CKD

SM－306516－A

INSTRUCTION MANUAL

GUIDED CYLINDER

(Rubber and air Cushioned)

STS・STL－$\frac{M}{B}$－※C

- 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

The 2nd edition

For Safety Use

To use this product safety, 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 applications, requirements, and how to use it.

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

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

⚠ CAUTION :

- 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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1. UNPACKING

1) Make sure that the type No. on the nameplate of the delivered Cylinder matches the type No. you ordered.
2) Check the appearance for any damage.
3) Stop up the piping port with a sealing plug to prevent the entry of foreign substances into the cylinder. Remove the sealing plug before piping.

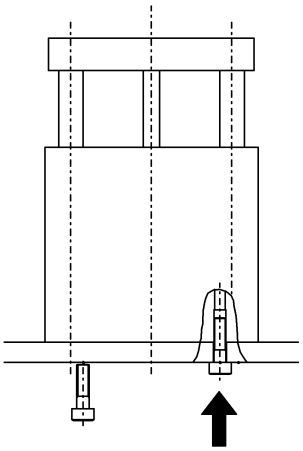
2. INSTALLATION

2.1 Installation

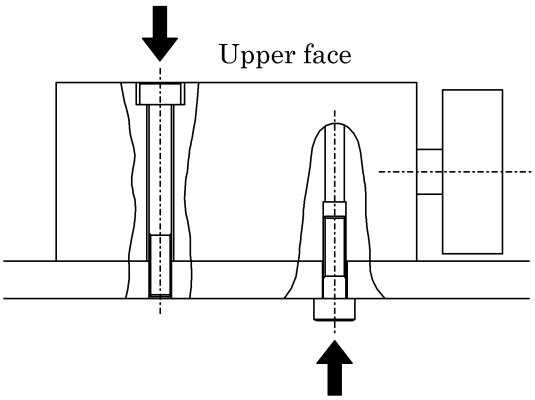
1) The ambient temperature for this cylinder is -10 to 60℃ (Standard). Always operate the cylinder within this temperature.

2) Install cylinder body with a hexagon socket head cap screw directly.

● Bottom



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



Note) In case of the installation of the body by a through bolt, tighten by the tightening torque in the bellow table.

Bore size (mm)	Tightening torque (N・m)
32 dia.・40 dia.	8.6
50 dia.・63 dia.	21.5

2.2 Piping

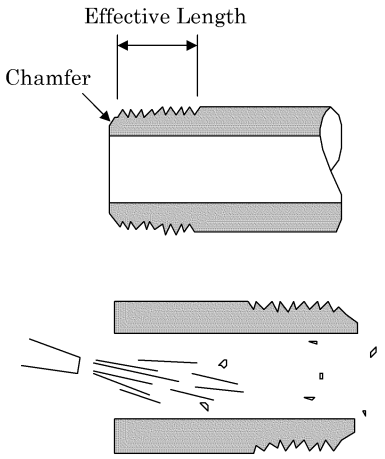
1) For piping beyond the filter, use pipes that are tough against corrosion such as galvanized pipes, nylon tubes, rubber tubes, etc.

2) See to it that the pipe connecting cylinder and solenoid valve has effective cross-sectional area which is needed for the cylinder to drive at the specified speed.

3) Install filter preferably adjacent to the upper-stream to the solenoid valve for eliminating rust, foreign substance in the drain of the pipe.

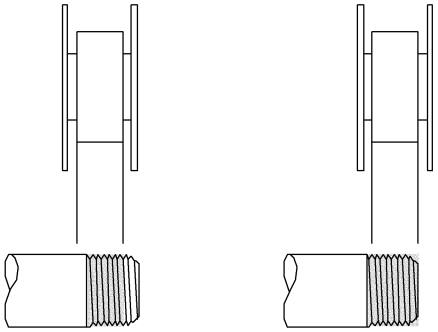
4) Be sure observe the effective thread length of gas pipe and give a chamfer of approx. 1/2 pitch from the threaded end.

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



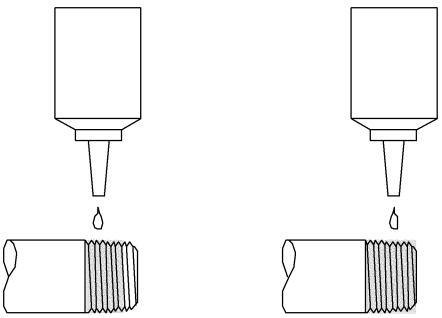
6) Refrain from applying sealant or sealing tape approx. two pitches of thread off the tip of pipe to avoid residual substances from falling into piping system.

● Seal Tape



(Correct) (Incorrect)

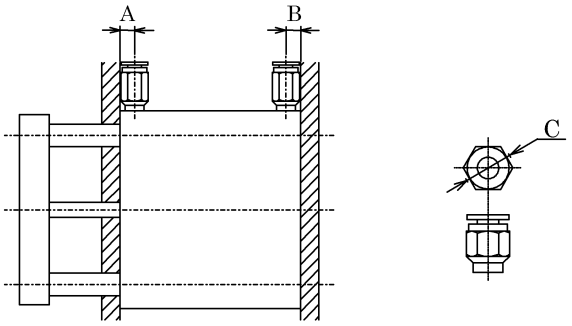
● Sealant (liquid)



(Correct) (Incorrect)

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

Descriptions / Bore size (mm)	Port size	Port dimension A	Port dimension B	Compatible joints	Joint OD C dia.
32 dia.	Rc1/8	14	9	SC3W-6-4·6·8 GWS4-6 GWS6-6 GWS8-6 GWL4-6 GWL6-6	15 mm or less
40 dia.		14.5	10		
50 dia.	Rc1/4	16	11	SC3W-8-6·8·10 GWS4-8 GWS6-8 GWS10-8 GWS-12-8 GWL4 to 12-8	21 mm or less
63 dia.		17.5	16		
80 dia.	Rc3/8	25	26	SC3W-10-8·10·12 GWS6-10 GWS8-10 GWS10-10 GWL6 to 12-10	21 mm or less

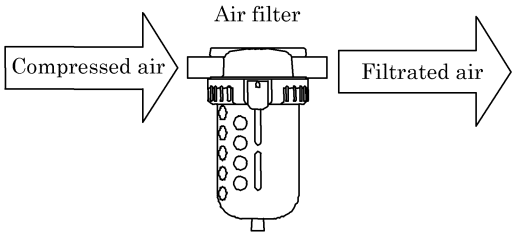


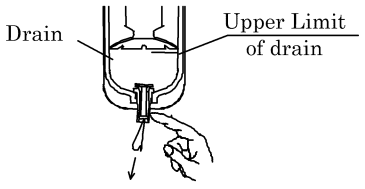
2.3 Fluid

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 5 μ m or less), flow rate and its mounting location (as nearest to the directional control valve as possible).

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

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.

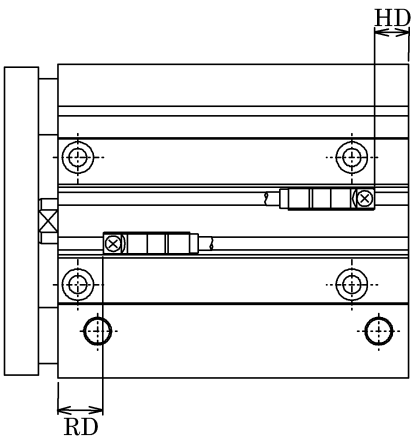




4) This cylinder does not require lubrication. It is recommended, however, to use Turbine oil Grade 1, ISO VG32 as a lubricant, if and when lubrication is needed.

2.4 Switch installation

1) Location of mounting switches on a cylinder.



(1) At the stroke end
Refer the illustration above. Mount switches within the rod side dimension RD as well as the head side dimension HD for the purpose of having switches function at the points of the maximum sensitive position.

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

- Relocation of switch
  Slide switch body along cylinder tube after loosening mounting screws and tighten screws when located the maximum sensitive position.
- Replacing switch
  Take out switch out of groove after loosening mounting screws. Slide new replacing switch into groove and tighten screws upon placing the switch at the maximum sensitive position. (Apply tightening torque of 0.1 to 0.2N･m)

2) Operating range

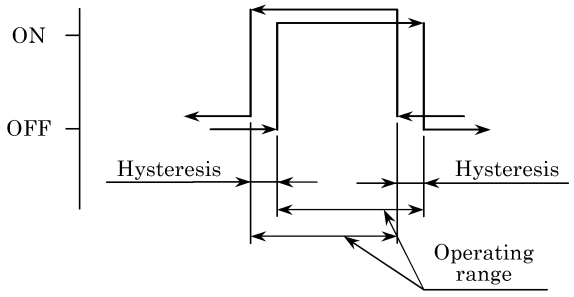
(1) The switch turns on first and turns off as the piston moves along its stroke. Precise operating range deviate slightly depending upon the direction of piston movement as shown right.

(2) The center of the range is the maximum sensitive position. Setting switch at this point eliminates majority of external disturbance and provides the most stabile actuation of switch.

3) Hysteresis

(1) Precise operating range deviate slightly depending upon the direction of piston movement as shown right.

(2) Switch is apt to be disturbed its accuracy by external effect when piston stops within this range. Carefully avoid designing stop-ping location of piston.



Maximum sensitive position, operating range and hysteresis (mm)

Item / Bore size (mm)	Solid state switch							
	T2H/V, T3H/V				T2YH/V, T3YH/V, T2JH/V, T2YD			
	Maximum sensitive position		Operating range	Hysteresis	Maximum sensitive position		Operating range	Hysteresis
	HD	RD			HD	RD		
ϕ 32	13.5	17.5	3 to 9	1.5 or less	12.0	16.0	5 to 9	1.5 or less
ϕ 40	14.0	21.0			12.5	19.5	6 to 10	
ϕ 50	16.0	22.0			13.5	21.5		
ϕ 63	23.0	20.0			21.5	18.5		
ϕ 80	30.5	26.5	4 to 10		33.0	25.0	7 to 11	

Item / Bore size (mm)	Solid state switch			
	T1H/V			
	Maximum sensitive position		Operating range	Hysteresis
	HD	RD		
ϕ 32	12.0	16.0	3 to 9	1.5 or less
ϕ 40	12.5	19.5		
ϕ 50	13.5	21.5		
ϕ 63	21.5	18.5		
ϕ 80	29.5	25.0	4 to 10	

Item / Bore size (mm)	Reed switch							
	T8H/V				T0H/V,T5H/V			
	Maximum sensitive position		Operating range	Hysteresis	Maximum sensitive position		Operating range	Hysteresis
	HD	RD			HD	RD		
ϕ 32	7.5	11.5	5 to 12	3.0 or less	13.5	17.5	5 to 12	3.0 or les
ϕ 40	8.0	15.0	6 to 14		14.0	21.0	6 to 14	
ϕ 50	10.0	16.0			16.0	22.0		
ϕ 63	17.0	14.0	7 to 15		23.0	20.0	7 to 15	
ϕ 80	24.5	20.5			30.5	26.5		

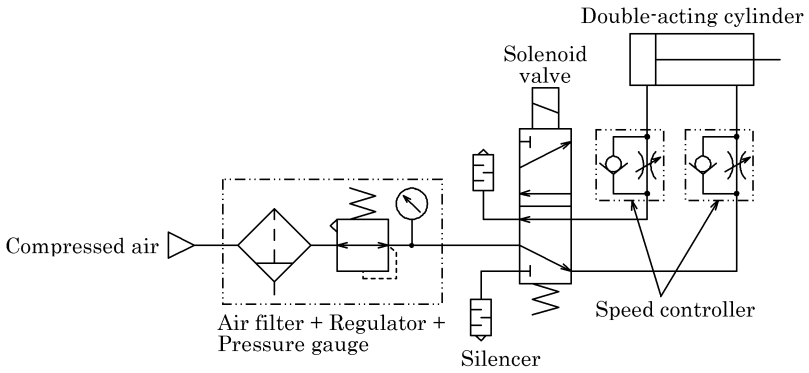
※ Switches at ex-factory shipment are positioned at the most sensitive points (HD and RD).

3. OPERATION

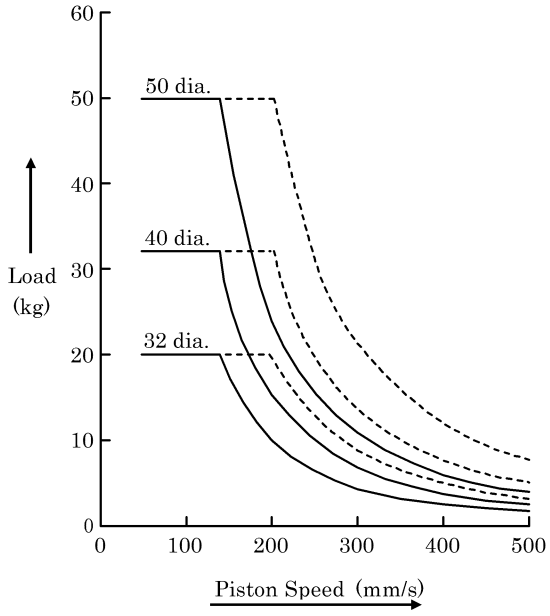
3.1 Operating the Cylinder

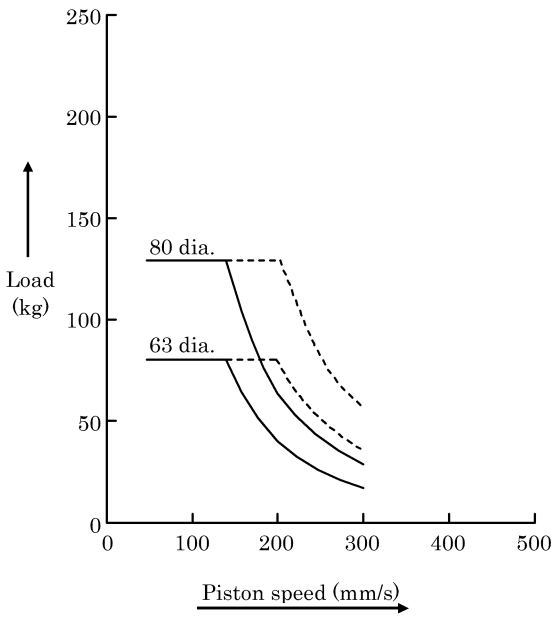
1) The working pressure for this type of cylinder is specified in “Cylinder Specifications”. Operate the system within this range.
2) Although a rubber cushion is internally provided for this type of cylinder, it is advisable to install an additional external stopper when the kinetic energy is excessive. Allowable energy absorption is as the graphs below indicate.
3) Regulate the working piston speed by installing speed controllers as per illustration in the Fundamental Circuit Diagram, below.

● Fundamental Circuit Diagram



● Graphs for allowable energy absorption





3.2 How to use the Switches

3.2.1 Common items

1) Magnetic environment
Do not operate this product in a place where a strong magnetic field or large current (large magnet or spot welder, etc.) exists. If a cylinder with the switch is installed in parallel to this product or the magnetic substance moves near the cylinder, the mutual interference may occur and affect the detection accuracy.

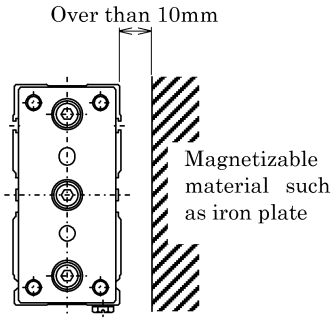
2) Protection of lead cord
Pay consideration to eliminate repeating bending stress or stretching of lead cord while laying the cord.
To the moving portion, use such cord of flexibility as for building a robot.

3) Operating temperature
Do not operate the product at a high temperature (60℃)
Always avoid operation of the product in a hot place due to temperature characteristics of magnetic and electronics parts.

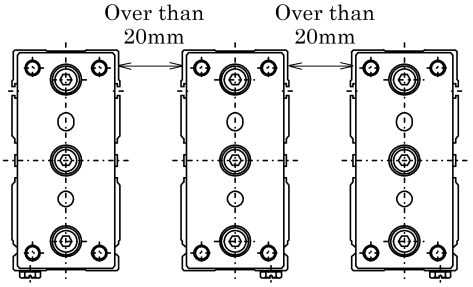
4) Intermediate position detection
When activating the switch halfway of the stroke, the relay may not respond if the working piston speed is too fast.
(Example) Operate cylinder with the speed of less than 500mm/s in case the relay actuation time is 20ms.

5) Impact
Do not apply a large vibration or impact to the product when transporting the cylinder, or mounting or adjusting the switch.

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



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



3.2.2 Reed switch (T0, T5, T8)

1) Lead wire connections
Do not connect the lead wires of the switch to the power supply directly. Always connect the loads in series. For T0 switch, carefully check following items (1), (2).

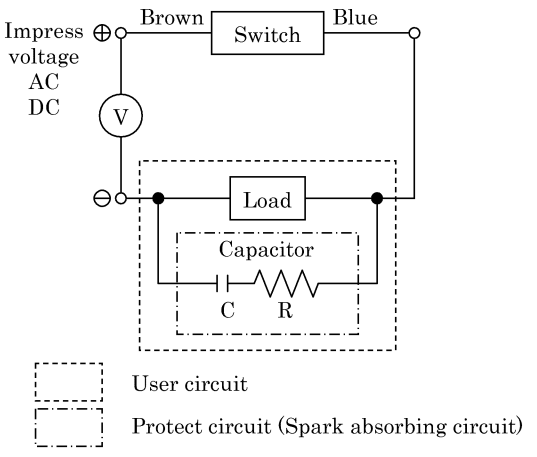
(1) When using the switch for DC power supply, connect the brown and blue lines to the positive and negative sides, respectively. If these lines are connected reversely, the switch is activated, but the indicator light is not lit.
(2) When the switch is connected to an AC relay or a programmable controller input, the indicator light on the switch is not lit if the half-wave rectification is performed in the connected circuit. If this occurs, reverse the polarities of the switch lead wire connection. The indicator light may then be lit.
Note that the R4 and R5 switches have no polarities.

2) Contact protective measures
When an inductive load, such as relay is used or the wire length exceeds that stated in Table2, always install a contact protective circuit.

Table2

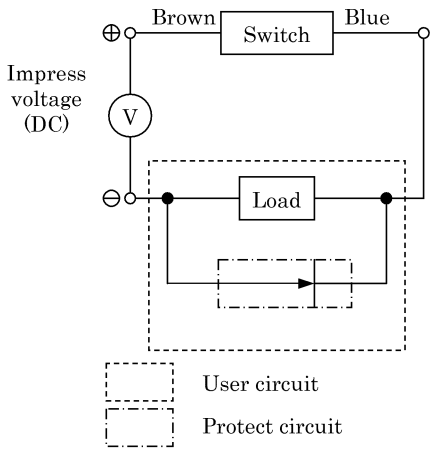
Electric power	Length of wire
DC	50m
AC	10m

(1) Protective circuit when connecting an inductive type load.



Recommended value
C (Capacitor) 0.033 to 0.1 μ F
R (Resister)1 to 3k Ω
XEB1K1 Okaya Denki Mfg or equivalent

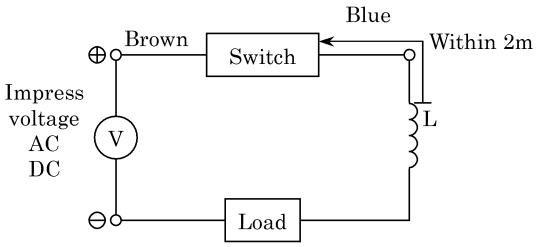
Fig.1 When capacitor resister is used.



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

Fig.2 When diode is used.

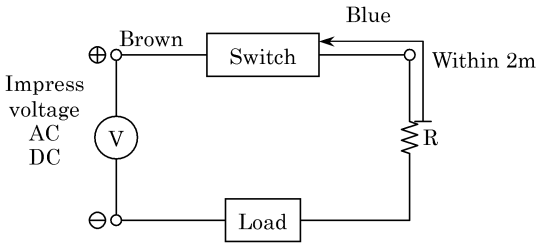
(2) Protective circuit when the wire length exceeds that stated Table 2



・ Choke coil
L=a couple hundred μH to a couple mH
surpassing high frequency characteristic

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

Fig.3



・ Dash current restriction resister
R=As much large resister as the load circuit can afford.

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

Fig.4

(3) Contact capacity

Do not use a load exceeding the maximum contact capacity of the switch. Additionally, if the current is lower than the rated current value, the indicator light may not be lit. (T0)

(4) Relay

Always use the relays listed below.

Omron Corporation ·····MY type
Fuji Electric Co., Ltd. ·····HH5 type
Tokyo Electric Co., Ltd. ·····MPM type
Panasonic, Ltd. ·····HC type

(5) Series connection

When multiple T0 switches are used with they connected in series, the voltage drop at the switch becomes the sum of voltage drop values of all switches.

When one T0 switch is used for checking of operation and T5 switch is used for other switches, they can be used with the voltage drop equivalent to one T0 switch (2.4V).

(6) Parallel connection

When multiple switches are connected in parallel, there are no limitations on the number of switches.

However, if multiple T0 switches are turned ON at the same time, the indicator light becomes dark or is not lit.

3.2.3 Solid state switch (T1, T2, T3)

1) Lead wire connections

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.

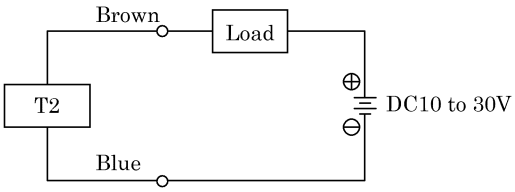


Fig.1 Fundamental circuit Example of T2

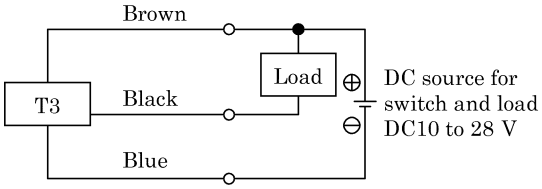


Fig.2 T3 Fundamental circuit Example of (1)
(In case the same source of power is used.)

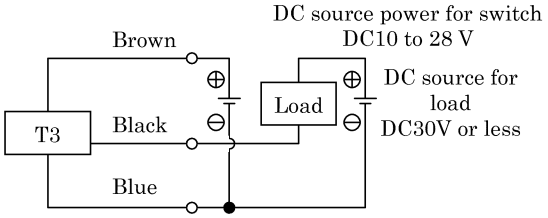


Fig.3 T3 Fundamental circuit Example of (2)
(In case individual sources of power are

2) Protection of output circuit

Install some protective circuit as illustrated in Fig. 4 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. 5 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. 6 or 7 (in case of model T2) and Fig 8 (in case of model T3).

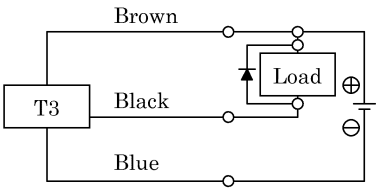
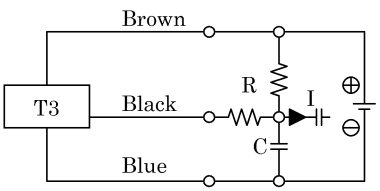


Fig.4 An example of using inducing load together with surge absorptive element (diode).
(Hitachi Mfg. made diode V06C or equivalent is recommended.)



Flg.5 An example of using capacitor type load together with current regulating resister R.
Comply with the following formula to figure out required R.

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

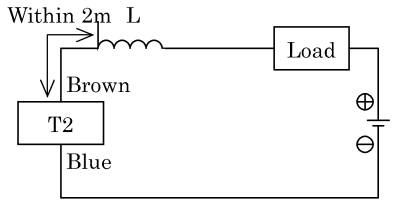


Fig.6 ・Choke coil
L= a couple hundred μ H to a couple mH surpassing high frequency characteristic
・Install it near by a switch (within 2m).

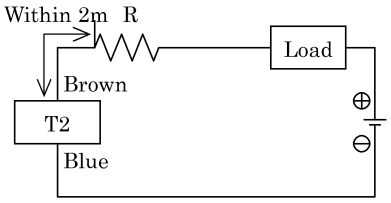


Fig.7 ・Dash current restriction resister.
R= As much large resister as the load circuit can afford.
・Install it near by a switch (within 2m).

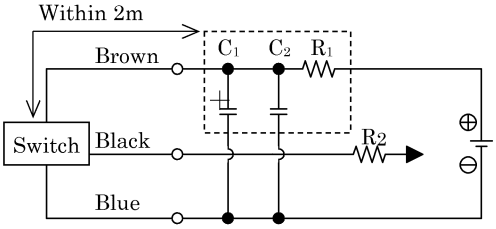


Fig8・ Electric power noise absorptive circuit.
C_1=20 to 50 μ F electrolytic capacitor
(Withstand voltage 50V or more)
C_2=0.01 to 0.1 μ F ceramic capacitor
R_1=20 to 30 Ω

・Dash current restriction resister.
R_2=As much large resister as the load circuit can afford.
・Install it nearby the switch (Within 2m)

3) Connection to a programmable controller (Sequencer).
Type of connection varies depending upon the model of the programmable controller. Refer to the following Fig. 9 to 13 respectively.

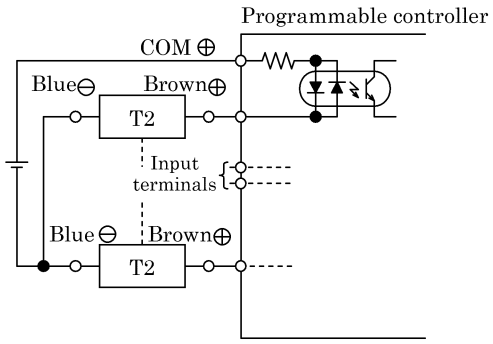


Fig.9 An example of T2 connection to source input type (an external power source)

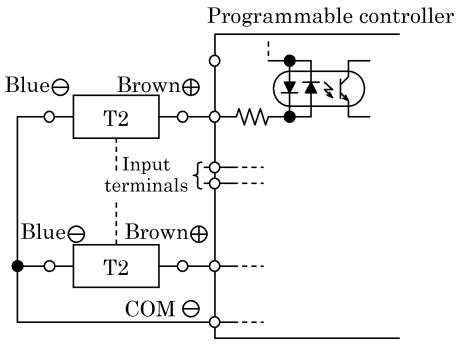


Fig.10 An example of T2 connection to source input type (an internal power source)

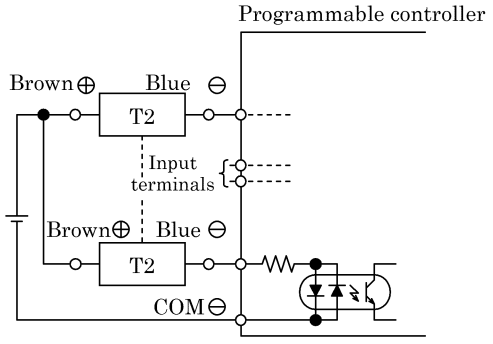


Fig.11 An example of T2 connection to source input type

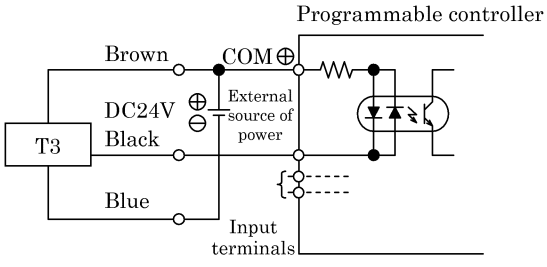


Fig.12 An example of T3 connection to source input type (an internal power source)

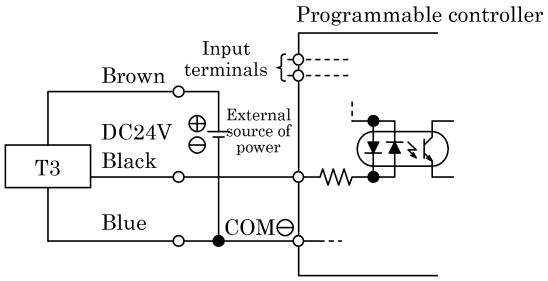


Fig.13 An example of T3 connection to source input type (an internal power source)

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 indicator light may exist.

T3 switches hardly ever leak. When less than 10 μ A, then leakage may occur. Usually dimming and failure of the indicator light do not occur.

4. MAINTENANCE

4.1 Periodical Inspection

1) In order to upkeep the cylinder in optimum condition, carry out periodic inspection once or twice a year.
2) Inspection items
   (1) Check the bolts and nuts fitting the piston rod end brackets and mounting brackets for slackening.
   (2) Check to see that the cylinder operates smoothly.
   (3) Check any change of the working piston speed and cycle time.
   (4) Check for internal and/or external leakage.
   (5) Check the piston rod for flaw (scratch) and deformation.
   (6) Check the stroke for abnormality.

   See “Trouble shooting”, 4.2 should there be any trouble found, also carry out additional tightening if bolts, nuts, etc. are slackened.

4.2 Trouble shooting

1) Cylinder

Trouble	Causes	Remedies
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 mounting style.
	Broken piston packing	Replace the piston packing.
Does not function smoothly.	Speed is below the low speed limit	Limit the load variation.
	Improper or misalignment of installation.	Correct the installation state and/or change the mounting style.
	Exertion of transverse (lateral) load.	Install a guide. Revise the installation state and/or change the mounting style.
	Excessive load.	Increase the pressure itself and/or the inner diameter of the tube.
	Speed control valve is built in the way of “Meter in” circuit.	Change the installation direction of the speed control valve.
Breakage and/or deformation	Impact force due to high speed operation	Turn the speed down. Reduce the load and/or install a mechanism with more secured cushion effect (e.g.external cushion mechanism).
	Exertion of transverse load.	Install a guide. Reverse the installation state and/or change the mounting style.

2) Switch

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

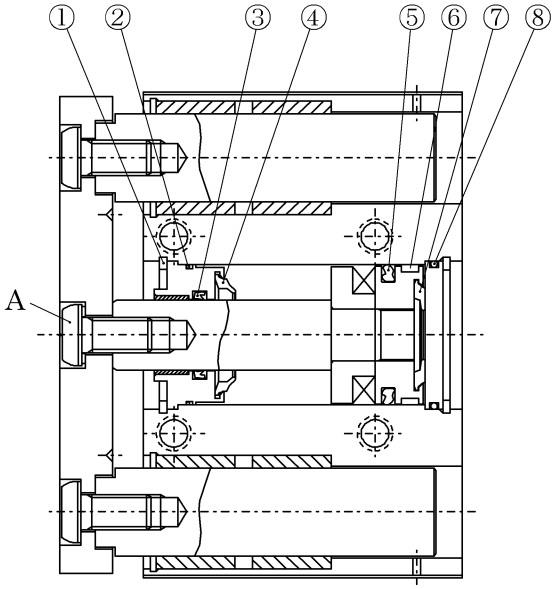
4.3 Disassembling

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 ①. 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 ϕ 32 to ϕ 80



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

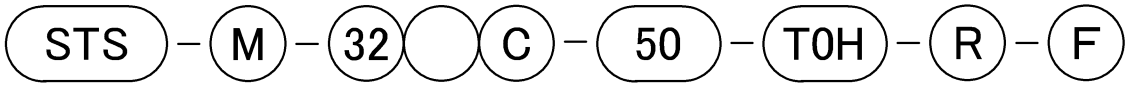
Bore size (mm) / Part name / Kit No. / Part No.		②	③	④	⑤
		Metal gasket	Rod packing	Rubber air cushion (R)	Piston packing
32 dia.	STS-32CK	F3-657975	MYR-16	F4-326732	PSD-32
40 dia.	STS-40CK	F3-657976	DRP-16	F4-318722	PSD-40
50 dia.	STS-50CK	F3-657977	DRP-20	F4-318724	PSD-50
63 dia.	STS-63CK	AS568-035	DRP-20	F4-318726	PSD-63
80 dia.	STS-80CK	AS568-041	DRP-25	F4-326733	PSD-80

Bore size (mm) / Part name / Kit No. / Part No.		⑥	⑦	⑧
		Wear ring	Rubber air cushion (H)	O ring
32 dia.	STS-32CK	F4-654960	F4-326731	AS568-025
40 dia.	STS-40CK	F4-650239	F4-318721	AS568-029
50 dia.	STS-50CK	F4-650240	F4-318723	AS568-032
63 dia.	STS-63CK	F4-650241	F4-318725	AS568-036
80 dia.	STS-80CK	F4-650242	F4-318726	AS568-041

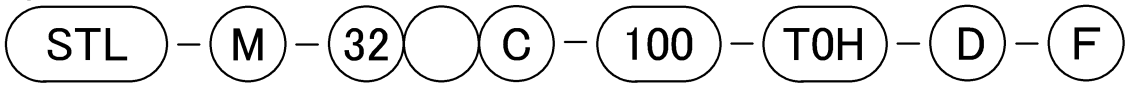
5. HOW TO ORDER

5.1 How to order

● Short stroke



● long stroke



(a) (b) (c) (d) (e) (f) (g)

(a) Type of bearing		(b) Bore size (mm)		(c) Pipe thread type	
M	Sliding bearing (Metal bearing)	32	32 dia	Blank	Rc
B	Rolling bearing (Ball bearing)	40	40 dia	N	NPT (32 dia. or more) (custom order)
		50	50 dia		
		63	63 dia	G	G (32 dia. or more) (custom order)
		80	80 dia		

(d) Standard stroke (mm)		25	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400
STS	32 dia to 63 dia.	○	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	80 dia.	○	○	○	○	—	—	—	—	—	—	—	—	—	—	—	—
STL	32 dia to 63 dia.	—	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	80 dia.	—	—	○	○	○	○	○	○	○	○	○	○	○	○	○	○

(e) Switch model No.					※ Lead wire length		(f) Qty. of switch	
Axial Lead wire	Radial Lead wire	Switch type	Indicator light	Lead wire	Blank	1m (Standard)	R	One on rod side
T0H※	T0V※	Reed	1 color indicator	2 wire	3	3m (Optional)	H	One on head side
T5H※	T5V※		Without indicator light		5	5m (Optional)	D	Two
T8H※	T8V※		1 color indicator				T	Three
T1H※	T1V※	Solid state						
T2H※	T2V※							
T3H※	T3V※			3 wire				
T2YH※	T2YV※		2 color indicator	2 wire				
T3YH※	T3YV※			3 wire				
T2JH※	T2JV※		Off delay type	2 wire				
T2YD※	—		Strong magnetic field proof					
T2YDT※	—							

※mark shows lead wire length.

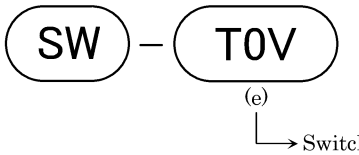
(g) Option	
F	Material of end plate: Steel
M	Corrosion proof end plate (aluminum)
M1	Corrosion proof end plate (SUS)
P6	Copper and PTFE free type

Note: Add "L1" to model code when ordering 2-color indicator or preventive maintenance switch of ϕ 40 or larger.

(Example)
STS-M-L1-63C-50-T2YH3-D-F

▸ 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.

5.2 How to order switch



(e) Switch model No.					※ Lead wire length	
Axial Lead wire	Radial Lead wire	Switch type	Indicator light	Lead wire	Blank	1m (Standard)
					3	3m (Optional)
					5	5m (Optional)
T0H※	T0V※	Reed	1 color indicator	2 wire		
T5H※	T5V※		Without indicator light			
T8H※	T8V※		1 color indicator			
T1H※	T1V※	Solid state				
T2H※	T2V※					
T3H※	T3V※			3 wire		
T2YH※	T2YV※		2 color indicator	2 wire		
T3YH※	T3YV※			3 wire		
T2JH※	T2JV※		Off delay type	2 wire		
T2YD※	—		Strong magnetic field proof			
T2YDT※	—					

6. SPECIFICATION

6.1 Cylinder Specifications

Descriptions		STS−M/B−※C STL−M/B−※C				
Bore size	mm	32 dia.	40 dia.	50 dia.	63 dia.	80 dia.
Actuation		Double-acting type				
Working fluid		Compressed air				
Max. working pressure	MPa	1.0				
Min. working pressure	MPa	0.2				
Proof pressure	MPa	1.6				
Ambient temperature	℃	-10 to 60 (No freezing)				
Port size		Rc1/8		Rc1/4		Rc3/8
Stroke length tolerance	mm	+2.0 0				
Working piston speed	mm/s	50 to 500			50 to 300	
Cushion		With rubber cushion				
Lubrication		Not required (when lubrication, use turbine oil class 1 ISO VG 32.)				
Allowable energy absorption	J	0.401	0.627	0.980	1.560	2.510

6.2 Switch Specifications

Descriptions	Reed 2 wire			
	T0H, T0V		T5H, T5V	
Applications	Programmable controller, relay		Programmable controller, relay, IC circuit (without indicator light), serial connection	
Power supply voltage	—			
Load voltage	DC12/24V	AC110V	DC5/12/24V	AC110V
Load current	5 to 50mA	7 to 20mA	50mA or less	20mA or less
Current consumption	—			
Internal voltage drop	3V or less		0V	
Indicator light	LED (ON lighting)		Without	
Leakage current	0mA			
Lead wire length (note1)	1m (oil resistant vinyl cabtire code 2 conductor 0.2mm²)			
Shock resistance	294m/s²			
Insulation resistance	20MΩ over at DC500V megger			
Withstand voltage	No failure at AC1000V impressed for one minute			
Ambient temperature	−10 to 60℃			
Degree of protection	IEC standards IP67, JIS C0920 (water tight type), oil resistance			

Descriptions	Reed 2 wire		
	T8H, T8V		
Applications	Programmable controller, relay		
Power supply voltage	—		
Load voltage	DC12/24V	AC110V	AC220V
Load current	5 to 50mA	7 to 20mA	7 to 10mA
Current consumption	—		
Internal voltage drop	3V or less		
Indicator light	LED (ON lighting)		
Leakage current	0mA		
Lead wire length (note1)	1m (oil resistant vinyl cabtire code 2 conductor 0.3mm²)		
Shock resistance	294m/s²		
Insulation resistance	100MΩ over at DC500V megger		
Withstand voltage	No failure at AC1500V impressed for one minute		
Ambient temperature	−10 to 60℃		
Degree of protection	IEC standards IP67, JIS C0920 (water tight type), oil resistance		

Descriptions	Solid state 2 wire	
	T2H, T2V	T2YH, T2YV
Applications	Programmable controller	
Power supply voltage	—	
Load voltage	DC10 to 30V	
Load current	5 to 20mA	
Current consumption	—	
Internal voltage drop	4V or less	
Indicator light	LED (ON lighting)	Red/Green LED (ON lighting)
Leakage current	1mA or less	
Lead wire length (note1)	1m (oil resistant vinyl cabtire code 2 conductor 0.2mm²)	1m (oil resistant vinyl cabtire code 2 conductor 0.3mm²)
Shock resistance	980m/s²	
Insulation resistance	20MΩ over at DC500V megger	100MΩ over at DC500V megger
Withstand voltage	No failure at AC1000V impressed for one minute	
Ambient temperature	−10 to 60℃	
Degree of protection	IEC standards IP67, JIS C0920 (water tight type), oil resistance	

Descriptions	Solid state 3 wire	
	T3H, T3V	T3YH, T3YV
Applications	Programmable controller, relay	
Switch output	NPN output	
Power supply voltage	DC10 to 28V	
Load voltage	DC30V or less	
Load current	100mA or less	50mA or less
Current consumption	10mA or less at DC24V	
Internal voltage drop	0.5V or less	
Indicator light	LED (ON lighting)	Red/Green LED (ON lighting)
Leakage current	10μA or less	
Lead wire length (note1)	1m (oil resistant vinyl cabtire code 3 conductor 0.2mm²)	
Shock resistance	980m/s²	
Insulation resistance	20MΩ over at DC500V megger	100MΩ over at DC500V megger
Withstand voltage	No failure at AC1000V impressed for one minute	
Ambient temperature	−10 to 60℃	
Degree of protection	IEC standards IP67, JIS C0920 (water tight type), oil resistance	

Descriptions	Solid state 2 wire	
	T1H, T1V	T2JH, T2JV
Applications	Programmable controller, relay, compact solenoid valve	Programmable controller, relay
Power supply voltage	—	
Load voltage	AC85 to 265V	DC10 to 30V
Load current	5 to 100mA	5 to 20mA
Current consumption	—	
Internal voltage drop	7V or less	4V or less
Off delay time	—	200±50ms
Indicator light	LED (ON lighting)	
Leakage current	1mA or less at AC100V 2mA or less at AC200V	1mA or less
Lead wire length (note1)	1m (oil resistant vinyl cabtire code 2 conductor 0.3mm²)	1m (oil resistant cabtire code 2 conductor 0.3mm²)
Shock resistance	980m/s²	
Insulation resistance	100MΩ over at DC500V megger	
Withstand voltage	No failure at AC1500V impressed for one minute	No failure at AC1000V impressed for one minute
Ambient temperature	−10 to 60℃	
Degree of protection	IEC standards IP67, JIS C0920 (water tight type), oil resistance	

Descriptions	Solid state 2 wire	
	T2YD	T2YDT
Applications	Programmable controller	
Load voltage	DC24V±10%	
Load current	5 to 20mA	
Internal voltage drop	6V or less	
Indicator light	Red/green LED (ON lighting)	
Leakage current	1.0mA or less	
Output delay time (Note3) (ON delay, OFF delay)	30 to 60ms	
Lead wire length (Note1)	Standard 1m (Oil resistant vinyl cabtire cord 2 conductor 0.5mm)	Standard 1m (Flame resistant vinyl cabtire cord 2 conductor 0.5mm)
Shock resistance	980m/s^2	
Insulation resistance	100MΩ over at DC500V megger	
Withstand voltage	No failure impressed at AC1000V for one minute	
Ambient temperature	−10 to 60℃	
Degree of protection	IEC Standards IP67, JIS C0920 (water tight type), oil resistance	

Note1 : 3m or 5m long lead wire is optionally available.

Note2 : Max. load current: 20mA above is the value at 25 ℃.
When ambient temperature around a switch is higher than 25 ℃, the value is lower than 20mA.
(5 to 10mA at 60 ℃).

Note3 : The time until the magnetic sensor outputs a switch signal after detected the magnet is shown.