Discontinue

CKD

SM－390104－A

INSTRUCTION MANUAL

LINEAR SLIDE CYLINDER

CLEAN ROOM SPECIFICATION

LCS-P7 Series

-P5 Series (custom order)

- 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
Ver.2

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.
- The P7 series uses fluorine-based grease. Avoid exposure to open flame to prevent generation of possibly injurious toxic gases. Smoking with a hand with the grease may generate toxic gas, so this is harmful to the health.

[SM-390104-A]

Discontinue

INDEX

LCS
Linear Slide Cylinder
Clean Room Specification
Manual No. SM-390104-A

1. UNPACKING

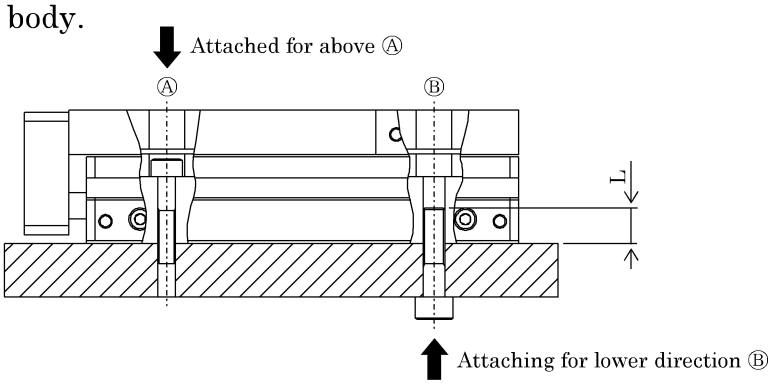
1) Make sure that the type No. on the nameplate of the delivered Selex Cylinder matches the type No. you ordered.
2) Check the appearance for any damage.
3) Stop up the piping port with a sealing plug to prevent the entry of foreign substances into the cylinder. Remove the sealing plug before piping.

2. INSTALLATION

2.1 Installation

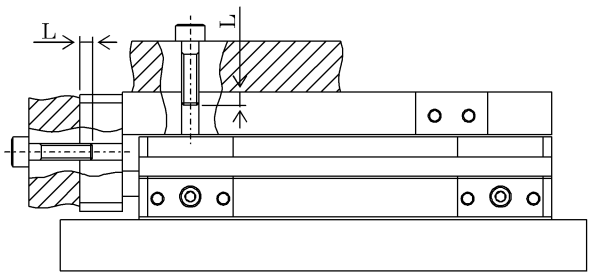
1) The Ambient temperature for this cylinder is -10 to 60℃ (No freezing). Always operate the cylinder within this temperature range.

2) Use the bolt threaded length and tightening torque below when installing the main body.



Item	Ⓐ		Ⓑ		
	Bolt	Torque (N・m)	Bolt	Torque (N・m)	Thread L (mm)
LCS-6	M3×0.5	0.6 to 1.1	M4×0.7	1.4 to 2.4	4 to 6
LCS-8					
LCS-12	M4×0.7	1.4 to 2.4	M5×0.8	2.9 to 5.1	5 to 8
LCS-16			M6×1.0	4.8 to 8.6	6 to 9
LCS-20	M5×0.8	2.9 to 5.1			
LCS-25	M6×1.0	4.8 to 8.6	M8×1.25	12.0 to 21.6	8 to 12

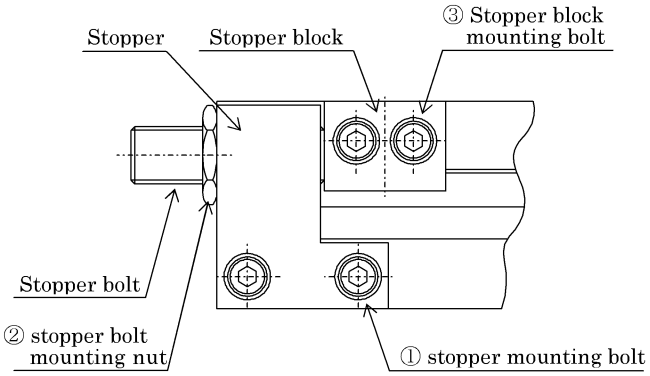
3) Use the bolt threaded length and tightening torque below when installing the jig onto the slide table or end plate.



Item	Slide table / End plate		
	Bolt	Torque (N・m)	Thread L (mm)
LCS-6	M3×0.5	0.6 to 1.1	3 to 4.5
LCS-8			
LCS-12	M4×0.7	1.4 to 2.4	4 to 6
LCS-16	M5×0.8	2.9 to 5.1	5 to 7.5
LCS-20			
LCS-25	M6×1.0	4.8 to 8.6	6 to 9

[SM-390104-A]

4) Use the following bolt and nut tightening torques for the stopper section.



Model	① Stopper bolt (N·m)	② Stopper bolt nut (N·m)	③ Stopper block bolt (N·m)
LCS-6	0.4 to 0.5	1.2 to 2.0	0.6 to 0.8
LCS-8			
LCS-12	0.6 to 0.8		
LCS-16		3.0 to 4.0	1.4 to 1.8
LCS-20	2.9to 3.5	4.5 to 6.0	
LCS-25			2.9 to 3.5

2.2 Allowable Load

1) Calculate the load (W) mounted on the table and the affected moment (M1, M2, M3) for each direction.

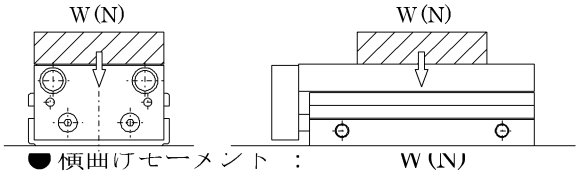
2) Input the calculated values into the following formula and the each value, which are shown on the following table.

$$\frac{W}{Wmax} + \frac{M1}{M1max} + \frac{M2}{M2max} + \frac{M3}{M3max} \leqq 1.0$$

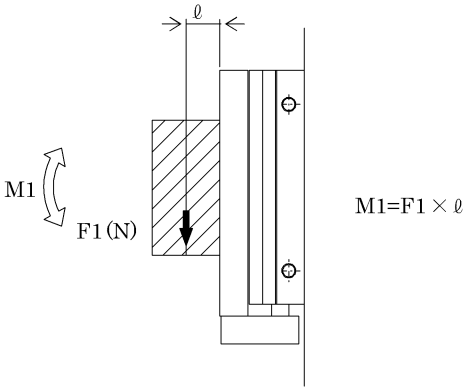
Bore size	Stroke length (mm)	Vertical load Wmax (N)	Bending moment M1max (N·m)	Radial moment M2max (N·m)	Twist moment M3max (N·m)
ϕ6	0 to 30	140	1.7	3.5	1.7
	40 to 50	186	10.68	5.64	10.68
ϕ8	0 to 30	140	1.7	3.5	1.7
	40 to 75	186	10.68	5.64	10.68
ϕ12	0 to 50	220.8	5.68	9.76	5.68
	75 to 100		22.2		22.2
ϕ16	0 to 50	380.8	17.82	19.2	17.82
	75 to 125		37.28		37.28
ϕ20	0 to 50	548.8	31.14	37.6	31.14
	75 to 150		56.24		56.24
ϕ25	0 to 50	961.5	65.11	116.25	65.11
	75 to 150		127.5		127.5

Discontinue

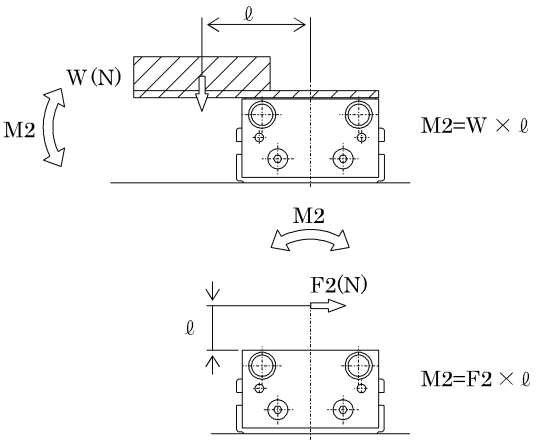
● Vertical load : W (N)



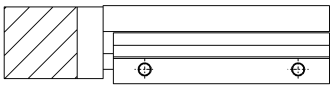
● Bending moment : M1 (N・m)



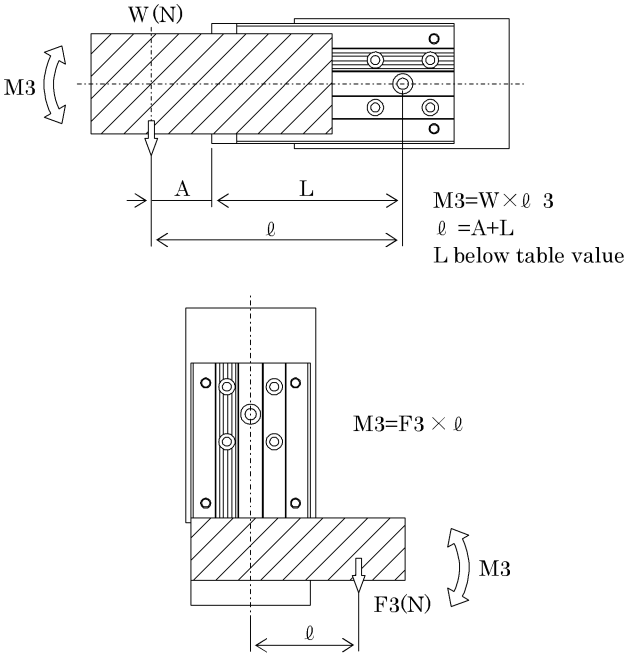
● Radial moment : M2 (N・m)



Note: The upper mentions shown under the condition with the load on the table.
Contact our member at the case of the use with the load on End plate.



● Twist moment : M3 (N・m)



Value L

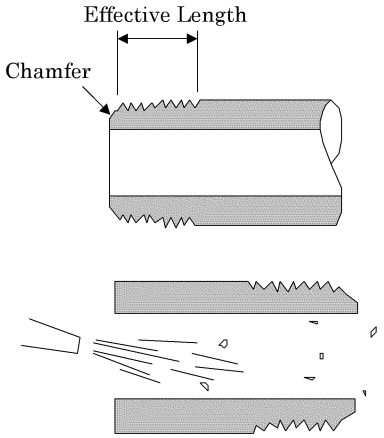
(unit:mm)

Stroke / Model	10	20	30	40	50	75	100	125	150
LCS-6	0.060	0.060	0.066	0.085	0.095	—	—	—	—
LCS-8	0.069	0.069	0.079	0.093	0.100	0.128	—	—	—
LCS-12	0.090	0.090	0.090	0.100	0.110	0.137	0.162	—	—
LCS-16	0.091	0.091	0.091	0.101	0.111	0.144	0.169	0.194	—
LCS-20	0.106	0.106	0.106	0.116	0.126	0.156	0.181	0.206	0.231
LCS-25	0.110	0.110	0.110	0.120	0.130	0.165	0.190	0.215	0.240

[SM-390104-A]

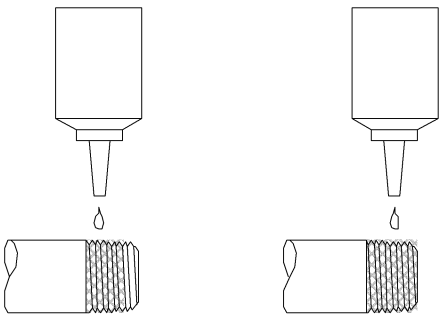
2.3 Piping

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 approx. the tip of pipe to avoid to residual substances from falling into piping systems.

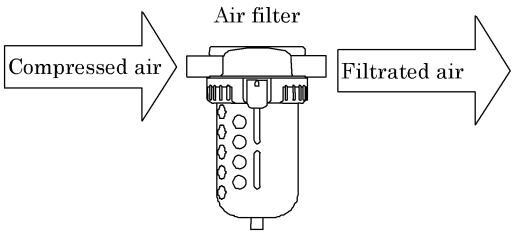
● Sealant (liquid)



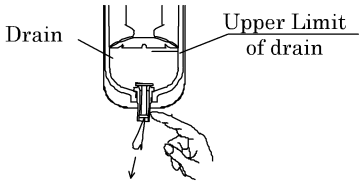
(Correct) (Incorrect)

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

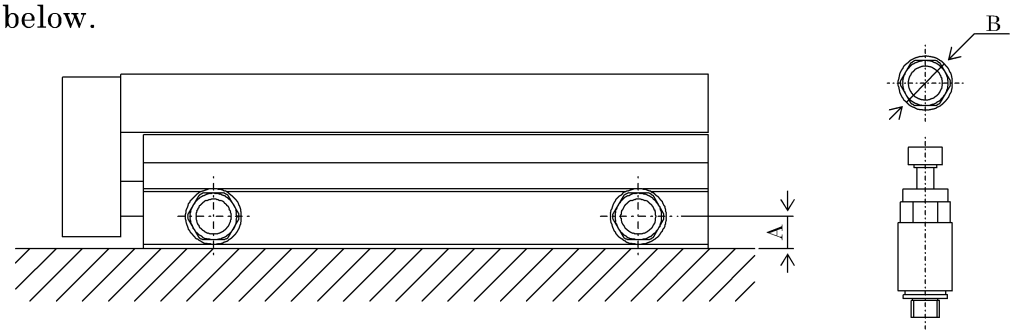


2) Be sure to drain out the accumulation in the filter periodically.



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



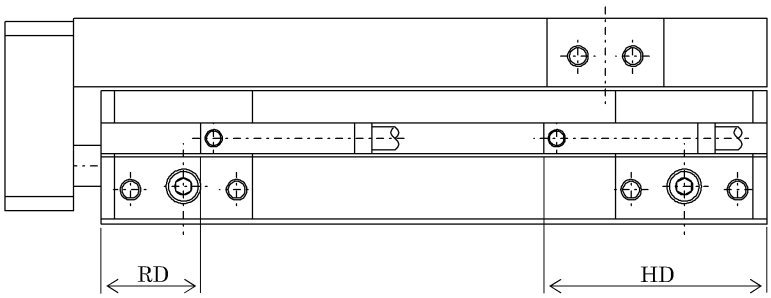
Item / Bore size (mm)	Port diam.	Port dimension A	Available joints	Joint OD ϕB
ϕ6	M3	4	SC3W-M3-3.2・4 SC3WU-M3-3.2・4 GWS3-M3-S GWS4-M3-S	ϕ8 or less
ϕ8	M5	5.5	SC3W-M5-4・6 GWS4-M5-S GWS4-M5	ϕ11or less
ϕ12				
ϕ16		6.5	SC3W-M5-4・6 GWS4-M5-S GWS4-M5 GWL4-M5 GWS6-M5 GWL6-M5	ϕ13 or less
ϕ20	Rc1/8	8	SC3W-6-4・6・8 GWS4-6 GWS8-6 GWL6-6 GWS6-6 GWL4-6	ϕ15 or less
ϕ25		9		

2.5 Location of Mounting Switches on a Cylinder

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 (Refer to 9 page) 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.

- Moving the switch

  Loosen the tightening screw (pan head small screw), and move the switch along the cylinder tube. Tighten at the required position.
- Exchange 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 to 0.2 N・m)

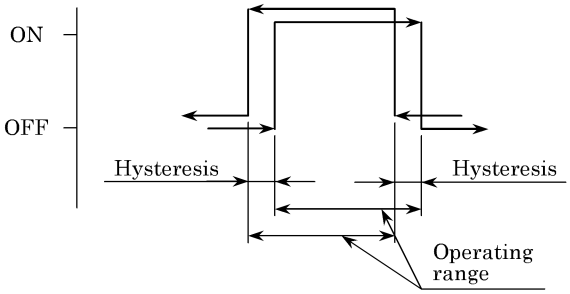
2) Operating range

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.

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 stopping location of piston.



Maximum sensitive position (HD・RD), operating range and hysteresis (unit : mm)

Bore size (mm) \ Max. sensitive Position		Stroke length									Solid state (F2H/V, F3H/V)	
		10	20	30	40	50	75	100	125	150	Operating range	Hysteresis
φ6	HD	22.5					—				2.5 to 3.5	1.5or less
	RD	37.5	27.5		37.5		—					

(unit : mm)

Bore size (mm) \ Max. sensitive position		Stroke length									Solid state (T2H/V, T3H/V)		Reed (T0H/V, T5H/V)	
		10	20	30	40	50	75	100	125	150	Operating range	Hysteresis	Operating range	Hysteresis
φ8	HD	27.5			36.5			—			1.5 to 4	1.5 or less	5 to 9	3 or less
	RD	38.5	28.5					—						
φ12	HD	32.5					41.5		—		1.5 to 5		6 to 10	
	RD	54.5	44.5	34.5					—					
φ16	HD	36.5					53.5			—	1.5 to 5		4 to 9	
	RD	54.5	44.5	34.5						—				
φ20	HD	44.5					56				3 to 8		6 to 14	
	RD	60	50	40										
φ25	HD	59					79.5				3 to 9		5 to 14	
	RD	60.5	50.5	40.5										

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

3. OPERATION

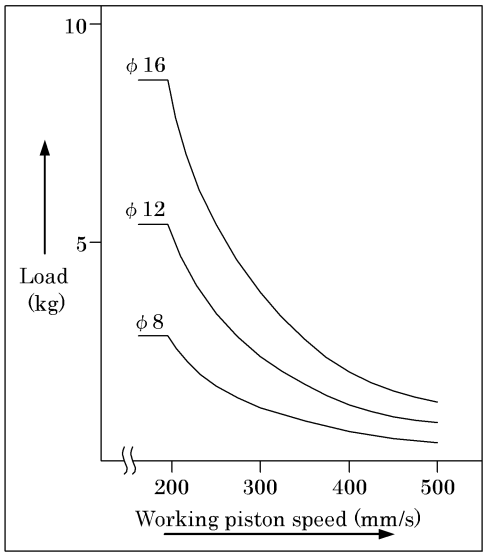
3.1 Operating the Cylinder

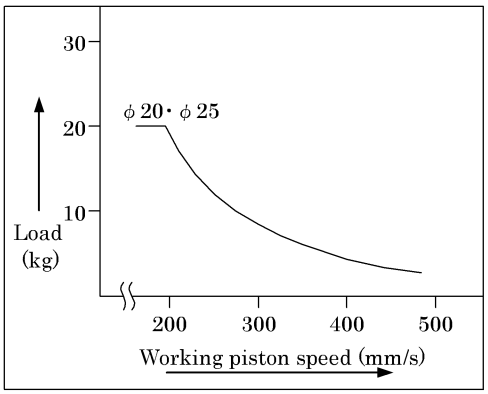
1) The working pressure for this type of cylinder is 0.05 to 1.0 MPa. Operate the system within this range.
Let the load factor of the cylinder be 50 % or less.

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

● Graphs for Tolerable kinetic energy





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

3.2 How to Use the Switches

3.2.1 Common Items

1) Magnetic environment
Do not use a switch other than the strong magnetic field proof switch in a place where strong magnetic field or large current (large magnet or spot welding machine, etc.) exists around the switch mounting position. 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) Lead wire wiring
Carefully perform the wiring so that a bending stress or tensile strength does not apply to the lead wire repeatedly.
Additionally, connect wires for robot having the bending resistance to movable parts.

3) Operating temperature
Do not operate the product at a high temperature (Over than 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 setting the cylinder switch at mid-stroke and driving a load when the piston changes, if the speed is too fast, the cylinder switch will function but operation time will be too short and the load may not respond correctly.

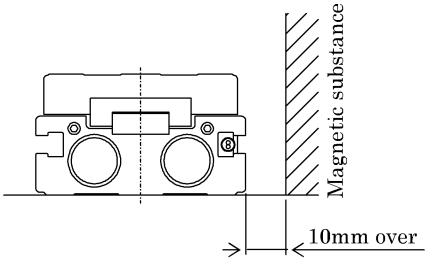
The maximum detectable working piston speed is :

$$V\,(\mathrm{mm/s}) = \frac{\text{Cylinder switch operation range (mm)}}{\text{Load operation time (s)}}$$

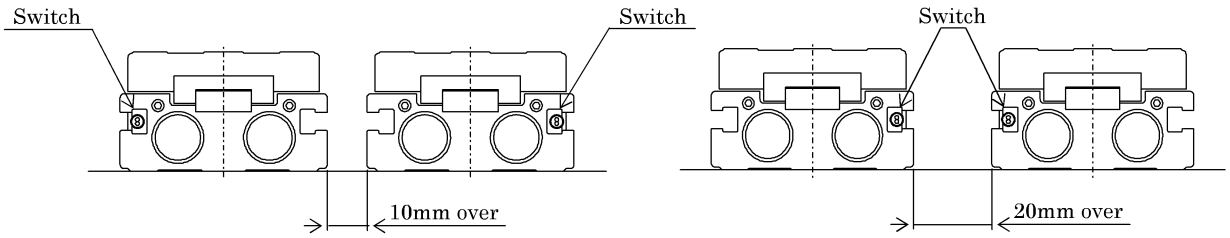
Refer to the minimum value of the table on page 7 4) about cylinder switch operating range.

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

6) The cylinder may malfunction if a magnetic substance, such as a steel plate, is nearby. Move the magnetic substance to at least 10 mm from the cylinder. (Same clearance for all diameters)



7) The cylinder switch may malfunction if cylinders are installed adjacently. Separate cylinders by the following distances. (Same clearance for all bore size)



3.2.1 Operational Cautions, Solid state switch (F2, F3)

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

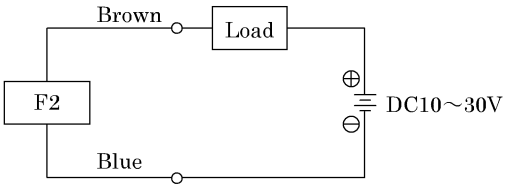


Fig.1 Fundamental circuit Example

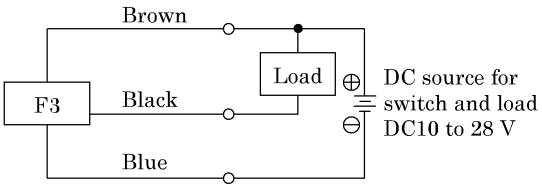


Fig.2 Fundamental circuit Example (1)
(In case the same source of power is used.)

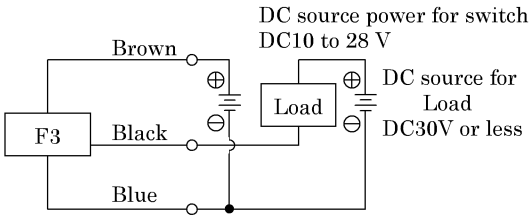


Fig.3 Fundamental circuit Example (2)
(In case individual sources of power are used.)

2) Output circuit protection

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 F2) and Fig 8 (in case of model F3).

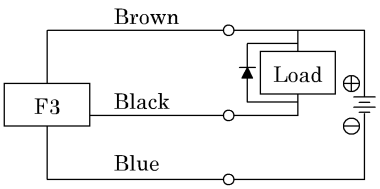
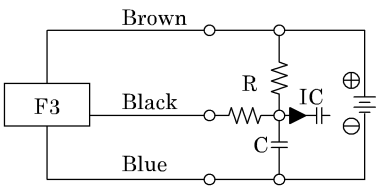


Fig.4 An example of using inducing load together with surge absorptive element (diode). (Hitachi Mfg. made diode V06C or equivalent is recommended.)



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.

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

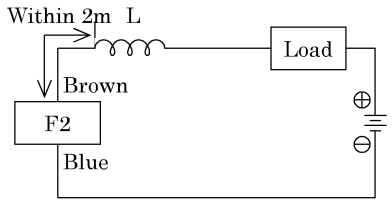


Fig.6 ・Choke coil
L＝a couple hundred μH to a couple mH surpassing high frequency characteristic
・Install it near by a switch (within 2m).

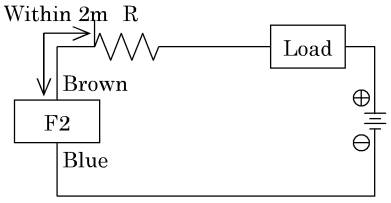


Fig.7 ・Dash current restriction resister.
R＝As much large resister as the load circuit can afford.
・Install it near by a switch (within 2m).

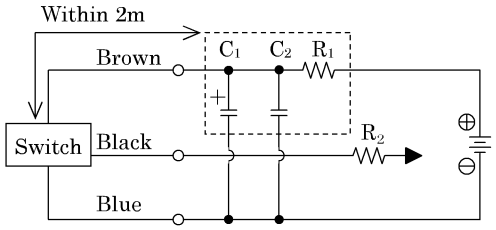


Fig8 ・Electric power noise absorptive circuit.
C_1=20 to 50 μF electrolytic capacitor
(Withstand voltage 50V or more)
C_2=0.01 to 0.1 μF ceramic capacitor
R_1=20 to 30 Ω

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

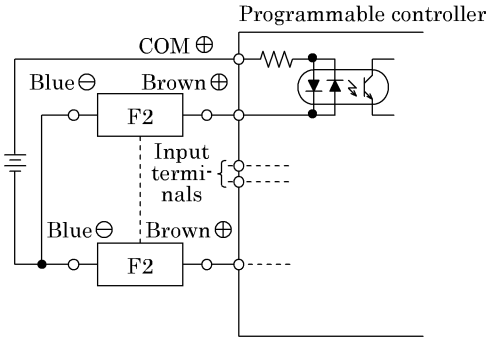


Fig.9 An example of F2 connection to source input type (an external power source)

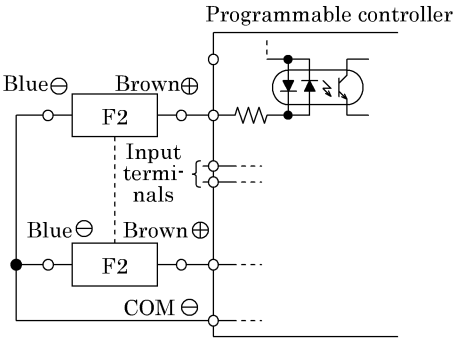


Fig.10 An example of F2 connection to source input type (an internal power source)

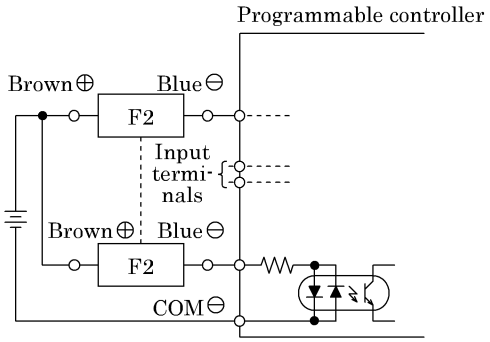


Fig.11 An example of F2 connection to sink input type

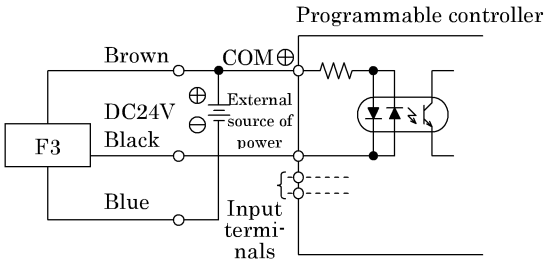


Fig.12 An example of F3 connection to source input type (an external power source)

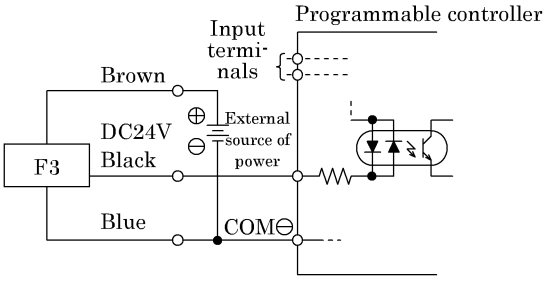


Fig.13 An example of F3 connection to source input type (an internal power source)

4) Series connection

The total voltage will decrease when the F2 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.

F3 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.

3.2.3 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

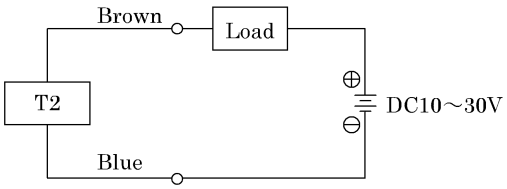


Fig.1 Fundamental circuit Example

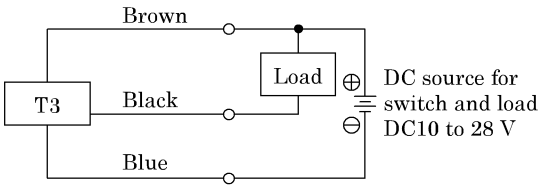


Fig.2 Fundamental circuit Example (1)
(In case the same source of power is used.)

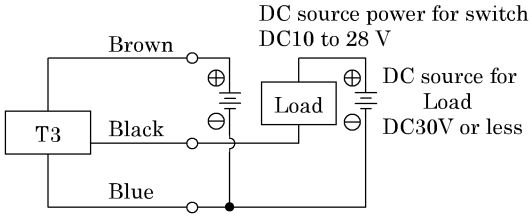


Fig.3 Fundamental circuit Example (2)
(In case individual sources of power are used.)

2) Output circuit protection

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).

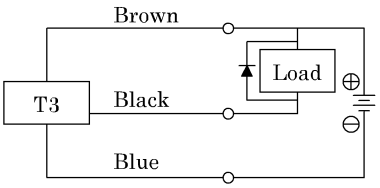
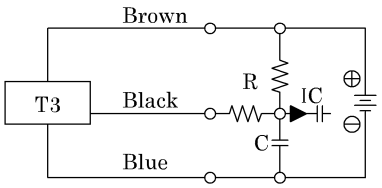


Fig.4 An example of using inducing load together with surge absorptive element (diode). (Hitachi Mfg. made diode V06C or equivalent is recommended.)



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.

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

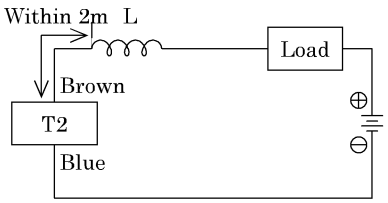


Fig.6 ・Choke coil
L = a couple hundred μH to a couple mH surpassing high frequency characteristic
・Install it near by a switch (within 2m).

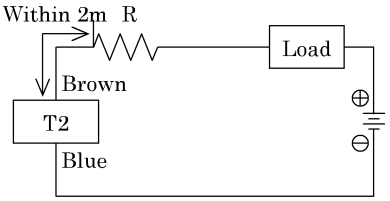


Fig.7 ・Dash current restriction resister.
R = As much large resister as the load circuit can afford.
・Install it near by a switch (within 2m).

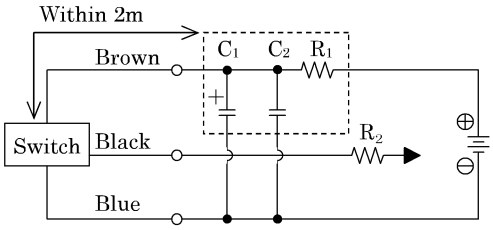


Fig8 ・Electric power noise absorptive circuit.
C_1=20 to 50 μF electrolytic capacitor (Withstand voltage 50V or more)
C_2=0.01 to 0.1 μF ceramic capacitor
R_1=20 to 30 Ω

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

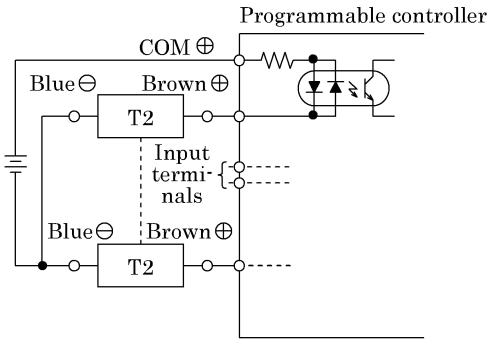


Fig.9 An example of T2 connection to source input type (an external power source)

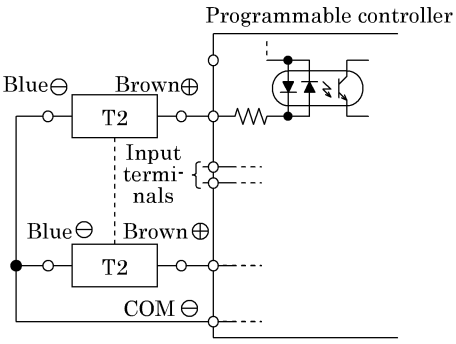


Fig.10 An example of T2 connection to source input type (an internal power source)

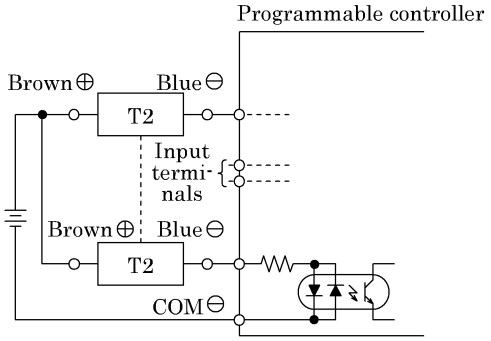


Fig.11 An example of T2 connection to source input type

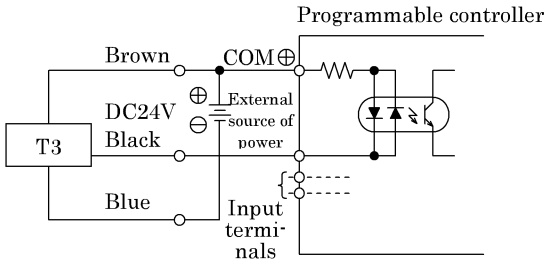


Fig.12 An example of T3 connection to source input type (an internal power source)

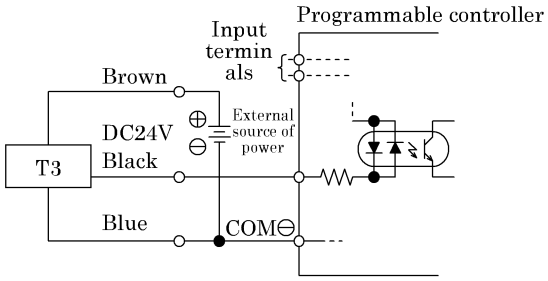


Fig.13 An example of T3 connection to source input type (an internal power source)

4) Parallel 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.

3.2.4 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 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.

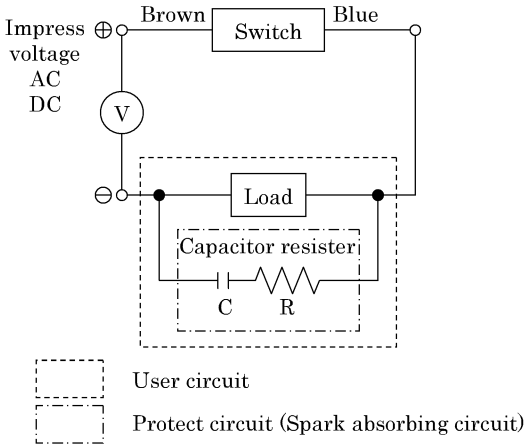
3) Contact protective measures

When an inductive load, such as relay is used or the wire length exceeds that stated in Table 1, always install a contact protective circuit.

Table1

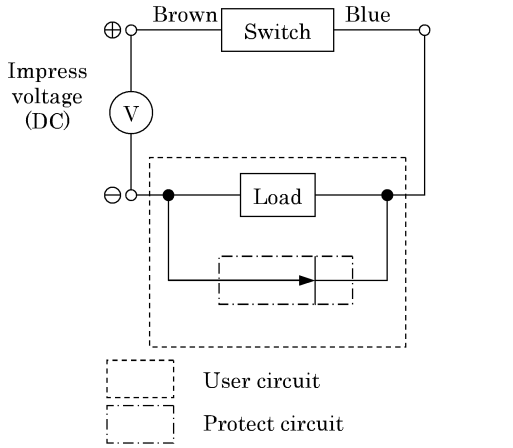
Electric power	Length of wire
DC	100m
AC	10m

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



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

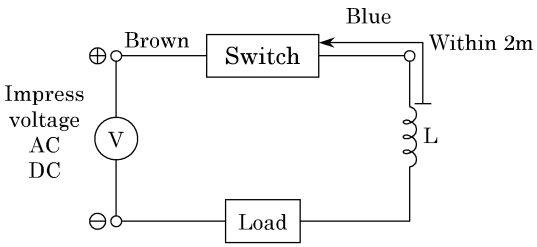
Fig.1 When capacitor resister
(In case the same source of power is used.)



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

Fig.2 When diode is used.

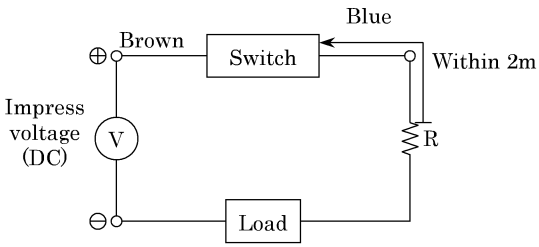
(2) Protective circuit when the wire length exceeds that stated Table 1.



・ 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

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.

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 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 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.

Discontinue

6. HOW TO ORDER

6.1 Product Number Coding

● Without switch

LCS – 8 – 40 ——————— S1DT P72

● With switch

LCS – 12 – 40 – T0H※ – R – S1DT P72

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

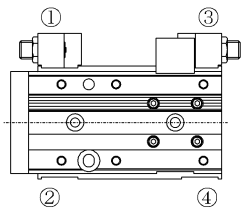
(a) Bore size (mm)		(b) Stroke length (mm)								
6	φ6	Code	Standard stroke length	Bore size						
8	φ8			φ6	φ8	φ12	φ16	φ20	φ25	
12	φ12	10	10mm	○	○	○	○	○	○	
16	φ16	20	20mm	○	○	○	○	○	○	
20	φ20	30	30mm	○	○	○	○	○	○	
25	φ25	40	40mm	○	○	○	○	○	○	
		50	50mm	○	○	○	○	○	○	
		75	75mm	—	○	○	○	○	○	
		100	100mm	—	—	○	○	○	○	
		125	125mm	—	—	—	○	○	○	
		150	150mm	—	—	—	—	○	○	

○ : Standard, — : Not available

(c) Switch model No.					(d) Qty. of switch	
Lead wire straight type	Lead wire L-shaped type	Switch type	Indicator light	Lead wire	R	One on rod side
T0H※	T0V※	Reed	1 color indicator	2 wire	H	One on head side
T5H※	T5V※		Without indicator light		D	Two
T2H※	T2V※	Solid state	1 color indicator	2 wire		
T3H※	T3V※			3 wire		
F2H※	F2V※			2 wire		
F3H※	F3V※					

※ Lead wire length	
Blank	1m (Standard)
3	3m (Optional)
5	5m (Optional)

(e) Option			Section ※※ (note 4)	
S : Stopper for adjustable stroke			Blank	Stopper section port : No port
Adjustable stroke single 5mm			D	Stopper section port : side and bottom port
S1※※	Stopper position ①	Refer to figure below for the stopper position	Blank	Stopper block material : Rolled steel
S2※※	Stopper position ②		T	Stopper block material : Equivalent to quenched material
S3※※	Stopper position ③			
S4※※	Stopper position ④			
S5※※	Stopper position ①, ③			
S6※※	Stopper position ②, ④			

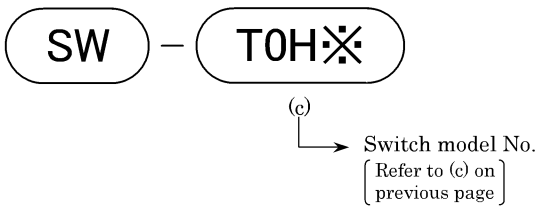


(f) Clean room specifications (note5)		
	Structure	Material restriction
P72	Exhaust treatment	–
P73	Vacuum treatment	–
P52	Exhaust treatment	Copper, silicon, halogen-based (fluorine, chlorine, oxalic) unacceptable.
P53	Vacuum treatment	Copper, silicon, halogen-based (fluorine, chlorine, oxalic) unacceptable.

Note1: Stroke adjustable range of Hexagon socket set screw with urethane type stopper (standard) is 5 mm for one direction.
When changing adjustable stroke range, use a discrete stopper.
Note2: Possible to change the stopper on the position (1) to the one on the position (4), and the stopper on the position (2) to the one on the position (3).
Be careful ; Impossible to change (1) to (2) and (3) to (4).
Note3: Standard port positions will be at (1) and (3) upper if no stopper is provided.
Note4: Selectable only when a stopper is used.
Note5: "P52" and "P53" is custom order.

6.2 Component Parts Model Coding

1) Switch
Switch alone



2) Stopper for adjustable stroke
Discrete stopper for adjustable stroke

(a) Adjustable stroke range	
S01	Single 5mm (standard)
S02	Single 15mm
S03	Single 25mm

S03 is not available for 6,8 mm bore.

7. SPECIFICATION

7.1 Product Specifications

Model / Item			LCS-P7・P5					
Bore size		mm	φ6	φ8	φ12	φ16	φ20	φ25
Actuation			Double acting					
Working fluid			Compressed air					
Max. working pressure		MPa	0.7					
Min. working pressure		MPa	0.15					
Proof pressure		MPa	1.0					
Ambient temperature		℃	−10～60 (No freezing) (Note1)					
Port size	Main body side		M3	M5			Rc1/8	
	Main body rear		—	M3		M5		Rc1/8
Port size (Relief port)			M3	M5			Rc1/8	
Stroke tolerance		mm	(note2)	+2.0 0				
Working piston speed		mm/s	50～500					
Cushion			Rubber cushion					
Lubrication			Not permissible					

7.2 Switch Specifications

1) Type of switch and applications

Model / Descriptions			Applications (Purpose)
Reed	2 wire	F2H	DC programmable controller
		F2V	
	3 wire	F3H	DC programmable controller, relay
		F3V	
	2 wire	T2H	DC programmable controller
		T2V	
	3 wire	T3H	DC programmable controller, relay
		T3V	
Solid state	2 wire	T0H	AC / DC programmable controller, relay
		T0V	
		T5H	AC / DC programmable controller, relay, IC circuit (without indicator light), serial connection
		T5V	

Note: T※H designates lead cord outlet is straight out type as well as T※V designates lead cord outlet is L shape type.

2) Switch specifications

Descriptions	Reed 2 wire			
	T0H, T0V		T5H, T5V	
Applications	Programmable controller		Programmable controller relay, IC circuit (without indicator light), serial connection	
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	2.4V or less		0V	
Indicator light	LED (ON lighting)		Without indicator light	
Leakage current	0mA			
Lead wire length (Note1)	1m (Oil resistant vinyl cabtire code 2-conductor 0.2mm^2)			
Shock resistance	294m/s^2			
Insulation resistance	20MΩ over at 500V DC megger			
Withstand voltage	No failure at 1000VAC applied 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	Solid state 3 wire
	F2H, F2V	F3H, F3V
Applications	Programmable controller	Programmable controller, relay
Power supply voltage	—	DC10 to 28V
Load voltage	DC10 to 30V	DC30V or less
Load current	5 to 20mA (Note2)	50mA or less
Current consumption	—	10 mA or less at 24V DC (at ON state)
Internal voltage drop	4V or less	0.5V or less
Indicator light	Yellow LED (ON lighting)	
Leakage current	1mA or less	10μA or less
Lead wire length (Note1)	Standard 1m (Oil resistant vinyl cabtire code 2-conductor 0.15mm^2)	Standard 1m (Oil resistant vinyl cabtire code 3-conductor 0.15mm^2)
Shock resistance	980m/s^2	
Insulation resistance	20MΩ over at 500V DC megger	
Withstand voltage	No failure at 1000VAC applied for one minute.	
Ambient temperature	−10 to 60℃	
Degree of protection	IEC standards IP67, JIS C0920 (water tight model), oil resistance	

7 SPECIFICATIONS

Descriptions	Solid state 2 wire	Solid state 3 wire
	T2H, T2V	T3H, T3V
Applications	Programmable controller	Programmable controller, relay
Power supply voltage	—	DC10 to 28V
Load voltage	DC10 to 30V	DC30V or less
Load current	5 to 20mA (Note2)	100mA or less
Current consumption	—	10mA at DC24V or less
Internal voltage drop	4V or less	0.5V or less
Indicator light	LED (ON lighting)	
Leakage current	1mA or less	10 μA or less
Lead wire length (Note1)	1m (Oil-proof vinyl cabtyre cord, 2-wire, 0.2mm²)	1m (Oil-proof vinyl cabtyre cord, 3-wire, 0.2mm²)
Shock resistance	980m/s²	
Insulation resistance	20MΩ or more measuring with DC500V megger tester	
Withstand voltage	No failure at 1000VAC applied 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: 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℃.