

SSD-LN BH□-LN

Linear Norm[®] Sensor Cylinder/Gripper

ø12, ø16, ø20, ø25, ø32, ø50

Special



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Special

MVC

STK

MCP

GLC

BBS

NHS

HR

LN

Cylinder
Switch

Ending

Special

MVC

STK

MCP

GLC

BBS

NHS

HR

LN

Cylinder
Switch

Ending

2-Function Integrated Actuator

Compact cylinder and gripper equipped with newly developed Linear Norm sensor. Achieves actuator function and length measurement function simultaneously

● Length measuring sensor

A coined word combining "linear" (meaning straight line) and "norm" (meaning standard), it is a newly developed special magnetic sensor that provides nearly linear output corresponding to the movement amount of a piston with a magnet.



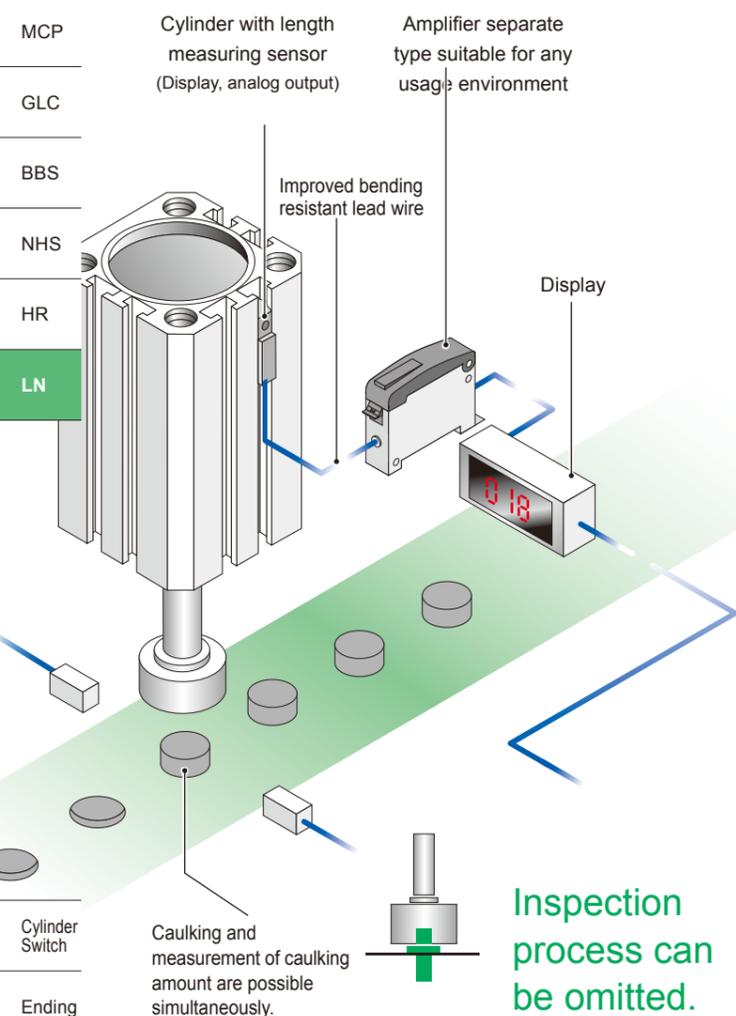
Cylinder with Linear Norm Sensor

Super compact type

SSD-LN (Double Acting Type)

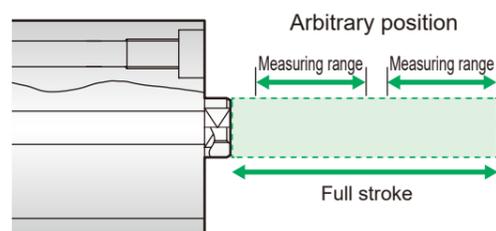
SSD-O-LN Series (Double Acting, Low Speed Type)

System Configuration



What is a Cylinder with Linear Norm Sensor?

Length measurement is possible within any set detection range (8 mm or 10 mm) within the stroke; the measurement range can be easily adjusted and changed.



Applications

Workpiece Good/No Good Judgment, Workpiece Type Judgment, Confirmation of Clamping Status, Measurement of Caulking/Press-fitting Amount, etc.

Variation

Bore Size (mm)	Stroke (mm)
ø12, ø16	20, 30
ø20, ø30, ø50	20, 50

Output Type	Indicator	Detection Range (mm)
Analog Output	None	8
Switch Output & Analog Output	Yes	10

Gripper with Linear Norm Sensor



Compact Cross Roller Parallel Gripper
BHA-LN Series



Small cross roller parallel hand (With rubber cover)
BHG-LN Series



Centering Gripper
BHE-LN Series

What is a Gripper with Linear Norm Sensor?

Length measurement possible across the full stroke of the gripper. Intermediate detection, which was difficult with conventional cylinder switches, can be easily performed.

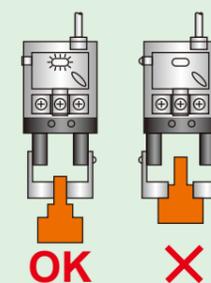
Variation

Item		BHA/BHG 01CS, 03CS	BHA/BHG 04CS, 05CS	BHE 01CS, 03CS	BHE 04CS, 05CS
Bore Size (mm)		Equivalent to ø12, ø16	Equivalent to ø20, ø25	Equivalent to ø12, ø16	Equivalent to ø20, ø25
Stroke (mm)		5, 9	11, 15	7, 10	14, 16
Gripping Force (N) *Per 1 Finger		15, 27	35, 80	15, 29	48, 80
Output Type	1-point Switch Output	●	●	●	●
	2-point Switch Output	●	●	●	●
	Analog Output	—	●	—	●
	Switch Output & Analog Output	—	●	—	●

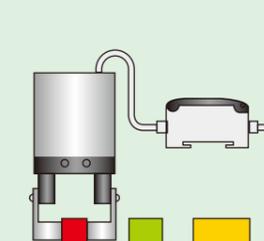
* Gripping force is the value at 0.5 MPa air pressure, when closed. Actual gripping force varies depending on the distance to the gripping point and the angle of the fingers, so please check the catalog when selecting.

Application Examples of Gripper with Linear Norm Sensor

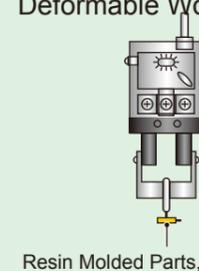
Confirmation of Workpiece Gripping Posture



Workpiece Identification

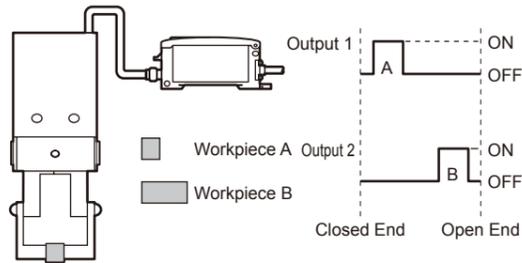


Gripping Confirmation of Deformable Workpieces



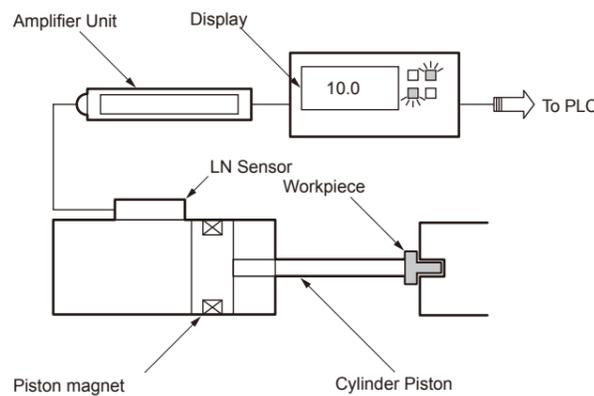
Resin Molded Parts, Rubber, etc.

1 Identification of Irregularly Shaped Workpieces



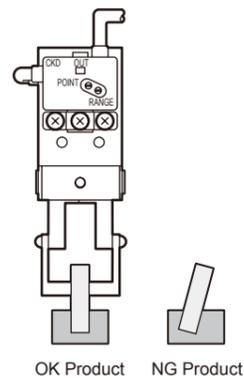
When there are workpieces A and B of different sizes, and you want to distinguish them when each is gripped, set output 1 when A is gripped, and output 2 when B is gripped. For switch type, settings can be easily adjusted with the trimmer on the amplifier unit of the Linear Norm sensor. (Indicator of switch outputs are digitally set with buttons.) The trimmer can change the operation point and range, so signals for each A and B workpiece can be output if a narrow operation range is set, and so the load side (example: PLC) can be used to judge workpieces. Furthermore, for the analog output type, the analog output changes according to the size of the workpiece, so control is possible by incorporating that change into the PLC.

2 Workpiece Press-fitting



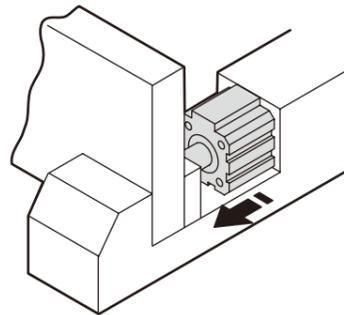
This is an example of using a Linear Norm sensor of the compact cylinder mounted type to inspect the press-fitting state of a workpiece using the output of the Linear Norm sensor while press-fitting the workpiece with the cylinder. Furthermore, when an indicator is used, the thickness of the workpiece can be measured on the display unit. Also, by incorporating the judged signal into the PLC, line automation can be performed. In the case of the cylinder type, the measurement range is limited, but it will be set at the factory according to the customer's detection position, so it can be used immediately after wiring.

3 Confirmation of Workpiece Gripping Posture



Can be used to confirm whether the workpiece is gripped in the correct posture. Set the operating range narrowly so that it turns ON only for normal workpiece gripping posture.

4 Confirmation of Clamping Status



By taking the cylinder piston stop position with the output of the Linear Norm sensor, the clamping state can be managed.



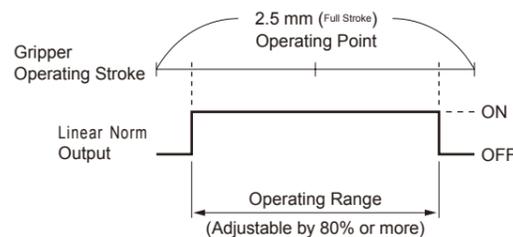
Sensor, Amplifier, Indicator



Sensor/Amplifier Unit Specifications

Item	Amplifier installed/ switch output LN-□ VS1PAH/V	Amplifier separate/ switch output LN-□H/ VCSS	Amplifier separate/ analog output LN-10□ CLS	Amplifier separate/display (LN-DN) dedicated LN- 10□CLDS
Applications	PLC/Relay		PLC	—
Power supply voltage	24 VDC ±10%			
Current consumption	20 mA or less		30 mA or less	
Indicator LED	Switch Output Indicator LED (Yellow LED ON when lit)		Green LED lights up when power is applied Sensor Mounting Position Indication Yellow LED lights up	
Number of Switch Outputs	1	2	—	
Switch Output	NPN Open Collector Output, 30 VDC or less, 50 mA or less, Internal Voltage Drop 1.2 V or less		—	
Analog Output	—		1-5 V Connecting load 50 kΩ and over	1-4.5 V (Input to display)
Analog Output Linearity	—		±5% F.S. or less	
Effective Measurement Range	—		Gripper Double jaw full stroke Cylinder At any 8 mm area over the piston stroke	Gripper Double jaw full stroke Cylinder At any 10mm interval with piston stroke
Lead Wire	Sensor Unit	35mm (oil resistant vinyl cabtyre cable 3-conductor 0.2 mm ²)		
	Amplifier Unit	3 m (oil resistant vinyl cabtyre cable 3-conductor, 0.2 mm ² , bend resistant wire)	3 m (oil resistant vinyl cabtyre cable 4-conductor 0.2 mm ²)	3 m (oil resistant vinyl cabtyre cable 4-conductor, 0.2 mm ² , shielded wire)
Insulation resistance	20 MΩ or more with 500 VDC megger			
Withstand Voltage	No abnormality when 1000 VAC is applied			
Shock Resistance	Sensor Unit	294 m/s ²		980 m/s ²
	Amplifier Unit	294 m/s ²		294 m/s ²
Enclosure	Sensor Unit	IEC Standard IP65		IEC Standard IP67
	Amplifier Unit	IEC Standard IP65		IEC Standard IP65
Ambient Temperature/Humidity	-10 to 60°C, 85% RH or less			
Switch Operating Range Adjustment Range (*3)	0 to 80% or more of full stroke (For the stroke of one of the two gripper fingers)			
Switch Operating Point Temperature Drift	0.1 mm/10°C or less			
Analog Output Temperature Drift	—		50 mV/10°C or less	
Repeatability (*1)	±0.1 mm or less (at 25°C, no external magnetic field, no deformation or wear of actuator/jig)			
Mounting method	Dedicated Bracket Mounting		DIN Rail or Direct Mounting	
Weight (g)	54	172	175	199

*1: Value including actuator repeatability. Also, in the case of a gripper, it is for the stroke of one of the two fingers.
*2: Refer to P. 1172 as a guide for model selection for mixed workpiece sorting applications.
*3: Switch operating range adjustment range
Example) BHA-LN-01CS operating stroke - 5 mm
For two jaws, 5mm→1 for two jaws, 2.5mm.

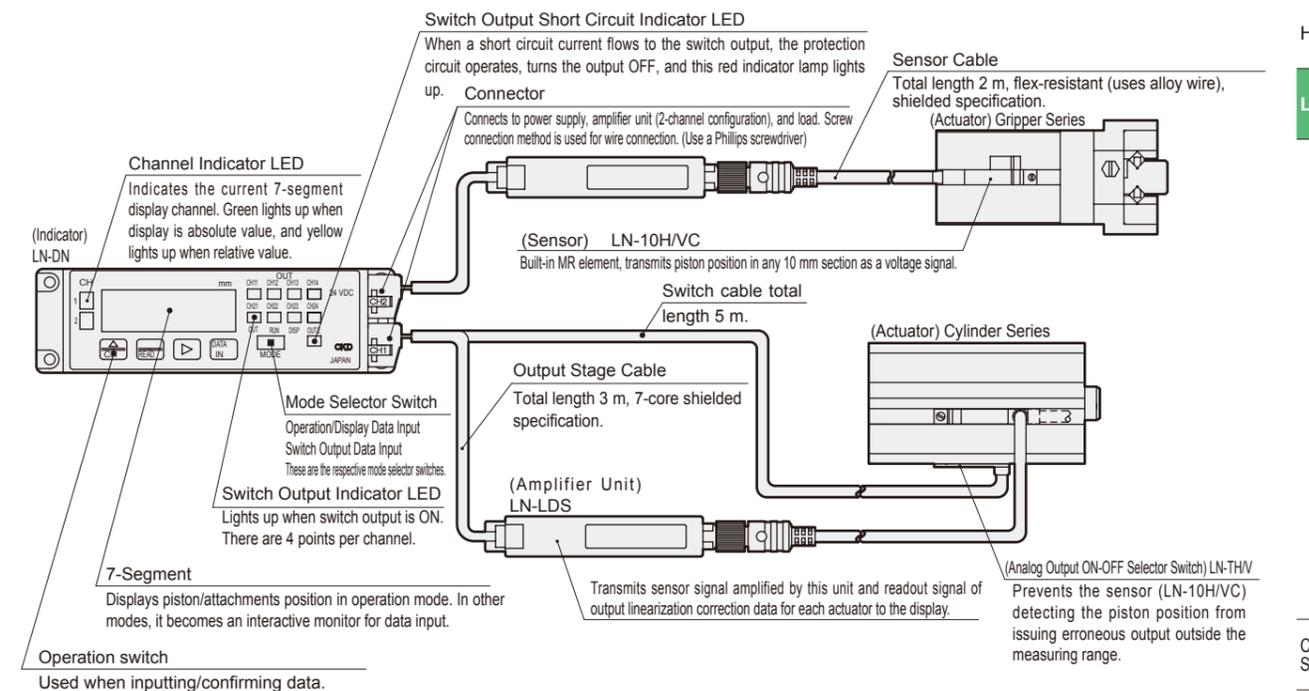


Indicator Unit Specifications

Item	LN-DN
Power supply voltage	24 VDC ±10%
Current consumption	150 mA or less
Sensor Input	2CH (1-4.5 V voltage input)
Output Type	• Analog Output (1 point)×2CH (1-5 V voltage output) • Switch Output (4 points)×2CH (ON-OFF output based on any 1 set position, or window output based on 2 set positions)
Display Type	• 7-segment display (Max display ±1999.9 mm, Min unit 0.1 mm) • Absolute/Relative Value Identification Display, CH Identification Display, Switch Output Display, Switch Output Short Circuit Display
Switch Output	NPN Open Collector Output (*4), 30 VDC / 50 mA or less, Internal Voltage Drop 1.2 V or less, PLC/Relay Compatible
Analog Output	1-5 V Voltage Output, Connection Load 500 kΩ or more
Analog Output Linear Accuracy(*1)	±1% F.S. or less (at 25°C, according to our company's specified measurement method)
7-Segment Display Linear Accuracy (*2)	7-segment display is a reference value
Repeatability (*3)	±0.1 mm or less (at 25°C, no external magnetic field, no deformation or wear of actuator/jig)
Analog Output Temperature Drift	50 mV/10°C or less (Equivalent to a variation of Approx. ±0.1 mm in terms of displayed value)
Insulation resistance	20 MΩ or more with 500 VDC megger
Withstand Voltage	No abnormality when 1000 VAC is applied
Shock Resistance	294 m/s ²
Enclosure	IEC Standard IP40
Ambient Temperature/Humidity	-10 to 60°C, 85% RH or less
Mounting method	DIN Rail or Direct Mounting
Weight (g)	93

*1: Since an analog sensor that converts the magnitude of piston magnet magnetic flux density into a voltage value is used, accuracy decreases in actual use if a magnetic body contacts from both end directions of the piston stroke or if disturbance magnetic fields enter.
*2: Display accuracy changes depending on the span setting value for the two piston stop positions.
*3: Includes the repetitive accuracy of the actuator. Also, in the case of a hand, it is relative to the stroke of one of the two fingers.
*4: For PNP open collector output, please consult us separately.

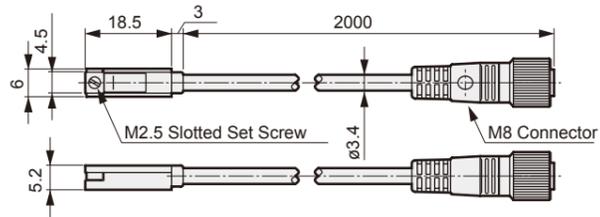
Configuration of Indicator Type



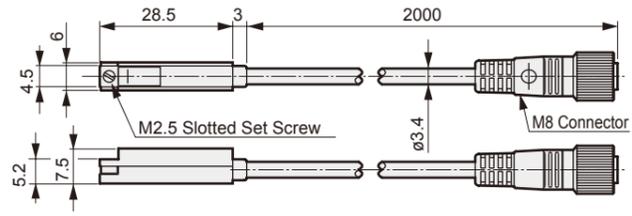
Dimensional Drawings

Sensor Unit

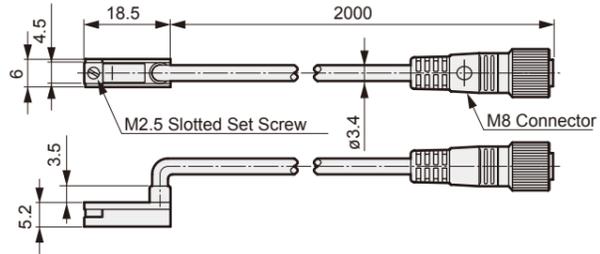
- Separate Amplifier Type
- LN-05HC



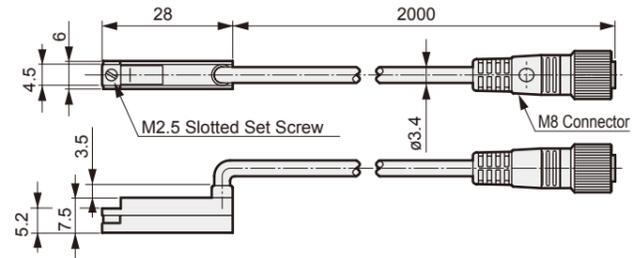
- LN-10HC



- LN-05VC

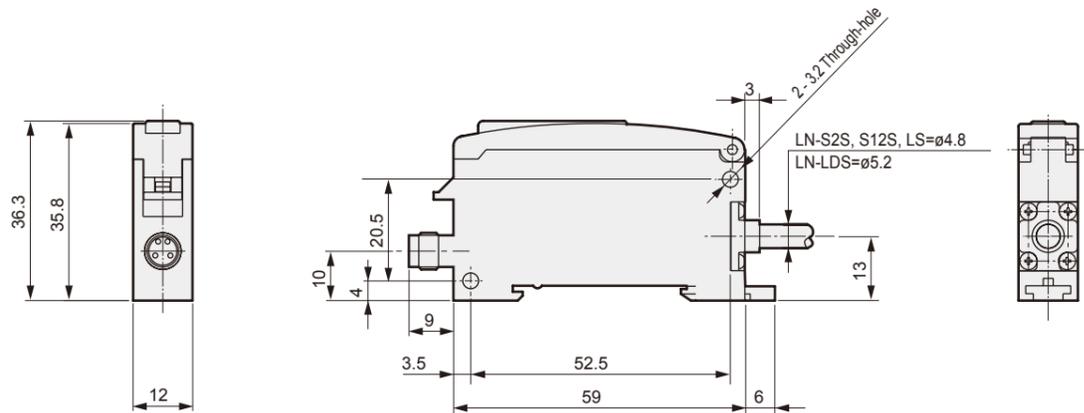
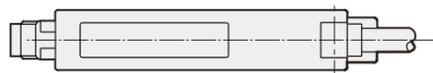


- LN-10VC



Amplifier Unit

- Separate Amplifier Type
- LN-□S

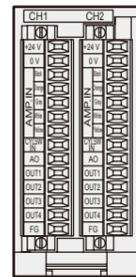
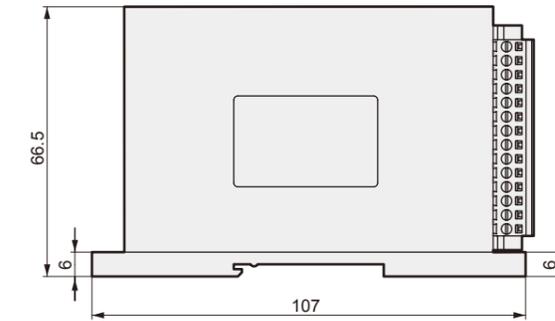
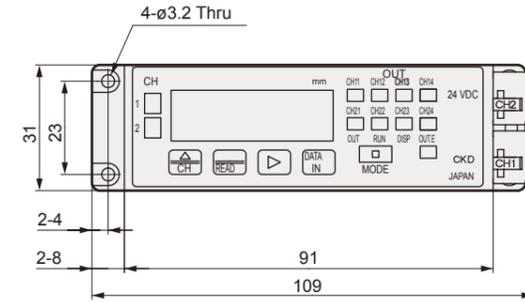


Dimensional Drawings

Dimensional Drawings

Indicator Unit

- LN-DN



Special

MVC

STK

MCP

GLC

BBS

NHS

HR

LN

Special

MVC

STK

MCP

GLC

BBS

NHS

HR

LN

Cylinder Switch

Ending

Cylinder Switch

Ending



Cylinder with Linear Norm Sensor SSD-LN Series

● Bore Size: $\phi 12$, $\phi 16$, $\phi 20$, $\phi 32$, $\phi 50$



SSD-LN Series

Model No. Notation

Cylinder Mounting Bracket Model No.

LN-A-LB-20

Model No. 2 Cylinder Bore Size

Note: Axial foot (2 pcs.) and mounting Hexagon Socket head bolts (8 pcs., 4 pcs. for $\phi 50$ only) are included.

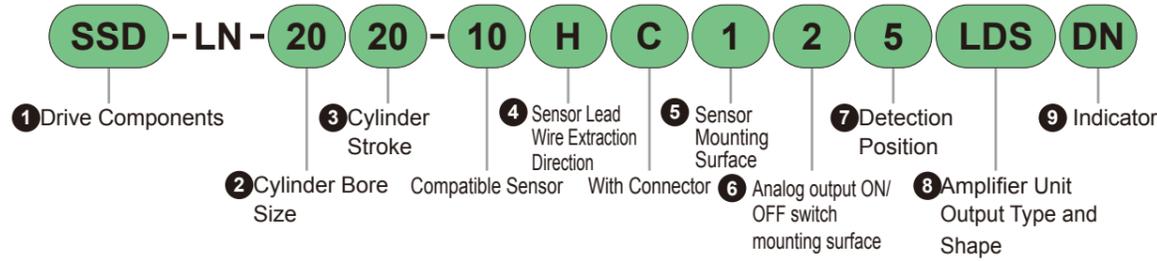
Cylinder Switch Single Unit Model No.

SW-T 0 H 3

Model No. 10 Output format 11 Lead Wire Extraction Direction 12 Lead wire length

Note: Cylinder mounting brackets (axial foot type) are also available, so please order separately if required. The appearance and external dimensions are the same as the Compact Cylinder, but the material of the mounting bolts is different. (Stainless Steel bolt used) Cylinder switches may be mountable in a separate groove for piston protrusion and pull end confirmation. Order separately when required.

Model No. Notation



1 Drive Components

Code	Content
SSD	Super compact type (Double Acting Type)
SSD-O	Super compact type (Double Acting, Low Speed Type)

2 Cylinder Bore Size (mm)

Code	Content
12	$\phi 12$
16	$\phi 16$
20	$\phi 20$
32	$\phi 32$
50	$\phi 50$

3 Cylinder Stroke (mm)

Code	Content
20	20
30	30 ($\phi 12$, $\phi 16$)
50	50 ($\phi 20$ to $\phi 50$)

4 Sensor Lead Wire Extraction Direction

Code	Content
H	Straight lead wire type
V	Lead wire L-type

5 Sensor Mounting Surface

Code	Content
1	Right side
2	Lower Side
3	Left side

Note: The sensor and analog output ON-OFF selector switch cannot be mounted on the same surface. ($\phi 12$, $\phi 16$ only)

6 Analog Output ON-OFF Selector Switch Mounting Surface

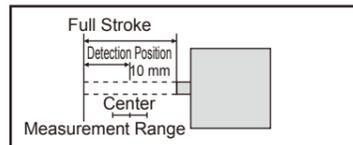
Code	Content
1	Right side
2	Lower Side
3	Left side

*1: Sensor and analog output ON-OFF switch cannot be installed on the same surface. ($\phi 12$, $\phi 16$ only)
*2: The lead wire outlet direction of analog output ON-OFF switch, the same one as the sensor, will be selected automatically. Lead wire length is 5 m specifications.

7 Detection Position (mm)

Cylinder Stroke	Detection Position		
	LS	LS	LDS
	$\phi 12$, $\phi 16$	$\phi 20$ to $\phi 50$	$\phi 12$ to $\phi 50$
20	5 to 15	4 to 16	5 to 15
30	5 to 25	—	5 to 25
50	—	4 to 46	5 to 45

*2: Detection position can be selected every 1 mm.



*1: When the detection position is "10", the center point of the detection position is 10 mm before the extended end of the cylinder full stroke, and the measuring range is ± 4 (± 5) mm from this center point.

8 Amplifier Unit Output Type and Shape

Code	Content
LS	Separate Amplifier/Analog Output Type
LDS	Separate Amplifier/For Indicator (LN-DN)

9 Indicator

Code	Content
DN	Switch Output Unit NPN Type Indicator

*1: Can be selected only when Amplifier separate / For display (LN-DN) (LDS) is selected.
*2: Two channels can be used for display. 1ch is for the amount arranged with this Model No. display. If you wish to use another channel, please arrange it separately.
①-LN-②③-10④⑤⑥⑦CLDS

10 Output format

Code	Content
0	Reed 2-wire type
5	Reed 2-wire No Indicator LED
2	Solid state 2-wire type
3	Solid state 3-wire type
2W	Solid State 2-wire 2-Color Indicator
3W	Solid State 3-wire 2-Color Indicator

11 Lead Wire Extraction Direction

Code	Content
H	Straight lead wire type
V	Lead wire L-type

12 Lead wire length

Code	Content
Blank	1 m (Standard)
3	3 m (Option)
5	5 m (Option)

Individual Order Model No. for Maintenance

For adjustment and setting methods when ordered individually, please see the product specification sheet or the instruction manual included with the product.

● Cylinder

SSD-LN-20-20

● Sensor

LN-10 H C

● Amplifier Unit

LN-LDS

● Indicator

LN-DN

Analog Output ON-OFF Selector Switch

● Amplifier separate/analog output (LS) $\phi 20$ or more

SW-T0H5

Code	Content
T0H5	Reed 2-wire, Straight Lead Wire
T0V5	Reed 2-wire, L-shaped Lead Wire Type

● Amplifier separate/analog output (LS) for $\phi 12$, $\phi 16$ ● Amplifier separate/for display (LN-DN) (LDS)

LN-TH

Code	Content
TH	Reed 2-wire, Straight Lead Wire
TV	Reed 2-wire, L-shaped Lead Wire Type

Cylinder Unit Specifications

● SSD-LN Series

Model No. (*1)	SSD-LN	SSD-O-LN
Item		
Actuation method	Double Acting, Single Rod Type	Double Acting, Single Rod, Low Speed Type
Operating Fluid	Compressed Air	
Max Operating Pressure MPa	1.0	
Min Operating Pressure MPa	0.1	0.05
Proof Pressure MPa	1.6	
Ambient Temperature °C	-10 to 60 (No freezing)	
Bore Size mm	ø12, ø16, ø20, ø32, ø50	
Stroke mm	20, 30 (ø12, ø16), 20, 50 (ø20, ø32, ø50)	
Stroke Tolerance mm	0 to +1	
Port Size	M5 (ø12, ø16, ø20), Rc1/8 (ø32), Rc1/4 (ø50)	
Piston speed (mm/s)	50 to 500	10 to 200
Cushion	None	
Lubrication	Not required (When lubricating, use turbine oil Class 1 ISO VG32)	Not allowed
Non-rotating accuracy °	±2 (ø12), ±1.5 (ø16, ø20), ±1 (ø32, ø50)	



SSD-LN

Note: The appearance of the cylinder is the same as the Compact Cylinder SSD-ML (Double Acting, non-rotating type), but please note that they are not compatible in terms of internal structure. (This cylinder is dedicated for Linear Norm.)

Sensor/Amplifier Unit (Separate Type) Specifications

Refer to P. 1140.

Indicator Unit Specifications

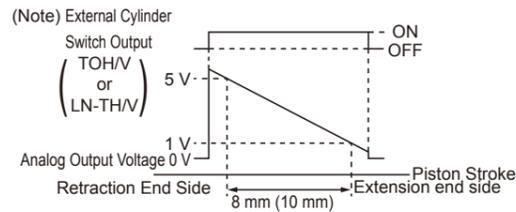
Refer to P. 1141.

Weight Table

Unit (g)

Stroke Tube I.D.	20	30	50
ø12	111	122	
ø16	135	157	
ø20	189		263
ø32	346		476
ø50	661		914

Linear Norm Sensor Output Characteristics



(Note)
An analog output ON-OFF selector switch is separately required to extract analog output voltage in an arbitrary 8 mm (10 mm for indicator type) section relative to the cylinder full stroke. The combinations are as shown in the table below.

Analog Output ON-OFF Selector Switch Model No.	Output Type	Measurement Range
TOH/V5	Analog Output Type	8 mm
LN-TH/V	Indicator Type	10 mm

MEMO

Special

Special

MVC

MVC

STK

STK

MCP

MCP

GLC

GLC

BBS

BBS

NHS

NHS

HR

HR

LN

LN

Cylinder Switch

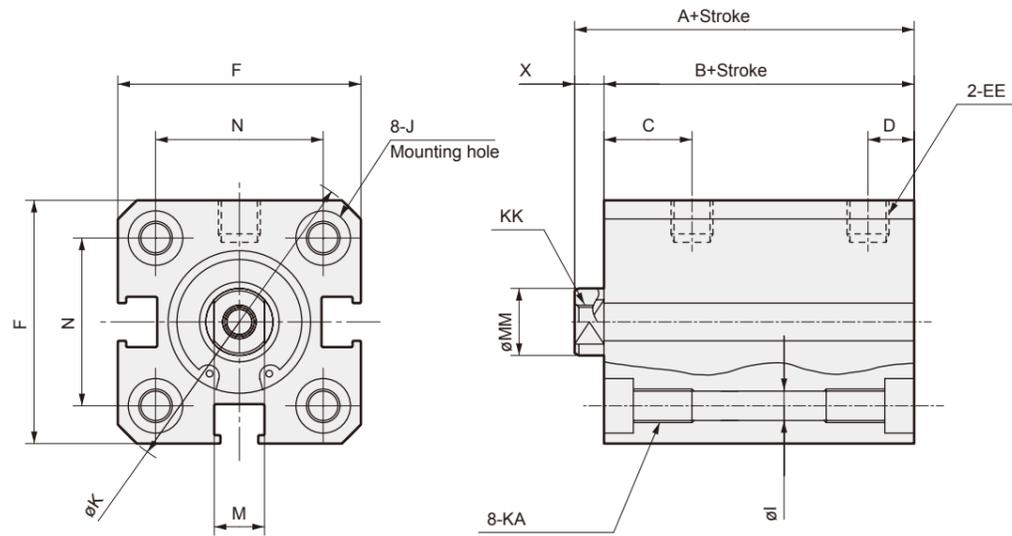
Cylinder Switch

Ending

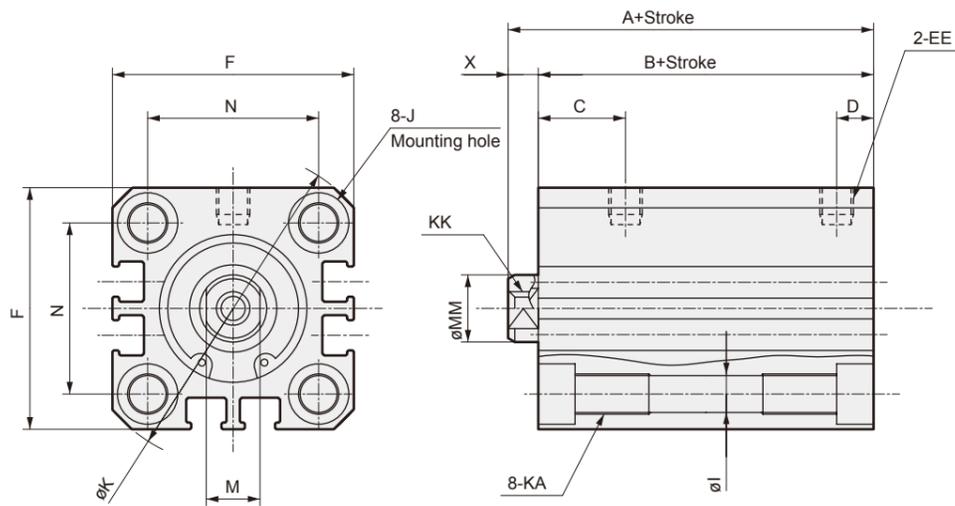
Ending

Dimensional Drawings

- SSD-LN, SSD-O-LN
- $\phi 12, \phi 16$

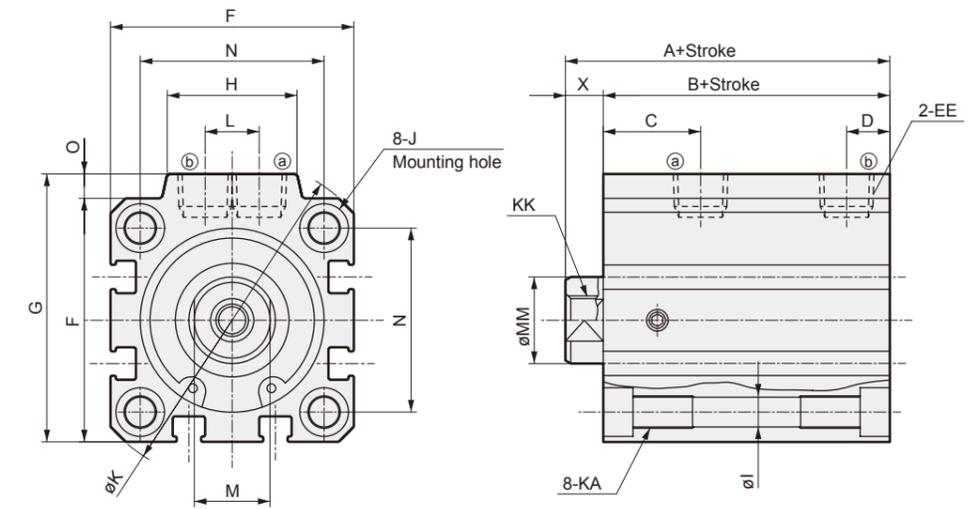


- SSD-LN / SSD-O-LN
- $\phi 20$



Dimensional Drawings

- SSD-LN, SSD-O-LN
- $\phi 32, \phi 50$



Code	A	B	C	D	EE	F	G	H	I	J	K	KA	KK	L
$\phi 12$	35.5	32	10.5	5.5	M5	25	-	-	3.5	6.5 Counterbore Depth 3.5	32	M4 Depth 7	M3 Depth 6	-
$\phi 16$	35.5	32	10.5	5.5	M5	29	-	-	3.5	6.5 Counterbore Depth 3.5	38	M4 Depth 7	M4 Depth 8	-
$\phi 20$	39	34.5	13	5.5	M5	36	-	-	5.5	9 Counterbore Depth 5.5	47	M6 Depth 11	M5 Depth 7	-
$\phi 32$	50	43	18	8	RC1/8	45	49.5	24	5.5	9 Counterbore Depth 5.5	60	M6 Depth 11	M8 Depth 13	10
$\phi 50$	53.5	45.5	15.5	10.5	RC1/4	64	71	33	6.9	11 Counterbore Depth 6.5	86	M8 Depth 13	M10 Depth 15	15

Code	M	MM	N	O	X	Remarks
$\phi 12$	5	6	15.5	-	3.5	Total length is 5 mm longer than the standard product (SSD-ML). Others are the same dimensions as the standard product.
$\phi 16$	6	8	20	-	3.5	Total length is 5 mm longer than the standard product (SSD-ML). Others are the same dimensions as the standard product.
$\phi 20$	8	10	25.5	-	4.5	Dimensions are the same as the standard product (SSD-ML).
$\phi 32$	14	16	34	4.5	7	Dimensions are the same as the standard product (SSD-ML).
$\phi 50$	18	20	50	7	8	Dimensions are the same as the standard product (SSD-ML).

Note: For outline dimension drawings of the sensor unit/amplifier unit (separate type) and indicator unit, refer to P. 1142, 1143.

Special

MVC

STK

MCP

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Cylinder Switch

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Cylinder Switch

Ending

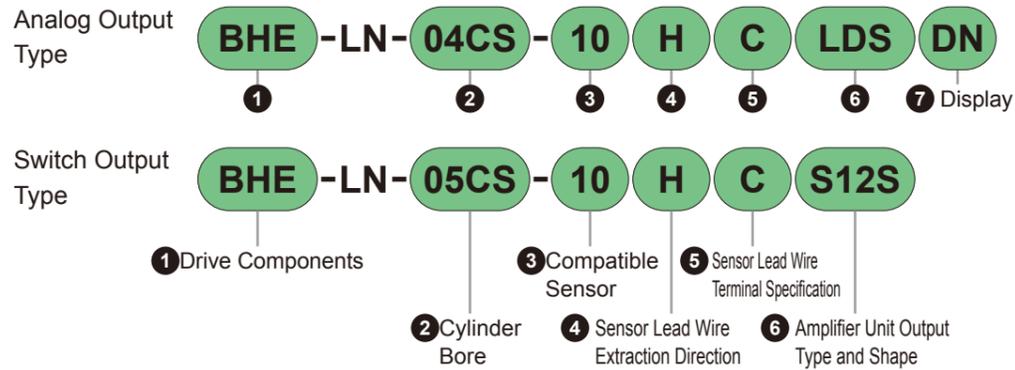


Gripper with Linear Norm Sensor BHA, BHG, BHE-LN Series

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



Model No. Notation



Note: Please note that the compatible sensor/amplifier unit differs depending on the Linear Norm sensor equipped drive equipment Model No..

1 Drive Components

Code	Content
BHA	Cross Roller Parallel Gripper (Double Acting Type)
BHG	Cross Roller Parallel Gripper (Double Acting Type, With Rubber Cover)
BHE	Centering Gripper (Double Acting Type)

2 Cylinder Bore

Code	Content
01CS	φ12
03CS	φ16
04CS	φ20
05CS	φ25

3 Compatible Sensor

Code	Content
05	For 01CS, 03CS
10	For 04CS, 05CS

4 Sensor Lead Wire Extraction Direction

Code	Content
H	Straight lead wire type
V	Lead wire L-type (V only for amplifier-mounted type)

5 Sensor Lead Wire Terminal Specification

Code	Content
Blank	Without Connector (Applicable to amplifier-mounted type)
C	With M8 Connector (Applicable to separate amplifier type)

6 Amplifier Unit Output Type and Shape

Code	Content
S1PAH	Amplifier Mounted, Straight Lead Wire, 1-point Switch Output Type
S1PAV	Amplifier Mounted, L-shaped Lead Wire, 1-point Switch Output Type
S2S	Separate Amplifier, 2-point Switch Output Type (For 01CS, 03CS compatibility)
S12S	Separate Amplifier, 2-point Switch Output Type (For 04CS, 05CS compatibility)
LS	Separate Amplifier, Analog Output Type (For 04CS, 05CS compatibility)
LDS	Separate Amplifier, For Indicator (LN-DN) (For 04CS, 05CS compatibility)

7 Display

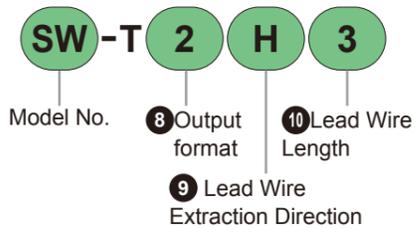
Code	Content
DN	Switch Output Unit NPN Type Indicator

*1: Can be selected only when Amplifier separate / For display (LN-DN) (LDS) is selected.

*2: Two channels can be used for display. 1ch is for the amount arranged with this Model No. display. If you wish to use another channel, please arrange it separately.

①-LN-②-③④⑤LDS

Cylinder Switch Single Unit Model No.



Note: In the case of a gripper, regardless of analog output type or switch output type, one cylinder switch can be mounted in a separate groove for confirming finger opening/closing, so please order separately if required.

8 Output format

Code	Content
2	Solid state 2-wire type
3	Solid state 3-wire type

9 Lead Wire Extraction Direction

Code	Content
H	Straight lead wire type
V	Lead wire L-type

10 Lead wire length

Code	Content
Blank	1 m (Standard)
3	3 m (Option)
5	5 m (Option)

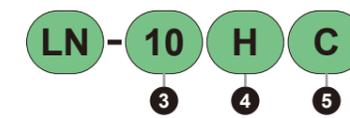
Individual Order Model No. for Maintenance

For adjustment and setting methods when ordered individually, please see the product specification sheet or the instruction manual included with the product.

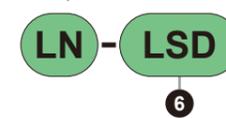
● Hand (Gripper)



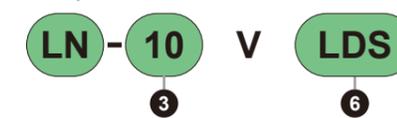
● Sensor



● Amplifier Unit



● Amplifier unit with sensor



● Display



BH □-LN Series

Specifications

Gripper Unit Specifications

●BHA Series

Item	Cross Roller Parallel Gripper (Double Acting Type)			
	BHA-LN-01CS	BHA-LN-03CS	BHA-LN-04CS	BHA-LN-05CS
Cylinder bore mm	ø12	ø16	ø20	ø25
Operating Fluid	Compressed Air			
Max Operating Pressure MPa	0.7			
Min Operating Pressure MPa	0.1			
Ambient Temperature °C	5 to 60			
Double jaw stroke mm	5	9	11	15
Port Size	M3		M5	
Weight g	140	200	290	460
Lubrication	Not required (When lubricating, use turbine oil Class 1 ISO VG32)			



BHA

●BHG Series

Item	Cross Roller Parallel Gripper (Double Acting Type, With Rubber Cover)			
	BHG-LN-01CS	BHG-LN-03CS	BHG-LN-04CS	BHG-LN-05CS
Cylinder bore mm	ø12	ø16	ø20	ø25
Operating Fluid	Compressed Air			
Max Operating Pressure MPa	0.7			
Min Operating Pressure MPa	0.15			
Ambient Temperature °C	5 to 60			
Double jaw stroke mm	5	9	11	15
Port Size	M3		M5	
Weight g	170	230	320	490
Lubrication	Not required (When lubricating, use turbine oil Class 1 ISO VG32)			



BHG

●BHE Series

Item	Centering Gripper (Double Acting Type)			
	BHE-LN-01CS	BHE-LN-03CS	BHE-LN-04CS	BHE-LN-05CS
Cylinder bore mm	ø12	ø16	ø20	ø25
Operating Fluid	Compressed Air			
Max Operating Pressure MPa	0.7			
Min Operating Pressure MPa	0.2			
Ambient Temperature °C	5 to 60			
Double jaw stroke mm	7	10	14	16
Port Size	M3		M5	
Weight g	130	180	300	480
Lubrication	Not required (When lubricating, use turbine oil Class 1 ISO VG32)			



BHE

Note: The appearance of the gripper is the same as the standard type, but please note that the internal structure is different. (This gripper is dedicated for Linear Norm.)

For gripping force performance data, refer to Pneumatic Cylinder ⑤ (No. RJ-006AA).

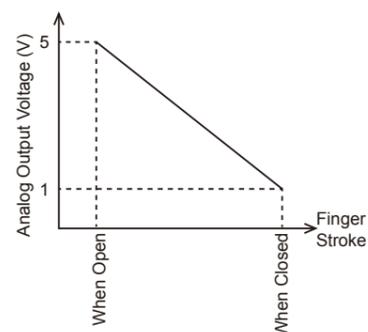
Sensor/Amplifier Unit (Separate Type) Specifications

Refer to P. 1140.

Indicator Unit Specifications

Refer to P. 1141.

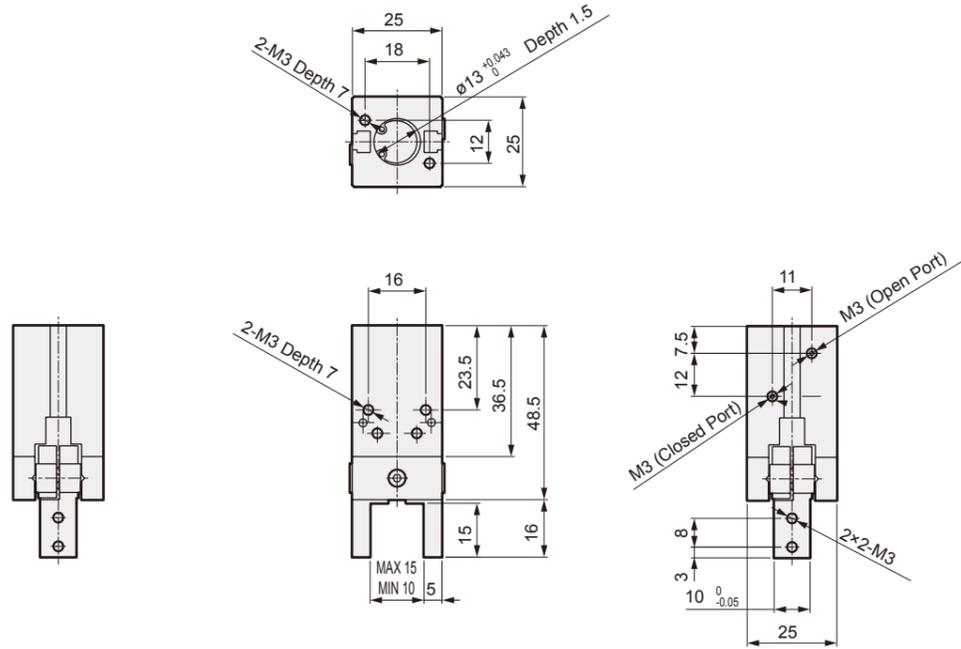
Linear Norm Sensor Output Characteristics



MEMO

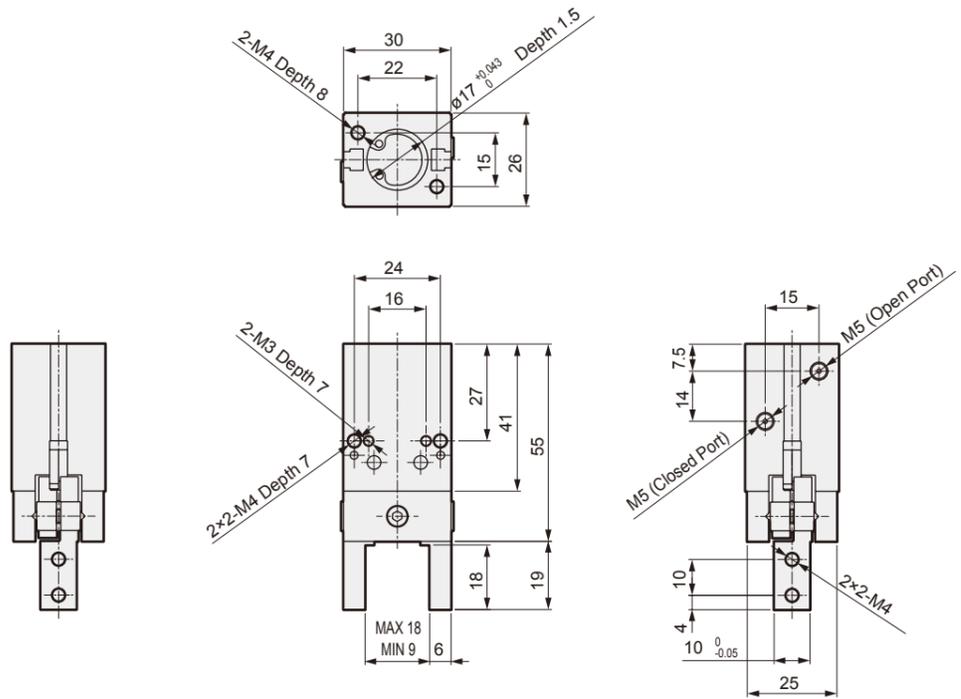
BHA-LN (Separate Amplifier Type)

●BHA-LN-01CS



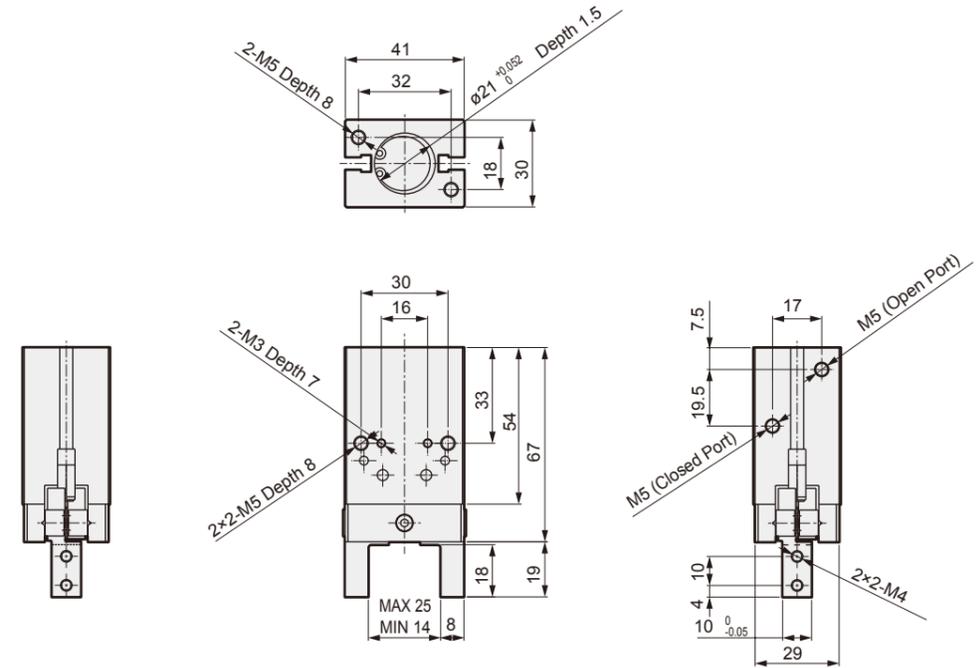
*1: Lengthwise direction is 3 mm longer than the standard product. Others are the same dimensions as the standard product.
 *2: For outline dimension drawings of the sensor unit/amplifier unit (separate type) and indicator unit, refer to P. 1142, 1143.
 *3: Indicator type/analog output type are only equipped with cylinder bore code 04CS/05CS.

●BHA-LN-03CS



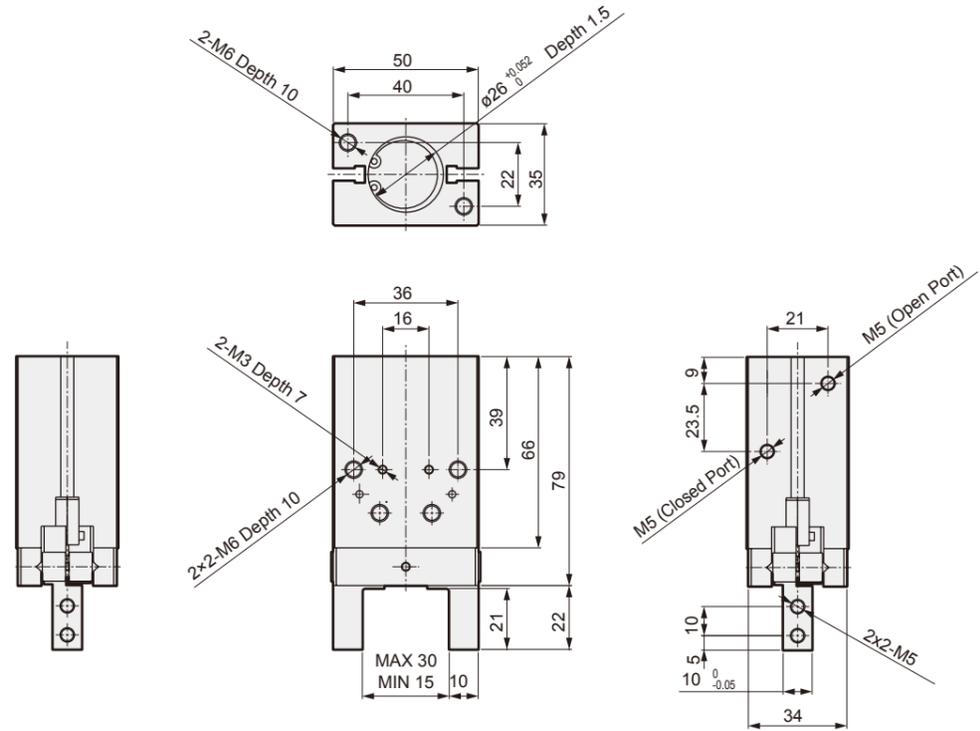
*1: Lengthwise direction is 2 mm longer than the standard product. Others are the same dimensions as the standard product.
 *2: For outline dimension drawings of the sensor unit/amplifier unit (separate type) and indicator unit, refer to P. 1142, 1143.
 *3: Indicator type/analog output type are only equipped with cylinder bore code 04CS/05CS.

●BHA-LN-04CS



*1: Lengthwise direction is 5 mm longer than the standard product. Others are the same dimensions as the standard product.
 *2: For outline dimension drawings of the sensor unit/amplifier unit (separate type) and indicator unit, refer to P. 1142, 1143.

BHA-LN-05CS

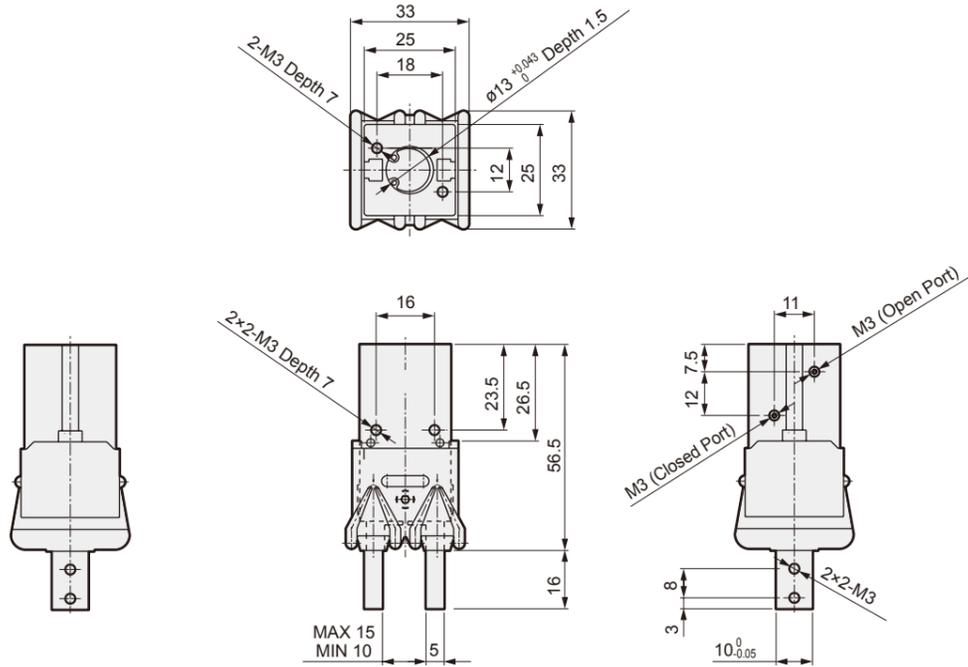


*1: Lengthwise direction is 5 mm longer than the standard product. Others are the same dimensions as the standard product.
 *2: For outline dimension drawings of the sensor unit/amplifier unit (separate type) and indicator unit, refer to P. 1142, 1143.

Dimensional Drawings

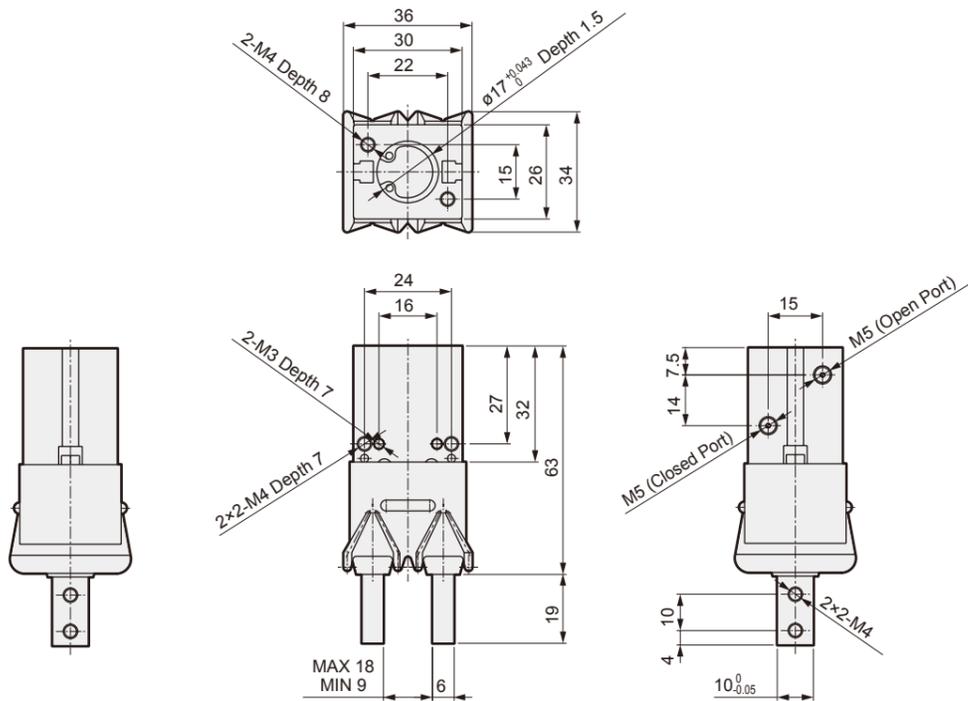
BHG-LN (Separate Amplifier Type)

●BHG-LN-01CS



*1: Lengthwise direction is 3 mm longer than the standard product. Others are the same dimensions as the standard product.
 *2: For outline dimension drawings of the sensor unit/amplifier unit (separate type) and indicator unit, refer to P. 1142, 1143.
 *3: Indicator type/analog output type are only equipped with cylinder bore code 04CS/05CS.

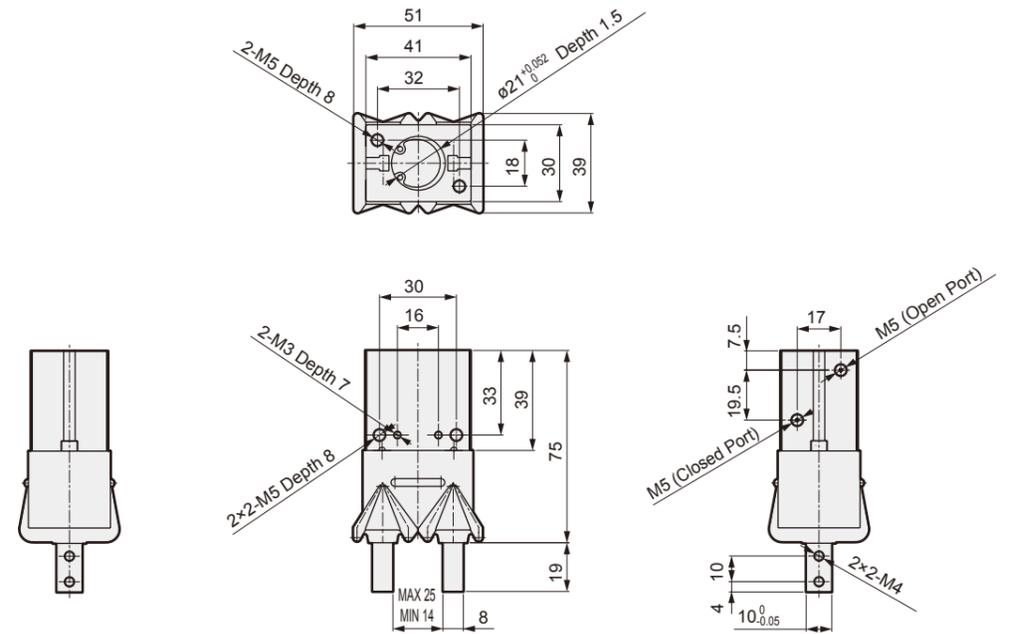
●BHG-LN-03CS



*1: Lengthwise direction is 2 mm longer than the standard product. Others are the same dimensions as the standard product.
 *2: For outline dimension drawings of the sensor unit/amplifier unit (separate type) and indicator unit, refer to P. 1142, 1143.
 *3: Indicator type/analog output type are only equipped with cylinder bore code 04CS/05CS.

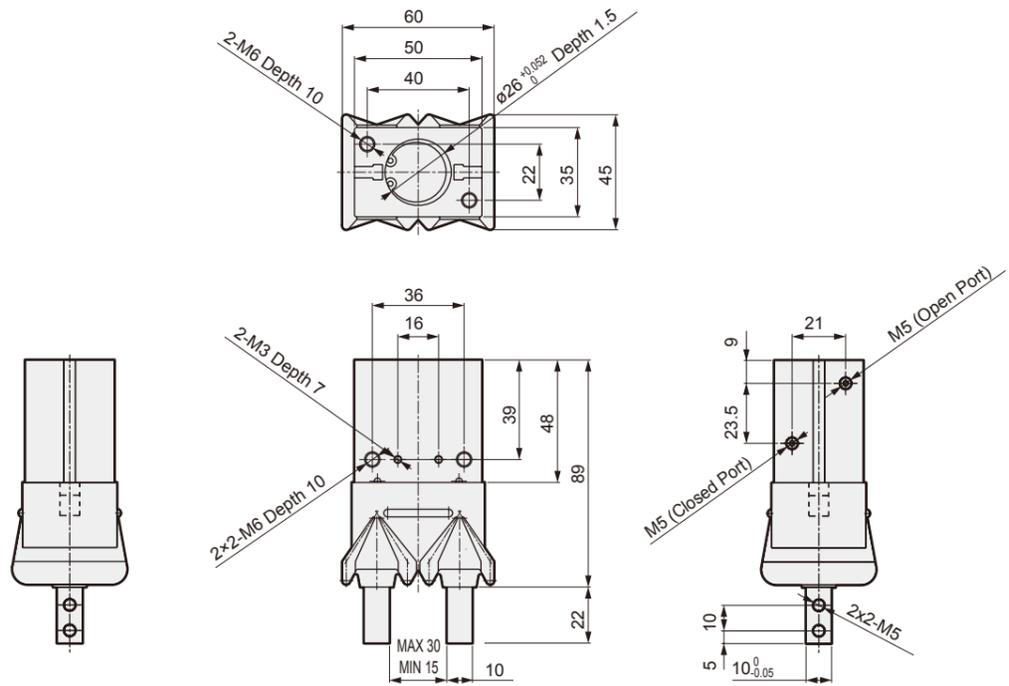
Dimensional Drawings

●BHG-LN-04CS



*1: Lengthwise direction is 5 mm longer than the standard product. Others are the same dimensions as the standard product.
 *2: For outline dimension drawings of the sensor unit/amplifier unit (separate type) and indicator unit, refer to P. 1142, 1143.

●BHG-LN-05CS



*1: Lengthwise direction is 5 mm longer than the standard product. Others are the same dimensions as the standard product.
 *2: For outline dimension drawings of the sensor unit/amplifier unit (separate type) and indicator unit, refer to P. 1142, 1143.

Special

MVC

STK

MCP

GLC

BBS

NHS

HR

LN

Cylinder Switch

Ending

Special

MVC

STK

MCP

GLC

BBS

NHS

HR

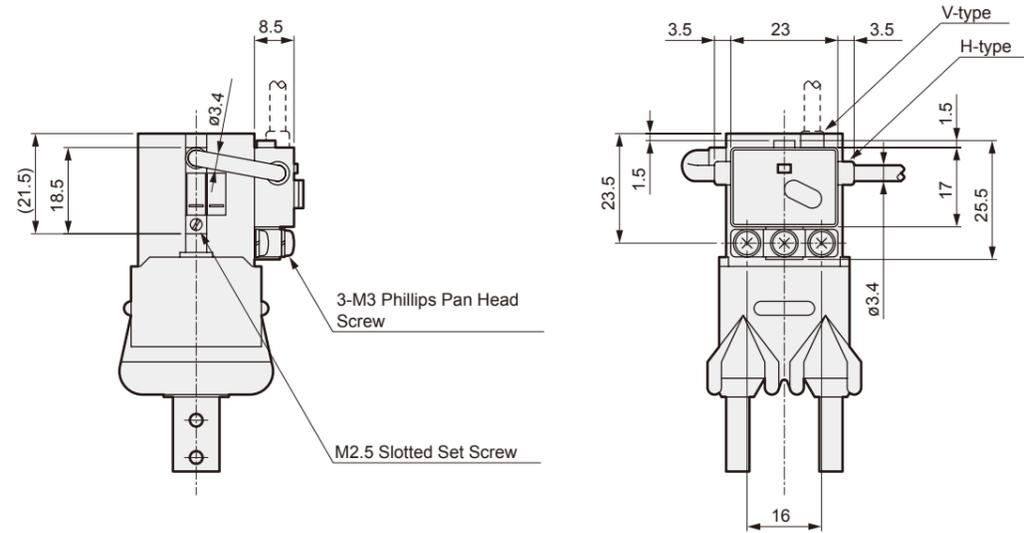
LN

Cylinder Switch

Ending

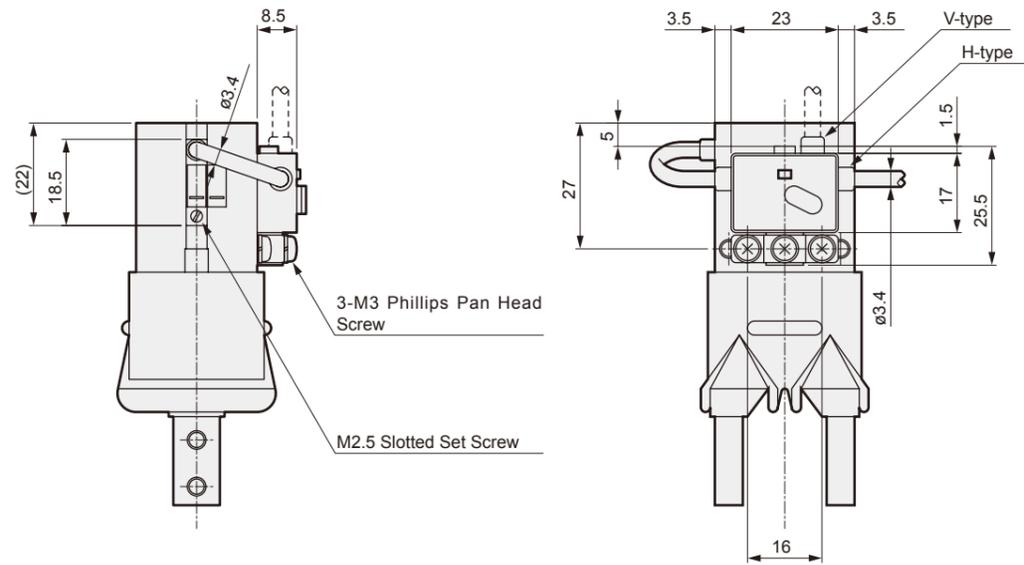
BHG-LN (Amplifier Unit with Amplifier-mounted Sensor)

●BHG-LN-01CS Mounting Drawing



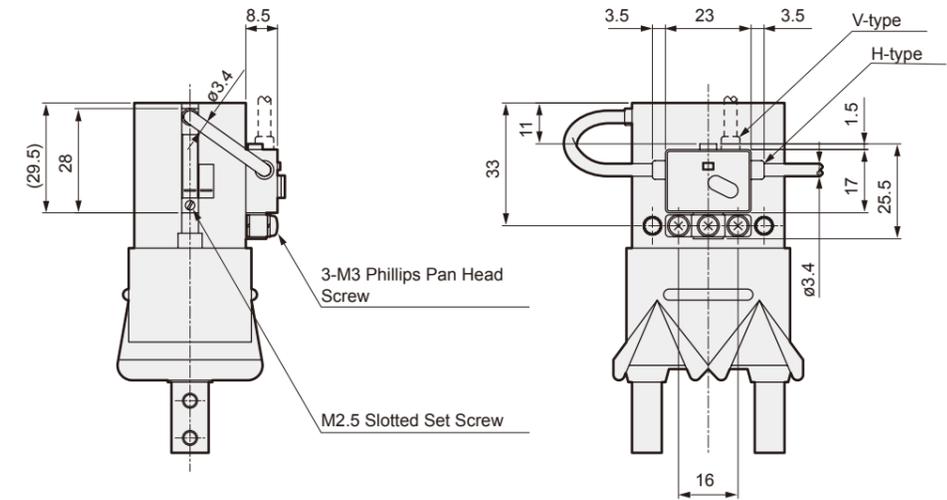
*1: For gripper external dimensions, refer to the external dimensions of the separate amplifier type.
 *2: The sensor lead wire extraction direction is V-type. H/V can be selected for the output stage lead wire.

●BHG-LN-03CS Mounting Drawing



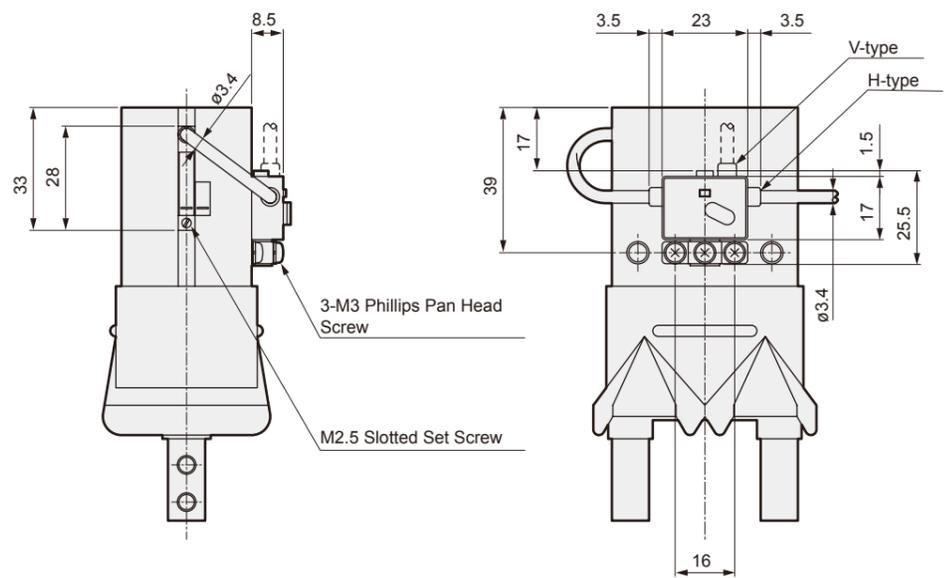
*1: For gripper external dimensions, refer to the external dimensions of the separate amplifier type.
 *2: The sensor lead wire extraction direction is V-type. H/V can be selected for the output stage lead wire.

●BHG-LN-04CS Mounting Drawing



*1: For gripper external dimensions, refer to the external dimensions of the separate amplifier type.
 *2: The sensor lead wire extraction direction is V-type. H/V can be selected for the output stage lead wire.

●BHG-LN-05CS Mounting Drawing



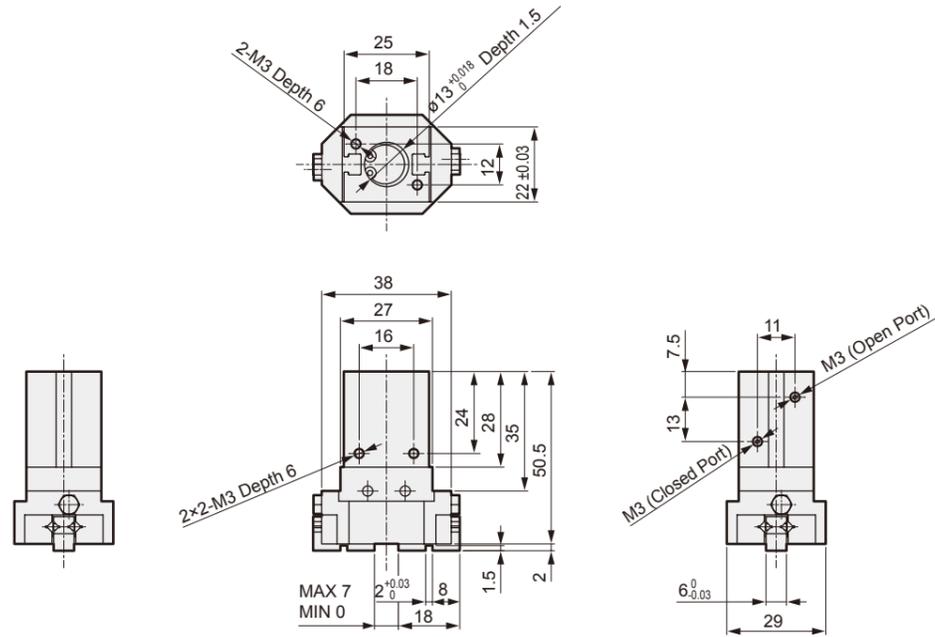
*1: For gripper external dimensions, refer to the external dimensions of the separate amplifier type.
 *2: The sensor lead wire extraction direction is V-type. H/V can be selected for the output stage lead wire.

Special
MVC
STK
MCP
GLC
BBS
NHS
HR
LN
Cylinder Switch
Ending

Special
MVC
STK
MCP
GLC
BBS
NHS
HR
LN
Cylinder Switch
Ending

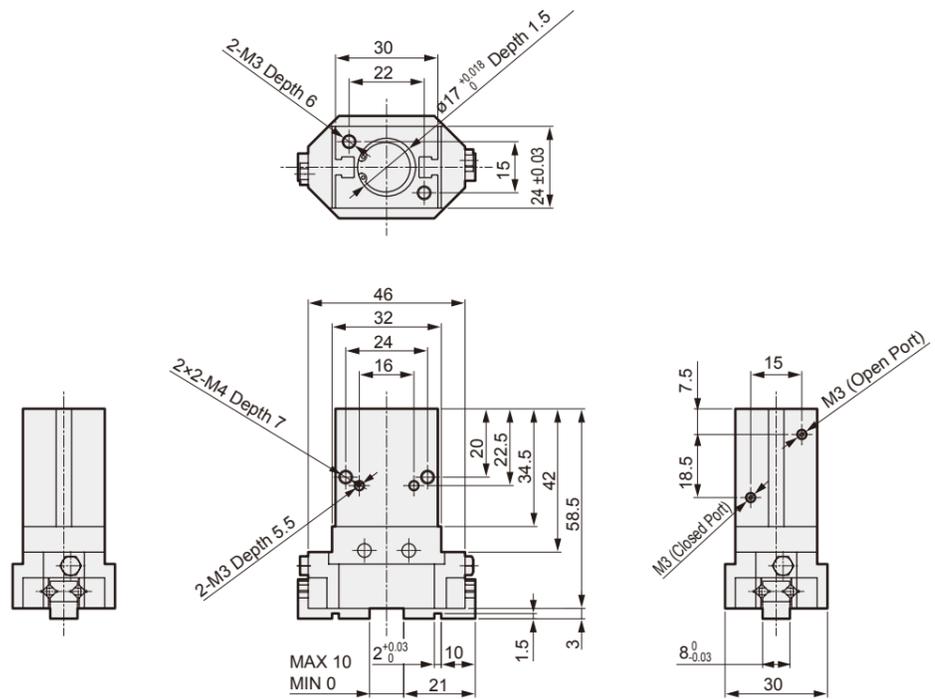
BHE-LN (Separate Amplifier Type)

●BHE-LN-01CS



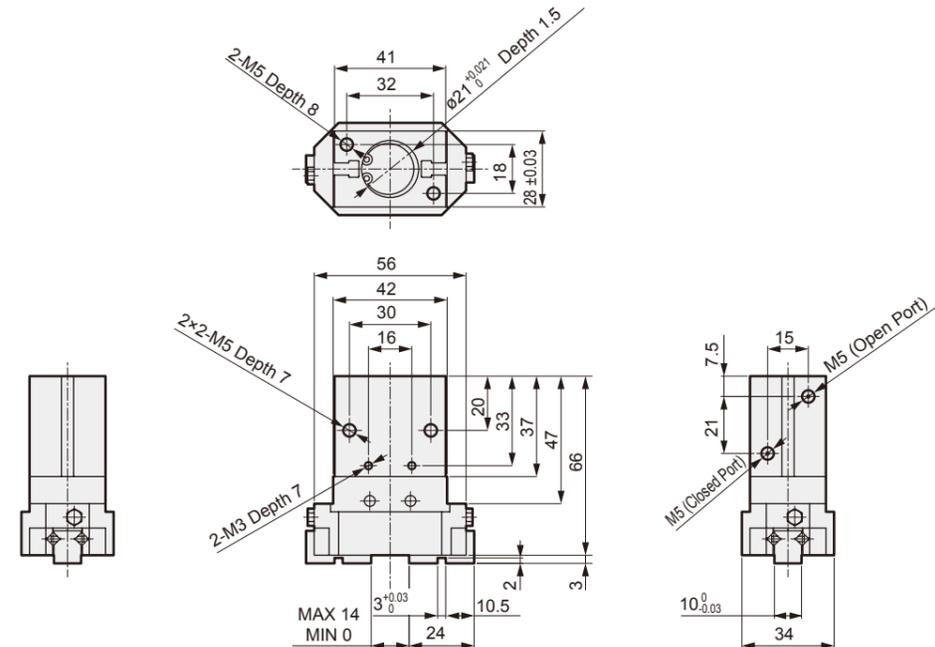
*1: Lengthwise direction is 3 mm longer than the standard product. Others are the same dimensions as the standard product.
 *2: For outline dimension drawings of the sensor unit/amplifier unit (separate type) and indicator unit, refer to P. 1142, 1143.
 *3: Indicator type/analog output type are only equipped with cylinder bore code 04CS/05CS.

●BHE-LN-03CS



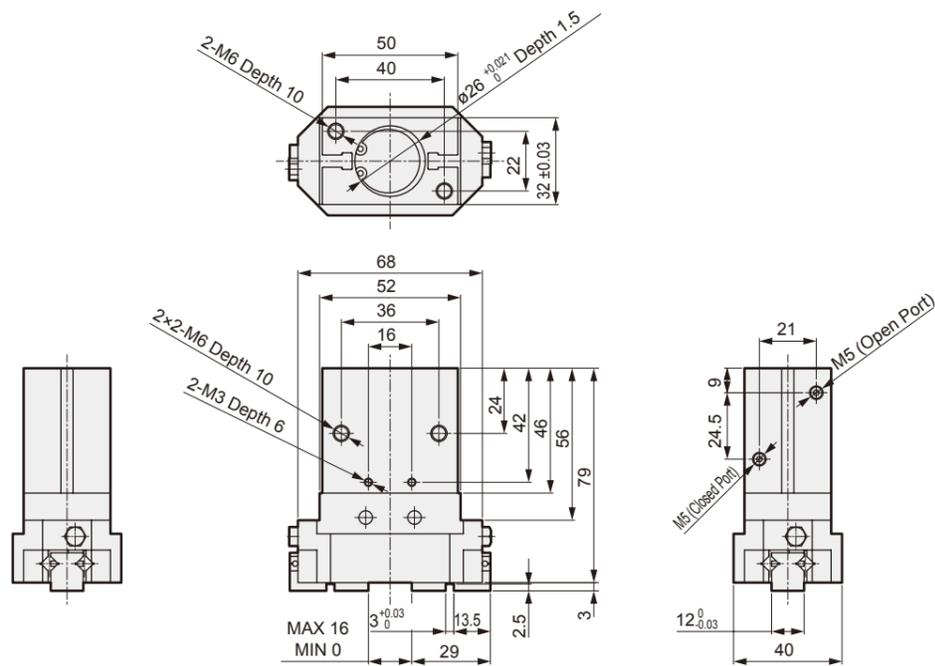
*1: Lengthwise direction is 6.5 mm longer than the standard product. Others are the same dimensions as the standard product.
 *2: For outline dimension drawings of the sensor unit/amplifier unit (separate type) and indicator unit, refer to P. 1142, 1143.
 *3: Indicator type/analog output type are only equipped with cylinder bore code 04CS/05CS.

●BHE-LN-04CS



*1: Lengthwise direction is 5 mm longer than the standard product. Others are the same dimensions as the standard product.
 *2: For outline dimension drawings of the sensor unit/amplifier unit (separate type) and indicator unit, refer to P. 1142, 1143.

●BHE-LN-05CS



*1: Lengthwise direction is 5 mm longer than the standard product. Others are the same dimensions as the standard product.
 *2: For outline dimension drawings of the sensor unit/amplifier unit (separate type) and indicator unit, refer to P. 1142, 1143.

Special

MVC

STK

MCP

GLC

BBS

NHS

HR

LN

Cylinder Switch

Ending

Special

MVC

STK

MCP

GLC

BBS

NHS

HR

LN

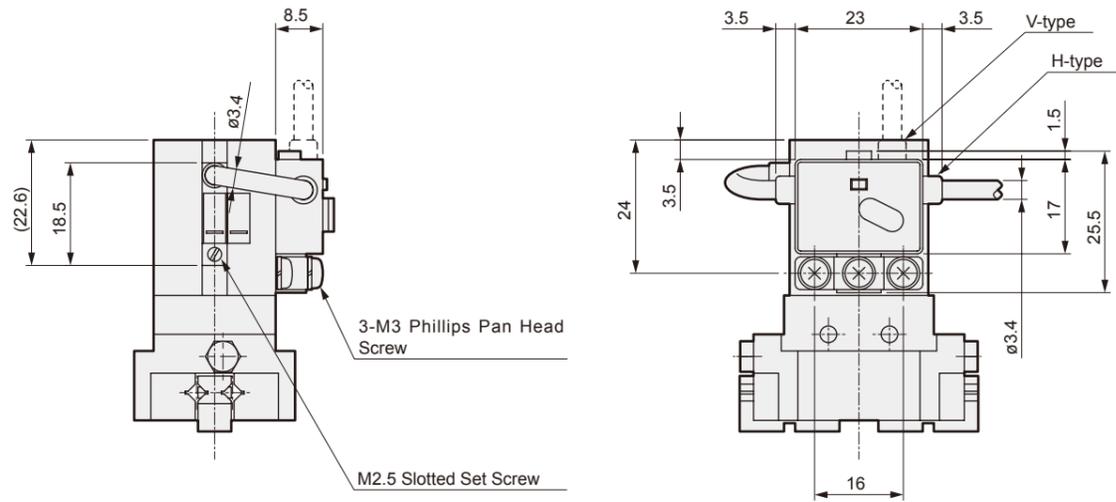
Cylinder Switch

Ending

Dimensional Drawings

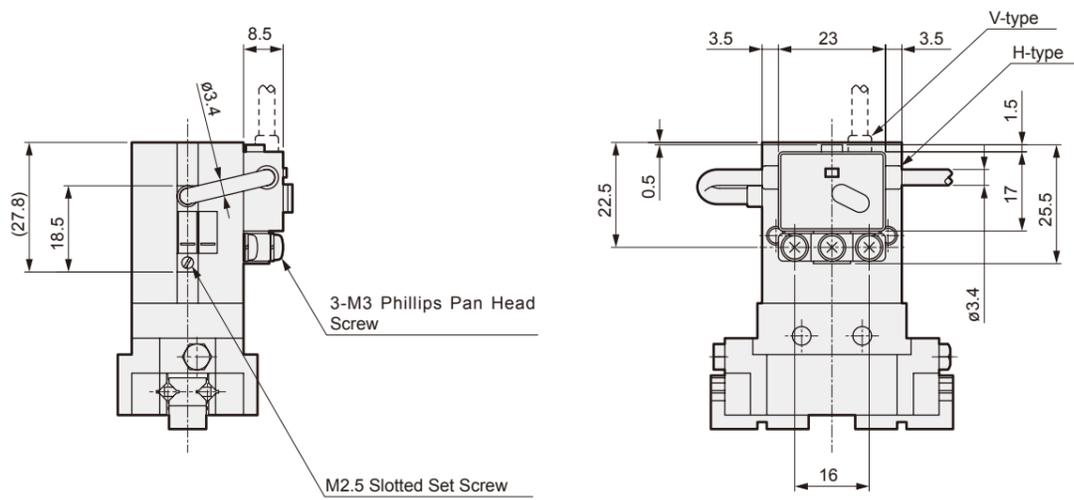
BHE-LN (Amplifier Unit with Amplifier-mounted Sensor)

●BHE-LN-01CS Mounting Drawing



*1: For gripper external dimensions, refer to the external dimensions of the separate amplifier type.
*2: The sensor lead wire extraction direction is V-type. H/V can be selected for the output stage lead wire.

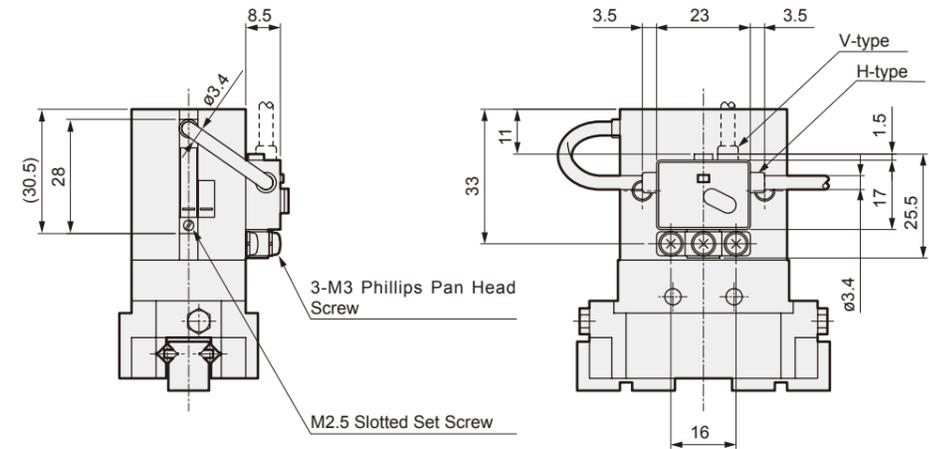
●BHE-LN-03CS Mounting Drawing



*1: For gripper external dimensions, refer to the external dimensions of the separate amplifier type.
*2: The sensor lead wire extraction direction is V-type. H/V can be selected for the output stage lead wire.

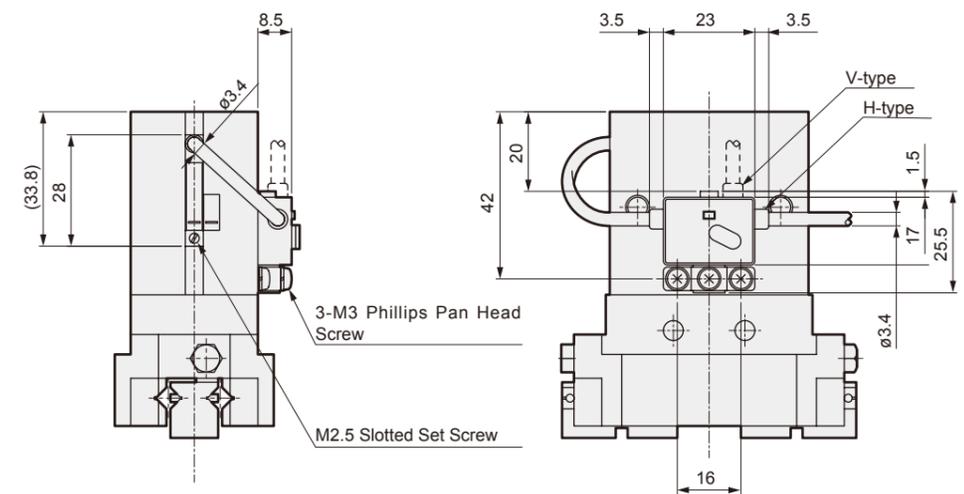
Dimensional Drawings

●BHE-LN-04CS Mounting Drawing



*1: For gripper external dimensions, refer to the external dimensions of the separate amplifier type.
*2: The sensor lead wire extraction direction is V-type. H/V can be selected for the output stage lead wire.

●BHE-LN-05CS Mounting Drawing



*1: For gripper external dimensions, refer to the external dimensions of the separate amplifier type.
*2: The sensor lead wire extraction direction is V-type. H/V can be selected for the output stage lead wire.

Special

MVC

STK

MCP

GLC

BBS

NHS

HR

LN

Cylinder Switch

Ending

Special

MVC

STK

MCP

GLC

BBS

NHS

HR

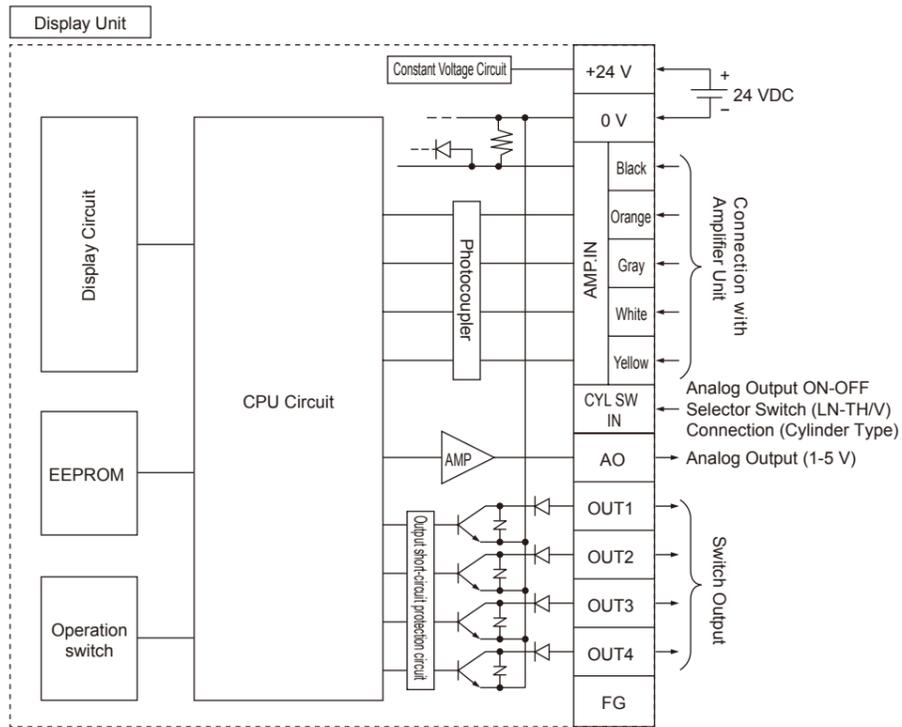
LN

Cylinder Switch

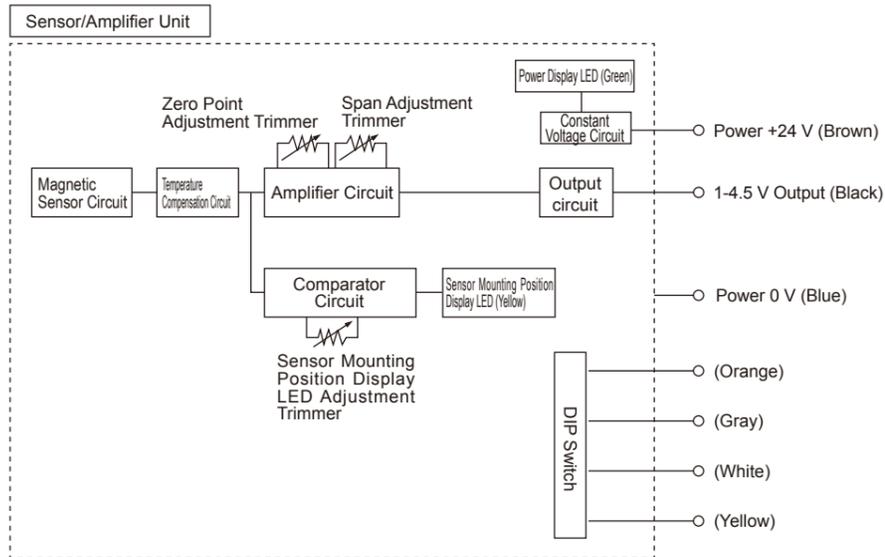
Ending

Internal circuit diagram

●Display Type



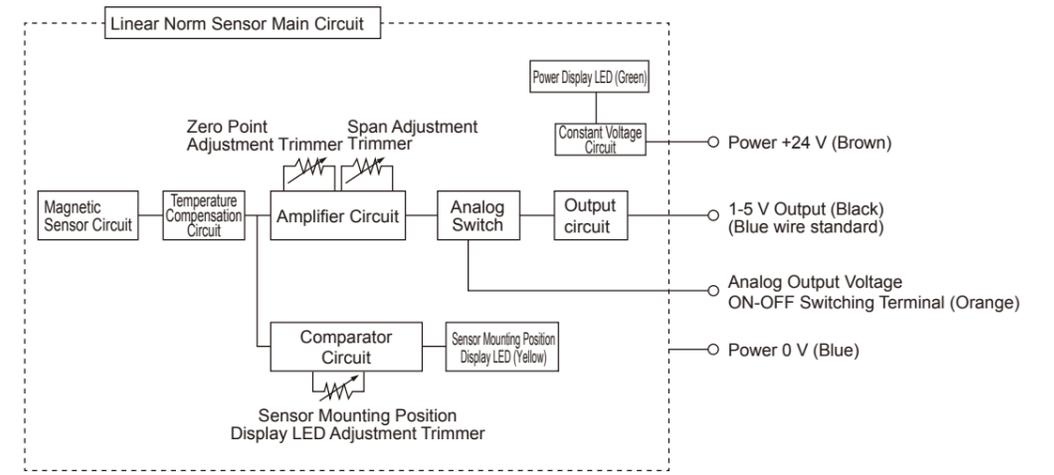
●The output stage transistor can be selected to be ON or OFF at piston detection using the operation switch.



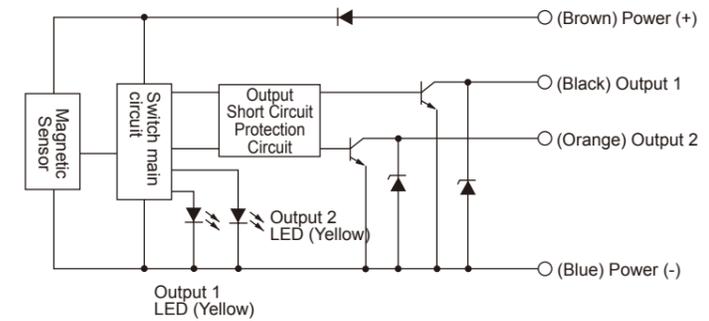
Internal circuit diagram

Internal circuit diagram

●Analog Output Type

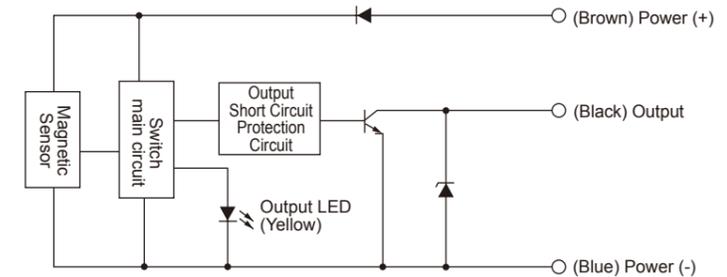


●Switch Output Type, Separate Amplifier Type



●The output stage transistor turns ON at piston detection.

●Switch Output Type, Amplifier Mounted Type



●The output stage transistor turns ON at piston detection.

Special

MVC

STK

MCP

GLC

BBS

NHS

HR

LN

Cylinder Switch

Ending

Special

MVC

STK

MCP

GLC

BBS

NHS

HR

LN

Cylinder Switch

Ending

When Mounting Analog Output Type Cylinder

When adjusting the sensor mounting position and analog output voltage, it is recommended to prepare a workpiece (master gauge) that allows the piston to stop at 4 mm on the extension end side and 4 mm on the return end side, respectively, with reference to the center of the measurement range and the same center. Also, perform these adjustments at the same air pressure as in actual use.

1 Sensor Mounting Position Adjustment Method

The sensor mounting position is set to the center of the specified measurement range (e.g., if from 8 mm before the piston extension end to the extension end, set to its center) and shipped. However, if changing the sensor mounting surface or measurement range, please perform according to the following procedure.

- (1) With the sensor removed, move the sensor mounting position indicator lamp adjustment trimmer so that the sensor mounting position indicator lamp (yellow LED) is constantly lit, and set the trimmer to the center of the yellow LED lighting section. (As it is adjusted before shipping, please perform this even if you have inadvertently touched this trimmer.)
- (2) Position the cylinder piston at the center of the measurement range.
- (3) Mount the sensor on the cylinder. At that time, fix it in a position that satisfies the following operation depending on the insertion direction. Sensor tightening torque is 0.1 to 0.2 N·m. Also, be sure to install the sensor case so that the sensor mounting screw (M2.5 slotted Set Screw) faces the cylinder head side.

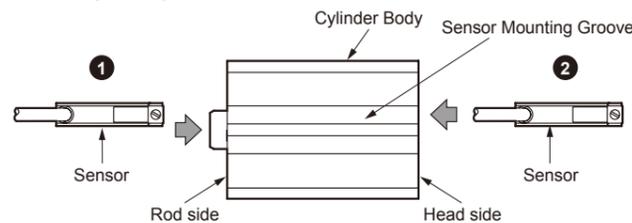
① When inserting from the rod side

Fix at the center position of the second lighting section of the sensor mounting position indicator lamp, including the lighting in (1). (The second lighting section is a short section of about 1 mm in terms of piston stroke.)

② When inserting from the head side

Fix at the center position of the second lighting section of the sensor mounting position indicator lamp, including the lighting in (1). (The second lighting section is a short section of about 1 mm in terms of piston stroke.)

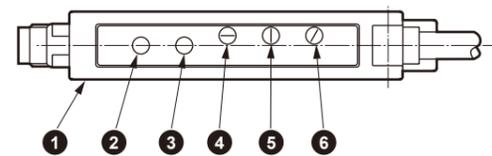
- (4) If the piston stroke of the cylinder to which the sensor is mounted is longer than 8 mm, and an 8 mm stroke range within it is to be measured, connect the cylinder switch TOH/V between the orange wire and the blue wire to prevent unnecessary analog output voltage from appearing outside the measurement range. (When the stroke is 8 mm or less, it will be short-circuited across the orange and blue wires.) As with the conventional cylinder switch, perform step (2) above, and then position this switch between ON points. The tightening torque of the switch is 0.1 to 0.2 N·m.



2 Analog Output Voltage Adjustment Method

The analog output voltage is adjusted and shipped so that, for the specified measurement range, for example, from 8 mm before the piston extension end to the extension end, it is 5 V at 8 mm before the extension end and 1 V at the extension end. However, slight deviations may occur depending on the operating environment (influence of surrounding magnetic materials), so please make fine adjustments according to the following procedure.

- (1) Connect the brown wire of the output stage lead wire to the (+) side of the 24 VDC stabilized power supply, connect the orange wire to the brown wire of the cylinder switch TOH/V, and connect both blue wires to the (-) side of the power supply.
- (2) Connect the black wire to the (+) side of the voltmeter, and the blue wire to the (-) side of the voltmeter.
- (3) Move the cylinder piston, and enter the measured range length start (example: 8 mm in front of projecting end) and end (example: Output end) voltage value.
- (4) If the voltage difference in (2) is 4 V or less, turn the span adjustment trimmer slightly clockwise. If it is 4 V or more, slightly move the trimmer counterclockwise.
- (5) Move the cylinder piston again, read the voltages at the start end and end of the measurement range respectively, and move the zero point adjustment trimmer so that it is 5 V when referenced to the start end and 1 V when referenced to the end.
- (6) Furthermore, repeat (3) → (4) → (5) several times to make fine adjustments.



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

When Mounting Analog Output Type Gripper

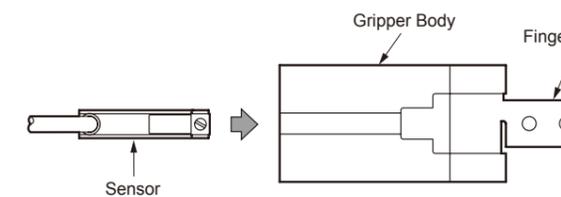
1 Sensor Mounting Position Adjustment Method

The sensor mounting position is set to the center of the both-finger stroke and shipped. However, if changing the sensor mounting surface or replacing the gripper, please perform according to the following procedure.

- (1) With the sensor removed, move the sensor mounting position indicator lamp adjustment trimmer so that the sensor mounting position indicator lamp (yellow LED) is constantly lit, and set the trimmer to the center of the yellow LED lighting section. (As it is adjusted before shipping, please perform this even if you have inadvertently touched this trimmer.)
- (2) Position the gripper finger at the center of the stroke.
- (3) Mount the sensor on the gripper. At that time, fix it in a position that satisfies the following operation. Sensor tightening torque is 0.1 to 0.2 N·m. Also, be sure to install the sensor case so that the sensor mounting screw (M2.5 slotted Set Screw) faces the finger side.

① Sensor Mounting Position

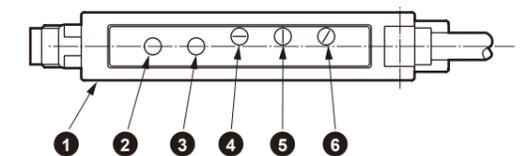
Fix at the center position of the second lighting section of the sensor mounting position indicator lamp, including the lighting in (1). (The second lighting section is a short section of about 1 mm in terms of piston stroke.)



2 Analog Output Voltage Adjustment Method

The analog output voltage is adjusted so that the full stroke of the finger is 5 V when open and 1 V when closed. However, slight deviations may occur depending on the operating environment (influence of surrounding magnetic materials), so please make fine adjustments according to the following procedure.

- (1) Connect the brown wire to the (+) side of the 24 VDC stabilized power supply, and connect 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 finger and read the voltage values when open and closed, respectively.
- (4) If the voltage difference in (3) is 4 V or less, turn the span adjustment trimmer slightly clockwise. If it is 4 V or more, slightly move the trimmer counterclockwise.
- (5) Move the finger again, read the voltages when open and closed respectively, and move the zero point adjustment trimmer so that it is 5 V when referenced to open and 1 V when referenced to closed.
- (6) Furthermore, repeat (3) → (4) → (5) several times to make fine adjustments.



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

Switch Output Type

1 Sensor Mounting Position Adjustment Method

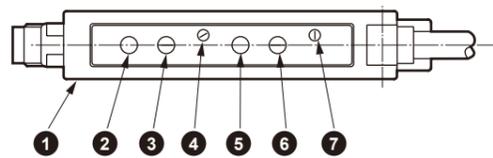
The sensor mounting position is set to the center of the both-finger stroke and shipped. However, if changing the sensor mounting surface or replacing the gripper, please perform according to the following procedure.

- (1) Align the red lines included with each sensor and gripper, and tighten the sensor with a torque of 0.1 to 0.2 N·m.
- (2) Be sure to install the sensor so that the mounting screw (M2.5 slotted Set Screw) faces the finger side.

2 Switch Output Position Setting Method

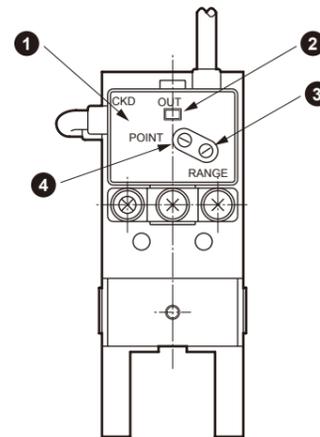
- (1) Move the gripper finger to the position where you want to get the switch output.
- (2) Temporarily set the operating range adjustment trimmer to a position slightly clockwise from the counter-clockwise end.
- (3) Move the operating point adjustment trimmer to turn the output ON. Then, set the trimmer to the center of the ON section.
- (4) Finally, move the operating range adjustment trimmer to determine the operating range. At this time, the operating range is expanded/contracted with the center of the operating point as a reference.
- (5) Move the finger several times, turn the switch output ON/OFF, and repeat (3) and (4) above to make fine adjustments.

Separate Amplifier Type



- 1 Amplifier unit case
- 2 Output 1 indicator lamp
- 3 Output 1 operating range adjustment trimmer
- 4 Output 1 operation point adjustment trimmer
- 5 Output 2 indicator lamp
- 6 Output 2 operating range adjustment trimmer
- 7 Output 2 indicator

Amplifier Mounted Type



- 1 Amplifier unit case
- 2 Output indicator
- 3 Output operation range adjustment trimmer
- 4 Output operation point adjustment trimmer

* For adjustment and setting methods of the indicator type, please refer to the instruction manual included with the product.



To Use This Product Safely

Be sure to read this before use. For general cylinder information, see Intro 41, and for Cylinder Switches, see P. 1512.

Individual Precautions: Cylinder with length measuring sensor/hand/actuator

Design / Selection

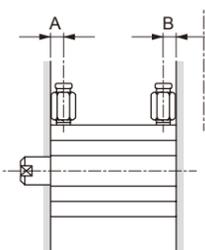
1. Cylinder

CAUTION

- Since SSD-LN and SSD-O-LN series use a non-rotating type, avoid using them in a way that applies rotational torque to the Piston Rod of SSD-LN and SSD-O-LN series. The non-rotating bush will deform, and the service life will be significantly reduced. If you require a standard Piston Rod, please contact us.
- Use so that the load on the Piston Rod is always applied in the axial direction of the Piston Rod.
- SSD-LN, SSD-O-LN When fixing a workpiece onto the tip of the series Piston Rod, retract the Piston Rod to the stroke end and apply a wrench to the section protruding from the rod's parallel section. Tighten so that torque is not applied to the Cylinder Body.
- Please note that usable piping fittings vary depending on the cylinder bore.

• SSD-LN, SSD-O-LN

Item	Port Size	Port position dimension		Usable Fittings	Fitting outer diameter	Unusable fittings
		A	B			
ø12-16	M5x0.8	5.5	5.5	SC3W-M5-4 SC3W-M5-6 GWS4-M5-S GWS4-M5 GWL4-M5 GWL6-M5	ø11 or less	GWS6-M5
ø20		8	5.5			
ø32	Rc1/8	8	8	SC3W-6-4/6/8 GWS4-6 GWS6-6 GWS8-6 GWL4-6 GWL6-6	ø15 or less	GWS10-6 GWL8-6 GWL10-6
ø50	Rc1/4	10.5	10.5	SC3W-8-6/8/10 GWS4-8 GWS6-8 GWS10-8 GWL4 to 12-8	ø21 or less	GWS-12-8



2. Gripper

CAUTION

- Gripping force varies depending on the length of the fingers included with the gripper, applied pressure, bore diameter, etc., so please determine it according to the workpiece to be gripped.
- The gripping characteristics of BHA, BHG, and BHE are equivalent to the standard type. Refer to "Pneumatic Cylinder ⑤" (No. RJ-006AA). Also, please check the common notes for grippers.
- Avoid outdoor use.
- The most desirable Ambient Temperature range for using the gripper is 5 to 60°C. If this temperature exceeds 60°C, it may cause damage or malfunction, so do not use it. Also, if it is 5°C or less, moisture in the circuit may freeze and cause damage or malfunction, so please take measures to prevent freezing.
- Do not use in an atmosphere where there is a risk of corrosion. Use in such an environment will cause damage or malfunction.
- Clamping operation becomes more accurate by performing it as softly and slowly as possible. Also, repeatability becomes stable.
- Use so as not to apply excessive lateral load to the fingers.

Model Selection for Mixed Workpiece Sorting Applications

Select the output type according to the difference in workpiece external shape.

Workpiece External Shape Difference ≥ 1 mm + Workpiece Tolerance Variation ... Switch Output Type

Workpiece External Shape Difference ≤ 1 mm + Workpiece Tolerance Variation ... Analog Output Type

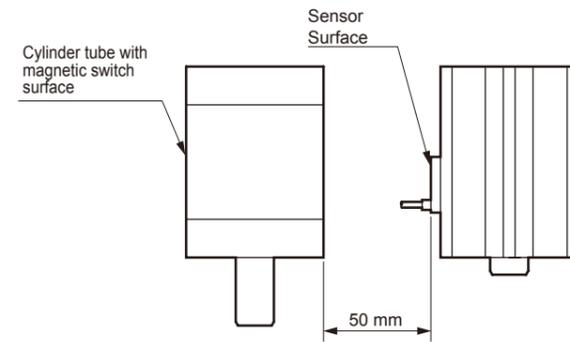
* For the switch output type, the switch output position setting is rough. The above values are guidelines and vary depending on the operating environment. Please contact us for details.

Individual Precautions: Sensor/amplifier/display

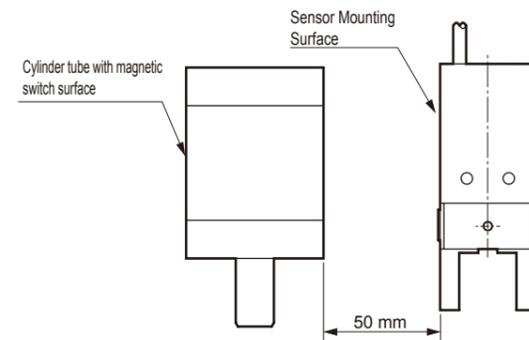
Design / Selection

CAUTION

- This product cannot be used in an environment where strong magnetic fields are generated (spot welding machine, etc.) because the sensor detection accuracy drops markedly. Also, be careful when this cylinder/gripper is close to other cylinders with magnetic switches. As a guideline, if the distance between the sensor surface and the cylinder tube surface is 50 mm or more, as shown in the figure below, there is no problem.



- If the sensor surface (sensor nameplate mounting surface) is covered with a magnetic material such as an iron plate, the magnetism will be disturbed and the sensor will not be able to detect the magnetic field, so please be careful when installing the actuator.

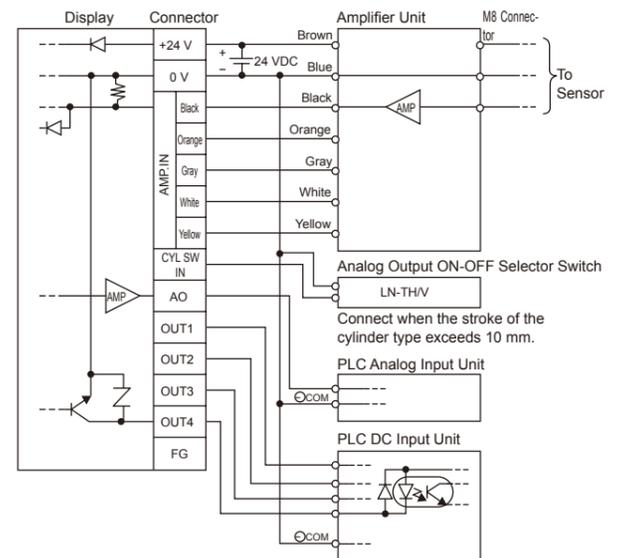


- When mounting the amplifier unit case with separated amplifier using a side through hole, use M3 cross-recessed pan head machine screws, with tightening torque of 0.5 to 0.7 N·m.

- Rubber plugs are attached to devices with the amplifier installed operating points adjustment trimmer and operating range adjustment trimmer section to maintain water resistance. Fit these plugs in after adjusting.

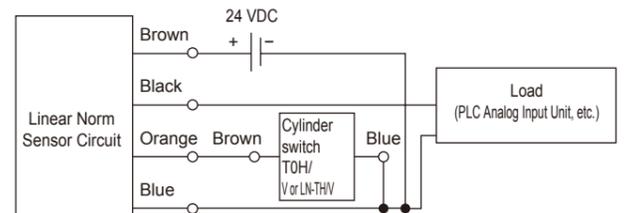
- When mounting the display using a bottom through hole, use M3 cross-recessed pan head machine screws, with tightening torque of 0.5 to 0.7 N·m.

- Connecting the lead wire
 - Display Type



- Since the indicator is a 2-channel specification, there are two +24 V and 0 V connections each in the connector part, but they are electrically connected inside the indicator, so it will operate with wiring to either one.
- When connecting only one amplifier unit, the channel of the connector part does not matter.
- Perform wiring with the power turned off.
- When connecting wires to the indicator connector part, do so with the female side unplugged.
- The connectable wire size for the indicator connector part is 0.08 to 1.5 mm², and its terminal screw tightening torque is 0.25 N·m.
- Do not plug or unplug the connector while it is energized.
- If the stroke of the cylinder type exceeds 10 mm, connect the "Analog Output ON-OFF Selector Switch" to the indicator, connecting its brown wire to the "CYL SW IN" terminal and its blue wire as 0 V.
- Shielded Wire Processing
If affected by noise, connect the shielded wire to COM or FG. Normally, connection is not required.

- When Mounting Analog Output Type Cylinder



Special

MVC

STK

MCP

GLC

BBS

NHS

HR

LN

Special

MVC

STK

MCP

GLC

BBS

NHS

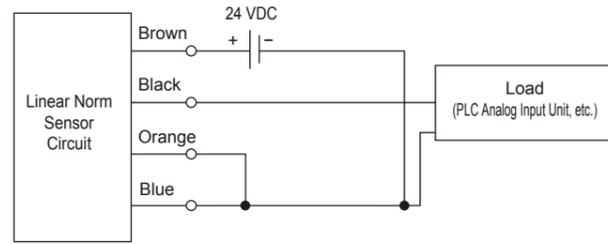
HR

LN

Cylinder Switch

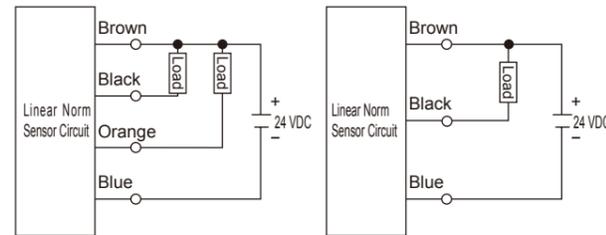
Ending

● When Mounting Analog Output Type Gripper



Be sure to connect the orange wire to the blue wire (-).

● Switch Output Type



Separate Amplifier Type Amplifier Mounted Type

The output of the switch output type is NPN transistor open collector type.

During Use

1. Common

CAUTION

■ Use only a DC safety power supply. Do not connect motors, valves, etc., that generate noise to the power supply used in this device.

■ When wiring, be careful not to use the same piping and wiring (multi-core cables, etc.) as the power line of the motor, etc., so that induction noise is not applied to the linear noise sensor. Also, pay attention to the inverter power supply and its wiring. (Ensure the frame ground of the inverter power supply is properly grounded so that noise can escape.)

■ Note that noise resistance performance may be adversely affected if the length of the sensor cable or output stage cable lead wire is changed.

■ A bend-resistant lead wire is used for the sensor cable and output stage cable. To optimize bend resistant 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.

■ Locations where the operating Ambient Temperature fluctuates suddenly (example: This product cannot be used with localized air conditioning).

■ This product cannot be used outdoors or in an atmosphere containing corrosive elements.

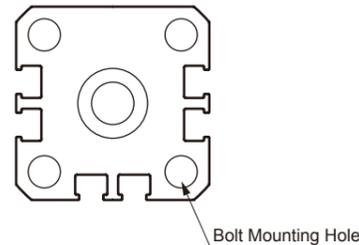
■ Select switch output type when conducting rough judgments and analog output type or display when conducting detailed judgments, including length measurement.

2. Analog Output/Indicator Type

CAUTION

■ Cylinder equipped

● When fixing the cylinder, use Stainless Steel bolts for cylinder bolt mounting to maintain sensor characteristics. Using iron bolts will cause distortion in the sensor output voltage waveform, increasing the display error of the indicator or reducing the linearity of the analog output voltage. (Although it does not affect repeatability, please check the performance during actual use.) Also, similar phenomena may be observed if a part of the Cylinder Body comes into contact with a magnetic material. Please note that this tendency is particularly noticeable near the LN sensor surface or when an iron plate is shorter than the actuator body.



Ex. SSD-LN, SSD-O-LN Type

- The Linear Norm sensor and the TOH/V (Note) or LN-TH/V switch for analog output voltage ON-OFF switching, or other cylinder switches can be mounted on the same surface if their mounting positions do not interfere with each other.
- Be sure to connect a cylinder switch (TOH/V or LN-TH/V) to extract analog output voltage in an arbitrary 8 mm section (10 mm for indicator type) relative to the cylinder full stroke.
- The sensor tightening torque should be 0.1 to 0.2 N·m, and install so that the sensor mounting screw faces the cylinder head side.

(Note) The switch selected differs depending on the mounted cylinder model, analog output type, and indicator type.

■ Hand equipped

- If this gripper is top-mounted using the spigot joint, and the base is a magnetic material such as an iron plate, distortion will occur in the sensor output voltage waveform, increasing the display error of the indicator or reducing the linearity of the analog output voltage. (Although it does not affect repeatability, please check the performance during actual use.) Similar phenomena may be observed if a part of the gripper front/side comes into contact with a magnetic material. Please note that this tendency is particularly noticeable near the LN sensor surface or when an iron plate is shorter than the actuator body. Also, regardless of top, side, or front mounting, use Stainless Steel bolts when fixing the gripper to maintain sensor characteristics.
- The sensor tightening torque should be 0.1 to 0.2 N·m, and install so that the sensor mounting screw faces the finger side.

■ Cylinder/hand common items

- For the indicator type, if a load short-circuit current flows to the switch output stage transistor due to wiring mistakes, misconnections, etc., the internal short-circuit protection circuit will operate and cut off the short-circuit current. (At this time, the output indicator lamp (yellow) turns off, and the short-circuit indicator lamp (red) turns on.) To release the short-circuit protection, temporarily cut off the supply current, correct wiring mistakes, etc., and then reapply power. Please note that the protection circuit of this product is effective only against specific incorrect connections and load short circuits, and cannot protect against all incorrect connections.

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. It will stabilize by turning the operating range adjustment trimmer clockwise to slightly widen the operating range.

■ If load short-circuit current flows to output stage transistors due to wiring errors/connection, the internal short-circuit protection circuit is activated (turns display OFF from ON) and the short-circuit current is cut. To release the short-circuit protection, temporarily cut off the supply power, correct wiring mistakes, etc., and then reapply power. Please note that the protection circuit of this product is effective only against specific incorrect connections and load short circuits, and cannot protect against all incorrect connections.

■ Install the sensor at a position where the red lines on the hand and sensor are aligned. Also, the sensor tightening torque should be 0.1 to 0.2 N·m, and ensure the sensor mounting screw faces the finger side.

For precautions during mounting, installation, adjustment, use, and maintenance, refer to "During Use" in this catalog and the CKD Components Product website (<https://www.ckd.co.jp/kiki/en/>) -> "Model No." -> [Instruction Manual](#).