CKD

Environment-Resistant Linear Slide Cylinder

LCR-G-HP1 Series

INSTRUCTION MANUAL

SM-A47886-A/2

- Read this Instruction Manual before using the product.
- Read the safety notes carefully.
- Keep this Instruction Manual in a safe and convenient place for future reference.

CKD Corporation

PREFACE

Thank you for purchasing CKD's **"LCR-G-HP1 Series" Environment Resistant Linear Slide Cylinder**.
This Instruction Manual contains basic matters such as installation and usage instructions in order to ensure optimal performance of the product. Please read this Instruction Manual thoroughly and use the product properly.
Keep this Instruction Manual in a safe place and be careful not to lose it.

Product specifications and appearances presented in this Instruction Manual are subject to change without notice.

- The product is intended for users who have basic knowledge about materials, piping, electricity, and mechanisms of pneumatic components. CKD shall not be responsible for accidents caused by persons who selected or used the product without knowledge or sufficient training.
- Since there are a wide variety of customer applications, it is impossible for CKD to be aware of all of them. Depending on the application or usage, the product may not be able to exercise its full performance or an accident may occur due to fluid, piping, or other conditions. It is the responsibility of the customer to check the product specifications and decide how the product shall be used in accordance with the application and usage.

SAFETY INFORMATION

When designing and manufacturing any device incorporating the product, the manufacturer has an obligation to ensure that the device is safe. To that end, make sure that the safety of the machine mechanism of the device, the fluid control circuit, and the electric system that controls such mechanism is ensured.

To ensure the safety of device design and control, observe organization standards, relevant laws and regulations, which include the following:

ISO 4414, JIS B 8370, JFPS 2008 (the latest edition of each standard), the High Pressure Gas Safety Act, the Industrial Safety and Health Act, other safety rules, organization standards, relevant laws and regulations

In order to use our products safely, it is important to select, use, handle, and maintain the products properly.
Observe the warnings and precautions described in this Instruction Manual to ensure device safety.

Although various safety measures have been adopted in the product, customer's improper handling may lead to an accident. To avoid this:

Thoroughly read and understand this Instruction Manual before using the product.

To explicitly indicate the severity and likelihood of a potential harm or damage, precautions are classified into three categories: "DANGER", "WARNING", and "CAUTION".

⚠ **DANGER**	Indicates an imminent hazard. Improper handling will cause death or serious injury to people.
⚠ **WARNING**	Indicates a potential hazard. Improper handling may cause death or serious injury to people.
⚠ **CAUTION**	Indicates a potential hazard. Improper handling may cause injury to people or damage to property.

Precautions classified as "CAUTION" may still lead to serious results depending on the situation.
All precautions are equally important and must be observed.

Other general precautions and tips on using the product are indicated by the following icon.

	Indicates general precautions and tips on using the product.

Precautions on Product Use

⚠ WARNING

The product must be handled by a qualified person who has extensive knowledge and experience.

The product is designed and manufactured as a device or part for general industrial machinery.

Use the product within the specifications.

The product must not be used beyond its specifications. Also, the product must not be modified and additional work on the product must not be performed.

The product is intended for use in devices or parts for general industrial machinery. It is not intended for use outdoors or in the conditions or environment listed below.

- In applications for nuclear power, railroad system, aviation, ship, vehicle, medical equipment, and equipment that directly touches beverage or food.
- For special applications that require safety including amusement equipment, emergency shut-off circuit, press machine, brake circuit, and safety measures.
- For applications where life or properties may be adversely affected and special safety measures are required.

(Exception is made if the customer consults with CKD prior to use and understands the specifications of the product. However, even in that case, safety measures must be taken to avoid danger in case of a possible failure.)

Do not handle the product or remove pipes and devices until confirming safety.

- Inspect and service the machine and devices after confirming the safety of the entire system. Also, turn off the energy source (air supply or water supply) and power to the relevant facility. Release compressed air from the system and use extreme care to avoid water or electric leakage.
- Since there may be hot or live parts even after operation has stopped, use extreme care when handling the product or removing pipes and devices.
- When starting or restarting a machine or device that incorporates pneumatic components, make sure that a safety measure (such as a pop-out prevention mechanism) is in place and system safety is secured.

Precautions on Product Disposal

⚠ CAUTION

When disposing of the product, comply with laws pertaining to disposal and cleaning of wastes and have an industrial waste disposal company dispose of the product.

CONTENTS

1. PRODUCT OVERVIEW

1.1 Model Number Indication

1.1.1 Product model number

Without switch(built-in magnet for switch)

LCR-G - 8 - 40 ——— S506 DTN - HP1

With switch(built-in magnet for switch)

LCR-G - 12 - 40 - F2H* - R - S506 DTN - HP1

Model No.

A Tube Bore size

B Stroke

D Switch quantity

C Switch model No.

F Option

E Stopper

Code	Description
A Bore size (mm)	
6	ø6
8	ø8
12	ø12
16	ø16
20	ø20
25	ø25

B Stroke length (mm)

		Bore size (ø)					
		6	8	12	16	20	25
10	10	●	●	●	●	●	●
20	20	●	●	●	●	●	●
30	30	●	●	●	●	●	●
40	40	●	●	●	●	●	●
50	50	●	●	●	●	●	●
75	75		●	●	●	●	●
100	100			●	●	●	●
125	125				●	●	●
150	150					●	●

C Switch model No.

Axial lead wire	Lead wire L-shaped	Contact	Voltage AC	Voltage DC	Display lamp	Lead wire	Bore size ø6	ø8	ø12	ø16	ø20	ø25
-	F2S*	Proximity		●	1-color display	2-wire	●	●	●			
-	F3S*			●		3-wire						
F2H*	F2V*			●		2-wire						
F3H*	F3V*			●		3-wire						
F3PH*	F3PV*			●	1-color display(PNP output)(Made to order)	3-wire						
F2YH*	F2YV*			●	2-color display	2-wire						
F3YH*	F3YV*			●		3-wire						
T0H*	T0V*	Reed	●	●	1-color display	2-wire				●	●	●
T5H*	T5V*		●	●	Without indicator lamp							
T2H*	T2V*	Proximity		●	1-color display	2-wire						
T3H*	T3V*			●		3-wire						
T3PH*	T3PV*			●	1-color display (PNP output)	3-wire						
T2WH*	T2WV*			●	2-color display	2-wire						
T3WH*	T3WV*			●		3-wire						

*** Lead wire length**

Blank	1 m (standard)				●		
3	3 m (option)				●		
5	5 m (option)					●	

D Switch quantity

R	1 on rod side
H	1 on head side
D	2

E Stopper

Refer to "Stopper" on page 2.

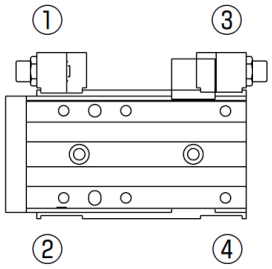
F Option

Blank	Port on stopper: without port	
D	Port on stopper: side and bottom ports	*1, *2, *5
Blank	Stopper block material: Steel	
T	Stopper block material: steel (nitriding)	*2
Plug included		
Blank	No	
N	With side piping port plug (not available for ø6, ø25)	*4

Note 1:For the port position, refer to the stopper dimensions in "Pneumatic Cylinders II (No.CB-030SA)".
Note 2:Can be selected for the type with stopper only.
Note 3:Refer to the selection table on page 3 to 5 for combinations of options.
Note 4:Select when using rear piping.
Note 5:Cannot be selected when choosing two-sided combined type (W).

■ (E)Stopper

● Stopper position



Code	Stopper installation position
Brank	No stopper Note 6
S Stroke adjusting stopper Note 2	
S1※※	Stopper position①(can be changed to ④)
S2※※	Stopper position②(can be changed to ③)
S3※※	Stopper position③(can be changed to ②) Note 7
S4※※	Stopper position④(can be changed to ①) Note 7
S5※※	Stopper position①,③
S6※※	Stopper position②,④
A Stopper position Note 1,2	
A1	Stopper position①(can be changed to④)
A2	Stopper position②(can be changed to③)
A3	Stopper position③(can be changed to②) Note 7
A4	Stopper position④(can be changed to①) Note 7
A5	Stopper position①,③
A6	Stopper position②,④
W Both-sided combined double stopper (shock absorber stopper,metal stopper) Note 4,5	
W1	A1+metal stopper
W2	A2+ metal stopper
W3	A3+metal stopper
W4	A4+ metal stopper
W5	A5+ metal stopper
W6	A6+ metal stopper
C One side hybrid stopper mix (shock absorber stopper,stroke adjusting stopper)	
C1※※	A1+S3
C2※※	A2+S4
C3※※	A3+S1
C4※※	A4+S2

※※part Adjustable stroke range ●Compatible with all. ▲Compatible with some. Note 3

	Protruding end	Return end	Stopper model No.			
			S	A	W	C
Blank	5mm or none	5mm or none	●	—	—	●
02	15mm or none	15mm or none	●			●
03	25mm or none	25mm or none	●			●
04	15mm	5mm	▲			—
05	25mm	5mm	▲			—
06	5mm	15mm	▲			—
07	5mm	25mm	▲			—

Note1:For the adjustable stroke range with a shock absorber stopper, refer to the stopper dimensions table in "Pneumatic Cylinders II (No. CB-030SA)".
Note2:Refer to stoppers “C*” and “W*” for combination of the stroke adjusting stopper and shock absorber type stopper.
Note3:Can be selected only when using stroke adjusting stopper (S) and one side mixed type (C).
Note4:When two switches are necessary or a switch is installed on the head side of W3 to 6 (both-sided combined stopper) of ø6 (all stroke lengths), ø8 with 20 or 30 mm stroke length, ø12 with 30 to 50 mm stroke length or ø16 with 30 to 50 mm stroke length,select the lead wire straight type.
Note5:The adjustable stroke range when choosing both-sided combined use (W) is ø6: 9 mm, ø8: 13.5 mm, ø12: 14.5 mm, ø16: 15 mm, ø20: 13 mm, ø25: 10 mm.
Note6:The port positions of the standard without stopper are ① and ③ .
Note7:When changing the stopper position from the head side to the rod side, the stopper must be purchased separately according to the stroke length and adjustable stroke length. Refer to "Precautions when purchasing discrete stopper" on page 8.
A1, A2 and adjustable stroke length of 15 mm and 25 mm may not be available depending on the stroke length.
Note8:The shock absorber is not dust-proof.

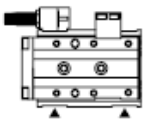
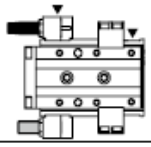
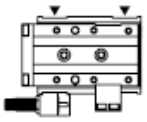
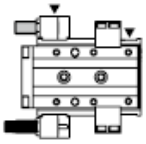
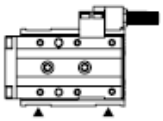
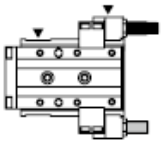
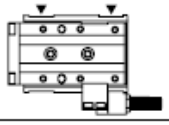
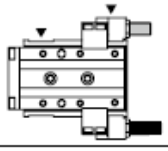
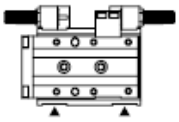
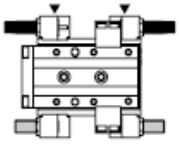
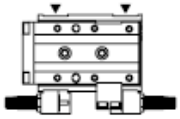
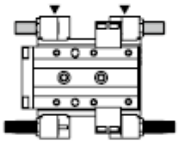
※A1**, A2**, A5** and A6** of ø6 to ø8 with 10 mm stroke length or less and ø12 to ø25 with 20 mm stroke length or less are made to order since they are not adjustable using the standard stopper.
※When two switches are necessary for the type with S*** or A*** of ø6 to ø8 with 30 mm stroke length or less, select the F□H type switch.
※The stroke adjusting stopper for 0.3 MPa and over working pressure is the metal sealing type.

1.1.2 Stopper model No. selection method

■ (A)Shock absorber stopper,(W)Two-sided combined double stopper

Model No.-[①Stopper model No.]+[②Stopper position Model No.]
Example)LCR-G-12-40-F2H-R-**[A][1]**-HP1

■ : Shock absorber stopper
▭ : Metal adjusting stopper (adjusting range 15 mm)

		Shock absorber (one side)	Two-sided combined double stopper
		Stopper model No. [①]	
		[A]	[W]
Stopper position model No. [②]	[1]	[A1] 	[W1] 
	[2]	[A2] 	[W2] 
	[3]	[A3] 	[W3] 
	[4]	[A4] 	[W4] 
	[5]	[A5] 	[W5] 
	[6]	[A6] 	[W6] 

▲ shows the piping direction.
If two-sided combined type (W) is selected, the stopper bracket comes with piping on both sides, ▲ (piping direction) and the reverse side stopper bracket comes with a plug.

<Selection table> ●: Available –: Not available

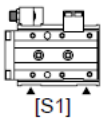
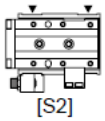
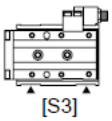
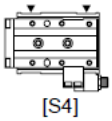
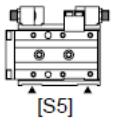
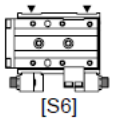
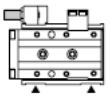
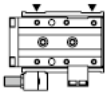
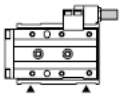
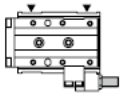
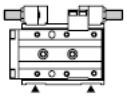
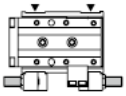
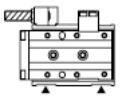
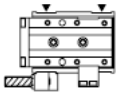
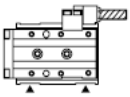
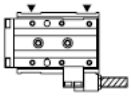
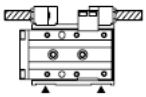
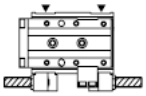
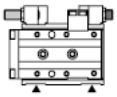
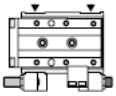
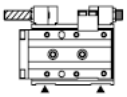
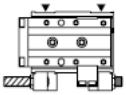
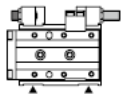
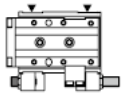
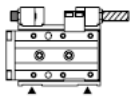
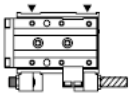
Model No.	Stopper type		Shock absorber						Two-sided combined double stopper					
	Stopper code		A1	A2	A3	A4	A5	A6	W1	W2	W3	W4	W5	W6
	Bore size	Stroke length												
LCR	ø6, ø8	10	–	–	●	●	–	–	–	–	●	●	–	–
		20 or more	●	●	●	●	●	●	●	●	●	●	●	●
	ø12 to ø25	10	–	–	●	●	–	–	–	–	●	●	–	–
		20	–	–	●	●	–	–	–	–	●	●	–	–
		30 or more	●	●	●	●	●	●	●	●	●	●	●	●

The table above also applies to combinations with option code D (with port on stopper) or T (steel stopper block (nitriding)).

■ (S)Stroke adjusting stopper

Model No.-[①②Stopper model No.]+[③Adjustable stroke range model No.]
Example)LCR-G-8-40-**[S5][06]**-HP1

: Stroke adjusting stopper (adjusting range 5 mm)
: Stroke adjusting stopper (adjusting range 15 mm)
: Stroke adjusting stopper (adjusting range 25 mm)

Adjustable stroke range Model No. [③]		Stopper adjusting range		Stopper model No. [①②]					
		Protruding end	Return end	[S1]	[S2]	[S3]	[S4]	[S5]	[S6]
	Blank	5 mm or None	5 mm or None	 [S1]	 [S2]	 [S3]	 [S4]	 [S5]	 [S6]
	[02]	15 mm or None	15 mm or None	 [S102]	 [S202]	 [S302]	 [S402]	 [S502]	 [S602]
	[03]	25 mm or None	25 mm or None	 [S103]	 [S203]	 [S303]	 [S403]	 [S503]	 [S603]
	[04]	15 mm	5 mm					 [S504]	 [S604]
	[05]	25 mm	5 mm					 [S505]	 [S605]
	[06]	5 mm	15 mm					 [S506]	 [S606]
	[07]	5 mm	25 mm					 [S507]	 [S607]

▲ shows the piping direction.

<Selection table>

●: Available –: Not available

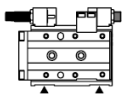
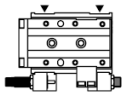
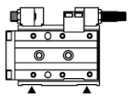
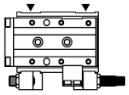
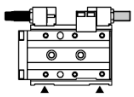
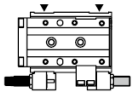
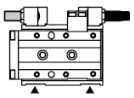
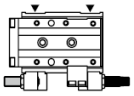
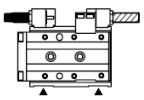
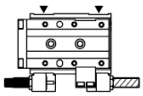
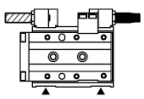
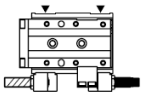
Model No.	Stopper type		Stroke adjustable																								
	Stopper code		S1			S2			S3			S4			S5							S6						
			Adjustment length code																								
	Bore size	Stroke length	Blank	02	03	Blank	02	03	Blank	02	03	Blank	02	03	Blank	02	03	04	05	06	07	Blank	02	03	04	05	06	07
LCR	ø6, ø8	10	●	–	–	●	–	–	●	●	–	●	●	–	●	–	–	–	–	●	–	●	–	–	–	–	●	–
		20 or more	●	●	–	●	●	–	●	●	–	●	●	–	●	●	–	●	–	●	–	●	●	–	●	–	●	–
	ø12 to ø25	10	●	–	–	●	–	–	●	●	–	●	●	–	●	–	–	–	–	●	–	●	–	–	–	–	●	–
		20	●	●	–	●	●	–	●	●	●	●	●	●	●	●	–	●	–	●	●	●	●	–	●	–	●	●
		30 or more	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

The table above also applies to combinations with option code D (with port on stopper) or T (steel stopper block (nitriding)).

■ (C)One side hybrid stopper mix

Model No.-[①②Stopper model No.]+[③Adjustable stroke range model No.]
Example)LCR-G-12-40-**[C2][03]**-HP1

■: Shock absorber stopper ▨: Stroke adjusting stopper (adjusting range 15 mm)
▨: Stroke adjusting stopper (adjusting range 5 mm) ▨: Stroke adjusting stopper (adjusting range 25 mm)

Adjustable stroke range Model No. [③]		Stopper adjusting range		Stopper model No. [①②]			
		Protruding end	Return end	[C1]	[C2]	[C3]	[C4]
	Blank	5 mm or shock absorber	5 mm or shock absorber	 [C1]	 [C2]	 [C3]	 [C4]
	[02]	15 mm or shock absorber	15 mm or shock absorber	 [C102]	 [C202]	 [C302]	 [C402]
	[03]	25 mm or shock absorber	25 mm or shock absorber	 [C103]	 [C203]	 [C303]	 [C403]

- ▲ shows the piping direction.
- For the adjustable stroke range for a shock absorber stopper, refer to the stopper dimensions table in "Pneumatic Cylinders II (No. CB-030SA)".

<Selection table>

●: Available –: Not available

Model No.	Stopper type		One side hybrid stopper mix											
	Stopper code		C1			C2			C3			C4		
			Adjustment length code											
	Bore size	Stroke length	Blank	02	03	Blank	02	03	Blank	02	03	Blank	02	03
LCR	ø6, ø8	10	–	–	–	–	–	–	●	–	–	●	–	–
		20 or more	●	●	–	●	●	–	●	●	–	●	●	–
	ø12 to ø25	10	–	–	–	–	–	–	●	–	–	●	–	–
		20	–	–	–	–	–	–	●	●	–	●	●	–
		30 or more	●	●	●	●	●	●	●	●	●	●	●	●

The table above also applies to combinations with option code D (with port on stopper) or T (steel stopper block (nitriding)).

1.1.3 Switch model No.

< Switch body only>

ø6 to ø12

SW - F2H

Switch model No.

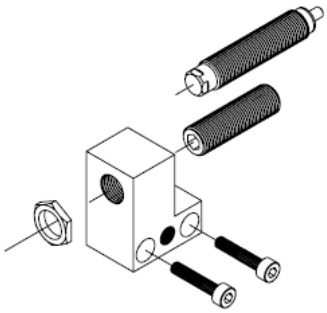
For ø16 to ø25

SW - T2H3

Switch model No.

1.1.4 How to order a stopper set

- Set of a stopper and stroke adjusting stopper or shock absorber stopper
- Use it when changing from the standard to the stroke adjusting stopper or shock absorber stopper



LCR - 12 - S 2 D - S02

Bore size

Ⓐ Stopper type	
S	Stroke adjusting stopper
A	Shock absorber stopper

Ⓑ Stopper mounting position *1	
1	Stopper position for ① or ④
2	Stopper position for ② or ③

Ⓒ Port on the stopper	
Blank	Without port
D	With side and bottom ports

Ⓓ Adjustable stroke length *2, *3	
Blank	Adjustable stroke range 5 mm
S02	Adjustable stroke range 15 mm
S03	Adjustable stroke range 25 mm

Note1 : When installing in the stopper mounting position ① or ②,
the stroke causes changes in the adjustable stroke length;see the next page.
Note2 : ø6 and ø8 are not available for S03.
Note3 : Cannot be selected for the shock absorber stopper "A".
Note4 : The shock absorber is not dust-proof.

Bottom port is plug-sealed.
When using the bottom port with ø20 and 25,buy a plug kit (LCR-20-N 2 pieces/set) and seal the side surface ports before using.

■ Precautions when purchasing the stopper set

When the stopper set is installed in the mounting position ① or ②(refer to page 2),note that the adjustable stroke length will be as shown on the below according to the stroke length.

Model No.	Opition code		Discrete stroke adjusting stopper		
			Adjustable stroke length (mm)		
	Bore size	Stroke length	-5	-15	-25
LCR-G-HP1 Series	φ6,φ8	10	S02	—	—
		20 or more	Blank	S02	—
	φ12 to φ25	10	S03	—	—
		20	S02	S03	—
		30 or more	Blank	S02	S03

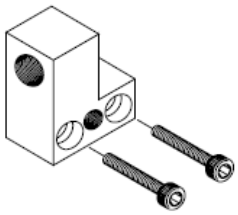
— : Not applicable

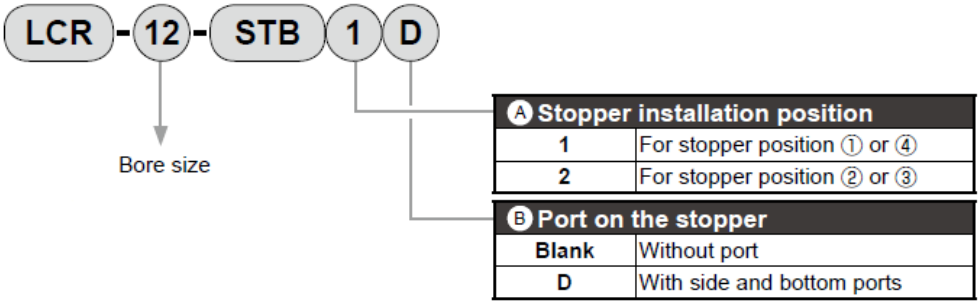
Stopper set weight (unit : g)

Stopper type	S1,S2			A1,A2
Port on the stopper	Blank,D			
Adjustable stroke length	Blank	S02	S03	Blank
φ6	15	18	—	18
φ8	21	25	—	27
φ12	28	31	34	33
φ16	42	47	52	49
φ20	77	85	92	86
φ25	87	94	101	95

1.1.5 How to order discrete stopper bracket

Used when changing between □1 (□3) and □2 (□4) or when changing to the stopper with port.
※ □: S,A





Stopper bracket weight (Unit: g)

Stopper installation position	1,2
Port on the stopper	Blank, D
φ6	8
φ8	14
φ12	20
φ16	29
φ20	53
φ25	62

Bottom port is plug-sealed.
When using the bottom port with ø20 and 25, buy a plug kit (LCR-20-N 2 pieces/set) and seal the side surface ports before using.

1.1.6 How to order discrete stroke adjusting stopper

- Hexagon socket set screw with urethane
- Use when changing the adjustable stroke range or when using a custom stroke length.

LCR - 12 - S02

Bore size

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

Specify S01, S02 or S03 in A.
S03 is not available for ø6 and ø8.
Some models may not be available and adjustable stroke range may differ from the above depending on the Model No.

■ Precautions when purchasing discrete stopper

When a discrete stroke adjusting stopper or a discrete shock absorber stopper is installed in the ① or ② position (refer to page 2), the combination will be as shown on the below according to the stroke length and adjustable stroke length.

Model No.	Option code		Discrete stroke adjusting stopper Adjustable stroke length (mm)			Discrete shock absorber stopper
	Bore size	Stroke length	-5	-15	-25	
LCR Series -S1, S2, S5, S6 -A1, A2, A5, A6	φ6,φ8	10	S02	—	—	—
		20 or more	S01	S02	—	A01
	φ12 to φ25	10	S03	—	—	—
		20	S02	S03	—	—
		30 or more	S01	S02	S03	A01

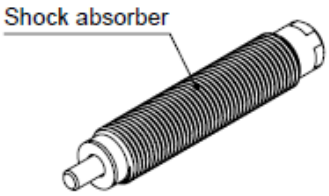
—: Not available

Discrete stroke adjusting stopper weight (Unit: g)

Adjustable stroke range	S01	S02	S03
φ6	6	9	—
φ8	7	10	—
φ12	7	11	14
φ16	11	16	22
φ20	22	30	37
φ25	23	30	37

1.1.7 How to order discrete shock absorber stopper

- Shock absorber set
- Use when changing from the stroke adjusting stopper to the shock absorber stopper



LCR - 12 - A01

Bore size

- Some models may not be available depending on the specifications.
- For the adjustable stroke range for a shock absorber stopper, refer to the stopper dimensions table in "Pneumatic Cylinders II (No. CB-030SA)".
- The shock absorber is not dust-proof.

Applicable shock absorber model No.

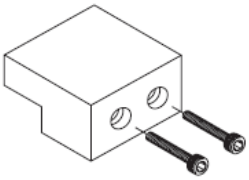
Model	Shock absorber model No.	Weight (g)
LCR-G-6-HP1	SKL-0804	9
LCR-G -8-HP1	SKL-0805	12
LCR-G-12-HP1	SKL-0805	12
LCR-G-16-HP1	SKL-1006	19
LCR-G-20-HP1	SKL-1208	31
LCR-G-25-HP1	SKL-1208	31

1.1.8 How to order discrete stopper block

- Use it when changing from the standard to the stroke adjusting stopper or shock absorber stopper.

LCR - 12 - SB1 T

Bore size

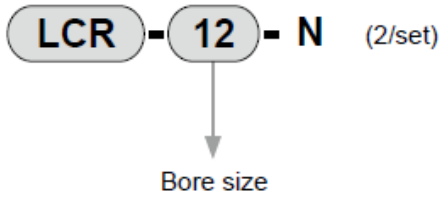


(A) Stopper block	
SBL	φ6: For 30 mm stroke length or less Stopper position (1) or (3).
SBR	φ6: For 30 mm stroke length or less Stopper position (2) or (4).
SB1	φ8: For 30 mm stroke length or less φ12 to φ25: For 50 mm stroke length or less
SB2	φ6/φ8: For 40 mm stroke length or more φ12 to φ25: For 75 mm stroke length or more
(B) Material	
Blank	Stopper block material: steel
T	Stopper block material: steel (nitriding)

Discrete stopper block weight (Unit: g)

Block	SBL/SBR/SB1(T)	SB2(T)
ϕ6	14	21
ϕ8	14	24
ϕ12	23	37
ϕ16	38	72
ϕ20	60	99
ϕ25	112	206

1.1.9 Model No. of plug kit for side piping port



Weight of plug kit for side piping port

Bore size	Weight (g)
φ8	1
φ12	1
φ16	1
φ20	5

1.2 Specifications

1.2.1 Product specifications

Model / Descriptions		LCR-G-HP1					
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 Note 1					
Proof pressure MPa		1.05					
Ambient temperature °C		-10 to 60 (no freezing)					
Port size	Main body side	M3	M5			Rc1/8	
	Main body back	—	M3			M5	Rc1/8
Stroke tolerance mm		$^{+2.0}_{0}$ Note 2					
Working piston speed mm/s		50 to 500 Note 3					
Cushion		With rubber cushion					
Lubrication		Not required (If lubrication is necessary, use Class 1 ISO VG32 turbine oil.)					

Note 1：0.2Mpa when using φ6 shock absorber stopper.
Note 2：Note that there will be a slight gap between the end plate and floating bush if no stopper is attached.
Note 3：Keep within 50 to 200 mm/s when using a stroke adjusting stopper.
※ The stroke adjusting stopper for 0.3 MPa and over working pressure is the metal sealing type.

1.2.2 Switch specifications

Descriptions	Reed 2-wire type			
	T0H/V		T5H/V	
Applications	For programmable controller, relay		For programmable controller, relay, IC circuit(without indicator), serial connection	
Power supply voltage	—			
Load voltage	12/24 VDC	110 VAC	5/12/24 VDC	110 VAC
Load current	5 mA to 50 mA	7 mA to 20 mA	50 mA or less	20 mA or less
Current consumption	—			
Internal voltage drop	3 V or less (For DC, when the load current is 30mA)		0.1 V or less (Internal resistance 0.5Ω or less)	
Indicator	Red LED (Lights up when turned on)		—	
Leakage current	—			
Lead wire Note 1	Standard is 1 m (Oil-resistant vinyl cabtyre 2 core cord, 0.2 mm^2)			
Shock resistance	294m/s^2			
Insulation resistance	20 MΩ or more with 500 VDC megger			
Withstand voltage	No abnormality after applying 1000 VAC for one minute			
Ambient temperature	−10°C to 60°C			
Degree of protection	IP 67 (IEC standard), JIS C 0920 (watertight), oil-resistant			

Descriptions	Proximity			
	2-wire type		3-wire type	
	F2S/H/V	F2YH/V	F3S/H/V	F3YH/V
Applications	Only for programmable controller		For programmable controller, relay	
Power supply voltage	—		10 to 28VDC	
Load voltage	10 to 30VDC	24VDC±10%	30 VDC or less	
Load current	5 to 20mA Note 2		50 mA or less	
Current consumption	—		10 mA or less at 24 VDC	
Internal voltage drop	4V or less		0.5V or less	
Indicator	Yellow LED Note 3 (Lights up when turned on)	Red/green LED (Lights up when turned on)	Yellow LED Note 3 (Lights up when turned on)	Red/green LED (Lights up when turned on)
Leakage current	1 mA or less		10 μA or less	
Lead wire Note 1	Standard is 1 m (Elasticity,Oil-resistant vinyl cabtyre 2 core cord, 0.15 mm^2)		Standard is 1 m (Elasticity,Oil-resistant vinyl cabtyre 3 core cord, 0.15 mm^2)	
Shock resistance	980m/s^2			
Insulation resistance	20 MΩ or more with 500 VDC megger			
Withstand voltage	No abnormality after applying 1000 VAC for one minute			
Ambient temperature	−10°C to 60°C			
Degree of protection	IP 67 (IEC standard), JIS C 0920 (watertight), oil-resistant			

Descriptions	Proximity			
	2-wire type		3-wire type	
	T2H/V	T2WH/V	T3H/V	T3WH/V
Applications	Only for programmable controller		For programmable controller, relay	
Power supply voltage	—		10 to 28VDC	
Load voltage	10 VDC to 30 VDC	24VDC±10%	30VDC or less	
Load current	5 mA to 20 mA Note 2		100 mA or less	50 mA or less
Current consumption	—		10 mA or less at 24 VDC	
Internal voltage drop	4 V or less		0.5V or less	
Indicator	Red LED (Lights up when turned on)	Red/green LED (Lights up when turned on)	Red LED (Lights up when turned on)	Red/green LED (Lights up when turned on)
Leakage current	1 mA or less		10μA or less	
Lead wire Note 1	Standard is 1 m (Oil-resistant vinyl cabtyre 2 core cord, 0.2 mm^2)		Standard is 1 m (Oil-resistant vinyl cabtyre 3 core cord, 0.2 mm^2)	
Shock resistance	980m/s^2			
Insulation resistance	20 MΩ or more with 500 VDC megger			
Withstand voltage	No abnormality after applying 1000 VAC for one minute			
Ambient temperature	−10°C to 60°C			
Degree of protection	IP 67 (IEC standard), JIS C 0920 (watertight), oil-resistant			

Descriptions	Proximity 3-wire type	
	T3PH/V	F3PH/V
Applications	For programmable controller, relay	
Power supply voltage	10 to 28 VDC	4.5 to 28VDC
Load voltage	30 VDC or less	
Load current	100mA or less	50mA or less
Current consumption	10 mA or less at 24 VDC	10 mA or less at 24 VDC
Internal voltage drop	0.5V or less	0.5 V or less at 30 mA
Indicator	Yellow LED (Lights up when turned on)	
Leakage current	10μA or less	
Lead wire Note 1	Standard is 1 m (Oil-resistantvinyl cabtyre 3 core cord, 0.2 mm^2)	Standard is 1 m (Elasticity,Oil-resistant vinyl cabtyre 3 core cord, 0.15 mm^2)
Shock resistance	980m/s^2	
Insulation resistance	20 MΩ or more with 500 VDC megger	
Withstand voltage	No abnormality after applying 1000 VAC for one minute	
Ambient temperature	−10°C to 60°C	
Degree of protection	IP 67 (IEC standard), JIS C 0920 (watertight), oil-resistant	

Descriptions	Proximity 2-wire type
	T2HR3,T2VR3(Bend resist lead wire)
Applications	Only for programmable controller
Power supply voltage	—
Load voltage	10 to 30VDC
Load current	5mA to 20mA Note 2
Current consumption	—
Internal voltage drop	4V or less
Indicator	Red LED (Lights up when turned on)
Leakage current	1mA or less
Lead wire Note 1	Standard is 3m (Elasticity, oilresistantvinyl cabtyre cable2-conductor 0.2 mm^2)
Shock resistance	980m/s^2
Insulation resistance	20 MΩ or more with 500 VDC megger
Withstand voltage	No abnormality after applying 1000 VAC for one minute
Ambient temperature	−10°C to 60°C
Degree of protection	IP 67 (IEC standard), JIS C 0920 (watertight), oil-resistant

Note 1: 3 m and 5 m lead wires are available as options. (Except 5m of F type switch)
Note 2: The maximum load current of 20 mA is the value when the ambient temperature is 25°C.
The current will be lower than 20 mA when the ambient temperature of the switch is higher than 25°C (5 mA to 10 mA at 60°C).
Note 3: The indicator is red LED for F2S and F3S.
※ "T□H" / "F□H" show Lead wire straight type, as well as "T□V" / "F□V" show Lead wire angled type.

2. INSTALLATION

2.1 Environment

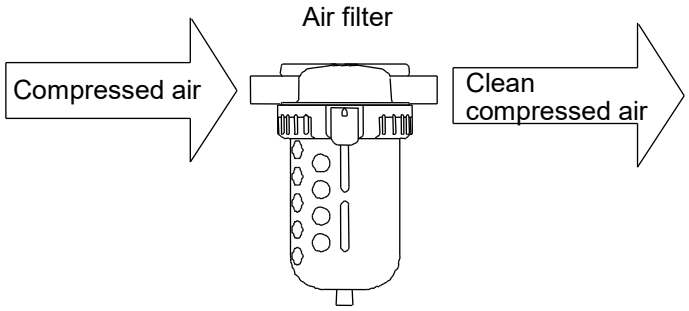
⚠CAUTION

When using the product in a cutting, casting, or welding plant, install a cover to prevent foreign matters such as cutting fluid, chips, powder, and dust from entering.

Do not use the equipment in the following environments.

- Where cutting oil can splash onto the product (abrasives and polishing powder in the oil can abrade the sliding section)
- Where organic solvents, chemicals, acids, alkalis, and kerosene are present
- Where water can splash onto the product

- Use the product within the following ambient temperature range.
  −10°C to 60°C (no freezing)
- For compressed air, use clean and dry air that has been passed through an air filter.
  Use an air filter in the circuit and be careful with the filtration rate (a filter that removes particles exceeding 5 μm is desirable), flow rate, and mounting position (install the filter near the directional control valve).



2.2 Unpacking

- Check that the model number ordered and the model number indicated on the product are the same.
- Check the exterior of the product for any damage.
- When storing the product, take proper measures to prevent foreign matters from entering the cylinder.

2.3 Mounting

2.3.1 Mounting the Body

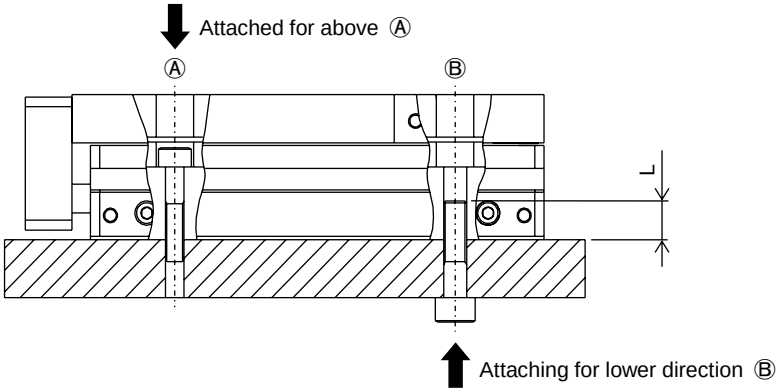
⚠CAUTION

Do not damage the surface flatness by denting or scratching the body (tube) mounting surface or the table surface.

In addition, make sure that the flatness of the mating surface for body and table mounting is 0.02 mm or less.

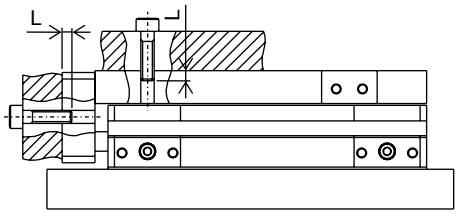
■ Tightening torque

Observe the following values for the bolt insertion length and tightening torque when installing this product.



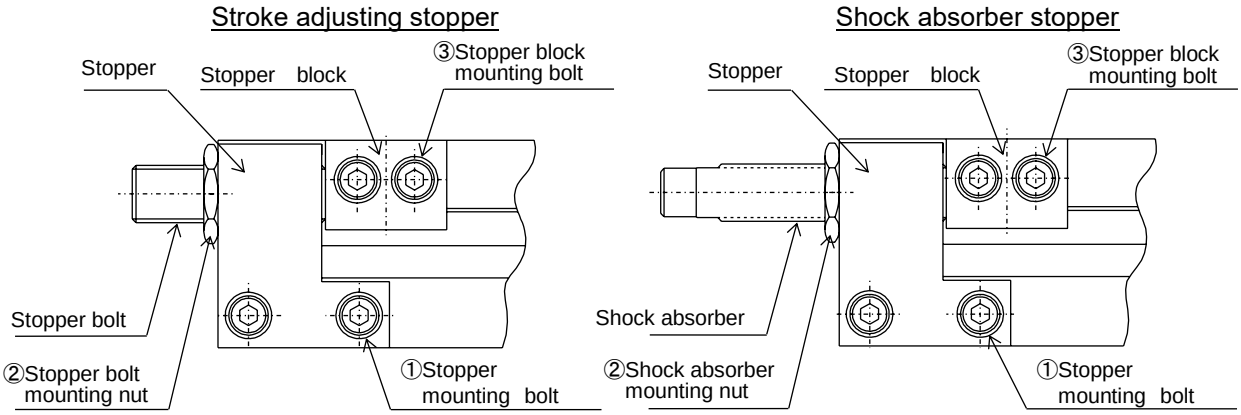
Model	A		B		
	Bolt size	Tightening torque (N·m)	Bolt size	Tightening torque (N·m)	Max. screw-in depth
LCR-G-6-HP1	M3 × 0.5	0.6 to 1.1	M4 × 0.7	1.4 to 2.4	6
LCR-G-8-HP1					
LCR-G-12-HP1	M4 × 0.7	1.4 to 2.4	M5 × 0.8	2.9 to 5.1	8
LCR-G-16-HP1	M5 × 0.8	2.9 to 5.1	M6 × 1.0	4.8 to 8.6	9
LCR-G-20-HP1					
LCR-G-25-HP1	M6 × 1.0	4.8 to 8.6	M8 × 1.25	12.0 to 21.6	12

Observe the following bolt insertion lengths and tightening torque when installing the jig on the slide table or end plate.
When attaching or detaching the workpiece to/from the slide table and end plate, be sure to keep the slide table itself retained.



Model	Bolt size	Tightening torque (N·m)	Max. screw-in depth L(mm)	
			Mounting the slide table	Mounting the end plate
LCR-G-6-HP1	M3×0.5	0.6	3	4.5 to 6
LCR-G-8-HP1			3 to 4.5	4.5 to 7
LCR-G-12-HP1	M4×0.7	1.4	4 to 5.5	6 to 9
LCR-G-16-HP1	M5×0.8	2.9	5 to 6	7.5 to 9
LCR-G-20-HP1			5 to 6	7.5 to 11
LCR-G-25-HP1	M6×1.0	4.8	6 to 7	9 to 11

Observe the following values for bolts at the stopper and in nut tightening torque.



Model	①Stopper mounting bolt (N·m)	②Stopper bolt mounting nut ②Shock absorber mounting nut(N·m)	③Stopper block mounting bolt(N·m)
LCR-G-6-HP1	0.4 to 0.5	1.2 to 2.0	0.6 to 0.8
LCR-G-8-HP1			
LCR-G-12-HP1	0.6 to 0.8		
LCR-G-16-HP1		3.0 to 4.0	1.4 to 1.8
LCR-G-20-HP1	2.9 to 3.5	4.5 to 6.0	
LCR-G-25-HP1			2.9 to 3.5

■ Allowable load

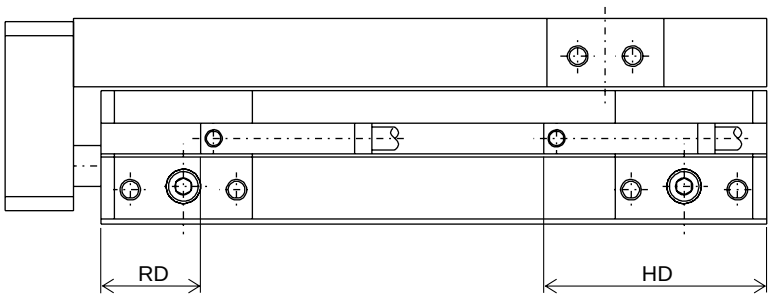
For details, refer to the "Model selection" pages in the catalog.

2.3.2 Mounting the switch

■ Precautions for type with switch

- When using the T□V switch with a stroke adjusting stopper (S3**/S4**/S5**/S6**) or shock absorber stopper (A3**/A4**/A5**/A6**), install the switch on the opposite side to the stopper. Otherwise the switch on the head side will make contact with the stopper.
- Be careful of the lead wire direction when designing the 30 mm or less stroke length, since a switch is installed in each groove of the body.

■ Mounting position



< Mounting the switch at the stroke end >
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.

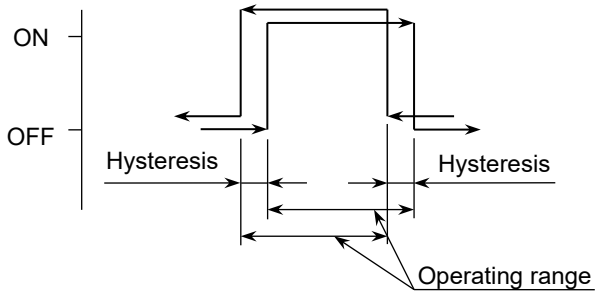
< Mounting the switch at the intermediate position of the stroke >
For the switch to function at an intermediate position of the stroke, secure the piston at the position where the switch needs to function and then slide the switch on the piston back and forth to find the positions where the switch turns on when slid forward and when slid backward. The intermediate point between these two positions is where the switch functions at maximum sensitivity for that piston position and where the switch is to be mounted.

■ Operating range

This is the range from where the switch is turned on when the piston moves and to where the switch is turned off when the piston moves farther in the same direction.

■ Hysteresis

This is the distance from where the switch is turned on when the piston moves and to where the switch is turned off when the piston moves in the opposite direction.



■ The maximum sensitivity position (HD,RD),Operating range, Hysteresis (unit：mm)

Proximity switch (F2S/H/V,F3S/H/V,F2YH/V,F3YH/V,F3PH/V)													
The maximum sensitivity position / Bore size (mm)		Stroke									Operating range		Hysteresis	
		10	20	30	40	50	75	100	125	150	1-color display	2-color display	1-color display	2-color display
φ6	HD	33 (34)	23 (24)		24 (25)		—				2 to 4	2.5 to 5.5	1 or less	1 or less
	RD	26(25)					—							
φ8	HD	33 (34)	23 (24)		33 (34)		—					3.5 to 6		
	RD	25(24)					—							
φ12	HD	44.5 (45.5)	34.5 (35.5)		24.5 (25.5)		35.5 (36.5)		—			3 to 4.5		
	RD	24.5(23.5)							—					

Note 1:Values in ( ) are for F2 / 3S.

Proximity switch (T2H/V,T3H/V,T2HR3,T2VR3,T3PH/V), Reed switch(T0H/V,T5H/V)														
The maximum sensitivity position / Bore size (mm)		Stroke									Operating range		Hysteresis	
		10	20	30	40	50	75	100	125	150	T2H/V T3H/V	T0H/V T5H/V	T2H/V T3H/V	T0H/V T5H/V
φ16	HD	53.5	43.5		33.5		51.5			—	2 to 4	5 to 9	1 or less	1 or less
	RD	23								—				
φ20	HD	69	59		49		63.5				2 to 5.5	6.5 to 11		
	RD	24.5												
φ25	HD	83.5	73.5		63.5		86				2.5 to 6	8 to 12		
	RD	23												

Proximity switch (T2WH/V,T3WH/V)												
The maximum sensitivity position / Bore size (mm)		Stroke									Operating range	Hysteresis
		10	20	30	40	50	75	100	125	150		
φ16	HD	51	41		31		49			—	3 to 4.5	1 or less
	RD	25.5								—		
φ20	HD	67	57		47		61.5				4 to 5.5	
	RD	26										
φ25	HD	81.5	71.5		61.5		84				3.5 to 6	
	RD	25										

2.3.3 Changing the position of the switch

1. Loosen the fastening screw (set screw).
2. Move the switch body along the groove on the side of the body and tighten it in place.

2.3.4 Replacing the switch

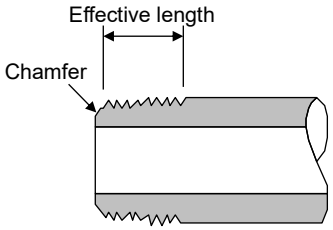
1. Loosen the fastening screw (set screw) and remove the switch body from the groove.
2. Put the replacement switch into the groove.
3. Determine where to position the switch and tighten the screw.
   (Tightening torque is 0.1 to 0.2N·m for T0, T5, T2, T3, T2W, T3W, T2HR, T2VR, T3P, 0.03 to 0.08N·m for F2, F3, F2Y, F3Y, F3P.)

2.4 Piping

⚠ WARNING

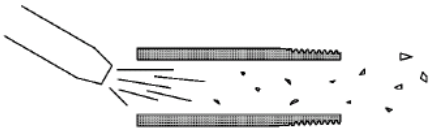
Insert the tube into the fitting until it firmly rests on the tube end and make sure that the tube does not come off before use.

- Use pipes that are made of corrosion-resistant materials after the filter such as zinc-plated pipes, nylon tubes, and rubber tubes.
- Use pipes with an effective cross-sectional area that allows the cylinder to achieve the predetermined piston speed.
- Install the filter for removing rust, foreign matters, and drainage from the piping as close as possible to the solenoid valve.
- Observe the effective thread length for the gas pipes.
- In addition, chamfer the threaded end of the pipes by about a 1/2 pitch.



■ Pipe cleaning

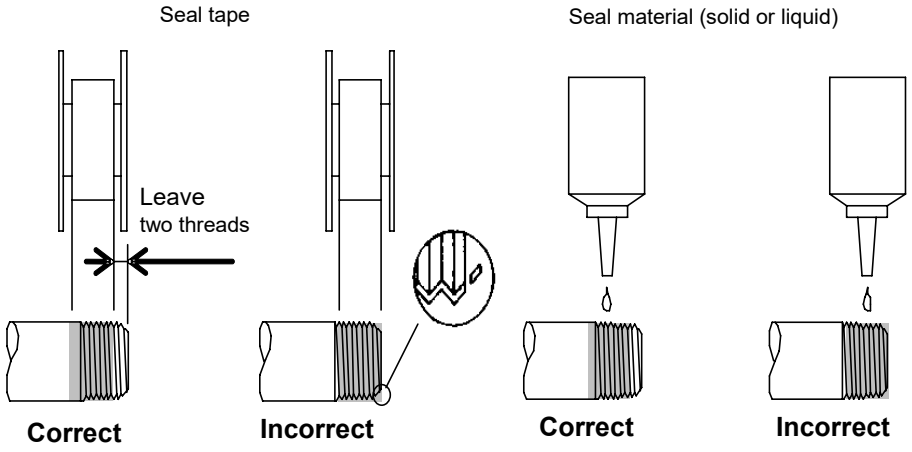
Before piping, blow air into the pipes to clean the interior and to remove cutting chips and foreign matters.



■ Seal material

Use a seal tape or a seal material to stop leakage from piping.
Apply a seal tape or seal material to the screw threads leaving two or more threads at the pipe end uncovered or uncoated. If the pipe end is fully covered or coated, a shred of seal tape or residue of seal material may enter inside of the pipes or device and cause a failure.

When using a seal tape, wind it around the screw threads in the direction opposite from the screw threads and press it down with your fingers to attach it firmly.
When using a liquid seal material, be careful not to apply it to resin parts. The resin parts can become damaged and this may lead to a failure or malfunction.
Also, do not apply seal material to the internal threads.



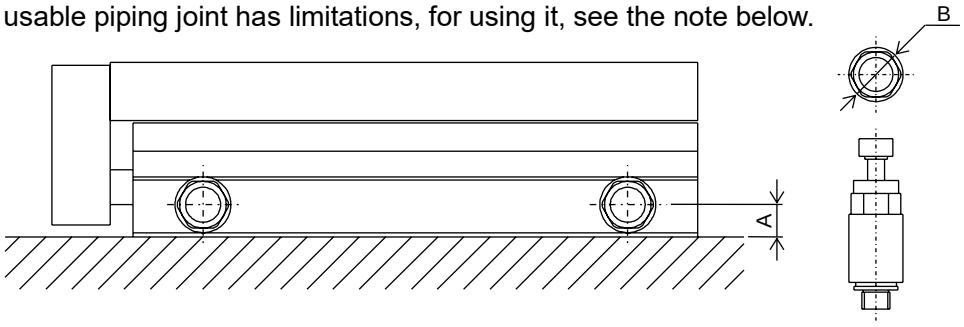
2.4.1 Piping port

■ Adhesive

Apply adhesive to the M3 and M5 plugs (hexagonsocket set screws) when changing the piping portposition. (Low strength adhesives such as LOCTITE222/221 or ThreeBond 1344 are recommended)

■ Piping joint

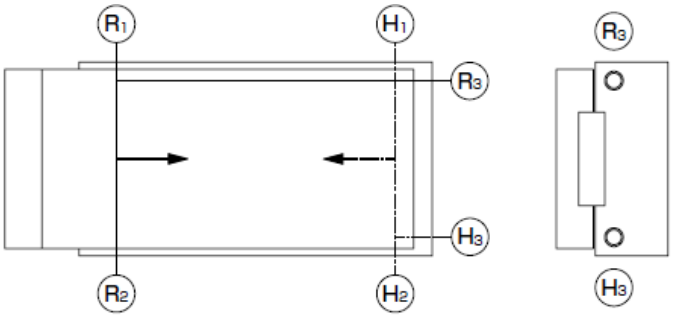
Because the usable piping joint has limitations, for using it, see the note below.



Bore size (mm)	Port size	Port dimension	Applicable joints	Joint OD
		A		φB
φ6	M3×0.5	4	SC3W−M3−3.2,4 SC3U−M3−3.2,4 GWS3,4-M3-S	φ8 or less
φ8	M5×0.8	5.5	SC3W−M5−4,6 GWS4-M5-S GWS4-M5	φ11 or less
φ12				
φ16		6.5	SC3W−M5−4,6 GWS4−M5−S GWS4,6−M5 GWL4,6−M5	φ13 or less
φ20	Rc1/8	8	SC3W−6−4,6,8 GWS4,6,8−6 GWL4,6−6	φ15 or less
φ25		9		

■ Piping port position and operating direction

R shows the rod side pressurizing port and H the head side pressurizing port. When the product is shipped from the factory, ports other than R_1 and H_1 (R_2 and H_2 depending on the stopper position when a stopper is attached) are sealed with plugs.



■ Rear piping

Rear piping (ports R_3 and H_3 in the figure above) is possible except in the case of φ6 and position locking.
Remove the plugs sealing ports R_3 and H_3 and seal ports R_1 and H_1 with the plugs shown in the table below.

Model	Plug
LCR-G-6-HP1	Port R_3 and H_3 do not exist.
LCR-G-8-HP1	M5 x 5 (hexagon socket head set screw)
LCR-G-12-HP1	
LCR-G-16-HP1	
LCR-G-20-HP1	R1/8 (hexagon socket head tapered screw plug)
LCR-G-25-HP1	Seal the R_1 and H_1 ports with the plugs removed from the R_3 , H_3 ports.

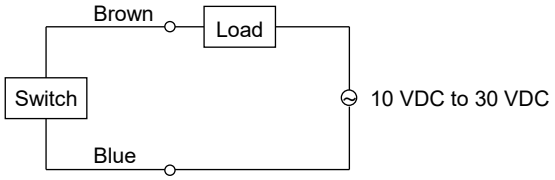
Prepare two separate plugs shown in the table above for φ8 to 20.
Option with plug (refer to page 1) or discrete plug model No. (refer to page 10) are also available.

2.5 Wiring

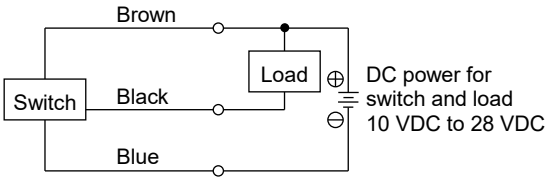
2.5.1 Proximity switch

■ Connection of lead wires

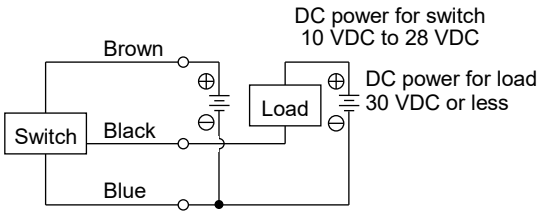
Turn off the power to the device in the electric circuit to which the switch is to be connected and connect the lead wires according to their color. Not turning off the power may cause damage to the electric circuit of the switch load.
If the switch is not wired correctly or the load is short-circuited, it may cause damage not only to the switch but also to the electric circuit on the load side.



Example of 2-wire basic circuit



Example of 3-wire basic circuit (1)
(When same power is used for switch and load)

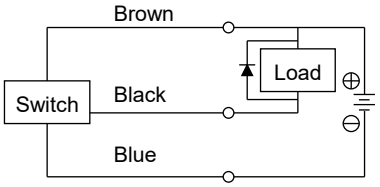


Example of 3-wire basic circuit (2)
(When separate power is used for switch and load)

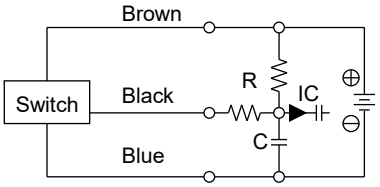
■ Protection of the output circuit

For the following cases, refer to the figures below and install a protection circuit:

- When an inductive load (relay or solenoid valve) is connected and used: See Ex. 1
  Use a surge absorption element since a surge voltage is generated when the switch is turned off.
- When a capacious load (capacitor) is connected and used: See Ex. 2
  Use a current regulating resistor since a starting current is generated when the switch is turned on.
- When the lead wire length exceeds 10 m: See Ex. 3 and 4 (2-wire type), Ex. 5 (3-wire type)

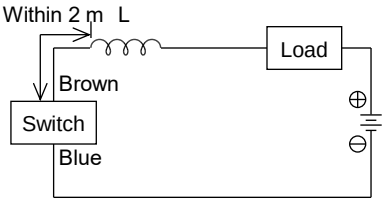


Ex. 1 Using inductive load with surge absorption element (diode). (For diode, use V06C manufactured by Hitachi or equivalent.)



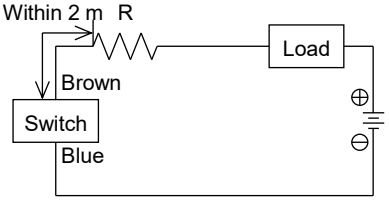
Ex. 2 Using capacious load with current regulating resistor R.
Use the following formula to figure out resistance R (Ω).

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



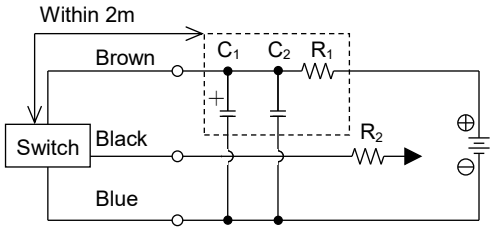
Ex. 3 - Choke coil
L = Several hundred μH to several mH
Excellent high frequency characteristic

- Wire near the switch (within 2 m).



Ex. 4 - Starting current restriction resistor
R = Highest possible resistance for the load circuit.

- Wire near the switch (within 2 m).



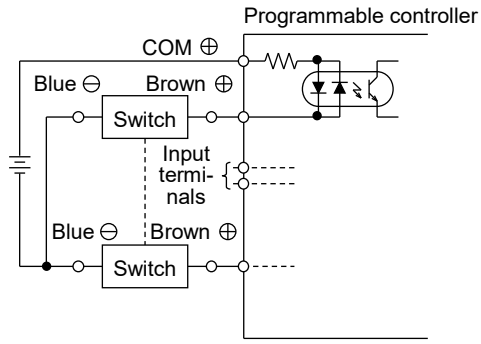
Ex. 5 - Power supply noise absorption circuit
C_1=20 μF to 50 μF electrolytic capacitor
(withstand voltage 50V or more)
C_2=0.01 μF to 0.1 μF ceramic capacitor
R_1=20 Ω to 30 Ω

- Starting current restriction resistor
R_2= Highest possible resistance for the load circuit.

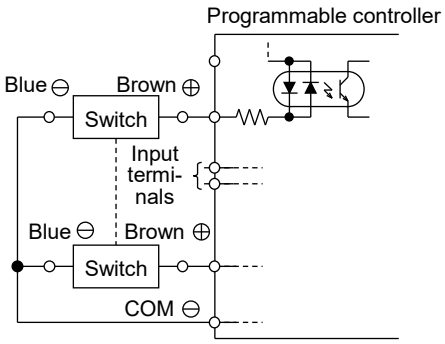
- Wire near the switch (within 2 m)

■ Connection to the programmable controller

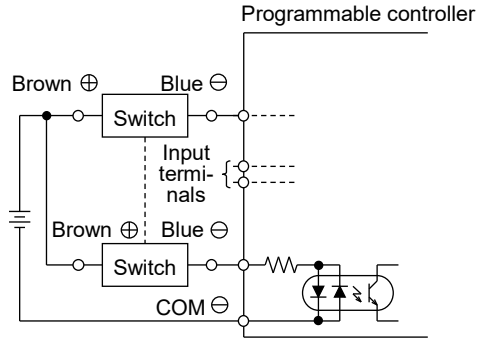
The connection method depends on the type of the programmable controller. Connect as shown below.



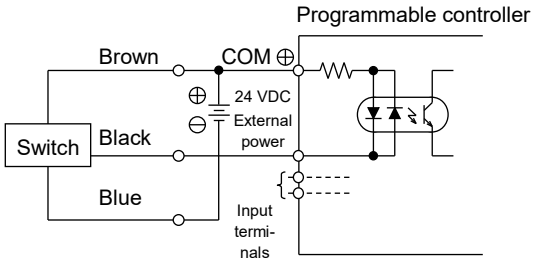
2-wire connection to source input
(external power)



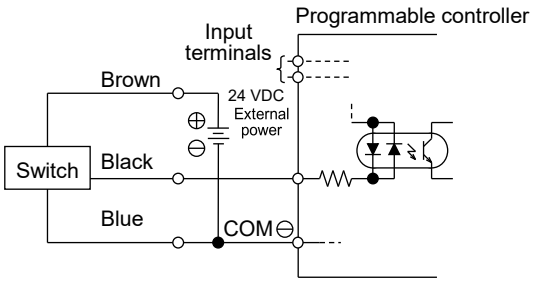
2-wire connection to source input
(internal power)



2-wire connection to sink input
(external power)



3-wire connection to source input
(external power)



3-wire connection to source input
(internal power)

■ Parallel connection

Since the leakage current of a 2-wire type switch increases according to the number of connected units, check the input specifications of the programmable controller, which is a connected load, to determine the number of switches to connect. For the 2-wire type switch, the indicator may become dim or not light up.

Although the leakage current of a 3-wire type switch increases according to the number of connected units, the leakage current is very small (10 μA or less) and can generally be ignored. For the 3-wire type switch, the indicator will light up without dimming.

2.5.2 Reed switch

■ Connection of lead wires

Do not connect the lead wire of the switch to the power directly. Make sure that the lead wire and the load are connected in serial.
For T0 switches, observe the following instructions as well:

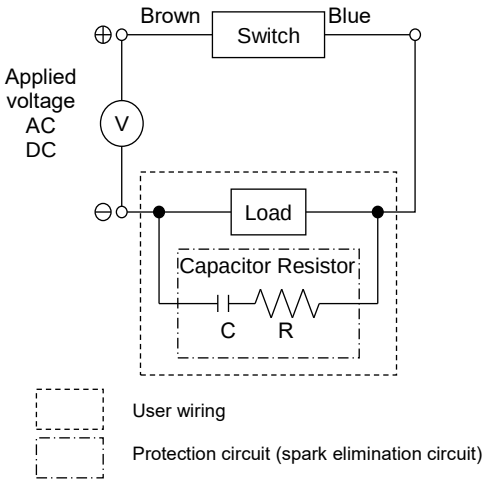
- When the switch is used with DC power, connect the brown wire to the positive side and the blue wire to the negative side. If the polarity of the connection of wires is reversed, the switch will turn on but the indicator will not light up.
- When the switch is connected to the input of a relay or a programmable controller for AC power and the half-wave rectification is performed in those circuits, the indicator on the switch may not light up. In that case, reversing the polarity of the connection of the lead wires of the switch will light up the indicator.

■ Contact protection measures

When the switch is used with an inductive load such as a relay or when the wiring length exceeds the value shown in the table to the right, install a contact protection circuit.

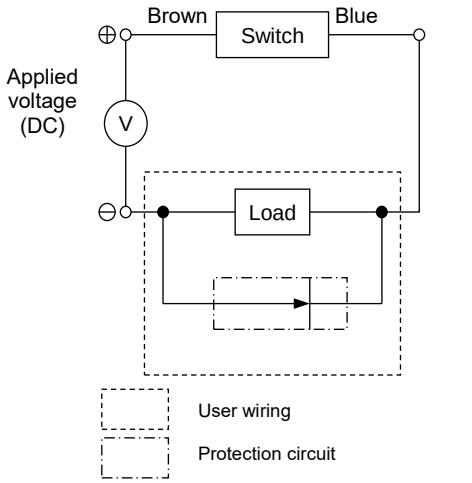
Power	Wiring length
DC	100 m
AC	10 m

<Protection when connecting an inductive load>



Recommended value
C (Capacitor) 0.033 μF to 0.1 μF
R (Resistor)1 kΩ to 3 kΩ
XEB1K1 manufactured by Okaya Electric Industries or equivalent

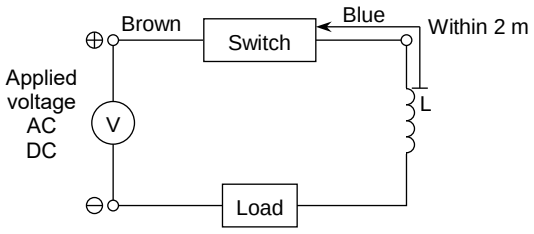
When capacitor and resistor are used



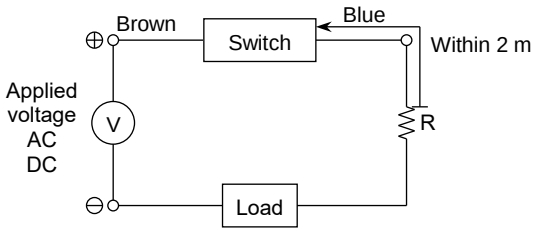
Rectifying diode for general use
V06C manufactured by Hitachi or equivalent

When diode is used

<Protection when the wiring length exceeds the value shown in the table above>



- Choke coil
  L = Several hundred μH to several mH
  Excellent high frequency characteristic
- Wire near the switch (within 2 m).



- Starting current restriction resistor
  R = Highest possible resistance for the load circuit
- Wire near the switch (within 2 m).

■ Contact capacity

Do not use a load that exceeds the maximum contact capacity of the switch. If the current falls below the rated current value, the indicator may not light up.

■ Relay

Use one of the following or equivalent relays:
- Omron Corporation ·····MY type
- Fuji Electric Co., Ltd. ·····HH5 type
- Panasonic Corporation ·····HC type

■ Serial connection

The voltage drop of multiple T0 switches connected in serial is the sum of the voltage drop of all switches.
The indicator will light up only when all the switches turn on.

■ Parallel connection

There is no limitation on the number of units that can be connected in parallel. However, the indicator may become dim or not light up for T0 switches.

3. USAGE

3.1 Using the Cylinder

■ Working pressure range

Use the cylinder within the following pressure range:

Model	Pressure range
LCR-G-HP1	0.15 to 0.7 Note 1

Note 1 : 0.2Mpa when using φ6 shock absorber stopper.

■ How to adjust the cushion

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.

Bore size(mm)	φ6	φ8	φ12	φ16	φ20	φ25
Allowable energy absorption (J)	0.025	0.058	0.112	0.176	0.314	0.314

■ Adjustment of the piston speed

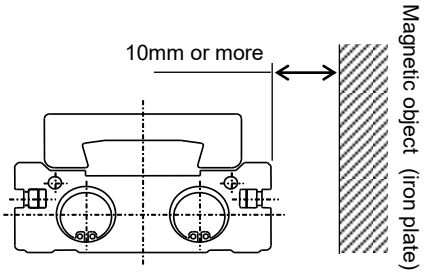
Mount a speed controller to adjust the piston speed.

3.2 Using the Switch

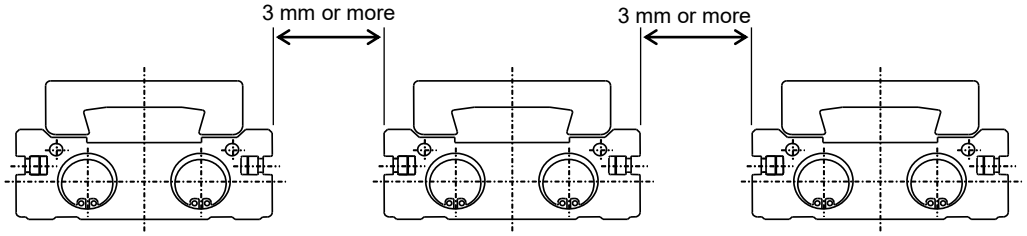
■ Magnetic environment

Do not use the switch in a place where there is a strong magnetic field or large current (such as a large magnet or welding machine). If switch mounted cylinders are installed close to each other and in parallel or if magnetic substances are moving close to the cylinder, the magnetic forces may interfere with each other and affect the detection accuracy.

The cylinder switch may malfunction if there is a magnetic object such as a steel plate installed nearby. Make sure that there is a distance of at least 10 mm between the magnetic object and the surface of the cylinder.



The cylinder switch may malfunction if the cylinder units are placed adjacently. Make sure to provide the following distance between each unit.



■ Wiring of lead wires

When wiring, be careful not to apply bending stress and tension repeatedly to lead wires.
For movable sections, use wiring material with the same level of bending resistance as the robot wire.

■ Ambient temperature

Do not use the switch in a high temperature environment (60°C or more).
Using the switch in a high temperature environment may affect its performance due to the temperature characteristics of magnetic parts and electronic parts.

■ Intermediate position detection

When the switch is operated at an intermediate position in the length of the stroke, the relay will not respond if the piston speed is too high.
If the operation time of the relay is 20 ms, keep the piston speed at 500 mm/s or less.

■ Shock

Do not subject the product to strong vibrations and shocks when transporting the cylinder and mounting and adjusting the switch.

4. MAINTENANCE AND INSPECTION

⚠ WARNING

Do not touch electrical wiring connections (bare live parts) of actuators equipped with switches, and other such actuators.

Do not touch live parts with bare hands.

An electric shock may occur.

Turn off the power, release the residual pressure and make sure that there is no residual pressure before disassembling or inspecting the actuator.

⚠ CAUTION

Plan and perform daily and periodic inspections so that maintenance can be managed properly.

If maintenance is not properly managed, the product's functions may deteriorate significantly and this may lead to faults (such as short service life, damage, and malfunction) or accidents.

4.1 Periodic Inspection

In order to use the product under optimum conditions, perform a periodic inspection once or twice a year.

4.1.1 Inspection item

- Actuation state
- Change in the piston speed and cycle time
- External and internal leakages
- Damage and deformation of the piston rod
- Stroke abnormality

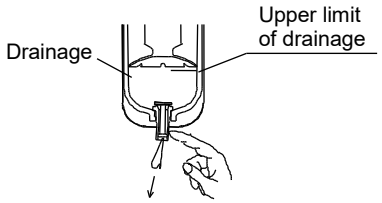
Check the items above and refer to "5. TROUBLESHOOTING" to correct any abnormality found. If there are loose threaded connections, tighten them.

4.1.2 Maintenance of the product

This cylinder does not require lubrication.

4.1.3 Maintenance of the circuit

- Discharge the drainage accumulated in the air filter periodically before it exceeds the specified line.
- Since foreign matters such as carbide (carbon or tar substance) from the compressor oil may contaminate the circuit and cause an operation fault of the solenoid valve or the cylinder, be careful when performing maintenance or inspection of the compressor.



4.2 Disassembly method,Assembly method

If any failure occurs such as air leakage, disassemble the product, referring to the internal structural diagram, and exchange the parts in the consumable parts list.

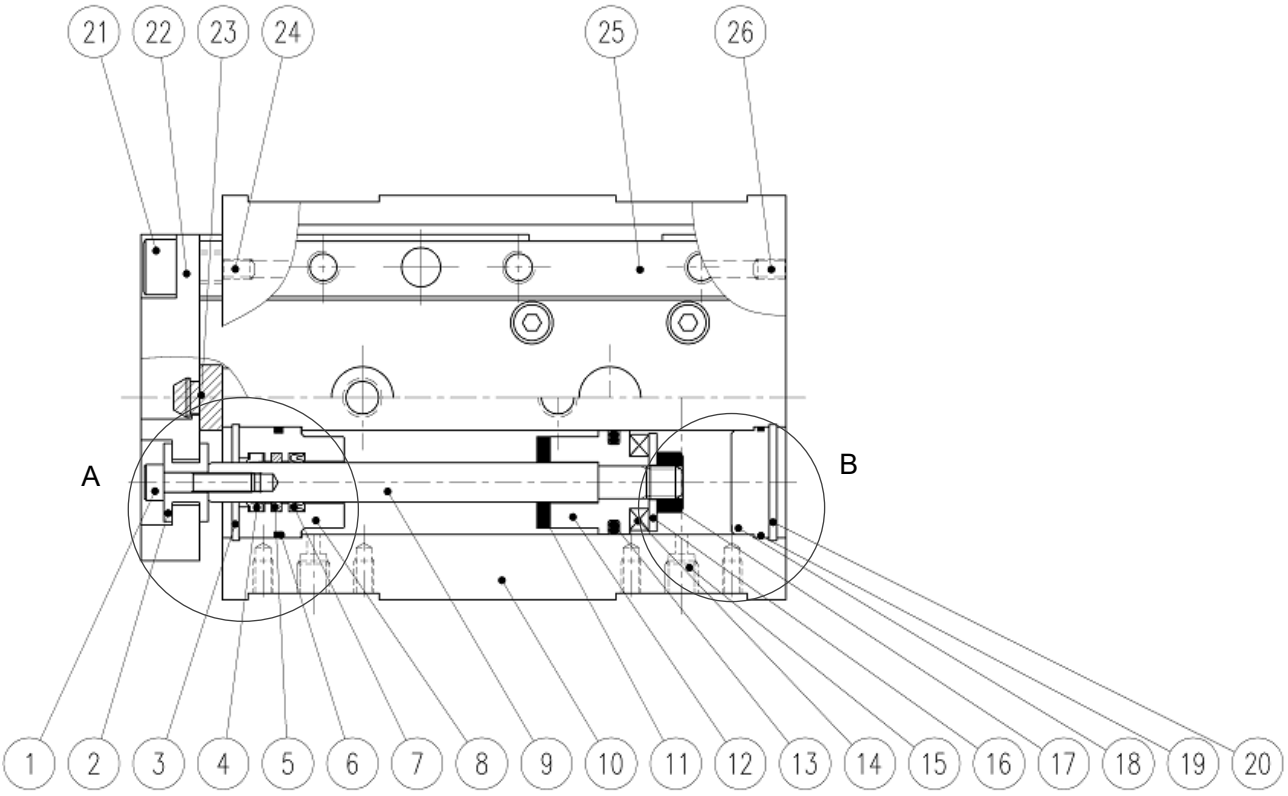
4.2.1 Disassembly method

Disassemble the product with the cylinder pulled. Remove bolt (1). (In the case of φ6 orφ8, remove floating bush (2).) Remove floating bush (2) . In this condition, fix slide table to the main body using adhesive tape. (The linear guide does not have the stopper. If the slide table is not fixed, the guide might be dropped.) After removing hexagon socket set screw (21), remove type-C set ring (3) and pull piston rod (9) together with rod metal (8).

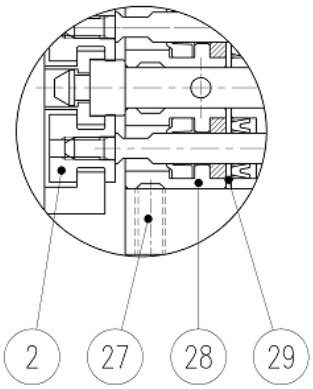
4.2.2 Assembly method

Assemble in the reverse order of "4.2.1 Disassembly method".
Do not forget to supply grease to the packing.

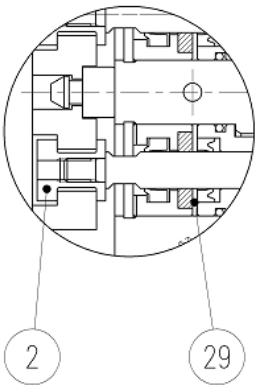
4.2.3 Internal structural diagram



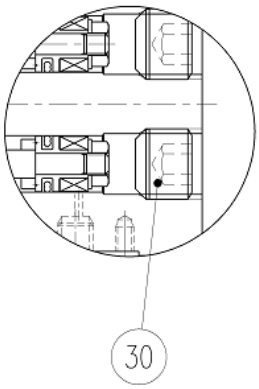
Section A φ6



Section A φ8



Section B φ6,8



Parts list

No.	Part name	Material	Remarks
1	Hexagon socket head cap screw	Alloy steel	Zinc chromate
2	Floating bush	Stainless steel	
3	C type snap ring	Steel	φ8 to 25 only
4	Scraper	NBR	
5	Lub Keeper	Special rubber	
6	Metal gasket	NBR	
7	Rod packing	NBR	
8	Rod metal	Aluminum alloy	Alumite
9	Piston rod	Stainless steel	
10	Cylinder body	Aluminum alloy	Hard alumite
11	Cushion rubber (R)	Urethane rubber	
12	Piston	Aluminum alloy	Chromate
13	Piston packing	NBR	
14	Magnet	Plastic	
15	Plug	Stainless steel	φ6 to 16
		Steel	φ20 to 25
16	Plain washer	Stainless steel	
17	Hexagon nut	Stainless steel	
18	Cover	Aluminum alloy	Chromate
19	Cover gasket	NBR	
20	C type snap ring	Steel	φ12 to 25 only
21	Hexagon socket head cap screw	Alloy steel	Zinc chromate
22	End plate	Aluminum alloy	Alumite
23	Cushion rubber (H)	Urethane rubber	
24	Hexagon socket set screw	Stainless steel	
25	Table	Aluminum alloy	Alumite
26	Plug	Stainless steel	φ6 to 20
		Steel	φ25
27	Hexagon socket set screw	Stainless steel	φ6 only
28	Rod metal A	Aluminum alloy	
29	Cap	Stainless steel	
30	Hexagon socket set screw	Alloy steel	Zinc chromate

Consumable parts list

Bore size (mm)	Kit no.	Remarks
φ6	LCR-G-6K-HP1	Part no. 4,5,6,7,11,13,19,23
φ8	LCR-G-8K-HP1	
φ12	LCR-G-12K-HP1	
φ16	LCR-G-16K-HP1	
φ20	LCR-G-20K-HP1	
φ25	LCR-G-25K-HP1	

5. TROUBLESHOOTING

5.1 Problems, Causes, and Solutions

If the product does not operate properly, check the table below for a possible solution.

5.1.1 Cylinder

Problem	Cause	Solution
Finger does not operate.	No pressure or insufficient pressure is applied.	Secure sufficient pressure.
	No signal is input to directional control valve.	Repair the control circuit.
	Centers were not aligned when mounted.	Correct the way the cylinder is mounted. Change the mounting style.
	Piston packing is damaged.	Replace the packing.
Finger does not operate smoothly.	Speed is lower than minimum working piston speed.	Mitigate load fluctuation.
	Centers were not aligned when mounted.	Correct the way the cylinder is mounted. Change the mounting style.
	Lateral load is applied.	Install a guide. Correct the way the cylinder is mounted. Change the mounting style.
	Load is too large.	Increase the pressure. Enlarge the bore size.
	Speed control valve has meter-in circuit.	Change the mounting direction of the speed control valve.
Finger is damaged or deformed.	Force of shock due to high-speed actuation is excessive.	Decrease the speed. Lighten the load. Install a more effective cushion mechanism (external cushion mechanism).
	Lateral load is applied.	Install a guide. Correct the way the cylinder is mounted. Change the mounting style.

5.1.2 Switch

Problem	Cause	Solution
Switch turns on but indicator does not blink.	Contact is welded.	Replace the switch.
	Rating of load is exceeded.	Replace the relay with one recommended by CKD or replace the switch.
	Indicator is damaged.	Replace the switch.
	External signal is faulty.	Check the external circuit.
Switch does not turn on.	Cables are disconnected.	Replace the switch.
	External signal is faulty.	Check the external circuit.
	Voltage is wrong.	Use specified voltage.
	Switch is not mounted in right place.	Mount the switch in right place.
	Switch is not positioned correctly.	Position and tighten the switch correctly.
	Switch is facing opposite direction.	Mount the switch so that it faces the correct direction.
	Load (relay) cannot respond for intermediate position detection.	Lower the speed. Replace the relay with one recommended by CKD.
	Rating of load is exceeded.	Replace the relay with one recommended by CKD or replace the switch.
Switch does not turn off.	Piston is not moving.	Move the piston.
	Contact is welded.	Replace the switch.
	Rating of relay is exceeded.	Replace the relay with one recommended by CKD or replace the switch.
	Ambient temperature is too high or too low.	Use the switch at an ambient temperature of −10°C to 60°C.
	Magnetic field is nearby.	Install a magnetic shield.
	External signal is faulty.	Check the external circuit.

If you have any other questions or concerns, contact your nearest CKD sales office or distributor.

6. WARRANTY PROVISIONS

6.1 Warranty Conditions

■ Warranty coverage

If the product specified herein fails for reasons attributable to CKD within the warranty period specified below, CKD will promptly provide a replacement for the faulty product or a part thereof or repair the faulty product at one of CKD's facilities free of charge.
However, following failures are excluded from this warranty:

- Failure caused by handling or use of the product under conditions and in environments not conforming to those stated in the catalog, the Specifications, or this Instruction Manual.
- Failure caused by incorrect use such as careless handling or improper management.
- Failure not caused by the product.
- Failure caused by use not intended for the product.
- Failure caused by modifications/alterations or repairs not carried out by CKD.
- Failure that could have been avoided if the customer's machinery or device, into which the product is incorporated, had functions and structures generally provided in the industry.
- Failure caused by reasons unforeseen at the level of technology available at the time of delivery.
- Failure caused by acts of nature and disasters beyond control of CKD.

The warranty stated herein covers only the delivered product itself. Any loss or damage induced by failure of the delivered product is excluded from this warranty.

■ Confirmation of product compatibility

It is the responsibility of the customer to confirm compatibility of the product with any system, machinery, or device used by the customer.

■ Others

The terms and conditions of this warranty stipulate basic matters.
When the terms and conditions of the warranty described in individual specification drawings or the Specifications are different from those of this warranty, the specification drawings or the Specifications shall have a higher priority.

6.2 Warranty Period

The product is warranted for one (1) year from the date of delivery to the location specified by the customer.