CKD

SM－244258－A

INSTRUCTION MANUAL

CROSS ROLLER PARALLEL HAND

BHG 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

The 3rd edition

For Safety Use

To use this product safety, 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 applications, 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:

⚠ CAUTION :

- 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 connection (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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BHG Series
Cross roller parallel hand
Manual No. SM-244258-A

Jan. 21. 1998
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1. PRODUCT

1.1 Specifications

Model / Item		BHG-01CS	BHG-03CS	BHG-04CS	BHG-05CS
Working fluid		Compressed air			
Max. working pressure	MPa	0.7			
Min. working pressure	MPa	0.1 (0.3 for O and C types)			
Ambient temperature	℃	5 to 60			
Operational stroke length	mm	5	9	11	15
Cylinder bore size	mm	ϕ 12	ϕ 16	ϕ 20	ϕ 25
Repeatability (Initial valve)	mm	±0.01	±0.01	±0.01	±0.01
Product weight	g	110	160	280	480
Lubrication		Not required (Use Turbine oil, Class 1, ISO VG32 when required.)			

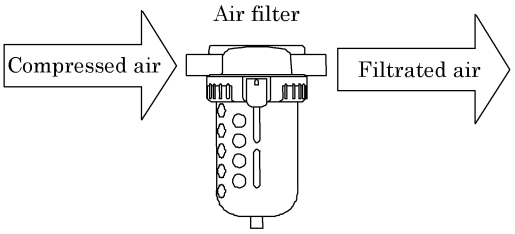
1.2 Characteristics of Unit

1) A rubber cover (standard item) provides the unit with a higher level of environmental resistance.
   A rubber cover shuts out chips of 1 mm or larger, providing the unit with a higher level of environmental resistance.
2) A cross roller guide ensures extremely accurate and smooth movements.
   The slide unit uses a cross roller bearing mechanism, which ensures extremely accurate and smooth movements.
3) Compact and highly rigid.
   An overlap & long holding mechanism makes the slide unit compact and enables it to bear larger moment loads.

2. CAUTION

2.1 Fluid

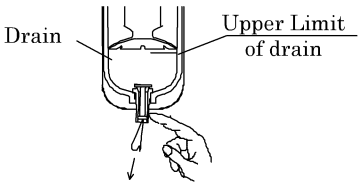
1) Use the compressed air, filtrated and dehumidified. Carefully select a filter of an adequate filtration rate (preferably 5 μm or less), flow rate and its mounting location (as closest to directional control valve as possible).



2) Be sure to drain out the accumulation in filter periodically before the level exceeds the mark line.

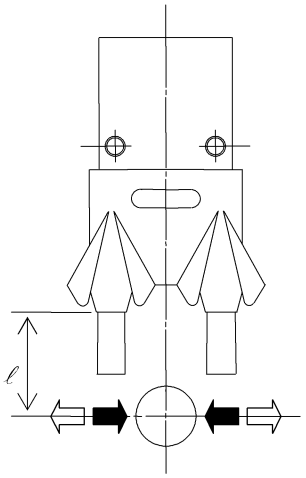
3) Note that the intrusion of carbide for the compressor oil (such as carbon or tarry substance) into the circuit causes malfunction of the solenoid valve and the cylinder. Be sure to carry out thorough inspection and maintenance of the compressor.

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



3. GRIPPING POWER

3.1 Gripping Power and Mass of Load



1) The table of Gripping 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 grip.

2) Required gripping 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 gripping 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 lines for selecting models.

- Holding only — W : (F × N) = 1 : 5
- Normal transference — W : (F × N) = 1 : 10
- Transference with high acceleration — W : (F × N) = 1 : 20

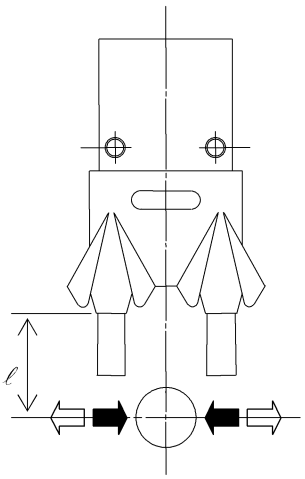
N : Number of claws

3.3 Data of Clumping Power

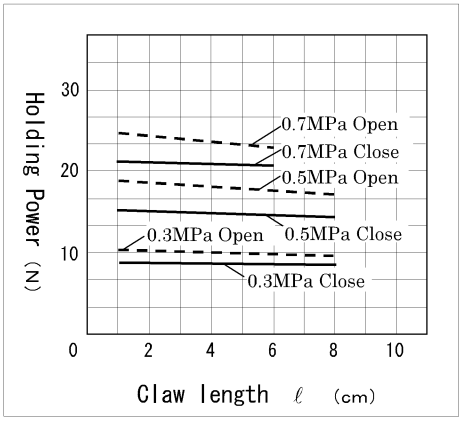
The following Tables represent the Gripping power in either opening motion or closing motion with Claw length ℓ of hand at 0.3, 0.5 & 0.7MPa of Supplying pressure.

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

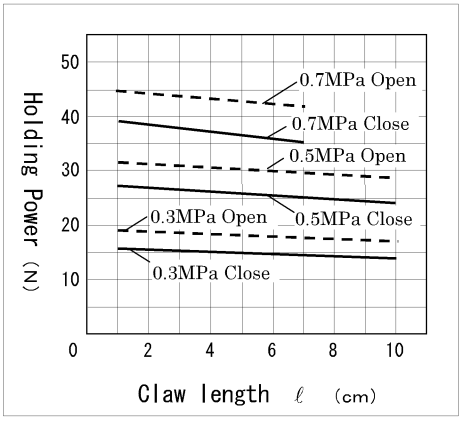
(Note) Clumping power of O type, in the closing way, falls 20 to 30% lower than that of double acting type.
Clumping power of C type, in the opening way, falls 10 to 20% lower than that of double acting type.



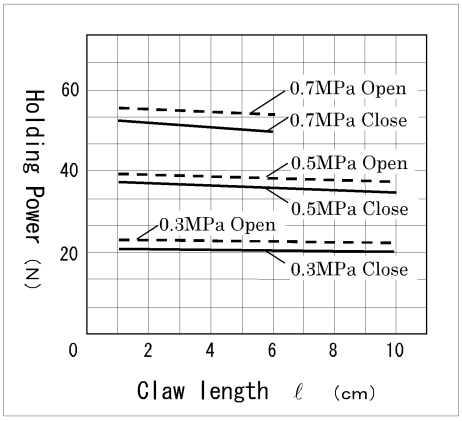
●BHG-01CS



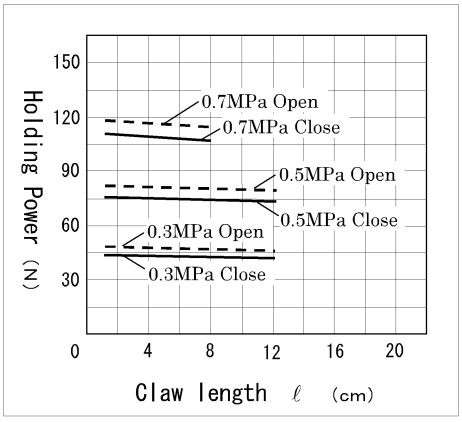
●BHG-03CS



●BHG-04CS



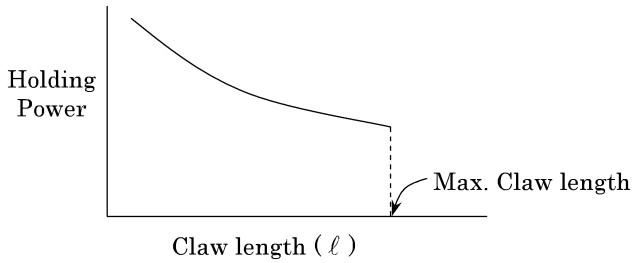
●BHG-05CS



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 to Tables above.



3) The weight of the claws affects the life of the unit. Maintain the following relationship:

W < 1/4H (one product) W : Weight of claws
H : Product weight of BHG

4. INSTALLATION

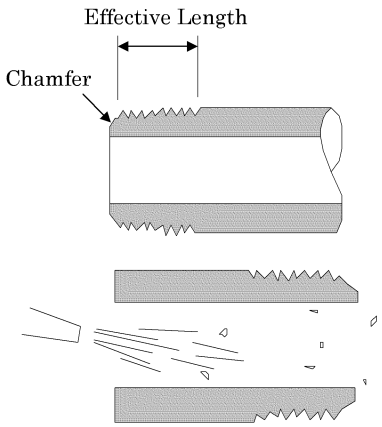
4.1 Piping

1) For piping beyond the filter, use pipes that are tough against corrosion such as galvanized pipes, nylon tubes, rubber tubes, etc.

2) See to it that the pipe connecting hand and solenoid valve has effective cross-sectional area which is needed for the hand to drive at the specified speed.

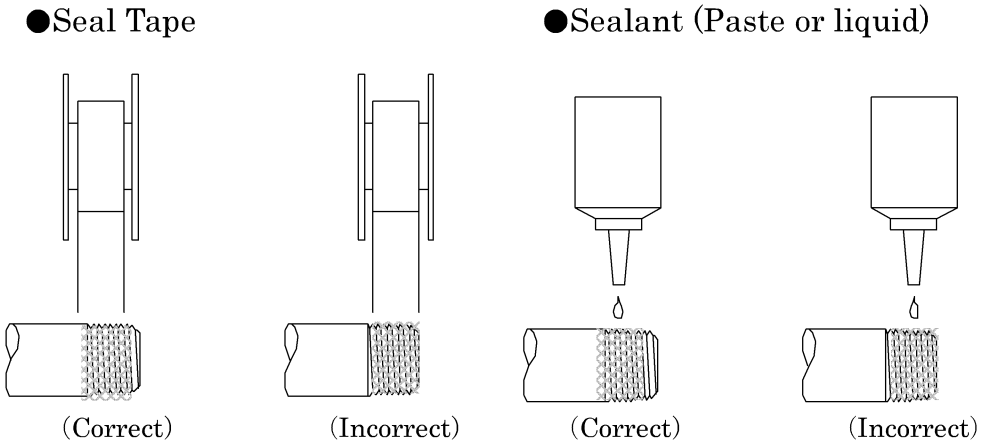
3) Install filter preferably adjacent to the upper-stream to the solenoid valve for eliminating rust, foreign substance in the drain of the pipe.

4) Be sure observe the effective thread length of gas pipe and give a chamfer of approx. 1/2 pitch from the threaded end.



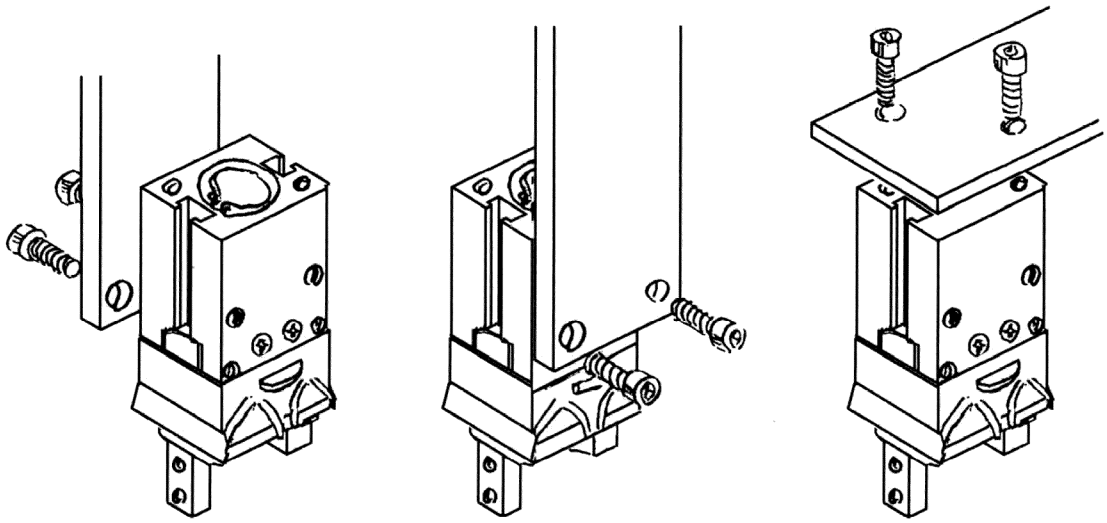
5) Flush air into the pipe to blow out foreign substances and chips before piping.

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



4.2 Installation

1) Ambient Temperature
   - The range of temperature is 5 to 60℃ where the hand of this type is serviceable.
2) Environmental Condition
   - The unit shuts out chips of 1mm or larger with the rubber cover. However, the cover and the surrounding components must be protected from exposure to water drops, oil, etc.
3) Installation of Body
   - Body mounting from either one of three sides is available. Select appropriate side to mount it depending upon the application of system.



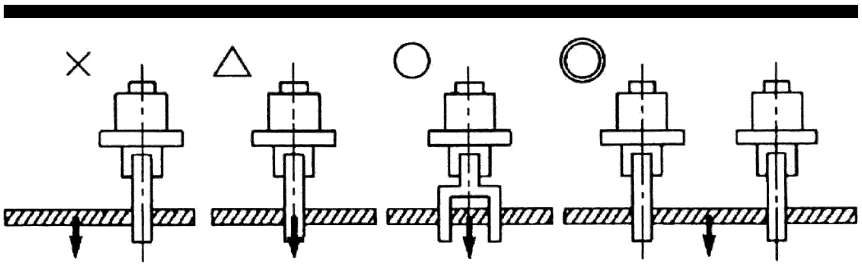
Rear mounting　　Front mounting　　Top end mounting

4) Thread diameter and depth of Body mounting bolt hole

Model	Diameter and Depth of threaded hole	
	Rear or front mounting	Top end mounting
BHG-01CS	M3, Depth 7	M3, Depth 7
BHG-03CS	M4, Depth 7	M4, Depth 8
BHG-04CS	M5, Depth 8	M5, Depth 8
BHG-05CS	M6, Depth 10	M6, Depth 10

5) In case of handling long material

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



6) 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.

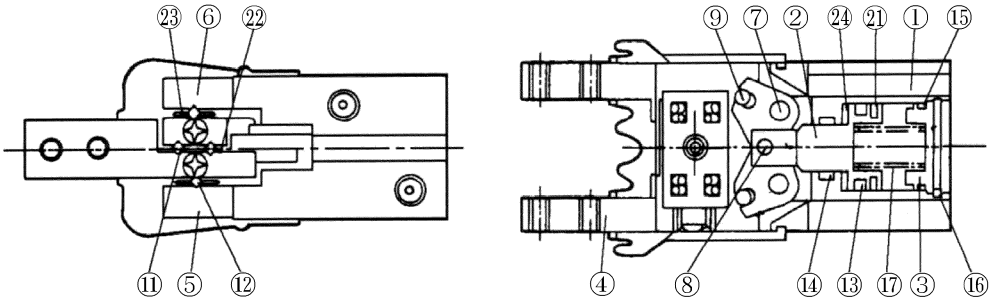
1) Inspection items
   (1) Apply grease to sliding portion.
   (2) Check whether its operation is smooth.
   (3) Check for any air leakage.
   (4) Check for any slackened bolts
   (5) Check for any play to master jaws.
   (6) Check if there is any abnormal stroke.

See 5.2, “Trouble shooting” , should there be any trouble found, also carry out additional tightening if bolts, nuts, etc. are slackened.

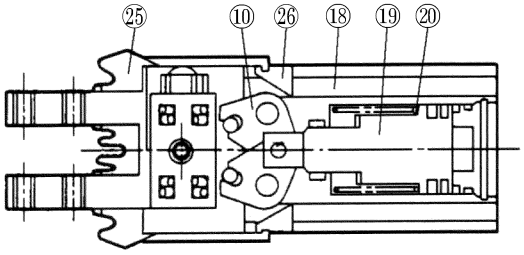
5.2 Internal Structure and Lists of Parts and Packings

1) Internal Structure

Standard (Double acting), O type (Single acting: Normally Open type)



C type (Single acting: Normally Close type)



2) Parts List

No spring ⑰, is used for standard (double acting) hands.

No.	Name of parts	Material	Note	No.	Name of parts	Material	Note
1	Body	Aluminum		14	Rod packing	Nitrile rubber	
2	Piston	Stainless steel		15	Cylinder gasket	Nitrile rubber	
3	Cylinder cover	Aluminum		16	Snap ring		
4	Master jaw	Carbon steel		17	Spring	Stainless steel wire	For O type only
5	Bearing guide A	Carbon steel		18	Body	Aluminum	
6	Bearing guide B	Carbon steel		19	Piston	Stainless steel	
7	Fulcrum shaft	Carbon steel		20	Spring	Stainless steel wire	
8	Function shaft A	Carbon steel		21	Magnet		
9	Function shaft B	Carbon steel		22	Retainer A		
10	Arm	Carbon steel		23	Retainer B		
11	Cross roller A			24	Cushion		
12	Cross roller B			25	Rubber cover	Rubber	
13	Piston packing			26	Hardware	Aluminum	

6. OPEN-CLOSE CONFIRMATION SWITCH

6.1 Features

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

6.2 Specifications of Switch

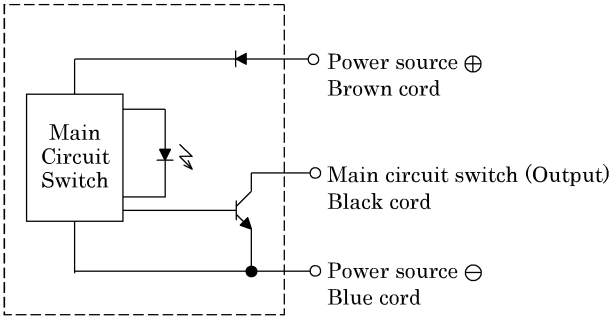
Mode / Item	T2H-T2V	T3H-T3V
Type	Solid state switch	
Applications	Exclusively for Programmable controller	For Programmable controller or Relay
Power supply voltage	—	DC10V to DC28V
Load voltage	DC10V to DC30V	DC30V or lower
Load current	5 to 20mA (Note 1)	100mA or lower
Indicator light	LED(ON lighting)	
Kind of lead wire	Oil-resistant PVC insulated and cabtyre cable, 2-cord 0.2mm^2	Oil-resistant PVC insulated and cabtyre cable, 3-cord 0.2mm^2
Ambient temperature	-10 to 60℃	
Current consumption	—	10mA or less at DC24V (When power is ON)
Leakage current	1mA or lower	10 μA or lower
Degree of protection	IEC Standard IP67 JISC0920 (water tight type), Oil resistance	
Shock resistance	980m/s^2	
Insulation resistance	20MΩ on DC500V megger tester	
Withstand voltage	Should withstand for 1 minute under AC1,000V	
Hysteresis (Single claw)	1.0mm or less	
Weight of unit with attachment	20g	

Note1 : Maximum value of load current specified as above is at 25℃. The value falls lower when ambient temperature of switch raises higher than 25℃.
(Example: 5mA to 10mA at 60℃ for T2 type.)

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

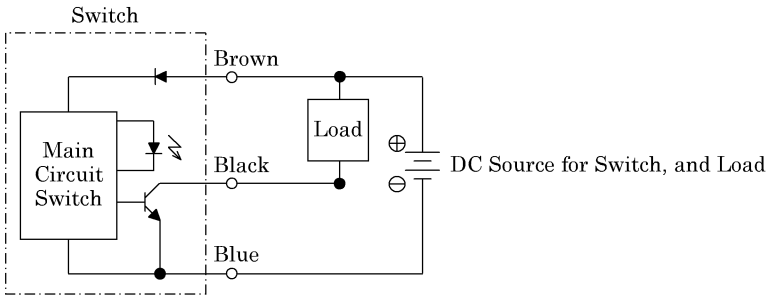
6.3 Internal Structure of Switch and Wire Connection

1) Internal Circuit Switch

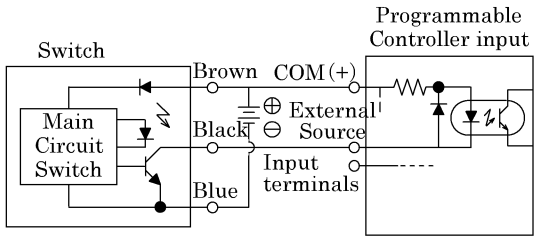


2) Wire Connection

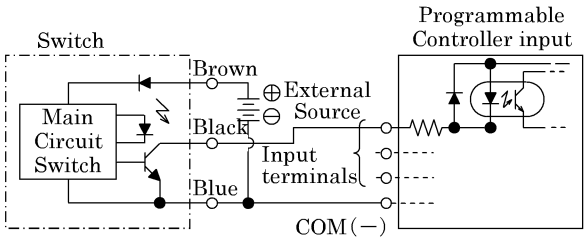
● Basic Circuit



● Example of connection to Programmable controller
(⊕commom with external source of power)

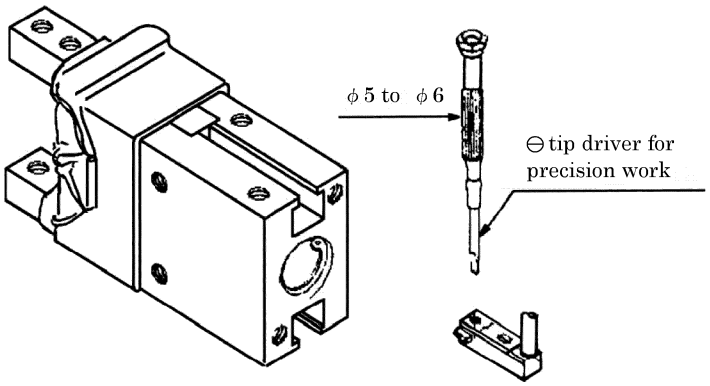


(Com⊖ with Controller internal source)



6.4 Switch Adjustment

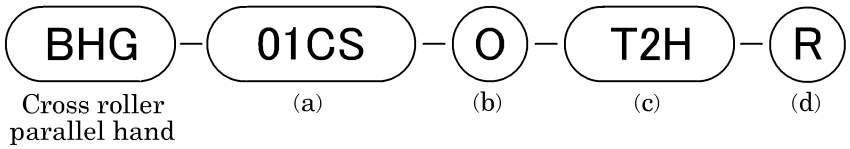
To adjust the Open-close confirmation Switch, slide the switch first to find the location where indicator light turns ON. Keep sliding the switch for further 0.3 to 0.5mm further away, and then fix the switch at that position.



Note) Use⊖tip driver for precision work as illustrated with handle diameter of approx. 5mm to tighten up the mounting screws.
Apply tightening torque of 10 to 20N･cm.

7. HOW TO ORDER

7.1 Model Code of Product itself



(a) Size	(b) Option		(c) Switch model code			
01CS	No code	Standard (Double acting)	Lead wire straight type	Lead wire L-shaped type	Switch type	Lead wire
03CS	O	Single acting (Normally open)				
04CS	C	Single acting (Normally closed)				
05CS	Y1	With Small jaw, material (S50C)	T2H	T2V	Solid state	2-core
	Y2	With Small jaw, material (MC Nylon)	T3H	T3V		3-core

※ Lead cord length	
No code	1m (Standard)
3	3m (Optional)
5	5m (Optional)

(d) Qty of Switches	
R	Open side, 1ea on
H	Close side, 1ea on
D	2ea

Example of model code	BHG-01CS-T3H-R Represents the standard cross roller parallel hand equipped with a solid state switch T3H and a switch.