CKD

SM－236245－A

INSTRUCTION MANUAL

HIGH ENERGY ABSORPTION CYLINDER

HCM

- 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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HCM
High energy absorption cylinder
Manual No. SM-236245-A

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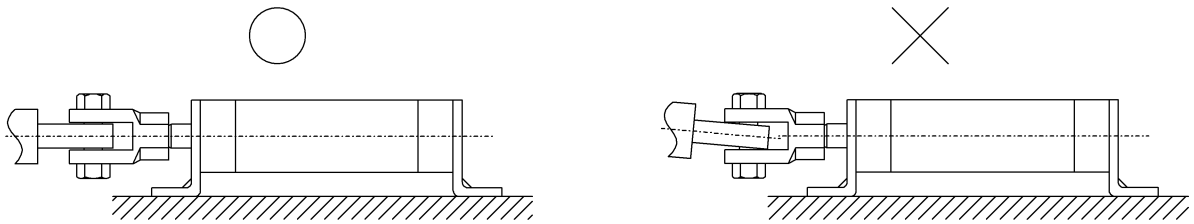
1. UNPACKING

1) Make sure that the type No. on the nameplate of the delivered Super Micro 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 range for this cylinder is -10 to 60℃.
2) Avoid use in the place where a lot of dust exists and the place where drop of water and drop of oil hang.
3) Carefully avoid other object from hitting the tube. Otherwise, it may get the tube distorted and cause malfunction of the cylinder.
4) When cylinder is fixed and rod end is guided:
   In case the piston rod of cylinder and the load are misaligned, the bushes and packings of the cylinder are extremely worn out. Hence, connect them with CKD floating connector (spherical bearing).
5) When cylinder is fixed and rod end is connected with pin joint:
   In case the load acting direction is not parallel with the rod axial center, the rod and tube may get entangled causing seizure, etc. Hence, make sure that the rod axial center and the load transfer direction are aligned to each other.



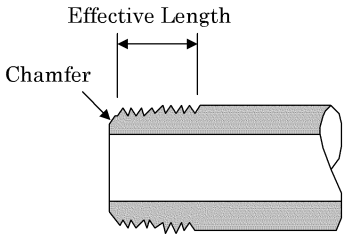
2.2 Piping

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

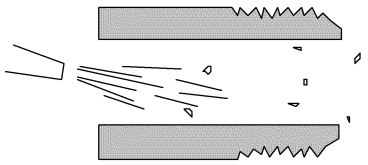
2) See to it that the pipe connecting cylinder and solenoid valve has effective cross-sectional area which is needed for the cylinder to drive at the specified speed.

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

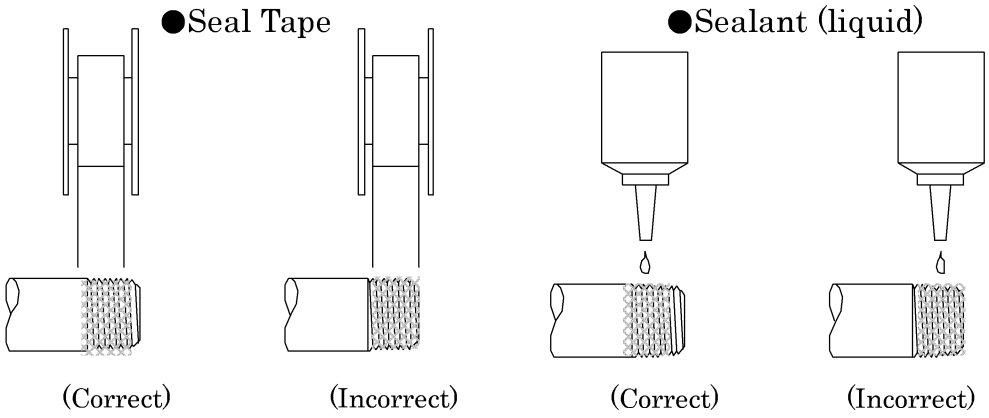
4) Be sure observe the effective thread length of gas pipe and give a chamfer of approx. 1/2 pitch from the threaded end.



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

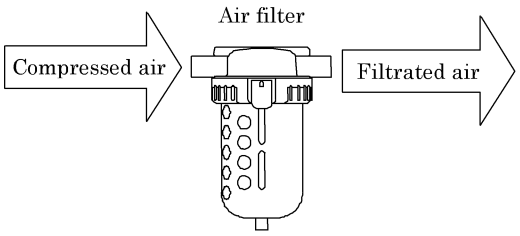


6) Refrain from applying sealant or sealing tape approx. two pitches of thread off the tip of pipe to avoid residual substances from falling into piping system.

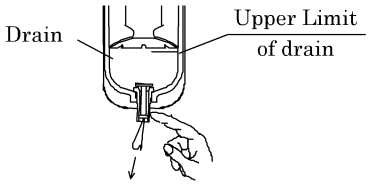


2.3 Fluid

1) It is necessary to use dehumidified air that has been filtered from com-pressed 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.

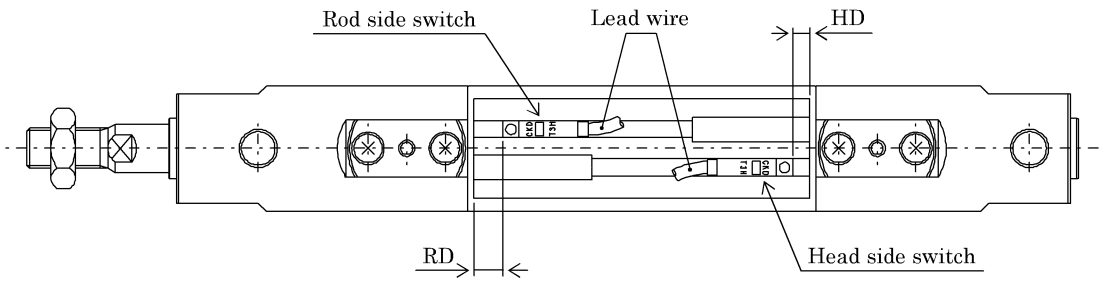


3) Note that the intrusion of carbide for the compressor oil (such as carbon or tarry substance) into the circuit causes malfunction of the solenoid valve and the cylinder. Be sure to carry out thorough inspection and maintenance of the compressor.

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 Location of mounting Switches on a Cylinder

1) Location of mounting switches on a cylinder. (Common items)



(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.
(Refer to Tables 1.)

(2) Intermediate of stroke
To detect a position of the piston on the way of the stroke, secure the piston at the detection position and move the switch above the position in the back and forth direction to find a position where each switch is turned ON first. The middle position between these two positions is the maximum sensitivity position at this piston position and is used as mounting position.

(3) Relocation of switch
Slide switch body along cylinder tube after loosening mounting screws and tighten screws when located the maximum sensitive position.

(4) Replacing switch
Take out switch out of band after loosening mounting screws(pan head screws). This time, fix the band and brackets etc. with the cylinder. Next, slide new replacing switch into the band and tighten screws upon placing the switch at the maximum sensitive position. (Tightening torque of pan head small screw is 0.5 to 0.7N･m)

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

3) Installation of switch rail
In case that switch rail is shipped together with cylinder or optionally purchased, refer to the “Switch rail mounting guide book” attached to the switch rail to mount it.

4) Hysteresis
Precise operating range deviate slightly depending upon the direction of piston movement as shown right.
Switch is apt to be disturbed its accuracy by external effect when piston stops within this range. Carefully avoid designing stopping location of piston.

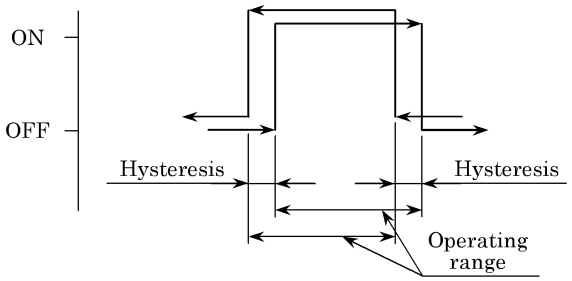
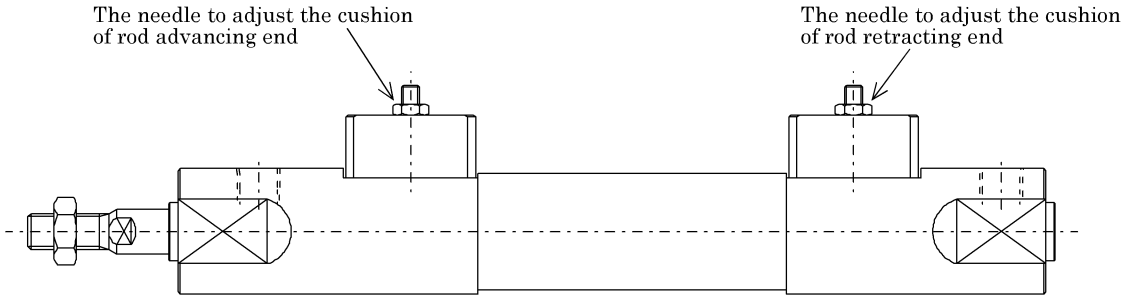


Table1 (Unit : mm)

Bore size (mm)	Solid state type (T2H/T2V, T3H/T3V)				Reed switch type (T0H/T0V, T5H/T5V)			
	Maximum sensitive position		Operating range	Hysteresis	Maximum sensitive position		Operating range	Hysteresis
	HD	RD			HD	RD		
φ20	10	10	3～8	1.5 or less	9	9.5	6～14	3 or less
φ25	9	11	3～9		8	10	5～14	
φ32			3～8				5～12	
φ40	11	13	3～9		10.5	12	6～14	
φ50	12	14			11.5	13		
φ63							7～15	

3. OPERATION

3.1 Operating the Cylinder



1) See to it that the air supply pressure to the cylinder is as shown in the "Specification". Operate the cylinder within this pressure range.

2) Though the cushion has been adjusted at no load when delivered, adjust the cushion needle when the change of cushion effect is required.
Tightening the needle (clockwise) makes cushion more effective. Tighten the needle lock nut all the way after adjustment.
However, if kinetic energy such as load is heavy or speed is too fast, exceeding the values given in Table 2, consider of providing a shock absorber.

Table 2 Table of cushion characteristics

Bore size (mm)	Allowable energy absorption (J)
ϕ 20	3
ϕ 25	5
ϕ 32	9
ϕ 40	14
ϕ 50	23
ϕ 63	30

3) Adjust the working piston speed with the speed controller mounted.

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 wire
Pay consideration to eliminate repeating bending stress or stretching of lead wire while laying the wire.
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.

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

6) Changing switch lead wire colors
The colors of the switch lead wires have been changed, as shown in the table3, in response to the revision of the JIS standard and the subsequent revision of the NECA (Nippon Electric Controllers Association) standard.

Table3

		Before change	After change
M, S, R, A, T, K, V, H Series	2-wire type	White (+)	Brown (+)
		Black (−)	Blue (−)
	3-wire type	Red (+)	Brown (+)
		White (output)	Black (output)
		Black (−)	Blue (−)
T, K Series (Equipped with preventive maintenance output)	3-wire type	White (+)	Brown (+)
		Yellow (preventive maintenance output)	Orange (preventive maintenance output)
		Black (−)	Blue (−)
	4-wire type	Red (+)	Brown (+)
		White (regular output)	Black (regular output)
		Yellow (preventive maintenance output)	Orange (preventive maintenance output)
		Black (−)	Blue (−)

3.2.2 Operational Cautions, Solid state switch (T2, T3)

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

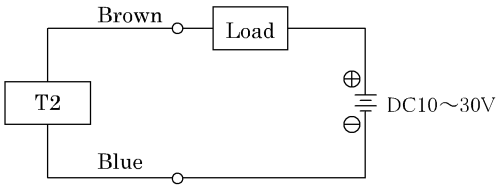


Fig.1 Fundamental circuit Example

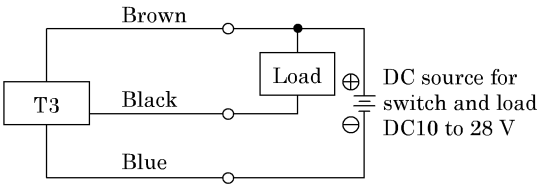


Fig.2 Fundamental circuit Example (1)
(In case the same source of power is used.)

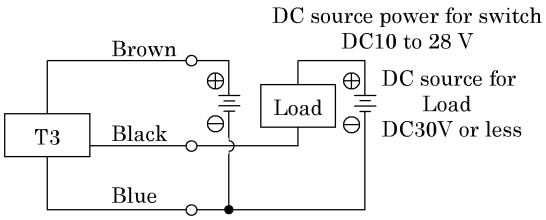


Fig.3 Fundamental circuit Example (2)
(In case individual sources of power are used.)

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).

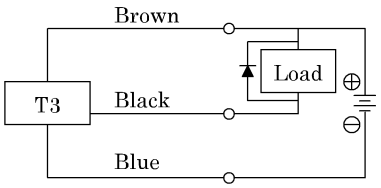
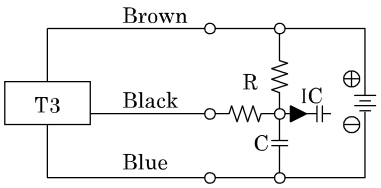


Fig.4 An example of using inducing load together with surge absorptive element (diode). (Hitachi Mfg. made diode V06C or equivalent is recommended.)



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.

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

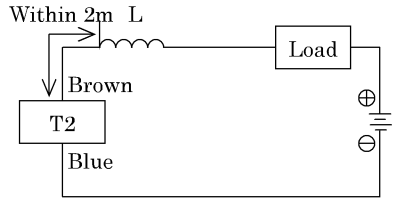


Fig.6 ・Choke coil
L = a couple hundred μH to a couple mH surpassing high frequency characteristic
・Install it near by a switch (within 2m).

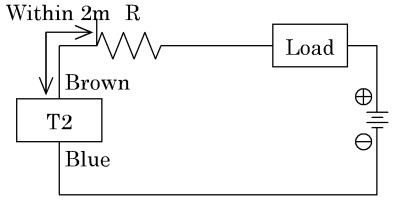


Fig.7 ・Dash current restriction resister.
R = As much large resister as the load circuit can afford.
・Install it near by a switch (within 2m).

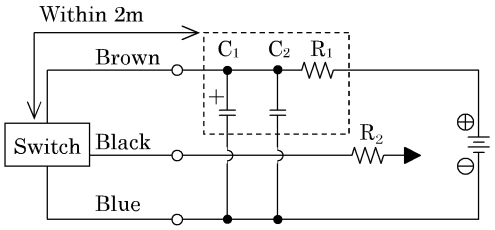


Fig8 ・Electric power noise absorptive circuit.
C_1=20 to 50 μF electrolytic capacitor
(Withstand voltage 50V or more)
C_2=0.01 to 0.1 μF ceramic capacitor
R_1=20 to 30 Ω

・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.

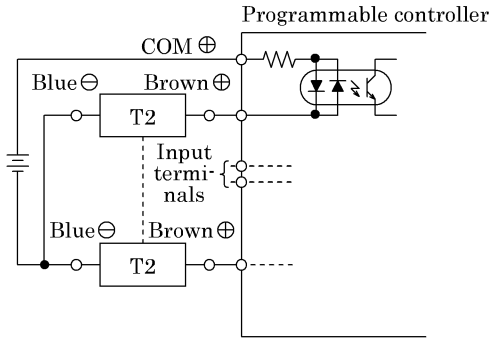


Fig.9 An example of T2 connection to source input type (an external power source)

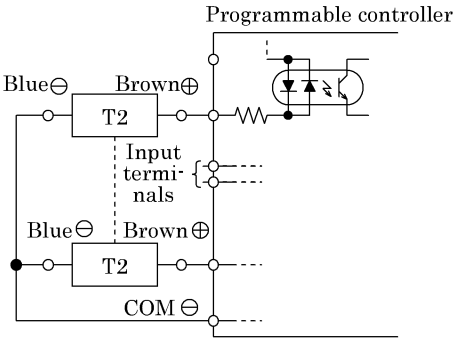


Fig.10 An example of T2 connection to source input type (an internal power source)

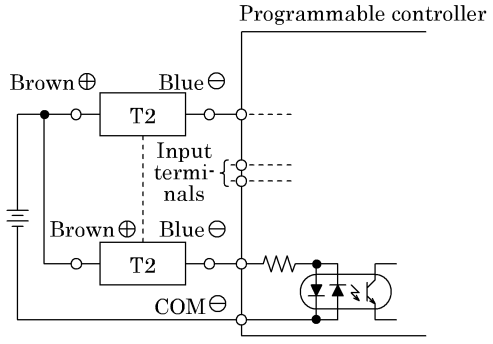


Fig.11 An example of T2 connection to source input type

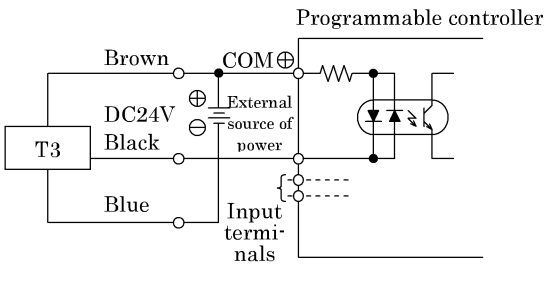


Fig.12 An example of T3 connection to source input type (an internal power source)

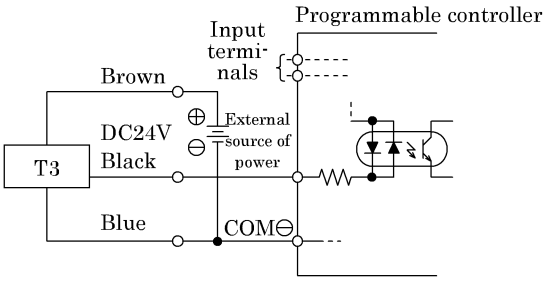


Fig.13 An example of T3 connection to source input type (an internal power source)

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.

3.2.2 Reed switch (T0, T5)

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 Ⓐ, Ⓑ.

Ⓐ 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.

Ⓑ 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.

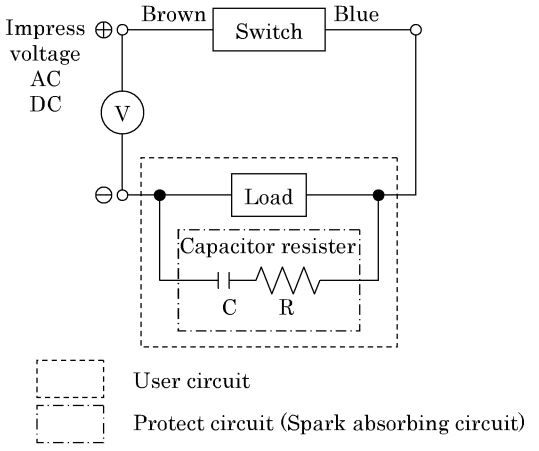
2) Contact protective measures

When an inductive load, such as relay is used or the wire length exceeds that stated in Table4, always install a contact protective circuit.

Table4

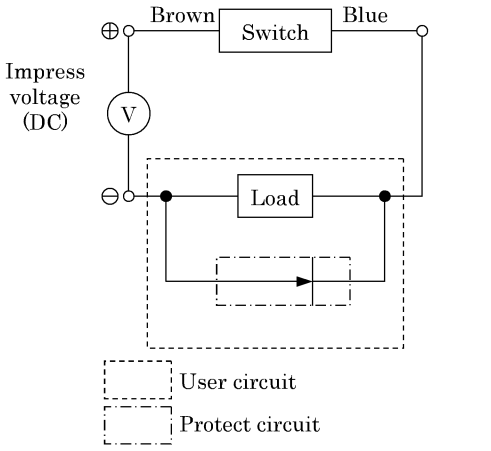
Electric power	Length of wire
DC	100m
AC	10m

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



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

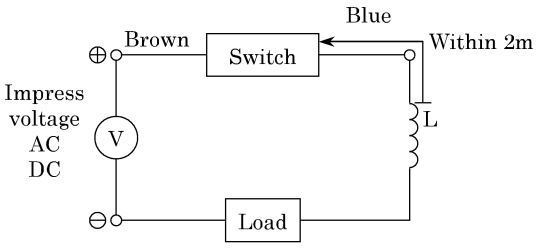
Fig.1 When capacitor resister is used.



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

Fig.2 When diode is used.

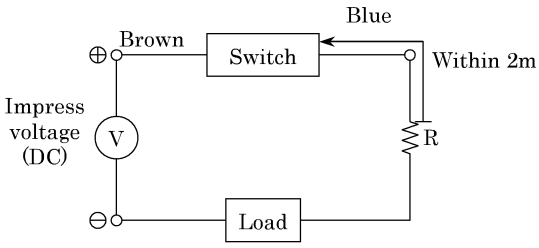
(2) Protective circuit when the wire length exceeds that stated Table 4.



・ 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.

4) Relay
Always use the relays listed below.
Omron Corporation ····· MY type
Fuji Electric Co., Ltd. ····· HH5 type
Panasonic, Ltd. ····· HC type

5) Serial 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 T5 switches. Indicator light 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 T0, sometimes, cause a dimmed indicator light or complete indicator light failure.

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

4.2 Disassembly Procedure

1) This cylinder is able to be disassembled.
   Replace component parts listed in Expendable parts List by disassembling cylinder referring to internal structure diagram when air leakage is ever occurred.
   (1) Shut off the fluid and remove the residual pressure.
   (2) Disconnect cylinder from piping and load.
   (3) Tuck a cover, either head cover ⑱ or rod cover ⑤, onto a pair of vise.
   (4) Remove the cover by holding the unfixed width across the flats of the cover with a spanner or monkey wrench.
   For tools required to remove the cover, see Table 5.

Table5

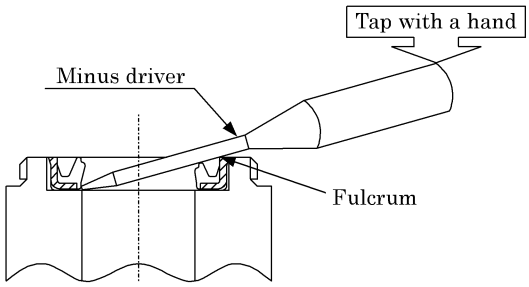
Bore size (mm)	Pair face of cover (mm)	Recommended hand tools
φ20	24	Spanner 24 Adjustable wrench 250 Pipe wrench 250
φ25	27	〃 27 〃 250 〃 350
φ32	32	〃 32 〃 375 〃 350
φ40	41	〃 375 〃 450
φ50	50	〃 600
φ63	60	〃 900

Note) ● Pipe wrench may sometimes give defects to cover.

(5) Remove rod packing ③, piston packing ⑪, cylinder gasket ⑥ & wear ring ⑭ using sharp pointed tool such as standard driver or bodkin.

(6) To replace cushion packing on the cover with cushion which was not disassembled, tuck pair face of the cover onto a pair of vise and loosen the tube by applying pipe wrench to OD of the tube as near to the cover as possible. (Beware that cylinder tube may be scratched by pipe wrench.)

(7) To remove cushion packing of ϕ 40 to ϕ 63, tuck the pair face of cover with a pair of vise, then ply it out with a minus driver by tapping the handle of screw driver with a hand upon inserting the tip under the loin of packing while making the corner edge of cover a fulcrum.



4.3 Assembly Procedure

1) Clean each component parts.
2) Take reversed sequence of disassembly to assemble cylinder after cleaning parts. Carefully avoid giving damage to packings to prevent malfunction or air leakage.
3) Assembling cushion packings. (ϕ 40 to ϕ 63)
To prevent a damage to packing also a tilt of it, use a jig and carefully press it in the place. Make sure to press it down so as the upper edge of its metal ring sink about 0.5mm below the top surface of the cover.
Table 6 and the illustration is an example of the jig.
Make it a reference of jig fabrication.

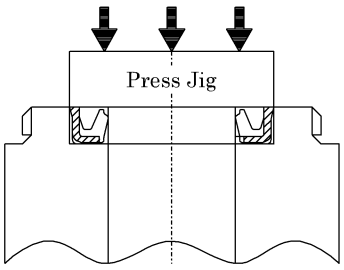
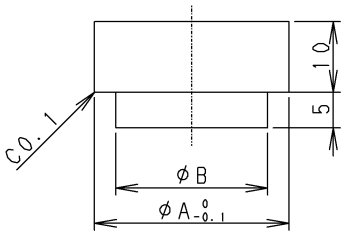


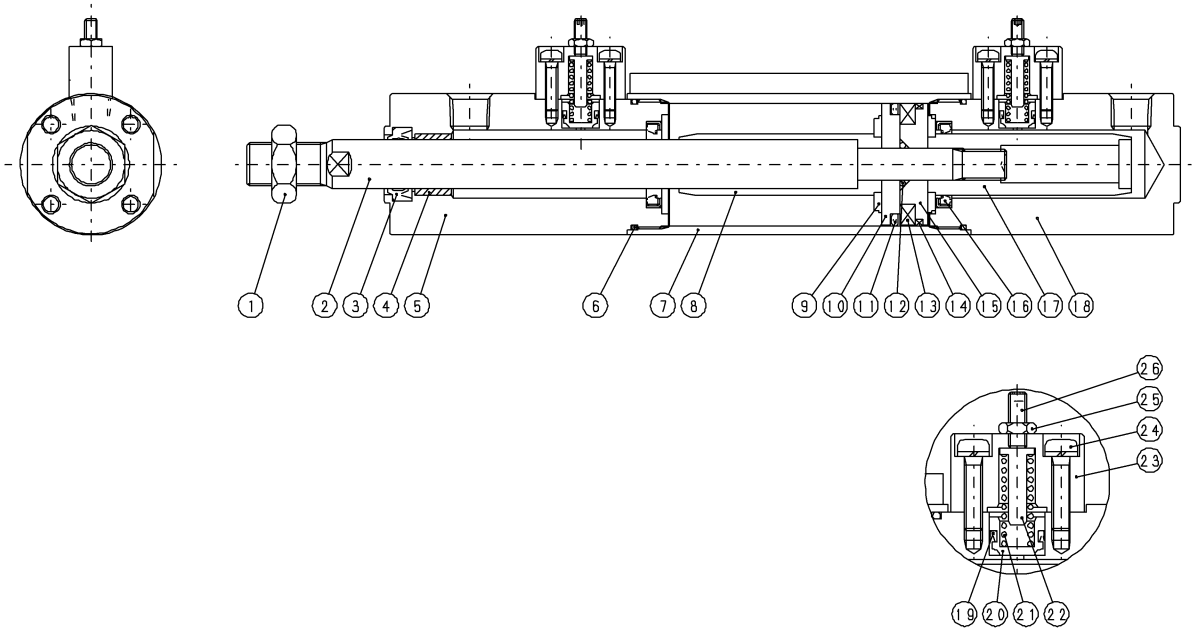
Table 6 Press Jig dimension (mm)

Bore size	A	B
ϕ 40	28	20
ϕ 50, ϕ 63	32	24



4) Apply a film of high grade grease (Lithium alkali base) over the inner surface of cylinder tube, outer surface of piston and packings.
5) When tightly assembling rod cover and head cover onto tube, make sure, for tight finishing, to turn the cover approx. 2° beyond former position before disassembling. (As for both end angle mounting type, carefully select tight finishing position so as to have both mounting faces of bracket become flat.)

4.4 Internal structure drawings and Expendable parts list



Part No.	Part Name	Material	Note
1	Rod nut	Steel	Nickel plating
2	Piston rod	ϕ 20～ ϕ 25 : Stainless steel ϕ 32～ ϕ 63 : Steel	Industrial chromium plating
3	Rod packing	Special nitril rubber	
4	Bushing	Oil impregnated bearing alloy	
5	Rod cover	Aluminum alloy	Black alumite
6	Cylinder gasket	Nitril rubber	
7	Cylinder tube	Aluminum alloy	Hard alumite disposal
8	Cushion ring (R)	Aluminum alloy	Chromate oxidation
9	Cushion rubber	Urethane rubber	
10	Piston (R)	Aluminum alloy	Chromate oxidation
11	Piston packing	Special nitril rubber	
12	Piston gasket	Nitril rubber	ϕ 25～ ϕ 63
13	Piston magnet	Plastic magnet	
14	Wear ring	Acetal resin	
15	Piston (H)	Aluminum alloy	Chromate oxidation
16	Cushion packing	ϕ 20～ ϕ 32 : Urethane ϕ 40～ ϕ 63 :Urethane・Steel	
17	Cushion ring(H)	Aluminum alloy	Chromate oxidation
18	Head cover	Aluminum alloy	Black alumite
19	Relief valve packing	Nitril rubber	
20	Relief valve	Copper alloy	
21	spring	Steel	Electrodeposition coating
22	Collar for spring	Steel	Chromate oxidation
23	Relief valve holder	Aluminum alloy	Black alumite
24	Cross recessed pan head screw	Steel	Black oxide finish
25	Hexagon nut	Steel	Black oxide finish
26	Hexagon socket set screw	Steel	Black oxide finish

Note) The structure changes somewhat by the models.

Expendable parts list (Specify the kit No. on your purchase order.)

Tube bore (mm) / Part Name / Kit No. / Part No.	Kit No.	③ Rod packing	⑥ Cylinder gasket	⑨ Cushion rubber	⑪ Piston packing
ϕ 20	HCM-20K	F4-200254	AS568-018	F4-339043	F4-200270
ϕ 25	HCM-25K	F4-200330	AS568-021	F4-339044	F4-200308
ϕ 32	HCM-35K	F4-200330	AS568-025	F4-116103	F4-200346
ϕ 40	HCM-40K	F4-200362	AS568-029	F4-659039	F4-200381
ϕ 50	HCM-50K	F4-200434	AS568-032	F4-659026	F4-200453
ϕ 63	HCM-63K	F4-200434	AS568-036	F4-200451	F4-200477

Tube bore (mm) / Part Name / Kit No. / Part No.	Kit No.	⑭ Wear ring	⑯ Cushion packing	⑲ Relief valve packing
ϕ 20	HCM-20K	F4-125610	F4-658562	DYP-12
ϕ 25	HCM-25K	F4-161716	F4-658563	DYP-12
ϕ 32	HCM-35K	F4-161733	F4-658563	DYP-12
ϕ 40	HCM-40K	F4-650239	F4-650636	DYP-12
ϕ 50	HCM-50K	F4-650240	F4-650637	DYP-12
ϕ 63	HCM-63K	F4-650241	F4-650637	DYP-12

5. 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 cylinder.
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 meter-out circuit 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

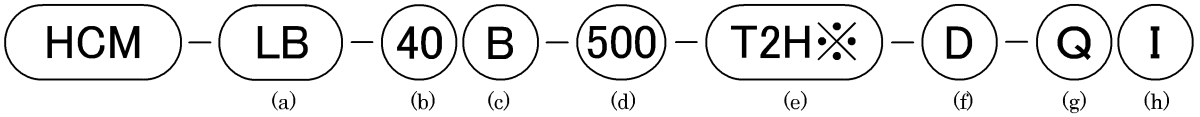
Troubles	Causes	Remedies
Indicator light is not lit.	Deposited contact point	Replace the switch.
	Excessive load than rated capacity	Replace the relay with a recommended one or replace the switch.
	Damaged indicator light	Replace the switch.
	Inadequate incoming signal	Review the external signal circuit 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.

6. HOW TO ORDER

6.1 Product Number Coding

● Without switch

● With switch



(a) Mounting style		(b) Bore size (mm)		(c) Cushion		(d) Stroke	
00	Basic type	20	φ20	B	With air cushion at both ends	Bore size (mm)	Stroke range (mm)
LB	Foot mount type, along axis	25	φ25	R	With air cushion at rod side		
		32	φ32	H	With air cushion at head side	φ20	200～700
FA	Rod side flange type	40	φ40	N	Without cushion	φ25	
FB	Head side flange type	50	φ50			φ32	
		63	φ63			φ40	200～1000
						φ50	
						φ63	

(e) Switch model code					(f) Qty. of switch (Note3, 4)	
Lead wire		Switch type	Indicator light	Lead wire	R	Rod side, 1 ea.
Straight type	L-shaped type				H	Head side, 1 ea.
T0H※	T0V※	Reed	1 color indicator	2-wire	D	2 ea.
T5H※	T5V※				T	3 ea.
T2H※	T2V※	Solid state	1 color indicator	2-wire	4	4 ea.
T3H※	T3V※			3-wire	5	5 ea.
T2YH※	T2YV※		2 color indicator	2-wire		
T3YH※	T3YV※			3-wire		
T2YFH※	T2YFV※		Preventive maintenance output	3-wire		
T3YFH※	T3YFV※			4-wire		
T2YMH※	T2YMV※			3-wire		
T3YMH※	T3YMV※			4-wire		
T2YD※	—		Critical magnetic proof switch 2 color indicator	2-wire		
T2YDT※	—					
T2JH※	T2JV※		OFF delay type	2-wire		

※mark indicates the length of lead wire.

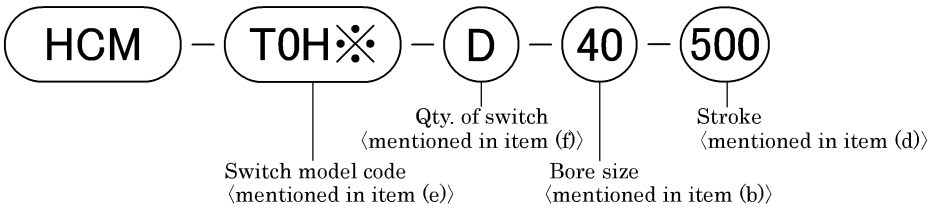
※ Lead wire length	
No code	1m (Standard)
3	3m (Option)
5	5m (Option)

(g) Option		(h) accessories	
Q	Delivered with switch rail	I	Rod eye
M	Piston rod stainless steel	Y	Rod clevis

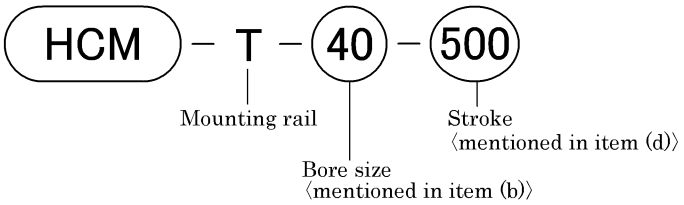
6.2 Component parts Model coding

1) Switch

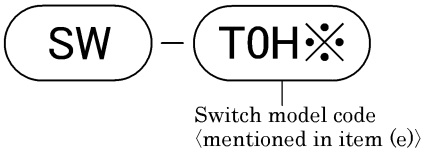
(1) Switch body + Set of mounting rail



(2) Mounting rail alone



(3) Switch alone



2) Model coding mounting bracket

Bore size (mm) / Mounting bracket	Foot mount type (LB)	Flange type (FA／FB)
ϕ20	HCM-LB-20	HCM-FA-20
ϕ25	HCM-LB-25	HCM-FA-25
ϕ32	HCM-LB-32	HCM-FA-32
ϕ40	HCM-LB-40	HCM-FA-40
ϕ50	HCM-LB-50	HCM-FA-50
ϕ63	HCM-LB-63	HCM-FA-63

7. SPECIFICATION

7.1 Product Specification

Model code / Item		HCM					
Bore size	mm	φ20	φ25	φ32	φ40	φ50	φ63
Actuation		Double-acting type					
Working fluid		Compressed air					
Max. working pressure	MPa	1.0					
Min. working pressure	MPa	0.15					
Proof pressure	MPa	1.6					
Ambient temperature	℃	−10 to 60 (No freezing)					
Port size		Rc1/8		Rc1/4		Rc3/8	
Stroke tolerance	mm	$^{+2.0}_{0}$					
Working piston speed	mm/s	50 to 2000 (Set the speed within the range of energy absorption.)					
Cushion		Air cushion					
Lubrication		Not required (Use Grade 1 ISO VG 32 Turbine oil, if lubrication is preferred)					
Allowable energy (Note1) absorption J	With air cushion	3	5	9	14	23	30
Effective air cushion length	mm	56.5			55.5	58.5	

Note1 : In the case of the kinetic energy exceeding this value, consider of providing a shock absorber.

7.2 Switch specification

Type & Model / Item	Reed switch			
	T0H, T0V		T5H, T5V	
Applications	For use with relay, programmable controller		For use with programmable controller relay, IC circuit (without indicator light), series connection	
Load Voltage	DC12/24V	AC110V	DC5/12/24V	AC110V
Load Current	5～50mA	7～20mA	50mA or less	20mA or less
Current consumption	—			
Internal voltage drop	2.4V or less		0V	
Indicator light	LED (ON lighting)		—	
Leakage current	0mA			
Lead wire length (Note1)	Standard 1m (Oil-proof vinyl cabtyre cord, 2-wire, 0.2mm²)			
Shock resistance	294m/s²			
Insulation resistance	20MΩ or more measuring with DC500V megger tester			
Withstand voltage	No abnormalities should occur after applying AC1,000V for 1 minute			
Ambient temperature	−10 to 60℃			
Degree of protection	IEC Standard IP67, JIS C0920 (water tight type), Oil resistance			

7 SPECIFICATION

Type & Model / Item	Solid state type switch		
	T2H, T2V	T2YH, T2YV	T2JH, T2JV
Applications	For use exclusively with programmable controller		
Power supply voltage	—		
Load Voltage	DC10 to 30V		
Load Current	5 to 20mA (Note2)		
Current consumption	—		
Internal voltage drop	4V or less		
Delay hour off	—		200±50ms
Indicator light	LED (ON lighting)	Red／Green LED (ON lighting)	LED (ON lighting)
Leakage current	1mA or less		
Lead wire length (Note 1)	Standard 1m (Oil-proof vinyl cabtyre cord, 2-wire, 0.2mm²)	Standard 1m (Oil-proof vinyl cabtyre cord, 2-wire, 0.3mm²)	
Shock resistance	980m/s²		
Insulation resistance	20MΩ or more measuring with DC500V megger tester	100MΩ or more measuring with DC500V megger tester	
Withstand voltage	No abnormalities should occur after applying AC1,000V for 1 minute		
Ambient temperature	−10 to 60℃		
Degree of protection	IEC Standard IP67, JIS C0920 (water tight type), Oil resistance		

Type & Model / Item	Solid state type switch	
	T3H, T3V	T3YH, T3YV
Applications	For use with programmable controller, relay	
Power supply voltage	DC10 to 28V	
Load Voltage	DC30V or less	
Load Current	100mA or less	50mA or les
Current consumption	10mA or less when it is on at DC24V	
Internal voltage drop	0.5V or less	
Delay hour off	—	
Indicator light	LED (ON lighting)	Red／Green LED (ON lighting)
Leakage current	10μA or less	
Lead wire length (Note 1)	Standard 1m (Oil-proof vinyl cabtyre cord, 3-wire, 0.2mm²)	
Shock resistance	980m/s²	
Insulation resistance	20MΩ or more measuring with DC500V megger tester	100MΩ or more measuring with DC500V megger tester
Withstand voltage	No abnormalities should occur after applying AC1,000V for 1 minute	
Ambient temperature	−10 to 60℃	
Degree of protection	IEC Standard IP67, JIS C0920 (water tight type), Oil resistance	

Type & Model		Solid state type switch	
Item		T2YFH, T2YFV	T3YFH, T3YFV
Applications		For use exclusively with programmable controller	For use with programmable controller, relay
Indicator light	Mounting position adjustment part	Red／Green LED (ON lighting)	
	Preventive maintenance output part	—	
Output part	Power supply voltage	—	DC10 to 28V
	Load voltage	DC10 to 30V	DC30V
	Load current	DC5 to 20mA	DC50mA or less
	Internal voltage drop	4V or less	0.5V or less
	Current consumption	—	10mA or less
	Leakage current	1mA or less	10 μA or less
Preventive maintenance output part	Load voltage	DC30V or less	
	Load current	DC20mA or less	DC50mA or less
	Internal voltage drop	0.5V or less	
	Leakage current	10 μA or less	
	Signal holding (T on)	—	
	Signal release (T off)	—	
Lead wire length (Note1)		Standard 1m (Oil-proof vinyl cabtyre cord, 3-wire, 0.2mm^2)	Standard 1m (Oil-proof vinyl cabtyre cord, 4-wire, 0.2mm^2)
Shock resistance		980m/s^2	
Insulation resistance		100MΩ or more measuring with DC500V megger tester	
Withstand voltage		No abnormalities should occur after applying AC1,000V for 1 minute	
Ambient temperature		−10 to 60℃	
Degree of protection		IEC Standard IP67, JIS C0920 (water tight type), Oil resistance	

Type & Model		Solid state type switch	
Item		T2YMH, T2YMV	T3YMH, T3YMV
Applications		For use exclusively with programmable controller	For use with programmable controller, relay
Indicator light	Mounting position adjustment part	Red／Green LED (ON lighting)	
	Preventive maintenance output part	Yellow LED (ON lighting)	
Output part	Power supply voltage	—	DC10 to 28V
	Load voltage	DC10 to 30V	DC30V or less
	Load current	DC5 to 20mA	DC50mA or less
	Internal voltage drop	4V or less	0.5V or less
	Current consumption	—	10mA or less
	Leakage current	1.2mA or less	10 μA or less
Preventive maintenance output part	Load voltage	DC30V or less	
	Load current	DC5～20mA or less	DC50mA or less
	Internal voltage drop	4V or less	2.4V or less
	Leakage current	10 μA or less	
	Signal holding (T on)	Turns ON(0. 4±0. 2) seconds after the red LED turns ON at Mounting position adjustment part	
	Signal release (T off)	Turns OFF(0. 7±0. 2) seconds after the red LED turns ON at Mounting position adjustment part	
Lead wire length (Note1)		Standard 1m (Oil-proof vinyl cabtyre cord, 3-wire, 0.2mm^2)	Standard 1m (Oil-proof vinyl cabtyre cord, 4-wire, 0.2mm^2)
Shock resistance		980m/s^2	
Insulation resistance		100MΩ or more measuring with DC500V megger tester	
Withstand voltage		No abnormalities should occur after applying AC1,000V for 1 minute	
Ambient temperature		−10 to 60℃	
Degree of protection		IEC Standard IP67, JIS C0920 (water tight type), Oil resistance	

7 SPECIFICATION

Type & Model / Item	Solid state type switch	
	T2YD	T2YDT
Applications	For use exclusively with programmable controller	
Indicator light	Red／Green LED (ON lighting)	
Load voltage	DC24V±10%	
Load current	5 to 20mA	
Internal voltage drop	6V or less	
Leakage current	1.0mA or less	
Output delay time (Note3) (ON delay、OFF delay)	30 to 60ms	
Lead wire length (Note1)	Standard 1m (Oil-proof vinyl cabtyre cord, 2-wire, 0.5mm²)	Standard 1m (Non-flammable cabtyre cord, 2-wire, 0.5mm²) (Option)
Shock resistance	980m/s²	
Insulation resistance	100MΩ or more measuring with DC500V megger tester	
Withstand voltage	No abnormalities should occur after applying AC1,000V for 1 minute	
Ambient temperature range	−10 to 60℃	
Degree of protection	IEC Standard IP67, JIS C0920 (water tight type), Oil resistance	

Note 1: 3m or 5m long lead wire is optionally available.

Note 2: Maximum value, 25mA is at 25℃ of ambient temperature. Load current decreases less than 25mA when the ambient temperature exceeds 25℃. For example: it may be 5 to 10mA at 60℃

Note 3: This shows a period of time between detection of the piston magnet by the magnetic sensor and sending of switch output.