

**KOGANEI**

Air Cylinder

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**FLAT TYPE AIR HAND**

**INSTRUCTION MANUAL** Ver.1.0



## Handling Instructions and Precautions



### 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

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.

#### 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

Avoid use in locations subject to dripping water or oil, or to large amounts of dust.

#### 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 reduction in the gripping accuracy, and wear and damage of the sliding portion etc., therefore speed controllers 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 actions, use a shock absorber etc., at the travel end to stop it as smoothly as possible. Sudden stops may cause the workpieces to jump out or fall from the gripper.

#### Workpiece

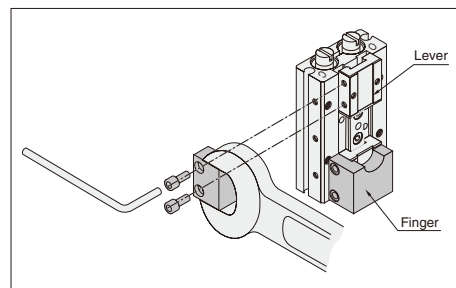
1. Set the mass of the workpiece actually gripped to about 1/10~1/20 of the effective gripping force.
2. Set the workpiece mass to about 1/30~1/50 of the effective gripping force when you move the air gripper while holding the workpiece.
3. As the workpiece mass which can be gripped changes greatly depending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



### Mounting

#### Mounting

1. Never attempt to convert or disassemble the main body. It could result in breakdowns or accidents.
2. Take care to avoid being pinched hands or fingers in the lever during mounting or operation.
3. Shut off the air supply before mounting the finger or hand (gripper).
4. When mounting the finger to the lever, use a wrench etc., for hold to avoid subjecting the lever to apply more than the allowable moment. Tighten the mounting bolts to the tightening torques shown in the table below.



Model	Bolt	Maximum tightening torque N · m [in · lbf]
AFDPG-6-□	M2×0.4	0.15 [1.33]
AFDPG(H)-8-□	M2.5×0.45	0.32 [2.83]
AFDPG(H)-12-□	M3×0.5	0.6 [5.3]
AFDPG(L)-14-□	M3×0.5	0.6 [5.3]
AFDPG(L)-18-□	M3×0.5	0.6 [5.3]

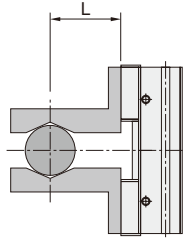
**Caution:** Side surface mounting on the lever is not available for  $\phi 14$  and  $\phi 18$ .



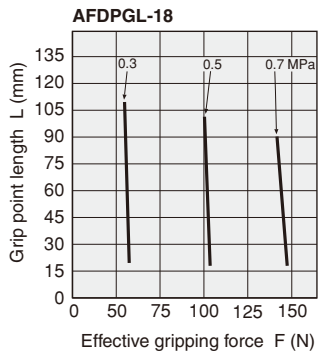
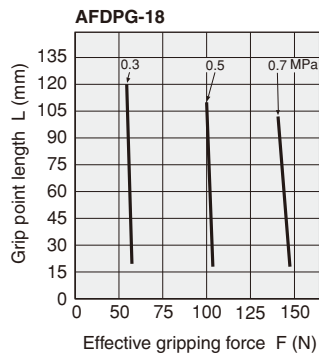
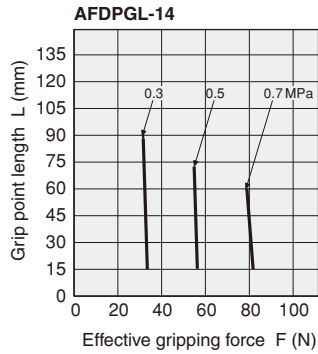
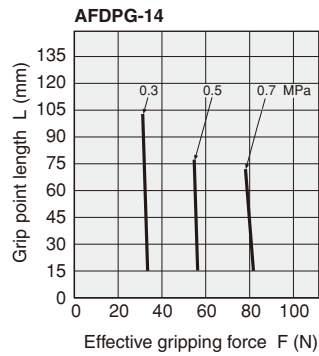
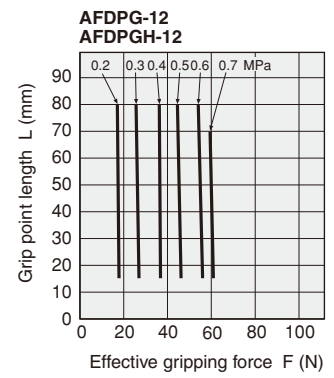
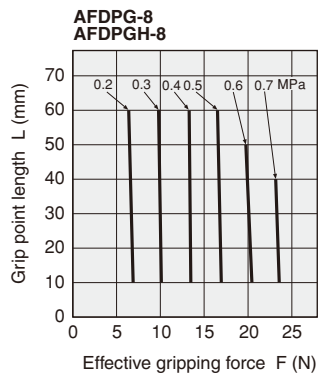
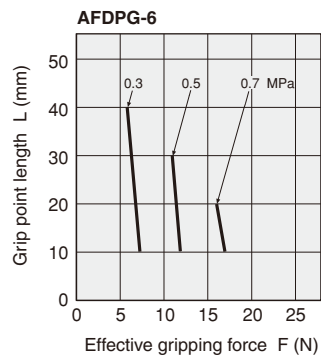


## Selection

### Effective gripping force



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

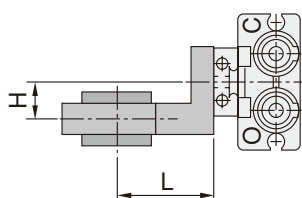
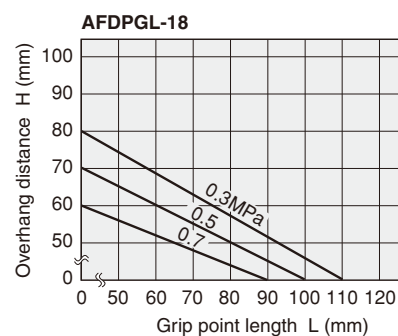
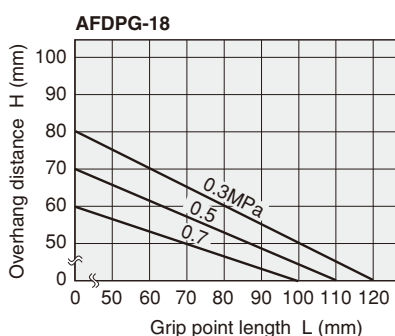
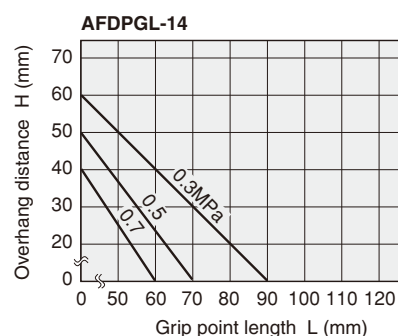
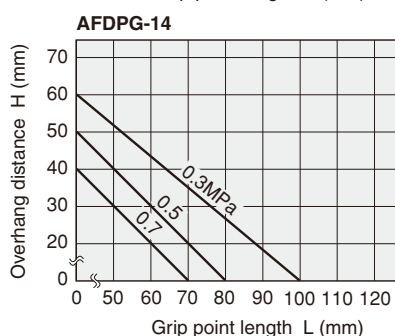
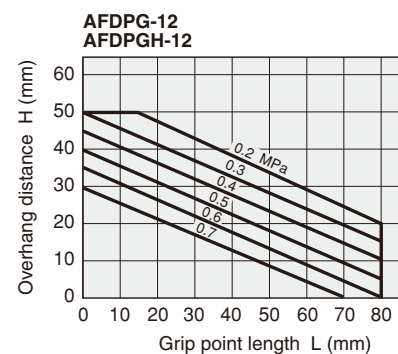
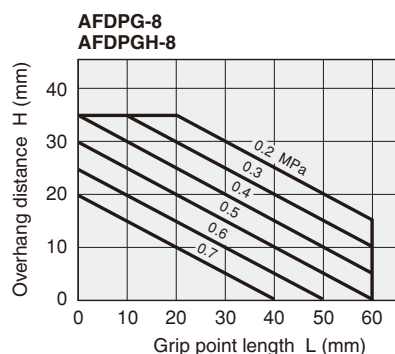
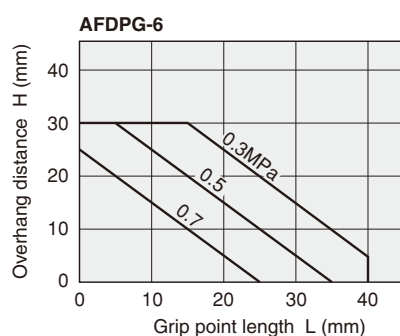


1mm = 0.0394in., 1N = 0.2248lbf.  
1MPa = 145psi.



## Handling Instructions and Precautions

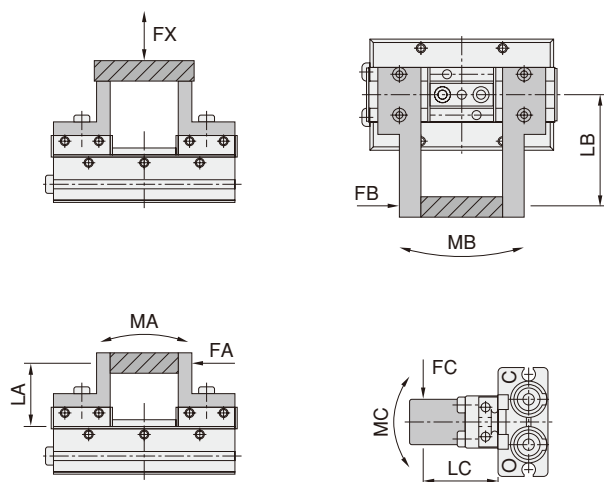
### Grip point limit range



H = Overhang distance  
L = Grip point length

1 mm = 0.0394 in.

### Allowable load and allowable moment



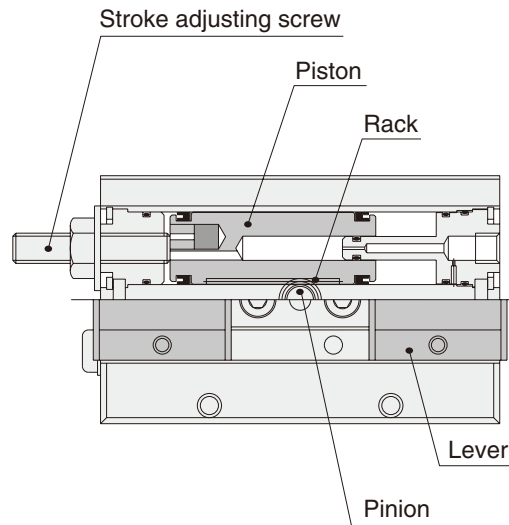
- $MA = FA \times LA$  (N·m)
- $MB = FB \times LB$  (N·m)
- $MC = FC \times LC$  (N·m)

Model	Load and moment FX N [lbf.]	MA N·m [ft·lbf]	MB N·m [ft·lbf]	MC N·m [ft·lbf]
<b>AFDPG-6</b>	12 [2.7]	0.04 [0.030]	0.04 [0.030]	0.08 [0.059]
<b>AFDPG(H)-8</b>	40 [9.0]	0.3 [0.22]	0.3 [0.22]	0.6 [0.44]
<b>AFDPG(H)-12</b>	120 [27.0]	1.0 [0.74]	1.0 [0.74]	2.0 [1.48]
<b>AFDPG(L)-14</b>	190 [42.7]	3.0 [2.21]	4.0 [2.95]	8.0 [5.90]
<b>AFDPG(L)-18</b>	210 [47.2]	4.0 [2.95]	6.0 [4.43]	9.0 [6.64]



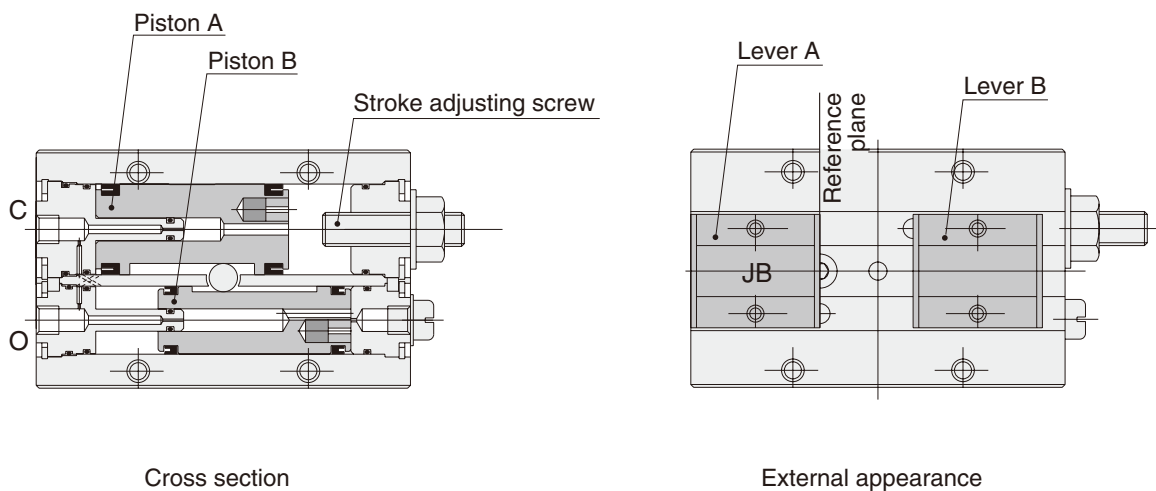
## Stroke adjusting method

### ● Synchronous type



Use a stroke adjusting screw to adjust the piston travel distance.  
 Applying air pressure moves the piston as far as the stroke adjusting screw.  
 Synchronized movement of the rack (one piece type with piston) and pinion moves the levers on both sides as far as the preset location.  
 (Diagram shows open side stroke adjustment. For closed side stroke adjustment, the stroke adjusting screw is reversed in the case.)

### ● Asynchronous type



#### ● How to determine the reference plane (Diagrams show **AFDPGH-12**)

Inside the air hand (gripper) there are pistons of different diameter ( $\phi 12$  [0.472in.] and  $\phi 14$  [0.551in.]). Applying air pressure causes the larger piston (piston A) to move as far as the stroke adjusting screw. The smaller piston (piston B) moves as far as the position where the workpiece can be gripped.

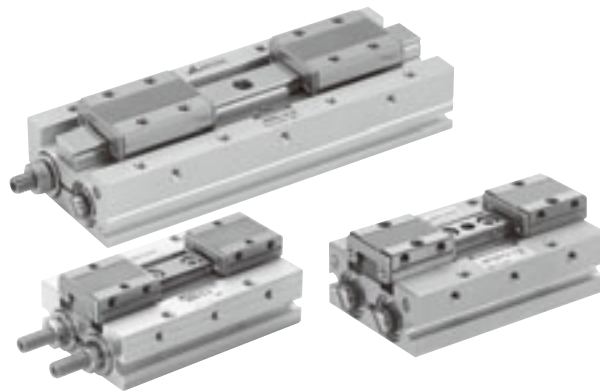
Because the piston thrust is larger on one side, the lever for the larger piston diameter side (lever A) always provides the reference plane for gripping.

The stroke adjusting method is the same as for the synchronous type.



# FLAT TYPE AIR HANDS

## Synchronous Type and Long Type



## Specifications

Basic model		AFDPG-6	AFDPG-8	AFDPG-12	AFDPG-14	AFDPGL-14	AFDPG-18	AFDPGL-18
Item								
Cylinder bore size	mm [in.]	6×2 [0.236×2]	8×2 [0.315×2]	12×2 [0.472×2]	14×2 [0.551×2]		18×2 [0.709×2]	
Operation type		Double acting type						
Media		Air						
Operating pressure range	MPa [psi.]	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	120			100			
Lubrication		Not required						
Effective gripping force (F) <sup>Note 1</sup>	N [lbf.]	12 [2.7]	17 [3.8]	44 [9.9]	58 [13.0]		105 [23.6]	
Open/closed stroke	mm [in.]	12 [0.472]	16 [0.630]	22 [0.866]	30 [1.181]	60 [2.362]	40 [1.575]	80 [3.150]
Stroke adjusting range <sup>Note 2</sup>	mm [in.]	Open/closed stroke max. 6 [0.236]	Open/closed stroke max. 8 [0.315]		Open/closed stroke max. 15 [0.591]			
Repeatability	mm [in.]	±0.07 [±0.0028]			±0.08 [±0.0031]			
Port size		M3×0.5		M5×0.8				
Mass <sup>Note 3</sup>	g [oz.]	52 [1.83] (0.5 [0.018])	74 [2.61] (9 [0.32])	183 [6.46] (12 [0.42])	440 [15.52] (20 [0.71])	510 [17.99] (20 [0.71])	645 [22.75] (25 [0.88])	945 [33.33] (25 [0.88])

Notes: 1. Values are obtained when grip point length is 30mm [1.18in.] under operating pressure 0.5 MPa [73psi.].

2. Applicable range with stroke adjustment mechanism (-JA, -JB, -JC). The stroke adjustment range for -JC type is shown separately for open side and closed side. When using the  $\phi$  6 and  $\phi$  8 both-side adjustment (-JC) type, ensure a minimum of 3 mm for the lever stroke to operate.

3. The figure in parentheses ( ) shows the amount of additional mass for the stroke adjustment mechanism. For -JC, double the amount of the figure in parentheses ( ).

## Order Codes

■ **Open/closed stroke<sup>Note</sup>**

Blank : Standard type  
L : Long type

■ **Stroke adjusting mechanism**

No adjusting mechanism

Blank

Open side stroke adjustment

-JA

Closed side stroke adjustment

-JB

Open/closed both-side stroke adjustment

-JC

■ **Sensor switch**

No sensor switch

Blank

With ZE135

-ZE135

With ZE155

-ZE155

With ZE235

-ZE235

With ZE255

-ZE255

■ **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

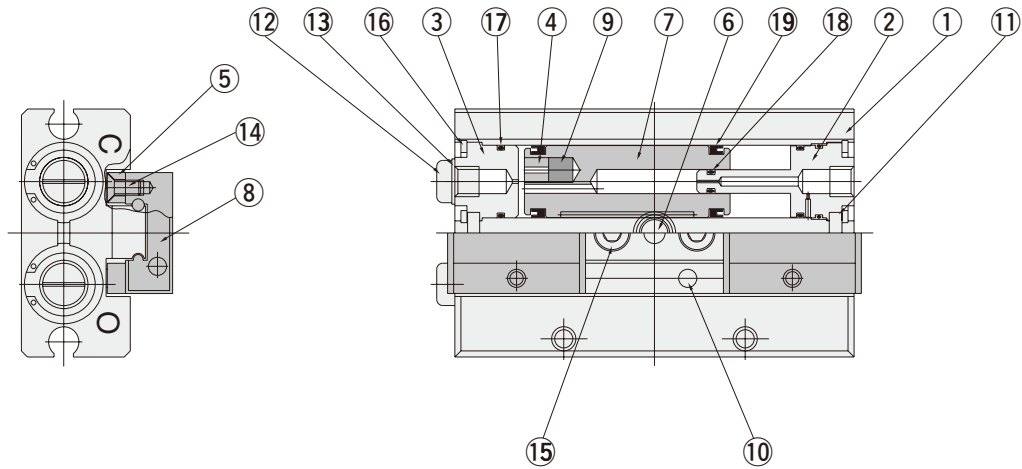
Double acting type	AFDPG	L	-6 -8 -12 -14 -18	-JA -JB -JC	-ZE135 -ZE155 -ZE235 -ZE255	A B	1 2
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Note: Selection available in  $\phi$  14 and  $\phi$  18 only.

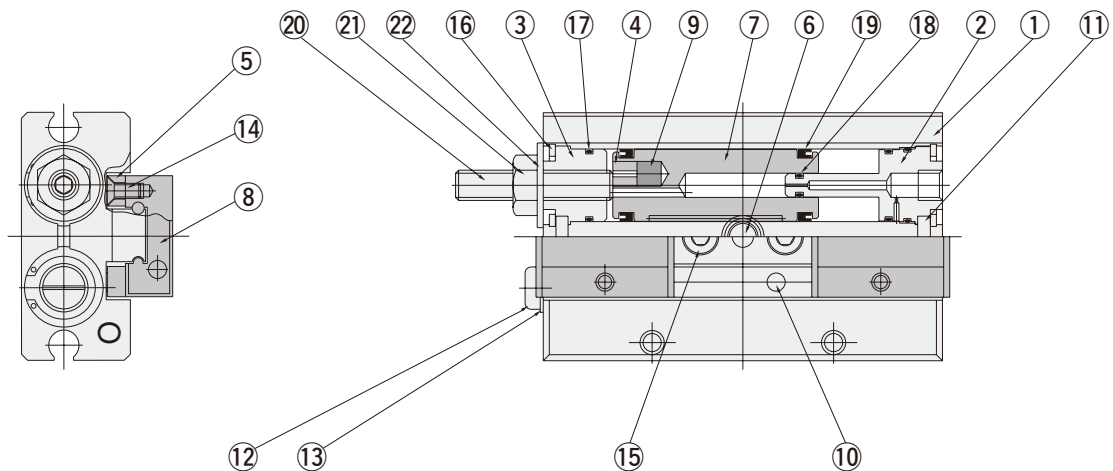


## Inner Construction

● Diagrams show double acting type  $\phi 12$  [0.472in.].



● Diagrams show double acting type with open side stroke adjustment  $\phi 12$  [0.472in.].



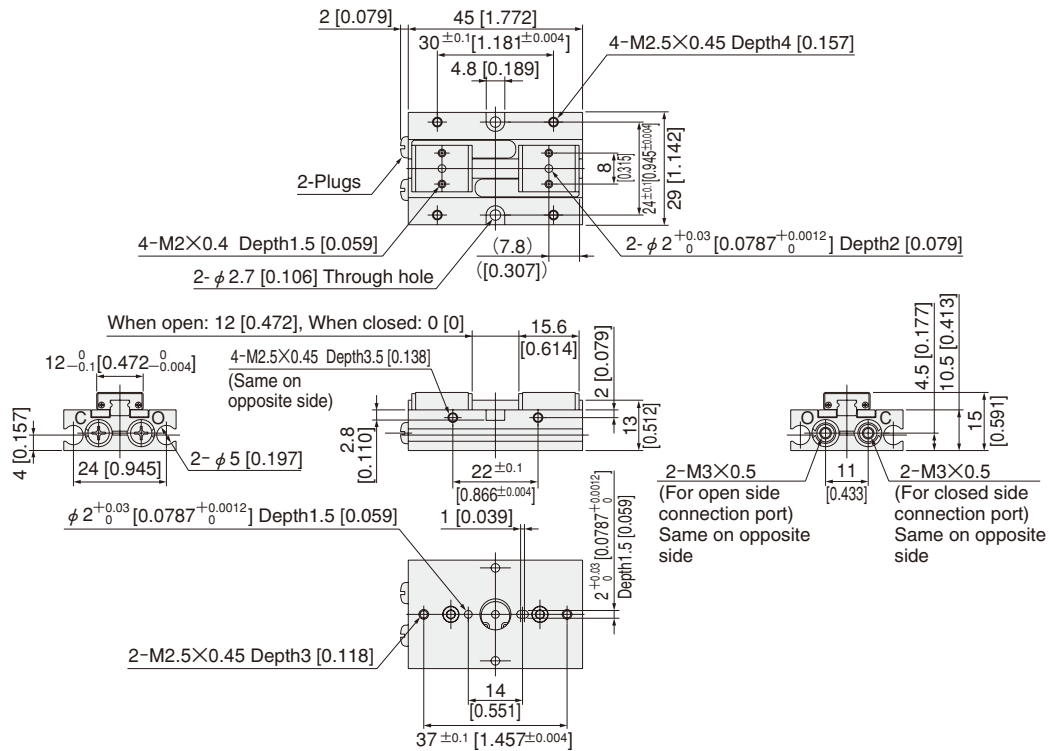
## Major Parts and Materials

No.	Parts	Materials
①	Body	Aluminum alloy
②	Head cover	Aluminum alloy
③	Head cover	Aluminum alloy
④	Cap (magnet)	Aluminum alloy
⑤	Lever	Carbon steel
⑥	Pinion rod	Stainless steel
⑦	Rack piston	Stainless steel
⑧	Bearing	Stainless steel
⑨	Magnet	Plastic magnet
⑩	Roller	Carbon steel
⑪	Roller	Carbon steel

No.	Parts	Materials
⑫	Plug	Brass (nickel plated)
⑬	Gasket	Synthetic rubber (NBR)
⑭	Screw	Mild steel
⑮	Hexagon socket head bolt	Alloy steel
⑯	Internal snap ring	Carbon steel
⑰	O-ring	Synthetic rubber (NBR)
⑱	O-ring	Synthetic rubber (NBR)
⑲	Seal	Synthetic rubber (NBR)
⑳	Hexagon socket setscrew	Mild steel
㉑	Hexagon nut	Mild steel
㉒	Sealing washer	Steel + Synthetic rubber (NBR)

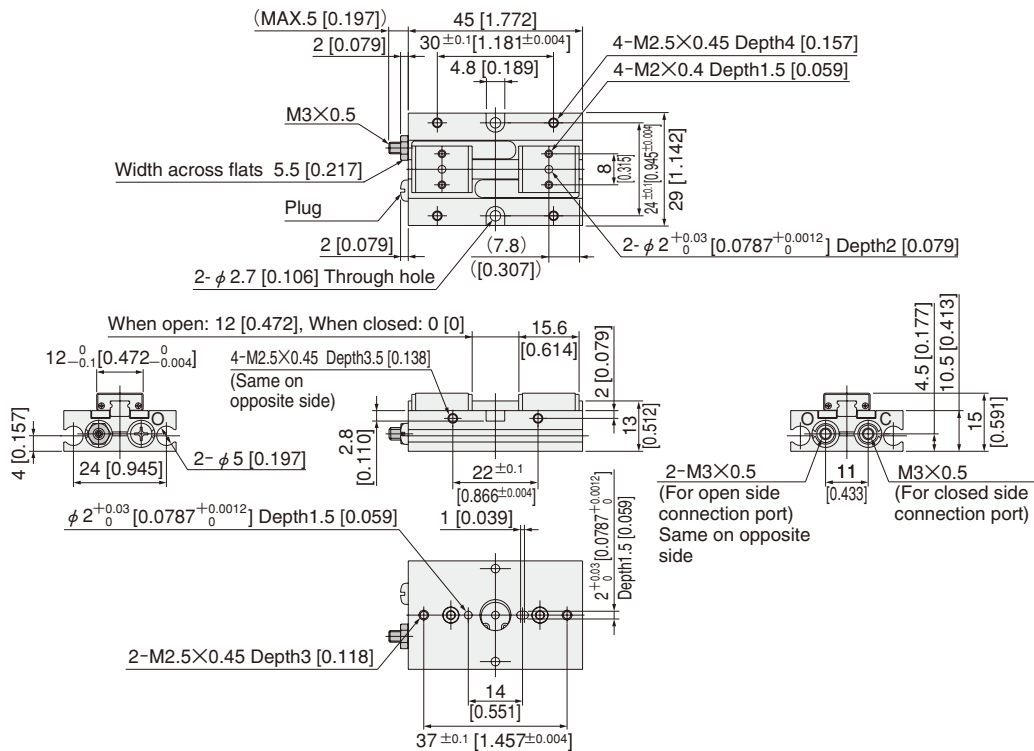


## AFDPG-6



## AFDPG-6-JA

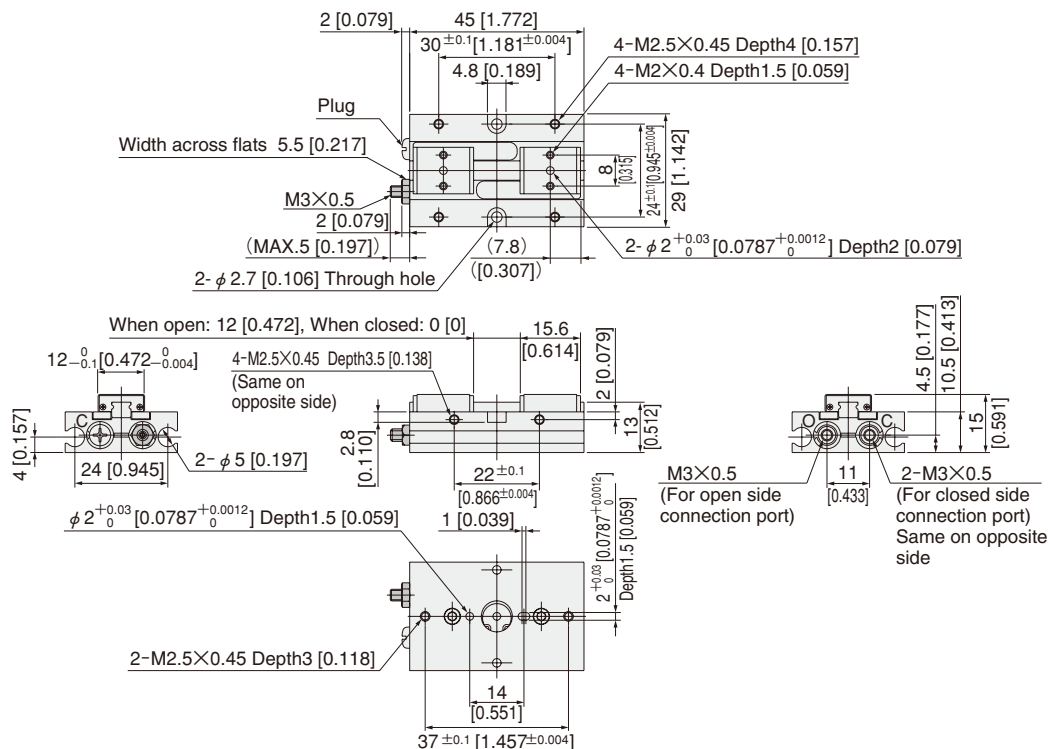
(Open side stroke adjustment)





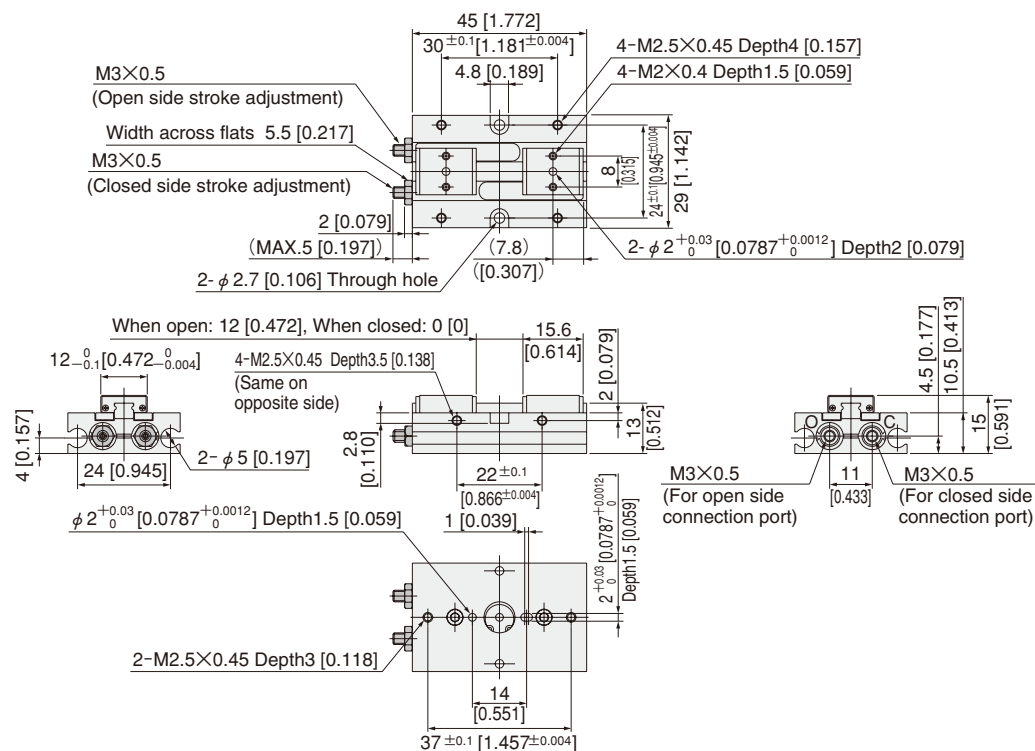
## AFDPG-6-JB

(Closed side stroke adjustment)



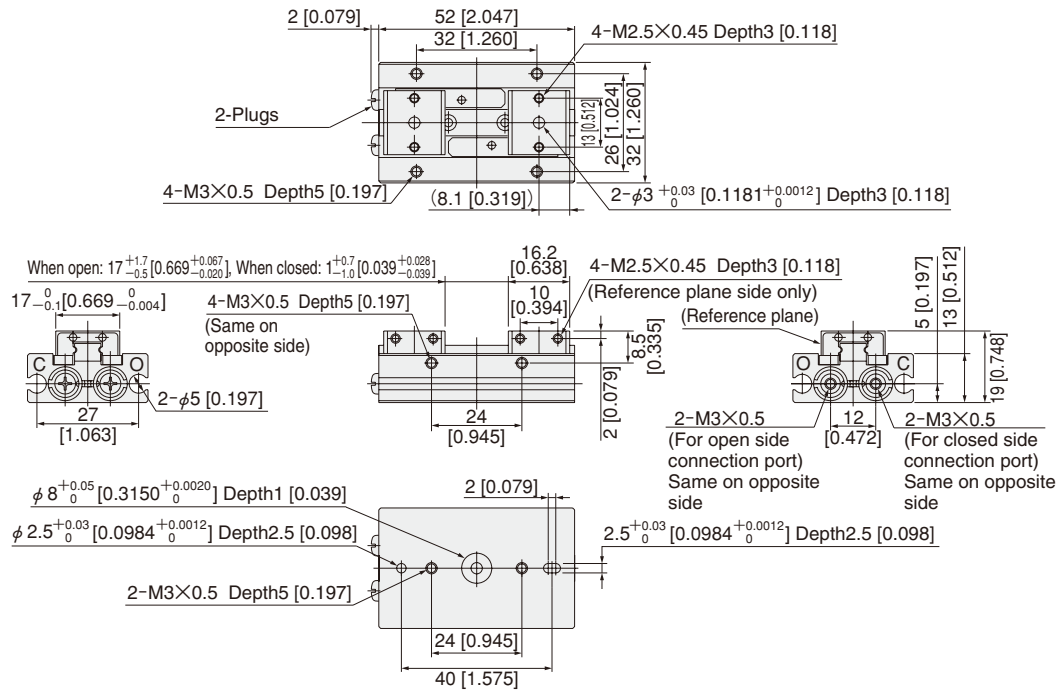
## AFDPG-6-JC

(Open/closed both-side stroke adjustment)



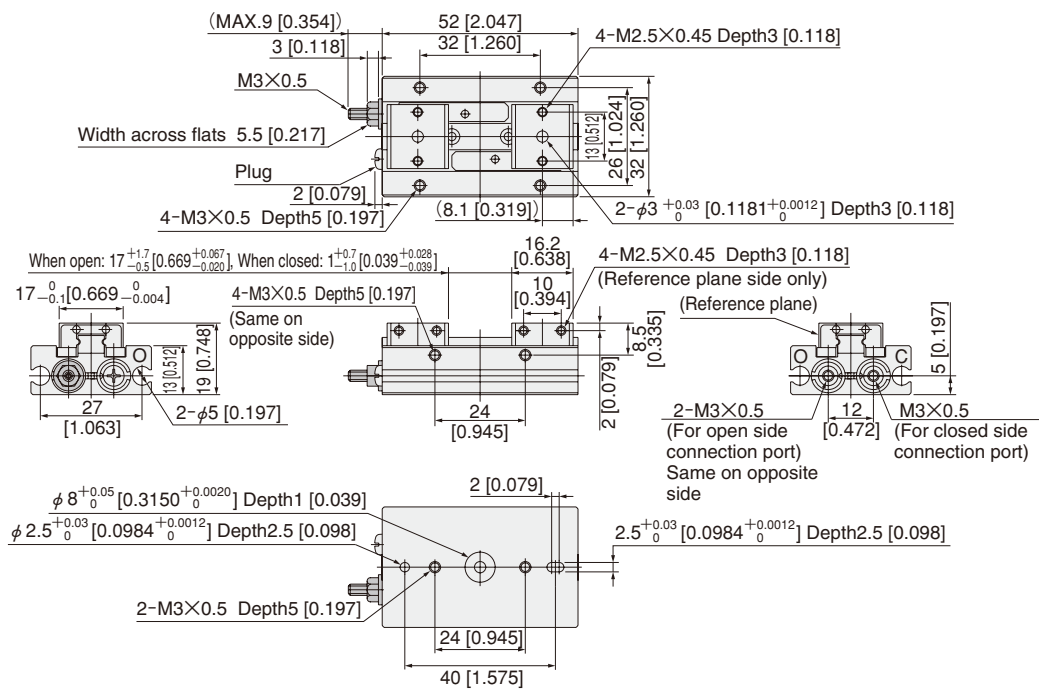


# AFDPG-8



**AFDPG-8-JA**

**(Open side stroke adjustment)**



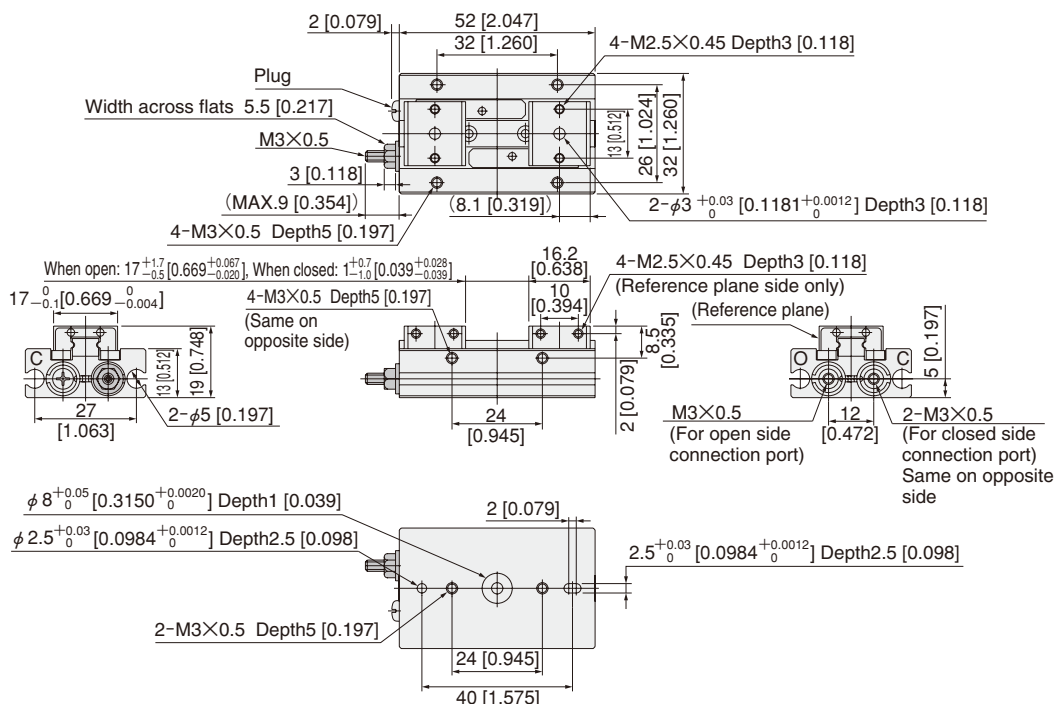


## AFDPG-8-JB

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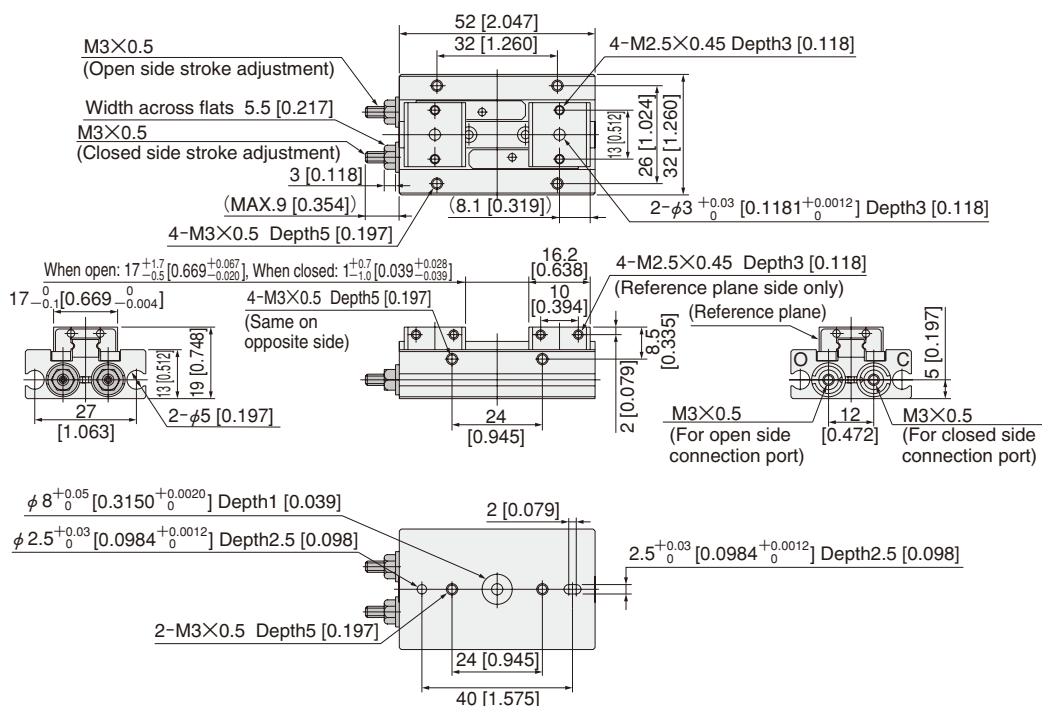


AFDPG-8-JB



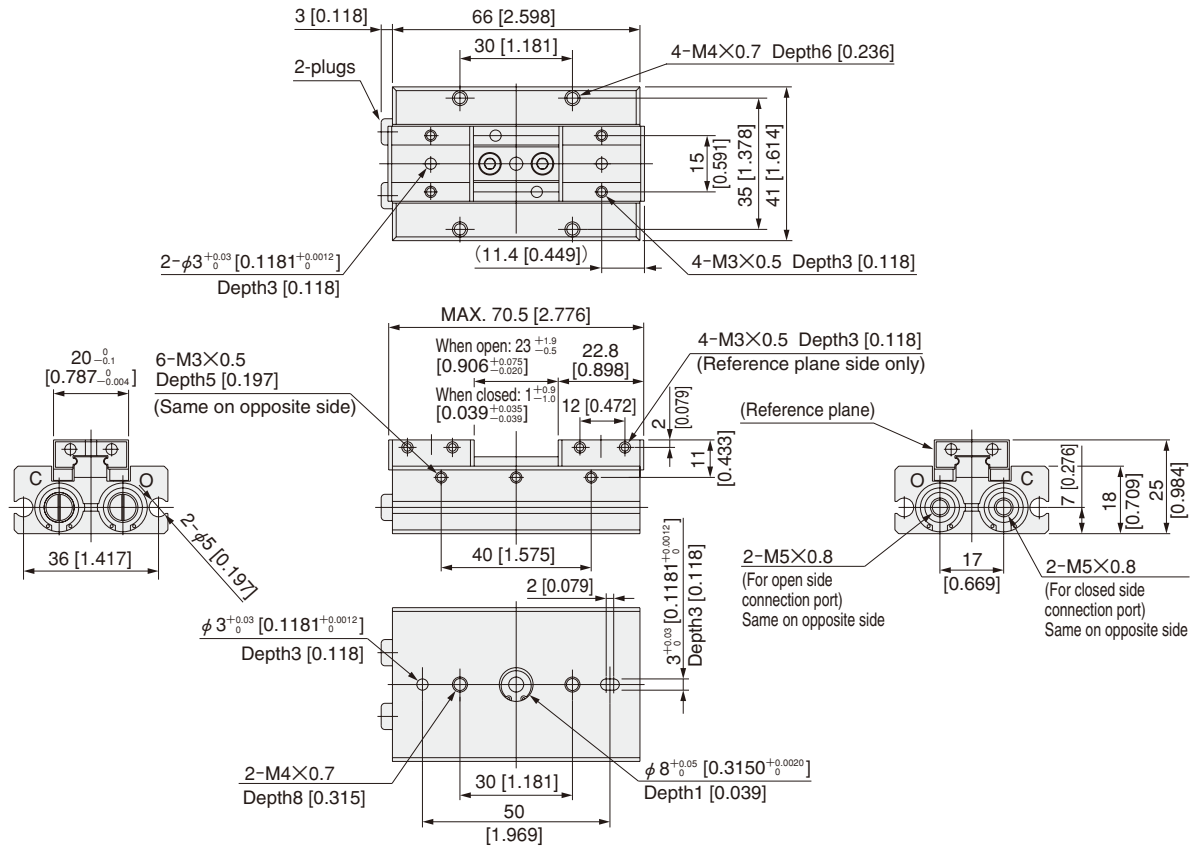
## AFDPG-8-JC

(Open/closed both-side stroke adjustment)



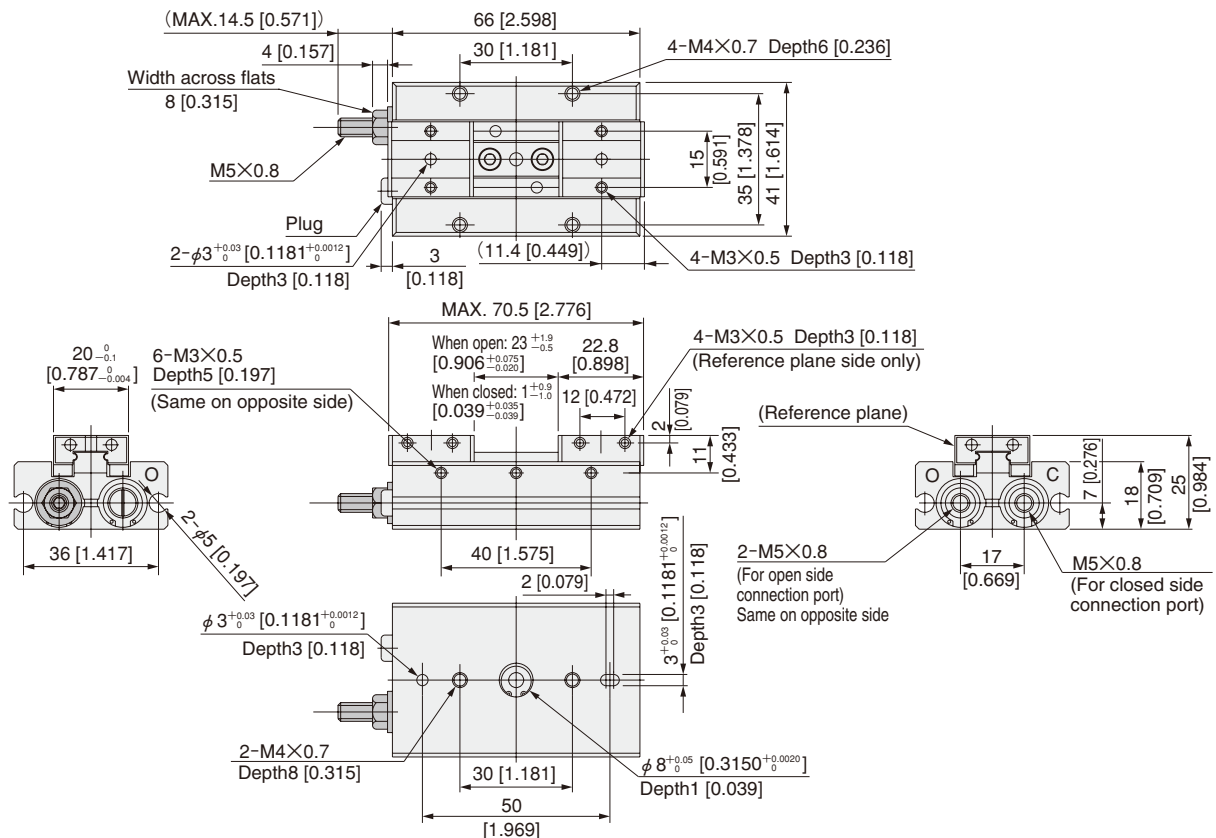


## AFDPG-12



## AFDPG-12-JA

(Open side stroke adjustment)



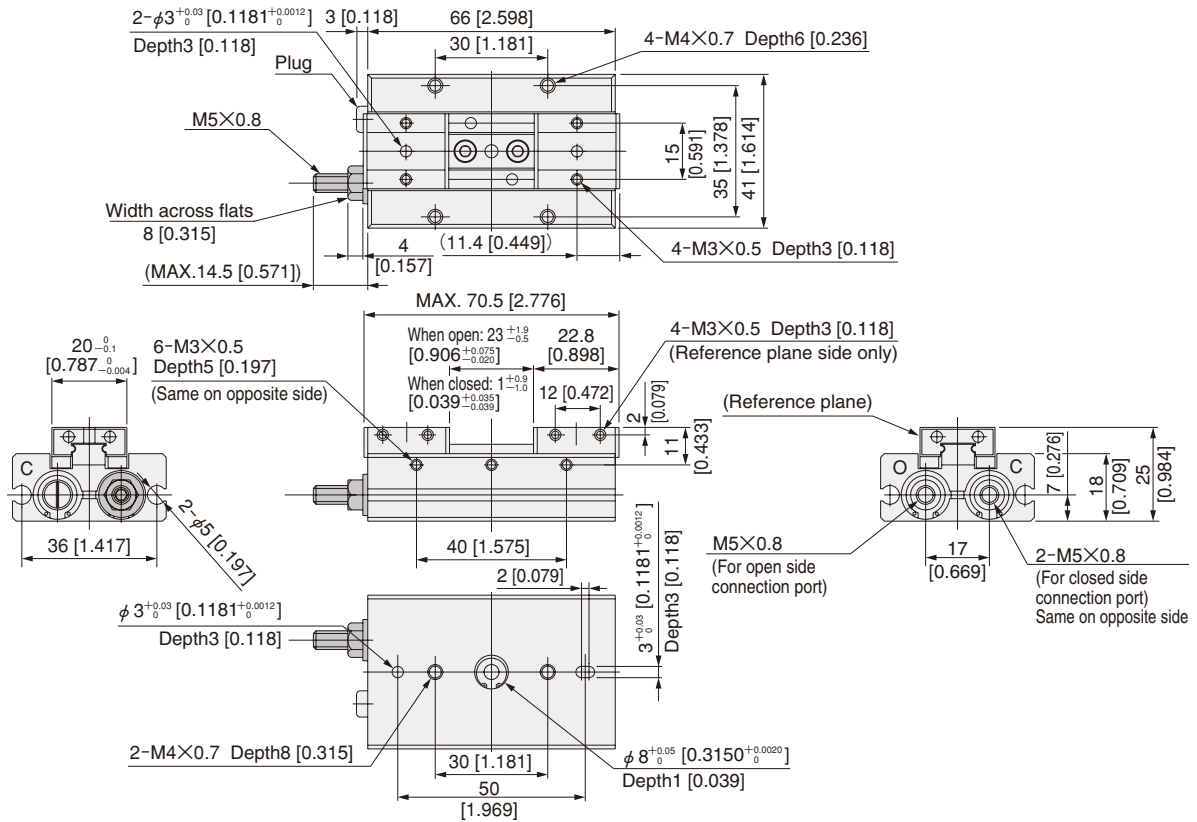


**AFDPG-12-JB**

**(Closed side stroke adjustment)**

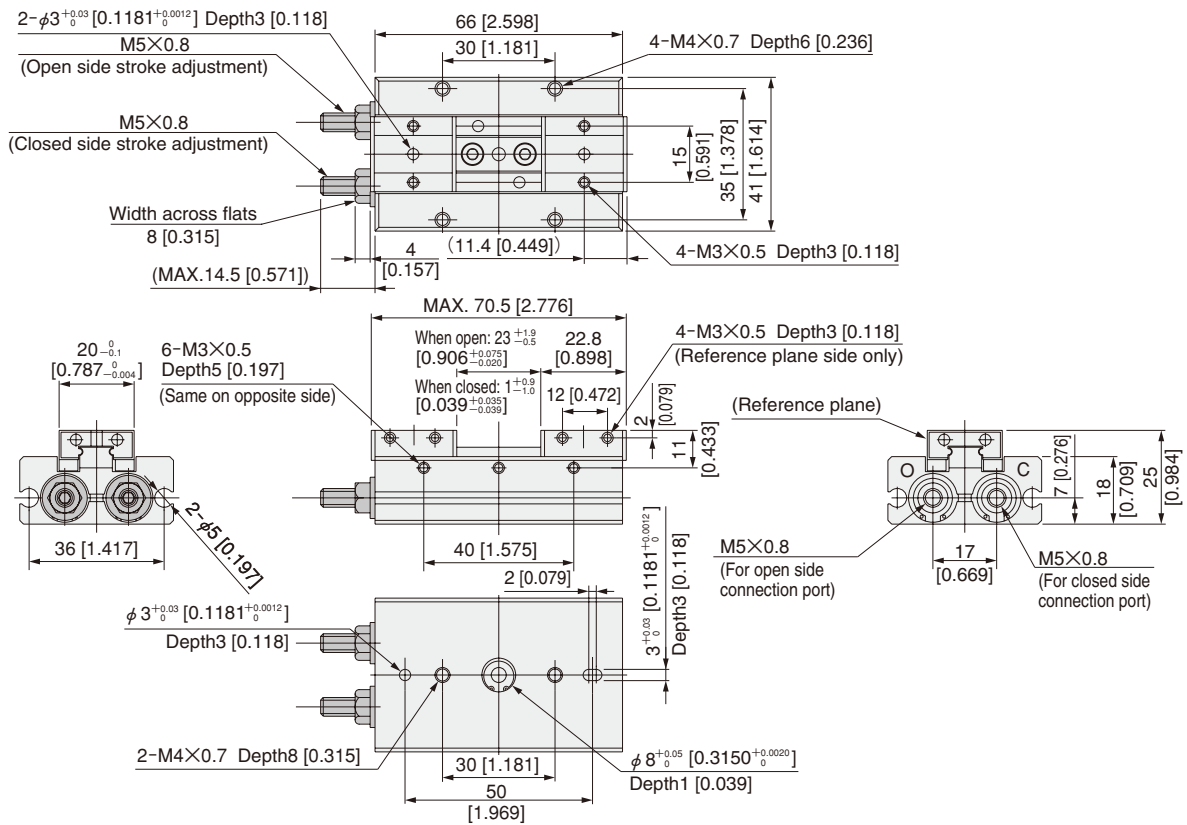


AFDPG-12-JB



**AFDPG-12-JC**

**(Open/closed both-side stroke adjustment)**

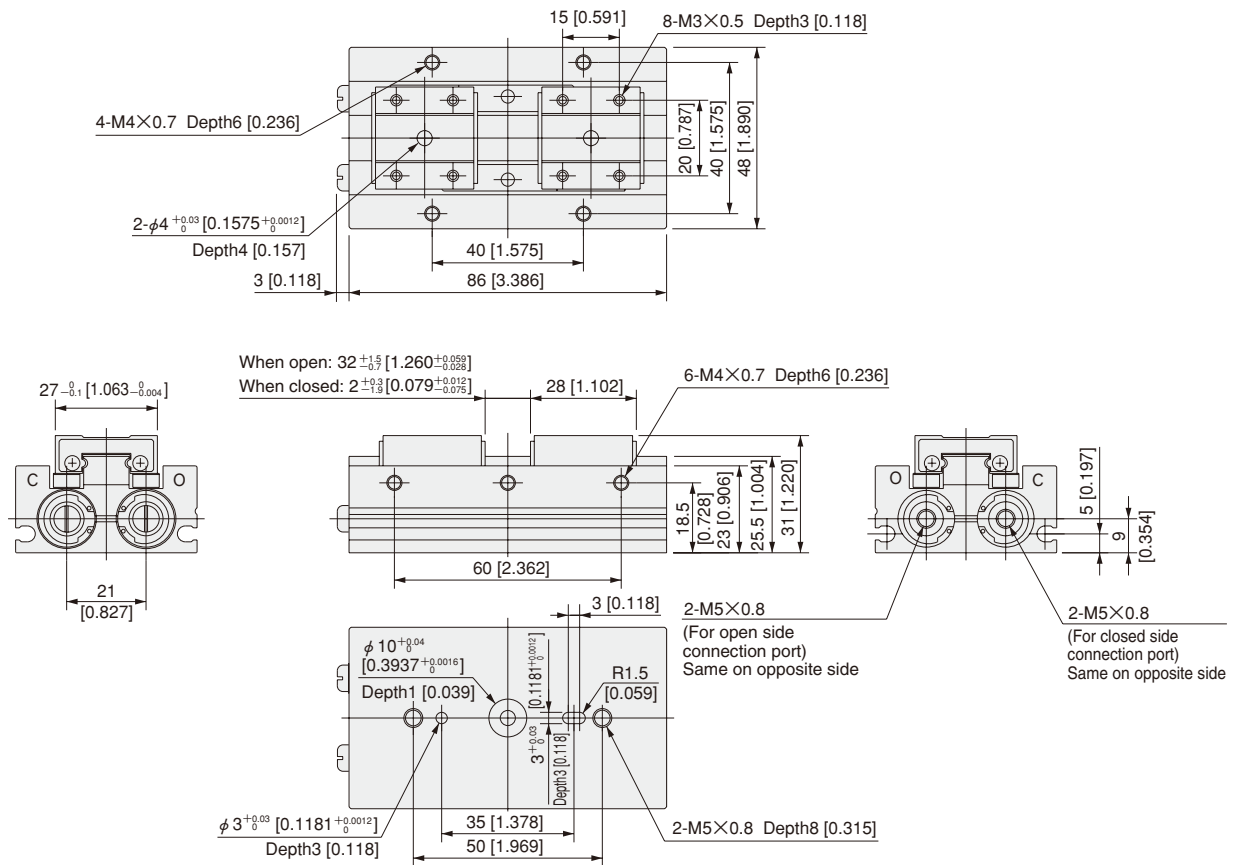




## AFDPG-14



AFDPG-14

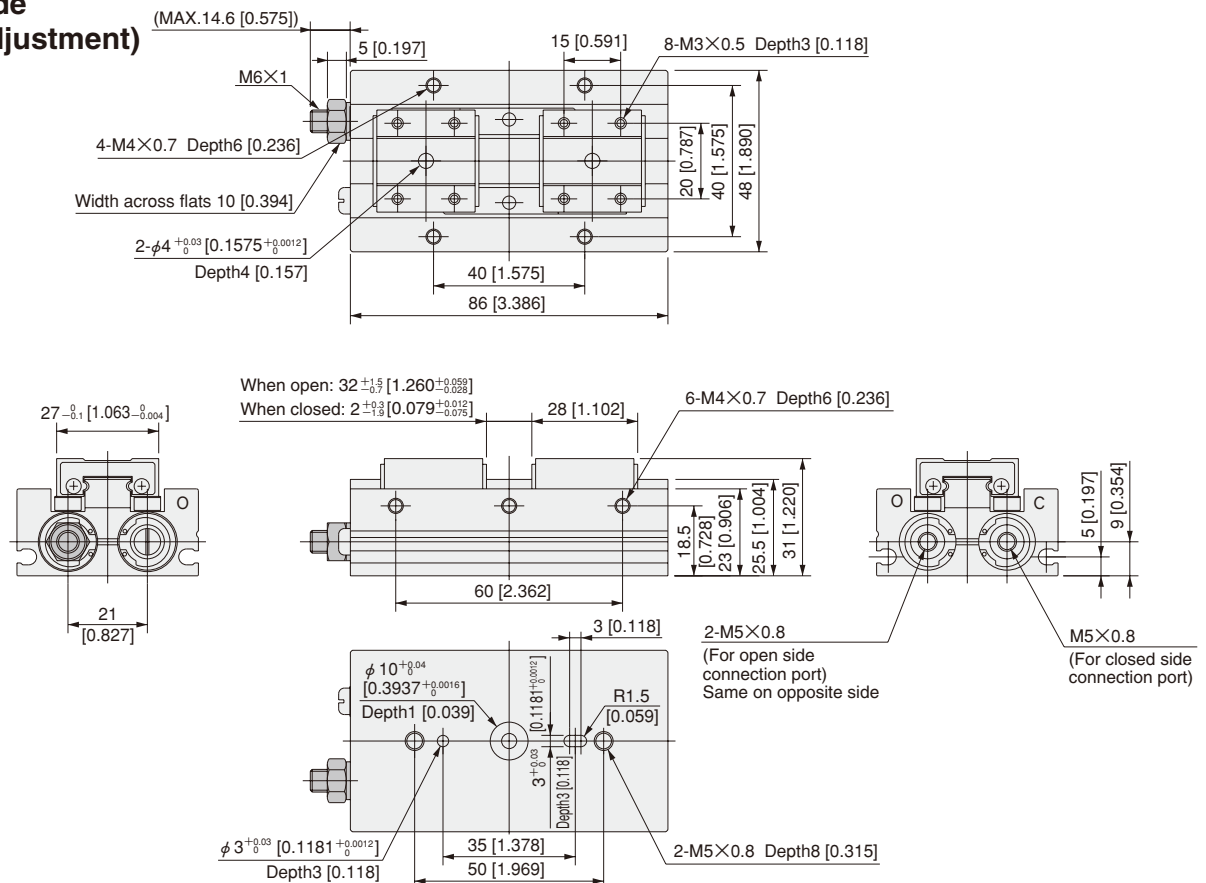


## AFDPG-14-JA

(Open side stroke adjustment)



AFDPG-14-JA



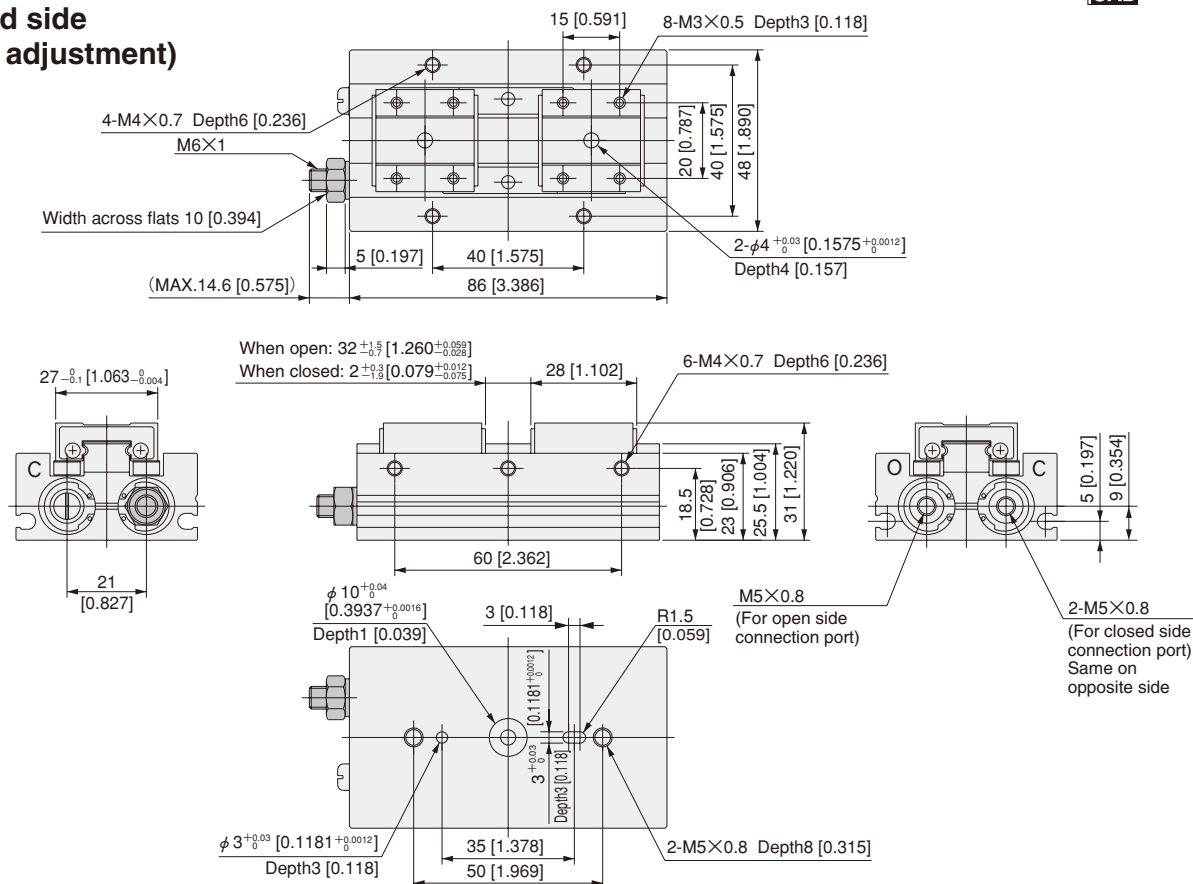


## AFDPG-14-JB

(Closed side stroke adjustment)

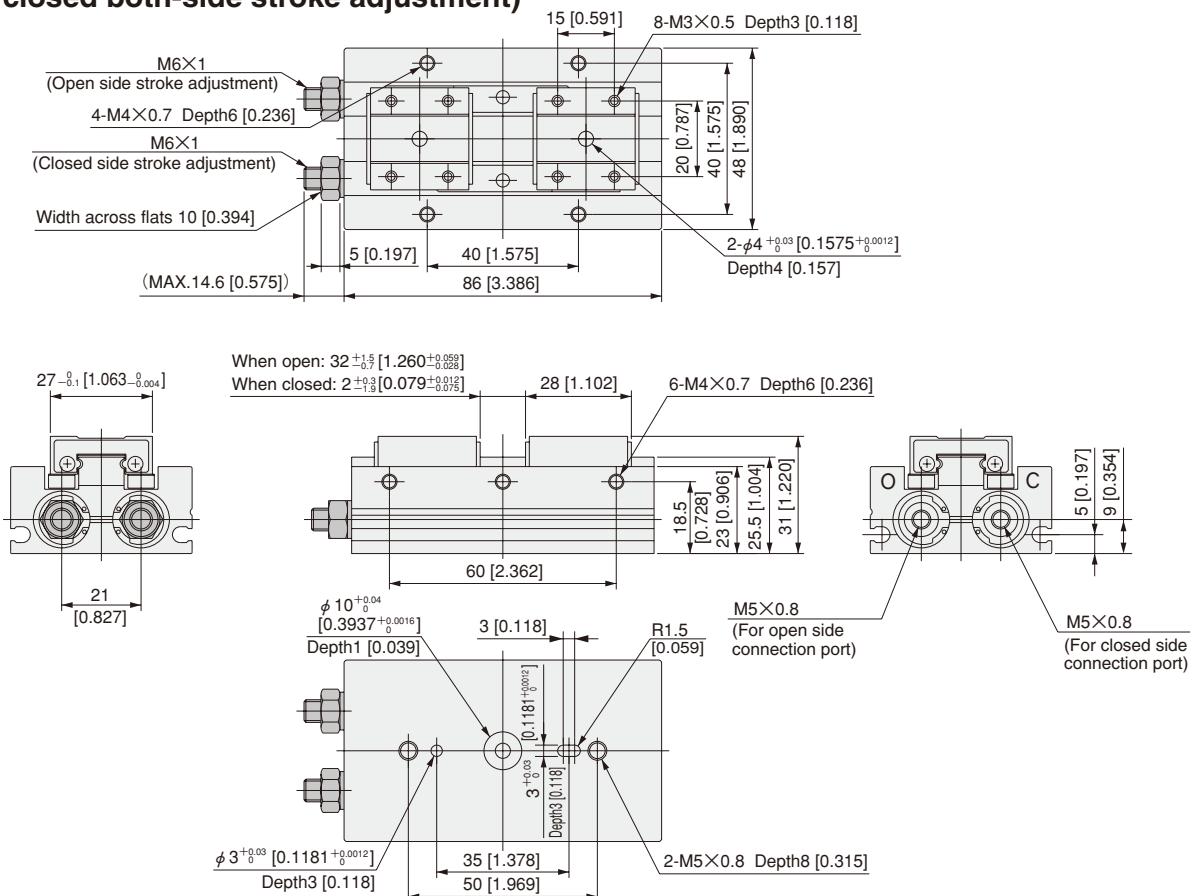


AFDPG-14-JB



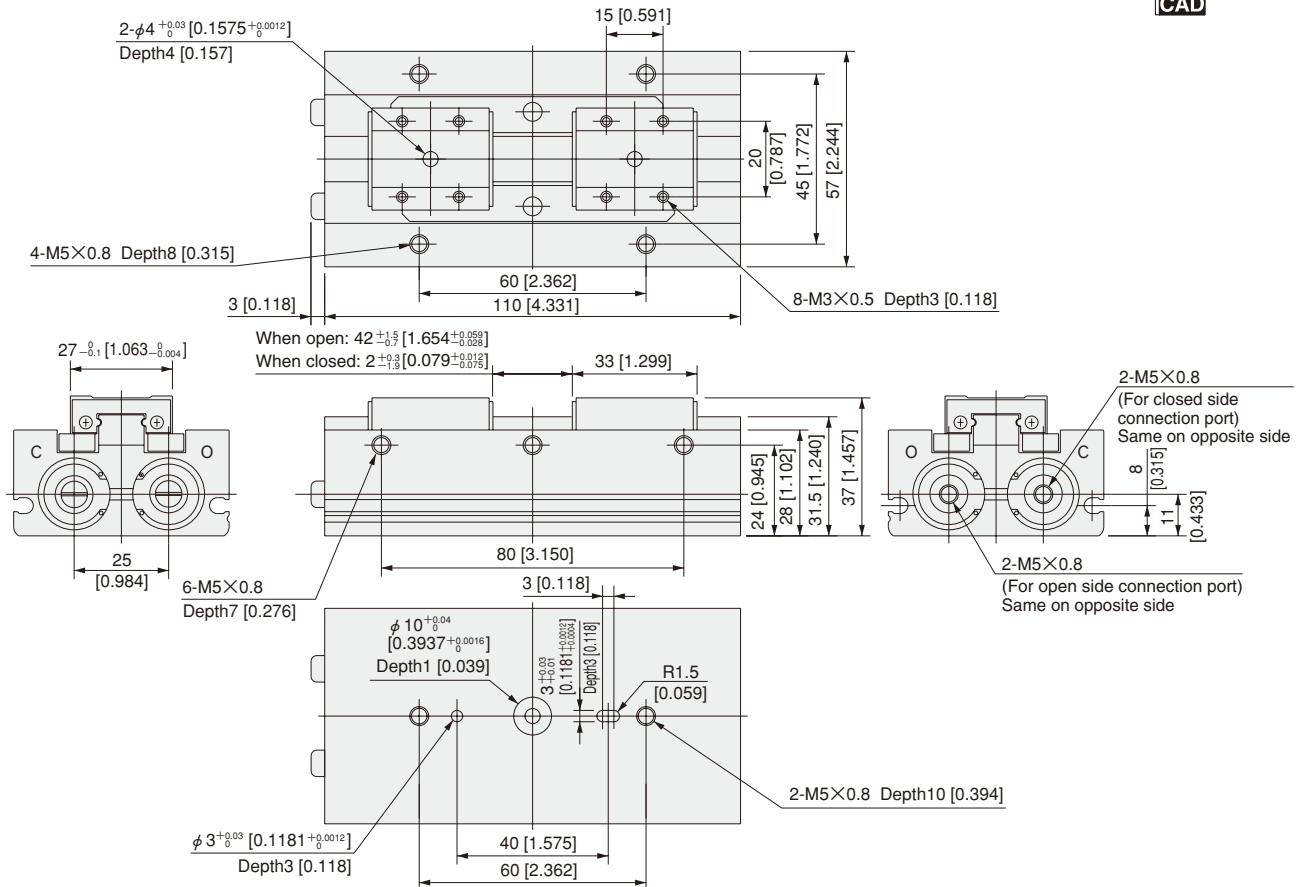
## AFDPG-14-JC

(Open/closed both-side stroke adjustment)



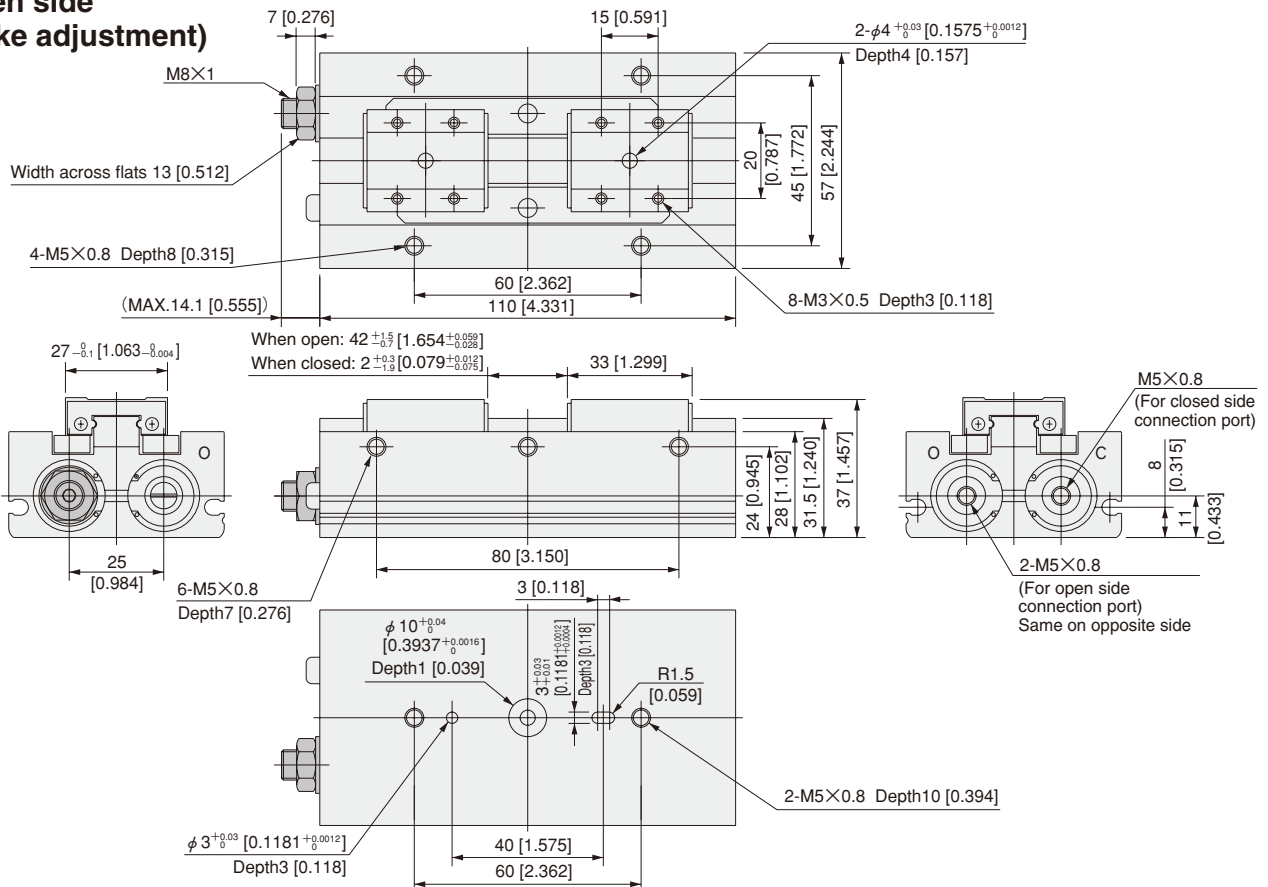


## AFDPG-18



## AFDPG-18-JA

(Open side stroke adjustment)



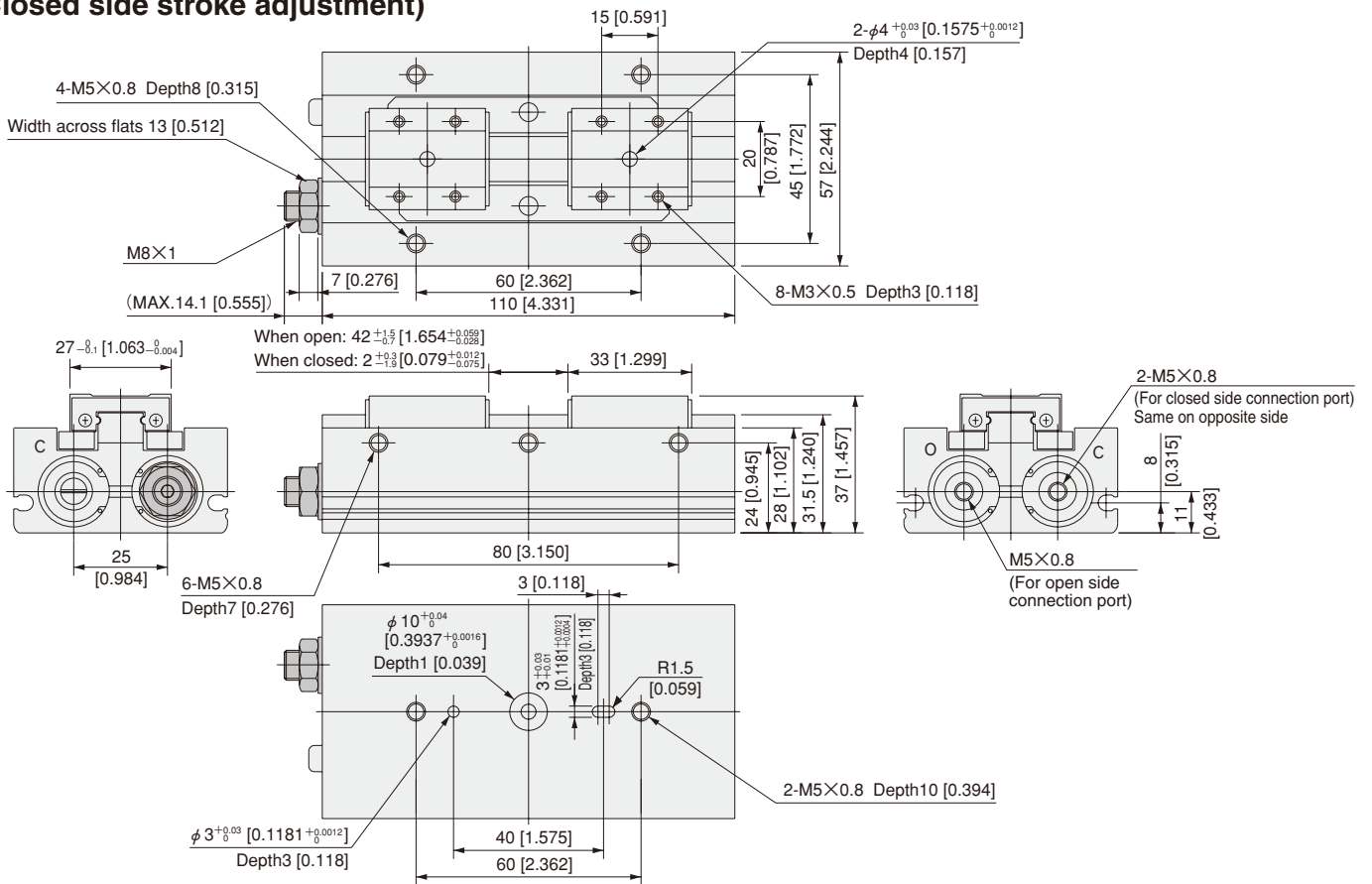


## AFDPG-18-JB

(Closed side stroke adjustment)

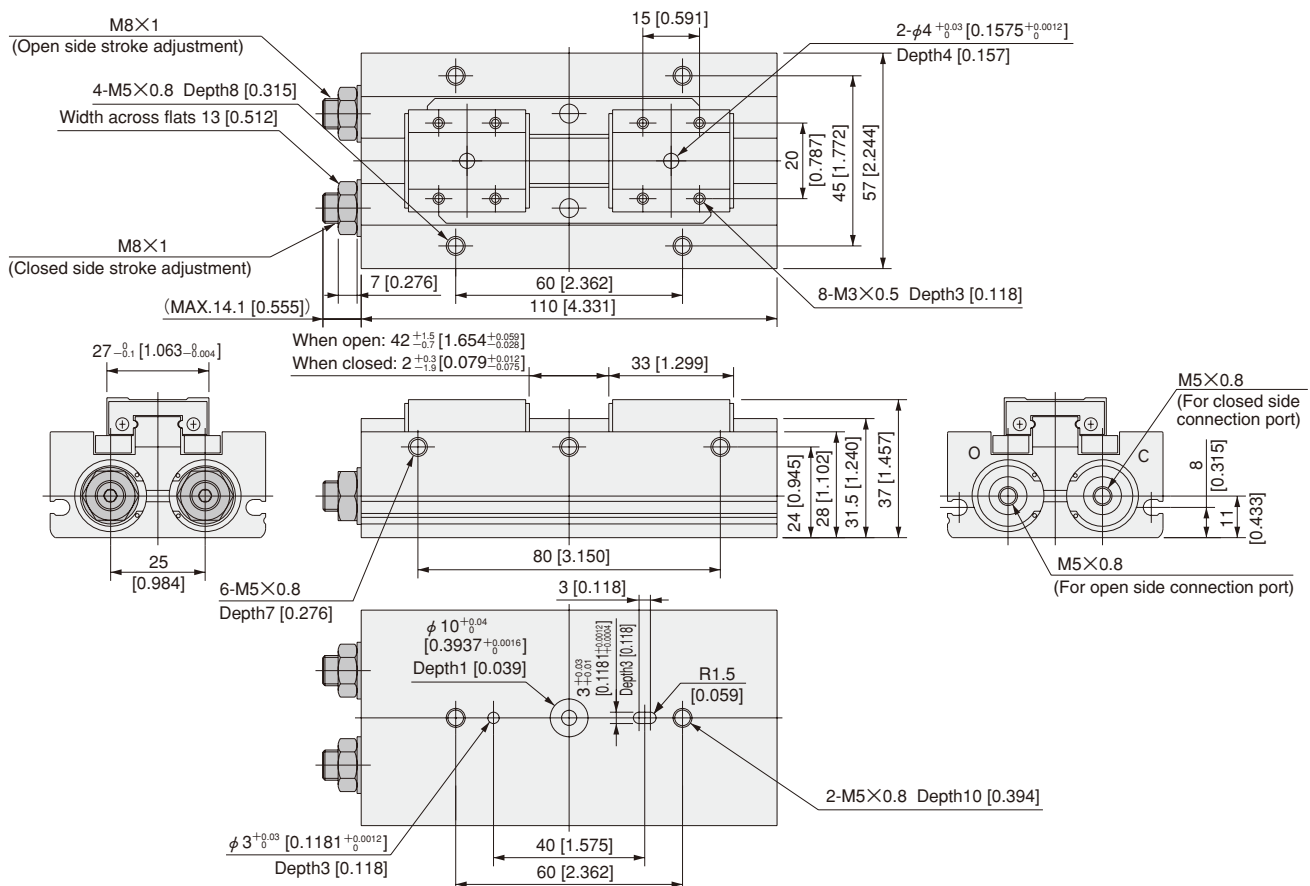


AFDPG-18-JB



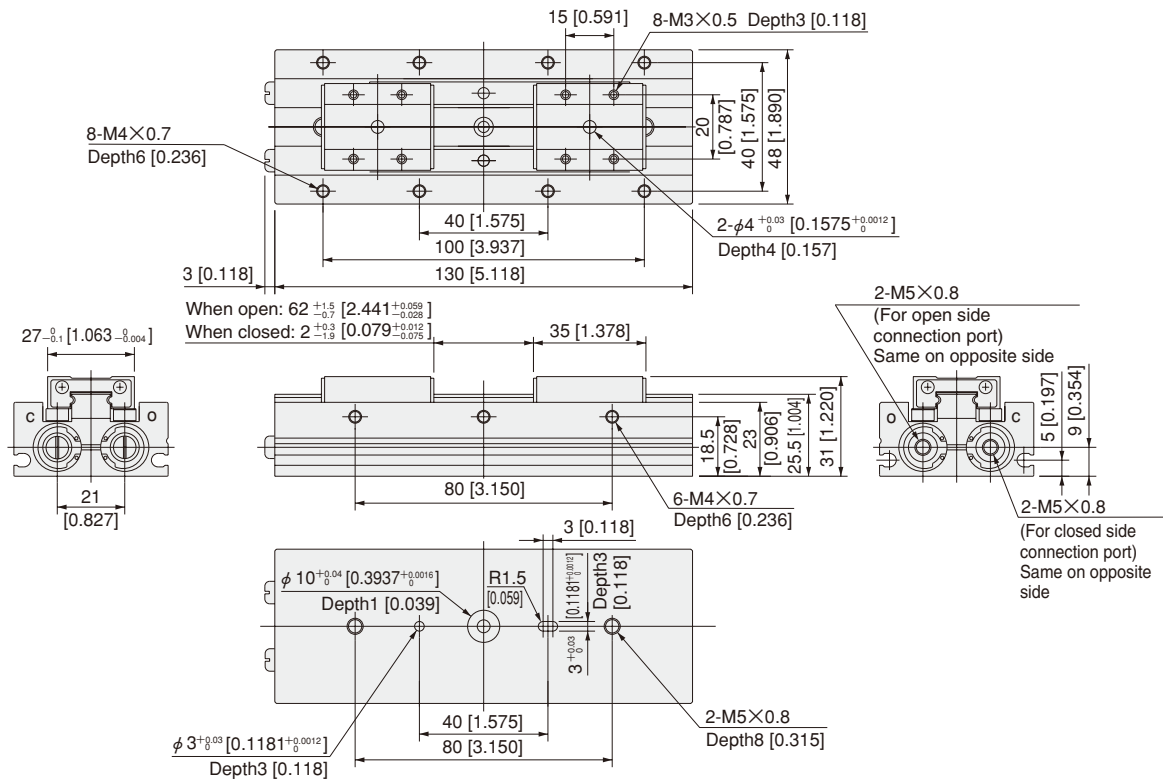
## AFDPG-18-JC

(Open/closed both-side stroke adjustment)



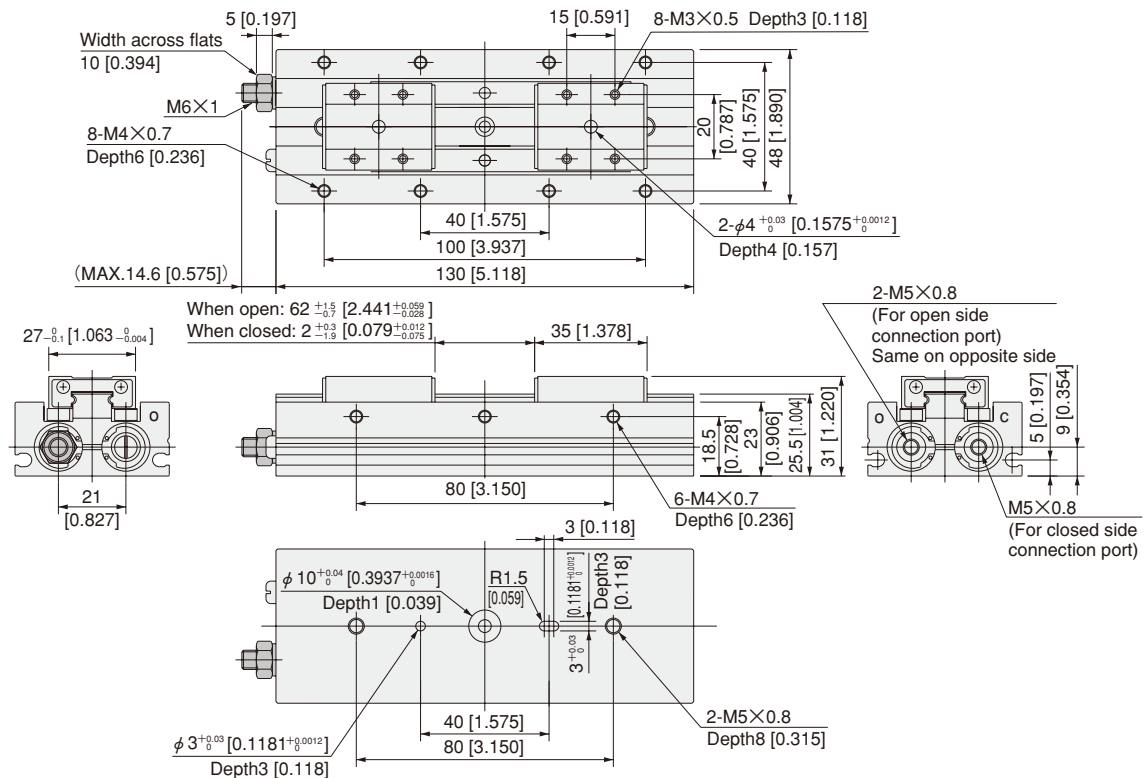


## AFDPGL-14



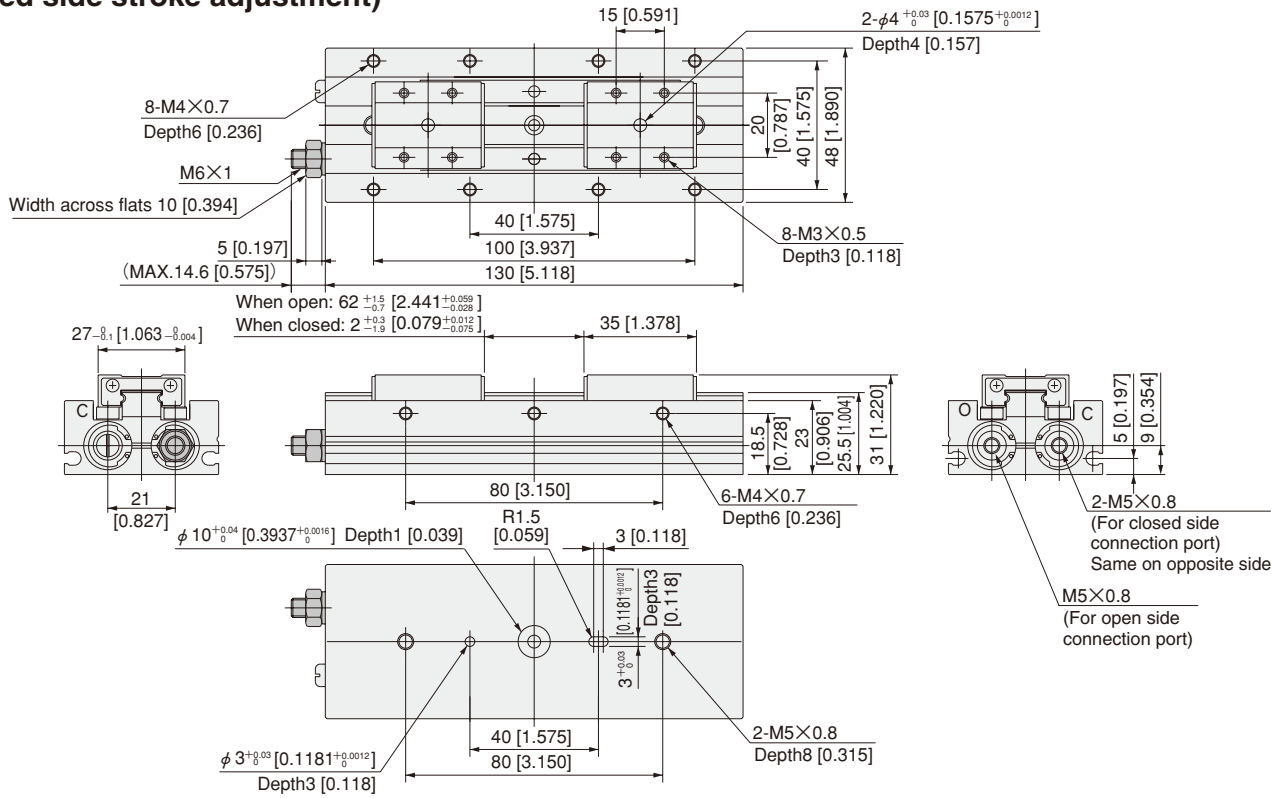
## AFDPGL-14-JA

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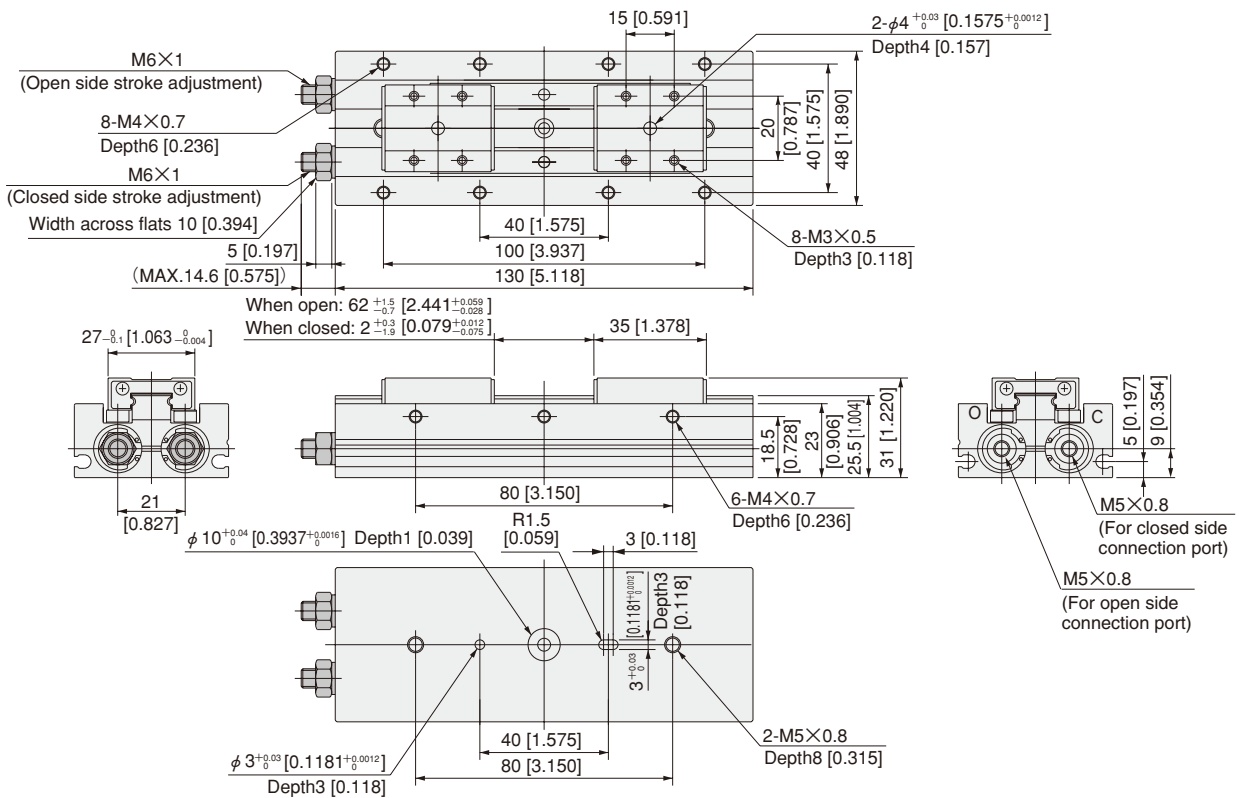




**(Closed side stroke adjustment)**



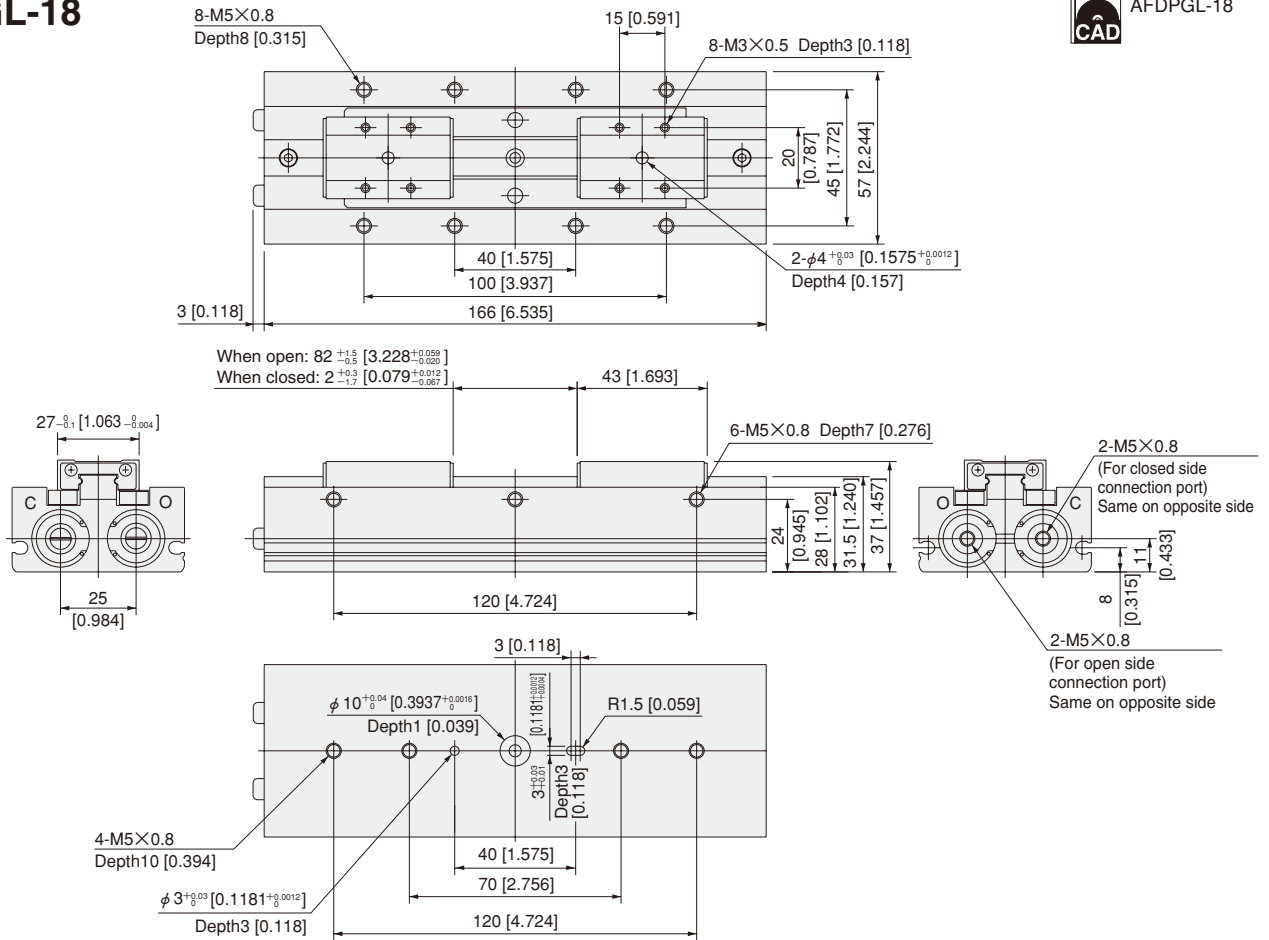
**(Open/closed both-side stroke adjustment)**





## AFDPGL-18

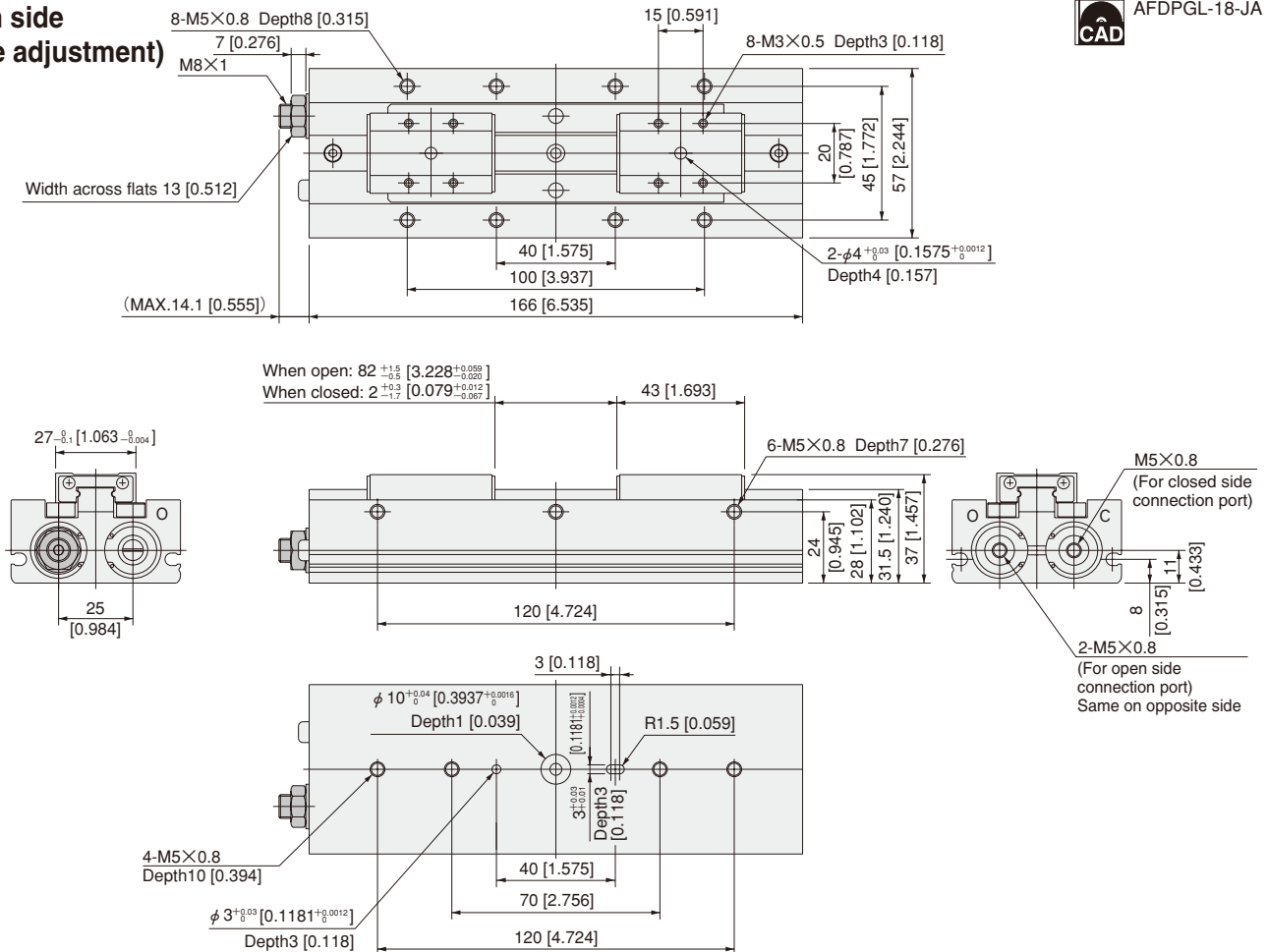
 AFDPGL-18



## AFDPGL-18-JA

(Open side stroke adjustment)

 AFDPGL-18-JA



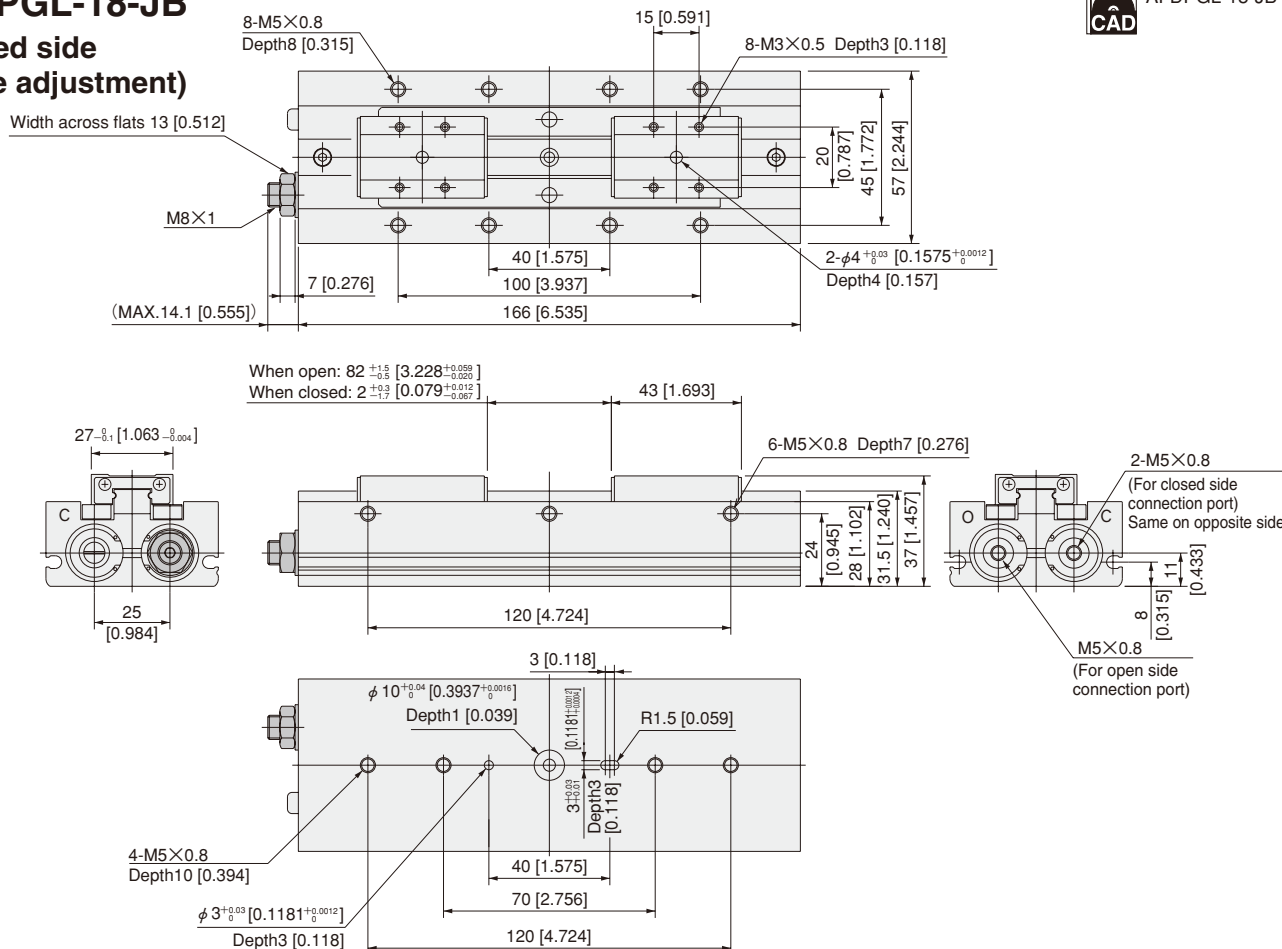


## AFDPGL-18-JB

(Closed side stroke adjustment)

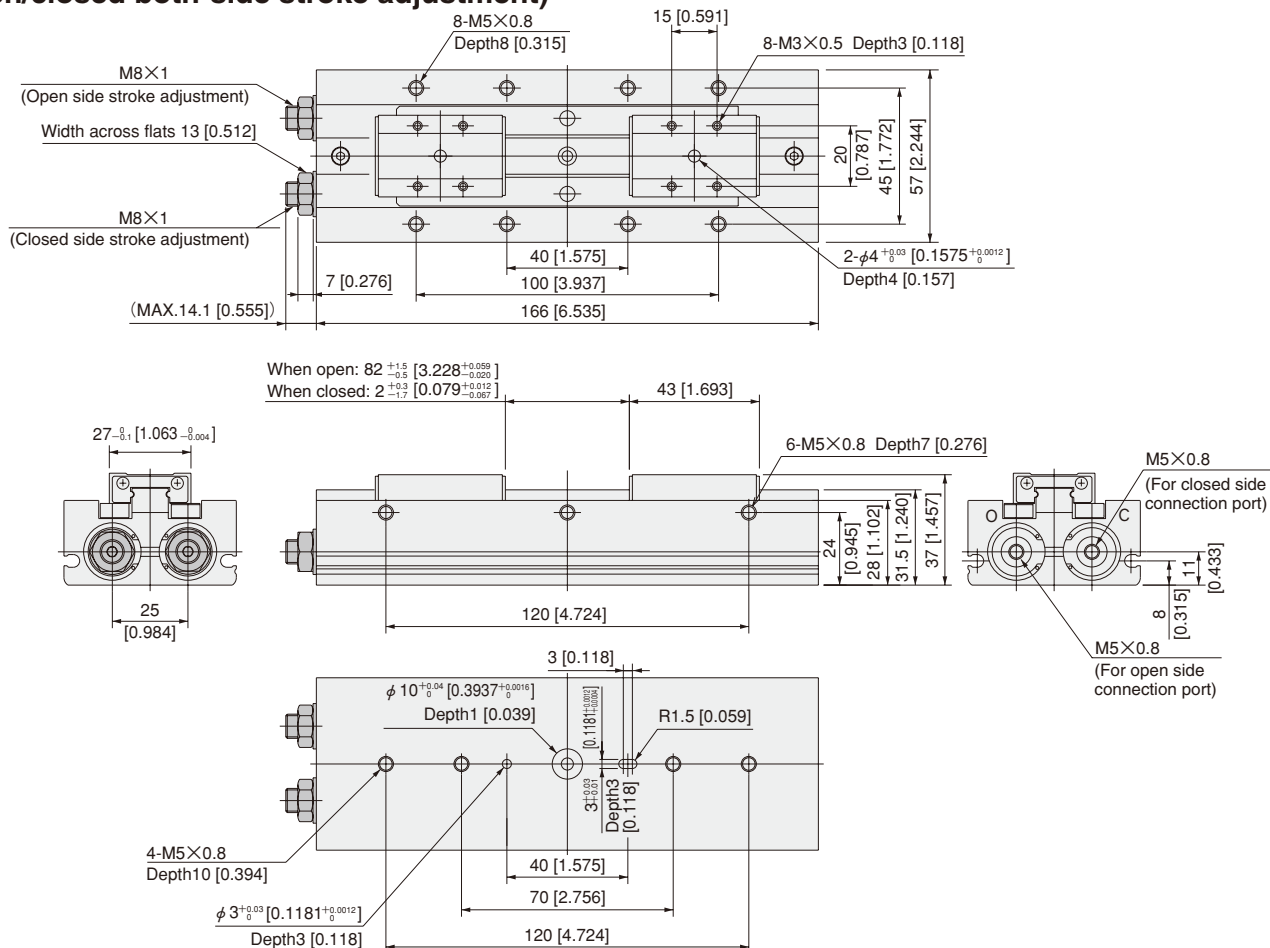


AFDPGL-18-JB



## AFDPGL-18-JC

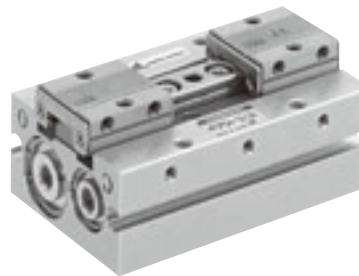
(Open/closed both-side stroke adjustment)





# FLAT TYPE AIR HANDS

## Asynchronous Type

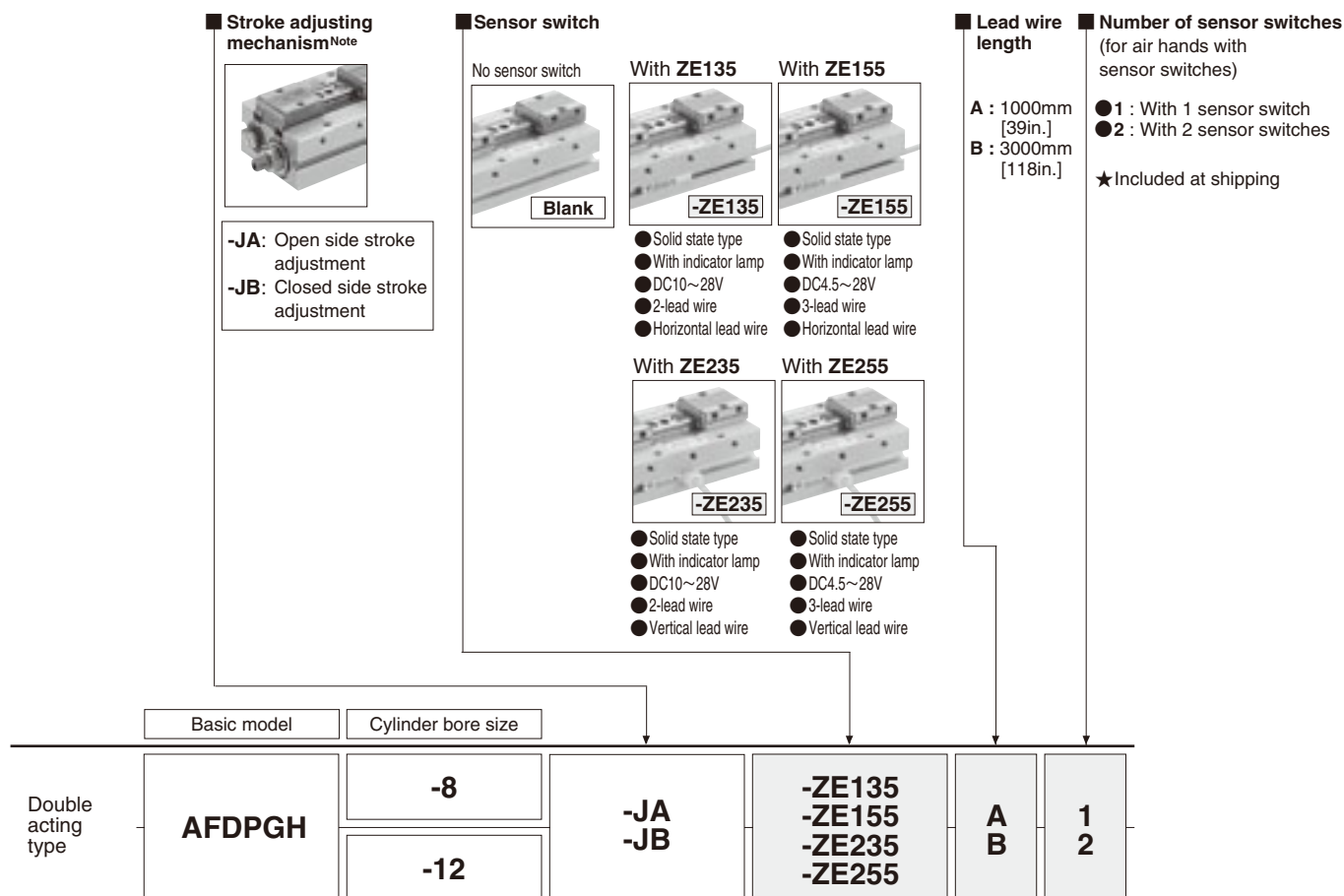


## Specifications

Basic model		AFDPGH-8-JA		AFDPGH-8-JB		AFDPGH-12-JA		AFDPGH-12-JB	
Item									
Cylinder bore size	mm [in.]	8×12 [0.315×0.472]				12×16 [0.472×0.630]			
Operation type		Double acting type							
Media		Air							
Operating pressure range	MPa [psi.]	0.2～0.7 [29～102]				0.15～0.7 [22～102]			
Proof pressure	MPa [psi.]	1.05 [152]							
Operating temperature range	℃ [°F]	0～60 [32～140]							
Maximum operating frequency	cycle/min	120							
Lubrication		Not required							
Effective gripping force (F) <sup>Note</sup>	N [lbf.]	17 [3.8]				44 [9.9]			
Open/closed stroke	mm [in.]	16 [0.630]				22 [0.866]			
Stroke adjusting range	mm [in.]	Open side stroke max. 5 [0.197]		Closed side stroke max.5 [0.197]		Open side stroke max. 8 [0.315]		Closed side stroke max. 8 [0.315]	
Repeatability	mm [in.]	±0.01 [±0.0004]							
Port size		M3×0.5				M5×0.8			
Mass	g [oz.]	128 [4.51]				251 [8.85]			

Note: Values are obtained when grip point length is 30mm [1.18in.] under operating pressure 0.5 MPa [73psi.].

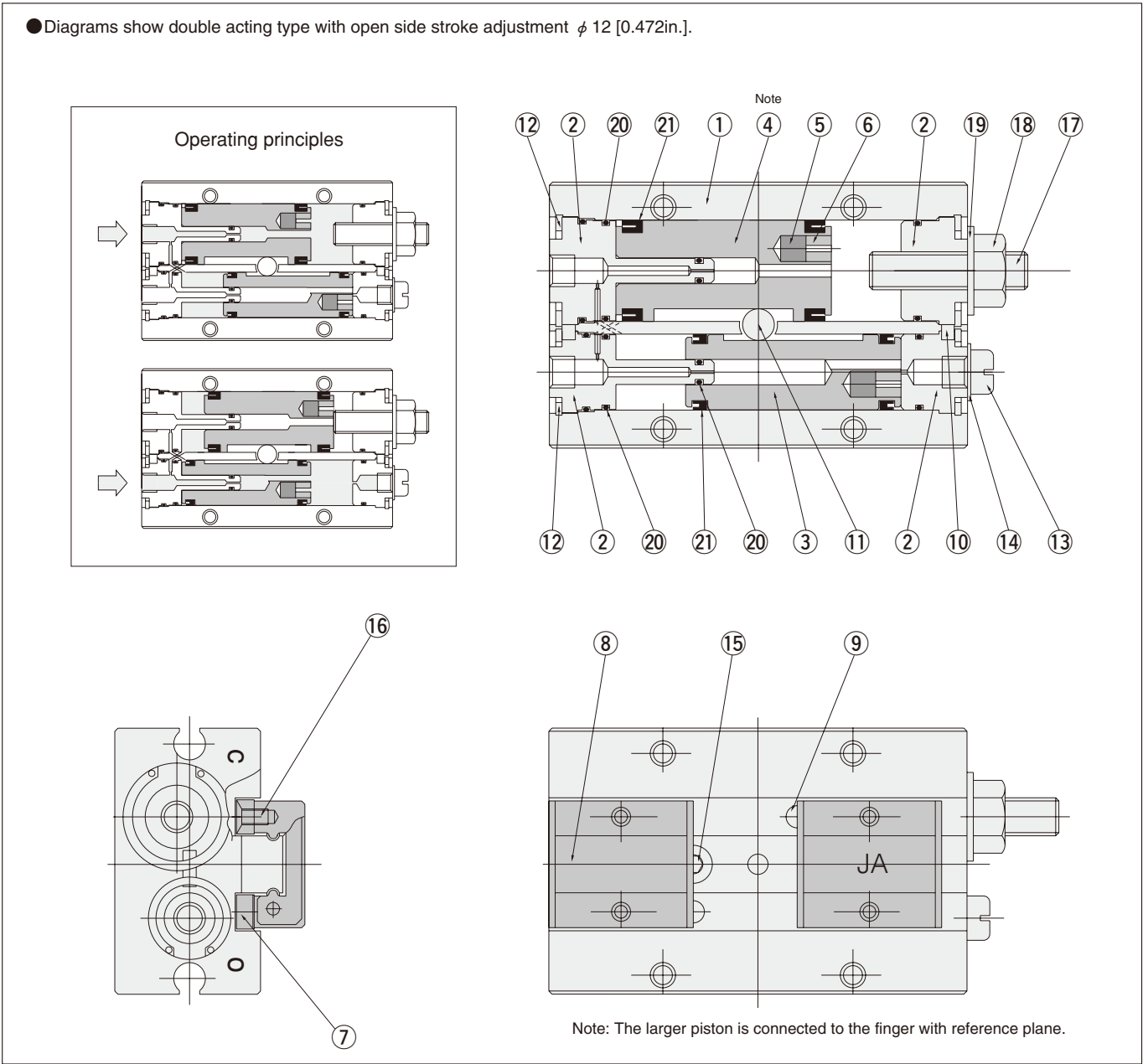
## Order Codes



Note: Appearance of the models with stroke adjusting mechanism is identical to each other. To identify, see the stamp on the bearing portion.



# Inner Construction



## Major Parts and Materials

No.	Parts	Materials
①	Body	Aluminum alloy
②	Head cover	Aluminum alloy
③	Piston	Stainless steel
④	Piston	Stainless steel
⑤	Magnet	Plastic magnet
⑥	Cap (magnet)	Aluminum alloy
⑦	Lever	Carbon steel
⑧	Bearing	Stainless steel
⑨	Roller	Carbon steel
⑩	Roller	Carbon steel
⑪	Parallel pin	Carbon steel

No.	Parts	Materials
⑫	Internal snap ring	Carbon steel
⑬	Plug	Brass (nickel plated)
⑭	Gasket	Synthetic rubber (NBR)
⑮	Hexagon socket head bolt	Alloy steel
⑯	Screw	Mild steel
⑰	Hexagon socket setscrew	Mild steel
⑱	Hexagon nut	Mild steel
⑲	Sealing washer	Steel+ Synthetic rubber (NBR)
⑳	O-ring	Synthetic rubber (NBR)
㉑	Seal	Synthetic rubber (NBR)

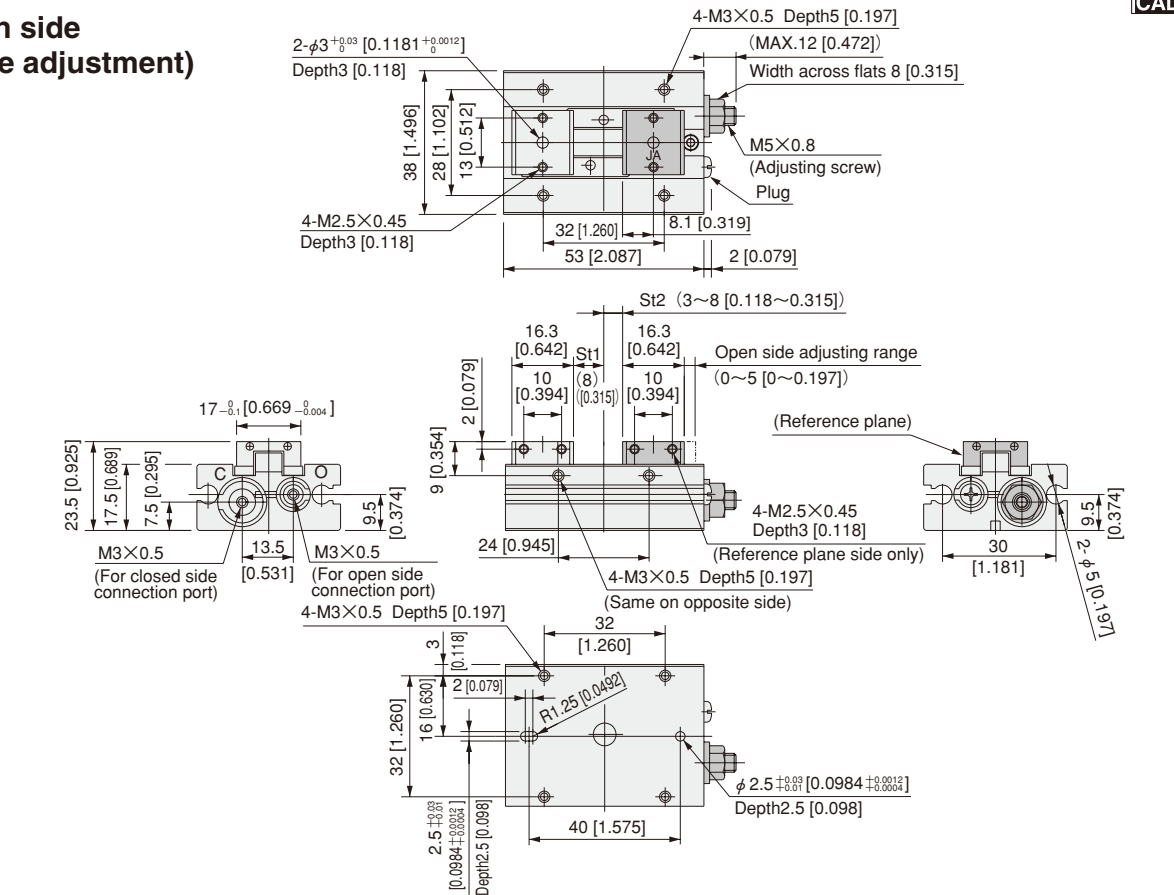


## AFDPGH-8-JA

(Open side stroke adjustment)



AFDPGH-8

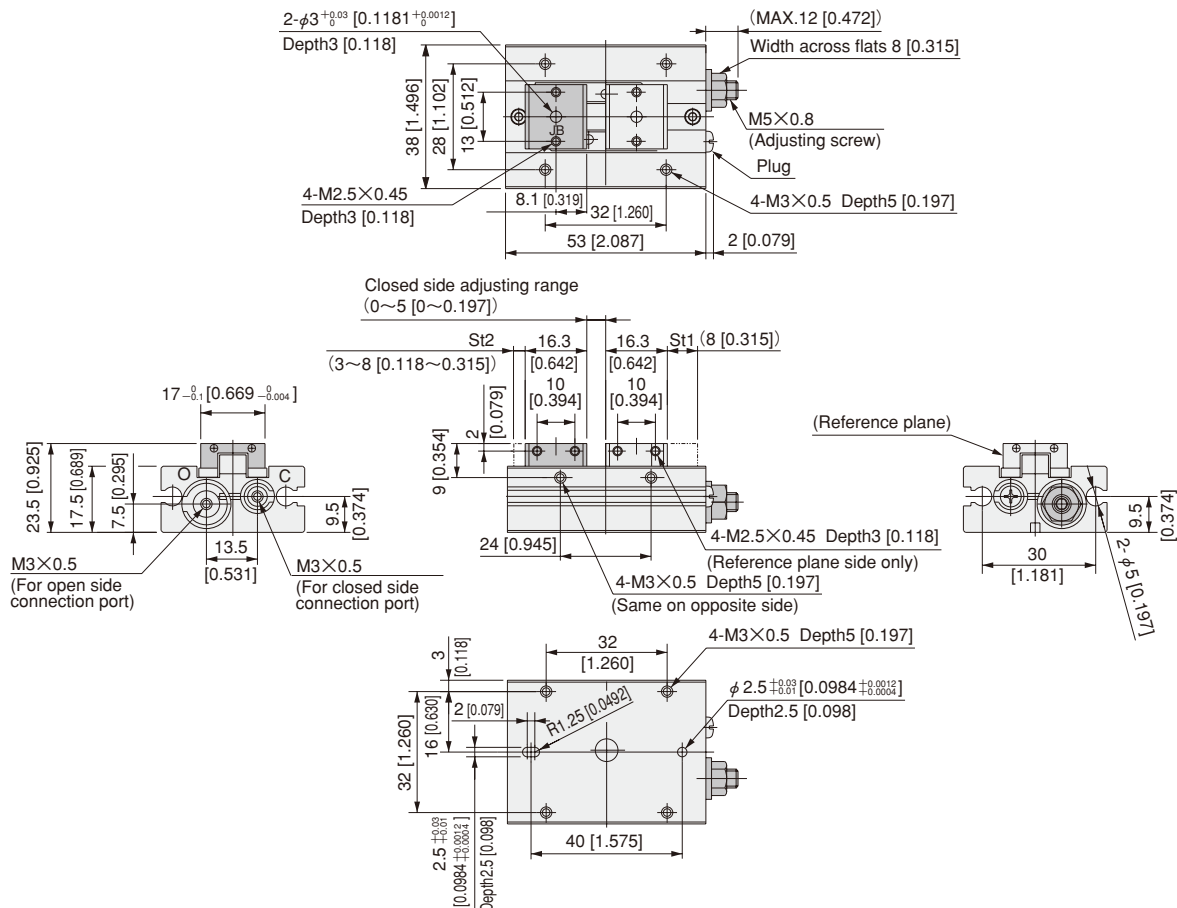


## AFDPGH-8-JB

(Closed side stroke adjustment)



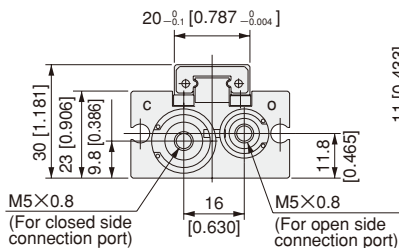
AFDPGH-8



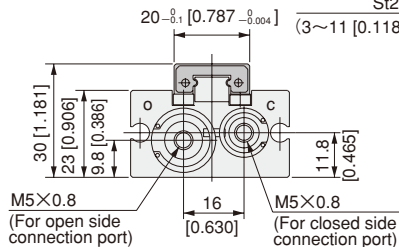


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**(Open side  
stroke adjustment)**



**(Closed side  
stroke adjustment)**

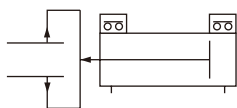




# SENSOR SWITCHES

## Solid State Type

### Symbol



### Order Codes

#### ● Sensor switch only



#### Lead wire length

A — 1000mm [39in.]

B — 3000mm [118in.]

**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

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

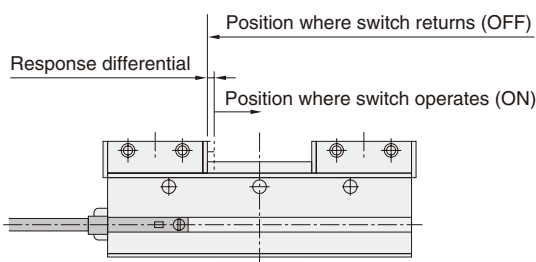
### Sensor Switch Response Differential and Operating Position Repeatability

#### ● Open/closed stroke differential

The stroke 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.



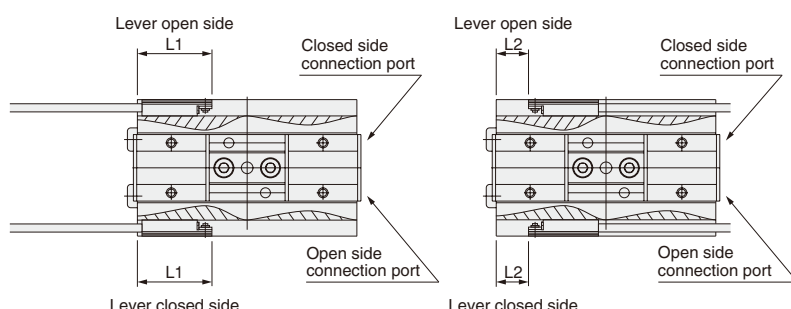
Model	Open/closed stroke differential	Operating position repeatability	Operating range
<b>AFDPG-6</b>	0.2 [0.008]	0.2 [0.008]	2.1 [0.083]
<b>AFDPG(H)-8</b>	0.2 [0.008]	0.2 [0.008]	2.6 [0.102]
<b>AFDPG(H)-12</b>	0.2 [0.008]	0.2 [0.008]	3.1 [0.122]
<b>AFDPG(L)-14</b>	0.2 [0.008]	0.2 [0.008]	4.5 [0.177]
<b>AFDPG(L)-18</b>	0.2 [0.008]	0.2 [0.008]	4.4 [0.173]

Remark: The above table shows reference values.

### Mounting Location of Sensor Switch

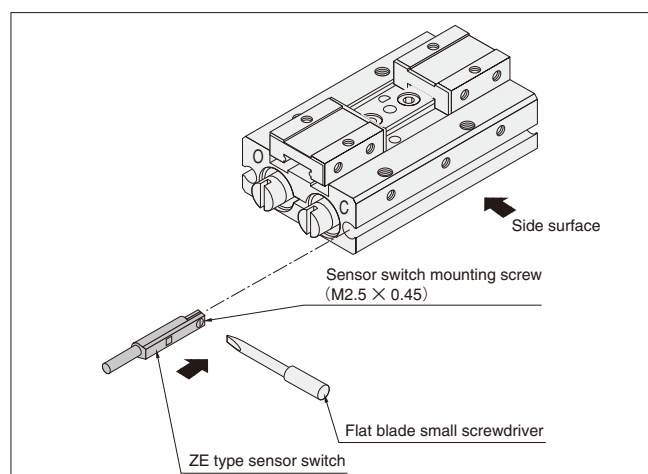
When the sensor switch is mounted in the locations shown below, the magnet in the piston comes to the maximum sensing location of the sensor switch at the end of the stroke.

Cylinder bore size (mm [in.])	6 [0.236]		8 [0.315]		12 [0.472]		14 [0.551]		18 [0.709]	
Sensor switch mounting location (mm [in.])	L1	L2	L1	L2	L1	L2	L1	L2	L1	L2
	18.5 [0.728]	6 [0.236]	21 [0.827]	7.5 [0.295]	23.5 [0.925]	10 [0.394]	19 [0.748]	6 [0.236]	20 [0.787]	7 [0.276]



### Mounting Sensor Switch

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 moved 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 diagram's side surface direction.