

2 functions integrated actuator

New length measurement sensor installed on small cylinder and hand components.
Next-generation pneumatic components enabling simultaneous work on workpiece (actuator function) and inspection (quality judgment, simple length measurement).

Series version of display units Making inspection easier and simpler

A display has been added for analog output. This new display lets inspection results be directly processed and displayed digitally, eliminating the need for subsequent processes.

Simplifying conventionally difficult intermediate detection (manual)

Simplifying conventionally difficult intermediate detection (manual) sensor output is proportional to actuator operation, so intermediate workpiece prehension is detected, and corresponding to workpiece transfer needs such as sorting of mixed workpieces, detection of irregular workpieces, and detection of abnormal prehension.

Simple adjustment with key operations

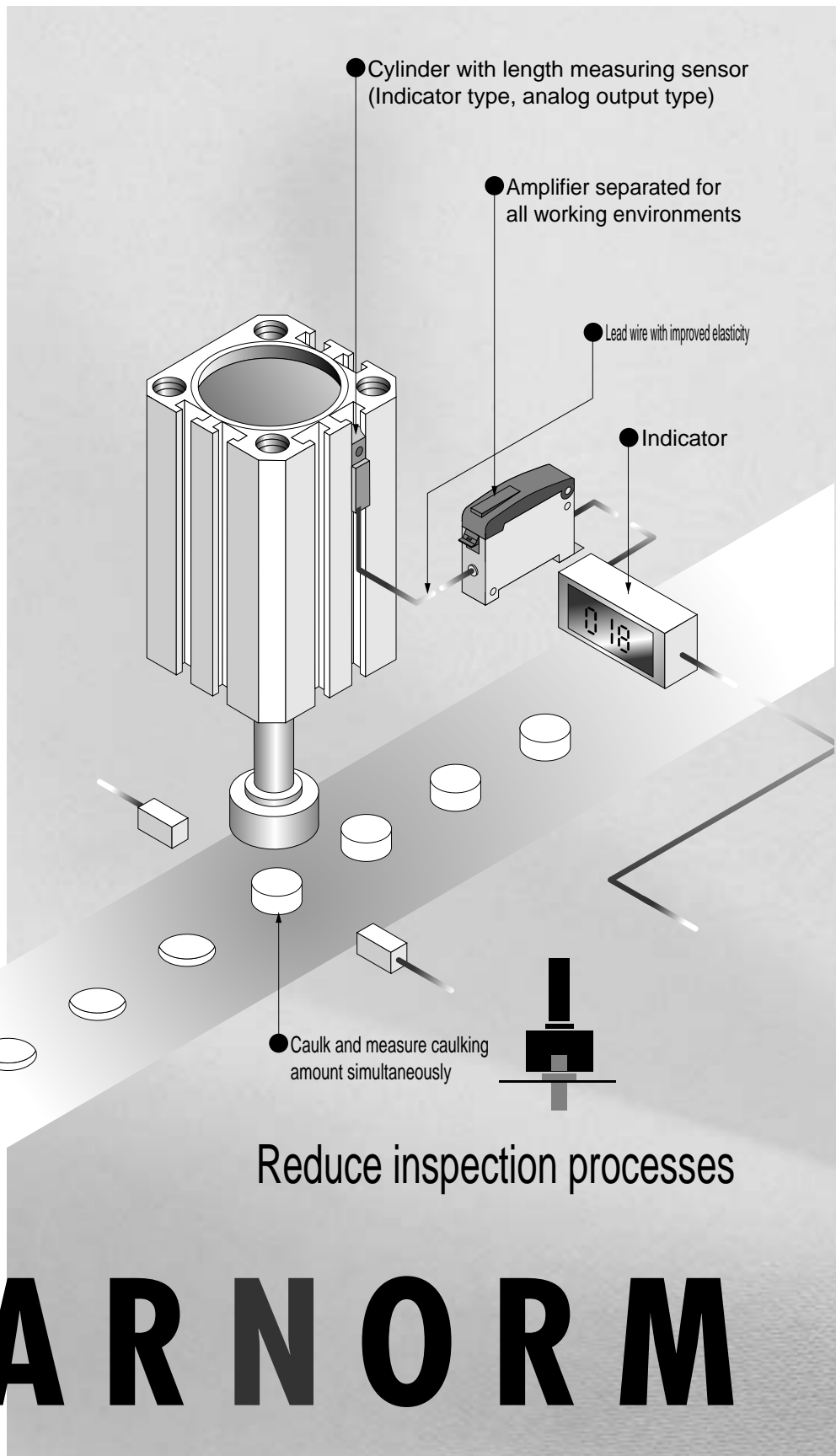
The switch operation point and movement range are easily adjusted with key operation on the display.

Wide selection of match applications with more mounted models and bore sizes

Compatible mounted actuators have been increased with the super compact cylinder SSD Series, linear sliding cylinder LCS Series, cross roller parallel hand BHA/BHG Series, and highly-rigid centering hand BHE Series, enabling use with many different applications.


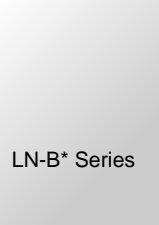


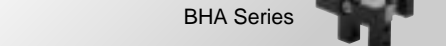
(What is the length measuring sensor?)

This special new magnetic sensor attains linear output for movement of the piston with a magnet (PAT.P). This sensor enables intermediate detection and workpiece judgment functions that the conventional cylinder switch never achieved.



LINEAR NORM

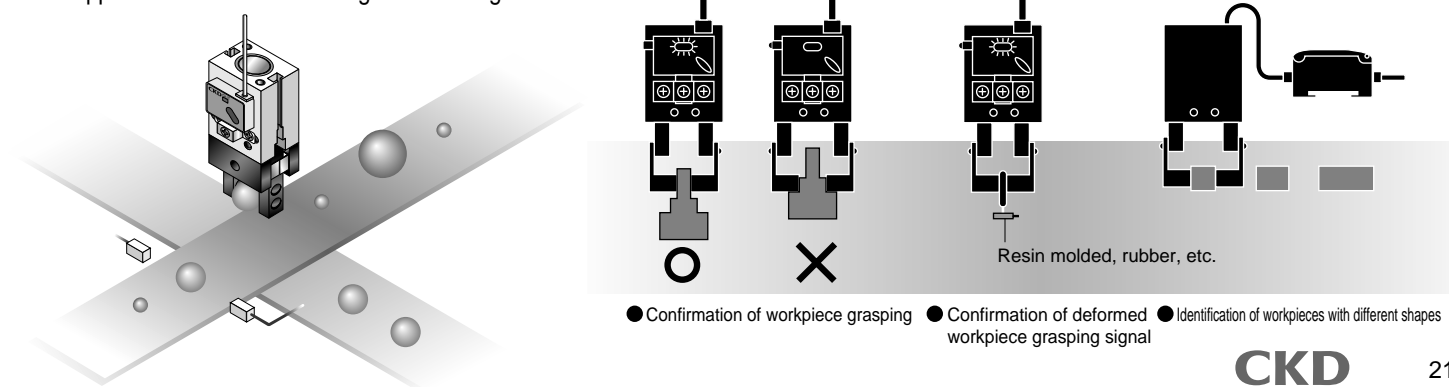
Actuator variations with length measuring sensor (LN)

| Linear system | Grasp system |
|--|--|
| Cylinder with LN Applicable cylinder Compact cylinder Linear slide cylinder | Hand with LN Incorporated hand Compact cross roller parallel hand Centering hand |
|  LN-A* Series  LN-B* Series |  BHE Series  BHG Series  BHA Series |

| Output type | Analog output type | | Switch/analog double output display | | Switch output type | |
|-------------------------|---|---|---|--|---|---|
| | 1-5V voltage output between random 8 mm in stroke | 1-5V voltage and switch output between random 10 mm in stroke | 1-5V voltage output at double-jaw full stroke | 1-5V voltage and switch output at double-jaw full stroke | ON-OFF output with full double jaw stroke length | |
| Amplifier separate type | ● | ● | ● | ● | ● | ● |
| Amplifier mounting | — | — | — | — | ● | ● |
| Bore size (mm) | φ12 φ16 φ20 φ32 φ50 | φ20 φ25 or equivalent or equivalent | φ20 φ25 or equivalent or equivalent | φ20 φ25 or equivalent or equivalent | φ12 φ16 φ20 φ50 or equivalent or equivalent or equivalent or equivalent | φ12 φ16 φ20 φ50 or equivalent or equivalent or equivalent or equivalent |
| Stroke length (mm) | (Note) 20, 30, 50 | | — | | | |

Note: Stroke varies with the model. Contact CKD for linear tube diameters and strokes.

Applications of hand with length measuring sensor



Cylinder/hand with length measuring sensor Length measuring function

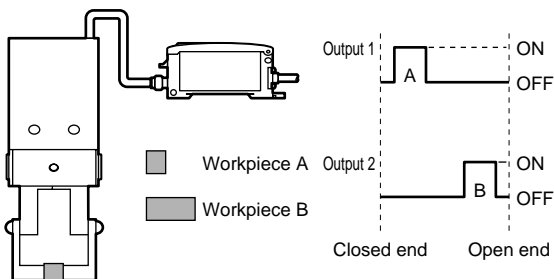
RRC
GRC
RV3*
NHS
HR
LN
FH100
HAP
BSA2
BHA/BHG
LHA
LHAG
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HLA/HLB
HLAG/HLBG
HEP
HCP
HMF
HMFB
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CKL2
CKL2 --HC
CKH2
CKLB2
NCK/SCK/FCK
FJ
FK
Ending

RRC
GRC
RV3*
NHS
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Applications

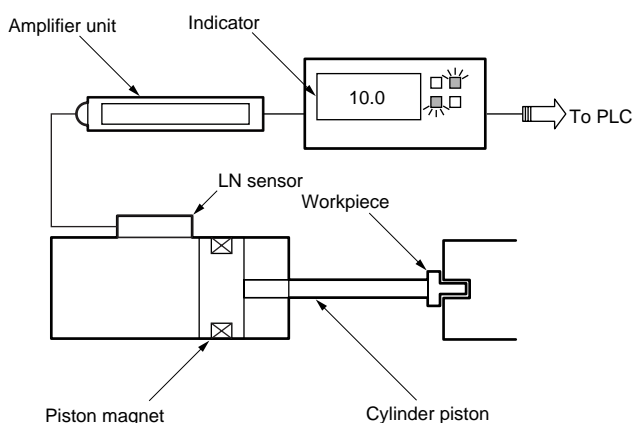
- RRC
- GRC
- RV3*
- NHS
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- LN**
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- CKF
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- CKL2
- CKL2 *-HC
- CKH2
- CKLB2
- NCK/SCK/FCK
- FJ
- FK
- Ending

1 Judgment of irregular workpieces



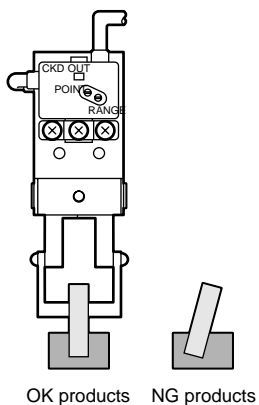
When workpieces A and B are different sizes and it must be decided when each workpiece is grasped, output 1 is issued when A is grasped and output 2 is issued when B is grasped. When using switch type, settings are made easily with the trimmer on the length of the measurement sensor's amplifier unit. Display switch outputs are digitally set with buttons. The trimmer changes the operation point and range, so signals for each A and B workpiece can be output if a narrow movement range is set. This lets the workpiece be decided on the load side, i.e., PLC. Analog output changes with workpiece size, so control is made by retrieving changes in the PLC.

2 Pressfit of workpiece



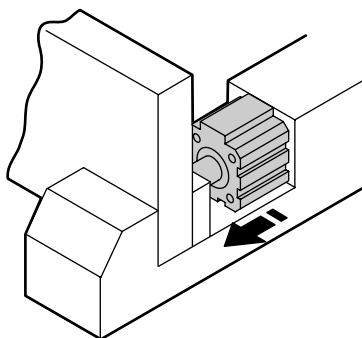
Using a length measurement sensor with the compact cylinder lets workpiece press-fitting be inspected with the length measurement sensor's output while the workpiece is press-fitted with the cylinder. Workpiece thickness is measured with the display. A line is automated by retrieving determined signals in the PLC. For the cylinder type, measurement length range is limited and set at the factory to match the user's required detection position, letting the system can be started by simply connecting wiring.

3 Workpiece grasping posture confirmation



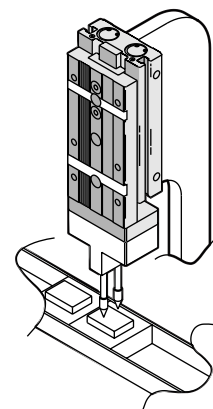
This is used to check whether the workpiece is held correctly. The operating range is set to narrow so that the sensor turns on only when the workpiece is correctly grasped.

4 Clamp state confirmation



Clamping is controlled by retrieving the cylinder piston stop position as length measurement sensor output.

5 Part inspection state confirmation



Small parts are inspected with the high-precision guided cylinder.



Pneumatic components

Safety precautions

Always read this section before starting use.

Refer to Intro 69 for general precautions of the cylinder, and to Intro 78 for general precautions of the cylinder switch.

- RRC
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- FH100
- HAP
- BSA2
- BHA/BHG
- LHA
- LHAG
- HKP
- HLA/HLB
- HLAG/HLBG
- HEP
- HCP
- HMF
- HMFb
- HFP
- HLC
- HGP
- FH500
- HBL
- HDL
- HMD
- HJL
- BHE
- CKG
- CK
- CKA
- CKS
- CKF
- CKJ
- CKL2
- CKL2 *-HC
- CKH2
- CKLB2
- NCK/SCK/FCK
- FJ
- FK

Cylinder/hand with length measuring sensor: actuator section

Design & Selection

1. Hand

CAUTION

- Gripping power differs based on the length of jaws on the master key, impress voltage, bore size, etc. Select the model based on the workpiece to be gripped.
- It is equivalent to standard type for the grasp characteristics. (BHA: page 284 BHG: page 290 BHE: page 405). Common precautions for the hand are given on pages 260 to 263.
- Avoid using outdoors.
- The range of the most preferable ambient temperature is 5 to 60°C. Do not use the unit if the temperature exceeds 60°C, or damage or operation faults may occur. If the temperature drops below 5°C, the water in the circuit could freeze and cause damage or operation faults, so always provide means to prevent freezing.
- Do not use this product in an environment where corrosion may occur. Failure to do so may cause damage or operation faults.

- Clamping is more accurate when done at low speed. Repeatability is also stable.
- Check that excessive lateral load is not applied to the master key.
- Selection guide of mixed workpiece selection applications
 Select the output type depending on the appearance differential of the workpiece.
 Workpiece differential dimension 1mm + workpiece tolerance variation : switch output type
 Workpiece differential dimension 1mm + workpiece tolerance variation : analog output type
- * With switch output type, switch output position setting is rough. The above values are reference only, and differ based on the working environment. Consult with CKD for details.

2. Cylinder

CAUTION

- Refer to "Pneumatic Cylinders I (Catalog No. CB-029SA)" for details on selecting the LN-B Series cylinder.

Installation & Adjustment

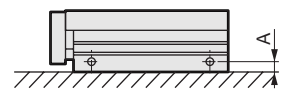
1. Cylinder

CAUTION

- The LN-A Series uses a nonrotating type, do not use where rotational torque is applied to the LN-A Series piston rod. Non-rotating bushing may be deformed and the service life remarkably shortened. Consult with CKD for standard piston rod.
- Use this cylinder always in the state that the load is applied to an axial direction of piston rod.
- When fixing a workpiece onto the end of the LN-A Series piston rod, retract the piston rod to the stroke end and catch a wrench on the section stick out of the rod's parallel section. Tighten so that tightening torque is not applied to the cylinder.
- Applicable piping joints differ based on the cylinder bore size.

· LN-A Series

| Descriptions Bore size (mm) | Port size | Port dimension | | Applicable joints | Joint O.D. | Inapplicable joints |
|--------------------------------|-----------|----------------|------|--|-------------|------------------------------|
| | | A | B | | | |
| φ12·16 | M5 × 0.8 | 5.5 | 5.5 | SC3W-M5-4 SC3W-M5-6 GWS4-M5-S GWS4-M5 GWL4-M5 GWL6-M5 | φ11 or less | GWS6-M5 |
| φ20 | | 8 | 5.5 | | | |
| φ32 | Rc1/8 | 8 | 8 | SC3W-6-4/6/8 GWS4-6 GWS6-6 GWS8-6 GWL4-6 GWL6-6 | φ15 or less | GWS10-6 GWL8-6 GWL10-6 |
| φ50 | Rc1/4 | 10.5 | 10.5 | SC3W-8-6/8/10 GWS4-8 GWS6-8 GWS10-8 GWL4 to 12-8 | φ21 or less | GWS-12-8 |



· LN-B Series

| Descriptions Bore size (mm) | Port size | Port dimension | Applicable joints | Joint O.D. |
|--------------------------------|-----------|----------------|--|-------------|
| | | A | | |
| φ12 | M5 × 0.8 | 5.5 | SC3W-M5-4 SC3W-M5-6 GWS4-M5-S GWS4-M5 | φ11 or less |
| φ16 | | 6.5 | SC3W-M5-4 SC3W-M5-6 GWS4-M5-S GWS4-M5 GWL4-M5 GWL6-M5 GWS6-M5 | φ13 or less |
| φ20 | Rc1/8 | 8 | SC3W-6-4/6/8 GWS4-6 GWS8-6 GWL6-6 GWS6-6 | φ15 or less |
| φ25 | | 9 | GWL4-6 | |

Cylinder/hand with length measuring sensor
Length measuring function

Installation & Adjustment

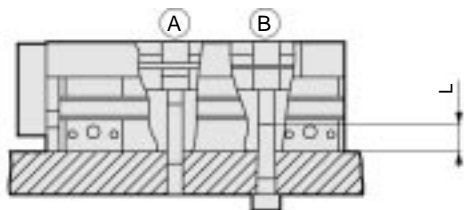
CAUTION

■ When changing LN-B Series piping port position, apply adhesive to M3 and M5 plug (hexagon socket head set screw). (Low intensity adhesive such as LOCTITE 222/221, or ThreeBond 1344 recommended)

■ Avoid denting or scratches that could obstruct the parallelism of the LN-B Series main body (tube) installation face or slide table face.

Maintain parallelism of the installation mate at 0.05 mm or less.

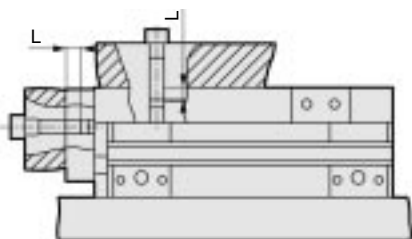
■ Observe the following values for the bolt insertion length and tightening torque when installing LN-B Series main body. (Fig. 1)



| Descriptions | A | | B | | |
|--------------|------------------|-------------------------|------------------|-------------------------|-------------------------|
| | Applicable bolts | Tightening torque (N·m) | Applicable bolts | Tightening torque (N·m) | Insertion length L (mm) |
| LN-B-12 | M4×0.7 | 1.4 to 2.4 | M5×0.8 | 2.9 to 5.1 | 5 to 8 |
| LN-B-16 | M4×0.7 | 1.4 to 2.4 | M6×1.0 | 4.8 to 8.6 | 6 to 9 |
| LN-B-20 | M5×0.8 | 2.9 to 5.1 | M6×1.0 | 4.8 to 8.6 | 6 to 9 |
| LN-B-25 | M6×1.0 | 4.8 to 8.6 | M8×1.25 | 12.0 to 21.6 | 8 to 12 |

■ Observe the following bolt insertion lengths and tightening torque when installing the jig on the slide table or end plate of LN-B Series.

(Fig. 2)



| Descriptions | Slide table/end plate | | |
|--------------|-----------------------|-------------------------|-------------------------|
| | Applicable bolts | Tightening torque (N·m) | Insertion length L (mm) |
| LN-B-12 | M4×0.7 | 1.4 to 2.4 | 4 to 6 |
| LN-B-16 | M5×0.8 | 2.9 to 5.1 | 5 to 7.5 |
| LN-B-20 | M5×0.8 | 2.9 to 5.1 | 5 to 7.5 |
| LN-B-25 | M6×1.0 | 4.8 to 8.6 | 6 to 9 |

2. Hand

CAUTION

■ Installation of an air dryer and filter is recommended to remove moisture from piping. Install the filter near the directional control valve (primary side) to remove rust, foreign matter and drain.

■ Use a corrosion-resistant galvanized pipe, stainless steel pipe, nylon pipe or rubber pipe, for piping material.

■ Check that the cross-section of the pipe connecting the hand and directional control valve has sufficient effective sectional area for attaining specified piston speed.

■ Before piping, air blow pipes to remove foreign matter, cutting chips, etc.

■ Check that sealing tape or adhesive does not enter when connecting the pipe to the components (filter, directional control valve, cylinder, hand chuck, etc.). Operation faults may occur if sealing tape or cutting chips, etc., are bitten.

■ When installing jaws onto the master key, take the effect onto the hand into consideration. Support the master key with a wrench, etc., so it does not twist, and tighten the jaw. The recommended tightening torques (N·m) are

- BHA/BHG/BHE-01 : 0.59
- BHA/BHG/BHE-03, 04 : 1.4
- BHA/BHG/BHE-05 : 2.8

During Use & Maintenance

1. Cylinder

⚠ CAUTION

- Use appropriate pliers (C type snap ring installation tool) to install and remove the rod bushing.
- Even when appropriate pliers are used, the snap ring may come off, causing possible damage or injury. When installing, check that the snap ring fits into the groove before supplying air.

2. Hand

⚠ CAUTION

- Regularly apply grease to the oscillating section of the master key to extend device life.
- Do not apply excessive force caused by dropping or collision to the master jaw, small jaw, or bearing guide. This could cause a large play in the master jaw and decrease the hand's repeatability to drop. The stop position of the piston, which acts as the sensor detector, could vary and decrease repeatability.

| |
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| RRC |
| GRC |
| RV3* |
| NHS |
| HR |
| LN |
| FH100 |
| HAP |
| BSA2 |
| BHA/ BHG |
| LHA |
| LHAG |
| HKP |
| HLA/ HLB |
| HLAG/ HLBG |
| HEP |
| HCP |
| HMF |
| HMFB |
| HFP |
| HLC |
| HGP |
| FH500 |
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| CKS |
| CKF |
| CKJ |
| CKL2 |
| CKL2 *-HC |
| CKH2 |
| CKLB2 |
| NCK/ SCK/FCK |
| FJ |
| FK |
| Ending |

Cylinder/hand with length measuring sensor
Length measuring function

| |
|-----------------|
| RRC |
| GRC |
| RV3* |
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| FH100 |
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| HDL |
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| CKS |
| CKF |
| CKJ |
| CKL2 |
| CKL2 -*HC |
| CKH2 |
| CKLB2 |
| NCK/ SCK/FCK |
| FJ |
| FK |
| Ending |

Sensor, amplifier, indicator section

Design & Selection

1. COMMON

⚠ CAUTION

- Use only a DC safety power supply. Avoid connecting devices, such as motor or valves, that generate noise in power for this unit.
- When wiring, do not lay the power wire for the motor, etc., in the same pipe or use the same wiring (multi-conductor cable, etc.) because induction noise may be applied to the length measuring sensor. Check the inverter power supply and wiring section. (Check that the inverter power frame ground is correctly grounded and noise is released.)
- Note that noise resistance performance may be adversely affected if the length of the sensor cable or output stage cable lead is changed.

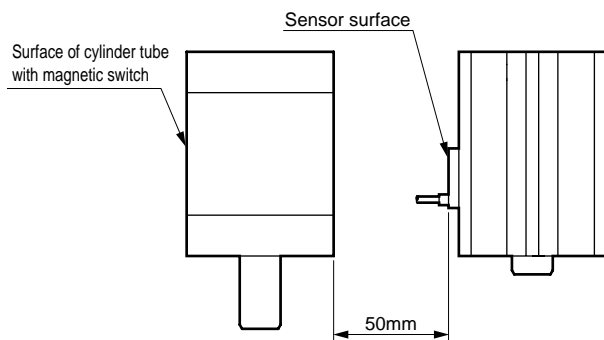
- An elastic lead wire is used for the sensor cable and output stage cable. To optimize elastic performance, check that the wire is not bent locally and that tension is not applied.
Note that compared to the middle section of the load, elasticity drops at the outlet from the sensor case or amplifier unit case and at the M8 connector section because the lead is fixed. Check that repeated bending is not applied to these sections.
- This product cannot be used where the ambient temperature fluctuates suddenly (e.g. local air conditioning).
- This product cannot be used outdoors or in an environment containing corrosive elements.
- Select switch output type when conducting rough judgments and analog output type or display when conducting detailed judgments, including length measurement.

Installation & Adjustment

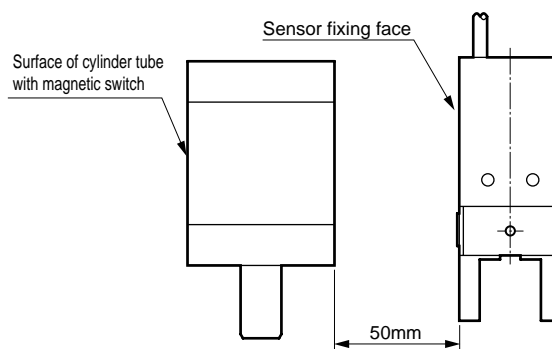
1. COMMON

⚠ CAUTION

- This product cannot be used in an environment where strong magnetic fields are generated (spot welding machine, etc.) because the sensor detection accuracy drop markedly.
Take care when the cylinder and hand approach other cylinders with magnetic switches. As a guide, there should be no problem if there is a distance of 50mm and over between the sensor surface and cylinder tube surface as shown below.

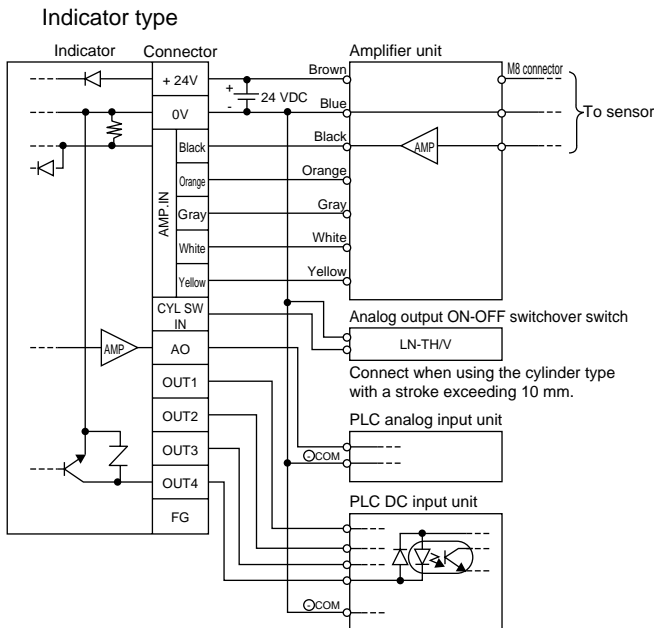


- If the sensor surface (sensor nameplate fixing face) is enclosed by a magnetic substance such as a steel plate, the magnetic force be disturbed, and the sensor not detect a magnetic field. Take care when installing the actuator.



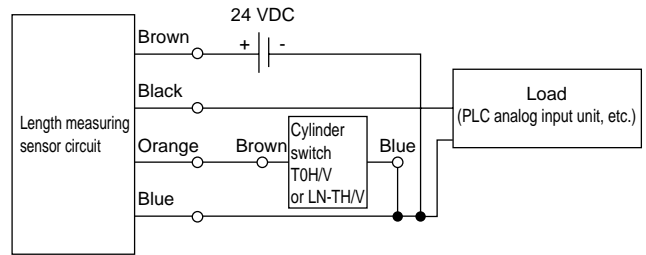
- When installing the amplifier unit case with the amplifier separated type using the through hole on the side, use an M3 cross-headed pan screw, and tighten with a torque of 0.5 to 0.7N·m.
- Rubber plugs are attached to devices with the amplifier installed operating point adjustment trimmer and operating range adjustment trimmer section to maintain waterproof properties. Fit these plugs in after adjusting.
- When installing the display using through holes on the base, use an M3 cross-headed pan screw and tighten with a torque of 0.5 to 0.7 N·m.

■ Connection of lead wire

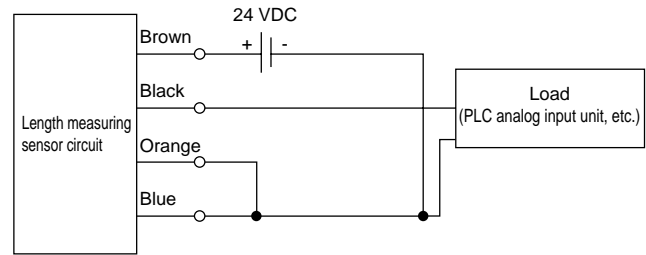


1. The display has 2-channel specifications, so there are two connectors for each, +24 V and 0 V. Each has continuity inside the display, so the display operates when one is connected.
2. Connector channels are irrelevant when only one amplifier is connected.
3. Turn power off before wiring.
4. Disconnect the female side before connecting wires to the display connector.
5. A 0.08 to 1.5mm² wire can be connected to the display connector with terminal screw tightening torque of 0.25 N·m.
6. Do not connect or disconnect the connector while power is on.
7. When using a cylinder with a stroke exceeding 10mm, connect the "analog output on-off switch" to the display. Connect the brown wire to the "CYL SW IN" terminal and the blue wire to 0 V.
8. Treating the shield wire
If noise is a problem, connect the shield wire to COM or FG.
This is not usually needed.

When analog output type cylinder is installed

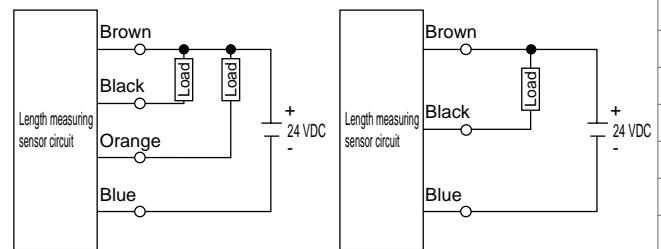


When analog output type hand is installed



Connect the orange wire to the blue wire (-).

Switch output type



Amplifier separate type

Amplifier mounting

Switch output is an NPN transistor open collector type.

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|-----------------|
| RRC |
| GRC |
| RV3* |
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| Ending |

Cylinder/hand with length measuring sensor
Length measuring function

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| CKF |
| CKJ |
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| CKLB2 |
| NCK/ SCK/FCK |
| FJ |
| FK |
| Ending |

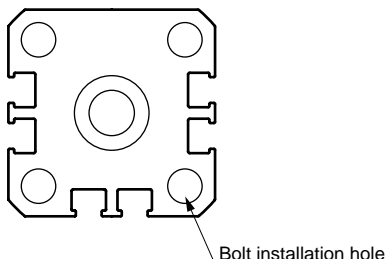
Installation & Adjustment

2. Analog output indicator type

⚠ CAUTION

■ When cylinder is installed.

- When fixing cylinder bolts to fix this cylinder, use stainless steel bolts to maintain the characteristics of the sensor. If an iron bolt is used, distortion may occur in the sensor output voltage waveform, display error could increase, and analog output voltage linearity could drop. (Repeatability is not affected, but performance should be confirmed before operation.)
- Similar problems may occur if the cylinder contacts a magnetic object, especially near the LN Sensor or when the steel plate is shorter than the actuator.



Example. LN-A type

- The length measuring sensor and analog output voltage ON-OFF select T0H/V (Note) or LN-TH/V switch or other cylinder switches can be mounted on the same surface if the mounting positions do not interfere.
- Always connect a cylinder switch (T0H/V or LN-TH/V) to retrieve the analog output voltage within a random 8mm interval (10mm for display type) of the cylinder's full stroke.
- Tighten the sensor with a torque of 0.1 to 0.2 N·m, and install so that sensor set screw faces the cylinder head.

(Note) The selected switch differs with the type of cylinder, analog output, and the display.

■ When hand is installed

- If a magnetic substance such as steel plate is used for the base when installing the hand on the top using the socket and spigot, the analog output voltage linearity may drop. (Repeatability is not affected, but performance should be confirmed before operation.)
- Similar problems may occur on the front or side of the hand if the section contacts a magnetic object.
- When fixing the hand on the top, side or front, use stainless steel bolts to maintain sensor characteristics.
- Tighten the sensor with a torque of 0.1 to 0.2 N·m, and install so that the sensor set screw faces the master key (jaw).

■ Precautions for cylinder and hand

- With the display, if a load short-circuit current flows to the switch output stage transistor because of incorrect wiring or connections, etc., the internal short-circuit protection circuit will cut the short-circuit current. (The output indicator (yellow) turns off and the short-circuit indicator (red) turns on.) To reset short-circuit protection, turn off supplied current once, correct wiring mistakes, etc., then turn the current on again. This product's protective circuit is effective only against specific incorrect connections and load short circuits. It does not necessarily provide protection against all incorrect connections.
- To prevent dislocation after fitting the connector's male and female sides, fix the female side to the male side with screws on the female side.

3. Switch output type

⚠ CAUTION

- If the operating range is too narrow or if the operating points are incorrectly adjusted when setting the switch output operating position, the output may or may not turn ON. Readjust in this case. The operation is stabilized by turning the operating range adjustment trimmer clockwise and widening the operating range slightly.
- If a load short circuit current flows to the output stage transistor because of incorrect wiring or connections, etc., the internal short circuit protection circuit function (indicator light change from ON to OFF), and the short circuit current be cut. To cancel the short circuit protection, turn the power supply OFF once, correct any incorrect wiring or connections, and then turn power ON again. This product's protective circuit is effective only against specific incorrect connections and load short circuits. It does not necessarily provide protection against all incorrect connections.
- Install the sensor at a position where the red lines on the hand and sensor are aligned. Tighten the sensor with a torque of 0.1 to 0.2 N·m, and install so the sensor set screw faces the master key (jaw).

During Use & Maintenance

1. Common

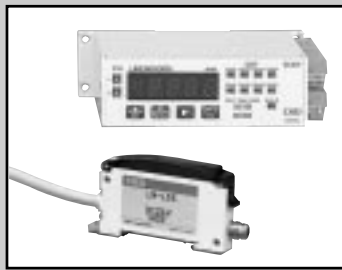
CAUTION

■ Length measuring sensor output voltage corresponds to the cylinder position. The value may fluctuate because of jig deformation and wear, etc., due to over-use. (With the hand, the value could fluctuate because of play in the open/close direction at the master jaw and deformation or wear of the small jaw.) The display value, analog output voltage, and switch output position may fluctuate because of this, regardless of the model, so compensation should be regularly made. (See product specifications or handling precautions enclosed with the product for operation procedures.)

- Length measuring sensor output voltage varies with temperature drift in piston magnet flux density (changes in working temperature). This is minimized by the compensation circuit on the sensor. However, when using the display for more detailed judgments and large errors occur in the display, analog output voltage or switch output position, compensation should be made regularly with simple key operations (teaching function) on the display. (Refer to the product specifications or handling precautions enclosed with the product for operation procedures.)
- Refer to the product specifications or handling precautions enclosed with the product for details on display operations.

| |
|-----------------|
| RRC |
| GRC |
| RV3* |
| NHS |
| HR |
| LN |
| FH100 |
| HAP |
| BSA2 |
| BHA/ BHG |
| LHA |
| LHAG |
| HKP |
| HLA/ HLB |
| HLAG/ HLBG |
| HEP |
| HCP |
| HMF |
| HMFB |
| HFP |
| HLC |
| HGP |
| FH500 |
| HBL |
| HDL |
| HMD |
| HJL |
| BHE |
| CKG |
| CK |
| CKA |
| CKS |
| CKF |
| CKJ |
| CKL2 |
| CKL2 *-HC |
| CKH2 |
| CKLB2 |
| NCK/ SCK/FCK |
| FJ |
| FK |
| Ending |

Cylinder/hand with length measuring sensor
Length measuring function



Sensor, amplifier, indicator



Refer to Intro 21 for details.
* Excluding indicator



Sensor/amplifier section specifications

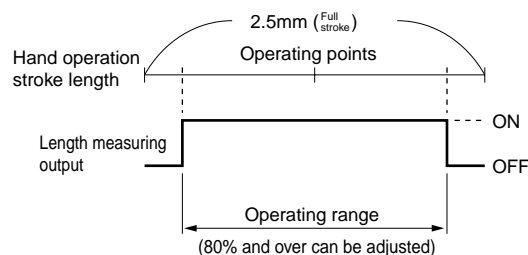
| Descriptions | Amplifier mounting switch output type LN-*VS1PAH/V | Amplifier separate switch output type LN-*H/VCS*S | Amplifier separate analog output type LN-10*CLS | Amplifier separate indicator (LN-DN) dedicated LN-10*CLDS | |
|---|--|--|--|---|---|
| Applications | PLC/relay | | PLC | — | |
| Power voltage | 24 VDC ±10% | | | | |
| Current consumption | 20mA or less | | 30mA or less | | |
| Indicator light | Switch output indicator light: Yellow LED ON lighting | | Green LED lighting at power supply impressed Sensor installation position indicator yellow LED lighting | | |
| Switch output point | 1 | 2 | — | | |
| Switch output specifications | NPN open collector output, 30 VDC or less 50mA or less, internal voltage drop 1.2V or less | | — | | |
| Analog output specifications | — | | 1-5V Connecting load 50KΩ and over | 1-4.5V (Input to indicator) | |
| Analog output linearity | — | | ±5%F.S. or less | — | |
| Valid length measuring range | — | | Hand: Double jaw full stroke Cylinder: At any 8mm area over piston stroke | Hand: Double jaw full stroke Cylinder: At any 8mm area over piston stroke | |
| Lead wire | Sensor | 35mm (oil resistant vinyl cabtire cable, 3 conductor, 0.2mm ²) | | | |
| | Amplifier | 3m (oil resistant vinyl cabtire cable, 3 conductor, 0.2mm ² , bend resistance line) | 3m (oil resistant vinyl cabtire cable, 4 conductor, 0.2mm ²) | 3m (oil resistant vinyl cabtire cable, 4 conductor, 0.2mm ² , shield wire) | 3m (oil resistant vinyl cabtire cable, 7 conductor, 0.2mm ² , shield wire) |
| Insulation resistance | 20MΩ and over with 500 VDC megger | | | | |
| Withstand voltage | No failure impressed at 1000 VAC for one minute | | | | |
| Maximum shock resistance | Sensor | 294m/s ² | | 980m/s ² | |
| | Amplifier | 294m/s ² | | 294m/s ² | |
| Protective structure | Sensor | IEC standards IP65 | | IEC standards IP67/oil resistance | |
| | Amplifier | IEC standards IP65 | | IEC standards IP65 | |
| Ambient temperature/humidity | -10 to 60°C, 85%RH or less | | | | |
| Switch operating range adjusting range | 0 to 80% or more of full stroke (Note 3) (Applies to one stroke of the two hand jaws) | | — | | |
| Switch operating points temperature drift | 0.1mm/10°C or less | | — | | |
| Analog output temperature drift | — | | 50mV/10°C or less | — | |
| Repeatability (Note 1) | ± 0.1 mm or less at 25°C, with no external magnetic force, or actuator or jig deformation wear | | — | | |
| Installation method | Dedicated bracket installation | DIN rail or direct installation | | | |

Note 1: Value including actuator repeatability. Applies to one stroke of two hand jaws.

Note 2: Refer to page 215 for a guide on selecting models for mixed workpiece sorting applications.

Note 3: Switch operation range adjustment

Example) BHA-LN-01CS operation stroke - 5 mm
5 mm with two jaws: 2.5 mm for one jaw



If the operation point is set to the center of the stroke, adjustments exceeding 80% or more of the full stroke are possible.

Indicator section specifications

| Descriptions | LN-DN |
|--|---|
| Power voltage | 24 VDC \pm 10% |
| Current consumption | 150mA or less |
| Sensor input | 2CH (1-4.5V voltage input) |
| Output type | · Analog output (1 point) \times 2 CH (1-5 V voltage output) · Switch output (4 points) \times 2 CH: On-off output based on 1 random set position, or window output based on 2 same set positions |
| Type of display | · 7-segment display: Maximum display \pm 1999.9 mm, minimum unit 0.1 mm · Absolute value/incremental value identification display, CH identification display, switch output display, switch output short-circuit display |
| Switch output type | NPN open collector output (Note 4), 30 VDC/50mA or less, internal voltage drop 1.2V or less, PLC, relay |
| Analog output type | 1-5V voltage output, connecting load 500K Ω and over |
| Analog output linear accuracy (Note 1) | \pm 1% F.S. or less (caused by at 25°C: our code measuring method) |
| 7-segment display linear accuracy (Note 2) | 7-segment display is reference value |
| Repeatability (Note 3) | \pm 0.1mm or less (Deforming wear free of at 25°C, disturbance magnetic field or actuator, jig) |
| Analog output temperature drift | 50mV/10°C or less (variation of approximate \pm 0.1mm or equivalent with displayed value conversion) |
| Insulation resistance | 20M Ω and over with 500 VDC megger |
| Withstand voltage | No failure impressed at 1000 VAC for one minute |
| Maximum shock resistance | 294m/s ² |
| Protective structure | IEC standards IP40 |
| Ambient temperature/humidity | -10 to 60°C/85%RH or less |
| Installation method | DIN rail or direct installation |

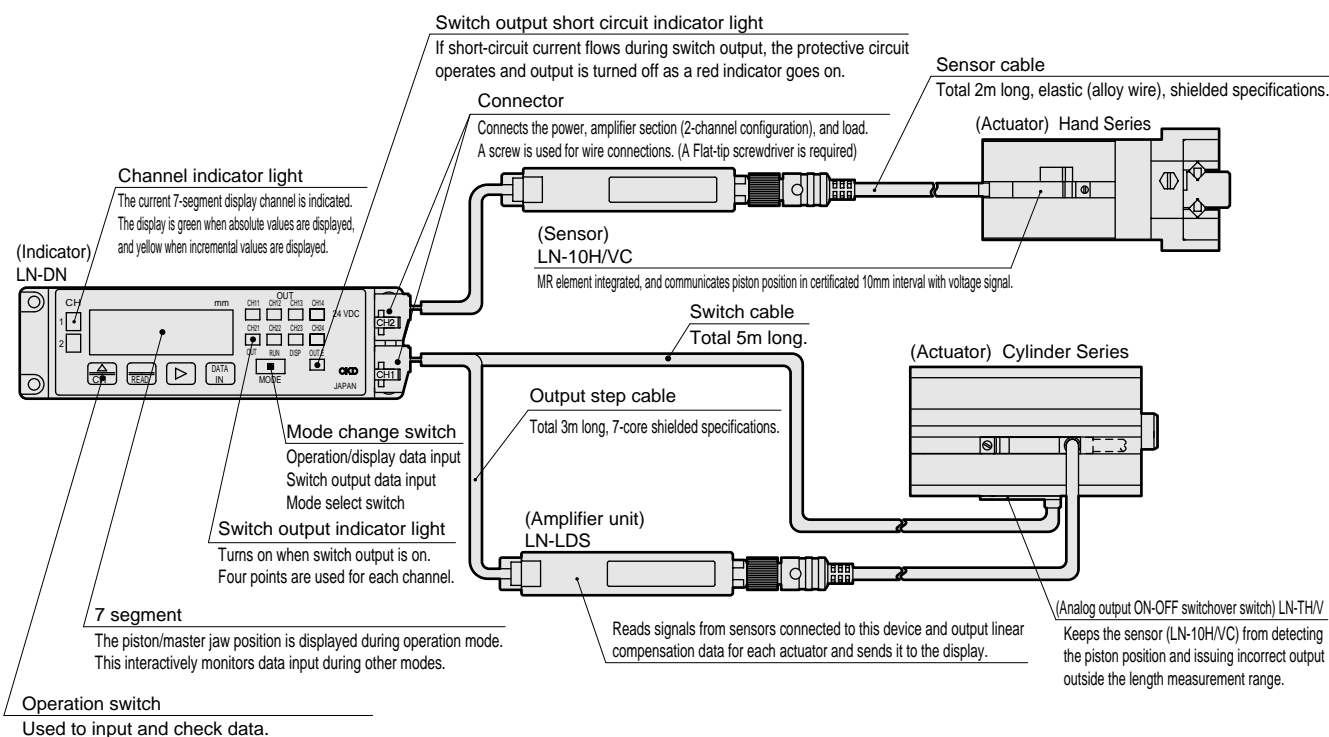
Note 1: Because an analog sensor for converting the piston magnetic flux density to a voltage is used, accuracy may decrease in actual use if magnetic contact occurs from either end of the piston stroke or an external magnetic field is encountered.

Note 2: Display accuracy varies with the span setting for the two piston stop points.

Note 3: This value includes actuator repeatability. This applies to one stroke of two hand jaw strokes.

Note 4: Consult with CKD for the PNP open collector output.

Configuration of indicator type



RRC
GRC
RV3*
NHS
HR
LN
FH100
HAP
BSA2
BHA/
BHG
LHA
LHAG
HKP
HLA/
HLB
HLAG/
HLBG
HEP
HCP
HMF
HMFB
HFP
HLC
HGP
FH500
HBL
HDL
HMD
HJL
BHE
CKG
CK
CKA
CKS
CKF
CKJ
CKL2
CKL2
-H-C
CKH2
CKLB2
NCK/
SCK/FCK
FJ
FK
Ending

Cylinder/hand with length measuring sensor
Length measuring function

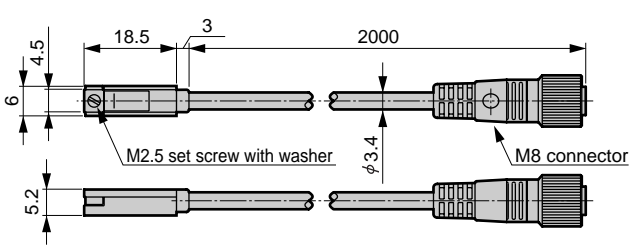
Dimensions



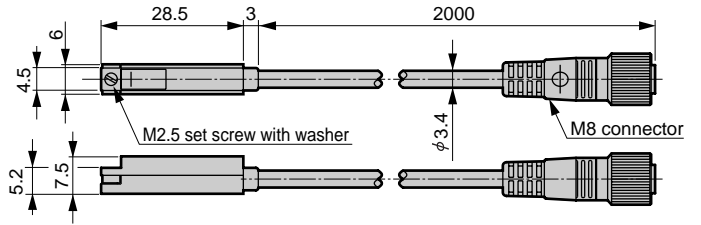
Sensor

● Amplifier separate type

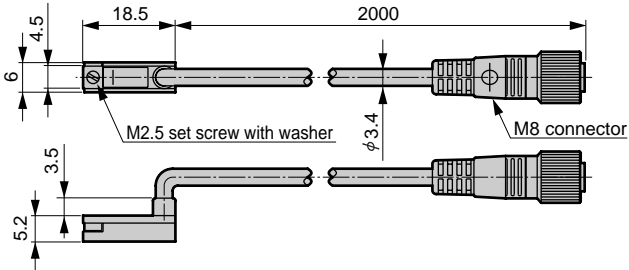
● LN-05HC



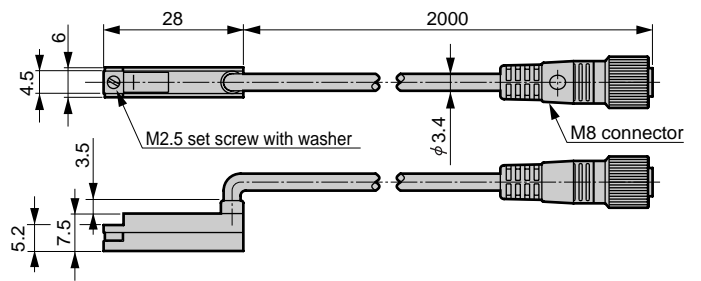
● LN-10HC



● LN-05VC



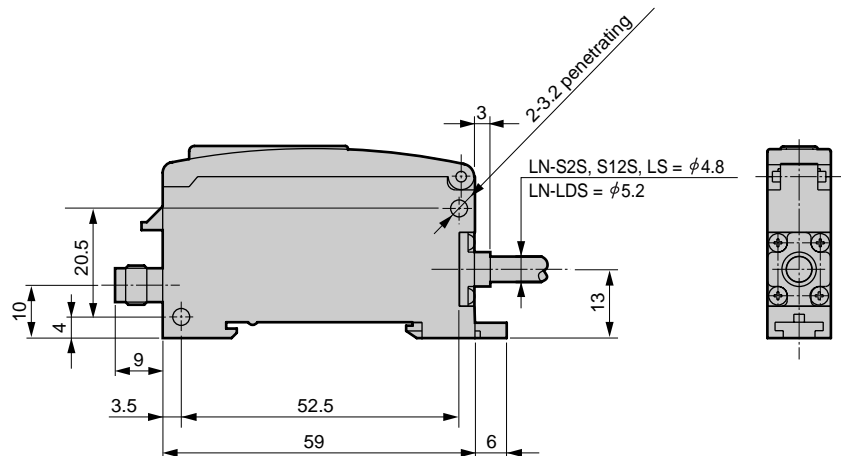
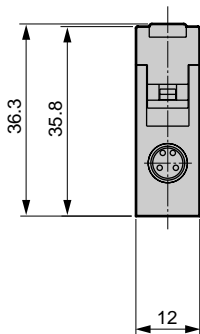
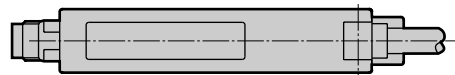
● LN-10VC



Amplifier

● Amplifier separate type

● LN-*S



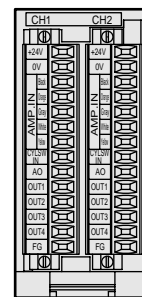
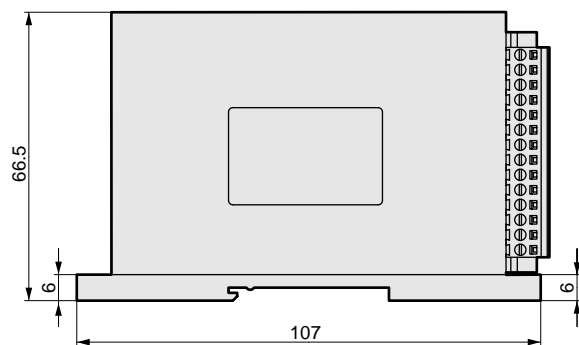
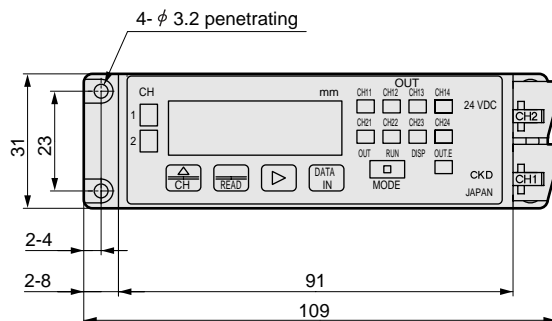
| |
|-------------|
| RRC |
| GRC |
| RV3* |
| NHS |
| HR |
| LN |
| FH100 |
| HAP |
| BSA2 |
| BHA/BHG |
| LHA |
| LHAG |
| HKP |
| HLA/HLB |
| HLAG/HLBG |
| HEP |
| HCP |
| HMF |
| HMFB |
| HFP |
| HLC |
| HGP |
| FH500 |
| HBL |
| HDL |
| HMD |
| HJL |
| BHE |
| CKG |
| CK |
| CKA |
| CKS |
| CKF |
| CKJ |
| CKL2 |
| CKL2-*HC |
| CKH2 |
| CKLB2 |
| NCK/SCK/FCK |
| FJ |
| FK |
| Ending |

Dimensions



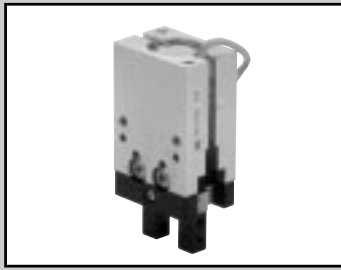
Indicator

● LN-DN



| |
|-----------------|
| RRC |
| GRC |
| RV3* |
| NHS |
| HR |
| LN |
| FH100 |
| HAP |
| BSA2 |
| BHA/ BHG |
| LHA |
| LHAG |
| HKP |
| HLA/ HLB |
| HLAG/ HLBG |
| HEP |
| HCP |
| HMF |
| HMFB |
| HFP |
| HLC |
| HGP |
| FH500 |
| HLB |
| HDL |
| HMD |
| HJL |
| BHE |
| CKG |
| CK |
| CKA |
| CKS |
| CKF |
| CKJ |
| CKL2 |
| CKL2 *-HC |
| CKH2 |
| CKLB2 |
| NCK/ SCK/FCK |
| FJ |
| FK |
| Ending |

Cylinder/hand with length measuring sensor
Length measuring function



Hand with length measuring sensor

BHA/BHG/BHE-LN Series

- Operational stroke length
 BHA-LN, BHG-LN: 5, 9, 11, 15mm
 BHE-LN: 7, 10, 14, 16mm



Refer to Intro 21 for details.
* Excluding indicator



RRC
GRC
RV3*
NHS
HR

Hand section specifications

● BHA Series



BHA

| Descriptions | Cross roller parallel hand (double acting) | | | |
|---------------------------|--|-------------|-------------|-------------|
| | BHA-LN-01CS | BHA-LN-03CS | BHA-LN-04CS | BHA-LN-05CS |
| Cylinder bore size mm | φ12 | φ16 | φ20 | φ25 |
| Working fluid | Compressed air | | | |
| Max. working pressure MPa | 0.7 | | | |
| Min. working pressure MPa | 0.1 | | | |
| Ambient temperature °C | 5 to 60 | | | |
| Double jaw stroke mm | 5 | 9 | 11 | 15 |
| Port size | M3 | | M5 | |
| Product weight g | 140 | 200 | 290 | 460 |
| Lubrication | Not required (use lubrication time turbine oil Class 1 ISO VG32) | | | |

● BHG Series



BHG

| Descriptions | Cross roller parallel hand (double acting/with rubber cover) | | | |
|---------------------------|--|-------------|-------------|-------------|
| | BHG-LN-01CS | BHG-LN-03CS | BHG-LN-04CS | BHG-LN-05CS |
| Cylinder bore size mm | φ12 | φ16 | φ20 | φ25 |
| Working fluid | Compressed air | | | |
| Max. working pressure MPa | 0.7 | | | |
| Min. working pressure MPa | 0.15 | | | |
| Ambient temperature °C | 5 to 60 | | | |
| Double jaw stroke mm | 5 | 9 | 11 | 15 |
| Port size | M3 | | M5 | |
| Product weight g | 170 | 230 | 320 | 490 |
| Lubrication | Not required (use lubrication time turbine oil Class 1 ISO VG32) | | | |

● BHE Series



BHE

| Descriptions | Centering hand (double acting) | | | |
|---------------------------|--|-------------|-------------|-------------|
| | BHE-LN-01CS | BHE-LN-03CS | BHE-LN-04CS | BHE-LN-05CS |
| Cylinder bore size mm | φ12 | φ16 | φ20 | φ25 |
| Working fluid | Compressed air | | | |
| Max. working pressure MPa | 0.7 | | | |
| Min. working pressure MPa | 0.2 | | | |
| Ambient temperature °C | 5 to 60 | | | |
| Double jaw stroke mm | 7 | 10 | 14 | 16 |
| Port size | M3 | | M5 | |
| Product weight g | 130 | 180 | 300 | 480 |
| Lubrication | Not required (use lubrication time turbine oil Class 1 ISO VG32) | | | |

Note 1: Appearance of hand is as same as standard type, but internal structure differs. This hand is for length measurement.)

Gripping power performance data

- BHA : page 284
- BHG : page 290
- BHE : page 405

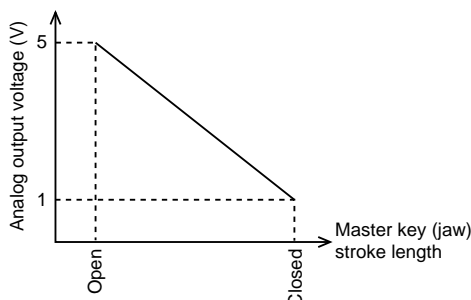
Sensor/amplifier section (separate type) specifications

Refer to page 222.

Indicator section specifications

Refer to page 223.

Length measuring sensor output characteristics



LN
FH100
HAP
BSA2
BHA/
BHG
LHA
LHAG
HKP
HLA/
HLB
HLAG/
HLBG
HEP
HCP
HMF
HMFB
HFP
HLC
HGP
FH500
HBL
HDL
HMD
HJL
BHE
CKG
CK
CKA
CKS
CKF
CKJ
CKL2
CKL2
*-HC
CKH2
CKLB2
NCK/
SCK/FCK
FJ
FK

Ending

Hand with length measuring sensor
Length measuring function

How to order

● Analog output type
BHE - LN - 04CS - 10 H C LDS DN

● Switch output type
BHE - LN - 05CS - 10 H C S12S

A Actuator specifications

B Cylinder bore size

C Sensor
(Note 2)

D Sensor lead wire outlet direction

E Sensor lead wire outlet direction
terminal specifications

F Amplifier unit
output type and shape

G Indicator
(Note 3)

⚠ Note on selection guide

Note 1: Contact CKD for the availability of the $\phi 12$ (01CS) and $\phi 16$ (03CS) diameter analog output and display.

Note 2: Compatible sensors and amplifiers differ with the actuator on the length measurement sensor.

Note 3: Two channels can be used for display. One channel is used by this model's display. When using the other channel, the display must be arranged separately.

(A) - (LN) - (B) - (C) (D) (E) (LDS)

Hand: **(A) - (LN) - (B)**

Sensor: **(LN) - (C) (D) (E)**

Amplifier unit (amplifier separate): **(LN) - (F)**

Amplifier unit (incorporated amplifier) with sensor: **(LN) - (C) (V) (F)**

Display: **LN - (DN)**

When placing a discrete order, see product specifications or handling precautions enclosed with the unit for details on setting.

● Discrete cylinder switch model no.

SW - T 2 H 3

A Output type

B Lead wire outlet direction

C Lead wire length

⚠ Note on selection guide

A cylinder switch is mounted manually in a separate groove to confirm whether the master jaw is open or closed, regardless of whether analog or switch output is used. Order separately when required.

| Symbol | Descriptions |
|---|---|
| A Actuator specifications | |
| BHA | Cross roller parallel hand (double acting) |
| BHG | Cross roller parallel hand (double acting/with rubber cover) |
| BHE | Centering hand (double acting) |
| B Size (cylinder bore size) | |
| 01CS | $\phi 12$ Note 1 |
| 02CS | $\phi 16$ Note 1 |
| 04CS | $\phi 20$ |
| 05CS | $\phi 25$ |
| C Sensor | |
| 05 | 01CS and 03CS |
| 10 | 04CS and 05CS |
| D Sensor lead wire outlet direction | |
| H | Axial lead wire |
| V | Radial lead wire (amplifier mounting is only V) |
| E Sensor lead wire terminal specifications | |
| Blank | Without connector (for amplifier mounting) |
| C | With M8 connector (for amplifier separate type) |
| F Amplifier unit output type and shape | |
| S1PAH | Incorporated amplifier, axial lead wire switch 1 point output type |
| S1PAV | Incorporated amplifier, radial lead wire switch 1 point output type |
| S2S | Amplifier separate, switch 2 points output type (01CS, 03CS) |
| S12S | Amplifier separate, switch 2 points output type (04CS, 05CS) |
| LS | Amplifier separate, analog output type (04CS, 05CS) |
| LDS | Amplifier separate, indicator (LN-DN) (04CS, 05CS) |
| G Indicator | |
| DN | Switch output section NPN type indicator (04CS, 05CS) |

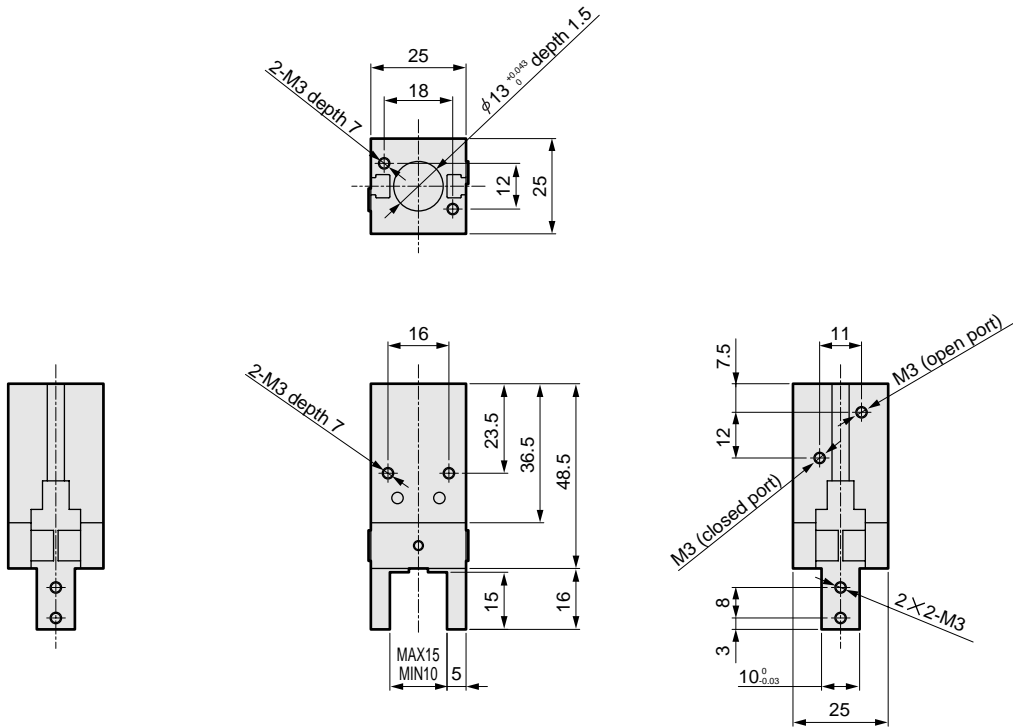
| Symbol | Descriptions |
|-------------------------------------|------------------|
| A Output type | |
| 2 | Proximity 2 wire |
| 3 | Proximity 3 wire |
| B Lead wire outlet direction | |
| H | Axial lead wire |
| V | Radial lead wire |
| C Lead wire length | |
| Blank | 1m (standard) |
| 3 | 3m (option) |
| 5 | 5m (option) |

Dimensions

| |
|-----------------|
| RRC |
| GRC |
| RV3* |
| NHS |
| HR |
| LN |
| FH100 |
| HAP |
| BSA2 |
| BHA/ BHG |
| LHA |
| LHAG |
| HKP |
| HLA/ HLB |
| HLAG/ HLBG |
| HEP |
| HCP |
| HMF |
| HMFB |
| HFP |
| HLC |
| HGP |
| FH500 |
| HBL |
| HDL |
| HMD |
| HJL |
| BHE |
| CKG |
| CK |
| CKA |
| CKS |
| CKF |
| CKJ |
| CKL2 |
| CKL2 -*-HC |
| CKH2 |
| CKLB2 |
| NCK/ SCK/FCK |
| FJ |
| FK |
| Ending |

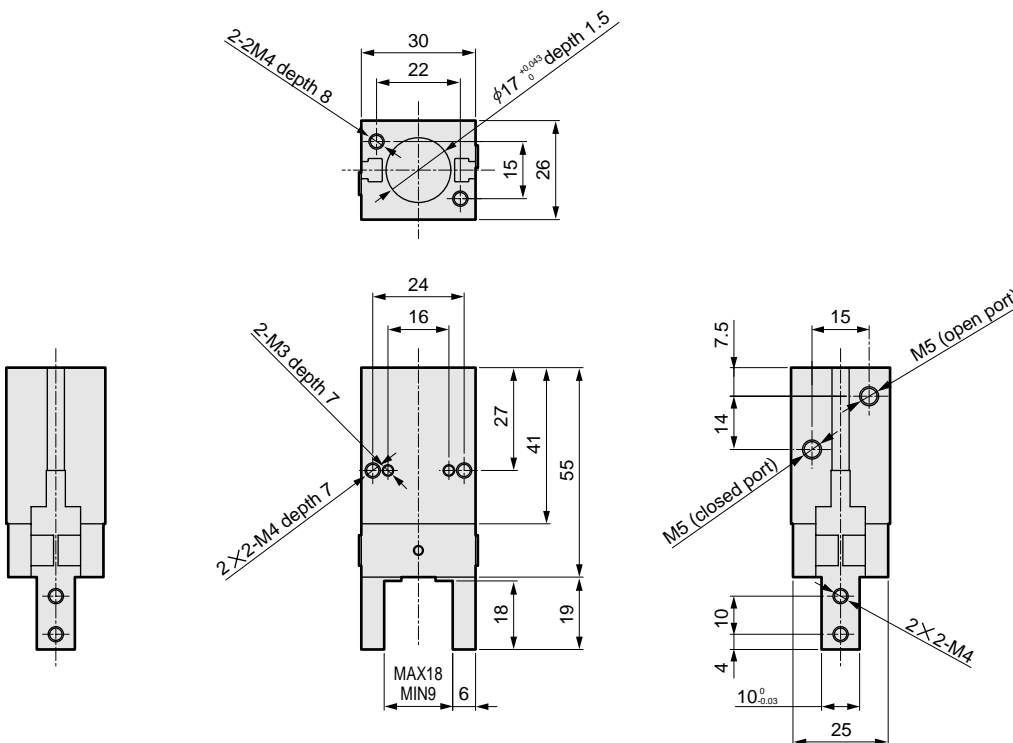
BHA-LN (amplifier separate type)

● BHA-LN-01CS



Note 1: Longitudinal direction is 3mm longer than standard products. Other dimensions are the same as standard products.
 Note 2: See pages 224 to 225 for outline dimensions of the sensor, amplifier (separate), and display.
 Note 3: Only the cylinder bore size symbol 04CS/05CS can be mounted on display or analog output models.

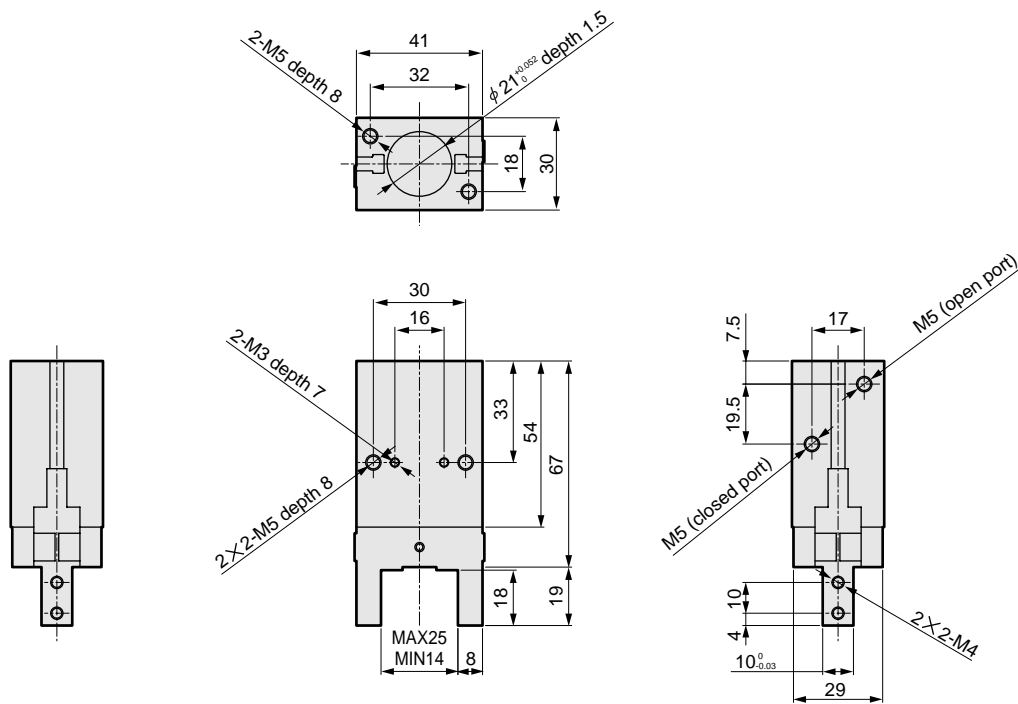
● BHA-LN-03CS



Note 1: Longitudinal direction is 2mm longer than standard products. Other dimensions are the same as standard products.
 Note 2: See pages 224 to 225 for outline dimensions of the sensor, amplifier (separate), and display.
 Note 3: Only the cylinder bore size symbol 04CS/05CS can be mounted on display or analog output models.

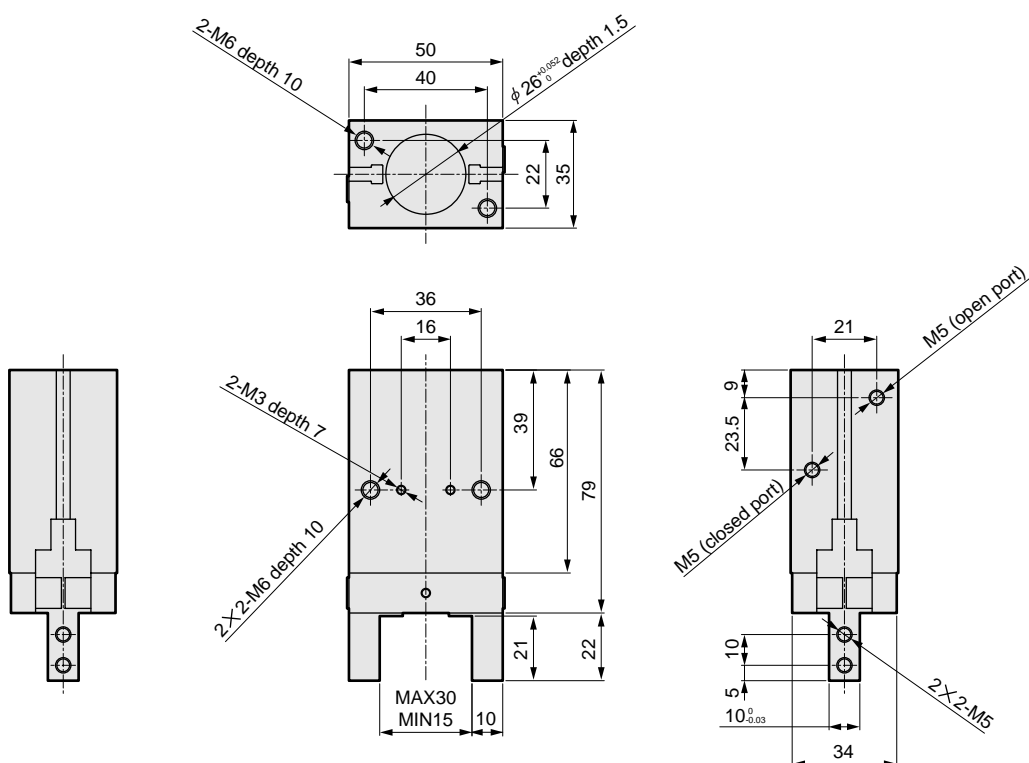
Dimensions

● BHA-LN-04CS



Note 1: Longitudinal direction is 5mm longer than standard products. Other dimensions are the same as standard products.
 Note 2: See pages 224 to 225 for outline dimensions of the sensor, amplifier (separate), and display.

● BHA-LN-05CS



Note 1: Longitudinal direction is 5mm longer than standard products. Other dimensions are the same as standard products.
 Note 2: See pages 224 to 225 for outline dimensions of the sensor, amplifier (separate), and display.

| |
|-----------------|
| RRC |
| GRC |
| RV3* |
| NHS |
| HR |
| LN |
| FH100 |
| HAP |
| BSA2 |
| BHA/BHG |
| LHA |
| LHAG |
| HKP |
| HLA/HLB |
| HLAG/HLBG |
| HEP |
| HCP |
| HMF |
| HMFB |
| HFP |
| HLC |
| HGP |
| FH500 |
| HLB |
| HDL |
| HMD |
| HJL |
| BHE |
| CKG |
| CK |
| CKA |
| CKS |
| CKF |
| CKJ |
| CKL2 |
| CKL2 *-HC |
| CKH2 |
| CKLB2 |
| NCK/ SCK/FCK |
| FJ |
| FK |
| Ending |

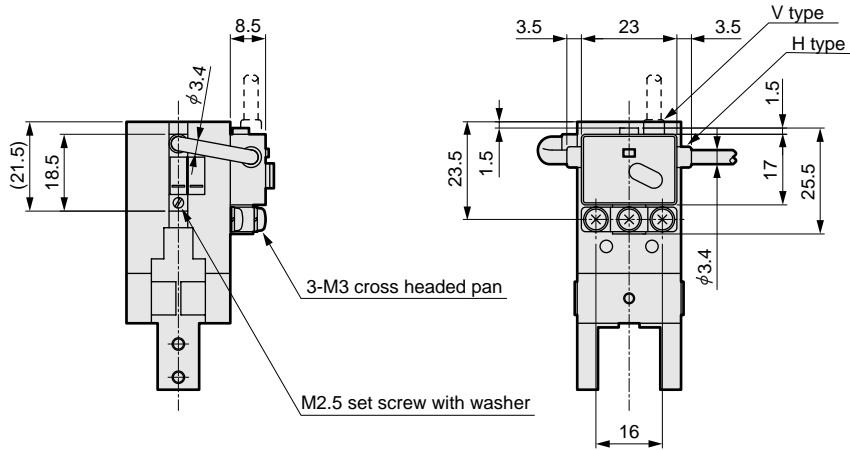
Hand with length measuring sensor
 Length measuring function

Dimensions

| |
|-----------------|
| RRC |
| GRC |
| RV3* |
| NHS |
| HR |
| LN |
| FH100 |
| HAP |
| BSA2 |
| BHA/BHG |
| LHA |
| LHAG |
| HKP |
| HLA/HLB |
| HLAG/HLBG |
| HEP |
| HCP |
| HMF |
| HMFB |
| HFP |
| HLC |
| HGP |
| FH500 |
| HBL |
| HDL |
| HMD |
| HJL |
| BHE |
| CKG |
| CK |
| CKA |
| CKS |
| CKF |
| CKJ |
| CKL2 |
| CKL2 -*HC |
| CKH2 |
| CKLB2 |
| NCK/ SCK/FCK |
| FJ |
| FK |
| Ending |

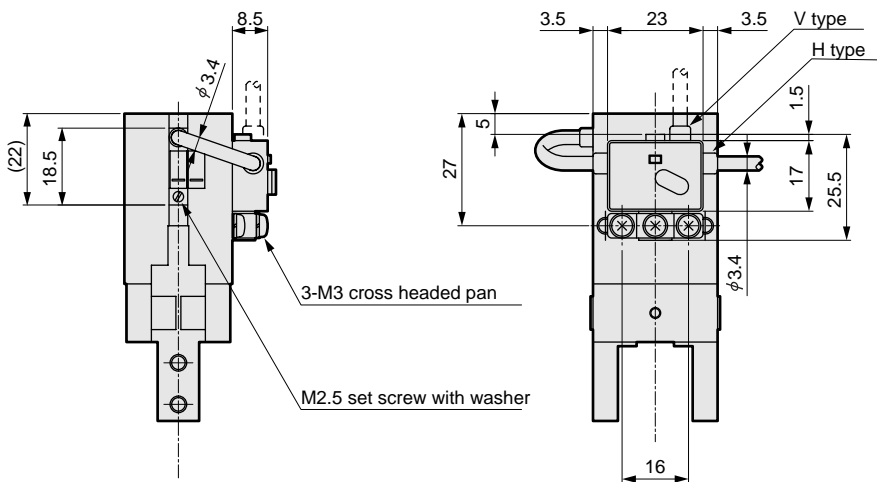
BHA-LN (amplifier with amplifier mounting sensor)

● BHA-LN-01CS



Note 1: Refer to the discrete amplifier dimensions for details on the hand's outline dimensions.
 Note 2: The V sensor lead lead-out direction is used. H or V can be selected for the output stage lead.

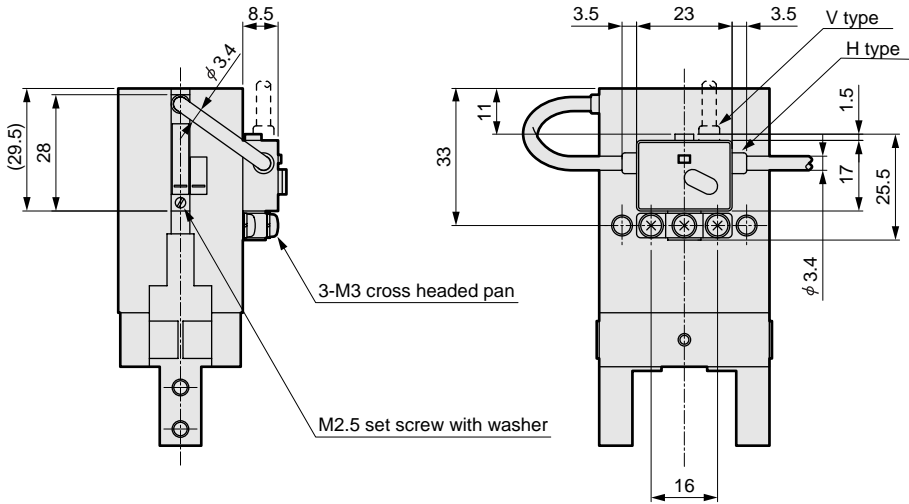
● BHA-LN-03CS



Note 1: Refer to the discrete amplifier dimensions for details on the hand's outline dimensions.
 Note 2: The V sensor lead lead-out direction is used. H or V can be selected for the output stage lead.

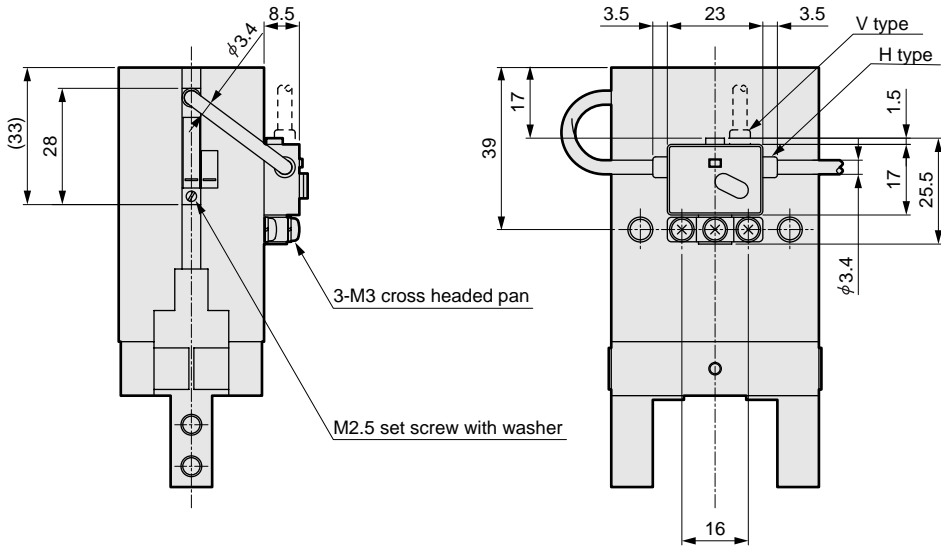
Dimensions

● BHA-LN-04CS



Note 1: Refer to the discrete amplifier dimensions for details on the hand's outline dimensions.
 Note 2: The V sensor lead lead-out direction is used. H or V can be selected for the output stage lead.

● BHA-LN-05CS



Note 1: Refer to the discrete amplifier dimensions for details on the hand's outline dimensions.
 Note 2: The V sensor lead lead-out direction is used. H or V can be selected for the output stage lead.

| |
|-----------------|
| RRC |
| GRC |
| RV3* |
| NHS |
| HR |
| LN |
| FH100 |
| HAP |
| BSA2 |
| BHA/BHG |
| LHA |
| LHAG |
| HKP |
| HLA/HLB |
| HLAG/HLBG |
| HEP |
| HCP |
| HMF |
| HMFB |
| HFP |
| HLC |
| HGP |
| FH500 |
| HBL |
| HDL |
| HMD |
| HJL |
| BHE |
| CKG |
| CK |
| CKA |
| CKS |
| CKF |
| CKJ |
| CKL2 |
| CKL2 -H-C |
| CKH2 |
| CKLB2 |
| NCK/ SCK/FCK |
| FJ |
| FK |
| Ending |

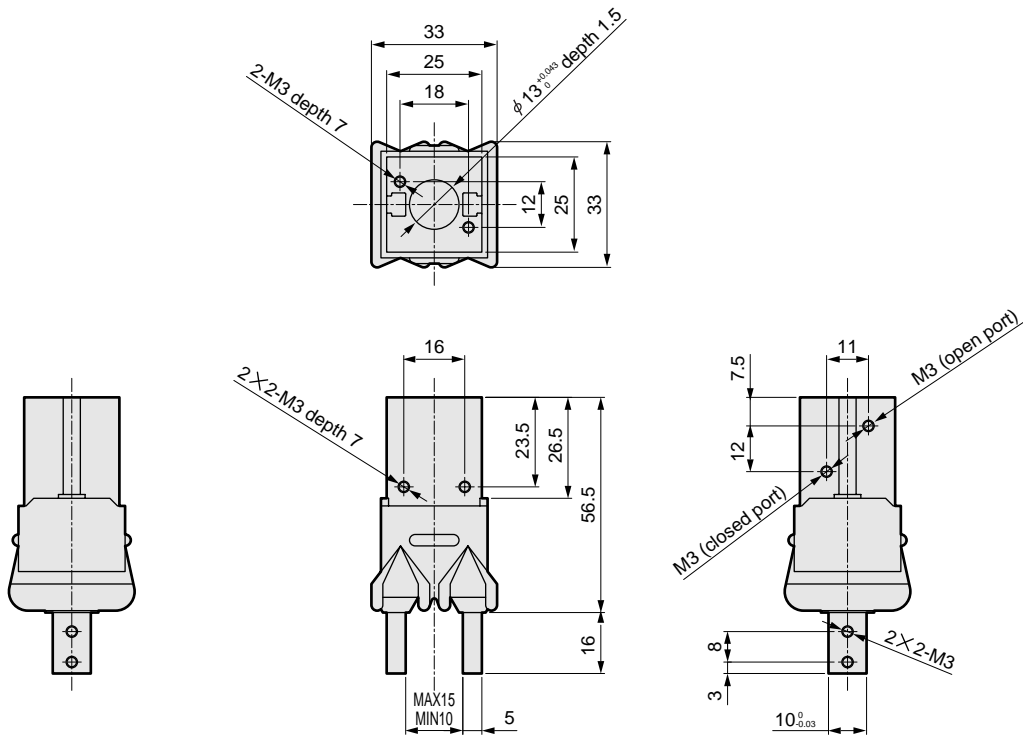
Hand with length measuring sensor
 Length measuring function

Dimensions

| |
|-----------------|
| RRC |
| GRC |
| RV3* |
| NHS |
| HR |
| LN |
| FH100 |
| HAP |
| BSA2 |
| BHA/ BHG |
| LHA |
| LHAG |
| HKP |
| HLA/ HLB |
| HLAG/ HLBG |
| HEP |
| HCP |
| HMF |
| HMFB |
| HFP |
| HLC |
| HGP |
| FH500 |
| HBL |
| HDL |
| HMD |
| HJL |
| BHE |
| CKG |
| CK |
| CKA |
| CKS |
| CKF |
| CKJ |
| CKL2 |
| CKL2 *-HC |
| CKH2 |
| CKLB2 |
| NCK/ SCK/FCK |
| FJ |
| FK |
| Ending |

BHG-LN (amplifier separate type)

● BHG-LN-01CS

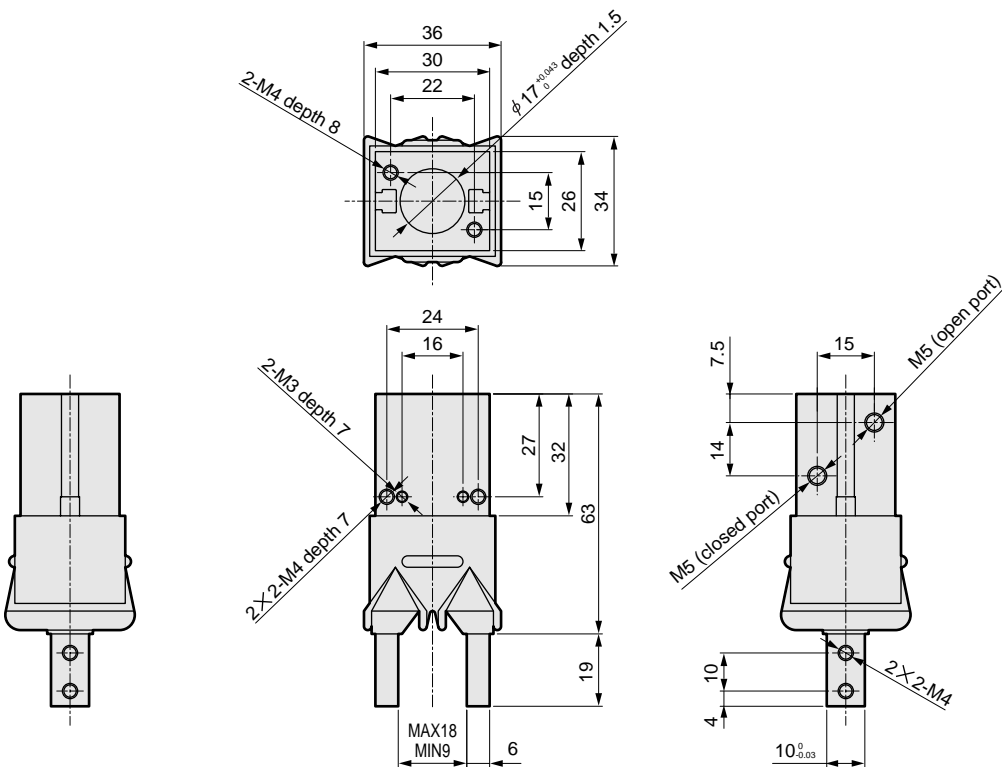


Note 1: Longitudinal direction is 3mm longer than standard products. Other dimensions are the same as standard products.

Note 2: See pages 224 to 225 for outline dimensions of the sensor, amplifier (separate), and display.

Note 3: Only the cylinder bore size symbol 04CS/05CS can be mounted on display or analog output models.

● BHG-LN-03CS



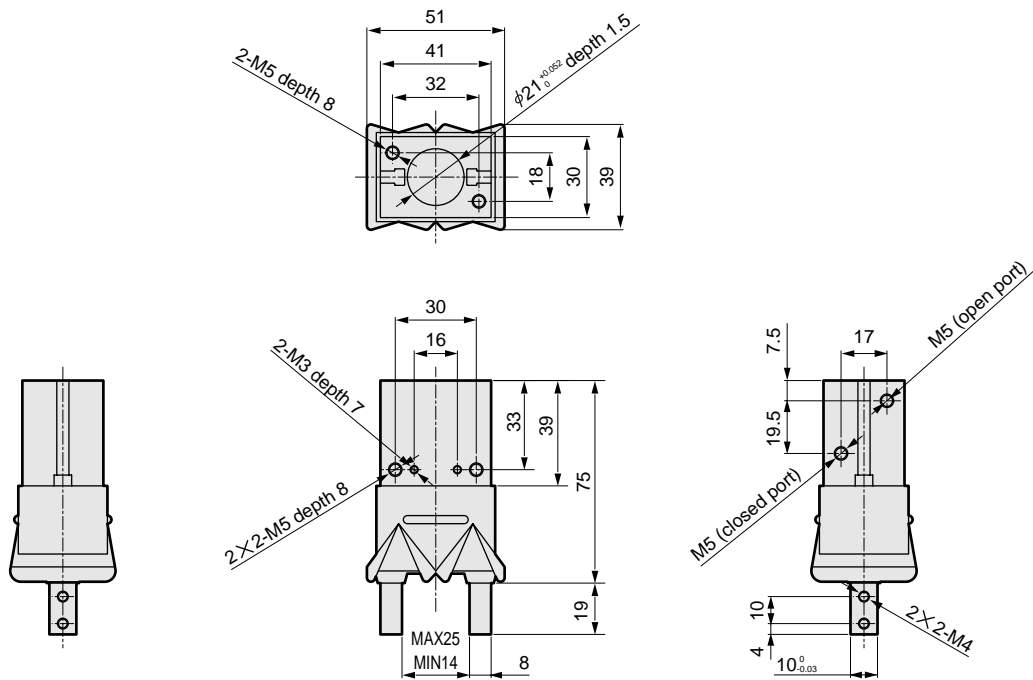
Note 1: Longitudinal direction is 2mm longer than standard products. Other dimensions are the same as standard products.

Note 2: See pages 224 to 225 for outline dimensions of the sensor, amplifier (separate), and display.

Note 3: Only the cylinder bore size symbol 04CS/05CS can be mounted on display or analog output models.

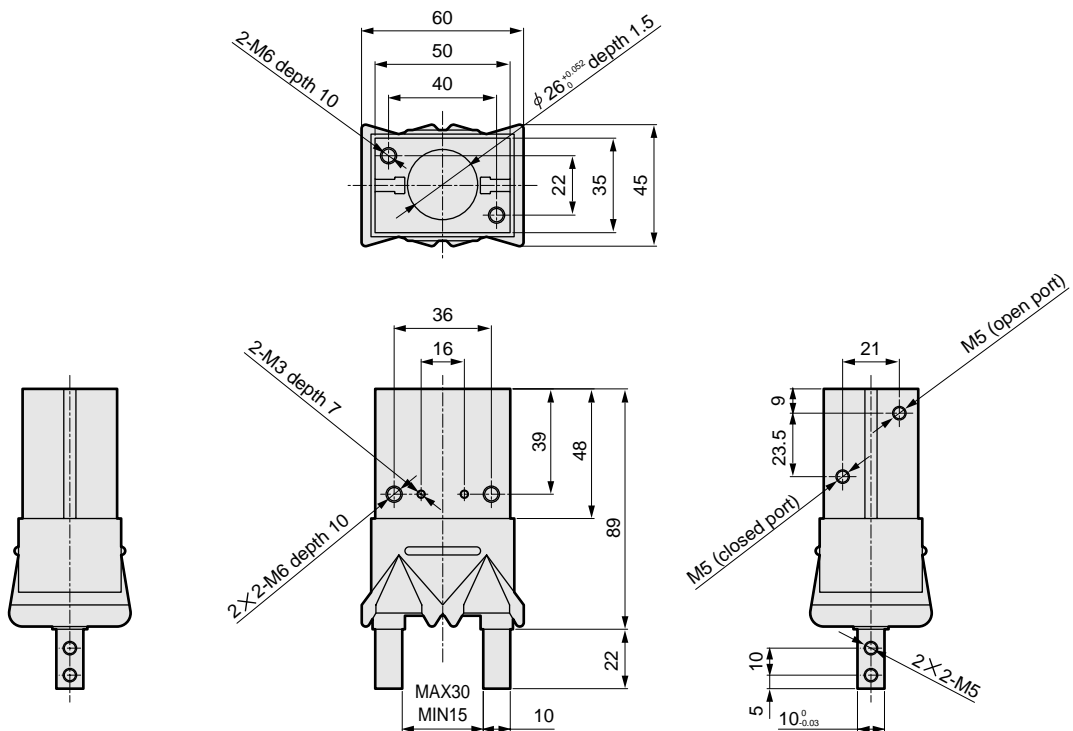
Dimensions

● BHG-LN-04CS



Note 1: Longitudinal direction is 5mm longer than standard products. Other dimensions are the same as standard products.
 Note 2: See pages 224 to 225 for outline dimensions of the sensor, amplifier (separate), and display.

● BHG-LN-05CS



Note 1: Longitudinal direction is 5mm longer than standard products. Other dimensions are the same as standard products.
 Note 2: See pages 224 to 225 for outline dimensions of the sensor, amplifier (separate), and display.

| |
|-----------------|
| RRC |
| GRC |
| RV3* |
| NHS |
| HR |
| LN |
| FH100 |
| HAP |
| BSA2 |
| BHA/ BHG |
| LHA |
| LHAG |
| HKP |
| HLA/ HLB |
| HLAG/ HLBG |
| HEP |
| HCP |
| HMF |
| HMFB |
| HFP |
| HLC |
| HGP |
| FH500 |
| HLB |
| HDL |
| HMD |
| HJL |
| BHE |
| CKG |
| CK |
| CKA |
| CKS |
| CKF |
| CKJ |
| CKL2 |
| CKL2 *-HC |
| CKH2 |
| CKLB2 |
| NCK/ SCK/FCK |
| FJ |
| FK |
| Ending |

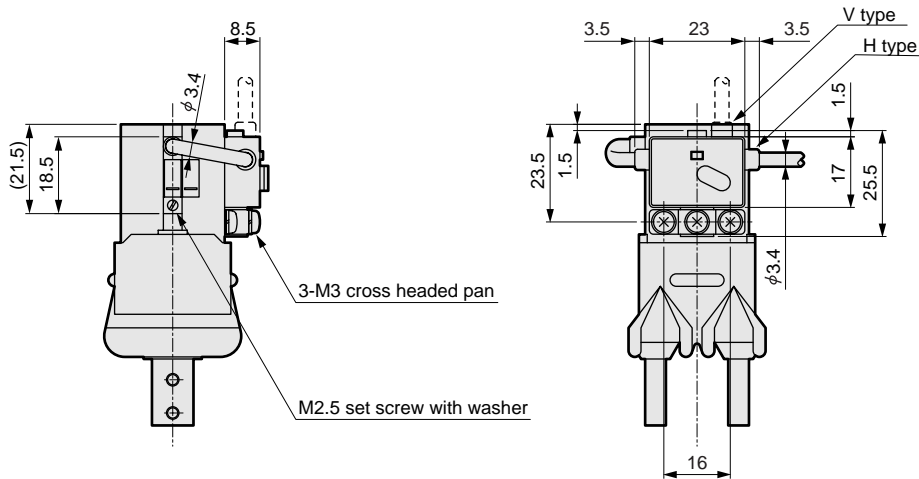
Hand with length measuring sensor
 Length measuring function

Dimensions

| |
|-----------------|
| RRC |
| GRC |
| RV3* |
| NHS |
| HR |
| LN |
| FH100 |
| HAP |
| BSA2 |
| BHA/ BHG |
| LHA |
| LHAG |
| HKP |
| HLA/ HLB |
| HLAG/ HLBG |
| HEP |
| HCP |
| HMF |
| HMFB |
| HFP |
| HLC |
| HGP |
| FH500 |
| HBL |
| HDL |
| HMD |
| HJL |
| BHE |
| CKG |
| CK |
| CKA |
| CKS |
| CKF |
| CKJ |
| CKL2 |
| CKL2 -*HC |
| CKH2 |
| CKLB2 |
| NCK/ SCK/FCK |
| FJ |
| FK |
| Ending |

BHG-LN (amplifier section with amplifier mounting sensor)

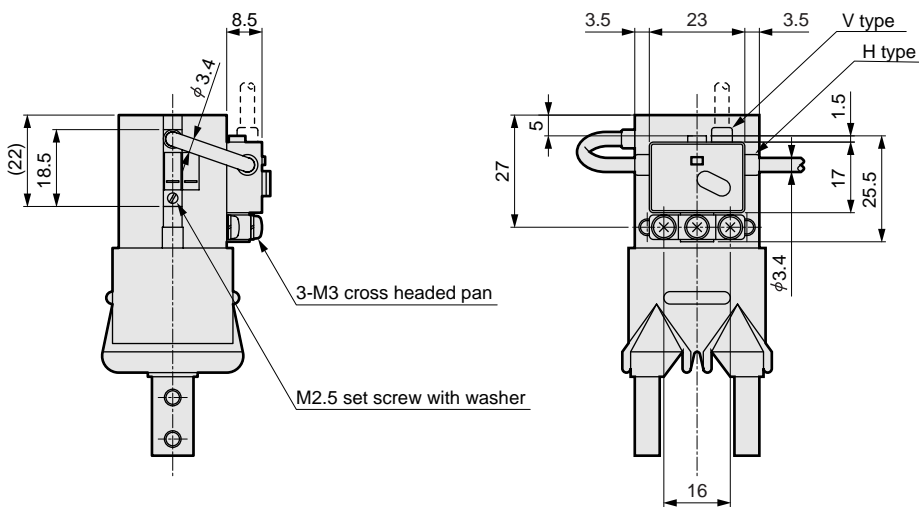
● BHG-LN-01CS



Note 1: Refer to the discrete amplifier dimensions for details on the hand's outline dimensions.

Note 2: The V sensor lead lead-out direction is used. H or V can be selected for the output stage lead.

● BHG-LN-03CS

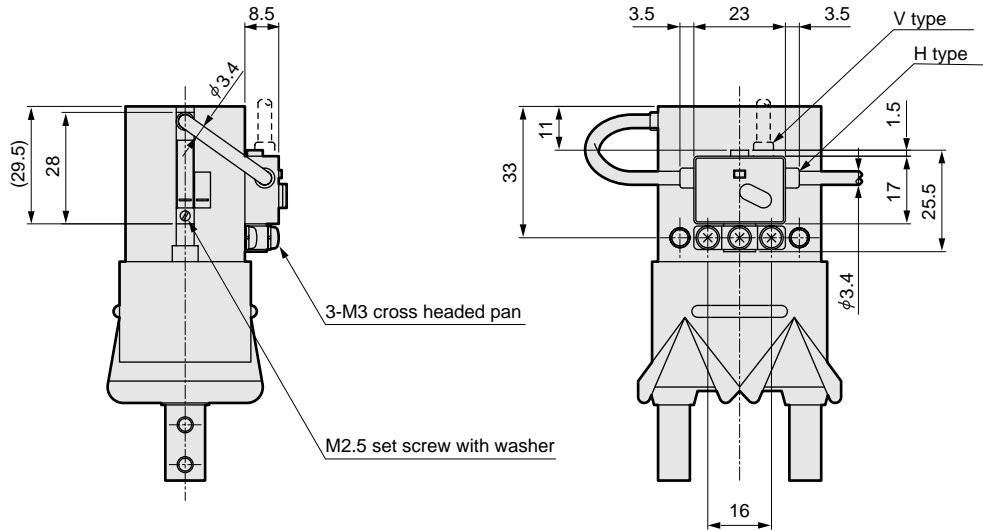


Note 1: Refer to the discrete amplifier dimensions for details on the hand's outline dimensions.

Note 2: The V sensor lead lead-out direction is used. H or V can be selected for the output stage lead.

Dimensions

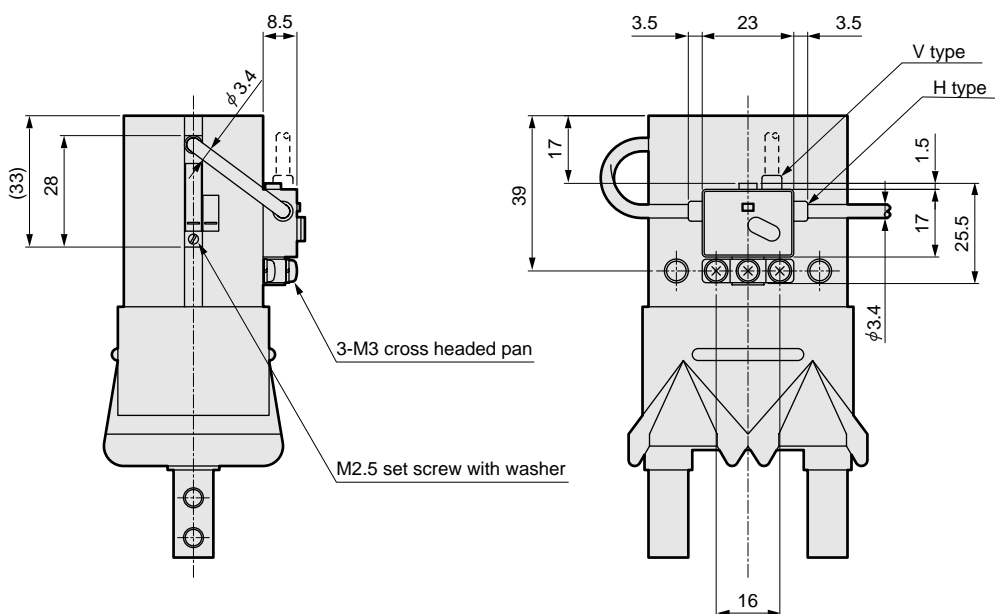
● BHG-LN-04CS



Note 1: Refer to the discrete amplifier dimensions for details on the hand's outline dimensions.

Note 2: The V sensor lead lead-out direction is used. H or V can be selected for the output stage lead.

● BHG-LN-05CS



Note 1: Refer to the discrete amplifier dimensions for details on the hand's outline dimensions.

Note 2: The V sensor lead lead-out direction is used. H or V can be selected for the output stage lead.

| |
|-----------------|
| RRC |
| GRC |
| RV3* |
| NHS |
| HR |
| LN |
| FH100 |
| HAP |
| BSA2 |
| BHA/ BHG |
| LHA |
| LHAG |
| HKP |
| HLA/ HLB |
| HLAG/ HLBG |
| HEP |
| HCP |
| HMF |
| HMFB |
| HFP |
| HLC |
| HGP |
| FH500 |
| HBL |
| HDL |
| HMD |
| HJL |
| BHE |
| CKG |
| CK |
| CKA |
| CKS |
| CKF |
| CKJ |
| CKL2 |
| CKL2 -HC |
| CKH2 |
| CKLB2 |
| NCK/ SCK/FCK |
| FJ |
| FK |
| Ending |

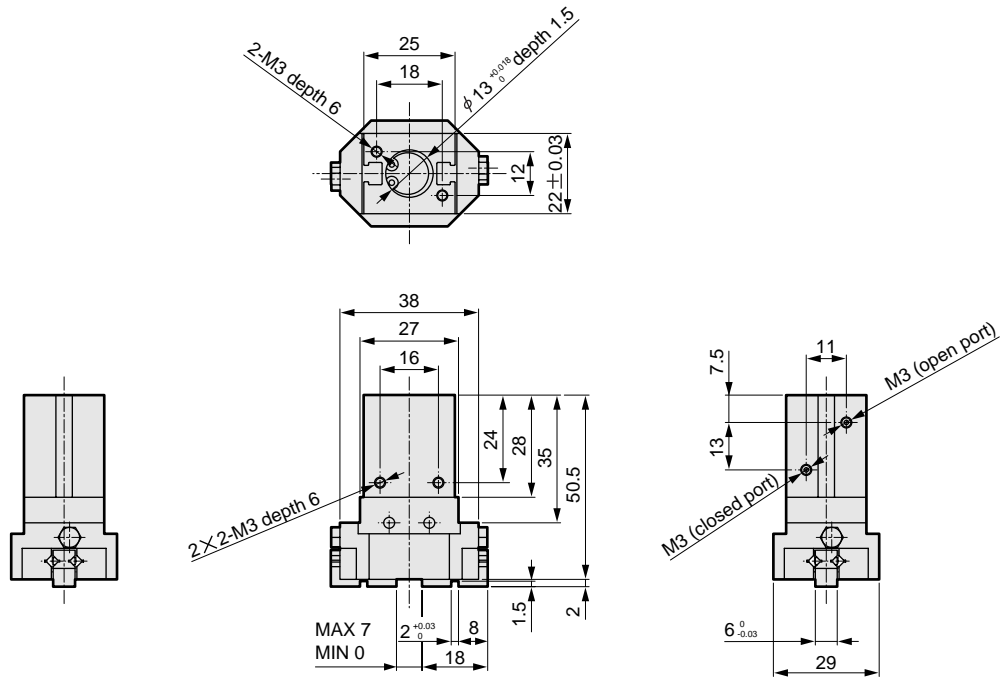
Hand with length measuring sensor
Length measuring function

Dimensions

| |
|-----------------|
| RRC |
| GRC |
| RV3* |
| NHS |
| HR |
| LN |
| FH100 |
| HAP |
| BSA2 |
| BHA/ BHG |
| LHA |
| LHAG |
| HKP |
| HLA/ HLB |
| HLAG/ HLBG |
| HEP |
| HCP |
| HMF |
| HMFB |
| HFP |
| HLC |
| HGP |
| FH500 |
| HBL |
| HDL |
| HMD |
| HJL |
| BHE |
| CKG |
| CK |
| CKA |
| CKS |
| CKF |
| CKJ |
| CKL2 |
| CKL2 *-HC |
| CKH2 |
| CKLB2 |
| NCK/ SCK/FCK |
| FJ |
| FK |
| Ending |

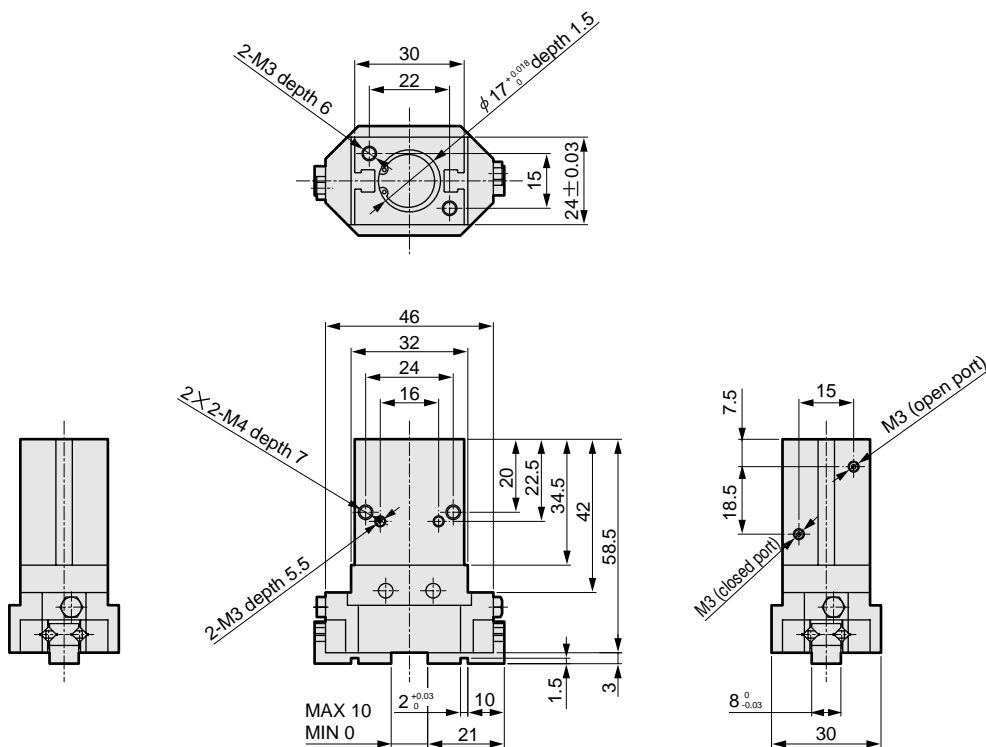
BHE-LN (amplifier separate type)

● BHE-LN-01CS



Note 1: Longitudinal direction is 3mm longer than standard products. Other dimensions are the same as standard products.
 Note 2: See pages 224 to 225 for outline dimensions of the sensor, amplifier (separate), and display.
 Note 3: Only the cylinder bore size symbol 04CS/05CS can be mounted on display or analog output models.

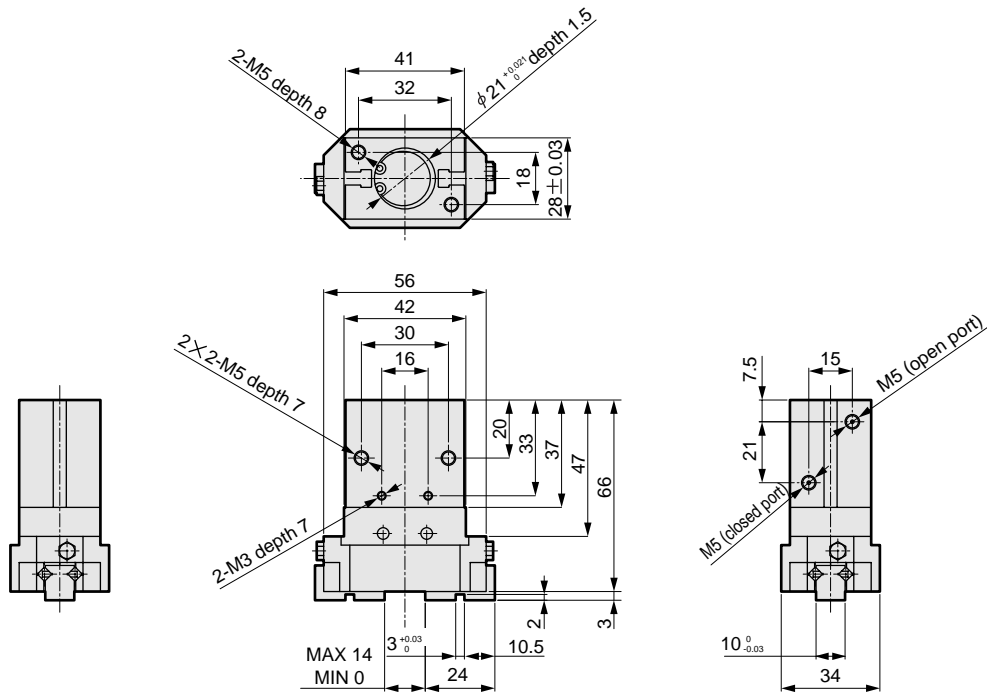
● BHE-LN-03CS



Note 1: Longitudinal direction is 6.5mm longer than standard products. Other dimensions are the same as standard products.
 Note 2: See pages 224 to 225 for outline dimensions of the sensor, amplifier (separate), and display.
 Note 3: Only the cylinder bore size symbol 04CS/05CS can be mounted on display or analog output models.

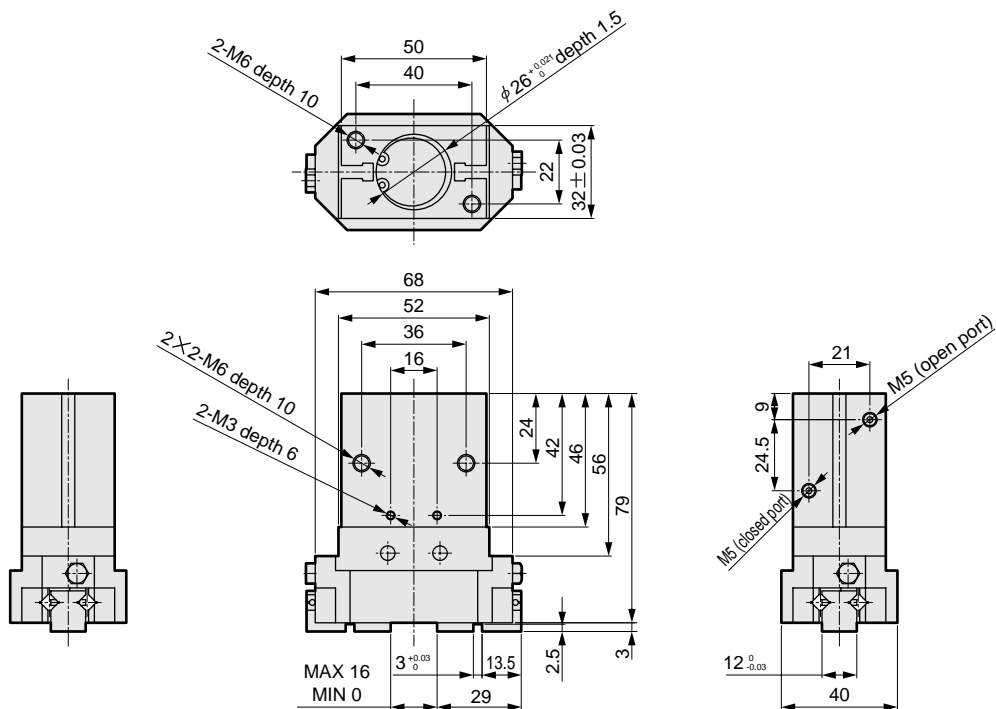
Dimensions

● BHE-LN-04CS



Note 1: Longitudinal direction is 5mm longer than standard products. Other dimensions are the same as standard products.
 Note 2: See pages 224 to 225 for outline dimensions of the sensor, amplifier (separate), and display.

● BHE-LN-05CS



Note 1: Longitudinal direction is 5mm longer than standard products. Other dimensions are the same as standard products.
 Note 2: See pages 224 to 225 for outline dimensions of the sensor, amplifier (separate), and display.

| |
|-----------------|
| RRC |
| GRC |
| RV3* |
| NHS |
| HR |
| LN |
| FH100 |
| HAP |
| BSA2 |
| BHA/ BHG |
| LHA |
| LHAG |
| HKP |
| HLA/ HLB |
| HLAG/ HLBG |
| HEP |
| HCP |
| HMF |
| HMFB |
| HFP |
| HLC |
| HGP |
| FH500 |
| HBL |
| HDL |
| HMD |
| HJL |
| BHE |
| CKG |
| CK |
| CKA |
| CKS |
| CKF |
| CKJ |
| CKL2 |
| CKL2 *-HC |
| CKH2 |
| CKLB2 |
| NCK/ SCK/FCK |
| FJ |
| FK |
| Ending |

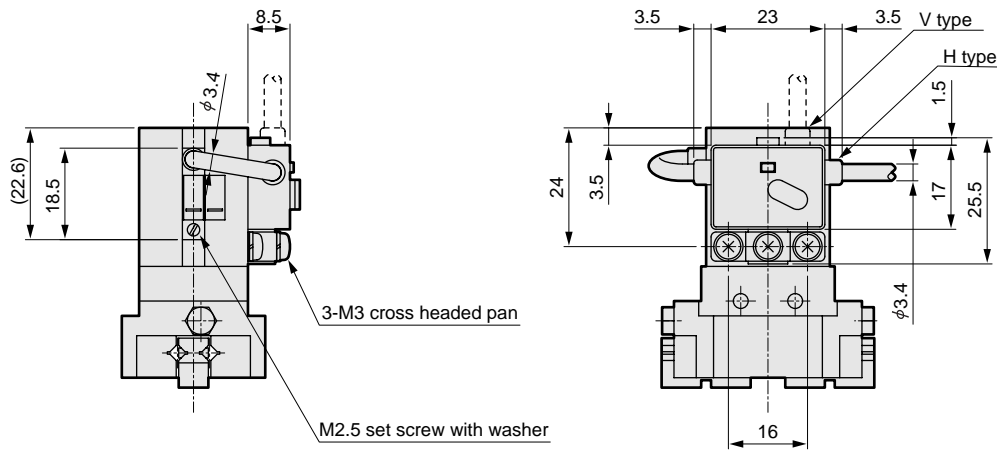
Hand with length measuring sensor
 Length measuring function

Dimensions

| |
|-----------------|
| RRC |
| GRC |
| RV3* |
| NHS |
| HR |
| LN |
| FH100 |
| HAP |
| BSA2 |
| BHA/BHG |
| LHA |
| LHAG |
| HKP |
| HLA/HLB |
| HLAG/HLBG |
| HEP |
| HCP |
| HMF |
| HMFB |
| HFP |
| HLC |
| HGP |
| FH500 |
| HBL |
| HDL |
| HMD |
| HJL |
| BHE |
| CKG |
| CK |
| CKA |
| CKS |
| CKF |
| CKJ |
| CKL2 |
| CKL2 -*HC |
| CKH2 |
| CKLB2 |
| NCK/ SCK/FCK |
| FJ |
| FK |
| Ending |

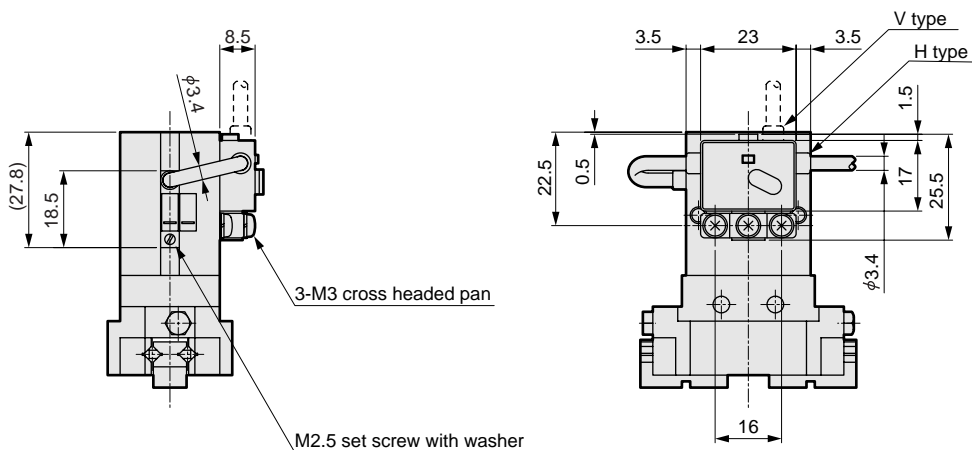
BHE-LN (amplifier section with amplifier mounting sensor)

● BHE-LN-01CS



Note 1: Refer to the discrete amplifier dimensions for details on the hand's outline dimensions.
 Note 2: The V sensor lead lead-out direction is used. H or V can be selected for the output stage lead.

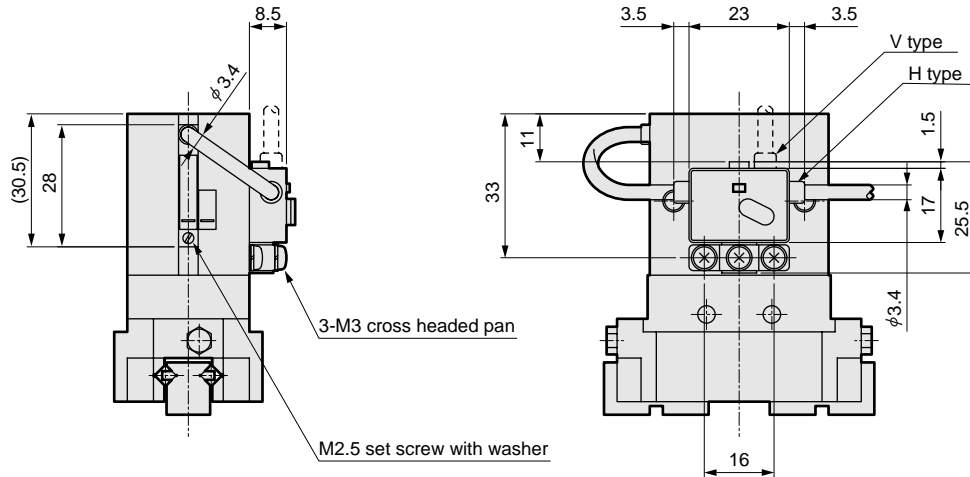
● BHE-LN-03CS



Note 1: Refer to the discrete amplifier dimensions for details on the hand's outline dimensions.
 Note 2: The V sensor lead lead-out direction is used. H or V can be selected for the output stage lead.

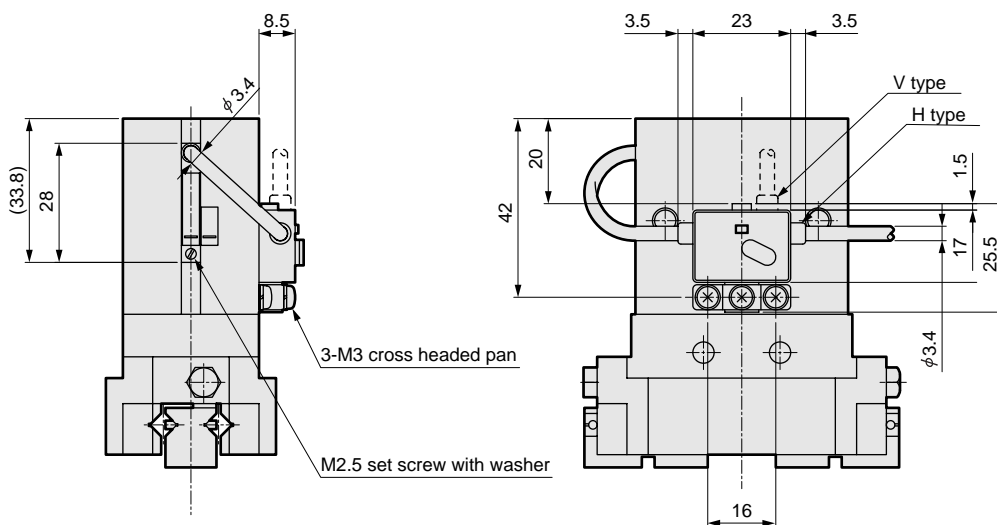
Dimensions

● BHE-LN-04CS



Note 1: Refer to the discrete amplifier dimensions for details on the hand's outline dimensions.
 Note 2: The V sensor lead lead-out direction is used. H or V can be selected for the output stage lead.

● BHE-LN-05CS



Note 1: Refer to the discrete amplifier dimensions for details on the hand's outline dimensions.
 Note 2: The V sensor lead lead-out direction is used. H or V can be selected for the output stage lead.

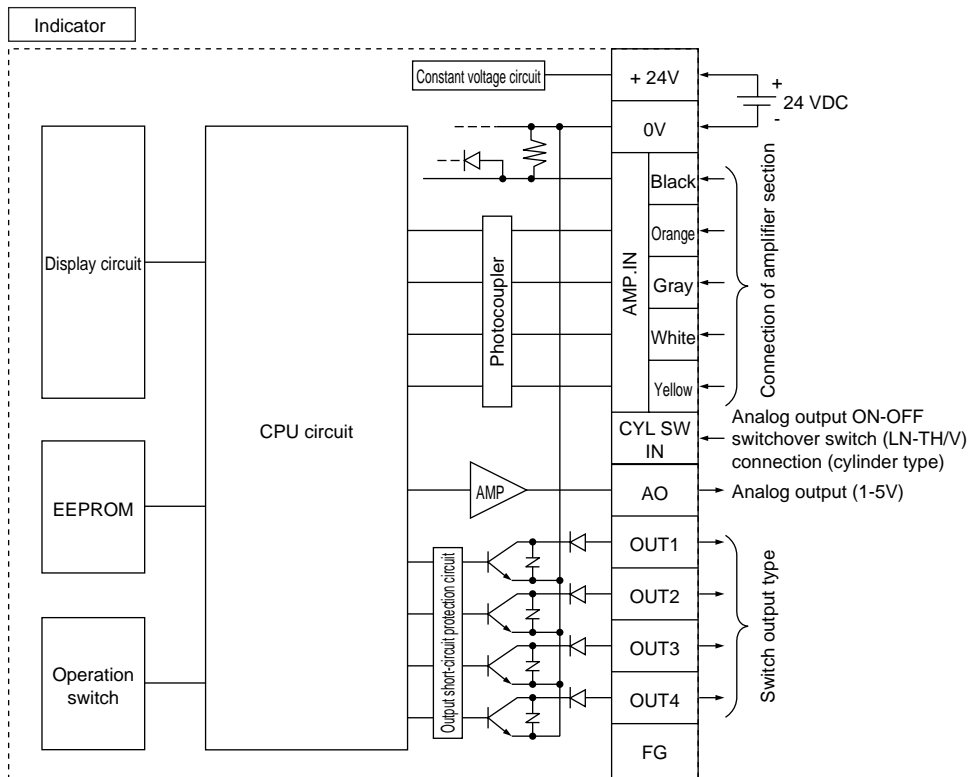
| |
|-----------------|
| RRC |
| GRC |
| RV3* |
| NHS |
| HR |
| LN |
| FH100 |
| HAP |
| BSA2 |
| BHA/ BHG |
| LHA |
| LHAG |
| HKP |
| HLA/ HLB |
| HLAG/ HLBG |
| HEP |
| HCP |
| HMF |
| HMFB |
| HFP |
| HLC |
| HGP |
| FH500 |
| HBL |
| HDL |
| HMD |
| HJL |
| BHE |
| CKG |
| CK |
| CKA |
| CKS |
| CKF |
| CKJ |
| CKL2 |
| CKL2 -H-C |
| CKH2 |
| CKLB2 |
| NCK/ SCK/FCK |
| FJ |
| FK |
| Ending |

Hand with length measuring sensor
 Length measuring function

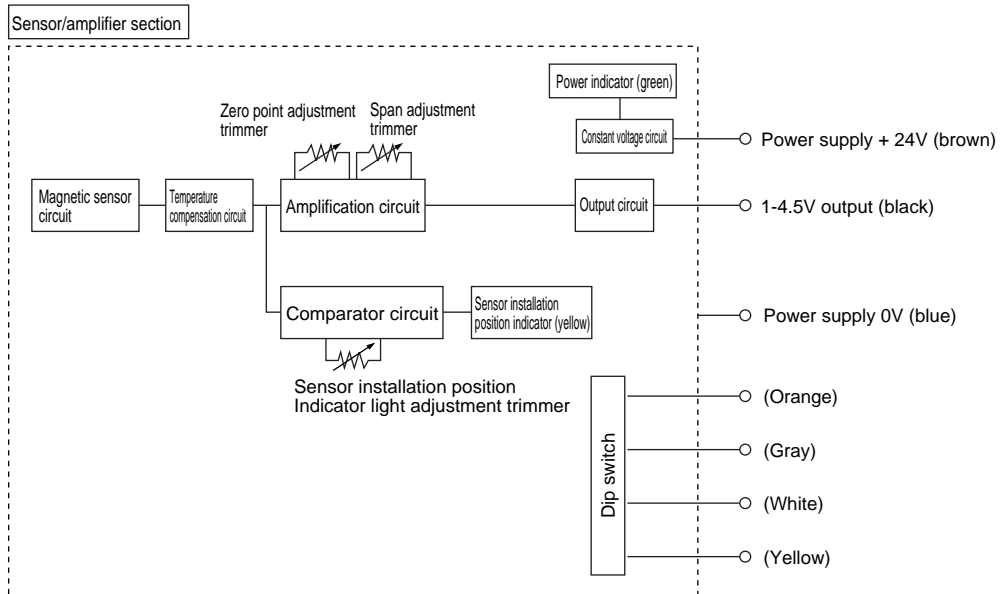
Internal circuit diagram

● Indicator type

| |
|-----------------|
| RRC |
| GRC |
| RV3* |
| NHS |
| HR |
| LN |
| FH100 |
| HAP |
| BSA2 |
| BHA/ BHG |
| LHA |
| LHAG |
| HKP |
| HLA/ HLB |
| HLAG/ HLBG |
| HEP |
| HCP |
| HMF |
| HMFB |
| HFP |
| HLC |
| HGP |
| FH500 |
| HBL |
| HDL |
| HMD |
| HJL |
| BHE |
| CKG |
| CK |
| CKA |
| CKS |
| CKF |
| CKJ |
| CKL2 |
| CKL2 -*HC |
| CKH2 |
| CKLB2 |
| NCK/ SCK/FCK |
| FJ |
| FK |
| Ending |

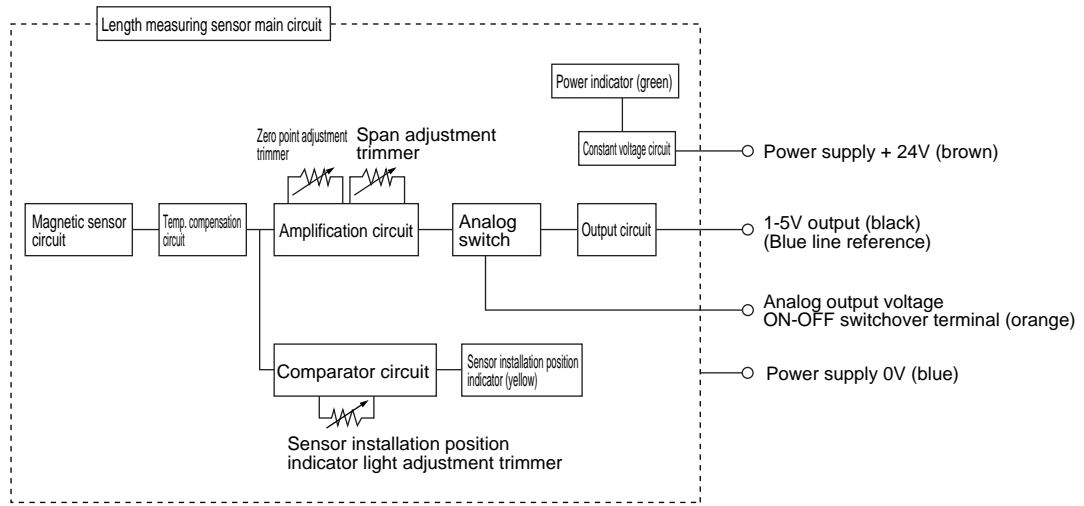


● An output stage transistor on or off during piston detection can be selected with the operation switch.

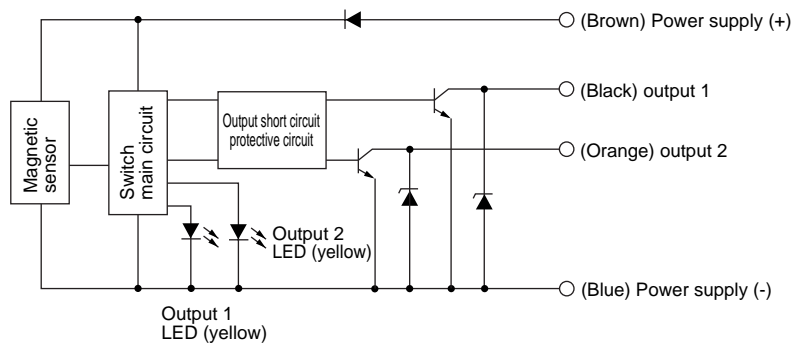


Internal circuit diagram

● Analog output type

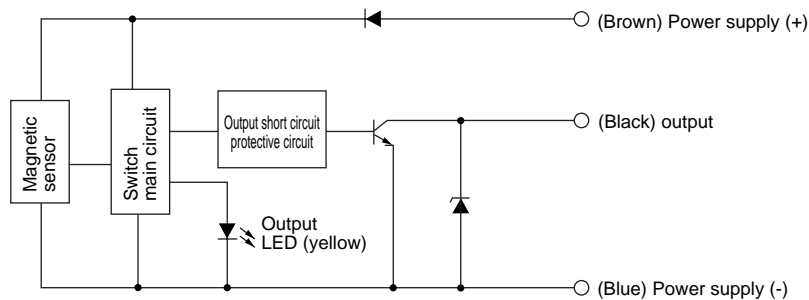


● Switch output type/amplifier separate type



● The output step transistor is turned ON during a piston detection.

● Switch output type, amplifier mounting



● The output step transistor is turned ON during a piston detection.

| |
|-----------------|
| RRC |
| GRC |
| RV3* |
| NHS |
| HR |
| LN |
| FH100 |
| HAP |
| BSA2 |
| BHA/ BHG |
| LHA |
| LHAG |
| HKP |
| HLA/ HLB |
| HLAG/ HLBG |
| HEP |
| HCP |
| HMF |
| HMFB |
| HFP |
| HLC |
| HGP |
| FH500 |
| HBL |
| HDL |
| HMD |
| HJL |
| BHE |
| CKG |
| CK |
| CKA |
| CKS |
| CKF |
| CKJ |
| CKL2 |
| CKL2 *-HC |
| CKH2 |
| CKLB2 |
| NCK/ SCK/FCK |
| FJ |
| FK |
| Ending |

Cylinder with length measuring sensor/hand
Length measuring function

| |
|-----------------|
| RRC |
| GRC |
| RV3* |
| NHS |
| HR |
| LN |
| FH100 |
| HAP |
| BSA2 |
| BHA/BHG |
| LHA |
| LHAG |
| HKP |
| HLA/HLB |
| HLAG/HLBG |
| HEP |
| HCP |
| HMF |
| HMFb |
| HFP |
| HLC |
| HGP |
| FH500 |
| HBL |
| HDL |
| HMD |
| HJL |
| BHE |
| CKG |
| CK |
| CKA |
| CKS |
| CKF |
| CKJ |
| CKL2 |
| CKL2 -*HC |
| CKH2 |
| CKLB2 |
| NCK/ SCK/FCK |
| FJ |
| FK |
| Ending |

When analog output type cylinder is installed

When adjusting the sensor installation position or analog output voltage, a workpiece (reference) should be provided so that the piston stops 4mm from the extension end and from the retraction end. The length measurement range center and the alignment center should be referenced.

Air pressure should be the same as for actual working conditions when making these adjustments.

1 Sensor installation position adjustment method

Before shipment, the sensor is installed within the specified length measurement range (e.g.: set to the center if the range is from 8 mm before piston extended end to extended end). Follow the following procedures to adjust the position if the sensor installation position has been changed or the length measurement range has been changed.

- With the sensor removed, move the sensor installation position indicator light adjustment trimmer so the sensor installation position indicator light (yellow LED) turns ON. Set the trimmer to the center of the interval at which the yellow LED turns ON. (This is adjusted before the product is shipped, so adjust even if the trimmer has been moved inadvertently.)
- Move the cylinder piston to the center of the length measuring range.
- install the sensor on the cylinder. Fix the sensor where the following operations are satisfied per insertion direction. The sensor tightening torque is 0.1 to 0.2 N·m. Install the sensor case so the sensor set screw (M2.5 set screw with washer) faces the cylinder head.

1) Insertion from rod end

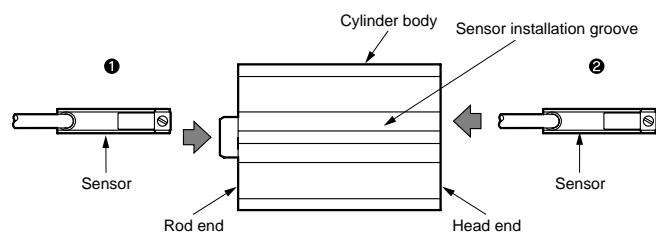
Fix at the center of the second lighting interval including where the sensor installation position indicator turns on at (1). (The second lighting is a short interval such as roughly 1mm when the piston stroke is converted.)

2) Insertion from head end

Fix at the center of the second lighting interval including where the sensor installation position indicator turns on at (1). (The second lighting is a short interval such as roughly 1mm when the piston stroke is converted.)

- When the piston stroke of the cylinder on which the sensor is installed is longer than 8mm, and the length is measured within an 8mm stroke range of that stroke, connect cylinder switch TOH/V across the orange and blue lines so unnecessary analog output voltages are not output outside the length measurement range. (When the stroke is less than 8mm, short-circuit across the orange and blue wires.)

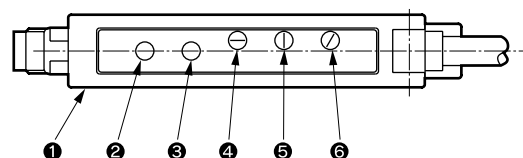
As for the conventional cylinder switch, do step (2) above, and then position this switch between ON points. The tightening torque of a switch is 0.1 to 0.2 N·m.



2 Analog output voltage adjustment method

If analog output voltage is output at 8mm in front of the piston extended end, for example, the specified measurement range is adjusted to 5V at 8mm in front of the extended end and 1V at the extended end.

- Connect the brown output stage lead to the (+) side of the 24 VDC stabilized power, the orange lead to the brown wire for cylinder switch TOH/V, and both blues wires to the (-) side of the power supply.
- Connect the black wire to the (+) side of the voltmeter and the blue wire to the (-) side of the voltmeter.
- Move the cylinder piston, and read the voltage value at the length measurement range's start end (e.g.: 8mm in front of extended end) and final end (e.g.: extended end).
- If the difference of the voltage in (2) is 4 V or less, turn the span adjustment trimmer slightly clockwise. If more than 4V, move the trimmer slightly counterclockwise.
- Move the cylinder piston again, and read the voltage at the length measurement range start and end. Adjust the zero point adjustment trimmer so the reading is 5V when using the start end as a reference, and 1V when using the end as a reference.
- Repeat steps (3), (4) and (5) several times, and adjust finely.



- 1 Amplifier unit case
- 2 Power indicator light
- 3 Sensor installation position indicator light
- 4 Sensor installation position indicator light adjustment trimmer
- 5 Zero point adjustment trimmer
- 6 Span adjustment trimmer

When analog output type hand is installed

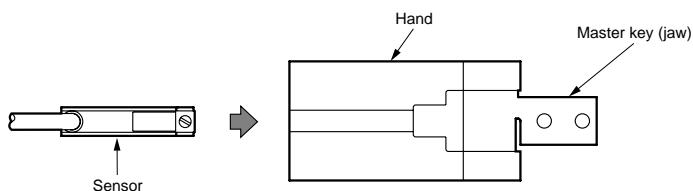
1 Sensor installation position adjustment method

Before shipment, the sensor is installed at the center of the stroke for both jaws on the master jaw. Follow the following procedures to adjust the position if the sensor installation position has been changed or the hand has been replaced.

- (1) With the sensor removed, move the sensor installation position indicator light adjustment trimmer so the sensor installation position indicator light (yellow LED) turns ON. Set the trimmer to the center of the interval at which the yellow LED turns ON. (This is adjusted before the product is shipped, so adjust even if the trimmer has been moved inadvertently.)
- (2) Move the hand master jaw (jaw) to the center of the stroke.
- (3) Install the sensor on the hand. Fix the sensor where the following operations are satisfied. The sensor tightening torque is 0.1 to 0.2 N·m. Install the sensor case so the sensor installation screw (M2.5 nonrotating set screw) faces the master jaw (jaw).

1. Sensor installation position

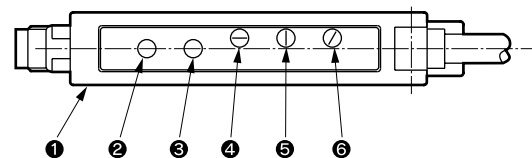
Fix at the center of the second lighting interval including where the sensor installation position indicator turns on at (1). (The second lighting is a short interval such as roughly 1mm when the piston stroke is converted.)



2 Analog output voltage adjustment method

The analog output voltage is adjusted so the master jaw (jaw) full stroke is 5 V when open and 1 V when closed. However, the voltage may slightly vary due to the working environment (effected by magnetic bodies in the area), so adjust finely with the following procedures.

- (1) Connect the brown wire to the (+) side of the 24 VDC stabilized power, and the blue and orange wires to the (-) side.
- (2) Connect the black wire to the (+) side of the voltmeter and the blue wire to the (-) side of the voltmeter.
- (3) Move the master jaw, and read the voltage value when open and closed.
- (4) If the difference of the voltage in (3) is 4 V or less, turn the span adjustment trimmer slightly clockwise. If more than 4 V, move the trimmer slightly counterclockwise.
- (5) Move the master jaw again, and read voltage when open and closed. Adjust the zero point adjustment trimmer so the reading is 5 V when using the open state as a reference, and 1 V when using the closed state as a reference.
- (6) Repeat steps (3), (4) and (5) several times, and adjust finely.



- ① Amplifier unit case
- ② Power indicator light
- ③ Sensor installation position indicator light
- ④ Sensor installation position indicator light adjustment trimmer
- ⑤ Zero point adjustment trimmer
- ⑥ Span adjustment trimmer

| |
|-----------------|
| RRC |
| GRC |
| RV3* |
| NHS |
| HR |
| LN |
| FH100 |
| HAP |
| B5A2 |
| BHA/ BHG |
| LHA |
| LHAG |
| HKP |
| HLA/ HLB |
| HLAG/ HLBG |
| HEP |
| HCP |
| HMF |
| HMFB |
| HFP |
| HLC |
| HGP |
| FH500 |
| HL |
| HDL |
| HMD |
| HJL |
| BHE |
| CKG |
| CK |
| CKA |
| CKS |
| CKF |
| CKJ |
| CKL2 |
| CKL2 *-HC |
| CKH2 |
| CKLB2 |
| NCK/ SCK/FCK |
| FJ |
| FK |
| Ending |

Cylinder/hand with length measuring sensor
Length measuring function

| |
|-----------------|
| RRC |
| GRC |
| RV3* |
| NHS |
| HR |
| LN |
| FH100 |
| HAP |
| BSA2 |
| BHA/ BHG |
| LHA |
| LHAG |
| HKP |
| HLA/ HLB |
| HLAG/ HLBG |
| HEP |
| HCP |
| HMF |
| HMFB |
| HFP |
| HLC |
| HGP |
| FH500 |
| HBL |
| HDL |
| HMD |
| HJL |
| BHE |
| CKG |
| CK |
| CKA |
| CKS |
| CKF |
| CKJ |
| CKL2 |
| CKL2 *-HC |
| CKH2 |
| CKLB2 |
| NCK/ SCK/FCK |
| FJ |
| FK |
| Ending |

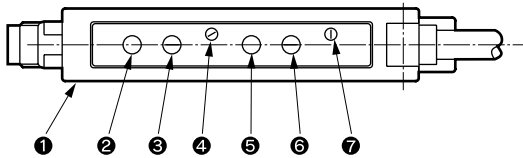
Switch output type

1 Sensor installation position adjustment method

Before shipment, the sensor is installed at the center of the stroke for both jaws on the master key (jaw). Follow the following procedures to adjust the position if the sensor installation position has been changed or the hand has been replaced.

- (1) Align the red lines on the sensor and hand, and tighten with a sensor tightening torque of 0.1 to 0.2 N·m.
- (2) Install the sensor so the set screw (M2.5 set screw with washer) faces the master key (jaw).

Amplifier separate type

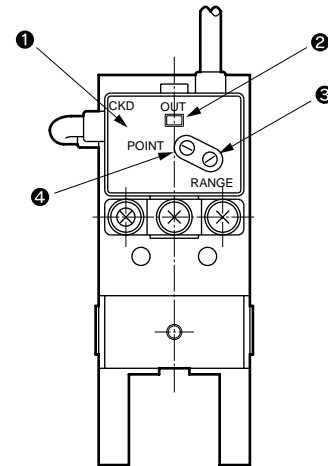


- 1 Amplifier unit case
- 2 Output 1 indicator light
- 3 Output 1 operating range adjustment trimmer
- 4 Output 1 operating points adjustment trimmer
- 5 Output 2 indicator light
- 6 Output 2 operating range adjustment trimmer
- 7 Output 2 operating points adjustment trimmer

2 Setting the switch output position

- (1) Move the hand's master key (jaw) to the position where the switch is to be output.
- (2) Turn the operating range adjustment trimmer a half turn clockwise and then turn slightly clockwise and set it temporarily.
- (3) Move the operating point adjustment trimmer and turn output ON. Set the trimmer at the center of the ON interval.
- (4) Move the operating range adjustment trimmer, and determine the operating range. The operating range is increased or decreased using the approximate center of the operating points as a reference.
- (5) Move the master key (jaws) several times and turn the switch output ON and OFF. Repeat steps (3) and (4) for fine adjustment.

Amplifier mounting



- 1 Amplifier unit case
- 2 Output indicator light
- 3 Output operating range adjustment trimmer
- 4 Output operating points adjustment trimmer

* Refer to the handling precautions enclosed with the product for details on adjusting and setting the display.