CKD

Guided Cylinder

STM-HP1 Series

INSTRUCTION MANUAL

SM-A42802-A/2

- 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 **"STM-HP1 Series "Guided 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 : STM-HP1 series**

Without switch (built-in magnet for switch)

STM - M - 10 - 15 ——— A - HP1

With switch (built-in magnet for switch)

STM - M - 10 - 15 - F2V - D - A - HP1

Ⓐ Bearing

Ⓑ Bore size

Ⓒ Stroke length

Ⓓ Switch model No. *1

Ⓔ Switch quantity

Ⓕ Option

Code	Description
Ⓐ Bearing	
M	Metal bush bearing
B	Ball bearing
Ⓑ Bore size (mm)	
6	ø6
10	ø10

Ⓒ Stroke length (mm)

		Bore size	
		6	10
5	5	●	●
10	10	●	●
15	15	●	●
20	20		●

Ⓓ Switch model No.

Lead wire Straight	Lead wire Radial	Contact	Voltage AC	Voltage DC	Display	Lead wire
-	F2S*	Proximity		●	1-color display	2-wire
F2H*	F2V*			●		
-	F3S*			●		3-wire
F3H*	F3V*			●		
F3PH*	F3PV*			●	1-color display (PNP output) (made to order)	3-wire
F2YH*	F2YV*			●	2-color display	2-wire
F3YH*	F3YV*			●		3-wire

* Lead wire length	
Blank	1 m (standard)
3	3 m (option)
Ⓔ Switch quantity	
R	1 on rod side
H	1 on head side
D	2
Ⓕ Option	
A	Side mounting
R	Rear piping

Note1: When using a 2-color display proximity switch for STM-B-6, avoid mounting the cylinder on a magnetic substance such as a metal plate. This could lead to switch detection malfunction.

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

Without switch (built-in magnet for switch)

STM - M - 10 - 15 —— A - P4 / P40 - HP1

With switch (built-in magnet for switch)

STM - M - 10 - 15 - SW83 - D - A - P4 / P40 - HP1

Ⓐ Bearing

Ⓑ Bore size

Ⓒ Stroke

Ⓓ Switch model No. *1

Ⓔ Switch quantity

Ⓕ Option

Code	Item
Ⓐ Bearing	
M	Metal bush bearing
B	Ball bearing
Ⓑ Bore size (mm)	
6	ø6
10	ø10

Ⓒ Stroke (mm)

		Bore size	
		6	10
5	5	●	●
10	10	●	●
15	15	●	●
20	20		●

Ⓓ Switch model No.

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

Code	Item
Ⓔ Switch quantity	
R	1 on rod side
H	1 on head side
D	2
Ⓕ Option	
A	Side mounting
R	Rear piping

Note1: When using a 2-color display proximity switch for STM-B-6, avoid mounting the cylinder on a magnetic substance such as a metal plate. This could lead to switch detection malfunction.

■ Stroke length

Bore size	Standard stroke length (mm)	Max. stroke length (mm)	Min. stroke length	Min. stroke with switch
φ6	5·10·15	15	5	5
φ10	5·10·15·20	20		

※ Products other than standard stroke length are made to order.

1.2 Specifications

1.2.1 Product specifications

Descriptions \ Model		STM-M/B-HP1 STM-M/B-P4※-HP1	
Bore size	mm	φ6	φ10
Actuation		Double acting	
Working fluid		Compressed air	
Max. working pressure	MPa	0.7	
Min. working pressure	MPa	0.15	
Proof pressure	MPa	1.05	
Ambient temperature	°C	-10 to 60 (no freezing)	
Port size		M3	
Stroke tolerance	mm	$^{+1.5}_{0}$	
Working piston speed	mm/s	50 to 500	
Cushion		With rubber cushion	
Lubrication		Not required	
Allowable absorbed energy	J	0.008	0.054

1.2.2 Switch specifications

Descriptions	Proximity			
	2-wire type		3-wire type	
	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%	30 VDC 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 Note 3 (Lights up when turned on)	Red/green LED (Lights up when turned on)	Yellow LED Note 3 (Lights up when turned on)	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	30 VDC or less
Load current	50mA or less
Current consumption	10 mA or less at 24 VDC
Internal voltage drop	0.5 V or less at 30 mA
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: The indicator is red LED for F2S and F3S.
Note 4: 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).
※ "F□H" show Lead wire straight type, as well as "F□V" show Lead wire angled type.

2. INSTALLATION

2.1 Environment

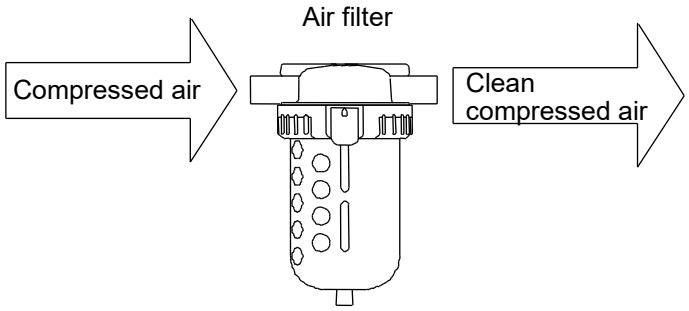
⚠CAUTION

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).



- Since the STM-M uses oil-impregnated bearings, oil may be discharged to the outside of the cylinder. Be careful when using it in a place where you do not want to drain oil.

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 Body

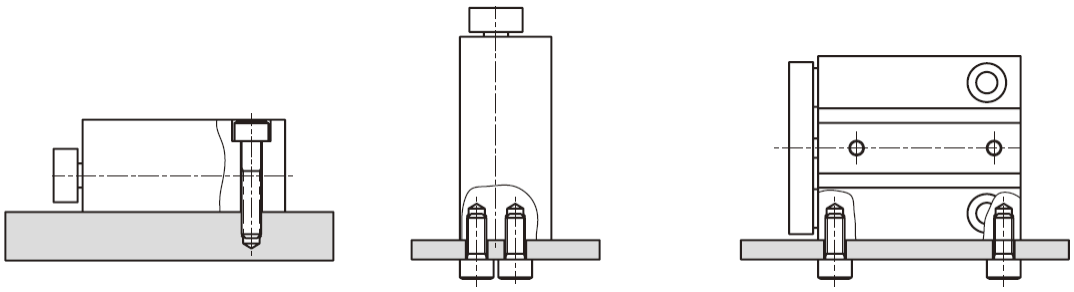
⚠CAUTION

Do not damage surface flatness by denting or scratching the tube main body mounting surface or the end plate surface.

Make sure that the flatness of the mating surface where the end plate will be attached is 0.02 mm or below.

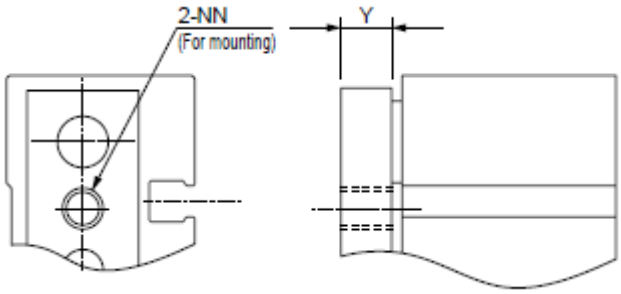
When mounting the body with bolts, tighten with tightening torque as shown in the table below.

●Through bolt ●Head side mount ●Side mounting



Bore size (mm)	Thread size	Tightening torque (N·m)		
		Through bolt	Bottom mount	Head side mount
φ6	M3	1.1	0.6	
φ10	M4	2.7	1.6	

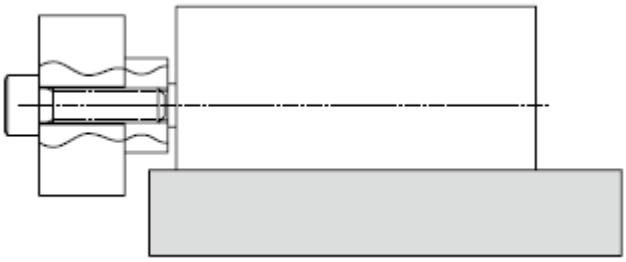
When attaching a jig, etc., to the end plate, make sure that the bolt insertion length is equivalent to the Y dimension.
Not doing so could cause malfunction or damage of the end plate.



Bore size (mm)	Y dimension
φ6	5
φ10	

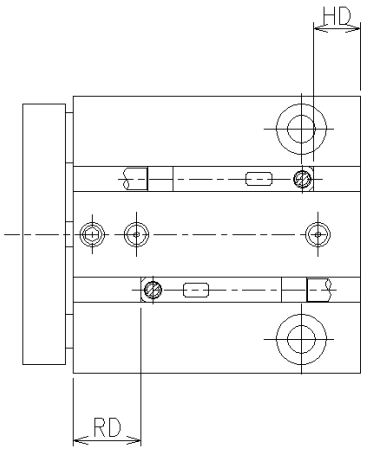
When mounting the workpiece on the end plate, tighten with tightening torque as shown in the table below.

Bore size (mm)	Thread size	Tightening torque (N·m)
φ6	M3	0.6
φ10	M4	1.6



2.3.2 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.

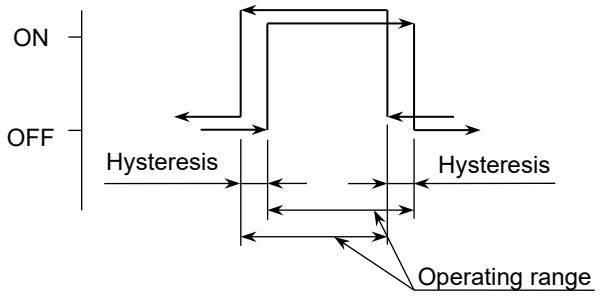
< Mounting the switch at the intermediate position of the stroke >
For the switch to function at an intermediate position of the stroke, secure the piston at the position where the switch needs to function and then slide the switch on the piston back and forth to find the positions where the switch turns 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

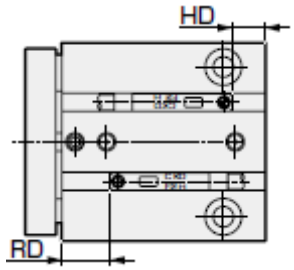
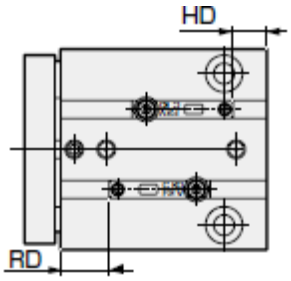
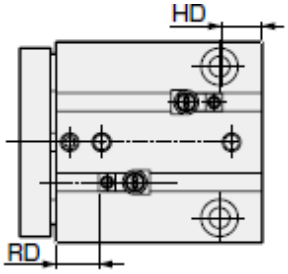
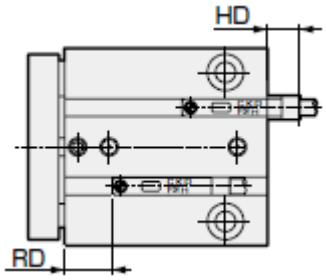
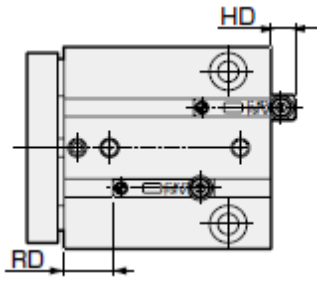
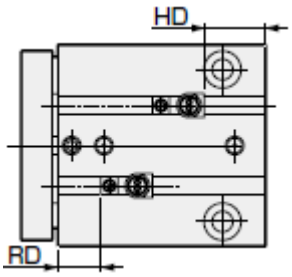
This is the range from where the switch is turned on when the piston moves and to where the switch is turned off when the piston moves farther in the same direction.

■ 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)

	Lead wire direction		
	H	V	S
Mounting A			
Mounting B Note1			

		F2H/V,F3H/V			F2YH/V,F3YH/V,F3PH/V			F2S,F3S	
		RD	HD(H)	HD(V)	RD	HD(H)	HD(V)	RD	HD
Mounting A	φ6	8	5.5(7.5)	5.5(7.5)	8	5.5(7.5)	5.5(7.5)	7	4.5
	φ10	10	7.5	7.5	10	7.5	7.5	9	6.5
Mounting B	φ6	8	-4.5(-6.5)	1.5(3.5)	8	-9(-11)	-6(-8)	7	8
	φ10	10	-3.5	0.5	10	8	-4	9	10

Note1： When the switch is mounted as shown in mounting B type, it may project from the body.
If the switch projects from the body, it will interfere with the equipment if the product is installed on the equipment by head side mounting.
Note2：Dimension in ( ) is the dimension for rear piping.
Note3：For mounting dimensions in the table, the negative dimensions are the protruding dimensions toward the head side.
Note4：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).

(unit：mm)

The maximum sensitivity position / Bore size (mm)	Proximity switch			
	1-color display		2-color display	
	Operating range	Hysteresis	Operating range	Hysteresis
φ6	2.5 to 4.5	1.5 or less	2.5 to 5.5	1.5 or less
φ10				

2.3.3 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.

2.3.4 Replacing the switch

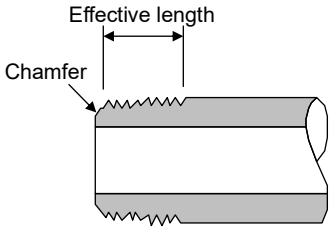
1. Loosen the fastening screw (set screw) and remove the switch body from the groove.
2. Put the replacement switch into the groove.
3. Determine where to position the switch and tighten the screw.
   (Tightening torque is 0.03 to 0.08N・m for F2,F3,F3P,F2Y,F3Y.)

2.4 Piping

⚠ WARNING

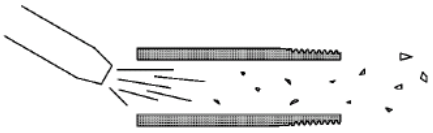
Insert the tube into the fitting until it firmly rests on the tube end and make sure that the tube does not come off before use.

- 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

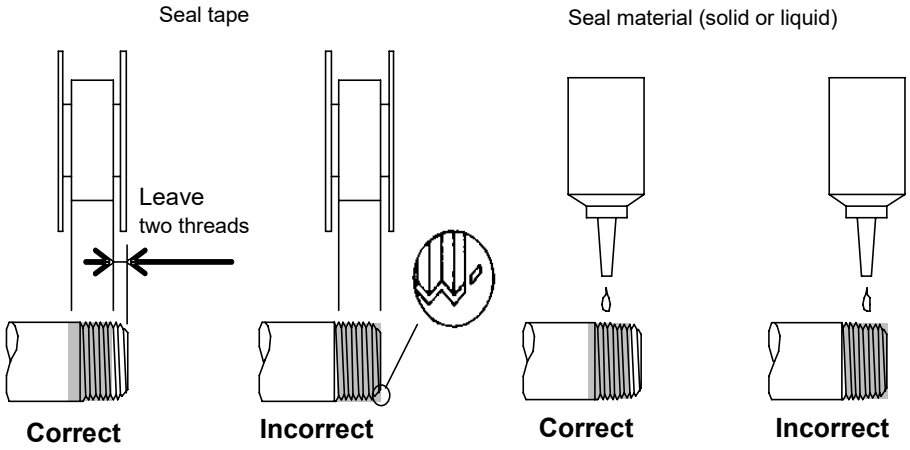
Before piping, blow air into the pipes to clean the interior and to remove cutting chips and foreign matters.



■ Seal material

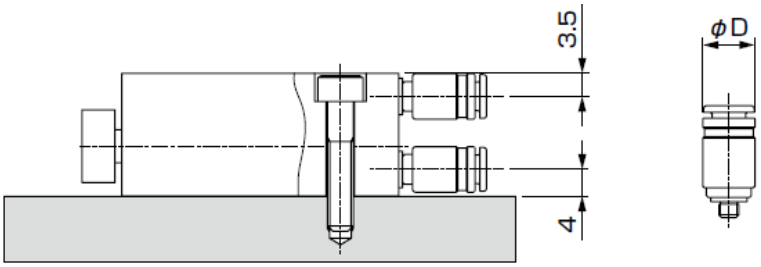
Use a seal tape or a seal material to stop leakage from piping.
Apply a seal tape or seal material to the screw threads leaving two or more threads at the pipe end uncovered or uncoated. If the pipe end is fully covered or coated, a shred of seal tape or residue of seal material may enter inside of the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

Be sure to attach a speed controller during piping before use.
In addition, when mounting the rear piping with through bolt, the applicable fittings are as follows.



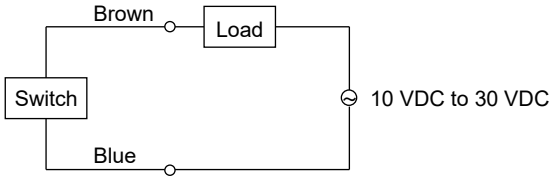
Bore size	Port size	Applicable fitting/ speed controller	Fitting O.D. D
φ6,10	M3	SC3W-M3-※ SC3U-M3-※	φ8
		FTS4-M3 FTL4-M3	
		GWS※-M3-S	
		PTN2-M3 PTNL-M3	

2.5 Wiring

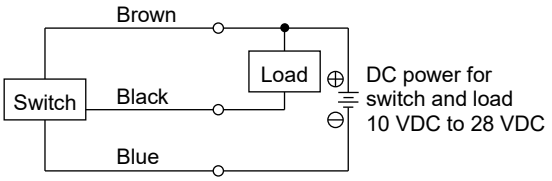
2.5.1 Proximity switch

■ Connection of lead wires

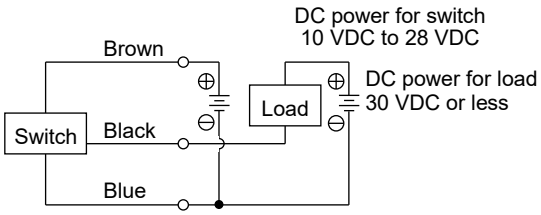
Turn off the power to the device in the electric circuit to which the switch is to be connected and connect the lead wires according to their color. Not turning off the power may cause damage to the electric circuit of the switch load.
If the switch is not wired correctly or the load is short-circuited,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



Example of 2-wire basic circuit



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

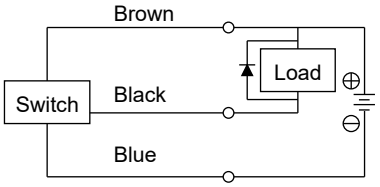


Example of 3-wire basic circuit (2)
(When separate power is used for switch and load)

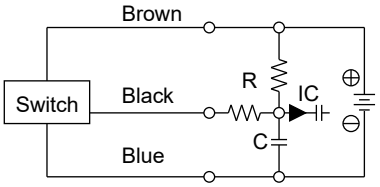
■ Protection of the output circuit

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)

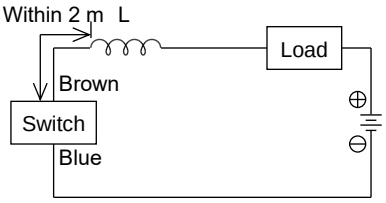


Ex. 1 Using inductive load with surge absorption element (diode). (For diode, use V06C manufactured by Hitachi or equivalent.)



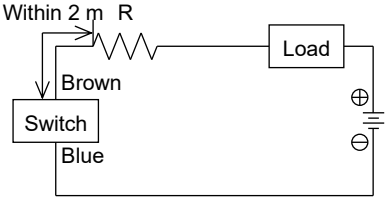
Ex. 2 Using capacious load with current regulating resistor R.
Use the following formula to figure out resistance R (Ω).

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



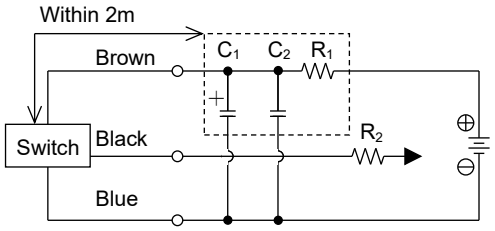
Ex. 3 - Choke coil
L = Several hundred μH to several mH
Excellent high frequency characteristic

- 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).



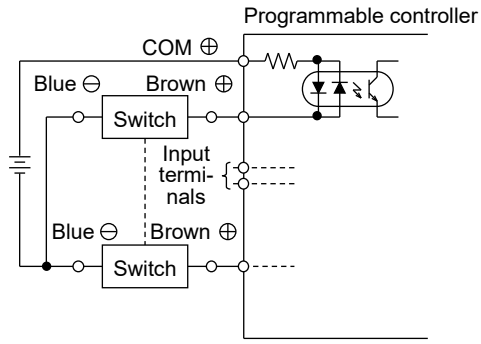
Ex. 5 - Power supply noise absorption circuit
C_1=20 μF to 50 μF electrolytic capacitor
(withstand voltage 50V or more)
C_2=0.01 μF to 0.1 μF ceramic capacitor
R_1=20 Ω to 30 Ω

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

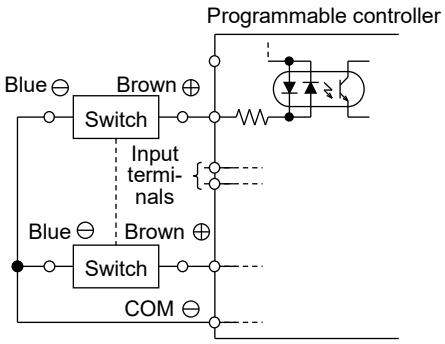
- Wire near the switch (within 2 m)

■ Connection to the programmable controller

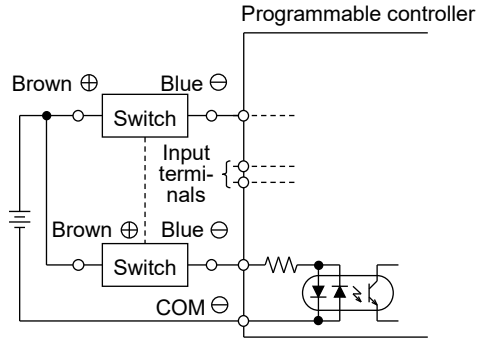
The connection method depends on the type of the programmable controller. Connect as shown below.



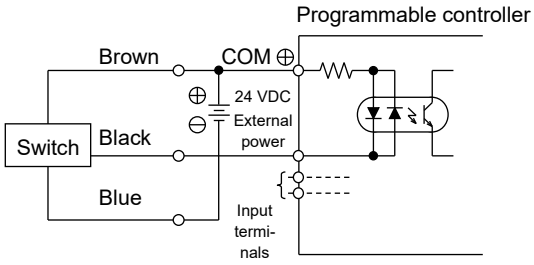
2-wire connection to source input
(external power)



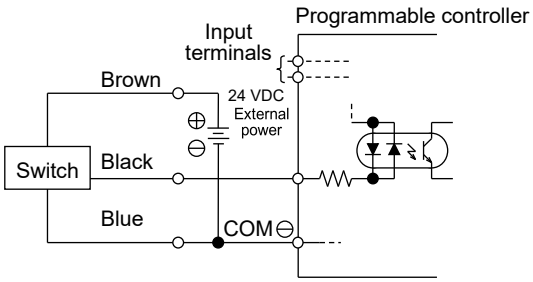
2-wire connection to source input
(internal power)



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.

3. USAGE

3.1 Using the Cylinder

■ Working pressure range

Use the cylinder within the following pressure range:

Bore size	φ6,10
Pressure range	0.15 to 0.7MPa

■ How to adjust the cushion

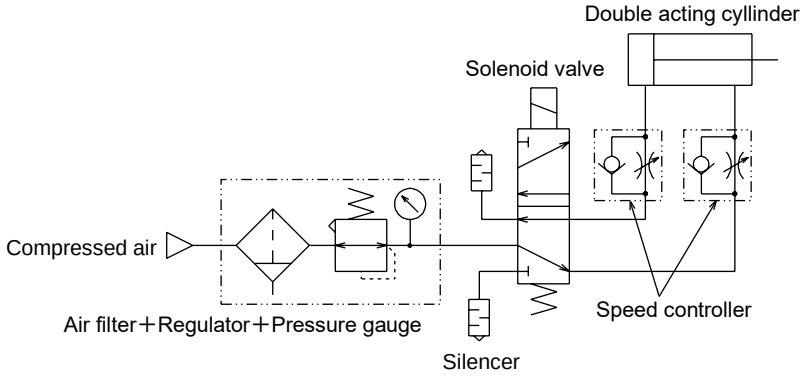
Although a rubber cushion is internally provided for this type of cylinder, it is advisable to install an additional external stopper when the kinetic energy is excessive.
Tolerable kinetic energy is as the graphs below indicate.

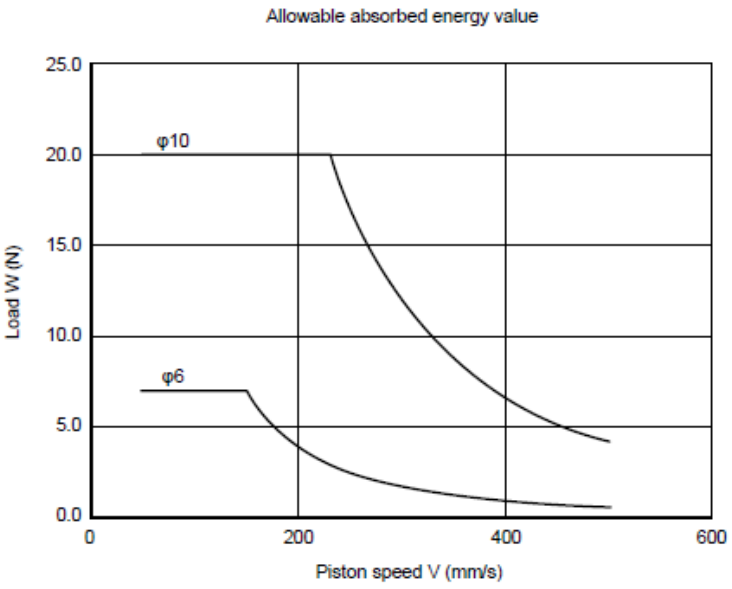
Bore size(mm)	φ6	φ10
Allowable energy absorption (J)	0.008	0.054

■ Adjustment of the piston speed

Mount a speed controller to adjust the piston speed.

< Basic circuit diagram >





Note : The area left and under the plotted curve designates serviceable range for the cylinder.
Additional external cushion is required to operate the cylinder within the area of right and upper plotted curve.

3.2 Using the Switch

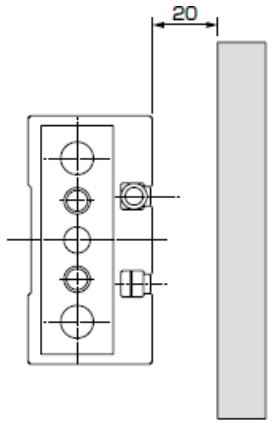
⚠CAUTION

When using a 2-color display proximity switch for STM-B-6, avoid mounting the cylinder on a magnetic substance such as a metal plate.
This could lead to switch detection malfunction.

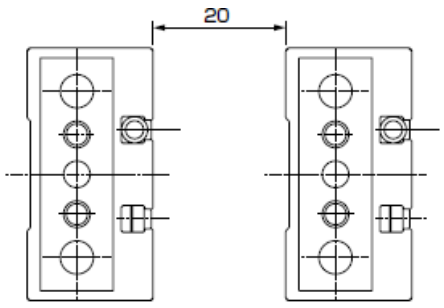
■ Magnetic environment

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 substance such as a metal plate installed adjacently. Check that a distance of 20 mm is provided from the surface of the cylinders. (Same clearance for all bore sizes)



- The cylinder switch may malfunction if cylinders are installed adjacently. Check that the following distances are provided between cylinders. (Same clearance for all bore sizes)



■ 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 disassemble the product.

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.

⚠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

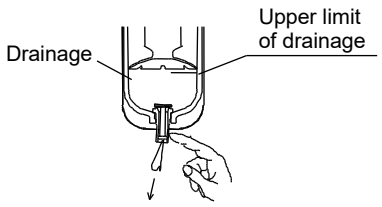
Check the items above and refer to "5. TROUBLESHOOTING" to correct any abnormality found. If there are loose threaded connections, tighten them.

4.1.2 Maintenance of the product

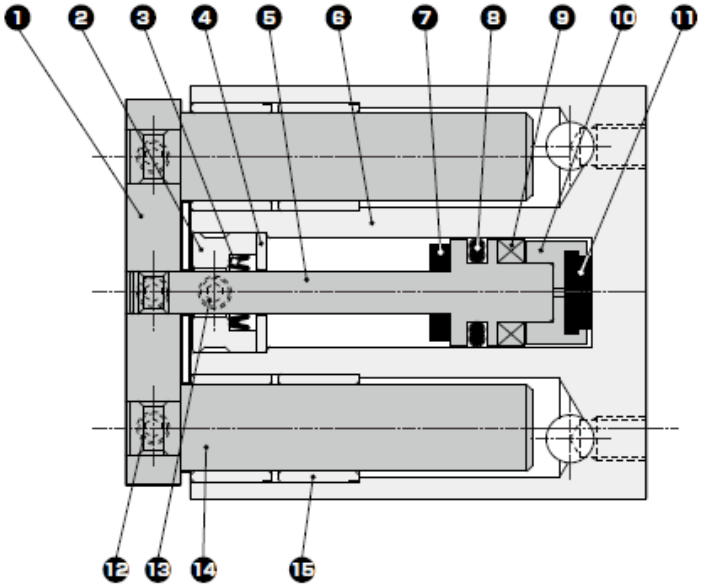
- This cylinder does not require lubrication.

4.1.3 Maintenance of the circuit

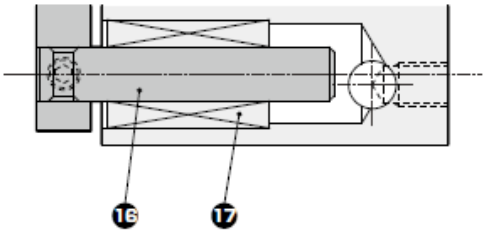
- Discharge the drainage accumulated in the air filter periodically before it exceeds the specified line.
- Since foreign matters such as carbide (carbon or tar substance) from the compressor oil may contaminate the circuit and cause an operation fault of the solenoid valve or the cylinder, be careful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



4.1.4 Internal structural diagram



Metal bush bearing



Ball bearing

Parts list

No.	Part name	Material	Remarks
1	End plate	Aluminum alloy	Alumite
2	Rod metal	Stainless steel	
3	Rod packing	Nitrile rubber	
4	Spacer	Aluminum alloy	Chromate
5	Piston	Stainless steel	
6	Cylinder body	Aluminum alloy	Hard alumite
7	Cushion rubber R	Urethane rubber	
8	Piston packing	Nitrile rubber	
9	Piston magnet		
10	Adaptor	Aluminum alloy	Chromate
11	Cushion rubber H	Urethane rubber	
12	Hexagon socket set screw	Stainless steel	
13	Hexagon socket set screw	Stainless steel	
14	Guide rod	Stainless steel	Industrial chrome plating (φ10)
15	Metal	Oil-impregnated copper alloy	
16	Guide rod	Alloy steel	Industrial chrome plating
17	Ball bearing		

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.

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.