



# Operation Manual

PRODUCT NAME

*Compact Guide Cylinder*

MODEL/ Series

*Series MGQ*

**SMC Corporation**

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# Series MGQ 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), Japan Industrial Standards (JIS)\*1) and other safety regulations\*2).

\*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  
JIS B 8370: General rules for pneumatic equipment.  
JIS B 8361: General rules for hydraulic equipment.  
JIS B 9960-1: Safety of machinery – Electrical equipment for machines. (Part 1: General requirements)  
JIS B 8433-1993: Manipulating industrial robots - Safety. etc.

\*2) Labor Safety and Sanitation Law, etc.



## Caution

Operator error could result in injury or equipment damage.



## Warning

Operator error could result in serious injury or loss of life.



## Danger

In extreme conditions, there is a possibility of serious injury or loss of life.

## 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.

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.

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.

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 MGQ Safety Instructions

## Caution

**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

**The warranty period of the product is 1 year in service or 1.5 years after the product is delivered.\*3) Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.**

**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.**

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

**\*3) 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.**

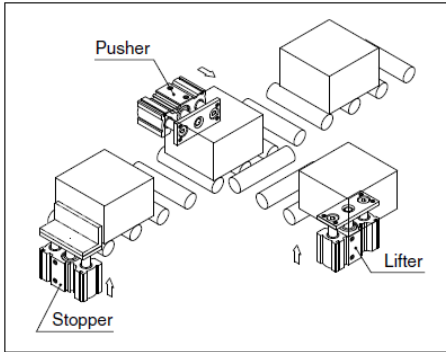
### Compliance Requirements

When the product is exported, strictly follow the laws required by the Ministry of Economy, Trade and Industry (Foreign Exchange and Foreign Trade Control Law).

## Product features

# Air cylinder with guide integrated that has achieved anti-lateral load and high non-rotating accuracy.

Space-saving cylinder.  
Suitable as stoppers or lifters in conveyor line.



### Cylinder position can be detected.

All models have built-in magnets for auto switches.



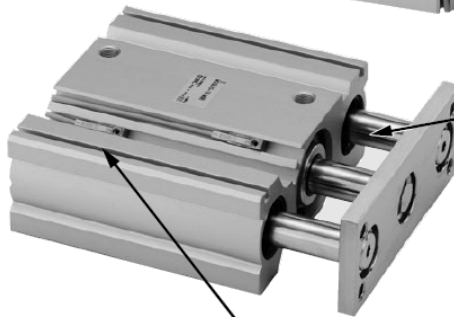
### Two types of guide rod bearing for different applications

#### Slide bearing

Slide bearing Strength against side load is more than 2 times as compared current stopper cylinder (Compared to SMC RSQ series, round bar type).

#### Ball bushing bearing

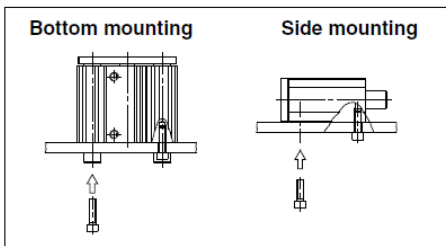
Smooth operation is suitable for pushing, lifter and applications where high precision is required.



### Non-rotating accuracy

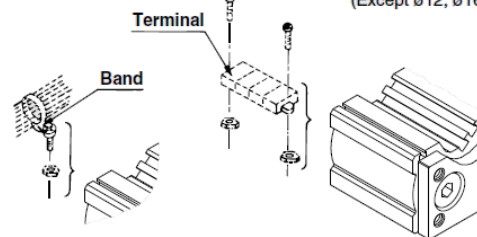
Bore size (mm)	Non-rotating accuracy $\theta$	
	MGQM	MGQL
12		
16	$\pm 0.08^\circ$	$\pm 0.10^\circ$
20		
25	$\pm 0.07^\circ$	$\pm 0.09^\circ$
32		
40	$\pm 0.06^\circ$	$\pm 0.08^\circ$
50		
63	$\pm 0.05^\circ$	$\pm 0.06^\circ$
80		
100	$\pm 0.04^\circ$	$\pm 0.05^\circ$

### Can be mounted from two directions

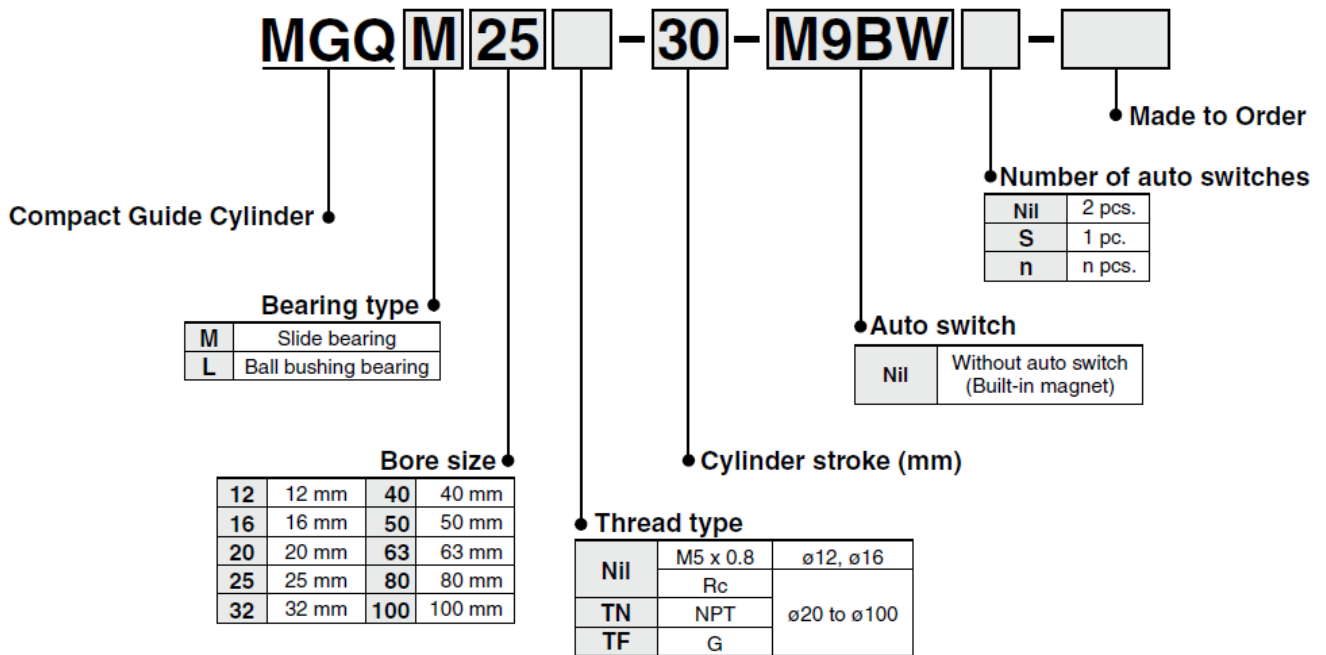


### Auto switches, lead wires and terminals can be fixed in the groove of cylinder body.

(Except  $\phi 12$ ,  $\phi 16$ ,  $\phi 20$ ,  $\phi 25$ )



# 1. How to Order



# 2. Model

Model	Cushion	Bearing type	Bore size(mm)
MGQ□□-□	Rubber bumper	Slide bearing	12,16,20,25,32,40,50,63,80,100
		Ball bushing	

# 3. Specifications

Model	MGQ□□-□	
<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>	φ12, φ16	0.12MPa
	φ 20 to φ 100	0.1MPa
<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 80, φ 100	50 to 400mm/s
<b>Cushion</b>	Rubber bumper on both ends	
<b>Lubrication</b>	Not required (Non-lube)	
<b>Stroke length tolerance</b>	+1.5 0 mm	

## 4. Standard strokes

Model	Bore size(mm)	Standard stroke (mm)
MGQ $\begin{matrix} M \\ L \end{matrix}$ □-□	12,16	10,20,30,40,50,75,100
	20,25	20,30,40,50,75,100,125,150,175,200
	32 to 100	25,50,75,100,125,150,175,200

## 5. Intermediate strokes

Description	Spacer installation type		Exclusive body (-XB10)	
	Spacers are installed in the standard stroke cylinder. • $\phi$ 12 to $\phi$ 32: Available by the 1 mm stroke interval. • $\phi$ 40 to $\phi$ 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)	$\phi$ 12, $\phi$ 16	1 to 249	$\phi$ 12, $\phi$ 16	11 to 249
	$\phi$ 20, $\phi$ 25, $\phi$ 32	1 to 399	$\phi$ 20, $\phi$ 25, $\phi$ 32	21 to 399
	$\phi$ 40 to $\phi$ 100	5 to 395	$\phi$ 40 to $\phi$ 100	26 to 395
Example	Part no.: MGQM20-39 A spacer 1 mm in width is installed in the MGQM20-40. C dimension is 77 mm.		Part no.: MGQM20-39-XB10 Special body manufactured for 39 stroke. C dimension is 76 mm.	

## 6. Weights

Slide Bearing : MGQM12 to 100

(kg)

Bore size (mm)	Model	Standard stroke (mm)											
		10	20	25	30	40	50	75	100	125	150	175	200
12	MGQM12	0.23	0.27	-	0.31	0.34	0.38	0.48	0.58	-	-	-	-
16	MGQM16	0.34	0.39	-	0.45	0.50	0.55	0.68	0.80	-	-	-	-
20	MGQM20	-	0.54	-	0.61	0.69	0.76	0.94	1.09	1.24	1.39	1.54	1.69
25	MGQM25	-	0.83	-	0.93	1.04	1.13	1.44	1.68	1.92	2.16	2.40	2.64
32	MGQM32	-	-	1.51	-	-	1.91	2.29	2.69	3.09	3.49	3.89	4.29
40	MGQM40	-	-	1.65	-	-	2.24	2.46	2.87	3.28	3.69	4.10	4.51
50	MGQM50	-	-	2.54	-	-	3.09	3.65	4.21	4.77	5.33	5.89	6.5
63	MGQM63	-	-	3.01	-	-	3.63	4.23	4.85	5.47	6.09	6.71	7.3
80	MGQM80	-	-	5.66	-	-	6.59	7.49	8.41	9.33	10.3	11.2	12.1
100	MGQM100	-	-	8.96	-	-	10.3	11.6	12.9	14.2	15.6	16.9	18.2

Ball Bushing : MGQL12 to 100

(kg)

Bore size (mm)	Model	Standard stroke (mm)											
		10	20	25	30	40	50	75	100	125	150	175	200
12	MGQL12	0.23	0.26	-	0.29	0.35	0.38	0.46	0.53	-	-	-	-
16	MGQL16	0.35	0.39	-	0.44	0.52	0.57	0.70	0.82	-	-	-	-
20	MGQL20	-	0.54	-	0.60	0.70	0.75	0.90	1.04	1.18	1.32	1.46	1.60
25	MGQL25	-	0.84	-	0.93	1.08	1.17	1.37	1.58	1.79	2.00	2.21	2.42
32	MGQL32	-	-	1.32	-	-	1.67	2.09	2.45	2.81	3.17	3.53	3.89
40	MGQL40	-	-	1.46	-	-	1.82	2.27	2.63	2.99	3.35	3.71	4.07
50	MGQL50	-	-	2.11	-	-	2.59	3.19	3.68	4.17	4.66	5.15	5.64
63	MGQL63	-	-	2.65	-	-	3.19	3.85	4.39	4.93	5.47	6.01	6.55
80	MGQL80	-	-	5.49	-	-	6.38	7.95	8.79	9.6	10.5	11.3	12.2
100	MGQL100	-	-	8.34	-	-	9.5	11.8	13.0	14.1	15.3	16.5	17.7

## 7. Weights of Moving Parts

Slide Bearing : MGQM12 to 100

(kg)

Bore size (mm)	Model	Standard stroke (mm)											
		10	20	25	30	40	50	75	100	125	150	175	200
12	MGQM12	0.12	0.13	-	0.14	0.15	0.16	0.19	0.21	-	-	-	-
16	MGQM16	0.17	0.19	-	0.20	0.22	0.23	0.26	0.30	-	-	-	-
20	MGQM20	-	0.28	-	0.30	0.33	0.62	0.44	0.50	0.56	0.62	0.68	0.74
25	MGQM25	-	0.44	-	0.48	0.52	0.56	0.71	0.81	0.91	1.02	1.12	1.22
32	MGQM32	-	-	0.88	-	-	1.05	1.21	1.37	1.54	1.70	1.87	2.03
40	MGQM40	-	-	0.95	-	-	1.10	1.26	1.43	1.59	1.76	1.92	2.08
50	MGQM50	-	-	1.56	-	-	1.82	2.08	2.33	2.59	2.84	3.10	3.35
63	MGQM63	-	-	1.86	-	-	2.11	2.37	2.62	2.88	3.13	3.39	3.64
80	MGQM80	-	-	3.59	-	-	3.93	4.03	4.61	5.19	5.77	6.35	6.93
100	MGQM100	-	-	5.80	-	-	6.34	6.88	7.42	7.96	8.50	9.04	9.58

Ball Bushing : MGQL12 to 100

(kg)

Bore size (mm)	Model	Standard stroke (mm)											
		10	20	25	30	40	50	75	100	125	150	175	200
12	MGQL12	0.11	0.12	-	0.12	0.14	0.14	0.16	0.18	-	-	-	-
16	MGQL16	0.16	0.17	-	0.18	0.21	0.22	0.25	0.28	-	-	-	-
20	MGQL20	-	0.26	-	0.28	0.32	0.34	0.39	0.43	0.48	0.52	0.57	0.62
25	MGQL25	-	0.42	-	0.45	0.52	0.55	0.62	0.70	0.77	0.84	0.92	0.99
32	MGQL32	-	-	0.67	-	-	0.79	0.91	1.03	1.15	1.27	1.39	1.50
40	MGQL40	-	-	0.73	-	-	0.84	0.96	1.08	1.20	1.32	1.44	1.56
50	MGQL50	-	-	1.21	-	-	1.40	1.58	1.77	1.95	2.14	2.32	2.51
63	MGQL63	-	-	1.49	-	-	1.67	1.86	2.04	2.23	2.42	2.60	2.79
80	MGQL80	-	-	3.36	-	-	3.65	3.94	4.23	4.52	4.81	5.10	5.39
100	MGQL100	-	-	5.10	-	-	5.51	5.93	6.35	6.76	7.18	7.60	8.01

## 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)	Allowable kinetic energy (J)
12	0.043
16	0.075
20	0.11
25	0.18
32	0.29
40	0.52
50	0.91
63	1.54
80	2.71
100	4.54

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

Note2) 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.

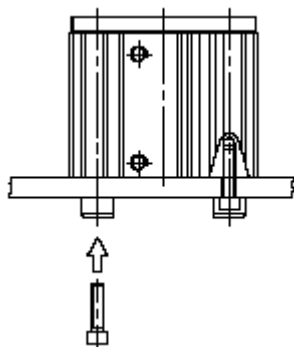
## 10) Do not synchronize cylinders only.

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.

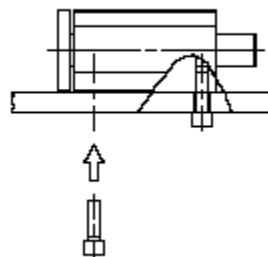
Since cylinders receive excessive force in such a case, do not design circuit synchronizing cylinders only.

# 11. Mounting Methods

Various mounting methods are available as follows.



Bottom mounting



Side mounting

### 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) 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.

### 2) 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.

### 3) 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.

**4) 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.

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

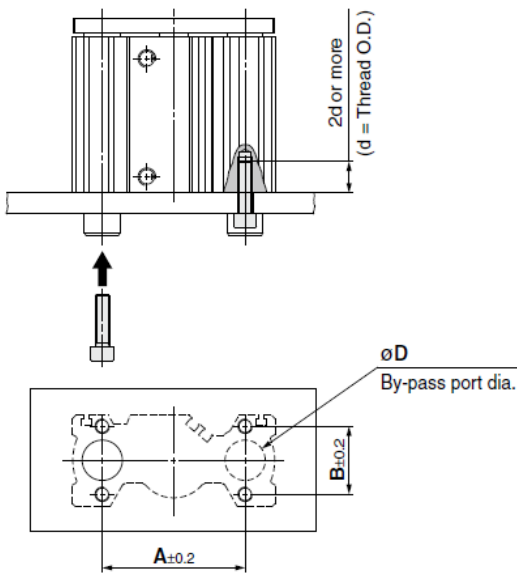
If the hole diameter is enlarged, the product's rotation speed will increase, causing the shock force to increase and damage to the product. As a result, it could pose a hazard to humans and damage the machinery and equipment.

**6) 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.

**7) 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.



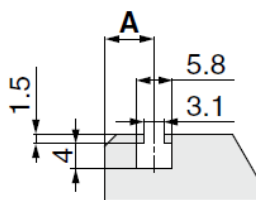
Bore size (mm)	A (mm)	B (mm)	C (mm)	øD(mm)		Hexagon socket head cap screw
				MGQM	MGQL	
12	40	18	36	10	8	M4 x 0.7
16	42	22	38	12	10	M5 x 0.8
20	52	26	46	14	12	M5 x 0.8
25	62	32	56	18	15	M6 x 1
32	80	38	—	22	18	M8 x 1.25
40	90	38	—	22	18	M8 x 1.25
50	100	44	—	27	22	M10 x 1.5
63	110	44	—	27	22	M10 x 1.5
80	140	56	—	31	28	M12 x 1.75
100	170	62	—	39	33	M14 x 2

C dimension for a bore size of 32 to 100 is identical to the A dimension.

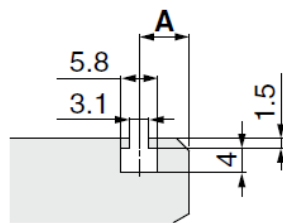
**8) About the fixing groove on the body port surface (Except φ 12, φ 16, φ 20, φ 25)**

Use groove section "a" and section "b" in the figure below of the cylinder body for firmly fixing in the following case. (Applicable bolt size is M3)

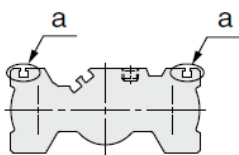
- These grooves can be used for firmly fixing the tying bands of lead wires of the auto switch, etc., and also terminal boards, etc., to the main body of the cylinder.
- When the terminal block is fixed on a cylinder directly.



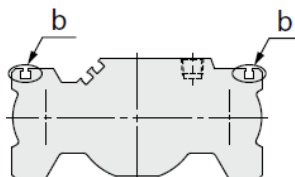
Detailed figure of "a" section



Detailed figure of "b" section



MGQ□32 to 50



MGQ□63 to 100

(mm)	
Model	A
MGQ□32	8
MGQ□40	8
MGQ□50	8
MGQ□63	8
MGQ□80	10
MGQ□100	10

## 12. 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) 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.

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

##### 3) 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.

##### 4) 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.

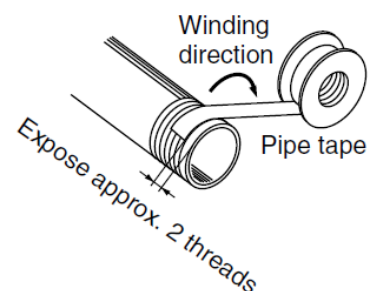
Do flushing or washing fully before the piping, and get rid of cutting chips in side the pipe, cutting oil, trash, and soon because cutting chips left in the pipe, and cutting oil cause air leak and malfunction when they get into the inside of the cylinder.

#### **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	Do not receive external force.	
		Consider where to install it.	
	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.

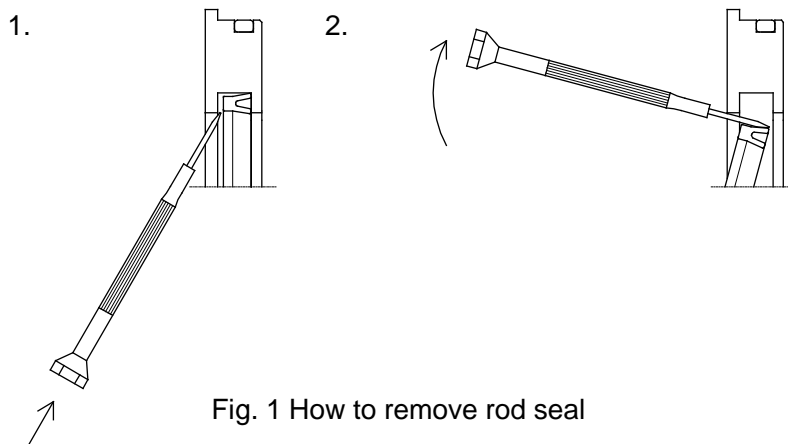


Fig. 1 How to remove rod seal

- 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.

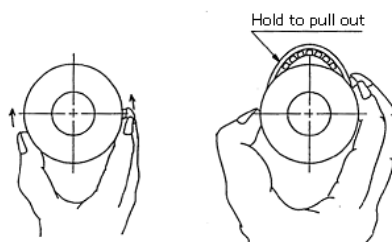


Fig. 2 How to remove piston seal

- 3) Gasket  
Use precision screw driver etc.

### 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 groove, fill it with grease.  
This is necessary for operation.

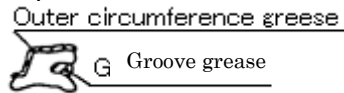


Fig. 4

#### 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.

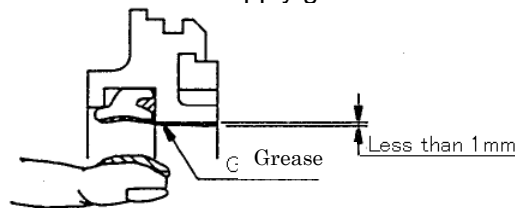


Fig. 5 Rod seal

##### ② Piston seal

Apply grease rubbing to seal groove and outer circumference.

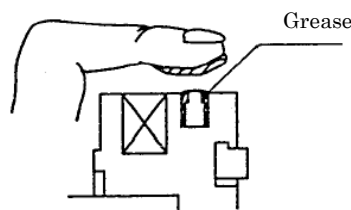


Fig. 6 Piston seal

##### ③ Gasket

Mount to the collar groove and the body groove.

#### 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 guide rod assembly.

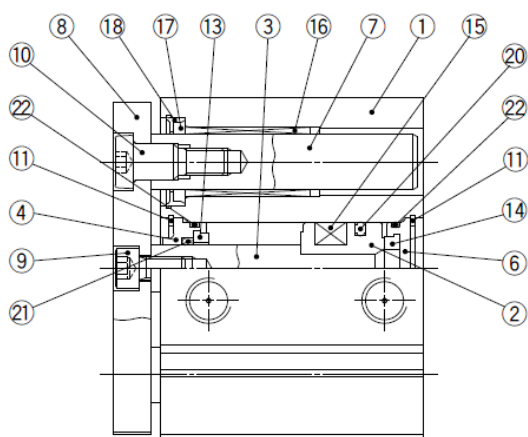
And tighten the bolt with tightening torque in table ..

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

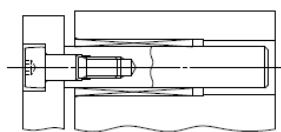


# 17. Construction

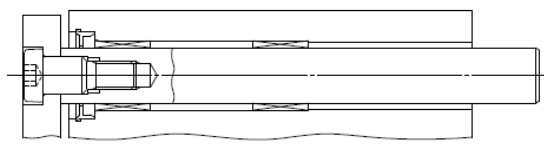
## MGQM12 to 25



50 stroke or less

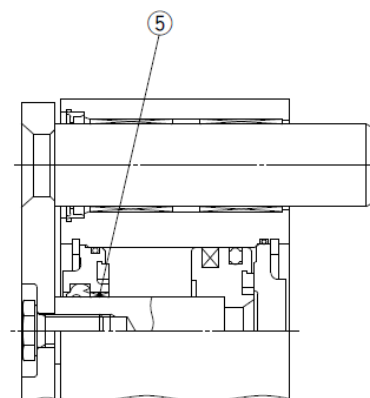
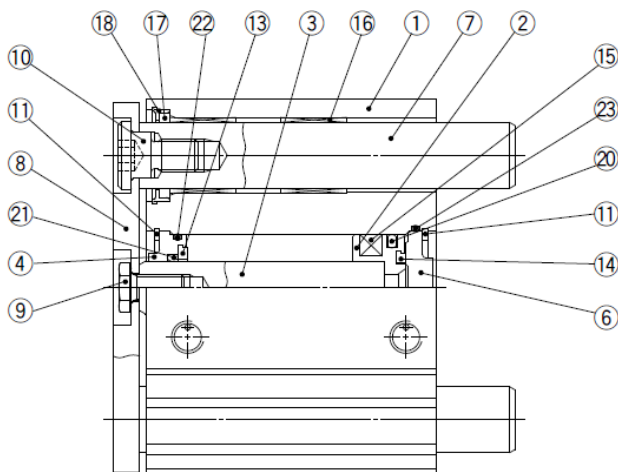


ø12, ø16



ø20, ø25 Over 50 stroke

## MGQM32 to 100



Over 50 stroke

### Component Parts

No.	Description	Material	Note
1	Body	Aluminum alloy	Hard anodized
2	Piston	Aluminum alloy	
3	Piston rod	Stainless steel	ø12 to ø25
		Carbon steel	ø32 to ø100 Hard chrome plated
4	Collar	Aluminum bearing alloy	ø12 to ø40 White anodized
		Aluminum alloy casted	ø50 to ø100 Painted
5	Bushing	Bearing alloy	ø50 to ø100
6	Head cover	Aluminum alloy	ø12 to ø63 Chromated
			ø80 to ø100 Painted
7	Guide rod	Carbon steel	Hard chrome plated
8	Plate	Carbon steel	Nickel plated
9	Plate mounting bolt	Carbon steel	Nickel plated
10	Guide bolt	Carbon steel	Nickel plated

No.	Description	Material	Note
11	Retaining ring	Carbon tool steel	Phosphate coated
12	Retaining ring	Carbon tool steel	Phosphate coated
13	Bumper A	Urethane	
14	Bumper B	Urethane	
15	Magnet	—	
16	Slide Bearing	Bearing alloy	
17	Felt	Felt	
18	Holder	Resin	
19	Ball bushing		
20*	Piston seal	NBR	
21*	Rod seal	NBR	
22*	Gasket A	NBR	
23*	Gasket B	NBR	

### Replacement Parts: Seal Kit

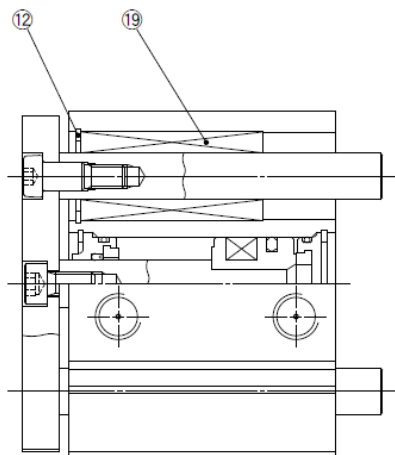
Bore size (mm)	Kit no.	Description
12	MGQ12-PS	A set of 20, 21, 22 and 23 listed above
16	MGQ16-PS	
20	MGQ20-PS	
25	MGQ25-PS	
32	MGQ32-PS	

\* Seal kit includes 20 to 23. Order the seal kit, based on each bore size.

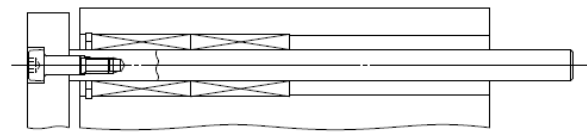
Bore size (mm)	Kit no.	Description
40	MGQ40-PS	A set of 20, 21, 22 and 23 listed above
50	MGQ50-PS	
63	MGQ63-PS	
80	MGQ80-PS	
100	MGQ100-PS	

\* Since the seal kit does not include a grease pack, order it separately.  
Grease pack part no.: GR-S-010 (10 g)

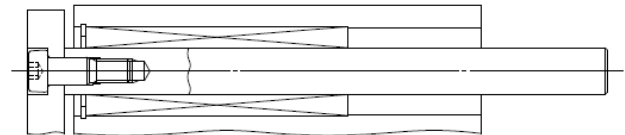
### MGQL12 to 25



30 stroke or less

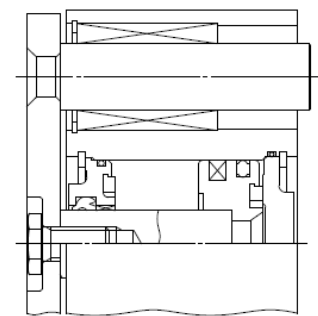
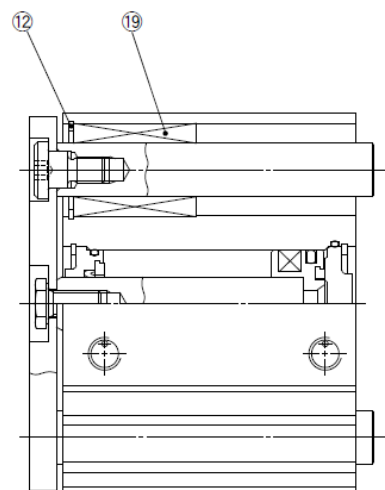


ø12, ø16 Over 30 stroke



ø20, ø25 Over 30 stroke

### MGQL32 to 100



ø50 or more

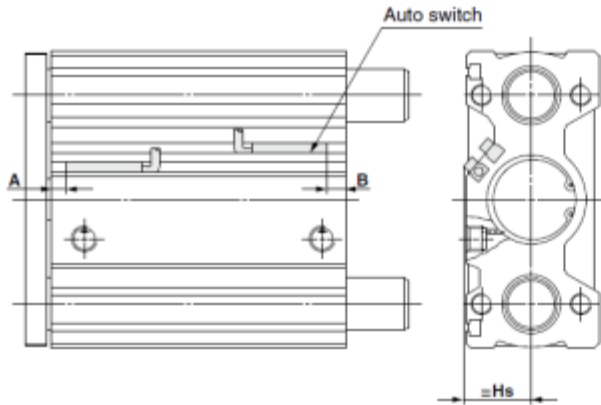
# 18. Auto Switch

## 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				M9BV	M9B	●	●	●	○	○			
				2-wire				M9BW	M9B	●	●	●	○	○			
	Diagnostic indication (2-color indicator)			3-wire (NPN)	5 V, 12 V	—	M9NVW	M9NW	●	●	●	○	○	IC circuit	Relay, PLC		
				3-wire (PNP)			M9PVW	M9PW	●	●	●	○	○				
				2-wire			M9BWW	M9BW	●	●	●	○	○				
				2-wire			M9BWW	M9BW	●	●	●	○	○				
Water resistant (2-color indicator)	3-wire (NPN)	5 V, 12 V	—	M9NAV*1	M9NA*1	○	○	●	○	○	IC circuit	Relay, PLC					
	3-wire (PNP)			M9PAV*1	M9PA*1	○	○	●	○	○							
	2-wire			M9BAV*1	M9BA*1	○	○	●	○	○							
	2-wire			M9BAV*1	M9BA*1	○	○	●	○	○							
Reed auto switch	—	Grommet	Yes	3-wire (NPN equivalent)	—	5 V	—	A96V	A96	●	—	●	—	—	IC circuit	—	
				No	2-wire	24 V	12 V	100 V	A93V*2	A93	●	●	●	●	—	—	IC circuit
								100 V or less	A90V	A90	●	—	●	—	—	IC circuit	—

- \*1 Water resistant type auto switches can be mounted on the above models, but in such case SMC cannot guarantee water resistance. Consult with SMC regarding water resistant types with the above model numbers.
- \*2 1 m type lead wire is only applicable to D-A93.
- \* Lead wire length symbols: 0.5 m ..... Nil (Example) M9NW  
1 m ..... M (Example) M9NWM  
3 m ..... L (Example) M9NWL  
5 m ..... Z (Example) M9NWZ
- \* Solid state auto switches marked with "○" are produced upon receipt of order.
- \* Since there are other applicable auto switches than listed.
- \* For details about auto switches with pre-wired connector.
- \* Auto switches are shipped together (not assembled).

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



Auto Switch Proper Mounting Position (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-Z7□/Z80 D-Y59□/Y7P D-Y69□/Y7PV D-Y7□W D-Y7□WV D-Y7BA	
	A	B	A	B	A	B
12	6	8	2	4	1	3
16	9	9	5	5	4	4
20	9.5	12.5	5.5	8.5	4.5	7.5
25	9.5	13	5.5	9	4.5	8
32	10.5	12	6.5	8	5.5	7
40	14.5	14.5	10.5	10.5	9.5	9.5
50	12.5	16.5	8.5	12.5	7.5	11.5
63	15	19	11	15	10	14
80	18	23.5	14	19.5	13	18.5
100	22.5	28.5	18.5	24.5	17.5	23.5

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

Auto Switch Mounting Height (mm)

Auto switch model	D-A9□ D-M9□ D-M9□W D-M9□A D-Z7□ D-Z80 D-Y59□ D-Y7P D-Y7□W D-Y7BA		D-A9□V	D-M9□V D-M9□WV D-M9□AV	D-Y69□ D-Y7PV D-Y7□WV
	Hs	Hs			
12	16	18.5	20.5	17	
16	18.5	21	23	19.5	
20	19.5	22.5	24.5	20.5	
25	21	23.5	26	22	
32	24.5	27	28.5	25.5	
40	24	26	27.5	25	
50	28	30	31.5	29	
63	34.5	36.5	39.5	35.5	
80	44	46.5	48.5	45	
100	52	54	56	52.5	

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

Auto switch model	No. of auto switches mounted	(mm)									
		ø12	ø16	ø20	ø25	ø32	ø40	ø50	ø63	ø80	ø100
D-A9□	1 pc.	5			5						
	2 pcs.	10			10						
D-A9□V D-M9□V	1 pc.	5					5				
	2 pcs.	10					10				
D-M9□	1 pc.	5			5						
	2 pcs.	10				10				10	
D-M9□W	1 pc.	5					5				
	2 pcs.	10				10				10	
D-M9□WV D-M9□AV	1 pc.	5					5				
	2 pcs.	10					10				
D-M9□A	1 pc.	5					5				
	2 pcs.	10					10				
D-Z7□ D-Z80 D-Y59□ D-Y7P	1 pc.	5			5						
	2 pcs.	10				10				10	
D-Y69□ D-Y7PV	1 pc.	5					5				
	2 pcs.	10					10				
D-Y7□W D-Y7□WV D-Y7BA	1 pc.	5					5				
	2 pcs.	10					10				

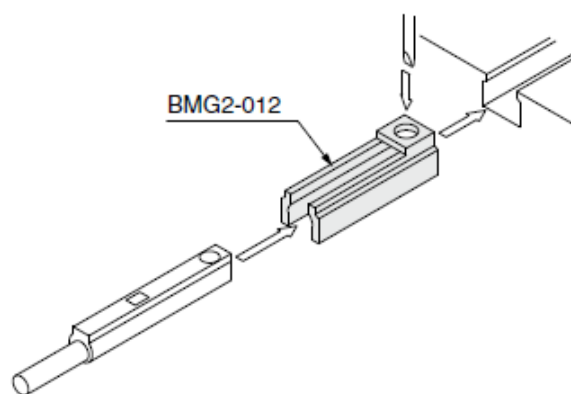
### 18-4. Auto switch operating range

Auto switch model	Bore size (mm)									
	12	16	20	25	32	40	50	63	80	100
D-A9□/A9□V	7	9.5	9	9	9	9	9	10.5	10	10.5
D-M9□/M9□V D-M9□W/M9□WV	4	5.5	5	5	5.5	5	5.5	5.5	6.5	7
D-Z7□/Z80 D-Y5□□/Y6□□/Y7□□	5	6	6	6.5	8.5	8.5	9	10	10	11.5

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

Auto switch model	Bore size (mm)
	ø12 to ø100
D-A9□/A9□V D-M9□/M9□V D-M9□W/M9□WV	BMG2-012

D-A9□(V)/M9□(V)/M9□W(V)



#### Revision history

Initial release : 1998/8/25  
Revision 1 : 2014/1/30 All revised

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Note: Specifications are subject to change without prior notice and any obligation on the part of the manufacturer.  
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