SENKO CO.,LTD

SI-301

Explosion-proof pump type gas detector

(SI-301) 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

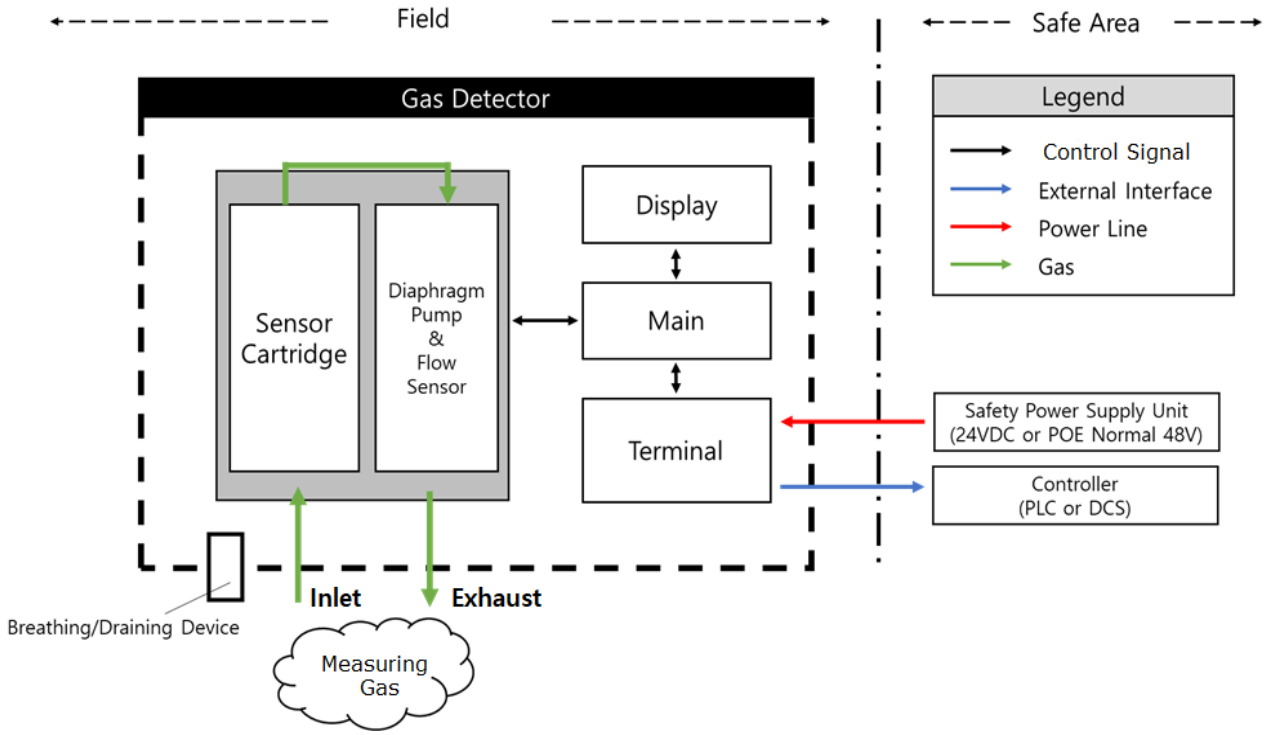
- Explosion-Proof structure.
- Cartridge type sensor – Easy maintenance
- Built-in flow control function.
- 4-Digit Digital Concentration Indication and Digital Flow Indication
- 4-20mA / RS-485 / Ethernet

Model	SI-301
Size	194mm(W) X 152.4mm(D) X 136mm(H)
Weight	4Kg
Operating voltage	DC : 24V ± 10% PoE : 36V~57V (Typical : 48V)
Flow rate	100 ~ 1,000 ml (Normal 301 ~ 500ml / min)
Power consumption	Approximately 5.0W
Measurement display	FND, gas concentration, flow rate, alarm, device faulty
Relay	Low Alarm, High Alarm, Fault Alarm
Analog Output signal	4-20mA
Digital communication	RS-485, TCP Ethernet
Sampling distance	Length of input gas tube: up to 30m (FEP tube) Length of exhaust gas tube: up to 30m (FEP tube)
Input/Output tube	1/4" Teflon tube
Operating temperature	-40°C ~ 55°C
Certification	KCs: Ex db IIC T6 Gb
IP	IP 65 (KS C IEC60529:2013)
Control/Set	4 Button & RS485 & Ethernet & Bluetooth
Warranty period of the device	2 years
Warranty period of sensor cartridge	1year
Remote interface	Ethernet , RS-485
Wiring	4 to 20mA / DC power / Relay : up to 14 AWG
Pressure range	90 to 110KPa
Maximum sample flow	Max. 1,000 ml
Maximum sample pressure	3KPa

1.2. Sensor List

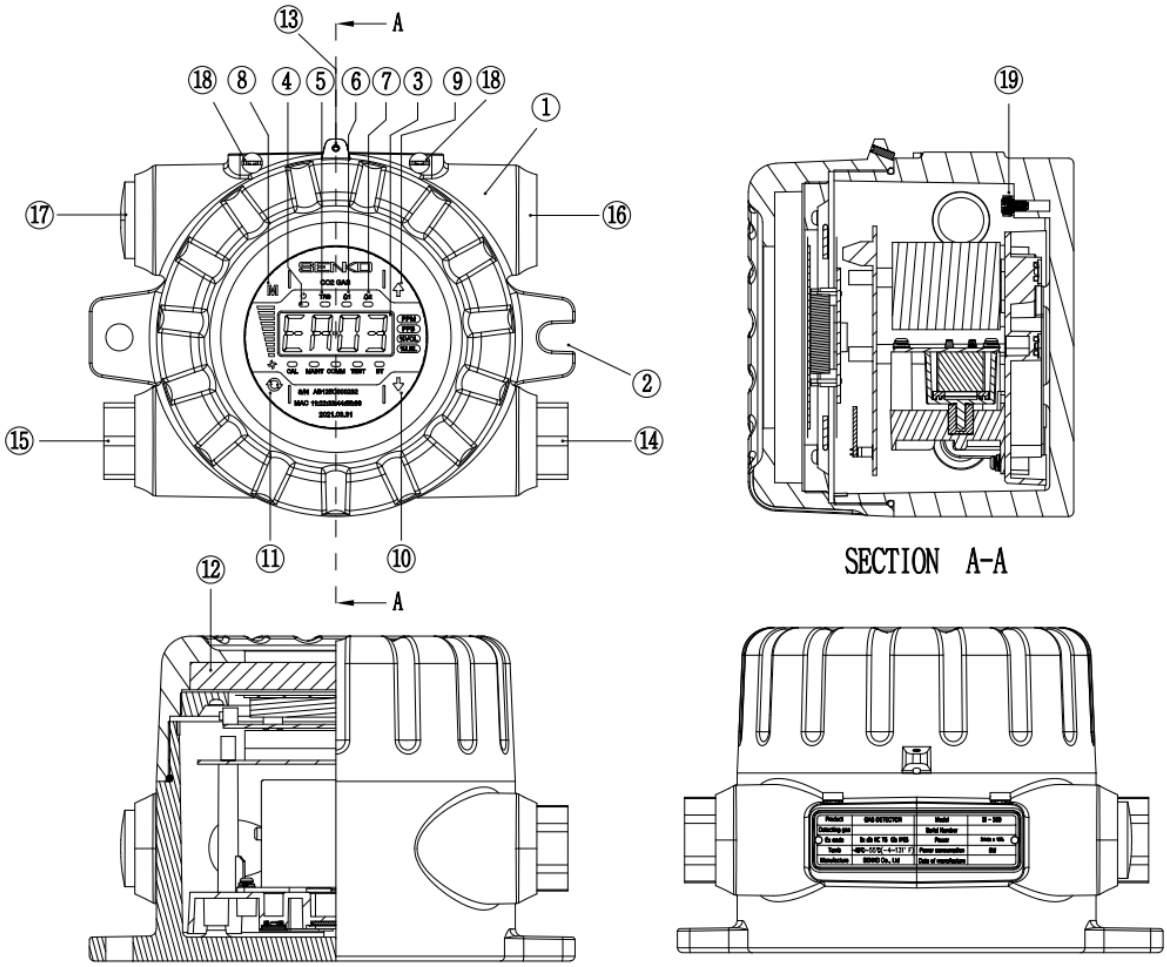
Gas		Sensor	Range	A1	A2	Resolution
Oxygen	O_2	Electrochemical	0~30%Vol	19.0%vol	23.0%vol	0.1%vol
Carbon Monoxide	CO	Electrochemical	0~500ppm	30ppm	60ppm	1ppm
Sulfur Dioxide	SO_2	Electrochemical	0~20ppm	2ppm	5ppm	0.1ppm
Hydrogen	H_2	Catalytic	0~100%LEL	15%LEL	50%LEL	1%LEL
Hydrogen	H_2	Electrochemical	0~1000ppm	100ppm	500ppm	within 5ppm
Hydrogen Sulfide	H_2S	Electrochemical	0~100ppm	10ppm	15ppm	1ppm
Combustible	-	Catalytic	0~100%LEL	15%LEL	50%LEL	1%LEL
Combustible	-	IR	0~100%LEL	15%LEL	50%LEL	1%LEL
Ammonia	NH_3	Electrochemical	0~100ppm	25ppm	35ppm	1ppm
Acetylene	C_2H_2	Catalytic	0~100%LEL	15%LEL	50%LEL	1%LEL
Ethanol	C_2H_6O	Catalytic	0~100%LEL	15%LEL	50%LEL	1%LEL
Toluene	C_7H_8	IR	0~100%LEL	15%LEL	50%LEL	1%LEL
Toluene	C_7H_8	Catalytic	0~100%LEL	15%LEL	50%LEL	1%LEL
Methane	CH_4	IR	0~100%LEL	15%LEL	50%LEL	1%LEL
Methane	CH_4	Catalytic	0~100%LEL	15%LEL	50%LEL	1%LEL
Chlorine	Cl_2	Electrochemical	0~5ppm	0.5ppm	1.0ppm	0.1ppm
Chlorine	Cl_2	Electrochemical	0~20ppm	0.5ppm	1.0ppm	0.1ppm
Carbon Dioxide	CO_2	IR	0~2000ppm	1000ppm	1500ppm	3ppm
Carbon Dioxide	CO_2	IR	0~5000ppm	3010ppm	5000ppm	8ppm
Carbon Dioxide	CO_2	IR	0~5%Vol	0.5%vol	3%vol	0.1%vol
Hydrogen Chloride	HCl	Electrochemical	0~10ppm	1ppm	2ppm	0.1ppm
VOC	VOC	PID	0~1000ppm	50ppm	100ppm	within 3ppm
Xylene	C_8H_{10}	IR	0~100%LEL	15%LEL	50%LEL	1%LEL
Hydrogen peroxide	H_2O_2	Electrochemical	0~10ppm	1ppm	2ppm	0.1ppm
Nitrogen Dioxide	NO_2	Electrochemical	0~20ppm	3ppm	5ppm	0.1ppm
Ethylene oxide	C_2H_4O	Electrochemical	0~30ppm	1ppm	2ppm	0.1ppm
Ethylene	C_2H_4	Catalytic	0~100%LEL	15%LEL	50%LEL	1%LEL
Nitrogen Monoxide	NO	Electrochemical	0~100ppm	25ppm	50ppm	1ppm
Hydrogen fluoride	HF	Electrochemical	0~5ppm	0.5ppm	1ppm	0.1ppm

1.3. Outline



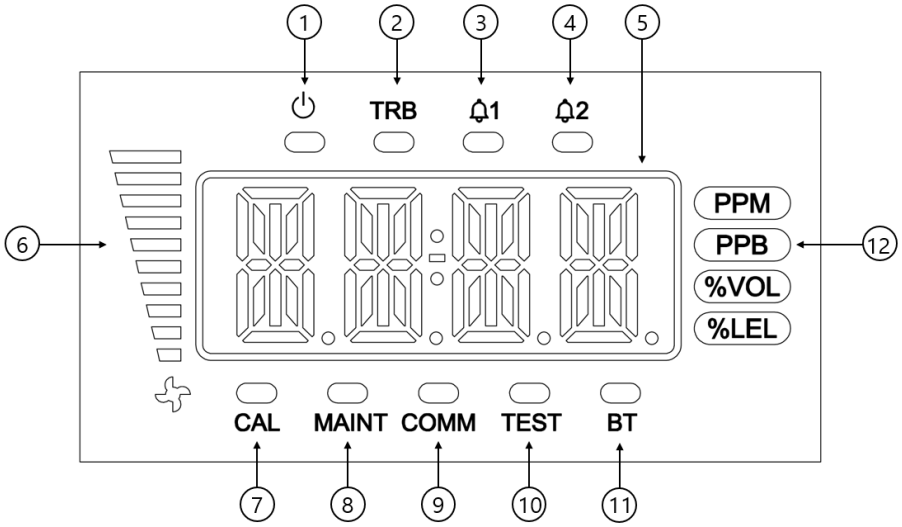
2. Appearance and Description

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) Authentication number: 17-GA2BO-0697U
18	External earth	External earth to protect against external noise or ferroelectricity. 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. 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.

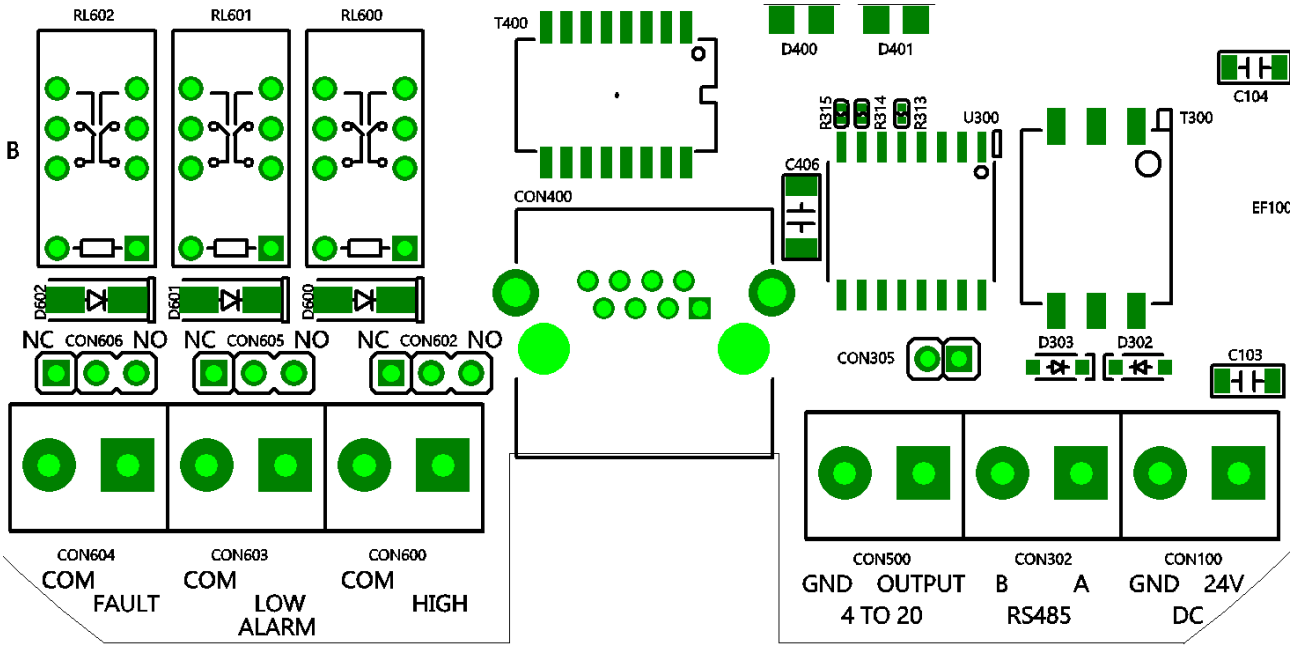
[Table 2. Description of Front LED Display Configuration]

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

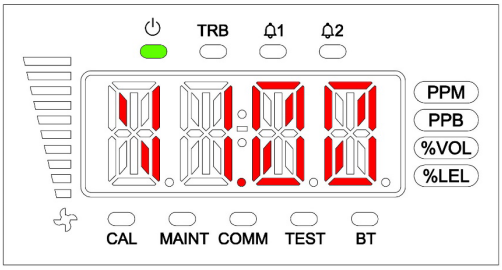
- Internal grounding: You can ground the internal grounding through point 1 using the ring terminal.

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

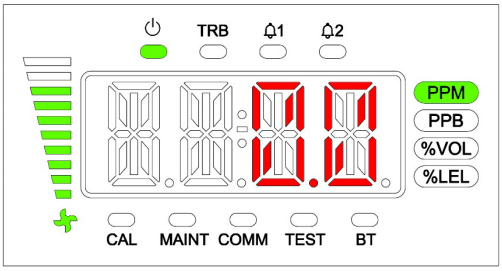
4. Usage

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

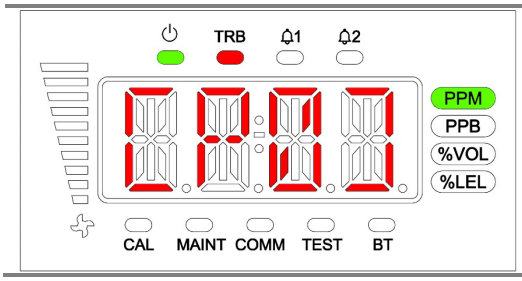
▶ CAL: Calibration in progress

▶ MAINT: Maintenance in progress

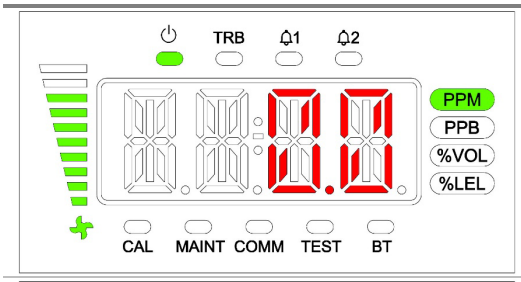
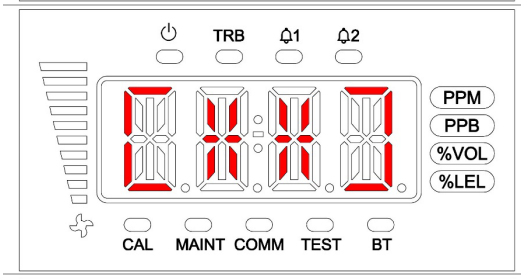
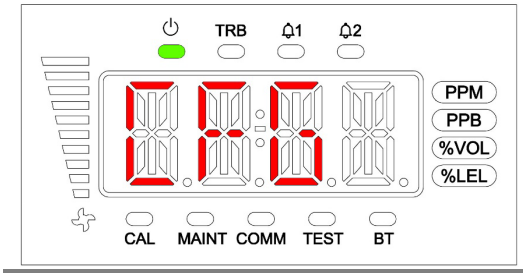
▶ COMM: Communication status

▶ 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. 2. The initial value is [00] and can be changed from [00] to [99] with the Up/Down Keys. 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. 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.

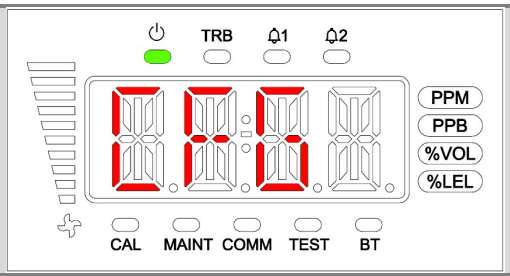
1 Depth	2 Depth	3 Depth	Default
CFG (Configuration)	GAS	Gas sensor type	-
	MODT	Modbus Type(RTU/TCP)	TCP
	ADR(Address)	Modbus Address(0~64)	1
	PWD(Password)	Password setting (00~99)	00
	C-TM(Calibration Time)	Calibration cycle (1~12months)	12
	HIDN(Hidden Area)	Hidden area (Full Range standard 0~20%)	03%
	BRIT	FND Brightness	5
	M1.00	Firmware version	-
	S1.00	Sensor cartridge version	-

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)	100
	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

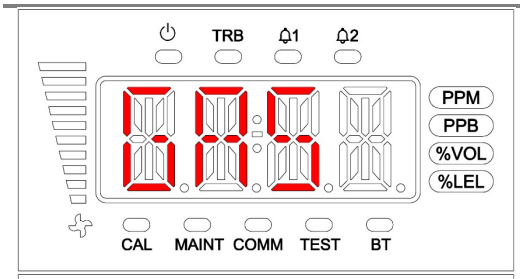
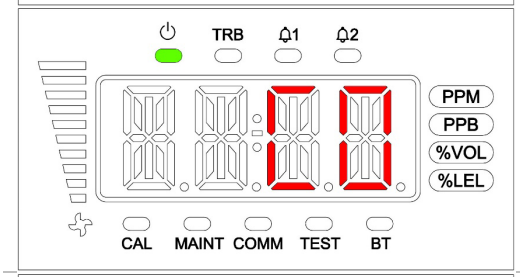
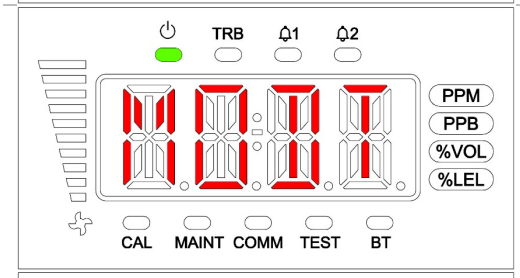
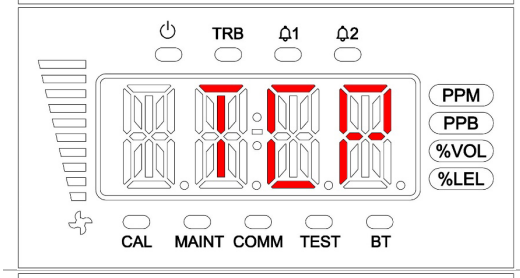
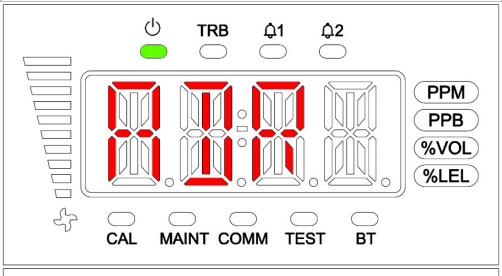
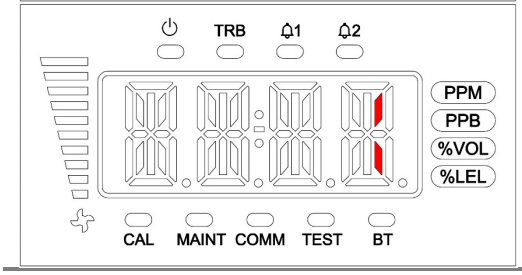
1 Depth	2 Depth	3 Depth	Default
ALM (Alarm)	LACH(Latch)	Alarm Latch(ON, OFF)	OFF
	ENER(Energized)	Alarm Energized(EN, D-EN)	EN
	DLY(Delay)	Alarm Delay(0~99sec)	0
	ALM1(Alarm level 1)	Alarm 1 level (1~Full Range)	Based on gas
	ALM2(Alarm level 2)	Alarm 2 level (1~Full Range)	Based on gas

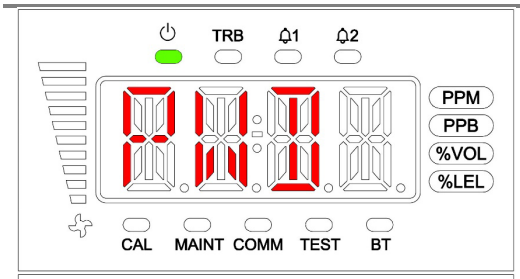
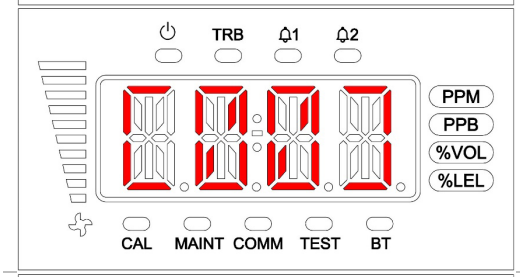
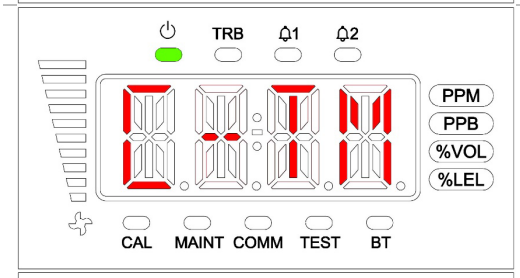
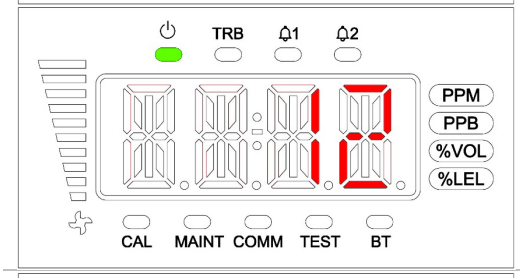
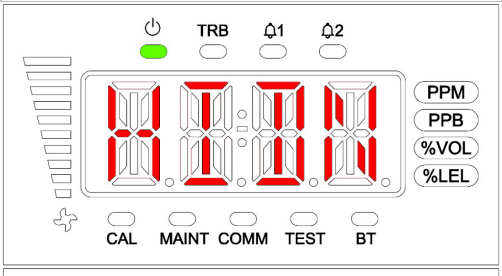
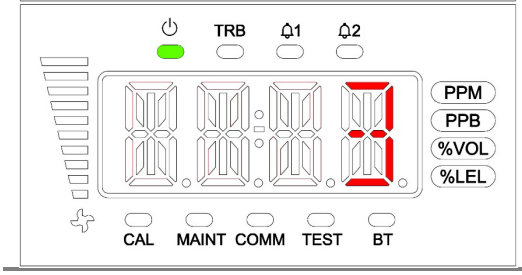
5.3. Setting/Configuration Menu

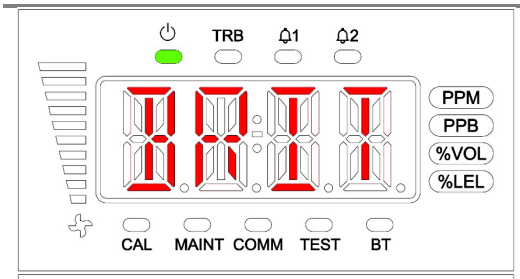
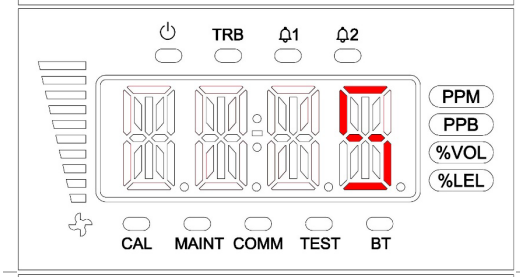
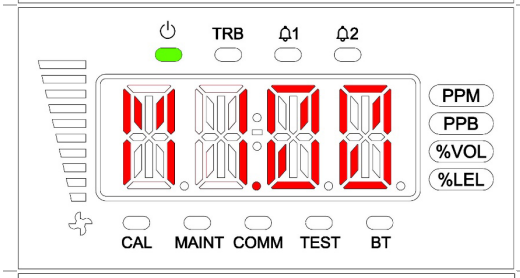
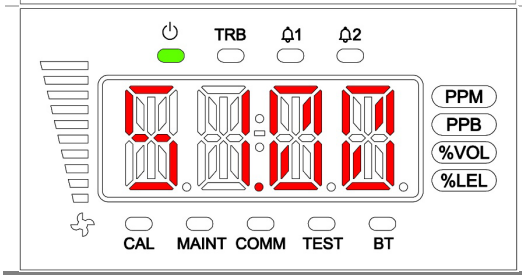


Internal preferences are configurable by using Up/Down Keys.

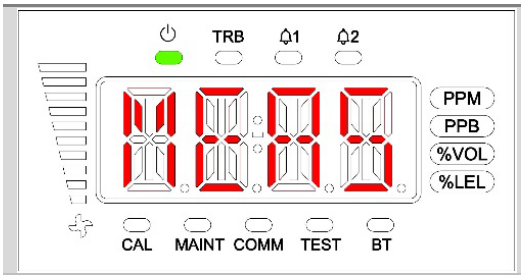
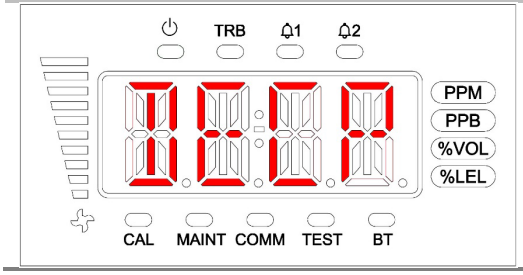
- GAS/MODT/ADR/PWD/C-TM/HIDN BRIT/M1.00/S1.00

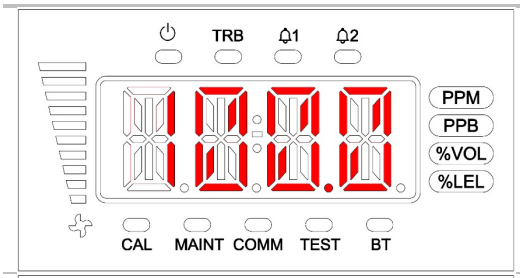
 	**Gas type** ▶ Press the Select Key to display the current gas type
 	**Changing to Modbus Type** ▶ Press the Select Key to enter the change ▶ Select RTU/TCP by using Up/Down Key ▶ Press the Select Key to save the change. The mode applies after restarting the device
 	**Changing Modbus Address** ▶ Press the Select Key to enter the change ▶ Select 1~64 by using Up/Down Key ▶ Press the Select Key to save the change

 	**Password settings** ▶ Press the Select Key to enter the change ▶ Select 00~99 by using Up/Down Key ▶ 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**

5.4. Setting/Measurement Menu

	Measurement settings are configurable by using Up/Down Keys. - DECP/F-RN/UNIT
	**Decimal Point setting** ▶ Press the Select Key to enter the change ▶ Select 1.000~1000 by using Up/Down Key ▶ Press the Select Key to save the change

<table>
<tr>
<td> 
</td>
<td></td>
<td></td>
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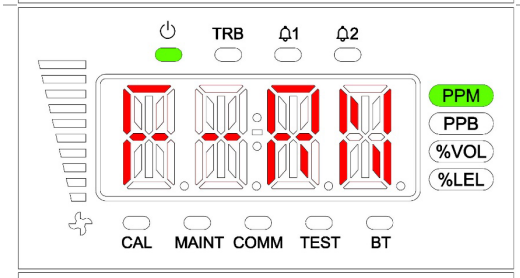
<td> 
</td>
<td></td>
<td rowspan="2">Full Range setting
▶ Press the Select Key to enter the change
▶ Select 1~9999 by using Up/Down Key
▶ Press the Select Key to save the change</td>
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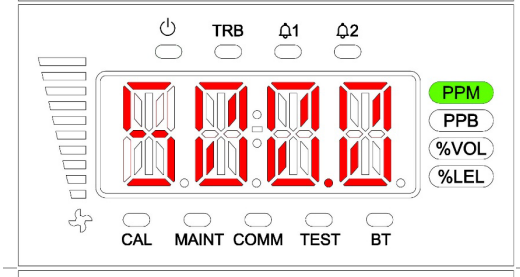
<tr>
<td> 
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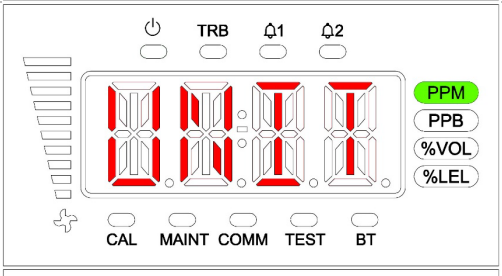
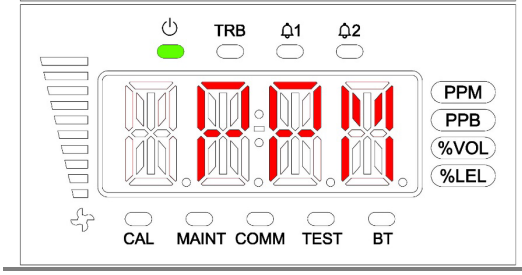
<td> 
</td>
<td></td>
<td rowspan="2">Gas Unit setting
▶ Press the Select Key to enter the change
▶ Select PPB/PPB/VOL/LEL by using Up/Down Key
▶ Press the Select Key to save the change</td>
</tr>
<tr>
<td> 
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<td></td>
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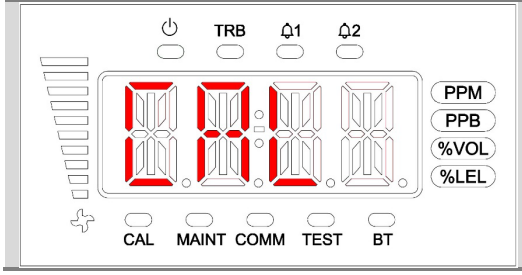
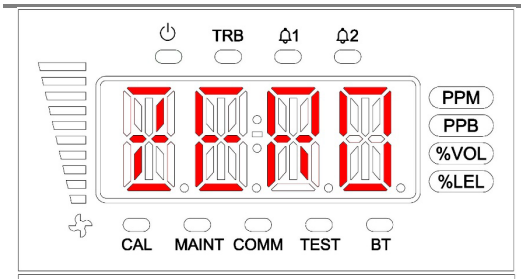
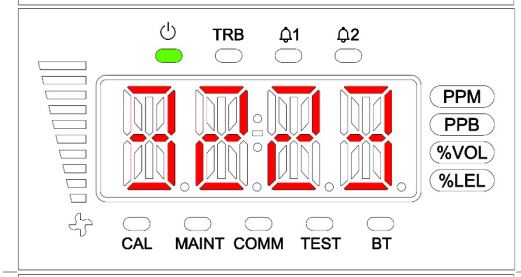
5.5. Setting/Calibration Menu

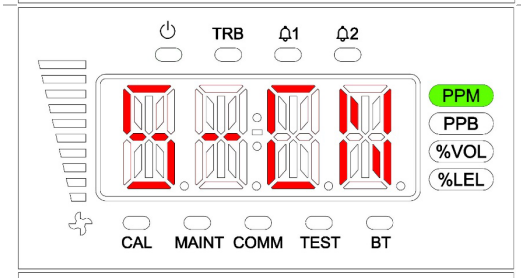
<table>
<tr>
<td> 
</td>
<td></td>
<td>Calibration settings are configurable by using Up/Down Keys.
- ZERO/S-CN/SPAN</td>
</tr>
</table>

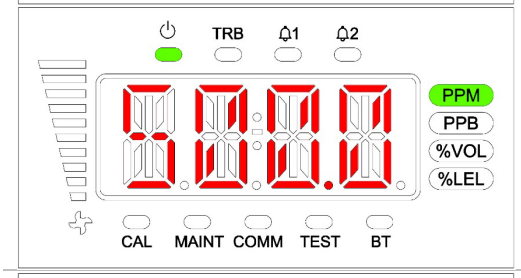




Zero Calibration setting

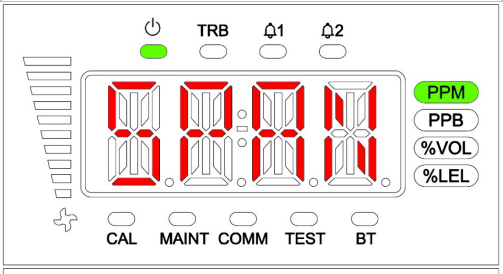
- ▶ Press the Select Key to enter the change
- ▶ The sensor`s input value blinks on the screen
- ▶ Press the Select Key to proceed the calibration

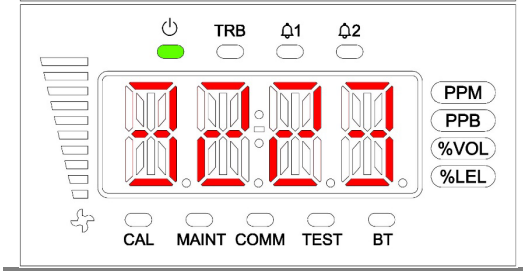




Span Concentration setting

- ▶ Press the Select Key to enter the change
- ▶ Select 1~9999 by using Up/Down Key
- ▶ Press the Select Key to save the change

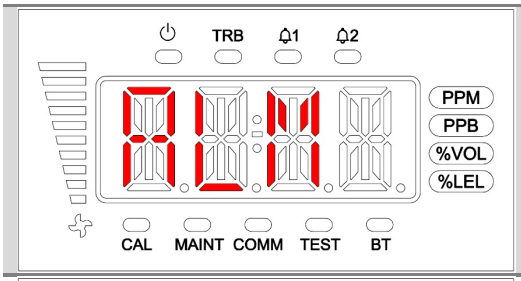
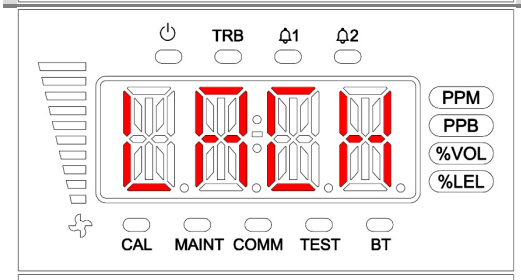


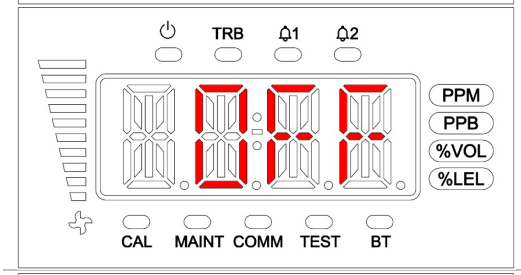
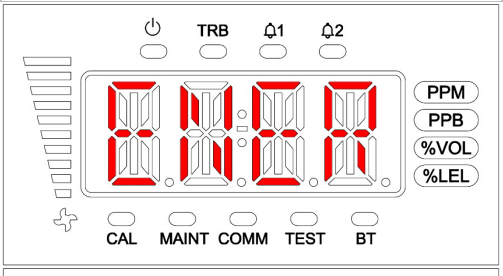


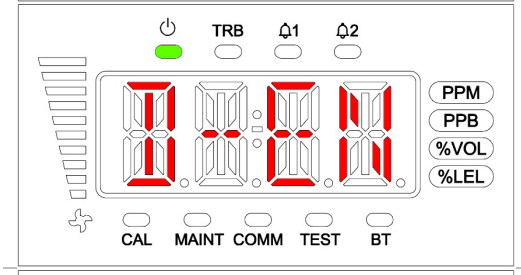
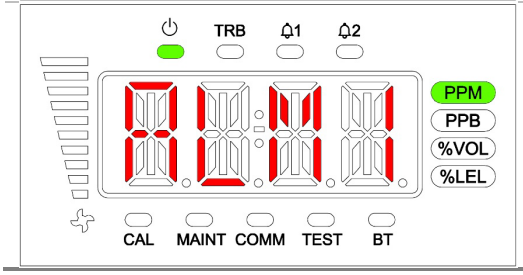
Span Calibration setting

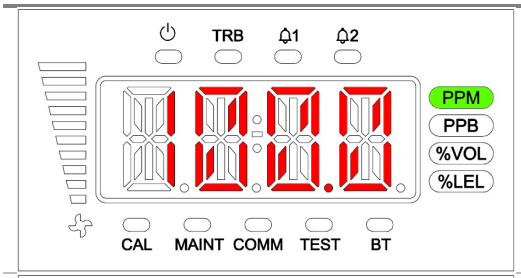
- ▶ Press the Select Key to enter the change
- ▶ The sensor`s input value blinks on the screen
- ▶ Press the Select Key to proceed Span calibration

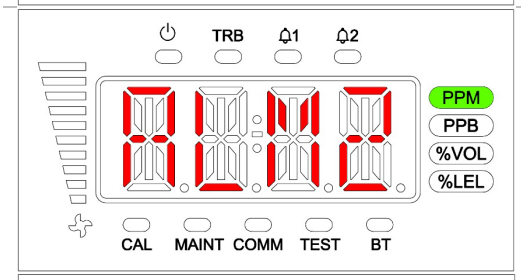
5.6. Setting/Alarm Menu

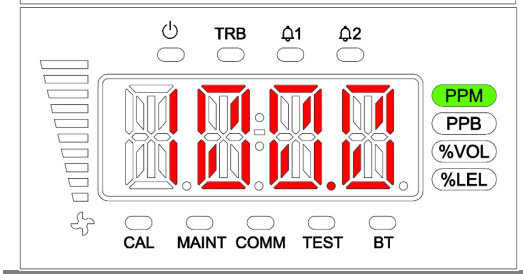
<table>
<tr><td> 
</td><td></td><td>Alarm settings are configurable by using Up/Down Keys.
- LACH/ENER/DLY/ALM1/ALM2</td></tr>
<tr><td> 

 
</td><td></td><td>Alarm Latch setting
▶ Press the Select Key to enter the change
▶ Select ON/OFF by using Up/Down Key
▶ Press the Select Key to save the change</td></tr>
<tr><td> 

 
</td><td></td><td>Alarm Energized setting
▶ Press the Select Key to enter the change
▶ Select D-EN/EN by using Up/Down Key
▶ Press the Select Key to save the change</td></tr>
<tr><td> 
</td><td></td><td>Alarm 1 Level setting
▶ Press the Select Key to enter the change
▶ Select 1~9999 by using Up/Down Key
▶ Press the Select Key to save the change</td></tr>
</table>







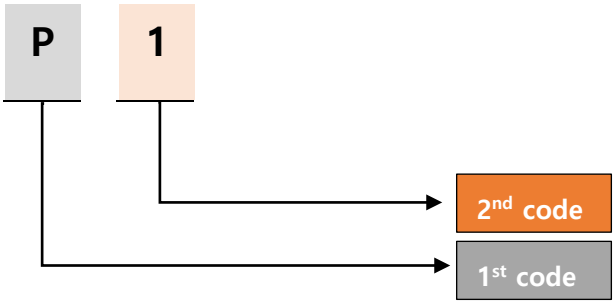
Alarm 2 Level setting

- ▶ Press the Select Key to enter the change
- ▶ Select 1~9999 by using Up/Down Key
- ▶ Press the Select Key to save the change

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	Y	0	Pyrolyzer Current is low	Check Pyrolyzer connection and operation status
7	Y	1	Pyrolyzer Current is low	Check Pyrolyzer connection and operation status
8	S	0	Smart Sensor Communication Failure	Check or replace Smart Sensor connector
9	S	1	Receive abnormal data from Smart Sensor	Check or replace Smart Sensor connector
10	S	2	Smart Sensor Life Expired	Change the Smart Sensor
11	S	3	Smart Sensor concentration is abnormally (reading low)	Check or replace Smart Sensor assembly status
12	S	4	Smart Sensor concentration is abnormally (reading high)	Check or replace Smart Sensor assembly status
13	S	5	Sensor internal Error (Applies to only PID Sensor)	Check or replace the Sensor inside Smart Sensor
14	S	6	Smart Sensor Zero CAL Failure	Check or replace Sensor
15	P	0	Pump is not connected or malfunctioning	Check Pump connection state
16	P	1	Low pressure of Pump	Check Pump connection and piping tube
17	P	2	High pressure of Pump	Check Pump connection and tube
18	R	0	Unstable operation of RS485	Check connection of RS485

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

- **3010X Register Read**

Sortation	Address	Bits	Description
Concentration of measured gas	30101	BIT15~0	Measured gas value (Integer/Decimal Point application required)
Gas Range	30102	BIT15~0	Measured gas value (Integer/Decimal Point application required)
Alarm 1 set value	30103	BIT15~0	Set value of Alarm 1 (Integer/Decimal Point application required)
Alarm 2 set value	30104	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: ppm (concentration unit)
			2: ppb (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 (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 (Real number)	40019	BIT0~15	Real number Gas Range (Upper 2byte)
	40020	BIT0~15	Real number Gas Range (Lower 2byte)
Detector 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 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

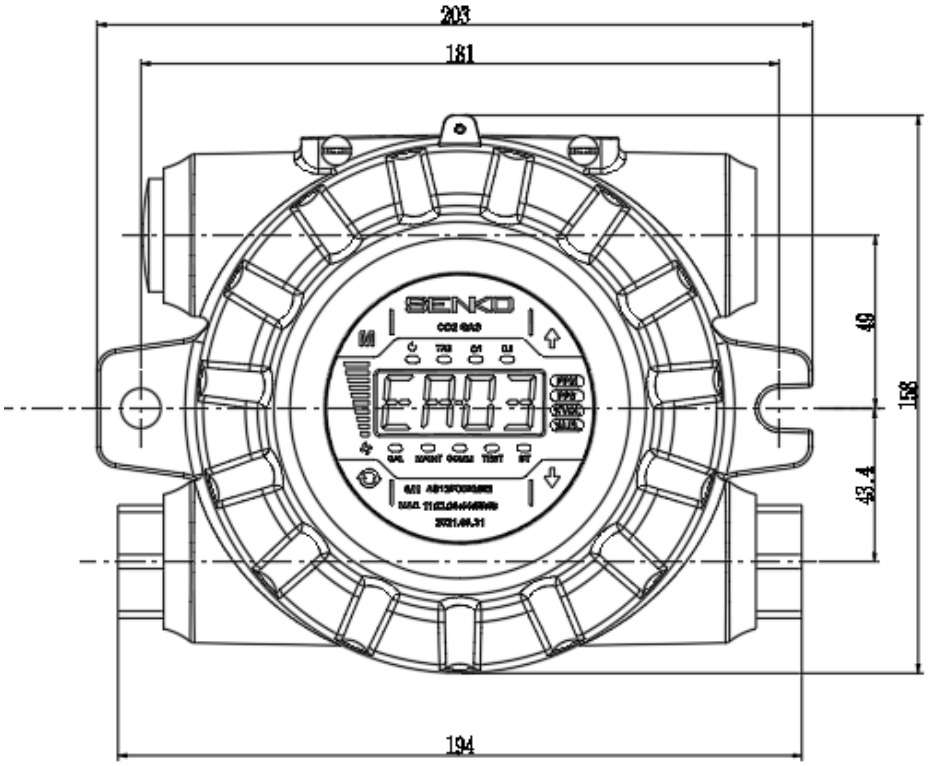
- **4000X Register Write**

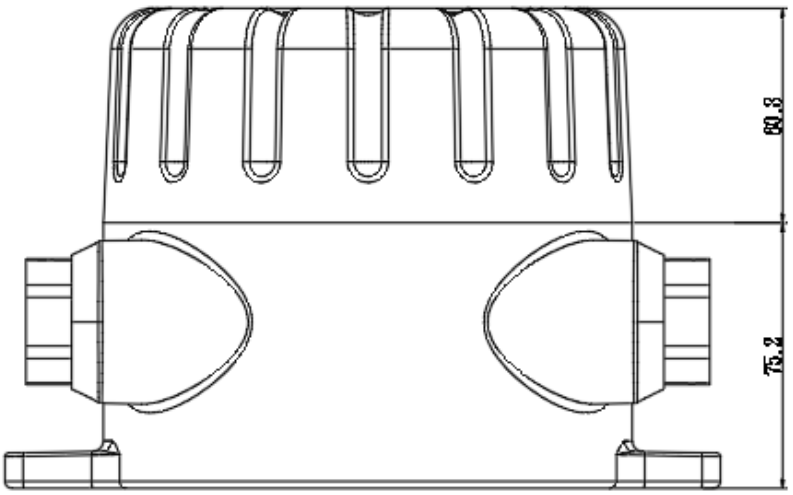
Sortation	Address	Bits	Description
Alarm 1 set value (Real number)	40013	BIT0~15	Real number Alarm 1 set value (Upper 2 bytes)
	40014	BIT0~15	Real number Alarm 1 set value (Lower 2 bytes)
Alarm 2 set value (Real number)	40015	BIT0~15	Real number Alarm 2 set value (Upper 2 bytes)
	40016	BIT0~15	Real number 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 = 301

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

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10. Revised History

No	Clause	Content	Revision	Revised Date
1	First written		Rev 1.0	2021.10.

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