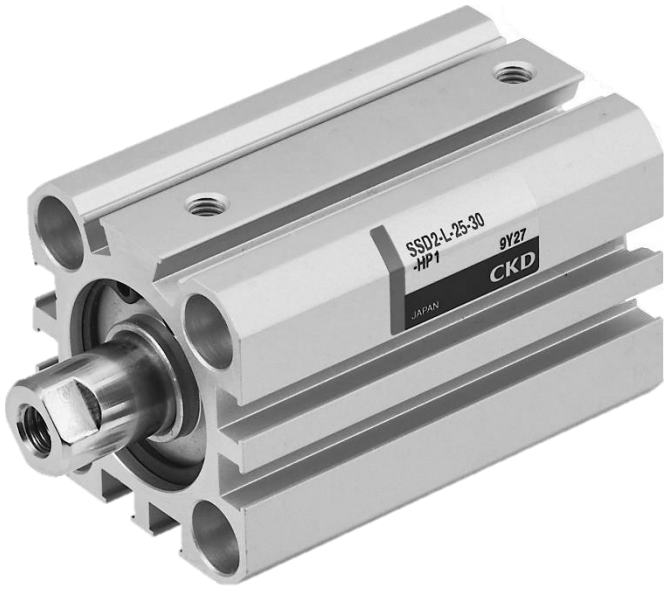
CKD

Compact Cylinder

SSD2-HP1 Series

INSTRUCTION MANUAL

SM-A02429-A/4



- Read this Instruction Manual before using the product.
- Read the safety notes carefully.
- Keep this Instruction Manual in a safe and convenient place for future reference.

CKD Corporation

PREFACE

Thank you for purchasing CKD's **"SSD2-HP1 Series" Compact Cylinder**.
This Instruction Manual contains basic matters such as installation and usage instructions in order to ensure optimal performance of the product. Please read this Instruction Manual thoroughly and use the product properly.
Keep this Instruction Manual in a safe place and be careful not to lose it.

Product specifications and appearances presented in this Instruction Manual are subject to change without notice.

- The product is intended for users who have basic knowledge about materials, piping, electricity, and mechanisms of pneumatic components. CKD shall not be responsible for accidents caused by persons who selected or used the product without knowledge or sufficient training.
- Since there are a wide variety of customer applications, it is impossible for CKD to be aware of all of them. Depending on the application or usage, the product may not be able to exercise its full performance or an accident may occur due to fluid, piping, or other conditions. It is the responsibility of the customer to check the product specifications and decide how the product shall be used in accordance with the application and usage.

SAFETY INFORMATION

When designing and manufacturing any device incorporating the product, the manufacturer has an obligation to ensure that the device is safe. To that end, make sure that the safety of the machine mechanism of the device, the fluid control circuit, and the electric system that controls such mechanism is ensured.

To ensure the safety of device design and control, observe organization standards, relevant laws and regulations, which include the following:

ISO 4414, JIS B 8370, JFPS 2008 (the latest edition of each standard), the High Pressure Gas Safety Act, the Industrial Safety and Health Act, other safety rules, organization standards, relevant laws and regulations

In order to use our products safely, it is important to select, use, handle, and maintain the products properly.
Observe the warnings and precautions described in this Instruction Manual to ensure device safety.

Although various safety measures have been adopted in the product, customer's improper handling may lead to an accident. To avoid this:

Thoroughly read and understand this Instruction Manual before using the product.

To explicitly indicate the severity and likelihood of a potential harm or damage, precautions are classified into three categories: "DANGER", "WARNING", and "CAUTION".

⚠ **DANGER**	Indicates an imminent hazard. Improper handling will cause death or serious injury to people.
⚠ **WARNING**	Indicates a potential hazard. Improper handling may cause death or serious injury to people.
⚠ **CAUTION**	Indicates a potential hazard. Improper handling may cause injury to people or damage to property.

Precautions classified as "CAUTION" may still lead to serious results depending on the situation.
All precautions are equally important and must be observed.

Other general precautions and tips on using the product are indicated by the following icon.

	Indicates general precautions and tips on using the product.

Precautions on Product Use

⚠ WARNING

The product must be handled by a qualified person who has extensive knowledge and experience.

The product is designed and manufactured as a device or part for general industrial machinery.

Use the product within the specifications.

The product must not be used beyond its specifications. Also, the product must not be modified and additional work on the product must not be performed.

The product is intended for use in devices or parts for general industrial machinery. It is not intended for use outdoors or in the conditions or environment listed below.

- In applications for nuclear power, railroad system, aviation, ship, vehicle, medical equipment, and equipment that directly touches beverage or food.
- For special applications that require safety including amusement equipment, emergency shut-off circuit, press machine, brake circuit, and safety measures.
- For applications where life or properties may be adversely affected and special safety measures are required.

(Exception is made if the customer consults with CKD prior to use and understands the specifications of the product. However, even in that case, safety measures must be taken to avoid danger in case of a possible failure.)

Do not handle the product or remove pipes and devices until confirming safety.

- Inspect and service the machine and devices after confirming the safety of the entire system. Also, turn off the energy source (air supply or water supply) and power to the relevant facility. Release compressed air from the system and use extreme care to avoid water or electric leakage.
- Since there may be hot or live parts even after operation has stopped, use extreme care when handling the product or removing pipes and devices.
- When starting or restarting a machine or device that incorporates pneumatic components, make sure that a safety measure (such as a pop-out prevention mechanism) is in place and system safety is secured.

Precautions on Product Disposal

⚠ CAUTION

When disposing of the product, comply with laws pertaining to disposal and cleaning of wastes and have an industrial waste disposal company dispose of the product.

CONTENTS

1. PRODUCT OVERVIEW

1.1 Model Number Indication

1.1.1 Product model number

■ **Example of model number indication : SSD2-HP1 series**

Without switch (without magnet for switch)

SSD2 - 12 ○ - 5 ——— N - LB - I - HP1

With switch (built-in magnet for switch)

SSD2-L - 12 ○ - 10 - T0H - R - N - LB - I - HP1

Ⓐ Model No.
Ⓑ Bore size
Ⓒ Port thread
Ⓓ Stroke
Ⓔ Switch model No. *1 *2 *3 *8 *9
Ⓕ Switch quantity
Ⓖ Option *4
Ⓗ Mounting bracket *5 *6
Ⓘ Accessory *7

Note 1: The T2YD* switch cannot be mounted on the ø12 and ø16 bore sizes.
Note 2: T8* switch cannot be installed on ø12 to ø32.
Note 3: The F type switch can only be mounted on the piping port surface of bore sizes ø20 and ø25.
Note 4: Piston rod of ø12 to ø25 is stainless steel as standard.C-snap ring will be stainless steel, not steel. The rod end male thread nut is stainless steel.
Note 5: The mounting bracket is attached at shipment.
Note 6 The projection dimension of piston rod WF when LB or FA is selected is different from that of the standard. Refer to "Pneumatic Cylinders I (CB-029SA)" for dimensions. The number of the specified protruding dimension will be added at the end of the model No. printed on the metal plate on the body.
Note 7: "I" and "Y" cannot be selected together.
Note 8: The F type switch with L type lead wire on ø20 models cannot be selected on stroke lengths 15 mm or under.
Note 9: Switches are shipped with the product. Contact CKD if assembling before shipment is necessary.
Note10: F type switch cannot be selected.
※ Copper and PTFE free as standard.

Code	Description
Ⓐ Model No.	
SSD2	Double acting/single rod
SSD2-L	Double acting/single rod/with switch
Ⓑ Bore size (mm)	
12	ø12
16	ø16
20	ø20
25	ø25
32	ø32
40	ø40
Ⓒ Port thread	
Blank	Rc thread
NN	NPT thread (ø32 and over) (made to order)
GN	G thread (ø32 and over) (made to order)
Ⓓ Stroke (mm)	
	Refer to the Stroke table.

Ⓔ Switch model No.

Lead wire Straight type	Lead wire L-shaped	Contact	Voltage AC	Voltage DC	Display	Lead wire	Bore size 12	16	20	25	32	40
F2S*		Proximity		●	1-color display	2-wire			●	●		
F3S*				●		3-wire			●	●		
F2H*	F2V*			●		2-wire			●	●		
F3H*	F3V*			●		3-wire			●	●		
F3PH*	F3PV*			●	1-color display PNP output (made to order)	3-wire			●	●		
F2YH*	F2YV*			●	2-color display	2-wire			●	●		
F3YH*	F3YV*			●		3-wire			●	●		
T0H*	T0V*	Reed	●	●	1-color display	2-wire	●	●	●	●	●	●
T5H*	T5V*		●	●	No indicator lamp		●	●	●	●	●	●
T8H*	T8V*		●	●	1-color display							●
T1H*	T1V*	Proximity	●		1-color display	2-wire			●	●	●	●
T2H*	T2V*			●			●	●	●	●	●	●
T3H*	T3V*			●		3-wire	●	●	●	●	●	●
T2HR3	T2VR3			●	1-color display bend resistant lead wire	2-wire	●	●	●	●	●	●
T3PH*	T3PV*			●	1-color display PNP output (made to order)	3-wire	●	●	●	●	●	●
T2WH*	T2WV*			●	2-color display	2-wire	●	●	●	●	●	●
T2YH*	T2YV*			●					●	●	●	●
T3WH*	T3WV*			●		3-wire	●	●	●	●	●	●
T3YH*	T3YV*			●					●	●	●	●
T2YD*	-			●	2-color display AC magnetic field	2-wire			●	●	●	●
T2YDT*	-			●					●	●	●	●
T2JH*	T2JV*			●	1-color display off-delay	2-wire			●	●	●	●

*** Lead wire length**	
Blank	1 m (standard)
3	3 m (option)
5	5 m (option) *10
Ⓕ Switch quantity	
R	1 on rod side
H	1 on head side
D	2
Ⓖ Option	
Blank	Rod end female thread
N	Rod end male thread
M	Piston rod material (stainless steel) *4
Ⓗ Mounting bracket	
Blank	Without mounting bracket
LB	Axial foot type
CB	Clevis bracket (pin and snap ring attached)
FA	Rod side flange
FB	Head side flange
Ⓘ Accessory (available when rod end male thread "N" is selected)	
I	Rod eye
Y	Rod clevis (pin and snap ring attached)

■ Example of model number indication : SSD2-P4※-HP1 series

Without switch (without magnet for switch)

SSD2 - 12 ◯ - 5 ——— N P4/P40 - LB - I - HP1

With switch (built-in magnet for switch)

SSD2-L - 12 ◯ - 10 - SW11 - R - N P4/P40 - LB - I - HP1

Ⓐ Model No.

Code	Description
Ⓐ Model No.	
SSD2	Double acting/single rod
SSD2-L	Double acting/single rod/with switch

Ⓑ Bore size

Ⓑ Bore size (mm)	
12	ø12
16	ø16
20	ø20
25	ø25
32	ø32
40	ø40

Ⓒ Stroke

Ⓒ Stroke (mm)
Refer to the Stroke table.

Ⓓ Switch model No. *1 *2 *3 *8 *9

Ⓓ Switch model No.
For switch model number, refer to "Equipment related to rechargeable batteries P4* Series"(No.CC-1226A) .

Ⓔ Switch quantity

Ⓔ Switch quantity	
R	1 on rod side
H	1 on head side
D	2

Ⓕ Option*4

Ⓕ Option	Bore size (mm)	12	16	20	25	32	40
Blank	Rod end female thread	●	●	●	●	●	●
N	Rod end male thread	●	●	●	●	●	●
M *4	Piston rod material (stainless steel)	●	●	●	●	●	●
		●	●	●	●	●	●
		●	●	●	●	●	●

Ⓖ Mounting bracket *5, *6

Ⓖ Mounting bracket	
Blank	Without mounting bracket
LB	Axial foot type
CB	Clevis bracket (pin and snap ring attached)
FA	Rod side flange
FB	Head side flange

Ⓗ Accessory *7

Ⓗ Accessory (available when rod end male thread "N" is selected)	
I	Rod eye
Y	Rod clevis (pin and snap ring attached)

Note 1: The T2YD* switch cannot be mounted on the ø12 and ø16 bore sizes.
Note 2: T8* switch cannot be installed on ø12 to ø32.
Note 3: The F type switch can only be mounted on the piping port surface of bore sizes ø20 and ø25.
Note 4: Piston rod of ø12 to ø25 is stainless steel as standard.C-snap ring will be stainless steel, not steel. The rod end male thread nut is stainless steel.
Note 5: The mounting bracket is attached at shipment.
Note 6: The projection dimension of piston rod WF when LB or FA is selected is different from that of the standard. Refer to "Pneumatic Cylinders I (CB-029SA)" for dimensions. The number of the specified protruding dimension will be added at the end of the model No. printed on the metal plate on the body.
Note 7: "I" and "Y" cannot be selected together.
Note 8: The F type switch with L type lead wire on ø20 models cannot be selected on Strokes 15 mm or under.
Note 9: Switches are shipped with the product. Contact CKD if assembling before shipment is necessary.
Note 10: 5 m lead wire for the F switch is a made to order product.

■ Stroke length

Bore size(mm)	Standard stroke length(mm)	Min. stroke length(mm)	Max. stroke length(mm)
φ12	5,10,15,20,25,30	1 Note 1	30
φ16			
φ20	5,10,15,20,25,30, 35,40,45,50		50
φ25			
φ32	5,10,15,20,25,30, 35,40,45,50,75,100		100
φ40			

Note 1: Less than 5 mm for 1-color display switch and less than 10 mm for the 2-color display,off-delay, AC magnetic field proof, T1*,T8* switch are not available.

※ The total length when using a custom stroke length is the same as that when using the next longer standard stroke length.

■ Min. stroke length with switch

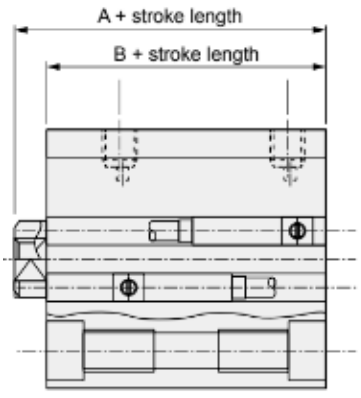
Switches / Bore size(mm)	2 switches	
	T0H/V,T5H/V	T2H/V,T3H/V
φ12	10(5) Note 1	5
φ16		
φ20	5	
φ25		
φ32		
φ40		

Note 1: Values in ( ) are for the type with 1 on rod side.

※ Less than 10 mm with the 2-color display, off-delay, AC magnetic field proof,T1*,T8* switch is not available.

■ Custom stroke length

Descriptions	Standard	
	Standard stroke length body with spacer	
Model No.	Refer to “Example of model number indication”	
Description	A spacer is added to the standard stroke length body to adjust the stroke length in 1 mm increments.	
Stroke range	Bore size	Stroke range
	12,16	1 to 29
	20,25	1 to 49
	32,40	1 to 99
Model No.	Model No.: SSD2-25-38-HP1 A + 2 mm spacer is added to the SSD2-25-40-HP1 to create 38 mm stroke length. B + stroke length is 62.5 mm.	



※ Refer to the SSD2 Series in "Pneumatic Cylinders I (CB-029SA)".

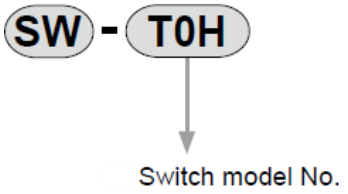
1.1.2 How to order mounting brackets

Bore size(mm) / Mounting bracket	φ12	φ16	φ20	φ25	φ32	φ40
Foot (LB)	SSD2-LB-12	SSD2-LB-16	SSD2-LB-20	SSD2-LB-25	SSD2-LB-32	SSD2-LB-40
Flange (FA/FB)	SSD2-FA-12	SSD2-FA-16	SSD2-FA-20	SSD2-FA-25	SSD2-FA-32	SSD2-FA-40
Clevis bracket (CB)	SSD2-CB-12	SSD2-CB-16	SSD2-CB-20	SSD2-CB-25	SSD2-CB-32	SSD2-CB-40

※ The foot mounting bracket is provided as 2 pcs./set.
※ For mounting brackets of P40 series, add "-P40" to the end of model number.

1.1.1 How to order switch

<Switch body only>



1.2 Specifications

1.2.1 Product specifications

Model / Descriptions		SSD2-HP1,SSD2-L-HP1 SSD2-P4※-HP1,SSD2-L-P4※-HP1					
Bore size	mm	φ12	φ16	φ20	φ25	φ32	φ40
Actuation		Double acting					
Working fluid		Compressed air					
Max. working pressure	MPa	1.0					
Min. working pressure	MPa	0.1					
Proof pressure	MPa	1.6					
Ambient temperature	°C	-10 to 60 (no freezing)					
Port size		M5				Rc1/8 Note 1	
Stroke tolerance	mm	$^{+1.0}_{0}$					
Working piston speed	mm/s	50 to 500					
Cushion		No					
Lubrication		Not required					
Allowable absorbed energy	J	0.004	0.01	0.016	0.021	0.025	0.092

Note 1:The φ32 bore size with a 5 mm stroke and without a switch has a port size of M5.

1.2.2 Switch specifications

Descriptions	Reed 2-wire type						
	T0H/V		T5H/V		T8H/V		
Applications	For programmable controller, relay		For programmable controller, relay, IC circuit(without indicator), serial connection		For programmable controller, relay		
Power supply voltage	—						
Load voltage	12/24VDC	110VAC	5/12/24VDC	110VAC	12/24VDC	110VAC	220VAC
Load current	5mA to 50mA	7mA to 20mA	50mA or less	20mA or less	5mA to 50mA	7mA to 20mA	7mA to 10mA
Current consumption	—						
Internal voltage drop	3V or less (For DC, when the load current is 30mA)		0.1V or less (Internal resistance 0.5Ω or less)		4V or less		
Indicator	Red LED (Lights up when turned on)		No indicator		Red LED (Lights up when turned on)		
Leakage current	—						
Lead wire Note 1	Standard is 1 m (Oil-resistant vinyl cabtyre 2 core cord, 0.2 mm^2)				Standard is 1 m (Oil-resistant vinyl cabtyre 2 core cord, 0.3 mm^2)		
Shock resistance	294m/s^2						
Insulation resistance	20 MΩ or more with 500 VDC megger				100 MΩ or more with 500 VDC megger		
Withstand voltage	No abnormality after applying 1000 VAC for one minute				No abnormality after applying 1500 VAC for one minute		
Ambient temperature	−10°C to 60°C						
Degree of protection	IP 67 (IEC standard), JIS C 0920 (watertight), oil-resistant						

Descriptions	Proximity 2-wire type			
	1-color display		1-color display off-delay	2-color display
	T1H/V	T2H/V	T2JH/V	T2YH/V
Applications	For programmable controller, relay,compact solenoid valve	Only for programmable controller		
Power supply voltage	—			
Load voltage	85 to 265VAC	10 to 30VDC		
Load current	5mA to 100mA	5mA to 20mA Note 2		
Current consumption	—			
Internal voltage drop	10% or less of load voltage	4V or less		
Indicator	Red LED (Lights up when turned on)			Red/green LED (Lights up when turned on)
Leakage current	1 mA or less with 100 VAC,2 mA or less with 200 VAC	1 mA or less		
Lead wire Note 1	Standard is 1 m (Oil-resistant vinyl cabtyre 2 core cord, 0.3 mm^2)	Standard is 1 m (Oil-resistant vinyl cabtyre 2 core cord, 0.2 mm^2)	Standard is 1 m (Oil-resistant vinyl cabtyre 2 core cord, 0.3 mm^2)	
Shock resistance	980m/s^2			
Insulation resistance	100 MΩ or more with 500 VDC megger	20 MΩ or more with 500 VDC megger	100 MΩ or more with 500 VDC megger	
Withstand voltage	No abnormality after applying 1500 VAC for one minute	No abnormality after applying 1000 VAC for one minute		
Ambient temperature	−10°C to 60°C			
Degree of protection	IP 67 (IEC standard), JIS C 0920 (watertight), oil-resistant			

Descriptions	Proximity 3-wire type		
	1-color display	1-color display (PNP output)(made to order)	2-color display
	T3H/V	T3PH/V	T3YH/V
Applications	For programmable controller, relay		
Output method	NPN	PNP	NPN
Power supply voltage	10 to 28VDC		
Load voltage	30VDC or less		
Load current	100mA or less		50mA or less
Current consumption	10 mA or less at 24 VDC	10 mA or less at 24 VDC	10 mA or less at 24 VDC
Internal voltage drop	0.5V or less		
Indicator	Red LED (Lights up when turned on)	Yellow LED (Lights up when turned on)	Red/green LED (Lights up when turned on)
Leakage current	10 μA or less		
Lead wire Note 1	Standard is 1 m (Oil-resistant vinyl cabtyre 3 core cord, 0.2 mm^2)		Standard is 1 m (Oil-resistant vinyl cabtyre 3 core cord, 0.3 mm^2)
Shock resistance	980m/s^2		
Insulation resistance	20 MΩ or more with 500 VDC megger		100 MΩ or more with 500 VDC megger
Withstand voltage	No abnormality after applying 1000 VAC for one minute		
Ambient temperature	−10°C to 60°C		
Degree of protection	IP 67 (IEC standard), JIS C 0920 (watertight), oil-resistant		

Descriptions	Proximity 2-wire type	
	2-color display for AC magnetic field	
	T2YD	T2YDT
Applications	Only for programmable controller	
Load voltage	24VDC±10%	
Load current	5mA to 20mA	
Internal voltage drop	6V or less	
Indicator	Red/green LED (Lights up when turned on)	
Leakage current	1.0mA or less	
Output delay time (Delay ON, delay OFF)Note 3	60ms or less	
Lead wire Note 1	Standard is 1 m (Oil-resistant vinyl cabtyre 2 core cord, 0.5 mm^2)	Standard is 1 m (Flame-resistant vinyl cabtyre 2 core cord, 0.5 mm^2)
Shock resistance	980m/s^2	
Insulation resistance	100 MΩ or more with 500 VDC megger	
Withstand voltage	No abnormality after applying 1000 VAC for one minute	
Ambient temperature	−10°C to 60°C	
Degree of protection	IP 67 (IEC standard), JIS C 0920 (watertight), oil-resistant	

Descriptions	Proximity 2,3-wire type	
	T2WH/V	T3WH/V
Applications	Only for programmable controller	For programmable controller, relay
Power supply voltage	—	10 to 28VDC
Load voltage	24VDC±10%	30VDC or less
Load current	5mA to 20mA Note 2	50mA or less
Current consumption	—	10 mA or less at 24 VDC
Internal voltage drop	4V or less	0.5V or less
Indicator	Red/green LED (Lights up when turned on)	
Leakage current	1mA or less	10 μA or less
Lead wire Note 1	Standard is 1 m (Oil-resistant vinyl cabtyre 2 core cord, 0.2 mm^2)	Standard is 1 m (Oil-resistant vinyl cabtyre 3 core cord, 0.2 mm^2)
Shock resistance	980m/s^2	
Insulation resistance	20 MΩ or more with 500 VDC megger	
Withstand voltage	No abnormality after applying 1000 VAC for one minute	
Ambient temperature	−10°C to 60°C	
Degree of protection	IP 67 (IEC standard), JIS C 0920 (watertight), oil-resistant	

Descriptions	Proximity 2-wire type
	T2HR3,T2VR3(Bend resist lead wire)
Applications	Only for programmable controller
Power supply voltage	—
Load voltage	10 to 30VDC
Load current	5mA to 20mA Note 2
Current consumption	—
Internal voltage drop	4V or less
Indicator	Red LED (Lights up when turned on)
Leakage current	1mA or less
Lead wire Note 1	Standard is 3m (Elasticity, oilresistantvinyl cabtyre cable2-conductor 0.2 mm^2)
Shock resistance	980m/s^2
Insulation resistance	20 MΩ or more with 500 VDC megger
Withstand voltage	No abnormality after applying 1000 VAC for one minute
Ambient temperature	−10°C to 60°C
Degree of protection	IP 67 (IEC standard), JIS C 0920 (watertight), oil-resistant

Descriptions	Proximity 2-wire type		Proximity 3-wire type	
	1-color display	2-color display	1-color display	2-color display
	F2S/H/V	F2YH/V	F3S/H/V	F3YH/V
Applications	Only for programmable controller		For programmable controller, relay	
Power supply voltage	—		10 to 28VDC	
Load voltage	10 to 30VDC	24VDC±10%	30VDC or less	
Load current	5 to 20mA Note 2		50 mA or less	
Current consumption	—		10 mA or less at 24 VDC	
Internal voltage drop	4V or less		0.5V or less	
Indicator	Yellow LED (Lights up when turned on) Note 4	Red/green LED (Lights up when turned on)	Yellow LED (Lights up when turned on) Note 4	Red/green LED (Lights up when turned on)
Leakage current	1 mA or less		10 μA or less	
Lead wire Note 1	Standard is 1 m (Elasticity,Oil-resistant vinyl cabtyre 2 core cord, 0.15 mm^2)		Standard is 1 m (Elasticity,Oil-resistant vinyl cabtyre 3 core cord, 0.15 mm^2)	
Shock resistance	980m/s^2			
Insulation resistance	20 MΩ or more with 500 VDC megger			
Withstand voltage	No abnormality after applying 1000 VAC for one minute			
Ambient temperature	−10°C to 60°C			
Degree of protection	IP 67 (IEC standard), JIS C 0920 (watertight), oil-resistant			

Descriptions	Proximity 3-wire type
	F3PH/V
Applications	For programmable controller, relay
Power supply voltage	4.5 to 28VDC
Load voltage	30VDC or less
Load current	50mA or less
Current consumption	10 mA or less at 24 VDC
Internal voltage drop	0.5V or less at 30mA
Indicator	Yellow LED(Lights up when turned on)
Leakage current	10μA or less
Lead wire Note 1	Standard is 1 m (Elasticity,Oil-resistant vinyl cabtyre 3 core cord, 0.15 mm^2)
Shock resistance	980m/s^2
Insulation resistance	20 MΩ or more with 500 VDC megger
Withstand voltage	No abnormality after applying 1000 VAC for one minute
Ambient temperature	−10°C to 60°C
Degree of protection	IP 67 (IEC standard), JIS C 0920 (watertight), oil-resistant

Note 1: 3 m and 5 m lead wires are available as options. (Except 5m of F type switch)
Note 2: The maximum load current of 20 mA is the value when the ambient temperature is 25°C.
The current will be lower than 20 mA when the ambient temperature of the switch is higher than 25°C (5 mA to 10 mA at 60°C).
Note 3: Indicates the time from magnetic sensor detection of the piston magnet until switch output.
Note 4: The indicator is red LED for F2S and F3S.
Note 5: Switches for P4 * series have different order model numbers from the standard ones.
Please refer to "Equipment related to rechargeable batteries P4* Series"(No.CC-1226A).
※ "T□H" / "F□H" show Lead wire straight type, as well as "T□V" / "F□V" show Lead wire angled type.

2. INSTALLATION

2.1 Environment

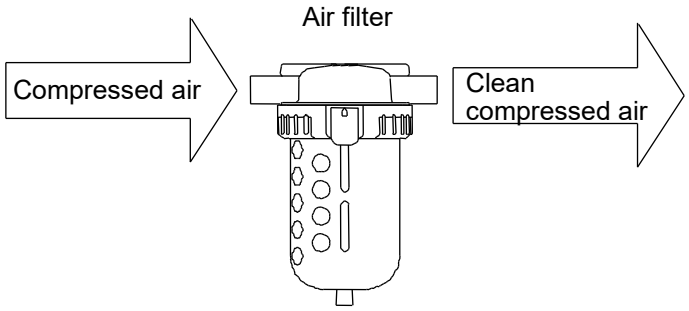
⚠CAUTION

When using the product in a cutting, casting, or welding plant, install a cover to prevent foreign matters such as cutting fluid, chips, powder, and dust from entering.

Do not use the equipment in the following environments.

- Where cutting oil can splash onto the product (abrasives and polishing powder in the oil can abrade the sliding section)
- Where organic solvents, chemicals, acids, alkalis, and kerosene are present
- Where water can splash onto the product

- Use the product within the following ambient temperature range.
  −10°C to 60°C (no freezing)
- For compressed air, use clean and dry air that has been passed through an air filter.
  Use an air filter in the circuit and be careful with the filtration rate (a filter that removes particles exceeding 5 μm is desirable), flow rate, and mounting position (install the filter near the directional control valve).



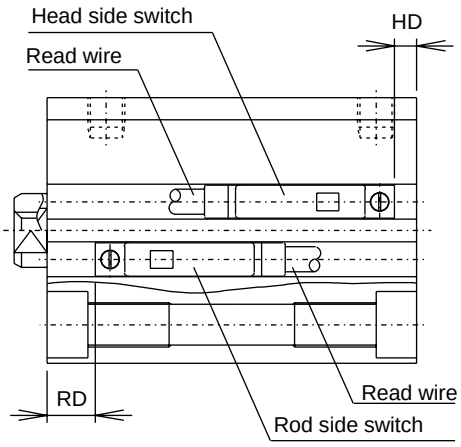
2.2 Unpacking

- Check that the model number ordered and the model number indicated on the product are the same.
- Check the exterior of the product for any damage.
- When storing the product, take proper measures to prevent foreign matters from entering the cylinder.

2.3 Mounting

2.3.1 Mounting the Switch

■ Mounting position



< Mounting the switch at the stroke end >
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 maximum sensitive position.

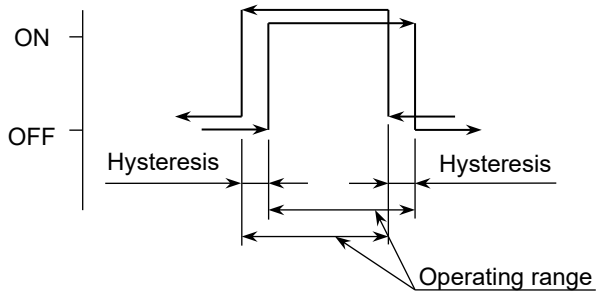
< Mounting the switch at the intermediate position of the stroke >
For the switch to function at an intermediate position of the stroke, secure the piston at the position where the switch needs to function and then slide the switch on the piston back and forth to find the positions where the switch turns on when slid forward and when slid backward. The intermediate point between these two positions is where the switch functions at maximum sensitivity for that piston position and where the switch is to be mounted.

■ Operating range

This is the range from where the switch is turned on when the piston moves and to where the switch is turned off when the piston moves farther in the same direction.

■ Hysteresis

This is the distance from where the switch is turned on when the piston moves and to where the switch is turned off when the piston moves in the opposite direction.



■ The maximum sensitivity position (HD,RD),Operating range,Hysteresis (unit：mm)

Proximity switch (T2H/V,T3H/V,T2HR3,T2VR3,T3PH/V)				
Bore size (mm)	The maximum sensitivity position		Operating range	Hysteresis
	HD(mm)	RD(mm)		
φ12	1.5	1.5	1.5 to 5.5	1.5 or less
φ16	0	4.5	1.5 to 4.5	
φ20	3	7.5	3 to 8	
φ25	4	9.5	3 to 9	
φ32	4	9.5	3 to 8	
φ40	7	12	3 to 9	

Proximity switch (T2WH/V,T3WH/V)				
Bore size (mm)	The maximum sensitivity position		Operating range	Hysteresis
	HD(mm)	RD(mm)		
φ12	3.5	3.5	3 to 6	1.0 or less
φ16	1	6	3 to 7	
φ20	5	9.5	4.5 to 8	
φ25	6	11.5	4.5 to 8	
φ32	6	11.5	4.5 to 8	
φ40	8.5	13.5	5 to 8.5	

Proximity switch (T2YH/V,T3YH/V,T2JH/V,T2YD,T2YDT,T1H/V)						
Bore size (mm)	The maximum sensitivity position		Operating range		Hysteresis	
	HD(mm)	RD(mm)	1-color display	2-color display	1-color display	2-color display
φ20	2	6.5	3 to 8	4.5 to 8	1.5 or less	1.0 or less
φ25	3	8.5	3 to 9	4.5 to 8		
φ32	3.5	8.5	3 to 8	4.5 to 8		
φ40	5.5	10.5	3 to 9	5 to 8.5		

Reed switch (T0H/V,T5H/V,T8H/V)						
Bore size (mm)	The maximum sensitivity position				Operating range	Hysteresis
	HD(mm)		RD(mm)			
	T0H/V T5H/V	T8H/V	T0H/V T5H/V	T8H/V		
φ12	1.5	-	1.5	-	5 to 8	3 or less
φ16	0	-	4	-	4 to 9	
φ20	3	-	7.5	-	6 to 14	
φ25	4	-	9.5	-	5 to 14	
φ32	4	-	9.5	-	5 to 12	
φ40	7	1	12	6	6 to 14	

Proximity switch（F2S/H/V,F3S/H/V,F2YH/V,F3YH/V,F3PH/V）						
Bore size (mm)	The maximum sensitivity position		Operating range		Hysteresis	
	HD(mm)	RD(mm)	1-color display	2-color display	1-color display	2-color display
φ20	7.5(6.5)	12(11)	4.5	4.5 to 5.5	1.0 or less	
φ25	8.5(7.5)	14(13)				

Note:1 Switches for P4 * series have different order model numbers from the standard ones.
Please refer to "Equipment related to rechargeable batteries P4* Series"(No.CC-1226A).

※ Values in ( ) are for F2/3S.

※ The HD and RD dimensions for 5 strokes differ from the actual dimensions depending on the setting.

2.3.2 Changing the position of the switch

1. Loosen the fastening screw (set screw).
2. Move the switch body along the groove on the side of the body and then tighten the screw at the predetermined position.

2.3.3 Replacing the switch

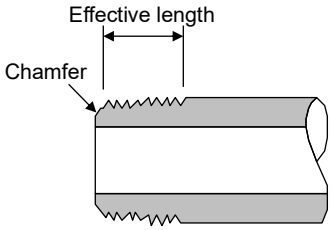
1. Loosen the fastening screw (set screw) and remove the switch body from the groove.
2. Put the replacement switch into the groove.
3. Determine where to position the switch and tighten the screw.
(Tightening torque is 0.1 to 0.2N·m for T0, T5, T2, T3, T2W, T3W, T3P, T2HR, T2VR and 0.03 to 0.08 N·m for F2, F3, F3P, F2Y, F3Y. In the case of T8, T1, T2Y, T3Y, T2YD, T2J, it is 0.5 to 0.7 N·m.)

2.4 Piping

⚠ WARNING

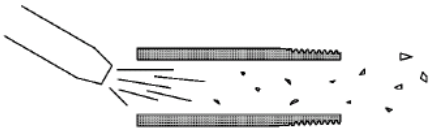
Insert the tube into the fitting until it firmly rests on the tube end and make sure that the tube does not come off before use.

- Use pipes that are made of corrosion-resistant materials after the filter such as zinc-plated pipes, nylon tubes, and rubber tubes.
- Use pipes with an effective cross-sectional area that allows the cylinder to achieve the predetermined piston speed.
- Install the filter for removing rust, foreign matters, and drainage from the piping as close as possible to the solenoid valve.
- Observe the effective thread length for the gas pipes.
- In addition, chamfer the threaded end of the pipes by about a 1/2 pitch.



■ Pipe cleaning

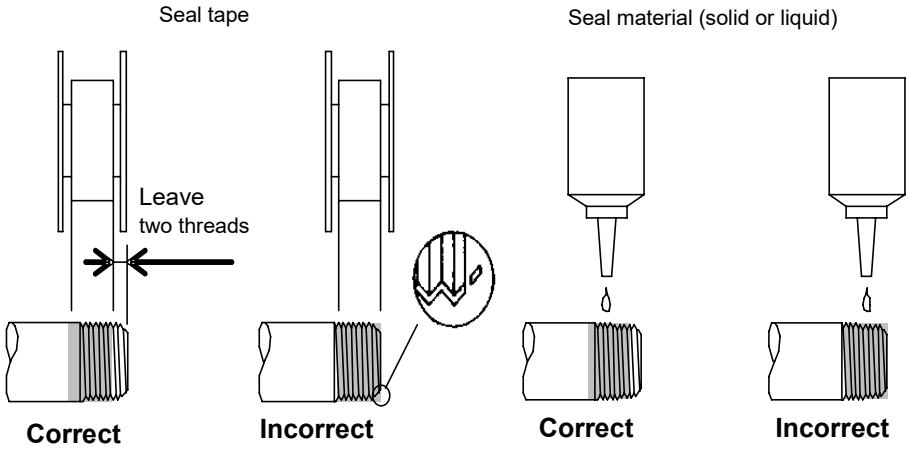
Before piping, blow air into the pipes to clean the interior and to remove cutting chips and foreign matters.



■ Seal material

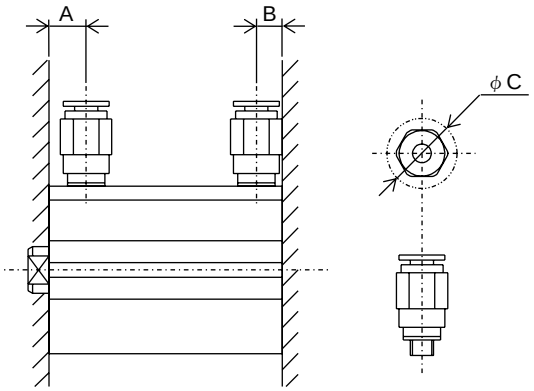
Use a seal tape or a seal material to stop leakage from piping.
Apply a seal tape or seal material to the screw threads leaving two or more threads at the pipe end uncovered or uncoated. If the pipe end is fully covered or coated, a shred of seal tape or residue of seal material may enter inside of the pipes or device and cause a failure.

When using a seal tape, wind it around the screw threads in the direction opposite from the screw threads and press it down with your fingers to attach it firmly.
When using a liquid seal material, be careful not to apply it to resin parts. The resin parts can become damaged and this may lead to a failure or malfunction.
Also, do not apply seal material to the internal threads.



2.4.1 Piping joint

Because the usable piping joint has limitations, for using it, see the note below.



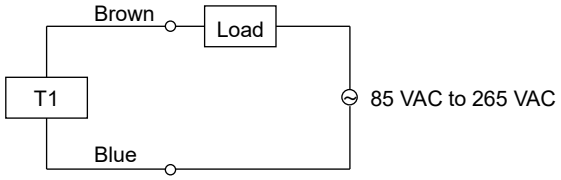
Descriptions / Bore size (mm)	Port size	Port size A	Port size B	Applicable joints	Joint OD φC	Unusable joints
φ12	M5	5.5	5.5	SC3W-M5-4 SC3W-M5-6 GWS4-M5-S GWS4-M5 GWL4-M5 GWL6-M5	φ11 or less	GWS6-M5
φ16						
φ20		8	5.5			
φ25		11	6			
φ32	Rc1/8	8	8	SC3W-6-4,6,8 GWS4-6 GWS6-6 GWS8-6 GWL4-6 GWL6-6	φ15 or less	GWS10-6 GWL8-6 GWL10-6
φ40		12	8.5			

2.5 Wiring

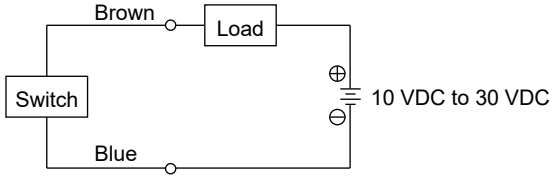
2.5.1 Proximity switch

■ Connection of lead wires

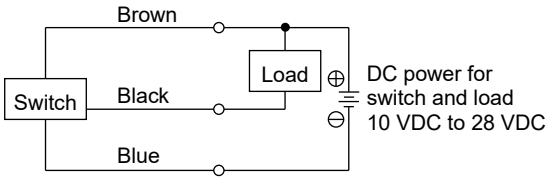
Turn off the power to the device in the electric circuit to which the switch is to be connected and connect the lead wires according to their color. Not turning off the power may cause damage to the electric circuit of the switch load.
If the switch is not wired correctly or the load is short-circuited, it may cause damage not only to the switch but also to the electric circuit on the load side.



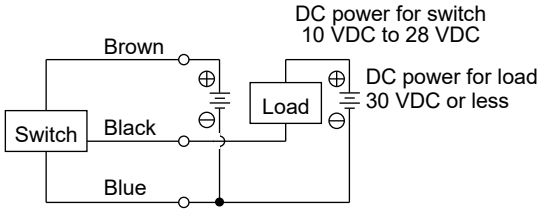
Example of T1 basic circuit



Example of 2-wire basic circuit



Example of 3-wire basic circuit (1)
(When same power is used for switch and load)

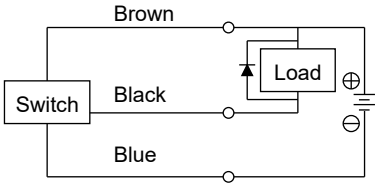


Example of 3-wire basic circuit (2)
(When separate power is used for switch and load)

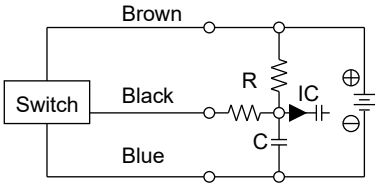
■ Protection of the output circuit

For the following cases, refer to the figures below and install a protection circuit:

- When an inductive load (relay or solenoid valve) is connected and used: See Ex. 1
  Use a surge absorption element since a surge voltage is generated when the switch is turned off.
- When a capacious load (capacitor) is connected and used: See Ex. 2
  Use a current regulating resistor since a starting current is generated when the switch is turned on.
- When the lead wire length exceeds 10 m: See Ex. 3 and 4 (2-wire type), Ex. 5 (3-wire type)

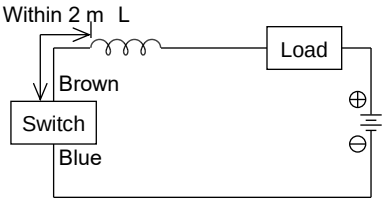


Ex. 1 Using inductive load with surge absorption element (diode). (For diode, use V06C manufactured by Hitachi or equivalent.)



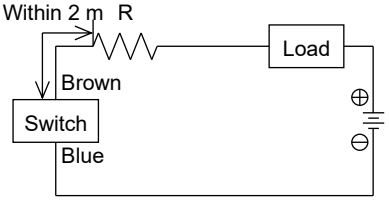
Ex. 2 Using capacious load with current regulating resistor R.
Use the following formula to figure out resistance R (Ω).

$$\frac{V}{0.05} = R\ (\Omega)$$



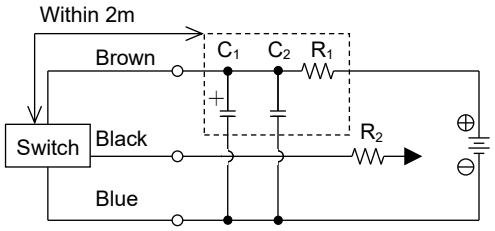
Ex. 3 - Choke coil
L = Several hundred μH to several mH
Excellent high frequency characteristic

- Wire near the switch (within 2 m).



Ex. 4 - Starting current restriction resistor
R = Highest possible resistance for the load circuit.

- Wire near the switch (within 2 m).



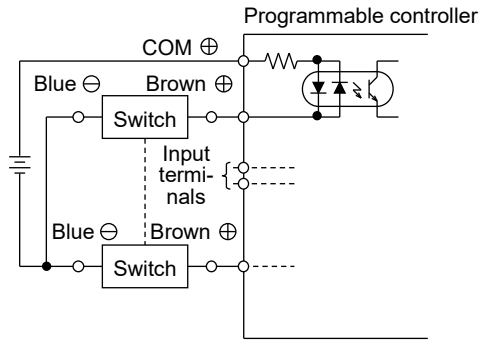
Ex. 5 - Power supply noise absorption circuit
C_1=20 μF to 50 μF electrolytic capacitor
(withstand voltage 50V or more)
C_2=0.01 μF to 0.1 μF ceramic capacitor
R_1=20 Ω to 30 Ω

- Starting current restriction resistor
R_2= Highest possible resistance for the load circuit.

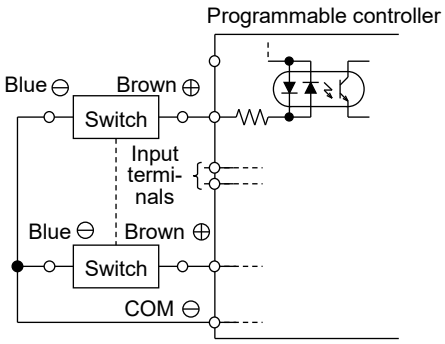
- Wire near the switch (within 2 m)

■ Connection to the programmable controller

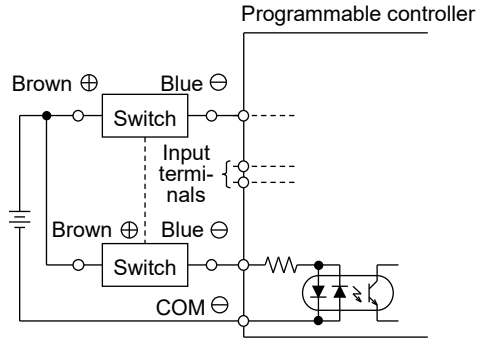
The connection method depends on the type of the programmable controller. Connect as shown below.



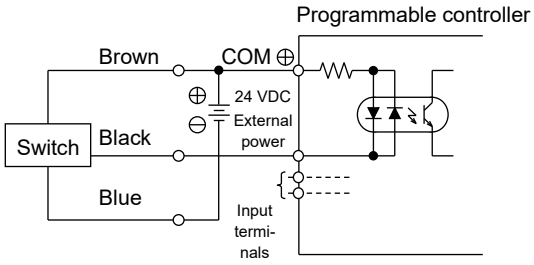
2-wire connection to source input
(external power)



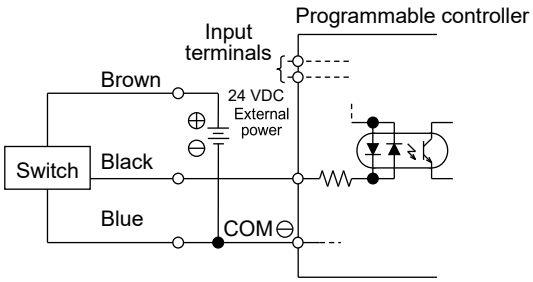
2-wire connection to source input
(internal power)



2-wire connection to sink input
(external power)



3-wire connection to source input
(external power)



3-wire connection to source input
(internal power)

■ Parallel connection

Since the leakage current of a 2-wire type switch increases according to the number of connected units, check the input specifications of the programmable controller, which is a connected load, to determine the number of switches to connect. For the 2-wire type switch, the indicator may become dim or not light up.

Although the leakage current of a 3-wire type switch increases according to the number of connected units, the leakage current is very small (10 μA or less) and can generally be ignored. For the 3-wire type switch, the indicator will light up without dimming.

2.5.2 Reed switch

■ Connection of lead wires

Do not connect the lead wire of the switch to the power directly. Make sure that the lead wire and the load are connected in serial.
For T0 switches, observe the following instructions as well:

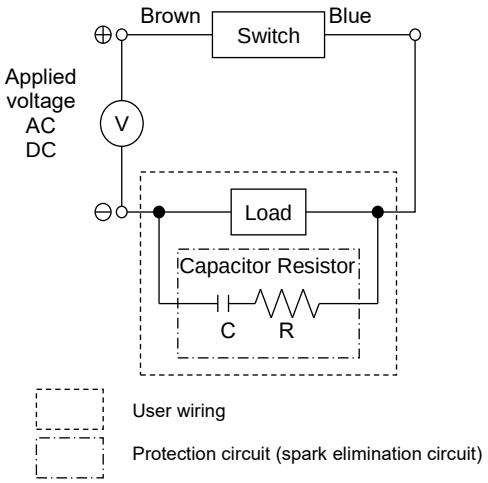
- When the switch is used with DC power, connect the brown wire to the positive side and the blue wire to the negative side. If the polarity of the connection of wires is reversed, the switch will turn on but the indicator will not light up.
- When the switch is connected to the input of a relay or a programmable controller for AC power and the half-wave rectification is performed in those circuits, the indicator on the switch may not light up. In that case, reversing the polarity of the connection of the lead wires of the switch will light up the indicator.

■ Contact protection measures

When the switch is used with an inductive load such as a relay or when the wiring length exceeds the value shown in the table to the right, install a contact protection circuit.

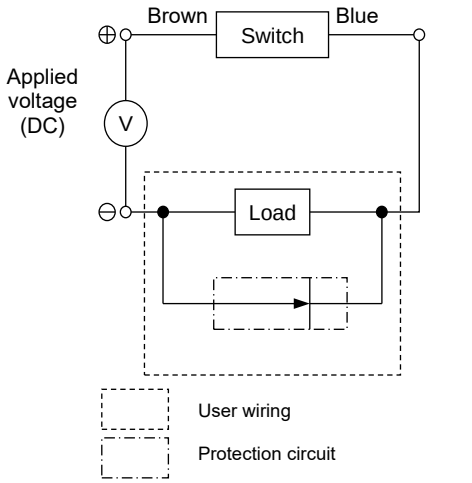
Power	Wiring length
DC	50 m
AC	10 m

<Protection when connecting an inductive load>



Recommended value
C (Capacitor) 0.033 μF to 0.1 μF
R (Resistor)1 kΩ to 3 kΩ
XEB1K1 manufactured by Okaya Electric Industries or equivalent

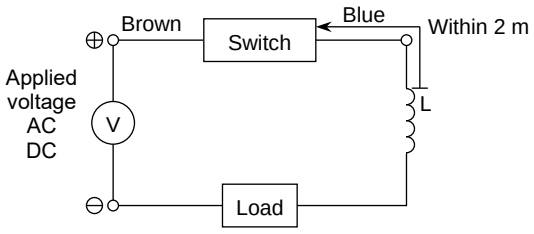
When capacitor and resistor are used



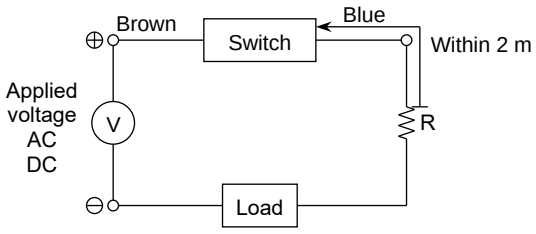
Rectifying diode for general use
V06C manufactured by Hitachi or equivalent

When diode is used

<Protection when the wiring length exceeds the value shown in the table above>



- Choke coil
  L = Several hundred μH to several mH
  Excellent high frequency characteristic
- Wire near the switch (within 2 m).



- Starting current restriction resistor
  R = Highest possible resistance for the load circuit
- Wire near the switch (within 2 m).

■ Contact capacity

Do not use a load that exceeds the maximum contact capacity of the switch. If the current falls below the rated current value, the indicator may not light up.

■ Relay

Use one of the following or equivalent relays:
- Omron Corporation ·····MY type
- Fuji Electric Co., Ltd. ·····HH5 type
- Panasonic Corporation ·····HC type

■ Serial connection

The voltage drop of multiple T0 switches connected in serial is the sum of the voltage drop of all switches.
The indicator will light up only when all the switches turn on.

■ Parallel connection

There is no limitation on the number of units that can be connected in parallel. However, the indicator may become dim or not light up for T0 switches.

3. USAGE

3.1 Using the Cylinder

■ Working pressure range

Use the cylinder within the following pressure range:

Model	Pressure range
SSD2-HP1	0.1 to 1.0

■ How to adjust the cushion

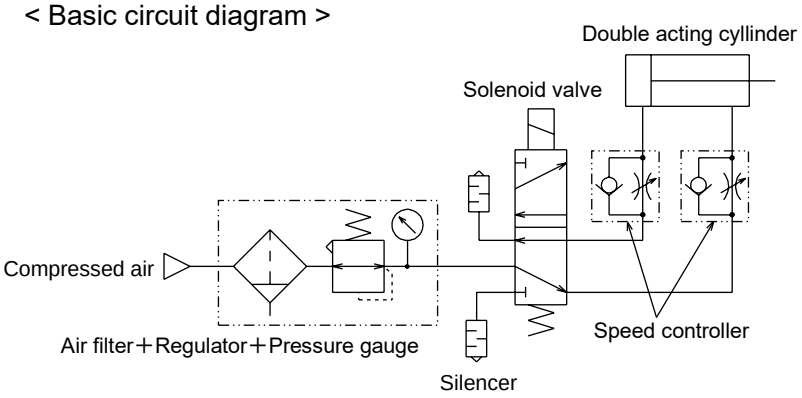
It is advisable to install an additional external stopper when the kinetic energy is excessive. Tolerable kinetic energy is as the graphs below indicate.

Bore size(mm)	φ12	φ16	φ20	φ25	φ32	φ40
Allowable energy absorption (J)	0.004	0.01	0.016	0.021	0.025	0.092

■ Adjustment of the piston speed

Mount a speed controller to adjust the piston speed.

< Basic circuit diagram >

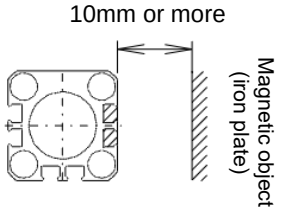


3.2 Using the Switch

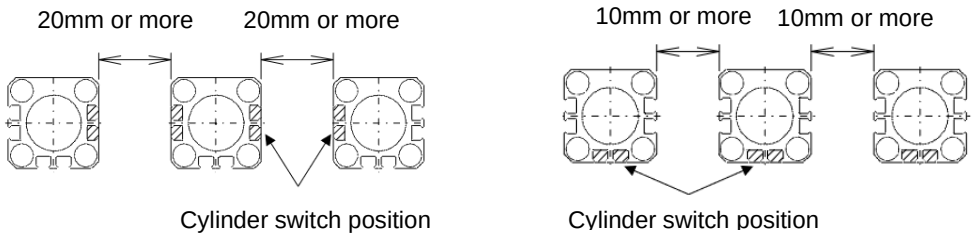
■ Magnetic environment

Do not use the switch in a place where there is a strong magnetic field or large current (such as a large magnet or welding machine). If switch mounted cylinders are installed close to each other and in parallel or if magnetic substances are moving close to the cylinder, the magnetic forces may interfere with each other and affect the detection accuracy.

- The cylinder switch may malfunction if there is a magnetic object such as a steel plate installed nearby. Make sure that there is a distance of at least 10 mm between the magnetic object and the surface of the cylinder.



- The cylinder switch may malfunction if the cylinder units are placed adjacently. Make sure to provide the following distance between each unit.



■ Wiring of lead wires

When wiring, be careful not to apply bending stress and tension repeatedly to lead wires.
For movable sections, use wiring material with the same level of bending resistance as the robot wire.

■ Ambient temperature

Do not use the switch in a high temperature environment (60°C or more).
Using the switch in a high temperature environment may affect its performance due to the temperature characteristics of magnetic parts and electronic parts.

■ Intermediate position detection

When the switch is operated at an intermediate position in the length of the stroke, the relay will not respond if the piston speed is too high.
If the operation time of the relay is 20 ms, keep the piston speed at 500 mm/s or less.

■ Shock

Do not subject the product to strong vibrations and shocks when transporting the cylinder and mounting and adjusting the switch.

4. MAINTENANCE AND INSPECTION

⚠ WARNING

Do not touch electrical wiring connections (bare live parts) of actuators equipped with switches, and other such actuators.

Do not touch live parts with bare hands.

An electric shock may occur.

Turn off the power, release the residual pressure and make sure that there is no residual pressure before disassembling or inspecting the actuator.

⚠ CAUTION

Plan and perform daily and periodic inspections so that maintenance can be managed properly.

If maintenance is not properly managed, the product's functions may deteriorate significantly and this may lead to faults (such as short service life, damage, and malfunction) or accidents.

4.1 Periodic Inspection

In order to use the product under optimum conditions, perform a periodic inspection once or twice a year.

4.1.1 Inspection item

- Actuation state
- Change in the piston speed and cycle time
- External and internal leakages
- Damage and deformation of the piston rod
- Stroke abnormality

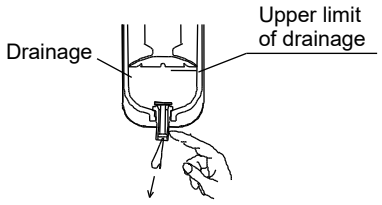
Check the items above and refer to "5. TROUBLESHOOTING" to correct any abnormality found. If there are loose threaded connections, tighten them.

4.1.2 Maintenance of the product

This cylinder does not require lubrication.

4.1.3 Maintenance of the circuit

- Discharge the drainage accumulated in the air filter periodically before it exceeds the specified line.
- Since foreign matters such as carbide (carbon or tar substance) from the compressor oil may contaminate the circuit and cause an operation fault of the solenoid valve or the cylinder, be careful when performing maintenance or inspection of the compressor.



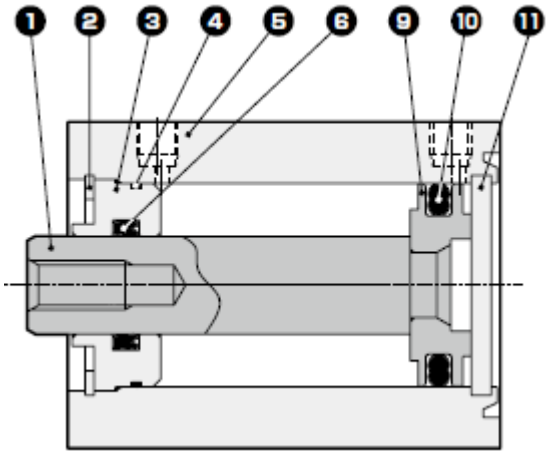
4.2 Disassembly method,Assembly method

If any failure occurs such as air leakage, disassemble the product, referring to the internal structural diagram, and exchange the parts in the consumable parts list.

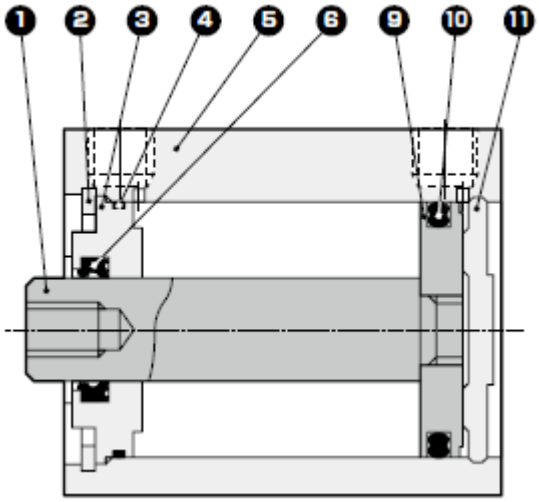
- Remove piston rod and rod metal after removing C type snap ring for the purpose of disassembly.
- Use appropriate pliers (C type snap ring mounting tool) to install and remove rod metal. Even in cases when appropriate pliers (C type snap ring mounting tool) are used, be careful as the snap ring may pop out at the tip of the pliers (C type snap ring mounting tool) and cause physical or equipment damage.
- Follow reverse steps of disassembling during the process of assembling after cleaning parts.Carefully avoid giving damage to packings to prevent malfunction or air leakage.
- When mounting the unit, be sure that the unit fits securely into the C type snap ring groove.

4.2.1 Internal structural diagram

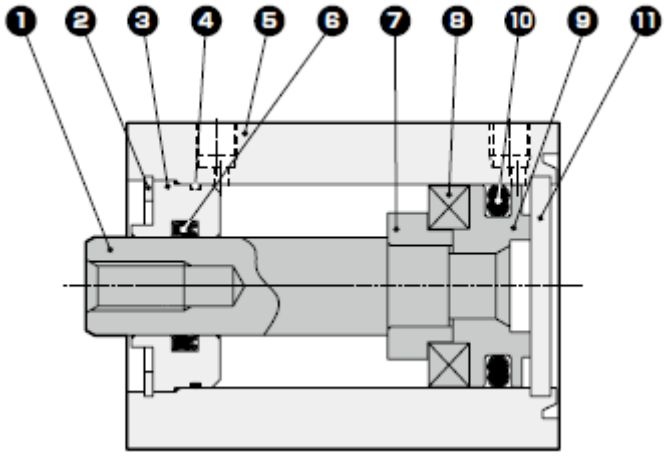
<φ12 to 25：Double acting >



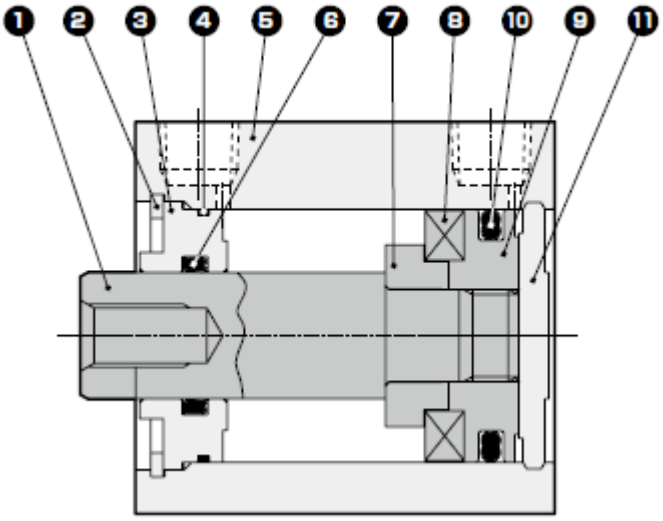
<φ32,40：Double acting >



<φ12 to 25：Double acting with switch >



<φ32,40：Double acting with switch >



Parts list

No.	Part name	Material	Remarks
1	Piston rod	Stainless steel (φ12 to 25) Steel (φ32 to 40)	Industrial chrome plating
2	C type snap ring	Steel	Zinc phosphate
3	Rod metal	Special aluminum	Alumite
4	Rod metal gasket	NBR	
5	Cylinder body	Aluminum alloy	Hard alumite
6	Rod packing	NBR	
7	Spacer	Aluminum alloy	Chromate (φ12 to 32)
8	Magnet	Plastic	
9	Piston	Aluminum alloy	Chromate
10	Piston packing	NBR	
11	Cover	Stainless steel (φ12 to 25) Aluminum alloy (φ32 to 40)	Alumite (φ32 to 40)

Note 1:The above is the parts list of HP1 series.
For P4 series, the use of copper, zinc, nickel-based materials and electrolytic nickel plating is limited in the construction of the flow path parts and sliding parts.
For 40 series, the use of copper, zinc, nickel-based materials, zinc plating and electrolytic nickel plating is limited in the construction of all parts.

Consumable parts list

Bore size (mm)	Kit no.	Remarks
φ12	SSD2-12K-HP1	Part no.4,6,10
φ16	SSD2-16K-HP1	
φ20	SSD2-20K-HP1	
φ25	SSD2-25K-HP1	
φ32	SSD2-32K-HP1	
φ40	SSD2-40K-HP1	

5. TROUBLESHOOTING

5.1 Problems, Causes, and Solutions

If the product does not operate properly, check the table below for a possible solution.

5.1.1 Cylinder

Problem	Cause	Solution
Does not operate.	No pressure or insufficient pressure is applied.	Secure sufficient pressure.
	No signal is input to directional control valve.	Repair the control circuit.
	Centers were not aligned when mounted.	Correct the way the cylinder is mounted. Change the mounting style.
	Piston packing is damaged.	Replace the cylinder.
Does not operate smoothly.	Speed is lower than minimum working piston speed.	Mitigate load fluctuation.
	Centers were not aligned when mounted.	Correct the way the cylinder is mounted. Change the mounting style.
	Lateral load is applied.	Install a guide. Correct the way the cylinder is mounted. Change the mounting style.
	Load is too large.	Increase the pressure. Enlarge the bore size.
	Speed control valve has meter-in circuit.	Change the mounting direction of the speed control valve.
Cylinder is damaged or deformed.	Force of shock due to high-speed actuation is excessive.	Decrease the speed. Lighten the load. Install a more effective cushion mechanism. (external cushion mechanism)
	Lateral load is applied.	Install a guide. Correct the way the cylinder is mounted. Change the mounting style.

5.1.2 Switch

Problem	Cause	Solution
Switch turns on but indicator does not blink.	Contact is welded.	Replace the switch.
	Rating of load is exceeded.	Replace the relay with one recommended by CKD or replace the switch.
	Indicator is damaged.	Replace the switch.
	External signal is faulty.	Check the external circuit.
Switch does not turn on.	Cables are disconnected.	Replace the switch.
	External signal is faulty.	Check the external circuit.
	Voltage is wrong.	Use specified voltage.
	Switch is not mounted in right place.	Mount the switch in right place.
	Switch is not positioned correctly.	Position and tighten the switch correctly.
	Switch is facing opposite direction.	Mount the switch so that it faces the correct direction.
	Load (relay) cannot respond for intermediate position detection.	Lower the speed. Replace the relay with one recommended by CKD.
	Rating of load is exceeded.	Replace the relay with one recommended by CKD or replace the switch.
Switch does not turn off.	Piston is not moving.	Move the piston.
	Contact is welded.	Replace the switch.
	Rating of relay is exceeded.	Replace the relay with one recommended by CKD or replace the switch.
	Ambient temperature is too high or too low.	Use the switch at an ambient temperature of −10°C to 60°C.
	Magnetic field is nearby.	Install a magnetic shield.
	External signal is faulty.	Check the external circuit.

If you have any other questions or concerns, contact your nearest CKD sales office or distributor.

6. WARRANTY PROVISIONS

6.1 Warranty Conditions

■ Warranty coverage

If the product specified herein fails for reasons attributable to CKD within the warranty period specified below, CKD will promptly provide a replacement for the faulty product or a part thereof or repair the faulty product at one of CKD's facilities free of charge.
However, following failures are excluded from this warranty:

- Failure caused by handling or use of the product under conditions and in environments not conforming to those stated in the catalog, the Specifications, or this Instruction Manual.
- Failure caused by incorrect use such as careless handling or improper management.
- Failure not caused by the product.
- Failure caused by use not intended for the product.
- Failure caused by modifications/alterations or repairs not carried out by CKD.
- Failure that could have been avoided if the customer's machinery or device, into which the product is incorporated, had functions and structures generally provided in the industry.
- Failure caused by reasons unforeseen at the level of technology available at the time of delivery.
- Failure caused by acts of nature and disasters beyond control of CKD.

The warranty stated herein covers only the delivered product itself. Any loss or damage induced by failure of the delivered product is excluded from this warranty.

■ Confirmation of product compatibility

It is the responsibility of the customer to confirm compatibility of the product with any system, machinery, or device used by the customer.

■ Others

The terms and conditions of this warranty stipulate basic matters.
When the terms and conditions of the warranty described in individual specification drawings or the Specifications are different from those of this warranty, the specification drawings or the Specifications shall have a higher priority.

6.2 Warranty Period

The product is warranted for one (1) year from the date of delivery to the location specified by the customer.