SI-200

Explosion-proof Diffusion Type Gas Detector

USER MANUAL

SI-200E

SI-200A

SENKO

www.senko-detection.com

CONTENTS

⚠ 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.
- Excessive impact to the device may cause malfunction of the sensor or device.
- The alarms are set according to the international standard and must be changed by an authorized expert.

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.
- Specific indication that the flameproof joints are not intended to be repaired.
- For details on the flame paths, the manufacturer shall be contacted.

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, 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 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.

1. Product Overview

1.1. Introduction

SI-200 was developed to prevent unfortunate accidents caused by gas explosions in hazardous places such as plants, gas storages, and factories. When installed in hazardous area, Toxic gas detector SI-200 will regularly and continuously detect the gas leakage and display the data with FND and to supply 4-20mA standard output.

1.2. Key Feature

- Explosion-Proof structure.
- 4-Digit Digital Concentration Indication
- 4-20mA / RS-485

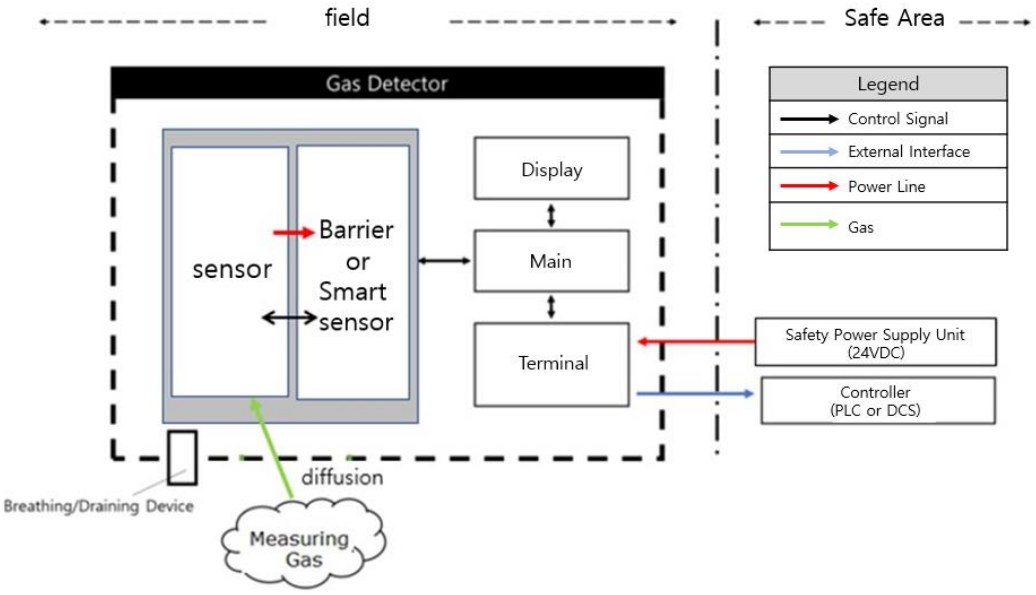
1.3. Specification

Model	SI-200
Measuring Type	Diffusion Type
Dimension	169(W) x 188.5(D) x 107(H)mm
Weight	2.4kg
Measuring Value Display	FND, Gas Concentration, Alarm, Device Faulty
Relay	Low Alarm, High Alarm, Fault Alarm (Rated 2.0A @30Vdc)
Analog Output Signal	4-20mA
Digital Communication	RS-485
Operating Temperature	-40°C ~ +60°C
Control/Set	4 Button & RS485 & Bluetooth
Warranty(Device)	2 years
Warranty(Sensor)	1 year
Remote Interface	RS-485 Modbus, HART(Option)
Wiring	4 to 20mA / DC Power / Relay : up to 14 AWG
Explosion proof	Explosion-proof enclosure
Body Material	Aluminum
Input Voltage	DC : +24Vdc ±10%
Analog Output current	Fault : 0mA, 0~100% : 4~20mA(all readings : ± 0.2mA) Maintenance/Initialize: 3mA
Approval	IECEx : Ex ia IIC T4 Ga / Ex db IIC T6 Gb

1.4. Sensor List

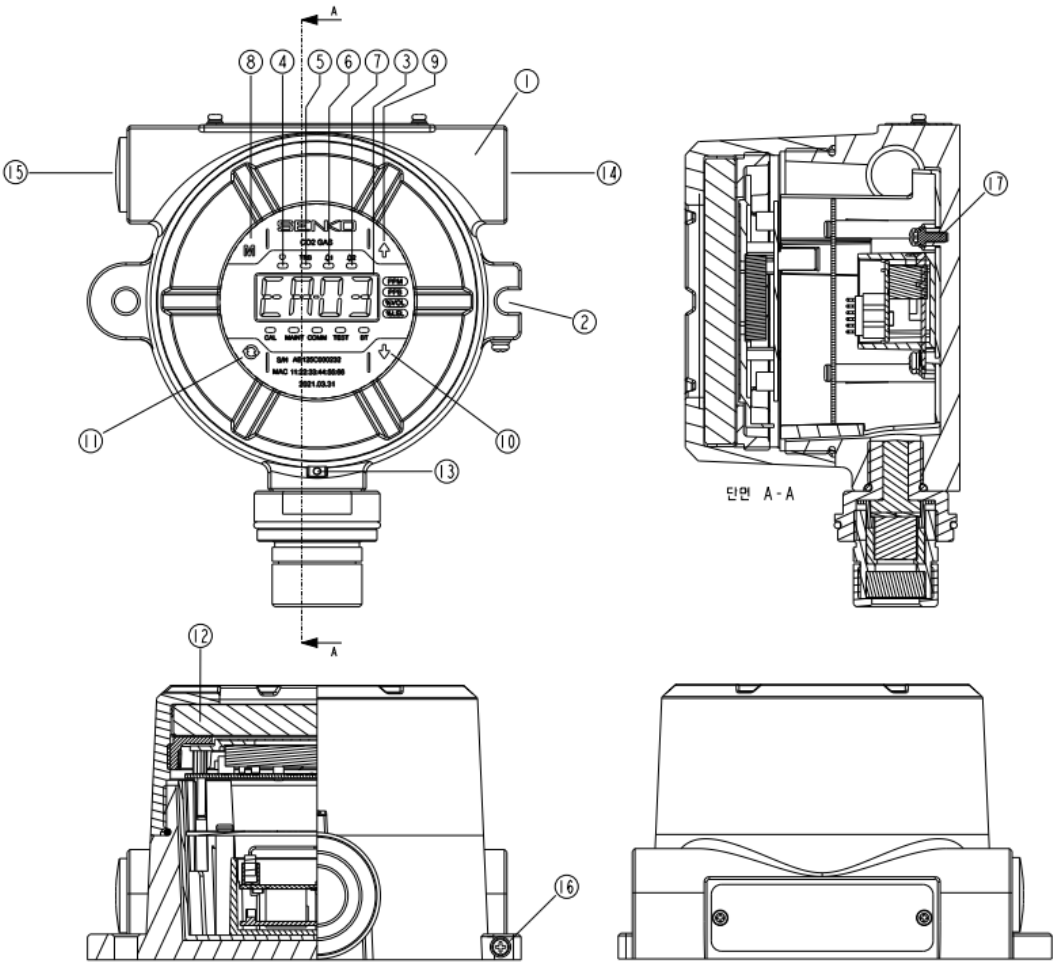
Gas		Sensor	Range	A1	A2	Resolution
Oxygen	O_2	Electrochemical	0~30%Vol	19.0%vol	23.0%vol	0.1%vol
Carbon Monoxide	CO	Electrochemical	0~500ppm 0~2,000ppm(Option)	30ppm	60ppm	1ppm
Sulfur Dioxide	SO_2	Electrochemical	0~20ppm	2ppm	5ppm	0.1ppm
Hydrogen	H_2	Catalytic	0~100%LEL	15%LEL	50%LEL	1%LEL
Hydrogen	H_2	Electrochemical	0~1000ppm	100ppm	500ppm	within 5ppm
Hydrogen Sulfide	H_2S	Electrochemical	0~500ppm	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
Carbon Dioxide	CO_2	IR	0~2000ppm	1000ppm	1500ppm	3ppm
Carbon Dioxide	CO_2	IR	0~5000ppm	3000ppm	5000ppm	8ppm
Carbon Dioxide	CO_2	IR	0~5%Vol	0.5%vol	3%vol	0.1%vol
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

1.5. Outline



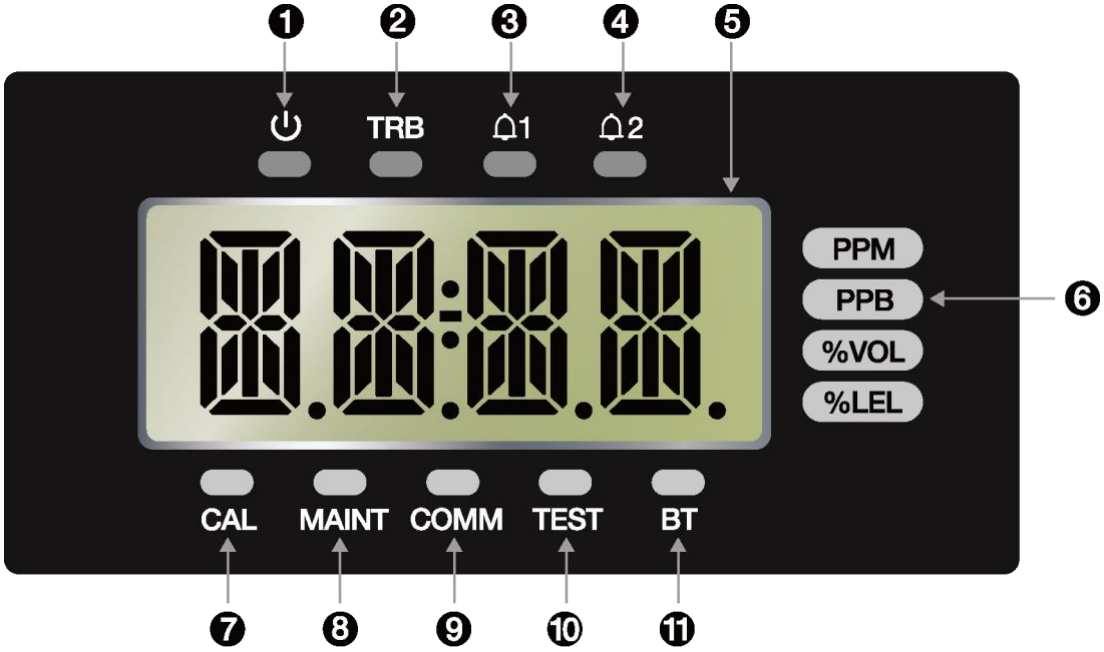
2. Appearance and Description

2.1. Component



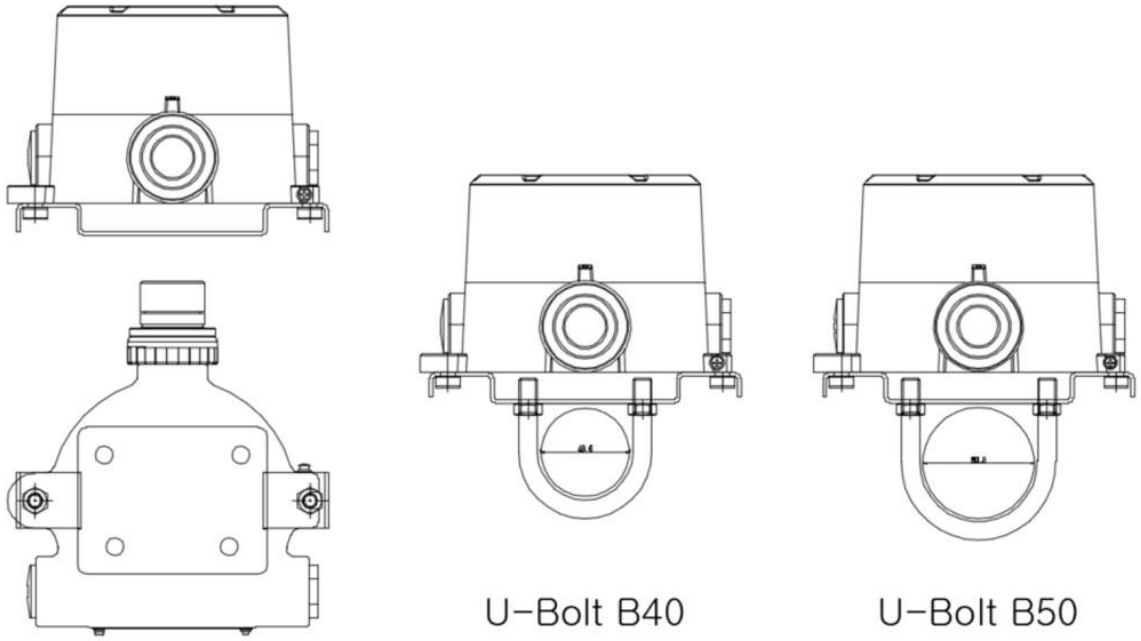
NO	NAME	DESCRIPTIONS
1	Case cover	It protects sensors and PCB boards built into the product from external environmental changes and shocks.
2	Mount Holes	It is a Mounting Hole used to fix the product.
3	FND display	When setting the gas concentration value and parameter measured by the sensor, the set 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 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	Cable gland	It's the entrance to the power and signal cable.
15	Plug	EPG 3/4” / Ex d IIC (IP66), Ex tD A21 IP66
16	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.
17	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.

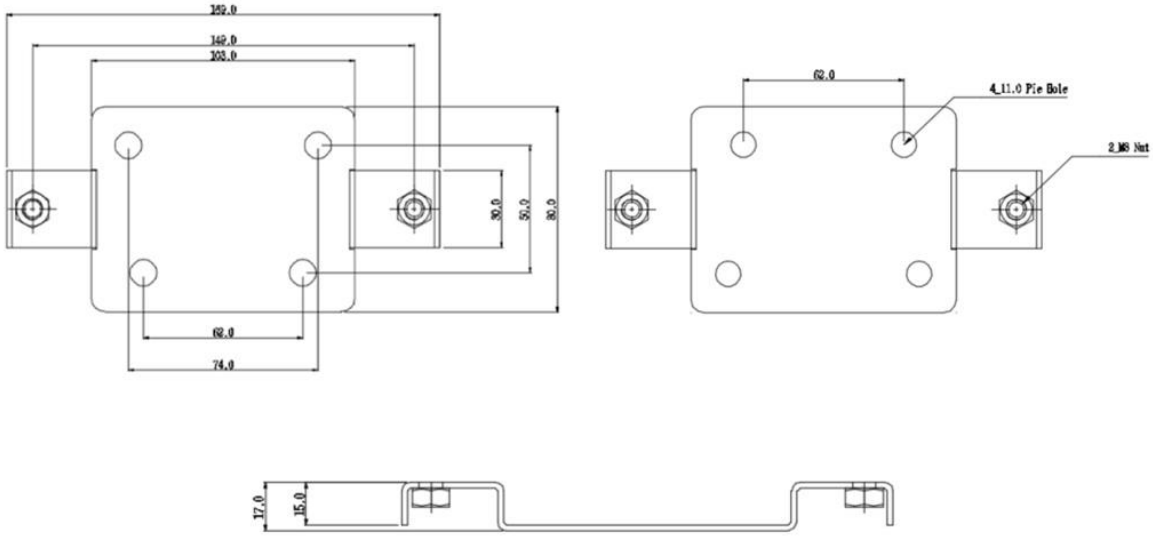
2.2. Front Display Configuration



No	Name	Descriptions
1	Power LED(Green)	When the power (DC 24V) is supplied normally, the LED flashes after lighting.
2	Trouble LED	Displayed when fault detected on gas detector self-diagnosis.
3	Alarm1 LED	Displayed when Alarm1 is set or detected.
4	Alarm2 LED	Displayed when Alarm2 is set or detected.
5	FND DISPLAY	When setting the gas concentration values and parameters measured by the sensor, the setting mode is displayed as a number and icon.
6	Unit LED	Indication of units of measurement concentration.
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.

2.3. Bracket Dimensions





3. How to install

CAUTION

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.

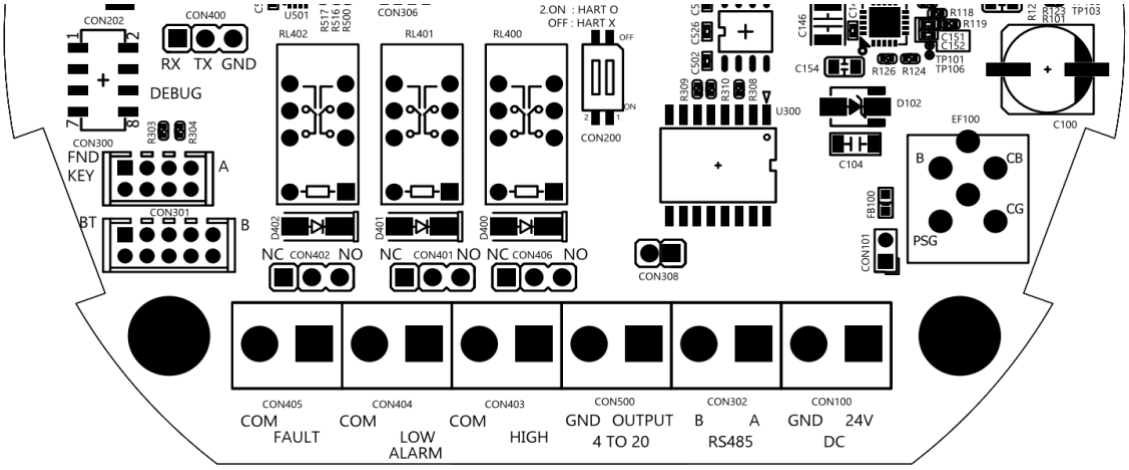
- Installation must be in accordance with the recognized standards of the appropriate authority in the country concerned.
- Access to the interior of the detector, when carrying out any work, must only be conducted by trained personnel.
- Before carrying out any work ensure local regulations and site procedures are followed. Appropriate standards must be followed to maintain the overall certification of the detector.
- To reduce risk of ignition of hazardous atmospheres, conduit runs must have a seal fitting connected within the enclosure.
- To reduce the risk of ignition of hazardous atmosphere, de-classify the area or disconnect the equipment from the supply circuit before opening the detector enclosure. Keep assembly tightly closed during operation.
- Never attempt to open a enclosure in potentially hazardous atmospheres.
- The detector must be earthed for electrical safety and to limit the effects of radio frequency interference. An earth point is provided inside and outside the unit. The internal grounding shall be used as the primary equipment ground. The external terminal is only a supplemental bonding connection where local authorities permit or require such a connection.
- Take care when handling sensors as they may contain corrosive solutions.
- Do not tamper or in any way disassemble the sensor.
- Do not expose to temperatures outside the recommended range.
- Do not expose sensor to organic solvents or flammable liquids.

3.1. Separation of detector body and cover

- The gas detector cover can be removed by turning the cover fixed screw, followed by turning the Cover counterclockwise by hand. After the separation of Cover, the display indicator appears.
- After the cover removal, remove the display part as follows.
  ① Click the left and right retainer rings on the front of the display module inwards at the same time.
  ② While holding, pull the Display Part forward to separate from the Gas detector Body.
  ③ With the Display Part removed, the Main PCB is shown under the Detector Body.

3.2. 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.



3.2.1. DC Terminal

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

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

3.2.2. RS-485 Terminal

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

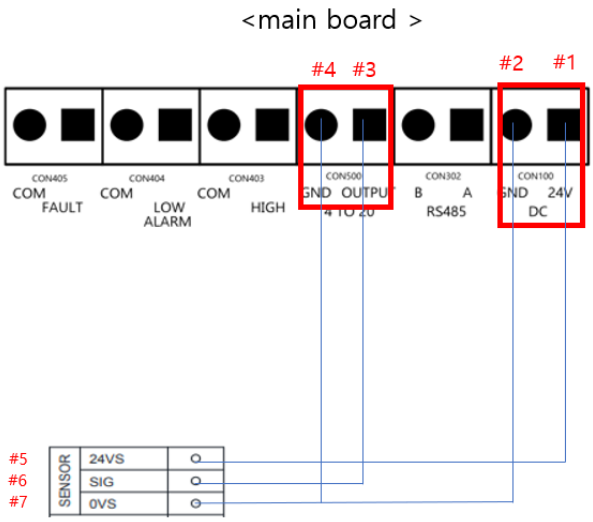
Pin No.	Name	Description
1	B	TRXD-' or 'B or 'N' '
2	A	TRXD+' or 'A or 'P'

3.2.3. 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

3.2.4. 4-20mA wiring method example



main board	Plc
#1(24V)	#5(24VS)
#2(GND)	#7(0VS)
#3(OUTPUT)	#6(SIG)
#4(GND)	#7(0VS)

3.3. Alarm Terminal Configuration

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

3.3.1. Fault Relay Output Configuration

Terminal	Fault Relay Contact	Jumper Setup
FAULT-OUT	Normal Close Mode	CON402 Jumper NC on
	Normal Open Mode	CON402 Jumper NO on
FAULT-COM	Common	

3.3.2. Low Relay Output Configuration

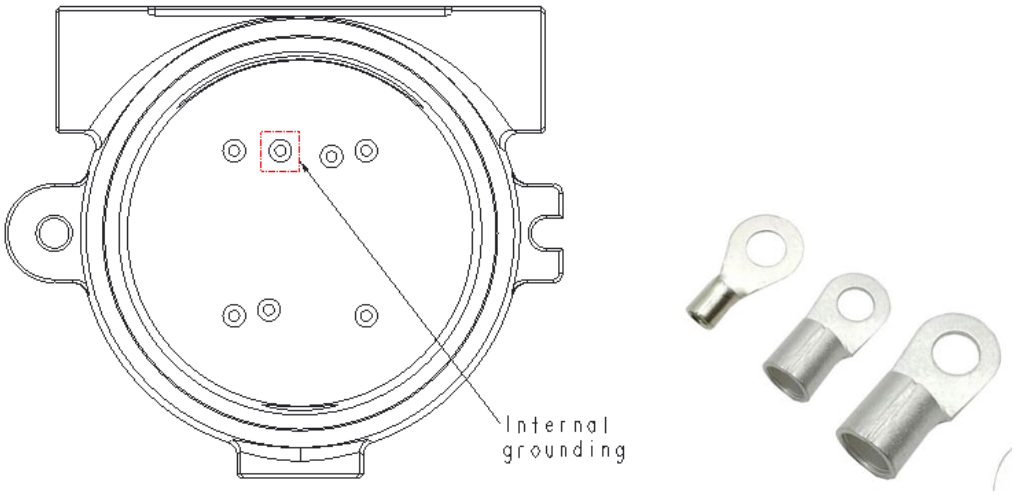
Terminal	Fault Relay Contact	Jumper Setup
AL1-OUT	Normal Close Mode	CON401 Jumper NC on
	Normal Open Mode	CON401 Jumper NO on
AL1-COM	Common	

3.3.3. High Relay Output Configuration

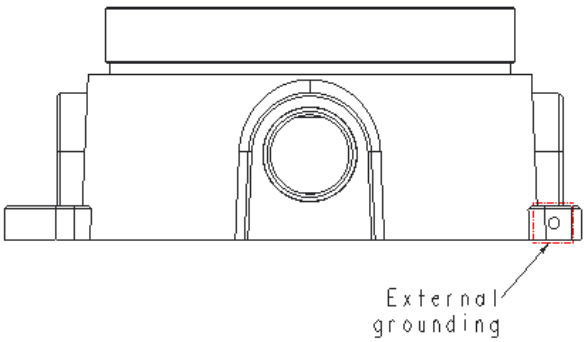
Terminal	Fault Relay Contact	Jumper Setup
AL2-OUT	Normal Close Mode	CON406 Jumper NC on
	Normal Open Mode	CON406 Jumper NO on
AL2-COM	Common	

3.4. 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.



- No two 'Earth Points' should be connected via screen or conduit so as to avoid 'ground loops'.).
- 'Bonded Points' (continuity of screen) may be achieved using appropriate glands or conduit;
- internal and external 'Earth Points' in the transmitter are provided.

When all electrical connections have been made, refit the display module and cover using the procedure below:

① Ensure that none of the wires in the terminal area may cause an obstruction.
② Align the display module plug with the socket on the terminal module.
③ Push the display module firmly, without twisting, until fully home.
④ Refit the cover by screwing clockwise until tight.

4. Operation

4.1. Default Configuration

SI-200 are supplied with a default configuration as shown below. The settings for full scale range, calibration gas level, calibration interval, access password can be changed to suit individual applications.

4.2. Power On

After mounting and wiring the transmitter, the plug-in sensor should be fitted and the installation visually and electrically tested as below

CAUTION

Prior to carrying out any work ensure local and site procedures are followed. The following procedure should be followed carefully and only performed by suitably trained personnel

① Check that the transmitter is wired correctly according to this manual and the associated control equipment manual.

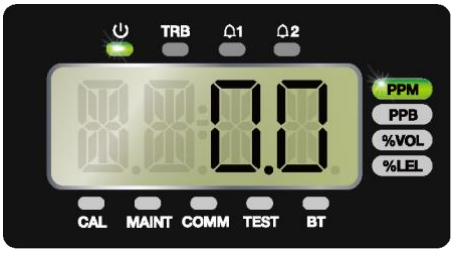
② Plug in the sensor taking care to align the sensor pins with the connector holes in the pcb.

③ check the wiring and power voltage then turn on the power switch.

④ After the Power LED (Green) and Version information (ex V1.00) are displayed, it followed to the Measuring mode.

⑤ 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.

4.3. Measure Mode



Alarm LED

▶Power/Trouble/Alarm 1/Alarm2

Current gas concentration display

Gas concentration unit display

▶Changing a decimal point based on the range

Status LED

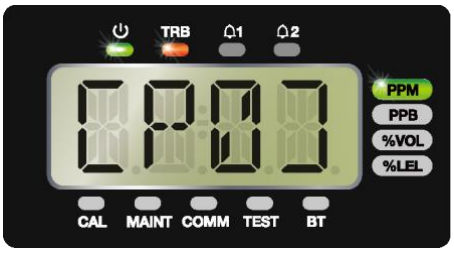
▶CAL: Calibration in progress

▶MAINT: Maintenance in progress

▶COMM: Communication status

▶TEST: Test in progress

▶BR: Bluetooth connection status

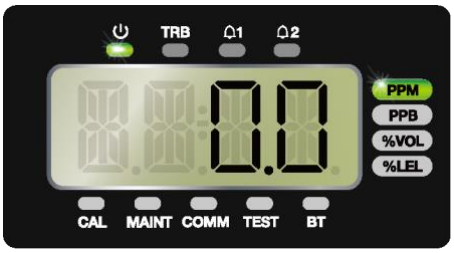


Trouble(Fault) Status

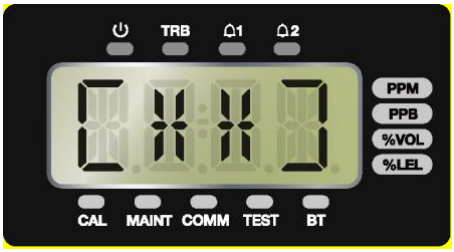
▶Trouble LED lights up when a problem occurs

▶See Error Code 6.1.

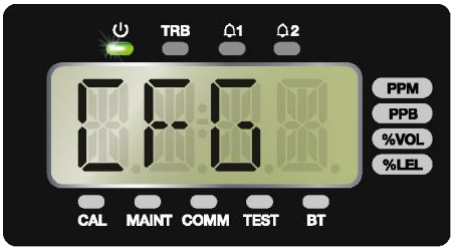
4.4. Internal Settings



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
NETWORK	NET	Ethernet setting	Engineering Mode
ADJUST	ADJ	4-20mA output setting	Engineering Mode
FACTORY	FACT	Factory setting	Engineering Mode

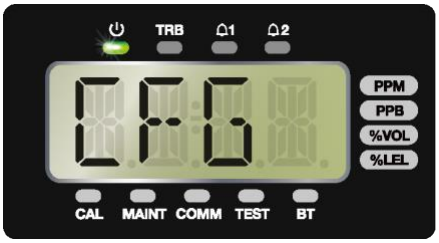
5.2. Menu Configuration

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	-
	ADR(Address)	Modbus Address(0~64)	1
	BAUD(Address)	RS485 Baudrate	9600
	PARI(Parity)	RS485 Parity	NONE
	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	-
	BMAC	BLE MAC ADDRESS	-

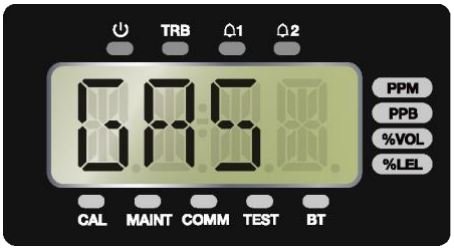
1 Depth	2 Depth	3 Depth	Default
MEAS (Measurement)	DECP(Decimal Point)	Decimal point (1000, 100.0, 10.00, 1.000)	100.0
	F-RN (Full Range 1~9999)	Full measuring range (1~9999)	500.0
	UNIT	Measuring unit (PPB, PPM, VOL%, %LEL)	PPM
CAL (Calibration)	ZERO (Zero Calibration)	Zero Calibration	Based on gas
	S-CN (Span Concentration)	Span Gas Concentration setting (1~9999)	Based on gas
	SPAN (Span Calibration)	Span Calibration	Based on gas
ALM (Alarm)	LACH(Latch)	Alarm Latch(ON, OFF)	OFF
	ENER(Energized)	Alarm Energized(EN, D-EN)	D-EN
	DLY(Delay)	Alarm Delay(0~99 초)	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

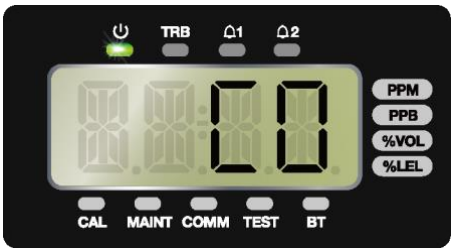
5.3. Setting / Configuration Munu



Internal preferences are configurable with the Up/Down Key.

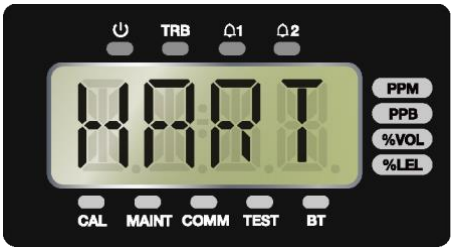
- GAS/HART/ADR/BAUD/PARI/PWD/ C-TM/HIDNBRIT/M1.00/S1.00/EMAC/BMAC

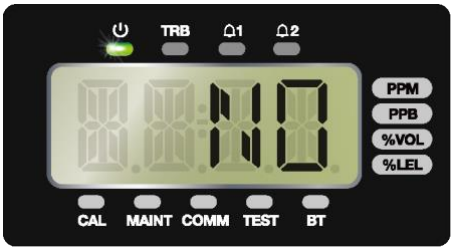




Gas Type

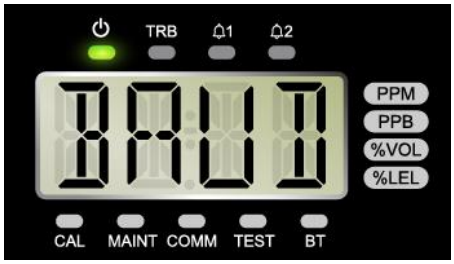
▶Press the Select Key, the current gas type is displayed.





HART Option

▶ Press the Select Key, you can check whether including HART option.

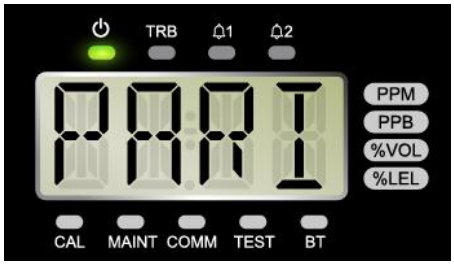


Change BAUD rate

▶Press the Select Key to get into the change option.

▶Select 1200 / 9600 / 19.2K / 38.4K with the Up / Down Key, and press the select key.

▶Changed option will be applied after turning off and on.

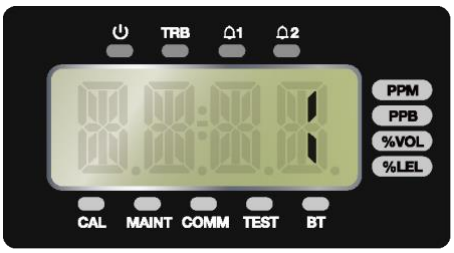


Change Parity

▶Press the Select Key to get into the change option.

▶Select NONE/ EVEN / ODD with the Up / Down Key, and press the select key.

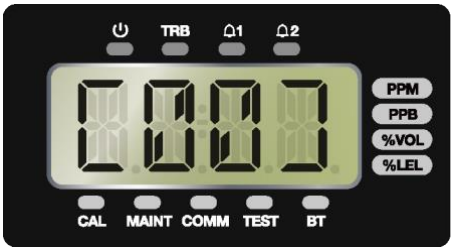
▶Changed option will be applied after turning off and on.



Change Modbus Address

▶Press the Select Key to get into the change option.

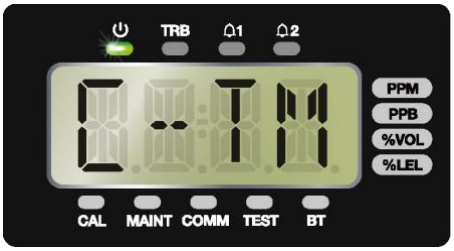
▶Select from 1 to 64 with the Up/Down Key, and press the select key.

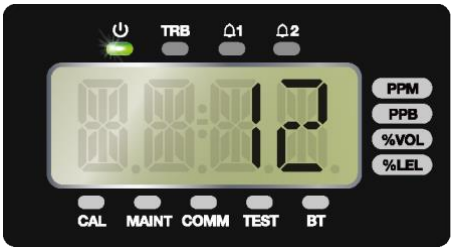


Change Password

▶Press the Select Key to get into the change option.

▶Select from 0 to 99 with the Up/Down Key, and press the Select Key.

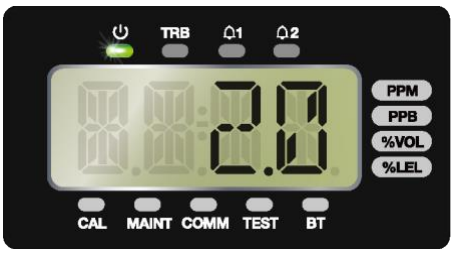




Change Calibration Period

▶Press the Select Key to get into the change option.

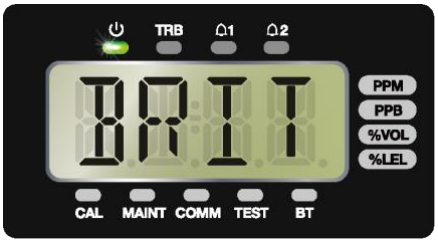
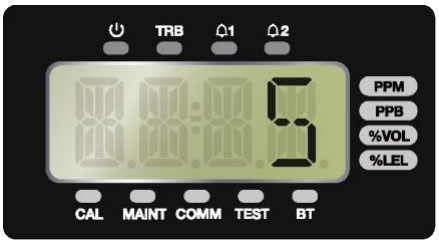
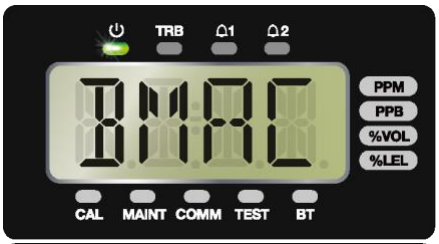
▶Select from 1 to 12 with the Up/Down Key, and press the Select Key.



Change Hidden Area

▶Press the Select Key to get into the change option.

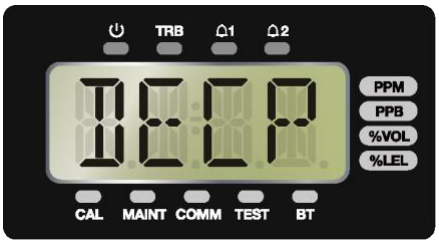
▶Select from 0 to 20% with the Up/Down Key, and press the Select Key.

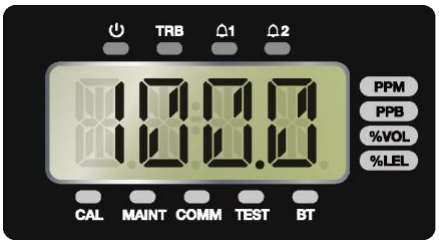
 	**Change Brightness** ▶Press the Select Key to get into the change option. ▶Select from 1 to 15 with the Up/Down Key, and press the Select Key.
	**Device version**
	**Sensor cartridge version**
 	**BLE MAC ADDRESS**

5.4. Setting / Measurement Menu

You can change the detection settings list with the Up/Down key.

- DECP/F-RN/UNIT

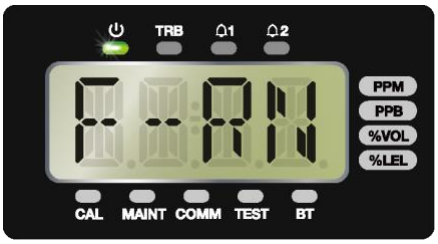


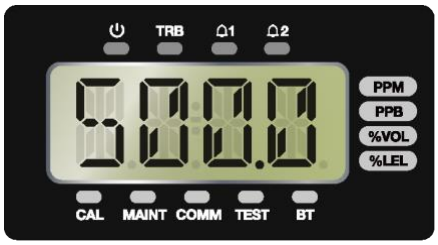


Change Decimal Point

▶Press the Select Key to get into the change option.

▶Select from 1.000 to 1000 with the Up / Down Key, and press the select key.

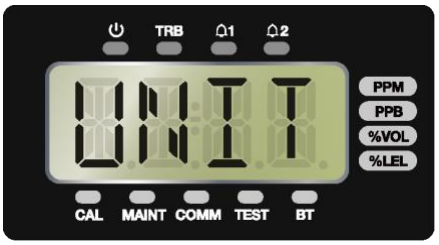


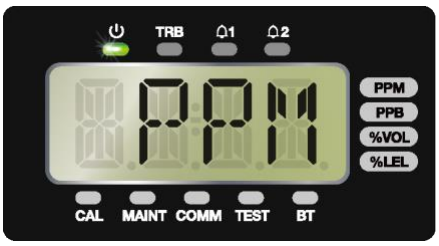


Change Full Range

▶Press the Select Key to get into the change option.

▶Select from 1 to 9999 with the Up / Down Key, and press the select key.



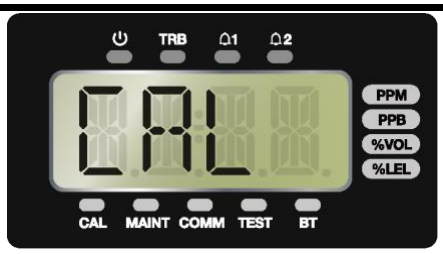


Change Gas Unit

▶Press the Select Key to get into the change option.

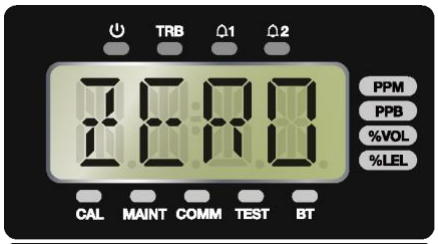
▶Select among PPM / PPB / VOL / LEL with the Up/Down Key, and press the select key.

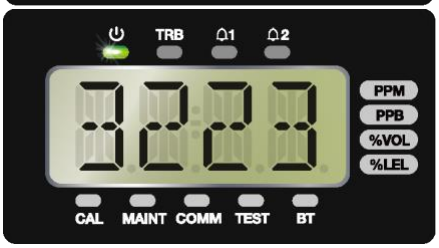
5.5. Setting / Calibration Menu



You can change the calibration settings list with the Up/Down key.

- ZERO/S-CN/SPAN



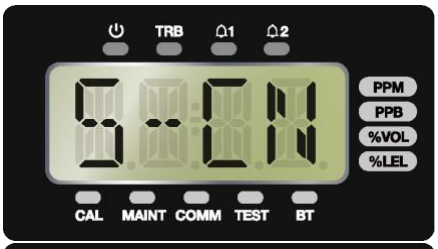


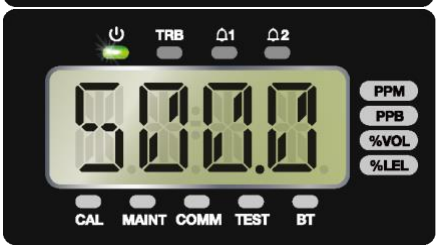
Zero Calibration

▶Press the Select Key to get into the change option.

▶Value indicates by a blink in the screen.

▶Zero calibration with the Select Key.

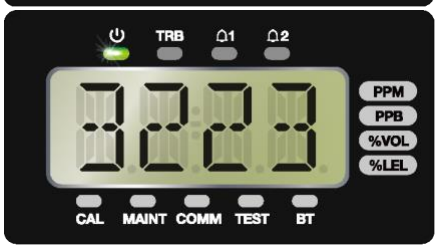




Change Span Concentration

▶Press the Select Key to get into the change option.

▶Select from 1 to 9999 with the Up / Down Key, and press the select key.



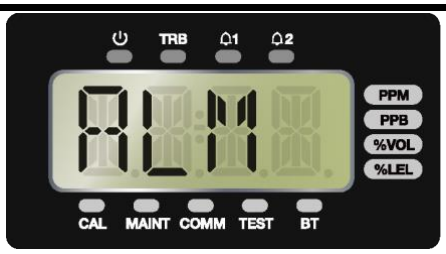
Span Calibration

▶Press the Select Key to get into the change option.

▶Value indicates by a blink in the screen.

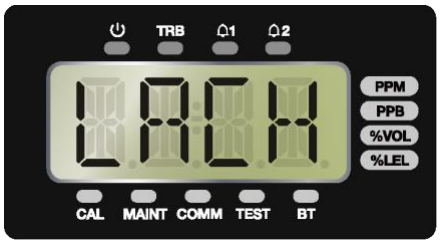
▶Span calibration with the Select Key.

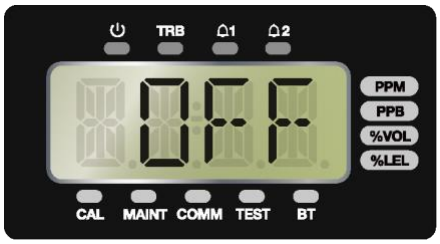
5.6. Setting / Alarm Menu



You can change the alarm settings list with the Up/Down key.

- LACH/ENER/DLY/ALM1/ALM2

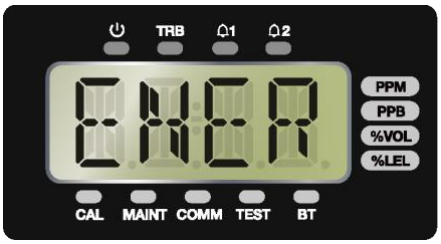


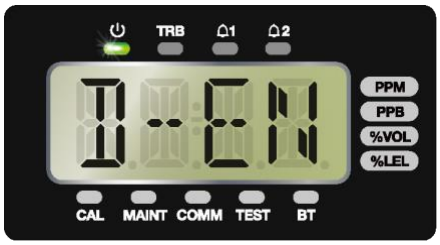


Change Alarm Latch

▶Press the Select Key to get into the change option.

▶Select between on and off with the Up/Down Key, and press the Select Key.

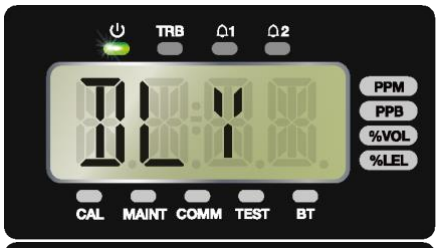


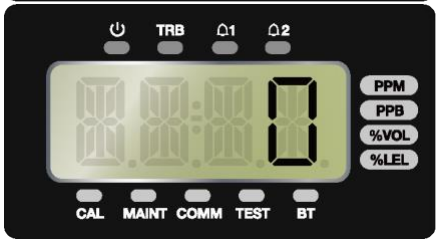


Change Alarm Energized

▶Press the Select Key to get into the change option.

▶Select between D-EN and EN with the Up/Down Key, and press the select key.

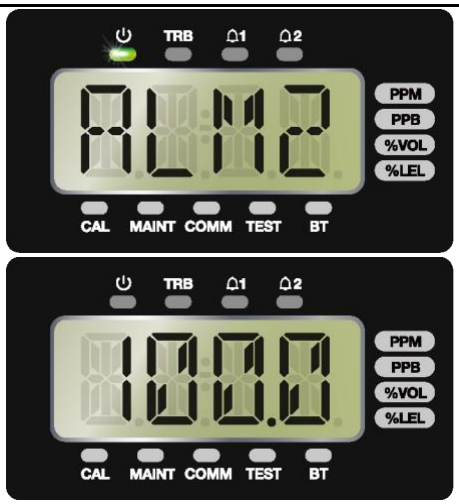




Change Alarm Delay

▶Press the Select Key to get into the change option.

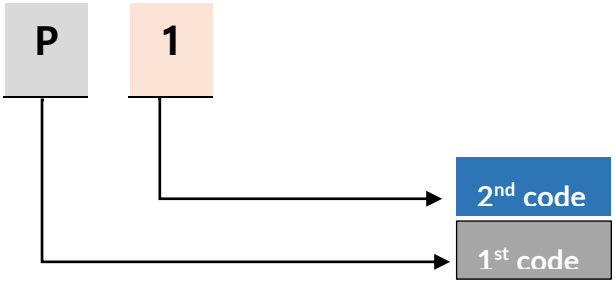
▶Select from 1 to 99 with the Up/Down Key, and press the Select Key.

	**Change Alarm 1 Level** ▶Press the Select Key to get into the change option. ▶Select from 1 to 9999 with the Up/Down Key, and press the Select Key.
	**Change Alarm 1 Level** ▶Press the Select Key to get into the change option. ▶Select from 1 to 9999 with the Up/Down Key, and press the Select Key.

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	Initialization fail of MODBUS	Change the MAIN Board
7	S	0	Smart Sensor Communication Failure	Check or replace the Smart Sensor connector
8	S	1	Receive abnormal data from Smart Sensor	Check or replace the Smart Sensor connector
9	S	2	Smart Sensor Life Expired	Replace the Smart Sensor connector
10	S	3	Smart Sensor concentration is abnormally low	Check or replace the Smart Sensor assembly status
11	S	4	Smart Sensor concentration is abnormally high	Check or replace the Smart Sensor assembly status
12	S	5	Sensor internal Error	Check or replace the Sensor inside Smart Sensor
13	D	0	4-20mA DAC not connected	Replace MAIN Board or check DAC connection
14	D	1	4-20mA DAC Error	Replace the MAIN board or check the DAC connection
15	R	0	RS485 is malfunctioning	Check the RS485 connection

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. Modbus RS485 / TCP Register

7.2.1. 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)

7.2.2. 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
			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)
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
		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 Sortation Monitoring Status	40031	BIT0~7	Detector Serial Number 1/10
		BIT8~15	Detector Serial Number 2/10
	40032	BIT0~7	Detector Serial Number 3/10
	Address	Bits	Description
	40001	BIT0~3	0: Warmup
		BIT8~15	1: Measure Mode
	40034	BIT0~7	2: Inhibit Alarm
		BIT8~15	3: Inhibit Alarm/Fault
	40035	BIT0~7	4: Inhibit Full
		BIT8~15	5: Reserved
Sensor Serial Number	40036	BIT0~7	6: Test Mode
		BIT8~15	7: 4-20mA Calibration Mode
	40037	BIT8~15	9-15: Reserved
	40038	BIT4	Fault Active Status
		BIT5	Reserved
	40039	BIT6	Alarm 1 Active
		BIT7	Alarm 2 Active
	40040	BIT8	Alarm 1 Relay energized
		BIT9	Alarm 2 Relay energized

7.2.3. 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 102 = 25
- To set Alarm at 30.0ppm when decimal point is 1, set 30.0 X 101 = 300

8. Maintenance

WARNING

- Appropriate standards must be followed to maintain the specified operation of the detector.
- It is recommended to bump test the sensors frequently to ensure proper operation.

8.1. Function Gas Test

It is essential that the sensor is tested frequently to be sure the system is operating properly. Typically gas detectors should be tested at least twice per year. However it is recommended that testing is conducted on a more frequent basis after initial start up as sensor operation and performance will vary in different environmental conditions and in the presence of other gases. It is the responsibility of the user to determine an appropriate calibration frequency for the application. It is the responsibility of the user to ensure suitability of this method for each application.

8.2. Detector Operational Life

Typical life of a toxic gas sensor is dependant on the application, frequency and amount of gas exposure.

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. Caution before installation

Rain shall be avoided because it can be an electrical problem, and accessibility should be considered for periodic maintenance before installation. Vibration or shock shall be avoided since it may affect the output value. sensor shall face the direction of gravity when installed.

- This device has high pressure explosion-proof structure; belongs to group II targeting gas and steam from general workplaces and plants
- The ambient temperature shall be in the range of -20 ℃ ~ 60 ℃.
- Relative Humidity: 5-95%
- Installation place: indoors or outdoors
- The wire conduit shall be sealed to prevent the gas moving or the explosion flame propagation
- through the conduit under 50mm when the explosion-proof cable gland is used at the cable inlet or when metal conduit is used in wiring works.

9.4. A/S Contact Information

- Address: 445, Doksanseong-ro, Osan-si, Gyeonggi-do, Rep of Korea, 18111
- Tel: 031-492-0445
- Web: https://www.senko.co.kr/

10. Certification

10.1. Related Standards

- IEC 60079-0:2017
- IEC 60079-1:2014
- IEC 60079-11:2011

11. Revised History

No	Clause	Content	Document NO.	Revision	Revised Date
1	First written		1862SI-200B1020-D200	Rev 1.0	2022.06.14
2	Update	Content Update		Rev 2.0	2024.04.16

SENKO CO., LTD

www.senko.co.kr
senko@senko.co.kr