CKD

Rotary Clamp Cylinder

(Single Guide)

RCS2 Series (ϕ12～ϕ63)

INSTRUCTION MANUAL

SM-T000001-A

- 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 **"RCS2 Series" Rotary Clamp 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, 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:

JIS B 8370 (the latest edition)

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 may 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.

Some statements classified as "CAUTION" may still lead to serious results depending on the situation. All statements that follow these labels are 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.

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1. PRODUCT OVERVIEW

1.1 Model Number Indication

1.1.1 Product model number

■ **Example of model number indication**

<Standard type>

RCS2 – 00 – 16 ○ – 17.5 – R – T0H – D – H ○

<Packing material fluoro rubber type>

RCS2-T2 – FA – 20 ○ – 19.5 – R – F2V – D – ○ A

<Anti-spatter adherence prevention type>

RCS2-G4 – 00 – 50 G – 49 – L – T2YD – D – H ○

(A) (B) (C) (D) (E) (F) (G) (H) (I) (J)

(A)Model No.	
RCS2	Standard type
RCS2-T2	Packing material fluoro rubber
RCS2-G4	Anti-spatter adherence (φ32 or more) Note 1

(B)Mounting	
00	Basic
FA	Rod side flange
FB	Head side flange

(C) Bore size	
12	φ12
16	φ16
20	φ20
25	φ25
32	φ32
40	φ40
50	φ50
63	φ63

(D)Port thread	
Blank	Rc thread (M5 for φ25 and less)
N	NPT thread (φ32 and over)
G	G thread (φ32 and over)

(E)Stroke (mm)	
φ12、16	17.5、27.5、37.5
φ20、25	19.5、29.5、39.5
φ32、40	25、35、45、65
φ50、63	29、39、49、69

(F)Rotation direction	
R	Rotated 90° in CW direction when pulled
L	Rotated 90° in CCW direction when pulled

(G)Switch model No.
Described on page 2

(H)Switch quantity	
R	1 on rod side
H	1 on head side
D	With both sides

(I)Option	
Blank	No option
H	Spigot at head side Note2

(J)Accessory (attached at shipment)	
Blank	No accessories
A	Clamp lever

Note 1: RCS2 - G4 (sputter adhesion prevention type) improves durability in sputter scattering atmosphere compared with other model number, but if it is used in other atmosphere, durability may be inferior Please be careful when selecting.

Note 2 : For (B) Mounting type "FA" or "FB" ,(I) Option "H" cannot be selected.

(G)Switch model No.															
Lead wire Straight	Lead wire L-shaped	Contact	Voltage		Display	Lead wire	Bore size							
			AC	DC			12	16	20	25	32	40	50	63
T0H※	T0V※	Reed	●	●	1-color display	2-wire	●	●	●	●	●	●	●	●
T5H※	T5V※		●	●	Without indicator lamp		●	●	●	●	●	●	●	●
T8H※	T8V※		●	●	1-color display				●	●	●	●	●	●
T1H※	T1V※	Proximity	●		1-color display	2-wire			●	●	●	●	●	●
T2H※	T2V※			●			●	●	●	●	●	●	●	●
T3H※	T3V※			●		3-wire	●	●	●	●	●	●	●	●
T3PH※	T3PV※			●	1-color display (PNP output)(custom order)		●	●	●	●	●	●	●	●
T2WH※	T2WV※			●	2-color display	2-wire	●	●	●	●	●	●	●	●
T2YH※	T2YV※			●					●	●	●	●	●	●
T3WH※	T3WV※			●		3-wire	●	●	●	●	●	●	●	●
T3YH※	T3YV※			●					●	●	●	●	●	●
T2YD※	-			●	2-color display AC magnetic field	2-wire			●	●	●	●	●	●
T2YDT※	-			●					●	●	●	●	●	●
T2JH※	T2JV※			●	1-color display off-delay	2-wire			●	●	●	●	●	●
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)(custom order)	3-wire			●	●				
F2YH※	F2YV※			●	2-color display	2-wire			●	●				
F3YH※	F3YV※			●		3-wire			●	●				

※Indicates the lead wire length. No symbol: 1 m, 3: 3 m, 5: 5 m.

1.1.2 Part model number

■ **Discrete switch model number**

SW – T0H3

Switch model no.
(Item (G) above item)

■ **Flange kit model number**

RCS2 – FA – 12

Bore size.
(Item (C) on the previous page)

■ **Clamp lever kit model number**

RCS2 – A – 12

Code	Applicable bore size
12	φ12
16	φ16
20	φ20、25
32	φ32、40
50	φ50、63

1.2 Specifications

1.2.1 Product Specification

■ RCS2 (Standard type)

Descriptions		RCS2							
Bore size	mm	φ12	φ16	φ20	φ25	φ32	φ40	φ50	φ63
Actuation		Double acting							
Working fluid		Compressed air							
Max. working pressure	MPa	1.0							0.6
Min. working pressure	MPa	0.1 (Note 1)							
Proof pressure	MPa	1.6							
Ambient temperature	℃	-10～60 (no freezing)							
Port size		M5				Rc1/8 NPT1/8 G1/8		Rc1/4 NPT1/4 G1/4	
Stroke tolerance	mm	+1.0 0		+1.2 0					
Working piston speed	mm/s	50～200							
Cushion		Rod side : rubber cushioned, Head side : no cushioning							
Lubrication		Not required(use turbine oil type 1 ISO VG32 if necessary)							
Rotating angle		90°±10°							
Rotation direction		Right/Left							
Non-rotating accuracy (clamping, default value)		±1.4°		±1.2°		±0.9°		±0.7°	
Pressurized area mm^2	Pull side	84	150	201	377	804	1256	1963	3117
	Push side	113	201	314	490	603	1056	1649	2803

*1 : With constant pressurization

■ RCS2-T2 (Packing material fluoro rubber)

Descriptions		RCS2-T2							
Bore size	mm	φ12	φ16	φ20	φ25	φ32	φ40	φ50	φ63
Actuation		Double acting							
Working fluid		Compressed air							
Max. working pressure	MPa	1.0							0.6
Min. working pressure	MPa	0.1 (Note 1)							
Proof pressure	MPa	1.6							
Ambient temperature	℃	5～60							
Port size		M5				Rc1/8 NPT1/8 G1/8		Rc1/4 NPT1/4 G1/4	
Stoke tolerance	mm	+1.0 0		+1.2 0					
Working piston speed	mm/s	50～200							
Cushion		Rod side : rubber cushioned, Head side : no cushioning							
Lubrication		Not required(use turbine oil type 1 ISO VG32 if necessary)							
Rotating angle		90°±10°							
Rotation direction		Right/Left							
Non-rotating accuracy (clamping, default value)		±1.4°		±1.2°		±0.9°		±0.7°	
Pressurized area mm^2	Pull side	84	150	201	377	804	1256	1963	3117
	Push side	113	201	314	490	603	1056	1649	2803

Note 1 : With constant pressurization

■ RCS2-G4 (Anti-spatter adherence)

Descriptions			RCS2-G4			
Bore size		mm	φ32	φ40	φ50	φ63
Actuation			Double acting			
Working fluid			Compressed air			
Max. working pressure		MPa	1.0			0.6
Min. working pressure		MPa	0.1 (Note 1)			
Proof pressure		MPa	1.6			
Ambient temperature		℃	-10～60 (no freezing)			
Port size			Rc1/8 NPT1/8 G1/8		Rc1/4 NPT1/4 G1/4	
Stoke tolerance		mm	+1.2 0			
Working piston speed		mm/s	50～200			
Cushion			Rod side : rubber cushioned, Head side : no cushioning			
Lubrication			Not required(use turbine oil type 1 ISO VG32 if necessary)			
Rotating angle			90° ±10°			
Rotation direction			Right/Left			
Non-rotating accuracy (clamping, default value)			±0.9°		±0.7°	
Pressurized area	Pull side	mm^2	804	1256	1963	3117
	Push side		603	1056	1649	2803

Note1 : With constant pressurization

1.2.2 Switch specifications

■ Reed 2-wire (T switch)

Descriptions	Reed 2-wire						
	T0H/T0V		T5H/T5V		T8H/T8V		
Applications	For programmable controller, relay		For programmable controller, relay, IC circuit (without indicator), serial connection		For programmable controller, relay		
Load voltage	12/24 VDC	110 VAC	5/12/24 VDC	100/110 VAC	12/24 VDC	110 VAC	220 VAC
Load current	5 to 50 mA	7 to 20 mA	50 mA or less	20 mA or less	5 to 50 mA	7 to 20 mA	7 to 10 mA
Internal voltage drop	3 V or less		0.1 V or less (Note 1)		3 V or less		
Indicator lamp	Red LED (Lit when ON)		Without indicator lamp		Red LED (Lit when ON)		
Leakage current	0 mA						
Lead wire length	1m、3m、5m (Oil-resistant vinyl cabtyre cable 2-conductor, 0.3 mm^2)				1m、3m、5m (Oil-resistant vinyl cabtyre cable 2-conductor, 0.3 mm^2)		
Shock resistance	294 m/s^2						
Insulation resistance	20 MΩ and over with 500 VDC megger				100 MΩ and over with 500 VDC megger		
Withstand voltage	No failure after 1 minute of 1,000 VAC applications.				No failure after 1 minute of 1,500 VAC applications.		
Ambient temperature	-10(14°F) to +60°C(140°F)						
Degree of protection	IEC standard IP 67, JIS C 0920 (water-tight), oil-resistant						
Contact protection circuit (Note 2)	None				Yes		

Note1: Internal resistance 0.5Ω or less.
Note2: Refer to Intro Page 14 for contact protective measures.

■ Proximity 2-wire (T switch)

Descriptions	Proximity 2-wire				
	T1H/T1V	T2H/T2V	T2JH/T2JV (Off-delay)	T2YH/T2YV (2-color display)	T2WH/T2WV (2-color display)
Applications	For programmable controller, relay solenoid valve	Dedicated for programmable controller			
Output method	85 to 265 VAC	10 to 30 VDC			24 VDC ±10%
Power supply voltage	5 to 100 mA	5 to 20 mA (Note 1)			
Internal voltage drop	10% or less of load voltage	4 V or less			
Indicator lamp	Red LED(Lit when ON)			Red/green LED(Lit when ON)	
Leakage current	1 mA or less with 100 VAC. 2 mA or less with 200 VAC.	1mAor less			
Lead wire length	1m、3m、5m (Oil-resistant vinyl cabtyre cable 2-conductor, 0.3 mm^2)	1m、3m、5m (Oil-resistant vinyl cabtyre cable 2-conductor, 0.2 mm^2)	1m、3m、5m (Oil-resistant vinyl cabtyre cable 2-conductor, 0.3 mm^2)		1m、3m、5m (Oil-resistant vinyl cabtyre cable 2-conductor, 0.2 mm^2)
Shock resistance	980 m/s^2				
Insulation resistance	≧100 MΩ at 500 VDC(megger)	20 MΩ and over with 500 VDC(megger)	≧100 MΩ at 500 VDC(megger)		20 MΩ and over with 500 VDC(megger)
Withstand voltage	No failure after 1 minute of 1,500 VAC applications.	No failure after 1 minute of 1,000 VAC applications.			
Ambient temperature	-10(14°F) to +60°C(140°F)				
Degree of protection	IEC standard IP 67, JIS C 0920 (water-tight), oil-resistant				

Note 1: The above maximum load current is 20 mA at 25°C. The current is lower than 20 Ma if the operating ambient temperature around the switch is higher than 25°C (5 mA to 10 mA at 60°C).

■ Proximity 3-wire (T switch)

Descriptions	Proximity 3-wire			
	T3H/T3V	T3PH/T3PV (PNP output)	T3YH/T3YV (2-color display)	T3WH/T3WV (2-color display)
Applications	For programmable controller, relay			
Output method	NPN output	PNP output	NPN output	
Power supply voltage	10 to 28 VDC			
Load voltage	30 VDC or less			
Load current	100 mA or less		50 mA or less	
Current consumption	With 24 VDC 10 mA or less	With 24 VDC 12 mA or less	10 Ma or less with 24 VDC	
Internal voltage drop	0.5 V or less			
Indicator lamp	Red LED (Lit when ON)	Yellow LED (Lit when ON)	Red/green LED (Lit when ON)	
Leakage current	10 μA or less			
Lead wire length	1m、3m、5m (Oil-resistant vinyl cabtyre cable 3-conductor, 0.2 mm^2)		1m、3m、5m (Oil-resistant vinyl cabtyre cable 3-conductor, 0.3 mm^2)	1m、3m、5m (Oil-resistant vinyl cabtyre cable 3-conductor, 0.2 mm^2)
Shock resistance	980 m/s^2			
Insulation resistance	20 MΩ and over with 500 VDC(megger)		100 MΩ and over with 500 VDC(megger)	20 MΩ and over with 500 VDC(megger)
Withstand voltage	No failure after 1 minute of 1,000 VAC applications.			
Ambient temperature	-10(14°F) to +60°C(140°F)			
Degree of protection	IEC standard IP 67, JIS C 0920 (water-tight), oil-resistant			

■ Proximity 2-wire (For AC magnetic field)(T switch)

Descriptions	Proximity 2-wire	
	T2YD	T2YDT
Applications	Dedicated for programmable controller	
Indicator lamp	Red/green LED (Lit when ON)	
Load voltage	24 VDC ±10%	
Load current	5 to 20 mA	
Internal voltage drop	6 V or less	
Leakage current	1.0 mA or less	
Output delay time(Note1) (ON/OFF delay)	30 to 60 mS	
Lead wire length	1m、3m、5m (Oil-resistant vinyl cabtyre cable 2-conductor, 0.5 mm^2)	1m、3m、5m (flame resistance vinyl cabtire cord 2 conductor 0.5 mm^2) (option)
Insulation resistance	100 MΩ and over with 500 VDC(megger)	
Withstand voltage	No failure after 1 minute of 1,000 VAC applications.	
Shock resistance	980 m/s^2	
Ambient temperature	-10(14°F) to +60°C(140°F)	
Degree of protection	IEC standard IP 67, JIS C 0920 (water-tight), oil-resistant	

Note 1: Indicates the time from magnetic sensor detection of the piston magnet until switch output.
Note 2: As the switch for AC magnetic field (T2YD*) is for spot welding machine, it cannot be used with arc welding machine (DC).

■ (Proximity 2-wire) (F switch)

Descriptions	Proximity switch		
	F2H/F2V	F2S	F2YH/F2YV
Applications	Dedicated for programmable controller		
Load voltage	10 to 30 VDC		24 VDC ±10%
Load current	5 to 20 mA(Note1)		
Internal voltage drop	4 V or less		
Indicator lamp	Yellow LED (Lit when ON)	Yellow LED (Lit when ON)	Red/green LED (Lit when ON)
Leakage current	1 mA or less		
Lead wire length	1m、3m (Oil-resistant vinyl cabtyre cable 2-conductor, 0.15 mm^2)		
Shock resistance	980 m/s^2		
Insulation resistance	20 MΩ and over with 500 VDC(megger)		
Withstand voltage	No failure after 1 minute of 1,000 VAC applications.		
Ambient temperature	-10(14°F) to +60°C(140°F)		
Degree of protection	IEC standard IP 67, JIS C 0920 (water-tight), oil-resistant		

Note 1: The above maximum load current is 20 mA at 25°C. The current is lower than 20 Ma if the operating ambient temperature around the switch is higher than 25°C (5 mA to 10 mA at 60°C).

■ (Proximity 3-wire) (F switch)

Descriptions	Proximity switch			
	F3H/F3V	F3S	F3PH/F3PV	F3YH/F3YV
Applications	For programmable controller, relay			
Output method	NPN output	NPN output	PNP output	NPN output
Power supply voltage	10 to 28 VDC		4.5 to 28 VDC	10 to 28 VDC
Load voltage	30 VDC or less			
Load current	50 mA or less			
Current consumption	10 mA or less with 24 VDC			
Internal voltage drop	0.5 V or less		0.5 V or less 30 mA	0.5 V or less
Indicator lamp	Yellow LED (Lit when ON)	Yellow LED (Lit when ON)	Yellow LED (Lit when ON)	Red/green LED (Lit when ON)
Leakage current	10 μA or less			
Lead wire length	1m、3m (Oil-resistant vinyl cabtyre cable 3-conductor, 0.15 mm^2)			
Shock resistance	980 m/s^2			
Insulation resistance	20 MΩ and over with 500 VDC(megger)			
Withstand voltage	No failure after 1 minute of 1,000 VAC applications.			
Ambient temperature	-10(14°F) to +60°C(140°F)			
Degree of protection	IEC standard IP 67, JIS C 0920 (water-tight), oil-resistant			

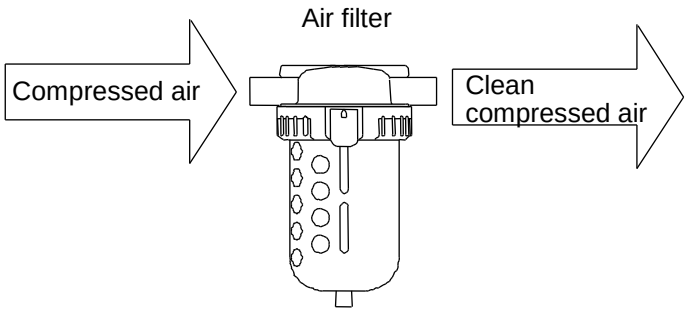
2. INSTALLATION

2.1 Environment

- Use the product within the following ambient temperature ranges:

RCS2	(standard type)	−10°C to 60°C (no freezing)
RCS2-T2	(low hydraulic type)	5°C to 50°C
RCS2-G4	(heat-resistant type)	5°C to 120°C

- 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, attach a sealing plug to the piping port to prevent foreign matters from entering the cylinder. Remove the sealing plug before piping.

2.3 Mounting

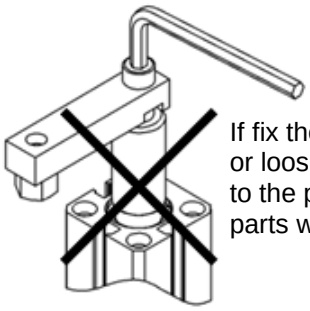
2.3.1 Cylinder installation

- This product, use mounting hokes of four through holes, screws and flange provided in the main body part, and install it vertically with bolts.

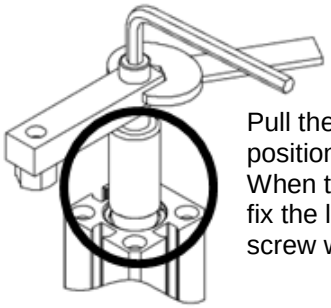
⚠CAUTION

Do not apply rotational torque to the piston rod when attaching or detaching the clamp lever.

If rotating torque is applied, internal parts may be deformed or damaged, resulting in malfunctioning.



If fix the body and tightening or loosening, torque is applied to the piston rod, and internal parts will be damaged



Pull the piston rod to the position where it rotates. When tightening or loosening, fix the lever by the vice or screw wrench.

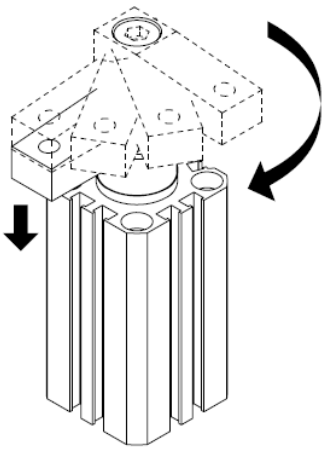
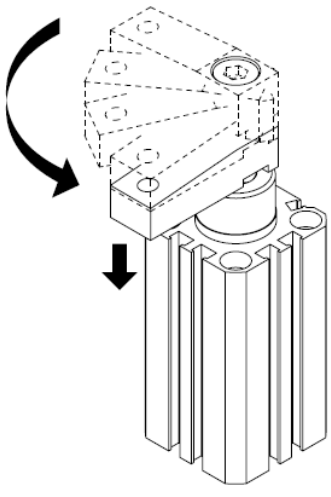
⚠WARNING

When rotating, make sure that the clamp lever attached to the tip of the piston rod does not interfere with external peripheral equipment.

This cylinder, the piston rod strokes while rotating 90 ° during operation.

If there is a danger that the rotating of the clamp lever may endanger the human body, implement safety measures such as installing a protective cover around the clamp lever.

(Rotation direction)

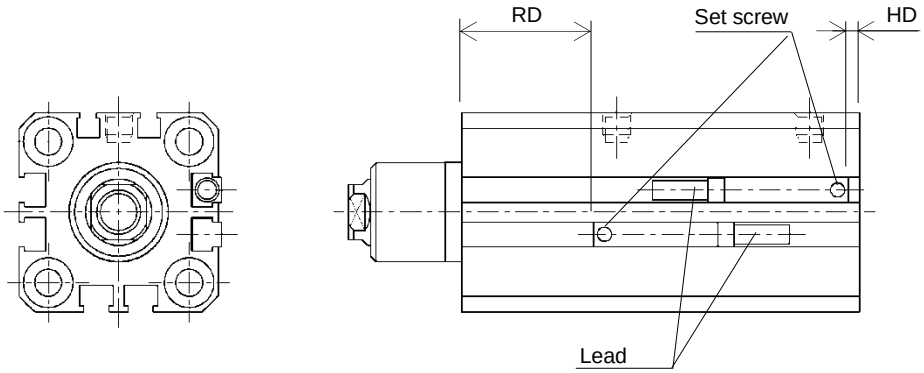
R	Rotated 90° in CW direction when pulled	L	Rotated 90° in CCW direction when pulled
			

2.3.2 Mounting the switch

■ Mounting position

<Mounting the switch at the end of the stroke>

In order to operate the switch at the maximum sensitivity position, install the switch at the position of RD dimension and HD dimension shown below. Also, please install the switch so that the lead wire is inside as shown below。



<How to move the switch>

Loosen the set screw of the switch, move the switch along the groove of the main body, and tighten the set screw at the specified position.

<When the stroke intermediate position is installed>

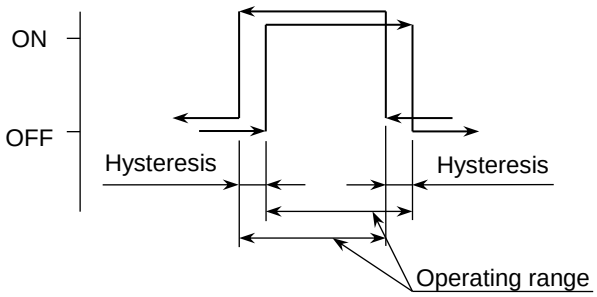
To detect the position in the middle of the stroke, move the switch back and forth on the piston with the piston fixed at the stop position and find the position where the switch is turned on first and the position where it is turned off. The middle of the two positions is the highest sensitivity position at that piston position.

<About the mounting surface of the switch>

There is no restriction on the mounting surface of this product. However, there are no switch grooves on the port surface for tube inner diameters φ 12 and 16. It is possible to install T type switch on 3 sides except port side. F type switches can be mounted on port surfaces with bore inner diameters φ 20 and 25. Please install it on the easy to use surface.

■ 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.

■ Operating range and hysteresis

The mounting position, operating range, hysteresis (Unit:mm)

Bore size (mm)	Proximity switch (T2,T3T3P)				Proximity switch (T2J)				Proximity switch (T2W,T3W)			
	RD	HD	Operating range (reference value)	Hysteretic	RD	HD	Operating range (reference value)	Hysteretic	RD	HD	Operating range (reference value)	Hysteretic
φ12	8.5	0.5	1.5～5.5	1.5 or less	-	-	-	-	10.5	2.5	3～6	1.0 or less
φ16	9	0.5	1.5～4.5		-	-	-	-	11	2.5	3～7	
φ20	23.5	10	3～8		22.5	9	3～8	1.5 or less	25.5	12	4.5～8	
φ25	24.5	9.5	3～9		23.5	8.5	3～9		26.5	11.5	4.5～8	
φ32	26.5	10.5	3～8		25.5	9.5	3～8		28.5	12.5	4.5～8	
φ40	23.5	7.5	3～9		22.5	6.5	3～9		25.5	9.5	5～8.5	
φ50	28.5	10	3～9		27.5	9	3～9		30.5	12	5.5～9.5	
φ63	27.5	14.5	3～9		26.5	13.5	3～9		29.5	16.5	5.5～9.5	

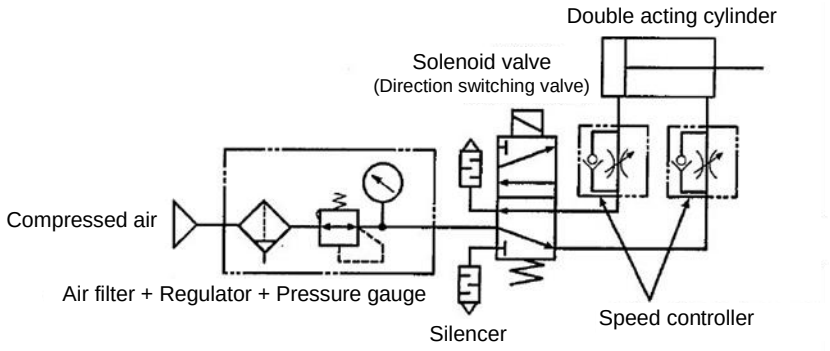
Bore size (mm)	Proximity switch (T2Y,T3Y,T1,T2YD,T2YDT)				Reed switch (T0,T5)				Reed switch (T8)			
	RD	HD	Operating range (reference value)	Hysteretic	RD	HD	Operating range (reference value)	Hysteretic	RD	HD	Operating range (reference value)	Hysteretic
φ12	-	-	-	-	8.5	0.5	5-8	3 or less	-	-	-	-
φ16	-	-	-	-	9	0.5	4-9		-	-	-	-
φ20	22.5	9	4.5～8	1.0 or less	23.5	10	6～14		17.5	4	6～14	3 or less
φ25	23.5	8.5	4.5～8		24.5	9.5	5～14		18.5	3.5	5～14	
φ32	25.5	9.5	4.5～8		26.5	10.5	5～12		20.5	4.5	5～12	
φ40	22.5	6.5	5～8.5		23.5	7.5	6～14		17.5	1.5	6～14	
φ50	27.5	9	5.5～9.5		28.5	10	6～14		22.5	4	6～14	
φ63	26.5	13.5	5.5～9.5		27.5	14.5	7～15		21.5	8.5	7～15	

Bore size (mm)	Proximity switch (F2S,F3S)				Proximity switch (F2,F3,F3P,F2Y,F3Y)			
	RD	HD	Operating range (reference value)	Hysteretic	RD	HD	Operating range (reference value)	Hysteretic
φ20	27	13.5	3～5	1.0 or less	28	14.5	3～5	1.0 or less
φ25	28	13	3～5		29	14	3～5	

2.4 Piping

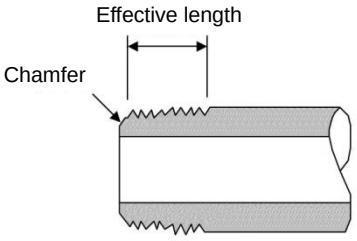
2.4.1 Basic circuit

In order to operate normally, follow the basic items below and make the circuit as shown below.

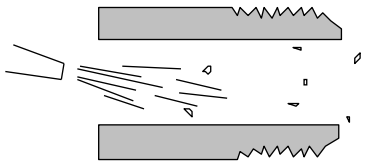


2.4.2 Piping

- 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.



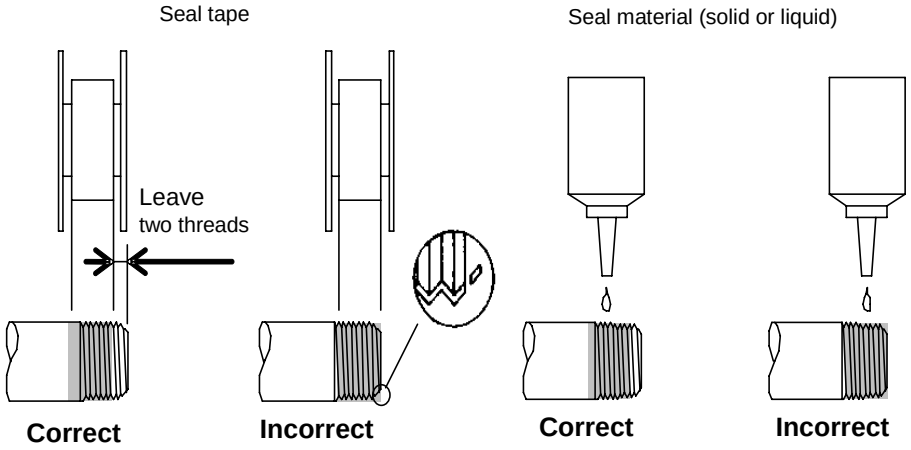
- Before connecting the pipes, flush (air blow) the interiors of the pipes to remove foreign matters and cutting chips.



- 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 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. It damages resin parts and causes a failure or malfunction. Also, do not apply it to internal threads.



2.5 Wiring

2.5.1 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 and T8, observe the following instructions as well:

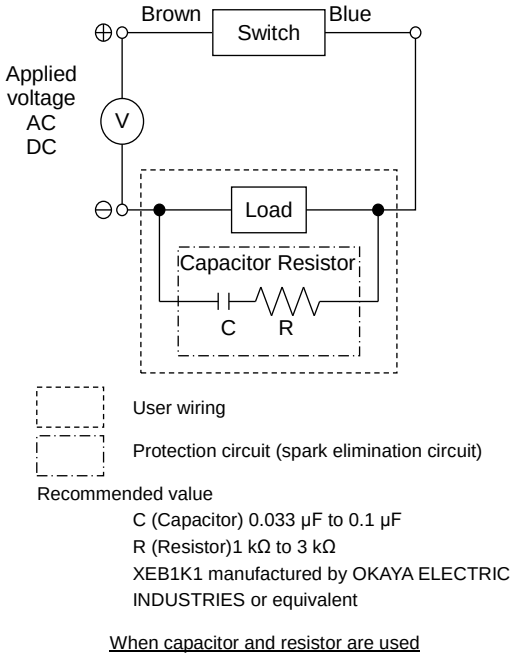
- When the switch is used with DC power, connect the brown wire to the positive side and the blue wire to the negative side. If the polarity of the connection of wires is reversed, the switch will turn on but the indicator will not light up.
- When the switch is connected to the input of a relay or a 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.

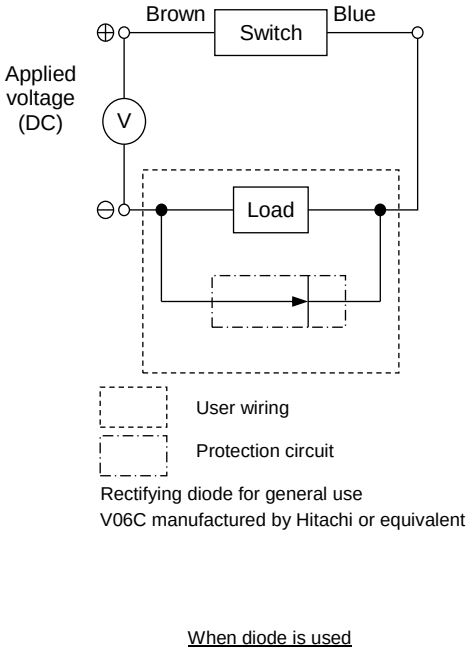
Power	Wiring length
DC	50 m
AC	10 m

<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

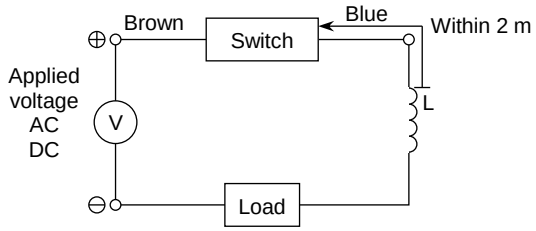
When capacitor and resistor are used



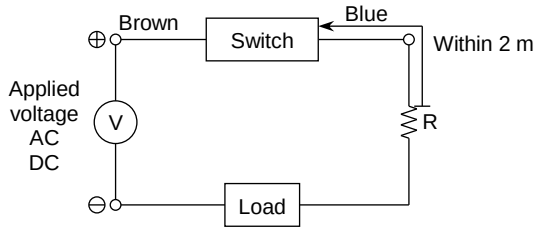
Rectifying diode for general use
V06C manufactured by Hitachi or equivalent

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 ····· MY type
- FUJI ELECTRIC ·· HH5 type
- Panasonic ····· HC type

■ Serial connection

The voltage drop of multiple T0 or T8 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.

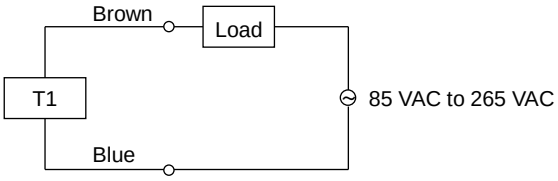
■ Parallel connection

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 and T8 switches.

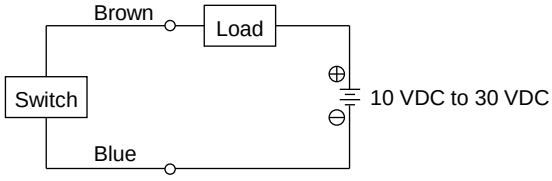
2.5.2 Proximity switch (T type)

■ Connection of lead wires

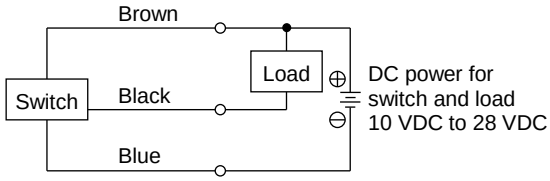
Turn off the power to the device in the electric circuit to which the switch is to be connected and connect the lead wires according to their color.
If the switch is not wired correctly or the load is short-circuited, it may cause damage not only to the switch but also to the electric circuit on the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



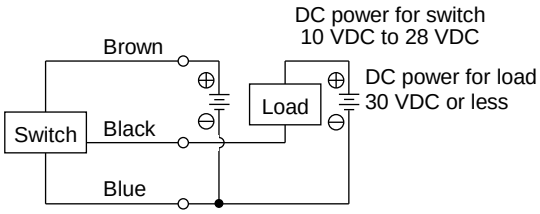
Example of T1 basic circuit



Example of 2-wire basic circuit



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

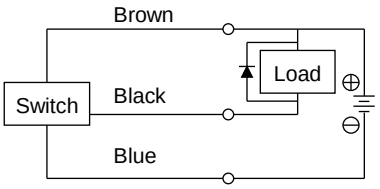


Example of 3-wire basic circuit (2)
(When separate power is used for switch and load)

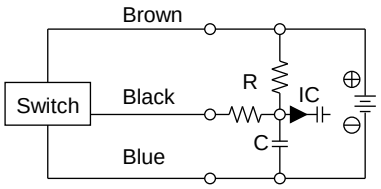
■ Protection of the output circuit

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)

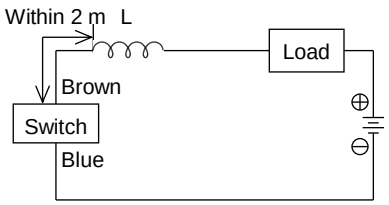


Ex. 1 Using inductive load with surge absorption element (diode). (For diode, use V06C manufactured by Hitachi or equivalent.)

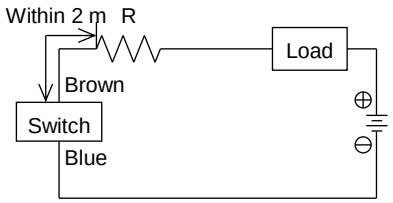


Ex. 2 Using capacious load with current regulating resistor R.
Use the following formula to figure out resistance R (Ω).

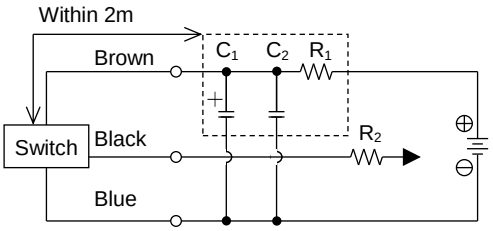
$$\frac{V}{0.05} = R\ (\Omega)$$



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).



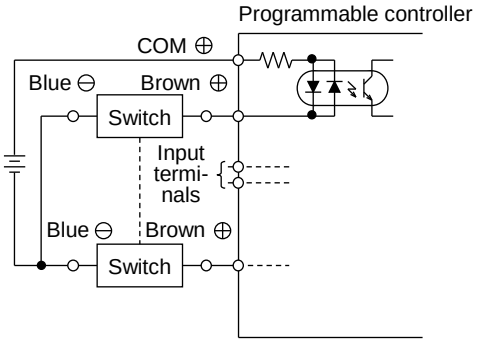
Ex. 5 - Power supply noise absorption circuit
C_1=20 µF to 50 µF electrolytic capacitor
(withstand voltage 50V or more)
C_2=0.01 µF to 0.1 µF ceramic capacitor
R_1=20 Ω to 30 Ω

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

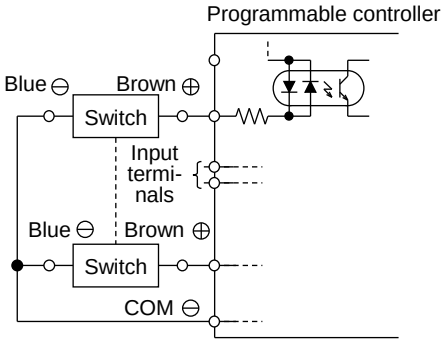
- Wire near the switch (within 2 m)

■ Connection to the programmable controller

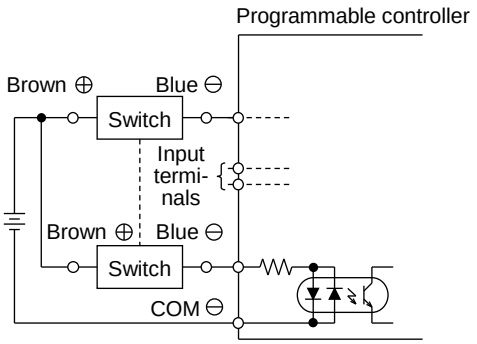
The connection method depends on the type of the programmable controller. Connect as shown below.



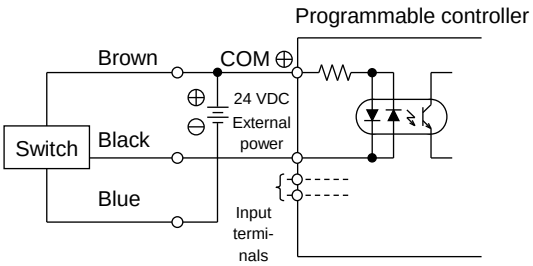
2-wire connection to source input (external power)



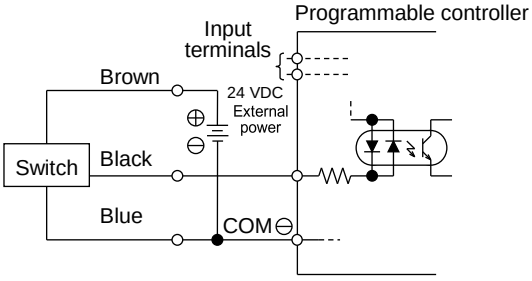
2-wire connection to source input (internal power)



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.

■ Switch for alternating magnetic field (T2YD)

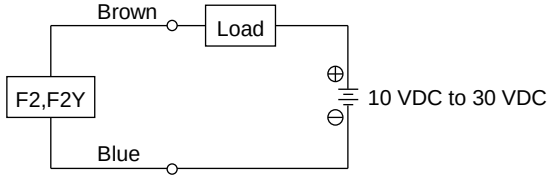
When using the switch with a welding current exceeding 14000 A of alternating current, keep the welding cable at least 35 mm away from the surface of the cylinder tube. (Test condition: Outside diameter of cable is ø36)

Alternating magnetic field resistance (when the welding current is 14000 A of alternating current)
The switch for alternating magnetic field (T2YD) can be used if only one welding cable is in contact with the cylinder or the switch. The welding cable must not be in contact with the cylinder or the switch if using two or more welding cables or in a cable loop.

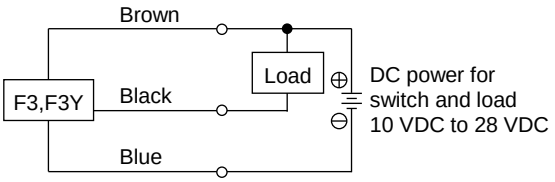
2.5.3 Proximity switch (F type)

■ Connection of lead wires

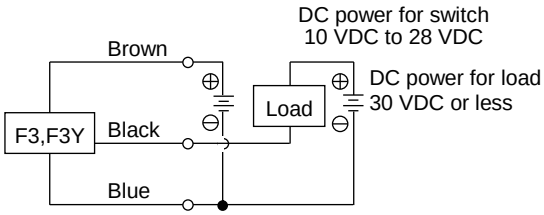
Turn off the power to the device in the electric circuit to which the switch is to be connected and connect the lead wires according to their color.
If the switch is not wired correctly or the load is short-circuited, it may cause damage not only to the switch but also to the electric circuit on the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



Example of F2, F2Y basic circuit



Example of F3, F3Y basic circuit (1)
(When same power is used for switch and load)

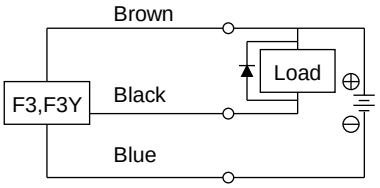


Example of F3, F3Y basic circuit (2)
(When separate power is used for switch and load)

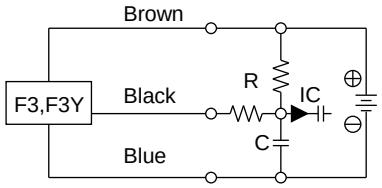
■ Protection of the output circuit

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. 6
  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. 7
  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. 8 and 9 (2-wire type), Ex. 10 (3-wire type)
-

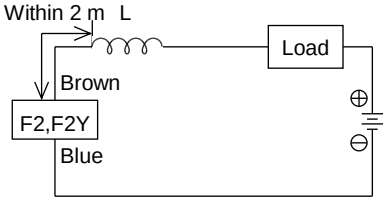


Ex. 6 Using inductive load with surge absorption element (diode). (For diode, use V06C manufactured by Hitachi or equivalent.)

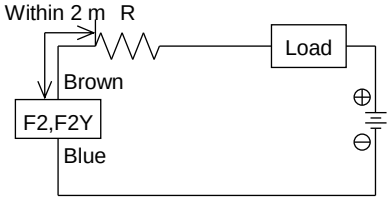


Ex. 7 Using capacious load with current regulating resistor R.
Use the following formula to figure out resistance R (Ω).

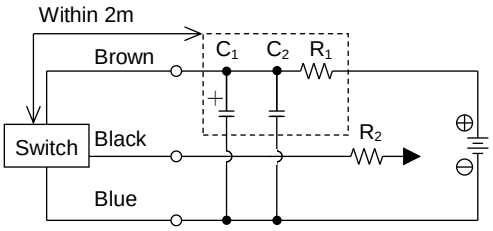
$$\frac{V}{0.05} = R\ (\Omega)$$



Ex. 8 - Choke coil
L = Several hundred μH to several mH
Excellent high frequency characteristic
- Wire near the switch (within 2 m).



Ex. 9 - Starting current restriction resistor
R = Highest possible resistance for the load circuit.
- Wire near the switch (within 2 m).



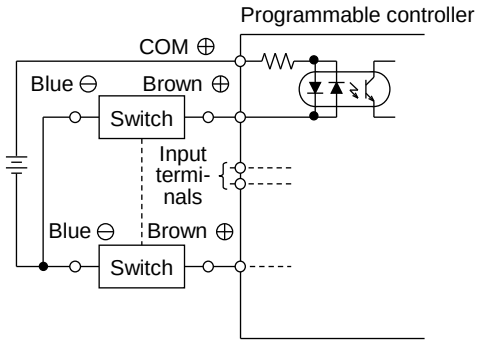
Ex. 10 - Power supply noise absorption circuit
C_1=20 µF to 50 µF electrolytic capacitor
(withstand voltage 50V or more)
C_2=0.01 µF to 0.1 µF ceramic capacitor
R_1=20 Ω to 30 Ω

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

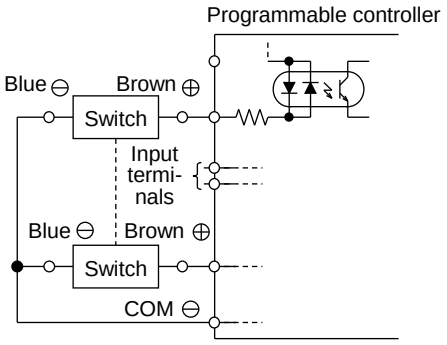
- Wire near the switch (within 2 m)

■ Connection to the programmable controller

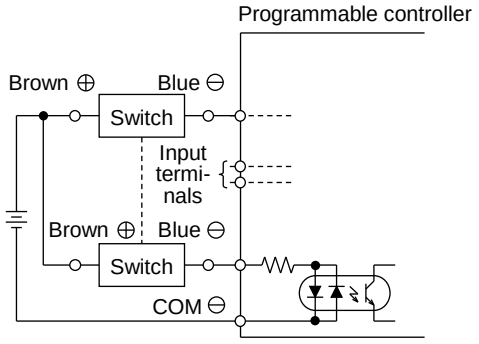
The connection method depends on the type of the programmable controller. Connect as shown below.



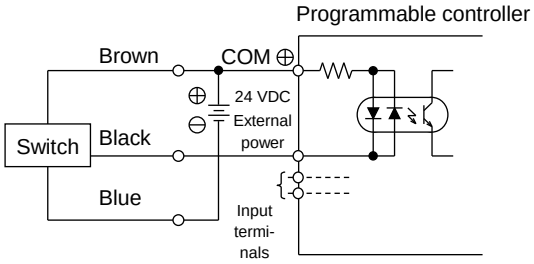
F2, F2Y connection to source input (external power)



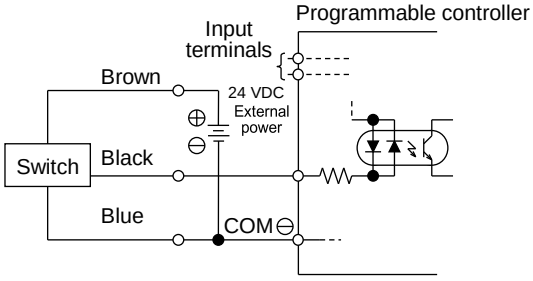
F2, F2Y connection to source input (internal power)



F2, F2Y connection to sink input (external power)



F3, F3Y connection to source input (external power)



F3, F3Y connection to source input (internal power)

■ Parallel connection

Since the leakage current of a F2 and F2Y type switches 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 F2 and F2Y type switch, the indicator may become dim or not light up.
Although the leakage current of a F3 and F3Y 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 F3 and F3Y type switch, the indicator will light up without dimming.

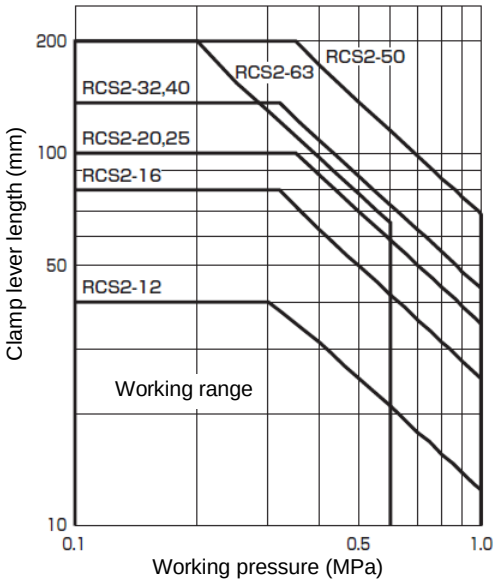
3. USAGE

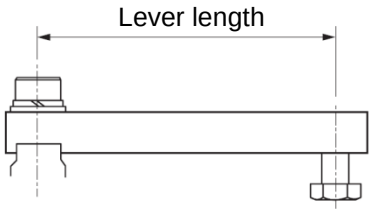
3.1 Using the cylinder

■ Clamp lever allowable length and working pressure

The upper limit of the clamp lever's allowable length differs depending on the working pressure. Set it to within the range shown below.

<Clamp lever allowable length>





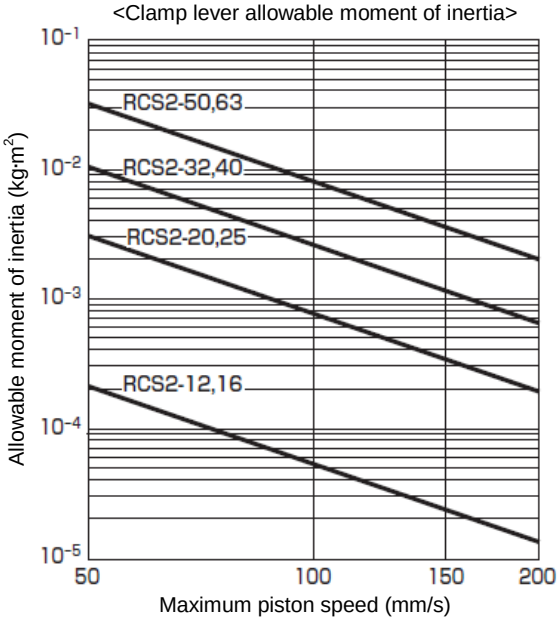
■ Adjustment of the piston speed

Mount a speed controller to adjust the piston speed.

■ Clamp lever allowable moment of inertia and piston speed

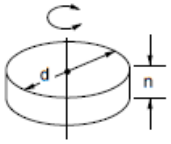
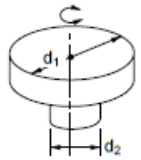
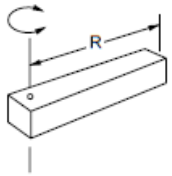
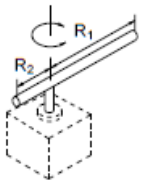
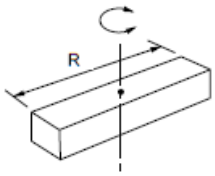
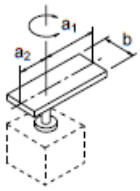
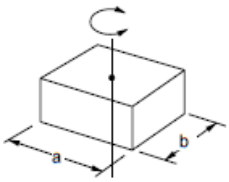
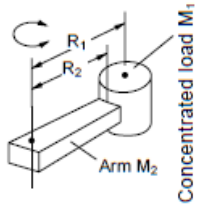
The upper limit of the clamp lever's allowable moment of inertia differs depending on the piston speed. Set it to within the range shown below.

<Clamp lever allowable moment of inertia>



■ Moment of inertia calculation

When rotary shaft passes through the workpiece

Shape	Sketch	Requirements	Moment of inertia I kg·m²	Radius of rotation K_1^2	Remarks
Dial plate		● Diameter d (m) ● Weight M (kg)	$I = \frac{Md^2}{8}$	$\frac{d^2}{8}$	● No workpiece mounting direction
Circular stepped plate		● Diameter d_1 (m) d_2 (m) ● Weight d_1 Part M_1 (kg) d_2 Part M_2 (kg)	$I = \frac{1}{8}(M_1d_1^2 + M_2d_2^2)$	$\frac{d_1^2 + d_2^2}{8}$	● Ignore when the d_2 section is extremely small compared to the d_1 section
Bar (center of rotation at end)		● Bar length R (m) ● Weight M (kg)	$I = \frac{MR^2}{3}$	$\frac{R^2}{3}$	● The workpiece mounting direction is horizontal.
Thin rod		● Bar length R_1 R_2 ● Weight M_1 M_2	$I = \frac{M_1 \cdot R_1^2}{3} + \frac{M_2 \cdot R_2^2}{3}$	$\frac{R_1^2 + R_2^2}{3}$	● The workpiece mounting direction is horizontal.
Bar (center of rotation at center of gravity)		● Bar length R (m) ● Weight M (kg)	$I = \frac{MR^2}{12}$	$\frac{R^2}{12}$	● No workpiece mounting direction
Thin rectangle plate (rectangular parallelepiped)		● Plate length a_1 a_2 ● Side length b ● Weight M_1 M_2	$I = \frac{M_1}{12}(4a_1^2 + b^2) + \frac{M_2}{12}(4a_2^2 + b^2)$	$\frac{(4a_1^2 + b^2) + (4a_2^2 + b^2)}{12}$	● The workpiece mounting direction is horizontal.
Rectangular parallelepiped		● Side length a (m) ● Weight b (m) M (kg)	$I = \frac{M}{12}(a^2 + b^2)$	$\frac{a^2 + b^2}{12}$	● No workpiece mounting direction
Concentrated load		● Shape of concentrated load ● Length to center of gravity of concentrated load R_1 ● Arm length R_2 (m) ● Concentrated load weight M_1 (kg) ● Arm weight M_2 (kg)	$I = M_1(R_1^2 + k_1^2) + \frac{M_2R_2^2}{3}$	Calculate k_1^2 according to shape of concentrated load	● The workpiece mounting direction is horizontal. ● When M_2 is extremely small compared to M_1, it may be calculated as $M_2 = 0$

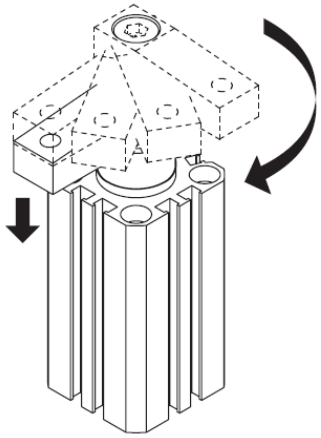
■ Precautions for operation

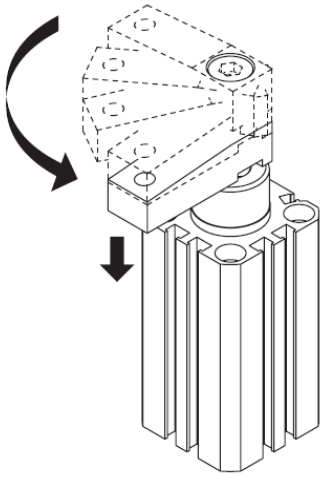
⚠ WARNING

When rotating, make sure that the clamp lever mounted to the piston rod end does not interfere with the exterior while rotating. If the rotation of the clamp lever could cause bodily injury, be sure to provide safety measures by installing a protective cover, etc. to clamp lever's surroundings.

This cylinder, the piston rod strokes while rotating 90° during operation.

R	Rotated 90° in CW direction when pulled	L	Rotated 90° in CCW direction when pulled





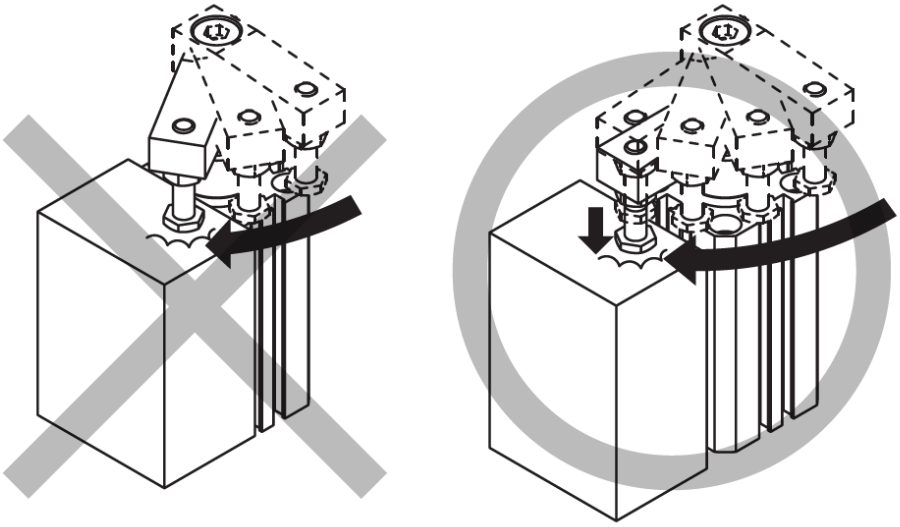
■ Usage precautions

⚠ CAUTION

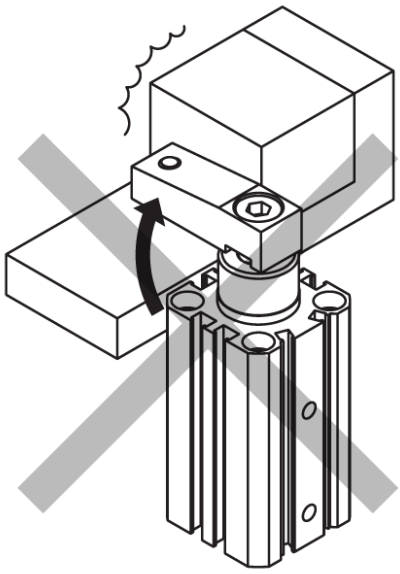
Be sure to observe the following precautions and use.

Using this product so as to apply rotation to the piston rod may lead to damage, faulty operation, or a reduction in non-rotating accuracy.

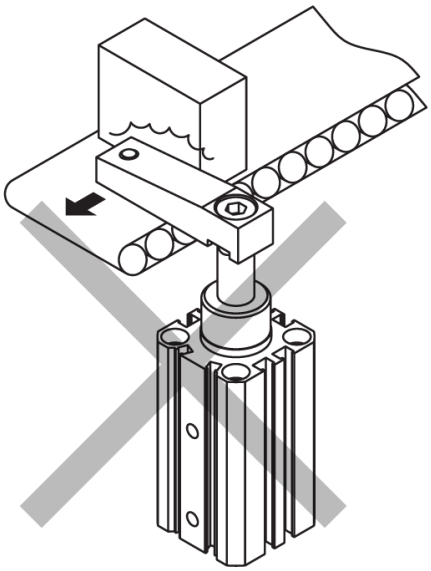
Do not clamp the product mid-rotary stroke. Adjust the clamping position to be approx. 3 mm or more before the stroke end position.



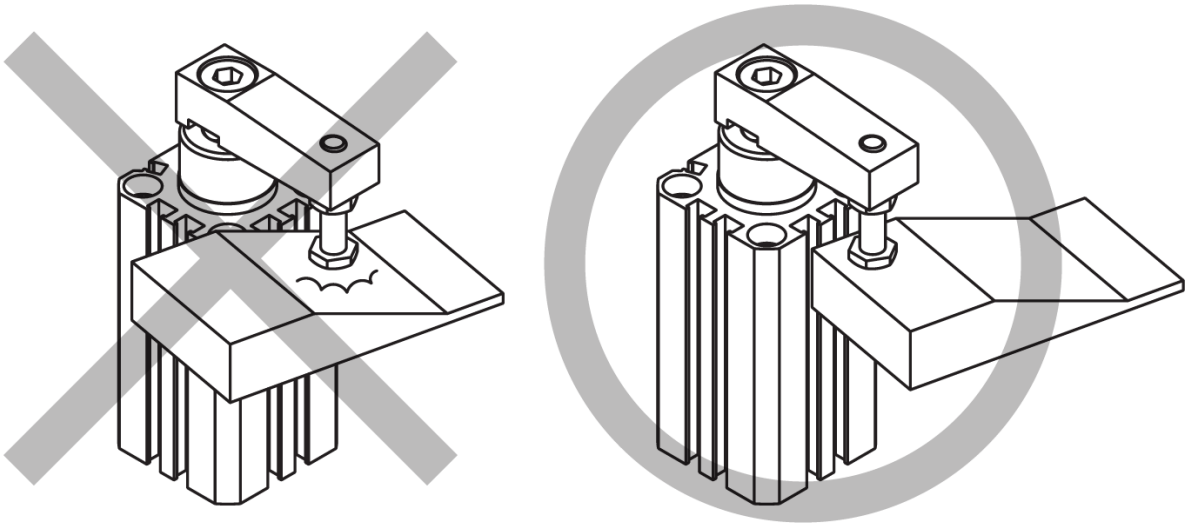
Do not clamp the product in the rotational direction.



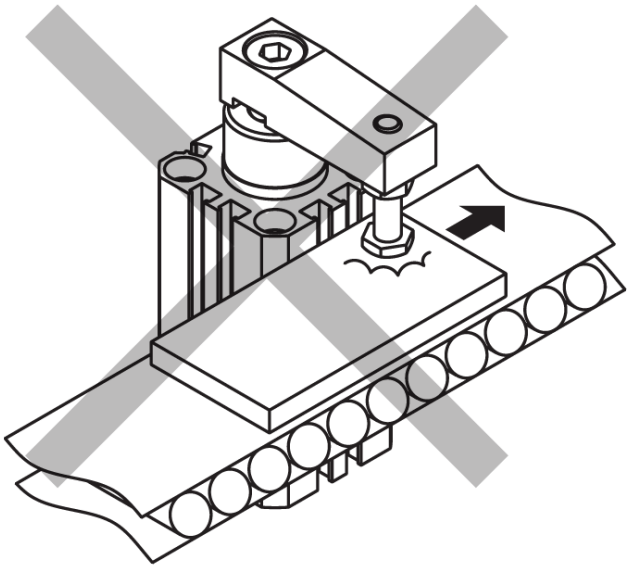
Do not use as a stopper.



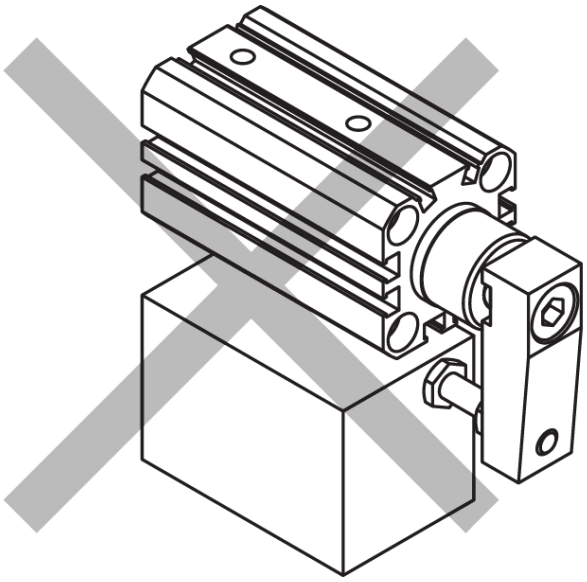
Do not clamp the inclined portion.



Do not move the workpiece with exterior power.



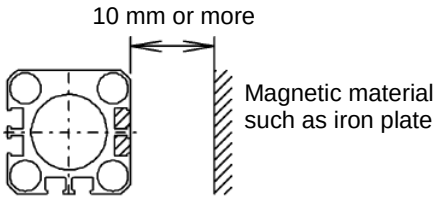
Do not install horizontally.

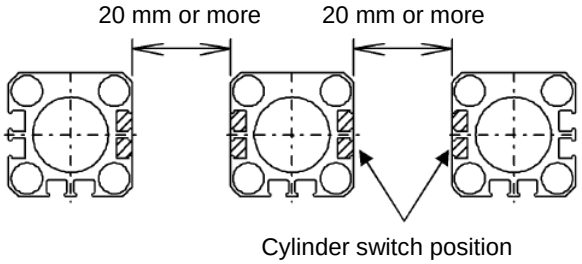


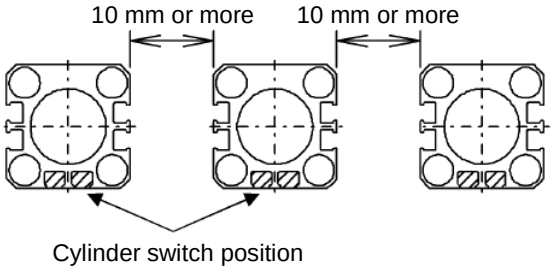
3.2 Using the switch

■ 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).
Magnetic material such as iron plate nearby cylinder switch is apt to cause malfunction of cylinder switches. Keep it from cylinder surface at least 10 mm away. (This is applicable for all bore sizes of tube).
It usually causes malfunction cylinder switches when plural cylinders are laid adjoining. Keep a space between each other as shown below.







■ Wiring of lead wire

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

■ Ambient temperature

The switch cannot be used 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. Do not use the switch in a high temperature environment.

■ 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 apply the product to strong vibrations and shocks when transporting the cylinder and mounting and adjusting the switch.

4. MAINTENANCE AND INSPECTION

⚠ CAUTION

Release the residual pressure and make sure that there is no residual pressure before disassembling or inspecting the actuator.

Turn off the power before disassembling or inspecting the actuator.

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

Do not touch live parts with bare hands.
An electric shock may occur.

Plan and conduct periodic inspections to prevent accidents due to the product and to prevent faults such as functional deterioration, short life, damage, and malfunctions.

4.1 Periodic Inspection

In order to use the air cylinder under optimum conditions, conduct a periodic inspection once or twice a year.

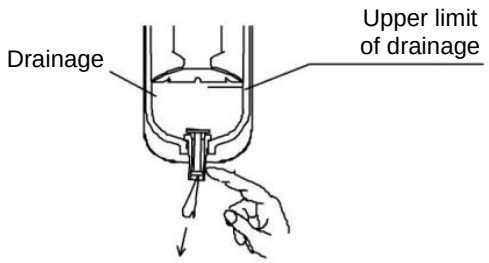
4.1.1 Inspection item

- Piston rod end fittings, support metal mounting bolts, loosening of nuts.
- Operating condition.
- Change in piston speed and cycle time.
- External leakage, internal leakage.
- Scratch and deformation of the piston rod.
- Stroke abnormality.
- Abnormal wear of sliding part (guide pin, lead groove of piston rod, bearing part etc.).

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 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.
- The product can be used without lubrication. If lubrication is necessary, use Class 1 ISO VG 32 turbine.

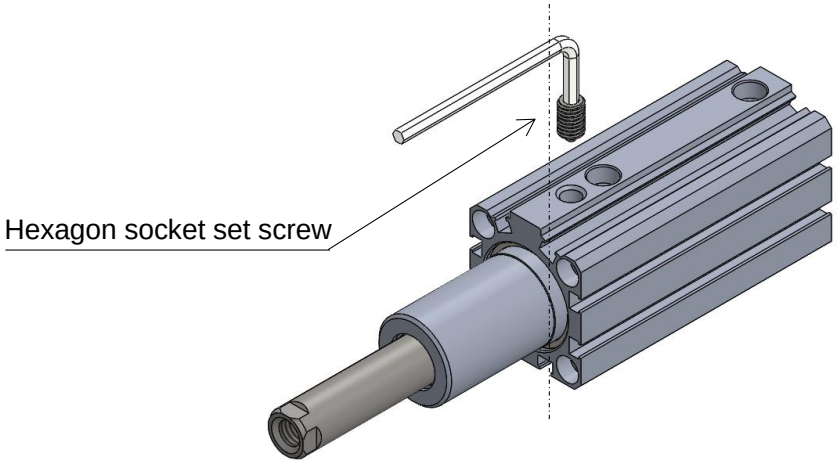


4.2 Disassembling and Assembling

Follow the procedure below to perform maintenance and repairs when a problem such as an air leakage occurs.

4.2.1 How to disassembly

1 Using a hexagonal wrench, Loosen the hexagon socket set screw next to the rod side port and remove it.

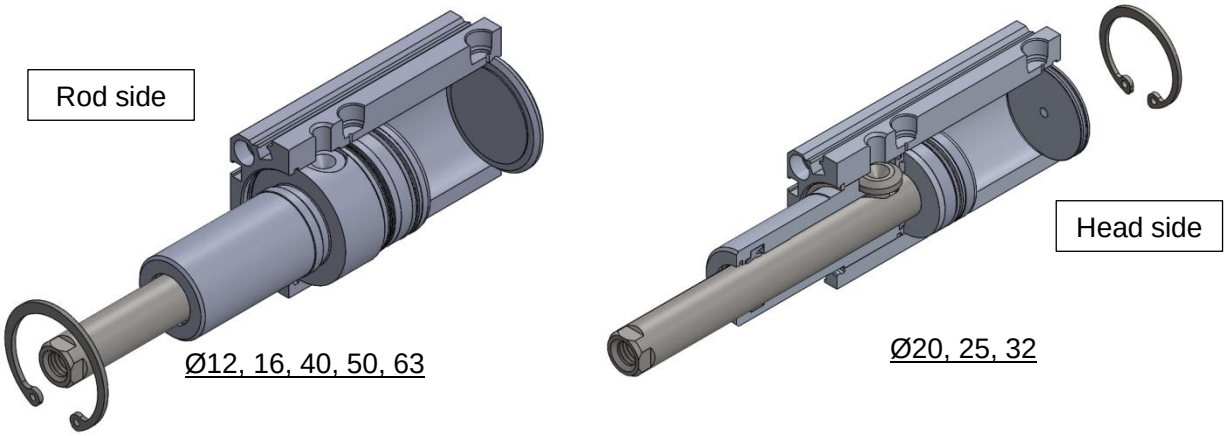


2 Use the snap ring pliers (for holes) to remove the C-ring (for Ø12, 16 is R-ring).
For Ø12, 16, 40, 50, 63 remove the C-ring on the rod side.
For Ø20, 25, 32 remove the C-ring on the head side.

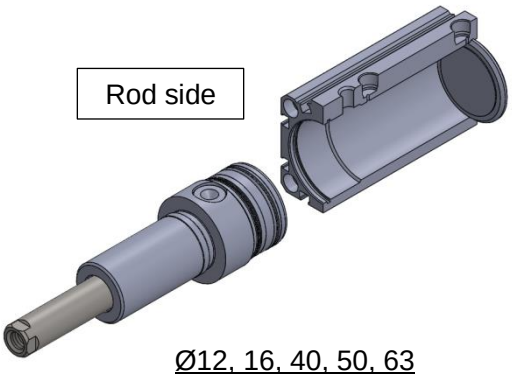
⚠ CAUTION

Use snap ring pliers that appropriate to remove the C-ring.

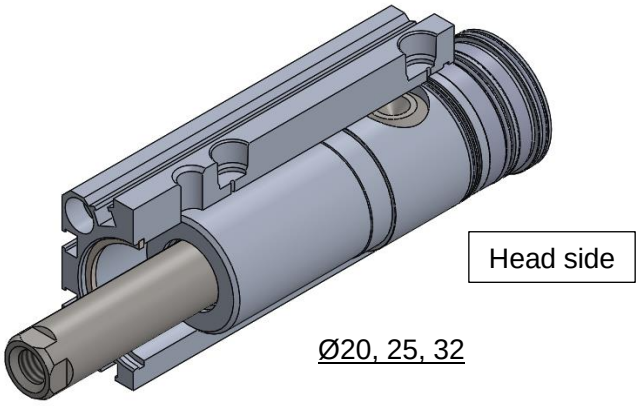
Even if you use the appropriate snap ring pliers, be careful as the C-ring jumps off the end of the pliers and may hurt the human body and peripheral equipment.



3 Remove the rod metal assembly. When Ø12, 16, 40, 50, 63 are pulled toward the rod side. When Ø20, 25, 32 are pushed toward the head side, the rod metal assembly including the piston rod assembly will come off. At this time, the rod metal assembly and the piston rod assembly disengage at the same time.

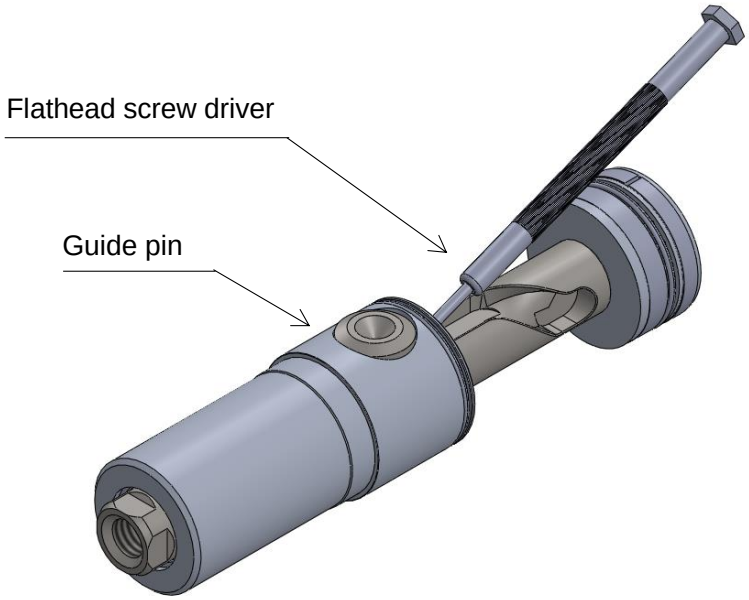


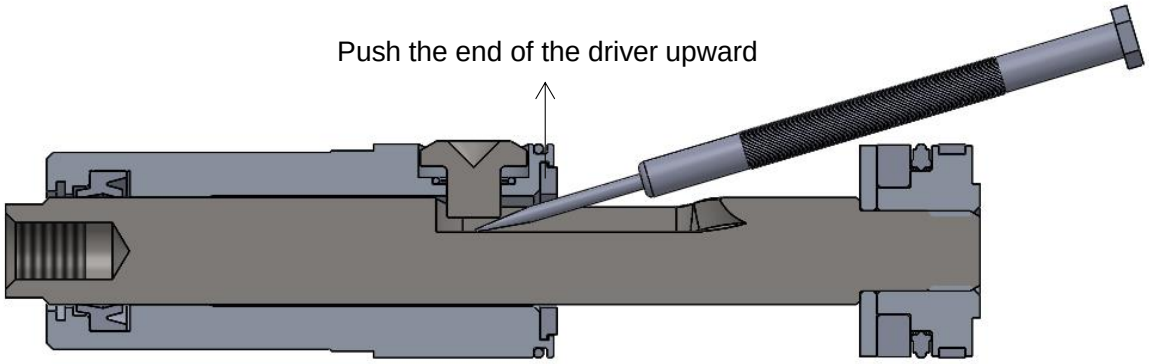
Ø12, 16, 40, 50, 63



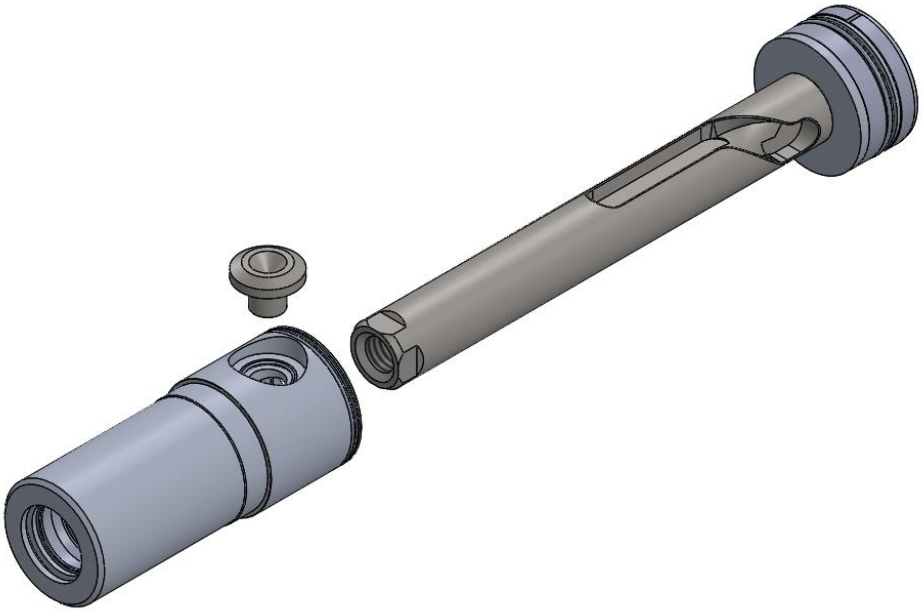
Ø20, 25, 32

4 Remove the guide pin inserted in the rod metal. Move the piston rod assembly toward the head side, insert the flathead screw driver to the gap of the lead groove and push up the guide pin to disengage.





5 Piston rod assembly will come off from rod metal assembly.



4.2.2 Inspection of parts

Perform the parts inspection of the following items.

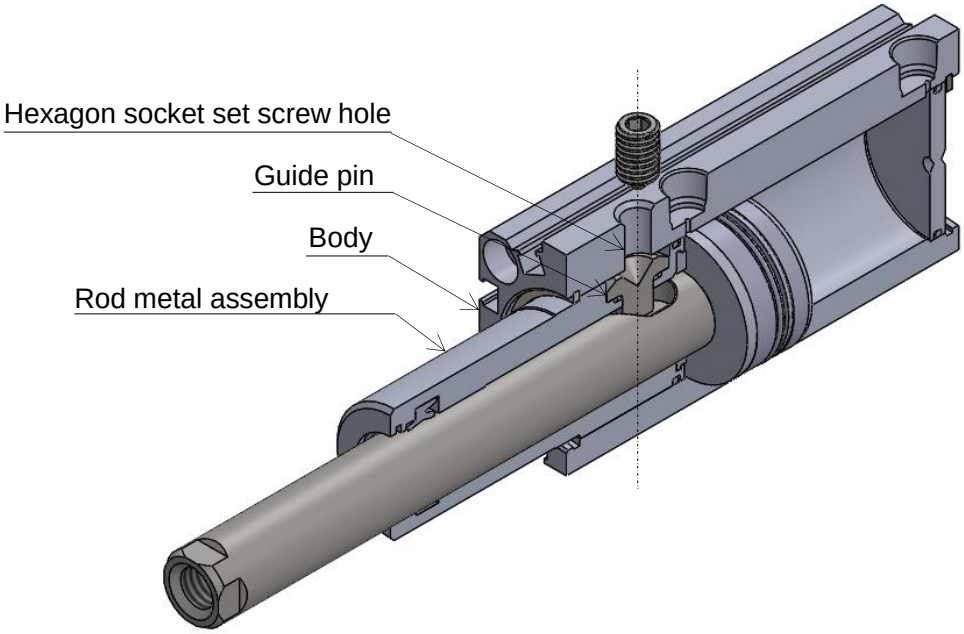
- Scratches on the inner surface of the tube.
- Scratches on the piston rod surface, delamination of metal surface treatment, rust.
- Scratches and wear on inner surface of rod metal bearing part.
- Scratches, wears, cracks on the piston surface.
- Loose connection of piston rod and piston.
- Crack of both end covers.
- Scratches and wear of sliding part packing (coil scraper, rod packing, piston packing, wear ring).
- Scratches, deformation, wear of gaskets (rod metal gasket, cover gasket, guide pin gasket).
- Wear position of guide pin sliding part.
- Wear position of piston rod lead groove.

Check the parts as described above and repair or replace the parts for which abnormalities are found.
For the internal structure and replaceable consumable parts, see 4.2.4.

4.2.3 Assembly

Attention to the following items and reassemble by the reverse procedure at disassembly.

- Apply thinly high quality grease (Lithium soap based grease of consistency 2) to the inner surface of the main body, the outer circumferential surface of the piston, the outer circumferential surface of the piston rod, the lead groove of the piston rod and entire the packing of the sliding portion.
- Bore size Ø20, 25, 32 after inserting the rod metal assembly and the piston rod assembly into the main body, apply the grease to the inner circumferential of the main body from the head side.
- Inserting the rod metal assembly into the main body, align the axial direction and rotational direction so that the guide pin is aligned with the setscrew mounting hole.



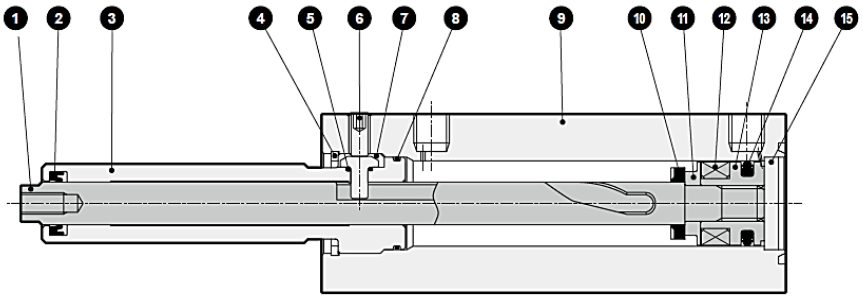
- Tighten the hexagon socket set screw with the following tightening torque after applying a disassemble adhesive (recommended: Henkel Japan Co., Loctite 243) to the threaded part.

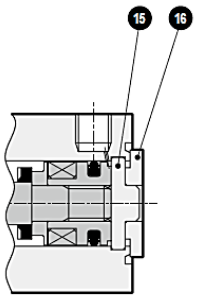
Bore size	Screw size	Tightening torque
Ø12, 16	M3	0.6±10% N･m
Ø20, 25	M5	3.0±10% N･m
Ø32, 40	M8	12.5±10% N･m
Ø50, 63	M10	24.5±10% N･m

- After assembly, be sure to smoothly operate at 0.1 MPa. Also check the air leak at working pressure.

4.2.4 Internal structure and consumable parts

- **RCS2-12, 16 / RCS2-T2-12, 16**



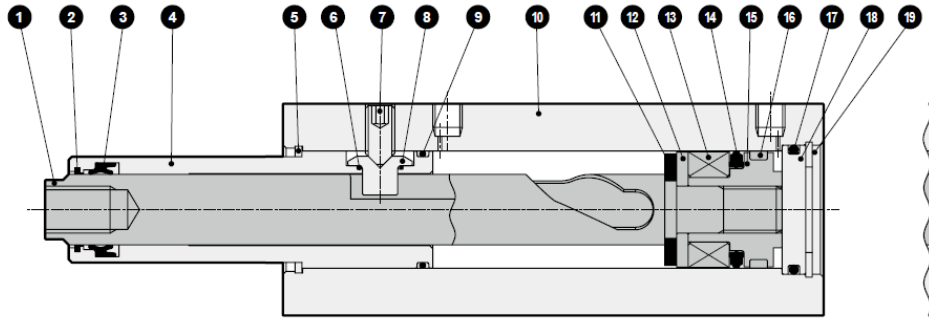


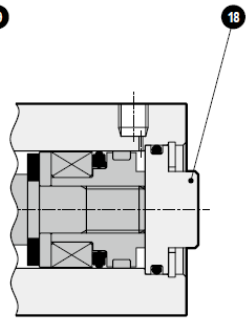
Spigot at head side (H)

For RCS2-T2-12,16 materials of 2, 5, 8 and 14 are changed to fluoro rubber.

No.	Part name	Material	Remarks	No.	Part name	Material	Remarks
1	Piston rod	Stainless steel	Special treatment	10	Cushion rubber (R)	Urethane rubber	
2	Rod packing	Nitrile rubber		11	Spacer	ø12: Aluminum alloy	Zinc chromate
3	Rod metal	Aluminum alloy	Hard alumite			ø16: Special plastic	
4	Round R type snap ring	Steel	Zinc phosphate	12	Magnet	Plastic	
5	Guide pin gasket	Nitrile rubber		13	Piston	Aluminum alloy	Zinc chromate
6	Hexagon socket set screw	Stainless steel		14	Piston packing	Nitrile rubber	
7	Guide pin	Steel	Special treatment	15	Cover	Stainless steel	
8	Rod metal gasket	Nitrile rubber		16	Spigot ring	Aluminum alloy	Zinc chromate
9	Body	Aluminum alloy	Hard alumite				

- **RCS2-20, 25 / RCS2-T2-20, 25**





Spigot at head side (H)

For RCS2-T2-20,25 materials of 3, 6, 9, 14 and 17 are changed to fluoro rubber.

No.	Part name	Material	Remarks	No.	Part name	Material	Remarks
1	Piston rod	Stainless steel	Special treatment	11	Cushion rubber (R)	Urethane rubber	
2	Coil scraper	Copper alloy		12	Spacer	Aluminum alloy	Zinc chromate
3	Rod packing	Nitrile rubber		13	Magnet	Plastic	
4	Rod metal	Aluminum alloy	Hard alumite	14	Piston packing	Nitrile rubber	
5	Circlip	Steel		15	Piston	Aluminum alloy	Zinc chromate
6	Guide pin gasket	Nitrile rubber		16	Wear ring	Polyacetal resin, polyester	
7	Hexagon socket set screw	Stainless steel		17	Cover gasket	Nitrile rubber	
8	Guide pin	Steel	Special treatment	18	Base plate	Aluminum alloy	Zinc chromate
9	Rod metal gasket	Nitrile rubber		19	C snap ring	Steel	Zinc phosphate
10	Body	Aluminum alloy	Hard alumite				

Consumable parts list

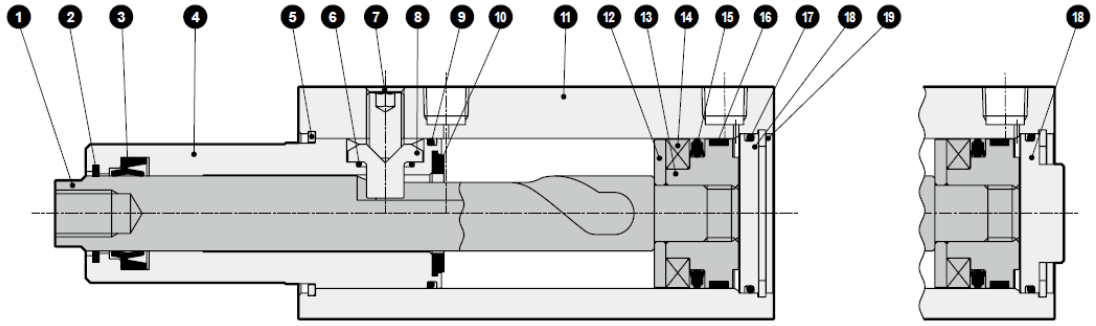
Packing kit

Bore size	For RCS2 standard	For RCS2-T2	Consumable part number
ϕ12	RCS2-12K	RCS2-T2-12K	2, 5, 8, 10, 14
ϕ16	RCS2-16K	RCS2-T2-16K	
ϕ20	RCS2-20K	RCS2-T2-20K	2, 3, 6, 9, 11, 14, 16, 17
ϕ25	RCS2-25K	RCS2-T2-25K	

Guide pin kit

Bore size	Common to RCS2 standard, RCS2-T2	Consumable part number
ϕ12	RCS2-G-12	6, 7
ϕ16	RCS2-G-16	
ϕ20	RCS2-G-20	7, 8
ϕ25	RCS2-G-25	

- **RCS2-32 / RCS2-T2-32**

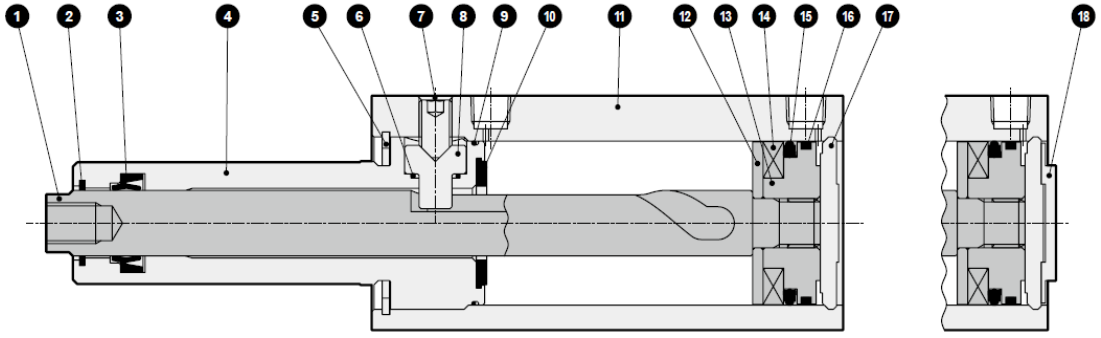


Spigot at head side (H)

For RCS2-T2-32 materials of 3, 6, 9, 15 and 17 are changed to fluoro rubber.

No.	Part name	Material	Remarks	No.	Part name	Material	Remarks
1	Piston rod	Stainless steel	Special treatment	11	Body	Aluminum alloy	Hard alumite
2	Coil scraper	Copper alloy		12	Spacer	Aluminum alloy	
3	Rod packing	Nitrile rubber		13	Piston	Aluminum alloy	Zinc chromate
4	Rod metal	Aluminum alloy	Hard alumite	14	Magnet	Plastic	
5	Circlip	Steel		15	Piston packing	Nitrile rubber	
6	Guide pin gasket	Nitrile rubber		16	Wear ring	Polyacetal resin, polyester	
7	Hexagon socket set screw	Stainless steel		17	Cover gasket	Nitrile rubber	
8	Guide pin	Steel	Special treatment	18	Base plate	Aluminum alloy	Zinc chromate
9	Rod metal gasket	Nitrile rubber		19	C snap ring	Steel	Zinc phosphate
10	Cushion rubber (R)	Urethane rubber					

- **RCS2-40, 50, 63 / RCS2-T2-40, 50, 63**



Spigot at head side (H)

For RCS2-T2-40,50,63 materials of 3, 6, 9, 15 are changed to fluoro rubber.

No.	Part name	Material	Remarks	No.	Part name	Material	Remarks
1	Piston rod	Stainless steel	Special treatment	10	Cushion rubber (R)	Urethane rubber	
2	Coil scraper	Copper alloy		11	Body	Aluminum alloy	Hard alumite
3	Rod packing	Nitrile rubber		12	Spacer	Aluminum alloy	
4	Rod metal	Aluminum alloy	Hard alumite	13	Piston	Aluminum alloy	Zinc chromate
5	C snap ring	Steel	Zinc phosphate	14	Magnet	Plastic	
6	Guide pin gasket	Nitrile rubber		15	Piston packing	Nitrile rubber	
7	Hexagon socket set screw	Stainless steel		16	Wear ring	Polyacetal resin, polyester	
8	Guide pin	Steel	Special treatment	17	Cover	Aluminum alloy	
9	Rod metal gasket	Nitrile rubber		18	Spigot ring	Aluminum alloy	Zinc chromate

Consumable parts list

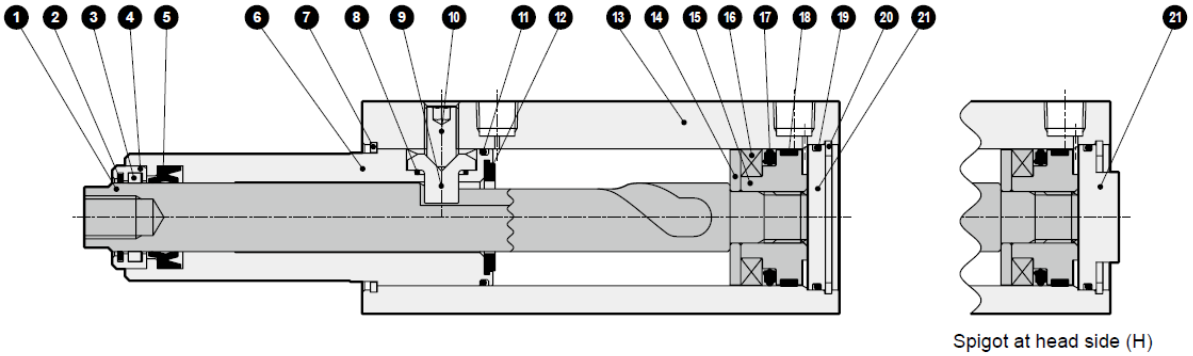
Packing kit

Bore size	For RCS2 standard	For RCS2-T2	Consumable part number
ϕ 32	RCS2-32K	RCS2-T2-32K	2, 3, 6, 9, 10, 15, 16, 17
ϕ 40	RCS2-40K	RCS2-T2-40K	2, 3, 6, 9, 10, 15, 16
ϕ 50	RCS2-50K	RCS2-T2-50K	
ϕ 63	RCS2-63K	RCS2-T2-63K	

Guide pin kit

Bore size	Common to RCS2 standard, RCS2-T2	Consumable part number
ϕ 32	RCS2-G-32	7,8
ϕ 40	RCS2-G-40	7,8
ϕ 50	RCS2-G-50	
ϕ 63	RCS2-G-63	

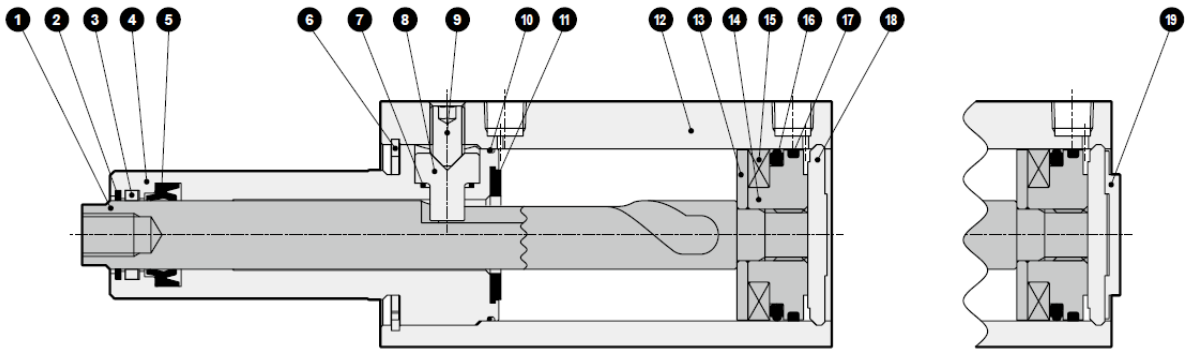
- **RCS2-G4-32**



Spigot at head side (H)

No.	Part name	Material	Remarks	No.	Part name	Material	Remarks
1	Piston rod	Stainless steel	Special treatment	12	Cushion rubber	Urethane rubber	
2	Coil scraper	Copper alloy		13	Body	Aluminum alloy	Hard alumite
3	Lubricator			14	Spacer	Aluminum alloy	Zinc chromate
4	Holder	Aluminum alloy	Zinc chromate	15	Piston	Aluminum alloy	Zinc chromate
5	Rod packing	Nitrile rubber		16	Piston magnet	Plastic	
6	Rod metal	Aluminum alloy	Hard alumite	17	Piston packing	Nitrile rubber	
7	Circlip	Steel	Zinc phosphate	18	Wear ring	Polyacetal resin, polyester	
8	Guide pin gasket	Nitrile rubber		19	Cover gasket	Nitrile rubber	
9	Guide pin	Steel	Special treatment	20	C snap ring	Steel	Zinc phosphate
10	Hexagon socket set screw	Stainless steel		21	Base plate	Aluminum alloy	Zinc chromate
11	Rod metal gasket	Nitrile rubber					

- **RCS2-G4-40, 50, 63**



Spigot at head side (H)

No.	Part name	Material	Remarks	No.	Part name	Material	Remarks
1	Piston rod	Stainless steel	Special treatment	11	Cushion rubber	Urethane rubber	
2	Coil scraper	Copper alloy		12	Body	Aluminum alloy	Hard alumite
3	Lubricator			13	Spacer	Aluminum alloy	Zinc chromate
4	Rod metal	Aluminum alloy	Hard alumite	14	Piston	Aluminum alloy	Zinc chromate
5	Rod packing	Nitrile rubber		15	Piston magnet	Plastic	
6	C snap ring	Steel	Zinc phosphate	16	Piston packing	Nitrile rubber	
7	Guide pin gasket	Nitrile rubber		17	Wear ring	Polyacetal resin, polyester	
8	Guide pin	Steel	Special treatment	18	Cover	Aluminum alloy	Zinc chromate
9	Hexagon socket set screw	Stainless steel		19	Spigot ring	Aluminum alloy	Zinc chromate
10	Rod metal gasket	Nitrile rubber					

Consumable parts list

Packing kit (Same as for RCS2 standard)

Bore size	For RCS2-G4	Consumable part number
ϕ32	RCS2-32K	2, 5, 8, 11, 12, 17, 18, 19
ϕ40	RCS2-40K	2, 5, 7, 10, 11, 16, 17
ϕ50	RCS2-50K	
ϕ63	RCS2-63K	

Guide pin kit (Same as for RCS2 standard)

Bore size	For RCS2-G4	Consumable part number
ϕ32	RCS2-G-32	9, 10
ϕ40	RCS2-G-40	8, 9
ϕ50	RCS2-G-50	
ϕ63	RCS2-G-63	

5. TROUBLESHOOTING

5.1 Problems, Causes and Solutions

5.1.1 Cylinder

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

Problem	Cause	Solution
Cylinder does not Work.	Insufficient pressure.	Confirm supply pressure to cylinder.
	No signal in the directional control valve.	Check the control circuit.
	Insufficient flow rate.	Check piping status. Check the opening of the speed control valve.
Piston rod does not operate smoothly.	Lubrication of sliding parts is insufficient.	Supply grease.
	Seal is bad.	Check packing installation condition. Change packing.
	The fixed orifice is blocked.	Clean the fixed orifice of the port bottom hole.
	Deformation of the guide pin, broken.	Replace guide pin.
	Insufficient flow rate.	Check piping status. Check the opening of the speed control valve.
Clamping force is insufficient.	Insufficient pressure.	Secure pressure source. Confirm supply pressure to cylinder.
	Clamp position setting is wrong. (The cylinder piston position at clamping is the head side stroke end)	Adjust the installation so that the cylinder piston position at clamping is 3 mm or more from the head side stroke end.
Clamping force reduce.	Seal is bad.	Check packing installation condition. Change packing.
	Insufficient flow rate.	Check piping status. Check the opening of the speed control valve.
	Cylinder installation is bad.	Confirm that the cylinder is firmly installed.
	The mounting of the clamp lever is bad.	Check if the clamp lever mounting screw is loose.
Speed increases.	The opening level of the speed control valve has changed.	Opening level of the speed control valve and checking the fixed state of the variable opening needle.
Speed is reduced.	The opening level of the speed control valve has changed.	Opening level of the speed control valve and checking the fixed state of the variable opening needle.
	The fixed orifice is blocked.	Clean the fixed orifice of the port bottom hole.
Clamp lever angle at clamping changes for each tact.	Guide pin and piston rod lead groove are worn out.	Change cylinder. Replace guide pin. Replace piston rod assembly.
Damage, Deform.	Impact force due to high speed operation is large.	Change cylinder. When resuming operation check the piston speed to be used.
	The moment of inertia of the clamp lever is higher than the allowable value.	Change cylinder. Check if the moment of inertia of clamp lever is within allowable value.
	Use it at a pressure exceeding the maximum working pressure.	Change cylinder. Check the supply pressure to the cylinder when restarting operation.

For other unclear points, please consult your nearest sales office or distributor.

5.1.2 Switch

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

Problem	Cause	Solution
Switch turns on but indicator does not blink.	Contact is welded.	Replace the switch.
	Rating of load is exceeded.	Replace with recommended relay or replace 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.
	Installation position is different.	To a normal position.
	Mounting position is shifted.	Correct deviation and tighten (Note 1).
	The direction of the switch is reversed.	Make it normal.
	Load (relay) cannot respond.	Replace to recommended relay.
	Rating of load is exceeded.	Replace with recommended relay or replace switch.
	Cylinder speed is too high for intermediate position detection.	Lower the speed.
Switch does not turn off.	Piston is not moving.	Move the piston.
	Contact is welded.	Replace the switch.
	Rating of relay is exceeded.	Replace with recommended relay or replace switch.
	Ambient temperature is not appropriate.	Use the switch at an ambient temperature of −5°C to 60°C.
	Magnetic field is nearby.	Install a magnetic shield.
	External signal is faulty.	Check the external circuit.

Note 1: Tighten the fastening screw (set screw) of the switch with proper torque.
Tighten the T2, T2W, T3, T3W, T0, T5 switches using a flat-blade screwdriver (watch screwdriver, precision screwdriver, etc.) with a grip diameter of 5 to 6 mm, a tip shape width of 2.4 mm or less and a thickness of 0.3 mm or less Tighten with torque 0.1 to 0.2 N · m.
Tighten the T2J, T2Y, T3Y, T2YD, T1, T8 switches at 0.5 to 0.7 N · m. Tighten the F2, F3, F2Y and F3Y switches at 0.03 to 0.08 N · m.

For other unclear points, please consult your nearest sales office or distributor.

6. WARRANTY

6.1 Warranty conditions

■ Warranty scope

In the even of a failure that is clearly recognized as our responsibility during the following warranty period, we will provide alternative products of this product, necessary replacement parts, or repair at our factory without charge.
However, if it falls under the following items, it is excluded from the scope of this warranty.

- When handling or using other than the conditions / environment described in the catalog, specifications, this instruction manual.
- Incorrect use such as careless handling, case cause by erroneous management.
- If the cause of the failure is due to reasons other than this product.
- When used other than the original method of using the product.
- In case of remodeling or repair that our company is not involved.
- When using this product by incorporating it into your company's machinery and equipment have the function, structure etc. that is provided in the industry's common wisdom.
- In the case where it is caused by unforeseeable reasons in the technology which was put into practical use at the time of delivery.
- Cases due to natural disasters, etc. that are not our responsibility.

In addition, the warranty referred to here means warranty for this product only, we will be excluded for any damage included by failure of this product.

■ Confirmation of compatibility

Customer's responsibility to confirm the suitability of our products to the system, machinery and equipment used by customers.

■ Other

This warranty clause specifies basic items.
If the warranty contents described in the individual specification drawing or specification sheet are different from this warranty clause, the specification drawing or the specification book will take precedence.

6.2 Warranty period

The warranty period of this product shall be 1 year after delivery to your designated location.