CKD

SM-228716-A

INSTRUCTION MANUAL

CYLINDER WITH GUIDE

STS-O·STL-O SERIES

- Please read this instruction manual carefully before using this product, particularly the section describing safety.
- Retain this instruction manual with the product for further consultation whenever necessary.

CKD Corporation

For Safety Use

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

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

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

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

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

⚠ Precautions

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

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NOTE : Letters & figures enclosed within Gothic style bracket (examples such as [C2-4PP07] · [V2-503-B] etc.) are editorial symbols being unrelated with contents of the book.

1. PRODUCT

1.1 Specifications

Model code / Item		STS-O (Short stroke · Low velocity type) STL-O (Long stroke · Low velocity type)			
Action		Double action, Single rod type			
Media		Compressed air			
Max. working pressure	MPa	1 {10.2}			
Min. working pressure	MPa	0.15 {1.53} (φ20 · φ25) 0.1 {1.02} (φ32~φ80)			
Proof pressure	MPa	1.6 {16.3}			
Ambient temperature	°C	−10~60 (no freezing)			
Tube bore	mm	φ8·φ12·φ16·φ20·φ25	φ32 · φ40	φ50 · φ63	φ80
Port size		M5×0.8	Rc1/8	Rc1/4	Rc3/8
Stroke tolerance	mm	+2.0 0			
Working piston speed	mm/s	10~200			
Cushioning		with rubber cushion (both sides)			
Lubrication		Not required (Use Turbine oil Class 1, ISO, VG32 if and when lubrication is needed.)			

1.2 Switch Specifications

1) Type of switches and applications

Model code / Item			Application (Purpose)
Proximity type	2-core	T2H	for DC programmable controller, exclusive
		T2V	
	3-core	T3H	for DC programmable controller or Relay
		T3V	
Contact point type	2-core	T0H	for AC/DC Relay or programmable controller
		T0V	
		T5H	for AC/DC programmable controller, relay or IC circuit (not including Lamp), for Series connection
		T5V	
2-color indicating, proximity type	2-core	T2YH	For DC programmable controller, exclusive
		T2YV	
	3-core	T3YH	For DC programmable controller or relay
		T3YV	
Proximity type w/prev. maintenance output	3-core	T2YFH	For DC programmable controller, exclusive
		T2YFV	
	4-core	T3YFH	For DC programmable controller or relay
		T3YFV	
	3-core	T2YMH	For DC programmable controller, exclusive (self holding)
		T2YMV	
	4-core	T3YMH	For DC programmable controller or relay (self holding)
		T3YMV	

Note 1 : T※H expresses the axial lead wire. T※V expresses the radial lead wire.
Note 2 : Note that applicable cylinders (φ40~φ80) with switches of 2-color indicating types for preventive maintenance type differ from that for the standard cylinders.

2) Switch specifications

Kind and Model code / Item	Contact point switch	
	T0H · T0V	T5H · T5V
Application	For Relay or Programmable controller	For AC/DC programmable controller, relay or IC circuit (not including Lamp), for Series connection
Voltage of source of power	——	
Load voltage and current	DC12/24V、5~50mA AC100V、7~20mA	DC 12/24V, 50mA or less AC100V, 20mA or less
Power consumption	——	
Internal voltage drop	2.4V or lower	0V
Lamp	LED (Lights while power is ON)	——
Current leak	0	
Length of lead cord (※1)	Standard 1m (Oil proof vinyl, Cabtyre cord, 2-core, 0.2mm²)	
Max. shock	294m/s² {30G}	
Insuration resistance	20MΩ or more by DC 500V megger	
Insuration voltage	No abnormalities upon charging AC1000V for one minute.	
Ambient temperature	−10~+60°C	
Protective structure	IEC Standard IP67, JIS C0920 (Intrusion type without water), Oil proof	

Kind and Model code / Item	Proximity Switch			
	T2H · T2V	T2YH · T2YV	T3H · T3V	T3YH · T3YV
Application	For Programmable controller, exclusive		For Programmable controller or Relay	
Voltage of source of power	——		DC10~28V	
Load voltage and current	DC10~30V 5~25mA (※2)		DC 30V or lower, 100mA or less	DC 30V or lower, 50mA or less
Power consumption	——		10mA or less at DC24V (While Power is ON)	
Internal voltage drop	4V or less		0.5V or less by 100mA	0.5V or less
Lamp	LED (Lights while power is ON)	LED (Red/Green) (Lights while power is ON)	LED (Lights while power is ON)	LED (Red/Green) (Lights while power is ON)
Current leak	1mA or less		10μA or less	
Length of lead cord (※1)	Standard 1m (Oil proof vinyl, Cabtyre cord, 2-core, 0.2mm²)		Standard 1m (Oil proof vinyl, Cabtyre cord, 3-core, 0.2mm²)	
Max. shock	980m/s² {100G}			
Insuration resistance	20MΩ or more by DC 500V megger	100MΩ or more by DC 500V megger	20MΩ or more by DC 500V megger	100MΩ or more by DC 500V megger
Insuration voltage	No abnormalities upon charging AC1000V for one minute.			
Ambient temperature	−10~+60°C			
Protective structure	IEC Standard IP67, JIS C0920 (Intrusion type without water), Oil proof			

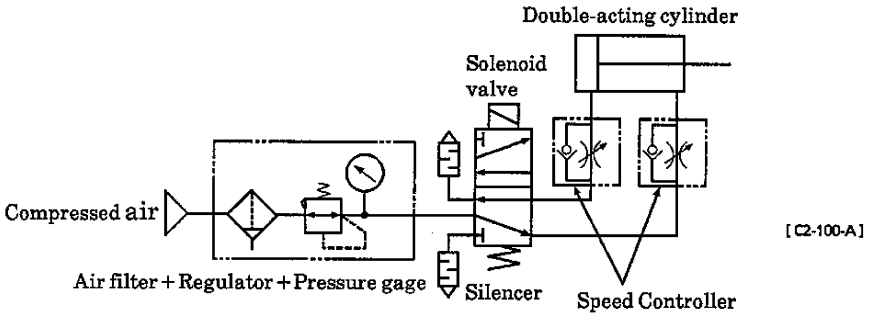
Kind and Model code		Proximity 3-core type	Proximity 4-core type	Proximity 3-core type	Proximity 4-core type
Item		T2YFH/V	T3YFH/V	T2YMH/V	T3YMH/V
Application		for Programmable controller	for Programmable controller or Relay	for Programmable controller	for Programmable controller or Relay
Indicator	Mounting position adjustment part	Red/Green LED (Lights while power is ON)			
	Preventive maintenance output part	———		Yellow LED (Lights while power is ON)	
Normal output Segment	Power voltage	———	DC10~28V	———	DC10~28V
	Load voltage	DC10~30V	DC30V or lower	DC10~30V	DC30V or lower
	Load current	DC5~20mA	DC50mA or less	DC5~20mA	DC50mA or less
	Internal voltage drop	4V or lower	0.5V or lower	4V or lower	0.5V or lower
	Current consumption	———	10mA or less	———	10mA or less
	Leak current	1mA or less	10μA or less	1.2mA or less	10A or less
Preventive maintenance Segment	Load voltage	DC30V or lower			
	Load current	DC20mA or less	DC50mA or less	DC5~20mA or less	DC50mA or less
	Internal voltage drop	0.5V or lower		4V or lower	2.4V or lower
	Leak current	10μA or less			
	Signal holding (Ton)	———	———	Turns ON (0.4±0.2) seconds after the red LED turns ON at Mounting position adjustment part	
	Signal release (Toff)	———	———	Turns OFF (0.7±0.2) seconds after the red LED turns ON at Mounting position adjustment part	
Length of lead cord (※1)		1m (Oil proof vinyl, Cabtyre cord, 3-core, 0.2m²)	1m (Oil proof vinyl, Cabtyre cord, 4-core, 0.2m²)	1m (Oil proof vinyl, Cabtyre cord, 3-core, 0.2m²)	1m (Oil proof vinyl, Cabtyre cord, 4-core, 0.2m²)
Insuration resistance		100MΩ or more by DC 500V megger			
Insuration voltage		No abnormalities upon charging AC1000V for one minute.			
Max. shock		980m/s² {100G}			
Ambient temperature		−10~+60℃			
Protective structure		JIS C0920 (Intrusion type without water), IP67, Oil proof			

※1: As for length of lead cord optional lengths of 3m and 5m are available.

※2: Max.value (25mA) of Load current is that of 25℃. It drops lower than 25mA when the switch ambient temperature exceeds 25℃. (5-10mA by 60℃)

1.3 Fundamental Circuit Diagram & Selection of Related Equipment

1) Fundamental Circuit Diagram of Double-acting Cylinder (Oilless type)
Fundamental Circuit Diagram:



[C2-100-A]

2) Selection of Related Equipment with the Fundamental Circuit Diagram above :

The related equipment depends on the tubes inner diameter and speed of the driving cylinder. Select equipment from the Selection Guide Table. (The table posted below is an example of related equipment.)

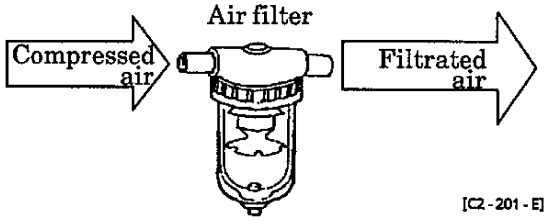
Selection Guide Table for Related Equipment (example)

Tube bore (mm)	Theoretical speed (mm/s)	Required flow ℓ/min P=0.5MPa {5kgf/cm²}時	Solenoid valve		Speed Controller	Silencer	Plumbing Tube
			Single Solenoid	Double Solenoid			
φ8 φ12 φ16 φ20 φ25	400	46	4KA110	4KA120	SC3G-M5-6	SL-M5	φ6×φ4 Nylon Tube
φ32 φ40	400	180	4K210-06 4L210-06 4F110-06	4K220-06 4L220-06 4F120-06	SCI-6	SLW-6A	φ8×φ6 Nylon Tube
φ50	500	350	4K210-08 4L210-08 4F110-08	4K220-08 4L220-08 4F120-08	SCI-8	SLW-8A SLW-6A	φ10×φ8 Nylon Tube
φ63	500	560	4F210-08	4F220-08	SCI-8	SLW-8A	φ10×φ8 Nylon Tube
φ80	500	910	4P310-10 4L310-10 4F410-10 4F310-10	4K320-10 4L320-10 4F420-10 4F320-10	SCI-10	SLW-10A	φ15×φ11.5 Nylon Tube

2. CAUTION

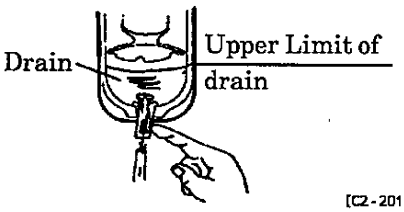
2.1 Fluid

1) It is necessary to use dehumidified air that has been filtered from compressed air. Carefully select an adequate filter that has an adequate filtration rate (preferably 5μm or less), flow rate and its mounting location (as nearest to the directional control valve as possible).



[C2-201-E]

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

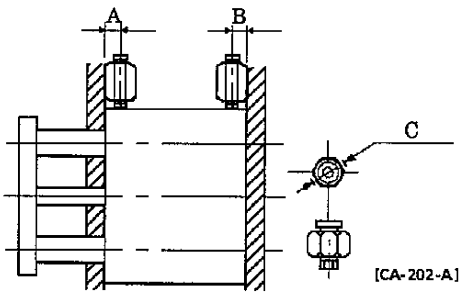


[C2-201-F]

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

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

5) Refer to the table, posted below, to select suitable joints because there are some restrictions for choosing appropriate plumbing joints.



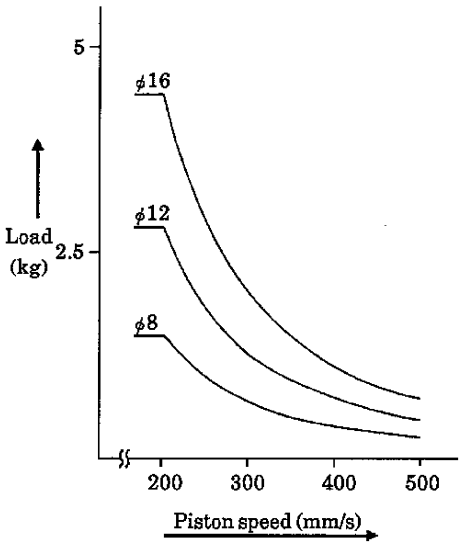
[CA-202-A]

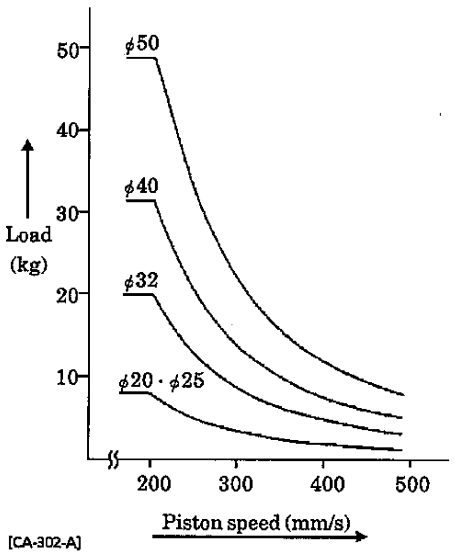
Item / Tube bore (mm)	Port diam.	Port location A	Port location B	Available joints	Joint OD ϕC
ϕ8	M5×0.8	11	6.5	SC3G-M5-4・6 GZS4-M5-S GZS4-M5 GZL4-M5 GZL6-M5 GZS6-M5	Less than ϕ12
ϕ12		7.5	7.5		
ϕ16		7.5	7.5		
ϕ20		12	8	SC3G-M5-4 GSS4-M5 SC3G-M5-6 GSL4-M5 GSS4-M5-S GSL6-M5	Less than ϕ15
ϕ25		12	9		
ϕ32	Rc1/8	14	9	SC3G-6-4・6・8 GSS4-6 GSS6-6 GSS8-6 GSL4-6 GSL6-6	Less than ϕ15
ϕ40		14.5	10		
ϕ50	Rc1/4	16	11	SC3G-8-6・8・10 GSS4-8 GSS6-8 GSS10-8 GSL4~12-8	Less than ϕ21
ϕ63		17.5	16		
ϕ80	Rc3/8	25	26	SC3G10-8・10・12 GSS6-10 GSS8-10 GSS10-10 GSL6~12-10	Less than ϕ21

3. OPERATION

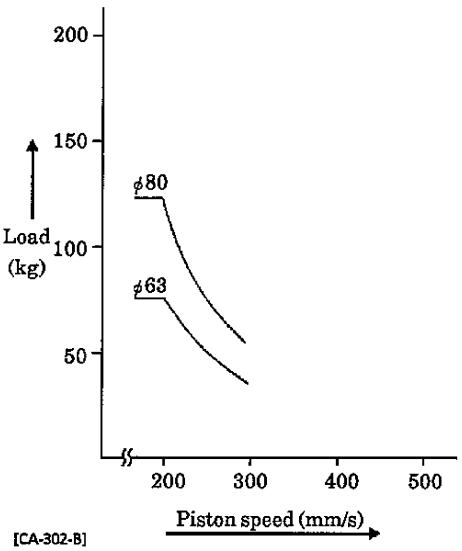
1) Air pressure supplied to the cylinder is as per specified in Section 1, "Specifications" and operates it within the range.
2) Although a rubber cushion is internally provided for this type of cylinder, it is advisable to install an additional external stopper when the kinetic energy is excessive. Tolerable kinetic energy is as the graphs below indicate.
3) Regulate the piston speed by installing speed controllers as per illustration in the Fundamental Circuit Diagram, page 4.

● Graphs for Tolerable kinetic energy





[CA-302-A]



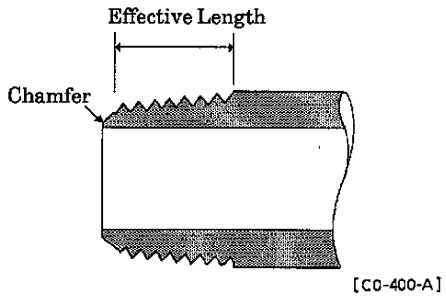
[CA-302-B]

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.

4. INSTALLATION

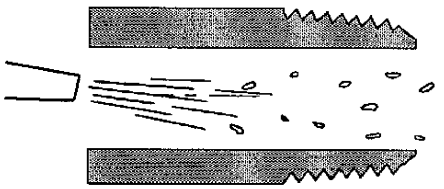
4.1 Piping

1) For piping beyond the filter, use pipes that are tough against corrosion such as galvanized pipes, nylon tubes, rubber tubes, etc. (Refer to Selection Guide Table for Related Equipment.)
2) See to it that the pipe connecting cylinder and solenoid valve has an effective sectional area which is needed for the cylinder to drive at the specified speed. (Refer to Selection Guide Table for Related Equipment.)
3) Install filter preferably adjacent to the upper-stream to the solenoid valve for eliminating rust and foreign substances in the drain of the pipe.
4) Be sure to adhere to the effective thread length of gas pipe and make a chamfer of approx. 1/2 pitch from the threaded end.



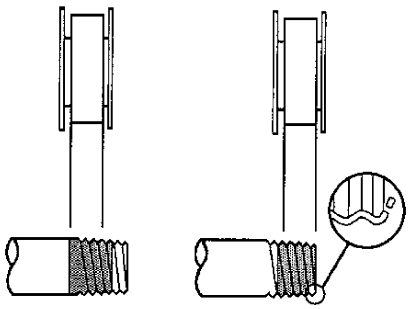
[C0-400-A]

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

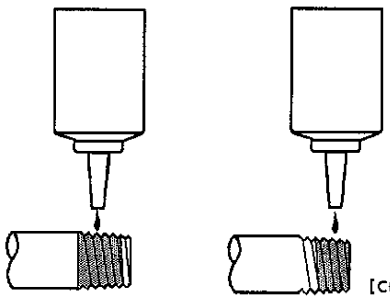

[C0-400-B]

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

● Seal Tape


Right False

● Sealant (Paste or liquid)

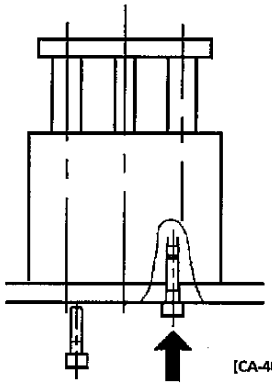

Right False

[C0-400-C]

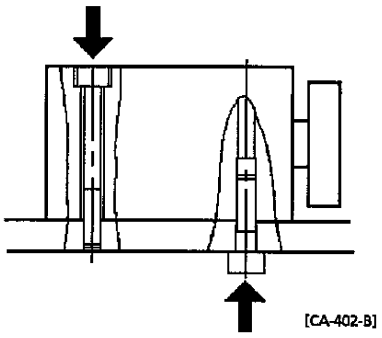
4.2 Installation

1) Operate cylinder within the range (−10℃～+60℃, standard) of tolerance ambient temperature.
2) Install cylinder directly on the mounting plate using hex. socket headed bolts.

● Bottom

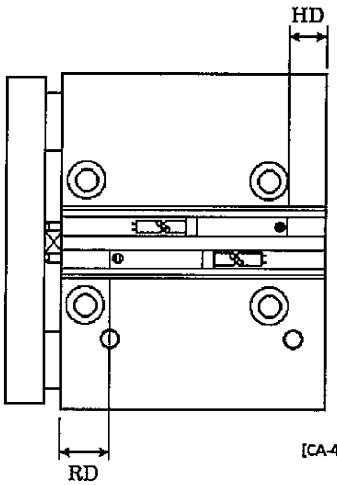


● Side mounting (ϕ80 bolt is unable to go through the hole.)



4.3 Switch installation

1) Switch mounting positions



(1) Stroke end mounting

Mount it to each position of RD (rod side) and HD (head side) respectively so as to have a switch actuate at the most sensitive position.

(2) Intermediate stroke mounting

Fix piston at the position where it is expected to stop. Slide switch back and forth along cylinder beyond fixed piston to locate positions where switch turns ON respectively. The center of those two points is the most sensitive position to have switch actuated. It is best suited where to have switch installed.

- How to slide switch

Loosen its mounting screws then slide switch back and forth along cylinder tube. Tighten screws after locating the point to have switch installed.

- How to replace the switch

Loosen its mounting screws then slide the switch all the way out of the groove on the cylinder side. Slide new one back to the groove. Locate its setting point and tighten mounting screws. (Apply screw setting torque to 0.1~0.2N · m {0.01~0.02kgf · m}.)

2) Actuation range

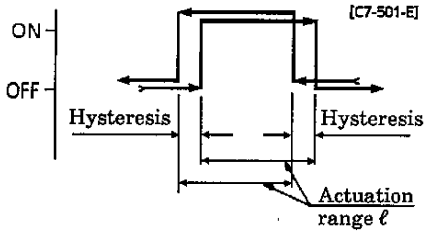
(1) It is the distance from where switch turns ON, while the piston strokes one way to the point where it turns OFF, while the piston continues to stroke in the same direction.

(2) The center of actuation range is the most sensitive point for the actuate switch. At this point, due to being the least of external magnetic disturbance, switch actuates most stably.

3) Hysteresis

(1) Switch turns ON while piston moves one way. Switch turns OFF while piston reverses its way after stopping at the point where switch turned ON once. The distance from ON point to OFF point is called hysteresis.

(2) When piston stops within the hysteresis, switch actuation becomes unstable as it easily is disturbed by an external magnetic field. Carefully avoid making it stop here.



The table of The most sensitive positions (HD & RD), Actuation range and Hysteresis

(Unit in mm)

Item / Tube bore (mm)	Proximity switch (T2H/V、T3H/V)				Contact point switch (T0H/V、T5H/V)			
	The most sensitive position		Actuation range	Hysteresis	The most sensitive position		Actuation range	Hysteresis
	HD	RD			HD	RD		
ϕ8	2.5	6.5	1.5~4	1.5 or less	2.5	6.5	5~9	3 or less
ϕ12	8.5	5	1.5~5		8.5	5	6~10	
ϕ16	9.5	4.5			9.5	4.5	4~9	
ϕ20		12.0	3~8			12.0	6~14	
ϕ25	9.0	13.0	3~9		9.0	13.0	5~14	
ϕ32	13.5	17.5			13.5	17.5	5~12	
ϕ40	14.0	21.0			14.0	21.0	6~14	
ϕ50	16.0	22.0			16.0	22.0		
ϕ63	23.0	20.0			23.0	20.0	7~15	
ϕ80	30.5	26.5	4~10		30.5	26.5		

※ Cylinder is shipped ex-factory having switches mounted at HD & RD locations respectively.

5. OPERATIONAL CAUTIONS OF SWITCHES

5.1 General Cautions

1) Magnetic environment

Avoid usage of these switches within the area where a strong magnetic field or large current exists. (such as a large magnet or spot welding equipment) Position censoring errors will result when installing many cylinders with switches that are parallel or a magnetized piece come across the cylinder due to intervention among each other.

2) Protection of lead cord

Pay consideration to eliminate bending stress or stretching of the lead cord while laying the cord. For the moving portion, use a cord of flexibility as for building a robot.

3) Service temperature

It is unsuitable to operate in high temperatures (above 60°C) due to thermal characteristics of magnetic parts and electronic parts. Eliminate operation in such high temperatures.

4) Intermediate position sensing

Beware of unstable responses of relay when piston speed is excessive in the event of intending actuation of switch in the way of piston stroke.

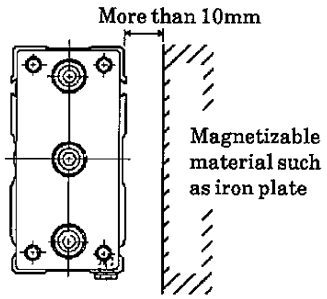
(Example) Operate cylinder with a speed of less than 500mm/s in case the relay actuation time is 20ms.

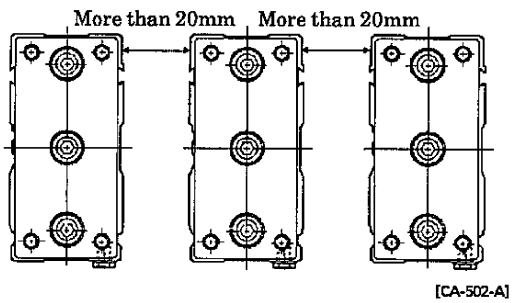
5) Shock

Carefully avoid big shocks or vibrations during transportation of the cylinder or mounting and adjusting the switch.

6) Magnetizable material such as an iron plate nearby the cylinder switch is apt to cause malfunction of the cylinder switches. Keep it at least 10mm away from the cylinder surface. (This is applicable for all bore sizes of tube.)

7) It usually causes malfunction of the cylinder switches when plural cylinders are laid adjacent. Keep a space between them as illustrated to the right.(This is applicable for all bore sizes of tube.)





5.2 Operational Cautions, Proximity switch

1) Connection of lead cord

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

An erroneous wiring or short circuiting of load causes damage to not only switches, but also load side circuit. Wiring work without shutting electricity off may cause damage to the load side circuit.

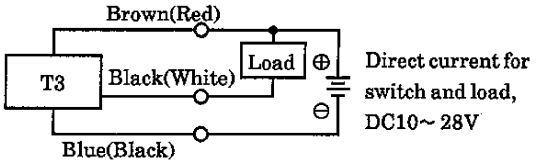


Fig.1 An example of the power for switch and load is the same.

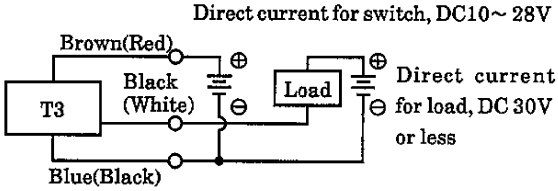


Fig.2 An example when the power for switch and load is independent.

2) Protection of output circuit

Install some protective circuit as illustrated in Fig. 3 when inducing type load (Relay or solenoid valve) are to be used because those types apt to generate surge current switch off.

Install some protective circuit as illustrated in Fig. 4 when capacitor type load (Capacitor type) are to be used, because these types apt to generate a dash current when turning the switch ON.

Install some protective circuit as illustrated in Fig. 5 or 6 (in case of model T2) and Fig 7 (in case of model T3)

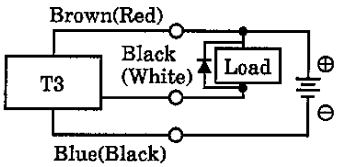


Fig.3 An example of using inducing load together with surge absorptive element (diode). (Hitachi Mfg. made diode V06C or equivalent is recommended.

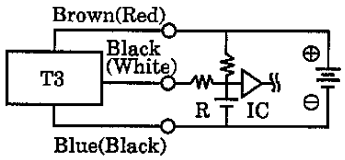


Fig. 4 An example of using capacitor type load together with current regulating resister R. Comply with the following formula to figure out required R. $\frac{V}{0.10} = R\,(\Omega)$

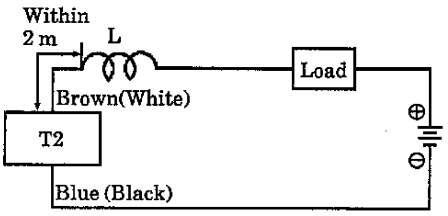


Fig. 5 • Choke coil L
L= a couple hundred μH ~ a couple mH surpassing high frequency characteristic
• Install it nearby the switch (within 2 m).

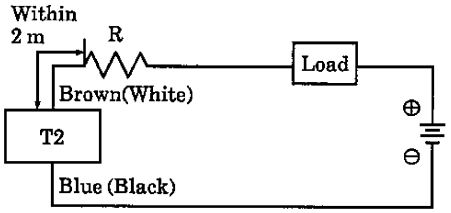


Fig. 6 • Dash current restriction resister R
R= As much large resister as the load circuit can afford.
• Install it nearby the switch (within 2 m).

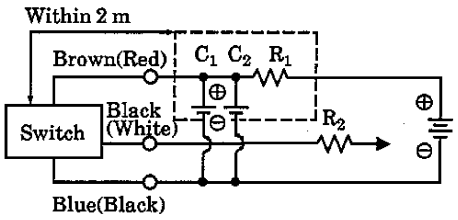


Fig. 7

- Electric power noise absorptive circuit C1
  C_1= 20~50μF electrolytic capacitor (withstanding 50V or more)
  C_2= 0.01~0.1μF ceramic capacitor
  R_1=20~30Ω
- Dash current restriction resister R2
  R_2= As much large resister as the load circuit can afford.
- Install it nearby the switch (within 2 m).

3) Connection to a programmable controller (Sequencer)

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

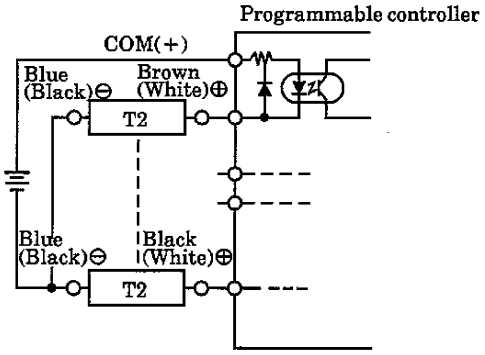


Fig. 8 An example of T2 connection to source input type (an external power source)

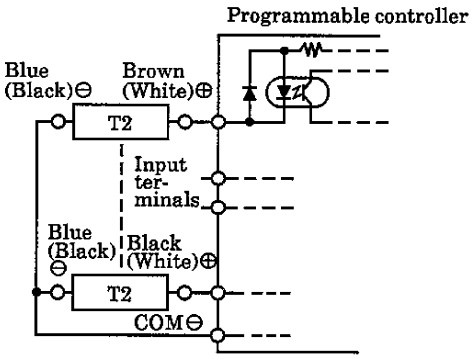


Fig. 9 An example of T2 connection to source input type (an internal power source)

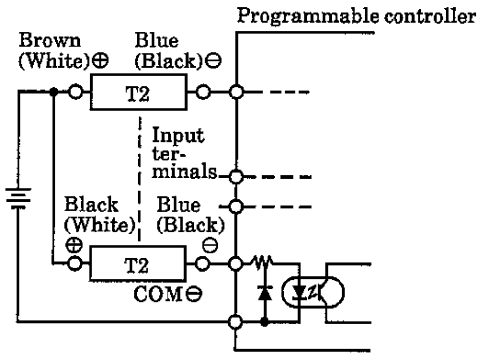


Fig. 10 An example of T2 connection to sink input type (an internal power source)

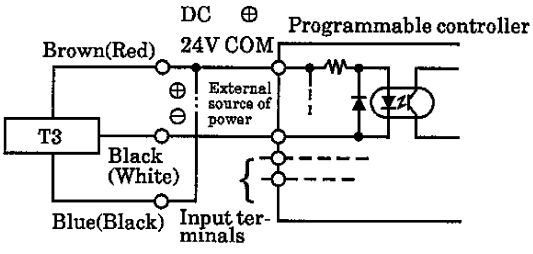


Fig. 11 An example of T3 connection to source input type (an external power source)

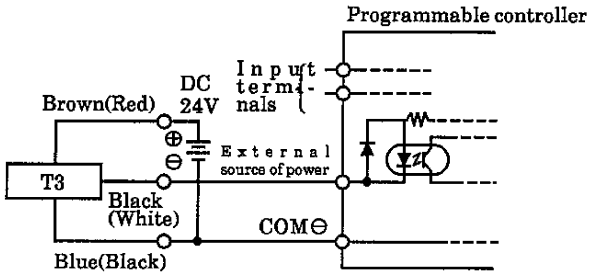


Fig. 12 An example of T3 connection to source input type (an internal power source)

4) Series connection

The total voltage will decrease when the T2 switches connections have a leak. Therefore, confirm the input specifications for the programmable controllers, which are the connecting load. However, dimming or total failure of the lamp may exist.

T3 switches hardly ever leak. When less than 10μA, then leakage may occur. Usually dimming and failure of the lamp do not occur.

5) Magnetic environment

Avoid usage of these switches within the area where a strong magnetic field or large current exists. (such as a large magnet or spot welding equipment) Position censoring errors will result when installing many cylinders with a switch which is parallel or a magnetized piece come across the cylinder due to intervention among them.

6) Protection of lead cord

Pay consideration to eliminate repeating bending stress or stretching of the lead cord while laying the cord. For the moving portion, use a cord of flexibility as for building a robot.

5.3 Operational cautions, Contact point switch, Model T0 & T5

1) Connection of lead cord

Instead of connecting the cord to the power source directly, always connect to the load in series. In case of model T0 connection, pay the following precautions.

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

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

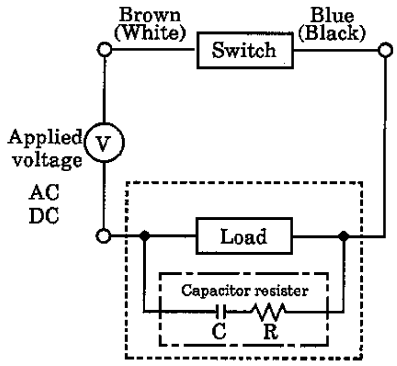
2) Capacity of contact points

Avoid using a load exceeding the max. capacity of contact points. On the other hand, in case of T0 model, switch lamp may not be lit sometimes when current is lower than the rated current.

3) Protection of contact point

Install such a protective circuit as illustrated in either Fig 1 or 2, as follows, when inducing a type load such as a relay is to be used.

Furthermore, install such protective circuits as illustrated in either Fig. 3 or 4, on the following page, in case the cord length exceeds the length per following table.

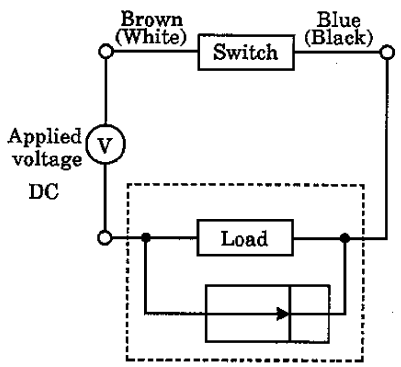


User circuit

Protective circuit (Spark absorbing circuit)

Recommended value C (Capacitor) = 0.033~0.1μF
R (Resister) = 1~3kΩ
XEB1K1 Okaya Denki Mfg. or equivalent

Fig. 1 When capacitor resister is used.

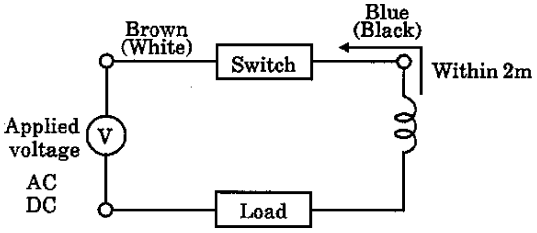


User circuit

Protective circuit

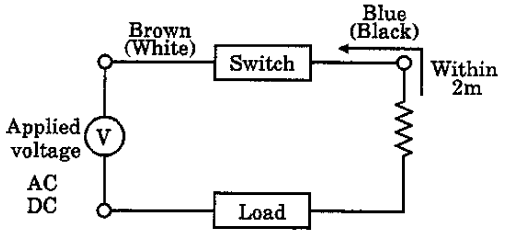
Rectifying diode, general use
Hitachi Mfg. product V06C or equivalent

Fig.2 When diode is used.



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

Fig. 3



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

Fig. 4

4) Relay

Use such products as specified below or equivalent.

OMRON Corporation	Model MY
FUJI ELECTRIC CORP	Model HH5
Matsushita Electric Works Ltd.	Model HC

5) Series connection

Total voltage loss, when connected T0 switches in series, equals to the sum of respective voltage loss of each switch. The total voltage loss becomes equivalent to one T0 (approx. 2.4V) when connecting the combination of one T0 for actuation confirming and rest of switches T5s. Lamp is lit only when all switches turn on.

6) Parallel connection

There is no restriction in parallel connection number of switches of these types. Multi number connection of model T0s, sometimes, cause a dimmed lamp or complete lamp failure.

7) Magnetic environment

Avoid usage of these switches within the area where strong magnetic fields or large currents exist. (such as a large magnet or spot welding equipment) Position censoring errors will result when installing many cylinders with switch in parallel or magnetized piece come across the cylinder due to intervention among each other.

8) Protection of lead cord

Pay consideration to eliminate repeating bending stress or stretching of lead cord while laying the cord. For the moving portion, use a cord of flexibility as for building a robot.

6. MAINTENANCE

6.1 Periodical Inspection

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

   See "Troubleshooting", 6.2, should there be any trouble found, also carry out additional tightening if bolts, nuts, etc.are loose.

6.2 Troubleshooting

1) Cylinder

Troubles	Causes	Countermeasures
Does not operate	No pressure or inadequate pressure	Provide an adequate pressure source.
	Signal is not transmitted to direction control valve	Correct the control circuit.
	Improper or misalignment of installation	Correct the installation state and/or change the supporting system.
	Broken packing	Replace the packing.
Does not function smoothly	Lower speed than rated	Reduce the load. Consider the use of a hydraulic cylinder.
	Improper or misalignment of installation	Correct the installation state and/or change the supporting system.
	Exertion of transverse (lateral) load	Install a guide. Revise the installation state and/or change the supporting system.
	Excessive load	Increase the pressure itself and/or the inner diameter of the tube.
	Speed control valve is built in the way of "Meter in" circuit	Change the installation direction of the speed control valve.
Breakage and/or deformation	Impact force due to high speed operation	Turn the speed down. Reduce the load. Install cushion device with more efficiency. (External cushion)
	Exertion of transverse load	Install a guide. Revise the installation state and/or change the supporting system.

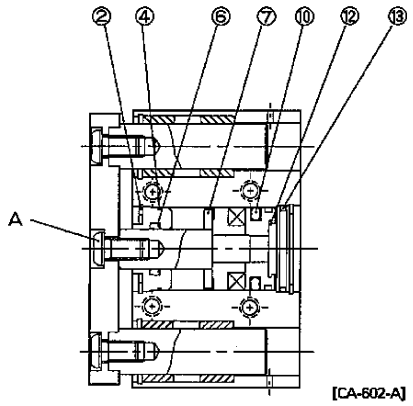
2) Switch

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

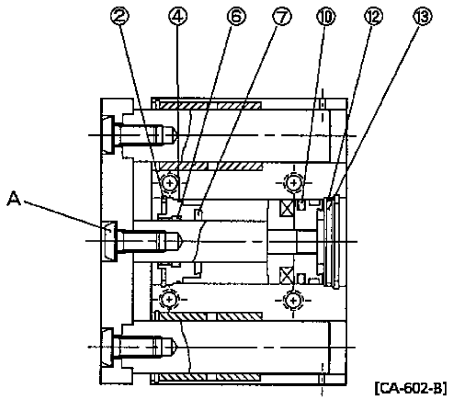
6.3 Disassembly

1) Cylinder of this type is able to be disassembled. Disassemble it, referring to the Internal structural drawing, should there be any disorder such as air leakage then replace the expendable parts refer to Exp. parts list posted below.
2) Remove bolt, A. Take out End plate together with Guide rod. Remove C-shape snap ring ②. Pull out piston rod together with rod metal. Follow reverse steps of disassembling during the process of assembling. Be sure at this time to apply a film of grease over packing and guide. Apply adhesive to bolt A. Verify that cylinder is in the state of pulling when tightening bolt A to the piston rod.
3) Internal structure drawings and Expendable parts list

● STS / L ϕ20, ϕ25



● STS /L ϕ32~ϕ80



Expendable Parts list (Designate the Kit No. when ordering)

Tube bore (mm) \ Part name / Kit No. \ Part No.		④	⑥	⑦	⑩	⑫	⑬
		Metal gasket	Rod packing	Rubber cushion(R)	Piston packing	Rubber cushion(H)	O ring
ϕ8	STS-O-8K	F3-657978	DYR-4K	F4-252066	PSD-8L	F4-659142	—
ϕ12	STS-O-12K	F3-657972	MYN-6	F4-166347	PSD-12L	F4-659142	—
ϕ16	STS-O-16K	F3-657972	MYN-8	F4-160424	PSD-16L	F4-659112	—
ϕ20	STS-O-20K	F3-657968	MYN-10	F4-116102	PSD-20L	F4-659112	AS568-018
ϕ25	STS-O-25K	F3-657969	MYN-12	F4-659113	PSD-25L	F4-116103	AS568-020
ϕ32	STS-O-32K	F3-657975	MYN-16	F4-659049	PSD-32L	F4-659049	AS568-025
ϕ40	STS-O-40K	F3-657976	DRP-16	F4-659039	PSD-40L	F4-659039	AS568-029
ϕ50	STS-O-50K	F3-657977	DRP-20	F4-659026	PSD-50L	F4-659026	AS568-032
ϕ63	STS-O-63K	AS568-035	DRP-20	F4-659069	PSD-63L	F4-659069	AS568-036
ϕ80	STS-O-80K	AS568-041	DRP-25	F4-162661	PSD-80L	F4-162661	AS568-041

7. HOW TO ORDER

7.1 Product Code

• Short stroke

STS – M – O – 63 – 50 – T0V – R – F

• Long stroke

STL – M – O – 40 – 100 – T0H – D – F

ⓐ ⓑ ⓒ ⓓ ⓔ ⓕ

Low velocity type

ⓐ Type of bearing	
M	Sliding bearing (Metal bearing)
B	Rolling bearing (Ball bearing)

ⓑ Tube bore (mm)			
8	ϕ8	32	ϕ32
12	ϕ12	40	ϕ40
16	ϕ16	50	ϕ50
20	ϕ20	63	ϕ63
25	ϕ25	80	ϕ80

○ : Standard —: Unavailable ● : Optional order made

ⓒ Standard stroke (mm)		10	20	25	30	40	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400
STS	ϕ8~ϕ16	○	○	—	○	○	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	ϕ20~ϕ63	—	—	○	—	—	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	ϕ80	—	—	○	—	—	○	○	○	—	—	—	—	—	—	—	—	—	—	—	—
STL	ϕ8~ϕ16	—	—	—	—	—	○	○	○	●	●	●	●	—	—	—	—	—	—	—	—
	ϕ20~ϕ63	—	—	—	—	—	○	○	○	○	○	○	○	●	●	●	●	●	●	●	●
	ϕ80	—	—	—	—	—	—	○	○	○	○	○	○	●	●	●	●	●	●	●	●

ⓓ Switch model code			
Lead cord straight outlet type	Lead cord L-shape outlet type		
T0H※	T0V※	Reed type	2-core
T5H※	T5V※		
T2H※	T2V※	Proximity type	3-core
T3H※	T3V※		
T2YH※	T2YV※	2-color indicating, Proximity type	2-core
T3YH※	T3YV※		
T2YFH※	T2YFV※	Preventive maintenance output, non-contact type	3-core
T3YFH※	T3YFV※		4-core
T2YMH※	T2YMV※		3-core
T3YMH※	T3YMV※		4-core

ⓔ Qty of switch	
R	Rod end, 1 ea.
H	Head end, 1 ea.
D	Switches, 2 ea.

ⓕ Option	
Material of end plate	
F	Steel
No code	Aluminum alloy

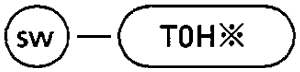
※ Lead cord length	
No code	1m (Standard)
3	3m (Optional)
5	5m (Optional)

Note: Add "L1" to model code when ordering 2-color indicator or preventive maintenance switch of ϕ40 or larger.
(Example) STS-M-O-L1-63-50-T2YH-D

▸ Shorter stroke than standard
Available to manufacturer in every 5mm intervals but overall length of cylinder itself is equivalent to that of the standard type.

7.2 Parts Code

1) Switch
Code of switch



Ⓓ

Switch code No.
(Same category with Ⓓ on preceding page.)