KOGANEI

M020961
Ver.1.0

# Linear Magnetic Sensor Controller Long Type

# ZL2

## Instruction Manual Ver. 1.0

Thank you for purchasing this Koganei product.
Before using it, be sure to read this manual and make sure you use it correctly.
Keep this manual in a safe place for future reference.

⚠ **DANGER** Do not use this product for the purpose of accident prevention or for other safety assurance purposes. Using the product in any of the ways described above creates the risk. of loss of human life.

## 1 Specifications

### ●Controller

| Item \ Model | ZL2 |
|---|---|
| Power supply voltage | 24 VDC ±10% |
| Consumption current | 50 mA max. (Not including supply power to sensor.) |
| Sensor input supply power and voltage | 5 VDC |
| Sensor input maximum input voltage | 3.0 V |
| Switch output method | NPN open collector output, 5 points |
| Load voltage | 30 VDC |
| Load current | 50 mA max. |
| Switch output volume repeatability | ±1%F.S. ±1 digit Note |
| Internal voltage drop | 0.3 V MAX. (When Ic = 5 mA) |
| Response time | 5 ms MAX. |
| Operation indicator light | Lights red when each switch output is on. |
| Value display | 1/1000 division display within effective measuring range(4 digits, 2-color display: red and green) |
| Analog output voltage range | DC1 to 5V within effective measuring range, DC0.8V outside effective measuring range (1kΩ output impedance) |
| Analog output repeatability | ±1% of F.S (25°C±5°C) Note |
| Insulation resistance | 100 MΩ MIN. (500 VDC Megger, between case and lead wire terminal) |
| Withstand voltage | 500 VAC (50/60 Hz) in 1 minute (between case and lead wire terminal) |
| Shock resistance | 294.2 m/s² (non repetitive) |
| Ambient temperature | 0 to 50°C (non-condensation, non-freezing) |
| Storage temperature range | -10 to 70°C (non-condensation, non-freezing) |
| Mass | 40 g |

Note: This performance excludes the mechanical looseness of a cylinder with a fixed magnet (standalone performance). In the case of a movable type cylinder whose magnet is not fixed, the movable part and repeatability are degraded.

### ●Sensor head

| Item \ Model | ZLL□-□L |
|---|---|
| Power supply voltage | 5 VDC±5% |
| Consumption current | 20 mA max. |
| Mounting methods | Body embedded type (**ZLL1, ZLL2**), □4 type (**ZLL3**) |
| Operation indicator light | Red LED lights at optimal sensitivity position (Operation position can be changed by setting.) |
| Lead wire | Heat-resistant, oil-resistant vinyl sheath instrumentation cable φ2.8 6 core With 6P connectors |
| Insulation resistance | 100 MΩ MIN. (500 VDC Megger, between case and lead wire terminal) |
| Withstand voltage | 500 VAC (50/60 Hz) in 1 minute (between case and lead wire terminal) |
| Shock resistance | 294.2 m/s² (non repetitive) |
| Protective structure | IP67 |
| Vibration resistance | 88.3 m/s² (Double amplitude: 1.5 mm 10 ~ 55 Hz) |
| Ambient temperature | 0 to 50°C (non-condensation, non-freezing) |
| Storage temperature range | -10 to 70°C (non-condensation, non-freezing) |
| Mass | 20 g (When 1L lead wire length is 1000 mm.) |

## Connector number

### ●Sensor head

| Connector side number | Signal name | Lead wire color |
|---|---|---|
| **1** | Sensor head voltage (+) | Sensor head brown lead |
| **2** | Sensor head voltage output A_IN | Sensor head white lead |
| **3** | Sensor head voltage output B_IN | Sensor head black lead |
| **4** | Indicator (LED) input | Sensor head red lead |
| **5** | GND | Sensor head blue lead |
| **6** | Sensor head voltage output C_IN | Sensor head yellow lead |

### ●Power supply

| Pin No. | Signal name | Lead wire color |
|---|---|---|
| **1** | Power supply voltage input (24 V) | Brown |
| **2** | Analog output (1 to 5V) | Gray |
| **3** | Effective measuring range signal output (STABI) | Black |
| **4** | GND | Blue |
| **5** | Switch output OUT1 | White |
| **6** | Switch output OUT2 | Red |
| **7** | Switch output OUT3 | Green |
| **8** | Switch output OUT4 | Yellow |



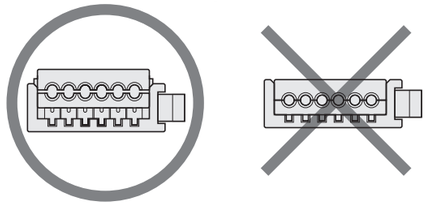
## 2 Installation

### Sensor head and connector connection overview

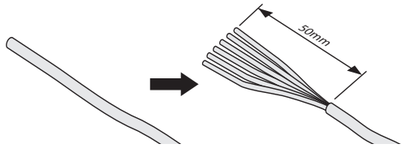
The **ZLL-□-□L** sensor head is provided to you with the mini plug wire mount plug connected to the sensor head unit. A special tool is required if you need to reconnect in order to adjust the length. Use the following procedure when reconnecting.

**1.** Be sure to use the mount plug and the special tool shown below when reconnecting.
6P mini clamp wire mount plug Model: **ZL-6M**
Special tool Model: **1729940-1**
Tyco Electronics Japan G.K.

**2.** Check to make sure that the connector cover (lead wire inlet) is sitting above the body of the connector. Note that a connector whose cover is even with the body of the connector cannot be used.

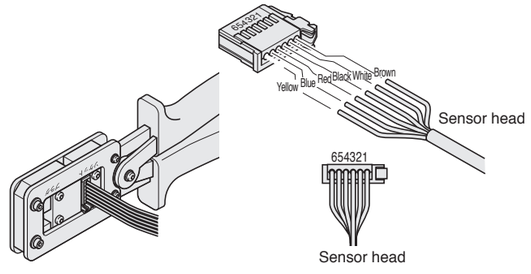


**3.** Cut the sensor head cable to the required length.
Strip the outer covering of the cable, 50 mm from the end, to expose the lead wires. Do not strip the insulation from the individual lead wires at this time.




**4.** Insert the lead wires into the connector cover holes in accordance with the information in the table below. Check to make sure the lead wires are fully inserted (wire goes in about 9 mm) as far as they will go by viewing the semi-transparent top cover of the connector.
Note that supplying power while connections are incorrect will damage the sensor head and controller.

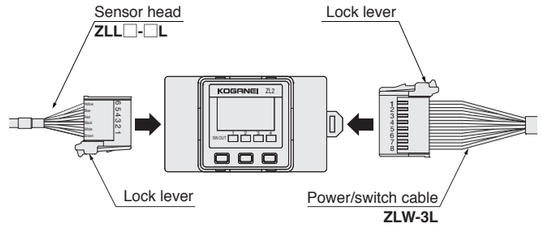
| Connector side number | Signal name | Lead wire color |
|---|---|---|
| **1** | Sensor head voltage (+) | Sensor head brown lead |
| **2** | Sensor head voltage output A_IN | Sensor head white lead |
| **3** | Sensor head voltage output B_IN | Sensor head black lead |
| **4** | Indicator (LED) input | Sensor head red lead |
| **5** | GND | Sensor head blue lead |
| **6** | Sensor head voltage output C_IN | Sensor head yellow lead |




**5.** Taking care not to allow the lead wires to come out of the connector, use the special tool (don't try to use any other tool) to squeeze the cover and body of the connector until the cover is pressed into the body.
Connection is complete when the cover is even with the connector body.

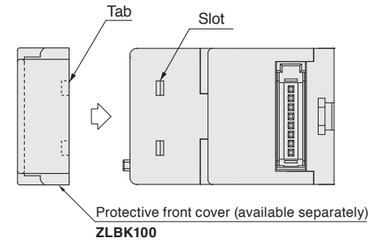
**6.** Double check to make sure that wiring is correct.

### Attaching and detaching of the sensor head and power/switch cables

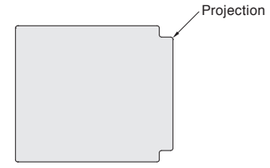



To attach the sensor head and the power/switch cables, position the lock levers as shown in the illustration above, and then insert until they lock into place with the controller side connectors. To disconnect, press the lock lever down as far as it will go as you pull the connector to unplug it. At this time, take care not to apply undue force to the lead wires.

### Attaching the protective front cover




Attach the protective front cover so the tabs inside the cover enter the slots on the Linear Magnetic Sensor Controller.



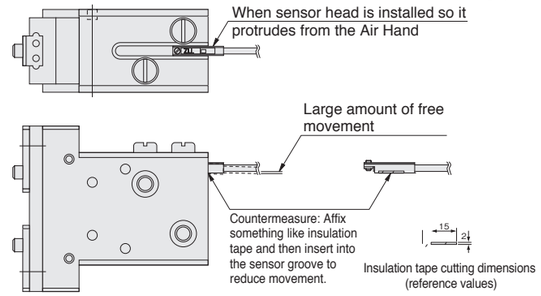

* To remove the protective front cover, hook your finger on the projection on one side of the cover and remove it.

### Sensor head installation precautions

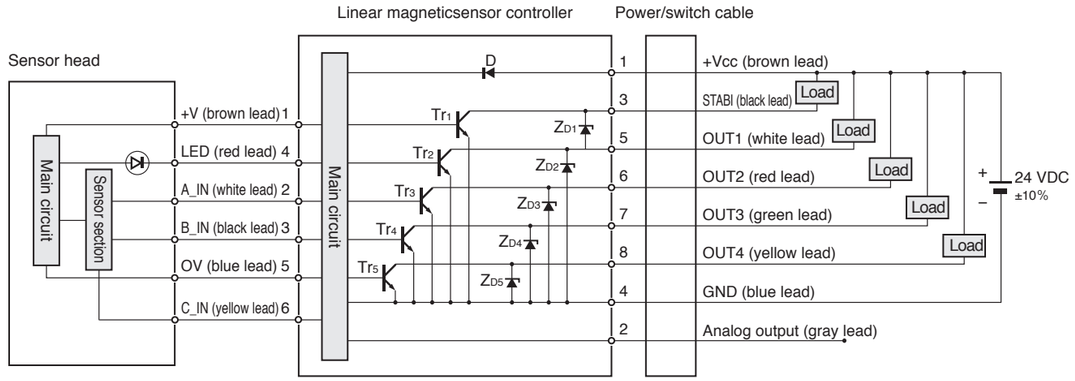
**1.** After inserting the sensor head into the Air Hand or cylinder switch mounting groove (depending on which you are using) and move the sensor head to the suitable position, secure it in place with the fixing screw. Use a tightening torque of 0.2 N·m or less.

**2.** For information about the sensor head insertion direction, see the "Sensor switch mounting method" for the Air Hand or cylinder you are using.

**3.** When the sensor head is installed in a position that causes it to protrude from the Air Hand or cylinder body you are using, the sensor head will move by the amount of the gap with the sensor groove, which will cause deterioration of sensing precision. Affix insulating tape or some other suitable material to the lower part of the sensor head (as shown in the illustration below) in order to reduce the gap.



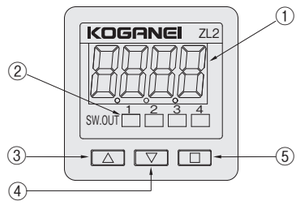
## 3 Inner Circuit Diagrams




Note: Note that extending the cable can cause a drop in voltage due to cable resistance.

| | | |
|---|---|---|
| Signal | D | : Power supply reverse-polarity protection diode |
| | $Z_{D1}$~ $Z_{D5}$ | : Surge voltage absorption zener diode |
| | $Tr_1$~$Tr_5$ | : NPN output transistors |

## 4 Nomenclature and functions



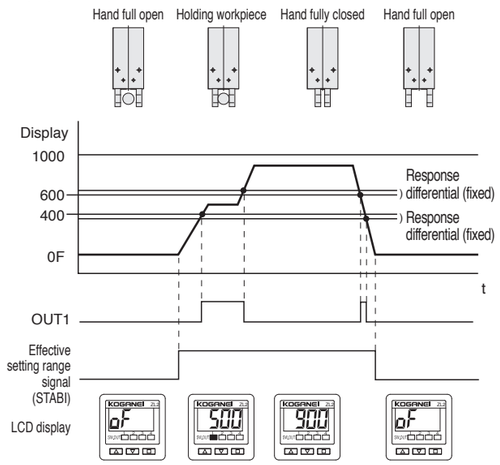

| No. | Name | |
|---|---|---|
| ① | Display | Shows effective measuring range %, setting details, error indicators. |
| ② | Switch output indicators | Light when switch output is ON (CH1 to CH4). |
| ③ | UP key ( △ ) | Use to increase a setting value. |
| ④ | DOWN key ( ▽ ) | Use to decrease a setting value. |
| ⑤ | MODE key ( □ ) | Use when configuring settings. |

## 5 Output mode

### ■Window comparator mode

**The ON range of each output can be set within the effective measuring range (sensor head ON range).**
**Response differential is fixed (2 digits)**

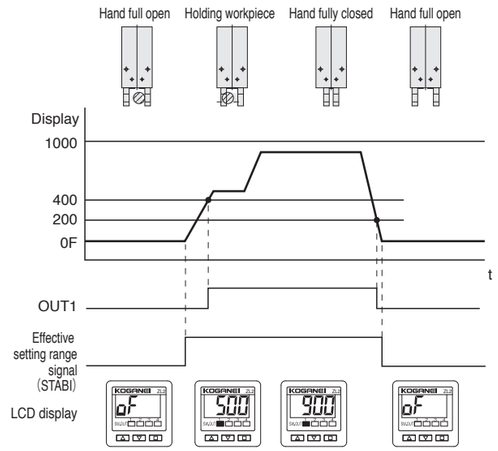
When the controller setting and sensor heat setting positions are as shown below.
OUT1 Threshold value setting Upper limit: 600 Lower limit: 400
Display when hand is full open: 900




### ■Hysteresis mode

**The ON position and OFF position each output can be set within the effective measuring range (sensor head ON range).**

When the controller setting and sensor heat setting positions are as shown below.
OUT1 Threshold value setting Upper limit: 400 Lower limit: 200
Display when hand is full open: 900




CAUTION: When the effective measuring range signal is OFF (outside the measuring range), OUT also becomes OFF.



## 6 Setting

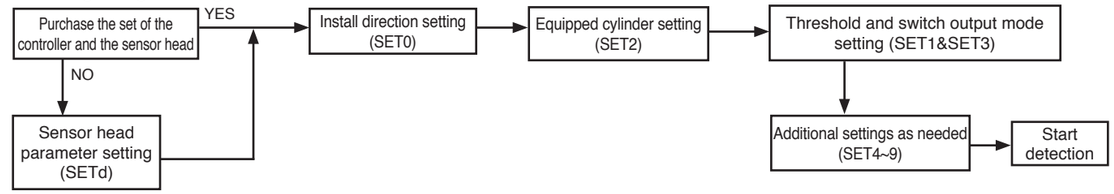
**⚠ CAUTION**

1. Incorrect wiring of the sensor head or power/switch cable will damage both the controller and the sensor head. Be sure to double-check and make sure that wiring is correct before supplying power.
2. Parameters that are set are recorded into flash memory and retained there. Note that flash memory has a limited service life. The guaranteed number of rewrites is 10,000.

### ■Getting ready to configure settings

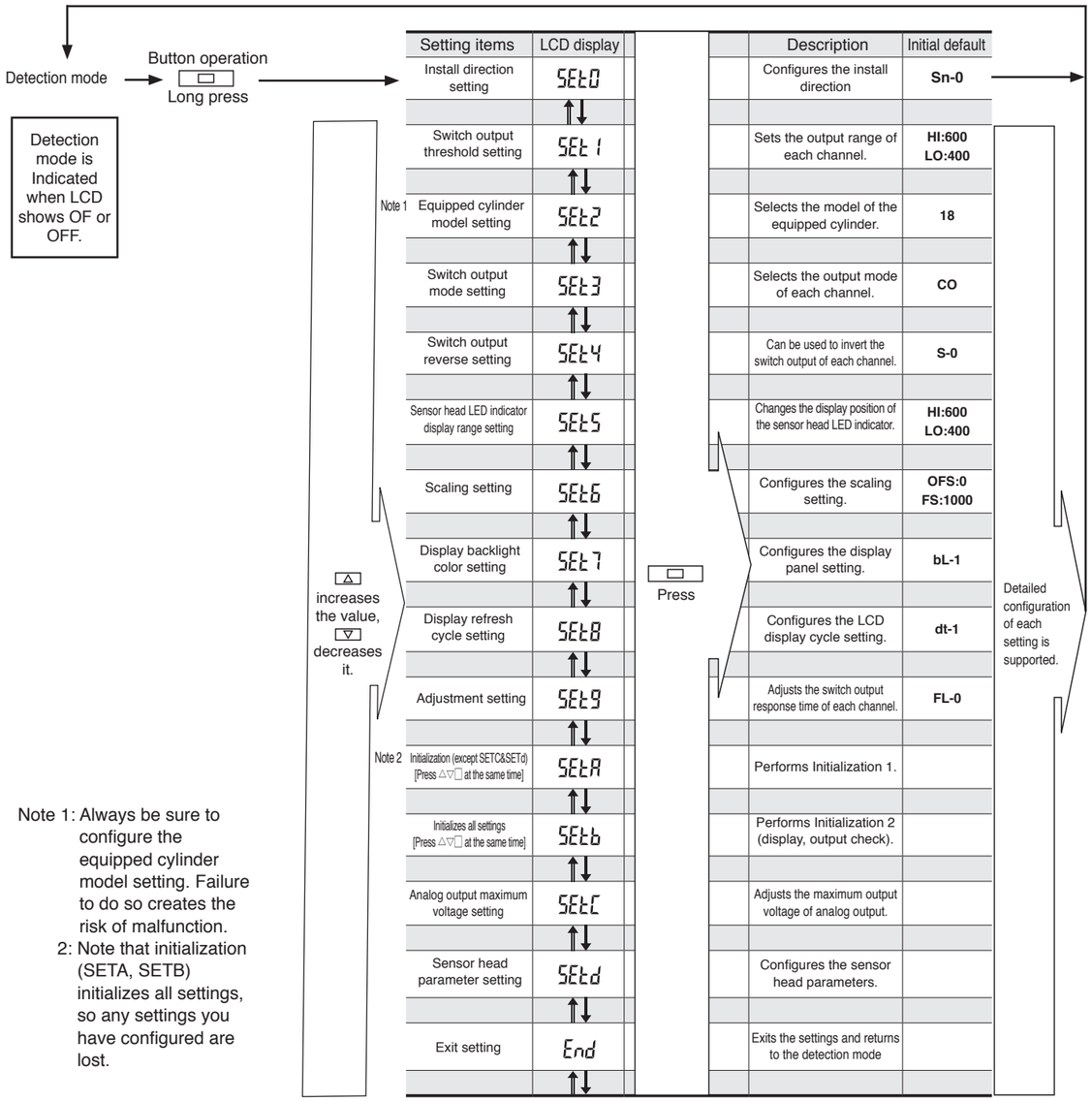
・Connect the sensor head and power/switch cable to the controller. (Refer to "Attaching and detaching of the sensor head and power/switch cables" on page ❷).

### ■Configuring settings




**General flow**

First specify the cylinder model that is equipped (SET2), and then configure the other settings (as shown below). You also can use the procedure below to modify settings.

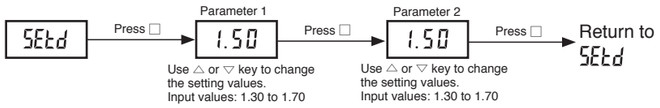


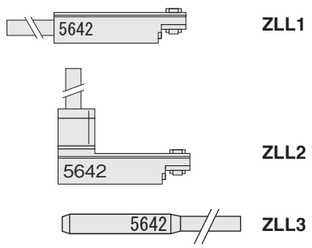

Note 1: Always be sure to configure the equipped cylinder model setting. Failure to do so creates the risk of malfunction.
2: Note that initialization (SETA, SETB) initializes all settings, so any settings you have configured are lost.

## Sensor head parameter setting (SETd)

Configures the sensor head parameters.

**This setting is not required if the controller and the sensor head are purchased as a set (Model: ZL2-ZLL □ - □ LK) as it is already configured.**




Refer to the parameter code embossed on the sensor head, and follow the example below to enter the parameter code.
The parameter code is embossed at the position shown in the sensor head diagrams on the right with the format display side facing up.

(Opposite to the "E※※※" impression)

Ex.) For the parameter code "5642"
Parameter 1: 1.56
Parameter 2: 1.42

## Install direction setting (SET0)

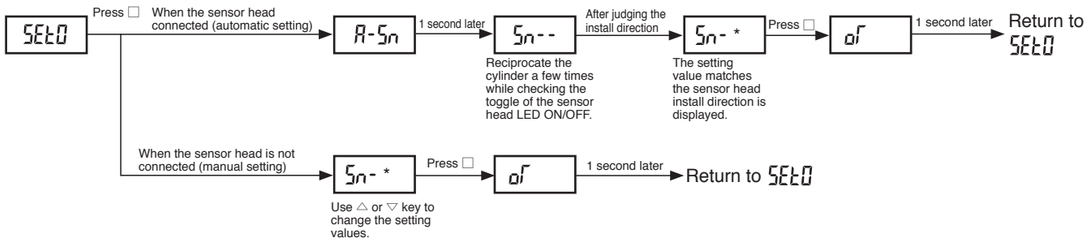
Configures the install direction of the sensor head. This setting must be configured after installing the cylinder head to the cylinder.

**If the system is used without configuring this setting, correct detection or output cannot be achieved.**

Factory setting : Sn-0

Setting : Sn-0 or Sn-1

The behavior differs depending whether the sensor head is connected or not.




Note 1) If the □ key is pressed before the setting judgment by automatic judgment, the display returns to "SEt0" without any change.

## Threshold value setting (SET1)

Use this setting to set threshold values for each channel.

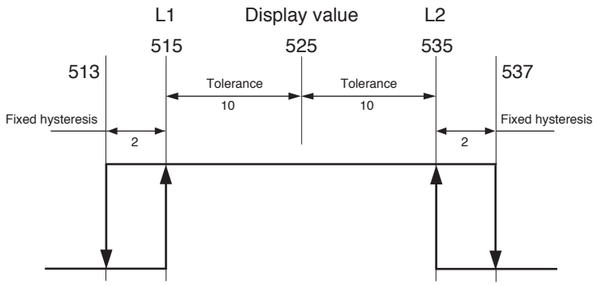
| | Factory setting | Input value | Window comparator mode | Hysteresis mode |
|---|---|---|---|---|
| Threshold (L2) | 600 | 0 to 1000 | Upper threshold | ON point |
| Threshold (L1) | 400 | 0 to 1000 | Lower threshold | OFF point |

Note1) Input condition L2 > L1+1

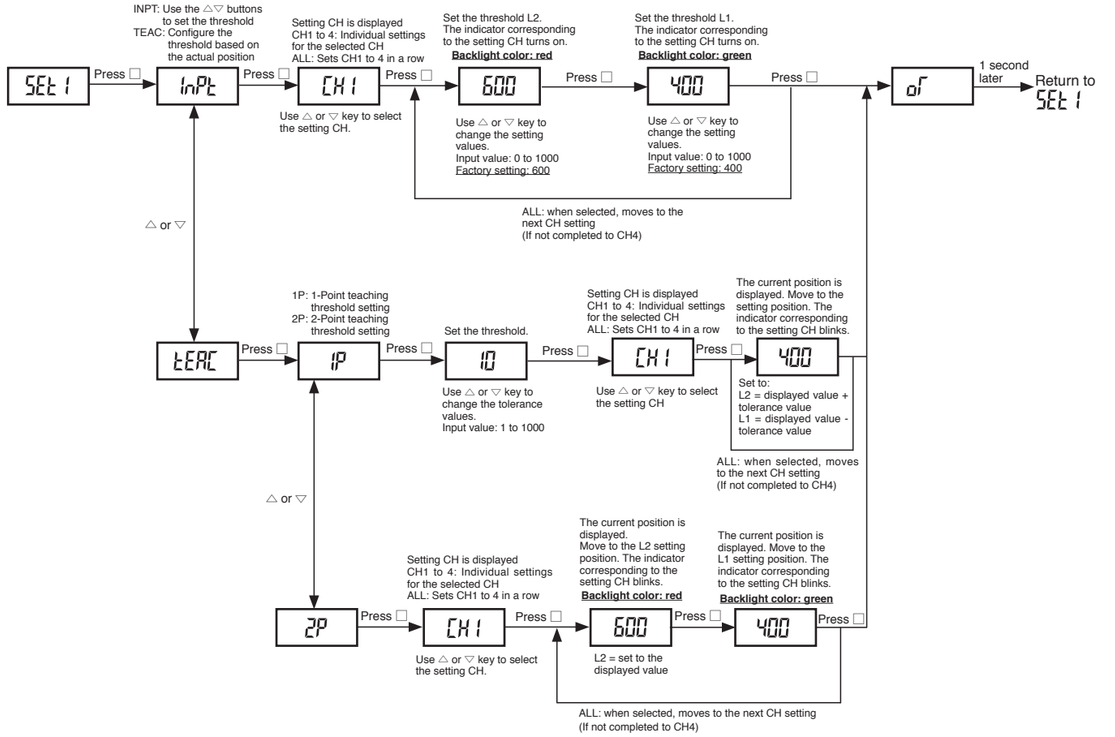
<About TEACH setting>

While actually moving the cylinder (hand), set the threshold based on the value displayed.
Because the threshold is set based on the displayed value, perform this task while the sensor head is connected.
(If TEACH setting is entered without setting the sensor head, E-1 is displayed)
It would be the same area as the threshold storage location. To see the stored value, use SET1.

Output behavior when configured with the tolerance = 10 and the displayed value 525 (in Window comparator mode)





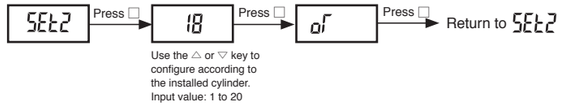




## Installed cylinder model setting (SET2)

Change this setting in accordance with the cylinder model that the cylinder head will be set into.

Factory setting : 18

Setting : 1 to 20

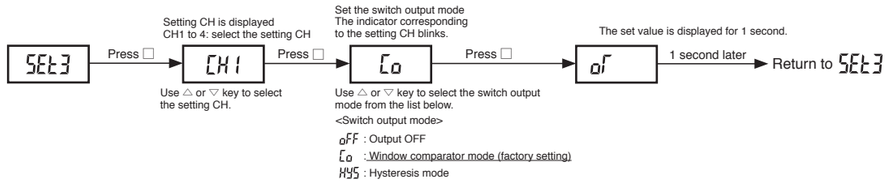



| Set value | Installed cylinder model |
|---|---|
| 8 | NHBDSL:25 |
| 16 | NHB□PG:40,50 |
| 17 | AFDPPG(L):14,18 |
| 18 | NHB□PG:8,10,16,20,25,30<br>NHBDSL:12,16,20<br>AFDPG(L):6,8,12,25<br>NHB□PGL,NHB□P(A),NHB□S<br>NHE1D,NHC1D,NHL1D<br>BDAS,NDAS,PBDAS<br>CDAS,SGDA,MGA,MGT,TBDA,ARS, |

*For information about other cylinders, contact Koganei.

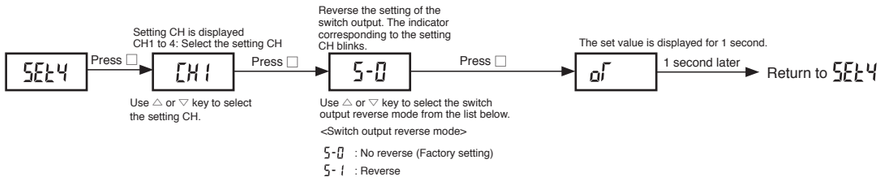
## Output mode setting (SET3)

Use this setting to set the output mode for each channel.



## Switch output inversion setting (SET4)

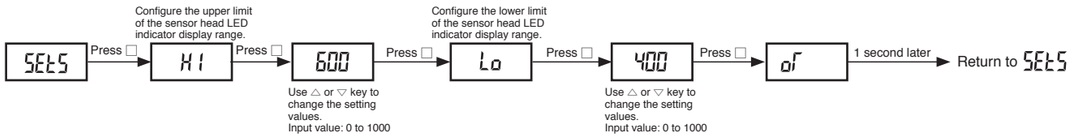
This setting can be used to invert the switch output of each channel.




## Sensor head LED indicator light setting SET5)

Configure the sensor head LED indicator display range setting

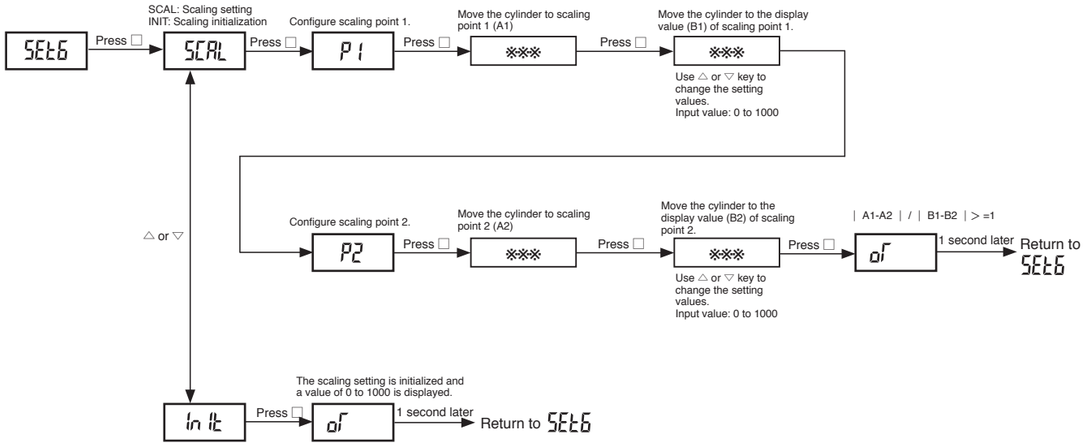
The sensor head LED indicator turns on within the effective measuring range with the factory setting.




## Scaling setting (SET6)

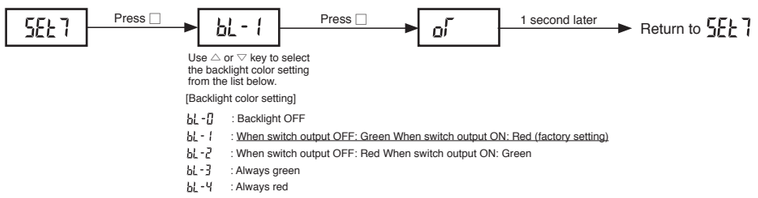
Configure the display scaling.

No change after scaling for the analog output (1-5V).




## Backlight display setting (SET7)

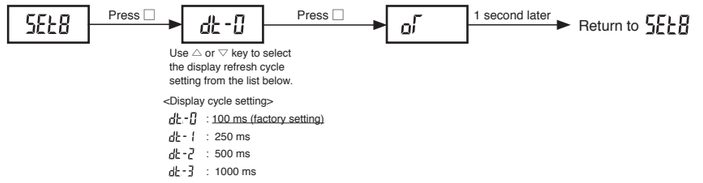
Use this setting to configure backlight color settings.





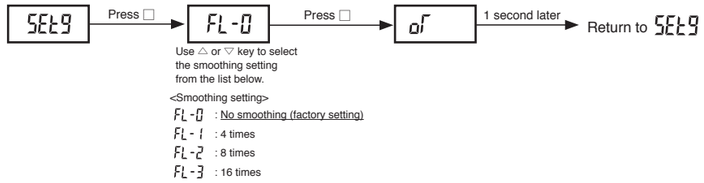

## Display cycle setting (SET8)

Use this setting to configure the display cycle.




## Adjustment setting (SET9)

Configures the adjustment setting.




*** Usually, it is not necessary to configure SETA - SETC.**

## Error Indicators

| Indicator | Meaning | Required action |
|---|---|---|
| oFF | The sensor head of the selected channel is not connected or has been disconnected. | In the case of disconnection, turn off power and replace the sensor head. |
| E-1 | Invalid scaling setting. | Reconfigure the scaling setting so it satisfies the required scaling conditions. |
| E-2 | Over voltage being applied to sensor input. | After correcting for the source of the problem, hold down the MODE key for more than one second. |
| E-3 n<br>(n: applicable channel) | Over voltage being applied to switch output. | |

* For other information, detailed specifications, and precautions, see the product catalog.

* For inquiries about the product, contact your nearest Koganei sales office or the Overseas Group noted below.

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