SM－8154-A

CKD

INSTRUCTION MANUAL

BEARING PARALLEL HAND

HEP 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 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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SM 8154-A

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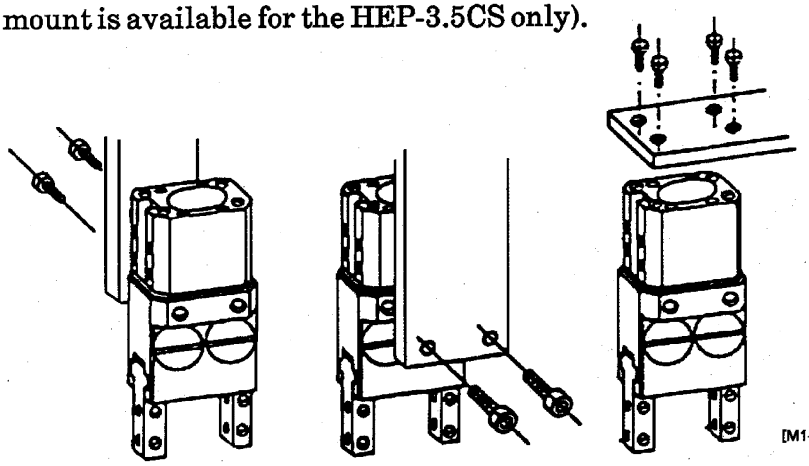
1. PRODUCT

1.1. Specifications

Model / Item	HEP-3.5CS	HEP-4CS	HEP-5CS	HEP-6CS	HEP-7CS
Operation fluid	Compressed air				
Max. operation pressure MPa	0.7				
Min. operation pressure MPa	0.3				
Ambient temperature (°C)	5~60				
Stroke (mm)	24	36	40	50	60
Cylinder bore (mm)	32	50	63	80	100
Rod diameter (mm)	14	20	24	28	30
Back-forth capacity (cm^3)	17.5	65.0	115.6	236	450
Repetition precision (initial value) (mm)	±0.03	±0.03	±0.03	±0.03	±0.03
Product weight (kg)	1.2	3.2	4.7	7.8	11.7
Lubrication	Unnecessary (use class 1 turbine oil ISO VG32 if necessary)				

1.2. Features

1) Shielded bearing guide for higher durability
   - The bearing guide is shielded to keep off dust, which improves the durability.
2) Compact and light weight
   - Although the body of the product is compact and light weight for easy handling, the hand exerts strong grabbing power.
3) Cylinder switch mountable
   - Up to two non-contact switches can be attached to each of the models.
4) 3-direction mounting
   - The product can be installed in three different ways--back, front and axis-wise--contributing to greater freedom in equipment designing (axis-wise mount is available for the HEP-3.5CS only).

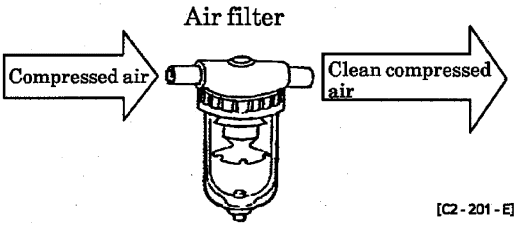


Back mount　　Front mount　　Axis-wise mount

2. CAUTION

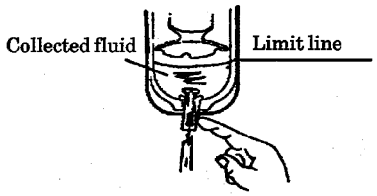
2.1. Operation fluid

1) To obtain clean and dry air, make the compressed air go through an air filter first. In installing the filter within the circuit, take the following into consideration: filtering ability (5 microns or smaller desirable), fluid volume, and installation position (near the direction-control valve).



[C2-201-E]

2) Drain the fluid regularly that has collected in the filter before the fluid level exceeds the limit line.



[C2-201-F]

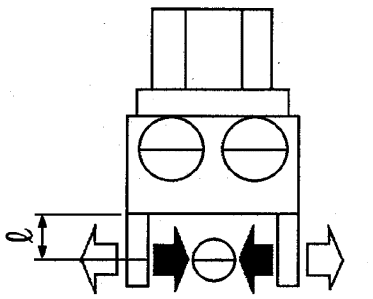
3) Make sure that the adequate maintenance and inspection of the compressor are carried out to ensure that the circuit is free from compressor oil carbide (carbon or tar-like material). The presence of carbide causes the electromagnetic valve and cylinder to malfunction.

4) The hand does not require additional lubrication. If lubrication becomes necessary, use class 1 turbine oil ISO VG32.

3. GRABBING POWER

3.1. Grabbing power and work weight

1) The data regarding the grabbing ability of the hand show the forces that apply to the work when the claws open and when they close at the claw length of l. The figures of the data do not represent the weight of a work that can be clamped.
2) The grabbing power significantly changes affected by the following conditions.
   - Friction coefficient between the work and the claws.
   - The force of inertia that applies to the work while it is being moved.
   - Distance between the clamping position and the center of the work, and the width of the claws.
   - Structure and shape of the claws.



[M1-301-A]

3.2. Model selection (required grabbing power) in relation to work weight

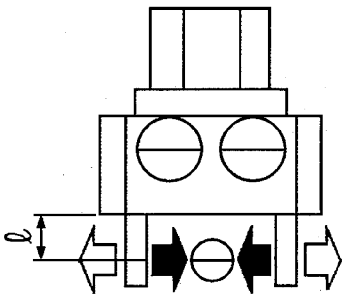
Just how much grabbing power is needed in relation to work weight depends on such factors as the work-claw coefficient, claw and work shapes and how the work is moved. The following figures are provided as a reference.

- Holding only — At least 5 times the work weight
- Normal carrying — At least 10 times the work weight
- Rapid acceleration — At least 20 times the work weight

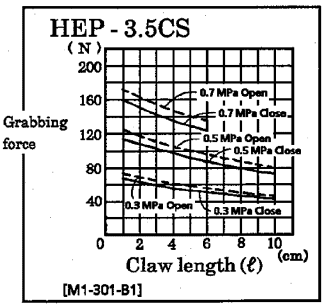
3.3. Data on grabbing ability of the hand

The following graphs show how the grabbing force changes when the claws open and close when the supply pressure is 0.3MPa, 0.5MPa, and 0.7MPa (at the claw length of ℓ cm).

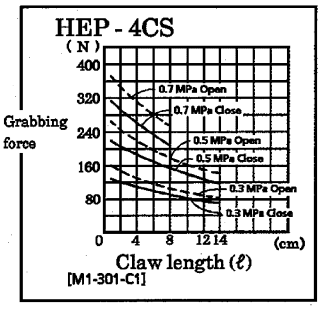
- Open direction (⇦) ····· (broken lines)
- Close direction (⇨) —— (solid lines)



[M1-301-H]



[M1-301-B1]



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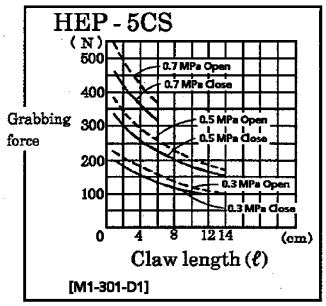

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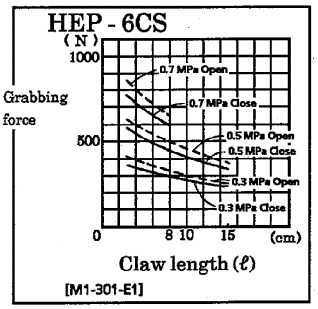
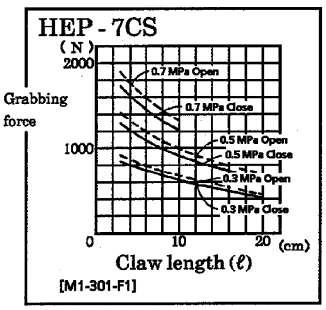


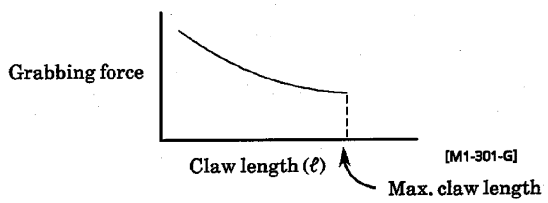
[M1-301-E1]



[M1-301-F1]

3.4. Claw length

1) The claw should be short and light as much as possible. A long and heavy claw quickens the wearing of the sliding part of the master jaw.
2) Be sure that the length of the claw is within the range of the performance data.

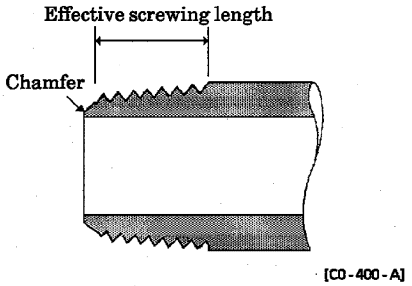


[M1-301-G]

4. INSTALLATION

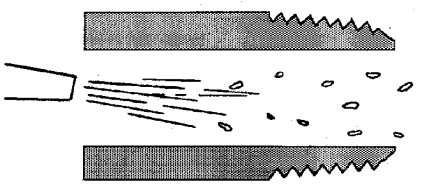
4.1. Piping

1) Be sure that the pipes and tubes in the circuit after the filter are of galvanized metal, nylon, rubber or other non-corrosive materials.
2) The pipe connecting the cylinder and the electromagnetic valve should have an effective cross-sectional area that allows the cylinder piston to move with the required speed.
3) Install the filter for removing rust, foreign matters or drain the fluid from inside the pipe as near the electromagnetic valve as possible.
4) Be sure that the gas pipe has the effective screwing length as shown in the drawing. The screw end should also have a 1/2-pitch chamfer.

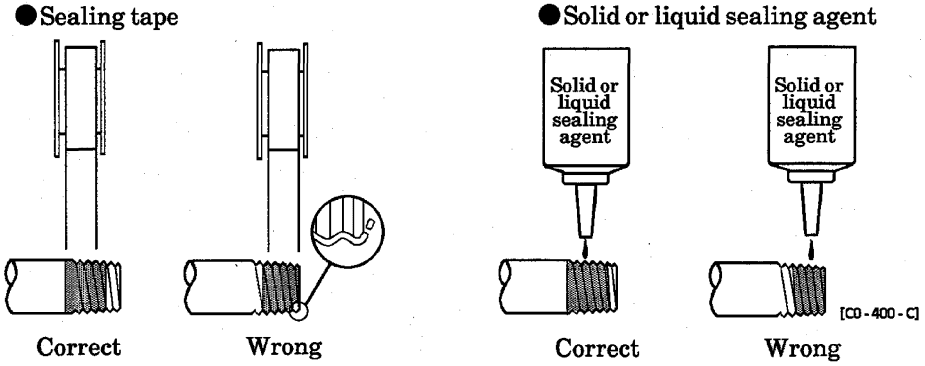


[C0-400-A]

5) Before connecting the pipe, be sure to flash it (air blow) in order to remove chips and other foreign matters from the inside.


[C0-400-B]

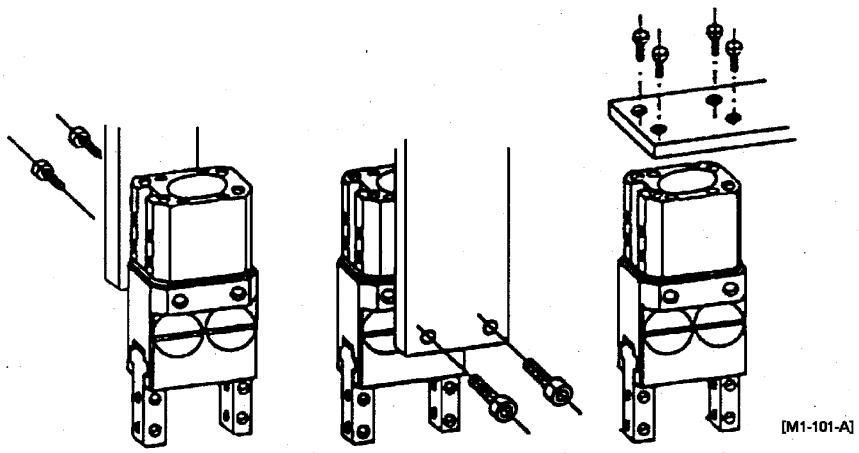
6) Sealing tape or a sealing agent is used for piping. Be sure to leave two threads from the end of the pipe as shown in the drawings so as to prevent fragments of the tape or the agent from entering the pipe or the equipment.



[C0-400-C]

4.2. Installation

1) Ambient temperature
   - The hand is operable within a 5~60°C range of the surrounding temperature.
2) Operation environment
   - Protect the product with a cover or some other means for use in a place where there are water dripping, oil splashes or a lot of dust.
3) Mounting
   - The hand can be mounted in three different ways--back, front, and axis-wise (available for only the HEP-3.5CS). Chose the mounting direction to suit the applications.

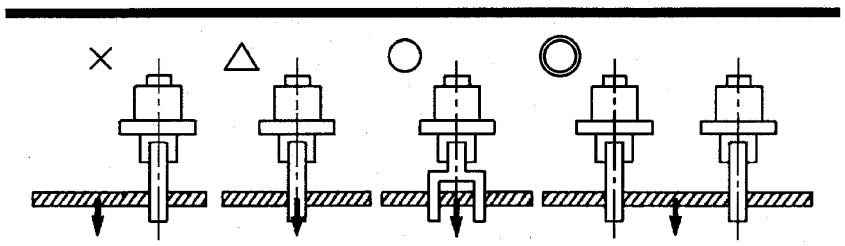


- Screw diameter and depth

Model	Screw diameter and depth
HEP - 3.5CS	M6, 12-mm deep
HEP - 4CS	M8, 12-mm deep
HEP - 5CS	M10, 15-mm deep
HEP - 6CS	M10, 16-mm deep
HEP - 7CS	M10, 16-mm deep

4) When grabbing a long object

· To grab a relatively long object with stability, the general principle is to hold it at the center of gravity. It often helps to use two or more sets of hands for increased stability.



[M1-401-A]

5) Others

· Please consult us in advance if the user wishes to modify the product after it has been purchased. Incorrect machining may cause malfunction, air leakage or other troubles.

5. MAINTENANCE

5.1. Regular check

To maintain the hand and chuck in excellent condition, it is recommended that they be checked every half a year or every 50,000 times of use.

1) Check items
   (1) Greasing of the sliding sections
   (2) Smooth movement
   (3) Air leak
   (4) Loose bolts
   (5) Too much play of the master jaw
   (6) Operation stroke

If any problems are detected, read 5.2. Troubles and Corrective Measures and implement proper remedies. Fasten any loose sections if there are any.

5.2. Troubles and Corrective Measures

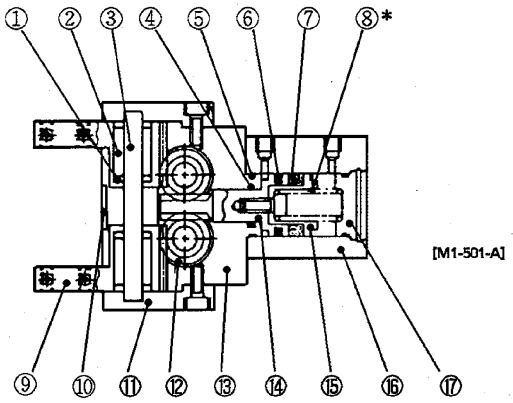
Troubles	Causes	Measures
Does not operate	Absence or lack of pressure	Secure a pressure source
	No signal for the direction control valve	Correct the control circuit
	Damaged parts	Refer to damage, distortion in the manual
	Damaged packing	Replace the cylinder
Jerky movement	Lack of pressure	Secure a pressure source
	Chips or dust bite	Disassemble and clean, remove chips
	Damaged packing	Replace the cylinder
Damage, distortion	Claw is too heavy	Lighten the claw
	Claw is too long	Shorten the claw
	Too high operating pressure	Reduce the pressure
	External load	1) Deflect the load 2) Reexamine the model and its use

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. Inner structure, parts list

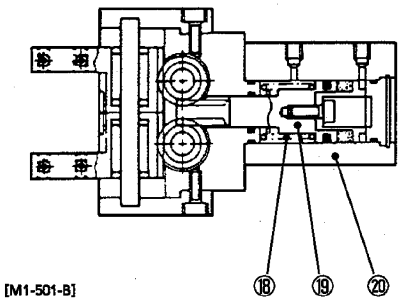
· Inner structure

Standard type (double acting), O type (single acting: normal open)



※ Standard type (double acting) does not have the spring ⑧.

C type (single acting: normal close)



· Parts list

Parts No.	Parts name	Material	Note
①	Felt seal		
②	Bearing	Steel	
③	Guide rod	High carbon chromium bearing	
④	Rod packing	Nitrile rubber	
⑤	Cylinder gasket	Nitrile rubber	
⑥	Piston packing	Nitrile rubber	
⑦	Magnet	Plastic magnet	
⑧	Spring	Piano wire	Type O only
⑨	Master jaw	Carbon steel	
⑩	Center cover	Carbon steel	

Parts No.	Parts name	Material	Note
⑪	Side cover	Aluminum alloy	
⑫	Pinion gear	Carbon steel	
⑬	Body	Aluminum alloy	
⑭	Piston A	Stainless steel	
⑮	Piston B	Stainless steel	
⑯	Cylinder	Aluminum alloy	
⑰	Cylinder cover	Aluminum alloy	
⑱	Spring	Stainless wire	Type C only
⑲	Piston	Stainless wire	Type C only
⑳	Cylinder	Aluminum alloy	Type C only

6. OPEN/CLOSE CHECK SWITCH

6.1. Features

- Non-contact switch
  The life of the switch is semi-eternal, and it has large load open/close capacity.
- Indicator lamp
  With the indicator lamp, the function of the switch can easily be checked. Its maintenance is also easy.
- Free switch installation position
  The installation position of the switch can easily be changed simply by loosening the screw.

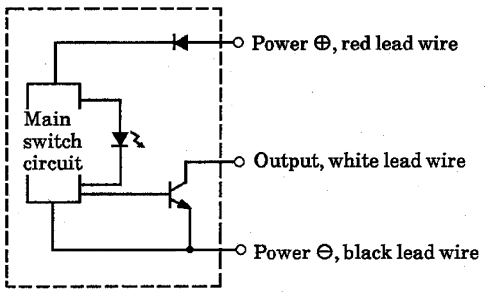
6.2. Specifications

Model / Item	S3
Switch type	Non-contact
Application	Programmable controller, relay, IC circuit, small electromagnetic valve
Power voltage	DC 4.5V~28V
Load voltage	DC30V or less
Load current	DC200mA or less
Indicator lamp	Red emitting diode comes on with power on
Lead wire type	Oil-resistant vinyl cabtire cord, 3-core, 0.15mm^2
Operation ambient temperature	−10~+60°C
Current consumption	15mA or less
Leak current	10 micro-amperes or less
Protective measure	IEC standard IP67 JISC0920 (water tight), oil-resistant
Max. impact	100G
Insulation resistance	100MΩ by Pd500V megger
Insulation withstand voltage	Should be no problem after AC1000V for 1 min.
Hysteresis (half claw)	1.5mm or less
Weight (with metal fittings)	20g

- Hysteresis
  The cylinder switch, just like the micro switch, has a hysteresis, which is defined as a distance between the point at which the switch is turned on after the piston moved, and the point when the switch is turned off after the piston moved in the opposite direction.

6.3. Switch inner circuit and wiring

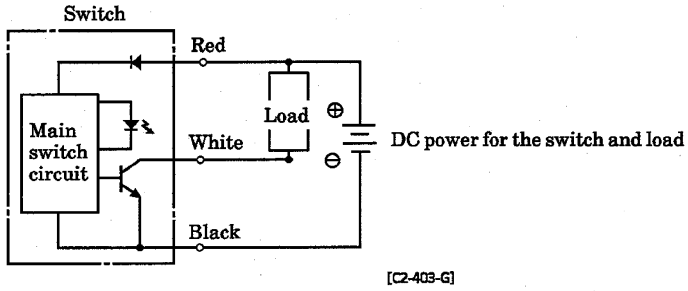
1) Switch inner circuit



[M1-401-B]

2) Wiring

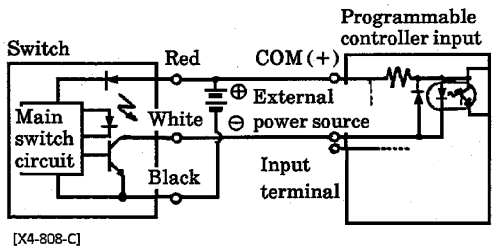
· Basic circuit



[C2-403-G]

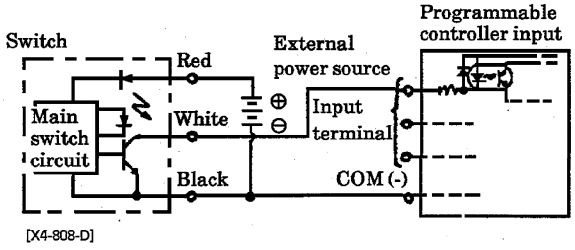
· Linking to programmable controller

(external power source, plus common)



[X4-808-C]

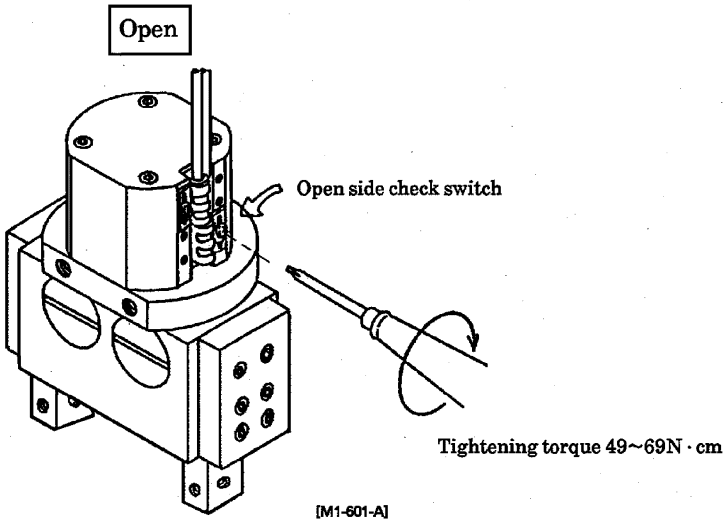
(power source inside controller, minus common)



[X4-808-D]

6.4. Adjustment of the switch

To adjust the open/close check switch, first move the switch until the indicator lamp comes on. Next, move the switch 0.3~0.5mm further beyond that point and fasten it there.



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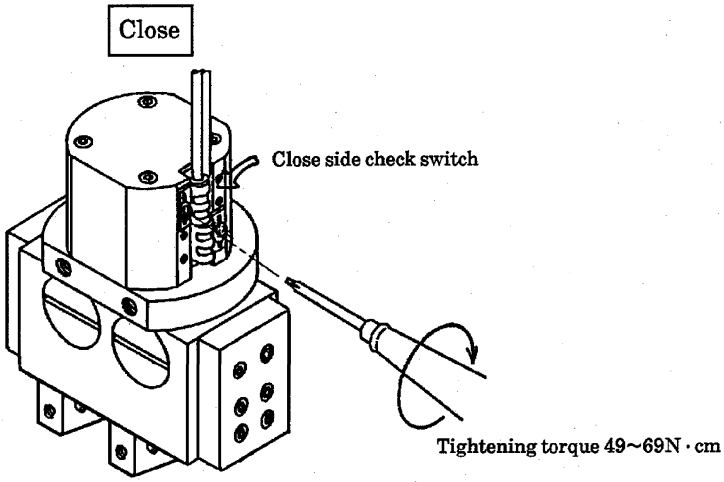
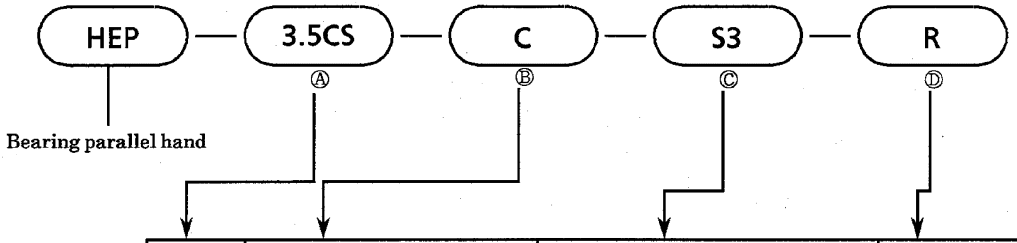


[M1-601-B]

7. HOW TO ORDER

7.1. Model marking of the hand



Ⓐ Size	Ⓑ Option		Ⓒ Switch model		Ⓓ No. of switches	
3.5CS	O	Normal open	S3※	Non-contact, 3 wires	R	One, open side
4 CS	C	Normal close	※Lead wire length		H	One, close side
5 CS	Y1	With sub-claw, material (S50C)	No marking	1m (standard)	D	Two
6 CS			3	3m (option)		
7 CS	Y2	With sub-claw, material (MC nylon)	5	5m (option)		