Discontinue

CKD Corporation

SM-9028-A

INSTRUCTION MANUAL

SUPER MOUNT CYLINDER
SMD2 Series

Please read this operation manual carefully before using this product, particularly the section describing safety.

Retain this operation manual with the product for further consultation whenever necessary.

[EC1-0FC12]

Discontinue

For Safety Use

To use this product safely, basic knowledge of pneumatic equipment, including materials, piping, electrical system and mechanism, is required (to the level pursuant to JIS B 8370 Pneumatic System Rules).

We do not bear any responsibility for accidents caused by any person without such knowledge or arising from improper operation.

Our customers use this product for a very wide range of applications, and we cannot keep track of all of them. Depending on operating conditions, the product may fail to operate to maximum performance, or cause an accident. Thus, before placing an order, examine whether the product meets your application, requirements, and how to use it.

This product incorporates many functions and mechanisms to ensure safety. However, improper operation could result in an accident. To prevent such accidents, read this operation manual carefully for proper operation.

Observe the cautions on handling described in this manual, as well as the following instructions :

⚠ Precautions

- Before performing an overhaul inspection on the actuator, deactivate residual pressure completely.
- While the actuator is operating, do not step into or place hands in the driving mechanism.
- To prevent an electric shock, do not touch the electric wiring connections (exposed live parts) of the actuator equipped with a solenoid valve or switch.
  Perform an overhaul inspection with the power off. Also, do not touch these live parts with wet hands.

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SMD2 Series
Supermount Cylinder
SM 9028-A

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1. PRODUCT

1-1. Cylinder Specification

Model and Class / Item	SMD2		SMD2-X	SMD2-Y	SMD2-M	
	Double acting		Single acting, Advancing type	Single acting, Retracting type	Double acting, Whirl stopping type	
Tube bore (mm)	6, 10, 16	20, 25, 32	6, 10, 16, 20, 25, 32		6, 10, 16	20, 25, 32
Standard Stroke (mm)	5, 10, 15, 20, 25, 30	5, 10, 15, 20, 25, 30, 40, 50	5, 10, 15		5, 10, 15, 20, 25, 30	5, 10, 15, 20, 25, 30, 40, 50
Media	Compressed Air					
Lubrication	Not required (Turbine oil, Class 1, ISO VG32 is recommended if and when used.)					
Max. Working pressure MPa {kgf/cm^2}	0.7 {7}					
Min. Working pressure MPa {kgf/cm^2}	ϕ6 : 0.15 {1.5} ϕ10~ϕ32 : 0.1 {1}		ϕ6 : 0.3 {3} ϕ10~ϕ25 : 0.2 {2} ϕ32 : 0.15 {1.5}	ϕ6 : 0.35 {3.5} ϕ10~ϕ25 : 0.2 {2} ϕ32 : 0.15 {1.5}	ϕ6 : 0.15 {1.5} ϕ10~ϕ32 : 0.1 {1}	
Withstanding pressure MPa {kgf/cm^2}	1.05 {10.5}					
Ambient temperature (°C)	−10~60 (Not to be frozen)					
Connecting port size	ϕ6~ϕ25 : M5, ϕ32 : Rc (PT) 1/8					
Working piston speed (mm/s)	50~500					

Whirl stopping accuracy of Double acting, whirl stopping Model SMD2-M,

Stopping position accuracy (°) (during retraction)	ϕ6~ϕ16 : ±0.8 ϕ20~ϕ32 : ±0.5

Discontinue

1 PRODUCT

1-2. Switch specification

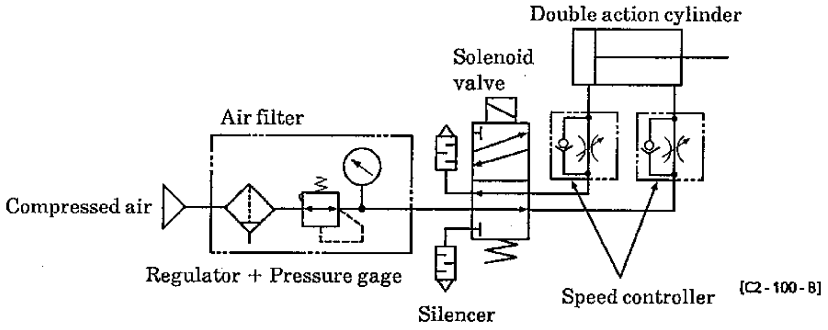
Type · Model / Item	Contact Switch	
	K0H · K0V	K5H · K5V
Application	For use with relay, programmable controller	For use with programmable controller, relay, IC circuit, series connection (without lamp)
Voltage of source of power	———	
Load voltage Current	DCV24V, 5~50mA AC100V, 7~20mA	DC24V, 50mA or less AC100V, 20mAor less
Current consumption	———	
Internal voltage drop	2.4V or less	0V
Lamp	Lit when LED is on	———
Leak current	0	
Length of lead wire (Note 1)	1m standard (Oil-proof vinyl cabtyre cord, 2-cord, 0.2mm²)	
Max. Impact	30G	
Insulation resistance	Over 20MΩ by measuring with DC500V megger tester.	
Dielectric strength	Should stand normal for 1 minute with AC1000V applied.	
Ambient temperature	−10~+60°C	
Protective structure	IEC Standard IP67, JIS 0920 (Splash proof) Oil resistant	

Type · Model / Item	Non Contact Switch	
	K2H · K2V	K3H · K3V
Application	For use with programmable controller, exclusively	For use with programmable controller and relay
Voltage of source of power	———	DC10~28V
Load voltage · Current	DC10~30V, 5~25mA (Note 2)	DC30V or less, DC100mA or less
Current consumption	———	10mA or less when it is on at DC24V
Internal voltage drop	4V or less	0.5V or less with 100mA
Lamp	Lit when LED is on.	
Leak current	1 mA or less	10μA or less
Length of lead wire (Note 1)	1 m Standard (Oil-proof vinyl cabtyre cord, 2-cord, 0.2mm²)	Standard 1 m (Oil-proof vinyl cabtyre cord, 3-cord, 0.15mm²)
Max. Impact	100G	
Insulation resistance	Over 20MΩ by measuring with DC500V megger tester.	
Dielectric strength	Should stand normal for 1 minute with AC1000V applied.	
Ambient temperature	−10~+60°C	
Protective structure	IEC Standard IP67, JIS 0920 (Splash proof) Oil resistant	

Note 1. Either 3m or 5m of lead wire are optionally available.
Note 2. The max. load current 25mA is at 25°C. Value will become lower than 25mA when ambient temperature rises higher than 25°C.

1-3. Fundamental Circuit Diagram

1) Fundamental Circuit Diagram For Double-acting Cylinder (Model SMD2) is as follows.



1-4. Selection of Peripheral equipment

Required peripheral equipment in accordance with the fundamental circuit drawing 1-3 above varies depending on Cylinder tube bore and speed. Select appropriate models out of the following table.

Tube bore (mm)	Theoretical Basic speed (mm/s)	Required flow (ℓ/min) (at pressure = 0.5MPa {5kgf/cm²})	Solenoid valve		Speed controller	Silencer	Tubing (Between solenoid and cylinder)
			Single solenoid	Double solenoid			
φ6	500	5	B5142	—	SC3G-M5-4	SL-M5	φ4×φ2.5 Nylon tube
φ10	500	14	B5142	—	SC3G-M5-4	SL-M5	φ4×φ2.5 Nylon tube
φ16	500	35	B5142	—	SC3G-M5-4	SL-M5	φ4×φ2.5 Nylon tube
φ20	500	55	4KA110 4KB110	4KA120 4KB120	SC1-6	SL-M5 SLW-6A	φ6×φ4 Nylon tube
φ25	500	86	4KA110 4KB110	4KA120 4KB120	SC1-6	SL-M5 SLW-6A	φ6×φ4 Nylon tube
φ32	250	71	4KA110 4KB110	4KA120 4KB120	SC1-6	SL-M5 SLW-6A	φ6×φ4 Nylon tube
	500	141	4KA210 4KB210	4KA220 4KB220	SC1-6	SLW-8S	φ8×φ5.7 Nylon tube

2
WARNING

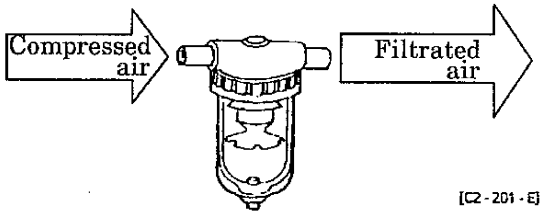
2. CAUTION

2-1. Fluid

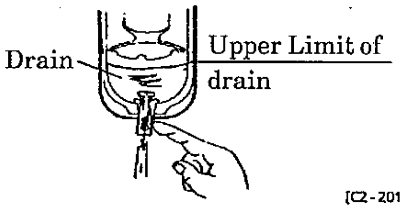
1) Use the compressed air, filtrated and dehumidified. Carefully select a filter of an adequate filtration rate (5μm or lower preferred), flow rate and its mounting location (as closest to solenoid valve as possible).

2) Be sure to drain out the accumulation in filter periodically.

3) Note that the intrusion of carbide of compressor oil (such as carbon or tarry substance) into the circuit causes malfunction of solenoid valve and cylinder. Be sure to carry out thorough inspection and maintenance of compressor.



[C2-201-E]



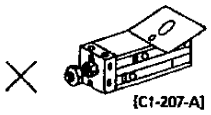
[C2-201-F]

4) This cylinder does not require lubrication. It is recommended, however, to use Turbine oil Grade 1, ISO VG32 as lubricant if lubrication is preferred.

2-2. Cylinder with switch

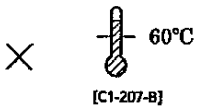
1) Keep anything magnetic items away.

Keep any magnetizable or magnetizing item such as magnet disk, magnet card, magnet tape, tester etc away from this type of cylinder as its piston has built-in magnet in it.


[C1-207-A]

2) Avoid operating it in such temperature as higher than 60°C.

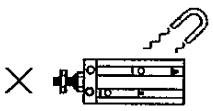
It is strongly suggested to avoid operating it within the ambient of high temperature due to thermal characteristic of magnetic parts and electronic parts.



[C1-207-B]

3) Avoid to operate it in the area with external magnetic disturbance.

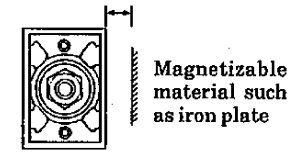
There may be bad influence to its operation due to external magnetic disturbance as the switch is built making use of magnet media.


[C1-207-C]

4) In case there is a magnetizable material such as iron plate near by.

Keep the cylinder at least more than 3.5mm away to eliminate the cause to malfunction of cylinder switch.

(Applies to all bore sizes)

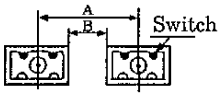
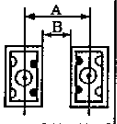
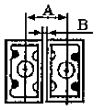
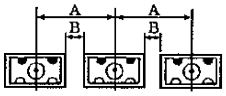
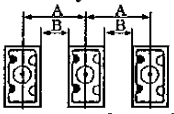


[C1-207-D]

5) Mounting pitch when installing them adjacent to each other

Give more mounting pitches than referred to the following table on the next pagge for the purpose of eliminating malfunction of switches.

2 WARNING

Lay out condition				φ6	φ10	φ20	φ20	φ25	φ32	Remarks
Two cylinders parallel	• Flat lay out  [C1-212-A]	A	K0、K5	27	29	37	45	55	67	
			K2、K3							
		B	K0、K5	4.5						
			K2、K3							
	• Vertical, switches facing to each other  [C1-212-B]	A	K0、K5	18	21	25	33	41	46	Beware of that it is unable to readjust switch location in later service, if the gap B is made shorter than overall length of screw driver.
			K2、K3	25	28	35	40	50	55	
		B	K0、K5	5.5	5.5	5.5	6.5	8.5	5.5	
			K2、K3	11.5	12.5	14.5	14.5	17.5	14.5	
	• Vertical, switches facing furthest away  [C1-212-C]	A	K0、K5	14	16	21	27	33	41	
			K2、K3							
		B	K0、K5	0.5						
			K2、K3							
Three or more cylinders parallel	• Flat lay out  [C1-212-D]	A	K0、K5	27	29	37	45	55	67	
			K2、K3							
		B	K0、K5	4.5						
			K2、K3							
	• Vertical lay out  [C1-212-E]	A	K0、K5	19	22	26	34	42	47	Beware of that it is unable to readjust switch location in later service, if the gap B is made shorter than overall length of screw driver.
			K2、K3	27	29	34	44	51	56	
		B	K0、K5	6.5	6.5	6.5	7.5	9.5	6.5	
			K2、K3	13.5	13.5	13.5	17.5	18.5	16.5	

6) Avoid repetitive stress to lead wire.

Pay consideration while laying lead wire to eliminate repetitive stress of neither bending nor tension. Apply such lead wire with bending proof as for designing robot.

7) Excessive speed of piston

Beware of that it sometimes causes failure of relay to respond.

(Example) It is advisable to retain piston speed within 500 mm/s when relay is of 20 ms actuation time and motion limit of switch is 10mm.

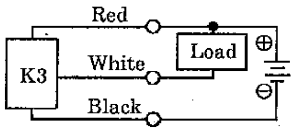
8) Large vibration or Great shock

Carefully avoid giving vibration or shock to cylinder during transportation or mounting switch on it.

2-3. Proximity switch - Models K2H · K2V · K3H and K3V

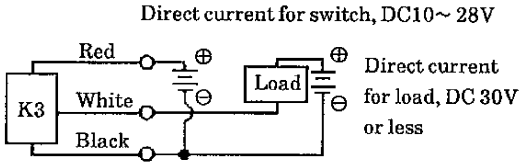
1) Connection of lead wire

Comply with the color coding specified on the illustrations. Be sure to turn the power off before starting connecting work.



[X4-401-A]

Fig. 1 An example (1) of fundamental circuit of K3 (In case the power for switch and load is the same.)

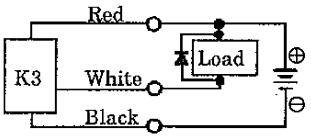


[X4-401-B]

Fig. 2 An example (2) of fundamental circuit of K3 (In case the power for switch and load is independent.)

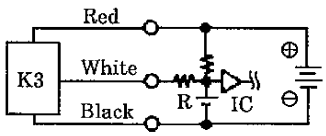
2) Protection of output circuit

- Install some protective circuit as per illustrated in Fig. 3 when inducing type load (Relay or solenoid valve) are to be used because those types apt to generate surge current at turning switch off.
- Install some protective circuit as per illustrated in Fig. 4 when capacitor type lord (Capacitor type) are to be used because those types apt to generate dash current at turning switch on.
- Install some protective circuit as per illustrated in Fig. 5 or 6 (in case of model K2) and Fig 7 (in case of model K3) when length of lead wire is over than 10m.



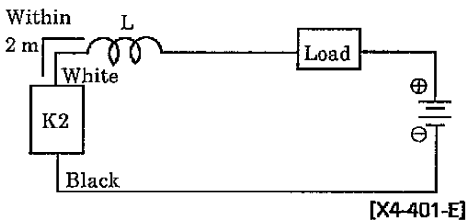
[X4-401-C]

Fig. 3 An example of using inducing load together with surge absorptive element (diode). (Hitachi Mfg. made diode V06C or equivalent is recommended.)



[X4-401-D]

Fig. 4 An example of using capacitor type load together with current regulating resister R. Comply with the following formula to figure out required R. $\frac{V}{0.05} = R\,(\Omega)$

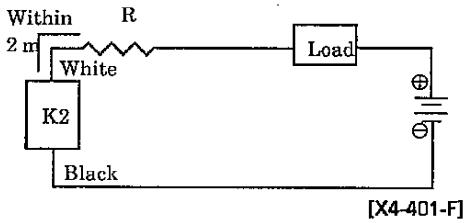


[X4-401-E]

Fig. 5 • Choke coil L

L = a couple hundred μH ~ a couple mH surpassing high frequency characteristic

• Install it near by a switch (within 2 m).



[X4-401-F]

Fig. 6 • Dash current restriction resister R

R = As much large resister as the load circuit can afford.

• Install it near by a switch (within 2 m).

2 WARNING

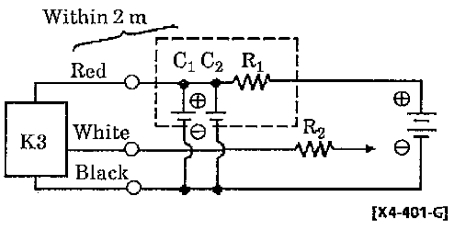


Fig. 7

- Electric power noise absorptive circuit C1
  C1 = 20~50μF electrolytic capacitor (withstanding 50V or more)
  C2 = 0.01~0.1μF ceramic capacitor
  R1 = 20~30Ω
- Dash current restriction resister R2
  R2 = As much large resister as the load circuit can afford.
- Install it near by a switch (within 2 m).

3) Connection to a programmable controller (Sequencer)

Type of the connection varies depending upon the model of the programmable controller. Refer to the following Fig. 8~12 respectively.

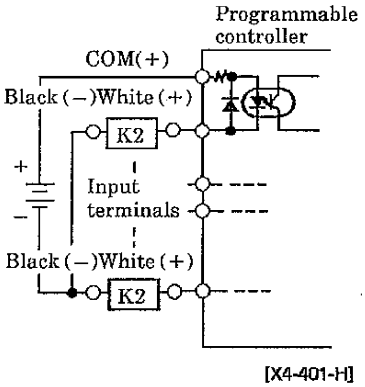


Fig. 8 K2 model connection to source load input type (an external power of source)

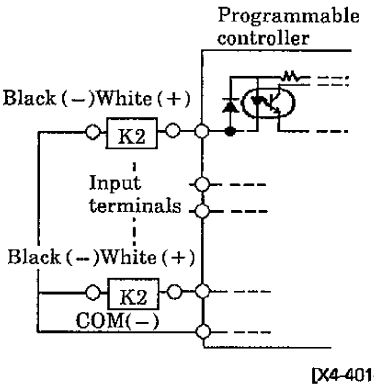


Fig. 9 An example of K2 model connection to source load input type (an internal power of source)

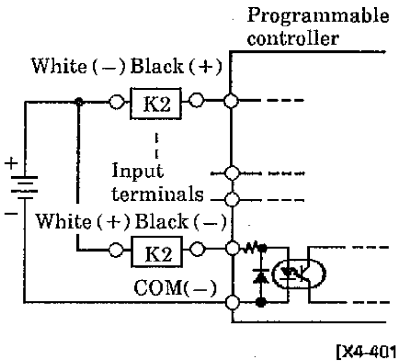


Fig. 10 An example of K2 model connection to sink load input type (an internal power of source)

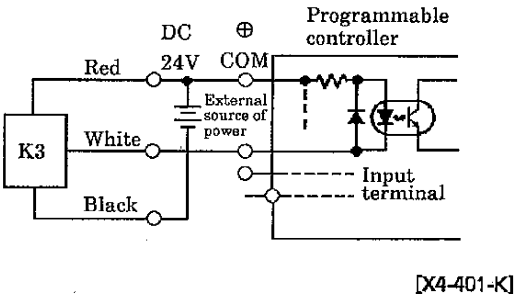


Fig. 11 An example of K3 model connection to source load input type (an external power of source)

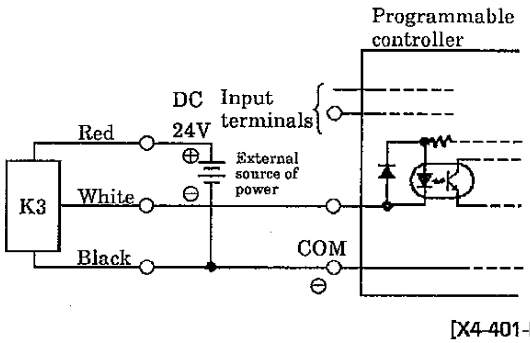


Fig. 12 An example of K3 model connection to source load input type (an internal power of source)
K3 switch is, however, unable to be connected to the source load input sequencer.

4) Series connection

The total voltage loss when series connected K2 switches equals to the sum of respective voltage loss of each switch. Load side voltage is only the residual after total voltage loss. Therefore, confirm the required voltage to the programmable controller input before deciding the number of switches connected in series. It is recommended of consulting us prior to have plural number of K3 switches connected.

5) Parallel connection

When connecting K2 switches in parallel, leak current multiplies by the number of switches connected. Therefore, confirm the required current to the programmable controller input before deciding the number of switches connected. In some occasions, either the lamps dim or distinguish at all. While one switch turns ON till turns OFF, the rest of switches do not turn ON due to internal voltage drop between both ends of switch coming lower than range of load voltage. It is, therefore, confirmation of input specification of programmable controller inlet is mandatory.

K3, on the contrary, connection of these switches creates very rare problem of multiplied leakage due to almost negligible leakage (less than 10 μA) of individual switch. There will be no visible difference of luminance of lamps.

2 WARNING

2-4. Reed switch - Model K0H · K0V · K5H and K5V

1) Connection of lead wire

Instead of connecting a wire to the power source directly, always connect to the load in series. In case of model K0 connection, pay the following precautions.

Ⓐ For DC connection, use such polarities of wires as white ⊕ and black ⊖. The switch still functions right with reversed polarities but lamp is not lit.

Ⓑ For AC connection to either relay or input terminal to programmable controller, Switch lamp sometimes is not lit in case when half-wave rectification is being carried out. Lamp is lit, in this occasion, when polarities of cords for switch is reversed.

2) Capacity of contact points

Avoid using a load exceeding the max. capacity of contact points. On the other hand, in case of K0 model, switch lamp may not be lit sometimes when current is lower than rated current.

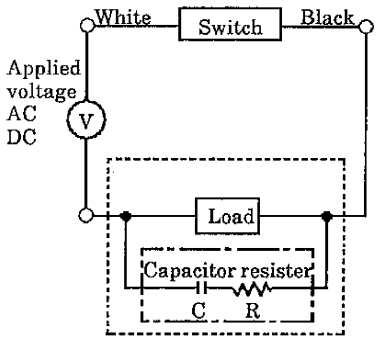
3) Protection of contact point

Install such protective circuit as illustrated in either Fig 1 or 2, on the following page, when inducing type load such as relay is to be used.

Furthermore, install such protective circuit as illustrated in either Fig. 3 or 4, o the following page, in case the cord length exceeds the length per table 1, right.

Table 1

Current	Wire length
DC	50m
AC	10m



User circuit

Protective circuit (Spark absorbing circuit) [X4-401-M]

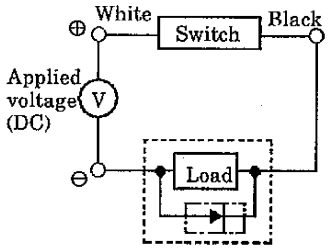
Recommended value

C (Capacitor) = 0.033 ~ 0.1 μF

R (Resister) = 1 ~ 3 kΩ

Okaya Denki XFB1K1 or equiv.

Fig. 1 When capacitor resister is used.



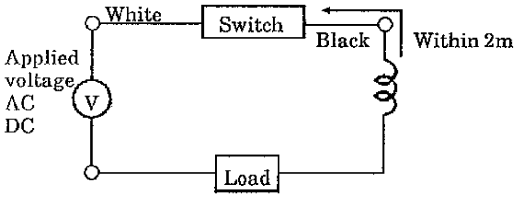
Load User circuit

Protective circuit [X4-401-N]

Rectifying diode, general use

Hitachi Mfg. product V06C or equivalent

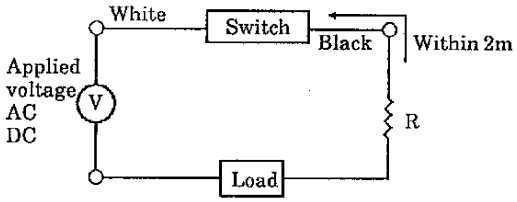
Fig. 2 When diode is used.



[X4-401-O]

- Choke coil L
  L= a couple hundred μH ~ a couple mH surpassing high frequency characteristic
- Install it near by a switch (within 2 m).

Fig. 3



[X4-401-P]

- Dash current restriction resister R
  R= As much large resister as the load circuit can afford.
- Install it near by a switch (within 2 m).

Fig. 4

4) Relay

Use such products as specified below or equivalent.

Omron	model MY
Fuji Denki Mfg.	model HH5
Tokyo Denki Mfg.	model MPM
Matsushita Denko Mfg.	model HC

5) Series connection

Total voltage loss, when connected K0 switches in series, equals to the sum of respective voltage loss of each switch. The total voltage loss becomes equivalent to one K0 switch (approx. 2.4V) when connecting the combination of one K0 switch for actuation confirming and rest of switches K5 Lamp is lit only when all switches turn on.

6) Parallel connection

There is no restriction in parallel connection number of switches of these types. Multi number connection of model K0, sometimes, cause dimmed lamp or no lamp lit.

3. OPERATION

1) The pressure supply range to cylinder is as posted in "1-1 Cylinder specification". Operate the cylinder within this range.
2) Although this type cylinder is provided with rubber cushion, it is recommendable to install some external stopper in the event that kinetic energy is large. Allowable kinetic energy is posted below.
3) Install a set of speed controller as shown in the fundamental circuit diagram, Section 1, 1-3 to retain the piston speed within specification.
4) Carefully avoid transversal load to piston rod. Otherwise it may cause remarkable wear of rod metal or damage to rod.
5) Eliminate fixing excessive load to piston rod. Excessive moment of inertia may cause damage to rod.

Reference : Allowable Kinetic energy

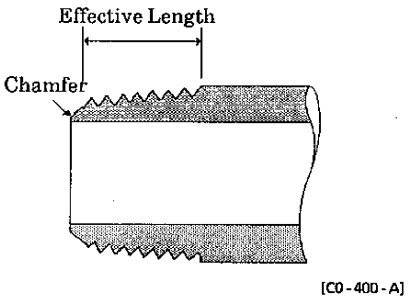
ϕ6 : 0.0056J {0.056kgf · cm}
ϕ10 : 0.036J {0.36kgf · cm}
ϕ16 : 0.1J {1kgf · cm}
ϕ20 : 0.1J {1kgf · cm}
ϕ25 : 0.19 {1.9kgf · cm}
ϕ32 : 0.5J {5kgf · cm}

6) For whirl stopper type cylinder, fix load onto the Rod tip thread.
(In other words, eliminate fixing load by using tap screws for whirl stop plate.)

4. INSTALLATION

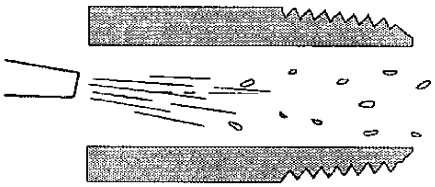
4-1. Piping

1) For piping beyond the filter, use pipes that hardly get corroded such as galvanized pipes, nylon tubes, rubber tubes, etc.
2) See to it that the pipe connecting cylinder and solenoid valve has effective sectional area needed for the cylinder to drive at specified speed.
3) Install filter preferably adjacent upper-stream to solenoid valve for eliminating rust, foreign substance and drain in the pipe.
4) Strictly observe the effective thread length of gas pipe and give a chamfer of approx. 1/2 pitch from the threaded end.



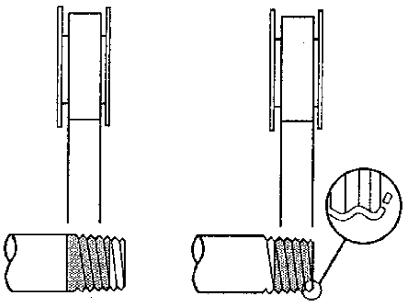
[C0-400-A]

5) Flush air into the pipe to blow out foreign substances and chips before piping.

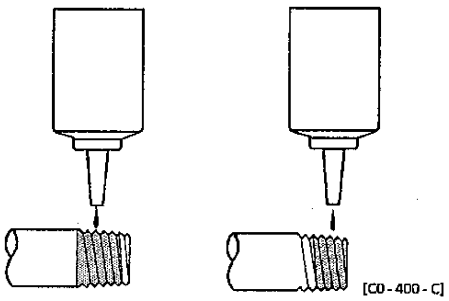

[C0-400-B]

6) Refrain applying sealant or sealing tape approx. two pitches of thread off the tip of pipe to avoid residual substances from falling into piping system.

● Seal Tape


Correct Incorrect

● Sealant (Paste or liquid)


Correct Incorrect

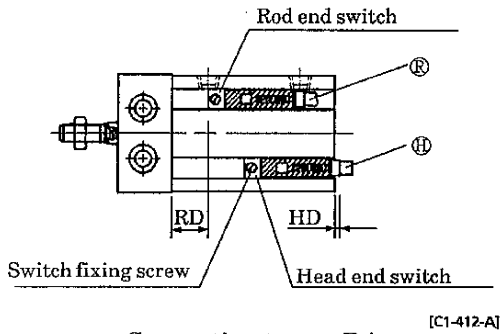
[C0-400-C]

4-2. Installation

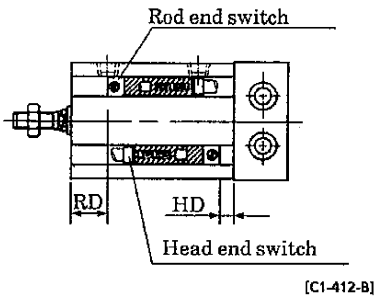
1) Range of serviceable ambient temperature for the cylinder of this type is −10°C~+60°C. Operate it within this range of temperature.
2) Install cylinder body directly by using cocket head bolts.

4-3. Installation of switch

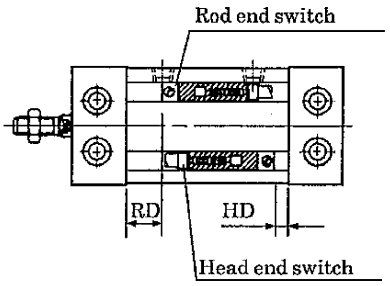
1) Location of mounting point
   (1) At the stroke end
   Refer the illustration above. Mount switches within the rod side dimension RD as well as the head side dimension HD for the purpose of having switches function at the points of the highest sensitivity.



Supporting type DA



Supporting type DB



Supporting type DC

   (2) Intermediate of stroke
   Move the piston where it is anticipated to stop and fix it tentatively Slide a switch carefully along the side of cylinder over the piston to find out the spot where switch turns ON. This type spot should be located on both side of piston. The mean spot between those points is of the highest sensitivity and where the switch is supposed to be installed.

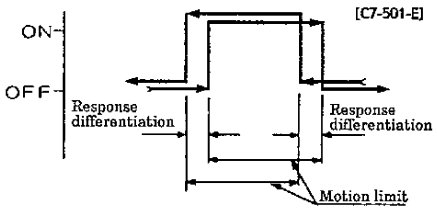
2) Motion limit

(1) The switch turns ON first and turns OFF as the piston moves along its stroke.

(2) The mean point of motion limit is where switch reacts most sensitively. Select this point to make piston stop as it is the point with the least magnetic disturbance making switch actuates most stably.

3) Hysteresis

(1) It is the distance from where switch turns ON first as piston moves along one direction to where switch turns OFF as piston reverses its stroke.



(2) Motion of switch becomes the most unstable if letting piston stop within this distance because it easily receive external magnetic disturbance.

4) Relocation of switch

Loosen the set screws then slide the switch along the cylinder tube without letting screws drop off then tighten screw at required position. (Note. 1)

5) Switch replacement

Slide switch body out of groove after loosening fixing screw. Make new switch slide into groove and fix it at required point. (Note. 1)

Note 1 : To tighten switch, use minus tip screw driver of less than 0.3mm thick, less than 2.4mm wide with grip handle diam. of 5~6 mm (such as watch repair driver and precision driver) applying torque of 0.1~0.2N · m {1~2kgf · cm}.

The most sensitive area (HD, RD) of switch mounted at stroke end of piston

SMD2-L

Supporting style	DA (Rod end mounting)							
Switch model No.	K0H, K5H		K2H, K3H		K0V, K5V		K2V, K3V	
Mounting location / Tube bore (mm)	HD (※1)	RD (※1)	HD (※1)	RD (※1)	HD (※1)	RD (※1)	HD (※1)	RD (※1)
ϕ 6	−2 (※2)	5	−3 (※2)	6	−5 (※2)	5	−6 (※2)	6
ϕ10	0	6	−1 (※2)	7	−3 (※2)	6	−4 (※2)	7
ϕ16	1	10	0	11	−2 (※2)	10	−3 (※2)	11
ϕ20	4	13	3	14	1	13	0	14
ϕ25	8	13	7	14	5	13	4	14
ϕ32	8.5	19.5	7.5	20.5	5.5	19.5	4.5	20.5

Supporting style	DB (Head end mounting), DC (Solid mounting)							
Switch model No.	K0H, K5H		K2H, K3H		K0V, K5V		K2V, K3V	
Mounting location / Tube bore (mm)	HD (※1)	RD (※1)	HD (※1)	RD (※1)	HD (※1)	RD (※1)	HD (※1)	RD (※1)
ϕ 6	1 (※3)	5 (※3)	2.5 (※3)	6 (※3)	1	5	2.5	6
ϕ10	3 (※4)	6 (※4)	4.5 (※4)	7 (※4)	3	6	4.5	7
ϕ16	4 (※4)	10 (※4)	5.5 (※4)	11 (※4)	4	10	5.5	11
ϕ20	7.5 (※4)	13 (※4)	8.5 (※4)	14 (※4)	7.5	13	8.5	14
ϕ25	11.5	13	12.5	14	11.5	13	12.5	14
ϕ32	12	19.5	13	20.5	12	19.5	13	20.5

※1 : Dimensions of HD, RD in this table are not applicable for cylinders of stroke 5.10 because it is to be set on each case individually.
※2 : Dimensions with negative sign designate projected dimension of switch out of body.
※3 : Use model K□V switch model for cylinder of stroke 5.10 because model K□H switch is not applicable for the cylinder.
※4 : Use model K□V switch model for cylinder of stroke 5 because model K□H switch is not applicable for the cylinder.

SMD2-XL

Supporting style	DA (Rod end mounting)							
Switch model No.	K0H, K5H		K2H, K3H		K0V, K5V		K2V, K3V	
Mounting location / Tube bore (mm)	HD (※1)	RD (※1)	HD (※1)	RD (※1)	HD (※1)	RD (※1)	HD (※1)	RD (※1)
ϕ 6	−2 (※2)	10	−3 (※2)	11	−5 (※2)	10	−6 (※2)	11
ϕ10	0	11	−1 (※2)	12	−3 (※2)	11	−4 (※2)	12
ϕ16	1	15	0	16	−2 (※2)	15	−3 (※2)	16
ϕ20	4	18	3	19	1	18	0	19
ϕ25	8	18	7	19	5	18	4	19
ϕ32	8.5	24.5	7.5	25.5	5.5	24.5	4.5	25.5

Supporting style	DB (Head end mounting), DC (Solid mounting)							
Switch model No.	K0H, K5H		K2H, K3H		K0V, K5V		K2V, K3V	
Mounting location / Tube bore (mm)	HD (※1)	RD (※1)	HD (※1)	RD (※1)	HD (※1)	RD (※1)	HD (※1)	RD (※1)
ϕ 6	1 (※3)	10 (※3)	2.5 (※3)	11 (※3)	1	10	2.5	11
ϕ10	3 (※4)	11 (※4)	4.5 (※4)	12 (※4)	3	11	4.5	12
ϕ16	4 (※4)	15 (※4)	5.5 (※4)	16 (※4)	4	15	5.5	16
ϕ20	7.5 (※4)	18 (※4)	8.5 (※4)	19 (※4)	7.5	18	8.5	19
ϕ25	11.5	18	12.5	19	11.5	18	12.5	19
ϕ32	12	24.5	13	25.5	12	24.5	13	25.5

※1 : Dimensions of HD, RD in this table are not applicable for cylinders of stroke 5.10 because it is to be set on each case individually.
※2 : Dimensions with negative sign designate projected dimension of switch out of body
※3 : Use model K□V switch model for cylinder of stroke 5.10 because model K□H switch is not applicable for the cylinder
※4 : Use model K□V switch model for cylinder of stroke 5 because model K□H switch is not applicable for the cylinder.

SMD2-YL

Supporting style	DA (Rod end mounting)							
Switch model No.	K0H, K5H		K2H, K3H		K0V, K5V		K2V, K3V	
Mounting location / Tube bore (mm)	HD (※1)	RD (※1)	HD (※1)	RD (※1)	HD (※1)	RD (※1)	HD (※1)	RD (※1)
ϕ 6	3	5	2	6	0	5	−1 (※2)	6
ϕ10	5	6	4	7	2	6	1	7
ϕ16	6	10	5	11	3	10	2	11
ϕ20	9	13	8	14	6	13	5	14
ϕ25	13	13	12	14	10	13	9	14
ϕ32	13.5	19.5	12.5	20.5	10.5	19.5	9.5	20.5

Supporting style	DB (Head end mounting), DC (Solid mounting)							
Switch model No.	K0H, K5H		K2H, K3H		K0V, K5V		K2V, K3V	
Mounting location / Tube bore (mm)	HD (※1)	RD (※1)	HD (※1)	RD (※1)	HD (※1)	RD (※1)	HD (※1)	RD (※1)
ϕ 6	6 (※3)	5 (※3)	7.5 (※3)	6 (※3)	6	5	7.5	6
ϕ10	8 (※3)	6 (※3)	9.5 (※3)	7 (※3)	8	6	9.5	7
ϕ16	9	10	10.5	11	9	10	10.5	11
ϕ20	12.5	13	13.5	14	12.5	13	13.5	14
ϕ25	16.5	13	17.5	14	16.5	13	17.5	14
ϕ32	17	19.5	18	20.5	17	19.5	18	20.5

※1 : Dimensions of HD, RD in this table are not applicable for cylinders of stroke 5.10 because it is to be set on each case individually.
※2 : Dimensions with negative sign designate projected dimension of switch out of body.
※3 : Use model K□V switch model for cylinder of stroke 5 because model K□H switch is not applicable for the cylinder.

The most sensitive area (HD, RD) of switch mounted at stroke end of piston

SMD2-ML

Switch model No.	K0H, K5H		K2H, K3H		K0V, K5V		K2V, K3V	
Mounting location / Tube bore (mm)	HD (※1)	RD (※1)	HD (※1)	RD (※1)	HD (※1)	RD (※1)	HD (※1)	RD (※1)
ϕ 6	1 (※2)	5 (※2)	2.5 (※2)	6 (※2)	1	5	2.5	6
ϕ10	3 (※3)	6 (※3)	4.5 (※3)	7 (※3)	3	6	4.5	7
ϕ16	4 (※3)	10 (※3)	5.5 (※3)	11 (※3)	4	10	5.5	11
ϕ20	7.5 (※3)	13 (※3)	8.5 (※3)	14 (※3)	7.5	13	8.5	14
ϕ25	11.5	13	12.5	14	11.5	13	12.5	14
ϕ32	12	19.5	13	20.5	12	19.5	13	20.5

※1 : Dimensions of HD, RD in this table are not applicable for cylinders of stroke 5.10 because it is to be set on each case individually.
※2 : Use model K□V switch model for cylinder of stroke 5.10 because model K□H switch is not applicable for the cylinder
※3 : Use model K□V switch model for cylinder of stroke 5 because model K□H switch is not applicable for the cylinder.

Motion limit and hysteresis

(Unit of measure : mm)

Item / Tube bore (mm)	Proximity switch (K2H · K2V, K3H · K3V)		Reed switch (K0H · K0V, K5H · K5V)	
	Motion limit	Hysteresis	Motion limit	Hysteresis
ϕ6	1.5~7	Less than 2	3~9.5	Less than 3
ϕ10	1.5~7		3.5~9.5	
ϕ16	1.5~7		4~11	
ϕ20	2.5~9		5~12.5	
ϕ25	3.5~11		6.5~14	
ϕ32	3.5~11.5		5.5~14	

5. MAINTENANCE

5-1. Periodic Inspection

1) In order to upkeep the cylinder in optimum condition, carry out periodic inspection once or twice a year.
2) Inspection items
   ⓐ Check the bolts and nuts fitting the piston rod end fittings and supporting fittings for slackening.
   ⓑ Check to see that the cylinder operates smoothly.
   ⓒ Check any change of the piston speed and cycle time.
   ⓓ Check for internal and/or external leakage.
   ⓔ Check the piston rod for flaw (scratch) and deformation.
   ⓕ Check the stroke for abnormality.

   See 5-2, "Trouble shooting", should there be any trouble found, also carry out additional tightening if bolts, nuts, etc.are slackened.

5-2. Trouble Shooting

1) Cylinder

Troubles	Causes	Countermeasure
Does not operate	No pressure or inadequate pressure	Provide an adequate pressure source.
	Signal is not transmitted to direction control valve	Correct the control circuit.
	Improper or misalignment of installation	Correct the installation state and/or change the supporting system.
	Broken piston packing	Replace the packing.
Does not function smoothly	Speed is below the low speed limit	Limit the load variation and consider the adoption of low pressure cylinder.
	Improper or misalignment of installation	Correct the installation state and /or change the supporting system.
	Exertion of transverse (lateral) load	Install a guide. Revise the installation state and/or change the supporting system.
	Excessive load	Increase the pressure itself and/or the inner diameter of the tube.
	Speed control valve is built in the way of "Meter in" circuit	Change the installation direction of the speed control valve.
Breakage and/or deformation	Impact force due to high speed operation	Turn the speed down. Reduce the load and/or install a mechanism with more secured cushion effect (e.g. external cushion mechanism).
	Exertion of transverse load	Install a guide. Reverse the installation state and/or change the supporting system.

2) Switch

Troubles	Causes	Remedies
Lamp is not lit.	Deposited contact point	Replace the switch.
	Excessive load than rated capacity	Replace the relay with a recommended one or replace the switch.
	Damaged lamp	Replace the switch
	Inadequate incoming signal	Review the external signal circuit and remove the causes.
Switch does not function right.	Broken circuit	Replace the switch.
	Inadequate incoming signal	Review the external signal circuit and remove the causes.
	Improper voltage	Correct voltage to specified.
	Incorrect location of switch	Correct its location.
	Aberrant position of switch	Set it back to original position.
	Incorrect direction of switch mounting	Correct the direction of the switch mounting.
	Relay is unable to respond properly within the piston stroke	Adjust speed slower. Replace the relay with a recommended one.
	Excessive load than rated capacity	Replace the relay with a recommended one or replace the switch.
Switch does not return.	Piston is not moving	Make the piston move.
	Deposited contact point	Replace the switch
	Excessive load (relay) than rated capacity	Replace the relay with a recommended one or replace the switch.
	Improper ambient temperature	Adjust the ambient temperature within the range of -10~$60°C$
	Existence of a foreign magnetic field	Shield the magnetic field.
	Inadequate incoming signal	Review the external signal circuit and remove the causes.

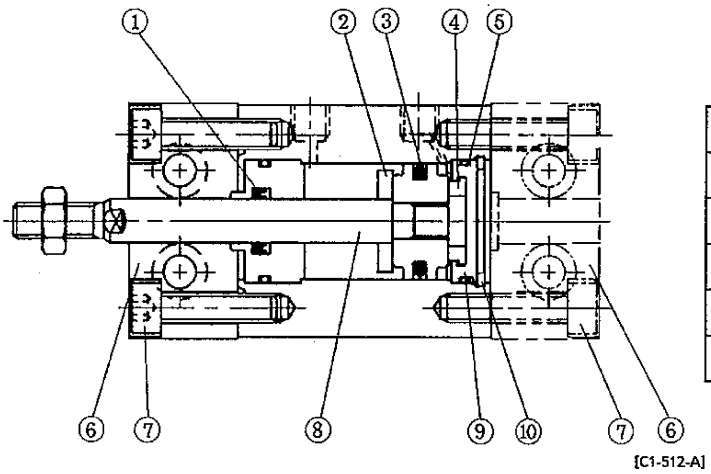
5-3. Disassembly

Replace expendable parts, referring to the following internal structure diagram, should there be any air leakage ever occurs.

1) SMD2 (Double action type)

(1) For disassembling, after removing mount ⑥ by taking out socket head bolt ⑦, remove C shape snap ring ⑩ to take out Bottom plate ⑨ and Piston rod ass'y ⑧.

(2) Internal structure diagram



[C1-512-A]

No.	Parts
⑥	Mount
⑦	Socket head bont
⑧	Piston rod ass'y
⑨	Bottom plate
⑩	C shape snap ring

(3) Expendable parts list

No. and Parts / Tube bore (mm)	Kit No.	① Rod packing	② Cushion rubber (R)	③ Piston packing	④ Cushion rubber (H)	⑤ Gasket
ϕ 6	SMD2- 6K	DYR-3K	F4-662938	PSL-6S	F4-160422	F4-160908
ϕ 10	SMD2-10K	DYR-4K	F4-662980	PSL-10S	F4-659142	F3-657978
ϕ 16	SMD2-16K	DYR-6K	F4-160423	PSL-16S	F4-659122	F4-160909
ϕ 20	SMD2-20K	DYR-8K	F4-160424	PSD-20	F4-659113	F3-657968
ϕ 25	SMD2-25K	DYR-10SK	F4-116102	PSD-25	F4-659113	F3-657969
ϕ 32	SMD2-32K	DYR-12	F4-116103	PSD-32	F4-659049	F3-657975

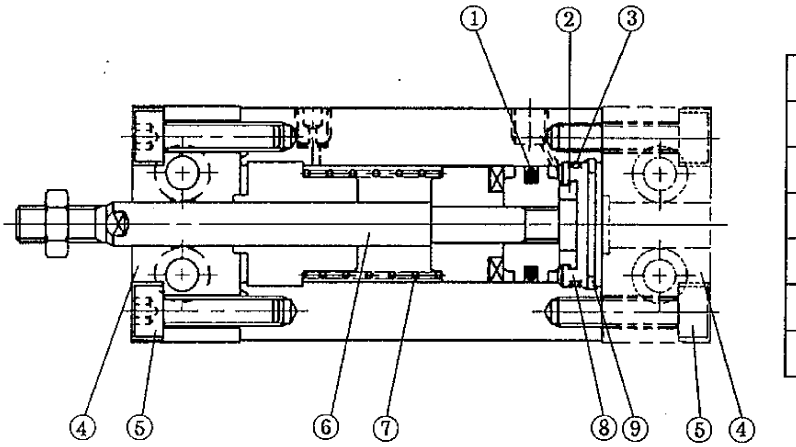
Specify the kit No. when ordering expendable parts.

[EC1-5AS12]

2) SMD2-X (Single action, advancing type)

(1) For disassembling, after removing mount ④ by taking out socket head bolt ⑤ (It is unnecessary to remove ④ and ⑤ in case of DA style supporting.) remove C shape snap ring ⑨ to take out Bottom plate ⑧ and Piston rod ass'y ⑥. Be cautious while removing C shape snap ring ⑨, to prevent such components as C shape snap ring ⑨, Bottom plate ⑧ and Piston rod ass'y ⑥ from popping out of tube due to the force of Spring ⑦.

(2) Internal structure diagram



[C1-512-8]

No.	Parts
④	Mount
⑤	Socket head bolt
⑥	Piston rod ass'y
⑦	Spring
⑧	Bottom plate
⑨	C shape snap ring

(3) Expendable parts list

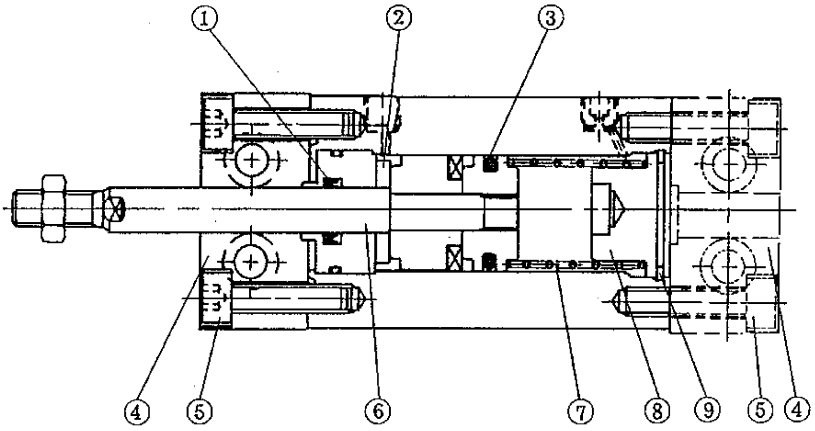
No. · Parts / Tube bore (mm)	Kit No.	① Piston packing	② Cushion rubber (H)	③ Gasket
ϕ 6	SMD2-X- 6K	PSL-6S	F4-160422	F4-160908
ϕ 10	SMD2-X-10K	PSL-10S	F4-659142	F3-657978
ϕ 16	SMD2-X-16K	PSL-16S	F4-659122	F4-160909
ϕ 20	SMD2-X-20K	PSD-20	F4-659113	F3-657968
ϕ 25	SMD2-X-25K	PSD-25	F4-659113	F3-657969
ϕ 32	SMD2-X-32K	PSD-32	F4-659049	F3-657975

Specify the kit No. when ordering expendable parts.

3) SMD2-Y (Single action, Retracting type)

(1) For disassembling, after removing mount ④ by taking out socket head bolt ⑤, remove C shape snap ring ⑨ to take out Bottom plate ⑧ and Piston rod ass'y ⑥. Be cautious while removing C shape snap ring ⑨, to prevent such components as C shape snap ring ⑨ and Bottom plate ⑧ from popping out of tube due to the force of Spring ⑦.

(2) Internal structure diagram



[C1-512-C]

No.	Parts
④	Mount
⑤	Socket head bolt
⑥	Piston rod ass'y
⑦	Spring
⑧	Bottom plate
⑨	C shape snap ring

(3) Expendable parts list

No. · Parts / Tube bore (mm)	Kit No.	① Rod packing	② Cushion rubber (R)	③ Piston packing
ϕ 6	SMD2-Y- 6K	DYR-3K	F4-662938	PSL-6S
ϕ 10	SMD2-Y-10K	DYR-4K	F4-662980	PSL-10S
ϕ 16	SMD2-Y-16K	DYR-6K	F4-160423	PSL-16S
ϕ 20	SMD2-Y-20K	DYR-8K	F4-160424	PSD-20
ϕ 25	SMD2-Y-25K	DYR-10SK	F4-116102	PSD-25
ϕ 32	SMD2-Y-32K	DYR-12	F4-116103	PSD-32

Specify the kit No. when ordering expendable parts.

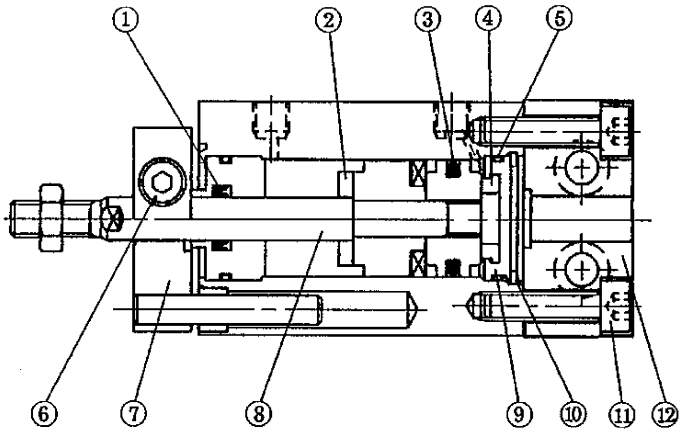
4) SMD2-M (Double action, Whirl stop type)

(1) For disassembling, after removing mount ⑫ by taking out socket head bolt ⑪, then removing Whirl stop plate ⑦ by taking our socket head bolt ⑥,remove C shape snap ring ⑩ to take out Bottom plate ⑨ and Piston rod ass'y ⑧. During assembly, apply tightening torque to Socket head bolt ⑩ as posted in the following table.

Tightening torque to Socket head bolt

Tube bore (mm)	ϕ6	ϕ10	ϕ16	ϕ20	ϕ21	ϕ32
Tightening torque (N·m){kgf·m}	1.26~1.54 {0.126~0.154}	1.26~1.54 {0.126~0.154}	1.26~1.54 {0.126~0.154}	1.26~1.54 {0.126~0.154}	3.06~3.74 {0.306~0.374}	5.13~6.27 {0.513~0.627}

(2) Internal structure diagram



[C1-512-D]

No.	Parts
⑥	Socket head bolt
⑦	Whirl stop plate Assy
⑧	Piston rod ass'y
⑨	Bottom plate
⑩	C shape snap ring
⑪	Socket head bolt
⑫	Mount

(3) Expendable parts list

No. - Parts / Tube bore (mm)	Kit No.	① Rod packing	② Cushion rubber (R)	③ Piston packing	④ Cushion rubber (H)	⑤ Gasket
ϕ 6	SMD2- 6K	DYR-3K	F4-662938	PSL-6S	F4-160422	F4-160908
ϕ 10	SMD2-10K	DYR-4K	F4-662980	PSL-10S	F4-659142	F3-657978
ϕ 16	SMD2-16K	DYR-6K	F4-160423	PSL-16S	F4-659122	F4-160909
ϕ 20	SMD2-20K	DYR-8K	F4-160424	PSD-20	F4-659113	F3-657968
ϕ 25	SMD2-25K	DYR-10SK	F4-116102	PSD-25	F4-659113	F3-657969
ϕ 32	SMD2-32K	DYR-12	F4-116103	PSD-32	F4-659049	F3-657975

Specify the kit No. when ordering expendable parts.

Discontinue

6. MODEL CODE

SMD2-L — DA — 6 — 5 — K2H — R

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ

Ⓐ Model Code	
SMD2	Double action
SMD2-L	Double action · w/switch
	Double action, Built-in magnet
SMD2-X	Single action Advancing type
SMD2-XL	Single action, Advancing typet w/switch
	Single action, Advancing type Built-in magnet
SMD2-Y	Single action, Retracting type
SMD2-YL	Single action, Retracting type w/switch
	Single action, Retracting type Built-in magnet
SMD2-M	Double action Whirl stop type
SMD2-ML	Double action Whirl stop type, w/switch
	Double action Whirl stop type , Built-in magnet

Ⓑ Mounting style (Note 1)	
DA	Rod end mount
DB	Head end mount
DC	Solid mount

Ⓒ Tube bore (mm)	
6	ϕ6
10	ϕ10
16	ϕ16
20	ϕ20
25	ϕ25
32	ϕ32

Note 1 : It is unnecessary to enter mounting style and a hyphen before the marking for whirl stop type (SMD1-M and SMD2-HL) because head end mounting is not available.

Note 2 : Stroke for the following models are with the range of 5, 10 and 15 : SMD2-X, SMD2-XL SMD2-Y, SMD2-YL

Ⓓ Stroke (mm)	Ⓔ Switch Model code				Ⓕ Qty of Switch	
5 · 10 · 15	Lead cord	Lead cord L			R	1 ea. Rod side
20 · 25 · 30	straight	letter shape			H	1 ea. Head side
(Note 2)	K0H※	K0V※	Reed	2-code	D	2 ea.
5 · 10 · 15 · 20	K5H※	K5V※				
25 · 30 · 40 · 50	K2H※	K2V※	Proxi			
(Note 2)	K3H※	K3V※	mity	3-code		

※ mark indicates the length of Lead wire.

※ Length of Lead wire	
No marking	1m (standard)
3	3m (Optional)
5	5m (Optional)

Switch alone

K2H※

Ⓔ

Switch code Ⓔ as above

● Example of Model Coding : SMD2-L-DA-6-5-K2H-R
It denotes to be Super mount cylinder of Double action one rod, Rod end mount,Tube bore ϕ6, Stroke 5mm, K2 type Switch, Lead cord stright type, Lead wire length 1m, with one Rod side Switch.