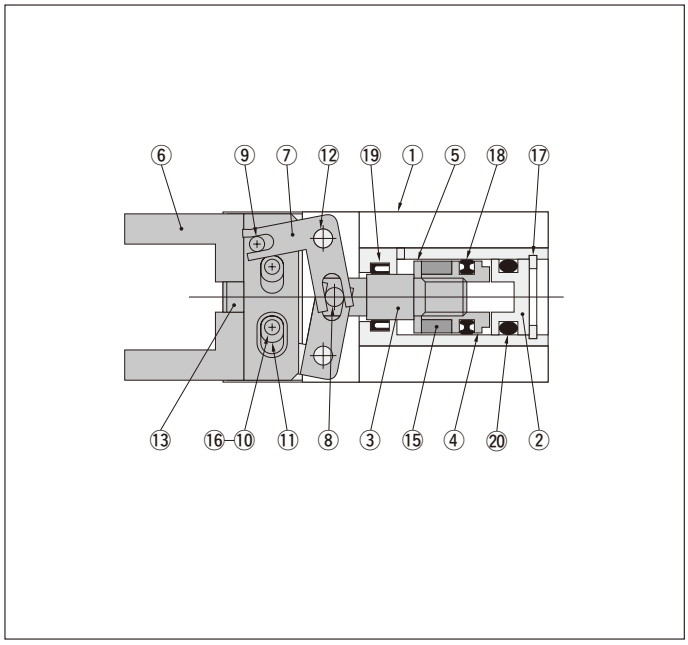
Notes: 1. Values are obtained when grip point length is 30mm [1.18in.] under operating pressure 0.5 MPa [73psi.]. For details of the effective gripping force, see the graphs on p.1387.
2. ( ) mean the mass with the mounting bracket: **-M**.

●Single acting normally open parallel type

Item \ Basic model		NHBRP-10	NHBRP-16	NHBRP-20	NHBRP-25
Cylinder bore size	mm [in.]	10 [0.394]	16 [0.630]	20 [0.787]	25 [0.984]
Operation type		Single acting normally open type			
Media		Air			
Operating pressure range	MPa [psi.]	0.35～0.7 [51～102]	0.25～0.7 [36～102]		
Proof pressure	MPa [psi.]	1.05 [152]			
Operating temperature range	°C [°F]	0～60 [32～140]			
Maximum operating frequency	cycle/min	180			
Lubrication	Cylinder portion	Not required			
	Lever portion	Required (Apply grease to the sliding portion)			
Maximum grip point length	mm [in.]	30 [1.18]	40 [1.57]	60 [2.36]	70 [2.76]
Gripping force[Note 1] N [lbf.]	Closed side	2.9 [0.65]	12.7 [2.85]	22.6 [5.08]	37.3 [8.39]
	Open side	2.0 [0.45]	3.9 [0.88]	6.9 [1.55]	13.7 [3.08]
Lever open/closed stroke	mm [in.]	4 [0.157]	8 [0.315]	12 [0.472]	14 [0.551]
Port size		M3×0.5	M5×0.8		
Mass[Note 2]	g [oz.]	48 [1.69] (59 [2.08])	121 [4.27] (140 [4.94])	232 [8.18] (258 [9.10])	392 [13.83] (443 [15.63])

Notes: 1. Values are obtained when grip point length is 30mm [1.18in.] under operating pressure 0.5 MPa [73psi.]. For details of the effective gripping force, see the graphs on p.1387.
2. ( ) mean the mass with the mounting bracket: **-M**.

Inner Construction



Note: Diagram shows the double acting type with the levers completely opened.

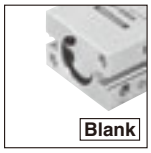
Major Parts and Materials

No.	Parts	Materials	Remarks
①	Body	Aluminum alloy	
②	Head cover	Aluminum alloy	
③	Piston rod	Stainless steel	
④	Piston	Aluminum alloy	
⑤	Magnet holder	Aluminum alloy	
⑥	Slide lever	Carbon steel	
⑦	Action lever	Carbon steel	
⑧	Rod pin	Carbon steel	
⑨	Slide pin	Carbon steel	
⑩	Slide guide pin	Carbon steel	
⑪	Ring	Carbon steel	
⑫	Fulcrum pin	Carbon steel	
⑬	Slide plate	Carbon steel	
⑭	Spring	Spring steel	Single acting type only
⑮	Magnet	Magnet material	
⑯	Hexagon socket setscrew	Mild steel	
⑰	C-shaped snap ring	Steel	
⑱	Piston seal	Synthetic rubber (NBR)	
⑲	Rod seal	Synthetic rubber (NBR)	
⑳	O-ring	Synthetic rubber (NBR)	

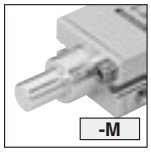
Order Codes

■Mounting bracket

No mounting bracket



With mounting bracket



★ Included at shipping

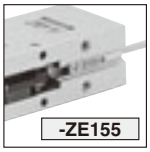
■Sensor switch

No sensor switch

With **ZE135**

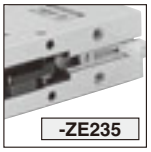
- Solid state type
- With indicator lamp
- DC10～28V
- 2-lead wire
- Horizontal lead wire

With **ZE155**



- Solid state type
- With indicator lamp
- DC4.5～28V
- 3-lead wire
- Horizontal lead wire

With **ZE235**



- Solid state type
- With indicator lamp
- DC10～28V
- 2-lead wire
- Vertical lead wire

With **ZE255**

- Solid state type
- With indicator lamp
- DC4.5～28V
- 3-lead wire
- Vertical lead wire

■Lead wire length

A : 1000mm [39in.]
B : 3000mm [118in.]

■Number of sensor switches
(for air hands with sensor switches)

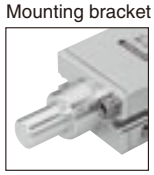
- **1** : With 1 sensor switch
- **2** : With 2 sensor switches

★Included at shipping

	Basic model	Cylinder bore size				
Double acting type	**NHBDP**	**-10** **-16** **-20** **-25**	**-M**	**-ZE135** **-ZE155** **-ZE235** **-ZE255**	**A** **B**	**1** **2**
Single acting normally open type	**NHBRP**	**-10** **-16** **-20** **-25**	**-M**	**-ZE135** **-ZE155** **-ZE235** **-ZE255**	**A** **B**	**1** **2**

Additional Parts (To be ordered separately)

Mounting bracket

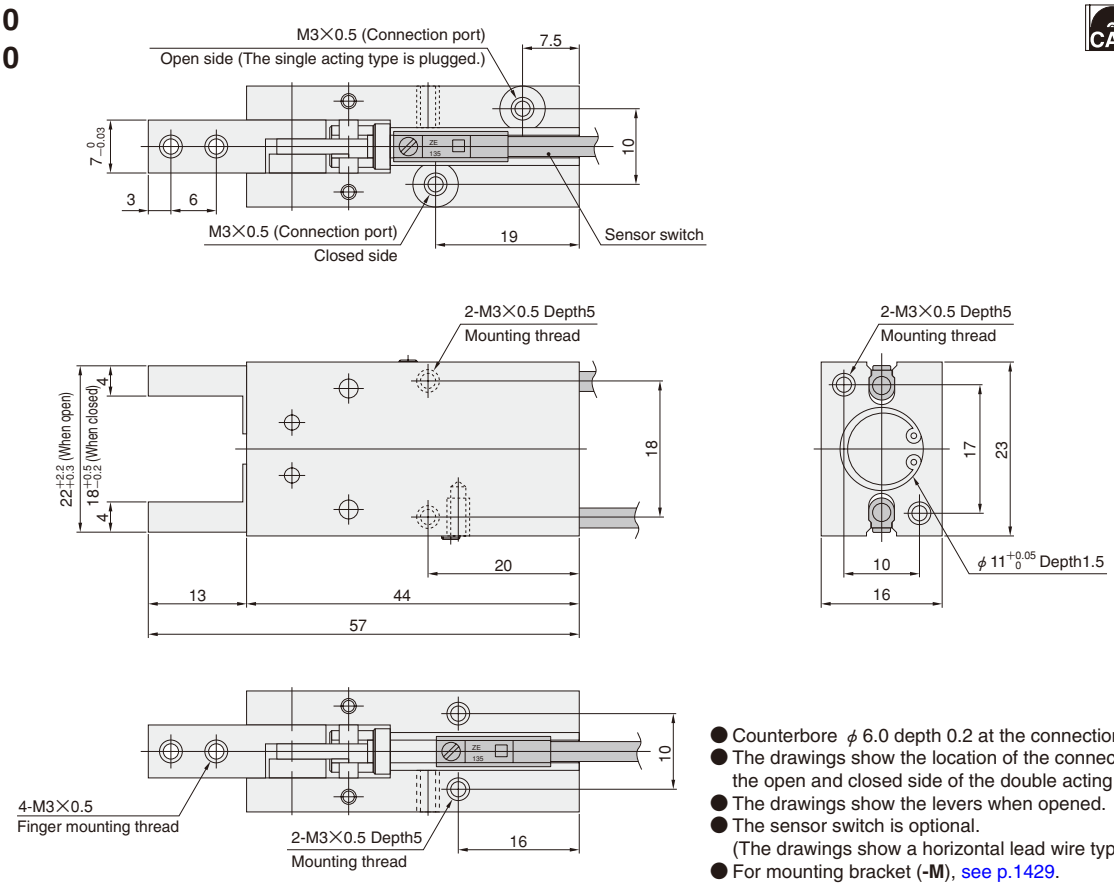


- For ϕ 10 [0.394in.] —**NHB-M10**
- For ϕ 16 [0.630in.] —**NHB-M16**
- For ϕ 20 [0.787in.] —**NHB-M20**
- For ϕ 25 [0.984in.] —**NHB-M25**

Dimensions of Parallel Type Plain Bearing Specification (mm)

NHBDP-10
NHBRP-10

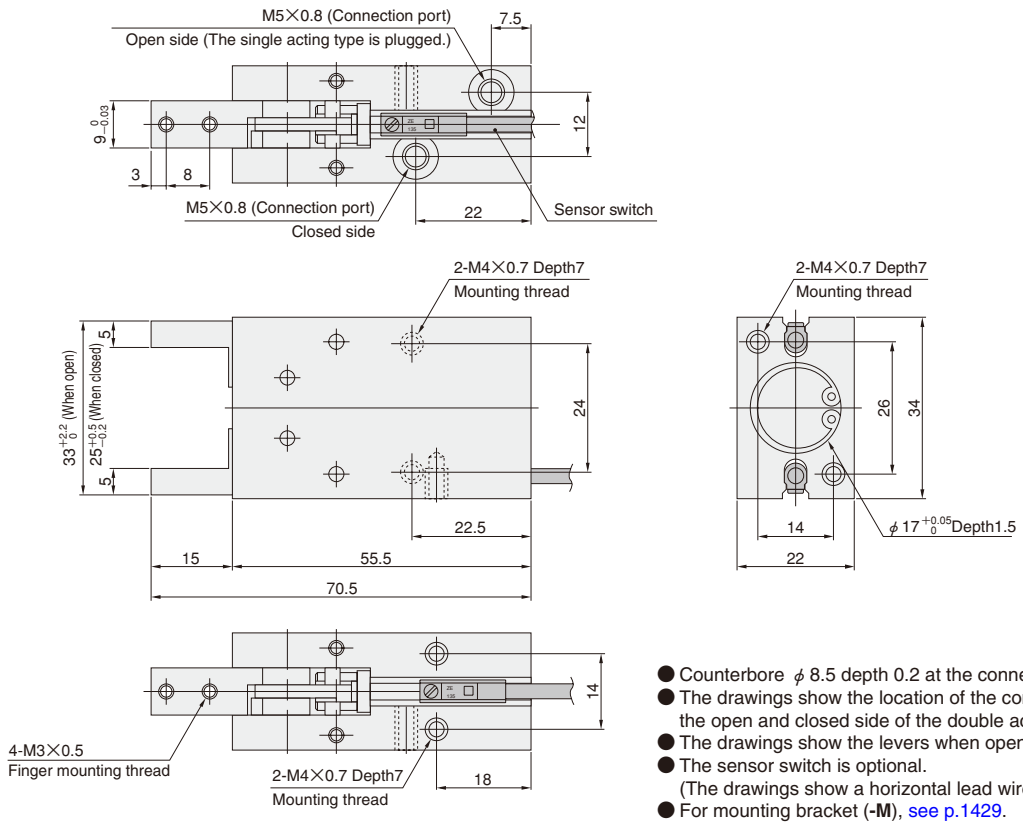
NHBDP10



- Counterbore ϕ 6.0 depth 0.2 at the connection port.
- The drawings show the location of the connection ports for the open and closed side of the double acting type.
- The drawings show the levers when opened.
- The sensor switch is optional. (The drawings show a horizontal lead wire type.)
- For mounting bracket (**-M**), see p.1429.

NHBDP-16
NHBRP-16

NHBDP16

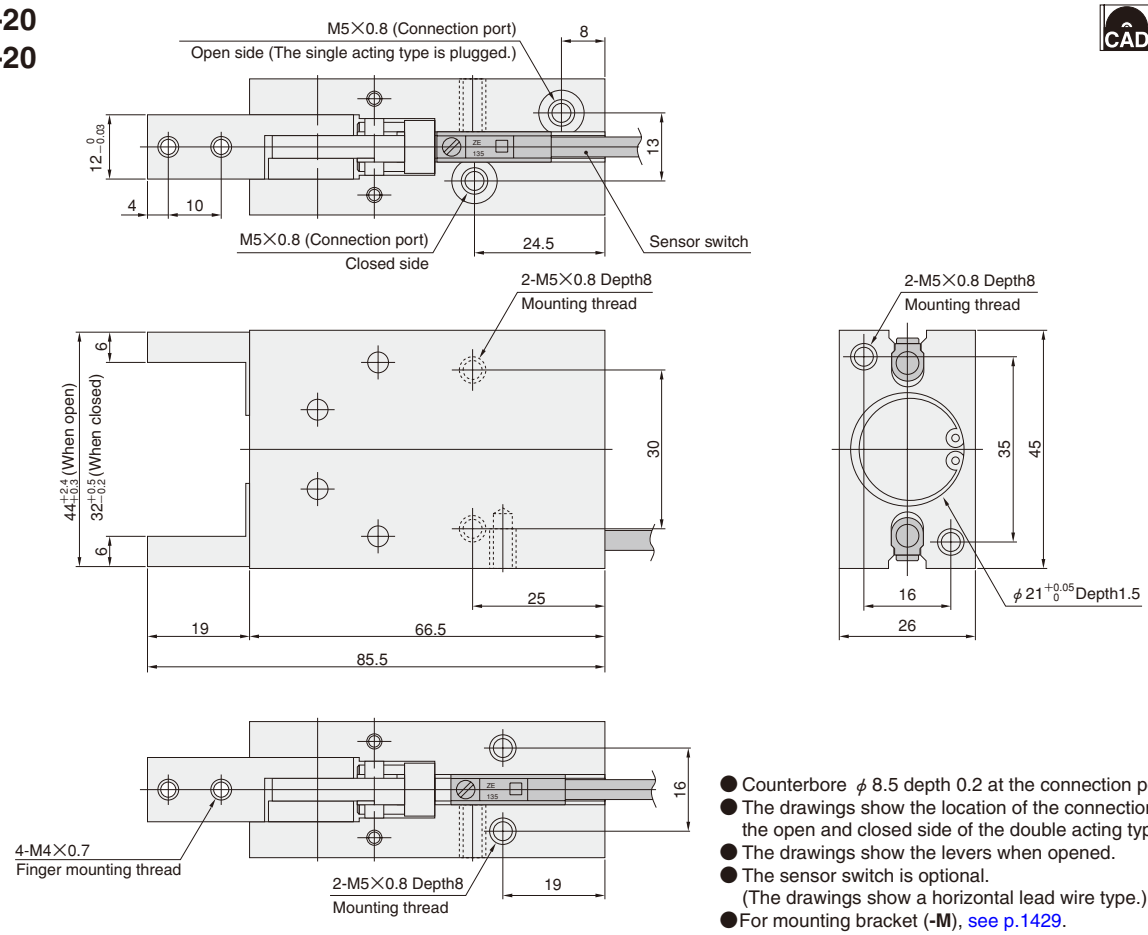


- Counterbore ϕ 8.5 depth 0.2 at the connection port.
- The drawings show the location of the connection ports for the open and closed side of the double acting type.
- The drawings show the levers when opened.
- The sensor switch is optional. (The drawings show a horizontal lead wire type.)
- For mounting bracket (**-M**), see p.1429.

Dimensions of Parallel Type Plain Bearing Specification (mm)

NHBDP-20
NHBRP-20

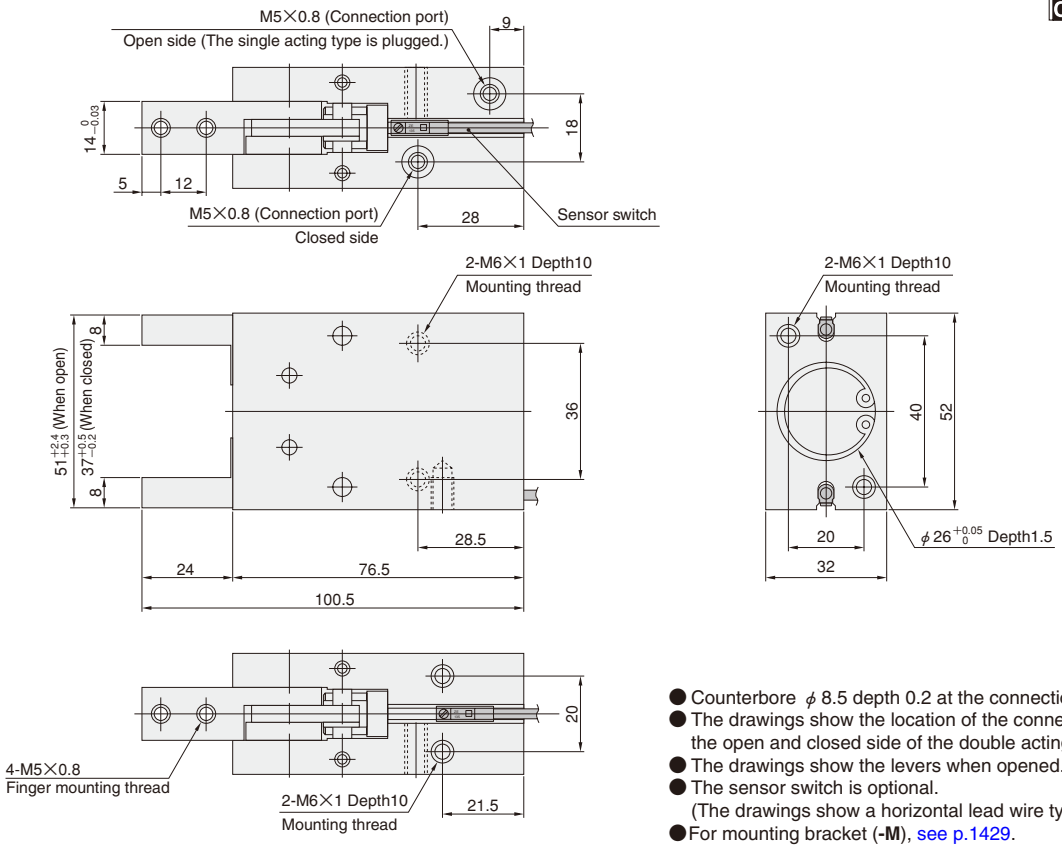
NHBDP20



- Counterbore ϕ 8.5 depth 0.2 at the connection port.
- The drawings show the location of the connection ports for the open and closed side of the double acting type.
- The drawings show the levers when opened.
- The sensor switch is optional.
  (The drawings show a horizontal lead wire type.)
- For mounting bracket (**-M**), see p.1429.

NHBDP-25
NHBRP-25

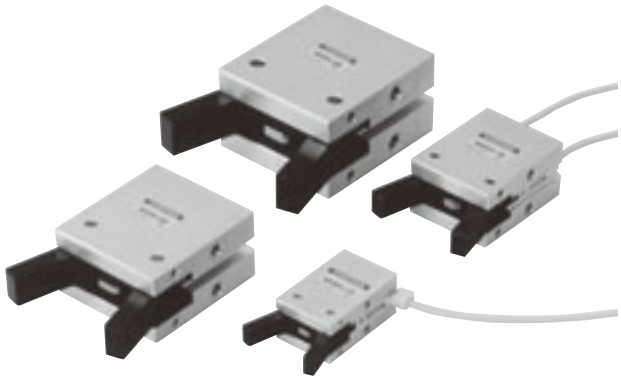
NHBDP25



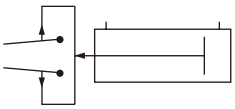
- Counterbore ϕ 8.5 depth 0.2 at the connection port.
- The drawings show the location of the connection ports for the open and closed side of the double acting type.
- The drawings show the levers when opened.
- The sensor switch is optional.
  (The drawings show a horizontal lead wire type.)
- For mounting bracket (**-M**), see p.1429.

NHB SERIES
SWING TYPE

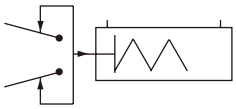
Double Acting Type,
Single Acting Normally Open Type



Symbols



Double Acting Type



Single Acting
Normally Open Type

Specifications

●Double acting swing type

Item \ Basic model		NHBDS-8	NHBDS-10	NHBDS-16	NHBDS-20	NHBDS-25
Cylinder bore size mm [in.]		8 [0.315]	10 [0.394]	16 [0.630]	20 [0.787]	25 [0.984]
Operation type		Double acting type				
Media		Air				
Operating pressure range MPa [psi.]		0.22～0.7 [32～102]	0.1～0.7 [15～102]			
Proof pressure MPa [psi.]		1.05 [152]				
Operating temperature range °C [°F]		0～60 [32～140]				
Maximum operating frequency cycle/min		100	180			
Lubrication	Cylinder portion	Not required				
	Lever portion	Required (Apply grease to the sliding portion)				
Theoretical gripping moment (M)[Note1] N・cm [in・lbf]	Closed side	9×P [0.0055×P]	17×P [0.0104×P]	90×P [0.0549×P]	170×P [0.104×P]	340×P [0.208×P]
	Open side	15×P [0.0092×P]	27×P [0.0165×P]	120×P [0.0732×P]	230×P [0.140×P]	440×P [0.269×P]
Maximum grip point length[Note2] mm [in.]		30 [1.18]		40 [1.57]	60 [2.36]	70 [2.76]
Effective gripping force (F)[Note1] N [lbf.]		F=M/L×8.5 [F=M/L×0.85]				
Lever open/closed angles		–10°～+30°				
Port size		M3×0.5		M5×0.8		
Mass[Note3] g [oz.]		23 [0.81] (28 [0.99])	40 [1.41] (51 [1.80])	96 [3.39] (115 [4.06])	180 [6.35] (206 [7.27])	313 [11.04] (364 [12.84])

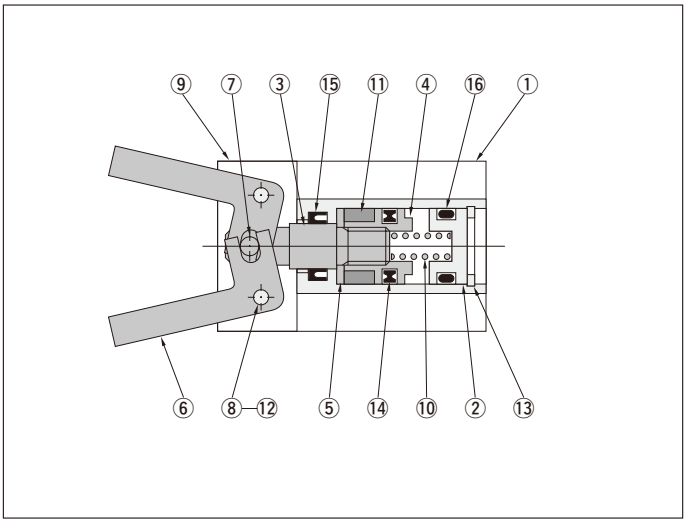
Notes: 1. F: Effective gripping force, M: Theoretical gripping moment, P: Operating pressure MPa [psi.], L: Grip point length mm [in.]. Values of P and L should vary from SI unit to imperial units. For details of the effective gripping force, see the graphs on p.1388.
2. The grip point length is measured from the fulcrum pin.
3. ( ) mean the mass with the mounting bracket: **-M**.

●Single acting normally open swing type

Item \ Basic model		NHBRS-8	NHBRS-10	NHBRS-16	NHBRS-20	NHBRS-25
Cylinder bore size mm [in.]		8 [0.315]	10 [0.394]	16 [0.630]	20 [0.787]	25 [0.984]
Operation type		Single acting normally open type				
Media		Air				
Operating pressure range MPa [psi.]		0.36～0.7 [52～102]	0.3～0.7 [44～102]	0.2～0.7 [29～102]		
Proof pressure MPa [psi.]		1.05 [152]				
Operating temperature range °C [°F]		0～60 [32～140]				
Maximum operating frequency cycle/min		100	180			
Lubrication	Cylinder portion	Not required				
	Lever portion	Required (Apply grease to the sliding portion)				
Theoretical gripping moment (M)[Note1] N・cm [in・lbf]	Closed side	9×P−2.5 [0.0055×P−0.22]	17×P−3.4 [0.0104×P−0.30]	90×P−9.8 [0.0549×P−0.87]	170×P−20.5 [0.104×P−1.81]	340×P−35.3 [0.208×P−3.12]
	Open side	2.5 [0.22]	3.4 [0.30]	9.8 [0.87]	20.5 [1.81]	35.3 [3.12]
Maximum grip point length[Note2] mm [in.]		30 [1.18]		40 [1.57]	60 [2.36]	70 [2.76]
Effective gripping force (F)[Note1] N [lbf.]		F=M/L×8.5 [F=M/L×0.85]				
Lever open/closed angles		−10°～+30°				
Port size		M3×0.5		M5×0.8		
Mass[Note3] g [oz.]		23 [0.81] (28 [0.99])	40 [1.41] (51 [1.80])	96 [3.39] (115 [4.06])	182 [6.42] (208 [7.34])	317 [11.18] (368 [12.98])

Notes: 1. F: Effective gripping force, M: Theoretical gripping moment, P: Operating pressure MPa [psi.], L: Grip point length mm [in.]. Values of P and L should vary from SI unit to imperial units. For details of the effective gripping force, see the graphs on p.1388.
2. The grip point length is measured from the fulcrum pin.
3. ( ) mean the mass with the mounting bracket: **-M**.

Inner Construction



Major Parts and Materials

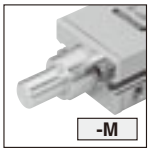
No.	Parts	Materials	Remarks
①	Body	Aluminum alloy	
②	Head cover	Aluminum alloy	
③	Piston rod	Stainless steel	
④	Piston	Aluminum alloy	
⑤	Magnet holder	Aluminum alloy	
⑥	Lever	Chrome molybdenum steel	
⑦	Rod pin	Carbon steel	
⑧	Fulcrum pin	Carbon steel	
⑨	Slide plate	Carbon steel	
⑩	Spring	Spring steel	Single acting type only
⑪	Magnet	Magnet material	
⑫	Hexagon socket setscrew	Mild steel	
⑬	C-shaped snap ring	Steel	
⑭	Piston seal	Synthetic rubber (NBR)	
⑮	Rod seal	Synthetic rubber (NBR)	
⑯	O-ring	Synthetic rubber (NBR)	

Order Codes

■Mounting bracket

No mounting bracket

With mounting bracket



★ Included at shipping

■Sensor switch

No sensor switch

With **ZE135**

- Solid state type
- With indicator lamp
- DC10~28V
- 2-lead wire
- Horizontal lead wire

With **ZE155**

- Solid state type
- With indicator lamp
- DC4.5~28V
- 3-lead wire
- Horizontal lead wire

With **ZE235**

- Solid state type
- With indicator lamp
- DC10~28V
- 2-lead wire
- Vertical lead wire

With **ZE255**

- Solid state type
- With indicator lamp
- DC4.5~28V
- 3-lead wire
- Vertical lead wire

■Lead wire length

A : 1000mm [39in.]
B : 3000mm [118in.]

■Number of sensor switches (for air hands with sensor switches)

- **1** : With 1 sensor switch
- **2** : With 2 sensor switches

★Included at shipping

	Basic model	Cylinder bore size				
Double acting type	**NHBDS**	**-8** **-10** **-16** **-20** **-25**	**-M**	**-ZE135** **-ZE155** **-ZE235** **-ZE255**	**A** **B**	**1** **2**
Single acting normally open type	**NHBRS**	**-8** **-10** **-16** **-20** **-25**	**-M**	**-ZE135** **-ZE155** **-ZE235** **-ZE255**	**A** **B**	**1** **2**

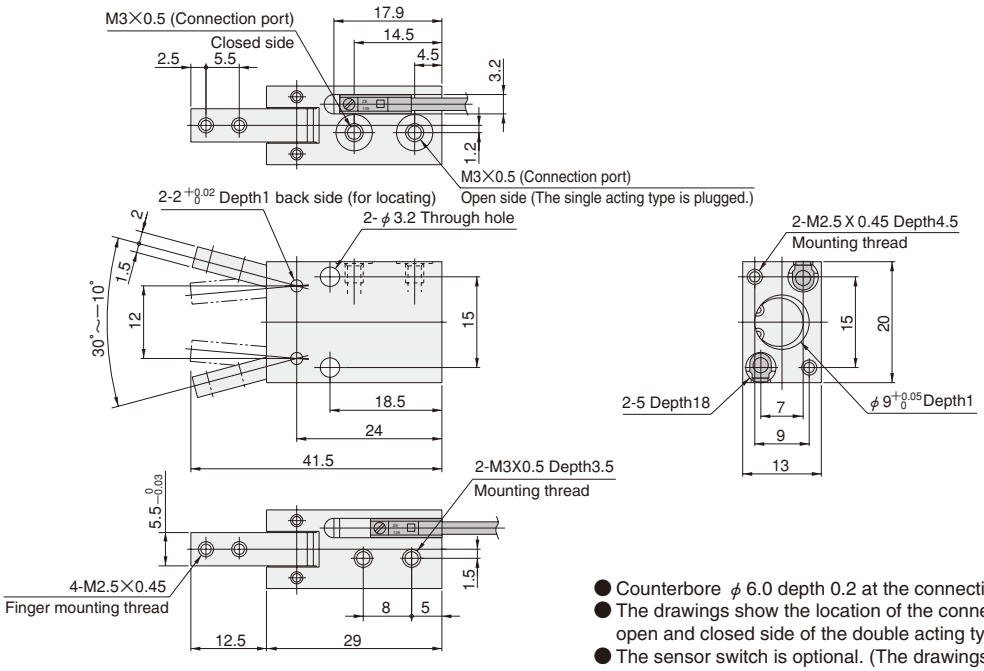
Additional Parts (To be ordered separately)

Mounting bracket

- For ϕ 8 [0.315in.] —**NHB-M8**
- For ϕ 10 [0.394in.] —**NHB-M10**
- For ϕ 16 [0.630in.] —**NHB-M16**
- For ϕ 20 [0.787in.] —**NHB-M20**
- For ϕ 25 [0.984in.] —**NHB-M25**

Dimensions of Swing Type (mm)

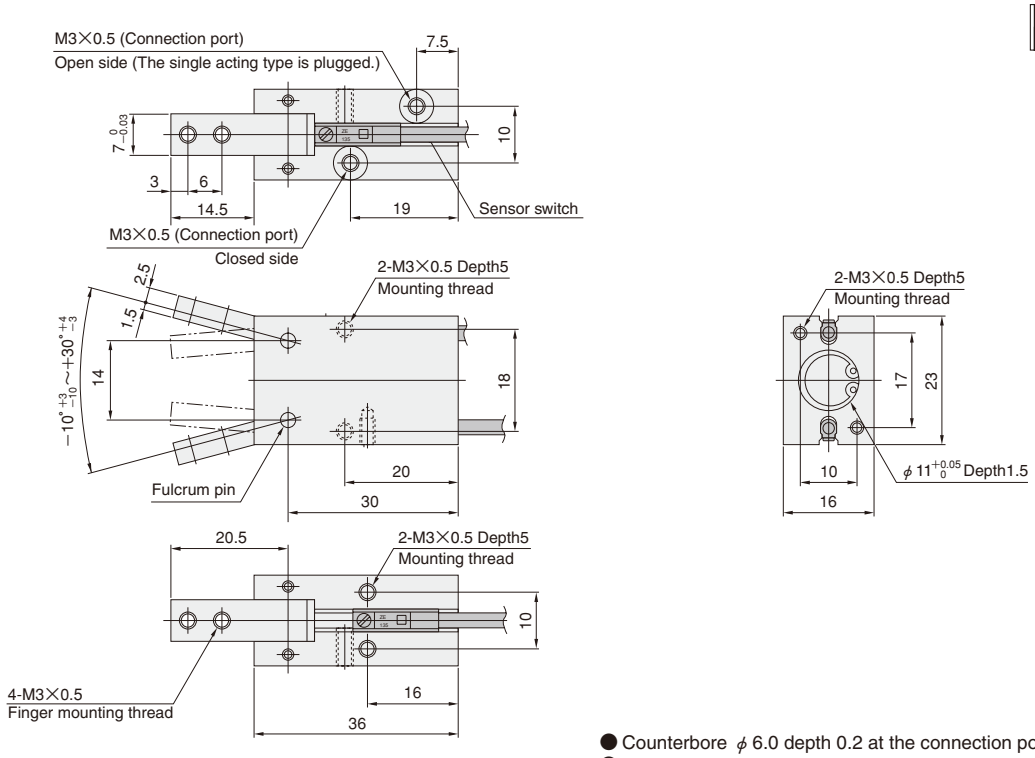
NHBDS-8
NHBRS-8



- Counterbore ϕ 6.0 depth 0.2 at the connection port.
- The drawings show the location of the connection ports for the open and closed side of the double acting type.
- The sensor switch is optional. (The drawings show a horizontal lead wire type.) When mounting the sensor switch, always be sure to see the cautions for mounting on p.1460.
- For mounting bracket (**-M**), see p.1438.

NHBDS-10
NHBRS-10

NHBDS10

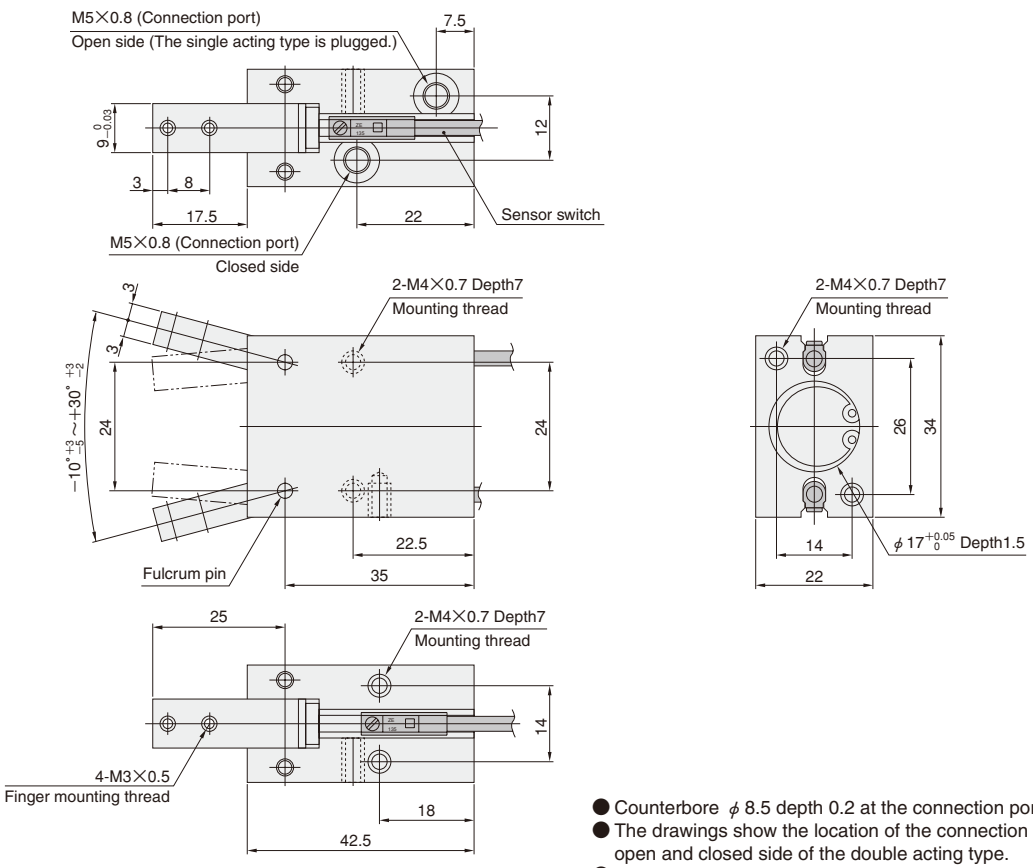


- Counterbore ϕ 6.0 depth 0.2 at the connection port.
- The drawings show the location of the connection ports for the open and closed side of the double acting type.
- The sensor switch is optional. (The drawings show a horizontal lead wire type.) When mounting the sensor switch always be sure to see the cautions for mounting on p.1460.
- For mounting bracket (**-M**), see p.1438.

Dimensions of Swing Type (mm)

NHBDS-16
NHBRS-16

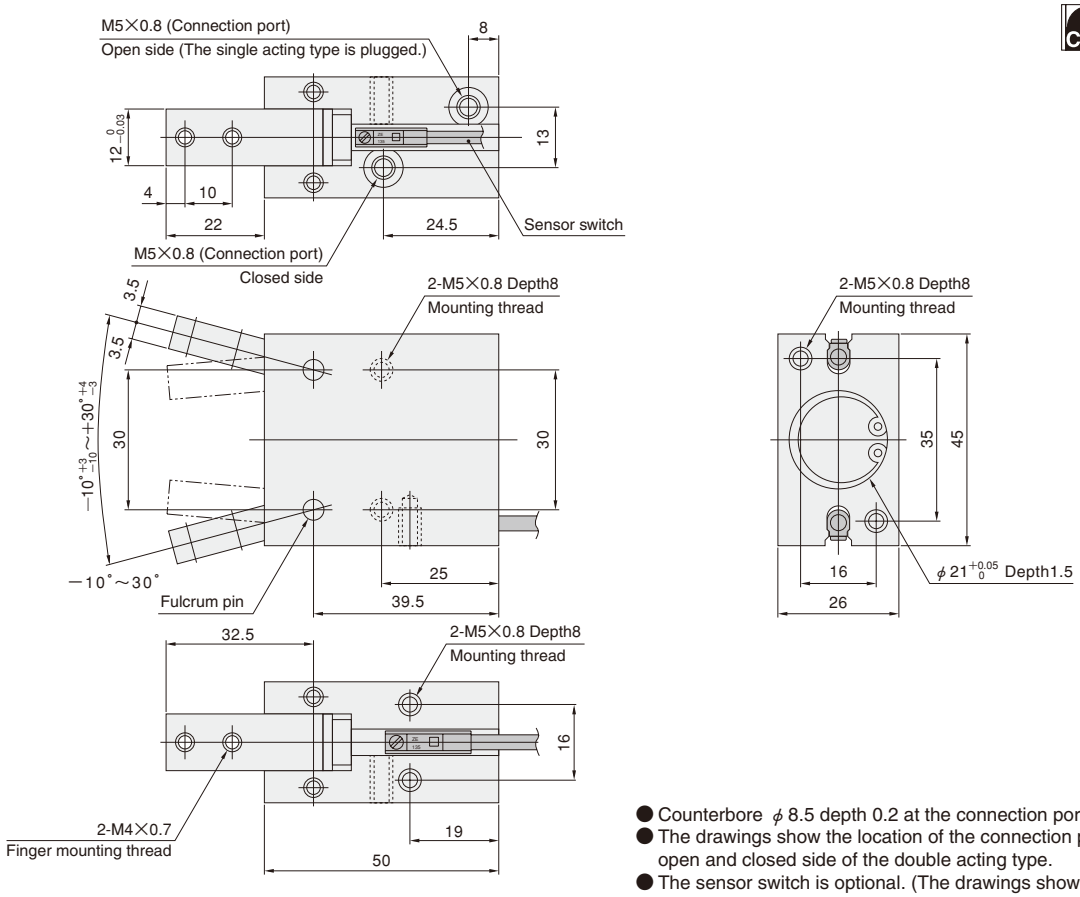
NHBDS16



- Counterbore ϕ 8.5 depth 0.2 at the connection port.
- The drawings show the location of the connection ports for the open and closed side of the double acting type.
- The sensor switch is optional. (The drawings show a horizontal lead wire type.) When mounting the sensor switch, always be sure to see the cautions for mounting on p.1460.
- For mounting bracket (**-M**), see p.1438.

NHBDS-20
NHBRS-20

NHBDS20

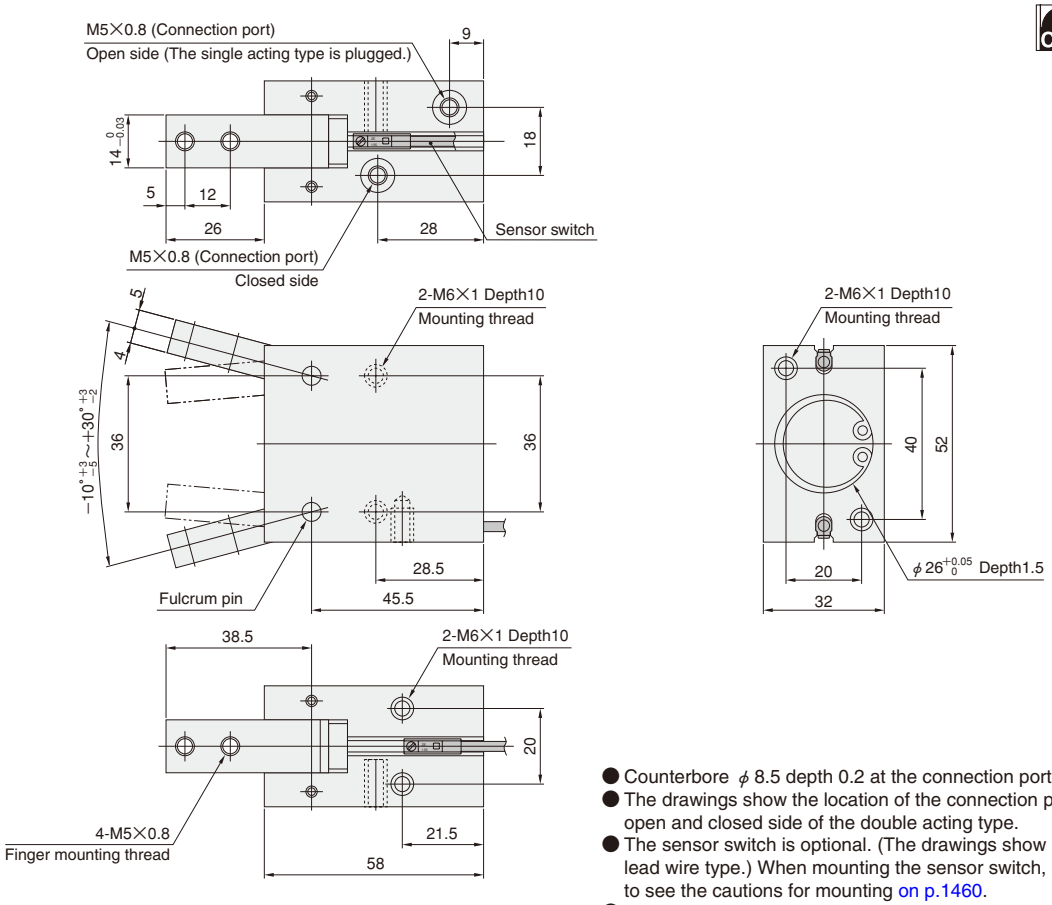


- Counterbore ϕ 8.5 depth 0.2 at the connection port.
- The drawings show the location of the connection ports for the open and closed side of the double acting type.
- The sensor switch is optional. (The drawings show a horizontal lead wire type.) When mounting the sensor switch, always be sure to see the cautions for mounting on p.1460.
- For mounting bracket (**-M**), see p.1438.

Dimensions of Swing Type (mm)

NHBDS-25
NHBRS-25

NHBDS25



- Counterbore ϕ 8.5 depth 0.2 at the connection port.
- The drawings show the location of the connection ports for the open and closed side of the double acting type.
- The sensor switch is optional. (The drawings show a horizontal lead wire type.) When mounting the sensor switch, always be sure to see the cautions for mounting on p.1460.
- For mounting bracket (**-M**), see below.

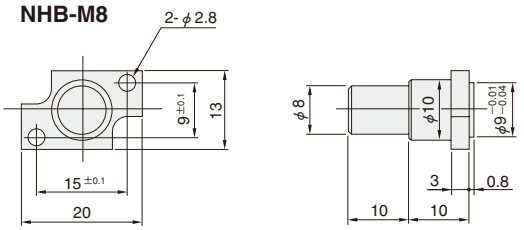
Options

HAND Note

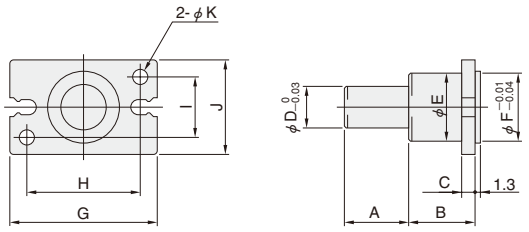
Note: Except NHB-M8 and NHB-M12.

● Mounting bracket: **-M**

NHB-M8



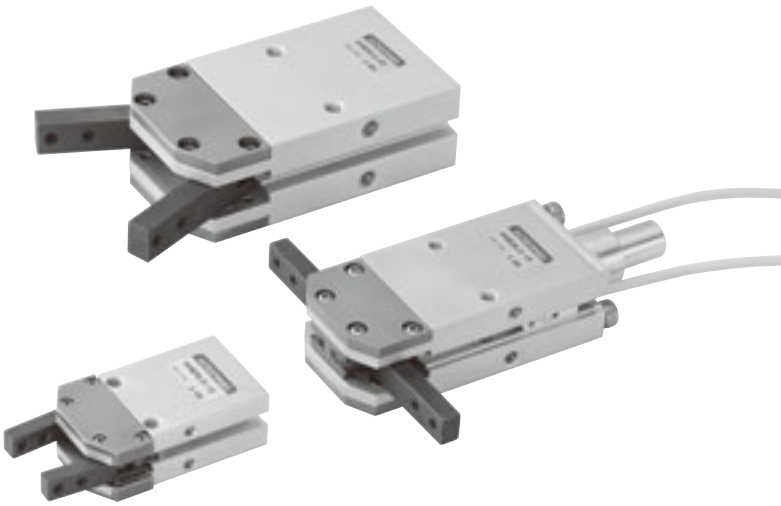
NHB-M10～25



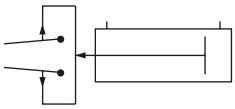
Model \ Code	A	B	C	D	E	F	G	H	I	J	K
NHB-M10	15	15	3	10	11	11	23	17	10	16	3.4
NHB-M12	15	15	3	10	12	13	27	20	10	16	3.4
NHB-M16	15	15	3	10	16	17	34	26	14	22	4.5
NHB-M20	15	15	3	10	18	21	45	35	16	26	5.5
NHB-M25	25	17	5	14	26	26	52	40	20	32	6.6

NHB SERIES
SWING TYPE

High Precision, 180° Open Specification



Symbol



Double Acting Type

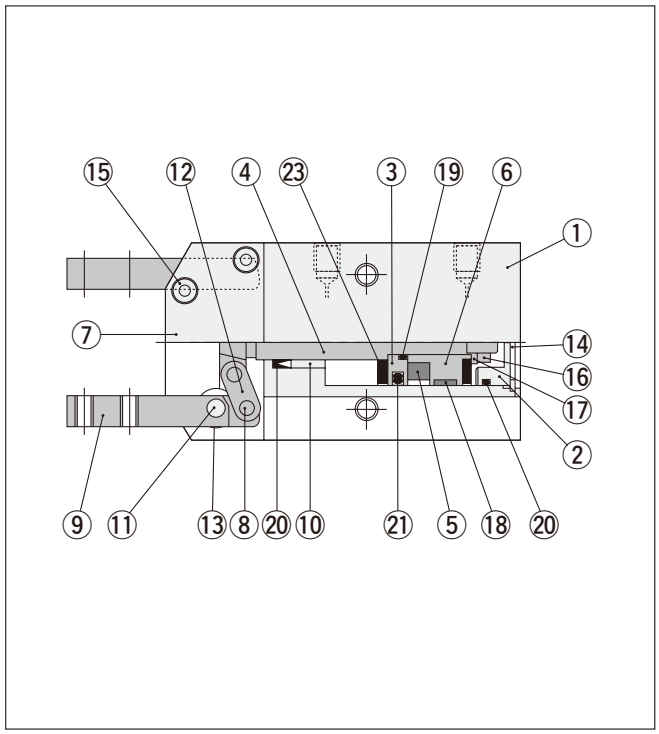
Specifications

●Double acting swing type

Item \ Basic model		NHBDSLG-12	NHBDSLG-16	NHBDSLG-20
Cylinder bore size mm [in.]		12 [0.472]	16 [0.630]	20 [0.984]
Operation type		Double acting type		
Media		Air		
Operating pressure range MPa [psi.]		0.2～0.7 [29～102]		
Proof pressure MPa [psi.]		1.05 [152]		
Operating temperature range °C [°F]		0～60 [32～140]		
Maximum operating frequency cycle/min		100		
Lubrication	Cylinder portion	Not required		
	Lever portion	Required (Apply grease to the sliding portion)		
Effective gripping force[Note] N [lbf.]	Open	20/L [0.177/L]	55/L [0.487/L]	113/L [1.000/L]
	Closed	24/L [0.212/L]	64/L [0.566/L]	134/L [1.19/L]
Lever open/closed angles		−6°±3°～180°±5°		
Port size		M3×0.5	M5×0.8	
Mass g [oz.]		63 [2.22] (73 [2.57])	168 [5.93] (187 [6.60])	312 [11.01] (338 [11.92])

Notes: 1. L expresses the length (mm [in.]) from the fulcrum pin to grip point. (Gripping at lever in parallel state) For details of the effective gripping force, see the graphs on p. 1388.
2. ( ) means the mass with the mounting bracket: **-M**.

Inner Construction



Major Parts and Materials

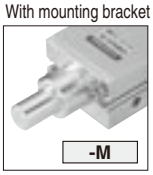
No.	Parts	Materials	Remarks
①	Body	Aluminum alloy	
②	Head cover	Aluminum alloy	
③	Piston	Aluminum alloy	
④	Piston rod	Stainless steel	
⑤	Magnet	Plastic magnet	
⑥	Magnet holder	Aluminum alloy	
⑦	Cover	Stainless steel	
⑧	Press fit pin	Steel	
⑨	Lever	Steel	
⑩	Metal	Oil impregnated copper alloy	
⑪	Fulcrum pin	Steel	
⑫	Link	Steel	
⑬	Bearing	Steel	
⑭	Internal snap ring	Steel	
⑮	Cross recessed round head screw	Stainless steel	
⑯	Hexagon nut	Stainless steel	
⑰	Spring washer	Stainless steel	
⑱	Wear ring	Plastic	Only ϕ 16 [0.630in.] and ϕ 20 [0.787in.]
⑲	O-ring	Synthetic rubber (NBR)	
⑳	O-ring	Synthetic rubber (NBR)	
㉑	Seal	Synthetic rubber (NBR)	
㉒	Seal	Synthetic rubber (NBR)	
㉓	Bumper	Synthetic rubber (NBR)	Only ϕ 16 [0.630in.] and ϕ 20 [0.787in.]

Order Codes

■Mounting bracket

No mounting bracket

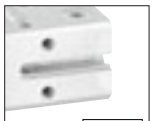
With mounting bracket



★ Included at shipping

■Sensor switch

No sensor switch



With **ZE135**

- Solid state type
- With indicator lamp
- DC10～28V
- 2-lead wire
- Horizontal lead wire

With **ZE155**

- Solid state type
- With indicator lamp
- DC4.5～28V
- 3-lead wire
- Horizontal lead wire

With **ZE235**

- Solid state type
- With indicator lamp
- DC10～28V
- 2-lead wire
- Vertical lead wire

With **ZE255**

- Solid state type
- With indicator lamp
- DC4.5～28V
- 3-lead wire
- Vertical lead wire

■Lead wire length

A : 1000mm [39in.]
B : 3000mm [118in.]

■Number of sensor switches (for air hands with sensor switches)

- **1** : With 1 sensor switch
- **2** : With 2 sensor switches

★Included at shipping

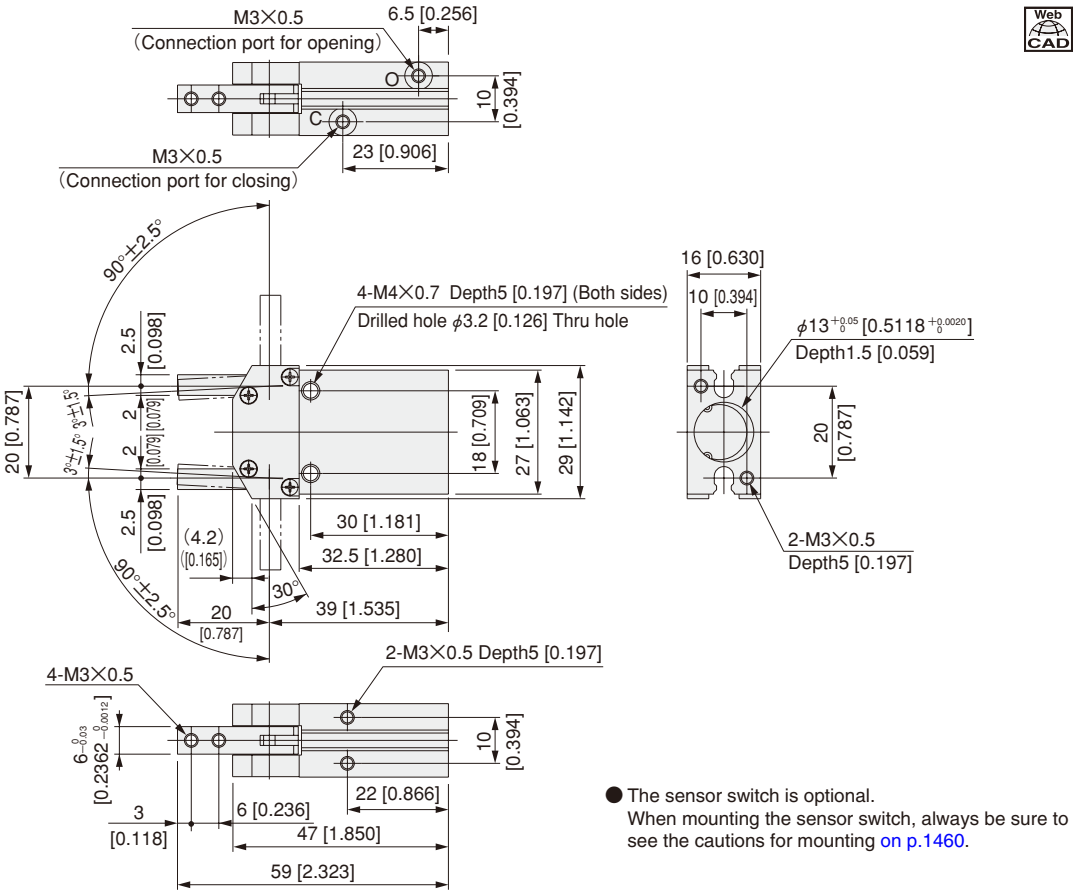
Basic model	Cylinder bore size				
Double acting type	**NHBDSLG**	**-12** **-16** **-20**	**-M**	**-ZE135** **-ZE155** **-ZE235** **-ZE255**	**A** **B**	**1** **2**

Additional Parts (To be ordered separately)

Mounting bracket

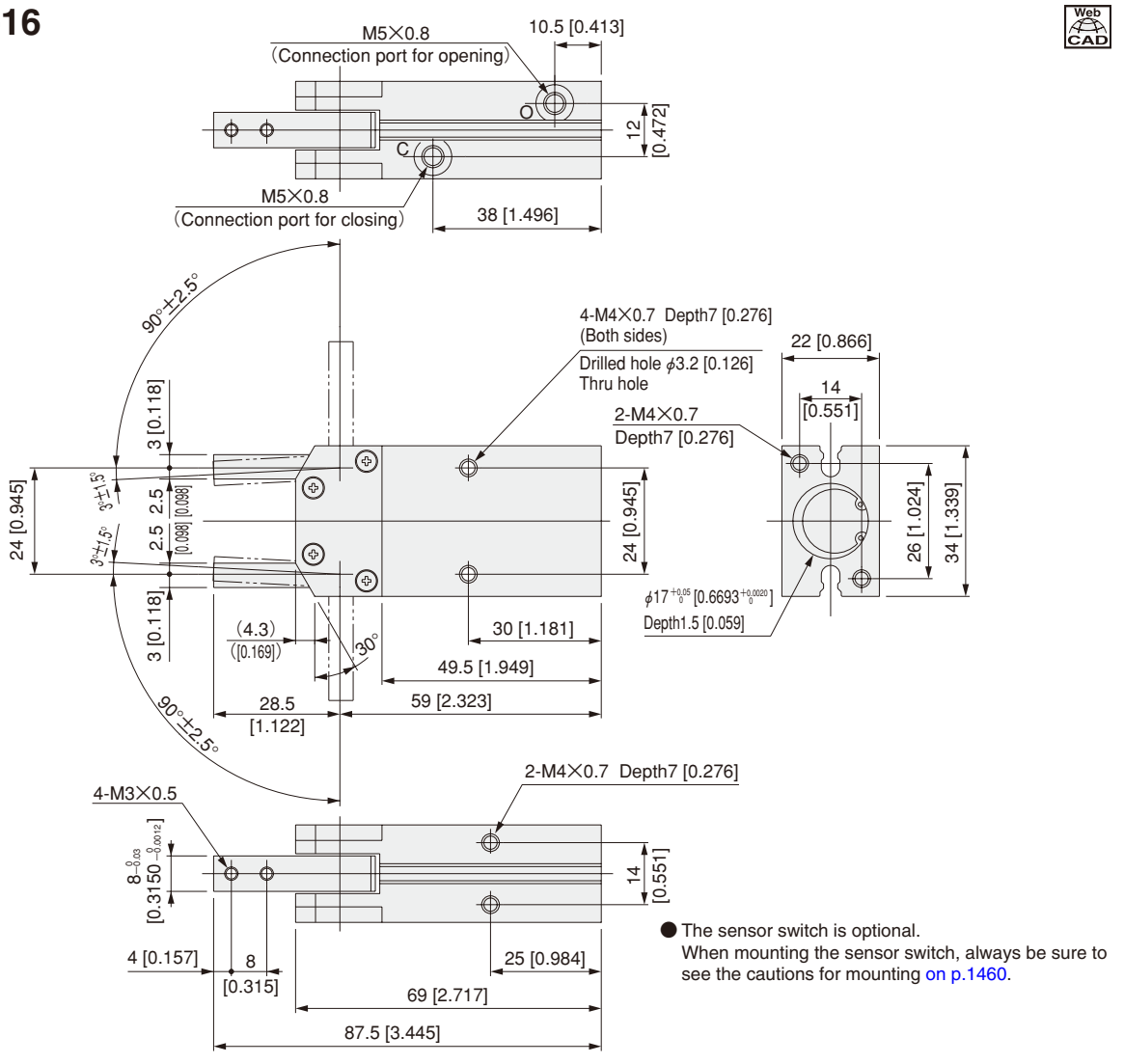
- For ϕ 12 [0.472in.] —**NHB-M12**
- For ϕ 16 [0.630in.] —**NHB-M16**
- For ϕ 20 [0.787in.] —**NHB-M20**

NHBDSLG-12



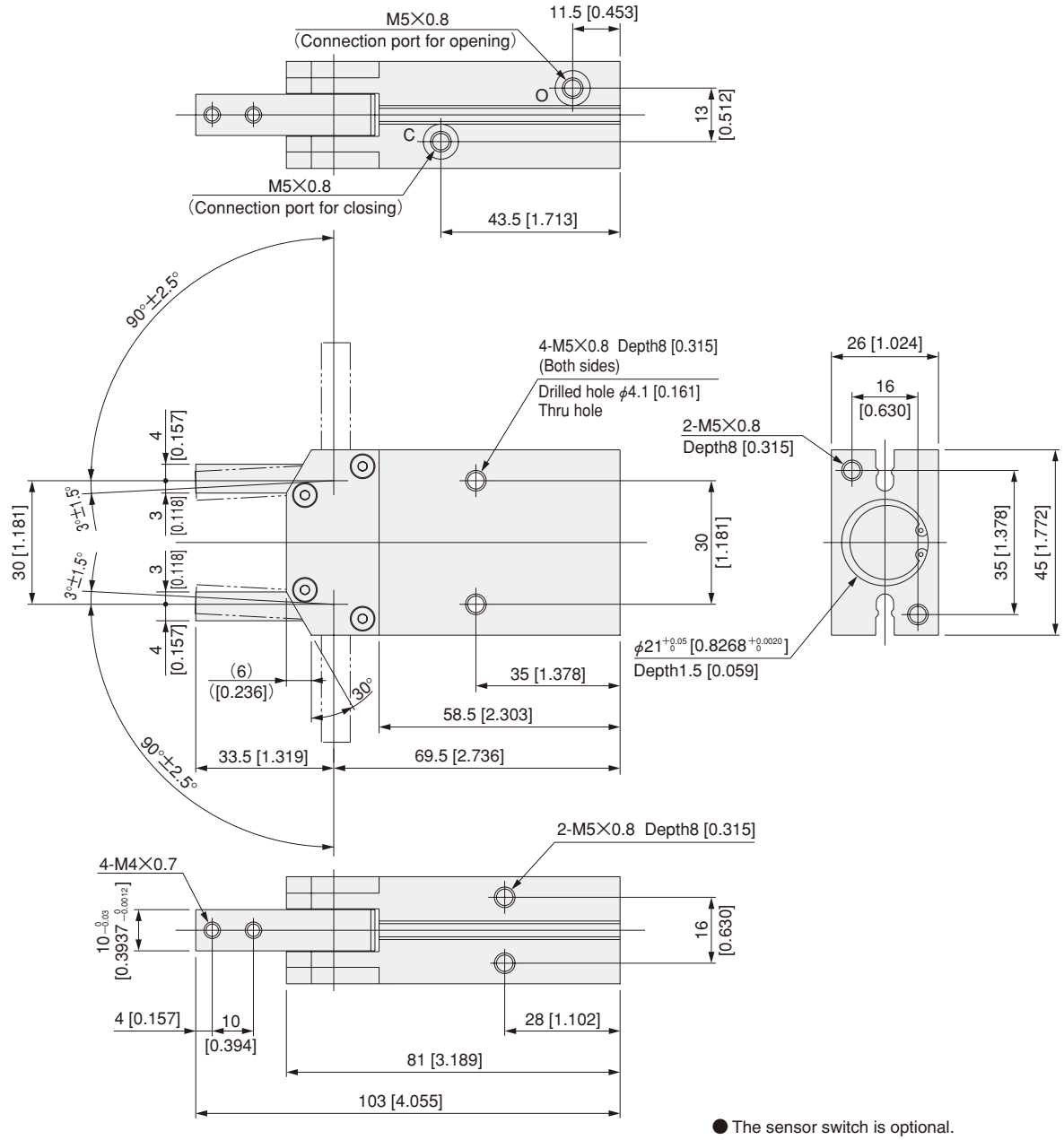
● The sensor switch is optional.
When mounting the sensor switch, always be sure to see the cautions for mounting on p.1460.

NHBDSLG-16



● The sensor switch is optional.
When mounting the sensor switch, always be sure to see the cautions for mounting on p.1460.

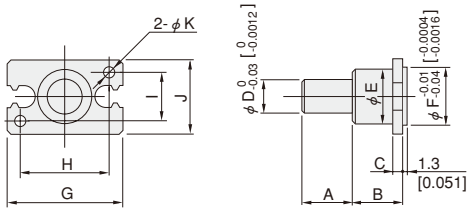
NHBDSLG-20



● The sensor switch is optional.
When mounting the sensor switch, always be sure to see the cautions for mounting on p.1460.

Options

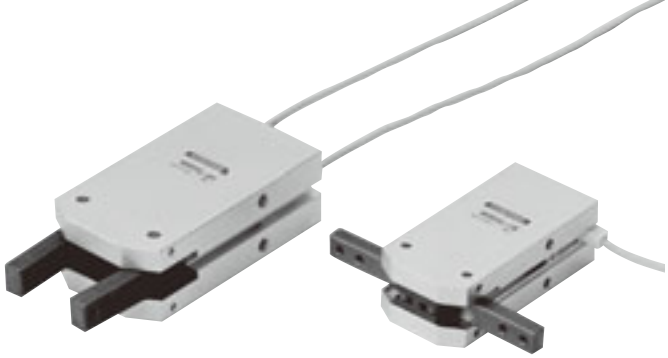
●Mounting bracket: **-M**



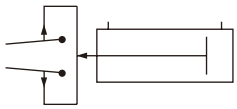
Model \ Code	A	B	C	D	E	F	G	H	I	J	K
NHB-M12	15 [0.591]	15 [0.591]	3 [0.118]	10 [0.3937]	12 [0.472]	13 [0.5118]	27 [1.063]	20 [0.787]	10 [0.394]	16 [0.630]	3.4 [0.134]
NHB-M16	15 [0.591]	15 [0.591]	3 [0.118]	10 [0.3937]	16 [0.630]	17 [0.6693]	34 [1.339]	26 [1.024]	14 [0.551]	22 [0.866]	4.5 [0.177]
NHB-M20	15 [0.591]	15 [0.591]	3 [0.118]	10 [0.3937]	18 [0.709]	21 [0.8268]	45 [1.772]	35 [1.378]	16 [0.630]	26 [1.024]	5.5 [0.217]

NHB SERIES
SWING TYPE

180° Open Specification



Symbol



Double Acting Type

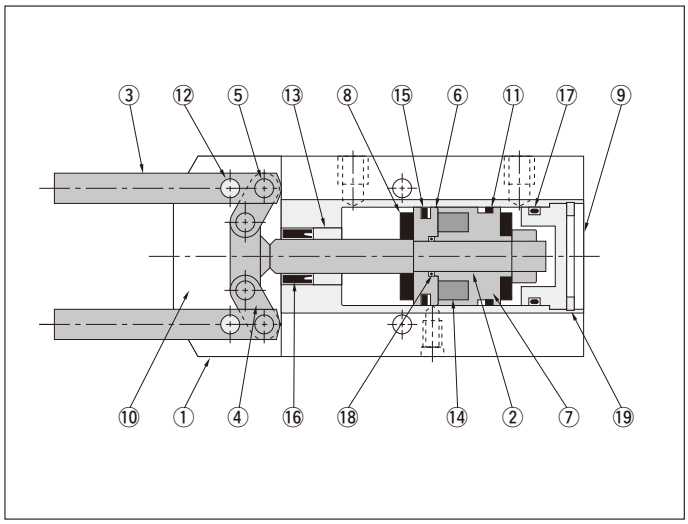
Specifications

●Double acting swing type

Item \ Basic model		NHBDSL-12	NHBDSL-16	NHBDSL-20	NHBDSL-25
Cylinder bore size mm [in.]		12 [0.472]	16 [0.630]	20 [0.787]	25 [0.984]
Operation type		Double acting type			
Media		Air			
Operating pressure range MPa [psi.]		0.2～0.7 [29～102]			
Proof pressure MPa [psi.]		1.0 [145]			
Operating temperature range °C [°F]		0～60 [32～140]			
Maximum operating frequency cycle/min		100			
Lubrication	Cylinder portion	Not required			
	Lever portion	Required (Apply grease to the sliding portion)			
Theoretical gripping moment (M)[Note] N・cm [in・lbf]		47P [0.0287P]	128P [0.0781P]	231P [0.1410P]	525P [0.3204P]
Maximum grip point length mm [in.]		40 [1.57]	80 [3.15]	100 [3.94]	60 [2.36]
Effective gripping force (F)[Note] N [lbf.]		F=M/L×9.0 [F=M/L×0.9]			
Lever open/closed angles		−10°～+180°	−6°～+180°		−10°～+180°
Port size		M3×0.5	M5×0.8		
Mass g [oz.]		55 [1.94] (65 [2.29])	146 [5.15] (165 [5.82])	277 [9.77] (303 [10.69])	427 [15.06] (478 [16.86])

Note: F: Effective gripping force (value when levers are parallel), L: Grip point length mm [in.], M: Theoretical gripping moment, P: Operating pressure MPa [psi.]. Values of P and L should vary from SI unit to imperial units.
For details of the effective gripping force, see the graphs on p. 1389.

Inner Construction



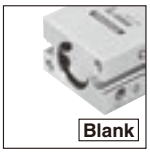
Major Parts and Materials

No.	Parts	Materials
①	Body	Aluminum alloy
②	Piston rod	Carbon steel
③	Lever	Carbon steel
④	Link	Carbon steel
⑤	Press fitting link pin	Carbon tool steel
⑥	Piston	Brass
⑦	Piston holder	Brass
⑧	Cushion rubber	Urethane
⑨	Head cover	Aluminum alloy
⑩	Slide plate	Phosphor bronze
⑪	Wear ring	Plastic
⑫	Fulcrum pin	Carbon tool steel
⑬	Oil impregnated bushing	Oil impregnated copper alloy
⑭	Magnet	Magnet material
⑮	Piston seal	Synthetic rubber (NBR)
⑯	Rod seal	Synthetic rubber (NBR)
⑰	Head seal	Synthetic rubber (NBR)
⑱	O-ring	Synthetic rubber (NBR)
⑲	C-shaped snap ring	Steel

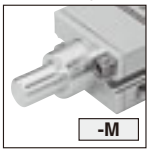
Order Codes

Mounting bracket

No mounting bracket



With mounting bracket



★ Included at shipping

Sensor switch

No sensor switch

With **ZE135**

- Solid state type
- With indicator lamp
- DC10～28V
- 2-lead wire
- Horizontal lead wire

With **ZE155**

- Solid state type
- With indicator lamp
- DC4.5～28V
- 3-lead wire
- Horizontal lead wire

With **ZE235**

- Solid state type
- With indicator lamp
- DC10～28V
- 2-lead wire
- Vertical lead wire

With **ZE255**

- Solid state type
- With indicator lamp
- DC4.5～28V
- 3-lead wire
- Vertical lead wire

Lead wire length

A : 1000mm [39in.]
B : 3000mm [118in.]

Number of sensor switches (for air hands with sensor switches)

- **1** : With 1 sensor switch
- **2** : With 2 sensor switches

★ Included at shipping

Basic model	Cylinder bore size				
Double acting type	**NHBDSL**	**-12** **-16** **-20** **-25**	**-M**	**-ZE135** **-ZE155** **-ZE235** **-ZE255**	**A** **B**	**1** **2**

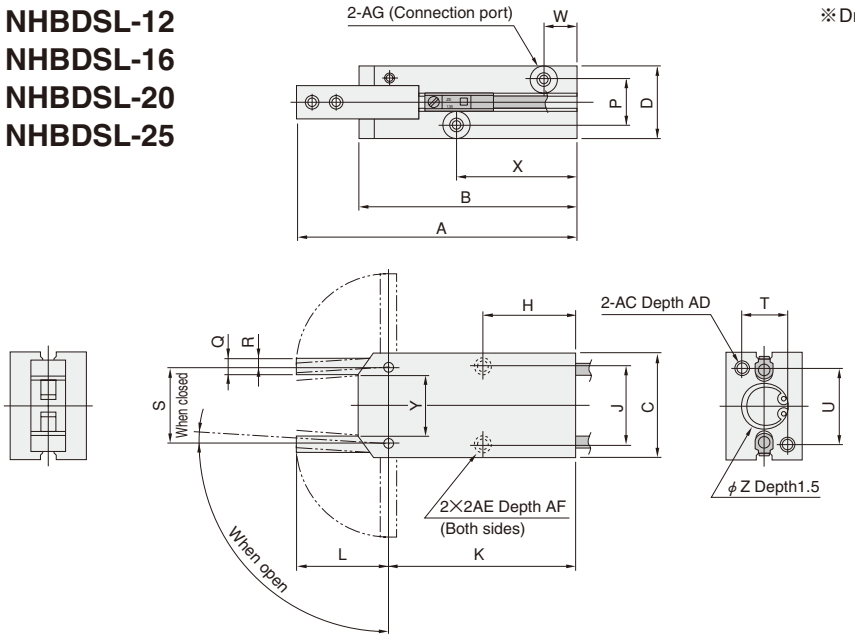
Additional Parts (To be ordered separately)

Mounting bracket

- For ϕ 12 [0.472in.] —**NHB-M12**
- For ϕ 16 [0.630in.] —**NHB-M16**
- For ϕ 20 [0.787in.] —**NHB-M20**
- For ϕ 25 [0.984in.] —**NHB-M25**

Dimensions of Swing Type 180° Open Specification (mm)

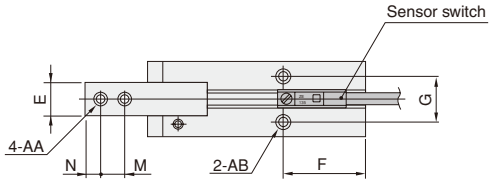
NHBDSL-12
NHBDSL-16
NHBDSL-20
NHBDSL-25



※Drawings show ϕ 20.

CAD NHBDSL Cylinder bore size Note

Note: Not including NHBDSL-12 and NHBDSL-25.



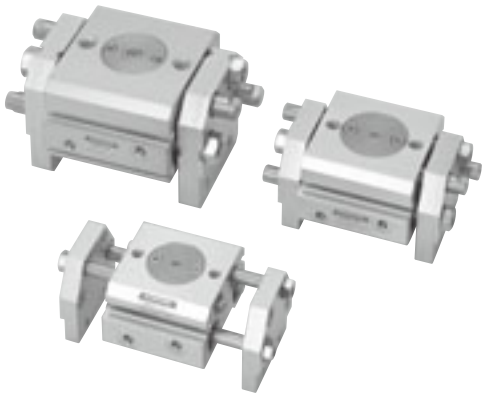
●For mounting bracket (**-M**), see p.1438.

Model \ Code	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q
NHBDSL-12	59	47	27	16	$6.0^{0}_{-0.03}$	22	10	30	18	39	20	6	3	10	4.5
NHBDSL-16	87.5	69	34	22	$8.0^{0}_{-0.03}$	25	14	30	24	59	28.5	8	4	12	5.5
NHBDSL-20	103	81	45	26	$10.0^{0}_{-0.03}$	28	16	35	30	69.5	33.5	10	4	13	7
NHBDSL-25	114.5	88	52	32	$12.0^{0}_{-0.03}$	45	18	43	36	73.5	41	12	5	$18^{+0.1}$	10

R	S	T	U	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	When open	When closed
2.5	20	10	20	6.5	23	16	$\phi 13^{+0.05}_{0}$	M3×0.5	M3×0.5	M3×0.5	5	M4×0.7	5 (ϕ3.2 Thru.)	M3×0.5	$90°^{\pm 2.5}$	$-3°^{\pm 1.5}$
3	24	14	26	10.5	38	19	$\phi 17^{+0.05}_{0}$	M3×0.5	M4×0.7	M4×0.7	7	M4×0.7	7 (ϕ3.2 Thru.)	M5×0.8		
4	30	16	35	11.5	43.5	24	$\phi 21^{+0.05}_{0}$	M4×0.7	M5×0.8	M5×0.8	8	M5×0.8	8 (ϕ4.2 Thru.)	M5×0.8		
6	37	20	40	14	43	29	$\phi 26^{+0.05}_{0}$	M5×0.8	M6×1	M6×1	—	M6×1	10 (ϕ5.2 Thru.)	M5×0.8		

WHDP SERIES
RACK OPERATION PARALLEL TYPE

Wide Type Air Hands, Double Acting Type



Specifications

●Double acting rack operation parallel type

Item \ Basic model	WHDP-12	WHDP-16	WHDP-20	WHDP-25
Cylinder bore size mm [in.]	12 [0.472]	16 [0.630]	20 [0.787]	25 [0.984]
Operation type	Double acting type			
Media	Air			
Operating pressure range MPa [psi.]	0.2～0.7 [29～102]			
Proof pressure MPa [psi.]	1.05 [152]			
Operating temperature range °C [°F]	0～60 [32～140]			
Maximum operating frequency cycle/min	120			
Lubrication	Not required			
Effective gripping force (F)Note N [lbf.]	24 [5.4]	48 [10.8]	82 [18.4]	132 [29.7]
Lever open/closed stroke mm [in.]	24 [0.945]	32 [1.260]	40 [1.575]	50 [1.969]
Repeatability mm [in.]	±0.08 [±0.0031]			
Port size	M5×0.8			
Mass g [oz.]	230 [8.1]	400 [14.1]	760 [26.8]	1100 [38.8]

Note: Values are obtained when grip point length is 50mm [1.97in.] under operating pressure 0.5 MPa [73psi.].
For details of the effective gripping force, see the graphs on p.1391.

Order Codes

■Sensor switch

Blank : No sensor switch
ZE235 : 2-lead wire, Solid state type, With indicator lamp DC10～28V, Vertical lead wire
ZE255 : 3-lead wire, Solid state type, With indicator lamp DC4.5～28V, Vertical lead wire

■Lead wire length

A : 1000mm [39in.]
B : 3000mm [118in.]

■Number of sensor switches (for air hands with sensor switches)

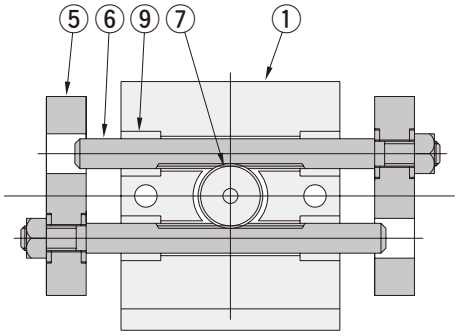
●**1** : With 1 sensor switch
●**2** : With 2 sensor switches

★Included at shipping

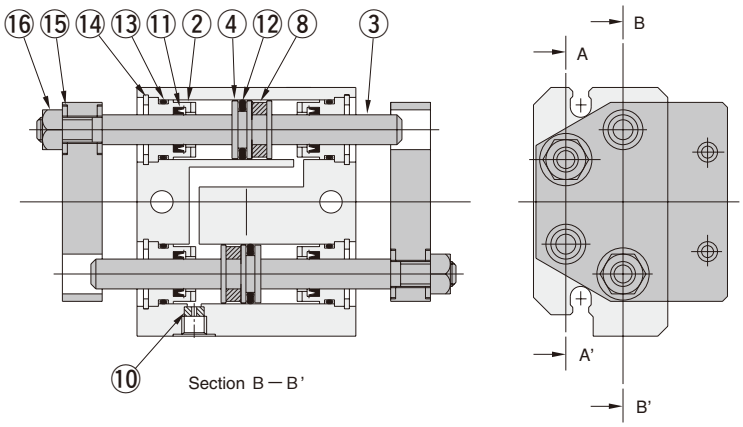
	Basic model	Cylinder bore size			
Double acting type	WHDP	-12	-ZE235 -ZE255	A B	1 2
		-16			
		-20			
		-25			

Inner Construction

● Diagrams show double acting type ϕ 12 [0.472in.].



Section A — A'



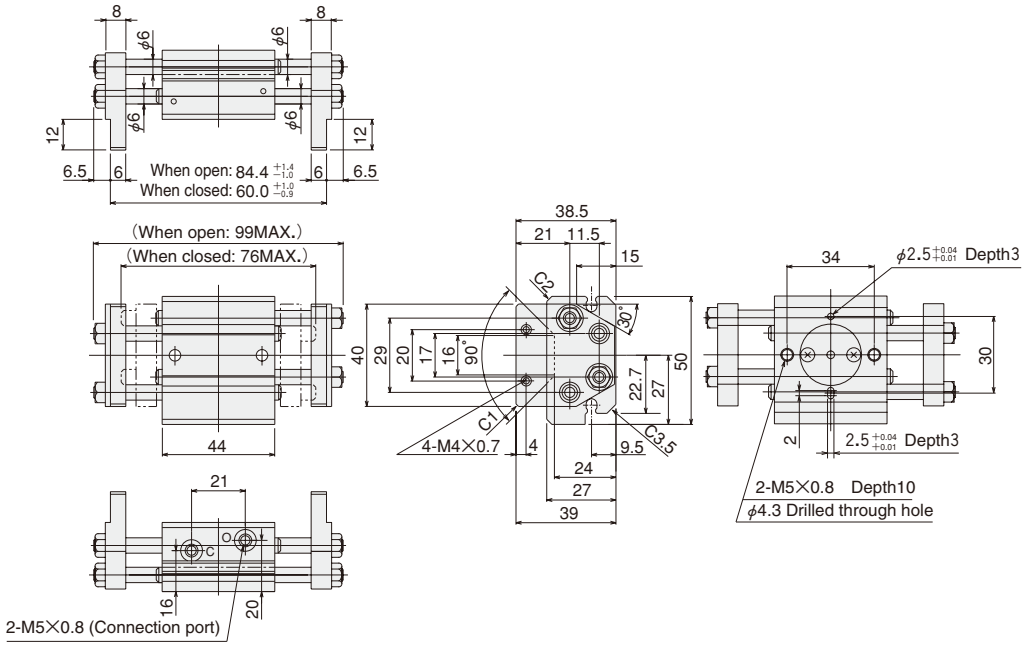
Section B — B'

Major Parts and Materials

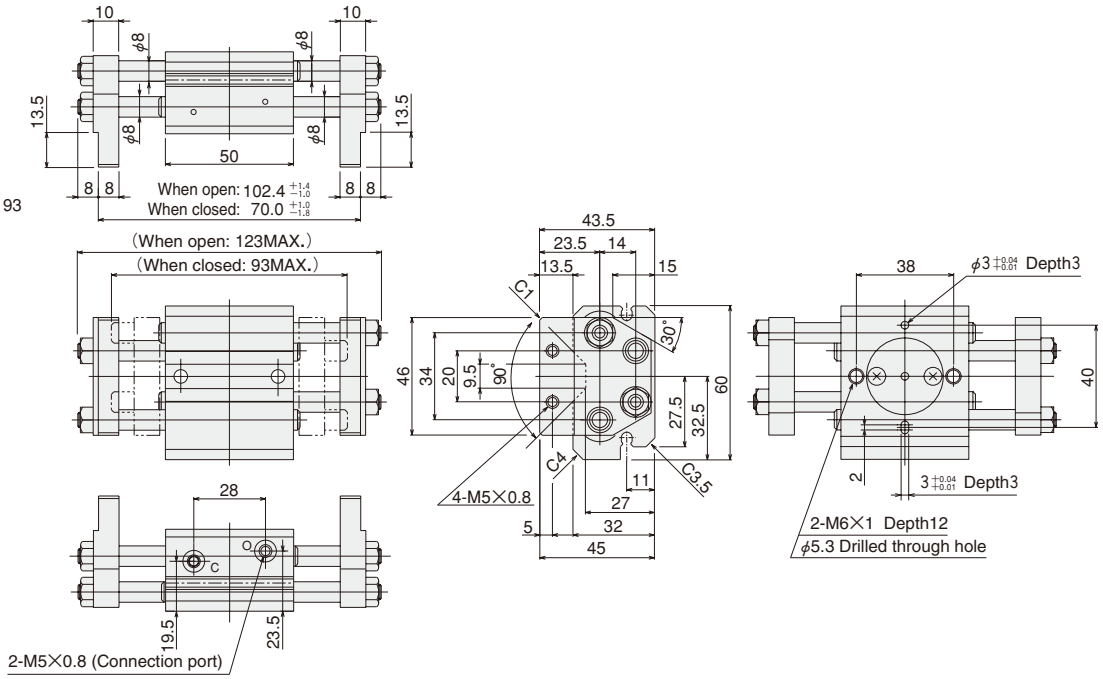
No.	Parts	Materials
①	Body	Aluminum alloy
②	Rod cover	Aluminum alloy
③	Piston rod	Stainless steel
④	Piston	Aluminum alloy
⑤	Lever	Aluminum alloy
⑥	Guide rod	Stainless steel
⑦	Pinion	Stainless steel
⑧	Magnet	Plastic magnet

No.	Parts	Materials
⑨	Metal bushing	Bearing copper alloy
⑩	Fixed throttle	Aluminum alloy
⑪	Seal	Synthetic rubber
⑫	Seal	Synthetic rubber
⑬	O-ring	Synthetic rubber
⑭	Snap ring	Carbon tool steel
⑮	Plain washer	Stainless steel
⑯	Hexagon nut	Mild steel

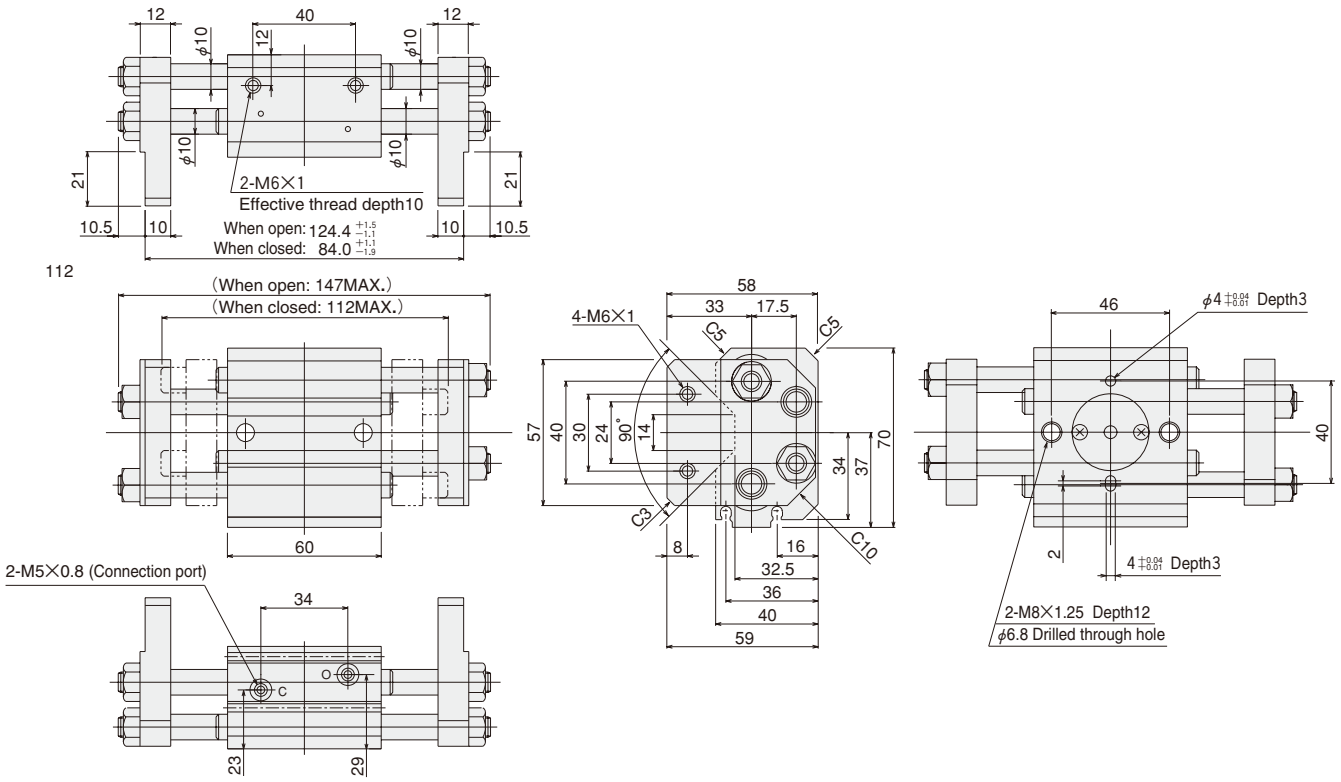
WHDP-12



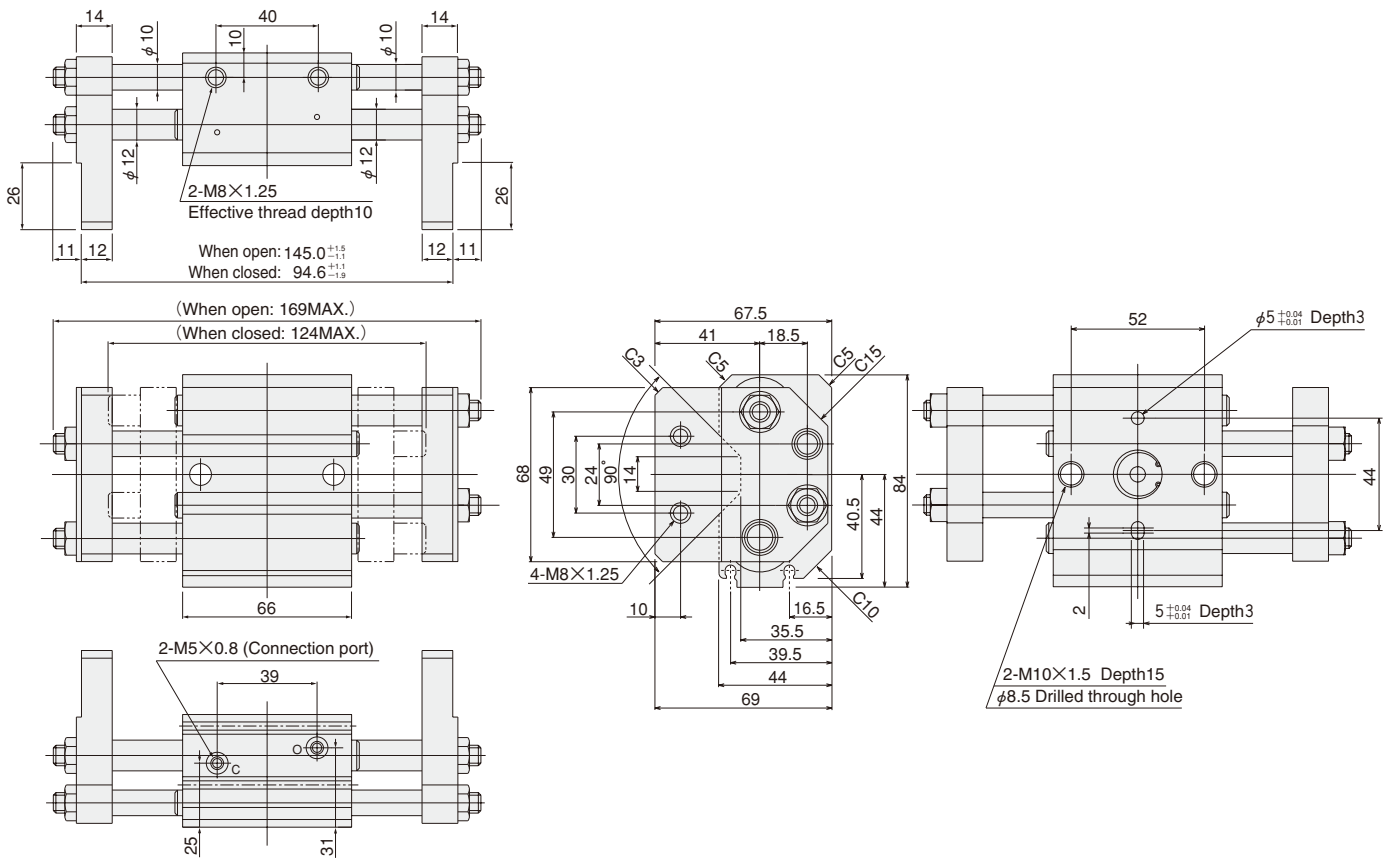
WHDP-16



WHDP-20

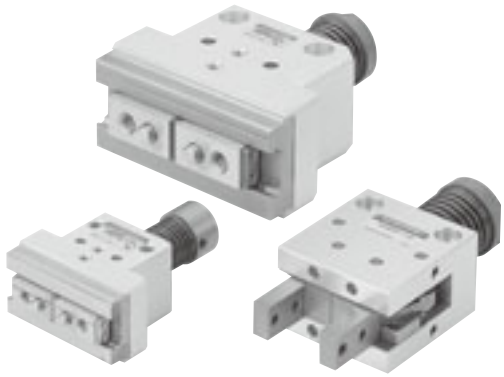


WHDP-25



NHB SERIES
PARALLEL TYPE

Mechanical Hands
Linear Guide Specification
Mechanical Hands



Specifications

●Parallel type mechanical hands

Item \ Basic model		NHBMRP-10	NHBMP-10	NHBMRP-16	NHBMP-16	NHBMRP-20	NHBMP-20
Nominal diameter (NHBDPG equivalent) mm [in.]		10 [0.394]		16 [0.630]		20 [0.787]	
Operation type		Single acting normally open type	Single acting normally closed type	Single acting normally open type	Single acting normally closed type	Single acting normally open type	Single acting normally closed type
Operation method		Operating by external force type when closed	Operating by external force type when open	Operating by external force type when closed	Operating by external force type when open	Operating by external force type when closed	Operating by external force type when open
Returning method		Compression spring					
Operating temperature range °C [°F]		0～60 [32～140]					
Maximum operating frequency cycle/min		100					
Lubrication		Required (Apply grease to the sliding portion)					
Repeatability mm [in.]		±0.01 [±0.0004]					
Gripping force N [lbf.]	-L	3.4 [0.76]		4.4 [0.99]		6.5 [1.46]	
	-M	4.5 [1.01]		6.4 [1.44]		8.3 [1.87]	
Pushing force[Note1] N [lbf.]	-L	23.5 [5.28]		32.3 [7.26]		47.0 [10.57]	
	-M	32.3 [7.26]		47.0 [10.57]		58.8 [13.22]	
Allowable pushing force N [lbf.]		50 [11.2]		130 [29.2]		210 [47.2]	
Lever ratio[Note2]		1 : 2.1					
Mass g [oz.]		60 [2.12]		135 [4.76]		245 [8.64]	

Notes: 1. Pushing force refers to the external force required to completely open the lever against the spring force constantly exerted in the closed direction.
2. Lever ratio expresses the “pushing distance : lever open distance (stroke)” where the pushing distance on the rear rod is assumed to be 1.

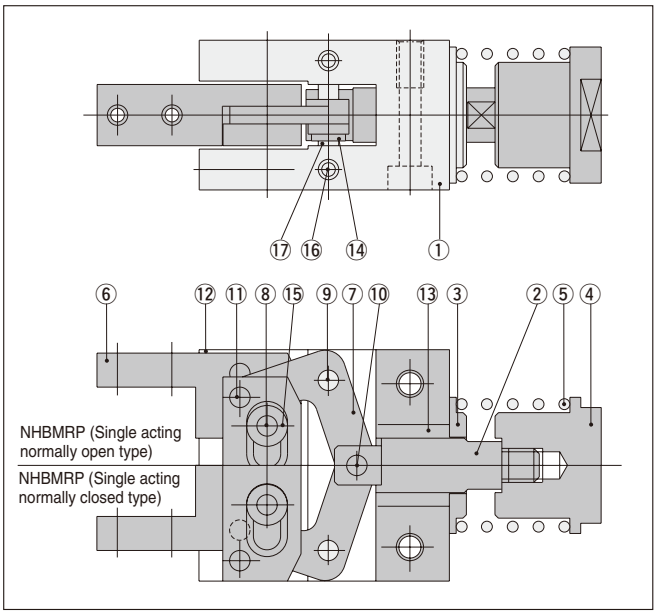
●Parallel type linear guide specification mechanical hands

Item \ Basic model		NHBMPG-8	NHBMPG-10	NHBMPG-16	NHBMPG-20
Nominal diameter (NHBDPG equivalent) mm [in.]		8 [0.315]	10 [0.394]	16 [0.630]	20 [0.787]
Operation type		Single acting normally closed type			
Operation method		Operating by external force type when open			
Returning method		Compression spring			
Operating temperature range °C [°F]		0～60 [32～140]			
Maximum operating frequency cycle/min		100			
Lubrication		Required (Apply grease to the sliding portion)			
Repeatability mm [in.]		±0.01 [±0.0004]			
Gripping force N [lbf.]	-L	1.6 [0.36]	3.4 [0.76]	4.4 [0.99]	6.5 [1.46]
	-M	2.6 [0.58]	4.5 [1.01]	6.4 [1.44]	8.3 [1.87]
Pushing force[Note1] N [lbf.]	-L	12.2 [2.74]	19.6 [4.41]	27.4 [6.16]	28.2 [6.34]
	-M	17.2 [3.87]	27.4 [6.16]	39.2 [8.81]	40.7 [9.15]
Allowable pushing force N [lbf.]		30 [6.7]	50 [11.2]	130 {[29.2]	210 [47.2]
Open/closed stroke mm [in.]		4.8 [0.189]	6.8 [0.268]	11.2 [0.441]	14.9 [0.587]
Lever ratio[Note2]		1 : 2		1 : 2.2	
Mass g [oz.]		31 [1.09]	78 [2.75]	156 [5.50]	312 [11.0]

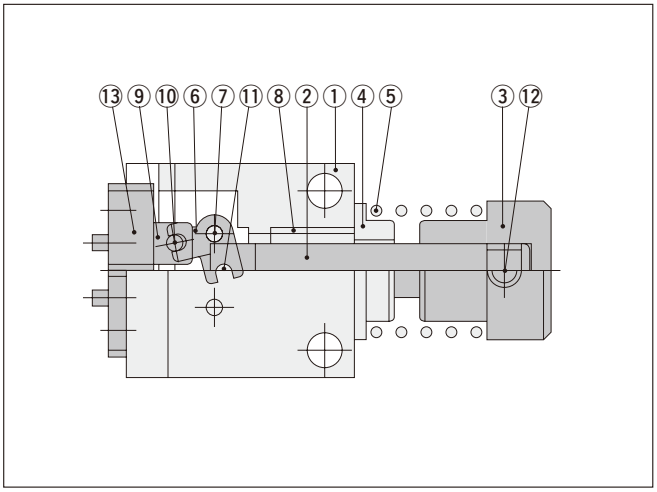
Notes: 1. Pushing force refers to the external force required to completely open the lever against the spring force constantly exerted in the closed direction.
2. Lever ratio expresses the “pushing distance : lever open distance (stroke)” where the pushing distance on the rear rod is assumed to be 1.

Inner Construction

●Parallel type mechanical hands



●Parallel type linear guide specification mechanical hands



Major Parts and Materials

●Parallel type mechanical hands

No.	Parts	Materials
①	Body	Aluminum alloy
②	Piston rod	Stainless steel
③	Holder	Aluminum alloy
④	Holder	Aluminum alloy
⑤	Spring	Steel wire
⑥	Lever	Steel
⑦	Action lever	Steel
⑧	Fulcrum pin	Steel
⑨	Fulcrum pin	Steel
⑩	Press fit pin	Steel
⑪	Press fit pin	Steel
⑫	Slide plate	Steel
⑬	Metal	—
⑭	Ring	Steel
⑮	Ring	Brass
⑯	Hexagon socket setscrew	Steel
⑰	Snap ring	Steel

●Parallel type linear guide specification mechanical hands

No.	Parts	Materials
①	Body	Aluminum alloy
②	Piston rod	Stainless steel
③	Holder	Steel
④	Holder	Aluminum alloy
⑤	Spring	Steel wire
⑥	Action lever	Steel
⑦	Fulcrum pin	Steel
⑧	Metal	—
⑨	Knuckle	Stainless steel
⑩	Roller	Steel
⑪	Roller	Steel
⑫	Hexagon socket setscrew	Steel
⑬	Bearing	—

Order Codes

●Parallel type mechanical hands

□ — □ — □

Gripping force
L — Light
M — Medium

Equivalent bore sizes (mm [in.])
10 — 10 [0.394] equivalent
16 — 16 [0.630] equivalent
20 — 20 [0.787] equivalent

Basic model
NHBMP — Air hand NHB series Parallel type Mechanical hand Single acting normally closed type
NHBMRP — Air hand NHB series Parallel type Mechanical hand Single acting normally open type

●Parallel type linear guide specification mechanical hands

NHBMPG — □ — □

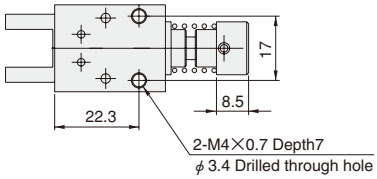
Gripping force
L — Light
M — Medium

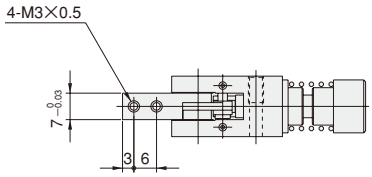
Equivalent bore sizes (mm [in.])
8 — 8 [0.315] equivalent
10 — 10 [0.394] equivalent
16 — 16 [0.630] equivalent
20 — 20 [0.787] equivalent

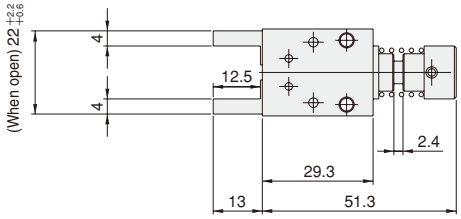
Air hand NHB series
Linear guide specification mechanical hand, single acting normally closed type

Caution: The sensor switch cannot be used with the mechanical hand.

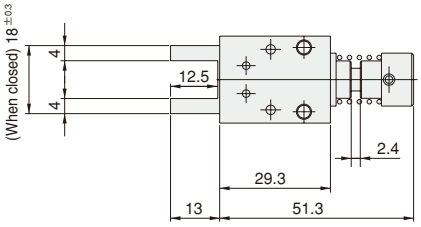
NHBMP-10
NHBMRP-10

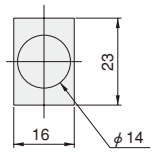






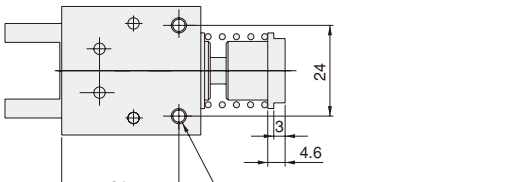
NHBMRP-10 (Single acting normally open type)

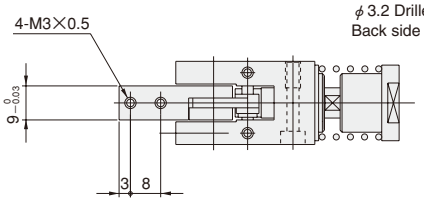


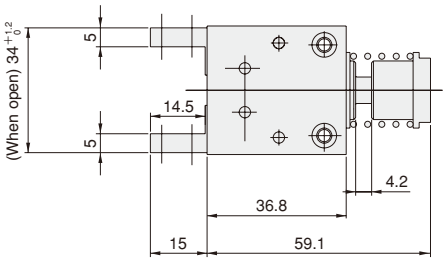


NHBMP-10 (Single acting normally closed type)

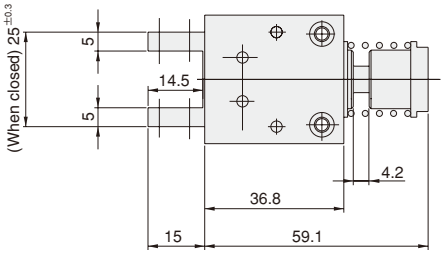
NHBMP-16
NHBMRP-16

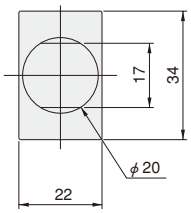






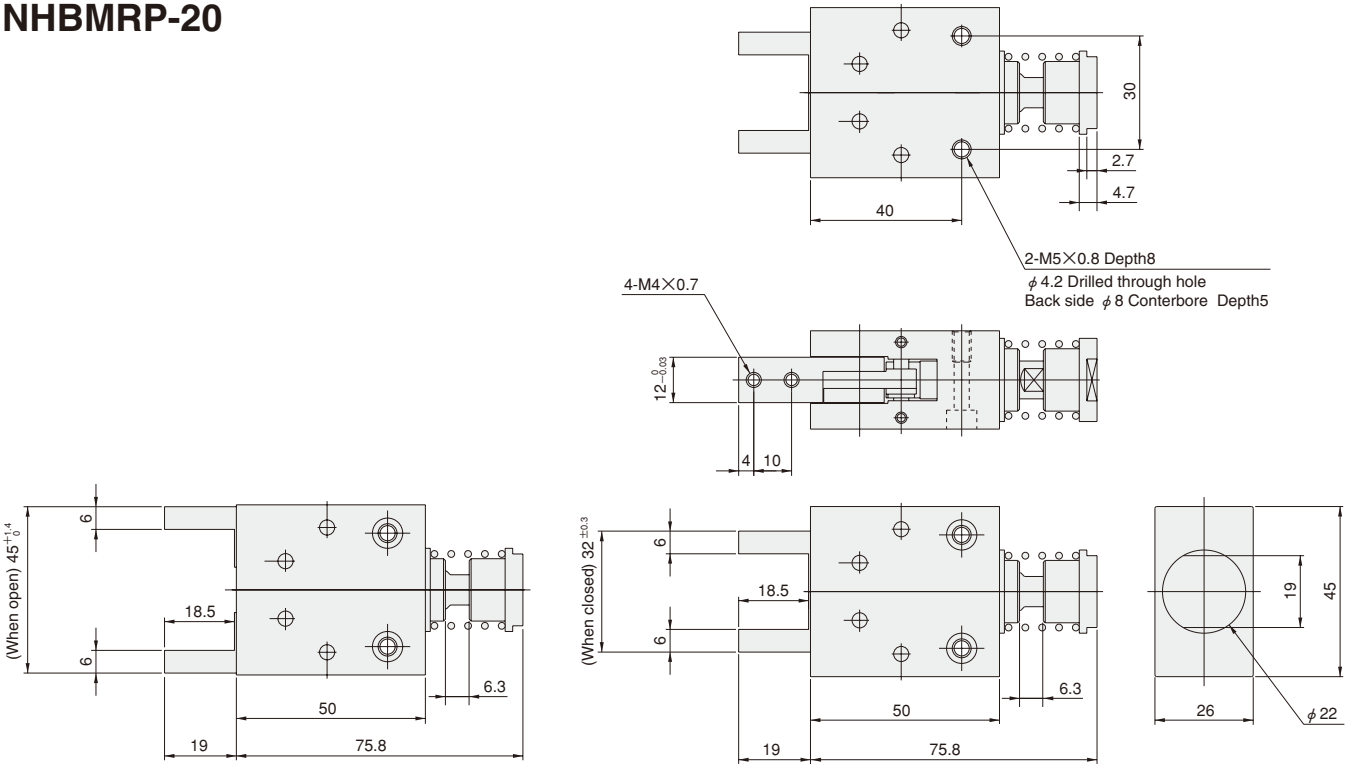
NHBMRP-16 (Single acting normally open type)





NHBMP-16 (Single acting normally closed type)

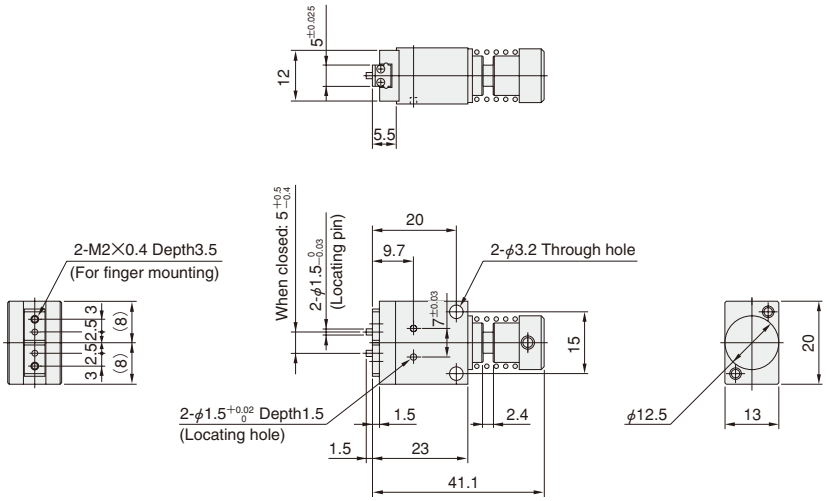
NHBMP-20
NHBMRP-20



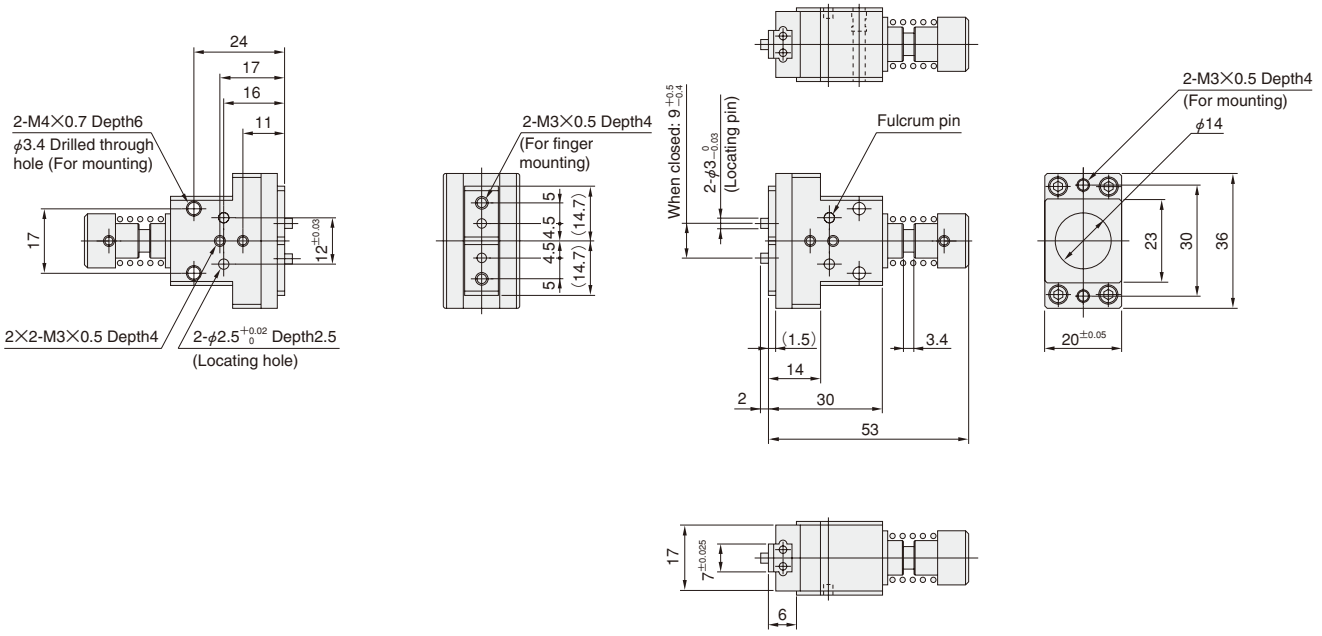
NHBMRP-20 (Single acting normally open type)

NHBMP-20 (Single acting normally closed type)

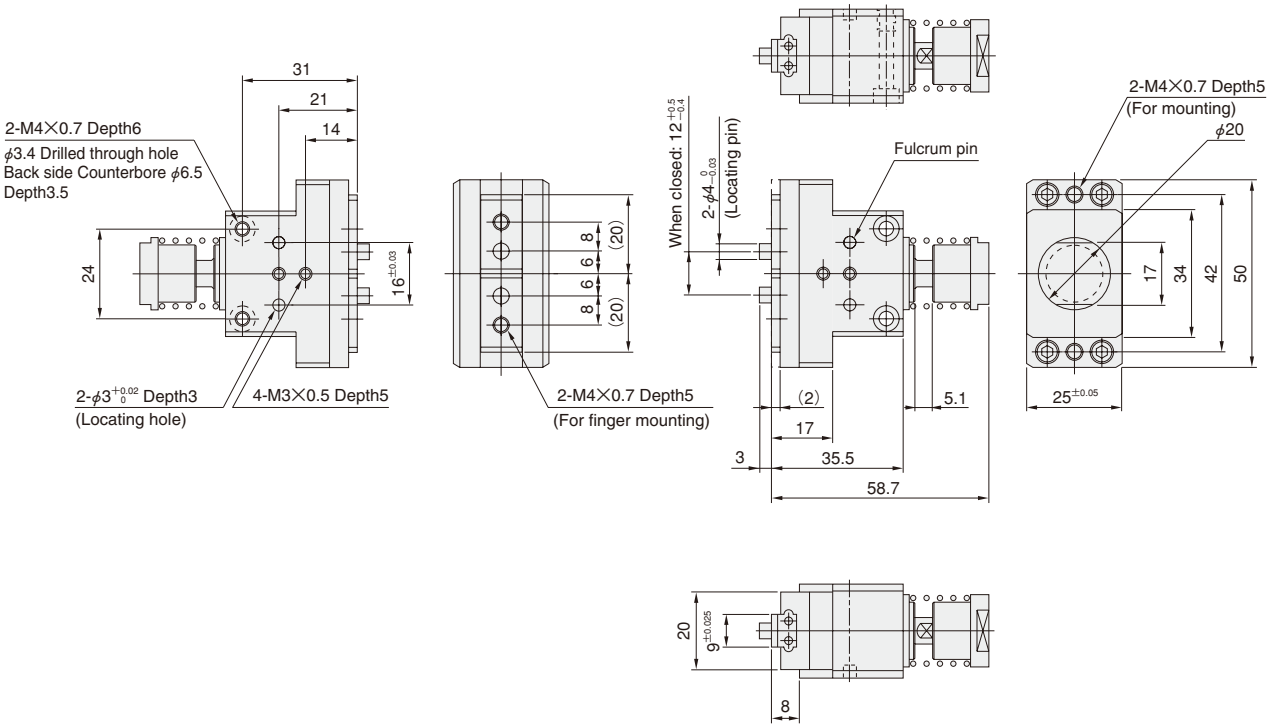
NHBMPG-8



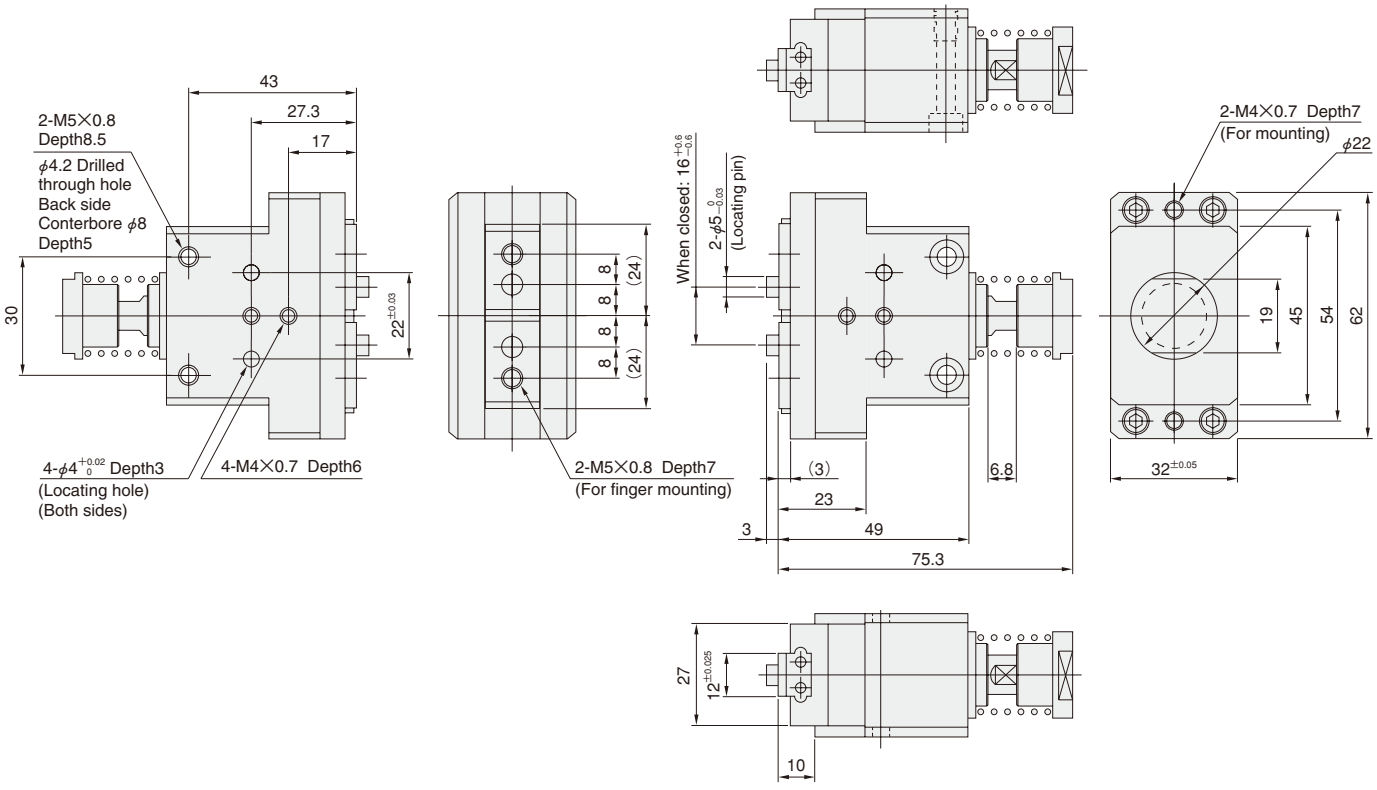
NHBMPG-10



NHBMPG-16

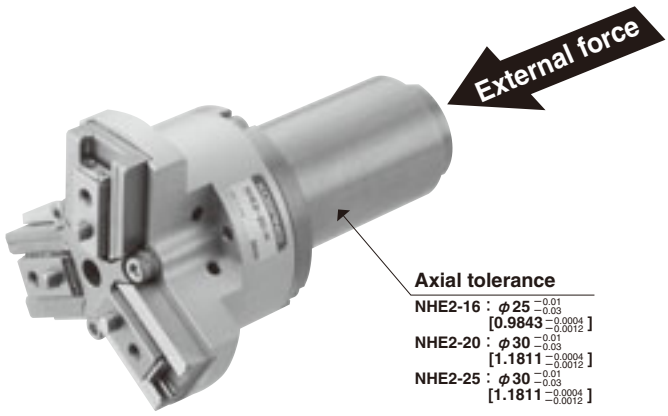


NHBMPG-20



THREE-FINGER TYPE LINEAR GUIDE SPECIFICATION

Mechanical Hands

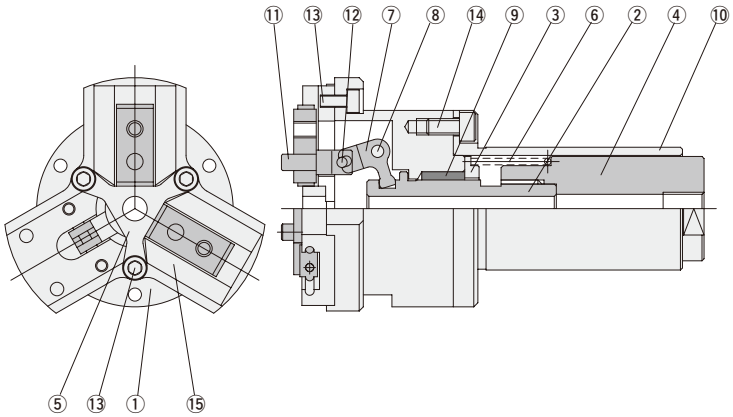


Specifications

Item \ Basic model		NHE2-16	NHE2-20	NHE2-25
Nominal diameter mm [in.]		16 [0.630]	20 [0.787]	25 [0.984]
Open/closed stroke mm [in.]		6 [0.236]	10 [0.394]	14 [0.551]
Operation type		Single acting normally closed type (external force drive when open)		
Elastic body used		Compression spring		
Operating temperature range °C [°F]		0～120 [32～248]		
Maximum operating frequency cycle/min		180		
Lubrication		Required		
Repeatability mm [in.]		±0.01 [±0.0004]		
Centering accuracy mm [in.]		±0.05 [±0.0020]		
Spring gripping force (when open) N [lbf.]	-L	3 [0.7]	7 [1.6]	12 [2.7]
	-M	5 [1.1]	12 [2.7]	18 [4.0]
	-H	7 [1.6]	17 [3.8]	26 [5.8]
Pushing force[Note1] N [lbf.]	-L	14 [3.1]	38 [8.5]	66 [14.8]
	-M	24 [5.4]	64 [14.4]	95 [21.4]
	-H	34 [7.6]	88 [19.8]	138 [31.0]
Allowable pushing force N [lbf.]		50 [11.2]	130 [29.2]	210 [47.2]
Lever ratio[Note 2]		1 : 1.1		
Mass g [oz.]		300 [10.6]	560 [19.8]	870 [30.7]

Notes: 1. Pushing force refers to the external force required to completely open the lever against the spring force constantly exerted in the closed direction.
2. Lever ratio expresses the "pushing distance : lever open distance (stroke)" where the pushing distance on the rear rod is assumed to be 1.

Inner Construction



Major Parts and Materials

No.	Parts	Materials
①	Body	Aluminum alloy
②	Piston rod	Stainless steel
③	Holder	Aluminum alloy
④	Holder	Stainless steel
⑤	Holder cover	Stainless steel
⑥	Spring	Spring steel
⑦	Action lever	Carbon steel
⑧	Fulcrum pin	Carbon steel
⑨	Metal	Sintered oil impregnated bushing
⑩	Case	Stainless steel
⑪	Knuckle	Stainless steel
⑫	Roller	Carbon steel
⑬	Hexagon socket head bolt	Stainless steel
⑭	Hexagon socket head bolt	Stainless steel
⑮	Bearing	Stainless steel

Order Codes

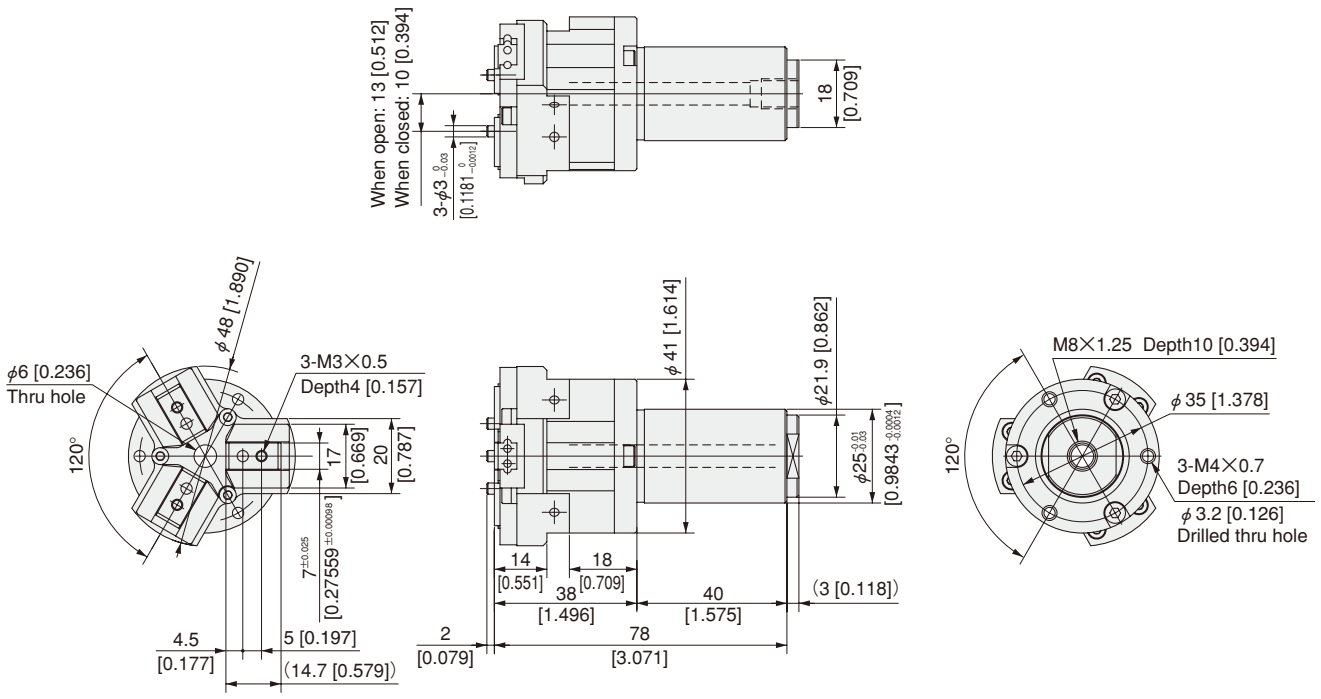
NHE 2 - □ - □

Three-finger hands series
Mechanical hand high precision specification

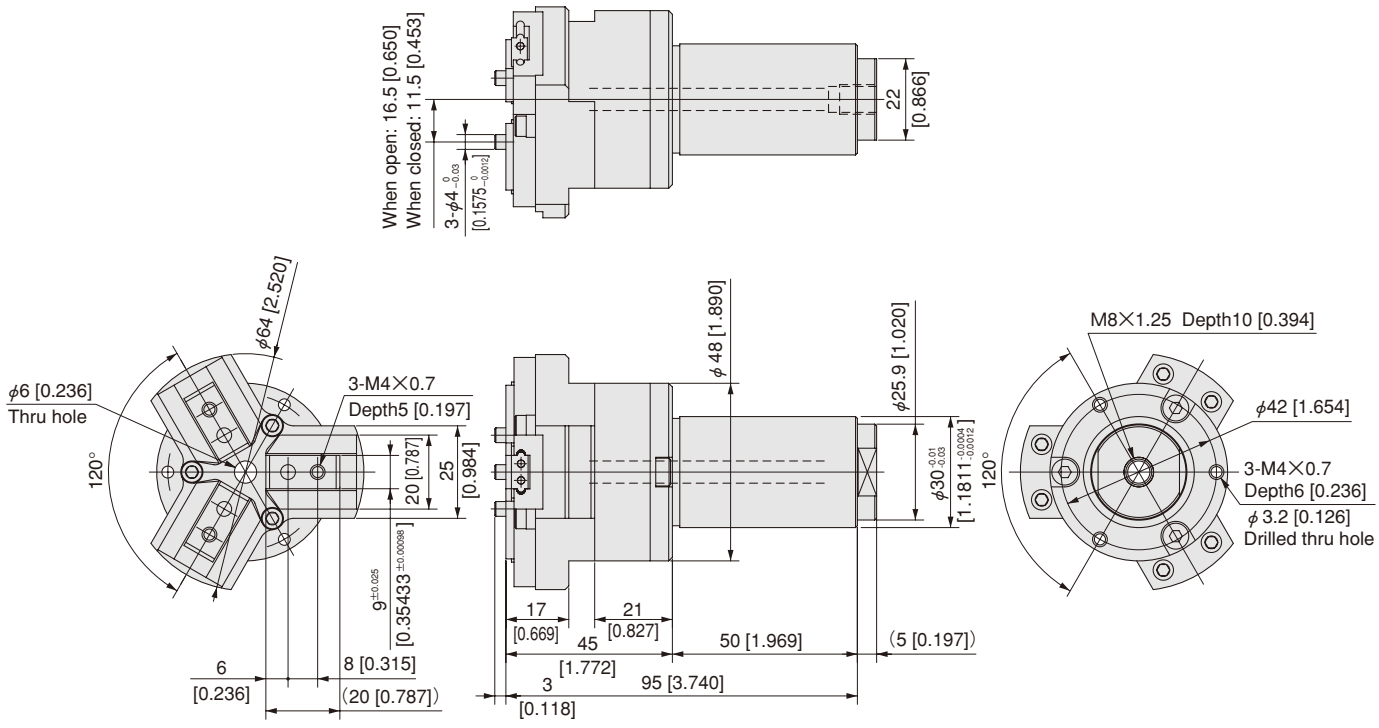
Nominal diameter
16 : φ 16mm [0.630in.]
20 : φ 20mm [0.787in.]
25 : φ 25mm [0.984in.]

Spring gripping force
L : Weak
M : Medium
H : Strong

NHE2-16-□

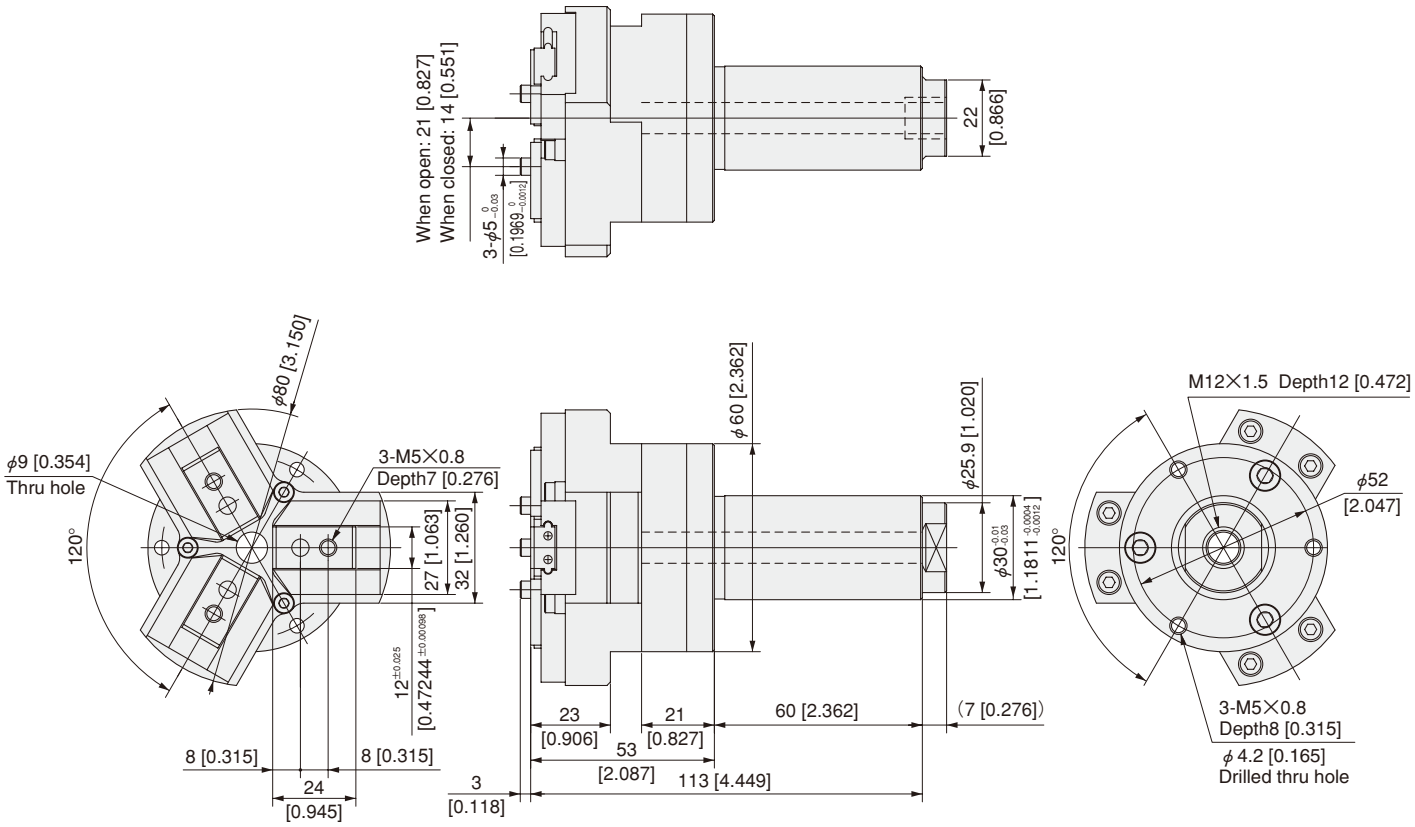


NHE2-20-□

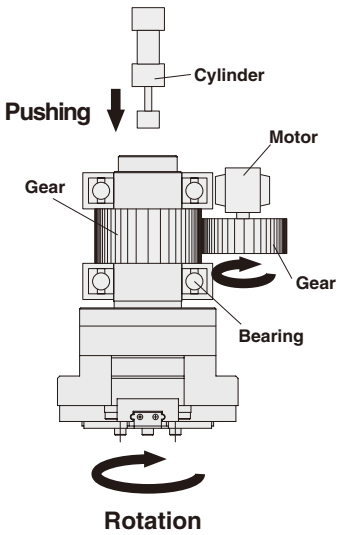


Dimensions mm [in.]

NHE2-25-□



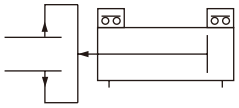
Application Example



SENSOR SWITCHES

Solid State Type

Symbol



Order Codes

●**Sensor switch only**

●**NHC1** series — **NHC**

Lead wire length
A — 1000mm [39in.]
B — 3000mm [118in.]

Sensor switch
ZE135 — Solid state type 2-lead wire with indicator lamp DC10～28V Horizontal lead wire
ZE235 — Solid state type 2-lead wire with indicator lamp DC10～28V Vertical lead wire
ZE155 — Solid state type 3-lead wire with indicator lamp DC4.5～28V Horizontal lead wire
ZE255 — Solid state type 3-lead wire with indicator lamp DC4.5～28V Vertical lead wire

●**NHB** series — **NHB**

Sensor switch
ZE135 — Solid state type 2-lead wire
ZE235 — Solid state type 2-lead wire
ZE155 — Solid state type 3-lead wire
ZE255 — Solid state type 3-lead wire

Lead wire length
A — 1000mm [39in.]
B — 3000mm [118in.]

●**WHDP** series

Sensor switch
ZE235 — Solid state type 2-lead wire
ZE255 — Solid state type 3-lead wire

Lead wire length
A — 1000mm [39in.]
B — 3000mm [118in.]

●**Three-finger type linear guide specification (air hands)**

— **NHE**

Lead wire length
A — 1000mm [39in.]
B — 3000mm [118in.]

Sensor switch
ZE135 — Solid state type 2-lead wire with indicator lamp DC10～28V Horizontal lead wire
ZE235 — Solid state type 2-lead wire with indicator lamp DC10～28V Vertical lead wire
ZE155 — Solid state type 3-lead wire with indicator lamp DC4.5～28V Horizontal lead wire
ZE255 — Solid state type 3-lead wire with indicator lamp DC4.5～28V Vertical lead wire

Caution: Sensor switch cannot be mounted on the mechanical hands.

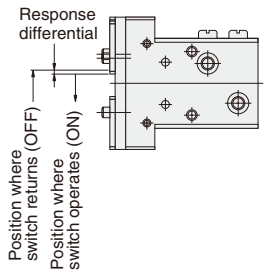
●For details of sensor switches, see p.1544.

Sensor Switch Operating Range and Response Differential

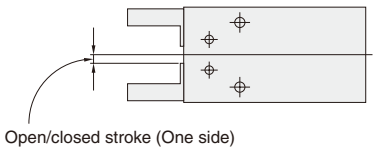
●Open/closed stroke differential (Open/closed angle differential)
The stroke differential (angle differential) between the point where the lever on one side moves and turns the switch ON and the point where the switch is turned OFF as the lever travels in the opposite direction.

●Operating position repeatability
When the lever on one side moves in the same direction, operating position repeatability is defined as the range of the deviation of the position where the switch is turned ON or turned OFF.

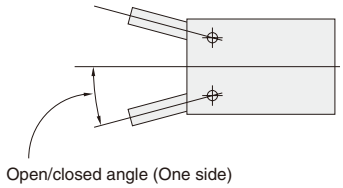
Parallel type linear guide specification



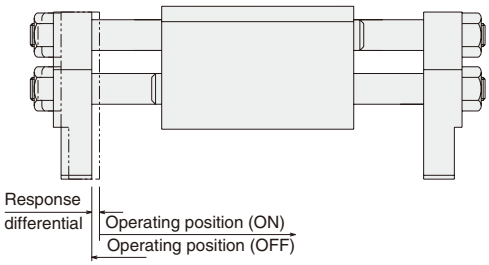
Parallel type



Swing type



Rack operation parallel type



●NHC1 series

mm [in.]

Model	Open/closed stroke differential	Operating position repeatability
NHC1D-10	0.2 [0.008]	0.1 [0.004]
NHC1D-16	0.2 [0.008]	0.1 [0.004]
NHC1D-20	0.2 [0.008]	0.1 [0.004]
NHC1D-25	0.2 [0.008]	0.1 [0.004]

Remark: The above table shows reference values.

●Parallel type

mm [in.]

Model	Open/closed stroke differential	Operating position repeatability
NHB□PA-6	0.5 [0.020]	0.2 [0.008]
NHB□P□-10	0.5 [0.020]	0.2 [0.008]
NHB□P□-16	0.6 [0.024]	0.2 [0.008]
NHB□P□-20	0.6 [0.024]	0.2 [0.008]
NHB□P□-25	0.6 [0.024]	0.2 [0.008]

Remark: The above table shows reference values.

●Swing type

Model	Open/closed angle differential	Operating position repeatability
NHB□S-8	3.0°	1.0°
NHB□S-10	2.0°	1.0°
NHB□S-16	1.5°	0.6°
NHB□S-20	1.5°	0.5°
NHB□S-25	1.0°	0.5°

Remark: The above table shows reference values.

●Parallel type linear guide specification (with rubber cover)

mm [in.]

Model	Open/closed stroke differential	Operating position repeatability
NHB□PG(J)-8	0.5 [0.020]	0.2 [0.008]
NHB□PG(J)-10	0.5 [0.020]	0.2 [0.008]
NHB□PG(J)-16	0.8 [0.031]	0.2 [0.008]
NHB□PG(J)-20	0.8 [0.031]	0.2 [0.008]
NHBDPG-32	0.8 [0.031]	0.2 [0.008]

Remark: The above table shows reference values.

●Swing type 180° open specification

Model	Open/closed angle differential	Operating position repeatability
NHBDSL-12	1.5°	0.5°
NHBDSL-16	1.0°	0.25° (one side)
NHBDSL-20	2.0°	0.2° (one side)
NHBDSL-25	3.0°	0.5°

Remark: The above table shows reference values.

●Rack operation parallel type

mm [in.]

Model	Open/closed stroke differential	Operating position repeatability
WHDP-12	0.6 [0.024]	0.2 [0.008]
WHDP-16	0.6 [0.024]	0.2 [0.008]
WHDP-20	0.5 [0.020]	0.2 [0.008]
WHDP-25	0.5 [0.020]	0.2 [0.008]

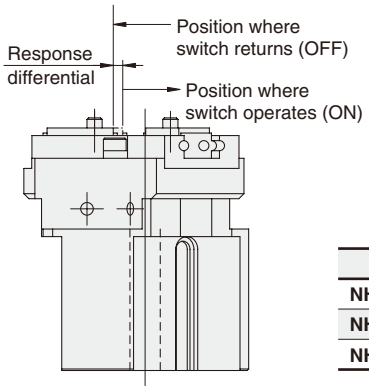
Remark: The above table shows reference values.

●Swing type high precision, 180° open specification

Model	Open/closed angle differential	Operating position repeatability
NHBDSLG-12	3.0°	0.5°
NHBDSLG-16	1.5°	0.5°
NHBDSLG-20	2.5°	0.5°

Remark: The above table shows reference values.

●Three-finger type linear guide specification (air hands)



mm [in.]

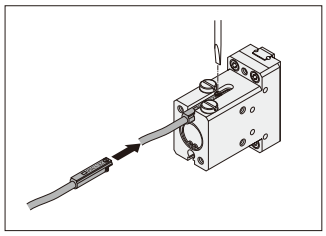
Model	Maximum response differential
NHE1D-16	0.5 [0.020]
NHE1D-20	0.6 [0.024]
NHE1D-25	0.5 [0.020]

Mounting Sensor Switch

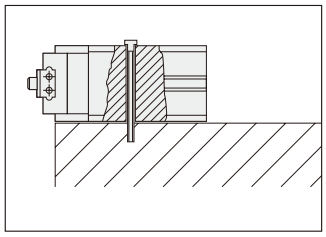
●NHB series

Tighten the mounting screw after the sensor switch is inserted in the switch mounting groove in the direction of the arrow in the diagram and move to the proper location. Tightening torque of the mounting screw is 0.1～0.2N・m [0.9～1.8in・lbf].

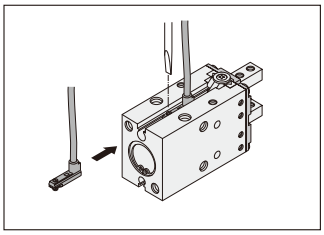
Caution: Care must be exercised that the sensor switch cannot be inserted into the switch mounting groove from the digram's top direction.



Caution: **NHC1** series
NHB□PG(Y, L, J) series
CS-NHBDPG series
NHB□PA series
NHB□S-8
NHBDSLG series
(Except NHB□PG-32 and NHB□PA-6)
Care must be exercised that a sensor switch cannot be mounted when the body is installed by using thru holes, as shown in the diagram to the right.

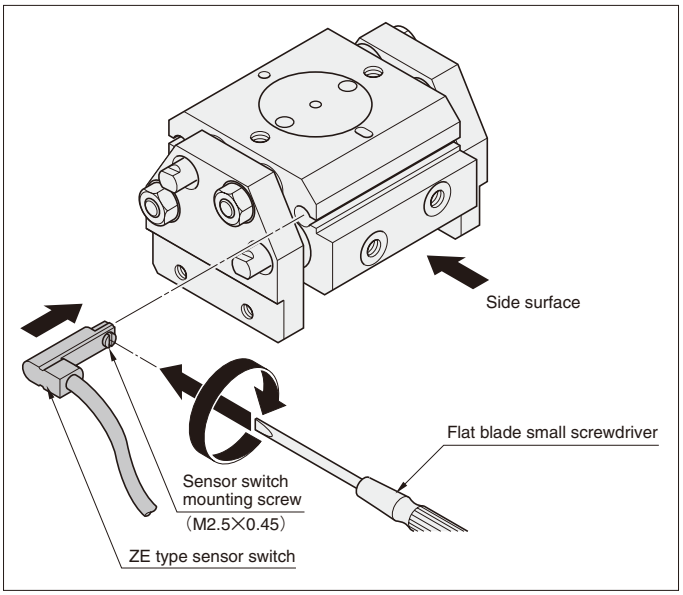


Caution: **NHB□PA-25**
When using a sensor switch on the lever open side, select the vertical lead wire type ZE235 or ZE255, and mount it in the facing shown in the illustration to the right.



●WHDP series

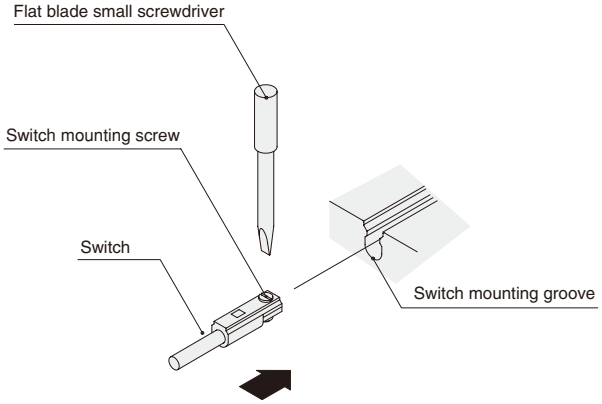
Tighten the mounting screw after the sensor switch is inserted in the switch mounting groove in the direction of the arrow in the diagram below and move to the proper location. Tightening torque of the mounting screw is 0.1～0.2N・m [0.9～1.8in・lbf].



Caution: Care must be exercised that the sensor switch cannot be inserted into the switch mounting groove from the digram's side surface direction.

●Three-finger type linear guide specification (air hands)

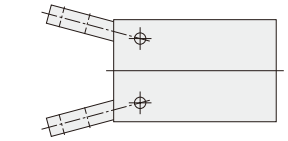
Insert the switch into the switch mounting groove. After setting in the mounting position, use a flat blade small screwdriver to tighten the switch mounting screw. Set the tightening torque to about 0.1～0.2N・m [0.9～1.8in・lbf]. Be sure to mount the sensor switch so that the side showing the model marking surface faces up.



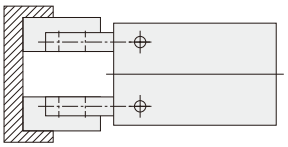
Mounting Sensor Switch

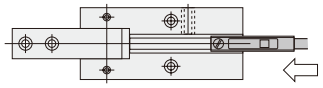
●For swing type (Mount the sensor switch so that the model marking surface faces up.)

《For inside gripping》

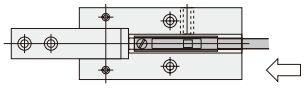


1) Confirm the levers are completely open.

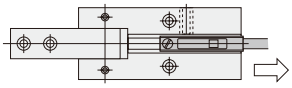




2) Push the switch into the groove on the body in the direction of the arrow.



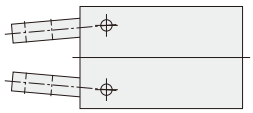
3) By moving the sensor switch in the direction of the arrow, the lamp turns ON, and by moving it further, the lamp turns OFF.



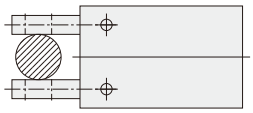
4) By moving back the sensor switch in the direction of the arrow (opposite direction), the lamp turns ON, and it should be secured by the sensor switch mounting screw after moving it about 0.3 mm [0.012in.] further.

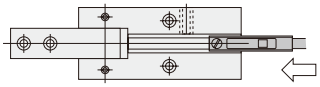
1) Confirm workpiece is inside gripped one.

《For outside gripping》

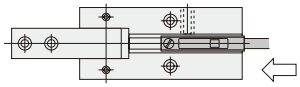


1) Confirm the levers are completely closed.

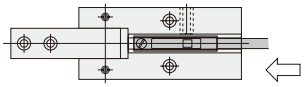




2) Push the switch into the groove on the body in the direction of the arrow.



3) By moving the switch in the direction of the arrow, the lamp turns ON.



4) Secure the sensor switch by the mounting screw after moving it about 0.3 mm [0.012in.] further in the direction of the arrow from where the lamp turned ON in step 3).

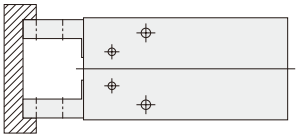
1) Confirm workpiece is outside gripped one.

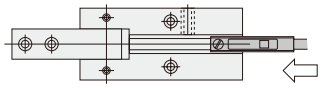
Remark: Step 1) shows the location where you want to confirm the switch turns ON. Install and adjust it in accordance with step 1) ～ 4) above.

●For parallel type (Mount the sensor switch so that the model marking surface faces up.)

《For inside gripping》

1) Confirm the levers are completely open.

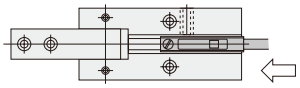




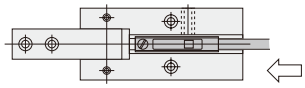
2) Push the switch into the groove on the body in the direction of the arrow.

1) Confirm workpiece is inside gripped one.

●For **NHBDP□**, **NHBRP□**

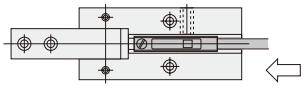


3) By moving the switch in the direction of the arrow, the lamp turns ON.

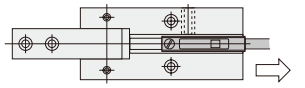


4) Secure the sensor switch by the mounting screw after moving it about 0.3 mm [0.012in.] further in the direction of the arrow from where the lamp turned ON in step 3).

●For **NHBDPA□**, **NHBRPA□**



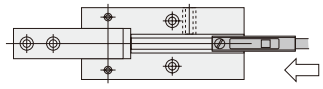
3) By moving the sensor switch in the direction of the arrow, the lamp turns ON, and by moving it further, the lamp turns OFF.



4) By moving back the sensor switch in the direction of the arrow (opposite direction), the lamp turns ON, and it should be secured by the mounting screw after moving it about 0.3 mm [0.012in.] further.

《For outside gripping》

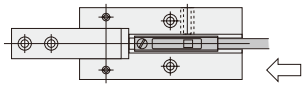
1) Confirm the levers are completely closed.



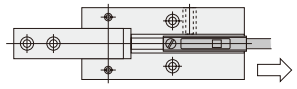
2) Push the switch into the groove on the body in the direction of the arrow.

1) Confirm workpiece is outside gripped one.

●For **NHBDP□**, **NHBRP□**

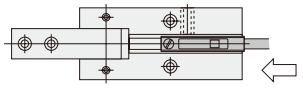


3) By moving the switch in the direction of the arrow, the lamp turns ON, and by moving it further, the lamp turns OFF.

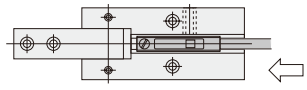


4) By moving back the sensor switch in the direction of the arrow (opposite direction), the lamp turns ON, and it should be secured by the mounting screw after moving it about 0.3 mm [0.012in.] further.

●For **NHBDPA□**, **NHBRPA□**



3) By moving the switch in the direction of the arrow, the lamp turns ON.

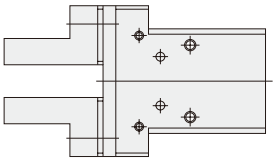


4) Secure the sensor switch by the mounting screw after moving it about 0.3 mm [0.012in.] further in the direction of the arrow from where the lamp turned ON in step 3).

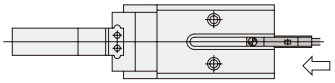
Remark: Step 1) shows the location where you want to confirm the switch turns ON. Install and adjust it in accordance with step 1) ～ 4) above.

●For parallel type linear guide specification (with rubber cover) (Mount the sensor switch so that the model marking surface faces up.)

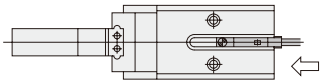
《For inside gripping》



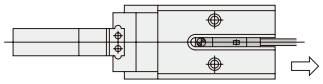
1) Confirm the levers are completely open.



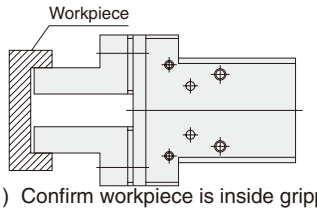
2) Insert the switch into the groove on the body in the direction of the arrow.



3) By moving the sensor switch in the direction of the arrow, the lamp turns ON, and by moving it further, the lamp turns OFF.

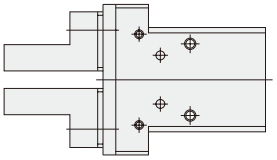


4) By moving back the sensor switch in the direction of the arrow (opposite direction), the lamp turns ON, and it should be secured by the sensor switch mounting screw after moving it about 0.3 mm [0.012in.] further.

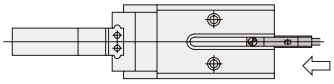


1) Confirm workpiece is inside gripped one.

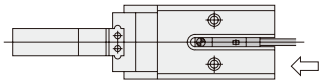
《For outside gripping》



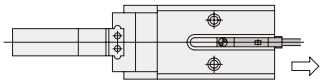
1) Confirm the levers are completely closed.



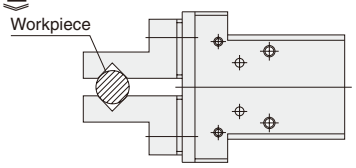
2) Insert the switch into the groove on the body in the direction of the arrow.



3) By moving the switch in the direction of the arrow, the lamp turns ON.



4) Secure the sensor switch by the mounting screw after moving it about 0.3 mm [0.012in.] further in the direction of the arrow from where the lamp turned ON in step 3).



1) Confirm workpiece is outside gripped one.

Remark: Step 1) shows the location where you want to confirm the switch turns ON. Install and adjust it in accordance with step 1) ～ 4) above.

Safety Precautions (Air Cylinders and General Actuators)

Always read these precautions carefully before use.

Before selecting and using the product, please read all the Safety Precautions carefully to ensure proper product use.
The Safety Precautions shown below are to help you use the product safely and correctly, and to prevent injury or damage to you, other people, and assets beforehand.
Follow the Safety Precautions for: ISO4414 (Pneumatic fluid power—Recommendations for the application of equipment to transmission and control systems), JIS B 8370 (Pneumatic system regulations)

The directions are ranked according to degree of potential danger or damage:
"DANGER!", "WARNING!", "CAUTION!", and "ATTENTION!"

⚠ **DANGER**	Expresses situations that can be clearly predicted as dangerous. If the noted danger is not avoided, it could result in death or serious injury. It could also result in damage or destruction of assets.
⚠ **WARNING**	Expresses situations that, while not immediately dangerous, could become dangerous. If the noted danger is not avoided, it could result in death or serious injury. It could also result in damage or destruction of assets.
⚠ **CAUTION**	Expresses situations that, while not immediately dangerous, could become dangerous. If the noted danger is not avoided, it could result in light or semi-serious injury. It could also result in damage or destruction of assets.
⚠ **ATTENTION**	While there is little chance of injury, this content refers to points that should be observed for appropriate use of the product.

■This product was designed and manufactured as parts for use in General Industrial Machinery.

- In the selection and handling of the equipment, the system designer or other person with fully adequate knowledge and experience should always read the Safety Precautions, Catalog, Owner's Manual and other literature before commencing operation. Making mistakes in handling is dangerous.
- After reading the Owner's Manual, Catalog, etc., always place them where they can be easily available for reference to users of this product.
- If transferring or lending the product to another person, always attach the Owner's Manual, Catalog, etc., to the product where they are easily visible, to ensure that the new user can use the product safely and properly.
- The danger, warning, and caution items listed under these "Safety Precautions" do not cover all possible cases. Read the Catalog and Owner's Manual carefully, and always keep safety first.

⚠ DANGER

- Do not use the product for the purposes listed below:
  1. Medical equipment related to maintenance or management of human lives or bodies.
  2. Mechanical devices or equipment designed for the purpose of moving or transporting people.
  3. Critical safety components in mechanical devices.

  This product has not been planned or designed for purposes that require advanced stages of safety. It could cause injury to human life.
- Do not use the product in locations with or near dangerous substances such as flammable or ignitable substances. This product is not explosion-proof. It could ignite or burst into flames.
- When mounting the product and workpiece, always firmly support and secure them in place. Dropping or falling the product or improper operation could result in injury.
- When mounting the Flat Rodless cylinder, always mount it with an end plate tightened with mounting bolts at 4 counterbore locations (left and right).
  Failure to firmly secure the end plate could result in separation of the connection between the cylinder barrel and the end plate, leading to possible injury.
- Persons who use a pacemaker, etc., should keep a distance of at least 1 meter [3.28ft.] away from the product. There is a possibility that the pacemaker will malfunction due to the strong magnet built into the product.
- Never attempt to remodel the product. It could result in abnormal operation leading to injury, electric shock, fire, etc.
- Never attempt inappropriate disassembly, or assembly of the product relating to its basic inner construction, or to its performance or functions. It could result in injury, electric shock, fire, etc.
- Do not splash water on the product. Spraying it with water, washing it, or using it underwater could result in malfunction of the product leading to injury, electric shock, fire, etc.
- While the product is in operation, avoid touching it with your hands or otherwise approaching too close. In addition, do not make any adjustments to the interior or to the attached mechanisms (shock absorbers, stroke adjusting mechanism, sensor switch mounting location, disconnection of piping tubes or plugs, etc.). The actuator can move suddenly, possibly resulting in injury.
- When operating the product, always install speed controllers, and gradually loosen the needle valve from a choked state to adjust the speed increasing. Failure to make this adjustment could result in sudden movements, putting lives at risk.
- Do not apply loads exceeding the allowable buckling and bending strength to piston rod. It could reduce operating life or cause abnormal wearing or other damage to the rod and tube.
- Connect axial center of the piston rod and movement direction of load to surely bring them in line. If not, applying excessive force to the piston rod and tube could cause abnormal wearing or other damage to them.

⚠ WARNING

- Do not use the product in excess of its specification range. Such use could result in product breakdowns, function stop, damage, or drastically reduce the operating life.
- Before supplying air or electricity to the device and before starting operation, always conduct a safety check of the area of machine operation. Unintentional supply of air or electricity could possibly result in electric shock, or in injury caused by contact with moving parts.
- Do not touch the terminals and the miscellaneous switches, etc., while the device is powered on. There is a possibility of electric shock and abnormal operation.
- Do not throw the product into fire.
  The product could explode and/or release toxic gases.
- Do not sit on the product, place your foot on it, or place other objects on it.
  Accidents such as falling could result in injury. Dropping or toppling the product may result in injury, or it might also damage or break it, resulting in abnormal or erratic operation, runaway, etc.
- When conducting any kind of operation for the product, such as maintenance, inspection, repair, or replacement, always turn off the air supply completely and confirm that residual pressure inside the product or in piping connected to the product is zero before proceeding. In particular, be aware that residual air will still be in the air compressor or air storage tank. The actuator could abruptly move if residual air pressure remains inside the piping, causing injury.
- Do not use the actuator for equipment whose purpose is absorbing the shocks and vibrations of mechanical devices. It could break and possibly result in injury or in damage to mechanical devices.
- Avoid scratching the cords for the sensor switch lead wires, etc.
  Letting the cords be subject to scratching, excessive bending, pulling, rolling up, or being placed under heavy objects or squeezed between 2 objects, may result in current leaks or defective continuity that lead to fire, electric shock, or abnormal operation.
- For the cylinder rod bushing, when the bore size is 16mm [0.630in.] or less, avoid applying a lateral load with a cylinder thrust force of 1/40 or

more generated by the nominal pressure, or when the bore size is 20mm [0.787in.] or more, avoid applying a lateral load with a cylinder thrust force of 1/20 or more. Such loads could reduce operating life or cause galling or other damage to the rod and tube.

- Do not subject the sensor switch to an external magnetic field during actuator operation. Unintended movements could result in damage to the equipment or in personal injury.
- Use within the recommended load and specified speed. Use exceeding the recommended load and specified speed could cause unintended movement of the rod and plate, and increase the possibility of damage to equipment or of personal injury.
- Use safety circuits or system designs to prevent damage to machinery or injury to personnel when the machine is shut down due to emergency stop or electrical power failure.
- Use under the conditions described below is subject to regulation under the Japanese High Pressure Gas Safety Law. Violation of this law can result in penalties to individuals or the corporation. Before use, perform procedures mandated by the supervising authorities.
  1. Pressurized gases at gauge pressures of 1MPa [145psi.] or more are used at room temperature. (Acetylene gas and liquefied gas are subject to even stricter standards.)
  2. Compressed air at gauge pressures of 5MPa [725psi.] or more are used. For details, see the Japanese High Pressure Gas Safety Law.
- Install relief valves, etc., to ensure that the actuator does not exceed its specified pressure when such pressure is rising due to external forces on the actuator. Excessive pressure could lead to breakdown and damage.
- In initial operations after the equipment has been idle for 48 hours or more, or has been in storage, there is a possibility that contacting parts may stick, resulting in equipment operation delays or sudden movements. For these initial operations, always run a test operation before use to check that operating performance is normal.

⚠ CAUTION

- Always wash your hands thoroughly after coming into contact with the grease used in the Low Speed Cylinders. If you light a cigarette with greasy hands, grease adhering to the cigarette could release toxic gases along with the cigarette smoke.
- Do not apply lubrication to the Low Speed Cylinders. Supplying oil could result in erratic operation.
- Do not use the product in locations that are subject to direct sunlight (ultraviolet rays), dust, salt, iron powder, high humidity, or in the ambient atmospheres that include organic solvents, phosphate ester type hydraulic oil, sulphur dioxide, chlorine gas, acids, etc. It could lead to an early shutdown of some functions or a sudden degradation of performance, and result in a reduced operating life. For the materials used, see Major Parts and Materials.
- When installing the product, leave room for adequate working space around it. Failure to ensure adequate working space will make it more difficult to conduct daily inspections or maintenance, which could eventually lead to system shutdown or damage to the product.
- For mounting or transport of heavy products, use a lift, supporting tool, or several people, to provide firm support, and proceed with due caution to ensure personal safety.
- Do not bring floppy disks or magnetic media, etc., within 1 meter [3.28ft.] of the product. There is the possibility that the data on the floppy disks will be destroyed due to the magnetism of the magnet.
- Do not use the sensor switch in locations subject to large electrical currents or strong magnetic fields. It could result in erratic operation. In addition, do not use magnetized materials in the mounting bracket. The magnetism could leak, possibly resulting in erratic operation.
- Do not place too closely to magnets. Placing near magnets or in locations subject to large magnetic fields can magnetize the main body or table, resulting in erratic operation of sensor switches or in other operating problems caused by metal powders sticking to parts.
- Never use other companies' sensor switches with these products. It could possibly cause erratic operation or out of control.
- Do not scratch, dent, or deform the actuator by climbing on the product, using it as a scaffold, or placing objects on top of it. It could result in damaged or broken a product that results in operation shutdown or degraded performance.
- Always post an "operations in progress" sign for installations, adjustments, or other operations, to avoid unintentional supplying of air, electrical power, etc. Such accidental supplies may cause electric shock or sudden activation of the product that could result in physical injury.
- Do not pull on the cords of the lead wires, etc., of the sensor switches mounted on the actuators, grab them when lifting or carrying, or place heavy objects or excessive loads on them. Such action could result in current leaks or defective continuity that lead to fire, electric shock, or abnormal operation.

⚠ ATTENTION

- When considering the possibility of using this product in situations or environments not specifically noted in the Catalog or Owner's Manual, or in applications where safety is an important requirement such as in an airplane facility, combustion equipment, leisure equipment, safety equipment, and other places where human life or assets may be greatly affected, take adequate safety precautions such as an application with enough margins for ratings and performance or fail-safe measure.
  Be sure to consult us about such applications.
- Always check the catalog and other reference materials for product wiring and plumbing setup.
- Use a protective cover, etc., to ensure that human bodies do not come into direct contact with the operating portion of mechanical devices, etc.
- Do not control in a way that would cause workpieces to fall during power failure. Take control measures so that they prevent the table or workpieces, etc., from falling during power failure or emergency stop of the mechanical devices.
- When handling the product, wear protective gloves, safety glasses, safety shoes, etc., to keep safety.
- When the product can no longer be used, or is no longer necessary, dispose of it appropriately as industrial waste.
- Pneumatic equipment can exhibit degraded performance and function over its operating life. Always conduct daily inspections of the pneumatic equipment, and confirm that all requisite system functions are satisfied, to prevent accidents from happening.
- For inquiries about the product, contact your nearest Koganei sales office or Koganei overseas department. The address and telephone number is shown on the back cover of this catalog.

⚠ OTHERS

- Always observe the following items.
  1. When using this product in pneumatic systems, always use genuine KOGANEI parts or compatible parts (recommended parts).
  When conducting maintenance and repairs, always use genuine KOGANEI parts or compatible parts (recommended parts). Always observe the required methods.
  2. Do not attempt inappropriate disassembly or assembly of the product relating to basic configurations, or its performance or functions.

  Koganei cannot be responsible if these items are not properly observed.

Design and selection

⚠ Warning

1. Check the specifications.
As use of this component over the specified ranges of voltage, current, temperature, shock, etc., could result in breakdown or abnormal operation, always read the specifications carefully to ensure correct use.

2. Avoid mounting actuators in close proximity.
Mounting 2 or more actuators with sensor switches in close proximity could result in erratic operation of the sensor switches, due to magnetic field interference with the system.
Follow the instructions of each cylinder series when written in the catalog.

3. Caution about sensor switch ON time for positioning detection at intermediate stroke position.
Take caution that if the sensor switch is mounted at an intermediate position of the actuator stroke for detection of the piston travel, the sensor switch actuation time may be too short when the actuator speed is very rapid, so that the load (programmable controller, etc.) may fail to activate.
Maximum cylinder speed for positioning detection

$$V\ (mm/s)\ [in./sec.] = \frac{\text{Sensor switch actuation range (mm) [in.]}}{\text{Time required for activating load (ms)}} \times 1000$$

4. Keep wiring as short as possible.
The solid state sensor switch lead wire length should be within 30m [98ft.] as stipulated in the EN standards. For the reed sensor switch, if the lead wire is long (10m [33ft.] or more), capacitive surges will shorten the operating life of the sensor switch. If long wiring is needed, install the protection circuit mentioned in the catalog. If the load is inductive or capacitive, also install the protection circuit mentioned in the catalog.

5. Avoid repeated or excessive bending or pulling of lead wires.
Applying repeated bending stress or tension force on the lead wire could result in wire breakage.

6. Check for leakage current.
Two-lead wire solid state sensor switches produce leakage current to activate their internal circuits, and the current flows even when in the turned off condition. Check to ensure they satisfy the following inequality.

Input off current of programmable controller > Leakage current

If the above inequality cannot be satisfied, select a 3-lead wire solid state sensor switch, instead. Also note that parallel connection of a total of *n* sensor switches will multiply the amount of leakage current by *n* times.

⚠ Caution

1. Check for sensor switch internal voltage drop.
Series connection of reed sensor switches with indicator lamps or 2-lead wire solid state sensor switches causes increasing internal voltage drop, and the load may fail to activate. A total of *n* sensor switches will lead to *n* times the internal voltage drop. Ensure that the system satisfies the following inequality.

Supply voltage – Internal voltage drop × *n* > Minimum operating voltage for load

In relays with rated voltage of less than 24VDC, check to see whether the above inequality is satisfied, even in the case of *n* = 1. If the above inequality cannot be satisfied, select a reed sensor switch without indicator lamp.

2. Do not use our sensor switches with other companies' actuators.
The sensor switches are designed for use with Koganei actuators. Use with other companies' actuators could lead to abnormal operation.

Installation and adjustment

⚠ Warning

1. Do not subject the sensor switch to an external magnetic field during actuator operation.
Unintended movements could result in damage to the equipment or in personal injury.

⚠ Caution

1. Ensure a safe installation environment for the actuators with sensor switches.
Do not use sensor switches in places where large current or magnetic fields are present. This could lead to unintentional operation. Do not use magnetic material for the mounting brackets. It could result in erratic operation.

2. Install sensor switches in the center of their operating range.
Adjust the mounting position of a sensor switch so that the piston stops in the center of its operating range (the range while the sensor turns ON). Operations can be unstable if mounted at the end of the operating range (at the boundary near ON and OFF). Also be aware that the operating range can vary with changes in temperature.

3. Follow the tightening torque of sensor switches when mounting.
Over-tightening beyond the allowed tightening torque may damage the mounting screws, mounting brackets, sensor switches, etc. In addition, insufficient tightening torque could cause the sensor switch position to be changed, resulting in operation instability.
For the tightening torque, follow the instructions of each cylinder series.

4. Do not carry the actuator grabbing its sensor switch lead wires.
After mounting a sensor switch to an actuator, do not grab and lift the lead wires to carry the actuator. Never do this, as it could result in lead wire disconnections, and could also apply stress to the interior of the sensor switch, resulting in breakage of internal elements.

5. Do not drop switches, or bump them against others.
During handling of switches, do not apply excessive shocks ($294.2 m/s^2$ [30G] or more) such as hitting, dropping, or bumping. In reed sensor switches, the contact reed can be activated unintentionally, causing it to send or break sudden signals. It can also cause changes in the contact interval that lead to changes in sensor switch sensitivity and result in erratic operation. Even if the sensor switch case is undamaged, the inner parts of the sensor switch may suffer breakdown or cause erratic operation.