SENKO CO.,LTD


# Explosion-proof pump type gas detector (Built-in pyrolyzer)

(SI-310) OPERATING MANUAL

# • WARNING

Please be fully aware of the manual before using the device. This device must be used and repaired in accordance with the instructions, and failure to follow the instructions can cause device failure or risk user injury or life.

## *Warning*

- Please remove any debris on the surfaces of the sensor before use.
- Please test the alarm to see if it's working regularly.
- Use within the range of temperature, humidity, and pressure that meet the product specifications. Out of this range, it may cause malfunction or failure of the device. The sensors inside the device may indicate the gas concentration differently according to the environment such as temperature, pressure, and humidity. Please make sure to calibrate the detector under the same or similar environment to the specification.
- Extreme changes in temperature may cause drastic changes of the gas concentration. (e.g. using the detector where there is a huge gap between the inside and outside temperature) Please use the device when the concentration becomes stable.
- The alarms are set according to the international standard and must be changed by an authorized expert.
- The FLOW LIMITED DEVICE must be connected, and the material should not include a polymer or an elastic material.

## *Caution*

- Use the device after reading this manual thoroughly.
- This product is not a gas measuring meter. It's a gas detector.
- Please stop using and consult the manufacturer if the calibration fails continuously.

## *Warranty*

We, SENKO CO., LTD warrant replacement or repair for the products of SI series for 24 months from the shipment date of the product(s). However, the parts, whose life can be shortened by use, such as sensors, batteries and lamps are not under the warranty. Also, Free repair and replacement is not available in case of purchases of our products through unauthorized channels, mechanical damage, and deformation by user's misuse, and calibration and replacements of parts without following the instruction in the manual. If any defect or quality problem occurs to the products during the warranty period, the user should notify it to the manufacturer. In this case, all the expenses except freight cost are paid by SENKO. Repair, replacement and freight cost for the products, whose warranty is already over, are paid by the user. SENKO CO., LTD does not have any responsibility for indirect, or accidental loss which occurs while using our products, and the warranty is limited to the exchange of parts and products. The warranty is subject to the users who have bought products from the authorized agency and office appointed by SENKO CO., LTD, and warranty repairs must be made through the designated A/S center of SENKO CO., LTD with a skilled technician.

# Contents

# 1. Product Overview

## 1.1. Specification

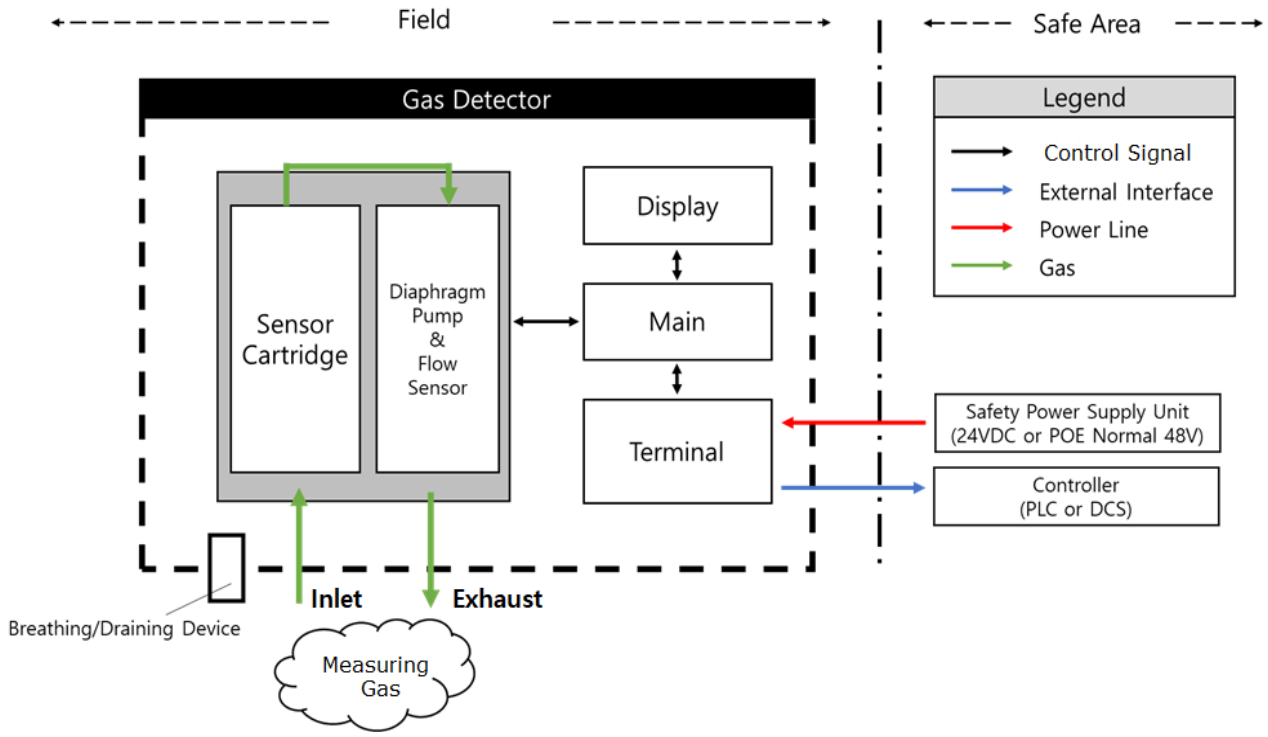
- Explosion-Proof structure.
- Cartridge type sensor – Easy maintenance
- Built-in flow control function.
- 4-Digit Digital Concentration Indication and Digital Flow Indication
- 4-20mA / RS-485 / Ethernet

| Model | SI-310 |
|---|---|
| Size | 212mm(W) X 225mm(D) X 141.7mm(H) |
| Weight | 6.5Kg |
| Operating voltage | DC : 24V ± 10%<br>PoE : 36V~57V (Typical : 48V) |
| Flow rate | 100 ~ 1,000 ml (Normal 300 ~ 500ml / min) |
| Power consumption | Approx. 15.0W @ +24VDC (Pyrolyzer Use 600mA@+24Vdc) |
| Measurement display | FND, gas concentration, flow rate, alarm, device faulty |
| Relay | Low Alarm, High Alarm, Fault Alarm (Rated 2.0A @ 30Vdc) |
| Analog Output signal | 4-20mA |
| Digital communication | RS-485, TCP Ethernet (PoE) |
| Sampling distance | Length of input gas tube: up to 30m (FEP tube)<br>Length of exhaust gas tube: up to 30m (FEP tube) |
| Input/Output tube | 1/4" Teflon tube |
| Operating temperature | -40°C ~ 60°C |
| Certification | KCs: Ex db IIC T6 Gb |
| IP | |
| Control/Set | 4 Button & RS485 & Ethernet & Bluetooth |
| Warranty period of the device | 2 years |
| Warranty period of sensor cartridge | 1year |
| Remote interface | Ethernet (PoE), RS-485, HART(Option) |
| Wiring | 4 to 20mA / DC power / Relay : up to 14 AWG / Ethernet : RJ-45 Cat.5E |
| Pressure range | 90 to 110KPa |
| Maximum sample flow | Max. 1,000 ml |
| Maximum sample pressure | 6KPa |

## 1.2. Pyrolyzer Applicable Gas List

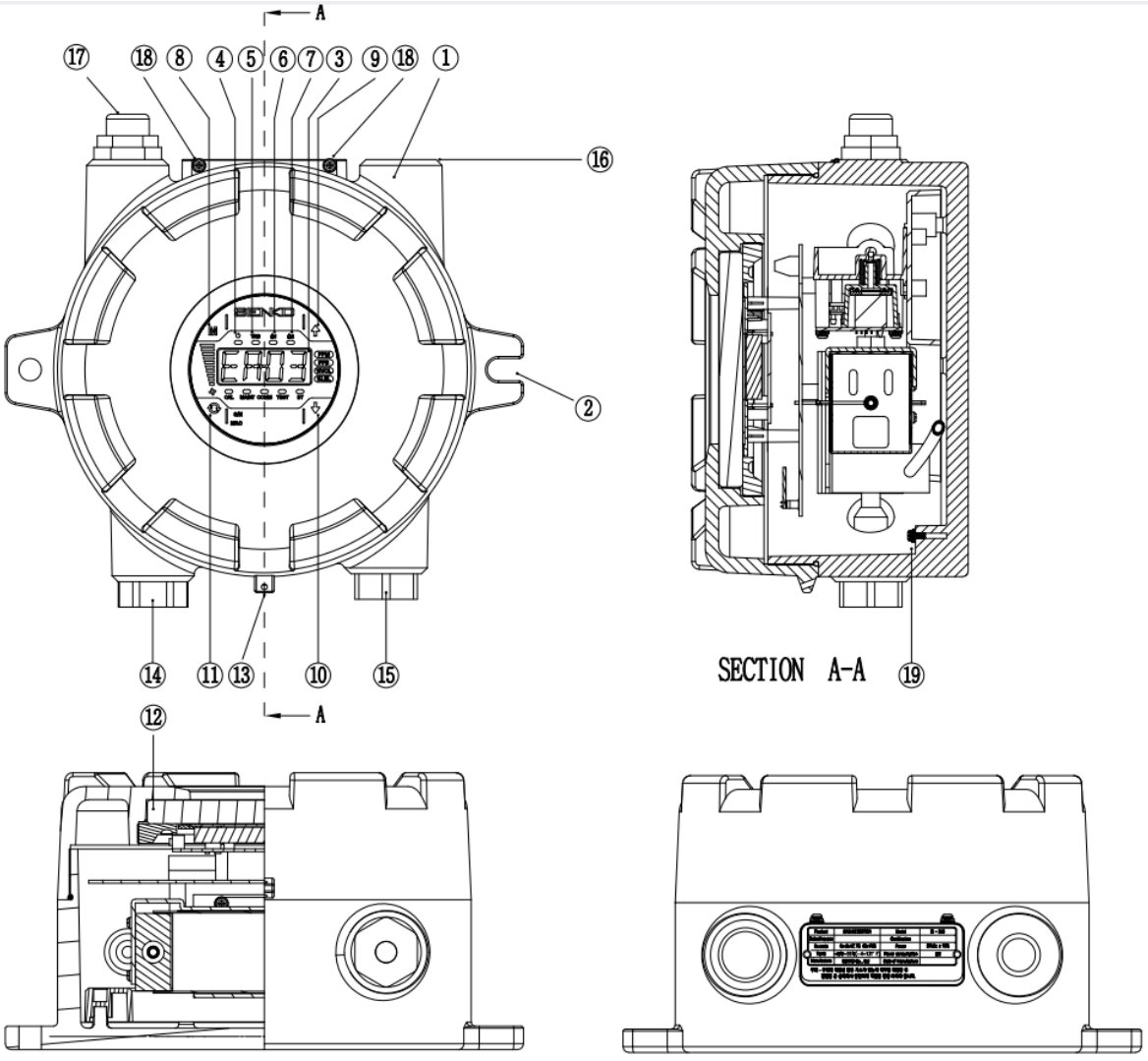
| Gas | | Sensor | Range | A1 | A2 | Resolution |
|---|---|---|---|---|---|---|
| Hexafluorobutadiene | $C_4F_6$ | Electrochemical | 0~40ppm | 10ppm | 20ppm | 1.5ppm |
| Octafluorocyclopentene | $C_5F_8$ | Electrochemical | 0~40ppm | 5ppm | 10ppm | 2.0ppm |
| Difluoromethane | $CH_2F_2$ | Electrochemical | 0~120ppm | 15ppm | 30ppm | 6.0ppm |
| Fluoromethane | $CH_3F$ | Electrochemical | 0~120ppm | 15ppm | 30ppm | 8.0ppm |

## 1.3. Outline



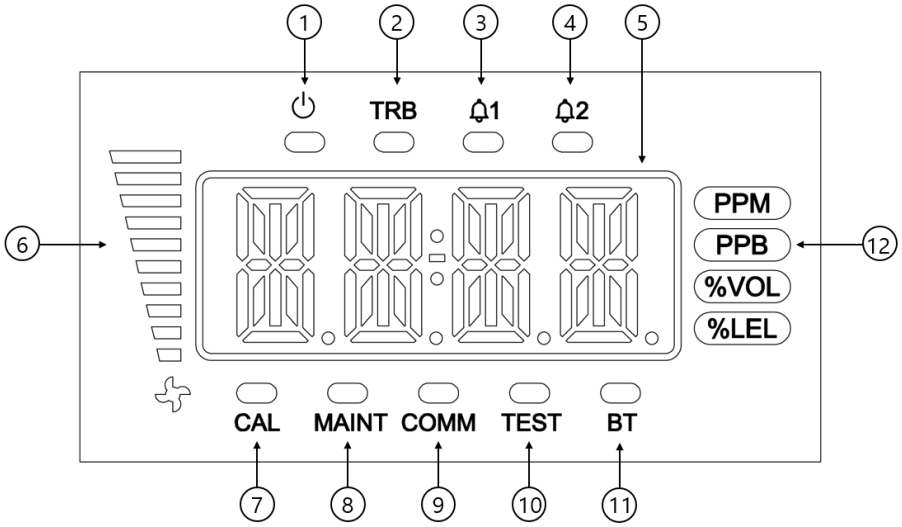
# 2. Appearance and Description

## 2.1. Component



| NO | NAME | DESCRIPTIONS |
|---|---|---|
| 1 | Case cover | It protects sensors and PCB boards built into the product from external environmental changes and shocks. |
| 2 | Mount Holes | It is a Mounting Hole used to fix the product. |
| 3 | FND display | When setting the gas concentration value and parameter measured by the sensor, the set mode is indicated by numbers and icons. (Refer to the "Front LED Display Configuration" described in detail.) |
| 4 | Power LED | When the power supply DC 24V is normally supplied, the green LED is turned on. |
| 5 | Trouble LED | When sensors and flow rates are recognized as failures, the yellow LED is lit, and when set, the Trouble Relay contact signal is output to the outside. |
| 6 | Alarm1 LED (Red) | When the measured gas concentration exceeds the Alarm1 setting, the LED is turned on, and the Relay contact signal is output to the outside when setting. (Alarm1 level setting can be arbitrarily set in Alarm setting mode.) |
| 7 | Alarm2 LED (Red) | When the measured gas concentration exceeds the Alarm2 setting, the LED is turned on, and the Relay contact signal is output to the outside when setting. (Alarm2 level setting can be arbitrarily set in Alarm setting mode.) |
| 8 | Menu key | Mode switching and setting key in function setting mode. If you press Menu for more than 1 second in the measurement mode, it enters the function setting Menu. (Configuration, Measurement, Calibration, Alarm, etc.) |
| 9 | Up key | It is a key that increases the setting value in the function setting mode. |
| 10 | Down key | It is a key that lowers the setting value in the function setting mode. |
| 11 | Select key | Select key is used when setting menu status in function setting mode. If you press the Select key and Down key more than 3 sec at the same time in the measurement mode, it enters the inspection mode, and the TEST LED flashes. |
| 12 | Window Glass | It is a tempered glass that allows you to see the display status that informs you of the product status in Housing. |
| 13 | Cover fixed screw | It is a screw that fixes the main body case and the front cover case. |
| 14 | Gas inlet | Sample gas inlet port. (1/4" Tube) |
| 15 | Gas outlet | Sample gas output port. (1/4" Tube) |
| 16 | Cable gland | It's the entrance to the power and signal cable. |
| 17 | Breathing Device | Breather function of Flame arrester / Ex d IIC Air Breather (SAB)<br>Authentication number: 17-GA2BO-0697U |
| 18 | External earth | External earth to protect against external noise or ferroelectricity.<br>The earth wire is coupled and connected using a conductor of 4mm or more. |
| 19 | Internal earth | Internal earth to protect against external noise or ferroelectricity.<br>The earth wire is coupled and connected using a conductor of 4mm or more. |

## 2.2. Front Display Configuration




| No | Name | Descriptions |
|---|---|---|
| 1 | Power LED(Green) | When the power (DC 24V) is supplied normally, the LED is lit.. |
| 2 | Trouble LED | When self-diagnosis of Gas detector, display if fault is detected. |
| 3 | Alarm1 LED | Alarm1 is set or displayed when detected. |
| 4 | Alarm2 LED | Alarm2 is set or displayed when detected. |
| 5 | FND DISPLAY | When setting the gas concentration value and parameter by the sensor, the setting mode is displayed as numbers and icons. |
| 6 | FLOW LED | Display the current flow rate in a graph bar. |
| 7 | CAL LED | Displayed during the calibration. |
| 8 | MAINT LED | Display when running Engineering mode. |
| 9 | COMM LED | Displayed during RS485/Ethernet communication. |
| 10 | TEST LED | Display when executing the test mode. |
| 11 | BT LED | Display when connecting to Bluetooth. |

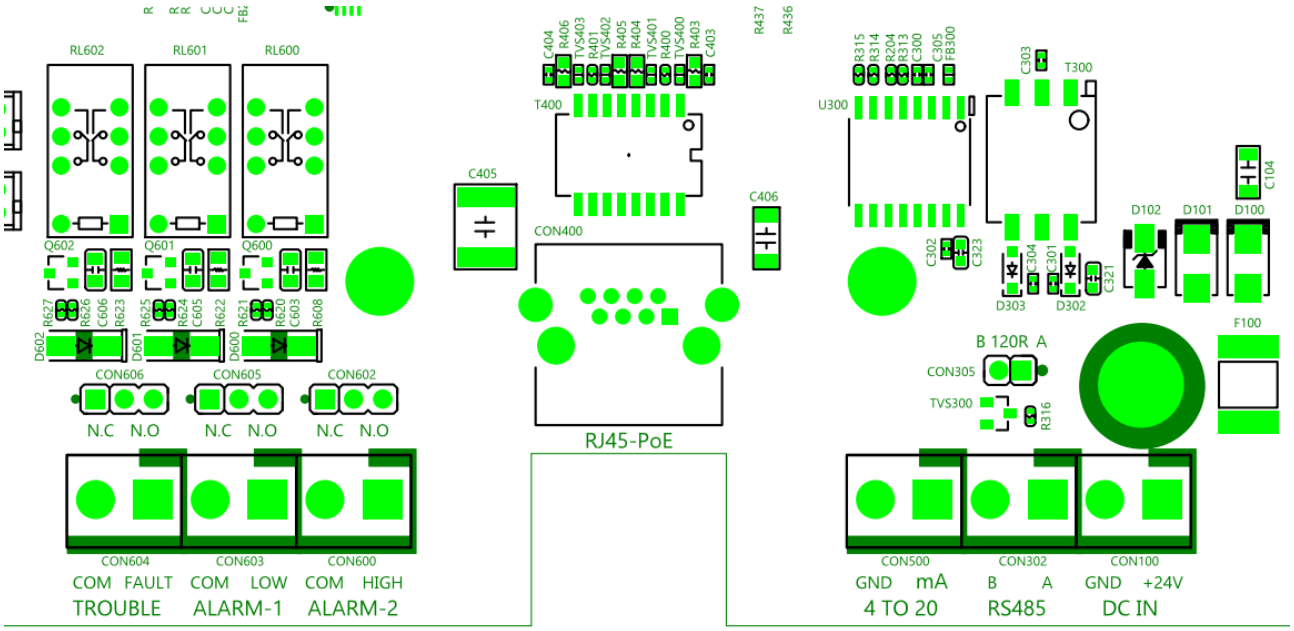
[Table 2. Description of Front LED Display Configuration]

# 3. How to install

⚠ Installing a detector at a site, opening the cover of a detector, or operating it may cause fire or explosion depending on the environment. Therefore, you should proceed with your work after turning off the power and examining whether explosive residual gas is around you or not.

## 3.1. Power, RS485, 4-20 mA Terminal configuration

- Loosen the case cover fixed screen on the side of the detector and separate the case cover. Then Terminal appears.




### 3.1.1. DC Terminal

- The DC terminal consists of a terminal for power supply of the detector.

| Pin No. | Name | Description |
|---|---|---|
| 1 | GND | Ground |
| 2 | 24V | Power |

- Shield cables above 1.5 sq should be used.
- When the external power DC24V is used, connect to the "CON100" Terminal of the terminal unit.

### 3.1.2. RS485 Terminal

• Connect the following MODBUS master terminals to RS-485A and RS-485B.

| Pin No. | Name | Description |
|---|---|---|
| 1 | B | TRXD-' or 'B or 'N' |
| 2 | A | TRXD+' or 'A or 'P' |

### 3.1.3. 4-20mA Terminal

- The 4-20 mA terminal consists of terminals for 4-20 mA output.

| Pin No. | Name | Description |
|---|---|---|
| 1 | GND | 4~20mA Ground |
| 2 | OUTPUT | 4~20mA Output Signal |

### 3.1.4 PoE Ethernet Terminal

- The PoE terminal connects the PSE and the detector through a LAN CABLE (CAT5 Cable or Equivalent RJ45).

| Pin No. | Name | Description |
|---|---|---|
| CON400 | RJ-45 JACK | PoE & Ethernet Connected |

## 3.2. Alarm Terminal configuration

- Connect the Alarm Relay connected to the terminal using the following configuration.
-

### 3.3.1. Fault Relay Output Configuration

| Name | Fault Relay Contact | Jumper Setting |
|---|---|---|
| FAULT-OUT | Normal Close Mode | J7 Jumper NC on |
| | Normal Open Mode | J7 Jumper NO on |
| FAULT-COM | Common | - |

### 3.3.2. Low Relay output configuration

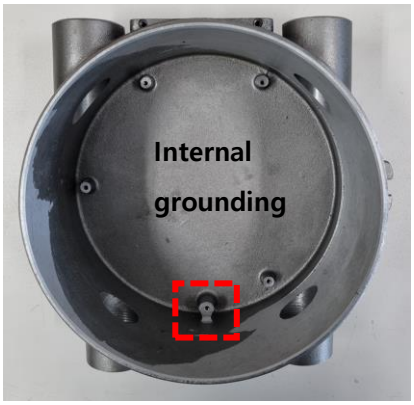
| Terminal | Fault Relay Contact | Jumper setup |
|---|---|---|
| AL1-OUT | Normal Close Mode | J6 Jumper NC on |
| | Normal Open Mode | J6 Jumper NO on |
| AL1-COM | Common | - |

### 3.3.3. High Relay output configuration

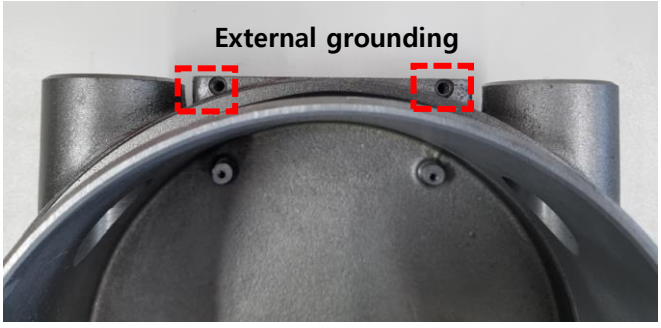
| Terminal | Fault Relay Contact | Jumper setup |
|---|---|---|
| AL2-OUT | Normal Close Mode | J3 Jumper NC on |
| | Normal Open Mode | J3 Jumper NO on |
| AL2-COM | Common | - |

## 3.3 Ground connection configuration

- Internal grounding: You can ground the internal grounding through point 1 using the ring terminal.



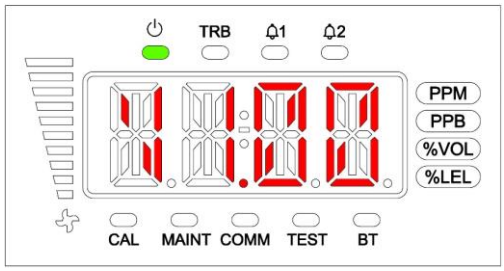

- External grounding: Can ground the external grounding through point 2 using the ring terminal.



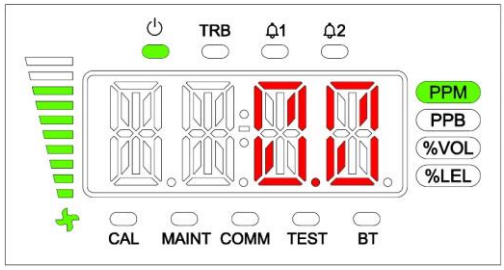
# 4. Usage

## 4.1. Power On

- Check the wiring and power voltage then turn on the power switch.
- After the Power LED (Green) and Version information (ex V1.00) are displayed, it followed to the Measuring mode.
- It takes about 3 minutes to warm up. If the MENU key is pressed during the instrument warm up operation, it immediately switches to the Measuring mode.




## 4.2. Measuring Mode




**Alarm LED**

▶ Power/Trouble/Alarm 1/Alarm2

**Current gas concentration display**

**Gas concentration unit display**

▶ Changing a decimal point based on the range

**Current Pump flow display**

**Pump flow**

▶ Current suction flow

**Status LED**

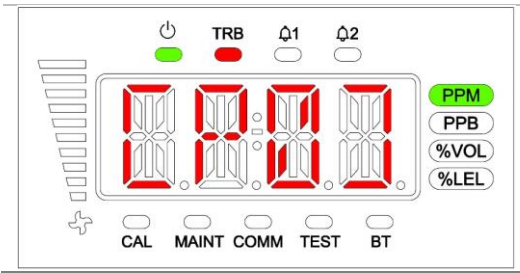
▶ CAL: Calibration in progress

▶ MAINT: Maintenance in progress

▶ COMM: Communication status

▶ TEST: Test in progress

▶ BR: Bluetooth connection status

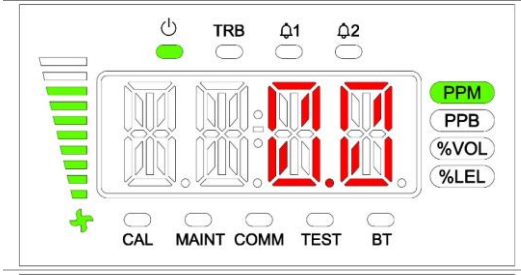
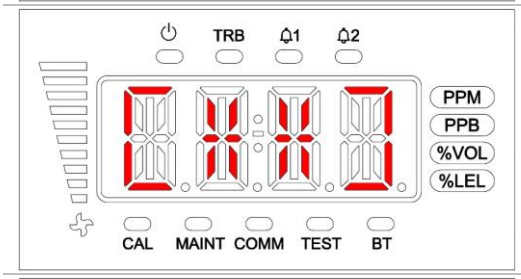
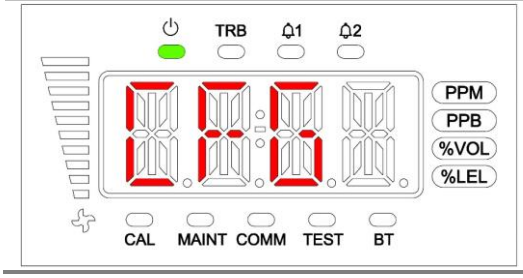



**Trouble(Fault) Status**

▶ Trouble LED lights up when a problem occurs

▶ See Error Code 6.1.

## 4.3. Internal settings

| | |
|---|---|
|  | ▶ In the measurement state, press the Menu Key for more than 1 second to enter the password request state. |
|  | 1. [**] will be displayed at the PW state.<br>2. The initial value is [00] and can be changed from [00] to [99] with the Up/Down Keys.<br>After entering the password, press the Select Key to enter the internal setting. |
|  | 1. In the internal setting mode, each setting can be entered by using the Up/Down Keys.<br>2. CFG/MEAS/CAL/ALM are configurable. |

# 5. System Mode

## 5.1. Mode configuration

The device consists of the following menu configuration.

| Division | Mark | Definition | Note |
|---|---|---|---|
| CONFIGURATION | CFG | Basic setting | |
| MEASUREMENT | MEAS | Measurement setting | |
| CALIBRATION | CAL | Calibration setting | |
| ALARM | ALM | Alarm setting | |
| TEST | TEST | Test | Engineering Mode |
| TIME | TIME | Time setting | Engineering Mode |
| FLOW | FLOW | Pump Flow setting | Engineering Mode |
| NETWORK | NET | Ethernet setting | Engineering Mode |
| ADJUST | ADJ | 4-20mA output setting | Engineering Mode |
| FACTORY | FACT | Factory setting | Engineering Mode |

**[Table 4. Mode Configuration]**

## 5.2. Menu configuration

The menu configuration of the equipment is as follows.

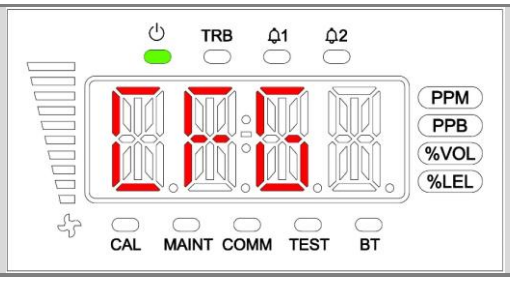
| 1 Depth | 2 Depth | 3 Depth | Default |
|---|---|---|---|
| CFG (Configuration) | GAS | Gas sensor type | - |
| | HART | HART Board availability | - |
| | PYRO | PYRO set voltage | 7V |
| | MODT | Modbus Type(RTU/TCP) | TCP |
| | ADR(Address) | Modbus Address(0~64) | 1 |
| | PWD(Password) | Password setting (00~99) | 00 |
| | C-TM(Calibration Time) | Calibration cycle (1~12months) | 12 |
| | HIDN(Hidden Area) | Hidden area (Full Range standard 0~20%) | 2.0 |
| | BRIT | FND Brightness | 5 |
| | M1.00 | Firmware version | - |
| | S1.00 | Sensor cartridge version | - |
| | EMAC | MAC ADDRESS | - |
| | BMAC | BLE MAC ADDRESS | - |

| 1 Depth | 2 Depth | 3 Depth | Default |
|---|---|---|---|
| MEAS (Measurement) | DECP (Decimal Point) | Decimal point (1000, 100.0, 10.00, 1.000) | 100.0 |
| | F-RN (Full Range 1~9999) | Full measuring range (1~9999) | 500 |
| | UNIT | Measuring unit (PPB, PPM, VOL%, %LEL) | PPM |

| 1 Depth | 2 Depth | 3 Depth | Default |
|---|---|---|---|
| CAL (Calibration) | ZERO (Zero Calibration) | Zero Calibration | Based on gas |
| | S-CN (Span Concentration) | Span Gas Concentration setting (1~9999) | Based on gas |
| | SPAN (Span Calibration) | Span Calibration | Based on gas |

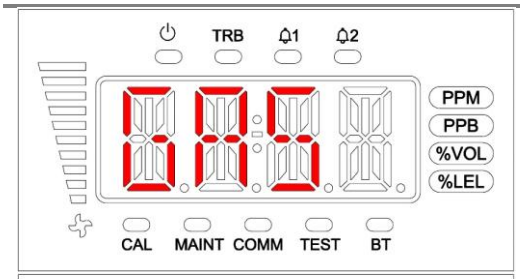
| 1 Depth | 2 Depth | 3 Depth | Default |
|---|---|---|---|
| ALM (Alarm) | LACH(Latch) | Alarm Latch(ON, OFF) | OFF |
| | ENER(Energized) | Alarm Energized(EN, D-EN) | D-EN |
| | DLY(Delay) | Alarm Delay(0~99sec) | 0 |
| | ALM1(Alarm level 1) | Alarm 1 level (1~Full Range) | Based on gas |
| | ALM2(Alarm level 2) | Alarm 2 level (1~Full Range) | Based on gas |

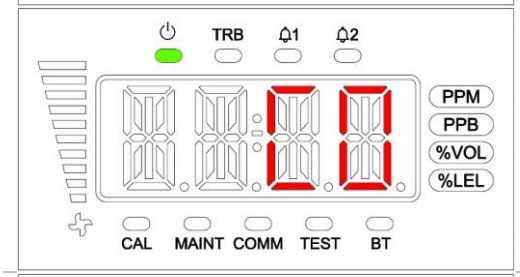
## 5.3. Setting/Configuration Menu




Internal preferences are configurable by using Up/Down Keys.

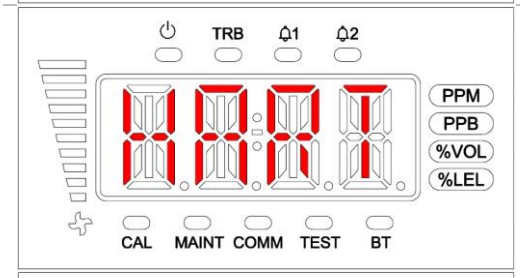
- GAS/HART/PYRO/MODT/ADR/PWD/C-TM/HIDN BRIT/M1.00/S1.00/EMAC/BMAC

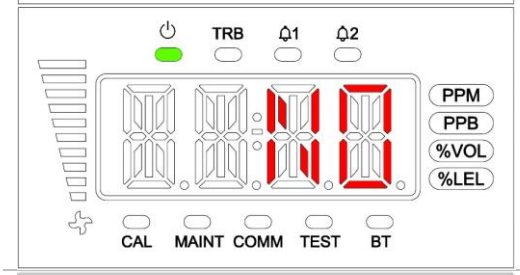



**Gas type**

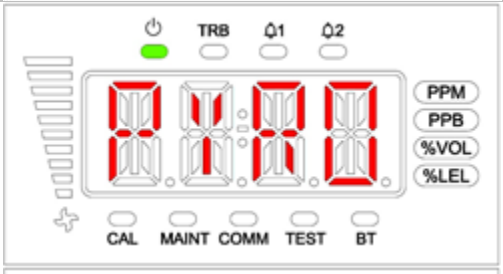
▶ Press the Select Key to display the current gas type

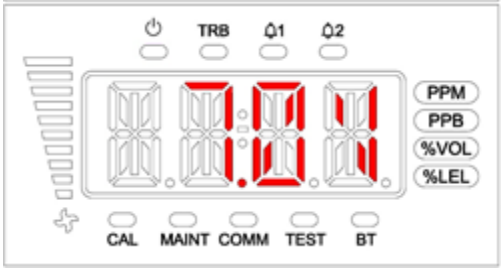



**HART availability**

▶ Press the Select Key to display the HART mode availability



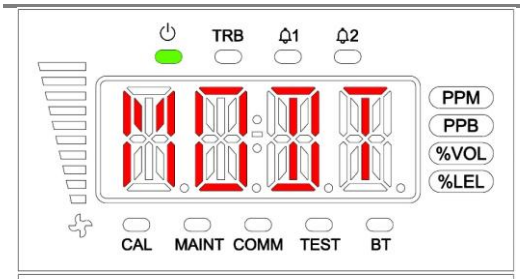
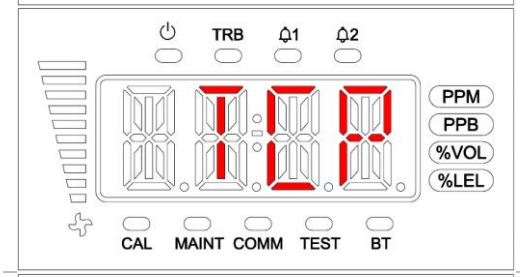
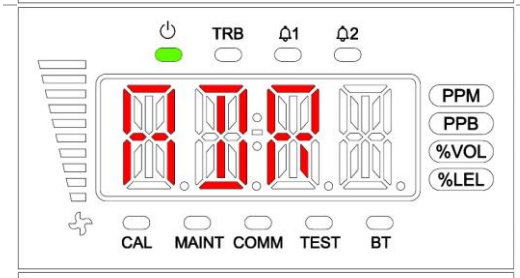
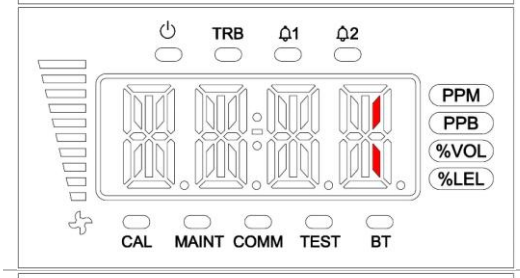
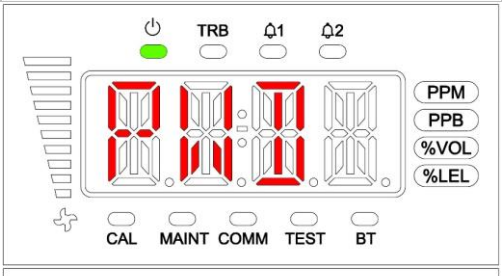
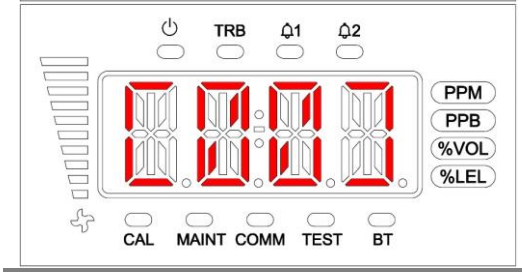



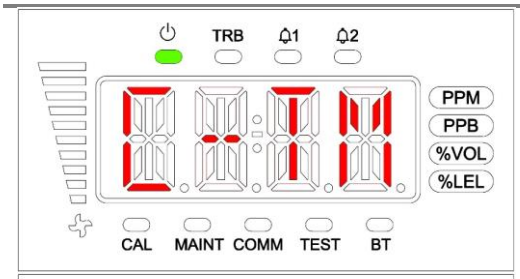

**Changing Pyro Voltage**

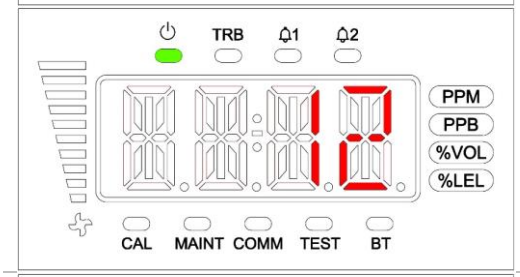
▶ Press the Select Key to enter the change

▶ Select OFF/7.0V~12.0V by using Up/Down Key

▶ Press the Select Key to save the change.

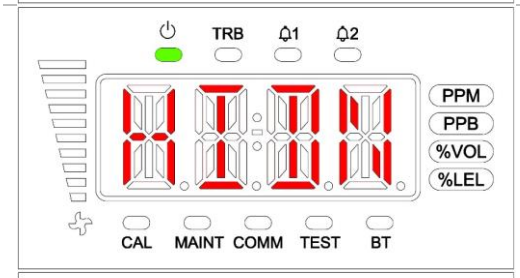
| | |
|---|---|
|  <br>  | **Changing to Modbus Type**<br>▶ Press the Select Key to enter the change<br>▶ Select RTU/TCP by using Up/Down Key<br>▶ Press the Select Key to save the change. The mode applies after restarting the device |
|  <br>  | **Changing Modbus Address**<br>▶ Press the Select Key to enter the change<br>▶ Select 1~64 by using Up/Down Key<br>▶ Press the Select Key to save the change |
|  <br>  | **Password settings**<br>▶ Press the Select Key to enter the change<br>▶ Select 00~99 by using Up/Down Key<br>▶ Press the Select Key to save the change |

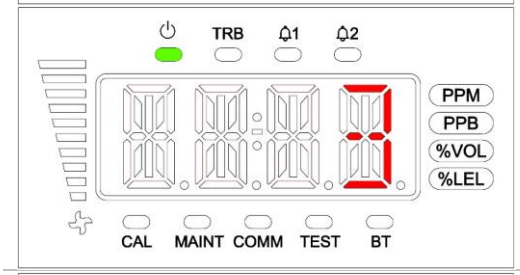



**Calibration cycle setting**

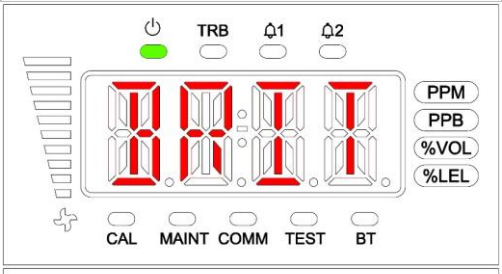
- ▶ Press the Select Key to enter the change
- ▶ Select 1~12months by using Up/Down Key
- ▶ Press the Select Key to save the change

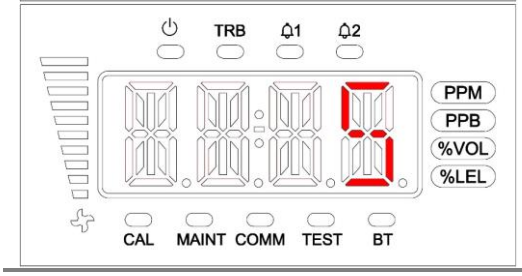



**Hidden Area setting**

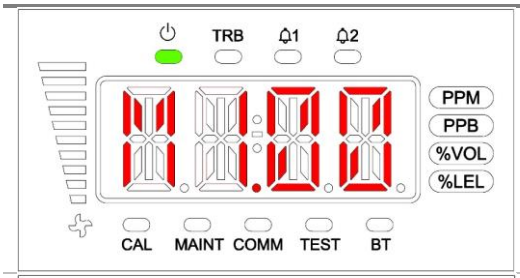
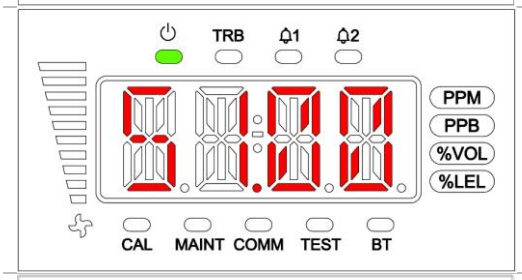
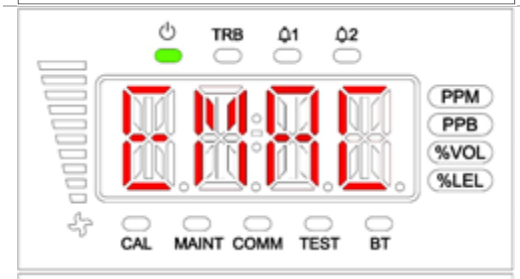
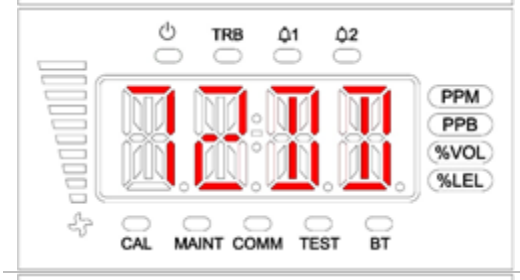
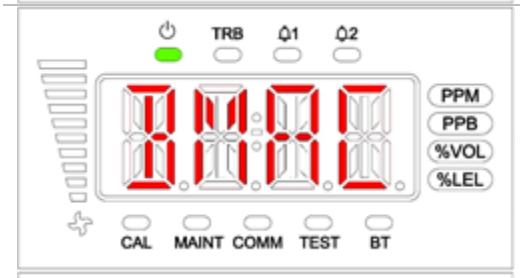
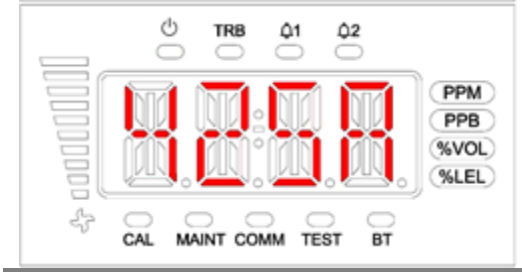
- ▶ Press the Select Key to enter the change
- ▶ Select 0~20% by using Up/Down Key
- ▶ Press the Select Key to save the change



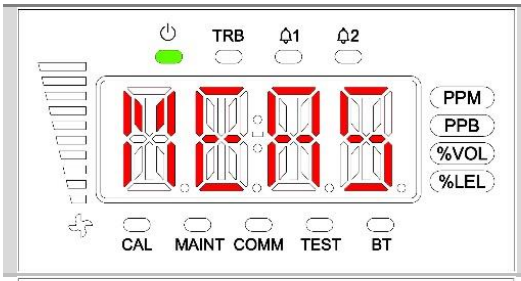
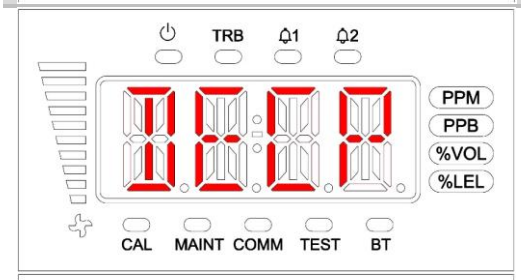
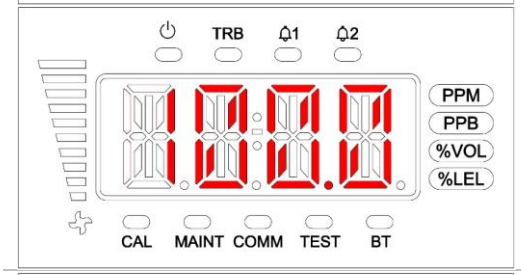
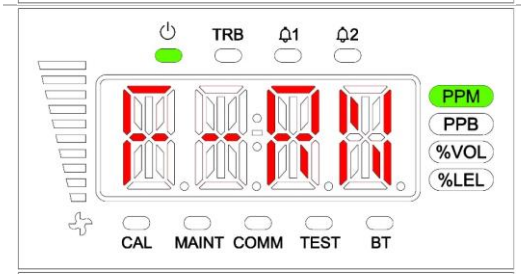
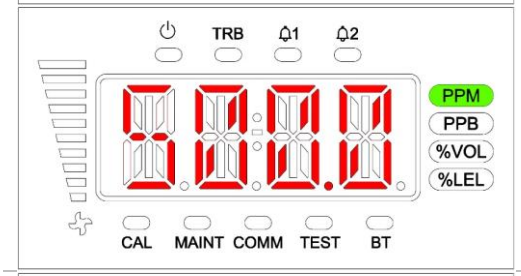
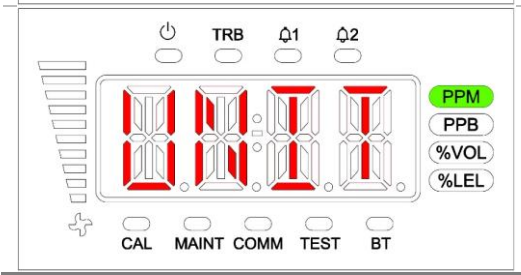



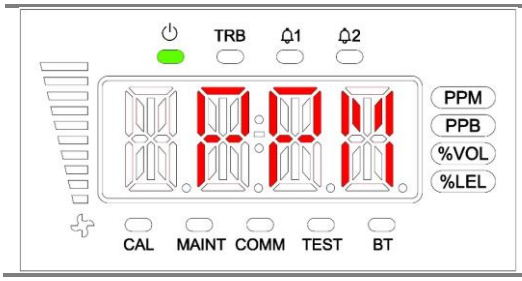

**Brightness setting**

- ▶ Press the Select Key to enter the change
- ▶ Select 1~15 by using Up/Down Key
- ▶ Press the Select Key to save the change

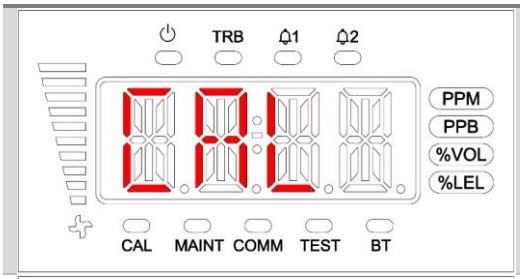
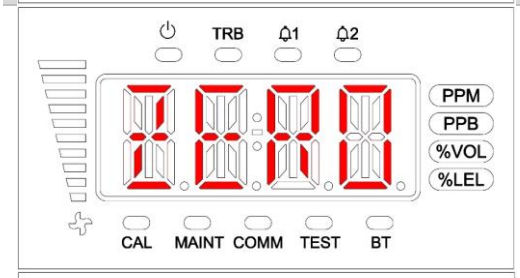
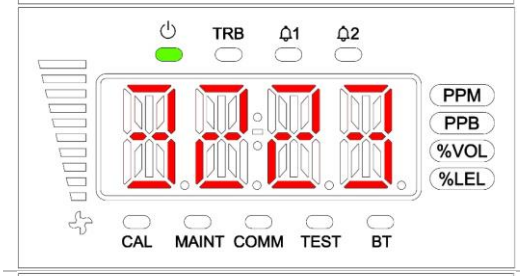
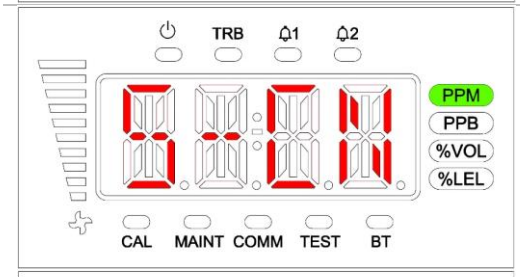
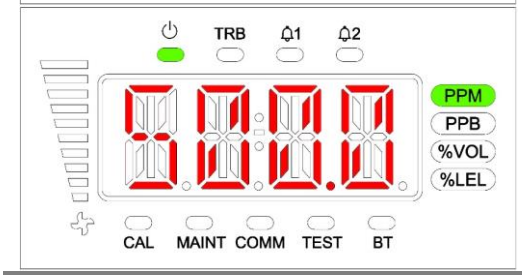
| | |
|---|---|
|  | **Firmware Version** |
|  | **Sensor cartridge version** |
|  <br>  | **MAC ADDRESS** |
|  <br>  | **BLE MAC ADDRESS** |

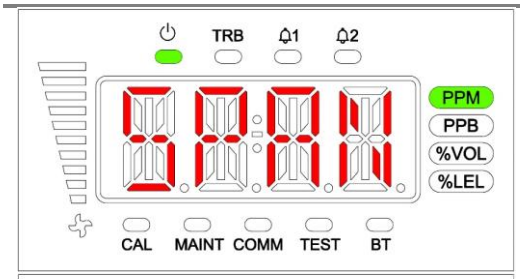
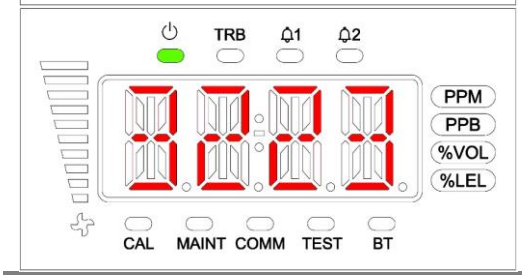
## 5.4. Setting/Measurement Menu

| | |
|---|---|
|  | Measurement settings are configurable by using Up/Down Keys.<br><br>- DECP/F-RN/UNIT |
|  <br>  | **Decimal Point setting**<br>▶ Press the Select Key to enter the change<br>▶ Select 1.000~1000 by using Up/Down Key<br>▶ Press the Select Key to save the change |
|  <br>  | **Full Range setting**<br>▶ Press the Select Key to enter the change<br>▶ Select 1~9999 by using Up/Down Key<br>▶ Press the Select Key to save the change |
|  | **Gas Unit setting**<br>▶ Press the Select Key to enter the change<br>▶ Select PPB/PPB/VOL/LEL by using Up/Down Key<br>▶ Press the Select Key to save the change |

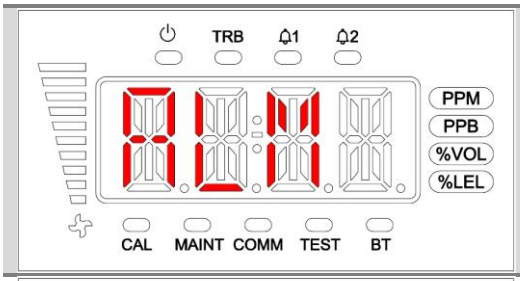
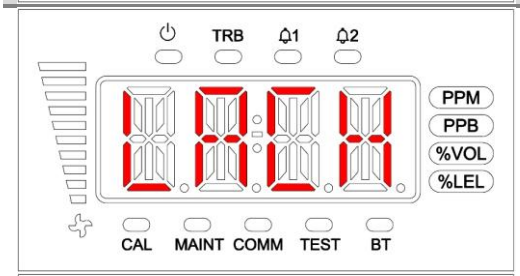
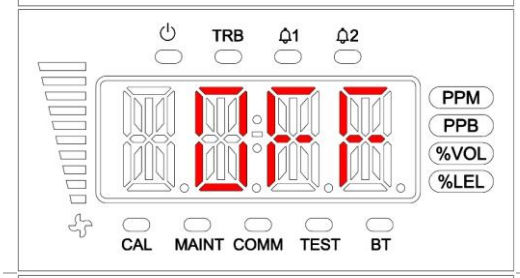
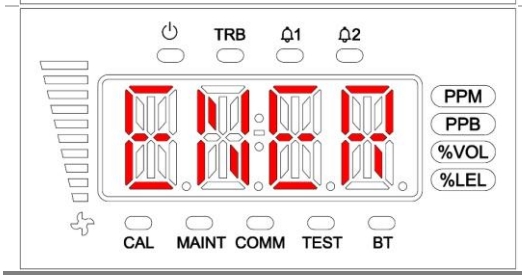
| | |
|---|---|
|  | |

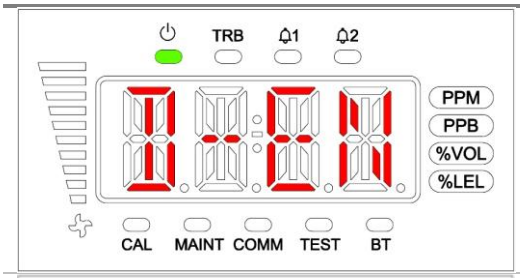
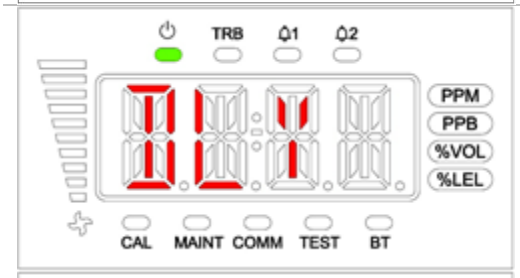
## 5.5. Setting/Calibration Menu

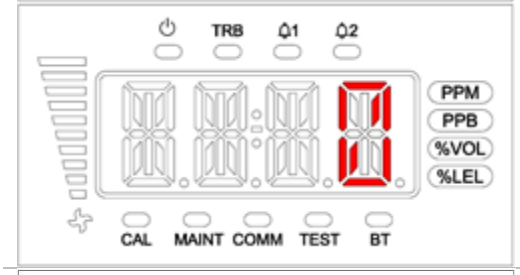
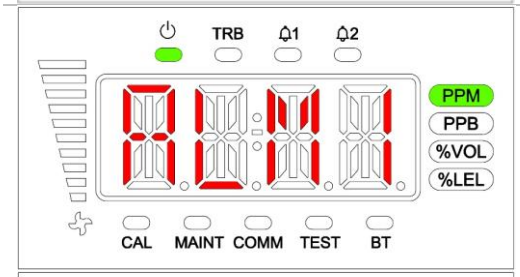
| | |
|---|---|
|  | Calibration settings are configurable by using Up/Down Keys.<br>- ZERO/S-CN/SPAN |
|  <br>  | **Zero Calibration setting**<br>▶ Press the Select Key to enter the change<br>▶ The sensor`s input value blinks on the screen<br>▶ Press the Select Key to proceed the calibration |
|  <br>  | **Span Concentration setting**<br>▶ Press the Select Key to enter the change<br>▶ Select 1~9999 by using Up/Down Key<br>▶ Press the Select Key to save the change |

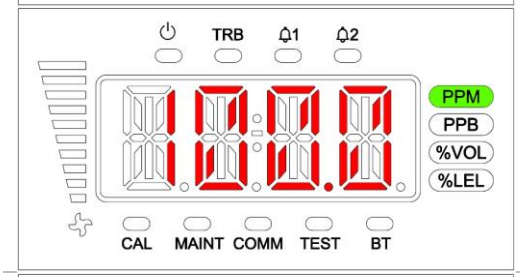
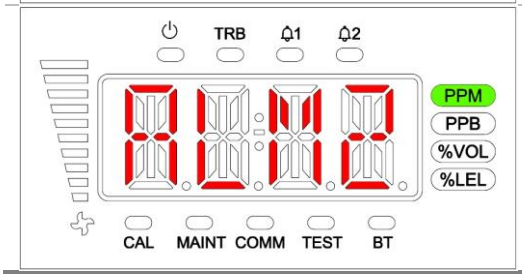
| | |
|---|---|
|  <br>  | **Span Calibration setting**<br>▶ Press the Select Key to enter the change<br>▶ The sensor`s input value blinks on the screen<br>▶ Press the Select Key to proceed Span calibration |

## 5.6. Setting/Alarm Menu

| | |
|---|---|
|  | Alarm settings are configurable by using Up/Down Keys.<br>- LACH/ENER/DLY/ALM1/ALM2 |
|  <br>  | **Alarm Latch setting**<br>▶ Press the Select Key to enter the change<br>▶ Select ON/OFF by using Up/Down Key<br>▶ Press the Select Key to save the change |
|  | **Alarm Energized setting**<br>▶ Press the Select Key to enter the change<br>▶ Select D-EN/EN by using Up/Down Key<br>▶ Press the Select Key to save the change |

<table>
<tr>
<td> 
</td>
<td></td>
<td></td>
</tr>
<tr>
<td> 


</td>
<td></td>
<td>Alarm Delay setting<br>▶ Press the Select Key to enter the change<br>▶ Select 1~99 by using Up/Down Key<br>▶ Press the Select Key to save the change</td>
</tr>
<tr>
<td> 


</td>
<td></td>
<td>Alarm 1 Level setting<br>▶ Press the Select Key to enter the change<br>▶ Select 1~9999 by using Up/Down Key<br>▶ Press the Select Key to save the change</td>
</tr>
<tr>
<td> 
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<td></td>
<td>Alarm 2 Level setting<br>▶ Press the Select Key to enter the change<br>▶ Select 1~9999 by using Up/Down Key<br>▶ Press the Select Key to save the change</td>
</tr>
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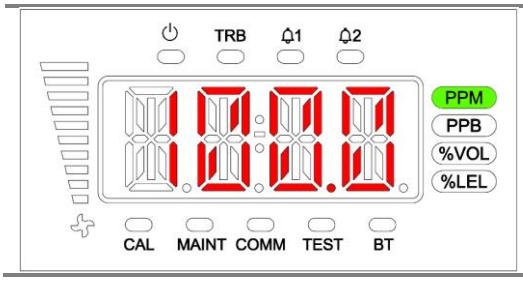
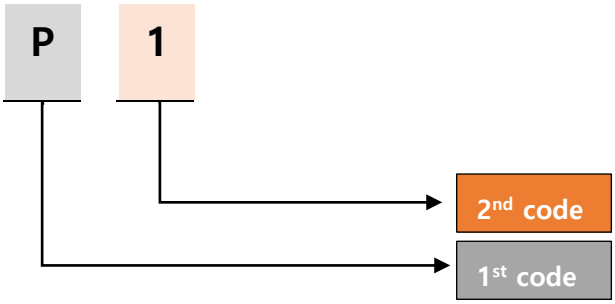



# 6. Problem Solving

## 6.1. Error code

**Ex) Error Display Code**




| No | 1st Code | 2nd Code | Cause | Solution |
|---|---|---|---|---|
| 1 | B | 0 | When Firmware Version is abnormal | Update the Firmware |
| 2 | B | 1 | The abnormal data of Firmware Tag | Update the Firmware |
| 3 | B | 2 | The abnormal data of Firmware CRC | Update the Firmware |
| 4 | B | 3 | EEPROM Read/Write Failure | Change the MAIN Board |
| 5 | B | 4 | RTC Access Failure | Change the MAIN Board |
| 6 | B | 5 | MODBUS initializations failure | Change the MAIN Board |
| 7 | S | 0 | Smart Sensor Communication Failure | Check or replace Smart Sensor connector |
| 8 | S | 1 | Receive abnormal data from Smart Sensor | Check or replace Smart Sensor connector |
| 9 | S | 2 | Smart Sensor Life Expired | Change the Smart Sensor |
| 10 | S | 3 | Smart Sensor concentration is abnormally (reading low) | Check or replace Smart Sensor assembly status |
| 11 | S | 4 | Smart Sensor concentration is abnormally (reading high) | Check or replace Smart Sensor assembly status |
| 12 | S | 5 | Sensor internal Error | Check or replace the Sensor inside Smart Sensor |
| 13 | P | 0 | Pump is not connected or malfunctioning | Check Pump connection state |

| | | | | |
|---|---|---|---|---|
| 14 | P | 1 | Low pressure of Pump | Check Pump connection and piping tube |
| 15 | P | 2 | High pressure of Pump | Check Pump connection and tube |
| 16 | D | 0 | 4-20mA DAC not connected | Replace the MAIN Board or check the DAC connection status |
| 17 | D | 1 | 4-20mA DAC Error | Replace the MAIN Board or check the DAC connection status |
| 18 | R | 0 | Unstable operation of RS485 | Check connection of RS485 |
| 19 | E | 0 | Ethernet not connecting | Change the MAIN Board |
| 20 | E | 1 | Ethernet initialization failure | Change the MAIN Board |
| 21 | E | 2 | Ethernet timeout | Change the MAIN Board |
| 22 | M | 0 | Mipex Sensor communication failure | Check and replace Mipex sensor |
| 23 | M | 1 | Abnormal Data of Mipex Sensor | Change the Mipex sensor |
| 24 | M | 2 | Mipex Sensor Warming up status | Sensor`s stabilizing |
| 25 | M | 3 | Mipex Sensor Zero Shift | Sensor Zero adjustment required |
| 26 | Y | 0 | Pyrolyzer Current is low | Change the Pyrolyzer |
| 27 | Y | 1 | Pyrolyzer Current is High | Change the Pyrolyzer |
| 28 | Y | 2 | Pyrolyzer control failure | Change the Pyrolyzer |

# 7. Interface Configuration

## 7.1 RS485 Interface setting

**Baud rate: 9600 bps**

**Data Format: RTU**

**Data bits: 8bits**

**Stop bit: 1bits**

**Parity: None**

**For more information, please visit: www.modbus.org**

## 7.2 TCP Interface setting

**IP : 192.168.0.200(Default)**

**Subnet Mask : 255.255.0.0(Default)**

**Gateway : 192.168.0.1(Default)**

**For more information, please visit: www.modbus.org**

## 7.3 MODBUS RS485/TCP Register

- **3000X Register Read**

| Sortation | Address | Bits | Description |
|---|---|---|---|
| Concentration of measured gas | 30001 | BIT15~0 | Measured gas value (Integer/Decimal Point application required) |
| Gas Range | 30002 | BIT15~0 | Measured gas value (Integer/Decimal Point application required) |
| Alarm 1 set value | 30003 | BIT15~0 | Set value of Alarm 1 (Integer/Decimal Point application required) |
| Alarm 2 set value | 30004 | BIT15~0 | Set value of Alarm 2 (Integer/Decimal Point application required) |
| Alarm 1 Active | 10001 | BIT7~0 | Alarm 1 Active state |
| Alarm 2 Active | 10002 | BIT7~0 | Alarm 2 Active state |
| Fault Active | 10003 | BIT7~0 | Fault Active state |
| Maintenance Mode | 10004 | BIT7~0 | Maintenance Mode state |
| Test Mode | 10005 | BIT7~0 | Test Mode state |
| Calibration Mode | 10006 | BIT7~0 | Calibration Mode state |
| Decimal Point | 10007 | BIT7~0 | Decimal Point (0~3) |
| Heartbeat | 10008 | BIT7~0 | Heartbeat Bit (2 second interval Toggle) |

- **4000X Register Read**

| Sortation | Address | Bits | Description |
|---|---|---|---|
| Monitoring Status | 40001 | BIT0~3 | 0: Warmup |
| | | | 1: Measure Mode |
| | | | 2: Inhibit Alarm |
| | | | 3: Inhibit Alarm/Fault |
| | | | 4: Inhibit Full |
| | | | 5: Reserved |
| | | | 6: Test Mode |
| | | | 7: 4-20mA Calibration Mode |
| | | | 8: Flow Calibration Mode |
| | | | 9-15: Reserved |
| | | BIT4 | Fault Active Status |

| | | | |
|---|---|---|---|
| | | BIT5 | Reserved |
| | | BIT6 | Alarm 1 Active |
| | | BIT7 | Alarm 2 Active |
| | | BIT8 | Alarm 1 Relay energized |
| | | BIT9 | Alarm 2 Relay energized |
| | | BIT10 | Fault Relay energized |
| | | BIT11 | Heartbeat Bit (2 second interval Toggle) |
| | | BIT12 | Over Range |
| | | BIT13 | Span Calibration Due Date |
| | | BIT14 | Sensor lifetime expired |
| | | BIT15 | Reserved |
| Cartridge Selection | 40002 | BIT0~7 | Gas ID (Sensor Type) |
| | | BIT8~15 | Reserved |
| Measured gas concentration (Real number) | 40003 | BIT0~15 | Real number gas concentration measurement (Upper 2 bytes) |
| | 40004 | BIT0~15 | Real number gas concentration measurement (Lower 2 bytes) |
| Measured gas concentration (Integer) | 40005 | BIT0~15 | Integer type gas concentration measurement |
| Fault Code | 40006 | BIT0~15 | Fault Code |
| Decimal Point and Units | 40007 | BIT0~2 | Decimal Point Indicator (0~3) |
| | | BIT3~7 | Reserved |
| | | BIT8~15 | 1: ppb (concentration unit) |
| | | | 2: ppm (concentration unit) |
| | | | 4: % volume (concentration unit) |
| | | | 8: %LEL (concentration unit) |
| | | | 16: mA |
| Temperature measurement | 40008 | BIT0~15 | Measured value of the temperature (Signed 16bit Integer) |
| Time Stamp | 40009 | BIT0~15 | Current Time Stamp (Upper 2byte) |
| | 40010 | BIT0~15 | Current Time Stamp (Lower 2byte) |
| Flowrate | 40011 | BIT0~15 | Flowrate(cc/min) |
| Heartbeat | 40012 | BIT0~15 | Detector Heartbeat |
| Alarm 1 set value (Real number) | 40013 | BIT0~15 | Real number Alarm 1 set value (Upper 2 bytes) |
| | 40014 | BIT0~15 | Real number Alarm 1 set value (Lower 2 bytes) |
| Alarm 2 set value (Real number) | 40015 | BIT0~15 | Real number Alarm 2 set value (Upper 2 bytes) |

| | | | |
|---|---|---|---|
| | 40016 | BIT0~15 | Real number Alarm 2 set value<br>(Lower 2 bytes) |
| State value | 40017 | BIT0 | Alarm 1 Active |
| | | BIT1 | Alarm 2 Active |
| | | BIT2 | Fault Active |
| | | BIT3 | Maintenance Mode |
| | | BIT4 | Test Mode |
| | | BIT5 | Calibration Mode |
| | | BIT6 | Gas Type Detect (IPA, Galden) |
| | | BIT7 | Cartridge Error |
| | | BIT8 | Flow Error |
| | | BIT9 | Internal Communication Error |
| | | BIT10 | Pyrolyzer Error |
| | | BIT11~15 | Reserved |
| Reserved | 40018 | BIT0~15 | Reserved |
| Gas Range<br>(Real number) | 40019 | BIT0~15 | Real number Gas Range (Upper 2byte) |
| | 40020 | BIT0~15 | Real number Gas Range (Lower 2byte) |
| Detector<br>Serial Number | 40031 | BIT0~7 | Detector Serial Number 1/10 |
| | | BIT8~15 | Detector Serial Number 2/10 |
| | 40032 | BIT0~7 | Detector Serial Number 3/10 |
| | | BIT8~15 | Detector Serial Number 4/10 |
| | 40033 | BIT0~7 | Detector Serial Number 5/10 |
| | | BIT8~15 | Detector Serial Number 6/10 |
| | 40034 | BIT0~7 | Detector Serial Number 7/10 |
| | | BIT8~15 | Detector Serial Number 8/10 |
| | 40035 | BIT0~7 | Detector Serial Number 9/10 |
| | | BIT8~15 | Detector Serial Number 10/10 |
| Sensor<br>Serial Number | 40036 | BIT0~7 | Sensor Serial Number 1/10 |
| | | BIT8~15 | Sensor Serial Number 2/10 |
| | 40037 | BIT0~7 | Sensor Serial Number 3/10 |
| | | BIT8~15 | Sensor Serial Number 4/10 |
| | 40038 | BIT0~7 | Sensor Serial Number 5/10 |
| | | BIT8~15 | Sensor Serial Number 6/10 |
| | 40039 | BIT0~7 | Sensor Serial Number 7/10 |
| | | BIT8~15 | Sensor Serial Number 8/10 |
| | 40040 | BIT0~7 | Sensor Serial Number 9/10 |
| | | BIT8~15 | Sensor Serial Number 10/10 |

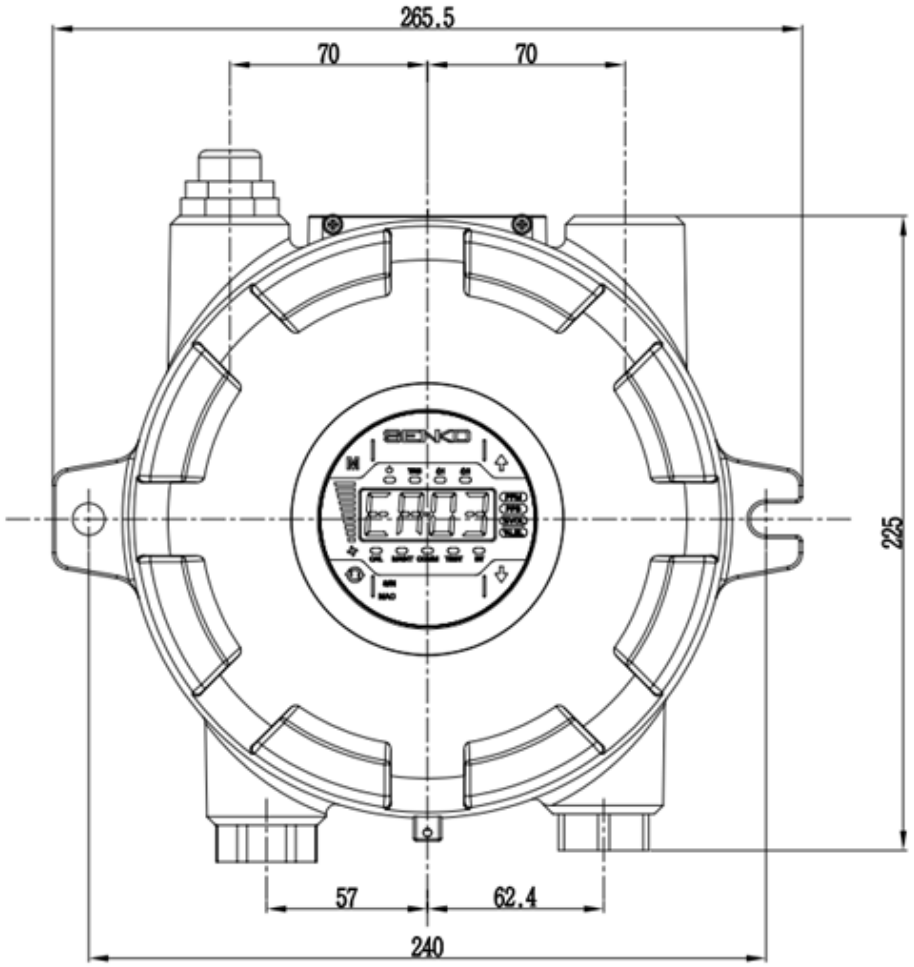
- **4000X Register Write**

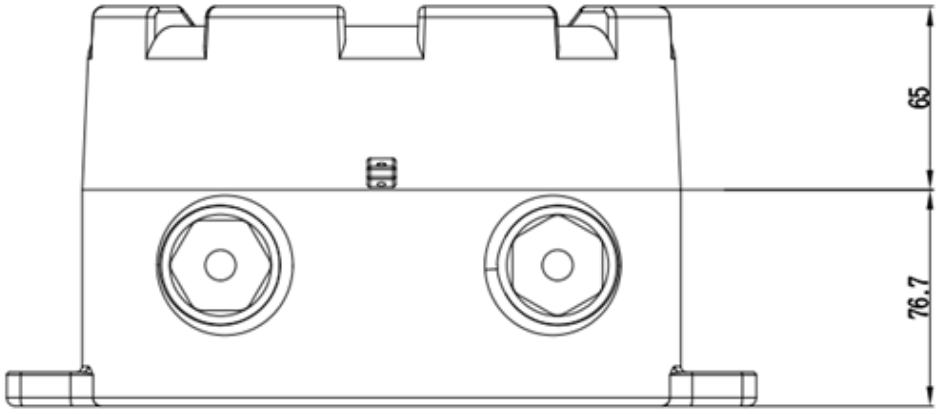
| Sortation | Address | Bits | Description |
|---|---|---|---|
| Alarm 1 set value (Real number) | 40013 | BIT0~15 | Real number Alarm 1 set value (Upper 2 bytes) |
| | 40014 | BIT0~15 | Real number Alarm 1 set value (Lower 2 bytes) |
| Alarm 2 set value (Real number) | 40015 | BIT0~15 | Real number Alarm 2 set value (Upper 2 bytes) |
| | 40016 | BIT0~15 | Real number Alarm 2 set value (Lower 2 bytes) |
| Alarm 1 Setting | 40041 | BIT15~0 | *Alarm 1 set value (No Integer/Decimal Point) |
| Alarm 2 Setting | 40042 | BIT15~0 | *Alarm 2 set value (No Integer/Decimal Point) |
| Reset Alarm & Fault | 40043 | BIT0 | Reset Alarms and Faults |
| | | BIT1~15 | Reserved |

* To set Alarm at 0.25ppm when Decimal Point is 2, set 0.25 X $10^2$ = 25

* To set Alarm at 30.0ppm when decimal point is 1, set 30.0 X $10^1$ = 300

# 8. Appearance and Dimensions



# 9. Installation Precautions

## 9.1 Selection of installation location

The places where Gas Detectors should be installed in accordance with the Occupational Safety and Health Act are as follows.

- Around chemical facilities and auxiliary facilities that are feared to leak gas, such as compressors, valves, reactors, and pipe connections that handle combustible and toxic substances installed inside and outside the building.
- Places where gas is easy to stay around manufacturing facilities with sources of fire, such as heating furnaces.
- The periphery of the connection part of the facility for filling combustible and toxic substances.
- The substation room, switchboard room, control room located in an explosion-proof area.
- Other places where gas is particularly easy to stay.

## 9.2 Selection of installation position

Gas Detectors should be installed as close to the leak area where gas leakage is feared as possible. However, direct gas leakage is not expected, but places where leaked gas is likely to stay should be installed at the following points.

- Gas detectors installed outside the building shall be installed at points where gas is easy to stay, considering wind direction, wind speed, and the proportion of gas.
- Gas Detectors installed in a building shall be installed in the lower part of the building if the gas to be detected is heavier than air, and in the case of lighter than air, shall be installed near the ventilation of the building or the upper part of the building.
- Gas Detectors shall be installed where workers reside.

## 9.3 A/S Contact Information

- Address: 73, Oesammi-ro 15beon-gil, Osan-si, Gyeonggi-do, Rep of Korea, 18111
- Tel: 031-492-0445
- Web: https://www.senko.co.kr/

# 10. Revised History

| No | Clause | Content | Revision | Revised Date |
|---|---|---|---|---|
| 1 | First written | | Rev 1.0 | 2022.02. |

SENKO

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