CKD

SM－435299－A

INSTRUCTION MANUAL

MECHANICAL POWER CYLINDER

MCP

- 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:

⚠ Precautions

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

[SM-435299-A]

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MCP
Mechanical power cylinder
Manual No. SM-435299-A

1. UNPACKING

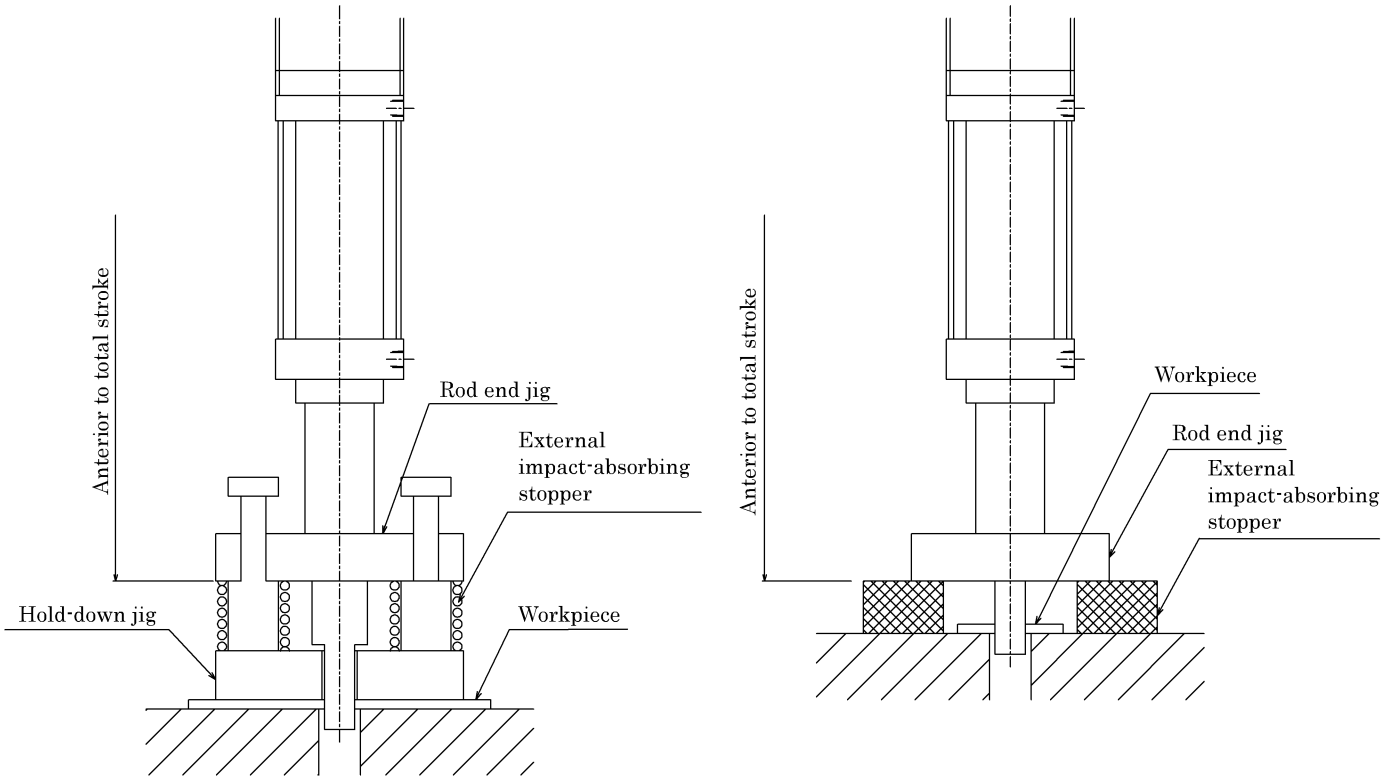
1) Make sure that the type No. on the nameplate of the delivered Selex Cylinder matches the type No. you ordered.
2) Check the appearance for any damage.
3) Stop up the piping port with a sealing plug to prevent the entry of foreign substances into the cylinder. Remove the sealing plug before piping.

2. INSTALLATION

2.1 Installation

1) The ambient temperature for this cylinder is -5 to 60℃ (No freezing).
2) Carefully avoid other object from hitting the tube. Otherwise, it may get the tube distorted and cause malfunction of the cylinder.
3) Check that tightening torque is not applied to the cylinder. When fixing the workpiece onto the end of the piston rod, use a wrench.
4) Avoid applying rotary torque to the piston rod. Use with a mechanism in which the rod does not rotate.
5) Check that no imbalance load is applied to the piston rod.
6) Do not use several cylinders in synchronization.
7) Check that the reactionary force is not applied to the piston rod after the booster stroke.
8) When mounting the cylinder with the rod facing up, take necessary measures to prevent the reactive force of the load from acting on the piston rod after the booster strokes.
   Ex. 1: Balance the load with external cylinders.
   Ex. 2: Use a 3-position PAB port connection solenoid valve for the valve for rapid feeding, and balance the load with a pressure relief valve with built-in check valve.
9) Use discrete solenoid valves for booster and moving sections. When assembling into a manifold, provide measures such as discrete exhaust spacers.

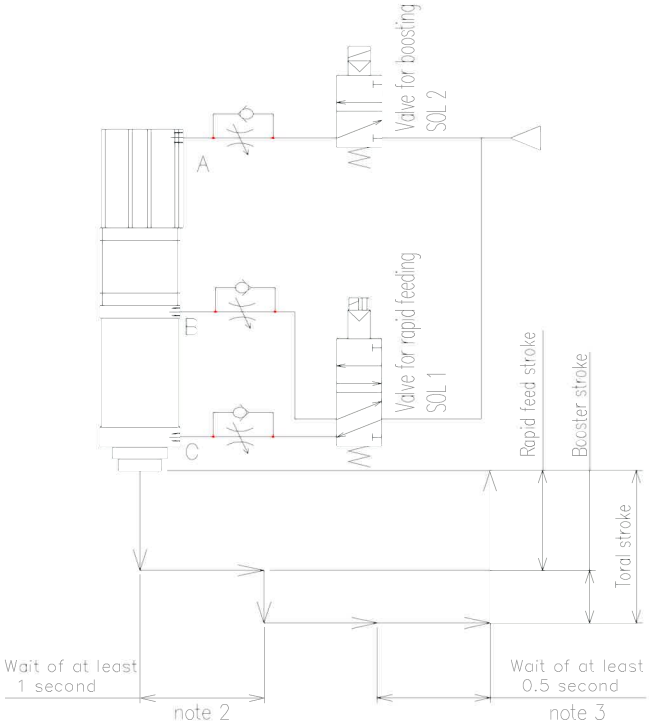
10) When the cylinder is used for punching out a workpiece, the piston rod may pop out after punching out the workpiece. If the piston rod pops out, it contacts the rod cover (W), and the impact may generate impact noise and/or damage the cylinder. Provide an external impact-absorbing stopper anterior to the total stroke.



11) If used near a welding machine, etc., the cylinder could be magnetized by the magnetic field generated and cause the cylinder field to malfunction. Use this cylinder in an environment free of magnetic fields.

12) Because MCP-S is a single-acting cylinder, the load (jig weight) attached to the piston rod end must not exceed 20 kg for the 2 t thrust model and 50 kg for the 5 t thrust model.

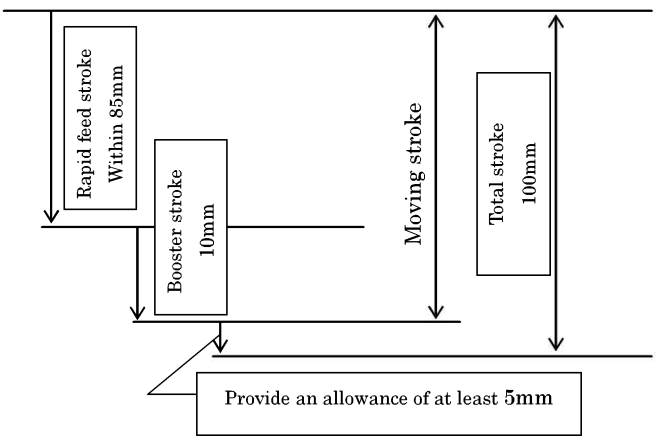
2.2 Fundamental Circuit



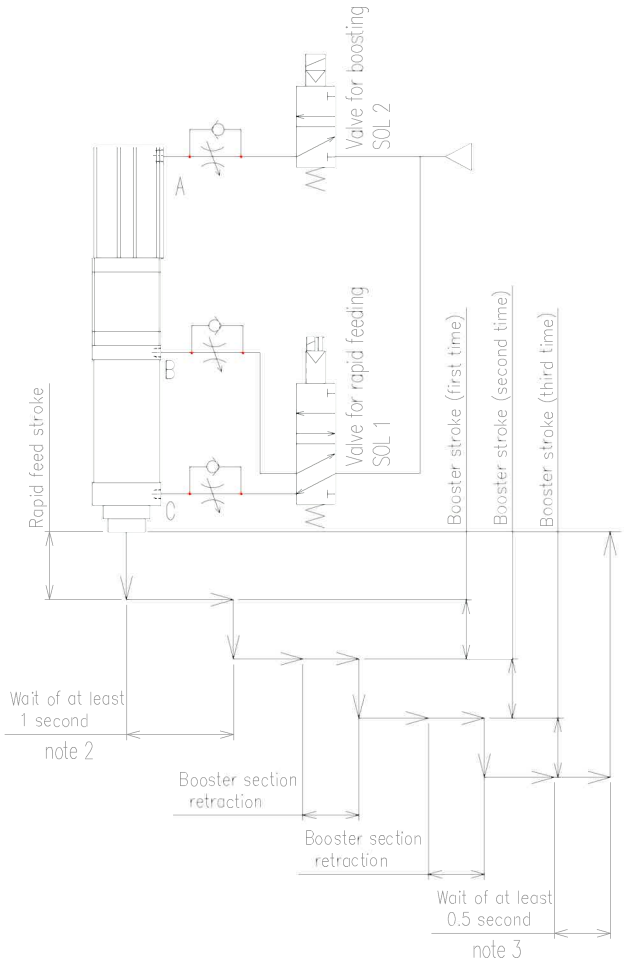
Solenoid valve / Operating condition	Moving stroke	Booster stroke
	SOL1	SOL2
Rapid feed stroke advances	ON	OFF
Rapid feed stroke end	ON	OFF
Wait of at least 1 second (note2)	ON	OFF
Booster stroke advance	ON	ON
Booster stroke retracts (note1)	ON	OFF
Wait of at least 0.5 second (note 3)	ON	OFF
Total stroke retacts	OFF	OFF

Note 1:Piston rod will not retract when the booster stroke retracts.
Note 2:Time for exhausting air from the rapid feed section's rod side and completing the connection between the rapid feed section and the booster section.
Note 3:Time for exhausting air from the booster section's head side and releasing the connection between the rapid feed section and the booster section.

1) Do not advance the booster stroke cylinder simultaneously with the end of the travel section advance because a coupling fault could occur. Provide a time lag of one second or longer from after the travel section moves forward and contacts the workpiece to when the booster section staets traveling.
2) After force is boosted , provide a time lag of 0.5 seconds or more between booster section retract travel and travel section retraction. If the moving section retracts before the booster stroke cylinder , the cylinder could be damaged if the booster stroke cylinder pops out when coupling is released.
3) Provide an allowance of at least +5 mm for the booster stroke.
   Example:
   If the working cylinder's total stroke is 100 mm and the booster stroke is 10 mm, the moving stroke actually used in your device must start boosting within 85 mm.



After rapid feeding, force can be boosted in 10 mm increments by repeating the pressurization and exhaustion process of only the booster section.
If a 30 mm boost is necessary, repeat the boosting process 3 times.

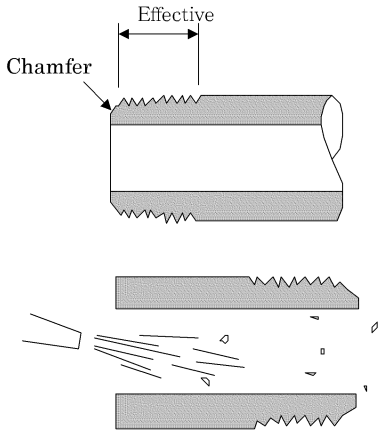


Solenoid valve / Operating condition	Moving stroke	Booster stroke
	SOL1	SOL2
Rapid feed stroke advances	ON	OFF
Rapid feed stroke end	ON	OFF
Wait of at least 1 second (note 2)	ON	OFF
Booster stroke advances (first time)	ON	ON
Booster stroke retracts (note 1)	ON	OFF
Booster stroke advances (second time)	ON	ON
Booster stroke retracts (note 1)	ON	OFF
Booster stroke advances (third time)	ON	ON
Booster stroke retracts (note1)	ON	OFF
Wait of at least 0.5 second (note 3)	ON	OFF
Total stroke retacts	OFF	OFF

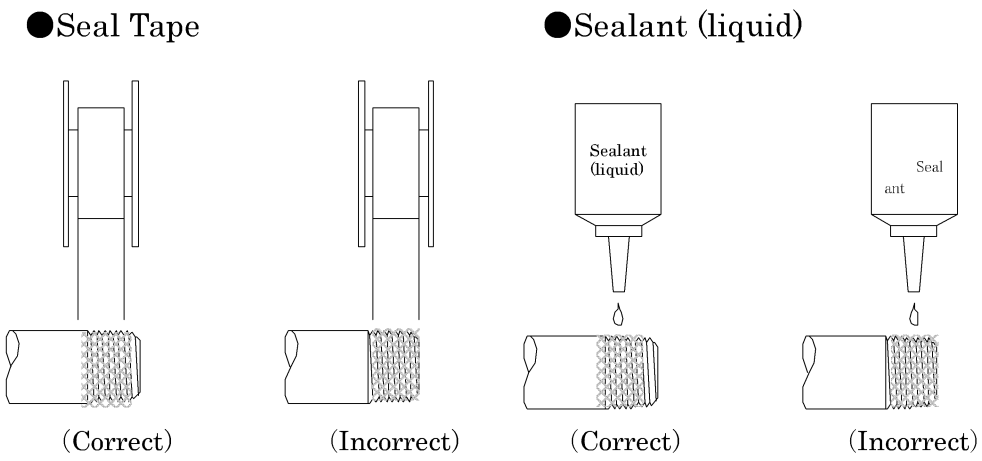
Note 1:Piston rod will not retract when the booster stroke retracts.
Note 2:Time for exhausting air from the rapid feed section's rod side and completing the connection between the rapid feed section and the booster section.
Note 3:Time for exhausting air from the booster section's head side and releasing the connection between the rapid feed section and the booster section.

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.



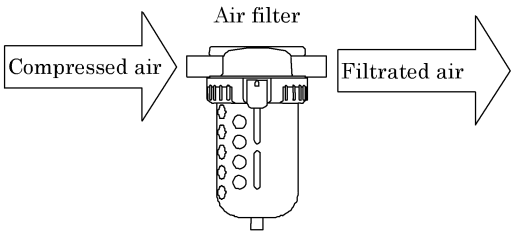
6) Refrain from applying sealant or sealing tape approx. two pitches of thread off the tip of pipe to avoid residual substances from falling into piping system.



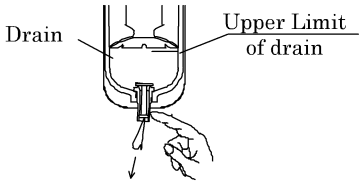
7) Inspect against any external leakage at each threaded joint, upon completion of plumbing , by applying soapy water over it. Wipe solusion well after inspection is completed.

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 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.

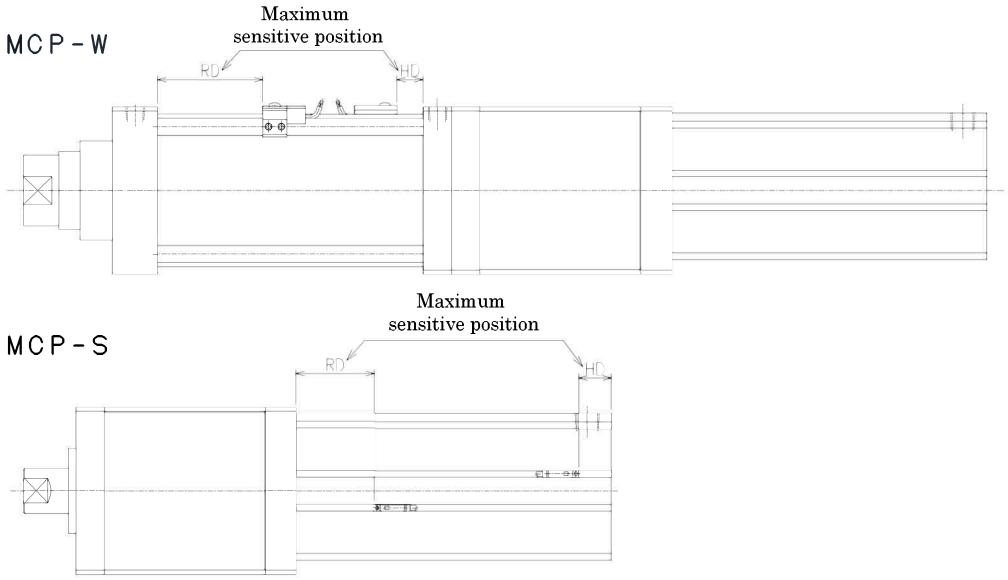


3) Note that the intrusion of carbide for the compressor oil (such as carbon or tarry substance) into the circuit causes malfunction of the solenoid valve and the cylinder. Be sure to carry out thorough inspection and maintenance of the compressor.

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.

2.5 Location of mounting Switches on a Cylinder

1) Location of mounting switches on a cylinder



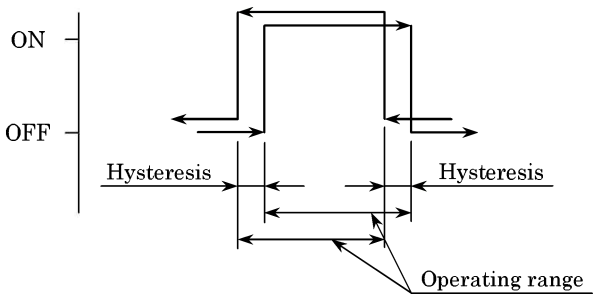
(1) At the stroke end
Refer the illustration above. Mount switches within the rod side dimension RD as well as the head side dimension HD for the purpose of having switches function at the points of maximum sensitive position.

(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 maximum sensitive position and where the switch is supposed to be installed.

(3) Location around the circumference of cylinder (MCP-W)
There is no restriction. However, 90° interval around circumference will be the most appropriate location when considered convenient posture of mounting tie rods.

2) Operating range
The switch turns on first and turns off as the piston moves along its stroke.

3) 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.



4) Maximum sensitive position, operating range and hysteresis

1 color (Unit:mm)

Model	Thrust	Solid state switch(T2H/T2V, T3H/T3V)			
		Maximum sensitive position		Operating range (Reference value)	Hysteresis
		RD	HD		
MCP-W	2t	105.5	18.5	3～8.5	1.5 or less
	5t	140.5	22.5	4～10	
MCP-S	2t	56.0	23.5	4～10	
	5t	81.0	26.5	4～10	

Model	Thrust	Reed switch(T0H/T0V, T5H/T5V)			
		Maximum sensitive position		Operating range (Reference value)	Hysteresis
		RD	HD		
MCP-W	2t	105.0	18.0	6～15.5	3 or less
	5t	140.0	21.5	9～15	
MCP-S	2t	55.5	23.0	7～15	
	5t	80.5	26.0	9～15	

2 color (Unit:mm)

Model	Thrust	Solid state switch(T2YH/T2YV, T3YH/T3YV)			
		Maximum sensitive position		Operating range (Reference value)	Hysteresis
		RD	HD		
MCP-W	2t	104.0	17.0	3～8.5	1.0 or less
	5t	139.0	21.0	6.5～9	
MCP-S	2t	54.5	22.0	6～10	
	5t	80.0	25.5	8～10	

5) Relocation of switch

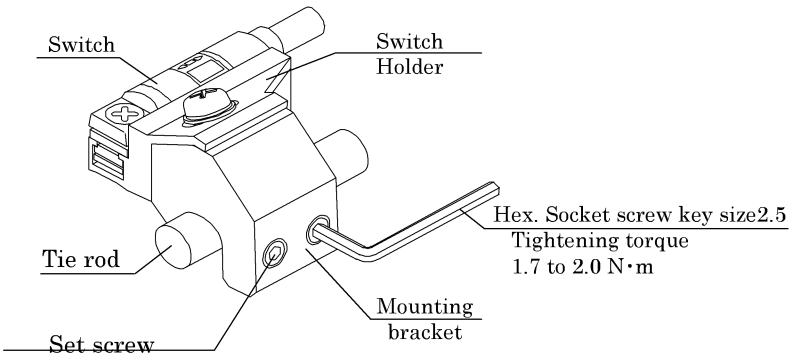
Cylinders equipped with switches are shipped from the factory with the switches set to have maximum sensitive position at the stroke end. However, with MCP-W types, because the cylinders are not used with the stroke fully extended, the switches are set to have maximum sensitive position at the maximum sensitive position at stroke fully extended + 15 mm.

To prevent the switch from detecting at the stroke end, adjust the position of the switch according to the method below.

＜MCP-W＞

Loosen the set screws (2 ea.) for approx. 1/2 to 3/4 turn. It enables the switch to slide along the tie rod without letting screws drop off.

After setting the new location of switch, hold switch holder against the tube surface and tighten set screws to the tie rod. Adequate torque of tightening it is 1.7 to 2.0 N・m. It is considered to be sufficient, as a rule of thumb, when Allen wrench starts bending slightly.



＜MCP-W＞

Slide switch body along cylinder tube after loosening mounting screws and tighten screws when located the maximum sensitive position.

6) Installation of switch

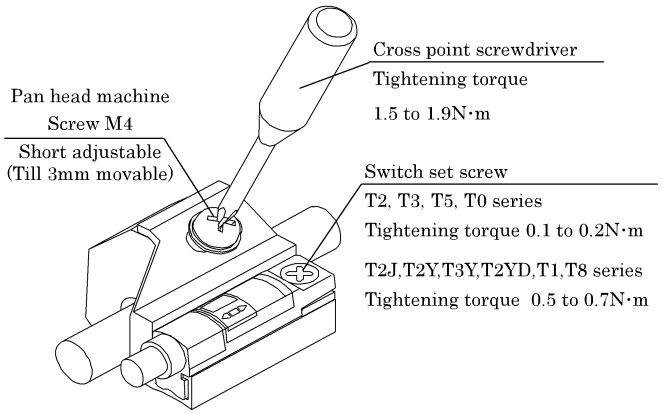
＜MCP-W＞

Follow the procedures (1) to (3) as described below.

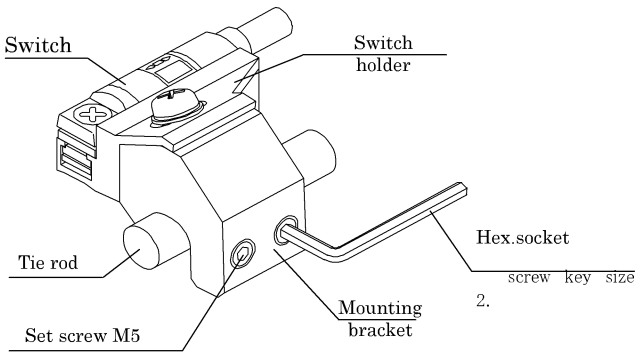
(1) While holding a switch underneath of switch holder, tighten M4×10 pan headed machine screws to mount it on the bracket.

※1 : In case of T2YD/T2YDT,
slotted hexagon head bolt

※2 : In case of T2YD/T2YDT,
minus headed screw driver.



(2) Screw-in the set screws to mount the bracket on the tie rod. While letting the mounting bracket hook the tie rod, slightly screw further until it touches the rod. Thus, it eliminates the whole set of switch from falling off the rod, yet enables to slide the set along the rod. Make use this merit when engaged in adjusting location of the switch set.



(3) To fix the mounting bracket on the tie rod, tighten screws while pressing bracket slightly against tube. Adequate torque of tightening screw is 1.7 to 2.0 N·m. It is considered to be sufficient, as a rule of thumb, when Allen wrench starts bending slightly.

＜MCP-W＞
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 0.2 N・m)

3. OPERATION

3.1 Operating the Cylinder

1) The working pressure for this type of cylinder is specified in "Product Specifications". Operate the system within this range.
2) 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 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 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.

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 (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.

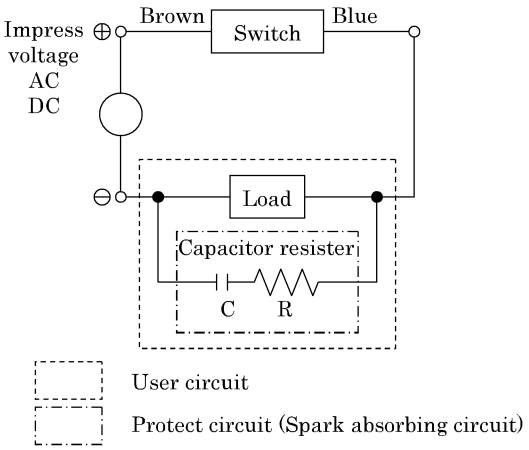
2) Contact protective measures
When an inductive load, such as relay is used or the wire length exceeds that stated in Table 1, always install a contact protective circuit.

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

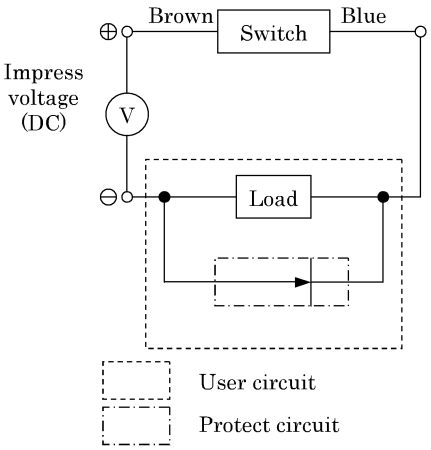
Electric power	Length of wire
DC	50m
AC	10m

(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

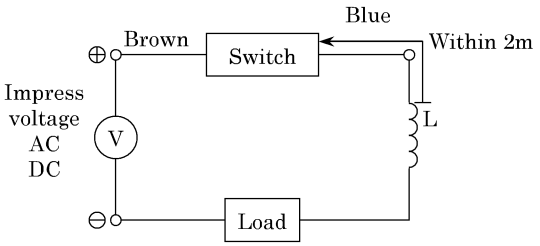
Fig.1 When capacitor resister is used.



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

Fig.2 When diode is used.

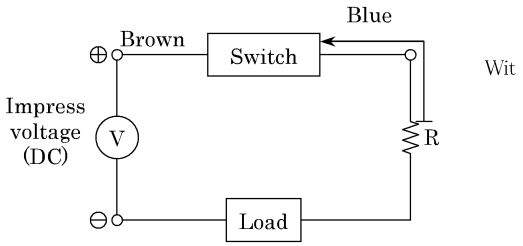
(2) Protective circuit when the wire length exceeds that stated Table 1



・ 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) Series connection

Total voltage loss, when connected T0 switches in series, equals to the sum of respective voltage loss of each switch.

The total voltage loss becomes equivalent to one T0 (approx. 2.4V) when connecting the combination of one T0 for actuation confirming and rest of 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.

3.2.3 Solid state type switch (T1, 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.

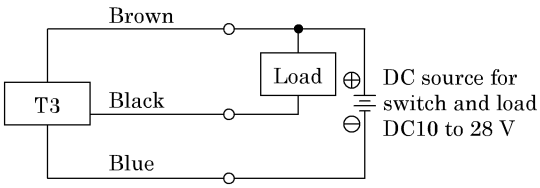


Fig. 1 T3 Fundamental circuit Example (1)
(In case the same source of power is used.)

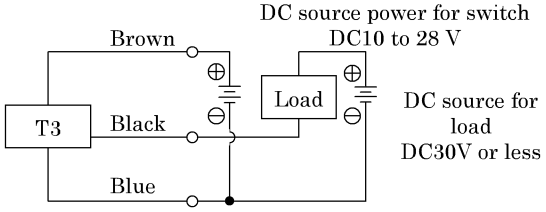


Fig. 2 T3 Fundamental circuit Example (2)
(In case individual sources of power are used.)

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).

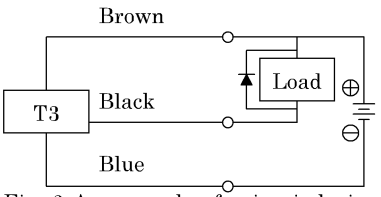


Fig. 3 An example of using inducing load together with surge absorptive element (diode). (Hitachi Mfg. made diode V06C or equivalent is recommended.)

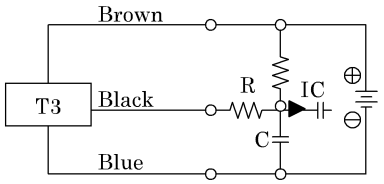


Fig. 4 An example of using capacitor type load together with current regulating resister R. Comply with the following formula to figure out required R.

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

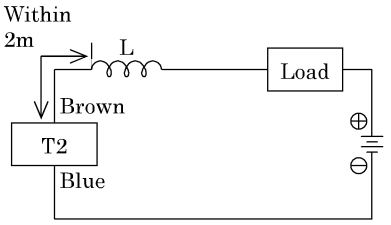


Fig. 5 ・Choke coil
L= a couple hundredμH to a couple mH surpassing high frequency characteristic
・Install it near by a switch (within 2m).

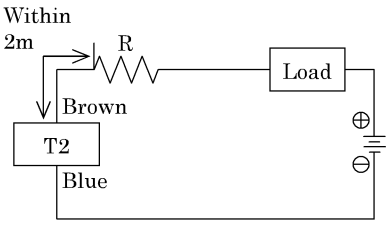


Fig. 6 ・Dash current restriction resister.
R= As much large resister as the load circuit can afford.
・Install it near by a switch (within 2m).

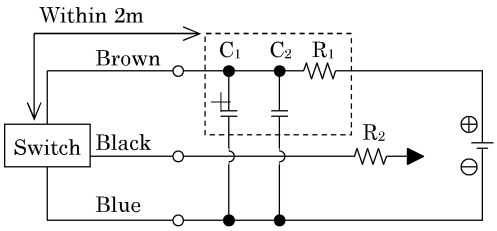


Fig. 7 ・Electric power noise absorptive circuit.
C_1=20 to 50 μF electrolytic capacitor
(Withstand voltage 50V or more)
C_2=0.01 to 0.1 μF ceramic capacitor
R_1=20 to 30 Ω

・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.

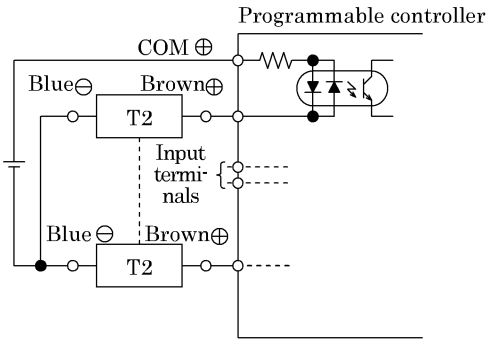


Fig.8 An example of T2 connection to source input type (an external power source)

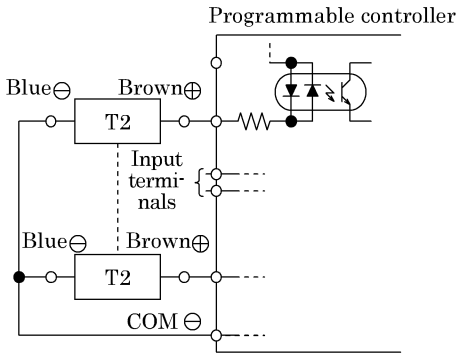


Fig.9 An example of T2 connection to source input type (an internal power source)

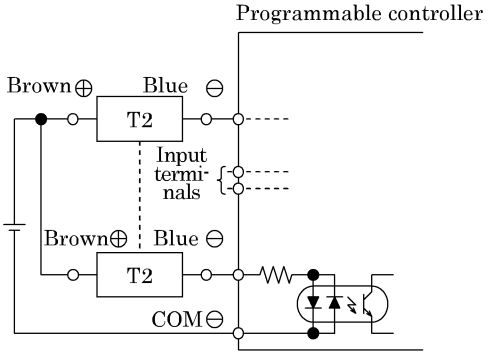


Fig.10 An example of T2 connection to source input type

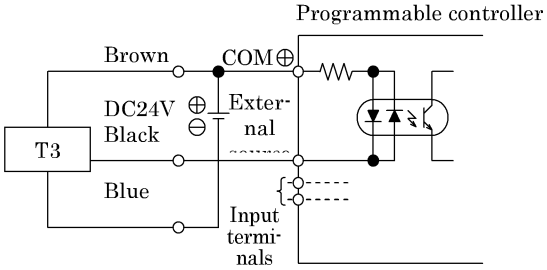


Fig.11 An example of T3 connection to source input type (an internal power source)

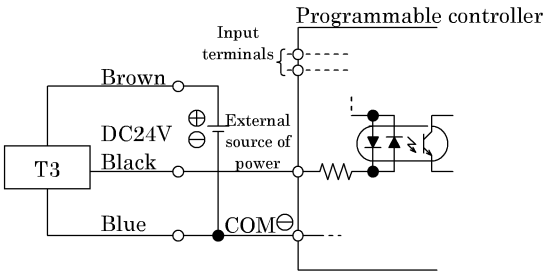


Fig.12 An example of T3 connection to source input type (an internal power source)

4) Series connection

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

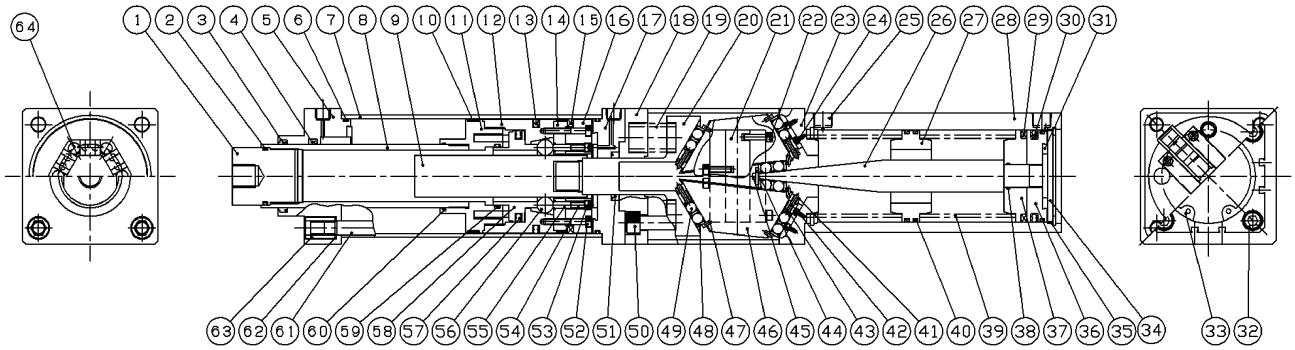
4.1 Periodical Inspection

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 mounting bolts and nuts of cylinder.
   (2) Check the bolts and nuts fitting the piston rod end brackets and mounting brackets for slackening.
   (3) Check to see that the cylinder operates smoothly.
   (4) Check any change of the working piston speed and cycle time.
   (5) Check for internal and/or external leakage.
   (6) Check the piston rod for flaw (scratch) and deformation.
   (7) Check the stroke for abnormality.
   (8) Check any corrosion inside of each port.

See "5. TROUBLE SHOOTING" should there be any trouble found, also carry out additional tightening if bolts, nuts, etc. are slackened.
Do not disassemble this product. Doing so may affect the quality of the connection mechanism since a spring is incorporated in this product. When repairs and/or parts replacement are required, CKD will perform the required service.

4.2 Internal Structure

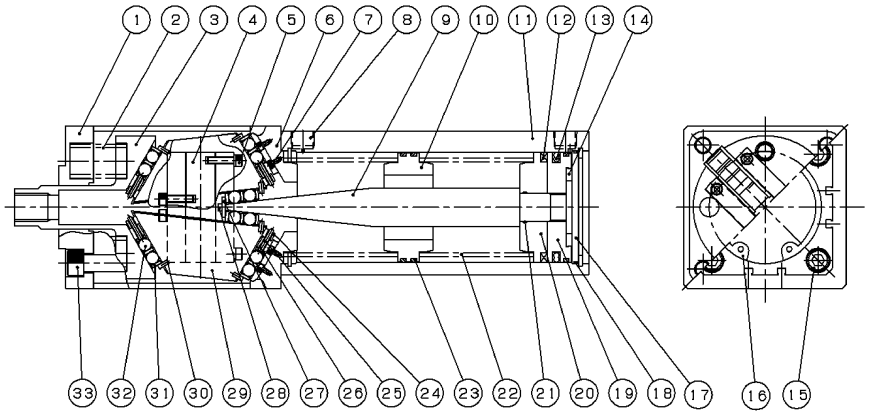
1) MCP-W



No.	Parts name	Material	Remarks	No.	Parts name	Material	Remarks
1	Plug	Steel	Trivalent chromate	33	C type snap rin(hole)	Steel	Blackening
2	Gasket	Nitrile rubber		34	Gasket	Nitrile rubber	
3	Dust wiper	Nitrile rubber		35	Guard	Aluminum alloy	
4	Rod packing(W)	Nitrile rubber		36	Piston	Aluminum alloy	Alumite treatment
5	Rod cover(W)	Cast iron	Trivalent chromate	37	Spacer	Aluminum alloy	Alumite treatment
6	Gasket	Nitrile rubber		38	Gasket	Nitrile rubber	
7	Moving cylinder tube	Aluminum alloy	Alumite treatment	39	Single acting spring	Steel	Blackening
8	Piston rod	Steel	Rigid plating	40	Wear ring(S)	Acetar resin	
9	Clutch shaft	Steel		41	Spring holder	Steel	Trivalent chromate
10	Wear ring(W)	Cloth entrance phenol resin		42	Spring holder pin	Stainless steel	
11	Connection piston B	Steel	Trivalent chromate	43	Retainer spring	Steel	Blackening
12	Connection piston A	Alloy steel		44	End plate	Steel	Trivalent chromate
13	Piston packing(W)	Nitrile rubber		45	Hexagon socket head cap bolt	Alloy steel	Blackening
14	Magnet spacer A	Stainless alloy		46	Cam	Alloy steel	
15	Magnet(W)	Plastic		47	Pin	Steel	
16	Magnet spacer B	Aluminum alloy	Alumite treatment	48	Retainer	Steel	Trivalent chromate
17	Head cover(W)	Aluminum alloy	Alumite treatment	49	Roller(S)	Alloy steel	
18	Rod cover(S)	Cast iron	Trivalent chromate	50	Hexagon socket head cap bolt	Alloy steel	Blackening
19	Return spring	Steel	Blackening	51	Rod packing(S)	Nitrile rubber	
20	Booster rod	Alloy steel		52	Hexagon socket head cap bolt	Stainless steel	
21	Slide bar	Steel		53	Hexagon socket head set screw	Alloy steel	Blackening
22	Hexagon socket head cap bolt	Alloy steel	Blackening	54	Roller holder spring	Steel	Blackening
23	Intermediate guard	Steel	Trivalent chromate	55	Roller holder	Alloy steel	
24	Hexagon socket head cap bolt	Alloy steel	Blackening	56	Roller(W)	Alloy steel	
25	Plug silencer	Steel + sintering alloy	Zinc plating	57	Release piston packing seal	Nitrile rubber	
26	Taper rod	Alloy steel		58	Release piston	Steel	Trivalent chromate
27	Single acting spring holder	Steel	Trivalent chromate	59	Gasket	Nitrile rubber	
28	Booster cylinder tube	Aluminum alloy	Hard alumite	60	Gasket	Nitrile rubber	
29	Magnet(S)	Plastic		61	Tie rod	Steel	Trivalent chromate
30	Piston packing(S)	Nitrile rubber		62	Conical spring washer	Steel	Blackening
31	Cushion rubber	Urethane rubber		63	Round nut	Steel	Trivalent chromate
32	Hexagon socket head cap bolt	Alloy steel	Blackening	64	Guide rubber	Urethane rubber	

Note : This product is not disassembled.

2) MCP-S



No.	Parts name	Material	Remarks
1	Rod cover(S)	Cast iron	Trivalent chromate
2	Return spring	Steel	Blackening
3	Booster rod	Alloy steel	
4	Slide bar	Steel	
5	Hexagon socket head cap bolt	Alloy steel	Blackening
6	Intermediate guard	Steel	Trivalent chromate
7	Hexagon socket head cap bolt	Alloy steel	Blackening
8	Plug silencer	Steel + sintering alloy	Zinc plating
9	Taper rod	Alloy steel	
10	Single acting spring holder	Steel	Trivalent chromate
11	Booster cylinder tube	Aluminum alloy	Hard alumite
12	Magnet(S)	Plastic	
13	Piston packing(S)	Nitrile rubber	
14	Cushion rubber	Urethane rubber	
15	Hexagon socket head cap bolt	Alloy steel	Blackening
16	C type snap rin(hole)	Steel	Blackening
17	Guard	Aluminum alloy	
18	Gasket	Nitrile rubber	
19	Piston	Aluminum alloy	Alumite treatment
20	Spacer	Aluminum alloy	Alumite treatment
21	Gasket	Nitrile rubber	
22	Single acting spring	Steel	Blackening
23	Wear ring(S)	Acetar resin	
24	Spring holder	Steel	Trivalent chromate
25	Spring holder pin	Stainless steel	
26	Retainer spring	Steel	Blackening
27	End plate	Steel	Trivalent chromate
28	Hexagon socket head cap bolt	Alloy steel	Blackening
29	Cam	Alloy steel	
30	Pin	Steel	
31	Retainer	Steel	Trivalent chromate
32	Roller(S)	Alloy steel	
33	Hexagon socket head cap bolt	Alloy steel	Blackening

Note : This product is not disassembled.

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 boost.	Improper connection between the rapid feed section and booster section.	After rapid feed stroke, provide a time lag of at least 1 second.
Does not function smoothly.	Speed is below the low speed limit	Limit the load variation and consider the adoption of low pressure cylinder.
	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.
	Excessive load	Increase the pressure itself.
	Speed control valve is built in the way of "Meter in" circuit	Change the meter-out circuit of the speed control valve.
	Grease shortage	Grease is spread.
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

2) Switch

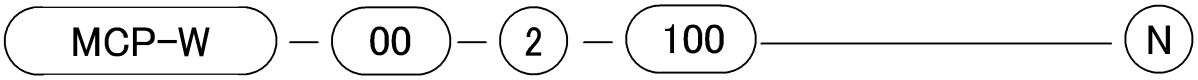
Troubles	Causes	Remedies
Indicator light is not lit.	Deposited contact point	Replace the switch.
	Excessive load than rated capacity	Replace the relay with a recommended one or replace the switch.
	Damaged indicator light	Replace the switch.
	Inadequate incoming signal	Review the external signal circuit 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. Tightening torque is 1.5 to 1.9 N·m
	Incorrect direction of switch mounting	Correct the direction of the switch mounting.
	Relay is unable to respond properly	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.

Note 1. Refer "2.4 Location of mounting Switches on a Cylinder" as for replacing a switch and correcting its location.

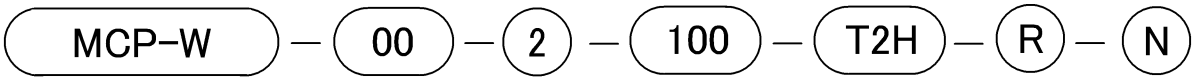
6. HOW TO ORDER

6.1 Product Number Coding

- No switch



- With switch



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

(a) Model no.		(b) Mounting style		(c) Thrust		(d) Stroke length (mm) (note 1)
MCP-W	Rapid feed + Booster stroke	00	Basic type	2	2t	50
		FA	Rod end flange type	5	5t	100
MCP-S	Only booster section					150
						200
						250
						300
						350
						400
						450
						500

(e) Switch model no.					※Lead wire length	
Lead wire Axial	Lead wire Radial	Switch type	Indicator light	Lead wire	Blank	1m (standard)
					3	3m (option)
T0H※	T0V※	Reed	1 color indicator type	2-wire	5	5m (potion)
T5H※	T5V※		Without indicator light		※ indicates lead wire length.	
T8H※	T8V※		1 color indicator type			
T1H※	T1V※	Solid state	1 color indicator type	2-wire		
T2H※	T2V※					
T3H※	T3V※			3-wire		
T2YH※	T2YV※		2 color indicator type	2-wire		
T2WH※	T2WV※					
T3YH※	T3YV※			3-wire		
T3WH※	T3WV※					
T2JH※	T2JV※		Off-delay type	2-wire		

(f) Switch quantity		(g) Option	
R	1 on rod end	Blank	Rod end female thread
H	1 on head end	N	Rod end male thread
D	2		
T	3		

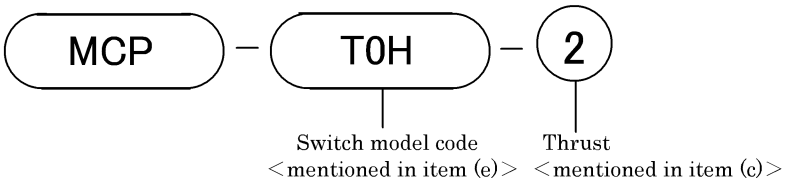
Note1 : For MCP-S, stroke = Booster stroke = 10 mm fixed.
(d) stroke length can not be selected.

Note 2: Because a magnet is also included in the booster section of MCP-W, a switch can be mounted on the booster section as well. To mount a switch, purchase a switch separately.

Note 3: With MCP-S, switch mounting bracket is not necessary. To mount a switch later or to replace it, purchase a switch separately.

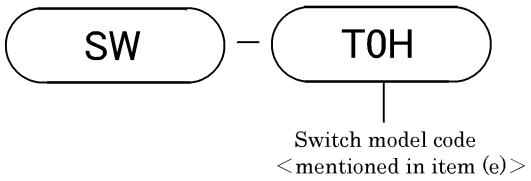
6.2 Component parts Model coding

(1) Switch body + Mounting bracket

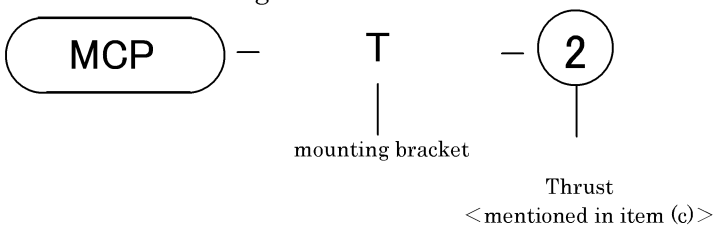


Note: With MCP-S, mounting bracket is not necessary.

(2) Switch alone



(3) A set of mounting bracket



7. SPECIFICATION

7.1 Product Specifications

Descriptions		MCP	
Thrust		2(2t)	5(5t)
Working fluid		Compressed air	
Actuation		Rapid feed section : double acting Booster section : single acting extend type	
Min. working pressure	MPa	Rapid feed section : 0.3 Booster section , MCP-S : 0.2	
Max. working pressure	MPa	0.6	
Proof pressure	MPa	1.0	
Ambient temperature	℃	−5 to 60 (No freezing)	
Rod end form		Female thread (male thread is option.)	
Booster stroke	mm	$10\ ^{+5}_{0}$ note 1	
Rapid feed port size		Rc1/4	Rc3/8
Booster section port size		Rc3/8	
Rapid feed working piston speed	mm/s	50～300	
Booster section working piston speed	mm/s	10～50	
Lubrication		Not required	
Booster section theoretical thrust(Advance) Note 2	KN 0.3MPa	S=12.3 W=14.6	S=30.0 W=34.5
	0.4MPa	S=16.4 W=19.5	S=40.0 W=46.1
	0.5MPa	S=20.5 W=24.3	S=50.1 W=57.6
	0.6MPa	S=24.6 W=29.2	S=60.1 W=69.1
Rapid feed section theoretical thrust	KN 0.3MPa	Advance 2.3 Return 1.6	Advance 4.5 Return 2.8
	0.4MPa	Advance 3.0 Return 2.1	Advance 6.0 Return 3.8
	0.5MPa	Advance 3.8 Return 2.6	Advance 7.5 Return 4.7
	0.6MPa	Advance 4.6 Return 3.2	Advance 9.0 Return 5.7

Note 1 : After rapid feeding, force can be boosted in 10 mm increments by repeating the pressurization and exhaustion process of only the booster section.

Note 2 : Actual thrust 80% of theoretical thrust.

Note 3 : Because MCP-S is a single-acting cylinder, the load (jig weight) attached to the piston rod end must not exceed 20 kg for he 2 t thrust model and 50 kg for the 5 t thrust model.

7.2 Switches Specification

Type & Model / Item	Reed 2-wire			
	T0H,T0V		T5H,T5V	
Application	For use with Programmable controller, relay		For use with Programmable controller, relay IC circuit(w/o indicator light), series 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	3V or less		0V	
Indicator light	LED (ON lighting)		Without indicator light	
Leakage current	0mA			
Lead wire length (Note 1)	1m (Oil-proof vinyl cabtyre cord, 2-core, 0.2mm²)			
Shock resistance	294m/s²			
Insulation resistance	20 MΩ 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 (Note 3)	IEC Standard IP67, JIS C0920 (water tight type), Oil resistance			

Type & Model / Item	Reed 2-wire		
	T8H,T8V		
Application	For use with programmable controller, relay,		
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 (Note 1)	1m (Oil-proof vinyl cabtyre cord, 2-core, 0.3mm²)		
Shock resistance	294m/s²		
Insulation resistance	100 MΩ or more measuring with DC500V megger tester		
Withstand voltage	No abnormalities should occur after applying AC1,500V for 1 minute		
Ambient temperature	-10 to 60℃		
Degree of protection (Note 3)	IEC Standard IP67, JIS C0920 (water tight type), Oil resistance		

Type & Model / Item	Solid state 2-wire	
	T2H,T2V	T2YH,T2YV
Application	For use with programmable controller	
Load voltage	DC10 to 30V	
Load current	5 to 20mA (Note 2)	
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 (Note 1)	Standard 1m (Oil-proof cabtyre cord, 2-core, 0.2mm²)	Standard 1m (Oil-proof vinyl cabtyre cord, 2-core 0.3mm²)
Shock resistance	980m/s²	
Insulation resistance	20 MΩ or more measuring with DC500V megger tester	100 MΩ 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 C 0920 (water tight type), Oil resistance	

Type & Model / Item	Solid state 2-wire	
	T2JH,T2JV	T1H,T1V
Application	For use with programmable controller	For use with Programmable controller, relay small solenoid calve
Load voltage	DC10 to 30V	AC85 to 265V
Load current	5 to 20mA (Note 2)	5 to 100mA
Current consumption	—	
Internal voltage drop	4V or less	7V or less
Delay hour off	200±50ms	—
Indicator light	LED (ON lighting)	
Leakage current	1mA or less	1mA or less at AC100V 2mA or less at AC200V
Lead wire length (Note 1)	1m (Oil-proof cabtyre cord, 2-core, 0.3mm²)	1m (Oil-proof vinyl cabtyre cord, 2-core, 0.3mm²)
Shock resistance	980m/s²	
Insulation resistance	100 MΩ or more measuring with DC500V megger tester	
Withstand voltage	No abnormalities should occur after applying AC1,000V for 1 minute	No abnormalities should occur after applying AC1,500V for 1 minute
Ambient temperature	-10 to 60℃	
Degree of protection (Note 3)	IEC Standard IP67, JIS C 0920 (water tight type), Oil resistance	

Type & Model / Item	Solid state 3-wire	
	T3H,T3V	T3YH,T3YV
Application	For use with programmable controller, relay	
Power supply voltage	DC10 to 28V	
Load voltage	DC30V or lower	
Load current	100mA or less	50mA or less
Current consumption	10mA or lower when it is on at DC24V	
Internal voltage drop	0.5V or lower	
Indicator light	LED (ON lighting)	Red/Green LED (ON lighting)
Leakage current	10 μA or lower	
Lead wire length (Note 1)	1m (Oil-proof vinyl cabtyre cord, 3-core, 0.2mm²)	
Shock resistance	980m/s²	
Insulation resistance	20 MΩ or more measuring with DC500V megger tester	100 MΩ 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 (Note 3)	IEC Standard IP67, JIS C 0920 (water tight type), Oil resistance	