CKD

SM－6062－A

INSTRUCTION MANUAL

HIGH SPEED CYLINDER

HCA

- 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 4th 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:

⚠ CAUTIONS

- 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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HCA
High Speed Cylinder
Manual No. SM-6062-A

1. UNPACKING

1) Make sure that the type No. on the nameplate of the delivered High Speed 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

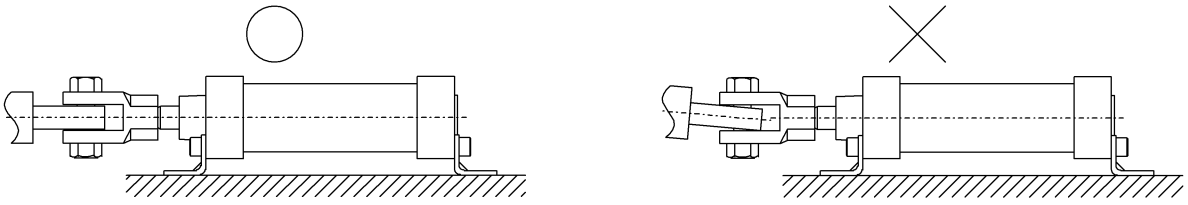
2.1 Installation

1) The ambient temperature range for this cylinder is -10 to 60℃ (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) 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).

4) 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.



5) The cylinder is designed to be used high speed. A JISB1554 nut (lock nut, washer, and fitting for rolling bearings) is used to install the main unit so it will not loosen. Use the following hook spanner when fixing mounting brackets on the main unit, and when tightening the lock nut to disassemble the main unit.

(1) Fixing mounting brackets on the main unit

Model no. / Descriptions	HCA-20	HCA-25	HCA-32	HCA-40	HCA-50	HCA-63	HCA-80	HCA-100
Working nut	AN05	AN05	AN05	AN07	AN08	AN08	AN12	AN12
Applicable hook spanners	Nominal 34-38	Nominal 34-38	Nominal 34-38	Nominal 45-50	Nominal 52-55	Nominal 58-62	Nominal 80-90	Nominal 80-90

(2) Tightening the main unit's lock nut

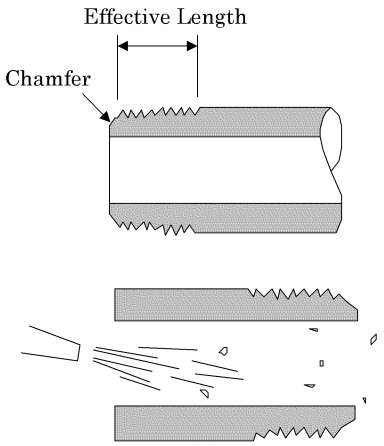
Model no. / Descriptions	HCA-20	HCA-25	HCA-32	HCA-40	HCA-50	HCA-63	HCA-80	HCA-100
Applicable hook spanners			Nominal 34-48	Nominal 45-50	Nominal 52-55	Nominal 68-75	Nominal 80-90	Nominal 110-115
Wrench	Nominal30	Nominal35						

6) The maximum speed for the working piston is 3000mm/s, which is not the average speed.

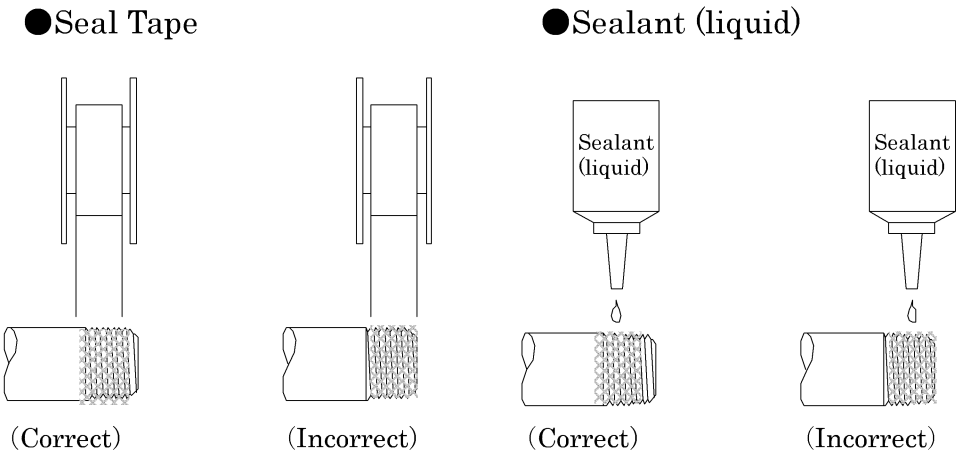
7) The cylinder main unit restriction is designed for a speed of 3000mm/s or more, and should not be restricted with piping, valves, or flow control valves.

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.

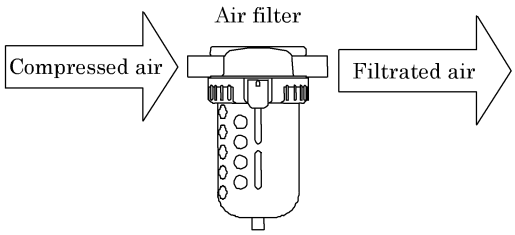


6) Refrain from applying sealant or sealing tape approx. two pitches of thread off the tip of pipe to avoid residual substances from falling into piping system.



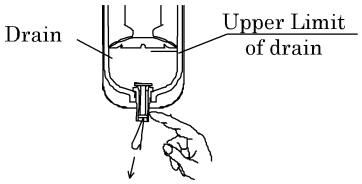
2.3 Fluid

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



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

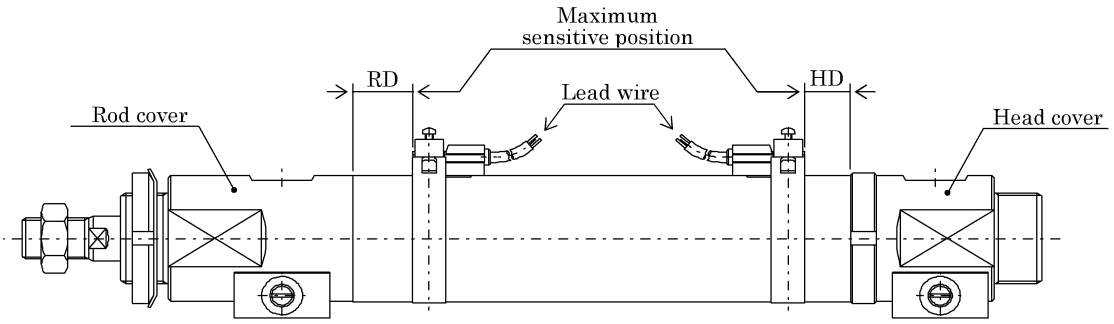
3) Note that the intrusion of carbide for the compressor oil (such as carbon or tarry substance) into the circuit causes malfunction of the solenoid valve and the cylinder. Be sure to carry out thorough inspection and maintenance of the compressor.



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

2.4 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 table 1)

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

(3) Relocation of switch
Slide switch body along cylinder tube after loosening mounting screws, and tighten screws when located the maximum sensitive position. (Tightening torque is 0.1 to 0.2N·m)

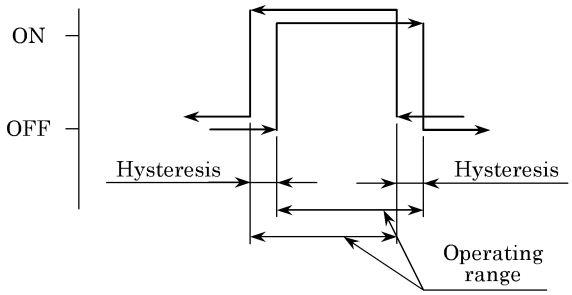
(4) Replacing of switch
Take out switch out of groove after loosening mounting screws. Slide new replacing switch into groove and tighten screws upon placing the switch at the maximum sensitive position. (Tightening torque is 0.1 to 0.2N·m)

2) Operating range
The switch turns on first and turns off as the piston moves along its stroke. The center of the range is the maximum sensitive position. Setting switch at this point eliminates majority of external disturbance and provides the most stabile actuation of switch.

3) Hysteresis

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

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



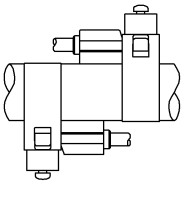
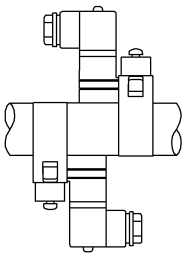
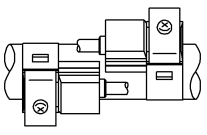
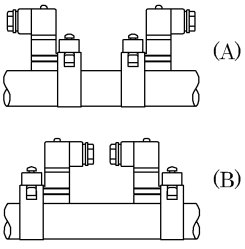
4) Maximum sensitive position, operating range and hysteresis

Table 1 (Unit:mm)

Item / Bore size	Maximum sensitive position		Solid state (R1, R2, R2Y, R3, R3Y)				Reed (R0, R4, R5, R6)	
			Operating range		Hysteresis			
	HD	RD	1 color indicator type	2 color indicator type	1 color indicator type	2 color indicator type	Operating range	hysteresis
φ20	15.5	17.5	6 to 14	11 to 18	1.5 or less	1.0 or less	7 to 14	3 or less
φ25	13	14.5	6 to 14	11 to 18			8 to 13	
φ32	22	21	6 to 14	11 to 18			9 to 14	
φ40	22	21	6 to 14	11 to 18			9 to 14	
φ50	19	25	6 to 14	11 to 18			9 to 14	
φ63	21	28	6 to 14	11 to 18			9 to 14	
φ80	24.5	33.5	6 to 14	11 to 18			9 to 14	
φ100	25	35	6 to 14	11 to 18			9 to 14	

5) Location of switches mounted at ex-factory

Switches are mounted at the maximum sensitive position on cylinder. The location along circumference of cylinder differs in accordance with stroke. Refer the table below.

	Min. stroke length of different surface installation (mm)		Min. stroke length of same surface installation (mm)	
Rough sketch of installation				
Descriptions	Grommet	Terminal box	Grommet	Terminal box
φ20 to φ100	15 (10) mm	15 (10) mm	30 mm	32 mm (Installation A) 80 mm (Installation B)

Note 1: The value in ( ) is for the type with a switch.

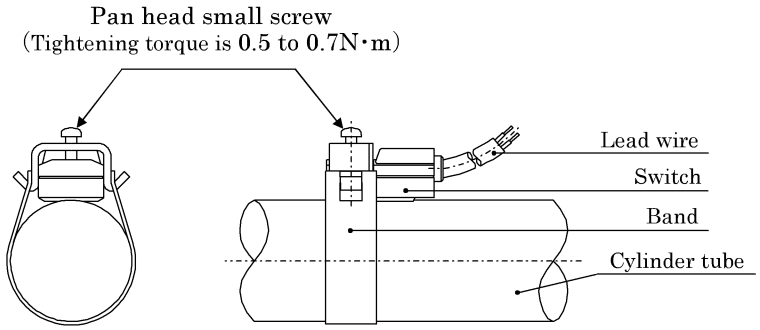
6) Relocation and replacing of switch

(1) Relocation of switch

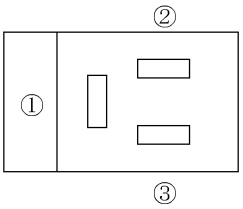
Slide switch body and band along cylinder tube after loosening mounting screws (pan head small screws), and tighten screws when located the maximum sensitive position. When make fine adjustment, fix the band position and slide only switch body.

(2) Replacing of switch

Remove switch out of band after loosening mounting screws (pan head small screws). At this time, fix the band and brackets etc. to the cylinder. Next, slide new replacing switch into the band and tighten screws upon placing the switch at the maximum sensitive position. For short stroke, turning switch improve work efficiency. (Tightening torque of pan head small screw is 0.5 to 0.7N·m)



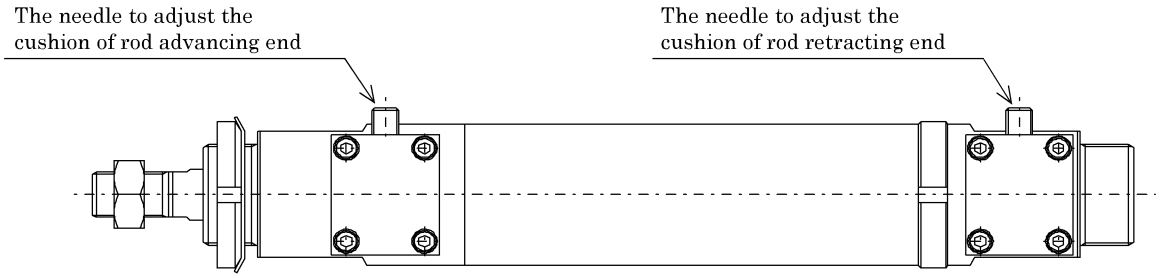
7) Wiring of terminal box



Terminal box / Switch model code	①	②	③
R0(DC), R2(Y), R6		+	−
R0(AC), R1, R4, R5		±	±
R3(Y)	OUT	+	−

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) The piston rod may pop out if operation is started while the exhaust side is at atmospheric pressure. Pressurize the exhaust side before starting.

3) 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 Cushion characteristics

Bore size (mm)	Allowable energy absorption (J)
ϕ 20	7.54
ϕ 25	11.8
ϕ 32	18.6
ϕ 40	29.4
ϕ 50	46.1
ϕ 63	73.5
ϕ 80	118
ϕ 100	184

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

5) When adjusting speed with the speed control valve, gradually open the needle from closed and raise speed. The piston rod may suddenly pop out and create a hazard if speed is adjusted while the needle is open.

6) Install the speed controller near cylinder piping port. Otherwise, speed cannot be controlled.

3.2 How to Use the Switches

3.2.1 Common items

1) Magnetic environment
Do not operate this product in a place where strong magnetic field or large current (large magnet or spot welding machine, 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.

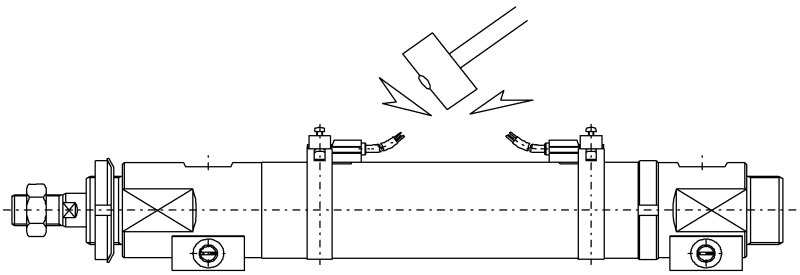
2) Lead wire wiring
Carefully perform the wiring so that a bending stress or tensile strength does not apply to the lead wire repeatedly.
Additionally, connect wires for robot having the bending resistance to movable parts.

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

4) Intermediate position detection
When activating the switch halfway of the stroke, the relay may not respond if the working piston speed is too fast.

(Example)In case that relay response time is 20ms, set working piston speed less than 500mm/s.

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 (R0, R4, R5, R6)

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 R0 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.

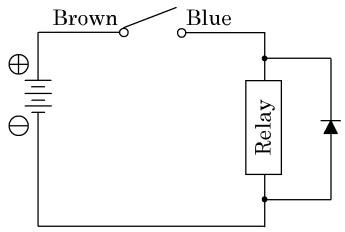
② When the switch is connected to an AC relay or a programmable controller input, the indicator light on the switch is not lit if the half-wave rectification is performed in the connected circuit. If this occurs, reverse the polarities of the switch lead wire connection. The indicator light may then be lit.

2) Contact protective measures
When an inductive load, such as relay is used or the wire length exceeds that stated in Table 3, always install a contact protective circuit.

Table 3

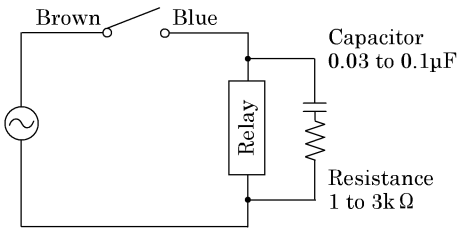
Switch model No.	Electric power	Length of wire
R0, R5, R6	DC	100m
R0, R5	AC	10m
R4	AC	50m

① Protective circuit when connecting an inductive type load



Hitachi Mfg. made diode V06C or equivalent is recommended.
(Carefully review polarities)

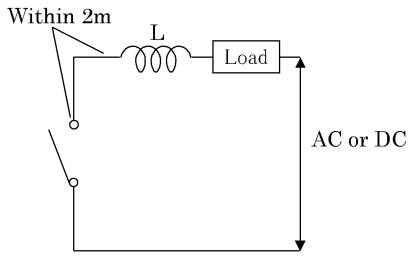
An example of R0, R5 using DC relay together with surge absorptive element (diode).



An example of R0, R5 using AC relay together with surge absorptive circuit.

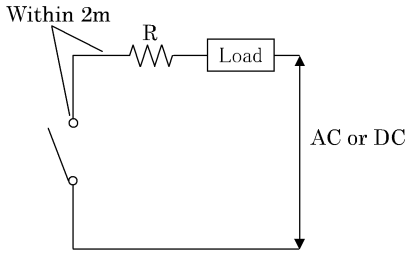
② Protective circuit when the wire length exceeds that stated in Table 3

● When using a choke coil



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

● When using a resistance



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

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. (R0, R6)

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
When multiple R0 switches are used with they connected in series, the voltage drop at the switch becomes the sum of voltage drop values of all switches. Therefore, the voltage applied to the load becomes a voltage that the voltage drop at the switch is subtracted from the power supply voltage. Thus, always check the minimum operating voltage value of the load.

Example: The following shows the voltage drop at the switch when three R0 switches are connected in series.

2.4V × 3 = 7.2 V

Since the voltage drop at the R5 switch is 0V, as many switches as required can be connected in series. When one R0 switch is used for checking of operation and R5 switch is used for other switches, they can be used with the voltage drop equivalent to one R0 switch (2.4V). In this case, the indicator light is lit only when all switches are turned ON.

If two R4 switches are connected at 100V AC or three or more R4 switches are connected at 200V AC, the indicator light is not lit. Additionally, the R6 switch cannot be connected in series.

6) Parallel connection
When multiple R0 and R5 switches are connected in parallel, there are no limitations on the number of switches. When multiple R4 and R6 switches are connected in parallel, the leakage current increases for the number of switches. Therefore, carefully check the load specifications to determine the number of switches to be connected.
However, if multiple R0 and R6 switches are turned ON at the same time, the indicator light becomes dark or is not lit. For R4 switch, if even one R4 switch is turned ON, all lamps go off.

3.2.3 Operational Cautions, Solid state switch (R1, R2(Y), R3(Y))

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 R2 switch, pay special attention to ① below.

① Connect the brown and blue lines to the positive and negative sides, respectively. If these lines are connected reversely, the switch and load are always kept activated. In this case, the indicator light is not lit.
For R3(Y) switch, pay special attention to ② below.

② Always connect the lead wires while referring to the colors shown on the lead wires. At this time, turn OFF the power to the unit in the electrical circuit on the connection side before starting the wire connection work.
For R3(Y) switch, if the wiring is performed incorrectly or the load is short-circuited, this may cause the switch, as well as the electrical circuit on the load side to break. Carefully connect the lead wires so that they are not connected incorrectly or short-circuited.
Additionally, the work with the power supplied may cause the switch and electrical circuit to break if the work is performed in an incorrect manner even though the incorrect wiring is not performed.

<Connection example of R3(Y)>

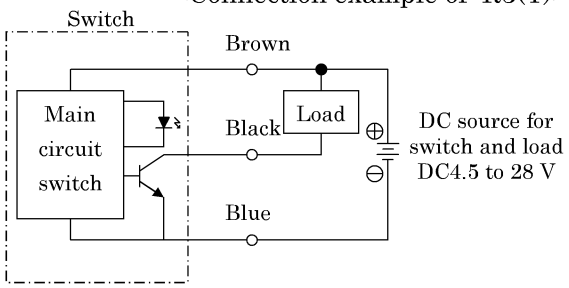


Fig.1 Fundamental circuit Example (1)
(In case the same source of power is used.)

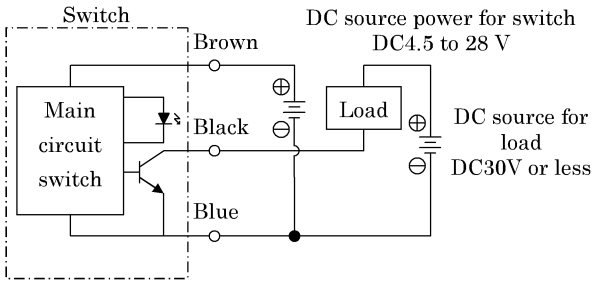


Fig.2 Fundamental circuit Example (2)
(In case individual sources of power are used.)

2) Connection load
The R1 switch can be connected to a load, such as AC programmable controller, relay, solenoid, or solenoid valve.
The R2(Y) switch is specially designed as a programmable controller switch. Since this switch uses two wires, it is connected to either the sink input or source input.
The R3(Y) switch can be connected to a load, such as digital IC, microcomputer, programmable controller, relay, solenoid, or solenoid valve.
When selecting or designing a load, carefully check the static electrical characteristics, as well as transient electrical characteristics (rush current when the switch is turned ON or surge voltage when the switch is turned OFF) so that they do not exceed the switch ratings. Additionally, if the electrical characteristics may exceed the switch ratings, appropriate protective measures are taken (surge absorbing element or rush current limiting resistance, etc.).

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

3) Inspect the following items

(a) Scratch marks on the bore surface of the tube.
(b) Scratch marks on the surface of piston rod, peel-off of plating and rusting.
(c) Scratch marks and wear inside of the bushing.
(d) Scratch marks, wear and crack of the surface of piston.
(e) Loosened connection of piston and rod.
(f) Crack of both end covers.
(g) Scratch marks and wears of packing in sliding part. (Dust wiper, rod packing seal, cushion packing seal and piston packing seal)

Check all of above items. If any abnormality is found, repair it or replace the parts, when defective.

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 ⑳ 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 4.

Table 4

Bore size (mm)	Pair face of cover (mm)	Recommended hand tools
φ20	24	Spanner 24 Adjustable wrench 250 Pipe wrench 250
φ25	29	〃 29 〃 250 〃 350
φ32	36	〃 36 〃 375 〃 350
φ40	44	〃 375 〃 450
φ50	55	〃 600
φ63	69	〃 900
φ80	80	〃 1200
φ100	100	〃 1200

Note) ・Pipe wrench may sometimes give defects to cover.
・Fairly large torque (350N･m or more) is required for φ80, φ100. Using rigid enough vise to fix the cylinder, also apply a piece of pipe of approx. 1.5m onto the handle of spanner, adjustable wrench or pipe wrench to loosen cylinder cover.

(5) Remove rod packing ㉑, piston packing ⑫, cylinder gasket ⑥ & wear ring ⑬ 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.)

2) About cushion packing (ϕ 40 to ϕ 100)

⑦ Cushion packing is different by the manufactured date. Please confirm the day of manufacturing the product plaque, and detach it according to the following procedure.

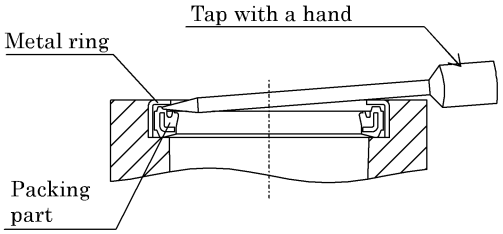
There is no difference in the cushion performance even when exchanging it for Cushion packing different from former.

〈Manufactured date : Product made before September, 2003〉

The product before September 2003 cannot exchange packing alone because there is cored bar in Packing.

Please exchange it with a metal ring.

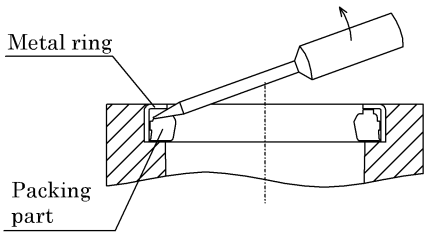
Forcing a minus driver etc. on a metal ring, the handle of a driver is struck by using the corner of a cover as a fulcrum, and a metal ring is removed.



〈Manufactured date : Product made after October, 2003〉

Because the product since October 2003 doesn't have Shin cane in Packing, only Packing can be exchanged.

Remove only the packing part using sharp pointed tool such as minus screw driver or ice pick. (The metal ring is left as it is without removing.)



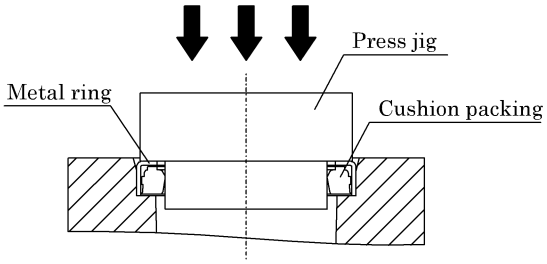
4.3 Assembly Procedure

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 100)

The product before September 2003 should press-fit a metallic ring when Cushion packing is exchanged, and exchange it according to the following procedure, please.



The packing part is incorporated in the metal ring so that a surface with a protruding portion may be on the metal ring side.

To prevent damage to packing also a tilt of it, use a jig carefully press it in the place.

Make sure to press it down so as the upper edge of its metal ring sink about 0.1 to 0.2 mm below the top surface of the cover.

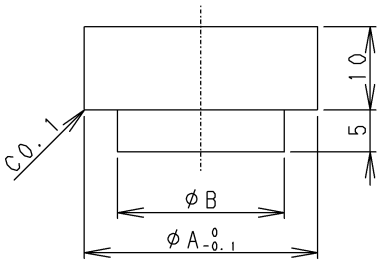


Table 5 and the illustration is an example of the jig.

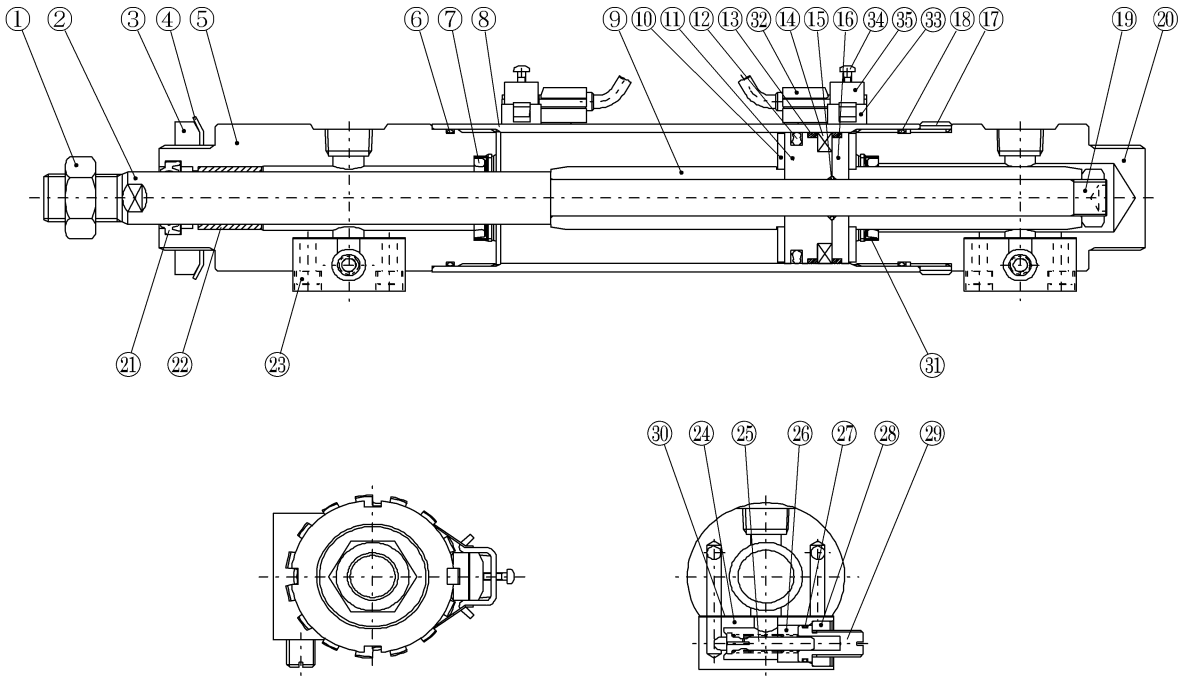
Table 5 Press Jig dimension

Bore size (mm)	A	B
ϕ 40	28	20
ϕ 50 , ϕ 63	32	24
ϕ 80	45	35
ϕ 100	55	45

4) Apply thinly and uniformly 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 and Expendable parts list



Note: The shape differs slightly only for the ϕ 20 type.

No.	Parts name	Material	Remarks	No.	Parts name	Material	Remarks
1	Rod nut	Steel	Zinc chromate	19	Piston nut	Steel	Zinc chromate
2	Piston rod	Steel	Industrial chrome plating	20	Head cover	Aluminum alloy	Alumite
3	Nut	Steel	galvanizing	21	Rod packing seal	Nitrile rubber	
4	The toothed washer	Steel	galvanizing	22	Bush	Oil impregnated bearing alloy	
5	Rod cover	Aluminum alloy	Alumite	23	Hexagon socket head cap bolt	Alloy steel	Blackening
6	Cylinder gasket	Nitrile rubber		24	Adjuster case	Aluminum alloy	Alumite
7	Cushion packing seal	Urethane and steel		25	Check valve	Copper alloy	
8	Cylinder tube	Aluminum alloy	Hard alumite	26	Spring	Stainless steel	
9	Cushion ring	Steel	Industrial chrome plating	27	Adjusting gasket	Nitrile rubber	
10	Cushion rubber	Urethane rubber		28	U nut	Steel	Zinc chromate
11	Piston	Aluminum alloy	Chromate	29	Adjusting bolt	Steel	Nickeling
12	Piston packing seal	Nitrile rubber		30	Case gasket	Asbestos special fiber cloth	Special fiber + NBR
13	Wear ring	Acetar resin		31	Stopper ring	Steel	Zinc chromate
14	Magnet	Plastic		With switch			
15	Piston gasket	Nitrile rubber		32	Switch body		
16	Piston holder	Aluminum alloy	Chromate	33	Band	Stainless steel	
17	Lock nut	Steel	Black chrome plating	34	Pan head machine screw	Steel	
18	Back up ring	Steel	Zinc chromate	35	Bracket	Stainless steel	

Expendable parts list (Specify the kit No. when ordering.)

Part No. / Name / Tube bore (mm)	Kit No.	⑥	⑦	⑩	⑫
		Cylinder gasket	Cushion packing seal	Cushion rubber	Piston packing seal
φ 20	HCA-20K				
φ 25	HCA-25K				
φ 32	HCA-35K				
φ 40	HCA-40K				
φ 50	HCA-50K				
φ 63	HCA-63K				
φ 80	HCA-80K				
φ 100	HCA-100K				

Part No. / Name / Tube bore (mm)	Kit No.	⑬	㉑	㉚
		Wear ring	Rod packing seal	Case gasket
φ 20	HCA-20K			
φ 25	HCA-25K			
φ 32	HCA-35K			
φ 40	HCA-40K			
φ 50	HCA-50K			
φ 63	HCA-63K			
φ 80	HCA-80K			
φ 100	HCA-100K			

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. Correct the installation state and/or change the mounting style.
	Excessive load	Increase the pressure itself and/or the inner diameter of the tube.
	Speed control valve is built in the way of "Meter in" circuit	Change the installation direction of the speed control valve.
Breakage and / or deformation	Impact force due to high speed operation	Turn the speed down. Reduce the load and/or install a mechanism with more secured cushion effect (e.g.external cushion mechanism).
	Exertion of transverse load	Install a guide. Correct 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 within the piston stroke	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

HCA – 00 – 20 B – 400 ———— I

● With switch

HCA – 00 – 20 B – 400 – R0 – R – I

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

(a) Mounting style (Note1)		(b) Bore size (mm)		(c) Cushion	
00	Basic type	20	φ 20	B	Both sides cushioned
LB	Axial foot type	25	φ 25(custom order)	R	Rod end cushion
FA	Rod end flange type	32	φ 32	H	Head end cushion
FB	Head end flange type	40	φ 40	N	No cushion
		50	φ 50		
		63	φ 63(custom order)		
		80	φ 80(custom order)		
		100	φ 100(custom order)		

(d) Stroke (mm)										(e) Switch model code					
Bore size (φ)		20	25	32	40	50	63	80	100	Grommet type	Terminal box type		Switch type	Indicator light	Lead wire
											Standard type	Splash -proof			
400	400	●	●	●	●	●	●	●	●						
450	450	●	●	●	●	●	●	●	●	R1※	R1B	R1A	Solid state	1 color indicator type	2-wire
500	500	●	●	●	●	●	●	●	●	R2※	R2B	R2A			
550	550	●	●	●	●	●	●	●	●	R2Y※	R2YB	R2YA		2 color indicator type	
600	600	●	●	●	●	●	●	●	●	R3※	R3B	R3A		1 color indicator type	3-wire
650	650	●	●	●	●	●	●	●	●	R3Y※	R3YB	R3YB		2 color indicator type	
700	700	●	●	●	●	●	●	●	●	R0※	R0B	R0A	Reed	1 color indicator type	2-wire
750	750				●	●	●	●	●	R4※	R4B	R4A			
800	800				●	●	●	●	●	R5※	R5B	R5A			
850	850				●	●	●	●	●	R6※	R6B	R6A			
900	900				●	●	●	●	●	※mark indicates the length of lead wire.					
950	950				●	●	●	●	●						
1000	1000				●	●	●	●	●						

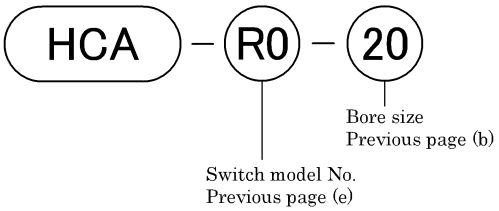
※ Lead wire length	
Blank	1m (Standard)
3	3m (Option)
5	5m (Option)

(g) Switch quantity (Note 3,4)		(i) Accessory	
R	One on rod end	I	Rod eye
H	One on head end	Y	Rod clevis
D	Two		
T	Three		

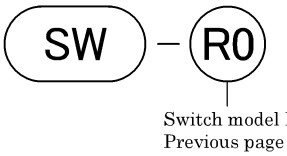
Note1: Mounting bracket, nut, and toothed washer are attached to the product, when shipping.

6.2 Component Parts Model Coding

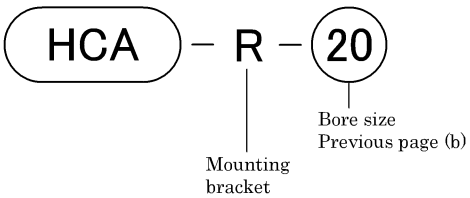
●Switch body + Mounting bracket



● Switch alone

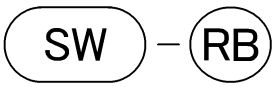


●Mounting bracket

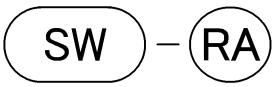


●Terminal box alone

・For R□B



・For R□A



6.3 Mounting bracket Model Coding

Bore size (mm) / Mounting bracket	Foot (LB)	Flange (FA・FB)
φ20	HCA - LB - 20	HCA - FA - 20
φ25	HCA - LB - 25	HCA - FA - 25
φ32	HCA - LB - 32	HCA - FA - 32
φ40	HCA - LB - 40	HCA - FA - 40
φ50	HCA - LB - 50	HCA - FA - 50
φ63	HCA - LB - 63	HCA - FA - 63
φ80	HCA - LB - 80	HCA - FA - 80
φ100	HCA - LB - 100	HCA - FA - 100

7. SPECIFICATION

7.1 Product Specifications

Model code / Item			HCA (Standard・With switch)							
Bore size		mm	φ20	φ25	φ32	φ40	φ50	φ63	φ80	φ100
Actuation			Double acting							
Working fluid			Compressed Air							
Max. working pressure		MPa	1.0							
Min. working pressure		MPa	0.1							
Proof pressure		MPa	1.6							
Ambient temperature		℃	-10 to 60 (No freezing)							
Port size			Rc1/8		Rc1/4		Rc3/8		Rc1/2	
Stroke tolerance		mm	+2.4 0	+3.6 0	+4.3 0				+5.0 0	
Working piston speed		mm/s	50 to 3000 (Use this within allowable energy absorption range.)							
Cushion			Air cushion							
Lubrication			Not required (When lubricating, use Turbine oil Class 1 ISOVG32)							
Allowable energy absorption	Cushioned	J	7.54	11.8	18.6	29.4	46.1	73.5	118	184
	No cushion		The types without cushion cannot absorb a large energy generated by an external load. We recommend installation of an external shock absorbing device.							
Effective air cushion length			85	75	70	70	70	70	70	70

Note : Bore size(mm) φ25, φ63, φ80, φ100 are custom orders.

7.2 Switch Specifications

Type & Model / Item	Reed switch	
	R0	R4
Applications	Programmable controller, relay,	High capacity relay, solenoid valve
Load Voltage / Load Current	DC12/24V, 5 to 50mA AC100V, 7 to 20mA AC200V, 7 to 10mA	AC100V, 20 to 200mA AC200V, 10 to 200mA
Internal voltage drop	2.4V or lower	2V or lower
Indicator light	LED (ON lighting)	Neon light OFF lighting
Leakage current	0mA	1mA or less
Lead wire length (Note 1)	1m (Oil-proof vinyl cabtyre cord, 2-wire, 0.3mm²)	
Shock resistance	294m/s²	
Insulation resistance	20 MΩ or more measuring with DC500V megger tester	
Withstand voltage	No abnormalities should occur after applying AC1500V for 1 minute	
Ambient temperature	-10 to 60℃	
Degree of protection (Note 3)	For Grommet - IEC Standard IP67, JIS C0920 (water tight type), Oil resistance	

Type & Model / Item	Reed switch	
	R5	R6
Applications	Programmable controller, relay, IC circuit(without indicator light), serial connection	Programmable controller (with DC self hold)
Load Voltage / Load Current	DC5/12/24V, 50mA or less AC100V, 20mA or less AC200V, 10mA or less	DC24V, 5 to 50mA
Internal voltage drop	0V	5V or lower
Indicator light	None	LED (ON lighting)
Leakage current	0mA	0.1mA or less
Lead wire length (Note 1)	1m (Oil-proof vinyl cabtyre cord, 2-wire, 0.3mm²)	
Shock resistance	294m/s²	
Insulation resistance	20 MΩ or more measuring with DC500V megger tester	
Withstand voltage	No abnormalities should occur after applying AC1500V for 1 minute	
Ambient temperature	-10 to 60℃	
Degree of protection (Note 3)	For Grommet - IEC Standard IP67, JIS C0920 (water tight type), Oil resistance	

Type & Model / Item	Solid state switch		
	R1	R2	R2Y (2 color indicator type)
Applications	Programmable controller, relay small solenoid valve	Programmable controller	
Load Voltage	AC85 to 265V	DC10 to 30V	
Load Current	5 to 100mA	5 to 30mA	
Internal voltage drop	—		
Indicator light	LED (ON lighting)		Red/Green LED (ON lighting)
Leakage current	1mA or lower at AC100V 2mA or lower at AC200V	1mA or lower	1.2mA or lower
Lead wire length (Note 1)	Standard 1m (Oil-proof vinyl cabtyre cord, 2-wire, 0.3mm²)		
Shock resistance	980m/s²		
Insulation resistance	20 MΩ or more measuring with DC500V megger tester		
Withstand voltage	No abnormalities should occur after applying AC1500V for 1 minute	No abnormalities should occur after applying AC1500V for 1 minute	
Ambient temperature	-10 to 60℃		
Degree of protection (Note 3)	For Grommet - IEC Standard IP67, JIS C 0920 (water tight type), Oil resistance		

Type & Model / Item	Solid state switch	
	R3	R3Y (2 color indicator type)
Applications	Programmable controller, relay, IC circuit, compact solenoid valve	
Power supply voltage	DC4.5 to 28V	
Load Voltage	DC30 or lower	
Load Current	200mA or lower	150mA or lower
Internal voltage drop	0.5V or lower at 150mA	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)	Standard 1m (Oil-proof vinyl cabtyre cord, 3-wire, 0.2mm²)	
Shock resistance	980m/s²	
Insulation resistance	20 MΩ or more measuring with DC500V megger tester	
Withstand voltage	No abnormalities should occur after applying AC1500V for 1 minute	
Ambient temperature	-10 to 60℃	
Degree of protection (Note 3)	For Grommet - IEC Standard IP67, JIS C 0920 (water tight type), Oil resistance	

Note 1: 3m or 5m long lead wire is optionally available.
Note 2 : Maximum value, 30mA is at 25℃ of ambient temperature. Load current decreases less than 30mA when the ambient temperature exceeds 25℃.
Note 3 : R※B(Terminal box type) is not water proof. R※A is manufactured for splash-proof (IP64) .(Custom order)