



# Operation Manual

PRODUCT NAME

## **Compact Guide Cylinder** *Remodeled*

MODEL / Series / Product Number

## **Series *MGP-Z***

**SMC Corporation**

# Contents

Safety Instructions	2
Product feature	4
1. How to Order	5
2. Model	5
3. Specifications	5
4. Standard strokes	6
5. Intermediate stroke	6
6. Weights	7
7. Weights of moving parts	8
8. Allowable Kinetic Energy	9
9. Precautions on Selection	9
10. Precautions on Design	10
11. Mounting Methods	11
12. Piping	13
13. Operating Environment	15
14. Speed Control	15
15. Troubleshooting	16
16. How to exchange seals	17
17. Construction	21
18. Auto Switch	25



# Series MGP

## Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of "Caution," "Warning" or "Danger." They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC)\*1), and other safety regulations.

\*1) ISO 4414: Pneumatic fluid power -- General rules relating to systems.  
ISO 4413: Hydraulic fluid power -- General rules relating to systems.  
IEC 60204-1: Safety of machinery -- Electrical equipment of machines .(Part 1: General requirements)  
ISO 10218-1992: Manipulating industrial robots -Safety.  
etc.



### Caution

**Caution** indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.



### Warning

**Warning** indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.



### Danger

**Danger** indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

## Warning

### 1. The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.

Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results.

The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product.

This person should also continuously review all specifications of the product referring to its latest catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

### 2. Only personnel with appropriate training should operate machinery and equipment.

The product specified here may become unsafe if handled incorrectly.

The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

### 3. Do not service or attempt to remove product and machinery/equipment until safety is confirmed.

1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.

2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.

3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

### 4. Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.

2. Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalog.

3. An application which could have negative effects on people, property, or animals requiring special safety analysis.

4. Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical

protective function, and periodical checks to confirm proper operation.



# Series MGP

## Safety Instructions

### Caution

#### **1. The product is provided for use in manufacturing industries.**

The product herein described is basically provided for peaceful use in manufacturing industries. If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary.  
If anything is unclear, contact your nearest sales branch.

### **Limited warranty and Disclaimer/Compliance Requirements**

The product used is subject to the following “Limited warranty and Disclaimer” and “Compliance Requirements”.

Read and accept them before using the product.

#### **Limited warranty and Disclaimer**

**1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered.\*2)**  
Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.

**2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.**  
This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.

**3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalog for the particular products.**

**\*2) Vacuum pads are excluded from this 1 year warranty.**

A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.  
Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

#### **Compliance Requirements**

- 1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction(WMD) or any other weapon is strictly prohibited.**
- 2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulation of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.**

## Product features

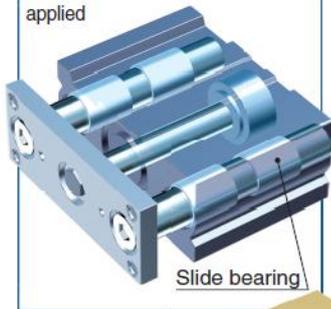
# Compact Guide Cylinder Series *MGP*

ø12, ø16, ø20, ø25, ø32, ø40, ø50, ø63, ø80, ø100

**3 types of bearing can be selected.**

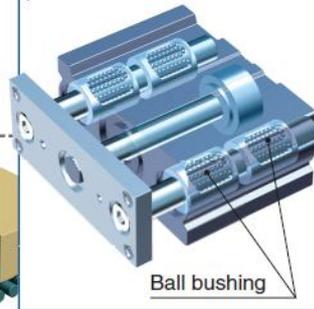
### Slide bearing Series MGPM

Suitable for lateral load applications such as a stopper where shock is applied



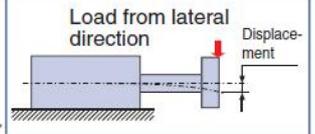
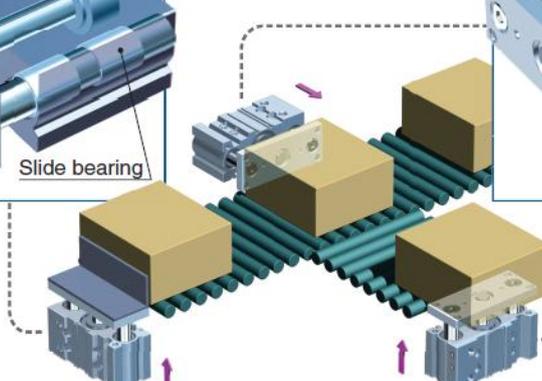
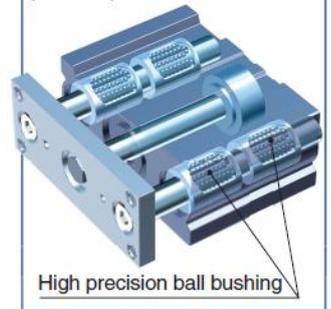
### Ball bearing Series MGPL

Smooth operation suitable for pusher and lifter

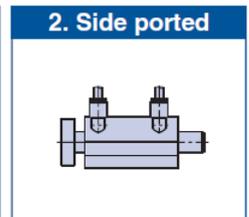
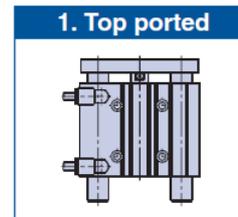


### High precision ball bearing Series MGPA

Suitable for minimizing plate displacement



Piping is possible from **2 directions.**



Small auto switches or magnetic field resistant auto switches can be mounted on **2 surfaces.**

D-M9□

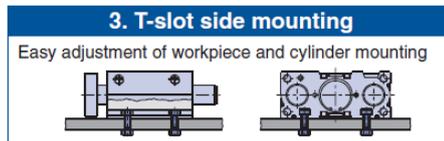
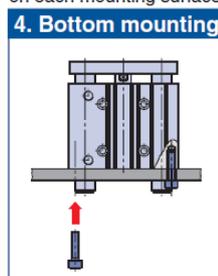
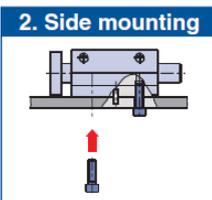
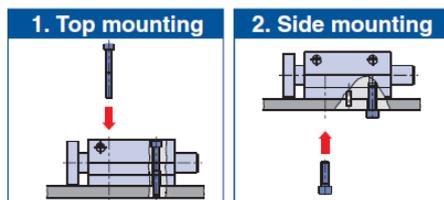
D-A9□

D-P3DW

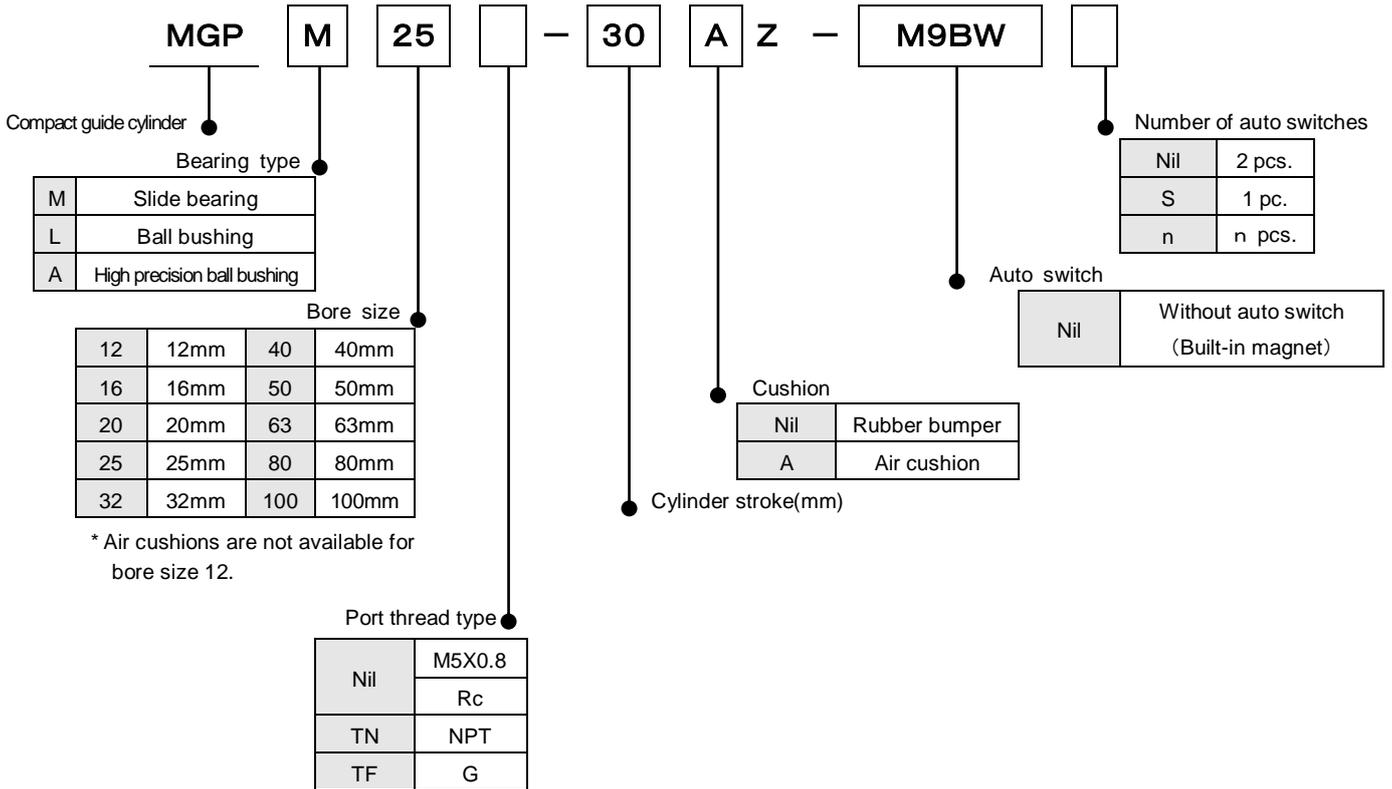
\* The D-Y7 and D-Z7 auto switches are not mountable.

**4 types of mounting are possible.**

Easy positioning  
Knock pin holes provided on each mounting surface



# 1. How to Order



\* For bore size with φ 12 and φ 16, only M5X0.8 is available.

## 2. Model

Model	Cushion	Bearing type	Bore size(mm)
MGP□□-□Z	Rubber bumper	Slide bearing	12, 16, 20, 25, 32, 40, 50, 63, 80, 100
		Ball bushing	
		High precision Ball Bushing	
MGP□□-□AZ	Air cushion	Slide bearing	16, 20, 25, 32, 40, 50, 63, 80, 100
		Ball bushing	
		High precision Ball Bushing	

## 3. Specifications

Model	MGP□□-□Z 【Basic type】		MGP□□-□AZ 【With air cushion】	
<b>Action</b>	Double acting			
<b>Fluid</b>	Air			
<b>Proof pressure</b>	1.5MPa			
<b>Maximum operating pressure</b>	1.0MPa			
<b>Minimum operating pressure</b>	φ 12, φ 16	0.12MPa	φ 16	0.15MPa
	φ 20 to φ 100	0.1MPa	φ 20 to φ 100	0.12MPa
<b>Ambient and fluid temperature</b>	-10 to 60°C (No freezing)			
<b>Piston speed</b>	φ 12 to φ 63	50 to 500mm/s	φ 16 to φ 63	50 to 500mm/s
	φ 80, φ 100	50 to 400mm/s	φ 80, φ 100	50 to 400mm/s
<b>Cushion</b>	Rubber bumper on both ends		Air cushion on both ends (Without bumper)	
<b>Lubrication</b>	Not required (Non-lube)			
<b>Stroke length tolerance</b>	+1.5 0 mm			

## 4. Standard strokes

### 4-1. Basic type

Model	Bore size(mm)	Standard stroke (mm)
MGP M L □-□Z A	12,16	10,20,30,40,50,75,100,125,150,175,200,250
	20,25	20,30,40,50,75,100,125,150,175,200,250,300,350,400
	32 to 100	25,50,75,100,125,150,175,200,250,300,350,400

### 4-2. With air cushion

Model	Bore size(mm)	Standard stroke (mm)
MGP M L □-□AZ A	16	25,50,75,100,125,150,175,200,250
	20 to 63	25,50,75,100,125,150,175,200,250,300,350,400
	80,100	50,75,100,125,150,175,200,250,300,350,400

## 5. Intermediate strokes

### 5-1. Basic type

Description	Spacer installation type		Exclusive body (-XB10)	
	Spacers are installed in the standard stroke cylinder. •φ 12 toφ 32: Available by the 1 mm stroke interval. •φ 40 toφ 100: Available by the 5 mm stroke interval.			Dealing with the stroke by making an exclusive body. • All bore sizes are available by the 1 mm interval.
Model no.	Refer to "How to Order" for the standard model numbers.		Add "-XB10" to the end of standard model number.	
Applicable stroke (mm)	φ 12, φ 16	1 to 249	φ 12, φ 16	11 to 249
	φ 20, φ 25, φ 32	1 to 399	φ 20, φ 25, φ 32	21 to 399
	φ 40 toφ 100	5 to 395	φ 40 to φ 100	26 to 395
Example	Part no.: MGPM20-39Z A spacer 1 mm in width is installed in the MGPM20-40. C dimension is 77 mm.		Part no.: MGPM20-39Z-XB10 Special body manufactured for 39 stroke. C dimension is 76 mm.	

### 5-2. With air cushion

Description	Spacer installation type	
	Intermediate strokes by the 1 mm interval are available by replacing collars of a standard stroke cylinder. Minimum manufacturable strokeφ 16 toφ 63: 15 mm φ 80, φ 100: 20 mm Select a rubber bumper type, because the cushion effect is not obtainable for less than this stroke.	
Model no.	Add "-XC19" to the end of standard part number.	
Applicable stroke (mm)	φ 16	15 to 249
	φ 20 to φ 63	15 to 399
	φ 80,φ 100	20 to 399
Example	Part no.: MGPM20-35AZ-XC19 A collar 15 mm in width is installed in the MGPM20-50AZ. C dimension is 112 mm.	

Note) Intermediate stroke (by the 1 mm interval) based on an exclusive body will be available upon request for special.

## 6. Weights

### 6-1. Basic type

Slide Bearing : MGPM12 to 100-\*Z

(kg)

Bore size (mm)	Model	Standard stroke (mm)															
		10	20	25	30	40	50	75	100	125	150	175	200	250	300	350	400
12	MGPM12-□Z	0.22	0.25	—	0.29	0.33	0.36	0.46	0.55	0.66	0.75	0.84	0.93	1.11	—	—	—
16	MGPM16-□Z	0.32	0.37	—	0.42	0.46	0.51	0.66	0.78	0.94	1.06	1.18	1.31	1.55	—	—	—
20	MGPM20-□Z	—	0.59	—	0.67	0.74	0.82	1.06	1.24	1.43	1.61	1.80	1.99	2.42	2.79	3.16	3.53
25	MGPM25-□Z	—	0.84	—	0.94	1.04	1.14	1.50	1.75	2.00	2.25	2.50	2.75	3.35	3.85	4.34	4.84
32	MGPM32-□Z	—	—	1.41	—	—	1.77	2.22	2.57	2.93	3.29	3.65	4.00	4.90	5.61	6.33	7.04
40	MGPM40-□Z	—	—	1.64	—	—	2.04	2.52	2.92	3.32	3.71	4.11	4.50	5.47	6.26	7.06	7.85
50	MGPM50-□Z	—	—	2.79	—	—	3.38	4.13	4.71	5.30	5.89	6.47	7.06	8.55	9.73	10.9	12.1
63	MGPM63-□Z	—	—	3.48	—	—	4.15	4.99	5.67	6.34	7.02	7.69	8.37	10.0	11.4	12.7	14.1
80	MGPM80-□Z	—	—	5.41	—	—	6.26	7.41	8.26	9.10	9.95	10.8	11.6	13.9	15.6	17.3	19.0
100	MGPM100-□Z	—	—	9.12	—	—	10.3	12.0	13.2	14.4	15.6	16.9	18.1	21.2	23.6	26.1	28.5

Ball Bushing : MGPL12 to 100-\*Z, High Precision Ball Bushing : MGPA12 to 100-\*Z

(kg)

Bore size (mm)	Model	Standard stroke (mm)															
		10	20	25	30	40	50	75	100	125	150	175	200	250	300	350	400
12	MGP□12-□Z	0.21	0.24	—	0.27	0.32	0.35	0.43	0.50	0.59	0.67	0.75	0.83	0.99	—	—	—
16	MGP□16-□Z	0.31	0.35	—	0.40	0.47	0.51	0.62	0.72	0.85	0.96	1.06	1.17	1.38	—	—	—
20	MGP□20-□Z	—	0.60	—	0.66	0.79	0.85	1.01	1.17	1.36	1.52	1.68	1.84	2.17	2.49	2.81	3.13
25	MGP□25-□Z	—	0.87	—	0.96	1.12	1.20	1.41	1.62	1.86	2.06	2.27	2.48	2.92	3.33	3.75	4.16
32	MGP□32-□Z	—	—	1.37	—	—	1.66	2.08	2.37	2.74	3.03	3.31	3.60	4.25	4.82	5.39	5.97
40	MGP□40-□Z	—	—	1.59	—	—	1.92	2.38	2.70	3.11	3.44	3.77	4.09	4.81	5.46	6.11	6.76
50	MGP□50-□Z	—	—	2.65	—	—	3.14	3.85	4.34	4.97	5.47	5.96	6.45	7.57	8.56	9.54	10.5
63	MGP□63-□Z	—	—	3.33	—	—	3.91	4.71	5.29	6.01	6.59	7.17	7.75	9.05	10.2	11.4	12.5
80	MGP□80-□Z	—	—	5.27	—	—	6.29	7.49	8.21	8.92	9.64	10.4	11.1	12.9	14.3	15.7	17.2
100	MGP□100-□Z	—	—	8.62	—	—	10.1	11.8	12.9	13.9	15.0	16.0	17.1	19.6	21.7	23.8	25.9

### 6-2. With air cushion

Slide Bearing : MGPM16 to 100-\*AZ

(kg)

Bore size (mm)	Model	Standard stroke (mm)											
		25	50	75	100	125	150	175	200	250	300	350	400
16	MGPM16-□AZ	0.46	0.62	0.74	0.83	1.02	1.10	1.19	1.28	1.46	-	-	-
20	MGPM20-□AZ	0.77	1.02	1.21	1.35	1.49	1.63	1.77	1.91	2.55	2.83	3.11	3.39
25	MGPM25-□AZ	1.06	1.43	1.68	1.84	2.01	2.18	2.35	2.52	3.50	3.84	4.18	4.51
32	MGPM32-□AZ	1.66	2.06	2.42	2.65	2.88	3.11	3.34	3.57	5.07	5.53	5.99	6.46
40	MGPM40-□AZ	1.95	2.40	2.79	3.06	3.33	3.59	3.86	4.13	5.71	6.25	6.78	7.32
50	MGPM50-□AZ	3.26	3.96	4.55	4.96	5.36	5.76	6.16	6.56	9.03	9.83	10.6	11.4
63	MGPM63-□AZ	4.11	4.90	5.58	6.07	6.56	7.05	7.54	8.04	10.7	11.7	12.6	13.6
80	MGPM80-□AZ	-	7.47	8.35	8.95	9.55	10.1	10.8	11.4	15.0	16.2	17.4	18.6
100	MGPM100-□AZ	-	12.1	13.4	14.2	15.1	16.0	16.8	17.7	22.9	24.6	26.4	28.1

Ball Bushing : MGPL16 to 100-\*AZ, High Precision Ball Bushing : MGPA16 to 100-\*AZ

(kg)

Bore size (mm)	Model	Standard stroke (mm)											
		25	50	75	100	125	150	175	200	250	300	350	400
16	MGP□16-□AZ	0.48	0.58	0.66	0.83	0.94	1.02	1.11	1.19	1.36	-	-	-
20	MGP□20-□AZ	0.82	0.97	1.10	1.35	1.50	1.63	1.76	1.89	2.33	2.59	2.84	3.10
25	MGP□25-□AZ	1.16	1.34	1.49	1.83	2.03	2.18	2.34	2.49	3.11	3.41	3.72	4.02
32	MGP□32-□AZ	1.58	2.00	2.29	2.67	2.95	3.15	3.36	3.57	4.47	4.88	5.29	5.70
40	MGP□40-□AZ	1.87	2.33	2.65	3.06	3.38	3.63	3.87	4.11	5.09	5.57	6.06	6.54
50	MGP□50-□AZ	3.10	3.81	4.30	4.92	5.42	5.79	6.17	6.55	8.08	8.83	9.58	10.3
63	MGP□63-□AZ	3.94	4.74	5.34	6.05	6.64	7.11	7.58	8.05	9.77	10.7	11.7	12.6
80	MGP□80-□AZ	-	7.61	8.35	8.91	9.46	10.0	10.6	11.1	14.0	15.1	16.2	17.3
100	MGP□100-□AZ	-	12.0	13.1	14.0	14.8	15.6	16.4	17.3	21.1	22.8	24.4	26.1

## 7. Weights of Moving Parts

### 7-1. Basic type

Slide Bearing : MGPM12 to 100-\*Z

(kg)

Bore size (mm)	Model	Standard stroke (mm)															
		10	20	25	30	40	50	75	100	125	150	175	200	250	300	350	400
12	MGPM12-□Z	0.10	0.11	-	0.12	0.13	0.14	0.19	0.21	0.25	0.28	0.31	0.33	0.38	-	-	-
16	MGPM16-□Z	0.15	0.17	-	0.18	0.20	0.22	0.29	0.33	0.40	0.44	0.49	0.53	0.61	-	-	-
20	MGPM20-□Z	-	0.27	-	0.29	0.32	0.34	0.46	0.52	0.58	0.64	0.70	0.76	0.94	1.06	1.18	1.30
25	MGPM25-□Z	-	0.42	-	0.46	0.50	0.54	0.73	0.83	0.92	1.02	1.11	1.21	1.50	1.69	1.88	2.07
32	MGPM32-□Z	-	-	0.83	-	-	0.99	1.23	1.39	1.54	1.69	1.85	2.00	2.49	2.80	3.10	3.41
40	MGPM40-□Z	-	-	0.89	-	-	1.04	1.28	1.44	1.59	1.75	1.90	2.05	2.54	2.85	3.16	3.46
50	MGPM50-□Z	-	-	1.77	-	-	2.01	2.42	2.66	2.90	3.15	3.39	3.63	4.43	4.92	5.41	5.89
63	MGPM63-□Z	-	-	2.05	-	-	2.30	2.70	2.94	3.19	3.43	3.67	3.92	4.72	5.21	5.69	6.18
80	MGPM80-□Z	-	-	3.52	-	-	3.87	4.52	4.88	5.23	5.58	5.94	6.29	7.54	8.25	8.95	9.66
100	MGPM100-□Z	-	-	5.98	-	-	6.48	7.39	7.89	8.40	8.90	9.41	9.91	11.5	12.6	13.6	14.6

Ball Bushing : MGPL12 to 100-\*Z, High Precision Ball Bushing : MGPA12 to 100-\*Z

(kg)

Bore size (mm)	Model	Standard stroke (mm)															
		10	20	25	30	40	50	75	100	125	150	175	200	250	300	350	400
12	MGP□12-□Z	0.09	0.10	-	0.11	0.12	0.13	0.14	0.16	0.19	0.21	0.22	0.24	0.27	-	-	-
16	MGP□16-□Z	0.14	0.15	-	0.16	0.19	0.20	0.23	0.26	0.31	0.34	0.37	0.40	0.46	-	-	-
20	MGP□20-□Z	-	0.26	-	0.28	0.32	0.34	0.39	0.43	0.51	0.56	0.60	0.65	0.76	0.86	0.95	1.04
25	MGP□25-□Z	-	0.43	-	0.45	0.51	0.54	0.61	0.68	0.78	0.85	0.92	0.99	1.16	1.29	1.43	1.57
32	MGP□32-□Z	-	-	0.71	-	-	0.82	0.98	1.09	1.26	1.37	1.48	1.59	1.88	2.10	2.32	2.54
40	MGP□40-□Z	-	-	0.76	-	-	0.87	1.03	1.14	1.32	1.43	1.54	1.64	1.93	2.15	2.37	2.59
50	MGP□50-□Z	-	-	1.50	-	-	1.67	1.95	2.12	2.40	2.57	2.74	2.92	3.40	3.75	4.09	4.44
63	MGP□63-□Z	-	-	1.79	-	-	1.96	2.24	2.41	2.68	2.86	3.03	3.20	3.69	4.03	4.38	4.73
80	MGP□80-□Z	-	-	3.13	-	-	3.59	4.09	4.35	4.62	4.89	5.16	5.43	6.22	6.75	7.29	7.82
100	MGP□100-□Z	-	-	5.25	-	-	5.92	6.67	7.06	7.44	7.82	8.20	8.59	9.61	10.4	11.1	11.9

### 7-2. With air cushion

Slide Bearing : MGPM16 to 100-\*AZ

(kg)

Bore size (mm)	Model	Standard stroke (mm)											
		25	50	75	100	125	150	175	200	250	300	350	400
16	MGPM16-□AZ	0.17	0.26	0.30	0.31	0.41	0.42	0.43	0.44	0.46	-	-	-
20	MGPM20-□AZ	0.30	0.43	0.49	0.50	0.52	0.53	0.55	0.57	0.97	1.00	1.03	1.06
25	MGPM25-□AZ	0.46	0.67	0.76	0.78	0.79	0.81	0.83	0.84	1.53	1.56	1.59	1.62
32	MGPM32-□AZ	0.88	1.13	1.28	1.31	1.34	1.37	1.40	1.43	2.53	2.59	2.66	2.72
40	MGPM40-□AZ	0.93	1.18	1.33	1.36	1.39	1.42	1.45	1.48	2.58	2.64	2.70	2.76
50	MGPM50-□AZ	1.80	2.21	2.47	2.53	2.59	2.65	2.71	2.78	4.56	4.69	4.81	4.93
63	MGPM63-□AZ	2.07	2.49	2.74	2.80	2.86	2.92	2.99	3.05	4.84	4.96	5.08	5.21
80	MGPM80-□AZ	-	4.22	4.60	4.69	4.79	4.89	4.98	5.08	7.76	7.95	8.14	8.34
100	MGPM100-□AZ	-	6.93	7.47	7.61	7.75	7.89	8.03	8.16	11.9	12.1	12.4	12.7

Ball Bushing : MGPL16 to 100-\*AZ, High Precision Ball Bushing : MGPA16 to 100-\*AZ

(kg)

Bore size (mm)	Model	Standard stroke (mm)											
		25	50	75	100	125	150	175	200	250	300	350	400
16	MGP□16-□AZ	0.18	0.20	0.21	0.29	0.32	0.33	0.34	0.35	0.37	-	-	-
20	MGP□20-□AZ	0.32	0.35	0.37	0.48	0.53	0.55	0.56	0.58	0.78	0.81	0.84	0.88
25	MGP□25-□AZ	0.49	0.54	0.55	0.73	0.80	0.81	0.83	0.84	1.17	1.20	1.23	1.26
32	MGP□32-□AZ	0.75	0.91	1.02	1.19	1.30	1.33	1.36	1.39	1.91	1.97	2.03	2.09
40	MGP□40-□AZ	0.79	0.96	1.06	1.24	1.34	1.37	1.40	1.43	1.96	2.02	2.08	2.14
50	MGP□50-□AZ	1.53	1.82	2.00	2.29	2.47	2.53	2.59	2.66	3.52	3.65	3.77	3.89
63	MGP□63-□AZ	1.80	2.09	2.28	2.56	2.74	2.80	2.87	2.93	3.80	3.92	4.04	4.17
80	MGP□80-□AZ	-	3.87	4.15	4.25	4.35	4.44	4.54	4.64	6.42	6.61	6.81	7.00
100	MGP□100-□AZ	-	6.34	6.75	6.89	7.03	7.17	7.30	7.44	9.78	10.1	10.3	10.6

## 8. Allowable Kinetic Energy

### Caution

A cylinder will be damaged if kinetic energy exceeds the allowable kinetic energy shown in Table 1. Select a cylinder so that  $E_k$  does not exceed the allowable kinetic energy shown in Table 1.

Table.1

Bore size (mm)	Rubber bumper	Air cushion	
	Allowable kinetic energy (J)	Allowable kinetic energy (J)	Effective cushion length (mm)
12	0.043	-	-
16	0.075	0.23	9.5
20	0.11	0.31	8.5
25	0.18	0.53	8.4
32	0.29	1.0	10.5
40	0.52	1.9	10.5
50	0.91	3.2	11.5
63	1.54	5.2	11.5
80	2.71	10.9	16.5
100	4.54	16.4	16.5

The kinetic energy of a load can be found with the following formula.

$$E_k = \frac{M+m}{2} v^2 \quad v = 1.4v_a$$

$E_k$ : Kinetic energy (J)

$M$ : Weight of attached object (kg)

$m$ : Weight of cylinder's moving parts (kg)

$v$ : Maximum speed (m/s)

$v_a$ : Average speed (m/s)

Note1) This is a mechanism which uses the compression of air to absorb the large kinetic energy generated by a large load and high speed operation when stopping the piston at the end of a stroke.

Consequently, the air cushion is not intended for reducing the piston's speed as it approaches the end of the stroke.

The kinetic energy of a load can be found using the following formula.

Note2)  $v_a$  should be set so that the speed  $u$  entering the cushion does not exceed 0.5m/s (0.4m/s for  $\varnothing 80$  and  $\varnothing 100$ ).

Note3) In the case of horizontal operation, be sure that the load weight does not exceed the allowable lateral load found.

## 9. Precautions on Selection

### Warning

#### 1) Confirm the specifications.

Products represented in this manual are designed only for use in compressed air systems.

Do not operate at pressures or temperatures, etc., beyond the range of specifications, as this can cause damage or malfunction. (Refer to the specifications.)

Please contact SMC when using a fluid other than compressed air made by pneumatic equipment.

#### 2) Intermediate stops

When intermediate stopped position is performed with a 3 position closed center type directional control valve, it is difficult to achieve accurate and precise stopped positions due to the compressibility of air.

Furthermore, since valves or cylinders are not guaranteed for zero air leakage, it may not be possible to hold a stopped position for an extended period of time. Please contact SMC in case

it is necessary to hold a stopped position for an extended period.

**3) Keep the speed setting within the allowable energy values for the product.**

Operation with a load's kinetic energy exceeding the allowable value can lead to damage of the product and cause human injury as well as damage to other equipment and machinery.

**4) Provide a shock absorbing mechanism in cases where the product is subjected to kinetic energy exceeding the allowable value.**

Operation exceeding the allowable energy can lead to damage of the product and cause human injury as well as damage to other equipment and machinery.

**5) Do not give excessive force and vibrations from outside.**

This compact cylinder consists of precisely machined parts.

External excessive vibrations may cause air leak, malfunction, parts breakage and deformation, which could result in injury or equipment damage.

## **Caution**

- 1) Adjust cylinder driving speed by means of speed controller.  
Gradually increase the speed to the desired level.**

## 10. Precautions on Design

### **Caution**

**1) There is a danger of sudden action by air cylinders if sliding parts of machinery are twisted, etc. and changes in forces occur.**

In such cases, human injury may occur; e.g., by catching hands or feet in the machinery, or damage to the machinery itself may occur.

Therefore, the machine should be designed to avoid such dangers.

**2) A protective cover is recommended to minimize the risk of personal injury.**

If a stationary object and moving parts of a cylinder are in close proximity, personal injury may occur. Design the structure to avoid contact with the human body.

**3) Securely tighten all stationary parts and connected parts so that they will not become loose.**

When a cylinder operates with high frequency or is installed where there is a lot of vibration, ensure that all parts remain secure.

**4) A deceleration circuit or shock absorber, etc., may be required.**

When a driven object is operated at high speed or the load is heavy, a cylinder's cushion will not be sufficient to absorb the impact.

Install a deceleration circuit to reduce the speed before cushioning, or install an external shock absorber to relieve the impact.

In this case, the rigidity of the machinery should also be examined.

**5) Consider a possible drop in operating pressure due to a power outage, etc.**

When a cylinder is used in a clamping mechanism, there is a danger of work pieces dropping if there is a decrease in clamping force due to a drop in circuit pressure caused by a power outage, etc.

Therefore, safety equipment should be installed to prevent damage to machinery and human injury. Suspension mechanisms and lifting devices also require consideration for drop prevention.

**6) Consider a possible loss of power source.**

Measures should be taken to protect against human injury and equipment damage in the event that there is a loss of power to equipment controlled by air pressure, electricity or hydraulics, etc.

**7) Design circuitry to prevent sudden lurching of driven objects.**

When a cylinder is driven by an exhaust center type directional control valve or when starting up after residual pressure is exhausted from the circuit, etc.,

the piston and its driven object will lurch at high speed if pressure is applied to one side of the cylinder because of the absence of air pressure inside the cylinder.

Therefore, equipment should be selected and circuits designed to prevent sudden lurching because there is a danger of human injury and/or damage to equipment when this occurs.

**8) Consider emergency stops.**

Design so that human injury and/or damage to machinery and equipment will not be caused

when machinery is stopped by a safety device under abnormal conditions, a power outage or a manual emergency stop.

**9) Consider the action when operation is restarted after an emergency stop or abnormal stop.**

Design the machinery so that human injury or equipment damage will not occur upon restart of operation.

When the cylinder has to be reset at the starting position, install manual safety equipment.

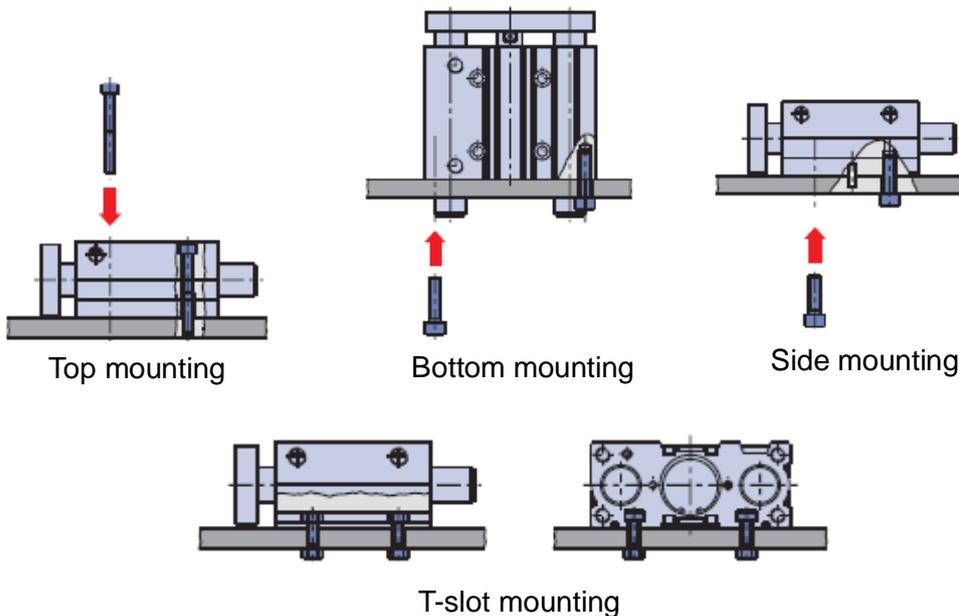
**10) Do not synchronize cylinders only.**

It is possible to synchronize cylinders for short period of time by adjusting them with speed controller. However, the synchronization could be failed easily due to changes of various conditions.

Since cylinders receive excessive force in such a case, do not design circuit synchronizing cylinders only.

## 11. Mounting Methods

Various mounting methods are available as follows.

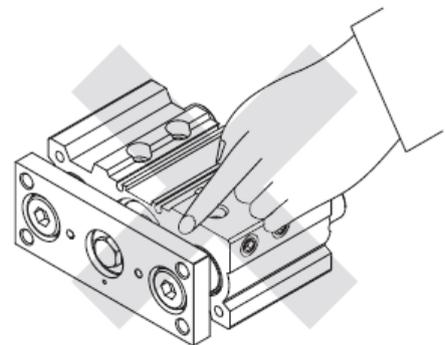


### 11-1. Cautions on Mounting

## Warning

**1) Never place your hands or fingers between the plate and the body.**

Be very careful to prevent your hands or fingers from getting caught in the gap between the cylinder body and the plate when air is applied.



## Caution

**1) Use cylinders within the piston speed range.**

An orifice is set for this cylinder, but the piston speed may exceed the operating range if the speed controller is not used. If the cylinder is used outside the operating speed range, it may cause damage to the cylinder and shorten the service life. Adjust the speed by installing the speed controller and use the cylinder within the limited range.

**2) Pay attention to the operating speed when the product is mounted vertically.**

When using the product in the vertical direction, if the load factor is large, the operating speed can be faster than the control speed of the speed controller (i.e. quick extension). In such cases, it is recommended to use a dual speed controller.

**3) Do not scratch or gouge the sliding portion of the piston rod and the guide rod.**

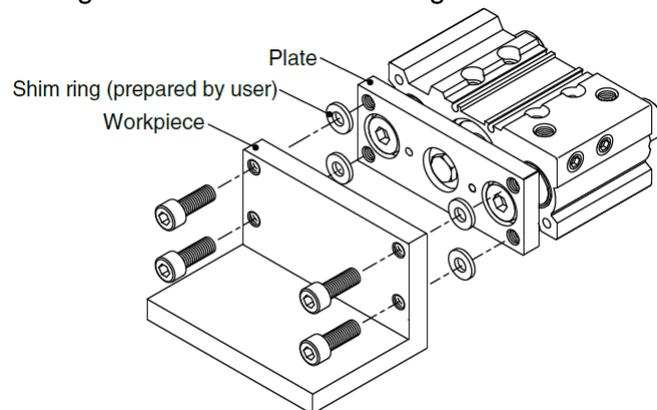
Damaged seals etc. will result in leakage or malfunction.

**4) Do not dent or scratch the mounting surface of the body and the plate.**

The flatness of the mounting surface may not be maintained, which would cause an increase in sliding resistance.

**5) Make sure that the cylinder mounting surface has a flatness of 0.05 mm or less.**

If the flatness of the work pieces and brackets mounted on the plate is not appropriate, sliding resistance may increase. If it is difficult to maintain a flatness of 0.05 or less, put a thin shim ring (prepared by user) between the plate and work piece mounting surface to prevent the sliding resistance from increasing.



**6) Do not perform additional machining to the product.**

Additional machining to the product can result in insufficient strength and cause damage to the product. This can lead to possible human injury and damage to the surrounding equipment.

**7) Do not enlarge the fixed throttle by modifying the pipe connectors.**

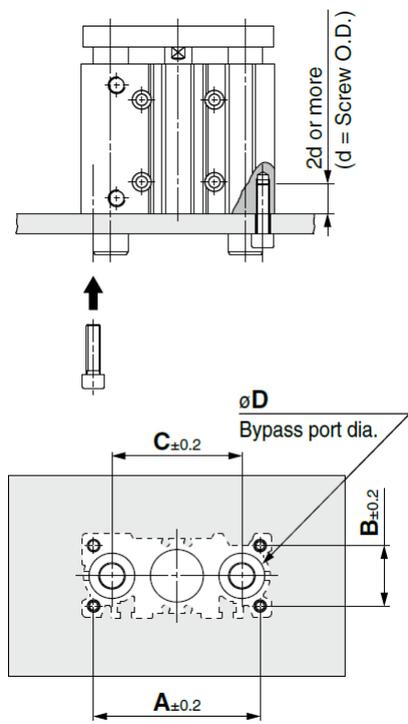
If the hole diameter is enlarged, the product's rotation speed will increase, causing the shock force to increase and damage to the product. As a result, it could pose a hazard to humans and damage the machinery and equipment.

**8) Do not use until you can verify that equipment can operate properly.**

Verify correct mounting by function and leak tests properly after compressed air and power are connected following mounting or repair.

**9) Bottom of cylinder**

The guide rods protrude from the bottom of the cylinder at the end of the retracting stroke, and therefore, in cases where the cylinder is to be bottom mounted, it is necessary to provide bypass ports in the mounting surface for the guide rods, as well as holes for the hexagon socket head cap screws which are used for mounting. Moreover, in applications where impact occurs from a stopper etc., the mounting screws should be inserted to a depth of 2d or more.



Bore size (mm)	A (mm)	B (mm)	C (mm)	D (mm)		Hexagon socket head cap screw
				MGPM	MGPL/A	
12*	50	18	41	10	8	M4 x 0.7
16	56	22	46	12	10	M5 x 0.8
20	72	24	54	14	12	M5 x 0.8
25	82	30	64	18	15	M6 x 1.0
32	98	34	78	22	18	M8 x 1.25
40	106	40	86	22	18	M8 x 1.25
50	130	46	110	27	22	M10 x 1.5
63	142	58	124	27	22	M10 x 1.5
80	180	54	156	33	28	M12 x 1.75
100	210	62	188	39	33	M14 x 2.0

\* Air cushions are not available for bore size 12.

## 11-2. Cushion (With air cushion)

### Warning

#### 1. Do not open the cushion valve excessively.

Air leakage will occur if operated after opening by 4 rotations or more. Furthermore, a stopper mechanism is provided for the cushion valve, and it should not be forced open beyond that position. Be aware that the cushion valve may jump up from the cover when the air is supplied.

### Caution

#### 1. Be sure to use the cylinder after the air cushion has been adjusted appropriately.

First, fully close the cushion valve. Start the operation at the cylinder speed to be used with the load applied, and then open the cushion valve gradually to make the adjustment. The optimal adjustment is that the piston reaches its stroke end and the collision sound is minimized. If the cushion valve is used without adjusting the air cushion appropriately, this may cause damage to the retaining ring or piston.

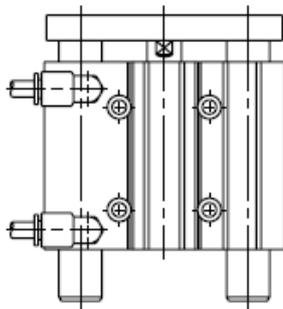
Bore size (mm)	Applicable tool
16,20,25,32,40	JIS B4648 hexagon wrench key 1.5
50,63,80,100	JIS B4648 hexagon wrench key 3

#### 2. Be sure to operate a cylinder equipped with air cushion to the end of the stroke.

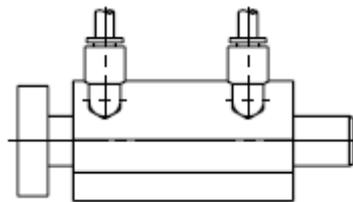
If it is not operated to the end of the stroke, the effect of the air cushion will not be fully exhibited. Consequently, in cases where the stroke is regulated by an external stopper etc., caution must be exercised, as the air cushion may become completely ineffective.

## 12. Piping

This cylinder can do it by changing the position of the plug as the bottom figure from 2 directions of the top pipe and the side pipe.



Top piping



Side piping

### 12-1. Attention in piping

### Warning

#### 1) Use clean air.

If compressed air includes chemicals, synthetic oils containing organic solvents, salt or corrosive gases, etc., it can cause damage or malfunction.

### Caution

#### 1) Depending on the operating conditions, piping port positions can be changed using a plug.

##### ① M5

After tightening by hand, tighten additional 1/6 to 1/4 rotation with a tightening tool

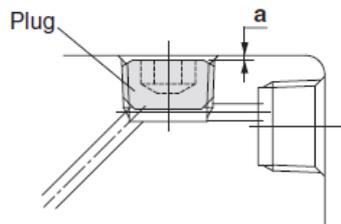
##### ② Tapered thread for Rc port (MGP) and NPT port (MGP□□TN)

Use the correct tightening torques listed below.

Before tightening the plug, wrap pipe tape around it. Also, with regard to the sunk dimension of a plug (dimension “a” in the drawing), use the stipulated figures as a guide and confirm the air leakage before operation.

\*If tightening plugs on the top mounting port with more than the proper tightening torque, plugs will be screwed much deeply and air passage will be squeezed. Consequently, the cylinder speed will be restricted.

Connection thread (plug) size	Proper tightening torque (N·m)	a dimension
1/8	7 to 9	0.5 mm or less
1/4	12 to 14	1 mm or less
3/8	22 to 24	1 mm or less



### ③ Parallel pipe thread for G port (MGP□□TF)

Screw in the plug to the surface of the body (dimension “a” in the drawing) by checking visually instead of using the tightening torque shown in the table.

## 2) Secure dry air.

If moisture enters cylinder, grease inside the cylinder is washed away and air leak and malfunction may occur due to deterioration of lubrication.

Install air cleaning equipment such as air dryer and drain catch to secure dry air.

Refer to the catalogue, SMC Air Cleaning Equipment.

## 3) Supply air filtered and regulated down to the specific pressure.

## 4) Lubrication isn't necessary because it is a lubrication-less type.

The cylinder is lubricated at the factory and can be used without any further lubrication. However, in the event that it will be lubricated, use class 1 turbine oil (with no additives) ISO VG32.

Stopping lubrication later may lead to malfunction due to the loss of the original lubricant.

Therefore, lubrication must be continued once it has been started.

## 5) Shorten piping.

Since too long cylinder piping makes volume inside the cylinder < volume inside the tubing, mist from adiabatic expansion is not exhausted to the air and remains in tubing.

It accumulates due to repeated operation and then from water drops.

As grease inside the cylinder is washed away, lubrication deteriorates and air leak and malfunction may occur.

Take the following measures to prevent them.

- ① Make tubing between solenoid valve and cylinder as short as possible so that generated mist is surely exhausted into atmosphere.

Standard length is:

$$\frac{\text{Conversion value for volume inside the cylinder under atmospheric pressure}}{\times 0.7} \leq \text{Volume inside the tubing}$$

- ② Send exhaust pressure directly into atmosphere by attaching speed controller or quick exhaust valve to cylinder.
- ③ Set piping port downwards so that moisture inside the piping does not go back to cylinder easily.

### 12-3.About the flushing

## Caution

#### 1)Get rid of trash in the pipe.

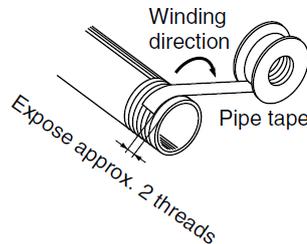
Do flushing or washing fully before the piping, and get rid of cutting chips in side the pipe, cutting oil, trash, and soon because cutting chips left in the pipe, and cutting oil cause air leak and malfunction when they get into the inside of the cylinder.

## Caution

#### 1)Prevent tape material from getting in to the pipe.

Prevent cutting chips of the pipe screw and tape material from getting in to the pipe inside when you thrust a pipe and fittings, etc., because tape material causes air leak and malfunction when you get into it in the cylinder from the thing in the pipe when you lay a pipe.

Also, when pipe tape is used, leave 1.5 to 2 thread ridges exposed at the end of the pipe.



## 13. Operating Environment

### Warning

#### 1)Do not use in environments where there is a danger of corrosion.

Refer to the construction drawings regarding cylinder materials.

#### 2)In dirty areas, such as dusty locations or where water, oil, etc. splash on the equipment, take suitable measures to protect the entire actuator.

Use water resistant cylinders in areas where liquids are scattered.

## Caution

#### 1)Use the cylinder within specified temperature range.

This compact cylinder is applicable within the range from  $-10$  to  $60$  °C.

Make sure to keep it during operation. In case of immoderate use over the range, extreme wearing due to hardening of packing may result in air leak and lubrication failure as lubrication grease cannot perform fully.

## 14. Speed Control

### Caution

1) When speed controller is used for speed adjustment, throttle air supplied to cylinder or exhausted from cylinder. With the former, cylinder operation may become unstable. Normally, double acting cylinder is adjusted in the latter way.

## 15. Troubleshooting

Nonconformit	Causes	Countermeasures	Remarks
No smooth operation	Lower operating speed than the limit	Consider providing low speed specification.	
	High load factor	Increase Pressure.	
		Use larger cylinder.	
	Meter-in speed controller	Change it to meter-out.	
Air leak Malfunction	High ambient temperature	Use heat resistant cylinder. (Type M only)	
	Low ambient temperature	Use cold resistant cylinder. (Available as a special.)	
	Soiled cylinder	Put a cover over cylinder.	
	Water from exhaust air of valve	Shorten piping.	
	Vibration	Review where to install the cylinder so as not to receive external force.	
	Splashes of water/coolant	Put a cover over cylinder.	
		Use cylinder improved in water resistant.	
	Excessive eccentric load	Check vertical mounting of model selection with catalogue.	
	Excessive lateral load	Check horizontal mounting of model selection with catalogue.	
	Dust	Set a cover over cylinder.	
Use cylinder with scraper.			
Parts breakage Parts deformation	Impact force from high speed operation	Check allowable kinetic energy.	
		Adjust cushion (with air cushion)	
		Lower speed.	
		Reduce load	
	Excessive eccentric load	Check vertical mounting of model selection with catalogue.	
Excessive lateral load	Check horizontal mounting of model selection with catalogue.		

## 16. How to exchange seals

### **Caution**

Disassemble and assemble the cylinder in clean condition. Wipe it with clean waste.

#### 16-1. How to disassemble

Tools : Snap ring plier for hole, Spanner, Socket wrench (or Air impact wrench)

- 1) Fix the spanner flat of piston rod with a spanner. Loosen the plate set bolt with the socket wrench to remove the guide rod assembly. Or, loosen the plate set bolt with air impact wrench to remove the slide assembly.
- 2) Remove snap ring with snap ring plier to pull out the collar, the piston rod Assembly.

Table.1

Bore size (mm)	Snap ring size	Plate set bolt tightening torque (N·m)
12	RTW-13	1.4
16	RTW-18	3.3
20	RTW-22	5.1
25	RTW-26	8.6
32	RTW-34	21.6
40	RTW-42	21.6
50	RTW-52	43.1
63	RTW-65	43.1
80	RTW-82	121.5
100	RTW-102	196

#### 16-2. How to remove seals

- 1) Rod seal

Tools : Precision screw driver etc.

Insert the fine driver to the collar front to pull out the seal like Fig.1.

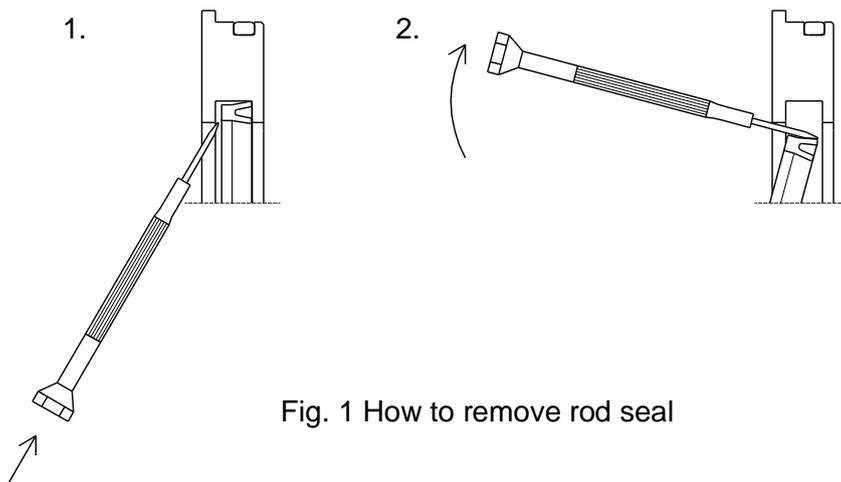


Fig. 1 How to remove rod seal

## 2) Piston seal

First, wipe off the grease around the piston seal. This helps remove of this seal.

As piston seal groove is deep, push the seal holding both sides like Fig.2, and pull out the seal risen from the piston surface.

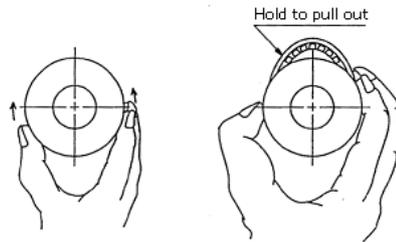


Fig. 2 How to remove piston seal

## 3) Gasket

Use precision screw driver etc.

## 4) Cushion seal (With air cushion)

See Fig. 3. Pull out the cushion seal inserting the precision screw driver from the back of the seal and the head cover. Attention should be taken not to hurt the seal groove.

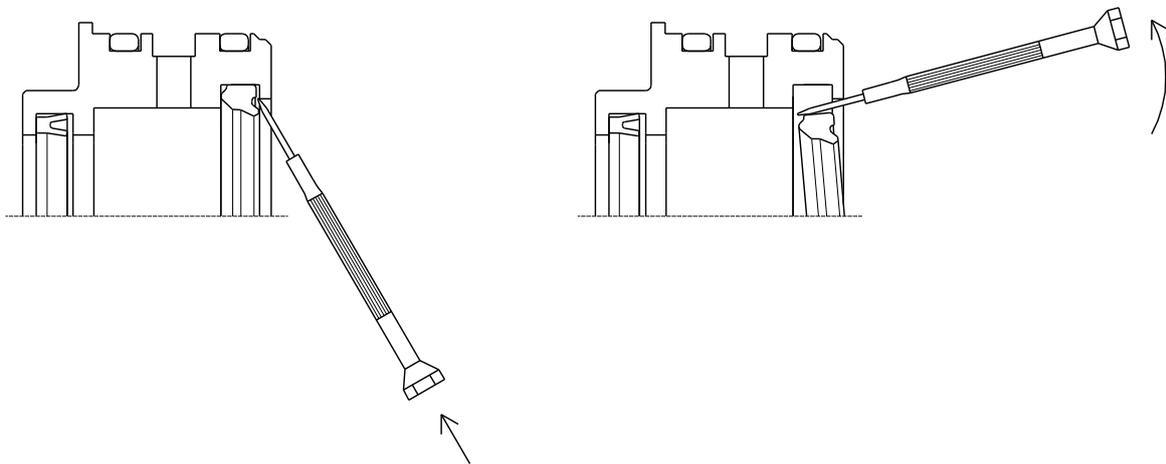


Fig. 3 How to remove cushion seal

## 16-3.How to apply grease

Use the grease pack:GR-S or lithium soap radical grease JIS2 corresponding.

### 1)Rod seal

Apply grease slightly to outer circumference of new seal for replace.

This helps the seal to accustom to the collar. For the grove, fill it with grease.

This is necessary for operation.

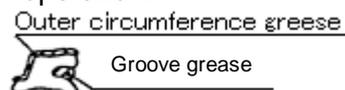


Fig. 4

### 2)Piston seal

Apply grease to outer/inner circumference of seal slightly and evenly to make mounting this to the piston easier.

### 3)Gasket

Apply grease slightly. Provide better sealing and stop falling.

## 16-4. How to assemble

### 1) Mount seals

#### ① Rod seal

Mind the seal direction. Apply grease all over the seal and inner surface of the bush as Fig.5. You may use a precision screw driver to apply grease when small bore diameter.

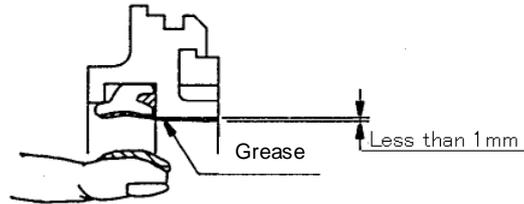


Fig. 5 Rod seal

#### ② Piston seal

Apply grease rubbing to seal groove and outer circumference.

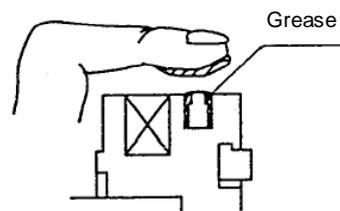


Fig. 6 Piston seal

#### ③ Gasket

Mount to the collar groove and the body groove.

#### ④ Gasket (With air cushion)

Mount to the groove of the collar and the head cover. Mount the gasket of  $\varnothing 32$  or more to the groove of the head cover and groove inside of the body.

The gasket size on the body is larger. Do not mount the gasket to the air passage (groove having through hole) as in Fig. 7.

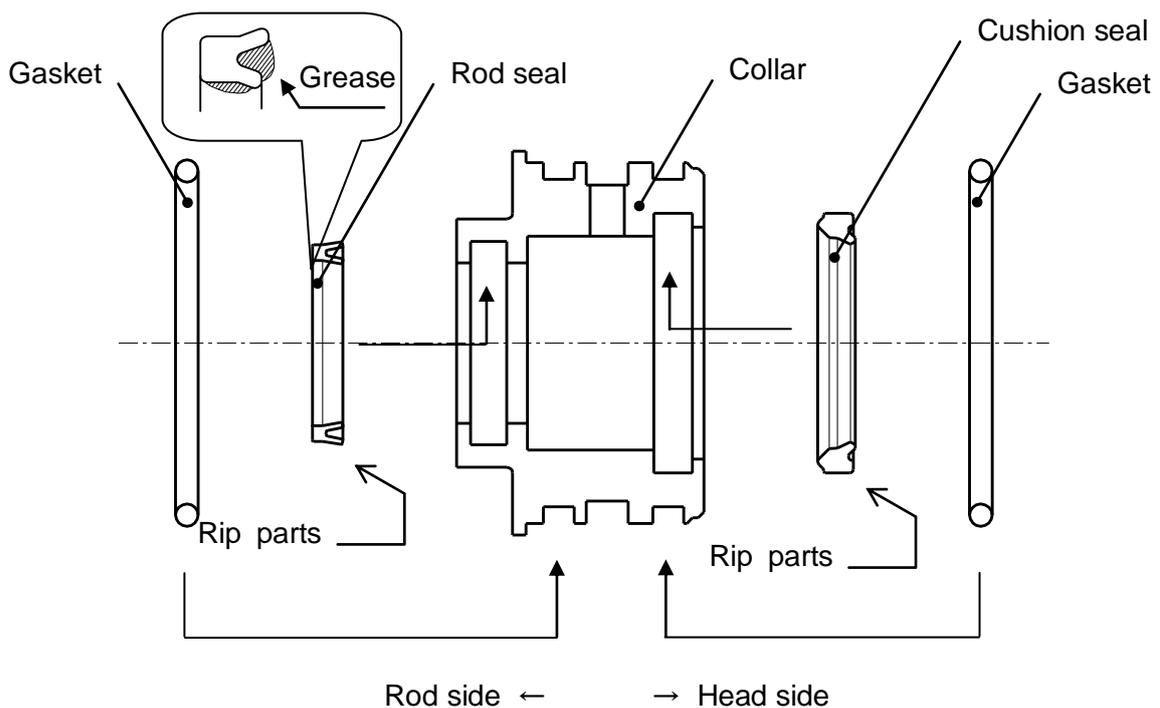


Fig. 7 Gasket position (collar)

⑤Cushion seal (With air cushion)

Mind the packing direction. Apply grease to inner circumference of the seal has some play, it is normal.

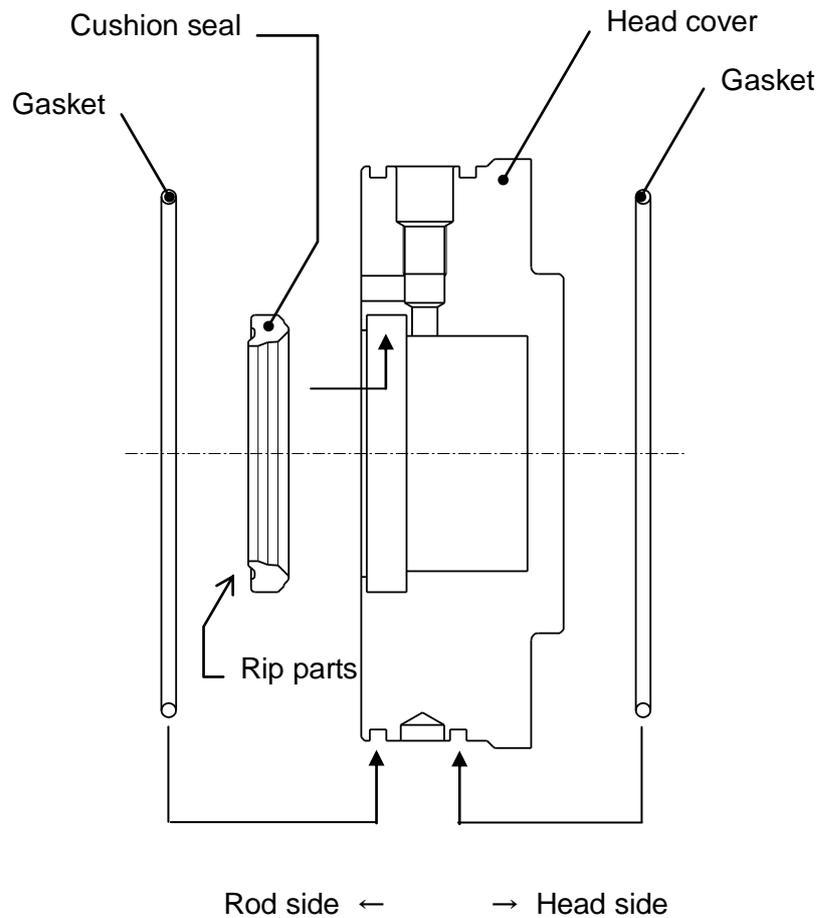


Fig. 8 Cushion seal position (Head cover)

2) Assemble cylinder

Mount parts with reversed order of disassembling.

Assemble order:

Piston rod assembly → Collar → Snap ring  
 Head cover → Snap ring } → Guide rod assembly

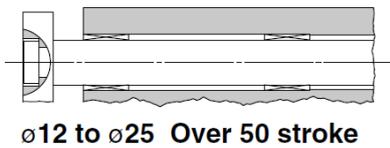
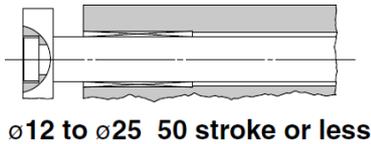
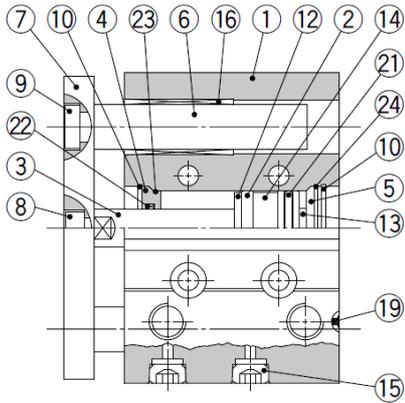
Apply locking glue to the plate set bolt when mounting the guide rod assembly.  
 And tighten the bolt with tightening torque in table 1.

Ensure if the cylinder move smoothly with a hand.  
 Check the air leakage.

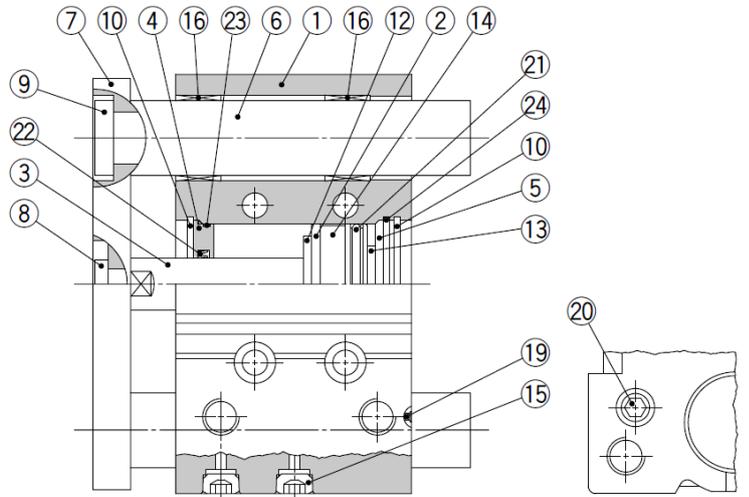
# 17. Construction

## 17-1. Basic type

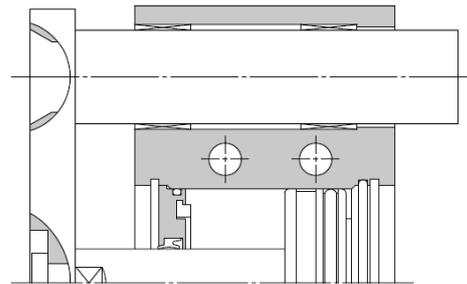
MGPM12 to 25



MGPM32 to 100



ø63 or more



### Component Parts

No.	Description	Material	Note
1	Body	Aluminum alloy	Hard anodized
2	Piston	Aluminum alloy	Chromated
3	Piston rod	Stainless steel	ø12 to ø25
		Carbon steel	ø32 to ø100   Hard chrome plating
4	Collar	Aluminum alloy	Chromated
5	Head cover	Aluminum alloy	ø12 to ø63   Chromated
			ø80, ø100   Painted
6	Guide rod	Carbon steel	Hard chrome plating
7	Plate	Carbon steel	Nickel plating
8	Plate mounting bolt	Carbon steel	Nickel plating
9	Guide bolt	Carbon steel	Nickel plating
10	Retaining ring	Carbon tool steel	Phosphate coated
11	Retaining ring	Carbon tool steel	Phosphate coated
12	Bumper A	Urethane	
13	Bumper B	Urethane	
14	Magnet	—	
15	Plug Hexagon socket head plug	Carbon steel	ø12, ø16   Nickel plating
			ø20 to ø100
16	Slide bearing	Bearing alloy	

### Component Parts

No.	Description	Material	Note
17	Ball bushing		
18	Spacer	Aluminum alloy	
19	Steel ball	Carbon steel	ø12 to ø50
20	Plug	Carbon steel	ø63 to ø100   Nickel plating
21*	Piston seal	NBR	
22*	Rod seal	NBR	
23*	Gasket A	NBR	
24*	Gasket B	NBR	

### Replacement Parts/Seal Kit

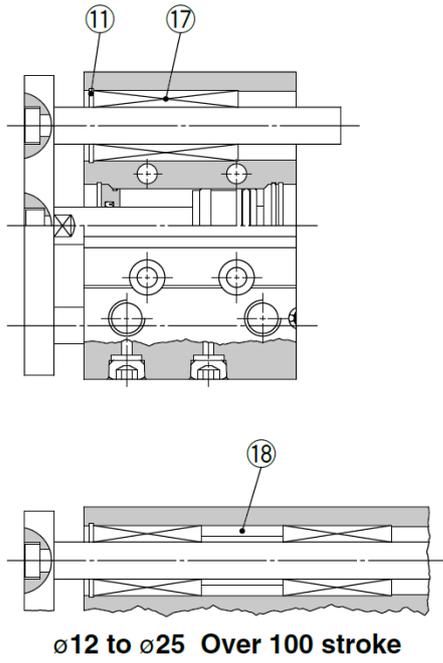
Bore size (mm)	Kit no.	Contents	Bore size (mm)	Kit no.	Contents
12	MGP12-Z-PS	Set of nos. above	40	MGP40-Z-PS	Set of nos. above
16	MGP16-Z-PS		50	MGP50-Z-PS	
20	MGP20-Z-PS		63	MGP63-Z-PS	
25	MGP25-Z-PS		80	MGP80-Z-PS	
32	MGP32-Z-PS		100	MGP100-Z-PS	

\* Seal kit includes 21 to 24. Order the seal kit, based on each bore size.

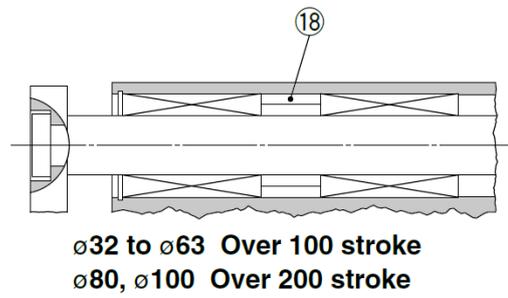
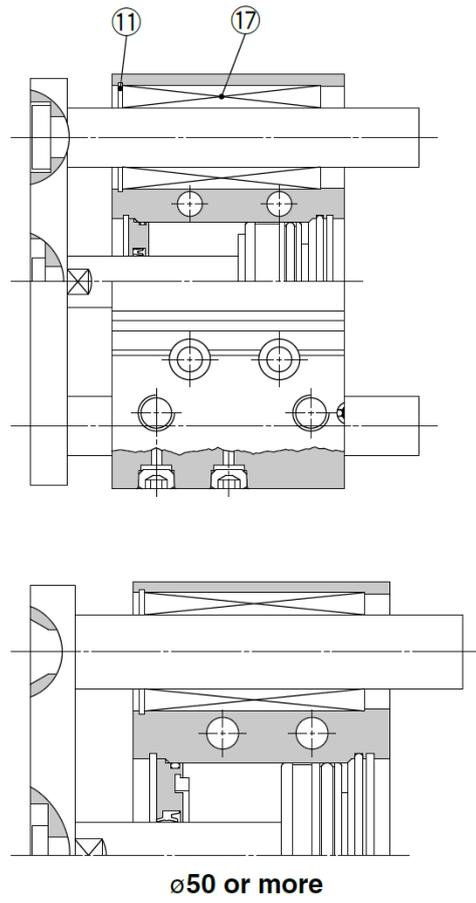
\* Since the seal kit does not include a grease pack, order it separately.

**Grease pack part number: GR-S-010 (10 g)**

MGPL12 to 25  
MGPA12 to 25

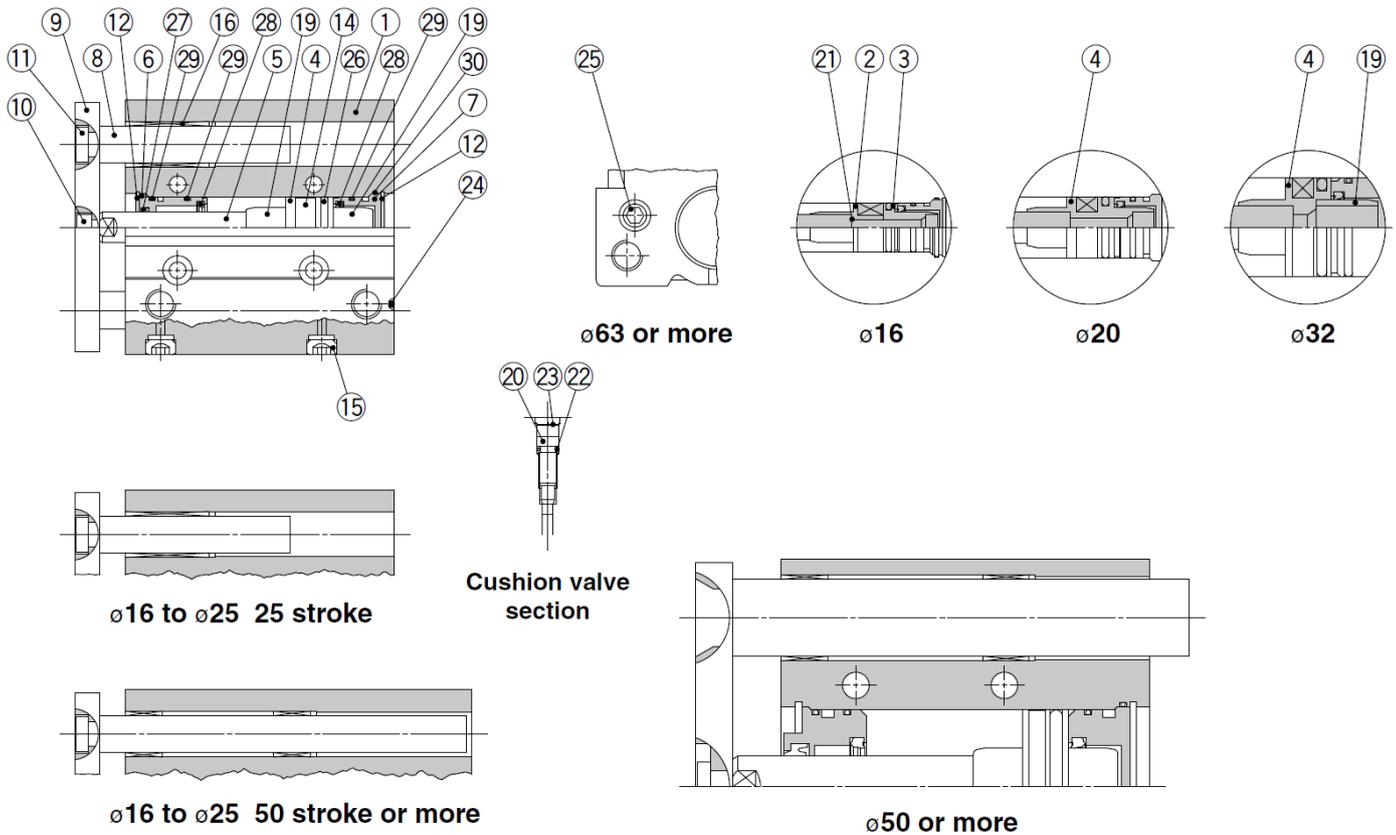


MGPL32 to 100  
MGPA32 to 100



## 17-2. Air cushion type

### MGPM



#### Component Parts

No.	Description	Material	Note	
1	Body	Aluminum alloy	Hard anodized	
2	Piston A	Aluminum alloy	ø16	Chromated
3	Piston B	Aluminum alloy	ø16	Chromated
4	Piston	Aluminum alloy	ø20 to ø100	Chromated
5	Piston rod	Stainless steel	ø16 to ø25	
		Carbon steel	ø32 to ø100	Hard chrome plating
6	Collar	Aluminum alloy	Chromated	
7	Head cover	Aluminum alloy	Chromated	
8	Guide rod	Carbon steel	Hard chrome plating	
9	Plate	Carbon steel	Nickel plating	
10	Plate mounting bolt	Carbon steel	Nickel plating	
11	Guide bolt	Carbon steel	Nickel plating	
12	Retaining ring	Carbon tool steel	Phosphate coated	
13	Retaining ring	Carbon tool steel	Phosphate coated	
14	Magnet	—		
15	Plug Hexagon socket head plug	Carbon steel	ø16	Nickel plating
			ø20 to ø100	
16	Slide bearing	Bearing alloy		
17	Ball bushing	—		
18	Spacer	Aluminum alloy		
19	Cushion ring	Aluminum alloy	ø25 to ø100	Anodized
20	Cushion valve		ø16 to ø32	Electroless nickel plating
			ø50 to ø100	Chromated
	Cushion needle		ø40 only	Electroless nickel plating

#### Component Parts

No.	Description	Material	Note	
21	Gasket	NBR	ø16	
22	Gasket	NBR		
23	Retaining ring	Carbon tool steel	ø50, ø63	Phosphate coated
24	Steel ball	Carbon steel	ø16 to ø50	
25	Plug	Carbon steel	ø63 to ø100	Nickel plating
26 <sup>*</sup>	Piston seal	NBR		
27 <sup>*</sup>	Rod seal	NBR		
28 <sup>*</sup>	Cushion seal	Urethane		
29 <sup>*</sup>	Gasket A	NBR		
30 <sup>*</sup>	Gasket B	NBR		

#### Replacement Parts/Seal Kit

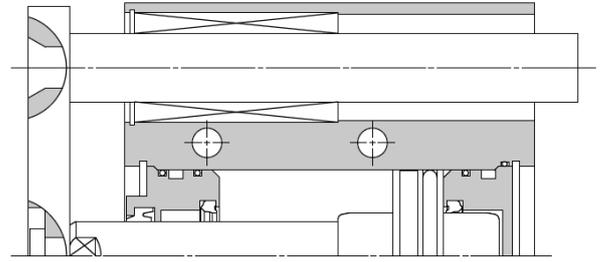
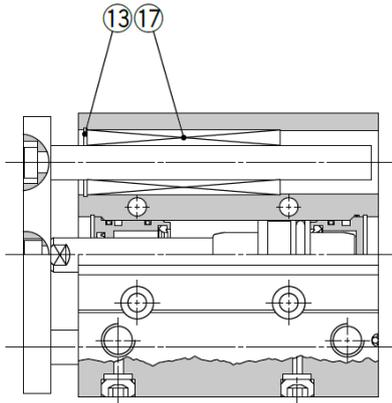
Bore size (mm)	Kit no.	Contents	Bore size (mm)	Kit no.	Contents
16	MGP16-AZ-PS	Set of nos. above ②⑥, ②⑦, ②⑧, ②⑨, ③①	50	MGP50-AZ-PS	Set of nos. above ②⑥, ②⑦, ②⑧, ②⑨, ③①
20	MGP20-AZ-PS		63	MGP63-AZ-PS	
25	MGP25-AZ-PS		80	MGP80-AZ-PS	
32	MGP32-AZ-PS		100	MGP100-AZ-PS	
40	MGP40-AZ-PS				

\* Seal kit includes ②⑥ to ③①. Order the seal kit, based on each bore size.

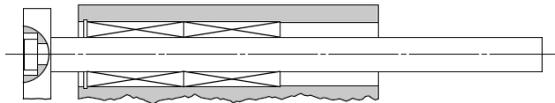
\* Since the seal kit does not include a grease pack, order it separately.

**Grease pack part no.: GR-S-010 (10 g)**

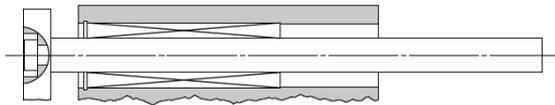
MGPL  
MGPA



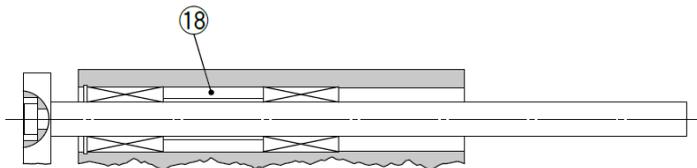
**ø50 or more**



**ø16 75 stroke or less**



**ø20 to ø63 75 stroke or less**



**ø16 to ø63 100 stroke or more  
ø80, ø100 250 stroke or more**

## 18. Auto Switch

### 18-1. Applicable auto switches

Type	Special function	Electrical entry	Indicator light	Wiring (Output)	Load voltage		Auto switch model		Lead wire length (m)				Pre-wired connector	Applicable load		
					DC	AC	Perpendicular	In-line	0.5 (Nil)	1 (M)	3 (L)	5 (Z)		IC circuit	Relay, PLC	
Solid state auto switch	—	Grommet	Yes	3-wire (NPN)	24 V	5 V, 12 V	—	M9NV	M9N	●	●	●	○	○	IC circuit	Relay, PLC
				3-wire (PNP)				M9PV	M9P	●	●	●	○	○		
	2-wire			24 V	12 V	—	M9BV	M9B	●	●	●	○	○	—		
	3-wire (NPN)						M9NVV	M9NV	●	●	●	○	○	IC circuit		
	3-wire (PNP)			M9PVV	M9PW	●	●	●	○	○	—					
	2-wire			M9BWV	M9BW	●	●	●	○	○	—					
	3-wire (NPN)			M9NAV***	M9NA***	○	○	●	○	○	IC circuit					
	3-wire (PNP)			M9PAV***	M9PA***	○	○	●	○	○	IC circuit					
	2-wire			M9BAV***	M9BA***	○	○	●	○	○	—					
	2-wire (Non-polar)			—	P3DWA**	●	—	●	●	○	—					
Reed auto switch	—	Grommet	Yes	3-wire (NPN equivalent)	—	5 V	—	A96V	A96	●	—	●	—	—	IC circuit	—
				2-wire	24 V	12 V	100 V	A93V	A93	●	—	●	●	—	—	Relay, PLC
								100 V or less	A90V	A90	●	—	●	—	—	IC circuit

\*\*\* Water resistant type auto switches are mountable on the above models, but in such case SMC cannot guarantee water resistance.

A water resistant type cylinder is recommended for use in an environment which requires water resistance.

However, please contact SMC for water resistant products of ø12 and ø16.

- \* Lead wire length symbols: 0.5 m..... Nil (Example) M9NW \* Solid state auto switches marked with "○" are produced upon receipt of order.
- 1 m..... M (Example) M9NWM \*\* The D-P3DWA is mountable on bore size ø25 to ø100.
- 3 m..... L (Example) M9NWL
- 5 m..... Z (Example) M9NWZ

\* Since there are other applicable auto switches than listed above, refer to the **WEB catalog** or the Best Pneumatics No. 3 for details.

\* For details about auto switches with pre-wired connector, refer to the **WEB catalog** or the Best Pneumatics No. 3.

For the D-P3DWA, refer to the **WEB catalog**.

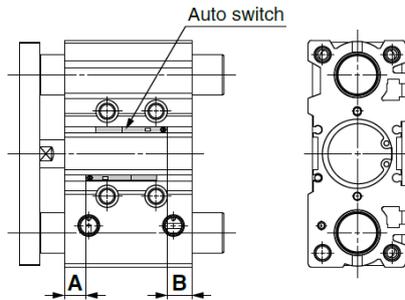
\* Auto switches are shipped together, (but not assembled).

## 18-2. Auto switch proper mounting position (detection at stroke end) and its mounting height

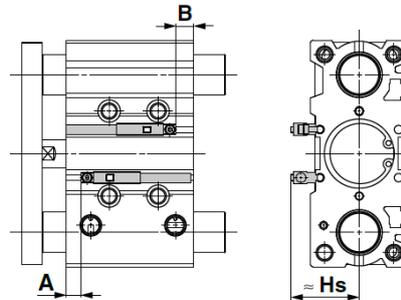
D-M9□/M9□V  
 D-M9□W/M9□WV  
 D-M9□A/M9□AV  
 D-A9□/A9□V

D-P3DWA

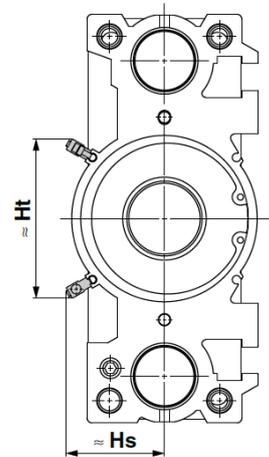
∅12 to ∅100



∅25 to ∅63



∅80, ∅100



### Auto Switch Proper Mounting Position Applicable Cylinder Series: MGP

(mm)

Auto switch model	D-M9□ D-M9□V D-M9□W D-M9□WV D-M9□A D-M9□AV		D-A9□ D-A9□V		D-P3DWA	
	A	B	A	B	A	B
Bore size						
12	7.5	9.5	3.5	5.5	—	—
16	10.5	10.5	6.5	6.5	—	—
20	12.5	12.5	8.5	8.5	—	—
25	11.5	14	7.5	10	7	9.5
32	12.5	13	8.5	9	8	8.5
40	15.5	16.5	11.5	12.5	11	12
50	14.5	17	10.5	13	10	12.5
63	16.5	20	12.5	16	12	15.5
80	18	26	14	22	13.5	21.5
100	21.5	32.5	17.5	28.5	17	28

Note) Adjust the auto switch after confirming the operating conditions in the actual setting.

### Auto Switch Proper Mounting Height

(mm)

Auto switch model	D-M9□V D-M9□WV D-M9□AV		D-A9□V		D-P3DWA	
	Hs	Ht	Hs	Ht	Hs	Ht
Bore size						
12	19.5	—	17	—	—	—
16	22	—	19.5	—	—	—
20	24.5	—	22	—	—	—
25	26	—	24	—	32.5	—
32	29	—	26.5	—	35	—
40	33	—	30.5	—	39	—
50	38.5	—	36	—	44.5	—
63	45.5	—	43	—	59.5	—
80	45	74	43	71.5	48.5	84
100	55	85.5	53	83	58.5	95

### Auto Switch Proper Mounting Position

Applicable Cylinder Series: MGP-A (With air cushion) (mm)

Auto switch model	D-M9□ D-M9□V D-M9□W D-M9□WV D-M9□A D-M9□AV		D-A9□ D-A9□V		D-P3DWA	
	A	B	A	B	A	B
Bore size						
16	25	20.5	21	16.5	—	—
20	27	23	23	19	—	—
25	27	23	23	19	22.5	18.5
32	21	29	17	25	16.5	24.5
40	25.5	31.5	21.5	27.5	21	27
50	26	30.5	22	26.5	21.5	26
63	30	31.5	26	27.5	25.5	27
80	30.5	38.5	26.5	34.5	26	34
100	34.5	44	30.5	40	30	39.5

### 18-3. Minimum mountable stroke for a cylinder with auto switch(es)

(mm)

Auto switch model	Number of auto switches	φ12	φ16	φ20	φ25	φ32	φ40	φ50	φ63	φ80	φ100	
D-M9□V	1 pc.						5					
	2 pcs.						5					
D-M9□	1 pc.	5 Note 1)				5						
	2 pcs.	10 Note 1)				10						
D-M9□W	1 pc.						5 Note 2)					
	2 pcs.	10 Note 2)				10						
D-M9□WV D-M9□AV	1 pc.						5 Note 2)					
	2 pcs.						10					
D-M9□A	1 pc.						5 Note 2)					
	2 pcs.						10 Note 2)					
D-A9□	1 pc.	5 Note 1)			5							
	2 pcs.	10 Note 1)			10							
D-A9□V	1 pc.						5					
	2 pcs.						10					
D-P3DWA	1 pc.	—			15							
	2 pcs.	—			15							

Note 1) Confirm that it is possible to secure the minimum bending radius of 10 mm of the auto switch lead wire before use.

Note 2) Confirm that it is possible to securely set the auto switch(es) within the range of indicator green light ON range before use.

For in-line entry type, also consider Note 1) shown above.

Note 3) The D-P3DWA is mountable on bore size φ25 to φ100.

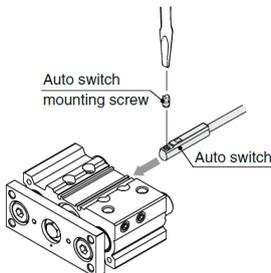
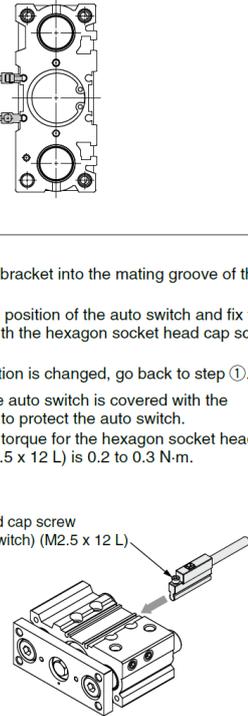
### 18-4. Auto switch operating range

(mm)

Auto switch model	Bore size									
	12	16	20	25	32	40	50	63	80	100
D-M9□/M9□V D-M9□W/M9□WV D-M9□A/M9□AV	3.5	5	5	5	6	6	6	6.5	6	7
D-A9□/A9□V	7	9	9	9	9.5	9.5	9.5	11	10.5	10.5
D-P3DWA	—	—	—	5	6	6	6	6	6	7

\* Values which include hysteresis are for guideline purposes only, they are not a guarantee (assuming approximately ±30% dispersion) and may change substantially depending on the ambient environment.

### 18-5. Part number of auto switch mounting bracket

Applicable auto switches	D-M9□/M9□V D-M9□W/M9□WV D-M9□A/M9□AV D-A9□/A9□V	D-P3DWA						
Bore size (mm)	φ12 to φ100	φ25 to φ100						
Auto switch mounting surfaces	Surfaces with auto switch mounting slot	Surfaces with auto switch mounting slot						
Mounting of auto switch	 <p>• When tightening the auto switch mounting screw, use a watchmakers' screwdriver with a handle 5 to 6 mm in diameter.</p> <p><b>Tightening Torque for Auto Switch Mounting Screw</b> (N·m)</p> <table border="1"> <thead> <tr> <th>Auto switch model</th> <th>Tightening torque</th> </tr> </thead> <tbody> <tr> <td>D-M9□(V) D-M9□W(V) D-M9□A(V)</td> <td>0.05 to 0.15</td> </tr> <tr> <td>D-A9□(V)</td> <td>0.10 to 0.20</td> </tr> </tbody> </table>	Auto switch model	Tightening torque	D-M9□(V) D-M9□W(V) D-M9□A(V)	0.05 to 0.15	D-A9□(V)	0.10 to 0.20	<ol style="list-style-type: none"> <li>Insert the mounting bracket into the mating groove of the cylinder tube.</li> <li>Check the detecting position of the auto switch and fix the auto switch firmly with the hexagon socket head cap screw (M2.5 x 12 L).*</li> <li>If the detecting position is changed, go back to step ①.</li> </ol> <p>Note 1) Ensure that the auto switch is covered with the mating groove to protect the auto switch.</p> <p>Note 2) The tightening torque for the hexagon socket head cap screw (M2.5 x 12 L) is 0.2 to 0.3 N·m.</p> 
Auto switch model	Tightening torque							
D-M9□(V) D-M9□W(V) D-M9□A(V)	0.05 to 0.15							
D-A9□(V)	0.10 to 0.20							

Note) Auto switch mounting brackets and auto switches are enclosed with the cylinder for shipment.  
For an environment that needs the water-resistant auto switch, select the D-M9□A(V) type.

Revision history
Initial release : 2012/5/21 Revision 1 : 2014/1/30 Add the air cushion.

## SMC Corporation

4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101-0021 JAPAN

Tel: + 81 3 5207 8249 Fax: +81 3 5298 5362

URL <http://www.smcworld.com>

---

Note: Specifications are subject to change without prior notice and any obligation on the part of the manufacturer.  
© 2012 SMC Corporation All Rights Reserved