

INSTRUCTION MANUAL

CRAB TYPE PARALLEL HAND

HFP 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.

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 instruction 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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HFP Series
Crab type Parallel hand
Manual No. SM-8361-A

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NOTE: Letters & figures enclosed within Gothic style bracket (examples such as [C2-4PP07] · [V2-503-B] etc.) are editorial symbols being unrelated with contents of the book.



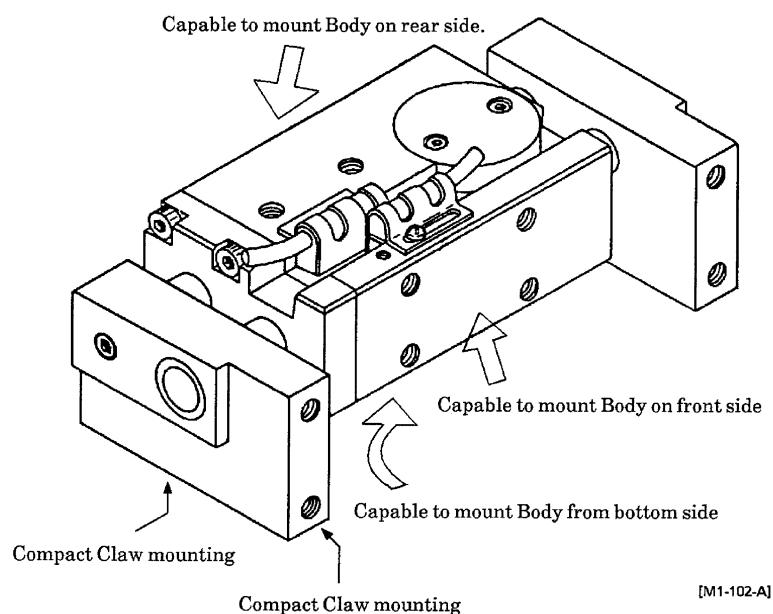
1. PRODUCTS

1.1 Specifications

Model code		HFP - 2CS	HFP - 3CS	HFP - 4CS	HFP - 5CS
Item					
Service Fluid		Compressed air			
Max. Working Pressure	MPa	0.7			
Min. Working Pressure	MPa	0.3			
Ambient Temperature	°C	5 - 60			
Stroke	mm	20	30	40	60
Tube Bore	mm	16	25	32	40
Rod Diameter	mm	10	12	15	18
Volume of Piston one cycle	cm ³	4.9	22.7	50.2	120.3
Repeating accuracy (Initial value)	mm	±0.03	±0.03	±0.03	±0.03
Mass of Equipment	kg	0.61	1.18	2.20	4.12
Lubrication		Not required. (Use Turbine oil, Class 1, ISO VG32 when required.)			

1.2 Features

- 1) Realization of compactization but powerful force output
Improved efficiency by adopting double-cylinder concept
- 2) Capable of Cylinder switch mounting
All models are capable to accommodate up to two switches.
- 3) Easy installation
Designing facility has been made easy due to lay-out freedom such as three sides for mounting body and two sides for mounting compact claw.

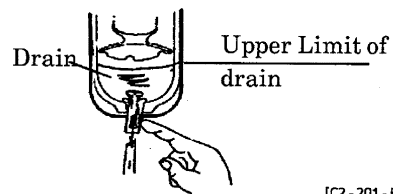
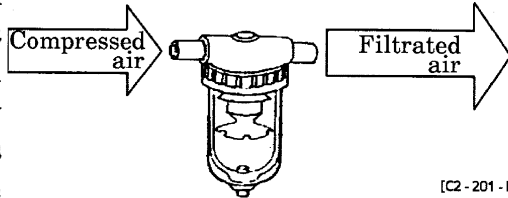




2. CAUTION

2.1 Fluid

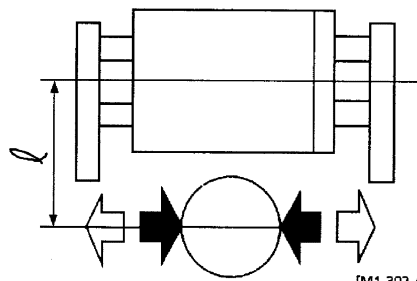
- 1) Use the compressed air, filtrated and dehumidified. Carefully select a filter of an adequate filtration rate ($5\mu\text{m}$ or lower preferred), flow rate and its mounting location (as close to directional control valve as possible).
- 2) Be sure to drain out the accumulation in filter periodically.
- 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.



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.



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

3.2 Guide line of Selecting appropriate model (required holding power) comparing with mass of Load

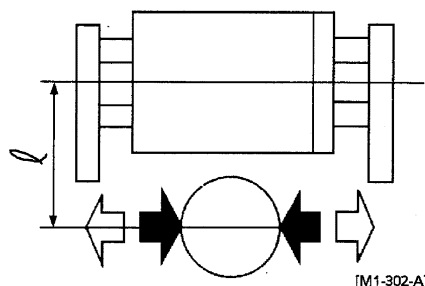
Safety coefficients for holding power against mass of Load are set as follows although it varies depending on Coefficient between Load and Claw, Shape of Load and Claws, transferring condition etc. Make those brief guide line for selecting models.

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

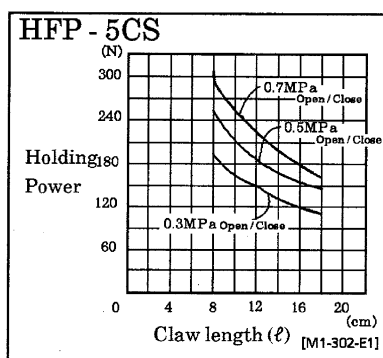
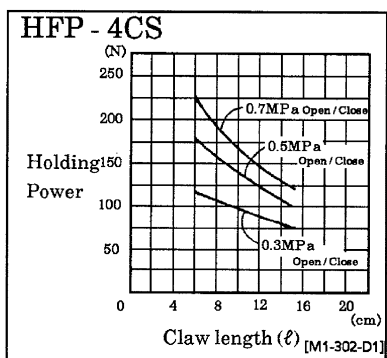
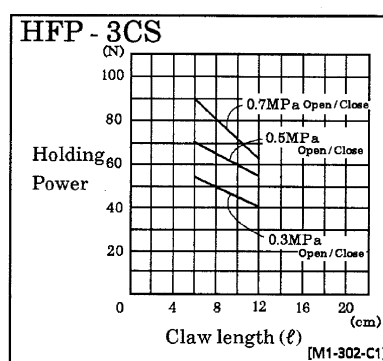
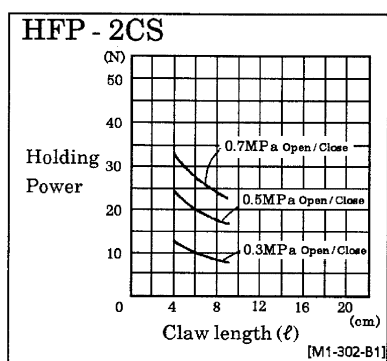
3.3 Data of Holding Power

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 ()
- Closing Motion ()

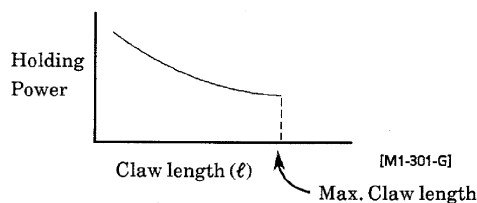


[M1-302-A]



3.4 Length of Claws

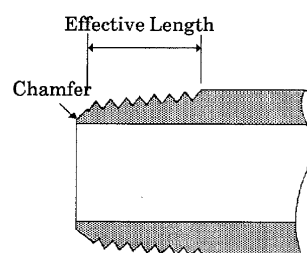
- 1) Make it short and light as much as possible because abrasion wear of moving parts of Master Jaw will be accelerated if claws are long and heavy.
- 2) Keep the claw length within the range of Tables above.



4. INSTALLATION

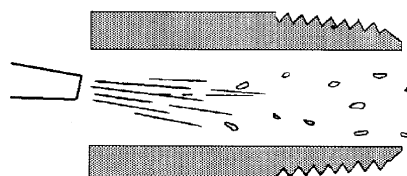
4.1 Piping

- 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.



[CO-400-A]

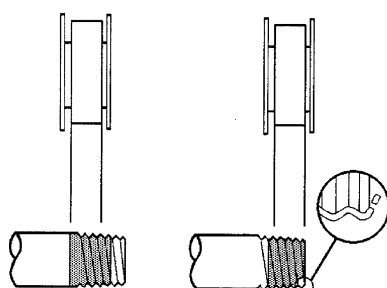
- 5) Flush air into the pipe to blow out foreign substances and chips before piping.



[CO-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.

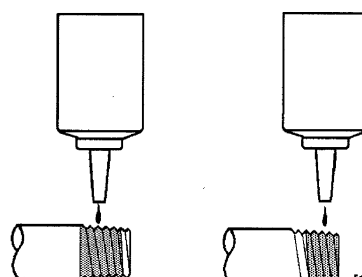
● Seal Tape



Correct

Incorrect

● Sealant (Paste or liquid)



Correct

Incorrect

[CO-400-C]

4 INSTALLATION

4.2 Installation

1) Ambient Temperature

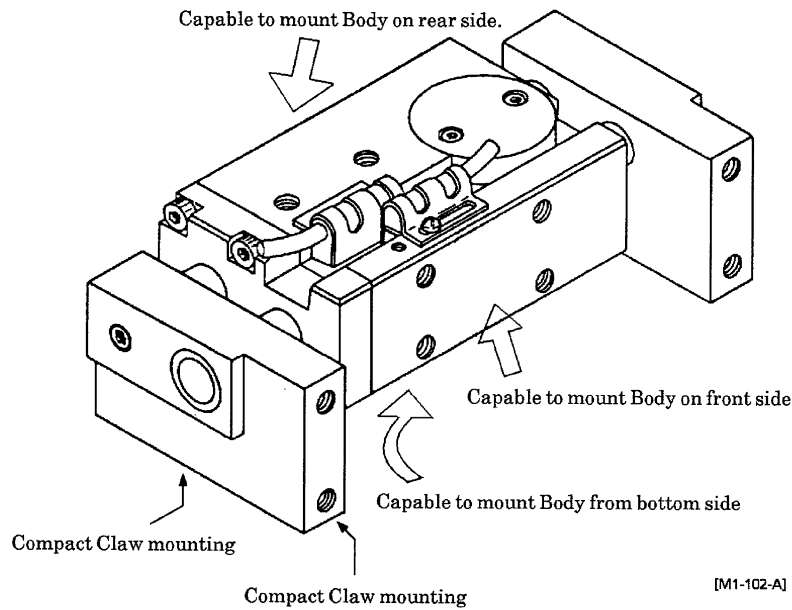
- The range of temperature is 5 - 60°C which the hand of this type is serviceable.

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.

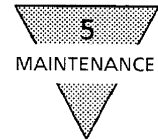
3) Installation of Body

- Three sides of hand are available to have body mounted. Select appropriate side to mount it depending upon the application of system.



● Thread diameter and depth of Body mounting bolt

Model	Diameter of thread and depth
HFP - 2CS	M4 Depth 8
HFP - 3CS	M5 Depth 9
HFP - 4CS	M6 Depth 10
HFP - 5CS	M8 Depth 12



5. MAINTENANCE

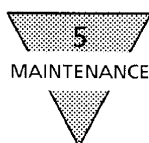
5.1 Periodic Inspection

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 to rubbing 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.



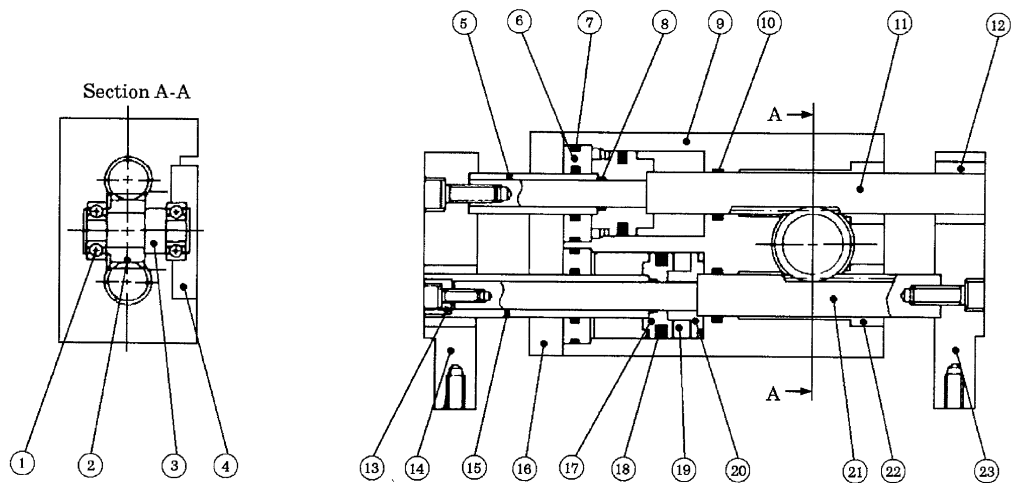
5.2 Trouble Shooting

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

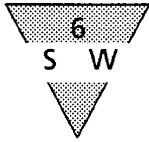
1) Internal Structure



[M1-502-A]

2) Parts List

No.	Parts	Material	Remarks	No.	Parts	Material	Remarks
①	Bearing	Carbon steel		⑬	Washer	Carbon steel	
②	Pinion gear	Carbon steel		⑭	Master jaw A	Aluminum	
③	Pinion gear shaft	Carbon steel		⑮	Sleeve B	Stainless Steel	
④	Bearing cover	Aluminum		⑯	Side cover	Aluminum	
⑤	Sleeve A	Stainless Steel		⑰	Piston A	Aluminum	
⑥	Packing housing	Aluminum		⑱	Piston packing	Nitril rubber	
⑦	Side seal	Nitril rubber		⑲	Magnet	Plastic, Magnet	
⑧	Seal	Nitril rubber		⑳	Piston B	Aluminum	
⑨	Body	Aluminum		㉑	Piston rod B	Stainless Steel	
⑩	Rod packing	Nitril rubber		㉒	Bushing	Special alloy	
⑪	Piston rod A	Stainless Steel		㉓	Master jaw B	Aluminum	SPBBushing
⑫	Bushing	Special alloy	SPBBushing				



6. OPEN-CLOSE CONFIRMATION SWITCH

6.1 Features

- 1) Proximity Switch
Service life 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	S3
Item	
Type	Proximity switch
Application	for Programmable controller, Relay, Compact solenoid
Voltage of Source	DC 4.5V - 28V
Voltage of Load	Below DC30V
Current of Load	Below DC200mA
Indicator Lamp	Red LED is lit while source of power is ON
Kind of Lead cord	Oil resistant Vinyl cap cord, 3-core 0,15mm ²
Working ambient Temperature	- 10 - + 60°C
Current Consumption	Below 15mA
Leak Current	Below 10 μ A
Protection structure	IEC Standard IP67 JIS 0920(Splash-proof), Oil Resistant)
Max. Shock	100G
Insulation Resistance	100M Ω on Pd500V megger tester
Dielectric Strength	Should withstand for 1 minute under AC 1,000V
Hysteresis (Single Claw)	Below 1.5mm
Mass (w/bracket)	20g

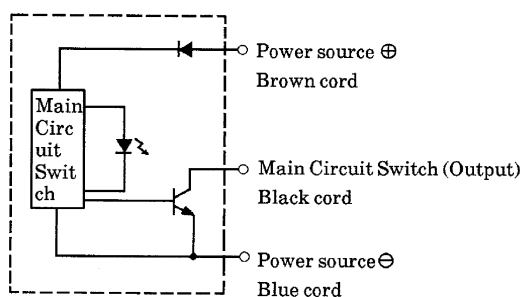
1) Hysteresis

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

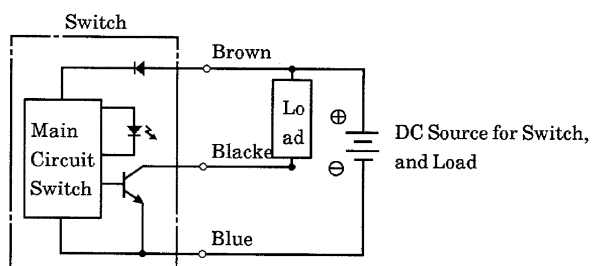
1) Internal Circuit of Switch



[M1-401-B]

2) Wire Connection

• Basic Circuit

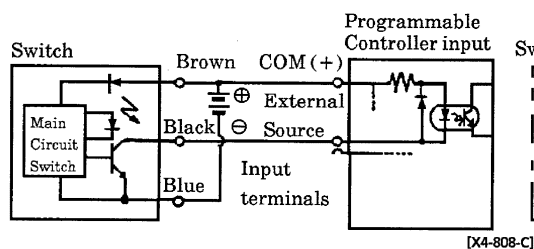


[C2-403-G]

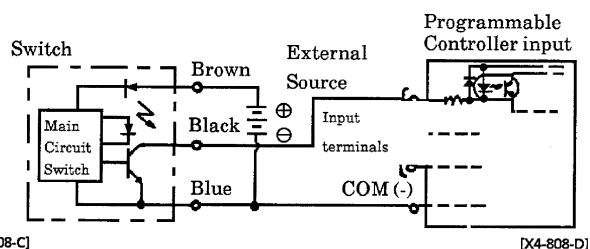
• Example of connection to Programmable controller

(⊕ common with external source of power)

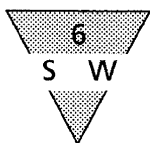
(Com ⊖ with Controller internal source)



[X4-808-C]

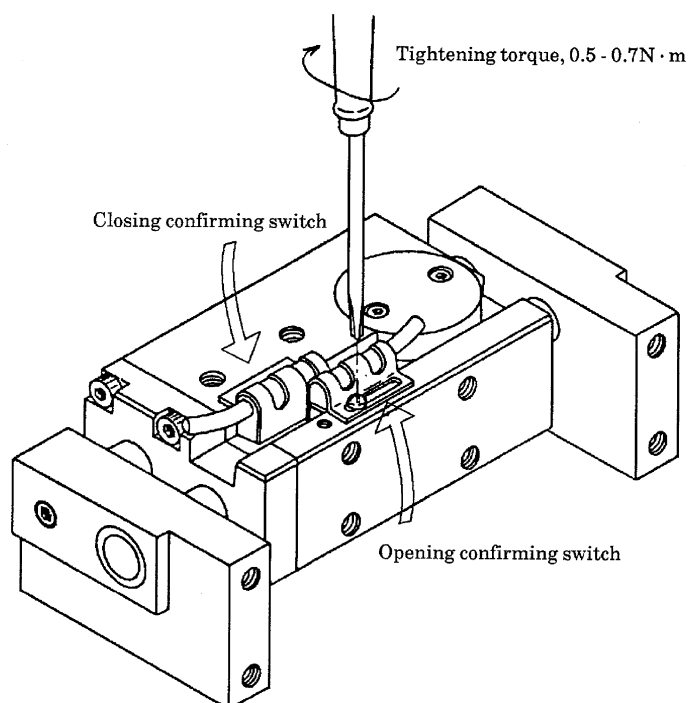


[X4-808-D]



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.



[M1-602-A]

7. HOW TO ORDER

7.1 Model Code of Product itself

