CKD

SM－8369－A

INSTRUCTION MANUAL

PARALLEL HAND
HAP Series

- Please read this instruction manual carefully before using this product, particularly the section describing safety.
- Retain this instruction manual with the product for further consultation whenever necessary.

CKD Corporation

For Safety Use

To use this product safely, basic knowledge of pneumatic equipment, including materials, piping, electrical system and mechanism, is required (to the level pursuant to JIS B 8370 Pneumatic System Rules).

We do not bear any responsibility for accidents caused by any person without such knowledge or arising from improper operation.

Our customers use this product for a very wide range of applications, and we cannot keep track of all of them. Depending on operating conditions, the product may fail to operate to maximum performance, or cause an accident. Thus, before placing an order, examine whether the product meets your application, requirements, and how to use it.

This product incorporates many functions and mechanisms to ensure safety. However, improper operation could result in an accident. To prevent such accidents, read this operation manual carefully for proper operation.

Observe the cautions on handling described in this manual, as well as the following instructions :

⚠ Precautions

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

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HAP Series
Parallel hand
SM 8369-A

1. PRODUCTS

1-1. HAP - 1C Series

1) Specifications

Model code / Item	HAP - 1CS
Service Fluid	Compressed air
Max. Working Pressure MPa	0.7
Min. Working Pressure MPa	0.3
Ambient Temperature (°C)	5~60
Stroke (mm)	8
Tube Bore (mm)	15
Rod Diameter (mm)	8
Volume of Piston one cycle (cm^2)	2.1
Repeating accuracy (Initial value) (mm)	±0.03
Mass of Equipment (g)	100
Lubrication	Not required. (Use Turbine oil, Class 1, ISO VG32 when required.)

2) Features

(1) Parallel motion

It has highly efficient holding power improved 15% higher than former product of ours being parallel type motion consisting of bearing and specially designed cam.

(2) Extended stroke

It is made easier to operate due to light weight and compact design with extended stroke of 8mm.

1-2. HAP - 2CS· 3CS · 4CS Series

1) Specifications

Model code / Item	HAP - 2CS	HAP - 3CS	HAP - 4CS
Service Fluid	Compressed air		
Max. Working Pressure MPa	0.7		
Min. Working Pressure MPa	0.3		
Ambient Temperature (°C)	5~60		
Stroke (mm)	16	26	41
Tube Bore (mm)	20	25	40
Rod Diameter (mm)	10	14	16
Volume of Piston one cycle (cm^2)	4.4	10.8	47.4
Repeating accuracy (Initial value) (mm)	±0.03	±0.03	±0.03
Mass of Equipment (g)	0.28	0.58	1.52
Lubrication	Not required. (Use Turbine oil, Class 1, ISO VG32 when required.)		

2) Features

(1) No requirement of readjusting for multiple application

No troublesome readjustment is required due to extended stroke of claws and their parallel motion.

(2) Light weight and compact design

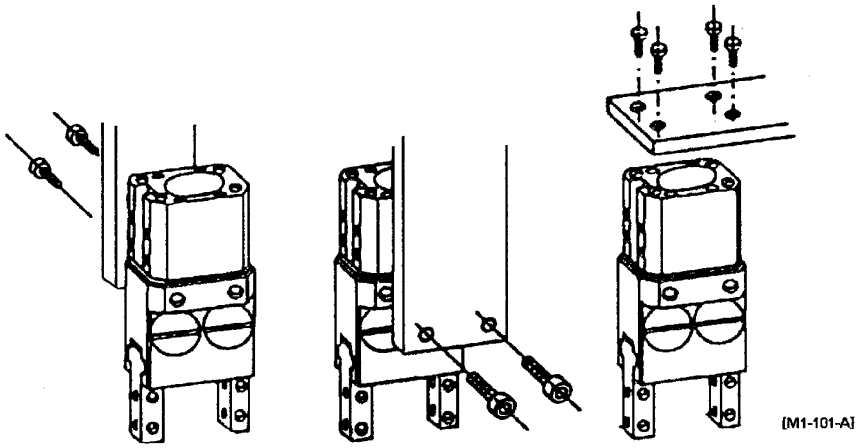
Easy operation due to light weight and compact design yet it brings its power holding capacity into full display.

(3) Available the installation of cylinder switches

It is available to install proximity type cylinder switches up to 2 ea on all models.

(4) Available its installation from three different directions respectively.

It makes system designing easy without being troubled with limitation of its mounting direction owing to 3 different mounting surfaces provided on such sides as rear, front and its top.

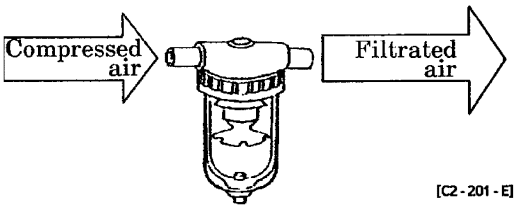


Rear mounting Front mounting Axial mounting

2. CAUTION

2-1. Fluid

1) Use the compressed air, filtrated and dehumidified. Carefully select a filter of an adequate filtration rate (5μm or lower preferred), flow rate and its mounting location (as closest to directional control valve as possible).

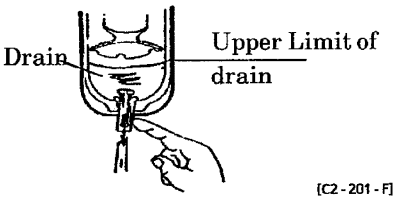


[C2-201-E]

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

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

4) This hand does not require lubrication. It is recommended, however, to use Turbine oil Grade 1, ISO VG32 as lubricant if lubrication is preferred.

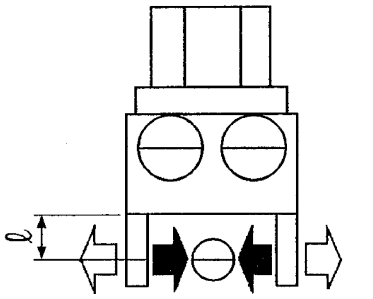


[C2-201-F]

3. HOLDING POWER

3-1. Holding Power and Mass of Load

1) The table of Holding Power on the next page represents the force with Claw length of ℓ at either Opening motion or Closing motion and does not represent max. mass of load capable to hold.



[M1-301-A]

2) Required holding power varies remarkably depending on numerous elements.
   - Friction coefficient between Load and Claws
   - Structure and configuration of Claws
   - Moment of inertia of Load curing transference
   - Relative position between center of gravity of Load and Clamp location, also width of Claws

3-2. Guide line of Selecting appropriate model (required holding power) comparing with mass of Load

Safety coefficients for holding power against mass of Load are set as follows although it varies depending on Coefficient between Load and Claw, Shape of Load and Claws, transferring condition etc. Make those brief guide line f or selecting models.

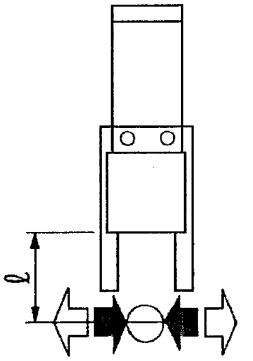
- Holding only — 5 times or Over
- Normal transference — 10 times or Over
- Transference with high acceleration — 20 times or Over

3-3. Data of Holding Power

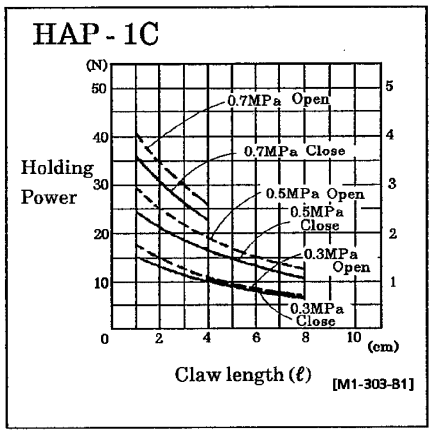
1) HAP-1C Series

The following Tables represents the Holding power in either opening motion or closing motion with Claw length ℓ of hand at 0.3, 0.5 & 0.7MPa of Supplying pressure.

- Opening Motion (⇦) ····· Broken line
- Closing Motion (➡) —— Full line



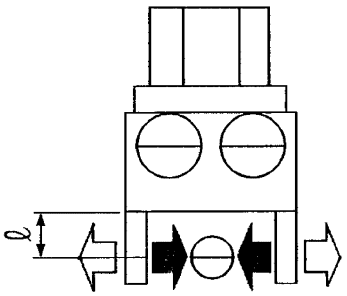
[M1-303-A]



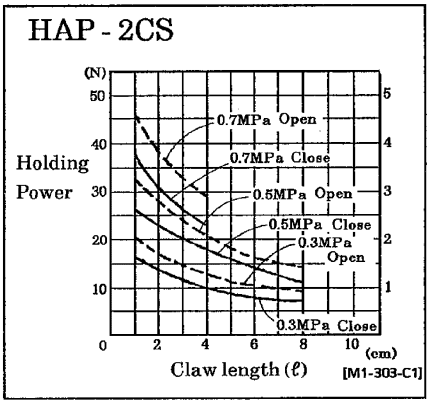
2) HAP-2CS · 3CS · 4CS Series

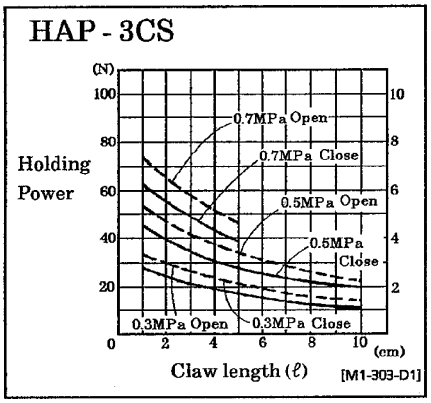
The following Tables represents the Holding power in either opening motion or closing motion with Claw length ℓ of hand at 0.3, 0.5 & 0.7MPa of Supplying pressure.

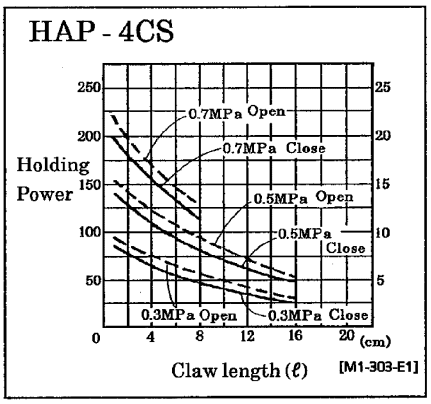
- Opening Motion (⇦) ·····Broken line
- Closing Motion (⇨) ——Full line



[M1-301-A]

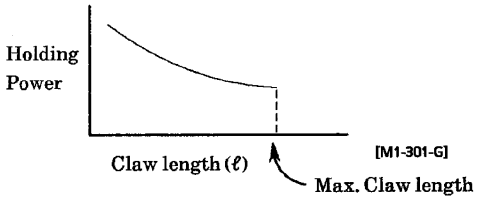






3-4. Length of Claws

1) Make it short and light as much as possible because abrasion wear of moving parts of Master Jaw will be accelerated if claws are long and heavy.
2) Keep the claw length within the range of Tables above.

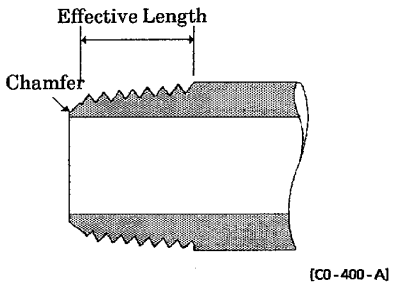


[M1-301-G]

4. INSTALLATION

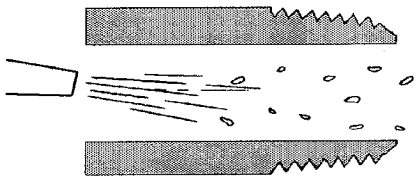
4-1. Piping

1) For piping beyond the filter, use pipes that hardly get corroded such as galvanized pipes, nylon tubes, rubber tubes, etc.
2) See to it that the pipe connecting cylinder and solenoid valve has effective sectional area needed for the cylinder to drive at specified speed.
3) Install filter preferably adjacent upper-stream to solenoid valve for eliminating rust, foreign substance and drain in the pipe.
4) Strictly observe the effective thread length of gas pipe and give a chamfer of approx. 1/2 pitch from the threaded end.

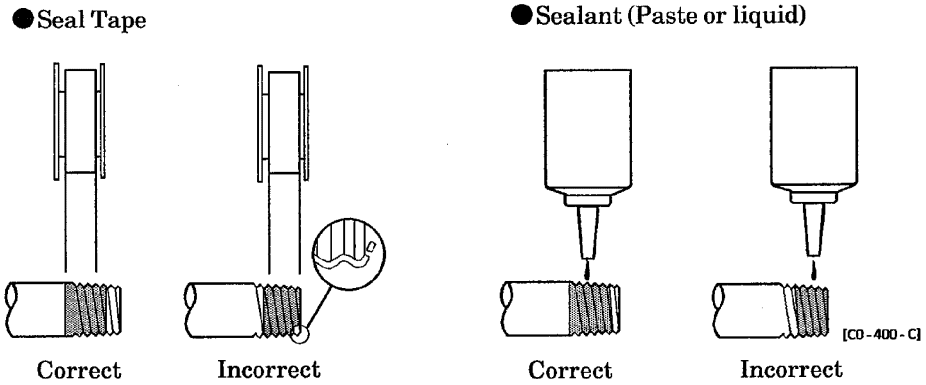


[C0-400-A]

5) Flush air into the pipe to blow out foreign substances and chips before piping.


[C0-400-B]

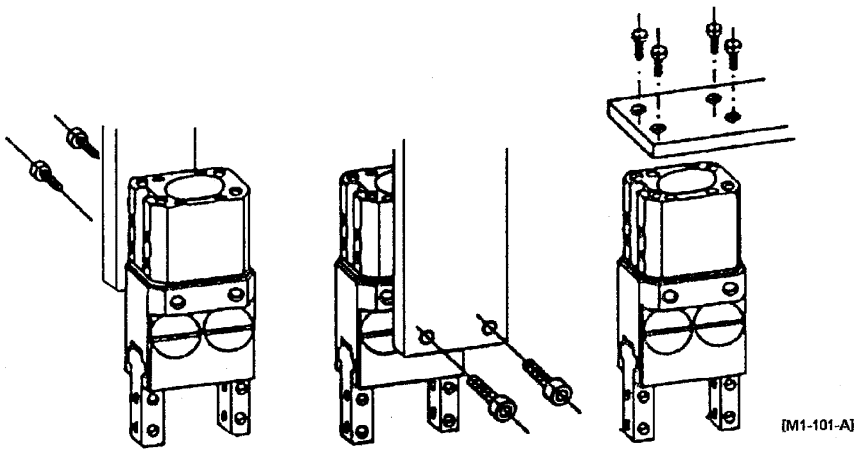
6) Refrain applying sealant or sealing tape approx. two pitches of thread off the tip of pipe to avoid residual substances from falling into piping system.



[C0-400-C]

4-2. Installation

1) Ambient Temperature
   - The range of temperature is 5~60°C which the hand of this type is serviceable.
2) Environmental Condition
   - Provide some protection to the system with such as cover etc. in the environment where much dusts exist and splash of water or oil is foreseen.
3) Installation of Body
   - Three sides of hand are available to have body mounted. Select appropriate side to mount it depending upon the application of system. Axial mounting using top surface is, however, unavailable for Model HAP-1C.



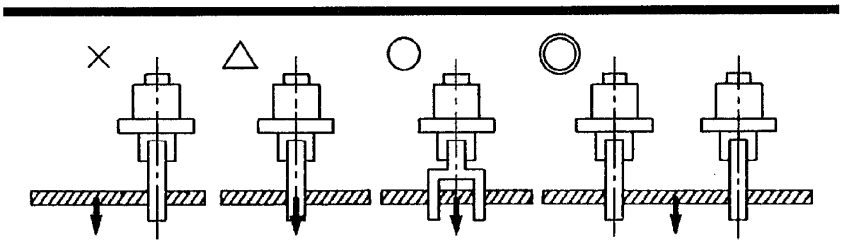
Rear mounting Front mounting Axial mounting

- Thread diameter and depth of Body mounting bolt

Model	Diameter of thread and depth	
	Rear mount & Front Mount,.	Axial Mount
HAP - 1C	M4 Depth 8	——
HAP - 2CS	M5 Depth 12	M5 Depth 10
HAP - 3CS	M6 Depth 14	M5 Depth 12
HAP - 4CS	M8 Depth 14	M6 Depth 12

4) In case of handling long material

It is mandatory to grave it at the center of gravity for stable lifting, it may sometime be necessary to use dual hands for more stability.



[M1-401-A]

5) Others

Consult us prior to start additional machining work on unit to prevent such troubles as malfunction or air leakage etc.

5. MAINTENANCE

5-1. Periodic Inspection

In order to upkeep the Hand chuck in optimum condition, carry out periodic inspection every half a year or at every 500,000 times of actuation.

1) Inspection items
   (1) Apply grease ti rabbing surface.
   (2) Check to see that the cylinder operates smoothly.
   (3) Check any change of the piston speed and cycle time.
   (4) Check for internal and/or external leakage.
   (5) Check the piston rod for flaw (scratch) and deformation.
   (6) Check the stroke for abnormality.

See 5-2, "Trouble shooting", should there be any trouble found, also carry out additional tightening if bolts, nuts, etc.are slackened.

5-2. Trouble Shooting

Trouble	PossibleCause	Countermeasure
Does not operate	No pressure or inadequate pressure	Provide an adequate pressure source.
	Signal is not transmitted to direction control valve	Correct the control circuit
	Broken parts	Refer to Table of Damage or Deformation
	Broken packing	Replace the cylinder.
Does not function smoothly	Insufficient pressure	Increase the pressure .
	Chip or foreign particles caught	Clean and remove chips or particles.
	Broken packing	Replace the cylinder.
Breakage and/or deformation	Too heavy Claws	Make claws light.
	Too long Claws	Make Claws short.
	Exertion working pressure	Reduce the pressure.
	External load is charged	1) Take some remedy to remove charging external load. 2) Review the model and the way using it. Correct the mis-usage.

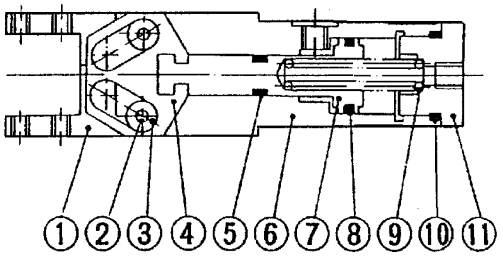
Note : The cylinder of this type is unable to be disassembled because of being the special structure. Replace cylinder in its entirety when some trouble is discovered.

5-3. Internal Structure and Lists of Parts

1) HAP - 1C Series

(1) Internal Structure

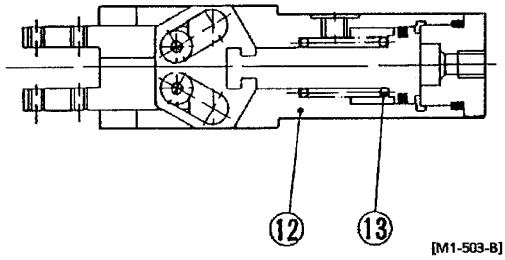
Standard (Double action)·O type (Single action: Normally Open)



[M1-503-A]

※ Spring ⑨is not used for Standard (Double action)

C type (Single action: NC)



[M1-503-B]

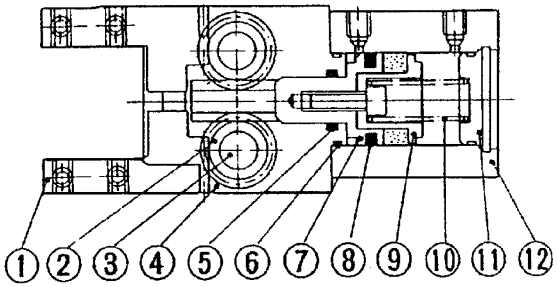
2) Parts List

No.	Parts	Material	Remarks	No.	Parts	Material	Remarks
①	Master jaw	Carbon steel		⑧	Piston packing	Nitril rubber	
②	Fulcrum axis	Carbon steel		⑨	Spring	Piano wire	O type only
③	Bearing	Carbon steel		⑩	Cylinder gasket	Nitril rubber	
④	Cam	Stainless steel		⑪	Head cover	Aluminum	
⑤	Rod packing	Nitril rubber		⑫	Body	Aluminum	
⑥	Body	Aluminum		⑱	Spring	Piano wire	
⑦	Piston	Stainless steel					

2) HAP - 2CS · 3CS · 4CSSeries

(1) Internal Structure

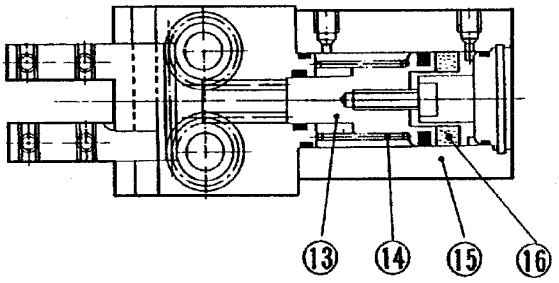
Standard (Double action)·O type (Single action: Normally Open)



[M1-503-C]

※ Spring ⑩is not used for Standard (Double action)

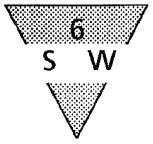
C type (Single action: NC)



[M1-503-D]

(2) Parts List

No.	Parts	Material	Remarks	No.	Parts	Material	Remarks
①	Master jaw	Carbon steel		⑨	Piston B	Stainless steel	
②	Pinion gear	Carbon steel		⑩	Spring	Piano wire	O type only
③	Pinion gear shaft	Carbon steel		⑪	Cylinder cover	Aluminum	
④	Body	Aluminum		⑫	Cylinder	Aluminum	
⑤	Rod packing	Nitril rubber		⑬	Piston	Stainless steel	
⑥	Cylinder gasket	Nitril rubber		⑭	Spring	Stainless steel	
⑦	Piston A	Stainless steel		⑮	Cylinder	Aluminum	
⑧	Piston packing	Nitril rubber		⑯	Magnet	Plastic, Magnet	



6. OPEN-CLOSE CONFIRMATION SWITCH

6-1. Features

1) Proximity Switch
   Service lift is almost infinite, also Open-close load capacity is large.
2) Indicator lamp
   It makes confirmation of actuation or maintenance inspection easy.
3) No restriction regarding to its mounting location
   Its relocation is also carried out easily by just loosening fixing screw.

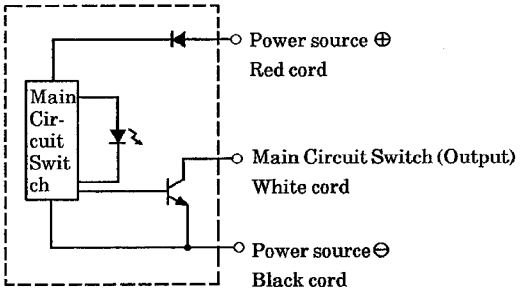
6-2. Specifications of Switch

Model code / Item	S3
Type	Proximity switch
Application	for Programmable controller, Relay, Compact solenoid
Voltage of Source	DC 4.5V~28V
Voltage of Load	Less than DC30V
Current of Load	Less than DC200mA
Indicator Lamp	Red LED is lit while source of power is ON
Kind of Lead cord	Oil resistant Vinyl cabtyre cord, 3-core 0,15mm^2
Working ambient Temperature	5~+60°C
Current Consumption	Less than 15mA
Leak Current	Less than 10μA
Protection structure	IEC Standard IP67 JIS 0920(Splash-proof), Oil Resistant)
Max. Shock	100G
Insulation Resistance	100MΩ on DC500V megger tester
Dielectric Strength	Should withstand for 1 minute under AC 1,000V
Hysteresis (Single Claw)	Below 1.5mm
Mass (w/bracket)	20g

1) Hysteresis
   There is hysteresis to cylinder switch as well as it is to micro switch.
   It is the distance between where switch turns ON while piston moves a certain direction and where the said switch turns OFF as piston reverses its stroke.

6-3. Internal Structure of Switch and Wire Connection

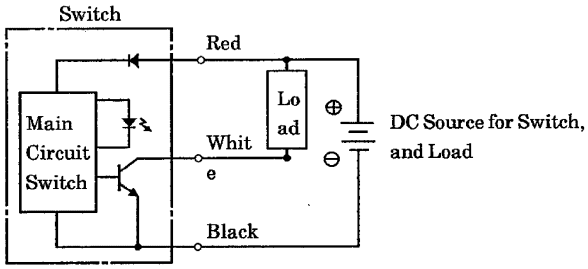
1) Internal Circuit of Switch



[M1-401-B]

2) Wire Connection

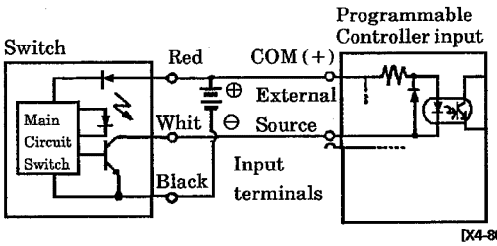
- Basic Circuit



[C2-403-G]

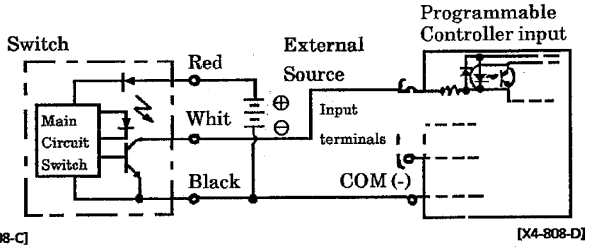
- Example of connection to Programmable controller

(⊕common with external source of power)



[X4-808-C]

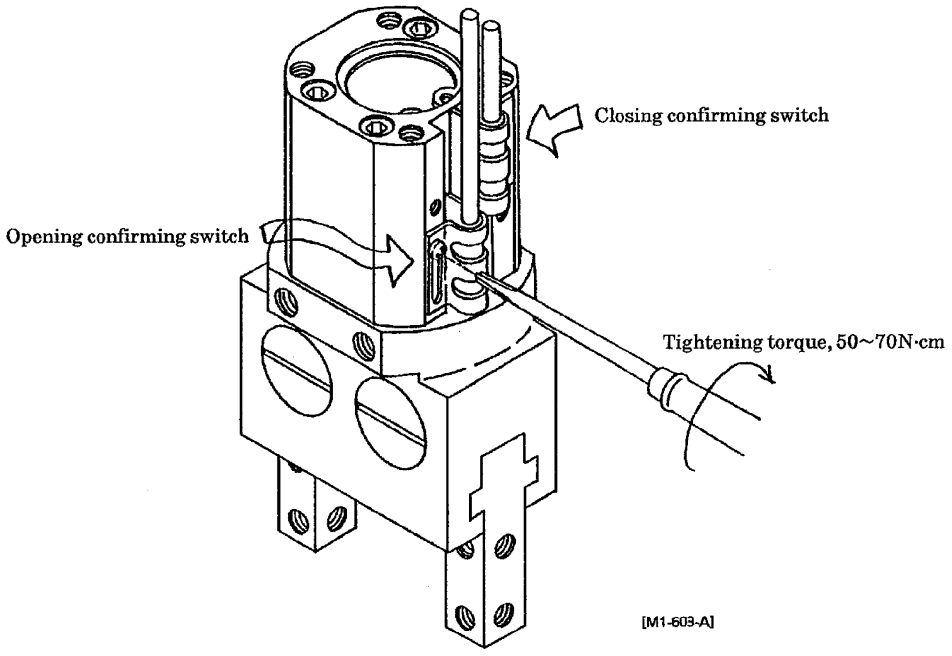
(Com ⊖ with Controller internal source)



[X4-808-D]

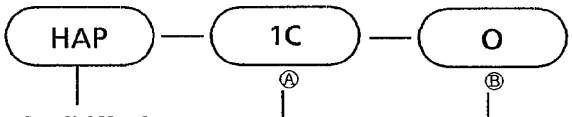
6-4. Switch Adjustment

To adjust the Open-close confirmation Switch, slide the switch first to find the location where Indicator lamp turns ON. Keep sliding the switch for further 0.3 ~ 0.5 further away, then fix the switch at that position.



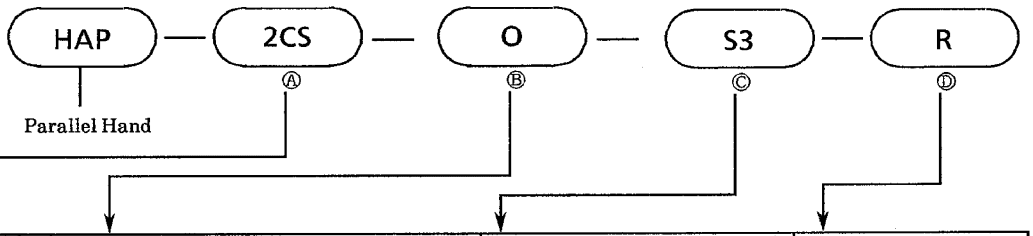
7. MODEL CODE

7-1. Model Code of Product itself



Ⓐ Size	Ⓑ Option	
1C	No symbol	Standard Double action
	O	NO
	C	NC
	Y1	w/small claw Material (S50C)
	Y2	w/small claw Material (MC nylon)

Note : Switch is not available for Model HAP - 1C.



Ⓐ Size	Ⓑ Option		Ⓒ Model code of Switch		Ⓓ Number of Switches	
2CS	No symbol	Standard Double action	S3※	Proximity, 3-core	R	Open side, 1 ea.
3CS			※ Length of Lead cord		H	Close side, 1 ea.
4CS	O	NO	Non marking	1m (Standard)	D	2 ea.
	C	NC	3	3m (Optional)		
	Y1	w/small claw Material (S50C)	5	5m (Optional)		
	Y2	w/small claw Material (MC nylon)				