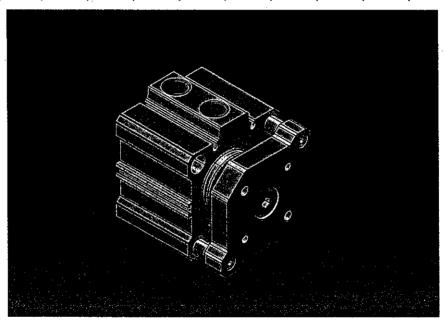


### **Operation Manual**

# Low Profile Cylinder/ Guide Rod Type [CQM Series]

 $\phi$ 12,  $\phi$  16,  $\phi$  20,  $\phi$  25,  $\phi$  32,  $\phi$  40,  $\phi$  50,  $\phi$  63,  $\phi$  80,  $\phi$  100



- Read this operation manual carefully and understand its content before installation and use of the product.
- Give special attention to safety instructions.
- Keep this operation manual available whenever necessary.

**SMC Corporation** 

## **Table of Contents**

1.	Saf	ety Instruction · · · · · · · · · · · · · · · P1
2.	Pro	duct specifications · · · · · · · · · · · · · · P2
	2-1.	Specifications
3.	Set	ting and Operation · · · · · · · P3
	3-1.	Operating Air
	3-2.	Operating Environment
	3-3.	Speed Control
	3-4.	Directional Control
	3-5.	Design
		Mounting, Setting, and The Others
	3-7.	Auto Switch
4.	Мо	del Selecting······P13
	4-1.	Allowable Kinetic Energy
	4-2.	Plate Allowable Lateral Load
	4-3.	Plate Allowable Rotating Torque
5.	Pn	eumatic Circuit······P15
6.	Ma	intenance · · · · · · · · · · · · · P16
	6-1.	Daily Inspection Items
	6-2.	Periodical Inspection Items
7.	Tro	publeshootingP17
_	_	
ж	Ka	sic Construction ************************************



# 1. Safety Instruction

These sagety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard by labeling "Caution", "Warning", and "Danger". To ensure safety, be sure to observe ISO4414\*1, JIS B8370\*2 and other safety precautions.

Caution: Operator error could result in injury or equipment damage.

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

<u> Danger:</u> In extreme conditions, there is a possibility of serious injury or loss of life.

- \*1) ISO4414:Pneumatic fluid power Recommendation for the application of equipment to transmission and control systems.
- \*2) JIS B 8370: Pneumatic system axiom.

### **N** Warning

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

Since the products specified here are used in various operating conditions, their compatibility with the specific pneumatic system must be based on specifications or after analysis and/or tests to meet your specific requirements.

- 2. Only trained personnel should operate pneumatically operated machinery and equipment.
  - Compressed air can be dangerous if an operator is unfamiliar with it. Assembly, handling or repair of pneumatic systems should be performed by trained and experienced operators.
- 3. Do not service machinery/equipment or attempt to remove components until safety is confirmed.
  - 1) Inspection and maintenance of machinery/equipment should only be performed after confirmation of safe locked out control positions.
  - 2) When equipment is to be removed, confirm the safety process as mentioned above. Cut the pressure supply for the equipment and exhaust all residual compressed air in the system.
  - 3) Before machinery/equipment is re-started, take measures to prevent quick extensions of the cylinder piston rod etc.
- 4. Contact SMC if the product is to be used in any of the following conditions.
  - 1) Conditions and environments beyond the given specifications or if product is used outdoors.
  - 2) Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverage, recreation equipment, emergency stop circuits, press applications or safety equipment.
  - 3)An application which has the possibility of having negative effects on people, property, or animals requiring special safety analysis.

### 2. Product Specifications

### 2-1. Specifications

<del></del>	<del></del>		<del></del>	,				1			ı		
Tube inside	diameter [mm]	12	16	20	35	32	40	50	63	80	100		
Actuating me	ethod					Double	acting						
Operating flu	iid					А	ir						
Proof pressu	re	1.5MPa											
Max. operati	ng pressure					1.01	ЛРа						
Min. operatir	ng pressure	0.12	MPa				0.11	//Ра					
Ambient ter	np. and operating		W	ithout a	auto sw	ritch: -1	0 to 70°	°C (No	freezin	ıg)			
fluid temp.		With auto switch: -10 to 60°C (No freezing)											
Cusion		Rubber cusion at both sides											
Lubrication	ï	No need											
Piston speed	t	50~500mm/sec 50~300mm/sec											
Thread torel	lance	JIS Class 2											
Tolerance o	f stroke length	÷1.0 0											
Connecting	C(D)QMoo-o		M5X			Rc 1/6 M5×0.8 only CQM * 3		Rc 1/4		Rc	3/8		
port size	C(D)QMooTN-o	_	_	_	_	NP	Γ 1/8	NP	Γ 1/4	NP.	Г 3/8		
	C(D)QMooTF-o	_			_	G	1/8	G	1/4	G	3/8		
Tube inside	diameter [mm]	12	16	20	25	32	40	50	63	80	100		



### Warning

#### 1) Operate the product with understanding of its features.

CQM low profile cylinder/ guide rod type is designed to minimize the various dimensions such as whole length so that the whole mechanical facility can be minimized to save the space. Therefore, if the cylinder is handled same as the existing cylinders, it cannot only maintain its performance for long, but may cause a damage accident according to an operating condition.

#### 2) Check the specifications.

The cylinder specified in this operation manual is designed according to use in industrial compressed air systems. If the cylinder are used in conditions where pressure, temperature, etc., are out of specification, damage and/or malfunction may be caused. Do not use under these conditions.

#### 3) Do not keep the cylinder in a humid environment.

Do not keep the cylinder in a humid environment to avoid rusting. The rod should be retracted for keeping.

### 3. Setting and Operation

### 3-1. Operating Air

Utilize the compressed air which is filtered and reduced to the specified set pressure with SMC's AF series air filter and AR series regulator.



### Warning

### Use clean air.

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



### Caution

#### 2) Install air filter.

Install air filter at upstream side of valves. The filtration degree should be 5µm or less.

### 3) Install air dryer, after cooler, drain catch etc.

Air that includes excessive condensate may cause malfunction of valves and other pneumatic equipment. To prevent this, install air cleaning equipment such as air dryer, after cooler, drain catch etc.

### 4) Use the product within the specified range of fluid and ambient temperature.

Take measures to prevent freezing, since moisture in circuits will be frozen under 5 °C, and this may cause damage to seals and lead to malfunction.

The operation available temperature range is -10 to 70°C (no freezing) for the cylinder without auto switch and -10 to 60°C (no freezing) for the cylinder with auto switch. Keep this range.

If the product is unreasonably used at out of the range, it will cause seal abrasion due to seal hardening and inadequate lubricantion and result in air leakage. The inadequate lubricantion will influence to the work of cylinder, and it will result in malfunction.

Refer to SMC's "Air Cleaning Equipment" catalog for further details on compressed air quality.

#### 5) Lubrication of cylinder

The cylinder has been lubricated for its entire life at the factory and can be used without any further lubrication.

However, in the event that it will be lubricated additionally, use equivalent oil to turbin oil Class 1 (no additive) ISO VG-32.

Stopping additional lubrication may lead to malfunction due to the loss of the original lubricant. Therefore, lubrication must be continued once it has been started.

#### 6) Preparation before piping

Before piping is connected, it should be thoroughly blown out with air (flushing) or washed to remove cutting chips, cutting oil and other debris from inside the pipe.

#### 7) Wrapping of sealnt tape

When piping or fitting is connected, make sure that cutting chips from the pipe threads and sealing material do not get inside the piping.

Also, when sealant tape is used, leave 1.5 to 2 thread mounting exposed at the end of the pipe/fitting.

Wrapping direction

Pipe tape

Expose approx.2 threads

### 3-2. Operating Environment



### Warning

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

Refer to the construction drawings regarding materials used for cylinder.

- 2) Mount a cover over the rod if it is used in an area that is dusty or in an environment where water or oil may splash on the cylinder.
- 3) If auto switch is used, do not use it in environment where strong magnetic fields are present.

### 3-3. Speed Control

For controlling the cylinder speed, mount a speed controller such as SMC's AS series near the air supply port and adjust to the specified speed. Speed can be controlled by regulating the air supplied to the cylinder or by regulating the air exhausted from the cylinder. Generally, the latter method is used.



### Caution

1) For controlling the operating speed, mount a speed controller and adjust the speed gradually from low speed to the specified speed.

#### 3-4. Directional Control

For switching the direction of actuation, mount a proper solenoid valve among SMC's various solenoid valves.



### Caution

Design circuit to prevent sudden quick extension of driven objects.

When a cylinder is driven by an exhaust center directional control valve or when starting up after residual pressure is exhausted from the circuit, etc., the piston and its driven object will quickly extends 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 circuit should be designed to prevent sudden lurching, because there is a danger of human injury and/or damage to equipment.

### 3-5. Design



### Warning

1) There is a possibility of dangerous sudden action of air cylinders if sliding part of equipment is twisted due to external forces etc.

In such a case, human injury may occur, e.g. by catching hands or feet in the equipment, or damage to the equipment itself may occur. Therefore, the equipment should be designed to avoid such dangers.

2) A protect 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 its construction 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 at high frequency or a cylinder 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 cushion will not be sufficient to absorb the shock. Install a deceleration circuit to reduce the speed before cushioning, or install an external shock absorber to relieve the shock. In this case, the rigidity of the equipment 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 dropping if there is a drop in circuit pressure caused by a power outage, etc.

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

6) Consider a possible failure of power source.

Take measures 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) Consider emergency stops.

Design so that human injury and/or equipment damage will not be caused when the equipment is stopped by a safety device under abnormal conditions, a power outage or a manual emergency stop.

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

Design the equipment 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, mount manual safety equipment.

9) Design a unit not to apply external force over the max. output to the cylinder.

There is a risk that the cylinder may be broken, and that may cause damage to a human or a unit.

10) As the cylinder outputs large force, mount the cylinder after giving enough consideration to stiffness of a mounting base.

There is a risk for a human or equipment to be damaged.

### 11) Do not make multiple cylinders operated at the same time.

It is difficalt to control the speed of air as it is a compressible fluid. The factors of speed variation are supply pressure, load variation, temperature, lubrication, performance difference between cylinders, deformation of parts due to aging, etc. Therefore, synchronous operation of several cylinders can be held for a short time with a speed controller, but will be easily collapsed due to change of the condition. In case the synchronous operation is collapsed, the difference of rods' location will apply excessive force, i.e. lateral load, to the tube rod, and possibly that the lareral load will cause partial friction of a seal, friction of bushing, and a scrape of the cylinder tube and the piston. Thus, do not design so as to apply synchronous operation of cylinders

If synchronous operation is reluctantly applied, use a guide which has high accuracy and stiffness to avoid troubles even if cylinders have output differences.

#### 12) Intermediate stops

When intermediate stopping of a cylinder is performed with a 3 position closed center directional control valve, it is difficult to achieve stopping positions as accurate and minute as with hydraulic pressure due to the compressibility of air.

Furthermore, since valves and cylinders, etc. are not guaranteed for zero air leakage, it may not be possible to hold a stopped position for an extended period of time. Contact SMC in case it is necessary to hold a stopped position for an extended period.

### **!**Caution

# 13) Operate the piston within a range so that collision damage will not occur at the end of the stroke.

Operate within a range so that damage will not occur when the piston having inertial force stops by striking the cover at the stroke end. Refer to the cylinder selection procedures for the range within which damage will not occur.

### 3-6. Mounting, Setting, and The Others

### **⚠**Caution

1) Make sure to connect a rod and load so that their axial center and movement directions will match.

If they do not match, stress could be applied to the rod and the tube, causing the inner surface of the tube, the bushing, the rod surface, and the seals to wear and to become damaged.

- 2) When an external guide is used, connect an external slider and load in such a way that there is no interference at any point within the stroke.
- 3) Do not scratch or gouge the sliding part of the cylinder tube or the piston rod by striking it with an object, or squeezing it.

The tube bore is manufactured under precise tolerances. Therefore, even a slight deformation may lead to a malfunction. Furthermore, any scratches or gouges on the sliding part of the piston rod may damage the seals and result in air leakage.

A flaw and gouge on the sliding part of guide rod would damage the bushing, and it would cause the decreased non-rotating accuracy and malfunction.

4) Do not use the cylinder until it is verified that the equipment can operate properly.

After mounting, repair or modification, etc., connect the air supply and electric power, and then confirm proper mounting by means of appropriate function and leak inspections.

5) Be careful of the screwed depth such as bolt for mounting.

The material of this cylinder tube is aluminum alloy, so inadequate screwed depth a bolt will cause breakage. The screwed depth of screw-in of a bolt must be same as the depth of female thread.

6) Do not use as a stopper.

This product is not designed as a stopper. For that purpose, use MGP cylinder.

7) Tighten the tube fittings to the cylinder port with proper torque.

If excessive torque was applied, a tube will be deformed, and it may cause malfunction and air leakage.

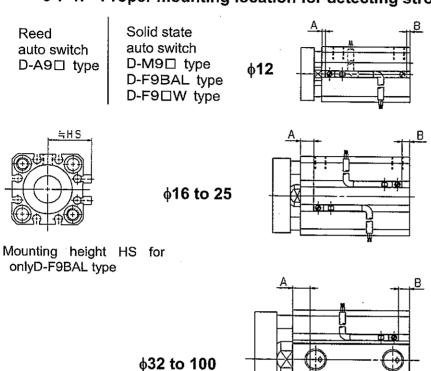
Use a fitting made by SMC, and tighten it with proper torque as below.

Model	Connecting port size	Proper tightening torque (N·m)
C(D)QM□12~25-□ CQM□32-5	M5 X 0.8	Tighten further for 1/6 turns after tightening manually.
C(D)QM□32~40-□ (excepting CQM□32-5)	Rc 1/8	7to 9
C(D)QM□32~40TN-□	NPT1/8	
C(D)QM□32~40TF-□	G 1/8	3 to 4
C(D)QM□50~63-□	Rc 1/4	12 to 14
C(D)QM□50~63TN-□	NPT 1/4	12 10 14
C(D)QM□50~63TF-□	G 1/4	4 to 5
C(D)QM□80~100-□	Rc 3/8	22 to 24
C(D)QM□80~100TN-□	NPT 3/8	22 to 24
C(D)QM□80~100TF-□	G 3/8	8 to 9

### 3-7. Auto Switch

Refer to the catalog for types of applicablel auto switches and specifications. Refer to the operation manual of auto switch for the operation of auto switch.

### 3-7-1. Proper mounting location for detecting stroke end



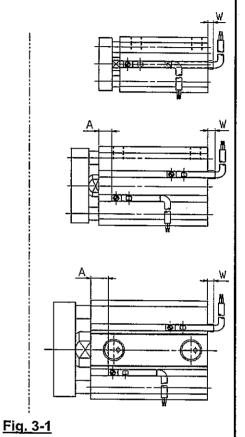
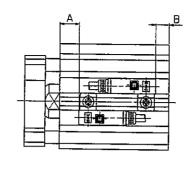


Table 3-1

Auto switch type			С	D-A9□		D-M9□ D-F9□W			D-F9BAL			
Syn	nbol	Α	В		W	Α	В	W	Α	В	W	HS
	12	1.5	0.5	1.5	(4)	5.5	4.5	5.5	4.5	3.5	14.5	16.5
	16	2	0	2	(4.5)	6	4	6	5	3	15	18.5
	20	6	3.5	-1.5	(1)	10	7.5	2.5	9	6.5	11.5	22
Tube	25	7	5.5	-3.5	(-1)	11	9.5	0.5	10	8.5	9.5	24
inside	32	8	5	3	(-0.5)	12	9	1	11	8	10	26.5
diameter	40	12	7.5	-5.5	(-3)	16	11.5	-1.5	15	10.5	7.5	30
(mm)	50	10	10.5	8.5	(-6)	14	14.5	-4.5	13	13.5	4.5	36
[	63	12.5	13.5	11.5	(-9)	16.5	17.5	-7.5	15.5	16.5	1.5	39.5
	80	15.5	18	16	(-13.5)	19.5	22	-12	18.5	21	-3	49.5
	100	20	23	-21	(18.5)	24	27	-17	23	26	-8	59.5

Reed auto switch D-A7□H type D-A80H type Solid state auto switch D-F7□ type D-J79 type D-J79W type D-F7BAL type D-F7□F type D-F7□F type D-F7NTL type

### φ32 to 100



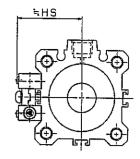


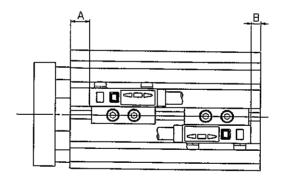
Fig. 3-2

**Table 3-2** 

Auto stype		D-A7□H D-A80H	D−F7□ D−J79 D−F7□W	D-J79W D-F7BAL D-F79F		D-F7NTL	•
Sym	bol	A	В	HS	Α	В	HS
	32	9.5	6.5	32.5	14.5	11.5	32.5
Tube	40	13.5	9	36	18.5	14	36
inside	50	11.5	12	42	16.5	17	42
diameter	63	14	15	48.5	15	16	48.5
(mm)	80	18	18.5	58.5	19	19.5	58.5
	100	21.5	24.5	68.5	22.5	15.5	68.5

Solid state auto switch D-P5DW type

φ40 to 100



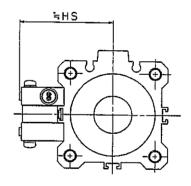
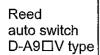


Fig. 3-3

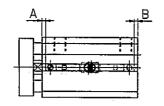
Table 3-3

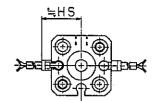
Auto switch t	ype	D-P5DW					
Symbol		Α	В	HS			
	40	9	4.5	44			
Today Santala	50	7	7.5	50			
Tube inside	63	9.5	10.5	56.5			
diameter (mm)	80	13.5	14	66			
	100	17	20	76.5			



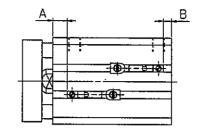
Solid state auto switch D-F9□V type D-F9□WV type

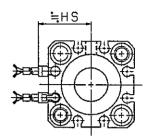
φ12



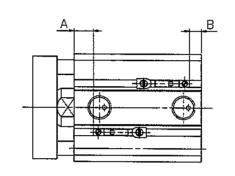


φ16 to φ25





φ32 to 100



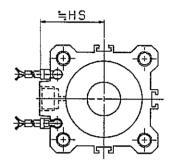


Table 3-4

Fig. 3-4

Table 3-4	Table 5-7									
Auto s	witch		D-A9□V	,	D-F9⊡V					
type			D-43EI V			D-F9□W\	,			
Sym	bol	Α	В	HS	A	В	HS			
	12	1.5	0.5	17	5.5	4.5	19			
	16	2	0	19	6	4	21			
	20	6	3.5	22.5	10	7.5	24			
Tube	25	7	5.5	24.5	11	9.5	26			
inside	32	8	5	27	12	9	29			
diameter	40	12	7.5	30.5	16	11.5	32.5			
(mm)	50	10	10.5	36.5	14	14.5	42			
	63	12.5	13.5	40	16.5	17.5	42			
	80		17	50	20.5	21	52			
	100	20	23	60	24	27	62			

Reed auto switch D-A7□ type D-A80 type D-A73C type Solid state auto switch D-F7□V type D-J79C type D-F7□WV type

D-A80C type D-A79W type D-F7⊟WV type D-F7BAVL type

φ32 to 100

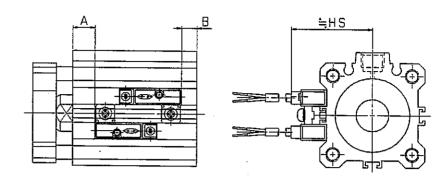


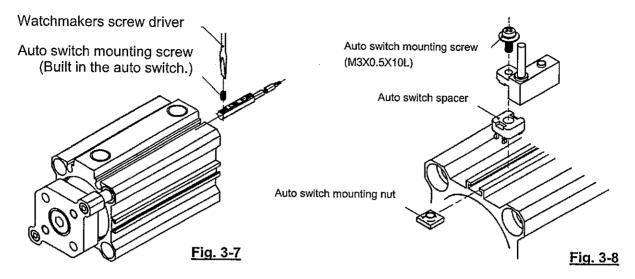
Fig. 3-5

Auto switch type		D-A7□ D-A80			D-A73C D-A80C		D-A79W		D-F7□V D-F7BAVL D-F7□WV			D-J79C				
Sym	bol	Α	В	HS	Α	В	HS	Α	В	HS	Α	В	HS	Α	В	HS
	32	9 (9.5)	6 (6.5)	31. 5	9.5	6.5	38.5	6.5	3.5	34	9.5	6.5	35	9.5	6.5	38
	40	13 (13.5)	8.5 (9)	35	13.5	9	42	10.5	6	37.5	13.5	9	38.5	13.5	9	41.5
Tube inside	50	11 (11.5)	11.5 (12)	41	11.5	12	48	12	8.5	43.5	11.5	12	44.5	11.5	12	47.5
diameter (mm)	63	13.5 (14)	14.5 (15)	47.5	14	15	54.5	11	12	50	14	15	51	14	15	54
` ,	80	17.5 (18)	18 (18.5)	57.5	18	18.5	64.5	15	15.5	60	18	18.5	61	18	18.5	64
	100	21 (21.5)	24 (24.5)	67.5	21.5	24.5	74.5	18.5	21.5	70	21.5	24.5	71.	21.5	24.5	74

The values in brackets are for D-Z72.

### 3-7-2. How to Mount Auto Switch

Mount an auto switch in accordance with the following figures.



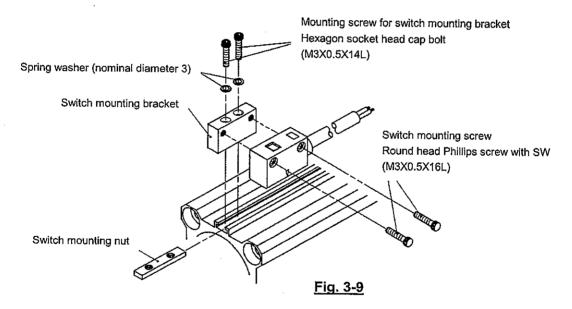
### φ12 to φ100/ Direct mounting

Use a watchmakers screw driver with grip diameter of 5 to 6 to fix an auto switch mounting screw. Tightening torque shall be 0.10 to 0.20N·m.

### φ32 to φ100/ Mounting on the rail

Tightening torque for an auto switch mounting screw shall be 0.5 to 0.7N·m.

\*An auto switch mounting bracket is enclosed with the cylinder with built-in magnet.



#### **φ40 to φ100/ D-P5DWL**

- 1. Fit up a switch mounting nut on a switch mounting bracket lightly with a screw for switch mounting bracket from through hole on the top.
- 2. Fix a mounting bracket with an assembly of the switch mounting nut on the rail groove (slide the nut into the groove), and set it at a rough mounting location.
- 3. Put in the switch mounting screw from the through hole of the switch body, and fix the switch on the mounting bracket tentatively.
- 4. After checking the detecting location, tighten the switch mounting bracket fixing screw and the switch fixing screw to fix the auto switch firmly (tightening torque shall be 0.5 to 0.7N·m).

### 3-7-3. Minimum Stroke For Mounting Auto Switch

An applicable auto switch for this cylinder may respond to the whole stroke, which has only 5 strokes or less, and 2 switches may respond at the same time with such a short stroke. Therefore, the distance the piston moves between the 2 switches must be more than 4 mm.

### 4. Selcting Model

### 4-1. Allowable kinetic energy

# **!**Caution

### 1) Keep the specified range of load weight and max. speed strictly.

If the load weight and speed exceeds the specified range, excessive impact and damage of the cylinder may be caused.

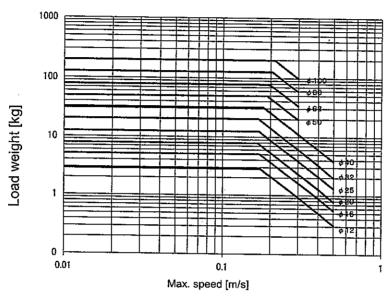


Fig. 4-1 Operating range (load weight and max. operating speed)

### 4-2. Plate allowable lateral load

### Caution

Load weight (W) in case eccentricity (L) is generated from the plate (rod end) shall be strictly kept the value on the below chart or less. Use over the specified range will cause short life or damage to the

cylinder.

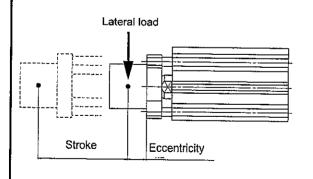


Fig. 4-2

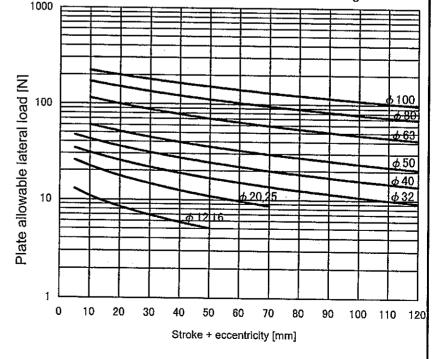


Fig. 4-3 Plate allowable lateral load

### 4-3. Plate allowable rotating torque



### **⚠** Caution

Keep the value on the below table or less for rotating torque (T) applied to the plate (rod end). Use over the specified range will cause short life or damage to the cylinder.

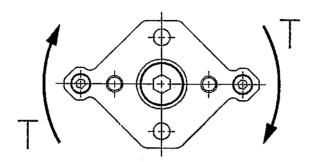


Fig. 4-4

Table 4-1

[N•m]

											fra mi	
Tube					Су	linder st	roke (m	m)				
I.D.(mm)	5	10	15	20	25	30	35	40	45	50	75	100
12	0.11	0.10	0.08	0.07	0.07	0.06	-	<u>.</u>	-	-	_	•
16	0.15	0.12	0.11	0.10	0.09	0.08	-	-	-	-	-	-
20	0.37	0.32	0.28	0.25	0.23	0.21	0.19	0.18	0.17	0.16	-	-
25	0.40	0.35	0.31	0.28	0.25	0.23	0.21	0.20	0.18	0.17	_	
32	0.66	0.59	0.53	0.49	0.45	0.42	0.39	0.36	0.34	0.32	0.25	0.20
40	1.06	0.96	0.88	0.81	0.75	0.70	0.65	0.61	0.58	0.55	0.43	0.36
50	-	1.70	1.56	1.45	1.35	1.26	1.19	1.12	1.06	1.01	0.80	0.67
63	_	3.90	3.62	3.37	3.15	2.96	2.80	2.65	2.51	2.39	1.92	1.61
80	-	7.44	6.98	6.56	6.20	5.87	5.57	5.31	5.07	4.84	3.98	3.37
100	<b>-</b>	11.85	11.19	10.61	10.08	9.60	9.17	8.77	8.41	8.07	6.73	5.77

### 5. Pneumatic Circuit

The basic circit (meter-out control type) for actuating the cylinder with an air filter, a regulator, solenoid valves, and speed controllers is as follows.

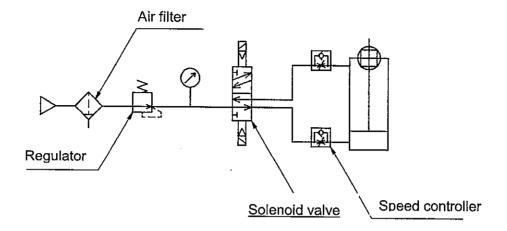


Fig. 5-1

### 6. Maintenance

### 6-1. Daily Inspection Items

- 1) Smoothness of operation
- 2) Operating speed and change of cycle time
- 3) Stroke error

### 6-2. Periodical Inspection Items

- 1) Looseness of cylinder mounting bolt and a work piece
- 2) Smoothness of operation
- 3) Operating speed and change of cycle time
- 4) External leakage
- 5) Incorrect length of stroke
- 6) Flaw on piston rod
- 7) Check whether or not periodical exhausting of drain is done.

Check for the above-mentioned items, and if any error is found, take a proper measure. If you have any questions, contact SMC's sales person.



### Warning

1) Follow the order of above-mentioned items for inspection.

Mishandling will cause breakage and malfunction of the cylinder and equipment.

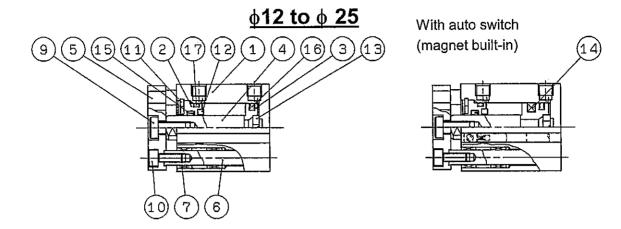
Removal of the cylinder and supply and exhaust of compressed air

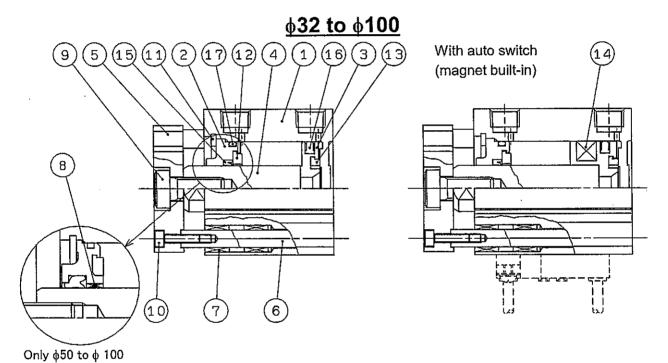
The cylinder shall be removed after checking drop preventive action and runaway preventive action for a driven object are taken and exhausting the compressed air inside the system by cutting off the air supply and power supply. For restarting, check the quick extention preventive action.

# 7. Troubleshooting

Trouble	Detail of trouble	Cause	Countermeasure	Corresponded
-Operation is	Air leakage	1. Rod seal wear-out due to a	1 Pople compart of red and by SMC	item
not smooth.	(external		Replacement of rod seal by SMC	
-Output	,	flaw on the piston rod.	2. Replacement of rod seal and	
decreased.	leakage)	2. Rod seal wear-out due to	applying of grease by SMC	
		inadequate grease at the	3. After the replacement by SMC,	
-Not operated.		piston rod.	operate the cylinder within the	
		3. Rod seal wear-out due to	operating temp. range.	
		operation over the temp.		
	Air leakage	1. Piston seal wear-out due to	1. After the replacement by SMC, use	
	(internal	spillage of grease, caused by	it with air cleaning equipment such	3-1
	leakage)	entered water such as drain.	as a filter mounted in line.	
	Inadequate	Decreased source pressure	Supply proper pressure	
	air	2. Difference of regulator setting	2. Set the regulator again.	3-1
	pressure	3. Clogged piping	3. Flash the piping.	
	Excessive	1. Excessive lateral load is	Operate within the allowable value.	
	load	applied.	2. Operate within the allowable value.	4-2
		2. Excessive rotating torque is		4-3
		applied.	·	
	Low speed	1. Operation below the operating	1 Operate within the energified	2.2
	operation	piston speed	Operate within the specified range.	3-3
	Pneumatic	1. Construction of system is not	Use proper size of tubes, fittings,	
	circuit	suitable.	directional control valve, and speed	3-1
	setting		controller.	3-5
	failure			
-Damaged parts	Damaged	1. High speed operation due to	1. Adjust the speed with a speed	
	damper,	improper adjustment of speed	controller, and operate it within the	
•	piston rod,	controller	specified range.	
	guide rod,	2. Excessive kinetic energy is	2. Operate within allowable kinetic	
	and rod	applied.	energy.	
	cover body	3. Excessive lateral load is	3. Opearte within allowable lateral	3-3
		applied.	load range.	4-1
		4. Excessive rotating torque is	4. Operate within allowable rotating	4-2
		applied.	torque range.	4-3
		5. Abnormal external force is	5. Interference of organization, offset	
		applied.	load, and excessive load will cause	
,			deformation and damage to the	
		·	cylinder. Remove these factors.	

### 8. Basic Construction





т т.	<del>-</del>		
17	Gasket	NBR	
16	Piston seal	NBR	
15	Rod seal	NBR	
14	Magnet	•	
13	Damper B	Urethane	
12	Damper A	Urethane	
11	Snap ring	Carbon tool steel	Phosphate coating
10	Hexagon socket head cap screw	Carbon steel	Nickel plating
9	Hexagon socket head cap screw	Carbon steel	Nickel plating
8	Bushing	Bronze alloy	φ50 to φ100
7	Bushing	Oil-impregnated sintered alloy	
6	Guide rod	Stainless alloy	Hard chromium plating
5	Plate	Aluminum alloy	Anodized
	F3*. t	Stainless steel	φ12 to φ25
4	Piston rod	Carbon steel	φ32 to φ100 Hard chromium plating
3	Piston	Aluminum alloy	
	0.11	At a change of the control of the co	φ12 to φ40 Anodized
2	Collar	Aluminum alloy	φ50 to φ100 Chromated, Coating
1	Cylinder tube	Aluminum alloy .	Hard anodized
No.	Part name	Material	Note