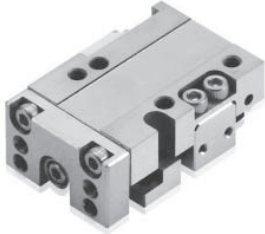


# SD Series

## Features



- High-accuracy Cross Roller Bearing Applied
- Excellent parallelism of motion with steel Body strong for external shock
- Thin, simple, compact appearance
- High-solidity structure without the need to attaching separate guide
- Stroke is adjustable (equipped with stopper cylinder body)
- Great allowable moment in small size (improved basic rated load by 4 sides contact)
- Diversity in installation and application
- Used for feeding, Pusher, Up Down, and positioning in the assembling of precision component and semiconductor industry

## Order Form

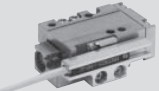

**SD 08 - 15 - W - A2 S - U**

① ② ③ ④ ⑤ ⑥ ⑦

⑦ Stopper Bolt type

U	Urethane Stopper
ME	Metal Stopper

■ Product specification reference table (●mark means possible to mount)

Specification	Auto Switch mounting (Only one mounted at a single side)	Stopper mounting (Standard mounting - forward stage)
		
Model		
SD05	●	●
SD06	●	●
SD08	●	●
SD12	●	●

• For the change of stopper adjustment unit and modification related to Auto Switch, please contact us separately.

① Series

②, ③ Bore size & Stroke(mm)

②Name	Bore size(mm)	③Stroke(mm)
05	5	5, 10
06	6	5, 10, 15
08	8	5, 10, 15, 20
12	12	10, 20, 30

④ Sensor bracket quantity

Blank	None
W	Mounting

⑤ Auto Switch type

Symbol	Type	Length
A2	DSC PRO-A2	1m
A2L	(2-wire)	3m
B2	PLC PRO-B2	1m
B2L	(3-wire)	3m

⑥ Auto Switch quantity

S	1ea
---	-----

## Specification

Model	SD05	SD06	SD08	SD12
Bore size(mm)	5	6	8	12
Rod(mm)	3	3	4	6
Stroke(mm)	5   10	5   10   15	5   10   15   20	10   20   30
Theoretical thrust(kgf) P : Air pressure(kgf/cm <sup>2</sup> )	Forward	0.19 × P	0.28 × P	0.5 × P
	Backward	0.12 × P	0.21 × P	0.37 × P
Air port size	M3	M3	M3	M5
Main body weight(kgf)	0.06   0.07	0.08   0.09   0.10	0.12   0.14   0.17   0.20	0.20   0.25   0.3
Max. load(kgf)	0.15	0.25	0.4	1.2
Fluid	Clean air Note 1)			
Air pressure(kgf/cm <sup>2</sup> )	1.5 ~ 7 (General resistance pressure: 10.5) Note 2)			
Lubrication	No need (if need, use one sort of turbine oil: SPEC ISOVG 32)			
Cushion	Urethane Stopper / Metal Stopper (There is no cushion for metal stopper)			
Temperature(°C)	5 ~ 60			
Motion speed	50 ~ 500 mm/sec (50 ~ 200 mm/sec for metal stopper)			
Stroke allowable tolerance in forward(mm)	0 ~ + 1			
Motion type	Double-acting type			
Accuracy(mm)	±0.01			

Note 1) Clean air: Fresh air containing solid matters with 0.3% of supersaturated moisture and 99.9% of liquid oil that passed through the 3~10 $\mu$ m degree of filtering

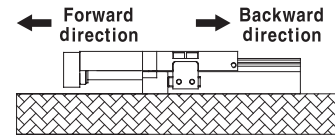
Note 2) Guaranteed capacity of resist pressure: A pressure that does not cause an abnormality in parts when it is applied for 1 minute without any weight loaded.



Unit: kgf

## Theoretical thrust

Model	Operation direction	Air pressure(kgf/cm <sup>2</sup> )					
		2	3	4	5	6	7
SD05	Forward	0.38	0.57	0.76	0.95	1.14	1.33
	Backward	0.24	0.36	0.48	0.6	0.72	0.84
SD06	Forward	0.56	0.84	1.12	1.4	1.68	1.96
	Backward	0.42	0.63	0.84	1.05	1.26	1.47
SD08	Forward	1	1.5	2	2.5	3	3.5
	Backward	0.74	1.11	1.48	1.85	2.22	2.59
SD12	Forward	2.26	3.39	4.52	5.65	6.78	7.91
	Backward	1.7	2.55	3.4	4.25	5.1	5.95



## Technical data by model

■ Mp, My, Mr 3 directions moment calculation formula

Fig1

Pitch Moment(Mp)	Yawing Moment(My)	Rolling Moment(Mr)
$M_p = W \times (A + \text{Stroke} + L_p)$ $M_p = W \times (B + L_p)$	$M_y = W \times (A + \text{Stroke} + L_y)$ $M_y = W \times (C + L_y)$	$M_r = W \times (C + L_r)$ $M_r = W \times (B + L_r)$

■ Corrections from the central distance of moments

Table1  
Unit: mm

Corrections Model	A	B	C
SD05-05	21	3.7	11
SD05-10	21	3.7	11
SD06-05	21	4.5	12
SD06-10	21	4.5	12
SD06-15	23	4.5	12
SD08-05	23	5.5	14
SD08-10	23	5.5	14
SD08-15	24	5.5	14
SD08-20	25	5.5	14
SD12-10	26.5	5.8	16.5
SD12-20	30	5.8	16.5
SD12-30	33	5.8	16.5

■ Maximum allowable kinetic energy (Ea)

※ Allowable values when using Urethane Stopper

Table2  
Unit: kgf · cm

Model	Maximum allowable kinetic energy
SD05-05	0.08
SD05-10	0.08
SD06-05	0.11
SD06-10	0.11
SD06-15	0.11
SD08-05	0.16
SD08-10	0.16
SD08-15	0.16
SD08-20	0.16
SD12-10	0.55
SD12-20	0.55
SD12-30	0.55

PRECISION

PST-NS

PST

SC

ST

STS-L

SD

PSW



# SD Series

## Maximum allowable moment Table3

Unit: kgf · cm

Model	Allowable moment Pitching moment Mp	Yawing moment My	Rolling moment Mr
SD05-05	2.02	2.02	7.43
SD05-10	2.02	2.02	7.43
SD06-05	4.14	4.14	7.59
SD06-10	4.14	4.14	7.59
SD06-15	4.97	4.97	8.86
SD08-05	4.97	4.97	10.58
SD08-10	4.97	4.97	10.58
SD08-15	4.97	4.97	10.58
SD08-20	5.80	5.80	12.10
SD12-10	10.00	10.00	35.23
SD12-20	14.28	14.28	48.44
SD12-30	17.14	17.14	57.24

## Maximum allowable load (Wa) Table4

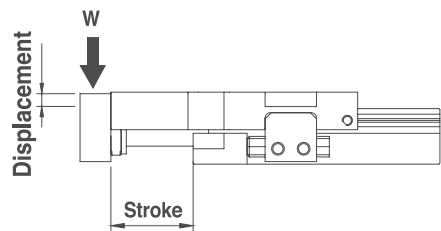
Unit: kgf

Model	Maximum allowable load
SD05-05	0.15
SD05-10	0.15
SD06-05	0.25
SD06-10	0.25
SD06-15	0.25
SD08-05	0.4
SD08-10	0.4
SD08-15	0.4
SD08-20	0.4
SD12-10	1.2
SD12-20	1.2
SD12-30	1.2

※ For vertical installation, loading factor check is not required.

## Table deflection

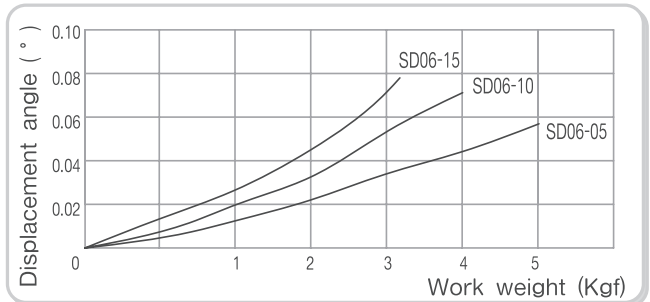
- The graph shows the deflection length when cylinder moves to forward with certain weight loaded at the end of table end, like right graphic.
- The deflection length values below graphs show only reference value when any weight loaded. (Please note that those are not maximum value)



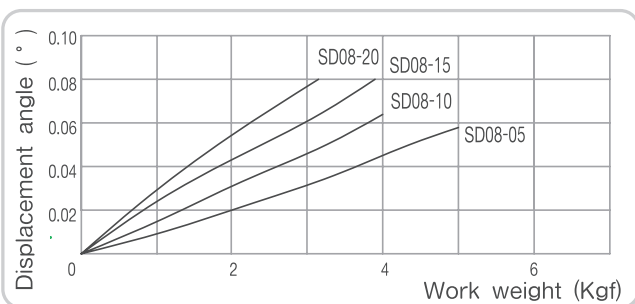
### ◆SD05 table displacement



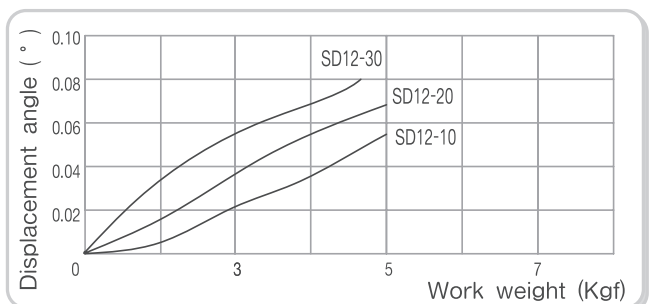
### ◆SD06 table displacement



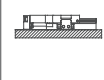
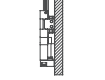
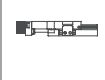

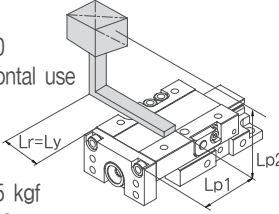
### ◆SD08 table displacement



### ◆SD12 table displacement



Model selection method

	Applied formula	Selection example
<p><b>Condition check</b></p>	<p> <ul style="list-style-type: none"> <li>■ Cylinder model selection</li> <li>■ Loaded weight</li> <li>■ Cushion type(urethane/metal)</li> <li>■ Block installation</li> </ul> </p> <p> <ul style="list-style-type: none"> <li>■ Average speed</li> <li>■ Distance to the center of gravity of load</li> <li>■ Load installation</li> </ul> </p> <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 2px;"> <p>Horizontal installation</p>  </div> <div style="border: 1px solid black; padding: 2px;"> <p>Vertical installation</p>  </div> <div style="border: 1px solid black; padding: 2px;"> <p>Plate installation</p>  </div> <div style="border: 1px solid black; padding: 2px;"> <p>Table installation</p>  </div> </div>	<p>Review target: SD12-30 Table installation, horizontal use Urethane cushion Average speed: V = 300mm/sec Loading factor W = 0.5 kgf Lp1 = 30mm Lp2 = 30mm Ly, Lr = 20mm</p> 
<p><b>Kinetic energy check</b></p> <p>- The kinetic energy of load should be within the allowable kinetic energy range of cylinder.</p>	<p>Work kinetic energy(kgf · cm)</p> $E = K_1 \times \frac{1}{2} \times \frac{W}{980} \times \left(\frac{1.4V}{10}\right)^2$ <p>W : work weight(kgf) V : average speed(mm/sec)</p> <p>K<sub>1</sub> : installation factor(table installation: 1, plate installation: 1.6) Ea : cylinder allowable kinetic energy(kgf · cm) Applicable only if E &lt; Ea</p> <p style="text-align: right;"><b>Table2</b></p>	$E = 1 \times \frac{1}{2} \times \frac{0.5}{980} \times \left(\frac{1.4 \cdot 300}{10}\right)^2 = 0.45 \text{ kgf} \cdot \text{cm}$ <p>Ea : 0.55 kgf · cm Available as E(0.45) &lt; Ea(0.55)</p>
<p><b>Load factor check</b></p> <p>- Loading factor - Static moment load factor - Dynamic moment load factor - Total sum of load factors should not exceed</p>	<p style="text-align: center;"><b>Loading factor</b></p> <p>Suitable loading factor(kgf) : <math>Wt = K_1 \times K_2 \times W</math></p> $\theta_1 : \text{Loading factor} = \frac{Wt}{Wa}$ <p>W : work weight(kgf) K<sub>1</sub> : installation factor(table installation: 1, plate installation: 1.6) K<sub>2</sub> : speed factor(300mm/sec or less: over 1, 300mm/sec: 1.6) Wa : cylinder Max. load(kgf)</p> <p style="text-align: right;"><b>Table4</b></p> <p>*For vertical installation, loading factor review is not required</p>	$Wt = 1 \times 1 \times 0.5 = 0.5 \text{ kgf}$ $Wa = 1.2 \text{ kgf}$ $\theta_1 = \frac{0.5}{1.2} = 0.41$
	<p style="text-align: center;"><b>Static moment</b></p> <p>Pitching moment(kgf · cm) : <math>Mp = W \times (A + \text{Stroke} + Lp1) / 10</math> Rolling moment(kgf · cm) : <math>Mr = W \times (C + Lr) / 10</math></p> $\theta_2 : \text{rolling static moment load factor} = \frac{Mp}{Mpa}$ $\theta_3 : \text{rolling static moment load factor} = \frac{Mr}{Mra}$ <p>A, C : corrections from the center distance of moments(mm) Lp, Lr : distance from the end of table to the center of load(mm) Mpa, Mra : cylinder allowable moment(kgf · cm)</p> <p style="text-align: right;"><b>Table1</b> <b>Fig1</b> <b>Table3</b></p>	$Mp = 0.5 \times \frac{(33+30-30)}{10} = 1.65 \text{ kgf} \cdot \text{cm}$ $\theta_2 = \frac{1.65}{17.14} = 0.1$ $Mr = 0.5 \times \frac{(16.5+20)}{10} = 1.82 \text{ kgf} \cdot \text{cm}$ $\theta_3 = \frac{1.82}{57.24} = 0.03$
	<p style="text-align: center;"><b>Dynamic moment</b></p> <p>Pitching moment(kgf · cm) : <math>Mp = K_2 \times K_3 \times W \times (B + Lp2) / 10</math> Yawing moment(kgf · cm) : <math>My = K_2 \times K_3 \times W \times (C + Ly) / 10</math></p> $\theta_4 : \text{pitching dynamic moment load factor} = \frac{Mp}{Mpa}$ $\theta_5 : \text{yawing dynamic moment load factor} = \frac{My}{Mya}$ <p>K<sub>2</sub> : speed factor(300mm/sec or less: over 1, 300mm/sec: 1.6) K<sub>3</sub> : duty factor(urethane stopper: 1, metal stopper: 4) B, C : corrections from the center distance of moments(mm) Lp, Ly : distance from the end of table to the center of load(mm) Mpa, Mya : cylinder allowable moment(kgf · cm)</p> <p style="text-align: right;"><b>Table1</b> <b>Fig1</b> <b>Table3</b></p>	$Mp = 1 \times 1 \times 0.5 \times \frac{(5.8+30)}{10} = 1.79 \text{ kgf} \cdot \text{cm}$ $\theta_4 = \frac{1.79}{17.14} = 0.1$ $My = 1 \times 1 \times 0.5 \times \frac{(16.5+20)}{10} = 1.82 \text{ kgf} \cdot \text{cm}$ $\theta_5 = \frac{1.82}{17.14} = 0.11$
<p><b>Total load factor</b></p>	$\theta_t = \theta_1 + \theta_2 + \theta_3 + \theta_4 + \theta_5 \leq 1$	$\theta_t = 0.41 + 0.1 + 0.03 + 0.1 + 0.11 = 0.75 \leq 1$ <p>SD12-30 is applicable</p>

Note 1) Static moment load factor: moment created by the gravity of work  
Dynamic moment load factor: moment created when the work is stopped by stopper

PRECISION

- PST-NS
- PST
- SC
- ST
- STS-L
- SD**
- PSW



# SD Series

05

06

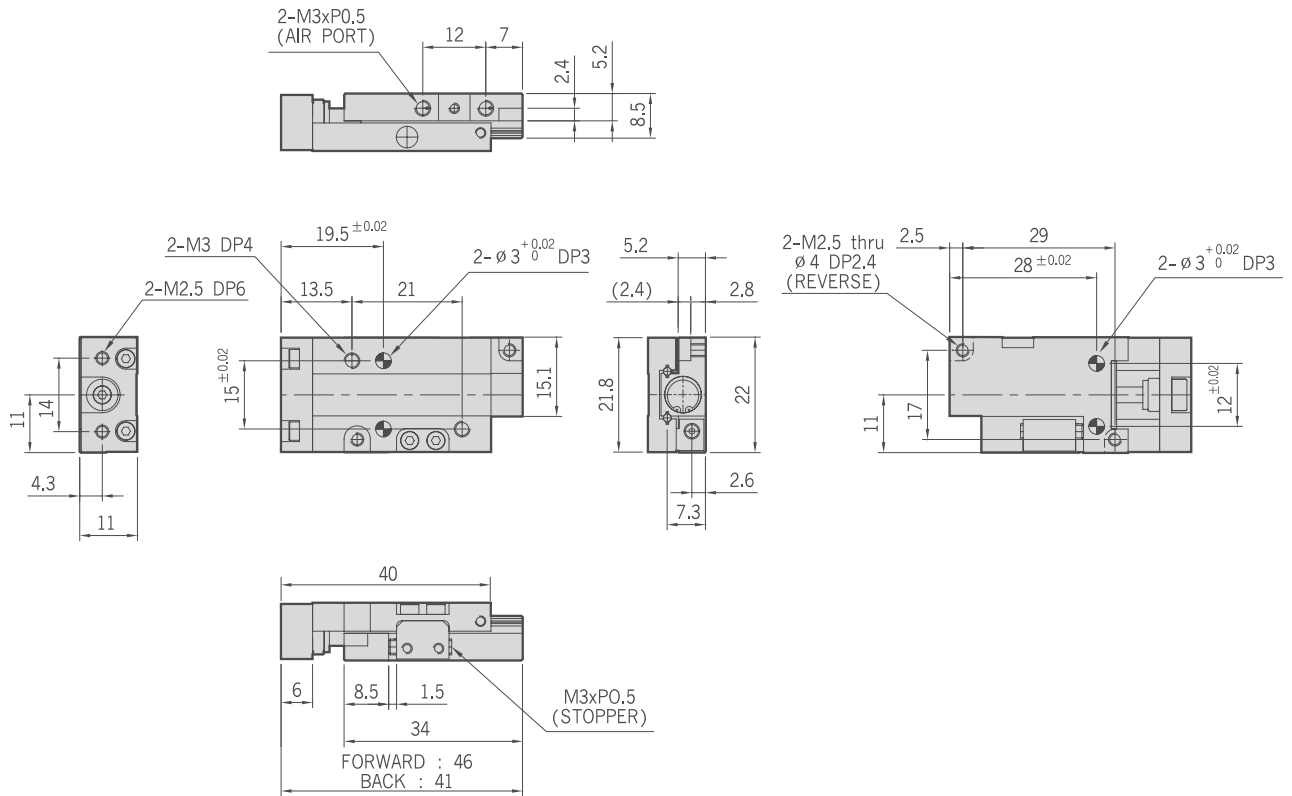
08

12

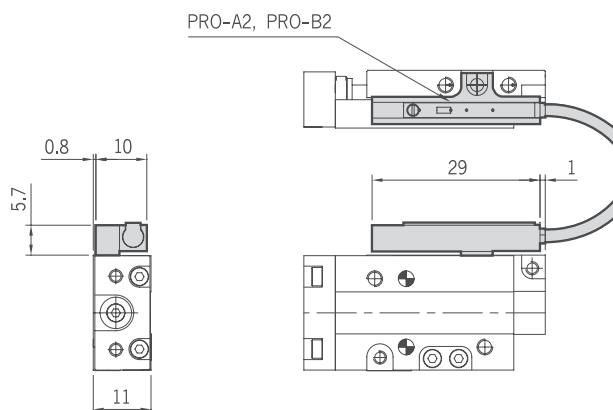
05

10

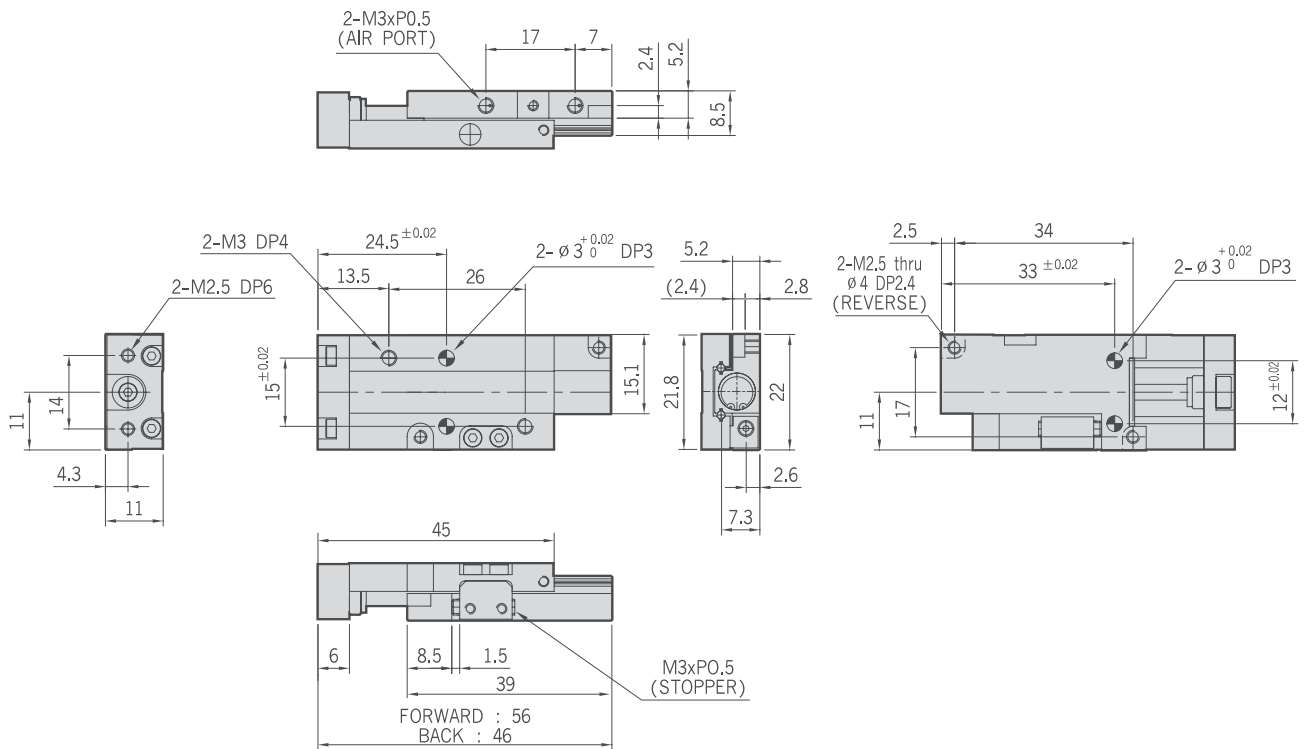
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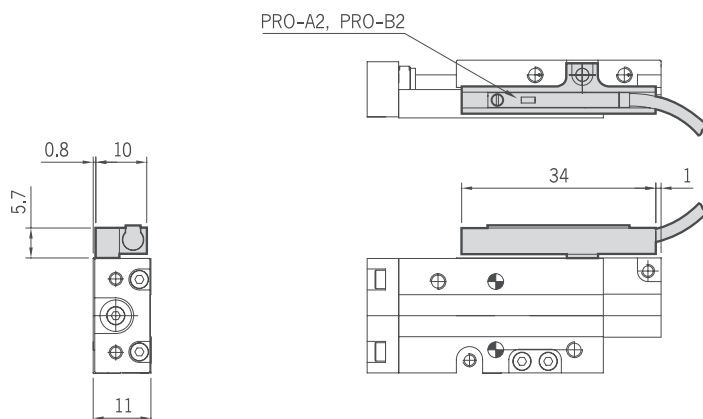
## SD05-05-Auto Switch



SD05-10



SD05-10-Auto Switch



- PRECISION**
- PST-NS
  - PST
  - SC
  - ST
  - STS-L
  - SD**
  - PSW



# SD Series

05

06

08

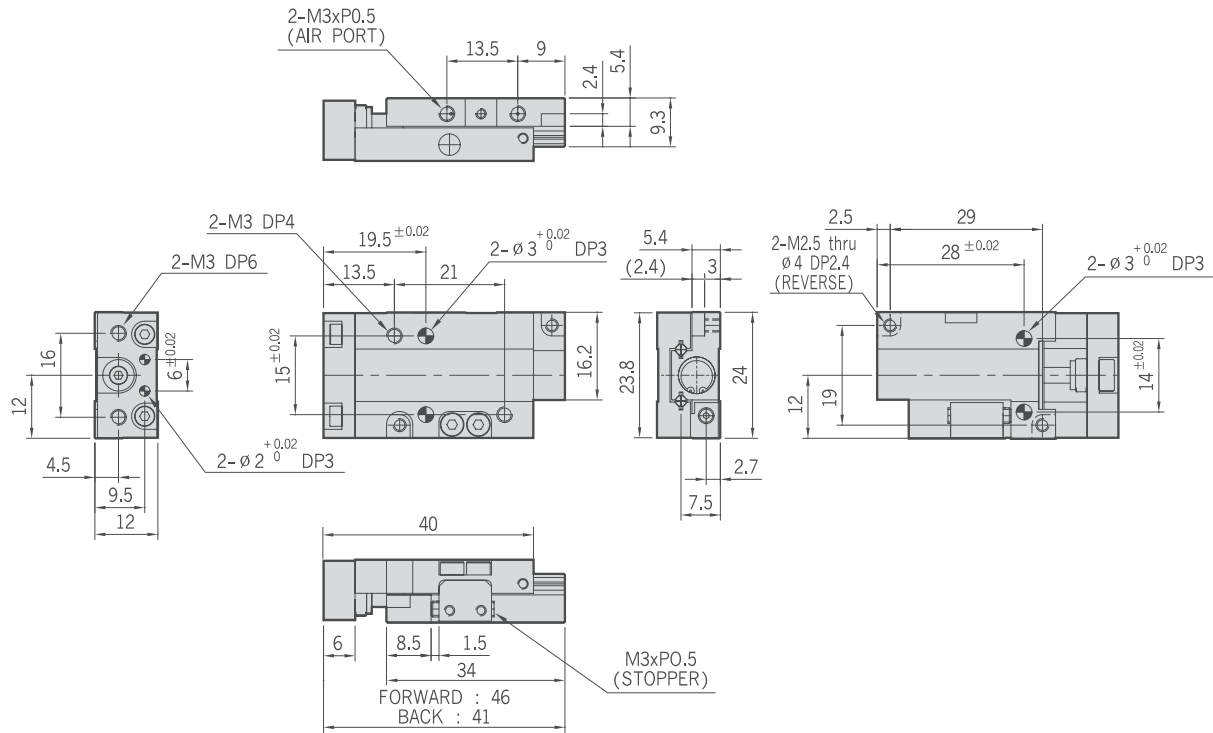
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05

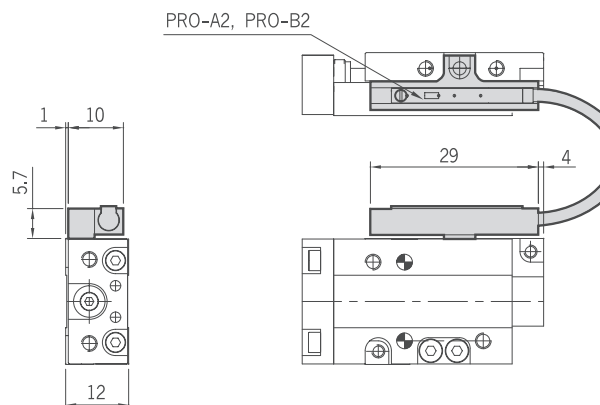
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15

## SD06-05



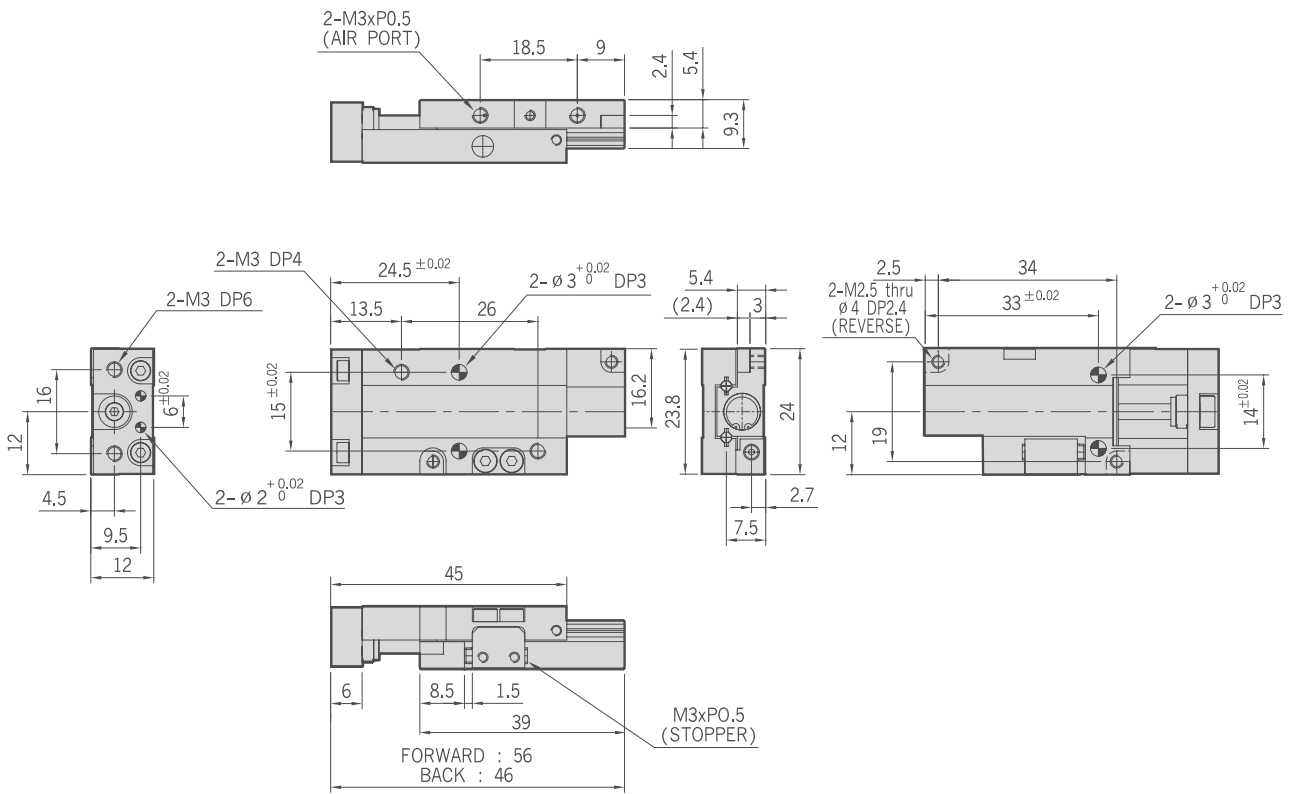
## SD06-05-Auto Switch



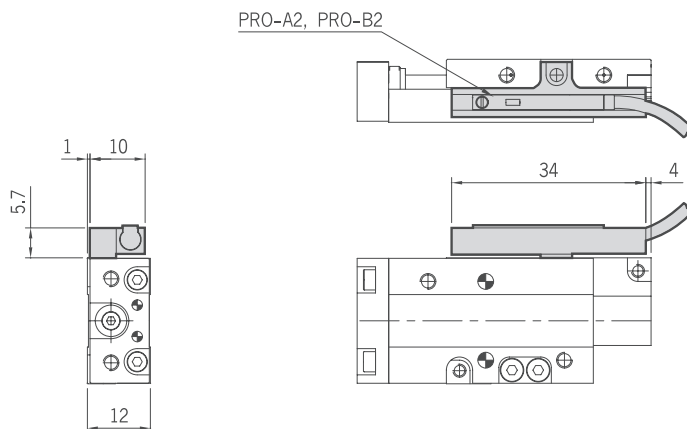
05 06 08 12

05 10 15

SD06-10



SD06-10-Auto Switch



**PRECISION**  
 PST-NS  
 PST  
 SC  
 ST  
 STS-L  
**SD**  
 PSW





# SD Series

05

06

08

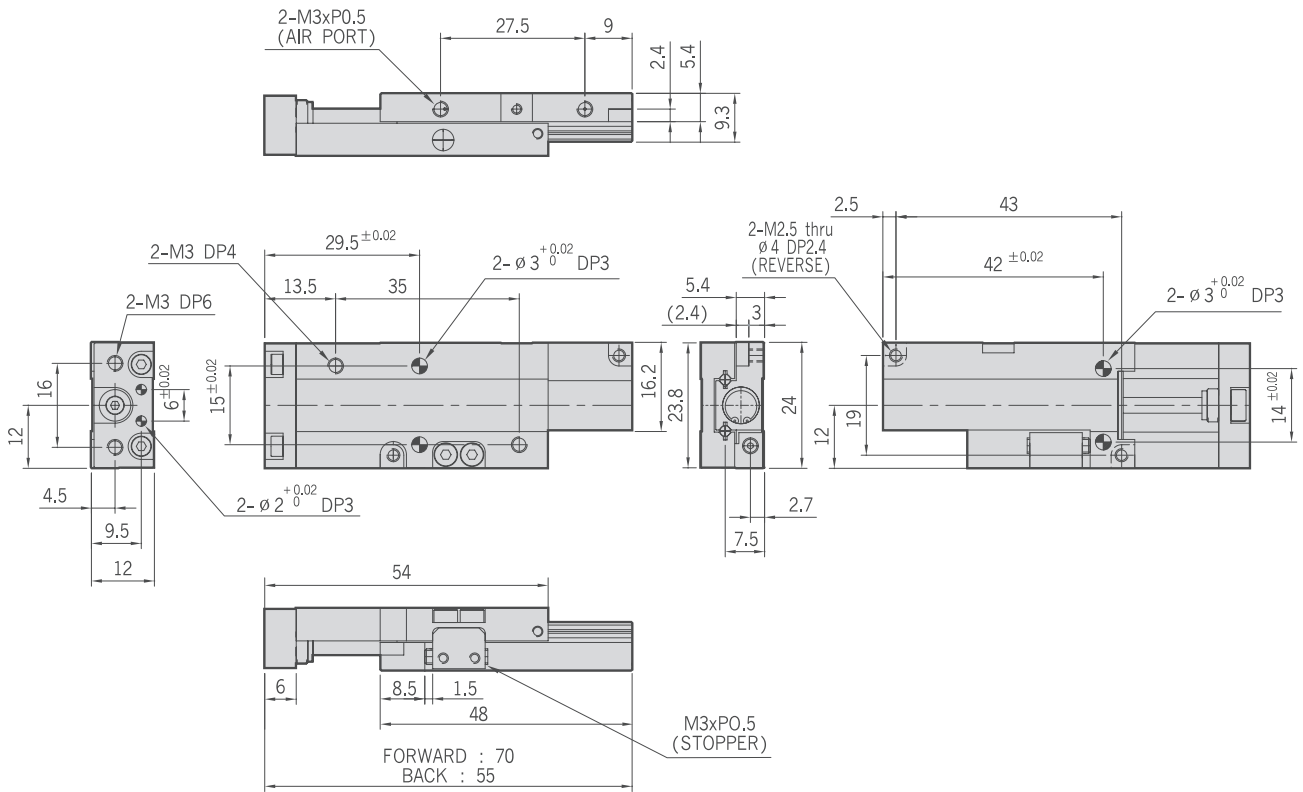
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05

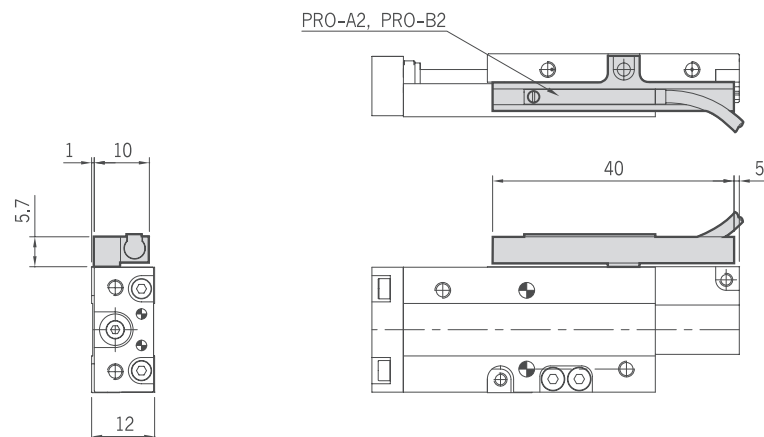
10

15

## SD06-15



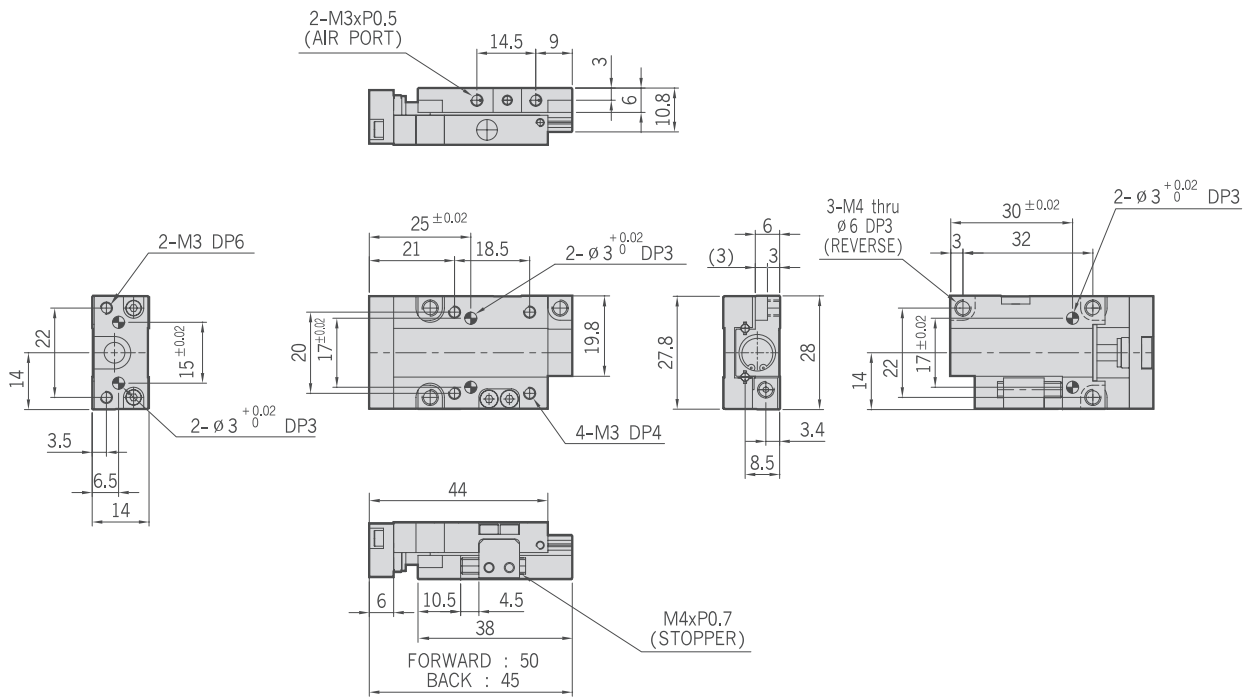
## SD06-15-Auto Switch



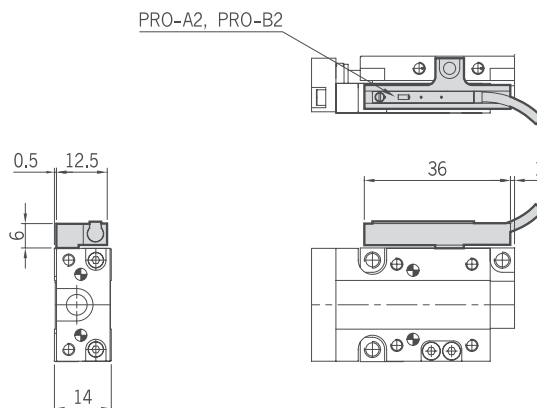
05 06 08 12

05 10 15 20

SD08-05



SD08-05-Auto Switch



PRECISION

- PST-NS
- PST
- SC
- ST
- STS-L
- SD**
- PSW



# SD Series

05

06

08

12

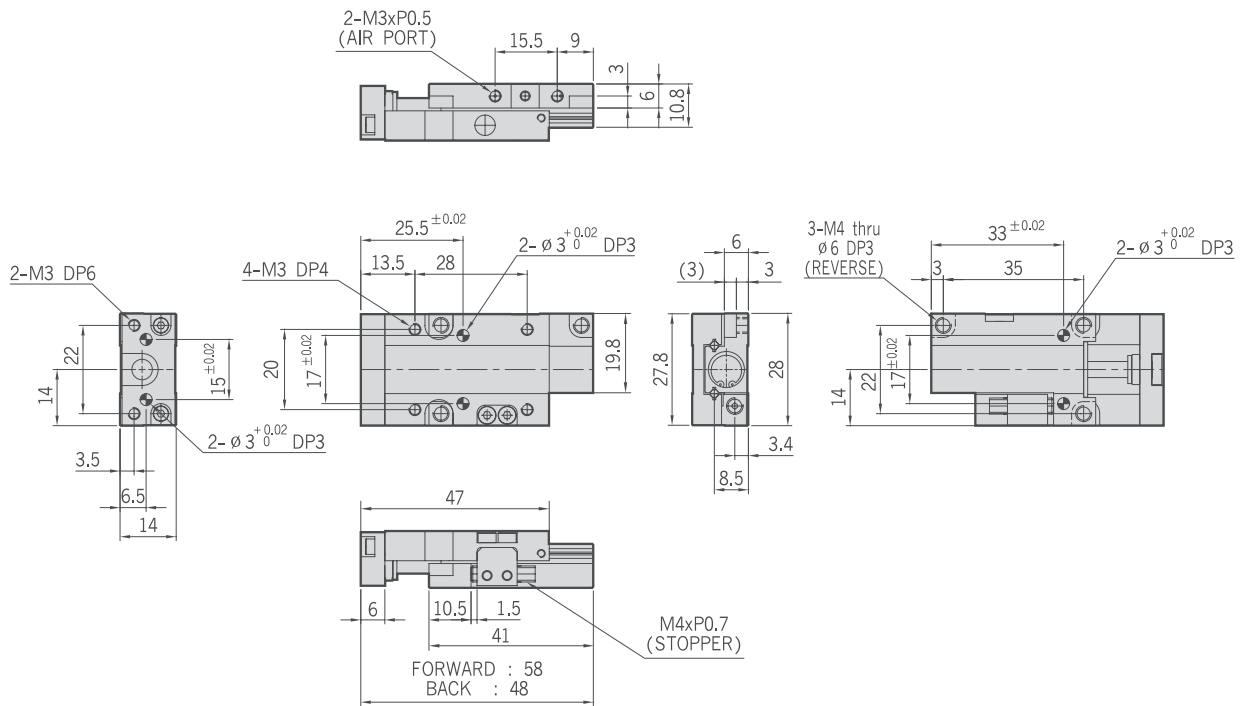
05

10

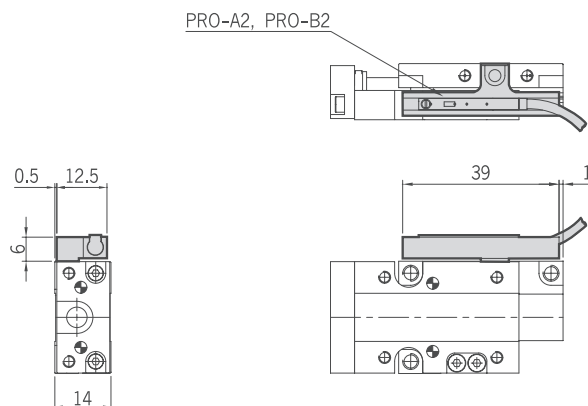
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20

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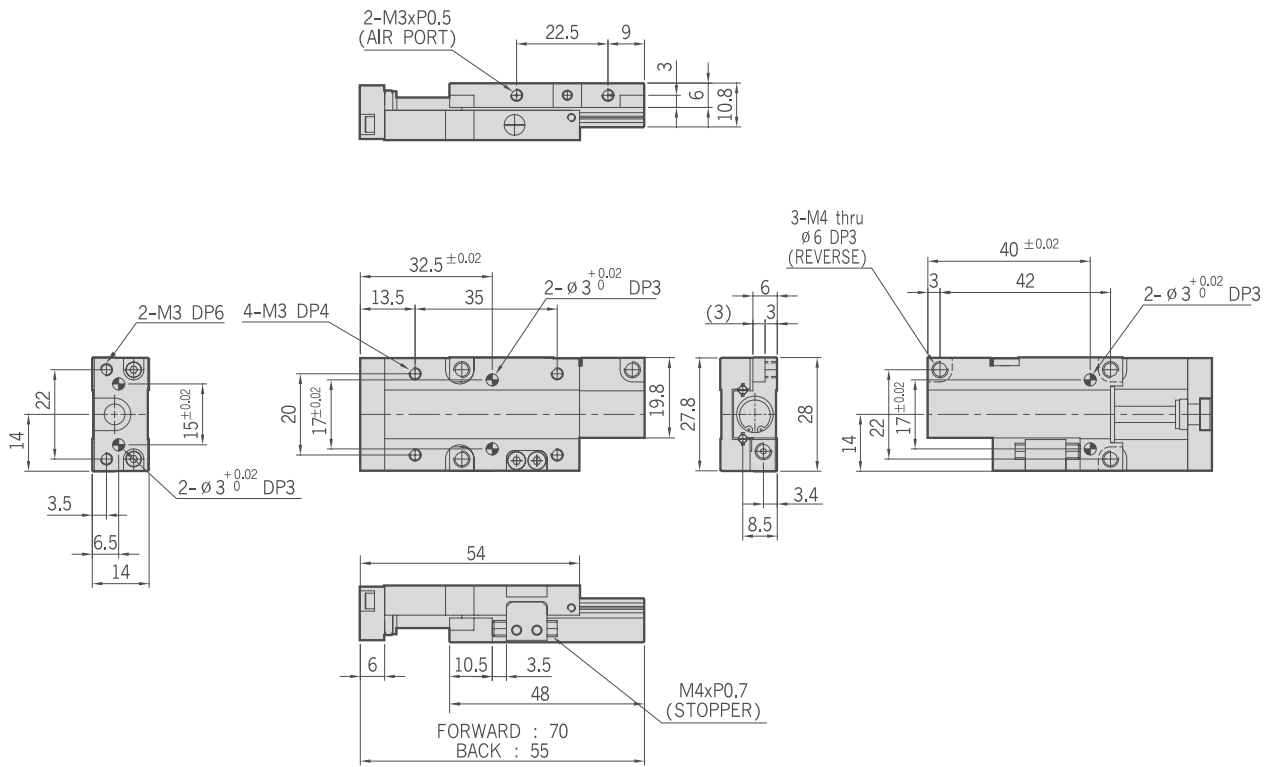


## SD08-10-Auto Switch

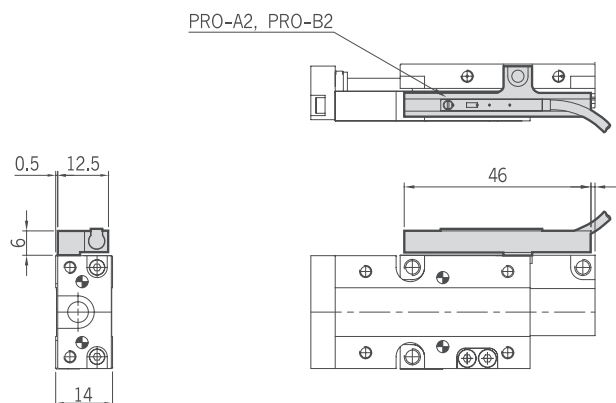


- |    |    |           |    |
|----|----|-----------|----|
| 05 | 06 | <b>08</b> | 12 |
| 05 | 10 | <b>15</b> | 20 |

**SD08-15**



**SD08-15-Auto Switch**



- PRECISION**
- PST-NS
  - PST
  - SC
  - ST
  - STS-L
  - SD**
  - PSW



# SD Series

05

06

08

12

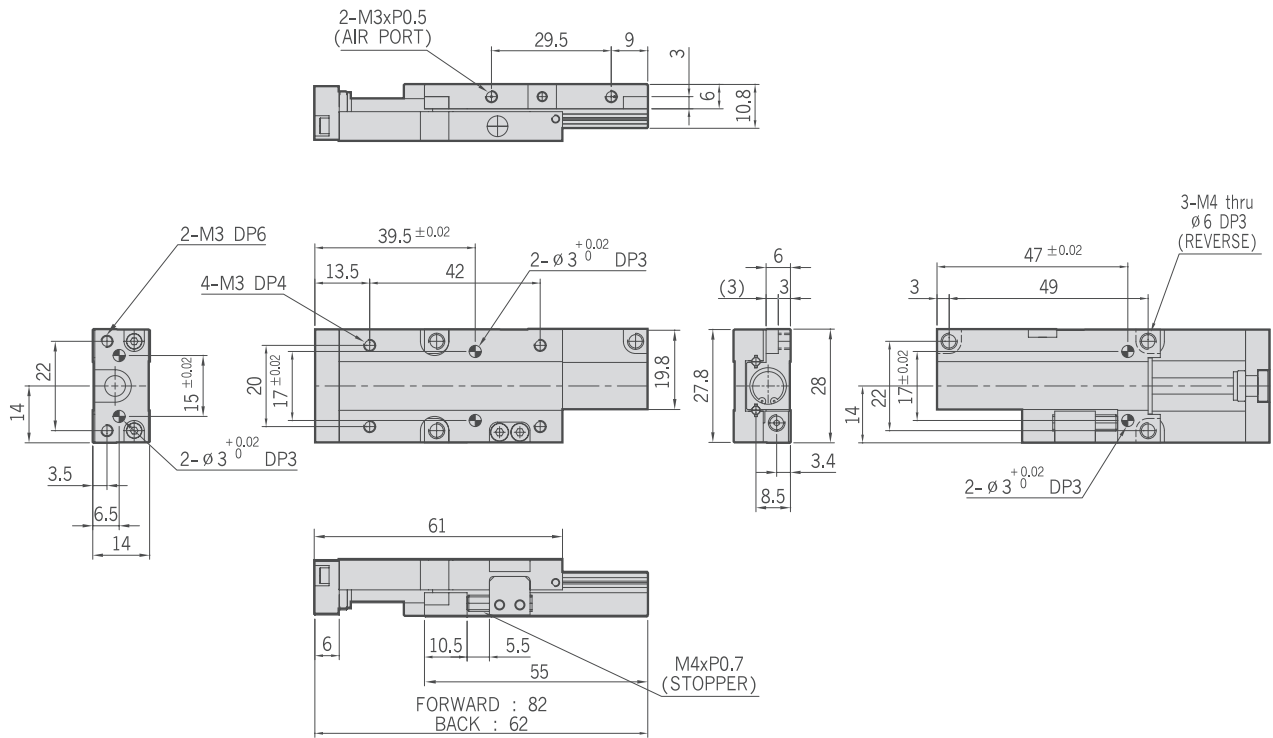
05

10

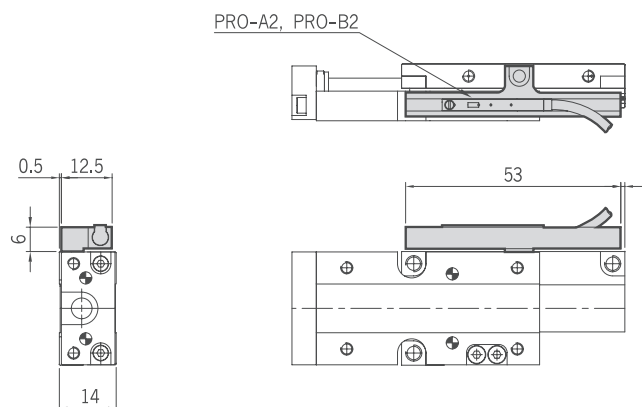
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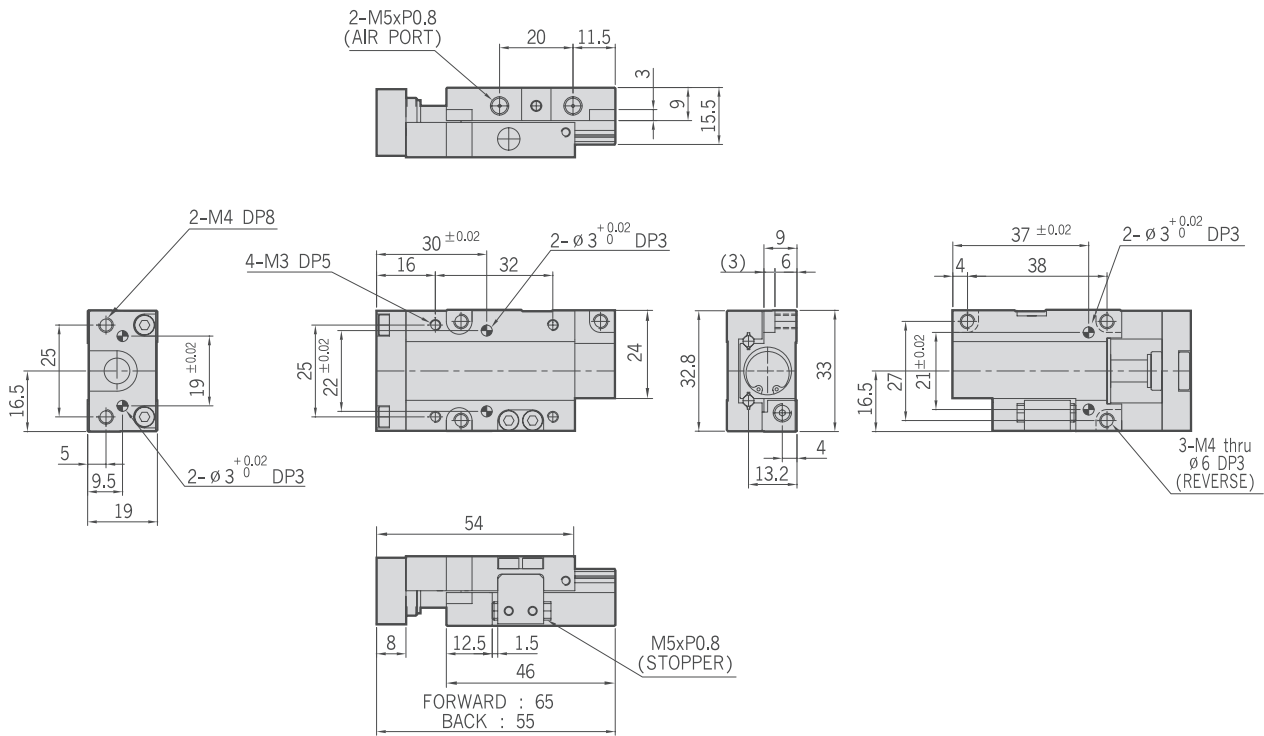
## SD08-20



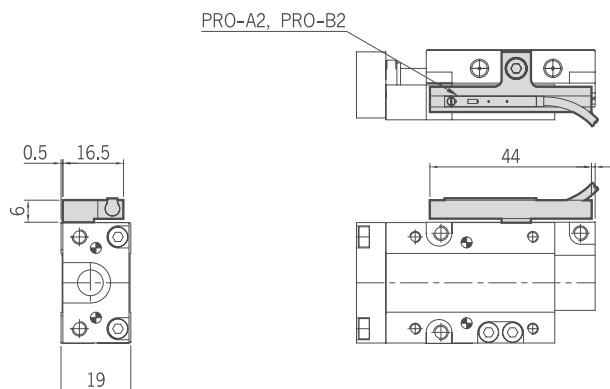
## SD08-20-Auto Switch



SD12-10



SD12-10-Auto Switch



PRECISION

PST-NS

PST

SC

ST

STS-L

SD

PSW



# SD Series

05

06

08

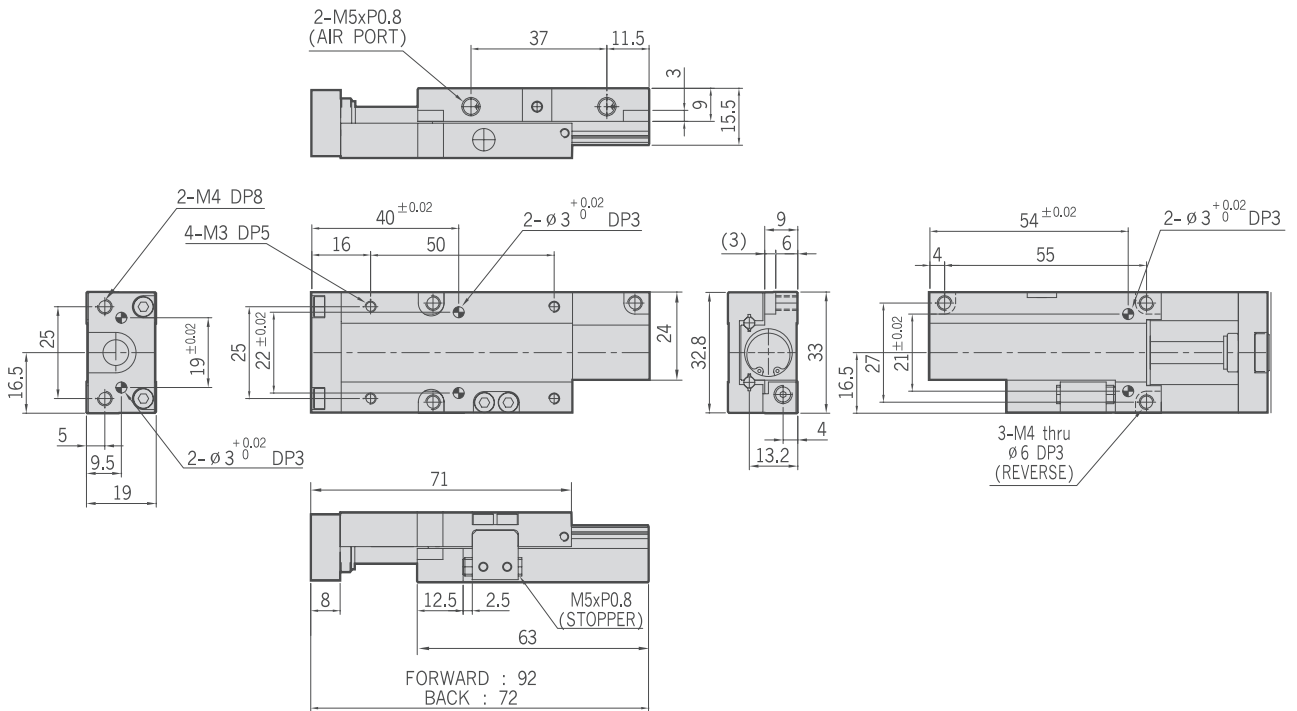
12

10

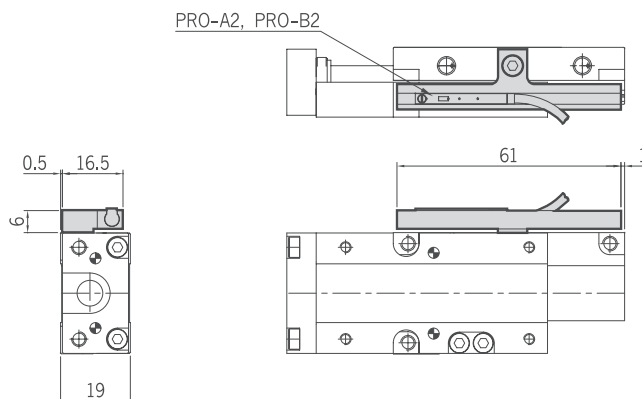
20

30

## SD12-20



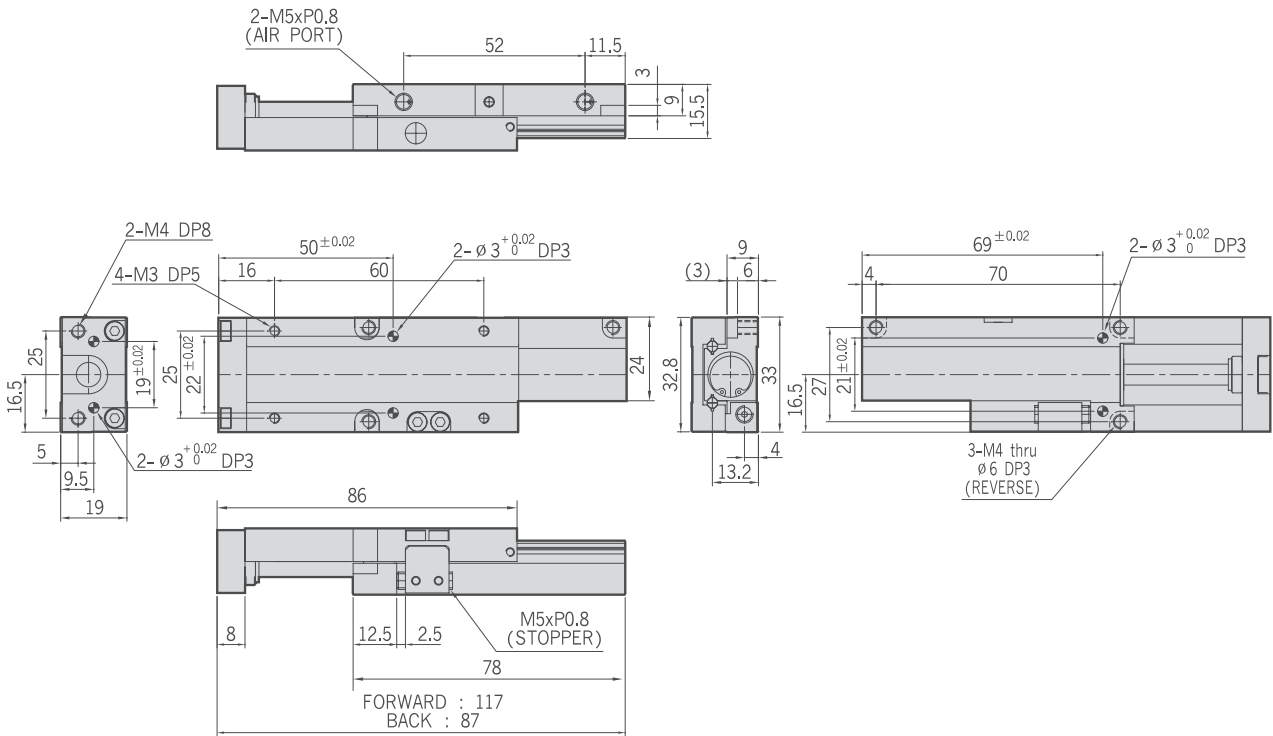
## SD12-20-Auto Switch



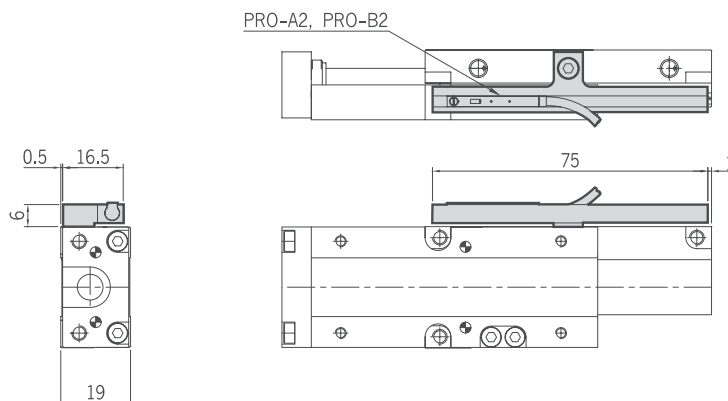
05 06 08 12

10 20 30

SD12-30



SD12-30-Auto Switch



PRECISION  
PST-NS  
PST  
SC  
ST  
STS-L  
SD  
PSW